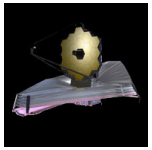

3543 - EXCELS: The Early eXtragalactic Continuum and Emission Line Survey

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Adam Carnall (PI) (ESA Member)	**University of Edinburgh, Institute for Astronomy**
Dr. Fergus Cullen (CoI) (ESA Member) (CoPI)	University of Edinburgh, Institute for Astronomy
Prof. Ross McLure (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Prof. James S. Dunlop (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Mr. Ryan Anthony Begley (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Ms. Massissilia Louisa Hamadouche (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Mr. Callum Donnan (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Dr. Kate Rowlands (CoI) (ESA Member)	Space Telescope Science Institute - ESA - JWST
Dr. Vivienne Wild (CoI) (ESA Member)	University of St. Andrews
Dr. Derek McLeod (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Mr. Thomas Stanton (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Dra. Karla Ziboney Arellano Cordova (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Prof. Alice E. Shapley (CoI) (US Admin CoI)	University of California - Los Angeles

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	p1_g140m, p1_g235m, p1_g395m	NIRSpec MultiObject Spectroscopy	(2) excels_apt_cat_pointing_1
	2	p2_g140m, p2_g235m, p2_g395m	NIRSpec MultiObject Spectroscopy	(3) excels_apt_cat_pointing_2
	3	p3_g140m, p3_g235m, p3_g395m	NIRSpec MultiObject Spectroscopy	(4) excels_apt_cat_pointing_3

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	4	p4_g140m, p4_g235m, p4_g395m	NIRSpec MultiObject Spectroscopy	(5) excels_apt_cat_pointing_4

ABSTRACT

We propose ultra-deep rest-frame optical NIRSpec MSA spectroscopy for a large, representative sample of ~120 galaxies before cosmic noon. Our priority 1 targets are 15-20 of the highest-redshift massive quiescent galaxies (2.5<z<5), including 2 objects at z>4. For these, we will a.) confirm redshifts and the absence of star formation to calculate robust number densities, b.) measure formation and quenching times, and c.) constrain stellar metallicity and alpha enhancement to probe star-formation physics in massive galaxies during the first billion years. Current simulations fail to reproduce the number density of the earliest quiescent galaxies: we will measure their detailed physical properties to understand what is missing from such simulations. We will target the UDS field, which contains ~1000 high-redshift galaxies benefiting from ultra-deep optical spectroscopy from VANDELS, a 1000-hour investment of VLT VIMOS time. The UDS will also benefit from JWST PRIMER imaging. Our priority 2 targets are 25-30 massive quiescent galaxies at 1<z<2.5 with VANDELS rest-frame near-UV spectra, which we will extend into the rest-optical to measure stellar metallicities, as well as to constrain residual/rejuvenated star-formation + AGN activity. Our priority 3 targets are 50-60 VANDELS star-forming galaxies at 2.5<z<6, for which we will measure rest-optical emission lines to constrain gas-phase metallicities, SFRs and dust attenuation levels. These will be combined with far-UV stellar metallicities and Lyman alpha fluxes from VANDELS to constrain alpha enhancement and the physics of Lyman alpha escape. We will finally observe ~10 of the highest-redshift (z>8) PRIMER galaxy candidates.

OBSERVING DESCRIPTION

This proposal aims to obtain extremely deep rest-frame optical continuum spectroscopy of high-redshift galaxies via MOS observations with the NIRSpec MSA. We will target the Ultra-Deep Survey (UDS) field, for which HST CANDELS and soon JWST PRIMER imaging will be available. This field also benefits from a significant quantity of optical spectroscopy for high-redshift galaxies from the ESO VANDELS survey, a 1000-hour investment of VLT time.

The target classes are 1.) the highest-redshift massive quiescent galaxies (2.5 < z < 5), 2.) massive quiescent galaxies in the cosmic noon epoch (1 < z < 2.5) with optical spectroscopy from the VANDELS survey, 3.) high-redshift star-forming galaxies (2.5 < z < 6), again with optical spectra from VANDELS, and 4.) the highest-redshift (z > 8) galaxy candidates to be selected from JWST PRIMER NIRCam imaging.

We propose to observe 4 NIRSpec pointings. Observations will be taken at R=1000 with the G140M, G235M and G395M gratings. Target acquisition will be via MSATA. We will use 5-shutter slitlets to make sure sufficient quality of sky subtraction is available for each object to

precisely measure the continuum emission. We will also observe at 2 dither positions on the MSA to mitigate detector effects. This results in about 25 objects being observed per MSA pointing, per grating (~120 unique objects in total). Based on our ETC calculations, we will observe for 4 hours with G140M, 6 hours with G235M and 3 hours with G395M.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	excels_apt_cat_pointing_1	RA: 02 17 29.0749 (34.3711454d) Dec: -05 09 2.01 (-5.15056d) Equinox: J2000		
Comments: *Description=[]*				
(3)	excels_apt_cat_pointing_2	RA: 02 17 2.4379 (34.2601579d) Dec: -05 09 17.90 (-5.15497d) Equinox: J2000		
Comments: *Description=[]*				
(4)	excels_apt_cat_pointing_3	RA: 02 17 24.6777 (34.3528237d) Dec: -05 13 22.24 (-5.22284d) Equinox: J2000		
Comments: *Description=[]*				
(5)	excels_apt_cat_pointing_4	RA: 02 17 7.8733 (34.2828054d) Dec: -05 14 18.75 (-5.23854d) Equinox: J2000		
Comments: *Description=[]*				

Observation

Proposal 3543, Observation 1: p1_g140m, p1_g235m, p1_g395m Tue Oct 17 00:01:01 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject 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
(2)	excels_apt_cat_pointing_1	RA: 02 17 29.0749 (34.3711454d) Dec: -05 09 2.01 (-5.15056d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 3 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	After Target ACQ and New MSA Config	MSA Center	g395m_p1 (858 sources)		jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	95713	34.393275	-5.169625	21.346160304648528	1	102060	34.361390	-5.158953	22.09587140823386
1	97465	34.360463	-5.162330	21.361680546377368	1	108812	34.355054	-5.149905	21.410266766194464
1	97873	34.352485	-5.165283	22.981834720863496	1	120095	34.395455	-5.132991	22.154004401122396
1	98310	34.378490	-5.162168	22.13236292296339	1	122795	34.397727	-5.128219	22.757599545208517

Confirmation

#	Confirmation Type	Conf. Readout Pattern	Conf. Groups/Int	Conf. Integrations/Exp	Conf. Total Integrations	Conf. Total Exposure Time
1	c1 : p1_g140m	NRSIRS2RAPID	12	1	1	189.656
2	c1 : p1_g235m	NRSIRS2RAPID	16	1	1	248.011
3	c1 : p1_g395m	NRSIRS2RAPID	20	1	1	306.367

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (G140M/F100LP)	c1 : p1_g140m	3 Shutter Slitlet	34.37394558333333 Degrees -5.142180555555569 Degrees	195.52354108216608			3	18	14705.601
2	2 (G235M/F170LP)	c1 : p1_g235m	3 Shutter Slitlet	34.37471191666666 Degrees -5.143100555555577 Degrees	195.52347484581344			3	18	19957.602
3	3 (G395M/F290LP)	c1 : p1_g395m	3 Shutter Slitlet	34.37799754166666 Degrees -5.144073611111139 Degrees	195.52318556739 34			3	18	14705.601

Special Requirements

MSA Scheduled Aperture PA 195.5238 to 195.5238 Degrees (V3 56.94923 to 56.94923)

Observation

Proposal 3543, Observation 2: p2_g140m, p2_g235m, p2_g395m Tue Oct 17 00:01:01 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	excels_apt_cat_pointing_2	RA: 02 17 2.4379 (34.2601579d) Dec: -05 09 17.90 (-5.15497d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	After Target ACQ and New MSA Config	MSA Center	g395m_p2 (1072 sources)		jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	91145	34.273907	-5.174545	22.25774644308687	1	102308	34.234690	-5.159740	21.92101913101816
1	93227	34.259736	-5.171756	22.77336930518165 7	1	104006	34.280854	-5.151137	22.11933001011737 3
1	93825	34.270908	-5.168644	22.71281235067181 5	1	121441	34.254463	-5.130296	22.97064171970910 4
1	101389	34.232318	-5.159429	22.99650326328602	1	126439	34.234613	-5.120205	22.98303421775015

Confirmation

#	Confirmation Type	Conf. Readout Pattern	Conf. Groups/Int	Conf. Integrations/Exp	Conf. Total Integrations	Conf. Total Exposure Time
1	c1 : p2_g140m	NRSIRS2RAPID	12	1	1	189.656
2	c1 : p2_g235m	NRSIRS2RAPID	16	1	1	248.011
3	c1 : p2_g395m	NRSIRS2RAPID	20	1	1	306.367

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (G140M/F100LP)	c1 : p2_g140m	3 Shutter Slitlet	34.25533075 Degrees -5.153134444444447 Degrees	195.53281909924704			3	18	14705.601
2	2 (G235M/F170LP)	c1 : p2_g235m	3 Shutter Slitlet	34.256316375 Degrees -5.153494166666669 Degrees	195.53273226636563			3	18	19957.602
3	3 (G395M/F290LP)	c1 : p2_g395m	3 Shutter Slitlet	34.256162624999995 Degrees -5.153397499999983 Degrees	195.53274573949278			3	18	14705.601

Special Requirements

MSA Scheduled Aperture PA 195.5324 to 195.5324 Degrees (V3 56.957798 to 56.957798)

Observation

Proposal 3543, Observation 3: p3_g140m, p3_g235m, p3_g395m Tue Oct 17 00:01:01 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	excels_apt_cat_pointing_3	RA: 02 17 24.6777 (34.3528237d) Dec: -05 13 22.24 (-5.22284d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 3 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	After Target ACQ and New MSA Config	MSA Center	g395m_p3 (1219 sources)		jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	42944	34.372788	-5.251168	22.06048952047088	1	67206	34.384999	-5.214119	21.36669502576662
1	50106	34.368471	-5.242918	21.49889708793183	1	69027	34.379374	-5.210413	21.77506738586466
1	53738	34.364536	-5.237590	21.49916560919	1	69493	34.381217	-5.210764	21.532220864719427
1	63250	34.385599	-5.216562	21.462438572884775	1	73697	34.355939	-5.198351	21.415319102329452

Confirmation

#	Confirmation Type	Conf. Readout Pattern	Conf. Groups/Int	Conf. Integrations/Exp	Conf. Total Integrations	Conf. Total Exposure Time
1	c1 : p3_g140m	NRSIRS2RAPID	12	1	1	189.656
2	c1 : p3_g235m	NRSIRS2RAPID	16	1	1	248.011
3	c1 : p3_g395m	NRSIRS2RAPID	20	1	1	306.367

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (G140M/F100LP)	c1 : p3_g140m	3 Shutter Slitlet	34.356558875 Degrees -5.223431111111097 Degrees	203.52746639698879			3	18	14705.601
2	2 (G235M/F170LP)	c1 : p3_g235m	3 Shutter Slitlet	34.35574716666666 Degrees -5.225315555555395 Degrees	203.5275430686506			3	18	19957.602
3	3 (G395M/F290LP)	c1 : p3_g395m	3 Shutter Slitlet	34.35621291666666 4 Degrees -5.225560277777788 Degrees	203.52750153925564			3	18	14705.601

Special Requirements

MSA Scheduled Aperture PA 203.5278 to 203.5278 Degrees (V3 64.95326 to 64.95326)

Observation

Proposal 3543, Observation 4: p4_g140m, p4_g235m, p4_g395m Tue Oct 17 00:01:01 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec MultiObject Spectroscopy

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	excels_apt_cat_pointing_4	RA: 02 17 7.8733 (34.2828054d) Dec: -05 14 18.75 (-5.23854d) Equinox: J2000		

Comments:
Description=[]

Acquisition

#	Reference Star Bin	Target	Filter	MSA Configuration	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	Filter: F110W; Readout: NRSRAPIDD6; 8 sources in 4 quads; [Optimal TA Accuracy]	SAME	F110W	Auto Acq MSA Config	NRSRAPIDD6	3	1	4	687.153	

Template

TA Method	Obtain Confirmation Images	Science Aperture	Primary Candidate List	Filler Candidate List	Spectral Overlap Map	Spectral Overlap Threshold
MSATA	After Target ACQ and New MSA Config	MSA Center	g395m_p4 (1126 sources)		jwst-nirspec-mr	1.5

Reference Stars

Visit	ID	RA	Dec	Magnitude	Visit	ID	RA	Dec	Magnitude
1	39037	34.280852	-5.262231	23.21323446973236	1	59692	34.293755	-5.225881	22.71588559042981
1	45561	34.258067	-5.250837	22.79740064935353 4	1	60928	34.267855	-5.223844	22.37670707366395 8
1	55414	34.301910	-5.230147	23.30108345800515 6	1	65985	34.273619	-5.215253	21.73460731635520 6
1	58680	34.276956	-5.227965	22.32574666348754 6	1	67843	34.270869	-5.213099	22.80788290704154 5

Confirmation

#	Confirmation Type	Conf. Readout Pattern	Conf. Groups/Int	Conf. Integrations/Exp	Conf. Total Integrations	Conf. Total Exposure Time
1	c1 : p4_g140m	NRSIRS2RAPID	12	1	1	189.656
2	c1 : p4_g235m	NRSIRS2RAPID	16	1	1	248.011
3	c1 : p4_g395m	NRSIRS2RAPID	20	1	1	306.367

Spectral Elements

#	Exposure Specification	MSA Configuration	Nod Pattern	Pointing	Aperture PA	Dispersion Offset (Shutters)	Cross-Dispersion Offset (Shutters)	Total Dithers	Total Integrations	Total Exposure Time
1	1 (G140M/F100LP)	c1 : p4_g140m	3 Shutter Slitlet	34.28290774999999 Degrees - 5.2361863888888 82 Degrees	203.45459129918			3	18	14705.601
2	2 (G235M/F170LP)	c1 : p4_g235m	3 Shutter Slitlet	34.283321125 Degrees - 5.2363636111111 305 Degrees	203.45455425955 242			3	18	19957.602
3	3 (G395M/F290LP)	c1 : p4_g395m	3 Shutter Slitlet	34.28334895833333 Degrees - 5.2363102777777 61 Degrees	203.45455164203 426			3	18	14705.601

Special Requirements

MSA Scheduled Aperture PA 203.4546 to 203.4546 Degrees (V3 64.880066 to 64.880066)