15696 - Constraints on the physical origins of Lyman-alpha halos at z>4 from giant gravitational arcs

Cycle: 26, 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	(2) MACS0940-ACS	ACS/WFC	3	15-May-2019 18:01:44.0	yes
02	(1) MACS0940	WFC3/IR	1	15-May-2019 18:01:45.0	yes
03	(1) MACS0940	WFC3/IR	1	15-May-2019 18:01:45.0	yes
63	(1) MACS0940	WFC3/IR	1	15-May-2019 18:01:45.0	yes

6 Total Orbits Used

ABSTRACT

Recent deep integral-field spectroscopy observations using VLT/MUSE revealed two high-redshift (z>4) lensed arcs in the galaxy cluster MACS0940. Notably, both lensed galaxies show highly extended Lyman-alpha emission (> 5 arcsec). These are very rare sources indeed, with only three other such systems known to date.

However, truly exceptional is the fact that one of these galaxies forms an almost complete Einstein ring, with the Lyman-alpha arc reaching an unrivaled extent of 30 arcsec. Moreover, the MUSE spectroscopy of this object has identified distinct large-scale spatial variations in the Lyman-alpha line profile.

While this object is very unusual from an observational perspective, it shares many intrinsic properties with other, typical, unlensed Lyman-alpha emitters, thus providing an unbiased testbed for distinguishing the different scenarios that have been proposed to explain the origin of Lyman-alpha halos: (a) scattering of the Lyman-alpha emission by neutral gas, (b) cold streams feeding the circumgalactic medium (CGM) and shining in Lyman alpha, and/or (c) the presence of satellite galaxies surrounding the main source of emission.

Using multi-band HST photometry in the rest-frame UV, we will map the star-formation activity in both Lyman-alpha arcs. By correlating the results with the Lyman-alpha properties observed with MUSE, and leveraging the magnification boost from the galaxy cluster, we will be able to empirically test the different scenarios.

OBSERVING DESCRIPTION

Observations of galaxy cluster MACS0940 in three filter bands. F814W (3 orbits), F125W (1 orbit) and F160W (1 orbit).
Pointing chosen to cover MUSE 1'x1' FoV within a single WFC chip
Roll angle constraints for F814W are required to avoid bright star.
Each orbit contains 2 exposures with a small dither.

Proposal 15696 - Visit 01 - Constraints on the physical origins of Lyman-alpha halos at z>4 from giant gravitational arcs

Visit

Proposal 15696, Visit 01, scheduled Wed May 15 22:01:46 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 45D TO 135 D

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(3)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

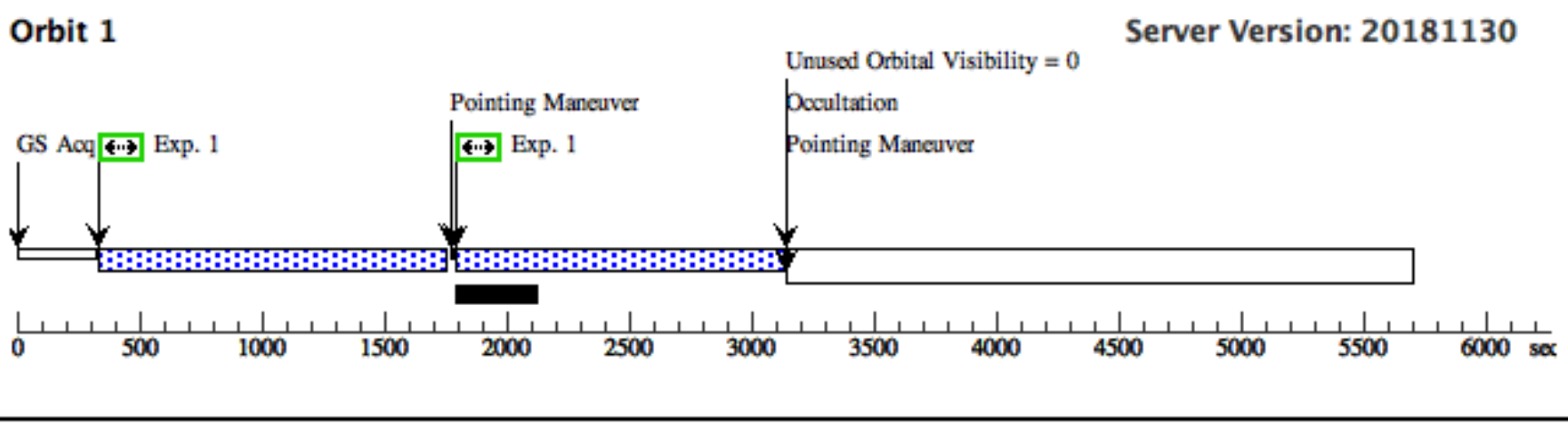
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	MACS0940-ACS	RA: 09 40 53.6960 (145.2237333d) Dec: +07 44 24.90 (7.74025d) Equinox: J2000		V=18.44+/-0.05 Primary target (System 1 arc): V -Magnitude = 22.27 +/- 0.1	Reference Frame: ICRS

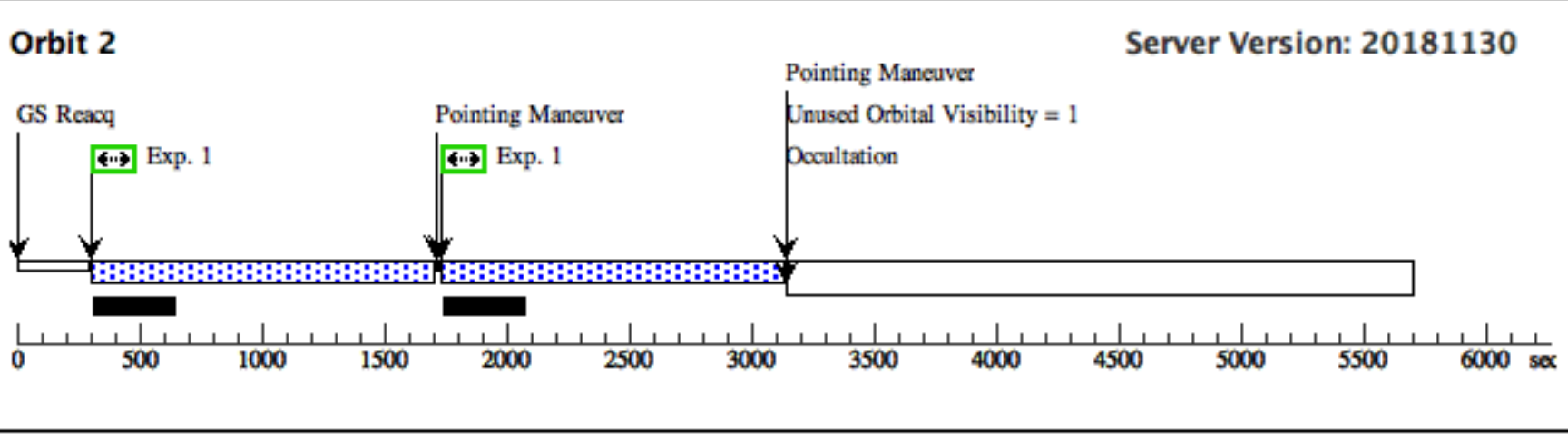
Comments:
Category=CLUSTER OF GALAXIES
Description=[EINSTEIN RING, GRAVITATIONAL LENS]

