IRTF Observations of the 8 O'clock Arc and 8 O'clock Clone

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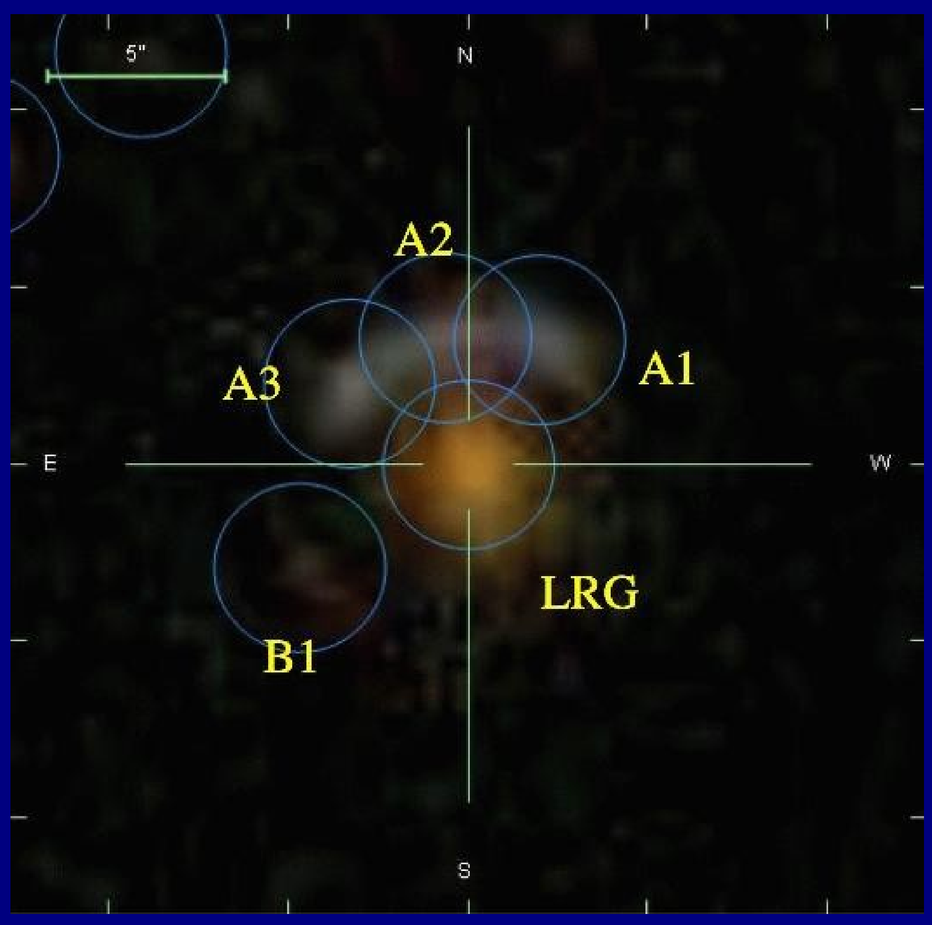
Abstract

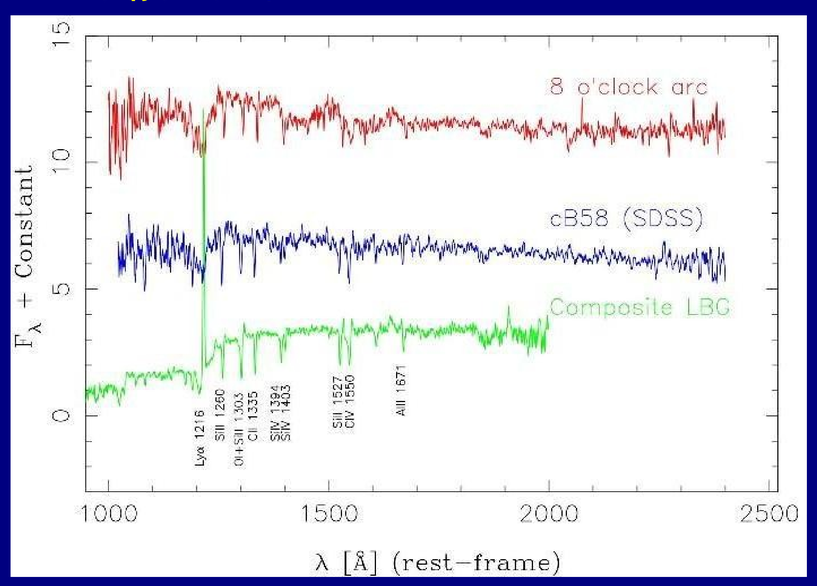
We discuss current and planned observations of the newly discovered brightest lensed Lyman Break Galaxy (LBG) currently known (the 8 O'clock Arc; Allam et al 2007), and a similar lensed LBG ("the Clone") using the NASA Infrared Telescope Facility (IRTF).

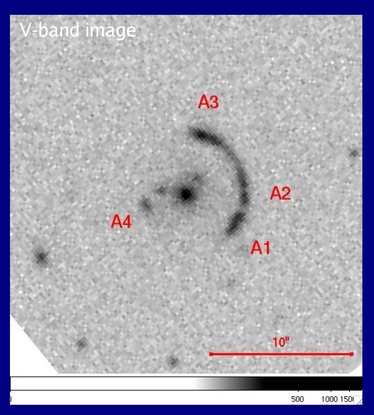
The 8 O'clock Arc.



The 8 o'clock arc is the brightest Lyman Break Galaxy (LBG) currently known. This LBG, at a redshift of z=2.73, is strongly lensed by a z=0.38 Luminous Red Galaxy (LRG). Initially discovered in the SDSS DR4 merging pair sample (Allam et al. 2007 in prep.), follow-up observations on the ARC 3.5m telescope at Apache Point Observatory confirmed the lensing nature of this system and led to the identification of the arc's spectrum as that of an LBG.

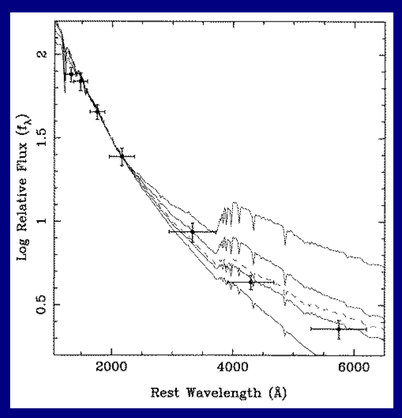
The arc spectrum (shown below) and a redshift remarkably similar to those of the previous record-holder for brightest LBG, cB58 (Steidel et al. 1998, ApJ, 492, 428, Pettini et al. 2002, ApJ, 569, 742, Shapley et al. 2001, ApJ, 562, 95), but is 3 times brighter. Although magnified by strong lensing by a factor of 12, the LBG is itself instrinsically quite luminous (~6L*) and shows indications of massive recent star formation. The discovery paper has been published in ApJL (Allam et al. 2007, ApJL, 662, L51).





The 8 O'clock Clone.

The 8 O'Clock Clone was discovered by Huan Lin in the SDSS imaging data in January 2007 during a systematic search for bright, bluish arcs lensed by SDSS Luminous Red Galaxies, or LRGs (see talk by Huan Lin). The LRG of this lens system was found to be at z=0.422, based upon SDSS spectroscopy. Follow-up imaging and spectroscopy using the Suburu telescope confirmed the arc to be a z=2.00 galaxy, with instrinisc rest-frame UV colors similar to those of LBGs at z=3. A V-band Subaru image is shown at left. A preliminary SIE lensing model indicates an Einstein radius of 3.7 arcsec, a total lensing mass within the Einstein radius of 2x10^12/h Msun, and a magnification factor for the LBG of ~ 30x; the LBG itself appears to have an intrinsic luminosity of 2L* (see poster by Liz Buckley-Geer).



Why Infrared?

The IR observations are critical to constraining the star formation history of these galaxies by constraining the model fits of the SEDs in the restframe. An example is shown from Ellingson et al. (1996) where the inclusion of the JHK' data (redshifted) allows determination of an age for a star burst and extinction to the galaxy for the lensed LBG cB58 (Shown at left). Without the IR data, the models are unconstrained.

We obtained initial JHK' images of our two targets as piggyback objects during other scheduled IRTF programs. These initial efforts were used primarily to obtain images to test exposure times and were obtained under conditions of variable seeing and photometricity. They will form the groundwork for a proposed follow-on program.

A first attempt at JHK reductions from the IRTF. By no means the prettiest image but it does show what the telescope is capable of doing under 0.5-arcsec seeing conditions. The installation of the upgraded secondary will significantly improve the image quality. These data were obtained using SpeX which was in place for the primary programs.