15435 - The sub-kiloparsec comparison of stellar clumps and molecular gas within the spiral arms of a high-redshift galaxy

Cycle: 25, 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?*
02	(1) A0521	WFC3/IR	1	18-Jan-2018 20:00:18.0	yes
03	(1) A0521	WFC3/IR	1	18-Jan-2018 20:00:19.0	yes
04	(1) A0521	WFC3/IR	1	18-Jan-2018 20:00:20.0	yes
05	(1) A0521	WFC3/UVIS	1	18-Jan-2018 20:00:20.0	yes

4 Total Orbits Used

ABSTRACT

Unlike local spiral galaxies, high-redshift galaxies typically have extremely clumpy morphologies. Recent simulations suggest that this clumpy morphology arises because extreme inflows of cool gas create gravitational instabilities that fragment the gaseous disk. High sensitivity and spatial resolution observations comparing individual stellar and gaseous clumps are required to provide the irrefutable evidence that fragmentation actually leads to the observed clumpy morphologies. Here we propose HST/WFC3 mid-cycle observations in three bands (F390W, F105W, F160W) of a highly magnified and spatially stretched galaxy at z = 1, where we can study gas and stars at 100 pc resolutions. These observations require a total of 4 orbits.

We need mid-cycle observations because we received exceptional ALMA CO(4-3) emission maps in April 2017. Amazingly, these ALMA observations show CO(4-3) emission along the spiral arms of the galaxy. This is the first time that molecular gas has been observed along spiral arms at high redshifts. With the new HST/WFC3 observations we will identify individual stellar clumps, and model their spectral energy distributions to determine their stellar masses, extinction corrected star formation rates, densities and ages. For the first time at z = 1, we will use these observations to establish the evolutionary sequence of stellar clumps, to test the redshift evolution of the Kennicutt-Schmidt law at sub-kpc scales, and to constrain the lifetimes of molecular clouds. This will be the first sub-kpc comparison of individual molecular and stellar clumps within the spiral arms of a high-redshift galaxy.

OBSERVING DESCRIPTION

Here, we make observations of the lensed z ~ 1 galaxy Abell0521. We observe the cluster in three HST/WFC3 filters to measure the star formation rate (F390W), stellar age (F105W), and stellar mass (F160W). We center the image at the same position as previous HST/WFPC2 F606W images (PID: 11312). We also use the same orientation constraints (between 270-310 degrees) but include the opposite of the constraints to increase schedulability (90-130 degrees). The opposite orientation would flip the image, but preserve the orientation of the F606W image. We use a four position dither script. We use one orbit for the F390W and F105W images and two orbits for the F160W images. We use a post-exposure flash for the F390W images.

Visit

Proposal 15435, Visit 02, implementation Fri Jan 19 01:00:21 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: ORIENT 270D TO 300 D; ORIENT 110D TO 130 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

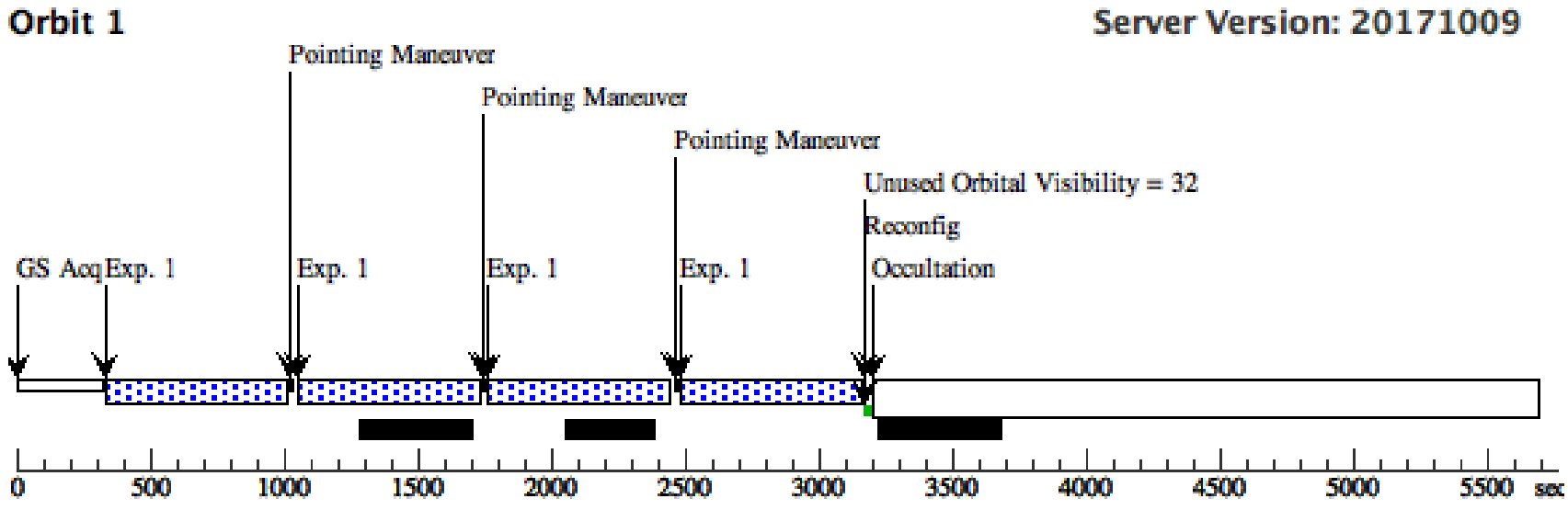
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	A0521	RA: 04 54 7.2660 (73.5302750d) Dec: -10 14 15.92 (-10.23776d) Equinox: J2000		V=16.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS]
Extended=YES

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W (WFC3IR.im.1035597)	(1) A0521	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 02 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 15435, Visit 03, implementation Fri Jan 19 01:00:22 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SAME ORIENT AS 02

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

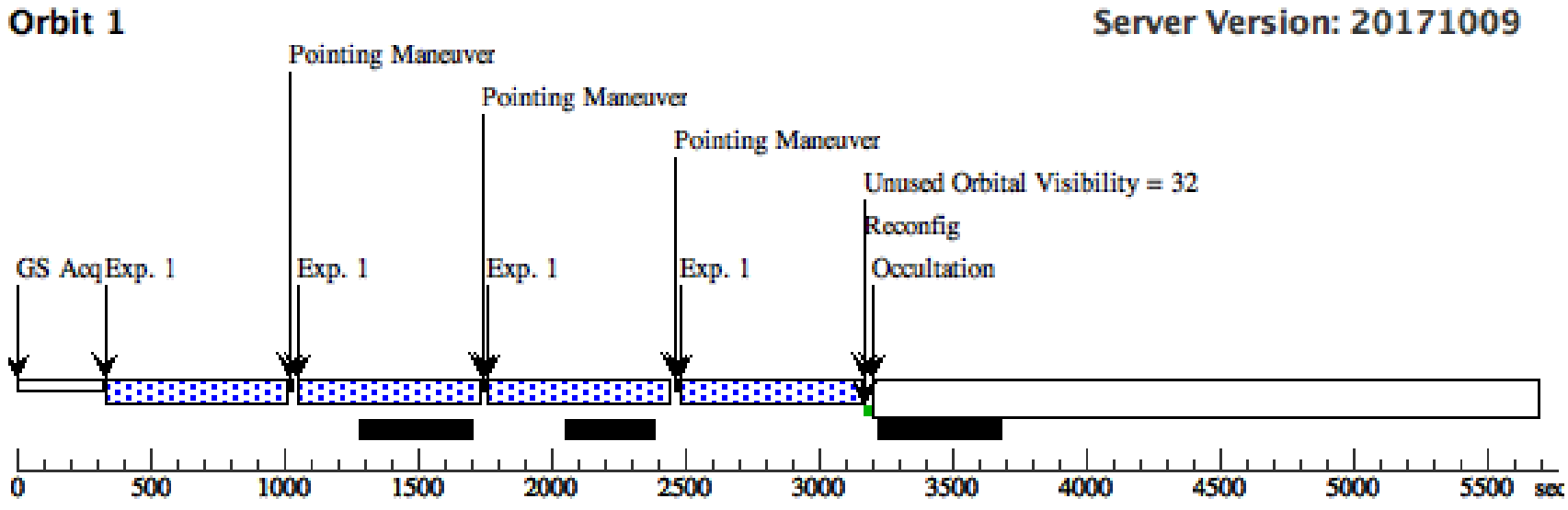
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	A0521	RA: 04 54 7.2660 (73.5302750d) Dec: -10 14 15.92 (-10.23776d) Equinox: J2000		V=16.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS]
Extended=YES

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W (WFC3IR.im.1035597)	(1) A0521	WFC3/IR, MULTIACCUM, IR-FIX	F160W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 03 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 15435, Visit 04, implementation Fri Jan 19 01:00:22 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SAME ORIENT AS 02

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

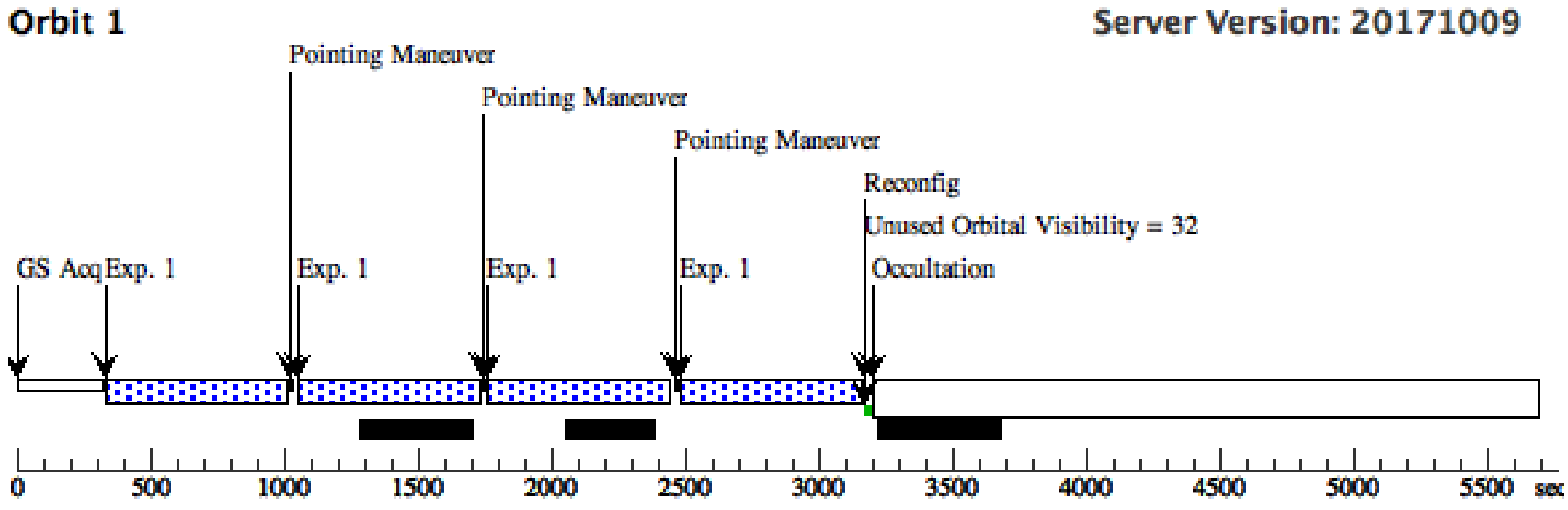
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	A0521	RA: 04 54 7.2660 (73.5302750d) Dec: -10 14 15.92 (-10.23776d) Equinox: J2000		V=16.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS]
Extended=YES

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F105W (WFC3IR.im.1035600)	(1) A0521	WFC3/IR, MULTIACCUM, IR-FIX	F105W	NSAMP=14; SAMP-SEQ=SPARS50		Pattern 1, Exps 1-1 in Visit 04 (1)	652.938154 Secs (2611.753 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	*[1]*

Orbit Structure



Visit

Proposal 15435, Visit 05, implementation Fri Jan 19 01:00:22 GMT 2018

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SAME ORIENT AS 02

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.519 Line Spacing=0.336	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	A0521	RA: 04 54 7.2660 (73.5302750d) Dec: -10 14 15.92 (-10.23776d) Equinox: J2000		V=16.1	Reference Frame: ICRS

Comments:
Category=CLUSTER OF GALAXIES
Description=[GRAVITATIONAL LENS]
Extended=YES

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F390W (WFC3UVIS.im.1035602)	(1) A0521	WFC3/UVIS, ACCUM, UVIS-FIX	F390W	FLASH=6		Pattern 2, Exps 1-1 in Visit 05 (2)	617 Secs (2468 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure