13789 - Essential UV Observations of Eta Carinae's Change of State

Cycle: 22, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

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) ETA-CAR-A WAVE	STIS/CCD	1	22-Jul-2014 21:15:29.0	yes
02	(1) ETA-CAR-A WAVE	STIS/CCD	1	22-Jul-2014 21:15:32.0	yes
03	(1) ETA-CAR-A	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	1	22-Jul-2014 21:15:34.0	yes

3 Total Orbits Used

ABSTRACT

Eta Carinae is now passing though a critical phase in its evolution as it recovers from its ``Great Eruption'' 170 years ago. About 12 years ago we began to see a dramatic and unpredicted change in eta Car's long-term behavior. The brightening rate suddenly accelerated, so by 2010 the central star had brightened by more than a factor of four in the near-UV. Between 2003 and 2010 the stellar-wind emission lines weakened by factors of 2 to 4(!) implying a rapid decrease in its mass loss rate. Eta Car is unsteadily returning to its pre-eruptive state, but the rapidity since 2000 has been astonishing. The recent secular changes are much stronger in the UV than at optical wavelengths, but no UV data have been obtained since 2010 and no far-UV observations since 2004. The extraordinary brightening and changes in the wind are fundamental and must indicate basic changes in the outer structure of this circa-130 Msun star. Therefore, this proposal focuses on the rapid secular changes rather than the expected 2014.6 periastron passage. This is primarily a UV problem, though longer wavelengths are also worthwhile. Fresh observations must be done early in Cycle 21 before the approaching periastron alters the system. Our highest priorities are the UV brightening and the long term changes in the wind.

OBSERVING DESCRIPTION

These observations are closely related to program 13377 in Cycle 21, which covered Eta Car's spectroscopic event in 2014. Each visit is one orbit.
(1) A STIS/CCD visit 2-3 months after the peak of the event. Orbital phase close to STIS observations made in late 2003.
(2) A STIS/CCD visit several months later. If convenient, prefer slit orientation at PA = -28D to match observations made in 1998-2004. However, this ORIENT is not absolutely essential. The ORIENT range can be widened if necessary.
(3) A STIS/MAMA visit for UV close to the time of visit 2. This visit duplicates obs made in late 2013.
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Depending on results in 2014 (this was written July 2014), we may need to revise some details -- especially the timing of each observation.
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The total is 3 orbits (8 were used in 13377/Cy21).
Integration times range from a few seconds in the red to several minutes in the UV.
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Visit

Proposal 13789, CY22-CCD1 (01), implementation Wed Jul 23 01:15:35 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: BETWEEN 15-OCT-2014:00:00:00 AND 15-NOV-2014:00:00:00

Comments: Aftermath of 2014.6 spectroscopic event. For comparison with HST obs in late 2003.

Fixed Targets

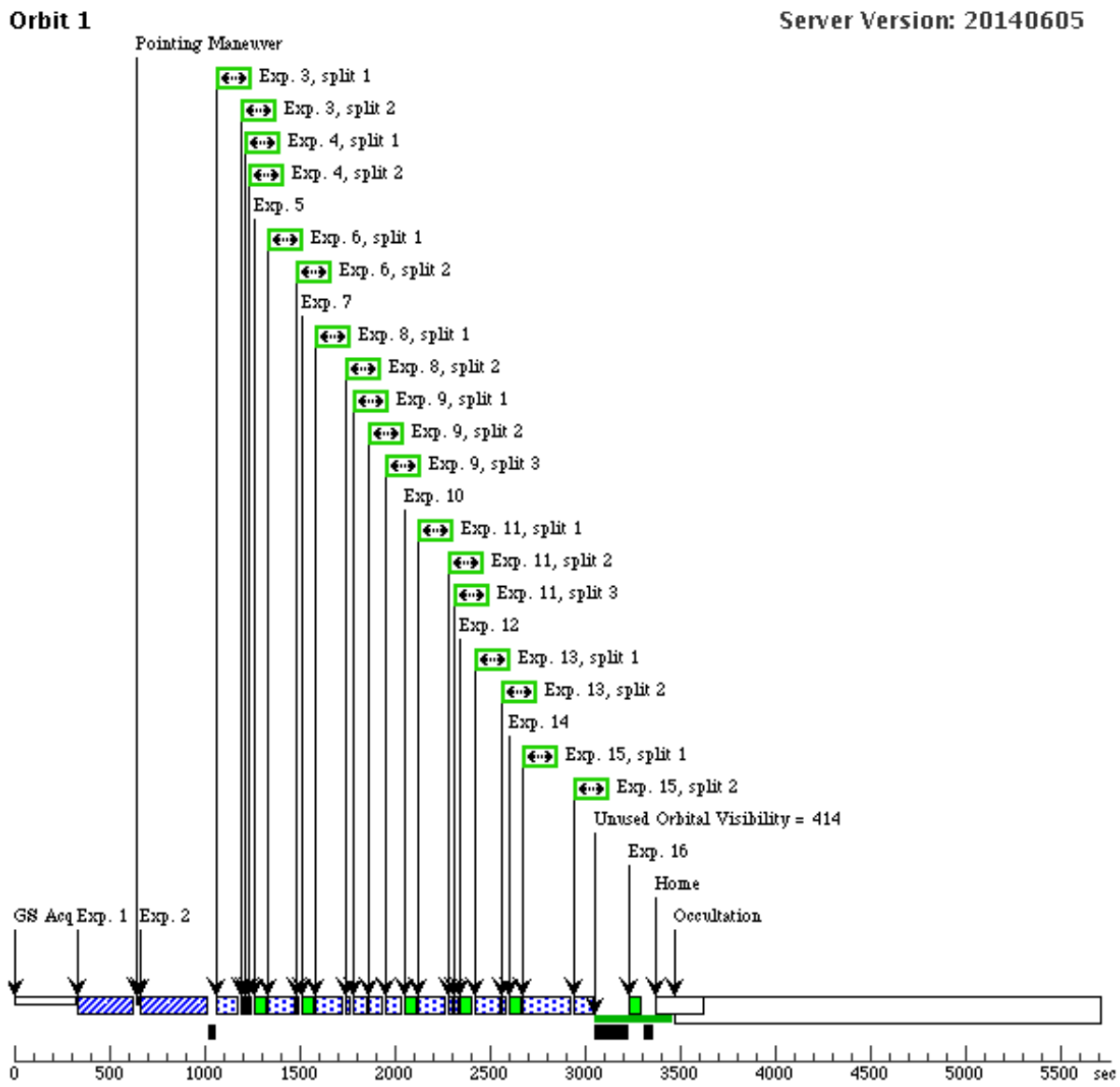
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ETA-CAR-A	RA: 10 45 3.5910 (161.2649625d) Dec: -59 41 4.26 (-59.68452d) Equinox: J2000 Plate Id: ZZZQ		V=5.0+/-0.5 F(2800) = 1.0E -11 +/- 0.4E-11, , F(2200) = 5E-12 +/- 3E-12	Reference Frame: GSC1

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ 1	(1) ETA-CAR-A	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT			0.4 Secs (0.4 Secs) *[==>]*	 ***[1]***
Comments: Target Acquisition for STIS CCD longslit									
2	ACQ 2	(1) ETA-CAR-A	STIS/CCD, ACQ/PEAK, 52X0.1	G750M 7795 A				0.5 Secs (0.5 Secs) *[==>]*	 ***[1]***
Comments: This wavelength interval 7795AA has no strong emision lines. Therefore peakup really leads to the star A and not to ejecta blobs like C and D.									
3	A 6768a	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A	CR-SPLIT=2; GAIN=4; SIZEAXIS2=80; WAVECAL=NO			0.2 Secs (0.2 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Ultra-short exposure to get extremely bright H-alpha emission line profile. WAVECAL=NO because we are explicitly managing the WCALs.									
4	A 6768b	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A	GAIN=4; WAVECAL=NO; SIZEAXIS2=160; CR-SPLIT=2			2 Secs (2 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Some H-alpha pixels will be saturated in this exposure; H-alpha is extremely bright. *NOTE: In past several years Eta Car has been brightening 0.1--0.2 magn per year.*									
5	WCAL 6768	WAVE	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A				*[==>]*	***[1]***
Comments: In this program we include WAVECALS explicitly so we can omit some that are definitely not needed for the program goals, and partly to force some of them into occultation periods.									
6	LODISP 4300	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A	CR-SPLIT=2; GAIN=4; WAVECAL=NO; SIZEAXIS2=160			3 Secs (3 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Mainly for photometry around 330 nm, also good for blue photometry.									
7	WCAL LO DISP 4300	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				*[==>]*	***[1]***
8	LODISP 2000a	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G230LB 2375 A	CR-SPLIT=2; SIZEAXIS2=80; GAIN=4; WAVECAL=NO			24 Secs (24 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Quick look at UV, for photometry and features 250-300 nm. Compare following long exposure.									
9	LODISP 2000b	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G230LB 2375 A	CR-SPLIT=3; SIZEAXIS2=160; GAIN=4; WAVECAL=NO			201 Secs (201 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	 ***[1]***
Comments: Long exposure for UV 170--250 nm. CR-SPLIT = 3 instead of 2, because this observation is critical and one c.r. hit could ruin an entire spectral line at low dispersion.									
10	WCAL 2000	WAVE	STIS/CCD, ACCUM, 52X0.1	G230LB 2375 A				*[==>]*	***[1]***
11	A 4706	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=3; SIZEAXIS2=160; WAVECAL=NO; GAIN=4			25.5 Secs (25.5 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	 ***[1]***
Comments: Extremely important wavelength interval for HeII 4687 and other varying emission features.									

12	WCAL 4706	WAVE	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A		*[==>]*		***[1]***
13	A 3936	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=2; WAVECAL=NO; SIZEAXIS2=160; GAIN=4	24 Secs (24 Secs) *[==>(Split 1)]* *[==>(Split 2)]*		***[1]***
Comments: Important spectral region includes diverse emission features.								
14	WCAL 3936	WAVE	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A		*[==>]*		***[1]***
15	A 2836	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G230MB 2836 A	SIZEAXIS2=80; CR-SPLIT=2; WAVECAL=NO; GAIN=4	180 Secs (180 Secs) *[==>(Split 1)]* *[==>(Split 2)]*		***[1]***
16	WCAL 2836	WAVE	STIS/CCD, ACCUM, 52X0.1	G230MB 2836 A		*[==>]*		***[1]***

Orbit Structure



Visit

Proposal 13789, CY22-CCD2 (02), implementation Wed Jul 23 01:15:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 196D TO 198 D; BETWEEN 31-JUL-2015:00:00:00 AND 10-OCT-2015

Comments: About 6 months after the 2014.6 spectroscopic event.
ORIENT is not absolutely essential, but it duplicates many obs in 1998-2004, and samples Weigelt knot.

Fixed Targets

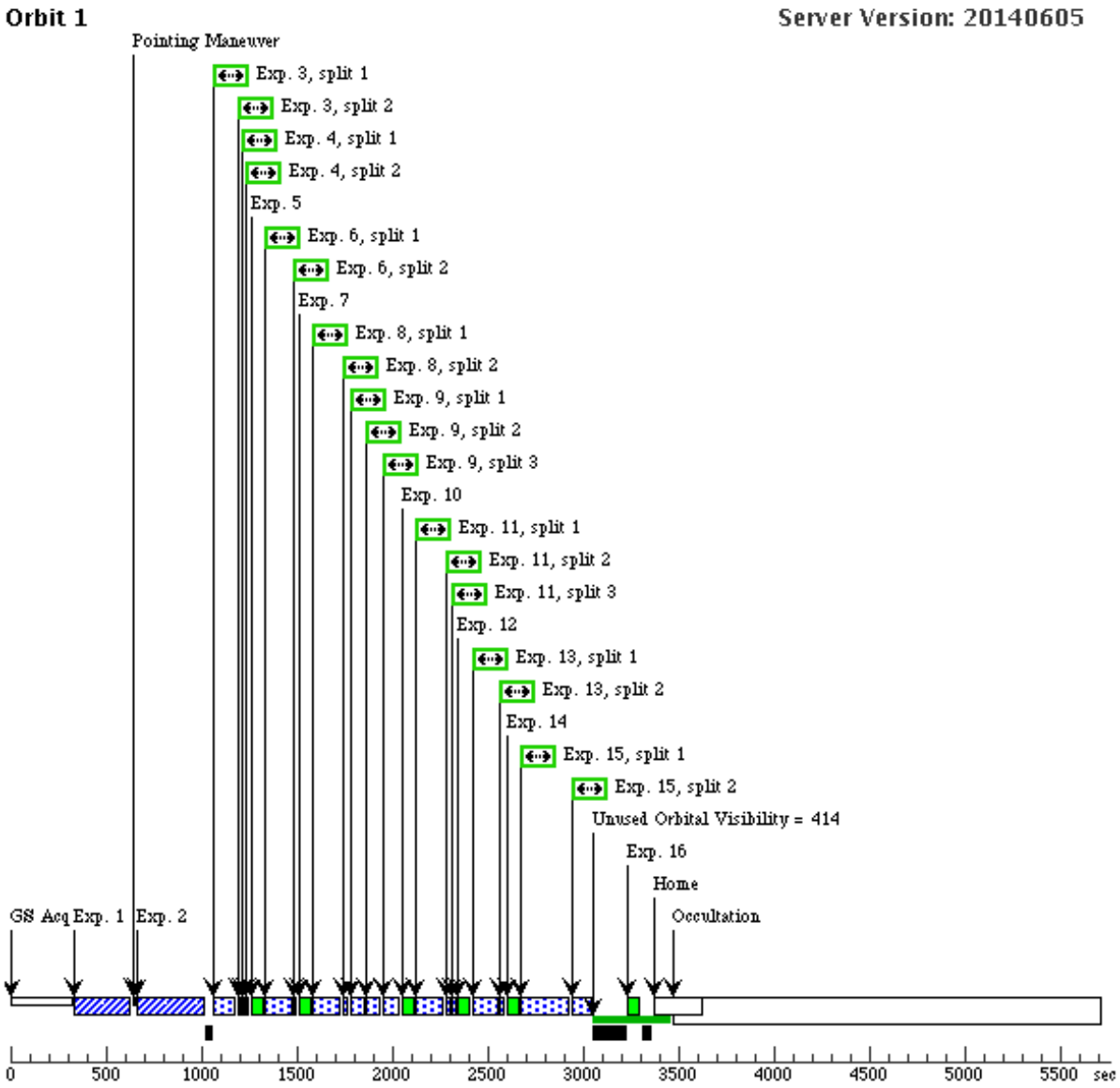
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ETA-CAR-A	RA: 10 45 3.5910 (161.2649625d) Dec: -59 41 4.26 (-59.68452d) Equinox: J2000 Plate Id: ZZZQ		V=5.0+/-0.5 F(2800) = 1.0E -11 +/- 0.4E-11, , F(2200) = 5E-12 +/- 3E-12	Reference Frame: GSC1

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ 1	(1) ETA-CAR-A	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT			0.4 Secs (0.4 Secs) *[==>]*	 ***[1]***
Comments: Target Acquisition for STIS CCD longslit									
2	ACQ 2	(1) ETA-CAR-A	STIS/CCD, ACQ/PEAK, 52X0.1	G750M 7795 A				0.5 Secs (0.5 Secs) *[==>]*	 ***[1]***
Comments: This wavelength interval 7795AA has no strong emision lines. Therefore peakup really leads to the star A and not to ejecta blobs like C and D.									
3	A 6768a	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A	CR-SPLIT=2; GAIN=4; SIZEAXIS2=80; WAVECAL=NO			0.2 Secs (0.2 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Ultra-short exposure to get extremely bright H-alpha emission line profile. WAVECAL=NO because we are explicitly managing the WCALs.									
4	A 6768b	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A	GAIN=4; WAVECAL=NO; SIZEAXIS2=160; CR-SPLIT=2			2 Secs (2 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Some H-alpha pixels will be saturated in this exposure; H-alpha is extremely bright. *NOTE: In past several years Eta Car has been brightening 0.1--0.2 magn per year.*									
5	WCAL 6768	WAVE	STIS/CCD, ACCUM, 52X0.1	G750M 6768 A				*[==>]*	***[1]***
Comments: In this program we include WAVECALS explicitly so we can omit some that are definitely not needed for the program goals, and partly to force some of them into occultation periods.									
6	LODISP 4300	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A	CR-SPLIT=2; GAIN=4; WAVECAL=NO; SIZEAXIS2=160			3 Secs (3 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Photometry around 330 nm and also in blue.									
7	WCAL LO DISP 4300	WAVE	STIS/CCD, ACCUM, 52X0.1	G430L 4300 A				*[==>]*	***[1]***
8	LODISP 2000a	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G230LB 2375 A	CR-SPLIT=2; SIZEAXIS2=80; GAIN=4; WAVECAL=NO			24 Secs (24 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
Comments: Photometry 250--300 nm, also good for spectral features in same range.									
9	LODISP 2000b	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G230LB 2375 A	CR-SPLIT=3; SIZEAXIS2=160; GAIN=4; WAVECAL=NO			201 Secs (201 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	 ***[1]***
Comments: Long exposure for features at short wavelengths 1650--2500 AA.									
10	WCAL 2000	WAVE	STIS/CCD, ACCUM, 52X0.1	G230LB 2375 A				*[==>]*	***[1]***
11	A 4706	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A	CR-SPLIT=3; SIZEAXIS2=160; WAVECAL=NO; GAIN=4			25.5 Secs (25.5 Secs) *[==>(Split 1)]* *[==>(Split 2)]* *[==>(Split 3)]*	 ***[1]***
Comments: Critical HeII 4687 and other emission features in this interval.									

	12	WCAL 4706	WAVE	STIS/CCD, ACCUM, 52X0.1	G430M 4706 A		*[==>]*	***[1]***
	13	A 3936	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A	CR-SPLIT=2; WAVECAL=NO; SIZEAXIS2=160; GAIN=4	24 Secs (24 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
	Comments: Important spectral region includes diverse emission features.							
	14	WCAL 3936	WAVE	STIS/CCD, ACCUM, 52X0.1	G430M 3936 A		*[==>]*	***[1]***
	15	A 2836	(1) ETA-CAR-A	STIS/CCD, ACCUM, 52X0.1	G230MB 2836 A	SIZEAXIS2=80; CR-SPLIT=2; WAVECAL=NO; GAIN=4	180 Secs (180 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	 ***[1]***
	16	WCAL 2836	WAVE	STIS/CCD, ACCUM, 52X0.1	G230MB 2836 A		*[==>]*	***[1]***

Orbit Structure



Visit

Proposal 13789, CY22-MAMA (03), implementation Wed Jul 23 01:15:36 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: PCS MODE FINE; GROUP 03,02 WITHIN 15D

Comments: UV spectra with E140M, E230M. Duplicates obs in October 2013. Grouped with CY22-CCD2.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ETA-CAR-A	RA: 10 45 3.5910 (161.2649625d) Dec: -59 41 4.26 (-59.68452d) Equinox: J2000 Plate Id: ZZZQ		V=5.0+/-0.5 F(2800) = 1.0E -11 +/- 0.4E-11, , F(2200) = 5E-12 +/- 3E-12	Reference Frame: GSC1

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ 1	(1) ETA-CAR-A	STIS/CCD, ACQ, F25ND3	MIRROR	ACQTYPE=POINT			0.4 Secs (0.4 Secs) *[==>]*	*[1]*
2	ACQ 2	(1) ETA-CAR-A	STIS/CCD, ACQ/PEAK, 52X0.1	G750M 7795 A				0.5 Secs (0.5 Secs) *[==>]*	*[1]*
Comments: The wavelength interval 7795AA has no strong emission lines. Therefore peakup leads to the star A and not to ejecta blobs like C and D.									
3	MAMA 1425 (STIS.sp.513973)	(1) ETA-CAR-A	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A				1000 Secs (1000 Secs) *[==>1000.0 Secs]*	*[1]*
4	MAMA 1978 (STIS.sp.513978)	(1) ETA-CAR-A	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 1978 A				820 Secs (800 Secs) *[==>800.0 Secs]*	*[1]*
Comments: Preceding STIS/CCD visit will be used to assure that this exposure does not violate brightness limits for NUV-MAMA.									

Orbit Structure