



13780 - The Nature of Newly Discovered Wolf-Rayet Stars in the LMC

Cycle: 22, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) LMC079-1	COS/FUV	2	08-Oct-2014 21:07:37.0	yes
02	(2) LMC170-2	COS/FUV	2	08-Oct-2014 21:07:40.0	yes
03	(3) LMC277-2	COS/FUV	2	08-Oct-2014 21:07:43.0	yes

6 Total Orbits Used

ABSTRACT

We have recently discovered five Wolf-Rayet (WR) stars in the LMC which might be naively classified as "WN3+O3 V." However, such a pairing is unlikely for a number of reasons: (a) O3 V stars are very rare, as they are the hottest and most luminous of the dwarfs; (b) the absolute visual magnitudes of our stars are quite faint ($M_v = -3$) compared to even an O3 V star by itself ($M_v = -5.5$); (c) these stars do not exhibit radial velocity variations, although our data on this are admittedly limited; and (d) such a pairing would be hard to understand from a stellar evolution point of view, since a massive star will evolve out of the O3 V phase in about a million years, while it takes several million years to form a WN star. We are forced

to conclude that we have discovered a new class of WRs. We have excellent optical spectra with Magellan, and our modeling of these data suggest a very high effective temperature (70,000 K), strongly enhanced nitrogen, and a very low mass-loss rate. However, these physical parameters are poorly constrained by the optical data alone, and we now seek UV spectra that will contain lines that will better determine the temperatures, and the important resonance lines that provide crucial diagnostics of the stellar winds. The results of this modeling will allow us to understand the nature of these objects, and where they fit in the evolution of massive stars. If they are the products of single star evolution, they indicate we have some fundamental misconceptions. If they are the products of binary evolution, how do we explain the absence of any companions? We can only address these questions by having reliable stellar parameters and abundances.

OBSERVING DESCRIPTION

Overview:

We will observe each of these three WN3/O3V stars using COS/FUV and the G140L grating in the standard two settings (G140L/1105, G140L/1280) for complete wavelength coverage in the FUV. Each star will be observed in a 2-orbit visit.

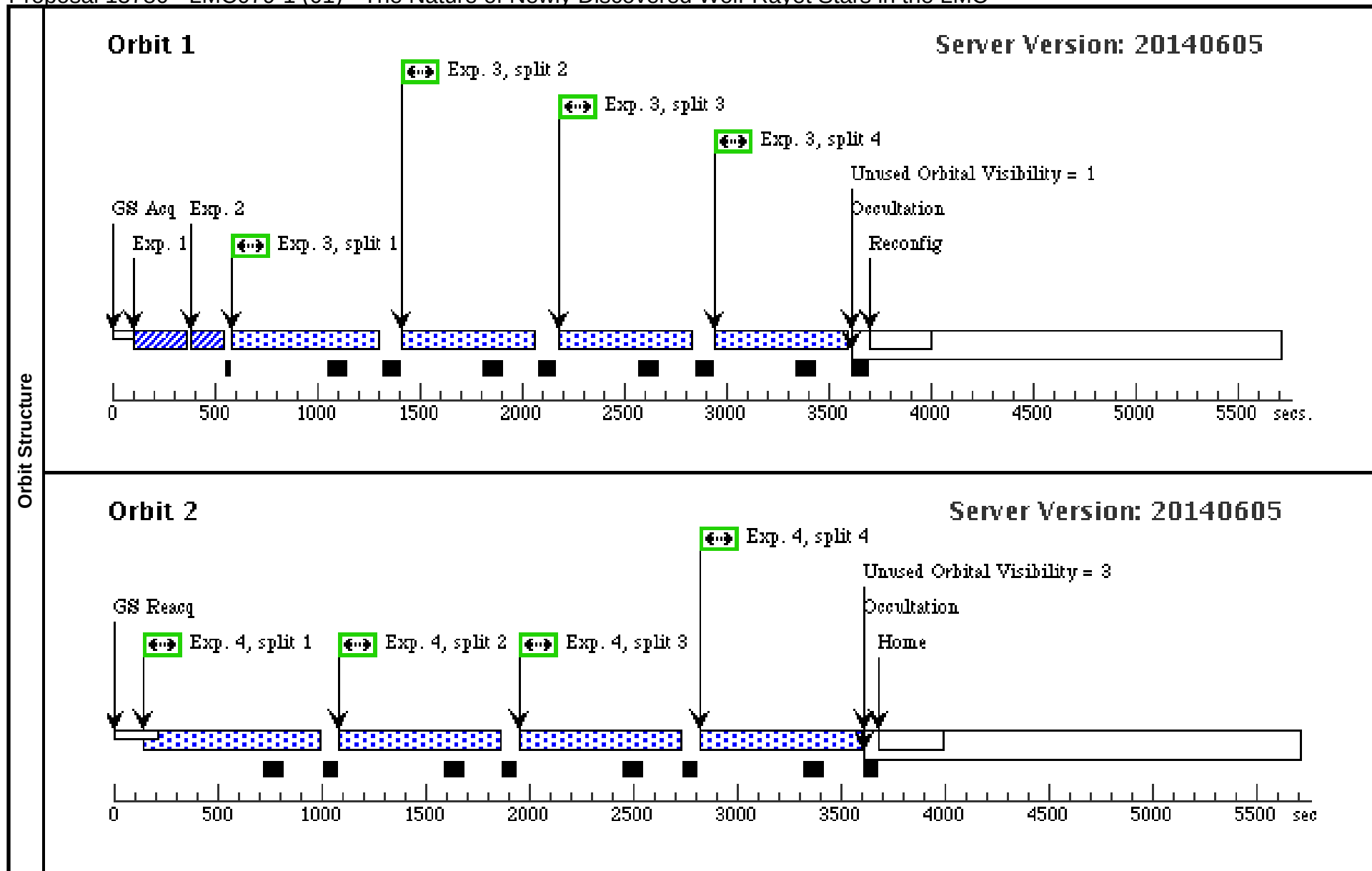
Target Acquisitions:

Our coordinates have been measured directly from our survey frames; all three targets are also listed in the GSC-II with coordinates that agree to $<0.1''$. The only complication is that our targets are too bright for acquisition through the Primary Science Aperture with Mirror A. We therefore do PEAKXD and PEAKD in dispersed light.

Exposure times have been estimated by (a) our preliminary CMFGEN 100K model, (b) flux distribution of an O3 V star, and (c) a 120,000 black-body, all with good agreement.

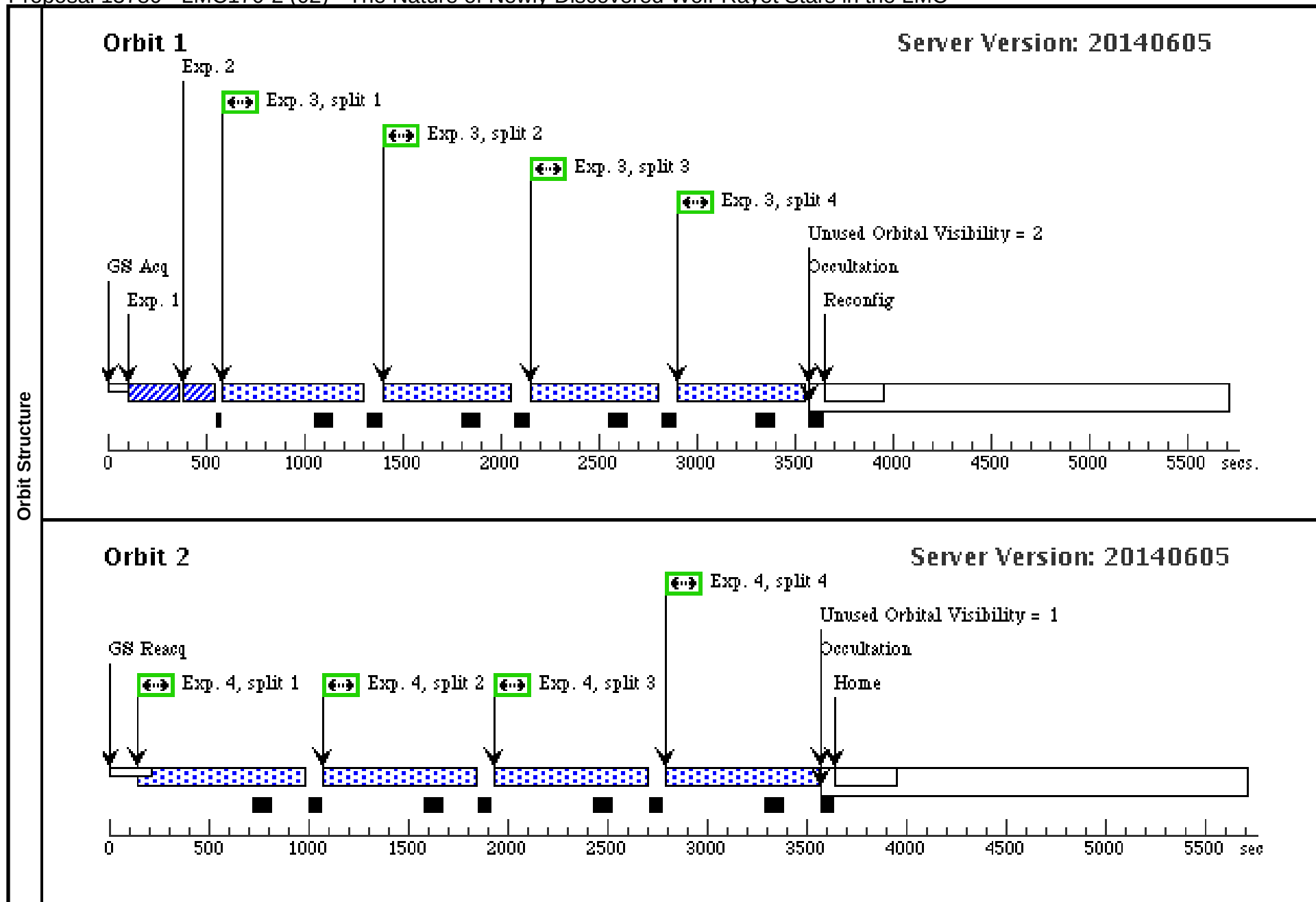
Proposal 13780 - LMC079-1 (01) - The Nature of Newly Discovered Wolf-Rayet Stars in the LMC

Visit	Proposal 13780, LMC079-1 (01), implementation Thu Oct 09 01:07:45 GMT 2014									
	Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	LMC079-1	RA: 05 07 13.2830 (76.8053458d) Dec: -70 33 34.05 (-70.55946d) Equinox: J2000		V=16.06+/-0.1 B-V=0.03, U-B=-1.02	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC079-1P EAKXD (639869)	(1) LMC079-1	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				2 Secs (2 Secs) [==>]	[1]
	2	LMC079-1P EAKD (639869)	(1) LMC079-1	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-W T-FLR			2 Secs (2 Secs) [==>]	[1]
	3	LMC079-1 G140/1105 (622040)	(1) LMC079-1	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=36 0			510 Secs (2404 Secs) [==>601.0 Secs (Split 1)] [==>601.0 Secs (Split 2)] [==>601.0 Secs (Split 3)] [==>601.0 Secs (Split 4)]	[1]
	Comments: Buffer-time returned is 550 sec both by using our CMFGEN model a input to the ETC (622040) and by using a 100,00 K black body with V=16.0 and E(B-V)=0.13 with LMC reddening law. 360 is roughly 2/3rds of that.									
	4	LMC079-1 G140L/1280 (622048)	(1) LMC079-1	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=ALL; BUFFER-TIME=47 0			600 Secs (2896 Secs) [==>724.0 Secs (Split 1)] [==>724.0 Secs (Split 2)] [==>724.0 Secs (Split 3)] [==>724.0 Secs (Split 4)]	[2]
	Comments: We obtain a buffer-time of 712-714 sec either with a 100K black-body or with our CMFGEN model; we have taken 2/3rds of that and used 470 sec.									



Proposal 13780 - LMC170-2 (02) - The Nature of Newly Discovered Wolf-Rayet Stars in the LMC

Visit	Proposal 13780, LMC170-2 (02), implementation Thu Oct 09 01:07:45 GMT 2014									
	Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	LMC170-2	RA: 05 29 18.1390 (82.3255792d) Dec: -69 19 43.03 (-69.32862d) Equinox: J2000		V=16.04+/-0.1 B-V=-0.25, U-B=-1.03	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC170-2P EAKXD (639869)	(2) LMC170-2	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				2 Secs (2 Secs) [==>]	[1]
	2	LMC170-2P EAKD (639869)	(2) LMC170-2	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-W T-FLR			2 Secs (2 Secs) [==>]	[1]
	3	G140L/1105 (617210)	(2) LMC170-2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=36 0			510 Secs (2388 Secs) [==>597.0 Secs (Split 1)] [==>597.0 Secs (Split 2)] [==>597.0 Secs (Split 3)] [==>597.0 Secs (Split 4)]	[1]
	Comments: Buffer-time returned is 550 sec both by using our CMFGEN model a input to the ETC (622040) and by using a 100,00 K black body with V=16.0 and E(B-V)=0.13 with LMC reddening law. 360 is roughly 2/3rds of that.									
	4	G140L/1280 (618022)	(2) LMC170-2	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=ALL; BUFFER-TIME=47 0			600 Secs (2856 Secs) [==>714.0 Secs (Split 1)] [==>714.0 Secs (Split 2)] [==>714.0 Secs (Split 3)] [==>714.0 Secs (Split 4)]	[2]
Comments: We obtain a buffer-time of 712-714 sec either with a 100K black-body or with our CMFGEN model; we have taken 2/3rds and used 470 sec.										



Proposal 13780 - LMC277-2 (03) - The Nature of Newly Discovered Wolf-Rayet Stars in the LMC

Visit	Proposal 13780, LMC277-2 (03), implementation Thu Oct 09 01:07:45 GMT 2014									
	Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	LMC277-2	RA: 05 04 32.5920 (76.1358000d) Dec: -68 00 59.34 (-68.01648d) Equinox: J2000		V=15.83+/-0.1 B-V=-0.16, U-B=-0.87	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC277-2P EAKXD (639869)	(3) LMC277-2	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A				2 Secs (2 Secs) [==>]	[1]
	2	LMC277-2P EAKD (639869)	(3) LMC277-2	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-W T-FLR			2 Secs (2 Secs) [==>]	[1]
	3	LMC277-1 G140L/1105 (617210)	(3) LMC277-2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=36 0			510 Secs (2388 Secs) [==>597.0 Secs (Split 1)] [==>597.0 Secs (Split 2)] [==>597.0 Secs (Split 3)] [==>597.0 Secs (Split 4)]	[1]
	Comments: ETC estimates BUFFER-TIME of 532 sec using our CMFGEN 100K model. 2/3rds of this is 350 sec. Decreased to 150sec to be conservative									
	4	LMC277-1 G140L/1280 (618022)	(3) LMC277-2	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=ALL; BUFFER-TIME=47 0			600 Secs (2856 Secs) [==>714.0 Secs (Split 1)] [==>714.0 Secs (Split 2)] [==>714.0 Secs (Split 3)] [==>714.0 Secs (Split 4)]	[2]
Comments: We obtain a buffer-time of 712-714 sec either with a 100K black-body or with our CMFGEN model; we have taken 2/3rds of that and used 470 sec.										

