13022 - Staring into the Beasts' Lair: HST Observations of the Host Galaxies of Pan-STARRS Ultra-luminous Supernovae

Cycle: 20, Proposal Category: GO

(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) PS1-10AWH	ACS/WFC	1	03-Jul-2012 23:11:58.0	yes
02	(2) PS1-10KY	ACS/WFC	1	03-Jul-2012 23:12:05.0	yes
03	(3) PS1-10PM	ACS/WFC	1	03-Jul-2012 23:12:11.0	yes
04	(4) PS1-11TT	ACS/WFC	1	03-Jul-2012 23:12:16.0	yes
05	(5) PS1-11AFV	ACS/WFC	1	03-Jul-2012 23:12:21.0	yes
06	(3) PS1-10PM	WFC3/IR	1	03-Jul-2012 23:12:27.0	yes
07	(4) PS1-11TT	WFC3/IR	1	03-Jul-2012 23:12:32.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
08	(5) PS1-11AFV	WFC3/IR	1	03-Jul-2012 23:12:37.0	yes

8 Total Orbits Used

ABSTRACT

The advent of wide-field optical time-domain surveys is providing an opportunity to discover and decipher new classes of astronomical transient phenomena. One of the most unexpected results from Pan-STARRS and other time-domain surveys is the discovery of ultra-luminous supernovae (ULSNe), with bolometric luminosities
up to 100 times higher than normal core-collapse and Type Ia supernovae (SNe), and with spectra that do not match known SN classes. These ULSNe represent a new challenge to our understanding of the deaths of massive stars, the standard core-collapse picture, and the mechanism for powering optical emission in SNe. Progress in our understanding of these mysterious explosions requires detailed studies of their light curves and spectra (available from our Pan-STARRS data and follow-up), and studies of their galactic and sub-galactic environments - the focus of this HST proposal. Here we propose rest-frame UV and optical observations of 5 Pan-STARRS ULSNe at z~1-1.5, whose hosts remain undetected from the ground to limits of r,i~25 mag. The observations will reach about 0.02 L* in the UV/optical (SFR~0.2 Msun/yr and M*~10^9 Msun), comparable to the least luminous hosts of GRBs and SNe. Taking advantage of HST's angular resolution we will also study the locations of the ULSNe relative to their host UV light distribution as a probe of the progenitor population (similar studies of GRBs and core-collapse SNe suggest distinct types of massive star progenitors). Thus, with a modest allocation of 8 HST orbits (combined with existing data on the transients from Pan-STARRS), we will begin to address one of the key new mysteries in time-domain astrophysics.

OBSERVING DESCRIPTION

Our targets are five ULSN host galaxies, at redshifts 0.9-1.4, that are undetected from the ground to a limit r,i>25 mag. We aim to image each target in two filters, corresponding to rest-frame UV and optical emission.

Two of our targets are at redshift ~0.9, and we use ACS/WFC F606W and F850LP as our two filters, fit into a single orbit for each target, doing a two-point dither in each filter. Our remaining three targets are at slightly higher redshifts (1.2-1.4), and so we do one orbit with ACS/WFC F606W to get rest-frame UV, and one orbit with WFC3/IR F110W to get the rest-frame optical, using a standard box dither pattern for each for optimal PSF subsampling.

Visit

Proposal 13022, Visit 01

Wed Jul 04 03:12:43 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1), (2)

