



17814 - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

Cycle: 32, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

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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	(2) SN-2025SHI	STIS/CCD STIS/NUV-MAMA	1	08-Aug-2025 11:00:29.0	yes
02	(2) SN-2025SHI	STIS/CCD STIS/FUV-MAMA	1	08-Aug-2025 11:00:30.0	yes
03	(2) SN-2025SHI	STIS/CCD STIS/FUV-MAMA	1	08-Aug-2025 11:00:30.0	yes
04	(2) SN-2025SHI	STIS/CCD STIS/NUV-MAMA	1	08-Aug-2025 11:00:31.0	yes
05	(2) SN-2025SHI	STIS/CCD STIS/NUV-MAMA	1	08-Aug-2025 11:00:31.0	yes
06	(2) SN-2025SHI	STIS/CCD STIS/NUV-MAMA	1	08-Aug-2025 11:00:31.0	yes

6 Total Orbits Used

ABSTRACT

Over the past decade, higher cadence all-sky surveys have uncovered a new, extreme class of transients with rapidly evolving light curves and high peak luminosities. The characteristics of these transients challenge our conventional understanding of massive star evolution and core-collapse supernovae (SNe). Most proposed models require a compact progenitor with extreme mass-loss, but the nature of both the progenitor and the mass-loss mechanism in these models does not often conform to conventional stellar evolution scenarios. UV spectra can offer important constraints on these models. They contain a significant fraction of the total energy output, uniquely probe thermal shock radiation that is not present at optical wavelengths, and directly trace the mass-loss history through P Cygni absorption profiles in the UV resonance lines. Over the past few years, the

transient community has ramped up efforts to both collect UV spectra of fast transients and update spectroscopic modeling software (i.e., CMFGEN) to handle the physical scenarios associated with this subclass. Yet, to date, only a few UV spectra exist, and only the Type Ibn SN 2020nxt was successfully modeled by CMFGEN at UV wavelengths. Furthermore, within this SN Ibn subclass, there is known spectroscopic diversity amongst the events. Here we propose a disruptive ToO with HST/STIS to obtain 2 epochs of UV spectra of a fast transient that is within 250 Mpc. We will implement detailed CMFGEN modeling to constrain the progenitor system and pre-explosion mass-loss history. This program is not appropriate for "Flex Thursday" as the rates are too low.

OBSERVING DESCRIPTION

We propose to obtain 2 epochs (3 orbits each) of STIS-MAMA spectra of a single Fast Transient supernova. The brightness is really the most important factor, but fast transients can vary in brightness substantially (magnitudes). We offer rough guidelines of a target within roughly 250 Mpc and as close to light-curve maximum as possible. The goal is to detect UV signatures that can distinguish between progenitor scenarios. These observations will also trace circumstellar interaction, constrain the progenitor mass loss, and identify late-time heating mechanisms for potential warm dust.

The initial spectrum will be triggered as a *disruptive* ToO, and observations should be scheduled as soon as possible. The second epoch should be obtained again within 10 days (the goal is to maximize the time between the two epochs, so there may be some wiggle room depending on the brightness and evolution timeline of the SN). We will use the data to trace circumstellar interaction, constrain the progenitor mass loss, and measure the CNO processing. Comparisons to other SN and FBOT subclasses will also help distinguish between progenitor systems and central engine powering mechanisms.

The first epoch will include observations in both the G140 and G230L bandpasses.

The second epoch will include observations in only the G230L bandpass.

We choose STIS over COS for several reasons. Most importantly, STIS offers spatially resolved spectra that exploit the intrinsically high resolution of HST over a large spectral range (accommodating both the C III] 1909 Ang and Mg II 2800 Ang lines). The long slit length will allow us to subtract contamination from zodiacal light, earthshine, the host galaxy, and H II regions. STIS also has superior sensitivity to COS in the NUV. While COS is optimized for isolated, faint point sources in the FUV with medium resolution, we would suffer from less wavelength coverage and require more integrations. We would also lose the advantages of the slit described above.

Important Note: COS, however, will be sufficient in the case that STIS is unavailable in the aging spacecraft.

Proposal 17814 - STIS-SN2025shi-Epoch1 (NUV) (01) - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

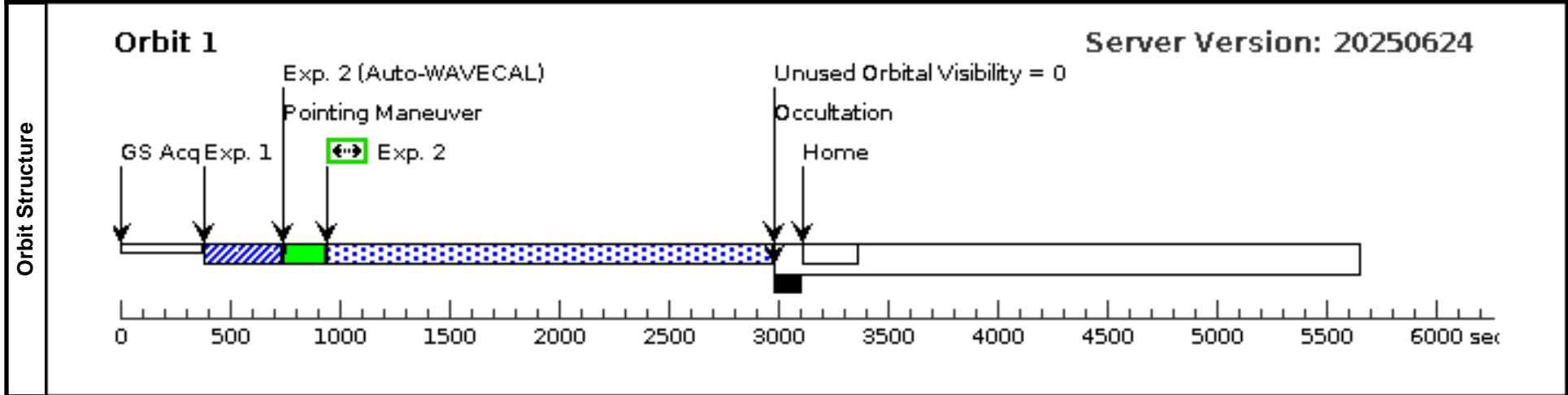
Fri Aug 08 15:00:32 GMT 2025

Proposal 17814, STIS-SN2025shi-Epoch1 (NUV) (01), implementation
Diagnostic Status: No Diagnostics
 Scientific Instruments: STIS/NUV-MAMA, STIS/CCD
 Special Requirements: ON HOLD ; TOO RESPONSE TIME 2.0D
 Comments: Likely to acquire on bright SN.
 On Hold Comments: Target-of-Opportunity.
 The initial spectrum will be triggered as a disruptive ToO, and observations should be scheduled as soon as possible (2-5 days as stated in the CfP). Less than 2 days could be possible since PI Fox works at STScI and has worked on ultra-rapid responses with HST planners in the past.
 The main goal, however, is to make sure the observations are obtained around peak, which typically happens about 3 days post-discovery.

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN-2025SHI	RA: 22 48 42.2790 (342.1761625d) Dec: +27 34 57.99 (27.58277d) Equinox: J2000		V=17.5	Reference Frame: ICRS

Comments:
 Category=EXT-STAR
 Description=[SUPERNOVA]
 Extended=NO

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.im.13 67909)	(2) SN-2025SHI	STIS/CCD, ACQ, F28X50LP	MIRROR				30 Secs (30 Secs) [==>]	[1]
Comments: Used 10,000K Blackbody normalized to V=16. SN should be bright during initial acquisition.									
2	STIS/NUV Exp 1 (STIS.sp.13 67898)	(2) SN-2025SHI	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2000 Secs (2014 Secs) [==>2014.0 Secs]	[1]



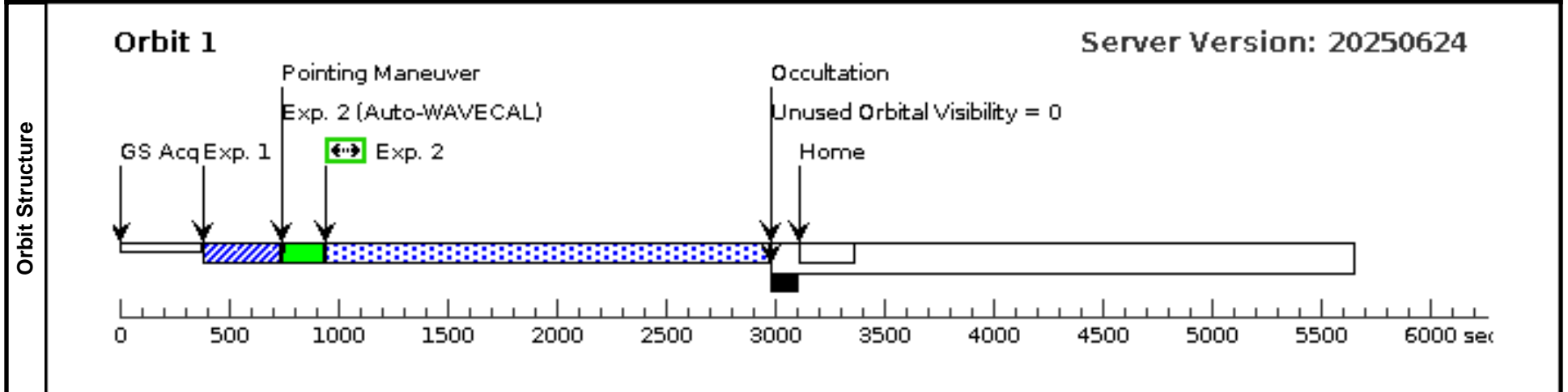
Proposal 17814 - STIS-SN2025shi-Epoch1 (FUV) (02) - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

Fri Aug 08 15:00:32 GMT 2025

Proposal 17814, STIS-SN2025shi-Epoch1 (FUV) (02), implementation
Diagnostic Status: No Diagnostics
 Scientific Instruments: STIS/CCD, STIS/FUV-MAMA
 Special Requirements: AFTER 01 BY 0 D TO 1.1 D; ON HOLD ; TOO RESPONSE TIME 2.0D
 Comments: Likely to acquire on bright SN.
 On Hold Comments: Target-of-Opportunity.
 The initial spectrum will be triggered as a disruptive ToO, and observations should be scheduled as soon as possible (2-5 days as stated in the CfP). Less than 2 days could be possible since PI Fox works at STScI and has worked on ultra-rapid responses with HST planners in the past.
 The main goal, however, is to make sure the observations are obtained around peak, which typically happens about 3 days post-discovery.

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN-2025SHI	RA: 22 48 42.2790 (342.1761625d) Dec: +27 34 57.99 (27.58277d) Equinox: J2000		V=17.5	Reference Frame: ICRS
Comments: Category=EXT-STAR Description=[SUPERNOVA] Extended=NO					

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.im.13 67909)	(2) SN-2025SHI	STIS/CCD, ACQ, F28X50LP	MIRROR				30 Secs (30 Secs) [==>]	[1]
Comments: Used 10,000K Blackbody normalized to V=16. SN should be bright during initial acquisition.									
2	STIS/FUV E xp 1 (STIS.sp.13 67898)	(2) SN-2025SHI	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A				2000 Secs (2014 Secs) [==>2014.0 Secs]	[1]



Proposal 17814 - STIS-SN2025shi-Epoch1 (FUV) (03) - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

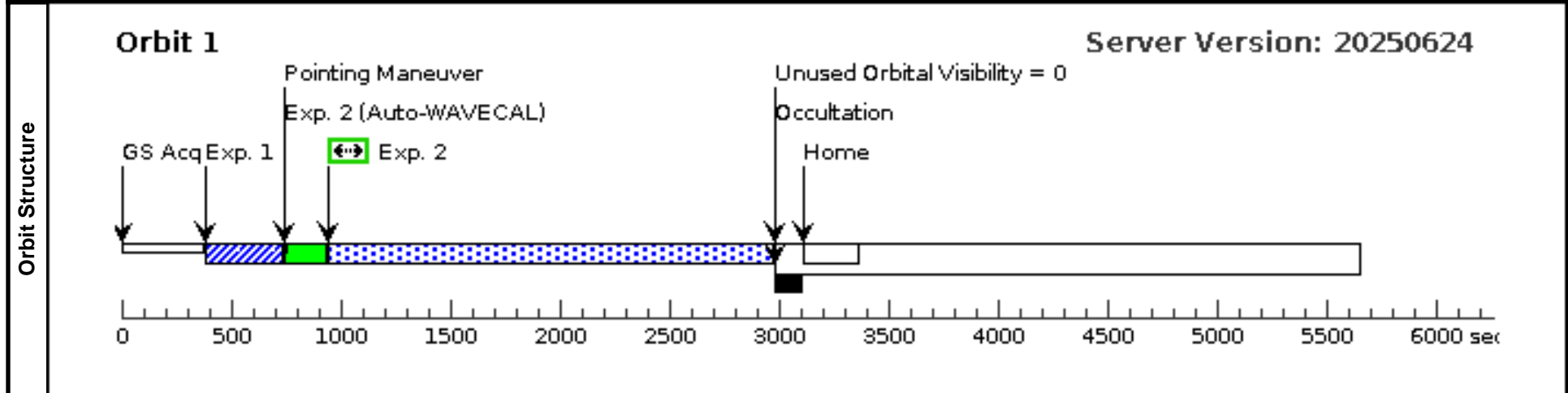
Fri Aug 08 15:00:32 GMT 2025

Proposal 17814, STIS-SN2025shi-Epoch1 (FUV) (03), implementation
Diagnostic Status: No Diagnostics
 Scientific Instruments: STIS/CCD, STIS/FUV-MAMA
 Special Requirements: AFTER 02 BY 0 D TO 1.1 D; ON HOLD ; TOO RESPONSE TIME 2.0D
 Comments: Likely to acquire on bright SN.
 On Hold Comments: Target-of-Opportunity.
 The initial spectrum will be triggered as a disruptive ToO, and observations should be scheduled as soon as possible (2-5 days as stated in the CfP). Less than 2 days could be possible since PI Fox works at STScI and has worked on ultra-rapid responses with HST planners in the past.
 The main goal, however, is to make sure the observations are obtained around peak, which typically happens about 3 days post-discovery.

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN-2025SHI	RA: 22 48 42.2790 (342.1761625d) Dec: +27 34 57.99 (27.58277d) Equinox: J2000		V=17.5	Reference Frame: ICRS

Comments:
 Category=EXT-STAR
 Description=[SUPERNOVA]
 Extended=NO

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.im.13 67909)	(2) SN-2025SHI	STIS/CCD, ACQ, F28X50LP	MIRROR				30 Secs (30 Secs) [==>]	[1]
Comments: Used 10,000K Blackbody normalized to V=16. SN should be bright during initial acquisition.									
2	STIS/FUV E xp 2 (STIS.sp.13 67898)	(2) SN-2025SHI	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A				2000 Secs (2014 Secs) [==>2014.0 Secs]	[1]



Proposal 17814 - STIS-SN2025shi-Epoch2 (NUV) (04) - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

Fri Aug 08 15:00:32 GMT 2025

Proposal 17814, STIS-SN2025shi-Epoch2 (NUV) (04), implementation

Diagnostic Status: No Diagnostics

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

Special Requirements: AFTER 01 BY 6 D TO 12 D; ON HOLD

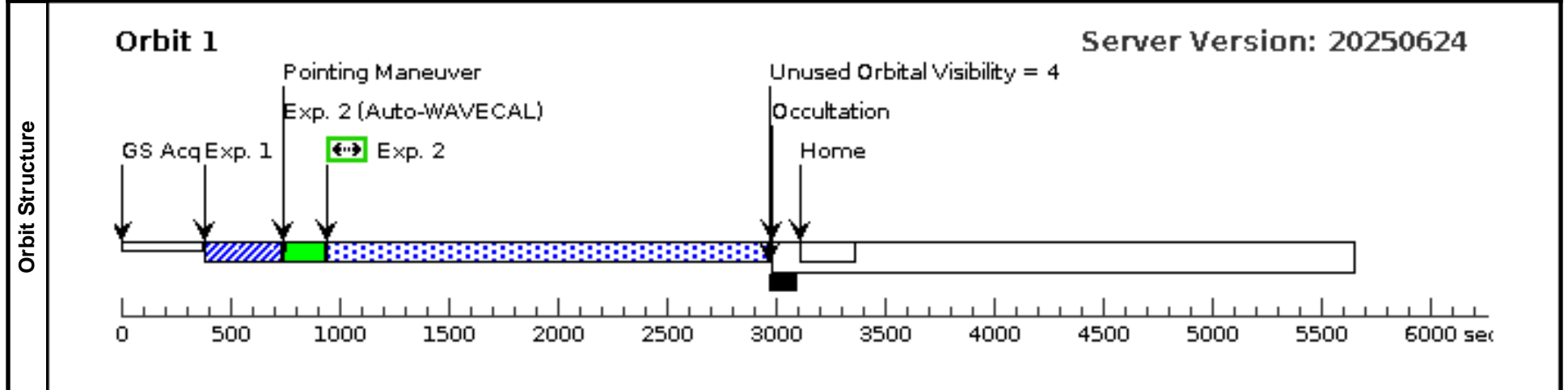
Comments: Likely to acquire on bright SN.

On Hold Comments: Target-of-Opportunity.

This visit will be scheduled for 6-12 days following the first visit (as specified in the Timing Requirements), ideally aiming for 10 days. But we'd like to have some flexibility with our final submission to account for the brightness and light-curve evolution.

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN-2025SHI	RA: 22 48 42.2790 (342.1761625d) Dec: +27 34 57.99 (27.58277d) Equinox: J2000		V=17.5	Reference Frame: ICRS
Comments: Category=EXT-STAR Description=[SUPERNOVA] Extended=NO					

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.im.13 67910)	(2) SN-2025SHI	STIS/CCD, ACQ, F28X50LP	MIRROR				30 Secs (30 Secs) [==>]	[1]
Comments: Used 10,000K Blackbody normalized to V=16. SN should be bright during initial acquisition.									
2	STIS/NUV Exp 1 (STIS.sp.13 67905)	(2) SN-2025SHI	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2000 Secs (2010 Secs) [==>2010.0 Secs]	[1]
Comments: Assuming a 7,000K Blackbody around 10 days post-max.									



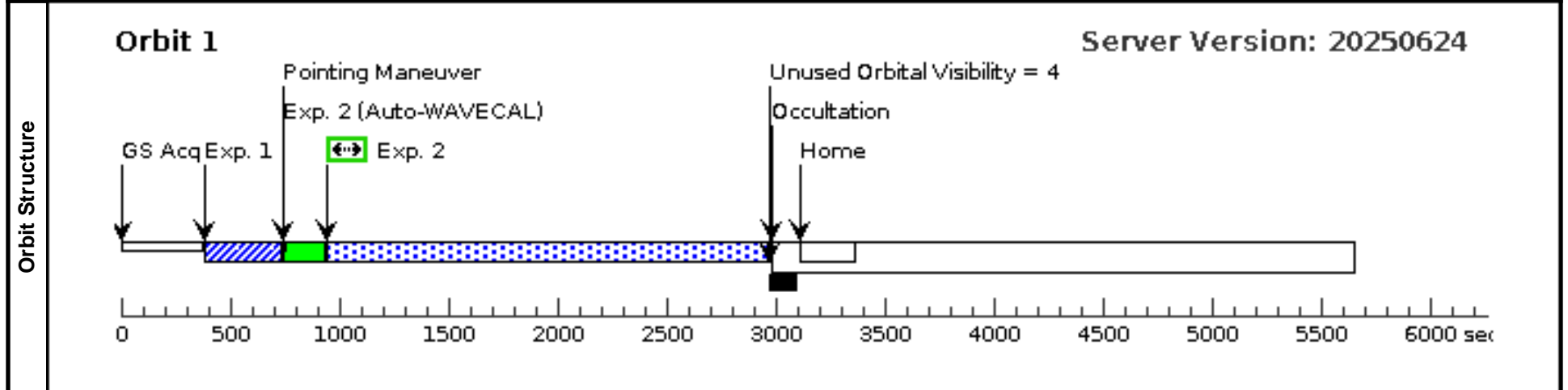
Proposal 17814 - STIS-SN2025shi-Epoch2 (NUV) (05) - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

Fri Aug 08 15:00:32 GMT 2025

Visit
Proposal 17814, STIS-SN2025shi-Epoch2 (NUV) (05), implementation
Diagnostic Status: No Diagnostics
 Scientific Instruments: STIS/NUV-MAMA, STIS/CCD
 Special Requirements: AFTER 04 BY 0 Orbits TO 1.1 Orbits; ON HOLD
 Comments: Likely to acquire on bright SN.
 On Hold Comments: Target-of-Opportunity.
 This visit will be scheduled for 6-12 days following the first visit (as specified in the Timing Requirements), ideally aiming for 10 days. But we'd like to have some flexibility with our final submission to account for the brightness and light-curve evolution.

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	SN-2025SHI	RA: 22 48 42.2790 (342.1761625d) Dec: +27 34 57.99 (27.58277d) Equinox: J2000		V=17.5	Reference Frame: ICRS
	Comments: Category=EXT-STAR Description=[SUPERNOVA] Extended=NO					

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.im.13 67910)	(2) SN-2025SHI	STIS/CCD, ACQ, F28X50LP	MIRROR				30 Secs (30 Secs) [==>]	[1]
	Comments: Used 10,000K Blackbody normalized to V=16. SN should be bright during initial acquisition.									
	2	STIS/NUV Exp 2 (STIS.sp.13 67905)	(2) SN-2025SHI	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2000 Secs (2010 Secs) [==>2010.0 Secs]	[1]
	Comments: Assuming a 7,000K Blackbody around 10 days post-max.									



Proposal 17814 - STIS-SN2025shi-Epoch2 (NUV) (06) - Diversifying the UV Spectroscopic Sample of Fast Evolving Transients

Fri Aug 08 15:00:32 GMT 2025

Visit
Proposal 17814, STIS-SN2025shi-Epoch2 (NUV) (06), implementation
Diagnostic Status: No Diagnostics
 Scientific Instruments: STIS/NUV-MAMA, STIS/CCD
 Special Requirements: AFTER 05 BY 0 Orbits TO 1.1 Orbits; ON HOLD
 Comments: Likely to acquire on bright SN.
 On Hold Comments: Target-of-Opportunity.
 This visit will be scheduled for 6-12 days following the first visit (as specified in the Timing Requirements), ideally aiming for 10 days. But we'd like to have some flexibility with our final submission to account for the brightness and light-curve evolution.

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	SN-2025SHI	RA: 22 48 42.2790 (342.1761625d) Dec: +27 34 57.99 (27.58277d) Equinox: J2000		V=17.5	Reference Frame: ICRS
	Comments: Category=EXT-STAR Description=[SUPERNOVA] Extended=NO					

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.im.13 67910)	(2) SN-2025SHI	STIS/CCD, ACQ, F28X50LP	MIRROR				30 Secs (30 Secs) [==>]	[1]
	Comments: Used 10,000K Blackbody normalized to V=16. SN should be bright during initial acquisition.									
	2	STIS/NUV Exp 3 (STIS.sp.13 67905)	(2) SN-2025SHI	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2000 Secs (2010 Secs) [==>2010.0 Secs]	[1]
	Comments: Assuming a 7,000K Blackbody around 10 days post-max.									

