12890 - The Unique Recurrent Nova T Pyxidis: The Decline and Transition to Quiescence

Cycle: 20, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Prof. Edward M. Sion (PI) (Contact)	**Villanova University**	**emsion@ast.villanova.edu**
Dr. Robert E. Williams (CoI)	Space Telescope Science Institute	wms@stsci.edu
Dr. Patrick Godon (CoI)	Villanova University	patrick.godon@villanova.edu
Dr. Mario Livio (CoI)	Space Telescope Science Institute	mlivio@stsci.edu
Dr. Sumner G. Starrfield (CoI)	Arizona State University	sumner.starrfield@asu.edu
Dr. Steve Shore (CoI) (ESA Member)	Universita di Pisa	shore@df.unipi.it
Dr. Gregory James Schwarz (CoI)	American Astronomical Society	greg.schwarz@aas.org
Dr. Charles E. Woodward (CoI)	University of Minnesota - Twin Cities	chelsea@astro.umn.edu
Dr. Kim Page (CoI) (ESA Member)	University of Leicester	kpa@star.le.ac.uk
Dr. Paul Kuin (CoI) (ESA Member)	University College London (UCL)	npkuin@gmail.com

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NOVA-PYX-1890	STIS/CCD STIS/FUV-MAMA	2	09-Nov-2012 21:36:12.0	yes
02	(1) NOVA-PYX-1890	COS/FUV COS/NUV	1	09-Nov-2012 21:36:23.0	yes
03	(1) NOVA-PYX-1890	STIS/CCD STIS/FUV-MAMA	2	09-Nov-2012 21:36:35.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(1) NOVA-PYX-1890	COS/FUV COS/NUV	1	09-Nov-2012 21:36:43.0	yes

6 Total Orbits Used

ABSTRACT

The surprising April, 2011 explosion of the recurrent nova T Pyxidis, a potential Type Ia supernova progenitor, offers a unique opportunity to catch T Pyx on the decline and into quiescence where we expect to see the FUV continuum fade, emission lines weaken and the heated, bloated white dwarf (WD) continue to cool. Our three earlier STIS observations of T Pyx were centered on the outburst maximum, followed by a just awarded DDT proposal to obtain a single STIS and COS spectrum to cover the decline, until this standard Cycle 20 GO proposal. This will culminate in a complete and unprecedented cooling curve of the heated, bloated WD in the FUV, for the first time down to the Lyman Limit at high resolution, all the way from outburst into quiescence. Our hydrodynamic and synthetic spectral modeling of this unique spectroscopic dataset will enable us to measure the cooling rate, discriminate between the cooling of a massive (near Chandrasekhar mass) post-nova WD versus the cooling of a less massive WD, detail the accretion environment including if, and when, the accretion disk is re-formed, discover how much the WD was heated by the outburst, constrain the accretion rate, and possibly help explain why its latest nova outburst was delayed by 44 years. Virtually nothing is known about the cooling behavior of the white dwarf in recurrent novae and classical novae so soon after outburst in the FUV with the necessary resolution.

OBSERVING DESCRIPTION

We request one observation (3 orbits) towards the beginning of Cycle 20 while T Pyx is declining and a secong observation about 6months later (or towards the end of Cycle 20; also 3 orbits) when T Pyx will have most possibly reached its quiescent state.

We request that each of the two observations (each of 3 orbits) be made of a STIS (E140M) observation (lasting 2 orbits) followed immediately by a COS (G130 1055A) observation (lasting 1 orbit). T Pyx was ob served in the Spring 2012 in this way and there were no safety issue using this configuration. Since the system is cooling down, we do not expect the flux to increase, rather the opposite. We request this configuration in order to obtain a spectrum in the FUV from about 900A to 1700A (with gaps) covering the Lyman series.

We request the first two visits (1 + 2) to be carried out towards the beginning of Cycle 20 and the

last two visits (3 + 4) to be carried out towards the end of Cycle 20. We set up the observations windows accordingly based on the visit planner results. Visit 2 has been grouped with visit 1; and visit 4 has been grouped with visit 3. We request Visit 2 to follow visit 1 immediately, and visit 4 to follow visit 3 immediately.

CALIBRATION JUSTIFICATION

We are aware that the configuration COS 130M 1055A does not yet have a formal automated (pipeline) callibration process and that we may have to wait (we were told it should be taken care of in Summer 2012). We have already worked closely with Steven Pendon from the COS team to work around this callibration problem.
Steven

Visit

Proposal 12890, Visit 01, implementation Sat Nov 10 02:36:50 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: BETWEEN 30-NOV-2012:00:00:00 AND 25-DEC-2012:00:00:00

Fixed Targets

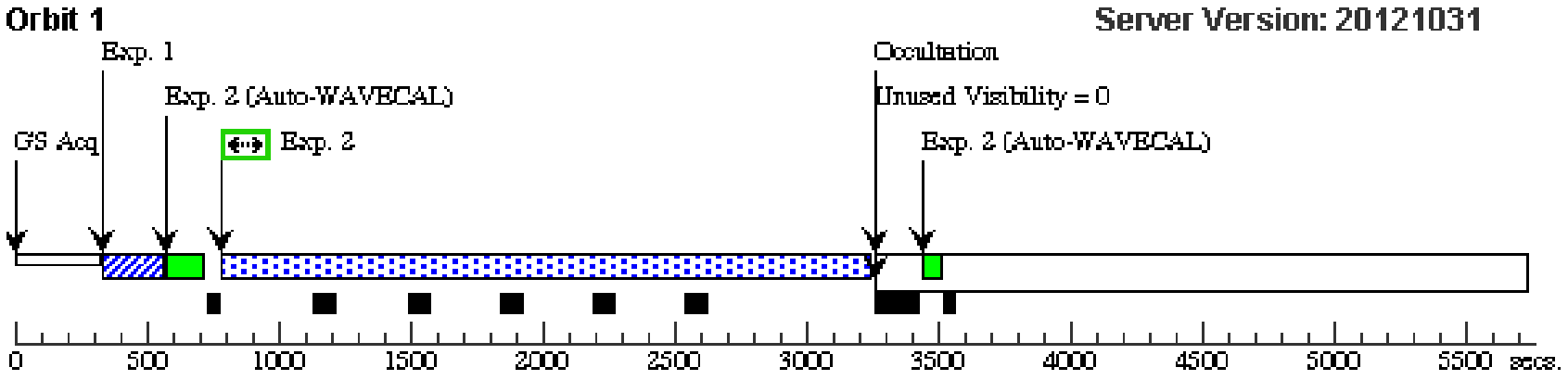
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NOVA-PYX-1890	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=13.0+/-1.0	Reference Frame: ICRS

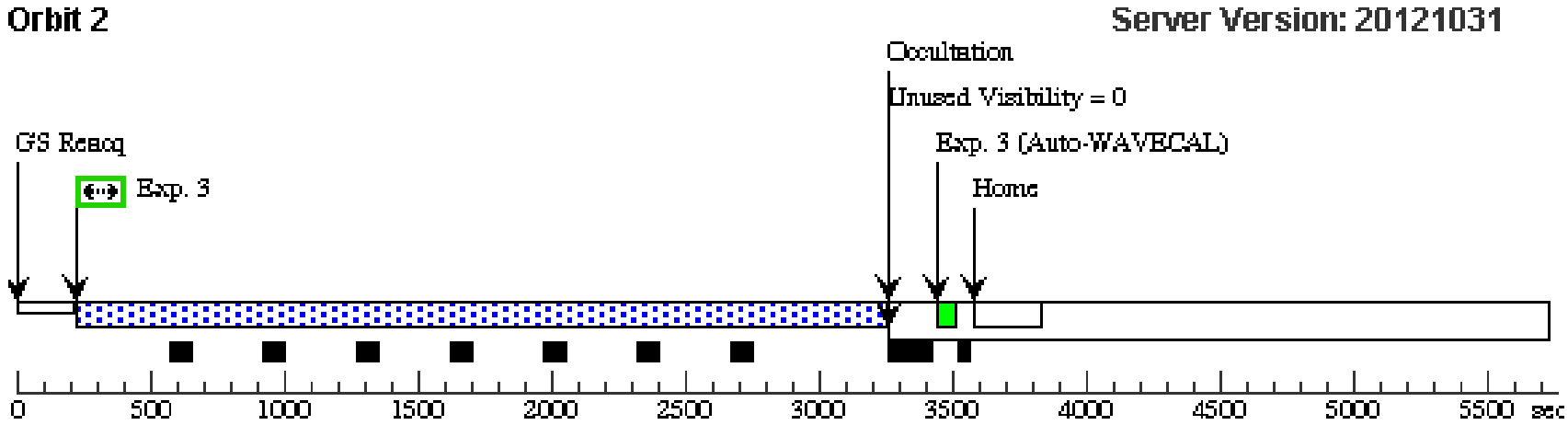
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) NOVA-PYX-1890	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs	
								[==>]	***[1]***
2	(STIS.sp.406136)	(1) NOVA-PYX-1890	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=350			2300 Secs	
								[==>2449.0 Secs]	***[1]***
3	(STIS.sp.406136)	(1) NOVA-PYX-1890	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=350			2300 Secs	
								[==>3015.0 Secs]	***[2]***

Orbit Structure





Visit

Proposal 12890, Visit 02, implementation Sat Nov 10 02:36:53 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: AFTER 01 BY 1.9 Orbits TO 2.1 Orbits; GROUP 02,01 WITHIN 2 Orbits

Fixed Targets

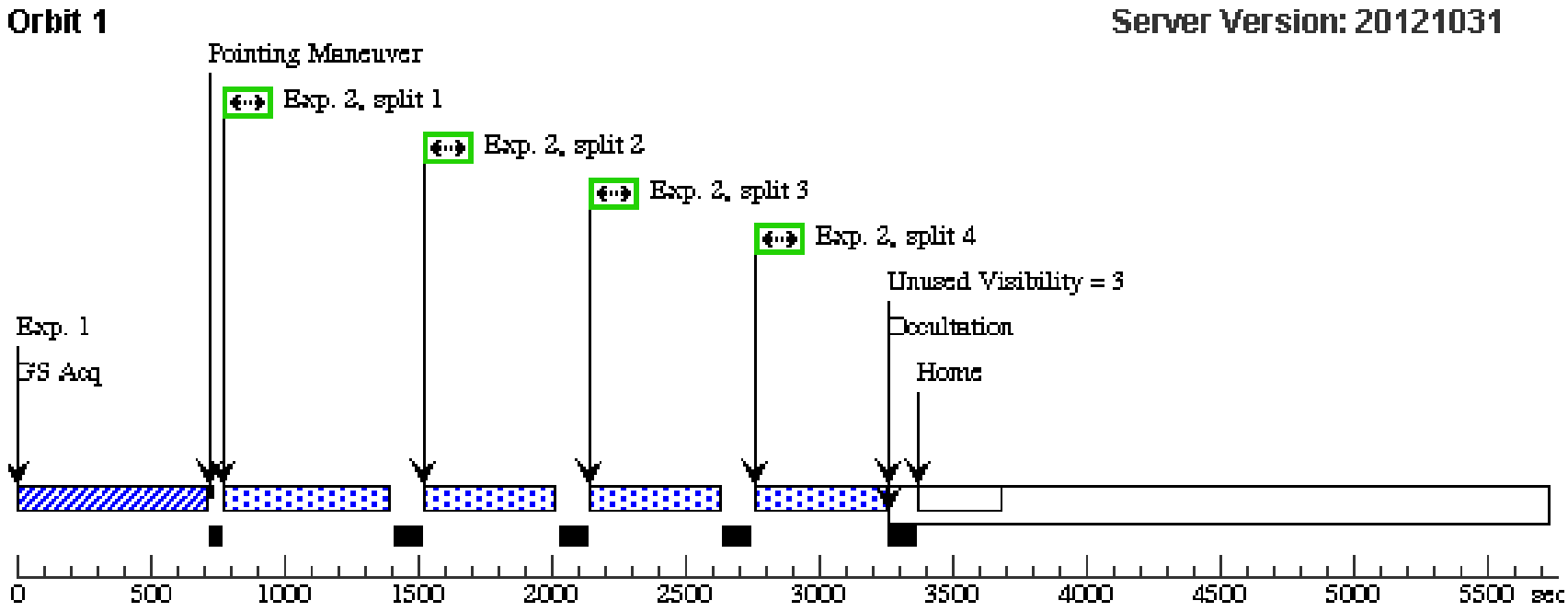
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NOVA-PYX-1890	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=13.0+/-1.0	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	(COS.ta.406137)	(1) NOVA-PYX-1890	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				150 Secs *[==>]*	*[1]*
2	(COS.sp.406138)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=479; FP-POS=ALL			479 Secs *[==>436.0 Secs (Split 1)]* *[==>436.0 Secs (Split 2)]* *[==>436.0 Secs (Split 3)]* *[==>436.0 Secs (Split 4)]*	*[1]*

Orbit Structure



Visit

Proposal 12890, Visit 03, scheduling Sat Nov 10 02:36:54 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: BETWEEN 25-JUL-2013:00:00:00 AND 01-AUG-2013:00:00:00

Fixed Targets

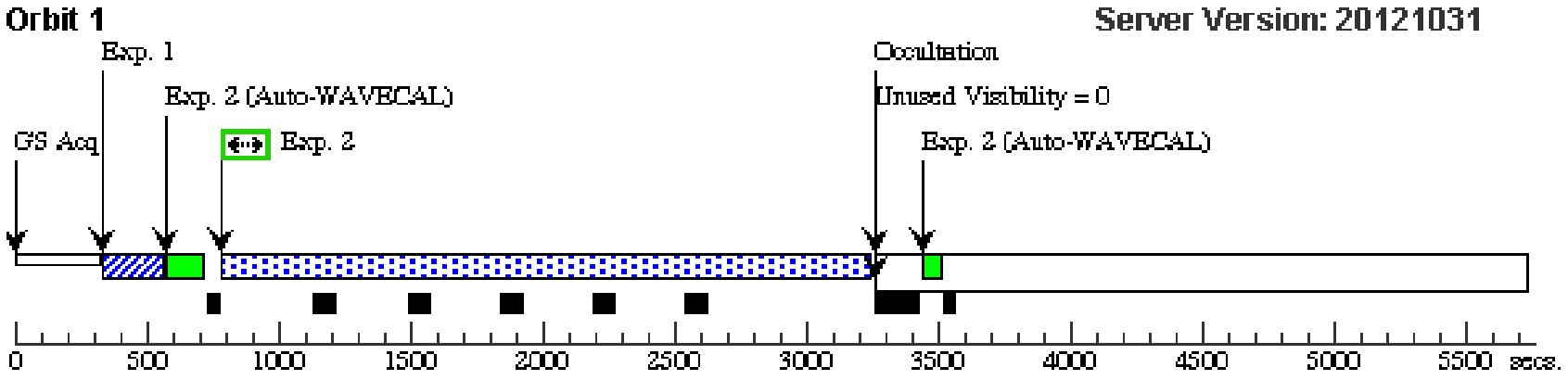
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NOVA-PYX-1890	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=13.0+/-1.0	Reference Frame: ICRS

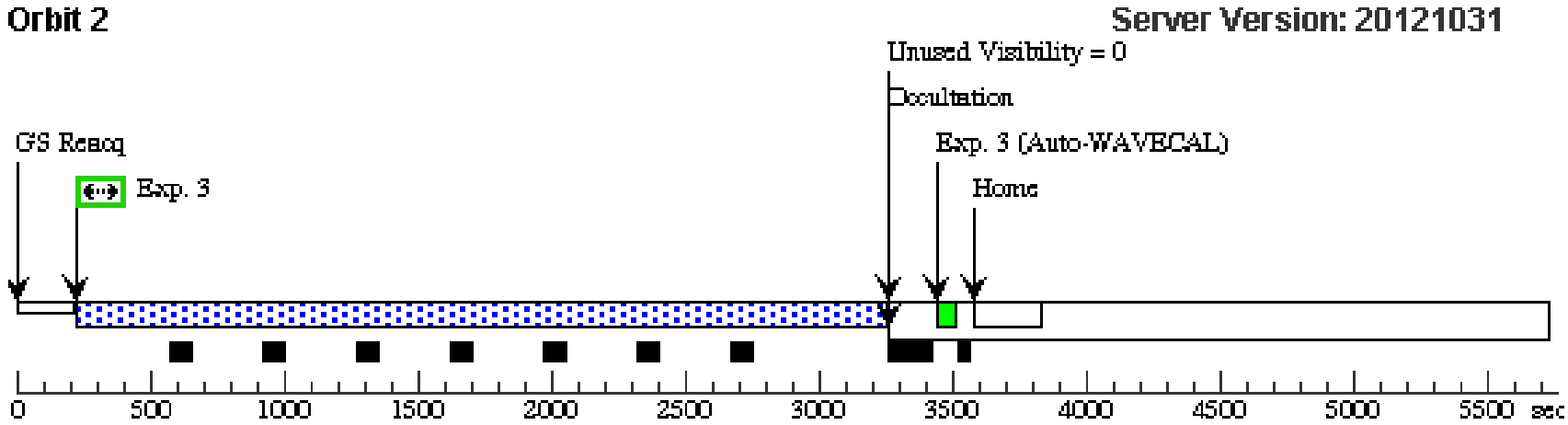
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) NOVA-PYX-1890	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs	
								[==>]	***[1]***
2	(STIS.sp.406136)	(1) NOVA-PYX-1890	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=350			2300 Secs	
								[==>2449.0 Secs]	***[1]***
3	(STIS.sp.406136)	(1) NOVA-PYX-1890	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=350			2300 Secs	
								[==>3015.0 Secs]	***[2]***

Orbit Structure





Visit

Proposal 12890, Visit 04, implementation Sat Nov 10 02:36:56 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: AFTER_03 BY 1.9_Orbits TO 2.1_Orbits

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NOVA-PYX-1890	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000		V=13.0+/-1.0	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	(COS.ta.406137)	(1) NOVA-PYX-1890	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				150 Secs *[==>]*	*[1]*
2	(COS.sp.406138)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=479; FP-POS=ALL			479 Secs *[==>436.0 Secs (Split 1)]* *[==>436.0 Secs (Split 2)]* *[==>436.0 Secs (Split 3)]* *[==>436.0 Secs (Split 4)]*	*[1]*

Orbit Structure