



## 18117 - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>
<b>Dr. Christy A. Tremonti (PI) (Contact)</b>	<b>University of Wisconsin - Madison</b>
Dr. Ralf Kotulla (CoI)	University of Wisconsin - Madison
Mr. Adam Linus Schaefer (CoI)	University of Wisconsin - Madison
Owen s Matthews Acuna (CoI)	University of Wisconsin - Madison
Dr. Marsha Wolf (CoI)	University of Wisconsin - Madison

### 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) MRK203	WFC3/UVIS	1	09-Oct-2025 14:00:41.0	yes
02	(1) MRK203	WFC3/UVIS	2	09-Oct-2025 14:00:42.0	yes
03	(1) MRK203 (2) MRK203-OFFSET-STAR	COS/FUV COS/NUV	3	09-Oct-2025 14:00:44.0	yes
04	(1) MRK203 (2) MRK203-OFFSET-STAR	COS/FUV COS/NUV	3	09-Oct-2025 14:00:45.0	yes
05	(1) MRK203 (2) MRK203-OFFSET-STAR	COS/FUV COS/NUV	2	09-Oct-2025 14:00:46.0	yes

11 Total Orbits Used

## **ABSTRACT**

One of the most startling discoveries made by JWST is a population of UV-bright  $z > 6$  galaxies that are metal-poor and extremely nitrogen-rich with N/O ratios 15 times higher than expected for their metallicity. While this unusual enrichment pattern appears to be a rare phenomenon at high- $z$ , it is notable that the C/N/O abundance patterns match those of second generation stars in globular clusters, suggesting that this may be a common, albeit short-lived, phase associated with the formation of massive star clusters in dense environments. Only 1 local analog of the N-rich high- $z$  galaxies is known, suggesting that the conditions that give rise to these abundance patterns are extremely rare in the local universe. Here we propose to study a second galaxy, MRK 203, which has a high density central region with an N/O ratio 5 times the solar value (comparable to the high- $z$  galaxies) and a normal N/O ratio outside the nucleus. The galaxy has much higher metallicity and lower ionization than the N-rich high- $z$  galaxies, but it enables us to probe the phenomenon of N-enrichment over a much wider range of galactic conditions. We propose U,B,I-band WFC3 imaging to characterize galactic conditions giving rise to the N-rich nuclear cluster(s) and H-alpha narrow band imaging to provide key constraints on the photoionization rate. We additionally propose COS FUV spectroscopy of the nuclear regions of MRK 203 to precisely constrain the cluster age and determine if the N-enrichment is due to rapid cooling of stellar wind ejecta from Wolf-Rayet stars or very massive stars ( $M > 150 M_{\text{sun}}$ ).

## **OBSERVING DESCRIPTION**

We seek to obtain WFC3 imaging and COS FUV spectroscopy of Mrk 203, a nearby ( $D \sim 100$  Mpc) interacting spiral galaxy. The chief goal is to understand the stellar populations of the bright nuclear star cluster(s) to determine the cause of the unusual N/O ratio in the nucleus.

WFC3 imaging:

Our goal is to measure the stellar masses and approximate stellar ages of the massive star clusters in Mrk 203's nuclear region using 3 broadbands and H-alpha narrow-band photometry. We also wish to measure the ionizing photon output of the clusters via their H-alpha luminosities. At the galaxy's distance, we do not expect to resolve the sizes of the star clusters, but we will determine whether there is a single dominant central star cluster or a complex of smaller clusters.

We will image the galaxy in 4 filters (F336W, F438W, F814W, F673N). Exposures are spread over 3 orbits which make up 2 Visits. Because we seek to use the F336W image as pre-imaging to define precise coordinates for COS, we have created a 1-orbit visit containing the F336W and F438W exposures to improve scheduling. The other filters make up a 2-orbit Visit. We have left a minute of unscheduled time in each orbit to improve scheduling.

We use the "UVIS2-FIX" position to place the galaxy's nucleus near the center of chip 2. While this is less optimal for CTE, it will enable the galaxy's merging companion to be included on the chips with only mild roll angle restrictions that would limit visibility. Using the "Roll Ranges Report" we find that the galaxy is only schedulable at ORIENTS = 200 - 335 when there are no restrictions. We restrict the ORIENT to 205-270, 300-335 to keep the companion galaxy out of the chip gap.

Because of the short exposures in each filter, we have elected to use a two-point dither pattern which will cover the chip gap (WFC3-UVIS-GAP-LINE). We tried to create 3 exposures for all filters, but ran into problems with exposures being shorter than the 350 sec buffer dump. Some filters are split into 2 sub-exposures and some into 3 so we have added a third point to the default WFC3-UVIS-GAP-LINE pattern for the filters with 3 dithers. We have adjusted the flash to reach the recommended minimum of 20 e- in each sub-exposure using the WFC3 ETC. Given that our target is at the center of a fairly extended bright galaxy, we are not as concerned about CTE issues; therefore we did not add extra FLASH to account for spatial variations.

COS spectroscopy:

Our goal is to obtain a UV spectrum of the of the most massive nuclear star cluster to look for spectral signatures of Very Massive Stars ( $M > 150 M_{\text{sun}}$ ).

Acquisition: We request that our COS Visits take place at least 30 days after our WFC3 imaging (we have submitted a TTRB request). The nuclear region of the galaxy is not well resolved in available ground based imaging and therefore we wish to use our F336W images to update the coordinates of our COS visits to focus on the brightest cluster.

Because COS peak-up may not work in the crowded center of the galaxy, we have opted to target a nearby bright star for acquisition and then do an offset to Mrk 203. The star is  $g=16$  and  $\text{NUV}=20.89$  mag and is 105 arcseconds away. Using the ETC and the GALEX NUV mag, we estimate that we can achieve  $S/N = 20$  in 10 seconds. We opt for a 30 second ACQ/IMAGE exposure to be on the safe side, yielding  $S/N=34$ .

