17740 - Gravitational-arc tomography of the circumgalactic medium at z~0.7: Identifying the host galaxies of three MgII absorbers

Cycle: 32, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Prof. Dawn K. Erb (PI) (Contact)	**University of Wisconsin - Milwaukee**
Dr. Britt Lundgren (CoI)	University of North Carolina Asheville
Prof. Max Pettini (CoI) (ESA Member)	University of Cambridge
Dr. Matthew Auger (CoI) (ESA Member)	University of Cambridge
Lindsay Oldham (CoI)	Harvard University
Dr. Annalisa Citro (CoI)	University of Minnesota - Twin Cities
Dr. Bethan Lesley James (CoI) (ESA Member)	Space Telescope Science Institute - ESA - JWST
Dr. Danielle Berg (CoI)	University of Texas at Austin

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) J1206+5142	WFC3/IR	1	16-Aug-2024 14:02:38.0	yes
02	(1) J1206+5142	WFC3/IR	1	16-Aug-2024 14:02:39.0	yes
03	(3) J0918+5104	WFC3/IR	1	16-Aug-2024 14:02:39.0	yes
04	(3) J0918+5104	WFC3/IR	1	16-Aug-2024 14:02:40.0	yes
05	(2) J1514+3636	WFC3/IR	1	16-Aug-2024 14:02:40.0	yes
06	(2) J1514+3636	WFC3/IR	1	16-Aug-2024 14:02:40.0	yes

6 Total Orbits Used

ABSTRACT

The dynamic circumgalactic medium (CGM) is the site of gas flows into, out of, and around galaxies, and thus plays a central role in regulating star formation over cosmic time. Many of its properties remain unconstrained, however, particularly on a spatially resolved basis. Extensive statistical studies of the gas around galaxies have been performed using the absorption it produces in background sources, usually quasars that probe a single line of sight. In particular, absorption from singly-ionized magnesium (MgII) has been shown to trace the outflow and accretion of cool, enriched gas surrounding galaxies.

More recently, a handful of MgII-absorbing galaxies have been studied with gravitational-arc tomography, which uses the fortuitous alignment of an intermediate redshift galaxy and a background lensed arc to probe the gas around the foreground galaxy in unprecedented detail over tens of kpc. We here propose to use WFC3/IR grism spectroscopy to identify the galaxies responsible for spatially varying foreground MgII and FeII absorption observed at z~0.7-0.8 in Keck Cosmic Web Imager (KCWI) integral field spectroscopy of three gravitationally lensed galaxies. The proposed observations will provide spectroscopy at high spatial resolution of the entire field surrounding each arc, targeting H-alpha emission at the redshifts of the absorbers. Identification of the absorbing galaxies will enable measurement of the impact parameters of the absorption and the correlation of the strength, structure and kinematics of the absorption lines with the morphologies, star formation rates, and star formation rate surface densities of the absorbing galaxies.

OBSERVING DESCRIPTION

The three target absorption systems are at z = 0.69, z = 0.83 and z = 0.65 for J1206+5142, J1514+3636 and J0918+5104 respectively, placing Halpha emission at 1.109, 1.201 and 1.083 um. We will therefore use the G102 grism with F098M direct images for the two lower redshift targets, J1206+5142 and J0918+5104, and the G141 grism with F140W direct images for J1514+3636.

Orbits and exposures:

We observe each target for two orbits, and each visit consists of one orbit. In each orbit 2 dithered exposures with the grism will be obtained, along with short direct images taken at the same position, which are necessary for the wavelength calibration. We schedule the two orbits on each target as two different visits, with the roll angle of the second visit set to differ from that of the first visit by at least 20 degrees. We set ORIENT 20 TO 160

from the previous visit to the target, but ORIENT -20 to -160 is also acceptable.

The purpose of using different roll angles for the two orbits is to improve our ability to account for contamination by overlapping spectra. This offset in the roll angle between visits to the same target will produce two sets of data with differing contamination properties, making the overall contamination for individual spectra easier to determine.

We follow the simple pattern:
direct, grism, offset, direct, grism

Dithering strategy:

We use POS-TARG offsets to enable rejection of hot/bad pixels and to improve sampling of the PSF. The pattern is:
POS-TARG: (0, 0) (1.355, 0.424)
pixels: (0, 0) (10.0, 3.5)

This is a larger version of the standard WFC3-IR-DITHER-BOX-MIN pattern, which has only 1-2 pixel offsets between pointings. As some bad pixels come in clumps we prefer a slightly larger pattern. No attempt is made to dither over the "dead spot", as large dithers introduce large differential distortion. We use the same dither pattern for both visits to each field, since the differing orientations will ensure that spectra of the same objects fall on different pixels.

Additional requirements:

For J1206+5142, we additionally specify an ORIENT range of 117 to 28 degrees for the first visit, based on avoiding spectral contamination from the lens and arc for the most likely host galaxy. We place no ORIENT constraints on the first visit for the other two targets.

Visit

Proposal 17740, Visit 01 Fri Aug 16 18:02:41 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 117D TO 28 D

Diagnostics

(Visit 01) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 01) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

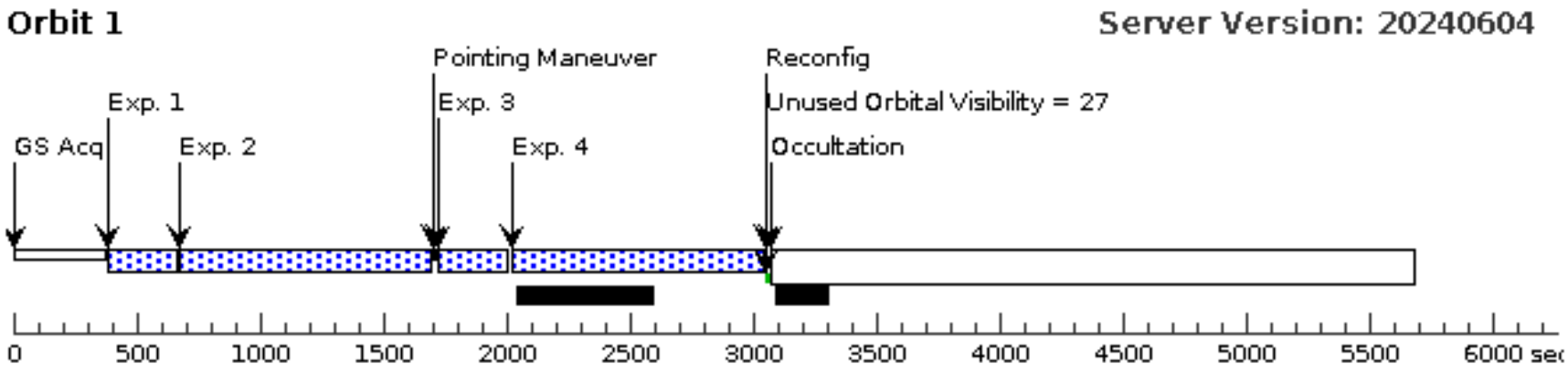
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J1206+5142	RA: 12 06 2.0180 (181.5084083d) Dec: +51 42 34.00 (51.70944d) Equinox: J2000		V=21	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J1206+5142	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50			252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
2		(1) J1206+5142	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 1		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*
3		(1) J1206+5142	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50	POS TARG 1.355,0.424		252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
4		(1) J1206+5142	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 3		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17740, Visit 02 Fri Aug 16 18:02:41 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 20D TO 160D FROM 01

Diagnostics

(Visit 02) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 02) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

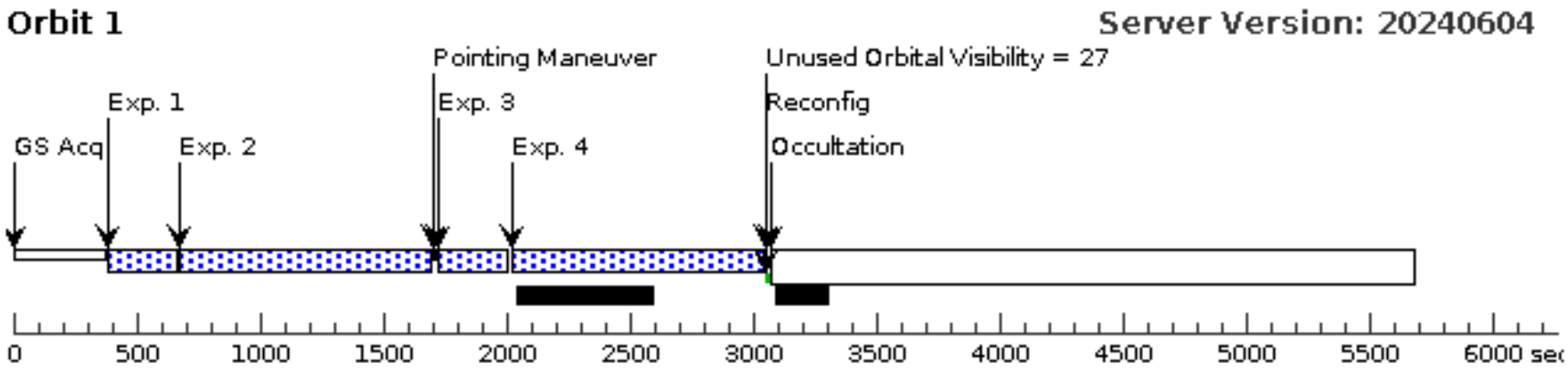
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J1206+5142	RA: 12 06 2.0180 (181.5084083d) Dec: +51 42 34.00 (51.70944d) Equinox: J2000		V=21	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J1206+5142	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50			252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
2		(1) J1206+5142	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 1		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*
3		(1) J1206+5142	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50	POS TARG 1.355,0.424		252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
4		(1) J1206+5142	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 3		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17740, Visit 03 Fri Aug 16 18:02:41 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Diagnostics

(Visit 03) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 03) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

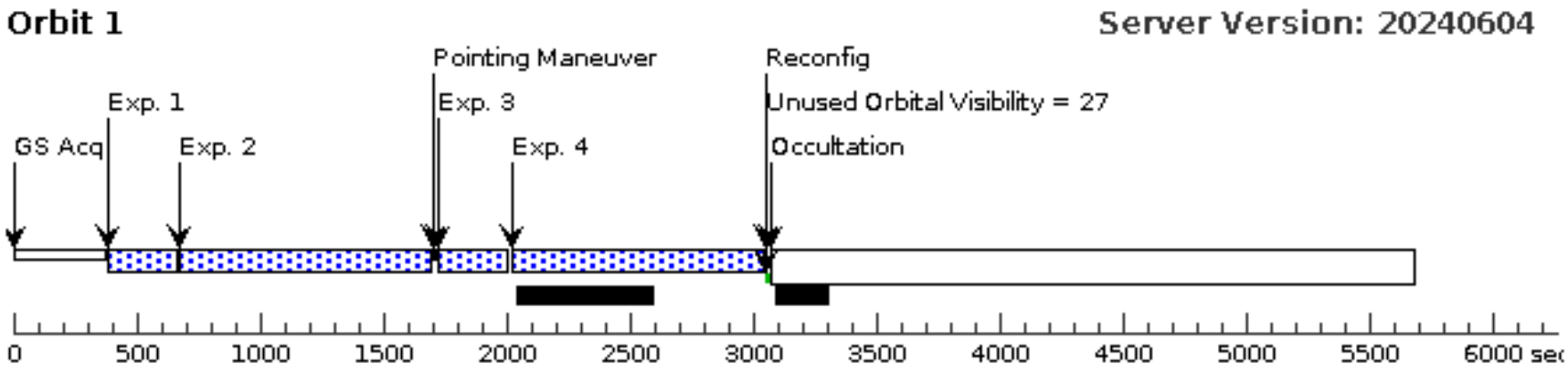
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	J0918+5104	RA: 09 18 59.2810 (139.7470042d) Dec: +51 04 53.07 (51.08141d) Equinox: J2000		V=21	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) J0918+5104	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50			252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
2		(3) J0918+5104	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 1		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*
3		(3) J0918+5104	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50	POS TARG 1.355,0.424		252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
4		(3) J0918+5104	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 3		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17740, Visit 04 Fri Aug 16 18:02:41 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 20D TO 160D FROM 03

Diagnostics

(Visit 04) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 04) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

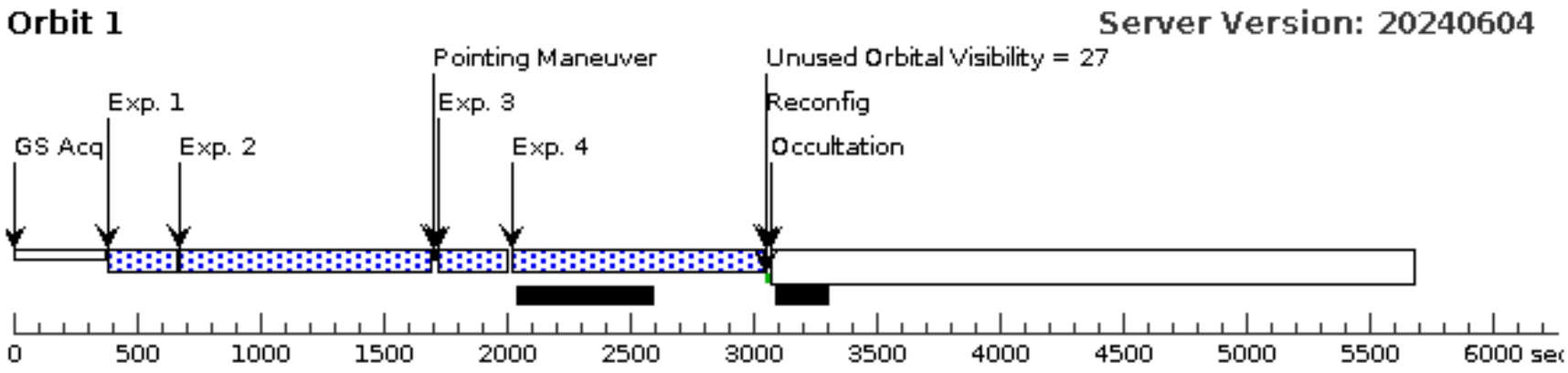
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	J0918+5104	RA: 09 18 59.2810 (139.7470042d) Dec: +51 04 53.07 (51.08141d) Equinox: J2000		V=21	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) J0918+5104	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50			252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
2		(3) J0918+5104	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 1		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*
3		(3) J0918+5104	WFC3/IR, MULTIACCUM, IR	F098M	NSAMP=6; SAMP-SEQ=SPARS50	POS TARG 1.355,0.424		252.934546 Secs (252.935 Secs) *[==>]*	*[1]*
4		(3) J0918+5104	WFC3/IR, MULTIACCUM, GRISM1024	G102	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 3		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17740, Visit 05 Fri Aug 16 18:02:41 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Diagnostics

