



16852 - Characterizing the aftermath of mega-outbursts of Centaur 29P

Cycle: 29, Proposal Category: GO/DD

(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) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:18.0	yes
02	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:18.0	yes
10	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:19.0	yes
11	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:20.0	yes
20	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:21.0	yes
21	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:21.0	yes
30	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:22.0	yes
31	(1) 29P-SW1	WFC3/UVIS	1	15-Nov-2021 09:00:23.0	yes

8 Total Orbits Used

ABSTRACT

We request 6 orbits of observing time to investigate the aftermath of a 7 magnitude series of outbursts of centaur 29P/Schwassmann-Wachmann using WFC3/UVIS. At 5.5 au from the Sun, this object is known for its irregular activity. The series of outbursts that started this week (9/27) are the largest on record, making the object brighter than ever before. The event provides a unique opportunity to study material ejected from below the surface and to investigate what processes drive these large outbursts. The versatility of WFC3 is necessary to search for fragments, characterize the morphology and amount of the ejected material, and use narrow and medium band filters to evaluate dust color and content. We request three 2-orbit visits to characterize the ejecta around 29P and to perform a deep search for 100 meter diameter fragments. We will determine the dynamical and color evolution of the ejecta to constrain the kinematics and thus the possible mechanisms of the outbursts. Only HST is capable of capturing the high spatial resolution images necessary to capture faint fragments near the active 29P nucleus to investigate the outbursts and their source.

OBSERVING DESCRIPTION

The objectives of the proposal are to characterize morphology and color of the outburst ejecta around 29P and to perform a deep search of any large fragments. Because the outburst ejecta is expanding and darkening, we would like the observations to be scheduled as soon as possible.

We plan to organize the 6 orbits into 3 2-orbit visits separated by about 1 week. In each visit, the two orbits should be executed back to back in order to facilitate the color analysis and stacking of images to increase the SNR. Because we only require two consecutive orbits in each visit, and we do not require extreme pointing accuracy with the use of 160" full field of view UVIS, we can disable the gyro bias update for all orbits to gain 5-6 min of extra exposure time in each orbit.

Each orbit will consist of 5 full-frame exposures for the largest possible spatial coverage of the ejecta. Each orbit will have two F350LP exposures, one F487N exposure, and two exposures with F689M for one orbit and F845M for the other. We use a two-point dither pattern in each orbit to dither across the chip gap and bad pixels/columns for all filters. In order to avoid the main part of the coma from falling into the chip gap, we will use POSTARG parameters to put the nucleus at 20" from the gap on the opposite chips in the two dither points. The dither will also offset the nucleus by 3" horizontally (along the gap direction).

The exposure times are estimated based on the previous observations of 29P with the same instrument and filters. The F689M, F845M, and F487N

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filters will not saturate the nucleus. The F350LP exposures will saturate the core of the comet in order to perform a deep search for faint fragments around the nucleus. With one 550 s exposures in F350LP filter, we expect to reach a magnitude just over 27 for SNR=5.

The 3-sigma position uncertainty of 29P is about 0.05" based on JPL Horizons, i.e., about 1 UVIS pixel, which brings no concerns for the pointing accuracy requirement. No orientation requirement is needed for our observations.

Proposal 16852 - Visit 01 - Characterizing the aftermath of mega-outbursts of Centaur 29P

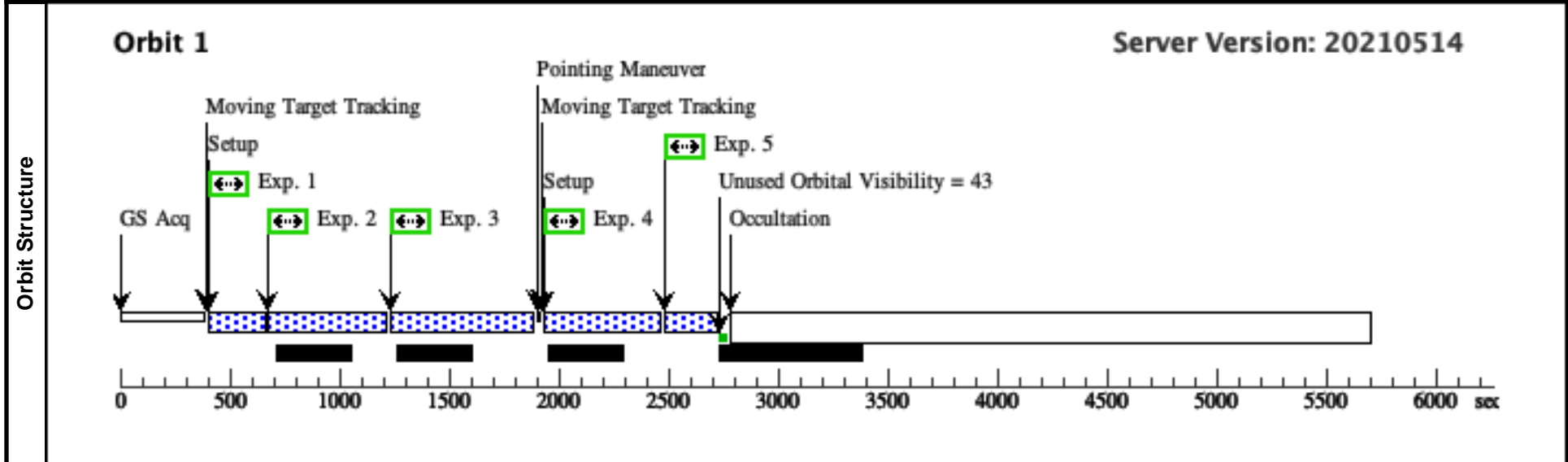
Mon Nov 15 14:00:23 GMT 2021

Visit	Proposal 16852, Visit 01, failed					
	Diagnostic Status: No Diagnostics					
	Scientific Instruments: WFC3/UVIS					
	Special Requirements: BEFORE 01-NOV-2021:00:00:00					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB				

*Comments: Description=Comet29P
Extended=YES*

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVIS.im.1541475)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 01	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVIS.im.1541444)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 01	400 Secs (400 Secs) [==>]	[1]
	3	(WFC3UVIS.im.1541450)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 01	500 Secs (500 Secs) [==>]	[1]
	4	(WFC3UVIS.im.1541444)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 01	400 Secs (400 Secs) [==>]	[1]
	5	(WFC3UVIS.im.1541475)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 01	100 Secs (100 Secs) [==>]	[1]



Proposal 16852 - Visit 02 - Characterizing the aftermath of mega-outbursts of Centaur 29P

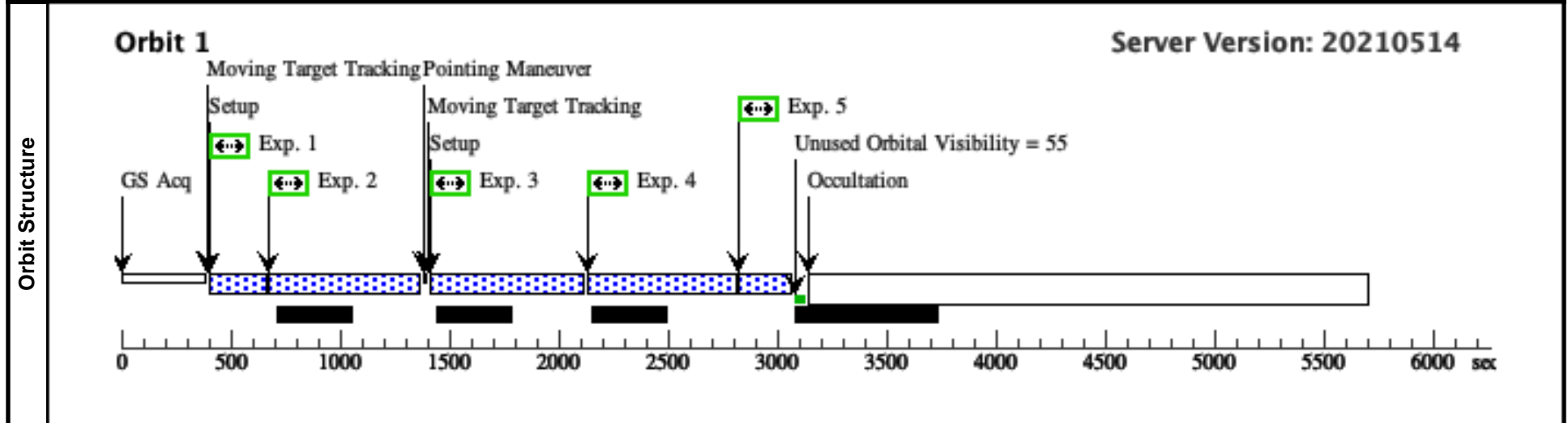
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Visit	Proposal 16852, Visit 02, failed					
	Diagnostic Status: No Diagnostics					
	Scientific Instruments: WFC3/UVIS					
	Special Requirements: AFTER 01 BY 0.9 Orbits TO 1.1 Orbits; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB				

*Comments: Description=Comet29P
Extended=YES*

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVI S.im.1541459)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 02	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVI S.im.1541444)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 02	550 Secs (550 Secs) [==>]	[1]
	3	(WFC3UVI S.im.1541450)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 02	550 Secs (550 Secs) [==>]	[1]
	4	(WFC3UVI S.im.1541444)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 02	550 Secs (550 Secs) [==>]	[1]
	5	(WFC3UVI S.im.1541459)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 02	100 Secs (100 Secs) [==>]	[1]



Proposal 16852 - Visit 10 - Characterizing the aftermath of mega-outbursts of Centaur 29P

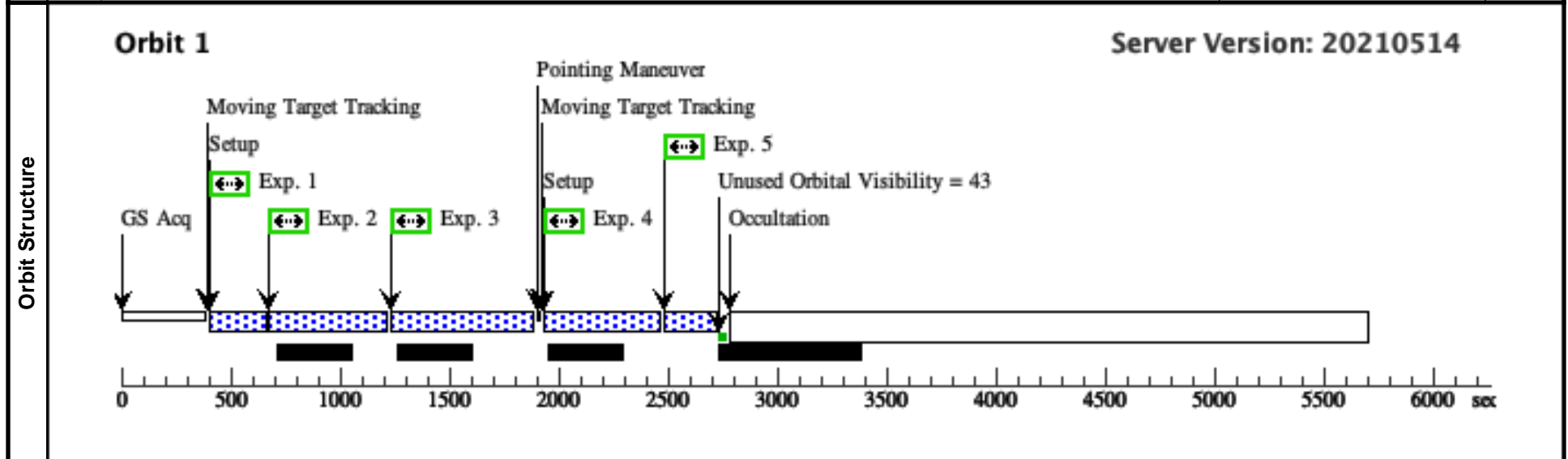
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Visit	Proposal 16852, Visit 10, scheduled					
	Diagnostic Status: No Diagnostics					
	Scientific Instruments: WFC3/UVIS					
	Special Requirements: (none)					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB				

*Comments: Description=Comet29P
Extended=YES*

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVIS.im.1541475)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 10	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVIS.im.1541444)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 10	400 Secs (400 Secs) [==>]	[1]
	3	(WFC3UVIS.im.1541450)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 10	500 Secs (500 Secs) [==>]	[1]
	4	(WFC3UVIS.im.1541444)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 10	400 Secs (400 Secs) [==>]	[1]
	5	(WFC3UVIS.im.1541475)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 10	100 Secs (100 Secs) [==>]	[1]



Proposal 16852 - Visit 11 - Characterizing the aftermath of mega-outbursts of Centaur 29P

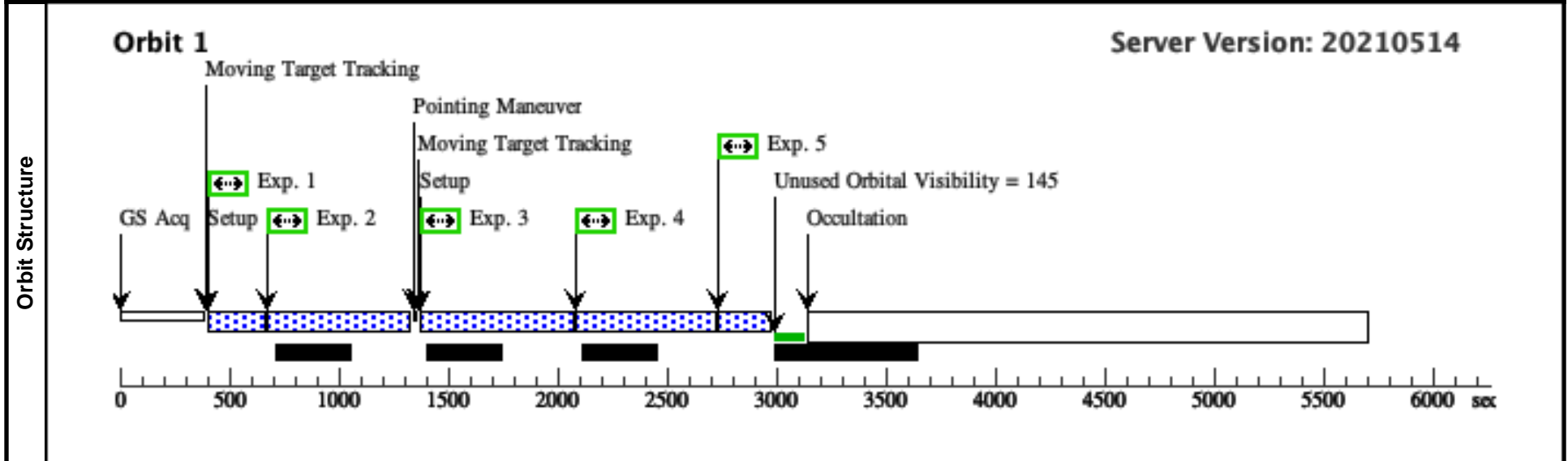
Mon Nov 15 14:00:23 GMT 2021

Visit	Proposal 16852, Visit 11, scheduled					
	Diagnostic Status: No Diagnostics					
	Scientific Instruments: WFC3/UVIS					
	Special Requirements: AFTER 10 BY 0.9 Orbits TO 1.1 Orbits; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB				

*Comments: Description=Comet29P
Extended=YES*

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVI S.im.154145 9)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG 0,30	Sequence 1-5 Non-Int in Visit 11	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,30	Sequence 1-5 Non-Int in Visit 11	505 Secs (505 Secs) [==>]	[1]
	3	(WFC3UVI S.im.154145 0)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 11	550 Secs (550 Secs) [==>]	[1]
	4	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 11	505 Secs (505 Secs) [==>]	[1]
	5	(WFC3UVI S.im.154145 9)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 11	100 Secs (100 Secs) [==>]	[1]

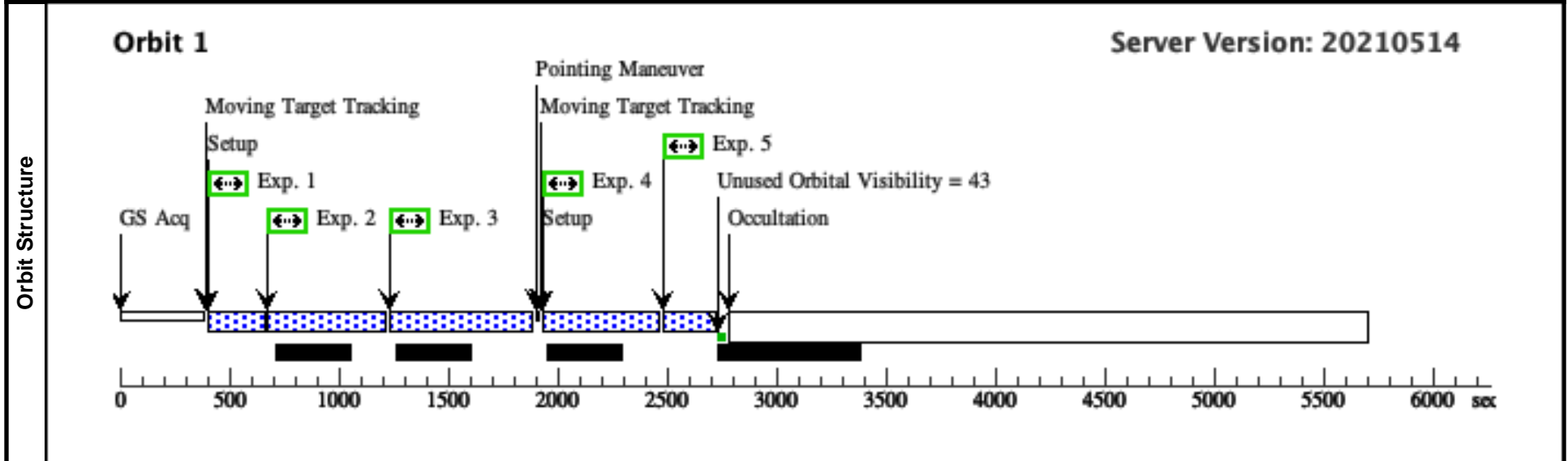


Visit	Proposal 16852, Visit 20, scheduling					
	Diagnostic Status: No Diagnostics					
	Scientific Instruments: WFC3/UVIS					
	Special Requirements: (none)					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB				

*Comments: Description=Comet29P
Extended=YES*

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVI S.im.154147 5)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG 0,30	Sequence 1-5 Non-Int in Visit 20	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,30	Sequence 1-5 Non-Int in Visit 20	400 Secs (400 Secs) [==>]	[1]
	3	(WFC3UVI S.im.154145 0)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG 0,30	Sequence 1-5 Non-Int in Visit 20	500 Secs (500 Secs) [==>]	[1]
	4	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 20	400 Secs (400 Secs) [==>]	[1]
	5	(WFC3UVI S.im.154147 5)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 20	100 Secs (100 Secs) [==>]	[1]



Proposal 16852 - Visit 21 - Characterizing the aftermath of mega-outbursts of Centaur 29P

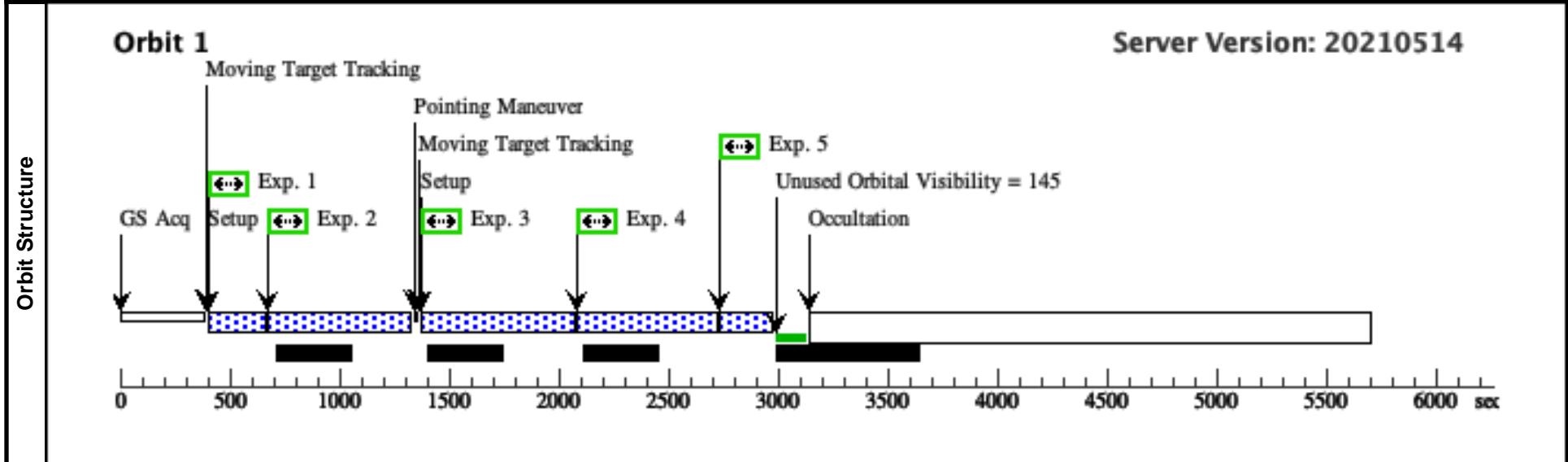
Mon Nov 15 14:00:23 GMT 2021

Visit	Proposal 16852, Visit 21, scheduling					
	Diagnostic Status: No Diagnostics					
	Scientific Instruments: WFC3/UVIS					
	Special Requirements: AFTER 20 BY 0.9 Orbits TO 1.1 Orbits; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB				

*Comments: Description=Comet29P
Extended=YES*

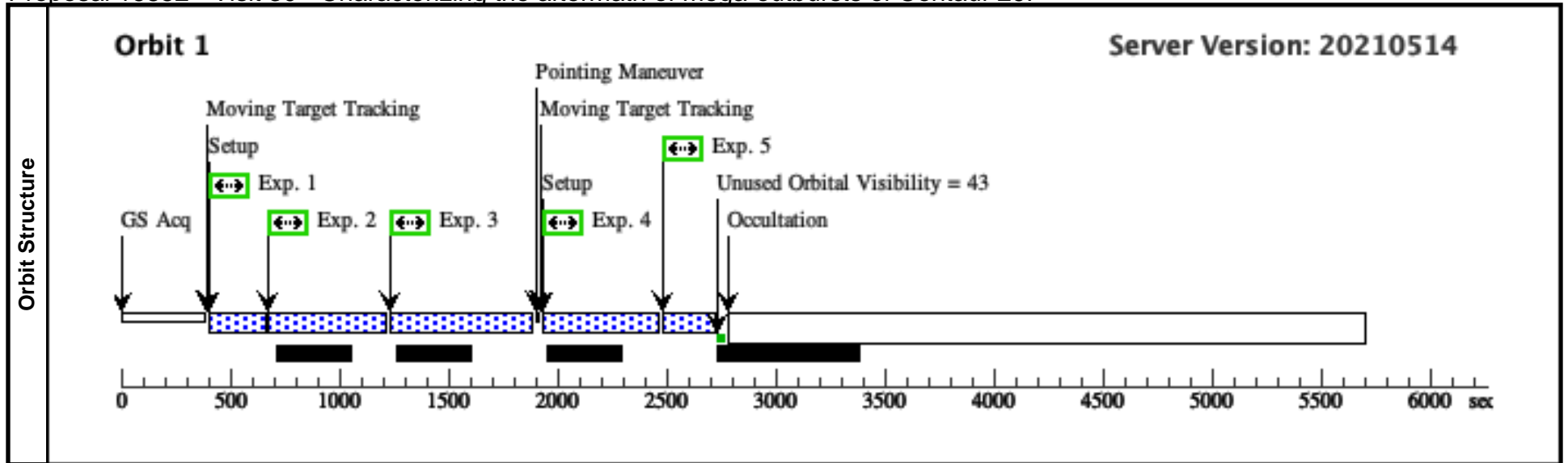
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVI S.im.154145 9)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG 0,30	Sequence 1-5 Non-Int in Visit 21	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,30	Sequence 1-5 Non-Int in Visit 21	505 Secs (505 Secs) [==>]	[1]
	3	(WFC3UVI S.im.154145 0)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 21	550 Secs (550 Secs) [==>]	[1]
	4	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 21	505 Secs (505 Secs) [==>]	[1]
	5	(WFC3UVI S.im.154145 9)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 21	100 Secs (100 Secs) [==>]	[1]



Proposal 16852 - Visit 30 - Characterizing the aftermath of mega-outbursts of Centaur 29P

Mon Nov 15 14:00:23 GMT 2021

Visit	Proposal 16852, Visit 30, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none) <i>Comments: copy of visit 1, lost due to safing event</i>									
	Solar System Targets									
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 ,O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TTTimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB								EARTH
<i>Comments: Description=Comet29P Extended=YES</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVI S.im.154147 5)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 30	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 30	400 Secs (400 Secs) [==>]	[1]
	3	(WFC3UVI S.im.154145 0)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 30	500 Secs (500 Secs) [==>]	[1]
	4	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 30	400 Secs (400 Secs) [==>]	[1]
	5	(WFC3UVI S.im.154147 5)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F689M	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 30	100 Secs (100 Secs) [==>]	[1]



Proposal 16852 - Visit 31 - Characterizing the aftermath of mega-outbursts of Centaur 29P

Mon Nov 15 14:00:23 GMT 2021

Visit	Proposal 16852, Visit 31, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: AFTER 30 BY 0.9 Orbits TO 1.1 Orbits; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: copy of visit 2, lost due to safing event									
	Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center		
	(1)	29P-SW1	TYPE=COMET,Q=5.7328510516827 2,E=0.04410336970518595,I=9.37985 821466569 .O=312.5786146183075,W=50.416020 27596368,T=07-APR- 2019:01:07:11,TimeScale=TDB,EQ UINOX=J2000,EPOCH=31-JAN- 2012:00:00:00,EpochTimeScale=TDB					EARTH		
	Comments: Description=Comet29P Extended=YES									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(WFC3UVI S.im.154145 9)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 31	100 Secs (100 Secs) [==>]	[1]
	2	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG 0,-30	Sequence 1-5 Non-Int in Visit 31	400 Secs (400 Secs) [==>]	[1]
	3	(WFC3UVI S.im.154145 0)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F487N	FLASH=18	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 31	550 Secs (550 Secs) [==>]	[1]
	4	(WFC3UVI S.im.154144 4)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F350LP		POS TARG -3,10	Sequence 1-5 Non-Int in Visit 31	400 Secs (400 Secs) [==>]	[1]
	5	(WFC3UVI S.im.154145 9)	(1) 29P-SW1	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=16	POS TARG -3,10	Sequence 1-5 Non-Int in Visit 31	100 Secs (100 Secs) [==>]	[1]

