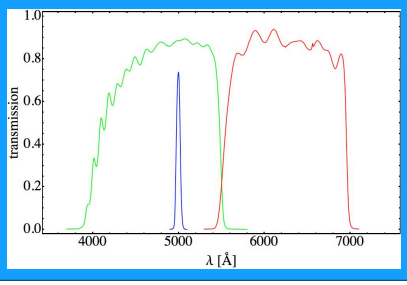
LAE clustering in LBG fields

L. Infante[1], J. González[1], H. Francke[1], T. Shanks[2], N. Crighton[2], R. Bielby[2], M. Hill[2], F. Menanteau[3]
[1] Pontificia Universidad Católica de Chile, [2] Durham University, [3] Rutgers University

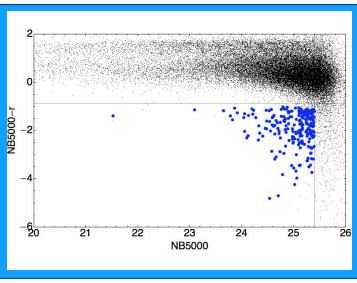
Abstract

We present preliminary results from our survey of Lyman Alpha Emitter (LAE) galaxies found in Lyman Break Galaxy (LBG) fields. Our survey aims to measure the two-point cross-correlation function between LAEs and LBGs, testing how these two galaxy populations trace the same volume in space. Taking advantage of the extensive spectroscopic database in our fields, we will be able to directly target LBGs in the narrow redshift range of LAE selection, reducing the projection effects in our cross-correlation calculation. Here we show the clustering results for the LAE sample in our successful pilot observation in the HE0940-1050 field.

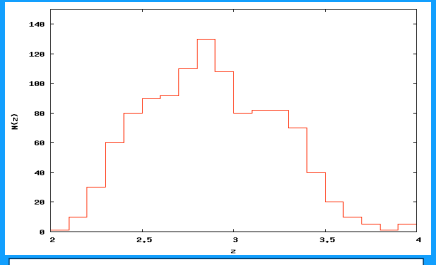
Dataset



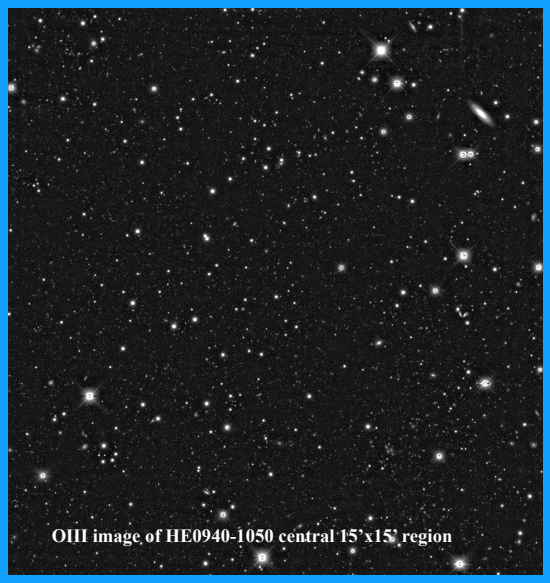
Transmission curve of sloan broadband filters g and r, and the narrow-band filter OIII at CTIO+MosaicII; used for the LAE selection in the HE0940-1050 field.



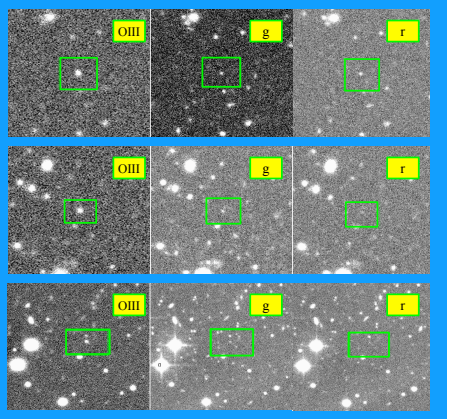
OIII - g color-magnitude diagram used for our LAE selection. The color selection -0.87 < OIII - g < -3.4 corresponds to a threshold in observed Lyman-α equivalent width (EW) of 80 Å. At this redshift, this EW cut has been shown to yield fairly clean LAE samples, with contamination rates from low redshift interlopers of <10% [1,2].



Redshift histogram of spectroscopically confirmed z~3 LBGs.in all fields. Spectroscopy was obtained using VIMOS +VLT.



Some LAE candidates found in HE0940-1050

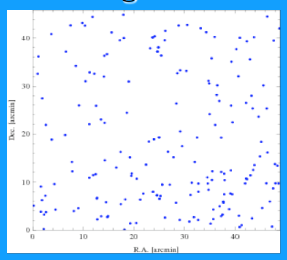


References:
[1] Gawiser, E.; Francke, H. et al. 2007, ApJ 671, 278
[2] Gronwall, C. et al. 2007, ApJ, 667, 79
[3] Cual?

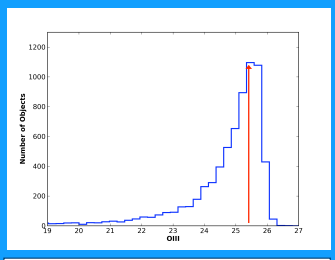
Science Goals

- **Measure the cross-correlation function between LAEs and LBGs:** When completed, our survey will allow us to probe the same volume in space both with LAEs and LBGs.
- **Constrain the properties of the dark matter halo hosting LAEs at z < 3:** We will be able to improve on existing results for LAE clustering at this redshift, and also at 2<z<3, when our future observations are completed. This will give additional constraints to the interesting result that z~3 LAEs could be the progenitors of spiral galaxies like our Milky Way[1].
- **Search for counterparts of QSO and LBG absorption systems among LAEs:** The overlap of LAE samples and QSO and LBG spectra in the same fields will give us a unique database to attempt this search.

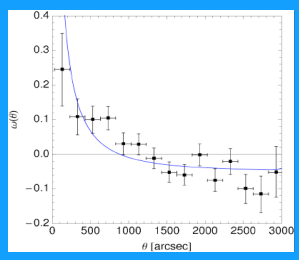
Clustering Results



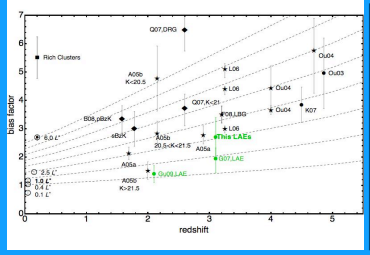
R.A. and Dec. position of LAEs, LBGs and QSO in the HE0940-1050 field.



Histogram of OIII magnitudes of the entire narrow-band selected catalog. Red arrow shows the magnitud cut OIII<25.4 required in the LAE selection.



Angular two-point auto-correlation function of the LAEs in HE0940-1050. Deprojection implies a spatial correlation length $\mathbf{r_0}$**=5.3+/-1.4 Mpc** (comoving).



Bias factor versus redshift for our result and several literature results for a variety of galaxy populations. This LAEs show stronger clustering than the LAE samples from MUSYC results: Gawiser et al. 2007 (G07) and Guaita et al. 2009 (Gu09, priv. comm.); but less clustering than LBGs at z~3 (Francke et al. 2008, F08). They also show less clustering than higher redshift LAE samples. The **bias factor for our LAEs is 2.7+/-0.7**, implying dark matter halo masses of **log(M/M$_0$) = 11.6+/-0.6**.

Labels: In the plot filled circles correspond to LAEs, stars to optically broadband selected galaxies, diamonds to NIR broadband selected galaxies and open circles to low-redshift samples. Adelberger et al. 2005a,b,c (A05a,b,c); Lee et al. 2006 (L06); Ouchi 2003,2004 (Ou03, Ou04); Kovac et al. 2007 (K07); Coil 2007,2008 (C07, C08). Low redshift galaxies, labeled by their optical luminosity, come from Zehavi et al. 2005 and rich galaxy clusters from Bahcall et al. 2003. Results for NIR selected samples: Quadri et al. 2007 (DRGs and K<21 selected galaxies) and Blanc et al. 2008 (B08, passive and star-forming BzK galaxies). Dashed lines are the expected bias evolution tracks for dark matter halos in a ΛCDM cosmology (Sheth & Tormen 2002).