15108 - Enabling physical studeis of the Kuiper belt via HST tracking observations of close fly-by targets for the New Horizons spacecraft.

Cycle: 25, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. J. J. Kavelaars (PI) (CSA Member) (Contact)	**National Research Council of Canada**	**jj.kavelaars@nrc-cnrc.gc.ca**
Dr. John R. Spencer (CoI)	Southwest Research Institute	spencer@boulder.swri.edu
Dr. Marc W. Buie (CoI)	Southwest Research Institute	buie@boulder.swri.edu
Dr. Simon Porter (CoI) (AdminUSPI)	Southwest Research Institute	porter@boulder.swri.edu
Dr. Alex Harrison Parker (CoI)	Southwest Research Institute	alexharrisonparker@gmail.com
Dr. Anne J. Verbiscer (CoI)	The University of Virginia	verbiscer@virginia.edu
Dr. S. Alan Stern (CoI)	Southwest Research Institute	astern@swri.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) K14OD3S	WFC3/UVIS	1	02-Aug-2018 17:37:38.0	yes
06	(1) K14OD3S	WFC3/UVIS	1	02-Aug-2018 17:37:39.0	yes
02	(1) K14OD3S	WFC3/UVIS	1	02-Aug-2018 17:37:40.0	yes
04	(2) K14P70N	WFC3/UVIS	1	02-Aug-2018 17:37:40.0	yes
07	(2) K14P70N	WFC3/UVIS	1	02-Aug-2018 17:37:41.0	yes
05	(2) K14P70N	WFC3/UVIS	1	02-Aug-2018 17:37:41.0	yes

6 Total Orbits Used

ABSTRACT

In winter 2018 / 2019, the New Horizons spacecraft will make close (~0.1 au) fly-bys of two small outer solar system bodies (2014 OS393 and 2014PN70). These two objects are among the three that we discovered during our HST based search for a New Horizons Kuiper belt enconter target (now selected; 2014 MU69). These will be our closest fly-by observations, amoung the nearly dozen TNOs that we will observed from NH. They will appear the brightest as seen from NH, be the best resolved (about 10x higher resolution than HST) and will provide the largest science impact among our flyby targets. We will measure their phase curves, their rotational light curves and search for rings and compangion objects.

Although the orbits of these two TNOs are amoung some of the best known they are not yet well enough constrained to enable the science. Due to the closeness of the fly-by we must furthre refine our knowledge of their orbits so as to reduce the uncertainty in the projeted sky-plane when viewed from New Horizons.

We are requesting 5 HST orbits to further secure the ephemrides of these objects and enable this high-impact science return from the New Horizons Kuiper Extended Mission.

OBSERVING DESCRIPTION

Recovery observation of 2 TNOs that are part of the New Horizons encounter plan. The plan here is to aquire 2 visits on each of 2 TNOs to obtain tracking observations.

Each Visit is a single orbit and we pack the maximum number of exposures we can manage into the orbit, for WFC/UVIC this about 440s per exposure.

Observations should be trailed at the motion rate of the object to get the maximal SNR.

We have special trailed PSF software to compute a small correction to the STScI WCS for the images, which we derive from Gaia.

Visit

Proposal 15108, K14OD3S First Recovery (01), failed

Thu Aug 02 21:37:42 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; BETWEEN 01-MAY-2018:00:00:00 AND 01-JUL-2018:00:00:00

Comments: First recovery of 2014 OS393 (K14OD3S) to enable rough orbit improvement.

Solar System Targets

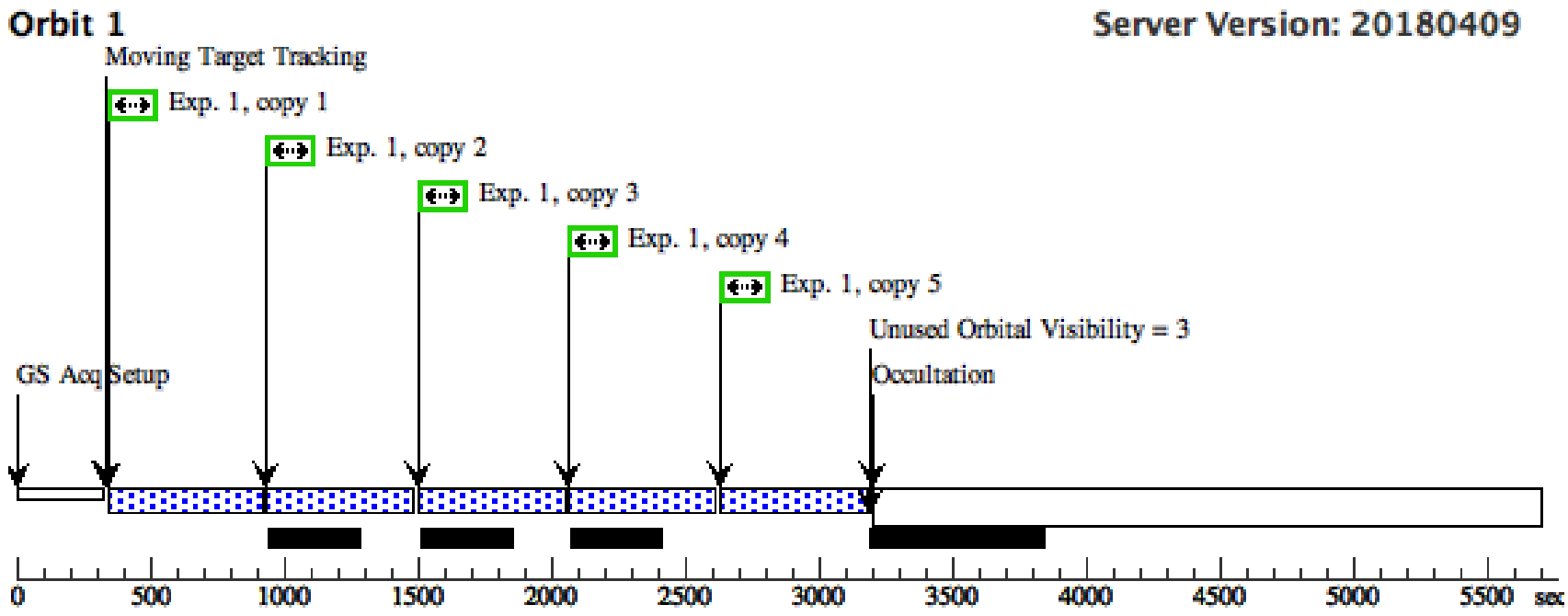
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	K14OD3S	TYPE=ASTEROID,A=43.9420722929 0335,E=0.03211962291069496,I=3.81 4918277503804,O=138.211463650379 7,W=78.58388140193212,M=60.5278 2890423461,EQUINOX=J2000,EPOC H=08-AUG- 2014:00:00:00,EpochTimeScale=TDB				EARTH

Comments: This source has been detected using HST WFC observation in the past and we will use those observation setups as our guide for the current program.
Description=TransNeptunian object.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	First Recove ry	(1) K14OD3S	WFC3/UVIS, ACCUM, UVIS1	F350LP				450 Secs X 5 (2185 Secs)	
								[==>437.0 Secs (Copy 1)]	
								[==>437.0 Secs (Copy 2)]	
								[==>437.0 Secs (Copy 3)]	***[1]***
								[==>437.0 Secs (Copy 4)]	
								[==>437.0 Secs (Copy 5)]	

Orbit Structure



Visit

Proposal 15108, K14OD3S First Recovery - redo (06), implementation Thu Aug 02 21:37:42 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; AFTER 02 BY 5 D TO 60 D; BETWEEN 2018.209:00:01:06 AND 2018.209:08:33:01; BETWEEN 2018.209:09:39:07 AND 2018.209:15:01:49; BETWEEN 2018.209:16:07:55 AND 2018.209:18:51:12; BETWEEN 2018.209:19:57:18 AND 2018.210:01:44:38; BETWEEN 2018.210:02:50:44 AND 2018.211:18:01:40; BETWEEN 2018.211:19:23:19 AND 2018.213:05:56:55; BETWEEN 2018.213:07:03:01 AND 2018.214:01:06:28; BETWEEN 2018.214:02:12:34 AND 2018.214:06:46:01; BETWEEN 2018.214:07:52:07 AND 2018.214:13:56:18; BETWEEN 2018.214:16:09:47 AND 2018.214:21:55:49; BETWEEN 2018.214:23:01:55 AND 2018.215:01:58:10; BETWEEN 2018.215:03:04:16 AND 2018.216:00:54:31; BETWEEN 2018.216:02:00:37 AND 2018.216:04:25:46; BETWEEN 2018.216:05:31:52 AND 2018.216:13:31:23; BETWEEN 2018.216:14:37:29 AND 2018.218:03:05:08; BETWEEN 2018.218:04:11:13 AND 2018.218:06:06:34; BETWEEN 2018.218:07:12:40 AND 2018.219:03:29:36; BETWEEN 2018.219:06:03:50 AND 2018.220:01:48:22; BETWEEN 2018.220:02:54:28 AND 2018.221:14:00:28; BETWEEN 2018.221:15:06:34 AND 2018.223:06:29:10; BETWEEN 2018.223:07:35:16 AND 2018.223:14:37:46; BETWEEN 2018.223:17:50:52 AND 2018.224:14:51:53; BETWEEN 2018.224:15:57:58 AND 2018.225:00:32:29; BETWEEN 2018.225:01:38:35 AND 2018.226:10:58:19; BETWEEN 2018.226:12:04:24 AND 2018.227:00:37:23; BETWEEN 2018.227:01:43:29 AND 2018.228:03:54:14; BETWEEN 2018.228:05:00:20 AND 2018.229:00:02:06; BETWEEN 2018.229:01:08:12 AND 2018.229:05:39:04; BETWEEN 2018.229:06:45:10 AND 2018.229:16:19:17; BETWEEN 2018.229:17:25:23 AND 2018.230:05:49:17; BETWEEN 2018.230:06:55:23 AND 2018.230:14:27:41; BETWEEN 2018.230:15:33:47 AND 2018.235:10:53:08; BETWEEN 2018.235:11:59:13 AND 2018.236:08:21:21; BETWEEN 2018.236:09:27:27 AND 2018.236:22:35:25; BETWEEN 2018.236:23:41:31 AND 2018.238:05:17:02; BETWEEN 2018.238:06:23:08 AND 2018.238:11:34:10; BETWEEN 2018.238:12:40:16 AND 2018.239:07:48:31; BETWEEN 2018.239:08:54:37 AND 2018.239:21:14:38; BETWEEN 2018.239:22:20:44 AND 2018.241:07:58:36; BETWEEN 2018.241:09:04:42 AND 2018.241:14:18:20; BETWEEN 2018.241:15:24:25 AND 2018.242:14:37:37; BETWEEN 2018.242:15:43:43 AND 2018.243:00:26:00; BETWEEN 2018.243:01:32:06 AND 2018.243:14:19:20; BETWEEN 2018.243:15:25:26 AND 2018.243:22:00:43

Comments: First recovery of 2014 OS393 (K14OD3S) to enable rough orbit improvement.

Solar System Targets

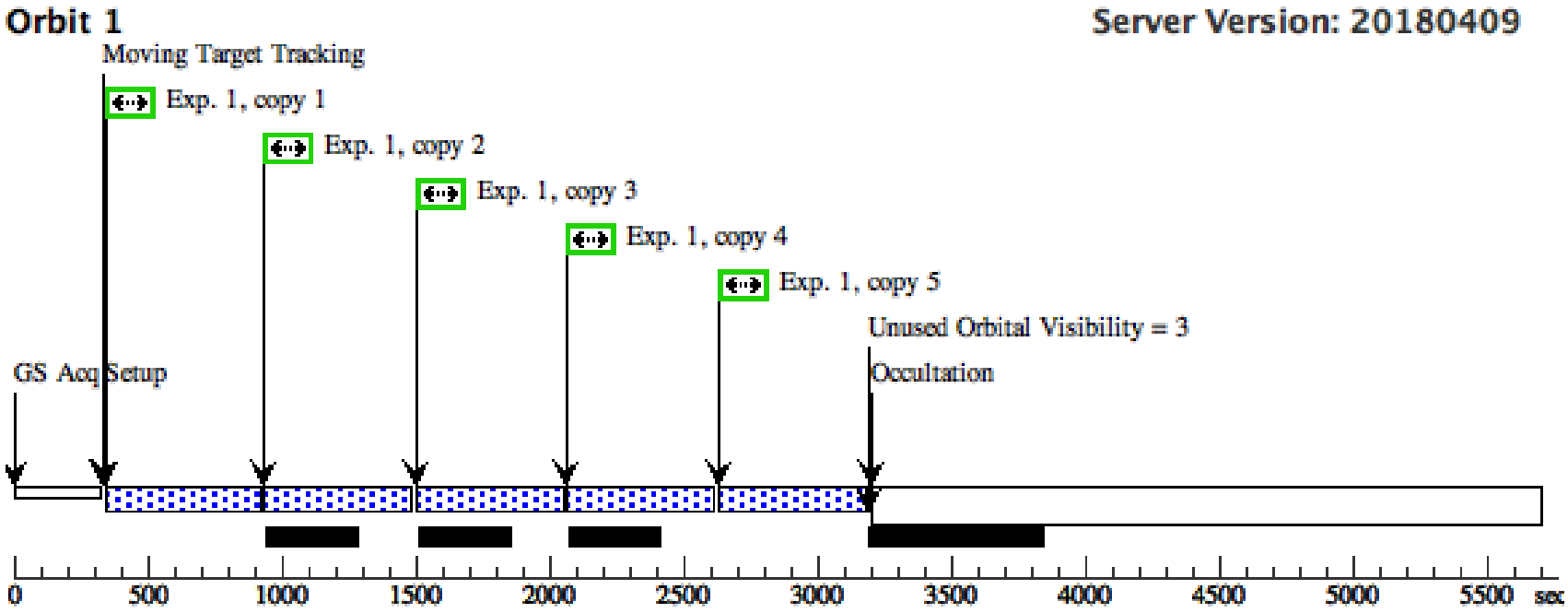
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	K14OD3S	TYPE=ASTEROID,A=43.9420722929 0335,E=0.03211962291069496,I=3.81 4918277503804,O=138.211463650379 7,W=78.58388140193212,M=60.5278 2890423461,EQUINOX=J2000,EPOC H=08-AUG- 2014:00:00:00,EpochTimeScale=TDB				EARTH

Comments: This source has been detected using HST WFC observation in the past and we will use those observation setups as our guide for the current program.
Description=TransNeptunian object.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	First Recove ry - redo	(1) K14OD3S	WFC3/UVIS, ACCUM, UVIS1	F350LP				450 Secs X 5 (2185 Secs)	
								[==>437.0 Secs (Copy 1)]	
								[==>437.0 Secs (Copy 2)]	
								[==>437.0 Secs (Copy 3)]	***[1]***
								[==>437.0 Secs (Copy 4)]	
								[==>437.0 Secs (Copy 5)]	

Orbit Structure



Visit

Proposal 15108, K14OD3S Second Recovery (02), completed Thu Aug 02 21:37:42 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; BETWEEN 01-JUL-2018:00:00:00 AND 01-SEP-2018:00:00:00

Comments: First recovery of 2014 OS393 (K14OD3S) to enable rough orbit improvement.

Solar System Targets

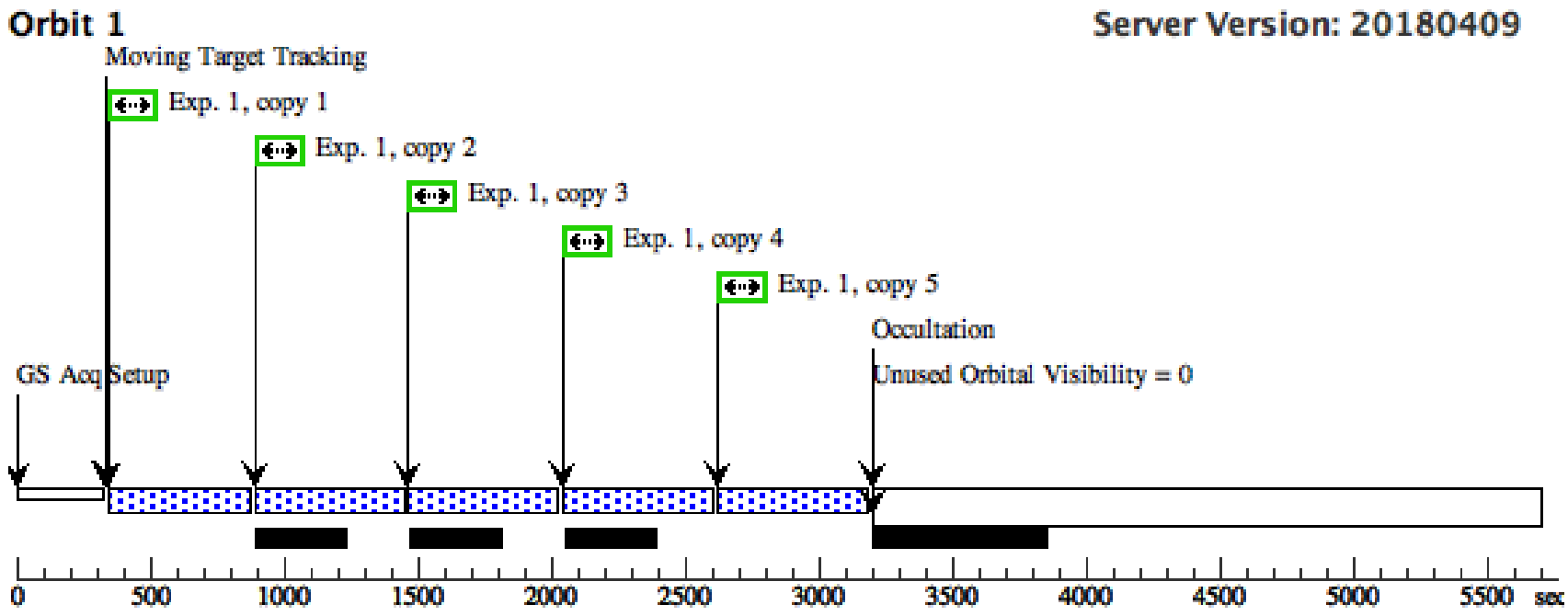
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	K14OD3S	TYPE=ASTEROID,A=43.9420722929 0335,E=0.03211962291069496,I=3.81 4918277503804,O=138.211463650379 7,W=78.58388140193212,M=60.5278 2890423461,EQUINOX=J2000,EPOC H=08-AUG- 2014:00:00:00,EpochTimeScale=TDB				EARTH

Comments: This source has been detected using HST WFC observation in the past and we will use those observation setups as our guide for the current program.
Description=TransNeptunian object.
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	First Recove ry	(1) K14OD3S	WFC3/UVIS, ACCUM, UVIS1	F350LP				450 Secs X 5 (2188 Secs)	
								[==>388.0 Secs (Copy 1)]	
								[==>450 Secs (Copy 2)]	
								[==>450 Secs (Copy 3)]	***[1]***
								[==>450 Secs (Copy 4)]	
								[==>450 Secs (Copy 5)]	

Orbit Structure



Visit

Proposal 15108, K14P70N First Recovery (04), failed Thu Aug 02 21:37:42 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; BETWEEN 01-MAY-2018:00:00:00 AND 01-JUL-2018:00:00:00

Comments: Tracking at motion rate of target. First recovery using same observing strategy as initial discovery.

Solar System Targets

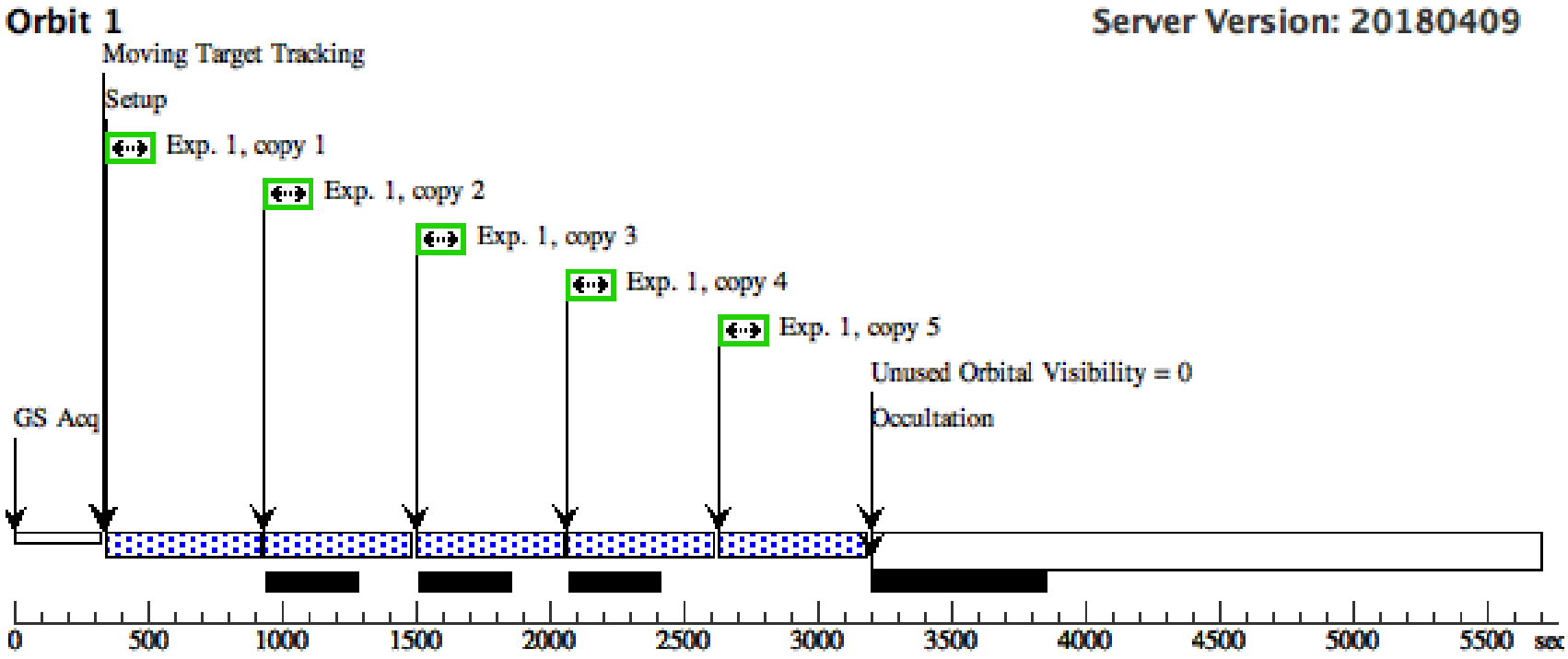
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(2)	K14P70N	TYPE=ASTEROID,A=44.0426891295 2388,E=0.05170378392398716,I=4.12 1313140882487,O=136.259260422746 3,W=239.4547871010788,M=270.751 8428006084,EQUINOX=J2000,EPOC H=14-SEP- 2014:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Target was discovered using HST and we will use same observing strategy for these tracking observations.
Description=TransNeptunian Object
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	First Recovery	(2) K14P70N	WFC3/UVIS, ACCUM, UVIS1	F350LP	CR-SPLIT=NO			400 Secs X 5 (2188 Secs)	
								[==>437.0 Secs (Copy 1)]	
								[==>437.0 Secs (Copy 2)]	
								[==>437.0 Secs (Copy 3)]	***[1]***
								[==>437.0 Secs (Copy 4)]	
								[==>440.0 Secs (Copy 5)]	

Orbit Structure



Visit

Proposal 15108, K14P70N First Recovery - redo (07), implementation Thu Aug 02 21:37:42 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; AFTER 05 BY 5 D TO 60 D; BETWEEN 2018.209:00:01:06 AND 2018.209:13:37:34; BETWEEN 2018.209:14:43:40 AND 2018.210:11:56:21; BETWEEN 2018.210:15:08:09 AND 2018.210:17:11:16; BETWEEN 2018.210:18:17:22 AND 2018.211:15:05:25; BETWEEN 2018.211:16:11:31 AND 2018.212:08:07:58; BETWEEN 2018.212:09:14:03 AND 2018.212:18:26:09; BETWEEN 2018.212:19:32:15 AND 2018.213:07:26:21; BETWEEN 2018.213:08:32:26 AND 2018.214:19:22:53; BETWEEN 2018.214:20:28:59 AND 2018.214:22:15:15; BETWEEN 2018.215:00:45:35 AND 2018.215:12:59:08; BETWEEN 2018.215:14:05:13 AND 2018.217:12:19:58; BETWEEN 2018.217:13:26:03 AND 2018.218:08:34:19; BETWEEN 2018.218:09:40:24 AND 2018.219:05:48:17; BETWEEN 2018.219:06:54:22 AND 2018.219:08:05:39; BETWEEN 2018.219:09:11:45 AND 2018.221:12:01:14; BETWEEN 2018.221:13:07:20 AND 2018.221:15:22:07; BETWEEN 2018.221:16:28:13 AND 2018.222:17:12:08; BETWEEN 2018.222:18:18:14 AND 2018.222:19:46:22; BETWEEN 2018.222:20:52:27 AND 2018.223:10:48:22; BETWEEN 2018.223:11:54:28 AND 2018.223:17:23:39; BETWEEN 2018.223:18:29:45 AND 2018.224:11:40:04; BETWEEN 2018.224:12:46:10 AND 2018.224:15:11:19; BETWEEN 2018.224:16:17:25 AND 2018.224:21:02:32; BETWEEN 2018.224:22:08:38 AND 2018.226:19:12:05; BETWEEN 2018.226:20:18:11 AND 2018.227:13:49:14; BETWEEN 2018.227:14:55:20 AND 2018.228:12:59:51; BETWEEN 2018.228:14:05:57 AND 2018.230:05:20:46; BETWEEN 2018.230:07:34:16 AND 2018.230:09:02:23; BETWEEN 2018.230:10:08:29 AND 2018.230:11:30:08; BETWEEN 2018.230:12:36:14 AND 2018.232:13:05:45; BETWEEN 2018.232:14:11:51 AND 2018.232:23:07:06; BETWEEN 2018.233:00:13:11 AND 2018.234:00:18:14; BETWEEN 2018.234:01:24:20 AND 2018.235:04:01:00; BETWEEN 2018.235:05:07:06 AND 2018.235:09:10:45; BETWEEN 2018.235:12:19:58 AND 2018.235:15:13:37; BETWEEN 2018.235:16:19:43 AND 2018.236:14:09:58; BETWEEN 2018.236:15:16:04 AND 2018.238:09:36:14; BETWEEN 2018.238:10:42:20 AND 2018.239:05:09:07; BETWEEN 2018.239:06:15:12 AND 2018.240:11:23:31; BETWEEN 2018.240:12:29:36 AND 2018.243:00:29:54; BETWEEN 2018.243:01:35:59 AND 2018.243:04:49:06; BETWEEN 2018.243:05:55:11 AND 2018.243:15:47:28; BETWEEN 2018.243:16:53:34 AND 2018.243:22:00:43

Comments: Tracking at motion rate of target. First recovery using same observing strategy as initial discovery.

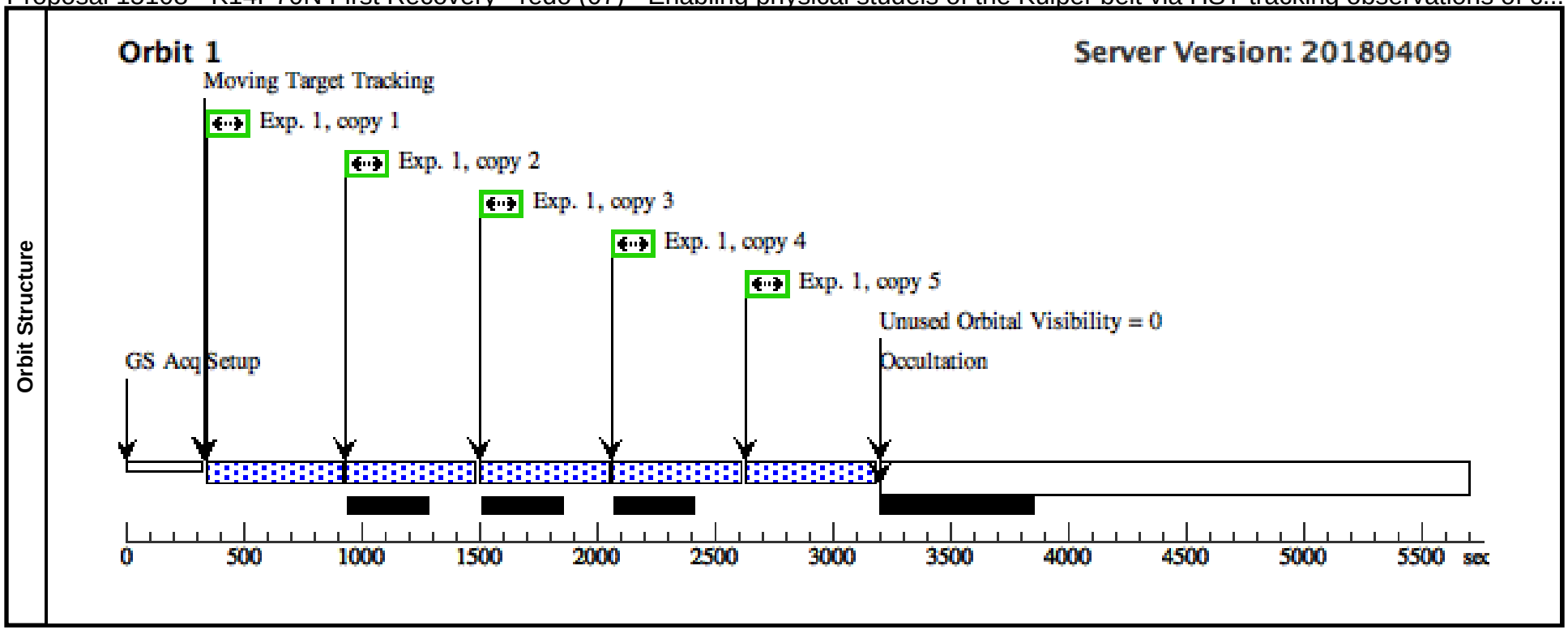
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(2)	K14P70N	TYPE=ASTEROID,A=44.0426891295 2388,E=0.05170378392398716,I=4.12 1313140882487,O=136.259260422746 3,W=239.4547871010788,M=270.751 8428006084,EQUINOX=J2000,EPOC H=14-SEP- 2014:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Target was discovered using HST and we will use same observing strategy for these tracking observations.
Description=TransNeptunian Object
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	First Recovery - redo	(2) K14P70N	WFC3/UVIS, ACCUM, UVIS1	F350LP	CR-SPLIT=NO			400 Secs X 5 (2188 Secs)	
								[==>437.0 Secs (Copy 1)]	
								[==>437.0 Secs (Copy 2)]	
								[==>437.0 Secs (Copy 3)]	***[1]***
								[==>437.0 Secs (Copy 4)]	
								[==>440.0 Secs (Copy 5)]	


Orbit Structure
Orbit 1
Server Version: 20180409
Moving Target Tracking
Exp. 1, copy 1
Exp. 1, copy 2
Exp. 1, copy 3
Exp. 1, copy 4
Exp. 1, copy 5
Unused Orbital Visibility = 0
GS Acq Setup
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15108, K14P70N Secondt Recovery (05), completed Thu Aug 02 21:37:42 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: PCS MODE FINE; BETWEEN 01-JUL-2018:00:00:00 AND 01-SEP-2018:00:00:00

Comments: Tracking at motion rate of target. First recovery using same observing strategy as initial discovery.

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(2)	K14P70N	TYPE=ASTEROID,A=44.0426891295 2388,E=0.05170378392398716,I=4.12 1313140882487,O=136.259260422746 3,W=239.4547871010788,M=270.751 8428006084,EQUINOX=J2000,EPOC H=14-SEP- 2014:00:00:00,EpochTimeScale=TDB				EARTH

Comments: Target was discovered using HST and we will use same observing strategy for these tracking observations.
Description=TransNeptunian Object
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	First Recove ry	(2) K14P70N	WFC3/UVIS, ACCUM, UVIS1	F350LP	CR-SPLIT=NO			400 Secs X 5 (2188 Secs)	
								[==>437.0 Secs (Copy 1)]	
								[==>437.0 Secs (Copy 2)]	
								[==>437.0 Secs (Copy 3)]	***[1]***
								[==>437.0 Secs (Copy 4)]	
								[==>440.0 Secs (Copy 5)]	

Orbit Structure