



17772 - Probing Red Supergiant Mass Loss 100-200 Years Before Explosion using UV Spectra of the Extraordinary SN 2023ixf

Cycle: 32, Proposal Category: GO
(Availability Mode: SUPPORTED)

INVESTIGATORS

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Prof. Griffin Hosseinzadeh (CoI)	University of California - San Diego

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	(1) SN-2023IXF	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	26-Mar-2025 15:01:18.0	yes
05	(1) SN-2023IXF	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	26-Mar-2025 15:01:19.0	yes
04	(1) SN-2023IXF (2) SN23IXF-OFFSET-LEGACY5313	STIS/CCD STIS/FUV-MAMA	2	26-Mar-2025 15:01:19.0	yes
03	(1) SN-2023IXF (2) SN23IXF-OFFSET-LEGACY5313	STIS/CCD STIS/NUV-MAMA	5	26-Mar-2025 15:01:20.0	yes

13 Total Orbits Used

ABSTRACT

Mass loss in red supergiants is currently a topic of much debate, with proposed rates between 10^{-7} and 10^{-1} solar masses per year and hints of periods of enhanced mass loss which may be more prevalent as the red supergiant approaches explosion. However, observations of red supergiants tend to probe thousand of years prior to explosion while optical observations of the supernova probe the final 5 years and are only sensitive to the highest levels of mass loss. About 50 days after explosion, Lyman-alpha and Mg II emission lines form when there is interaction between the supernova ejecta and circumstellar medium, even when the optical is indistinguishable from a non-interacting supernova. These lines are extremely sensitive to all levels of circumstellar interaction, however, as the UV is very faint, obtaining these observations requires a very nearby supernova. On May 19, 2023, SN 2023ixf was discovered at 6.9 Mpc. Early spectra showed narrow, high-ionization emission lines characteristic of dense, confined circumstellar material which disappeared within a week. With a non-detection less than 24 hours before and rapid classification, this very nearby supernova was observed in exquisite detail from gamma rays to radio, including with HST in the UV starting just 3.5d after explosion and continuing through ~300d after explosion. With these observations, we can map out the mass-loss history of the red supergiant progenitor out to 75 years before explosion. Here, we ask for two epochs of FUV and NUV spectra, taking our mass-loss history of the progenitor star to ~200 years before explosion, giving us an unprecedented and detailed view of mass loss in a red supergiant.

