16886 - A Remarkable Inbound Long-Period Comet at Record Heliocentric Distances

Cycle: 29, 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) 2014UN271	WFC3/UVIS	1	10-Dec-2021 14:00:11.0	yes

1 Total Orbits Used

ABSTRACT

C/2014 UN271 (Bernardinelli-Bernstein) is a recently discovered long-period comet that was observed at unprecedentedly large inbound distances from the Sun (~29 au). Here we seek one HST mid-cycle orbit using the WFC3 camera to observe the remarkable comet at heliocentric distance ~20 au. Our primary scientific objective is to determine the nucleus size by photometrically isolating the nucleus signal from the surrounding coma. The proposed HST program will enable us to study an inbound comet at a rarely-seen distance from the Sun in good detail.

OBSERVING DESCRIPTION

Here we request one mid-cycle orbit primarily to characterize the nucleus of distantly active comet C/2014 UN271 (Bernardinelli-Bernstein) with WFC3-UVIS and the F350LP filter. As the comet is nearing the Sun, resulting in intensifying activity, our observation should be performed as early as possible lest the nucleus signal is overwhelmed by the surrounding dust in the coma. According to the Orbit Planner, in the single orbit, we will obtain five individual exposures each of 285 s duration, with an image dithering executed in the middle. All of the images should be tracked at the nonsidereal motion rate of the target, which will be no more than ~0.14"/min due to its great distance, easily within the tracking capacity of the telescope. Combining all of these five images will improve the signal-to-noise ratio of the comet and will also effectively mitigate effects from CCD defects and cosmic ray strikes. Within the entire observability window, the individual images will be also used to search for possible variability of the near-nucleus region of the comet due to the spin of the nucleus, which can be only achieved through the WFC3 camera thanks to its supreme sensitivity, stability, and angular resolution. Given the small apparent size of the observed coma of the comet (~20"), reading out 2k x 2k subarrays only, which has a square field of view (FOV) of ~80" x 80", will be sufficient for our program. According to the WFC3 user document, amp C on CCD chip2 outperforms others because of milder geometric distortion and fewer ghosts from bright background sources. Therefore, we choose WFC3's UVIS2-2K2C-SUB for our program. The current 3-sigma ephemeris uncertainty of the comet is only at a subarcsec level, much smaller than the FOV of the subarrays, and therefore will not cause any problem to telescope pointing. Ideally, we prefer that the CCD can be oriented to place the tail (extended approximately in the NE direction) roughly along the diagonal of the subarrays. However, given that the FOV of the subarrays is large enough and we will have no control over the roll angle of the spacecraft, we should be able to obtain high-quality data of the distant comet regardless of the roll angle used in our program.

Visit

Proposal 16886, Visit 01, implementation Fri Dec 10 19:00:12 GMT 2021

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 62D TO 74 D; BETWEEN 07-JAN-2022:18:00:00 AND 09-JAN-2022:12:00:00

Comments: Schedule this visit as soon as possible.

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	2014UN271	TYPE=COMET,Q=10.95346775840689,E=0.9995433744217906,I=95.56709024101407,O=190.1002771851635,W=326.267349724131,T=24-JAN-2031:00:22:52,TTimeScale=TDB,EQUINOX=J2000,EPOCH=11-APR-2017:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Description=Distantly active comet
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) 2014UN271	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F350LP	CR-SPLIT=NO	POS TARG 15,15	Sequence 1-2 Non-Int in Visit 01	285 Secs X 3 (855 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	 ***[1]***
2		(1) 2014UN271	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F350LP	CR-SPLIT=NO	POS TARG 15.4,15.4	Sequence 1-2 Non-Int in Visit 01	285 Secs X 2 (570 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]*	 ***[1]***

Orbit Structure