After the first acquisition and move to MRK 203, we take a 60 second NUV IMAGE to confirm the target centering and provide additional NUV photometry for our SED fitting. We have assumed that the 3"-diameter nuclear region has a flux of 18.5 mag AB in the GALEX FUV filter. Assuming 1/3 of that flux is in the central star cluster gives  $m=19.7$  mag. For a NUV image the ETC reaches  $S/N = 20$  in 17.5 seconds. We adopt an

Proposal 18117 (STScI Edit Number: 0, Created: Thursday, October 9, 2025, 1:00:47PM Eastern Standard Time) - Overview  
exposure time of 60 seconds (COS.ta.2027085) in case the central star cluster is fainter.

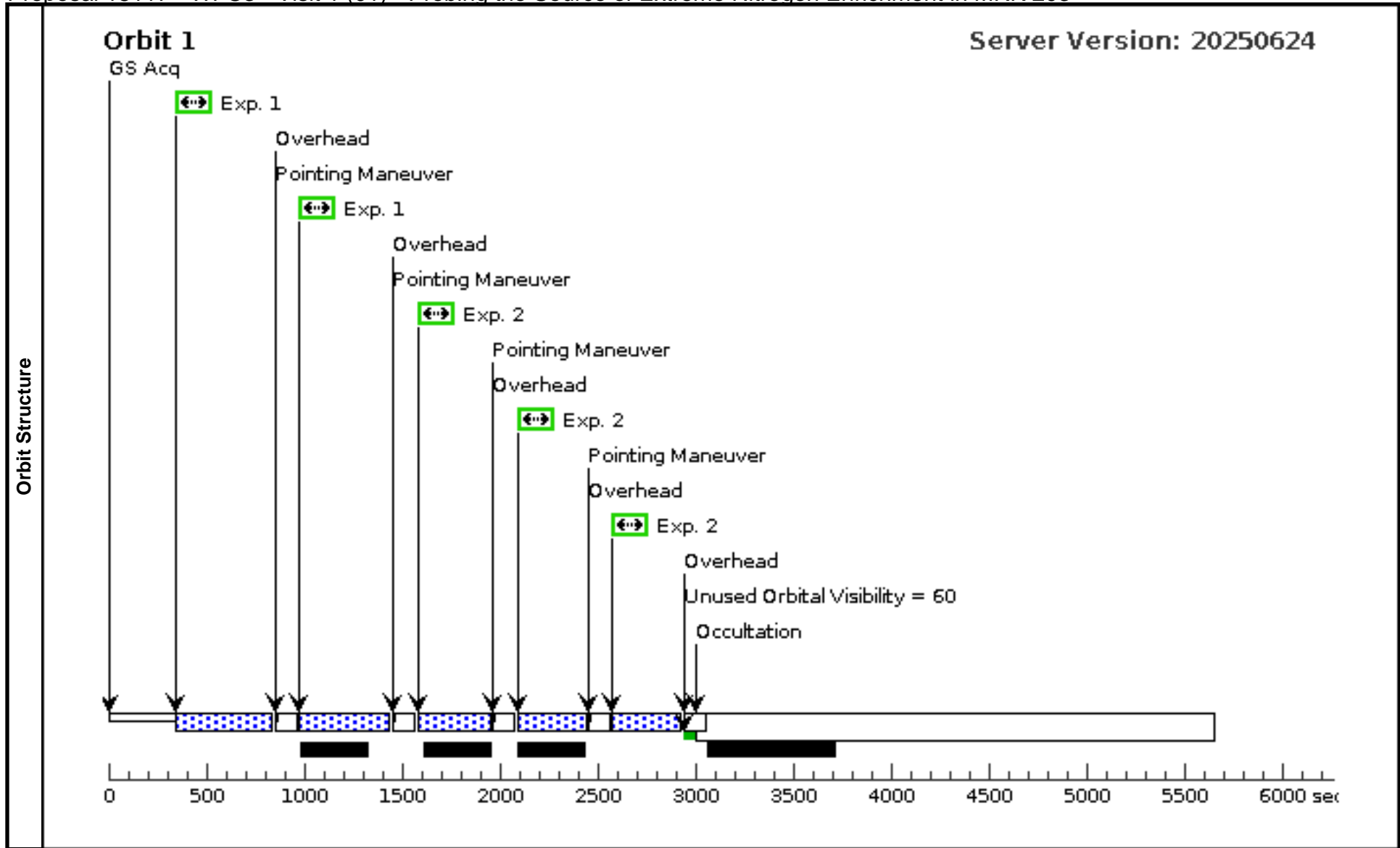
We will use the G140L grating centered at 1105 to obtain  $R \sim 3000$  spectra from 1120- 2000 Å. This will enable us to measure several key diagnostics of massive stars: NV 1240, Si IV 1440, C IV 1550, He II 1640. Following standard recommendations to reduce fixed pattern noise, we chose FP-POS=ALL. We have used the magnitude estimated for the 3" diameter nuclear region ( $m_{\text{FUV}} = 18.5$ ) to estimate our Buffer time of 7580 seconds. We assume a point source for our calculations, but recognize that some of the flux may be more diffusely distributed. A total exposure time of 16,320 seconds meets our requirement of  $S/N=15$  per resolution element at 1550 Å. (ETC =COS.sp.2027092).

We require 8 orbits for our COS exposures which we split into 3 Visits for ease of scheduling.

