



18067 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Prof. Kevin Luhman (PI) (Contact)	The Pennsylvania State University
Dr. Catherine Espaillat (CoI)	Boston University
Dr. Catarina Alves de Oliveira (CoI) (ESA Member)	ESA, European Space Astronomy Centre

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) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:44.0	yes
02	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:45.0	yes
03	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:45.0	yes
04	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:45.0	yes
05	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:46.0	yes
06	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:46.0	yes
07	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:46.0	yes
08	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:46.0	yes
09	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:47.0	yes
10	(1) IC348-11040	WFC3/UVIS	1	28-Jul-2025 12:01:47.0	yes

10 Total Orbits Used

ABSTRACT

A Cycle 3 JWST program has searched for free-floating brown dwarfs down to the mass of Jupiter in the nearby star-forming cluster IC 348 (5 Myr, 300 pc). Those observations have discovered a brown dwarf that has an estimated mass of 2 Jupiter masses and that exhibits excess emission at 3-5 μm from a circumstellar disk, making it the least massive known brown dwarf with a disk. We propose to use UV imaging with HST to measure the disk's accretion, which is a vital component of any effort to model the disk and constrain its properties. Using the accretion rate measured with HST, we will develop a model that fits the IR excess emission detected by JWST, which will provide an estimate of the inner radius of the disk. The accretion rate will also facilitate the modeling of any other future observations of the disk, such as JWST spectroscopy at 5-15 μm and ALMA millimeter continuum measurements. Ultimately, this system represents a unique opportunity to study disk accretion and planet formation in an extreme, unexplored regime of stellar mass.

OBSERVING DESCRIPTION

We will obtain WFC3/UVIS images in the F336W filter of a point source (a brown dwarf) within a cluster of young stars. In each of 10 orbits, we will obtain one 1230 s exposure at each position in a two-point dither pattern. To mitigate CTE losses, a post flash of 13 electrons per pixel will be applied to each exposure, which should raise the background to the desired level of 20 electrons per pixel according to the ETC. The target will be observed at the UVIS2-C512C-CTE aperture, which also should mitigate CTE losses. The 10 orbits are divided among 10 visits. The ORIENT and timing of the visits are unconstrained.

Proposal 18067 - Visit 01 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

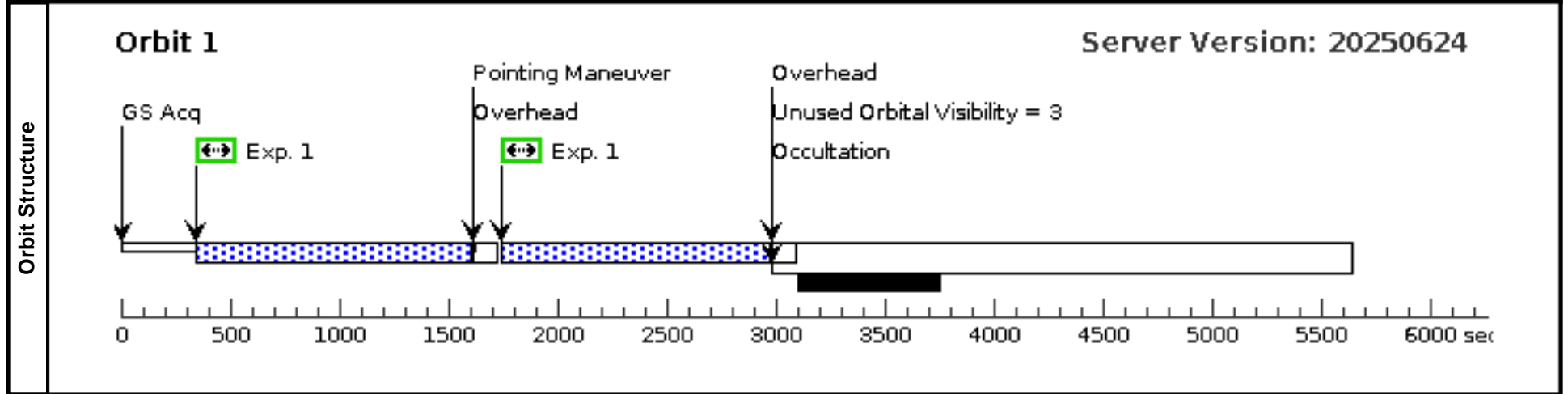
Visit	Proposal 18067, Visit 01		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	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	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 01 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 02 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

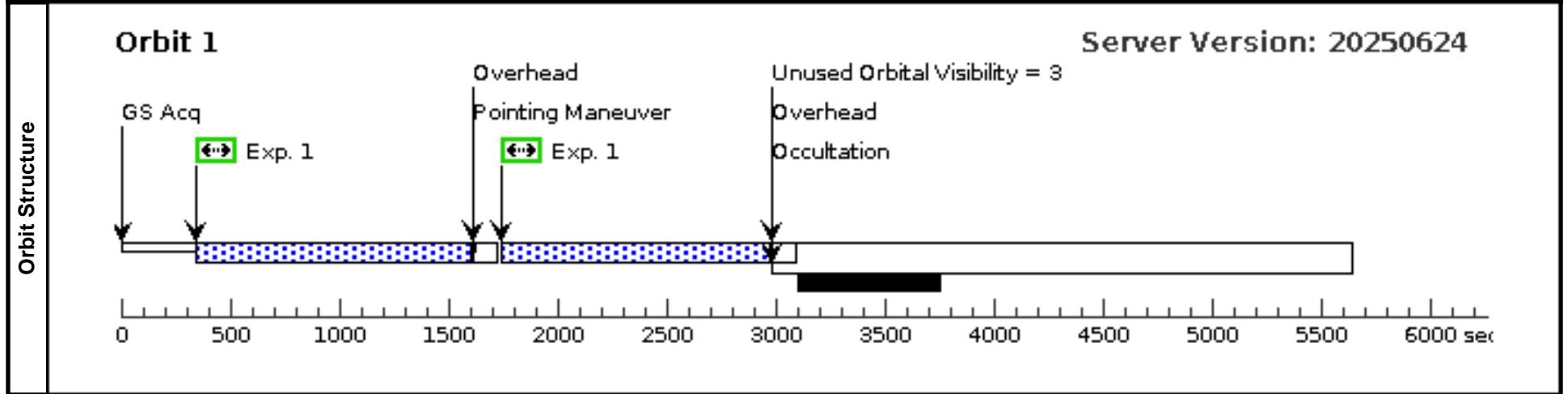
Visit	Proposal 18067, Visit 02		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 02 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 03 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

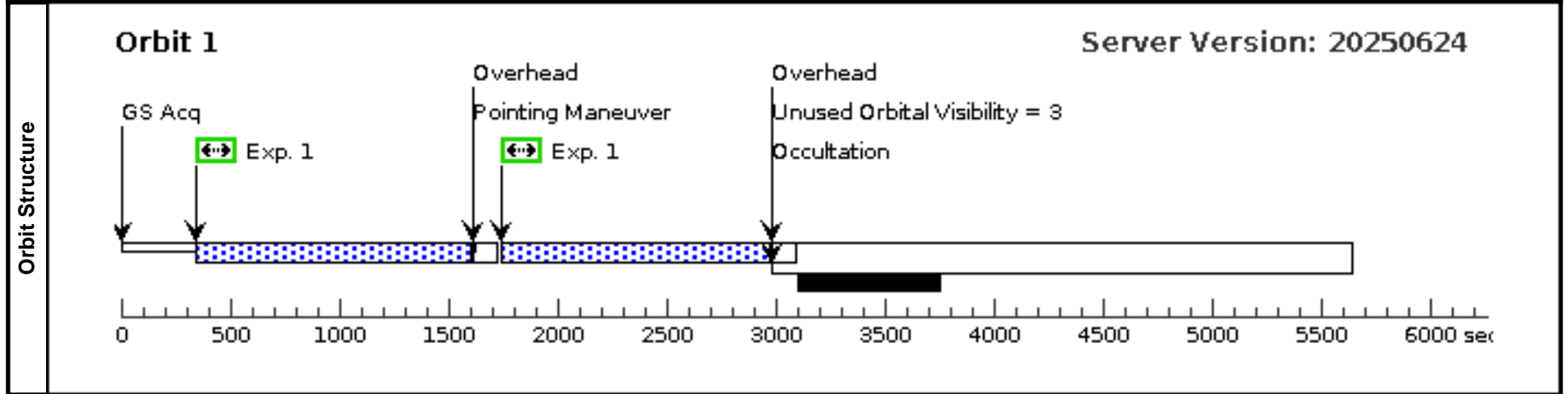
Visit	Proposal 18067, Visit 03		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 03 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 04 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

