

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

Acknowledgements

D. R. acknowledges support from the Deutsche Forschungsgemeinschaft (DFG) Priority Programme 1177. C. C. acknowledges support from the Max-Planck-Gesellschaft and the Alexander von Humboldt-Stiftung through the Max-Planck-Forschungspreis.

References

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