OBSERVING DESCRIPTION

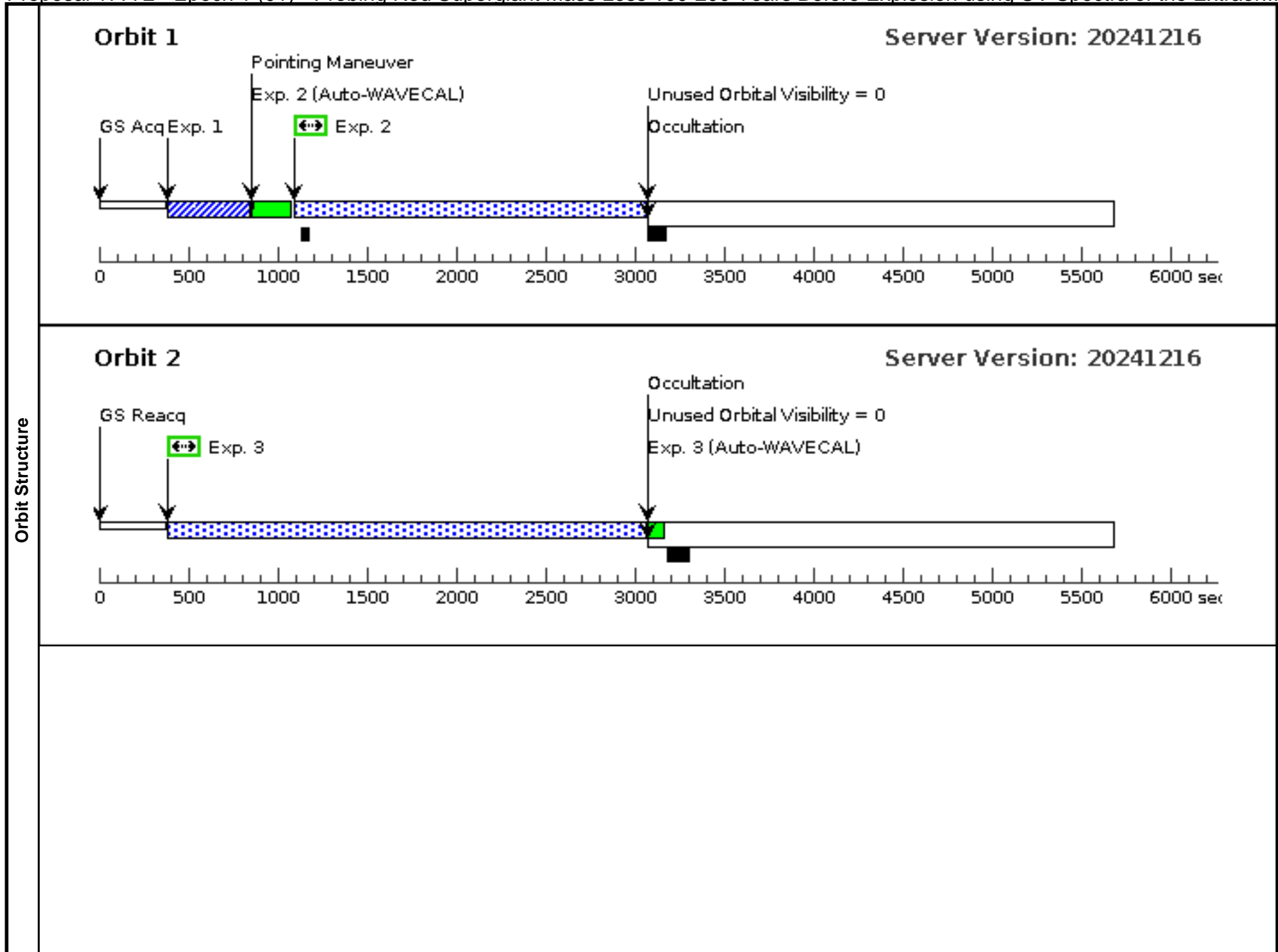
This program is to observe SN 2023ixf in the FUV and NUV at two epochs. The first epoch is 3 orbits (1 FUV, 2 NUV) and will be scheduled as a single visit before Mar 1, 2025. The faintest SN 2023ixf will be at this phase is $V=21.5$

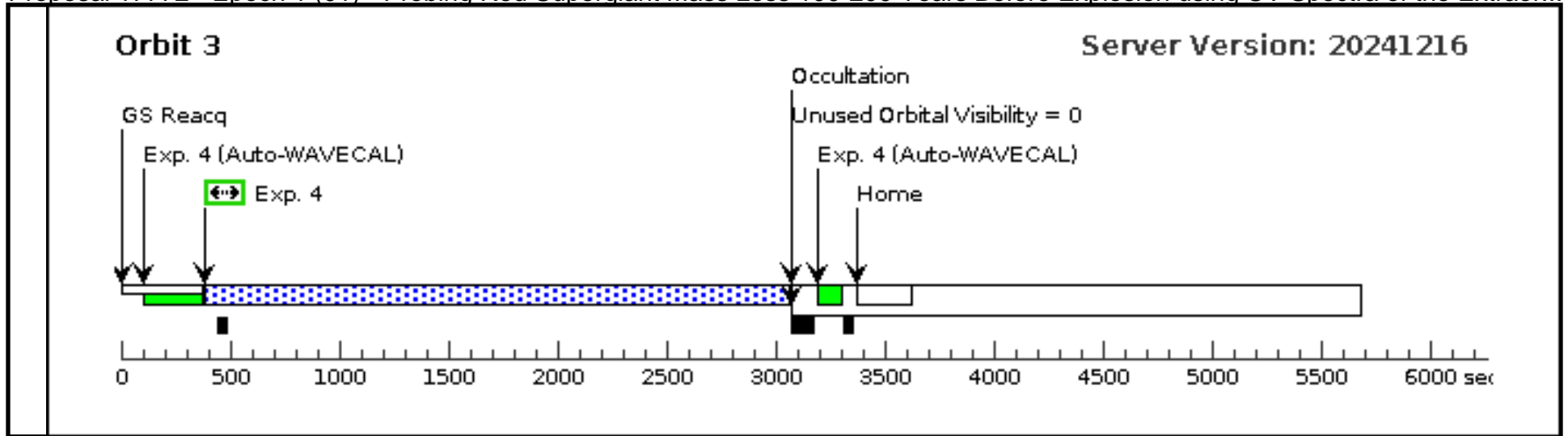
The epoch will be broken into a FUV visit (2 orbits) and an NUV visit (5 orbits) scheduled within a week of each other. This epoch will occur after Mar 1, 2025 and after visit 1 by 4 months. The faintest SN 2023ixf will be at this phase is $V=23$

Proposal 17772 - Epoch 1 (01) - Probing Red Supergiant Mass Loss 100-200 Years Before Explosion using UV Spectra of the Extraor...

Wed Mar 26 19:01:20 GMT 2025

Visit	Proposal 17772, Epoch 1 (01), failed Diagnostic Status: Warning Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA Special Requirements: BEFORE 01-MAR-2025:00:00:00									
	(Epoch 1 (01)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 1 (01)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 1 (01)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 1 (01)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE									
Diagnosics										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SN-2023IXF	RA: 14 03 38.5620 (210.9106750d) Dec: +54 18 41.94 (54.31165d) Equinox: J2000	Epoch of Position: 2000	V=23	Reference Frame: SIMBAD				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=EXT-STAR Description=[SUPERNOVA, SUPERNOVA TYPE II]										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	TA	(1) SN-2023IXF	STIS/CCD, ACQ, 50CCD	MIRROR				55 Secs (55 Secs) [==>]	[1]
	2	NUV (STIS.sp.19 33029)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				1934 Secs (1934 Secs) [==>]	[1]
	3	NUV (STIS.sp.19 33029)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				2670 Secs (2670 Secs) [==>]	[2]
	4	FUV (STIS.sp.19 33026)	(1) SN-2023IXF	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A				2628 Secs (2628 Secs) [==>]	[3]

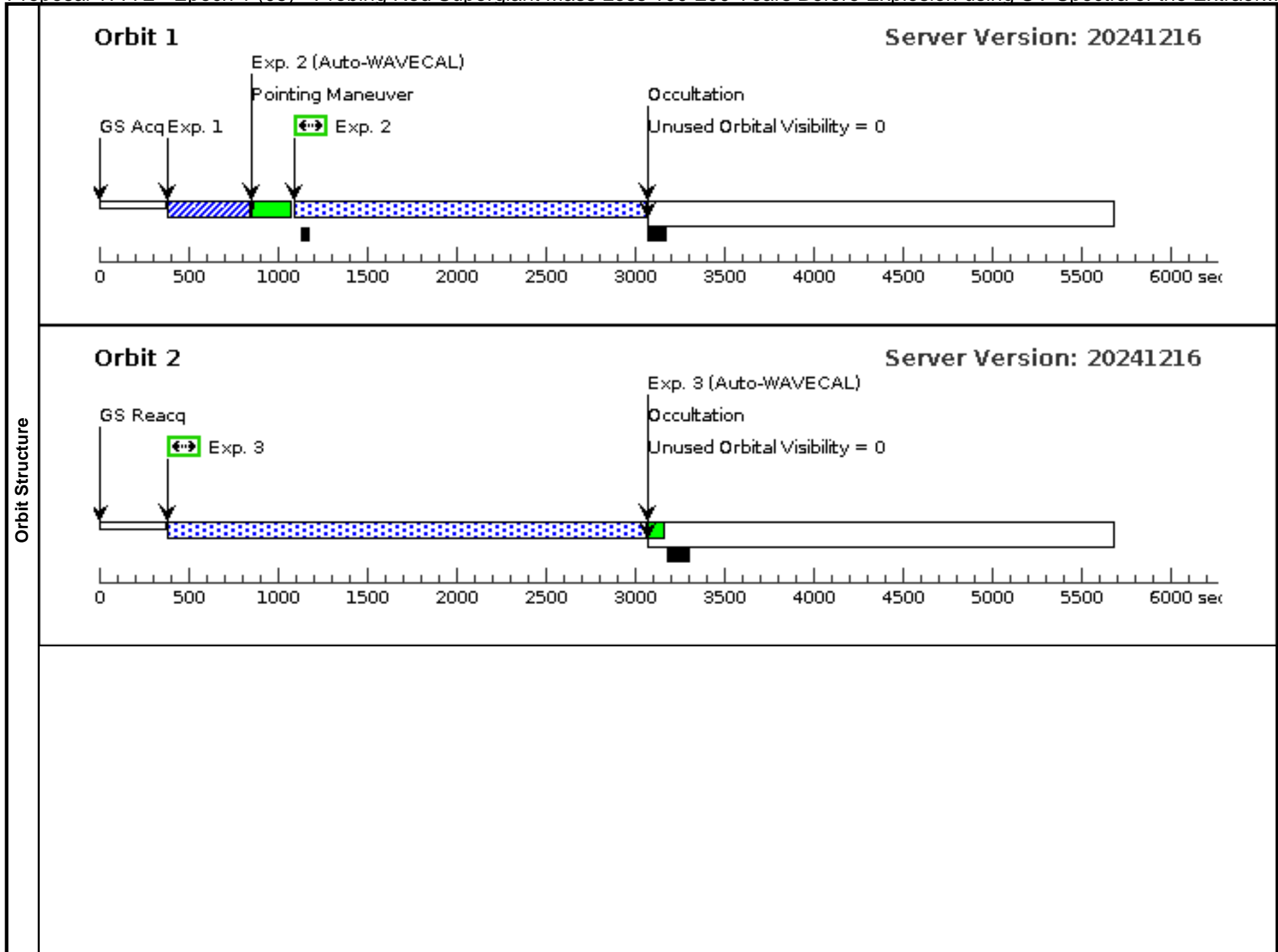


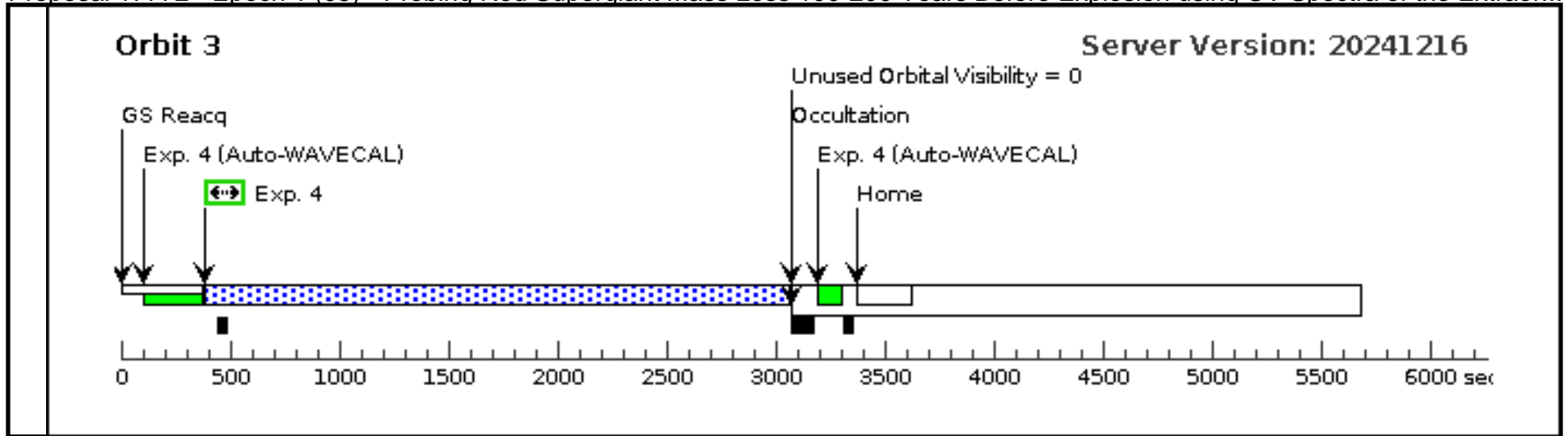


Proposal 17772 - Epoch 1 (05) - Probing Red Supergiant Mass Loss 100-200 Years Before Explosion using UV Spectra of the Extraor...

Wed Mar 26 19:01:21 GMT 2025

Visit	Proposal 17772, Epoch 1 (05), completed Diagnostic Status: Warning Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA Special Requirements: BEFORE 01-MAR-2025:00:00:00									
	Diagnosics (Epoch 1 (05)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 1 (05)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 1 (05)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 1 (05)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SN-2023IXF	RA: 14 03 38.5620 (210.9106750d) Dec: +54 18 41.94 (54.31165d) Equinox: J2000	Epoch of Position: 2000	V=23	Reference Frame: SIMBAD				
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=EXT-STAR Description=[SUPERNOVA, SUPERNOVA TYPE II]										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	TA	(1) SN-2023IXF	STIS/CCD, ACQ, 50CCD	MIRROR				55 Secs (55 Secs) [==>]	[1]
	2	NUV (STIS.sp.19 33029)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				1934 Secs (1934 Secs) [==>]	[1]
	3	NUV (STIS.sp.19 33029)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				2670 Secs (2670 Secs) [==>]	[2]
	4	FUV (STIS.sp.19 33026)	(1) SN-2023IXF	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A				2628 Secs (2628 Secs) [==>]	[3]

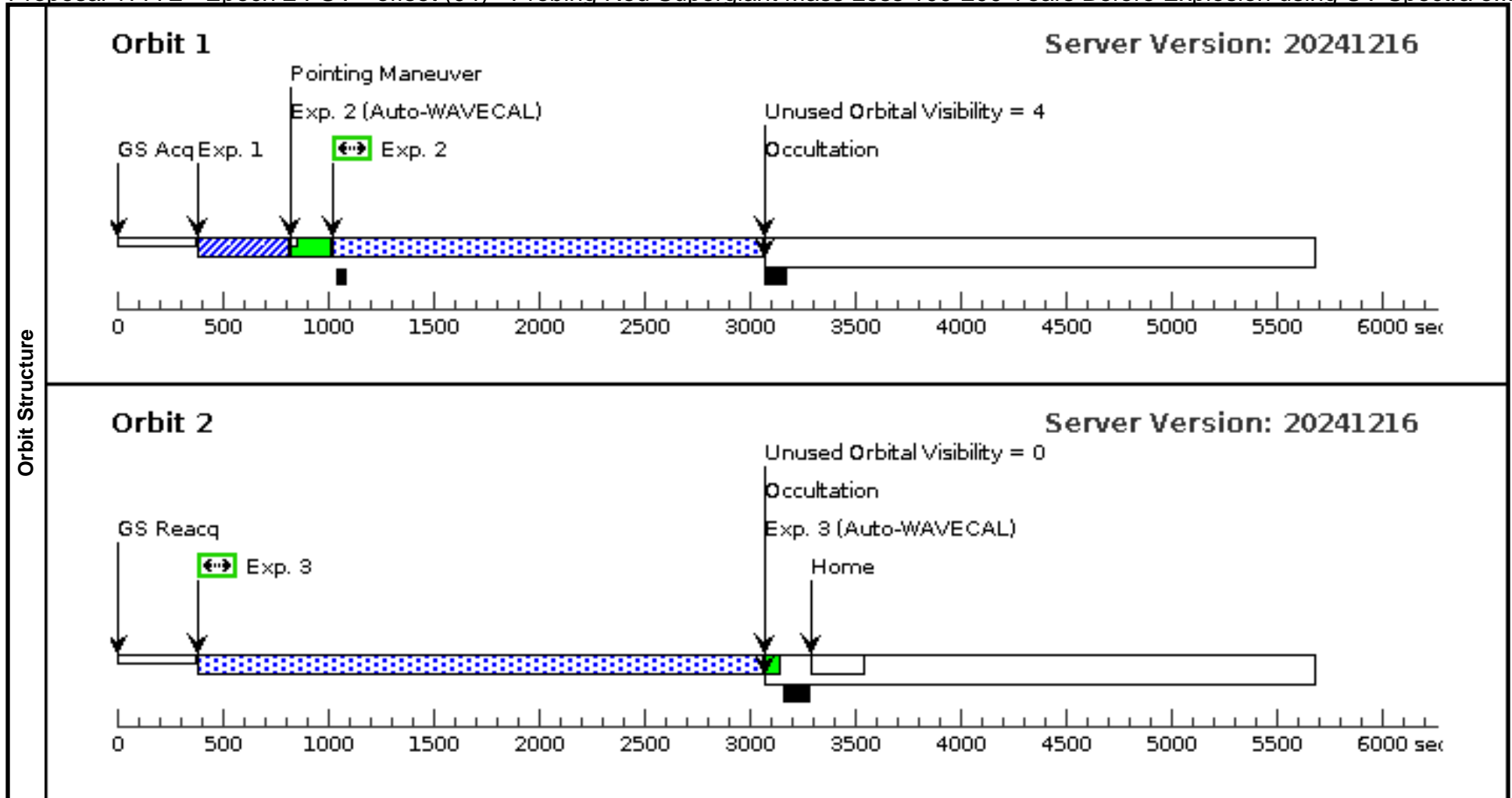




Proposal 17772 - Epoch 2 FUV - offset (04) - Probing Red Superqiant Mass Loss 100-200 Years Before Explosion using UV Spectra o...

Wed Mar 26 19:01:21 GMT 2025

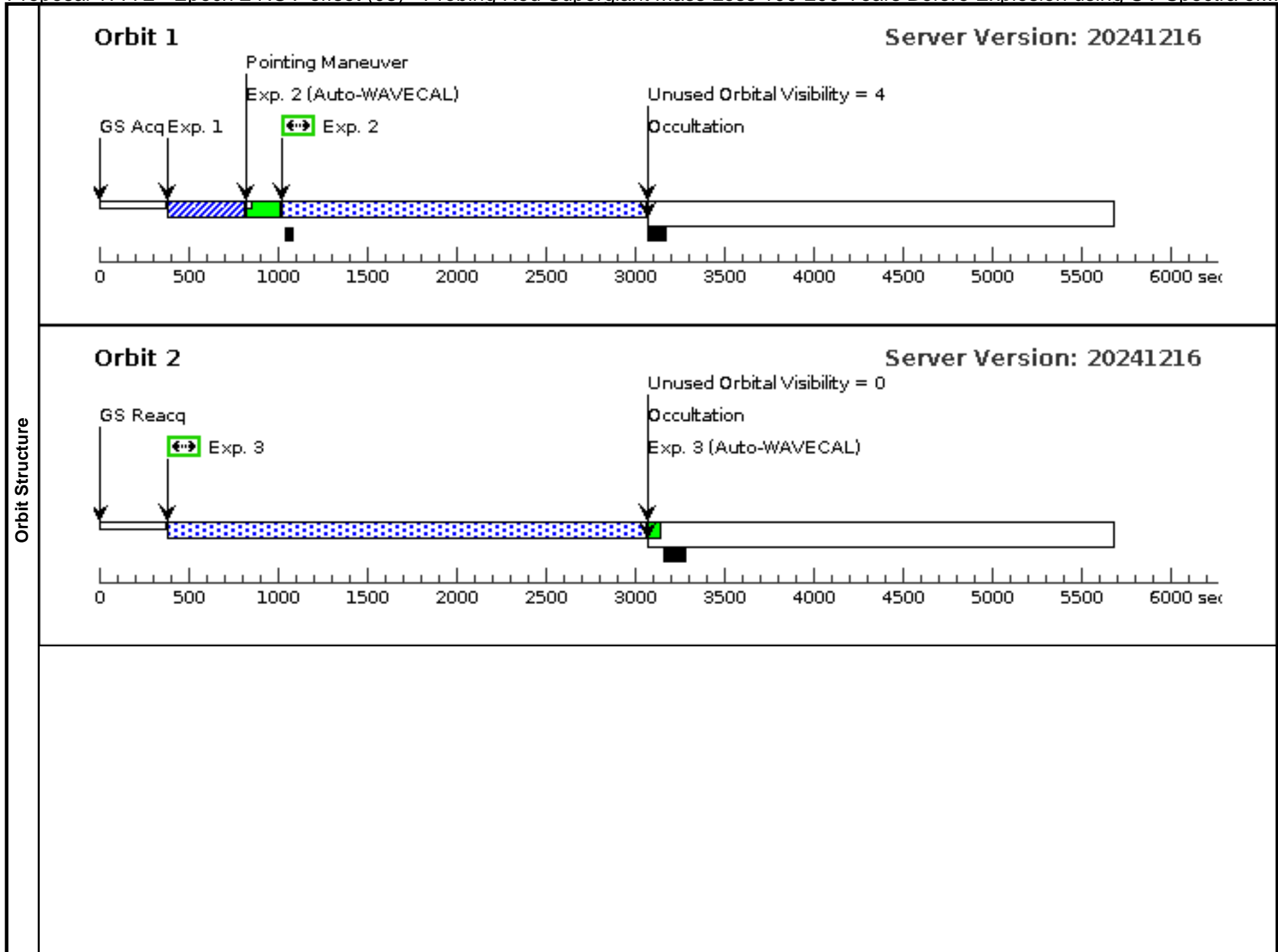
Visit	Proposal 17772, Epoch 2 FUV - offset (04), implementation Diagnostic Status: Warning Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: AFTER 05 BY 100 D TO 365 D; BETWEEN 01-MAR-2025:00:00:00 AND 01-JUL-2025:00:00:00; GROUP 04.03 WITHIN 7D									
	(Epoch 2 FUV - offset (04)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 2 FUV - offset (04)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE									
Diagnosics										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SN-2023IXF	RA: 14 03 38.5620 (210.9106750d) Dec: +54 18 41.94 (54.31165d) Equinox: J2000	Epoch of Position: 2000	V=23	Reference Frame: SIMBAD				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=EXT-STAR Description=[SUPERNOVA, SUPERNOVA TYPE II]									
	(2)	SN23IXF-OFFSET-LEGACY5313	RA: 14 03 39.8499 (210.9160413d) Dec: +54 18 6.99 (54.30194d) Equinox: J2000		V=20.5	Reference Frame: ICRS				
<i>Comments: g=20.48, r=20.43, z=20.39</i> Category=EXT-STAR Description=[K V-IV]										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	TA (STIS.ta.1933004)	(2) SN23IXF-OFFS ET-LEGACY5313	STIS/CCD, ACQ, F28X50LP	MIRROR				50 Secs (50 Secs) [==>]	[1]
	2	FUV orbit 1 (STIS.sp.1933035)	(1) SN-2023IXF	STIS/FUV-MAMA, ACCUM, 52X0.2	G140L 1425 A				2025 Secs (2025 Secs) [==>]	[1]
	3	FUV orbit 2 (STIS.sp.1933035)	(1) SN-2023IXF	STIS/FUV-MAMA, ACCUM, 52X0.2	G140L 1425 A				2670 Secs (2670 Secs) [==>]	[2]



Proposal 17772 - Epoch 2 NUV-offset (03) - Probing Red Supergiant Mass Loss 100-200 Years Before Explosion using UV Spectra of...

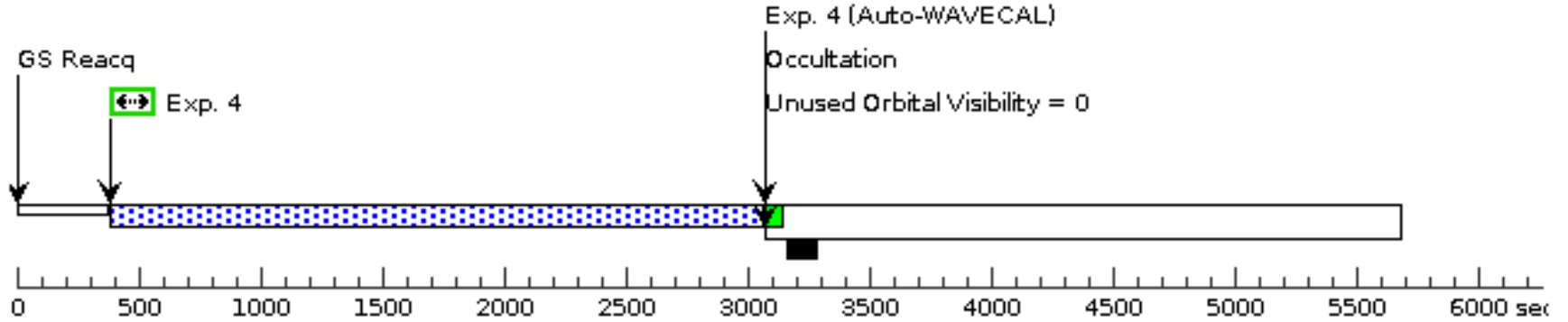
Wed Mar 26 19:01:21 GMT 2025

Visit	Proposal 17772, Epoch 2 NUV-offset (03), implementation Diagnostic Status: Warning Scientific Instruments: STIS/NUV-MAMA, STIS/CCD Special Requirements: AFTER 05 BY 100 D TO 365 D; BETWEEN 01-MAR-2025:00:00:00 AND 01-JUL-2025:00:00:00; GROUP 03,04 WITHIN 7D									
	(Epoch 2 NUV-offset (03)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 2 NUV-offset (03)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 2 NUV-offset (03)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 2 NUV-offset (03)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE (Epoch 2 NUV-offset (03)) Warning (Orbit Planner): COORDINATES SHOULD BE IN THE ICRS REFERENCE SYSTEM FOR A SMALL APERTURE									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SN-2023IXF	RA: 14 03 38.5620 (210.9106750d) Dec: +54 18 41.94 (54.31165d) Equinox: J2000	Epoch of Position: 2000	V=23	Reference Frame: SIMBAD				
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=EXT-STAR Description=[SUPERNOVA, SUPERNOVA TYPE II]										
(2)	SN23IXF-OFFSET-LEGACY5313	RA: 14 03 39.8499 (210.9160413d) Dec: +54 18 6.99 (54.30194d) Equinox: J2000		V=20.5	Reference Frame: ICRS					
<i>Comments: g=20.48, r=20.43, z=20.39</i> Category=EXT-STAR Description=[K V-IV]										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	TA (STIS.ta.1933004)	(2) SN23IXF-OFFS ET-LEGACY5313	STIS/CCD, ACQ, F28X50LP	MIRROR				50 Secs (50 Secs) [==>]	[1]
	2	NUV orbit 1 (STIS.sp.1933033)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2025 Secs (2025 Secs) [==>]	[1]
	3	NUV orbit 2 (STIS.sp.1933033)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2670 Secs (2670 Secs) [==>]	[2]
	4	NUV orbit 3 (STIS.sp.1933033)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2670 Secs (2670 Secs) [==>]	[3]
	5	NUV orbit 4 (STIS.sp.1933033)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2670 Secs (2670 Secs) [==>]	[4]
	6	NUV orbit 5 (STIS.sp.1933033)	(1) SN-2023IXF	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A				2670 Secs (2670 Secs) [==>]	[5]



Orbit 3

Server Version: 20241216



Orbit 4

Server Version: 20241216