Proposal 18117 - WFC3 - Visit 1 (01) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

Thu Oct 09 18:00:47 GMT 2025

Visit	<b>Proposal 18117, WFC3 - Visit 1 (01), implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	Patterns	#	Primary Pattern				Secondary Pattern			
(5)		Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=3 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=								(2)
(6)		Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=								(1)
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous		
	(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245		V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS			
<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F336W (WFC3UVI S.im.2027074)	(1) MRK203	WFC3/UVIS, ACCUM, UVIS2-FIX	F336W	FLASH=18		Pattern 6, Exps 1-1 in WFC3 - Visit 1 (01) (6)	465 Secs (930 Secs) [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	2	F438W (WFC3UVI S.im.2027081)	(1) MRK203	WFC3/UVIS, ACCUM, UVIS2-FIX	F438W	FLASH=16		Pattern 5, Exps 2-2 in WFC3 - Visit 1 (01) (5)	350 Secs (1050 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)]	[1]

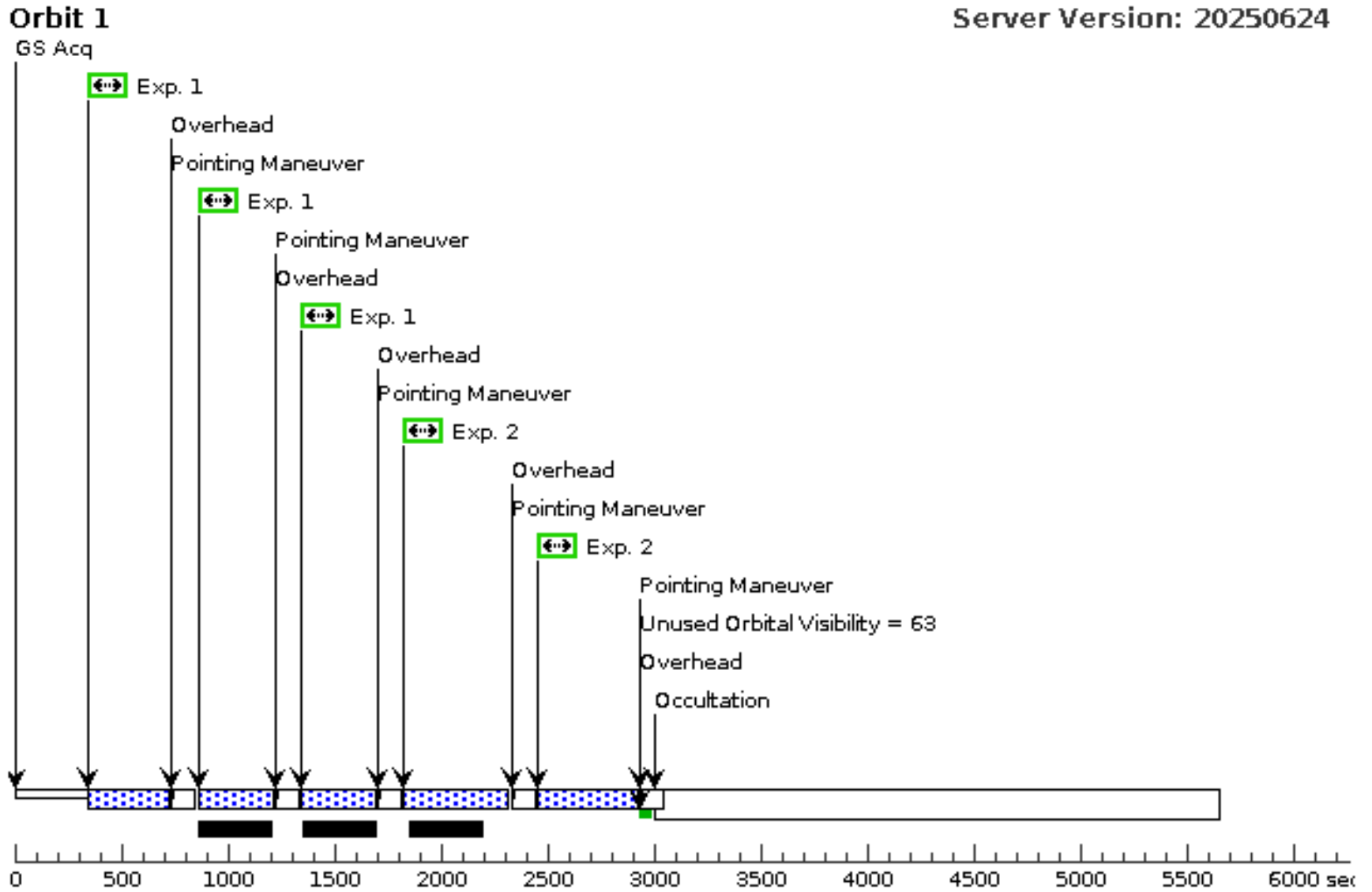


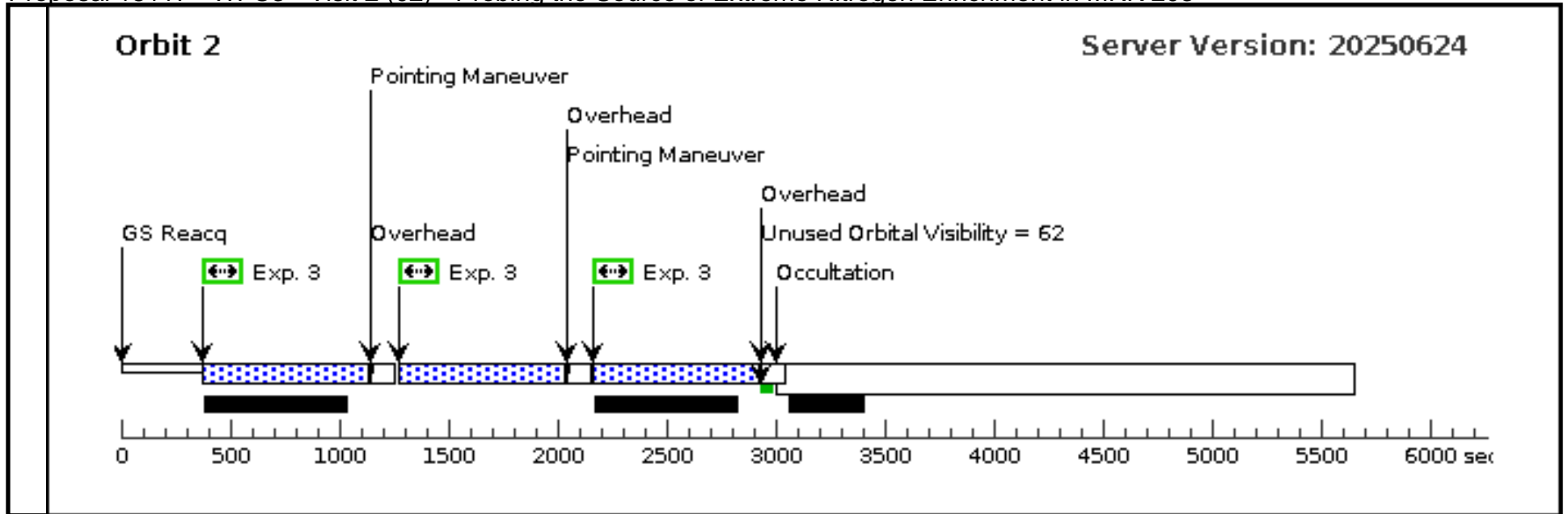
Proposal 18117 - WFC3 - Visit 2 (02) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

