17773 - Searching for Once-Oceanic Salts on Charon with HST/STIS

Cycle: 32, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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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) CHARON (2) PLUTO WAVE	STIS/CCD	1	10-Mar-2025 11:00:11.0	yes

1 Total Orbits Used

ABSTRACT

The New Horizons mission revealed that Charon could be an example of an "extinct ocean world", whose once liquid layer has completely frozen. The extensive tectonism and smooth plains on Charon are consistent with the pressure-driven resurfacing of a freezing subsurface ocean, and suggest that once-oceanic materials could have reached the surface. Intriguingly, Charon's infrared spectrum shows evidence for widespread ammoniated material suggested to be possible ammonia hydrates or, most recently, ammonium salts like NH4Cl, both of which could have become concentrated as the subsurface liquid froze. While this interpretation from just the infrared data is ambiguous, visible-wavelength spectra sensitive to absorptions from irradiation-induced crystal defects known as "color centers" provide a diagnostic means of salt detection that has been successfully implemented for Europa, Ceres, and Mars. Both the proposed NH4Cl on Charon and the NaCl detected on these other bodies should form during the freezing of NH4-, Cl-, and Na-bearing brines and, thus, are plausible surface materials for Charon. Both salts exhibit strong color-center absorptions across the 300 - 550 nm wavelengths that have remained totally unexplored for Charon in the nearly 50 years since its discovery. We propose a simple, single-

orbit program with HST/STIS that will provide the first-ever spectral coverage of Charon across these wavelengths and enable a robust search for these salt color-center absorptions. This single-orbit request has the potential to transform our understanding of the connection between Charon's long-changed internal structure and its modern-day surface.

OBSERVING DESCRIPTION

The observations entail a single orbit of HST, druring which we will acquire and observe Charon with STIS using the 52"x0.2" slit and G430L first-order spectroscopy mode. Our observations are straightforward and consist of a single visit and pointing, including one science exposure with the maximum exposure time allowable by the orbit constraints. To maximize this exposure time, we defer the wavelength calibration until after Earth occultation.

Visit

Proposal 17773, Visit 01, implementation Mon Mar 10 15:00:11 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Diagnostics

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

(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
(1)	CHARON	STD=PLUTO	STD=CHARON			EARTH
Comments: Description=Charon Extended=NO						
(2)	PLUTO	STD=PLUTO				EARTH
Comments: Description=Pluto Extended=NO						

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.1954676)	(2) PLUTO	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Visit 01	8 Secs (8 Secs) *[==>]*	***[1]***
2	G430L (STIS.sp.1932104)	(1) CHARON	STIS/CCD, ACCUM, 52X0.2	G430L 4300 A	WAVECAL=NO		Sequence 1-3 Non-Int in Visit 01	1777 Secs (1777 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
3	G430L wave cal	WAVE	STIS/CCD, ACCUM, 52X0.2	G430L 4300 A			Sequence 1-3 Non-Int in Visit 01	*[==>]*	***[1]***

Orbit Structure