

Supplementary Information

Enantioselective Synthesis of *Anomala Osakana* Pheromone and *Janus integer* Pheromone: A Flexible Approach to Chiral γ -Butyrolactones

Li Lin,^a Qiangyang Zhao,^a A-Ni Li,^a Fengbo Ren,^a Fanzhi Yang,^a Rui Wang^{*a, b}

^a *State Key Laboratory of Applied Organic Chemistry and Institute of Biochemistry and Molecular Biology, Lanzhou University, Lanzhou 730000, China,* ^b *Department of Applied Biology and Chemical Technology The Hong Kong Polytechnic University, Hong Kong*

E-mail: wangrui@lzu.edu.cn

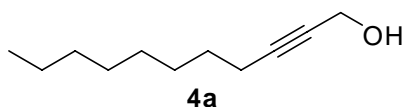
1. General Methods.....	2
2. General preparation of propargylic alcohol 4.....	2
3. Zipper isomerization for the preparation of 6.....	2
4. Coupling reaction of 6 with 1-bromooctane for the preparation of 7.....	3
5. Swern oxidation for the preparation of 5.....	3
6. General procedure for the asymmetric addition of methyl propiolate to 5.....	4
7. General procedure for the conversion of 8 to (4<i>S</i>, 5<i>Z</i>)-1 or (4<i>R</i>, 9<i>Z</i>)-2.....	5
8. NMR spectra.....	6-27

1. General Methods.

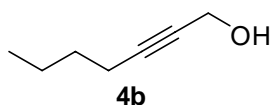
All reactions were carried out under an argon atmosphere and solvents were dried according to established procedures. Reactions were monitored by thin layer chromatography (TLC). Column chromatography purifications were carried out using silica gel. All solvents and reagents were freshly distilled before used. Diethylzinc was prepared from EtI with Zn, and then was diluted with toluene to 1.0 M. ^1H and ^{13}C NMR spectral measurements were measured on a 300-Bruker spectrometer with TMS as an internal standard. Optical rotations were recorded on a Perkin-Elmer 341 polarimeter. The ESI-MS was recorded on a Mariner biomassspectrometer. The ee value determination was carried out using chiral HPLC with a Daicel Chiracel OD-H column on Waters with a 996 UV-detector.

2. General preparation of propargylic alcohol 4:

To a solution of propargyl alcohol (**3**, 1.12 g, 20 mmol) in tetrahydrofuran (THF, 30 ml) and hexamethylphosphoric triamide (HMPA, 8 ml) was added *n*-BuLi (1.5 M in hexane, 26.7 ml, 40 mmol) at $-78\text{ }^\circ\text{C}$. After the reaction temperature was warmed to $-30\text{ }^\circ\text{C}$, 1-bromooctane or 1-bromobutane (15 mmol) was added to the mixture and stirred at room temperature overnight. The reaction mixture was treated with aqueous saturated NH_4Cl and extracted with EtOAc. The organic extract was washed with brine and dried over anhydrous Na_2SO_4 . The solvent was evaporated under vacuum. The residue was purified by silica gel column chromatography (PE : EA = 9:1) to afford **4** as colorless oil.

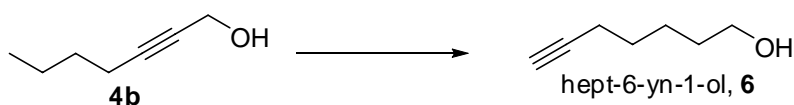


Undec-2-yn-1-ol (4a): 1.76g, 70% yield. ^1H NMR (300 MHz, CDCl_3) δ : 4.25 (2H, t, $J = 2.1$ Hz), 2.21 (2H, tt, $J = 2.1, 7.2$ Hz), 1.67 (1H, bs), 1.51 (2H, m), 1.39-1.27 (10H, m), 0.88 (3H, t, $J = 6.9$ Hz). ^{13}C NMR (75 MHz, CDCl_3) δ : 86.6, 78.2, 51.4, 31.8, 29.2, 29.1, 28.9, 28.6, 22.6, 18.7, 14.1. EI-MS (m/z): 168 (M^+), 111 (M^+-57), 99 (M^+-69), 97 (M^+-71), 85 (M^+-83), 83 (M^+-85), 71 (M^+-97), 69 (M^+-99).



Hept-2-yn-1-ol, 4b: 1.19g, 71% yield. ^1H NMR (300 MHz, CDCl_3) δ : 4.25 (2H, s), 2.22 (2H, tt, $J = 2, 7$ Hz), 1.69 (1H, br), 1.55-1.35 (4H, m), 0.91 (3H, t, $J = 7.2$ Hz). ^{13}C NMR (75 MHz, CDCl_3) δ : 86.6, 78.2, 51.4, 30.6, 21.9, 18.4, 13.5. EI-MS (m/z): 112 (M^+), 111 (M^+-1), 95 (M^+-17), 81 (M^+-31), 67 (M^+-45).

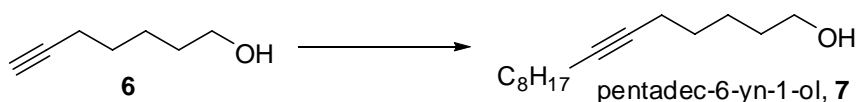
3. Zipper isomerization for the preparation of 6:



The mixture of Li (0.56 g, 80 mmol) in 1,3-diaminopropane (30 ml) was stirred and heated in an

oil bath at 70°C until the blue color discharges (1 h), affording a white suspension of the lithium amide. After cooling to room temperature, potassium tert-butoxide (5.3 g, 48 mmol,) was added to the mixture. The resultant pale yellow solution is stirred for 20 min at room temperature, and then **4b** (0.9 g, 8 mmol) was added. Residual **4b** was washed into the mixture with small portion of 1,3-diaminopropane. After stirring at room temperature for 3h, the reaction mixture was poured into plenty of ice-water and extracted with Et₂O for three times. The organic phase was combined and washed with 5% aqueous HCl and brine, then dried over anhy. Na₂SO₄. The solvent was evaporated under vacuum. The residue was purified by silica gel column chromatography (PE : EA = 7:1) to afford **6** (0.82 g, 90%) as colorless oil. ¹H NMR (300 MHz, CDCl₃) δ: 3.65 (2H, t, *J*= 6 Hz), 2.21 (2H, td, *J*= 3, 6.9 Hz), 1.96 (1H, t, *J*= 3 Hz), 1.64-1.55 (5H, m), 1.53-1.45 (2H, m). ¹³C NMR (75 MHz, CDCl₃) δ: 84.4, 68.3, 62.7, 32.1, 28.1, 24.8, 18.3. EI-MS (*m/z*): 112 (M⁺), 111 (M⁺-1), 97 (M⁺-15), 95 (M⁺-17), 83 (M⁺-29), 81 (M⁺-31), 69 (M⁺-43), 57 (M⁺-55), 55 (M⁺-57).

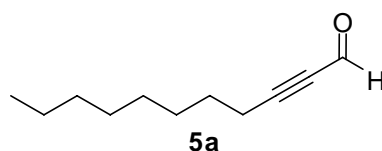
4. Coupling reaction of **6** with 1-bromooctane for the preparation of **7**:



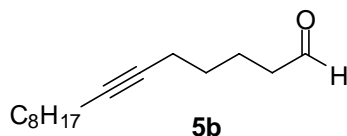
The ratio of **6**, 1-bromooctane and *n*-BuLi was 1:1:1. Using a similar procedure as the preparation of **4** afforded **7** in 90% yield based on 40% of the recovered **6**. ¹H NMR (300 MHz, CDCl₃) δ: 3.65 (2H, t, *J*= 6 Hz), 2.19-2.10 (4H, m), 1.63-1.54 (2H, m), 1.52-1.42 (6H, m), 1.40-1.33 (3H, m), 1.27 (8H, m), 0.88 (3H, m). ¹³C NMR (75 MHz, CDCl₃) δ: 80.5, 79.8, 62.9, 32.3, 31.8, 29.2, 29.1, 28.7, 24.9, 24.1, 22.6, 18.71, 18.70, 14.1. ESI-MS: [M+Na]⁺ 247.2.

5. Swern oxidation for the preparation of **5**:

Oxalyl chloride (0.52 ml, 6 mmol, 1.2 equiv) was added to dry DCM (20 mL) and cooled to -60°C under Ar. Dry DMSO (0.85 ml, 12 mmol, 2.4 equiv) was then added to the oxalyl chloride solution in drop wise. After stirring for 5 mins, the solution of **4a** or **7** in 10 ml DCM was added to the mixture in 1 min. The resulting cloudy white mixture was stirred for 15 min at -60°C. TEA (3.5 mL, 25 mol, 5.0 equiv) was added and the solution was stirred for 15 min at -60°C and 10 min at 0°C. Ice-water was added to quench the reaction and extracted with DCM for three times. The organic phase was combined and washed with 5% aqueous HCl and brine, then dried over anhy. Na₂SO₄. The solvent was evaporated under vacuum. The residue was purified by silica gel column chromatography (PE : EA = 15:1) to afford **5**.



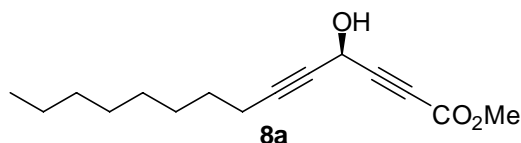
Undec-2-ynal (5a): yellow oil, 0.63g, 75% yield. ¹H NMR (300 MHz, CDCl₃) δ: 9.18 (1H, s), 2.41 (2H, t, *J*= 7.2 Hz), 1.65-1.55 (2H, m), 1.43-1.36 (2H, m), 1.28 (8H, m), 0.89 (3H, t, *J*= 6.9 Hz). ¹³C NMR (75 MHz, CDCl₃) δ: 177.3, 99.4, 81.7, 31.8, 29.1, 29.0, 28.8, 27.5, 22.6, 19.1, 14.1. EI-MS (*m/z*): 166 (M⁺), 165 (M⁺-1), 137 (M⁺-29), 123 (M⁺-43), 109 (M⁺-67), 95 (M⁺-71), 81 (M⁺-85), 71 (M⁺-95), 67 (M⁺-99).



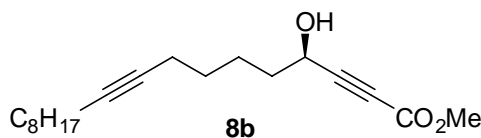
Pentadec-6-ynal (5b): colorless oil, 0.81 g, 73% yield. ^1H NMR (300 MHz, CDCl_3) δ : 9.78 (1H, t, $J = 2$ Hz), 2.46 (2H, td, $J = 2, 7.2$ Hz), 2.22-2.10 (4H, m), 1.75 (2H, q, $J = 7.5$ Hz), 1.57-1.42 (4H, m), 1.38-1.33 (2H, m), 1.27 (8H, m), 0.88 (3H, t, $J = 6.9$ Hz). ^{13}C NMR (75 MHz, CDCl_3) δ : 202.5, 80.9, 79.2, 43.4, 31.8, 29.2, 29.1, 28.9, 28.4, 22.6, 21.2, 18.7, 18.5, 14.1. ESI-MS: $[\text{M}+\text{Na}]^+$ 245.2.

6. General procedure for the asymmetric addition of methyl propiolate to 5:

To a stirred solution of **L*** (21.6 mg, 0.06 mmol, 30 mol %), DME (20.7 μL , 0.2 mmol) and Et_2Zn (0.4 mL, 0.4 mmol) in toluene (2 mL) under Ar, methyl propiolate (35.7 μL , 0.2 mmol) was added in one portion. After the solution has been stirred at 25 $^\circ\text{C}$ overnight, $\text{Ti}(\text{O}^i\text{Pr})_4$ (17.5 μL , 0.06 mmol, 30 mol %) was added and stirred for 1 h. Then, the aldehyde **5** (0.2 mmol) was added in one portion at 0 $^\circ\text{C}$. Ammonium chloride (saturated aq.) was added to quench the reaction until the reaction was complete (monitoring with TLC), and the mixture was extracted with methylene chloride and dried with sodium sulfate. After column chromatography on silica gel eluted with 10% ethyl acetate in hexanes, the optically active γ -hydroxy- α,β -acetylenic ester **8** was isolated. The enantiomeric purity of the product was determined by using HPLC.



(R)-Methyl 4-hydroxytetradeca-2, 5-diyynoate (8a): colorless oil, 80% yield. 84% ee was determined by HPLC analysis (OD column, 1.0 mL/min, 3% *i*-PrOH in hexane); retention times: 17.5 min (major) and 19.4 min (minor). $[\alpha]_D^{20} = -4$ ($c = 1.31$, CHCl_3). ^1H NMR (300 MHz, CDCl_3) δ : 5.21 (1H, bs), 3.80 (3H, s), 2.64 (1H, bs), 2.23 (2H, td, $J = 2.1, 7.2$ Hz), 1.57-1.47 (2H, m), 1.41-1.32 (2H, m), 1.27 (8H, m), 0.88 (3H, t, $J = 6.9$ Hz). ^{13}C NMR (75 MHz, CDCl_3) δ : 153.6, 87.5, 84.1, 75.2, 74.6, 52.9, 52.1, 31.8, 29.1, 29.0, 28.8, 28.1, 22.6, 18.6, 14.0. ESI-MS: $[\text{M}+\text{Na}]^+$ 273.1.



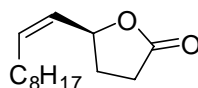
(R)-Methyl 4-hydroxyoctadeca-2, 9-diyynoate (8b) colorless oil, 78% yield, 84% ee was determined by HPLC analysis (OD column, 1.0 mL/min, 3% *i*-PrOH in hexane); retention times: 14.8 min (major) and 19.1 min (minor). $[\alpha]_D^{20} = -9$ ($c = 1.27$, CHCl_3). ^1H NMR (300 MHz, CDCl_3) δ : 4.50 (1H, t, $J = 6$ Hz), 3.79 (3H, s), 2.20-2.10 (4H, m), 2.01 (1H, bs), 1.83-1.75 (2H, m), 1.63-1.53 (4H, m), 1.51-1.43 (2H, m), 1.38-1.33 (2H, m), 1.27 (8H, m), 0.88 (3H, t, $J = 6.9$ Hz). ^{13}C NMR (75 MHz, CDCl_3) δ : 153.7, 88.0, 79.5, 76.3, 62.0, 52.8, 36.4, 31.8, 29.2, 29.1, 28.9, 28.6, 24.1, 22.6, 18.7, 18.6, 14.1. ESI-MS: $[\text{M}+\text{Na}]^+$ 329.2.

7. General procedure for the conversion of **8** to (4*S*, 5*Z*)-**1** or (4*R*, 9*Z*)-**2**:

Lindlar's Pd catalyst (5 wt.-% on BaSO₄, 20 mg) was added to a solution of **8** (0.2 mmol) in hexane (10 mL). The suspension was vigorously stirred under H₂ (1 atm) for 2h until the reaction completed (monitored by ¹H NMR). The catalyst was then removed by filtration through a small portion of Celite[®], and washed with hexane. The hexane solution was concentrated in vacuo and used for the next step without purification.

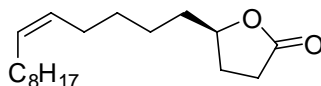
CuCl (21.9 mg, 1.1 equiv relative to the amount of **8** in the first) was added to the stirred solution of the above residue in 5 ml of MeOH. After cooling to 0°C. NaBH₄ (38 mg, 5 equiv) was added to the mixture in small portions until the reduction completed (monitored by TLC, 0.5 h). 1 ml 2M HCl was then added to quench the reaction. The mixture was extracted with EtOAc (5 ml × 3) and washed with brine, then dried over anhy. Na₂SO₄. The solvent was evaporated under vacuum to afford **10**.

The residue obtained from the above step was added 10 ml benzene and 3mg TsOH • H₂O. The mixture was heated at reflux for 2h. After the lactonization completed, benzene was evaporated under vacuum and diluted with Et₂O. The organic phase was washed with 5% aqueous NaHCO₃, 5% aqueous HCl and brine, then dried over anhy. Na₂SO₄. The solvent was evaporated under vacuum. The residue was purified by silica gel column chromatography (PE : EA = 9:1), and afforded (4*S*, 5*Z*)-**1** or (4*R*, 9*Z*)-**2** as both colorless oil.



(4*S*, 5*Z*)-**1**, *Anomala Osakana* Pheromone

(4*S*, 5*Z*)-**1**: 87 % overall yield. $[\alpha]_D^{20} = +49$ (c = 1.14, CHCl₃). ¹H NMR (300 MHz, CDCl₃) δ: 5.67 (1H, dtd, *J* = 0.9, 7.5, 10.8 Hz), 5.46 (1H, tt, *J* = 1.5, 10.8 Hz), 5.25 (1H, dtd, *J* = 0.9, 8.4, 6.6 Hz), 2.60-2.54 (2H, m), 2.43-2.33 (1H, m), 2.19-2.04 (2H, m), 2.01-1.88 (1H, m), 1.39-1.35 (1H, m), 1.39-1.26 (11H, m), 0.88 (3H, t, *J* = 6.9 Hz). ¹³C NMR (75 MHz, CDCl₃) δ: 177.2, 135.9, 127.2, 76.4, 31.8, 29.4, 29.3, 29.2, 29.0, 27.8, 22.6, 14.1. HRMS (ESI): calcd. for C₁₄H₂₄O₂ [M+Na]⁺ 247.1699, found 247.1700, error = 0.4 ppm. Lit.¹: $[\alpha]_D^{26} = +70.5$ (c = 5.5, CHCl₃). ¹H NMR (CDCl₃): δ: 0.85 (t, *J* = 6.8 Hz, 3H), 1.20-1.30 (12H, m), 2.02-2.14 (2H, m), 2.31-2.39 (1H, m), 2.49-2.56 (2H, m), 5.22 (1H, tdd, *J* = 8.3, 6.6, 1.0 Hz), 5.42 (1H, ddt, *J* = 10.7, 8.6, 1.5 Hz), 5.64 (1H, dtd, *J* = 10.9, 7.7, 1.0 Hz). ¹³C NMR (CDCl₃) δ: 14.48, 23.05, 28.23, 29.41, 29.60, 29.63, 29.71, 29.80, 29.82, 32.26, 76.83, 127.64, 136.25, 177.52.



(4*R*, 9*Z*)-**2**, *Janus integer* Pheromone

(4*R*, 9*Z*)-**2**: 89% overall yield. $[\alpha]_D^{20} = +13$ (c = 1.19, CHCl₃). ¹H NMR (300 MHz, CDCl₃) δ: 5.42-5.28 (2H, m), 4.53-4.44 (1H, m), 2.56-2.51 (2H, dd, *J* = 6.9, 9.6 Hz), 2.38-2.27 (1H, m), 2.08-1.98 (4H, m), 1.92-1.81 (1H, m), 1.80-1.69 (1H, m), 1.67-1.55 (1H, m), 1.53-1.37 (4H, m), 1.36-1.27 (13H, m), 0.88 (3H, t, *J* = 6.9 Hz). ¹³C NMR (75 MHz, CDCl₃) δ: 177.2, 130.4, 129.1,

(1) (a) J. H. Tumlinson, M. G. Klein, R. E. Doolittle, T. L. Ladd, A. T. Proveaux, *Science* **1977**, *197*, 789; (b) A. A. Dos Santos, W. Francke, *Tetrahedron: Asymmetry* **2006**, *17*, 2487

80.9, 35.5, 31.9, 29.7, 29.5, 29.4, 29.3, 28.8, 28.0, 27.2, 26.9, 24.8, 22.6, 14.1. HRMS (ESI): calcd. for C₁₈H₃₀O₂ [M+Na]⁺ 303.2295, found 303.2291, error = 1.3ppm. Lit.:² $[\alpha]_D^{26} = +24$ (c = 0.50, CHCl₃). ¹H NMR (500 MHz, CDCl₃): δ : 0.88 (t, *J* = 7.0 Hz, 3H), 1.27-1.76 (m, 19 H), 1.81-1.89 (m, 1 H), 1.99-2.06 (m, 4 H), 2.32 (ddt, *J* = 6.5, 7.5, 13 Hz, 1 H), 2.53 (ddd, *J* = 1.3, 7.5, 9.2 Hz, 2 H), 4.48 (quint, *J* = 6.5 Hz, 1 H), 5.35 (dtt, *J* = 7.1, 12, 18 Hz, 2 H) ppm. ¹³C NMR (100 MHz, CDCl₃): δ : 14.10, 14.11, 22.7, 24.9, 27.0, 27.2, 28.0, 28.9, 29.3, 29.4, 29.5, 29.7, 31.9, 35.5, 81.0, 129.1, 130.5, 177.3.

(2) C. Shibata, K.Mori, *Eur. J. Org. Chem.* **2004**, 1083.

Supplementary Material (ESI) for Organic & Biomolecular Chemistry
 This journal is (c) The Royal Society of Chemistry 2009

```

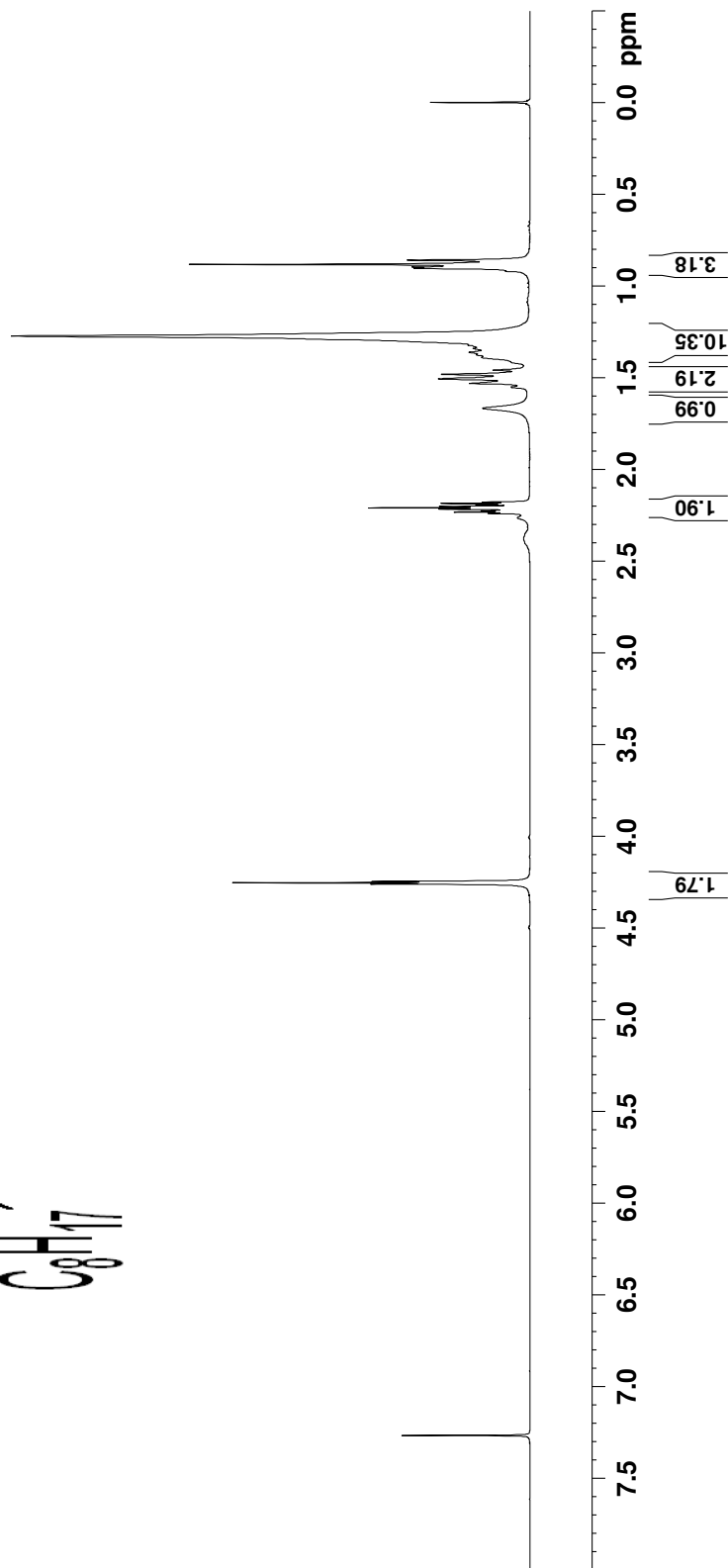
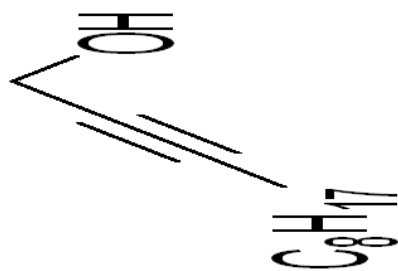
NAME          C8-M7A
EXPNO         13
PROCNO        1
Date_         20081230
Time         19.35
INSTRUM       spect
PROBHD        5 mm PABBO BB-
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            8
DS            0
SWH           6188.119 Hz
FIDRES       0.094423 Hz
AQ           5.2953587 sec
RG           203
DW           80.800 usec
DE           6.50 usec
TE           289.9 K
D1           1.00000000 sec
TD0          1

===== CHANNEL f1 =====
NUC1          1H
P1           11.80 usec
PL1          0.00 dB
PL1W         11.55467796 W
SF01         300.1318534 MHz
SI           32768
SF           300.1300002 MHz
WDW          EM
SSB          0
LB           0.30 Hz
GB           0
PC           1.00
    
```

2.240
2.233
2.226
2.217
2.210
2.203
2.193
2.186
2.179
1.667
1.555
1.552
1.532
1.507
1.482
1.459
1.390
1.375
1.362
1.341
1.322
1.273
0.904
0.882
0.859

4.261
4.254
4.247

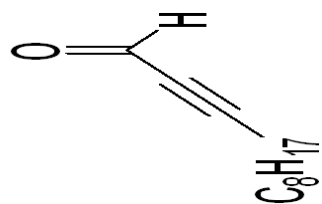
7.267



NAME U8173U
EXPNO 5
PROCNO 1
Date_ 20081230
Time 19.46
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 0
SWH 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 144
DW 80.800 usec
DE 6.50 usec
TE 300.0 K
D1 1.00000000 sec
TD0 1

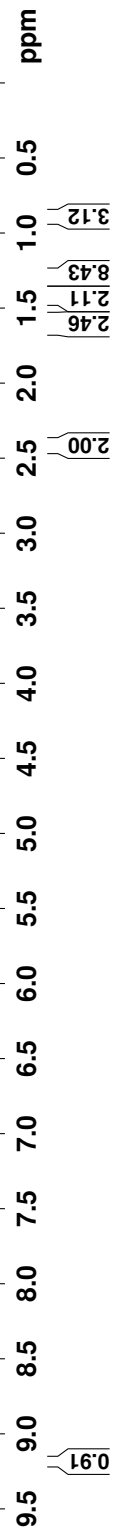
===== CHANNEL f1 =====
NUC1 1H
P1 11.80 usec
PL1 0.00 dB
PL1W 11.55467796 W
SF01 300.1318534 MHz
SI 32768
SF 300.1300011 MHz
EM
WDW 0
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

2.436
2.434
2.412
2.411
2.389
2.049
1.648
1.626
1.602
1.576
1.552
1.453
1.430
1.412
1.407
1.401
1.384
1.360
1.285
1.278
1.262
1.237
0.907
0.886
0.863
0.000



7.266

9.183



```

NAME          081230
EXPNO         1
PROCNO        1
Date_         20081230
Time_        17.54
INSTRUM      spect
PROBHD       5 mm PABBO BB-
PULPROG      zgpg30
TD           65536
SOLVENT      CDCl3
NS           226
DS           4
SMH          18028.846 Hz
FIDRES       0.275098 Hz
AQ           1.8175818 sec
RG           203
DM           27.733 usec
DE           6.50 usec
TE           290.8 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

===== CHANNEL f1 =====
NUC1          13C
P1           9.70 usec
PL1          0.00 dB
PL1W         29.38907051 W
SFO1         75.4752953 MHz

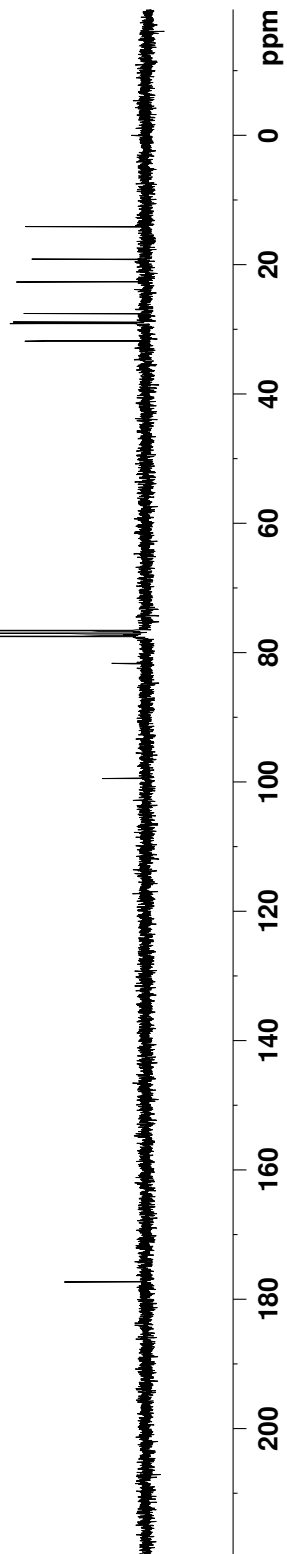
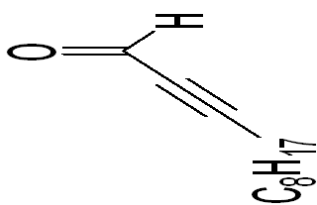
===== CHANNEL f2 =====
CPDPRG2      waitz16
NUC2          1H
PCPD2        80.00 usec
PL2          1.00 dB
PL2W         17.00 dB
PL12         17.00 dB
PL13         17.00 dB
PL14         17.00 dB
PL15         17.00 dB
PL16         17.00 dB
PL17         17.00 dB
PL18         17.00 dB
PL19         17.00 dB
PL20         17.00 dB
PL21         17.00 dB
PL22         17.00 dB
PL23         17.00 dB
PL24         17.00 dB
PL25         17.00 dB
PL26         17.00 dB
PL27         17.00 dB
PL28         17.00 dB
PL29         17.00 dB
PL30         17.00 dB
PL31         17.00 dB
PL32         17.00 dB
PL33         17.00 dB
PL34         17.00 dB
PL35         17.00 dB
PL36         17.00 dB
PL37         17.00 dB
PL38         17.00 dB
PL39         17.00 dB
PL40         17.00 dB
PL41         17.00 dB
PL42         17.00 dB
PL43         17.00 dB
PL44         17.00 dB
PL45         17.00 dB
PL46         17.00 dB
PL47         17.00 dB
PL48         17.00 dB
PL49         17.00 dB
PL50         17.00 dB
PL51         17.00 dB
PL52         17.00 dB
PL53         17.00 dB
PL54         17.00 dB
PL55         17.00 dB
PL56         17.00 dB
PL57         17.00 dB
PL58         17.00 dB
PL59         17.00 dB
PL60         17.00 dB
PL61         17.00 dB
PL62         17.00 dB
PL63         17.00 dB
PL64         17.00 dB
PL65         17.00 dB
PL66         17.00 dB
PL67         17.00 dB
PL68         17.00 dB
PL69         17.00 dB
PL70         17.00 dB
PL71         17.00 dB
PL72         17.00 dB
PL73         17.00 dB
PL74         17.00 dB
PL75         17.00 dB
PL76         17.00 dB
PL77         17.00 dB
PL78         17.00 dB
PL79         17.00 dB
PL80         17.00 dB
PL81         17.00 dB
PL82         17.00 dB
PL83         17.00 dB
PL84         17.00 dB
PL85         17.00 dB
PL86         17.00 dB
PL87         17.00 dB
PL88         17.00 dB
PL89         17.00 dB
PL90         17.00 dB
PL91         17.00 dB
PL92         17.00 dB
PL93         17.00 dB
PL94         17.00 dB
PL95         17.00 dB
PL96         17.00 dB
PL97         17.00 dB
PL98         17.00 dB
PL99         17.00 dB
PL100        17.00 dB
PL101        17.00 dB
PL102        17.00 dB
PL103        17.00 dB
PL104        17.00 dB
PL105        17.00 dB
PL106        17.00 dB
PL107        17.00 dB
PL108        17.00 dB
PL109        17.00 dB
PL110        17.00 dB
PL111        17.00 dB
PL112        17.00 dB
PL113        17.00 dB
PL114        17.00 dB
PL115        17.00 dB
PL116        17.00 dB
PL117        17.00 dB
PL118        17.00 dB
PL119        17.00 dB
PL120        17.00 dB
PL121        17.00 dB
PL122        17.00 dB
PL123        17.00 dB
PL124        17.00 dB
PL125        17.00 dB
PL126        17.00 dB
PL127        17.00 dB
PL128        17.00 dB
PL129        17.00 dB
PL130        17.00 dB
PL131        17.00 dB
PL132        17.00 dB
PL133        17.00 dB
PL134        17.00 dB
PL135        17.00 dB
PL136        17.00 dB
PL137        17.00 dB
PL138        17.00 dB
PL139        17.00 dB
PL140        17.00 dB
PL141        17.00 dB
PL142        17.00 dB
PL143        17.00 dB
PL144        17.00 dB
PL145        17.00 dB
PL146        17.00 dB
PL147        17.00 dB
PL148        17.00 dB
PL149        17.00 dB
PL150        17.00 dB
PL151        17.00 dB
PL152        17.00 dB
PL153        17.00 dB
PL154        17.00 dB
PL155        17.00 dB
PL156        17.00 dB
PL157        17.00 dB
PL158        17.00 dB
PL159        17.00 dB
PL160        17.00 dB
PL161        17.00 dB
PL162        17.00 dB
PL163        17.00 dB
PL164        17.00 dB
PL165        17.00 dB
PL166        17.00 dB
PL167        17.00 dB
PL168        17.00 dB
PL169        17.00 dB
PL170        17.00 dB
PL171        17.00 dB
PL172        17.00 dB
PL173        17.00 dB
PL174        17.00 dB
PL175        17.00 dB
PL176        17.00 dB
PL177        17.00 dB
PL178        17.00 dB
PL179        17.00 dB
PL180        17.00 dB
PL181        17.00 dB
PL182        17.00 dB
PL183        17.00 dB
PL184        17.00 dB
PL185        17.00 dB
PL186        17.00 dB
PL187        17.00 dB
PL188        17.00 dB
PL189        17.00 dB
PL190        17.00 dB
PL191        17.00 dB
PL192        17.00 dB
PL193        17.00 dB
PL194        17.00 dB
PL195        17.00 dB
PL196        17.00 dB
PL197        17.00 dB
PL198        17.00 dB
PL199        17.00 dB
PL200        17.00 dB
PL201        17.00 dB
PL202        17.00 dB
PL203        17.00 dB
PL204        17.00 dB
PL205        17.00 dB
PL206        17.00 dB
PL207        17.00 dB
PL208        17.00 dB
PL209        17.00 dB
PL210        17.00 dB
PL211        17.00 dB
PL212        17.00 dB
PL213        17.00 dB
PL214        17.00 dB
PL215        17.00 dB
PL216        17.00 dB
PL217        17.00 dB
PL218        17.00 dB
PL219        17.00 dB
PL220        17.00 dB
PL221        17.00 dB
PL222        17.00 dB
PL223        17.00 dB
PL224        17.00 dB
PL225        17.00 dB
PL226        17.00 dB
PL227        17.00 dB
PL228        17.00 dB
PL229        17.00 dB
PL230        17.00 dB
PL231        17.00 dB
PL232        17.00 dB
PL233        17.00 dB
PL234        17.00 dB
PL235        17.00 dB
PL236        17.00 dB
PL237        17.00 dB
PL238        17.00 dB
PL239        17.00 dB
PL240        17.00 dB
PL241        17.00 dB
PL242        17.00 dB
PL243        17.00 dB
PL244        17.00 dB
PL245        17.00 dB
PL246        17.00 dB
PL247        17.00 dB
PL248        17.00 dB
PL249        17.00 dB
PL250        17.00 dB
PL251        17.00 dB
PL252        17.00 dB
PL253        17.00 dB
PL254        17.00 dB
PL255        17.00 dB
PL256        17.00 dB
PL257        17.00 dB
PL258        17.00 dB
PL259        17.00 dB
PL260        17.00 dB
PL261        17.00 dB
PL262        17.00 dB
PL263        17.00 dB
PL264        17.00 dB
PL265        17.00 dB
PL266        17.00 dB
PL267        17.00 dB
PL268        17.00 dB
PL269        17.00 dB
PL270        17.00 dB
PL271        17.00 dB
PL272        17.00 dB
PL273        17.00 dB
PL274        17.00 dB
PL275        17.00 dB
PL276        17.00 dB
PL277        17.00 dB
PL278        17.00 dB
PL279        17.00 dB
PL280        17.00 dB
PL281        17.00 dB
PL282        17.00 dB
PL283        17.00 dB
PL284        17.00 dB
PL285        17.00 dB
PL286        17.00 dB
PL287        17.00 dB
PL288        17.00 dB
PL289        17.00 dB
PL290        17.00 dB
PL291        17.00 dB
PL292        17.00 dB
PL293        17.00 dB
PL294        17.00 dB
PL295        17.00 dB
PL296        17.00 dB
PL297        17.00 dB
PL298        17.00 dB
PL299        17.00 dB
PL300        17.00 dB
PL301        17.00 dB
PL302        17.00 dB
PL303        17.00 dB
PL304        17.00 dB
PL305        17.00 dB
PL306        17.00 dB
PL307        17.00 dB
PL308        17.00 dB
PL309        17.00 dB
PL310        17.00 dB
PL311        17.00 dB
PL312        17.00 dB
PL313        17.00 dB
PL314        17.00 dB
PL315        17.00 dB
PL316        17.00 dB
PL317        17.00 dB
PL318        17.00 dB
PL319        17.00 dB
PL320        17.00 dB
PL321        17.00 dB
PL322        17.00 dB
PL323        17.00 dB
PL324        17.00 dB
PL325        17.00 dB
PL326        17.00 dB
PL327        17.00 dB
PL328        17.00 dB
PL329        17.00 dB
PL330        17.00 dB
PL331        17.00 dB
PL332        17.00 dB
PL333        17.00 dB
PL334        17.00 dB
PL335        17.00 dB
PL336        17.00 dB
PL337        17.00 dB
PL338        17.00 dB
PL339        17.00 dB
PL340        17.00 dB
PL341        17.00 dB
PL342        17.00 dB
PL343        17.00 dB
PL344        17.00 dB
PL345        17.00 dB
PL346        17.00 dB
PL347        17.00 dB
PL348        17.00 dB
PL349        17.00 dB
PL350        17.00 dB
PL351        17.00 dB
PL352        17.00 dB
PL353        17.00 dB
PL354        17.00 dB
PL355        17.00 dB
PL356        17.00 dB
PL357        17.00 dB
PL358        17.00 dB
PL359        17.00 dB
PL360        17.00 dB
PL361        17.00 dB
PL362        17.00 dB
PL363        17.00 dB
PL364        17.00 dB
PL365        17.00 dB
PL366        17.00 dB
PL367        17.00 dB
PL368        17.00 dB
PL369        17.00 dB
PL370        17.00 dB
PL371        17.00 dB
PL372        17.00 dB
PL373        17.00 dB
PL374        17.00 dB
PL375        17.00 dB
PL376        17.00 dB
PL377        17.00 dB
PL378        17.00 dB
PL379        17.00 dB
PL380        17.00 dB
PL381        17.00 dB
PL382        17.00 dB
PL383        17.00 dB
PL384        17.00 dB
PL385        17.00 dB
PL386        17.00 dB
PL387        17.00 dB
PL388        17.00 dB
PL389        17.00 dB
PL390        17.00 dB
PL391        17.00 dB
PL392        17.00 dB
PL393        17.00 dB
PL394        17.00 dB
PL395        17.00 dB
PL396        17.00 dB
PL397        17.00 dB
PL398        17.00 dB
PL399        17.00 dB
PL400        17.00 dB
PL401        17.00 dB
PL402        17.00 dB
PL403        17.00 dB
PL404        17.00 dB
PL405        17.00 dB
PL406        17.00 dB
PL407        17.00 dB
PL408        17.00 dB
PL409        17.00 dB
PL410        17.00 dB
PL411        17.00 dB
PL412        17.00 dB
PL413        17.00 dB
PL414        17.00 dB
PL415        17.00 dB
PL416        17.00 dB
PL417        17.00 dB
PL418        17.00 dB
PL419        17.00 dB
PL420        17.00 dB
PL421        17.00 dB
PL422        17.00 dB
PL423        17.00 dB
PL424        17.00 dB
PL425        17.00 dB
PL426        17.00 dB
PL427        17.00 dB
PL428        17.00 dB
PL429        17.00 dB
PL430        17.00 dB
PL431        17.00 dB
PL432        17.00 dB
PL433        17.00 dB
PL434        17.00 dB
PL435        17.00 dB
PL436        17.00 dB
PL437        17.00 dB
PL438        17.00 dB
PL439        17.00 dB
PL440        17.00 dB
PL441        17.00 dB
PL442        17.00 dB
PL443        17.00 dB
PL444        17.00 dB
PL445        17.00 dB
PL446        17.00 dB
PL447        17.00 dB
PL448        17.00 dB
PL449        17.00 dB
PL450        17.00 dB
PL451        17.00 dB
PL452        17.00 dB
PL453        17.00 dB
PL454        17.00 dB
PL455        17.00 dB
PL456        17.00 dB
PL457        17.00 dB
PL458        17.00 dB
PL459        17.00 dB
PL460        17.00 dB
PL461        17.00 dB
PL462        17.00 dB
PL463        17.00 dB
PL464        17.00 dB
PL465        17.00 dB
PL466        17.00 dB
PL467        17.00 dB
PL468        17.00 dB
PL469        17.00 dB
PL470        17.00 dB
PL471        17.00 dB
PL472        17.00 dB
PL473        17.00 dB
PL474        17.00 dB
PL475        17.00 dB
PL476        17.00 dB
PL477        17.00 dB
PL478        17.00 dB
PL479        17.00 dB
PL480        17.00 dB
PL481        17.00 dB
PL482        17.00 dB
PL483        17.00 dB
PL484        17.00 dB
PL485        17.00 dB
PL486        17.00 dB
PL487        17.00 dB
PL488        17.00 dB
PL489        17.00 dB
PL490        17.00 dB
PL491        17.00 dB
PL492        17.00 dB
PL493        17.00 dB
PL494        17.00 dB
PL495        17.00 dB
PL496        17.00 dB
PL497        17.00 dB
PL498        17.00 dB
PL499        17.00 dB
PL500        17.00 dB
    
```

14.07
19.12
22.61
27.51
28.82
28.95
29.07
31.76

76.57
77.00
77.42
81.66

99.45

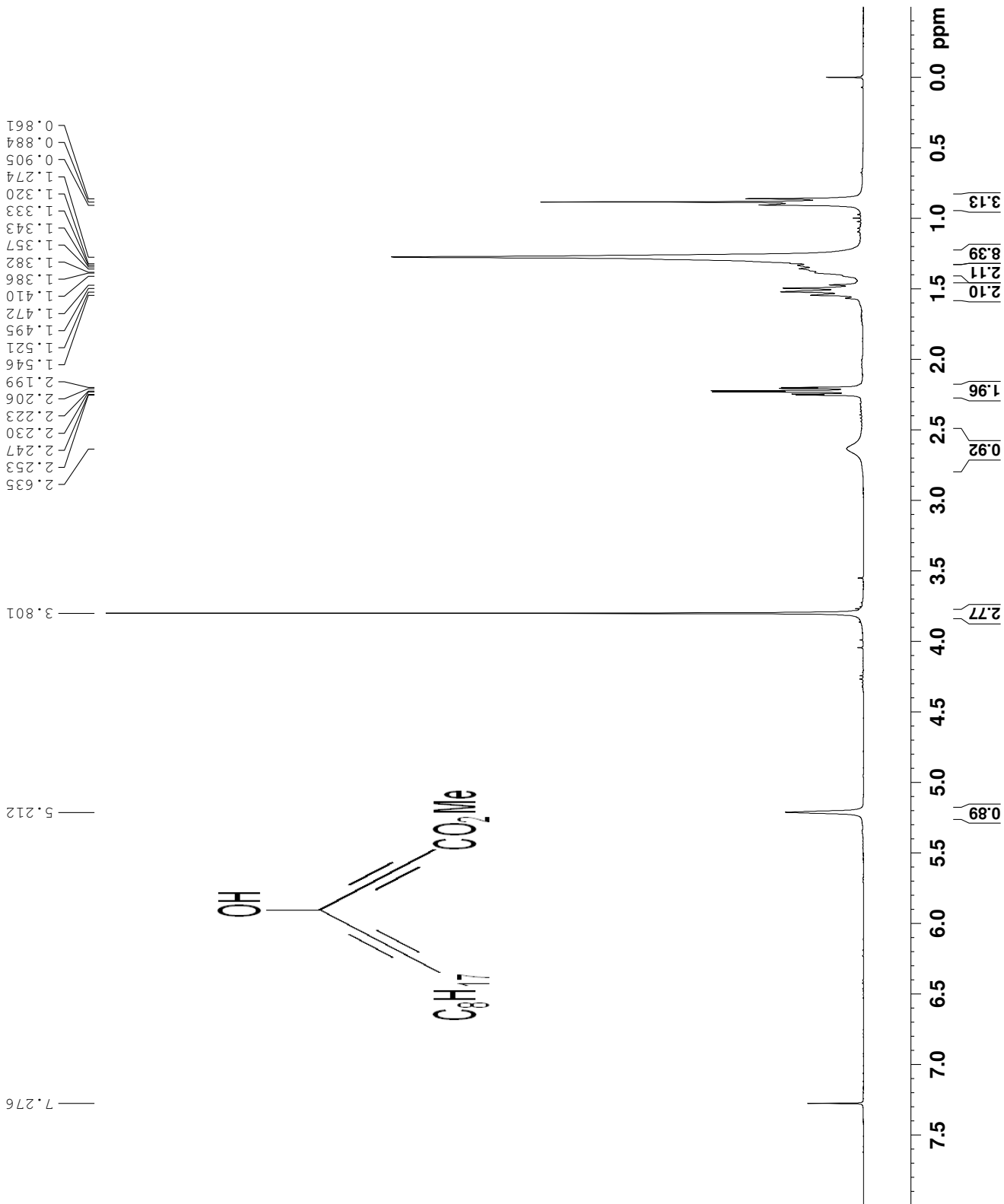
177.30



```

NAME          U81ZJ0
EXPNO         3
PROCNO        1
Date_         20081230
Time          17.23
INSTRUM       spect
PROBHD        5 mm PABBO BB-
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            8
DS            2
SWH           6188.119 Hz
FIDRES        0.094423 Hz
AQ            5.2953587 sec
RG            36
DW            80.800 usec
DE            6.50 usec
TE            290.0 K
D1            1.00000000 sec
TD0           1

===== CHANNEL f1 =====
NUC1          1H
P1            11.80 usec
PL1           0.00 dB
PL1W          11.55467796 W
SF01          300.1318534 MHz
SI            32768
SF            300.1299972 MHz
EM
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
    
```



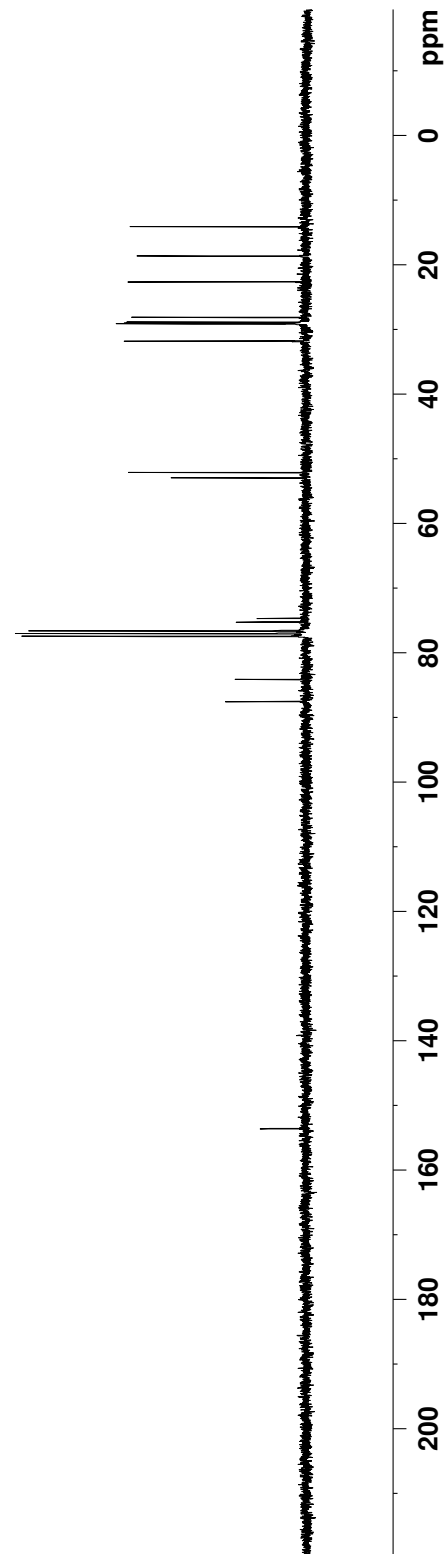
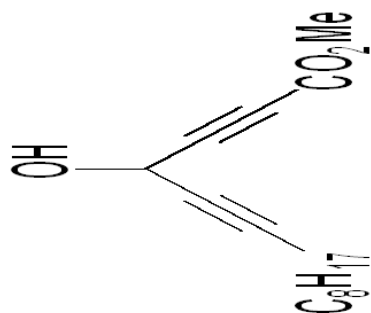
```

NAME          081230
EXPNO         4
PROCNO        1
Date_         20081230
Time_         17.31
INSTRUM       spect
PROBHD        5 mm PABBO BB-
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            105
DS            4
SMH           18028.846 Hz
FIDRES        0.275098 Hz
AQ            1.8175818 sec
RG            203
DM            27.733 usec
DE            6.50 usec
TE            290.7 K
D1            2.0000000 sec
D11           0.0300000 sec
TD0           1

===== CHANNEL f1 =====
NUC1          13C
P1            9.70 usec
PL1           0.00 dB
P1LW         29.38907051 W
SFO1          75.4752953 MHz

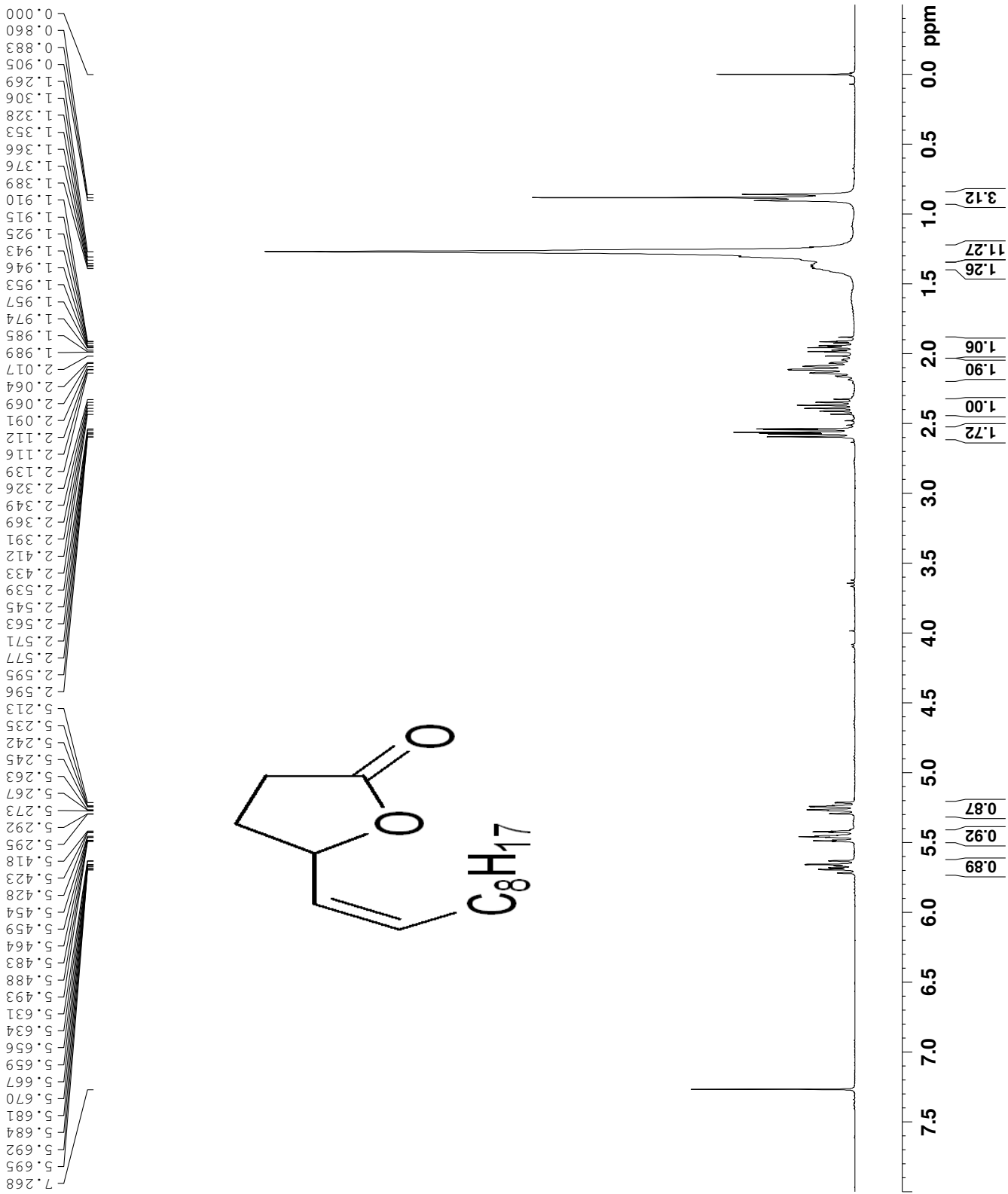
===== CHANNEL f2 =====
CPDPRG2       waitz16
NUC2          1H
PCPD2        80.00 usec
PL2           1.00 dB
P1L2         17.00 dB
P1L3         17.00 dB
P1L4         17.00 dB
P1L5         17.00 dB
P1L6         17.00 dB
P1L7         17.00 dB
P1L8         17.00 dB
P1L9         17.00 dB
P1L10        17.00 dB
P1L11        17.00 dB
P1L12        17.00 dB
P1L13        17.00 dB
P1L14        17.00 dB
P1L15        17.00 dB
P1L16        17.00 dB
P1L17        17.00 dB
P1L18        17.00 dB
P1L19        17.00 dB
P1L20        17.00 dB
SFO2          300.1312005 MHz
SI            32768
SF            75.4677514 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
    
```

153.58
 87.55
 84.09
 77.42
 77.00
 76.58
 75.21
 74.65
 52.92
 52.07
 31.76
 29.09
 28.99
 28.81
 28.10
 22.60
 18.62
 14.05



NAME UYU1U9
EXPNO 6
PROCNO 1
Date_ 20090108
Time 20.17
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 2
SWH 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 114
DW 80.800 usec
DE 6.50 usec
TE 289.8 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 11.80 usec
PL1 0.00 dB
PL1W 11.55467796 W
SF01 300.1318534 MHz
SI 32768
SF 300.1299998 MHz
EM
WDW 0
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



```
NAME 090108
EXPNO 7
PROCNO 1
Date_ 20090108
Time_ 20.38
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65336
SOLVENT CDCl3
NS 144
DS 4
SWH 18028.846 Hz
FIDRES 0.275098 Hz
AQ 1.8175818 sec
RG 203
DW 27.733 usec
DE 6.50 usec
TE 290.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.70 usec
PL1 0.00 dB
PL1W 29.38907051 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waitz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL2 17.00 dB
PL1 2 17.00 dB
PL1 3 17.00 dB
PL1 2W 9.17820644 W
PL1 2M 0.23854613 W
PL1 3W 0.23854613 W
SFO2 300.1312005 MHz
SI 32968
SF 75.4677503 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
```

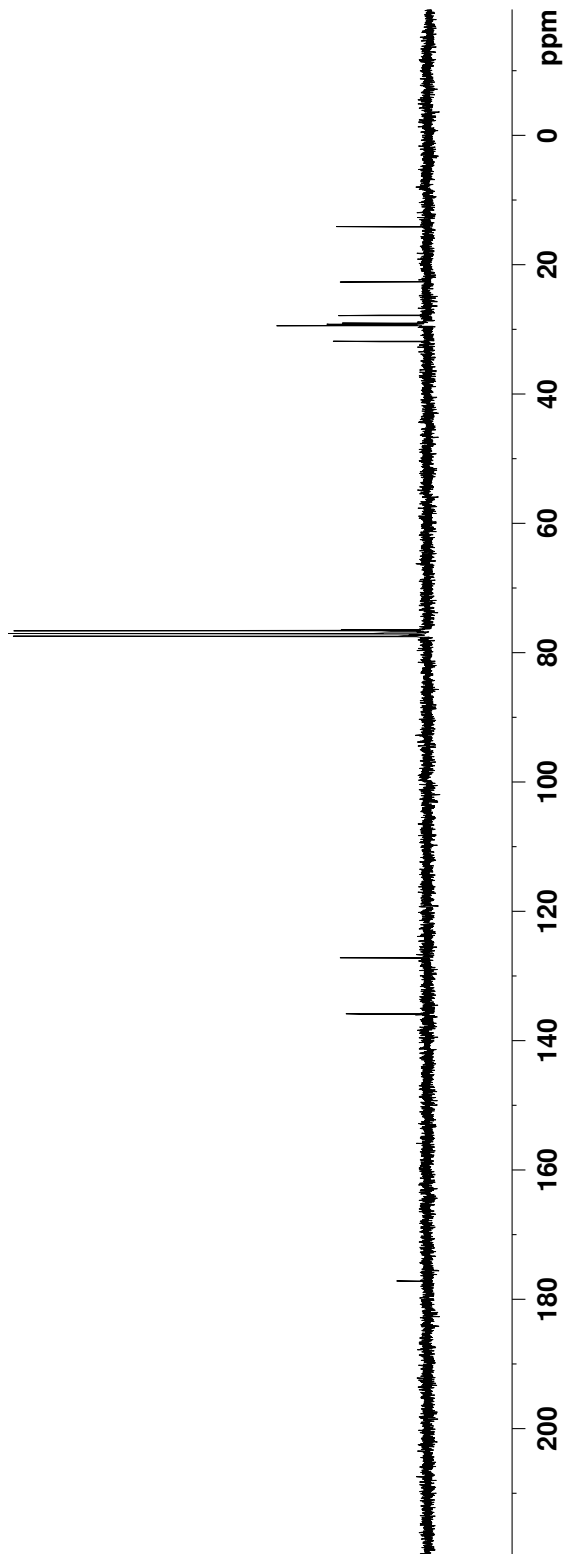
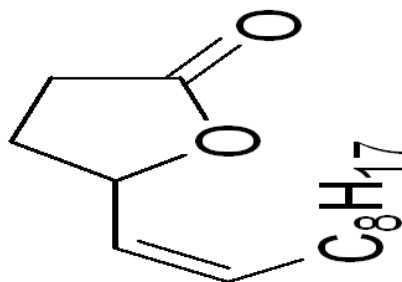
14.08
22.63
27.80
29.01
29.17
29.21
29.21
29.29
29.38
31.83

76.42
76.58
77.00
77.42

127.16

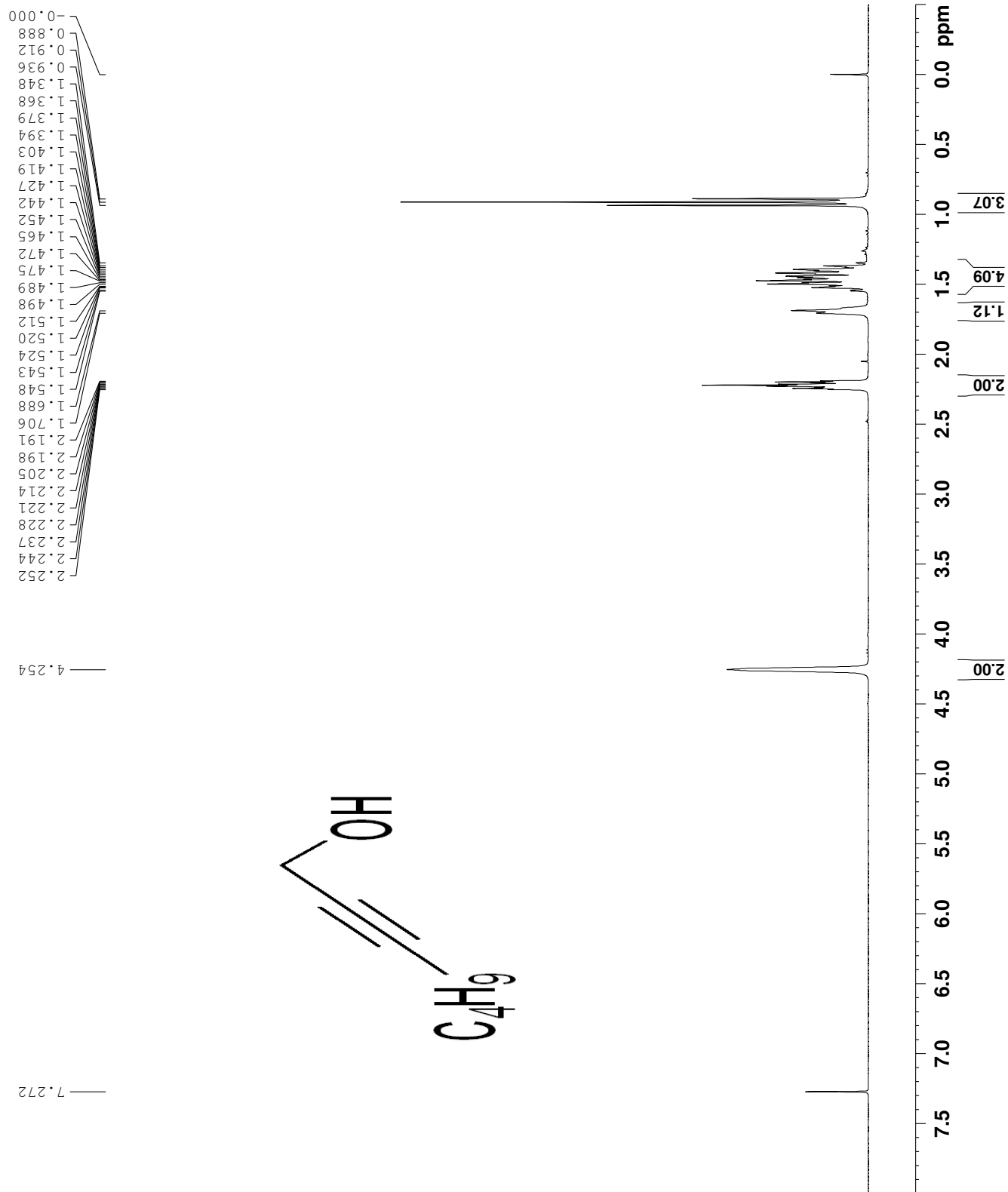
135.86

177.17



NAME 4-¹³C-γ-lactone
 EXPNO 3
 PROCNO 1
 Date_ 20081209
 Time 21.02
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 ID CDC13
 NS 8
 DS 0
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 80.6
 DW 80.800 usec
 DE 6.50 usec
 TE 290.4 K
 D1 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 11.80 usec
 PL1 0.00 dB
 PL1W 11.55467796 W
 SF01 300.1318534 MHz
 SI 32768
 SF 300.1299985 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

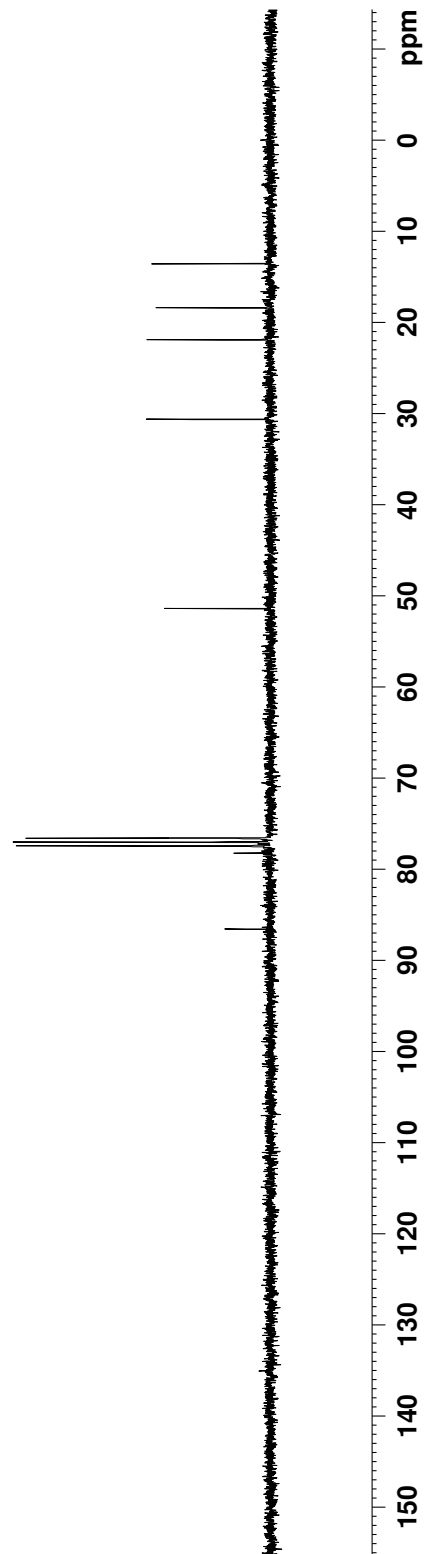
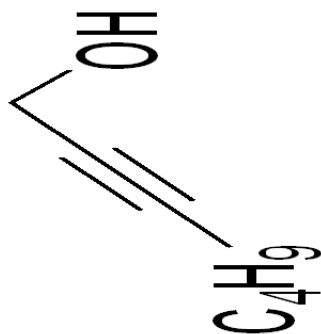


```
NAME C4-C7-lactone
EXPNO 4
PROCNO 1
Date_ 20081209
Time_ 21.09
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65336
SOLVENT CDCl3
NS 38
DS 0
SWH 18028.846 Hz
FIDRES 0.275098 Hz
AQ 1.8175818 sec
RG 203
DW 27.733 usec
DE 6.50 usec
TE 290.7 K
D1 2.0000000 sec
D11 0.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.70 usec
PL1 0.00 dB
PL1W 29.38907051 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waitz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL2 17.00 dB
PL1 17.00 dB
PL1W 9.17820644 W
PL2W 0.23854613 W
PL13W 0.23854613 W
SFO2 300.1312005 MHz
SI 32968
SF 75.4677509 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
```

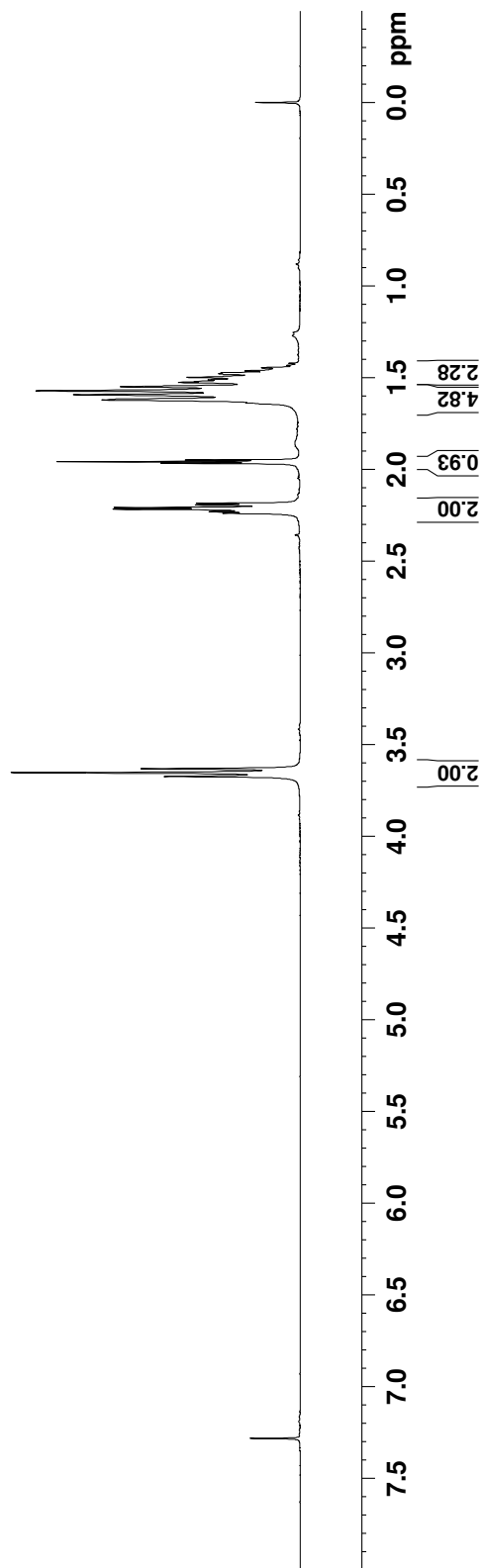
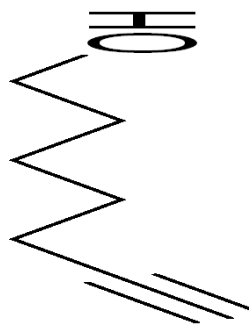
86.56
78.21
77.42
77.00
76.57
51.37
30.60
21.88
18.37
13.54



NAME 4- α -lactone
EXPNO 10
PROCNO 1
Date_ 20081219
Time 10.47
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 0
SWH 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 57
DW 80.800 usec
DE 6.50 usec
TE 289.7 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 11.80 usec
PL1 0.00 dB
PL1W 11.55467796 W
SF01 300.1318534 MHz
SI 32768
SF 300.1299962 MHz
EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

7.281
3.674
3.654
3.632
2.239
2.231
2.217
2.208
2.194
2.186
1.967
1.958
1.949
1.637
1.621
1.593
1.571
1.549
1.526
1.520
1.512
1.498
1.478
1.474
1.463



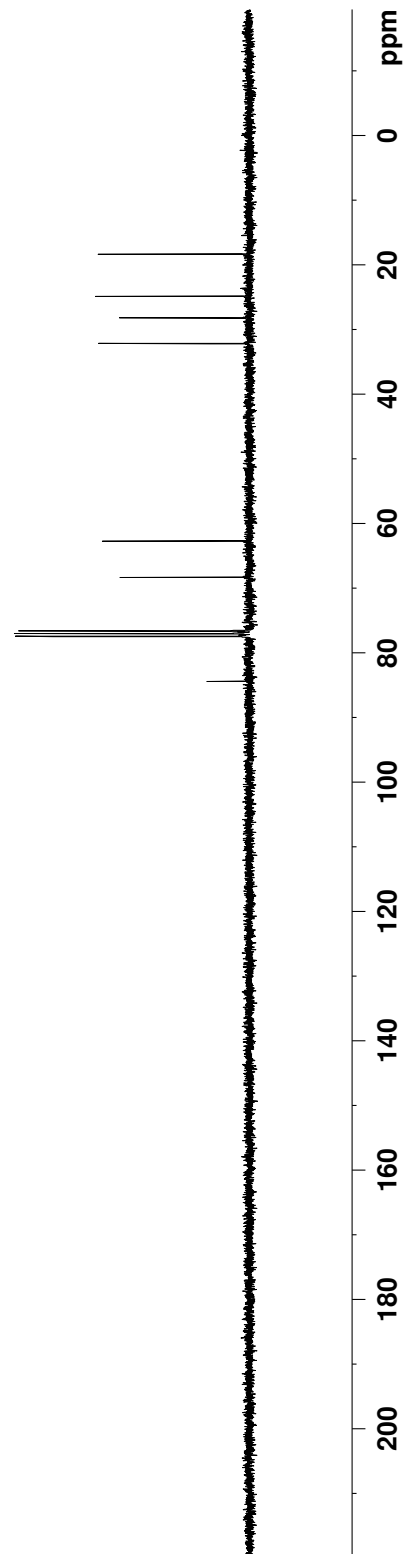
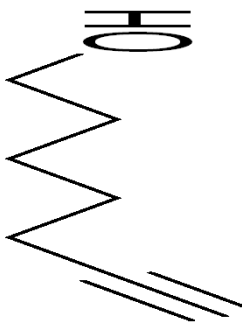
NAME C4-C7-lactone
EXPNO 11
PROCNO 1
Date_ 20081219
Time_ 10.47
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65336
SOLVENT CDCl3
NS 40
DS 0
SWH 18028.846 Hz
FIDRES 0.275098 Hz
AQ 1.8175818 sec
RG 203
DM 27.733 usec
DE 6.50 usec
TE 289.6 K
D1 2.0000000 sec
D11 0.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.70 usec
PL1 0.00 dB
PL1W 29.38907051 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waitz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL2 17.00 dB
PL1 2 17.00 dB
PL1 3 17.00 dB
PL1 2W 9.17820644 W
PL1 2W 0.23854613 W
PL1 3W 0.23854613 W
SFO2 300.1312005 MHz
SI 32968
SF 75.4677520 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

18.31
24.83
28.15
32.13

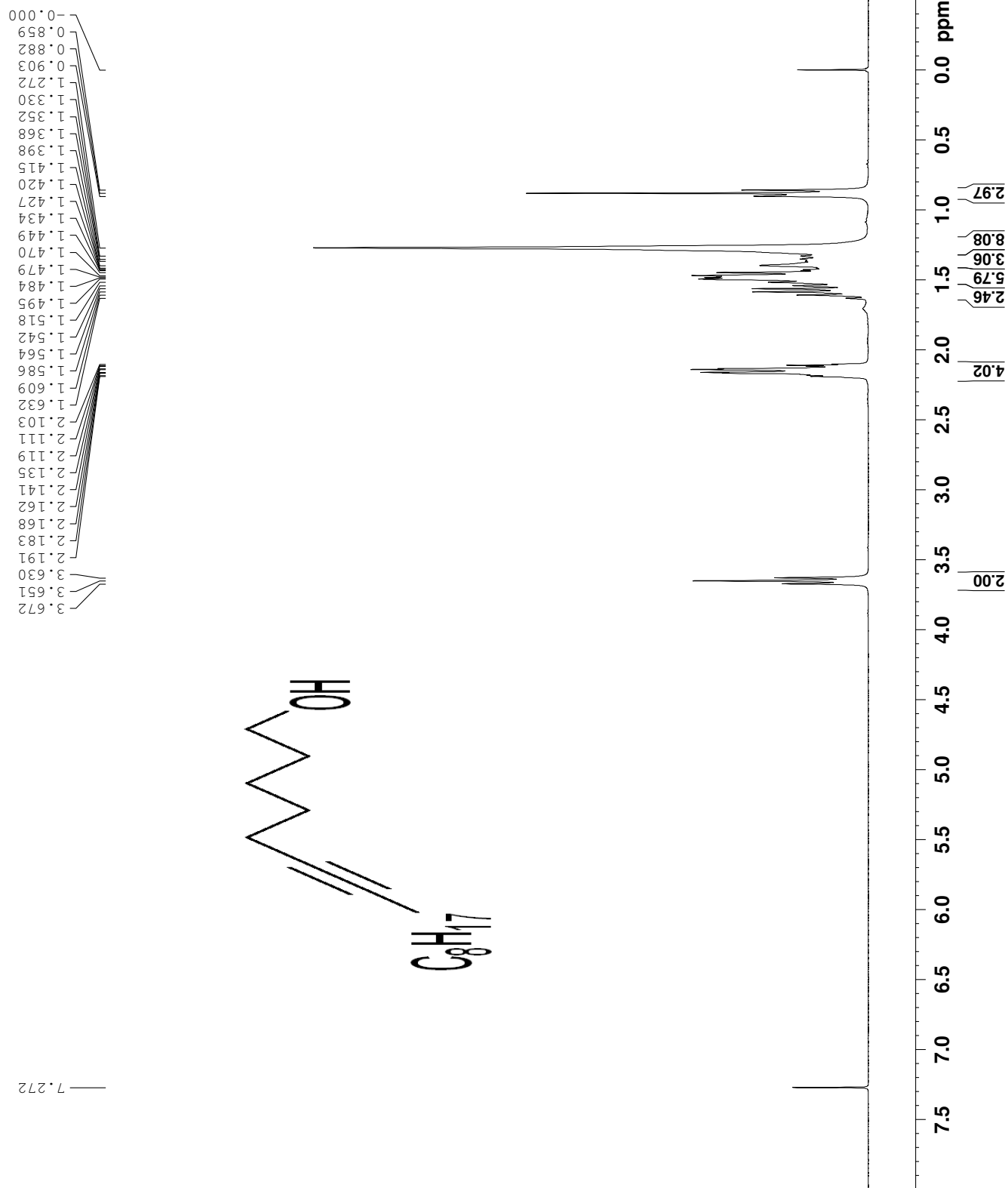
62.68
68.29
76.58
77.00
77.42
84.40



```

NAME          U11718
EXPNO         1
PROCNO        1
Date_         20081218
Time          16.53
INSTRUM       spect
PROBHD        5 mm PABBO BB-
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            8
DS            0
SWH           6188.119 Hz
FIDRES        0.094423 Hz
AQ            5.2953587 sec
RG            45.2
DW            80.800 usec
DE            6.50 usec
TE            290.4 K
D1            1.00000000 sec
TD0           1

===== CHANNEL f1 =====
NUC1          1H
P1            11.80 usec
PL1           0.00 dB
PL1W          11.55467796 W
SF01          300.1318534 MHz
SI            32768
SF            300.1299988 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
    
```



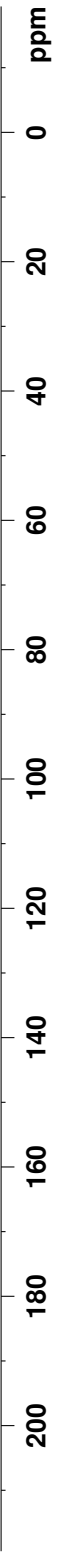
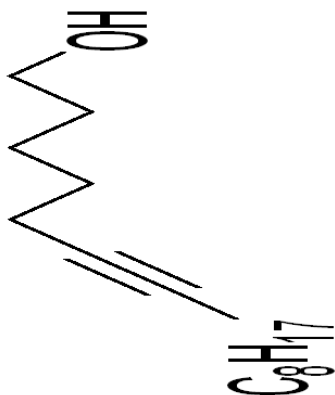
```
NAME 081218
EXPNO 2
PROCNO 1
Date_ 20081218
Time_ 16:56
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65336
SOLVENT CDCl3
NS 65
DS 0
SWH 18028.846 Hz
FIDRES 0.275098 Hz
AQ 1.8175818 sec
RG 203
DW 27.733 usec
DE 6.50 usec
TE 290.4 K
D1 2.0000000 sec
D11 0.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.70 usec
PL1 0.00 dB
PL1W 29.38907051 W
SFO1 75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2 waitz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL2 1.00 dB
PL1 2 17.00 dB
PL1 3 17.00 dB
PL1 2W 9.17820644 W
PL1 2M 0.23854613 W
PL1 3W 0.23854613 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677503 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.10
```

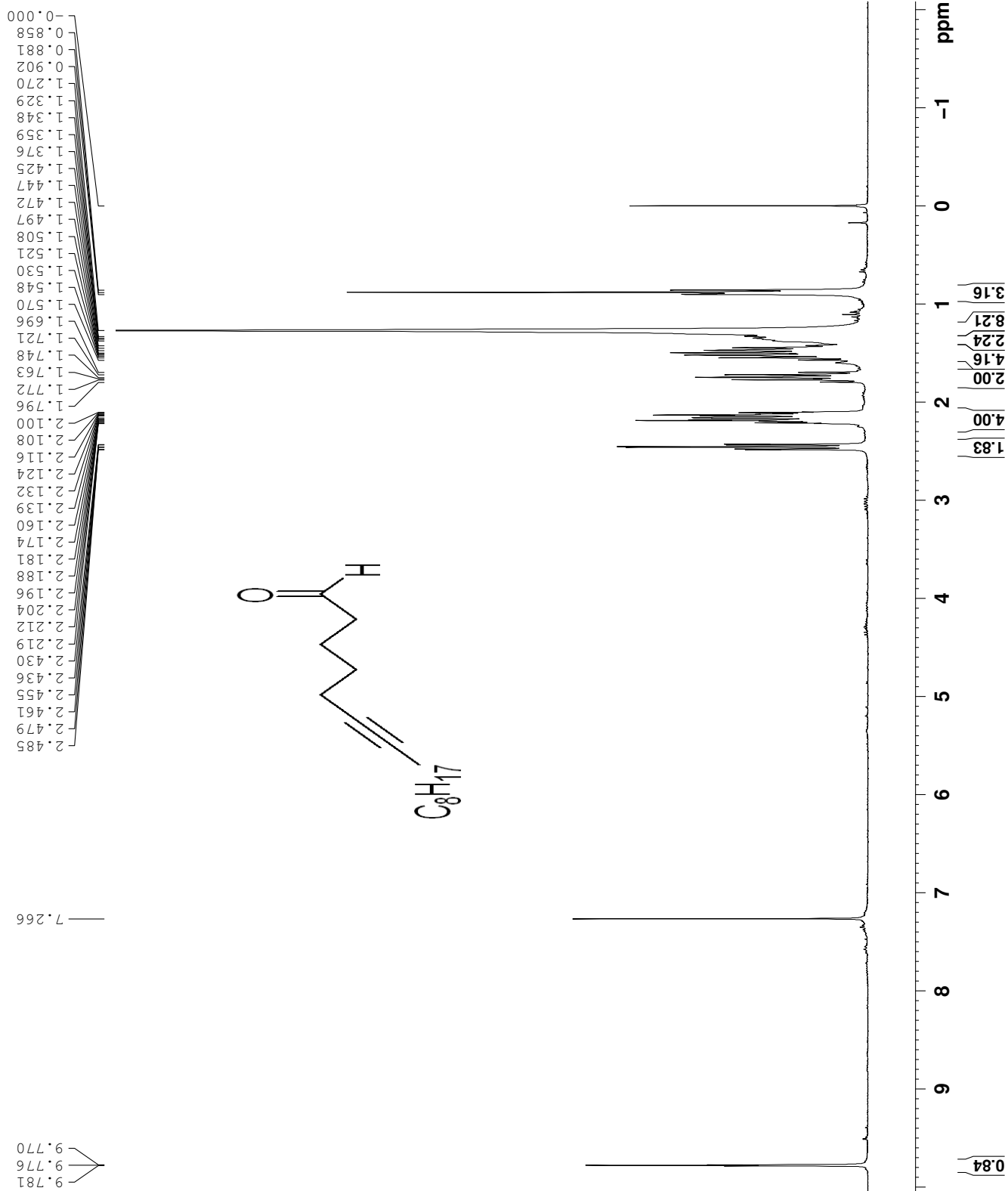
32.27
31.82
29.20
29.12
29.10
28.86
24.93
24.10
22.64
18.72
18.70
14.09

80.48
79.82
77.42
77.00
76.58
62.87



NAME C4-C7-lactone
EXPNO 12
PROCNO 1
Date_ 20081222
Time 16.51
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 0
SWH 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 203
DW 80.800 usec
DE 6.50 usec
TE 289.7 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 11.80 usec
PL1 0.00 dB
PL1W 11.55467796 W
SF01 300.1318534 MHz
SI 32768
SF 300.1300005 MHz
EM
WDW 0
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



```

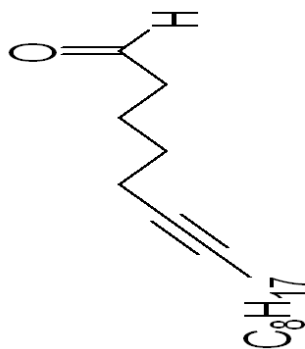
NAME C4-C7-lactone
EXPNO 13
PROCNO 1
Date_ 20081222
Time_ 16:55
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65336
SOLVENT CDCl3
NS 187
DS 0
SWH 18028.846 Hz
FIDRES 0.275098 Hz
AQ 1.8175818 sec
RG 203
DW 27.733 usec
DE 6.50 usec
TE 290.4 K
D1 2.0000000 sec
D11 0.0300000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.70 usec
PL1 0.00 dB
PL1W 29.38907051 W
SFO1 75.4752953 MHz

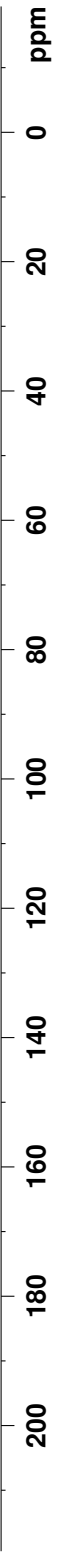
===== CHANNEL f2 =====
CPDPRG2 waitz16
NUC2 1H
PCPD2 80.00 usec
PL2 1.00 dB
PL2 17.00 dB
PL1 17.00 dB
PL2W 9.17820644 W
PL1W 0.23054613 W
SFO2 300.1312005 MHz
SI 32768
SF 75.4677498 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
    
```

43.39
 31.83
 29.20
 29.10
 28.87
 28.43
 22.65
 21.21
 18.71
 18.51
 14.10

80.91
 79.21
 77.42
 77.00
 76.58



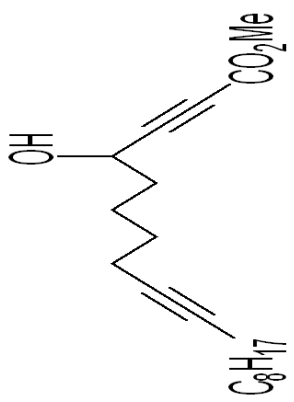
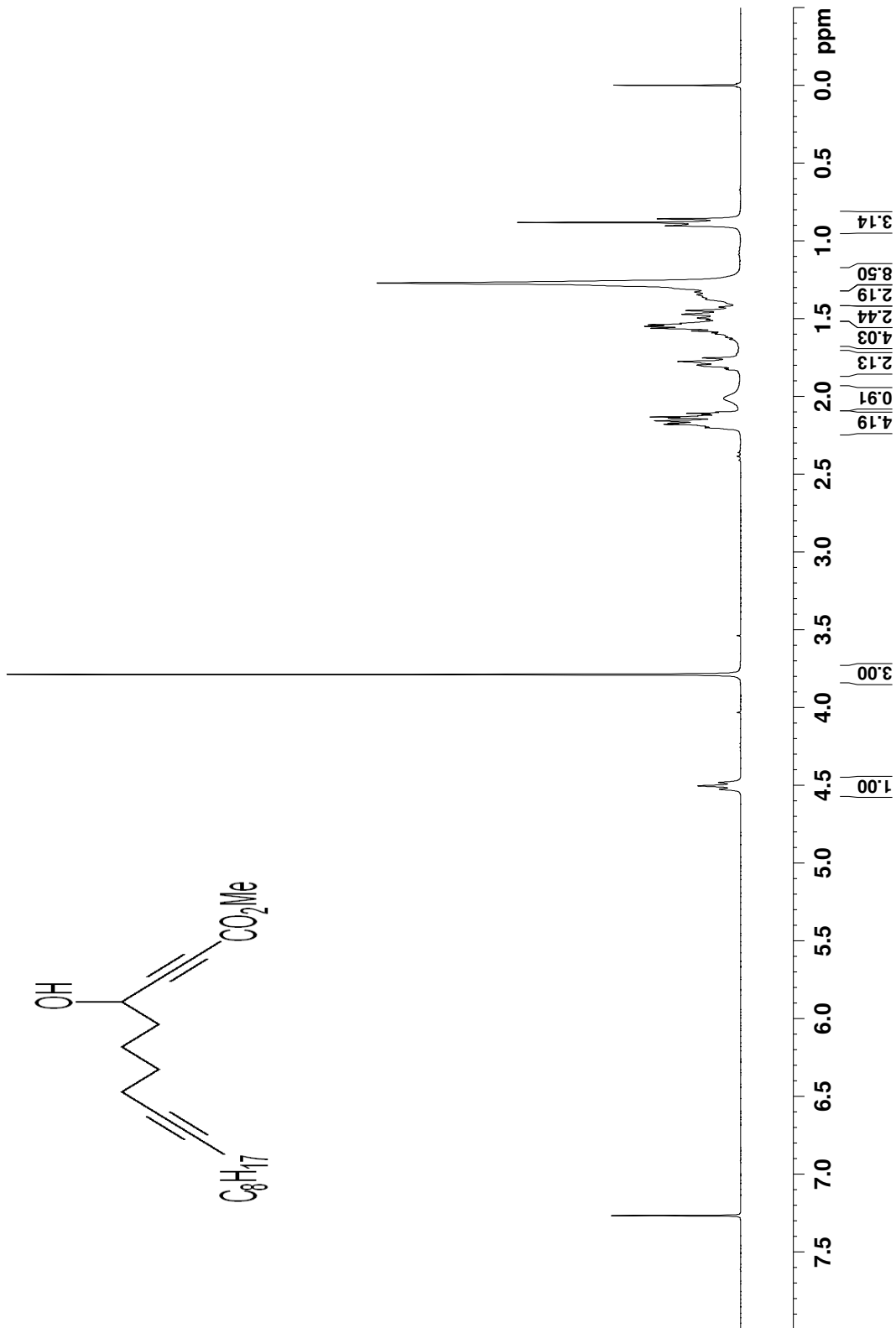
202.49



NAME: C4-C7-lactone
 EXPNO: 14
 PROCNO: 1
 Date_: 20081224
 Time: 15.09
 INSTRUM: spect
 PROBD: 5 mm PABBO BB-
 PULPROG: zg30
 ID: 65536
 SOLVENT: CDCl3
 NS: 8
 DS: 0
 SWH: 6188.119 Hz
 FIDRES: 0.094423 Hz
 AQ: 5.2953587 sec
 RG: 80.6
 DW: 80.800 usec
 DE: 6.50 usec
 TE: 290.1 K
 D1: 1.00000000 sec
 TD0: 1

===== CHANNEL f1 =====
 NUC1: 1H
 P1: 11.80 usec
 PL1: 0.00 dB
 PL1W: 11.55467796 W
 SF01: 300.1318534 MHz
 SI: 32768
 SF: 300.1300002 MHz
 EM:
 WDW: 0
 SSB: 0
 LB: 0.30 Hz
 GB: 0
 PC: 1.00

7.267
 4.526
 4.505
 4.483
 3.788
 2.202
 2.194
 2.180
 2.172
 2.157
 2.139
 2.132
 2.125
 2.116
 2.109
 2.101
 2.013
 1.827
 1.821
 1.799
 1.775
 1.753
 1.632
 1.620
 1.612
 1.598
 1.591
 1.579
 1.562
 1.550
 1.540
 1.531
 1.508
 1.496
 1.472
 1.448
 1.426
 1.375
 1.360
 1.347
 1.329
 1.271



```

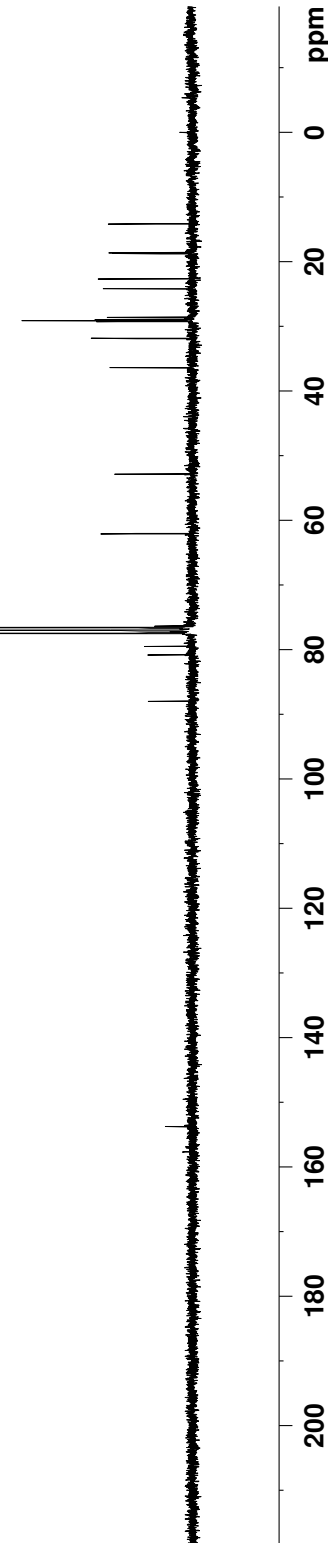
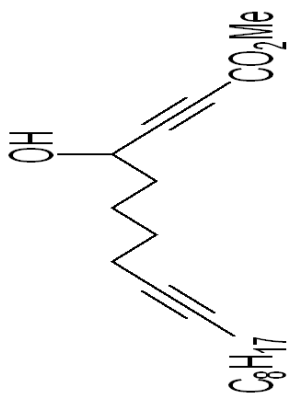
NAME      C4-C7-lactone
EXPNO    15
PROCNO   1
Date_    20081224
Time_    15.13
INSTRUM  spect
PROBHD   5 mm PABBO BB-
PULPROG  zgpg30
TD        65536
SOLVENT  CDCl3
NS        240
DS        0
SWH       18028.846 Hz
FIDRES   0.275098 Hz
AQ        1.8175818 sec
RG        203
DM        27.733 usec
DE        6.50 usec
TE        290.9 K
D1        2.0000000 sec
D11       0.0300000 sec
TD0       1

===== CHANNEL f1 =====
NUC1      13C
P1        9.70 usec
PL1       0.00 dB
PL1W      29.38907051 W
SFO1      75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2  waitz16
NUC2      1H
PCPD2     80.00 usec
PL2       1.00 dB
PL2W      17.00 dB
PL12      17.00 dB
PL13      17.00 dB
PL14      17.00 dB
PL15      17.00 dB
PL16      17.00 dB
PL17      17.00 dB
PL18      17.00 dB
PL19      17.00 dB
PL20      17.00 dB
PL21      17.00 dB
PL22      17.00 dB
PL23      17.00 dB
PL24      17.00 dB
PL25      17.00 dB
PL26      17.00 dB
PL27      17.00 dB
PL28      17.00 dB
PL29      17.00 dB
PL30      17.00 dB
PL31      17.00 dB
PL32      17.00 dB
PL33      17.00 dB
PL34      17.00 dB
PL35      17.00 dB
PL36      17.00 dB
PL37      17.00 dB
PL38      17.00 dB
PL39      17.00 dB
PL40      17.00 dB
PL41      17.00 dB
PL42      17.00 dB
PL43      17.00 dB
PL44      17.00 dB
PL45      17.00 dB
PL46      17.00 dB
PL47      17.00 dB
PL48      17.00 dB
PL49      17.00 dB
PL50      17.00 dB
PL51      17.00 dB
PL52      17.00 dB
PL53      17.00 dB
PL54      17.00 dB
PL55      17.00 dB
PL56      17.00 dB
PL57      17.00 dB
PL58      17.00 dB
PL59      17.00 dB
PL60      17.00 dB
PL61      17.00 dB
PL62      17.00 dB
PL63      17.00 dB
PL64      17.00 dB
PL65      17.00 dB
PL66      17.00 dB
PL67      17.00 dB
PL68      17.00 dB
PL69      17.00 dB
PL70      17.00 dB
PL71      17.00 dB
PL72      17.00 dB
PL73      17.00 dB
PL74      17.00 dB
PL75      17.00 dB
PL76      17.00 dB
PL77      17.00 dB
PL78      17.00 dB
PL79      17.00 dB
PL80      17.00 dB
PL81      17.00 dB
PL82      17.00 dB
PL83      17.00 dB
PL84      17.00 dB
PL85      17.00 dB
PL86      17.00 dB
PL87      17.00 dB
PL88      17.00 dB
PL89      17.00 dB
PL90      17.00 dB
PL91      17.00 dB
PL92      17.00 dB
PL93      17.00 dB
PL94      17.00 dB
PL95      17.00 dB
PL96      17.00 dB
PL97      17.00 dB
PL98      17.00 dB
PL99      17.00 dB
PL100     17.00 dB
PL101     17.00 dB
PL102     17.00 dB
PL103     17.00 dB
PL104     17.00 dB
PL105     17.00 dB
PL106     17.00 dB
PL107     17.00 dB
PL108     17.00 dB
PL109     17.00 dB
PL110     17.00 dB
PL111     17.00 dB
PL112     17.00 dB
PL113     17.00 dB
PL114     17.00 dB
PL115     17.00 dB
PL116     17.00 dB
PL117     17.00 dB
PL118     17.00 dB
PL119     17.00 dB
PL120     17.00 dB
PL121     17.00 dB
PL122     17.00 dB
PL123     17.00 dB
PL124     17.00 dB
PL125     17.00 dB
PL126     17.00 dB
PL127     17.00 dB
PL128     17.00 dB
PL129     17.00 dB
PL130     17.00 dB
PL131     17.00 dB
PL132     17.00 dB
PL133     17.00 dB
PL134     17.00 dB
PL135     17.00 dB
PL136     17.00 dB
PL137     17.00 dB
PL138     17.00 dB
PL139     17.00 dB
PL140     17.00 dB
PL141     17.00 dB
PL142     17.00 dB
PL143     17.00 dB
PL144     17.00 dB
PL145     17.00 dB
PL146     17.00 dB
PL147     17.00 dB
PL148     17.00 dB
PL149     17.00 dB
PL150     17.00 dB
PL151     17.00 dB
PL152     17.00 dB
PL153     17.00 dB
PL154     17.00 dB
PL155     17.00 dB
PL156     17.00 dB
PL157     17.00 dB
PL158     17.00 dB
PL159     17.00 dB
PL160     17.00 dB
PL161     17.00 dB
PL162     17.00 dB
PL163     17.00 dB
PL164     17.00 dB
PL165     17.00 dB
PL166     17.00 dB
PL167     17.00 dB
PL168     17.00 dB
PL169     17.00 dB
PL170     17.00 dB
PL171     17.00 dB
PL172     17.00 dB
PL173     17.00 dB
PL174     17.00 dB
PL175     17.00 dB
PL176     17.00 dB
PL177     17.00 dB
PL178     17.00 dB
PL179     17.00 dB
PL180     17.00 dB
PL181     17.00 dB
PL182     17.00 dB
PL183     17.00 dB
PL184     17.00 dB
PL185     17.00 dB
PL186     17.00 dB
PL187     17.00 dB
PL188     17.00 dB
PL189     17.00 dB
PL190     17.00 dB
PL191     17.00 dB
PL192     17.00 dB
PL193     17.00 dB
PL194     17.00 dB
PL195     17.00 dB
PL196     17.00 dB
PL197     17.00 dB
PL198     17.00 dB
PL199     17.00 dB
PL200     17.00 dB
PL201     17.00 dB
PL202     17.00 dB
PL203     17.00 dB
PL204     17.00 dB
PL205     17.00 dB
PL206     17.00 dB
PL207     17.00 dB
PL208     17.00 dB
PL209     17.00 dB
PL210     17.00 dB
PL211     17.00 dB
PL212     17.00 dB
PL213     17.00 dB
PL214     17.00 dB
PL215     17.00 dB
PL216     17.00 dB
PL217     17.00 dB
PL218     17.00 dB
PL219     17.00 dB
PL220     17.00 dB
PL221     17.00 dB
PL222     17.00 dB
PL223     17.00 dB
PL224     17.00 dB
PL225     17.00 dB
PL226     17.00 dB
PL227     17.00 dB
PL228     17.00 dB
PL229     17.00 dB
PL230     17.00 dB
PL231     17.00 dB
PL232     17.00 dB
PL233     17.00 dB
PL234     17.00 dB
PL235     17.00 dB
PL236     17.00 dB
PL237     17.00 dB
PL238     17.00 dB
PL239     17.00 dB
PL240     17.00 dB
PL241     17.00 dB
PL242     17.00 dB
PL243     17.00 dB
PL244     17.00 dB
PL245     17.00 dB
PL246     17.00 dB
PL247     17.00 dB
PL248     17.00 dB
PL249     17.00 dB
PL250     17.00 dB
PL251     17.00 dB
PL252     17.00 dB
PL253     17.00 dB
PL254     17.00 dB
PL255     17.00 dB
PL256     17.00 dB
PL257     17.00 dB
PL258     17.00 dB
PL259     17.00 dB
PL260     17.00 dB
PL261     17.00 dB
PL262     17.00 dB
PL263     17.00 dB
PL264     17.00 dB
PL265     17.00 dB
PL266     17.00 dB
PL267     17.00 dB
PL268     17.00 dB
PL269     17.00 dB
PL270     17.00 dB
PL271     17.00 dB
PL272     17.00 dB
PL273     17.00 dB
PL274     17.00 dB
PL275     17.00 dB
PL276     17.00 dB
PL277     17.00 dB
PL278     17.00 dB
PL279     17.00 dB
PL280     17.00 dB
PL281     17.00 dB
PL282     17.00 dB
PL283     17.00 dB
PL284     17.00 dB
PL285     17.00 dB
PL286     17.00 dB
PL287     17.00 dB
PL288     17.00 dB
PL289     17.00 dB
PL290     17.00 dB
PL291     17.00 dB
PL292     17.00 dB
PL293     17.00 dB
PL294     17.00 dB
PL295     17.00 dB
PL296     17.00 dB
PL297     17.00 dB
PL298     17.00 dB
PL299     17.00 dB
PL300     17.00 dB
PL301     17.00 dB
PL302     17.00 dB
PL303     17.00 dB
PL304     17.00 dB
PL305     17.00 dB
PL306     17.00 dB
PL307     17.00 dB
PL308     17.00 dB
PL309     17.00 dB
PL310     17.00 dB
PL311     17.00 dB
PL312     17.00 dB
PL313     17.00 dB
PL314     17.00 dB
PL315     17.00 dB
PL316     17.00 dB
PL317     17.00 dB
PL318     17.00 dB
PL319     17.00 dB
PL320     17.00 dB
PL321     17.00 dB
PL322     17.00 dB
PL323     17.00 dB
PL324     17.00 dB
PL325     17.00 dB
PL326     17.00 dB
PL327     17.00 dB
PL328     17.00 dB
PL329     17.00 dB
PL330     17.00 dB
PL331     17.00 dB
PL332     17.00 dB
PL333     17.00 dB
PL334     17.00 dB
PL335     17.00 dB
PL336     17.00 dB
PL337     17.00 dB
PL338     17.00 dB
PL339     17.00 dB
PL340     17.00 dB
PL341     17.00 dB
PL342     17.00 dB
PL343     17.00 dB
PL344     17.00 dB
PL345     17.00 dB
PL346     17.00 dB
PL347     17.00 dB
PL348     17.00 dB
PL349     17.00 dB
PL350     17.00 dB
PL351     17.00 dB
PL352     17.00 dB
PL353     17.00 dB
PL354     17.00 dB
PL355     17.00 dB
PL356     17.00 dB
PL357     17.00 dB
PL358     17.00 dB
PL359     17.00 dB
PL360     17.00 dB
PL361     17.00 dB
PL362     17.00 dB
PL363     17.00 dB
PL364     17.00 dB
PL365     17.00 dB
PL366     17.00 dB
PL367     17.00 dB
PL368     17.00 dB
PL369     17.00 dB
PL370     17.00 dB
PL371     17.00 dB
PL372     17.00 dB
PL373     17.00 dB
PL374     17.00 dB
PL375     17.00 dB
PL376     17.00 dB
PL377     17.00 dB
PL378     17.00 dB
PL379     17.00 dB
PL380     17.00 dB
PL381     17.00 dB
PL382     17.00 dB
PL383     17.00 dB
PL384     17.00 dB
PL385     17.00 dB
PL386     17.00 dB
PL387     17.00 dB
PL388     17.00 dB
PL389     17.00 dB
PL390     17.00 dB
PL391     17.00 dB
PL392     17.00 dB
PL393     17.00 dB
PL394     17.00 dB
PL395     17.00 dB
PL396     17.00 dB
PL397     17.00 dB
PL398     17.00 dB
PL399     17.00 dB
PL400     17.00 dB
PL401     17.00 dB
PL402     17.00 dB
PL403     17.00 dB
PL404     17.00 dB
PL405     17.00 dB
PL406     17.00 dB
PL407     17.00 dB
PL408     17.00 dB
PL409     17.00 dB
PL410     17.00 dB
PL411     17.00 dB
PL412     17.00 dB
PL413     17.00 dB
PL414     17.00 dB
PL415     17.00 dB
PL416     17.00 dB
PL417     17.00 dB
PL418     17.00 dB
PL419     17.00 dB
PL420     17.00 dB
PL421     17.00 dB
PL422     17.00 dB
PL423     17.00 dB
PL424     17.00 dB
PL425     17.00 dB
PL426     17.00 dB
PL427     17.00 dB
PL428     17.00 dB
PL429     17.00 dB
PL430     17.00 dB
PL431     17.00 dB
PL432     17.00 dB
PL433     17.00 dB
PL434     17.00 dB
PL435     17.00 dB
PL436     17.00 dB
PL437     17.00 dB
PL438     17.00 dB
PL439     17.00 dB
PL440     17.00 dB
PL441     17.00 dB
PL442     17.00 dB
PL443     17.00 dB
PL444     17.00 dB
PL445     17.00 dB
PL446     17.00 dB
PL447     17.00 dB
PL448     17.00 dB
PL449     17.00 dB
PL450     17.00 dB
PL451     17.00 dB
PL452     17.00 dB
PL453     17.00 dB
PL454     17.00 dB
PL455     17.00 dB
PL456     17.00 dB
PL457     17.00 dB
PL458     17.00 dB
PL459     17.00 dB
PL460     17.00 dB
PL461     17.00 dB
PL462     17.00 dB
PL463     17.00 dB
PL464     17.00 dB
PL465     17.00 dB
PL466     17.00 dB
PL467     17.00 dB
PL468     17.00 dB
PL469     17.00 dB
PL470     17.00 dB
PL471     17.00 dB
PL472     17.00 dB
PL473     17.00 dB
PL474     17.00 dB
PL475     17.00 dB
PL476     17.00 dB
PL477     17.00 dB
PL478     17.00 dB
PL479     17.00 dB
PL480     17.00 dB
PL481     17.00 dB
PL482     17.00 dB
PL483     17.00 dB
PL484     17.00 dB
PL485     17.00 dB
PL486     17.00 dB
PL487     17.00 dB
PL488     17.00 dB
PL489     17.00 dB
PL490     17.00 dB
PL491     17.00 dB
PL492     17.00 dB
PL493     17.00 dB
PL494     17.00 dB
PL495     17.00 dB
PL496     17.00 dB
PL497     17.00 dB
PL498     17.00 dB
PL499     17.00 dB
PL500     17.00 dB
    
```

14.11
 18.59
 18.71
 22.65
 24.13
 28.57
 28.88
 29.10
 29.21
 31.83
 36.35
 52.82
 62.03
 76.31
 76.58
 77.00
 77.42
 79.47
 80.77
 87.96

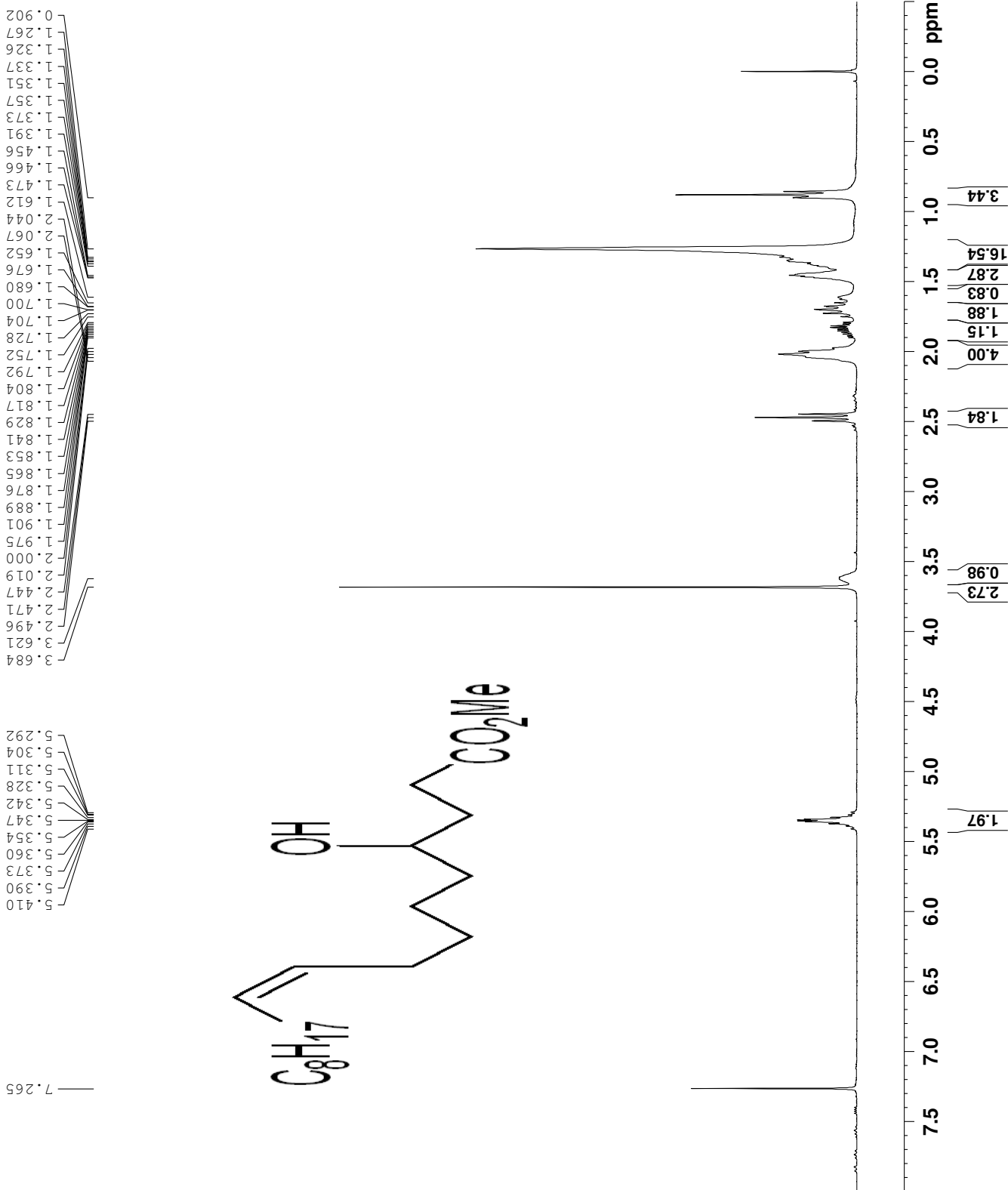
153.74




```

NAME          1Z4Z64008F
EXPNO         1
PROCNO        1
Date_         20081226
Time          10.54
INSTRUM       spect
PROBHD        5 mm PABBO BB-
PULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            8
DS            2
SWH           6188.119 Hz
FIDRES        0.094423 Hz
AQ            5.2953587 sec
RG            144
DW            80.800 usec
DE            6.50 usec
TE            289.4 K
D1            1.00000000 sec
TD0           1

===== CHANNEL f1 =====
NUC1          1H
P1            11.80 usec
PL1           0.00 dB
PL1W          11.55467796 W
SF01          300.1318534 MHz
SI            32768
SF            300.1300006 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
    
```



```

NAME          LINLI
EXPNO         1
PROCNO        1
Date_         20081226
Time_         15.47
INSTRUM       spect
PROBHD        5 mm PABBO BB-
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            412
DS            4
SWH           18028.846 Hz
FIDRES        0.275098 Hz
AQ            1.8175818 sec
RG            203
DW            27.733 usec
DE            6.50 usec
TE            291.0 K
D1            2.0000000 sec
D11           0.0300000 sec
TD0           1

===== CHANNEL f1 =====
NUC1          13C
P1            9.70 usec
PL1           0.00 dB
PIL1W        29.38907051 W
SFO1         75.4752953 MHz

===== CHANNEL f2 =====
CPDPRG2       waitz16
NUC2          1H
P2            80.00 usec
PL2           1.00 dB
PIL2W        17.00 dB
SFO2         400.1464018 MHz

===== CHANNEL f3 =====
CPDPRG2       waitz16
NUC2          1H
P2            80.00 usec
PL2           1.00 dB
PIL2W        17.00 dB
SFO2         400.1464018 MHz

===== CHANNEL f4 =====
CPDPRG2       waitz16
NUC2          1H
P2            80.00 usec
PL2           1.00 dB
PIL2W        17.00 dB
SFO2         400.1464018 MHz

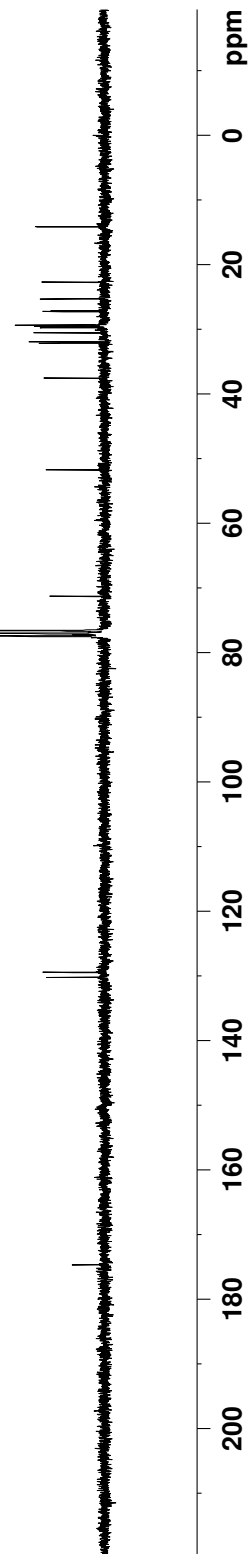
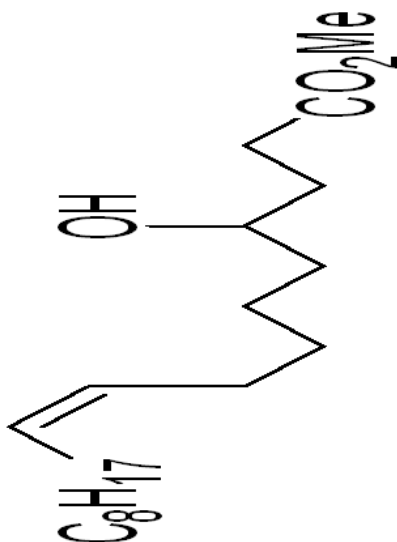
===== CHANNEL f5 =====
CPDPRG2       waitz16
NUC2          1H
P2            80.00 usec
PL2           1.00 dB
PIL2W        17.00 dB
SFO2         400.1464018 MHz
    
```

51.68
37.51
32.10
31.89
30.51
29.75
29.70
29.51
29.31
27.23
27.11
25.26
22.67
14.11

77.42
77.00
76.58
71.23

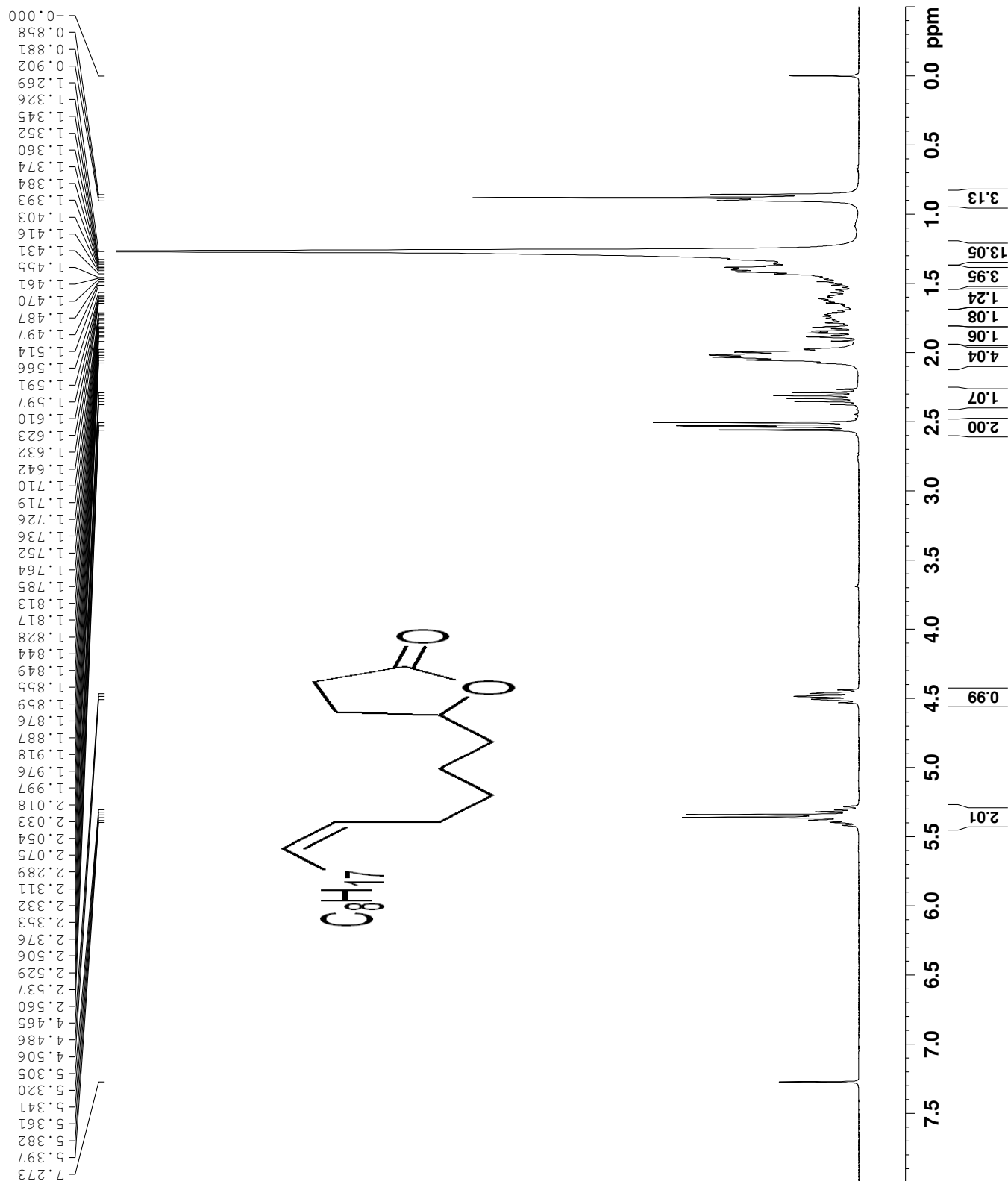
130.22
129.43

174.67



NAME C4-C7-lactone
EXPNO 18
PROCNO 1
Date_ 20081226
Time 9.48
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 0
SWH 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 40.3
DW 80.800 usec
DE 6.50 usec
TE 289.5 K
D1 1.00000000 sec
TD0 1

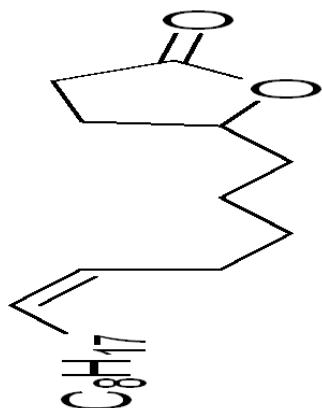
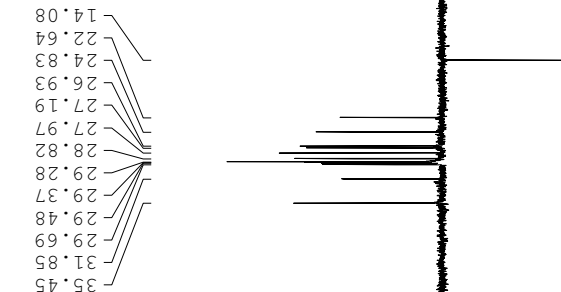
===== CHANNEL f1 =====
NUC1 1H
P1 11.80 usec
PL1 0.00 dB
PL1W 11.55467796 W
SF01 300.1318534 MHz
SI 32768
SF 300.1299986 MHz
EM
WDW 0
SSB 0.30 Hz
LB 0
GB 0
PC 1.00



C4-C7-lactone
 NAME
 EXPNO 20
 PROCNO 1
 Date_ 20081215
 Time 10:00
 INSTRUM spect
 PROBDW 5 mm PABBO B6
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 77
 SMH 18028.846 Hz
 FIDRES 0.275098 Hz
 AQ 1.8175918 sec
 RG 327.5
 DW 27.733 usec
 DE 6.50 usec
 TE 298.2 K
 CREST2 145.0000000 sec
 D1 2.00000000 sec
 D2 0.00344828 sec
 D3 0.00000000 sec
 TD0 1

CHANNEL f1
 NUC1 13C
 PU 9.70 usec
 P2 19.40 usec
 PL1 0.00 dB
 PL2 0.00 dB
 SFO1 75.4752953 MHz

CHANNEL f2
 NUC2 1H
 PU 13.00 usec
 P2 26.00 usec
 PL1 0.00 dB
 PL2 1.00 dB
 SFO2 300.1312005 MHz
 SI 32768
 SM 75.4677518 MHz
 DM 0
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



C4-C7-lactone
 NAME
 EXPNO 20
 PROCNO 1
 Date_ 20081226
 Time 9:49
 INSTRUM spect
 PROBDW 5 mm PABBO B6
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 77
 SMH 18028.846 Hz
 FIDRES 0.275098 Hz
 AQ 1.8175918 sec
 RG 327.5
 DW 27.733 usec
 DE 6.50 usec
 TE 289.5 K
 CREST2 145.0000000 sec
 D1 2.00000000 sec
 D2 0.00344828 sec
 TD0 1

CHANNEL f1
 NUC1 13C
 PU 9.70 usec
 P2 19.40 usec
 PL1 0.00 dB
 PL2 0.00 dB
 SFO1 75.4752953 MHz

CHANNEL f2
 NUC2 1H
 PU 13.00 usec
 P2 26.00 usec
 PL1 0.00 dB
 PL2 1.00 dB
 SFO2 300.1312005 MHz
 SI 32768
 SM 75.4677518 MHz
 DM 0
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

