16699 - Constraining the emergent EUV ionizing emission in the reawakening monster in Mrk 590

Cycle: 29, Proposal Category: GO

(UV Initiative)

(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	(2) NGC-863-1	COS/FUV COS/NUV	1	16-Nov-2023 04:00:19.0	yes
02	(2) NGC-863-1	COS/FUV COS/NUV	1	16-Nov-2023 04:00:20.0	yes
03	(2) NGC-863-1	COS/FUV COS/NUV	1	16-Nov-2023 04:00:20.0	yes
04	(2) NGC-863-1	COS/FUV COS/NUV	1	16-Nov-2023 04:00:21.0	yes

4 Total Orbits Used

ABSTRACT

After a 10-year hiatus, Mrk 590 has rekindled its nuclear activity and is now strongly flaring in a low X-ray state. This offers a very rare opportunity to follow in real time the onset of AGN activity that can lead to better insights on the AGN central engine physics. While directly impacting galaxy evolution through energetic feedback, the AGN structure and physics are still poorly understood. We wish to catch the early onset of AGN activity to test details of AGN accretion physics that cannot be constrained in any other way.

We propose a ToO program to obtain four COS spectra of Mrk 590 at different X-ray flux levels as its AGN builds up. We will measure UV broad-line fluxes, constrain the UV and EUV ionizing continuum emission from the accretion disk, and establish the critical ionizing luminosity required for broad-line production, something that is still unknown. This allows us to test theoretical model predictions for the broad-line region physics. The efficient strategy we employ ensures that instructive constraints are obtained with a very modest HST program - yet, the full time request may not be needed. HST is the only telescope that can obtain spectra of the far-UV emission below 1900A that are crucial to reach our science goals.

By combining this HST program with observations obtained with Swift, NuSTAR, XMM and VLT we will provide a comprehensive account of the black hole accretion state changes during the early onset of AGN activity as the AGN builds up. These HST/COS data will contribute with unique information to the legacy database on this intriguing object that will undoubtedly spawn new insight on AGN physics and the changing-look AGN phenomenon.

OBSERVING DESCRIPTION

We request COS low-resolution FUV observations of Seyfert 1 galaxy Mrk 590 to determine the strength of the AGN thermal disk continuum emission and the broad emission lines.
Using the G140L grating with the 1105 cenwave setting (=1120-2100A) we will cover the Ly 1215, Nv 1240, Si iv+Oiv 1400, Civ 1549, and He ii 1640 broad emission lines in a single exposure. The resolution (R 1500-4000) is adequate to resolve the typical AGN narrow emission components; the [O III] 5007 narrow line width is FWHM~400 km s-1.

The program consists of 4 ToOs (1 orbit each), that will be triggered based on SWIFT XRT and UV monitoring. Initially, Mrk590 will be monitored with Swift every 12 days. The first visit will be triggered when the XRT flux gets less than L1=0.3e-11 erg s-1 cm-2. The remaining 3 visits will be

triggered once the XRT flux rises above the following limits: (0.5, 0.9, 1.3) x 10e-11 erg s-1 cm-2. Once the second orbit is triggered, SWIFT monitoring will intensify to ~daily cadence.

We have requested 3 non disruptive ToOs (requested response time ~21 days) and 1 disruptive ToO (requested response time ~7 days). The disruptive ToO will be triggered only in case of rapid rise of the X-Ray and UV fluxes.

We request long term status for these observations since we cannot guarantee trigger during cy29.

The current observing strategy (see below) is based on previous COS observations of the same sources (e.g. PID 15448). We will update strategy, exposure time and ETC calculations as needed once visits are triggered and SWIFT UV fluxes are available.

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ACQUISITION: The target has precise 2MASS coordinates (ICRS reproduced with an error < 0.1"). We plan to use ACQ/IMG NUV MIRRORB and an exp time of 140s. For our ETC calculations we assume a flat continuum in fl normalized to half of the min observed UVW2 flux f_l ~1.1e-15 erg s-1 cm-2 Ang-1 @1928 Ang (http://etc.stsci.edu/etc/results/COS.ta.1030198/). This will ensure acquisition in case of "faint" state. The source will not pose a threat to the detector even if it ends up being 5 times more luminous than the max detected in the past 80 days (http://etc.stsci.edu/etc/results/COS.ta.1030199/).

SCIENCE: We use the G140L grating at 1105Ang with FP_POS=ALL. For ETC calculations we assume a flat continuum normalized to the mean observed UVW2 flux in the past 80 days (http://etc.stsci.edu/etc/results/COS.sp.1030204/). Buffer time is set to 2/3 of the ETC buffer time. The source will not pose a threat to the detector even if it ends up being 5 times more luminous than the past 80 days (http://etc.stsci.edu/etc/results/COS.sp.1030205/).

Visit

Proposal 16699, Visit 01, completed Thu Nov 16 09:00:22 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: ON HOLD ; TOO RESPONSE TIME 21.0D

Comments: Observing strategy and exposure times are currently based on previous COS observations (PID 15448).
We will update acq settings, exp times and ETC calculations as soon as the observations are triggered and SWIFT UV fluxes are available.

01/12/2022 GDR
SWIFT flux: flambda@1928=1.12e-15 erg s-1 cm-2 Ang-1; Observing strategy is OK, no changes to observation plan (added ETC calculations).
Acquisition will stil be succesful if the source gets significantly fainter, while it will not pose a risk if it gets 5x brighter (https://etc.stsci.edu/etc/results/COS.ta.1683253/)

On Hold Comments: Non disruptive ToO.

Diagnostics

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

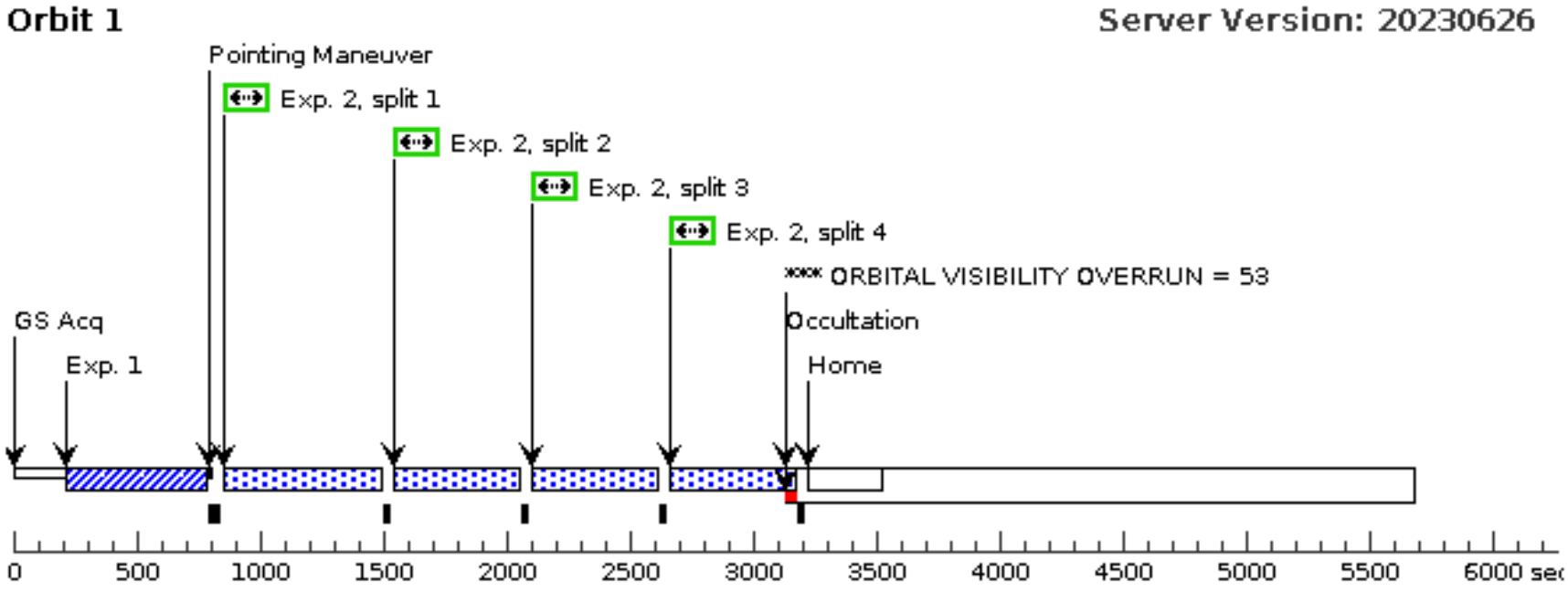
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-863-1	RA: 02 14 33.5611 (33.6398379d) Dec: -00 46 0.18 (-.76672d) Equinox: J2000	Epoch of Position: 2015.5	V=13.81	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ACCRETION DISK, BLR, SEYFERT]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.1683251)	(2) NGC-863-1	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				140 Secs (140 Secs) *[==>]*	 ***[1]***
2	(COS.sp.1683252)	(2) NGC-863-1	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=ALL; BUFFER-TIME=5000			400 Secs (1824 Secs) *[==>456.0 Secs (Split 1)]* *[==>456.0 Secs (Split 2)]* *[==>456.0 Secs (Split 3)]* *[==>456.0 Secs (Split 4)]*	 ***[1]***

Orbit Structure



Visit

Proposal 16699, Visit 02, implementation Thu Nov 16 09:00:22 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: ON HOLD ; TOO RESPONSE TIME 21.0D

Comments: Observing strategy and exposure times are currently based on previous COS observations (PID 15448).
We will update acq settings, exp times and ETC calculations as soon as the observations are triggered and SWIFT UV fluxes are available.

On Hold Comments: Non disruptive ToO.

Diagnostics

(Exposure 1 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 2 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Fixed Targets

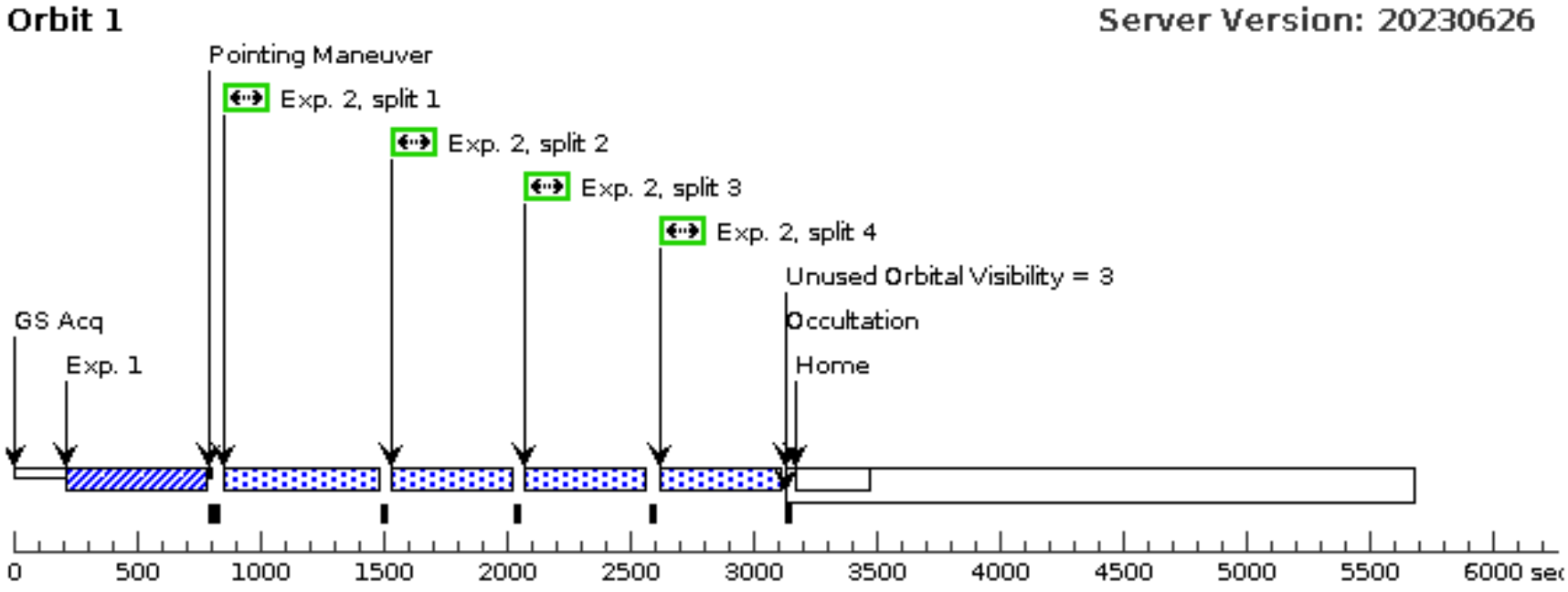
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-863-1	RA: 02 14 33.5611 (33.6398379d) Dec: -00 46 0.18 (-.76672d) Equinox: J2000	Epoch of Position: 2015.5	V=13.81	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ACCRETION DISK, BLR, SEYFERT]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) NGC-863-1	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				140 Secs (140 Secs)	
								[==>]	***[1]***
2		(2) NGC-863-1	COS/FUV, TIME-TAG, PSA	G140L	FP-POS=ALL;			400 Secs (1768 Secs)	
				1105 A	BUFFER-TIME=5000			*[==>442.0 Secs (Split 1)]* *[==>442.0 Secs (Split 2)]* *[==>442.0 Secs (Split 3)]* *[==>442.0 Secs (Split 4)]*	***[1]***

Orbit Structure



Visit

Proposal 16699, Visit 03, implementation Thu Nov 16 09:00:22 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: ON HOLD ; TOO RESPONSE TIME 21.0D

Comments: Observing strategy and exposure times are currently based on previous COS observations (PID 15448).
We will update acq settings, exp times and ETC calculations as soon as the observations are triggered and SWIFT UV fluxes are available.

On Hold Comments: Non disruptive ToO.

Diagnostics

(Visit 03) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Exposure 1 (Visit 03)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 2 (Visit 03)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Fixed Targets

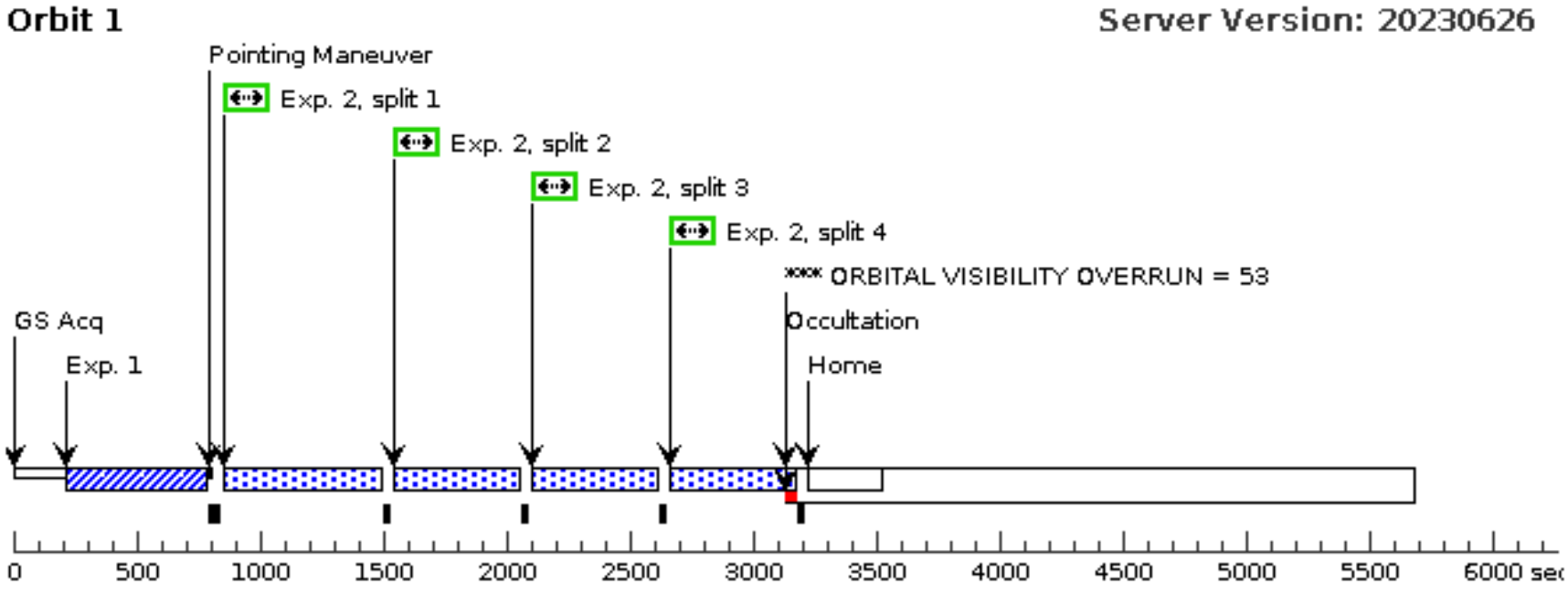
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-863-1	RA: 02 14 33.5611 (33.6398379d) Dec: -00 46 0.18 (-.76672d) Equinox: J2000	Epoch of Position: 2015.5	V=13.81	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ACCRETION DISK, BLR, SEYFERT]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) NGC-863-1	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				140 Secs (140 Secs)	
								[==>]	***[1]***
2		(2) NGC-863-1	COS/FUV, TIME-TAG, PSA	G140L	FP-POS=ALL;			400 Secs (1824 Secs)	
				1105 A	BUFFER-TIME=5000			*[==>456.0 Secs (Split 1)]* *[==>456.0 Secs (Split 2)]* *[==>456.0 Secs (Split 3)]* *[==>456.0 Secs (Split 4)]*	***[1]***

Orbit Structure



Visit

Proposal 16699, Visit 04, implementation Thu Nov 16 09:00:22 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: ON HOLD ; TOO RESPONSE TIME 7.0D

Comments: Observing strategy and exposure times are currently based on previous COS observations (PID 15448).
We will update acq settings, exp times and ETC calculations as soon as the observations are triggered and SWIFT UV fluxes are available.

On Hold Comments: Disruptive ToO.

Diagnostics

(Visit 04) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Exposure 1 (Visit 04)) Warning (Form): Sensitive exposures should have an ETC run number provided.

(Exposure 2 (Visit 04)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-863-1	RA: 02 14 33.5611 (33.6398379d) Dec: -00 46 0.18 (-.76672d) Equinox: J2000	Epoch of Position: 2015.5	V=13.81	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ACCRETION DISK, BLR, SEYFERT]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) NGC-863-1	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				140 Secs (140 Secs)	
								[==>]	***[1]***
2		(2) NGC-863-1	COS/FUV, TIME-TAG, PSA	G140L	FP-POS=ALL;			400 Secs (1824 Secs)	
				1105 A	BUFFER-TIME=5000			*[==>456.0 Secs (Split 1)]* *[==>456.0 Secs (Split 2)]* *[==>456.0 Secs (Split 3)]* *[==>456.0 Secs (Split 4)]*	***[1]***

Orbit Structure