



13488 - Using Hubble to Resolve Fundamental Discrepancies in the Surface Composition of the Asteroid (21) Lutetia

Cycle: 21, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) ASTEROID-LUTETIA	STIS/CCD STIS/NUV-MAMA	4	12-Jul-2013 14:06:45.0	yes

4 Total Orbits Used

ABSTRACT

(21) Lutetia is one of the largest asteroids in the main belt, with dimensions of 121x101x75 km along its principal axes of inertia. On July 10, 2010, the European Space Agency's Rosetta spacecraft passed within 3168 +/- 7.5 km of Lutetia's surface. However, even after the Rosetta flyby, fundamental uncertainties remain about the composition of Lutetia's surface. The primary reason for this is that from visible to millimeter wavelengths, Lutetia's reflectance spectrum is almost completely devoid of absorption features and contains nothing that can uniquely constrain its

surface composition. The scientific literature is now split with about half advocating an enstatite chondrite composition and half a carbonaceous chondrite composition. Although these materials look similar in the visible/IR, they have markedly different appearances in the NUV. In addition, the FUV spectrograph on the Rosetta spacecraft identified a strong absorption edge in Lutetia's spectrum at 170nm. This could be indicative of plagioclase feldspar minerals or water ice. The presence of either of these materials is not expected on Lutetia's surface and would be a major discovery. However, it is not possible to confirm/rule out their presence using existing data--for that NUV spectra are required. We propose a focused, 4-orbit program to obtain the spectrum of Lutetia from 180-570nm using STIS/G230L and STIS/G430L.

OBSERVING DESCRIPTION

The goal of this program is to obtain spectra of the asteroid (21) Lutetia from 180-570nm. Using our best estimate of Lutetia's spectrum--derived from FUV spectra by the Rosetta Alice spectrograph and ACS photometry--and the STIS and COS ETCs, we find that the STIS/G230L is more efficient than the COS/G230L. The predicted global count rate from the STIS ETC is 2460, well below the MAMA bright object limits. We will therefore operate the STIS NUV MAMA in TIME-TAG mode with a very conservative buffer time of 650s. Seen from Earth at opposition, Lutetia is about 0.075" in diameter, so it will appear only marginally larger than a point source. Thus, we will use the 52"x0.2" slit. Based on the results from the ETC, obtaining a SNR of 10 at 200 nm for a 2-pixel resel (3.2 Å resolution) requires 7331s of integration time. In this phase II proposal, we obtain a total of 7830s. SNRs in excess of 100 will be achieved at wavelengths greater than ~260 nm. The STIS/G430L configuration provides a bridge between the NUV and visible, covering the wavelength range of 295-570 nm with high SNR. Since the Sun, and hence Lutetia, is significantly brighter in the visible than the NUV, we can obtain comparable SNRs in just 200s of total integration time using the STIS CCD and G430L grating (CR-SPLIT=3). The SNR is > 50 for all wavelengths > 310 nm.

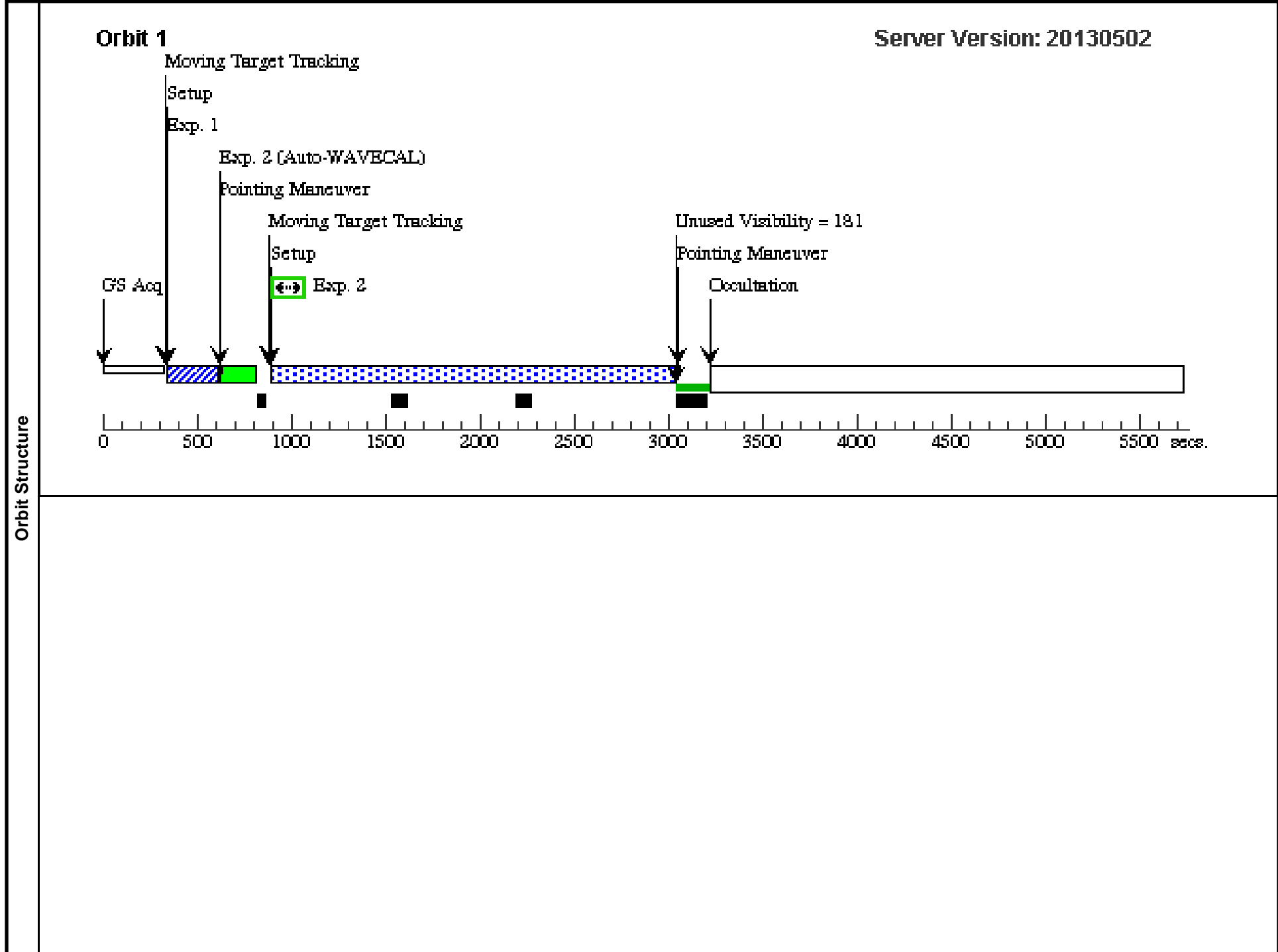
ADDITIONAL COMMENTS

The length of the planned orbits (and amount of unused observing time, if any) should be re-checked in early 2014, when the orbit of HST becomes known.

Proposal 13488 - Visit 01 - Using Hubble to Resolve Fundamental Discrepancies in the Surface Composition of the Asteroid (21) Lutetia

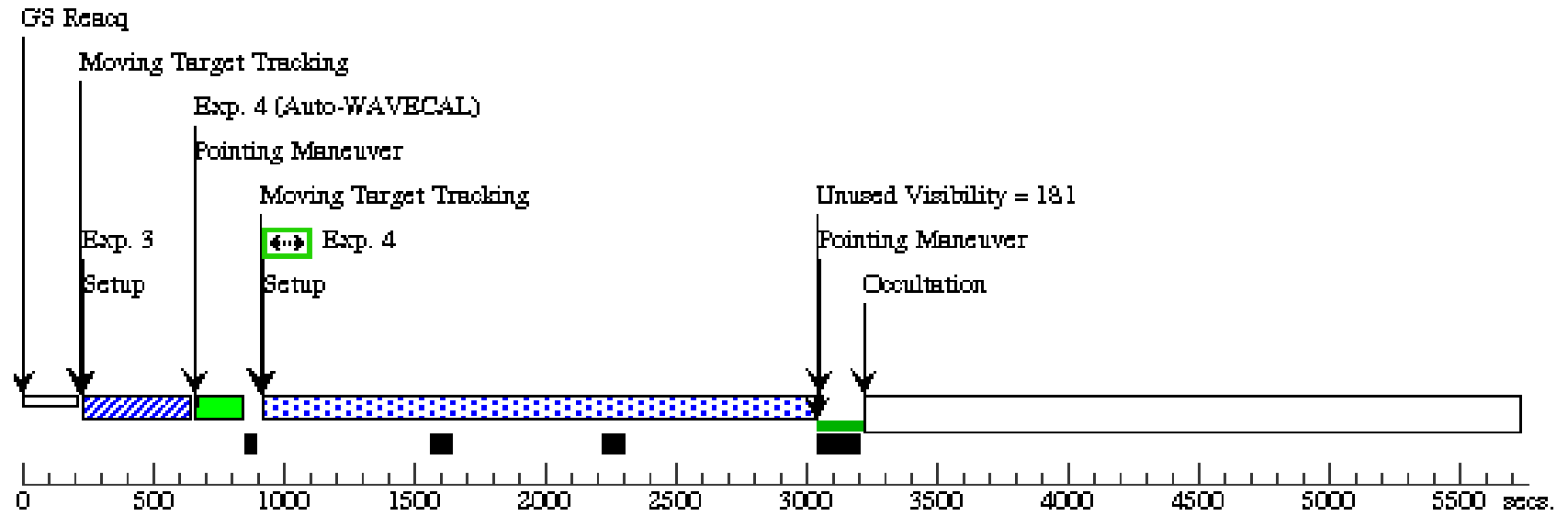
Fri Jul 12 18:06:57 GMT 2013

Visit	Proposal 13488, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/NUV-MAMA Special Requirements: BETWEEN 17-MAR-2014:18:00:00 AND 27-MAR-2014:03:00:00 <i>Comments: For accurate determination of Lutetia's geometric albedo (defined as the reflectance at a phase angle of 0 deg) we require the phase angle correction to be < 30%. This constrains the observations to occur when Lutetia's phase angle is < 2.7 deg, when seen from Earth, which occurs between 2014 Mar 17-28. Although we can accept observations at any time during this window, we strongly prefer the visit be made as close to opposition (2014-Mar-22 11:00:00) as possible.</i>									
	Solar System Targets									
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
(1)	ASTEROID-LUTETIA	TYPE=ASTEROID,A=2.43425422470 0,E=0.164545157839,I=3.0638618425 41,O=80.884245472306,W=250.21328 4373741,M=220.967267326744,EQUI NOX=J2000,EPOCH=22-MAR-2014:00:00:00,EpochTimeScale=UTC				EARTH				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Orbit1-ACQ (STIS.taSTI S.ta.510554)	(1) ASTEROID-LUTETIA	STIS/CCD, ACQ, F28X50LP	MIRROR				.1 Secs (0.1 Secs) [==>]	[1]
	2	Orbit1-NUV (STIS.sp.51 0551)	(1) ASTEROID-LUTETIA	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=65 0			2130 Secs (2130 Secs) [==>]	[1]
	3	Orbit2-ACQ (STIS.taSTI S.ta.510554)	(1) ASTEROID-LUTETIA	STIS/CCD, ACQ, F28X50LP	MIRROR				.1 Secs (0.1 Secs) [==>]	[2]
	4	Orbit2-NUV (STIS.sp.51 0557)	(1) ASTEROID-LUTETIA	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=65 0			2100 Secs (2100 Secs) [==>]	[2]
	5	Orbit3-ACQ (STIS.taSTI S.ta.510554)	(1) ASTEROID-LUTETIA	STIS/CCD, ACQ, F28X50LP	MIRROR				.1 Secs (0.1 Secs) [==>]	[3]
	6	Orbit3-VIS (STIS.sp.51 0561)	(1) ASTEROID-LUTETIA	STIS/CCD, ACCUM, 52X0.2	G430L 4300 A	CR-SPLIT=3			200.1 Secs (200.1 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)]	[3]
	7	Orbit3-NUV (STIS.sp.51 0557)	(1) ASTEROID-LUTETIA	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=65 0			1500 Secs (1500 Secs) [==>]	[3]
	8	Orbit4-ACQ (STIS.taSTI S.ta.510554)	(1) ASTEROID-LUTETIA	STIS/CCD, ACQ, F28X50LP	MIRROR				.1 Secs (0.1 Secs) [==>]	[4]
	9	Orbit4-NUV (STIS.sp.51 0557)	(1) ASTEROID-LUTETIA	STIS/NUV-MAMA, TIME-TAG, 52X0.2	G230L 2376 A	BUFFER-TIME=65 0			2100 Secs (2100 Secs) [==>]	[4]



Orbit 2

Server Version: 20130502



Orbit 3

Server Version: 20130502

