

LINE POSITIONS OF CENTRIFUGAL DISTORSION INDUCED ROTATIONAL TRANSITIONS OF METHANE MEASURED UP TO 2.6 THZ AT SUB-MHZ ACCURACY WITH A CW-THZ PHOTOMIXING SPECTROMETER

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Several Doppler limited rotational transitions of methane induced by centrifugal distortion have been measured with an unprecedented frequency accuracy using the THz photomixing synthesizer based on a frequency comb. Compared to previous synchrotron based FT-Far-IR measurements of Boudon *et al.*^a, the accuracy of the line frequency measurements is improved by one order of magnitude, this yields a corresponding increase of two orders of magnitude to the weighting of these transitions in the global fit. The rotational transitions in the $\nu_4 \leftarrow \nu_4$ hot band are measured for the first time by the broad spectral coverage of the photomixing CW-THz spectrometer providing access up to $R(5)$ transitions at 2.6 THz. The new global fit including the present lines has been used to update the methane line list of the HITRAN database. Some small, but significant variations of the parameter values are observed and are accompanied by a reduction of the $1\text{-}\sigma$ uncertainties on the rotational (B_0) and centrifugal distortion (D_0) constants.

^aV. Boudon, O. Pirali, P. Roy, J.-B. Brubach, L. Manceron, J. Vander Auwera, J. Quant. Spectrosc. Radiat. Transfer, **111**, 1117–1129 (2010).