



11337 - Investigating the X-ray Variability of Cassiopeia A

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) CAS-A-SOUTH (2) CAS-A-SOUTH-NIC1-A (3) CAS-A-SOUTH-NIC1-B	NIC1 NIC3 WFPC2	4	29-Apr-2008 21:36:57.0	yes
02	(4) CAS-A-WEST (5) CAS-A-WEST-NIC3-B (6) CAS-A-WEST-NIC1-A (7) CAS-A-WEST-NIC1-B	NIC1 NIC3 WFPC2	4	29-Apr-2008 21:37:21.0	yes
03	(8) CAS-A-NW (9) CAS-A-NW-NIC3 (10) CAS-A-NW-NIC1-A (11) CAS-A-NW-NIC1-B	NIC1 NIC3 WFPC2	4	29-Apr-2008 21:37:42.0	yes

12 Total Orbits Used

ABSTRACT

We propose a 50 ksec ACIS-S observation of Cas A to follow X-ray flux changes associated with ejecta recently encountered by the reverse shock. This will allow us to investigate Cas A's near-term X-ray evolution and the fine-scale structure of its SN debris. We also request the Chandra observation be followed by HST NICMOS & WFPC2 images of four identified X-ray variable features in the high ionization NIR lines of [Si VI] and [Si X] and low ionization optical lines of [S II] and [O III]. The proposed X-ray/optical/NIR observations will yield a multi-wavelength study of the remnant's advancing reverse shock in an inhomogeneous multi-phase ejecta medium at resolutions down to a fraction of an arcsecond, providing a hi-resolution broad temperature study of reverse shock heated SN ejecta.

OBSERVING DESCRIPTION

This project involves WFPC2 imaging and NICMOS imaging of three (3) regions in the Cas A supernova remnant that have been identified as likely reverse shock front regions. Although we currently (Oct 2007) don't know exactly what specific regions in the remnant will show significant X-ray emission changes - that information will come from a scheduled 12 Dec 2007 Chandra observation - we have selected three place-holding targets regions, namely, CAS-A-SOUTH, CAS-A_WEST, and CAS-A_NW for the HST planning of Phase II observations.

The WFPC2 images will consist of red (F675W) and blue/green (F450W, mainly sensitive to [O III] 5007,4959 line emission). Since the regions of interest are small, we will center them in the WFC3 chip and perform a four point dither. CTE should not be too much of a problem since the features of interest will likely not be very faint.

The NICMOS observations will involve both NIC1 and NIC3 due to the need of different NIR filters. For NIC3, we wish to use the F196N filter, while for NIC1 we want to use the F145M filter. Because more than one reverse shock feature may be present within the FOV of both the WFC3 and NIC3 but not the NIC1 due to its much smaller FOV, we have designed a program consisting of two NIC1 pointings within each of the three NIC3 and WFPC2 pointings. These are called regions ...-NIC1-A and ...NIC1-B.

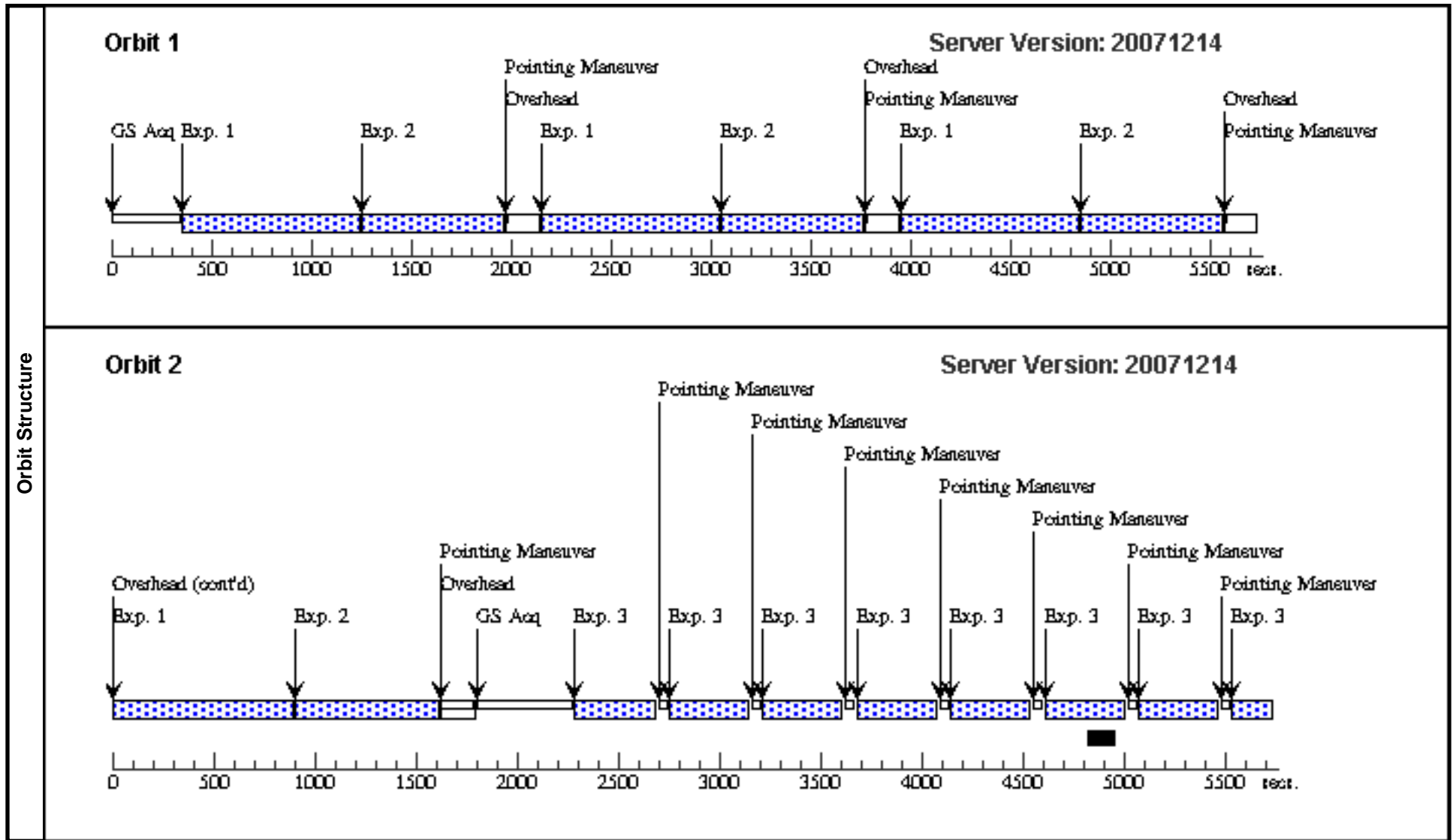
Proposal 11337 - Visit 01 - Investigating the X-ray Variability of Cassiopeia A

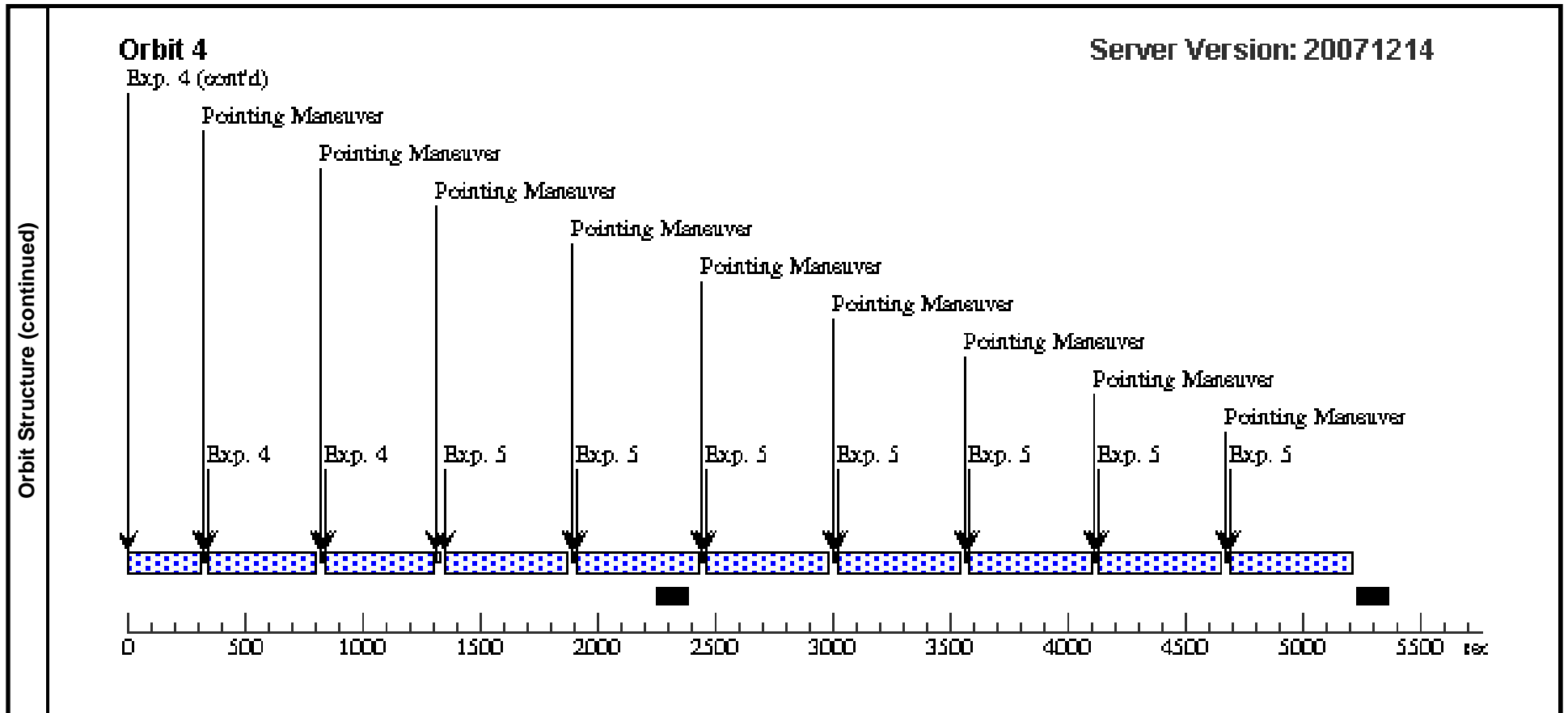
Wed Apr 30 01:37:49 GMT 2008

Visit	Proposal 11337, Visit 01, completed Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2, NIC3, NIC1 Special Requirements: CVZ; BETWEEN 01-JAN-2008:00:00:00 AND 01-MAR-2008:00:00:00									
	#	Primary Pattern	Secondary Pattern				Exposures			
Patterns	(1)	Pattern Type=WFPC2-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.559017 Line Spacing=0.559017	Coordinate Frame=POS-TARG Pattern Orientation=26.56505 Angle Between Sides=143.1301 Center Pattern=false					(1-2)		
	(3)	Pattern Type=NIC-SKY-SPIRAL-DITH-CHOP Purpose=DITHER Number Of Points=7 Point Spacing=2.0 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=0.0 Angle Between Sides= Center Pattern=false	Pattern Type=NIC-SKY-SPIRAL-DITH-CHOP Purpose=BACKGROUND Number Of Points=2 Point Spacing=75.0 Line Spacing=	Coordinate Frame=CELESTIAL Pattern Orientation=150.0 Angle Between Sides= Center Pattern=false	(3)				
	(6)	Pattern Type=NIC-SPIRAL-DITH Purpose=DITHER Number Of Points=7 Point Spacing=0.2 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=0.0 Angle Between Sides= Center Pattern=false					(4), (5)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	CAS-A-SOUTH	RA: 23 23 25.9800 (350.8582500d) Dec: +58 47 11.20 (58.78644d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS				
	(2)	CAS-A-SOUTH-NIC1-A	RA: 23 23 24.5450 (350.8522708d) Dec: +58 47 13.50 (58.78708d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS				
	(3)	CAS-A-SOUTH-NIC1-B	RA: 23 23 27.6800 (350.8653333d) Dec: +58 47 11.36 (58.78649d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(1) CAS-A-SOUTH	WFPC2, IMAGE, WF3	F450W	CR-SPLIT=NO		Pattern 1-2 (1)	600.0 Secs	
									[==>(Pattern 1)]	
									[==>(Pattern 2)]	[1]
									[==>(Pattern 3)]	
								[==>(Pattern 4)]	[2]	

Proposal 11337 - Visit 01 - Investigating the X-ray Variability of Cassiopeia A

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
Exposures (continued)	2	(1) CAS-A-SOUTH	WFPC2, IMAGE, WF3	F675W	CR-SPLIT=NO		Pattern 1-2 (1)	600.0 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	[1]
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	[2]
	3	(1) CAS-A-SOUTH	NIC3, MULTIACCUM, NIC3-FIX	F196N	NSAMP=14; OFFSET=SAM; SAMP-SEQ=STEP6 4		Pattern 3-3 (3)	[==>(Pattern 1,1)]	
								[==>(Pattern 1,2)]	
								[==>(Pattern 2,1)]	
								[==>(Pattern 2,2)]	
								[==>(Pattern 3,1)]	[2]
							[==>(Pattern 3,2)]		
							[==>(Pattern 4,1)]		
							[==>(Pattern 4,2)]		
							[==>(Pattern 5,1)]		
							[==>(Pattern 5,2)]		
							[==>(Pattern 6,1)]		
							[==>(Pattern 6,2)]	[3]	
							[==>(Pattern 7,1)]		
							[==>(Pattern 7,2)]		
4	(2) CAS-A-SOUTH- NIC1-A	NIC1, MULTIACCUM, NIC1-FIX	F145M	OFFSET=SAM; NSAMP=15; SAMP-SEQ=STEP6 4		Pattern 4-4 (6)	[==>(Pattern 1)]		
							[==>(Pattern 2)]		
							[==>(Pattern 3)]		
							[==>(Pattern 4)]		
							[==>(Pattern 5)]		
							[==>(Pattern 6)]		
							[==>(Pattern 7)]	[3]	
							[==>(Pattern 7)]	[4]	
5	(3) CAS-A-SOUTH- NIC1-B	NIC1, MULTIACCUM, NIC1-FIX	F145M	OFFSET=SAM; NSAMP=16; SAMP-SEQ=STEP6 4		Pattern 5-5 (6)	[==>(Pattern 1)]		
							[==>(Pattern 2)]		
							[==>(Pattern 3)]		
							[==>(Pattern 4)]		
							[==>(Pattern 5)]		
							[==>(Pattern 6)]		
							[==>(Pattern 7)]	[4]	
							[==>(Pattern 7)]		





Proposal 11337 - Visit 02 - Investigating the X-ray Variability of Cassiopeia A

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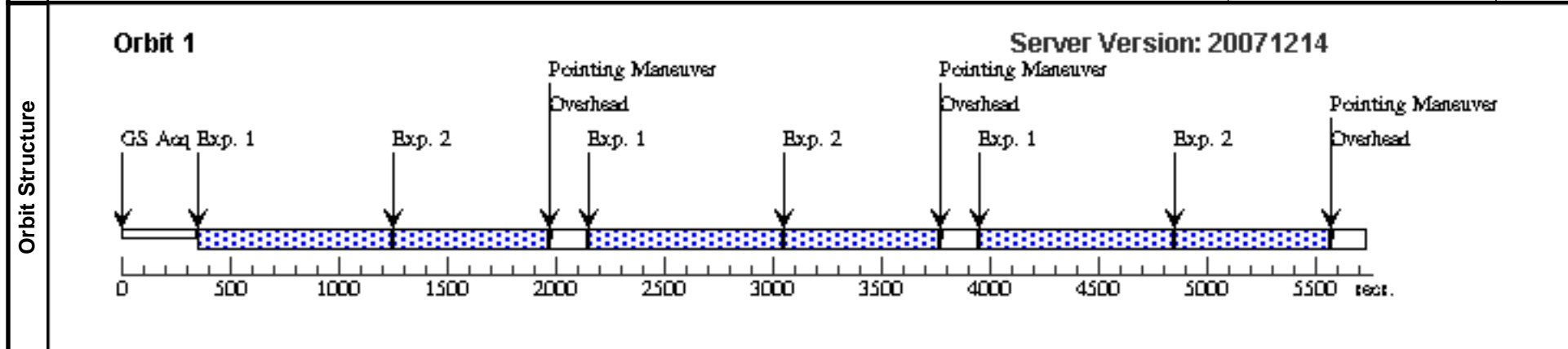
Visit		Proposal 11337, Visit 02, scheduling Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2, NIC3, NIC1 Special Requirements: CVZ; BETWEEN 01-JAN-2008:00:00:00 AND 10-JUN-2008:00:00:00					
Patterns		#	Primary Pattern	Secondary Pattern	Exposures		
		(1)	Pattern Type=WFPC2-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.559017 Line Spacing=0.559017 Coordinate Frame=POS-TARG Pattern Orientation=26.56505 Angle Between Sides=143.1301 Center Pattern=false		(1-2)		
		(4)	Pattern Type=NIC-SKY-SPIRAL-DITH-CHOP Purpose=DITHER Number Of Points=7 Point Spacing=2.0 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=0.0 Angle Between Sides= Center Pattern=false	Pattern Type=NIC-SKY-SPIRAL-DITH-CHOP Purpose=BACKGROUND Number Of Points=2 Point Spacing=75.0 Line Spacing= Coordinate Frame=CELESTIAL Pattern Orientation=25.0 Angle Between Sides= Center Pattern=false	(3)		
		(6)	Pattern Type=NIC-SPIRAL-DITH Purpose=DITHER Number Of Points=7 Point Spacing=0.2 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=0.0 Angle Between Sides= Center Pattern=false		(4), (5)		
Fixed Targets		#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
		(4)	CAS-A-WEST	RA: 23 23 18.8350 (350.8284792d) Dec: +58 50 14.61 (58.83739d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS
		(5)	CAS-A-WEST-NIC3-B	RA: 23 23 18.8670 (350.8286125d) Dec: +58 50 14.50 (58.83736d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS
		(6)	CAS-A-WEST-NIC1-A	RA: 23 23 20.9820 (350.8374250d) Dec: +58 50 28.82 (58.84134d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS
		(7)	CAS-A-WEST-NIC1-B	RA: 23 23 19.3930 (350.8308042d) Dec: +58 50 27.19 (58.84089d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS

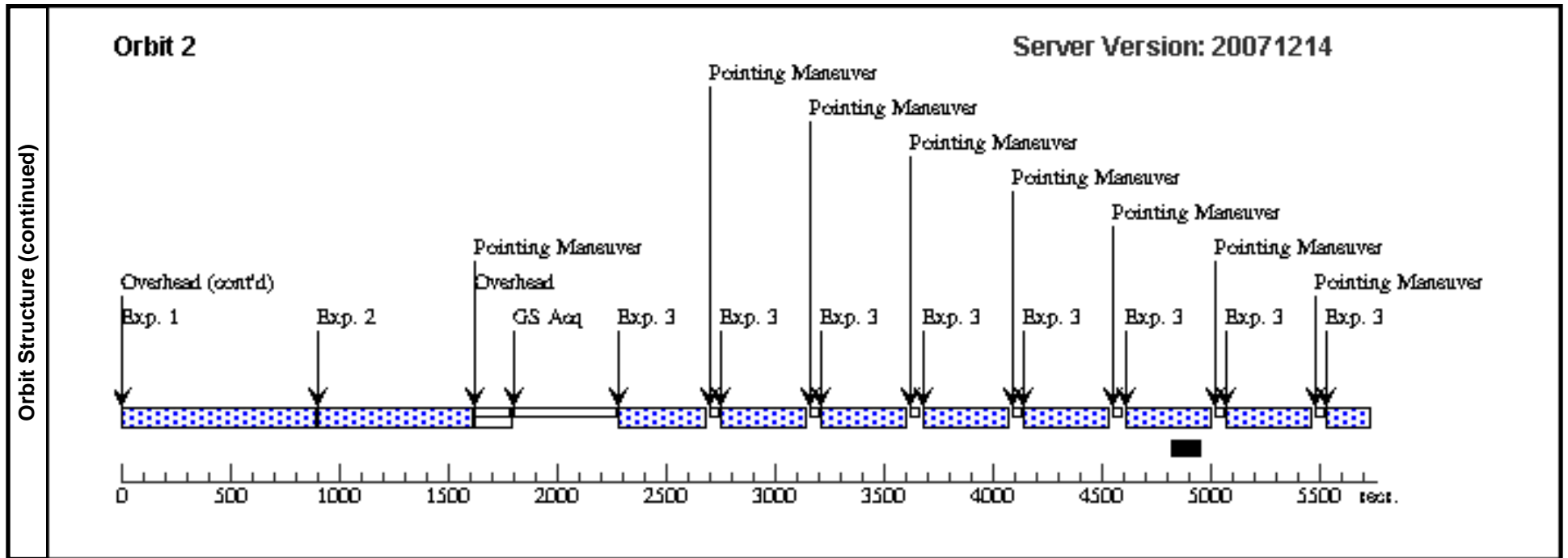
Proposal 11337 - Visit 02 - Investigating the X-ray Variability of Cassiopeia A

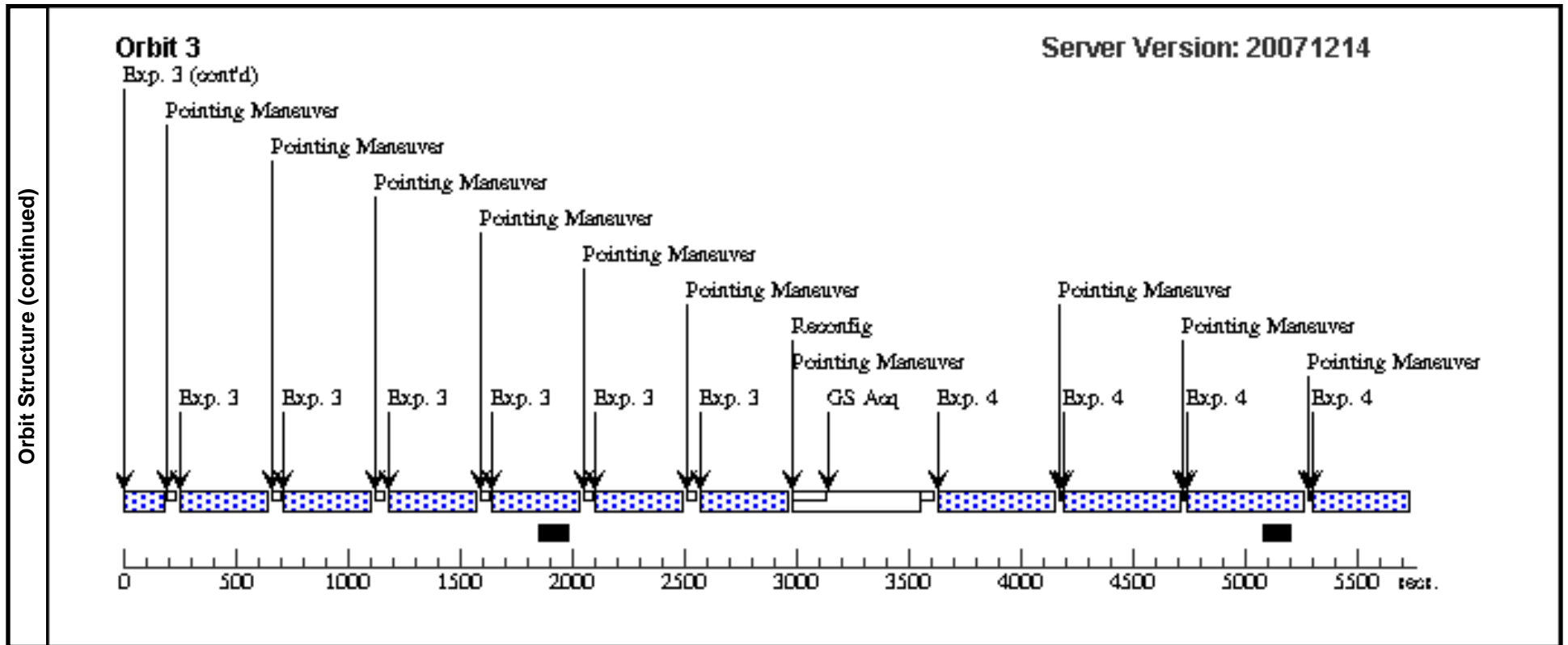
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
Exposures	1	(4) CAS-A-WEST	WFPC2, IMAGE, WF3	F450W	CR-SPLIT=NO		Pattern 1-2 (1)	600.0 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	[1]
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	[2]
	2	(4) CAS-A-WEST	WFPC2, IMAGE, WF3	F675W	CR-SPLIT=NO		Pattern 1-2 (1)	600.0 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	[1]
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	[2]
	3	(5) CAS-A-WEST-N IC3-B	NIC3, MULTIACCUM, NIC3-FIX	F196N	NSAMP=14; OFFSET=SAM; SAMP-SEQ=STEP6 4		Pattern 3-3 (4)		
								[==>(Pattern 1,1)]	
							[==>(Pattern 1,2)]		
							[==>(Pattern 2,1)]		
							[==>(Pattern 2,2)]		
							[==>(Pattern 3,1)]	[2]	
							[==>(Pattern 3,2)]		
							[==>(Pattern 4,1)]		
							[==>(Pattern 4,2)]		
							[==>(Pattern 5,1)]		
							[==>(Pattern 5,2)]		
							[==>(Pattern 6,1)]	[3]	
							[==>(Pattern 6,2)]		
							[==>(Pattern 7,1)]		
							[==>(Pattern 7,2)]		
4	(6) CAS-A-WEST-N IC1-A	NIC1, MULTIACCUM, NIC1-FIX	F145M	OFFSET=SAM; NSAMP=16; SAMP-SEQ=STEP6 4		Pattern 4-4 (6)			
							[==>(Pattern 1)]		
							[==>(Pattern 2)]		
							[==>(Pattern 3)]	[3]	
							[==>(Pattern 4)]		
							[==>(Pattern 5)]		
							[==>(Pattern 6)]	[4]	
							[==>(Pattern 7)]		

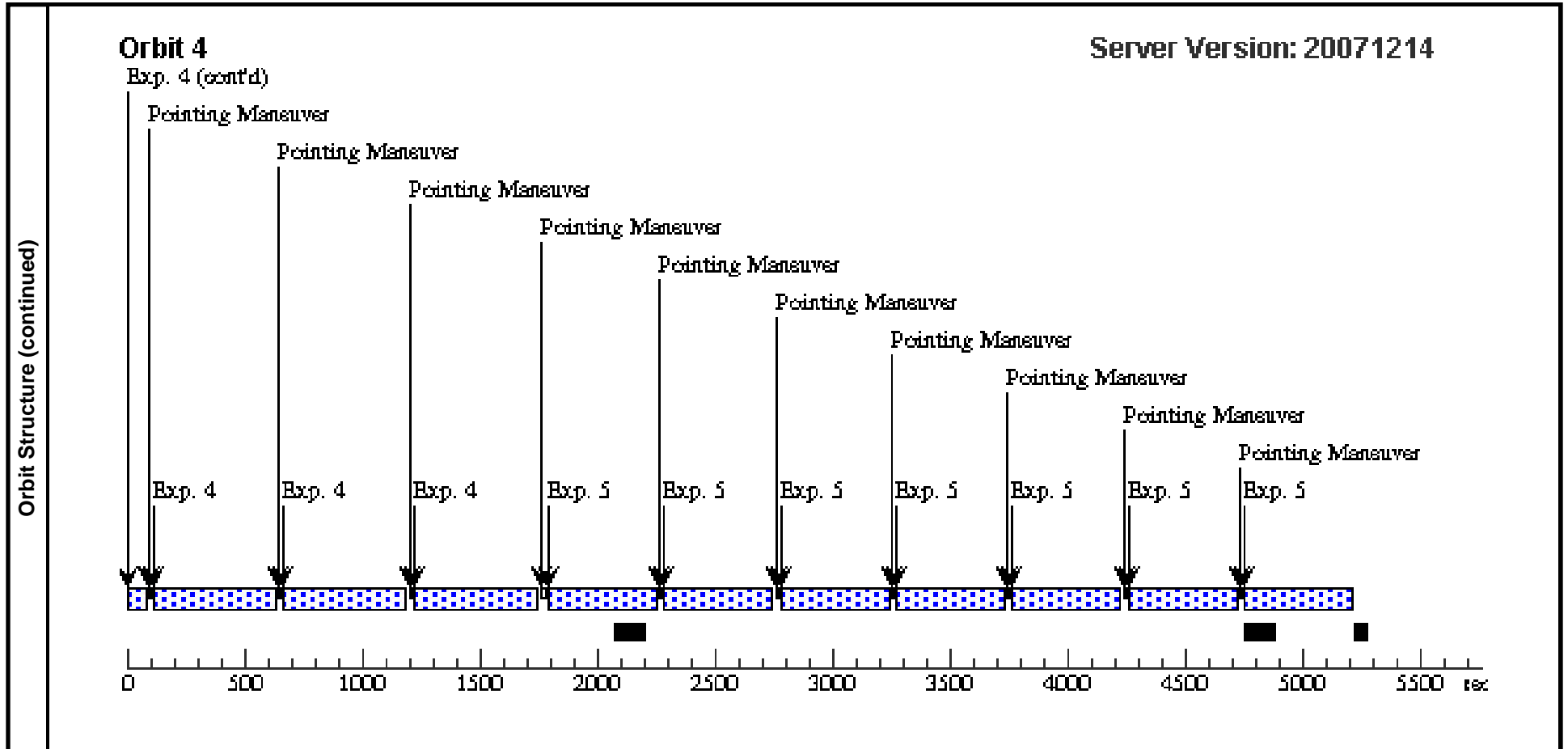
Proposal 11337 - Visit 02 - Investigating the X-ray Variability of Cassiopeia A

Exposures (continued)	#	Label	Target	Config, Mode, Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	5		(7) CAS-A-WEST-N IC1-B	NIC1, MULTIACCUM, NIC1-FIX	F145M	SAMP-SEQ=STEP6 4; OFFSET=SAM; NSAMP=15		Pattern 5-5 (6)	[=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)] [=>(Pattern 5)] [=>(Pattern 6)] [=>(Pattern 7)]	[4]









Proposal 11337 - Visit 03 - Investigating the X-ray Variability of Cassiopeia A

Wed Apr 30 01:37:52 GMT 2008

Visit		Proposal 11337, Visit 03, scheduling Diagnostic Status: No Diagnostics Scientific Instruments: WFPC2, NIC3, NIC1 Special Requirements: CVZ; BETWEEN 01-JAN-2008:00:00:00 AND 10-JUN-2008:00:00:00					
Patterns		#	Primary Pattern	Secondary Pattern	Exposures		
		(1)	Pattern Type=WFPC2-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.559017 Line Spacing=0.559017 Coordinate Frame=POS-TARG Pattern Orientation=26.56505 Angle Between Sides=143.1301 Center Pattern=false		(1-2)		
		(5)	Pattern Type=NIC-SKY-SPIRAL-DITH-CHOP Purpose=DITHER Number Of Points=7 Point Spacing=2.0 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=0.0 Angle Between Sides= Center Pattern=false	Pattern Type=NIC-SKY-SPIRAL-DITH-CHOP Purpose=BACKGROUND Number Of Points=2 Point Spacing=75.0 Line Spacing= Coordinate Frame=CELESTIAL Pattern Orientation=5.0 Angle Between Sides= Center Pattern=false	(3)		
		(6)	Pattern Type=NIC-SPIRAL-DITH Purpose=DITHER Number Of Points=7 Point Spacing=0.2 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=0.0 Angle Between Sides= Center Pattern=false		(4), (5)		
Fixed Targets		#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
		(8)	CAS-A-NW	RA: 23 23 23.3510 (350.8472958d) Dec: +58 50 25.57 (58.84044d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS
		(9)	CAS-A-NW-NIC3	RA: 23 23 23.2720 (350.8469667d) Dec: +58 50 25.57 (58.84044d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS
		(10)	CAS-A-NW-NIC1-A	RA: 23 23 23.8780 (350.8494917d) Dec: +58 50 24.92 (58.84026d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS
		(11)	CAS-A-NW-NIC1-B	RA: 23 23 24.8130 (350.8533875d) Dec: +58 50 27.57 (58.84099d) Equinox: J2000		V=21+/-2	Reference Frame: ICRS

Proposal 11337 - Visit 03 - Investigating the X-ray Variability of Cassiopeia A

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
Exposures	1	(8) CAS-A-NW	WFPC2, IMAGE, WF3	F450W	CR-SPLIT=NO		Pattern 1-2 (1)	600.0 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	[1]
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	[2]
	2	(8) CAS-A-NW	WFPC2, IMAGE, WF3	F675W	CR-SPLIT=NO		Pattern 1-2 (1)	600.0 Secs	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	[1]
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	[2]
	3	(9) CAS-A-NW-NIC 3	NIC3, MULTIACCUM, NIC3-FIX	F196N	NSAMP=14; OFFSET=SAM; SAMP-SEQ=STEP6 4		Pattern 3-3 (5)		
								[==>(Pattern 1,1)]	
							[==>(Pattern 1,2)]		
							[==>(Pattern 2,1)]		
							[==>(Pattern 2,2)]	[2]	
							[==>(Pattern 3,1)]		
							[==>(Pattern 3,2)]		
							[==>(Pattern 4,1)]		
							[==>(Pattern 4,2)]		
							[==>(Pattern 5,1)]		
							[==>(Pattern 5,2)]		
							[==>(Pattern 6,1)]	[3]	
							[==>(Pattern 6,2)]		
							[==>(Pattern 7,1)]		
							[==>(Pattern 7,2)]		
4	(10) CAS-A-NW-NI C1-A	NIC1, MULTIACCUM, NIC1-FIX	F145M	NSAMP=16; SAMP-SEQ=STEP6 4; OFFSET=SAM		Pattern 4-4 (6)			
							[==>(Pattern 1)]		
							[==>(Pattern 2)]		
							[==>(Pattern 3)]	[3]	
							[==>(Pattern 4)]		
							[==>(Pattern 5)]		
							[==>(Pattern 6)]	[4]	
							[==>(Pattern 7)]		

Proposal 11337 - Visit 03 - Investigating the X-ray Variability of Cassiopeia A

Exposures (continued)	#	Label	Target	Config, Mode, Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	5		(11) CAS-A-NW-NI C1-B	NIC1, MULTIACCUM, NIC1-FIX	F145M	SAMP-SEQ=STEP6 4; OFFSET=SAM; NSAMP=16		Pattern 5-5 (6)	[=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)] [=>(Pattern 5)] [=>(Pattern 6)] [=>(Pattern 7)]	[4]

Orbit Structure	Orbit 1 Server Version: 20071214	

