



12021 - An Irradiated Disk in an Ultraluminous X-Ray Source

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Dr. Philip Kaaret (PI)	University of Iowa	philip-kaaret@uiowa.edu
Dr. Stephane Corbel (CoI) (ESA Member)	Commissariat a l'Energie Atomique (CEA)	corbel@discovery.saclay.cea.fr

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) NGC5408X-1	WFC3/IR WFC3/UVIS	1	28-Jul-2010 11:24:01.0	yes
02	(1) NGC5408X-1	WFC3/IR WFC3/UVIS	1	28-Jul-2010 11:24:04.0	yes
03	(1) NGC5408X-1	WFC3/IR WFC3/UVIS	1	28-Jul-2010 11:24:07.0	yes
53	(1) NGC5408X-1	WFC3/IR WFC3/UVIS	1	28-Jul-2010 11:24:09.0	yes
04	(1) NGC5408X-1	WFC3/UVIS	1	28-Jul-2010 11:24:10.0	yes

5 Total Orbits Used

ABSTRACT

Whether ultraluminous X-ray sources (ULXs) contain stellar-mass or intermediate-mass black holes (IMBHs) is an important, but as yet unresolved, astrophysical question. We have discovered variable optical emission from the ULX NGC 5408 X-1 that we interpret as reprocessed emission in an

irradiated disk. We propose simultaneous observations with Chandra and HST to test this interpretation and place constraints on the geometry of the accretion disk. The observations should provide a means to discriminate between stellar-mass versus intermediate-mass black holes.

OBSERVING DESCRIPTION

The observations consist of three simultaneous Chandra/HST observations to test the irradiated disk model and one HST-only observation to image the surrounding nebula in the [O III] emission line. For the observations simultaneous with Chandra, we will obtain images in the F225W, F336W, F547M, and F845M filters with the WFC3/UVIS and in the F105W and F160W filters with the WFC3/IR. For the HST-only observations, we will use the WFC3 with the F502N filter. Continuum subtraction will be done using the F547M images obtained in the other observations.

REAL TIME JUSTIFICATION

The first three visits must be simultaneous with a corresponding Chandra observation in order to determine whether the optical continuum flux is correlated with the X-ray emission, as predicted in the irradiated disk model, and to better constrain the parameters of the irradiated disk model. For each of these visits, the one HST orbit should be scheduled to occur during the 12,000 second duration of the corresponding Chandra observations.

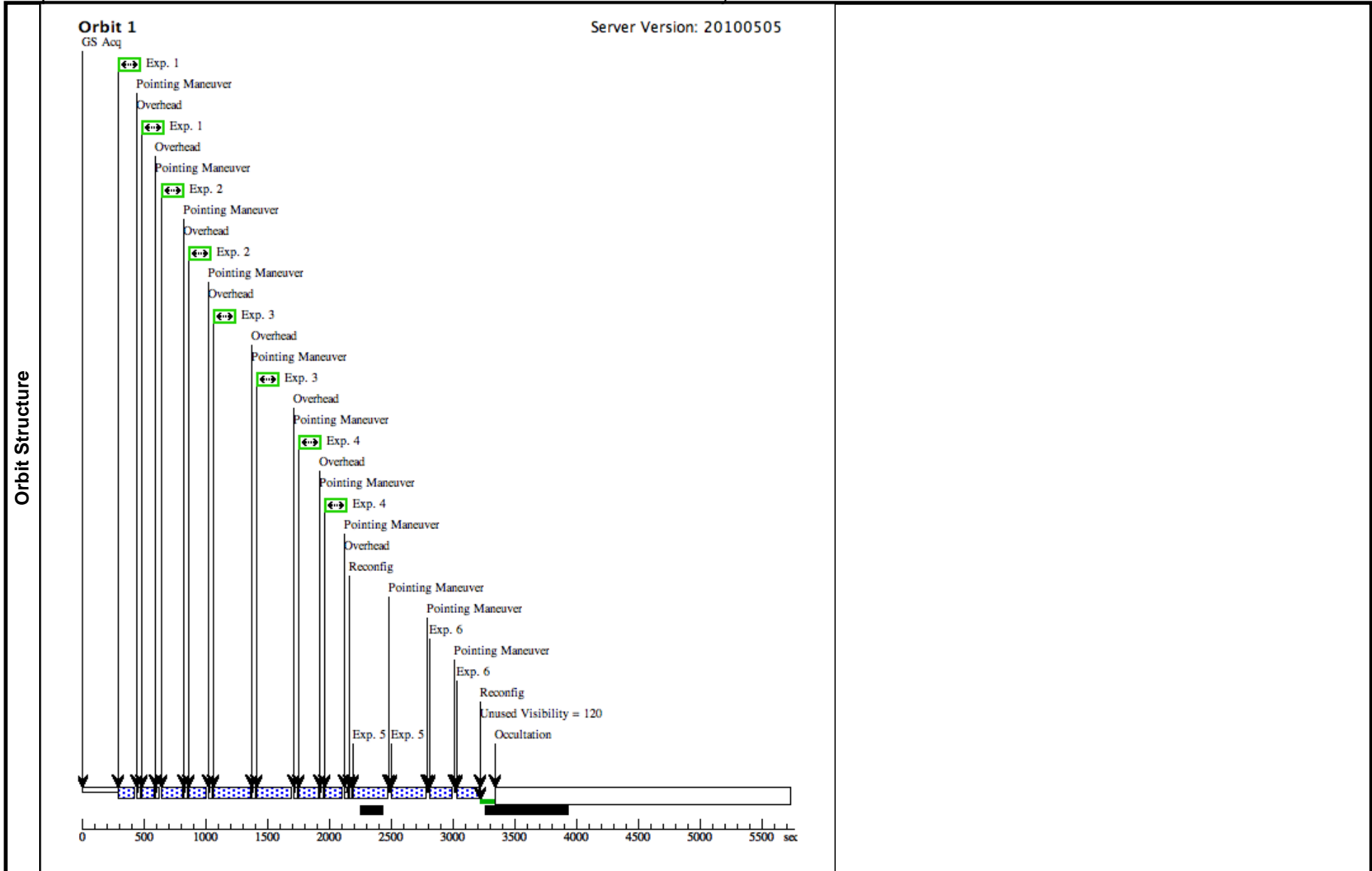
Proposal 12021 (STScI Edit Number: 1, Created: Wednesday, July 28, 2010 11:24:11 AM EDT) - Overview

Wed Jul 28 15:24:11 GMT 2010

Visit	<p>Proposal 12021, Visit 01, completed</p> <p>Diagnostic Status: Error</p> <p>Scientific Instruments: WFC3/IR, WFC3/UVIS</p> <p>Special Requirements: BETWEEN 30-APR-2010:00:00:00 AND 07-MAY-2010:23:59:59</p> <p><i>Comments: This visit should be scheduled to occur during the 12,000 second duration of the corresponding Chandra observation (Chandra Seq: 401067 ObsId: 11032).</i></p>					
Diagnostics	<p>(Exposure 1 (Pattern 2, Exps 1-1)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.</p> <p>(Exposure 1 (Pattern 2, Exps 1-1)) Error (Form): Illegal selection: UVIS1-M512-SUB.</p> <p>(Exposure 2 (Pattern 2, Exps 2-2)) Error (Form): Illegal selection: UVIS1-M512-SUB.</p> <p>(Exposure 2 (Pattern 2, Exps 2-2)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.</p> <p>(Exposure 3 (Pattern 2, Exps 3-3)) Error (Form): Illegal selection: UVIS1-M512-SUB.</p> <p>(Exposure 3 (Pattern 2, Exps 3-3)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.</p> <p>(Exposure 4 (Pattern 2, Exps 4-4)) Error (Form): Illegal selection: UVIS1-M512-SUB.</p> <p>(Exposure 4 (Pattern 2, Exps 4-4)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.</p>					
Patterns	#	Primary Pattern	Secondary Pattern	Exposures		
	(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4)		
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	NGC5408X-1	RA: 14 03 19.6200 (210.8317500d) Dec: -41 22 58.54 (-41.38293d) Equinox: J2000		V=22.4+/-0.2	Reference Frame: ICRS

Proposal 12021 (STScI Edit Number: 1, Created: Wednesday, July 28, 2010 11:24:11 AM EDT) - Overview

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F547M	CR-SPLIT=NO		Pattern 2, Exps 1-1 (2)	100 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F336W	CR-SPLIT=NO		Pattern 2, Exps 2-2 (2)	140 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F225W	CR-SPLIT=NO		Pattern 2, Exps 3-3 (2)	280 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F845M	CR-SPLIT=NO		Pattern 2, Exps 4-4 (2)	140 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	5	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP5 0		Pattern 3, Exps 5-5 (3)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	6	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=8; SAMP-SEQ=STEP5 0		Pattern 3, Exps 6-6 (3)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]



Proposal 12021 - Visit 01 - An Irradiated Disk in an Ultraluminous X-Ray Source

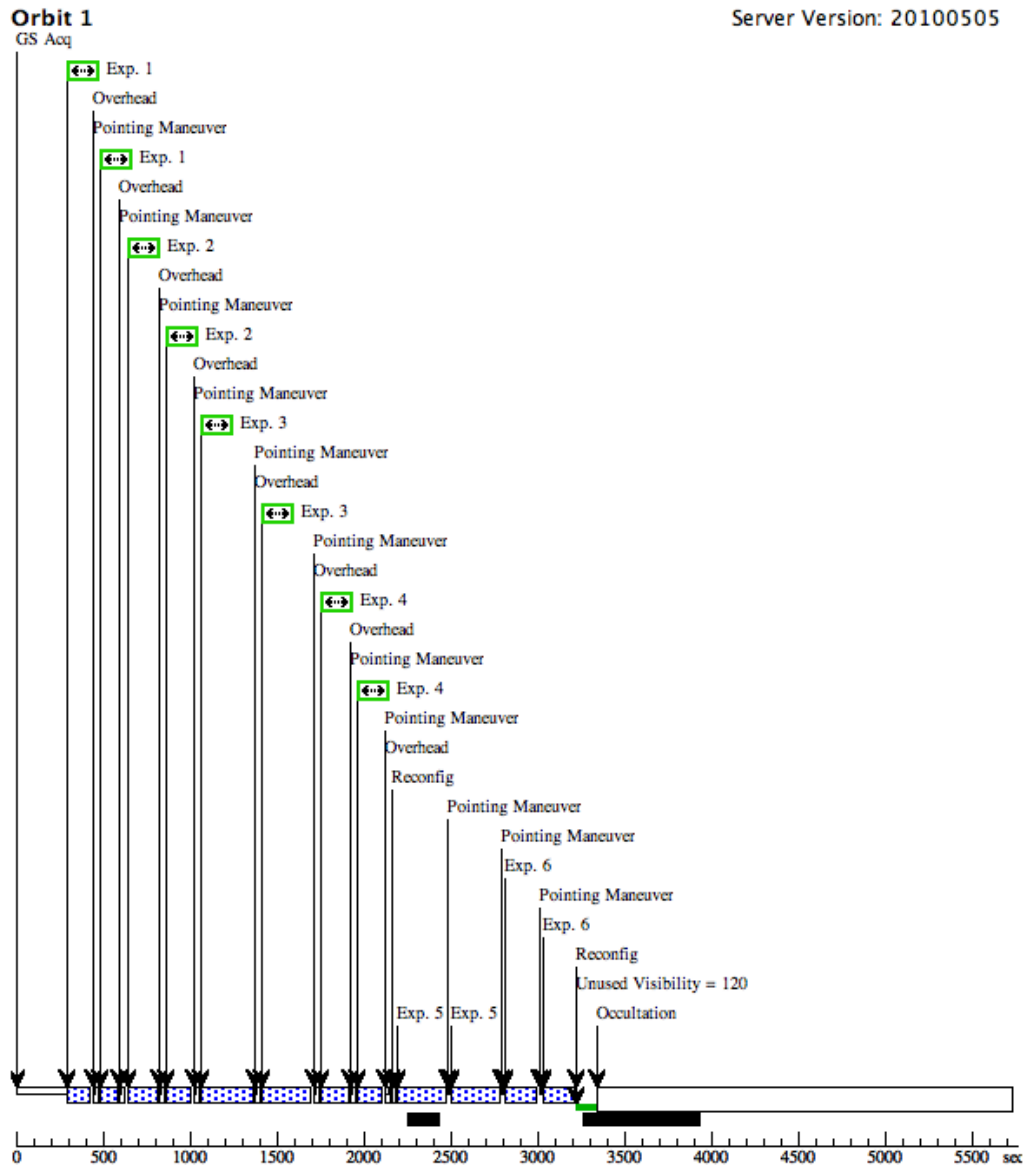
Wed Jul 28 15:24:11 GMT 2010

Visit	Proposal 12021, Visit 02, completed Diagnostic Status: Error Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: BETWEEN 14-MAY-2010:00:00:00 AND 21-MAY-2010:23:59:59 <i>Comments: This visit should be scheduled to occur during the 12,000 second duration of the corresponding Chandra observation (Chandra Seq: 401068 ObsId: 11033).</i>					
	Diagnosics (Exposure 1 (Pattern 2, Exps 1-1)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal. (Exposure 1 (Pattern 2, Exps 1-1)) Error (Form): Illegal selection: UVIS1-M512-SUB. (Exposure 2 (Pattern 2, Exps 2-2)) Error (Form): Illegal selection: UVIS1-M512-SUB. (Exposure 2 (Pattern 2, Exps 2-2)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal. (Exposure 3 (Pattern 2, Exps 3-3)) Error (Form): Illegal selection: UVIS1-M512-SUB. (Exposure 3 (Pattern 2, Exps 3-3)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal. (Exposure 4 (Pattern 2, Exps 4-4)) Error (Form): Illegal selection: UVIS1-M512-SUB. (Exposure 4 (Pattern 2, Exps 4-4)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.					
Patterns	#	Primary Pattern	Secondary Pattern	Exposures		
	(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4)		
(3)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing= Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(5), (6)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	NGC5408X-1	RA: 14 03 19.6200 (210.8317500d) Dec: -41 22 58.54 (-41.38293d) Equinox: J2000		V=22.4+/-0.2	Reference Frame: ICRS

Proposal 12021 - Visit 01 - An Irradiated Disk in an Ultraluminous X-Ray Source

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F547M	CR-SPLIT=NO			Pattern 2, Exps 1-1 (2)	100 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F336W	CR-SPLIT=NO			Pattern 2, Exps 2-2 (2)	140 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F225W	CR-SPLIT=NO			Pattern 2, Exps 3-3 (2)	280 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F845M	CR-SPLIT=NO			Pattern 2, Exps 4-4 (2)	140 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	5	(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP5 0			Pattern 3, Exps 5-5 (3)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	6	(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=8; SAMP-SEQ=STEP5 0			Pattern 3, Exps 6-6 (3)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]

Orbit Structure



Proposal 12021 - Visit 02 - An Irradiated Disk in an Ultraluminous X-Ray Source

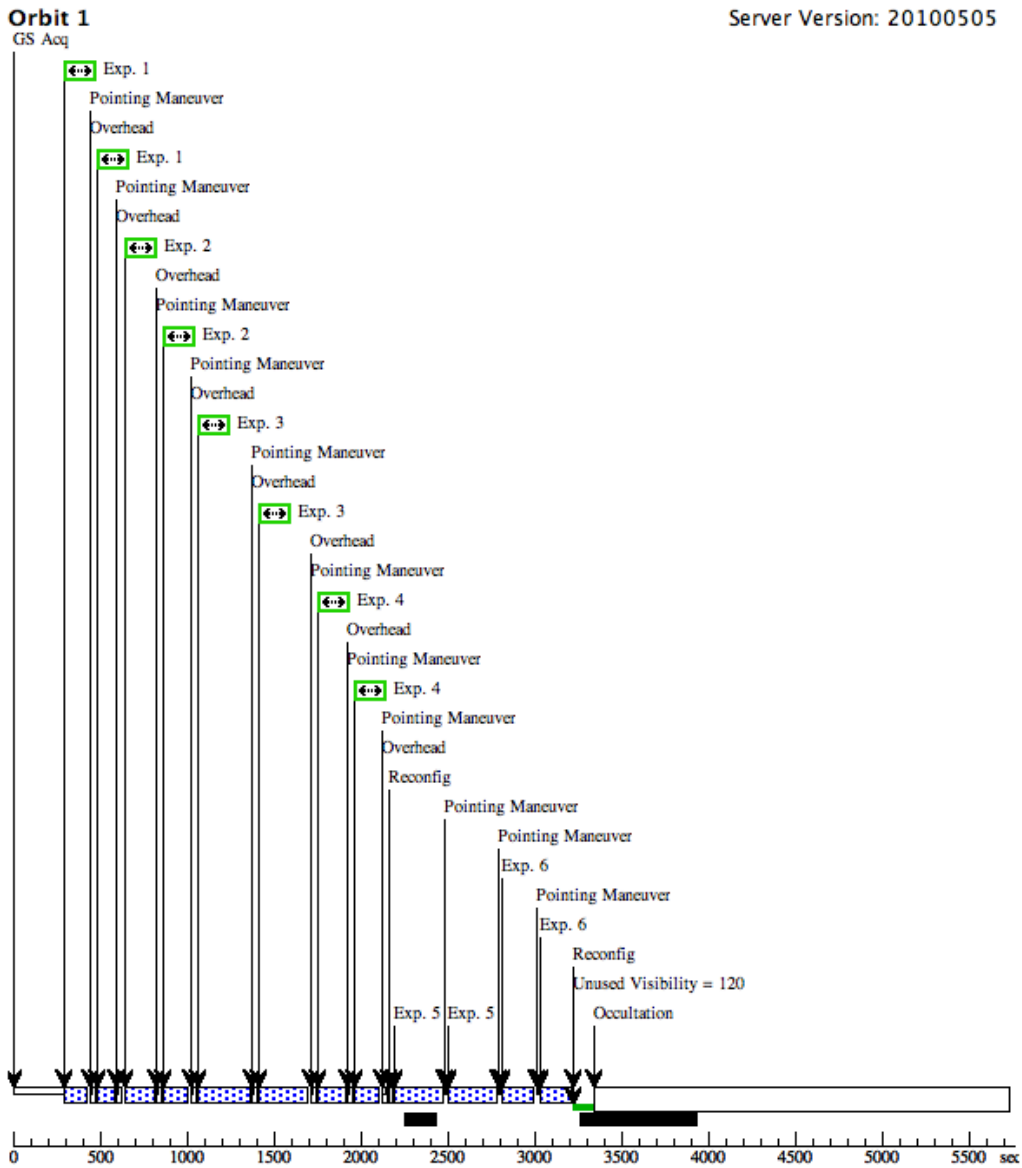
Wed Jul 28 15:24:12 GMT 2010

Visit	Proposal 12021, Visit 03, failed Diagnostic Status: Error Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: BETWEEN 28-MAY-2010:00:00:00 AND 05-JUN-2010:23:59:59 <i>Comments: This visit should be scheduled to occur during the 12,000 second duration of the corresponding Chandra observation (Chandra Seq: 401069 ObsId: 11034).</i>					
	Diagnostics	(Exposure 1 (Pattern 2, Exps 1-1)) Error (Form): Illegal selection: UVIS1-M512-SUB.				
(Exposure 1 (Pattern 2, Exps 1-1)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.						
(Exposure 2 (Pattern 2, Exps 2-2)) Error (Form): Illegal selection: UVIS1-M512-SUB.						
(Exposure 2 (Pattern 2, Exps 2-2)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.						
(Exposure 3 (Pattern 2, Exps 3-3)) Error (Form): Illegal selection: UVIS1-M512-SUB.						
Patterns	(Exposure 3 (Pattern 2, Exps 3-3)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.					
	(Exposure 4 (Pattern 2, Exps 4-4)) Error (Form): This attribute is not allowed to have this value: Aperture = UVIS1-M512-SUB It is an Available option and cannot normally be used in a GO proposal.					
	(Exposure 4 (Pattern 2, Exps 4-4)) Error (Form): Illegal selection: UVIS1-M512-SUB.					
	#	Primary Pattern	Secondary Pattern	Exposures		
	(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1), (2), (3), (4)		
(3)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false	(5), (6)			
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	NGC5408X-1	RA: 14 03 19.6200 (210.8317500d) Dec: -41 22 58.54 (-41.38293d) Equinox: J2000		V=22.4+/-0.2	Reference Frame: ICRS

Proposal 12021 - Visit 02 - An Irradiated Disk in an Ultraluminous X-Ray Source

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F547M	CR-SPLIT=NO		Pattern 2, Exps 1-1 (2)	100 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	2		(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F336W	CR-SPLIT=NO		Pattern 2, Exps 2-2 (2)	140 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	3		(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F225W	CR-SPLIT=NO		Pattern 2, Exps 3-3 (2)	280 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	4		(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS1-M512-SUB	F845M	CR-SPLIT=NO		Pattern 2, Exps 4-4 (2)	140 Secs [==>(Pattern 1)] [==>(Pattern 2)]	[1]
	5		(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP5 0		Pattern 3, Exps 5-5 (3)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]
	6		(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=8; SAMP-SEQ=STEP5 0		Pattern 3, Exps 6-6 (3)	[==>(Pattern 1)] [==>(Pattern 2)]	[1]

Orbit Structure

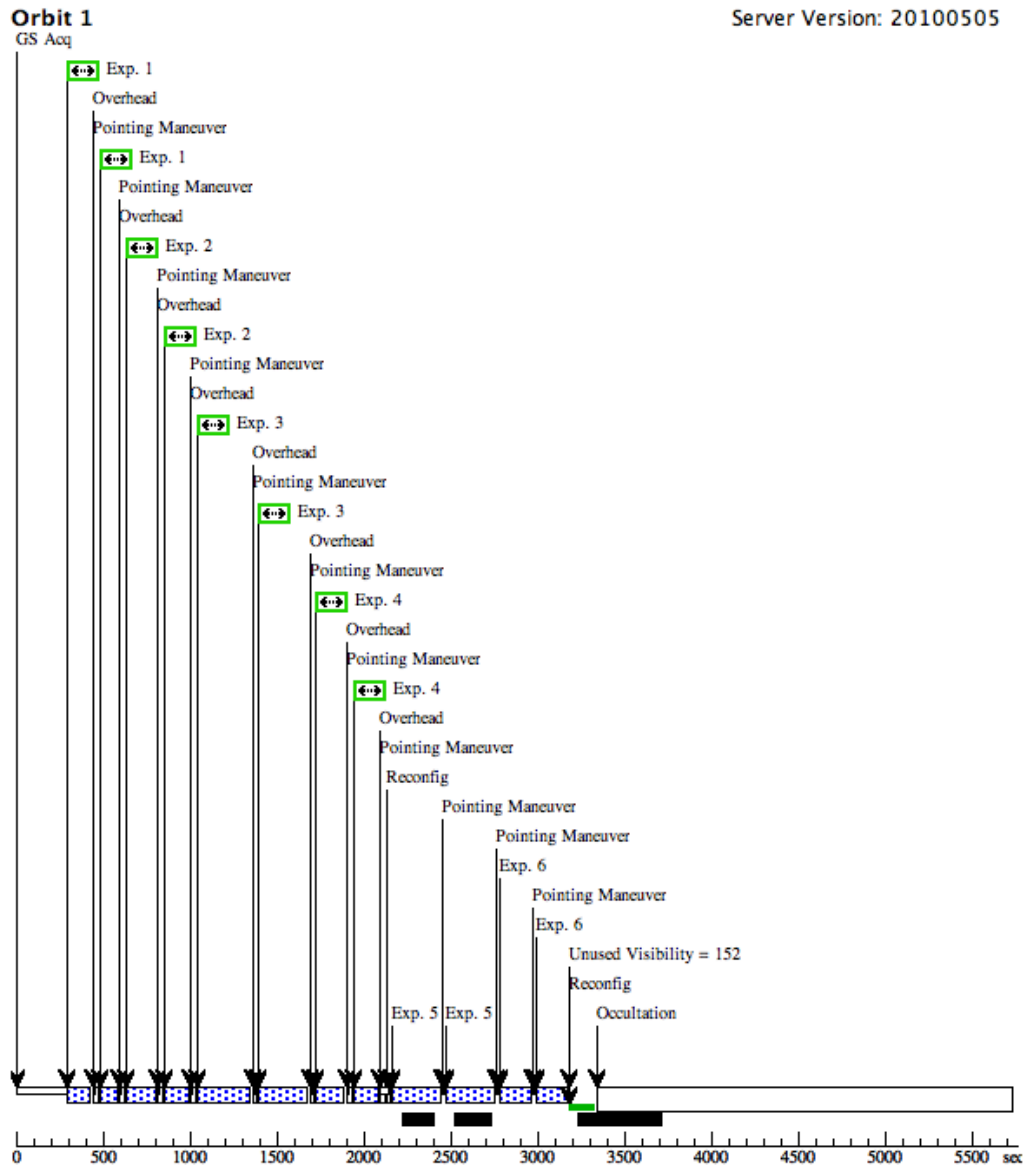


Proposal 12021 - Visit 03 - An Irradiated Disk in an Ultraluminous X-Ray Source

Wed Jul 28 15:24:12 GMT 2010

Visit	Proposal 12021, Visit 53, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR, WFC3/UVIS Special Requirements: BETWEEN 06-SEP-2010:00:00:01 AND 13-SEP-2010:23:59:59 <i>Comments: This visit should be scheduled to occur during the 12,000 second duration of the Chandra re-observation that was approved due to the HST problems.</i>									
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures					
		(2)	Pattern Type=WFC3-UVIS-DITHER- LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4)				
	(3)	Pattern Type=WFC3-IR-DITHER- LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(5), (6)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	NGC5408X-1	RA: 14 03 19.6200 (210.8317500d) Dec: -41 22 58.54 (-41.38293d) Equinox: J2000		V=22.4+/-0.2	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F547M	CR-SPLIT=NO		Pattern 2, Exps 1-1 (2)	100 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	2	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F336W	CR-SPLIT=NO		Pattern 2, Exps 2-2 (2)	140 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	3	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F225W	CR-SPLIT=NO		Pattern 2, Exps 3-3 (2)	280 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	4	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F845M	CR-SPLIT=NO		Pattern 2, Exps 4-4 (2)	140 Secs [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	5	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=10; SAMP-SEQ=STEP5 0		Pattern 3, Exps 5-5 (3)	[=>(Pattern 1)] [=>(Pattern 2)]	[1]
6	(1) NGC5408X-1	(1) NGC5408X-1	WFC3/IR, MULTIACCUM, IR	F105W	NSAMP=8; SAMP-SEQ=STEP5 0		Pattern 3, Exps 6-6 (3)	[=>(Pattern 1)] [=>(Pattern 2)]	[1]	

Orbit Structure



Proposal 12021 - Visit 53 - An Irradiated Disk in an Ultraluminous X-Ray Source

Visit	Proposal 12021, Visit 04, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)					Wed Jul 28 15:24:12 GMT 2010				
Patterns	#	Primary Pattern	Secondary Pattern	Exposures						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	(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)					
	(1)	NGC5408X-1	RA: 14 03 19.6200 (210.8317500d) Dec: -41 22 58.54 (-41.38293d) Equinox: J2000		V=22.4+/-0.2	Reference Frame: ICRS				
	1	(1) NGC5408X-1	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F502N	CR-SPLIT=NO		Pattern 1, Exps 1-1 (1)	650 Secs [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]	

