15942 - Are the most massive stars in the Local Group truly single?

Cycle: 27, 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	(5) BAT99-116-MK-34 (6) A1-2	STIS/CCD	1	05-Mar-2020 12:00:29.0	yes
02	(5) BAT99-116-MK-34 (6) A1-2	STIS/CCD	1	05-Mar-2020 12:00:31.0	yes
03	(5) BAT99-116-MK-34 (6) A1-2	STIS/CCD	1	05-Mar-2020 12:00:32.0	yes
04	(5) BAT99-116-MK-34 (7) A3-C	STIS/CCD	1	05-Mar-2020 12:00:34.0	yes
05	(5) BAT99-116-MK-34 (7) A3-C	STIS/CCD	1	05-Mar-2020 12:00:35.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
06	(5) BAT99-116-MK-34 (7) A3-C	STIS/CCD	1	05-Mar-2020 12:00:37.0	yes

6 Total Orbits Used

ABSTRACT

The chemical evolution and integrated appearance of galaxies are governed by the most massive stars they host. With masses in excess of 50 solar masses (Ms), these stars dominate entire clusters in terms of their energy production. They are ideal progenitors of superluminous / pair-instability supernovae, gamma-ray bursts, and the massive black holes identified through recent gravitational-wave detections. While fundamental to many of our models and predictions, we do not know how massive a star can become. Masses derived from binary orbits generally do not exceed 130Ms. In contrast, a few supposedly-single stars residing in R136 in the Large Magellanic Cloud (LMC) were reported to have masses exceeding 300Ms, twice the canonical upper-mass limit. These mass estimates, however, rely on one risky assumption: that the stars are single. The incidence of multiplicity among the massive stars and the very high crowding in R136 shed doubts on the single-star assumption and warrant a careful investigation of these stars.

Several known binaries with components more massive than 100Ms have periods of the order of several months. And yet, the most massive stars in R136 have only been investigated on a time-base of a few weeks and with low-resolution spectroscopy. Here, we propose to collect 3 epochs of HST/STIS spectroscopy of the four most massive candidate stars in the Local Group - R136 a1, a2, a3, and c. With merely 6 orbits, and relying on data quality that is exclusive to the HST/STIS and vital for the study, our analysis will yield statistically-firm constraints on the multiplicity of these objects within a 90% detection limit up to a period of about three years.

OBSERVING DESCRIPTION

Goal: Secure 3 epochs of optical spectra (G430 M 3936, 4706, 4961) per target for BAT99 106, 108, 109, and 112 (R136 a3, a1, a2, and c).

We define two slit orientations:

1. A1-2: defined between R136 a1 and a2, centered at midpoint of R136 a1 and a2 (5:38:42.3978 -69:06:3.03 orient angle 109 / 289, position angle 64 / 249)
2. A3-C: defined between R136 a3 and c, centered at midpoint of R136 a3 and c (5:38:42.6166 -69:06:4.1785, orient angle 162.2 / 342.2, position

angle 116.8 / 296.8)

Due to crowding, slit positioning is relative to initial acquisition + peakup of the bright and isolated star BAT99 116 (Melnick 34, Brey 84).

Visit

Proposal 15942, A1-2,first epoch (01), implementation Thu Mar 05 17:00:37 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 80%; ORIENT 106D TO 106 D; ORIENT 286D TO 286 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.35546	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	BAT99-116-MK-34	RA: 05 38 44.2508 (84.6843783d)	Proper Motion RA: 1.874 mas/yr	V=13.09+/-0.01	Reference Frame: ICRS
		Dec: -69 06 6.01 (-69.10167d)	Proper Motion Dec: 0.753 mas/yr	B-V=0.25	
		Equinox: J2000	Epoch of Position: 2000		

*Comments: VEGAMAG Photometry from WFC3 F555W Early Release Obervation IB6WD6050 (De Marchi et al. 2011). ICRS astrometry of Melnick 34 from Gaia DR2 (Gaia DR2 4657685534828257792). Used for acquision due to severe crowding within R136 itself. Coordinates of Mk34 in *astrometricallty-uncorrecred" WFC image: '05 38 44.2416', '-69 06 5.930'*
Category=STAR
Description=[WOLF RAYET - WN]
Extended=NO

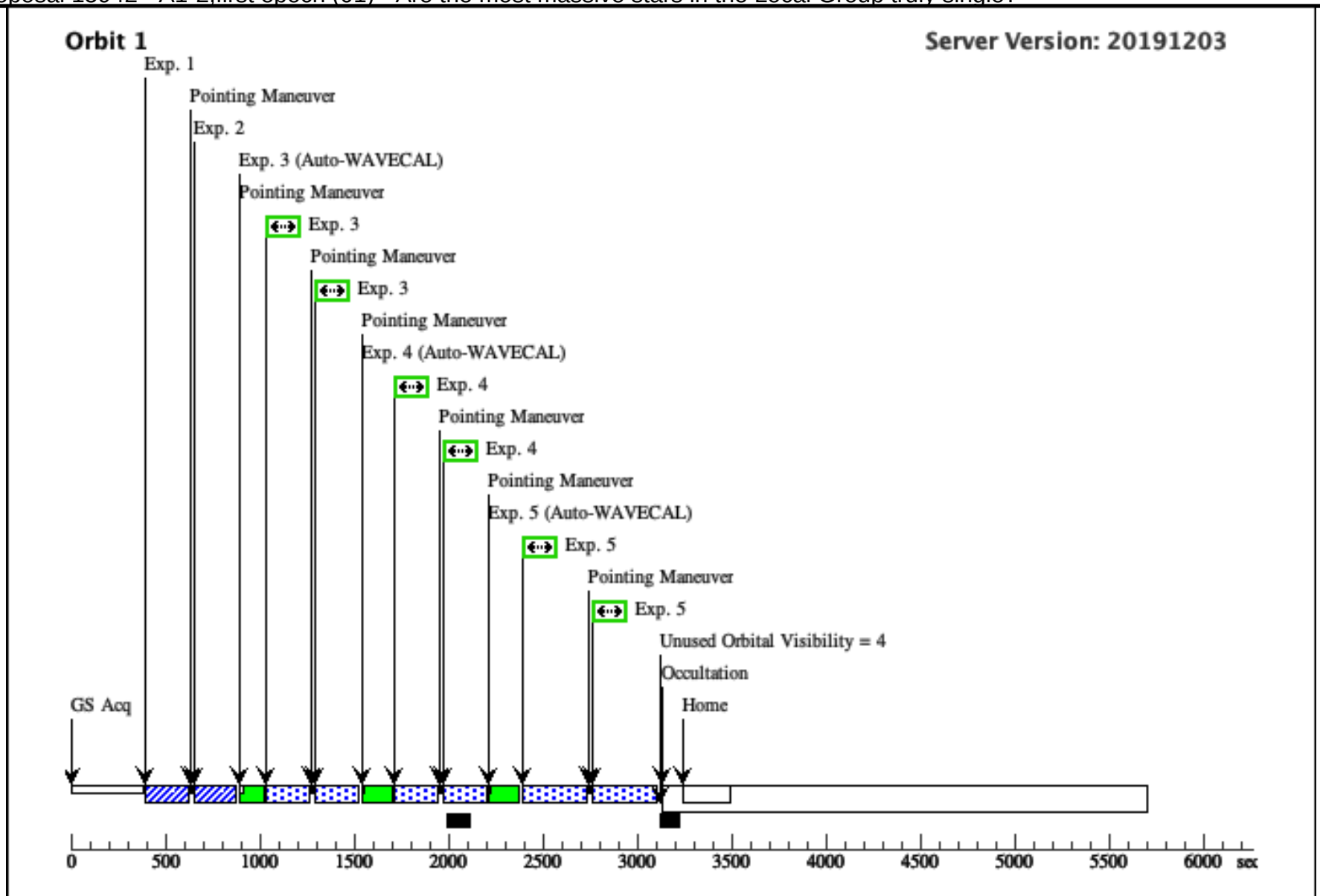
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	A1-2	Offset from BAT99-116-MK-34		V=12.28	Offset Position (A1-2)
		RA Offset: -1.86 Secs			
		Dec Offset: 2.97 Arcsec			

Comments: Center between R136a1 and R136a2 (BAT99 108 and 109), -1.862 sec (RA) and 2.975 (DEC) offset relative to Brey 84 (Melnick 34). Determined from F336W WFC3 image of R136 (de Marchi et al. 2011, Crowther et al. 2016).
Brightest cluster star in slit R136a1 (BAT99 108). VEGA V = 12.28
Category=STAR
Description=[WOLF RAYET - WN]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acq Mk 34 (197926)	(5) BAT99-116-MK-34	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	*[1]*
Comments: ETC predicts S/N=174 for 1 sec exposure through F28X50LP aperture for Melnick 34 (V=13.09).									
2	Acq-peak-Mk 34 (198019)	(5) BAT99-116-MK-34	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	*[1]*
Comments: Peakup on Melnick 34 for accurate positioning prior to offset. ETC predicts 58,000 e- from source in 0.5 sec exposure through 52x0.1 aperture for Melnick 34 (V=13.09), order of magnitude below saturation level.									
3	(1367600)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=NO		Pattern 4, Exps 3-3 in A1-2,first epoch (01) (4)	450 Secs (380 Secs) *[==>190.0 Secs (Pattern 1)]* *[==>190.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2: 1367278 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are somewhat shorter, S/N and other parameters are easily scalable.*									
4	(1367602)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=NO		Pattern 4, Exps 4-4 in A1-2,first epoch (01) (4)	450 Secs (380 Secs) *[==>190.0 Secs (Pattern 1)]* *[==>190.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2:1367279 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									
5	(1367603)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 4961 A	CR-SPLIT=NO		Pattern 4, Exps 5-5 in A1-2,first epoch (01) (4)	450 Secs (608 Secs) *[==>304.0 Secs (Pattern 1)]* *[==>304.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2: 1367422 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									

Orbit Structure



Visit

Proposal 15942, A1-2, second epoch (02), implementation Thu Mar 05 17:00:37 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 70%; ORIENT 106D TO 106 D; ORIENT 286D TO 286 D; AFTER 01 BY 50 D TO 230 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.35546	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	BAT99-116-MK-34	RA: 05 38 44.2508 (84.6843783d)	Proper Motion RA: 1.874 mas/yr	V=13.09+/-0.01	Reference Frame: ICRS
		Dec: -69 06 6.01 (-69.10167d)	Proper Motion Dec: 0.753 mas/yr	B-V=0.25	
		Equinox: J2000	Epoch of Position: 2000		

*Comments: VEGAMAG Photometry from WFC3 F555W Early Release Obervation IB6WD6050 (De Marchi et al. 2011). ICRS astrometry of Melnick 34 from Gaia DR2 (Gaia DR2 4657685534828257792). Used for acquision due to severe crowding within R136 itself. Coordinates of Mk34 in *astrometricallty-uncorrecred" WFC image: '05 38 44.2416', '-69 06 5.930'*
Category=STAR
Description=[WOLF RAYET - WN]
Extended=NO

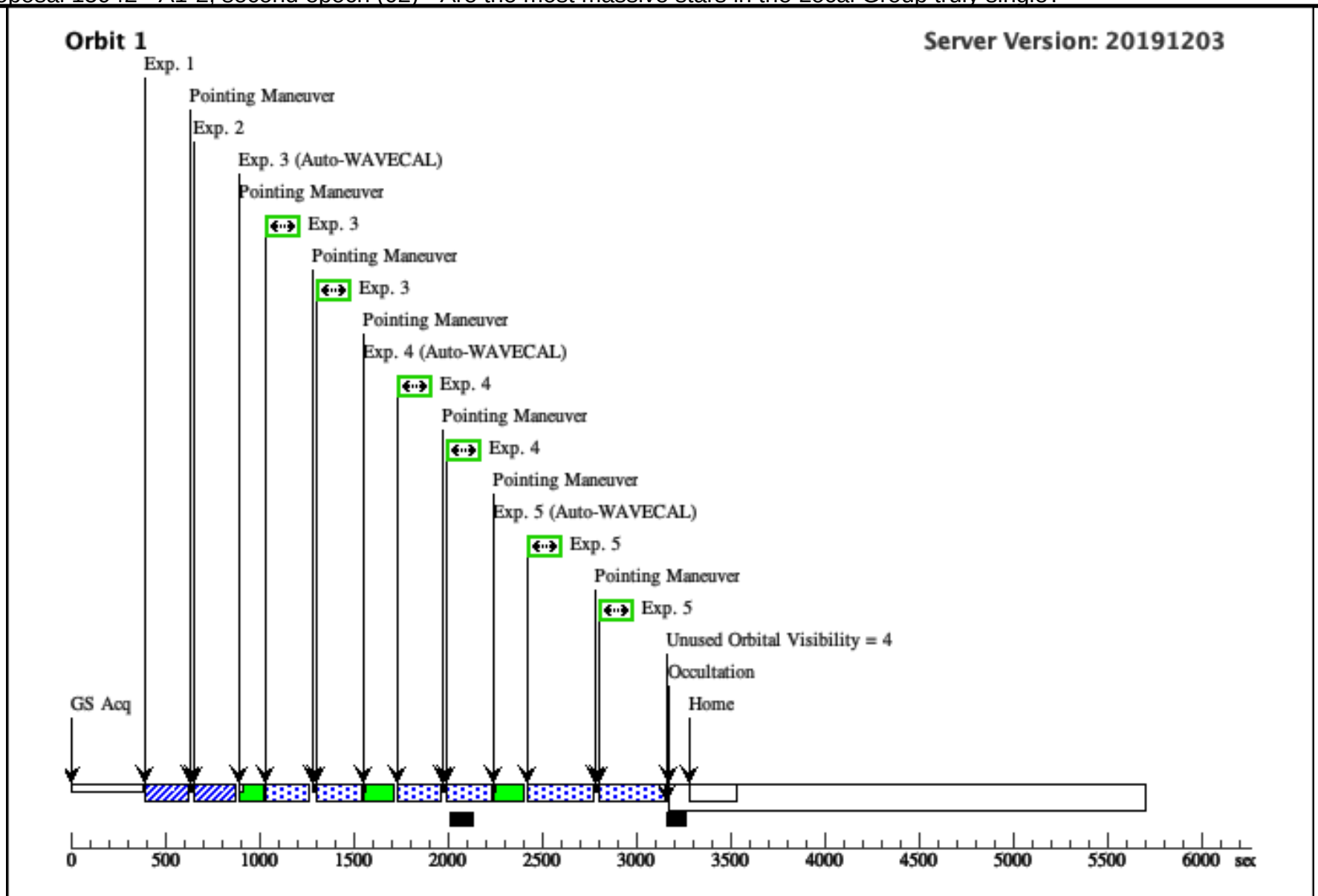
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	A1-2	Offset from BAT99-116-MK-34		V=12.28	Offset Position (A1-2)
		RA Offset: -1.86 Secs			
		Dec Offset: 2.97 Arcsec			

Comments: Center between R136a1 and R136a2 (BAT99 108 and 109), -1.862 sec (RA) and 2.975 (DEC) offset relative to Brey 84 (Melnick 34). Determined from F336W WFC3 image of R136 (de Marchi et al. 2011, Crowther et al. 2016).
Brightest cluster star in slit R136a1 (BAT99 108). VEGA V = 12.28
Category=STAR
Description=[WOLF RAYET - WN]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acq Mk 34 (197926)	(5) BAT99-116-MK-34	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	*[1]*
Comments: ETC predicts S/N=174 for 1 sec exposure through F28X50LP aperture for Melnick 34 (V=13.09).									
2	Acq-peak-Mk 34 (198019)	(5) BAT99-116-MK-34	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	*[1]*
Comments: Peakup on Melnick 34 for accurate positioning prior to offset. ETC predicts 58,000 e- from source in 0.5 sec exposure through 52x0.1 aperture for Melnick 34 (V=13.09), order of magnitude below saturation level.									
3	(1367600)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=NO		Pattern 4, Exps 3-3 in A1-2, second epoch (02) (4)	450 Secs (394 Secs) *[==>197.0 Secs (Pattern 1)]* *[==>197.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2: 1367278 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									
4	(1367602)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=NO		Pattern 4, Exps 4-4 in A1-2, second epoch (02) (4)	450 Secs (394 Secs) *[==>197.0 Secs (Pattern 1)]* *[==>197.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2:1367279 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									
5	(1367603)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 4961 A	CR-SPLIT=NO		Pattern 4, Exps 5-5 in A1-2, second epoch (02) (4)	450 Secs (622 Secs) *[==>311.0 Secs (Pattern 1)]* *[==>311.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2: 1367422 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									

Orbit Structure



Visit

Proposal 15942, A1-2, third epoch (03), implementation Thu Mar 05 17:00:38 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 70%; ORIENT 106D TO 106 D; ORIENT 286D TO 286 D; AFTER 01 BY 250 D TO 540 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.35546	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	BAT99-116-MK-34	RA: 05 38 44.2508 (84.6843783d)	Proper Motion RA: 1.874 mas/yr	V=13.09+/-0.01	Reference Frame: ICRS
		Dec: -69 06 6.01 (-69.10167d)	Proper Motion Dec: 0.753 mas/yr	B-V=0.25	
		Equinox: J2000	Epoch of Position: 2000		

*Comments: VEGAMAG Photometry from WFC3 F555W Early Release Obervation IB6WD6050 (De Marchi et al. 2011). ICRS astrometry of Melnick 34 from Gaia DR2 (Gaia DR2 4657685534828257792). Used for acquision due to severe crowding within R136 itself. Coordinates of Mk34 in *astrometricallty-uncorrecred" WFC image: '05 38 44.2416', '-69 06 5.930'*
Category=STAR
Description=[WOLF RAYET - WN]
Extended=NO

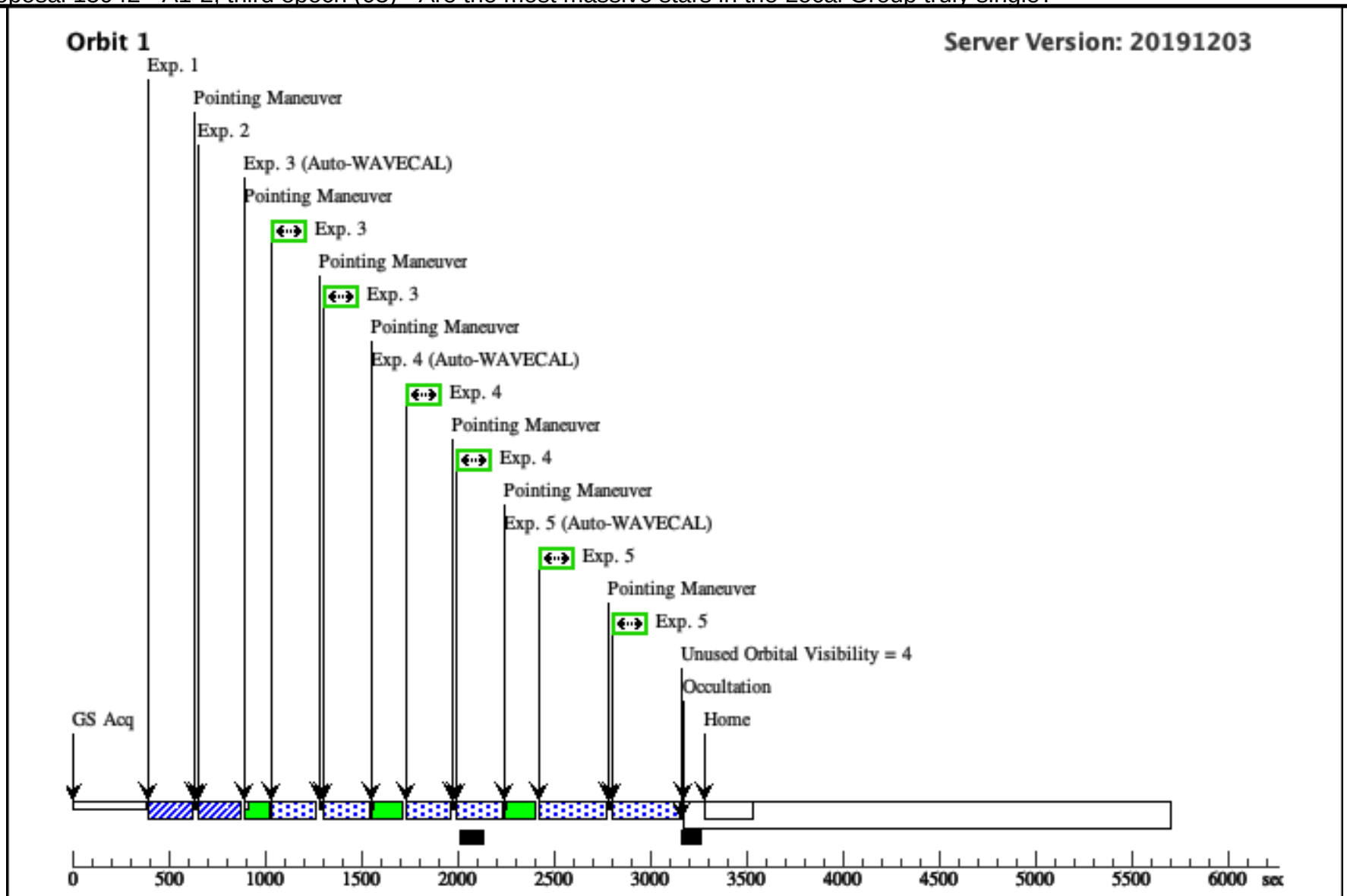
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	A1-2	Offset from BAT99-116-MK-34		V=12.28	Offset Position (A1-2)
		RA Offset: -1.86 Secs			
		Dec Offset: 2.97 Arcsec			

Comments: Center between R136a1 and R136a2 (BAT99 108 and 109), -1.862 sec (RA) and 2.975 (DEC) offset relative to Brey 84 (Melnick 34). Determined from F336W WFC3 image of R136 (de Marchi et al. 2011, Crowther et al. 2016).
Brightest cluster star in slit R136a1 (BAT99 108). VEGA V = 12.28
Category=STAR
Description=[WOLF RAYET - WN]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acq Mk 34 (197926)	(5) BAT99-116-MK-34	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	*[1]*
Comments: ETC predicts S/N=174 for 1 sec exposure through F28X50LP aperture for Melnick 34 (V=13.09).									
2	Acq-peak-Mk 34 (198019)	(5) BAT99-116-MK-34	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	*[1]*
Comments: Peakup on Melnick 34 for accurate positioning prior to offset. ETC predicts 58,000 e- from source in 0.5 sec exposure through 52x0.1 aperture for Melnick 34 (V=13.09), order of magnitude below saturation level.									
3	(1367600)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=NO		Pattern 4, Exps 3-3 in A1-2, third epoch (03) (4)	450 Secs (394 Secs) *[==>197.0 Secs (Pattern 1)]* *[==>197.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2: 1367278 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									
4	(1367602)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=NO		Pattern 4, Exps 4-4 in A1-2, third epoch (03) (4)	450 Secs (394 Secs) *[==>197.0 Secs (Pattern 1)]* *[==>197.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2:1367279 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									
5	(1367603)	(6) A1-2	STIS/CCD, ACCUM, 52X0.1	G430M 4961 A	CR-SPLIT=NO		Pattern 4, Exps 5-5 in A1-2, third epoch (03) (4)	450 Secs (622 Secs) *[==>311.0 Secs (Pattern 1)]* *[==>311.0 Secs (Pattern 2)]*	*[1]*
Comments: ETC run for fainter R136a2: 1367422 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*									

Orbit Structure



Visit

Proposal 15942, A3-c, first epoch (04), implementation Thu Mar 05 17:00:38 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 90%; ORIENT 162.2D TO 162.2 D; ORIENT 342.2D TO 342.2 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.35546	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	BAT99-116-MK-34	RA: 05 38 44.2508 (84.6843783d)	Proper Motion RA: 1.874 mas/yr	V=13.09+/-0.01	Reference Frame: ICRS
		Dec: -69 06 6.01 (-69.10167d)	Proper Motion Dec: 0.753 mas/yr	B-V=0.25	
		Equinox: J2000	Epoch of Position: 2000		

*Comments: VEGAMAG Photometry from WFC3 F555W Early Release Obervation IB6WD6050 (De Marchi et al. 2011). ICRS astrometry of Melnick 34 from Gaia DR2 (Gaia DR2 4657685534828257792). Used for acquision due to severe crowding within R136 itself. Coordinates of Mk34 in *astrometricallty-uncorrecred" WFC image: '05 38 44.2416', '-69 06 5.930'*
Category=STAR
Description=[WOLF RAYET - WN]
Extended=NO

(7)	A3-C	Offset from BAT99-116-MK-34		V=12.86	Offset Position (A3-C)
		RA Offset: -1.64 Secs			
		Dec Offset: 1.82 Arcsec			

Comments: Center between R136a3 and R136c (BAT99 106 and 112), -1.62935 sec (RA) and 1.6715 (DEC) offset relative to Brey 84 (Melnick 34). Determined from F336W WFC3 image of R136 (de Marchi et al. 2011, Crowther et al. 2016).
Brightest cluster star in slit R136 C (BAT99 112). VEGA V = 12.86
Category=STAR
Description=[WOLF RAYET - WN]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acq Mk 34 (197926)	(5) BAT99-116-MK-34	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	Acq-peak-Mk 34 (198019)	(5) BAT99-116-MK-34	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	 ***[1]***
3	(1367439)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=NO		Pattern 4, Exps 3-3 in A3-c, first epoch (04) (4)	450 Secs (292 Secs) *[==>146.0 Secs (Pattern 1)]* *[==>146.0 Secs (Pattern 2)]*	 ***[1]***

Comments: ETC run for fainter R136c: 1367432
ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.

