Ligand-Enabled, Copper-Catalyzed Regio- and Stereoselective Synthesis of Trialkylsubstituted Alkenylboronates from Unactivated Internal Alkynes

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Supporting Information

Table of Contents

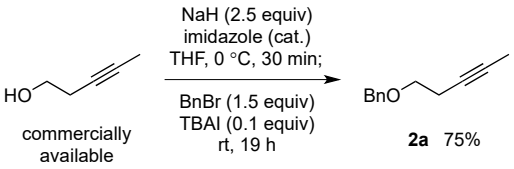
1. General Information

NMR spectra were recorded on JEOL ECX500 (500 MHz for ^{1}H NMR and 125 MHz for ^{13}C NMR) spectrometers. Chemical shifts were reported in ppm on the δ scale relative to TMS (δ = 0.00 for ^{1}H NMR and δ = 0.00 for ^{13}C NMR) as an internal reference. Infrared (IR) spectra were recorded on a JASCO FT/IR 410 Fourier transform infrared spectrophotometer. ESI- and DART-mass spectra were measured on a JEOL JMS-T100LC AccuTOF spectrometer for HRMS. Microwave reactions were performed on Biotage Initiator. Normal phase column chromatographies were performed with Biotage Isolera One and Biotage SNAP Ultra. Gel permeation chromatographies (GPC) were performed with JAI LC-9210 NEXT. Reactions were carried out in dry solvents under an argon atmosphere, unless otherwise stated. Reagents were used as received from commercial sources, unless otherwise stated.

2. Preparation of Substrates

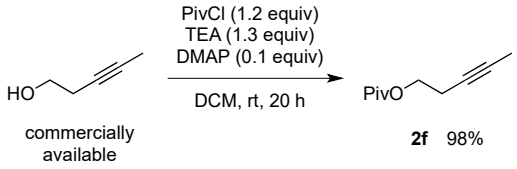
2-Octyne (**2b**), 4-methyl-1-butyne (**2c**), 3-hexyne (**2d**) and 1-phenyl-1-hexyne (**2m**) were purchased from commercial vendors and used after Kugelrohr distillation. 5-Phenyl-1-pentyne (**2n**) was purchased from a commercial vendor and used after silica gel column chromatography (eluent: hexane). 1-Iodobutane (**3a**), 1-iodo-3-phenylpropane (**3b**), (iodomethyl)cyclopropane (**3e**), iodomethane (**3f**), benzyl bromide (**3g**), ethyl bromoacetate (**3h**), 1-iodo-2-methylpropane (**3i**), $(Bpin)_2$, KO*t*Bu, and dehydrated DMF were purchased from commercial vendors and used without any purification. *tert*-Butyldimethylsilyl(3-pentynyloxy)silane (**2e**) was synthesized referring to the reported procedure.[1]

Benzyl 3-pentynyl ether (**2a**)



To a dried 300 mL flask were added NaH (3.25 g, 81.3 mmol) and THF (100 mL). The resulting mixture was stirred at 0 °C, before 3-pentyn-1-ol (3.00 mL, 32.5 mmol) and imidazole (1 small crystal) were added. The resulting mixture was stirred at 0 °C for 30 min, before benzyl bromide (5.80 mL, 48.8 mmol) and TBAI (1.20 g, 3.25 mmol) were added. The resulting mixture was stirred at ambient temperature for 19 h. The reaction was quenched with water, and extracted three times with ether. The combined organic layer was washed with brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1→19/1) to give pale yellow oil. After Kugelrohr distillation, pure **2a** was obtained as colorless oil (4.24 g, 24.3 mmol, 75%). The spectral data were identical with the reported value.[2]

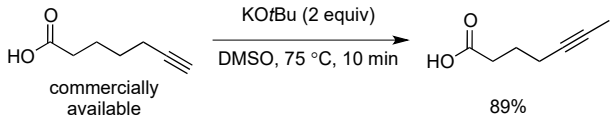
3-Pentynyl pivalate (2f)



To a dried 200 mL flask were added 3-pentyn-1-ol (2.00 mL, 21.8 mmol), triethylamine (4.00 mL, 28.4 mmol), DMAP (0.270 g, 2.18 mmol) and DCM (44 mL). The resulting mixture was stirred at 0 °C, before pivaloyl chloride (3.20 mL, 26.2 mmol) was added. The resulting mixture was stirred at 0 °C for 5 min, and then at ambient temperature for 20 h. The reaction mixture was filtrated through a short pad of silica gel (eluted with DCM). After evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 9/1) to give colorless oil. After Kugelrohr distillation, pure **2f** was obtained as colorless oil (3.58 g, 21.3 mmol, 98%).

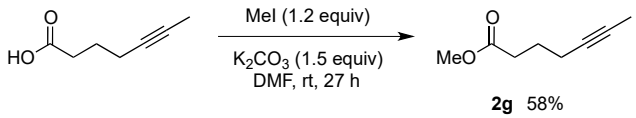
^{1}H NMR (500 MHz, $CDCl_3$): δ 4.11 (t, *J* = 7.0 Hz, 2H), 2.45 (qt, *J* = 2.4 Hz, 7.0 Hz, 2H), 1.76 (t, *J* = 2.4 Hz, 3H), 1.20 (s, 9H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 178.3, 77.1, 74.7, 62.5, 38.7, 27.1, 19.2, 3.4; IR (neat, cm^{-1}): 3444, 2972, 2922, 2873, 1809, 1730, 1481, 1460, 1398, 1366, 1283, 1226, 1154, 1039, 1006, 941, 916, 867, 833, 770, 734; HRMS (ESI): *m/z* calcd for $C_{10}H_{16}NaO_2^+$ [M+Na^+]: 191.1043. Found: 191.1034.

5-Heptynoic acid



To a dried 50 mL flask were added 6-heptynoic acid (0.980 g, 7.70 mmol), KO*t*Bu (1.73 g, 15.4 mmol) and DMSO (15 mL). The resulting mixture was stirred at 75 °C for 10 min, and then cooled with ice bath. The reaction was quenched with 1 M aq. HCl (20 mL), and extracted three times with ether. The combined organic layer was washed successively with water and brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 4/1) to give 5-heptynoic acid as white solids (0.860 g, 6.82 mmol, 89%). The spectral data were identical with the reported value.[3]

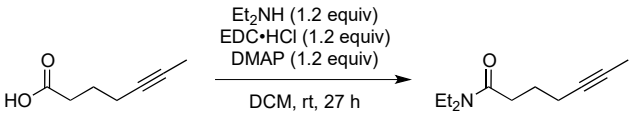
Methyl 5-heptynoate (2g)



To a dried 30 mL flask were added 5-heptynoic acid (0.38 g, 3.0 mmol), K_2CO_3 (0.62 g, 4.5 mmol) and DMF (6.0 mL). The resulting mixture was stirred at 0 °C, before iodomethane (0.22 mL, 3.6 mmol) was added. The resulting mixture was stirred at ambient temperature for 27 h. The reaction was quenched with water, and extracted three times with ether. The combined organic layer was dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column

chromatography (eluent: hexane/AcOEt = 19/1) to give **2g** as colorless oil (0.24 g, 1.7 mmol, 58%). The spectral data were identical with the reported value.[4]

***N*,*N*-diethyl-5-heptynamide (2h)**

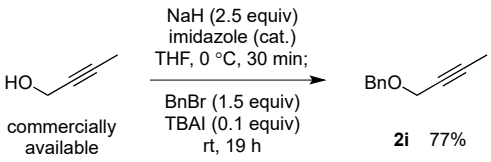


2h 79%

To a dried 50 mL flask were added 5-heptynoic acid (0.38 g, 3.0 mmol), EDC•HCl (0.69 g, 3.6 mmol), DMAP (0.44 g, 3.6 mmol) and DCM (15 mL). To the resulting mixture was added diethylamine (0.37 mL, 3.6 mmol). The resulting mixture was stirred at ambient temperature for 27 h. The reaction was quenched with 10% aq. citric acid, and extracted three times with DCM. The combined organic layer was dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 9/1→4/1) to give **2h** as colorless oil (0.43 g, 2.4 mmol, 79%).

^{1}H NMR (500 MHz, $CDCl_3$): δ 3.37 (q, *J* = 7.1 Hz, 2H), 3.33 (q, *J* = 7.1 Hz, 2H), 2.42 (t, *J* = 7.4 Hz, 2H), 2.21 (qt, *J* = 2.6 Hz, 6.8 Hz, 2H), 1.85-1.79 (m, 2H), 1.77 (t, *J* = 2.6 Hz, 3H), 1.18 (t, *J* = 7.1 Hz, 3H), 1.11 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 171.6, 78.6, 76.1, 41.9, 40.0, 31.7, 24.5, 18.3, 14.3, 13.1, 3.4; IR (neat, cm^{-1}): 3450, 2976, 2935, 1631, 1457, 1433, 1379, 1362, 1263, 1220, 1139, 1097, 1070, 754, 664; HRMS (ESI): *m/z* calcd for $C_{11}H_{19}NNaO^+$ [M+Na^+]: 204.1359. Found: 204.1352.

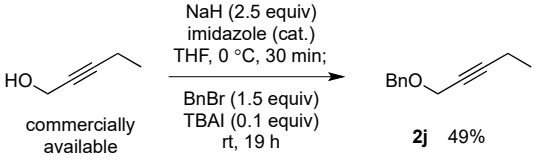
Benzyl 2-butynyl ether (2i)



2i 77%

To a dried 200 mL flask were added NaH (2.68 g, 67.0 mmol) and THF (100 mL). The resulting mixture was stirred at 0 °C, before 2-butyn-1-ol (2.00 mL, 26.8 mmol) and imidazole (1 small crystal) were added. The resulting mixture was stirred at 0 °C for 30 min, before benzyl bromide (4.77 mL, 40.2 mmol) and TBAI (0.990 g, 2.68 mmol) were added. The resulting mixture was stirred at ambient temperature for 19 h. The reaction was quenched with water, and extracted three times with ether. The combined organic layer was washed with brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1→19/1) to give pale yellow oil. After Kugelrohr distillation, pure **2i** was obtained as colorless oil (3.30 g, 20.6 mmol, 77%). The spectral data were identical with the reported value.[5]

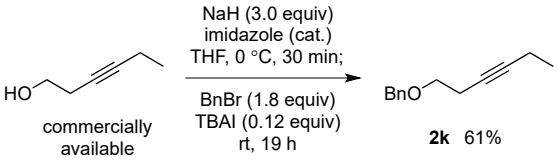
Benzyl 2-pentynyl ether (2j)



To a dried 200 mL flask were added NaH (2.16 g, 54.0 mmol) and THF (70 mL). The resulting mixture was stirred at 0 °C, before 2-pentyn-1-ol (2.00 mL, 21.6 mmol) and imidazole (1 small crystal) were added. The resulting mixture was stirred at 0 °C for 30 min, before benzyl bromide (3.85 mL, 32.4 mmol) and TBAI (0.800 g, 2.16 mmol) were added. The resulting mixture was stirred at ambient temperature for 19 h. The reaction was quenched with water, and extracted three times with ether. The combined organic layer was washed with brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1→19/1) to give pale yellow oil. After Kugelrohr distillation, pure **2j** was obtained as colorless oil (1.85 g, 10.6 mmol, 49%).

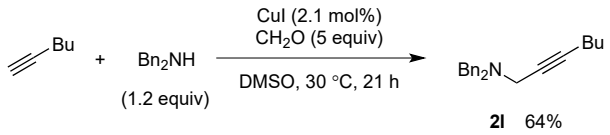
^{1}H NMR (500 MHz, $CDCl_3$): δ 7.36-7.32 (m, 4H), 7.30-7.28 (m, 1H), 4.58 (s, 2H), 4.15 (t, J = 2.1 Hz, 2H), 2.25 (qt, J = 2.1 Hz, 7.5 Hz, 2H), 1.16 (t, J = 7.5 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 137.6, 128.4, 128.0, 127.7, 88.5, 75.1, 71.4, 57.7, 13.8, 12.4; IR (neat, cm^{-1}): 3087, 3064, 3030, 2976, 2937, 2851, 2284, 2225, 1952, 1871, 1810, 1722, 1604, 1586, 1496, 1454, 1406, 1385, 1354, 1319, 1262, 1206, 1151, 1134, 1071, 1026, 955, 936, 904, 736, 698; HRMS (ESI): *m/z* calcd for $C_{12}H_{14}NaO^+$ [M+Na^+]: 197.0937. Found: 197.0935.

Benzyl 3-hexynyl ether (**2k**)



To a dried 200 mL flask were added NaH (2.16 g, 54.0 mmol) and THF (70 mL). The resulting mixture was stirred at 0 °C, before 3-hexyn-1-ol (2.00 mL, 18.2 mmol) and imidazole (1 small crystal) were added. The resulting mixture was stirred at 0 °C for 30 min, before benzyl bromide (3.85 mL, 32.4 mmol) and TBAI (0.800 g, 2.16 mmol) were added. The resulting mixture was stirred at ambient temperature for 19 h. The reaction was quenched with water, and extracted three times with ether. The combined organic layer was washed with brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1→19/1) to give yellow oil. After Kugelrohr distillation, pure **2k** was obtained as colorless oil (2.08 g, 11.0 mmol, 61%). The spectral data were identical with the reported value.[2]

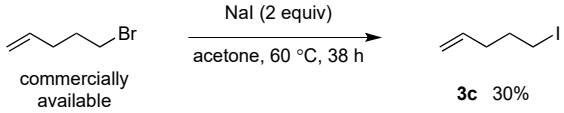
***N*,*N*-dibenzyl-2-heptynylamine (2l)**



2l 64%

To a dried 100 mL flask were added CuI (40.0 mg, 0.210 mmol), dibenzylamine (2.30 mL, 12.0 mmol) and DMSO (20 mL). To the resulting mixture were added formaldehyde solution (37%, 4.00 mL) and 1-hexyne (1.15 mL, 10.0 mmol). The resulting mixture was stirred at 30 °C for 21 h. The reaction was quenched with water, and extracted three times with ether. The combined organic layer was washed with brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 19/1→9/1) to give **2l** as colorless oil (1.85 g, 6.35 mmol, 64%). The spectral data were identical with the reported value.[6]

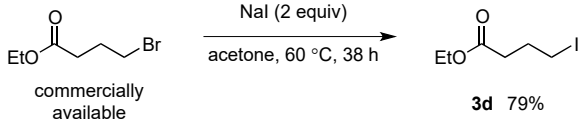
5-Iodo-1-pentene (3c)



3c 30%

To a dried screw cap tube were added 5-bromo-1-pentene (1.18 mL, 10.0 mmol), NaI (3.00 g, 20.0 mmol) and acetone (20 mL). After the tube was sealed with a cap, the resulting mixture was stirred at 60 °C for 38 h. After filtration and evaporation, the residue was diluted with ether, washed successively with water and brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane) to give **3c** as colorless oil (0.593 g, 3.03 mmol, 30%). The yield was decreased because **3c** was volatile under reduced pressure. The spectral data were identical with the reported value.[7]

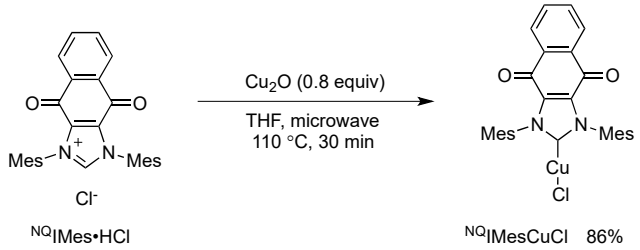
Ethyl 4-iodobutyrate (3d)



3d 79%

To a dried screw cap tube were added ethyl 4-bromobutyrate (0.72 mL, 5.0 mmol), NaI (1.5 g, 10 mmol) and acetone (10 mL). After the tube was sealed with a cap, the resulting mixture was stirred at 60 °C for 37 h. After filtration and evaporation, the residue was diluted with ether, washed successively with water and brine, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 19/1) to give **3d** as colorless oil (0.95 g, 3.9 mmol, 79%). The spectral data were identical with the reported value.[8]

3. Synthesis of ^{NQ}IMesCuCl

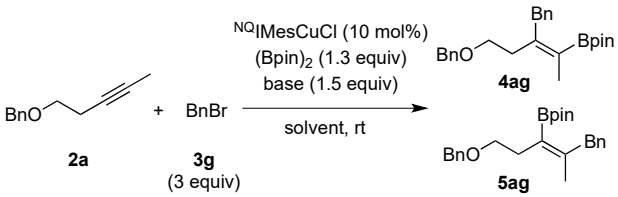


^{NQ}IMes•HCl ^{NQ}IMesCuCl 86%

^{NQ}IMes•HCl was synthesized according to the reported procedure.[9] To a dried 0.5-2 mL microwave vessel were added ^{NQ}IMes•HCl (0.24 g, 0.51 mmol), Cu_2O (0.057 g, 0.40 mmol) and THF (4 mL). The resulting mixture was reacted in the microwave reactor for 30 min at 110 °C. The reaction mixture was filtrated through a short pad of celite (eluted with DCM). After evaporation, the residue was redissolved in DCM. The resulting red solution was diluted with pentane to give a yellow precipitation. After filtration, ^{NQ}IMesCuCl was obtained as yellow powder (0.22 g, 0.44 mmol, 86%).

^{1}H NMR (500 MHz, $CDCl_3$): δ 8.08 (dd, J = 3.2 Hz, 5.8 Hz, 2H), 7.78 (dd, J = 3.2 Hz, 5.8 Hz, 2H), 7.08 (s, 4H), 2.40 (s, 6H), 2.09 (s, 12H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 188.5, 174.3, 140.3, 134.8, 133.6, 133.0, 132.0, 129.8, 127.2, 21.3, 17.9; IR (neat, cm^{-1}): 3343, 2987, 2918, 1727, 1678, 1589, 1570, 1481, 1411, 1321, 1305, 1264, 1217, 1194, 1072, 1032, 954, 941, 853, 793, 754, 721, 691, 664; HRMS (ESI): *m/z* calcd for $C_{29}H_{26}ClCuN_2NaO_2^+$ [M+Na$^+$]: 555.0871. Found: 555.0860.

4. Optimization Study: Base Effect and Solvent Effect[a]

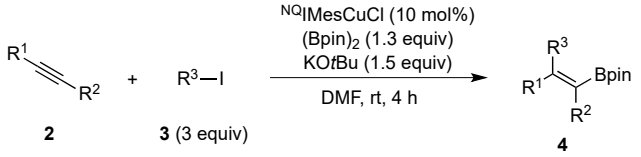


entry	base	solvent	yield(%)[b]	r.r.
1	LiO*t*Bu	DMF	60	13 : 1
2	NaO*t*Bu	DMF	62	13 : 1
3	KO*t*Bu	DMF	74	13 : 1
4	KO*t*Bu	toluene	38	12 : 1
5	KO*t*Bu	THF	<42	>4.1 : 1
6	KO*t*Bu	dioxane	<27	>2.8 : 1

[a]General reaction conditions: **2a** (0.10 mmol), **3g** (3 equiv), ^{NQ}IMesCuCl (10 mol%), $(Bpin)_2$ (1.3 equiv), and base (1.5 equiv) in solvent (0.5 mL) at rt for 4 h. Yield and regioisomeric ratio (r.r. = **4ag** : **5ag**) were determined by ^{1}H NMR analysis of a crude mixture using 1,1,2,2-tetrachloroethane as an internal standard. [b]Combined yield of **4ag** and **5ag**.

DMF was the optimum solvent regarding both product yield and regioselectivity. The base did not affect regioselectivity, but KO*t*Bu produced the highest reactivity.

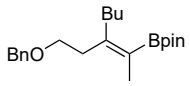
5. Copper-Catalyzed Regioselective Borylalkylation of Dialkylsubstituted Internal Alkynes



2 **3** (3 equiv) **4**

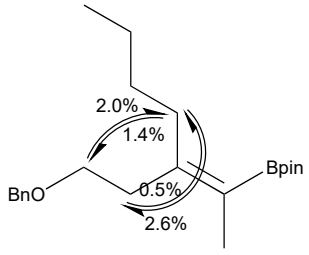
^{NQ}IMesCuCl (10.6 mg, 0.0200 mmol) and $(Bpin)_2$ (66.0 mg, 0.260 mmol) were weighed and added to a test tube under air. The test tube was transferred to an Ar filled glove box. KO*t*Bu (33.6 mg, 0.300 mmol) was added to the test tube in the glove box. The test tube was sealed with a rubber septum, and removed from the glove box. Dehydrated DMF (1.0 mL, commercially available from Kanto Chemical Co., Inc.) was added by syringe. The resulting mixture was stirred at 0 °C for 10 min, before **2** (0.200 mmol) and **3** (0.600 mmol) were added. The resulting mixture was stirred at ambient temperature with water bath for 4 h. The reaction was quenched with sat. aq. NH_4Cl, extracted three times with hexane/AcOEt = 4/1, and dried over Na_2SO_4. After filtration and evaporation, the residue was purified by silica gel column chromatography to give a mixture of **4** and **5**, with **4** as the major isomer. The stereochemistry of **4** was assigned based on the NOE measurement (see below).

(*Z*)-2-(3-(2-(benzyloxy)ethyl)hept-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4aa**)



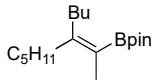
2a (36.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 10.2 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4aa** and **5aa** as colorless oil (64.5 mg, 0.180 mmol, 90%, r.r. = 9.7 : 1).

R_f = 0.30 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.36-7.25 (m, 5H, **4aa**+**5aa**), 4.51 (s, 2H, **4aa**+**5aa**), 3.47 (t, *J* = 7.9 Hz, 2H, **4aa**), 3.39 (t, *J* = 7.9 Hz, 2H, **5aa**), 2.48 (t, *J* = 7.9 Hz, 2H, **4aa**+**5aa**), 2.29 (t, *J* = 7.7 Hz, 2H, **4aa**+**5aa**), 1.74 (s, 3H, **5aa**), 1.59 (s, 3H, **4aa**), 1.38-1.22 (m, 16H, **4aa**+**5aa**), 0.88 (t, *J* = 7.1 Hz, 3H, **4aa**+**5aa**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 151.5, 138.5, 128.3, 127.6, 127.4, 82.7, 72.8, 68.4, 36.2, 33.2, 32.3, 24.7, 24.7, 22.8, 16.3, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3420, 2972, 2959, 2928, 2857, 2359, 1623, 1455, 1357, 1286, 1209, 1147, 1089, 961, 854, 734, 696; HRMS (ESI): *m/z* calcd for $C_{22}H_{35}BNaO_3^+$ [M+Na$^+$]: 381.2571. Found: 381.2560.



4aa NOE study

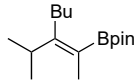
(*Z*)-2-(3-butyloct-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ba**)



2b (29.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 6.9 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 99/1) to give an inseparable mixture of **4ba** and **5ba** as colorless oil (43.5 mg, 0.147 mmol, 74%, r.r. = 9.0 : 1).

R_f = 0.40 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 2.28 (t, *J* = 7.4 Hz, 2H, **4ba**+**5ba**), 2.07 (t, 7.9 Hz, 2H, **4ba**+**5ba**), 1.69 (s, 3H, **5ba**), 1.67 (s, 3H, **4ba**), 1.37-1.24 (m, 10H, **4ba**+**5ba**), 1.27 (s, 12H. **4ba**+**5ba**) 0.91-0.87 (m, 6H, **4ba**+**5ba**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 156.6, 82.6, 35.7, 32.7, 32.4, 32.3, 27.7, 24.8, 22.9, 22.6, 16.1, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3466, 2972, 2957, 2929, 2859, 1619, 1540, 1507, 1465, 1357, 1284, 1213, 1148, 1092, 966, 856, 691, 670; HRMS (DART): *m/z* calcd for $C_{18}H_{36}BO_2^+$ [M+H$^+$]: 295.2803. Found: 295.2793.

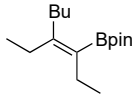
(*Z*)-2-(3-isopropylhept-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ca**)



2c (23.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. could not be determined due to overlapped impurities). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) and GPC to give an inseparable mixture of **4ca** and **5ca** as colorless oil (27.0 mg, 0.101 mmol, 51%, r.r. = 17.2 : 1).

R_f = 0.51 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 2.93 (sept, *J* = 6.9 Hz, 1H, **4ca**), 2.65 (sept, *J* = 6.9 Hz, 1H, **5ca**), 2.20 (t, *J* = 7.9 Hz, 2H, **4ca**), 2.08 (t, *J* = 7.7 Hz, 2H, **5ca**), 1.69 (s, 3H, **4ca**), 1.66 (s, 3H, **5ca**), 1.39-1.19 (m, 4H, **4ca**+**5ca**), 1.26 (s, 12H, **4ca**+**5ca**), 1.01 (d, *J* = 6.9 Hz, 6H, **5ca**), 0.98 (d, *J* = 6.9 Hz, 6H, **4ca**), 0.89 (t, *J* = 7.0 Hz, 3H, **4ca**+**5ca**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 160.5, 82.6, 35.2, 31.1, 30.6, 24.8, 23.5, 20.8, 15.5, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 2959, 2929, 2872, 1607, 1457, 1375, 1353, 1282, 1146, 1086, 966, 865, 765, 730; HRMS (DART): *m/z* calcd for $C_{16}H_{32}BO_2^+$ [M+H$^+$]: 267.2490. Found: 267.2502.

(*E*)-2-(4-ethyloct-3-en-3-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4da**)

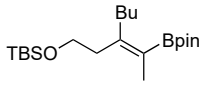


2d (23.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product. The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 99/1) to give pure **4da** as colorless oil (44.0 mg, 0.165 mmol, 83%).

R_f = 0.44 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 2.25 (t, *J* = 7.6 Hz, 2H), 2.14-2.07 (m, 4H), 1.36-1.24 (m, 4H), 1.28 (s, 12H), 0.97 (dt, *J* = 0.9 Hz, 7.6 Hz, 3H), 0.93 (dt, *J* = 0.9 Hz, 7.6 Hz, 3H), 0.89 (t, *J* = 7.1 Hz,

3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 155.3, 82.6, 35.3, 32.4, 24.8, 24.7, 23.7, 23.0, 15.2, 14.0, 13.5 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3420, 3011, 2963, 2931, 2871, 1617, 1466, 1389, 1372, 1358, 1318, 1284, 1256, 1215, 1146, 1109, 1036, 965, 927, 869, 852, 760, 668; HRMS (DART): *m/z* calcd for $C_{16}H_{32}BO_2^+$ [M+H$^+$]: 267.2490. Found: 267.2499.

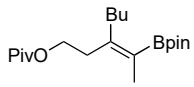
(*Z*)-*tert*-butyldimethyl((3-(1-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)ethylidene)heptyl)oxy)silane (4ea)



2e (48.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 11.6 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ea** and **5ea** as colorless oil (69.7 mg, 0.182 mmol, 91%, r.r. = 9.8 : 1).

R_f = 0.43 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.59 (t, *J* = 8.0 Hz, 2H, **4ea**), 3.51 (t, *J* = 8.0 Hz, 2H, **5ea**), 2.38 (t, *J* = 8.0 Hz, 2H, **4ea+5ea**), 2.28 (t, *J* = 7.6 Hz, 2H, **4ea+5ea**), 1.75 (s, 3H, **5ea**), 1.69 (s, 3H, **4ea**), 1.38-1.22 (m, 16H, **4ea+5ea**), 0.89 (t, *J* = 7.2 Hz, 3H, **4ea+5ea**), 0.89 (s, 9H, **4ea+5ea**), 0.05 (s, 6H, **4ea+5ea**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 151.7, 82.7, 61.5, 36.6, 36.3, 32.2, 26.0, 24.7, 22.8, 18.3, 16.3, 14.0, -5.2 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3446, 3018, 2957, 2929, 2857, 2399, 1620, 1520, 1470, 1358, 1285, 1255, 1215, 1146, 1082, 1005, 964, 929, 836, 756, 691, 669, 626; HRMS (ESI): *m/z* calcd for $C_{21}H_{43}BNaO_3Si^+$ [M+Na$^+$]: 405.2967. Found: 405.2971.

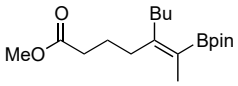
(*Z*)-3-(1-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)ethylidene)heptyl pivalate (4fa)



2f (38.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 8.1 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4fa** and **5fa** as colorless oil (57.1 mg, 0.162 mmol, 81%, r.r. = 7.5 : 1).

R_f = 0.32 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 4.05 (t, *J* = 7.7 Hz, 2H, **4fa**), 3.98 (t, *J* = 7.6 Hz, 2H, **4fa**), 2.36 (t, *J* = 7.6 Hz, 2H, **4fa**), 2.32 (t, *J* = 7.7 Hz, 2H, **4fa**), 1.79 (s, 3H, **4fa**), 1.73 (s, 3H, **4fa**), 1.39-1.13 (m, 4H, **4fa**+**5fa**), 1.26 (s, 12H, **4fa**+**5fa**), 1.19 (s, 9H, **4fa**+**5fa**), 0.90 (t, *J* = 7.1 Hz, 3H, **4fa**+**5fa**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 178.6, 150.4, 82.8, 62.5, 38.6, 35.9, 32.2, 31.8, 27.2, 27.2, 24.7, 22.8, 16.4, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3420, 3019, 2978, 2931, 2872, 2399, 1717, 1622, 1480, 1457, 1359, 1287, 1215, 1146, 1090, 1034, 965, 852, 756, 669; HRMS (ESI): *m/z* calcd for $C_{20}H_{37}BNaO_4^+$ [M+Na$^+$]: 375.2677. Found: 375.2668.

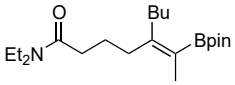
(*Z*)-methyl 5-(1-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)ethylidene)nonanoate (4ga)



2g (29.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. could not be determined due to overlapped impurities). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ga** and **5ga** as colorless oil (51.5 mg, 0.159 mmol, 79%, r.r. = 10.3 : 1).

R_f = 0.11 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.66 (s, 3H, **4ga**), 3.65 (s, 3H, **5ga**), 2.33-2.27 (m, 4H, **4ga**+**5ga**), 2.12 (t, *J* = 8.0 Hz, 2H, **4ga**+**5ga**), 1.67 (s, 3H, **4ga**), 1.64 (s, 3H, **5ga**), 1.35-1.25 (m, 4H, **4ga**+**5ga**), 1.26 (s, 12H, **4ga**+**5ga**), 0.89 (t, *J* = 7.1 Hz, 3H, **4ga**+**5ga**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 174.1, 154.6, 82.7, 51.4, 35.4, 34.1, 32.3, 31.7, 24.8, 23.2, 22.9, 16.1, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3446, 3016, 2981, 2955, 2933, 2870, 1732, 1619, 1461, 1437, 1360, 1284, 1215, 1146, 1109, 1088, 965, 860, 756, 690, 668; HRMS (ESI): *m/z* calcd for $C_{18}H_{33}BNaO_4^+$ [M+Na^+]: 347.2364. Found: 347.2361.

(*Z*)-*N*,*N*-diethyl-5-(1-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)ethylidene)nonanamide (4ha)

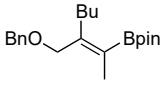


2h (39.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. could not be determined due to overlapped impurities). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give pure **4ha** (50.0 mg, 0.160 mmol) and **5ha** (6.4 mg, 0.018 mmol) as colorless oil (89%, r.r. = 9.1 : 1).

4ha: R_f = 0.36 (hexane/AcOEt = 2/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.36 (q, 2H, *J* = 7.1 Hz), 3.29 (q, 2H, *J* = 7.1 Hz), 2.32-2.28 (m, 4H), 2.15 (t, 2H, *J* = 8.0 Hz), 1.75-1.69 (m, 2H), 1.68 (s, 3H), 1.36-1.24 (m, 4H), 1.26 (s, 12H), 1.16 (t, 3H, *J* = 7.1 Hz), 1.10 (t, 3H, *J* = 7.1 Hz), 0.89 (t, 3H, *J* = 7.1 Hz); ^{13}C NMR (125 MHz, $CDCl_3$): δ 171.9, 155.4, 82.6, 41.9, 39.9, 35.5, 33.1, 32.4, 32.1, 24.8, 23.7, 22.9, 16.2, 14.3, 14.0, 13.1 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3420, 2975, 2929, 2872, 1644, 1457, 1431, 1360, 1283, 1217, 1146, 1087, 966, 861, 754, 687, 665; HRMS (ESI): *m/z* calcd for $C_{21}H_{40}BNNaO_3^+$ [M+Na^+]: 388.2993. Found: 388.2980.

5ha: R_f = 0.25 (hexane/AcOEt = 2/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 3.35 (q, *J* = 7.1 Hz, 2H), 3.28 (q, *J* = 7.1 Hz, 2H), 2.32-2.26 (m, 4H), 2.16 (t, *J* = 7.6 Hz, 2H), 1.72 (s, 3H), 1.68-1.62 (m, 2H), 1.38-1.24 (m, 4H), 1.25 (s, 12H), 1.15 (t, *J* = 7.1 Hz, 3H), 1.09 (t, *J* = 7.1 Hz, 3H), 0.89 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 172.5, 152.0, 82.6, 41.9, 39.8, 38.0, 33.0, 31.7, 30.6, 25.9, 24.8, 22.6, 18.7, 14.3, 14.1, 13.1 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3447, 2974, 2930, 2871, 1644, 1458, 1428, 1376, 1352, 1276, 1214, 1144, 1082, 968, 862, 710; HRMS (ESI): *m/z* calcd for $C_{21}H_{40}BNNaO_3^+$ [M+Na^+]: 388.2993. Found: 388.2980.

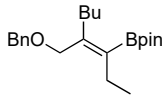
(*Z*)-2-(3-((benzyloxy)methyl)hept-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (4ia)



2i (33.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = >20 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give pure **4ia** as colorless oil (59.2 mg, 0.163 mmol, 82%).

R_f = 0.28 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.31 (m, 4H), 7.28-7.25 (m, 1H), 4.47 (s, 2H), 4.08 (s, 2H), 2.42 (t, *J* = 7.8 Hz, 2H), 1.71 (s, 3H), 1.41-1.36 (m, 2H), 1.33-1.28 (m, 2H), 1.27 (s, 12H), 0.89 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 150.9, 138.7, 128.2, 127.6, 127.4, 82.9, 72.1, 68.5, 33.6, 32.2, 24.8, 22.9, 15.9, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3420, 2972, 2955, 2929, 2858, 1716, 1623, 1540, 1507, 1455, 1353, 1294, 1213, 1146, 1073, 965, 853, 734, 697; HRMS (ESI): *m/z* calcd for $C_{21}H_{33}BNaO_3^+$ [M+Na^+]: 367.2415. Found: 267.2401.

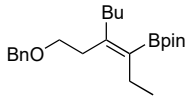
(*Z*)-2-(4-((benzyloxy)methyl)oct-3-en-3-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ja**)



2j (36.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. could not be determined due to overlapped impurities). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ja** and **5ja** as colorless oil (50.0 mg, 0.139 mmol, 70%, r.r. = 11.9 : 1).

R_f = 0.22 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.37-7.24 (m, 5H, **4ja**+**5ja**), 4.49 (s, 2H, **5ja**), 4.46 (s, 2H, **4ja**), 4.14 (s, 2H, **5ja**), 4.07 (s, 2H, **4ja**), 2.38 (t, *J* = 7.8 Hz, 2H, **4ja**), 2.26 (t, *J* = 7.9 Hz, 2H, **5ja**), 2.16 (q, *J* = 7.4 Hz, 2H, **4ja**), 2.11 (q, *J* = 7.7 Hz, 2H, **5ja**), 1.42-1.36 (m, 2H, **4ja**+**5ja**), 1.34-1.21 (m, 14H, **4ja**+**5ja**), 0.91 (t, *J* = 7.4 Hz, 3H, **4ja**+**5ja**), 0.89 (t, *J* = 7.1 Hz, 3H, **4ja**+**5ja**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 148.7, 138.7, 128.2, 127.6, 127.4, 82.9, 71.9, 67.8, 33.8, 32.2, 24.8, 23.6, 22.9, 15.1, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3412, 2958, 2924, 2868, 2367, 2319, 1652, 1540, 1507, 1456, 1360, 1288, 1145, 1091, 966, 857, 769; HRMS (ESI): *m/z* calcd for $C_{22}H_{35}BNaO_3^+$ [M+Na^+]: 381.2571. Found: 381.2575.

(*Z*)-2-(4-(2-(benzyloxy)ethyl)oct-3-en-3-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ka**)

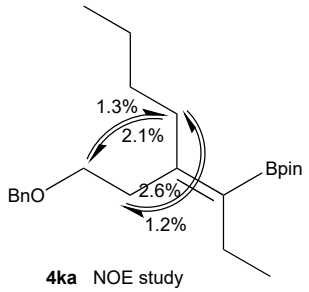


2k (39.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 1.7 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give a mixture of **4ka** and **5ka** as colorless oil (66.1 mg, 0.177 mmol, 89%, r.r. = 1.8 : 1). Pure **4ka** and **5ka** were isolated by GPC.

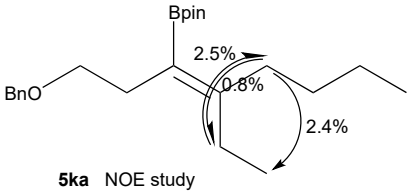
4ka: R_f = 0.23 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.33 (d, *J* = 4.6 Hz, 4H), 7.28-7.25 (m, 1H), 4.50 (s, 2H), 3.46 (t, *J* = 8.0 Hz, 2H), 2.46 (t, *J* = 8.0 Hz, 2H), 2.23 (t, *J* = 7.9 Hz, 2H), 2.12 (q, *J* = 7.4 Hz, 2H), 1.38-1.25 (m, 4H), 1.26 (s, 12H), 0.91 (t, *J* = 7.4 Hz, 3H), 0.88 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 149.0, 138.6, 128.4, 127.7, 127.6, 82.9, 72.9, 69.4, 36.5, 32.6, 32.5, 24.9, 24.2, 23.0, 15.2, 14.2 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3446, 2972, 2958, 2928, 2868, 1617, 1455,

1357, 1286, 1257, 1213, 1146, 1105, 968, 858, 733, 697; HRMS (ESI): *m/z* calcd for $C_{23}H_{37}BNaO_3^+$ [M+Na$^+$]: 395.2728. Found: 395.2732.

5ka: R_f = 0.23 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.30 (m, 4H), 7.26-7.25 (m, 1H), 4.51 (s, 2H), 3.39 (t, *J* = 7.9 Hz, 2H), 2.47 (t, *J* = 7.9 Hz, 2H), 2.28 (t, *J* = 7.7 Hz, 2H), 2.11 (q, *J* = 7.6 Hz, 2H), 1.34-1.26 (m, 4H), 1.22 (s, 12H), 0.96 (t, *J* = 7.6 Hz, 3H), 0.89 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 159.0, 138.8, 128.2, 127.5, 127.3, 82.6, 72.5, 70.6, 35.1, 32.4, 31.0, 25.1, 24.7, 22.9, 14.0, 13.4 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3419, 2973, 2929, 2863, 1617, 1455, 1359, 1285, 1213, 1146, 1103, 965, 853, 697; HRMS (ESI): *m/z* calcd for $C_{23}H_{37}BNaO_3^+$ [M+Na$^+$]: 395.2728. Found: 395.2732.

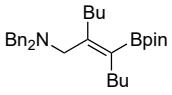


4ka NOE study



5ka NOE study

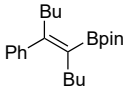
(*Z*)-*N*,*N*-dibenzyl-2-butyl-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)hept-2-en-1-amine (**4la**)



2l (59.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = >20 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 19/1) to give pure **4la** as white solids (62.0 mg, 0.130 mmol, 65%).

R_f = 0.45 (hexane/AcOEt = 10/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.37 (d, *J* = 7.2 Hz, 4H), 7.29 (t, *J* = 7.6 Hz, 4H), 7.20 (t, *J* = 7.3 Hz, 2H), 3.45 (s, 4H), 2.99 (s, 2H), 2.41 (t, *J* = 8.2 Hz, 2H), 2.19 (t, *J* = 7.6 Hz, 2H), 1.31-1.20 (m, 6H), 1.24 (s, 12H), 1.12-1.07 (m, 2H), 0.88 (t, *J* = 7.0 Hz, 3H), 0.83 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 150.1, 140.2, 128.7, 128.0, 126.6, 82.7, 58.4, 52.7, 33.8, 32.9, 32.1, 30.0, 24.7, 23.1, 22.7, 14.1, 14.0 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3435, 3027, 2955, 2928, 2870, 2788, 1617, 1494, 1455, 1352, 1287, 1211, 1146, 1107, 1027, 966, 852, 746, 698; HRMS (ESI): *m/z* calcd for $C_{31}H_{47}BNO_2^+$ [M+H$^+$]: 476.3694. Found: 476.3694.

(*Z*)-4,4,5,5-tetramethyl-2-(6-phenyldec-5-en-5-yl)-1,3,2-dioxaborolane (**4ma**)

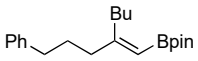


2m (35.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. could not be determined due to overlapped impurities). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 99/1) to give a mixture of **4ma** and **5ma** as colorless oil (60.5 mg, 0.176 mmol, 88%, r.r. = 13.8 : 1). Pure **4ma** was

isolated by PTLC (eluent: hexane/AcOEt = 20/1).

4ma: R_f = 0.34 (hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.29 (t, *J* = 7.4 Hz, 2H), 7.20 (t, *J* = 7.4 Hz, 1H), 7.05 (d, *J* = 7.4 Hz, 2H), 2.52 (t, *J* = 7.4 Hz, 2H), 1.92 (t, *J* = 7.6 Hz, 2H), 1.32 (s, 12H), 1.25-1.19 (m, 6H), 1.16-1.09 (m, 2H), 0.82 (t, *J* = 7.0 Hz, 3H), 0.73 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 152.9, 143.4, 128.0, 127.7, 126.0, 83.0, 38.2, 32.6, 31.8, 31.1, 24.8, 22.6, 22.5, 14.0, 13.9 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 2956, 2928, 2858, 1616, 1595, 1489, 1352, 1286, 1213, 1137, 1108, 966, 865, 841, 758, 702; HRMS (ESI): *m/z* calcd for $C_{22}H_{35}BNaO_2^+$ [M+Na^+]: 365.2622. Found: 365.2609.

(*E*)-4,4,5,5-tetramethyl-2-(2-(3-phenylpropyl)hex-1-en-1-yl)-1,3,2-dioxaborolane (**4na**)

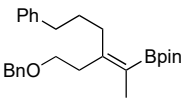


2n (31.0 μL, 0.200 mmol) and **3a** (68.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 3.2 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 99/1) to give a mixture of **4ma** and **5ma** as colorless oil (54.9 mg, 0.167 mmol, 84%, r.r. = 3.0 : 1). Pure **4na** and **5na** was isolated by PTLC (eluent: hexane/AcOEt = 20/1).

4na: R_f = 0.38 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.27-7.24 (m, 2H), 7.17-7.15 (m, 3H), 5.13 (s, 1H), 2.60 (t, *J* = 7.7 Hz, 2H), 2.38 (t, *J* = 7.6 Hz, 2H), 2.14 (t, *J* = 7.6 Hz, 2H), 1.80-1.74 (m, 2H), 1.39-1.33 (m, 2H), 1.32-1.27 (m, 2H), 1.25 (s, 12H), 0.89 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 167.1, 142.4, 128.4, 128.2, 125.6, 82.5, 38.5, 35.5, 34.4, 31.7, 29.4, 24.8, 22.6, 13.9 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3405, 2978, 2955, 2930, 2859, 1632, 1491, 1455, 1379, 1324, 1262, 1215, 1142, 1105, 970, 852, 756, 699, 623; HRMS (ESI): *m/z* calcd for $C_{21}H_{33}BNaO_2^+$ [M+Na^+]: 351.2466. Found: 351.2467.

5na: R_f = 0.57 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.25 (t, *J* = 7.4 Hz, 2H), 7.18-7.14 (m, 3H), 6.00 (t, *J* = 7.4 Hz, 1H), 2.58 (t, *J* = 7.9 Hz, 2H), 2.33-2.28 (m, 2H), 2.14 (t, *J* = 7.6 Hz, 2H), 1.71-1.65 (m, 2H), 1.34-1.29 (m, 4H), 1.26 (s, 12H), 0.88 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 146.7, 143.0, 128.4, 128.1, 125.4, 82.7, 36.6, 35.5, 32.2, 32.0, 30.8, 24.8, 22.2, 13.9 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3406, 2976, 2956, 2927, 2857, 1629, 1603, 1496, 1455, 1426, 1404, 1389, 1371, 1296, 1266, 1213, 1144, 1109, 1084, 966, 862, 747, 699; HRMS (ESI): *m/z* calcd for $C_{21}H_{33}BNaO_2^+$ [M+Na^+]: 351.2466. Found: 351.2480.

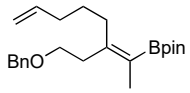
(*Z*)-2-(3-(2-(benzyloxy)ethyl)-6-phenylhex-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ab**)



2a (36.0 μL, 0.200 mmol) and **3b** (96.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 9.5 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ab** and **5ab** as colorless oil (72.3 mg, 0.172 mmol, 86%, r.r. = 10.4 : 1).

R_f = 0.21 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.34-7.24 (m, 7H, **4ab**+**5ab**), 7.17-7.14 (m, 3H, **4ab**+**5ab**), 4,50 (s, 2H, **5ab**), 4.48 (s, 2H, **4ab**), 3.46 (t, *J* = 7.9 Hz, 2H, **4ab**), 3.38 (t, *J* = 7.7 Hz, 2H, **5ab**), 2.58 (t, *J* = 7.8 Hz, 2H, **4ab**+**5ab**), 2.48 (t, *J* = 7.9 Hz, 2H, **4ab**+**5ab**), 2.36 (t, *J* = 7.9 Hz, 2H, **4ab**+**5ab**), 1.74-1.66 (m, 2H, **4ab**+**5ab**), 1.69 (s, 3H, **4ab**+**5ab**), 1.23 (s, 12H, **4ab**), 1.19 (s, 12H, **5ab**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 151.1, 142.7, 138.4, 128.3, 128.3, 128.2, 127.6, 127.4, 125.5, 82.8, 72.7, 68.3, 36.4, 36.2, 33.2, 31.7, 24.7, 24.7, 16.3 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3446, 3025, 2976, 2930, 2857, 1620, 1496, 1454, 1358, 1288, 1214, 1143, 1088, 1028, 965, 856, 750, 698, 670; HRMS (ESI): *m/z* calcd for $C_{27}H_{37}BNaO_3^+$ [M+Na^+]: 443.2728. Found: 443.2736.

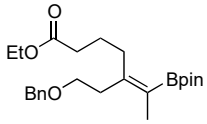
(*Z*)-2-(3-(2-(benzyloxy)ethyl)octa-2,7-dien-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ac**)



2a (36.0 μL, 0.200 mmol) and **3c** (74.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 11.7 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ac** and **5ac** as colorless oil (54.6 mg, 0.147 mmol, 74%, r.r. = 11.2 : 1).

R_f = 0.17 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.25 (m, 5H, **4ac**+**5ac**), 5.86-5.78 (m, 1H, **4ac**+**5ac**), 5.01-4.90 (m, 2H, **4ac**+**5ac**), 4.50 (s, 2H, **4ac**+**5ac**), 3.47 (t, *J* = 7.9 Hz, 2H, **4ac**), 3.39 (t, *J* = 7.8 Hz, 2H, **5ac**), 2.48 (t, *J* = 7.9 Hz, 2H, **4ac**+**5ac**), 2.30 (t, *J* = 8.0 Hz, 2H, **4ac**+**5ac**), 2.05-2.00 (m, 2H, **4ac**+**5ac**), 1.74 (s, 3H, **5ac**), 1.69 (s, 3H, **4ac**), 1.49-1.43 (m, 2H, **4ac**+**5ac**), 1.25 (s, 12H, **4ac**), 1.22 (s, 12H, **5ac**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 151.2, 139.0, 138.4, 128.3, 127.6, 127.5, 114.1, 82.8, 72.8, 68.4, 36.1, 33.9, 33.2, 29.3, 24.8, 24.7, 16.3 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3066, 2977, 2929, 2860, 1620, 1495, 1358, 1293, 1215, 1145, 1089, 1027, 993, 965, 910, 855, 758, 697, 667; HRMS (ESI): *m/z* calcd for $C_{23}H_{35}BNaO_3^+$ [M+Na^+]: 393.2571. Found: 393.2568.

(*Z*)-ethyl 5-(2-(benzyloxy)ethyl)-6-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)hept-5-enoate (**4ad**)

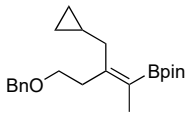


2a (36.0 μL, 0.200 mmol) and **3d** (89.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 9.4 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1→19/1) to give an inseparable mixture of **4ad** and **5ad** as colorless oil (66.9 mg, 0.161 mmol, 80%, r.r. = 10.7 : 1).

R_f = 0.27 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.24 (m, 5H, **4ad**+**5ad**), 4.50 (s, 2H, **4ad**+**5ad**), 4.10 (q, *J* = 7.1 Hz, 2H, **4ad**+**5ad**), 3.48 (t, *J* = 7.7 Hz, 2H, **4ad**), 3.38 (t, *J* = 7.7 Hz, 2H, **5ad**), 2.49 (t, *J* = 7.7 Hz, 2H, **4ad**+**5ad**), 2.26 (t, *J* = 7.7 Hz, 2H, **4ad**+**5ad**), 1.75-1.66 (m, 2H, **4ad**+**5ad**), 1.69 (s, 3H, **4ad**+**5ad**), 1.26-1.21 (m, 3H, **4ad**+**5ad**), 1.25 (s, 12H, **4ad**+**5ad**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 173.8, 150.7, 138.4, 128.3, 127.5, 127.4, 82.8, 72.8,

68.3, 60.1, 35.5, 34.2, 33.1, 25.0, 24.8, 24.7, 16.4, 14.2 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3446, 2977, 2933, 2863, 1734, 1621, 1455, 1357, 1294, 1247, 1213, 1144, 1090, 1028, 965, 856, 737, 697, 671; HRMS (ESI): *m/z* calcd for $C_{24}H_{37}BNaO_5^+$ [M+Na^+]: 439.2626. Found: 439.2631.

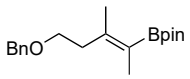
(*Z*)-2-(5-(benzyloxy)-3-(cyclopropylmethyl)pent-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (4ae)



2a (36.0 μL, 0.200 mmol) and **3e** (63.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 12.1 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ae** and **5ae** as colorless oil (56.0 mg, 0.172 mmol, 86%, r.r. = 11.2 : 1).

R_f = 0.13 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.36-7.25 (m, 5H, **4ae**+**5ae**), 4.51 (s, 2H, **4ae**+**5ae**), 3.51 (t, 2H, *J* = 8.0 Hz, **4ae**), 3.40 (t, *J* = 7.7 Hz, 2H, **5ae**), 2.59 (t, *J* = 8.0 Hz, 2H, **4ae**), 2.50 (t, *J* = 7.7 Hz, 2H, **5ae**), 2.25 (d, *J* = 6.5 Hz, 2H, **4ae**+**5ae**), 1.82 (s, 2H, **5ae**), 1.71 (s, 2H, **4ae**), 1.24 (s, 12H, **4ae**), 1.21 (s, 12H, **5ae**), 0.82-0.75 (m, 1H, **4ae**+**5ae**), 0.40-0.35 (m, 2H, **4ae**+**5ae**), 0.14-0.11 (m, 2H, **4ae**+**5ae**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 138.5, 128.3, 127.6, 127.4, 82.8, 72.7, 68.3, 40.5, 33.1, 24.7, 16.3, 10.8, 4.4 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3396, 3073, 2977, 2929, 2858, 1621, 1455, 1355, 1290, 1214, 1147, 1087, 1016, 966, 854, 736, 697; HRMS (ESI): *m/z* calcd for $C_{22}H_{33}BNaO_3^+$ [M+Na^+]: 379.2415. Found: 379.2422.

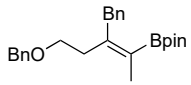
(*Z*)-2-(5-(benzyloxy)-3-methylpent-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (4af)



2a (36.0 μL, 0.200 mmol), **3f** (2.0 M in DMF, 0.300 mL, 0.600 mmol) and DMF (0.70 mL) were used. **3f** was added dropwise over 1 h at ambient temperature. The resulting mixture was stirred for another 3 h to give the crude product (r.r. = 14.1 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4af** and **5af** as sticky white solids (52.4 mg, 0.166 mmol, 83%, r.r. = 14.5 : 1).

R_f = 0.35 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.25 (m, 5H, **4af**+**5af**), 4.51 (s, 2H, **4af**+**5af**), 3.51 (t, *J* = 7.6 Hz, 2H, **4af**), 3.39 (t, *J* = 7.8 Hz, 2H, **5af**), 2.48 (t, *J* = 7.6 Hz, 2H, **4af**+**5af**), 1.97 (d, *J* = 1.5 Hz, 3H, **4af**+**5af**), 1.75 (s, 3H, **5af**), 1.69 (s, 3H, **4af**), 1.26 (s, 12H, **4af**), 1.23 (s, 12H, **5af**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 147.4, 138.5, 128.3, 127.6, 127.4, 82.8, 72.8, 68.1, 35.3, 24.8, 24.7, 22.8, 16.2 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3445, 2977, 2929, 2863, 1733, 1626, 1455, 1358, 1292, 1214, 1147, 1088, 965, 854, 735, 697, 685, 635; HRMS (ESI): *m/z* calcd for $C_{19}H_{29}BNaO_3^+$ [M+Na^+]: 339.2102. Found: 339.2115.

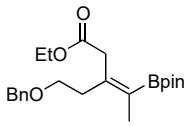
(*Z*)-2-(3-benzyl-5-(benzyloxy)pent-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ag**)



2a (36.0 μL, 0.200 mmol) and **3g** (71.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 12.8 : 1). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1→19/1) to give an inseparable mixture of **4ag** and **5ag** as colorless oil (56.7 mg, 0.144 mmol, 72%, r.r. = 12.6 : 1).

R_f = 0.15 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.34-7.14 (m, 10 H, **4ag**+**5ag**), 4.51 (s, 2H, **5ag**), 4.41 (s, 2H, **4ag**), 3.72 (s, 2H, **4ag**), 3.70 (s, 2H, **5ag**), 3.45 (t, *J* = 7.4 Hz, 2H, **5ag**), 3.33 (t, *J* = 7.7 Hz, 2H, **4ag**), 2.54 (t, *J* = 7.4 Hz, 2H, **5ag**), 2.38 (t, *J* = 7.7 Hz, 2H, **4ag**), 1.76 (s, 3H, **4ag**), 1.63 (s, 3H, **5ag**), 1.26 (s, 12H, **4ag**), 1.23 (s, 12H, **5ag**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 149.5, 140.7, 138.5, 129.0, 128.3, 128.1, 127.5, 127.4, 125.7, 83.0, 72.6, 68.2, 42.3, 32.5, 24.7, 16.5 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3421, 3024, 2976, 2929, 2858, 1623, 1455, 1353, 1301, 1214, 1143, 1081, 966, 854, 754, 699; HRMS (ESI): *m/z* calcd for $C_{25}H_{33}BNaO_3^+$ [M+Na^+]: 415.2415. Found: 415.2404.

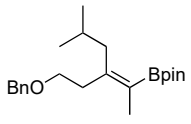
(*E*)-ethyl 3-(2-(benzyloxy)ethyl)-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)pent-3-enoate (**4ah**)



2a (36.0 μL, 0.200 mmol) and **3h** (66.0 μL, 0.600 mmol) were used to give the crude product (r.r. could not be determined due to overlapped impurities). The crude product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 19/1→9/1) and GPC to give an inseparable mixture of **4ah** and **5ah** as colorless oil (33.4 mg, 0.0860 mmol, 43%, r.r. = 13.0 : 1).

R_f = 0.22 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.24 (m, 5H, **4ah**+**5ah**), 4.51 (s, 2H, **5ah**), 4.49 (s, 2H, **4ah**), 4.08 (q, *J* = 7.1 Hz, 2H, **4ah**+**5ah**), 3.51 (s, 2H, **4ah**+**5ah**), 3.51 (t, *J* = 7.3 Hz, 2H, **4ah**), 3.42 (t, *J* = 7.6 Hz, 2H, **5ah**), 2.56 (t, *J* = 7.3 Hz, 2H, **4ah**+**5ah**), 1.83 (s, 3H, **5ah**), 1.76 (s, 3H, **4ah**), 1.26-1.21 (m, 3H, **4ah**+**5ah**), 1.24 (s, 12H, **4ah**+**5ah**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 172.3, 144.0, 138.4, 128.3, 127.5, 127.4, 83.0, 72.8, 68.1, 60.2, 41.1, 34.1, 24.7, 16.5, 14.2 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3450, 2979, 2933, 2858, 1731, 1628, 1455, 1359, 1301, 1215, 1143, 1094, 1030, 966, 853, 755, 698, 668; HRMS (ESI): *m/z* calcd for $C_{22}H_{33}BNaO_5^+$ [M+Na^+]: 411.2313. Found: 411.2308.

(*Z*)-2-(3-(2-(benzyloxy)ethyl)-5-methylhex-2-en-2-yl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (**4ai**)



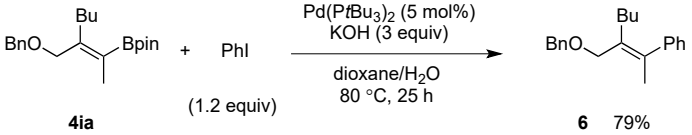
2a (36.0 μL, 0.200 mmol) and **3i** (69.0 μL, 0.600 mmol) were used to give the crude product (r.r. = 5.4 : 1). The crude

product was purified by silica gel column chromatography (eluent: hexane/AcOEt = 49/1) to give an inseparable mixture of **4ai** and **5ai** as colorless oil (21.7 mg, 0.0606 mmol, 30%, r.r. = 4.8 : 1).

R_f = 0.27 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.35-7.25 (m, 5H, **4ai**+**5ai**), 4.51 (s, 2H, **5ai**), 4.50 (s, 2H, **4ai**), 3.46 (t, *J* = 8.0 Hz, 2H, **4ai**), 3.40 (t, *J* = 7.8 Hz, 2H, **5ai**), 2.47 (t, *J* = 8.0 Hz, 2H, **4ai**+**5ai**), 2.24 (d, *J* = 7.3 Hz, 2H, **5ai**), 2.21 (d, *J* = 7.2 Hz, 2H, **4ai**), 1.73-1.69 (m, 1H, **4ai**+**5ai**), 1.72 (s, 3H, **5ai**), 1.71 (s, 3H, **4ai**), 1.25 (s, 12H, **4ai**), 1.22 (s, 12H, **5ai**), 0.84 (d, *J* = 6.5 Hz, 6H, **4ai**), 0.83 (d, *J* = 6.5 Hz, 6H, **5ai**); ^{13}C NMR (125 MHz, $CDCl_3$): δ 149.9, 138.5, 128.3, 128.2, 127.6, 127.5, 127.4, 82.7, 72.7, 68.3, 45.0, 33.2, 27.9, 24.8, 24.7, 22.5, 16.4 (The carbon directly attached to the boron atom was not detected due to quadrupolar relaxation); IR (neat, cm^{-1}): 3420, 2972, 2955, 2929, 2866, 1619, 1455, 1356, 1294, 1215, 1147, 1130, 1087, 966, 855, 755, 697, 668; HRMS (ESI): *m/z* calcd for $C_{22}H_{35}BNaO_3^+$ [M+Na^+]: 381.2571. Found: 381.2565.

6. Applications

6.1 Suzuki-Miyaura Coupling with PhI



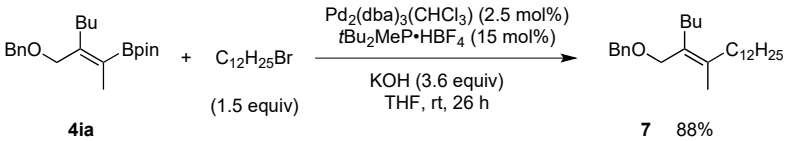
4ia **6** 79%

(*E*)-3-(benzyloxy)methyl-2-phenyl-2-heptene (6)

To a dried screw cap tube were added **4ia** (27.6 mg, 0.0802 mmol), iodobenzene (10.7 μL, 0.0960 mmol), (tBu$_3$P)$_2$Pd (2.0 mg, 0.0040 mmol), KOH (13.5 mg, 0.240 mmol), 1,4-dioxane (0.16 mL) and water (0.040 mL). After the tube was sealed with a cap, the resulting mixture was stirred at 80 °C for 25 h. The reaction was quenched with water, and extracted three times with hexane/AcOEt = 4/1. After filtration over Na_2SO_4 and evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 99/1) to give **6** as NMR-pure brown oil (18.6 mg, 0.0632 mmol, 79%). Colorless oil **6** was obtained after GPC.

R_f = 0.30 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.40-7.34 (m, 4H), 7.32- 7.28 (m, 3H), 7.21 (t, *J* = 7.1 Hz, 1H), 7.11 (d, *J* = 7.1 Hz, 2H), 4.56 (s, 2H), 4.15 (s, 2H), 1.98 (t, *J* = 7.7 Hz, 2H), 1.98 (s, 3H), 1.32-1.25 (m, 2H), 1.16-1.08 (m, 2H), 0.74 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 144.6, 138.6, 136.3, 132.5, 128.3, 128.0, 127.8, 127.8, 127.5, 126.1, 72.2, 68.3, 31.4, 30.9, 22.6, 21.1, 13.8; IR (neat, cm^{-1}): 3420, 2950, 2925, 2858, 2358, 1646, 1455, 1361, 1214, 1087, 1071, 1026, 764, 700, 635; HRMS (ESI): *m/z* calcd for $C_{21}H_{26}NaO^+$ [M+Na^+]: 317.1876. Found: 317.1878.

6.2 Suzuki-Miyaura Coupling with $C_{12}H_{25}Br$



4ia **7** 88%

(*E*)-5-(benzyloxy)methyl-6-methyl-5-octadecene (7)

To a dried screw cap tube were added **4ia** (26.2 mg, 0.0760 mmol), $Pd_2(dba)_3$•$CHCl_3$ (2.0 mg, 0.0019 mmol),

tBu_2MeP•HBF_4 (2.8 mg, 0.011 mmol), KOH (15.4 mg, 0.274 mmol) and THF (0.19 mL). The resulting mixture was stirred for 20 min, before 1-bromododecane (27.0 μL, 0.114 mmol) was added. After the tube was sealed with a cap, the resulting mixture was stirred at ambient temperature for 26 h. The reaction mixture was filtrated through a short pad of silica gel (eluted with hexane/AcOEt = 10/1). After evaporation, the residue was purified by silica gel column chromatography (eluent: hexane/AcOEt = 99/1→49/1) to give **7** as yellow oil (26.0 mg, 0.0672 mmol, 88%).

R_f = 0.44 (twice with hexane/AcOEt = 30/1); ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.37-7.31 (m, 4H), 7.29-7.25 (m, 1H), 4.45 (s, 2H), 3.98 (s, 2H), 2.11 (t, *J* = 7.7 Hz, 2H), 2.03 (t, *J* = 7.7 Hz, 2H), 1.67 (s, 3H), 1.55-1.25 (m, 24H), 0.89 (t, *J* = 6.8 Hz, 3H), 0.87 (t, *J* = 6.8 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$): δ 138.8, 135.2, 129.8, 128.2, 127.8, 127.4, 71.7, 69.1, 34.4, 31.9, 31.3, 30.3, 29.8, 29.7, 29.6, 29.6, 29.6, 29.6, 29.3, 28.3, 23.0, 22.7, 18.0, 14.1, 14.0; IR (neat, cm^{-1}): 3406, 2955, 2924, 2854, 1495, 1455, 1376, 1355, 1214, 1087, 1069, 1027, 938, 732, 696; HRMS (ESI): *m/z* calcd for $C_{27}H_{46}ONa^+$ [M+Na^+]: 409.3441. Found: 409.3449.

7. References

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CTEMP	21.2 c
SLVNT	CDCL3
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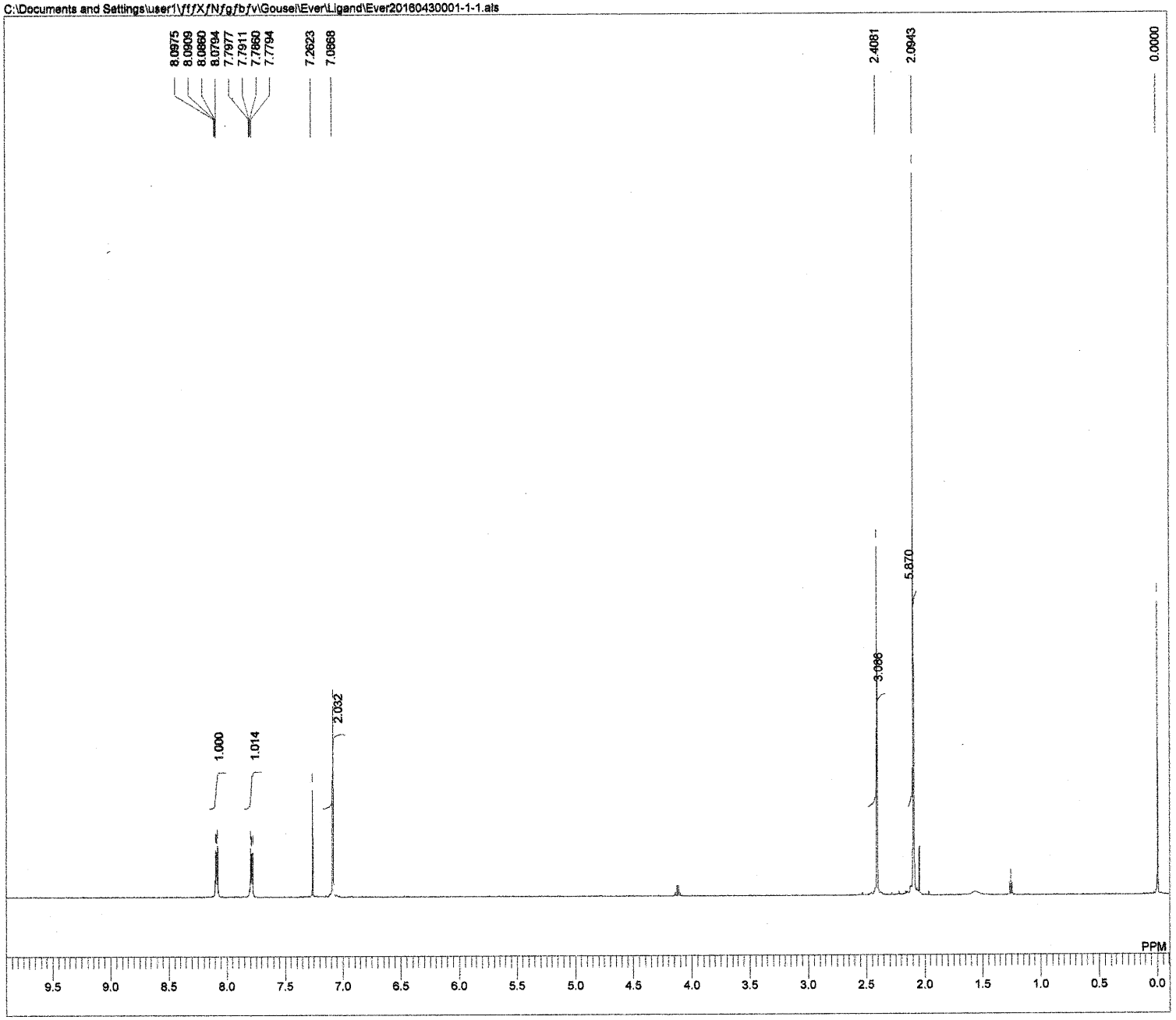
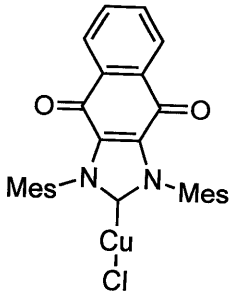
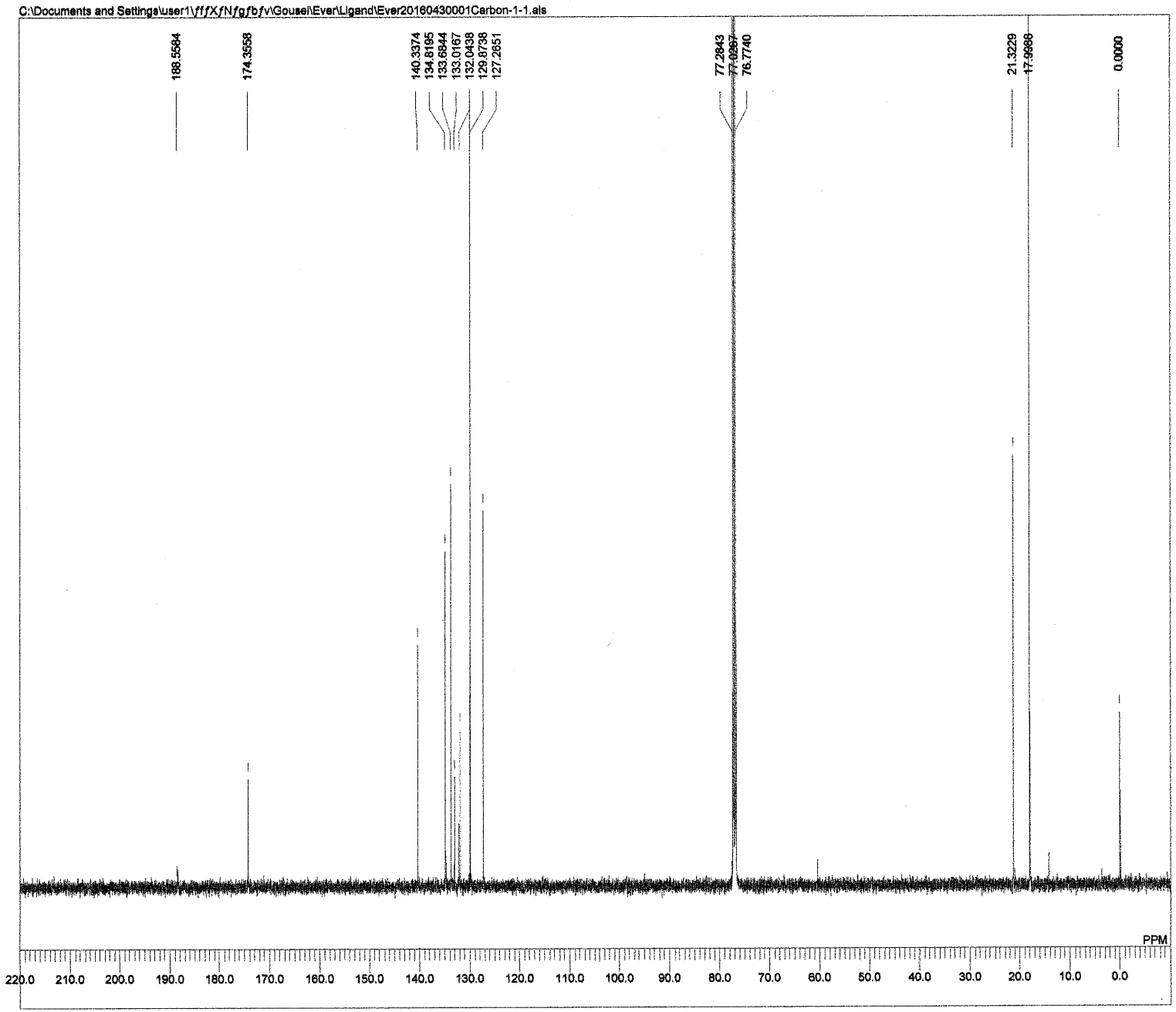




^{NQ}IMesCuCl

NQIMesCuCl Carbon



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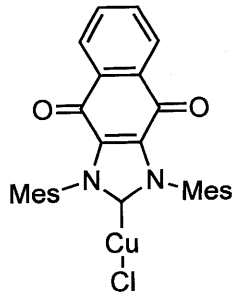

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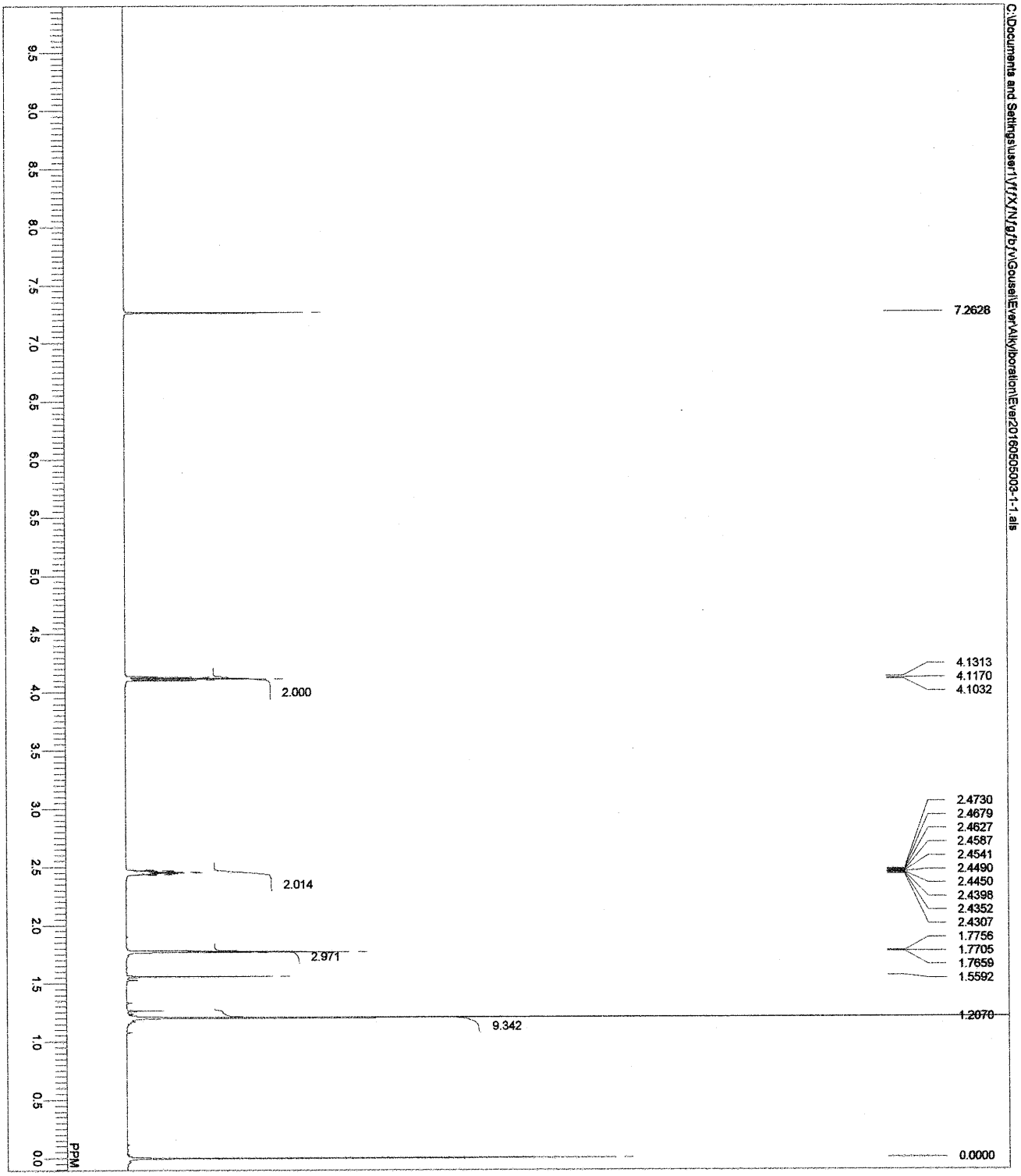

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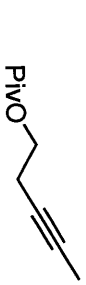

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No.2799 F5 Carbon

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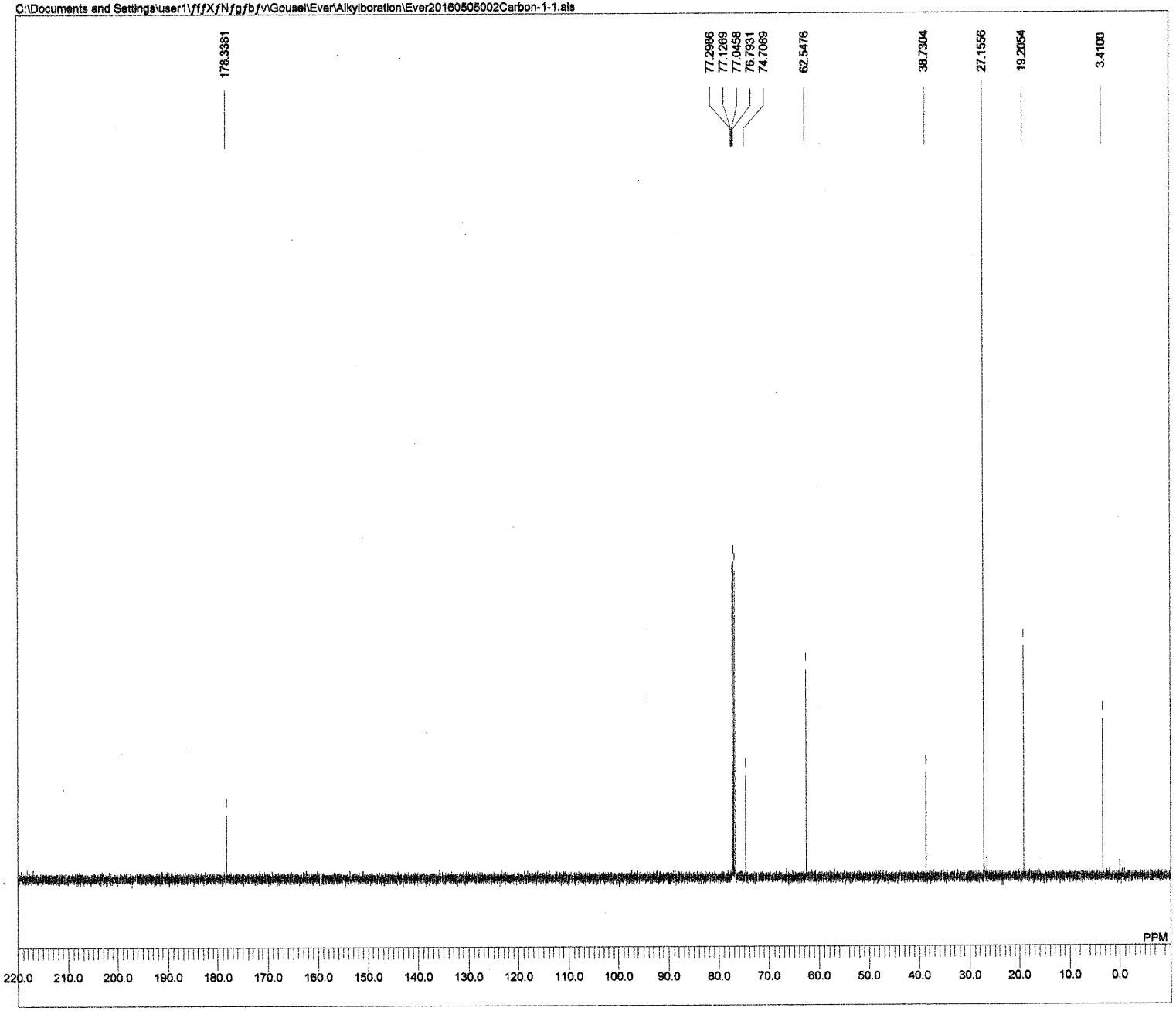

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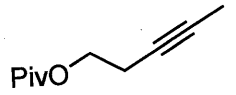

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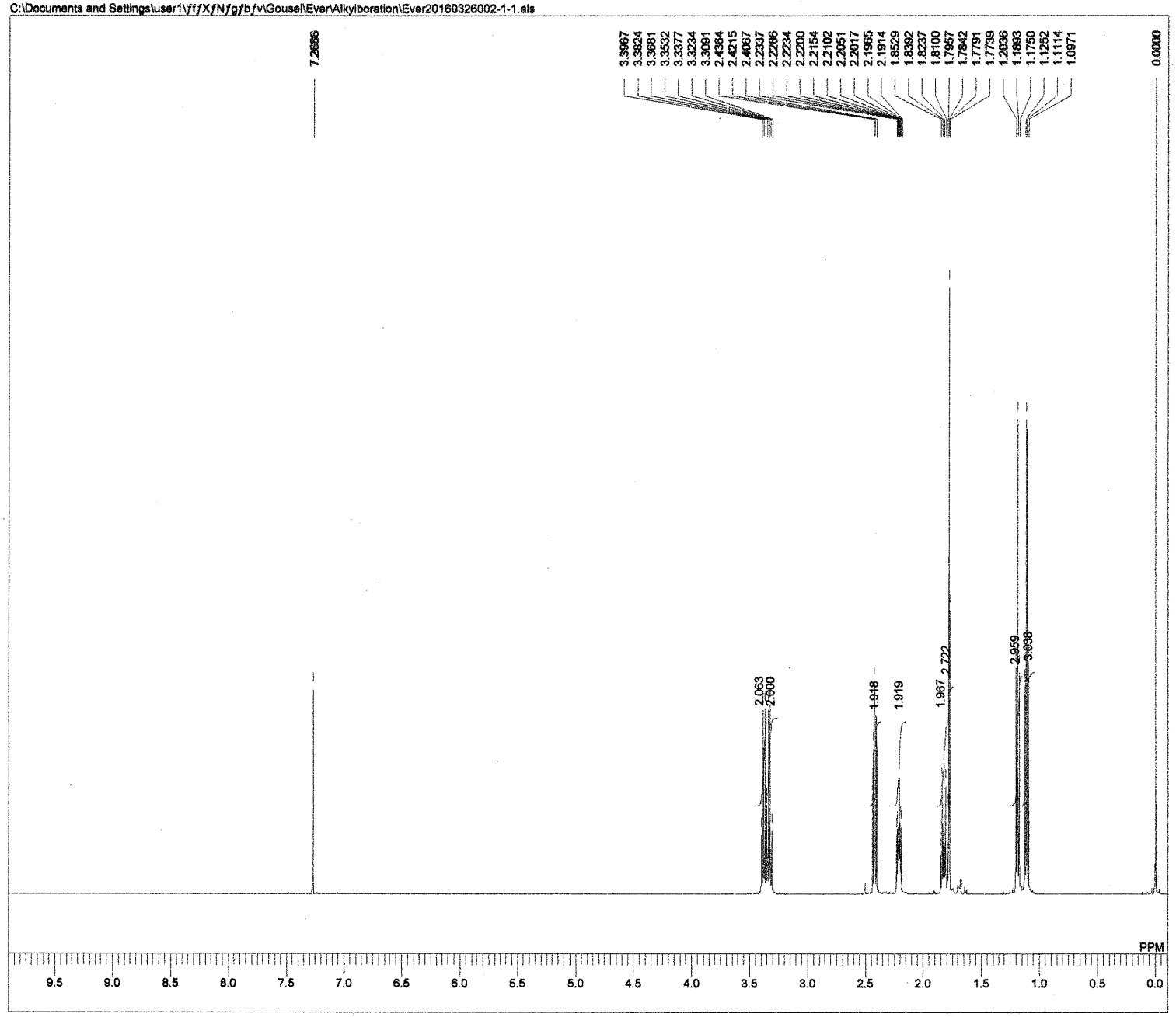

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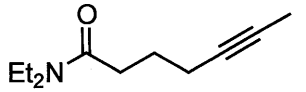

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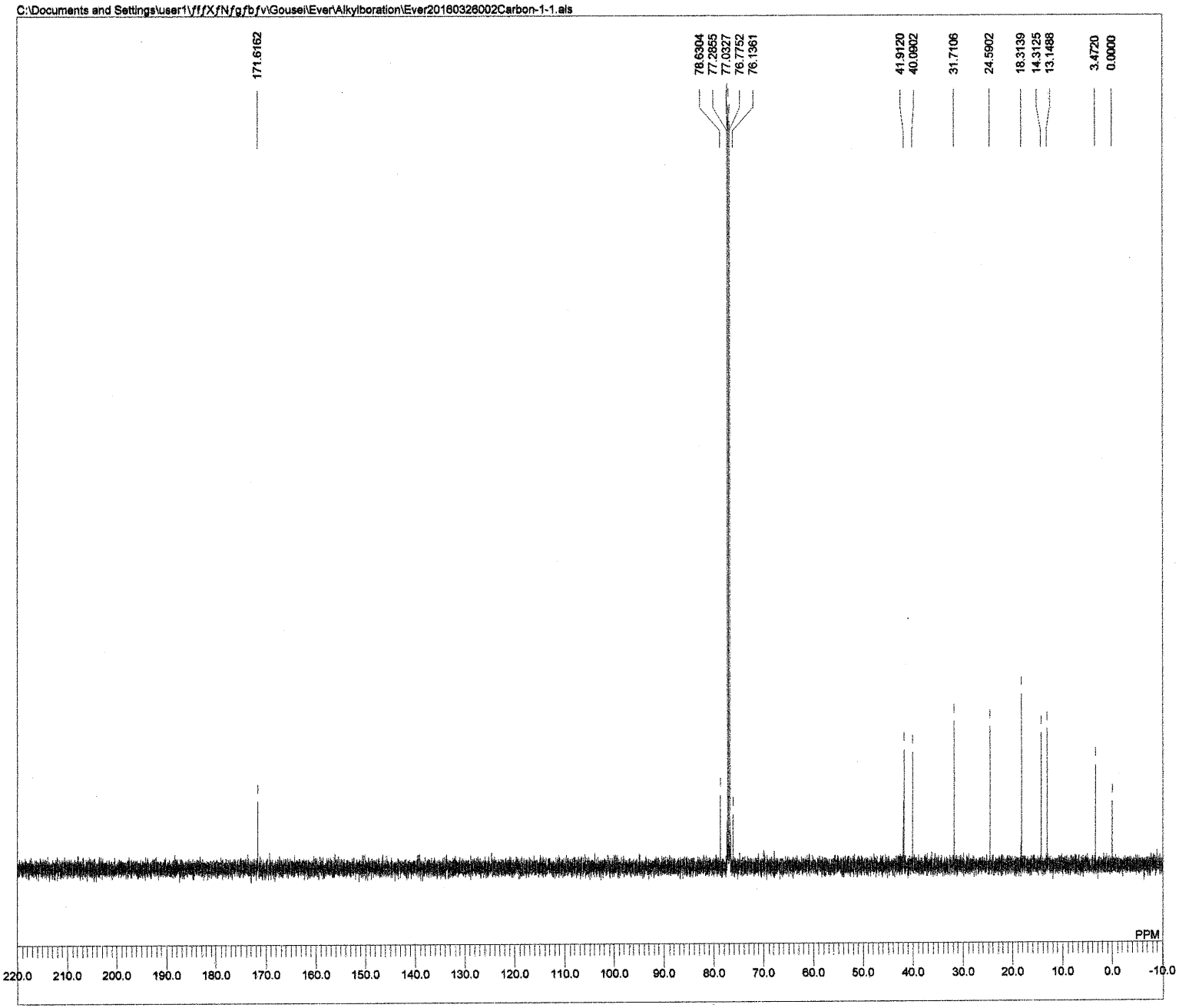

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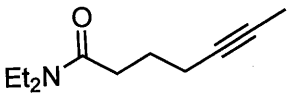

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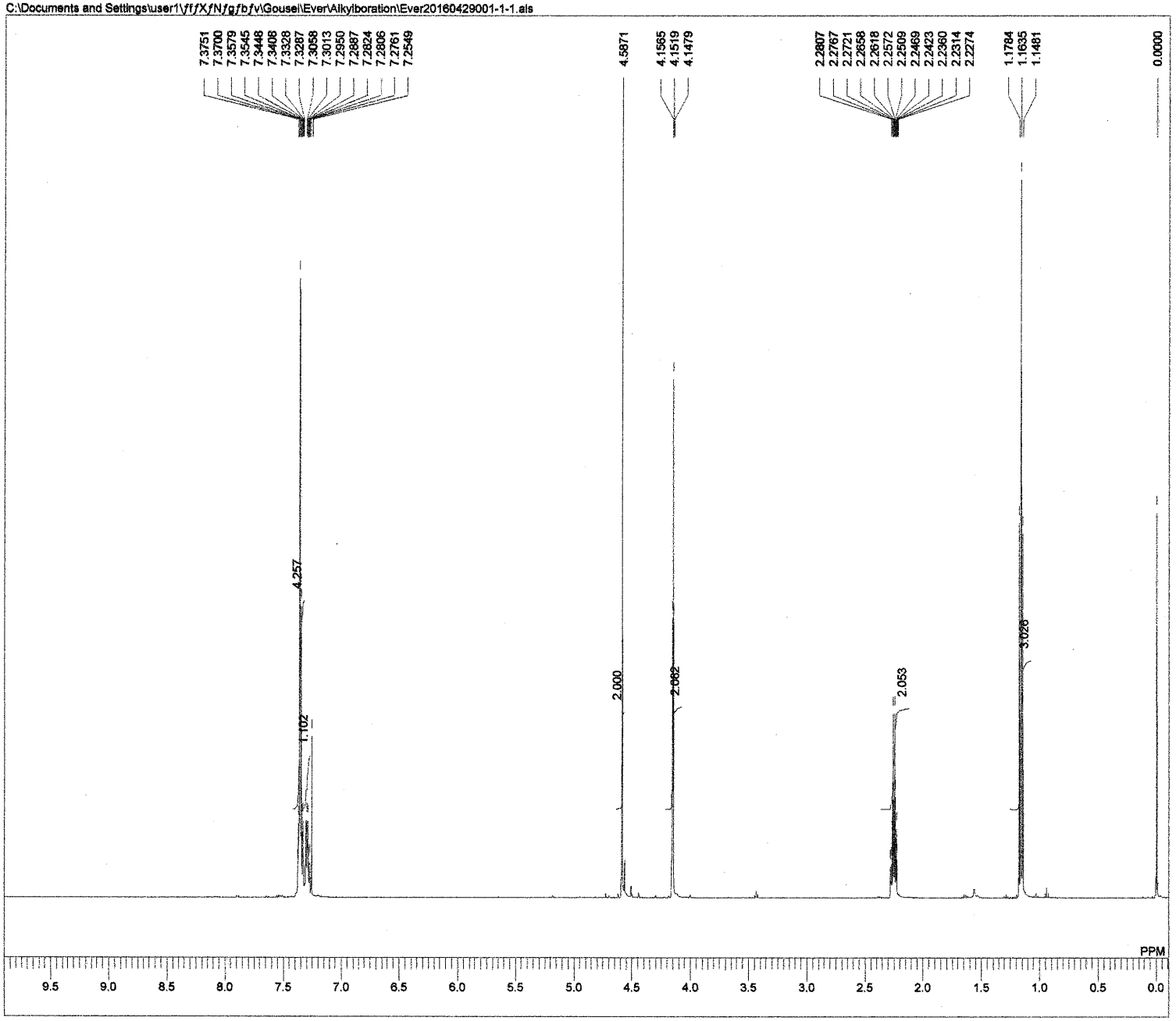

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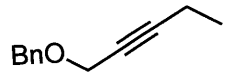

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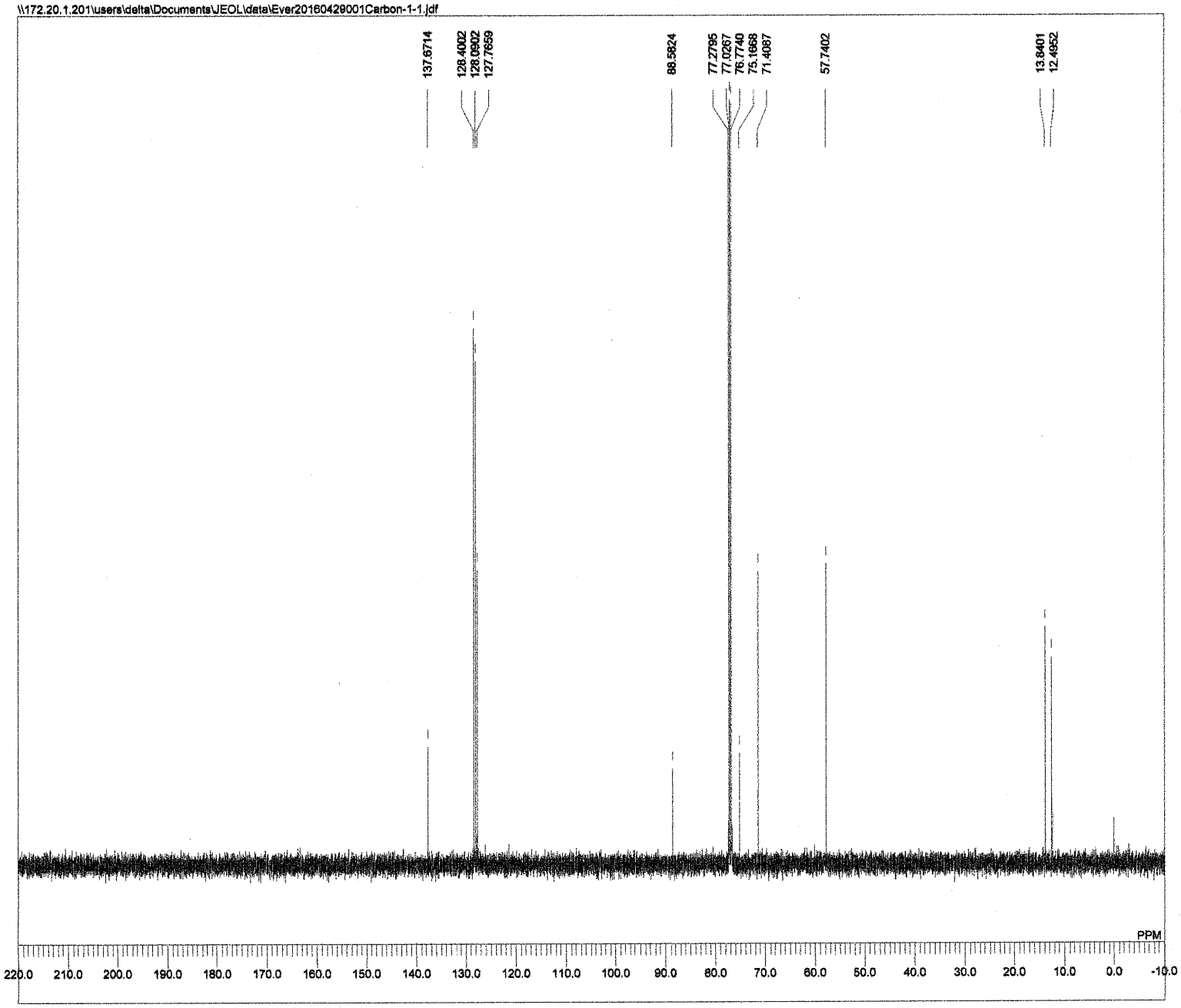
No.2801 Carbon



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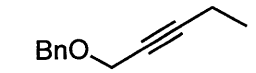

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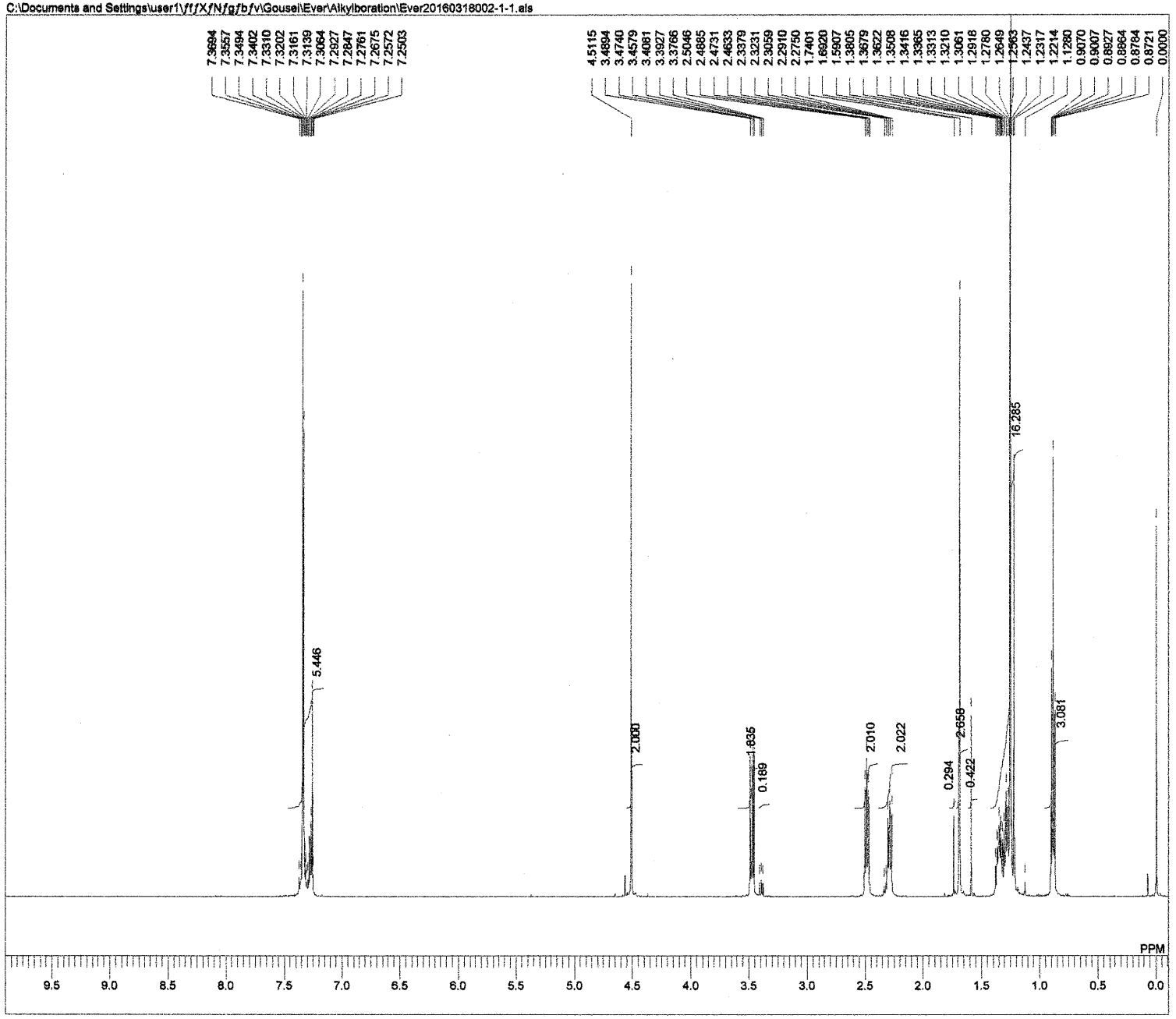

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ACQTM 1.7459 sec
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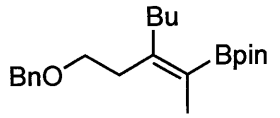

4aa

No.2822 Carbon

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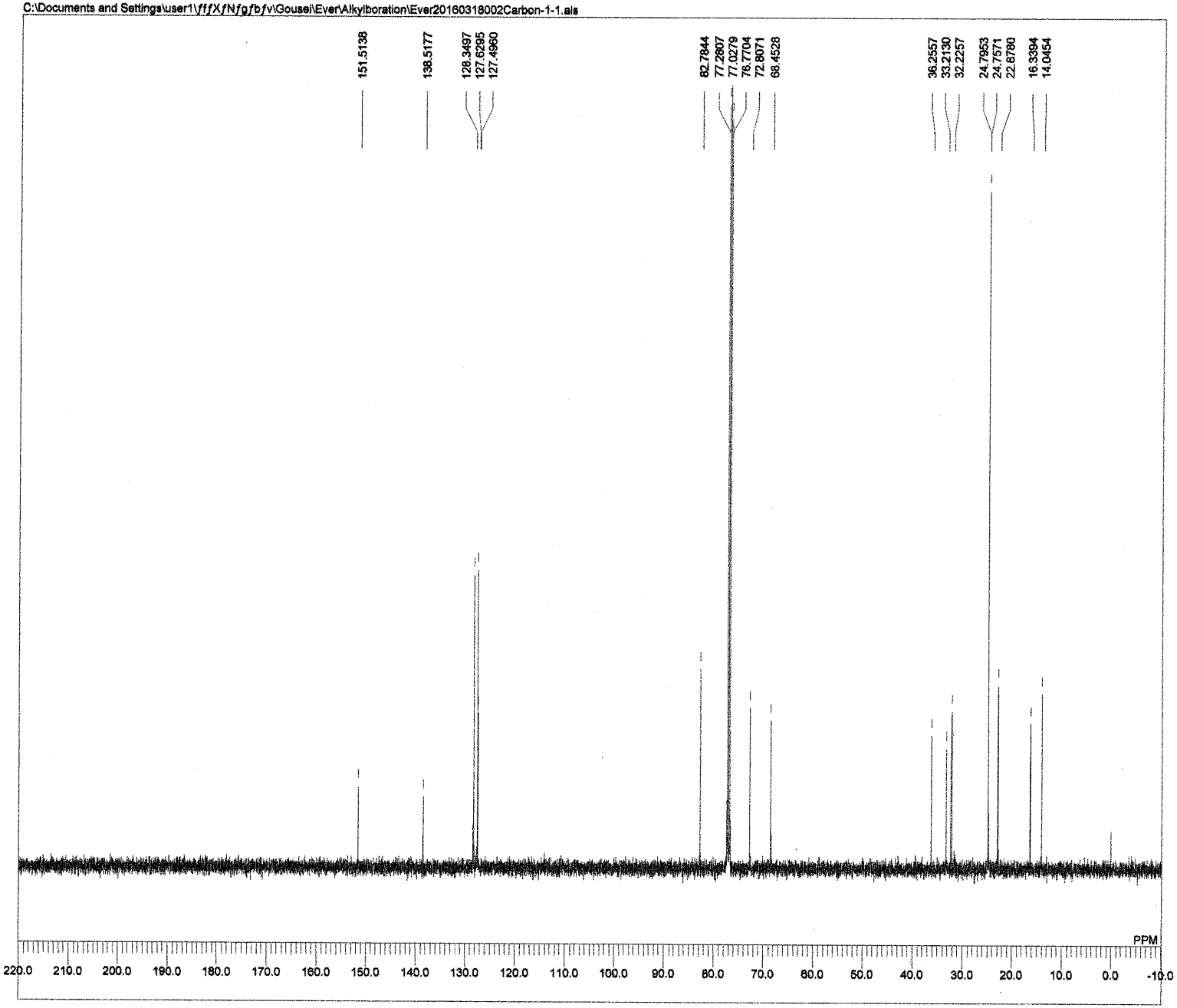
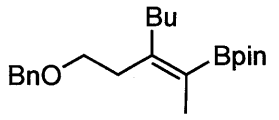
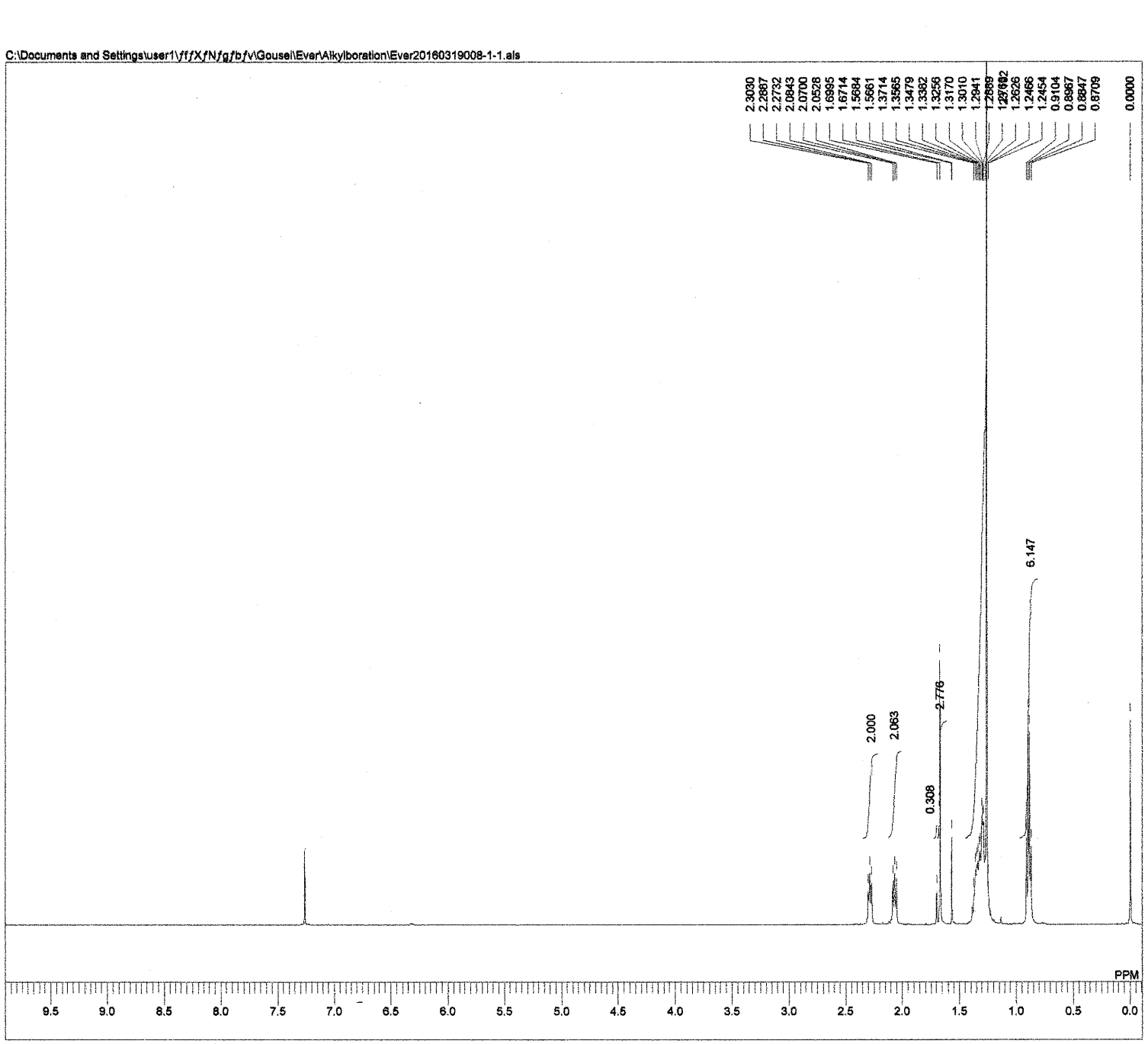


DFILE	Ever20160318002Carbon-1-1.als
COMNT	No.2822 Carbon
DATIM	2016-03-18 15:53:43
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	128
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.5 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	1.20 Hz
RGAIN	60

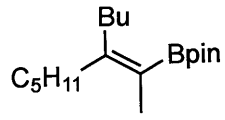


4aa

No.2830



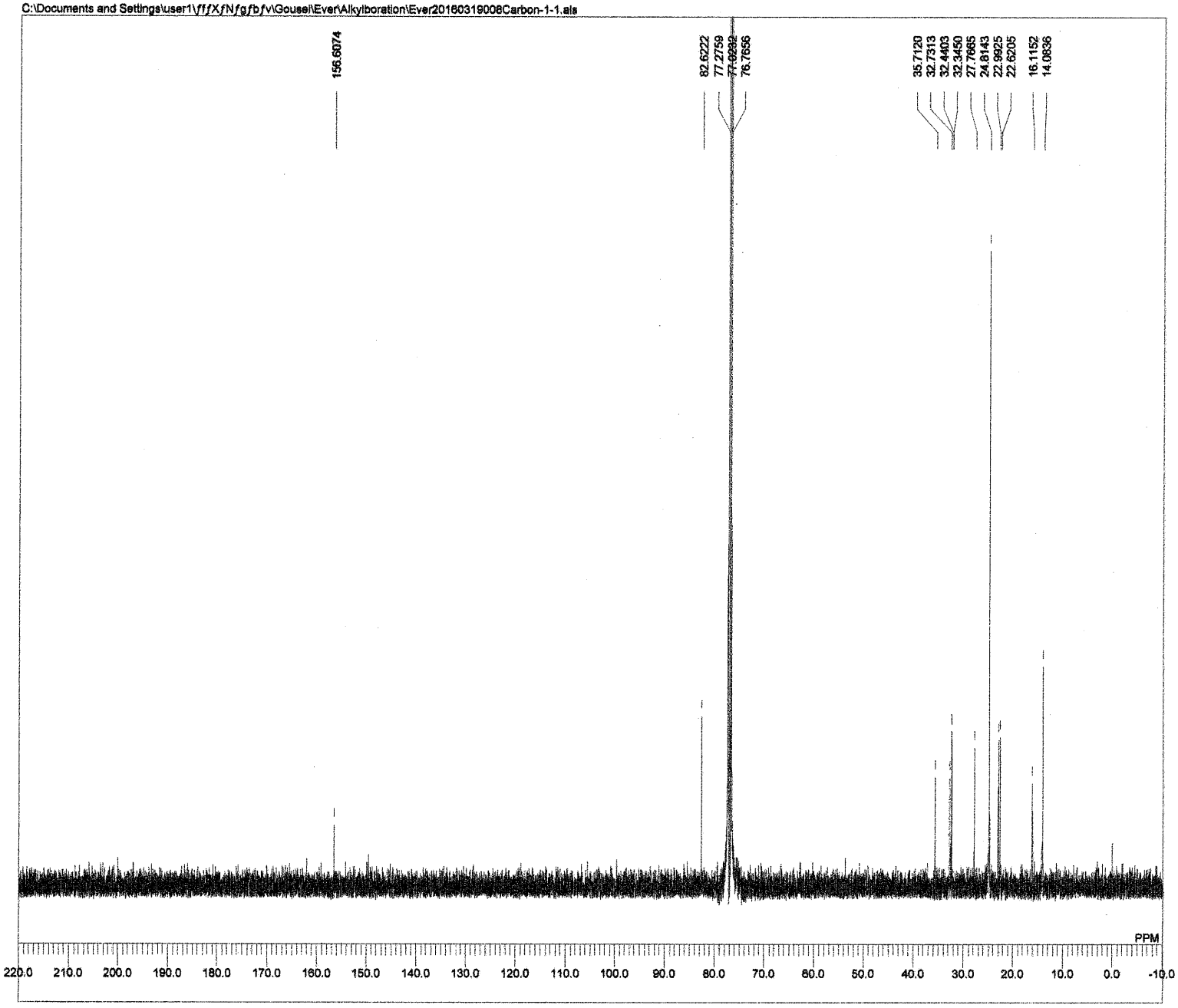
DFILE	Ever20160319008-1-1.als
COMNT	No.2830
DATIM	2016-03-19 19:13:38
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	32.9 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30



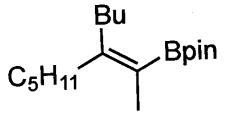
4ba

No.2830 Carbon

C:\Documents and Settings\user1\ƒƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160319008Carbon-1-1.als

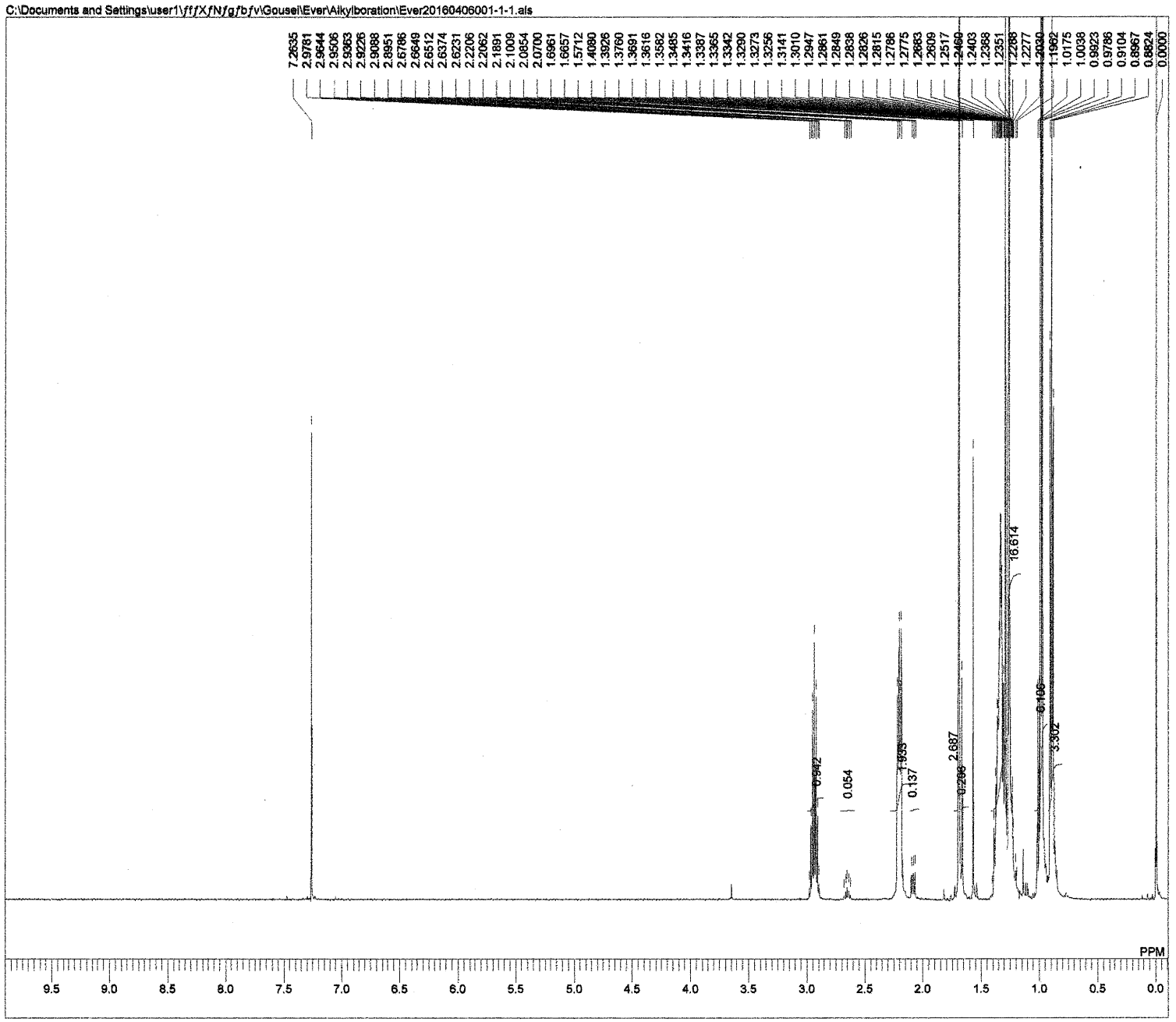


DFILE	Ever20160319008Carbon-1-1.als
COMNT	No.2830 Carbon
DATIM	2016-03-19 19:15:07
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	68
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	29.8 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.92 Hz
RGAIN	60

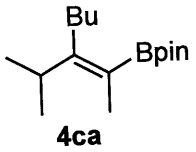


4ba

No.2856 GPC

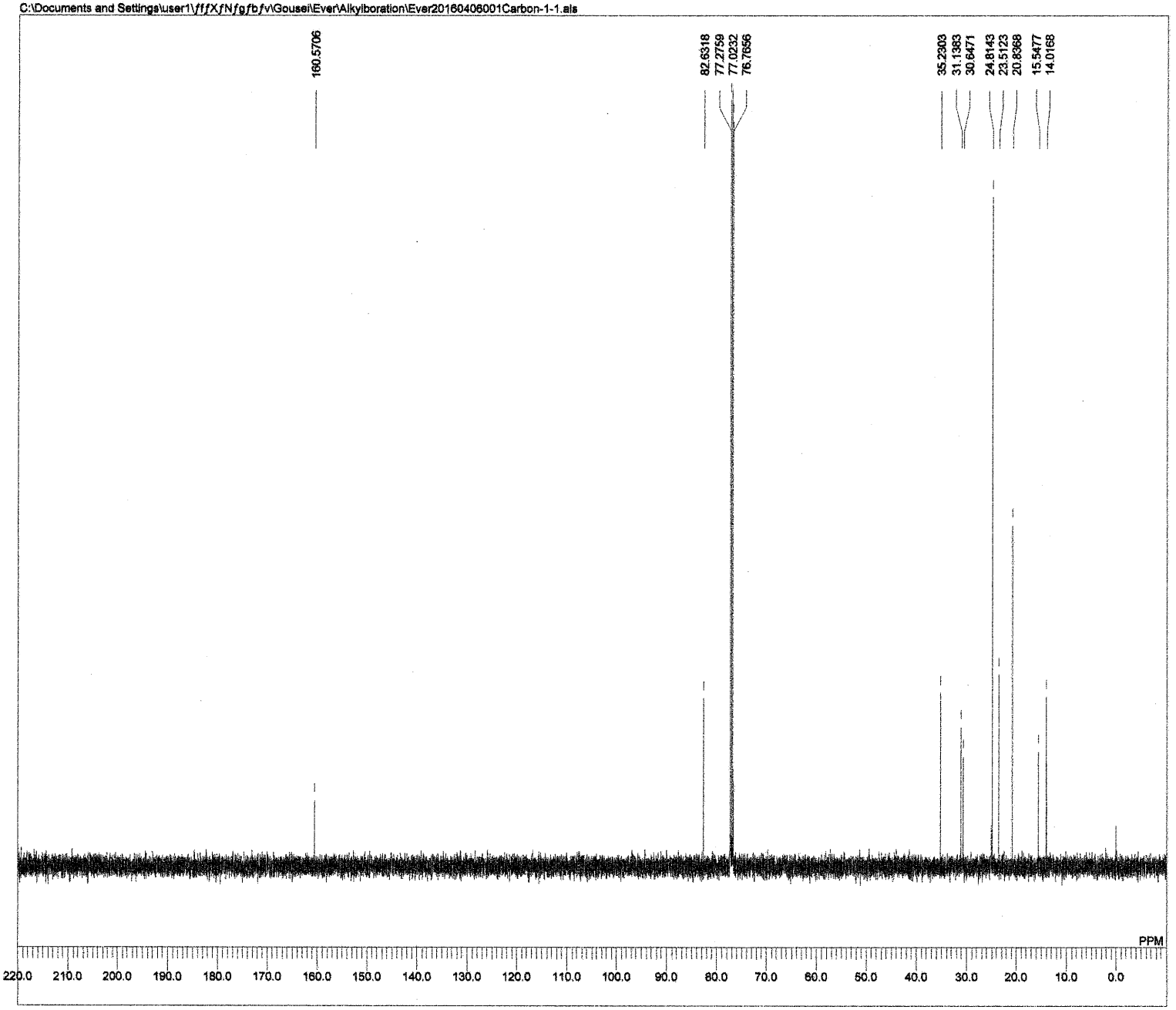


DFILE	Ever20160406001-1-1.als
COMNT	No.2856 GPC
DATIM	2016-04-06 17:07:59
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	33.1 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30

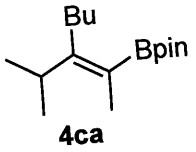


4ca

No.2856 GPC Carbon

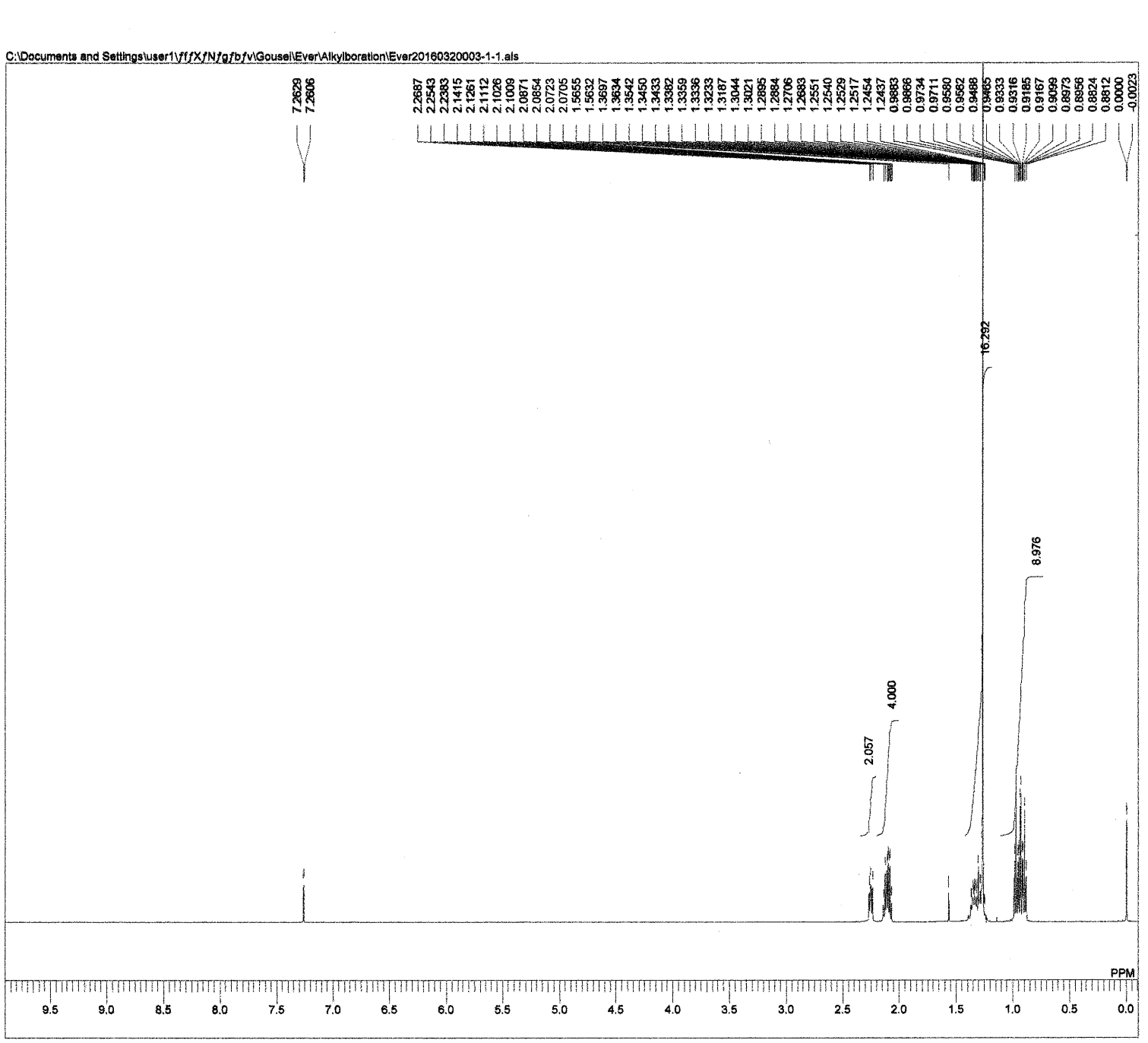


DFILE	Ever20160406001Carbon-1-1.als
COMNT	No.2856 GPC Carbon
DATIM	2016-04-06 17:10:11
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	86
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.3 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60

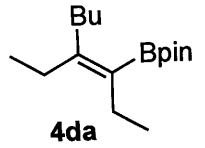


4ca

No.2834



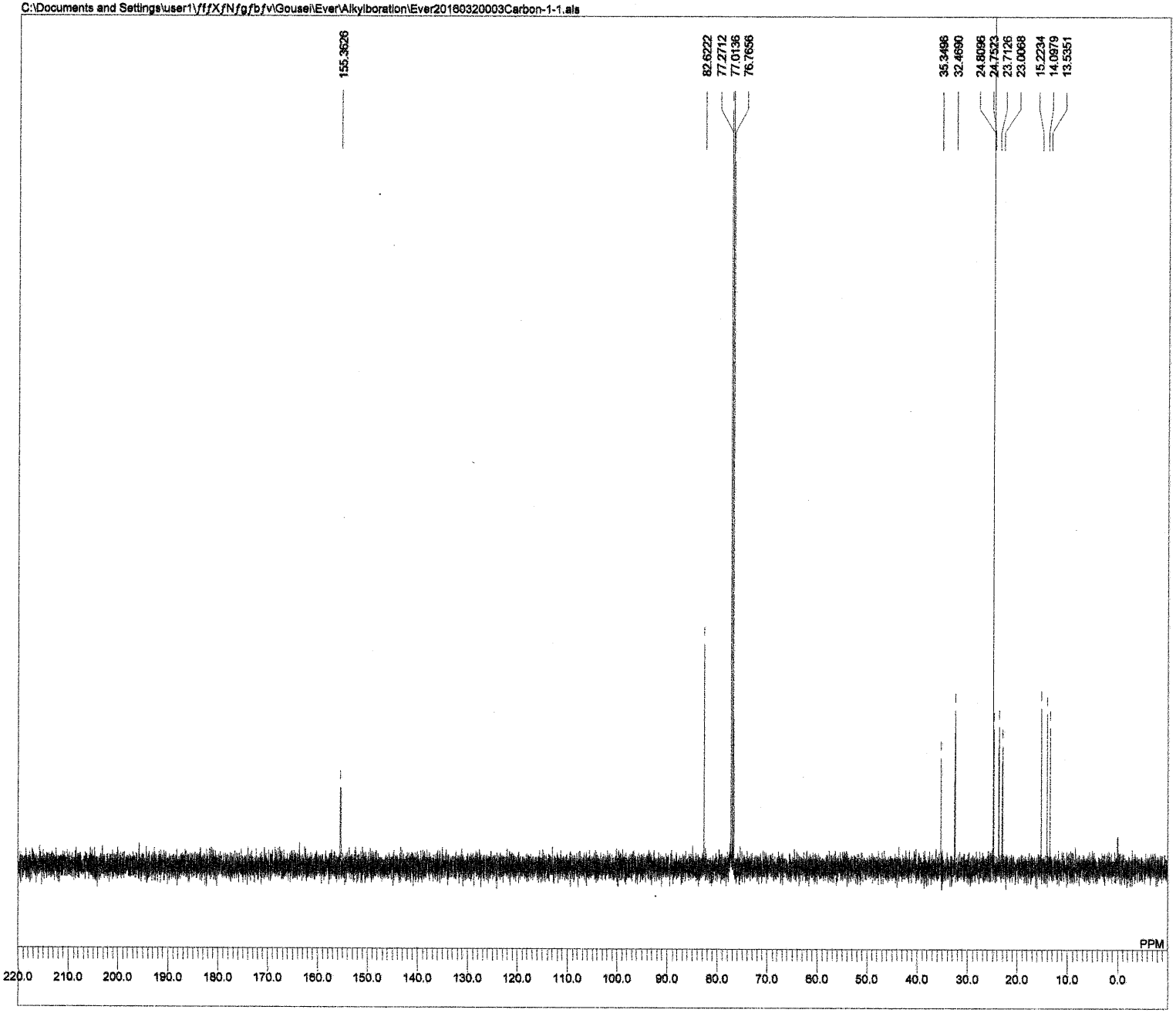
DFILE Ever20160320003-1-1.als
COMNT No.2834
DATIM 2016-03-20 15:31:42
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.7 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 30



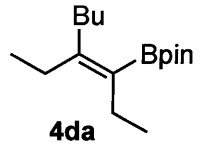
4da

No.2834 Carbon

C:\Documents and Settings\user1\ff fX fN fg fb f v\Gousei\Ever\Alkylboration\Ever20160320003Carbon-1-1.als

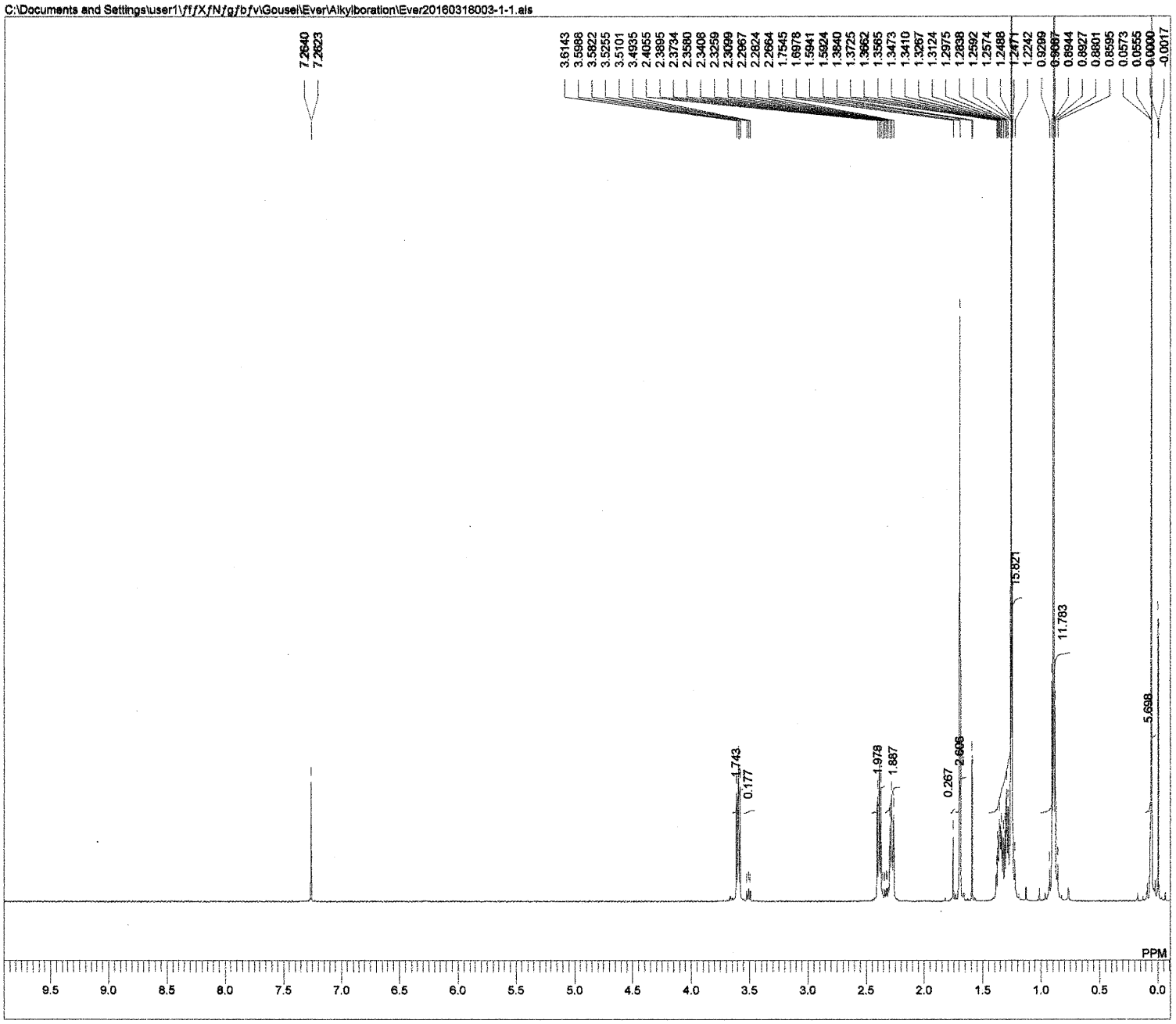


DFILE	Ever20160320003Carbon-1-1.als
COMNT	No.2834 Carbon
DATIM	2016-03-20 15:33:12
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	26214
FREQU	31446.54 Hz
SCANS	65
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.5 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.32 Hz
RGAIN	60

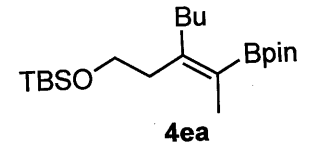


4da

No.2823



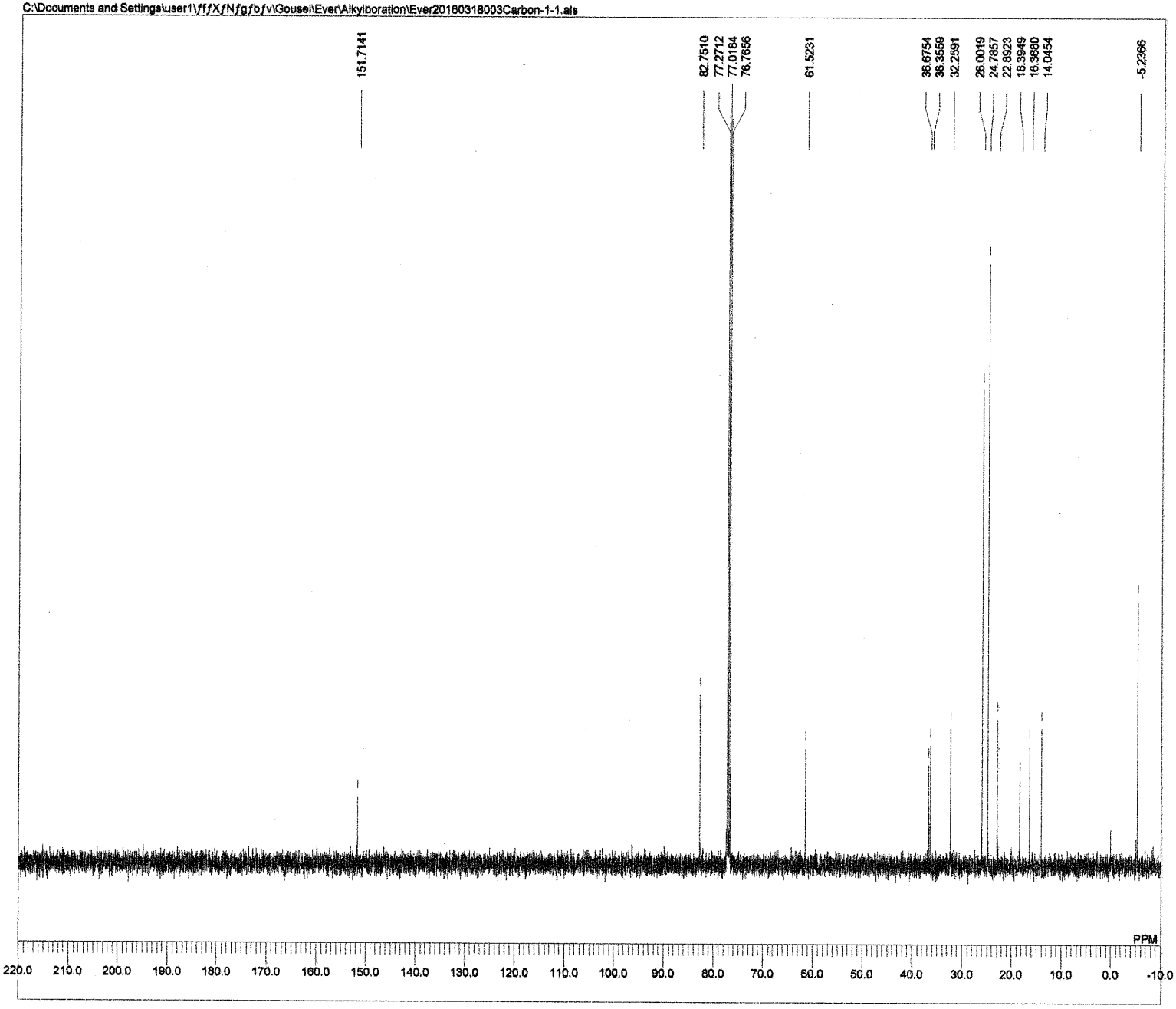
DFILE Ever20160318003-1-1.als
COMNT No.2823
DATIM 2016-03-18 16:02:42
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.7 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 28



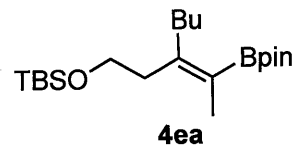
4ea

No.2823 Carbon

C:\Documents and Settings\user1\ffXfNfgfbfv\Gousei\Ever\Alkylboration\Ever20160318003Carbon-1-1.als

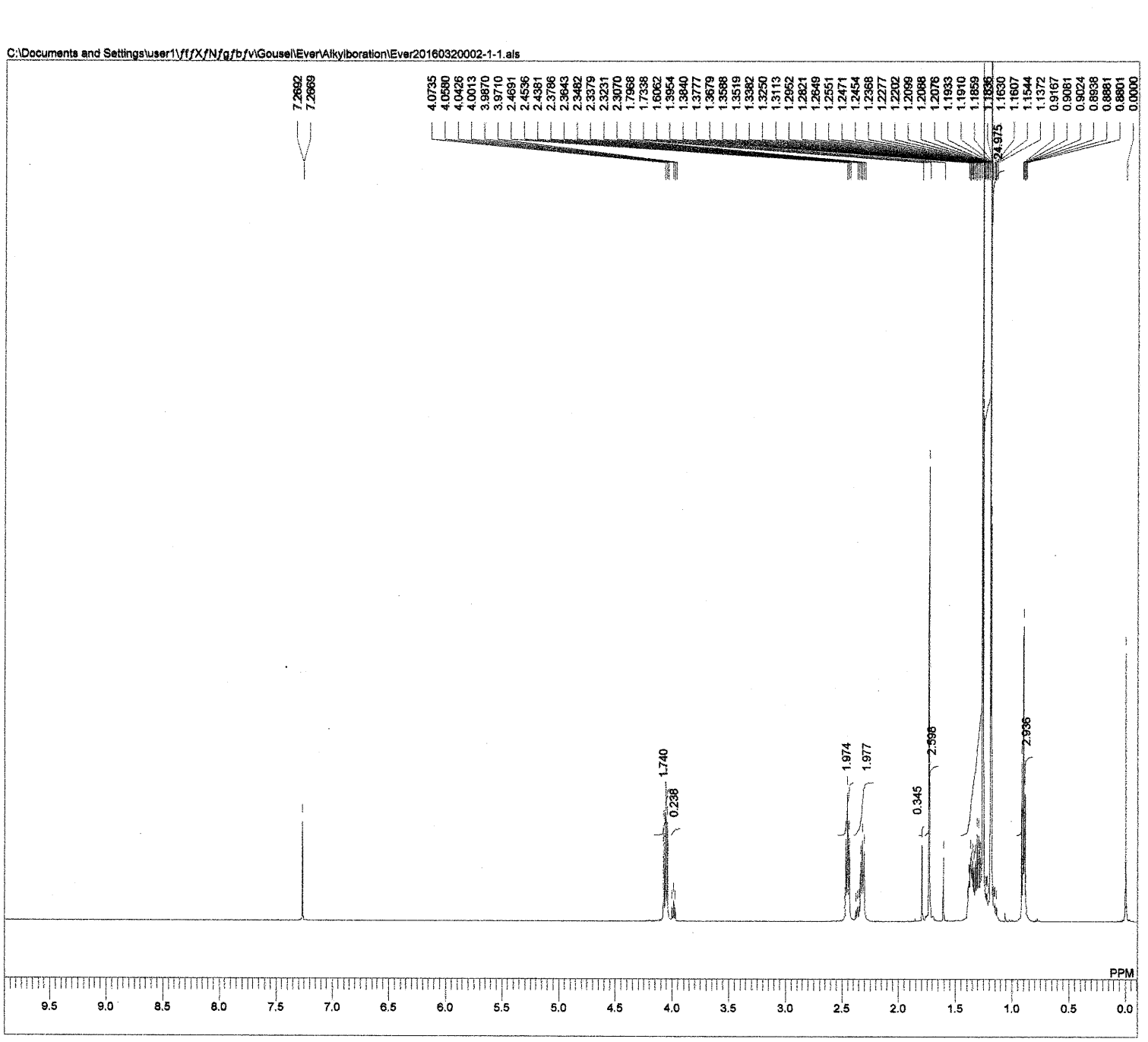


DFILE	Ever20160318003Carbon-1-1.als
COMNT	No.2823 Carbon
DATIM	2016-03-18 16:04:12
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	64
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.9 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	1.20 Hz
RGAIN	60

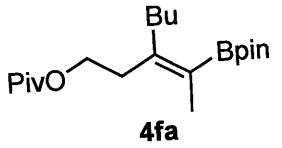


4ea

No.2833



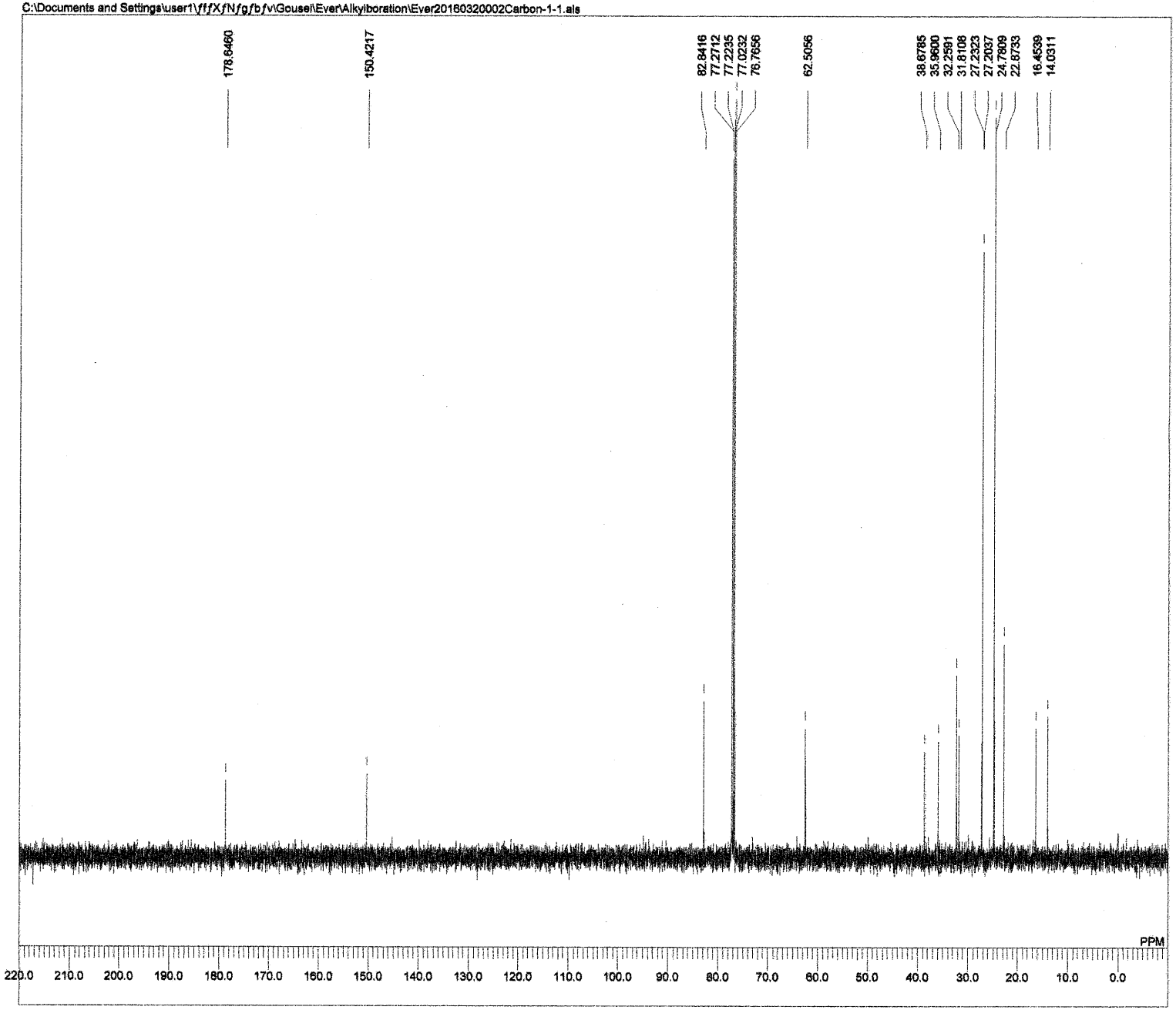
DFILE	Ever20160320002-1-1.als
COMNT	No.2833
DATIM	2016-03-20 15:24:37
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	32.9 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	28



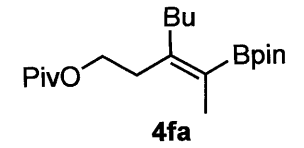
4fa

No.2833 Carbon

C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160320002Carbon-1-1.als



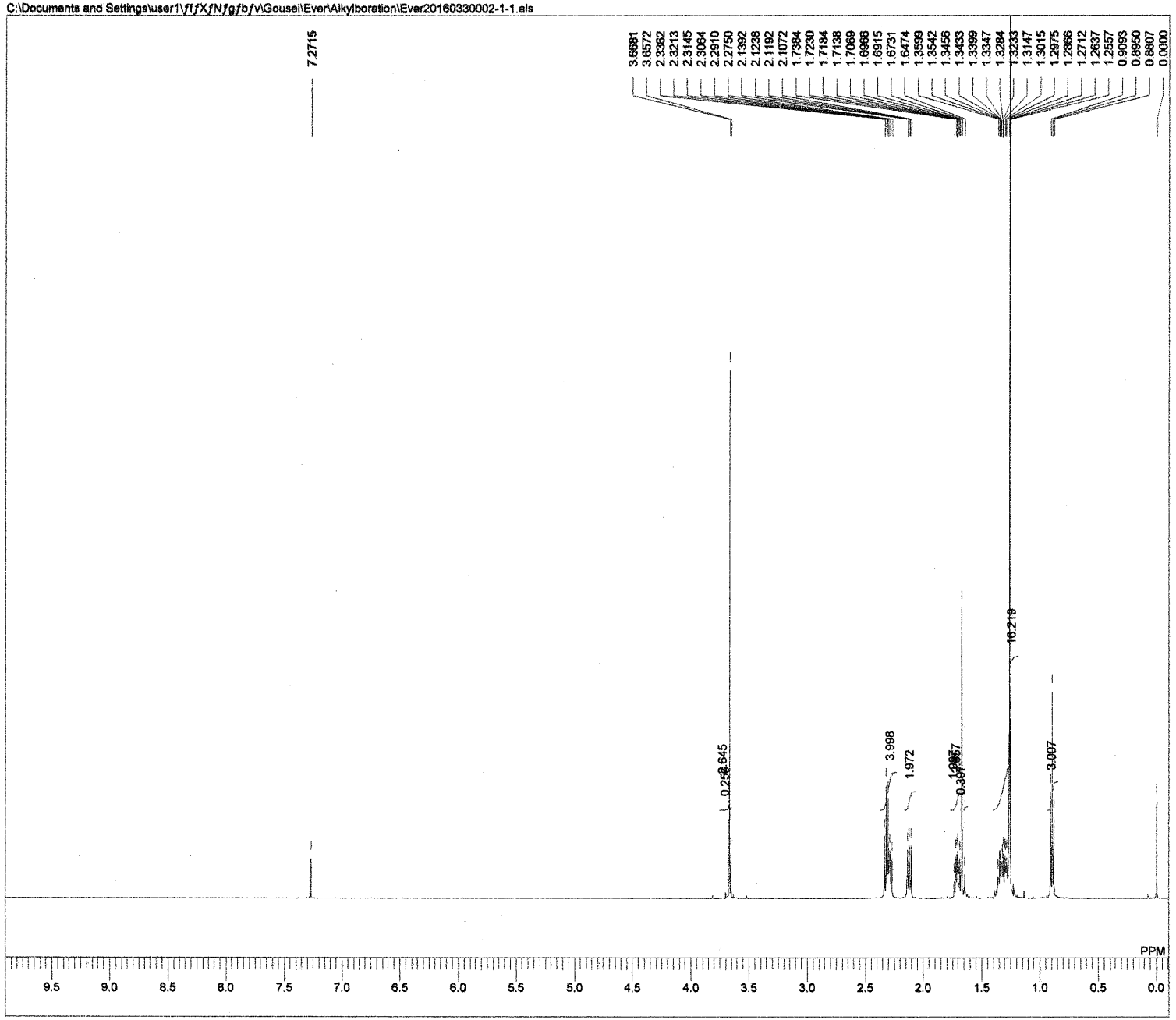
DFILE	Ever20160320002Carbon-1-1.als
COMNT	No.2833 Carbon
DATIM	2016-03-20 15:26:07
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	26214
FREQU	31446.54 Hz
SCANS	65
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	29.6 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.72 Hz
RGAIN	60



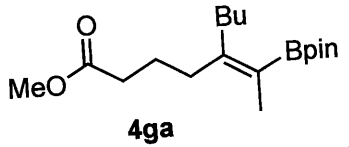
4fa

No.2857

C:\Documents and Settings\user1\ƒtƒXƒN‚ð‚ƒv\Gousei\Ever\Alkylboration\Ever20160330002-1-1.als



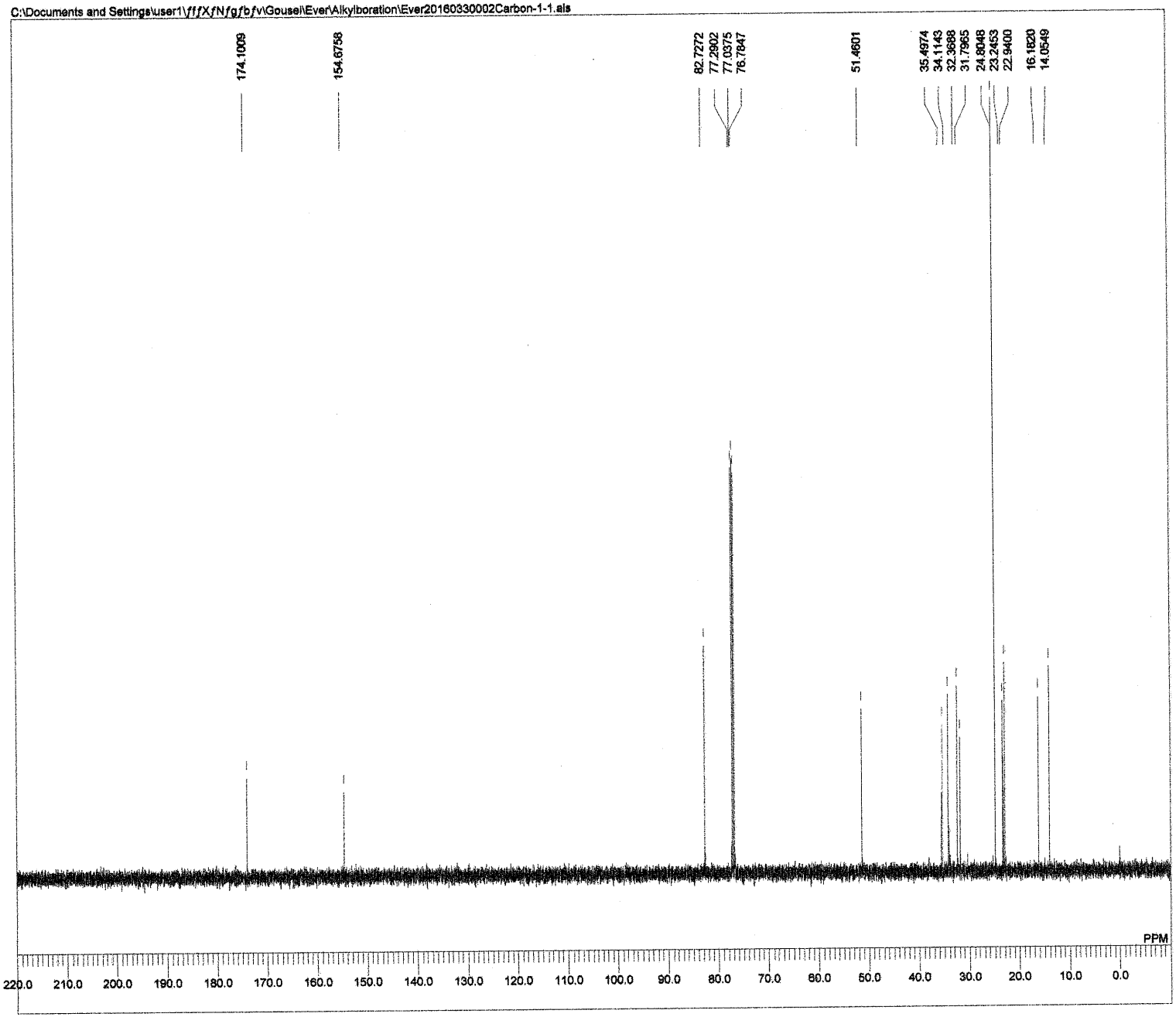
DFILE Ever20160330002-1-1.als
COMNT No.2857
DATIM 2016-03-30 15:45:47
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.4 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 26



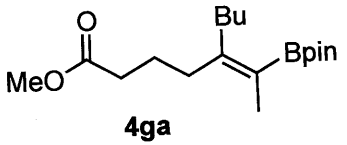
4ga

No.2857 Carbon

C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160330002Carbon-1-1.als

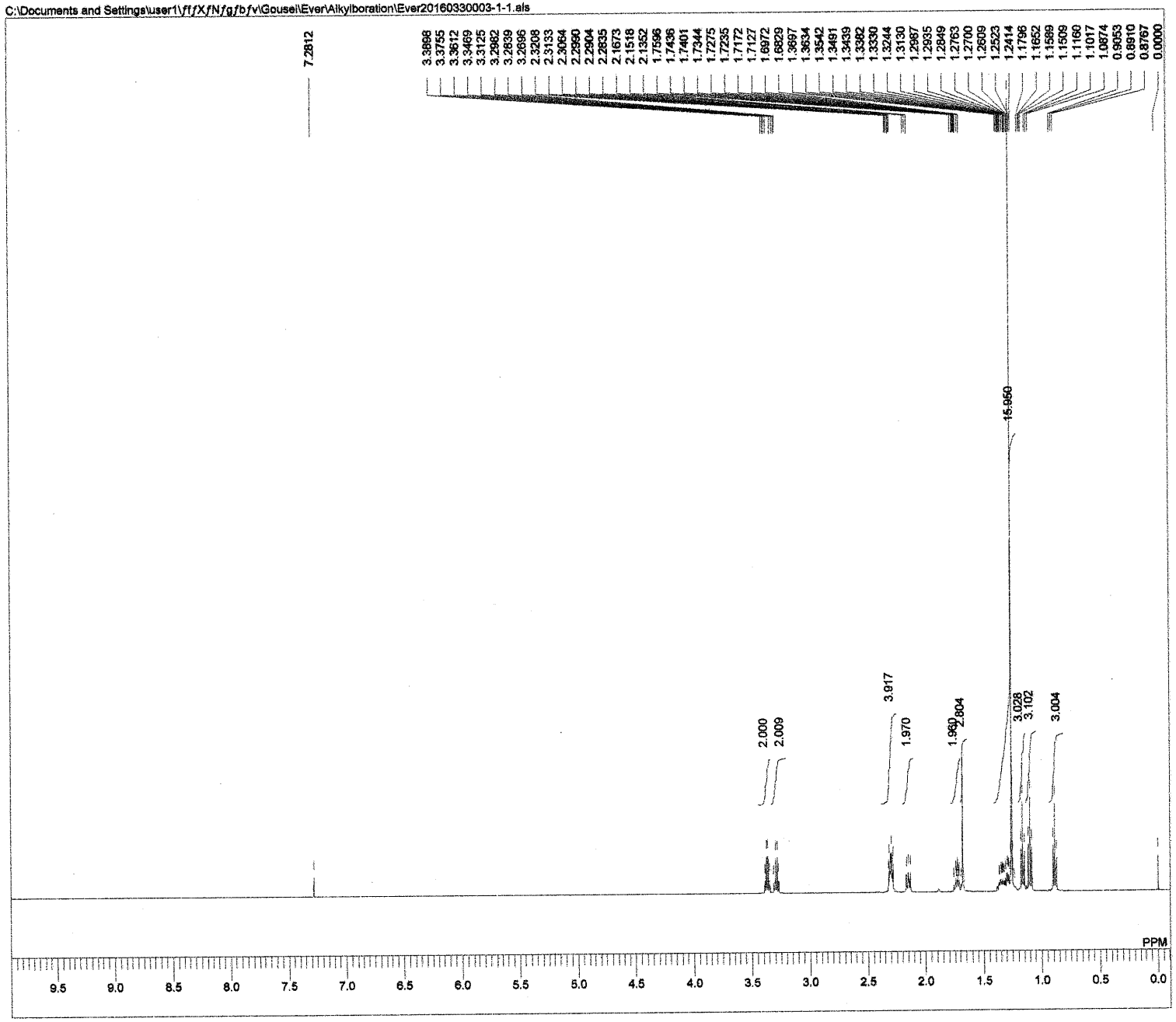


DFILE	Ever20160330002Carbon-1-1.als
COMNT	No.2857 Carbon
DATIM	2016-03-30 15:47:17
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	64
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.6 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60

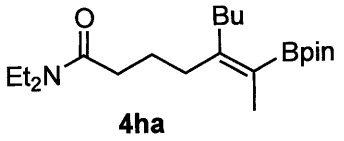


4ga

No.2858 F7-9

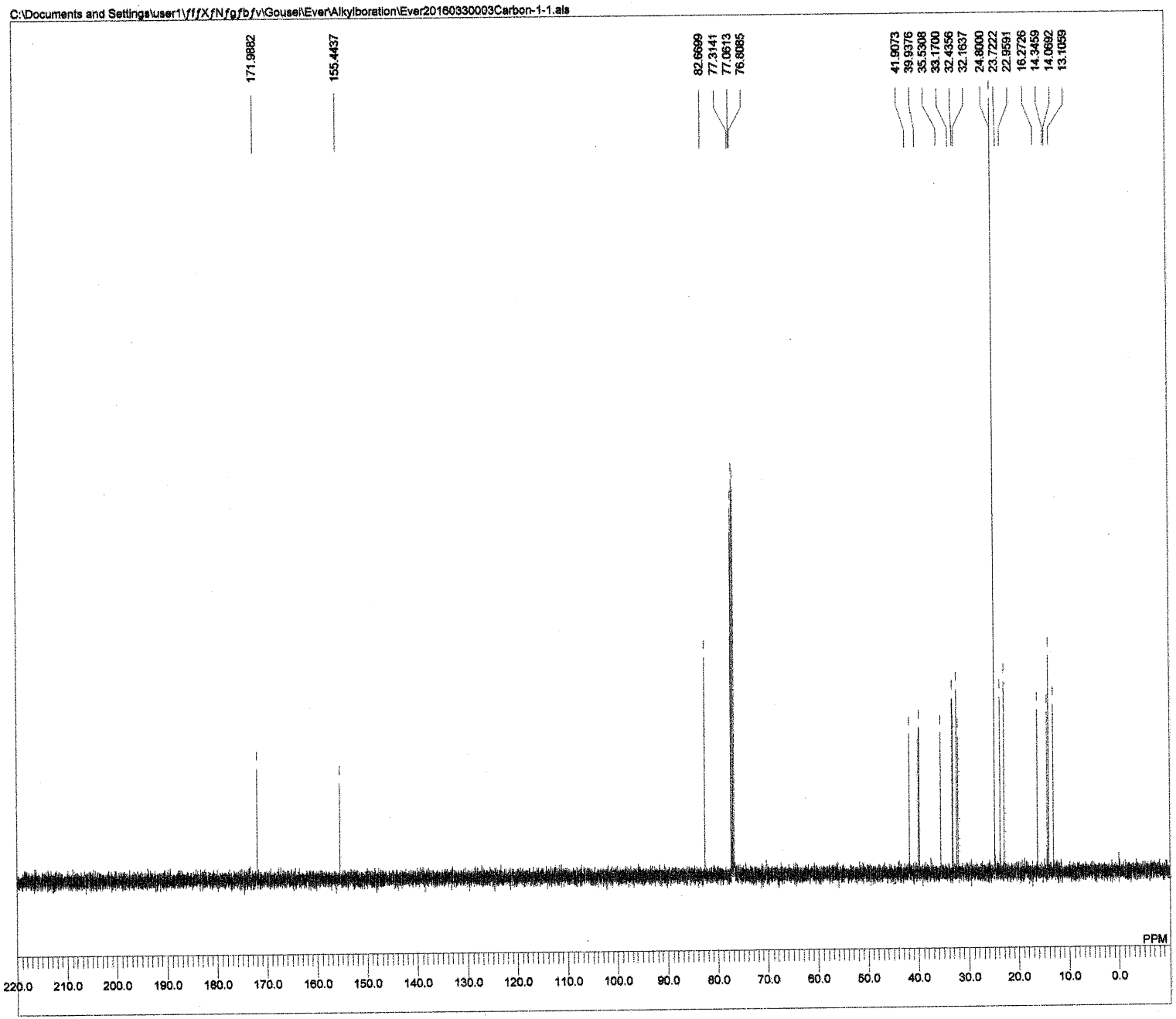


DFILE	Ever20160330003-1-1.als
COMNT	No.2858 F7-9
DATIM	2016-03-30 15:52:54
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	32.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	24

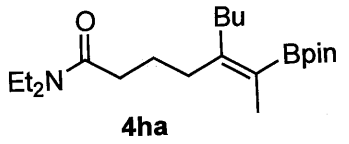


4ha

No.2858 F7-9 Carbon



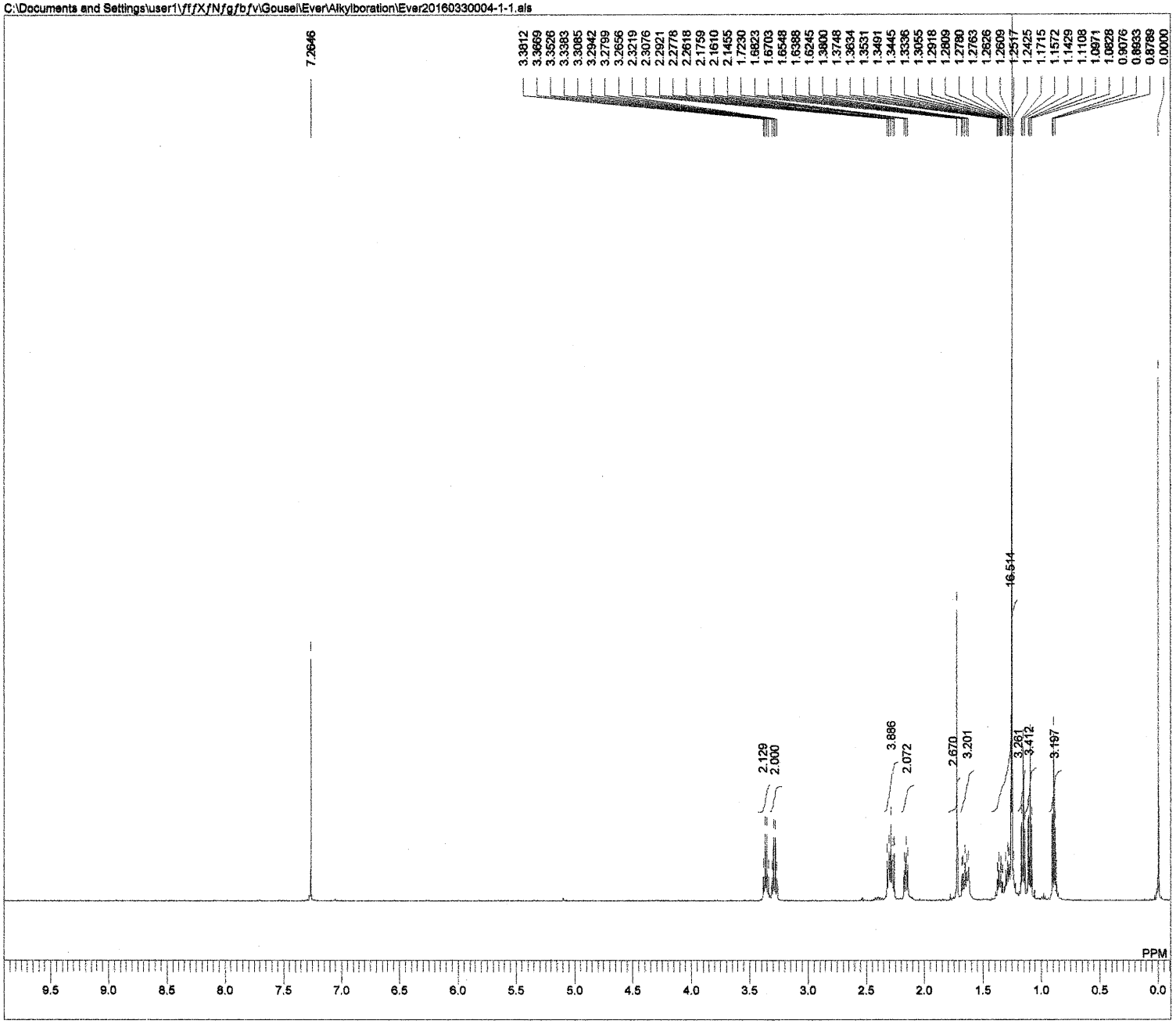
DFILE	Ever20160330003Carbon-1-1.als
COMNT	No.2858 F7-9 Carbon
DATIM	2016-03-30 15:54:24
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.64 Hz
SCANS	37
ACQTM	0.8338 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	29.9 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60



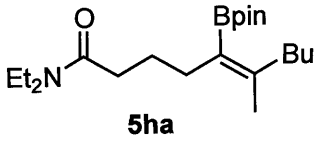
4ha

No.2858 F11

C:\Documents and Settings\user1\ƒƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160330004-1-1.als

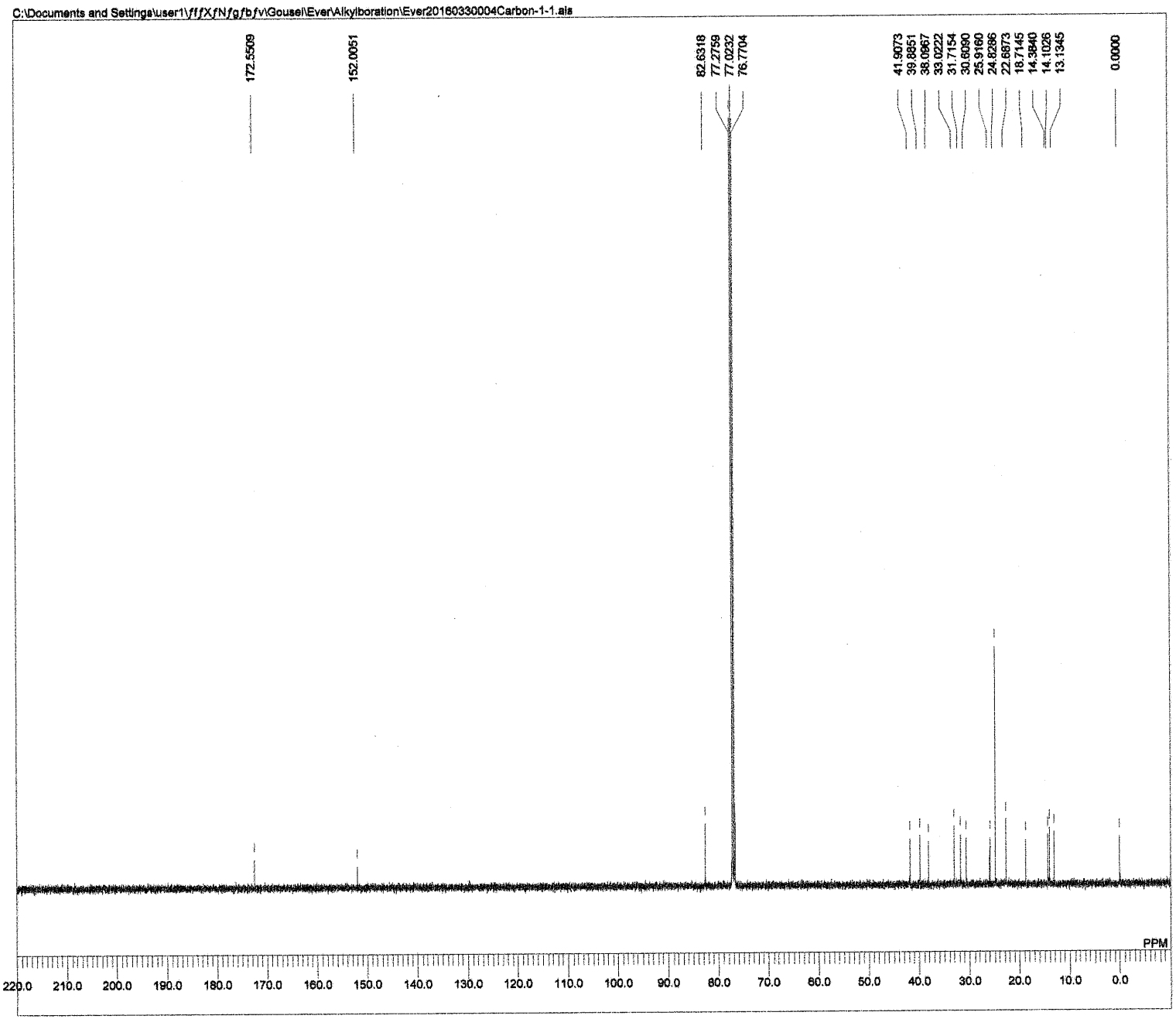


DFILE	Ever20160330004-1-1.als
COMNT	No.2858 F11
DATIM	2016-03-30 15:58:21
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	33.0 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30

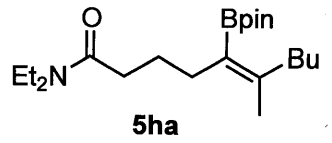


5ha

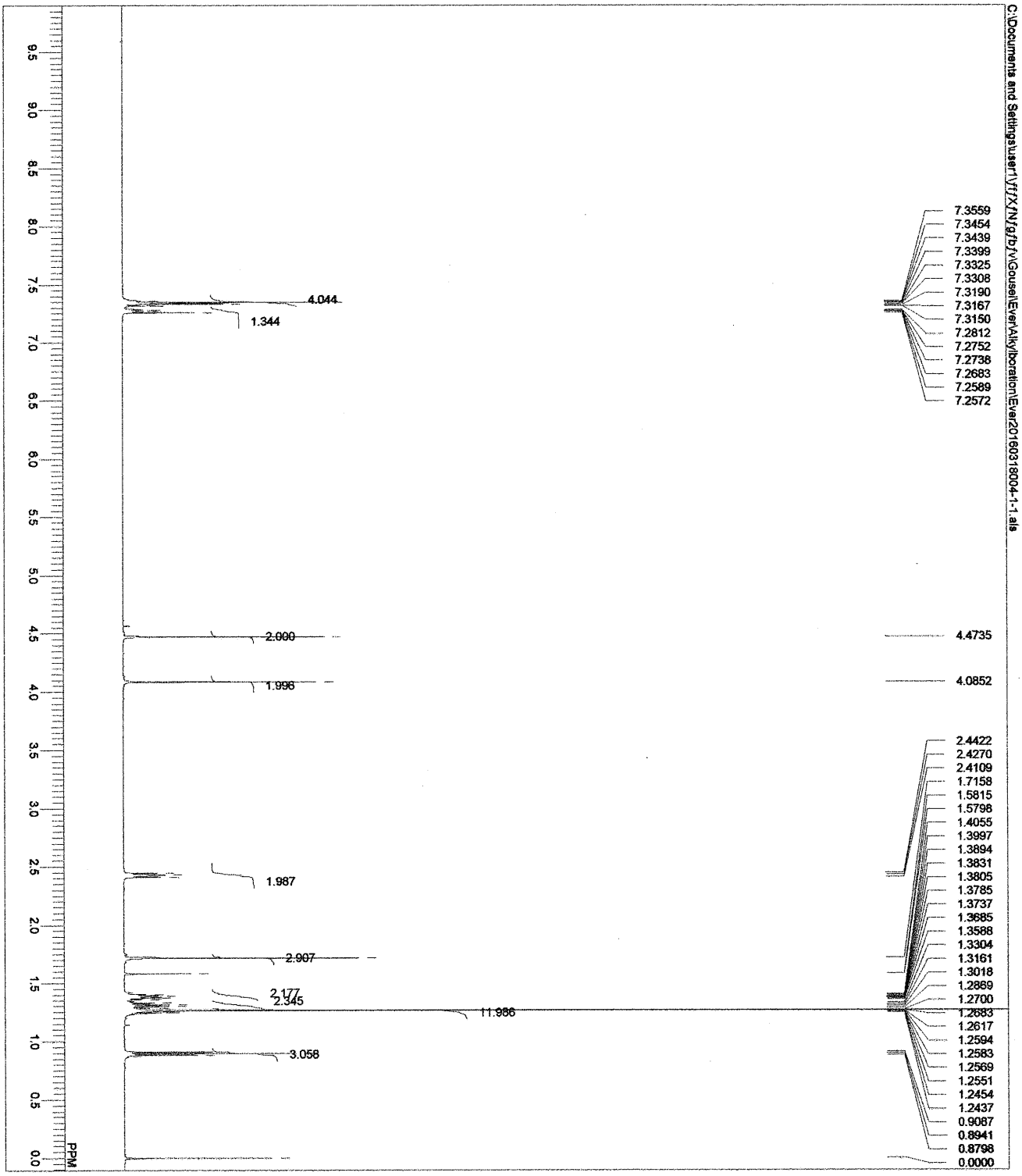
No.2858 F11 Carbon

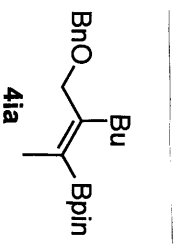


DFILE Ever20160330004Carbon-1-1.als
COMNT No.2858 F11 Carbon
DATIM 2016-03-30 18:45:14
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 125.77 MHz
OBSET 7.87 KHz
OBFIN 4.21 Hz
POINT 52428
FREQU 31446.54 Hz
SCANS 1024
ACQTM 0.8336 sec
PD 2.0000 sec
PW1 3.40 usec
IRNUC 1H
CTEMP 33.4 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.62 Hz
RGAIN 60



5ha


C:\Documents and Settings\user1\桌面\XiNgfb\NGousei\EverAlkylboration\Ever20160318004-1-1.als
7.3559
7.3454
7.3439
7.3399
7.3325
7.3308
7.3190
7.3167
7.3150
7.2812
7.2752
7.2738
7.2683
7.2589
7.2572
4.4735
4.0852
2.4422
2.4270
2.4109
1.7158
1.5815
1.5798
1.4055
1.3997
1.3894
1.3831
1.3805
1.3785
1.3737
1.3685
1.3588
1.3304
1.3161
1.3018
1.2869
1.2700
1.2683
1.2617
1.2594
1.2583
1.2569
1.2551
1.2454
1.2437
0.9087
0.8941
0.8798
0.0000
4.044
1.344
2.000
1.998
1.987
2.907
2.177
2.345
11.986
3.058
PPM
DFILE Ever20160318004-1-1.als
COMNT No.2824
DATIM 2016-03-18 16:09:45
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 52428
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 33.5 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 30


BnO
Bu
Bpin

4ia

No.2824 Carbon

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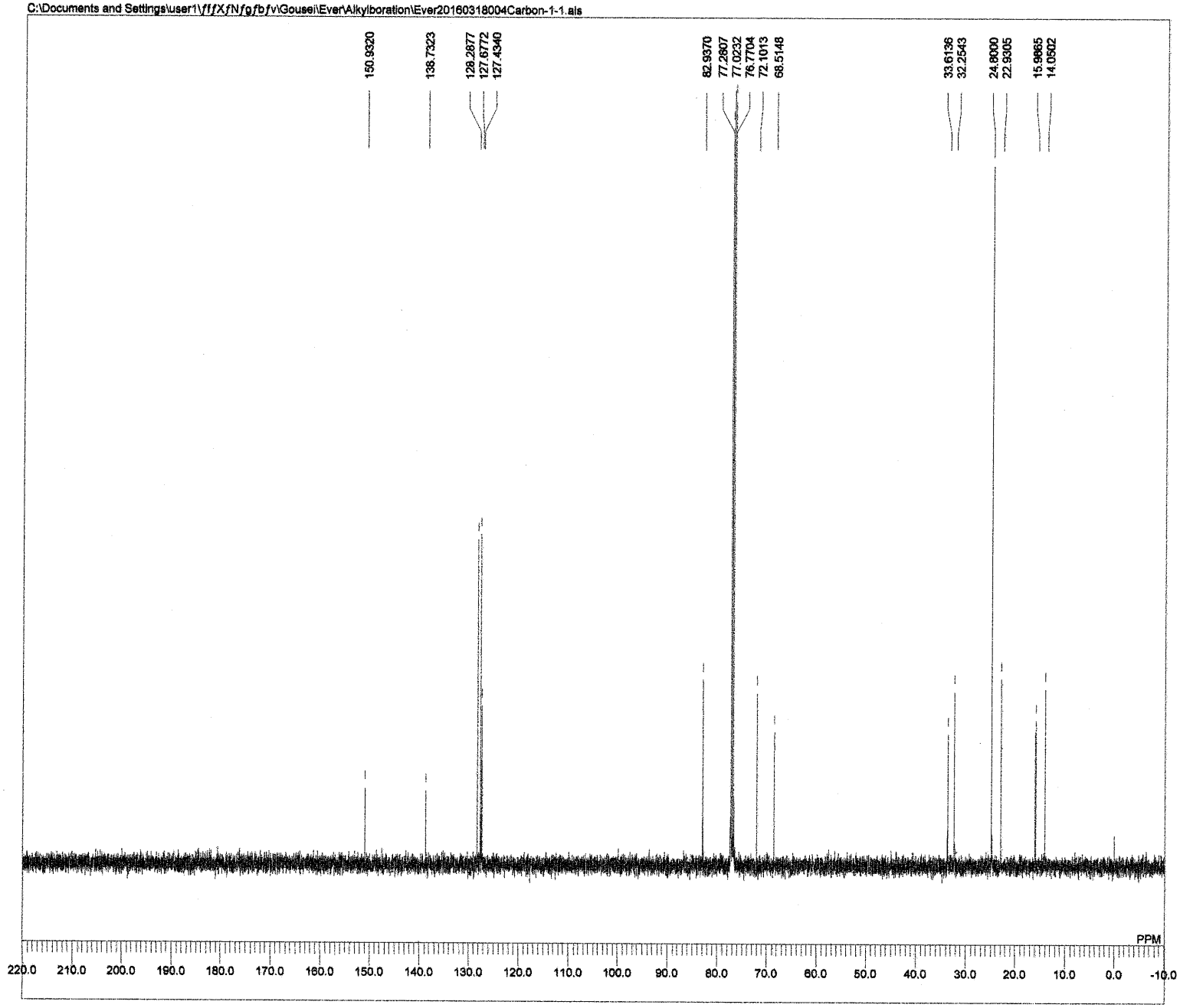
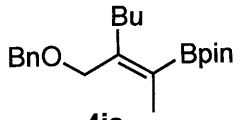
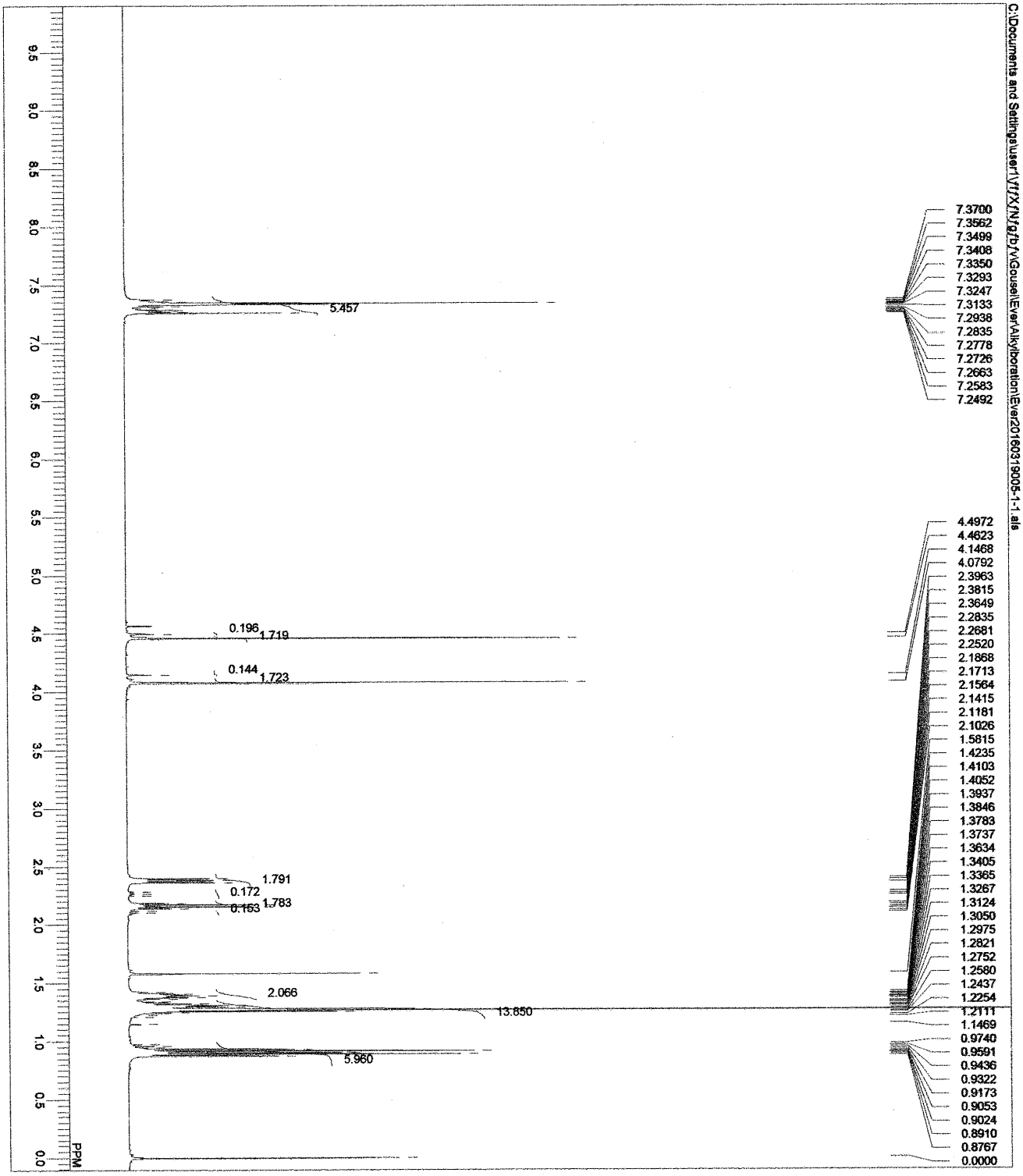


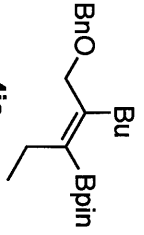
DFILE Ever20160318004Carbon-1-1.als
COMNT No.2824 Carbon
DATIM 2016-03-18 16:11:15
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 125.77 MHz
OBSET 7.87 KHz
OBFIN 4.21 Hz
POINT 52428
FREQU 31446.54 Hz
SCANS 89
ACQTM 0.8336 sec
PD 2.0000 sec
PW1 3.40 usec
IRNUC 1H
CTEMP 32.6 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 1.20 Hz
RGAIN 60



4ia



DFILE Ever20180319005-1-1.als
COMNT No.2827
DATIM 2016-03-19 18:47:21
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 28214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.8 c
SLVNT CDCl3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 30



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No.2827 Carbon

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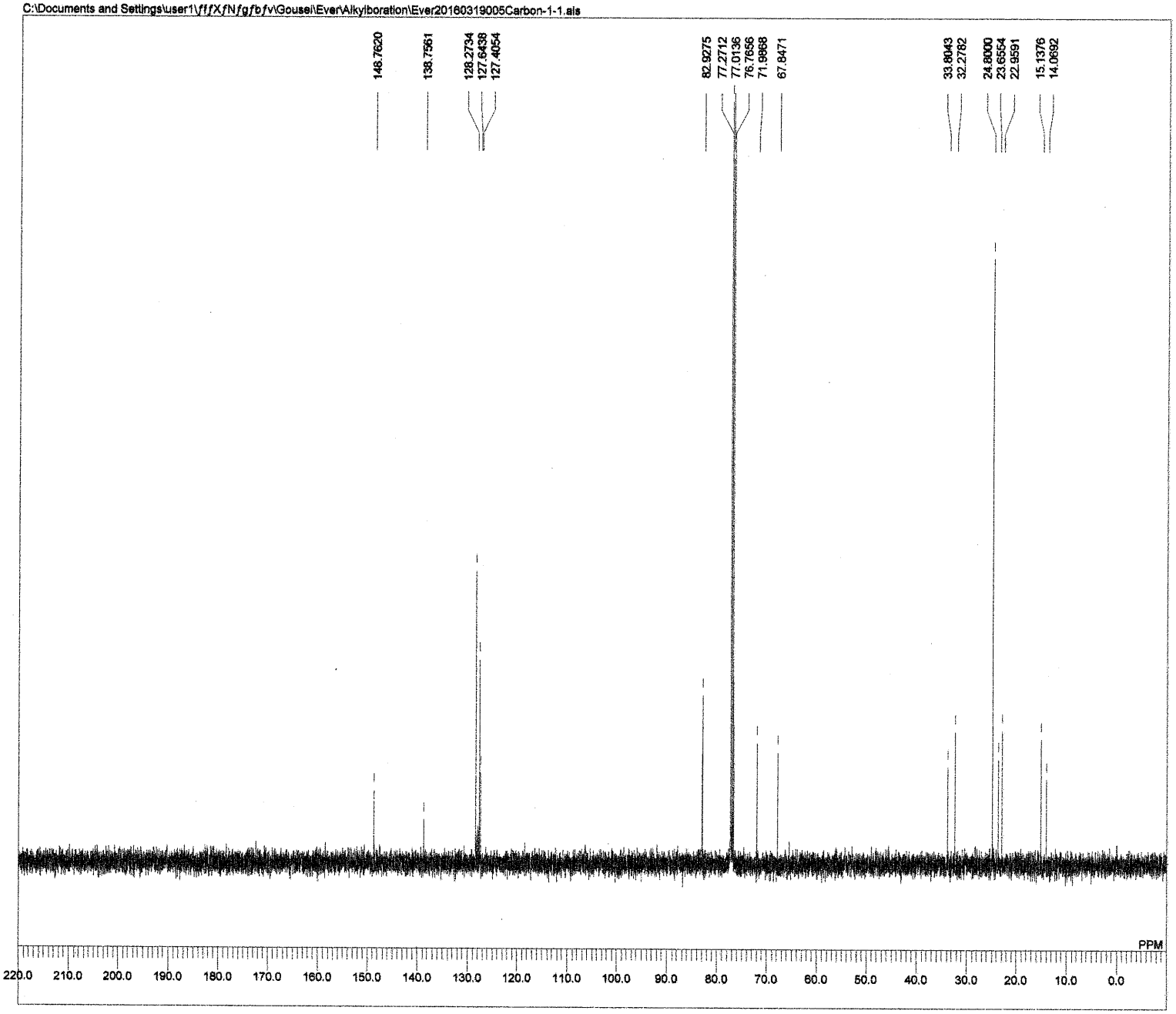
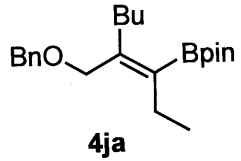
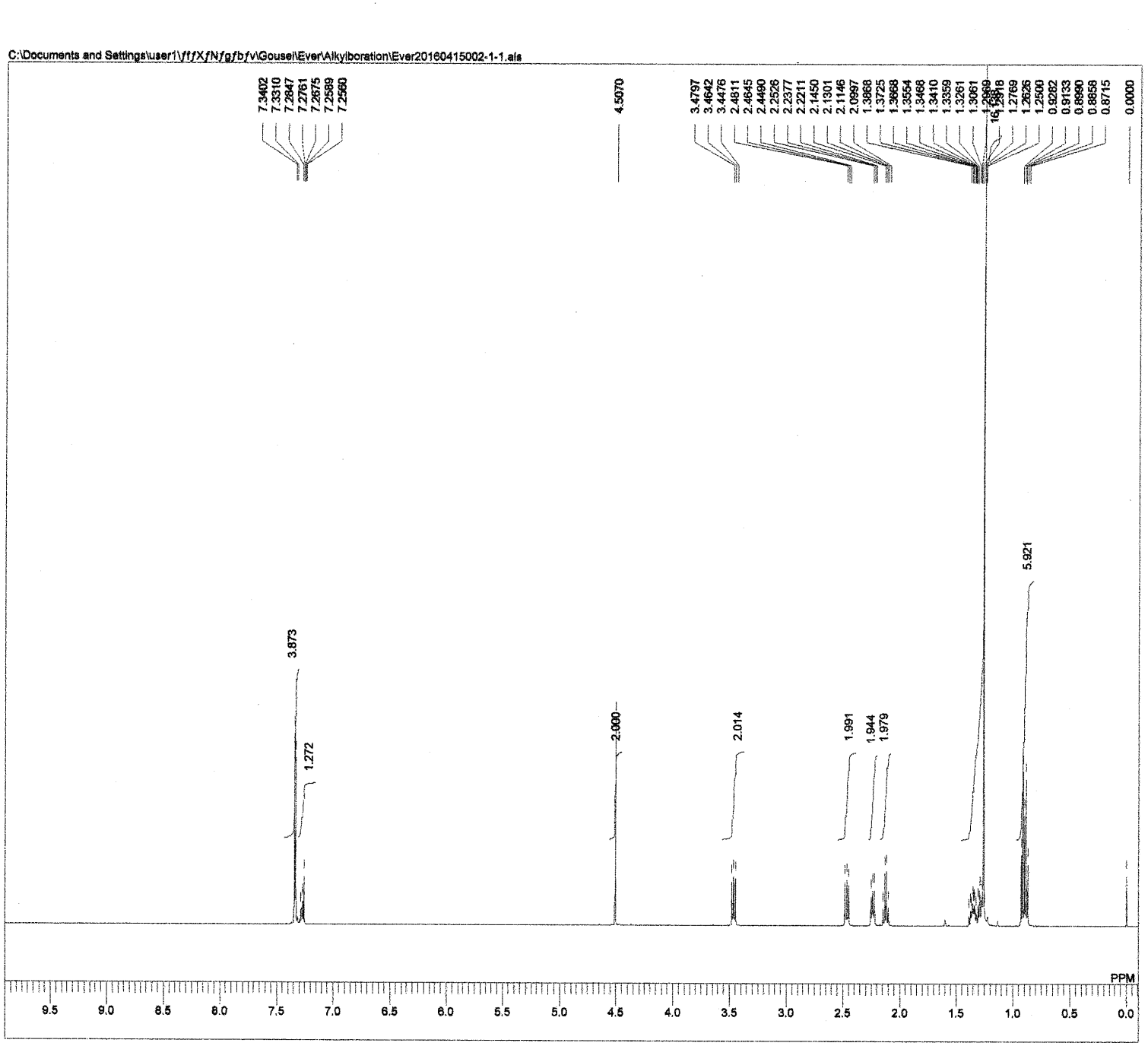


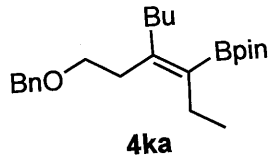
DFILE	Ever20160319005Carbon-1-1.als
COMNT	No.2827 Carbon
DATIM	2016-03-19 18:48:50
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	26214
FREQU	31446.54 Hz
SCANS	73
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	30.2 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60



4ja



DFILE Ever20160415002-1-1.als
COMNT No.2828 GPC former
DATIM 2016-04-15 14:23:16
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 21.1 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 26



4ka

No.2828 GPC former Carbon

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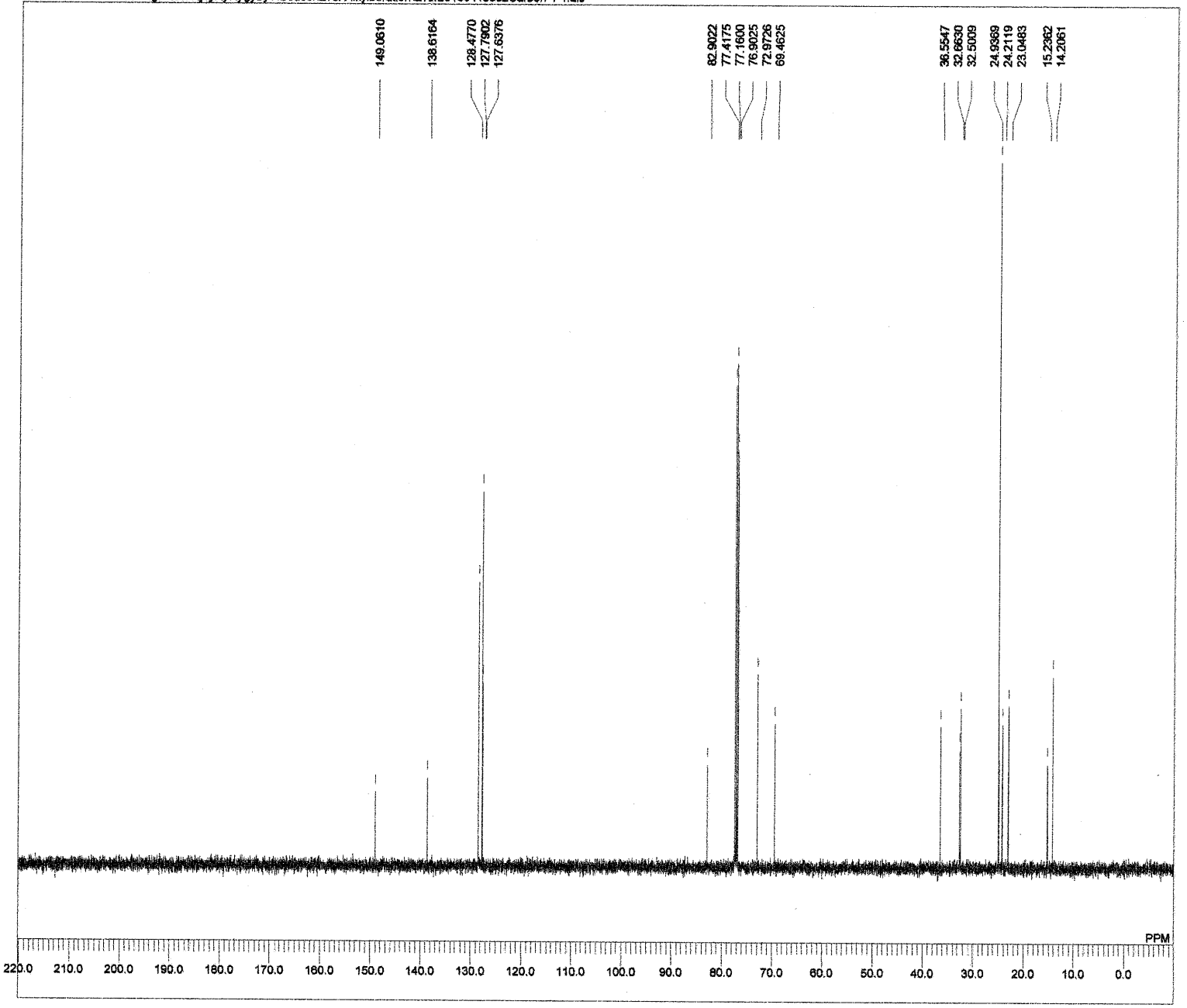
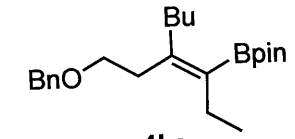
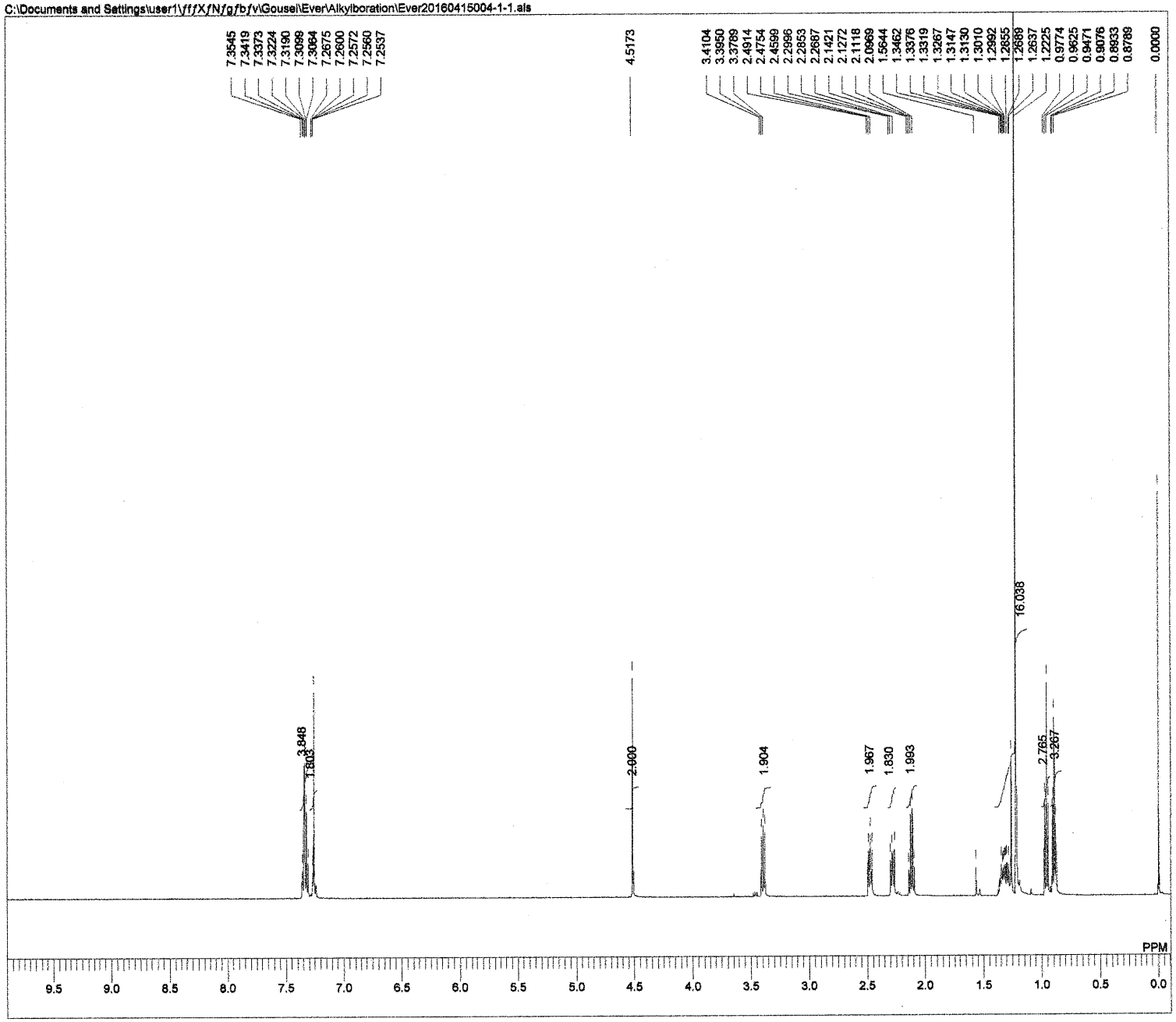


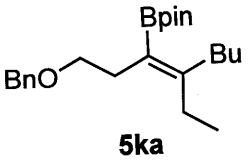
DFILE Ever20160415002Carbon-1-1.als
COMNT No.2828 GPC former Carbon
DATIM 2016-04-15 14:24:46
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 125.77 MHz
OBSET 7.87 KHz
OBFIN 4.21 Hz
POINT 26214
FREQU 31446.54 Hz
SCANS 77
ACQTM 0.8338 sec
PD 2.0000 sec
PW1 3.40 usec
IRNUC 1H
CTEMP 21.5 c
SLVNT CDCL3
EXREF 77.16 ppm
BF 0.62 Hz
RGAIN 60



4ka



DFILE	Ever20160415004-1-1.als
COMNT	No.2828 GPC latter
DATIM	2016-04-15 18:31:50
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	21.2 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30



