17415 - SN 2019yvr: A Hydrogen-poor Supernova with Late-Time Circumstellar Interaction and a Progenitor Candidate

Cycle: 31, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
02	(2) SN2022CRV	WFC3/UVIS	4	15-Aug-2024 16:00:16.0	yes

4 Total Orbits Used

ABSTRACT

There is now significant evidence that at least 10% of massive stars undergo substantial and impulsive mass loss within a few years of core-collapse. In particular, observations of interacting supernovae suggest that their progenitors undergo extreme episodes of mass-loss shortly before core collapse, creating a dense shell of circumstellar material (CSM). While most of our understanding of this link has come predominantly from hydrogen-rich supernovae, there is a growing population of SN initially classified as hydrogen free but with evidence of CSM interaction at later times. Here we propose to take advantage of HST sensitivity and angular resolution to observe the nearby (d=14.4 Mpc) Type Ib SN2019yvr and

constrain the disappearance of its progenitor star and ongoing circumstellar interaction. SN2019yvr is only the second stripped envelope SN with a candidate progenitor detection in pre-explosion HST images, and 150 days post-explosion it began to shown signs of SN2014C-like interaction with a hydrogen-rich medium. We request new imaging in F438W and F555W to confirm the disappearance of its pre-explosion counterpart and determine whether it is interacting with CSM at large separations from the progenitor system, implying its progenitor system was losing mass thousands of years before core collapse.

OBSERVING DESCRIPTION

We propose to observe the site of the Type Ib supernova (SN Ib) 2019yvr with WFC3. This site was previously observed in 2017 with WFC3/UVIS F438W and F555W, which revealed the a point source consistent with being the supernova's counterpart. Our program will observe this same source more than 4 years after the explosion and determine whether it has faded or disappeared, consistent with predictions that it was the progenitor star of 2019yvr and exploded in 2019.

To maximize time on-source within each orbit, we split our observations into two orbits of F438W and two of F555W, both using a 3-point line pattern to guarantee a high S/N detection of any potential counterpart as well as nearby sources that will aid in alignment and PSF reconstruction near the site of SN2019yvr. Combined with the requested FLASH in each exposure (FLASH=12 for F438W and no FLASH for F555W), this will also minimize the effects of CTE while maximizing the field observed around the host galaxy NGC4666.

Visit

Proposal 17415, SN2022crv - 01 (02), implementation Thu Aug 15 20:00:17 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(SN2022crv - 01 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(SN2022crv - 01 (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2), (3), (4)

Fixed Targets

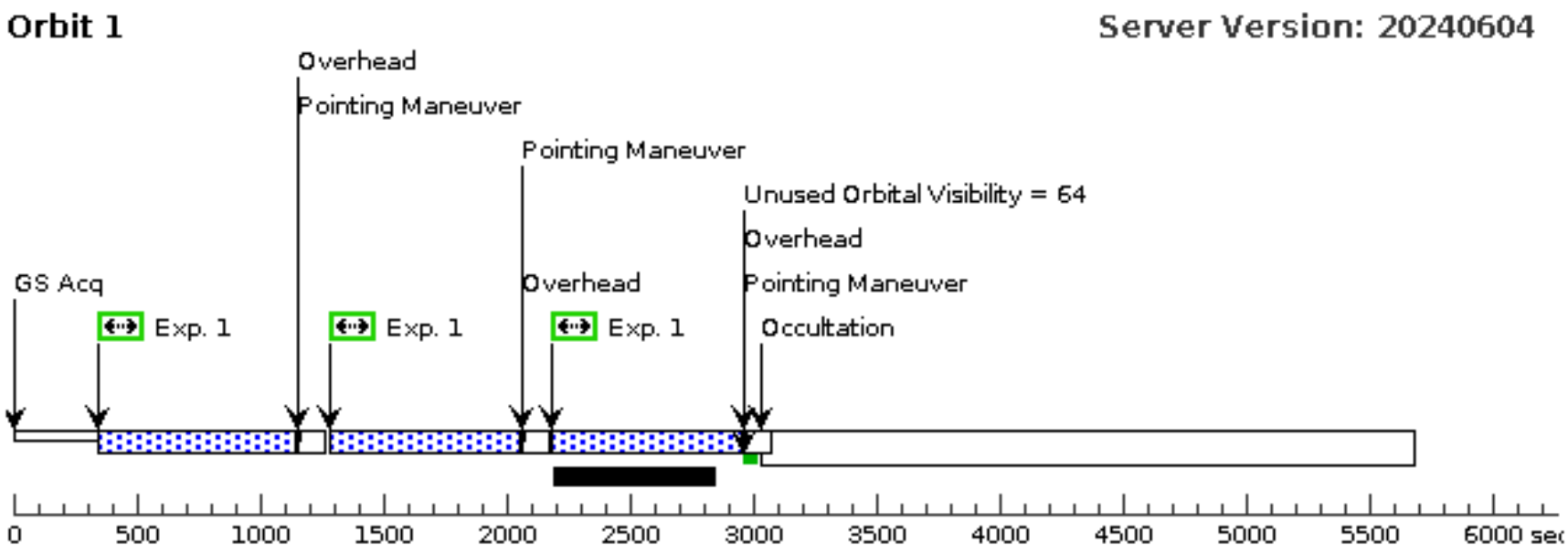
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN2022CRV	RA: 09 54 25.9100 (148.6079583d) Dec: -25 42 11.16 (-25.70310d) Equinox: J2000	Epoch of Position: 2015.5	V=24	Reference Frame: SIMBAD

