15503 - Imaging the transition of SN 1987A to SNR 1987A

Cycle: 26, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Prof. Claes Fransson (PI) (ESA Member) (Contact)	**Stockholm University**	**claes@astro.su.se**
Dr. Josefin Larsson (CoI) (ESA Member)	Royal Institute of Technology	josla@kth.se
Prof. Robert P. Kirshner (CoI) (AdminUSPI)	Harvard University	kirshner@cfa.harvard.edu
Mr. Peter Challis (CoI)	Harvard University	pchallis@cfa.harvard.edu
Dr. Roger A. Chevalier (CoI)	The University of Virginia	rac5x@virginia.edu
Dr. Kevin France (CoI)	University of Colorado at Boulder	kevin.france@colorado.edu
Prof. Peter Lundqvist (CoI) (ESA Member)	Stockholm University	peter@astro.su.se
Dr. Jason Spyromilio (CoI) (ESA Member)	European Southern Observatory - Germany	jspyromi@eso.org
Dr. Richard McCray (CoI)	University of Colorado at Boulder	dick@jila.colorado.edu
Prof. Kevin Heng (CoI) (ESA Member)	University of Bern	kevin.heng@csh.unibe.ch
Dr. J. Craig Wheeler (CoI)	University of Texas at Austin	wheel@astro.as.utexas.edu
Dr. Stephen S. Lawrence (CoI)	Hofstra University	stephen.lawrence@hofstra.edu
Dr. Jesper Sollerman (CoI) (ESA Member)	Stockholm University	jesper@astro.su.se
Dr. Nicholas B. Suntzeff (CoI)	Texas A & M University	suntzeff@physics.tamu.edu
Mr. Dennis Alp (CoI) (ESA Member)	Royal Institute of Technology	dalp@kth.se
Dr. Seppo Mattila (CoI) (ESA Member)	University of Turku	seppo.mattila@utu.fi
Dr. George Sonneborn (CoI)	NASA Goddard Space Flight Center	george.sonneborn@nasa.gov
Ms. Katia Migotto (CoI) (ESA Member)	Stockholm University	katia.migotto@astro.su.se
Dr. Bruno Leibundgut (CoI) (ESA Member)	European Southern Observatory - Germany	bleibund@eso.org

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
10	(1) SN-1987A	WFC3/UVIS	1	09-Aug-2018 11:00:55.0	yes
11	(1) SN-1987A	WFC3/UVIS	1	09-Aug-2018 11:00:56.0	yes

2 Total Orbits Used

ABSTRACT

SN 1987A is the great supernova (SN) of the HST era. An unbroken string of observations is the essential tool for detecting change and establishing a uniform legacy archive. Previous imaging has shown that the SN ejecta has changed from being powered by radioactive 44Ti up to day 5000, to being powered by the X-rays from the ring collision. This is seen both in the light curve and the rapidly changing morphology of the ejecta. As the X-rays penetrate further in we expect the metal rich core to also become illuminated. As the ejecta expand the dust in the center may become transparent and our limits on a compact object will become stronger, or yield a detection. Also the circumstellar ring surrounding the SN is undergoing a dramatic change. After a rapid increase, the flux reached a maximum around day 8000 and is now decaying rapidly. This marks the final destruction of the ring and we estimate that by 2025 it will be dissolved. At the same time, diffuse emission and new hot spots outside the inner ring are becoming visible, providing a tool to study the unknown circumstellar environment outside the ring.

Imaging in both narrow and broad bands allow us to follow these developments. The HST observations have a unique blend of photometric fidelity and angular resolution that makes them the indispensable partner to ongoing ground-based, X-ray and sub-mm ALMA observations, providing the morphology of both the inner metal rich core and the H-rich envelope. They will also be a necessary complement to our approved STIS and COS observations and by 2019 also of the JWST GTO observations. This is a long term study: given the rapid change we see, sampling every year is necessary.

OBSERVING DESCRIPTION

The WFC3/UVIS observations using filters F438W, F625W, F502N and F657N connect with our earlier observations at similar, or better S/N ratio through drizzled observations. As described above, these new images will allow us to follow the light curve, the morphology of the ejecta, the ring emission as well as new spots and diffuse gas outside the ring. Broad band images: We request imaging with F438W and F625W in all three years. To obtain a similar quality as our previous observations we need half an orbit per filter. This is our request for F438W all three years and for F625W in year one and year three. In year two, we request a significantly deeper observation of 1.5 orbits for F625W. This observation will allow us to probe

the faintest structures in the ejecta, ring and reverse shock. Such a deep observation also offers the possibility of detecting previously unseen emission components. The total request for the broad filters is thus 1+2+1=4 orbits.

Narrow band images: We request imaging in F502N and F657N in year one and year three only. To obtain similar quality as our previous observations we need two orbits for F502N and one orbit for F657N.

