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Detecting Low-Order CO Emission from $z \gtrsim 4$ Quasar Host Galaxies

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Abstract. Molecular gas has now been detected in 15 $z > 2$ QSOs. These detections are commonly obtained by observing high–J CO transitions due to their relatively high peak fluxes and observing frequencies in the millimeter atmospheric windows. However, only observations of the CO ground-state transition, CO(1–0), have the potential to trace the molecular gas at lower excitations, which may give a better estimate of the total molecular gas mass of high–z QSOs. Here we present first $z > 4$ CO(1–0) observations obtained with the NRAO Green Bank Telescope and the MPIfR Effelsberg telescope (Riechers *et al.* 2006). With these two 100m telescopes, we detect the CO(1–0) transition in the high–redshift QSOs BR 1202-0725 ($z = 4.7$), PSS J2322+1944 ($z = 4.1$), and APM 08279+5255 ($z = 3.9$). We find that the CO/FIR luminosity ratios of these high-z sources follow the same trend as seen for low-z galaxies. Utilizing large velocity gradient (LVG) models based on previous results for higher–J CO transitions, we derive that all CO emission can be described by a single gas component and that all molecular gas appears to be concentrated in a compact nuclear region. We thus find no evidence for luminous, extended CO(1–0) components in the molecular gas reservoirs around our target quasars.

Keywords. cosmology: observations, galaxies: ISM, galaxies: high-redshift, galaxies: formation, galaxies: starburst, galaxies: active

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Reference

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