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KOSMA room | 9:15 pm | supplementary colloquium

Physikalische Institute Köln
Zülpicher Straße 77 | 50937 Köln

Kaori Kobayashi

Department of Physics, University of Toyama, Japan

Microwave Spectroscopy of Small Organic Molecules of Astronomical Interest

This talk will focus on methyl formate and t-ethyl methyl ether. The microwave spectra of both of these molecules are complicated by methyl-top internal-rotation splitting in the spectra, and both have astrophysical importance. Methyl formate in its ground vibrational state is a very well-known interstellar molecule and very abundant in warm parts of star forming regions. We have extended the spectroscopic assignments in its second torsional state and revised the spectroscopic parameters [1]. We identified a number of unidentified lines in Orion KL as belonging to methyl formate in its first and second torsional states [2, 3]. We hope that the ALMA science verification data provides us with further information.

Thus far, only a tentative detection of the t-ethyl methyl ether in W51 e2 was reported [4]. The interesting spectroscopic feature of this molecule is that two inequivalent internal rotors exist. The rotational spectral patterns in the torsionally excited states often differ from those expected from the one-top case or those of the two symmetric tops. In the case of t-ethyl methyl ether, not only the interaction between the two methyl torsions, but also an interaction with the lowest vibrational mode (skeletal torsion) must be considered as well. More than 4000 lines were least-square analyzed nearly within the experimental uncertainties.

[1] K. Kobayashi, K. Takamura, Y. Sakai, S. Tsunekawa, H. Odashima, and N. Ohashi, *Astrophysical Journal*, Supplement Series, 205, 9 (2013).

[2] K. Kobayashi, K. Ogata, S. Tsunekawa, and S. Takano, *Astrophys. J. Lett.*, 657, L17-L19 (2007).

[3] S. Takano, Y. Sakai, S. Kakimoto, M. Sasaki, and K. Kobayashi, *Pub. Astron. Soc. Japan*, 64(5), 89 (2012)

[4] G. W. Fuchs, U. Fuchs, T. F. Giesen, F. Wyrowski, *Astronom. Astrophys.* 444, 521–530 (2010).

