15325 - HST Imaging of the Eye of Horus, a Double Source Plane Gravitational Lens

Cycle: 25, 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) EYEOFHORUS	ACS/WFC	3	10-Apr-2018 11:01:07.0	yes

3 Total Orbits Used

ABSTRACT

Double source plane (DSP) gravitational lenses are extremely rare alignments of a massive lens galaxy with two background sources at distinct redshifts. The presence of two source planes provides important constraints on cosmology and galaxy structure beyond that of typical lens systems by breaking degeneracies between parameters that vary with source redshift. While these systems are extremely valuable, only a handful are known. We have discovered the first DSP lens, the "Eye of Horus", in the Hyper Suprime-Cam survey and have confirmed both source redshifts with follow-up spectroscopy, making this the only known DSP lens with both source redshifts measured. Furthermore, the brightest image of the most distant source (S2) is split into a pair of images by a mass component that is undetected in our ground-based data, suggesting the presence of a satellite or line-of-sight galaxy causing this splitting. In order to better understand this system and use it for cosmology and galaxy studies, we must construct an accurate lens model, accounting for the lensing effects of both the main lens galaxy and the intermediate source. Only with deep, high-resolution imaging from HST/ACS can we accurately model this system. Our proposed multiband imaging will clearly separate out the two sources by their distinct colors, allowing us to use their extended surface brightness distributions as constraints on our lens model. These data may also reveal the satellite galaxy responsible for the splitting of the brightest image of S2. With these observations, we will be able to take full advantage of the wealth of information provided by this system.

OBSERVING DESCRIPTION

We aim to image the double source plane lens, the "Eye of Horus", using the ACS/WFC. Our goal is to obtain a S/N = 3 per pixel for both S1 (z=1.30) in the F606W filter, as well as S2 (z=1.99) in the F850LP filter. To attain this, we require 2 orbits in F606W and 1 orbit in F850LP.

We use the ACS-WFC-DITHER-BOX 4-point dither pattern for our observations to eliminate defects and improve the PSF sampling. The entire target is ~10 arcsec across, which easily fits within the ACS field of view.

Our proposed observations consist of a single visit of 3 orbits, using the WFC aperture.
Orbit 1: Dither 1 (2 exposures in F606W, 1 exposure in F850LP), Dither 2 (1 exposure in F606W)
Orbit 2: Dither 2 (1 exposure in F606W, 1 exposure in F850LP), Dither 3 (2 exposures in F606W)
Orbit 3: Dither 3 (1 exposure in F850LP), Dither 4 (2 exposures in F606W, 1 exposure in F850LP)

Visit

Proposal 15325, Visit 1 (01), implementation Tue Apr 10 15:01:08 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.262 Line Spacing=0.192	Coordinate Frame=POS-TARG Pattern Orientation=18.39 Angle Between Sides=68.14 Center Pattern=false		(1-2)

Fixed Targets

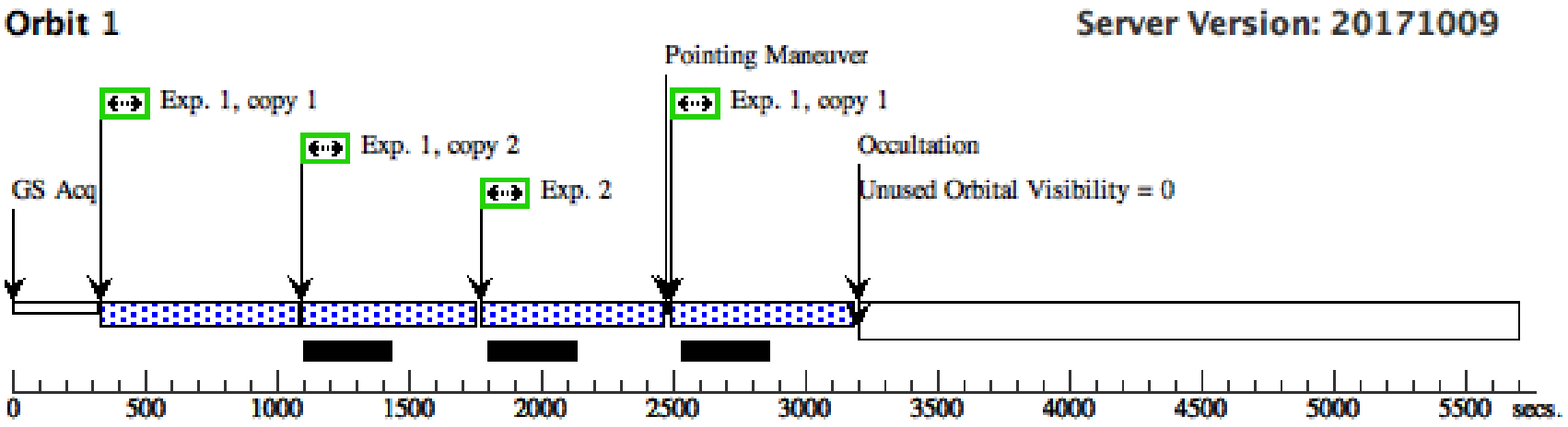
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	EYEOFHORUS	RA: 14 24 49.0000 (216.2041667d) Dec: -00 53 22.00 (-.88944d) Equinox: J2000		V=20.5+/-0.5	Reference Frame: ICRS

