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J/A+A/609/A121 Lab measurements for C-cyanomethanimine (Melosso+, 2018)

Laboratory measurements and astronomical search for cyanomethanimine.

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=[2018A&A...609A.121M](#) (SIMBAD/NED BibCode)

ADC_Keywords: Atomic physics ; Interstellar medium

Keywords: ISM: molecules - molecular data - methods: data analysis -
methods: laboratory: molecular

Abstract:

C-cyanomethanimine (HNCHCN), existing in the two Z and E isomeric forms, is a key prebiotic molecule, but, so far, only the E isomer has been detected towards the massive star forming region Sagittarius B2(N) using transitions in the radio wavelength domain.

With the aim of detecting HNCHCN in Sun-like star-forming regions, the laboratory investigation of its rotational spectrum has been extended to the millimeter-/submillimeter-wave (mm-/submm-) spectral window where several unbiased spectral surveys have been already obtained. High-resolution laboratory measurements of the rotational spectrum of C-cyanomethanimine were carried out in the 100-420GHz range using a frequency-modulation absorption spectrometer. The C-cyanomethanimine spectral features were then searched for in the mm-wave range using the high-sensitivity and unbiased spectral surveys obtained with the IRAM 30-m antenna in the ASAI context, the earliest stages of star formation from starless to evolved Class I objects being sampled.

For both the Z and E isomers, the spectroscopic work has led to an improved and extended knowledge of the spectroscopic parameters, thus providing accurate predictions of the rotational signatures up to ~700GHz. So far, no C-cyanomethanimine emission has been detected towards the ASAI targets, and upper limits on the column density of 10^{11} - 10^{12} cm⁻² could only be derived. Consequently, the C-cyanomethanimine abundances have to be less than a few 10^{-10} for starless and hot-corinos. A less stringent constraint, $\leq 10^{-9}$, is obtained for shocks sites. The combination of the upper limits on the abundances of C-cyanomethanimine together with accurate laboratory frequencies up to ~700GHz poses the basis for future higher sensitivity searches around Sun-like star forming regions. For compact

(typically less than 1 arcsec) and chemically enriched sources such as hot-corinos, the use of interferometers as NOEMA and ALMA in their extended configurations are clearly needed.

Description:

Table 2 contains measured rotational transitions and residuals from the fit for the two isomers of C-cyanomethanimine in the ground state.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
table2.dat	80	1185	Measured rotational transitions and residuals from the fit for the two isomers of C-cyanomethanimine in the ground state

See also:

[J/A+A/562/A56](#) : Cyanomethyl anion & its deuterated derivatives (Majumdar+ 2014)

Byte-by-byte Description of file: [table2.dat](#)

Bytes	Format	Units	Label	Explanations
1-	6	A6	---	Species Isomer
8-	9	I2	---	N' Upper N quantum number
11-	12	I2	---	Ka' Upper Ka quantum number
14-	15	I2	---	Kc' Upper Kc quantum number
17-	18	I2	---	I' ? Upper I quantum number (1)
20-	21	I2	---	F' ? Upper F quantum number (1)
23-	24	I2	---	N Lower N quantum number
26-	27	I2	---	Ka Lower Ka quantum number
29-	30	I2	---	Kc Lower Kc quantum number
32-	33	I2	---	I ? Lower I quantum number (1)
35-	36	I2	---	F ? Lower F quantum number (1)
39-	49	F11.4	MHz	Freq Observed frequency
53-	57	F5.3	MHz	Unc Experimental uncertainty
61-	67	F7.4	MHz	O-C Observed minus calculated frequencies
71-	74	F4.2	---	Weight ? Relative weight (2)
78-	80	A3	---	Ref Reference (3)

Note (1): Omitted in cases of unresolved hyperfine components

Note (2): Given only for blended lines

Note (3): References as follows:

(a) = Zaleski et al. ([2013ApJ...765L..10Z](#))

(b) = Takeo et al. (1986, CPL, 123, 229)

(c) = Takano et al. (1990, J. Mol. Spectr., 141, 13)

(d) = This work

Acknowledgements:

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(End)

Patricia Vannier [CDS] 17-Oct-2017

The document above follows the rules of the [Standard Description for Astronomical Catalogues](#); from this documentation it is possible to generate `f77` program to load files [into arrays](#) or [line by line](#)

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