

# Science with FMOS

## The UDS perspective

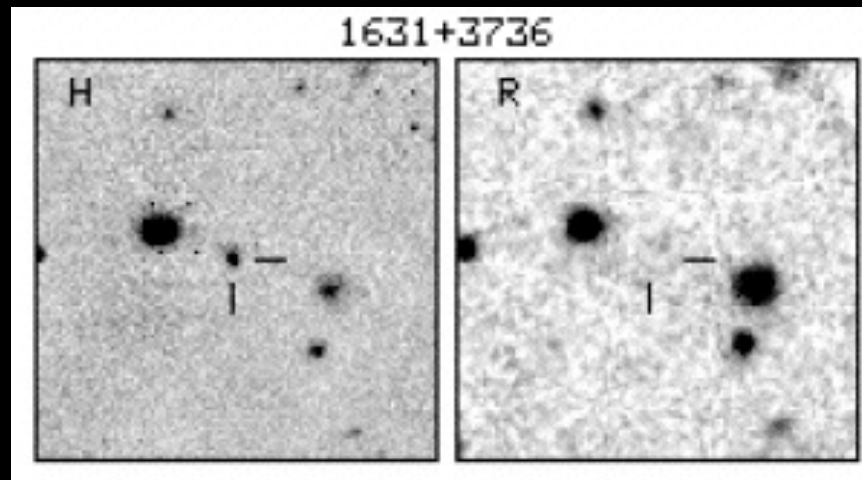
*Omar Almaini (Nottingham)*

- Update on UKIDSS UDS
- The UDS redshift survey (UDSz)
- Opportunities with FMOS

# The need for deep infrared surveys

*Optical selection samples rest-frame UV at high-z*

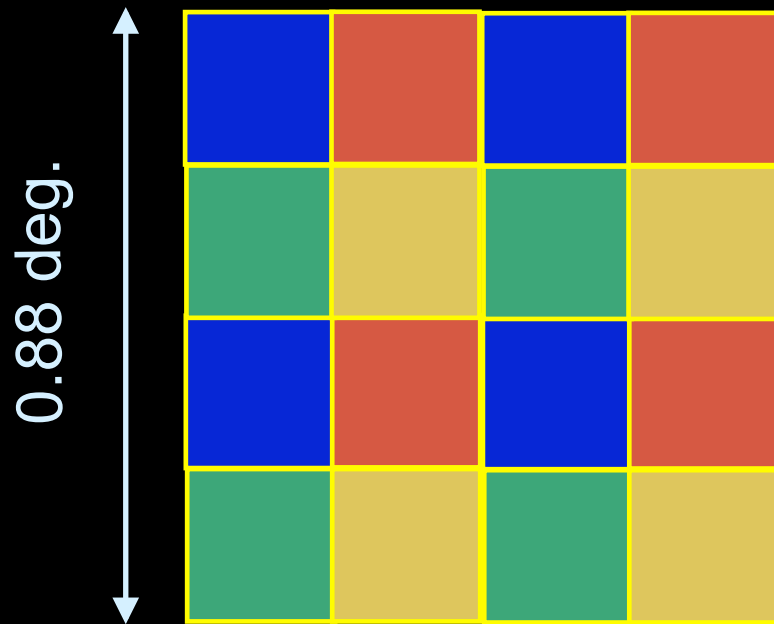
1. Miss galaxies heavily obscured by *dust*
2. Miss galaxies with *old stellar populations*
3. Provide poor estimate of stellar mass



**Deep IR surveys vital for a complete census**

# The UKIDSS Ultra-Deep Survey

Depths achieved so far:  
(AB,  $5\sigma$ , 2" apertures)



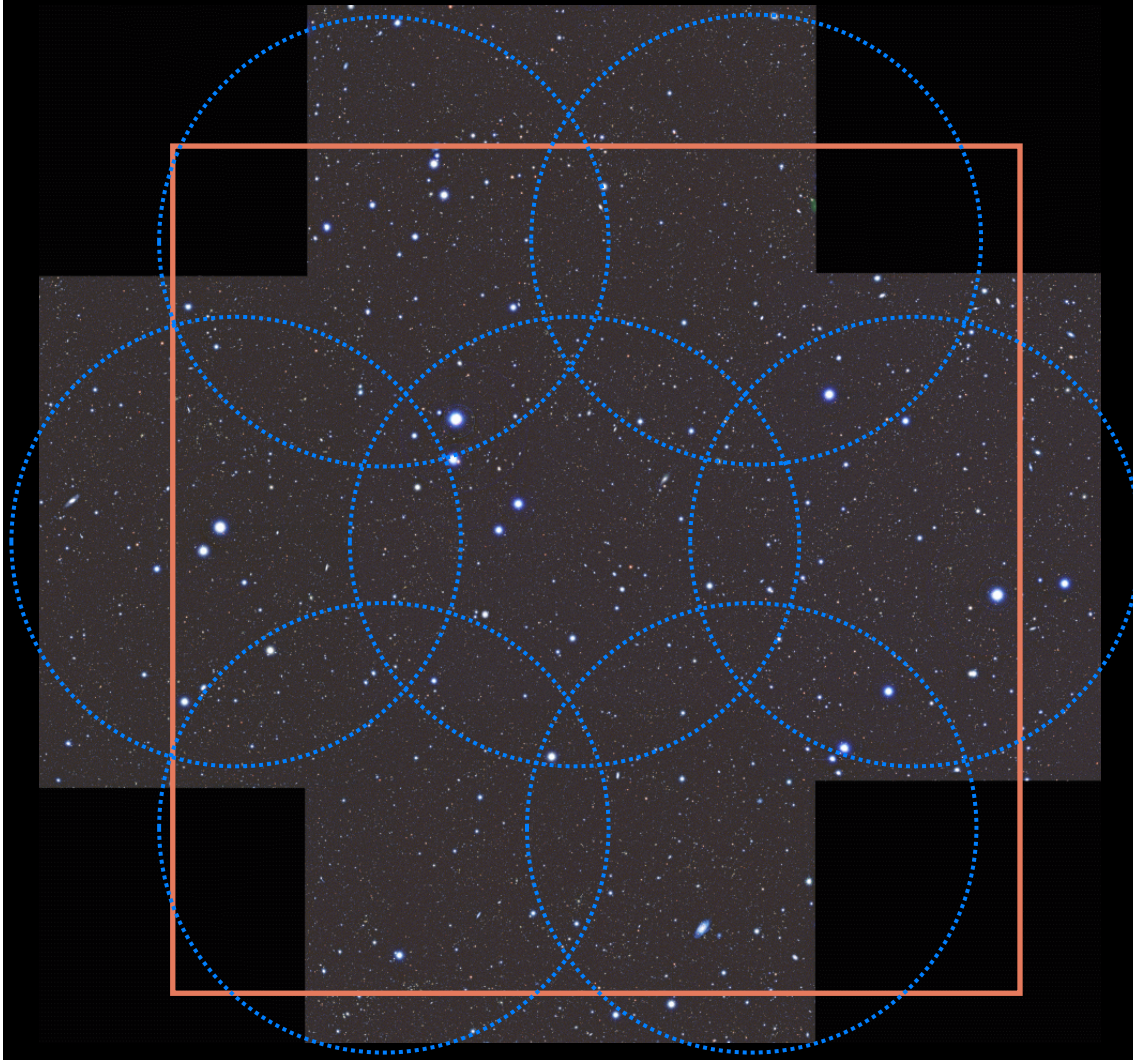
*DR3*: K=23.6, H=23.5, J=23.8  
(104 hours)

*DR5*: K=24.0, H=23.8, J=24.2  
(178 hours)

*2012*: K=25.0, H=25.2, J=25.5  
(~1700 hours)

***Already deepest IR survey over this area...***

# The Subaru/XMM Deep Field



*RA = 02 18 00, Dec = -05 00 00*

## Optical:

B=28.2, V=27.6, R=27.5,  
i'=27.2, z'=26.5, U=27.0

## X-ray:

XMM-Newton 100ks + 6x50ks

## Radio:

VLA 12  $\mu$  Jy rms 1.4Ghz

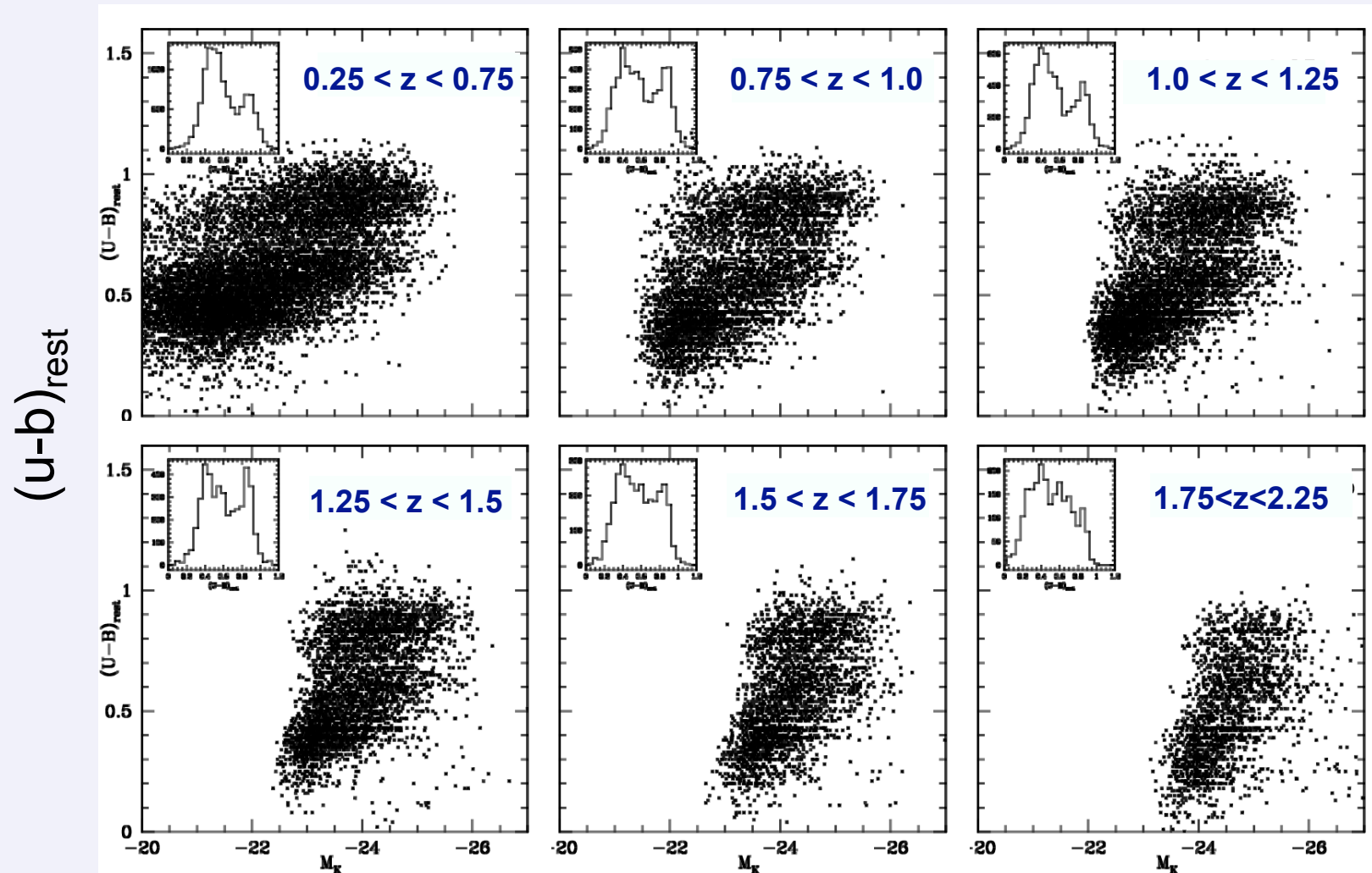
## Spitzer:

Spitzer SWIRE 3.6-160 $\mu$ m  
(**NEW**: Legacy survey to  
~24 AB at 3.6, 4.5 $\mu$ m)

## Submm:

SHADES 8mJy (850 $\mu$ m)  
+ SCUBA2 from 2010

# Evolution in colour bimodality to $K_{AB}=23$

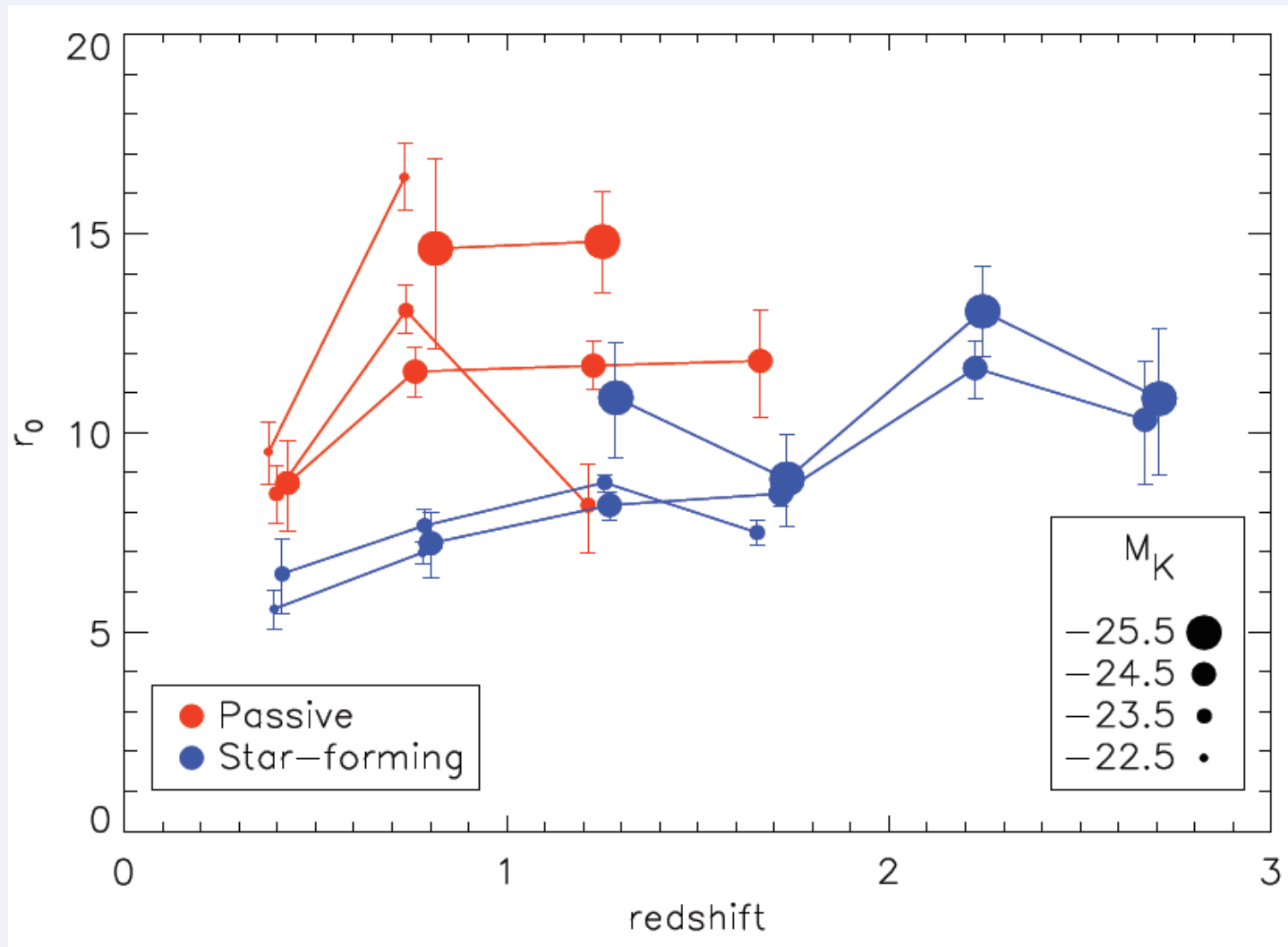


$M_K$

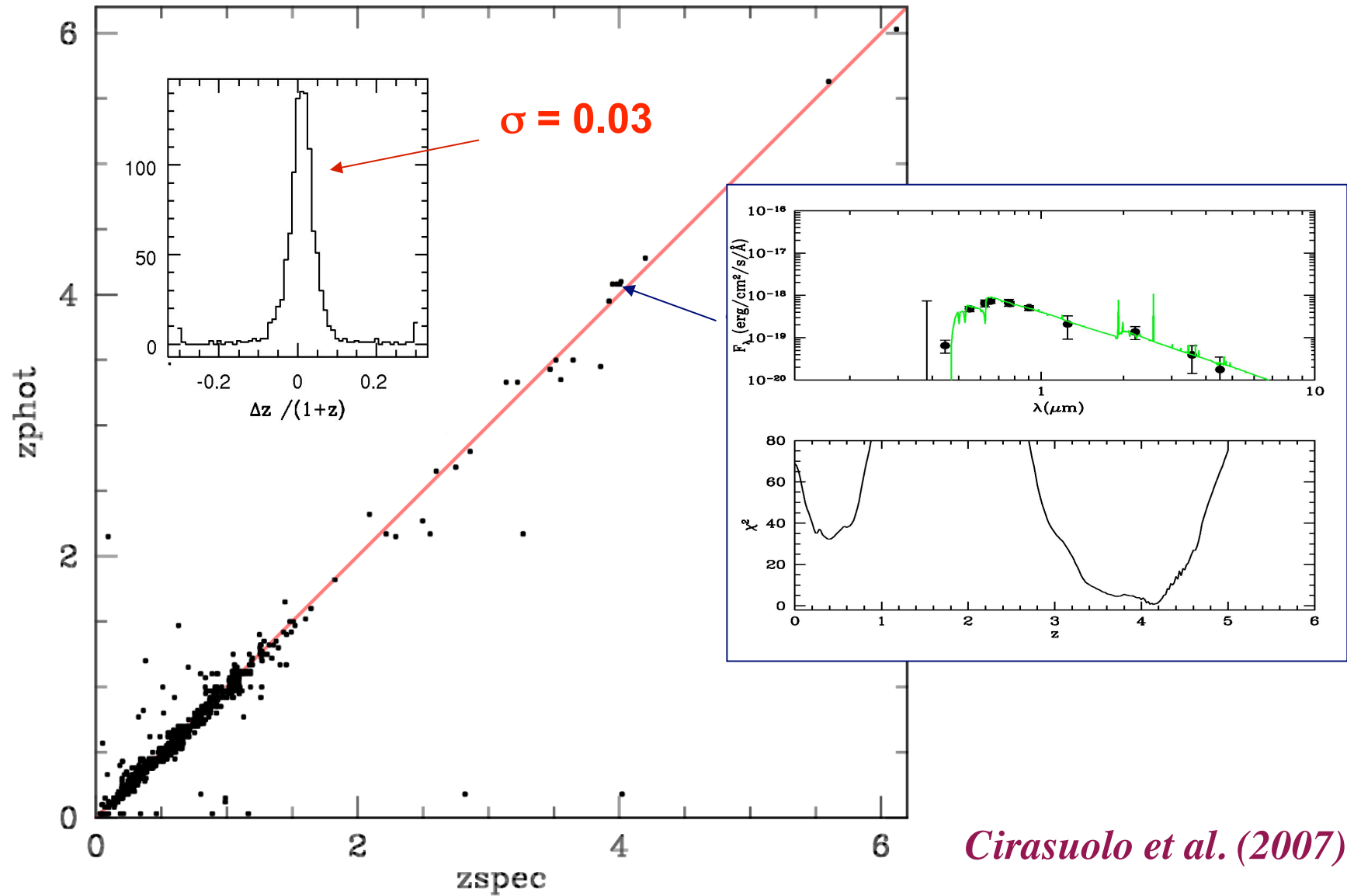
*Cirasuolo et al. (2009)*

# Clustering evolution with redshift and luminosity (passive vs starforming)

*Hartley et al. (2009)*



# Photometric redshifts ( $U, B, V, R, i', z', J, H, K, 3.6, 4.5$ )

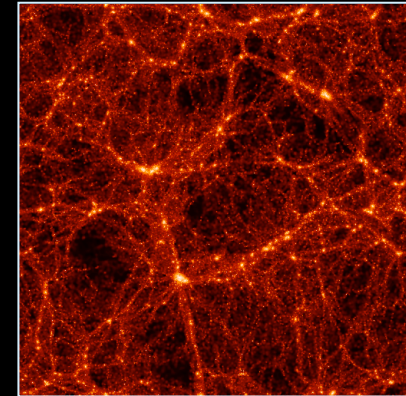
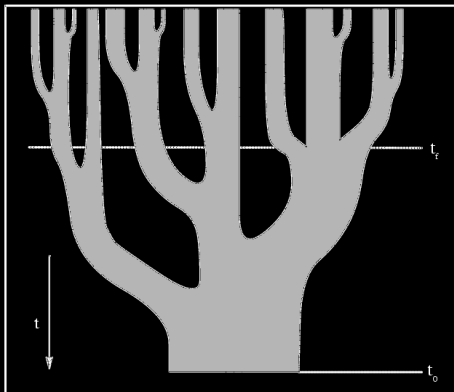


*Cirasuolo et al. (2007)*

# The UDS Redshift Survey (UDSz)

Omar Almaini (PI), Rob Chuter, Sebastien Foucaud,  
Will Hartley, Emma Bradshaw (**Nottingham**)  
Jim Dunlop, Ross McLure, Michele Cirasuolo,  
Henry Pearce, Rob Ivison (**Edinburgh**)  
Chris Simpson (**LJM**), Ian Smail (**Durham**),  
Malcolm Bremer (**Bristol**)

+ many other Co-Is



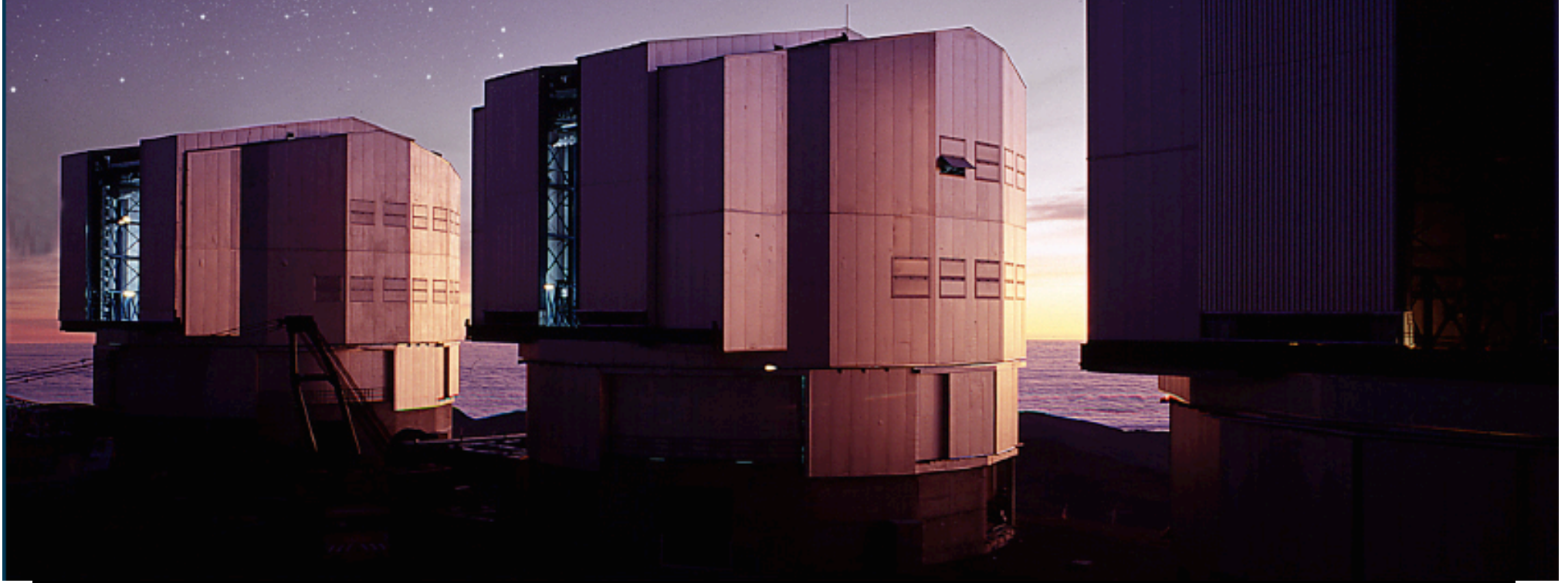


# UDSz

ESO Large Programme (~60% complete)

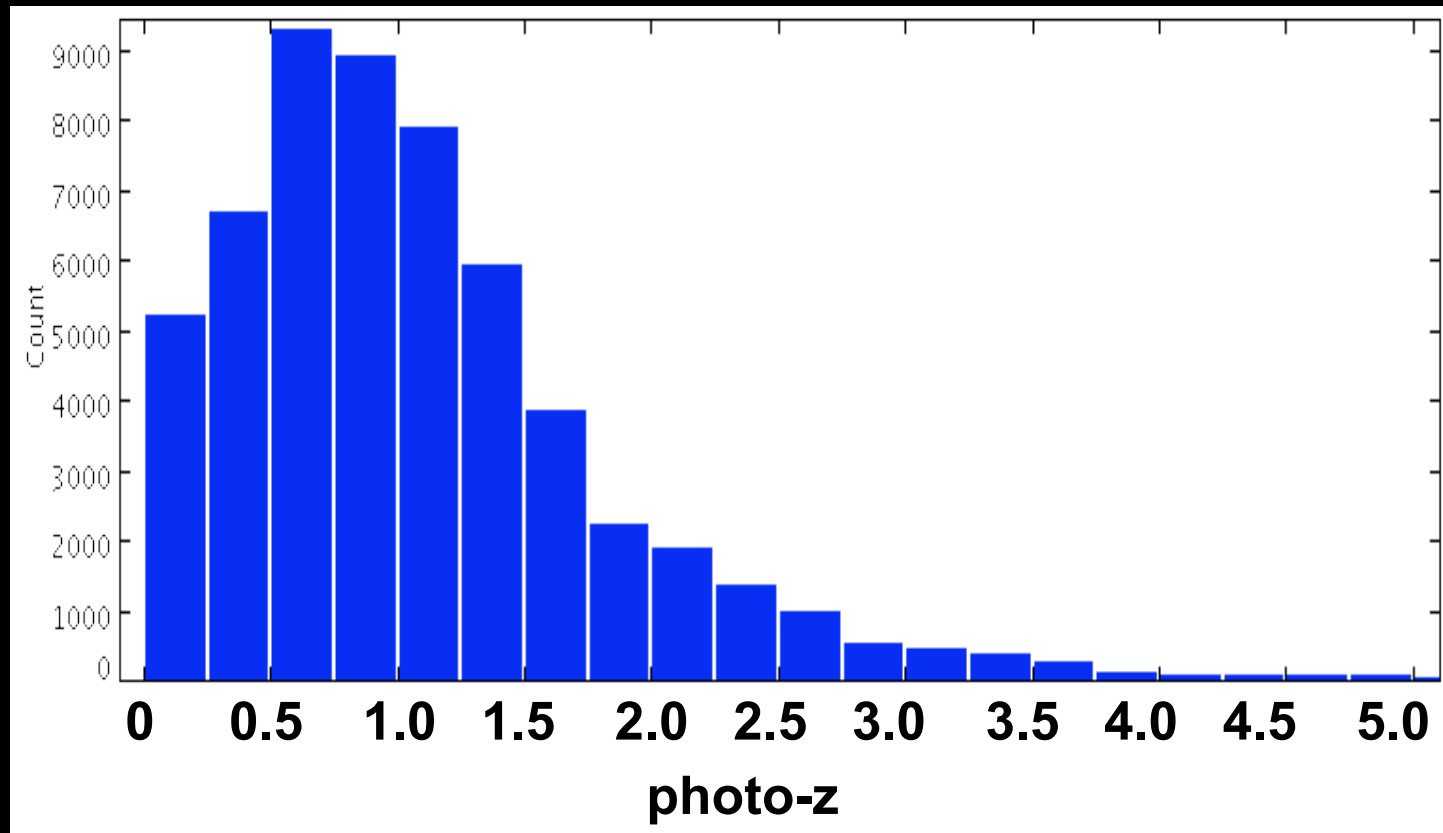
*93 hours VIMOS*

*142 hours FORS2*



# ESO Large Programme: UDSz

- K-selected sample to  $K_{AB} < 23$  over 0.6 sq degrees
- Primary sample pre-selected with  $z_{\text{phot}} > 1$
- Sampling 1/6 galaxies (~4000)

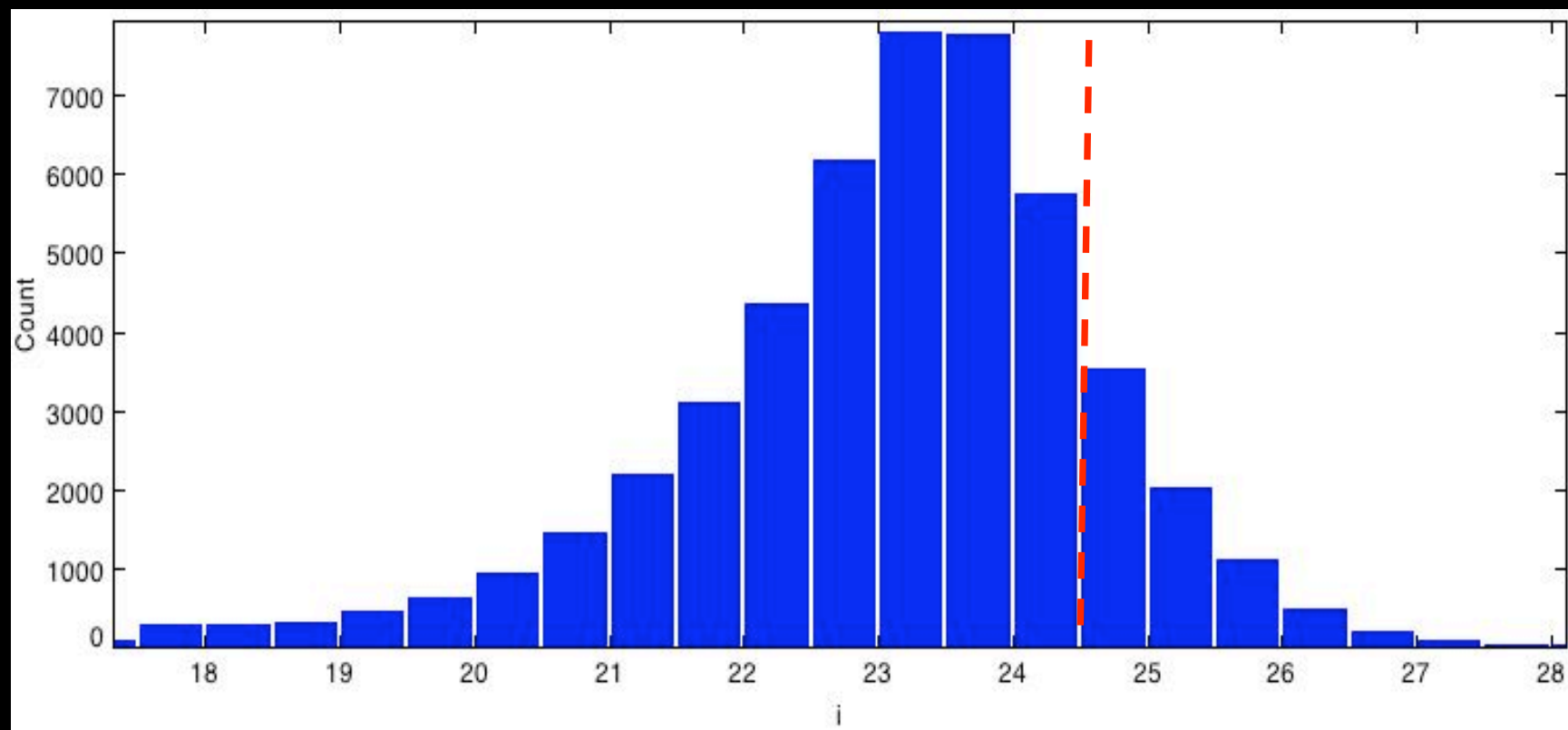


# Selection Criteria

VIMOS (Red+Blue)  $i' < 24$  or  $V < 25.5$

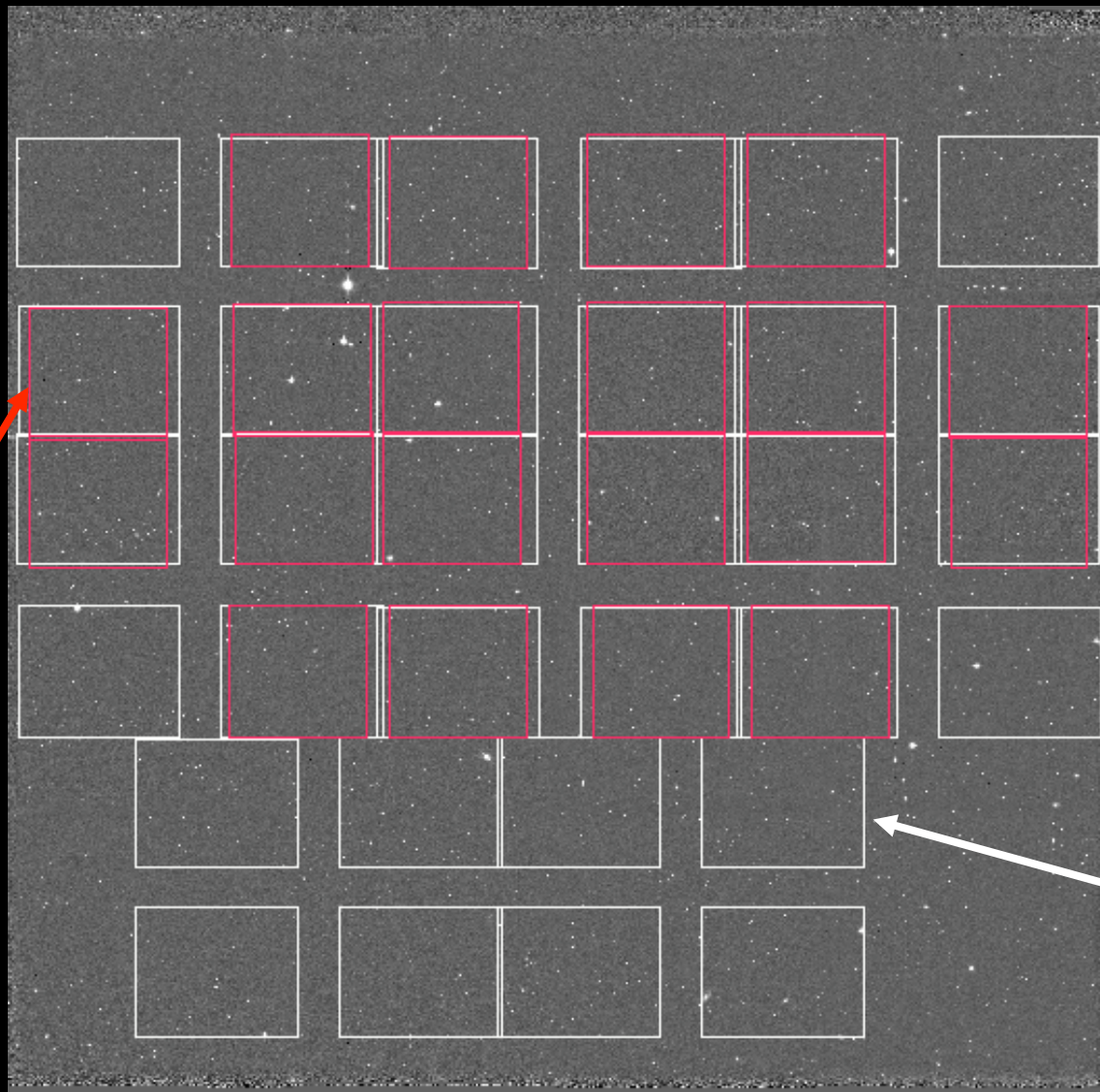
FORS2 (300I)  $i' < 25$  &  $V > 25.0$

+ extras (e.g.  $z > 5$  LBGs, SCUBA gals)



FORS2

5.5 hours 300l

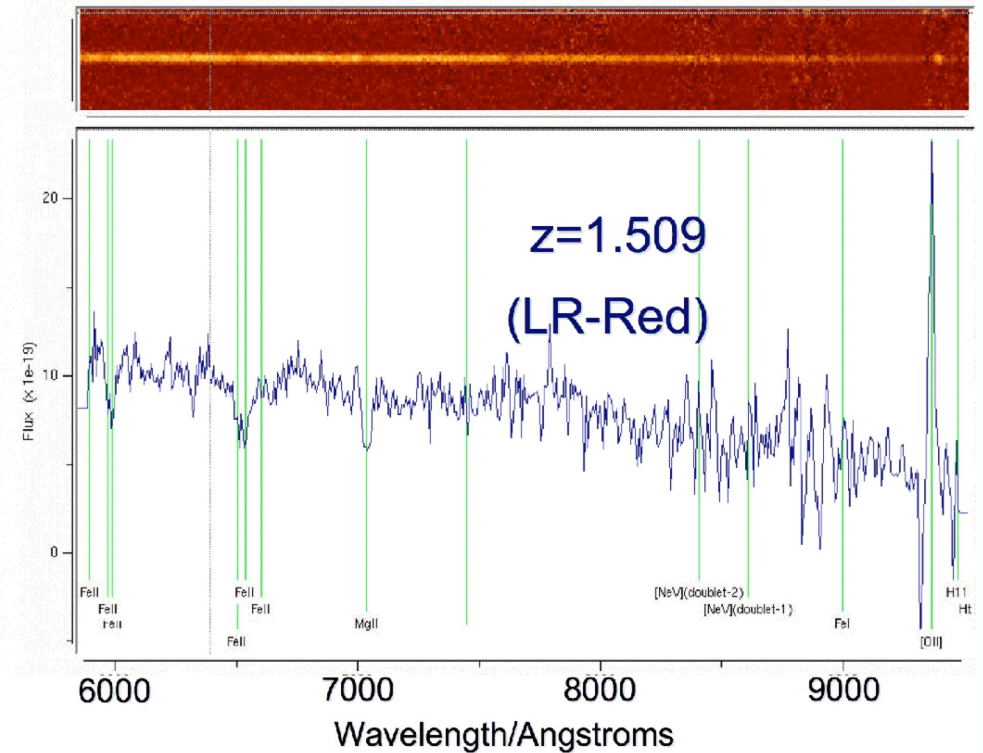
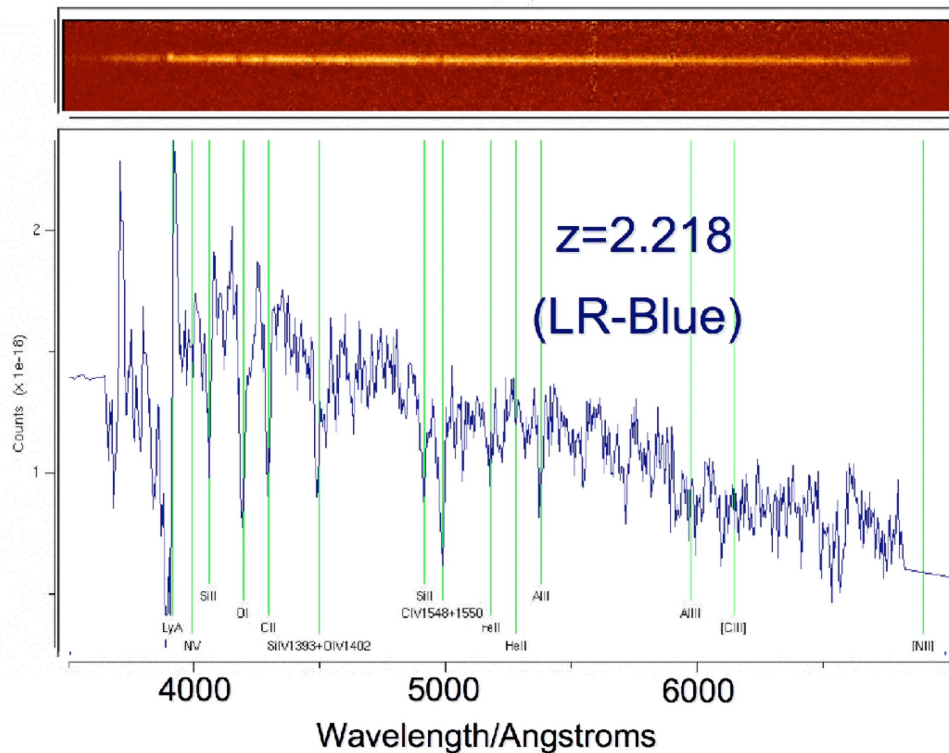


VIMOS

2.6 hours red  
4.5 hours blue

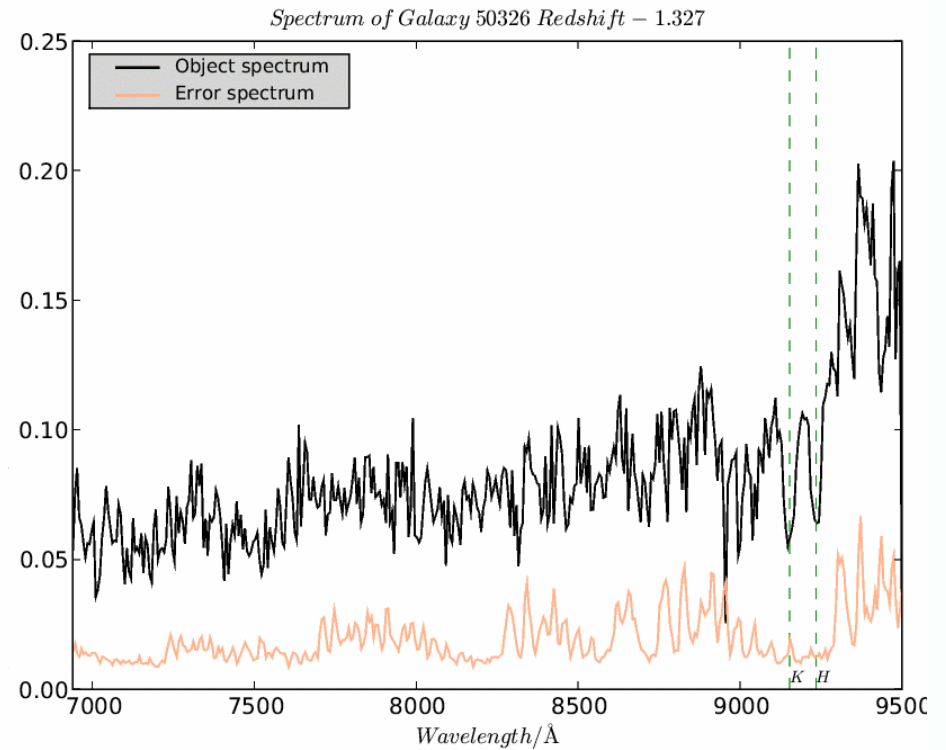
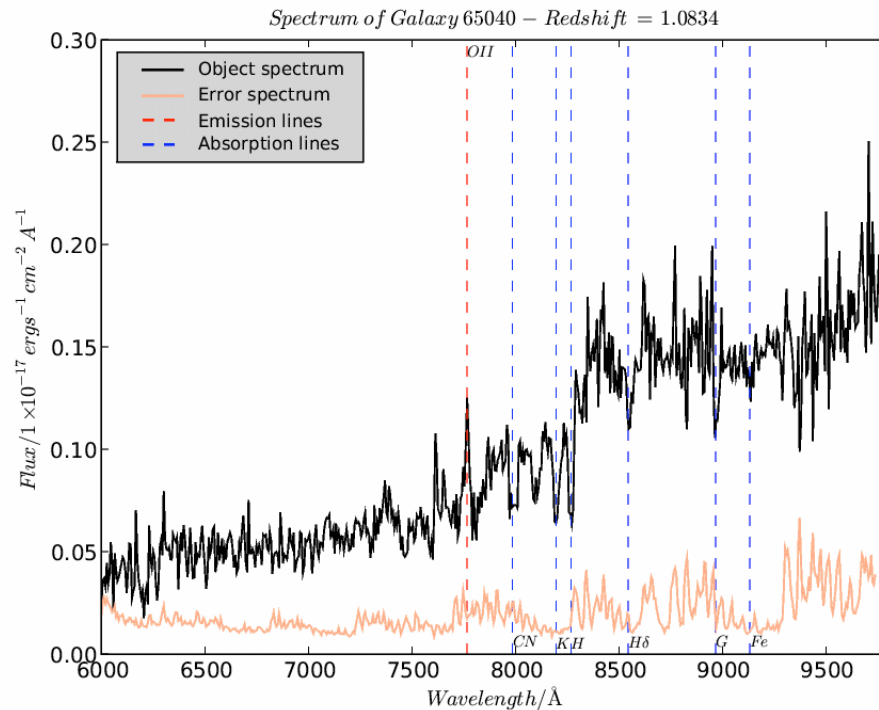
# BzK galaxies observed with VIMOS

*Rob Chuter (Nottingham)*



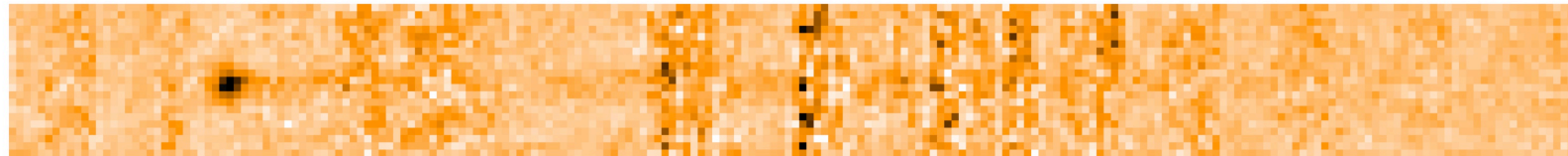
# EROs (R-K>5.5) observed with FORS2

*Henry Pearce (Edinburgh)*

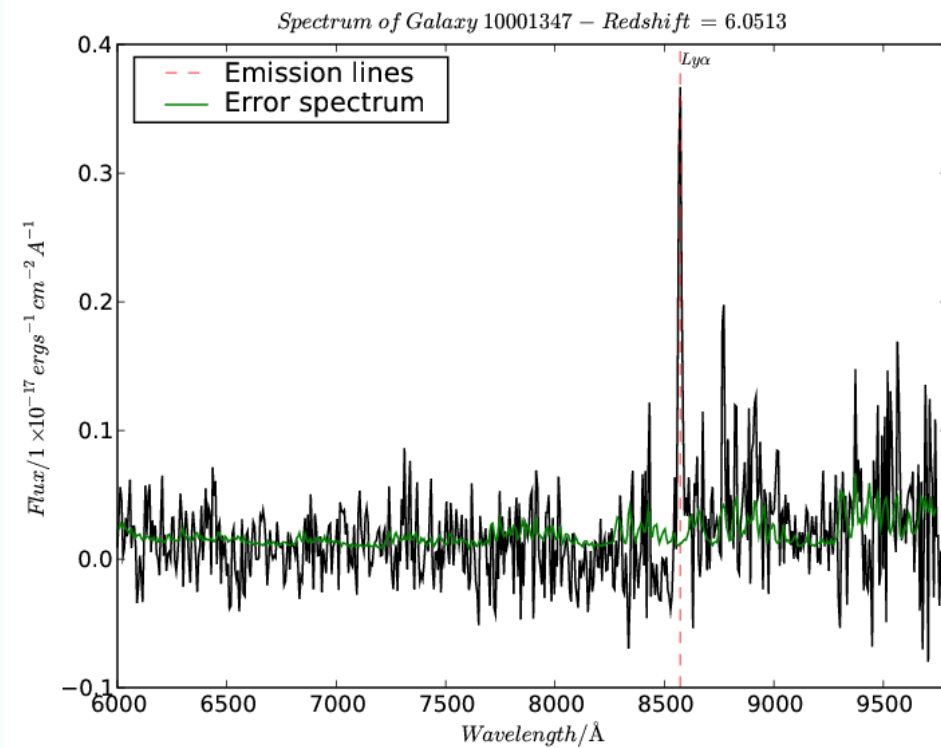


# First confirmed UDS galaxy at $z > 6$

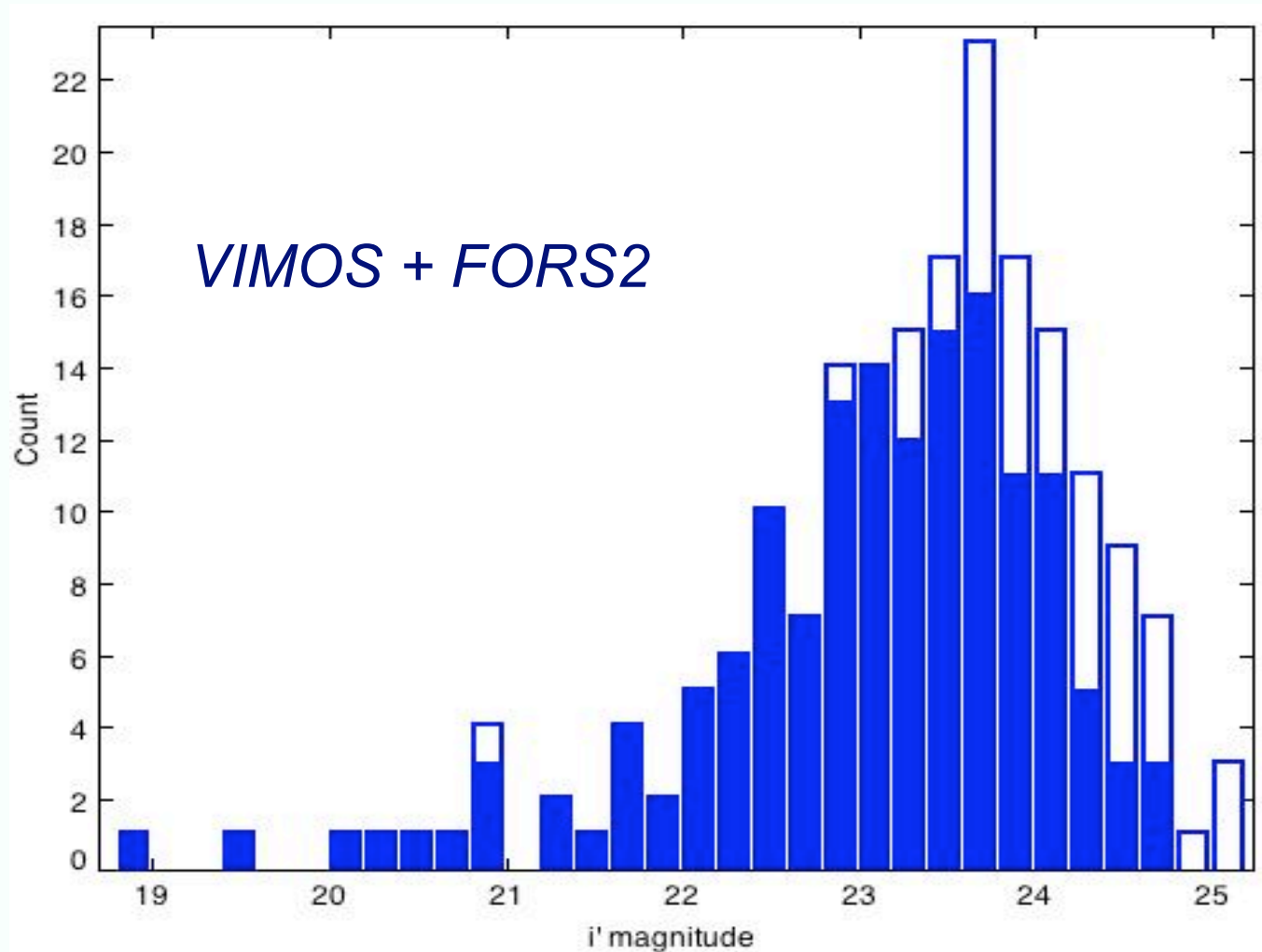
Ly- $\alpha$  at  $z=6.05$  (FORS2)



8500 8600 8700 8800 8900 9000 9100



Early estimate of redshift completeness: 77%





## First public release of UDSz early 2010

- Observations ~60% complete
- Reduction and redshift determination ongoing
- Anticipate ~3000 reliable redshifts
- First public release early 2010

## The need for FMOS

- Ideally suited for spectroscopy in the *redshift desert* ( $1.4 < z < 2.5$ )  
... and for *optically-faint galaxies* ( $i > 25$ )

With FMOS:	H $\alpha$ /NII	$0.5 < z < 1.6$
	H $\beta$ /OIII	$1.2 < z < 3.4$
	OII	$2.0 < z < 3.6$
	MgII	$2.7 < z < 5.0$
	Ca H+K	$1.6 < z < 3.5$

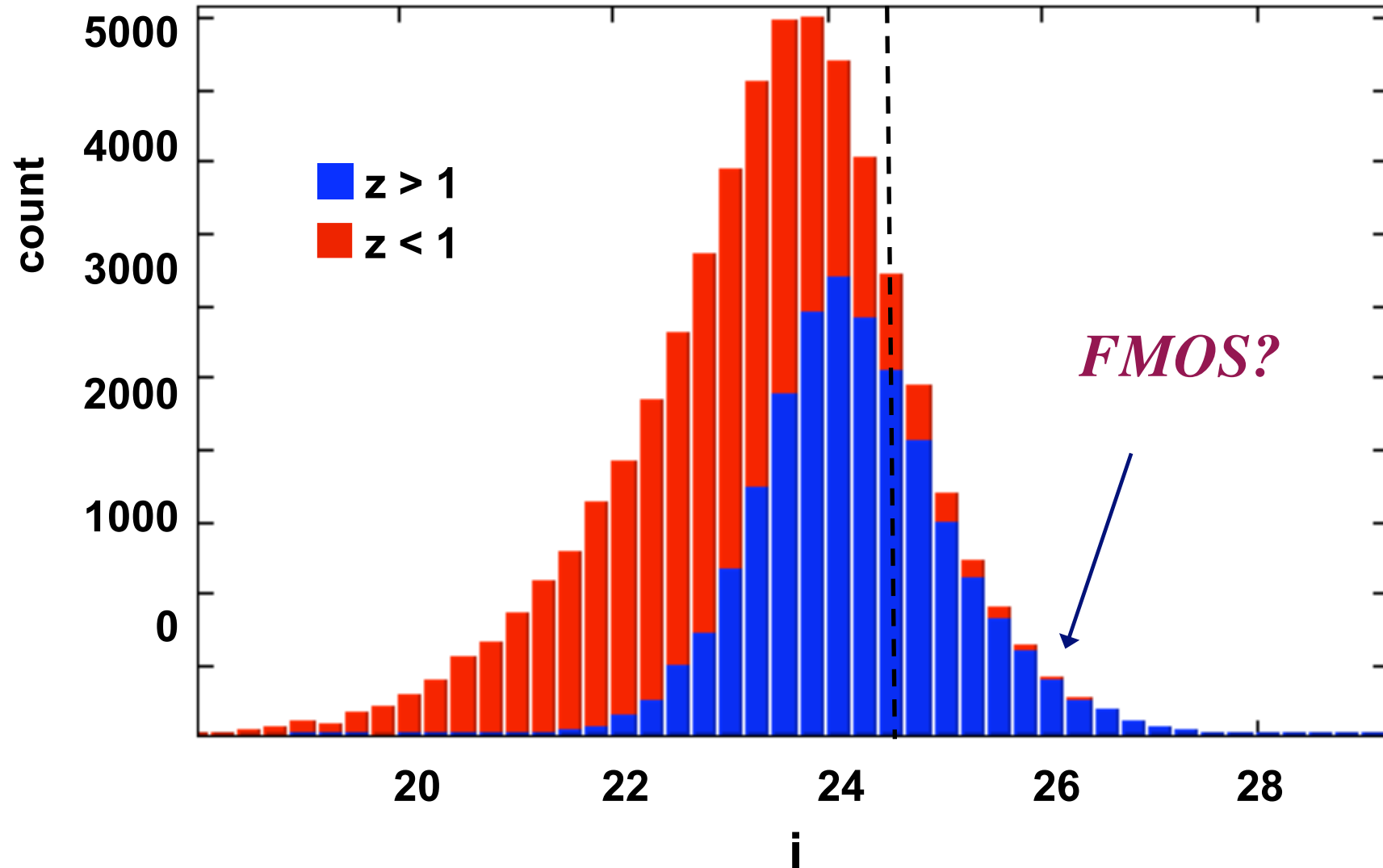
=> SFR, age of stellar population, AGN prevalence, outflows,  
studies of environment, clustering, halo occupation

- Is it feasible?

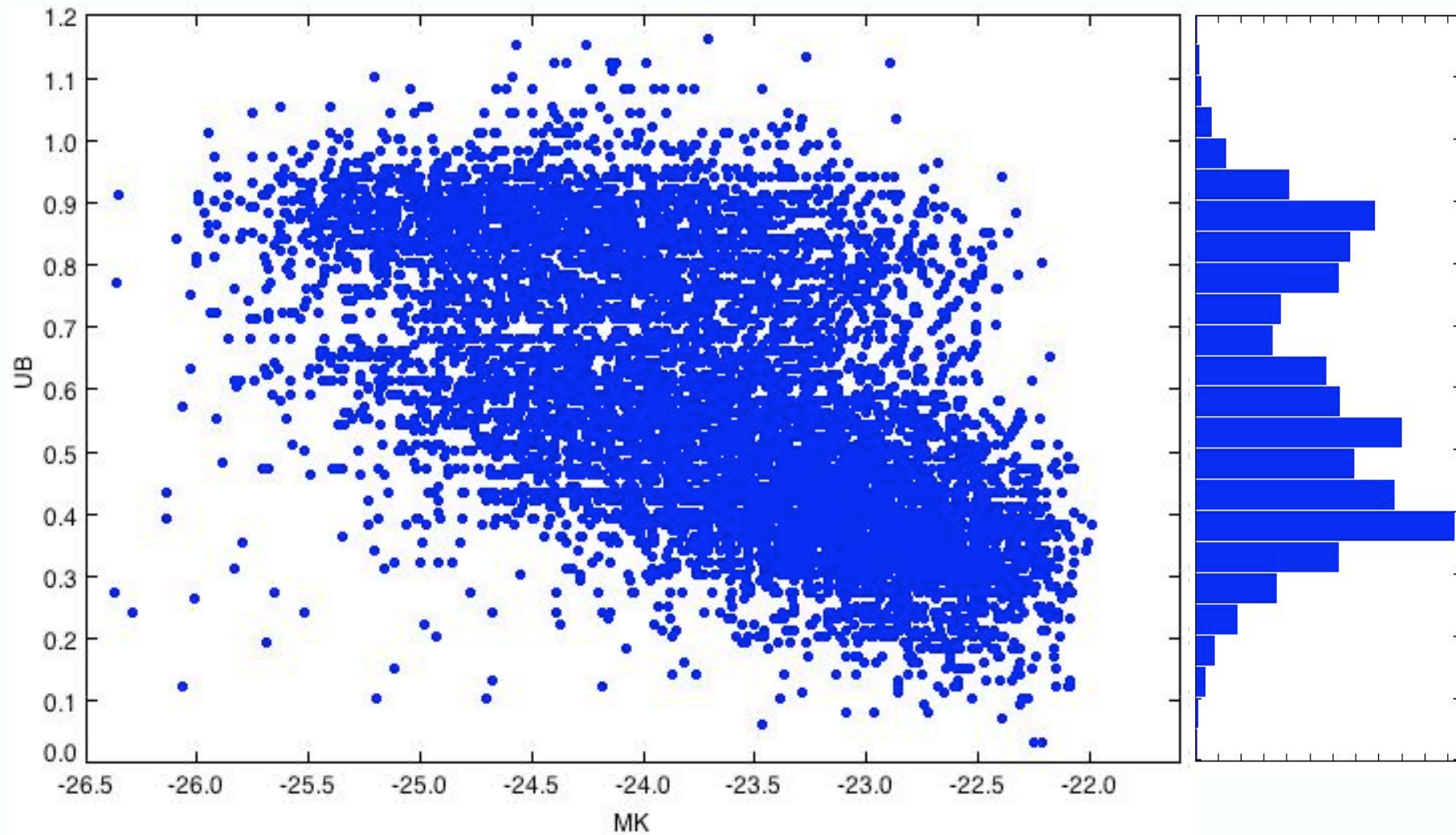
**Line:** H $\alpha$  limit in 5 hours  $\sim 3 \times 10^{-17}$  cgs => SFR of  $3 M_{\odot} \text{yr}^{-1}$  ( $z=1.5$ )

**Continuum:**  $\sim 7$  hours to reach S/N=5 to J $\sim 22$ , H $\sim 21$

# Challenge for FMOS: the optically faint population ( $i > 24.5$ )

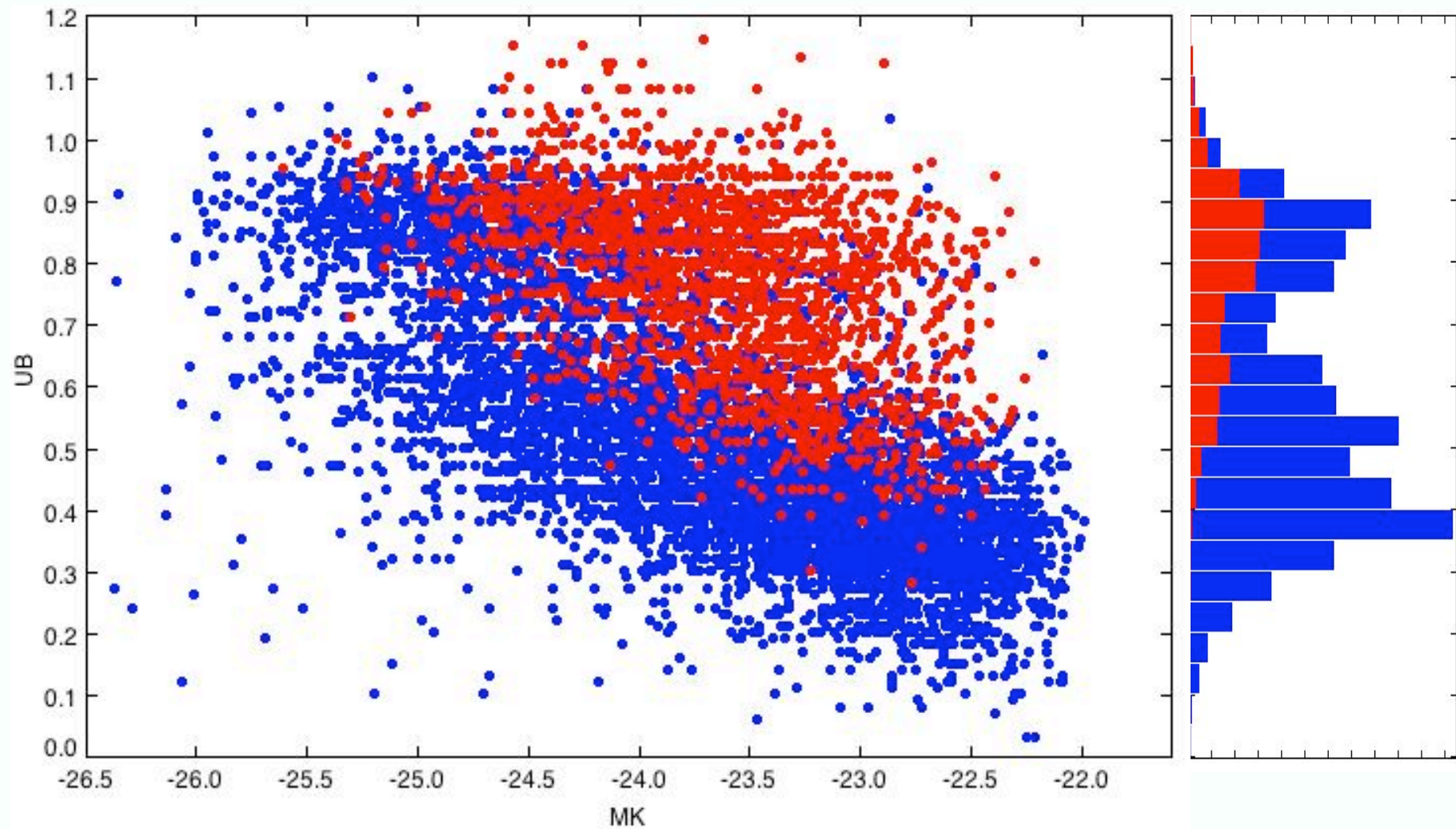


$1.0 < z < 1.5$



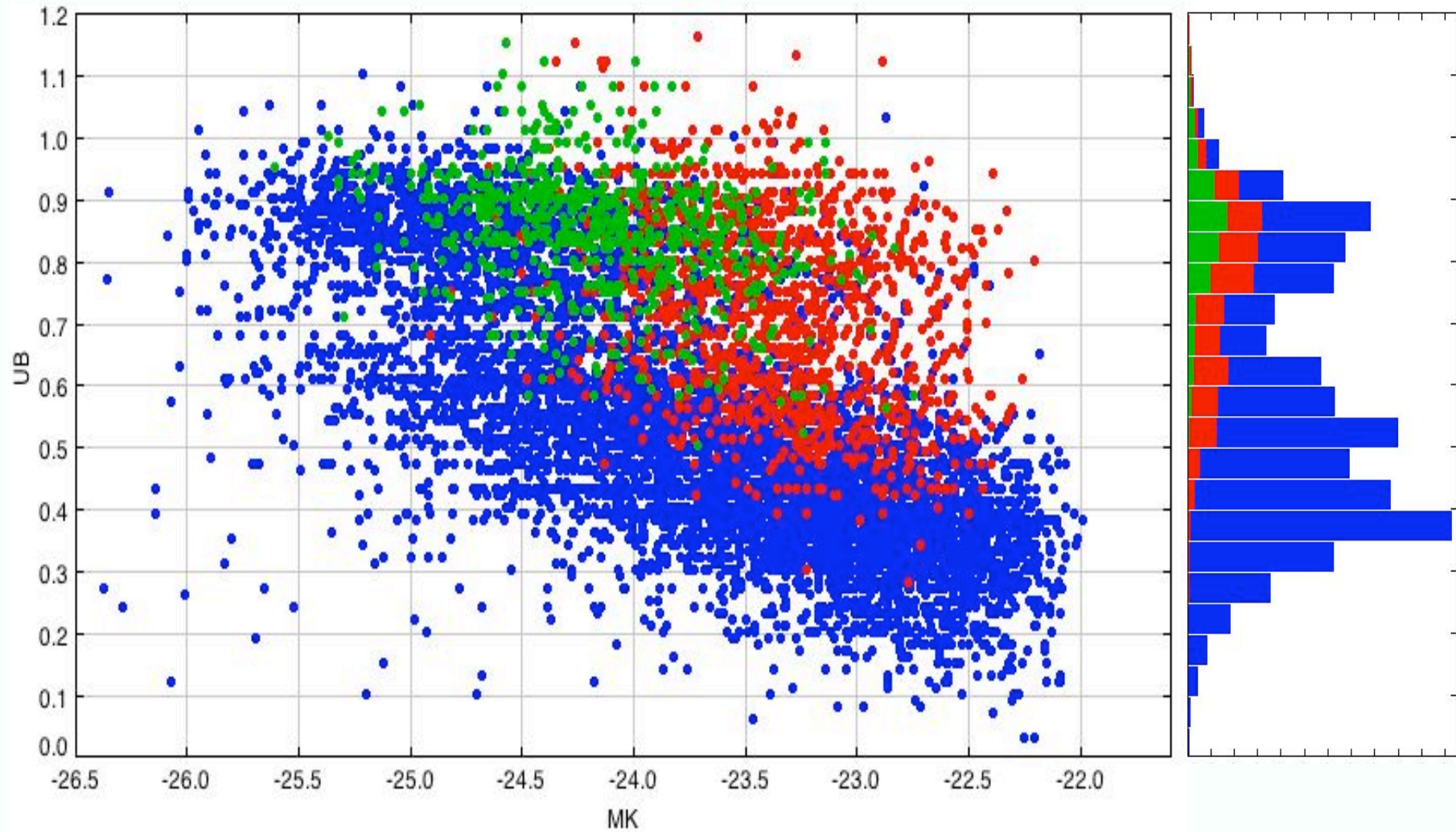
$1.0 < z < 1.5$

■  $i < 24.5$   
■  $i > 24.5$

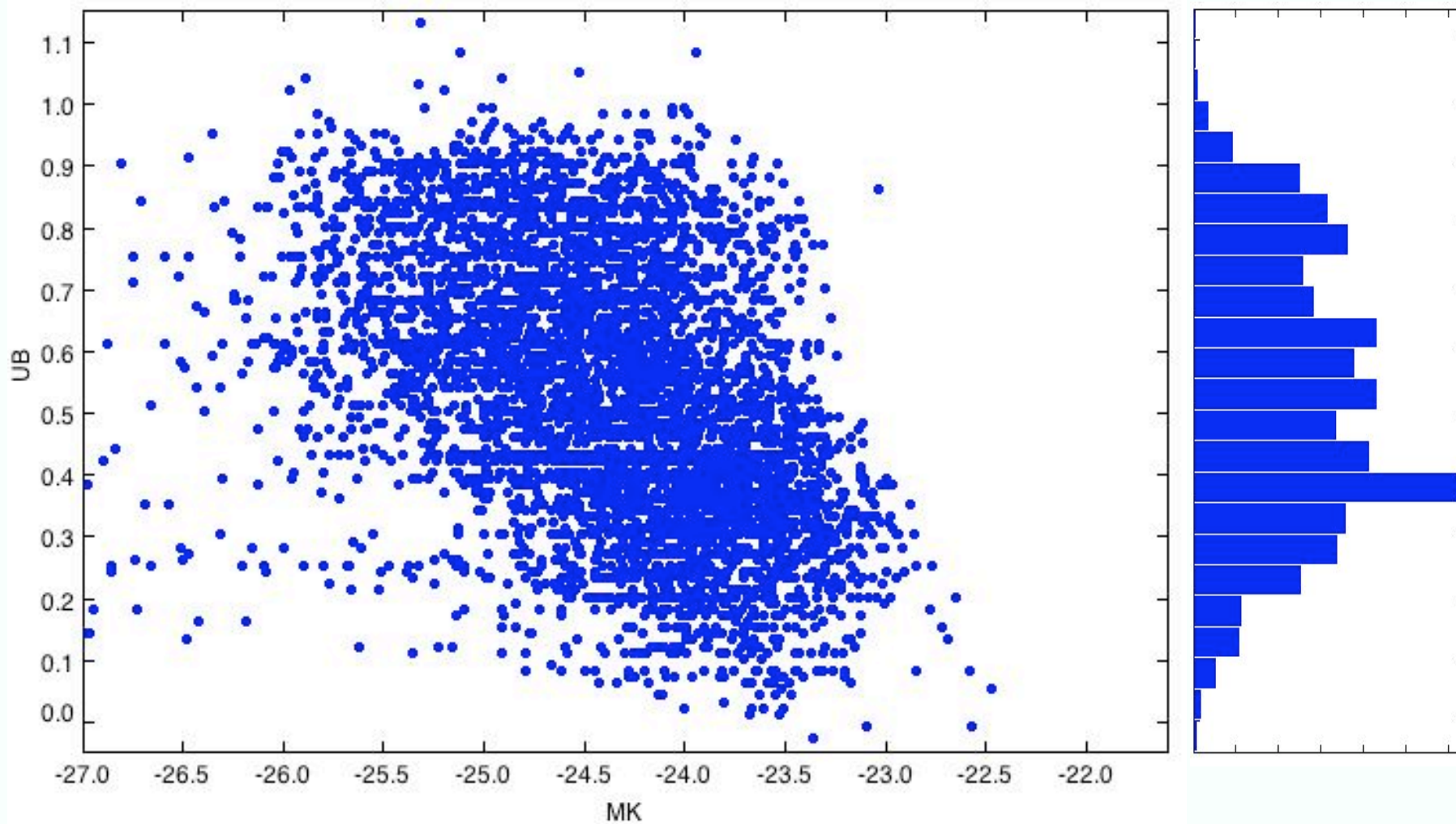


$1.0 < z < 1.5$

- $i < 24.5$
- $i > 24.5$
- $J < 22, H < 21$

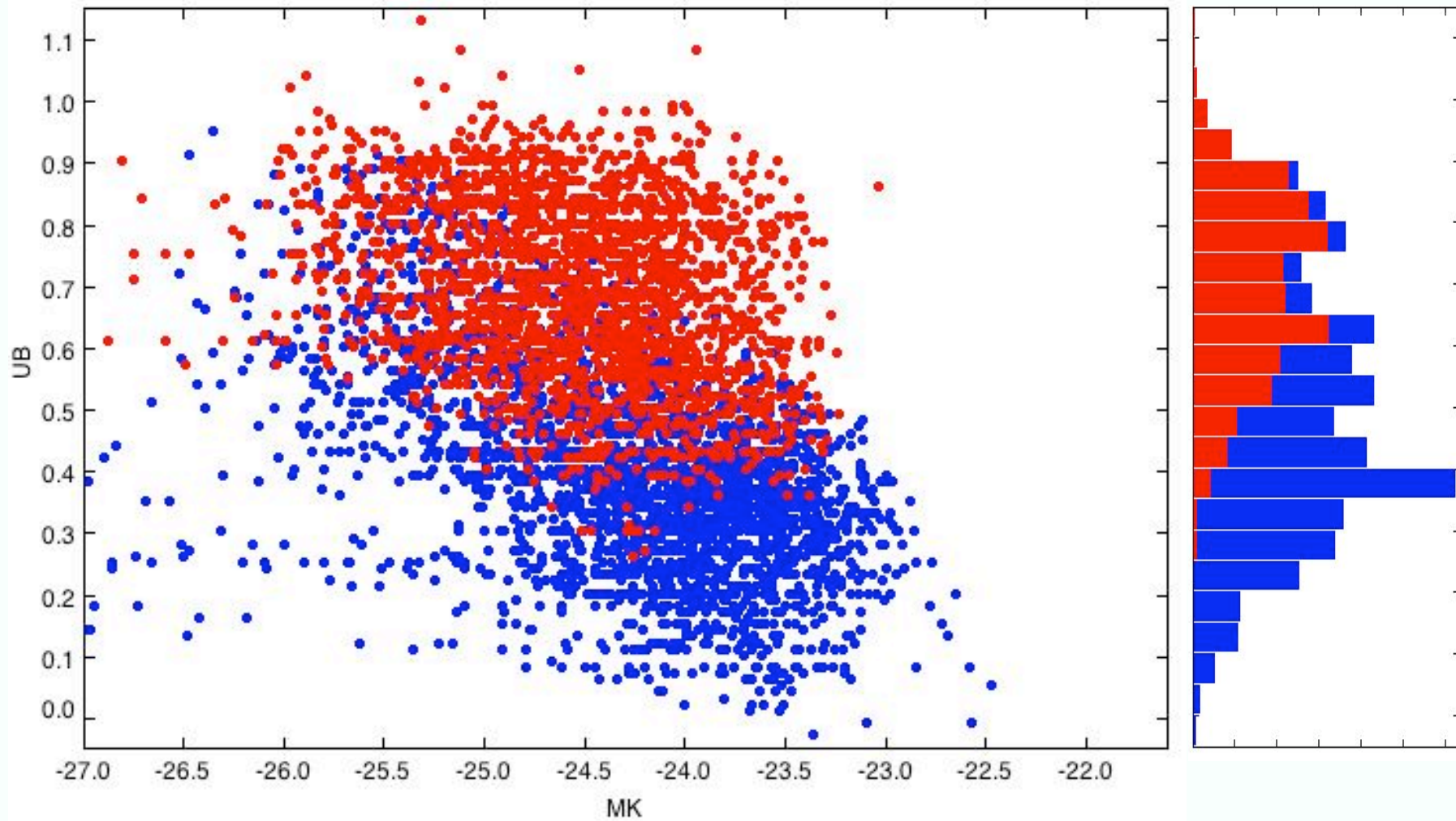


$1.5 < z < 2.5$



# 1.5 < z < 2.5

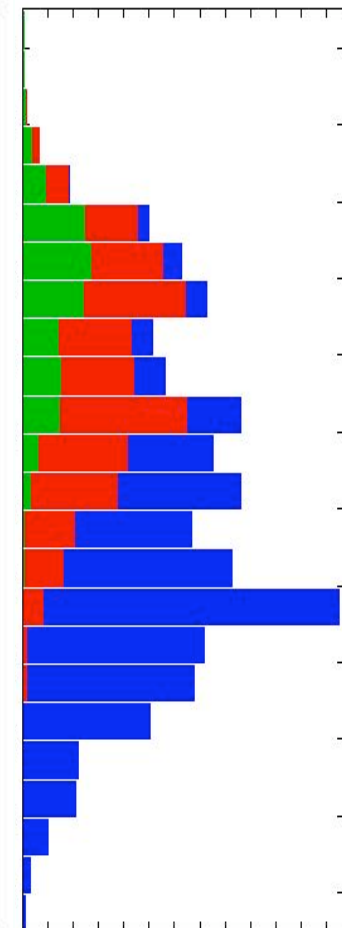
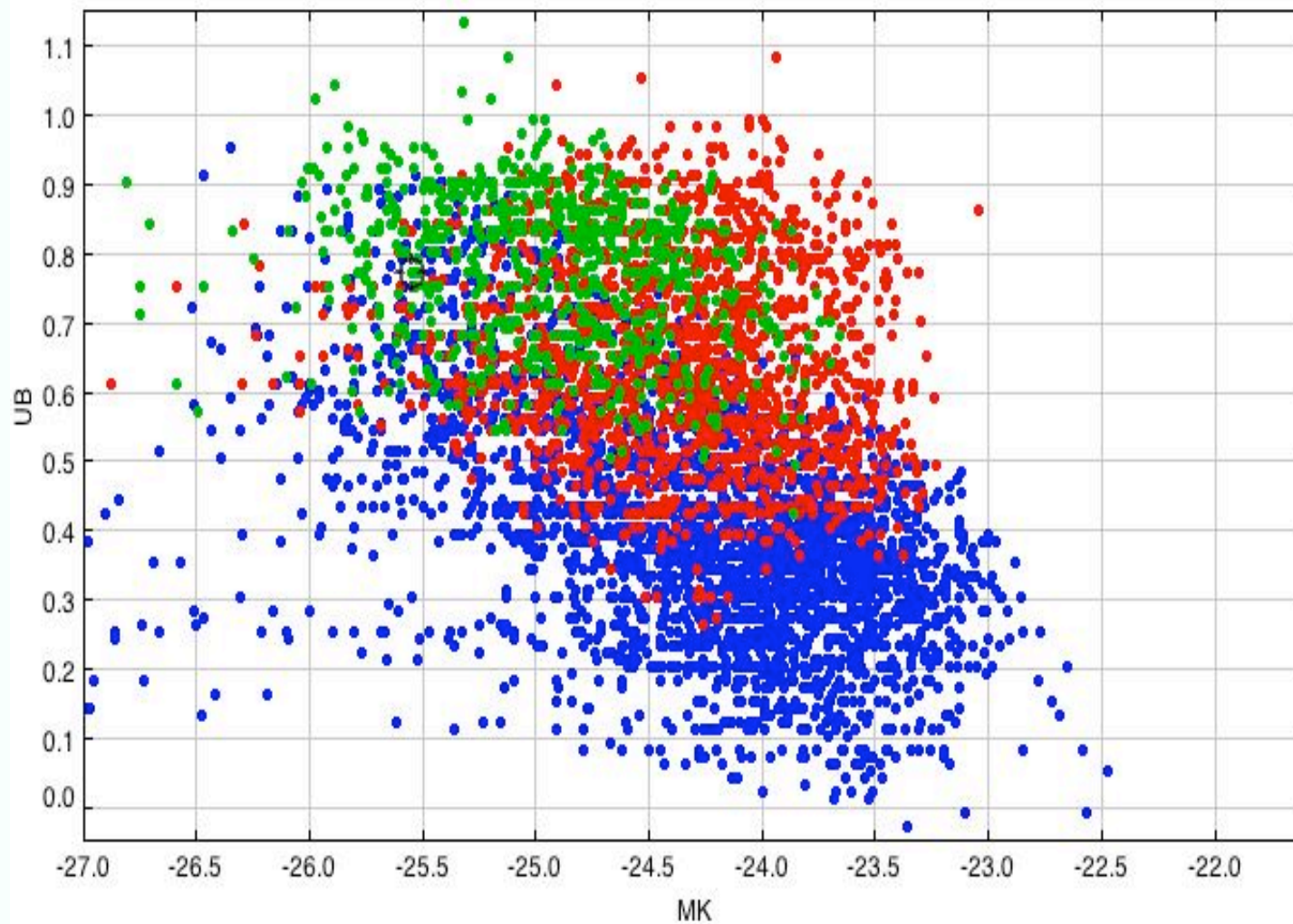
■ i < 24.5  
■ i > 24.5





# 1.5 < z < 2.5

- i < 24.5
- i > 24.5
- J < 22, H < 21



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Fin



