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J/A+A/605/A20 Zeeman effect in sulfur monoxide (SO) (Cazzoli+, 2017)

Zeeman effect in sulfur monoxide. A tool to probe magnetic fields in star forming regions.

Cazzoli G., Lattanzi V., Coriani S., Gauss J., Codella C., Asensio Ramos A., Cernicharo J., Puzzarini C.

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=[2017A&A...605A..20C](#) (SIMBAD/NED BibCode)

ADC_Keywords: Atomic physics

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

Abstract:

Magnetic fields play a fundamental role in star formation processes and the best method to evaluate their intensity is to measure the Zeeman effect of atomic and molecular lines. However, a direct measurement of the Zeeman spectral pattern from interstellar molecular species is challenging due to the high sensitivity and high spectral resolution required. So far, the Zeeman effect has been detected unambiguously in star forming regions for very few non-masing species, such as OH and CN.

We decided to investigate the suitability of sulfur monoxide (SO), which is one of the most abundant species in star forming regions, for probing the intensity of magnetic fields via the Zeeman effect.

We investigated the Zeeman effect for several rotational transitions of SO in the (sub-)mm spectral regions by using a frequency-modulated, computer-controlled spectrometer, and by applying a magnetic field parallel to the radiation propagation (i.e., perpendicular to the oscillating magnetic field of the radiation). To support the experimental determination of the g factors of SO, a systematic quantum-chemical investigation of these parameters for both SO and O₂ has been carried out.

Description:

The complete list of measured Zeeman components of sulfur monoxide (SO).

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
zeecomp.dat	71	360	Sulfur Monoxide: Zeeman spectra

See also:

[J/A+A/531/A103](#) : Collisional excitation of sulfur dioxide (Cernicharo+, 2011)
[J/ApJ/799/115](#) : Absorption spectrum of SO up to 2.5THz (Martin-Drumel+ 2015)
[J/MNRAS/459/3890](#) : ExoMol line lists for SO2 (Underwood+, 2016)

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

Bytes	Format	Units	Label	Explanations
1- 2	I2	---	N0	Lower level rotational angular momentum, N'
5- 6	I2	---	J0	Lower level total angular momentum, J'
8- 10	I3	---	M0J	Lower level rotational level, M' _J
12- 13	I2	---	N1	Upper level rotational angular momentum, N''
16- 17	I2	---	J1	Upper level total angular momentum, J''
20- 21	I2	---	M1J	Upper level rotational level, M'' _J
23- 34	F12.5	MHz	Freq	Frequency
36- 42	F7.5	MHz	e_Freq	rms uncertainty on Freq
44- 52	F9.5	---	Int	Intensity (in arbitrary unit)
54- 61	F8.5	A	Current	Current (in Ampere)
63- 71	F9.5	gauss	B	? Magnetic field

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(End)

Patricia Vannier [CDS] 15-May-2017

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