13795 - HST Observations of Comet-Induced Aurora on Mars during the Siding Spring Encounter

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Prof. John T. Clarke (PI) (Contact)	**Boston University**	**jclarke@bu.edu**
Dr. Roger V. Yelle (CoI)	University of Arizona	roger.yelle@nau.edu
Dr. Majd Matta (CoI)	Boston University	majdm@bu.edu
Dr. Jean-Loup C Bertaux (CoI)	Boston University	jean-loup.bertaux@latmos.ipsl.fr
Dr. Dave Brain (CoI)	University of Colorado at Boulder	david.brain@colorado.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) MARS-ACS	ACS/SBC	1	08-Oct-2014 21:10:45.0	yes
02	(2) MARS-STIS	STIS/CCD STIS/FUV-MAMA	1	08-Oct-2014 21:10:48.0	yes
03	(2) MARS-STIS	STIS/CCD STIS/FUV-MAMA	1	08-Oct-2014 21:10:50.0	yes
04	(1) MARS-ACS	ACS/SBC	1	08-Oct-2014 21:10:52.0	yes

4 Total Orbits Used

ABSTRACT

The martian upper atmosphere is likely to be strongly perturbed by the near collision with Comet C/2013 A1 (Siding Spring) on 19 Oct. 2014. This is a unique event in the history of space science, it will be the first time that we have a chance to study the close encounter of an active comet with a terrestrial planet. Significant mass and energy will be deposited in the upper atmosphere of Mars if the comet coma is sufficiently dense. Present estimates have Comet Siding Spring at a moderate production rate when it passes by Mars, which is expected to result in the strong perturbations of the martian atmosphere. This proposal is to make HST observations of the atmosphere of Mars before and during the comet encounter to measure the energy input to the upper atmosphere through the auroral emissions that will be produced by the deposition of energy of incoming water-group molecules. The observation of auroral emissions will permit a direct estimate of the total energy input to the martian upper atmosphere, and it will provide us a unique chance to determine the response of the martian atmosphere to strong auroral processes. This will likely be the only opportunity to make this measurement in the lifetime of HST, and it will provide support for the NASA MAVEN mission, which will have recently arrived in orbit about Mars.

OBSERVING DESCRIPTION

The proposed HST observations will consist of far-UV images to be obtained with the ACS/SBC, and far and near UV spectra to be obtained with the STIS/MAMA and STIS/CCD modes. The images will provide high resolution maps of the auroral emissions and corresponding energy input, and the highest sensitivity will be obtained in the dark nightside atmosphere. The spectra will be obtained with a long narrow aperture (52 x 0.5) in both far-UV and near-UV wavelengths ranges to cover all the emissions indicated in the SPICAM data. For the spectra the aperture will be placed E/W across the disc of Mars, which will be ~ 10 arc sec in diameter on 19 Oct. 2014, and thus cover both day and nightside atmospheres with the field of view extending to high altitudes above the martian limb. If the martian exosphere expands on a short time scale in response to the comet energy input, we be able to measure this in individual species. We request one visit of 2 orbits (one for ACS, one for STIS) about a week before the encounter to establish the "normal" emissions close in time to the impact, and another visit of two orbits scheduled at the time of the encounter:

12 x 100 sec ACS/SBC FUV images, with F115 and F125 filters

a 1000 sec STIS G140L long slit spectrum, aperture E/W across the disc of Mars

two 500 sec STIS/CCD near-UV long slit spectra, aperture E/W across the disc

One key element of this program is that it must be scheduled as close as possible to the 1-2 hour time of the passage of the comet coma past Mars. If

the closest HST visibility window is during an SAA passage, it will not be possible to conduct the far-UV observations with the MAMA's, and we would just schedule the STIS/CCD near-UV spectra.

Visit

Proposal 13795, Visit 01, implementation Thu Oct 09 01:10:54 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: ACS/SBC

Special Requirements: ORIENT 93D TO 95 D; BETWEEN 19-OCT-2014:03:30:00 AND 19-OCT-2014:04:30:00

Diagnostics

(Visit 01) Warning (Orbit Planner): ILLEGAL GS ACQ SCENARIO USED WITH ACS/SBC

(Exposure 1 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 2 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets

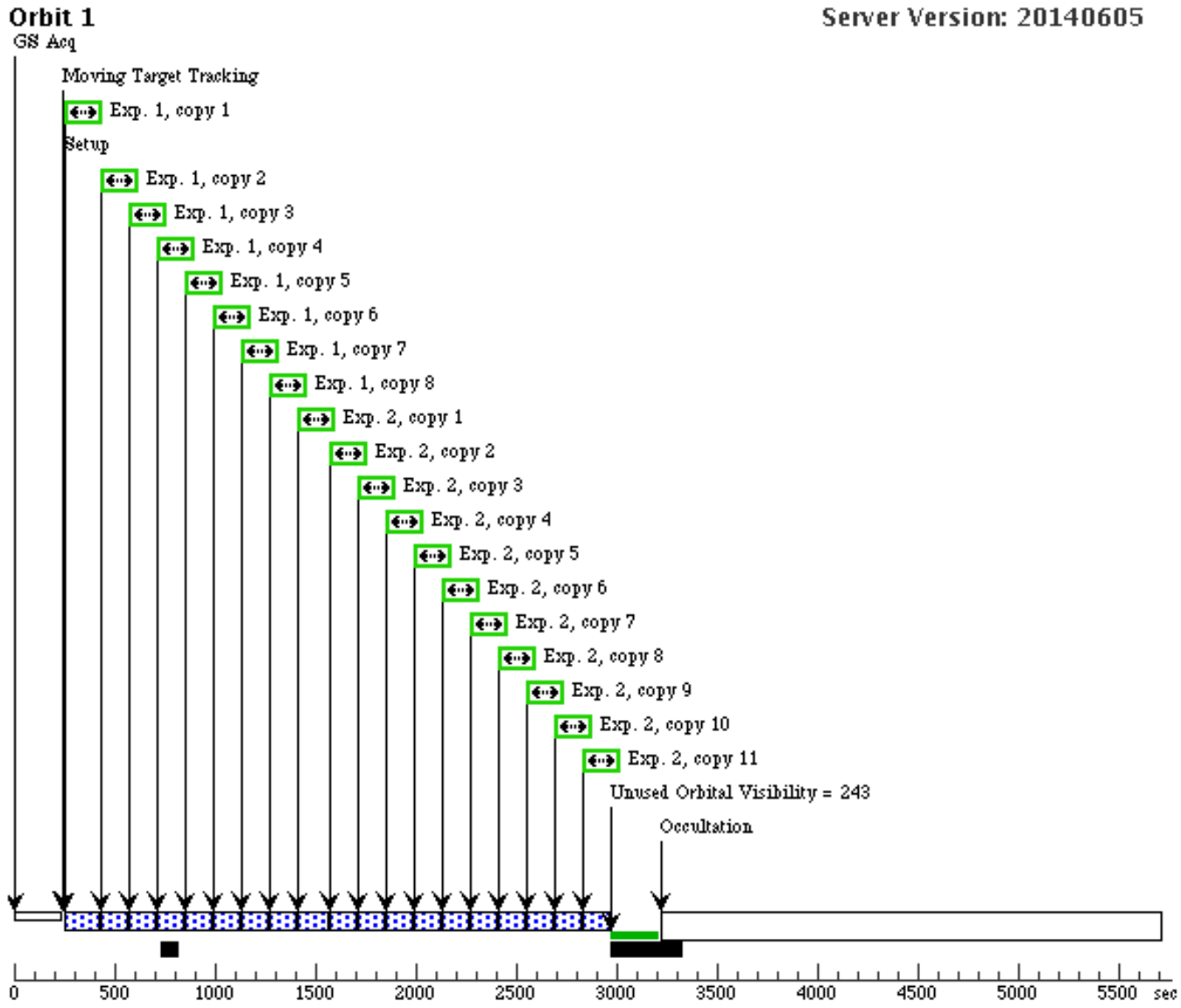
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	MARS-ACS	STD=MARS	TYPE=POS_ANGLE,RAD=13,ANG=320,REF=NORTH			EARTH