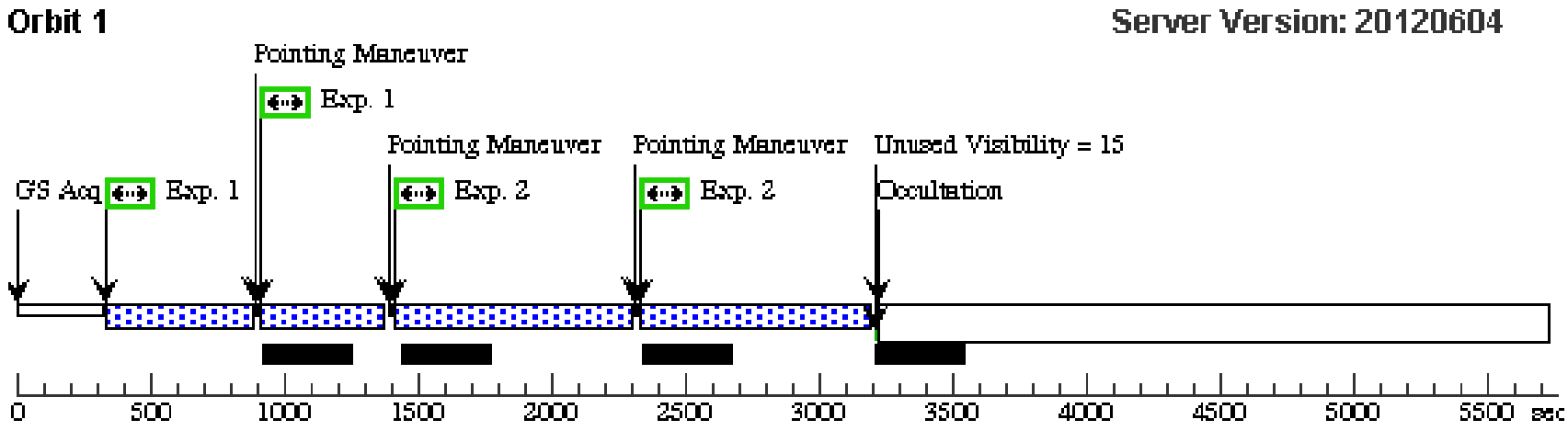
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PS1-10AWH	RA: 22 14 29.8310 (333.6242958d) Dec: -00 04 3.62 (-.06767d) Equinox: J2000	Redshift: 0.909	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) PS1-10AWH	ACS/WFC, ACCUM, WFC1-CTE	F606W			Pattern 2, Exps 1-1 in Visit 01 (2)	340 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*
2		(1) PS1-10AWH	ACS/WFC, ACCUM, WFC1-CTE	F850LP			Pattern 2, Exps 2-2 in Visit 01 (2)	740 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 13022, Visit 02 Wed Jul 04 03:12:45 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1), (2)

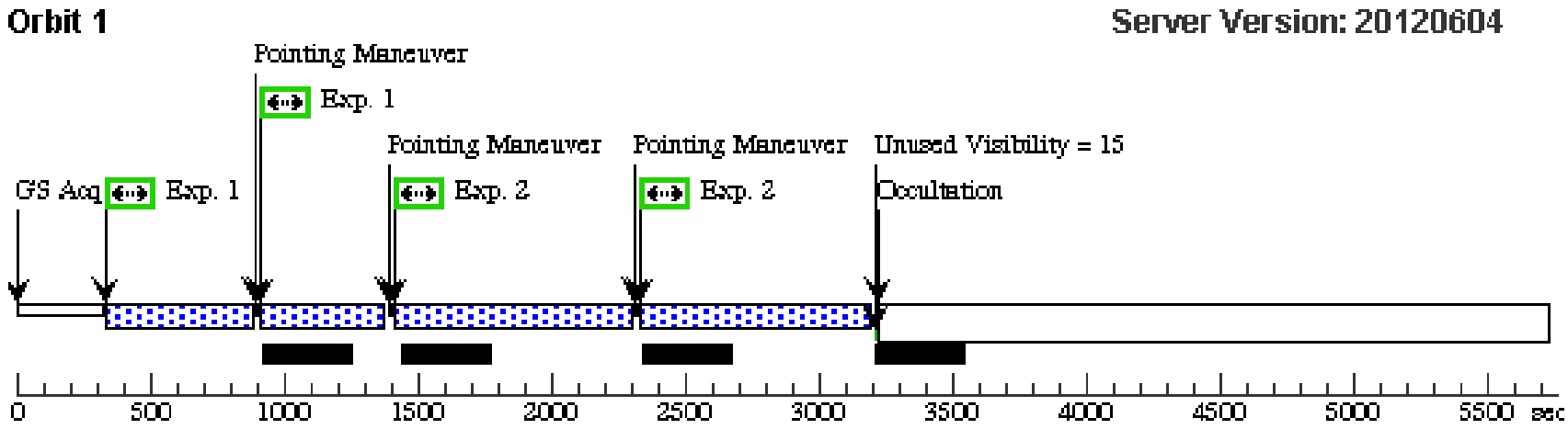
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	PS1-10KY	RA: 22 13 37.8510 (333.4077125d) Dec: +01 14 23.57 (1.23988d) Equinox: J2000	Redshift: 0.956	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) PS1-10KY	ACS/WFC, ACCUM, WFC1-CTE	F606W			Pattern 2, Exps 1-1 in Visit 02 (2)	340 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*
2		(2) PS1-10KY	ACS/WFC, ACCUM, WFC1-CTE	F850LP			Pattern 2, Exps 2-2 in Visit 02 (2)	740 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 13022, Visit 03 Wed Jul 04 03:12:46 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.264 Line Spacing=0.185	Coordinate Frame=POS-TARG Pattern Orientation=20.86 Angle Between Sides=69.07 Center Pattern=false		(1)

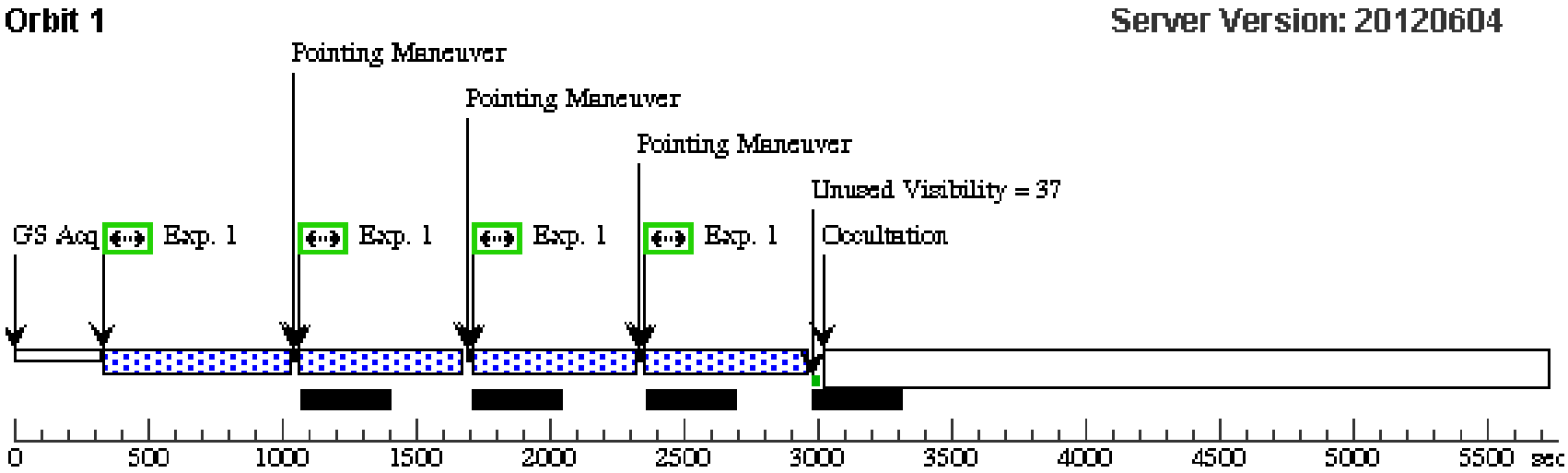
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	PS1-10PM	RA: 12 12 42.2000 (183.1758333d) Dec: +46 59 29.48 (46.99152d) Equinox: J2000	Redshift: 1.2	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(3) PS1-10PM	ACS/WFC, ACCUM, WFC1-CTE	F606W			Pattern 1, Exps 1-1 in Visit 03 (1)	490 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 13022, Visit 04 Wed Jul 04 03:12:47 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.264 Line Spacing=0.185	Coordinate Frame=POS-TARG Pattern Orientation=20.86 Angle Between Sides=69.07 Center Pattern=false		(1)

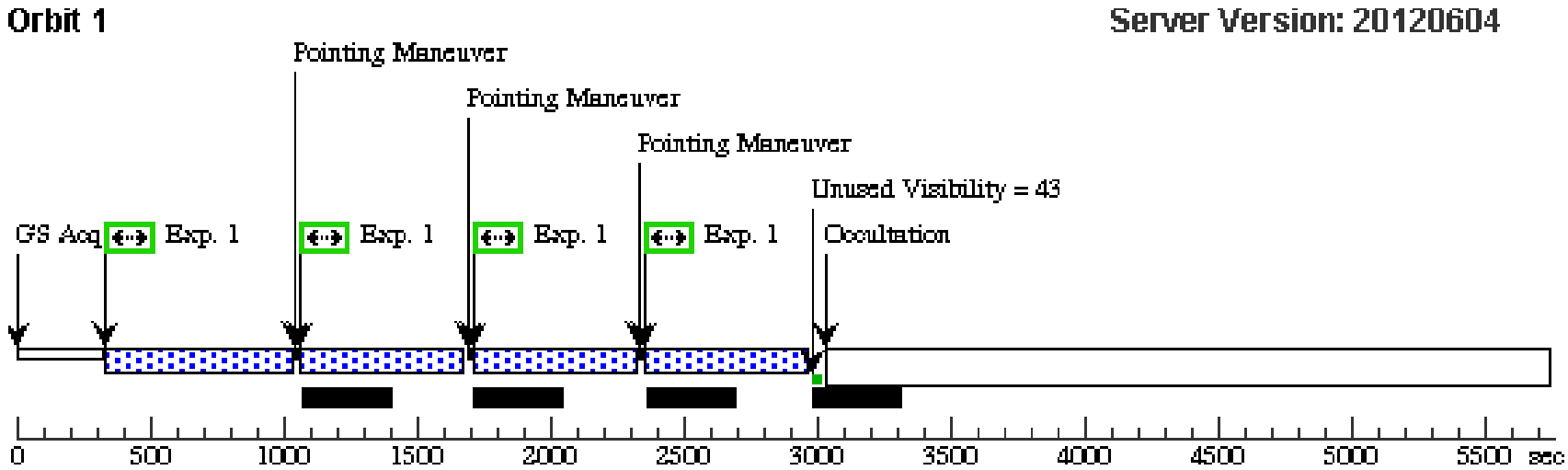
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	PS1-11TT	RA: 16 12 45.7780 (243.1907417d) Dec: +54 04 16.96 (54.07138d) Equinox: J2000	Redshift: 1.283	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) PS1-11TT	ACS/WFC, ACCUM, WFC1-CTE	F606W			Pattern 1, Exps 1-1 in Visit 04 (1)	490 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 13022, Visit 05 Wed Jul 04 03:12:50 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.264 Line Spacing=0.185	Coordinate Frame=POS-TARG Pattern Orientation=20.86 Angle Between Sides=69.07 Center Pattern=false		(1)