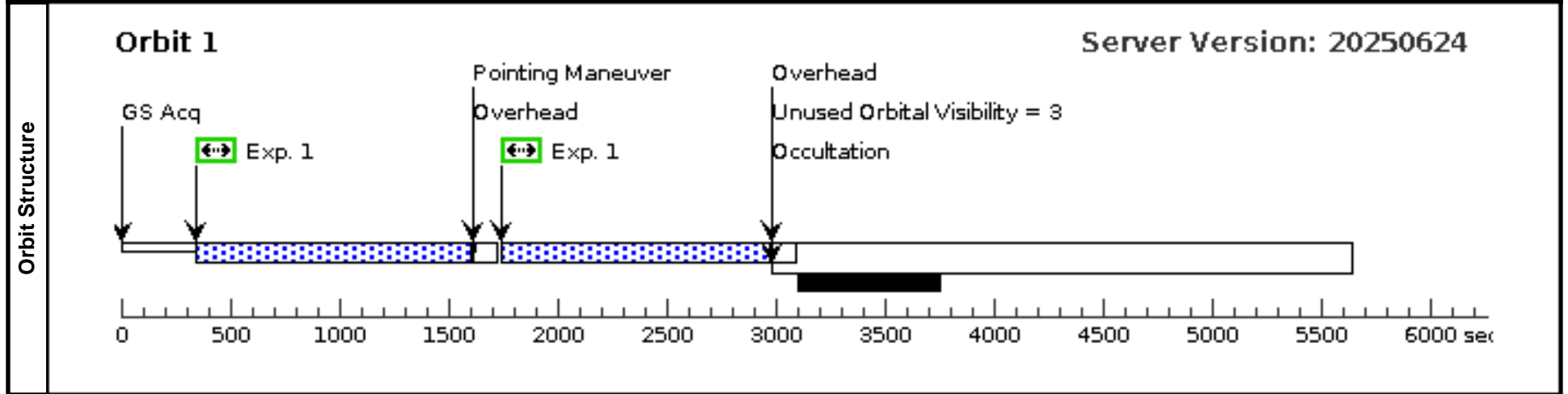
Visit	Proposal 18067, Visit 04		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 04 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 05 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

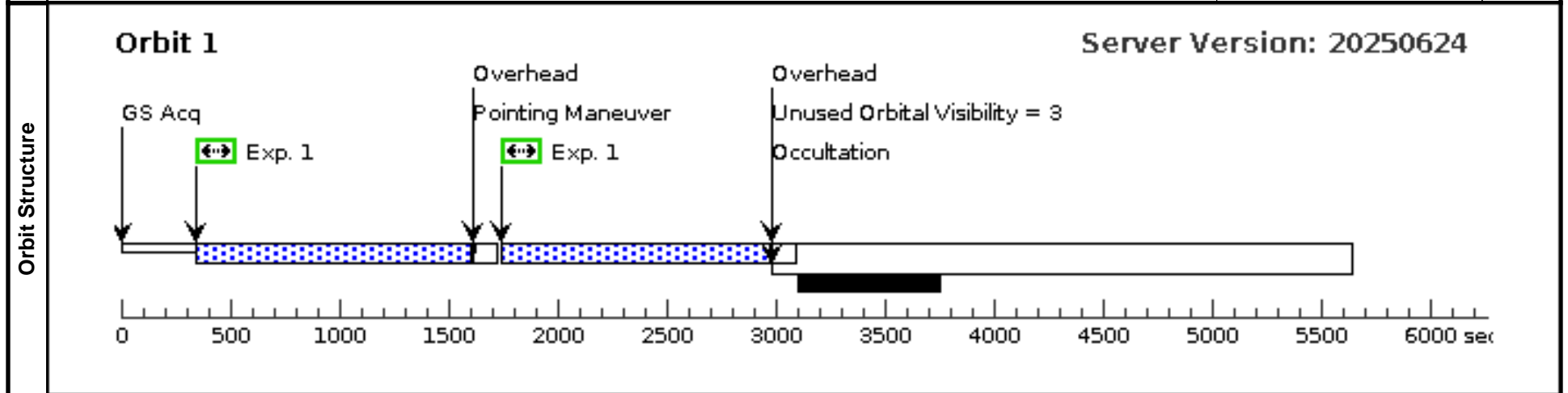
Visit	Proposal 18067, Visit 05		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 05 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 06 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

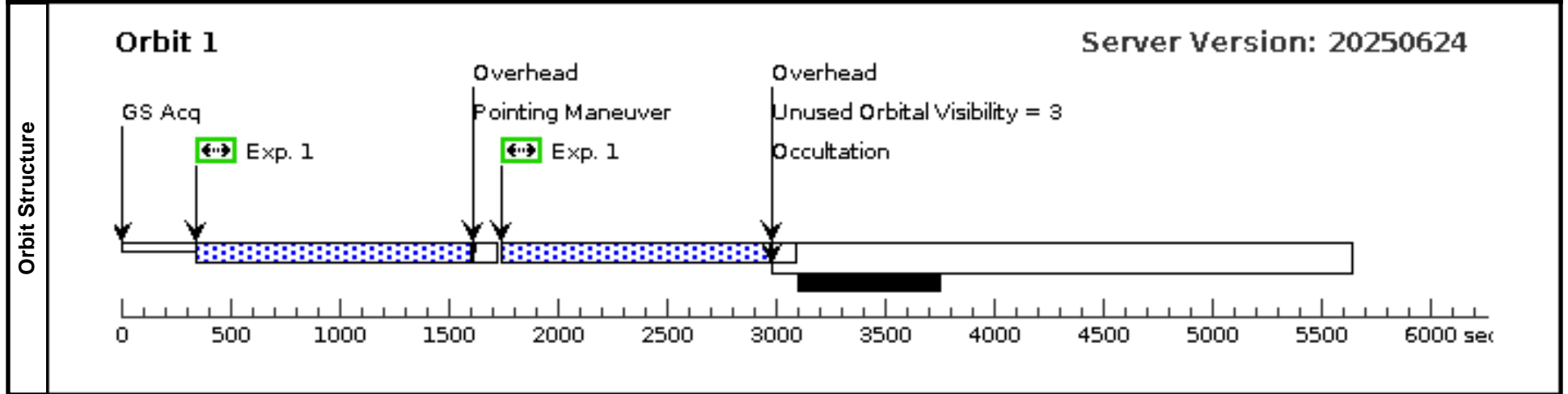
Visit	Proposal 18067, Visit 06		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	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	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 06 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 07 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

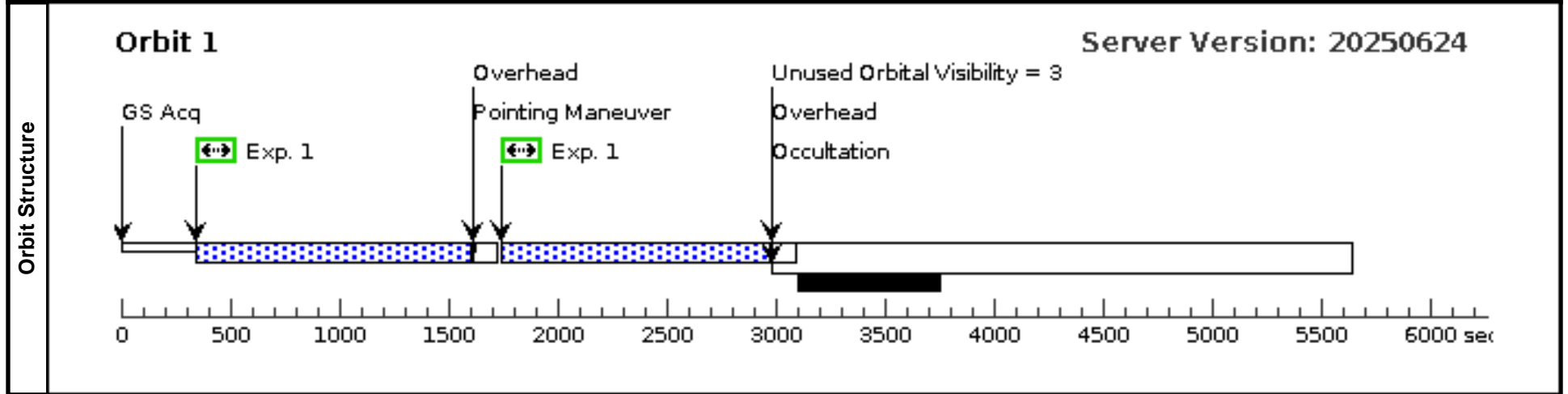
Visit	Proposal 18067, Visit 07		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	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	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 07 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 08 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:47 GMT 2025

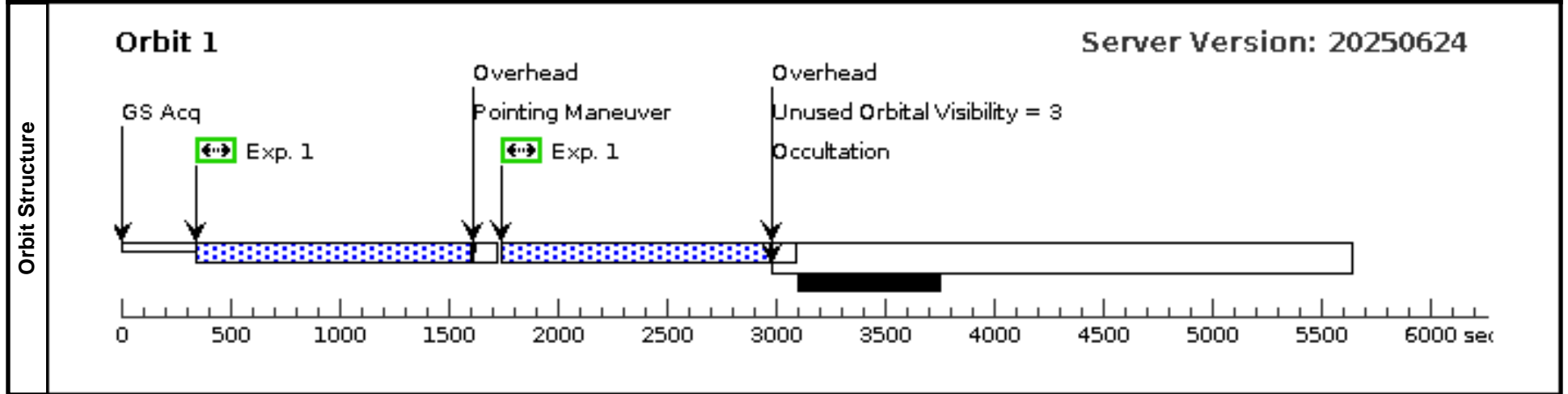
Visit	Proposal 18067, Visit 08		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	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	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 08 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 09 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:48 GMT 2025

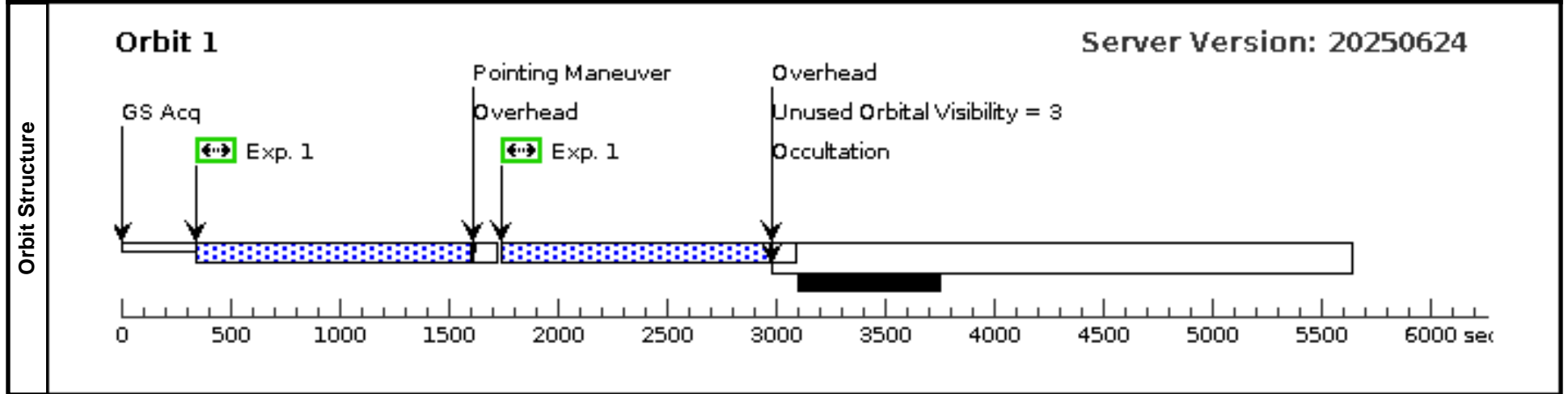
Visit	Proposal 18067, Visit 09		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 09 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]



Proposal 18067 - Visit 10 - Measuring the Accretion Rate for the Least Massive Known Brown Dwarf with a Circumstellar Disk

Mon Jul 28 16:01:48 GMT 2025

Visit	Proposal 18067, Visit 10		
	Diagnostic Status: No Diagnostics		
	Scientific Instruments: WFC3/UVIS		
	Special Requirements: (none)		

Patterns	#	Primary Pattern	Secondary Pattern	Exposures
	(1)	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	

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	IC348-11040	RA: 03 45 7.3842 (56.2807675d) Dec: +32 15 26.93 (32.25748d) Equinox: J2000		V=30	Reference Frame: ICRS

Comments:
 Category=STAR
 Description=[BROWN DWARF]
 Extended=NO

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) IC348-11040	WFC3/UVIS, ACCUM, UVIS2-C512C-CTE	F336W	FLASH=13			Pattern 1, Exps 1-1 in Visit 10 (1)	1230 Secs (2460 Secs) [=>(Pattern 1)] [=>(Pattern 2)]

