13836 - Unveiling the X-ray/UV Connection in AGN Winds: the PG 1126-041 Case Study

Cycle: 22, Proposal Category: GO

(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	(1) PG1126-041	COS/FUV	2	24-Jul-2014 21:59:55.0	yes

2 Total Orbits Used

ABSTRACT

Winds are key to understanding the nature of AGN at small and large scales. Winds are common in AGN, and likely play a role in regulating the black hole growth and star formation in the surrounding galaxies. Models of radiatively-driven winds predict that X-ray absorbing gas acts as a shield, preventing over-ionization of the UV outflowing gas by the strong illuminating continuum source. However, recent observations are putting

the hypothesis of this X-ray absorbing gas to the test.

We propose a 2-cycle small GO program of 4 HST+XMM coordinated observations with the goal of exploring the connection (if any) between the UV and X-ray absorbing wind phase(s). PG 1126-041 is a low redshift (z=0.06) luminous Seyfert 1 galaxy that displays complex and variable UV and X-ray absorption. A 1992 simultaneous IUE+ROSAT observation revealed X-ray absorption in the OVII/OVIII band, and broad blueshifted (v~-5,000 km/s) UV absorption in, at least, CIV and NV transitions. Later, independent IUE and XMM-Newton observations showed that UV and X-ray absorption is highly variable, but no more UV+X-ray simultaneous observations have been carried out since 1992. The X-ray absorbing gas could be acting as a "patchy" porous shield, and its variations in our line-of-sight could be causing the observed UV variability; if so, a correlation between UV and X-ray absorption is expected. COS observations will cover a large range of transitions, allowing the detections of changes in the ionization of the UV absorber. Our results will be a direct test of the relation between the UV and the X-ray phases of the wind, and as such will be of crucial interest to test AGN wind models.

OBSERVING DESCRIPTION

Our goal is to observe the AGN PG1126-410 with sufficiently high S/N ratios (S/N >~ 10 per resolution element per grating) in order to detect changes in the ionization of the UV absorber and test whether they are coordinated with changes in the X-ray absorption (which is obtained with near-simultaneous XMM-Newton/EPIC, not separated from the HST/COS observations in more than 1 day).

We used the ETC on the HST/COS website to calculate the necessary exposure times to obtain spectra with, at least, S/N=10 per resolution element. UV fluxes are included as "Other Fluxes" and are determined based on a previous HST/COS observation in cycle 19, which proves the feasibility of our program. In the ETC we employed average background, a spectrum of power law with index 0. (based on the previous HST/COS observation and other IUE previous exposures), a z=0.06196 and a typical flux of 1.e-14 flam with no extinction.

We will use gratings G130M (centered at 1055 and 1327) and G160M (centered at 1577 A) for the science exposures to cover a large range of UV absorption transitions (CIV, NV, OVI, PV, SiIV, and many lower ionization transitions). Grating M is necessary to be able to resolve these absorption profiles into multiple narrower components.

We will observe PG1126-410 during 4 visits: 3 of them spaced 15 days during cycle 21, and a fourth observation on cycle 22 11 months later.

This target has accurate coordinates, and the HST/COS observation in 2012 was acquired successfully without ACQ/SEARCH and with dispersed light acquisition. Thus, during each visit we choose to do dispersed light acquisition (PEAKXD, PEAKD), which exposure times are calculated with S/N=40 (as recommended).

The science exposures are all done in TIME-TAG mode to exclude poor quality data and improved background removal. We use the FP-SPLIT mode to reduce fixed pattern noise and avoid having important lines fall on grid wires. Since we only have 2 orbits and 3 different settings, we use 2 FP POSITIONS in the case of G130M/1327 and G130M/1577 and all 4 in the case of G130M/1055, starting in the neutral position (FP-POS=3) and increasing in 1 from exposure to exposure to minimize overheads as suggested in the COS manual.

--------- Additional Comments ----------

The buffer time has been selected based on 2/3s of the real buffer time derived from ETC for double the flux to acquire the requested total S/N of 10. However, we are confused as whether once the exposure is divided in several FP-POS we should modify the buffer time as the exposure time for each observation has been reduced. We are waiting on information from STScI on this matter.

Visit

Proposal 13836, Visit 01, implementation Fri Jul 25 01:59:57 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PG1126-041	RA: 11 29 16.7300 (172.3197083d) Dec: -04 24 7.50 (-4.40208d) Equinox: J2000	Redshift: 0.061960	V=14.4 Previous HST/COS flux at 1320 A rest-frame (1400 A observed) = 1 x 10^(-14) erg/s/cm2/A	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PG1126-041 -ACQ/PEA KXD (517633)	(1) PG1126-041	COS/FUV, ACQ/PEAKXD, PSA	G130M 1327 A	SEGMENT=BOTH			13 Secs (13 Secs) *[==>]*	*[1]*
	*Comments: Calculated for 0.5*F(1150)=0.5E-14 erg/cm2/s/A COS ETC result for S/N=40 (default setting) is 12.1228 (id COS.sa.517633). Count rate entire detector: 523.445 c/sec.*								
2	PG1126-041 -ACQ/PEA KD (517633)	(1) PG1126-041	COS/FUV, ACQ/PEAKD, PSA	G130M 1327 A	CENTER=DEF; NUM-POS=5.; STEP-SIZE=0.9			13 Secs (13 Secs) *[==>]*	*[1]*
	*Comments: Calculated for 0.5*F(1150)=0.5E-14 erg/cm2/s/A COS ETC result for S/N=40 (default setting) is 12.1228 (id COS.sa.517633). Count rate entire detector: 523.445 c/sec.*								
3	PG1126-041 -orbit1(1327 -3) (sp.515008)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=1489; FP-POS=3			770 Secs (770 Secs) *[==>]*	*[1]*
	Comments: 2/3rds of buffer time at twice nominal flux is 1489 sec								
4	PG1126-041 -orbit1(1327 -4) (sp.515008)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G130M 1327 A	BUFFER-TIME=1489; FP-POS=4			770 Secs (770 Secs) *[==>]*	*[1]*
	Comments: 2/3rds of buffer time at twice nominal flux is 1489 sec								
5	PG1126-041 -orbit1(1055 -1) (sp.515007)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=7878; FP-POS=1			548 Secs (548 Secs) *[==>]*	*[1]*
	Comments: 2/3rds of buffer time at twice nominal flux is 7878 sec								
6	PG1126-041 -orbit1(1055 -2) (sp.515007)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=7878; FP-POS=2			489 Secs (489 Secs) *[==>]*	*[2]*
	Comments: 2/3rds of buffer time at twice nominal flux is 7878 sec								
7	PG1126-041 -orbit1(1055 -3) (sp.515007)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=7878; FP-POS=3			400 Secs (400 Secs) *[==>]*	*[2]*
	Comments: 2/3rds of buffer time at twice nominal flux is 7878 sec								
8	PG1126-041 -orbit1(1055 -4) (sp.515007)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G130M 1055 A	BUFFER-TIME=7878; FP-POS=4			400 Secs (400 Secs) *[==>]*	*[2]*
	Comments: 2/3rds of buffer time at twice nominal flux is 7878 sec								
9	PG1126-041 -orbit1(1327 -1) (sp.515009)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2701; FP-POS=1			530 Secs (530 Secs) *[==>]*	*[2]*
	Comments: 2/3rds of buffer time at twice nominal flux is 2701 sec								
10	PG1126-041 -orbit1(1327 -2) (sp.515009)	(1) PG1126-041	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=2701; FP-POS=2			530 Secs (530 Secs) *[==>]*	*[2]*
	Comments: 2/3rds of buffer time at twice nominal flux is 2701 sec								

Orbit Structure