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Search for Galaxies at the Cosmic Frontier

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Abstract. We introduce our on-going search for Ly α emitters and z -dropouts at $z = 7 - 9$ in the GOODS-N field with Subaru/MOIRCS. In the course of MOIRCS Deep Survey started in 2006, we perform deep imaging with a set of broad- and narrow-band filters for $z = 8.8$ LAEs and z -dropouts. We plan to complete our observations by early 2009.

1. Introduction

The cosmic reionization is one of the most important issues in astrophysics. Ly α emission from high- z galaxies is good probes of neutral fraction of inter-galactic medium. The wide field Ly α emitter (LAE) surveys at $z \sim 7$ suggest that the neutral fraction of the Universe at $z = 6.6 - 7.0$ is as small as $\lesssim 40\%$ from evolution of LAE luminosity function (LF; Kashikawa et al. 2006; Iye et al. 2006). On the other hand, WMAP5 results show that the Universe is reionized at $z \sim 11$, if instantaneous reionization took place (Komatsu et al. 2008). It is essential to fill the observational gap between the largely ionized ($z \sim 7$) and the fairly neutral epochs ($z \sim 11$), and to understand the history of reionization.

2. Search for $z > 7$ Galaxies with Subaru Telescope

We have started an ambitious search for LAEs and dropout galaxies at $z \simeq 7 - 9$ to study cosmic reionization as well as galaxy formation since 2006, exploiting the wide-field imaging capability of Subaru/MOIRCS whose FoV is 28 arcmin². We take deep images of J , K_s , and a narrow band, $NB119$ ($\lambda_c=1.19\mu m$, $FWHM = 141\text{\AA}$; Figure 1 *left*), with MOIRCS, in the course of

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MOIRCS Deep Survey (MODS; Ichikawa et al. 2007) started in 2006. This survey is being conducted in a 100 arcmin^2 area of the GOODS-N field which is covered by four pointings of MOIRCS. One of the four pointing positions is chosen for ultra-deep imaging. The ultra-deep images currently reach $J(AB) \sim 26.7$, $K_s(AB) \sim 26.3$, and $NB119(AB) \sim 25.0$ at the 5σ level, while the other deep images are shallower by $\simeq 0.5 - 1$ mag than the ultra-deep images. Figure 1 *right* presents the goals of depths and volumes of our LAE search with the deep and ultra-deep data. We plan to complete our observations by early 2009.

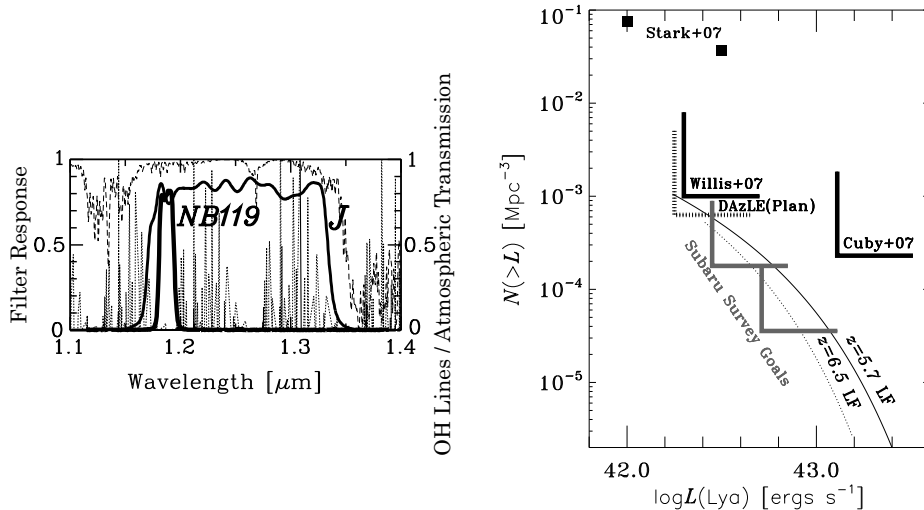


Figure 1. *Left*: The response curve of our narrow-band filter, *NB119* (solid line), sky spectra (dotted line), and atmospheric transmission curves (dashed line). *Right*: The depths and volumes of our search for LAEs at $z = 8.8$ (gray lines), together with the luminosity function of $z = 5.7$ and 6.5 LAEs (solid and dotted lines; Ouchi et al. 2008; Kashikawa et al. 2006). The squares represent number densities of faint LAE candidates obtained by Stark et al. (2007). The survey limits of other previous studies are presented with black lines (Willis et al. 2008; Horton et al. 2004; Cuby et al. 2007).

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