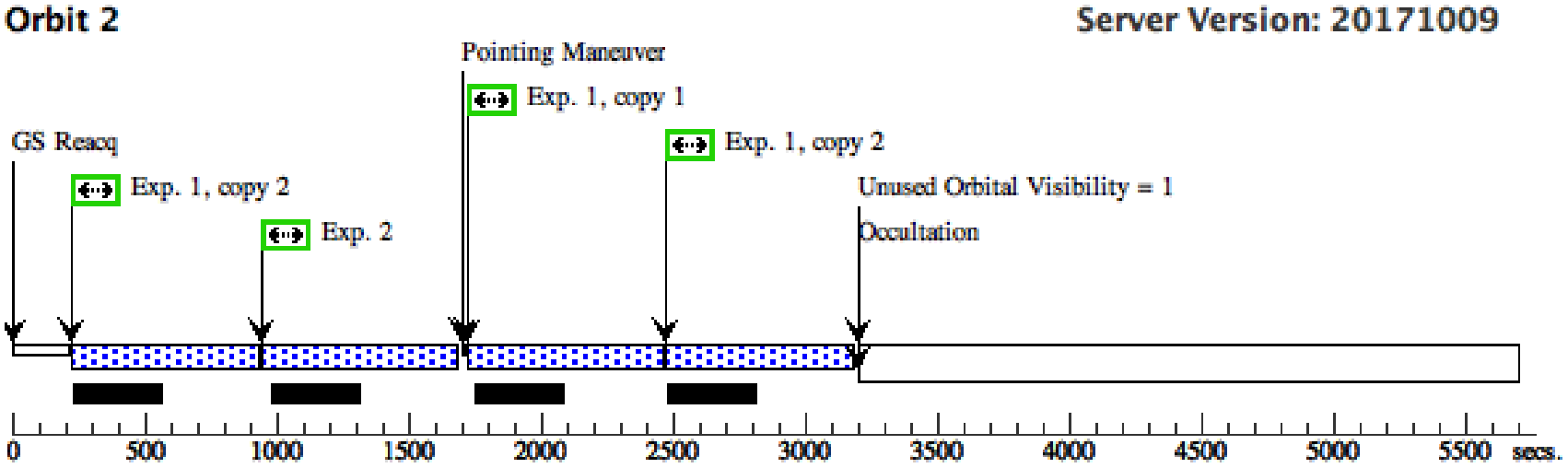
Comments:
Category=GALAXY
Description=[EINSTEIN RING, GRAVITATIONAL LENS]

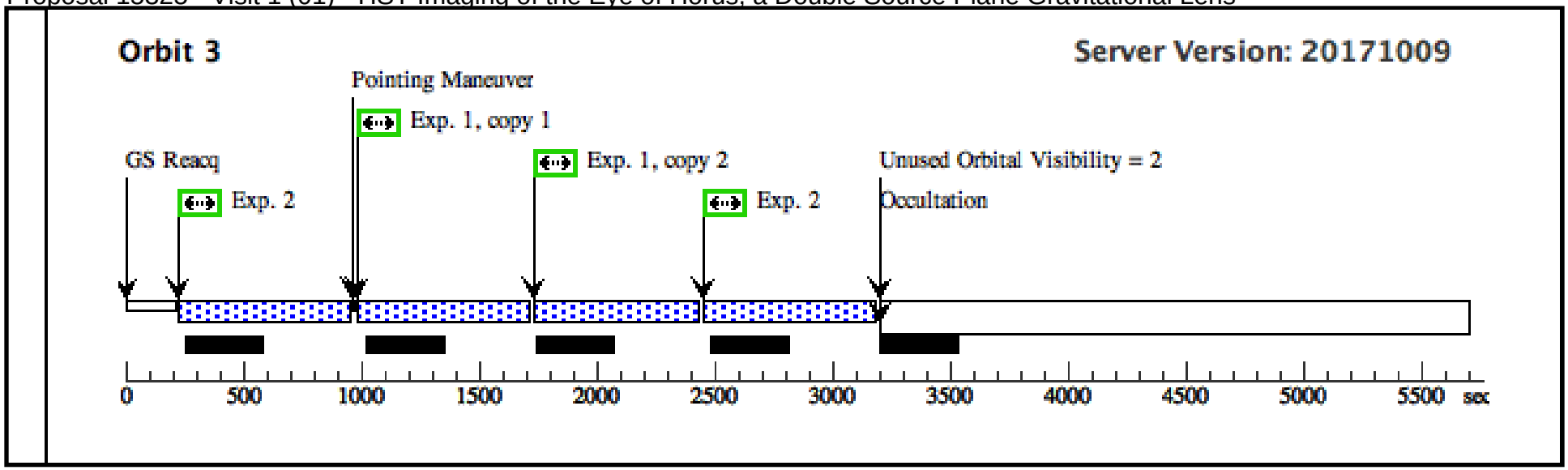
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F606W (1003548)	(1) EYEOFHORUS	ACS/WFC, ACCUM, WFC1	F606W		GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-2 in Visit 1 (01) (1)	540 Secs X 2 (4546 Secs)	
								[==>(Pattern 1, Copy 1)]	***[1]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 2, Copy 1)]	
								[==>588.0 Secs (Pattern 2, Copy 2)]	***[2]***
								[==>588.0 Secs (Pattern 3, Copy 1)]	
								[==>588.0 Secs (Pattern 3, Copy 2)]	
								[==>581.0 Secs (Pattern 4, Copy 1)]	***[3]***
								[==>581.0 Secs (Pattern 4, Copy 2)]	
2	F850LP (1003552)	(1) EYEOFHORUS	ACS/WFC, ACCUM, WFC1	F850LP			Pattern 1, Exps 1-2 in Visit 1 (01) (1)	540 Secs (2290 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>588.0 Secs (Pattern 2)]	***[2]***
								[==>581.0 Secs (Pattern 3)]	***[3]***
								[==>581.0 Secs (Pattern 4)]	

Orbit Structure






Orbit 3
Server Version: 20171009
Pointing Maneuver
Exp. 1, copy 1
GS Reacq
Exp. 2
Exp. 1, copy 2
Exp. 2
Unused Orbital Visibility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec