



## 14152 - Hot gas cooling and turbulence in the 3C326N radio-galaxy

Cycle: 23, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

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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) 3C-326	COS/FUV COS/NUV	5	08-Jul-2015 21:09:21.0	yes

5 Total Orbits Used

### ABSTRACT

The 3C326N radio-galaxy is one of the best examples of negative AGN feedback: with  $2e9$  Msun of molecular gas, its star formation rate is below  $0.07$  Msun/year, 20 times lower than what the Kennicutt law predicts. Why there is so much of molecular gas and why it is not forming stars? Powerful mid-IR H<sub>2</sub> emission and very broad optical and far-IR lines suggest that strong turbulence may heat the H<sub>2</sub> gas and prevent it from being

gravitationally bound at all scales. The turbulence driven at large scales by the radio jet would cascade down to smaller scales where it is dissipated. It must be powerful enough to drive high-speed shocks (100-400 km/s) in the hot ( $1e7$  K) plasma that will compress it and allows it to cool down to temperatures where the gas becomes molecular. This cooling is expected to occur through UV line emission, and especially through CIV and OVI lines. To test this prediction, we propose to observe those lines in the 3C326N radio-galaxy. This will allow us to: (1) determine whether UV line emission is a significant cooling process of the hot gas, compute the mass cooling rate of the hot gas (is it high enough to form the H<sub>2</sub> disk?), and (2) test our model of the multiphase turbulent gas energized by a radio-jet which would account for both H<sub>2</sub> masses and energetics (can turbulence be sustained by shocks pressurizing the disk?). These observations will greatly enhance our understanding of why 3C~326N, and massive early-type galaxies in general, have large masses of molecular gas but yet weak star formation. The physics explored in this proposal applies to a wide range of environments, including cluster cooling flows and hot gas cooling in haloes of galaxies.

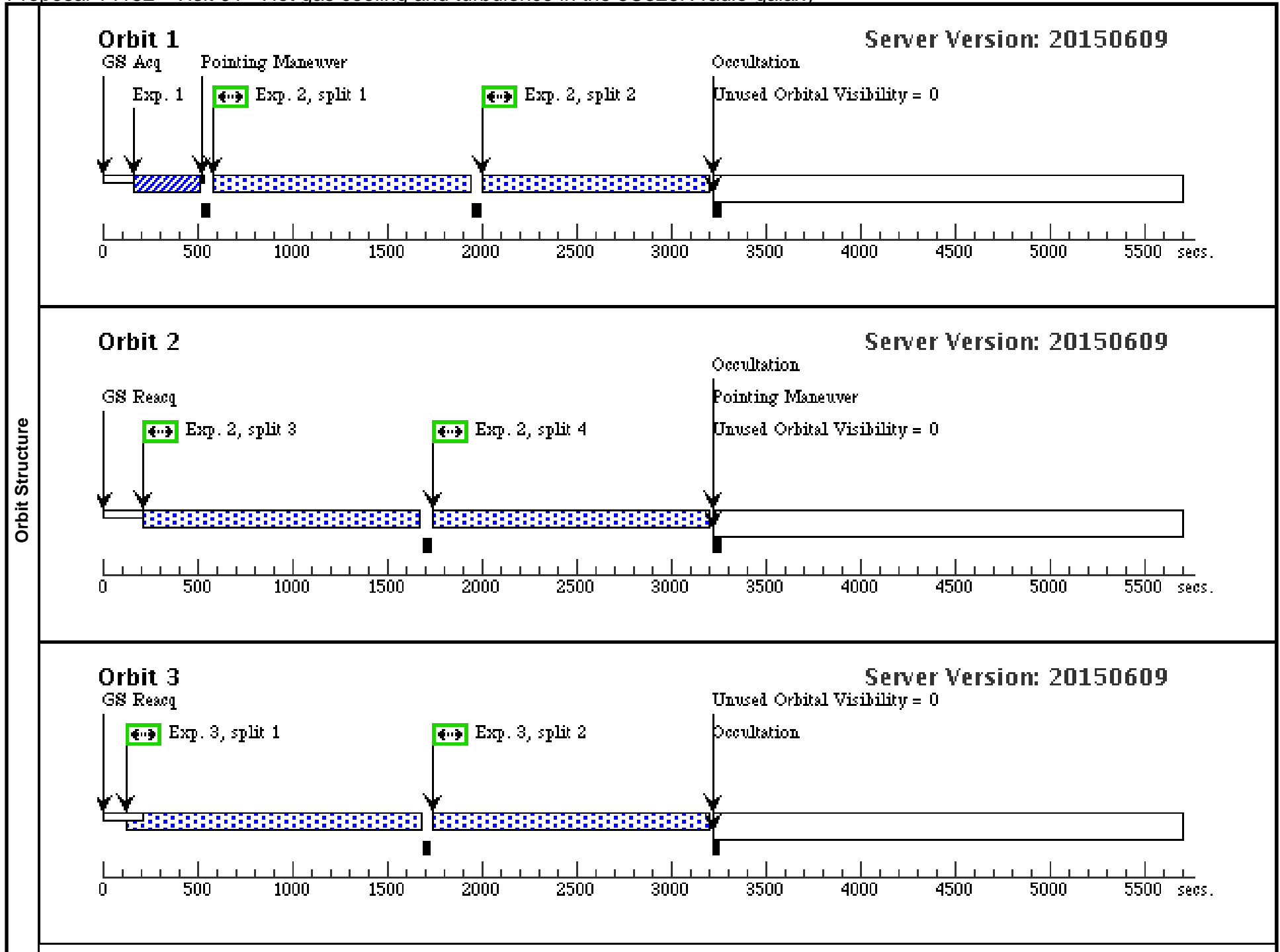
## **OBSERVING DESCRIPTION**

We request observations of the 3C326N radio-galaxy at moderate resolution using the G130M and G160M settings for all positions. This ensures, even if the emission is extended, a minimum resolution of 1400, which is enough to avoid line blending issues that we may encounter with the low-resolution grating. In order to achieve continuous spectral coverage and minimize fixed pattern noise, observations in each grating will be made at two (three) central wavelengths for G140L (G130M and G160M). The O<sub>VI</sub> and C<sub>IV</sub> lines are redshifted at 1138Å and 1703Å, so we will use central wavelengths settings at 1222 and 1096Å for G130M and 1589 and 1600Å for G160M. Note that the Ly $\alpha$  line falls in the 1222Å G130M setting. We will optimize S/N using the on-orbit line spread function and correcting for fixed pattern noise. We will also dither instrumental and gain-sag features.

Proposal 14152 - Visit 01 - Hot gas cooling and turbulence in the 3C326N radio-galaxy

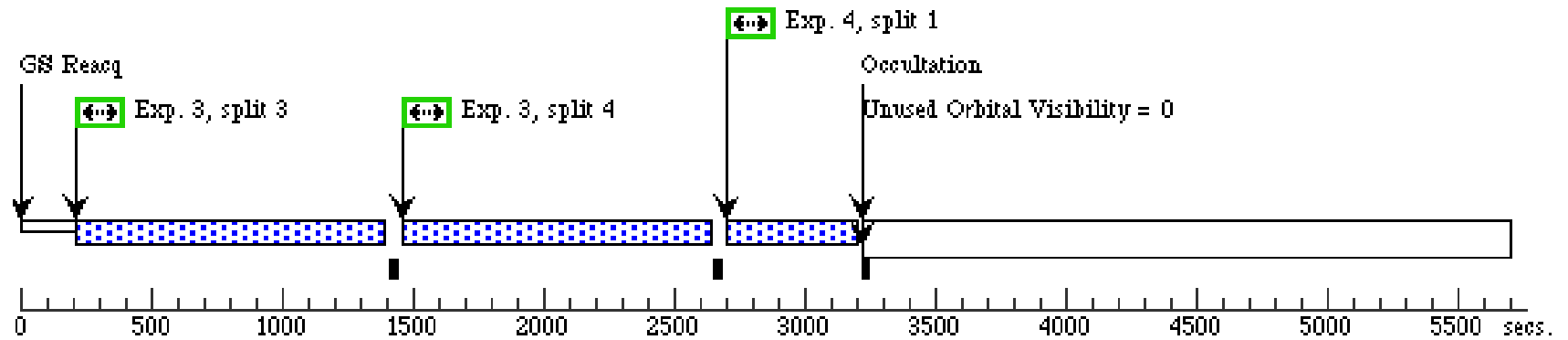
Thu Jul 09 01:09:24 GMT 2015

Visit	<b>Proposal 14152, Visit 01</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: COS/NUV, COS/FUV Special Requirements: (none)									
	Diagnostics	(Exposure 2 (Visit 01)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See the proposal instructions for more details. (Exposure 3 (Visit 01)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See the proposal instructions for more details. (Exposure 4 (Visit 01)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See the proposal instructions for more details. (Exposure 5 (Visit 01)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See the proposal instructions for more details.								
Fixed Targets		#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
		(1)	3C-326	RA: 15 52 9.1200 (238.0380000d) Dec: +20 05 48.50 (20.09681d) Equinox: J2000	Redshift: 0.09002	V=13.5+/-1.0	Reference Frame: ICRS			
	<i>Comments: This object was generated by the targetselector and retrieved from the NED database. Extended=YES</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(COS.ta.716 741)	(1) 3C-326	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				60 Secs (60 Secs) [==>]	[1]
	2	(COS.sp.716 734)	(1) 3C-326	COS/FUV, TIME-TAG, PSA	G130M 1096 A	BUFFER-TIME=51 60; FP-POS=ALL			1100 Secs (5106 Secs)	
									[==>1147.0 Secs (Split 1)]	[1]
									[==>1147.0 Secs (Split 2)]	
									[==>1406.0 Secs (Split 3)] [==>1406.0 Secs (Split 4)]	[2]
	3	(COS.sp.716 736)	(1) 3C-326	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=77 80; FP-POS=ALL			1100 Secs (5075 Secs)	
									[==>1410.0 Secs (Split 1)]	[3]
									[==>1411.0 Secs (Split 2)]	
									[==>1127.0 Secs (Split 3)] [==>1127.0 Secs (Split 4)]	[4]
	4	(COS.sp.716 738)	(1) 3C-326	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=65 20; FP-POS=ALL			300 Secs (1284 Secs)	
									[==>327.0 Secs (Split 1)]	[4]
[==>319.0 Secs (Split 2)] [==>319.0 Secs (Split 3)]									[5]	
[==>319.0 Secs (Split 4)]										
5	(COS.sp.716 739)	(1) 3C-326	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=66 30; FP-POS=ALL			300 Secs (1276 Secs)		
								[==>319.0 Secs (Split 1)]		
								[==>319.0 Secs (Split 2)] [==>319.0 Secs (Split 3)]	[5]	
								[==>319.0 Secs (Split 4)]		



### Orbit 4

Server Version: 20150609



### Orbit 5

Server Version: 20150609

