16065 - The irradiation and atmospheric escape of the brightest gaseous super-Earth

Cycle: 27, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) PI-MEN WAVE	STIS/CCD STIS/FUV-MAMA	5	08-Mar-2021 11:00:19.0	yes
51	(1) PI-MEN WAVE	STIS/CCD STIS/FUV-MAMA	5	08-Mar-2021 11:00:22.0	yes

10 Total Orbits Used

ABSTRACT

The recent discovery of Pi Men c, a super-Earth transiting an outstandingly bright nearby star (V = 5.67; 18 pc), presents an unrivalled opportunity to study the atmosphere of a small planet just above the radius-period valley. While the expected transit signature of the atmosphere in the optical/infrared is very small, the high-energy environment of the planet is thought to be favourable for large transit absorption features in the far-

ultraviolet due to an escaping, extended upper atmosphere. Using simultaneous XMM-Newton and HST observations, we propose to perform both a full reconstruction of the differential emission measure in order to characterise the high-energy irradiation impingent on the planet, and a sensitive search for evaporation signals due to these photons.

OBSERVING DESCRIPTION

We will observe the FUV transit of the brightest (V = 5.7), gaseous, transiting super-Earth: Pi Men c. The host star is a G0 dwarf slightly larger than the Sun. Our primary aim with these HST observations is to probe material evaporating from the planet's atmosphere by measuring absorption in lines associated with H, C, and O.

We will use the STIS instrument with the echelle grating E140H. Our science goals in observing a planet transit with sufficient out of transit baseline necessitate all 5 orbits awarded occuring consecutively in a single visit. HST has previously observed this target before (proposal ids 14633 and 15699), but not with this specific setup.

These orbits were awarded as part of a joint proposal from XMM-Newton cycle AO-19, and the observations should be conducted contemporaneously with the XMM-Newton observations, which also aim to cover the transit of the planet at both X-ray and near-UV wavelengths. Putting the data from the two spacecraft together should also result in a precise measurement of the high-energy environment in which the planet resides, a key input to models of photoevaporation.

Visit

Proposal 16065, Visit 01, failed Mon Mar 08 16:00:23 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 70%; Period 6.2679 D AND ZERO-PHASE HJD2458325.50400

Diagnostics

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PI-MEN	RA: 05 37 12.4933 (84.3020554d)	Proper Motion RA: 311.187 mas/yr	V=5.67+/-0.01	Reference Frame: ICRS
	Alt Name1: HD39091	Dec: -80 27 46.98 (-80.46305d)	Proper Motion Dec: +1048.845 mas/yr		
		Equinox: J2000	Parallax: 0.05471"		
			Epoch of Position: 2020.83		
			Radial Velocity: 10.595 km/sec		

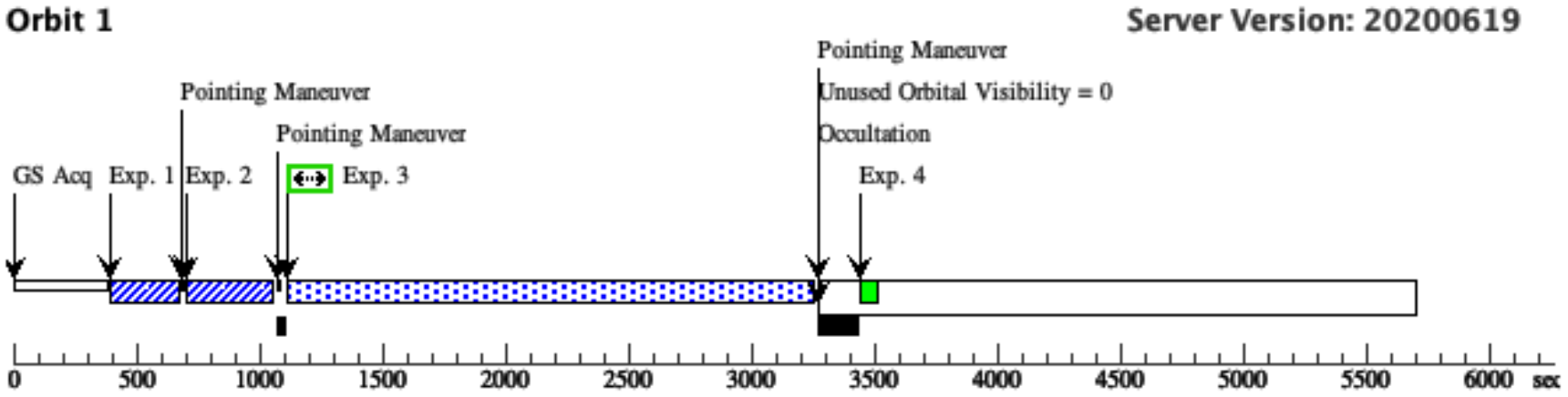
Comments:
Category=STAR
Description=[G V-IV]

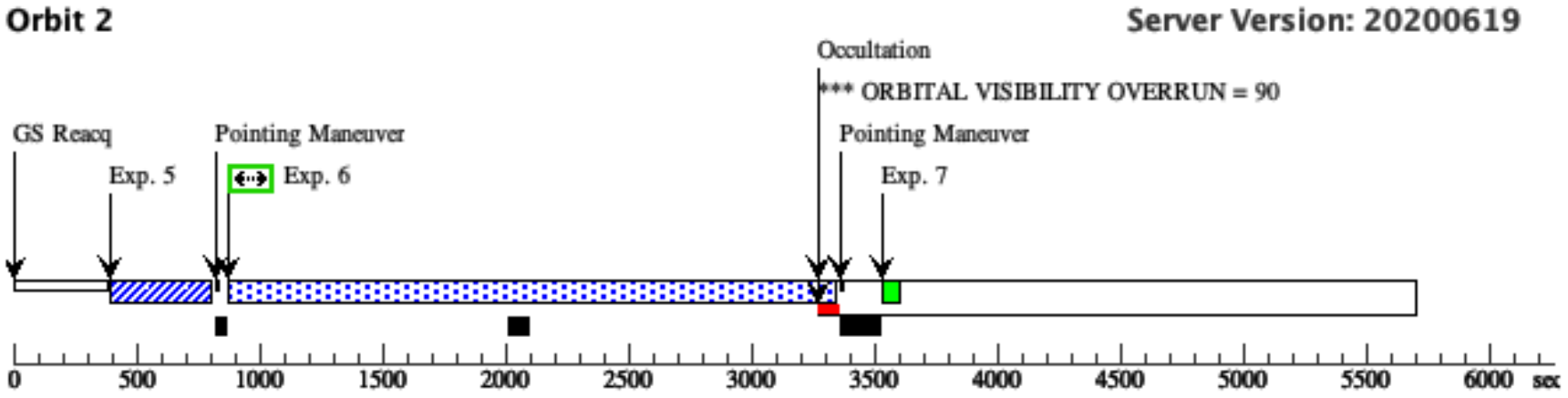
Exposures

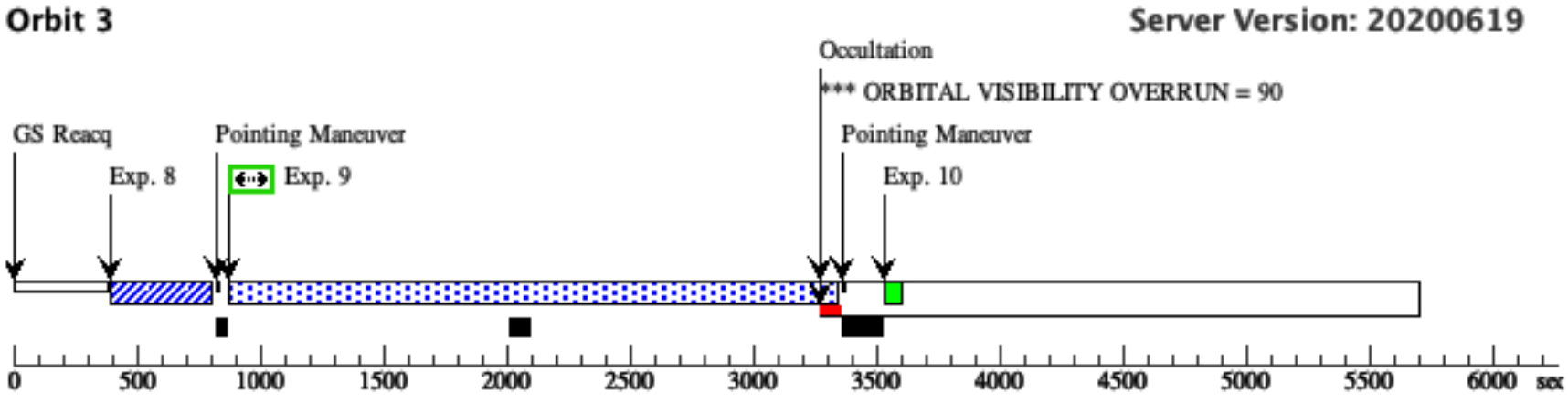
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.1410291)	(1) PI-MEN	STIS/CCD, ACQ, F28X50OIII	MIRROR		PHASE 0.9675 TO 0.9755	Sequence 1-4 Non-Int in Visit 01	2 Secs (2 Secs) *[==>]*	*[1]*
2	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 01	1 Secs (1 Secs) *[==>]*	*[1]*
3	SCI E140H (STIS.sp.1410383)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 01	2253 Secs (1989 Secs) *[==>1989.0 Secs]*	*[1]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
4	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 1-4 Non-Int in Visit 01	*[==>]*	*[1]*
5	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 01	1 Secs (1 Secs) *[==>]*	*[2]*
6	SCI E140H (STIS.sp.1410557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 5-7 Non-Int in Visit 01	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	*[2]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
7	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 5-7 Non-Int in Visit 01	*[==>]*	*[2]*
8	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 01	1 Secs (1 Secs) *[==>]*	*[3]*
9	SCI E140H (STIS.sp.1410557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 8-10 Non-Int in Visit 01	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	*[3]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