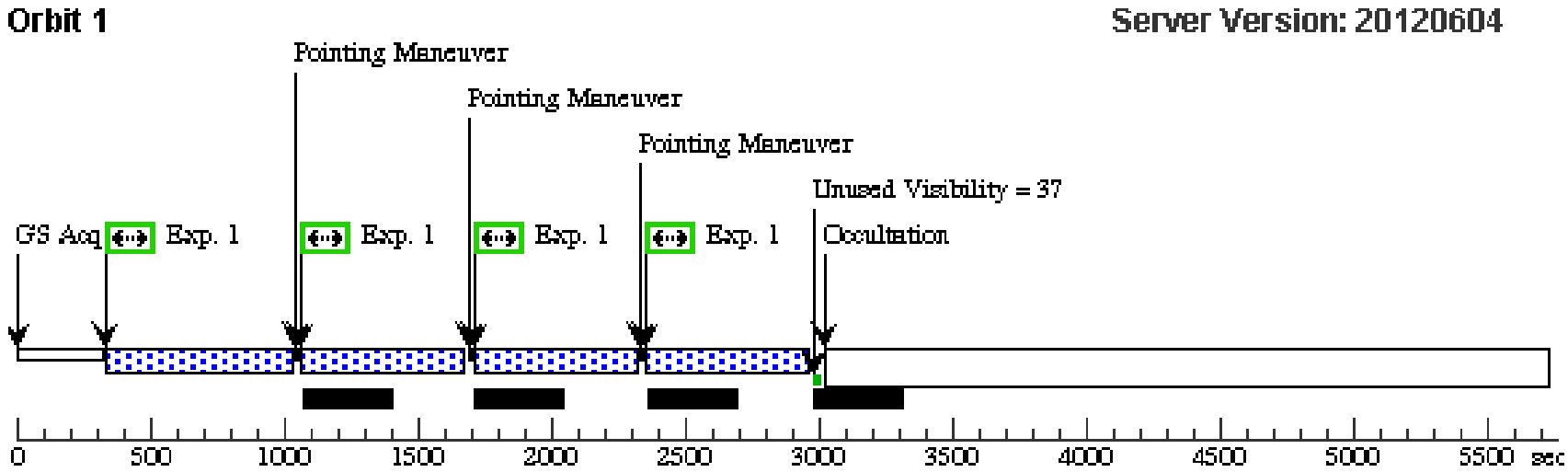
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	PS1-11AFV	RA: 12 15 37.7700 (183.9073750d) Dec: +48 10 48.62 (48.18017d) Equinox: J2000	Redshift: 1.407	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(5) PS1-11AFV	ACS/WFC, ACCUM, WFC1-CTE	F606W			Pattern 1, Exps 1-1 in Visit 05 (1)	490 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 13022, Visit 06 Wed Jul 04 03:12:51 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

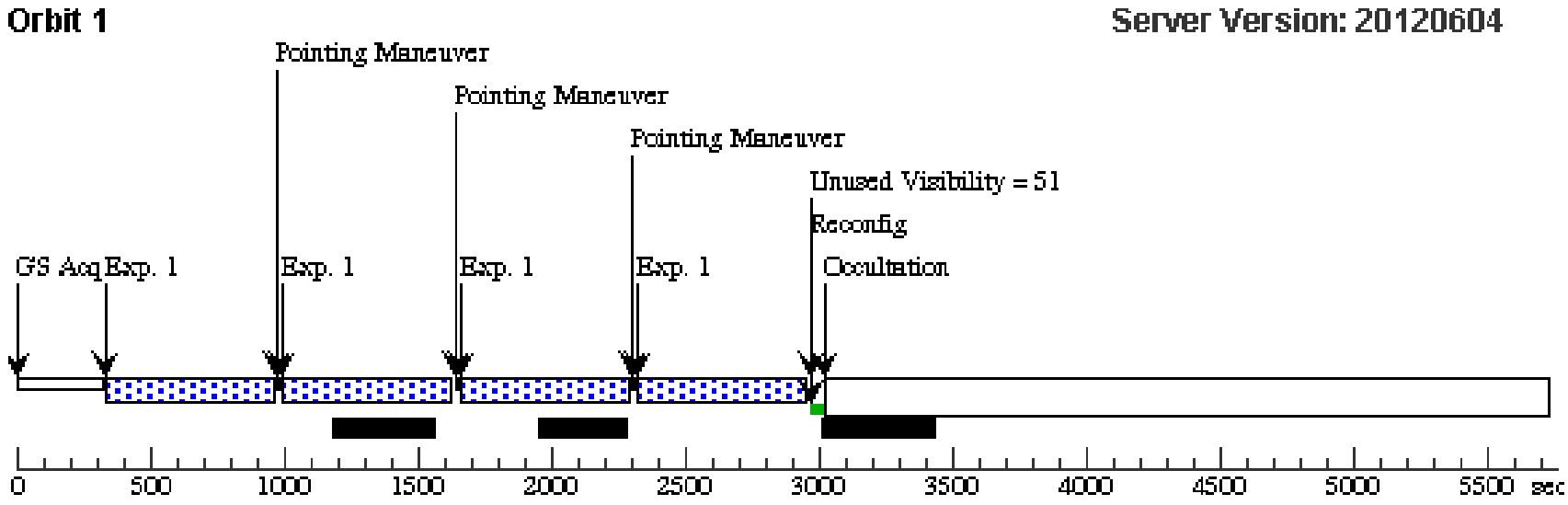
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	PS1-10PM	RA: 12 12 42.2000 (183.1758333d) Dec: +46 59 29.48 (46.99152d) Equinox: J2000	Redshift: 1.2	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(3) PS1-10PM	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=13		Pattern 3, Exps 1-1 in Visit 06 (3)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13022, Visit 07 Wed Jul 04 03:12:52 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

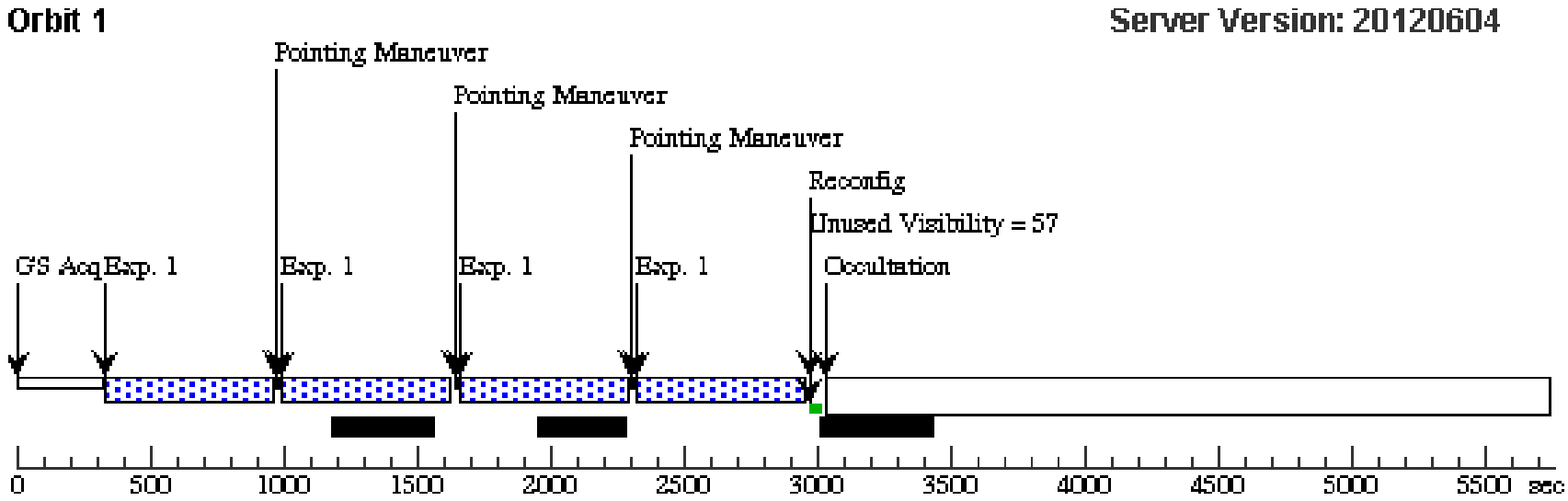
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	PS1-11TT	RA: 16 12 45.7780 (243.1907417d) Dec: +54 04 16.96 (54.07138d) Equinox: J2000	Redshift: 1.283	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) PS1-11TT	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=13		Pattern 3, Exps 1-1 in Visit 07 (3)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13022, Visit 08 Wed Jul 04 03:12:53 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	PS1-11AFV	RA: 12 15 37.7700 (183.9073750d) Dec: +48 10 48.62 (48.18017d) Equinox: J2000	Redshift: 1.407	V=(?) r>25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(5) PS1-11AFV	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=SPARS50; NSAMP=13		Pattern 3, Exps 1-1 in Visit 08 (3)	*[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure