15289 - Imaging Shock Fronts in the Outer Ejecta of Eta Carinae

Cycle: 25, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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	WFC3/UVIS	1	15-Feb-2018 20:00:12.0	yes
02	(1) ETA-CAR	WFC3/IR	1	15-Feb-2018 20:00:13.0	yes

2 Total Orbits Used

ABSTRACT

Although Eta Car has been imaged many times with HST to monitor the central star and the bright Homunculus Nebula, we propose the first WFC3 imaging of Eta Car to study the more extended "Outer Ejecta" from previous eruptions. WFC3 has two key filters that have not been used before to image Eta Car, which will provide critical physical information about its eruptive history: (1) F280N with WFC3/UVIS will produce the first Mg II 2800 image of Eta Car, the sharpest image of its complex Outer Ejecta, and will unambiguously trace shock fronts, and (2) F126N with WFC3/IR will sample [Fe II] 12567 arising in the densest post-shock gas. Eta Car is surrounded by a bright, soft X-ray shell seen in Chandra images, which arises from the fastest 1840s ejecta overtaking slower older material. Our recent proper motion measurements show that the outer knots were ejected in two outbursts several hundred years before the 1840s eruption, and spectroscopy of light echoes has recently revealed extremely fast ejecta during the 1840s that indicate an explosive event. Were those previous eruptions explosive as well? If so, were they as energetic, did they also have such

fast ejecta, and did they have the same geometry? The structure and excitation of the Outer Ejecta hold unique clues for reconstructing Eta Car's violent mass loss history. The locations of shock fronts in circumstellar material provide critical information, because they identify past discontinuities in the mass loss. This is one of the only ways to investigate the long term (i.e. centuries) evolution and duty cycle of eruptive mass loss in the most massive stars.

OBSERVING DESCRIPTION

These observations aim to obtain an image of the extended Mg II 2800 emission and the [Fe II] 1.2567 um emission of the Outer Ejecta nebulosity around the Homunculus of Eta Carinae. For the MgII 2800 line, we use the WFC3/UVIS F280N filter. For the near-IR [Fe II] emission, we use the WFC3/IR F126N emission line filter and the F130N filter for off-line continuum to subtract. The IR images will use a 4-point dither pattern with a gap in the middel to avoid the central star, which is extremely bright in the IR.

Visit

Proposal 15289, MgII (01), implementation Fri Feb 16 01:00:14 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: CVZ; ORIENT 345D TO 359 D

Comments: MgII line emission image of the Outer Ejecta.

Diagnostics

(Mg2 (01.001)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-MOS-DITH-LINE Purpose=MOSAIC Number Of Points=3 Point Spacing=2.4 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.754 Angle Between Sides= Center Pattern=true		(1)

Fixed Targets

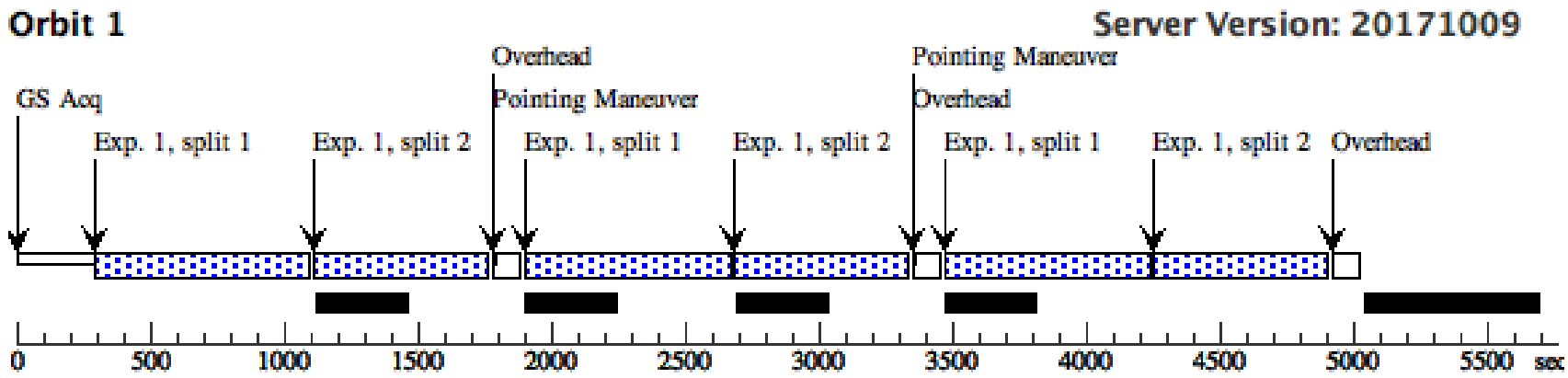
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ETA-CAR	RA: 10 45 3.5460 (161.2647750d) Dec: -59 41 3.95 (-59.68443d) Equinox: J2000		V=6.21	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[CIRCUMSTELLAR MATTER, EMISSION LINE NEBULA, EMISSION LINE STAR, ETA CARINAE STAR, LUMINOUS BLUE VARIABLE]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Mg2	(1) ETA-CAR	WFC3/UVIS, ACCUM, UVIS-CENTER	F280N	CR-SPLIT=2; FLASH=2.0		Pattern 1, Exps 1-1 in MgII (01) (1)	1310 Secs (3930 Secs)	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 3, Split 1)]	
								[==>(Pattern 3, Split 2)]	

Orbit Structure



Visit

Proposal 15289, FeII (02), implementation Fri Feb 16 01:00:15 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: DROP TO GYRO IF NECESSARY ; CVZ; ORIENT 350D TO 5 D

Comments: FeII and continuum images of Outer Ejecta.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=LINE	Coordinate Frame=POS-TARG	Pattern Type=LINE	Coordinate Frame=POS-TARG	(1-2)
	Purpose=MOSAIC	Pattern Orientation=40	Purpose=MOSAIC	Pattern Orientation=134	
	Number Of Points=2	Angle Between Sides=	Number Of Points=2	Angle Between Sides=	
	Point Spacing=94	Center Pattern=true	Point Spacing=104	Center Pattern=true	
	Line Spacing=		Line Spacing=		

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ETA-CAR	RA: 10 45 3.5460 (161.2647750d) Dec: -59 41 3.95 (-59.68443d) Equinox: J2000		V=6.21	Reference Frame: SIMBAD

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[CIRCUMSTELLAR MATTER, EMISSION LINE NEBULA, EMISSION LINE STAR, ETA CARINAE STAR, LUMINOUS BLUE VARIABLE]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Fe2	(1) ETA-CAR	WFC3/IR, MULTIACCUM, IR-FIX	F126N	NSAMP=15; SAMP-SEQ=STEP50		Pattern 2, Exps 1-2 in FeII (02) (2)	499.234285 Secs (1996.937 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***
2	continuum	(1) ETA-CAR	WFC3/IR, MULTIACCUM, IR-FIX	F130N	NSAMP=15; SAMP-SEQ=STEP50		Pattern 2, Exps 1-2 in FeII (02) (2)	499.234285 Secs (1996.937 Secs) *[==>(Pattern 1,1)]* *[==>(Pattern 1,2)]* *[==>(Pattern 2,1)]* *[==>(Pattern 2,2)]*	***[1]***

Orbit Structure