5ka

No.2828 GPC latter Carbon

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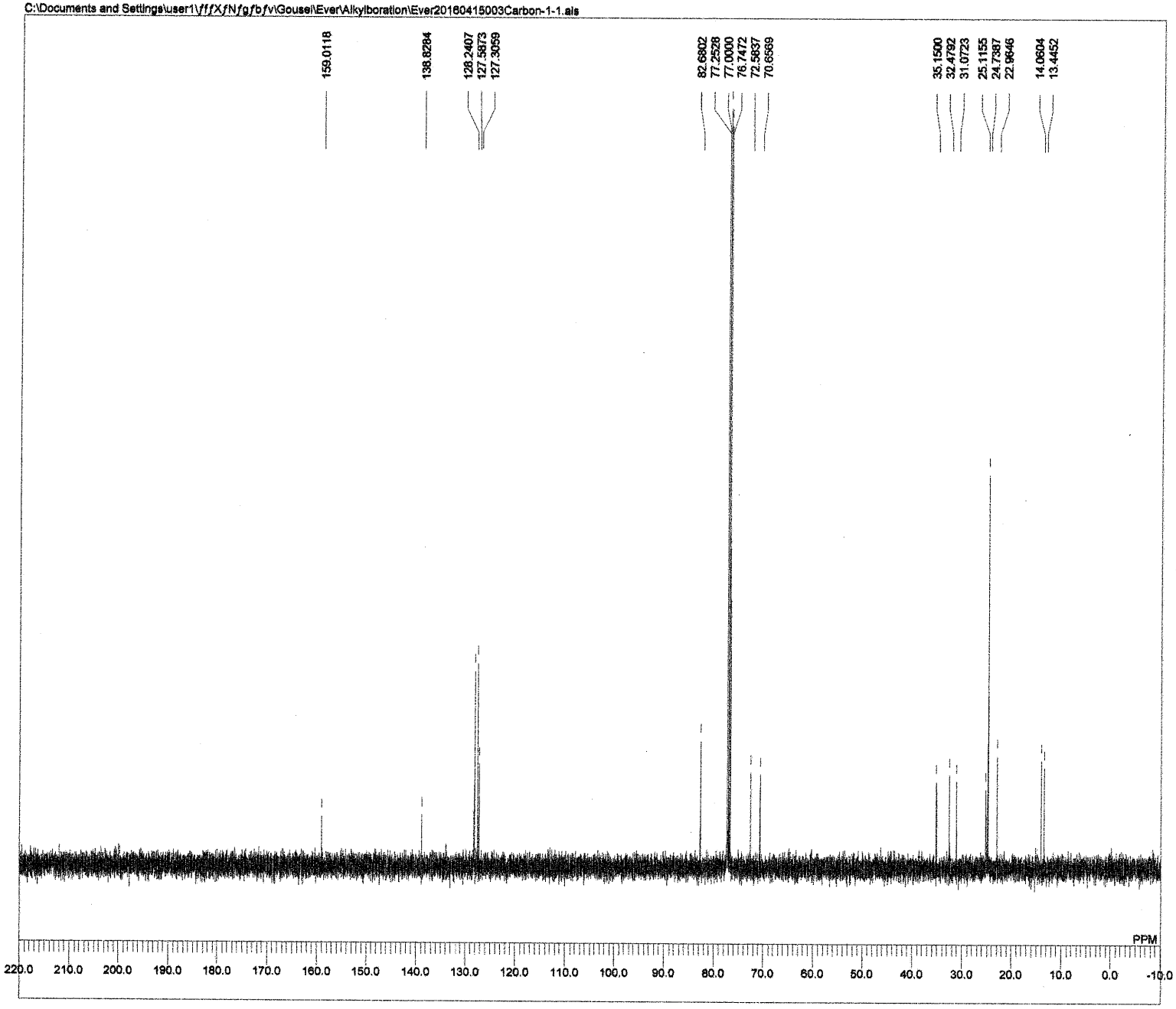
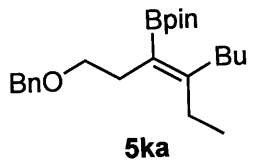


DFILE	Ever20160415003Carbon-1-1.als
COMNT	No.2828 GPC latter Carbon
DATIM	2016-04-15 15:11:13
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	78
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	21.2 c
SLVNT	CDCL3
EXREF	77.00 ppm
BF	0.62 Hz
RGAIN	60



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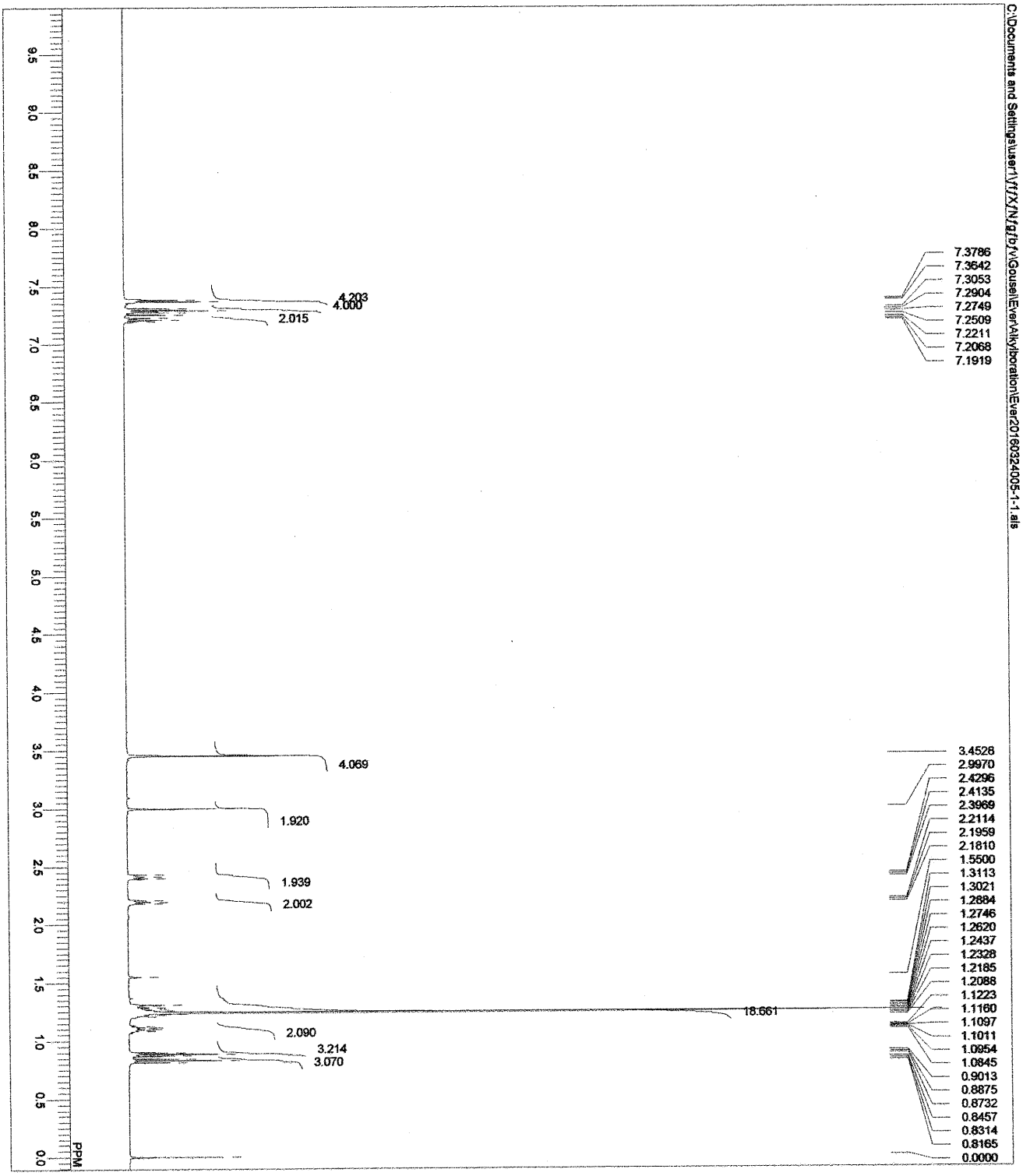
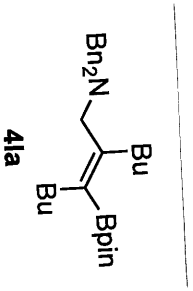


DFILE Ever20160324005-1-1.als
COMNT No.2846
DATIM 2016-03-24 14:12:11
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 28214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.6 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 28



4la

No.2846 Carbon

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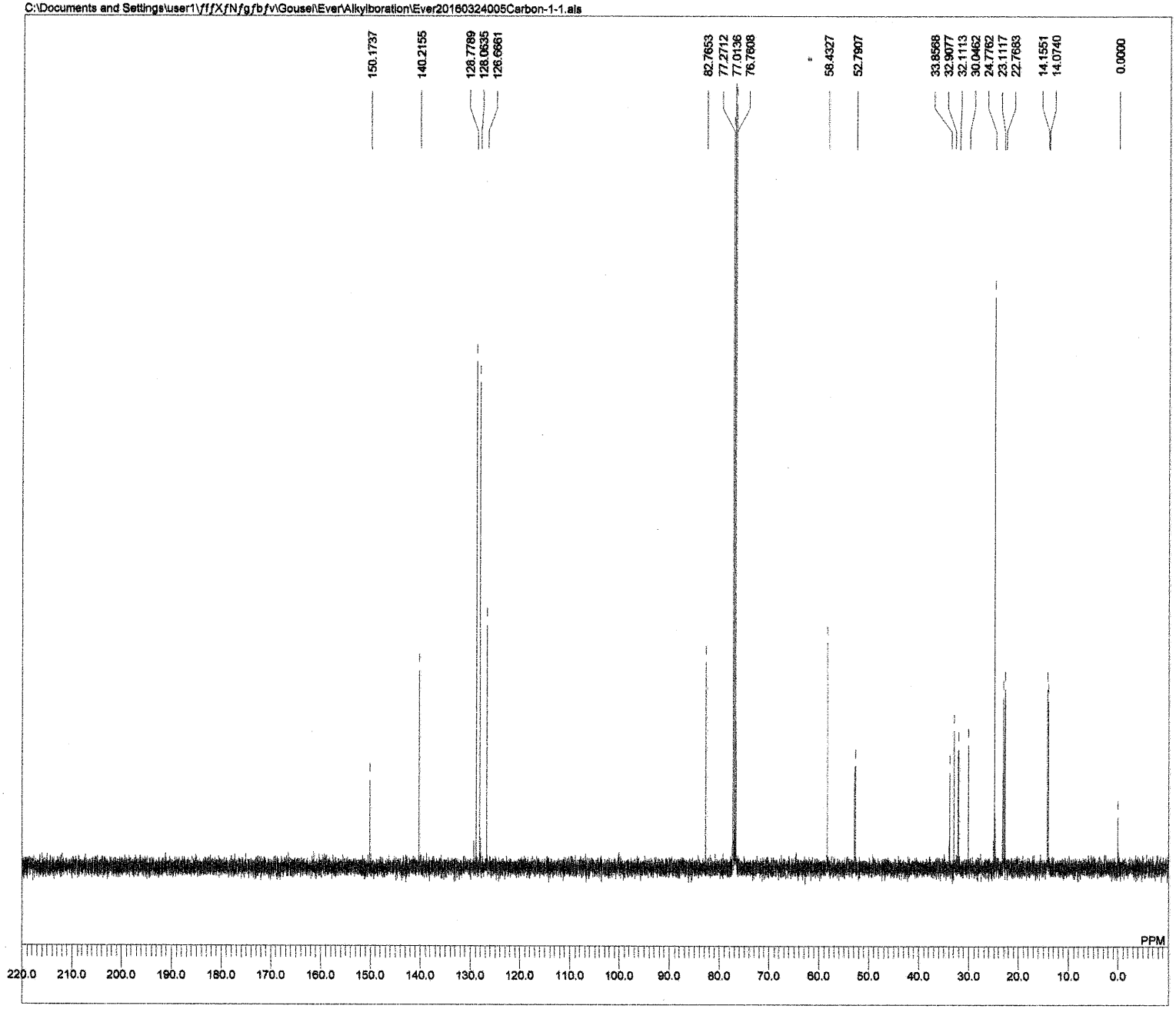
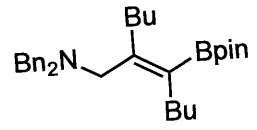


DFILE	Ever20160324005Carbon-1-1.als
COMNT	No.2846 Carbon
DATIM	2016-03-24 14:13:40
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	128
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60



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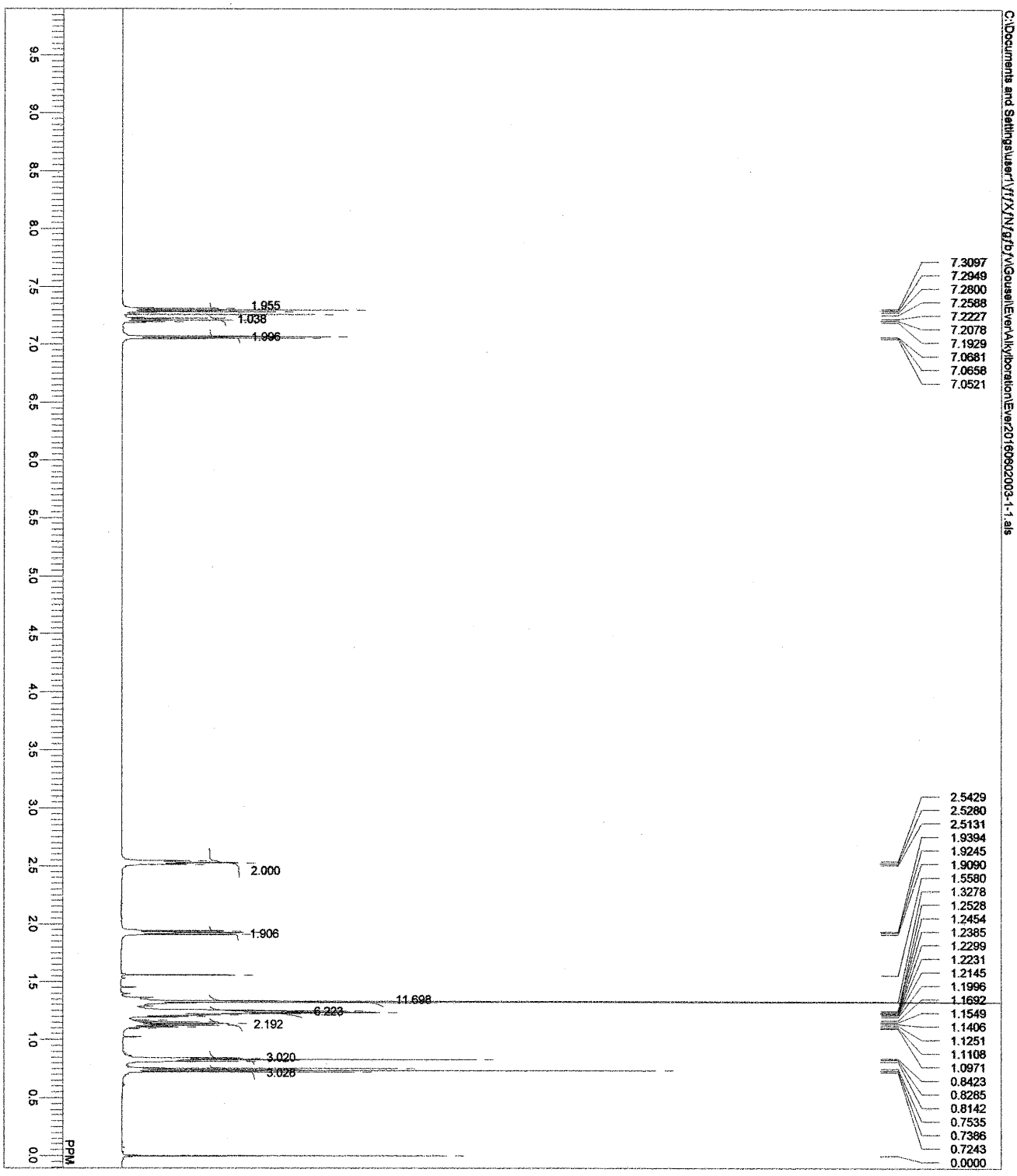
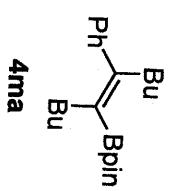


DFILE Ever20160602003-1-1.als
COMNT No.2829 PTLC F2
DATIM 2016-06-02 17:28:46
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 32767
FREQU 9384.38 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 21.7 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 30



4ma

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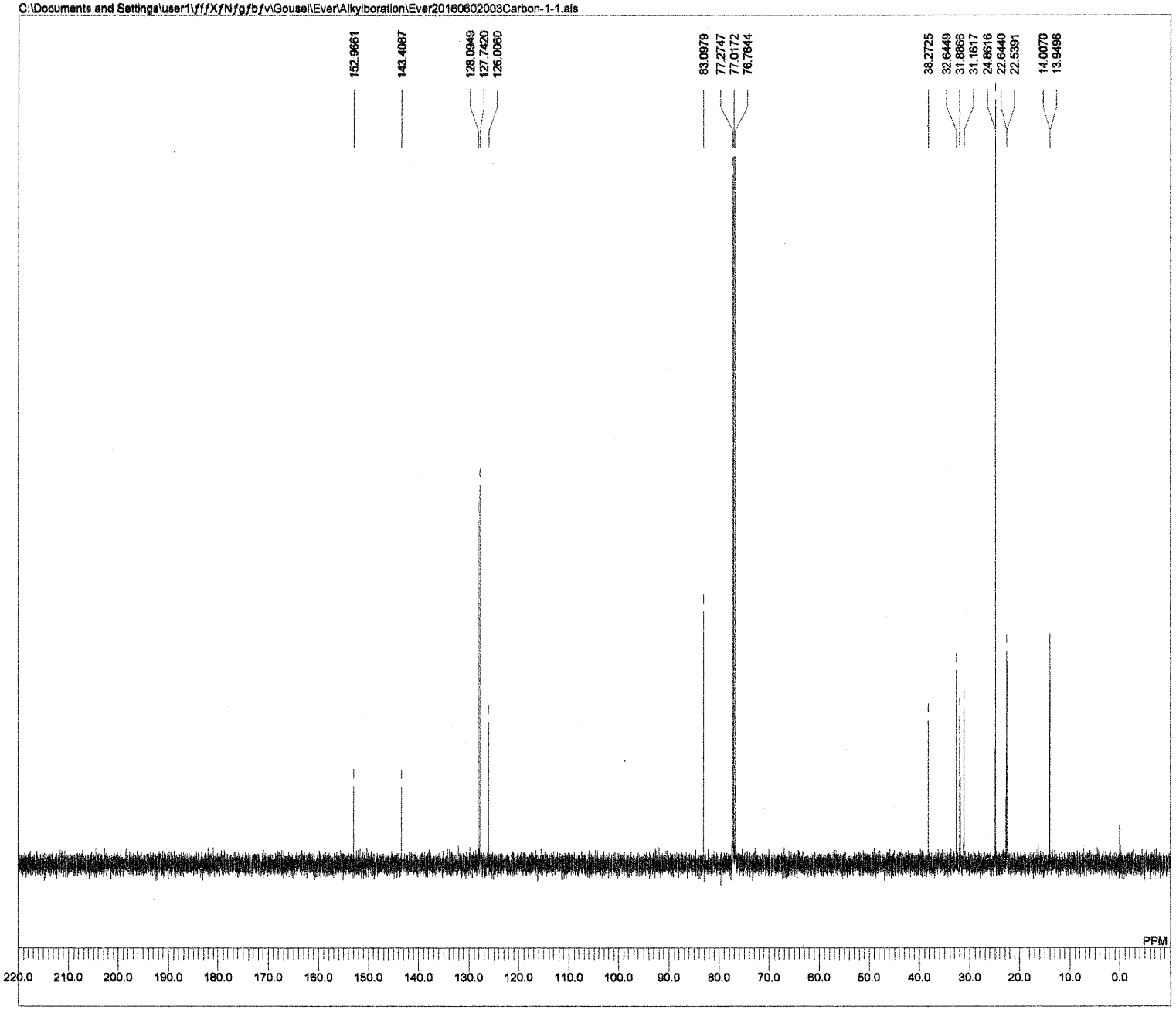
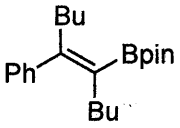


DFILE	Ever20160602003Carbon-1-1.als
COMNT	No.2829 PTLC F2 Carbon
DATIM	2016-06-02 17:30:17
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	65535
FREQU	39308.18 Hz
SCANS	92
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	21.9 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.52 Hz
RGAIN	60



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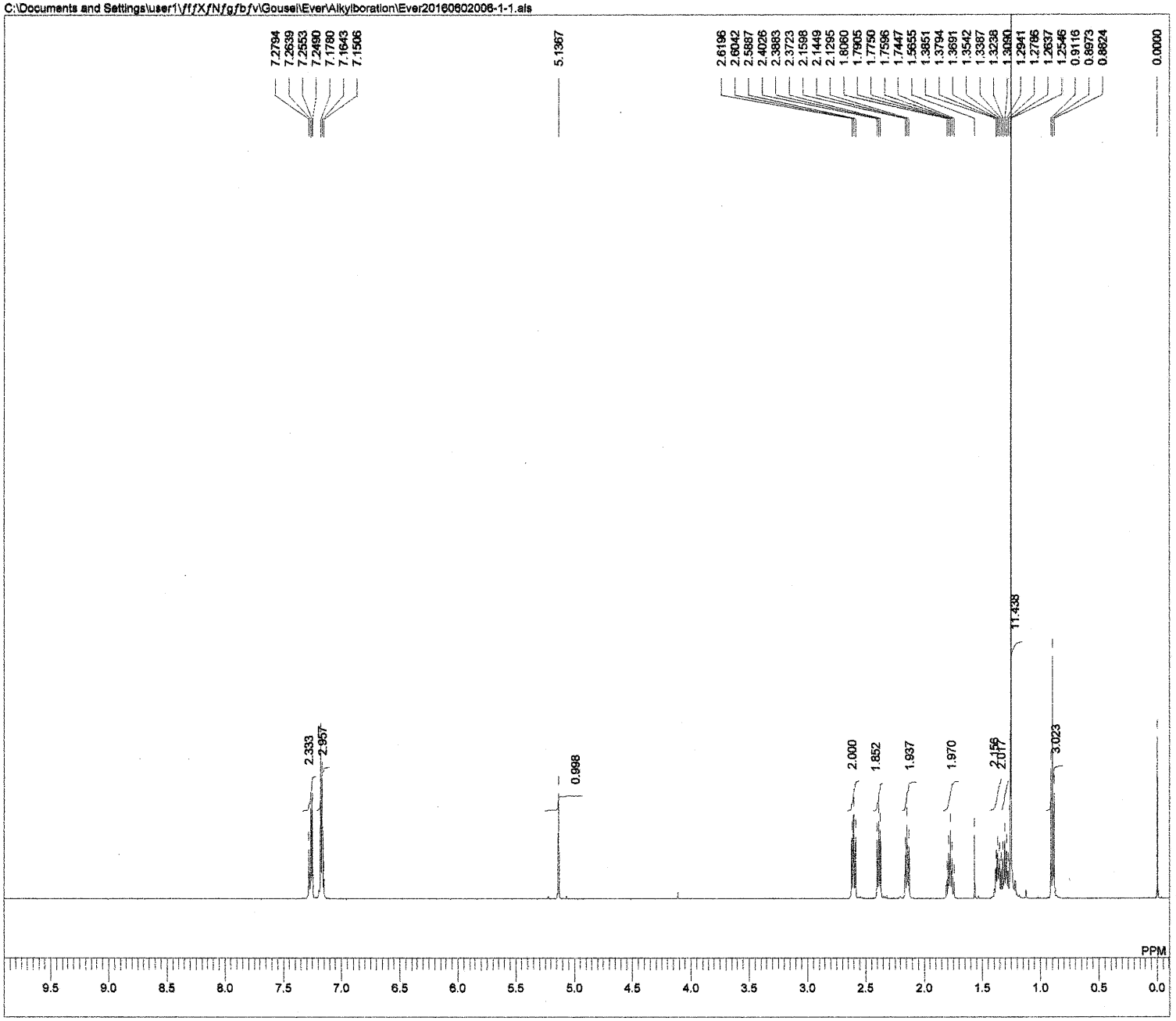
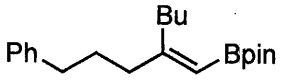
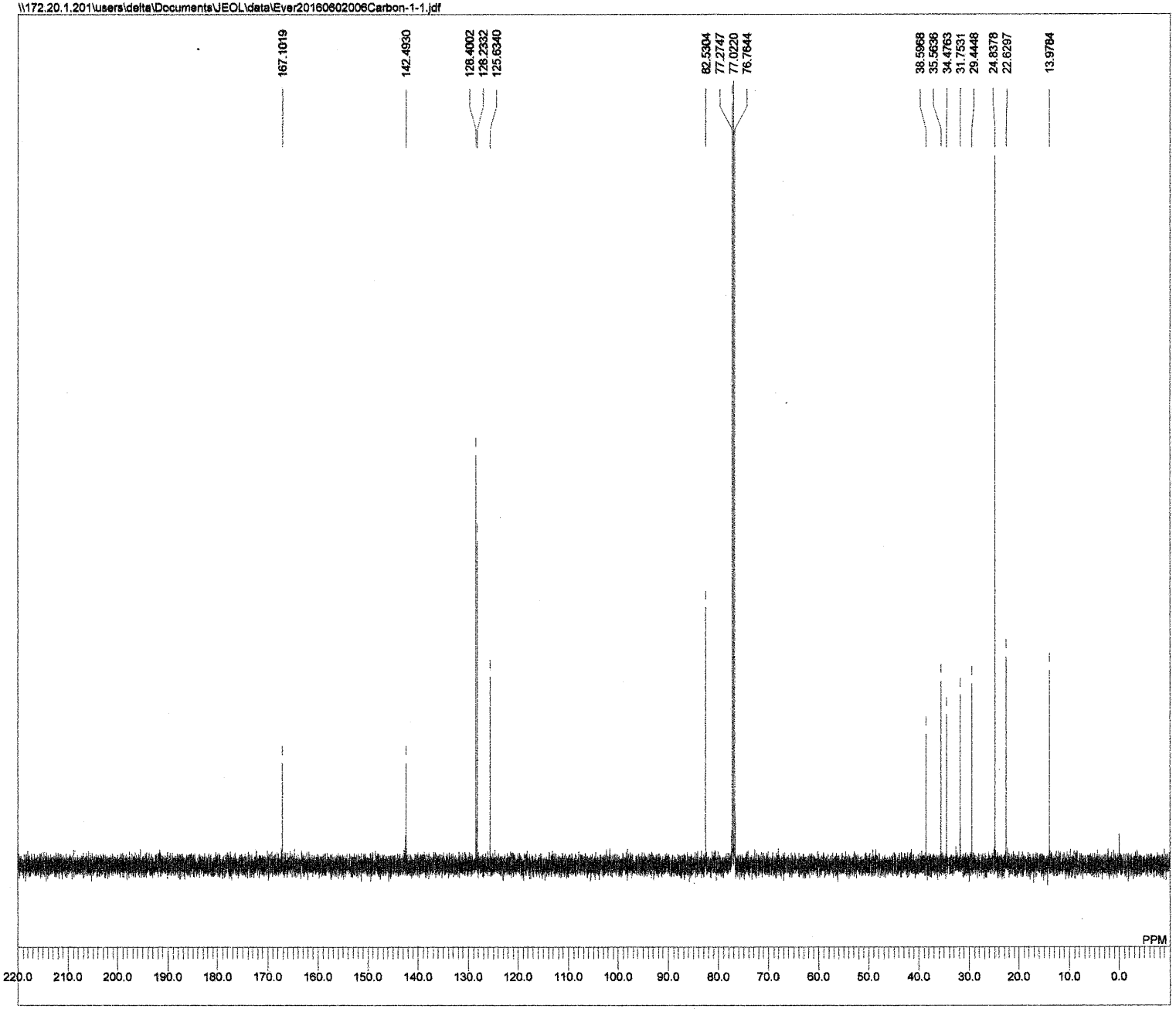
DFILE Ever20160602006-1-1.als
COMNT No.2998 PTLC F2
DATIM 2016-06-02 20:52:46
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 32767
FREQU 9384.38 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 21.6 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 30



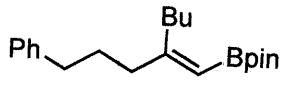


4na

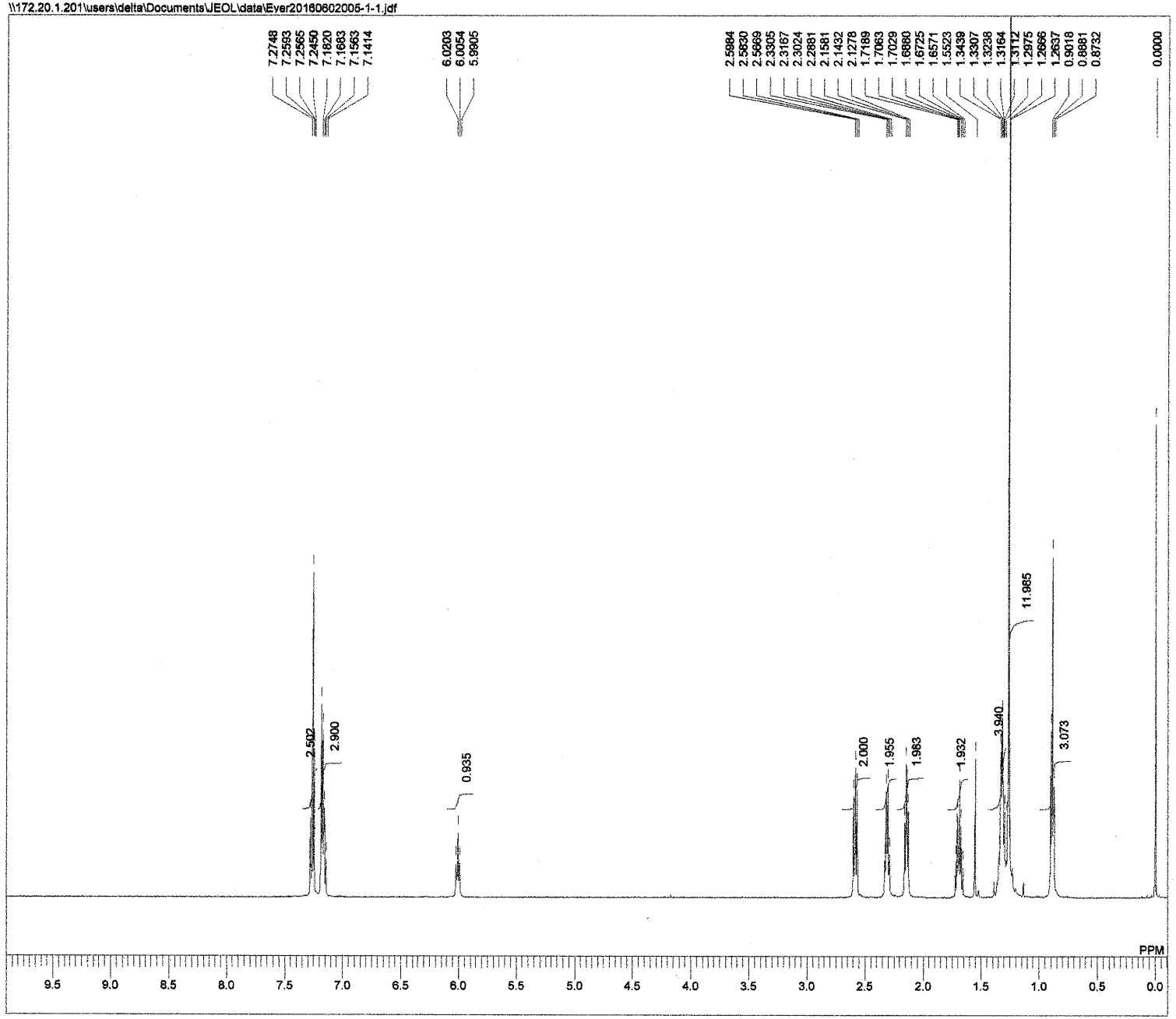
\\172.20.1.201\users\delta\Documents\JEOL\data\Ever20160602006Carbon-1-1.jdf



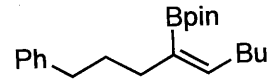
DFILE	Ever20160602006Carbon-1-1.jdf
COMNT	No.2998 PTLC F2 Carbon
DATIM	2016-06-02 20:54:16
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	65535
FREQU	39308.18 Hz
SCANS	92
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	21.8 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.52 Hz
RGAIN	60



4na

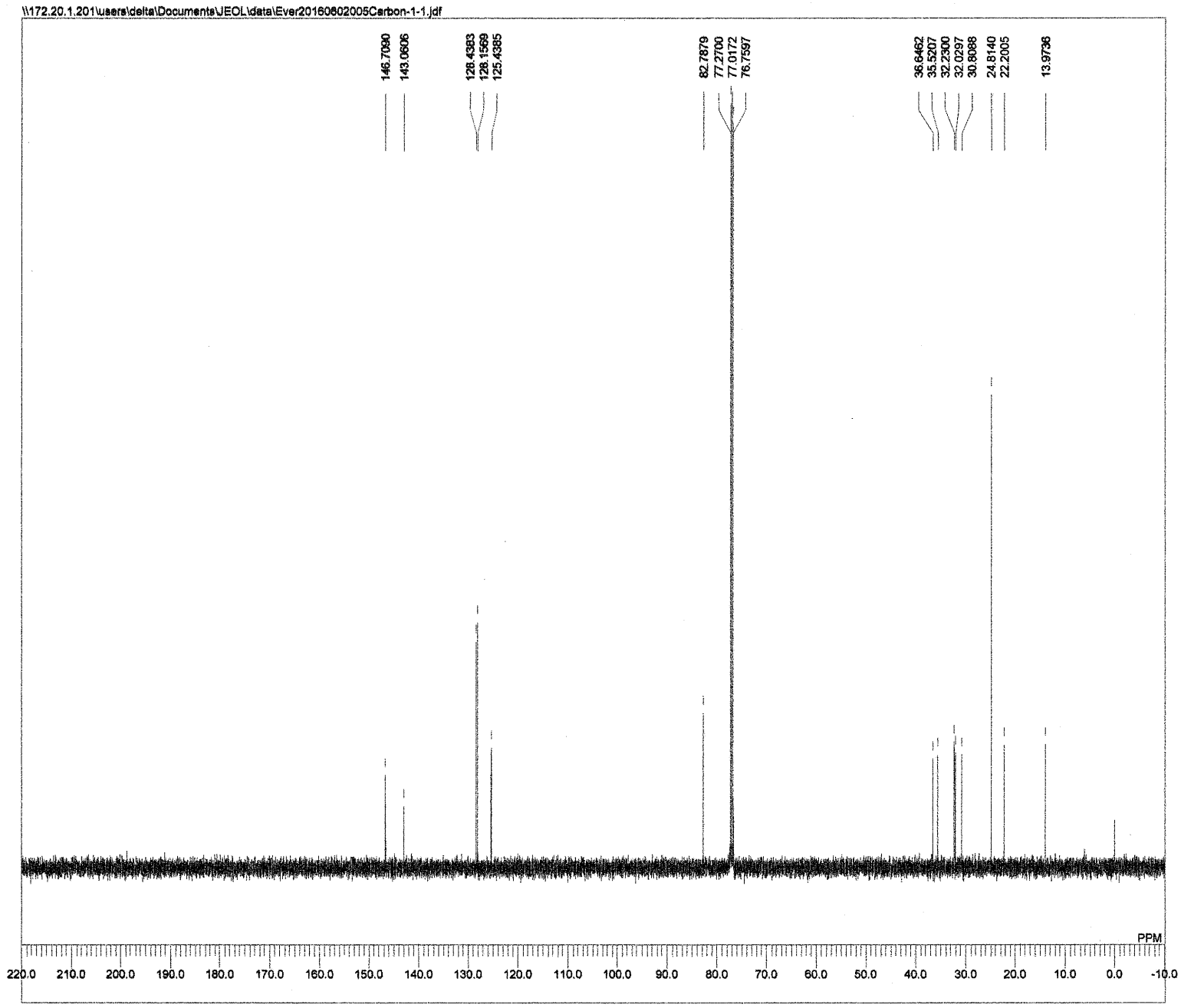


DFILE	Ever20160602005-1-1.jdf
COMNT	No.2998 PTLC F1
DATIM	2016-06-02 21:00:50
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	32767
FREQU	9384.38 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	21.6 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30

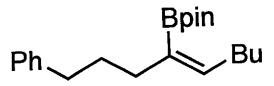


5na

No.2998 PTLC F1 Carbon



DFILE	Ever20160602005Carbon-1-1.jdf
COMNT	No.2998 PTLC F1 Carbon
DATIM	2016-06-02 21:02:20
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	65535
FREQU	39308.18 Hz
SCANS	128
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	21.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.52 Hz
RGAIN	60

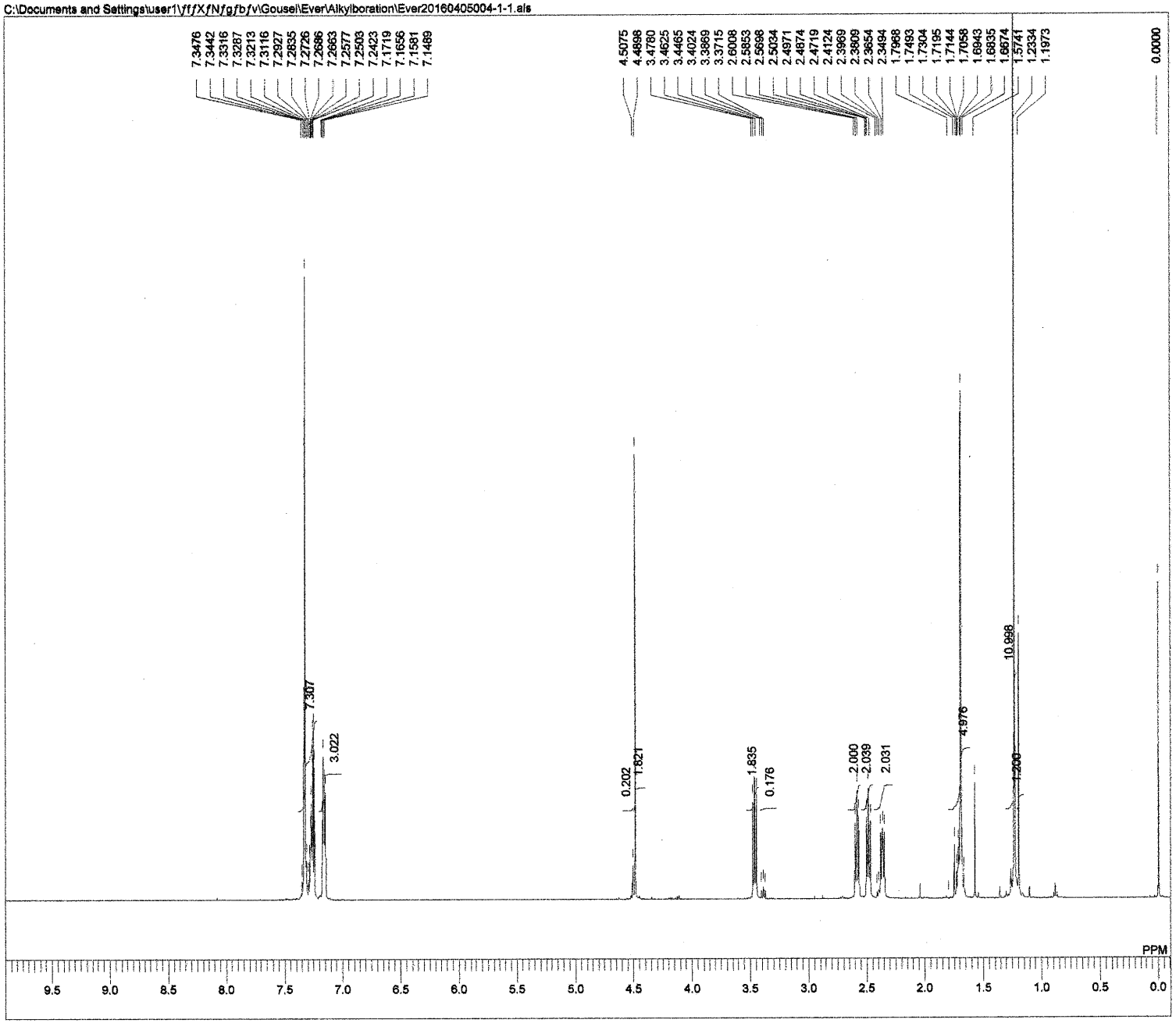


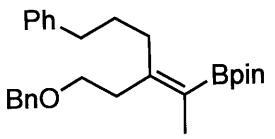
5na

No.2869

C:\Documents and Settings\user1\ÿfÿX/Nfg/fb/v\Gousei\Ever\Alkylboration\Ever20160405004-1-1.als

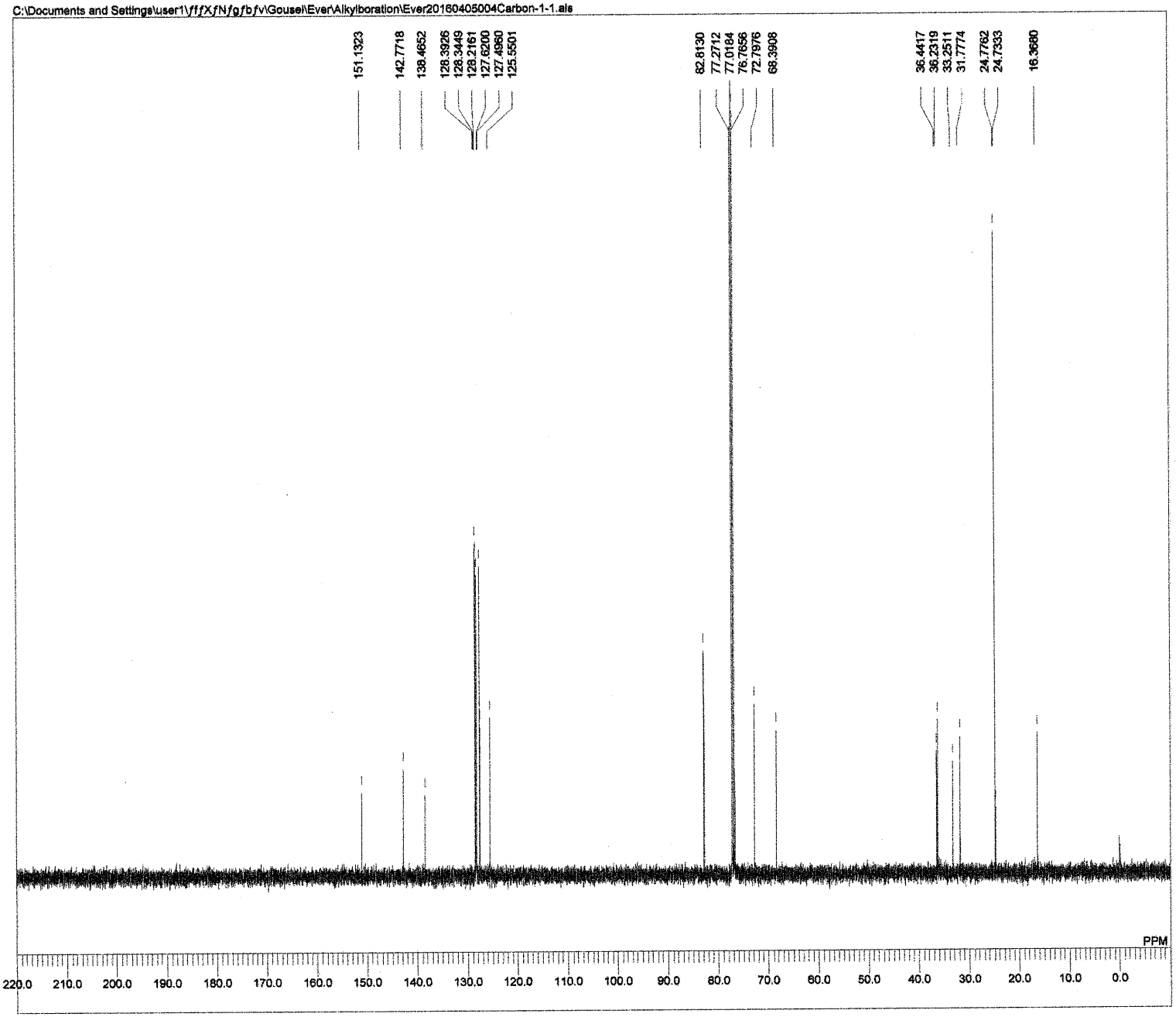
DFILE	Ever20160405004-1-1.als
COMNT	No.2869
DATIM	2016-04-05 20:29:18
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	29.8 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	28



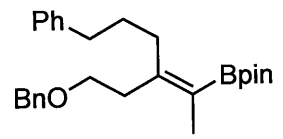


4ab

No.2869 Carbon

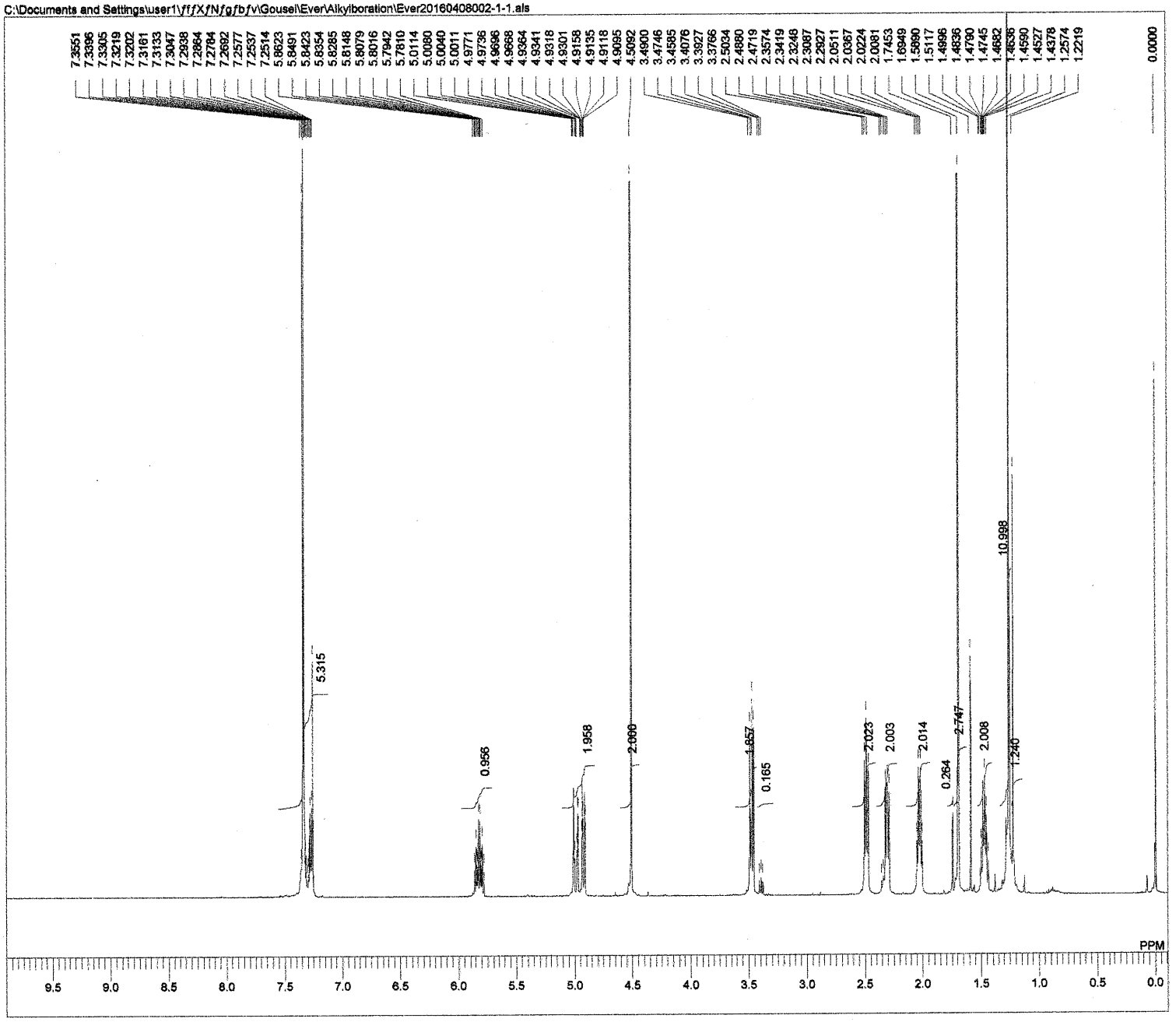


DFILE	Ever20160405004Carbon-1-1.als
COMNT	No.2869 Carbon
DATIM	2016-04-05 20:30:48
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	128
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.9 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60

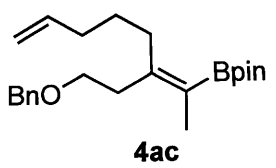


4ab

No.2877

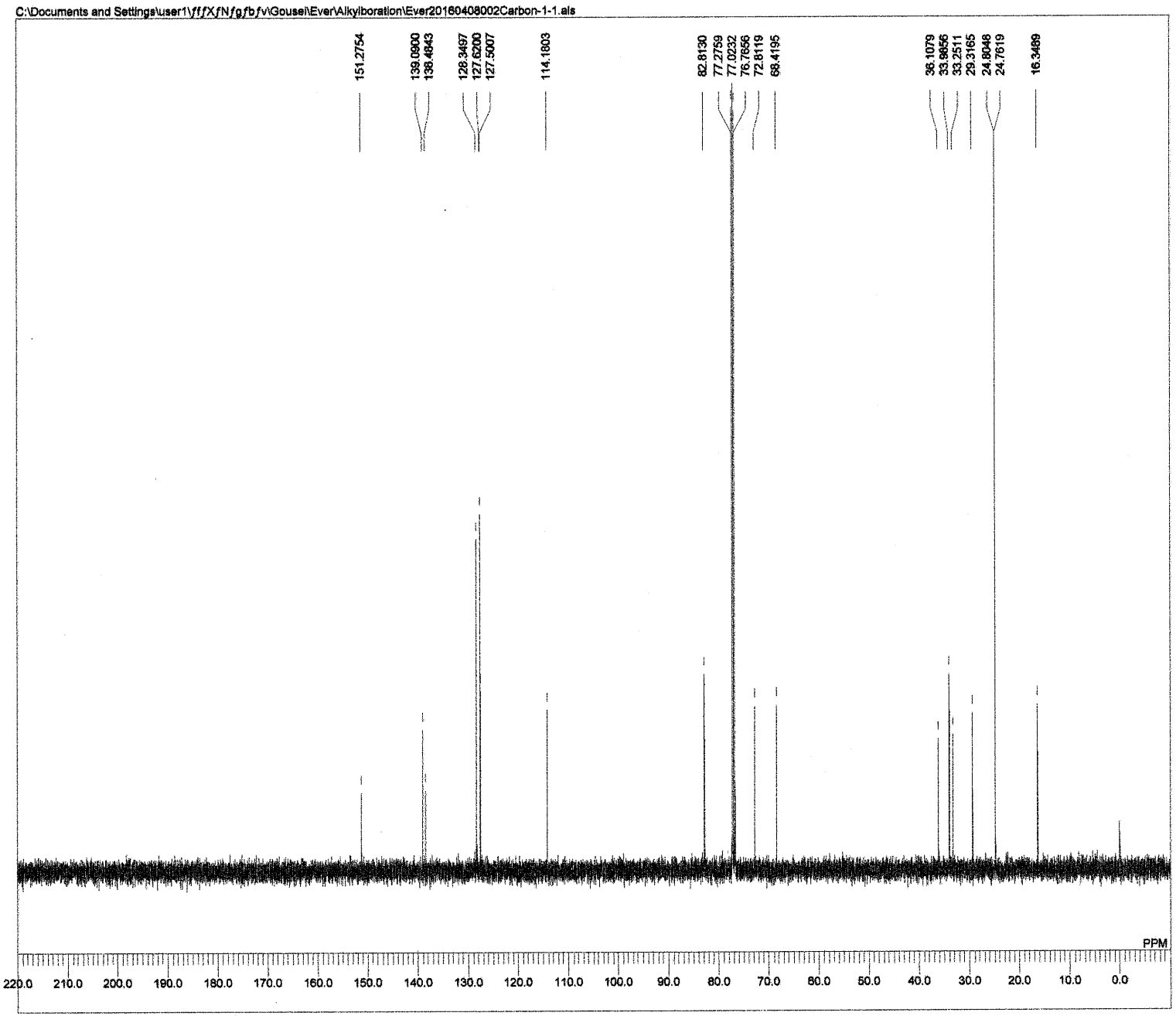


DFILE Ever20160408002-1-1.als
COMNT No.2877
DATIM 2016-04-08 15:34:39
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 33.0 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 28

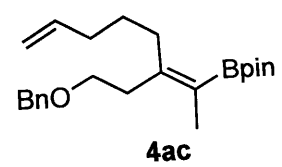


4ac

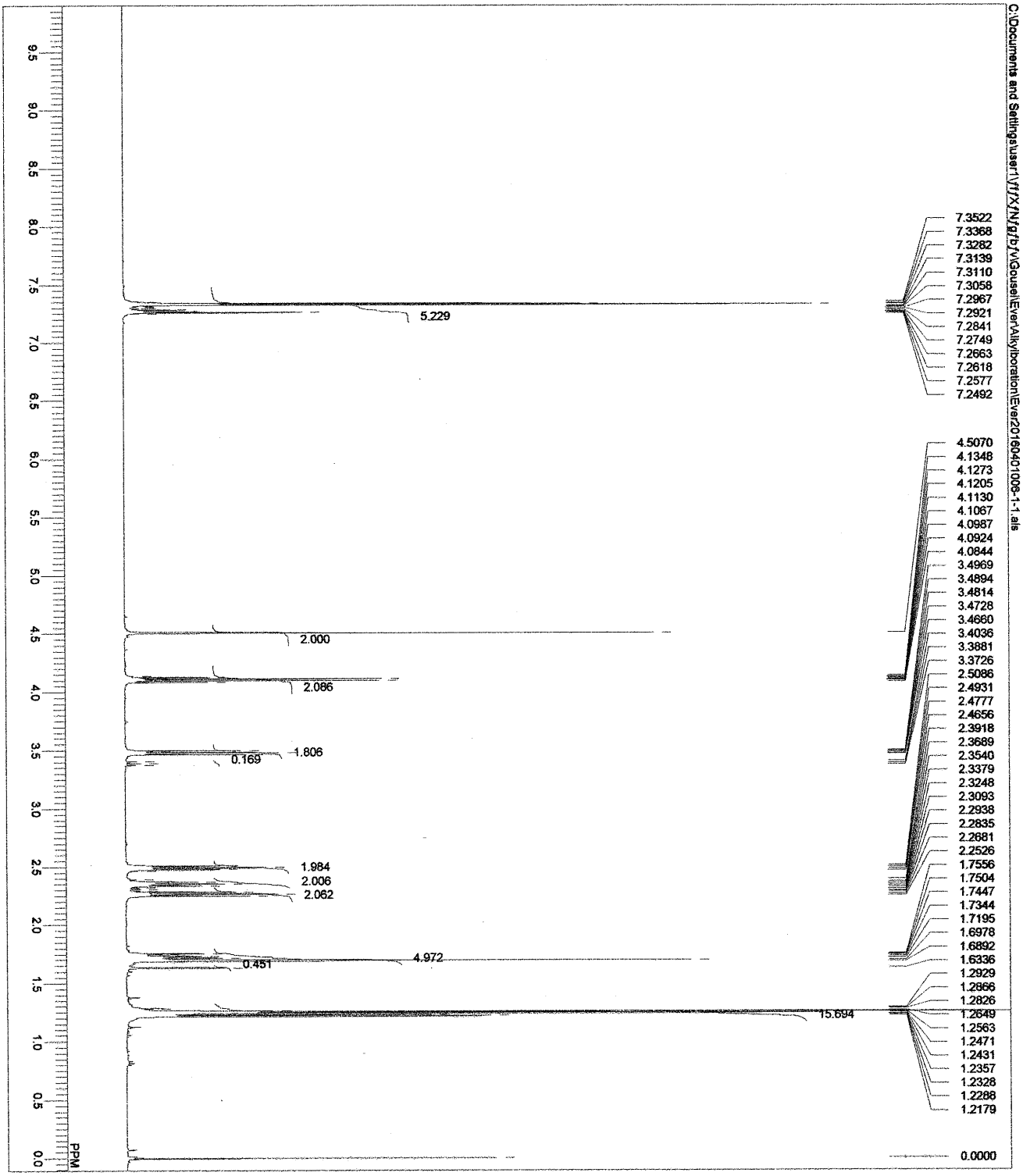
No.2877 Carbon



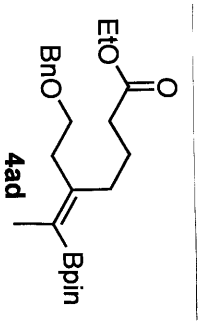
DFILE	Ever20160408002Carbon-1-1.als
COMNT	No.2877 Carbon
DATIM	2016-04-08 15:36:08
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	92
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	33.0 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60



4ac



DFILE Ever20160401006-1-1.als
COMNT No.2866 F17-21
DATIM 2016-04-01 22:48:30
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 8.01 Hz
POINT 28214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.9 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 28



4ad

No.2866 F17-21

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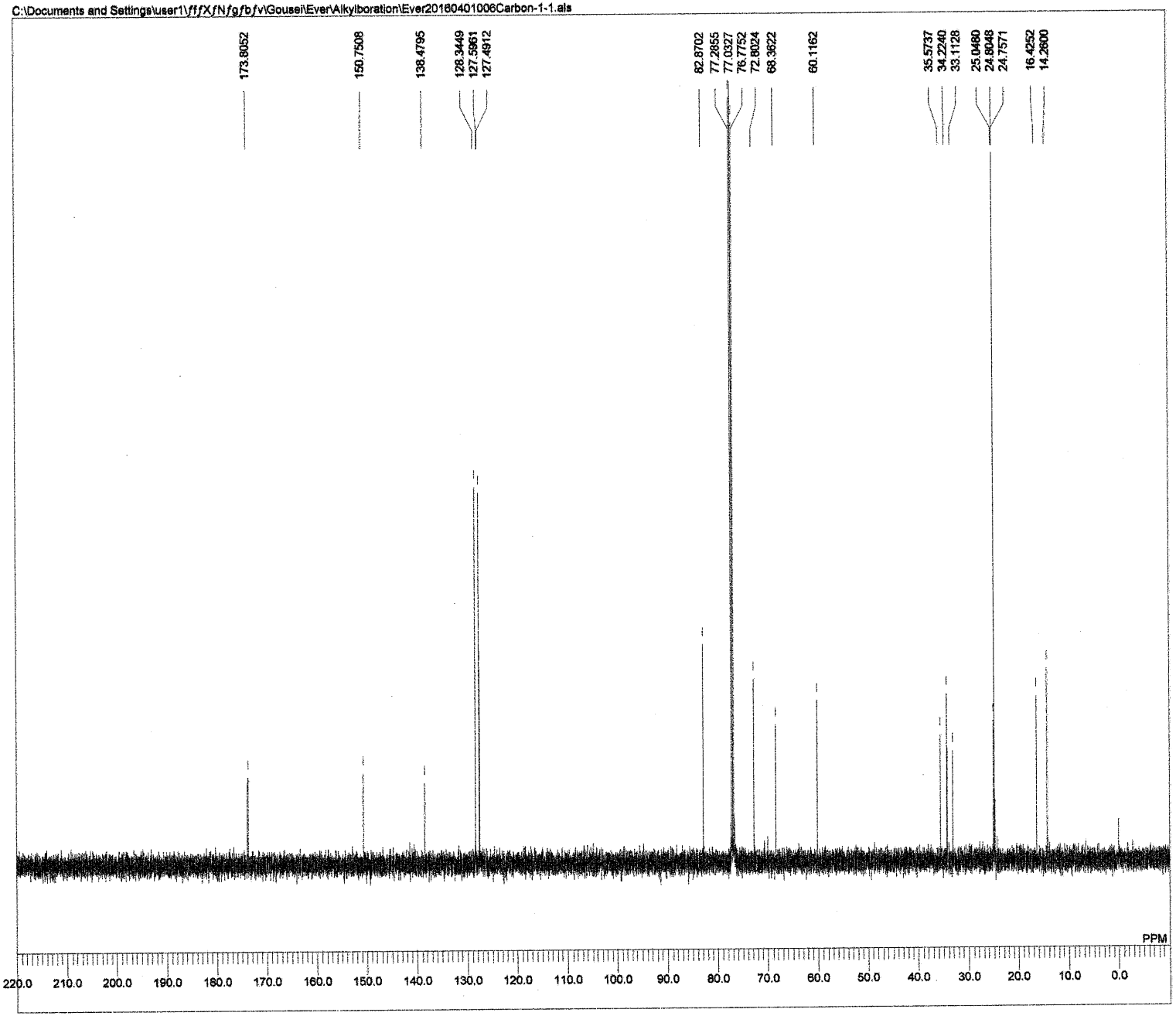
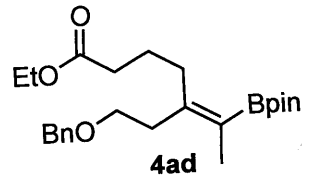


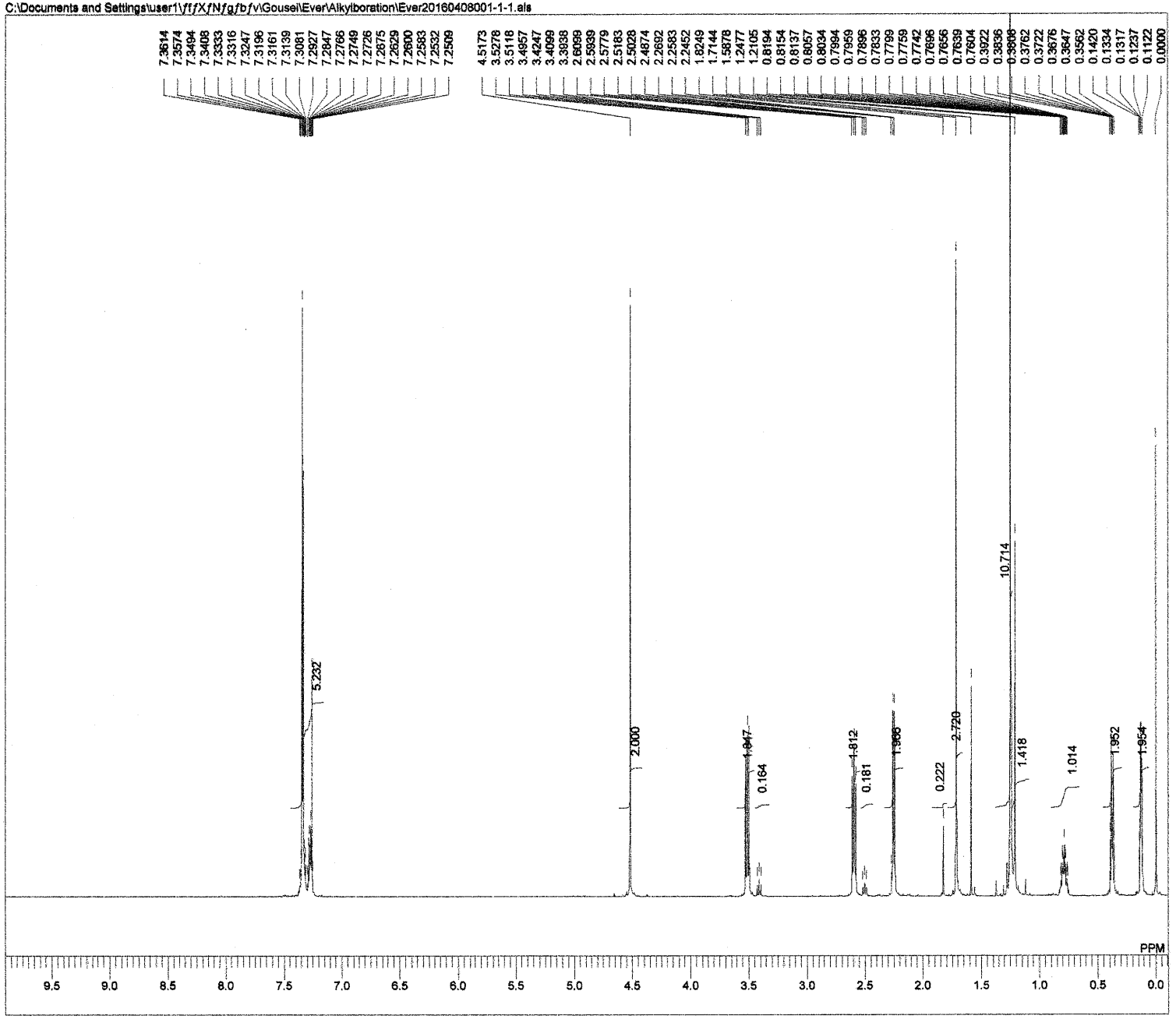
DFILE Ever20160401006Carbon-1-1.als
COMNT No.2866 F17-21
DATIM 2016-04-01 22:49:60
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 125.77 MHz
OBSET 7.87 KHz
OBFIN 4.21 Hz
POINT 52428
FREQU 31446.54 Hz
SCANS 64
ACQTM 0.8336 sec
PD 2.0000 sec
PW1 3.40 usec
IRNUC 1H
CTEMP 32.8 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.62 Hz
RGAIN 60

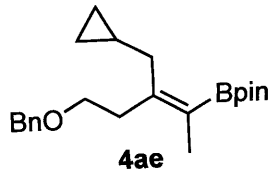


4ad

C:\Documents and Settings\user1\ÿfÿX/Nfg/bfv\Gousei\Ever\Alkylboration\Ever20160408001-1-1.als

DFILE	Ever20160408001-1-1.als
COMNT	No.2876
DATIM	2016-04-08 15:26:15
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	33.0 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	28

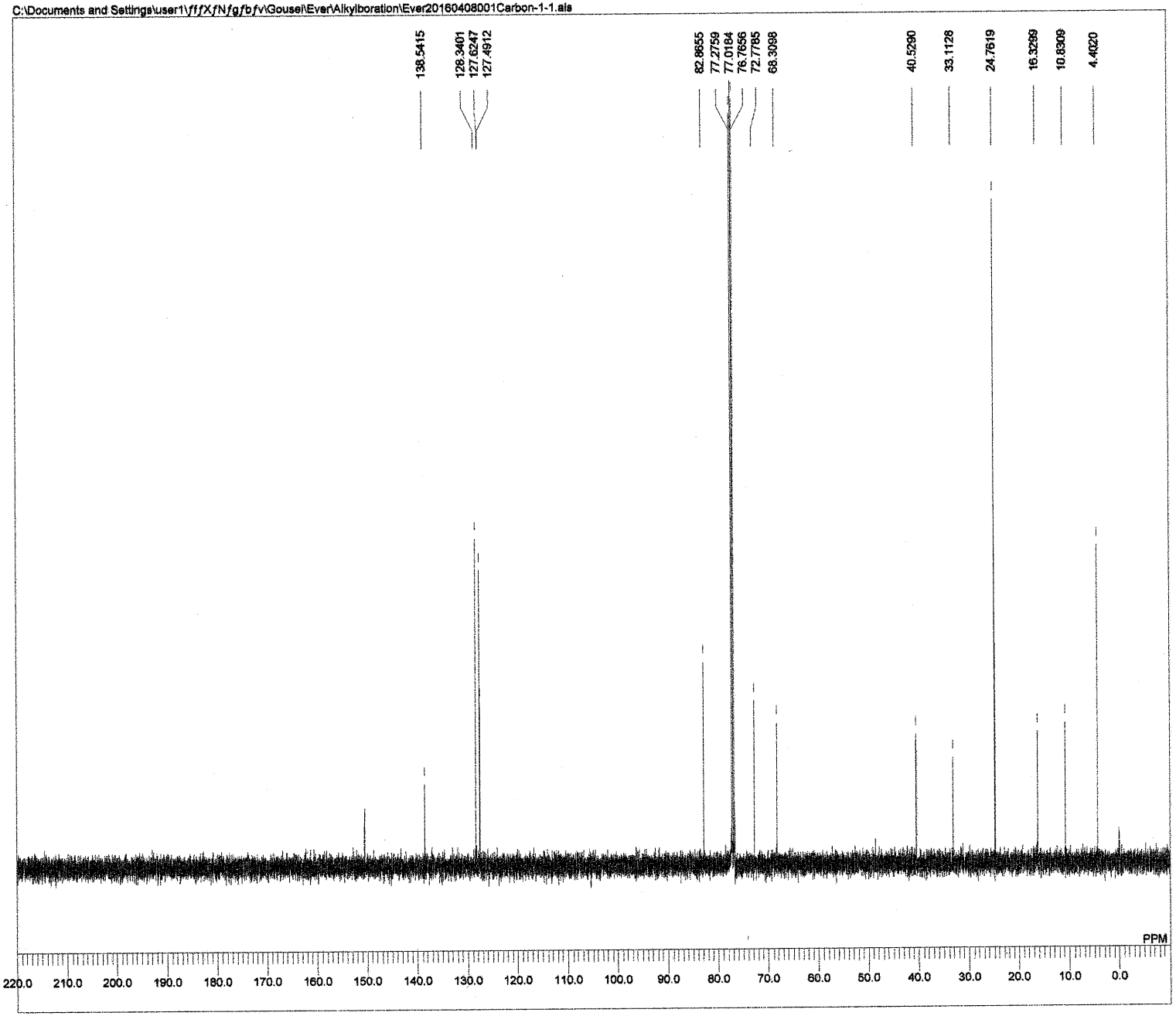




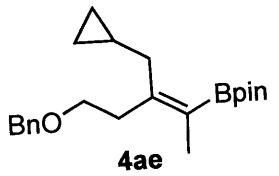
4ae

No.2876 Carbon

C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160408001Carbon-1-1.als



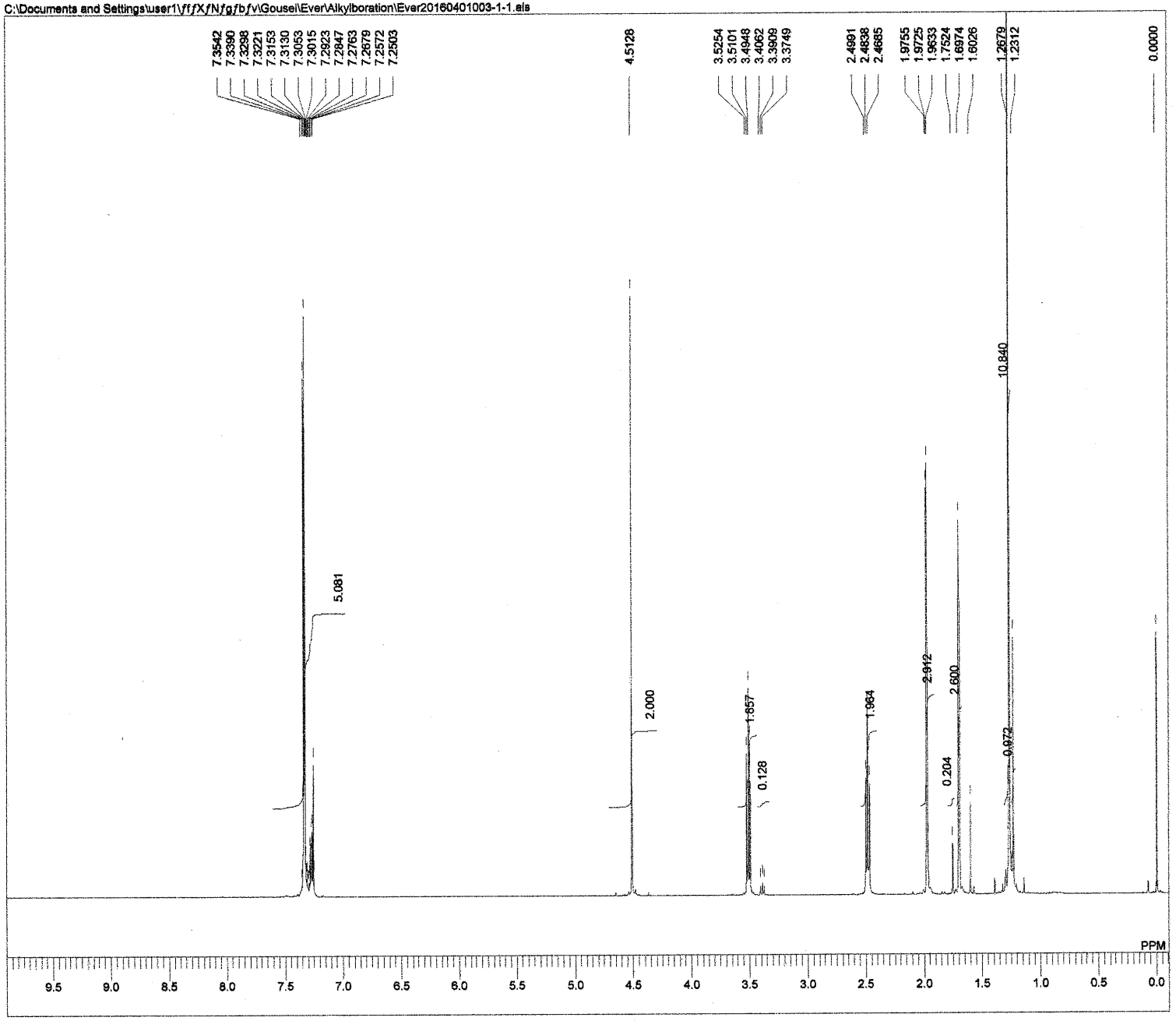
DFILE	Ever20160408001Carbon-1-1.als
COMNT	No.2876 Carbon
DATIM	2016-04-08 15:28:33
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	64
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.5 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60



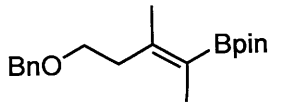
4ae

No.2868

C:\Documents and Settings\user1\ff X/N fg fb f v\Gousei\Ever\Alkylboration\Ever20160401003-1-1.als



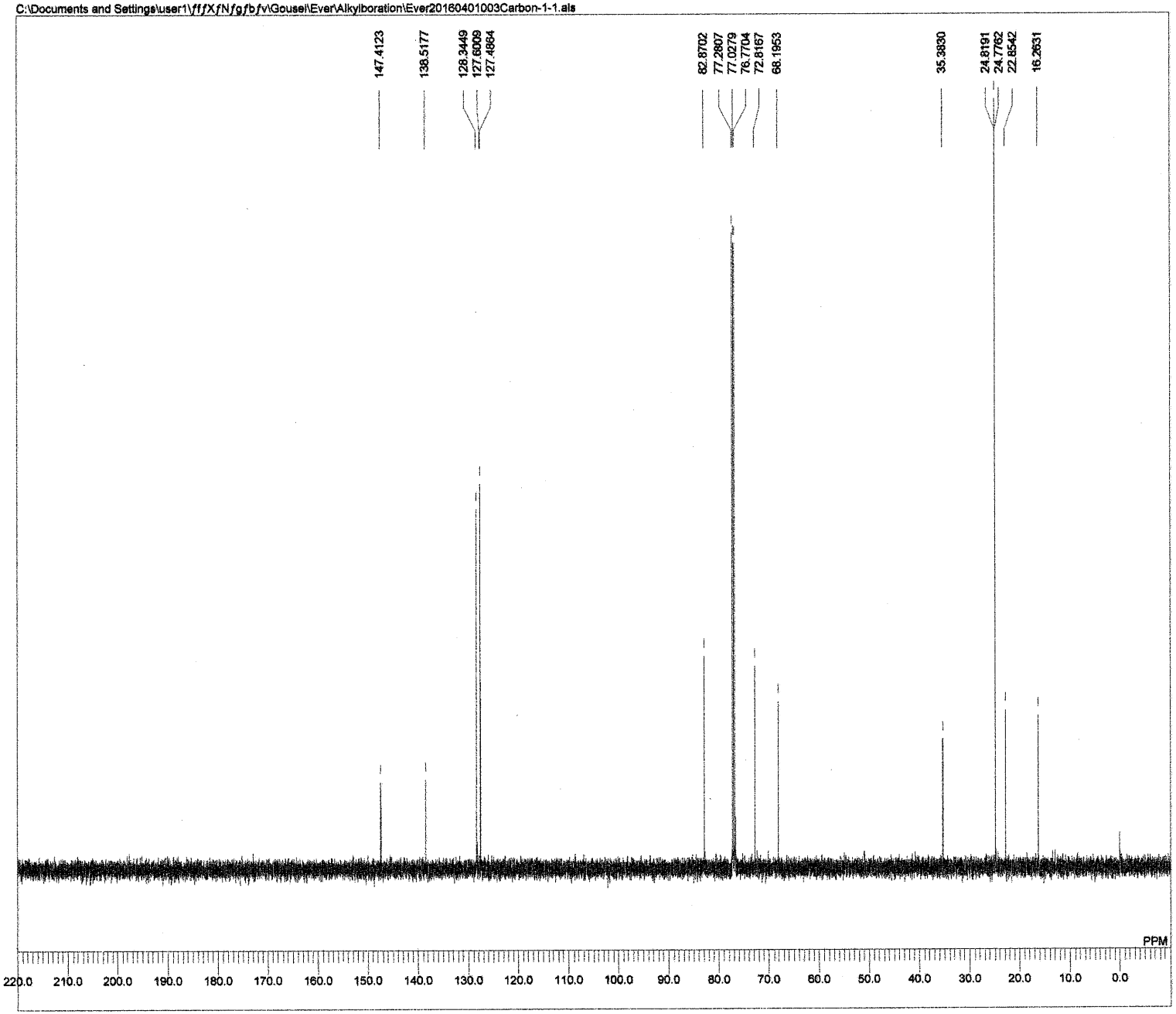
DFILE Ever20160401003-1-1.als
COMNT No.2868
DATIM 2016-04-01 15:55:24
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 10020.04 Hz
SCANS 8
ACQTM 1.3081 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 32.5 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 26



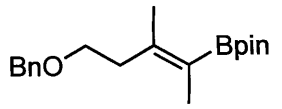
4af

No.2868 Carbon

C:\Documents and Settings\user1\ƒƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160401003Carbon-1-1.als



DFILE	Ever20160401003Carbon-1-1.als
COMNT	No.2868 Carbon
DATIM	2016-04-01 15:56:50
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	64
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	29.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60

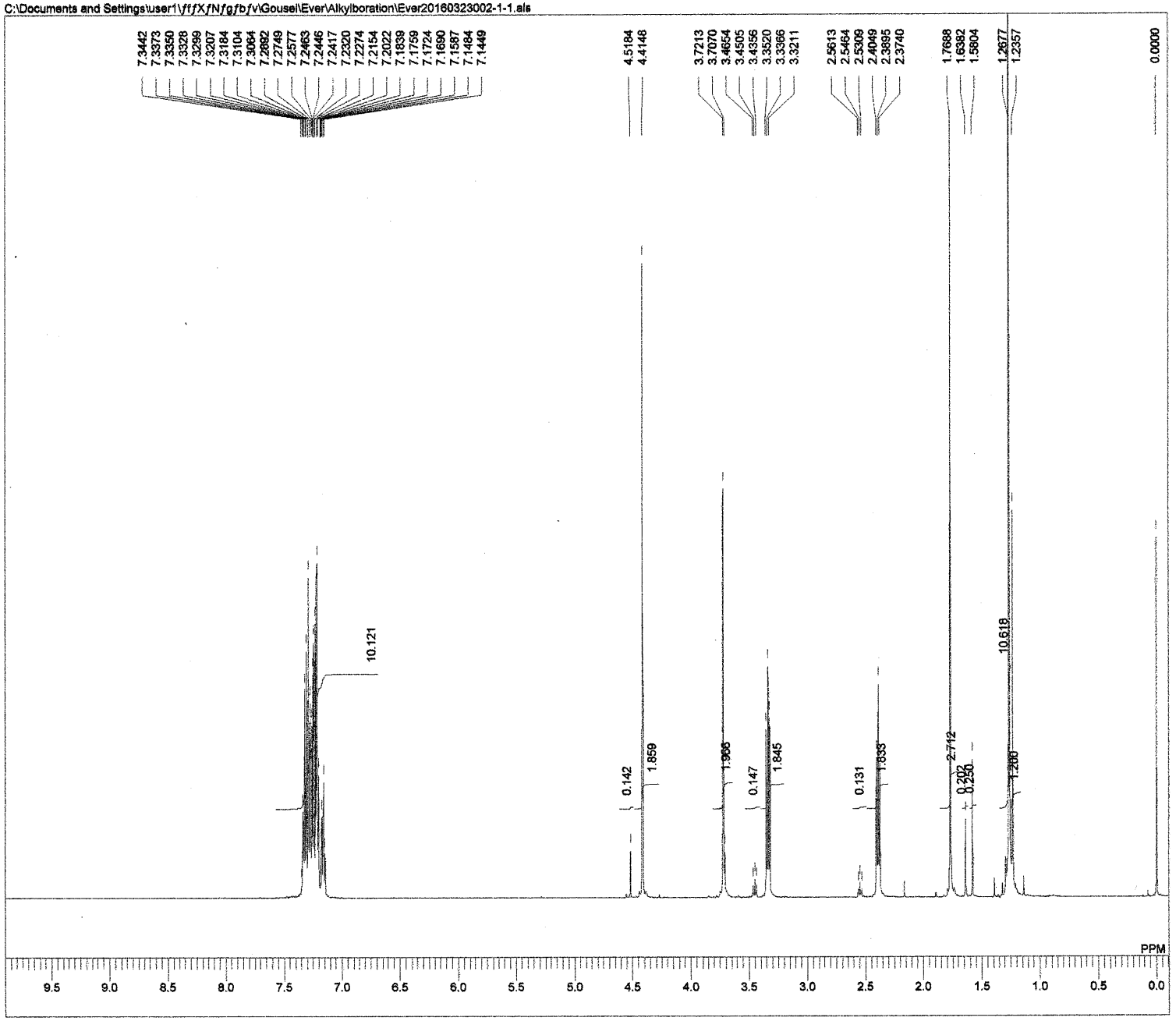


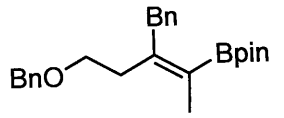
4af

No.2841

C:\Documents and Settings\user1\ff fX fN fg fb fv\Gousei\Ever\Alkylboration\Ever20160323002-1-1.als

DFILE	Ever20160323002-1-1.als
COMNT	No.2841
DATIM	2016-03-23 15:06:13
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	32.8 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	28

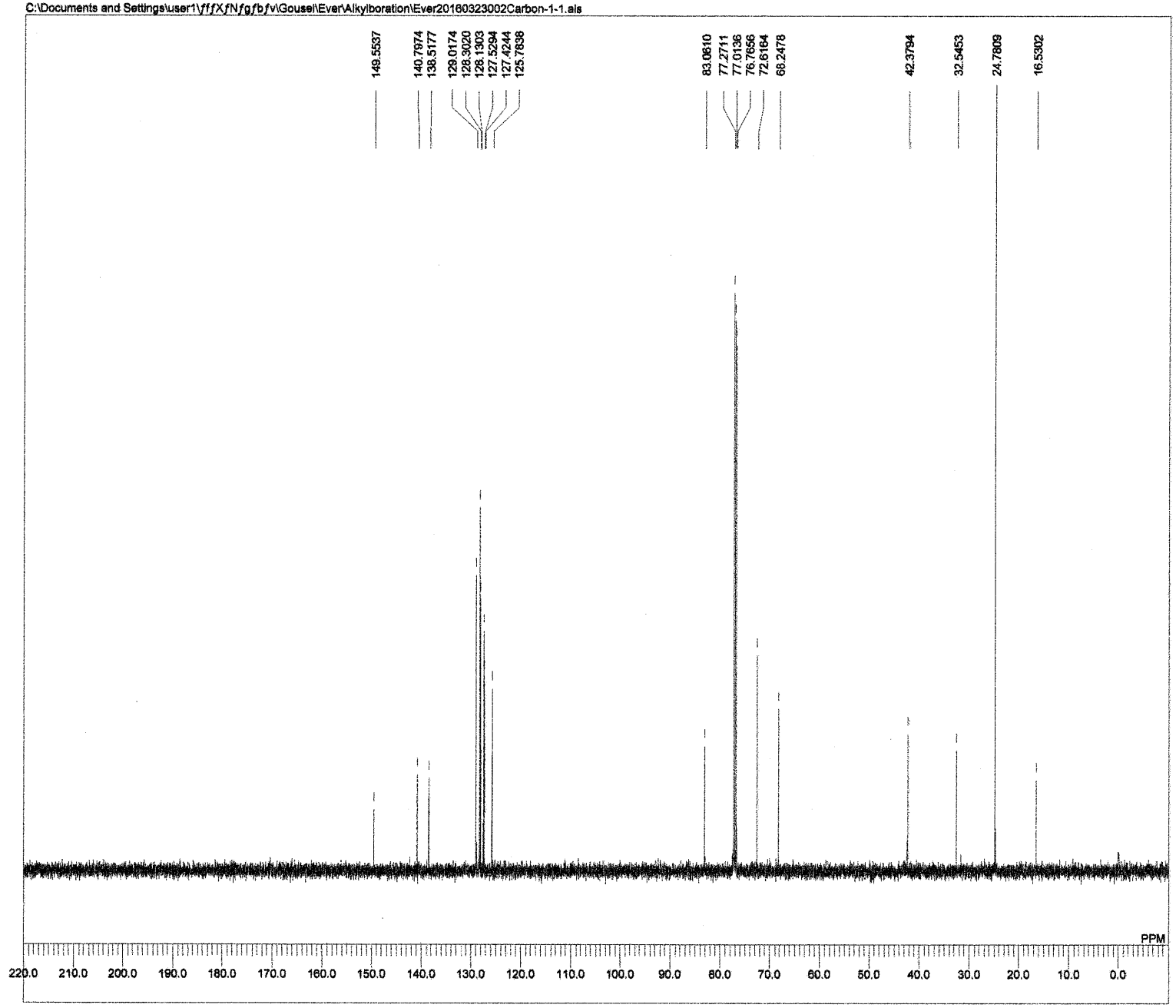




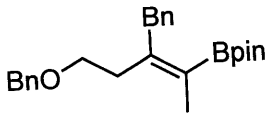
4ag

No.2841 Carbon

C:\Documents and Settings\user1\ffXfNfgfbfv\Gousei\Ever\Alkylboration\Ever20160323002Carbon-1-1.als



DFILE Ever20160323002Carbon-1-1.als
COMNT No.2841 Carbon
DATIM 2016-03-23 15:07:42
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 125.77 MHz
OBSET 7.87 KHz
OBFIN 4.21 Hz
POINT 26214
FREQU 31446.54 Hz
SCANS 100
ACQTM 0.8338 sec
PD 2.0000 sec
PW1 3.40 usec
IRNUC 1H
CTEMP 32.9 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.52 Hz
RGAIN 60

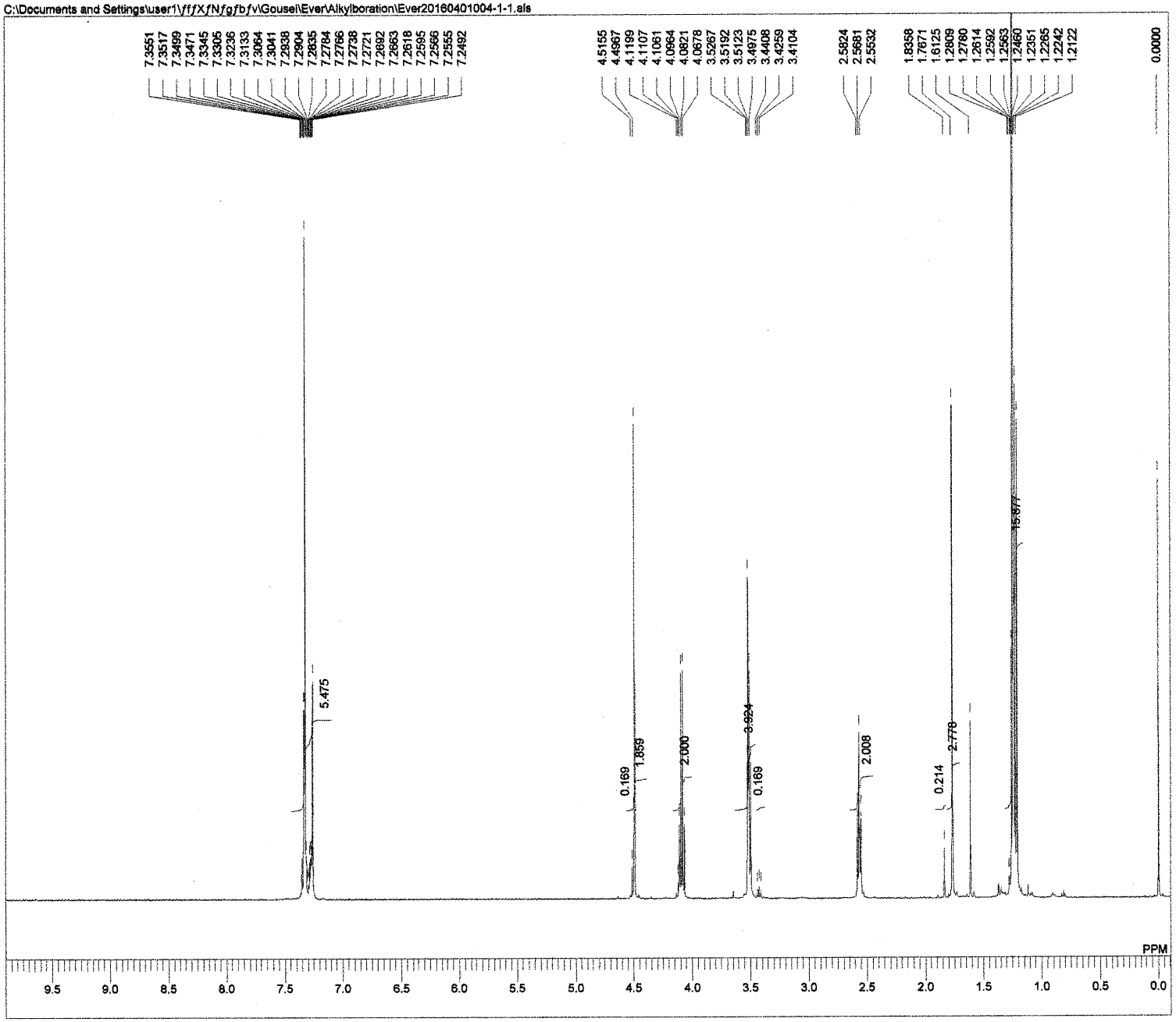


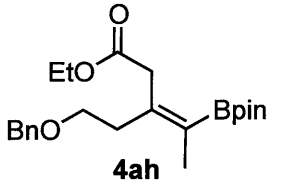
4ag

No.2852 GPC

C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160401004-1-1.als

DFILE	Ever20160401004-1-1.als
COMNT	No.2852 GPC
DATIM	2016-04-01 22:34:46
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	32.5 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30

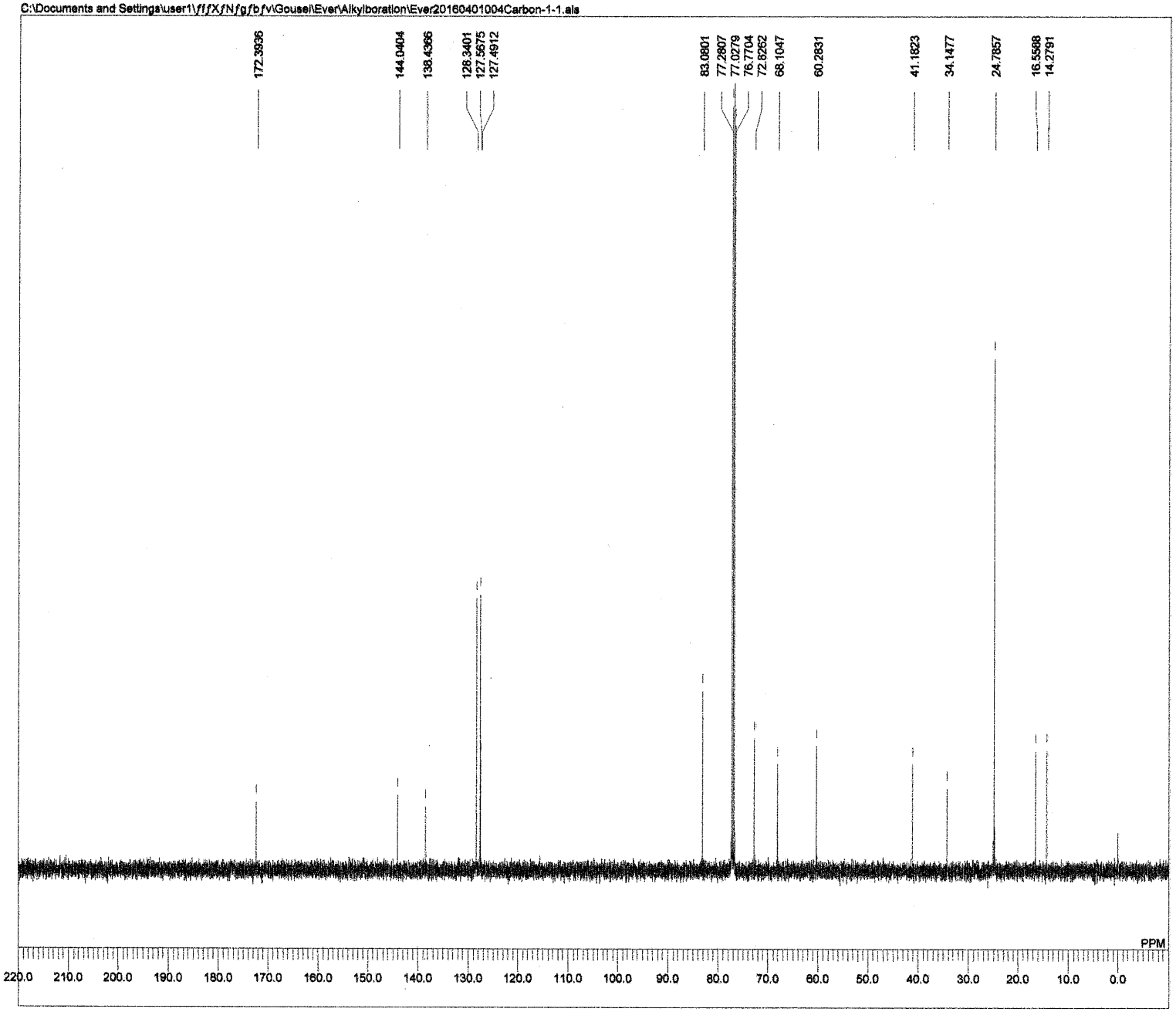




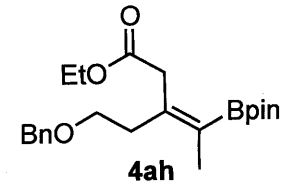
4ah

No.2852 GPC Carbon

C:\Documents and Settings\user1\ff/XfNfgfbfv\Gousel\Ever\Alkylboration\Ever20160401004Carbon-1-1.als



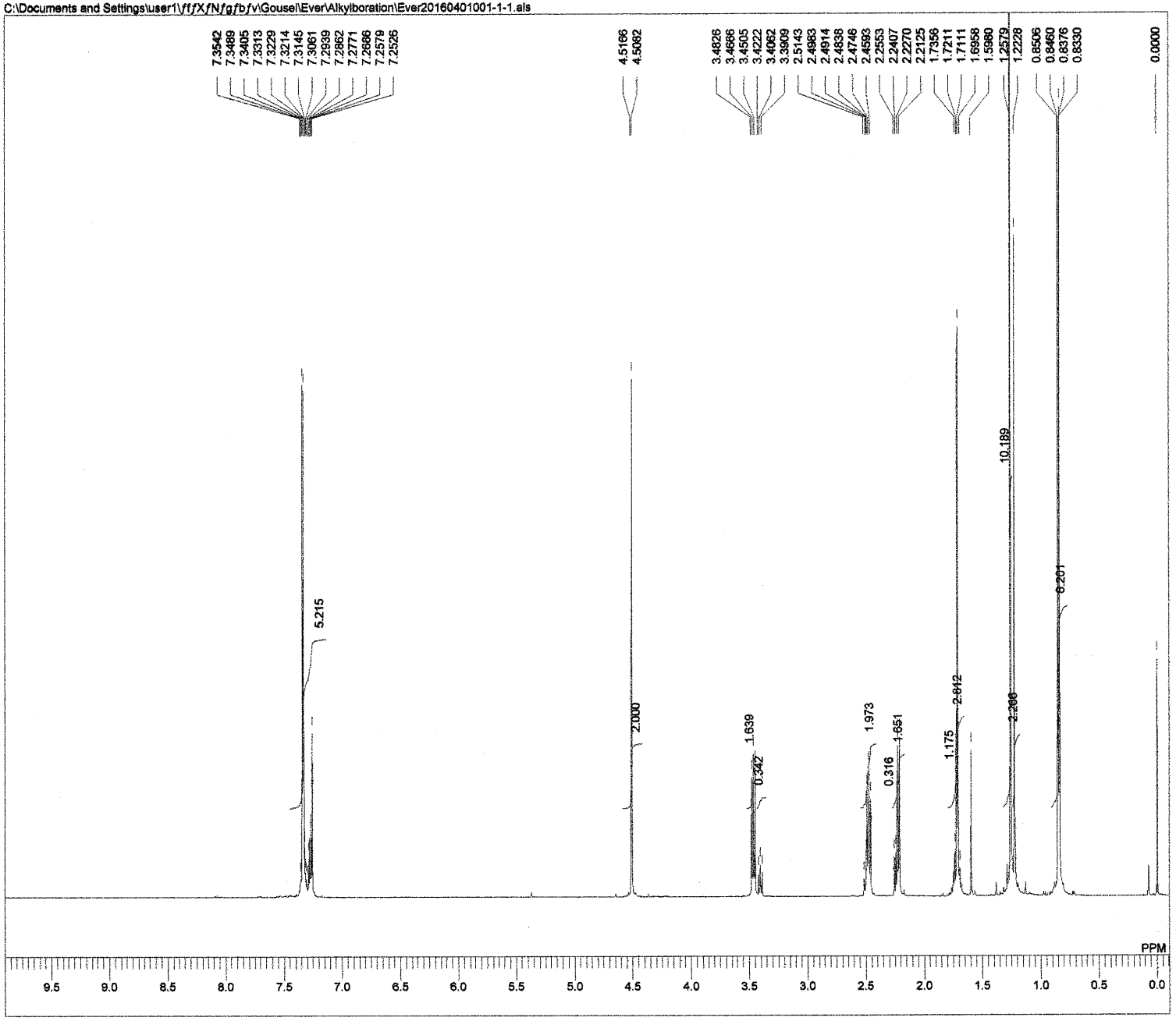
DFILE	Ever20160401004Carbon-1-1.als
COMNT	No.2852 GPC Carbon
DATIM	2016-04-01 22:36:16
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	128
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	32.3 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60

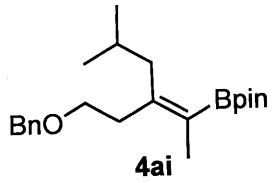


4ah

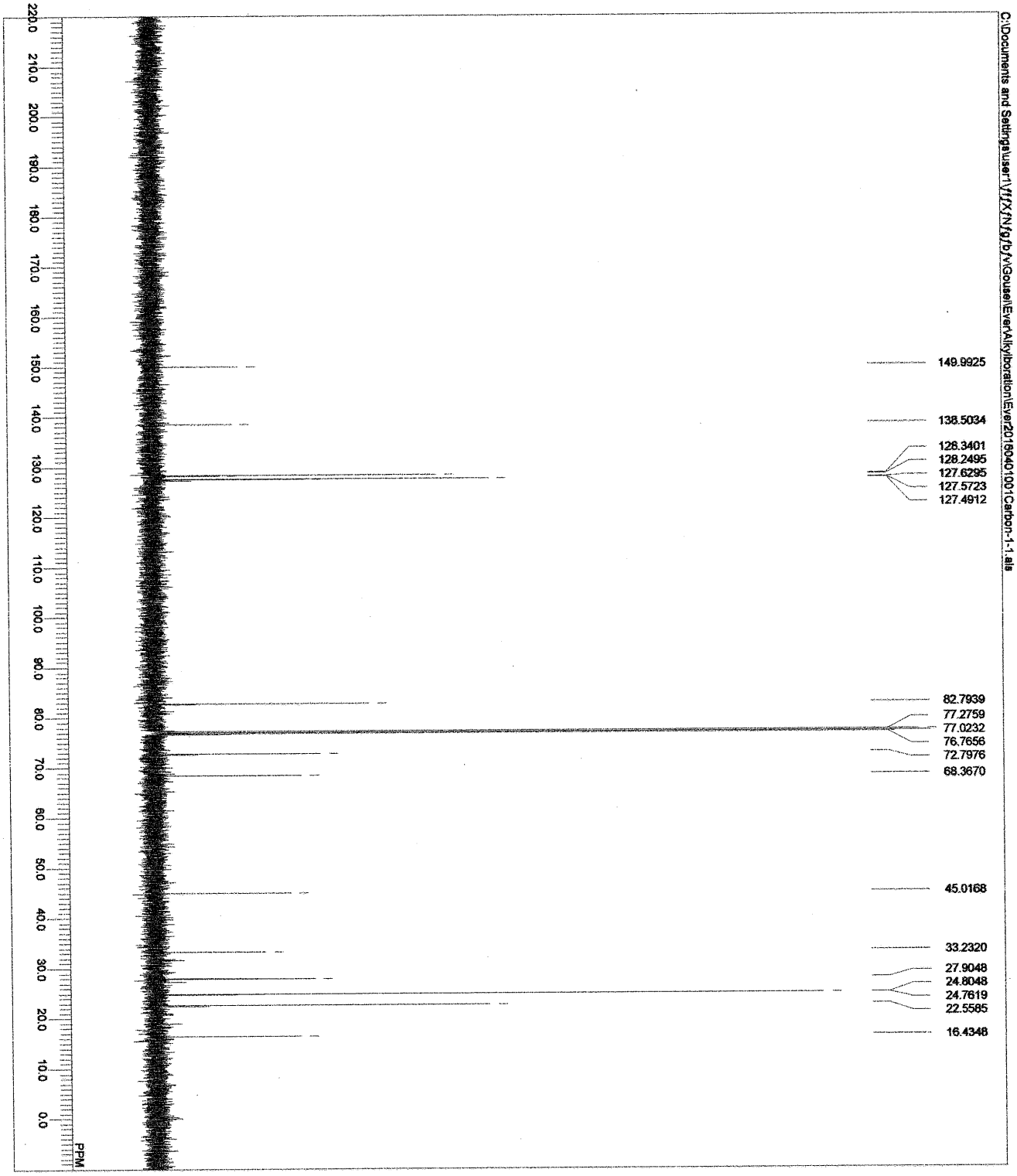
C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160401001-1-1.als

DFILE	Ever20160401001-1-1.als
COMNT	No.2865 F5-7
DATIM	2016-04-01 15:45:13
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	10020.04 Hz
SCANS	8
ACQTM	1.3081 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	32.8 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	26

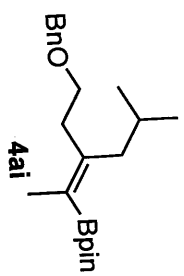




4ai



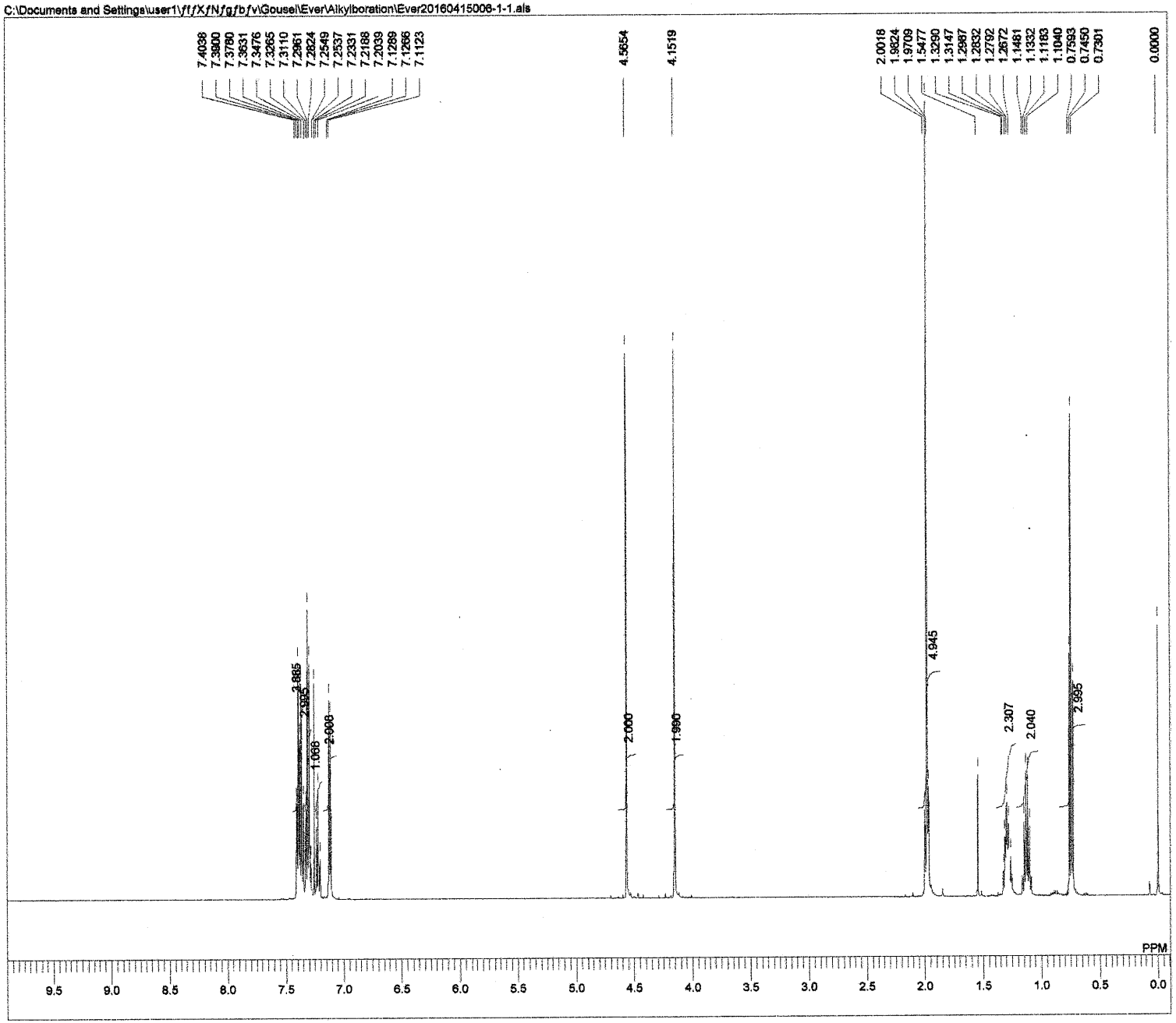
DFILE Ever20160401001Carbon-1-1.als
COMNT No.2865 F5-7 Carbon
DATIM 2016-04-01 15:46:38
OBNUC 13C
EXMOD carbon.jxp
OBFRQ 125.77 MHz
OBSET 7.87 KHz
OBFIN 4.21 Hz
POINT 52428
FREQU 31446.54 Hz
SCANS 56
ACQTM 0.8338 sec
PD 2.0000 sec
PW1 3.40 usec
IRNUC 1H
CTEMP 32.4 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.62 Hz
RGAIN 60



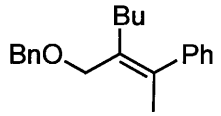
4ai

No.2892

C:\Documents and Settings\user1\ƒtƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160415006-1-1.als



DFILE Ever20160415006-1-1.als
COMNT No.2892
DATIM 2016-04-15 21:16:27
OBNUC 1H
EXMOD proton.jxp
OBFRQ 500.16 MHz
OBSET 2.41 KHz
OBFIN 6.01 Hz
POINT 26214
FREQU 7507.51 Hz
SCANS 8
ACQTM 1.7459 sec
PD 5.0000 sec
PW1 5.55 usec
IRNUC 1H
CTEMP 21.2 c
SLVNT CDCL3
EXREF 0.00 ppm
BF 0.12 Hz
RGAIN 28



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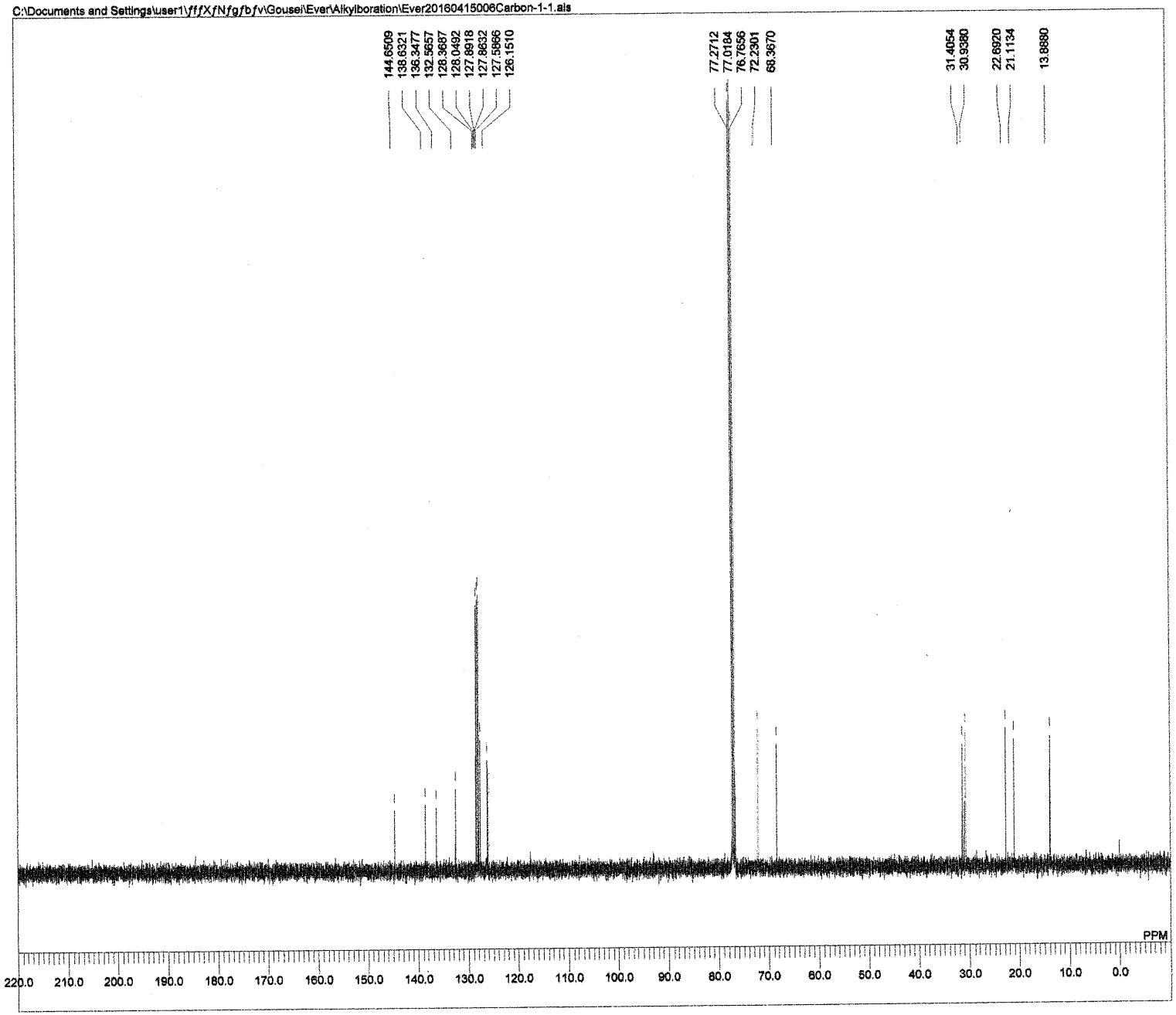
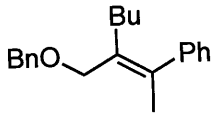
No.2892 Carbon

C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160415006Carbon-1-1.als



DFILE	Ever20160415006Carbon-1-1.als
COMNT	No.2892 Carbon
DATIM	2016-04-15 21:17:57
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	128
ACQTM	0.8336 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	21.5 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.62 Hz
RGAIN	60

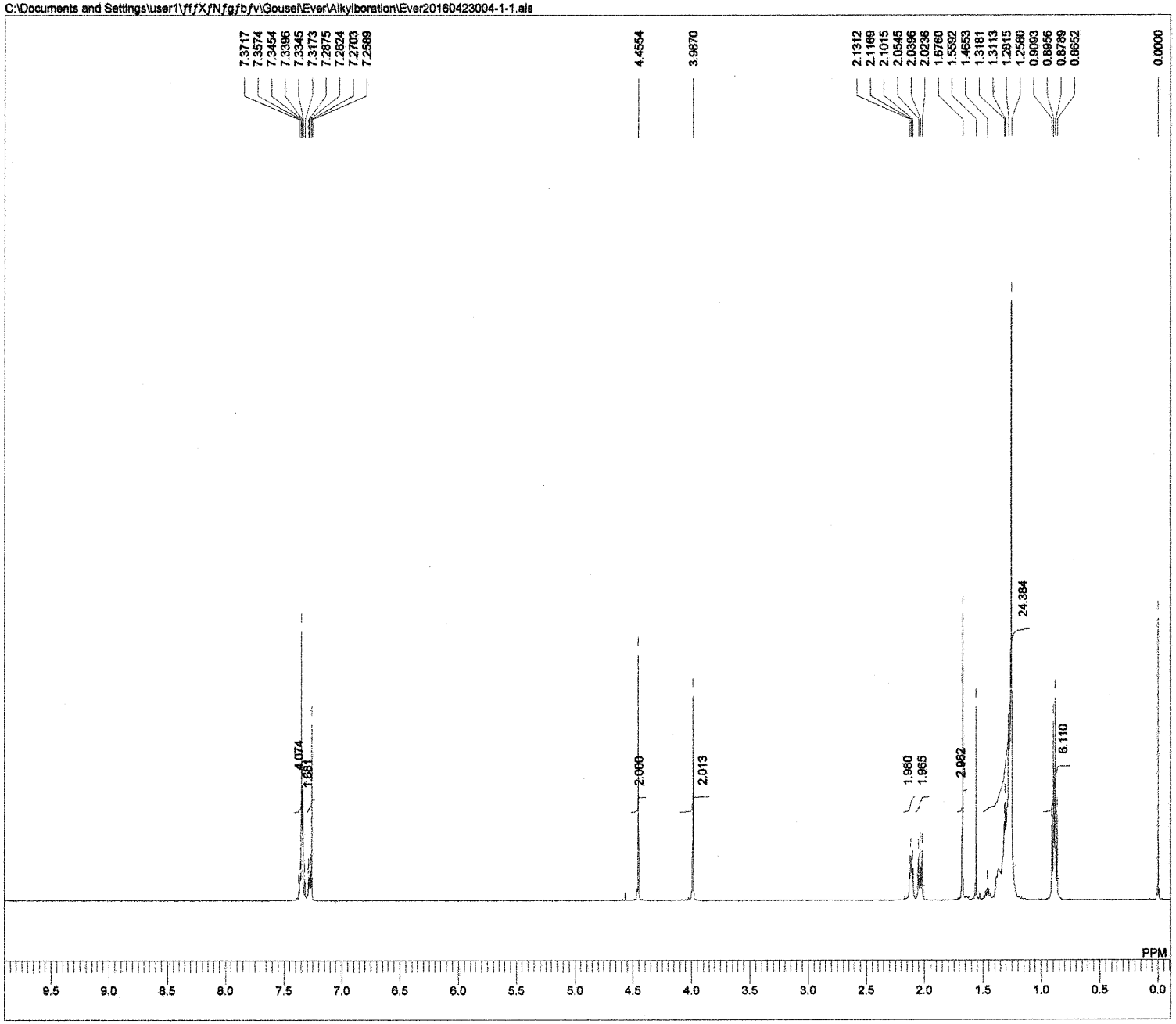


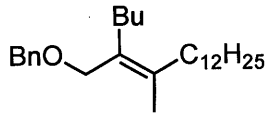
6

No.2927

C:\Documents and Settings\user1\ff X fNfg fb fv\Gousei\Ever\Alkylboration\Ever20160423004-1-1.als

DFILE	Ever20160423004-1-1.als
COMNT	No.2927
DATIM	2016-04-23 19:14:50
OBNUC	1H
EXMOD	proton.jxp
OBFRQ	500.16 MHz
OBSET	2.41 KHz
OBFIN	6.01 Hz
POINT	26214
FREQU	7507.51 Hz
SCANS	8
ACQTM	1.7459 sec
PD	5.0000 sec
PW1	5.55 usec
IRNUC	1H
CTEMP	21.2 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	30

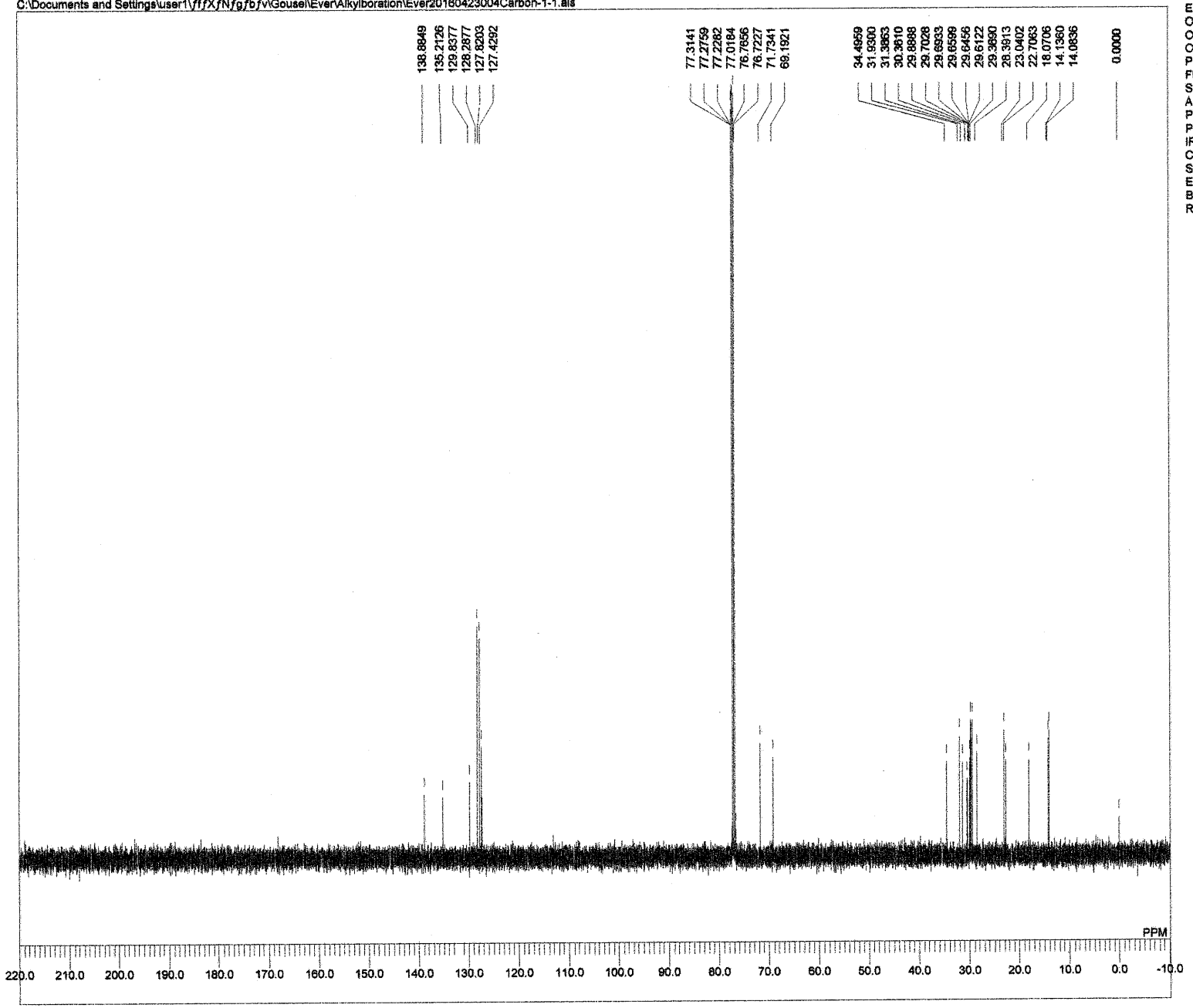




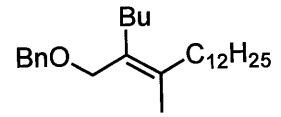
7

No.2927 Carbon

C:\Documents and Settings\user1\ƒƒXƒNƒgƒbƒv\Gousei\Ever\Alkylboration\Ever20160423004Carbon-1-1.als



DFILE	Ever20160423004Carbon-1-1.als
COMNT	No.2927 Carbon
DATIM	2016-04-23 19:18:41
OBNUC	13C
EXMOD	carbon.jxp
OBFRQ	125.77 MHz
OBSET	7.87 KHz
OBFIN	4.21 Hz
POINT	52428
FREQU	31446.54 Hz
SCANS	128
ACQTM	0.8338 sec
PD	2.0000 sec
PW1	3.40 usec
IRNUC	1H
CTEMP	21.7 c
SLVNT	CDCL3
EXREF	0.00 ppm
BF	0.12 Hz
RGAIN	60



7