

An aerial photograph of a vast, arid mountain range. The terrain is characterized by rolling hills and valleys in shades of brown and tan. In the center, a prominent, dark, conical mountain peak is topped with a cluster of white, rectangular buildings, likely an observatory. A dirt road winds up the slope of this peak. In the foreground, another smaller mountain peak is visible, also topped with a small, white, cylindrical structure, possibly another observatory. The sky is a clear, pale blue, and the overall scene is one of a high-altitude, remote location.

Future ESO Galaxy Redshift Surveys

T. Shanks, Durham University

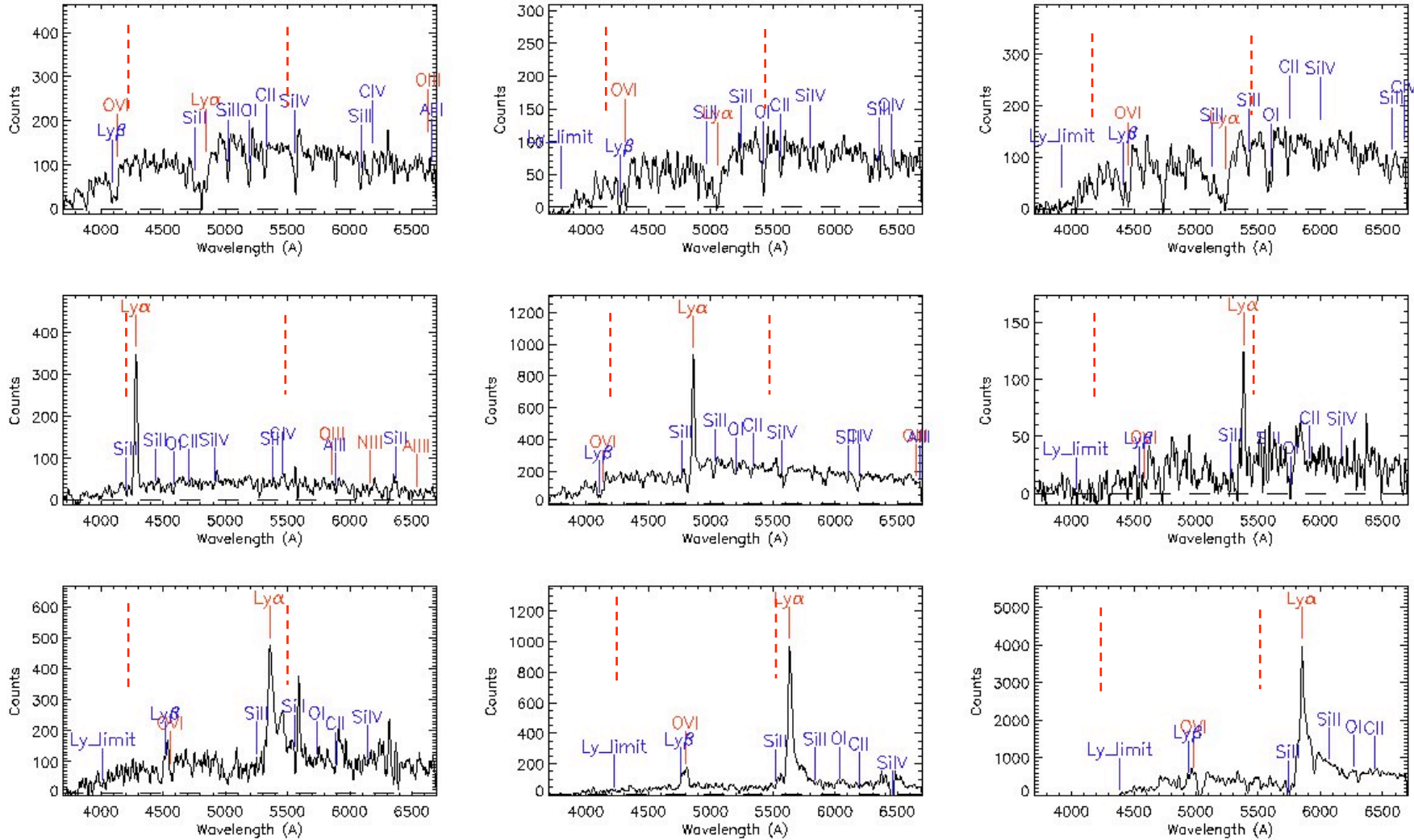
VLT VIMOS LBG Survey

- CFHTLS Wide covers 140 deg^2 to $r=24.5$
- Propose VLT VIMOS public survey of ~ 100000 $r < 24.5$ LBGs at sky density of $0.3 \text{ arcmin}^{-2} \rightarrow \sim 100$ per VIMOS field
- ~ 1 hr exposure for LBG redshift with VIMOS LR-Blue grism in 1 arcsec seeing
- \Rightarrow 120 night project at 20 nights per Period over 3 years $\rightarrow \sim 50\%$ of CFHTLS area
- Biggest $z \sim 3$ galaxy survey by factor $> 50x$

LBG z survey science

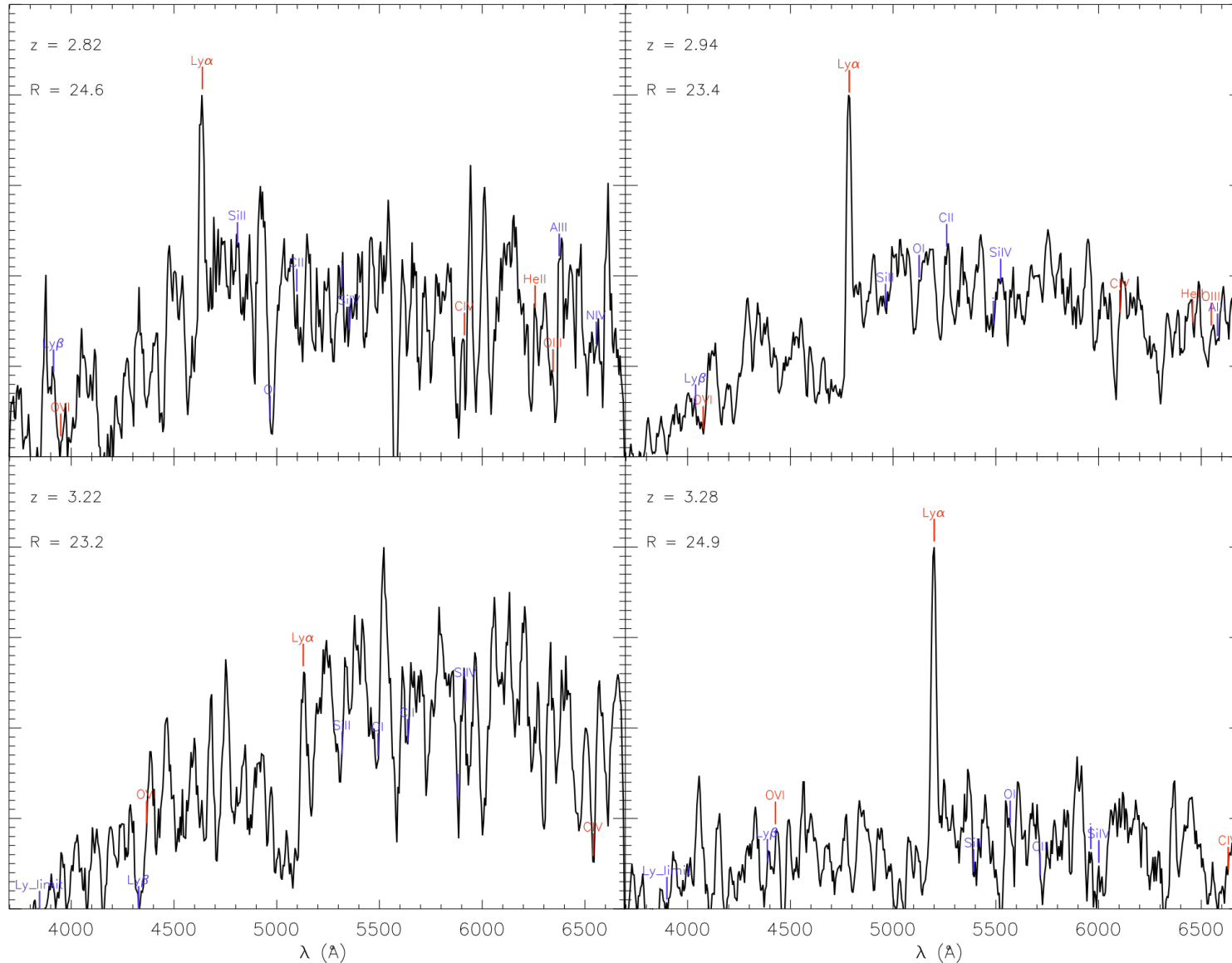
- Baryon Acoustic Oscillations via $z \sim 3$ LBGs $\rightarrow \pm 2\%$ in BAO scale $\rightarrow \pm 10\%$ in $w(z=3)$
- BAO via Lyman α forest of ~ 8000 $r < 24.5$ QSOs \rightarrow also gives $w(z=3)$ to $\pm 10\%$
- Gravitational growth rate via LBG z-distortion
- LBG feedback via LBG cross-correlated with Lyman α forests from ~ 2000 $r < 22$ QSOs
- Optional - simultaneous survey of ~ 200000 $z \sim 0.7$ galaxies

2.5 < z < 3.5 VLT LBGs (Bielby et al)

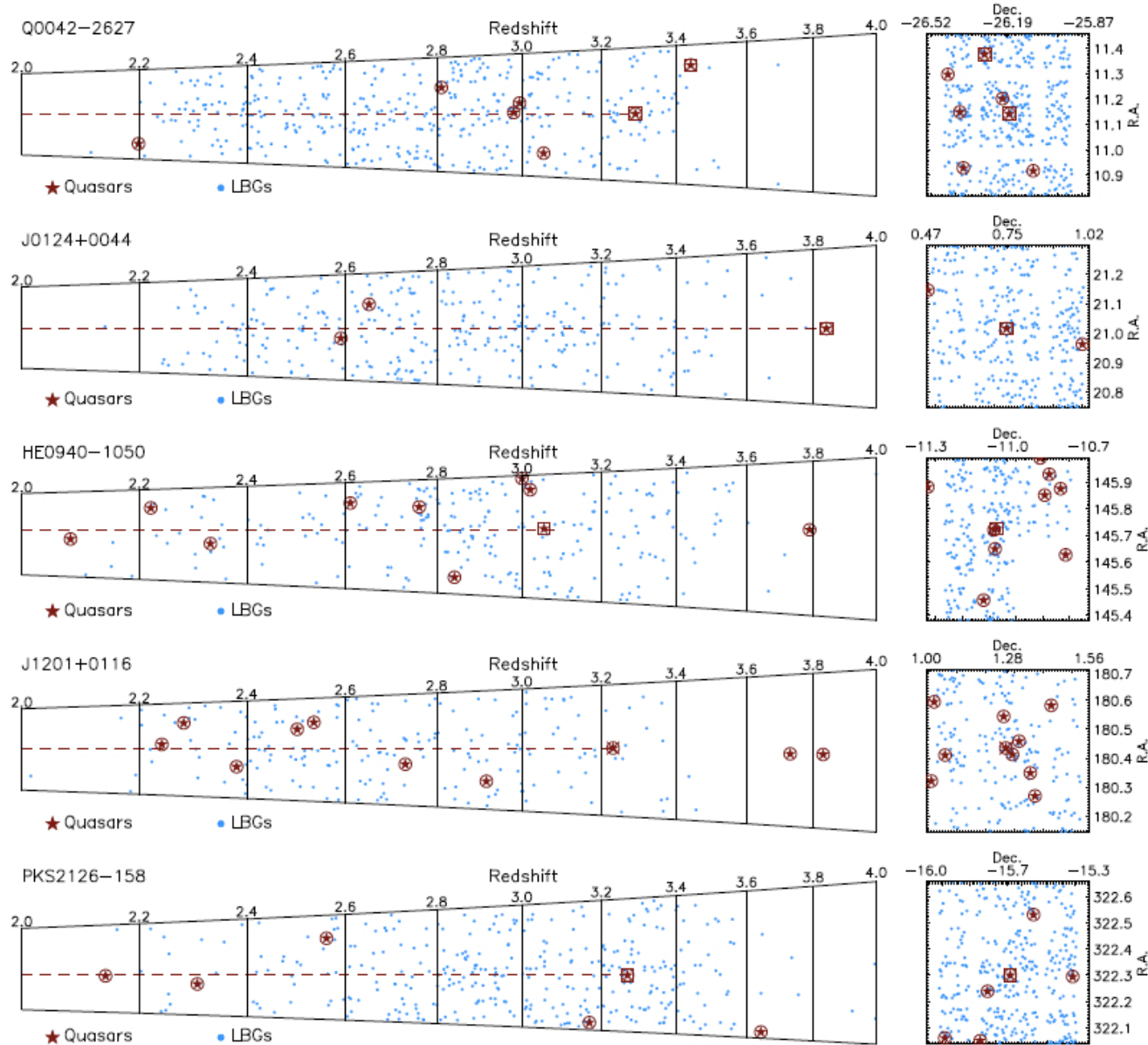


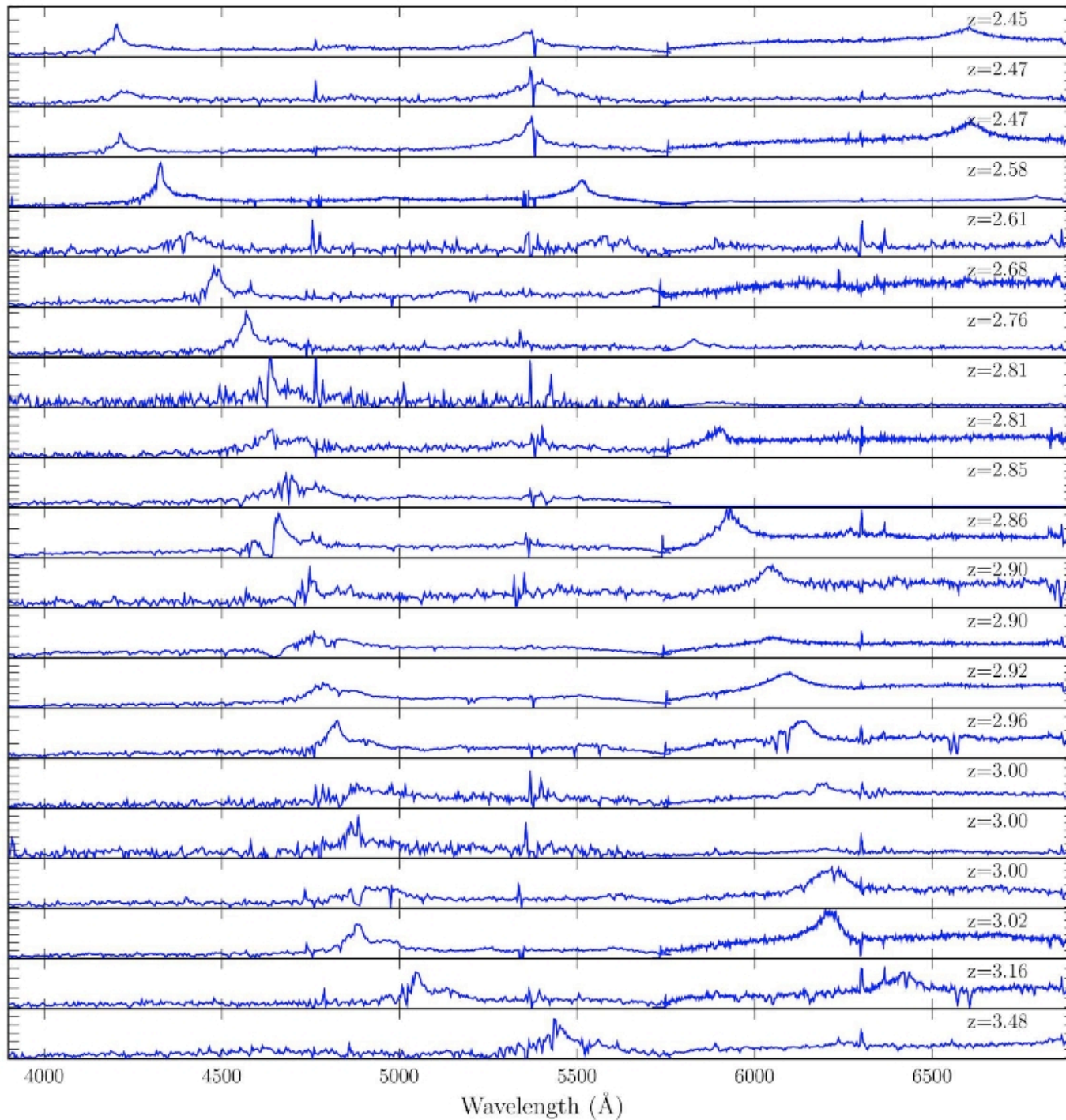
3hr VLT exposure in $\sim 1''$ seeing