Visit

Proposal 15503, Visit 10, implementation Thu Aug 09 15:00:57 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 01-JUN-2019:00:00:00 AND 30-AUG-2019:00:00:00; SEQ 10,11 WITHIN 14 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1-2)

Fixed Targets

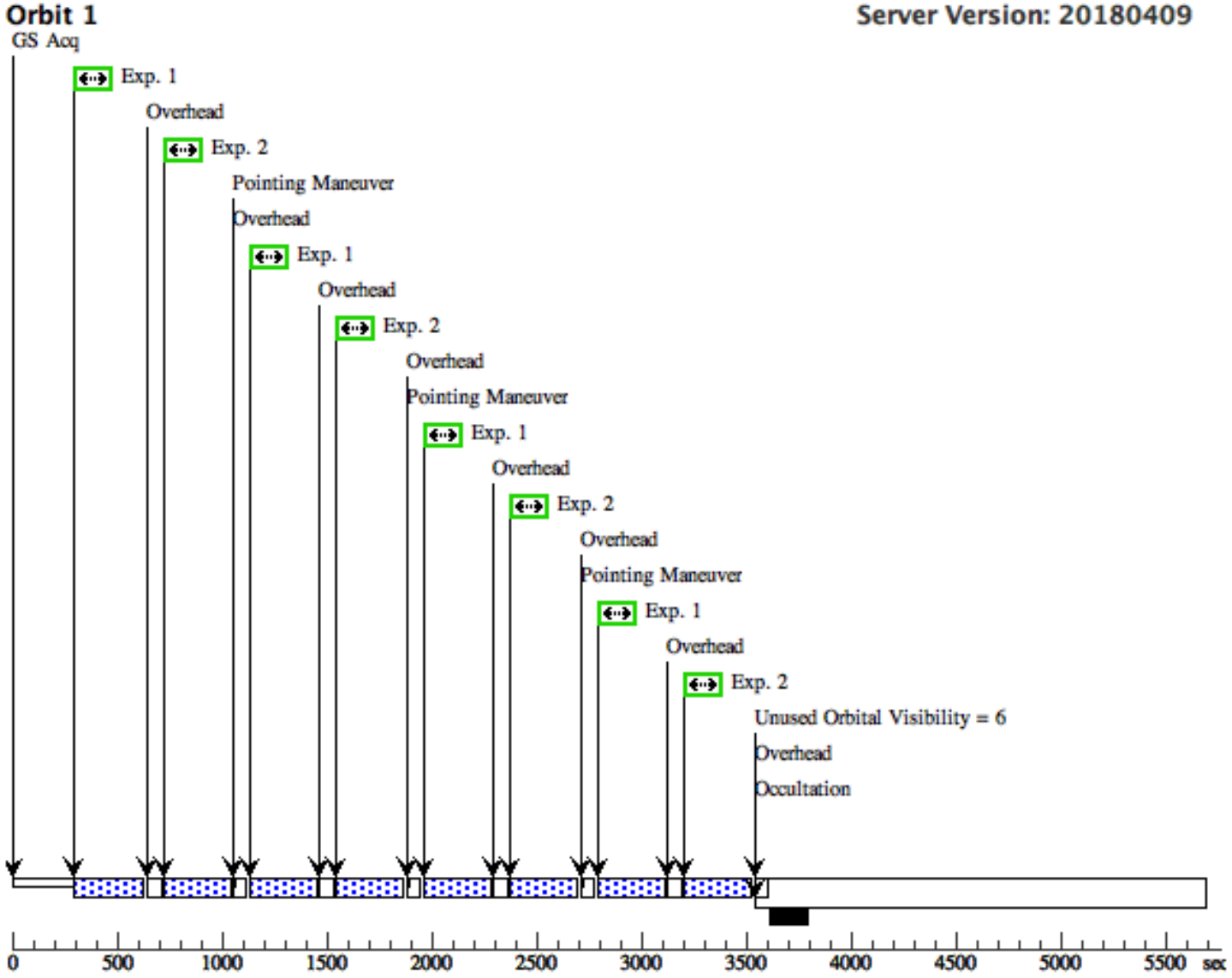
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-1987A	RA: 05 35 28.1000 (83.8670833d) Dec: -69 16 11.07 (-69.26974d) Equinox: J2000		V=23.0	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
frpk our astrometric STIS image
5:35:28.107 -69:16:11.050 fk5 514 503 142.747
Category=EXT-STAR
Description=[SUPERNOVA, SUPERNOVA TYPE II]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SN-1987A	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F438W	FLASH=10		Pattern 1, Exps 1-2 in Visit 10 (1)	300 Secs (1200 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) SN-1987A	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F625W	FLASH=5		Pattern 1, Exps 1-2 in Visit 10 (1)	300 Secs (1200 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 15503, Visit 11, implementation Thu Aug 09 15:00:57 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 01-JUN-2019:00:00:00 AND 30-AUG-2019:00:00:00

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Category=EXT-STAR
Description=[SUPERNOVA, SUPERNOVA TYPE II]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SN-1987A	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F657N	FLASH=12		Pattern 1, Exps 1-1 in Visit 11 (1)	720 Secs (2880 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure