# THE ROTATION-TUNNELING SPECTRUM OF DIMETHYLAMINE, $(CH_3)_2NH$

HOLGER S. P. MÜLLER, FRANK LEWEN, STEPHAN SCHLEMMER, *I. Physikalisches Institut, Universität zu Köln, Köln, Germany*.

Methylamine ($CH_3NH_2$) was among the molecules detected early by means of radio astronomy. Detected initially only toward the giant star-forming region Sagittarius B2 close to the Galactic center. Recently, vinylamine ($C_2H_3NH_2$) and ethylamine ($C_2H_5NH_2$) were detected securely and tentative, respectively, toward the cold Galactic center source G+0.693−0.03,[a] making $(CH_3)_2NH$ a prime target for searches in space.

The microwave spectrum of dimethylamine was studied more than 50 years ago up to 45 GHz and $J = 8$.[b] The spectrum displays an inversion splitting of the amino H atom of 2646 MHz, and the $^{14}N$ hyperfine splitting was well resolved for transitions with $J \leq 1$. The internal rotation splitting of the two equivalent methyl rotors was not resolved. Very recently, a Fourier transform microwave spectroscopic (FTMW) study ($2 - 40$ GHz) of secondary amines[c] revealed a small internal rotation splitting of order of ∼200 kHz in dimethylamine.

We have studied the rotation-inversion spectrum of dimethylamine between 76 and 1091 GHz covering quantum numbers up to $J = 60$ and $K_a = 21$. Hyperfine splitting was resolved at least partly for many transitions and was treated in the analysis. The small internal rotation splitting was resolved in particular for transitions at lower frequencies or with lower quantum numbers, but was not considered thus far. The analysis was carried out with Pickett's spfit program. As the program is capable of treating internal rotation, we want to combine our data with the FTMW data.

[a] S. Zeng et al., *Astrophys. J. Lett.* **920** (2021) L27.

[b] J. E. Wollrab and V. W. Laurie, *J. Chem. Phys.* **48** (1968) 5058.

[c] K. J. Koziol, W. Stahl, H. V. L. Nguyen, Contribution WH19, 74th ISMS, June 21−25, 2021, Urbana-Champaign, IL, USA