17274 - Catching changing-look AGN NGC 3516 at a bright flux level to establish the role of winds

Cycle: 30, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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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) NGC-3516	COS/FUV COS/NUV	2	09-Dec-2025 10:00:29.0	yes

2 Total Orbits Used

ABSTRACT

NGC 3516 is a remarkable Seyfert-1 galaxy, which over the last decade has undergone major spectral transformations, classifying it as a changing-look AGN. Understanding the nature and origin of spectral variability in such changing-look AGN would provide key insights into the accretion-outflow mechanism. Swift monitoring of NGC 3516 shows dramatic flux rises and declines during its changing-look state. We propose ToO observations with XMM, NuSTAR, and HST, triggered using Swift monitoring, to catch NGC 3516 at a high flux level to be able to carry out the

first high resolution X-ray and UV spectroscopy of its winds during the changing-look state. The proposed observations would enable us to ascertain the role of winds in the transformation of NGC 351

OBSERVING DESCRIPTION

This is a HST ToO observation, approved as part of a joint ToO XMM-Newton proposal. It plans to obtain the HST/COS spectrum of NGC 3516 during its bright flux state of the changing-look state. The simultaneous COS UV spectrum of NGC 3516 is crucial for our investigation

Please note that the agreement between XMM-Newton and HST missions allows one Disruptive HST ToO per cycle, which corresponds to this proposal. For confirmation of this you may contact the XMM mission PI (Norbert Schartel): Norbert.Schartel@sciops.esa.int

In case another XMM ToO proposal triggers a Disruptive HST ToO, then this HST ToO observation becomes non-Disruptive. However, that is very unlikely because our XMM proposal was the only approved proposal requesting joint ToO observation with HST.

Please note this ToO HST observation needs to be taken simultaneously with XMM-Newton (within 2 days). As stated in our proposal the ToO observations may be carried out any time within 14 days after the trigger request.

The HST ToO observation will be triggered in one of the following windows, when the target is observable with XMM:
2023-05-01 to 2023-05-31
2023-09-21 to 2023-12-02
2024-03-17 to 2024-04-30.

Our HST/COS time and setup is based on the prior observations of NGC 3516 and our simulations (described in the XMM proposal), which required 2 orbits to constrain broad absorption lines of Ly-alpha, N V, and C IV with gratings G130M and G160M. This also allows measurement of weak, low-ionization lines associated with the new ionization state of the warm absorber.

Following the Phase II Proposal instructions and the allowed COS settings for Cycle 30, the central wavelengths and FPPOS positions that we have selected provide the optimum full spectral coverage of the interested regions with the G130M and G160M gratings, minimize spectral gaps, and maximize the potential of the detection of the relevant broad and narrow absorption lines. This enables us to fully explore the UV spectral signatures of the obscuring outflow in NGC 3516. Thus, for our observation we utilize G130M/1222, G130M/1291, G160M/1600, and G160M/1623.

We obtained the required time for each exposure using the COS Exposure Time Calculator (ETC) tool and the NGC 3516 UV fluxes at 2030 A published by Mehdipour et al. 2022, ApJ, 925, 84. The redshift z=0.00973 and foreground extinction of E(B-V)=0.107 are taken into account. For the target acquisition we used the minimum expected UV flux of 0.7e-14 erg/cm^2/s/A and calculated the required exposure time to get a S/N of 30 using ACQ/IMAGE with BOA. Using the expected flux of 1.5e-14 erg/cm^2/s/A for the ToO, the exposure times were calculated to give a S/N of about 10 for each exposure with G130M/1222, G130M/1291, G160M/1600, and G160M/1623. The maximum UV flux observed (3e-14) does not pose a bright object risk for COS. NGC 3516 has been acquired and observed with HST COS before, and there are no bright field objects that would prove an overlight risk to COS.

For the BUFFER-TIME, we obtained the recommended buffer (2/3 of the buffer fill time) from the ETC for each exposure.

Please note because we are using two different CENWAVES with each grating and two FP-POS positions in each, we already accomplish the actual objectives of switching between different FP-POS settings:

(1) Better science return: the spectrum is placed at four different locations on the detector, enabling us to detect and reject detector anomalies like dead spots, hot spots, grid-wire shadows, etc.

(2) Spread the flux across the detector in multiple locations, especially in bright emission lines, to decrease charge depletion and extend the lifetime of the detectors.

We do not want to sacrifice S/N with unnecessary extra exposures and increased overhead during each visit by using all 4 FP-POS settings with each CENWAVE. When only one CENWAVE is used, then 4 FP-POS settings makes sense, but that's not the case for our observations. Our chosen FP-POS settings reflect our S/N requirements while still meeting the objectives of using different FP-POS settings in our program.

Although reduced gyro operations for HST would be unfortunate, our program would still remain fully feasible. Reduced gyro operations would approximately halve the opportunities for coordination with XMM-Newton. Also, any orientation limitation would not impact our program.

Proposal 17274 - Visit 01 - Catching changing-look AGN NGC 3516 at a bright flux level to establish the role of winds

Visit

Proposal 17274, Visit 01, completed Tue Dec 09 15:00:30 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%; BETWEEN 01-MAY-2023:00:00:00 AND 31-MAY-2023:00:00:00; BETWEEN 21-SEP-2023:00:00:00 AND 02-DEC-2023:00:00:00; BETWEEN 17-MAR-2024:00:00:00 AND 30-APR-2024:00:00:00; TOO RESPONSE TIME 14.0D

Diagnostics

(Visit 01) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions at a given COS cenwave (or 2 positions for certain exception cases). See extended explanation in the diagnostic browser.

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

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

Fixed Targets

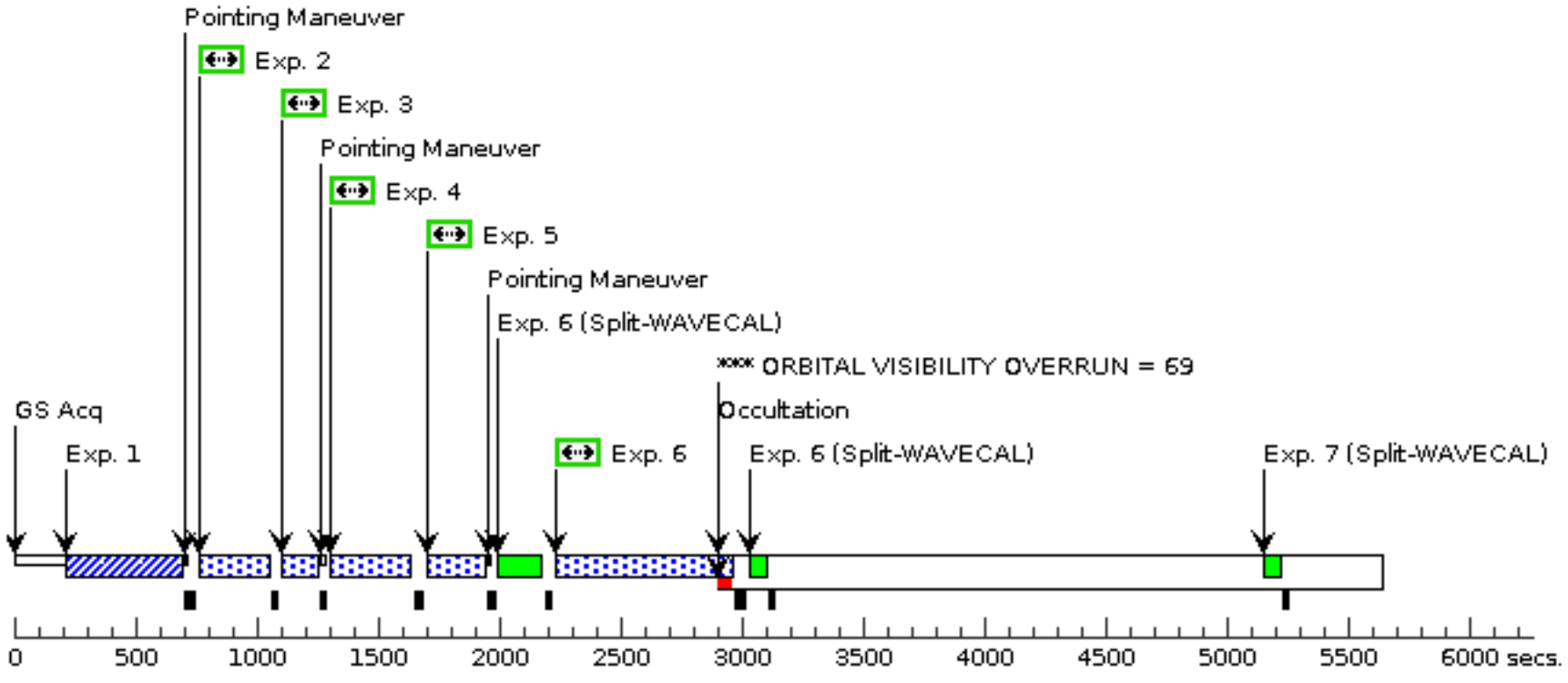
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-3516	RA: 11 06 47.4633 (166.6977638d) Dec: +72 34 7.27 (72.56869d) Equinox: J2000	Proper Motion RA: 5.786220836866838E-6 sec of time/yr Proper Motion Dec: -0.0015670000721001998 arcsec/yr Epoch of Position: 2015.5	V=12.4	Reference Frame: ICRS

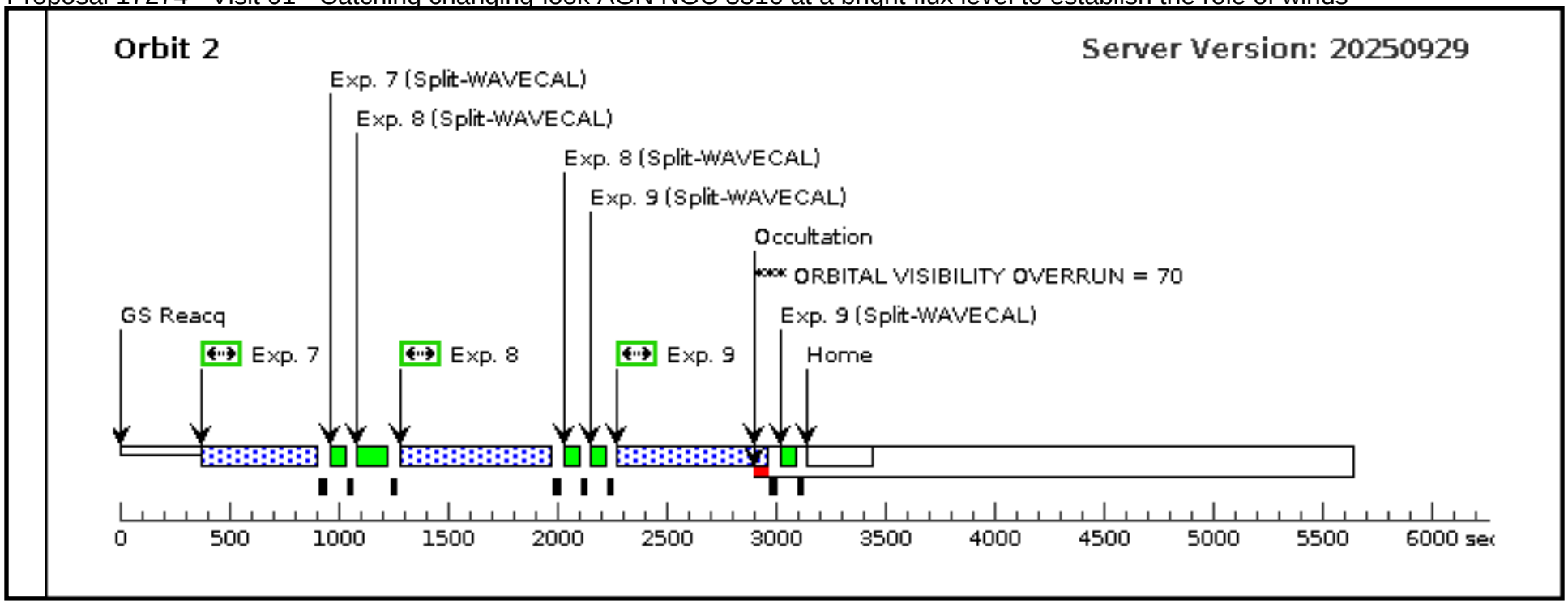
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[ACCRETION DISK, BLR, SEYFERT, WIND]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(1836889)	(1) NGC-3516	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				126 Secs (126 Secs)	
								[==>]	***[1]***
Comments: Using NGC 3516 minimum flux (corresponding to our ToO) of 0.7e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve target acquisition with S/N of 30.									
2	(1836894)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1779; FP-POS=1			100 Secs (100 Secs)	
								[==>]	***[1]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G130M.									
3	(1836894)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1779; FP-POS=2			100 Secs (100 Secs)	
								[==>]	***[1]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G130M.									
4	(1836895)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=1203; FP-POS=3			183 Secs (183 Secs)	
								[==>]	***[1]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G130M.									
5	(1836895)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G130M 1291 A	BUFFER-TIME=1203; FP-POS=4			183 Secs (183 Secs)	
								[==>]	***[1]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G130M.									
6	(1836896)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=3042; FP-POS=1			681 Secs (681 Secs)	
								[==>]	***[1]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G160M.									
7	(1836896)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=3042; FP-POS=2			479 Secs (479 Secs)	
								[==>]	***[2]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G160M.									
8	(1836897)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=3289; FP-POS=3			639 Secs (639 Secs)	
								[==>]	***[2]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G160M.									
9	(1836897)	(1) NGC-3516	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=3289; FP-POS=4			639 Secs (639 Secs)	
								[==>]	***[2]***
Comments: Using NGC 3516 expected ToO flux of 1.5e-14 erg/cm2/s/A at 2030 A (Mehdipour et al. 2022), we calculated the exposure time to achieve S/N of about 10 with G160M.									

Orbit Structure




Orbit 2
Server Version: 20250929
Exp. 7 (Split-WAVECAL)
Exp. 8 (Split-WAVECAL)
Exp. 8 (Split-WAVECAL)
Exp. 9 (Split-WAVECAL)
Occultation
**** ORBITAL VISIBILITY OVERRUN = 70
Exp. 9 (Split-WAVECAL)
GS Reacq
Exp. 7
Exp. 8
Exp. 9
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec