Nickel-Catalyzed, Intermolecular Coupling of Aldehydes, Silyl Triflates, and Alkenes

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Supporting Information

Experimental Procedures, Analytical and Spectroscopic Data for Compounds **1a** – **2l**.
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^{1}H and ^{13}C NMRs for compounds **1a** – **2l**.
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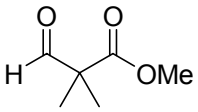
General Information.

Unless otherwise noted, all reactions were performed under an oxygen-free atmosphere of nitrogen or argon with rigid exclusion of moisture from reagents and glassware. Tetrahydrofuran was distilled from a blue solution of sodium benzophenone ketyl. Dichloromethane and toluene was distilled from calcium hydride. All aldehydes were distilled and saturated with nitrogen before use. Bis(cyclooctadienyl)nickel(0) ($Ni(cod)_2$) and tris-(*o*-methoxyphenyl)-phosphine was purchased from Strem Chemicals, Inc., stored under nitrogen atomosphere and used without further purification. Ethylene was purchased from BOC Gases and used as received. 1-octene, 4-methyl-1-pentene, 7-methyl-1,6-octadiene were purchased from Aldrich Chemical Co. and used as received. Dicyclohexylphenylphosphine was purchased from Aldrich Chemical Co., stored under nitrogen atmosphere and used without further purification. Triethylsilyltrifluoro-methanesulfonate (TESOTf) and trimethylsilyl-trifluoromethansulfonate (TMSOTf) were purchased from Aldrich Chemical Co. and were distilled over calcium hydride before use. Tert-butyldimethysilyl-trifluoromethanesulfonate (TBSOTf) was purchased from Alfa Aesar and was distilled over calcium hydride before use.

Analytical thin layer chromatography (TLC) was performed using EM Science silica gel 60 F_{254} plates. The developed chromatogram was analyzed by UV lamp (254 nm), ethanolic phosphomolybdic acid (PMA) or potassium permanganate ($KMnO_4$). Liquid chromatography was performed using a forced flow (flash chromatography) of the indicated solvent system on Silicycle Silica Gel (230 – 400 mesh). ^1H and ^{13}C NMR spectra were recorded on Varian 300 MHz, Varian 500 MHz or Bruker 400 MHz spectrometers in $CDCl_3$ or C_6D_6, unless otherwise noted. Chemical shifts in ^1H NMR spectra are reported in parts per million (ppm) on the δ scale from an internal standard of residual chloroform (7.27 ppm) or residual benzene (7.16 ppm). Data are reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, b = broad), coupling constant in hertz (Hz), and integration. Chemical shifts of ^{13}C NMR spectra are reported in ppm from the central peak of $CDCl_3$ (77.23 ppm) on the δ scale. Infrared (IR) spectra were recorded on a Perkin-Elmer 2000 FT-IR. High resolution mass spectra (HRMS) were obtained on a Bruker Daltonics APEXII 3 Tesla Fourier Transform Mass Spectrometer by Dr. Li Li of the Massachusetts Institute of Technology Department of Chemistry Instrument Facility. Chiral GC analysis was performed on a Varian CP-3800 gas chromatograph fitted with Chiraldex B-PH, B-DA, and G-TA capillary columns. Chiral HPLC analysis was performed on a Hewlett-Packard 1100 chromatograph equipped with a variable wavelength detector and Chiralcel OD or OD-H columns. Specific Rotations ($[\alpha]_D$) were measured on a Perkin-Elmer 241

polarimeter at 589 nm.

Preparation of 2,2-dimethyl-3-oxo-propionic acid methyl ester



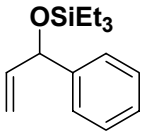
2,2-dimethyl-3-oxo-propionic acid methyl ester. 3-Hydroxy-2,2-dimethyl-propionic acid methyl ester (15 g, 113 mmol) in 200 mL dichloromethane was cooled to 0°C. Pyridinium chlorochromate (43 g, 200 mmol) was added. The mixture was slowly warmed to room temperature and stirred 24 h. The crude in dichloromethane was filtered through silica gel. Celite was added to the remaining black viscous oil from the reaction mixture until the viscous oil is all absorbed to the celite. Dichloromethane was added to this slurry and the dichloromethane solution was filtered through silica gel. Dichloromethane was removed at reduced pressure (80 Torr) to give a pale yellow crude. Distillation removed residue dichloromethane and obtained 2,2-dimethyl-3-oxo-propionic acid methyl ester as a colorless oil (7 g, 48% yield).

^{1}H NMR (300 MHz, $CDCl_3$, δ): 9.60 (s, 1H); 3.70 (s, 3H); 1.29 (s, 6H).
^{13}C NMR (75 MHz, $CDCl_3$, δ): 199.1, 173.2, 53.9, 52.6, 19.7.
IR (NaCl, thin film): 2988, 2958, 1726, 1468, 1278, 1151, 866.

Nickel-catalyzed couplings of ethylene and liquid aldehydes (1a, 1b, 1c, 1d, 1h, 1i).

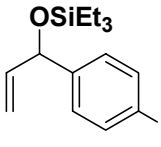
General procedure. A 10 mL round bottom flask and a stir bar were oven-dried and brought into a glove box. $Ni(cod)_2$ (27.5 mg, 0.1 mmol, 20 mol%) and tris-*o*-methoxyphenylphosphine (70.5 mg, 0.2 mmol, 40 mol%) were added to the round bottom flask, the flask was sealed with a septum, and the sealed flask was brought out of the glove box and connected to an argon line. The catalyst mixture was dissolved in toluene (2.5 mL) under argon and stirred 15 min at room temperature. The reaction mixture was purged with ethylene for 1 min to remove argon, taken care not to introduce oxygen. The ethylene atmosphere was maintained with an ethylene balloon. Next triethylamine (418 μL, 3 mmol, 600 mol%) was added. Silyltriflate (0.875 mmol, 175 mol%, as specified) was added. Aldehyde (0.5 mmol, 100 mol%, as specified) was added. The mixture was stirred at room temperature for 3 – 18 h. The mixture was filtered through a plug of silica gel. Solvent was removed under reduced pressure and the crude mixture was diluted in hexane. Purification via flash chromatography on silica afforded

the coupling product.



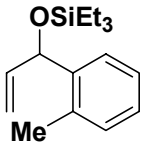
Triethyl-(1-phenyl-allyloxy)-silane (1a). The reaction of ethylene and benzaldehyde (51 μL, 0.5 mmol) with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1a** in 82% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.32 – 7.45 (m, 4H); 7.29 (t, *J* = 7.0 Hz, 1H); 6.01 (ddd, *J* = 6.0, 10.2, 16.9 Hz, 1H); 5.34 (dt, *J* = 1.5, 16.9 Hz, 1H); 5.25 (d, *J* = 5.9 Hz, 1H); 5.13 (dt, *J* = 1.5, 10.2 Hz, 1H); 0.99 (t, *J* = 8.0 Hz, 9H); 0.66 (dq, *J* = 1.8, 7.8 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 143.9, 141.8, 128.4, 127.3, 126.2, 113.7, 75.9, 7.0, 5.1.
IR (NaCl, thin film): 2956, 2877, 1640, 1454, 1240, 1065, 744, 699.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{15}H_{24}OSi$, 271.149; found, 271.150.



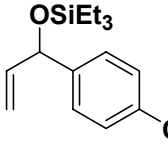
Triethyl-(1-p-tolyl-allyloxy)-silane (1b). The reaction of ethylene and *p*-tolualdehyde (59 μL, 0.5 mmol) with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1b** in 88% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.27 (d, *J* = 8.0, 2H); 7.16 (d, *J* = 8.0 Hz, 2H); 5.97 (ddd, *J* = 5.9, 10.2, 16.9 Hz, 1H); 5.30 (dt, *J* = 1.5, 17.0 Hz, 1H); 5.17 (d, *J* = 5.9 Hz, 1H); 5.09 (dt, *J* = 1.3, 10.2 Hz, 1H); 2.37 (s, 3H); 0.97 (t, *J* = 7.9 Hz, 9H); 0.65 (dq, *J* = 1.9, 7.5 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 142.1, 141.1, 136.8, 129.1, 126.2, 113.4, 75.8, 21.3, 7.0, 5.2.
IR (NaCl, thin film): 2955, 2877, 1640, 1513, 1458, 1415, 1079, 1007, 844.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{16}H_{26}OSi$, 285.165; found, 285.165.



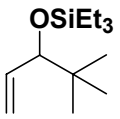
Triethyl-(1-o-tolyl-allyloxy)-silane (1c). The reaction of ethylene and *o*-tolualdehyde (58 μL, 0.5 mmol) with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1c** in 93% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.50 (d, *J* = 7.0, 1H); 7.11 – 7.24 (m, 4H); 5.93 (ddd, *J* = 5.7, 10.2, 17.0 Hz, 1H); 5.36 (d, *J* = 5.6 Hz, 1H); 5.22 (dt, *J* = 1.6, 17.1 Hz, 1H); 5.08 (dt, *J* = 1.5, 10.2 Hz, 1H); 2.34 (s, 3H); 0.95 (t, *J* = 8.0 Hz, 9H); 0.61 (dq, *J* = 2.8, 7.5 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 141.9, 140.7, 134.4, 130.3, 127.1, 126.5, 126.3, 113.7, 73.1, 19.4, 7.0, 5.1.
IR (NaCl, thin film): 2955, 2877, 1639, 1461, 1066, 1007, 744.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{16}H_{26}OSi$, 285.165; found, 285.165.



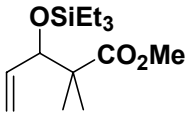
Triethyl-[1-(4-methoxy-phenyl)-allyloxy]-silane (1d). The reaction of ethylene and *p*-anisaldehyde (61 μL, 0.5 mmol) with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1d** in 95% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.30 (d, *J* = 8.7 Hz, 2H); 6.90 (d, *J* = 8.7 Hz, 2H); 5.97 (ddd, *J* = 5.9, 10.2, 16.9 Hz, 1H); 5.29 (dt, *J* = 1.4, 17.0 Hz, 1H); 5.16 (d, *J* = 5.9 Hz, 1H); 5.10 (dt, *J* = 1.4, 10.2 Hz, 1H); 3.83 (s, 3H); 0.96 (t, *J* = 7.9 Hz, 9H); 0.63 (dq, *J* = 1.8, 7.5 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 158.9, 142.0, 136.2, 127.4, 113.7, 113.4, 75.4, 55.4, 7.0, 5.1.
IR (NaCl, thin film): 2955, 2877, 1639, 1511, 1464, 1246, 1037, 744.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{16}H_{26}O_2Si$, 301.159; found, 301.159.



(1-tert-Butyl-allyloxy)-triethyl-silane (1h). The reaction of ethylene and pivaldehyde (55 μL, 0.5 mmol) with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1h** in 70% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 5.97 (ddd, *J* = 5.9, 10.2, 16.9 Hz, 1H); 5.12 (bs, 1H); 5.10 (bs, 1H); 5.08 (bs, 1H); 3.67 (d, *J* = 7.5 Hz, 1H); 0.96 (t, *J* = 7.9 Hz, 9H); 0.86 (s, 9H); 0.63 (q, *J* = 7.7 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 139.4, 115.8, 82.4, 35.5, 26.0, 7.2, 5.3.
IR (NaCl, thin film): 2955, 2877, 1641, 1462, 1239, 1082, 835.



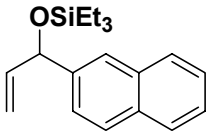
2,2-Dimethyl-3-triethylsilanyloxy-pent-4-enoic acid methyl ester (1i). The reaction of ethylene and 2,2-dimethyl-3-oxo-propionic acid methyl ester (70 mg, 0.54 mmol) with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1i** in 81% (0.28 mmol) isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 5.75 (ddd, *J* = 7.6, 10.4, 17.5 Hz, 1H); 5.17 (bd, *J* = 17.3 Hz, 1H); 5.15 (bd, *J* = 10.3 Hz, 1H); 5.10 (dt, *J* = 1.4, 10.2 Hz, 1H); 4.31 (d, *J* = 7.6 Hz, 1H); 3.66 (s, 3H); 1.15 (s, 3H); 1.05 (s, 3H); 0.92 (t, *J* = 7.9 Hz, 9H); 0.55 (dq, *J* = 1.5, 7.6 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 177.4, 137.8, 117.3, 79.2, 51.8, 48.3, 21.4, 19.9, 7.0, 5.2.
IR (NaCl, thin film): 2954, 2878, 1745, 1732, 1642, 1468, 1261, 1087, 834.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{14}H_{28}O_3Si$, 295.170; found, 295.171.

Nickel-catalyzed couplings of ethylene and 2-naphthaldehyde (1e, 1f, 1j).

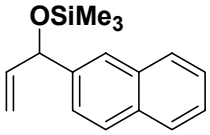
General procedure. A 10 mL round bottom flask and a stir bar were oven-dried and brought into a glove box. $Ni(cod)_2$ (27.5 mg, 0.1 mmol, 20 mol%),

tris-*o*-methoxyphenylphosphine (70.5 mg, 0.2 mmol, 40 mol%) and 2-naphthaldehyde (78 mg, 0.5 mmol) were added to the round bottom flask, the flask was sealed with a septum, and the sealed flask was brought out of the glove box and connected to an argon line. The catalyst mixture was dissolved in toluene (2.5 mL) under argon and stirred 15 min at room temperature. The reaction mixture was purged with ethylene for 1 min to remove argon, taken care not to introduce oxygen. The ethylene atmosphere was maintained with an ethylene balloon. Next triethylamine (418 μL, 3 mmol, 600 mol%) was added. Silyltriflate (0.875 mmol, 175 mol%, as specified) was added. The mixture was stirred at room temperature for 5 h. The mixture was filtered through a plug of silica gel. Solvent was removed under reduced pressure and the crude mixture was diluted in hexane. Purification via flash chromatography on silica afforded the coupling product.



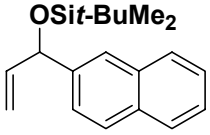
Triethyl-(1-naphthalen-2-yl-allyloxy)-silane (1e). The reaction of ethylene and 2-naphthaldehyde with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TESOTf (197 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1e** in 95% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.82 – 7.92 (m, 4H); 7.48 – 7.55 (m, 3H); 6.07 (ddd, J = 6.2, 10.2, 15.8 Hz, 1H); 5.35 – 5.45 (m, 2H); 5.17 (dt, J = 1.3, 10.1 Hz, 1H); 1.00 (t, J = 7.8 Hz, 9H); 0.68 (dq, J = 2.5, 7.5 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 141.7, 141.4, 133.5, 133.0, 128.2, 128.1, 127.7, 126.1, 125.8, 124.8, 124.6, 114.0, 76.0, 7.0, 5.1.
IR (NaCl, thin film): 2955, 2876, 1640, 1458, 1239, 1006, 743.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{19}H_{26}OSi$, 321.165; found, 321.164.



Trimethyl-(1-naphthalen-2-yl-allyloxy)-silane (1f). The reaction of ethylene and 2-naphthaldehyde with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TMSOTf (158 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1f** in 60% isolated yield as a colorless oil.

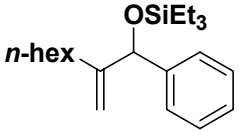
^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.80 – 7.90 (m, 4H); 7.45 – 7.54 (m, 3H); 6.06 (ddd, *J* = 5.6, 10.2, 17.4 Hz, 1H); 5.30 (dt, *J* = 1.5, 17.3 Hz, 1H); 5.37 (bs, 1H); 5.17 (dt, *J* = 1.4, 10.2 Hz, 1H); 0.18 (s, 9H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 141.4, 141.0, 133.5, 133.0, 128.19, 128.18, 127.9, 126.2, 125.9, 124.9, 124.8, 114.4, 76.1, 0.4.
IR (NaCl, thin film): 2958, 1640, 1251, 1077, 841.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{16}H_{20}OSi$, 279.118; found, 279.119.



Tert-Butyl-dimethyl-(1-naphthalen-2-yl-allyloxy)-silane (1g). The reaction of ethylene and 2-naphthaldehyde with $Ni(cod)_2$, tris-*o*-methoxyphenylphosphine and TBSOTf (201 μL, 0.875 mmol), triethylamine in toluene following the general procedure above, afforded **1g** in 67% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.80 – 7.92 (m, 4H); 7.45 – 7.55 (m, 3H); 6.04 (ddd, *J* = 5.8, 10.2, 16.8 Hz, 1H); 5.39 (dt, *J* = 1.5, 17.0, 1H); 5.38 (s, 1H); 5.14 (dt, *J* = 1.5, 10.2 Hz, 1H); 0.99 (s, 9H); 0.16 (s, 3H); 0.06 (s, 3H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 141.8, 141.4, 133.5, 133.0, 128.2, 128.1, 127.9, 126.1, 125.8, 124.8, 124.6, 113.8, 76.2, 26.1, 18.6, -4.4, -4.6.
IR (NaCl, thin film): 2956, 2857, 1636, 1472, 1252, 1081, 837.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{19}H_{26}OSi$, 321.165; found, 321.164.

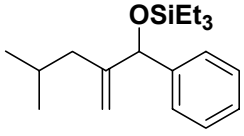
Nickel-catalyzed couplings of α-olefin and benzaldehyde (1j, 1k, 1l).



