15666 - Probing Infall of Cold Gas in an Interacting Galaxy

Cycle: 26, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) J151225.15+012954.20	COS/FUV COS/NUV	3	05-Jul-2019 11:00:29.0	yes
02	(1) J151225.15+012954.20	COS/FUV COS/NUV	2	05-Jul-2019 11:00:31.0	yes

5 Total Orbits Used

ABSTRACT

The inflow of massive amounts of gas towards the centers of galaxies is commonly seen in simulations of galaxy interactions and mergers. Such inflows are associated with strong starbursts in interacting galaxies as well as their enhanced nuclear activity. While the importance of inflow of gas is clear, there is little observational data to strengthen our understanding of the physics of gas inflow. This program aims to study a rare case where our previous D- and C- configuration VLA imaging detected blue-shifted HI 21cm emission tracing infall of atomic gas into a spiral galaxy. We request for 27.5 hours of high-resolution VLA B-configuration imaging to identify the location of the inflowing gas and to characterize its nature and origin. We also request for 3 orbits of ultraviolet spectroscopy with HST COS to establish the origin of the gas as inflow and rule out outflow with high confidence. This system is truly unique and provides unprecedented opportunity to study infall of gas into galaxies that have so far been studied only in simulations. Therefore, we believe that our modest request of 27.5 hours of the VLA and 3 orbits of the HST will yield significant scientific

results.

OBSERVING DESCRIPTION

The main goals of this project are to (1) confirm if there in ongoing infall of gas into the target galaxy and (2) if so, reveal the physical process responsible for it.

The program aims to obtain UV spectrum with G130M. The spectrum will be analyzed to estimate outflow signatures (at 200 km/s centroid) and to verify inflow. In addition to the standard target acquisition image, we will obtain deeper NUV images with MIRRORA along with the spectroscopic observations. These images will provide important guidance for the interpretation of the spectra. The high-angular resolution of COS NUV imaging (47.1 mas/resel) is a factor of > 120 higher resolution than existing GALEX NUV imaging (where the source is unresolved). The data will be complemented by ground-based imagery and would link the connection between location of gas inflow and recent star-formation.

A detailed study of the COS UV spectra and comparison of Starburst99 models will be used to predict the stellar populations (age, burst type etc.). The nature of the ISM combined with morphology of star forming region will provide vital clues about the triggering mechanism of star-formation in an interacting system. We will interpret our data and measurements in terms of results from simulations.

We require 3 orbits to get a COS spectrum with G130M granting in the 1327 setting. The galaxy has a FUV GALEX magnitude of 18.3. Based on the u-band size in the SDSS image, we expect the UV magnitude within the COS aperture to be from 18.3 -19.0 mag. Based on that we request for 3 orbits to get a S/N of 10 at 1251A so that we can cover Lyman-alpha, Si II 1260, 1190, 1193, OI 1302 and multiple other species at a S/N ~10. The ETC IDs for these calculations are COS.sp.1178547 and COS.sp.1178545.

Visit

Proposal 15666, Visit 01 (01), failed Fri Jul 05 15:00:31 GMT 2019

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Comments: 3 orbits

Diagnostics

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

Fixed Targets

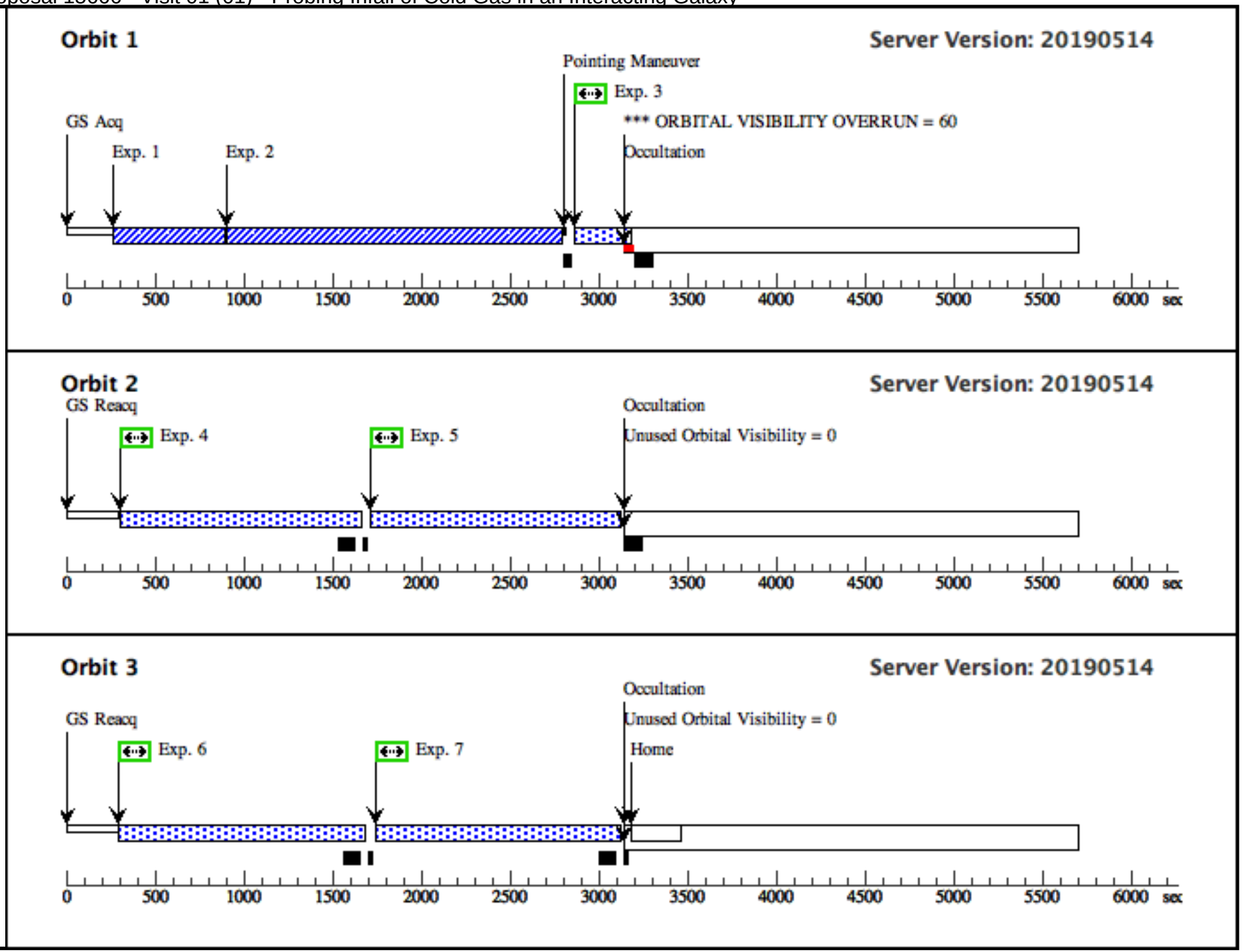
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J151225.15+012954.20	RA: 15 12 25.1500 (228.1047917d) Dec: +01 29 54.20 (1.49839d) Equinox: J2000	Redshift: 0.0289	V=16.55+/-0.1 GALEX FUV=18.3 & NUV=17.9	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[INTERACTING GALAXY]
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.1314513)	(1) J151225.15+012954.20	COS/NUV, ACQ/SEARCH, PSA	MIRRORA	CENTER=BRIGHTEST; STEP-SIZE=1.7; SCAN-SIZE=3			24 Secs (24 Secs) *[==>]*	*[1]*
2	Target Acq (1307463)	(1) J151225.15+012954.20	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				900 Secs (900 Secs) *[==>]*	*[1]*
3	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1400; FP-POS=1; FLASH=YES; SEGMENT=BOTH			140 Secs (140 Secs) *[==>]*	*[1]*
4	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1200; FP-POS=1; FLASH=YES; SEGMENT=BOTH			1310 Secs (1310 Secs) *[==>]*	*[2]*
5	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1361; FP-POS=2; FLASH=YES; SEGMENT=BOTH			1361 Secs (1361 Secs) *[==>]*	*[2]*
6	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1230; FP-POS=3; FLASH=YES; SEGMENT=BOTH			1340 Secs (1340 Secs) *[==>]*	*[3]*
7	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1221; FP-POS=4; FLASH=YES; SEGMENT=BOTH			1331 Secs (1331 Secs) *[==>]*	*[3]*

Orbit Structure



Visit

Proposal 15666, Visit 02 (02) Fri Jul 05 15:00:31 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Comments: 2 orbits

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J151225.15+012954.20	RA: 15 12 25.1500 (228.1047917d) Dec: +01 29 54.20 (1.49839d) Equinox: J2000	Redshift: 0.0289	V=16.55+/-0.1 GALEX FUV=18.3 & NUV=17.9	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[INTERACTING GALAXY]
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.1314513)	(1) J151225.15+012954.20	COS/NUV, ACQ/SEARCH, PSA	MIRRORA	CENTER=BRIGHTEST; STEP-SIZE=1.7; SCAN-SIZE=3			24 Secs (24 Secs) *[==>]*	 ***[1]***
2	Target Acq (1365143)	(1) J151225.15+012954.20	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				90 Secs (90 Secs) *[==>]*	 ***[1]***
3	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=656; FP-POS=1; FLASH=YES; SEGMENT=BOTH			766 Secs (766 Secs) *[==>]*	 ***[1]***
4	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=709; FP-POS=2; FLASH=YES; SEGMENT=BOTH			819 Secs (819 Secs) *[==>]*	 ***[1]***
5	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1230; FP-POS=3; FLASH=YES; SEGMENT=BOTH			1340 Secs (1340 Secs) *[==>]*	 ***[2]***
6	Spectrum_G130M (COS.sp.1178547)	(1) J151225.15+012954.20	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=1221; FP-POS=4; FLASH=YES; SEGMENT=BOTH			1331 Secs (1331 Secs) *[==>]*	 ***[2]***

Orbit Structure