



## 13296 - The nuclear outflow in PDS 456

Cycle: 21, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
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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) PDS456	COS/FUV	2	01-Apr-2014 21:01:25.0	yes
51	(1) PDS456	COS/FUV	2	01-Apr-2014 21:01:37.0	yes

4 Total Orbits Used

### ABSTRACT

PDS 456 is the most luminous object in the local universe and has one of the most extreme X-ray and UV spectra of any active galactic nucleus. The X-ray data reveal a massive, ionised outflow, which carries as much kinetic energy as the bolometric output of this quasar. Such outflows are thought to be disk driven, should be common when AGN are feeding/merging and may explain the M - sigma relation through a feedback mechanism. Situated at low redshift ( $z=0.184$ ), PDS 456 provides an excellent opportunity to study such an outflow in detail. A short HST/STIS observation taken in 2000 also revealed an extraordinary UV spectrum, including the most blueshifted CIV emission line known (at  $-5000 \text{ km s}^{-1}$ ) and a broad, blueshifted absorption feature probably due either to Ly-alpha or NV 1240 angstroms. More recently, PDS 456 has been shown to have a highly variable X-ray spectrum, and during 2013/14 we will monitor the outflow in this quasar using large programs allocated on Suzaku and XMM-

Newton. Here we request a HST/COS observation towards the end of the X-ray monitoring campaign to provide contemporaneous UV data in order to constrain the physical properties of the outflow. In particular, we wish to search for associated UV/X-ray absorption features and relate the UV emission and absorption characteristics of PDS 456.

### **OBSERVING DESCRIPTION**

We propose a HST/COS observation of PDS~456 using the G140L grating which give a suitable velocity resolution over the required wavelength range from blueward of Ly $\alpha$  to redward of HeII  $\lambda$  1640. We adopt the previous HST/STIS spectrum as a guide to the target flux, and assume no major UV continuum variability. Comparing the HST/STIS observed flux with the XMM-Newton OM UV magnitudes provides fluxes consistent to well within a factor of two.

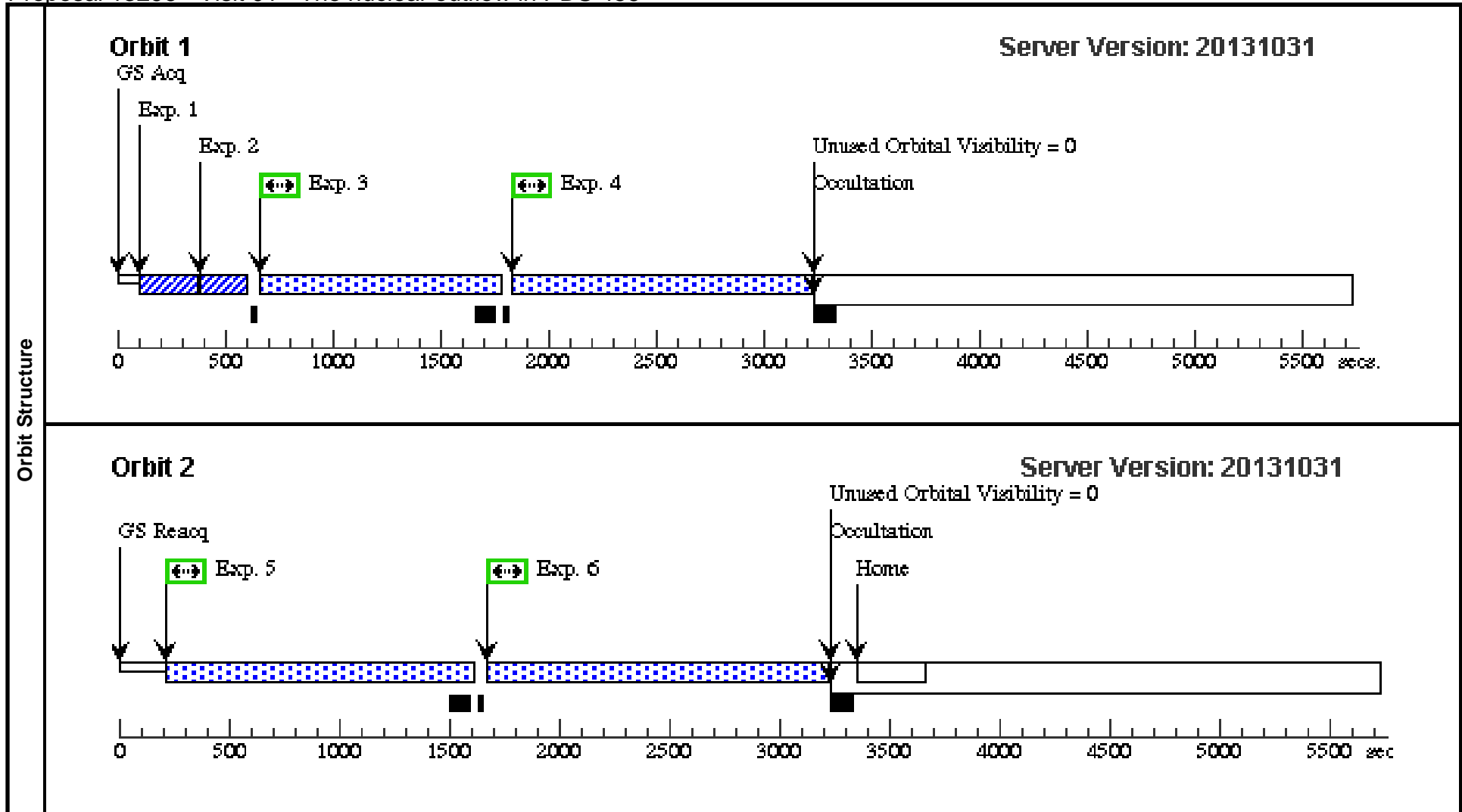
Simulations show that we can measure the required spectral features with sufficient accuracy to achieve the science goals of our proposal by attaining a signal-to-noise ratio of 20-30 per HST/COS spectral resolution element. We require this S/N particularly at the location of the broad absorption feature (observed wavelength  $\approx$  1350 $\text{\AA}$ ) and the NV and CIV emission lines (observed wavelengths  $\approx$  1450 $\text{\AA}$  and 1800 $\text{\AA}$ ).

We have used the on-line HST exposure-time calculators to determine and compare the required exposure times. From these we have concluded that HST/COS is more efficient than HST/STIS and hence is our chosen instrument. To cover the spectral range required, we request observations using the G140L grating for 95 minutes. The previous HST/STIS observation shows that the host-galaxy of PDS~456 does not contaminate the UV spectrum significantly. Given the declination of PDS~456, we have 54 minutes per orbit of visibility.

Proposal 13296 - Visit 01 - The nuclear outflow in PDS 456

Wed Apr 02 01:01:46 GMT 2014

Fixed Targets	Visit									
	Proposal 13296, Visit 01, completed Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV Special Requirements: BETWEEN 01-FEB-2014:00:00:00 AND 31-MAR-2014:00:00:00; BETWEEN 01-SEP-2013:00:00:00 AND 30-OCT-2013:00:00:00									
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous					
(1)	PDS456	RA: 17 28 19.8000 (262.0825000d) Dec: -14 15 55.90 (-14.26553d) Equinox: J2000	Redshift: 0.184	V=14.03 The observed continuum flux at 1350 angstroms is approximately 4e-15 erg cm <sup>-2</sup> s <sup>-1</sup>	Reference Frame: ICRS					
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.sa.510 365)	(1) PDS456	COS/FUV, ACQ/PEAKXD, PSA	G140L 1280 A				10 Secs (10 Secs) [==>]	[1]
	2	(COS.sa.510 365)	(1) PDS456	COS/FUV, ACQ/PEAKD, PSA	G140L 1280 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-W T-FLR			15 Secs (15 Secs) [==>]	[1]
	3	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=90 0; FP-POS=1			1000 Secs (1000 Secs) [==>]	[1]
	4	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=13 38; FP-POS=2			1338 Secs (1338 Secs) [==>]	[1]
	5	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=12 50			1350 Secs (1350 Secs) [==>]	[2]
	6	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=4; BUFFER-TIME=14 98			1498 Secs (1498 Secs) [==>]	[2]



Proposal 13296 - Visit 51 - The nuclear outflow in PDS 456

Wed Apr 02 01:01:49 GMT 2014

Visit	<b>Proposal 13296, Visit 51</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: COS/FUV Special Requirements: (none) <i>Comments: This is a HOPR repeat of visit 01</i>									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	PDS456	RA: 17 28 19.8000 (262.0825000d) Dec: -14 15 55.90 (-14.26553d) Equinox: J2000	Redshift: 0.184	V=14.03 The observed continuum flux at 1350 angstroms is approximately 4e-15 erg cm <sup>-2</sup> s <sup>-1</sup>	Reference Frame: ICRS				
	<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.sa.510 365)	(1) PDS456	COS/FUV, ACQ/PEAKXD, PSA	G140L 1280 A				10 Secs (10 Secs) [==>]	[1]
	2	(COS.sa.510 365)	(1) PDS456	COS/FUV, ACQ/PEAKD, PSA	G140L 1280 A	NUM-POS=5; STEP-SIZE=0.9; CENTER=FLUX-W T-FLR			15 Secs (15 Secs) [==>]	[1]
	3	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A		BUFFER-TIME=90 0; FP-POS=1		1000 Secs (1000 Secs) [==>]	[1]
	4	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A		BUFFER-TIME=13 38; FP-POS=2		1338 Secs (1338 Secs) [==>]	[1]
	5	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A		FP-POS=3; BUFFER-TIME=12 50		1350 Secs (1350 Secs) [==>]	[2]
	6	(COS.sp.510 345)	(1) PDS456	COS/FUV, TIME-TAG, PSA	G140L 1280 A		FP-POS=4; BUFFER-TIME=14 98		1498 Secs (1498 Secs) [==>]	[2]