Comments: Offset Mars disc to corner of ACS/SBC field of view to image extended H Lyman alpha coronal emission

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MARS-ACS	ACS/SBC, ACCUM, SBC-FIX	F140LP		GS ACQ SCENARIO SINGLE		100 Secs X 8 (800 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]*	***[1]***
2		(1) MARS-ACS	ACS/SBC, ACCUM, SBC-FIX	F115LP				100 Secs X 11 (1100 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]*	***[1]***

Orbit Structure



Visit

Proposal 13795, Visit 02, scheduling Thu Oct 09 01:10:54 GMT 2014

Diagnostic Status: Warning

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

Special Requirements: ORIENT 93D TO 95 D; BETWEEN 19-OCT-2014:07:00:00 AND 19-OCT-2014:08:30:00

Diagnostics

(Visit 02) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

(Exposure 5 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

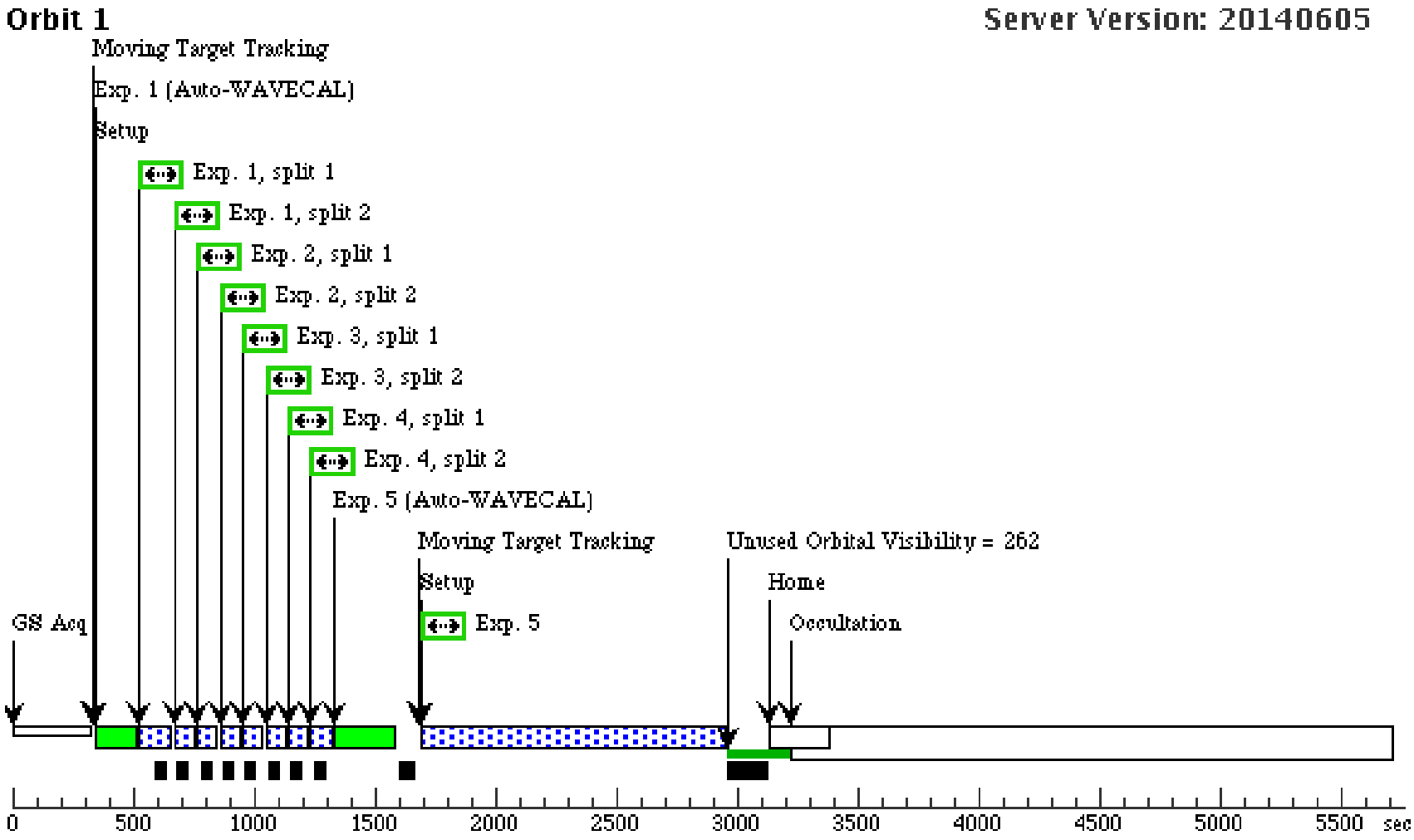
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(2)	MARS-STIS	STD=MARS				EARTH

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A		GS ACQ SCENARIO BASE1B3		100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
2		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A				100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A				100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
4		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A				100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
5		(2) MARS-STIS	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=8000			1200 Secs (1200 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 13795, Visit 03, scheduling Thu Oct 09 01:10:54 GMT 2014

Diagnostic Status: Warning

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

Special Requirements: ORIENT 93D TO 95 D; BETWEEN 19-OCT-2014:21:20:00 AND 19-OCT-2014:22:50:00

Diagnostics

(Visit 03) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

(Exposure 5 (Visit 03)) Warning (Form): Sensitive exposures should have an ETC run number provided.

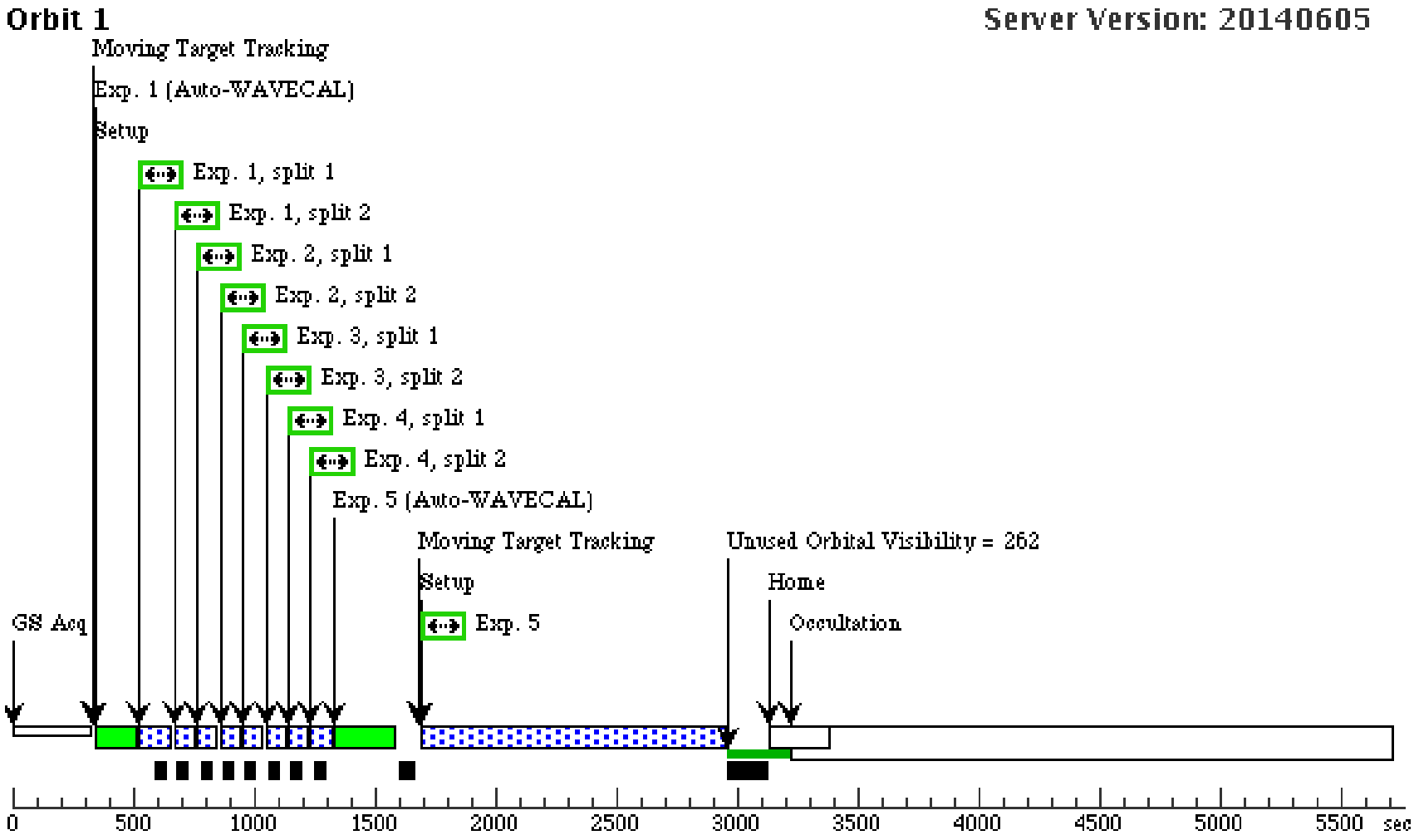
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(2)	MARS-STIS	STD=MARS				EARTH

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A		GS ACQ SCENARIO BASE1B3		100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
2		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A				100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A				100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
4		(2) MARS-STIS	STIS/CCD, ACCUM, 52X0.5	G230LB 2375 A				100 Secs (100 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
5		(2) MARS-STIS	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=8000			1200 Secs (1200 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 13795, Visit 04, scheduling Thu Oct 09 01:10:55 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: ACS/SBC

Special Requirements: ORIENT 89D TO 95 D; BETWEEN 20-OCT-2014:00:30:00 AND 20-OCT-2014:01:50:00

Diagnostics

(Exposure 1 (Visit 04)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 2 (Visit 04)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	MARS-ACS	STD=MARS	TYPE=POS_ANGLE,RAD=13,ANG=320,REF=NORTH			EARTH

Comments: Offset Mars disc to corner of ACS/SBC field of view to image extended H Lyman alpha coronal emission

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) MARS-ACS	ACS/SBC, ACCUM, SBC-FIX	F140LP		GS ACQ SCENARIO BASE1B3		100 Secs X 8 (800 Secs)	
								[==>(Copy 1)]	***[1]***
								[==>(Copy 2)]	
								[==>(Copy 3)]	
								[==>(Copy 4)]	
								[==>(Copy 5)]	
								[==>(Copy 6)]	
								[==>(Copy 7)]	
								[==>(Copy 8)]	
2		(1) MARS-ACS	ACS/SBC, ACCUM, SBC-FIX	F115LP				100 Secs X 9 (900 Secs)	
								[==>(Copy 1)]	***[1]***
								[==>(Copy 2)]	
								[==>(Copy 3)]	
								[==>(Copy 4)]	
								[==>(Copy 5)]	
								[==>(Copy 6)]	
								[==>(Copy 7)]	
								[==>(Copy 8)]	
								[==>(Copy 9)]	

Orbit Structure