Near-Infrared Observations of BL Lacertae Host Galaxies

C. C. Cheung1,4, C. Megan Urry2,4, Riccardo Scarpa3,4 & Mauro Giavalisco4

1Department of Physics, MS 057, Brandeis University, Waltham, MA 02454; ccheung@brandeis.edu

2Yale Center for Astrophysics

abstract

Multi-band near-infrared images of twelve BL Lacertae objects were obtained with the 2.5m telescope at the Las Campanas Observatory in order to determine the properties of their underlying host galaxies. Resolved emission was clearly detected in eight of the lowest redshift targets (up to \( z \sim 0.3 \)), and was modeled with a de Vaucouleurs \( r^{1/4} \) surface brightness law. We find that the morphologies match the elliptical galaxy profiles well, and that the BL Lac objects reside in large and luminous, but otherwise normal hosts—consistent with previous studies done predominantly at optical wavelengths. The median absolute K-band magnitude of the galaxies in this study is \(-26.2\), the average half-light radius is \( 4.2 \pm 2.3 \) kpc, and their average integrated \( R - K \) color is \( 2.7 \pm 0.3 \) mag. These are well within the range of values measured previously in the H-band by Kotilainen et al. and Scarpa et al. in a comparable number of targets. Taking their data together with our results, we find a best-fit K-band Kormendy relation of \( \mu_e = 4.3 \log_{10} (r_e/\text{kpc}) +14.2 \) mag arcsec\(^{-2} \), virtually identical to that obtained for normal ellipticals. Finally, the near-infrared colors determined for five galaxies (average \( J - K = 0.8 \pm 0.3 \) mag) are the first such measurements for BL Lac hosts, and match those expected from old stellar populations at the BL Lac redshifts.