18389 - NUV Exospheric Magnesium as a Constraint on Europa's Ocean Salinity

Cycle: 34, Proposal Category: GO

(UV Initiative, HWO Precursor Science (HPS))

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Emma Lovett (PI) (Contact)	**Boston University**
Dr. Richard Cartwright (CoI)	The Johns Hopkins University Applied Physics Laboratory
Dr. Carl Schmidt (CoI)	Boston University
Prof. John T. Clarke (CoI)	Boston University

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(3) EUROPA-TRAILING	STIS/CCD	2	18-Aug-2026 11:04:35.0	yes
02	(4) EUROPA-LEADING	STIS/CCD	2	18-Aug-2026 11:04:35.0	yes

4 Total Orbits Used

ABSTRACT

The characteristics of Europa's subsurface water depend on its salinity, which remains poorly constrained. While there is good evidence for NaCl salt and Na gas present at Europa's surface and exosphere, respectively, it is challenging to quantify how much of this material is actually sourced from Europa's saltwater, as opposed to being painted on by the ton/s of material escaping the adjacent moon, Io. Mg-based salts on the other hand, which have long been suspected at Europa, cannot derive from Io. The mixture of these dissolved salts in Europa's oceans has critical influence over conductivity and freezing points, but still remains unclear: NaCl and Mg-based salts have overlapping features in near-IR reflectance spectroscopy, and in situ mass spectrometer and plasma wave measurements have insufficient resolution to distinguish the Na and Mg mass-to-charge. The

proposed observations address this issue by constraining near-UV Mg emissions in Europa's exosphere. A careful search for these emissions has yet to be undertaken. A small program of 4 orbits with STIS that would offer insightful new constraints on the composition of Europa's hydrated salts is proposed.

OBSERVING DESCRIPTION

Our program aims to detect or place upper limits of both neutral and ionized magnesium in Europa's exosphere. This will be achieved by sampling Europa's exosphere at both western and eastern elongations from Jupiter, when the moon is close to or in Jupiter's plasma equator to maximize sputtering yields, and by orienting the slit such that it passes through Europa's orbital plane where most gas is confined. We will use the STIS G230MB CCD grating mode with the c2836 center wavelength in two visits with two orbits each. One visit will view Europa's trailing hemisphere at western elongation from Jupiter. The first orbit will be used to acquire Europa, take an on-disk spectrum with the 52x0.5 arcsec slit that will act as a fiducial sunlight spectrum due to the high surface reflectivity, and then offset 1.2 arcseconds north to remove Europa's bright limb from the slit. The second orbit of this visit will then offset 1.2 arcseconds south of Europa and take another long exposure. This process will be repeated for a second visit that views Europa's leading hemisphere at eastern elongation from Jupiter.

Visit

Proposal 18389, EUROPA-TRAILING-VISIT (01) Tue Aug 18 15:04:36 GMT 2026

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: (none)

Diagnostics

(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-TRAILING-VISIT (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-TRAILING-VISIT (01)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(3)	EUROPA-TRAILING	STD=JUPITER	STD=EUROPA		NOT OCC OF EUROPA-TRAILING BY JUPITER FROM EARTH, SEP OF EUROPA-TRAILING IO FROM EARTH GT 10", SEP OF EUROPA-TRAILING GANYMEDE FROM EARTH GT 10", SEP OF EUROPA-TRAILING CALLISTO FROM EARTH GT 10", OLG OF EUROPA FROM EARTH BETWEEN 250 290	EARTH

Comments: Description=center of Europa's disk
Extended=YES

Exposures

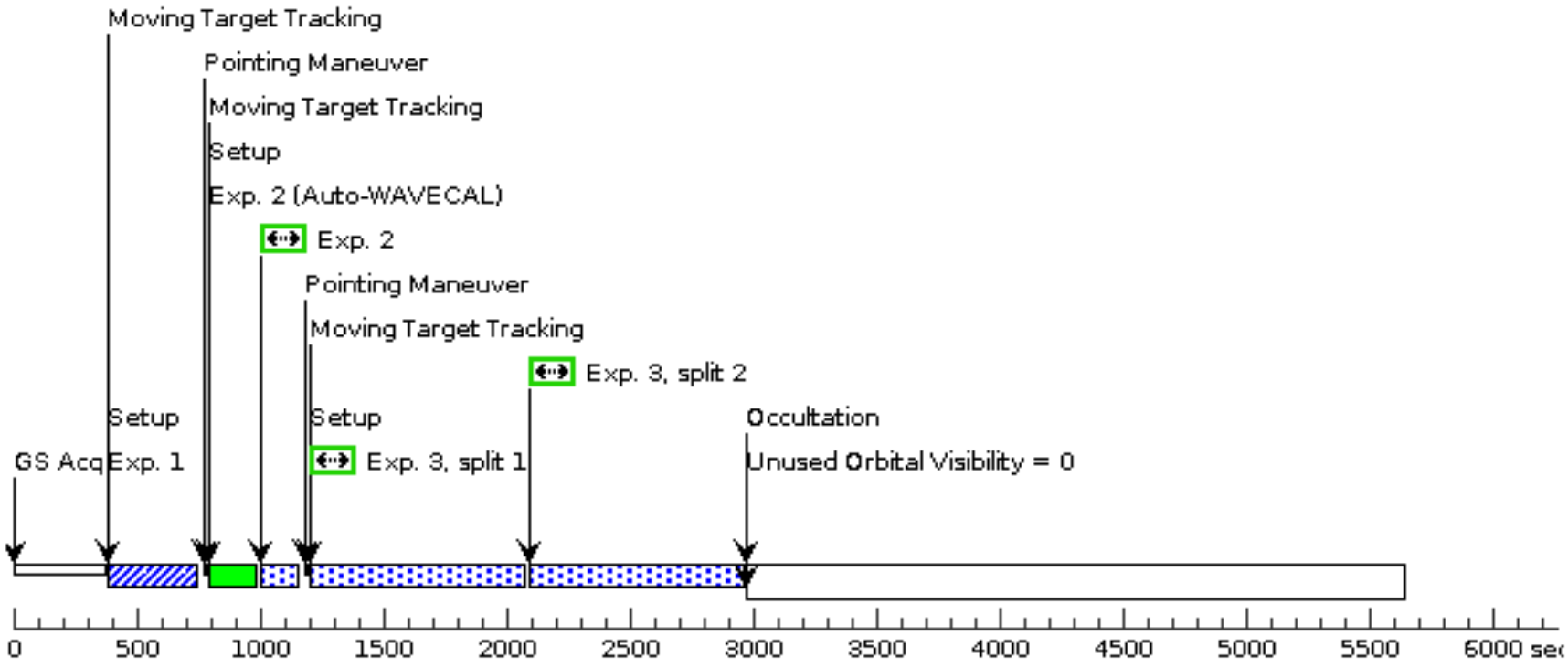
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	acq	(3) EUROPA-TRAILING	STIS/CCD, ACQ, F28X50LP	MIRROR	DIFFUSE-CENTER=GEOMETRIC-CENTER; ACQTYPE=DIFFUSE; CHECKBOX=21			0.1 Secs (0.1 Secs) *[==>]*	***[1]***
2	EUROPA-TRAILING-FIDUCIAL	(3) EUROPA-TRAILING	STIS/CCD, ACCUM, 52X0.5	G230MB 2836 A	CR-SPLIT=NO			70 Secs (70 Secs) *[==>70 Secs]*	***[1]***
3	EUROPA-TRAILING-OFFSET-NORTH	(3) EUROPA-TRAILING	STIS/CCD, ACCUM, 52X0.5	G230MB 2836 A		POS TARG 1.2,1.2		2100 Secs (1676 Secs) *[==>839.0 Secs (Split 1)]* *[==>837.0 Secs (Split 2)]*	***[1]***

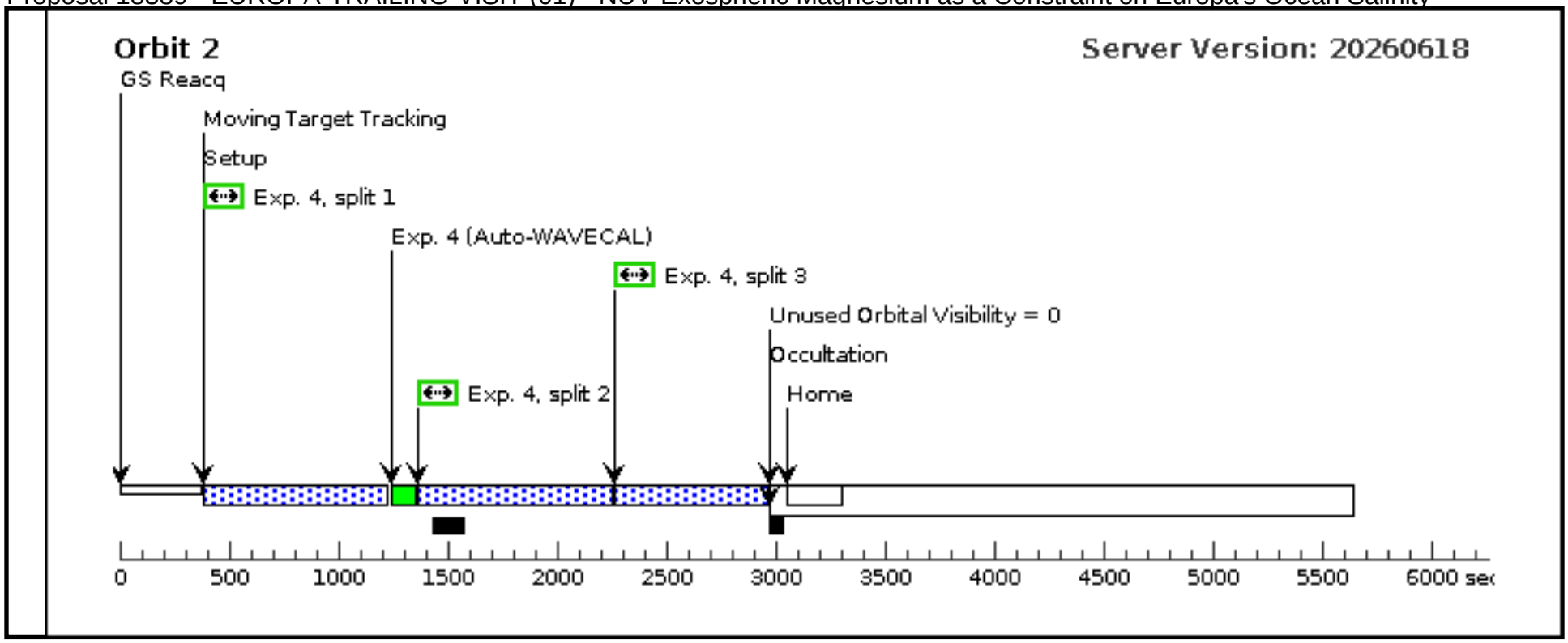
Comments: POS-TARG X and Y coordinates will depend on spacecraft roll angle and cannot be determined until after observations are scheduled. The values input currently are to include an offset in the Orbit Planner. Once scheduled, the correct offset x- and y-coordinates will be provided.

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
4	EUROPA-TRAILING-OFFSET-SOUTH	(3) EUROPA-TRAILING	STIS/CCD, ACCUM, 52X0.5	G230MB 2836 A	CR-SPLIT=3	POS TARG 1.2,1.2		2100 Secs (2273 Secs) *[==>806 Secs (Split 1)]* *[==>806 Secs (Split 2)]* *[==>661.0 Secs (Split 3)]*	***[2]***

Comments: POS-TARG X and Y coordinates will depend on spacecraft roll angle and cannot be determined until after observations are scheduled. The values input currently are to include an offset in the Orbit Planner. Once scheduled, the correct offset x- and y-coordinates will be provided.

Orbit Structure




Orbit 2
Server Version: 20260618
GS Reacq
Moving Target Tracking
Setup
Exp. 4, split 1
Exp. 4 (Auto-WAVECAL)
Exp. 4, split 3
Unused Orbital Visibility = 0
Occultation
Exp. 4, split 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18389, EUROPA-LEADING-VISIT (02) Tue Aug 18 15:04:36 GMT 2026

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: (none)

Diagnostics

(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-LEADING-VISIT (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT
(EUROPA-LEADING-VISIT (02)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

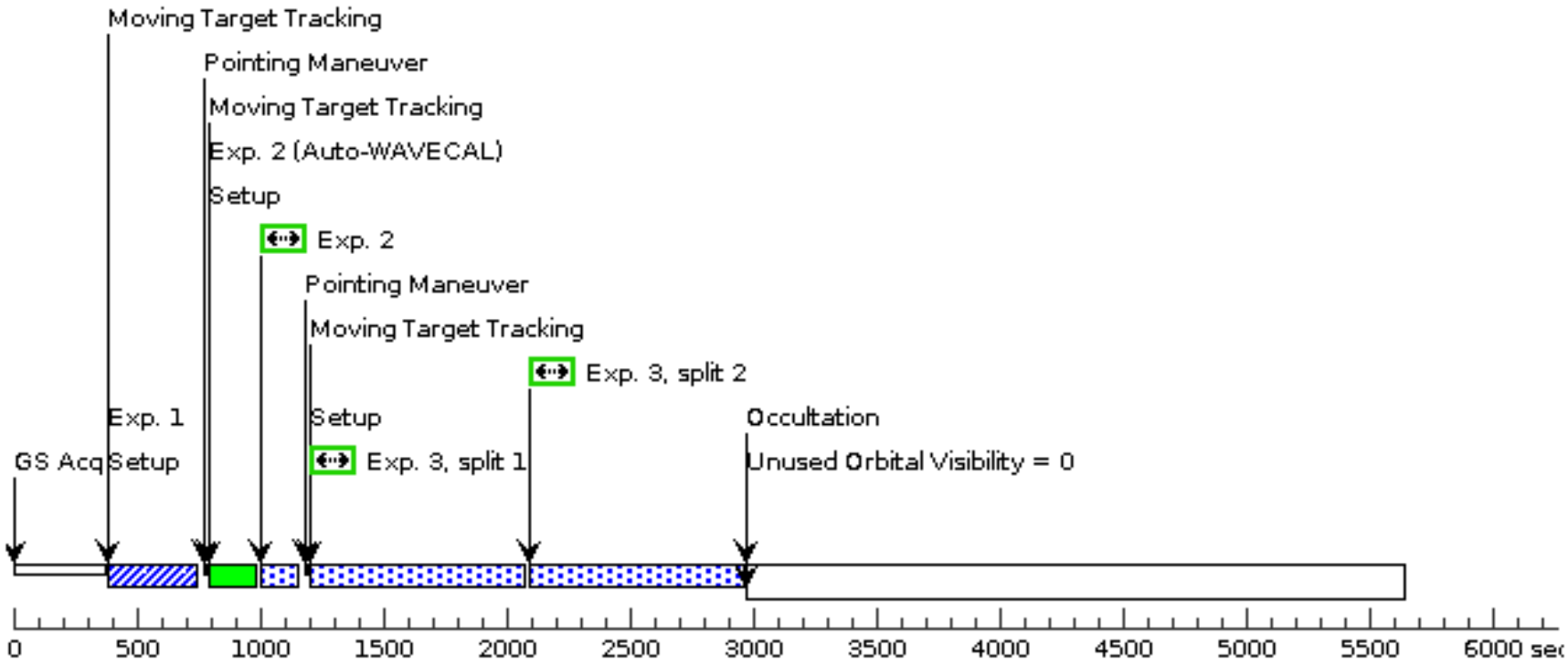
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(4)	EUROPA-LEADING	STD=JUPITER	STD=EUROPA		NOT OCC OF EUROPA-LEADING BY JUPITER FROM EARTH, SEP OF EUROPA-LEADING IO FROM EARTH GT 10", SEP OF EUROPA-LEADING GANYMEDE FROM EARTH GT 10", SEP OF EUROPA-LEADING CALLISTO FROM EARTH GT 10", OLG OF EUROPA BETWEEN 70 110	EARTH

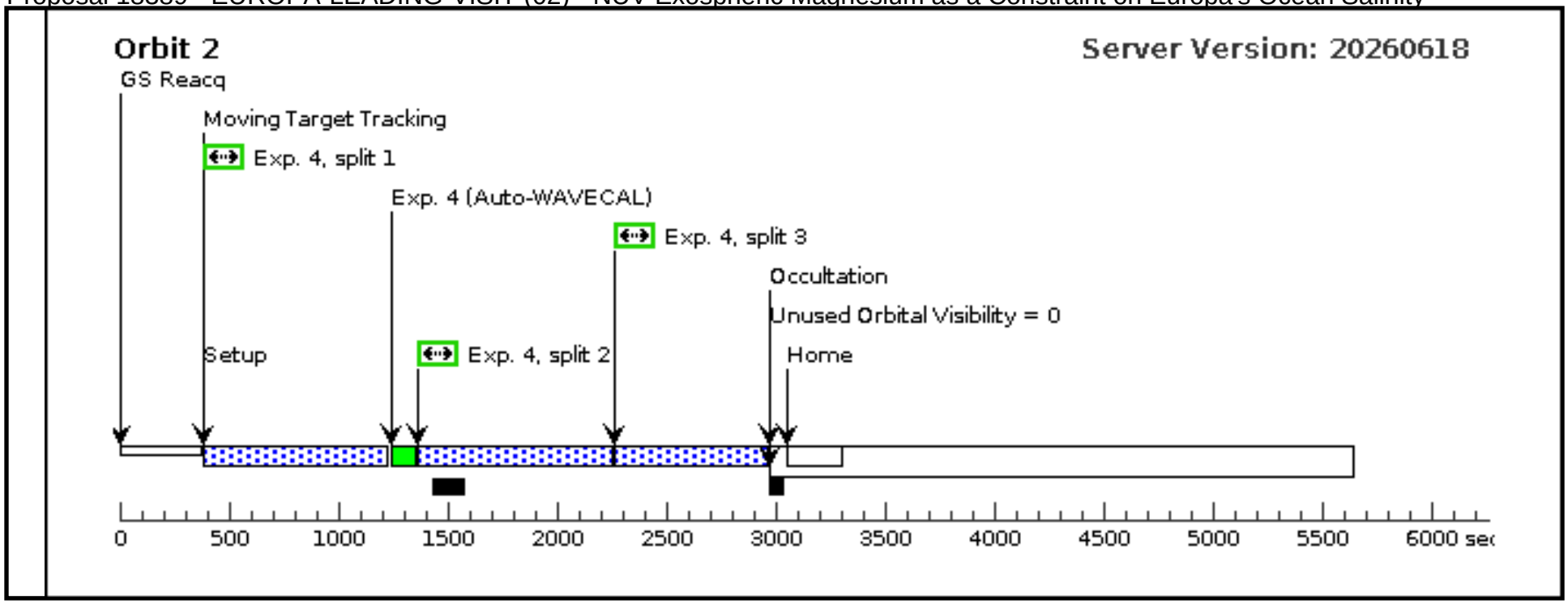
Comments: Description=center of Europa's disk
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	acq	(4) EUROPA-LEADING	STIS/CCD, ACQ, F28X50LP	MIRROR	DIFFUSE-CENTER=GEOMETRIC-CENTER; ACQTYPE=DIFFUSE; CHECKBOX=21			0.1 Secs (0.1 Secs) *[==>]*	***[1]***
2	EUROPA-LEADING-FIDUCIAL	(4) EUROPA-LEADING	STIS/CCD, ACCUM, 52X0.5	G230MB 2836 A	CR-SPLIT=NO			70 Secs (70 Secs) *[==>70 Secs]*	***[1]***
3	EUROPA-LEADING-OFFSET-NORTH	(4) EUROPA-LEADING	STIS/CCD, ACCUM, 52X0.5	G230MB 2836 A		POS TARG 1.2,1.2		2100 Secs (1676 Secs) *[==>839.0 Secs (Split 1)]* *[==>837.0 Secs (Split 2)]*	***[1]***
Comments: POS-TARG X and Y coordinates will depend on spacecraft roll angle and cannot be determined until after observations are scheduled. The values input currently are to include an offset in the Orbit Planner. Once scheduled, the correct offset x- and y-coordinates will be provided.									
4	EUROPA-LEADING-OFFSET-SOUTH	(4) EUROPA-LEADING	STIS/CCD, ACCUM, 52X0.5	G230MB 2836 A	CR-SPLIT=3	POS TARG 1.2,1.2		2100 Secs (2273 Secs) *[==>806 Secs (Split 1)]* *[==>806 Secs (Split 2)]* *[==>661.0 Secs (Split 3)]*	***[2]***
Comments: POS-TARG X and Y coordinates will depend on spacecraft roll angle and cannot be determined until after observations are scheduled. The values input currently are to include an offset in the Orbit Planner. Once scheduled, the correct offset x- and y-coordinates will be provided.									

Orbit Structure




Orbit 2
Server Version: 20260618
GS Reacq
Moving Target Tracking
Exp. 4, split 1
Exp. 4 (Auto-WAVECAL)
Exp. 4, split 3
Occultation
Unused Orbital Visibility = 0
Setup
Exp. 4, split 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec