A Spectroscopic Redshift for the Cl0024+16 Multiple Arc System: Implications for the Central Mass Distribution

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abstract

We present a spectroscopic redshift of $z = 1.675$ for the well-known multiply lensed system of arcs seen in the $z = 0.39$ cluster Cl0024+16. In contrast to earlier work, we find that the lensed images are accurately reproduced by a projected mass distribution which traces the locations of the brightest cluster ellipticals, suggesting that the most significant minima of the cluster potential are not fully erased. The averaged mass profile is shallow and consistent with predictions of recent numerical simulations. The source redshift enables us to determine an enclosed cluster mass of $M(<100\text{kpc}/h)=1.11 \pm 0.03 \times 10^{14}h^{-1}\text{M}_\odot$ and a mass-to-light ratio of $M/L_B(<100\text{kpc}/h)=320h(M/L_B)_\odot$, after correction for passive stellar evolution. The arc spectrum contains many ionized absorption lines and closely resembles that of the local Wolf-Rayet galaxy NGC4217. Our lens model predicts a high magnification ($\simeq 20$) for each image and identifies a new pair of multiple images at a predicted redshift of $z=1.3$. 