10	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 8-10 Non-Int in Visit 01	*[==>]*	*[3]*
11	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 01	1 Secs (1 Secs) *[==>]*	*[4]*
12	SCI E140H (STIS.sp.1410557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 11-13 Non-Int in Visit 01	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	*[4]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
13	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 11-13 Non-Int in Visit 01	*[==>]*	*[4]*
14	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 14-16 Non-Int in Visit 01	1 Secs (1 Secs) *[==>]*	*[5]*

	15	SCI E140H (STIS.sp.14 10557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO	Sequence 14-16 Non-Int in Visit 01	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	 ***[5]***
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
	16	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A		Sequence 14-16 Non-Int in Visit 01	*[==>]*	***[5]***

Orbit Structure



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Server Version: 20200619
Occultation
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Pointing Maneuver
Pointing Maneuver
Exp. 8
Exp. 9
Exp. 10
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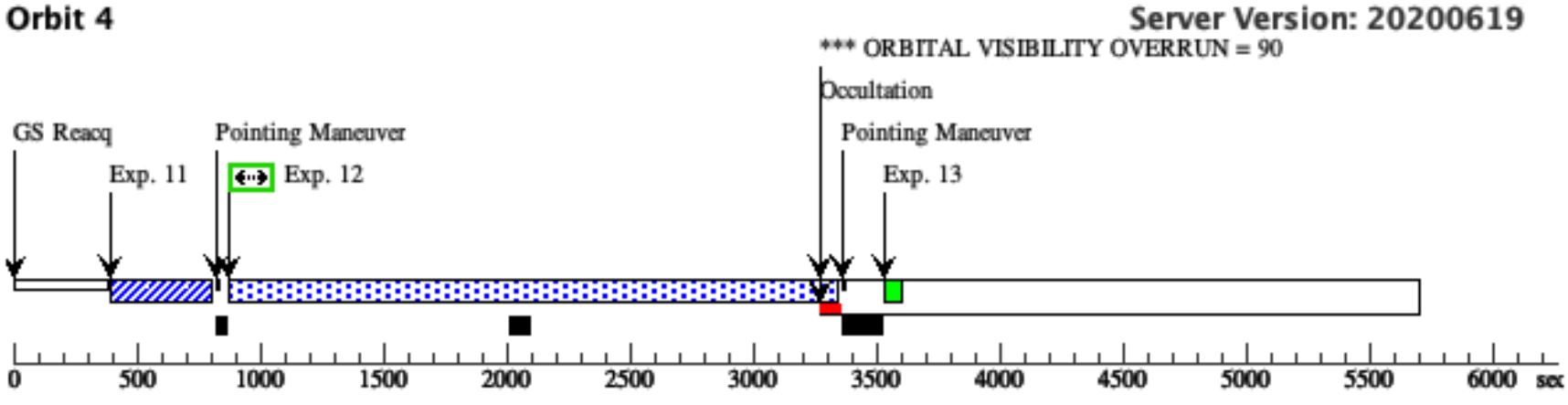
5000
5500
6000
sec


Orbit 4
Server Version: 20200619
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Pointing Maneuver
Pointing Maneuver
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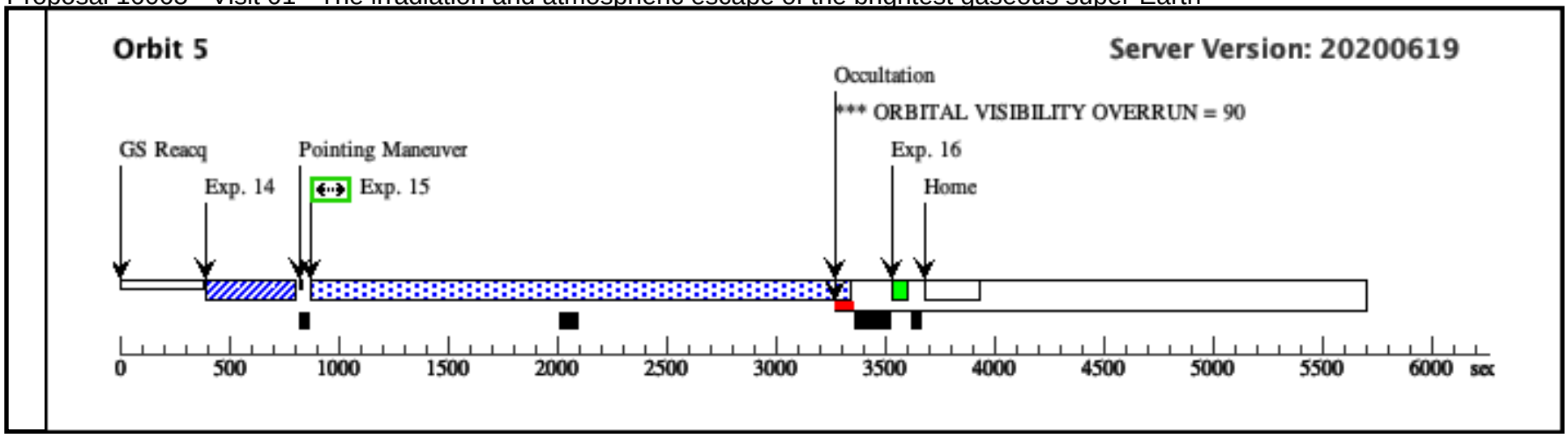
Orbit 5
Server Version: 20200619
Occultation
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Pointing Maneuver
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Exp. 14
Exp. 15
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Visit

Proposal 16065, Visit 51 Mon Mar 08 16:00:24 GMT 2021

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SCHED 70%; Period 6.2679 D AND ZERO-PHASE HJD2458325.50400

Diagnostics

(Visit 51) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 51) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 51) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 51) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PI-MEN	RA: 05 37 12.4933 (84.3020554d)	Proper Motion RA: 311.187 mas/yr	V=5.67+/-0.01	Reference Frame: ICRS
	Alt Name1: HD39091	Dec: -80 27 46.98 (-80.46305d)	Proper Motion Dec: +1048.845 mas/yr		
		Equinox: J2000	Parallax: 0.05471"		
			Epoch of Position: 2020.83		
			Radial Velocity: 10.595 km/sec		

