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An Hα Dynamical Mass for HE 0047−1756

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Abstract. We derive $M_{\rm bulge}$ for HE 0047−1756 via Hα gas dynamics. The resulting large value of $M_{\rm BH}/M_{\rm bulge}$ may imply evolution in the correlation at high redshifts.

Keywords. galaxies: active, galaxies: evolution, quasars: individual (HE 0047−1756)

We have obtained AO-IFU spectroscopy of the gravitationally lensed $z = 1.66$ QSO HE 0047−1756 (Figure 1a) using SINFONI (Eisenhauer *et al.* 2003, Bonnet *et al.* 2004). After successful removal of the strong QSO emission, we locate and model the host galaxy's narrow Hα emission. The resulting velocity field (Figure 1b) is consistent with ordered rotation; applying the lensing model for this source (Peng *et al.* 2006) implies a dynamical mass of $M_{\rm bulge} \sim 6.5 \times 10^{10}\ M_\odot$. Together with a measured value of $M_{\rm BH} = 1.48 \times 10^9\ M_\odot$ (Peng *et al.* 2006), we include HE 0047−1756 on the nearby galaxy $M_{\rm BH}$ vs. $M_{\rm bulge}$ relation of Häring & Rix (2004) (Figure 1c). Our derived mass, although somewhat small, is comparable to some other high-z CO-based measurements (e.g., Riechers *et al.* 2008). Overall, these results favor evolution in the ratio $M_{\rm BH}/M_{\rm bulge}$, with massive black holes existing in relatively less massive host galaxies at earlier cosmic epochs.

References

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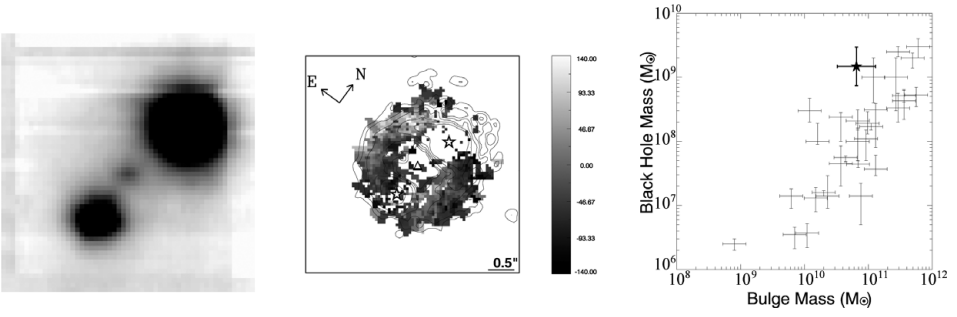

Figure 1. *Left:* Median data cube image. *Center:* Hα velocity field (velocities in km s^{-1}). *Right:* $M_{\rm BH}$ vs. $M_{\rm bulge}$ relation (Häring & Rix 2004) including HE 0047−1756 (large star).