Triethyl-(2-methylene-1-phenyl-octyloxy)-silane (1j). A 25 mL round bottom flask and a stir bar were oven-dried and brought into a glove box. $Ni(cod)_2$ (110 mg, 0.4 mmol, 20 mol%) and dicyclohexylphenylphosphine (220 mg, 0.8 mmol,

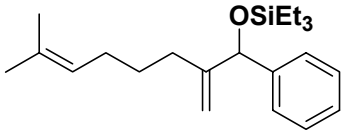
40 mol%) were added to the round bottom flask, the flask was sealed with a septum, and the sealed flask was brought out of the glove box and connected to an argon line. The catalyst mixture was dissolved in toluene (5.0 mL) under argon and stirred 5 min at room temperature. 1-octene (1.57 mL, 10 mmol, 500 mol%) was added. Triethylamine (1.7 mL, 12 mmol, 600 mol%) was added. TESOTf (0.8 mL, 3.5 mmol, 175 mol%) was added. Benzaldehyde (200 μL, 2 mmol, 100 mol%) in 5 mL toluene was added to the reaction mixture over 10 min. The mixture was stirred at room temperature for 15 h. The mixture was filtered through a plug of silica gel. Solvent was removed under reduced pressure and the crude mixture was diluted in hexane. Purification via flash chromatography on silica afforded **1j** in 44% isolated yield as a colorless oil.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.36 (d, J = 7.0 Hz, 2H); 7.31 (t, J = 7.1 Hz, 2H); 7.24 (t, J = 7.2, 1H); 5.22 (bs, 1H); 5.15 (bs, 1H); 5.25 (d, J = 5.9 Hz, 1H); 4.87 (s, 1H); 1.96 (pentet, J = 7.8 Hz, 1H); 1.76 (pentet, J = 8.0 Hz, 1H); 1.15 – 1.40 (m, 8H); 0.93 (t, J = 8.0 Hz, 9H); 0.87 (t, J = 6.8 Hz, 3H); 0.60 (dq, J = 1.6, 7.9 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 152.3, 143.8, 128.1, 127.1, 126.6, 109.5, 78.3, 32.0, 30.8, 29.4, 28.0, 22.8, 14.3, 7.0, 5.1.
IR (NaCl, thin film): 2956, 2876, 1647, 1456, 1089, 1066, 742.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{21}H_{36}OSi$, 355.243; found, 355.242.



Triethyl-(4-methyl-2-methylene-1-phenyl-pentyloxy)-silane (1k). A 10 mL round bottom flask and a stir bar were oven-dried and brought into a glove box. $Ni(cod)_2$ (27.5 mg, 0.2 mmol, 20 mol%) and dicyclohexylphenylphosphine (55 mg, 0.4 mmol, 40 mol%) were added to the round bottom flask, the flask was sealed with a septum, and the sealed flask was brought out of the glove box and connected to an argon line. The catalyst mixture was dissolved in toluene (2.5 mL) under argon and stirred 5 min at room temperature. 4-methyl-1-pentene (633 μL, 5 mmol, 1000 mol%) was added. Triethylamine (418 μL, 3 mmol, 600 mol%) was added. TESOTf (197 μL, 0.875 mmol, 175 mol%) was added. Benzaldehyde (51 μL, 0.5 mmol, 100 mol%) was added to the reaction mixture. The mixture was stirred at room temperature for 14 h. The mixture was filtered through a plug of silica gel. Solvent was removed under reduced pressure and the crude mixture was diluted in hexane. Purification via flash chromatography on silica afforded **1k** in 44% isolated yield as a colorless oil.

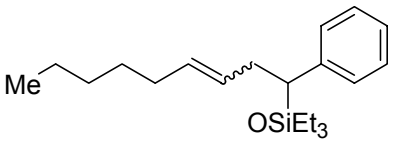
^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.36 (d, *J* = 7.8 Hz, 2H); 7.32 (t, *J* = 7.1 Hz, 2H); 7.25 (t, *J* = 7.1, 1H); 5.30 (bs, 1H); 5.12 (bs, 1H); 4.87 (bs, 1H); 1.65 – 1.85 (m, 3H); 0.93 (t, *J* = 8.0 Hz, 9H); 0.84 (d, *J* = 6.4 Hz, 3H); 0.82 (d, *J* = 6.2 Hz, 3H); 0.60 (dq, *J* = 1.3, 8.3 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 150.5, 143.7, 128.1, 127.1, 126.7, 110.7, 77.9, 41.1, 26.3, 23.0, 22.6, 7.0, 5.0.
IR (NaCl, thin film): 2955, 2877, 1646, 1454, 1088, 1067, 743.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{19}H_{32}OSi$, 327.211; found, 327.212.



Triethyl-(7-methyl-2-methylene-1-phenyl-oct-6-enyloxy)-silane (1l). A 10 mL round bottom flask and a stir bar were oven-dried and brought into a glove box. $Ni(cod)_2$ (27.5 mg, 0.2 mmol, 20 mol%) and dicyclohexylphenylphosphine (55 mg, 0.4 mmol, 40 mol%) were added to the round bottom flask, the flask was sealed with a septum, and the sealed flask was brought out of the glove box and connected to an argon line. The catalyst mixture was dissolved in toluene (1.0 mL) under argon and stirred 5 min at room temperature. 7-methyl-1,7-octadiene (825 μL, 5 mmol, 1000 mol%) was added. Triethylamine (418 μL, 3 mmol, 600 mol%) was added. TESOTf (197 μL, 0.875 mmol, 175 mol%) was added. Benzaldehyde (51 μL, 0.5 mmol, 100 mol%) in 1.5 mL toluene was added to the reaction mixture over 6 min. The mixture was stirred at room temperature for 18 h. The mixture was filtered through a plug of silica gel. Solvent was removed under reduced pressure and the crude mixture was diluted in hexane. Purification via flash chromatography on silica afforded **1l** in 50% isolated yield as a colorless oil.

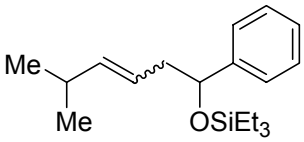
^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.40 (d, *J* = 7.0 Hz, 2H); 7.34 (t, *J* = 7.8 Hz, 2H); 7.27 (t, *J* = 7.2, 1H); 5.26 (bs, 1H); 5.18 (bs, 1H); 5.10 (t, *J* = 7.2 Hz, 1H); 4.81 (bs, 1H); 1.76 – 2.10 (m, 4H); 1.71 (s, 3H); 1.60 (s, 3H); 1.44 (quintet, *J* = 7.7 Hz); 0.97 (t, *J* = 7.9 Hz, 9H); 0.62 (dq, *J* = 1.5, 7.9 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 152.1, 143.7, 131.6, 128.1, 127.1, 126.6, 124.8, 109.5, 78.2, 30.4, 28.2, 28.1, 25.9, 17.8, 7.0, 5.0.
IR (NaCl, thin film): 2955, 2877, 1647, 1456, 1091, 1067, 743.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{22}H_{36}OSi$, 367.243; found, 367.243.

Nickel-catalyzed couplings of α-olefin and benzaldehyde (2j, 2k, 2l). For entries 10, 11, and 12, in addition to the major products isolated (i.e. **1j**, **1k** and **1l**), homoallylic minor products were also isolated (**2j**, **2k**, **2l**). NMR of the crude mixtures of all three entries suggested the ratio of the major product to the minor product was approximately 2.5 : 1. Trace amount of other regioisomers could be observed by NMR (<5%).



Triethyl-(1-phenyl-non-3-enyloxy)-silane (2j). The reaction of 1-octene and benzaldehyde with $Ni(cod)_2$, dicyclohexylphenylphosphine, TESOTf and triethylamine in toluene (see **1j** for experimental procedure) afforded **1j** (44%) and **2j** in 19% isolated yield as a colorless oil.

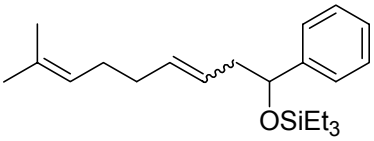
^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.20 – 7.40 (m, 5H); 5.30 – 5.50 (m, 2H); 4.63 (dd, *J* = 5.6, 7.2 Hz, 1H); 2.45 (quintet, *J* = 6.1 Hz, 1H); 2.35 (quintet, *J* = 5.9 Hz, 1H); 1.33 (m, 2H); 0.92 (t, *J* = 7.8 Hz, 12H); 0.56 (dq, *J* = 2.4, 7.6 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 145.6, 133.3, 128.1, 127.1, 126.6, 126.2, 75.6, 44.5, 32.8, 31.6, 29.3, 22.8, 14.2, 7.0, 5.1.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{21}H_{36}OSi$, 355.243; found, 355.244.



Triethyl-(5-methyl-1-phenyl-hex-3-enyloxy)-silane (2k). The reaction of 4-methyl-1-pentene and benzaldehyde with $Ni(cod)_2$, dicyclohexyl-phenylphosphine, TESOTf and triethylamine in toluene (see **1k** for experimental procedure) afforded **1k** (44%) and **2k** in ~10% isolated yield as a colorless oil. **2k** was isolated together with a small amount of a third regioisomer.

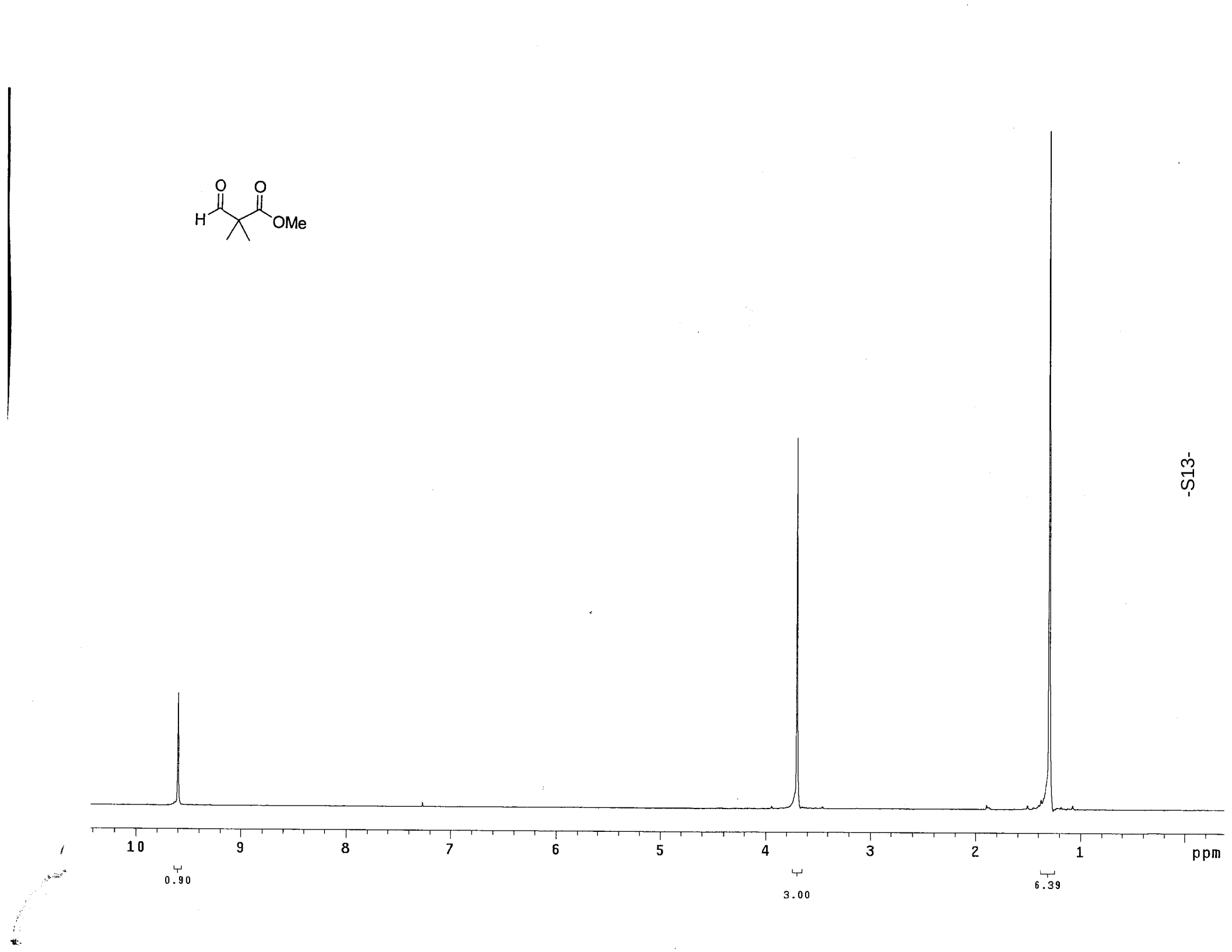
^{1}H NMR (500 MHz, $CDCl_3$, δ): 7.30 (m, *5*H); 5.40 (m, 2H); 4.63 (dd, *J* = 5.3, 7.3 Hz, 1H); 2.41 (quintet, *J* = 5.3 Hz, 1H); 2.30 (quintet, *J* = 5.5 Hz, 1H); 2.24 (septet, *J* = 6.7 Hz, 1H); 2.00 (m, 2H); 0.95 (dd, *J* = 6.7, 7.6 Hz, 6H); 0.89 (t, *J* = 7.9 Hz, 9H); 0.62 (q, *J* = 7.9 Hz, 6H).
^{13}C NMR (125 MHz, $CDCl_3$, δ): 145.6, 140.2, 128.1, 127.0, 126.1, 123.7, 75.7, 44.5, 31.3, 22.6, 7.01, 5.0.

HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{19}H_{32}OSi$, 327.212; found, 327.212.



Triethyl-(8-methyl-1-phenyl-nona-3,7-dienyloxy)-silane (1l). The reaction of 7-methyl-1,7-octadiene and benzaldehyde with $Ni(cod)_2$, dicyclohexylphenylphosphine, TESOTf and triethylamine in toluene (see **1k** for experimental procedure) afforded **1l** (50%) and **2l** in 22% isolated yield.

^{1}H NMR (400 MHz, $CDCl_3$, δ): 7.30 (m, 5H); 5.45 (m, 2H); 5.15 (t, *J* = 7.1 Hz, 1H); 4.64 (dd, *J* = 5.4, 7.3 Hz, 1H); 2.45 (quintet, *J* = 5.4 Hz, 1H); 2.35 (quintet, *J* = 5.9 Hz, 1H); 2.05 (m, 4H); 1.62 (s, 3H); 1.72 (s, 3H); 1.44 (quintet, *J* = 7.7 Hz); 0.92 (t, *J* = 7.9 Hz, 9H); 0.55 (dq, *J* = 1.5, 7.9 Hz, 6H).
^{13}C NMR (100 MHz, $CDCl_3$, δ): 145.6, 132.8, 131.7, 128.1, 127.1, 126.9, 126.1, 124.4, 75.6, 44.5, 33.1, 28.2, 25.9, 17.9, 7.0, 5.0.
IR (NaCl, thin film): 2955, 2876, 1454, 1089, 1005, 742.
HRMS-ESI (m / z): $[M + Na]^+$ calcd for $C_{22}H_{36}OSi$, 367.243; found, 367.243.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7
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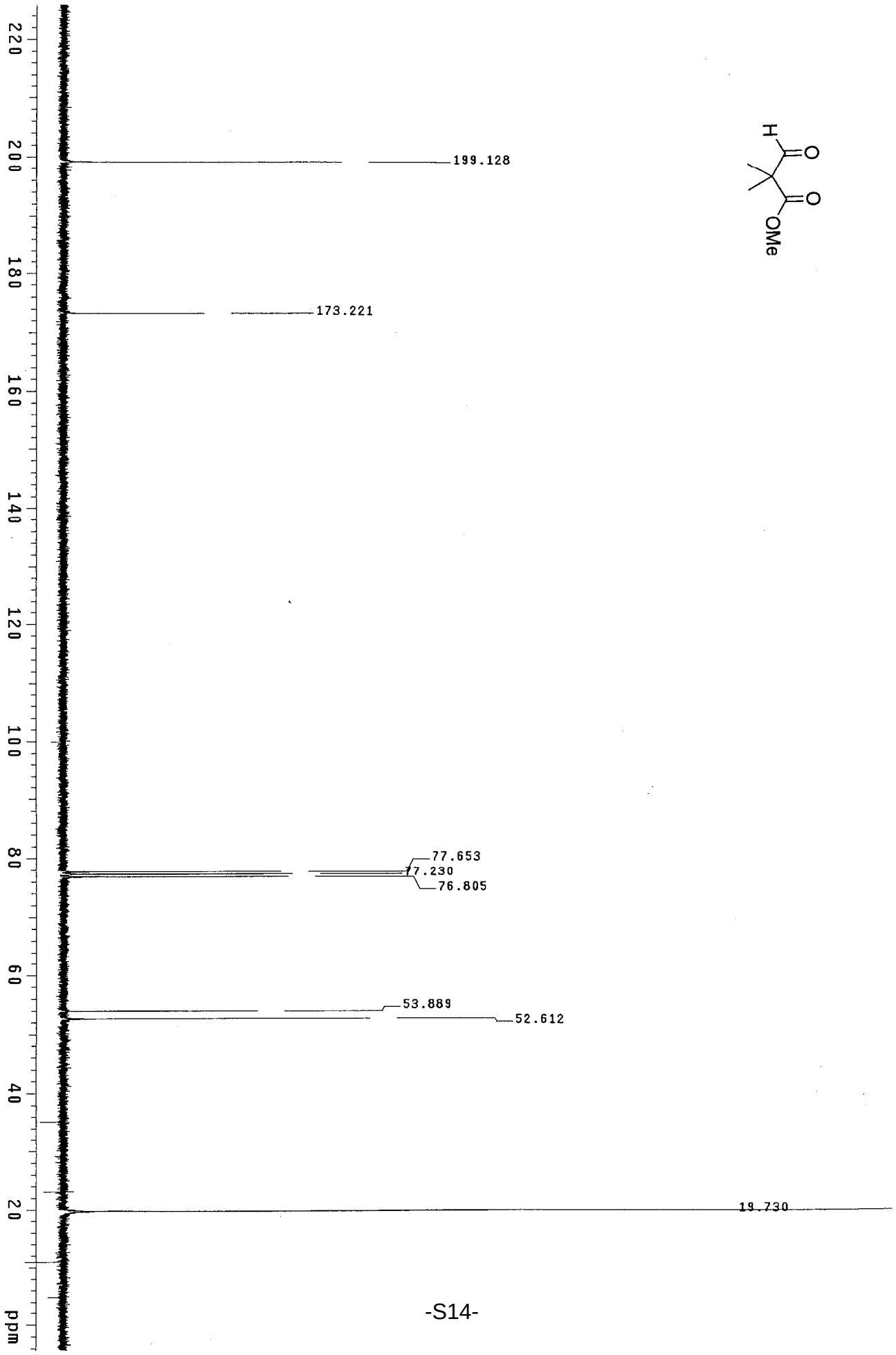
6.39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140
120
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80
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40
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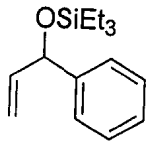
H
O
O
OMe

SN050690



1a

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PROCNO 1

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FIDRES 0.126314 Hz
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RG 45.3
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DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

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PL1 2.00 dB
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F2 - Processing parameters
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SF 400.1300000 MHz
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LB 0.30 Hz
GB 0
PC 1.00

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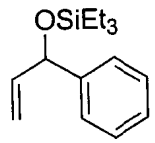
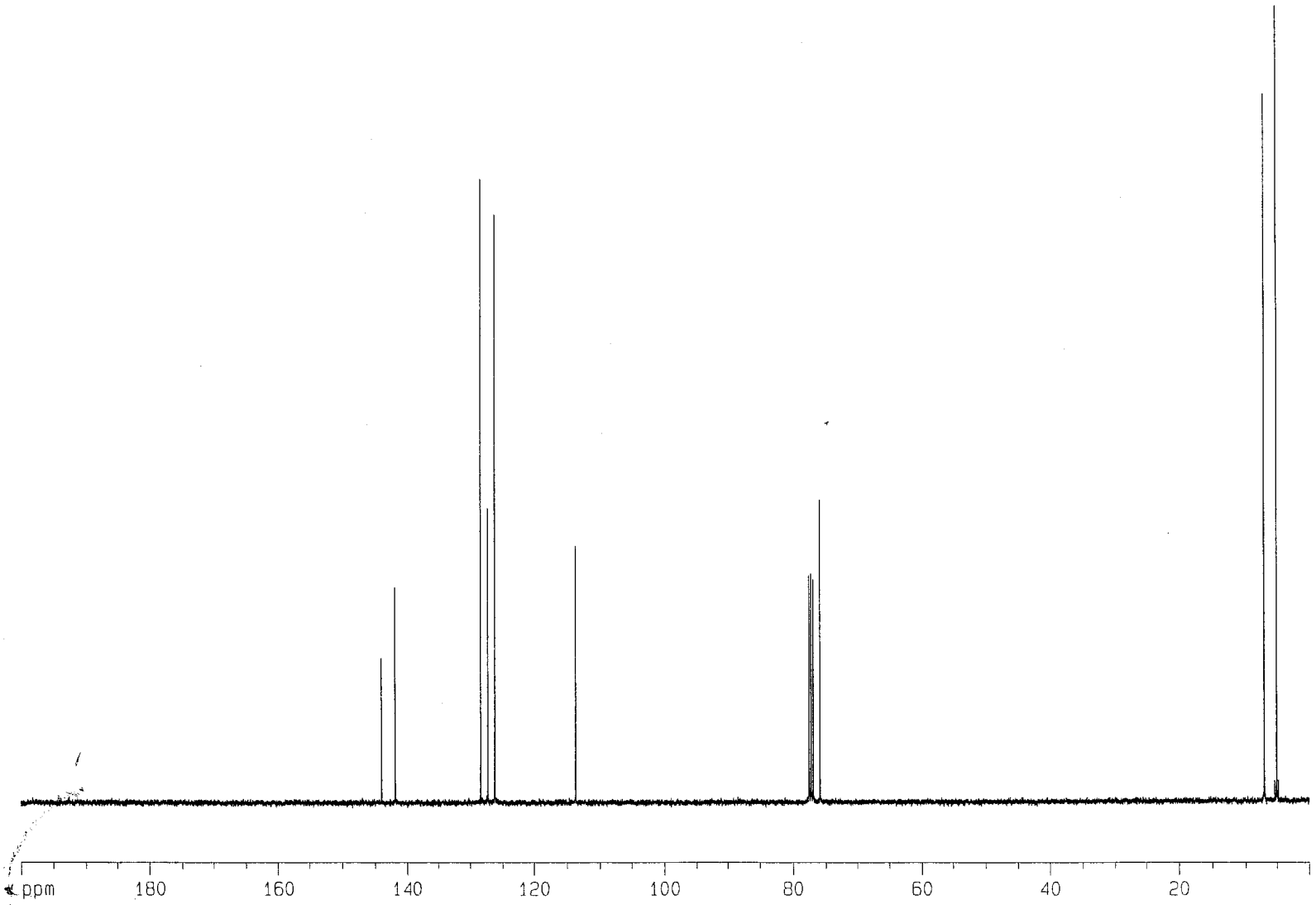
SN050690



1a



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PROCNO 1

F2 - Acquisition Parameters
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SOLVENT CDCl3
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SWH 24330.900 Hz
FIDRES 0.371260 Hz
AQ 1.3468148 sec
RG 1024
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TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

========== CHANNEL f1 ==========
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P1 8.50 usec
PL1 3.00 dB
SF01 100.6237959 MHz

========== CHANNEL f2 ==========
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PCPD2 100.00 usec
PL2 2.00 dB
PL12 22.00 dB
PL13 22.00 dB
SF02 400.1316005 MHz

F2 - Processing parameters
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WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

1D NMR plot parameters
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HZCM 1006.12756 Hz/cm

SN050714

1b

Current Data Parameters
NAME SN714-H
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20050716
Time 21.05
INSTRUM spect
PROBHD 5mm BBO BB-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 2
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 35.9
DW 60.400 usec
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TE 300.0 K
D1 1.00000000 sec

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PL1 0.00 dB
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F2 - Processing parameters
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WDW EM
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1D NMR plot parameters
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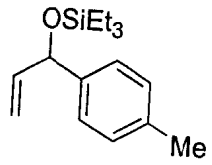
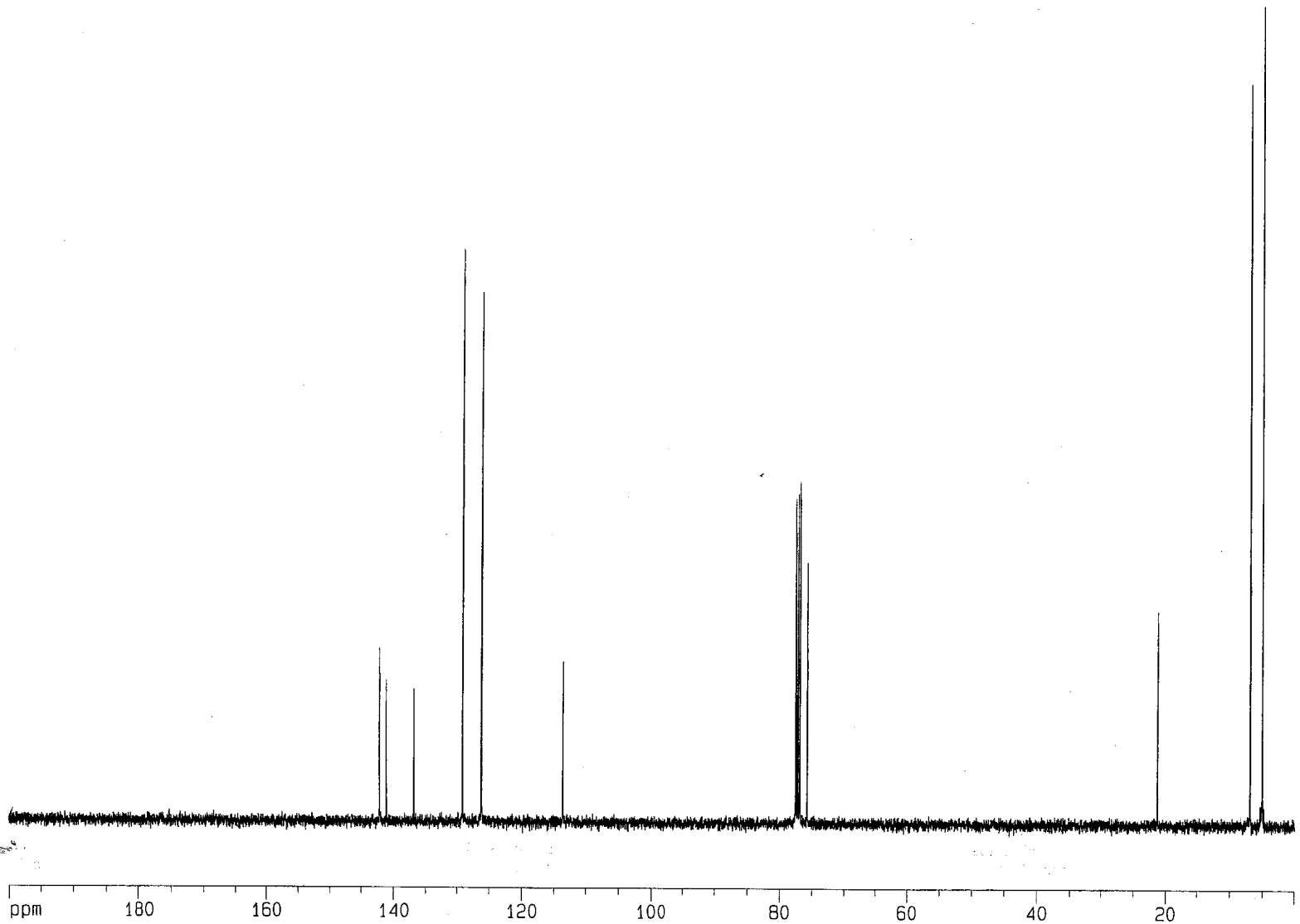
SN050714



1b

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PROCNO                      1

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TD                    65536
SOLVENT               CDCl3
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RG                     2048
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TE                  300.0 K
D1               2.00000000 sec
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P1                  15.25 usec
PL1                  3.00 dB
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============ CHANNEL f2 ============
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NUC2                   1H
PCPD2              107.50 usec
PL2                  0.00 dB

PL13                24.00 dB
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F2 - Processing parameters
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SF               100.6127492 MHz
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SSB                       0
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1D NMR plot parameters
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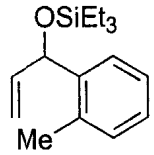
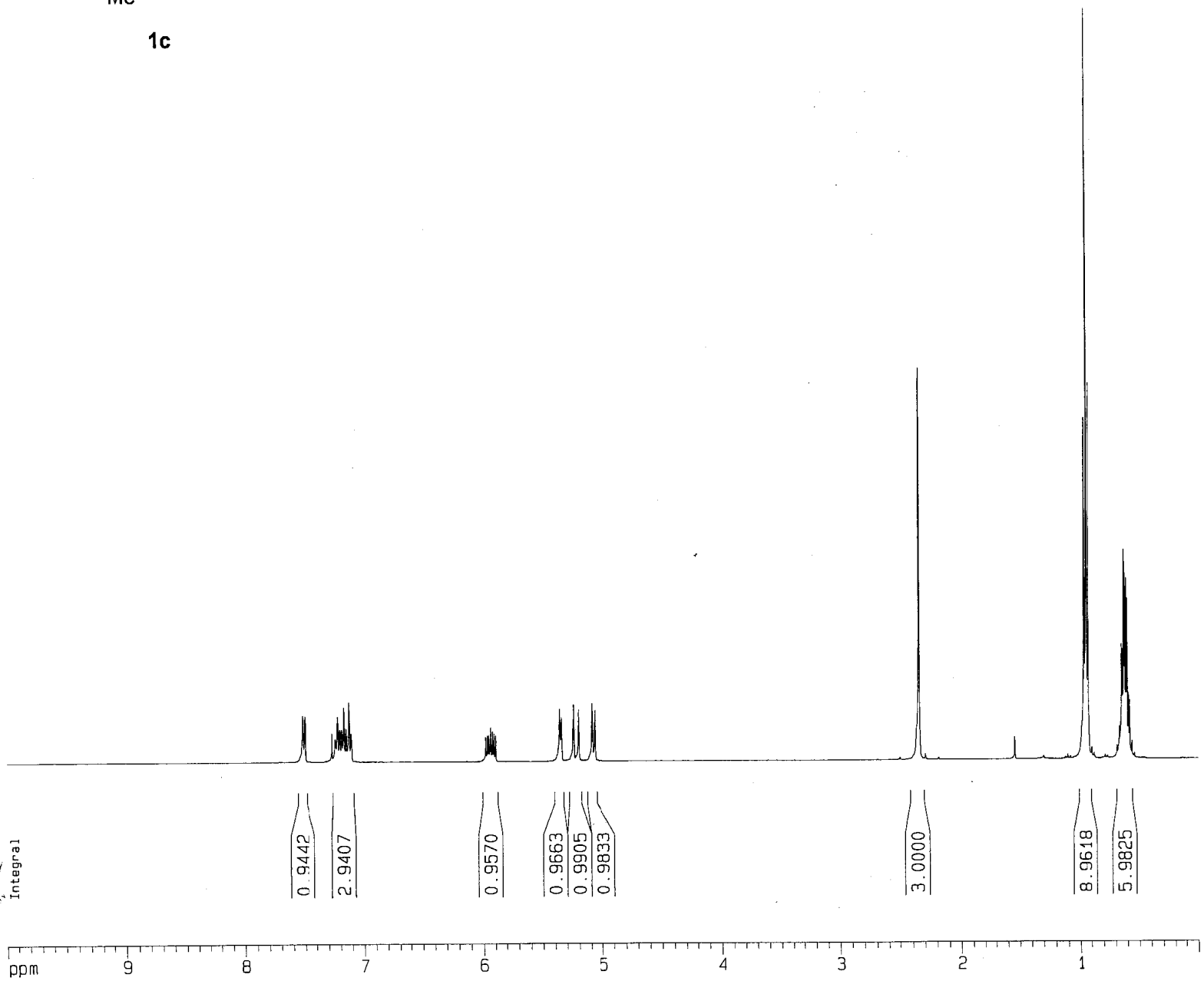


1c

SN050715



Current Data Parameters
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EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
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Time 21.18
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PULPROG zg30
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SOLVENT CDCl3
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DS 2
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FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 50.8
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DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ========
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P1 7.90 usec
PL1 0.00 dB
SFO1 400.1324710 MHz

F2 - Processing parameters
SI 32768
SF 400.1300054 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
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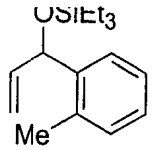
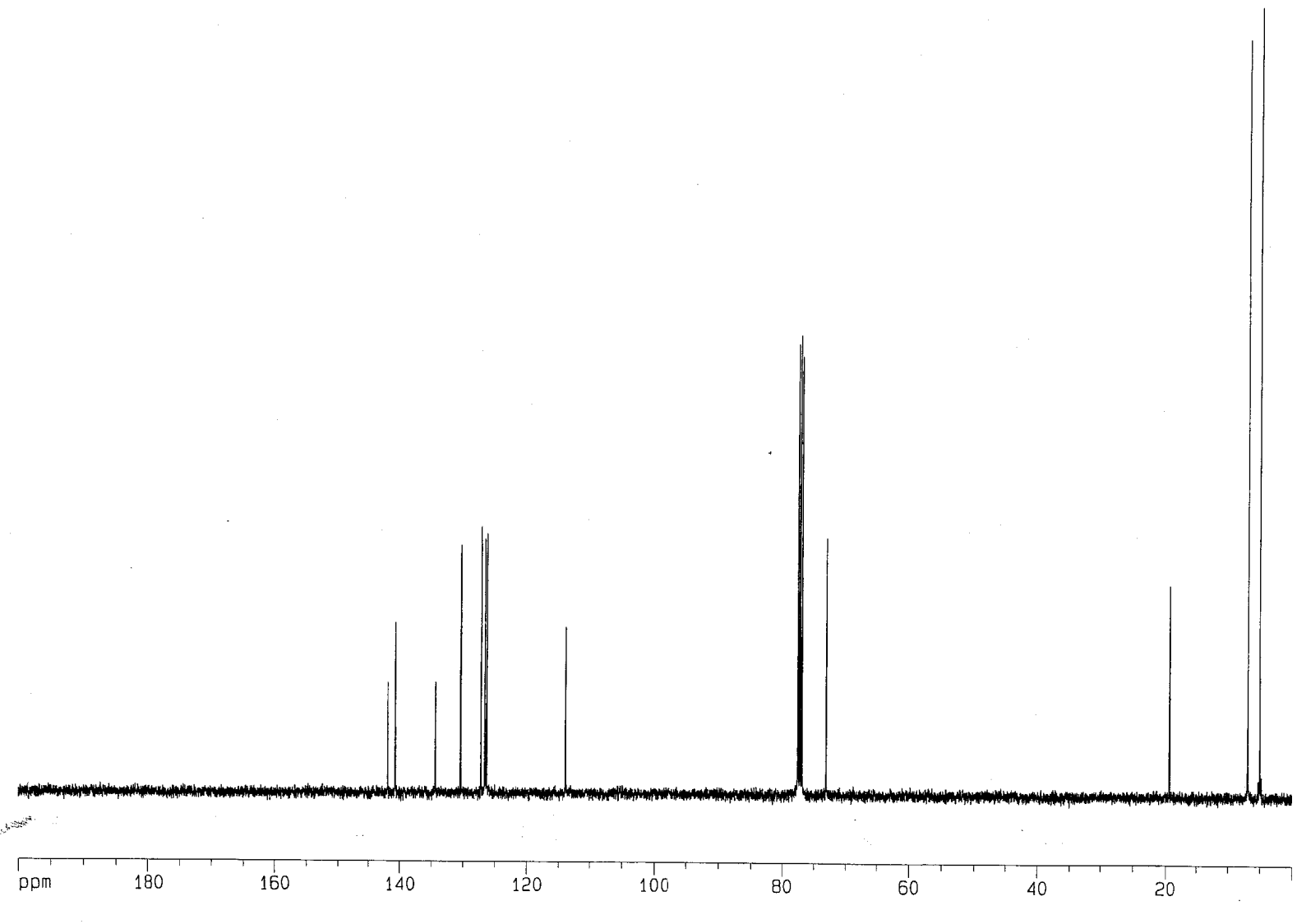


