18024 - Untangling the stellar content of the NGC 6822 Hubble regions with the unique WFC3/IR filters

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NGC-6822-HUBBLE-V	WFC3/IR	1	04-Dec-2025 11:00:15.0	yes
02	(2) NGC-6822-HUBBLE-X	WFC3/IR	1	04-Dec-2025 11:00:16.0	yes
03	(3) NGC-6822-HUBBLE-IV	WFC3/IR	1	04-Dec-2025 11:00:17.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(4) NGC-6822-HUBBLE-I-III	WFC3/IR	1	04-Dec-2025 11:00:18.0	yes

4 Total Orbits Used

ABSTRACT

With the unique WFC3/IR medium band filters we will image massive star-formation regions (Hubble I/III, IV, V, X) in the low-metallicity dwarf galaxy NGC 6822. These regions, spanning various evolutionary stages, provide a temporal sequence of star formation under conditions analogous to the early Universe. This high-resolution HST data will be combined with existing JWST and ALMA observations to study star formation, stellar feedback, and dust evolution in this system. A central challenge is distinguishing young stellar objects in the Hubble regions from the significant population of evolved stars in the NGC 6822 field, which overlap in colour space. The unique WFC3/IR filters, sensitive to H2O absorption in M-type AGB stars and the CN+C2 features in Carbon stars, break this degeneracy. It will even determine AGB star chemistries from which we can quantify their dust production.

Given the significant roles of evolved stars in the chemical enrichment of the interstellar medium (ISM) and young massive stars in shaping their environments through intense radiative feedback, jets and winds, detailed observations of the interplay of these populations in nearby systems where CO cores and atomic gas have also been resolved on 1--3 pc scales is essential. By characterizing the stars physical properties via SED modeling and their effects on the HII regions in NGC 6822, we can refine our understanding of massive star formation and the dust lifecycle in chemically unenriched environments.

OBSERVING DESCRIPTION

We are imaging four metal-poor star-forming (SF) regions (Hubble I/III, Hubble IV, Hubble V, and Hubble X) with WFC3/IR medium band filters . Our observations aim to conduct a census of massive young stellar objects (YSOs) and asymptotic giant branch (AGB) stars, and characterize their properties with spectral energy distribution (SED) model fitting in effort to better understand star formation and dust production mechanics, as well as massive star cluster evolution, in an extragalactic system which mimics the metal-poor nature of early-universe SF galaxies.

Filters:

To take full advantage of the CN+C2 and water features near 1.4 microns, we require observations with F127M, F139M, and F153M. All three filters are necessary, since combinations with the broad-band optical, near-IR, and IR filters do not successfully isolate the carbon stars.

Required exposure times and photometric depth:

To detect all AGB stars, we must achieve full photometric completeness at the tip of the red giant branch (TRGB).
The orbit time for our target is 52 min, so we can achieve the necessary photometric depth within a single orbit (as demonstrated by Boyer et al. 2013).
This allows for total exposure times of 700-800s in each filter, resulting in S/N > 10 in F127M for Ko=17.5mag, using a Bruzual template for an M6III star, simulating a TRGB star in the galaxy.

Dithering Strategy:
Dithering diminishes errors associated with where a source is placed on a pixel, undersampling of the WFC3/IR channel, and image artifacts such as cosmic rays.
We choose a 4-point dithering strategy to acheive Nyquist sampling of the PSF & to simultaneously allow us to fit the three selected filters into a single orbit.
We have entered the dither offsets manually into the target offset entries following the WFC3 handbook WFC3-IR-DITHER-BOX-MIN values from table C.3

Parallels:
There are no parallel observations for this program.

Scheduling Constraints:
There are no scheduling constrains for this program.

Visit

Proposal 18024, NGC-6822-HUBBLE-V (01), implementation Thu Dec 04 16:00:18 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: -All three medium-band filters (F127M, F139M, F153M), in field.
-~800s exposures per filter, using the STEP200 timing sequences. NSAMP = 8
-Using a 4pt dither for F127M, F139M and F153M.
-Exposures arranged to avoid latency due to buffer dump.
-Total of one orbit

Fixed Targets

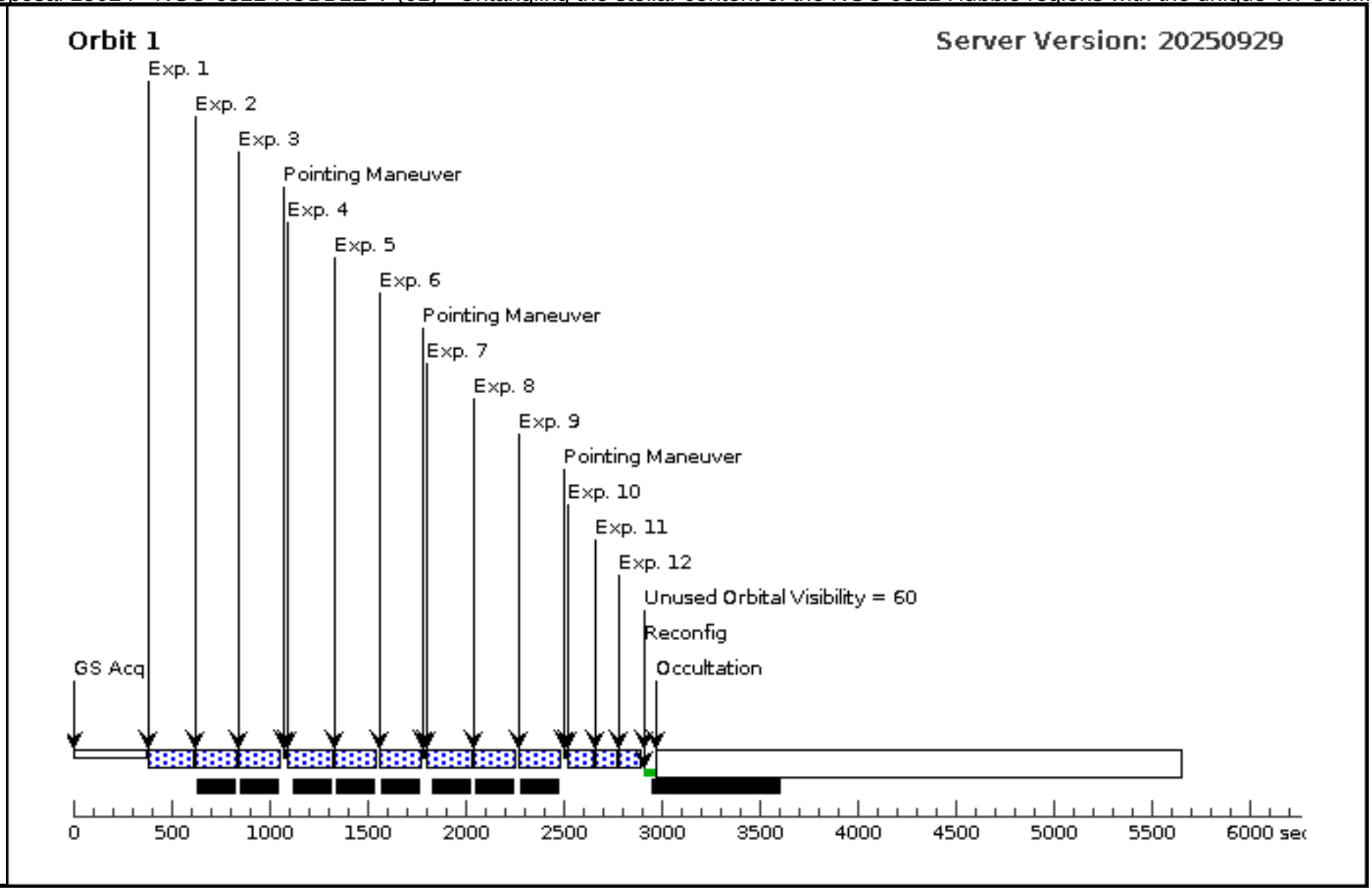
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-6822-HUBBLE-V	RA: 19 44 52.8960 (296.2204000d) Dec: -14 43 4.80 (-14.71800d) Equinox: J2000		V=8.1	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[STAR FORMING REGION]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F139M-dither1	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
2	F127M-dither1	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
3	F153M-dither1	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
4	F127M-dither2	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
5	F139M-dither2	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
6	F153M-dither2	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
7	F127M-dither3	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
8	F139M-dither3	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
9	F153M-dither3	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs)	
								[==>]	***[1]***
10	F127M-dither4	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs)	
								[==>]	***[1]***
11	F139M-dither4	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs)	
								[==>]	***[1]***
12	F153M-dither4	(1) NGC-6822-HUBBLE-V	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs)	
								[==>]	***[1]***

Orbit Structure



Visit

Proposal 18024, NGC-6822-HUBBLE-X (02), implementation Thu Dec 04 16:00:18 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: -All three medium-band filters (F127M, F139M, F153M), in field.
-~800s exposures per filter, using the STEP200 timing sequences. NSAMP = 8
-Using a 4pt dither for F127M, F139M and F153M.
-Exposures arranged to avoid latency due to buffer dump.
-Total of one orbit

Fixed Targets

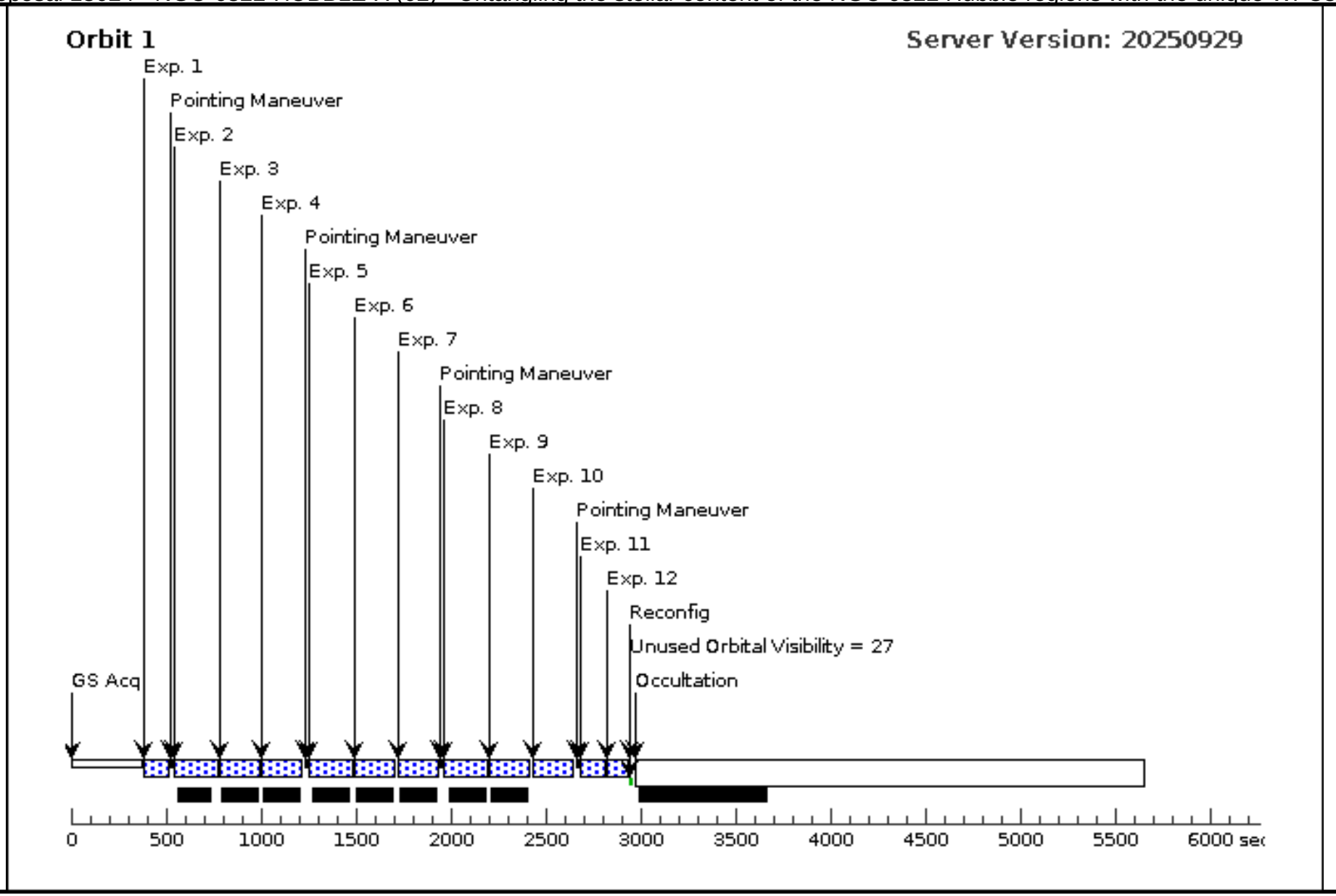
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-6822-HUBBLE-X	RA: 19 45 5.3520 (296.2723000d) Dec: -14 43 17.76 (-14.72160d) Equinox: J2000		V=8.1	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[STAR FORMING REGION]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither4	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	*[1]*
2	F127M-dither1	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
3	F139M-dither1	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
4	F153M-dither1	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
5	F127M-dither2	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
6	F139M-dither2	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
7	F153M-dither2	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
8	F127M-dither3	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
9	F139M-dither3	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
10	F153M-dither3	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	*[1]*
11	F139M-dither4	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	*[1]*
12	F153M-dither4	(2) NGC-6822-HUBBLE-X	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 18024, NGC-6822-HUBBLE-IV (03), implementation Thu Dec 04 16:00:18 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: -All three medium-band filters (F127M, F139M, F153M), in field.
-~800s exposures per filter, using the STEP200 timing sequences. NSAMP = 8
-Using a 4pt dither for F127M, F139M and F153M.
-Exposures arranged to avoid latency due to buffer dump.
-Total of one orbit

Fixed Targets

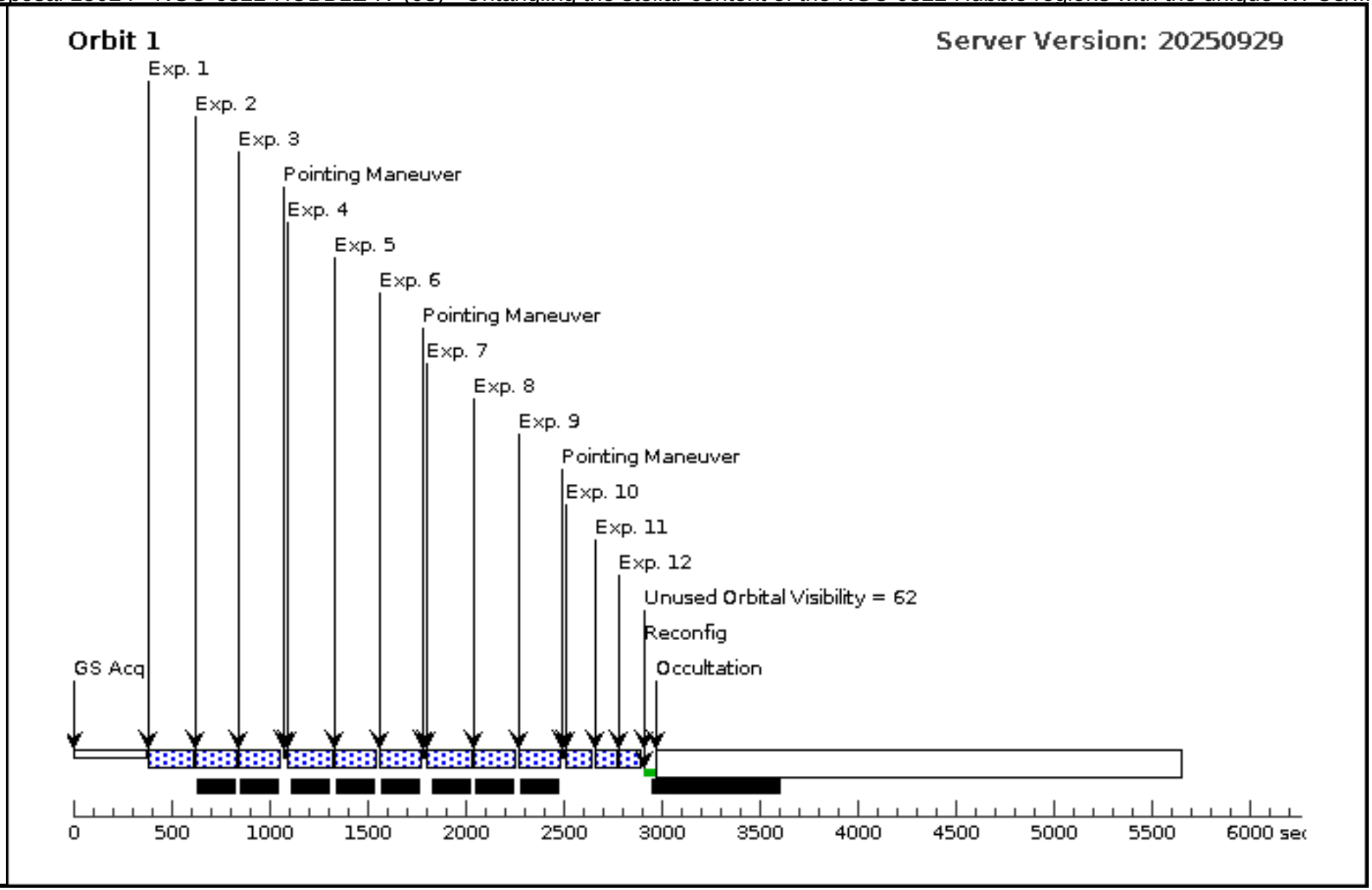
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	NGC-6822-HUBBLE-IV	RA: 19 44 49.8240 (296.2076000d) Dec: -14 52 45.48 (-14.87930d) Equinox: J2000		V=8.1	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[STAR FORMING REGION]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither1	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
2	F139M-dither1	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
3	F153M-dither1	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
4	F127M-dither2	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
5	F139M-dither2	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
6	F153M-dither2	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
7	F127M-dither3	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
8	F139M-dither3	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
9	F153M-dither3	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
10	F127M-dither4	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	 ***[1]***
11	F139M-dither4	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	 ***[1]***
12	F153M-dither4	(3) NGC-6822-HUBBLE-IV	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	 ***[1]***

Orbit Structure



Visit

Proposal 18024, NGC-6822-HUBBLE-1-III (05) Thu Dec 04 16:00:19 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: (none)

Comments: -All three medium-band filters (F127M, F139M, F153M), in field.
-~800s exposures per filter, using the STEP200 timing sequences. NSAMP = 8
-Using a 4pt dither for F127M, F139M and F153M.
-Exposures arranged to avoid latency due to buffer dump.
-Total of one orbit

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	NGC-6822-HUBBLE-I-III	RA: 19 44 33.5700 (296.1398750d) Dec: -14 42 15.20 (-14.70422d) Equinox: J2000		V=8.1	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[STAR FORMING REGION]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither1	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
2	F139M-dither1	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
3	F153M-dither1	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
4	F127M-dither2	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
5	F139M-dither2	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
6	F153M-dither2	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
7	F127M-dither3	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
8	F139M-dither3	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
9	F153M-dither3	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0		199.231 Secs (199.231 Secs) *[==>]*	 ***[1]***
10	F127M-dither4	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	 ***[1]***
11	F139M-dither4	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	 ***[1]***
12	F153M-dither4	(4) NGC-6822-HUBBLE-I-III	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=7; SAMP-SEQ=STEP200	POS TARG 0.339,0.485		99.230677 Secs (99.231 Secs) *[==>]*	 ***[1]***

Orbit Structure