15952 - A first measurement of the global AGB dust production in a metal-rich galaxy

Cycle: 27, Proposal Category: GO

(JWST Initative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Olivia Jones (PI) (Contact)	**United Kingdom Astronomy Technology Centre**	**olivia.jones@stfc.ac.uk**
Dr. Margaret Meixner (CoI) (AdminUSPI)	The Johns Hopkins University	meixner@stsci.edu
Dr. Martha L. Boyer (CoI)	Space Telescope Science Institute	mboyer@stsci.edu
Dr. Iain McDonald (CoI) (ESA Member)	Manchester University	mcdonald@jb.man.ac.uk
Dr. R. Michael Rich (CoI)	University of California - Los Angeles	rmr@astro.ucla.edu

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) M32-FIELD1	WFC3/IR	1	23-Jul-2019 18:06:52.0	yes
05	(2) M32-FIELD2	WFC3/IR	1	23-Jul-2019 18:06:54.0	yes
06	(3) M32-FIELD3	WFC3/IR	1	23-Jul-2019 18:06:56.0	yes
07	(4) M32-FIELD4	WFC3/IR	1	23-Jul-2019 18:06:57.0	yes

4 Total Orbits Used

ABSTRACT

Asymptotic Giant Branch (AGB) stars are significant contributors to the enrichment of the interstellar medium. Their total dust contribution relative to supernovae, and how it changes with metallicity, is less certain. This uncertainty is largely due to the poorly determined dust-production rates.

Using Spitzer, we identified 110 extreme AGB stars and >1500 candidate evolved stars within the Local Group dwarf elliptical galaxy M32. As M32 is an elliptical, metal-rich system, it provides a test environment similar to massive galaxies at high redshift. The unique medium-band filter set for HST WFC3/IR will identify and isolate the evolved stars in M32, and thereby overcome resolution limitations to constrain their spectral energy distributions. The HST medium-band filters are integral to distinguishing oxygen- from carbon-rich AGB stars, providing key constraints to the derived stellar parameters and decreasing the uncertainty in the dust production by an order of magnitude. With only 4 fields, we will confirm and characterise the majority of our AGB candidates, thereby calculating the global dust budget of our closest metal-rich elliptical galaxy. Comparison to complementary studies in metal-poor galaxies will provide a critical test of how metallicity influences evolved star dust production. These AGB stars are prime targets for follow-up spectroscopy with JWST to determine elemental abundances and the mineralogy of the ejected mass; the HST observations will provide the high-precision astrometry required for JWST.

OBSERVING DESCRIPTION

Using one orbit per pointing, we will observe four regions of M32 using WFC3/IR medium band filters to identify AGB stars.

We target four fields in M32 that overlap with Spitzer coverage. Our selected fields represent the best compromise between sampling the bulge of M32 at a point at which crowding should not be a factor versus minimizing the M31 background populations.

To isolate carbon stars from oxygen-rich AGB stars, we will use WFC3/IR with the F127M, F139M, and F153M medium-band filters.

We can achieve the necessary photometric depth in of 23 mag for a M6III star, with a S/N >7 for the F139M band in 850 seconds.
The S/N is even better in the F127M, and F153M filters, owing to a higher throughput.

We will use four IR dither positions for each filter to get Nyquist sampling of the PSF.
We will avoid saturation of bright sources by using the STEP ramp sequences with 5 reads per dither.

Visit

Proposal 15952, M32_Field1 (01) Tue Jul 23 22:06:58 GMT 2019

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

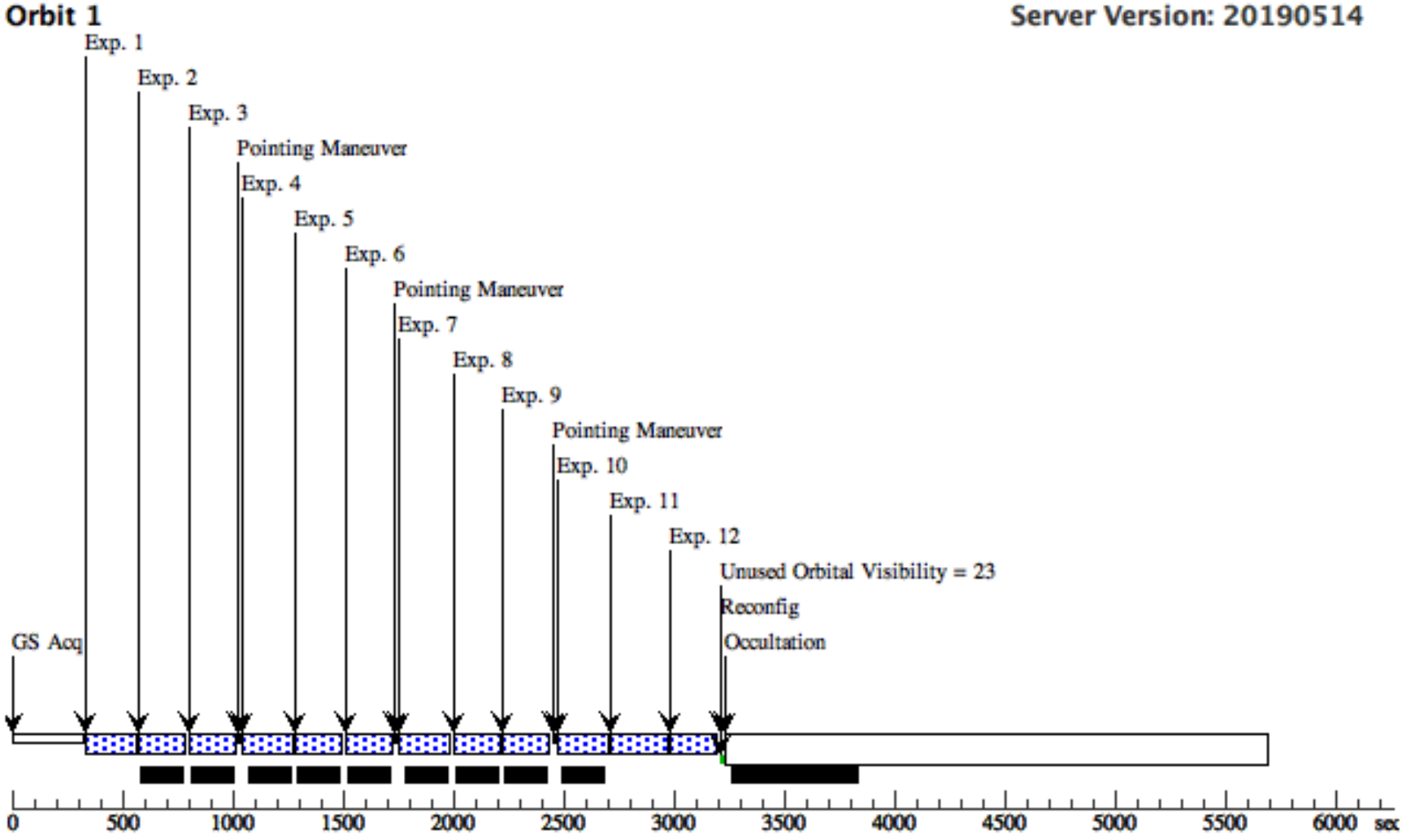
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M32-FIELD1	RA: 00 42 49.8440 (10.7076833d)		V=24.846	Reference Frame: SIMBAD
	Alt Name1: NGC0221	Dec: +40 53 12.47 (40.88680d)		16 < H mag < 21	
		Equinox: J2000			

Comments: This is a star field of M32, with a wide range of V-mags. The field is centered on a RR Lyr star ([FCT2012] V74, V=24.846 mag, I = 24.456 mag.) We are targeting all AGB stars in the field (H < 21 mag); these range from approximately F814W=18-23 mag.
Category=GALAXY
Description=[DWARF ELLIPTICAL, ELLIPTICAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither1	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
2	F139M-dither1	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
3	F153M-dither1	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
4	F127M-dither2	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
5	F139M-dither2	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
6	F153M-dither2	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
7	F127M-dither3	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
8	F139M-dither3	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
9	F153M-dither3	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
10	F127M-dither4	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
11	F139M-dither4	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=10; SAMP-SEQ=STEP50	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field1 (01)	249.23203 Secs (249.232 Secs) *[==>]*	*[1]*
12	F153M-dither4	(1) M32-FIELD1	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field1 (01)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15952, M32_Field2 (05) Tue Jul 23 22:06:58 GMT 2019

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

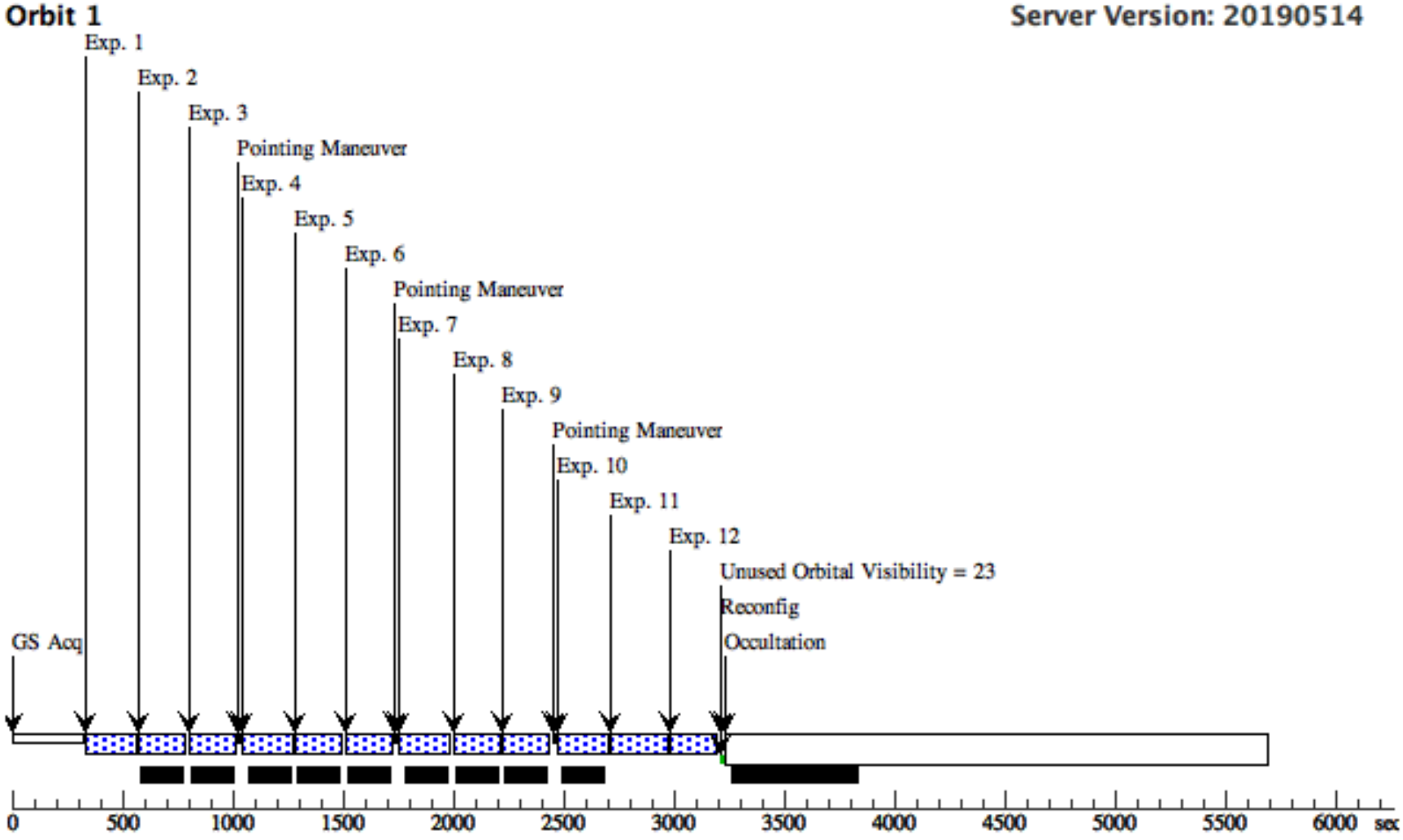
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	M32-FIELD2	RA: 00 42 33.8444 (10.6410183d)		V=(?)	Reference Frame: SIMBAD
	Alt Name1: NGC0221	Dec: +40 53 26.59 (40.89072d)		16 < H mag < 21	
		Equinox: J2000			

Comments: This is a star field of M32, with a wide range of V-mags. We are targeting all AGB stars in the field (H < 21 mag); these range from approximately F814W=18-23 mag.
Category=GALAXY
Description=[DWARF ELLIPTICAL, ELLIPTICAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither1	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
2	F139M-dither1	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
3	F153M-dither1	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
4	F127M-dither2	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
5	F139M-dither2	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
6	F153M-dither2	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
7	F127M-dither3	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
8	F139M-dither3	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
9	F153M-dither3	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
10	F127M-dither4	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
11	F139M-dither4	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=10; SAMP-SEQ=STEP50	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field2 (05)	249.23203 Secs (249.232 Secs) *[==>]*	*[1]*
12	F153M-dither4	(2) M32-FIELD2	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field2 (05)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15952, M32_Field3 (06) Tue Jul 23 22:06:58 GMT 2019

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

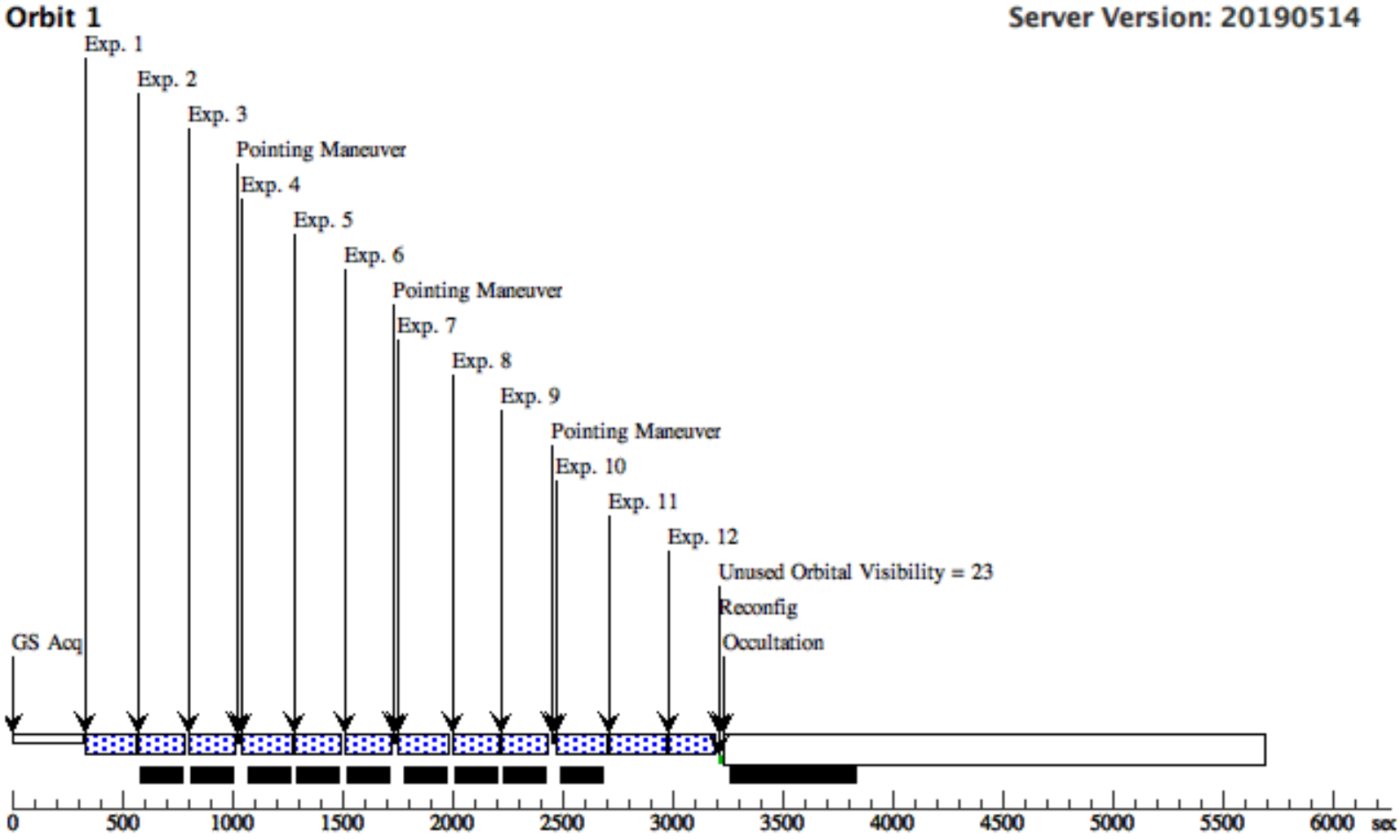
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	M32-FIELD3	RA: 00 42 33.8211 (10.6409212d)		V=(?)	Reference Frame: SIMBAD
	Alt Name1: NGC0221	Dec: +40 50 33.49 (40.84264d)		16 < H mag < 21	
		Equinox: J2000			

