TERAHERTZ SPECTRA OF DOUBLY DEUTERATED DIMETHYL ETHER: CH_2DOCH_2D

L. MARGULÈS, R.A. MOTIYENKO, *Univ. Lille, CNRS, UMR 8523 - PhLAM - Physique des Lasers Atomes et Molécules, F-59000 Lille, France*; **P. GRONER**, *Department of Chemistry, University of Missouri-Kansas City, Kansas City, MO 64110-2499, USA*; **J. JØRGENSEN**, *Niels Bohr Institute, University of Copenhagen, 1350 Copenhagen, Denmark*; **J.-C. GUILLEMIN**, *UMR 6226 CNRS - ENSCR, Institut des Sciences Chimiques de Rennes, Rennes, France*

This work follow our previous studies about the mono-detuterated (CH_3OCH_2D)[1] and doubly deuterated (CH_3OCHD_2)[2] species of dimethyl-ether. The analysis of their rotational spectra permits their first detection in the Interstellar medium in the solar-typeprotostar IRAS 16293-2422. Dimethyl ether is one of the most abundant complex organic molecules in star- forming regions, and its D-to-H (D/H) ratios are important to understand its chemistry and trace the source history. Dimethyl-ether is still a relatively light molecule compared to other COMs. Its spectrum is the most intense in the THz domain in the 100-150 K temperature regime. We recorded the spectra in Lille from 150 to 1500 GHz. It should be noted that the analysis here is quite different from that of the previous two species which exhibit internal rotation of a methyl rotor as if we had a deuterium atom in each methyl group. Here we have 4 equivalent conformers, multiplets could be observed due to tuneling effects between equivalent configurations.The analysis of the spectra were carried out using the RAS formalism implemented in the SPFIT code. The first spectroscopic results will be presented.

This work was supported by the Programme National "Physique et Chimie du Milieu Interstellaire" (PCMI) of CNRS-INSU with INC-INP co-funded by CEA and CNES

[1] Richard, C. ; *et al.*, 2013, *A& A* **552**, A117, 10.1051/0004-6361/201220826

[2] Richard, C. ; *et al.*, 2021, *A& A* **651**, A120, 10.1051/0004-6361/202141282