Thu Oct 09 18:00:47 GMT 2025

Visit	<b>Proposal 18117, WFC3 - Visit 2 (02), implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	#	Primary Pattern	Secondary Pattern	Exposures						
Patterns	(5)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=3 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=		(1), (3)						
	(6)	Pattern Type=WFC3-UVIS-GAP-LINE Coordinate Frame=POS-TARG Purpose=MOSAIC Pattern Orientation=85.759 Number Of Points=2 Angle Between Sides= Point Spacing=2.414 Center Pattern=true Line Spacing=		(2)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245	V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS				
<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	F814W (WFC3UVI S.im.2027078)	(1) MRK203	WFC3/UVIS, ACCUM, UVIS2-FIX	F814W	FLASH=9		Pattern 5, Exps 1-1 in WFC3 - Visit 2 (02) (5)	350 Secs (1050 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)]	[1]
	2	F673N (WFC3UVI S.im.2027070)	(1) MRK203	WFC3/UVIS, ACCUM, UVIS2-FIX	F673N	FLASH=17		Pattern 6, Exps 2-2 in WFC3 - Visit 2 (02) (6)	470 Secs (940 Secs) [=>(Pattern 1)] [=>(Pattern 2)]	[1]
	3	F637N #2	(1) MRK203	WFC3/UVIS, ACCUM, UVIS2-FIX	F673N	FLASH=16		Pattern 5, Exps 3-3 in WFC3 - Visit 2 (02) (5)	759 Secs (2277 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)]	[2]

Orbit Structure





Proposal 18117 - COS - Visit 3 (03) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

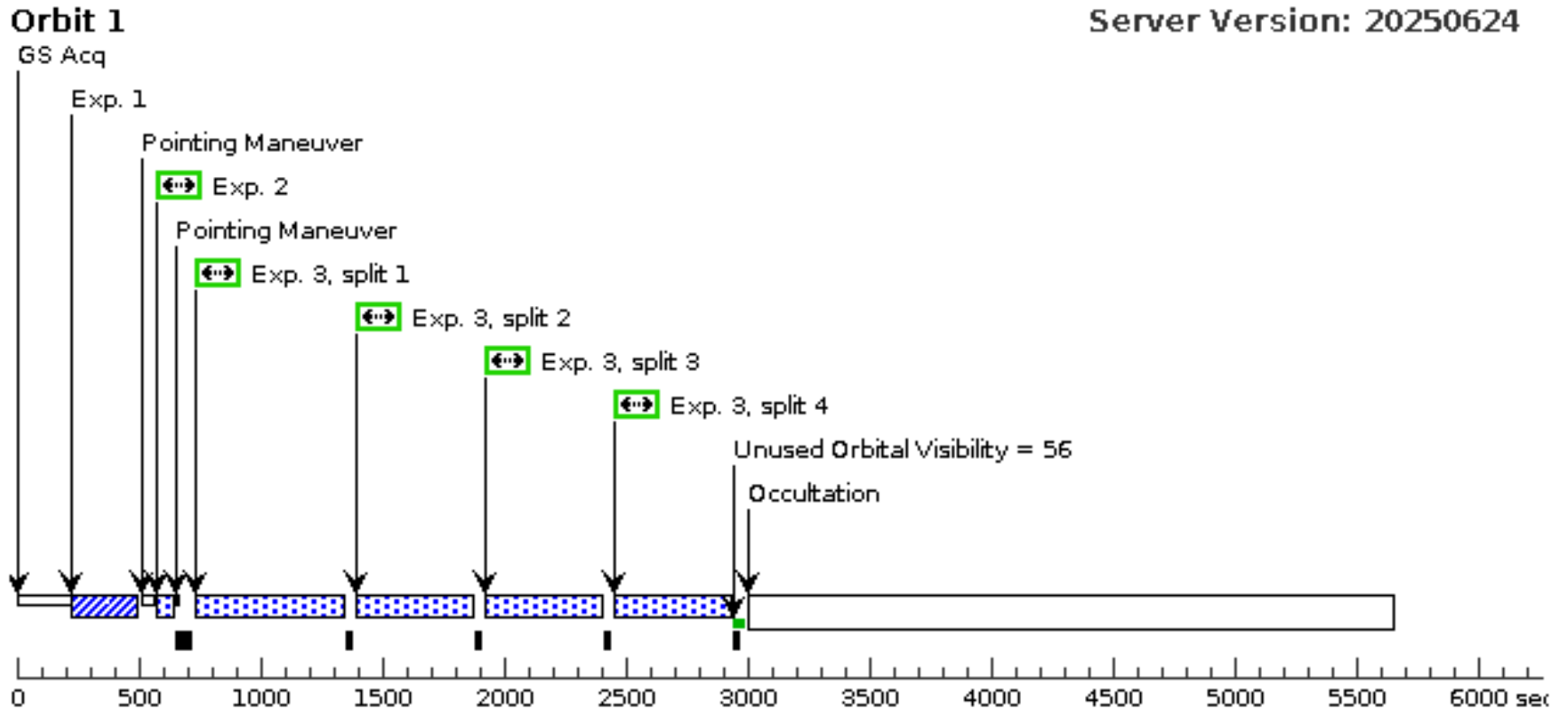
Thu Oct 09 18:00:47 GMT 2025

<b>Visit</b>	<b>Proposal 18117, COS - Visit 3 (03), implementation</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: COS/FUV, COS/NUV Special Requirements: AFTER 01 BY 30.0 D TO 365.0 D; ON HOLD FOR 01 <i>On Hold Comments: We require the WFC3 imaging in Visit 1 to happen first in order to center the COS aperture on our target. The target is the brightest UV cluster in a crowded region at the center of the galaxy. We will use our WFC3 F336W imaging to select the cluster for COS spectroscopy and update the target coordinates.</i>																																		
	<b>Diagnosics</b> (COS - Visit 3 (03)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS (COS - Visit 3 (03)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS (G140L spectra 1 (03.003)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G140L Spectra 2 (03.004)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G140L Spectra 3 (03.005)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.																																		
<b>Fixed Targets</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>MRK203 Alt Name1: UGC07340</td> <td>RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000</td> <td>Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245</td> <td>V=13.85+/-0.01 M_FUV = 16.75</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"> <i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i>                      Category=GALAXY                      Description=[SPIRAL, STARBURST]                      Extended=YES                 </td> </tr> <tr> <td>(2)</td> <td>MRK203-OFFSET-STAR Alt Name1: J121803+441051</td> <td>RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000</td> <td>Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016</td> <td>V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"> <i>Comments: Star to be used for COS Offset targeting</i>                      Category=STAR                      Description=[G V-IV]                      Extended=NO                 </td> </tr> </tbody> </table>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245	V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS	<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES						(2)	MRK203-OFFSET-STAR Alt Name1: J121803+441051	RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000	Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016	V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89	Reference Frame: ICRS	<i>Comments: Star to be used for COS Offset targeting</i> Category=STAR Description=[G V-IV] Extended=NO									
	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous																													
(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245	V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS																														
<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES																																			
(2)	MRK203-OFFSET-STAR Alt Name1: J121803+441051	RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000	Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016	V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89	Reference Frame: ICRS																														
<i>Comments: Star to be used for COS Offset targeting</i> Category=STAR Description=[G V-IV] Extended=NO																																			

Proposal 18117 - COS - Visit 3 (03) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

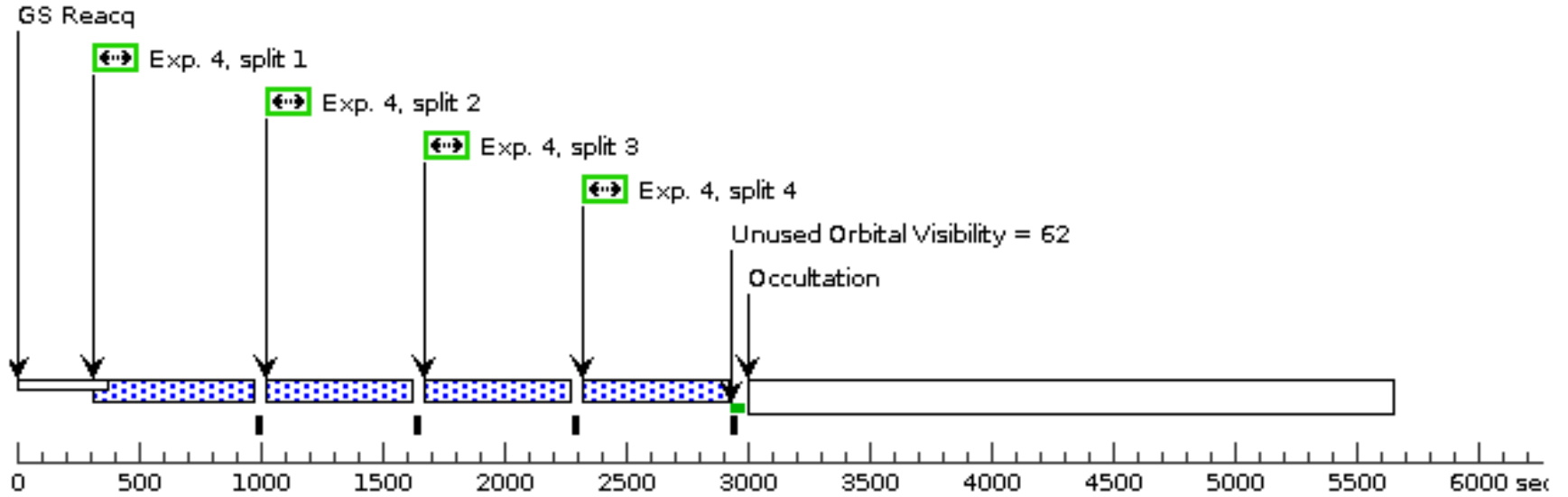
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	Acq Image Offset Star 1 (COS.ta.202 7084)	(2) MRK203-OFFSE T-STAR	COS/NUV, ACQ/IMAGE, PSA	MIRRORA			30 Secs (30 Secs) [==>]	[1]	
	2	NUV Image MRK203 (COS.ta.202 7085)	(1) MRK203	COS/NUV, ACCUM, PSA	MIRRORA			60 Secs (60 Secs) [==>]	[1]	
	<i>Comments: Image to help us understand which clusters in the crowded nuclear region are observed in the COS aperture.</i>									
	<i>We have assumed that the 3"-diameter nuclear region has a flux of 18.5 mag AB in the GALEX FUV filter. Assuming 1/3 of that flux is in the central star cluster gives m=19.7 mag. For a NUV image the ETC reaches S/N = 20 in 17.5 seconds. We adopt an exposure time of 60 seconds.</i>									
	3	G140L spect ra 1 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL			425 Secs (1700 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[1]
4	G140L Spec tra 2 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL			545 Secs (2180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[2]	
5	G140L Spec tra 3 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL			545 Secs (2180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[3]	

Orbit Structure



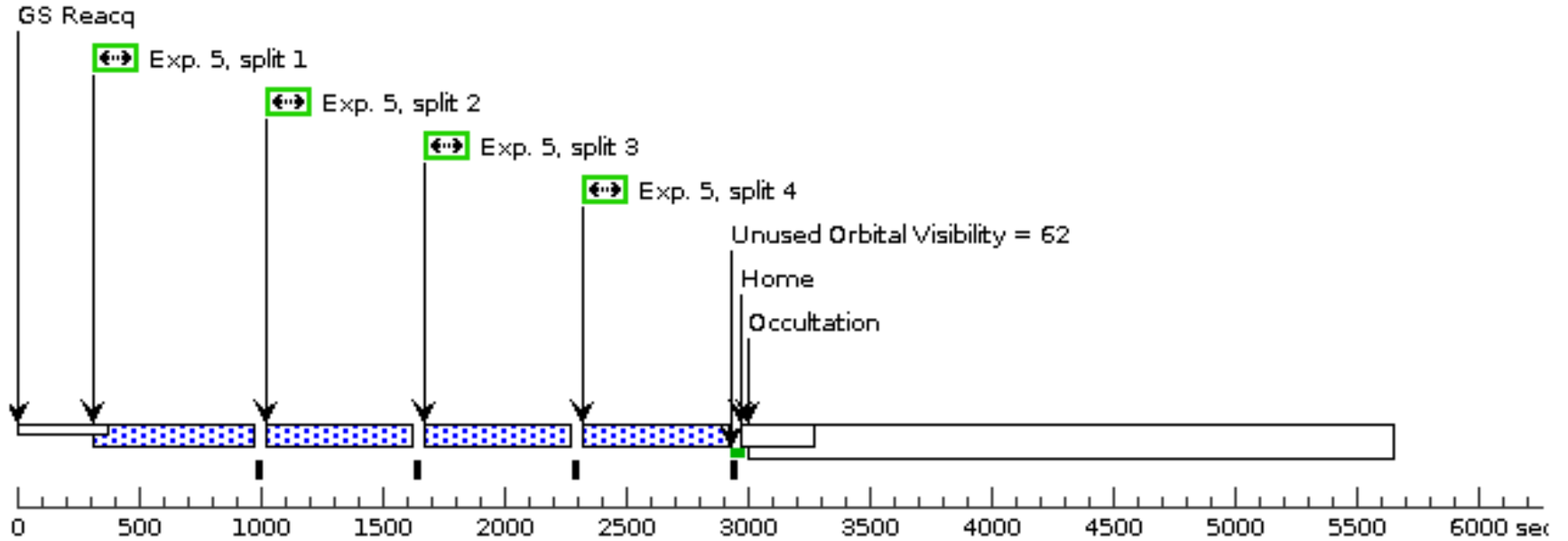
### Orbit 2

Server Version: 20250624



### Orbit 3

Server Version: 20250624



Proposal 18117 - COS - Visit 4 (04) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

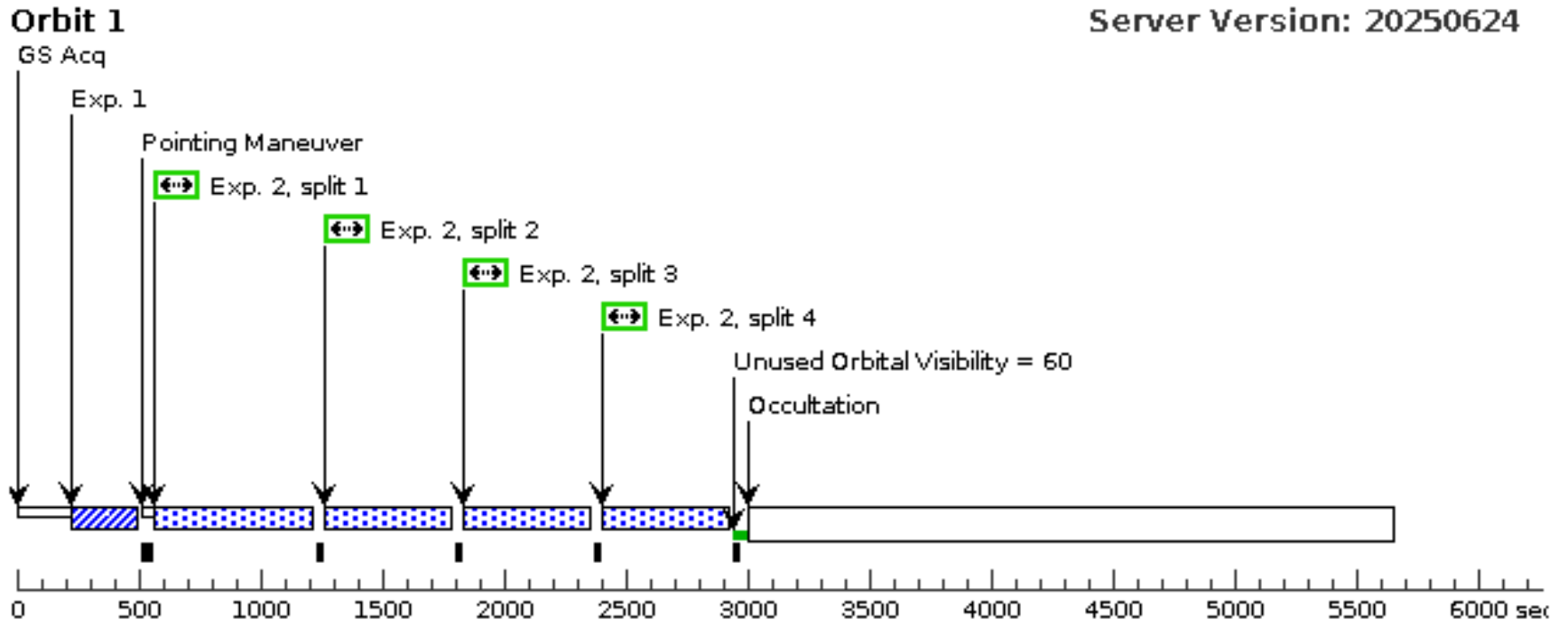
Thu Oct 09 18:00:47 GMT 2025

<b>Visit</b>	<b>Proposal 18117, COS - Visit 4 (04), implementation</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: COS/FUV, COS/NUV Special Requirements: AFTER 01 BY 30.0 D TO 365.0 D; ON HOLD FOR 01 <i>On Hold Comments: We require the WFC3 imaging in Visit 1 to happen first in order to center the COS aperture on our target. The target is the brightest UV cluster in a crowded region at the center of the galaxy. We will use our WFC3 F336W imaging to select the cluster for COS spectroscopy and update the target coordinates.</i>																																		
	<b>Diagnosics</b> (COS - Visit 4 (04)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS (COS - Visit 4 (04)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS (G140L spectra 4 (04.002)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G140L Spectra 5 (04.003)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G140L Spectra 6 (04.004)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.																																		
<b>Fixed Targets</b>	<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Fluxes</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>MRK203 Alt Name1: UGC07340</td> <td>RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000</td> <td>Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245</td> <td>V=13.85+/-0.01 M_FUV = 16.75</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"> <i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i>                      Category=GALAXY                      Description=[SPIRAL, STARBURST]                      Extended=YES                 </td> </tr> <tr> <td>(2)</td> <td>MRK203-OFFSET-STAR Alt Name1: J121803+441051</td> <td>RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000</td> <td>Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016</td> <td>V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89</td> <td>Reference Frame: ICRS</td> </tr> <tr> <td colspan="6"> <i>Comments: Star to be used for COS Offset targeting</i>                      Category=STAR                      Description=[G V-IV]                      Extended=NO                 </td> </tr> </tbody> </table>	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous	(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245	V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS	<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES						(2)	MRK203-OFFSET-STAR Alt Name1: J121803+441051	RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000	Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016	V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89	Reference Frame: ICRS	<i>Comments: Star to be used for COS Offset targeting</i> Category=STAR Description=[G V-IV] Extended=NO									
	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous																													
(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245	V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS																														
<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES																																			
(2)	MRK203-OFFSET-STAR Alt Name1: J121803+441051	RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000	Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016	V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89	Reference Frame: ICRS																														
<i>Comments: Star to be used for COS Offset targeting</i> Category=STAR Description=[G V-IV] Extended=NO																																			

Proposal 18117 - COS - Visit 4 (04) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

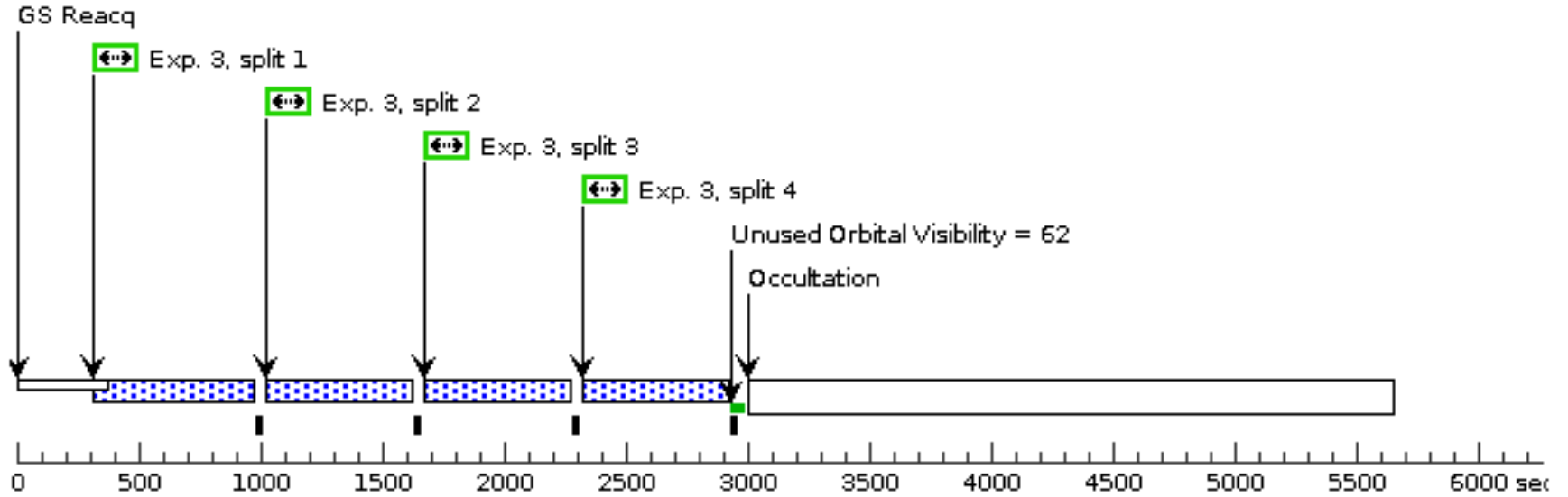
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	Acq Image Offset Star 2 (COS.ta.202 7084)	(2) MRK203-OFFSE T-STAR	COS/NUV, ACQ/IMAGE, PSA	MIRRORA					30 Secs (30 Secs) [==>]	[1]
	2	G140L spect ra 4 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL			465 Secs (1860 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[1]	
	3	G140L Spec tra 5 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL			545 Secs (2180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[2]	
	4	G140L Spec tra 6 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL			545 Secs (2180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[3]	

Orbit Structure



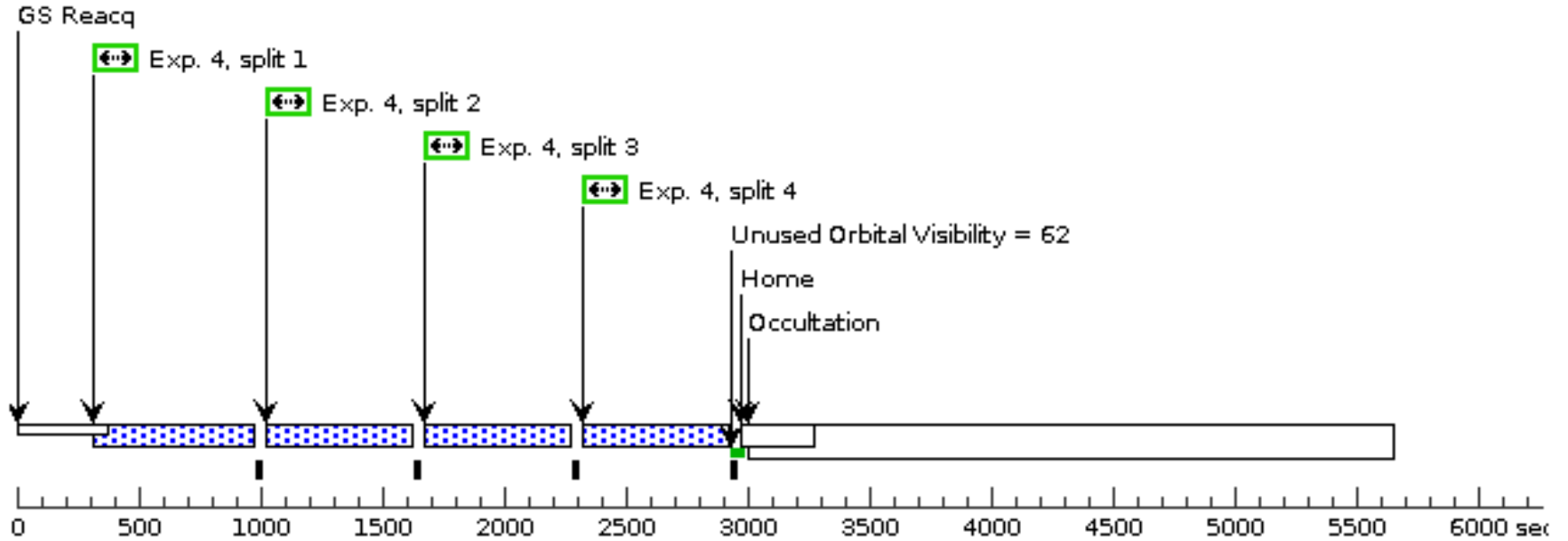
### Orbit 2

Server Version: 20250624



### Orbit 3

Server Version: 20250624



Proposal 18117 - COS - Visit 5 (05) - Probing the Source of Extreme Nitrogen Enrichment in MRK 203

Thu Oct 09 18:00:47 GMT 2025

<b>Visit</b>	<b>Proposal 18117, COS - Visit 5 (05), implementation</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: COS/FUV, COS/NUV Special Requirements: AFTER 01 BY 30 D TO 365 D; ON HOLD FOR 01 <i>On Hold Comments: We require the WFC3 imaging in Visit 1 to happen first in order to center the COS aperture on our target. The target is the brightest UV cluster in a crowded region at the center of the galaxy. We will use our WFC3 F336W imaging to select the cluster for COS spectroscopy and update the target coordinates.</i>									
	<b>Diagnosics</b> (COS - Visit 5 (05)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS (G140L spectra 7 (05.002)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details. (G140L Spectra 8 (05.003)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.									
<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>				
	(1)	MRK203 Alt Name1: UGC07340	RA: 12 18 12.8632 (184.5535967d) Dec: +44 10 23.68 (44.17324d) Equinox: J2000	Proper Motion RA: 0 arcsec/yr Proper Motion Dec: 0 arcsec/yr Epoch of Position: 2016 Redshift: 0.0245	V=13.85+/-0.01 M_FUV = 16.75	Reference Frame: ICRS				
	<i>Comments: The galaxy is fairly nearby (D~111 Mpc) spiral galaxy with a diameter of about 30". Our coordinates are from GAIA. For our WFC3 imaging, coordinate uncertainties are not a concern. We will be targeting the bright nuclear star cluster for our COS observations. We will update the coordinates of our COS pointings based on our WFC3 imaging.</i> Category=GALAXY Description=[SPIRAL, STARBURST] Extended=YES									
(2)	MRK203-OFFSET-STAR Alt Name1: J121803+441051	RA: 12 18 3.3482 (184.5139508d) Dec: +44 10 51.13 (44.18087d) Equinox: J2000	Proper Motion RA: -21.1374 mas/yr Proper Motion Dec: -14.3820 mas/yr Parallax: 0.6930" Epoch of Position: 2016	V=16.02+/-0.5 SDSS u=17.35, g=16.0, GALEX NUV = 20.89	Reference Frame: ICRS					
<i>Comments: Star to be used for COS Offset targeting</i> Category=STAR Description=[G V-IV] Extended=NO										
<b>Exposures</b>	<b>#</b>	<b>Label (ETC Run)</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time (Total)/[Actual Dur.]</b>	<b>Orbit</b>
	1	Acq Image Offset Star 3 (COS.ta.202 7084)	(2) MRK203-OFFSE T-STAR	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				30 Secs (30 Secs) [==>]	[1]
	<i>Comments: We will use the coordintates from our WFC3 F336W image to update the COS pointing coordinates to center on the brightest nuclear star cluster.</i>									
	2	G140L spect ra 7 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL				465 Secs (1860 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]
3	G140L Spec tra 8 (COS.sp.202 5576)	(1) MRK203	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=75 80; FP-POS=ALL				545 Secs (2180 Secs) [==>(Split 1)] [==>(Split 2)] [==>(Split 3)] [==>(Split 4)]	[2]

Orbit Structure