Comments: This is a star field of M32, with a wide range of V-mags. We are targeting all AGB stars in the field (H < 21 mag); these range from approximately F814W=18-23 mag.
Category=GALAXY
Description=[DWARF ELLIPTICAL, ELLIPTICAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither1	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
2	F139M-dither1	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
3	F153M-dither1	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
4	F127M-dither2	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
5	F139M-dither2	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
6	F153M-dither2	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
7	F127M-dither3	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
8	F139M-dither3	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
9	F153M-dither3	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
10	F127M-dither4	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
11	F139M-dither4	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=10; SAMP-SEQ=STEP50	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field3 (06)	249.23203 Secs (249.232 Secs) *[==>]*	*[1]*
12	F153M-dither4	(3) M32-FIELD3	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field3 (06)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 15952, M32_Field4 (07) Tue Jul 23 22:06:59 GMT 2019

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)	M32-FIELD4	RA: 00 42 49.6536 (10.7068900d)		V=(?)	Reference Frame: SIMBAD
	Alt Name1: NGC0221	Dec: +40 50 19.88 (40.83886d)		16 < H mag < 21	
		Equinox: J2000			

Comments: This is a star field of M32, with a wide range of V-mags. We are targeting all AGB stars in the field (H < 21 mag); these range from approximately F814W=18-23 mag.
Category=GALAXY
Description=[DWARF ELLIPTICAL, ELLIPTICAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F127M-dither1	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
2	F139M-dither1	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
3	F153M-dither1	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.542,0.182	Sequence 1-3 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
4	F127M-dither2	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
5	F139M-dither2	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
6	F153M-dither2	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG -0.203,0.303	Sequence 4-6 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
7	F127M-dither3	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
8	F139M-dither3	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
9	F153M-dither3	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0,0	Sequence 7-9 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
10	F127M-dither4	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F127M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*
11	F139M-dither4	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F139M	NSAMP=10; SAMP-SEQ=STEP50	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field4 (07)	249.23203 Secs (249.232 Secs) *[==>]*	*[1]*
12	F153M-dither4	(4) M32-FIELD4	WFC3/IR, MULTIACCUM, IR	F153M	NSAMP=8; SAMP-SEQ=STEP200	POS TARG 0.339,0.485	Sequence 10-12 Non-Int in M32_Field4 (07)	199.231 Secs (199.231 Secs) *[==>]*	*[1]*

Orbit Structure