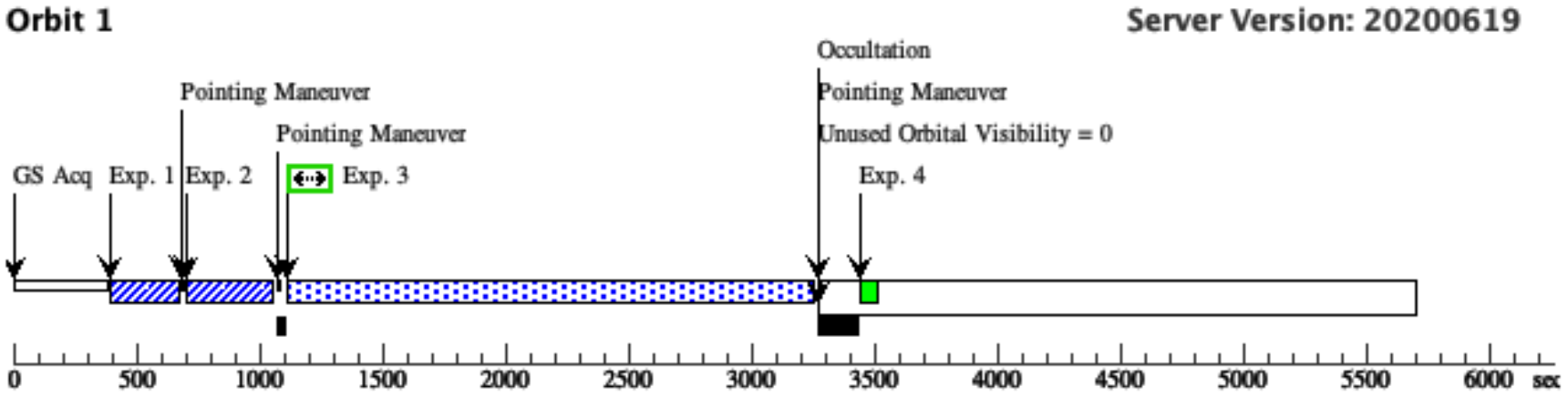
Comments:
Category=STAR
Description=[G V-IV]

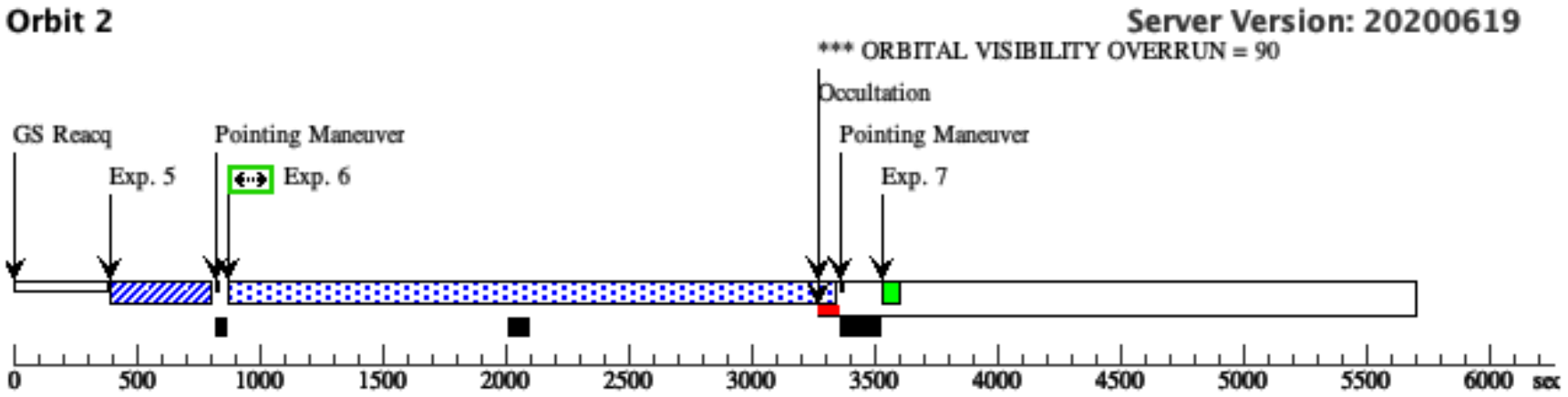
Exposures

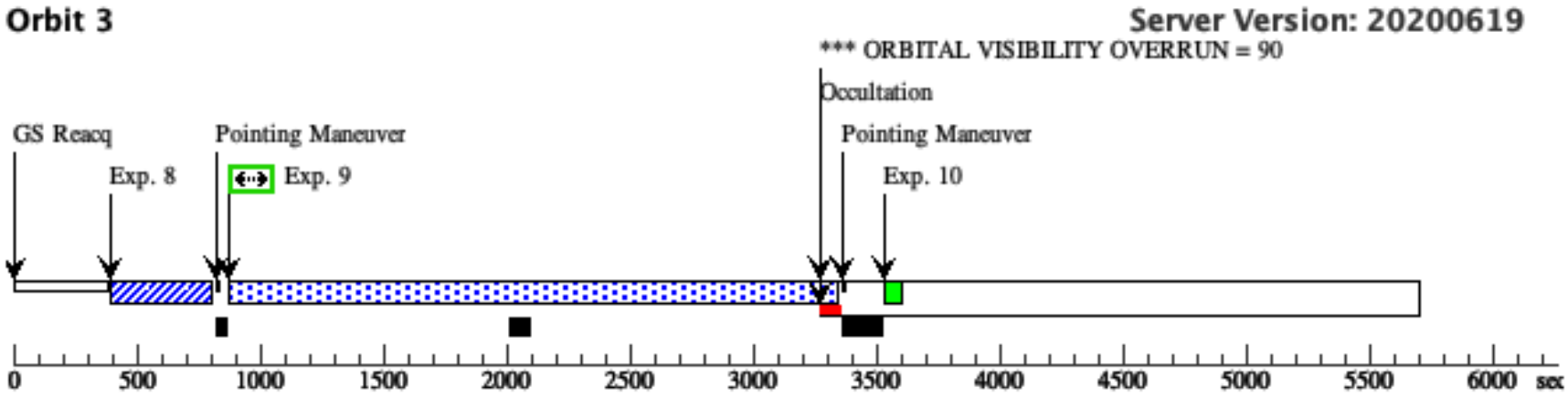
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.1410291)	(1) PI-MEN	STIS/CCD, ACQ, F28X50OIII	MIRROR		PHASE 0.9675 TO 0.9755	Sequence 1-4 Non-Int in Visit 51	2 Secs (2 Secs) *[==>]*	*[1]*
2	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 51	1 Secs (1 Secs) *[==>]*	*[1]*
3	SCI E140H (STIS.sp.1410383)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 51	2253 Secs (1989 Secs) *[==>1989.0 Secs]*	*[1]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
4	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 1-4 Non-Int in Visit 51	*[==>]*	*[1]*
5	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 51	1 Secs (1 Secs) *[==>]*	*[2]*
6	SCI E140H (STIS.sp.1410557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 5-7 Non-Int in Visit 51	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	*[2]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
7	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 5-7 Non-Int in Visit 51	*[==>]*	*[2]*
8	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 51	1 Secs (1 Secs) *[==>]*	*[3]*
9	SCI E140H (STIS.sp.1410557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 8-10 Non-Int in Visit 51	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	*[3]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
10	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 8-10 Non-Int in Visit 51	*[==>]*	*[3]*
11	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 51	1 Secs (1 Secs) *[==>]*	*[4]*
12	SCI E140H (STIS.sp.1410557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO		Sequence 11-13 Non-Int in Visit 51	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	*[4]*
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
13	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A			Sequence 11-13 Non-Int in Visit 51	*[==>]*	*[4]*
14	ACQ/PEAK (STIS.sp.1410289)	(1) PI-MEN	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 14-16 Non-Int in Visit 51	1 Secs (1 Secs) *[==>]*	*[5]*

	15	SCI E140H (STIS.sp.14 10557)	(1) PI-MEN	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140H 1271 A	BUFFER-TIME=1000; WAVECAL=NO	Sequence 14-16 Non-Int in Visit 51	2580 Secs (2316 Secs) *[==>2316.0 Secs]*	 ***[5]***
	*Comments: Buffer time limit from 1.6*10^6 / 245 = 6530, however we add in an extra factor of a few as leeway. A similar buffer time was used for obsevations of the similar brightness target HD 219134, which operated with the same instrumental setup as here.*								
	16	GO-WAVE CAL E140H	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140H 1271 A		Sequence 14-16 Non-Int in Visit 51	*[==>]*	***[5]***

Orbit Structure






Orbit 3
Server Version: 20200619
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Occultation
GS Reacq
Pointing Maneuver
Pointing Maneuver
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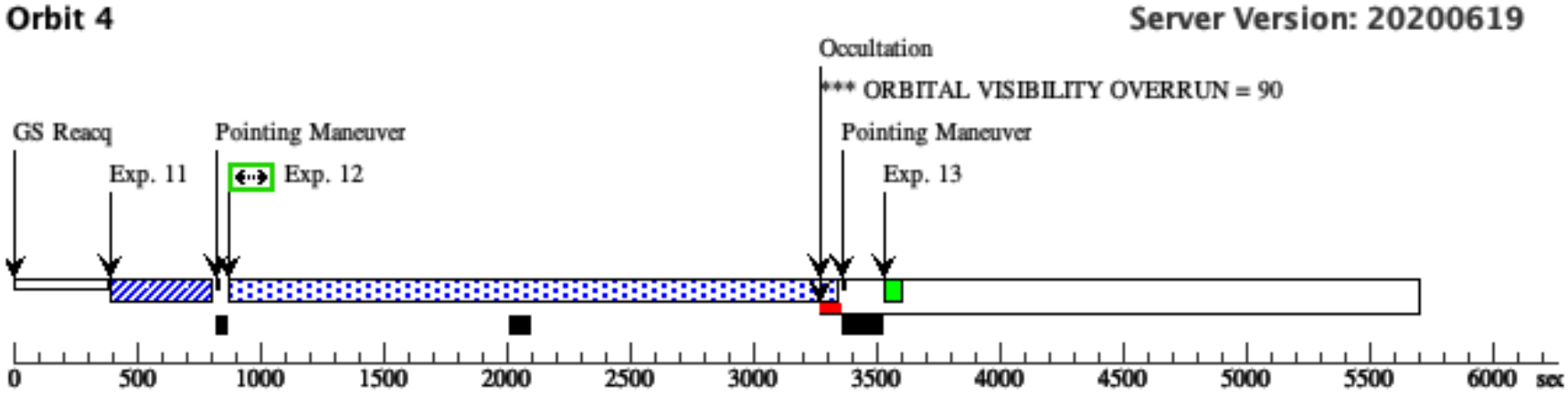
Orbit 4
Server Version: 20200619
Occultation
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Pointing Maneuver
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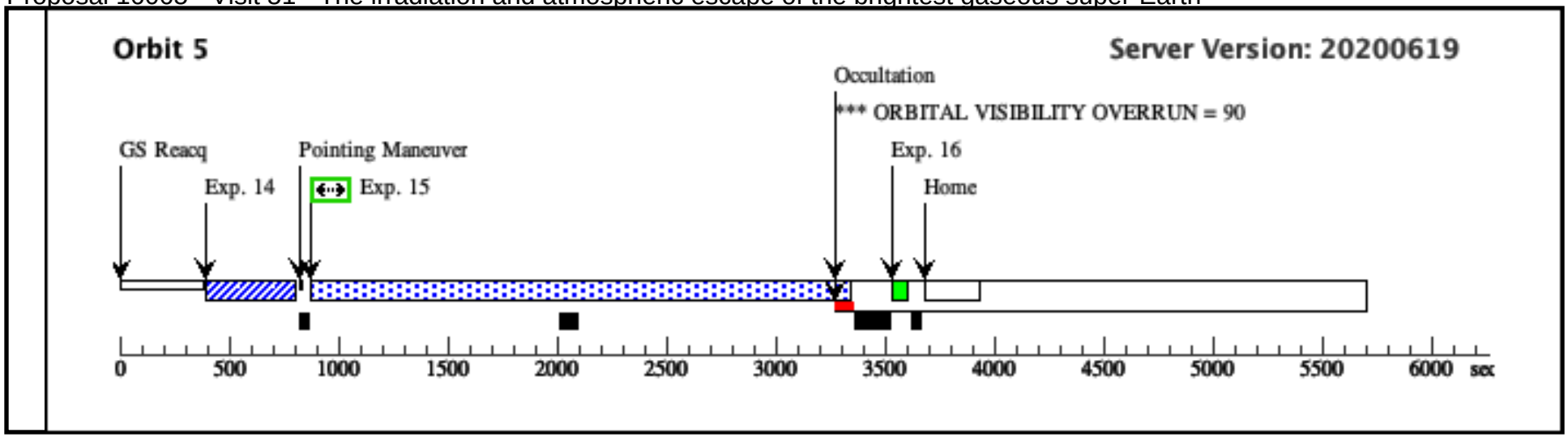
Orbit 5
Server Version: 20200619
Occultation
*** ORBITAL VISIBILITY OVERRUN = 90
GS Reacq
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Exp. 16
Exp. 14
Exp. 15
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