

Supporting Information for Ytterbium(III) Triflate/TMSCl; Efficient Catalyst for Imino Ene Reaction

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General Experimental.

All reactions were carried out under argon atmosphere. Tetrahydrofuran was distilled from sodium/ benzophenone prior to use. Dichloromethane was distilled from P₂O₅ and redistilled from CaH₂ prior to use. Analytical TLC was performed on Merck DC-Platten Kieselgel 60 GF254 plates. Silica gel column chromatography was carried out with Merck Kieselgel (60 mesh). ¹H-NMR spectra were recorded on JNM-GSX 400α (400 MHz). ¹³C-NMR spectra were recorded on JNM-GSX 400α (100 MHz). IR spectra were obtained with JASCO FT/ IR-230. Mass spectra (MS) were recorded on JEOL HX-100A (LR-FAB, HR-FAB) mass spectrometer. The imines **1a**,¹ **1b**,² **1c**,¹ **1d**,³ and **1e**,⁴ were prepared by known methods.

1 Jennings, W. B; Lovely, C. J. *Tetrahedron* **1991**, 47, 5561-5568.

2 Kupfer, R.; Meier, S.; Wüthwein, E. U. *Synthesis* **1984**, 688-690.

3 Texier-Boullet, F. *Synthesis* **1985**, 679-681.

4 Bigelow, L. A.; Eatough, H. *Org. Synth.* **1941**, I, 80-81.

General Procedure of Imino Ene Reaction

Dichloromethane (4 mL) solution of imine (0.5 mmol) was added to the tetrahydrofuran (1 mL) solution of ytterbium(III) trifluoromethanesulfonate (Yb(OTf)₃). Then silyl reagent and *o*-methylstyrene (1.0 mmol) were added successively. Then the reaction mixture was stirred at room temperature. The reaction was monitored by TLC analysis. After usual work-up, obtained crude residue was purified by column chromatography.

General Procedure of Three-Component Coupling

Benzaldehyde (1.0 mmol) was added to the dichloromethane (8 mL) and tetrahydrofuran (2 mL) solution of ytterbium(III) trifluoromethanesulfonate ($\text{Yb}(\text{OTf})_3$) and *p*-toluenesulfonamide (1.0 mmol). Then silyl reagent and α -methylstyrene (2.0 mmol) were added successively. Then the reaction mixture was stirred at room temperature. The reaction was monitored by TLC analysis. After usual work-up, obtained crude residue was purified by column chromatography.

Chemical yield of Figure 1

with TMSCl : Sc(OTf)₃ : 88%, Y(OTf)₃ : 67%, La(OTf)₃ : 17%, Ce(OTf)₃ : 21%, Pr(OTf)₃ : 34%, Nd(OTf)₃ : 25%, Sm(OTf)₃ : 26%, Eu(OTf)₃ : 42%, Gd(OTf)₃ : 30%, Tb(OTf)₃ : 34%, Dy(OTf)₃ : 37%, Ho(OTf)₃ : 47%, Er(OTf)₃ : 53%, Tm(OTf)₃ : 58%, Yb(OTf)₃ : 93%, Lu(OTf)₃ : 63%.

Spectral Data

2,4-Diphenyl-4-tosylamino-1-butene (**2a**)

pale yellow oil; IR (neat) 3278, 3031, 2925, 1599, 1495, 1443, 1323, 1158, 1093, 963, 904, 698, 663 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3) δ 2.33 (3H, s), 2.89 (2H, m), 4.23 (1H, dd, $J = 7.2, 12.9$ Hz), 4.94 (1H, d, $J = 1.0$ Hz), 5.17 (1H, brs), 5.22 (1H, d, $J = 1.2$ Hz), 7.02-7.05 (4H, m), 7.13-7.26 (8H, m), 7.44 (2H, d, $J = 8.0$ Hz); $^{13}\text{C-NMR}$ (CDCl_3) δ 21.37, 44.05, 56.36, 111.34, 126.07, 126.60, 127.04, 127.35, 127.65, 128.25, 128.37, 129.18, 136.93, 139.26, 140.65, 142.86, 143.70; LRMS (FAB) m/z 376 [5, $\text{M}^+ - \text{H}$], 260 [100]; HRMS ($\text{C}_{23}\text{H}_{22}\text{NO}_2\text{S}$) found 376.1371; calcd 376.1371.

2,4-Diphenyl-4-methoxycarbonylamino-1-butene (**2b**)

colorless oil; IR (neat) 3328, 3030, 1718, 1701, 1543, 1509, 1458, 1363, 1252, 1193, 904, 778, 699 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3) δ 2.95 (2H, d, $J = 6.8$ Hz), 3.57 (3H, s), 4.72 (1H, brs), 4.94 (1H, brs), 5.00 (1H, d, $J = 1.2$ Hz), 5.27 (1H, d, $J = 1.2$ Hz), 7.18-7.37 (10H, m); $^{13}\text{C-NMR}$ (CDCl_3) δ 43.23, 51.89, 54.20, 115.59, 126.30, 127.31, 127.69, 128.44, 128.50, 140.49, 142.35, 144.86, 156.24; LRMS (FAB) m/z 282 [7, $\text{M}^+ + \text{H}$], 164 [100]; HRMS ($\text{C}_{18}\text{H}_{20}\text{NO}_2$) found 282.1504; calcd 282.1494.

2,4-Diphenyl-4-diphenylphosphinoylamino-1-butene (2c)

white powder; IR (KBr) 3446, 3135, 2918, 1437, 1187, 1125, 1090, 900, 778, 749, 694 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3) δ 2.99 (1H, dd, $J = 8.2, 14.0$ Hz), 3.24 (1H, dd, $J = 6.3, 13.8$ Hz), 3.35 (1H, brs), 4.27 (1H, dd, $J = 6.5, 8.4$ Hz), 4.87 (1H, d, $J = 0.9$ Hz), 5.21 (1H, d, $J = 1.2$ Hz), 7.06 (2H, d, $J = 6.4$ Hz), 7.16-7.75 (18H, m); $^{13}\text{C-NMR}$ (CDCl_3) δ 45.51, 54.75, 115.96, 126.22, 126.61, 127.19, 127.51, 128.30, 128.35, 128.40, 128.47, 131.78, 131.86, 131.95, 132.22, 132.31, 140.00, 142.89, 144.37; LRMS (FAB) m/z 424 [20, M^+H], 306 [100]; HRMS ($\text{C}_{28}\text{H}_{27}\text{NOP}$) found 424.1817; calcd 424.1830.

2,4-Diphenyl-4-methyl-1,2,3,4-tetrahydroquinoline (3, major diastereomer)

yellow solid; IR (KBr) 3383, 2966, 1602, 1495, 1474, 1345, 1311, 1256, 1113, 1028, 752, 702 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3) δ 1.82 (3H, s), 1.95 (1H, dd, $J = 2.7, 13.4$ Hz), 2.26 (1H, dd, $J = 12.7, 12.7$ Hz), 4.60 (1H, dd, $J = 2.7, 12.0$ Hz), 6.58 (1H, d, $J = 8.5$ Hz), 7.00 (1H, ddd, $J = 1.6, 7.5, 7.6$ Hz), 7.14-7.37 (10H, m), 7.44 (2H, d, $J = 7.3$ Hz); $^{13}\text{C-NMR}$ (CDCl_3) δ 29.73, 42.28, 48.30, 54.01, 114.50, 117.63, 125.82, 126.66, 126.86, 127.20, 127.32, 127.48, 127.63, 127.96, 128.58, 143.94, 144.73, 150.19; LRMS (FAB) m/z 299 [100, M^+]; HRMS ($\text{C}_{22}\text{H}_{21}\text{N}$) found 299.1659; calcd 299.1674.

2,4-Diphenyl-4-methyl-1,2,3,4-tetrahydroquinoline (3, minor diastereomer)

yellow solid; IR (KBr) 3385, 2958, 1602, 1482, 1444, 1338, 1312, 1259, 1119, 1030, 770, 751, 702 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3) δ 1.75 (3H, s), 2.14 (1H, dd, $J = 11.7, 13.1$ Hz), 2.26 (1H, dd, $J = 3.1, 13.1$ Hz), 4.01 (1H, dd, $J = 2.9, 11.7$ Hz), 6.60 (1H, dd, $J = 1.2, 8.5$ Hz), 6.75 (1H, ddd, $J = 1.2, 7.6, 7.6$ Hz), 7.09-7.13 (3H, m), 7.16-7.32 (9H, m); $^{13}\text{C-NMR}$ (CDCl_3) δ 29.62, 41.57, 47.93, 53.12, 114.19, 117.25, 125.77, 126.40, 126.63, 127.08, 127.53, 127.55, 128.16, 128.24, 128.53, 144.27, 144.56, 150.41; LRMS (FAB) m/z 299 [100, M^+]; HRMS ($\text{C}_{22}\text{H}_{21}\text{N}$) found 299.1672; calcd 299.1674.

2-Phenyl-4-tosylamino-1-pentene (4)

IR (neat) 3278, 2973, 2929, 1599, 1495, 1426, 1323, 1161, 1092, 991, 906, 815, 758, 706, 664 cm^{-1} ; ^1H NMR (CDCl_3) δ 0.98 (3H, d, $J = 6.6$ Hz), 2.31 (3H, s), 2.40 (1H, dd, $J = 7.7, 14.1$ Hz), 2.65 (1H, dd, $J = 6.4, 13.4$ Hz), 3.18 (1H, ddq, $J = 6.6, 6.7, 7.0$ Hz), 4.66 (1H, brs), 4.95 (1H, s), 5.20 (1H, s), 7.08-7.17 (7H, m), 7.56-7.58 (2H, m); ^{13}C NMR (CDCl_3) δ 21.21, 21.43, 43.44, 48.08, 115.73, 125.98, 127.03, 127.61, 128.33, 129.48, 137.47, 139.39, 143.06, 144.33; LRMS (FAB) m/z 315 [40, M^+], 198 [100]; HRMS ($\text{C}_{18}\text{H}_{21}\text{NO}_2\text{S}$) found 315.1301; calcd 315.1293.

2-Phenyl-4-tosylamino-5-methyl-1-hexene (5)

colorless solid, mp. 104-105 $^\circ\text{C}$ (acetone/*n*-hexane); IR (KBr) 3290, 2952, 1629, 1602, 1464, 1420, 1319, 1162, 1095, 1056, 956, 906, 812, 783, 715, 666 cm^{-1} ; ^1H NMR (CDCl_3) δ 0.72 (3H, d, $J = 6.8$ Hz), 0.82 (3H, d, $J = 6.8$ Hz), 1.86 (1H, m), 2.40 (3H, s), 2.54 (1H, ddd, $J = 1.0, 7.1, 14.4$ Hz), 2.60 (1H, ddd, $J = 1.0, 7.9, 14.4$ Hz), 3.10 (1H, dddd, $J = 3.4, 7.4, 7.4, 7.4$ Hz), 4.57 (1H, d, $J = 7.6$ Hz), 5.01 (1H, d, $J = 1.2$ Hz), 5.22 (1H, d, $J = 1.5$ Hz), 7.11-7.27 (7H, m), 7.64 (2H, d, $J = 8.3$ Hz); ^{13}C NMR (CDCl_3) δ 16.29, 18.30, 21.47, 29.53, 37.77, 56.76, 115.59, 126.07, 127.21, 127.61, 128.29, 129.41, 137.65, 139.44, 143.01, 144.64; LRMS (FAB) m/z 343 [35, M^+], 226 [100]; HRMS ($\text{C}_{20}\text{H}_{25}\text{NO}_2\text{S}$) found 343.1606; calcd 343.1606.

JEOL

19-AUG-1999 19:10:20.56

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SFILE : G5MY

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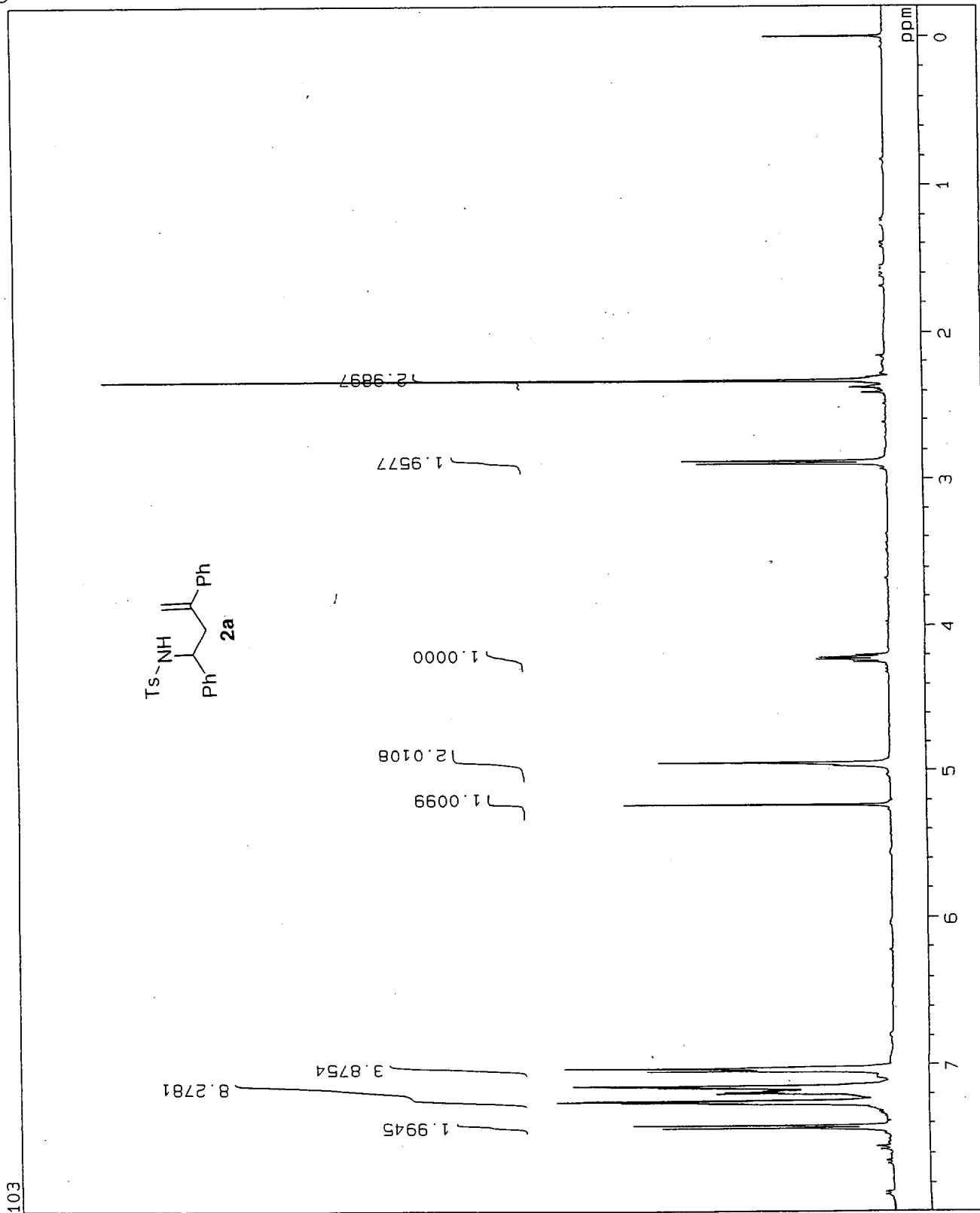
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IRRS : 0

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CTEMP : 28.8 c
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operator



103

JEOL

20-AUG-1999 12:14:17.11

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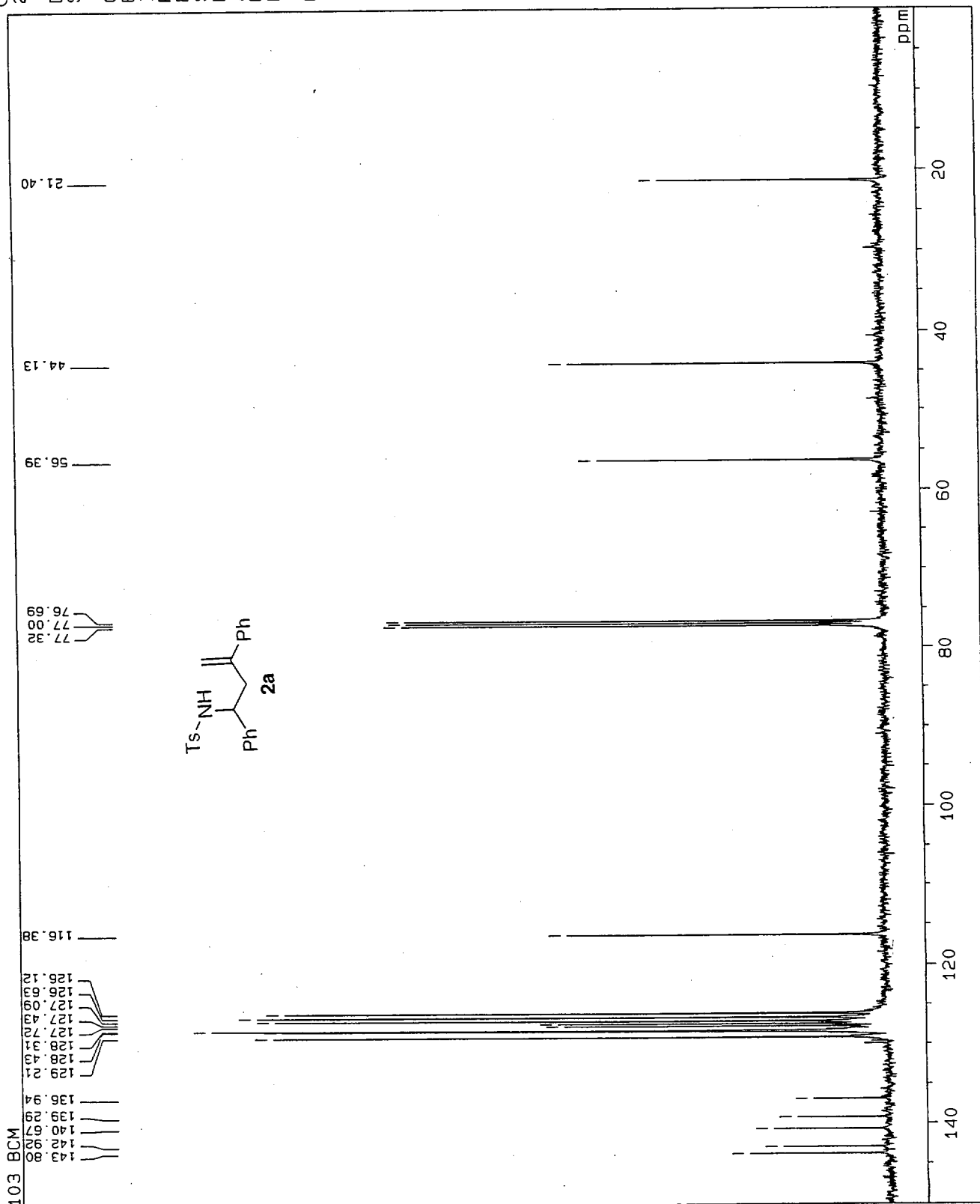
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OBSET : 135500.00 Hz

IRNUC : 1H
IRFRQ : 339.65 MHz
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IRRPW : 50.0 usec
IRBP1 : 25
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IRRS : 0

ADBIT : 16
CTEMP : 30.0 C
CSPED : 13 Hz
SLVNT : CDCL3

RESOL : 0.83 Hz
BF : 3.00 Hz
T1 : 0.00 %
T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 77.00 ppm
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operator



JEOL

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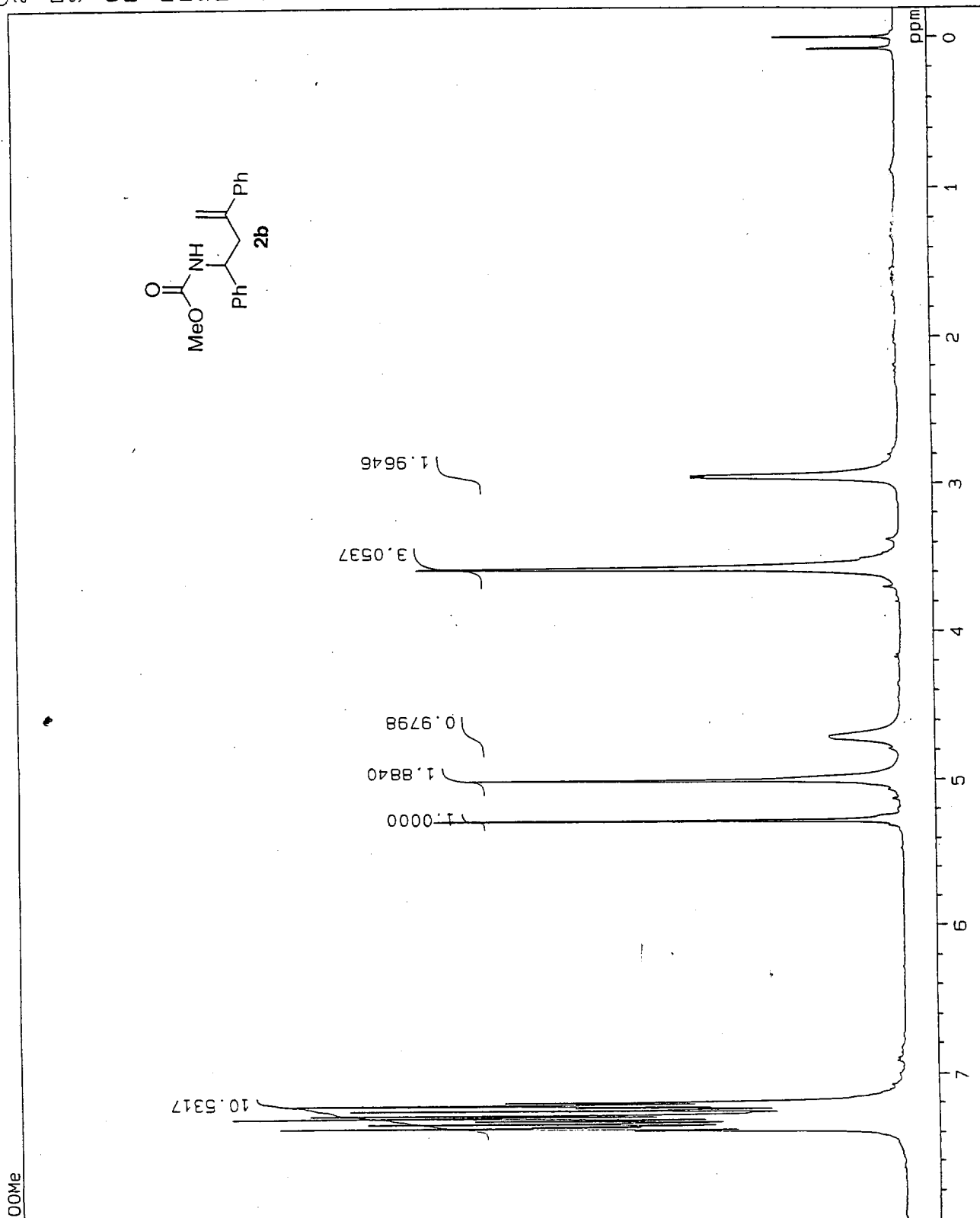
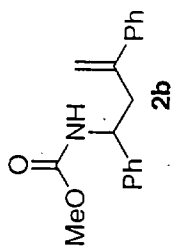
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OBNUC : 1H
OBFRQ : 399.65 MHz
OBSET : 134500.00 Hz

IRNUC : 1H
IRFRQ : 399.65 MHz
IRSET : 134300.00 Hz
IRATN : 511
IRRPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRRNS : 0

ADBIT : 16
CTEMP : 28.4 C
CSPED : 13 Hz
SLVNT : CDCL3

RESOL : 0.31 Hz
BF : 0.01 Hz
T1 : 0.00 %
T2 : 0.00 %
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XE : 3278.20 Hz
XS : 426.03 Hz
operator



00Me

JEOL

18-OCT-1978 08:09:16.67

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SFIL : GSMY

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EXMOD : SINGL
IRMOD : BCM
POINT : 32768
FREGU : 27100.27 Hz
SCANS : 2560
DUMMY : 4
ACQTM : 1.2091 sec
PD : 0.3000 sec
RGAIN : 23

PW1 : 4.55 usec

OBNUC : 13C
OBFRQ : 100.40 MHz
OBSET : 135500.00 Hz

IRNUC : 1H
IRFRQ : 339.65 MHz
IRSET : 134300.00 Hz
IRATN : 511
IRRPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRRNS : 0

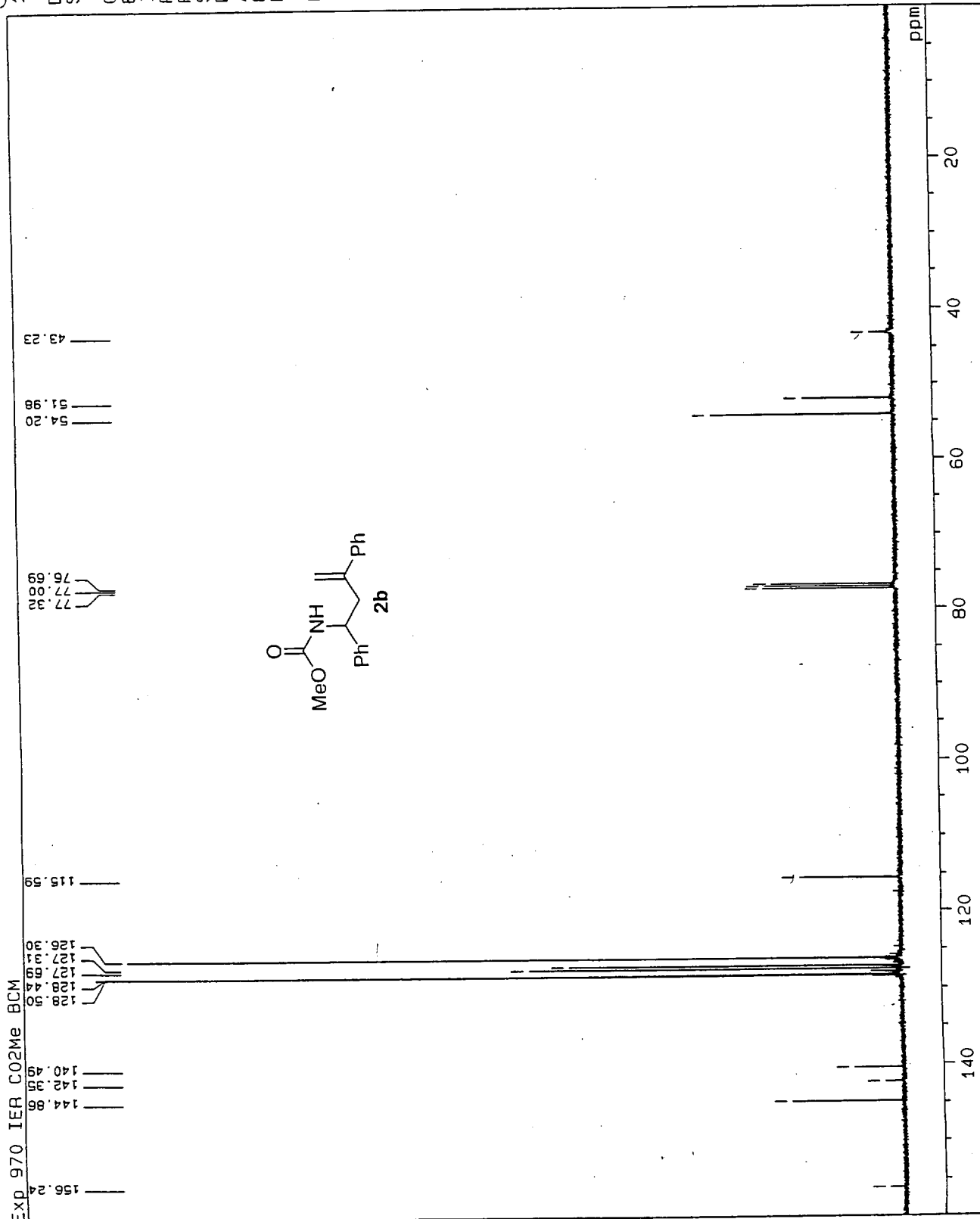
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SLVNT : CDCL3

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T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 77.00 ppm
XE : 16083.34 Hz
XS : 2071.31 Hz

operator

Exp 970 IER C02Me BCM



JEOL

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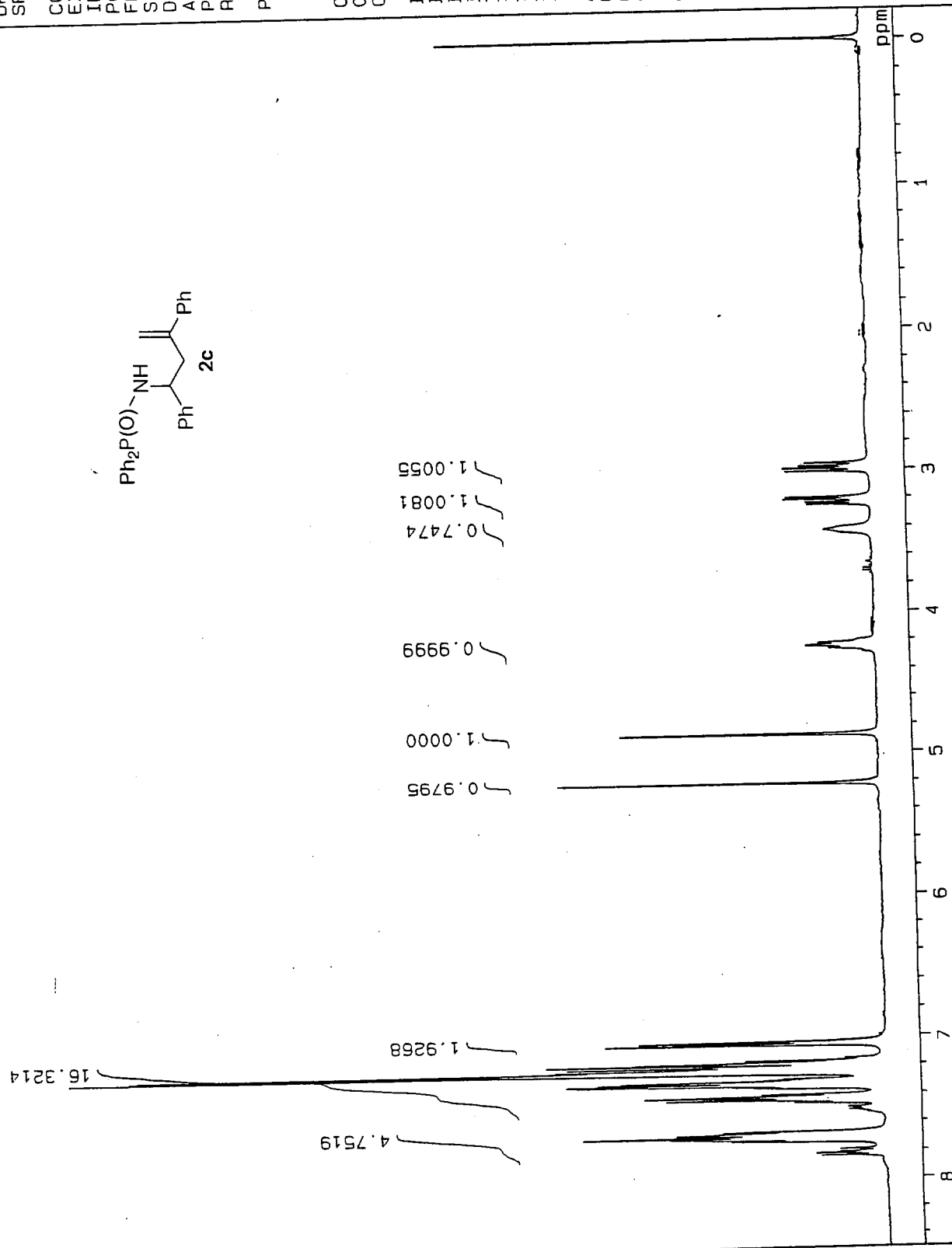
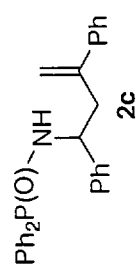
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SCANS : 16
DUMMY : 2
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PD : 3.0000 sec
RGAIN : 16
PW1 : 4.90 usec

OBNUC : 1H
OBFRQ : 399.65 MHz
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IRNUC : 1H
IRFRQ : 399.65 MHz
IRSET : 134300.00 Hz
IRATN : 511
IRRPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRRNS : 0

ADBIT : 16
CTEMP : 24.6 C
CSPED : 12 Hz
SLVNT : CDCL3

RESOL : 0.24 Hz
BF : 0.01 Hz
T1 : 0.00 %
T2 : 0.00 %
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T4 : 100.00 %
REFVL : 0.00 ppm
XE : 3477.69 Hz
XS : 332.74 Hz
operator

IER P (0) Ph2

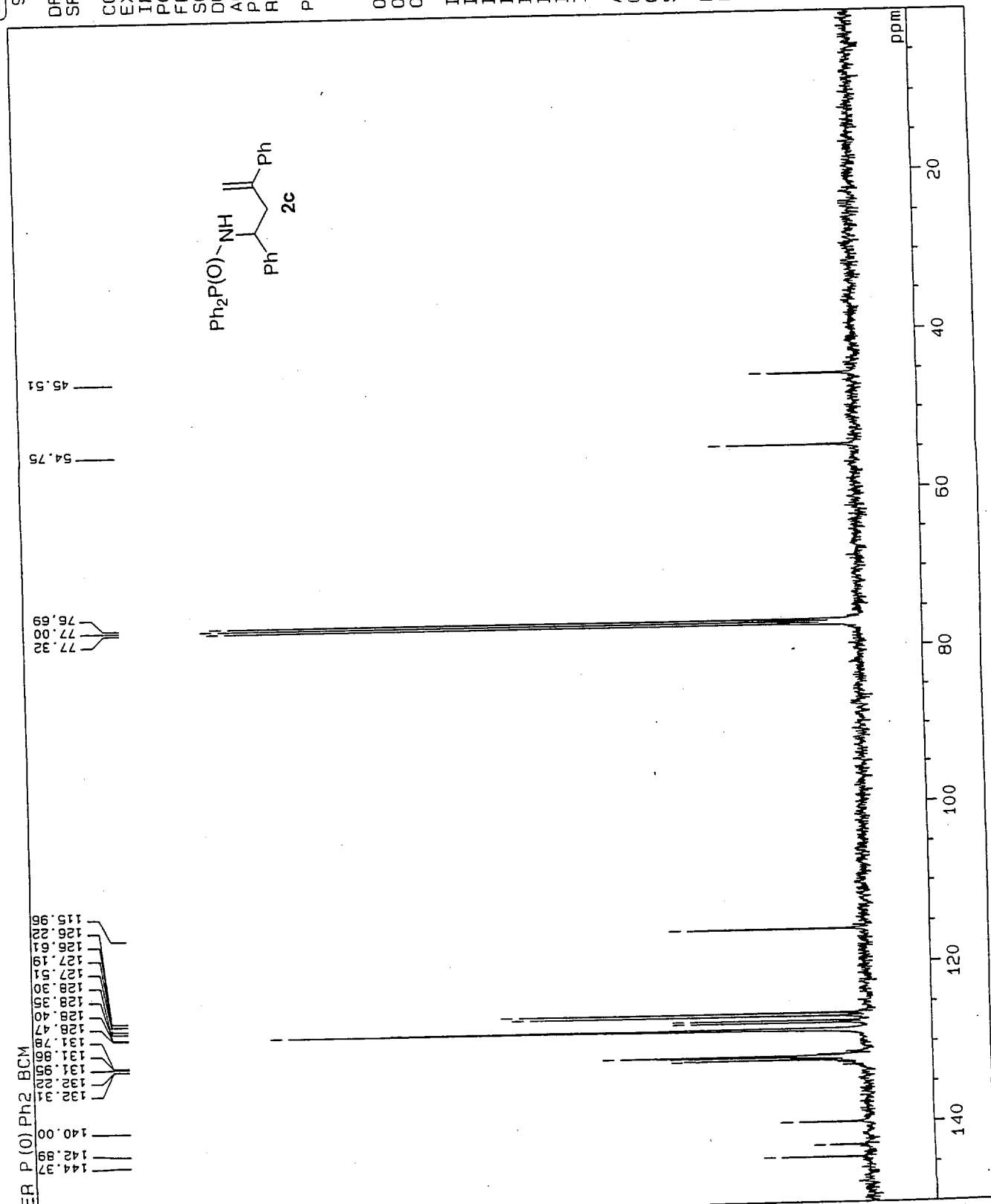


JEOL

9-JUL-1999 08:40:17.91

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IRMOD : BCM
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FREQU : 27100.27 Hz
SCANS : 1280
DUMMY : 4
ACQTM : 1.2091 sec
PD : 0.3000 sec
RGAIN : 23
PW1 : 4.55 usec

OBNUC : 13C
OBFRQ : 100.40 MHz
OBSET : 135500.00 Hz
IRNUC : 1H
IRFRQ : 339.65 MHz
IRSET : 134300.00 Hz
IRAIN : 511
IRAPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRRNS : 0
ADBIT : 16
CTEMP : 24.7 C
CSPED : 11 Hz
SLVNT : CDCL3
RESOL : 0.83 Hz
BF : 3.00 Hz
T1 : 0.00 %
T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 77.00 ppm
XE : 15078.50 Hz
XS : 2568.77 Hz
 operator



JEOL

2-AUG-1999 08:20:19.43

DFILE : ALPHA
SFIL : MY-AZAB1NON

COMNT : 1H SINGL NON MY-AZAB
EXMOD : SINGL
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SCANS : 16
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RGAIN : 14

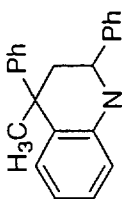
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IRATN : 511
IRRPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRRNS : 0

ADBIT : 16
CTEMP : 25.0 C
CSPED : 11 Hz
SLVNT : CDCL3

RESOL : 0.49 Hz
BF : 0.01 Hz
T1 : 0.00 %
T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 0.00 ppm
XE : 3277.65 Hz
XS : 416.66 Hz
operator



3 (major diastereomer)

1H SINGL NON MY-AZAB

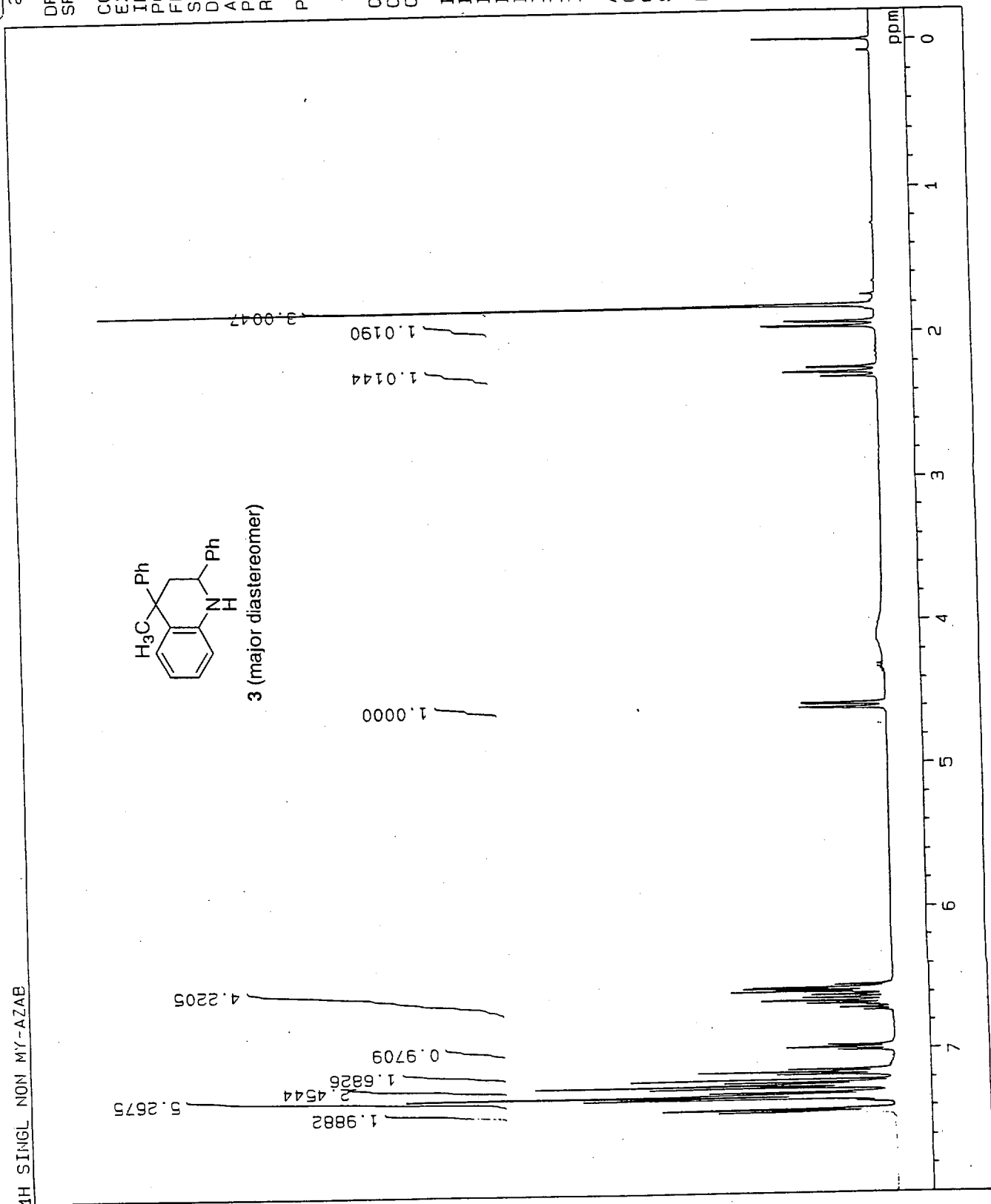
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4.2205

1.0000

1.0144

1.0190

3.0047



JEOL

2-AUG-1999 08:26:15.15

13C SINGL BCM MY-AZAB

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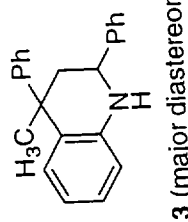
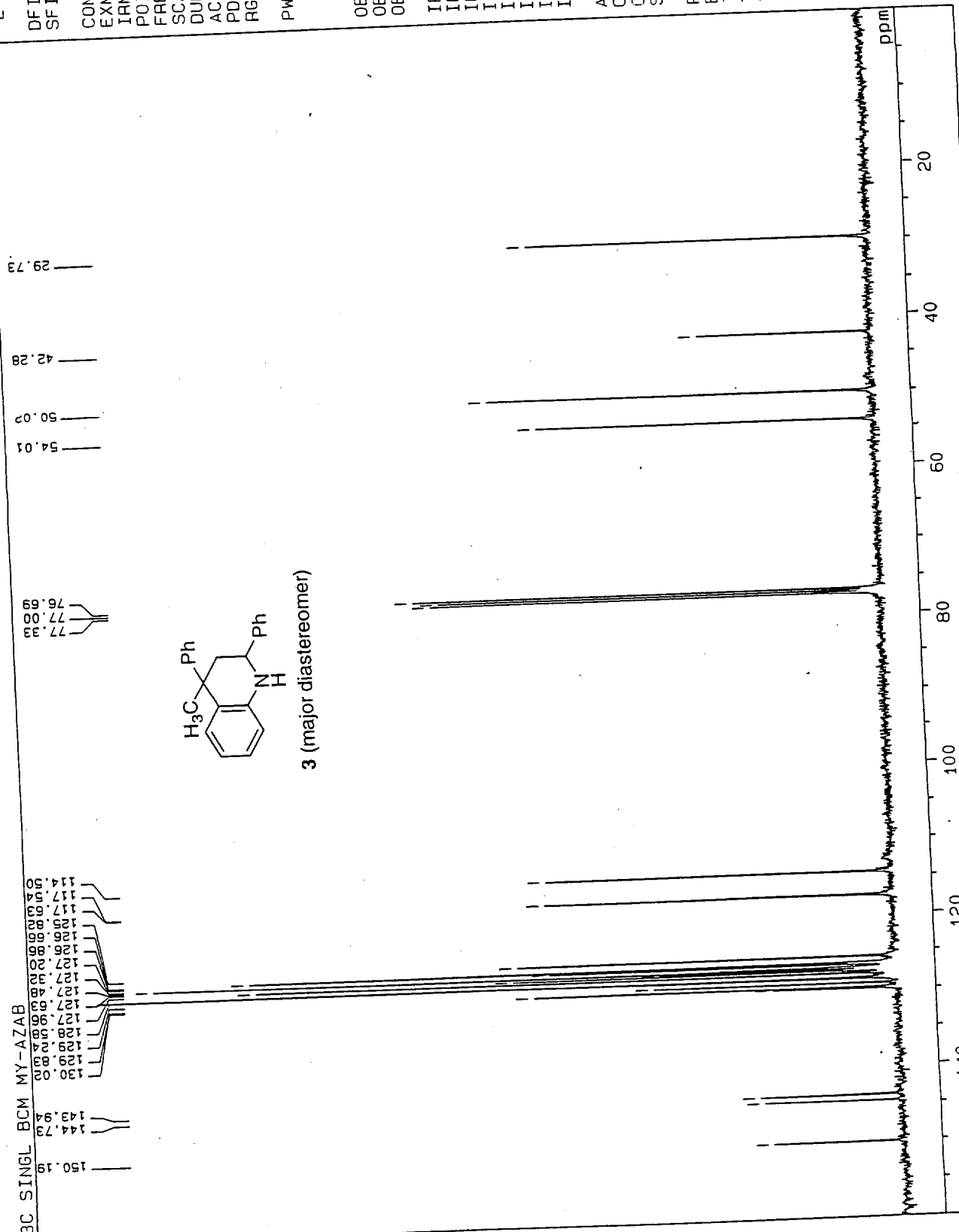
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SCANS : 1280
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RGAIN : 23
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OBNUC : 13C
OBFRQ : 100.40 MHz
OBSET : 135500.00 HZ

IRNUC : 1H
IRFRQ : 399.65 MHz
IRSET : 134500.00 HZ
IRATN : 511
IRRPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRANS : 0

ADBIT : 16
CTEMP : 25.3 C
CSPED : 12 HZ
SLVNT : CDCL3

RESOL : 1.65 HZ
BF : 3.00 HZ
T1 : 0.00 %
T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 77.00 ppm
XE : 16082.52 HZ
XS : 2063.45 HZ
operator



JEOL

14-JUL-1999 15:55:38.70

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DUMMY : 2
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PD : 3.0000 sec
RGAIN : 15

PW1 : 4.90 usec

OBNUC : 1H
OBFRQ : 399.65 MHz
OBSET : 134500.00 Hz

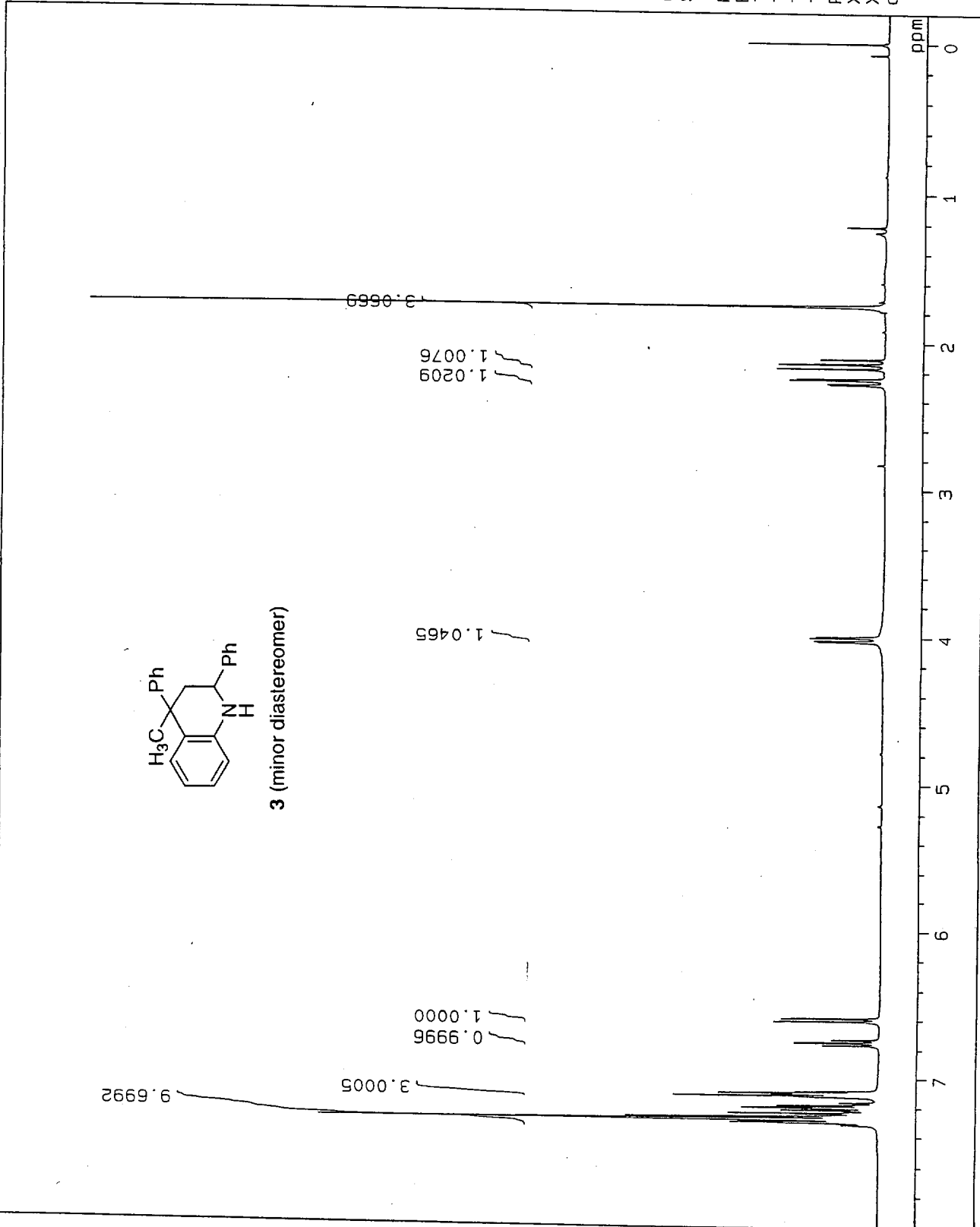
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IRBP2 : 6
IRRNS : 0

AOBIT : 16
CTEMP : 25.1 C
CSPED : 10 Hz
SLVNT : CDCL3

RESOL : 0.24 Hz
BF : 0.01 Hz
T1 : 0.00 %
T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 0.00 ppm
XE : 3277.90 Hz
XS : 423.86 Hz

operator

AZA D-A A



JEOL

3-AUG-1999 18:30:47.66

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SFIL : GSYM AZAA BCM

COMNT : AZA A BCM
EXMOD : SINGL
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SCANS : 1600
DUMMY : 4
ACQTM : 1.2091 sec
PD : 0.3000 sec
RGAIN : 23

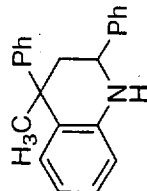
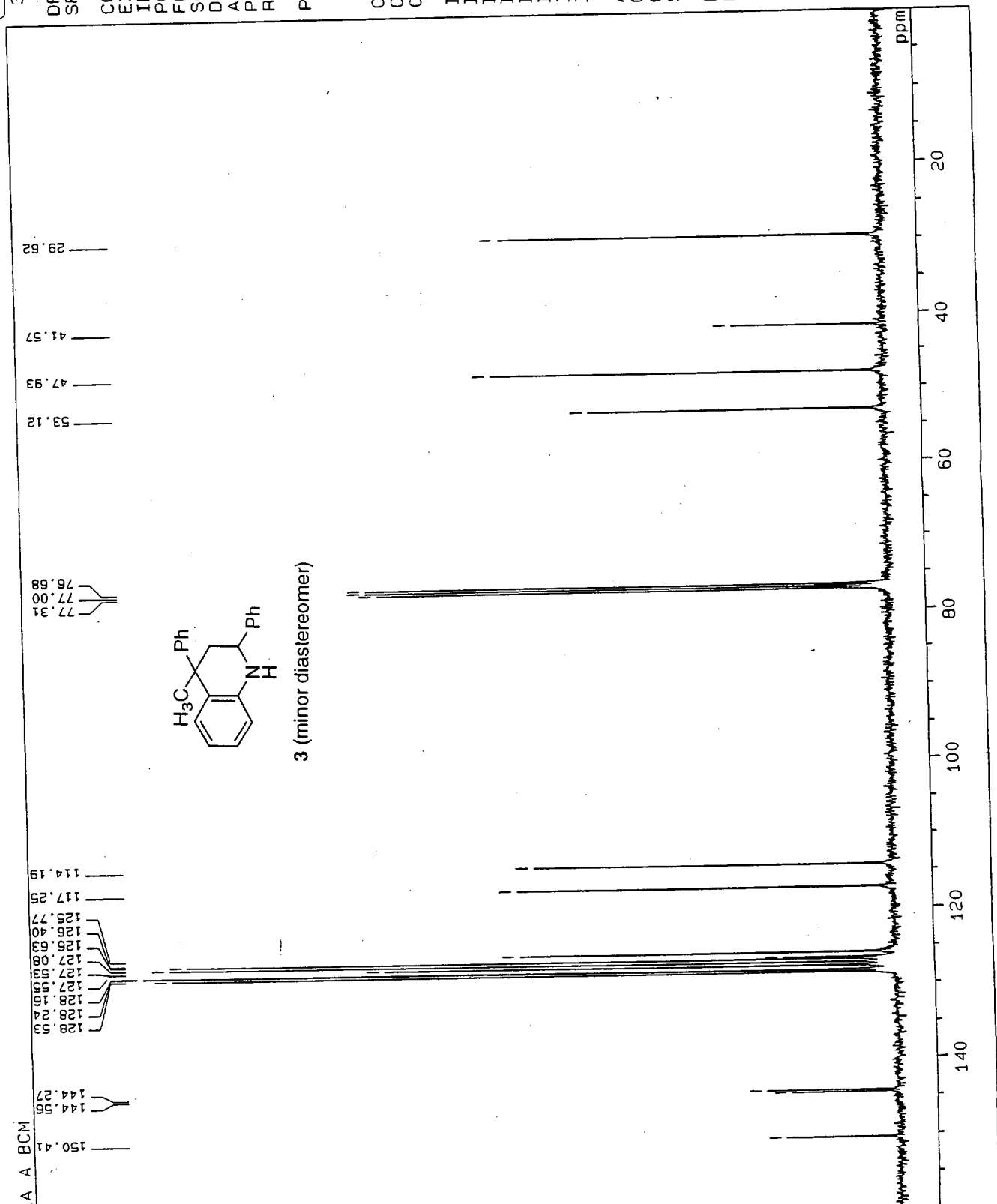
PW1 : 4.55 usec

OBNUC : 13C
OBFRG : 100.40 MHz
OBSET : 135500.00 Hz

IRNUC : 1H
IRFRG : 339.65 MHz
IRSET : 134300.00 Hz
IRAIN : 511
IRAPW : 50.0 usec
IRBP1 : 25
IRBP2 : 6
IRRNS : 0

ADBIT : 16
CTEMP : 28.6 C
CSPED : 10 Hz
SLVNT : CDCL3

RESOL : 0.83 Hz
BF : 3.00 Hz
T1 : 0.00 %
T2 : 0.00 %
T3 : 90.00 %
T4 : 100.00 %
REFVL : 77.00 ppm
XE : 16083.34 Hz
XS : 2065.52 Hz
operator



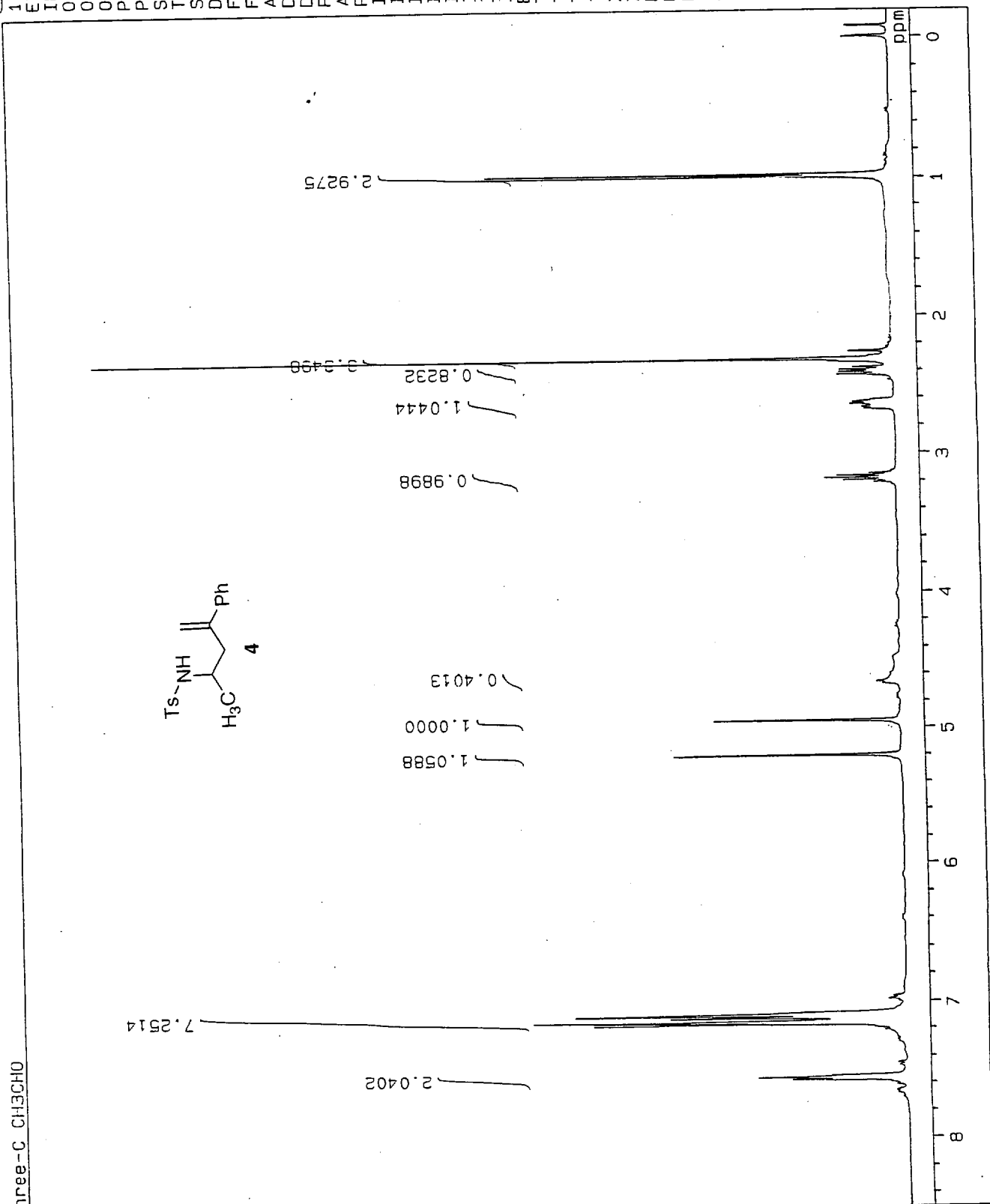
3 (minor diastereomer)

ZA A BCM

JEOL

11-SEP-1999 11:17:46.99

EXMOD : SINGL
 IRMOD : 1H
 OBNUC : 1H 399.65 MHz
 OBFREQ : 134500.00 Hz
 OBSSET : 4.90 usec
 PW1 : 32768
 POINT : 32768
 SAMPO : 32768
 TIMES : 16
 SCANS : 16
 DUMMY : 2
 FREQU : 7993.61 Hz
 FILTR : 4000 Hz
 ACQTM : 4.0993 sec
 DEATH : 72.55 usec
 DELAY : 50.00 usec
 PD : 3.0000 sec
 ADBIT : 16
 RGAIN : 15
 IRNUC : 1H 399.65 MHz
 IRFRQ : 134300.00 Hz
 IRSET : 50.0 usec
 IRRPW : 511
 IRATN : 0
 IRRNS : 25
 IRBP1 : 6
 IRBP2 : 6
 BF : 0.01 Hz
 T1 : 0.00 %
 T2 : 0.00 %
 T3 : 90.00 %
 T4 : 100.00 %
 XE : 3477.69 Hz
 XS : 298.83 Hz
 REFVL : 0.00 ppm
 DFIL : ALPHA
 MENUF : 6S-1H-NON
 SHMFL : TH5
 LKSET : 61679.1 Hz
 LKLEV : 200
 LGAIN : 24
 LKPHS : 248.91 deg
 LKSIG : 1435
 CTEMP : 26.9 C
 CSPED : 14 Hz
 FIELD : -10867

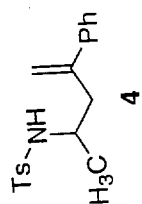
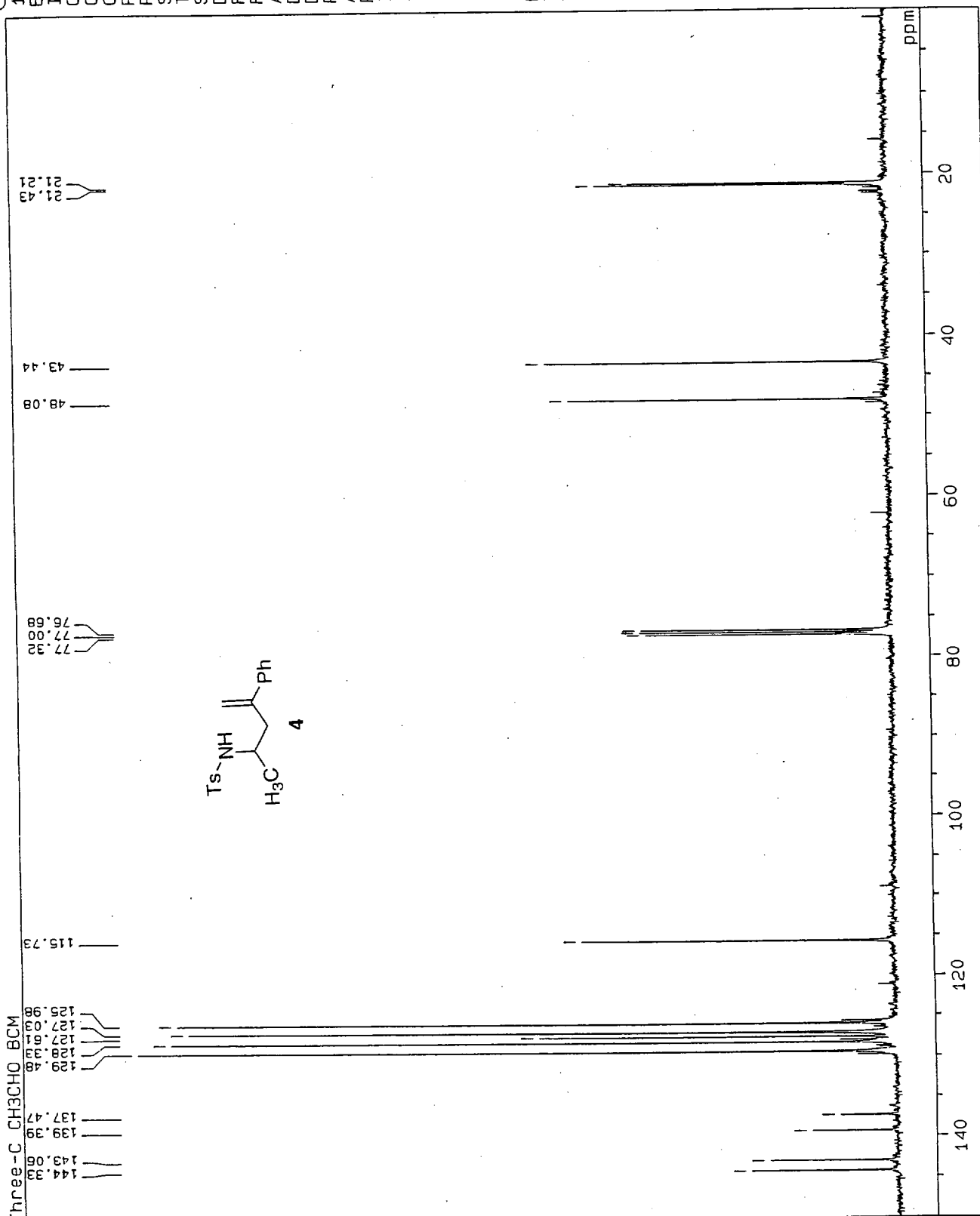


three-C CH3CHO

JEOL

11-SEP-1999 11:58:11.18

EXMOD : SINGL
 IRMOD : BCM
 OBNUC : 13C
 OBFRQ : 100.40 MHz
 OBSET : 135500.00 Hz
 PW1 : 4.55 usec
 POINT : 32768
 SAMPO : 32768
 TIMES : 1280
 SCANS : 1280
 DUMMY : 4
 FREQU : 27100.27 Hz
 FILTR : 13550 Hz
 ACGTM : 1.2091 sec
 DEADT : 10.00 usec
 DELAY : 14.76 usec
 PD : 0.3000 sec
 ADBIT : 16
 RGAIN : 23
 IRNUC : 1H
 IRFRQ : 339.65 MHz
 IRSET : 134300.00 Hz
 IRAPW : 50.0 usec
 IRATN : 511
 IRANS : 0
 IRBP1 : 25
 IRBP2 : 6
 BF : 3.00 Hz
 T1 : 0.00 %
 T2 : 0.00 %
 T3 : 90.00 %
 T4 : 100.00 %
 XE : 15078.50 Hz
 XS : 2564.63 Hz
 REFVL : 77.00 ppm
 DFILE : ALPHA
 MNUF : GS-BCM
 SHMFL : TH5
 LKSET : 61679.1 Hz
 LKLEV : 200
 LGAIN : 24
 LKPHS : 248.91 deg
 LKSIG : 1435
 CTEMP : 27.8 C
 CSPED : 13 Hz
 FIELD : -10867



three-C CH3CHO BCM

144.33
 143.08
 139.39
 137.47
 129.48
 128.38
 127.81
 127.03
 125.98
 115.73

77.32
 77.00
 76.88

48.08

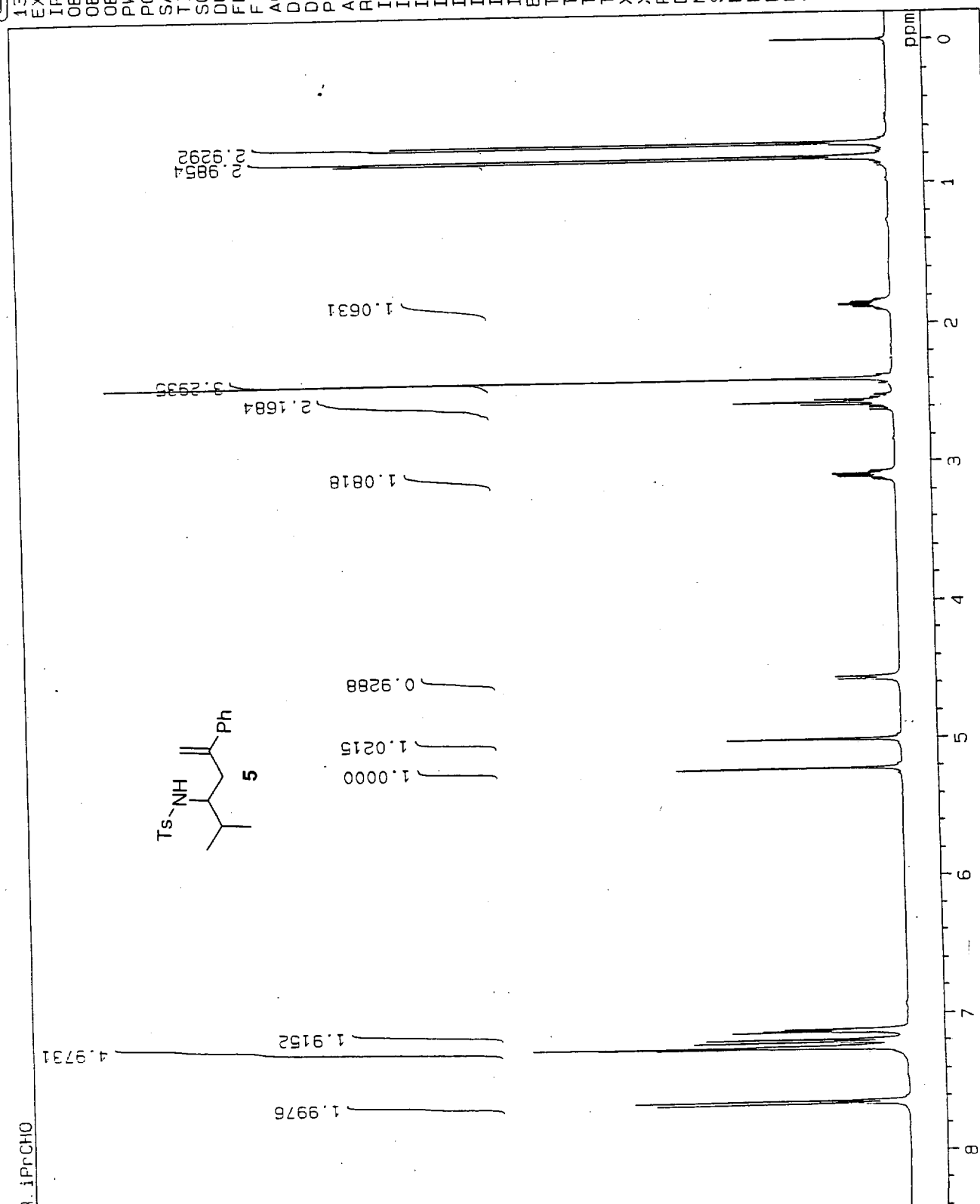
43.44

21.43
 21.21

JEOL

13-SEP-1999 09:11:23.39

EXMOD : SINGL
 IRMOD : NON
 OBNUC : 1H
 OBFRQ : 399.65 MHz
 OBSST : 134500.00 Hz
 PW1 : 4.90 usec
 POINT : 32768
 SAMPO : 32768
 TIMES : 16
 SCANS : 16
 DUMMY : 2
 FREQU : 7993.61 Hz
 FILTR : 4000 Hz
 ACGTM : 4.0993 sec
 DEADT : 72.55 usec
 DELAY : 50.00 usec
 PD : 3.0000 sec
 ADBIT : 16
 RGAIN : 16
 IRNUC : 1H
 IRFRQ : 399.65 MHz
 IRSET : 134300.00 Hz
 IRRPW : 50.0 usec
 IRATN : 511
 IRRNS : 0
 IRBP1 : 25
 IRBP2 : 6
 BF : 0.01 Hz
 T1 : 0.00 %
 T2 : 0.00 %
 T3 : 90.00 %
 T4 : 100.00 %
 XE : 3477.69 Hz
 XS : 331.52 Hz
 REFVL : 0.00 ppm
 ALPHA :
 DFLE :
 MENUF : GS-1H-NON
 TH5 :
 SHMFL : 61679.1 Hz
 LKSET : 200
 LKLEV : 23
 LGAIN : 23
 LKPHS : 248.91 deg
 LKSIG : 1310
 CTEMP : 27.9 C
 CSPED : 13 Hz
 FIELD : -10867



R. iPrCHO

JEOL

13-SEP-1999 09:49:36.73
 EXMOD : SINGL
 IRMOD : BCM
 OBNUC : 13C
 OBFRQ : 100.40 MHz
 OBSET : 135500.00 Hz
 PW1 : 4.55 usec
 POINT : 32768
 SAMPO : 32768
 TIMES : 1280
 SCANS : 1280
 DUMMY : 4
 FREQU : 27100.27 Hz
 FILTR : 13550 Hz
 ACGTM : 1.2091 sec
 DEADT : 10.00 usec
 DELAY : 14.75 usec
 PD : 0.3000 sec
 ADBIT : 16
 RGAIN : 23
 IRNUC : 1H
 IRFRQ : 339.65 MHz
 IRSET : 134300.00 Hz
 IRRPW : 50.0 usec
 IRATN : 511
 IRRNS : 0
 IRBP1 : 25
 IRBP2 : 6
 BF : 3.00 Hz
 T1 : 0.00 %
 T2 : 0.00 %
 T3 : 90.00 %
 T4 : 100.00 %
 XE : 15078.50 Hz
 XS : 2567.94 Hz
 REFVL : 77.00 ppm
 DFIL : ALPHA
 MENUF : GS-BCM
 SHMFL : THS
 LKSET : 61679.1 Hz
 LKLEV : 200
 LGAIN : 23
 LKPHS : 248.91 deg
 LKSIG : 1310
 CTEMP : 28.6 c
 CSPED : 13 Hz
 FIELD : -10867

