12467 - Probing ISM in the Stellar Disk of Dwarf Galaxy GQ1042+0747

Cycle: 19, 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) SDSSJ104257.58+074850.5	COS/FUV COS/NUV	1	20-Jul-2011 01:26:40.0	yes

1 Total Orbits Used

ABSTRACT

QSO-galaxy pairs with small impact parameters of few kpcs are very rare. The QSO-galaxy pair J104257.5+074850.5-GQ1042 is a unique system that presents us with the opportunity to study the stellar disk of an extragalactic source using a background QSO at an impact parameter of 1.7 kpc. In addition, the background QSO is bright in the UV as well as radio frequencies, thus allowing us to probe the cold (21 cm HI) gas as well as warmer components enveloping it. Taking advantage of the radio brightness of the quasar, we have obtained high spectral (0.3 km/s) and spatial (parsec-scale) resolution data and detected a very narrow (3.6 km/s) absorber of column density of ~1x10^20 cm^{-2}. We found significant variations in the

optical depth within the cloud (cloud of size ~14x27 pc). We request HST time to observe this QSO-galaxy pair with COS for a pilot study to check for presence of any Lyman limit system and estimate the HI column density. This study aims to probe the warmer phases of gas associated with the cold 21 cm absorber. This will provide us with a good understanding of multi-phase ISM cloud structures in this dwarf spiral galaxy. This system is one of the few galaxies outside our local group where we can study the ISM within the stellar disk at such small scales. This makes it an excellent test bed for ISM theories in dwarf galaxies and for studying how (if real) ISMs of smaller galaxies differ from those of bigger galaxies such as the Milky Way.

OBSERVING DESCRIPTION

GQ1042 is a unique dwarf galaxy with a background UV bright QSO behind its stellar disk thus enabling us to study the ISM in its disk. In this pilot project we aim to check if there is any Lyman limit system in the FUV range. This in turn will prove if a high-resolution UV study is possible.

Our primary goal is to understand the ISM of the dwarf-isolated galaxy, GQ1042. The purpose of this pilot project is to find out the following:
1. If future high-resolution COS observations of this target is feasible.
2. The strength of the Lyman-alpha transition associated with the target. The strength of this transition when put together with the available 21cm radio observations of the gas will provide us with the spin temperature of the gas.

The project uses COS FUV grating G140L for 1 orbit in order to achieve the above mentioned goals. The 2221sec observations for the QSO with FUV of 20.15 +/- 0.22 mags at 1225 A (Ly-alpha of foreground galaxy) will result in a S/N >6 (COS.sp.201236). As a safety check, a magnitude higher source (i.e FUV = 19.15 mag) when observed for 2221 secs will yield 229 cts/s for the entire detector (COS.sp.201237).

For the target acquisition we use NUV MIRROR A imaging setting for 34 secs, based on the ETC estimate (ID: 201202) for the QSO with NUV=19.75 +/-0.1 mags or 19.85 mags in the worst case scenario based on error estimate. This exposure will have a count rate for the entire detector of 826 cts/s and for the brightest pixel 6 cts/s. To check the safety of the aquisition exposures, we estimate the counts for an exposure of 34 secs for a source 1 mag brighter, i.e NUV=18.75 +/- 0.1 mags or 18.65 mags including the error margin, to 20 cts/s for the brightest pixel and 923 cts/s for the entire detector.

Hence, we conclude that both the exposures are within safe limits for the detectors.

Visit

Proposal 12467, Visit 01, implementation Wed Jul 20 05:26:44 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Comments: 1 orbit of G140L. The QSO lies behind a low surface brightness galaxy. GALEX FUV flux is recorded at the position of the QSO, and this observation is designed to test whether the FUV flux arises from the QSO (or, instead, from the galaxy).

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.

(Visit 01) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ104257.58+074850.5	RA: 10 42 57.5888 (160.7399533d) Dec: +07 48 50.53 (7.81404d) Equinox: J2000	Redshift: 2.666	V=19.5 GALEX FUV = 20.15+/-0.22 mags, NUV = 19.75+/-0.10 mags	Reference Frame: ICRS

Comments: Coordinates taken from DR7 of SDSS.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Target Acq (201202)	(1) SDSSJ104257.58+074850.5	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				34 Secs *[==>]*	*[1]*
2	(201236)	(1) SDSSJ104257.58+074850.5	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=2111; FP-POS=4			2221 Secs *[==>]*	*[1]*

Comments: The amount of time on-target is small. We therefore include no additional FP-SPLITs.

Orbit Structure