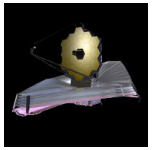

5192 - The first multi-scale and multi-phase characterization of black hole feedback at z>6

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Manuela Bischetti (PI) (ESA Member)	**Universita degli Studi di Trieste**
Dr. Hyunseop Choi (CoI) (CSA Member) (CoPI)	Universite de Montreal
Dr. Stefano Carniani (CoI) (ESA Member)	Scuola Normale Superiore, Pisa
Dr. Valentina D'Odorico (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Trieste
Dr. Chiara Feruglio (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Trieste
Dr. Fabrizio Fiore (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Trieste
Dr. Francesco Salvestrini (CoI) (ESA Member)	INAF, Osservatorio Astronomico di Trieste
Dr. Laurence Perreault-Levasseur (CoI) (CSA Member)	Universite de Montreal
Prof. Julie Hlavacek-Larrondo (CoI) (CSA Member)	Universite de Montreal
Dr. Andrea Travascio (CoI) (ESA Member)	University of Milano-Bicocca

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	IFU J0923+0402	NIRSpec IFU Spectroscopy	(1) J0923+0402

ABSTRACT

Bright quasars at z > 6 are powered by rapidly accreting supermassive black holes that lie above the local black hole (BH)-galaxy mass correlation. Simulations predict that these BHs at redshifts around 6-7 release strong radiation and power energetic winds, regulating both BH and galaxy evolution. Recent near-infrared surveys reveal that up to 50% of quasars at z>6 show evidence for BH-driven winds through broad absorption lines

(BAL) in rest-frame UV spectra, indicating the importance of winds in regulating both black hole and host-galaxy growth in the early universe. Here we propose to target with JWST/NIRSpec IFU a z~6.6 quasar with multi-phase detection of a BH-driven outflow and a robust measurement of the outflow energetics, both on 10-100 pc and on ~2 kpc scale. Strong AlIII and MgII absorption lines provided excellent constraints on the energetics of the nuclear wind, consistent with >10% of the quasa luminosity. ALMA observationsalso discovered the presence of a powerful, galaxy scale cold gas outflow. The excellent sensitivity and spatial resolution of the JWST/NIRSpec will allow us to map the galaxy-scale ionized outflow, the distribution of dust, and the unobscured star-formation in the quasar host using the rest-optical emission line diagnostics (e.g., [OIII], Ha, [NII], Hb). We will also probe the ionized counterpart of the 10 kpc, cold gas halo detected by ALMA.
The outcome of this proposal will provide the first multi-phase, multi-scale characterization of a BH-driven outflow at z>6 and its impact on galaxy and circumgalactic scales.

OBSERVING DESCRIPTION

We propose JWST/NIRpec IFU observations of a Lo-BAL quasar at z~6.6, to map emission from the quasar host-galaxy with an angular resolution of ~0.11 arcsec, corresponding to about 600-700 pc, up to a distance of ~10 kpc from the quasar. The high resolution G395H disperser in the F290LP filter is requested to cover nebular emission lines in the Hbeta-[OIII] and Halpha-[NII]-[SII] spectral regions, with a spectral resolution of ~100 km/s.
To improve the spatial sampling of the JWST PSF, we require a 9 point cycling dither to improve the PSF. We also require a short MSA leakage exposure to filtter MSA contamination from bright sources. We do not include background exposures, as we verified that a medium/high background level does not significantly affecs the S/N of emission lines, given the requested spectral setup. We use the NRSIRS2 readout pattern to reduce correlated detector noise and improve the identification and removal of cosmic rays.
The request of 4.6 hrs of on-source time is driven by the need of detecting and accurately mapping the wing component of the [OIII]5007A emission line. Specifically, we request a S/N~5-7 over one third of the width of the [OIII] wing, for a binned region of 0.24x0.24 arcsec2. This will allow us to map the morphology and kinematics of the [OIII] wing in ~14 independent spatial regions.

Proposal 5192 - Targets - The first multi-scale and multi-phase characterization of black hole feedback at z>6

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J0923+0402	RA: 09 23 47.1220 (140.9463417d) Dec: +04 02 54.40 (4.04844d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galaxies, Broad-absorption line quasar, High-redshift galaxies, Quasars]

Observation

Proposal 5192, Observation 1: IFU J0923+0402

Fri Mar 01 01:02:28 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	J0923+0402	RA: 09 23 47.1220 (140.9463417d) Dec: +04 02 54.40 (4.04844d) Equinox: J2000		

Comments:
Category=Galaxy
Description=[Active galaxies, Broad-absorption line quasar, High-redshift galaxies, Quasars]

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	9	

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395M/F290LP	NRSIRS2	25	1	false	true	NONE	9	9	16543.801	
2	G395M/F290LP	NRSIRS2	25	1	true	false	NONE	1	1	1838.2	