

B16a ALMA serendipitous detection of a distant CO emitting galaxy with a buried active galactic nucleus beyond nearby merging galaxies VV114

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We report a detection of a distant star-forming galaxy, ALMA J010748.3–173028, which is identified by a $13\text{-}\sigma$ emission line at 99.75 GHz ($S\Delta v = 3.1 \text{ Jy km s}^{-1}$) behind nearby merging galaxies VV114, using the Atacama Large Millimeter/submillimeter Array (ALMA) Band 3. We also find an 880- μm counterpart with ALMA Band 7 ($S_{880\mu\text{m}} = 11.2 \text{ mJy}$). A careful comparison of intensities between the line and the continuum suggests that the line is a redshifted ^{12}CO transition. The photometric redshift analysis using the infrared-to-radio data favors the CO redshift of $z = 2.467$, while $z = 3.622$ is still acceptable. We also find a hard X-ray counterpart, suggesting presence of a luminous ($L_X \sim 10^{44} \text{ erg s}^{-1}$) active galactic nucleus obscured by a large hydrogen column ($N_H \sim 2 \times 10^{23} \text{ cm}^{-2}$ if $z = 2.47$). A cosmological simulation shows that a chance detection rate of a CO emitting galaxy at $z > 1$ with $\geq 1 \text{ Jy km s}^{-1}$ is $\sim 10^{-3}$ per single ALMA field of view and 7.5-GHz bandwidth at 99.75 GHz. This demonstrates that ALMA has sufficient sensitivity to find an emission-line galaxy like ALMA J010748.3–173028 even by chance, while the likelihood of stumbling across such a source is still not high.