Spectroscopic confirmation of z~7 LBGs: probing the earliest galaxies and the epoch of reionization

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(Submitted on 7 Jul 2011)

We present the final results from our ultra-deep spectroscopic campaign with FORS2 at the ESO/VLT for the confirmation of z~7 "z--band dropout" candidates selected from our VLT/Hawk-I imaging survey over three independent fields. In particular we report on two newly discovered galaxies at redshift ~6.7 in the NTT deep field: both galaxies show a Ly-alpha emission line with rest-frame EWs of the order 15-20 A and luminosities of 2-4 X 10^{42} erg/s. We also present the results of ultra-deep observations of a sample of i-dropout galaxies, from which we set a solid upper limit on the fraction of interlopers. Out of the 20 z-dropouts observed we confirm 5 galaxies at 6.7 < z < 7.1. This is systematically below the expectations drawn on the basis of lower redshift observations: in particular there is a significant lack of objects with intermediate Ly-alpha EWs (between 20 and 55 A). We conclude that the trend for the fraction of Ly-alpha emission in LBGs that is constantly increasing from z~3 to z~6 is most probably reversed from z~6 to z~7. Explaining the observed rapid change in the LAE fraction among the drop-out population with reionization requires a fast evolution of the neutral fraction of hydrogen in the Universe. Assuming that the Universe is completely ionized at z=6 and adopting the semi-analytical models of Dijkstra et al. (2011), we find that our data require a change of the neutral hydrogen fraction of the order Delta chi_{HI} ~ 0.6 in a time Delta z ~ 1, provided that the escape fraction does not increase dramatically over the same redshift interval.

Comments: Submitted to ApJ
Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as: **arXiv:1107.1376 [astro-ph.CO]**
(or **arXiv:1107.1376v1 [astro-ph.CO]** for this version)

Submission history

From: Laura Pentericci [view email]
[v1] Thu, 7 Jul 2011 13:22:59 GMT (1529kb)

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