17848 - Astrometry for an Upcoming Double Occultation of Salacia-Actaea

Cycle: 31, Proposal Category: GO/DD

(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) SALACIA	WFC3/UVIS	1	19-Jul-2024 12:01:17.0	yes
02	(1) SALACIA	WFC3/UVIS	1	19-Jul-2024 12:01:18.0	yes

2 Total Orbits Used

ABSTRACT

Binary trans-Neptunian objects (TNOs) are some of the most powerful tracers of solar system formation and evolution. One of the highest resolution way to study binary TNOs is by using stellar occultations, which enable direct determinations of the size and shape of each binary component. Although considerable effort has been expended targeting individual binary components, very few occultation campaigns have been able to simultaneously observe both binary components. On August 17th 2024, Salacia and its binary companion Actaea will occult a relatively bright star within 5 minutes of each other. This double occultation event will be visible along the same shadow path, allowing for a focused campaign to observe both bodies. Currently, uncertainties on the exact location of the shadow path are ~2500 km. We request two single-orbit visits to acquire both

absolute and relative astrometry of the Salacia-Actaea system to allow for a more precise determination of the shadow path. Our observations will enable updated event predictions with uncertainties of ~300 km. The secondary science opportunities provided by the ultra-precise astrometry of the system are also substantial.

OBSERVING DESCRIPTION

Observations are to be used for both relative (Actaea's position relative to Salacia) and absolute astrometry to provide precise predictions for an August 17 double occultation of Salacia and Actaea. To maximize efficiency of our observations during each visit, we request 4 images with a subarray to get relative astrometry, followed by 4 images with the full UVIS2 aperture. This maximizes exposure time over the orbit, with only one long buffer dump during the observations, and allows us to observe as many reference stars as possible during the observations. The "No gyro bias update" option was chosen to increase the orbital visibility to maximize exposure time on our single-orbit visits. Our observations use the a box dither to minimize per-pixel effects and optimally sample the PSFs of Salacia and Actaea.

Visits are to occur at least 1 day apart to allow for orbital motion to accumulate. This also provides redundancy in the event of a guiding (or other) failure, as a HOPR would likely not allow rapid enough turnaround to reschedule observations before the August 17 occultation event.

We have checked background fields to ensure that nearby bright field stars will not contaminate the relative astrometry, while also ensuring that enough reference stars are within the large aperture images.

Both visits leave some "unused orbital visibility" when using the Orbit Planner. This has been purposefully included to increase the schedulability of the observations. If difficulties arrive in scheduling, we are happy to change number of exposures and/or exposure time to allow for better schedulability.

Visit

Proposal 17848, Visit 01, implementation Fri Jul 19 16:01:19 GMT 2024

Diagnostic Status: Informational

Scientific Instruments: WFC3/UVIS

Special Requirements: BEFORE 03-AUG-2024:00:00:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Diagnostics

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

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1), (2)

Solar System Targets

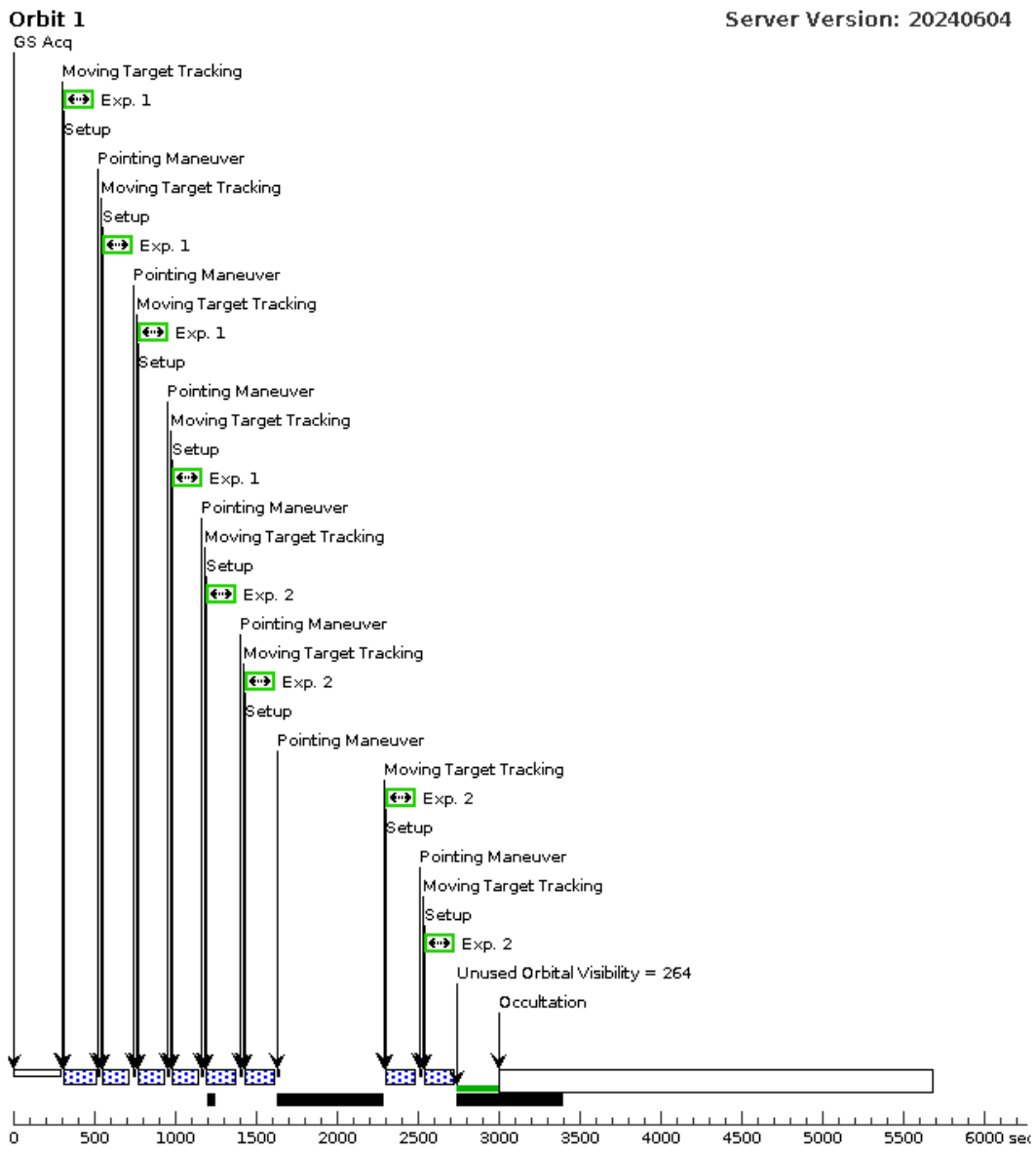
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	SALACIA	TYPE=ASTEROID,A=41.9186434042 4245,E=0.1098795382573878,I=23.92 61520468926 ,O=279.9835651860334,W=309.19967 40556897,M=122.8445075195537,EQ UINOX=J2000,EPOCH=04-NOV-2017:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Description=Dwarf planet with moon, Actaea (V ~ 23.3)

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SALACIA	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F350LP	FLASH=7	GS ACQ SCENARIO ONEB1O3	Sequence 1-2 Non-Int in Visit 01 Pattern 1, Exps 1-1 in Sequence 1-2 Non-Int in Visit 01 (1)	120 Secs (480 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2		(1) SALACIA	WFC3/UVIS, ACCUM, UVIS2	F350LP	FLASH=12		Sequence 1-2 Non-Int in Visit 01 Pattern 1, Exps 2-2 in Sequence 1-2 Non-Int in Visit 01 (1)	60 Secs (240 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***

Orbit Structure



Visit

Proposal 17848, Visit 02, implementation Fri Jul 19 16:01:19 GMT 2024

Diagnostic Status: Informational

Scientific Instruments: WFC3/UVIS

Special Requirements: AFTER 01 BY 1 D TO 100 D; BEFORE 03-AUG-2024:00:00:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Comments: To be taken at least 1 day after Visit 1

Diagnostics

(Visit 02) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1), (2)

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	SALACIA	TYPE=ASTEROID,A=41.9186434042 4245,E=0.1098795382573878,I=23.92 61520468926 ,O=279.9835651860334,W=309.19967 40556897,M=122.8445075195537,EQ UINOX=J2000,EPOCH=04-NOV- 2017:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Description=Dwarf planet with moon, Actaea (V ~ 23.3)

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SALACIA	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F350LP	FLASH=7	GS ACQ SCENARIO ONEB1O3	Sequence 1-2 Non-Int in Visit 02 Pattern 1, Exps 1-1 in Sequence 1-2 Non-Int in Visit 02 (1)	120 Secs (480 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) SALACIA	WFC3/UVIS, ACCUM, UVIS2	F350LP	FLASH=12		Sequence 1-2 Non-Int in Visit 02 Pattern 1, Exps 2-2 in Sequence 1-2 Non-Int in Visit 02 (1)	60 Secs (240 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure