

Spectroscopy of the near-infrared afterglow of GRB 050904 at $z = 6.3$

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Abstract. We present the optical/NIR spectrum of the afterglow of GRB 050904 obtained with the Faint Object Camera And Spectrograph on the Subaru 8.2 m telescope taken 3.4 days after the burst. It is, as of June 2006, the only GRB with a known redshift larger than 6. The spectrum shows a clear continuum at the long wavelength end of the spectrum with a sharp cutoff at around 900 nm due to Ly α absorption at a redshift of 6.3 with a damping wing. Little flux is present in the waveband shortward of the Ly α break. A system of absorption lines of heavy elements at redshift $z = 6.295 \pm 0.002$ were also detected, yielding a precise measurement of the largest known redshift of a GRB. Analysis of the silicon and sulphur absorption lines suggests a dense environment around the GRB with the metallicity larger than 0.1 solar, providing unique information on the galaxy and star forming region at $z > 6$. This observation has shown that GRB is a powerful probe of the early universe.

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