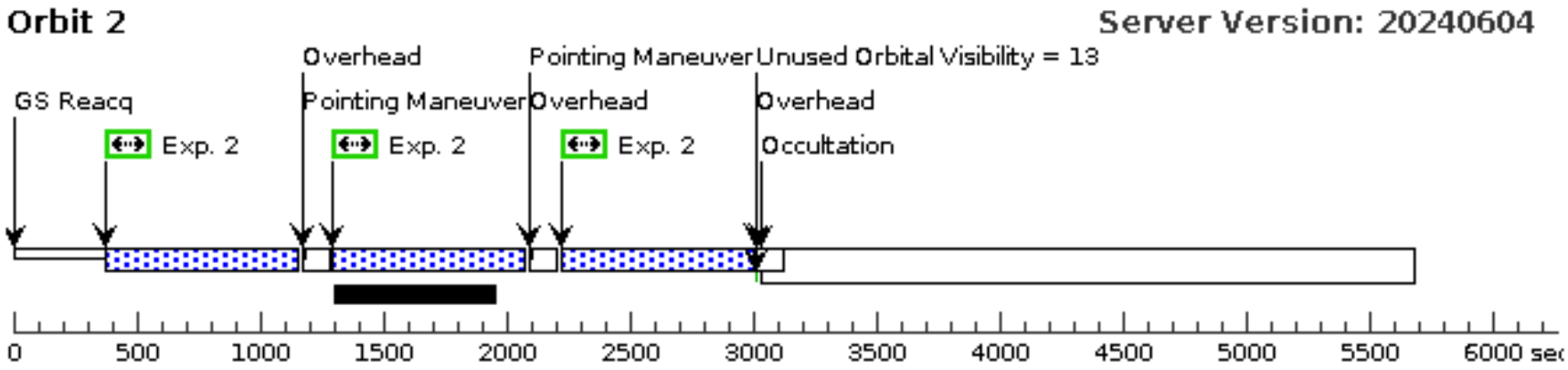
Comments:
Category=STAR
Description=[SUPERNOVA, SUPERNOVA TYPE IB]

