14111 - The SN Ia Candidate T Pyxidis: The Mystery of its High Accretion Rate

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Prof. Edward M. Sion (PI) (Contact)	**Villanova University**	**edward.sion@villanova.edu**
Dr. Sumner G. Starrfield (CoI)	Arizona State University	sumner.starrfield@asu.edu
Dr. Patrick Godon (CoI) (Contact)	Villanova University	patrick.godon@villanova.edu
Dr. Mario Livio (CoI)	Space Telescope Science Institute	mlivio@stsci.edu
Dr. Robert E. Williams (CoI)	Space Telescope Science Institute	wms@stsci.edu

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	COS/FUV	2	14-Jul-2015 21:18:09.0	yes
02	(1) NOVA-PYX-1890	COS/FUV	2	14-Jul-2015 21:18:13.0	yes

4 Total Orbits Used

ABSTRACT

T Pyx is a recurrent nova that unexpectedly went into outburst in 2011. It has now declined to its quiescent level but it appears to be accreting at a very high rate, possibly driven by irradiation of the donor star by the hot white dwarf or by the hot inner disk. Our team (Godon et al. 2014) has shown, using the light echo distance of 4.8 kpc (Sokoloski 2013), that the white dwarf in T Pyx is actually growing in mass and might be on its way to exploding as a Type Ia supernova.

We propose to continue spectroscopic monitoring of T Pyx with HST COS during Cycle 23, to obtain the first FUV spectrum early in the quiescent period (only four years after its 44 years-delayed outburst). The first FUV spectra of T Pyx following its 1967 outburst were a full 13 years later, in 1980, when IUE was launched. By obtaining FUV spectra with COS at the beginning and at the end of Cycle 23, we will detect any changes in the continuum slope, in the velocity widths and intensities of emission lines. We will use our extensive suite of modeling codes to study the evolution of the accretion disk and also model the stellar photosphere, if detected. Our analysis will yield the accretion rate, WD temperature and elemental abundances. We will compare these data to our values obtained on the decline from outburst and transition into quiescence. Our observations will provide fiducial spectra from 1800A down to 912A for this puzzling and pivotal recurrent nova, and would solidify the identification of recurrent novae as Type Ia Supernova progenitors.

OBSERVING DESCRIPTION

T Pyx is the only target.
We request that T Pyx be observed at two epochs.
The first epoch at the beginning of Cycle 23.
The second epoch toward the end of Cycle 23.
The observations for the first and second epoch are identical.
Each epoch consists of two consecutive observations, each of which lasts only one orbit
(so that each epoch lasts only 2 orbits, for a total of 4 orbits).
Each epoch consists of two consecutive observations as follows:
A first observation/orbit with COS in the FUV spectroscopic configuration G140L central wave 1105A, directly followed by another COS observation/orbit in the FUV spectroscopic configuration G130 at wave 1055A.

Visit

Proposal 14111, Visit 01 Wed Jul 15 01:18:15 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: BETWEEN 12-OCT-2015:00:00:00 AND 29-OCT-2015:00:00:00

Diagnostics

(Visit 01) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

Fixed Targets

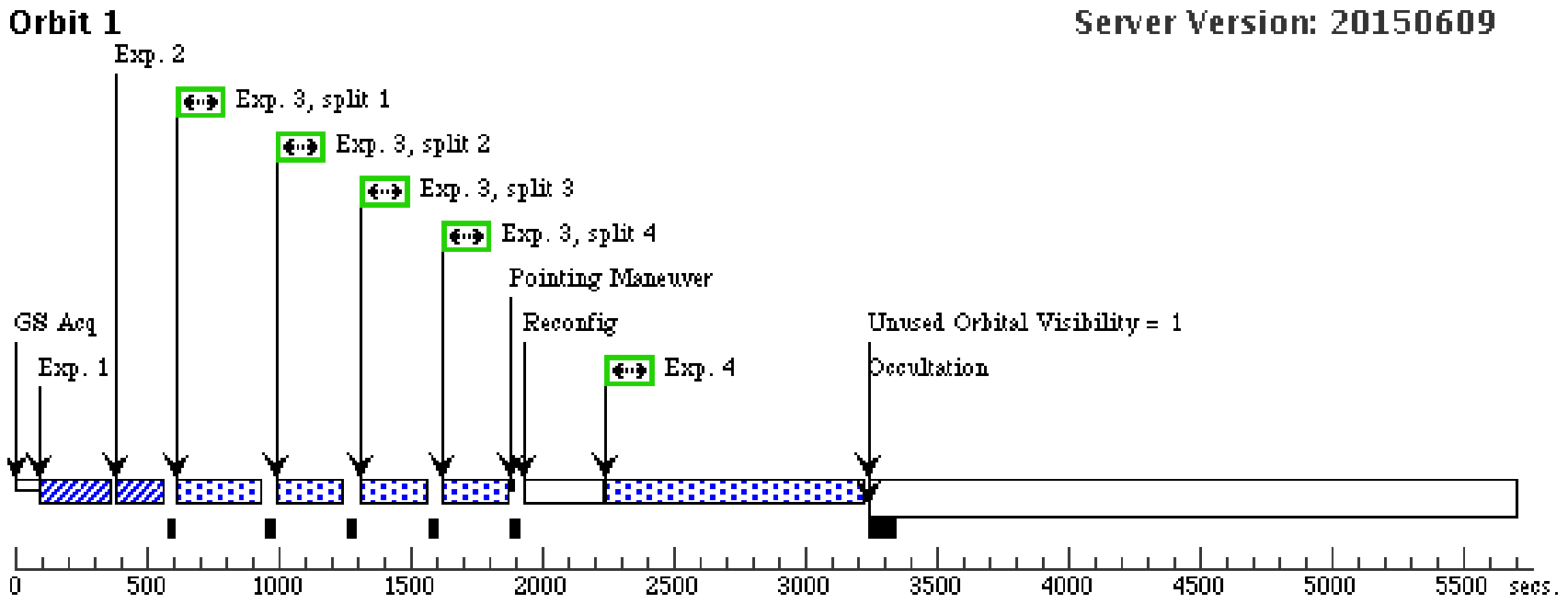
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NOVA-PYX-1890	RA: 09 04 41.5000 (136.1729167d) Dec: -32 22 47.50 (-32.37986d) Equinox: J2000	Epoch of Position: 2000	V=17.5	Reference Frame: ICRS

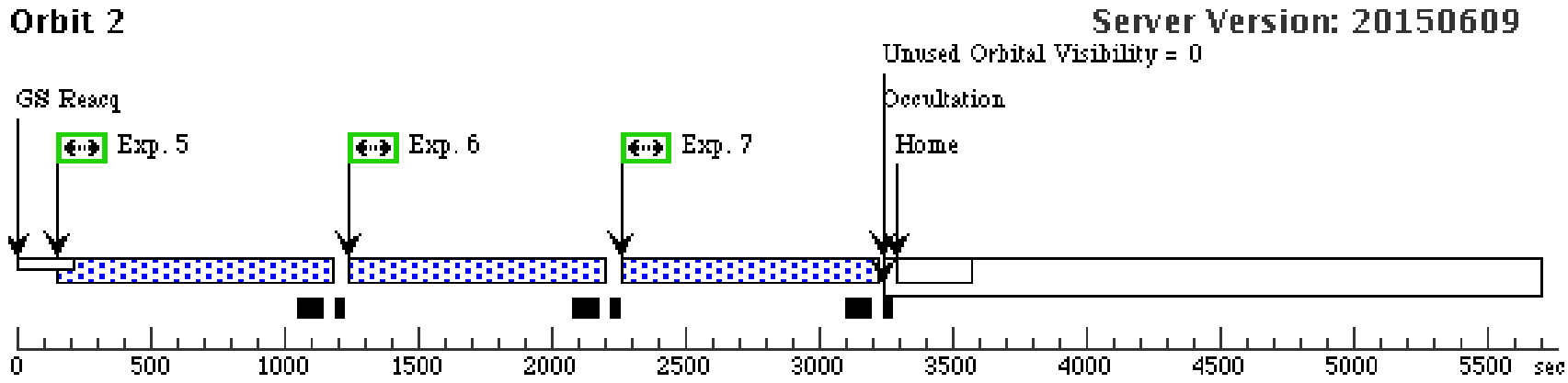
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PEAKXD (COS.sa.718892)	(1) NOVA-PYX-1890	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				7 Secs (7 Secs) *[==>]*	*[1]*
Comments: 2 s should be sufficient, but use 7s in case the target has faded									
2	PEAKD (COS.sa.718892)	(1) NOVA-PYX-1890	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	NUM-POS=5; STEP-SIZE=0.9			7 Secs (7 Secs) *[==>]*	*[1]*
Comments: 2 s should be sufficient, but use 7s in case the target has faded									
3	G140L/1105 (COS.sp.715835)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=1000			197 Secs (788 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]*
Comments: ETC BT is 2704, 2/3 of this is 1800, 1000 just to safe (and efficient)									
4	C1055/FP=3 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=3			736 Secs (736 Secs) *[==>]*	*[1]*
Comments: ETC BT=8936, 2/3 of which is 6000. Just 800 to match Orbit 2									
5	C1055/FP=1 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=1			910 Secs (910 Secs) *[==>]*	*[2]*
Comments: Use BT=ET-110 for max efficiency. ETC gives BT=6000. (shorter is ok)									
6	C1055/FP=2 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=2			910 Secs (910 Secs) *[==>]*	*[2]*
Comments: Use BT=ET-110 for max efficiency. ETC gives BT=6000. (shorter is ok)									
7	C1055/FP=4 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=4			909 Secs (909 Secs) *[==>]*	*[2]*
Comments: Use BT=ET-110 for max efficiency. ETC gives BT=6000. (shorter is ok)									

Orbit Structure





Visit

Proposal 14111, Visit 02 Wed Jul 15 01:18:16 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: BETWEEN 01-JUN-2016:00:00:00 AND 25-JUN-2016:00:00:00

Diagnostics

(Visit 02) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

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	Epoch of Position: 2000	V=17.5	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PEAKXD (COS.sa.718892)	(1) NOVA-PYX-1890	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				7 Secs (7 Secs) *[==>]*	*[1]*
Comments: 2 s should be sufficient, but use 7s in case the target has faded									
2	PEAKD (COS.sa.718892)	(1) NOVA-PYX-1890	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	NUM-POS=5; STEP-SIZE=0.9			7 Secs (7 Secs) *[==>]*	*[1]*
Comments: 2 s should be sufficient, but use 7s in case the target has faded									
3	G140L/1105 (COS.sp.715835)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=1000			197 Secs (788 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]* *[==>(Split 4)]*	*[1]*
Comments: ETC BT is 2704, 2/3 of this is 1800, 1000 just to safe (and efficient)									
4	C1055/FP=3 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=3			736 Secs (736 Secs) *[==>]*	*[1]*
Comments: ETC BT=8936, 2/3 of which is 6000. Just 800 to match Orbit 2									
5	C1055/FP=1 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=1			910 Secs (910 Secs) *[==>]*	*[2]*
Comments: Use BT=ET-110 for max efficiency. ETC gives BT=6000. (shorter is ok)									
6	C1055/FP=2 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=2			910 Secs (910 Secs) *[==>]*	*[2]*
Comments: Use BT=ET-110 for max efficiency. ETC gives BT=6000. (shorter is ok)									
7	C1055/FP=4 (COS.sp.715838)	(1) NOVA-PYX-1890	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=800; FP-POS=4			909 Secs (909 Secs) *[==>]*	*[2]*
Comments: Use BT=ET-110 for max efficiency. ETC gives BT=6000. (shorter is ok)									

Orbit Structure