1c

SN050715



Current Data Parameters

NAME	SN715-C
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

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D1	2.00000000 sec
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NUC1	13C
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PL1	3.00 dB
SFO1	100.6237959 MHz

========== CHANNEL f2 ==========

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PL12	24.00 dB
PL13	24.00 dB
SFO2	400.1316005 MHz

F2 - Processing parameters

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SF	100.6127476 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

1D NMR plot parameters

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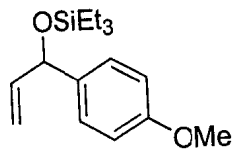
HZCM	1006.12744 Hz/cm

SN050729



1d

Current Data Parameters
NAME SN729-H
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
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Time 19.06
INSTRUM spect
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PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 2
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 40.3
DW 60.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ========
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P1 7.90 usec
PL1 0.00 dB
SFO1 400.1324710 MHz

F2 - Processing parameters
SI 32768
SF 400.1300000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
CX 20.00 cm
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F2 0.00 Hz
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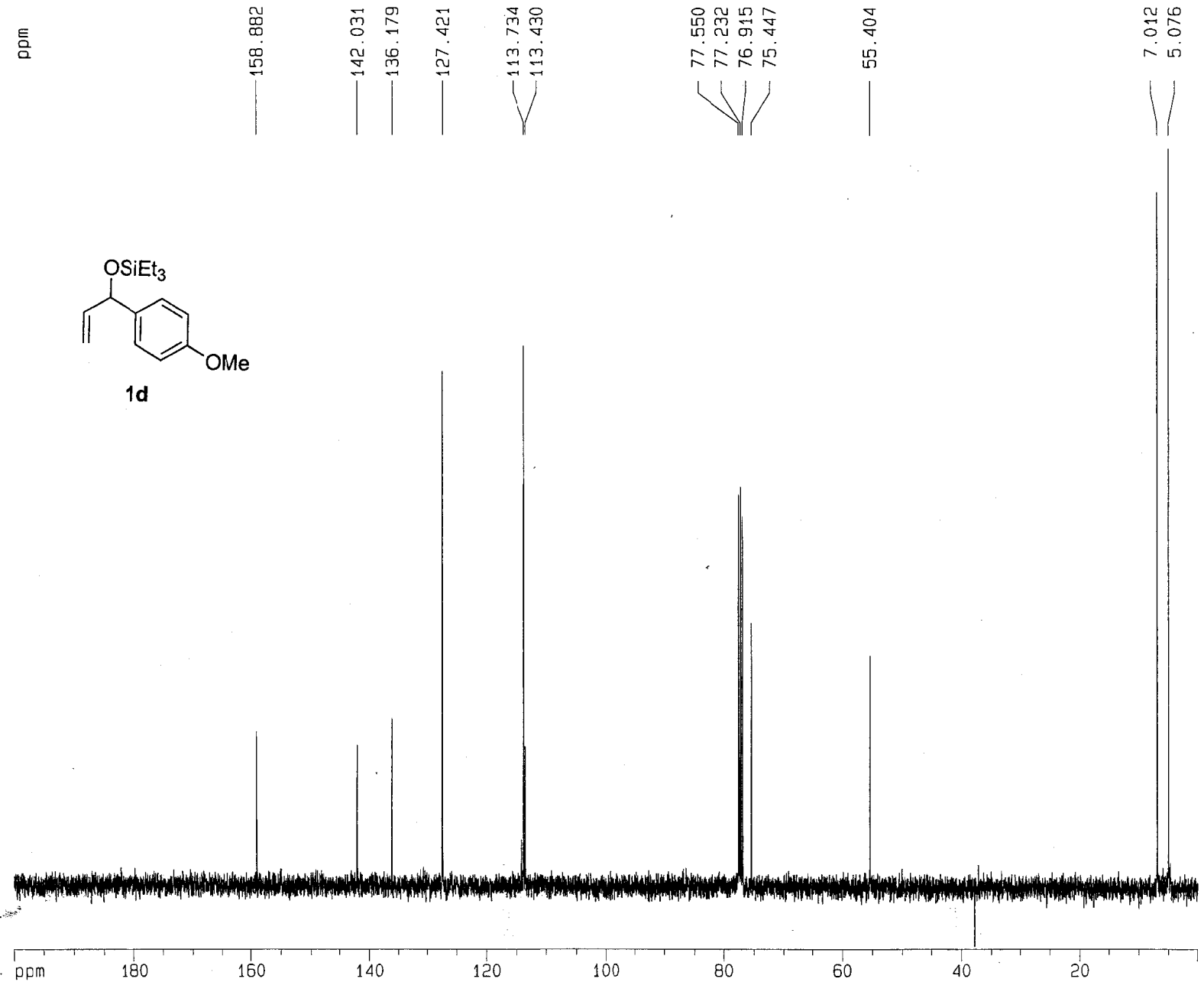
HZCM 200.06500 Hz/cm

SN050729



Current Data Parameters

NAME	SN729-C
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

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SOLVENT	CDCl3
NS	28
DS	4
SWH	25125.629 Hz
FIDRES	0.383387 Hz
AQ	1.3042164 sec
RG	2048
DW	19.900 usec
DE	6.00 usec
TE	300.0 K
D1	2.00000000 sec
d11	0.03000000 sec
d12	0.00002000 sec

========== CHANNEL f1 ==========

NUC1	13C
P1	15.25 usec
PL1	3.00 dB
SFO1	100.6237959 MHz

========== CHANNEL f2 ==========

CPDPRG2	waltz16
NUC2	1H
PCPD2	107.50 usec
PL2	0.00 dB
PL12	24.00 dB
PL13	24.00 dB
SFO2	400.1316005 MHz

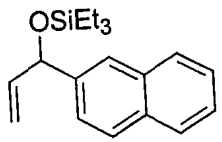
F2 - Processing parameters

SI	32768
SF	100.6127515 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

1D NMR plot parameters

CX	20.00 cm
F1P	200.000 ppm
F1	20122.55 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	10.00000 ppm/cm
HZCM	1006.12756 Hz/cm

SN050723



1e

Current Data Parameters
NAME SN723-H
EXPNO 1
PROCNO 1

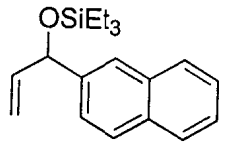
F2 - Acquisition Parameters
Date_ 20050721
Time 22.05
INSTRUM spect
PROBHD 5mm BBO BB-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 2
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 40.3
DW 60.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ========
NUC1 1H
P1 7.90 usec
PL1 0.00 dB
SFO1 400.1324710 MHz

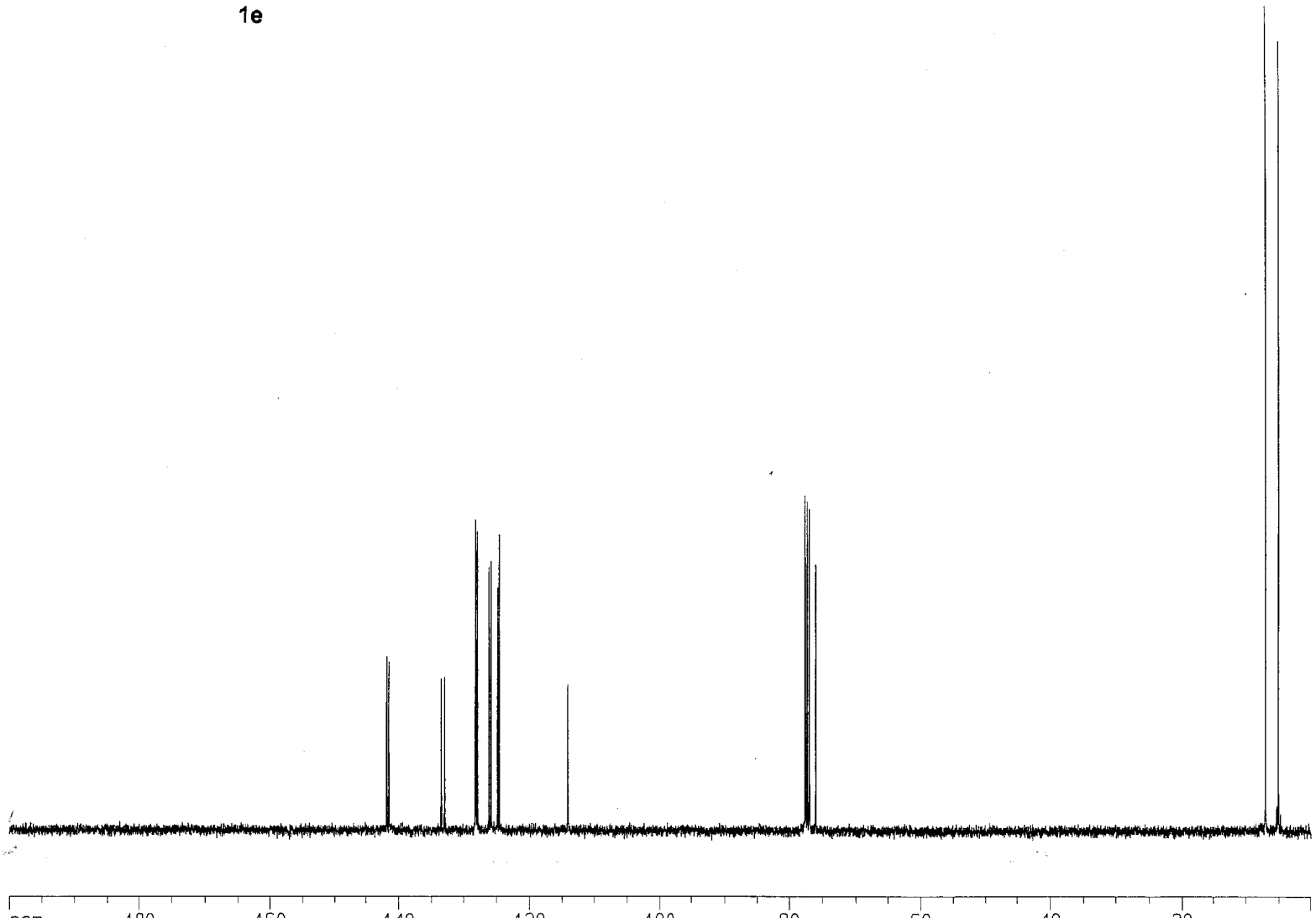
F2 - Processing parameters
SI 32768
SF 400.1300056 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
CX 20.00 cm
F1P 10.000 ppm
F1 4001.30 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 0.50000 ppm/cm
HZCM 200.06500 Hz/cm

SN050723



1e



Current Data Parameters

NAME	SN723-C
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050721
Time	22.21
INSTRUM	spect
PROBHD	5mm BBO BB-1
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	137
DS	4
SWH	25125.629 Hz
FIDRES	0.383387 Hz
AQ	1.3042164 sec
RG	4096
DW	19.900 usec
DE	6.00 usec
TE	300.0 K
D1	2.00000000 sec
d11	0.03000000 sec
d12	0.00002000 sec

========== CHANNEL f1 ==========

NUC1	13C
P1	15.25 usec
PL1	3.00 dB
SFO1	100.6237959 MHz

========== CHANNEL f2 ==========

CPDPRG2	waltz16
NUC2	1H
PCPD2	107.50 usec
PL2	0.00 dB
PL12	24.00 dB
PL13	24.00 dB
SFO2	400.1316005 MHz

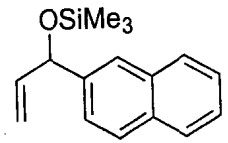
F2 - Processing parameters

SI	32768
SF	100.6127538 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

1D NMR plot parameters

CX	20.00 cm
F1P	200.000 ppm
F1	20122.55 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	10.00000 ppm/cm
HZCM	1006.12756 Hz/cm

SN050740



1f

Current Data Parameters

NAME	SN740-H
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050729
Time	22.03
INSTRUM	spect
PROBHD	5mm BBO BB-1
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	4
DS	2
SWH	8278.146 Hz
FIDRES	0.126314 Hz
AQ	3.9584243 sec
RG	71.8
DW	60.400 usec
DE	6.00 usec
TE	300.0 K
D1	1.00000000 sec

========== CHANNEL f1 ========

NUC1	1H
P1	7.90 usec
PL1	0.00 dB
SFO1	400.1324710 MHz

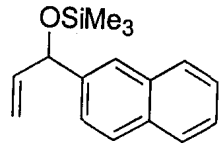
F2 - Processing parameters

SI	32768
SF	400.1300059 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

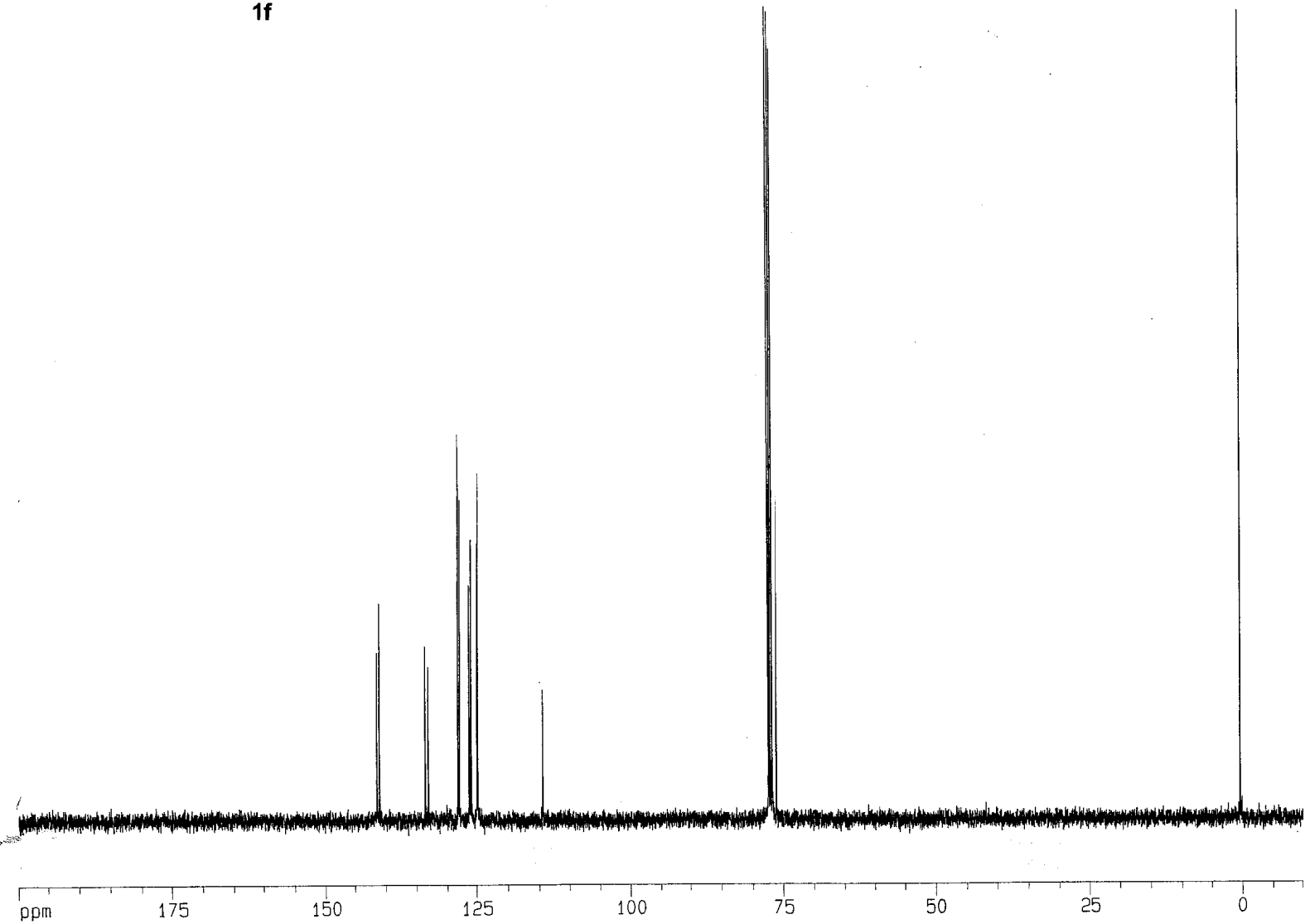
1D NMR plot parameters

CX	20.00 cm
F1P	10.000 ppm
F1	4001.30 Hz
F2P	-1.000 ppm
F2	-400.13 Hz
PPMCM	0.55000 ppm/cm
HZCM	220.07150 Hz/cm

SN050740



1f



Current Data Parameters

NAME	SN740-C
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050729
Time	22.05
INSTRUM	spect
PROBHD	5mm BBO BB-1
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	201
DS	4
SWH	25125.629 Hz
FIDRES	0.383387 Hz
AQ	1.3042164 sec
RG	16384
DW	19.900 usec
DE	6.00 usec
TE	300.0 K
D1	2.00000000 sec
d11	0.03000000 sec
d12	0.00002000 sec

========== CHANNEL f1 ==========

NUC1	13C
P1	15.25 usec
PL1	3.00 dB
SFO1	100.6237959 MHz

========== CHANNEL f2 ==========

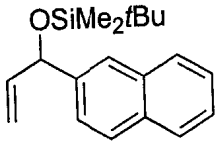
CPDPRG2	waltz16
NUC2	1H
PCPD2	107.50 usec
PL2	0.00 dB
PL12	24.00 dB
PL13	24.00 dB
SFO2	400.1316005 MHz

F2 - Processing parameters

SI	32768
SF	100.6127522 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

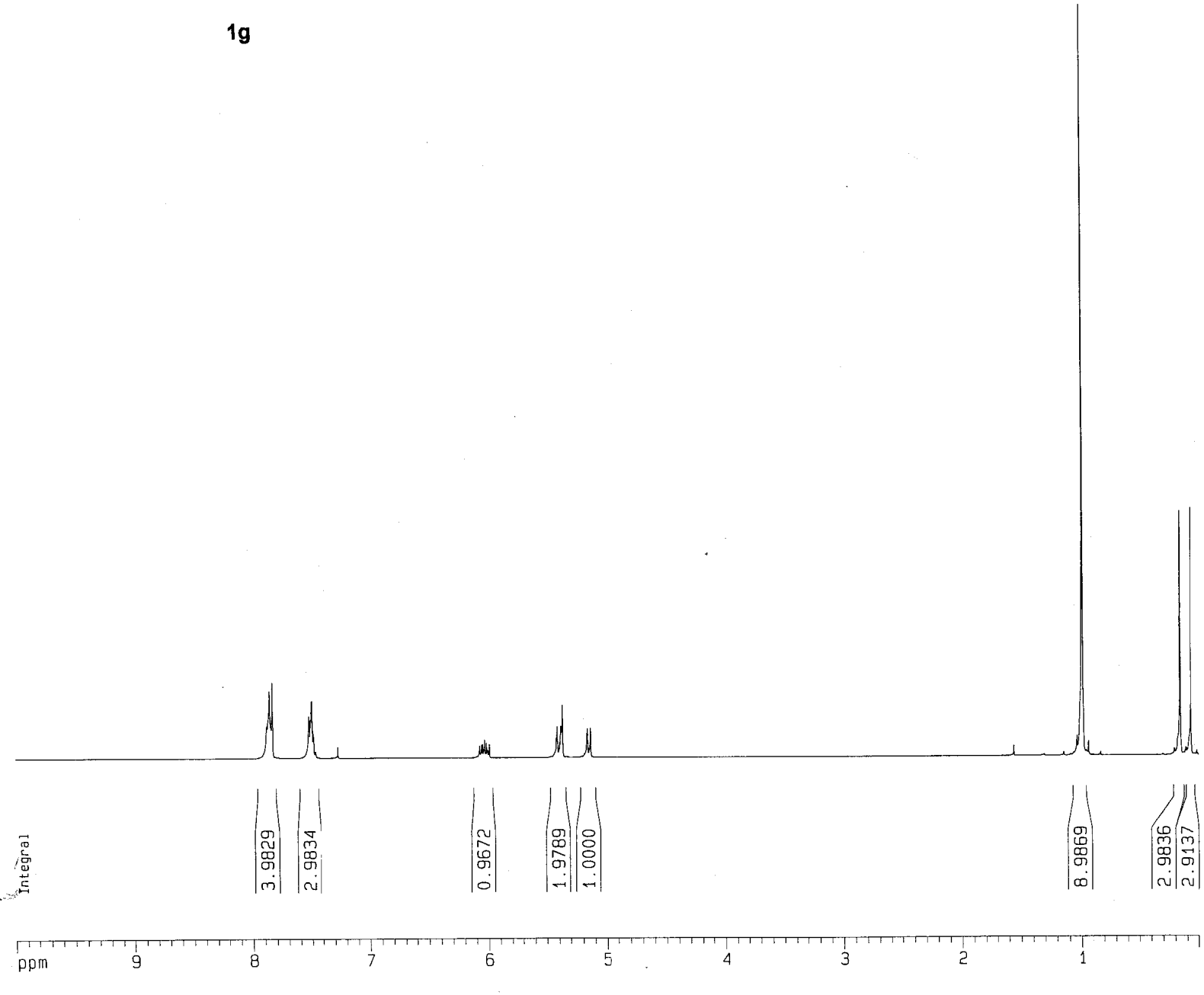
1D NMR plot parameters

CX	20.00 cm
F1P	200.000 ppm
F1	20122.55 Hz
F2P	-10.000 ppm
F2	-1006.13 Hz
PPMCM	10.50000 ppm/cm
HZCM	1056.43396 Hz/cm



1g

SN050737



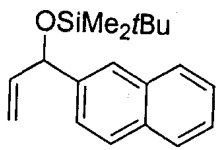
Current Data Parameters
NAME SN737-H
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20050727
Time 22.18
INSTRUM spect
PROBHD 5mm BBO BB-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 4
DS 2
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 50.8
DW 60.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ========
NUC1 1H
P1 7.90 usec
PL1 0.00 dB
SFO1 400.1324710 MHz

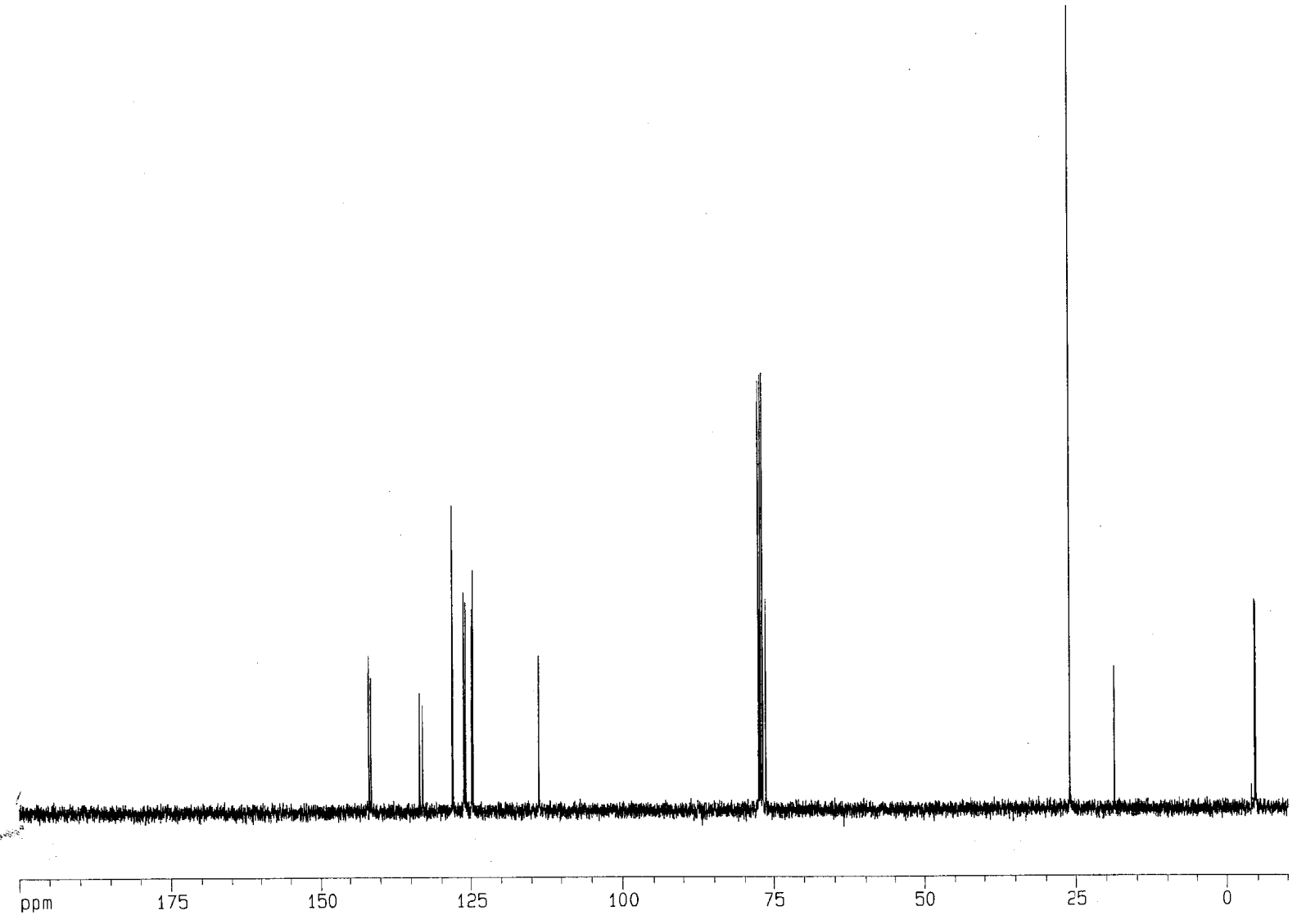
F2 - Processing parameters
SI 32768
SF 400.1300054 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
CX 20.00 cm
F1P 10.000 ppm
F1 4001.30 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 0.50000 ppm/cm
HZCM 200.06500 Hz/cm



1g

SN050737




```
Current Data Parameters
NAME                  SN737-C
EXPNO                       1
PROCNO                      1

F2 - Acquisition Parameters
Date_              20050727
Time                  22.25
INSTRUM               spect
PROBHD      5mm BBO BB-1
PULPROG             zgpg30
TD                   65536
SOLVENT              CDCl3
NS                     151
DS                       4
SWH               25125.629 Hz
FIDRES            0.383387 Hz
AQ                1.3042164 sec
RG                    3251
DW                  19.900 usec
DE                   6.00 usec
TE                  300.0 K
D1              2.00000000 sec
d11             0.03000000 sec
d12             0.00002000 sec

========== CHANNEL f1 ==========
NUC1                   13C
P1                   15.25 usec
PL1                   3.00 dB
SFO1          100.6237959 MHz

========== CHANNEL f2 ==========
CPDPRG2            waltz16
NUC2                   1H
PCPD2               107.50 usec
PL2                   0.00 dB
PL12                 24.00 dB
PL13                 24.00 dB
SFO2          400.1316005 MHz

F2 - Processing parameters
SI                    32768
SF            100.6127530 MHz
WDW                     EM
SSB                      0
LB                    1.00 Hz
GB                       0
PC                    1.40

1D NMR plot parameters
CX                   20.00 cm
F1P                 200.000 ppm
F1                20122.55 Hz
F2P                -10.000 ppm
F2                -1006.13 Hz
PPMCM              10.50000 ppm/cm
HZCM            1056.43396 Hz/cm
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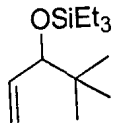
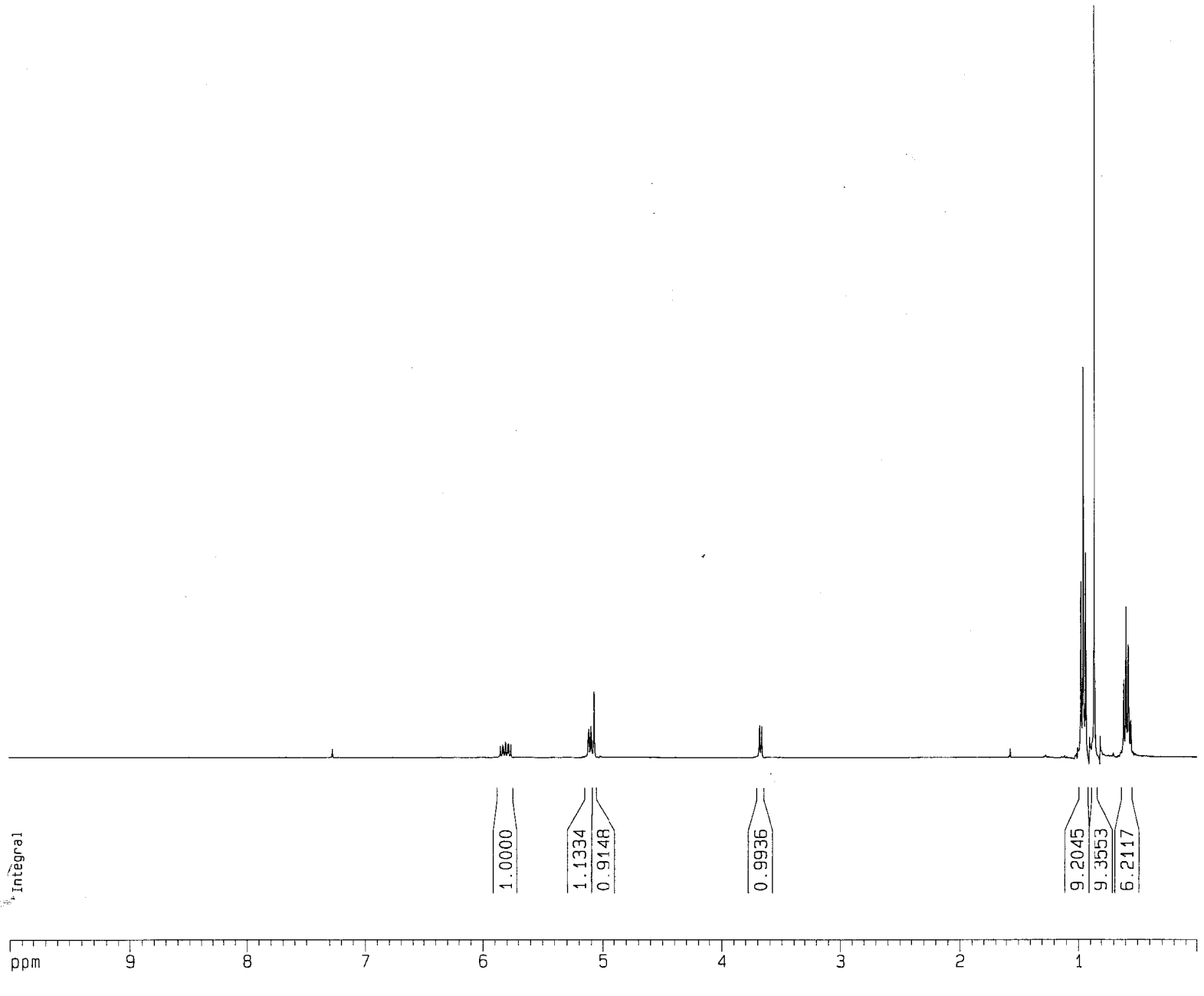


1h

SN050733



Current Data Parameters

NAME	SN733-H
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050727
Time	22.00
INSTRUM	spect
PROBHD	5mm B30 BB-1
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	4
DS	2
SWH	8278.146 Hz
FIDRES	0.126314 Hz
AQ	3.9584243 sec
RG	40.3
DW	60.400 usec
DE	6.00 usec
TE	300.0 K
D1	1.00000000 sec

========== CHANNEL f1 ========

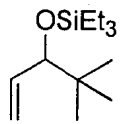
NUC1	1H
P1	7.90 usec
PL1	0.00 dB
SFO1	400.1324710 MHz

F2 - Processing parameters

SI	32768
SF	400.1300056 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

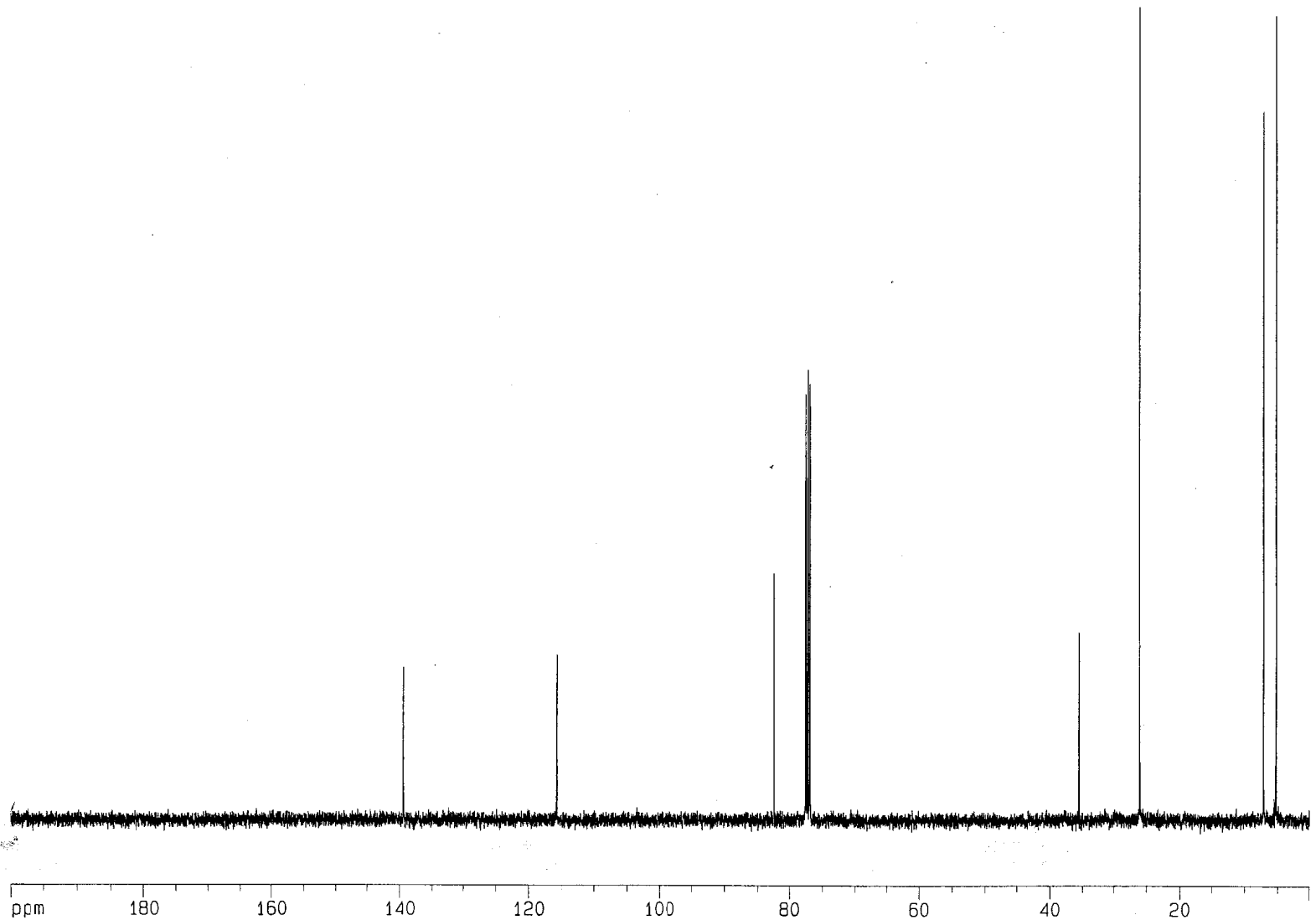
1D NMR plot parameters

CX	20.00 cm
F1P	10.000 ppm
F1	4001.30 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	0.50000 ppm/cm
HZCM	200.06500 Hz/cm



1h

SN050733



Current Data Parameters
NAME SN733-C
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20050727
Time 22.05
INSTRUM spect
PROBHD 5mm BB0 BB-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 132
DS 4
SWH 25125.629 Hz
FIDRES 0.383387 Hz
AQ 1.3042164 sec
RG 4096
DW 19.900 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

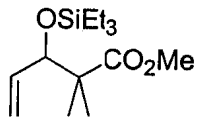
========== CHANNEL f1 ==========
NUC1 13C
P1 15.25 usec
PL1 3.00 dB
SFO1 100.6237959 MHz

========== CHANNEL f2 ==========
CPDPRG2 waltz16
NUC2 1H
PCPD2 107.50 usec
PL2 0.00 dB
PL12 24.00 dB
PL13 24.00 dB
SFO2 400.1316005 MHz

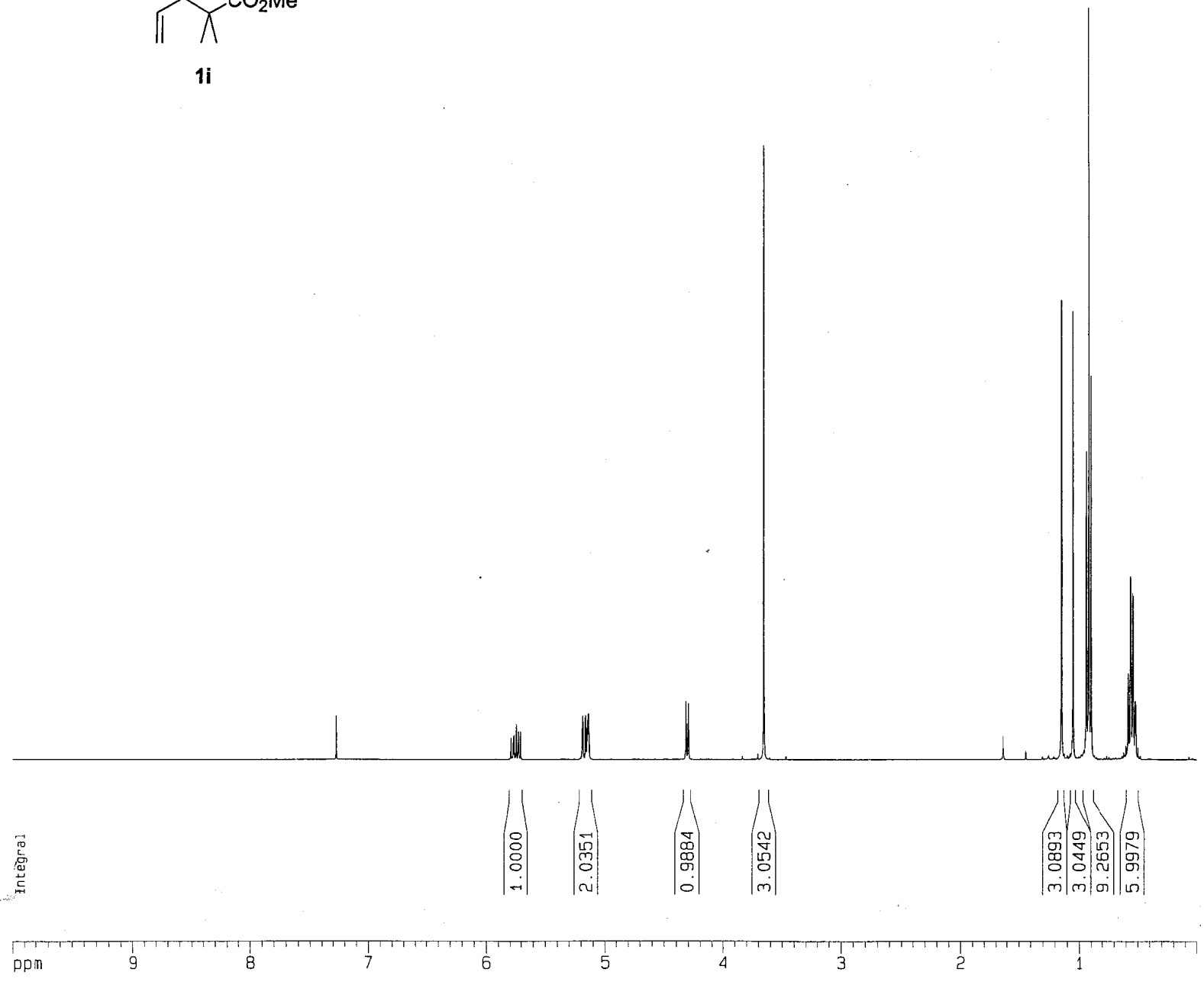
F2 - Processing parameters
SI 32768
SF 100.6127469 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

1D NMR plot parameters
CX 20.00 cm
F1P 200.000 ppm
F1 20122.55 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 10.00000 ppm/cm
HZCM 1006.12744 Hz/cm

SN050745



1i



Current Data Parameters
NAME SN745-H
EXPNO 1
PROCNO 1

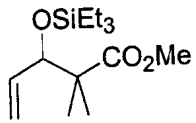
F2 - Acquisition Parameters
Date_ 20050801
Time 5.13
INSTRUM spect
PROBHD 5mm BBO BB-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 4
DS 2
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 64
DW 60.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ========
NUC1 1H
P1 7.90 usec
PL1 0.00 dB
SFO1 400.1324710 MHz

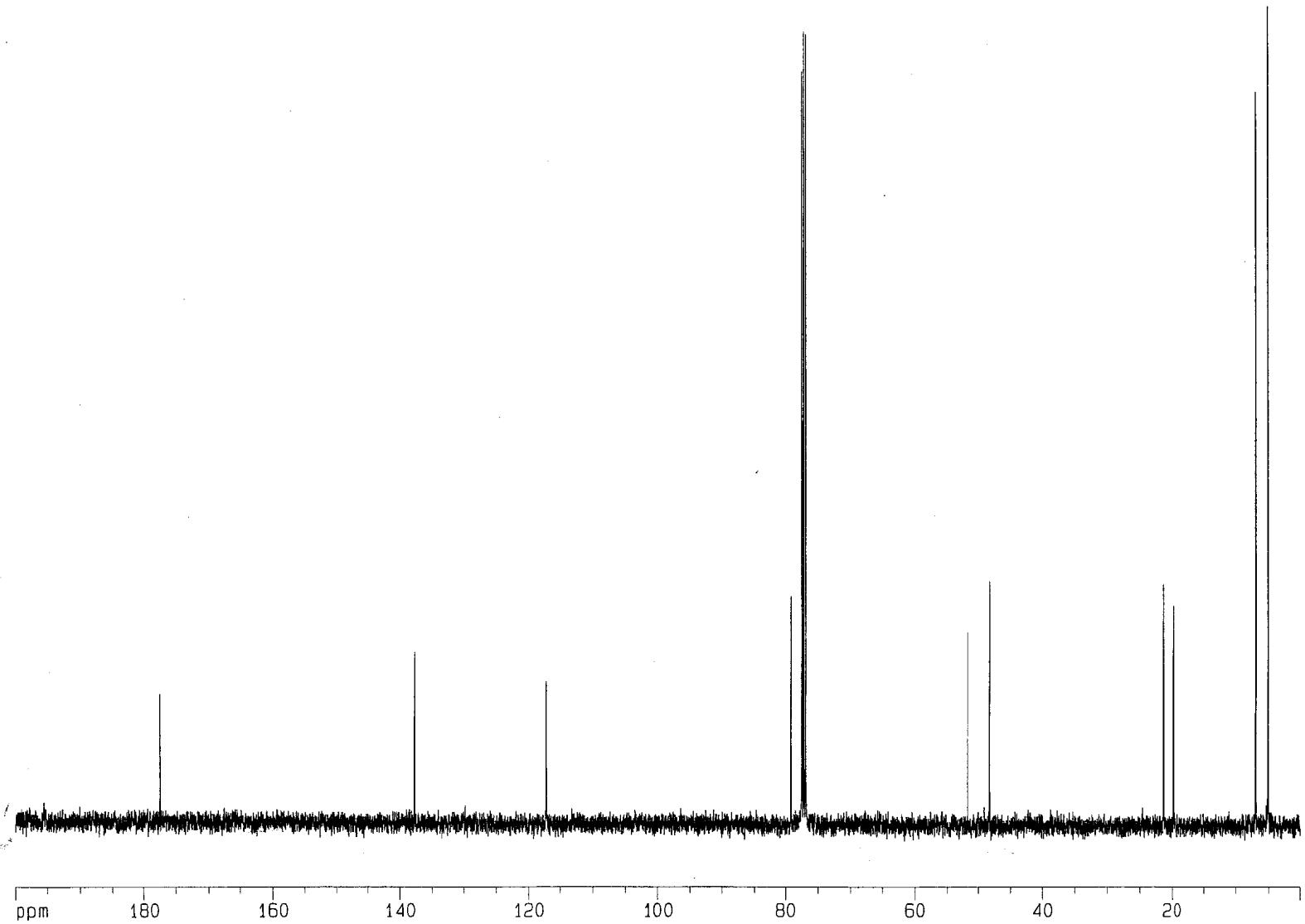
F2 - Processing parameters
SI 32768
SF 400.1300059 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
CX 20.00 cm
F1P 10.000 ppm
F1 4001.30 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 0.50000 ppm/cm
HZCM 200.06500 Hz/cm

SN050745



1i



Current Data Parameters

NAME	SN745-C
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050801
Time	5.22
INSTRUM	spect
PROBHD	5mm B30 BB-1
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	150
DS	4
SWH	25125.629 Hz
FIDRES	0.383387 Hz
AQ	1.3042164 sec
RG	4096
DW	19.900 usec
DE	6.00 usec
TE	300.0 K
D1	2.00000000 sec
d11	0.03000000 sec
d12	0.00002000 sec

========== CHANNEL f1 ==========

NUC1	13C
P1	15.25 usec
PL1	3.00 dB
SFO1	100.6237959 MHz

========== CHANNEL f2 ==========

CPDPRG2	waltz16
NUC2	1H
PCPD2	107.50 usec
PL2	0.00 dB
PL12	24.00 dB
PL13	24.00 dB
SFO2	400.1316005 MHz

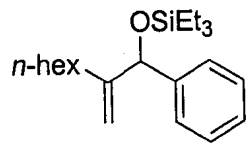
F2 - Processing parameters

SI	32768
SF	100.5127492 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

1D NMR plot parameters

CX	20.00 cm
F1P	200.000 ppm
F1	20122.55 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	10.00000 ppm/cm
HZCM	1006.12744 Hz/cm

SN050658 allylic alcohol



1j

Current Data Parameters

NAME	SN658heck-c
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050614
Time	19.05
INSTRUM	spect
PROBHD	5 mm QNP 1H
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	8
DS	4
SWH	8278.146 Hz
FIDRES	0.126314 Hz
AQ	3.9584243 sec
RG	64
DW	60.400 usec
DE	6.00 usec
TE	300.0 K
D1	1.00000000 sec

========== CHANNEL f1 ==========

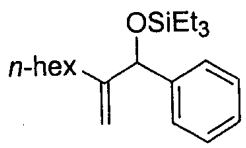
NUC1	1H
P1	9.50 usec
PL1	2.00 dB
SFO1	400.1324710 MHz

F2 - Processing parameters

SI	32768
SF	400.1300000 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

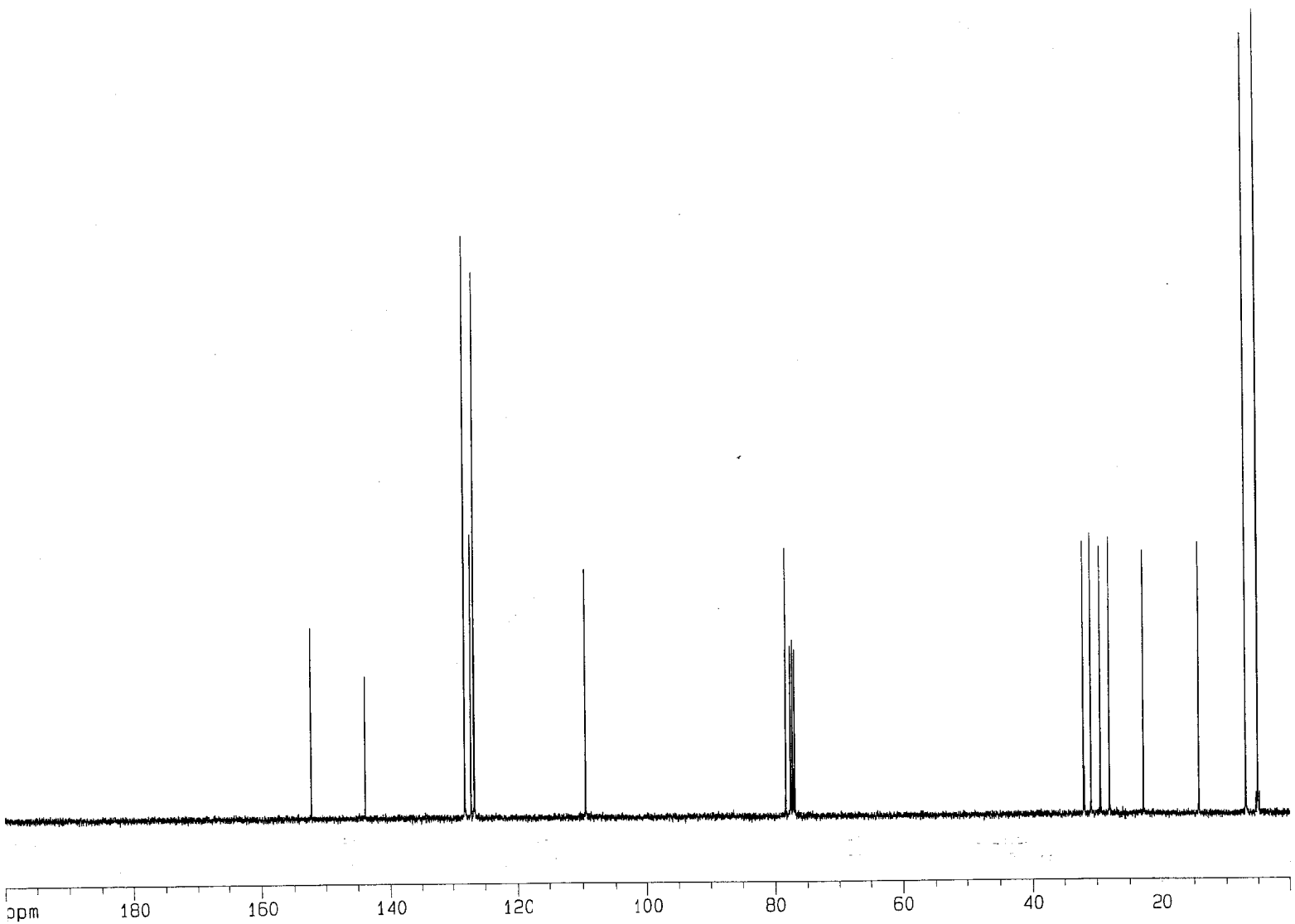
1D NMR plot parameters

CX	20.00 cm
F1P	10.000 ppm
F1	4001.30 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	0.50000 ppm/cm
HZCM	200.06500 Hz/cm



1j

octene benzaldehyde TESOTf



Current Data Parameters

NAME	octene-al-C
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050716
Time	21.50
INSTRUM	spect
PROBHD	5mm BBO BB-1
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	95
DS	4
SWH	25125.629 Hz
FIDRES	0.383387 Hz
AQ	1.3042164 sec
RG	8192
DW	19.900 usec
DE	6.00 usec
TE	300.0 K
D1	2.00000000 sec
d11	0.03000000 sec
d12	0.00002000 sec

========== CHANNEL f1 ==========

NUC1	13C
P1	15.25 usec
PL1	3.00 dB
SFO1	100.6237959 MHz

========== CHANNEL f2 ==========

CPDPRG2	waltz16
NUC2	1H
PCPD2	107.50 usec
PL2	0.00 dB
PL12	24.00 dB
PL13	24.00 dB
SFO2	400.1316005 MHz

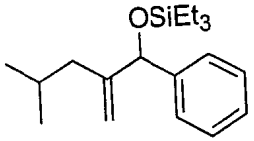
F2 - Processing parameters

SI	32768
SF	100.6127484 MHz
WDW	EM
SSB	0
LB	1.00 Hz
GB	0
PC	1.40

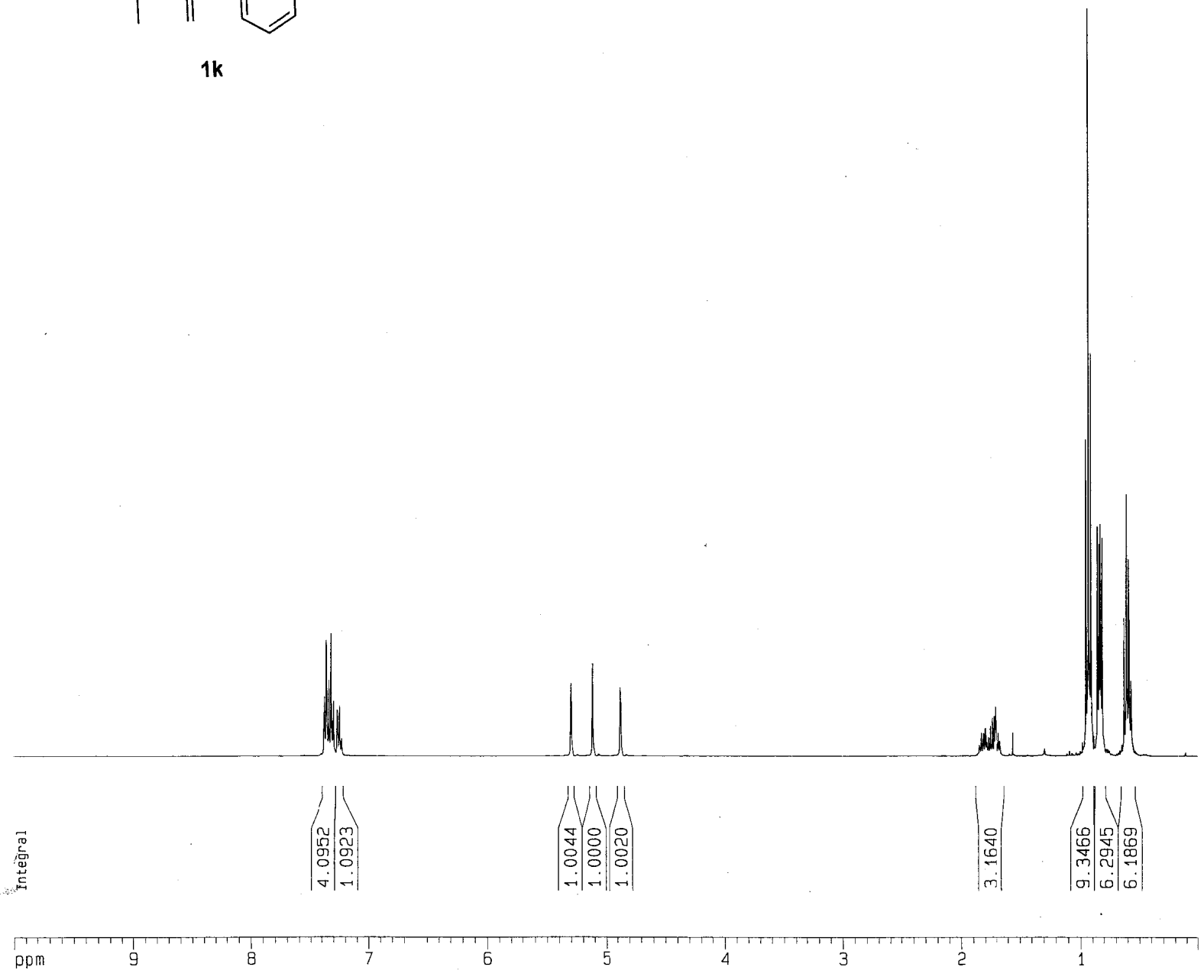
1D NMR plot parameters

CX	20.00 cm
F1P	200.000 ppm
F1	20122.55 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	10.00000 ppm/cm
HZCM	1006.12744 Hz/cm

SN050726 allylic alcohol



1k



Current Data Parameters

NAME	SN726-all-H
EXPNO	1
PROCNO	1

F2 - Acquisition Parameters

Date_	20050722
Time	21.51
INSTRUM	spect
PROBHD	5mm BBO BB-1
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	8
DS	2
SWH	8278.146 Hz
FIDRES	0.126314 Hz
AQ	3.9584243 sec
RG	32
DW	60.400 usec
DE	6.00 usec
TE	300.0 K
D1	1.00000000 sec

========== CHANNEL f1 ========

NUC1	1H
P1	7.90 usec
PL1	0.00 dB
SFO1	400.1324710 MHz

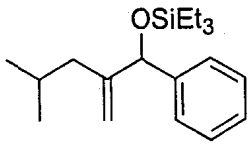
F2 - Processing parameters

SI	32768
SF	400.1300056 MHz
WDW	EM
SSB	0
LB	0.30 Hz
GB	0
PC	1.00

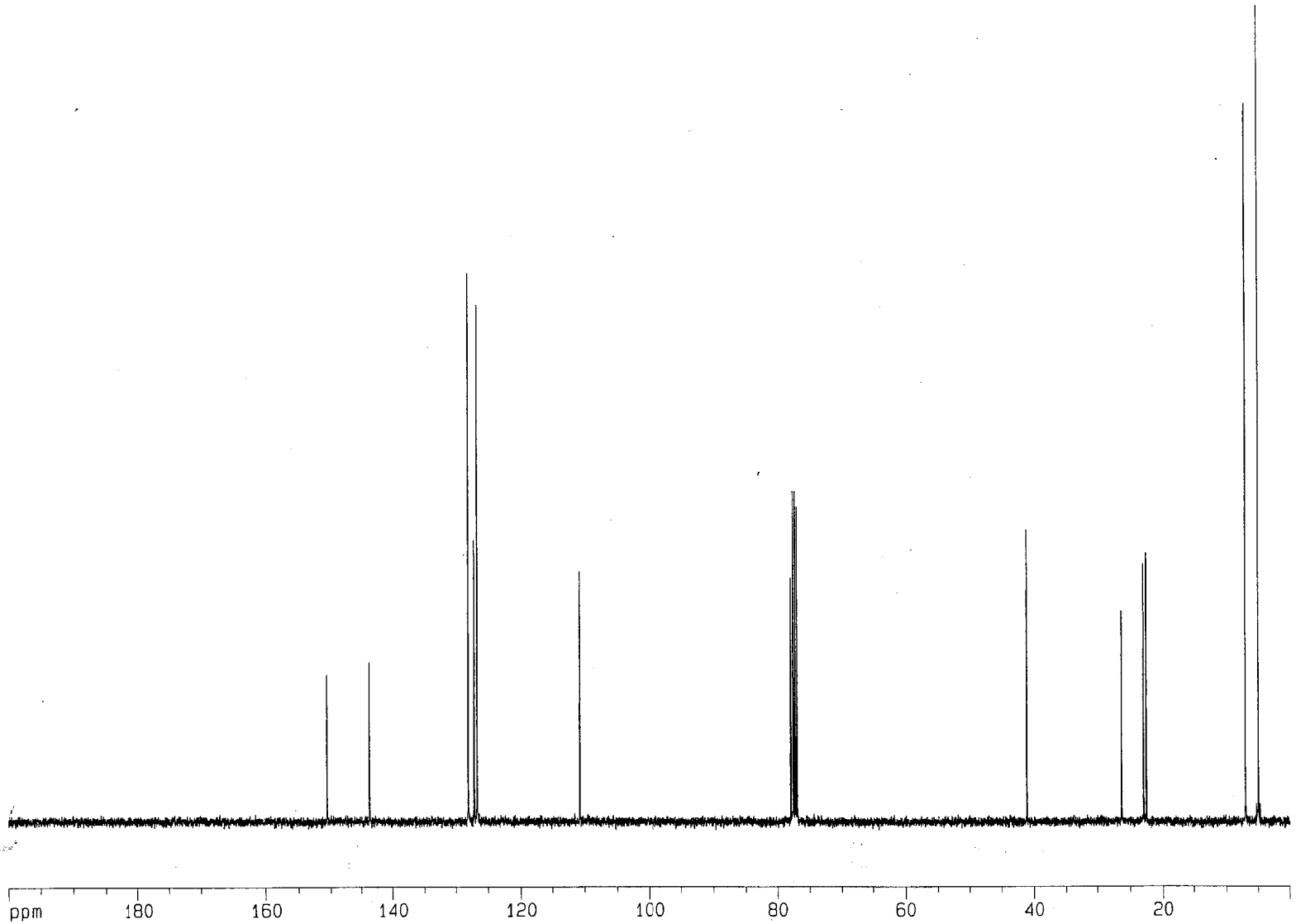
1D NMR plot parameters

CX	20.00 cm
F1P	10.000 ppm
F1	4001.30 Hz
F2P	0.000 ppm
F2	0.00 Hz
PPMCM	0.50000 ppm/cm
HZCM	200.06500 Hz/cm

SN050726 allylic alcohol



1k



Current Data Parameters
NAME SN726-all-C
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20050722
Time 21.53
INSTRUM spect
PROBHD 5mm BBO BB-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 159
DS 4
SWH 25125.629 Hz
FIDRES 0.383387 Hz
AQ 1.3042164 sec
RG 8192
DW 19.900 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

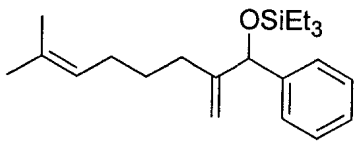
========== CHANNEL f1 ==========
NUC1 13C
P1 15.25 usec
PL1 3.00 dB
SFO1 100.6237959 MHz

========== CHANNEL f2 ==========
CPDPRG2 waltz16
NUC2 1H
PCPD2 107.50 usec
PL2 0.00 dB
PL12 24.00 dB
PL13 24.00 dB
SFO2 400.1316005 MHz

F2 - Processing parameters
SI 32768
SF 100.6127499 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

1D NMR plot parameters
CX 20.00 cm
F1P 200.000 ppm
F1 20122.55 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 10.00000 ppm/cm
HZCM 1006.12744 Hz/cm

SN050672 a



1l

Current Data Parameters
NAME SN672-a-H
EXPNO 1
PROCNO 1

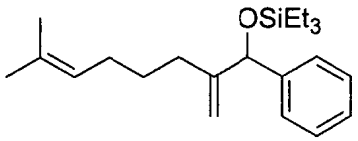
F2 - Acquisition Parameters
Date_ 20050625
Time 16.55
INSTRUM spect
PROBHD 5 mm QNP 1H
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 4
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 32
DW 60.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ==========
NUC1 1H
P1 9.50 usec
PL1 2.00 dB
SFO1 400.1324710 MHz

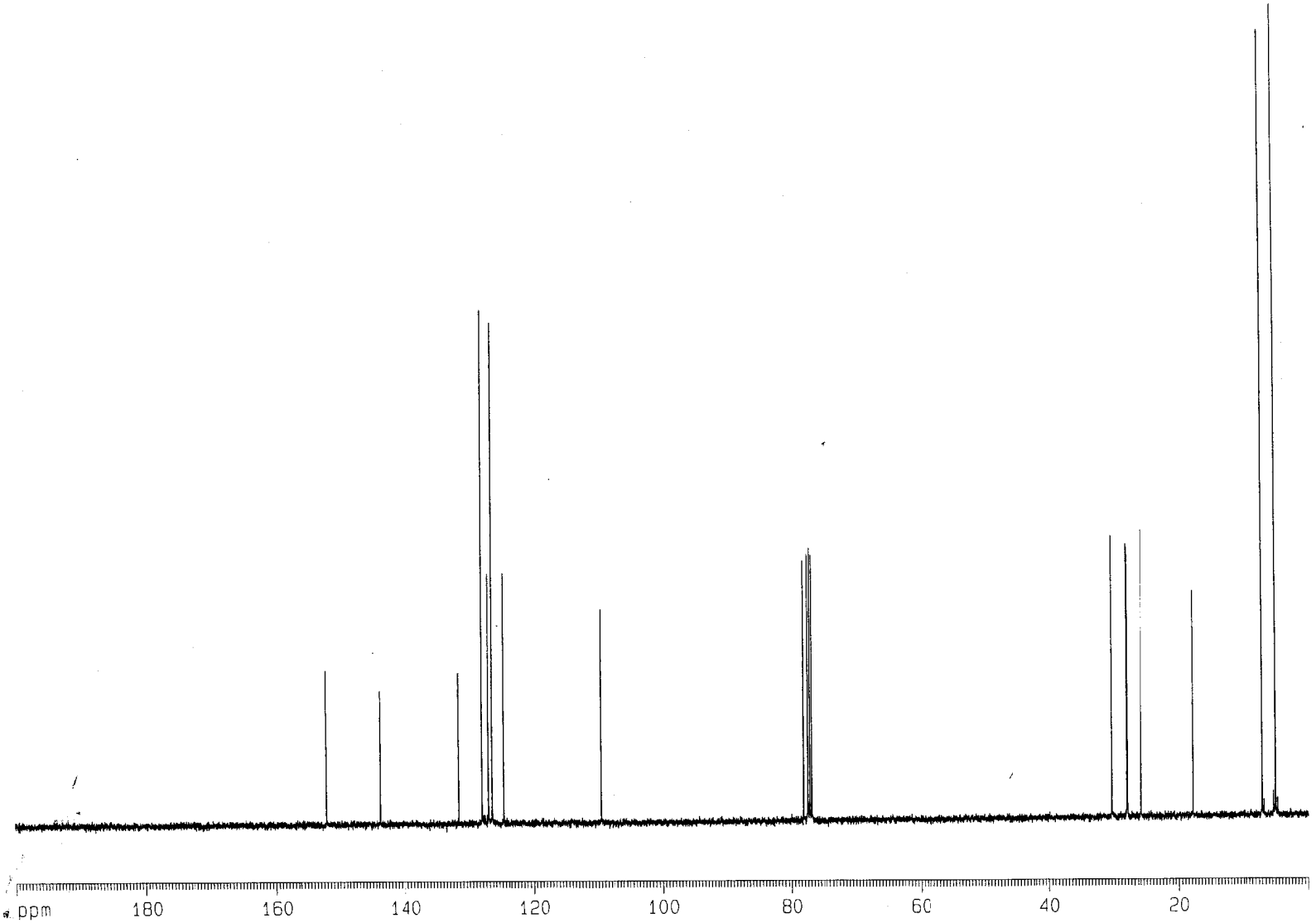
F2 - Processing parameters
SI 32768
SF 400.1300000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
CX 20.00 cm
F1P 10.000 ppm
F1 4001.30 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 0.50000 ppm/cm
HZCM 200.06500 Hz/cm

SN050672 a



1l



Current Data Parameters
NAME SN672-a-C
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20050625
Time 18.00
INSTRUM spect
PROBHD 5 mm QNP 1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 760
DS 4
SWH 24330.900 Hz
FIDRES 0.371260 Hz
AQ 1.3468148 sec
RG 1824.6
DW 20.550 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

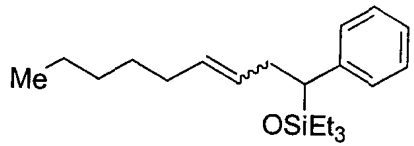
========== CHANNEL f1 ==========
NUC1 13C
P1 8.50 usec
PL1 3.00 dB
SFO1 100.6237959 MHz

========== CHANNEL f2 ==========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 2.00 dB
PL12 22.00 dB
PL13 22.00 dB
SFO2 400.1316005 MHz

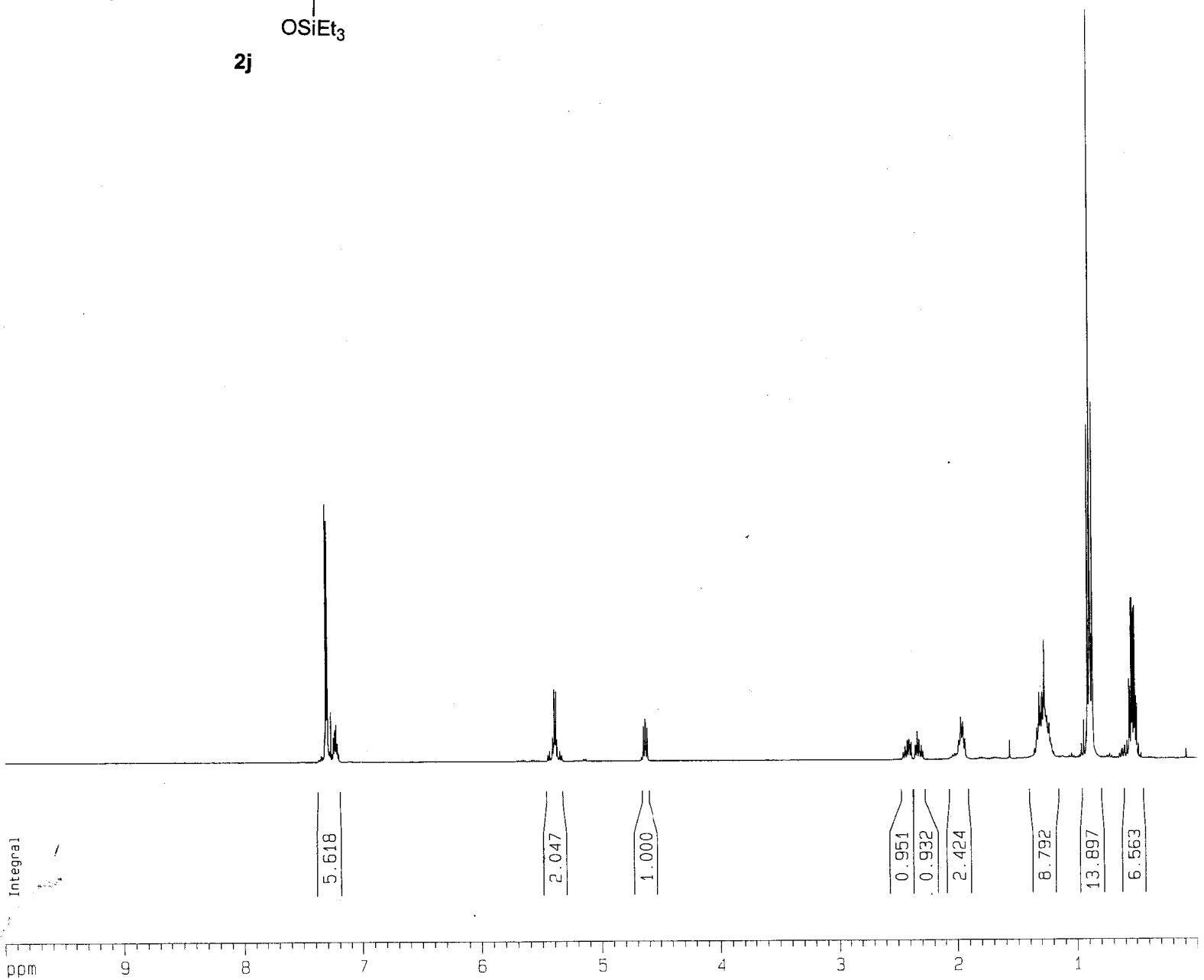
F2 - Processing parameters
SI 32768
SF 100.6127518 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

1D NMR plot parameters
CX 20.00 cm
F1P 200.000 ppm
F1 20122.55 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 10.00000 ppm/cm
HZCM 1006.12756 Hz/cm

SN050658 ene product



2j

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Current Data Parameters
NAME          SN568ene-H
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_          20050614
Time              19.59
INSTRUM           spect
PROBHD     5 mm GNP 1H
PULPROG           zg30
TD               65536
SOLVENT          CDCl3
NS                   8
DS                   4
SWH           8278.146 Hz
FIDRES        0.126314 Hz
AQ            3.9584243 sec
RG                 128
DW              60.400 usec
DE               6.00 usec
TE              300.0 K
D1            1.00000000 sec

============ CHANNEL f1 =============
NUC1                1H
P1               9.50 usec
PL1              2.00 dB
SFO1        400.1324710 MHz

F2 - Processing parameters
SI                 32768
SF          400.1300059 MHz
WDW                EM
SSB                0
LB              0.30 Hz
GB                 0
PC              1.00

1D NMR plot parameters
CX             20.00 cm
F1P            10.000 ppm
F1             4001.30 Hz
F2P            0.000 ppm
F2             0.00 Hz
PPMCM          0.50000 ppm/cm
HZCM           200.06500 Hz/cm
```
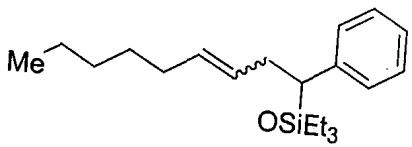

octene benzaldehyde TESOTf ene



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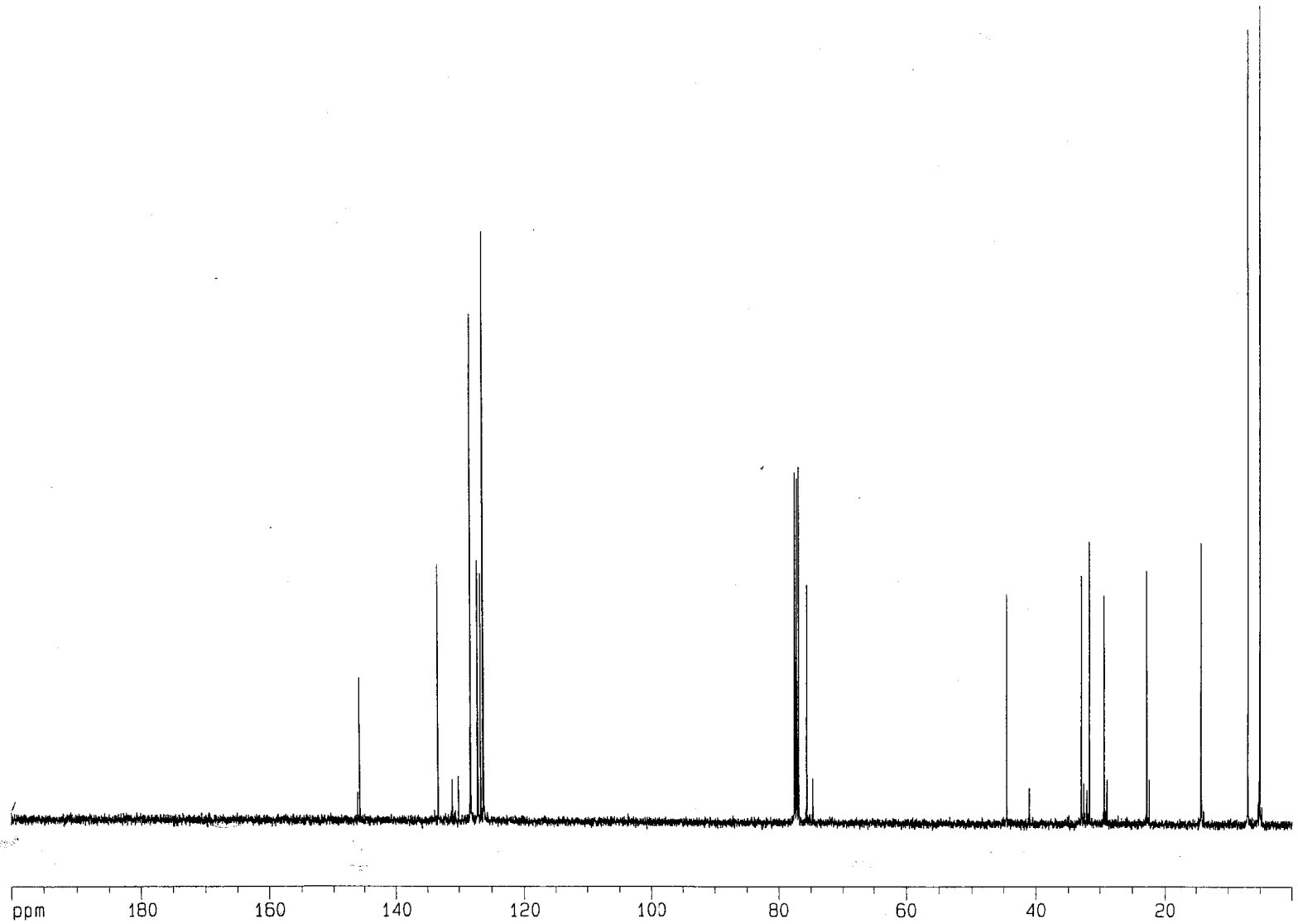
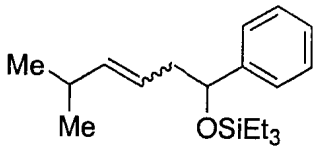
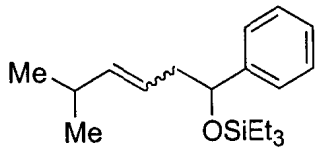


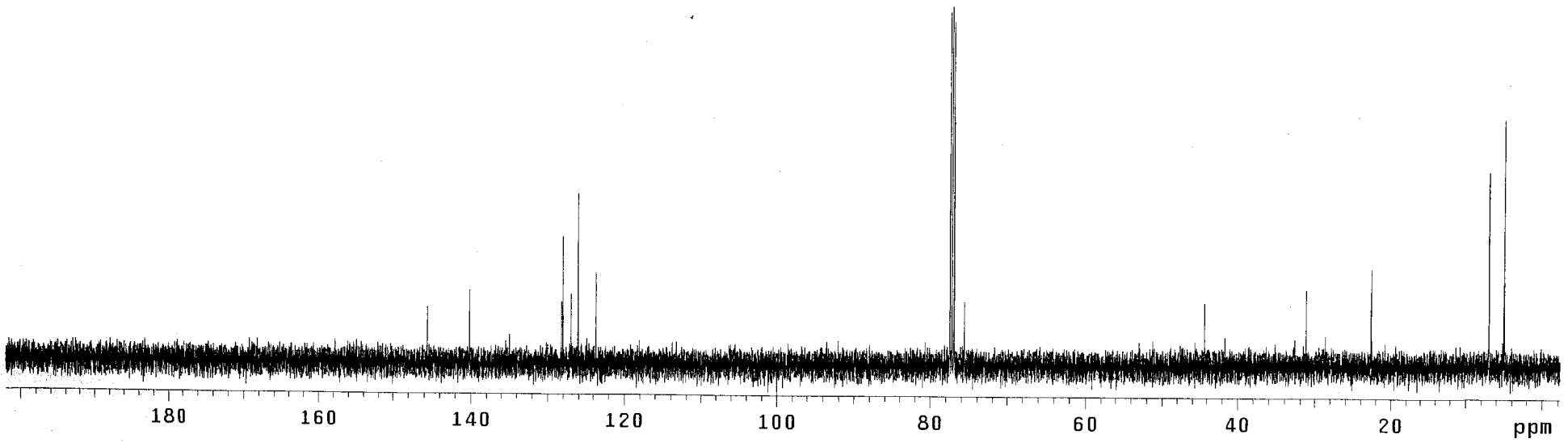

```
Current Data Parameters
NAME        octene-ene-C
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20050716
Time              22.11
INSTRUM           spect
PROBHD     5mm BBC BB-1
PULPROG         zgpg30
TD                65536
SOLVENT           CDCl3
NS                  213
DS                    4
SWH           25125.629 Hz
FIDRES        0.383387 Hz
AQ            1.3042164 sec
RG               1149.4
DW               19.900 usec
DE                6.00 usec
TE               300.0 K
D1            2.00000000 sec
d11           0.03000000 sec
d12           0.00002000 sec

============ CHANNEL f1 ============
NUC1                13C
P1               15.25 usec
PL1               3.00 dB
SFO1        100.6237959 MHz

============ CHANNEL f2 ============
CPDPRG2         waltz16
NUC2                1H
PCPD2           107.50 usec
PL2               0.00 dB
PL12             24.00 dB
PL13             24.00 dB
SFO2        400.1316005 MHz

F2 - Processing parameters
SI                32768
SF          100.6127476 MHz
WDW                  EM
SSB                   0
LB                 1.00 Hz
GB                    0
PC                 1.40

1D NMR plot parameters
CX                20.00 cm
F1P              200.000 ppm
F1             20122.55 Hz
F2P              0.000 ppm
F2               0.00 Hz
PPMCM         10.00000 ppm/cm
HZCM        1006.12744 Hz/cm
```



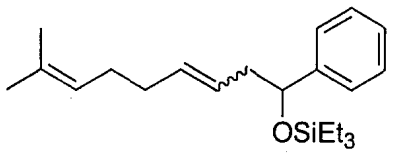
2k



2k



SN050672-b



2l

Current Data Parameters
NAME SN672-b-H
EXPNO 1
PROCNO 1

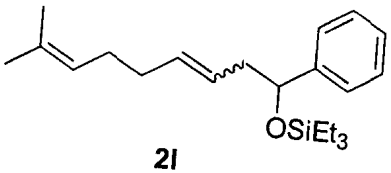
F2 - Acquisition Parameters
Date_ 20050625
Time 18.50
INSTRUM spect
PROBHD 5 mm QNP 1H
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 4
SWH 8278.146 Hz
FIDRES 0.126314 Hz
AQ 3.9584243 sec
RG 54
DW 60.400 usec
DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

========== CHANNEL f1 ==========
NUC1 1H
P1 9.50 usec
PL1 2.00 dB
SFO1 400.1324710 MHz

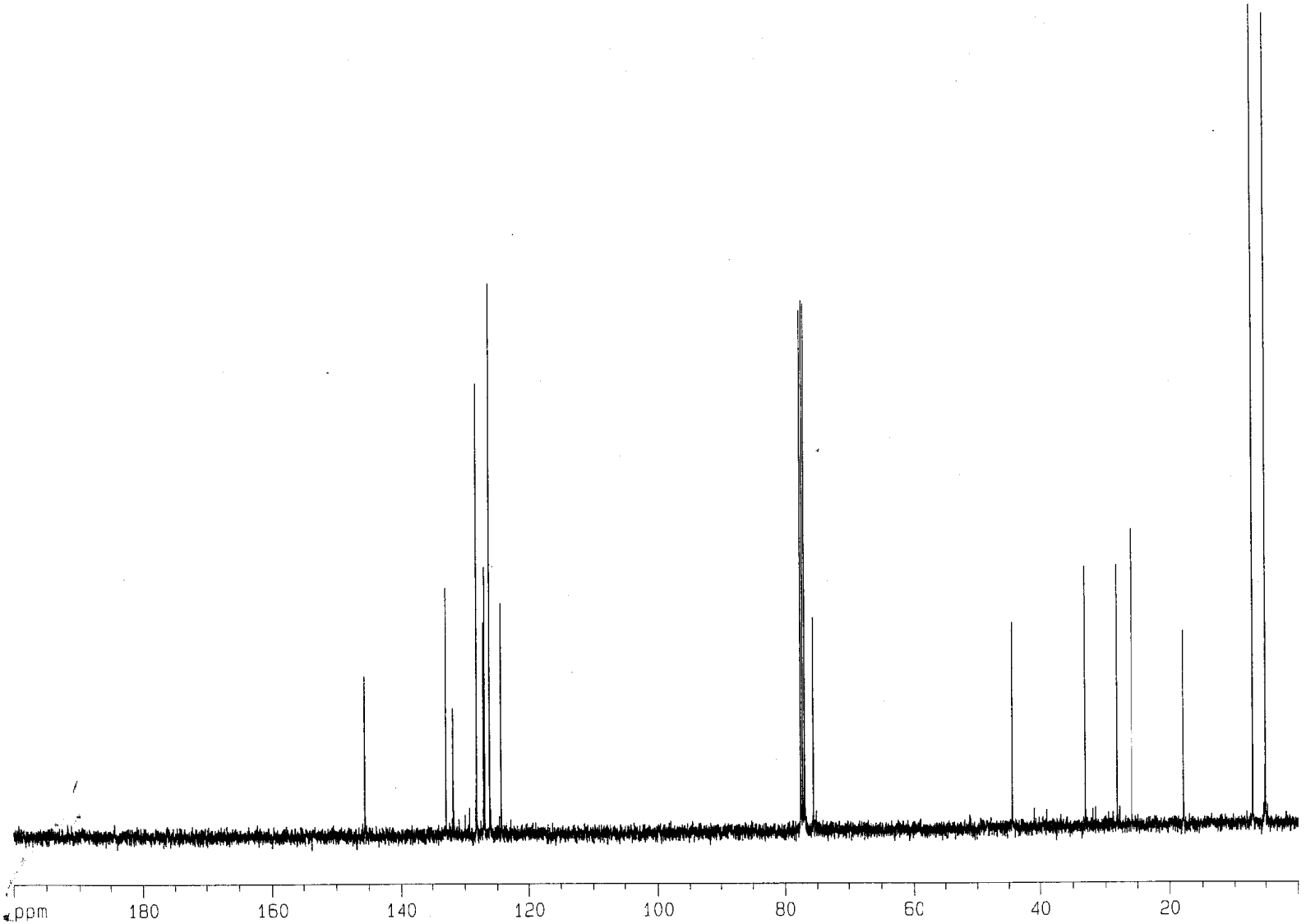
F2 - Processing parameters
SI 32768
SF 400.1300000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

1D NMR plot parameters
CX 20.00 cm
F1P 10.000 ppm
F1 4001.30 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 0.50000 ppm/cm
HZCM 200.06500 Hz/cm

SN050672-b



2l



Current Data Parameters
NAME SN672-b-C
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20050625
Time 18.59
INSTRUM spect
PROBHD 5 mm QNP 1H
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 746
DS 4
SWH 24330.900 Hz
FIDRES 0.371260 Hz
AQ 1.3468148 sec
RG 1149.4
DW 20.550 usec
DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

========== CHANNEL f1 ==========
NUC1 13C
P1 8.50 usec
PL1 3.00 dB
SFO1 100.6237959 MHz

========== CHANNEL f2 ==========
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 2.00 dB
PL12 22.00 dB
PL13 22.00 dB
SFO2 400.1316005 MHz

F2 - Processing parameters
SI 32768
SF 100.6127503 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

1D NMR plot parameters
CX 20.00 cm
F1P 200.000 ppm
F1 20122.55 Hz
F2P 0.000 ppm
F2 0.00 Hz
PPMCM 10.00000 ppm/cm
HZCM 1006.12744 Hz/cm