17963 - WFC3 IR Time-Dependent Sensitivity: Clusters

Cycle: 33, Proposal Category: CAL/WFC3

(Availability Mode: RESTRICTED)

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?*
01	(1) 47TUC DARK	WFC3/IR	1	03-Mar-2026 10:00:13.0	yes
02	(2) M-4	WFC3/IR	1	03-Mar-2026 10:00:14.0	yes
03	(1) 47TUC DARK	WFC3/IR	1	03-Mar-2026 10:00:15.0	yes
A3	(1) 47TUC DARK	WFC3/IR	1	03-Mar-2026 10:00:15.0	yes

4 Total Orbits Used

ABSTRACT

A variety targets/techniques result in range of IR sensitivity loss estimates. For example, the IR grism flux monitor suggests losses of 0.12+/-0.01%/yr (G102) and 0.06+/-0.01%/yr(G141). The IR photometric monitor, however, shows no strong evidence of sensitivity loss in the IR imaging filters, but the repeatability is limited by systematic errors of +/-1%. Scanned images of M35 show marginal losses 0.065+/-0.01%/yr in F140W, but these data have a large scatter which may be related to detector preconditioning. Cluster observations allow for the measurement of many more stars.

We continue the monitoring of the sensitivity of the WFC3/IR channel using relative photometry of the clusters M-4 and 47 Tuc, as performed in HST programs 16864, 16512, 17260, 17363 and 17683. This program serves to complement the sensitivity change slopes from the M35 scans, G102/G141 measurements, and standard star photometric monitoring.

We observe the same targets as 17683 (M4 and 47 Tuc external fields) and use similar observation strategies, though some exposures were necessarily shortened due to the reduced gyro mode effects on orbital visibility length. As M4 was imaged twice in the previous cycle, we swap to observing 47 Tuc twice and M4 once to keep a roughly balanced cadence.

These observations will help constrain the time dependent sensitivity change through 2025, as well as provide a rich dataset for examining other detector behaviors. Recent analysis of these data suggest losses of 0.12+/-0.01%/yr in F110W (M4) and 0.05+/-0.05%/yr in F160W (NGC104)

OBSERVING DESCRIPTION

These observations use a very similar observing strategy as seen in 17863. For the M4 visits, the two F110W exposures remain the same, however the second of the F160W exposures was shortened to fit within the shorter orbit. For 47 Tuc the dark exposure in the middle of the visit was shortened from NSAMP = 8 to NSAMP=7 to fit within the shortened orbit.

The M4 visits consist of 4 exposures, starting with two F110W and ending with two F160W exposures. The F110W exposures will use the SPARS50 sample sequence with 14 samples. The F160W exposures will only use 13 and then 9 samples, due to the shorter orbital length due to RGM After each exposure POSTARGS of 2.5" will be applied, to mitigate self persistence.

The 47 Tuc observations match the observing strategy from 17863 of alternating F160W exposures of the cluster with dark frames. Though the dark frames are unecessary for this monitoring, we keep them to specifically keep consistent detector conditions, to eliminate systematics due to observation strategy differences. However, in this cycle the penultimate dark is further shortened, to keep the same exposure times for the external images, so there is slight modification to the strategy overall.

Visit

Proposal 17963, 47Tuc Rolled (01), scheduling Tue Mar 03 15:00:16 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 310D TO 318 D; BETWEEN 01-JUL-2026:00:00:00 AND 15-AUG-2026:00:00:00

Fixed Targets

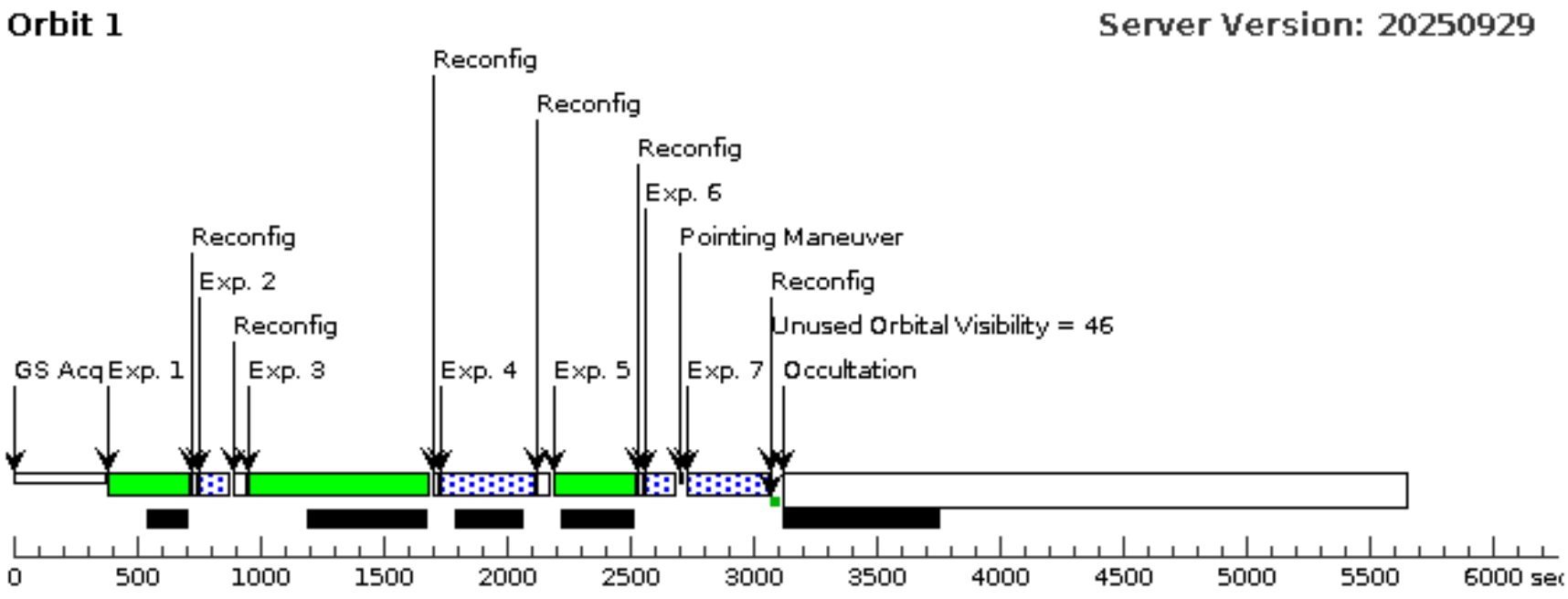
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	47TUC Alt Name1: NGC104	RA: 00 22 27.8446 (5.6160192d) Dec: -72 04 4.75 (-72.06799d) Equinox: J2000		V=22.0	Reference Frame: ICRS

Comments:
Category=CALIBRATION
Description=[DETECTOR LINEARITY TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS25; NSAMP=13	GS ACQ SCENARIO BASE1O3		302.938471 Secs (302.938 Secs) *[==>]*	***[1]***
2	Short	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS10; NSAMP=10			92.940958 Secs (92.941 Secs) *[==>]*	***[1]***
3	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS50; NSAMP=15			702.938605 Secs (702.939 Secs) *[==>]*	***[1]***
4	Long	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS25; NSAMP=15			352.939501 Secs (352.94 Secs) *[==>]*	***[1]***
Comments: Designed to just saturate V=20 stars.									
5	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS50; NSAMP=7			302.934997 Secs (302.935 Secs) *[==>]*	***[1]***
6	Short	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS10; NSAMP=10			92.940958 Secs (92.941 Secs) *[==>]*	***[1]***
7	Extra External	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS25; NSAMP=13	POS TARG 4,4		302.938471 Secs (302.938 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 17963, M-4 (02), completed Tue Mar 03 15:00:16 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 280D TO 282 D; BETWEEN 01-JAN-2026:00:00:00 AND 01-APR-2026:00:00:00

Fixed Targets

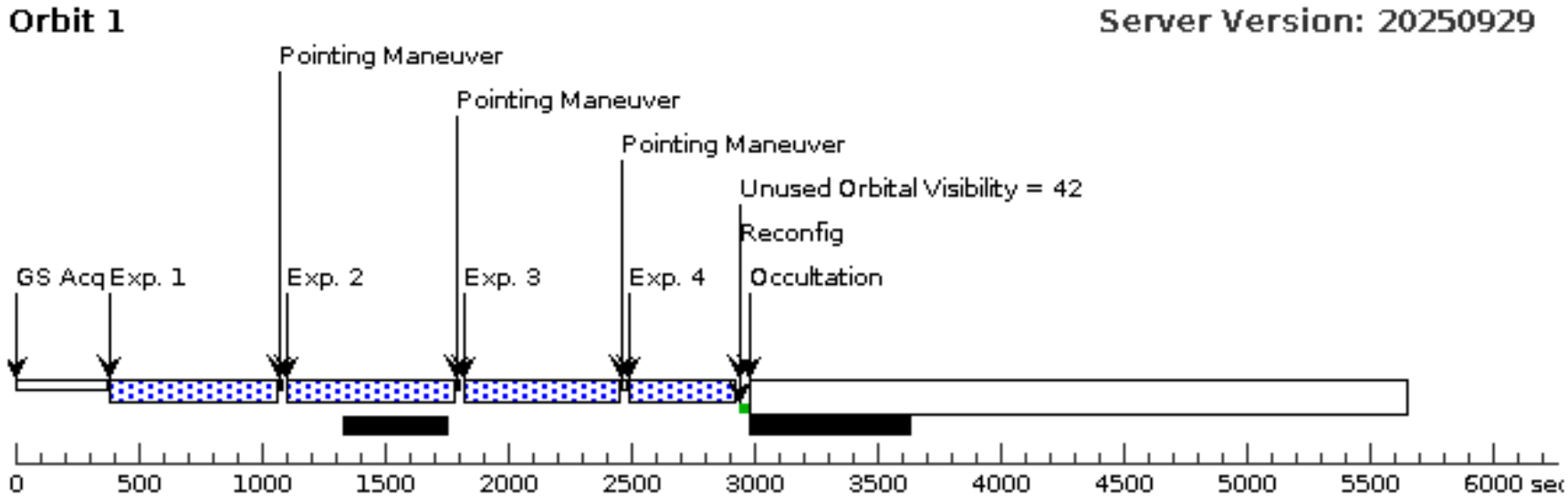
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	M-4	RA: 16 23 41.7160 (245.9238167d) Dec: -26 30 19.01 (-26.50528d) Equinox: J2000		V=5.9	Reference Frame: ICRS

Comments:
Category=STELLAR CLUSTER
Description=[GLOBULAR CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) M-4	WFC3/IR, MULTIACCUM, IR-UVIS-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -5,5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
2		(2) M-4	WFC3/IR, MULTIACCUM, IR-UVIS-FIX	F110W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -2.5,2.5		652.938154 Secs (652.938 Secs) *[==>]*	*[1]*
3		(2) M-4	WFC3/IR, MULTIACCUM, IR-UVIS-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=13	POS TARG 0,0		602.937703 Secs (602.938 Secs) *[==>]*	*[1]*
4		(2) M-4	WFC3/IR, MULTIACCUM, IR-UVIS-FIX	F160W	SAMP-SEQ=SPARS50; NSAMP=9	POS TARG -7.5,7.5		402.935899 Secs (402.936 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17963, 47Tuc (03), failed Tue Mar 03 15:00:16 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 113D TO 130 D; BETWEEN 01-JAN-2026:00:00:00 AND 01-MAR-2026:00:00:00

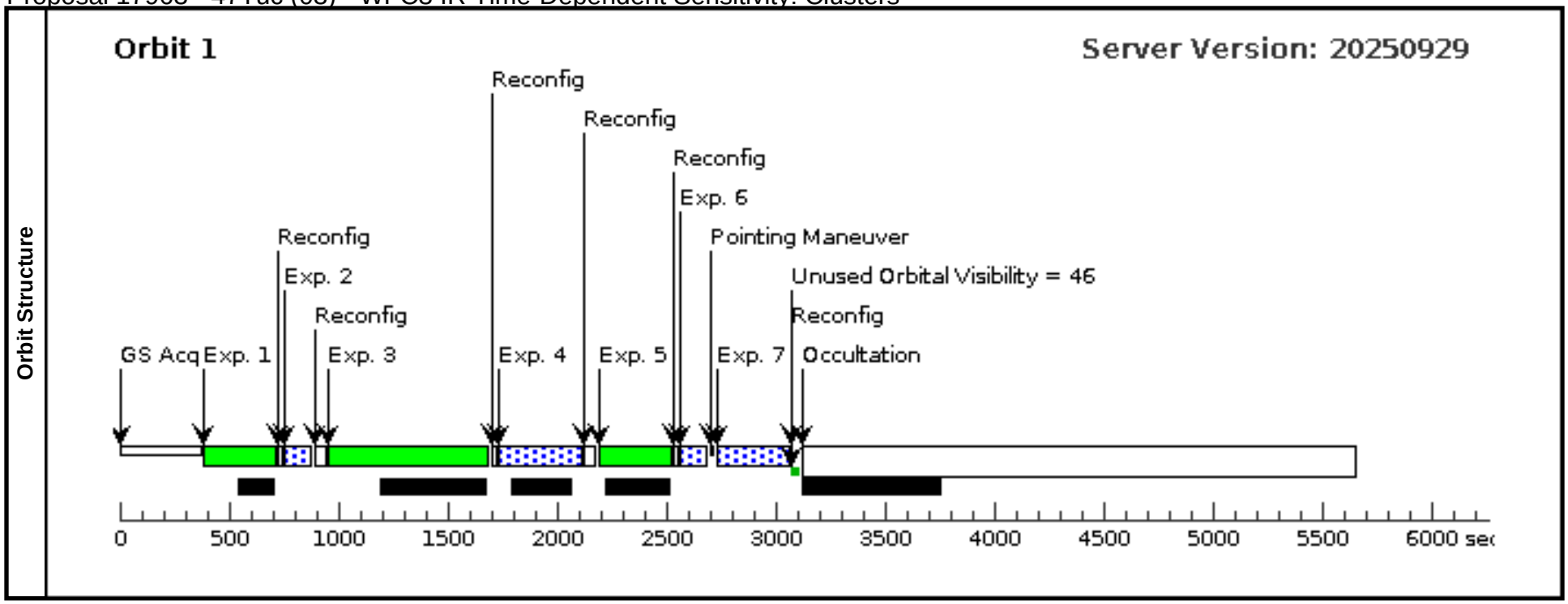
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	47TUC Alt Name1: NGC104	RA: 00 22 27.8446 (5.6160192d) Dec: -72 04 4.75 (-72.06799d) Equinox: J2000		V=22.0	Reference Frame: ICRS

Comments:
Category=CALIBRATION
Description=[DETECTOR LINEARITY TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS25; NSAMP=13	GS ACQ SCENARIO BASE1O3		302.938471 Secs (302.938 Secs) *[==>]*	***[1]***
2	Short	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS10; NSAMP=10			92.940958 Secs (92.941 Secs) *[==>]*	***[1]***
3	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS50; NSAMP=15			702.938605 Secs (702.939 Secs) *[==>]*	***[1]***
4	Long	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS25; NSAMP=15			352.939501 Secs (352.94 Secs) *[==>]*	***[1]***
Comments: Designed to just saturate V=20 stars.									
5	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS50; NSAMP=7			302.934997 Secs (302.935 Secs) *[==>]*	***[1]***
6	Short	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS10; NSAMP=10			92.940958 Secs (92.941 Secs) *[==>]*	***[1]***
7	Extra External	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS25; NSAMP=13	POS TARG 4,4		302.938471 Secs (302.938 Secs) *[==>]*	***[1]***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Orbit 1
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Reconfig
Reconfig
Reconfig
Exp. 6
Pointing Maneuver
Unused Orbital Visibility = 46
Reconfig
Occultation
Reconfig
Exp. 2
Reconfig
Exp. 3
GS Acq
Exp. 1
Exp. 4
Exp. 5
Exp. 7
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17963, 47Tuc (A3), implementation Tue Mar 03 15:00:16 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 203D TO 220 D; BETWEEN 01-JAN-2026:00:00:00 AND 01-MAY-2026:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	47TUC Alt Name1: NGC104	RA: 00 22 27.8446 (5.6160192d) Dec: -72 04 4.75 (-72.06799d) Equinox: J2000		V=22.0	Reference Frame: ICRS

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Description=[DETECTOR LINEARITY TEST]

Exposures

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1	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS25; NSAMP=13	GS ACQ SCENARIO ONEB1O3		302.938471 Secs (302.938 Secs) *[==>]*	***[1]***
2	Short	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS10; NSAMP=10			92.940958 Secs (92.941 Secs) *[==>]*	***[1]***
3	Dark	DARK	WFC3/IR, MULTIACCUM, IR	BLANK	SAMP-SEQ=SPARS50; NSAMP=15			702.938605 Secs (702.939 Secs) *[==>]*	***[1]***
4	Long	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS25; NSAMP=15			352.939501 Secs (352.94 Secs) *[==>]*	***[1]***
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7	Extra External	(1) 47TUC	WFC3/IR, MULTIACCUM, IR-FIX	F160W	SAMP-SEQ=SPARS25; NSAMP=13	POS TARG 4,4		302.938471 Secs (302.938 Secs) *[==>]*	***[1]***

Orbit Structure