(Visit 05) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 05) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

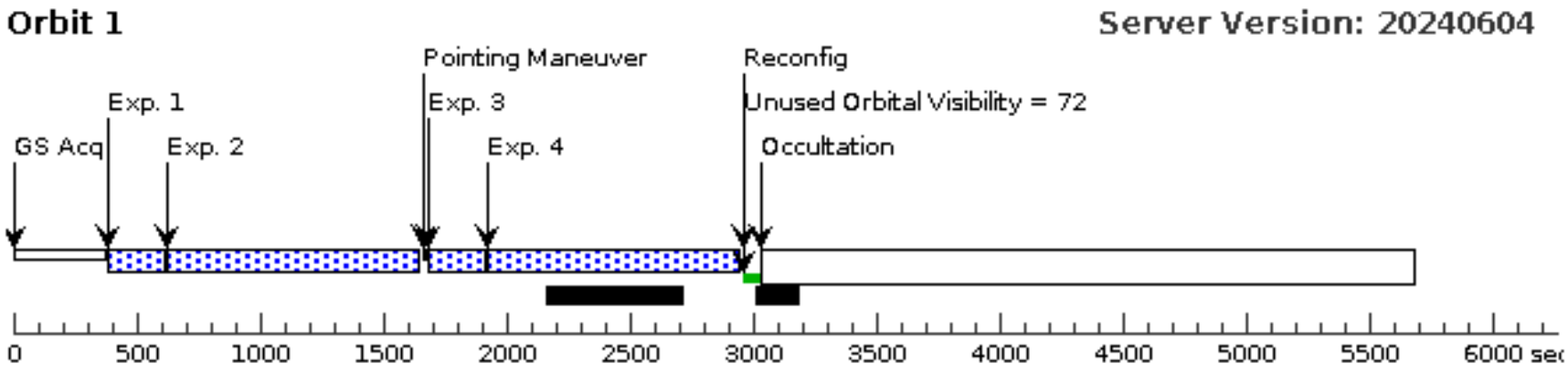
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J1514+3636	RA: 15 14 22.2670 (228.5927792d) Dec: +36 36 25.46 (36.60707d) Equinox: J2000		V=21	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) J1514+3636	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=5; SAMP-SEQ=SPARS50			202.934095 Secs (202.934 Secs) *[==>]*	*[1]*
2		(2) J1514+3636	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 1		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*
3		(2) J1514+3636	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=5; SAMP-SEQ=SPARS50	POS TARG 1.355,0.424		202.934095 Secs (202.934 Secs) *[==>]*	*[1]*
4		(2) J1514+3636	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 3		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17740, Visit 06

Fri Aug 16 18:02:41 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 20D TO 160D FROM 05

Diagnostics

(Visit 06) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

(Visit 06) Warning (Orbit Planner): SAME POS MAY NOT BE APPROPRIATE

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J1514+3636	RA: 15 14 22.2670 (228.5927792d) Dec: +36 36 25.46 (36.60707d) Equinox: J2000		V=21	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) J1514+3636	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=5; SAMP-SEQ=SPARS50			202.934095 Secs (202.934 Secs) *[==>]*	*[1]*
2		(2) J1514+3636	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 1		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*
3		(2) J1514+3636	WFC3/IR, MULTIACCUM, IR	F140W	NSAMP=5; SAMP-SEQ=SPARS50	POS TARG 1.355,0.424		202.934095 Secs (202.934 Secs) *[==>]*	*[1]*
4		(2) J1514+3636	WFC3/IR, MULTIACCUM, GRISM1024	G141	NSAMP=11; SAMP-SEQ=SPARS100	SAME POS AS 3		1002.935521 Secs (1002.936 Secs) *[==>]*	*[1]*

Orbit Structure