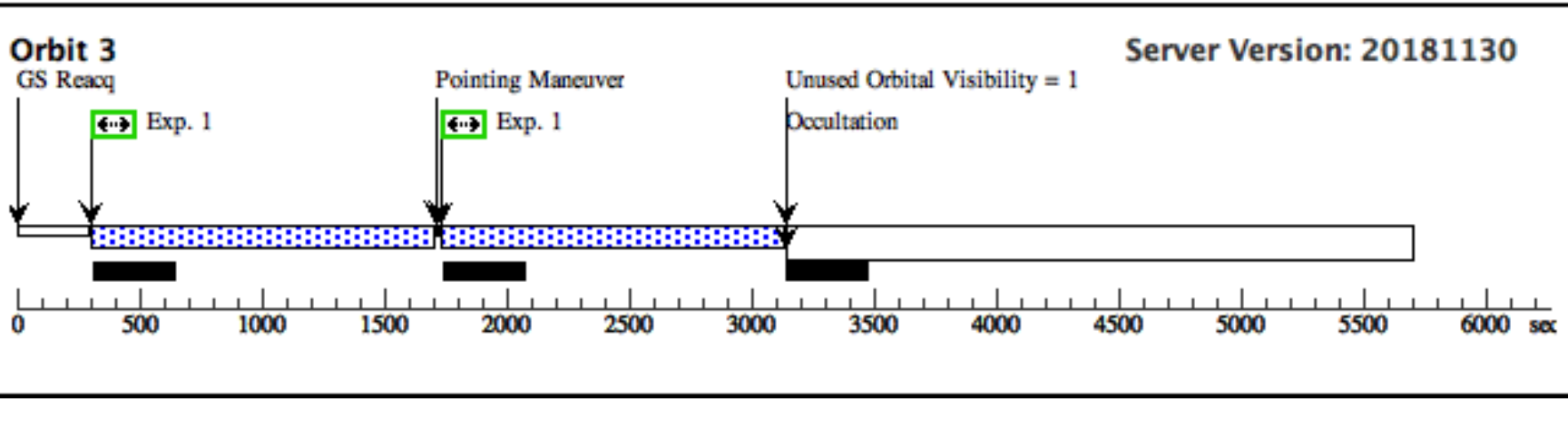
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) MACS0940-ACS	ACS/WFC, ACCUM, WFC1	F814W			Pattern 3, Exps 1-1 in Visit 01 (3)	1000 Secs (7526 Secs)	
								[==>1217.0 Secs (Pattern 1,1)] *[==>1217.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1273.0 Secs (Pattern 2,1)] *[==>1273.0 Secs (Pattern 2,2)]*	***[2]***
								[==>1273.0 Secs (Pattern 3,1)] *[==>1273.0 Secs (Pattern 3,2)]*	***[3]***

Orbit Structure







Visit

Proposal 15696, Visit 02, completed Wed May 15 22:01:46 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	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)

Fixed Targets

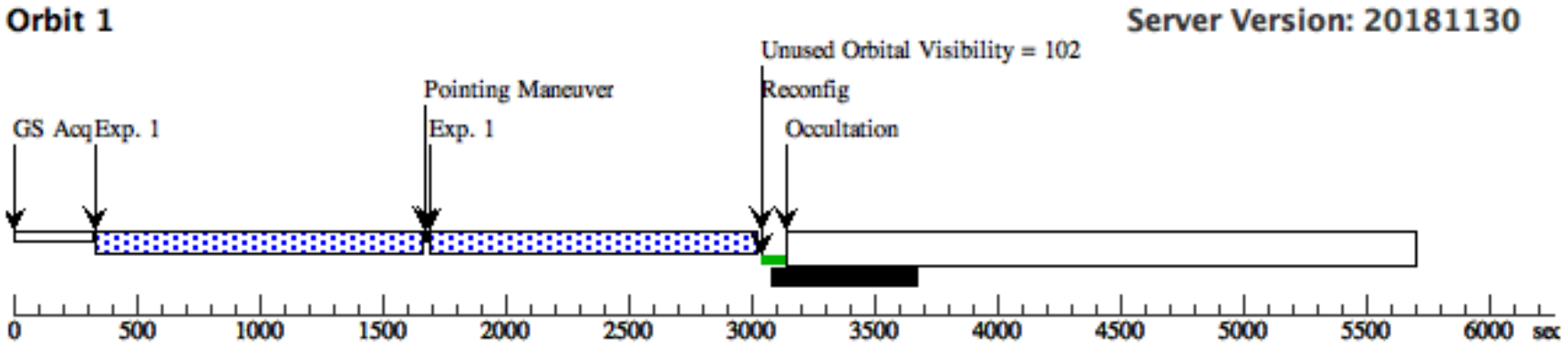
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MACS0940	RA: 09 40 53.6000 (145.2233333d) Dec: +07 44 24.90 (7.74025d) Equinox: J2000		V=18.44+/-0.05 Primary target (System 1 arc): V -Magnitude = 22.27 +/- 0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[EINSTEIN RING, GRAVITATIONAL LENS]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MACS0940	WFC3/IR, MULTIACCUM, IR	F125W	NSAMP=14; SAMP-SEQ=SPARS100		Pattern 2, Exps 1-1 in Visit 02 (2)	1302.93649 Secs (2605.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 15696, Visit 03, failed

Wed May 15 22:01:46 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	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)

Fixed Targets

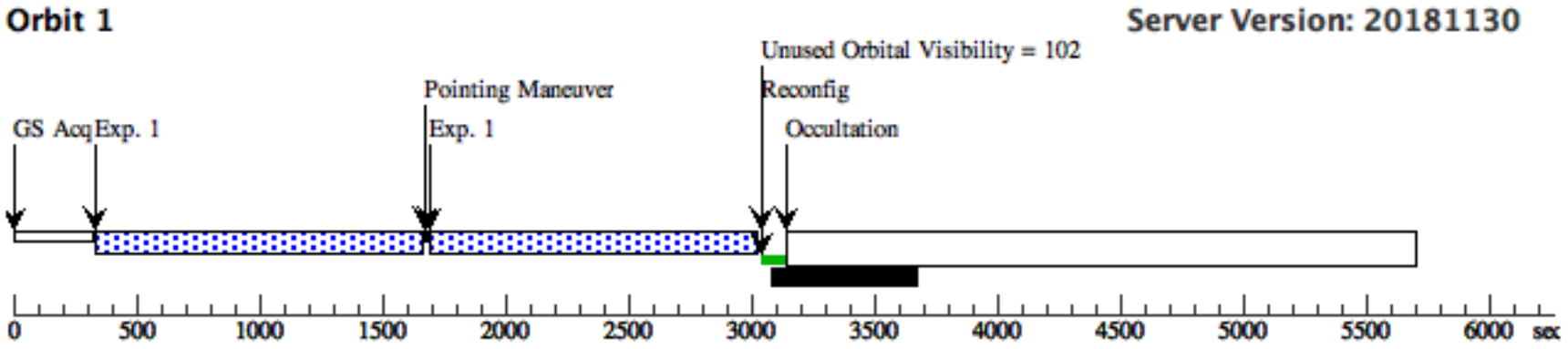
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MACS0940	RA: 09 40 53.6000 (145.2233333d) Dec: +07 44 24.90 (7.74025d) Equinox: J2000		V=18.44+/-0.05 Primary target (System 1 arc): V -Magnitude = 22.27 +/- 0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[EINSTEIN RING, GRAVITATIONAL LENS]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MACS0940	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS100	POS TARG -0.82,null	Pattern 2, Exps 1-1 in Visit 03 (2)	1302.93649 Secs (2605.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure



Visit

Proposal 15696, Visit 63, implementation

Wed May 15 22:01:46 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=2.088 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MACS0940	RA: 09 40 53.6000 (145.2233333d) Dec: +07 44 24.90 (7.74025d) Equinox: J2000		V=18.44+/-0.05 Primary target (System 1 arc): V -Magnitude = 22.27 +/- 0.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[EINSTEIN RING, GRAVITATIONAL LENS]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MACS0940	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=14; SAMP-SEQ=SPARS100	POS TARG null,-0.79; GS ACQ SCENARIO BASE1B3	Pattern 4, Exps 1-1 in Visit 63 (4)	1302.93649 Secs (2605.873 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	*[1]*

Orbit Structure