

De Novo Asymmetric Syntheses of Muricatacin and its Analogues via Dihydroxylation of Dienoates.

Md. Moinuddin Ahmed, Hu Cui and George A. O'Doherty*

Department of Chemistry, West Virginia University

Morgantown, WV 26506

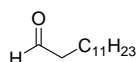
Supporting Information:

Table of Contents

Page	
S3	General Methods and Materials.
S3	Experimental Procedure for Tridecanal (7).
S4	Experimental Procedure for (<i>E</i>)-Ethyl pentadec-2-enoate (A).
S4	Experimental Procedure for (<i>E</i>)-Pentadec-2-en-1-ol (9).
S5	Experimental Procedure for (<i>E</i>)-Pentadec-2-enal (10).
S6	Experimental Procedure for (2 <i>Z</i> ,4 <i>E</i>)-Methyl heptadeca-2,4-dienoate (6).
S7	Experimental Procedure for (<i>R</i>)-5-((<i>R</i>)-1'-hydroxytridecyl)furan-2(5 <i>H</i>)-one (5).
S8	Experimental Procedure for (<i>R</i>)-Dihydro-5-((<i>R</i>)-1'-hydroxytridecyl)furan-2(3 <i>H</i>)-one (4).
S8	Experimental Procedure for (<i>S</i>)-5-((<i>S</i>)-1'-hydroxytridecyl)furan-2(5 <i>H</i>)-one (<i>ent</i> -5).
S9	Experimental Procedure for (<i>S</i>)-Dihydro-5-((<i>S</i>)-1'-hydroxytridecyl)furan-2(3 <i>H</i>)-one (<i>ent</i> -4).

S10	Experimental Procedure for (<i>S</i>)-1'-((<i>R</i>)-Tetrahydro-5''-oxofuran-2''-yl)tridecyl 4-nitrobenzoate (11).
S11	Experimental Procedure for (<i>S</i>)-Dihydro-5-((<i>R</i>)-1'-hydroxytridecyl)furan-2(3 <i>H</i>)-one (12).
S12-S13	¹ H and ¹³ C NMR spectra of 7
S14-S15	¹ H and ¹³ C NMR spectra of A
S16-S17	¹ H and ¹³ C NMR spectra of 9
S18-S19	¹ H and ¹³ C NMR spectra of 10
S20-S21	¹ H and ¹³ C NMR spectra of 6
S22-S23	¹ H and ¹³ C NMR spectra of 5
S24-S25	¹ H and ¹³ C NMR spectra of 4
S26-S27	¹ H and ¹³ C NMR spectra of <i>ent</i> - 5
S28-S29	¹ H and ¹³ C NMR spectra of <i>ent</i> - 4
S30-S31	¹ H and ¹³ C NMR spectra of 11
S32-S33	¹ H and ¹³ C NMR spectra of 12
S34	Chiral HPLC detail information.

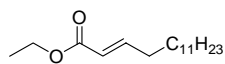
General Methods and Materials. ^1H and ^{13}C NMR spectra were recorded on 270 MHz and 600 MHz spectrometers. Chemical shifts are reported relative to internal tetramethylsilane (δ 0.00 ppm) or CDCl_3 (δ 7.26 ppm) for ^1H and CDCl_3 (δ 77.0 ppm) for ^{13}C . Infrared (IR) spectra were obtained on FT-IR spectrometer. Optical rotations were measured with a digital polarimeter in the solvent specified. Flash column chromatography was performed on 60-200 mesh silica gel. Analytical thin-layer chromatography was performed with precoated glass-backed plates (60Å, F_{254}) and visualized by quenching of fluorescence and by charring after treatment with *p*-anisaldehyde or phosphomolybdic acid or potassium permanganate stain. R_f values are obtained by elution in the stated solvent ratios (v/v). Ether, THF, methylene chloride and triethylamine were dried by passing through activated alumina columns with argon gas pressure. Commercial reagents were used without purification unless otherwise noted. Melting points are uncorrected. Air- and/or moisture-sensitive reactions were carried out under an atmosphere of argon/nitrogen using oven-dried glassware and standard syringe/septa techniques.



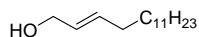
Tridecanal (7). (Commercial available from Aldrich)¹³ A solution of tridecanol **8** (200 mg, 1mmol) and ethyl trichloroisocyanuric acid (247 mg, 1.5 mmol) in ethyl ether (60 mL) was stirred at -30 °C , then 2,2,6,6-tetramethylpiperidinoxy was added in one portion. The mixture is stirred for 30 min and then quenched with 50 mL saturated potassium carbonate. The organic layer was separated and the aqueous layer was extracted with ether (2 x 30 mL). Combined the organic layer and washed with brine, dried (Na_2SO_4), filtered and concentrated. Chromatograph on silica gel (10:1 Hexane/EtOAc)

to yield tridecanal **7** (190 mg, 0.95 mmol, 95% yield) as a colorless oil. R_f (10% EtOAc/hexanes) = 0.7; IR (thin film, cm^{-1}) 2922, 2853, 2715, 1726, 1466, 1411, 1389, 1378, 721; ^1H NMR (CDCl_3 , 270 MHz): δ 9.73 (t, J = 1.7 Hz, 1H), 2.38 (dt, J = 7.1, 1.7 Hz, 2H), 1.59 (tt, J = 7.1, 7.1 Hz, 2H), 1.25-1.22(m, 18H), 0.84 (t, J = 7.2 Hz, 3H), 1.25 (m, 20H), 0.87 (t, J = 6.9 Hz, 3H); ^{13}C NMR (CDCl_3 , 75 MHz): δ 202.7, 43.8, 31.8, 29.56(2C), 29.5, 29.3, 29.2(2C), 29.1, 22.6, 22.0, 14.0.

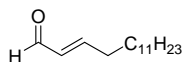
$^{13}\text{Beil. 1, IV}$, 3386.



(E)-Ethyl pentadec-2-enoate (A). A solution of tridecanal **7** (1.6 g, 7.9 mmol) and ethyl (triphenylphosphoranylidene)acetate (3.3 g, 9.5 mmol) in THF (60 mL) was stirred at room temperature overnight. Remove the solvent under reduced pressure and chromatograph on silica gel (hexane) to yield (E)-ethyl pentadec-2-enoate **9** (2.0 g, 7.4 mmol, >25:1 *E/Z* ratio, 94% yield) as light yellow oil. Major isomer (**3**): R_f (10% EtOAc/hexanes) = 0.8; IR (thin film, cm^{-1}) 2923, 2853, 1721, 1655, 1367, 1307, 1263, 1177, 1044, 979; ^1H NMR (CDCl_3 , 600 MHz): δ 6.95 (dt, J = 15.6, 7.2 Hz, 1H), 5.79 (d, J = 15.6 Hz, 1H), 4.17 (q, J = 7.2 Hz, 2H), 2.18(m, 2H), 1.27 (t, J = 7.2 Hz, 3H), 1.25 (m, 20H), 0.87 (t, J = 7.2 Hz, 3H); ^{13}C NMR (CDCl_3 , 150 MHz): δ 166.7, 149.4, 121.2, 60.0, 32.1, 31.8, 29.6 (2C), 29.5, 29.4, 29.3, 29.2, 28.0, 22.6, 14.2, 14.0; CIHRMS: Calculated for $[\text{C}_{17}\text{H}_{32}\text{O}_2\text{Na}]^+$: 291.2300, Found: 291.2294.

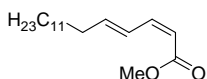


(E)-Pentadec-2-en-1-ol (9). A solution of (*E*)-ethyl pentadec-2-enoate (1.8 g, 6.7 mmol) in THF (80 mL) was cooled to -78 °C, then Dibal-H (1M, 16.8 mL, 16.8 mmol) was added dropwise. After the mixture was stirred for 30 min, the reaction mixture was quenched with 2 mL acetone. Remove bulk THF under reduced pressure and the residue was treated with 30 mL 1N HCl solution and then extracted with ether (3 x 30 mL) and the organic extracts were washed with brine, dried (Na₂SO₄), filtered and concentrated. The crude product was purified by flash chromatography on silica gel (20:1 (v/v) hexane/EtOAc) to yield (*E*)-pentadec-2-en-1-ol **9** (1.5 g, 6.4 mmol, 96% yield) as a white solid: mp: 31–33 °C; *R_f*(20% EtOAc/ hexanes) = 0.52; IR (thin film, cm⁻¹) 3288, 2955, 2917, 2848, 1472, 1462, 1081, 1001, 961, 719, 666; ¹H NMR (CDCl₃, 600 MHz): δ 5.69 (m, 1H), 5.63 (m, 1H), 4.0 (d, *J* = 6 Hz, 2H), 2.0 (tdd, *J* = 7, 7, 1.2 Hz, 2H), 1.25 (m, 20H), 0.88 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (CDCl₃, 150 MHz): δ 133.6, 128.8, 63.8, 32.2, 31.9, 29.66, 29.65, 29.63, 29.6, 29.4, 29.3, 29.2, 29.1, 22.6, 14.0; HRMS(ESI): Calculated for [C₁₅H₃₀ONa]⁺: 249.2194, Found: 249.2189.



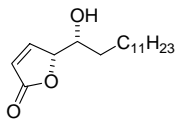
(E)-Pentadec-2-enal (10). A solution of (*E*)-pentadec-2-en-1-ol **9** (1.0 g, 4.58 mmol) in 30 mL hexane was added manganese (IV) oxide (4.8 g, 55 mmol). The mixture was stirred for 24h at room temperature and then filtrated. The solvent was removed under reduced pressure and residue was purified by flash chromatography on silica gel (Hexane) to yield (*E*)-pentadec-2-enal **10** (0.97 g, 4.48 mmol, 98% yield) as a colorless oil: *R_f*(10% EtOAc/ hexanes) = 0.7; IR (thin film, cm⁻¹) 2923, 2853, 2732, 1694, 1638, 1466, 1378, 1138, 974, 722; ¹H NMR (CDCl₃, 600 MHz): δ 9.48 (dd, *J*=7.8,

1.2 Hz, 1H), 6.82 (dtd, $J=15.6$, 6.6, 1.2 Hz, 1H), 6.1 (ddt, $J=15.6$, 7.8, 1.2 Hz, 1H), 2.3 (dtd, $J=7.8$, 6, 1.2 Hz, 2H), 1.48 (tt, $J=7.2$, 7.2 Hz, 2H), 1.26–1.24 (m, 20H), 0.85 (t, $J=7.2$ Hz, 3H); ^{13}C NMR (CDCl_3 , 150 MHz): δ 193.4, 158.8, 132.9, 32.6, 31.8, 29.58, 29.56, 29.54, 29.4, 29.2 (2C), 29.1, 27.8, 22.6, 14.0; HRMS(ESI): Calculated for $[\text{C}_{15}\text{H}_{28}\text{ONa}]^+$: 247.2038, Found: 247.2032.

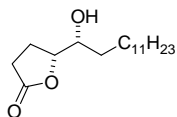


(2Z, 4E)-Methyl heptadeca-2,4-dienoate (6). A solution of $(\text{CF}_3\text{CH}_2\text{O})_2\text{P}(\text{O})\text{CH}_2\text{CO}_2\text{CH}_3$ (1.03 g, 4.58 mmol) and 18-crown-6 (5.1 g, 19.4 mmol) in THF (100 mL) was cooled to -78°C and treated with *t*-BuOK (0.6 g, 5.5 mmol). After the mixture was stirred for 15 min, a solution of the (*E*)-pentadecyl-2-enal **10** (1.0 g, 4.6 mmol) in THF (10 mL, plus 5 mL of rinse) was added by cannula. The resulting mixture was stirred at -78°C for 2.5 h and the reaction mixture was quenched by the addition of saturated aqueous NH_4Cl and the bulk of THF was removed under reduced pressure. The residue was extracted with ether (3 x 30 mL) and the organic extracts were washed with brine, dried (Na_2SO_4), filtered and concentrated. The crude product was purified by flash chromatography on silica gel (Hexane) to yield (2Z, 4E)-methyl heptadeca-2,4-dienoate **6** (1.2 g, 4.3 mmol, >20:1 *Z,E/E,E* ratio, 93% yield) as a viscous oil. Major isomer (**6**): R_f (10% EtOAc/ hexanes) = 0.85; IR (thin film, cm^{-1}) 2922, 2853, 1719, 1639, 1437, 1192, 1074, 999, 962, 895, 816, 721; ^1H NMR (CDCl_3 , 600 MHz): δ 7.34 (ddt, $J=15.0$, 11.4, 1.2 Hz, 1H), 6.54 (dd, $J=11.4$, 11.4 Hz, 1H), 6.07 (dt, $J=15.0$, 7.2 Hz, 1H), 5.56 (d, $J=11.4$, 1H), 3.71 (s, 3H), 2.2 (m, 2H), 1.25 (m, 20H), 0.87 (t, $J=7.2$ Hz, 3H); ^{13}C NMR (CDCl_3 , 150 MHz): δ 166.9, 146.0, 145.6, 126.8, 114.9 ,

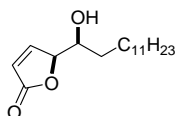
51.0, 33.0, 31.9, 29.65, 29.62 (2C), 29.5, 29.4, 29.3, 29.2, 28.8, 22.6, 14.0; MS(EI): Calculated for $[C_{18}H_{32}O_2]^+$: 280, Found: 280.



(R)-5-((R)-1'-hydroxytridecyl)furan-2(5H)-one (5). Into a 10 mL round bottom flask was added 1 mL of *t*-BuOH, 1 mL of water, $K_3Fe(CN)_6$ (1.6 g, 4.7 mmol), K_2CO_3 (0.6g, 4.7 mmol), $MeSO_2NH_2$ (0.2 g, 1.6 mmol), $(DHQD)_2PHAL$ (26 mg, 34 μ mol, 2.1 mol%), and OsO_4 (4 mg, 16 μ mol, 1 mol%). The mixture was stirred at room temperature for about 15 minutes and then cooled to 0 °C. To this solution was added (2*Z*,4*E*)-methyl heptadeca-2,4-dienoate **6** (0.4g, 1.6 mmol) and the reaction was stirred vigorously at 0 °C overnight. The reaction was quenched with solid sodium sulfite (10 mg) at room temperature. Ethyl acetate (5 mL) was added to the reaction mixture, and after separation of the layers, the aqueous phase was further extracted with the ethyl acetate (2 x 5 mL). The combined organic layers were washed with brine and dried over anhydrous sodium sulfate. After removal of the solvents *in vacuo*, flash chromatography on silica gel (5:1 (v/v) hexanes/EtOAc) afforded (R)-5-((R)-1'-hydroxytridecyl)furan-2(5H)-one **5** (379 mg, 1.4 mmol, 86% yield) as a white solid: mp 89-91 °C; R_f (50% EtOAc/hexanes) = 0.55; $[\alpha]_D^{25}$ 69 (*c* 1.8, CH_2Cl_2); IR (thin film, cm^{-1}) 3370, 2952, 2913, 2849, 1715, 1603, 1471, 1179, 1108, 1020, 919, 866, 836, 827, 801, 718, 658 cm^{-1} ; 1H NMR ($CDCl_3$, 600 MHz): δ 7.45 (dd, $J = 6, 1.8$ Hz, 1H), 6.18 (dd, $J = 6, 1.8$ Hz, 1H), 4.98 (ddd, $J = 5.6, 1.8, 1.8$ Hz, 1H), 3.75 (ddd, $J = 12, 6, 6$ Hz, 1H), 2.1 (m, 1H), 1.59 (m, 2H), 1.52 (m, 2H), 1.32–1.25 (m, 20H), 0.87 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR ($CDCl_3$, 150 MHz): δ 172.7, 153.5, 122.7, 86.0, 71.9, 33.2, 31.9, 29.63, 29.6 (2H), 29.5, 29.46, 29.40, 29.3, 25.4, 22.6, 14.0; HRMS(ESI): Calculated for $[C_{17}H_{30}O_3Na]^+$: 305.2093, Found: 305.2086.

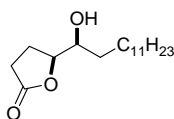


(R)-Dihydro-5-((R)-1'-hydroxytridecyl)furan-2(3H)-one (4). Into a 10 mL round bottom flask was added (*R*)-5-((*R*)-1'-hydroxytridecyl)furan-2(5*H*)-one **5** (52 mg, 0.18 mmol) and 4 mL of MeOH and 10 mg 10 wt. % Pd on activated carbon. The reaction was stirred under 1 atmosphere of H₂ for 24 h. After filtration and evacuation under reduced pressure afforded **4** (-)Muricatacin (51 mg, 0.17 mmol, 98% yield) as a white solid. Mp: 68–70 °C; *R_f* (50% EtOAc/Hexane) = 0.55; $[\alpha]_D^{25}$ -19 (*c* 1.8, CH₂Cl₂); IR (thin film, cm⁻¹) 3394, 2953, 2916, 2849, 1743, 1471, 1364, 1319, 1189, 1099, 975, 810, 720; ¹H NMR (CDCl₃, 600 MHz) δ 4.41 (ddd, *J* = 7.2, 7.2, 4.2 Hz, 1H), 3.55 (ddd, *J* = 8.4, 4.8, 4.8 Hz, 1H), 2.60 (dd, *J* = 18, 9.6, 1H), 2.52 (dd, *J* = 18, 9.6 Hz, 1H), 2.22 (m, 1H), 2.12 (m, 1H), 1.52 (m, 2H), 1.28–1.24 (m, 20H), 0.86 (t, *J* = 7.2 Hz, 1H); ¹³C NMR (CDCl₃, 150 MHz) δ 177.1, 82.9, 73.6, 32.9, 31.8, 29.63, 29.6 (2H), 29.5, 29.49, 29.48, 29.3, 28.6, 25.4, 24.0, 22.6, 14.0; HRMS(ESI): Calculated for [C₁₇H₃₂O₃Na]⁺: 307.2249, Found: 307.2243.



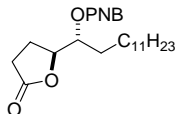
(S)-5-((S)-1'-hydroxytridecyl)furan-2(5H)-one (ent-5). Into a 25 mL round bottom flask was added 2 mL of *t*-BuOH, 2 mL of water, K₃Fe(CN)₆ (2.4 g, 7.3 mmol), K₂CO₃ (1.0 g, 7.3 mmol), MeSO₂NH₂ (0.23 g, 2.4 mmol), (DHQ)₂PHAL (39 mg, 50 μ mol, 2.1 mol%), and OsO₄ (6 mg, 24 μ mol, 1 mol%). The mixture was stirred at room temperature for about 15 minutes and then cooled to 0 °C. To this solution was added (2*Z*, 4*E*)-methyl heptadeca-2,4-dienoate **6** (0.68 g, 2.4 mmol) and the reaction was stirred vigorously at 0 °C overnight. The reaction was quenched with solid sodium sulfite (15

mg) at room temperature. Ethyl acetate (10 mL) was added to the reaction mixture, and after separation of the layers, the aqueous phase was further extracted with the organic solvent (2 x 10 mL). The combined organic layers were washed with brine and dried over anhydrous sodium sulfate. After removal of the solvents *in vacuo*, flash chromatography on silica gel (5:1 (v/v) hexanes/EtOAc) afforded (*S*)-5-((*S*)-1'-hydroxytridecyl)furan-2(5*H*)-one **ent-5** (557 mg, 2.0 mmol, 83% yield) of as a white solid: mp 89-91 °C; R_f (50% EtOAc/hexanes) = 0.55; $[\alpha]_D^{25}$ -68 (*c* 1.2, CH₂Cl₂); IR (thin film, cm⁻¹) 3393, 3358, 3080, 2914, 2849, 1714, 1702, 1604, 1471, 1360, 1225, 1180, 1073, 1021, 919, 867, 838, 830, 803, 718, 656 cm⁻¹; ¹H NMR (CDCl₃, 600 MHz): δ 7.45 (dd, *J* = 6, 1.8 Hz, 1H), 6.18 (dd, *J* = 6, 1.8 Hz, 1H), 4.98 (ddd, *J* = 5.6, 1.8, 1.8 Hz, 1H), 3.75 (ddd, *J* = 12, 6, 6 Hz, 1H), 2.1 (m, 1H), 1.59 (m, 2H), 1.52 (m, 2H), 1.32–1.25 (m, 20H), 0.87 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (CDCl₃, 150 MHz): δ 172.7, 153.6, 122.7, 86.0, 71.8, 33.2, 31.8, 29.63, 29.6, 29.59, 29.52, 29.45, 29.40, 29.3, 25.4, 22.6, 14.0.¹⁴

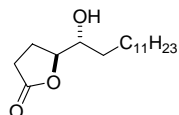


(*S*)-Dihydro-5-((*S*)-1'-hydroxytridecyl)furan-2(3*H*)-one (*ent-4*). Into a 50 mL round bottom flask was added (*S*)-5-((*S*)-1'-hydroxytridecyl)furan-2(5*H*)-one **ent-5** (200 mg, 0.69 mmol) and 20 mL of CH₃OH and 20 mg 10 wt. % Pd on activated carbon. The reaction was stirred under 1 atmosphere of H₂ for 24 h. After filtration and evacuation under reduced pressure afforded **ent-4** (+) muricatacin (195 mg, 0.67 mmol, 97% yield) as a white solid. Mp: 68-70 °C; R_f (50% EtOAc/Hexane) = 0.55; $[\alpha]_D^{25}$ 19.7 (*c* 1.5, CH₂Cl₂); IR (thin film, cm⁻¹) 3394, 2952, 2915, 2848, 1742, 1471, 1362, 1268, 1186, 1101, 1019, 998, 977, 902, 832, 721; ¹H NMR (CDCl₃, 600 MHz) δ 4.41 (ddd, *J* = 7.2, 7.2, 4.2 Hz, 1H), 3.55 (ddd, *J* = 8.4, 4.8, 4.8 Hz, 1H), 2.60 (dd, *J* = 18, 9.6, 1H), 2.52 (dd,

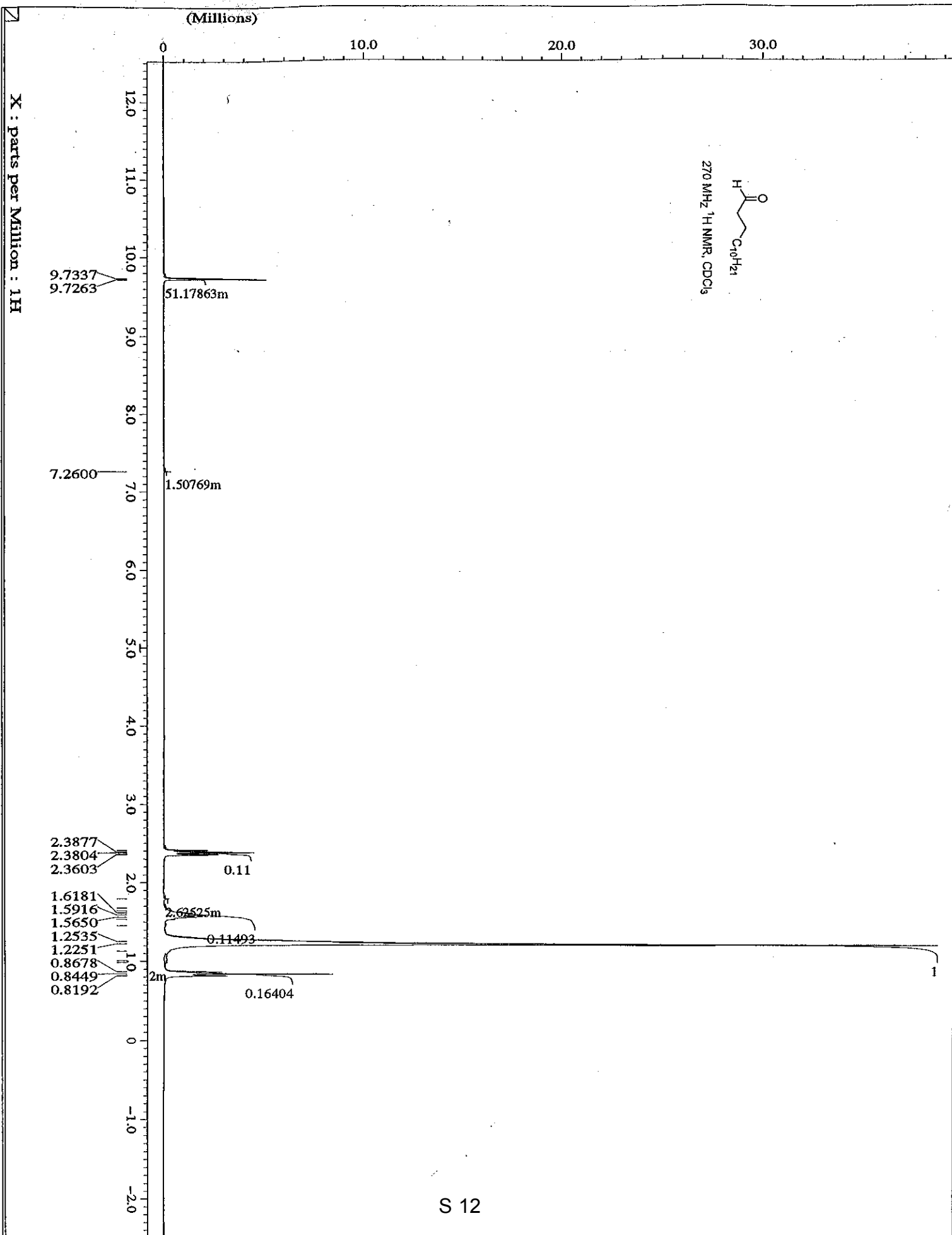
$J = 18, 9.6$ Hz, 1H), 2.22 (m, 1H), 2.12 (m, 1H), 1.52 (m, 2H), 1.28–1.24 (m, 20H), 0.86 (t, $J = 7.2$ Hz, 1H); ^{13}C NMR (CDCl_3 , 150 MHz) δ 177.2, 82.9, 73.5, 32.9, 31.8, 29.6, 29.57 (2H), 29.51, 29.4 (2H), 29.2, 28.6, 25.4, 24.0, 22.6, 14.0. ¹⁴

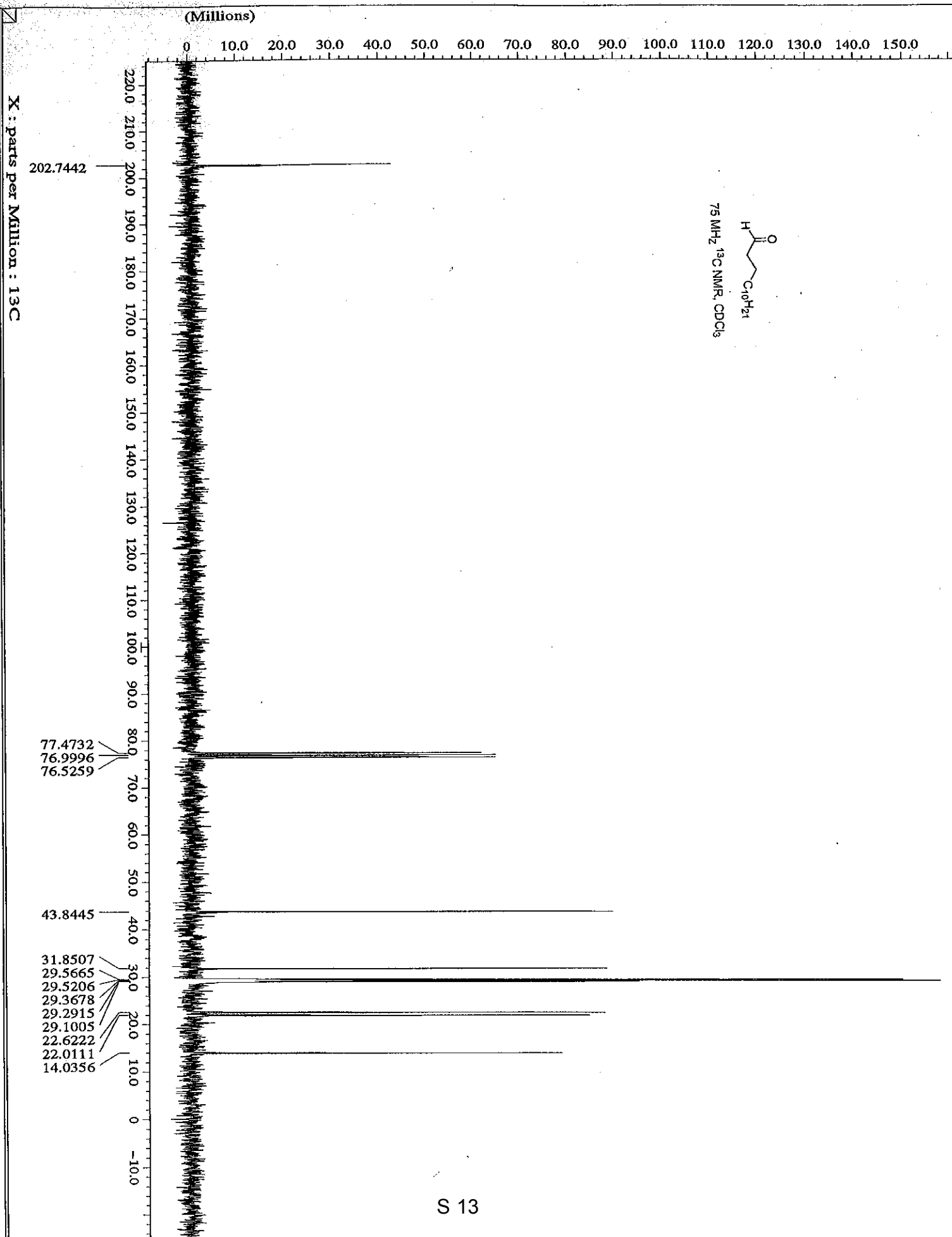


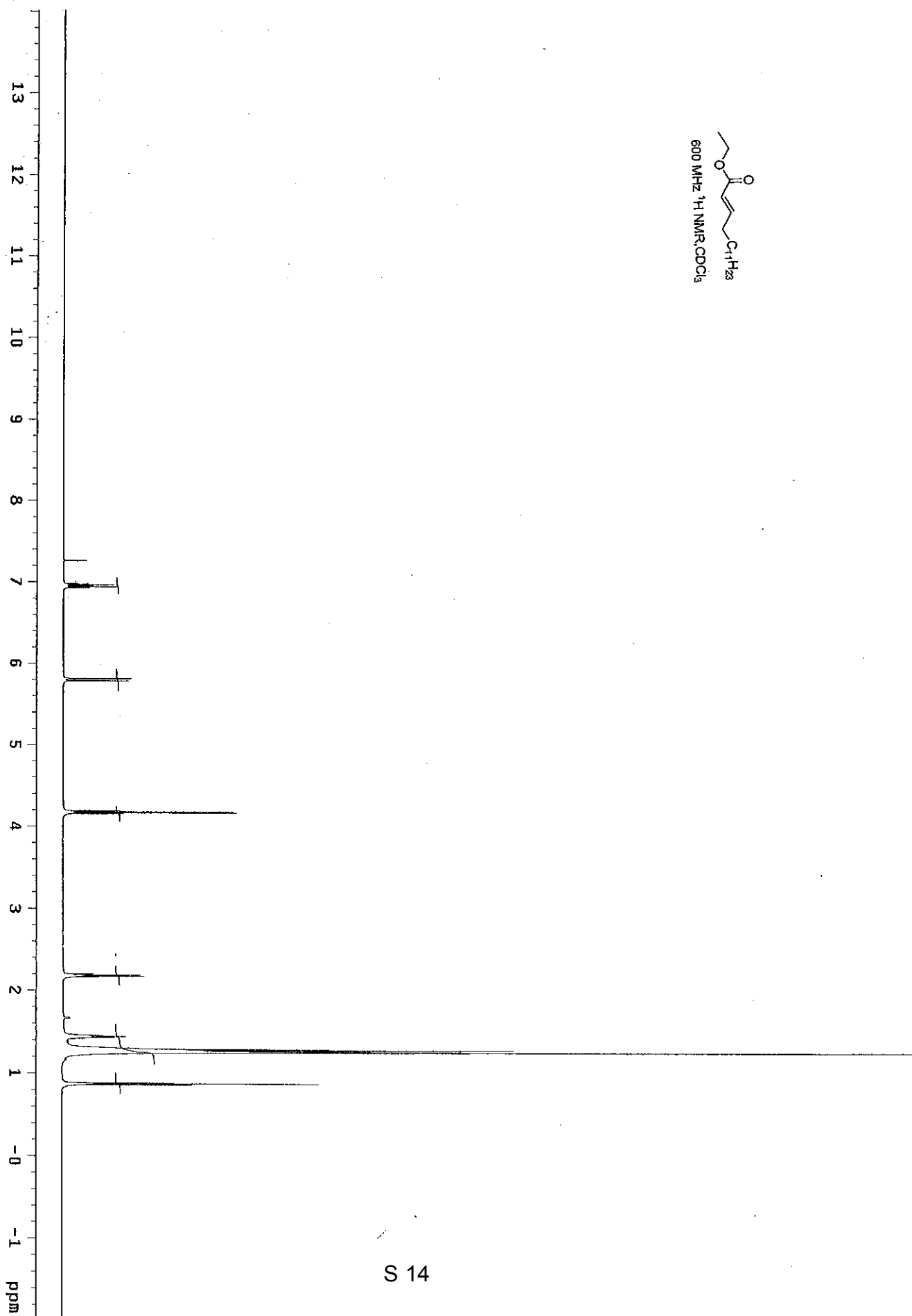
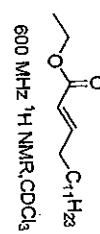
(S)-1'-((R)-Tetrahydro-5''-oxofuran-2''-yl)tridecyl 4-nitrobenzoate (11). Into a 50 mL round bottom flask was added 20 mL THF, cooled to 0 °C, then add triphenylphosphine (440 mg, 1.9 mmol) and DEAD (330 mg, 1.9 mmol), then add (*S*)-dihydro-5-((*S*)-1'-hydroxytridecyl)furan-2(3*H*)-one **ent-4** (180 mg, 0.63 mmol) and *p*-nitro-benzoic acid (127 mg, 0.76 mmol). The mixture was stirred at room temperature for 2 h. The solvent is removed under reduced pressure and the residue is purified by chromatography on silica gel (20:1 (v/v) hexanes/EtOAc) afforded (*S*)-1'-((*R*)-tetrahydro-5''-oxofuran-2''-yl)tridecyl 4-nitrobenzoate **11** (255 mg, 0.58 mmol, 92 % yield) as a light yellow solid: Mp: 42–44 °C; R_f (30% EtOAc/Hexane) = 0.75; $[\alpha]_D^{25}$ 8.1 (c 1.0, CH_2Cl_2); IR (thin film, cm^{-1}) 2924, 2854, 1781, 1726, 1608, 1528, 1465, 1348, 1268, 1179, 1115, 1102, 1014, 921, 873, 783, 719; ^1H NMR (CDCl_3 , 600 MHz) δ 8.29 (m, 2H), 8.18 (m, 2H), 5.38 (ddd, $J = 9, 4.8, 4.8$ Hz, 1H), 4.68 (ddd, $J = 7.8, 7.8, 4.2$ Hz, 1H), 2.58 (m, 2H), 2.36 (dddd, $J = 13.2, 9.6, 7.8, 6.0$ Hz, 1H), 2.21 (dddd, $J = 12.6, 9.6, 8.4, 7.2$ Hz, 1H), 1.80 (m, 1H), 1.73 (m, 2H), 1.28–1.22 (m, 20H), 0.86 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (CDCl_3 , 150 MHz) δ 176.0, 164.0, 150.7, 135.0, 130.7, 128.8, 123.6, 123.5, 79.8, 75.2, 31.8, 29.8, 29.57, 29.56, 29.52, 29.4, 29.3, 29.29, 29.28, 27.9, 25.1, 23.1, 22.6, 14.0; HRMS(ESI): Calculated for $[\text{C}_{24}\text{H}_{35}\text{NO}_6\text{Na}]^+$: 456.2362, Found: 456.2357.

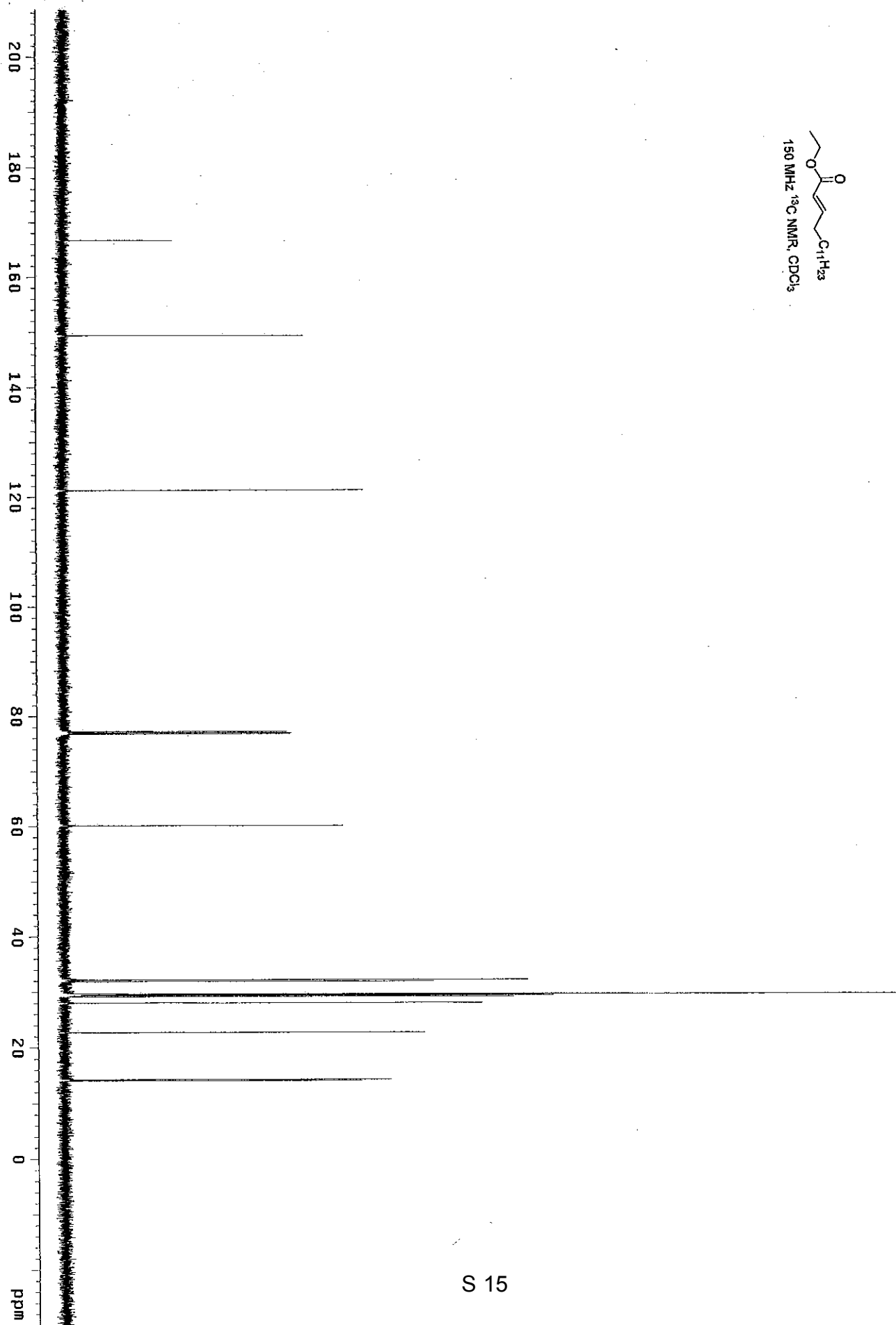
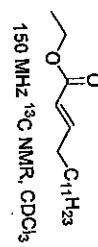


(S)-Dihydro-5-((R)-1'-hydroxytridecyl)furan-2(3H)-one (12). Into a 5 mL round bottom flask was added 3 mL CH₃OH, then add potassium carbonate (289 mg, 2.1 mmol) and (S)-1'-((R)-tetrahydro-5''-oxofuran-2''-yl) tridecyl 4-nitrobenzoate (180 mg, 0.42 mmol). The mixture is stirred for 10 minutes at room temperature and then filtrated with a pad of celite. The solvent is removed under reduced pressure and the residue is purified by chromatography on silica gel (4:1 (v/v) hexanes/EtOAc) afforded (S)-dihydro-5-((R)-1'-hydroxytridecyl)furan-2(3H)-one **12** (100 mg, 0.36 mmol, 85% yield) as a white solid: mp: 70-72 °C; *R_f* (50% EtOAc/Hexane) = 0.50; [α]_D²⁵ 14 (*c* 1.2, CH₂Cl₂); IR (thin film, cm⁻¹) 3415, 2956, 2917, 2849, 1783, 1471, 1462, 1268, 1206, 1191, 1082, 1071, 1011, 729, 720; ¹H NMR (CDCl₃, 600 MHz) δ 4.40 (ddd, *J* = 7.2, 7.2, 3 Hz, 1H), 3.92 (m, 1H), 2.58 (dd, *J* = 18, 9.6, 1H), 2.50 (m, 1H), 2.25 (m, 1H), 2.13 (m, 1H), 1.51 (m, 2H), 1.41(m, 2H), 1.31–1.25 (m, 18H), 0.87 (t, *J* = 7.2Hz, 3H); ¹³C NMR (CDCl₃, 150 MHz) δ 177.4, 82.8, 71.3, 31.9, 31.8, 29.62, 29.6, 29.59, 29.53, 29.5, 29.4, 29.3, 28.6, 25.6, 22.6, 21.0, 14.0; HRMS(ESI): Calculated for [C₁₇H₃₂O₃Na]⁺: 307.2249, Found: 307.2243.

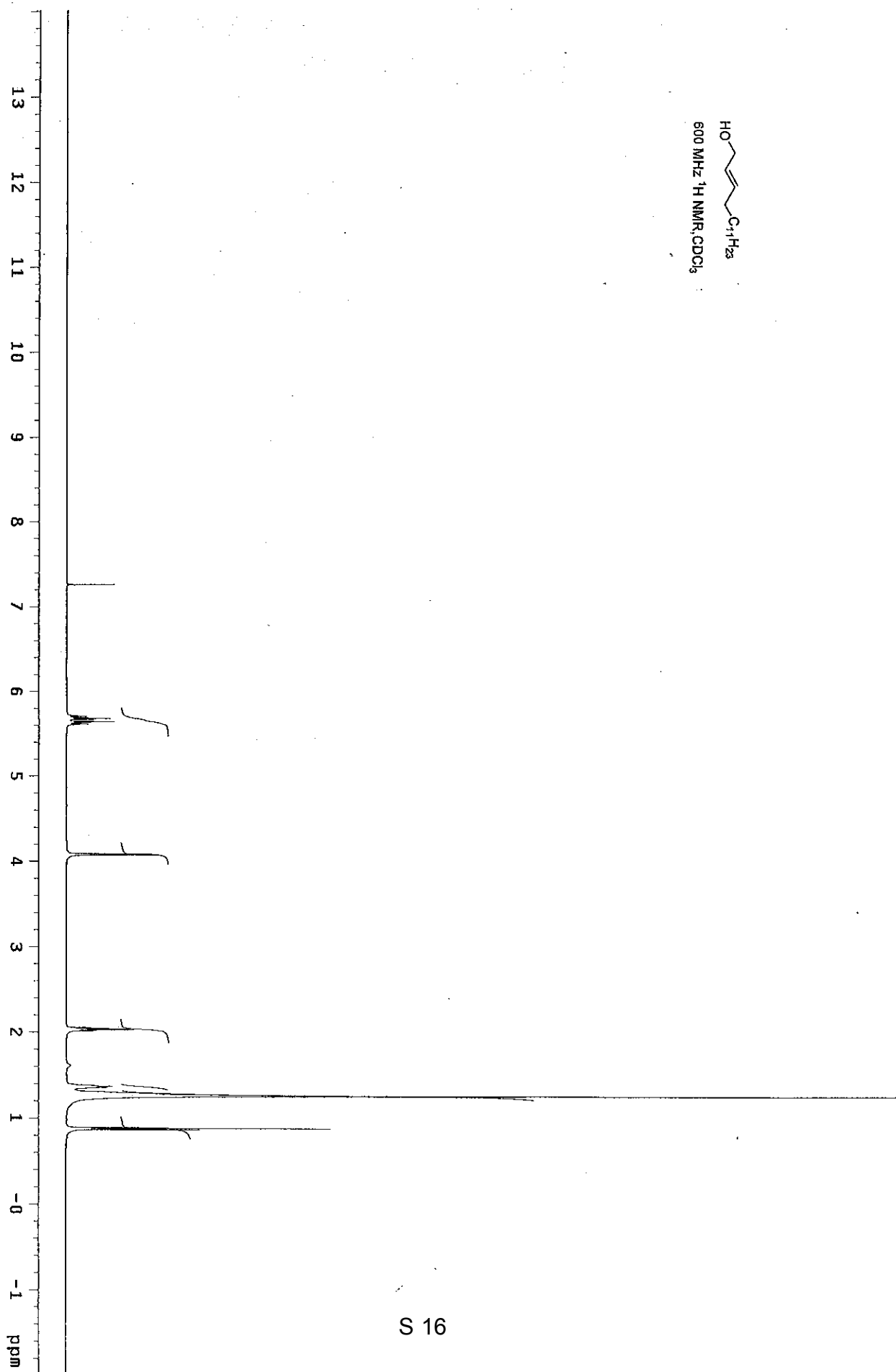




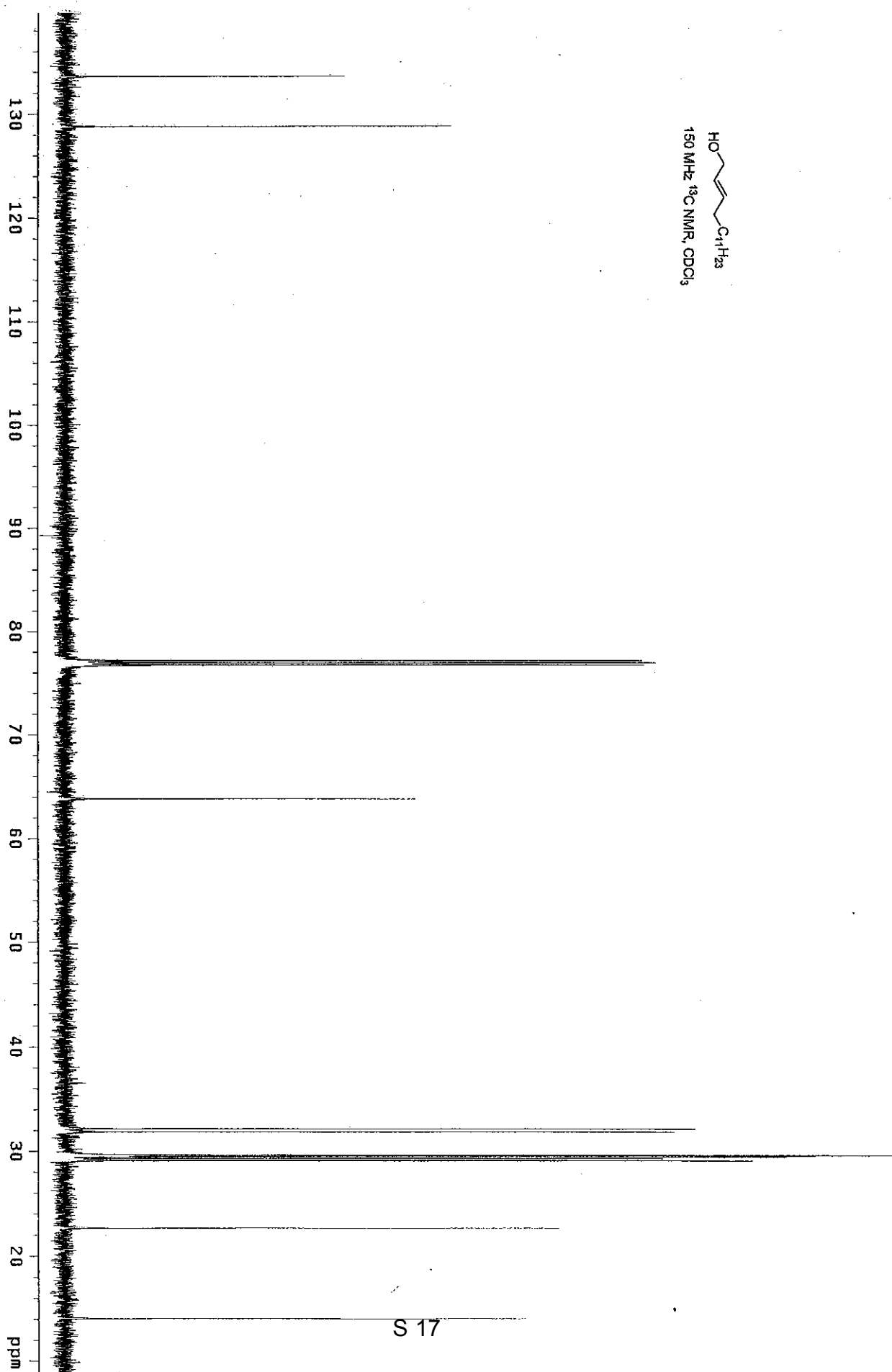




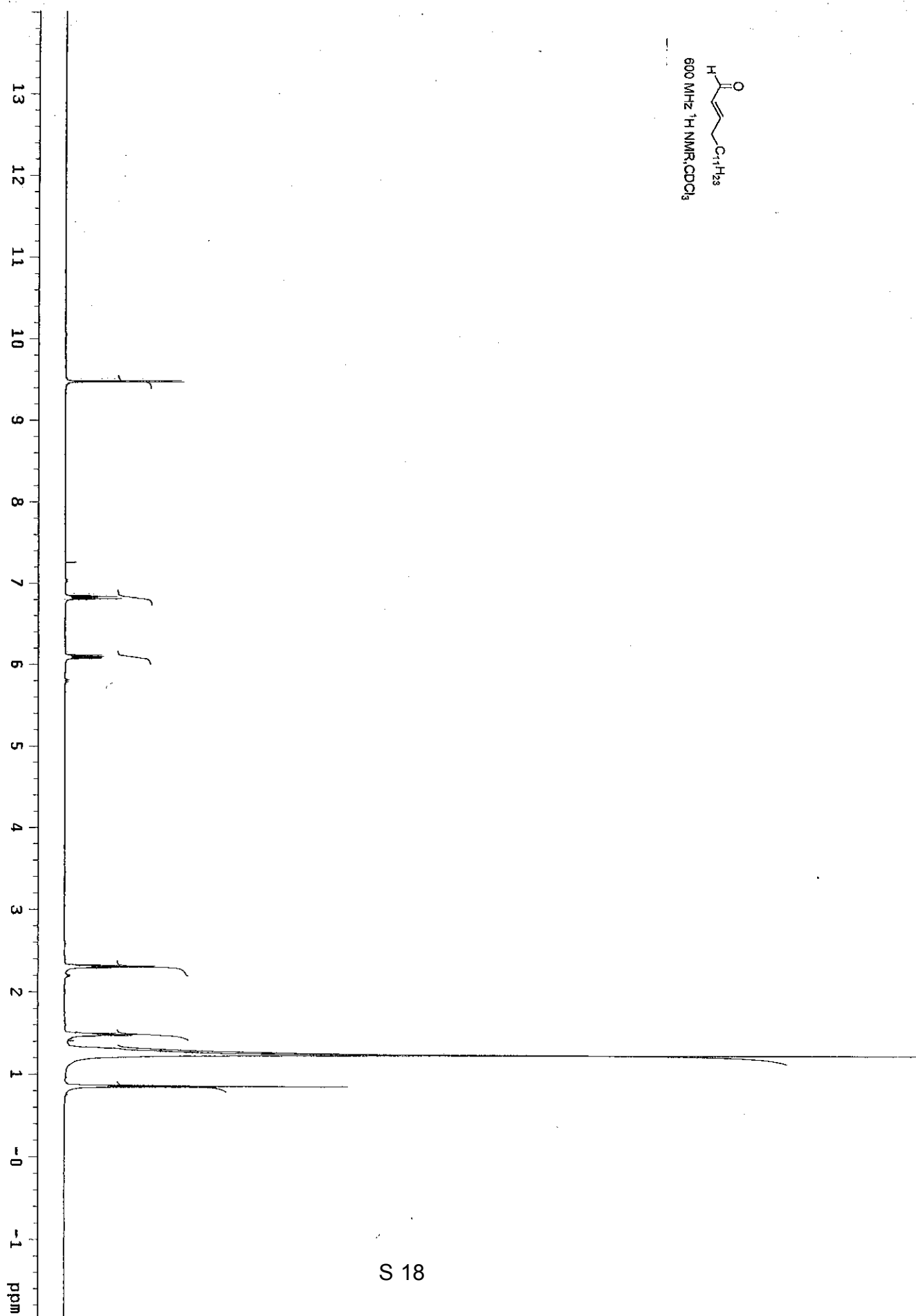
HO-CH=CH-C₁₁H₂₃
600 MHz ¹H NMR, CDCl₃



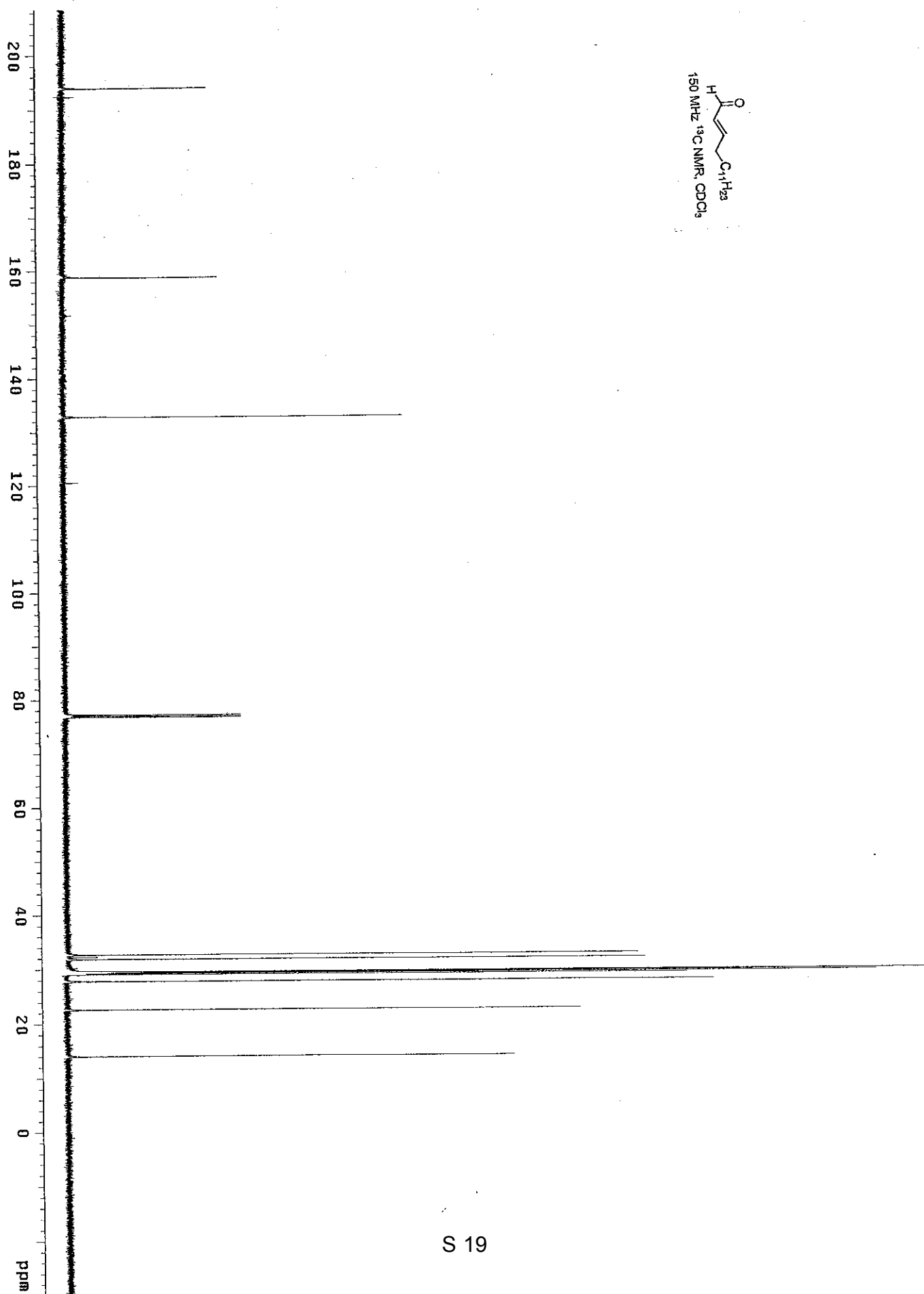
HO-CH₂-CH=CH-CH₂-C₁₁H₂₃
150 MHz ¹³C NMR, CDCl₃

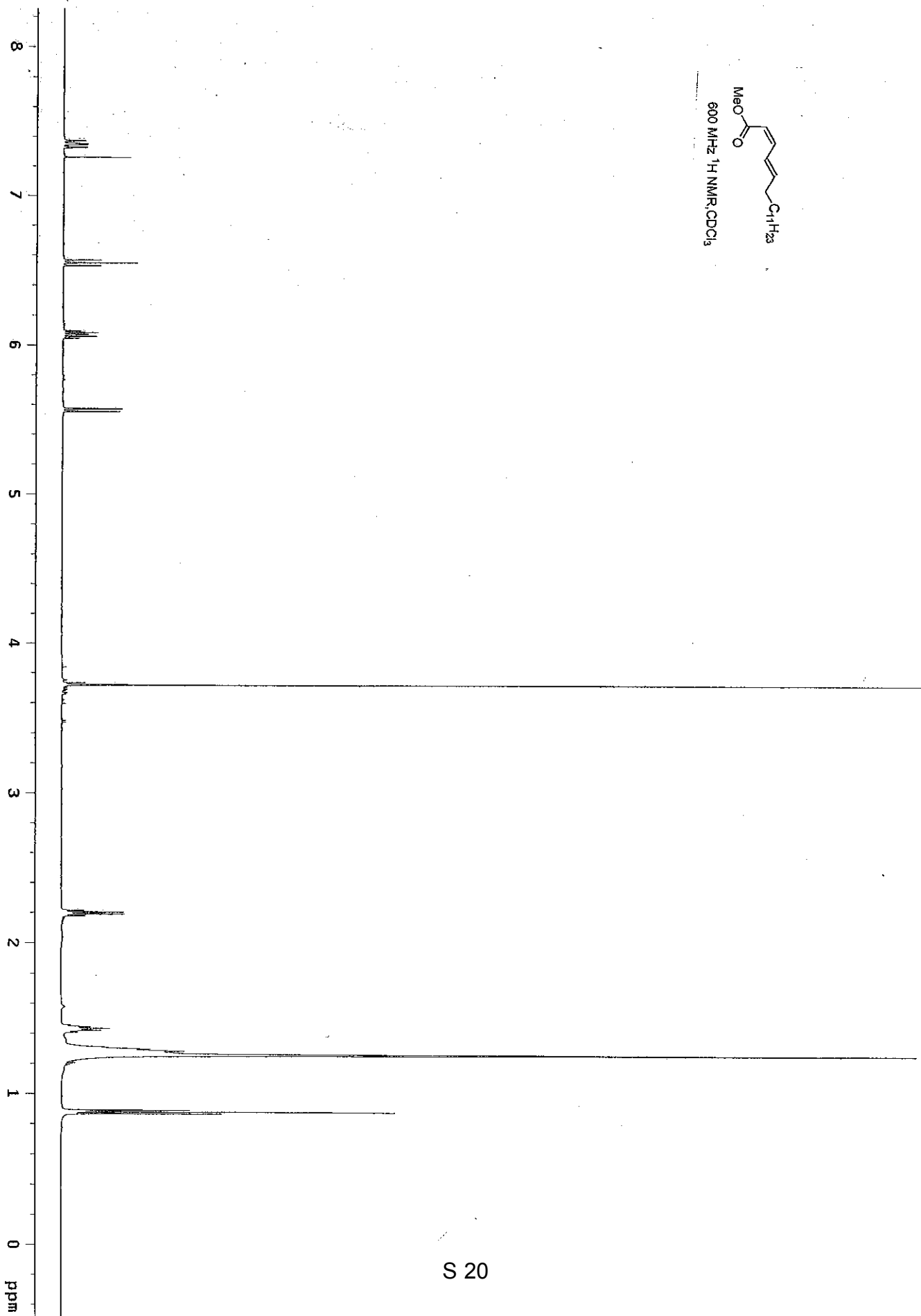
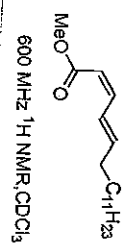


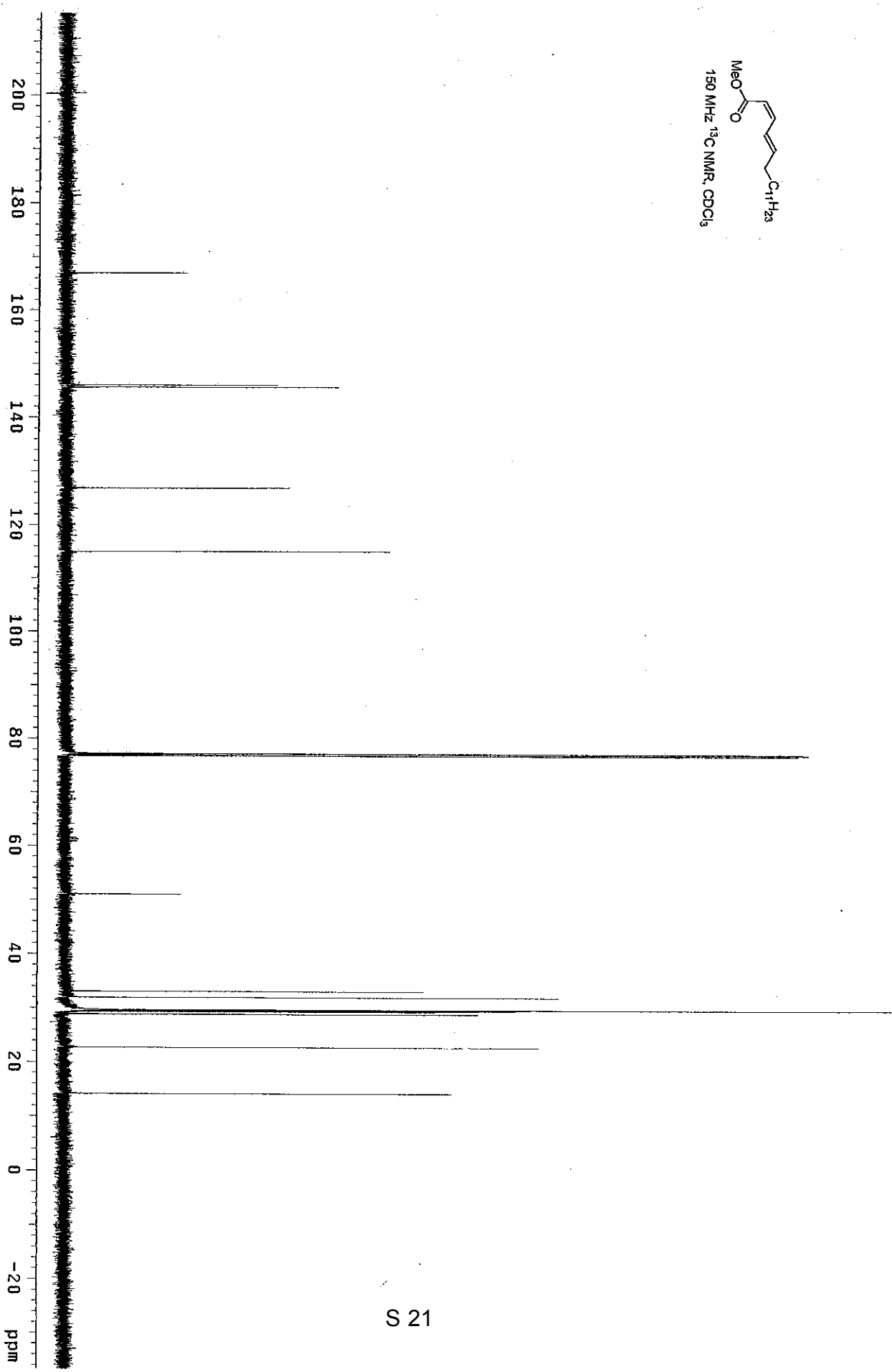
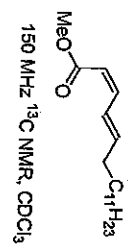
CCCCCCCCCCCC=CC=O
600 MHz ^1H NMR, CDCl_3

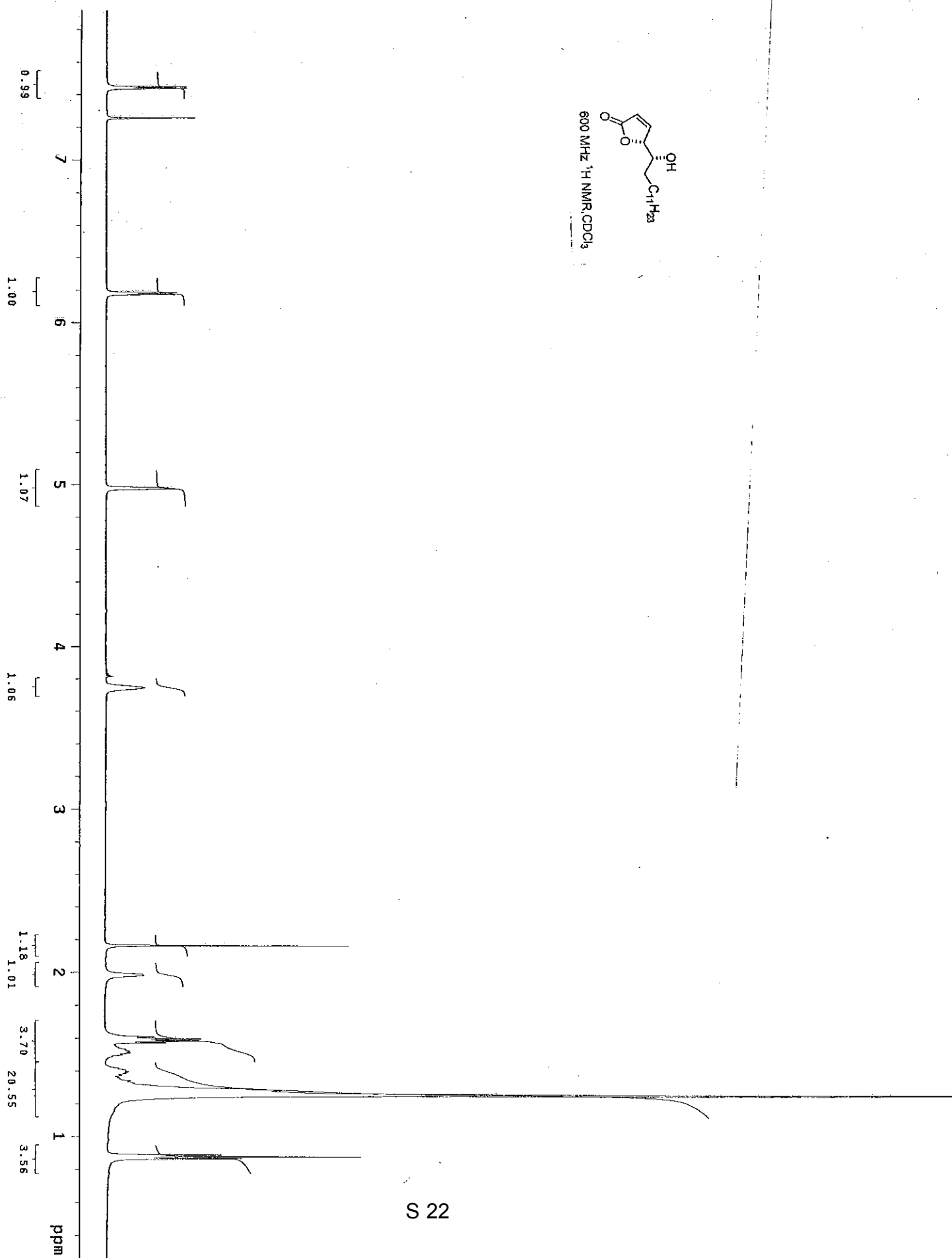
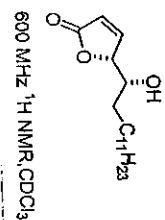


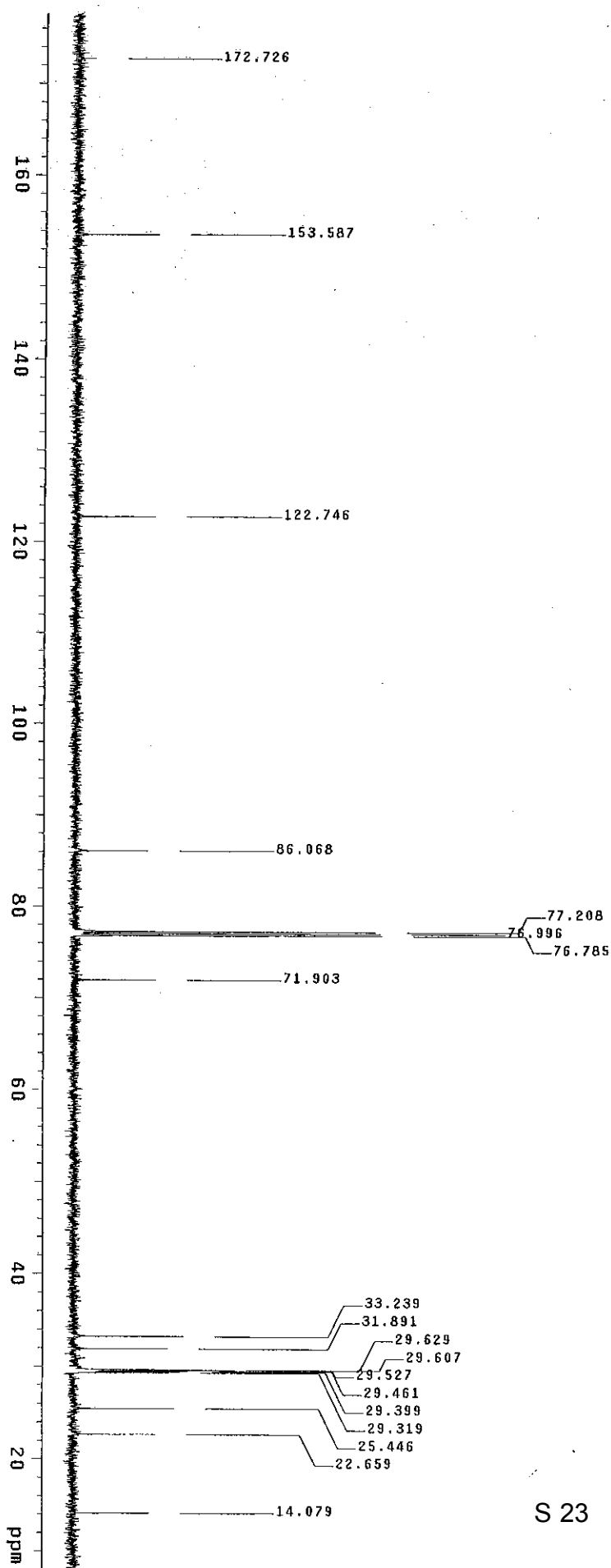
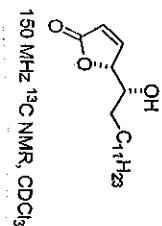
CCCCC=O
150 MHz ^{13}C NMR, CDCl_3

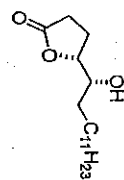




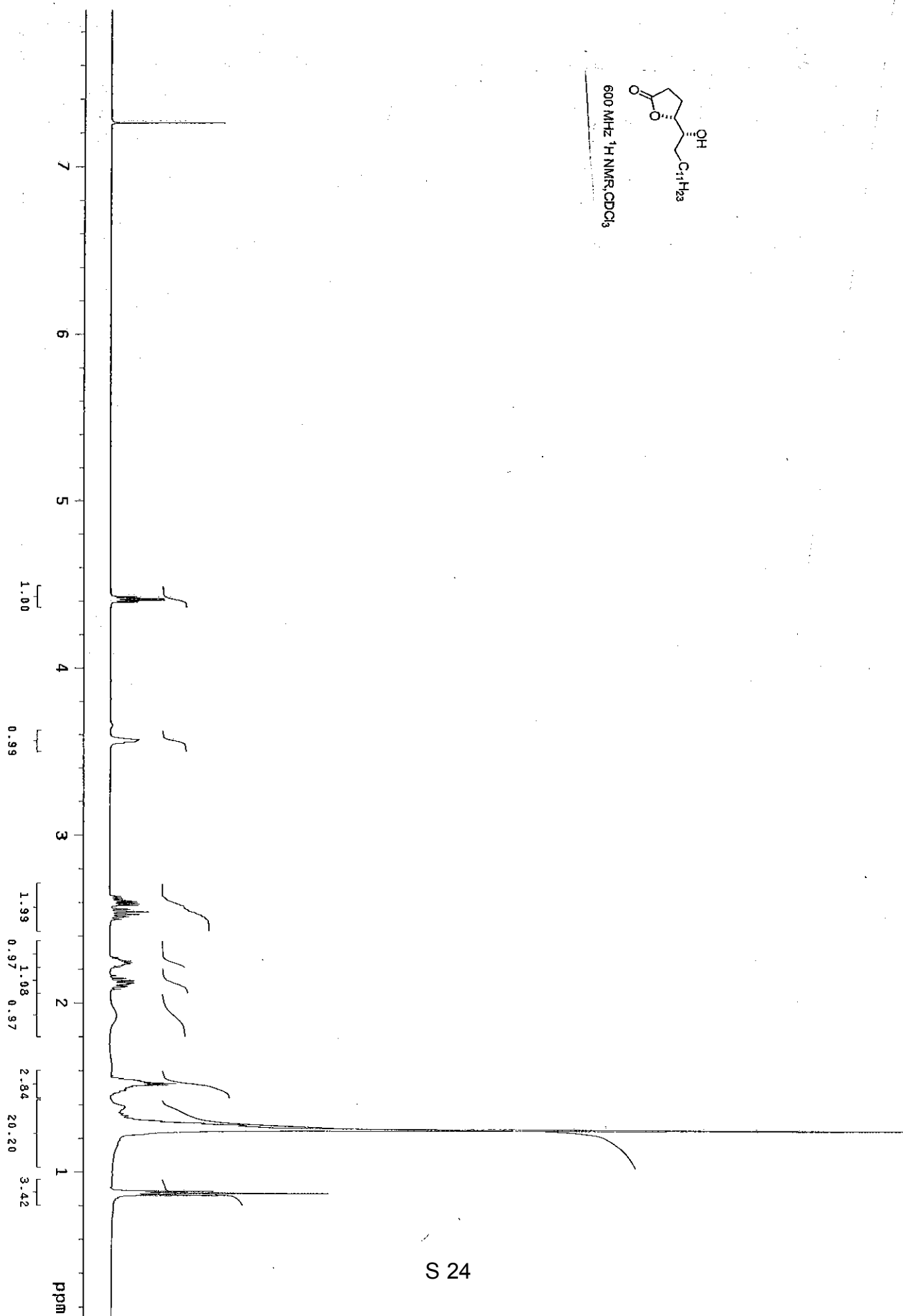


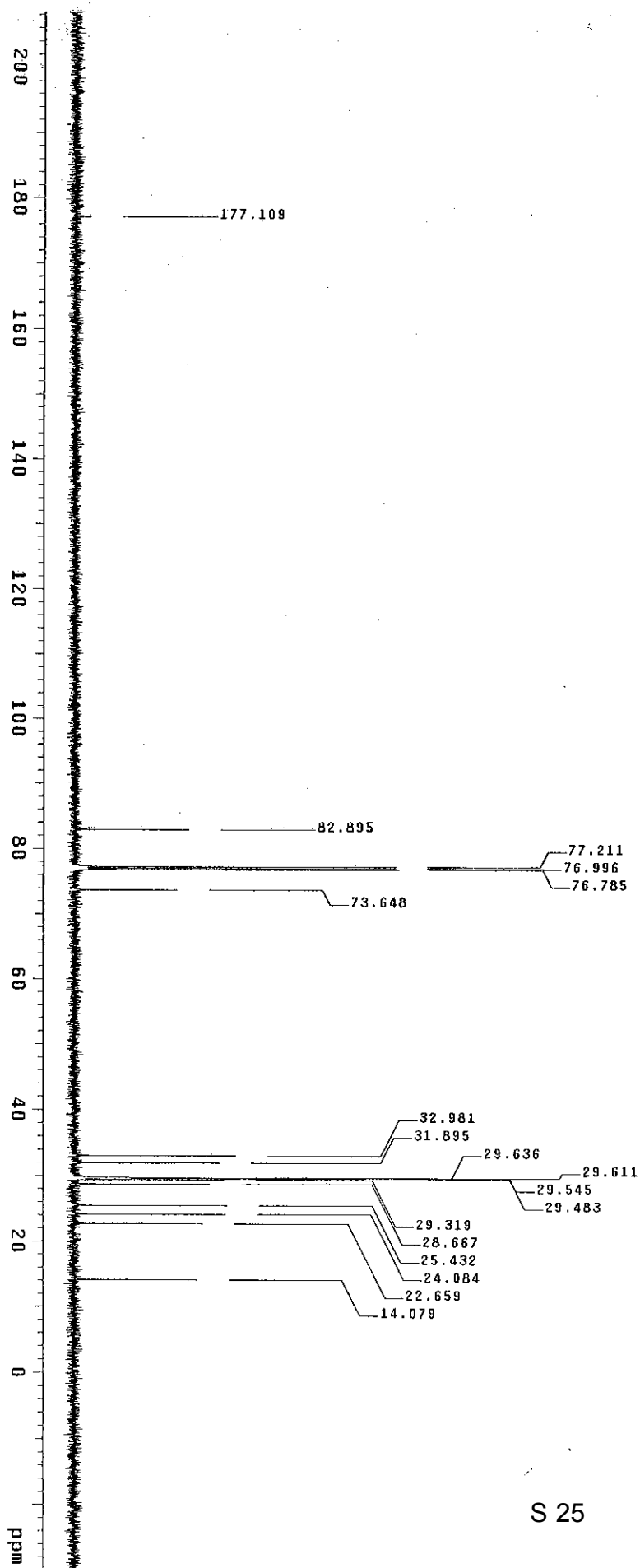
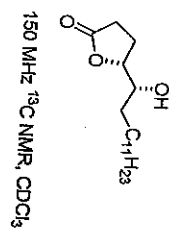


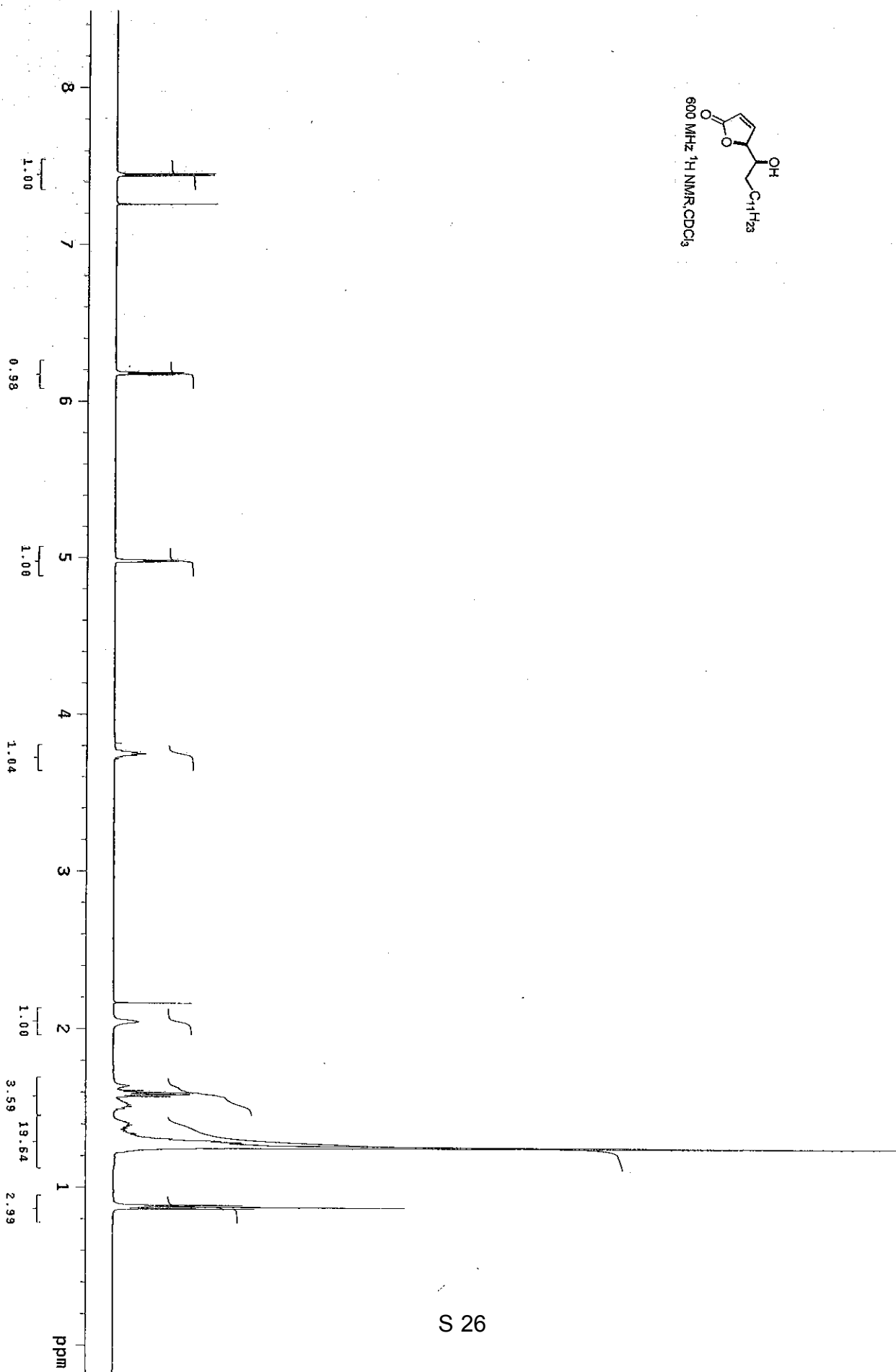
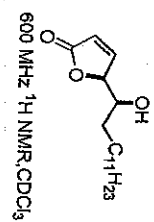




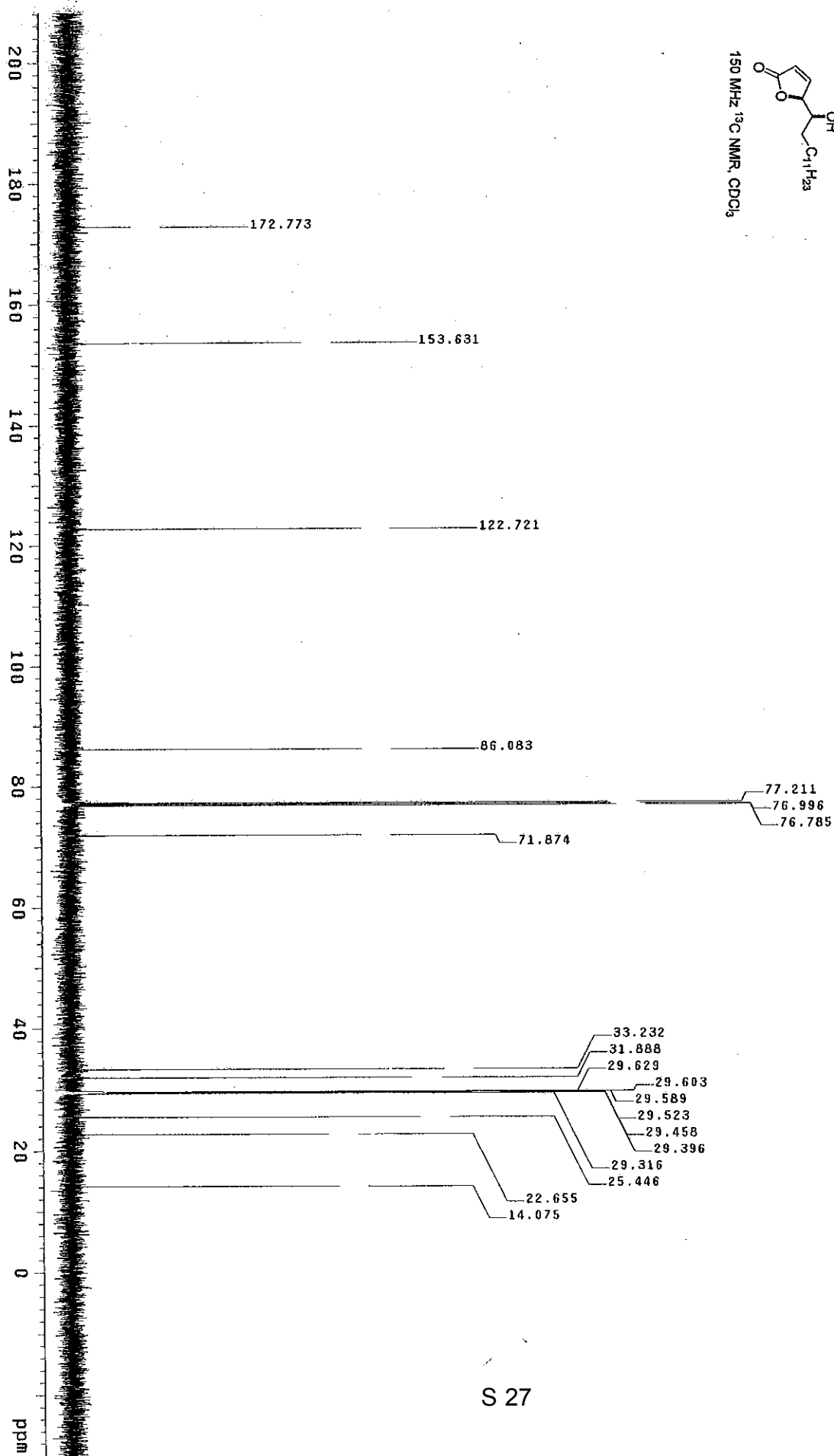
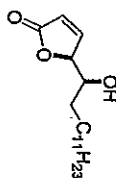
600 MHz ^1H NMR, CDCl_3

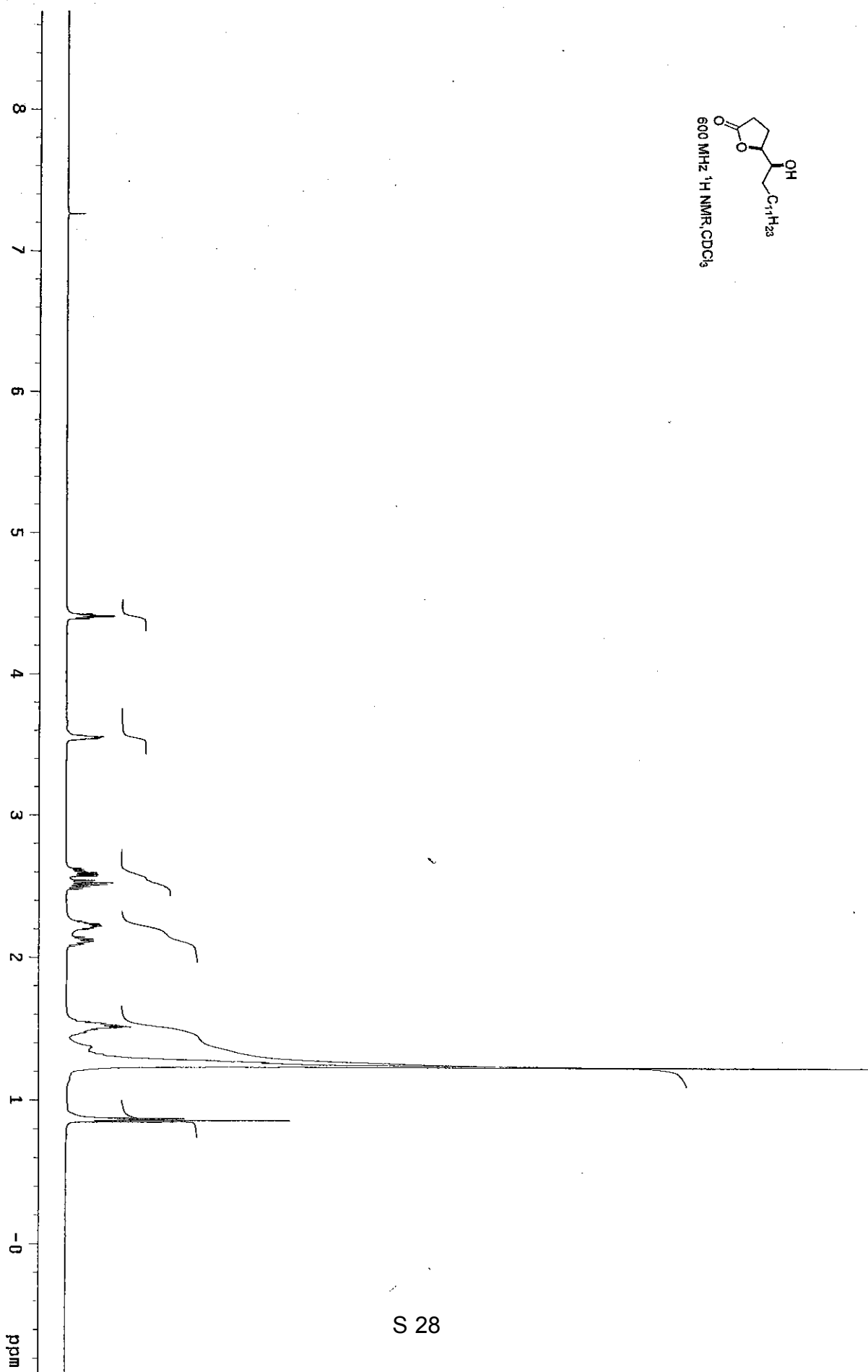
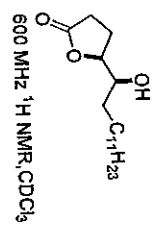


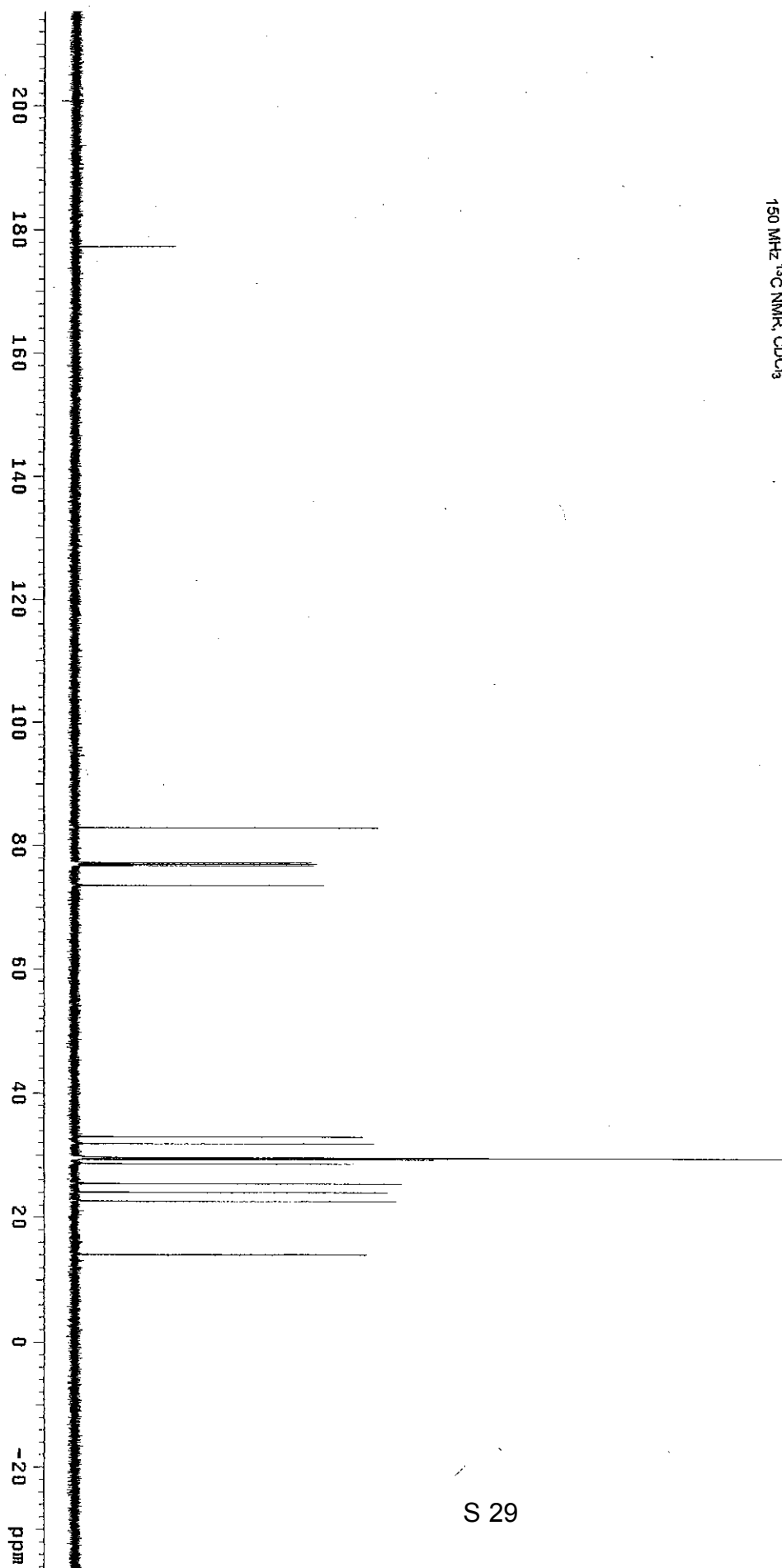
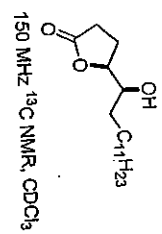


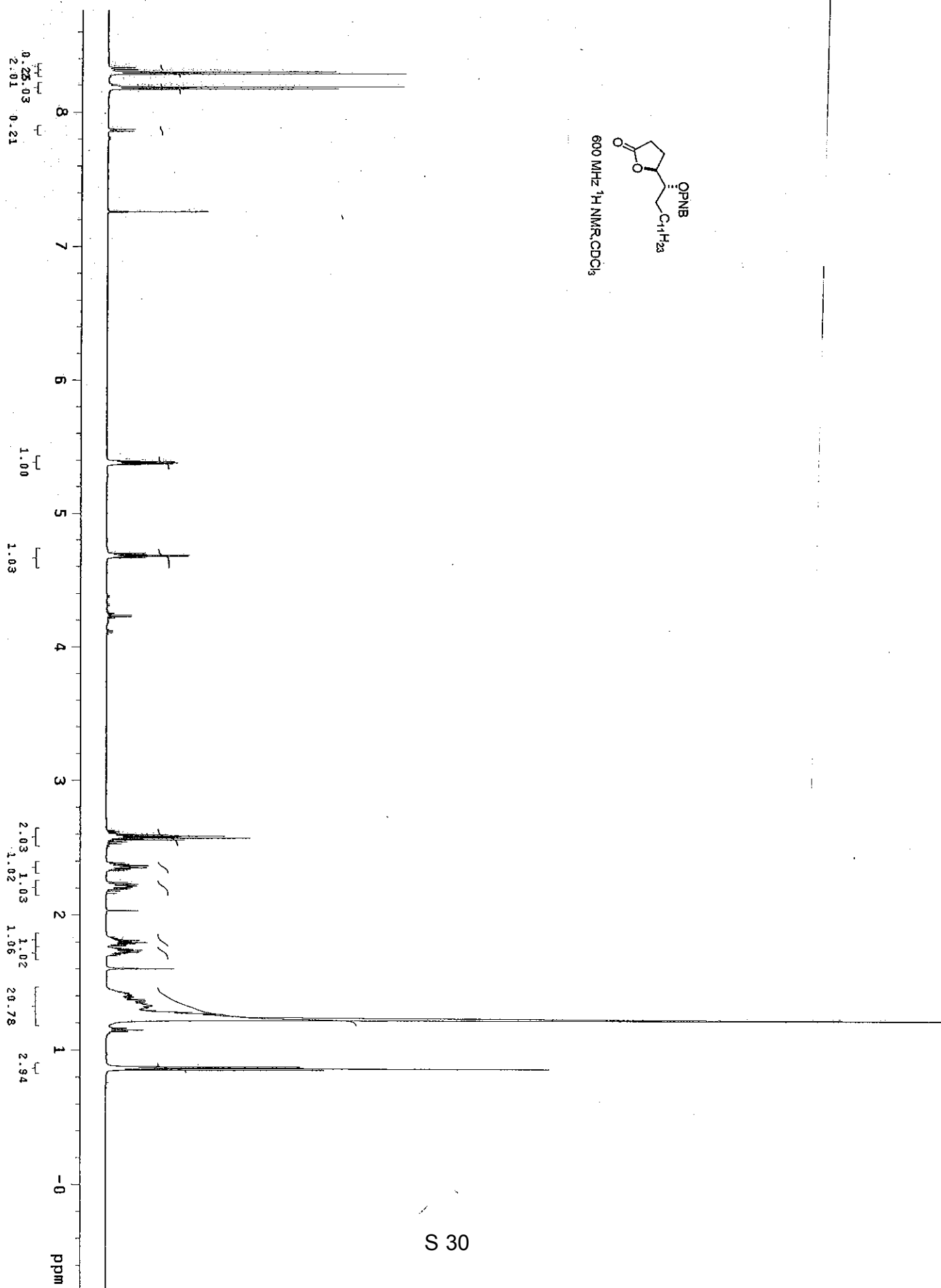
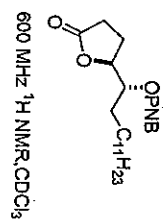


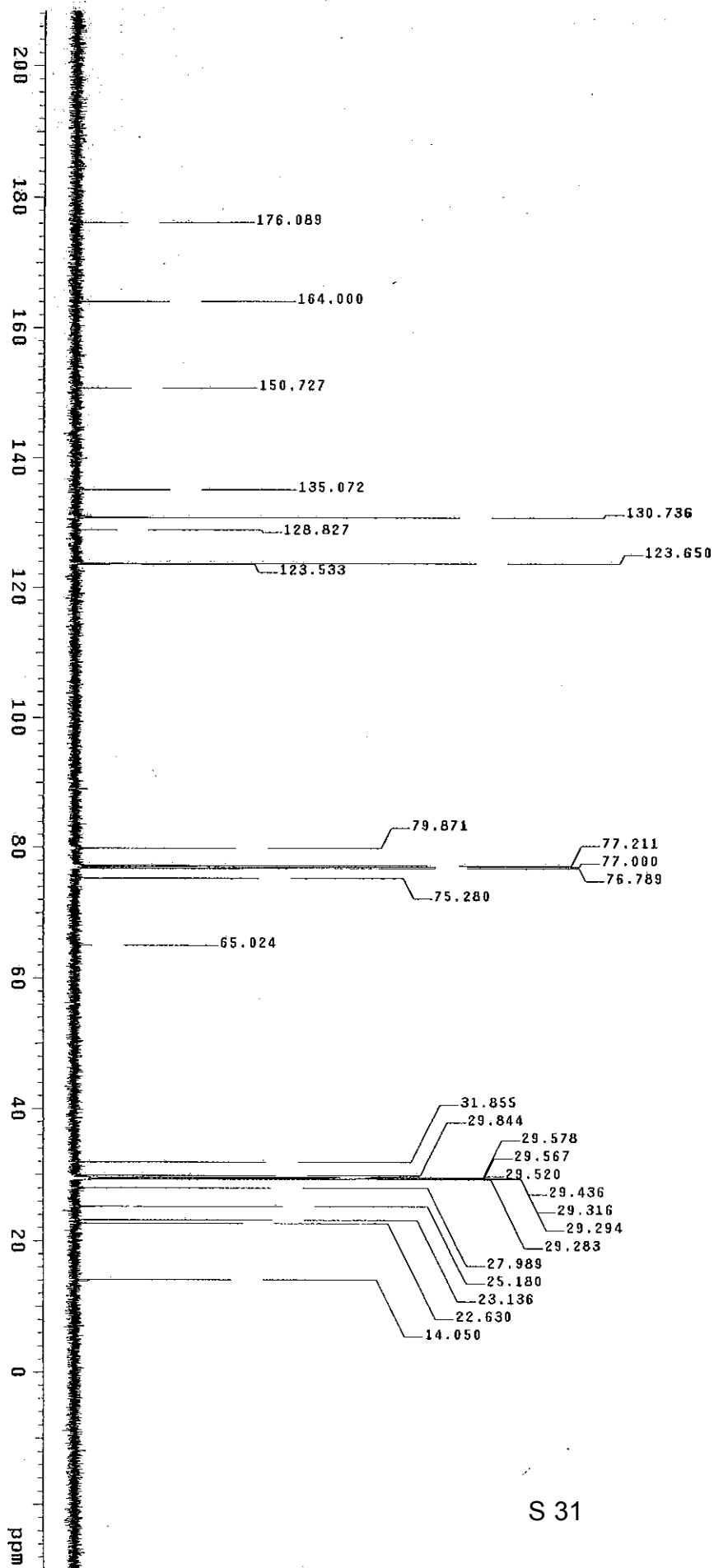
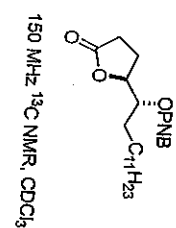
150 MHz ^{13}C NMR, CDCl_3

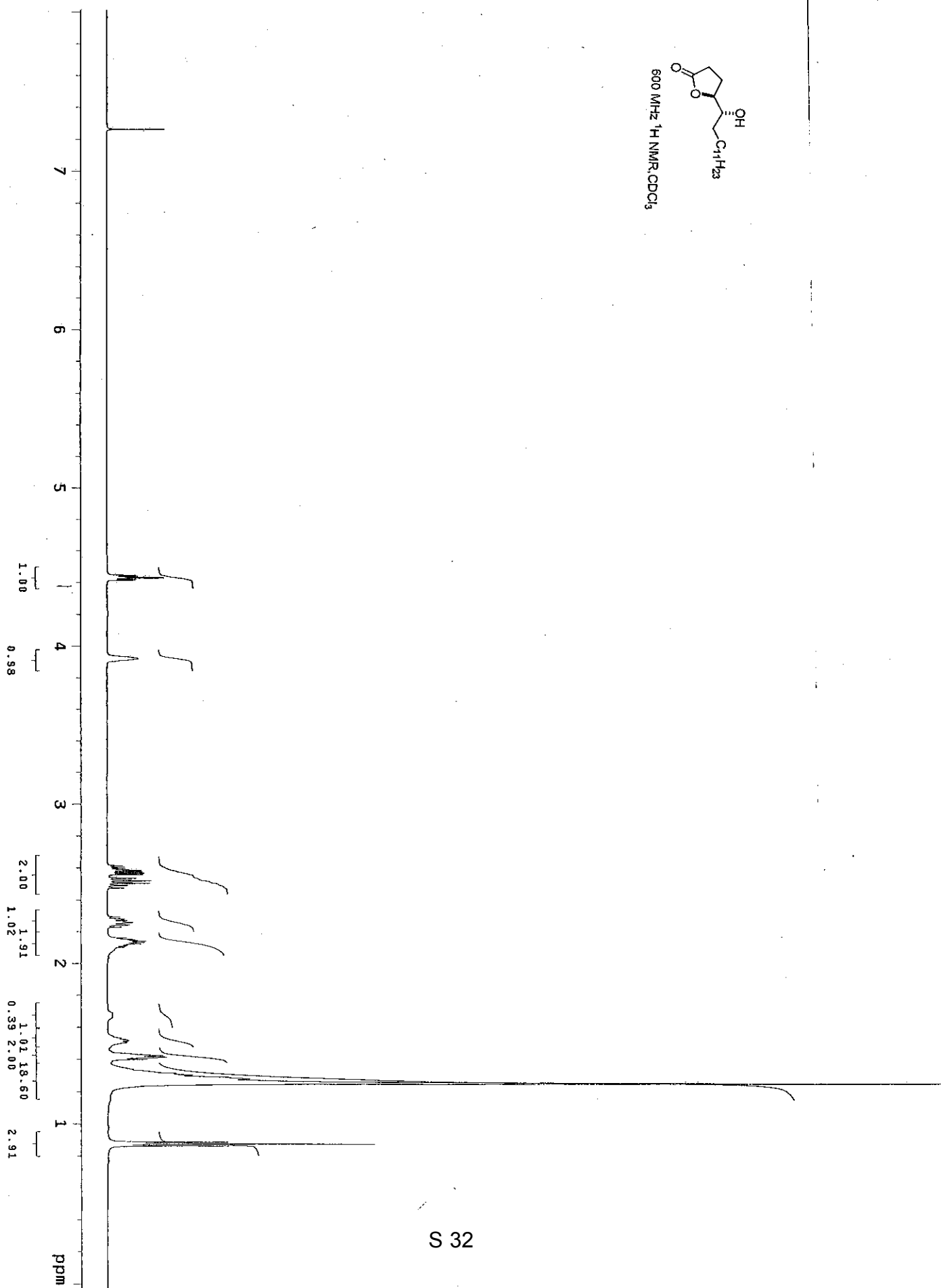
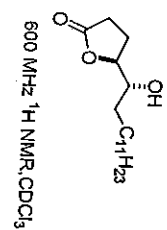


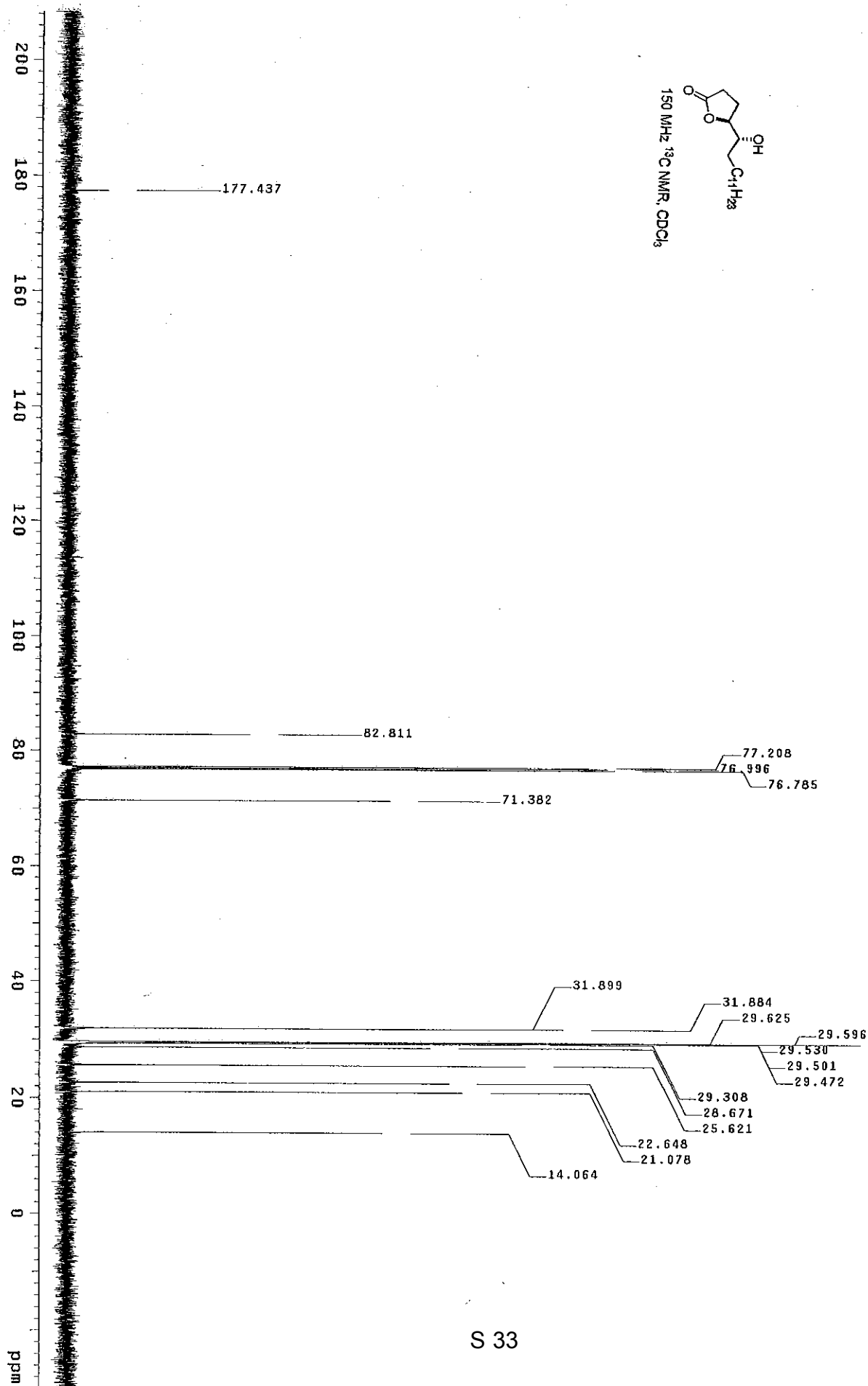
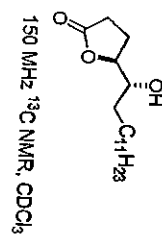












The data of using chiral HPLC to determine the enantiomer excess of (-)muricatacin and (+)muricatacin:

(-) Muricatacin

	Retention time	Purity
Minor	12.4 minutes	
Major	13.8 minutes	> 95% ee

Column: Chiral-OD

Solvent: 95:5 Hexane/isopropanol

(+) muricatacin

	Retention time	Purity
Minor	12.4 minutes	
Major	13.8 minutes	> 92% ee

Column: Chiral-OD

Solvent: 95:5 Hexane/isopropanol