12480 - Characterizing a gravitational lens in the molecular Einstein ring SMG 18423+5938

Cycle: 19, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Chris Carilli (PI)	**Associated Universities, Inc.**	**ccarilli@nrao.edu**
Dr. Jean-Francois Lestrade (CoI) (ESA Member)	Observatoire de Paris	jean-francois.lestrade@obspm.fr
Dr. Manuel A Aravena (CoI) (Contact)	Associated Universities, Inc.	maravena@nrao.edu
Dr. Karun Thanjavur (CoI)	Canada-France-Hawaii Telescope Corporation	karun@cfht.hawaii.edu
Prof. Jean-Paul Kneib (CoI) (ESA Member) (Contact)	Laboratoire d'Astrophysique de Marseille	jean-paul.kneib@oamp.fr
Dr. Dominik A. Riechers (CoI)	California Institute of Technology	dr@astro.caltech.edu
Dr. Fabian Walter (CoI) (ESA Member)	Max-Planck-Institut fur Astronomie, Heidelberg	walter@mpia.de
Dr. Frank Bertoldi (CoI) (ESA Member)	Max-Planck-Institut fur Radioastronomie	bertoldi@mpifr.mpg-bonn.de
Prof. Alain Omont (CoI) (ESA Member)	CNRS, Institut d'Astrophysique de Paris	omont@iap.fr

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) MM18423+5938	WFC3/IR	1	29-Jun-2011 21:38:58.0	yes

1 Total Orbits Used

ABSTRACT

We propose a single orbit exposure of the strongly lensed submm galaxy (SMG), MM18423+5938, using WFC3 110W. MM1842 is the brightest SMG with a published spectroscopic redshift (z = 3.9296), and has an apparent star formation rate of order 1e4 Mo/yr. Recent EVLA observations

reveal a complete Einstein ring for the CO emission, confirming the strong lensing hypothesis for MM1842. Using the CFHT, we have identified the lensing galaxy at the center of the CO ring, with z_phot ~ 1.0. MM1842 is the archetype, and best studied, of the new population of strongly lensed SMGs that have recently been identified in shallow, wide field submm surveys. These systems represent the formation of massive galaxies at high redshift in luminous starburst events. MM1842 presents a unique opportunity to study the physical processes involved in early galaxy formation at unprecedented physical resolution. The goal of this modest HST request is to obtain detailed information on the stellar distribution in the lensing galaxy. Such information is fundamental to accurate lens modeling of the system, as has been clearly demonstrated with the CASTLES HST survey. In parallel, we are performing high resolution imaging (0.1") of the very luminous CO, atomic fine structure line, and dust continuum emission from MM1842 with the EVLA and IRAM PdBI. Using the lens model, we can then trace back the gas distribution and dynamics in the source-plane at an effective physical resolution approaching 100pc. The proposed HST observations are crucial to constrain the lens model, and thereby enable a truly breath-taking, high physical resolution study of massive galaxy formation in the early Universe.

OBSERVING DESCRIPTION

We propose a 1 orbit exposure with WFC3/F110W to image the strong gravitational lens system MM1842. We are aiming to a point source sensitivity is 27.15 AB (4).

The goal is to obtain detailed information on the stellar distribution in the lensing galaxy at z 1. Such information is fundamental to improve the lens model for the system, enabling the accurate lens inversion studies discussed above. Even with this modest time request, these data will provide a high significance detection of the integrated emission from the lensing galaxy, which, combined with the superb spatial resolution (0.15”), will result in a precise determination of the lensing galaxy stellar distribution. Our current imaging suggests that the lensing galaxy is about 1” in extent, which is consistent with the expected size of such a lensing galaxy (8kpc; Langston et al. 1990), although this is complicated by the seeing limitations of the current ground based images. The light should then e distributed over about 40 diffraction limited resolution elements of the HST. At the proposed sensitivity, we should detect the light over this entire area, and obtain accurate measures of the position, ellipticity, orientation, and light profile of the galaxy.

The sensitive imaging may also reveal substructure in the field (satellite galaxy, faint companions) which would also be critical to the lens model. Indeed, such substructure is already suggested by the presence of the brighter galaxy 4” to the north with a similar photometric redshift.

REAL TIME JUSTIFICATION

None

CALIBRATION JUSTIFICATION

None

ADDITIONAL COMMENTS

None

Visit

Proposal 12480, Visit 01 Thu Jun 30 01:39:03 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE

Patterns

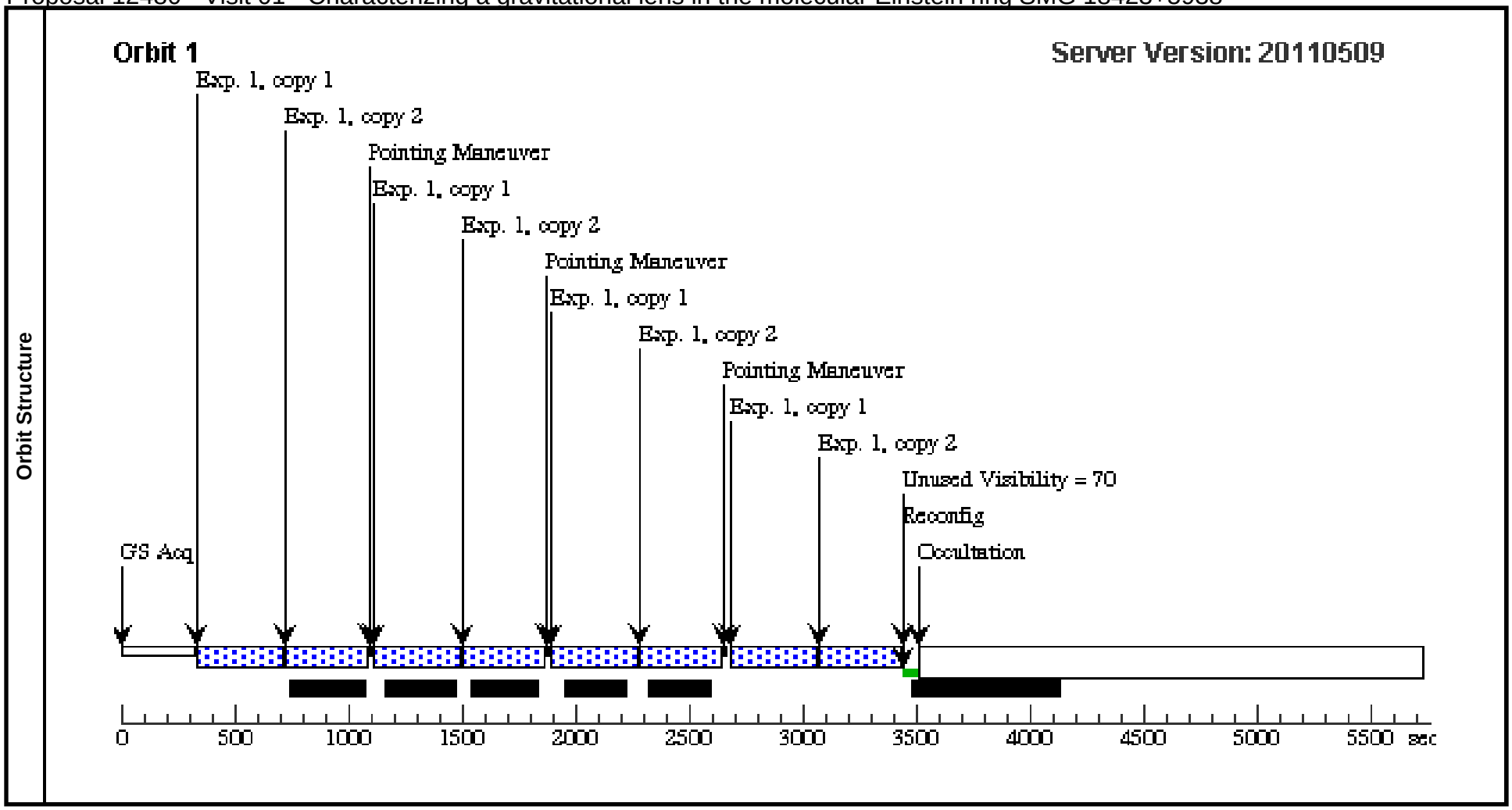
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.716 Line Spacing=1.095	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MM18423+5938	RA: 18 42 22.2900 (280.5928750d) Dec: +59 38 29.50 (59.64153d) Equinox: J2000		V=26.3+/-0.4 J (AB) = 21.8; H (AB)=21.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) MM18423+5938	WFC3/IR, MULTIACCUM, IR-FIX	F110W	NSAMP=12; SAMP-SEQ=STEP50		Pattern 1, Exps 1-1 in Visit 01 (1)	*[==>(Pattern 1, Copy 1)]* *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 3, Copy 1)]* *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20110509
Exp. 1, copy 1
Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Unused Visibility = 70
Reconfig
Occultation
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec