

H A R V A R D U N I V E R S I T Y

Department of Chemistry

12 Oxford Street
Cambridge 38, Massachusetts

October 1, 1962

Dear Contributor:

This is the fifth microwave spectroscopy information letter and is being sent to those who contributed.

1--ACADEMY OF SCIENCES OF THE AZERBAIJAN SSR
Physical Institute
(Ch. O. Gadjar and L. M. Imanov)

C_2H_5OH ethyl alcohol (ethanol) manuscript prepared

2--ACADEMY OF SCIENCES OF THE USSR
P. N. Lebedev Physical Institute
(I. A. Mukhtarov)

$C_2H_2DF_3$ (FDHC-CHF₂) gauche 1-fluoro, 1-deutero, manuscript prepared
2,2-difluoro ethane

$C_2HD_2F_3$ (FDHC-CDF₂) gauche 1-fluoro, 1-deutero, manuscript prepared
2,2-difluoro deutero ethane

3--AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
Department of Chemistry
(Albert W. Jache)*

SF_5Br bromopentafluoro sulfur VI E. Neuvar manuscript in preparation

SiF_3Br bromotrifluorosilicon IV L. Sams manuscript in preparation

4--UNIVERSITY OF BIRMINGHAM
Department of Chemistry
(John Sheridan)

$CH_2F.CCD$ 3-fluoropropyne-1-d B. E. Job inertial and distortion constants evaluated

*Present address: Research Department
Ozark-Mahoning Company
310 West 6th Street, Tulsa 19, Oklahoma

(continued UNIVERSITY OF BIRMINGHAM)

$\text{CH}_2\text{F}\cdot\text{CN}$	fluoro-acetonitrile	B. E. Job	components of eqQ of N-14 measured.
$\text{CF}_2\text{H}\cdot\text{CN}$	difluoro-acetonitrile	B. E. Job	many lines measured. Rotational constant assignment, confirmation in progress.
C_2HF_3	trifluorethylene	O. L. Stiefvater	many lines measured. Rotational constant assignment, confirmation in progress.
$\text{CH}_3\cdot\text{CO}\cdot\text{CCH}$	acetyl acetylene (1-butyne-3-one)	O. L. Stiefvater	inertial constants assigned. Internal rotation splittings measured. Further analysis and chemical work in progress.
C_3IN	iodocyanoacetylene	B. E. Job	assignment of B-values to different vibrational states in progress.

5--UNIVERSITY OF CALIFORNIA
 Department of Chemistry
 (W. D. Gwinn and R. J. Myers)

CH_2O_2	formic acid	preprints prepared
$\text{C}_2\text{H}_5\text{N}$	ethyleneimine	measured quadrupole coupling
$\text{C}_3\text{H}_6\text{S}$	trimethylene sulfide	assignment, including excited states
C_4H_6	cyclobutene	complete assignment
CF_3NO_2	trifluoronitromethane	work in progress
CH_3ONO	methyl nitrite	work in progress
$\text{C}_4\text{H}_8\text{O}$	tetrahydrofuran	work in progress
$\text{C}_2\text{H}_6\text{O}$	dimethyl ether	submitted to J.C.P.

(continued UNIVERSITY OF CALIFORNIA)

CH_3SF_5	methyl sulfurpentafluoride		paper in progress
IF_5	iodine pentafluoride		work in progress
$\text{C}_4\text{H}_7\text{Cl}$	chlorocyclobutane		assigned
$\text{F}_3\text{CC}\equiv\text{CCl}$	trifluoromethyl chloroacetylene		work in progress

6--COLUMBIA UNIVERSITY
Department of Chemistry
(B. P. Dailey)

$\text{C}_6\text{H}_5\text{Br}$	bromobenzene	Eli Rosenthal	manuscript being prepared
$\text{C}_6\text{H}_5\text{Cl}$	chlorobenzene	Eli Rosenthal	measurements not yet finished

7--UNIVERSITY OF COPENHAGEN
Department of Chemistry
(Børge Bak)

$\text{C}_2\text{H}_2\text{N}_2\text{S}$	1,3,4-thiadiazole		in press, J. Mol. Spectroscopy
$\text{C}_3\text{H}_3\text{NS}$	thiazole		in press, J. Mol. Spectroscopy
$\text{C}_3\text{H}_4\text{O}$	methyl ketene		in press, Spectrochim. Acta
$\text{C}_4\text{H}_4\text{O}$	furan		in press, J. Mol. Spectroscopy
$\text{C}_7\text{H}_5\text{N}$	benzonitrile		in press, J. Chem. Phys.

8--UNIVERSITY OF FREIBURG
Institute für Physical Chemistry, Freiburg I.Br.
(W. Maier)

$(\text{CH}_3)_2\text{S}_2$	dimethyldisulphide	H. Dreizler and G. Dendl	about 200 lines measured, partially triplets and quartets; assignment failed, suspended
$(\text{CH}_3)_2\text{SO}$	dimethylsulfoxide	H. Dreizler and G. Dendl	about 300 lines measured, assignment and determination of centrifugal distortion under way.

(continued UNIVERSITY OF FREIBURG)

$(\text{CH}_3)_3\text{NBH}_3$		H.-G. Schirdewahn	two transitions measured and assigned
CF_3NO	trifluoronitrosomethane	F. Mönig	several lines observed; further work under way

9--GEORGIA INSTITUTE OF TECHNOLOGY
School of Physics
(Quitman Williams and T. L. Weatherly)

CHClF_2	chlorodifluoromethane	E. Beeson	in press
NO_2Cl	nitryl chloride (Stark effect)	D. Eagle	in manuscript
NOBr	nitrosyl bromide (Stark effect)	D. Eagle	in manuscript
SCCl_2	thiophosgene	J. Murray	in progress

10--HARVARD UNIVERSITY
Department of Chemistry
(E. Bright Wilson, Jr.)

F_2O_2	fluorine peroxide	R. Jackson	in press
$\text{CH}_3\text{CH:CFH}$	cis fluoropropene	R. A. Beaudet	in press
$\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$	butyronitrile	E. Hirota	in press
$\text{C}_3\text{H}_5\text{Cl}$	trans chloropropene	R. A. Beaudet	in press
COF_2	carbonyl fluoride (In collaboration with Prof. Laurie, Stanford Univ.)	R. Jackson	in press
$\text{CH}_2\text{FCH:CH}_2$	3-fluoropropene	E. Hirota	assigned
CH_2NOH	formaldoxime	I. Levine	isotopic species, manuscript being prepared
$\text{CH}_3\text{CH}_2\text{CHO}$	propionaldehyde	S. Butcher	manuscript being prepared
HNSO		W. Kirchhoff	manuscript being prepared
NSF		W. Kirchhoff	work completed
cis N_2F_2		R. Kuczkowski	main species assigned

(continued HARVARD UNIVERSITY)

S_2F_2		R. Kuczkowski	tentative assignment
$CH_3-CH-CH-CH_3$ \ / O	trans 2,3-epoxybutane	M. Emptage	lines assigned
CH_2CO	ketene	A. P. Cox	intensities of satellites
CH_3CHCH_2OS 	propylene sulfide	S. Butcher	manuscript in preparation
CH_3OCl		J. Rigden	awaiting manuscript
GeH_3F		J. Rigden	awaiting manuscript
GeH_3Br		J. Rigden	awaiting manuscript

11--UNIVERSITY OF LOUVAIN
Institute for Nuclear and Molecular Physics
(M. de Hemptinne)

SO_2	$S^{32}O_2$ $S^{33}O_2$ $S^{34}O_2$	sulfur dioxide	R. Van Riet F. Greindl A. Defossez	manuscript to appear in Bulletin de l'Académie Royale de Belgique, in I, III and IV.
$CH_2 = CF_2$		vinylidene fluoride	Chauffoureaux J. Cl.	manuscript in preparation
CH_2CHBr CD_2CDBr CH_2CDBr CD_2CHBr $CHD CHBr$ $CHD CDBr$		vinyl bromide	R. Geodertier S. de Hepcee R. Windmolders	spectra observed and assigned
$CH_3 - CH_2OH$ $CH_3 - CH_2OD$		ethyl alcohol	J. Michielsens-Effinger	spectra measured between 13.000 and 35.000 Mc. The transitions observed are being identified. Manuscript in press.
$CH_3 - CD_2OH$ $CD_3 - CD_2OH$				Spectra measured between 13.000 and 25.000 Mc.

12--MICHIGAN STATE UNIVERSITY
Department of Chemistry
(R. H. Schwendeman)

$\text{CH}_2\text{CH}_2\text{CHCl}$	cyclopropylchloride	some lines assigned in C-13 and D species
$\text{CH}_3\text{CHClCH}_3$	2-chloropropane	nearly complete
$\text{CH}_3\text{CHBrCH}_3$	2-bromopropane	Br-79 and Br-81 species assigned
$\text{OCH}_2\text{CH}_2\text{OBH}$	1,3,2-dioxaborolane	ground and first excited state species assigned

13--NATIONAL BUREAU OF STANDARDS
Molecular Spectroscopy Section
(D. R. Lide, Jr.)

$\text{CH}_2:\text{CHCF}:\text{CH}_2$	fluoroprene	D. R. Lide, Jr.	in press
NF_2H	difluoramine	D. R. Lide, Jr.	in press
$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$	n-propyl chloride	T. Sarachman	ms. prepared
$(\text{CH}_3)_3\text{C Cl}$	t-butyl chloride	D. R. Lide, Jr.	ms. prepared
$\text{CH}_2:\text{CHC}(\text{CH}_3):\text{CH}_2$	isoprene	D. R. Lide, Jr.	spectrum assigned
ClO_3F	perchlorylfluoride	D. R. Lide, Jr.	spectrum assigned
HCOOH	formic acid, excited states	T. Sarachman	in progress
$\text{CH}_3\text{CH}:\text{CHCH}_3$	cis 2 butene	T. Sarachman	tentative assignment

14--NATIONAL RESEARCH COUNCIL
Division of Pure Physics
(C. C. Costain)

$\text{CF}_3\text{COOH}-\text{CH}_3\text{COOH}$	} H-bond studies	G.P. Srivastava	manuscript
$\text{CF}_3\text{COOH}-\text{HCOOH}$			in
$\text{CF}_3\text{COOH}-\text{CH}_2\text{FCOOH}$			preparation
CH_2FCOOH	monofluoroacetic acid	G.P. Srivastava	work suspended temporarily
NH_2NO_2	} nitramide	J. K. Tyler	manuscript
NHDNO_2			in
ND_2NO_2			preparation
$\text{CH}_2:\text{CHCH}:\text{CHCN}$	1-cyano-1,3-butadiene	W.B. Dixon	work in progress

15--UNIVERSITY OF OKLAHOMA
Department of Physics
(Chun C. Lin)

CH_3SCN		Lin and Takahashi	lines assigned and doublets analyzed
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16--RICE UNIVERSITY
Department of Chemistry
(R. F. Curl)

NO_2	nitrogen dioxide	J. Hodgeson	$\text{N}^{14}\text{O}^{16}\text{O}^{18}$ analysis underway $\text{N}^{14}\text{O}^{16}\text{O}^{17}$ sample prepared
NOF	nitrosyl fluoride	R. F. Curl	centrifugal distortion analysis is underway
CH_3COOH	acetic acid	R. F. Curl	isotopic samples prepared, a few lines assigned

17--QUEEN'S UNIVERSITY
Department of Physics
(David B. McLay)

CDCl_3	deutero-chloroform	D. B. McLay	$J=3 \rightarrow 4$ lines measured for symmetric and asymmetric top species
CHFCl_2	dichlorofluoromethane	D. B. McLay	manuscript in preparation

18--STANFORD UNIVERSITY
Department of Chemistry
(Victor W. Laurie)

COF_2	carbonyl fluoride	D. Pence	submitted to J. Chem. Phys.
$(\text{CH}_3)_2\text{NH}$	dimethylamine	J. Wollrab	two isotopes completed, others under study
CHF:CHF cis	1,2-difluoroethylene, cis	D. Pence	deuterated species completed

19--SWISS FEDERAL INSTITUTE OF TECHNOLOGY
Department of Physical Chemistry
(Hs. H. Günthard)

$\text{CD}_2\text{CH}_2\text{CH}_2\text{CD}_2\text{C:O}$ $\alpha\text{-d}_4\text{-cyclopentanone}$ O. Oehler rotational constants
A. Bauder
 $\text{CH}_2\text{:CHNO}_2$ nitroethylene H.D. Hess work in progress

20--TECHNISCHE HOCHSCHULE KARLSRUHE
Institute für Physikalische Chemie
(Werner Zell)

$(\text{CH}_3)_3\text{C}^{35}\text{Cl}$ tertiarbutylchlorid manuscript prepared

21--UNIVERSITY OF TOKYO
Department of Chemistry
(Yonezo Morino)

H_2CO formaldehyde K. Takagi $1 \leftarrow 0$ transitions in millimeter
wave region: in manuscript
 SO_2 sulfur dioxide Y. Kikuchi ν_2 excited states: in manuscript
 F_2CO carbonyl fluoride S. Saito inertia defects in the excited
vibrational states: in manuscript
 ClNO_2 nitryl chloride T. Oka inertia defect: in manuscript
 $\text{C}_6\text{H}_5\text{NO}_2$ nitrobenzene T. Oka analysis is in progress

22--UNIVERSITY OF TOKYO
Department of Physics
(Koichi Shimoda)

NH_3 ammonia Kunitaka Kondo almost completed
Zeeman effect Koichi Shimoda
by beam maser
 H_2CO formaldehyde Katsumi Sakurai analysis in
Zeeman effect Tadao Shimizu progress
by beam maser Kunitaka Kondo

23--UNIVERSITY OF WISCONSIN
Department of Chemistry
(C. D. Cornwell)

CH_3PF_2 methyl difluorophosphine E. Cohen in progress

24--UNIVERSITY OF ILLINOIS
Department of Chemistry
(W. H. Flygare)

$\text{Cl}_2\text{H}_2\text{Si}$	dichlorosilane
CH_3NCS	methyl isothiocyanate
CH_3SCN	methyl thiocyanate
CH_2O	formaldehyde- D_2 (quadrupole)
C_5H_8	methylene cyclobutane

FORMULA INDEX

(Arrangement as in Townes and Schawlow.
Numbers refer to Institution)

BrNO	(nitrosyl chloride) - 9	C ₂ H ₅ N	(ethyleneimine) - 5
CCl ₂ S	(thiophosgene) - 9	C ₂ H ₆ O	(dimethyl ether) - 5
CF ₂ O	(carbonyl fluoride) - 10,18,21	C ₂ H ₆ O	(ethyl alcohol) - 1,11
CF ₃ NO	(trifluoronitrosomethane) - 8	C ₂ H ₆ OS	(dimethyl sulfoxide) - 8
CF ₃ NO ₂	(trifluoronitromethane) - 5	C ₂ H ₆ S ₂	(dimethyldisulfide) - 8
CHClF ₂	(chlorodifluoromethane) - 9	C ₂ H ₇ N	(dimethylamine) - 18
CHCl ₂ F	(dichlorofluoromethane) - 17	C ₃ ClF ₃	(trifluoromethyl chloro- acetylene) - 5
CHCl ₃	(chloroform) - 17	C ₃ H ₃ F	(3-fluoropropyne-1-d) - 4
CH ₂ O	(formaldehyde) - 21,22,24	C ₃ H ₃ NS	(thiazole) - 7
CH ₂ O ₂	(formic acid) - 5,13,14	C ₃ H ₄ O	(methyl ketene) - 7
CH ₃ ClO	(methyl hypochlorite) - 10	C ₃ H ₅ Cl	(cyclopropyl chloride) -12
CH ₃ F ₂ P	(methyl difluorophosphine) - 23	C ₃ H ₅ Cl	(trans chloropropene) -10
CH ₃ F ₅ S	(methyl sulfurpentafluoride)-5	C ₃ H ₅ F	(cis fluoropropene) - 10
CH ₃ NO	(formaldoxime) - 10	C ₃ H ₅ F	(3 fluoropropene) - 10
CH ₃ NO ₂	(methyl nitrite) - 5	C ₃ H ₆ O	(propionaldehyde) - 10
C ₂ HF ₂ N	(difluoro-acetonitrile) - 4	C ₃ H ₆ S	(propylene sulfide) - 10
C ₂ HF ₃	(trifluoroethylene) - 4	C ₃ H ₆ S	(trimethylene sulfide)-5
C ₂ HF ₃ O ₂	(trifluoroacetic acid) - 14	C ₃ H ₇ Br	(2-bromopropane) - 12
C ₂ H ₂ FN	(fluoro-acetonitrile) - 4	C ₃ H ₇ Cl	(2-chloropropane) - 12
C ₂ H ₂ F ₂	(vinylidene fluoride) - 11	C ₃ H ₇ Cl	(n-propylchloride) - 13
C ₂ H ₂ F ₂	(1,2-difluoroethylene, cis)-18	C ₃ IN	(iodocyanoacetylene) - 4
C ₂ H ₂ N ₂ S	(1,3,4-thiadiazole) - 7	C ₃ H ₁₂ ^{BN}	∠(CH ₃) ₃ NBH ₃ - 8
C ₂ H ₂ O	(ketene) - 10	C ₄ H ₄ O	(acetyl acetylene) - 4
C ₂ H ₃ Br	(vinyl bromide) - 11	C ₄ H ₄ O	(furan) - 7
C ₂ H ₃ FO ₂	(monofluoroacetic acid) - 14	C ₄ H ₅ F	(fluoroprene) - 13
C ₂ H ₃ F ₃	(1-fluoro,1-deutero,2,2-difluoro ethane) - 2	C ₄ H ₆	(cyclobutene) - 5
C ₂ H ₃ NO ₂	(nitroethylene) - 19	C ₄ H ₇ Cl	(chlorocyclobutane) - 5
C ₂ H ₃ NS	(methyl isothiocyanate) -15,24	C ₄ H ₈	(cis 2 butene) - 13
C ₂ H ₃ NS	(methyl thiocyanate) - 24	C ₄ H ₈ N	(butyronitrile) - 10
C ₂ H ₄ O ₂	(acetic acid) - 14,16	C ₄ H ₈ O	(trans 2,3-epoxybutane)-10
C ₂ H ₅ BO ₂	(1,3,2-dioxaborolane) - 12	C ₄ H ₈ O	(tetrahydrofuran) - 5

C_4H_9Cl	(<u>t</u> -butyl chloride)	-13,20
C_5H_5N	(1-cyano-1,3-butadiene)	- 14
C_5H_8	(methylene cyclobutane)	- 24
C_5H_8	(isoprene)	- 13
C_5H_8O	(α - d_4 -cyclopentanone)	- 19
C_6H_5Br	(bromobenzene)	- 6
C_6H_5Cl	(chlorobenzene)	- 6
$C_6H_5NO_2$	(nitrobenzene)	- 21
C_7H_5N	(benzonitrile)	- 7
$ClNO_2$	(nitryl chloride)	- 9,21
$ClFO_3$	(perchlorylfluoride)	- 13
Cl_2H_2Si	(dichlorosilane)	- 24
FNO	(NOF)	- 16
FNS	(NSF)	- 10
F_2HN	(difluoramine)	- 13
F_2N_2	(<i>cis</i> N_2F_2)	- 10
F_2O_2	(fluorine peroxide)	- 10
F_2S_2	(S_2F_2)	- 10
F_5BrS	(SF_5Br)	- 3
F_3BrSi	(SiF_3Br)	- 3
F_5I	(iodine pentafluoride)	- 5
GeH_3Br		- 10
GeH_3F		- 10
$HNOS$	(HNSO)	- 10
$H_2N_2O_2$	(nitramide)	- 14
H_3N	(ammonia)	- 22
NO_2	(nitrogen dioxide)	-16
O_2S	(sulfur dioxide)	- 11,21