~1hr VIMOS LBG spectra to $r \sim 24.5$



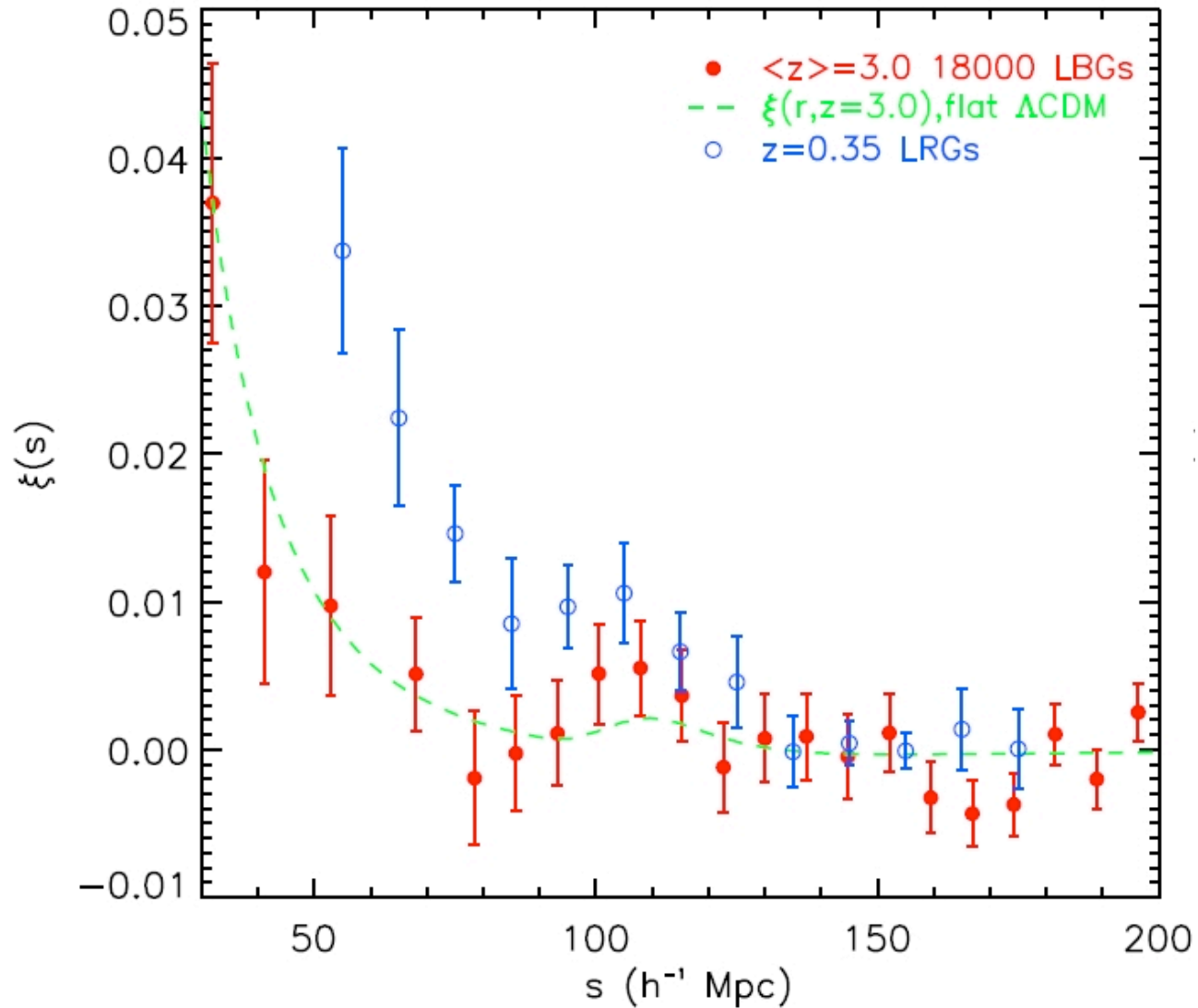
Current VIMOS LBG Survey



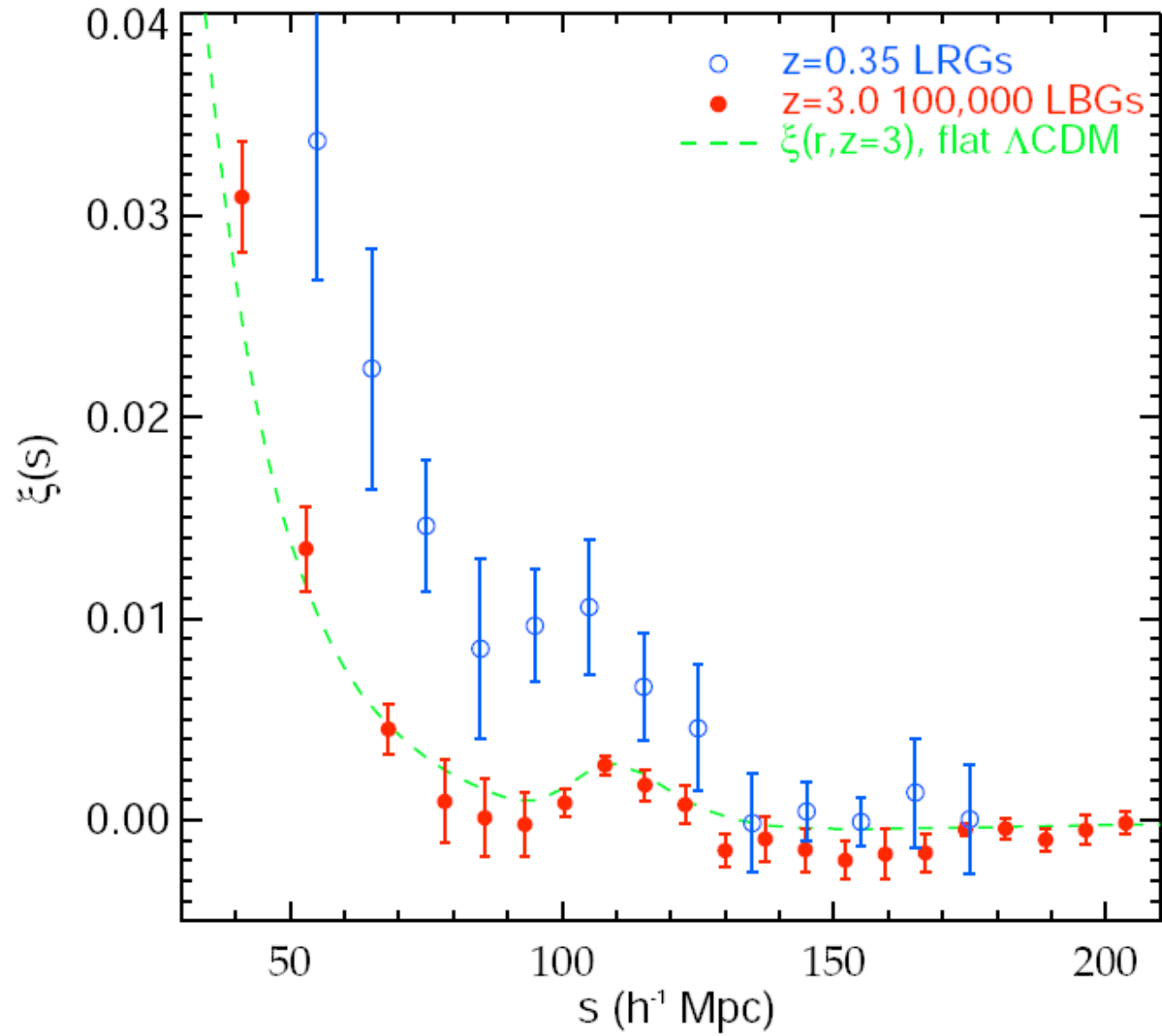


21 AAOmega $z \sim 3$
QSO Spectra in
HE0940 LBG Field

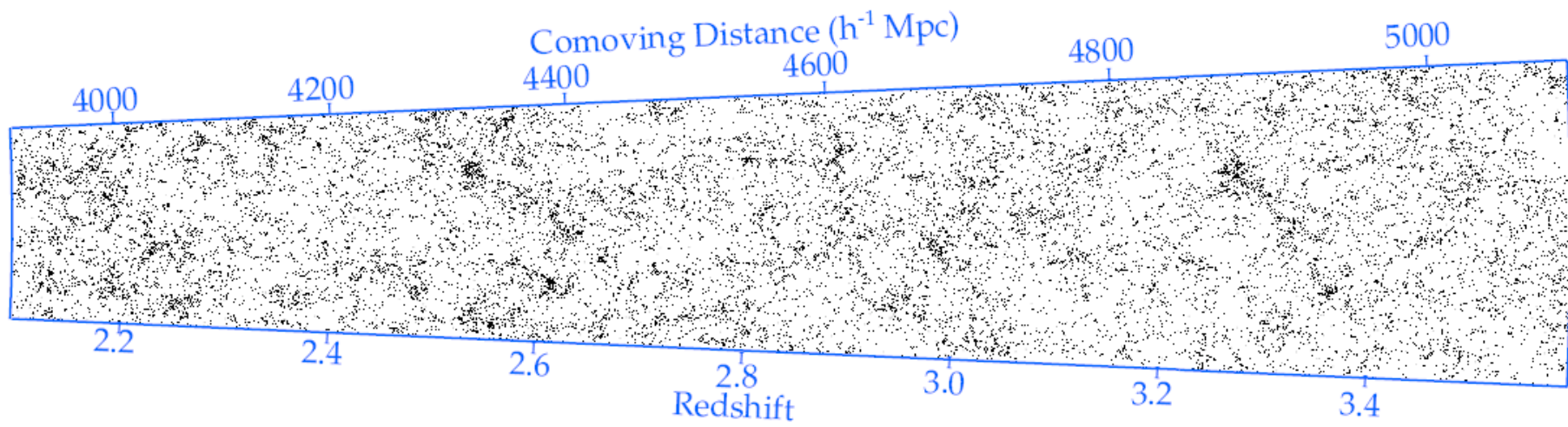
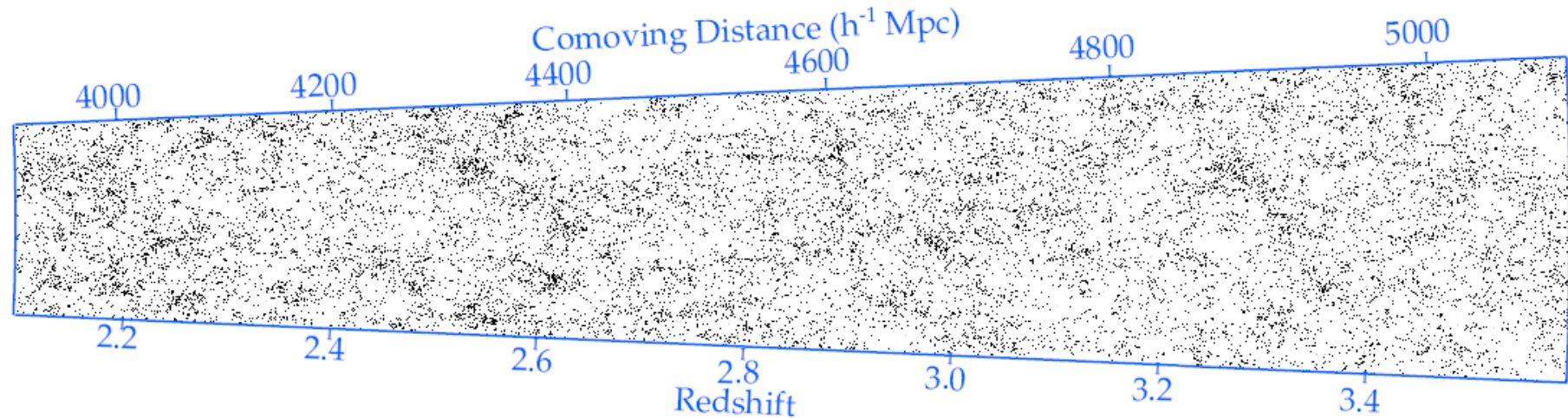
Millennium LBG Mock Catalogue



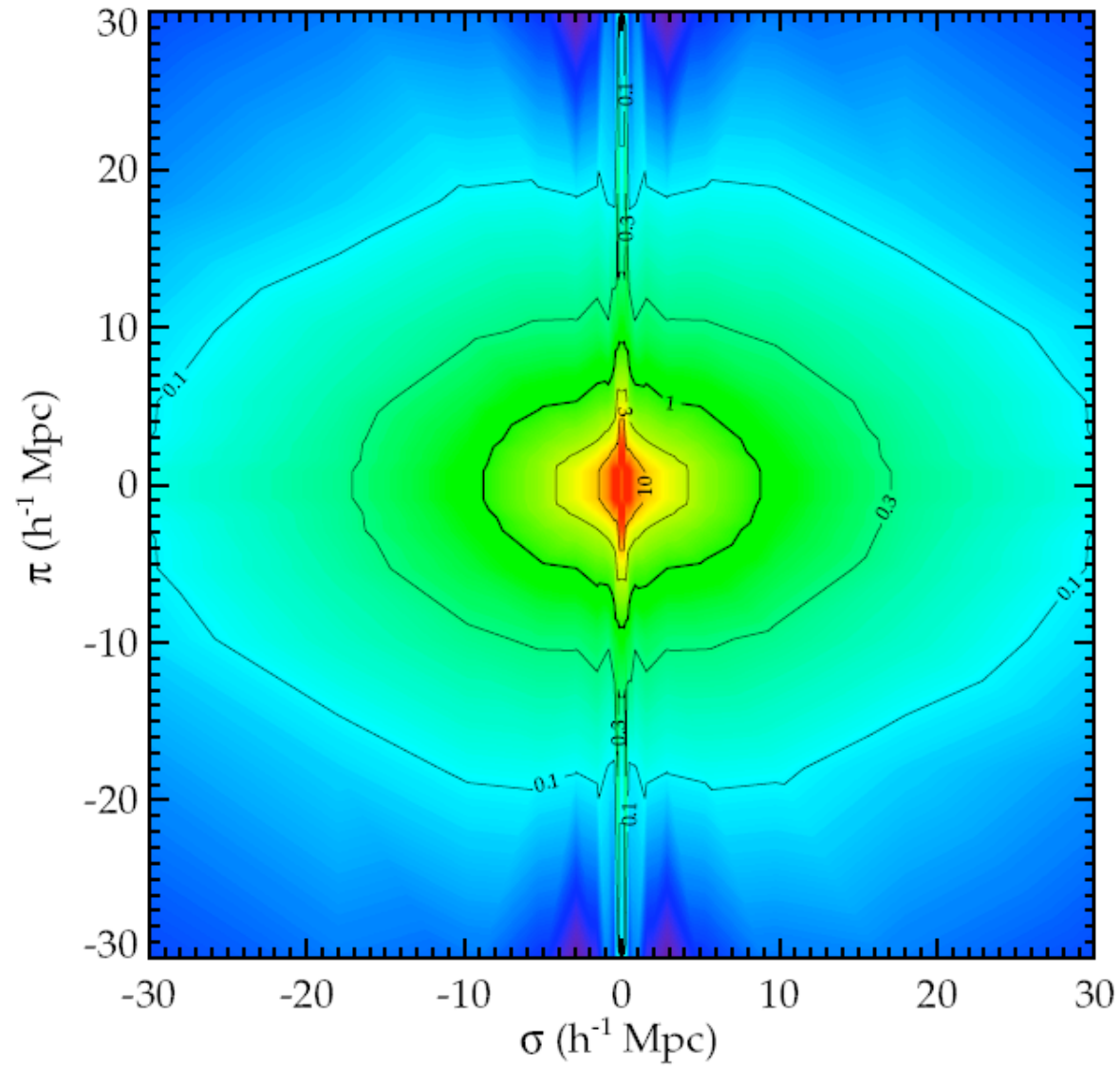
Millennium LBG Mock Catalogue



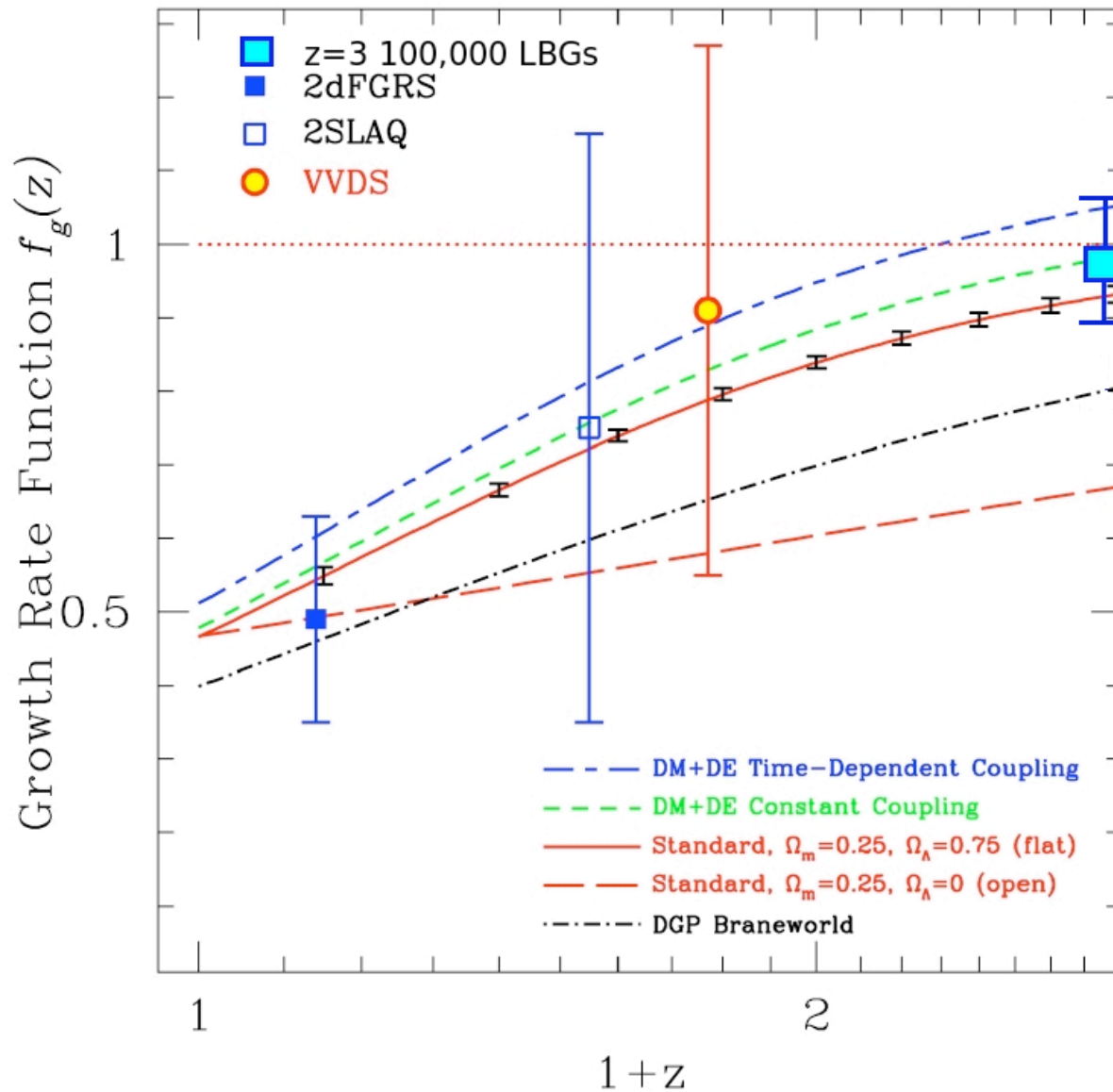
Millennium Mock Real+Z-space



LBG Mock – Z Distortion



Millennium LBG Mock Catalogue



$$f_g(z) = \Omega_m^{0.55}(z)$$

for Λ CDM

$$f_g(z) = \Omega_m^{0.67}(z)$$

for DGP

(From Guzzo et al 2008)

LBG z survey summary

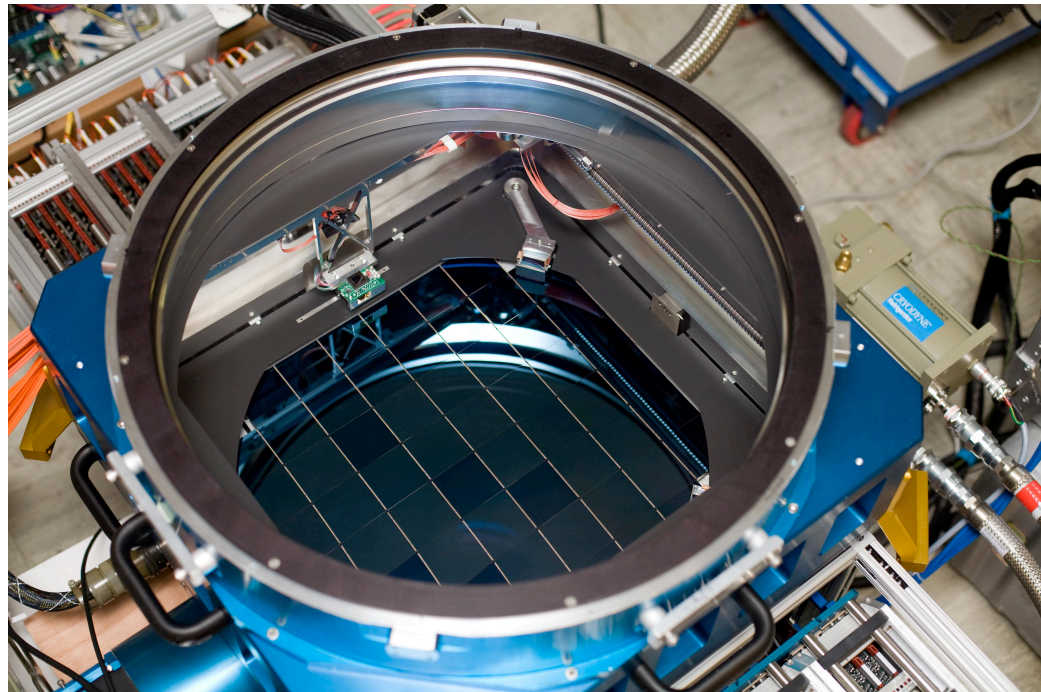
- 120 night VLT VIMOS LBG public survey of ~ 100000 $z \sim 3$ galaxies in CFHTLS Wide
- Baryon Acoustic Oscillations via $z \sim 3$ LBGs $\rightarrow \pm 2\%$ in BAO scale $\rightarrow \pm 10\%$ in $w(z=3)$
- BAO via Lyman α forest of ~ 8000 $r < 24.5$ QSOs \rightarrow also gives $w(z=3)$ to $\pm 10\%$
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- LBG galaxy formation feedback via LBG cross-correlated with ~ 2000 $r < 22$ QSO Lyman α forest
- Optional - simultaneous survey of ~ 200000 $z \sim 0.7$ galaxies

VISTA Extreme Multiplex Spectroscopy (VXMS)

- 12 cloned spectrographs to cover 3 deg² field at VISTA 4-m f/3.25 Cassegrain Focus
- Gives ~12000 slits at default resolution $R \sim 600$ (10Å) over 2000Å range (slits 1.''5x10'')
- Using eg 5200-7200Å range could survey 250000 galaxy redshifts at $z \sim 0.7$ in 3 nights!
- → 2dFGRS in 1% of the observing time at 6x bigger z and ~4mag fainter!!!
- VISTA has ~50x bigger field and only 4x smaller aperture than 8-m
- Ideal for follow-up of VST/VISTA imaging surveys

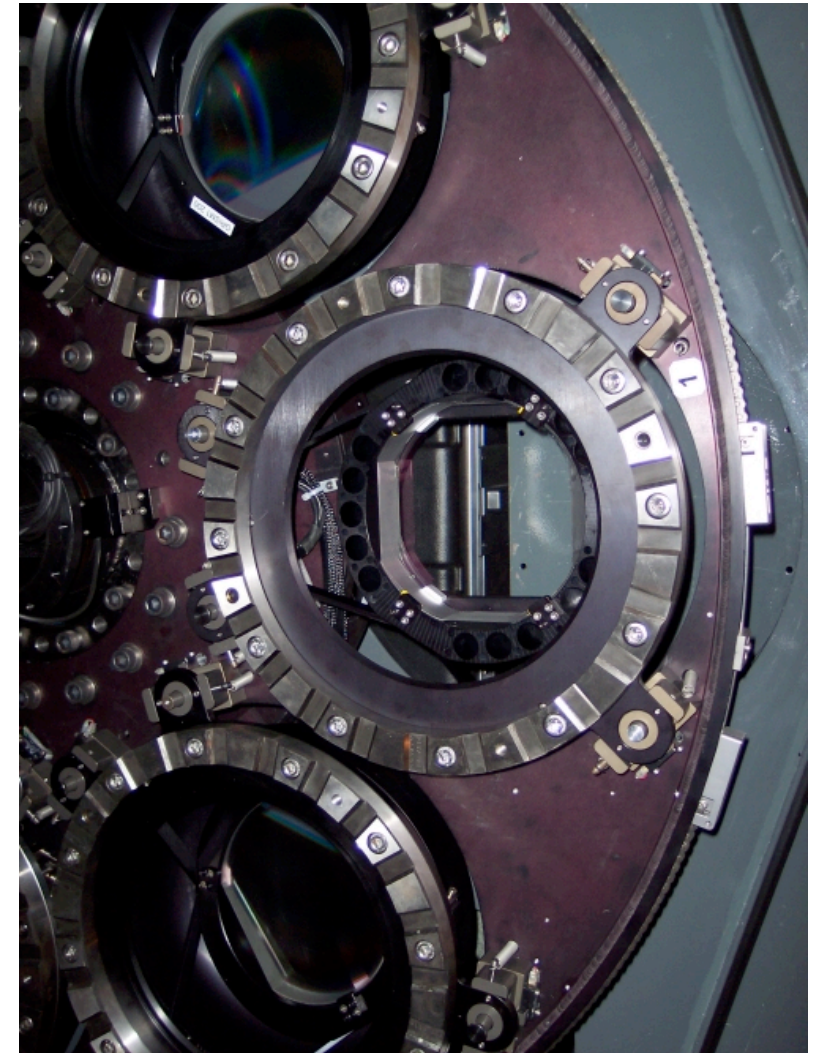
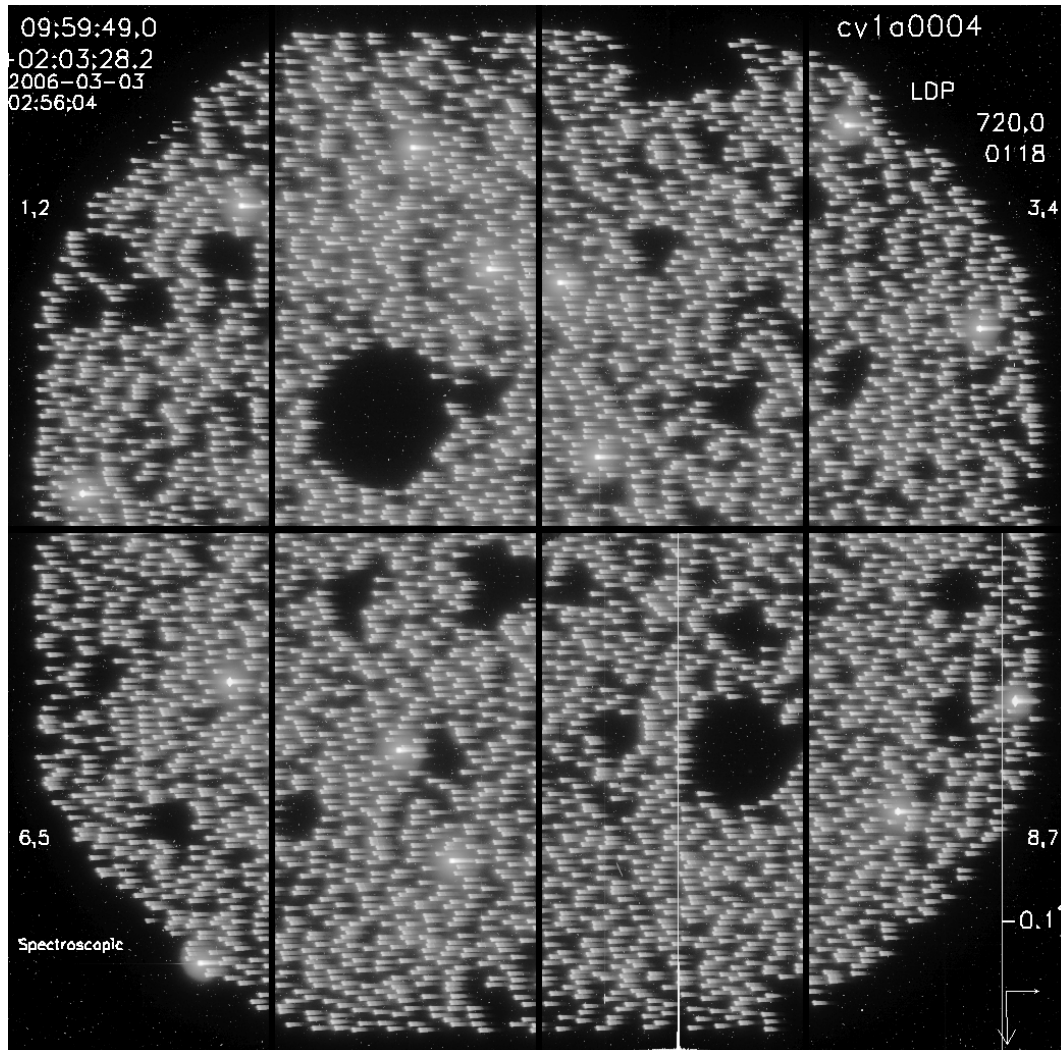


Pan-STARRS
PS1 Science Consortium

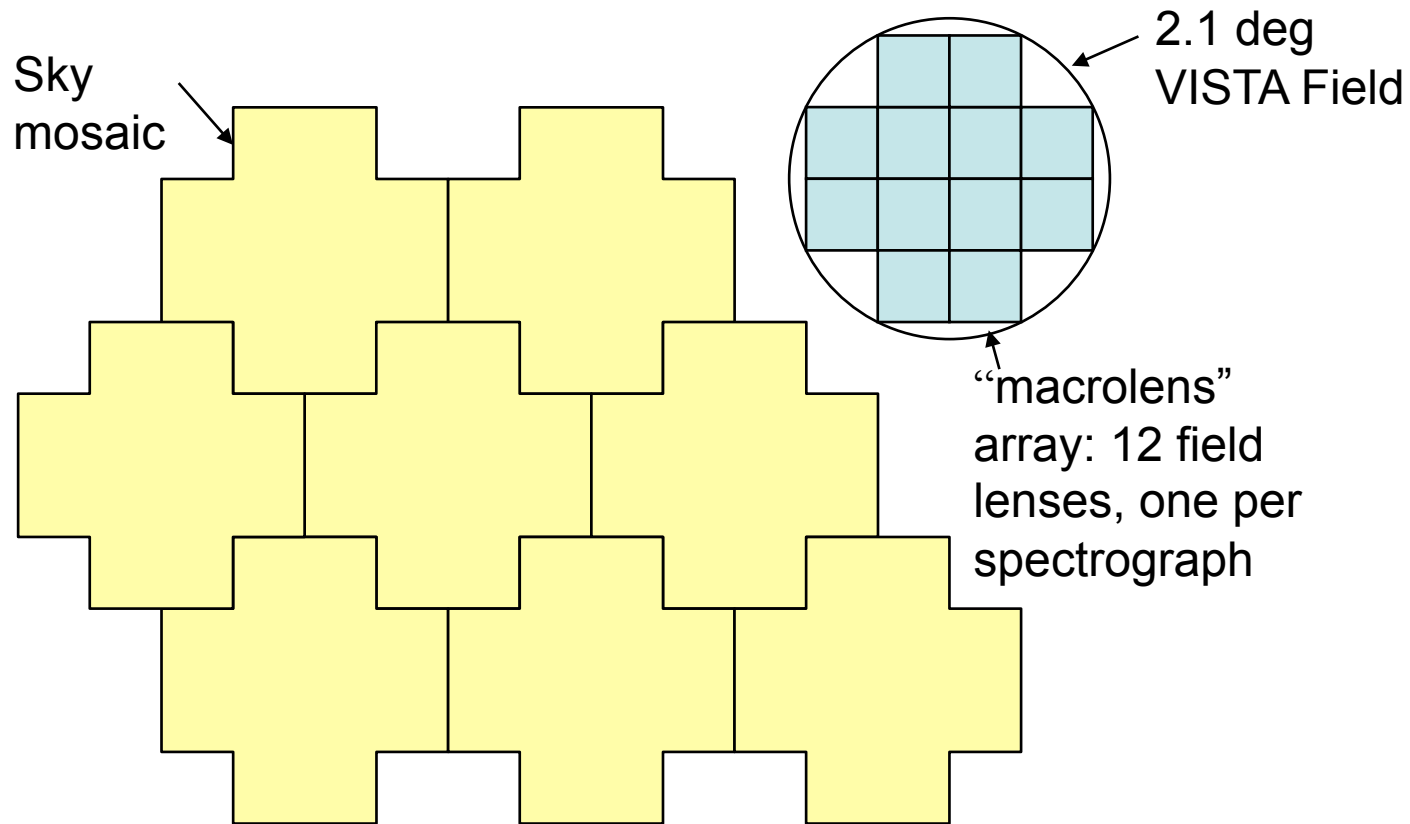


Magellan PRIMUS

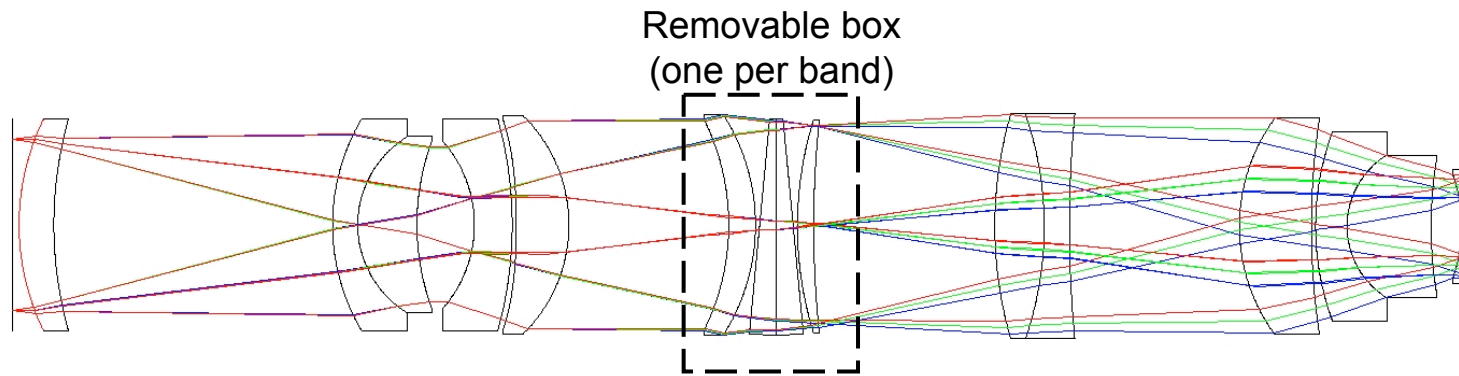
25' fov, ~5000 slits at R~40



VXMS Survey Tiling



Layout of one spectrograph



y
z

3D LAYOUT

MON OCT 29 2007
SCALE: 0.3333

60.00 MILLIMETERS

NG2DF UNIT H10B0.ZMX
CONFIGURATION 1 OF 2

VXMS Science:

- BAO $z \sim 0.7$ LRGs+ELGs+Luminosity Class
 - Post WiggleZ Search for BAO systematics
- Z-space distortion ($z \sim 0.7$)
 - Growth of Structure
 - Alcock-Paczynski Test
 - Group M/L vs L (GAMA)
- Z-distortion/BAO from $z \sim 3$ LBGs
- Dynamics as function of environment, morphology, redshift
- Photo-z calibration for VST+VISTA, DES, EUCLID...
- Legacy Spectroscopic Archive of Southern Sky

250 night survey concept

- ~12000 galaxy redshifts per hour
- Include ~9000 $z \sim 0.7$, $21 < i < 22$ OII emission galaxies
- Include ~3000 $z \sim 0.5$, $i < 21$ absn+em galaxies
- 200 nights \rightarrow ~12 million $z \sim 0.7$ galaxies and ~3 million $z \sim 0.5$ galaxies
- \rightarrow Total of ~15 million $z < 1$ galaxies over 5000 deg²
- In best seeing ($\sim 1''$) observe $z \sim 3$ $r < 25$ LBGs taking 4x3hrs to get ~12000 redshifts
- In 50 nights also get 300,000 $z \sim 3$ LBGs in 75deg²

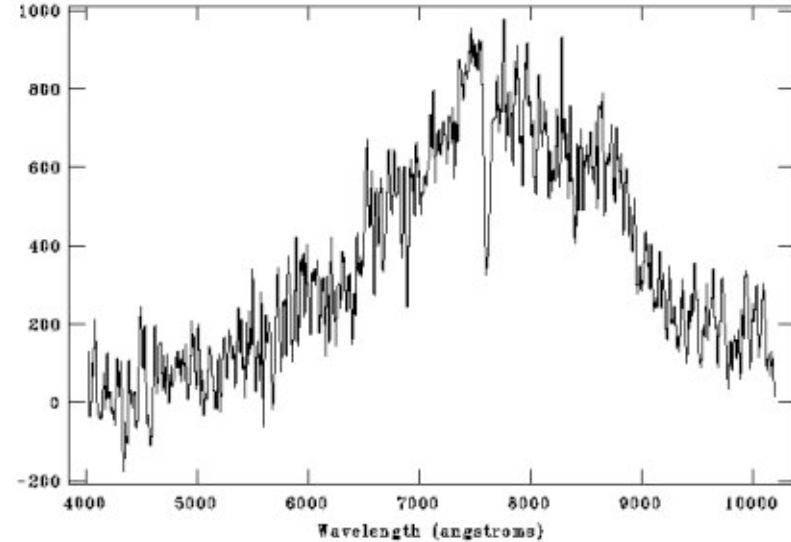
Conclusions

- **Today:** VLT VIMOS Survey of 100000 $z \sim 3$ LBGs
- \rightarrow unique $z \sim 3$ measurements of BAO and gravitational growth rate – probes DE and gravity
- \rightarrow measure feedback at $z=3$ via LBGs \otimes QSO Ly α
- **Tomorrow:** VXMS offers **10x** improvement in MOS multiplex over previous spectrographs (**1000 \rightarrow 12000**)
- New generation spectroscopic follow-up to match new generation imaging surveys from VST+VISTA
- **VXMS offers MOS world-leadership via $\sim 50x$ bigger field of 4-m VISTA telescope**

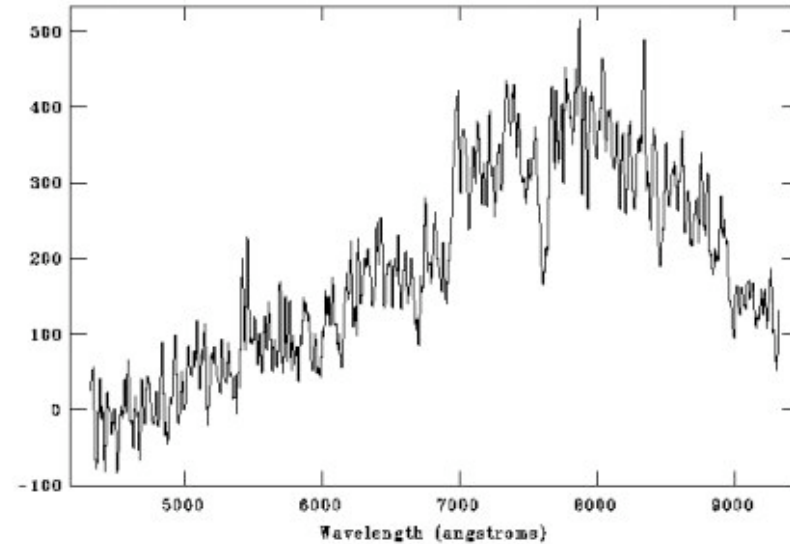


Calar Alto MOSCA spectra

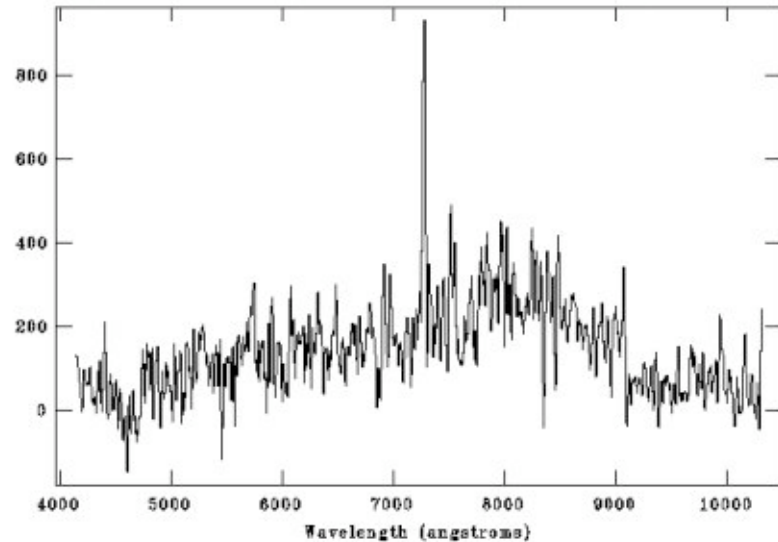
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