13422 - Riding the wake of a cluster merger: star formation, filaments and turbulence

Cycle: 21, Proposal Category: GO

(Availability Mode: SUPPORTED)

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(1) ABELL2146-BCG ANY	ACS/WFC WFC3/UVIS	1	28-Jan-2014 21:14:17.0	yes
05	(1) ABELL2146-BCG ANY	ACS/WFC WFC3/UVIS	1	28-Jan-2014 21:14:28.0	yes
06	(1) ABELL2146-BCG ANY	ACS/WFC WFC3/UVIS	1	28-Jan-2014 21:14:38.0	yes
07	(1) ABELL2146-BCG ANY	ACS/WFC WFC3/UVIS	1	28-Jan-2014 21:14:46.0	yes

4 Total Orbits Used

ABSTRACT

In hierarchical structure formation, galaxy clusters form via gravitational infall and mergers with subclusters, which have a dramatic impact on the properties of both the intracluster medium and the cluster galaxies. Studies of these exciting objects can constrain gas properties and structure evolution. Using Chandra X-ray observations, we have recently discovered the spectacular merging cluster Abell 2146, which has two large Mach ~2 shock fronts and a similar gas structure to the Bullet cluster. The subcluster contains a ram pressure stripped dense X-ray core of gas which shows signs of both turbulent disruption and also stabilization by magnetic fields. The brightest cluster galaxy is unique in that it is located in the wake of this disintegrating core and our OASIS IFU observations have uncovered an ordered plume of H-alpha-emitting gas coincident with the coolest and densest X-ray material trailing from the core onto the BCG. We will obtain HST/WFC3/UVIS observations to resolve this H-alpha tail and to examine the young star formation. These observations will allow us to investigate gas transport properties in the intracluster medium and to probe the separate evolution of the X-ray cool core and the BCG. These observations will also enable us to investigate the effect of the merger enviroment on star formation in the Abell 2146 member galaxies.

OBSERVING DESCRIPTION

We will obtain primary observations in WFC3/UVIS F845M, F850LP and F275W filters of the Abell 2146 primary cluster and subcluster. We will use 4 orbits in total: two in F845M, and one in each of F850LP and F275W. The field-of-view is sufficiently large that we require only one pointing per filter (the same pointing in each). We will supplement our primary observations with parallel exposures of the primary cluster in the ACS/WFC F814W, F606W and F435W filters. The F814W filter will be employed for two orbits with one in each of the F606W and F435W filters.

Our OASIS spectrum shows the surface brightness of the emission line plume is 1e-16 ergs/cm2/s/arcsec2 in [N II]6583 emission; the H alpha surface brightness is comparable to this. The plume is not resolved in the OASIS image and so we expect the intrinsic surface brightness to be higher. Using the ETC (version 21.1) we modeled the spectrum as that of an elliptical galaxy with the three emission lines of H alpha+[N II]. Assuming E(B-V) of 0.0295, the signal-to-noise in the emission lines (two orbits with F845M and one with F850LP) after subtraction of the continuum using the F850LP filter and scaling by the filter widths is 9 per square arcsecond. In the UV (F275W) filter the WFC3/UVIS ETC (version 21.1) indicates we will achieve a signal-to-noise ratio greater than 5 for a 25 magnitude point source with an O-star spectrum in a 0.2 arcsec radius circular aperture in one orbit.

To better sample the psf we will employ the WFC3-UVIS-DITHER-BOX pattern for these observations which will result in four exposures per orbit resulting in 16 primary and 16 parallel exposures in total in the four orbits. The exposures require being at the same orient but do not need to be taken at the same time so have been arranged in separate visits. Exposures of 705 seconds in each of the WFC3 filters and of 580 seconds in the ACS filters efficiently fill the orbits.

ADDITIONAL COMMENTS

We request to fine-tune our target pointing once the observations are scheduled.

Visit

Proposal 13422, F275W_exposures (04), implementation Wed Jan 29 02:14:56 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 80D TO 110 D

Patterns

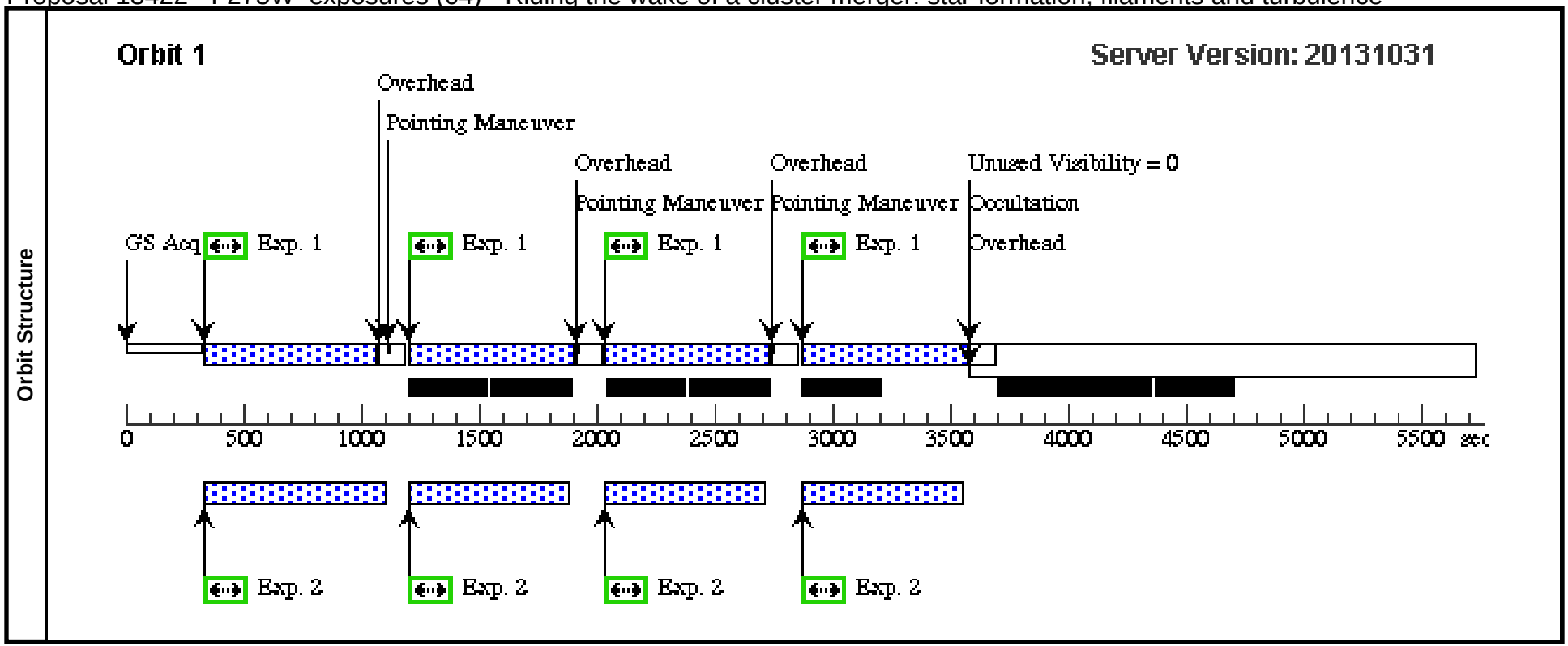
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1-2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ABELL2146-BCG	RA: 15 56 13.9849 (239.0582704d) Dec: +66 20 53.85 (66.34829d) Equinox: J2000		V=18+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) ABELL2146-BCG	WFC3/UVIS, ACCUM, UVIS2-FIX	F275W	FLASH=11		Pattern 1, Exps 1-2 in F275W_exposures (04) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F275W_exposures (04)	700 Secs (2800 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		ANY	ACS/WFC, ACCUM, WFC	F814W			Pattern 1, Exps 1-2 in F275W_exposures (04) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F275W_exposures (04)	560 Secs (2240 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***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Server Version: 20131031
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
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Pointing Maneuver
Unused Visibility = 0
Occultation
GS Acq
Exp. 1
Exp. 1
Exp. 1
Exp. 1
Overhead
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec
Exp. 2
Exp. 2
Exp. 2
Exp. 2

Visit

Proposal 13422, F850LP_exposures (05), implementation Wed Jan 29 02:14:58 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SAME ORIENT AS 04

Patterns

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

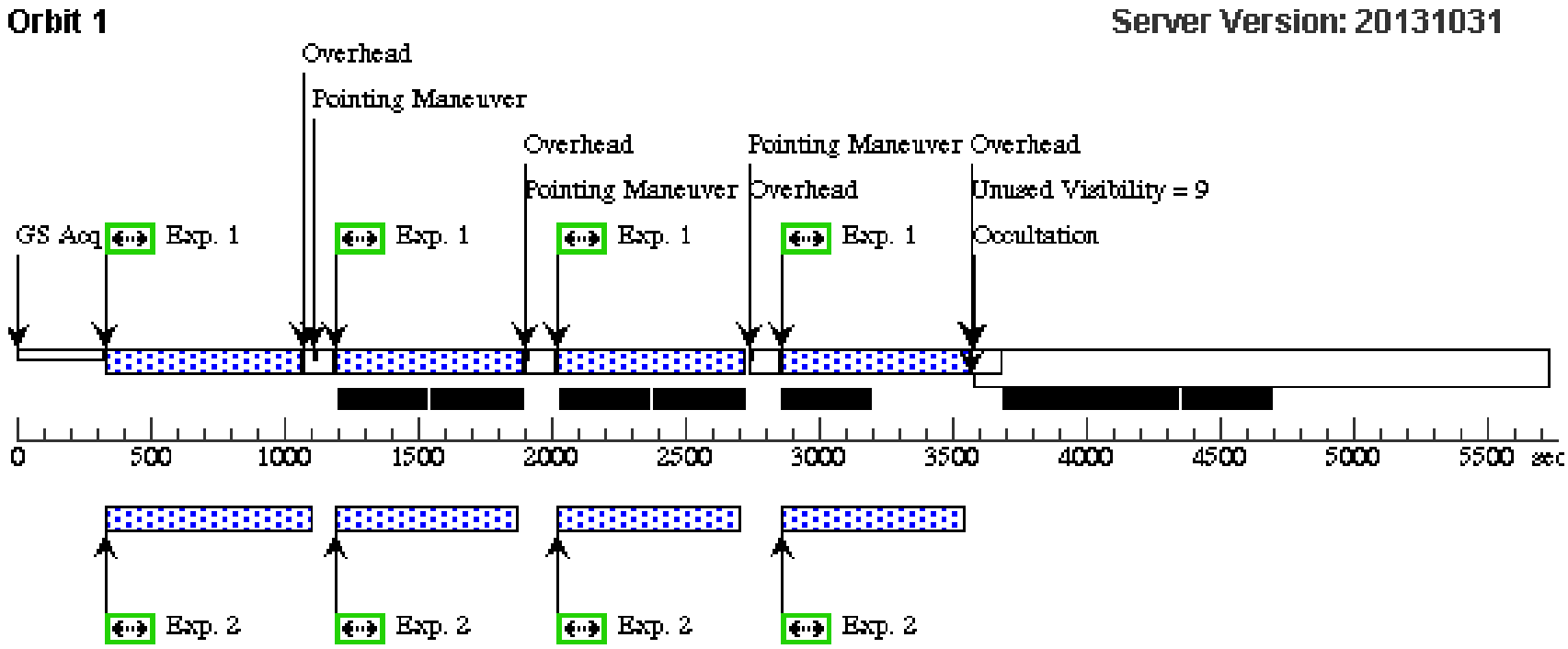
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ABELL2146-BCG	RA: 15 56 13.9849 (239.0582704d) Dec: +66 20 53.85 (66.34829d) Equinox: J2000		V=18+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) ABELL2146-BCG	WFC3/UVIS, ACCUM, UVIS2-FIX	F850LP	FLASH=5		Pattern 1, Exps 1-2 in F850LP_exposures (05) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F850LP_exposures (05)	700 Secs (2800 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		ANY	ACS/WFC, ACCUM, WFC	F606W			Pattern 1, Exps 1-2 in F850LP_exposures (05) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F850LP_exposures (05)	560 Secs (2240 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13422, F845M_exposures (06), implementation Wed Jan 29 02:14:59 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SAME ORIENT AS 04

Patterns

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

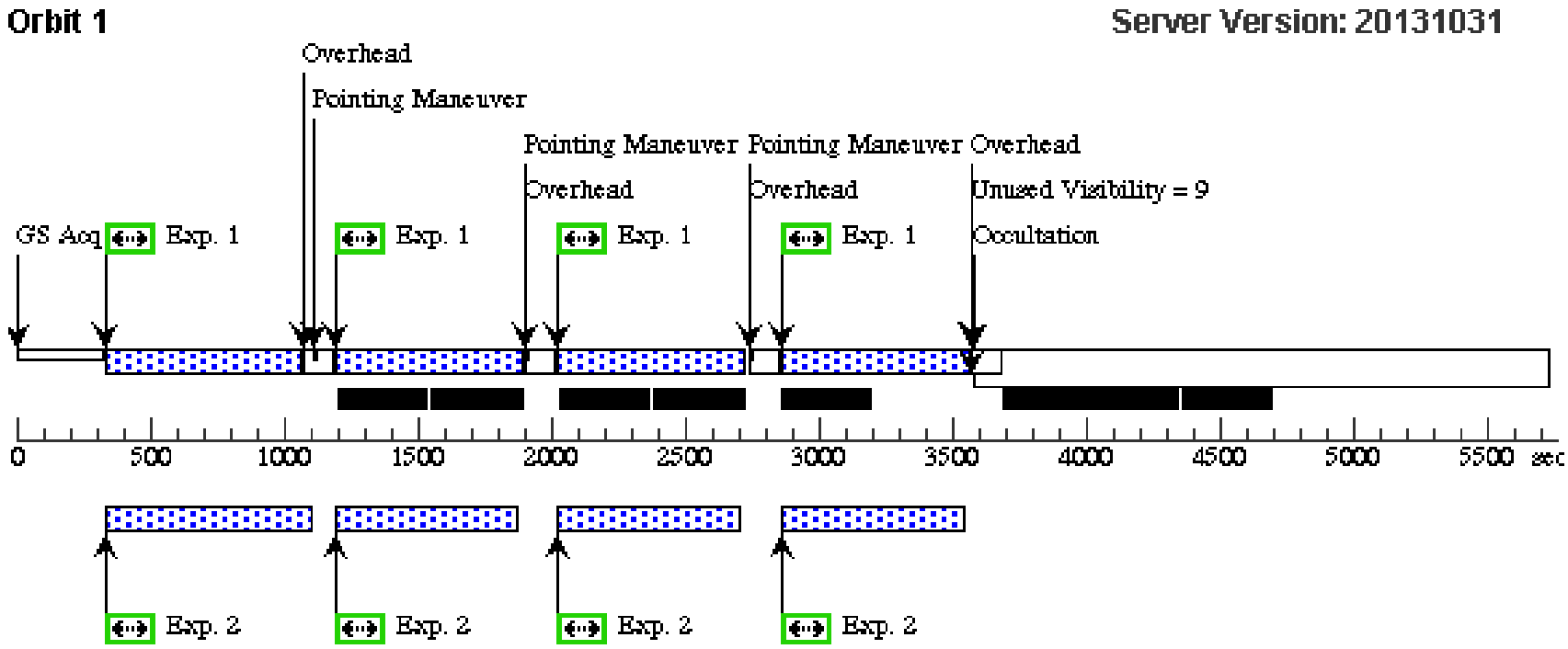
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ABELL2146-BCG	RA: 15 56 13.9849 (239.0582704d) Dec: +66 20 53.85 (66.34829d) Equinox: J2000		V=18+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) ABELL2146-BCG	WFC3/UVIS, ACCUM, UVIS2-FIX	F845M	FLASH=5		Pattern 1, Exps 1-2 in F845M_exposures (06) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F845M_exposures (06)	700 Secs (2800 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		ANY	ACS/WFC, ACCUM, WFC	F814W			Pattern 1, Exps 1-2 in F845M_exposures (06) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F845M_exposures (06)	560 Secs (2240 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13422, F845M_exposures (07), implementation Wed Jan 29 02:15:00 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: SAME ORIENT AS 04

Patterns

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ABELL2146-BCG	RA: 15 56 13.9849 (239.0582704d) Dec: +66 20 53.85 (66.34829d) Equinox: J2000		V=18+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) ABELL2146-BCG	WFC3/UVIS, ACCUM, UVIS2-FIX	F845M	FLASH=5		Pattern 1, Exps 1-2 in F845M_exposures (07) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F845M_exposures (07)	700 Secs (2800 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		ANY	ACS/WFC, ACCUM, WFC	F435W			Pattern 1, Exps 1-2 in F845M_exposures (07) (1) Prime + Parallel Group 1-2 in Pattern 1, Exps 1-2 in F845M_exposures (07)	560 Secs (2240 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure