15831 - Measuring the Stellar Populations In a Strongly Lensed X-ray Emitting Dwarf Starburst at Cosmic Noon

Cycle: 27, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Matthew Bayliss (PI) (Contact)	**University of Cincinnati Main Campus**	**mbbayliss@gmail.com**
Prof. Michael D. Gladders (CoI)	University of Chicago	gladders@oddjob.uchicago.edu
Prof. Keren Sharon (CoI)	University of Michigan	kerens@umich.edu
Dr. Guillaume Mahler (CoI)	University of Michigan	guillaume.mahler@gmail.com
Dr. Haakon Dahle (CoI) (ESA Member)	University of Oslo	hdahle@astro.uio.no
Dr. T. Emil Rivera-Thorsen (CoI) (ESA Member)	University of Oslo	emil.rivera-thorsen@astro.uio.no
Dr. Katherine E. Whitaker (CoI)	University of Connecticut	kate.whitaker@uconn.edu
Prof. Michael A. McDonald (CoI)	Massachusetts Institute of Technology	mcdonald@space.mit.edu
Prof. Steven W. Allen (CoI)	Stanford University	swa@stanford.edu
Dr. Jane R. Rigby (CoI)	NASA Goddard Space Flight Center	jane.r.rigby@nasa.gov
Dr. Michael Florian (CoI)	NASA Goddard Space Flight Center	michael.k.florian@nasa.gov
Mr. Gourav Khullar (CoI)	University of Chicago	gkhullar@uchicago.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) PHOENIX-XRAY-ARC-POS1 (2) PHOENIX-XRAY-ARC-POS2	WFC3/IR	2	19-Jul-2019 16:00:19.0	yes
02	(1) PHOENIX-XRAY-ARC-POS1 (2) PHOENIX-XRAY-ARC-POS2	WFC3/IR	2	19-Jul-2019 16:00:22.0	yes

4 Total Orbits Used

ABSTRACT

We propose a pioneering study of the X-ray emission from star-forming stellar populations in a dwarf galaxy during the epoch of peak star-formation in the Universe (Cosmic Noon). Extreme, but short-lived, X-ray sources in young stellar populations can inject significant mechanical feedback into their local star--forming environments, and may even play a crucial role in clearing out the interstellar medium, allowing ionizing radiation to escape galaxies. Understanding these sources and the stellar populations that host them is an essential piece of accurately modeling star formation across cosmic history. The goal of this proposal is to take full advantage of an extraordinarily highly magnified X-ray emitting dwarf starburst galaxy to study the connection between star-formation, stellar populations, and HMXBs at Cosmic Noon. Doing so requires precision measurements of the continuum emission spanning the rest-frame optical spanning the 4000 angstrom break in this galaxy. Our proposed observations will allow us to constrain the rest-frame optical properties of the stellar populations in this galaxy. We will measure the stellar populations of two spatially resolved UV-bright star-forming clumps (one X-ray bright and one not) in a distant (z=1.52) strongly lensed X-ray emitting star-forming galaxy. This small program would, for the first time, extend our ability to perform spatially resolved studies of the X-ray emission from star-forming stellar populations beyond the local universe, out to Cosmic Noon.

OBSERVING DESCRIPTION

The purpose of these observations is to obtain photometry in for WFC3/IR bands (F098M, F125W, F140W, and F160W) of the field containing a strongly lensed dwarf star-forming galaxy at z=1.52 that has an X-ray detection in existing Chandra data. The four WFC3/IR bands be combined with existing optical detections (ACS/WFC F475W and F775W data) to measure the spectral energy distribution between rest-frame ~1700-6700 angstroms for 1) the total integrated light from lensed galaxy, and 2) for individual, spatially resolved (due to the high lensing magnification) star-forming regions-one with the X-ray emission, one without-in the lensed galaxy. We will use the WFC3/IR photometry to constrain the properties of the stellar populations in the X-ray emitting dwarf galaxy as a whole (as it would be observed in a typical deep field survey), and of the individual star-forming clumps within the galaxy. The observations are designed primarily to yield good signal-to-noise detections of the individual star-forming clumps in each band. Following the scheduling instructions for Cycle 27, we have split the for orbits in this program into two separate visits of 2 orbits each. We have designed the two visits to be identical, so that each visit will, on its own, provide four dithered images (for good PSF reconstruction) in each of the four bands. This design ensures scientifically useful data even in the event that only one of the visits executes successfully.

Visit

Proposal 15831, Visit 01 Fri Jul 19 20:00:23 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(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		(1), (2), (3), (4), (5), (6), (7), (8)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PHOENIX-XRAY-ARC-POS1	RA: 23 44 44.1000 (356.1837500d) Dec: -42 43 9.70 (-42.71936d) Equinox: J2000	Epoch of Position: 2000	V=24.3	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[GRAVITATIONAL LENS, STARBURST]
Extended=YES

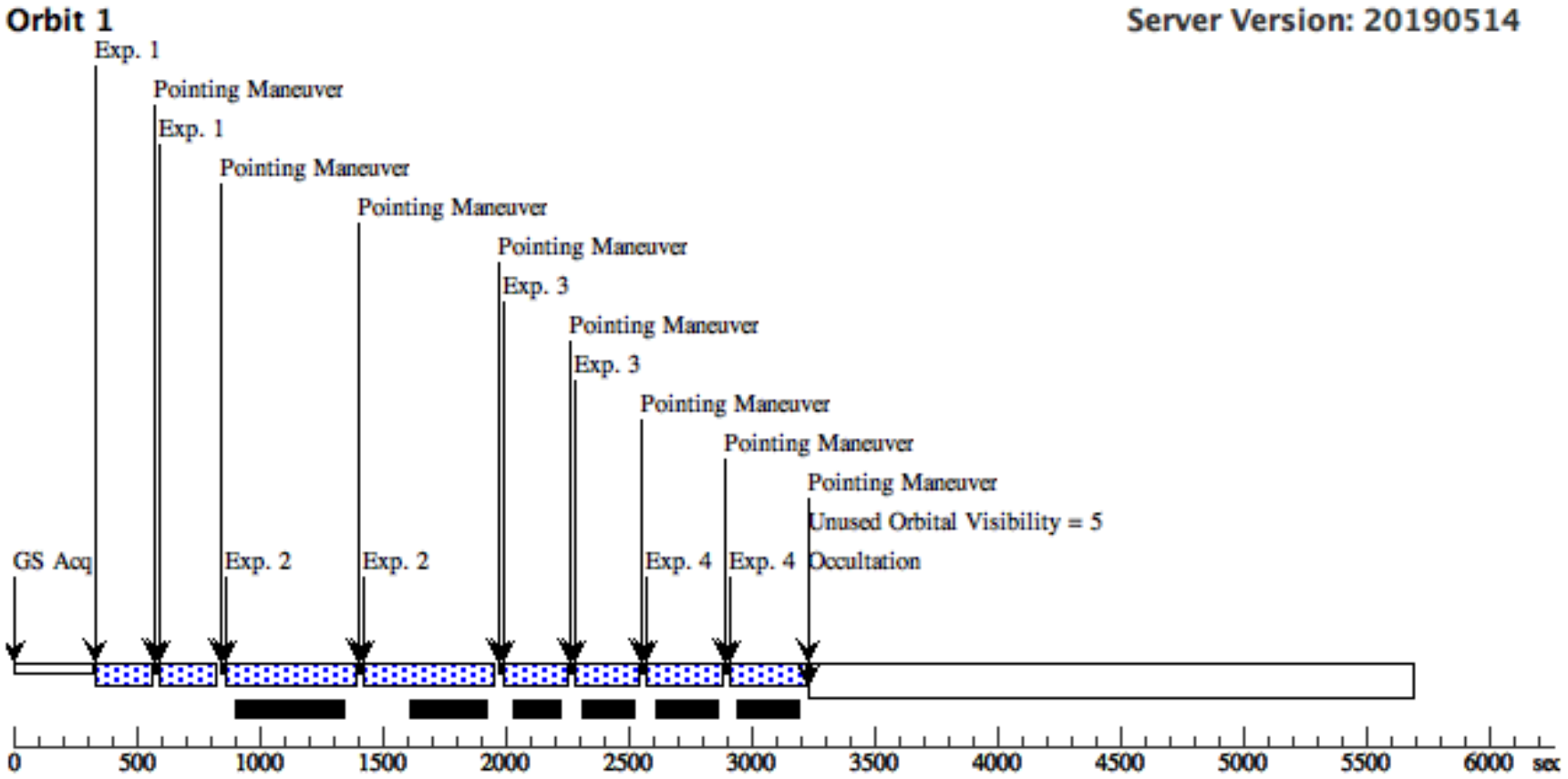
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	PHOENIX-XRAY-ARC-POS2	RA: 23 44 44.1000 (356.1837500d) Dec: -42 43 4.00 (-42.71778d) Equinox: J2000	Epoch of Position: 2000	V=24.3	Reference Frame: SIMBAD

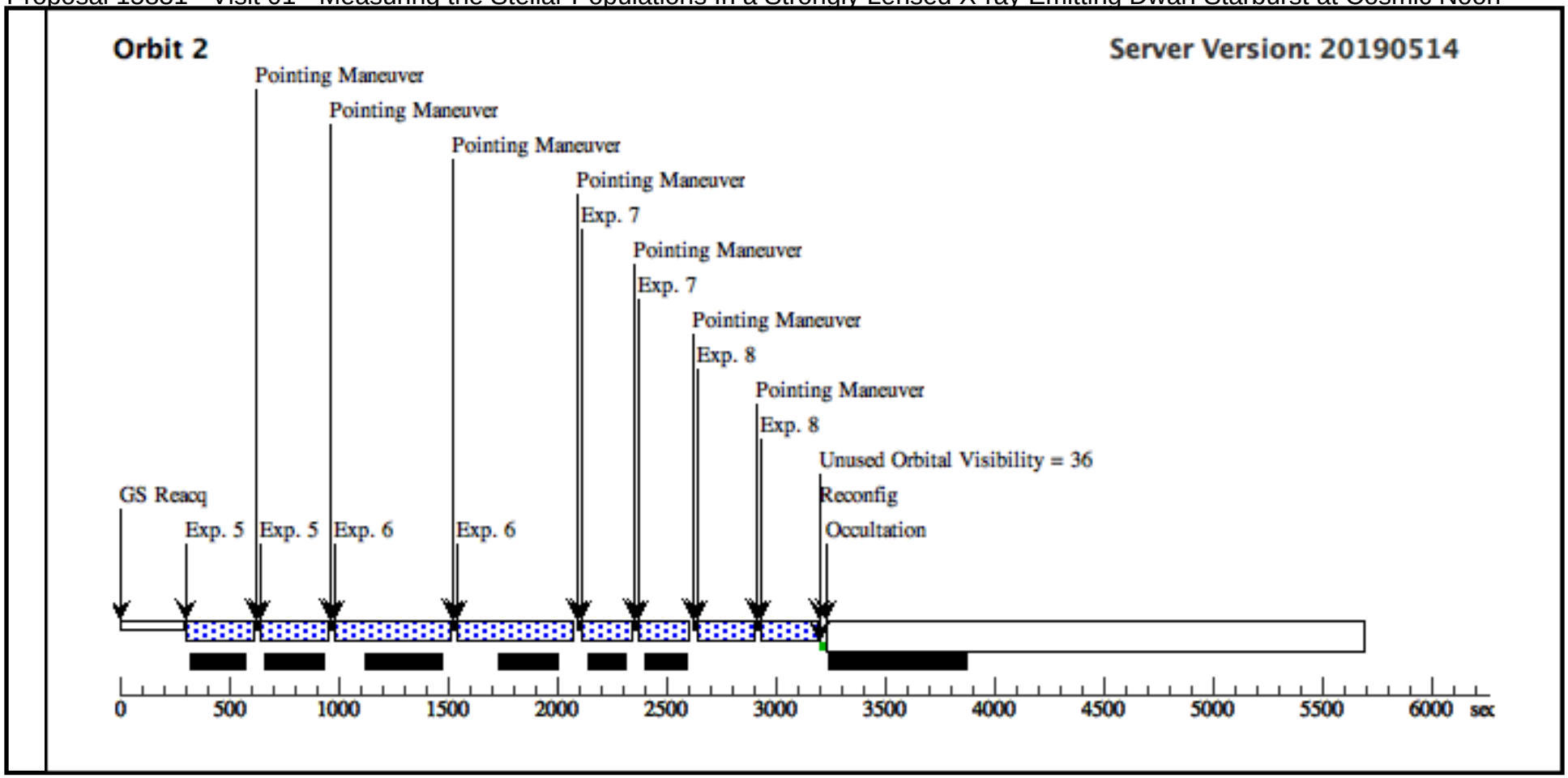
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[GRAVITATIONAL LENS, STARBURST]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F125W	SAMP-SEQ=SPARS25; NSAMP=9		Pattern 3, Exps 1-1 in Visit 01 (3)	202.936411 Secs (405.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=11		Pattern 3, Exps 2-2 in Visit 01 (3)	502.936801 Secs (1005.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F140W	SAMP-SEQ=SPARS25; NSAMP=10		Pattern 3, Exps 3-3 in Visit 01 (3)	227.936926 Secs (455.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F098M	SAMP-SEQ=SPARS25; NSAMP=12		Pattern 3, Exps 4-4 in Visit 01 (3)	277.937956 Secs (555.876 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F098M	SAMP-SEQ=SPARS25; NSAMP=12		Pattern 3, Exps 5-5 in Visit 01 (3)	277.937956 Secs (555.876 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
6		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=11		Pattern 3, Exps 6-6 in Visit 01 (3)	502.936801 Secs (1005.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
7		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F125W	SAMP-SEQ=SPARS25; NSAMP=9		Pattern 3, Exps 7-7 in Visit 01 (3)	202.936411 Secs (405.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
8		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F140W	SAMP-SEQ=SPARS25; NSAMP=10		Pattern 3, Exps 8-8 in Visit 01 (3)	227.936926 Secs (455.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20190514
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Exp. 7
Pointing Maneuver
Exp. 7
Pointing Maneuver
Exp. 8
Pointing Maneuver
Exp. 8
Unused Orbital Visibility = 36
Reconfig
Occultation
GS Reacq
Exp. 5
Exp. 5
Exp. 6
Exp. 6
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15831, Visit 02 Fri Jul 19 20:00:23 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(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		(1), (2), (3), (4), (5), (6), (7), (8)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PHOENIX-XRAY-ARC-POS1	RA: 23 44 44.1000 (356.1837500d) Dec: -42 43 9.70 (-42.71936d) Equinox: J2000	Epoch of Position: 2000	V=24.3	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[GRAVITATIONAL LENS, STARBURST]
Extended=YES

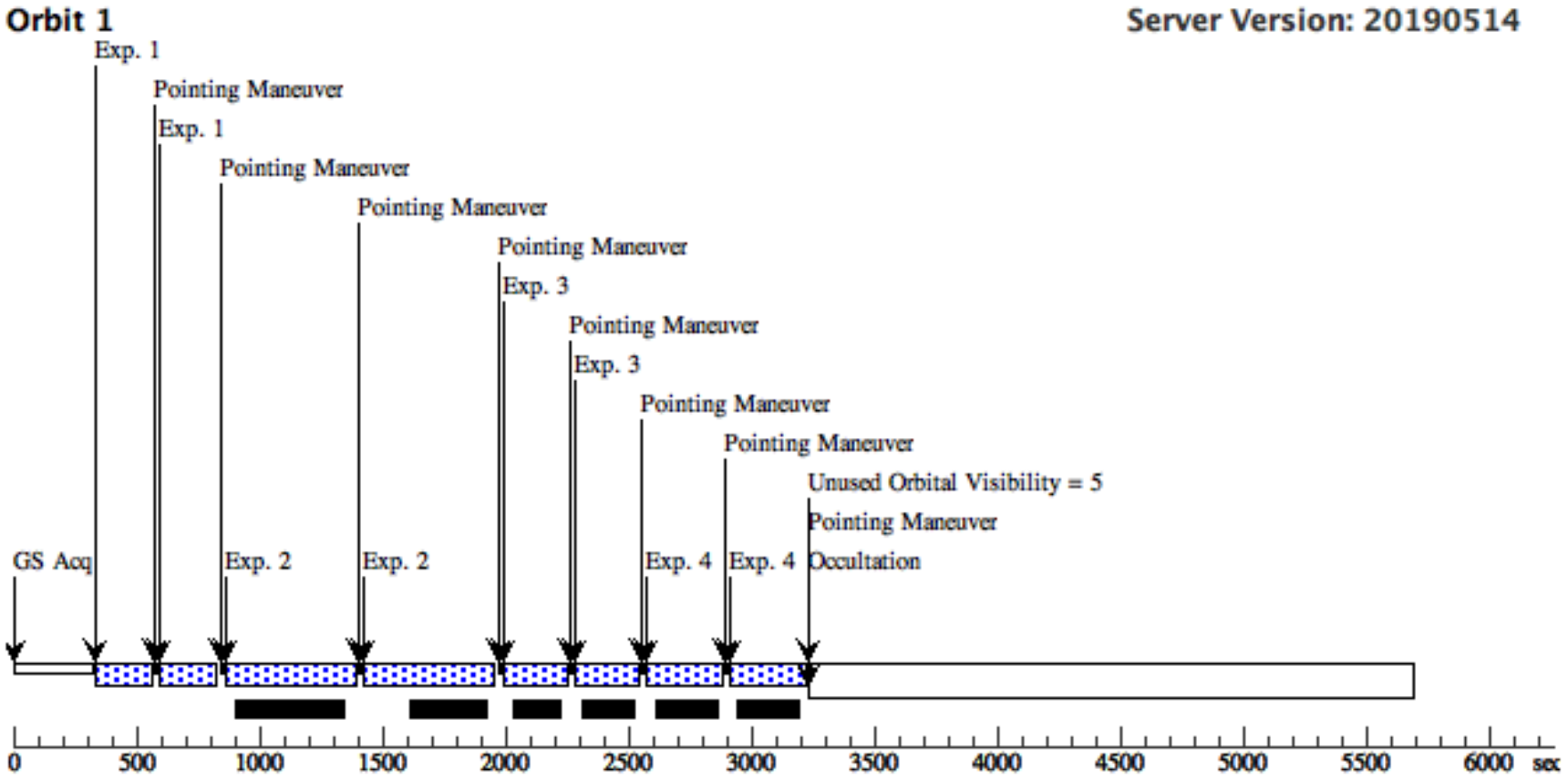
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	PHOENIX-XRAY-ARC-POS2	RA: 23 44 44.1000 (356.1837500d) Dec: -42 43 4.00 (-42.71778d) Equinox: J2000	Epoch of Position: 2000	V=24.3	Reference Frame: SIMBAD

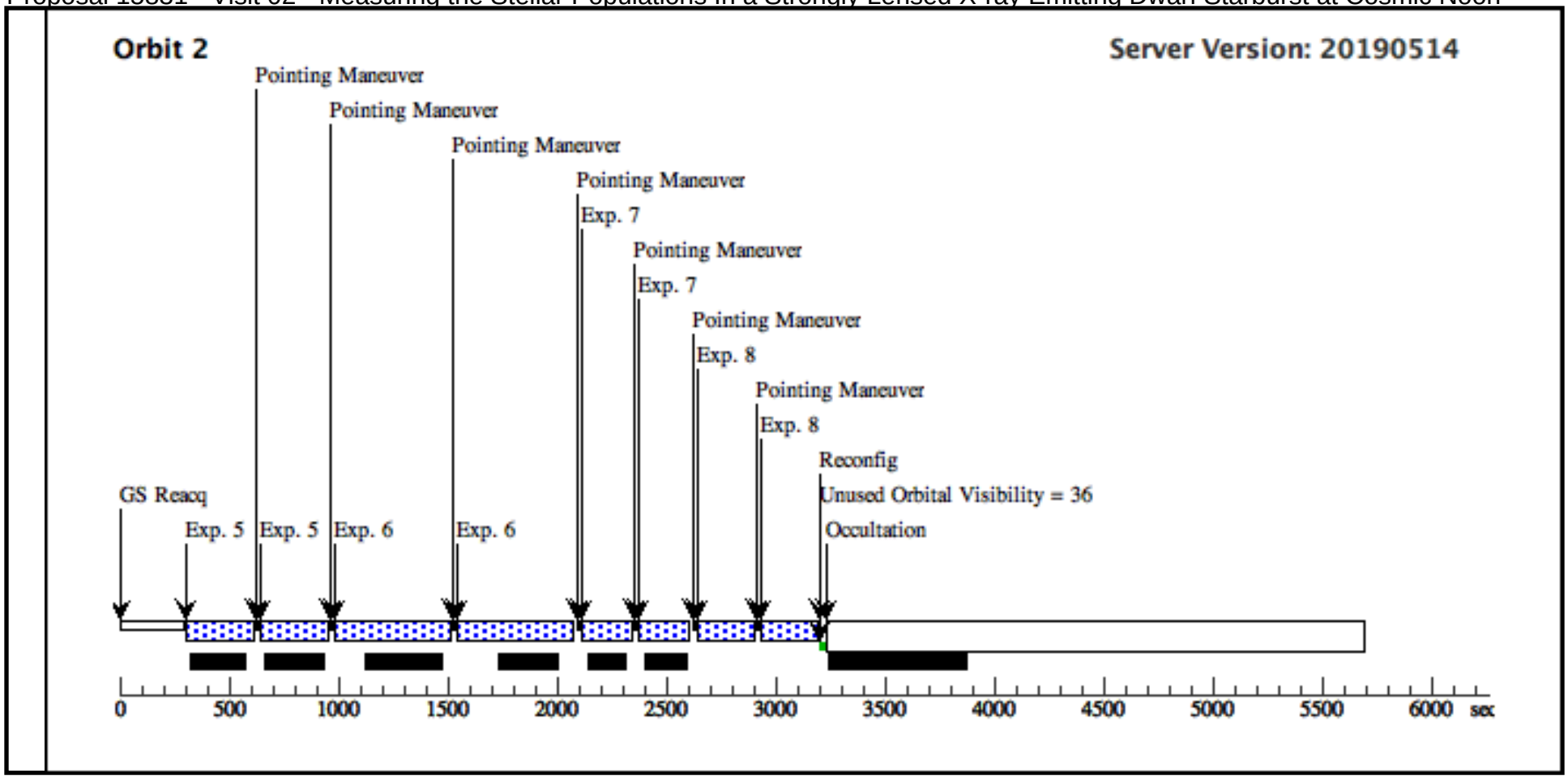
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[GRAVITATIONAL LENS, STARBURST]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F140W	SAMP-SEQ=SPARS25; NSAMP=9		Pattern 3, Exps 1-1 in Visit 02 (3)	202.936411 Secs (405.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=11		Pattern 3, Exps 2-2 in Visit 02 (3)	502.936801 Secs (1005.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
3		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F125W	SAMP-SEQ=SPARS25; NSAMP=10		Pattern 3, Exps 3-3 in Visit 02 (3)	227.936926 Secs (455.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
4		(1) PHOENIX-XRAY-ARC-POS1	WFC3/IR, MULTIACCUM, IR-FIX	F098M	SAMP-SEQ=SPARS25; NSAMP=12		Pattern 3, Exps 4-4 in Visit 02 (3)	277.937956 Secs (555.876 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
5		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F098M	SAMP-SEQ=SPARS25; NSAMP=12		Pattern 3, Exps 5-5 in Visit 02 (3)	277.937956 Secs (555.876 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
6		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=11		Pattern 3, Exps 6-6 in Visit 02 (3)	502.936801 Secs (1005.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
7		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F125W	SAMP-SEQ=SPARS25; NSAMP=9		Pattern 3, Exps 7-7 in Visit 02 (3)	202.936411 Secs (405.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
8		(2) PHOENIX-XRAY-ARC-POS2	WFC3/IR, MULTIACCUM, IR-FIX	F140W	SAMP-SEQ=SPARS25; NSAMP=10		Pattern 3, Exps 8-8 in Visit 02 (3)	227.936926 Secs (455.874 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20190514
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Exp. 7
Pointing Maneuver
Exp. 7
Pointing Maneuver
Exp. 8
Pointing Maneuver
Exp. 8
Reconfig
Unused Orbital Visibility = 36
Occultation
GS Reacq
Exp. 5
Exp. 5
Exp. 6
Exp. 6
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec