18071 - Confirming distantly-active long period comets on retrograde orbits beyond 20 au

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) 336756	WFC3/UVIS	1	30-Jul-2025 10:00:28.0	yes
02	(2) 523797	WFC3/UVIS	1	30-Jul-2025 10:00:29.0	yes

2 Total Orbits Used

ABSTRACT

The vast majority of comets show maximum amounts of activity when they cross the ice sublimation line between 4-5 au. Bodies that show activity beyond the ice sublimation line are thought to be driven by the sublimation of hypervolatiles such as CO2 and CO, which begin to sublimate well beyond 10 au. Recently, a class of objects known as distantly active comets, such as long-period comets C/2017 K2 and C/2014 UN271, and Centaur 95P/Chiron, have shown activity well beyond this distance, strongly supporting the hypervolatile activity hypothesis. However, additional examples of distantly active comets are rare. In this proposal, we have identified two candidate comets located more than ~20 au from the Sun and show evidence of being active by having significant non-gravitational accelerations. We propose to use the exceptional sensitivity and angular resolution of HST/WFC3 to test or set stringent limits on the activity of two distantly active comet candidates, (336756) 2010 NV1 and (523797) 2016 NM56. Our observations will test these candidate comets' activity by using the high sensitivity and resolution of HST to constrain their extendedness relative to point sources and mass loss below the limit implied by their non-gravitational accelerations. By testing these candidates for distant activity, we will dramatically increase the sample of distantly active comets, which will be used to test the predictions of planet formation models used to describe the formation and early evolution of cometary bodies in the solar system.

OBSERVING DESCRIPTION

We will acquire images in the F350LP filter for a maximum throughput of a Solar-like source, which is expected for our targets. Each visit will consist of six 320-s exposures using the F350LP filter and the UVIS2-C1K1C-SUB detector setup for a total integration time of 1920 s. The UVIS2-C1K1C-SUB is used because it provides a field of view large enough to contain our targets, which all have ephemeris uncertainties of less than 1 arcsec and have a low data volume to allow us to take six exposures without a serial dump penalty. Each of our visits will only consist of a single orbit. Therefore, we will not need to use a gyro bias update. The F350LP filter provides the maximum throughput enabled by WFC3/UVIS in the 300 nm - 800 nm wavelength range for a Solar-like source expected of solar system objects while allowing for a 0.04 pixel scale. We will use the methodology of Jewitt et al. 2020 for color calibrations of the F350LP filter observations. We will use line dithering to reduce the noise from flat-field calibration errors, cosmic rays, and residual images.

Visit

Proposal 18071, 336756_Visit_1 (01) Wed Jul 30 14:00:29 GMT 2025

Diagnostic Status: Informational

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 05-FEB-2026:18:00:00 AND 06-FEB-2026:18:00:00; BETWEEN 08-FEB-2026:00:00:00 AND 11-FEB-2026:18:00:00; BETWEEN 12-FEB-2026:12:00:00 AND 16-FEB-2026:00:00:00; BETWEEN 17-FEB-2026:06:00:00 AND 18-FEB-2026:06:00:00; BETWEEN 19-FEB-2026:18:00:00 AND 24-FEB-2026:00:00:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Diagnostics

(336756_Visit_1 (01)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

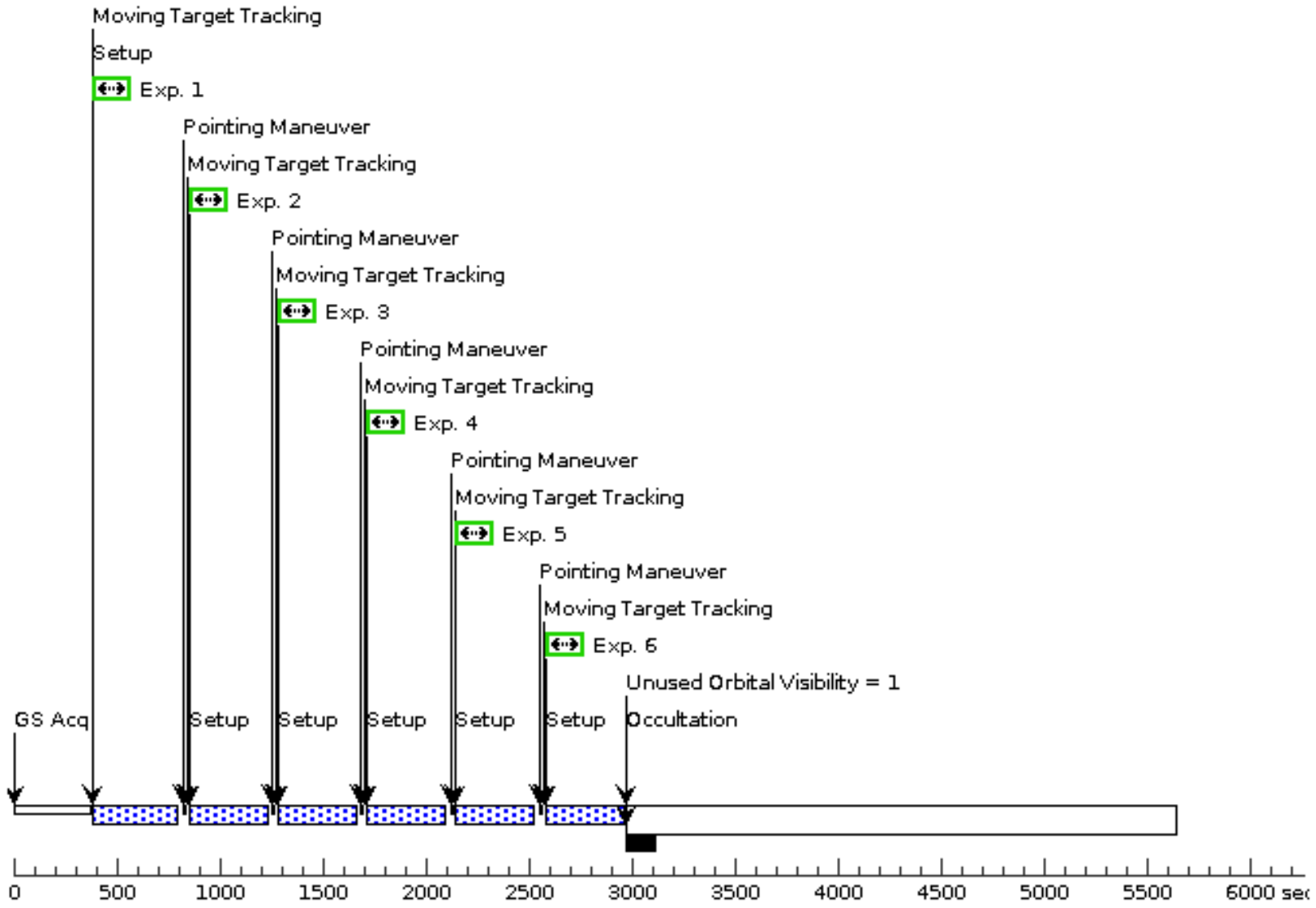
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	336756	TYPE=COMET,Q=9.418643768523664,E=0.969512448983736,I=140.8078454726423,O=136.1979282539766,W=132.9680938874039,T=14-DEC-2010:12:00:53,TTimeScale=TDB,EQUINOX=J2000,EPOCH=22-JUN-2013:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Description=distant comet
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) 336756	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG 0.1,0.1	Sequence 1-6 Non-Int in 336756_Visit_1 (01)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
2		(1) 336756	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG -0.1,0.1	Sequence 1-6 Non-Int in 336756_Visit_1 (01)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
3		(1) 336756	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG 0.2,0.2	Sequence 1-6 Non-Int in 336756_Visit_1 (01)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
4		(1) 336756	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG 0.2,-0.2	Sequence 1-6 Non-Int in 336756_Visit_1 (01)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
5		(1) 336756	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG -0.2,0.1	Sequence 1-6 Non-Int in 336756_Visit_1 (01)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
6		(1) 336756	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG -0.5,0.3	Sequence 1-6 Non-Int in 336756_Visit_1 (01)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***

Orbit Structure



Visit

Proposal 18071, 523797_Visit_1 (02) Wed Jul 30 14:00:29 GMT 2025

Diagnostic Status: Informational

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 04-MAR-2026:00:00:00 AND 06-MAR-2026:06:00:00; BETWEEN 06-MAR-2026:12:00:00 AND 08-MAR-2026:12:00:00; BETWEEN 08-MAR-2026:18:00:00 AND 09-MAR-2026:18:00:00; BETWEEN 10-MAR-2026:06:00:00 AND 11-MAR-2026:06:00:00; BETWEEN 12-MAR-2026:00:00:00 AND 12-MAR-2026:12:00:00; BETWEEN 16-MAR-2026:06:00:00 AND 17-MAR-2026:12:00:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Diagnostics

(523797_Visit_1 (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
(2)	523797	TYPE=COMET,Q=10.526988644631 87,E=0.8578637261172851,I=144.048 3239884555 ,O=350.0186370149513,W=345.66836 65580405,T=14-OCT- 2015:02:49:09,TTimeScale=TDB,EQ UINOX=J2000,EPOCH=22-NOV- 2015:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Description=distant comet
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) 523797	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG 0.1,0.1	Sequence 1-6 Non-In t in 523797_Visit_1 (02)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
2		(2) 523797	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG -0.1,0.1	Sequence 1-6 Non-In t in 523797_Visit_1 (02)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
3		(2) 523797	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG 0.2,0.2	Sequence 1-6 Non-In t in 523797_Visit_1 (02)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
4		(2) 523797	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG 0.2,-0.2	Sequence 1-6 Non-In t in 523797_Visit_1 (02)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
5		(2) 523797	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG -0.2,0.1	Sequence 1-6 Non-In t in 523797_Visit_1 (02)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***
6		(2) 523797	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F350LP		POS TARG -0.5,0.3	Sequence 1-6 Non-In t in 523797_Visit_1 (02)	240 Secs (311 Secs)	
								[==>311.0 Secs]	***[1]***

Orbit Structure