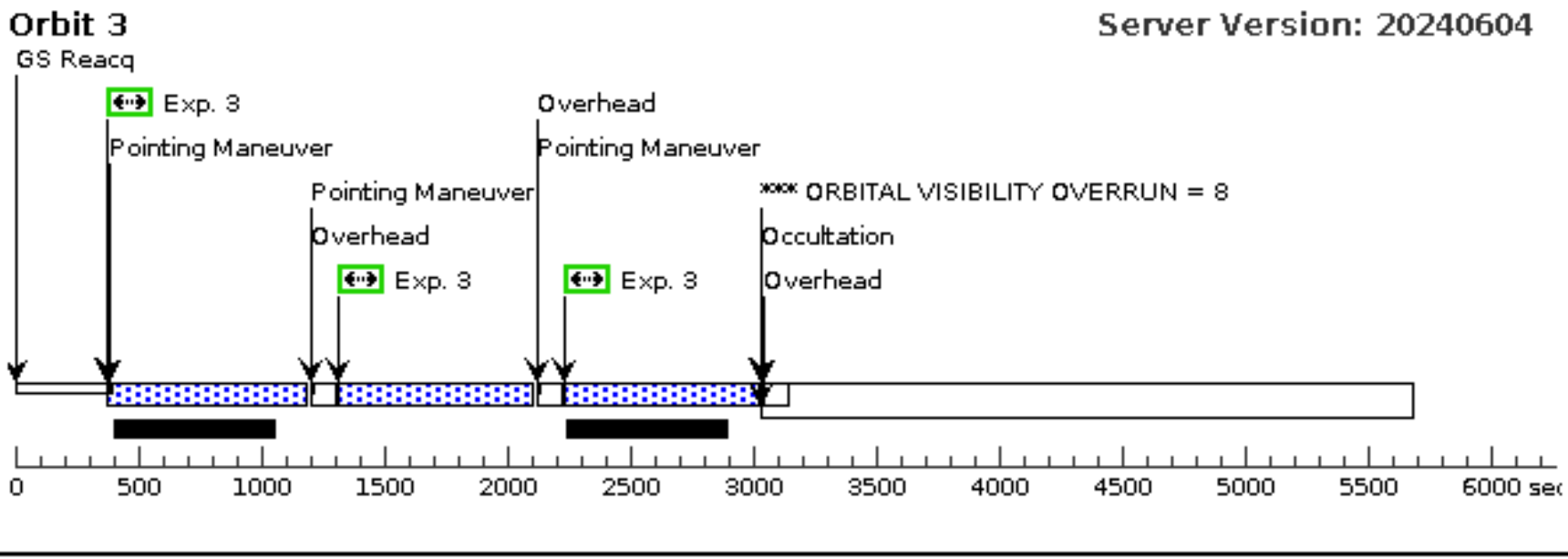
Exposures

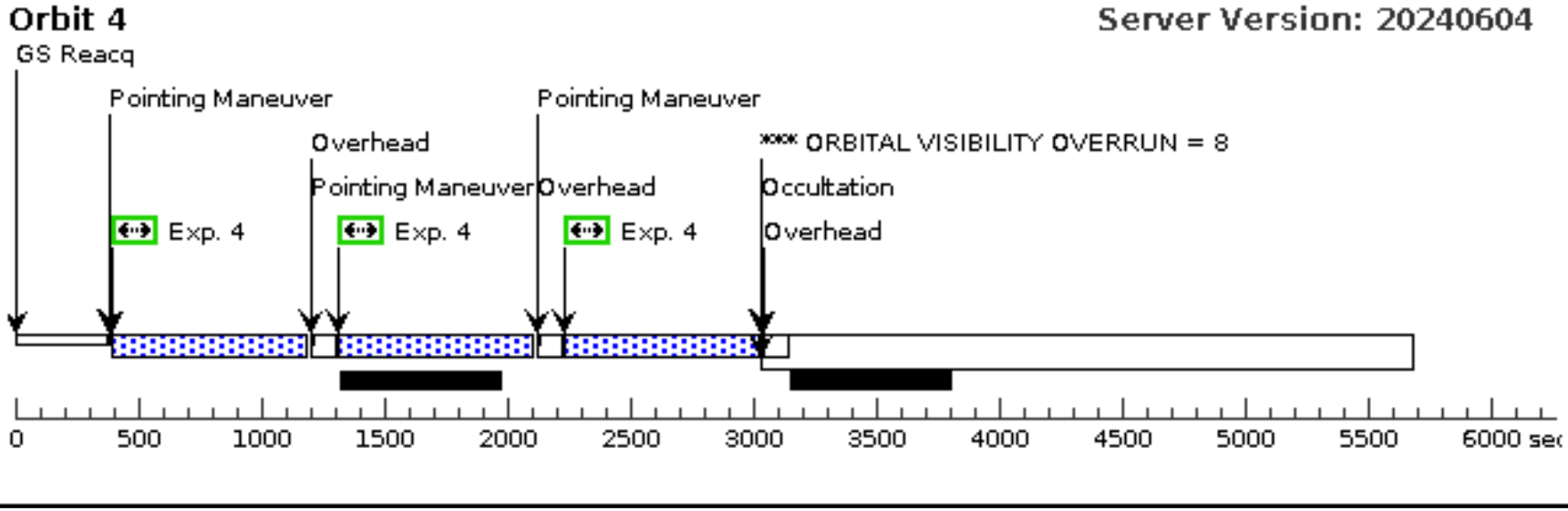
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F438W - 1	(2) SN2022CRV	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=12		Pattern 1, Exps 1-1 in SN2022crv - 01 (02) (1)	800 Secs (2310 Secs) *[==>770.0 Secs (Pattern 1)]* *[==>770.0 Secs (Pattern 2)]* *[==>770.0 Secs (Pattern 3)]*	***[1]***
2	F438W - 2	(2) SN2022CRV	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=12		Pattern 1, Exps 2-2 in SN2022crv - 01 (02) (1)	800 Secs (2361 Secs) *[==>787.0 Secs (Pattern 1)]* *[==>787.0 Secs (Pattern 2)]* *[==>787.0 Secs (Pattern 3)]*	***[2]***
3	F606W - 1	(2) SN2022CRV	WFC3/UVIS, ACCUM, UVIS2	F606W			Pattern 1, Exps 3-3 in SN2022crv - 01 (02) (1)	800 Secs (2376 Secs) *[==>792.0 Secs (Pattern 1)]* *[==>792.0 Secs (Pattern 2)]* *[==>792.0 Secs (Pattern 3)]*	***[3]***
4	F606W - 2	(2) SN2022CRV	WFC3/UVIS, ACCUM, UVIS2	F606W			Pattern 1, Exps 4-4 in SN2022crv - 01 (02) (1)	800 Secs (2376 Secs) *[==>792.0 Secs (Pattern 1)]* *[==>792.0 Secs (Pattern 2)]* *[==>792.0 Secs (Pattern 3)]*	***[4]***

Orbit Structure






Orbit 3
Server Version: 20240604
GS Reacq
Exp. 3
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Exp. 3
Exp. 3
**** ORBITAL VISIBILITY OVERRUN = 8
Occultation
Overhead
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec


Orbit 4
Server Version: 20240604
GS Reacq
Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
**** ORBITAL VISIBILITY OVERRUN = 8
Occultation
Exp. 4
Exp. 4
Exp. 4
Overhead
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec