12446 - Ionization and Light Echoes in the T Pyxidis Nebula

Cycle: 18, Proposal Category: GO/DD

(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) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:01:56.0	yes
02	(1) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:02:01.0	yes
05	(1) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:02:06.0	yes
07	(1) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:02:10.0	yes
08	(1) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:02:15.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
09	(1) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:02:19.0	yes
10	(1) T-PYXIDIS	WFC3/UVIS	1	04-May-2011 21:02:23.0	yes

7 Total Orbits Used

ABSTRACT

Contrary to published predictions, the famous prototype recurrent nova T Pyxidis unexpectedly commenced a new outburst on 2011 April 14 UT --- its first outburst since 1966. T Pyx is unique among recurrent novae in being surrounded by a nebula, representing material ejected during previous eruptions, which is well resolved into thousands of sub-arcsecond features in HST images. The outburst offers the opportunity to make two unique measurements. (1) A direct geometric determination of the distance to T Pyx (a highly controversial subject), based on imaging polarimetry of the knots --- a technique already validated for the light echo around V838 Monocerotis. (2) A determination of the 3D structure of the nebula, based on the ionization echo that will sweep out into the nebula, causing each individual knot to develop strong Halpha emission when first illuminated by the nova. Our proposed observations consist of Halpha imaging with WFC3, and broadband polarimetric imaging with ACS. Our results will 1) Allow a determination of the distance, and hence the true luminosity and mass accretion rate onto the white dwarf in T Pyx. This is essential for determining if T Pyx (and other recurrent novae) will exceed the Chandrasekhar limit and erupt as a type Ia SN. 2) Allow a direct test of the most detailed numerical modeling of nova explosions ever done. Recently predicted features and geometries in the ejecta must be present, and will be observed by HST for the first time, if, and only if our state-of-the-art models of novae are correct.

The wave of illumination and ionization will pass through the entire nebula within the next few months, so it is crucial to begin the HST observations as soon as possible.

OBSERVING DESCRIPTION

We request the first Halpha observation to be made as soon as possible, nominally about 7-10 days after the outburst begins. After that, images should be obtained at about 14, 24, 38, 58, 86, 109, 155, 190, and 225 days after April 14. (The gap between 109 and 155 days is due to T Pyx being too close to the Sun during that interval.) We also request two visits for the polarimetric imaging, at about 20 and 30 days after April 14.

Visit

Proposal 12446, Visit 01, completed Thu May 05 01:02:27 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

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)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 01 (1)	480 Secs	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 1, Split 3)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 2, Split 3)]	
								[==>(Pattern 3, Split 1)]	
								[==>(Pattern 3, Split 2)]	
								[==>(Pattern 3, Split 3)]	
								[==>(Pattern 4, Split 1)]	
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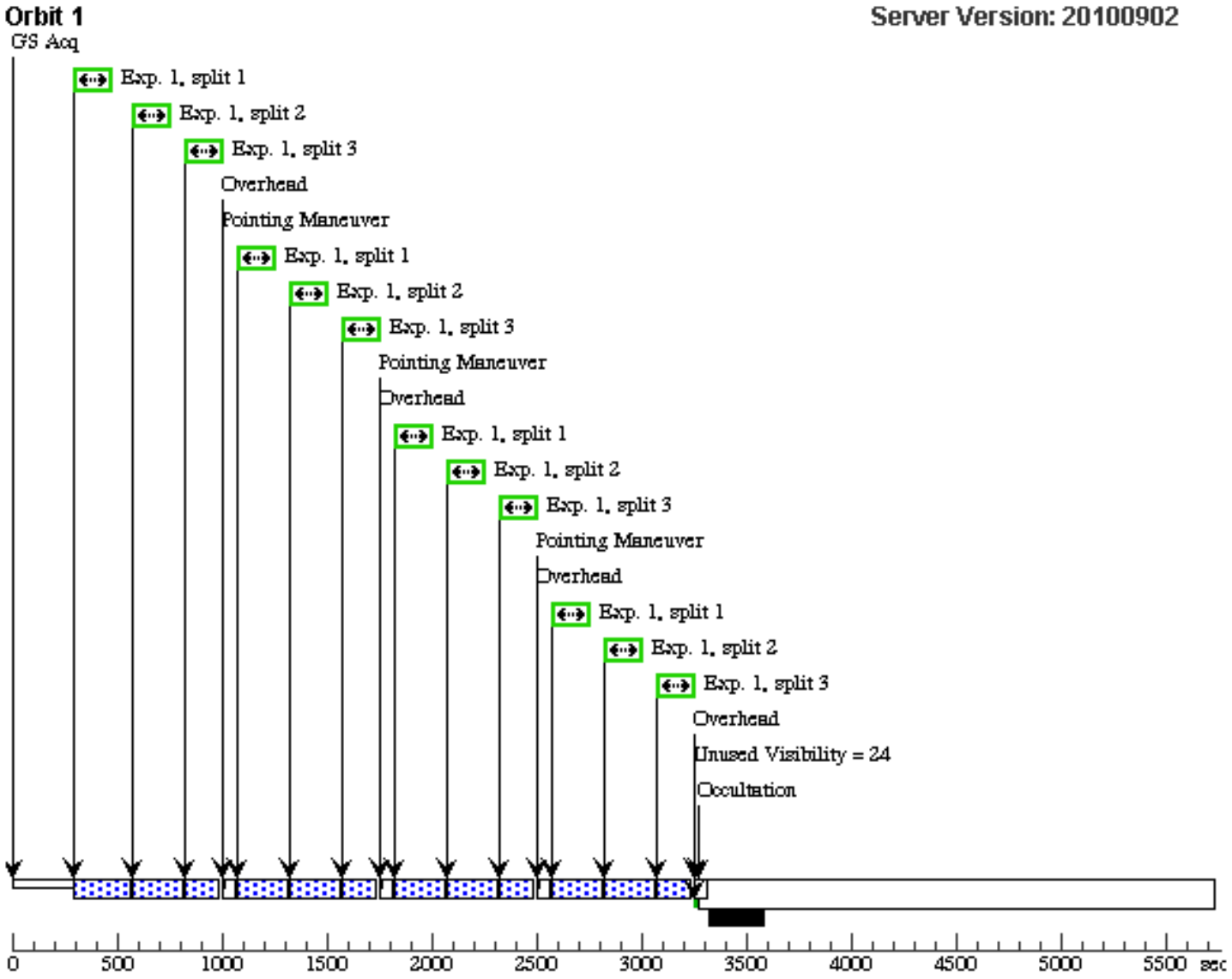
								[==>(Pattern 4, Split 3)]	

Orbit Structure



Visit

Proposal 12446, Visit 02, completed Thu May 05 01:02:28 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 108D TO 118 D

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)

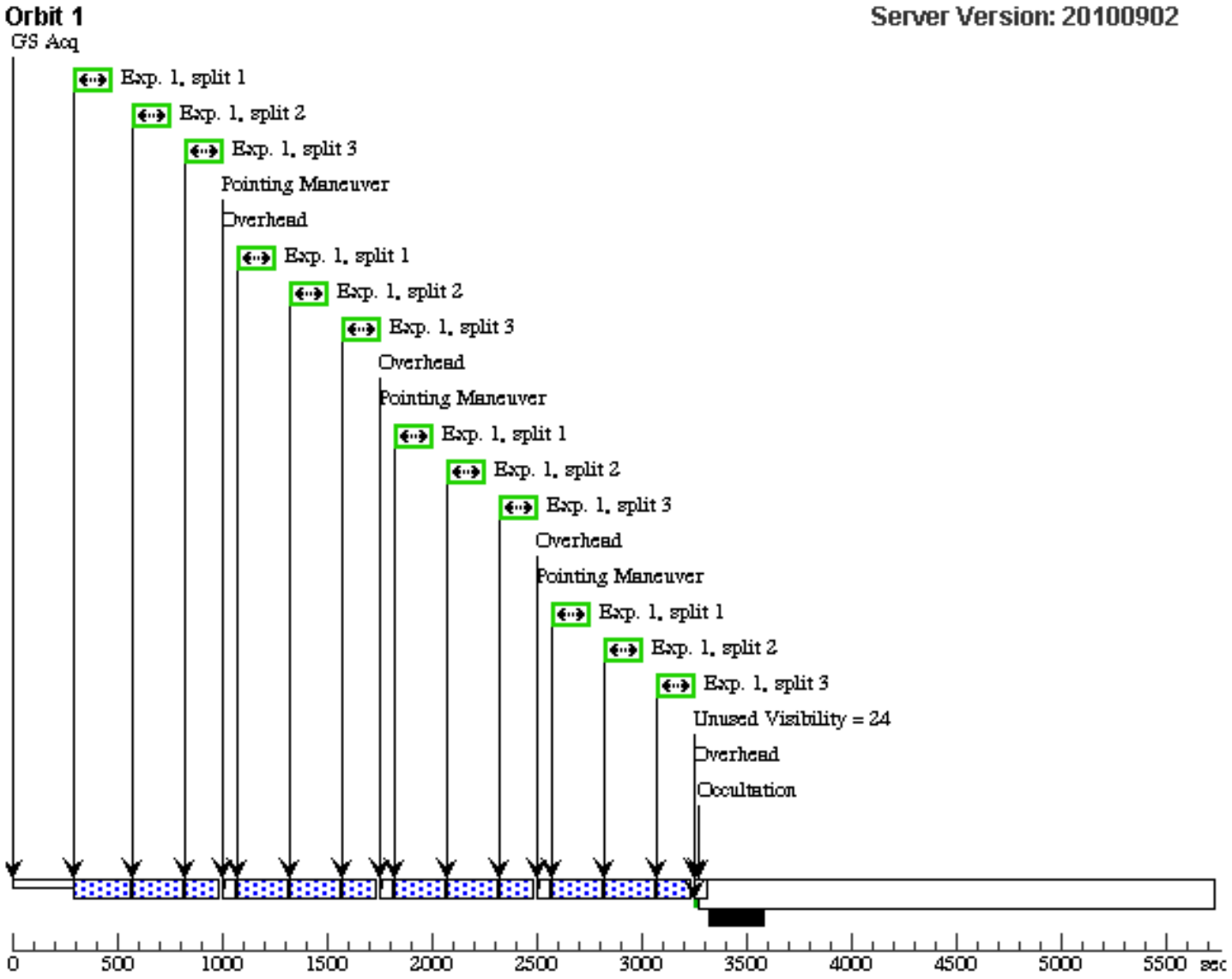
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 02 (1)	480 Secs *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 1, Split 3)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 2, Split 3)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 3, Split 3)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]* *[==>(Pattern 4, Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12446, Visit 05, implementation Thu May 05 01:02:29 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 144D TO 154 D; BETWEEN 08-JUL-2011 AND 10-JUL-2011

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)

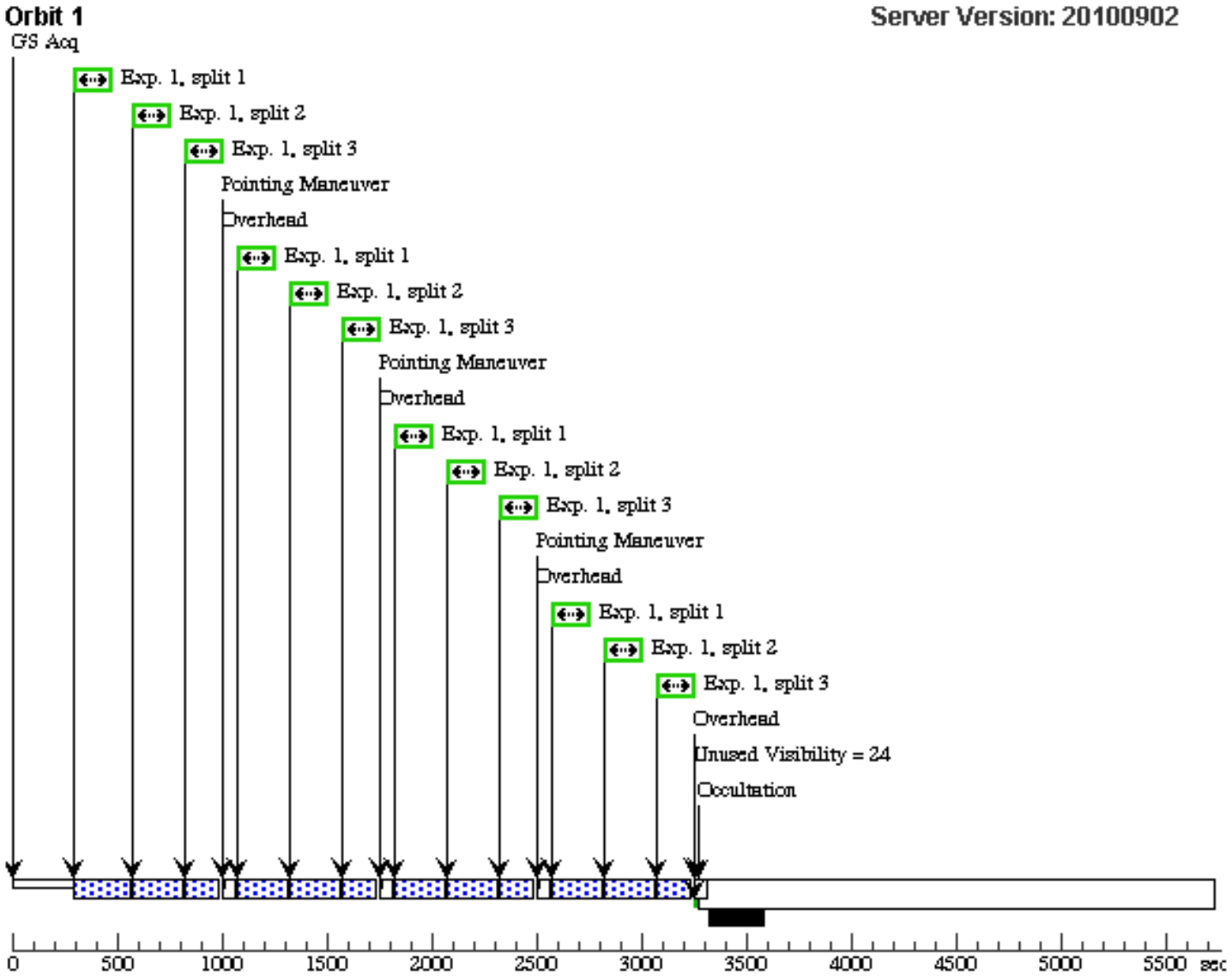
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 05 (1)	480 Secs *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 1, Split 3)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 2, Split 3)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 3, Split 3)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]* *[==>(Pattern 4, Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12446, Visit 07, implementation Thu May 05 01:02:29 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 235D TO 260 D; BETWEEN 24-SEP-2011 AND 08-OCT-2011

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)

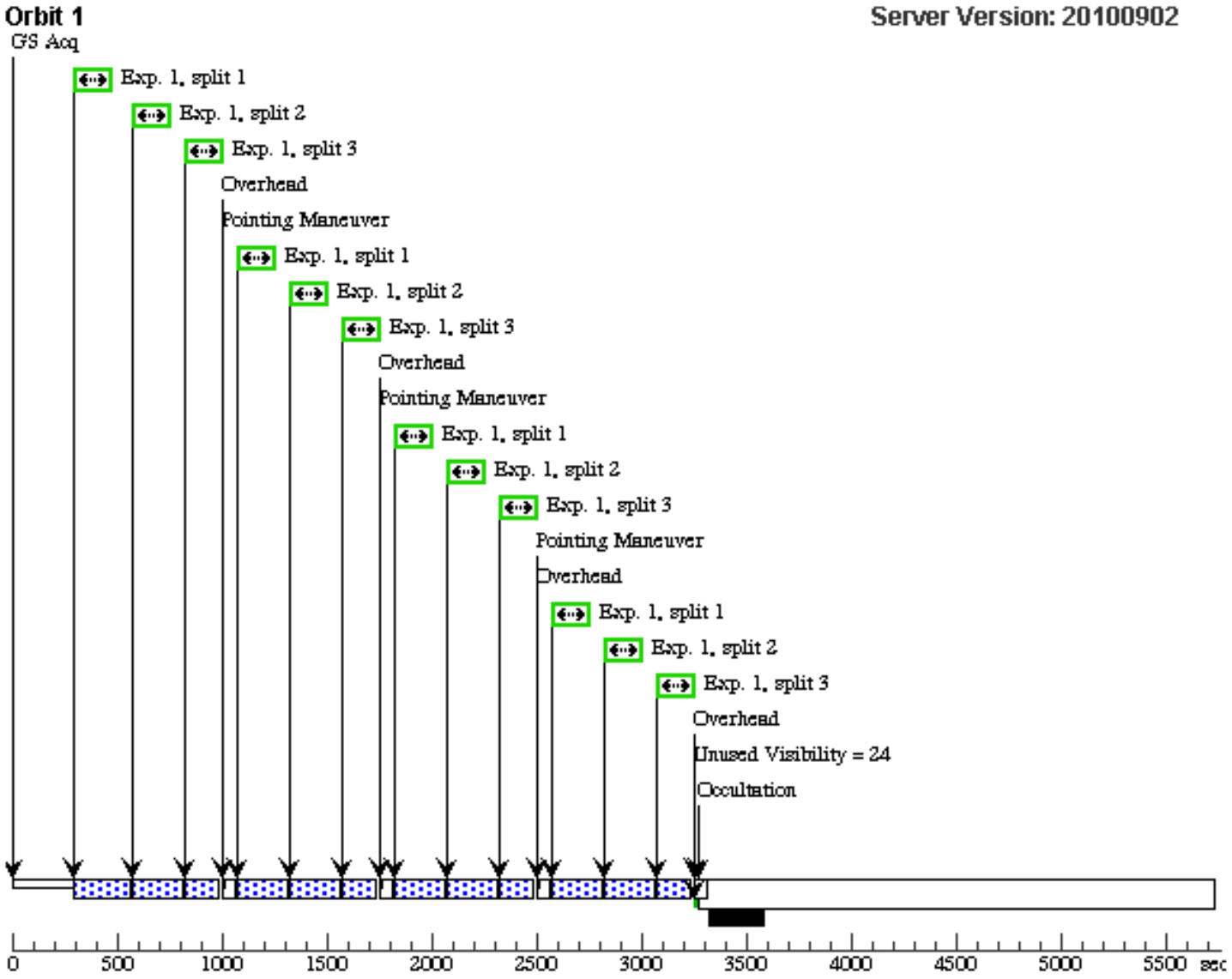
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 07 (1)	480 Secs *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 1, Split 3)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 2, Split 3)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 3, Split 3)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]* *[==>(Pattern 4, Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12446, Visit 08, implementation Thu May 05 01:02:29 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 282D TO 317 D; BETWEEN 14-NOV-2011 AND 05-DEC-2011

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)

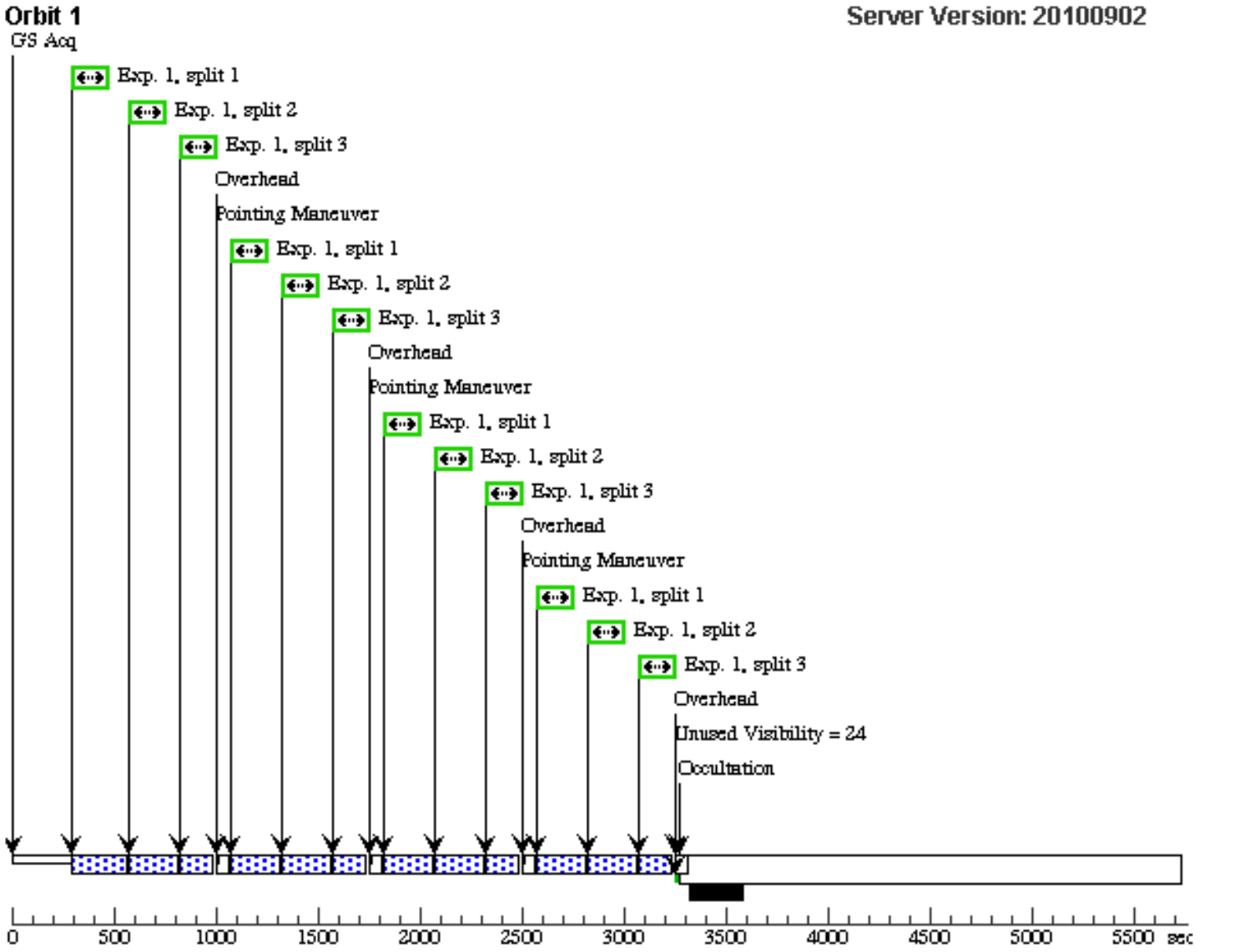
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 08 (1)	480 Secs *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 1, Split 3)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 2, Split 3)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 3, Split 3)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]* *[==>(Pattern 4, Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12446, Visit 09, implementation Thu May 05 01:02:30 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 14D TO 41 D; BETWEEN 19-FEB-2012 AND 19-MAR-2012

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)

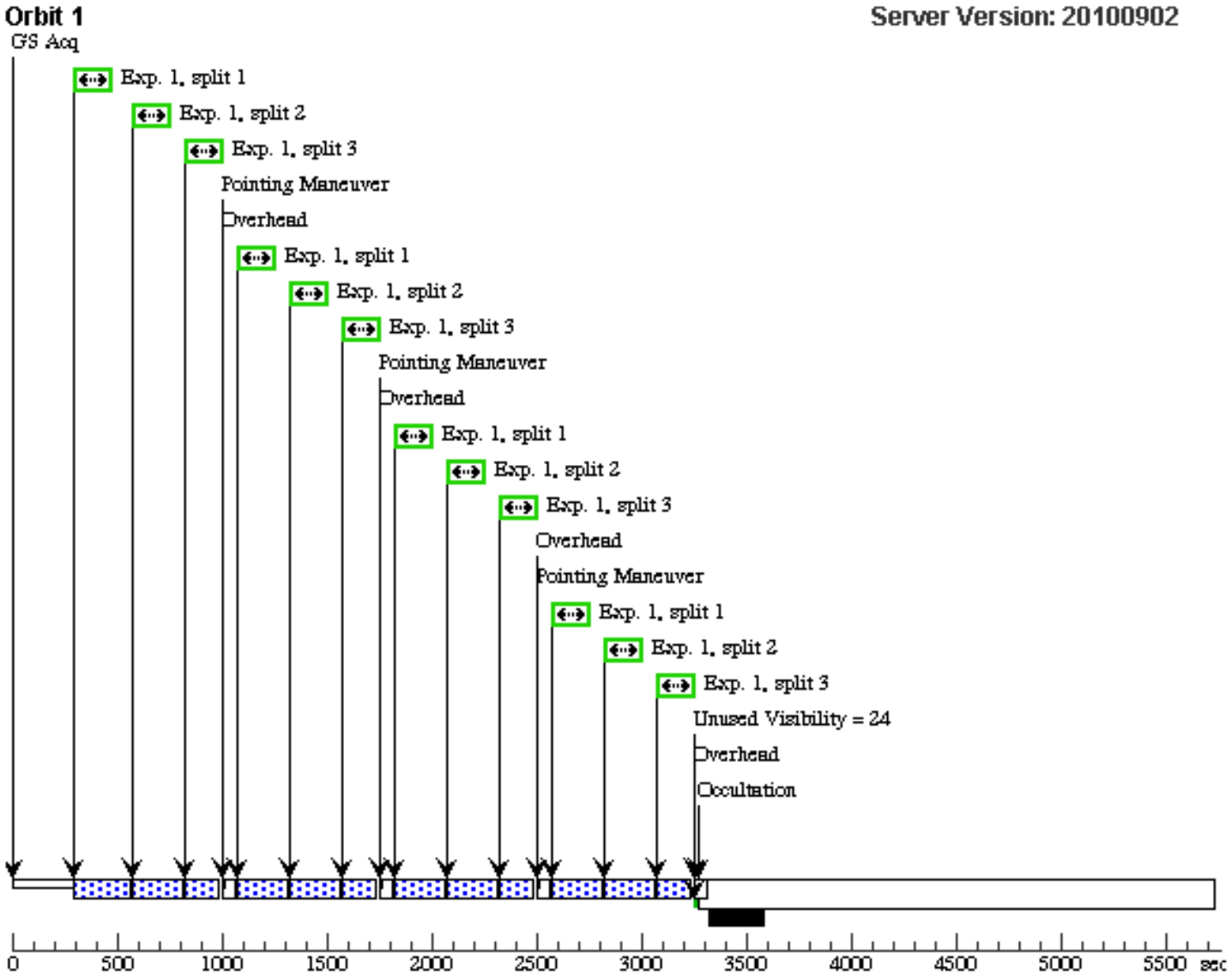
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 09 (1)	480 Secs *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 1, Split 3)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 2, Split 3)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]* *[==>(Pattern 3, Split 3)]* *[==>(Pattern 4, Split 1)]* *[==>(Pattern 4, Split 2)]* *[==>(Pattern 4, Split 3)]*	***[1]***

Orbit Structure



Visit

Proposal 12446, Visit 10, implementation Thu May 05 01:02:30 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 109D TO 124 D; BETWEEN 30-APR-2012 AND 30-MAY-2012

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)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	T-PYXIDIS	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=11.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) T-PYXIDIS	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F656N	CR-SPLIT=3		Pattern 1, Exps 1-1 in Visit 10 (1)	480 Secs	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 1, Split 3)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 2, Split 3)]	
								[==>(Pattern 3, Split 1)]	
								[==>(Pattern 3, Split 2)]	
								[==>(Pattern 3, Split 3)]	
								[==>(Pattern 4, Split 1)]	
								[==>(Pattern 4, Split 2)]	
								[==>(Pattern 4, Split 3)]	

Orbit Structure