

CAVITY RING-DOWN SPECTROSCOPY OF CO₂ NEAR $\lambda = 2.06 \mu\text{m}$

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The 20013 \leftarrow 00001 rotation-vibration band of $^{12}\text{C}^{16}\text{O}_2$ near $2.06 \mu\text{m}$ is widely used for remote sensing of carbon dioxide concentration in the terrestrial atmosphere. The high accuracy target of such applications (0.3 % for the OCO-2 satellite mission) motivates reducing the uncertainties of relevant line intensities in currently available line lists. To this end, we present transition intensities measured by frequency-stabilized cavity ring-down spectroscopy for 39 transitions of the $2.06 \mu\text{m}$ CO₂ band. The relative combined standard uncertainty of the line intensities is estimated to be $u_r = 0.09 \%$.

To determine the integrated band intensity from these measurements, two approaches were used to model the J -dependence of the intensities. The first approach is based on a one-dimensional quantum mechanical model with Herman-Wallis rotation-vibration corrections, whereas in the second approach, we fit a single factor to rescale the intensities derived from the ab initio dipole moment surface (DMS) of Zak et al. [JQSRT 177, 31-42 (2016)]. Although the two approaches yield equally adequate representations of the observed J -dependence, we consider the rescaled ab initio DMS intensities to be the more physically general representation of our data. The results will be compared to existing databases and other experiments.