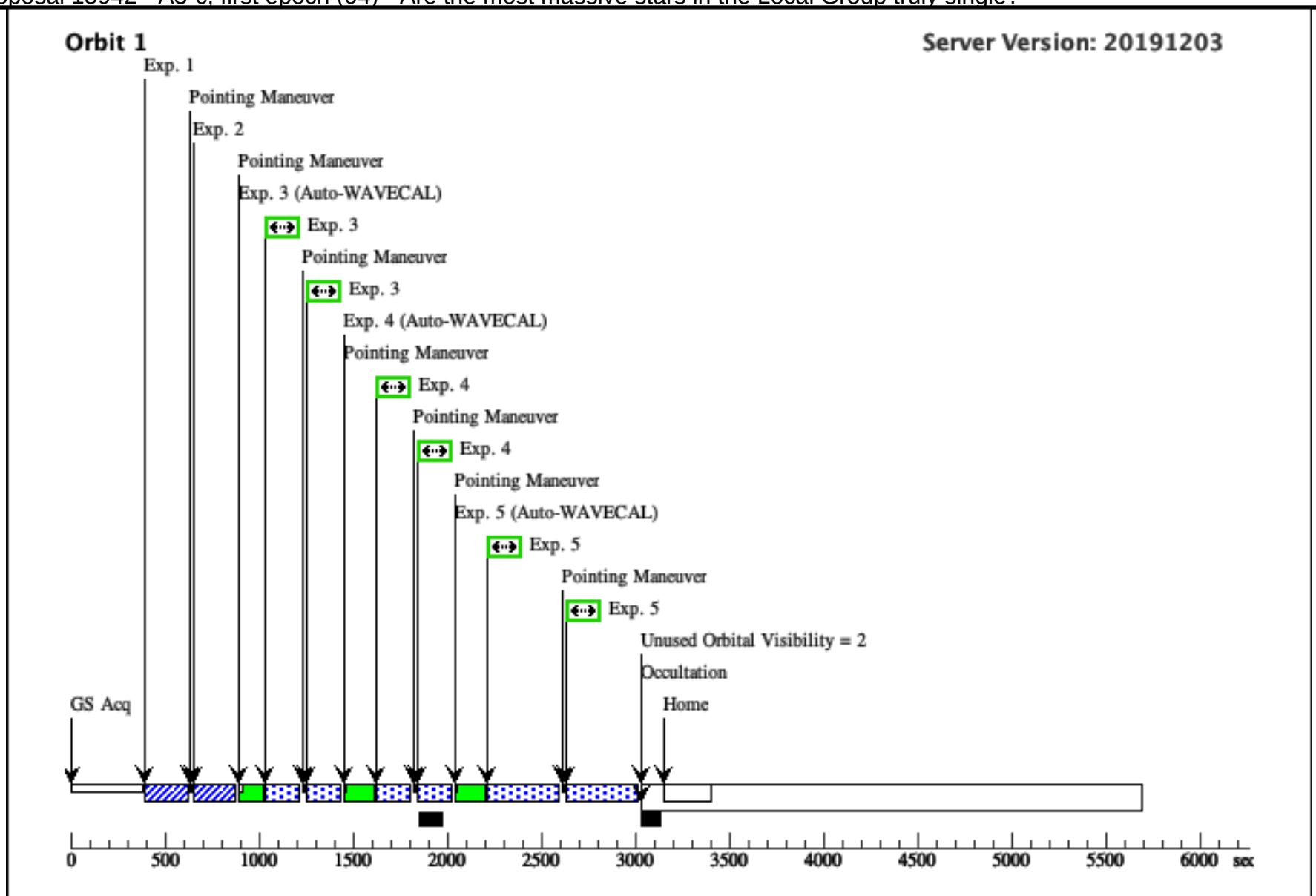
4	(1367438)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=NO		Pattern 4, Exps 4-4 in A3-c, first epoch (04) (4)	450 Secs (292 Secs) *[==>146.0 Secs (Pattern 1)]* *[==>146.0 Secs (Pattern 2)]*	 ***[1]***

Comments: ETC run for fainter R136c: 1367433
ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.

5	(1367436)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 4961 A	CR-SPLIT=NO		Pattern 4, Exps 5-5 in A3-c, first epoch (04) (4)	450 Secs (692 Secs) *[==>346.0 Secs (Pattern 1)]* *[==>346.0 Secs (Pattern 2)]*	 ***[1]***

Comments: ETC run for fainter R136c: 1367434
ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.

Orbit Structure



Visit

Proposal 15942, A3-c, second epoch (05), implementation Thu Mar 05 17:00:38 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 50%; ORIENT 162.2D TO 162.2 D; ORIENT 342.2D TO 342.2 D; AFTER_04 BY 50 D TO 230 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.35546	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	BAT99-116-MK-34	RA: 05 38 44.2508 (84.6843783d)	Proper Motion RA: 1.874 mas/yr	V=13.09+/-0.01	Reference Frame: ICRS
		Dec: -69 06 6.01 (-69.10167d)	Proper Motion Dec: 0.753 mas/yr	B-V=0.25	
		Equinox: J2000	Epoch of Position: 2000		

*Comments: VEGAMAG Photometry from WFC3 F555W Early Release Obervation IB6WD6050 (De Marchi et al. 2011). ICRS astrometry of Melnick 34 from Gaia DR2 (Gaia DR2 4657685534828257792). Used for acquision due to severe crowding within R136 itself. Coordinates of Mk34 in *astrometricallty-uncorrecred" WFC image: '05 38 44.2416', '-69 06 5.930'*
Category=STAR
Description=[WOLF RAYET - WN]
Extended=NO

(7)	A3-C	Offset from BAT99-116-MK-34		V=12.86	Offset Position (A3-C)
		RA Offset: -1.64 Secs			
		Dec Offset: 1.82 Arcsec			

Comments: Center between R136a3 and R136c (BAT99 106 and 112), -1.62935 sec (RA) and 1.6715 (DEC) offset relative to Brey 84 (Melnick 34). Determined from F336W WFC3 image of R136 (de Marchi et al. 2011, Crowther et al. 2016).
Brightest cluster star in slit R136 C (BAT99 112). VEGA V = 12.86
Category=STAR
Description=[WOLF RAYET - WN]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acq Mk 34 (197926)	(5) BAT99-116-MK-34	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	 ***[1]***
2	Acq-peak-Mk 34 (198019)	(5) BAT99-116-MK-34	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	 ***[1]***
3	(1367439)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=NO		Pattern 4, Exps 3-3 in A3-c, second epoch (05) (4)	450 Secs (374 Secs) *[==>187.0 Secs (Pattern 1)]* *[==>187.0 Secs (Pattern 2)]*	 ***[1]***

Comments: ETC run for fainter R136c: 1367432
ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.

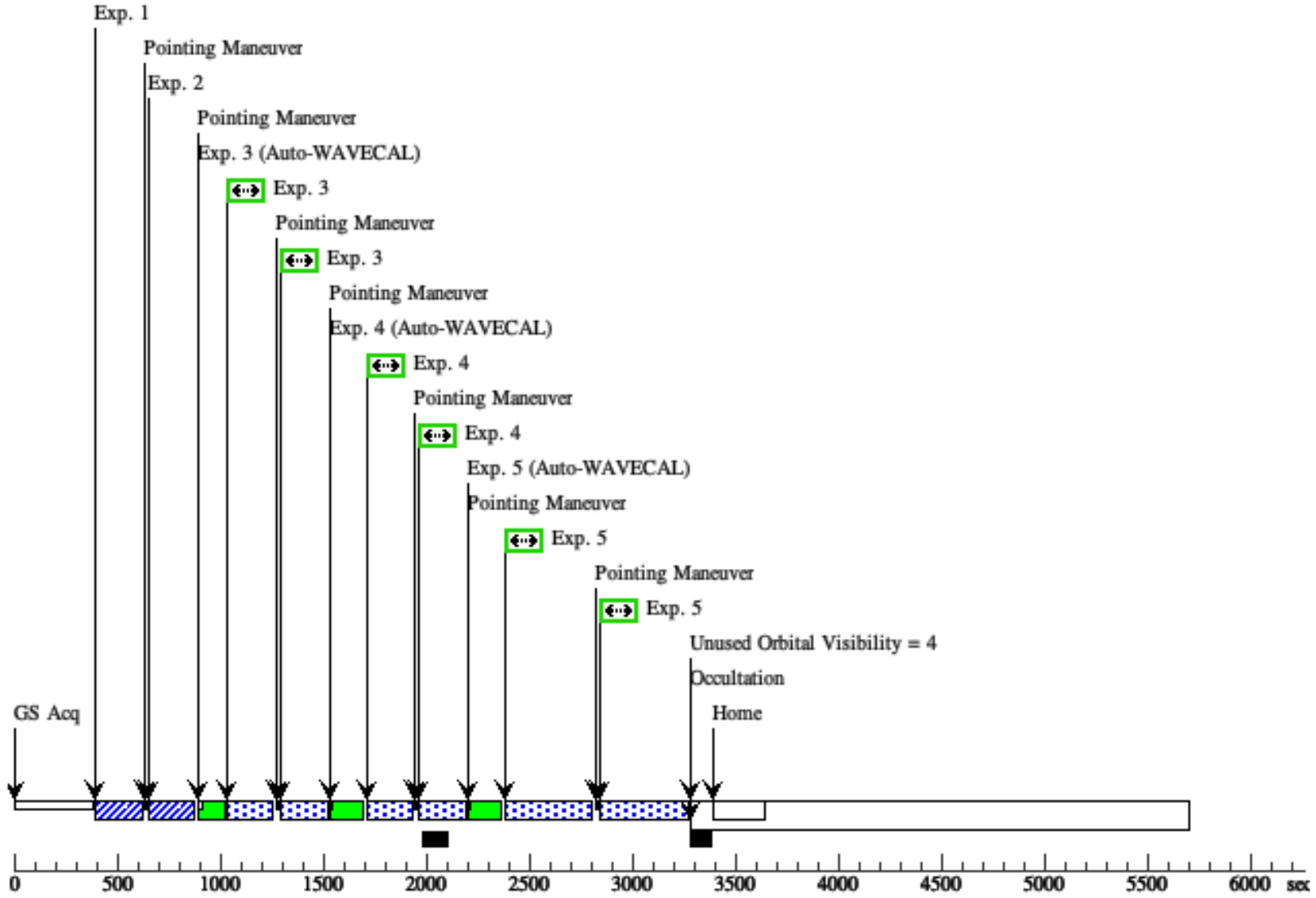
4	(1367438)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=NO		Pattern 4, Exps 4-4 in A3-c, second epoch (05) (4)	450 Secs (374 Secs) *[==>187.0 Secs (Pattern 1)]* *[==>187.0 Secs (Pattern 2)]*	 ***[1]***

Comments: ETC run for fainter R136c: 1367433
ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.

5	(1367436)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 4961 A	CR-SPLIT=NO		Pattern 4, Exps 5-5 in A3-c, second epoch (05) (4)	450 Secs (774 Secs) *[==>387.0 Secs (Pattern 1)]* *[==>387.0 Secs (Pattern 2)]*	 ***[1]***

Comments: ETC run for fainter R136c: 1367434
ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.

Orbit Structure



Visit

Proposal 15942, A3-c, third epoch (06), implementation Thu Mar 05 17:00:38 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 30%; ORIENT 162.2D TO 162.2 D; ORIENT 342.2D TO 342.2 D; AFTER_04 BY 250 D TO 540 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(4)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(3), (4), (5)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.35546	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	BAT99-116-MK-34	RA: 05 38 44.2508 (84.6843783d)	Proper Motion RA: 1.874 mas/yr	V=13.09+/-0.01	Reference Frame: ICRS
		Dec: -69 06 6.01 (-69.10167d)	Proper Motion Dec: 0.753 mas/yr	B-V=0.25	
		Equinox: J2000	Epoch of Position: 2000		

*Comments: VEGAMAG Photometry from WFC3 F555W Early Release Obervation IB6WD6050 (De Marchi et al. 2011). ICRS astrometry of Melnick 34 from Gaia DR2 (Gaia DR2 4657685534828257792). Used for acquision due to severe crowding within R136 itself. Coordinates of Mk34 in *astrometricallty-uncorrecred" WFC image: '05 38 44.2416', '-69 06 5.930'*
Category=STAR
Description=[WOLF RAYET - WN]
Extended=NO

(7)	A3-C	Offset from BAT99-116-MK-34		V=12.86	Offset Position (A3-C)
		RA Offset: -1.64 Secs			
		Dec Offset: 1.82 Arcsec			

Comments: Center between R136a3 and R136c (BAT99 106 and 112), -1.62935 sec (RA) and 1.6715 (DEC) offset relative to Brey 84 (Melnick 34). Determined from F336W WFC3 image of R136 (de Marchi et al. 2011, Crowther et al. 2016).
Brightest cluster star in slit R136 C (BAT99 112). VEGA V = 12.86
Category=STAR
Description=[WOLF RAYET - WN]

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acq Mk 34 (197926)	(5) BAT99-116-MK-34	STIS/CCD, ACQ, F28X50LP	MIRROR				1 Secs (1 Secs) *[==>]*	***[1]***
2	Acq-peak-Mk 34 (198019)	(5) BAT99-116-MK-34	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.5 Secs (0.5 Secs) *[==>]*	***[1]***
3	(1367439)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=NO		Pattern 4, Exps 3-3 in A3-c, third epoch (06) (4)	450 Secs (442 Secs) *[==>221.0 Secs (Pattern 1)]* *[==>221.0 Secs (Pattern 2)]*	***[1]***
	Comments: ETC run for fainter R136c: 1367432 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*								
4	(1367438)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=NO		Pattern 4, Exps 4-4 in A3-c, third epoch (06) (4)	450 Secs (442 Secs) *[==>221.0 Secs (Pattern 1)]* *[==>221.0 Secs (Pattern 2)]*	***[1]***
	Comments: ETC run for fainter R136c: 1367433 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*								
5	(1367436)	(7) A3-C	STIS/CCD, ACCUM, 52X0.1	G430M 4961 A	CR-SPLIT=NO		Pattern 4, Exps 5-5 in A3-c, third epoch (06) (4)	450 Secs (842 Secs) *[==>421.0 Secs (Pattern 1)]* *[==>421.0 Secs (Pattern 2)]*	***[1]***
	Comments: ETC run for fainter R136c: 1367434 *ETC runs performed for exposure times in first phase II submission. The exposure times in ths second submission are slightly shorter, S/N and other parameters are easily scalable.*								

Orbit Structure