Properties of Lyman alpha emitters at z = 4.86 and z=5.70 in the COSMOS 2 square degree field

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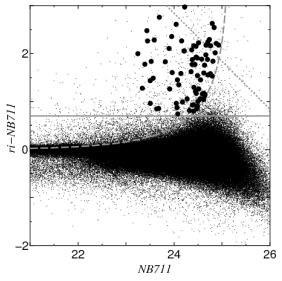
ABSTRACT

We present results of surveys for Ly alpha emitters (LAEs) at z =4.86 and z=5.70 based on optical narrowband (NB711 and NB816) and broadband (B, V, r', i', and z') observations of the Cosmic Evolution Survey (COSMOS) field using Suprime-Cam on the Subaru Telescope. We find 79 LAE candidates at z=4.86 and 119 LAE candidates at z=5.70 over a contiguous survey area of about 2 deg^2. We obtain the Ly alpha luminosity function with a best-fit Schechter parameters of log L^* = $42.9^{+0.5}_{-0.3}$ ergs s^{-1} and Φ^* = $1.2^{+8.0}_{-1.1}$ x 10^{-4} Mpc^{-3} for alpha=-1.5 (fixed) and the two-point correlation function of $\xi(r) = (r/4.4^{+5.7}_{-2.9}$ Mpc$)^{-1.90\pm0.22}$ for LAEs at z=4.86.
In order to investigate the field-to-field variations of the properties of LAEs at z=4.86, we divide the survey area into nine tiles of 0.5 deg x 0.5 deg each. We find that the number density varies with a factor of ~2 from field to field with high statistical significance. However, we find no significant field-to-field variance when we divide the field into four tiles with 0.7 deg x 0.7 deg each. We conclude that at least 0.5 deg^2 survey area is required to derive averaged properties of LAEs at z~5, and our survey field is wide enough.

Sample

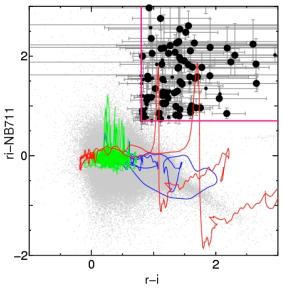
LAEs@z=4.86

1.Selection of Emission line objects



$ri - NB711 \geq \max[0.7, 3\sigma_{ri-NB711}]$

2.Selection of Lyman alpha emitters

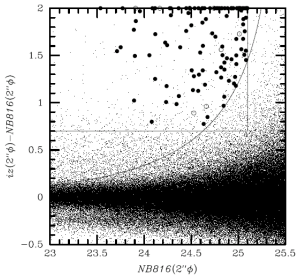


$r'-i' > 0.8$,
$B(0.5"\phi) > 30.1$

➔79 LAEs

Blue lines: Coleman, Wu, Weedman(1980),
Green lines: Kinney et al. (1996)'s starburst,
Red line: Bruzual & Charlot (2003)'s synthesized SED with emission lines.

LAEs@z=5.70



$NB816(2"\phi) < 25.1$,
$B(0.5"\phi) > 29.6$,
$g'(0.5"\phi) > 29.2$,
$V(0.5"\phi) > 29.1$,
$r'(0.5"\phi) > 29.1$

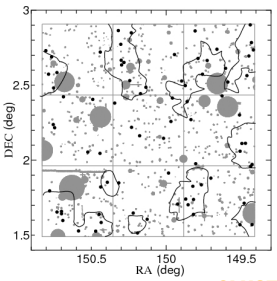
➔119LAEs

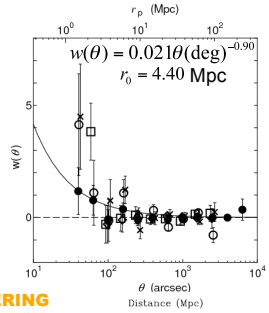
$iz - NB816 \geq \max[0.7, 3\sigma_{ri-NB711}]$

Results

Spatial distribution and correlation function

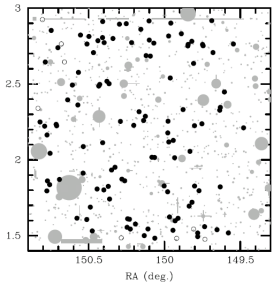
LAEs@z=4.86

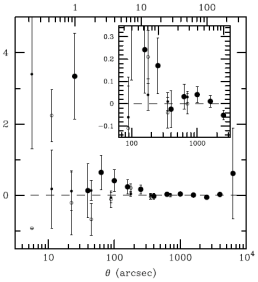




CLUSTERING

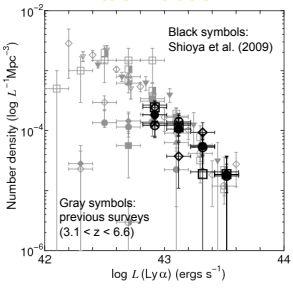
LAEs@z=5.70

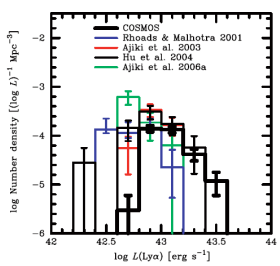




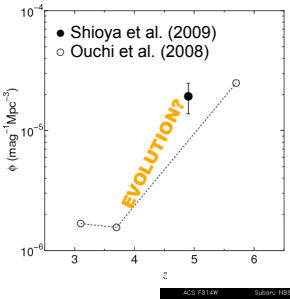
Lyman α luminosity function

Little Evolution

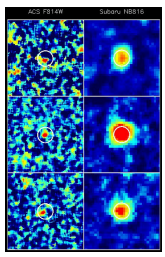




Number density at M_{UV}=-21.5



ACS images vs. NB816 images



(Shioya et al. 2009, ApJ, 696, 546; Murayama et al. 2007, ApJS, 172, 523)