Fluorous TBAF: A Convenient and Selective Reagent for Fluoride-Mediated Deprotections

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SUPPORTING INFORMATION

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1. General methods.

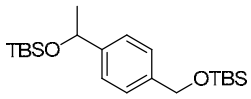
All reactions were carried out under argon or nitrogen atmosphere. All reagents and solvents were used as received except THF and Et_2O which were distilled from sodium/benzophenone. The reactions were monitored with the aid of thin-layer chromatography (TLC) using 0.25 mm precoated silica gel plates (visualization was carried out with UV light and aqueous ceric ammonium molybdate solution or potassium permanganate stain) and by GC/MS. Flash column chromatography was performed with the indicated solvents on silica gel 60 (particle size 0.040-0.063 mm). Fluorous solid-phase extraction (F-SPE) was performed on cartridges loaded with fluorous silica gel; in a typical purification, the sample was charged on the cartridge and eluted first with 67% aqueous MeOH (fluorophobic solvent for eluting non-fluorinated compounds), then with MeOH (fluorophilic solvent for eluting fluorinated compounds). Chemical shifts of NMR spectra are given in ppm (δ), referenced to the residual proton resonances of the solvents or fluorotrichloromethane in ^{19}F NMR experiments. Coupling constants (*J*) are given in Hertz (Hz). The letters m, s, d, t, and q stand for multiplet, singlet, doublet, triplet, and quartet, respectively. The letters br indicate that the signal is broad.

GC analyses were performed using a 19091S HP-5MS (30m-0.25mm-0.25μm) CG column or a Valcobond VB-5 (30 m-0.25 mm-0.25 μm) CG column (temperature ramp: 40 to 250 ºC, 25 min; 250 ºC, 5 min). HPLC analyses were performed using a C18 column (5 μm, 110 Å).

All microwave experiments were carried out on sealed vials using an Initiator™ 2.0, by Biotage. The equipment contains an IR probe in order to control the internal temperature of the reaction mixture. The solutions were pre-stirred before the irradiation was started. The absorbance of the solvent was set as “normal” and the reaction time was initiated as soon the system reached the input temperature. At the end of the irradiation, the mixture was cooled to room temperature with an air flow, and the pressure was liberated with a needle before removing the vial cap.

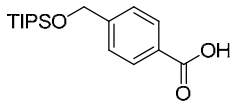
2. Preparation of silylated substrates.

2.1. Synthesis of 1-(*tert*-butyldimethylsilyloxymethyl)-4-(1'-(*tert*-butyldimethylsilyloxy)ethyl)benzene (6).



Imidazole (1.089 g, 16 mmol) and TBSCl (1.206 g, 8 mmol) were added to a solution of 4-(1'-hydroxyethyl)benzyl alcohol (**7**)[1] (304 mg, 2 mmol) in DMF (20 mL). The reaction was stirred at room temperature for 14 h, and then quenched with sat. aq. NH_4Cl. The phases were separated, the aqueous layer was extracted several times with Et_2O and the combined organic layers were dried over Na_2SO_4. The solvent was removed under reduced pressure and the residue was purified by column chromatography to afford 580 mg of the title compound as a colorless oil (76% yield). R_f 0.40 (hexane/EtOAc, 4:1). ^{1}H NMR (300 MHz, $CDCl_3$) δ –0.09 (s, 3H), –0.09 (s, 3H), 0.04-0.09 (s, 6H), 0.85 (s, 9H), 0.90 (s, 9H), 1.34 (d, J = 6.6 Hz, 3H), 4.68 (s, 2H), 4.81 (q, J = 6.3 Hz, 1H), 7.19-7.25 (m, 4H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ –5.2, –4.9, –4.8, 18.3, 18.4, 25.9, 26.0, 27.3, 64.9, 70.7, 125.1, 125.9, 139.7, 145.6. HRMS (FAB): Calcd for $C_{21}H_{40}O_2Si_2$ $[M]^+$: 380.2567; found: 380.2546.

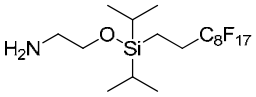
2.2. Synthesis of 4-(triisopropylsilyloxymethyl)benzoic acid (10).



DMSO (1.2 mL, 17 mmol) was added to a solution of $(COCl)_2$ (2M in CH_2Cl_2, 4.25 mL, 8.5 mmol) in CH_2Cl_2 (20 mL) at –78 ºC. After stirring for 10 min, a solution of (4-triisopropylsilyloxymethylphenyl)methanol (**22**)[2] (0.5 g, 1.7 mmol) in CH_2Cl_2 (17 mL) was added. The reaction was stirred for 30 min at –60 ºC, and then Et_3N (3.5 mL, 25.5 mmol) was added. The mixture was warmed up to room temperature and concentrated under reduced pressure. The residue was dissolved in hexane, filtered through a short pad of celite and concentrated under reduced pressure to afford 430 mg of the crude aldehyde. A 1M aq. solution of NaH_2PO_4 (3.0 mL, 3.0

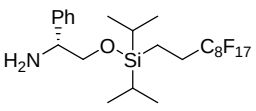
mmol) was added to a solution of the aldehyde in MeCN (6 mL). After cooling to 0 ºC, a 1M aq. solution of $NaClO_2$ (2.25 mL, 2.25 mmol) and H_2O_2 (27%, 0.23 mL, 1.8 mmol) were added. The reaction was stirred at room temperature for 4 h and then quenched with sat. aq. $Na_2S_2O_3$. 1M HCl was added until pH=1, and the aqueous layer was extracted with EtOAc. The combined organic layers were dried over Na_2SO_4 and the solvent was removed under reduced pressure. The title compound was obtained as a white solid and used without further purification (380 mg, 72% yield). mp: 110-112 ºC. ^{1}H NMR (300 MHz, $CDCl_3$) δ 1.09-1.28 (m, 21H), 4.93 (s, 2H), 7.48 (d, *J* = 8.4 Hz, 2H), 8.12 (d, *J* = 8.4 Hz, 2H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ 12.0, 18.0, 64.6, 125.4, 127.8, 130.2, 148.0, 172.5. HRMS (FAB): Calcd for $C_{17}H_{29}O_3Si$ $[M+1]^+$: 309.1886; found: 309.1882.

2.3. Synthesis of *O*-^{F}TIPS-ethanolamine (14).



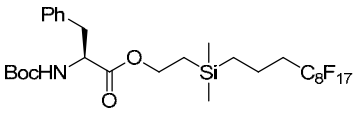
2,6-Lutidine (350 µL, 3 mmol) and ^{F}TIPSOTf[3] (0.5M in CH_2Cl_2, 2 mL, 1.0 mmol) were added to a solution of ethanolamine (**15**) (73 mg, 1.2 mmol) in CH_2Cl_2 (12 mL) at 0 ºC. The reaction was stirred at room temperature for 3 h and then quenched with sat. aq. $NaHCO_3$. The aqueous layer was extracted 3 times with EtOAc and the combined organic layers were dried over Na_2SO_4. The solvent was removed under reduced pressure and the crude material was purified by F-SPE to afford 550 mg of the title compound as a colorless oil (88% yield). ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.83-0.89 (m, 2H), 1.04 (br, 14H), 2.04-2.21(m, 4H), 2.82 (t, *J*= 5.2 Hz, 2H), 3.70 (t, *J*= 5.2 Hz, 2H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ –0.2, 12.3, 17.3, 17.4, 25.4 (t, *J* = 23.8 Hz), 44.2, 65.3, (the signals from the C_8F_{17} group were obscured due to their low intensity). ^{19}F NMR (282.4 MHz, $CDCl_3$) δ –80.9 (t, *J* = 9.9 Hz, 3F), –116.6 (br, 2F), –121.9 (s, 6F), –122.8 (s, 2F), –123.3 (s, 2F), –126.2 (s, 2F). HRMS (FAB): Calcd for $C_{18}H_{25}F_{17}NOSi$ $[M+1]^+$: 622.1434; found: 622.1431.

2.4. Synthesis of (*R*)-*O*-^{F}TIPS-phenylglycinol (16).



2,6-Lutidine (350 μL, 3 mmol) and ^{F}TIPSOTf[3] (0.5M in CH_2Cl_2, 2 mL, 1.0 mmol) were added to a solution of (*R*)-phenylglycinol (**9**) (137 mg, 1.0 mmol) in CH_2Cl_2 (10 mL) at 0 ºC. The reaction was stirred at room temperature for 3 h and then quenched with sat. aq. $NaHCO_3$. The aqueous layer was extracted 3 times with EtOAc and the combined organic layers were dried over Na_2SO_4. The solvent was removed under reduced pressure and the crude material was purified by F-SPE to afford 450 mg of the title compound as a colorless oil (65% yield). $[\alpha]^{25}_D$ −6.9 (*c* 1.0, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.80-0.87 (m, 2H), 1.04 (br, 14H), 1.92 (br, 2H), 2.05-2.17 (m, 2H), 3.63 (dd, *J* = 9.6, 7.8 Hz, 1H), 3.79 (dd, *J* = 9.5, 4.3 Hz, 1H), 4.10 (dd, *J* = 7.8, 4.3 Hz, 1H), 7.26-7.38 (m, 5H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ −0.3, 12.3, 17.3, 17.4, 25.3 (t, *J* = 23.8 Hz), 57.7, 69.8, 126.8, 127.5, 128.4, 142.4, (the signals from the C_8F_{17} group were obscured due to their low intensity). ^{19}F NMR (282.4 Mhz, $CDCl_3$) δ −80.9 (t, *J* = 9.9 Hz, 3F), −116.6 (br, 2F), −121.9 (s, 6F), −122.8 (s, 2F), −123.3 (s, 2F), −126.2 (s, 2F). HRMS (FAB): Calcd for $C_{24}H_{29}F_{17}NOSi$ $[M+1]^+$: 698.1747; found: 698.1753.

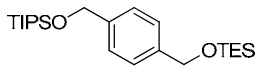
2.5. Synthesis of Boc-Phe-*O*-^{F}TMSE (17).



Boc-Phe-OH (**18**) (328 mg, 1.2 mmol), 1-hydroxybenzotriazole (HOBt) (162 mg, 1.2 mmol), *N*,*N*'-diisopropylcarbodiimide (DIC) (316 μL, 1.2 mmol) and DMAP (366 mg, 3 mmol) were added to a solution of ^{F}TMSEOH[4] (564 mg, 1 mmol) in CH_2Cl_2 (10 mL). The mixture was stirred at room temperature for 14 h. After this time, the reaction was diluted with EtOAc and the organic phase was washed with sat. aq. $NaHCO_3$ and 10% aq. citric acid, dried over Na_2SO_4 and the solvent was removed under reduced pressure. The residue was purified by means of column chromatography to afford 650 mg of the title compound as a colorless oil (80% yield). R_f 0.55 (hexane/EtOAc, 2:1). $[\alpha]^{25}_D$ +10.3 (*c* 1.1, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$) δ −0.02 (s, 6H), 0.51-0.57 (m, 2H), 0.87-0.93 (m, 2H) 1.35 (s, 9H), 1.53-1.60 (m, 2H), 1.93-2.11 (m, 2H), 2.95-3.03 (m, 2H), 4.04-4.19 (m, 2H), 4.47-4.50 (m, 1H), 4.93 (br, 1H), 7.07-7.25 (m, 5H). ^{13}C NMR (75.5

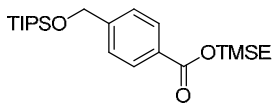
MHz, $CDCl_3$) δ −3.6, 14.8, 15.1, 15.7, 28.2, 34.4 (t, *J* = 22.1 Hz), 38.4, 54.6, 63.2, 79.8, 126.9, 128.5, 129.2, 129.4, 136.1, 155.1, 172.0, (the signals from the C_8F_{17} group were obscured due to their low intensity). ^{19}F NMR (282.4 Mhz, $CDCl_3$) δ −81.3 (t, 3F, *J* = 9.9 Hz), −114.9 (br, 2F), −122.2 (s, 6F), −123.2 (s, 2F), −124.7 (s, 2F), −126.2 (s, 2F). HRMS (FAB): Calcd for $C_{29}H_{34}F_{17}NO_4Si$ $[M+1]^+$: 812.2064; found: 812.2077.

2.6. Synthesis of 1-(triethylsilyloxymethyl)-4-(triisopropylsilyloxymethyl)benzene (21).



2,6-Lutidine (350 μL, 3 mmol) and TESOTf (270 μL, 1.2 mmol) were added to a solution of (4-triisopropylsilyloxymethylphenyl)methanol (**22**)[2] (295 mg, 1.0 mmol) in CH_2Cl_2 (10 mL) at 0 ºC. The reaction was stirred at room temperature for 6 h, then diluted with hexane and filtered through a short pad of silica. The solvent was removed under reduced pressure and the crude material was purified by column chromatography to afford 310 mg of the title compound as a colorless oil (76% yield). R_f 0.35 (Hexane:EtOAc, 4:1). ^1H NMR (300 MHz, $CDCl_3$) δ 0.73 (q, *J* = 8.1 Hz, 6H), 1.07 (t, *J* = 8.1 Hz, 9H), 1.04-1.22 (m, 21H), 4.80 (s, 2H), 4.91 (s, 2H), 7.38-7.39 (m, 4H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ 4.5, 6.7, 12.0, 18.0, 64.6, 64.9, 125.6, 126.1, 139.8, 140.4. HRMS (FAB): Calcd for $C_{23}H_{43}O_2Si_2$ $[M-H]^+$: 407.2807; found: 407.2801.

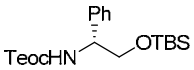
2.7. Synthesis of 2'-(trimethylsilyl)ethyl 4-(triisopropylsilyloxymethyl)benzoate (24).



DIC (290 μL 1.88 mmol), DMAP (305 mg, 2.5 mmol) and TMSEOH (215 μL, 1.5 mmol) were added to a solution of **10** (380 mg, 1.23 mmol) in CH_2Cl_2 (12 mL). The reaction was stirred at room temperature for 15 h. EtOAc and H_2O were added, the phases were separated and the organic phase was washed sequentially with 5% aq. $NaHCO_3$, 10% aq. citric acid and brine, dried over Na_2SO_4 and concentrated at reduced pressure. The residue was purified by means of column chromatography to afford 290 mg of the title compound as a colorless oil (57% yield). R_f 0.30 (toluene/CH_2Cl_2, 7:1). ^1H NMR (300 MHz, $CDCl_3$) δ 0.09 (s, 9H), 1.07-1.22 (m, 23H), 4.39-4.45

(m, 2H), 4.89 (s, 2H), 7.42 (d, J = 8.5 Hz, 2H), 8.02 (d, J = 8.5 Hz, 2H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ –1.5, 11.9, 1.4, 17.9, 62.9, 64.6, 125.3, 129.1, 129.4, 145.7, 166.6. HRMS (EI): Calcd for $C_{21}H_{37}O_3Si_2$ $[M\text{-}CH_3]^+$: 393.2276; found: 393.2254.

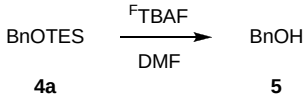
2.8. Synthesis of (*R*)-*O*-(*tert*-butyldimethylsilyl)-*N*-(2'-(trimethylsilyl)ethoxycarbonyl)phenylglycinol (26).



DMAP (245 mg, 2.0 mmol) and TeocCl[5] (1M in CH_2Cl_2, 1.1 mL, 1.1 mmol) were added to a solution of (*R*)-*O*-(*tert*-butyldimethylsilyl)phenylglycinol **8**[6] (252 mg, 1.0 mmol) in CH_2Cl_2 (10 mL). The reaction was stirred at room temperature for 10 h, and then quenched with H_2O. The aqueous layer was extracted several times with Et_2O, the combined organic layers were dried over Na_2SO_4 and concentrated under reduced pressure. The residue was purified by column chromatography to afford 320 mg of the title compound as a colorless oil (81% yield). R_f 0.57 (hexane/EtOAc, 2:1). $[\alpha]^{25}_D$ –20.2 (*c* 1.0, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$) δ –0.09 (s, 3H), –0.06 (s, 3H), 0.02 (s, 9H), 0.84 (s, 9H), 0.91-0.97 (m, 2H), 3.74 (dd, J = 10.3, 4.7 Hz, 1H), 3.89 (dd, J = 10.3, 4.4 Hz, 1H), 4.14 (dd, J = 9.0, 6.7 Hz, 2H), 4.76 (br, 1H), 5.41 (d, J = 6.9 Hz, 1H), 7.24-7.32 (m, 5H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ –5.7, –5.7, –1.5, 17.6, 18.1, 25.7, 56.3, 63.0, 66.5, 126.7, 127.2, 128.2, 140.4, 156.3. HRMS (FAB): Calcd for $C_{20}H_{38}NO_3Si_2$ $[M+1]^+$:396.2390; found: 396.2387.

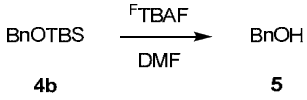
3. ^{F}TBAF-mediated deprotections.

3.1. Deprotection of 4a.



Following the general procedure, from 44 mg (0.2 mmol) of **4a**[7] and 0.3 mmol of ^{F}TBAF, after 2 h at room temperature 21.5 mg of BnOH (**5**) were obtained (99% yield). Purity (GC-MS): 92% (rt: 6.15 min).

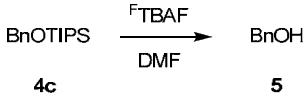
3.2. Deprotection of 4b.



A: Following the general procedure, from 44 mg (0.2 mmol) of **4b**[8] and 0.3 mmol of ^{F}TBAF, after 18 h at room temperature 20 mg of BnOH (**5**) were obtained (92% yield). Purity (GC-MS): 93 % (rt: 5.80 min).

B: Following the general procedure, from 22 mg (0.1 mmol) of **4b**[8] and 0.15 mmol of ^{F}TBAF, after 45 min at 60 ºC under microwave irradiation 9.2 mg of BnOH (**5**) were obtained (85% yield). Purity (GC-MS): 96 % (rt: 5.99 min).

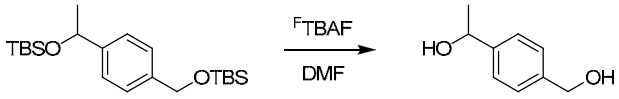
3.3. Deprotection of 4c.



A: Following the general procedure, from 53 mg (0.2 mmol) of **4c**[9] and 0.3 mmol of ^{F}TBAF, after 48 h at room temperature 19 mg of BnOH (**5**) were obtained (88% yield). Purity (GC-MS): 94% (rt: 5.93 min).

B: Following the general procedure, from 13 mg (0.05 mmol) of **4c**[9] and 0.15 mmol of ^{F}TBAF, after 45 min at 40 ºC under microwave irradiation 4.5 mg of BnOH (**5**) were obtained (83% yield). Purity (GC-MS): 91% (rt: 5.86 min).

3.4. Deprotection of 6.



6 7

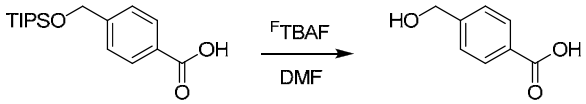
Following the general procedure, from 76 mg (0.2 mmol) of **6** and 0.6 mmol of ^{F}TBAF, after 45 min at 40 ºC under microwave irradiation 22 mg of **7**[1] were obtained (72% yield). Purity (GC-MS): 99% (rt: 11.41 min).

3.5. Deprotection of 8.

8 9

Following the general procedure, from 25 mg (0.1 mmol) of **8**[6] and 0.15 mmol of ^{F}TBAF, after 12 h at room temperature 12 mg of **9** were obtained (88% yield). Purity (GC-MS): 93% (rt: 9.74 min).

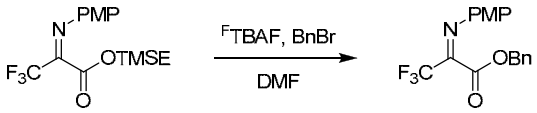
3.6. Deprotection of 10.



10 11

Following the general procedure, from 62 mg (0.2 mmol) of **10** and 0.4 mmol of ^{F}TBAF, after 12 h at room temperature 29 mg of **11** were obtained (95% yield). Purity (GC-MS): 92 % (rt: 12.37 min).

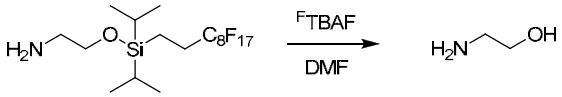
3.7. Deprotection of 12.



12 13

Following the general procedure, from 17.5 mg (0.05 mmol) of **12**,[10] 0.1 mmol of ^{F}TBAF and 8.5 mg (0.05 mmol) of BnBr, after 2 h at room temperature 16 mg of **13**[10] were obtained (94% yield). Purity (GC-MS): 92 % (rt: 17.51 min).

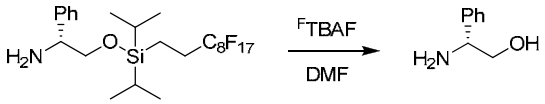
3.8. Deprotection of 14.



14 **15**

Following the general procedure, from 87 mg (0.13 mmol) of **14** and 0.19 mmol of ^{F}TBAF, after 3 h at room temperature 6.8 mg of **15** were obtained (86% yield). Purity (GC-MS): 93 % (rt: 10.83 min).

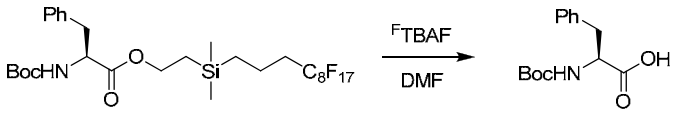
3.9. Deprotection of 16.



16 **9**

Following the general procedure, from 70 mg (0.1 mmol) of **16** and 0.15 mmol of ^{F}TBAF, after 3 h at room temperature 11.5 mg of **9** were obtained (84% yield). Purity (GC-MS): 94 % (rt: 9.77 min).

3.10. Deprotection of 17.



17 **18**

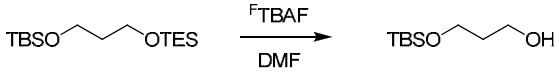
Following the general procedure, from 81 mg (0.1 mmol) of **17** and 0.4 mmol of ^{F}TBAF, after 1 h at 40 ºC under microwave irradiation 19 mg of **18** were obtained (72% yield). Purity (HPLC): >99 % (rt: 9.45 min).

4. ^{F}TBAF-mediated selective deprotections.

4.1. General procedure.

A pre-diluted (ca. 0.05 M in THF) solution of ^{F}TBAF was added to a solution of the protected substrate (1 equiv) in DMF (0.05M). The reaction was stirred at the temperature and time indicated in each case and then analyzed by GC-MS. The deprotected products were identified by comparison with commercially available samples or previously reported compounds, or by fully characterization in the case of new compounds.

4.2. Selective deprotection of 19.



19 **20**

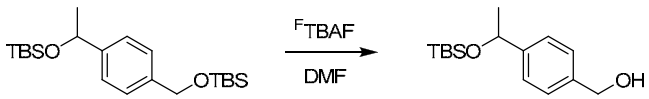
Following the general procedure, from 61 mg (0.2 mmol) of **19**[11] and 0.22 mmol of ^{F}TBAF, after 10 min at 0 ºC, only monoprotected product was observed by GC-MS analysis. F-SPE purification of the crude mixture afforded 30 mg of **20** (79% yield). Purity (GC-MS): 98 % (rt: 7.74 min).

4.3. Selective deprotection of 21.

21 **22**

Following the general procedure, from 21 mg (0.05 mmol) of **21** and 0.055 mmol of ^{F}TBAF, after 10 min at 0 ºC, a mixture of **22** (92%, rt: 18.53 min) and free diol (8%, rt: 11.16 min) was observed by GC-MS analysis.

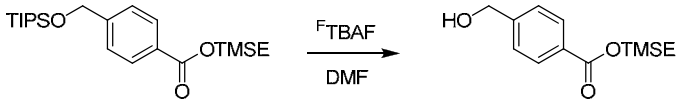
4.4. Selective deprotection of 6.



6 **23**

Following the general procedure, from 19 mg (0.05 mmol) of **6** and 0.055 mmol of ^{F}TBAF, after 12 h from 0 ºC to room temperature, a mixture of **23**[12] (98%, rt: 14.88 min) and starting material (2%, rt: 9.90 min) was observed by GC-MS analysis.

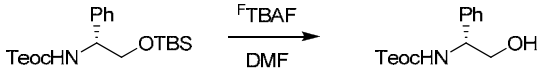
4.5. Selective deprotection of 24.



24 **25**

Following the general procedure, from 41 mg (0.1 mmol) of **24** and 0.2 mmol of ^{F}TBAF, after 4 h at 0 ºC and further 12 h at room temperature, only monoprotected product was observed by GC-MS analysis. F-SPE purification of the crude mixture afforded 22 mg of **25** as a colorless oil (87% yield). Purity (GC-MS): >99% (rt: 20.96 min). ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.08 (s, 9H), 1.11-1.16 (m, 2H), 1.86 (br, 1H), 4.39-4.45 (m, 2H), 4.77 (s, 2H), 7.43 (d, *J*= 8.7 Hz, 2H), 8.02 (d, *J* = 8.4 Hz, 2H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ −1.5, 17.4, 63.2, 64.7, 126.4, 129.7, 129.8, 145.7, 166.6. HRMS (EI): Calcd for $C_{13}H_{20}O_3Si$ $[M]^+$: 252.1182; found: 252.1179.

4.6. Selective deprotection of 26.



26 **27**

Following the general procedure, from 16 mg (0.04 mmol) of **26** and 0.1 mmol of ^{F}TBAF, after 2 h at 0 ºC and further 14 h at room temperature, only monoprotected product was observed by GC-MS analysis. F-SPE purification of the crude mixture afforded 9.5 mg of **27** as a colorless oil (95% yield). Purity (GC-MS): 97 % (rt: 18.28 min). $[\alpha]^{25}_{D}$ −38.5 (*c* 1.3, $CHCl_3$). ^{1}H NMR (300 MHz, $CDCl_3$) δ 0.02 (s, 9H), 0.94-1.00 (m, 2H), 1.70 (br, 1H), 3.87 (d, *J* = 4.2 Hz, 2H), 4.12-4.18 (m, 2H), 4.81-4.83 (m, 1H), 5.36 (br, 1H), 7.25-7.39 (m, 5H). ^{13}C NMR (75.5 MHz, $CDCl_3$) δ −1.5, 17.7, 57.1, 63.5, 66.7, 126.6, 127.9, 128.9, 139.2, 156.9. HRMS (EI): Calcd for $C_{13}H_{20}NO_2Si$ $[M-CH_2OH]^+$: 250.1263; found: 250.1258.

References:

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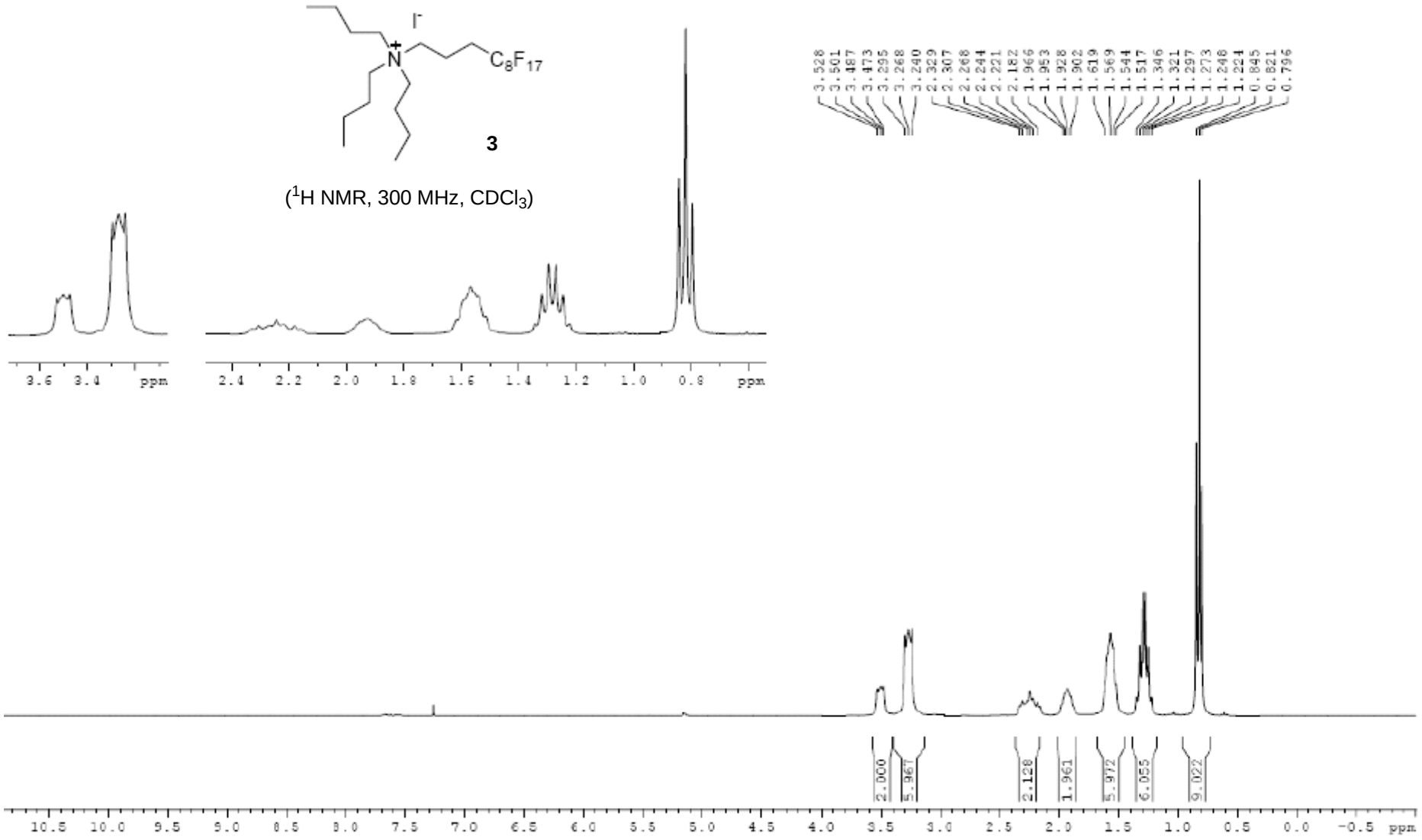
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N+
C8F17
3
(1H NMR, 300 MHz, CDCl3)
3.528
3.501
3.487
3.473
3.295
3.268
3.240
2.329
2.307
2.268
2.244
2.221
2.182
1.966
1.953
1.928
1.902
1.619
1.569
1.544
1.517
1.346
1.321
1.297
1.273
1.246
1.224
0.845
0.821
0.796
2.000
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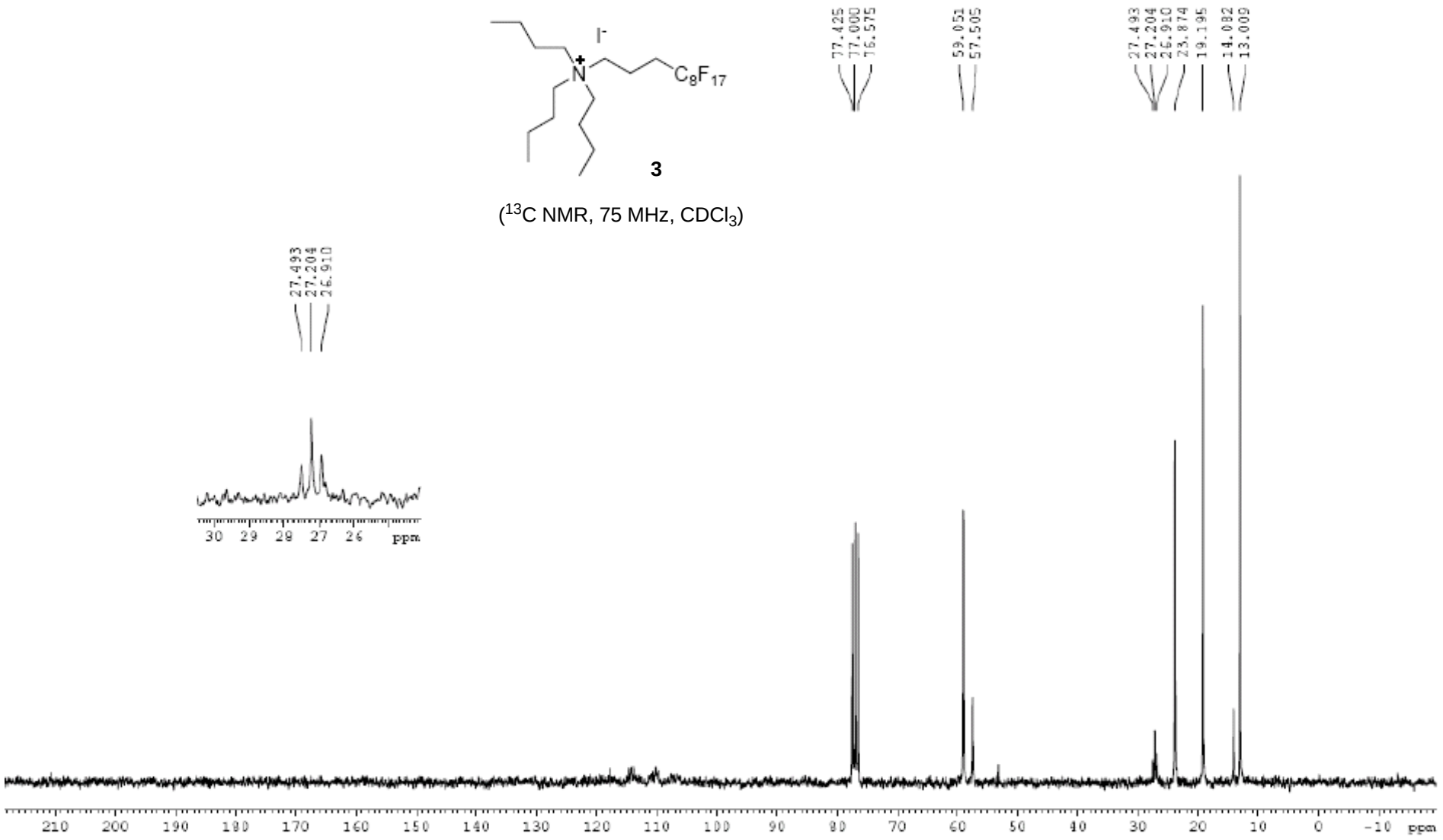
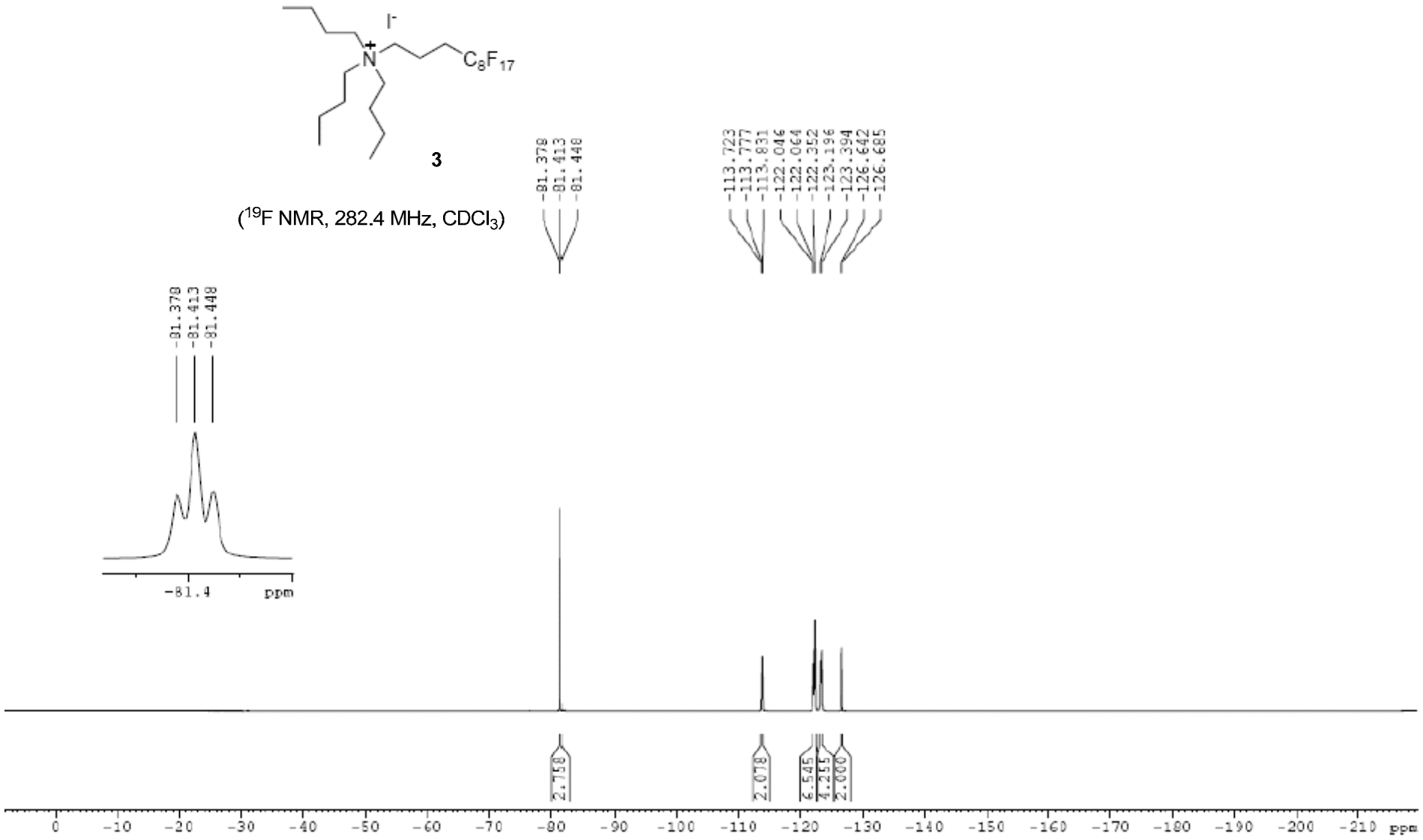
2.128
1.961
5.972
6.055
9.022
ppm



(^{13}C NMR, 75 MHz, $CDCl_3$)


I-
N+
C8F17
3
(19F NMR, 282.4 MHz, CDCl3)
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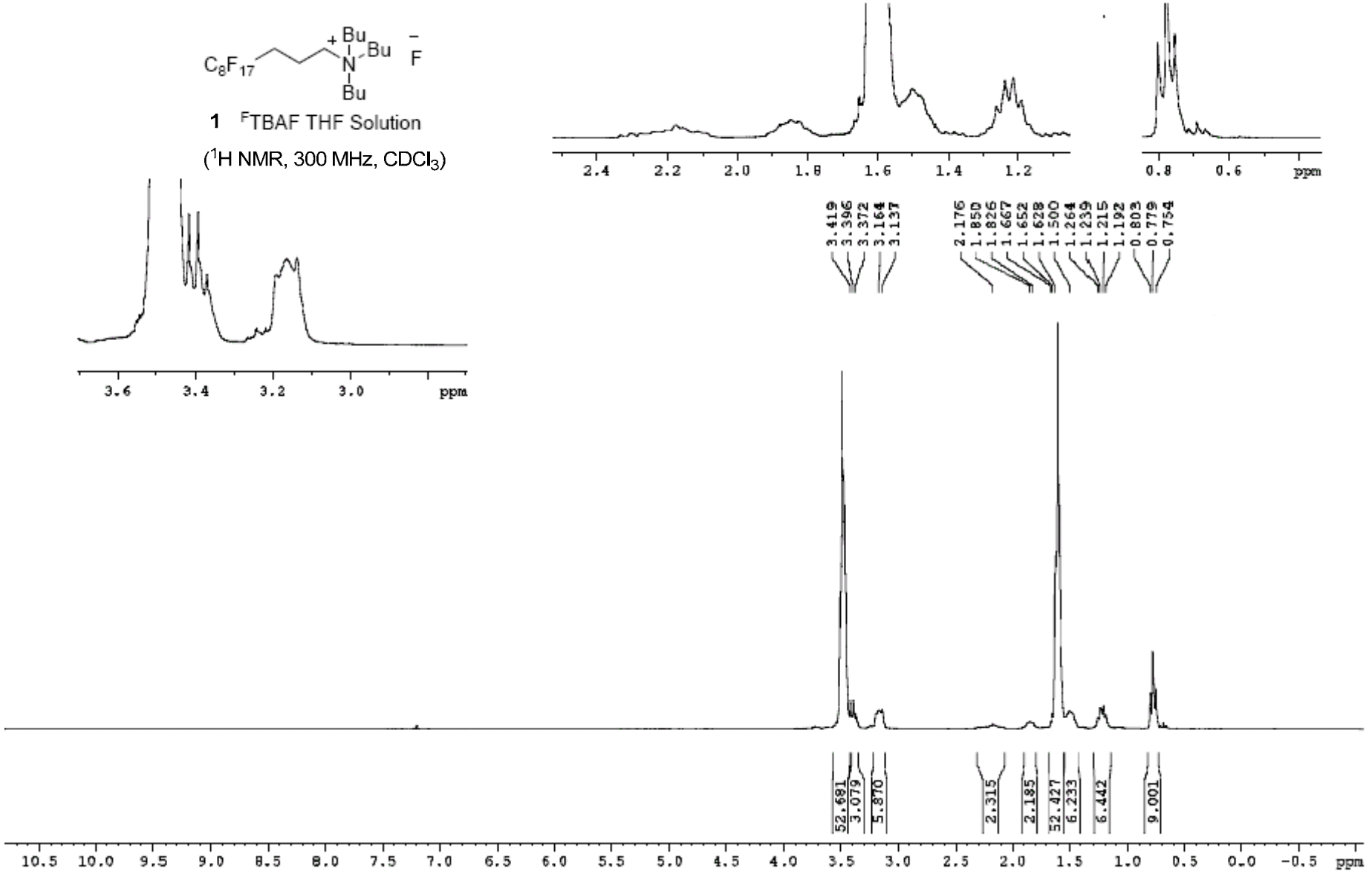
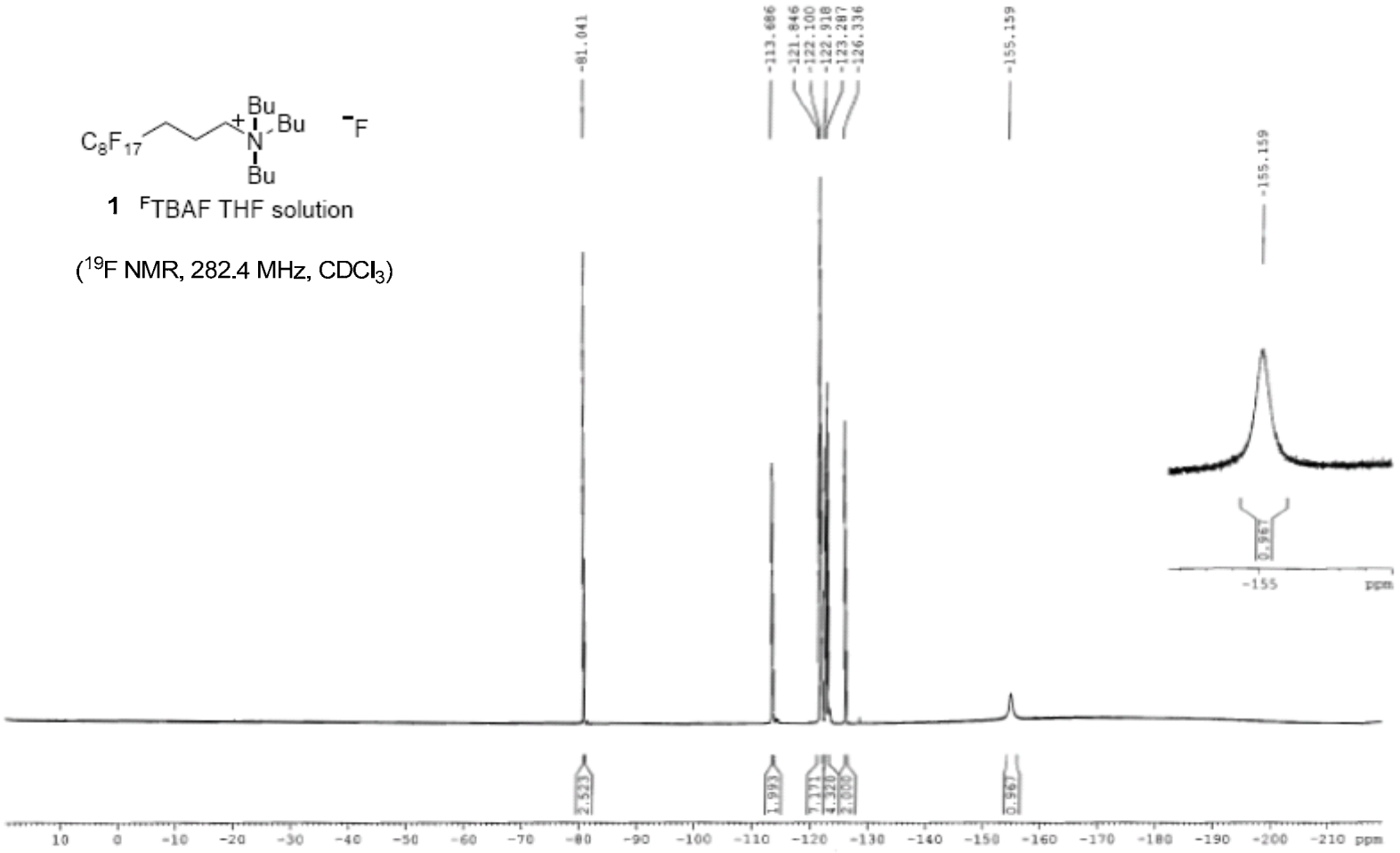
-81.413
-81.448
-113.723
-113.777
-113.831
-122.046
-122.064
-122.352
-123.196
-123.394
-126.642
-126.685
-81.4
ppm
2.758
2.078
6.545
4.255
2.000
0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 ppm

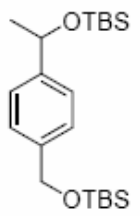

Bu
Bu
Bu
F
C_8F_{17}
1 FTBAF THF Solution
(^{1}H NMR, 300 MHz, $CDCl_3$)
3.419
3.396
3.372
3.164
3.137
2.176
1.850
1.826
1.667
1.652
1.628
1.500
1.264
1.239
1.215
1.192
0.803
0.779
0.754
52.681
3.079
5.870
2.315
2.185
52.427
6.233
6.442
9.001
ppm



1 ^{F}TBAF THF solution

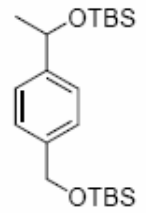
(^{19}F NMR, 282.4 MHz, $CDCl_3$)

6

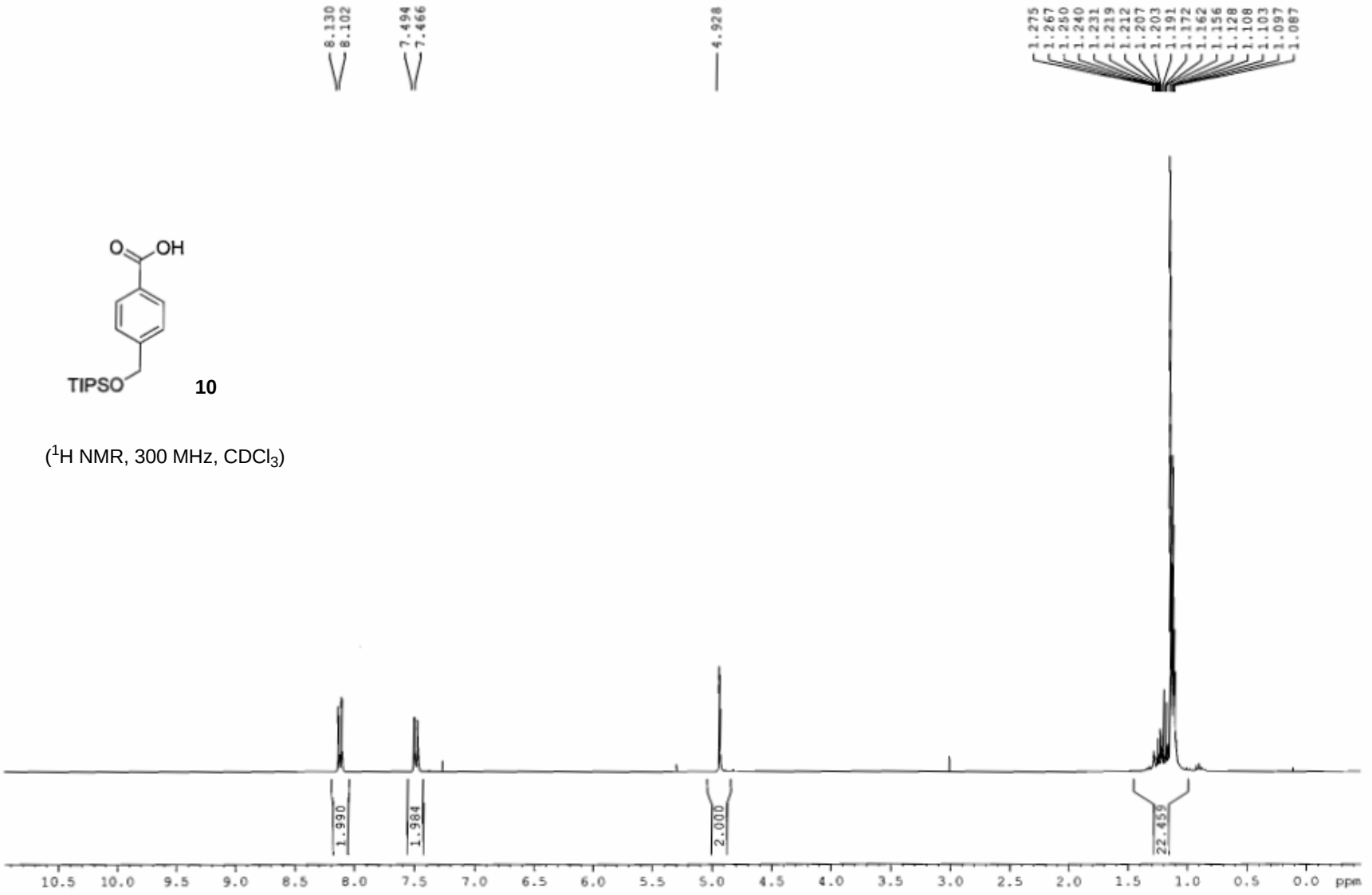


(^{1}H NMR, 300 MHz, $CDCl_3$)

6

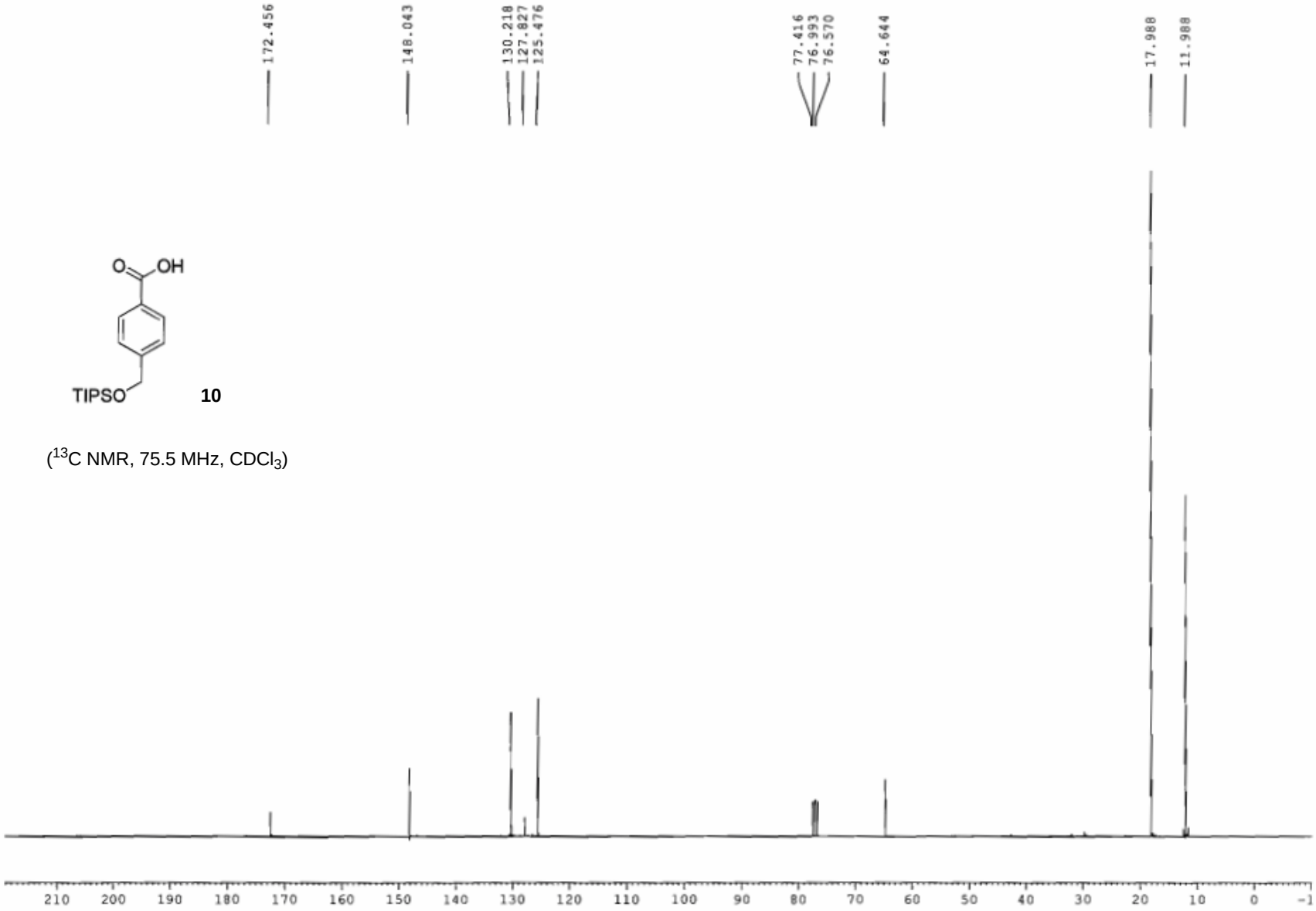


(^{13}C NMR, 75.5 MHz, $CDCl_3$)



10

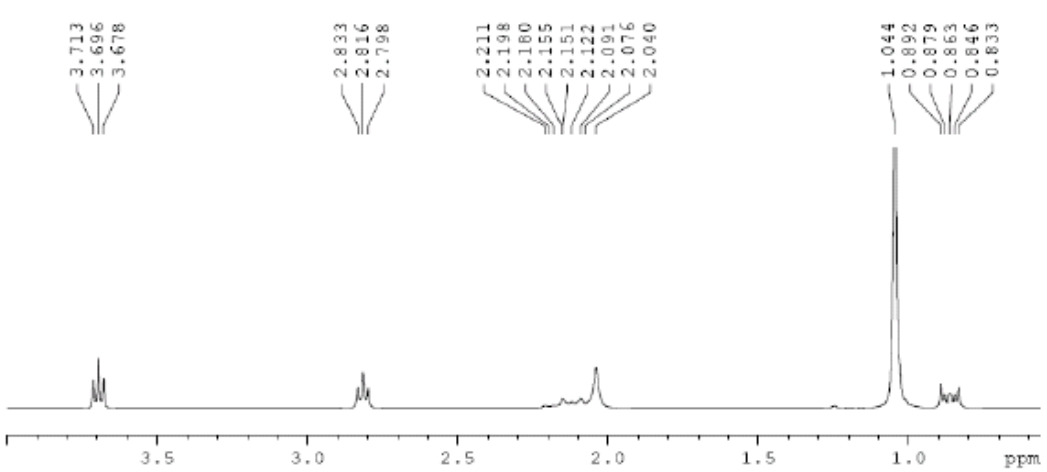
(^{1}H NMR, 300 MHz, $CDCl_3$)

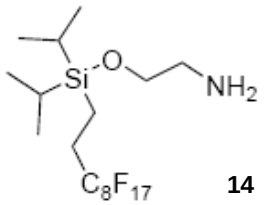


10

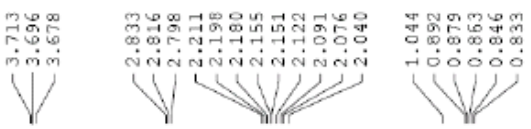
(^{13}C NMR, 75.5 MHz, $CDCl_3$)

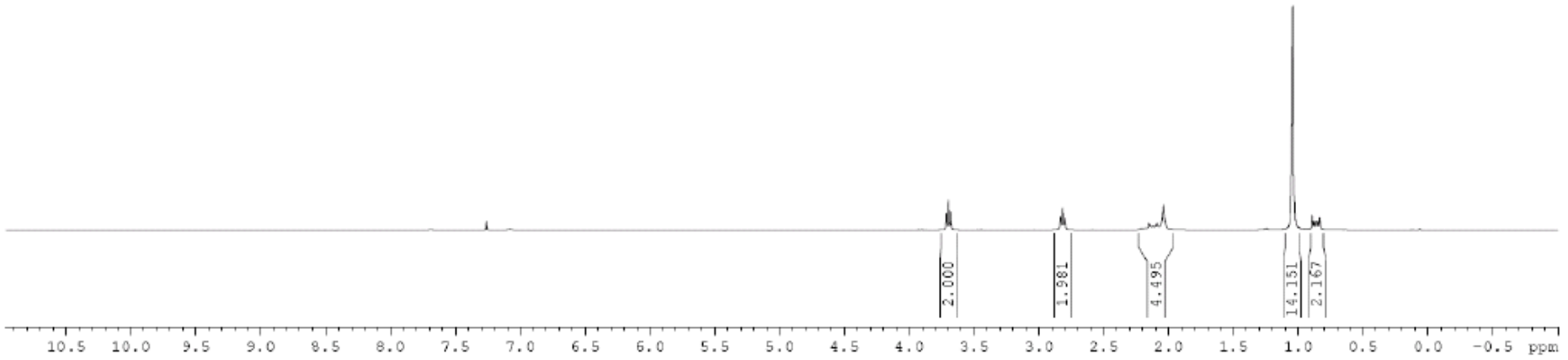
(^{1}H NMR, 300 MHz, $CDCl_3$)

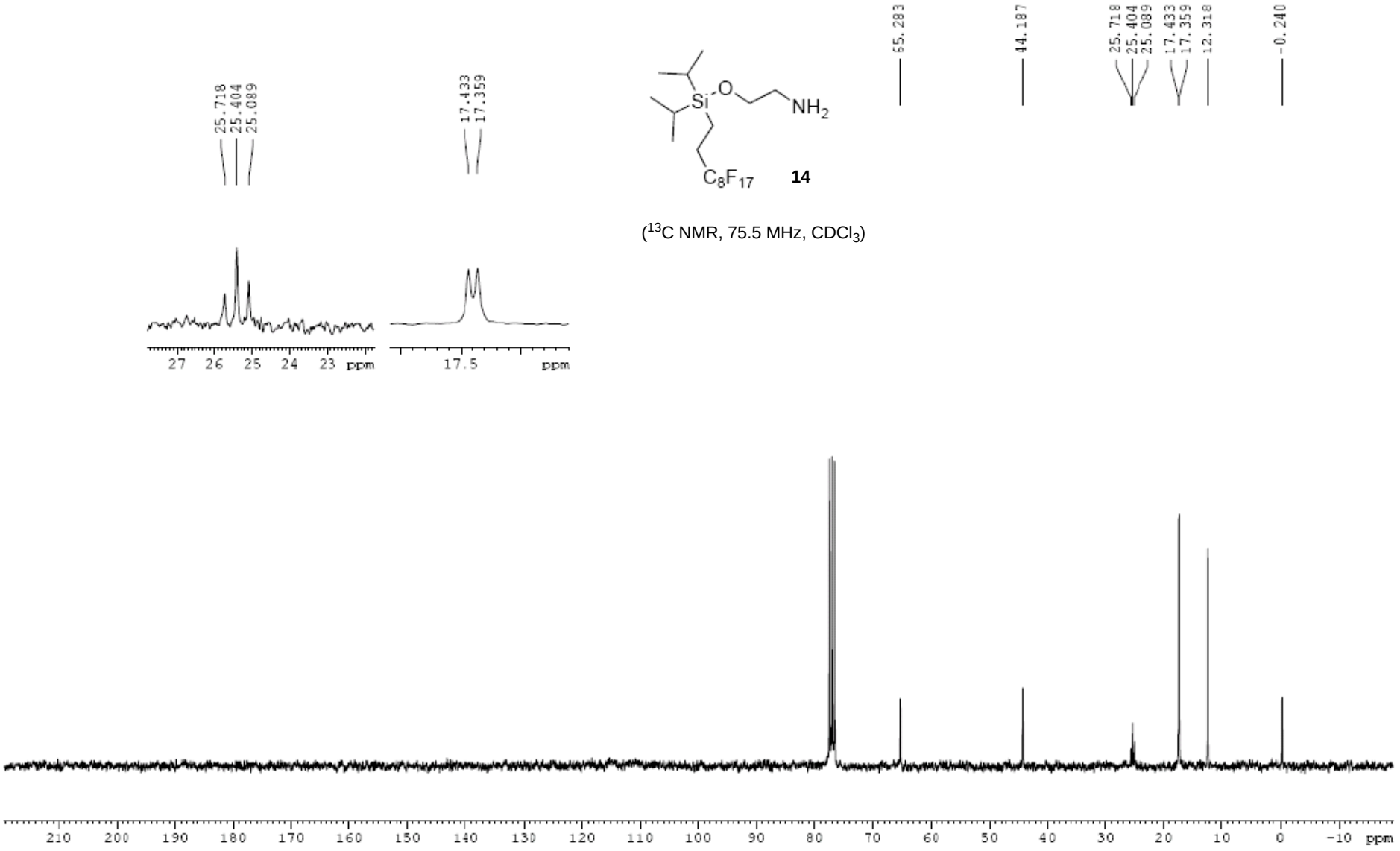




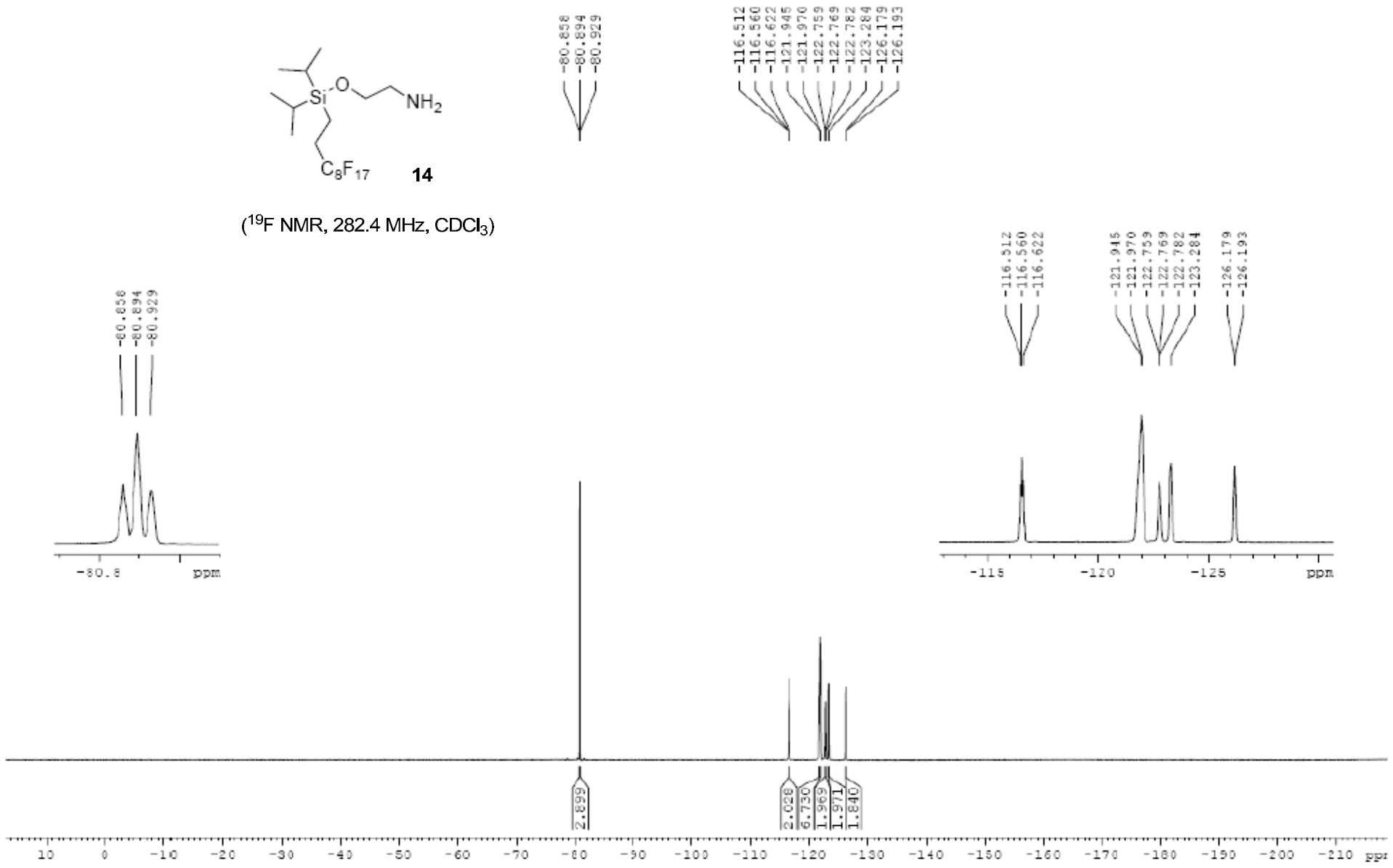
14







(^{13}C NMR, 75.5 MHz, $CDCl_3$)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-80.894
-80.929
-116.512
-116.560
-116.622
-121.945
-121.970
-122.759
-122.769
-122.782
-123.284
-126.179
-126.193
Si
O
NH2
C8F17
14
(19F NMR, 282.4 MHz, CDCl3)
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ppm
-115
-120
-125
2.899
2.028
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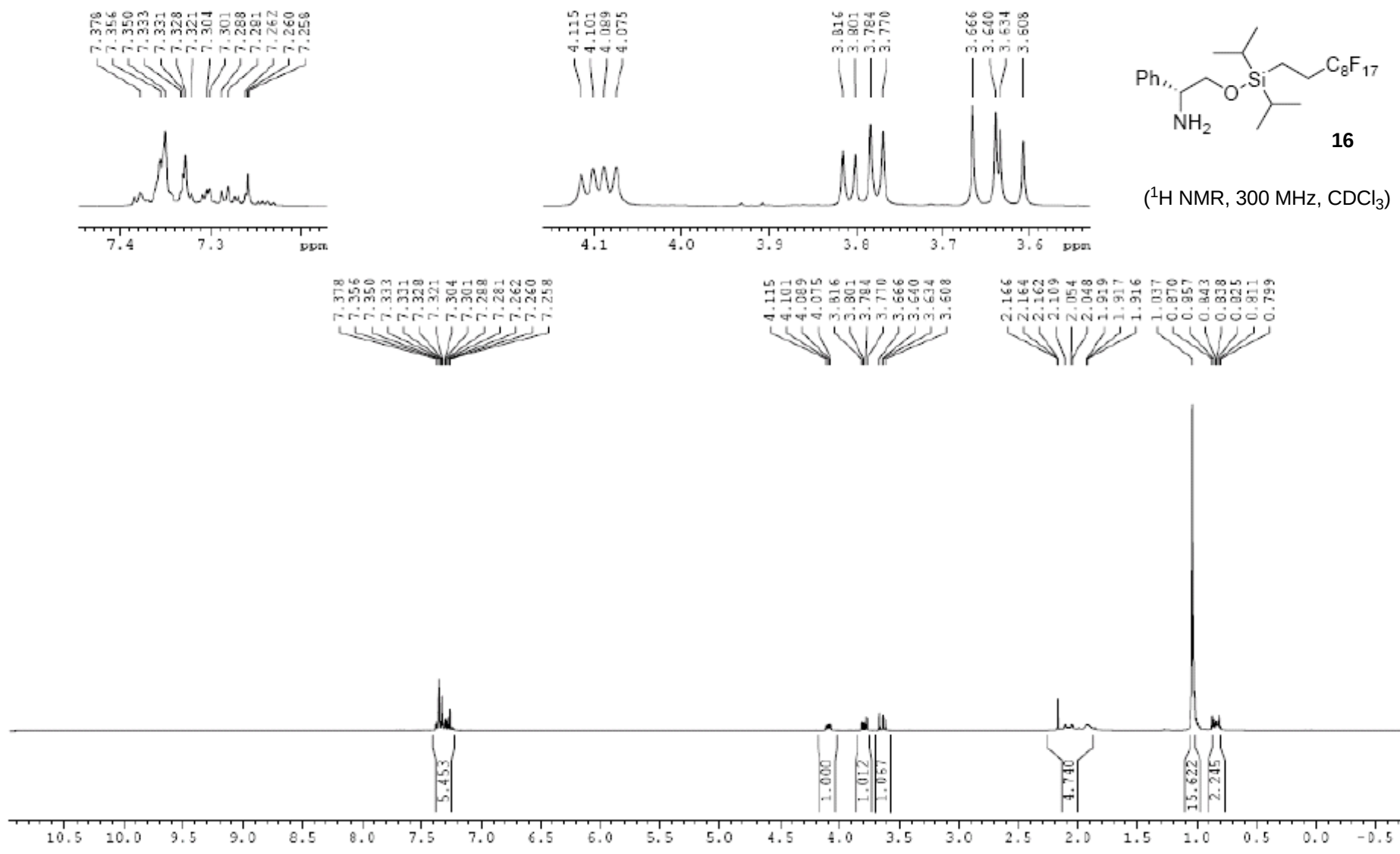
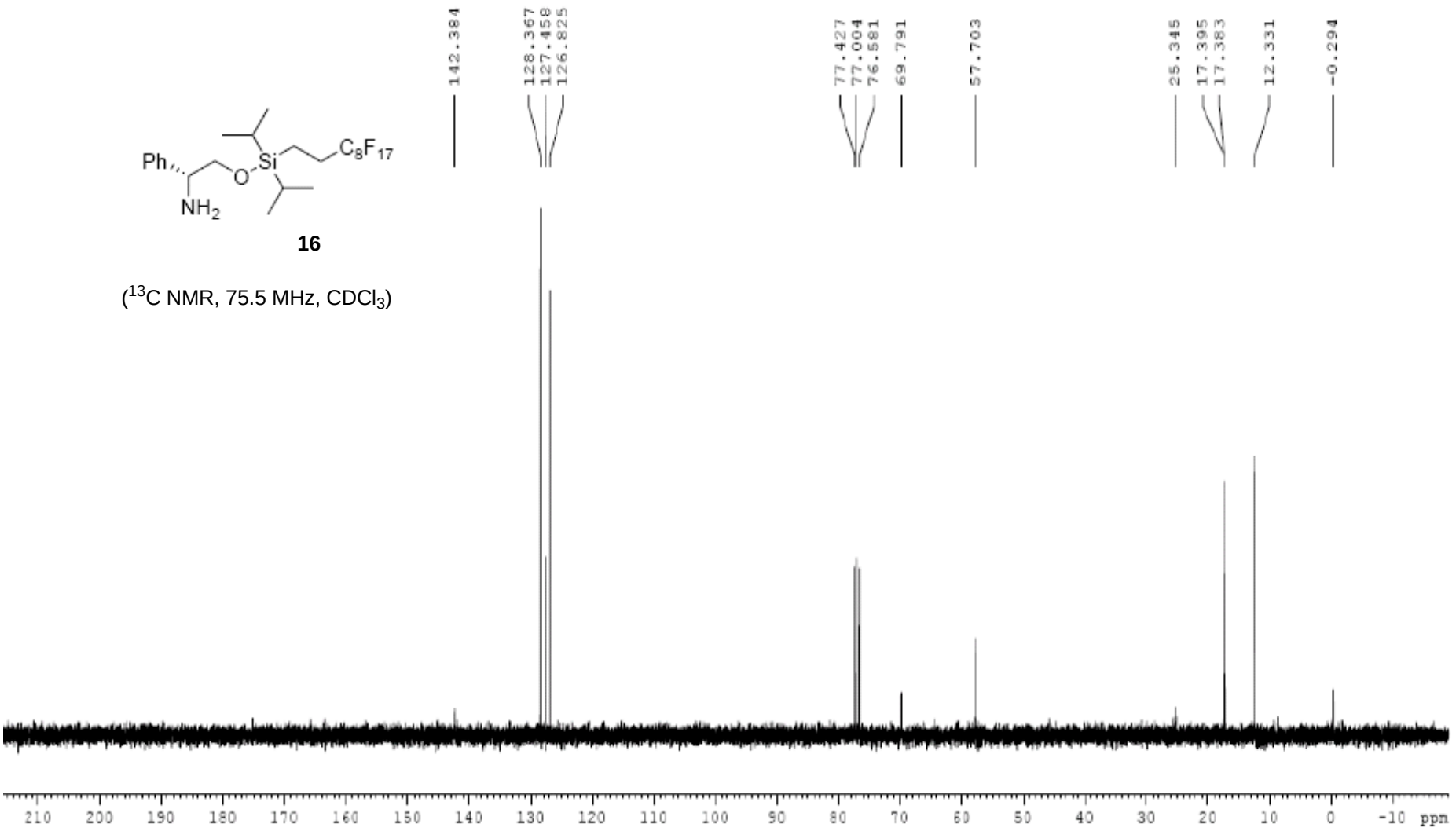
1.969
1.971
1.840



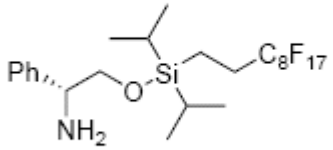
16

(^{1}H NMR, 300 MHz, $CDCl_3$)



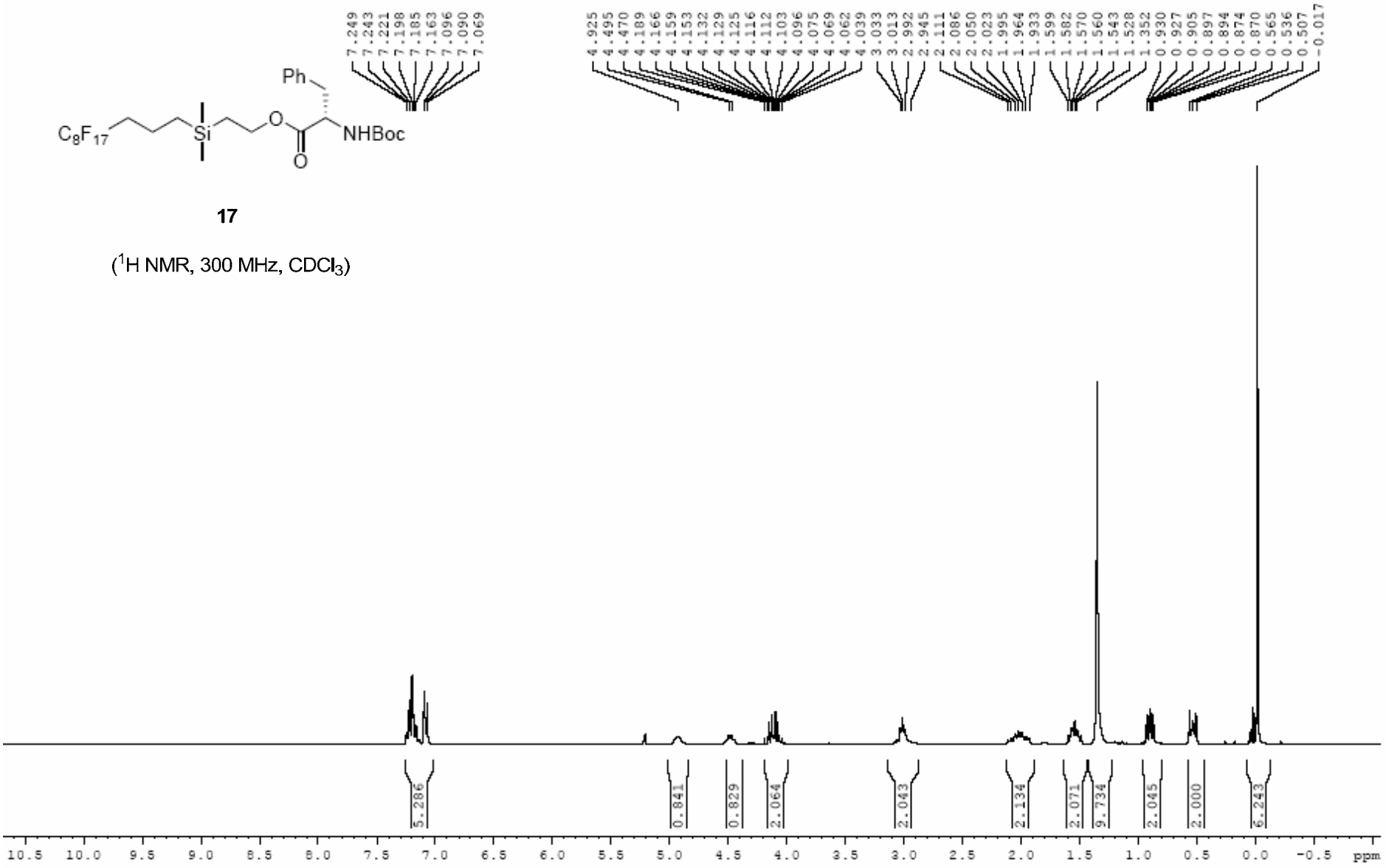
16

(^{13}C NMR, 75.5 MHz, $CDCl_3$)



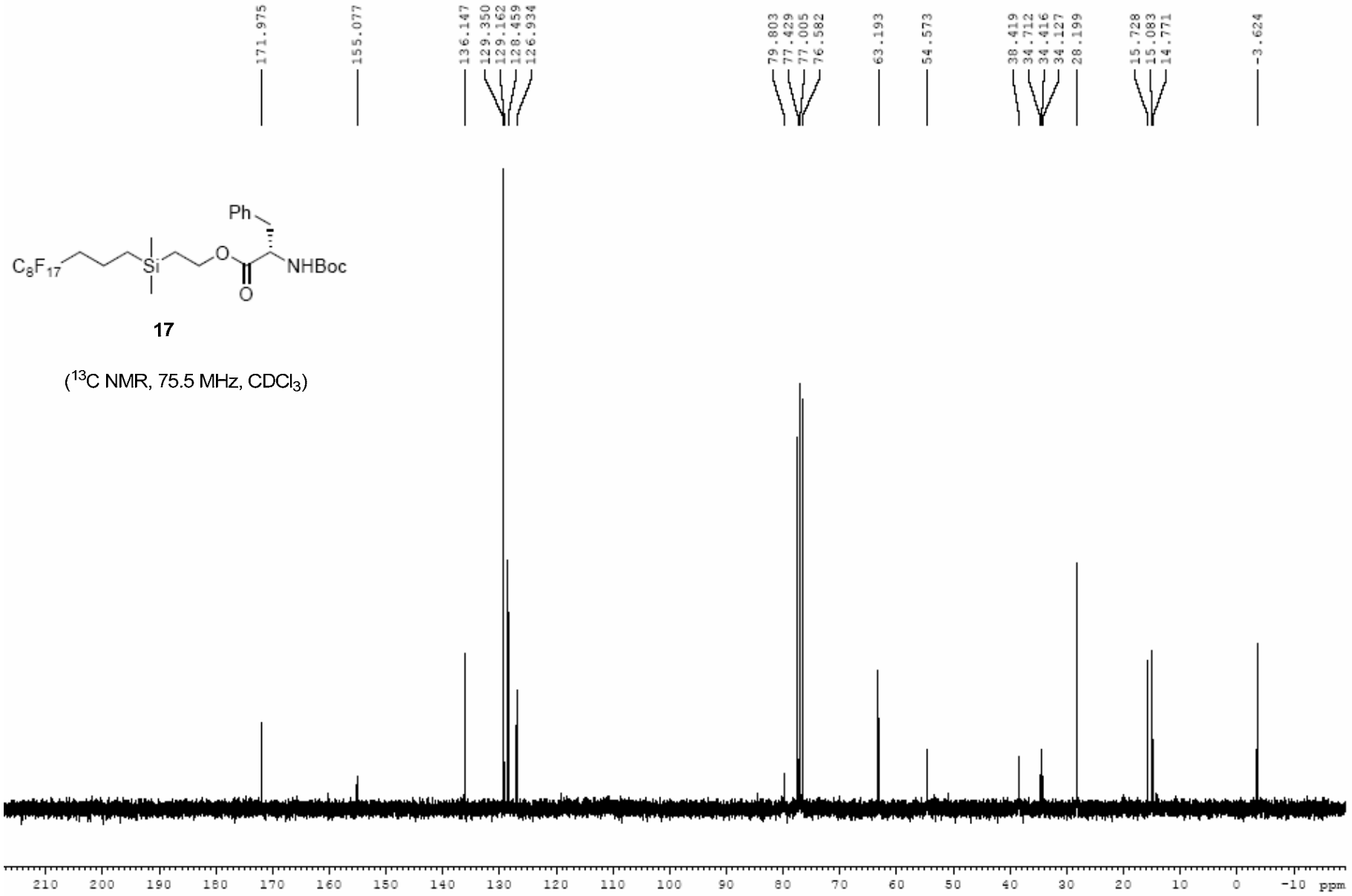
16

(^{19}F NMR, 282.4 MHz, $CDCl_3$)



17

(^{1}H NMR, 300 MHz, $CDCl_3$)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129.162
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126.934
79.803
77.429
77.005
76.582
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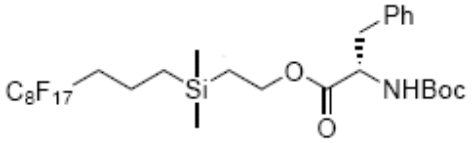
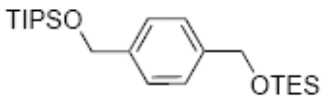
54.573
38.419
34.712
34.416
34.127
28.199
15.728
15.083
14.771
-3.624
Ph
C_8F_{17}
Si
O
O
NHBoc
17
(^{13}C NMR, 75.5 MHz, $CDCl_3$)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 ppm



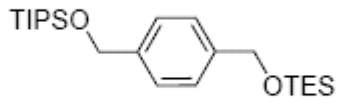
17

(^{19}F NMR, 282.4 MHz, $CDCl_3$)



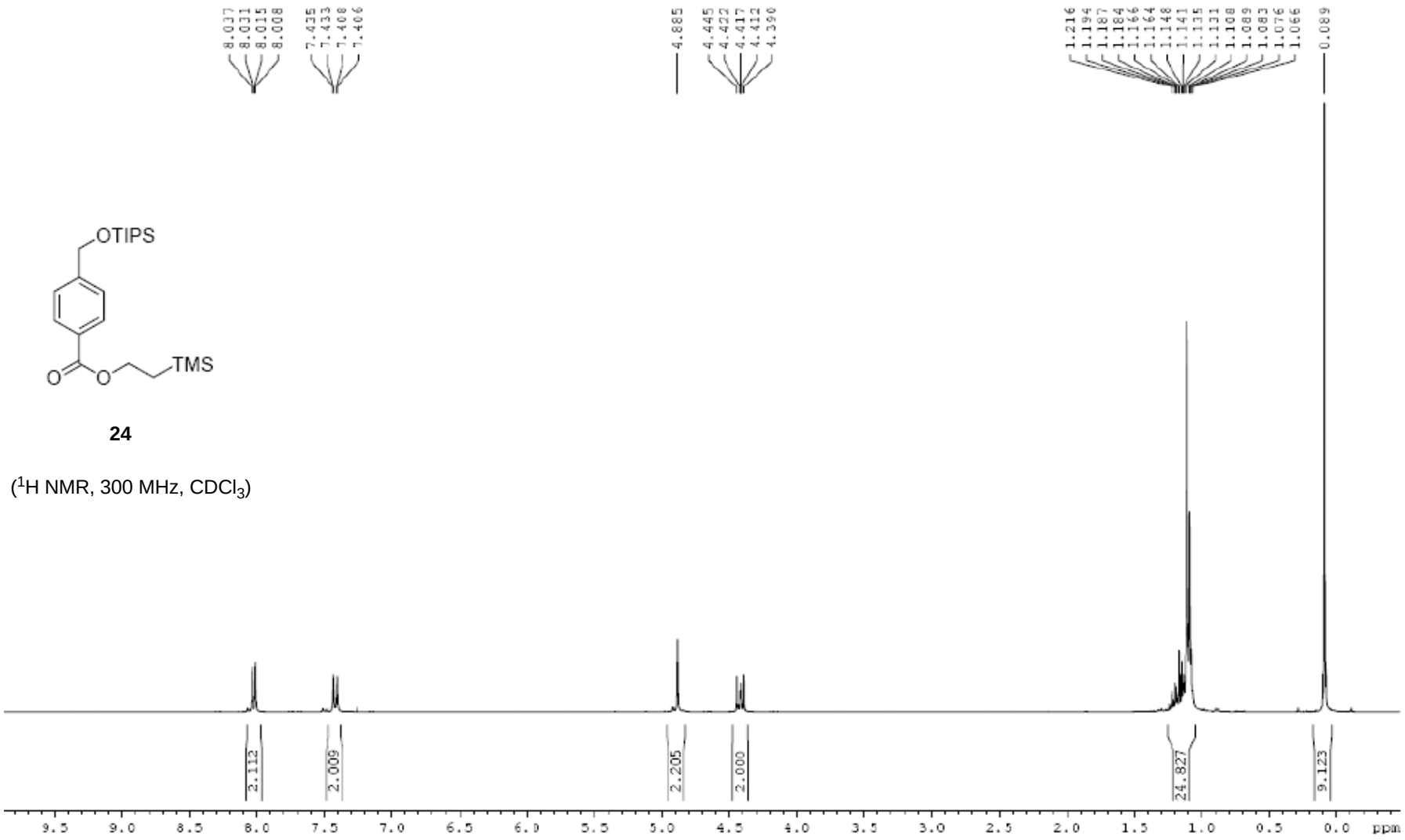
21

(^{1}H NMR, 300 MHz, $CDCl_3$)



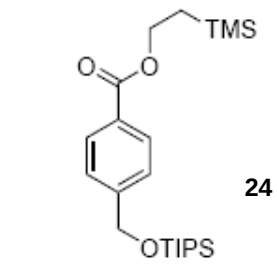
21

(^{13}C NMR, 75.5 MHz, $CDCl_3$)



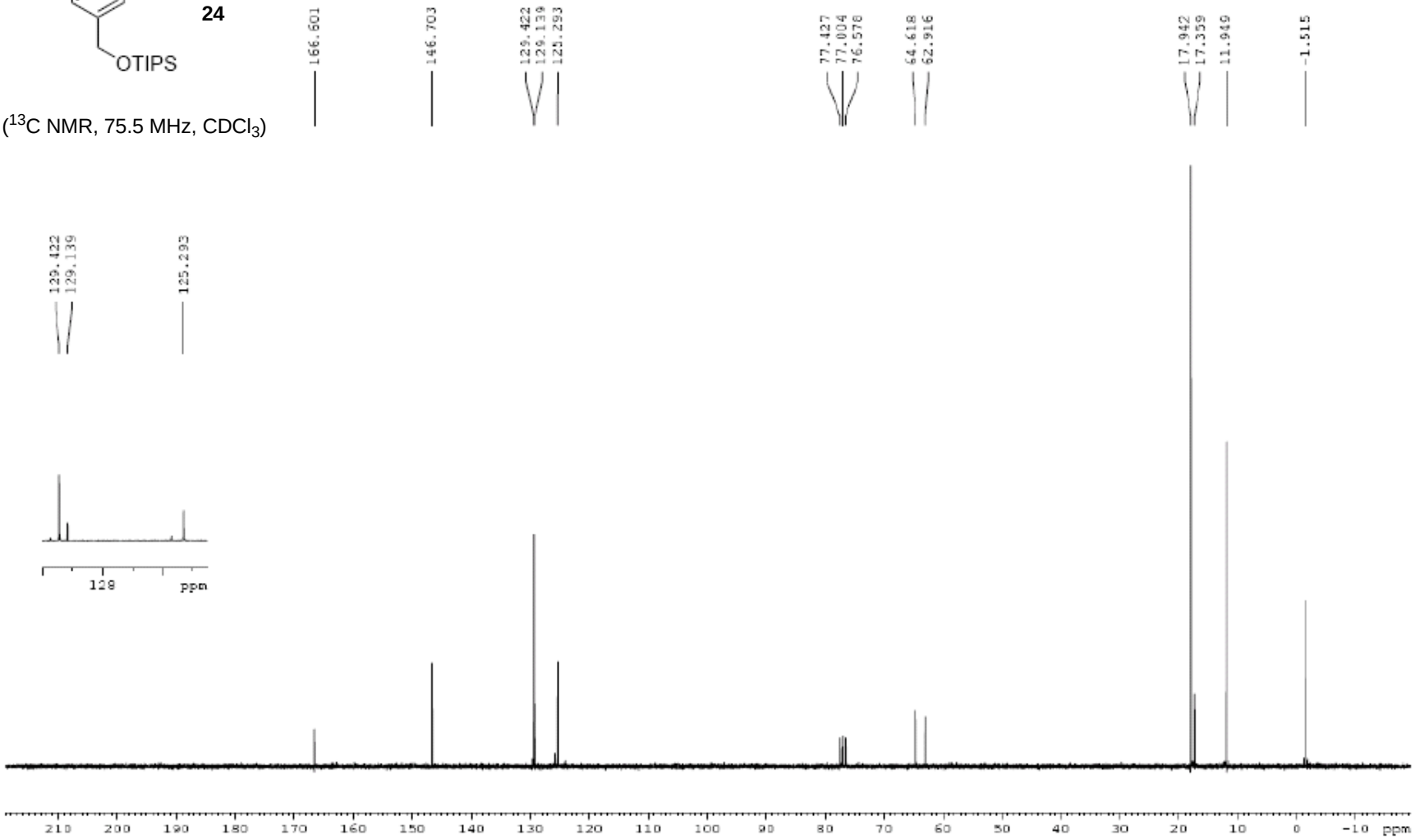
24

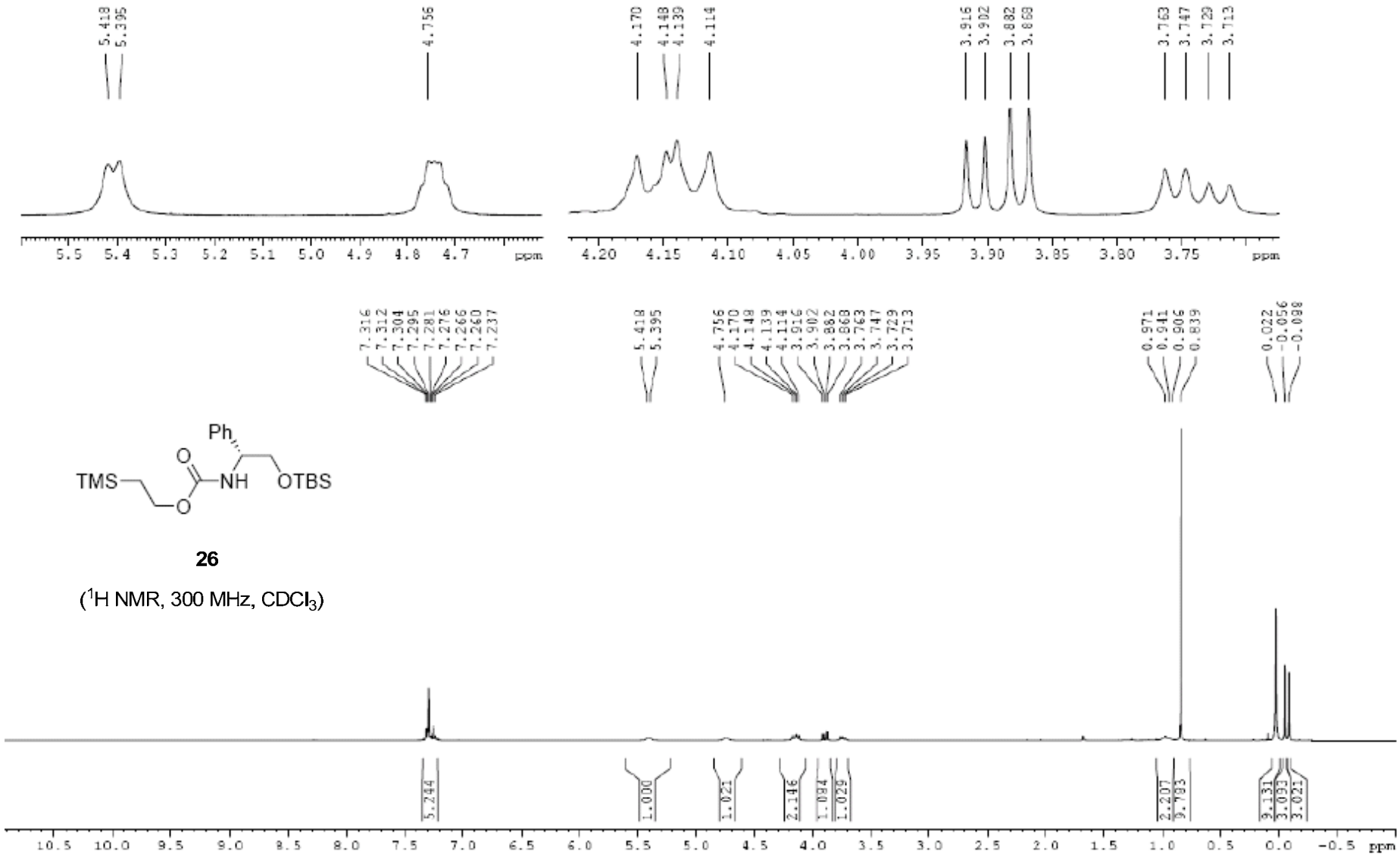
(^{1}H NMR, 300 MHz, $CDCl_3$)



24

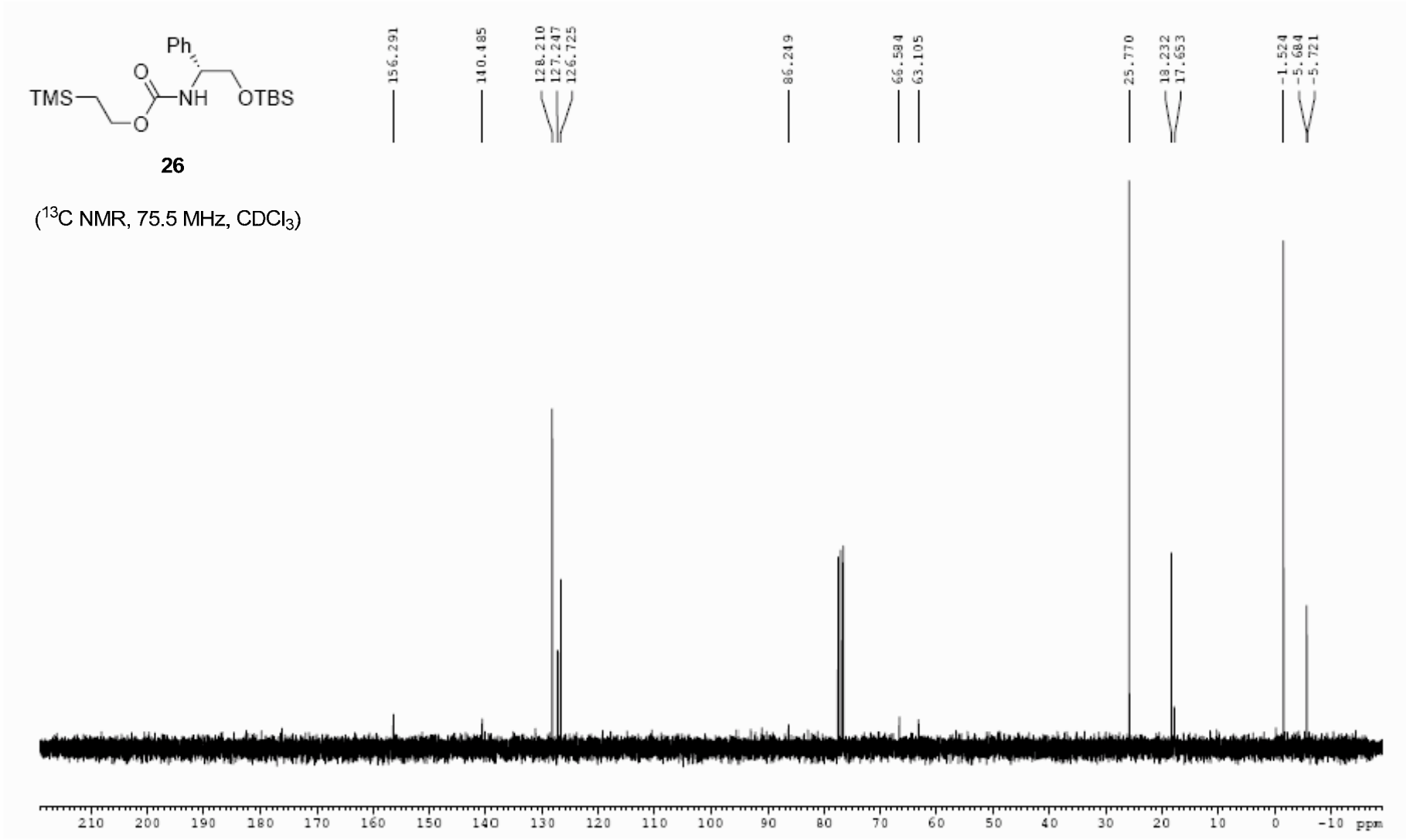
(^{13}C NMR, 75.5 MHz, $CDCl_3$)

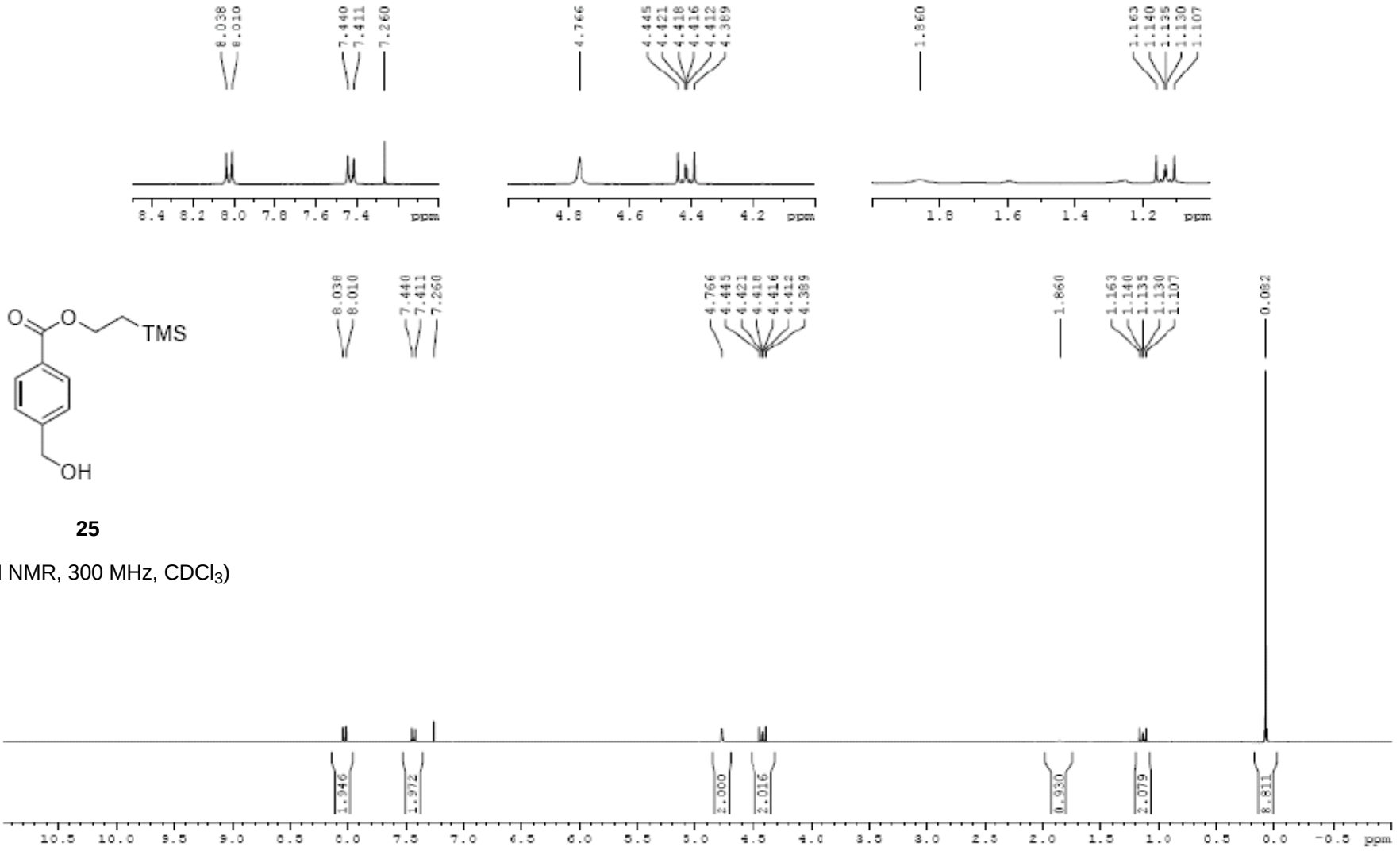




26

(^{1}H NMR, 300 MHz, $CDCl_3$)


Ph
O
TMS
NH
OTBS
O
26
(13C NMR, 75.5 MHz, CDCl3)
156.291
140.485
128.210
127.247
126.725
86.249
66.584
63.105
25.770
18.232
17.653
-1.524
-5.684
-5.721
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 ppm

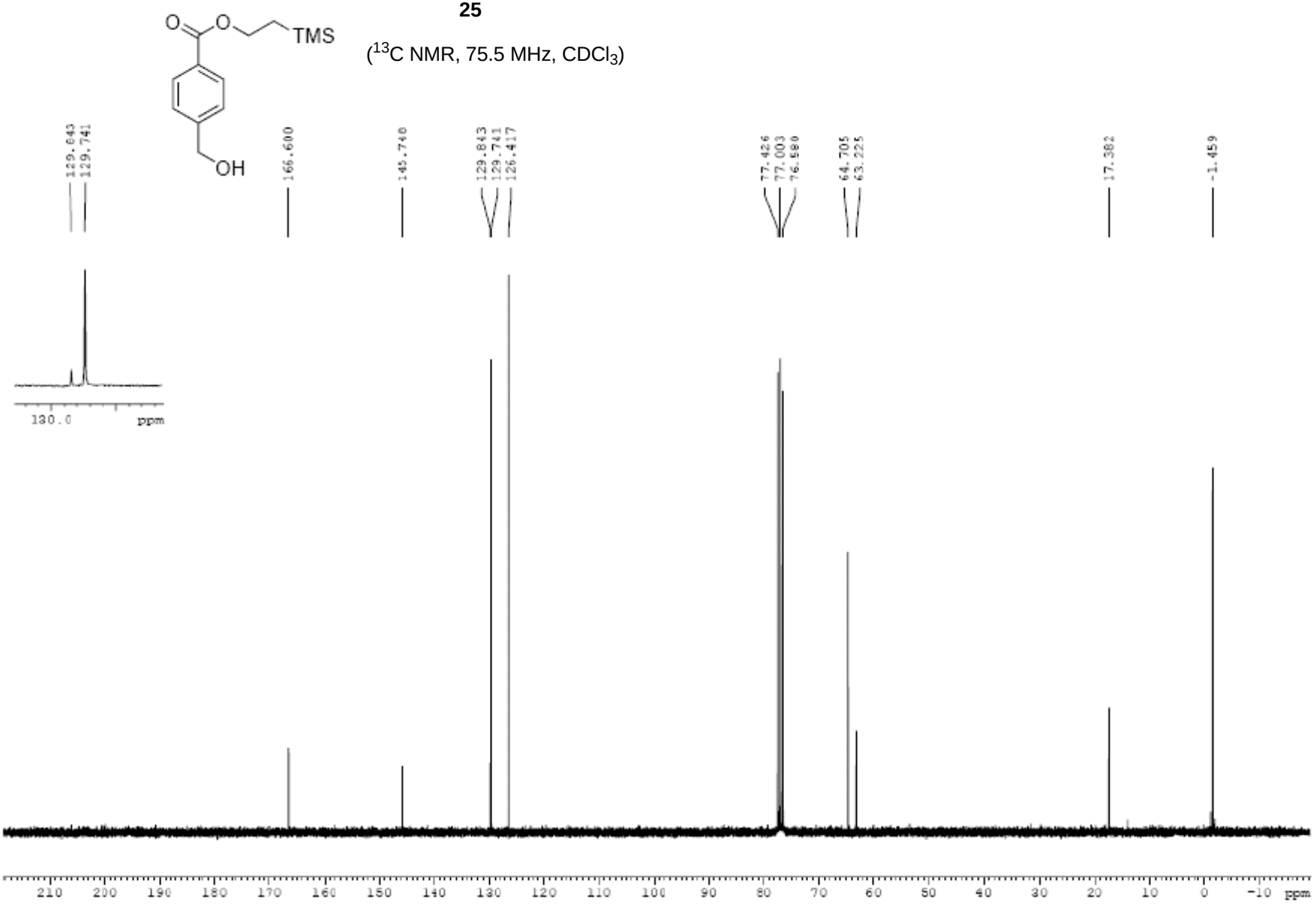


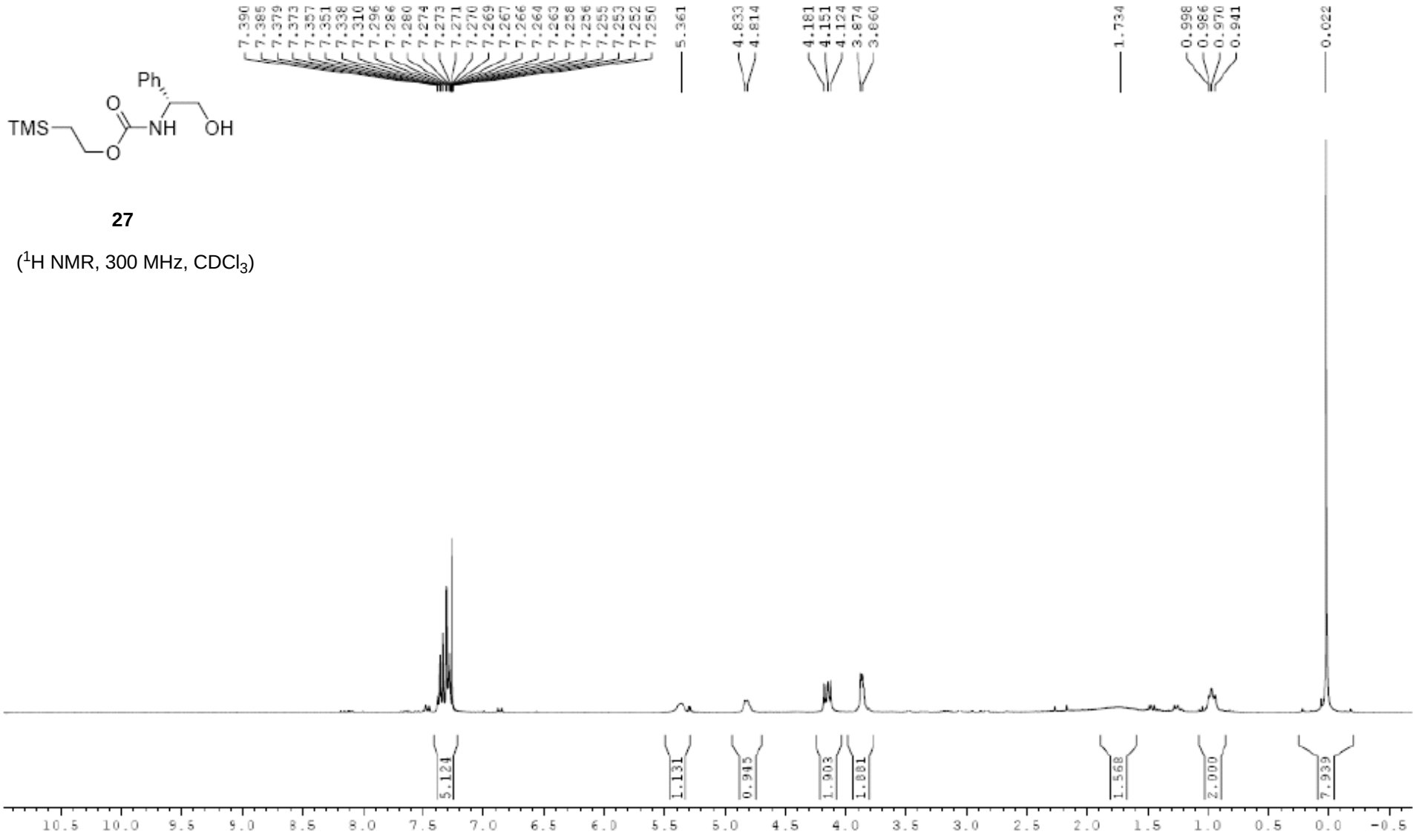
25

(^{1}H NMR, 300 MHz, $CDCl_3$)

25

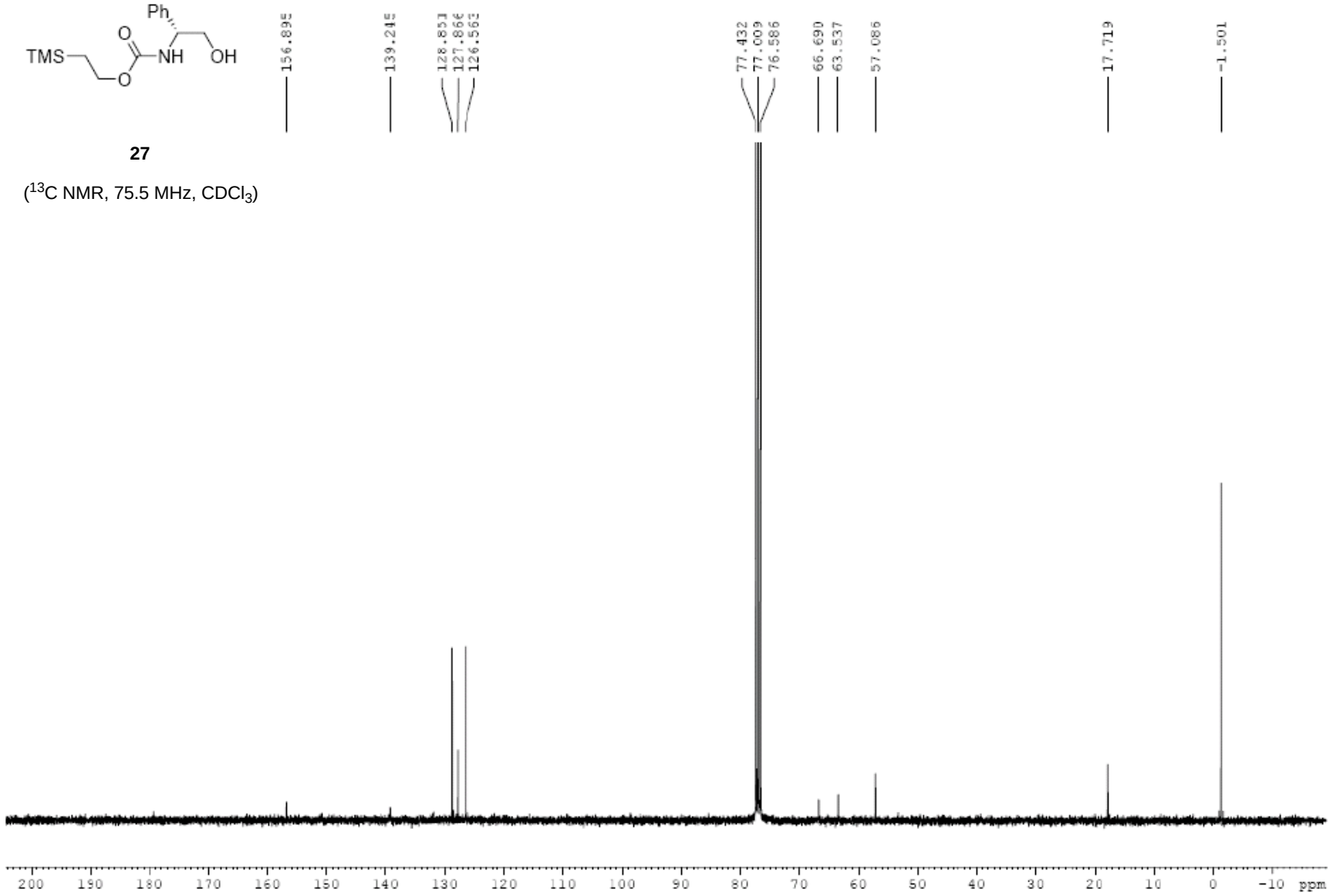
(^{13}C NMR, 75.5 MHz, $CDCl_3$)





27

(^{1}H NMR, 300 MHz, $CDCl_3$)

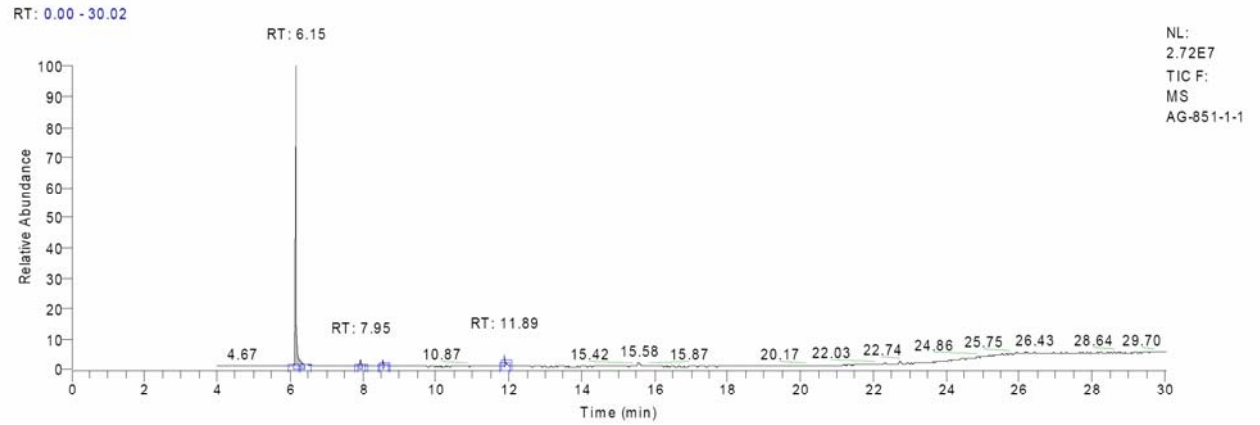


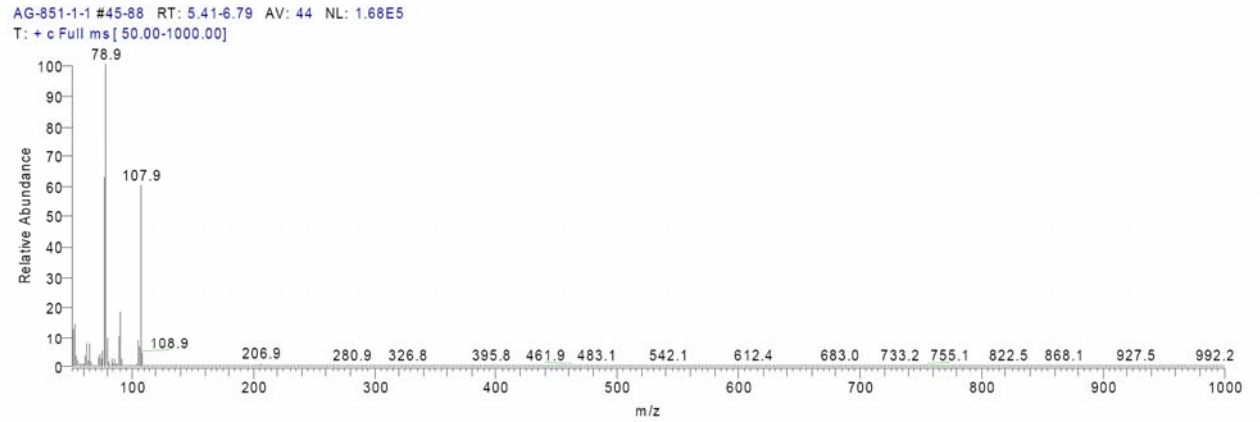
27

(^{13}C NMR, 75.5 MHz, $CDCl_3$)

Table 1, entry 1

C:\Xcalibur\data\AG\AG-851-1-1 4/14/2008 1:59:13 PM AG-851-1-1

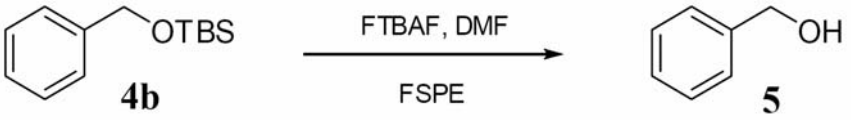




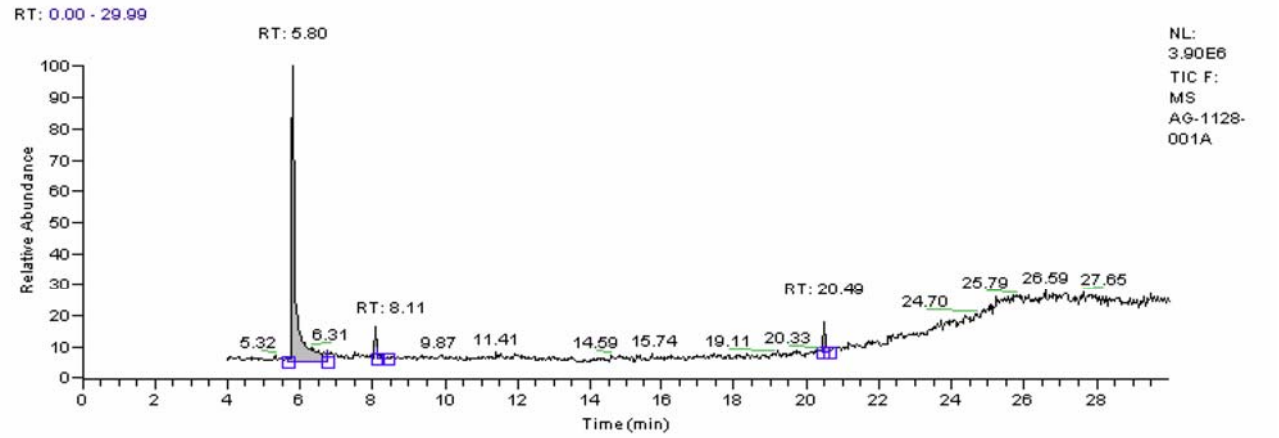
PEAK LIST
AG-851-1-1.RAW
RT: 5.98 - 12.08
Number of detected peaks: 4

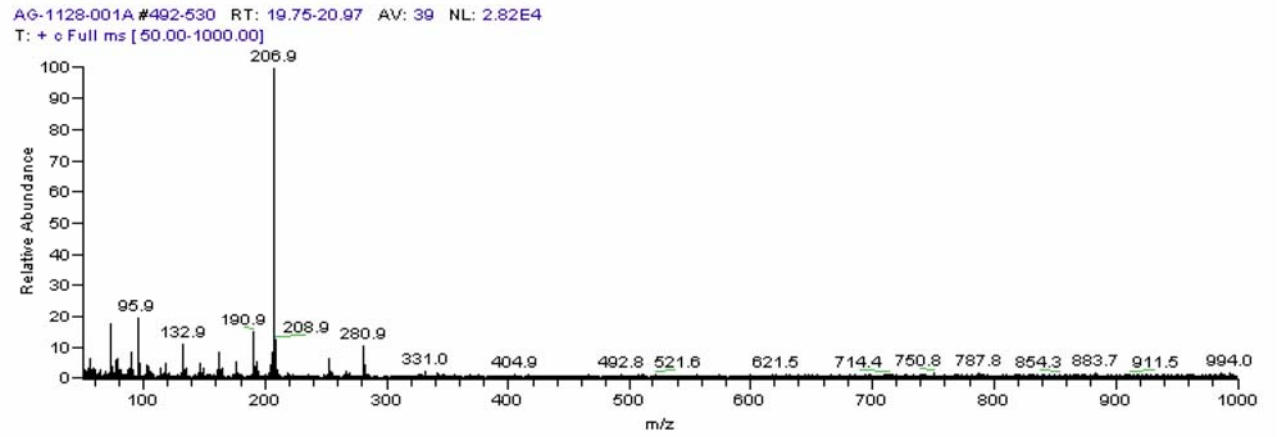
Apex RT	Start RT	End RT	Area	%Area
6,15	6,09	6,41	68358834,35	91,82
7,95	7,88	7,98	2476492,03	3,33
8,56	8,53	8,59	1733439,23	2,33
11,89	11,86	11,93	1876130,96	2,52

Table 1, entry 6



C:\Xcalibur\data\AG\AG-1128-001A 3/12/2009 2:16:14 PM AG-1128-0001A

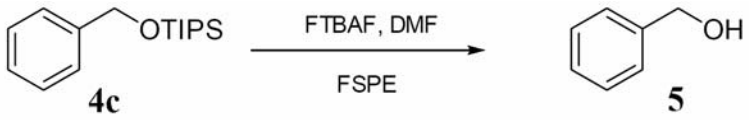




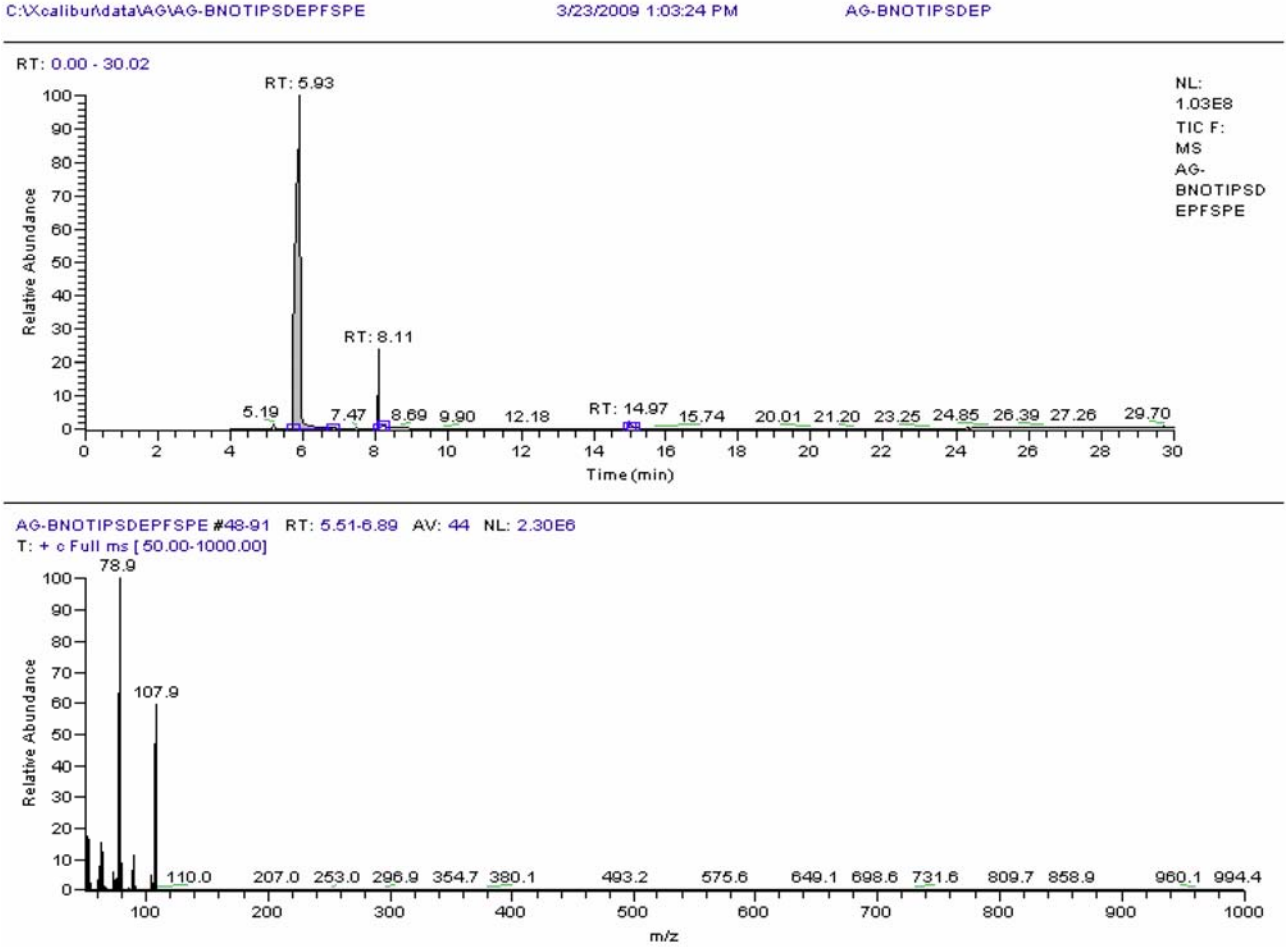
PEAK LIST
AG-1128-001A.RAW
RT: 0.00 - 29.99
Number of detected peaks: 3

Apex RT	Start RT	End RT	Area	%Area
5,8	5,67	6,76	26900143	**92,63**
8,11	8,11	8,4	731010,4	2,52
20,49	20,46	20,65	1409179	4,85

Table 1, entry 7



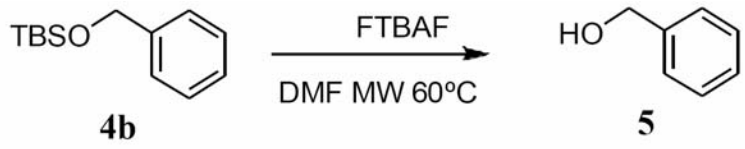
4c 5



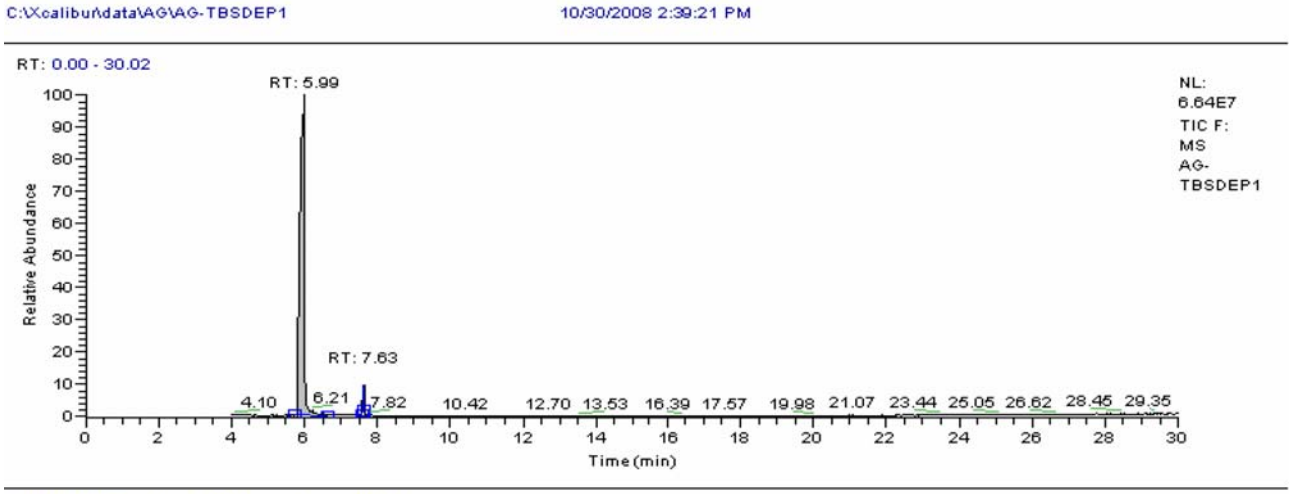
PEAK LIST
AG-BNOTIPSDEPFSPE.RAW
RT: 11.95 - 18.40
Number of detected peaks: 4

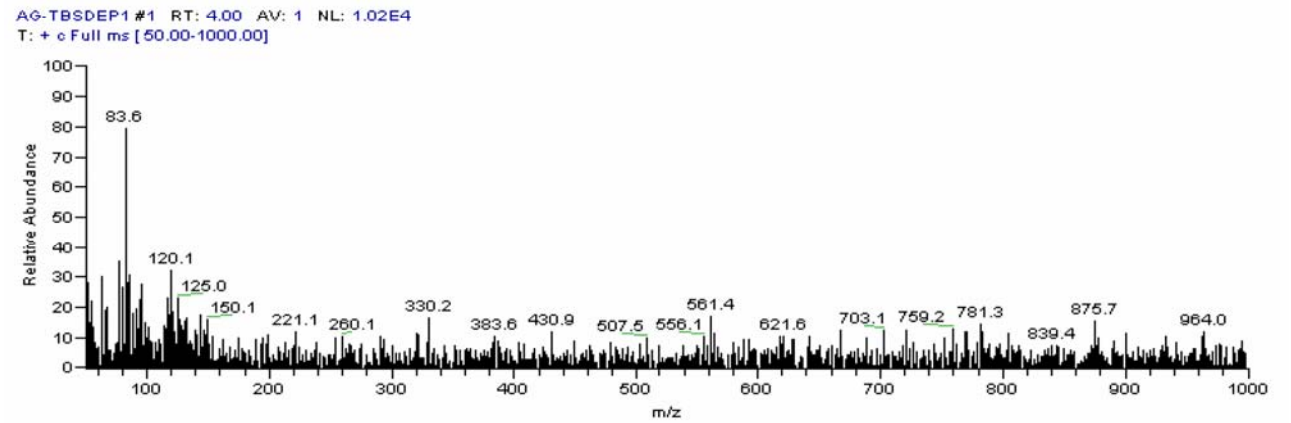
Apex RT	Start RT	End RT	Area	%Area
5,93	5,7	6,79	1000681424	**93,69**
8,08	8,04	8,11	63698132	5,96
14,97	14,97	15,04	3665403,695	0,34

Table 1, entry 8



4b **5**

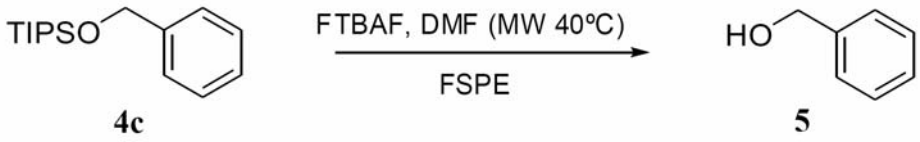




PEAK LIST
AG-TBSDEP1.RAW
RT: 0.00 - 30.02
Number of detected peaks: 2

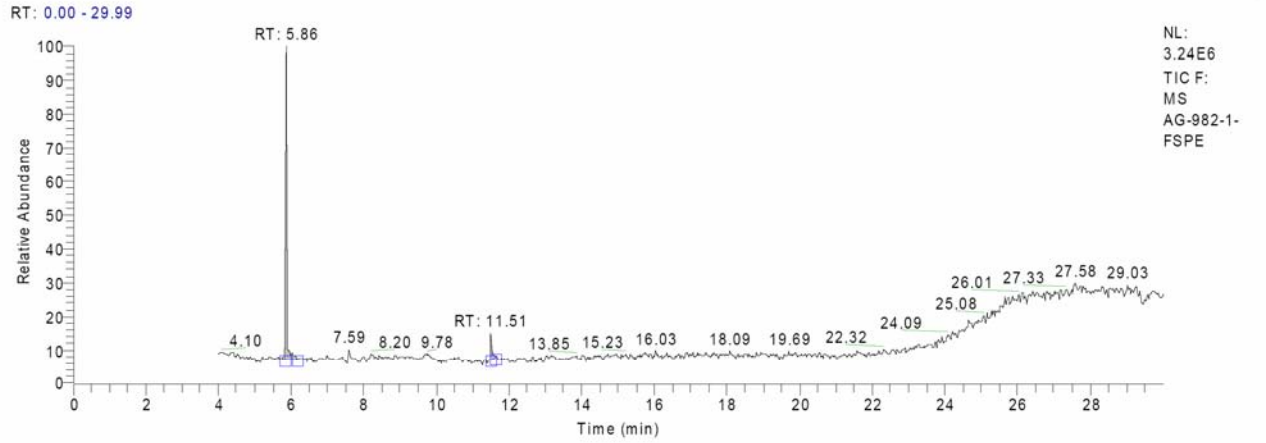
Apex RT	Start RT	End RT	Area	%Area
5,99	5,7	6,6	563064132,56	96,08
7,63	7,56	7,63	22956578,69	3,92

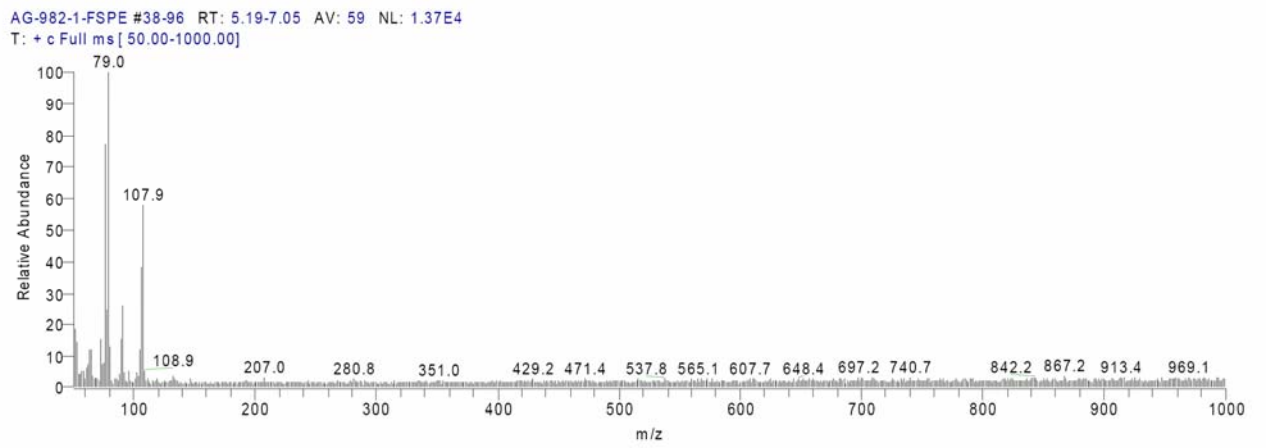
Table 1, entry 9



4c **5**

C:\Xcalibur\data\AG\AG-982-1-FSPE 7/17/2008 10:47:16 AM AG-982-1-FSPE

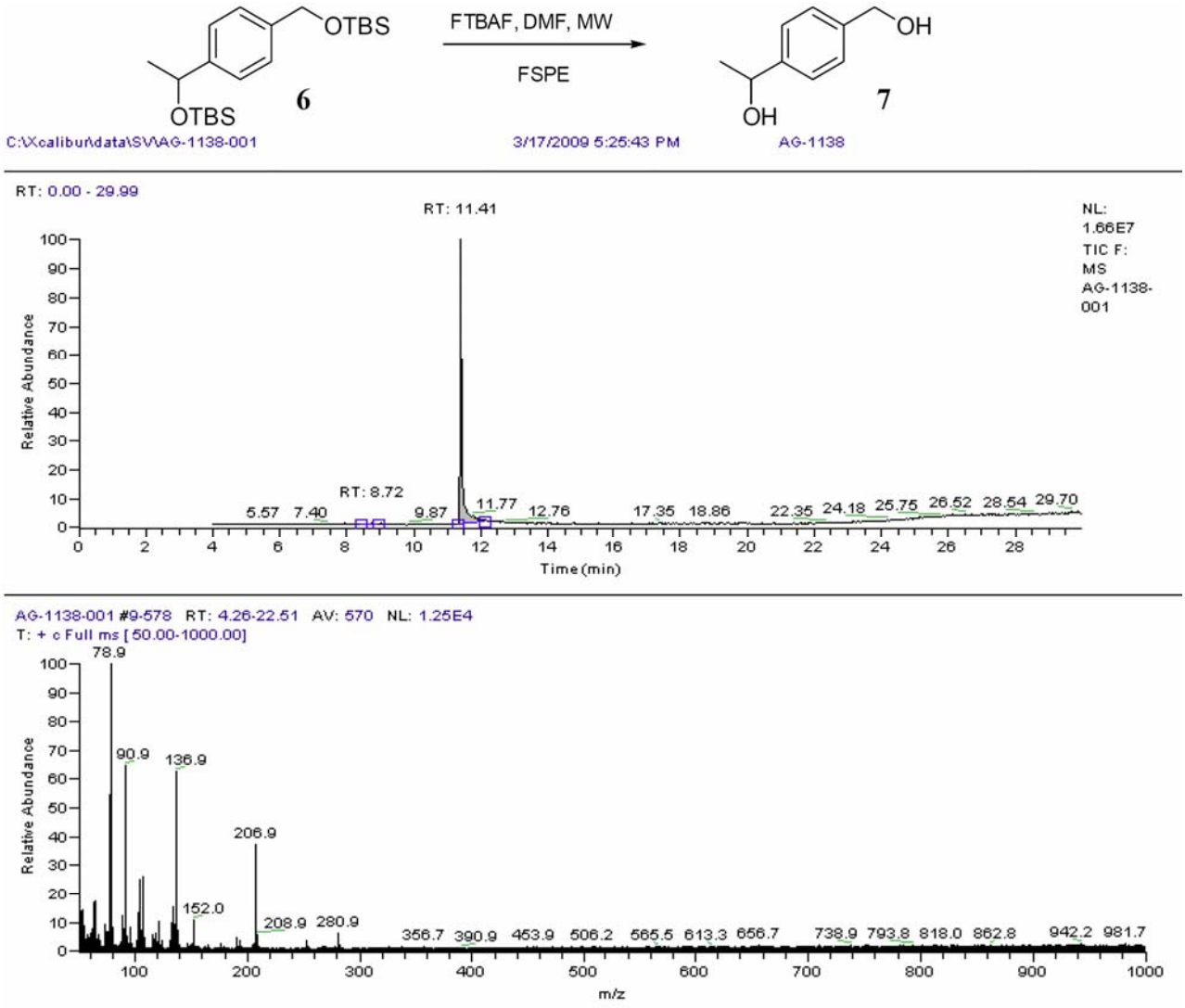




PEAK LIST
AG-982-1-FSPE.RAW
RT: 3.16 - 14.37
Number of detected peaks: 2

Apex RT	Start RT	End RT	Area	%Area
5,86	5,83	6,18	7346525,56	90,91
11,51	11,48	11,64	806495,27	9,09

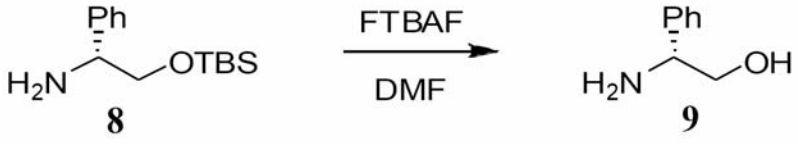
Scheme 3

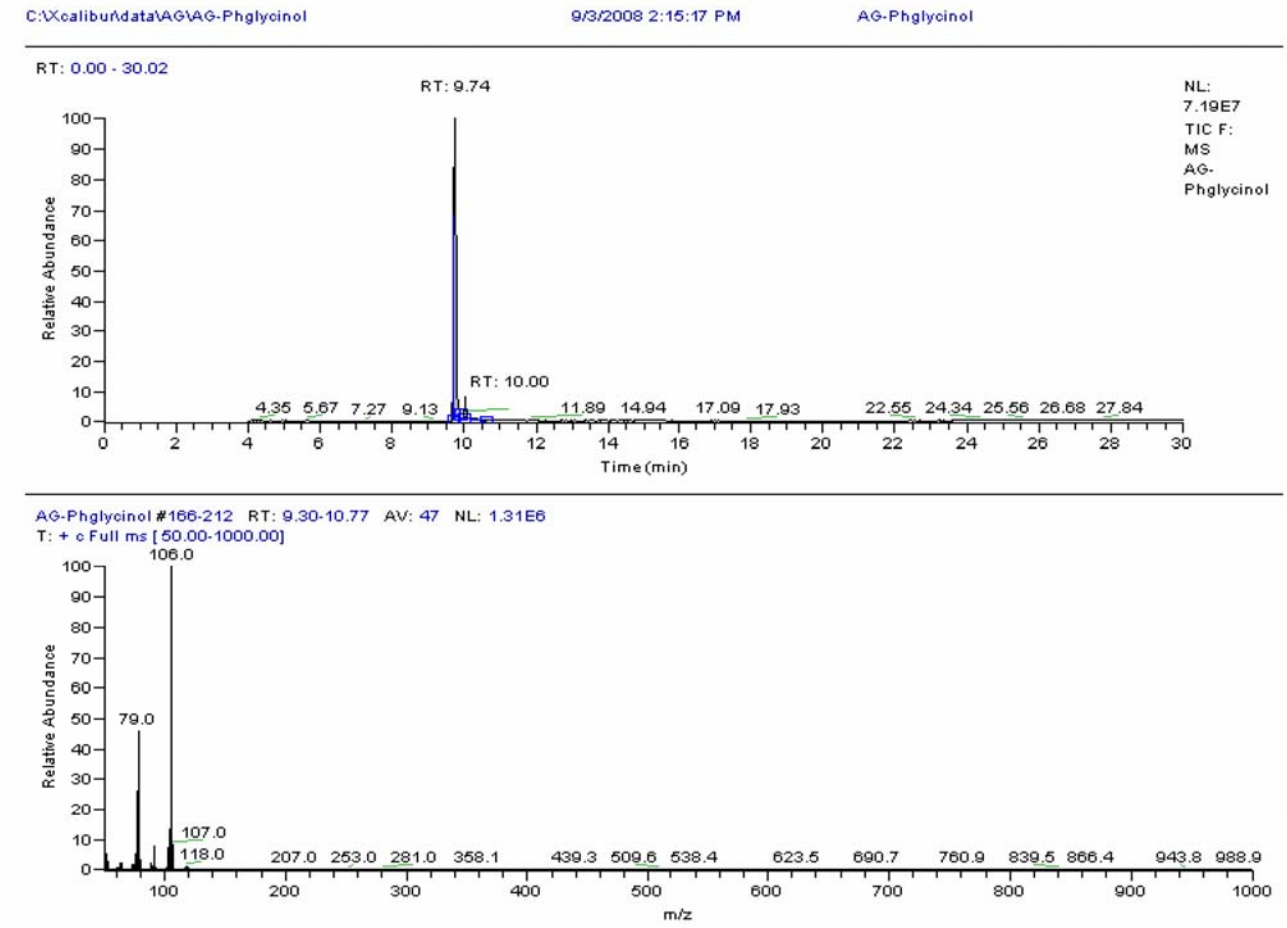


PEAK LIST
AG-1138-001.RAW
RT: 0.00 - 29.99
Number of detected peaks: 2

Apex RT	Start RT	End RT	Area	%Area
8,72	8,43	8,91	771035,7	1,18
11,41	11,32	12,12	64373365	**98,82**

Table 2, entry 1

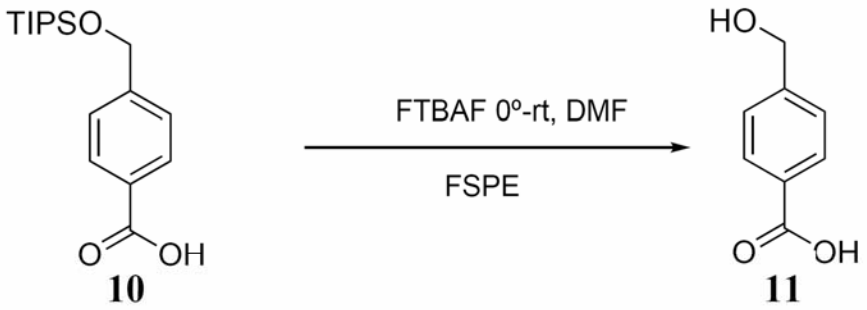




PEAK LIST
AG-TBSPG FSPE.RAW
RT: 8.56 - 23.87
Number of detected peaks: 2

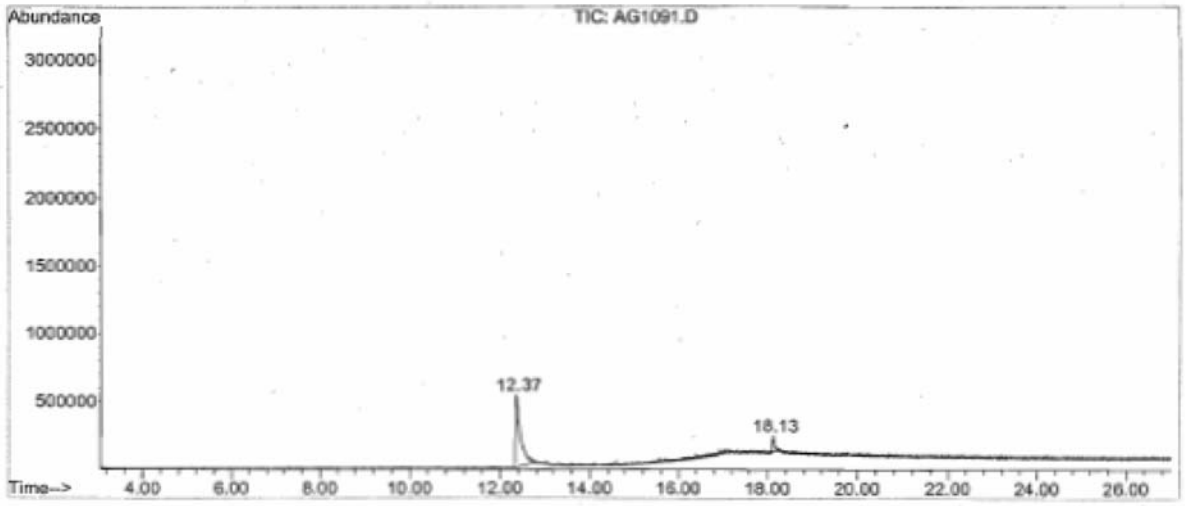
Apex RT	Start RT	End RT	Area	%Area
9,74	9,71	9,87	228538323,75	92,52
10	10	10,61	18467736,64	7,48

Table 2, entry 2



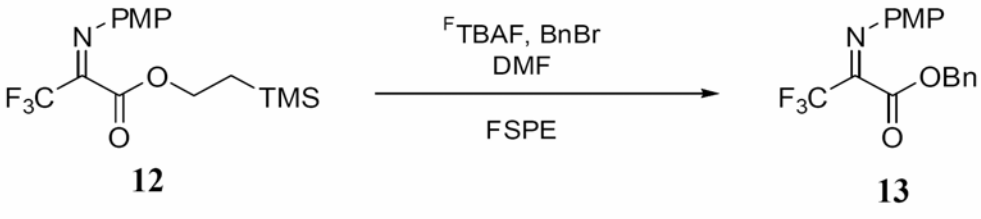
10 **11**

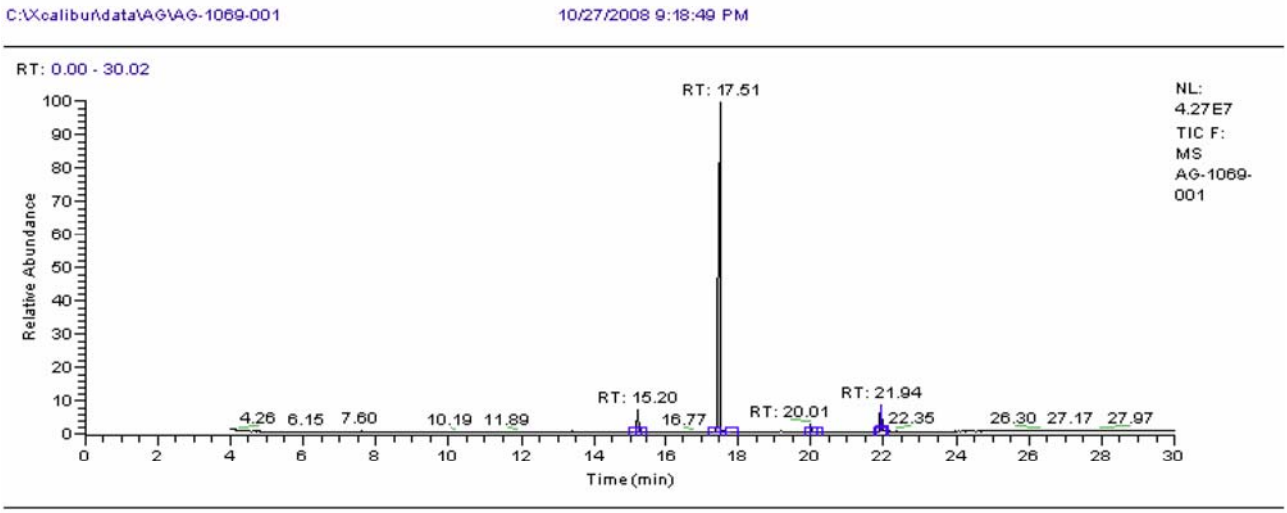
```
Data File : C:\MSDCHEM\1\DATA\sfustero\AG1091.D          Vial: 10
Acq On    :  4 Dec 2008  14:14                        Operator:
Sample    :                                           Inst    : Instrumen
Misc      :                                           Multiplr: 1.00
                                                   Sample Amount: 0.00
MS Integration Params: autoint1.e
Method    : C:\MSDCHEM\1\METHODS\AMADOR.M (Chemstation Integrator)
Title     :
```

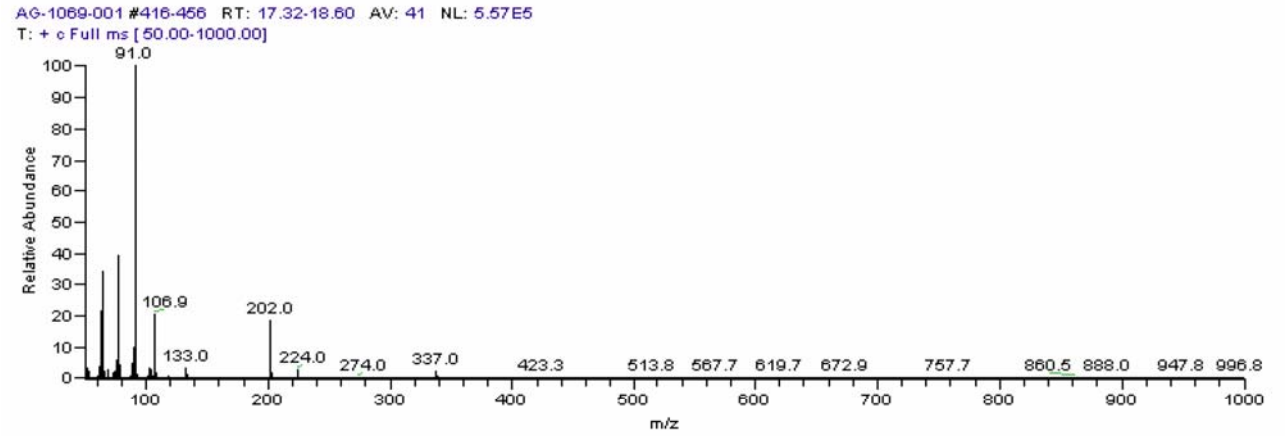



```
AG1091.D  AMADOR.M      Thu Dec 04 14:41:32 2008                    Page 2

                          Area Percent Report

Data File : C:\MSDCHEM\1\DATA\sfustero\AG1091.D          Vial: 10
Acq On    :  4 Dec 2008  14:14                        Operator:
Sample    :                                           Inst    : Instrumen
Misc      :                                           Multiplr: 1.00
                                                   Sample Amount: 0.00
MS Integration Params: autoint1.e

Method    : C:\MSDCHEM\1\METHODS\AMADOR.M (Chemstation Integrator)
Title     :

Signal    : TIC

peak  R.T. first  max last  PK   peak      corr.    corr.    % of
  #   min  scan scan scan  TY  height      area    % max.   total
---  ----- ----- ---- ---- --- -------  -------  ------  -------
 1  12.369  3537 3574 3739 BV 10  513369  39539609 100.00%  92.443%
 2  18.129  5704 5791 5836 BV 6   107675   3232057   8.17%   7.557%

                        Sum of corrected areas:    42771667
```

Table 2, entry 3





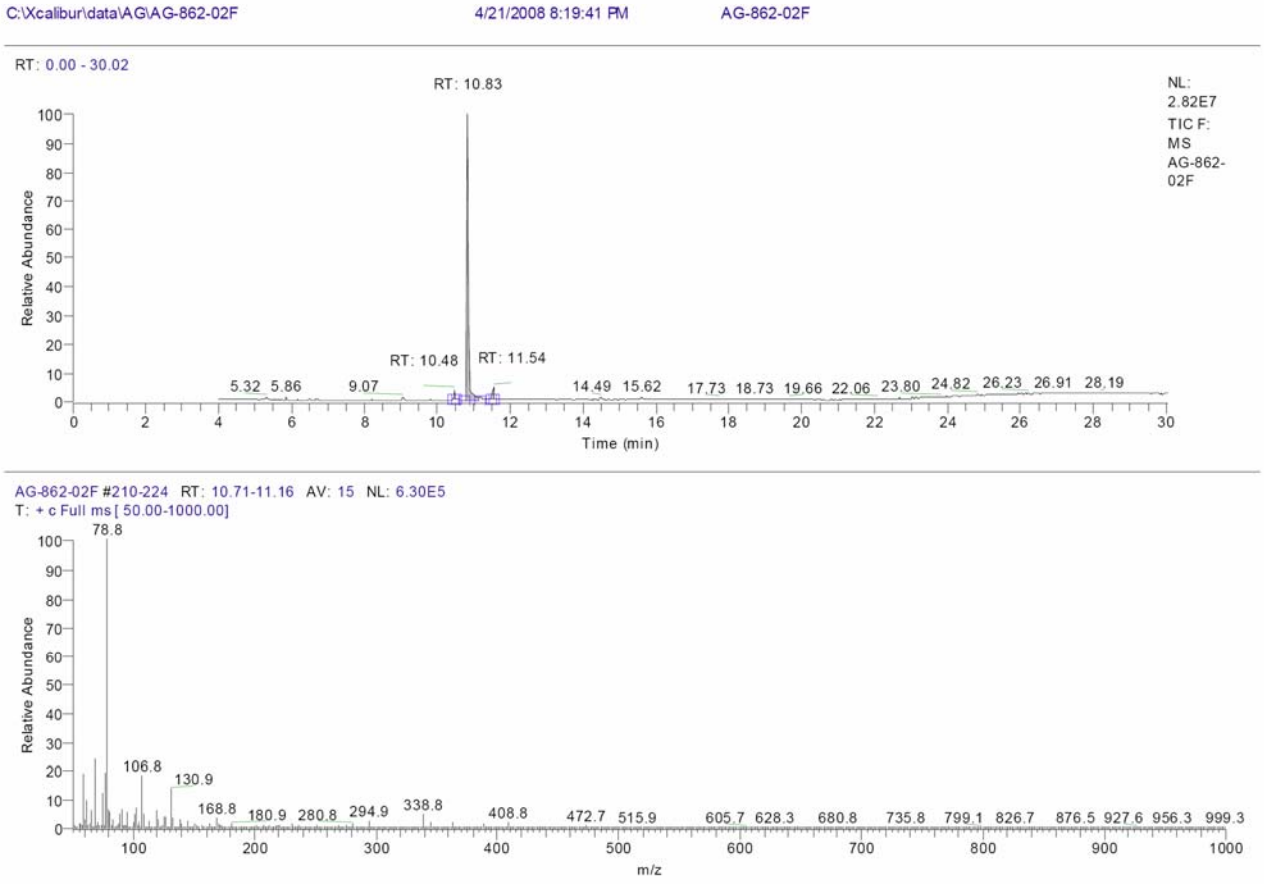


PEAK LIST
AG-1069-001.RAW
RT: 11.38 - 26.37
Number of detected peaks: 4

Apex RT	Start RT	End RT	Area	%Area
15,2	15,1	15,3	5763434	3,24
17,51	17,32	17,83	1,64E+08	92,34
20,01	19,98	20,14	2504595	1,41
21,94	21,87	21,94	5363358	3,01

Table 2, entry 4

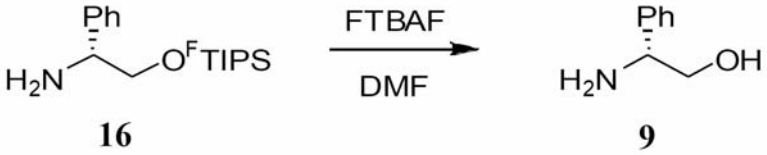
14 **15**



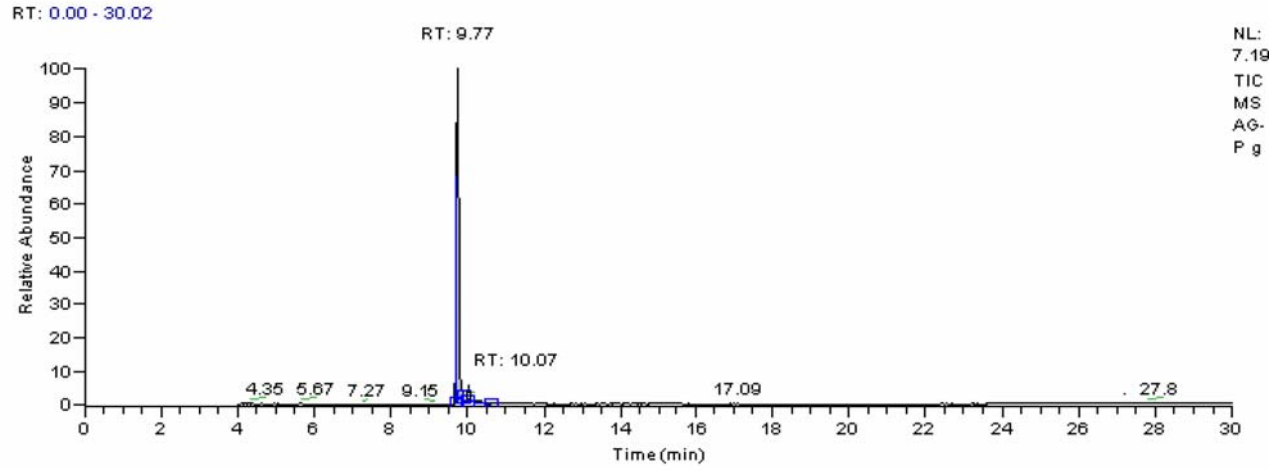
PEAK LIST
AG-862-02F.RAW MeOH-H2O 8:2
RT: 10.01 - 12.58
Number of detected peaks: 3

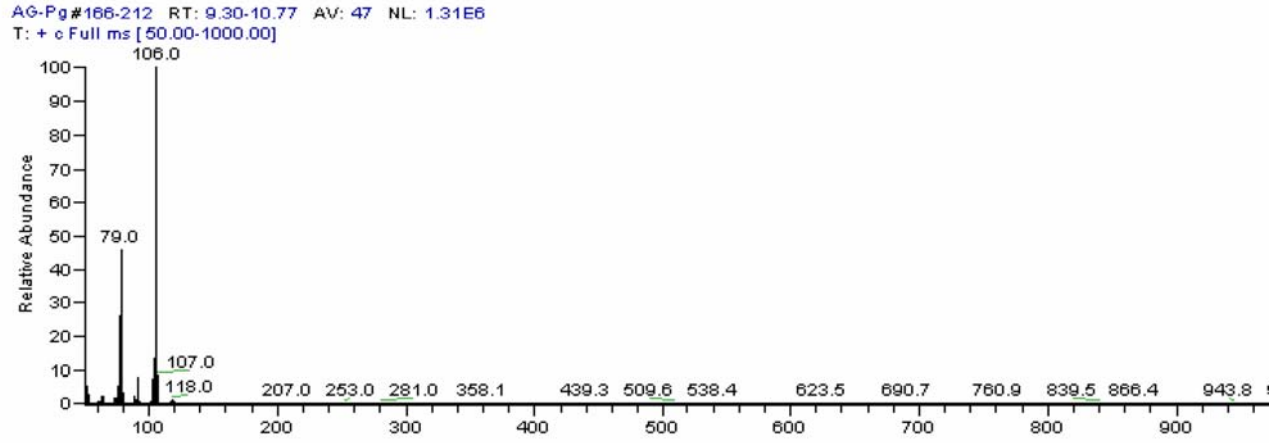
Apex RT	Start RT	End RT	Area	%Area
10,48	10,42	10,51	2567189,416	3,09
10,83	10,74	11,16	76966737,26	92,73
11,54	11,48	11,57	3464044,925	4,17

Table 2, entry 5



16 **9**

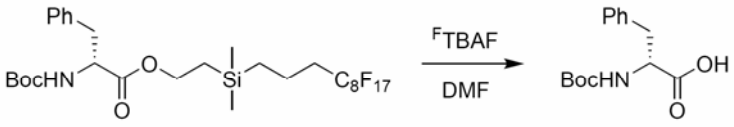




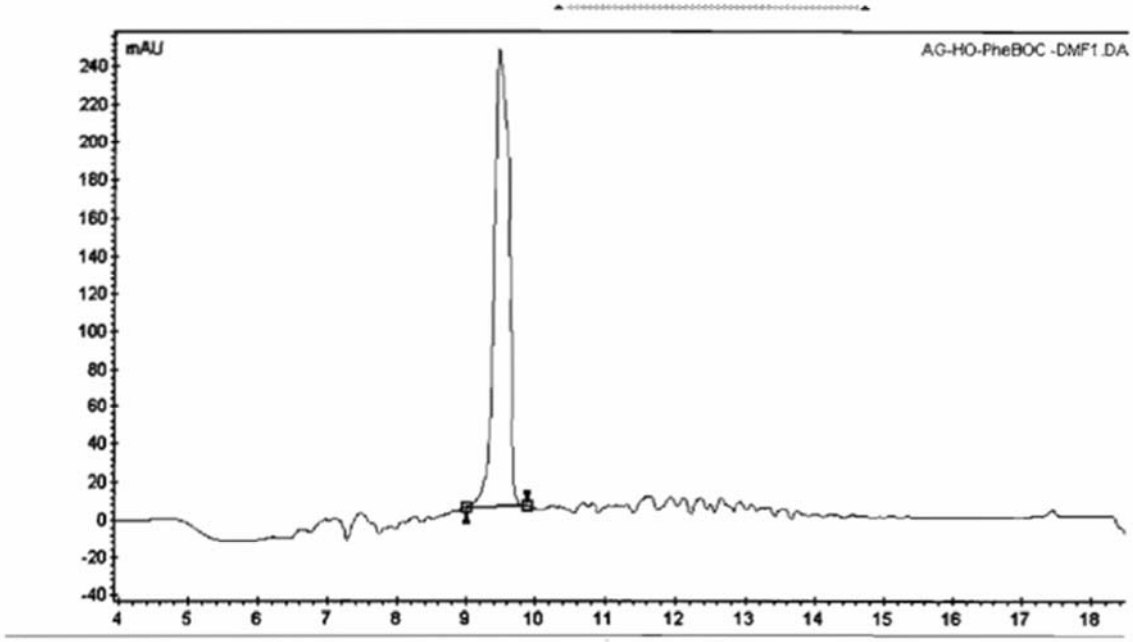
PEAK LIST
AG-fTIPSPG FSPE.RAW
RT: 8.56 - 23.87
Number of detected peaks: 2

Apex RT	Start RT	End RT	Area	%Area
9,77	9,74	9,92	378638924,8	93,57
10,07	10,03	10,31	26019539,2	6,43

Table 2, entry 6

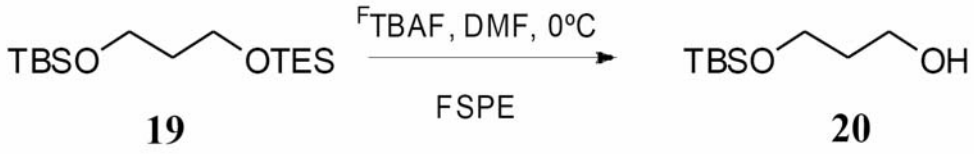


17 **18**

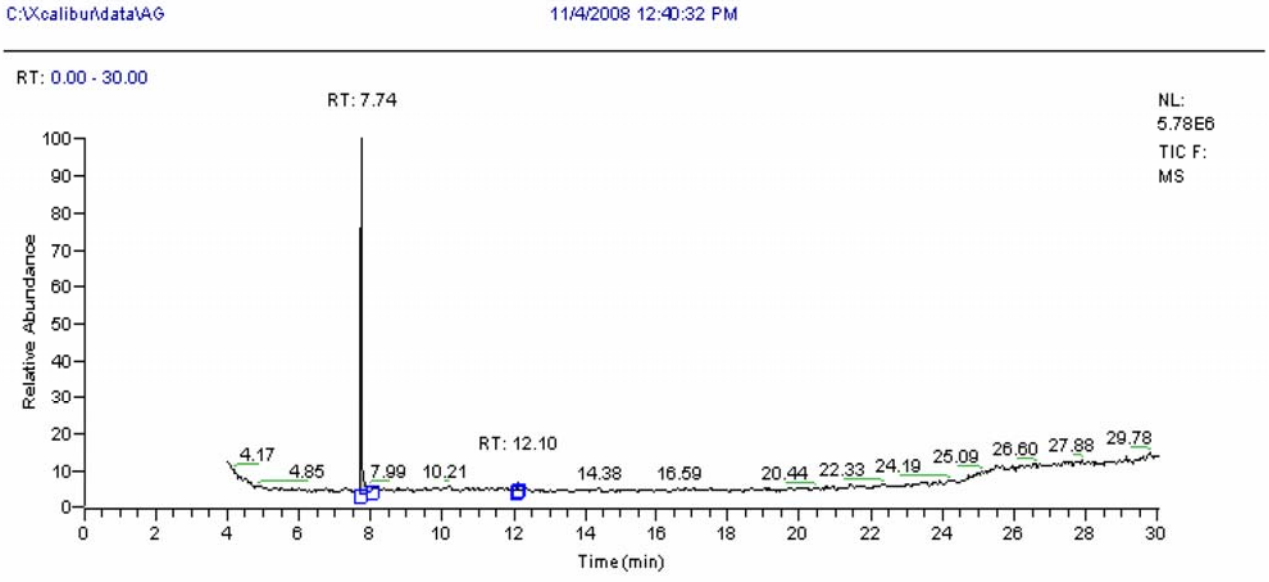


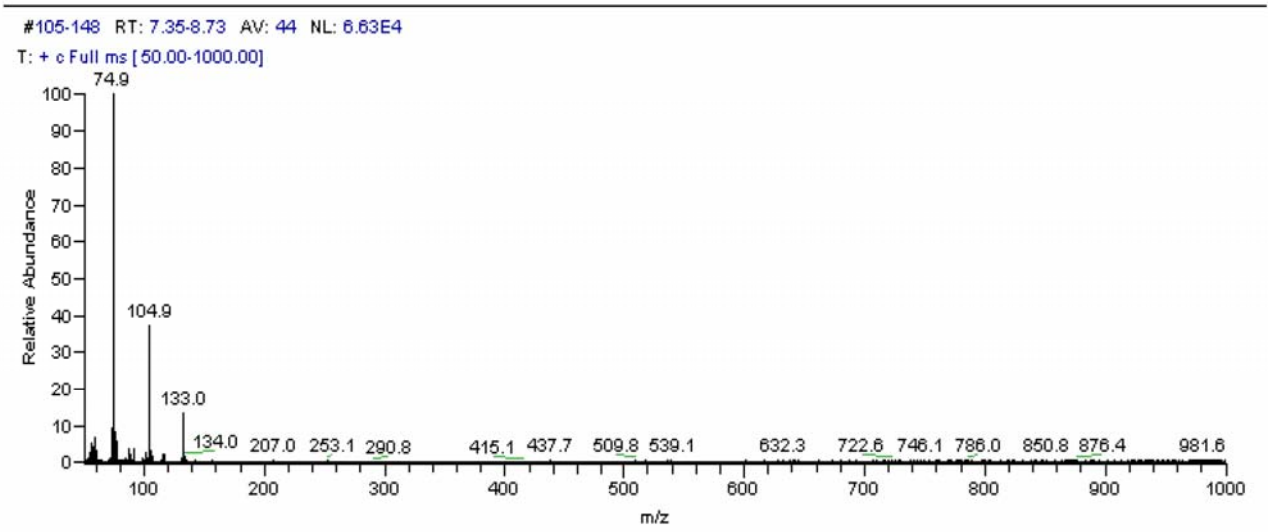
#	Name	Time [Min]	Quantity [% Area]	Height [mAU]	Area [mAU.Min]	Area % [%]
1	UNKNOWN	9,453	100,00	241,8	59,2	100,000
Total			100,00	241,8	59,2	100,000

Table 3, entry 1



19 **20**

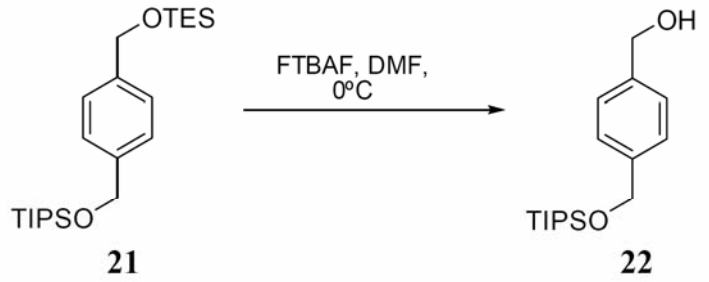




PEAK LIST
AG-914 DepReactionTBSCH2CH2CH2OTES
RT: 0.00 - 30.00
Number of detected peaks: 2

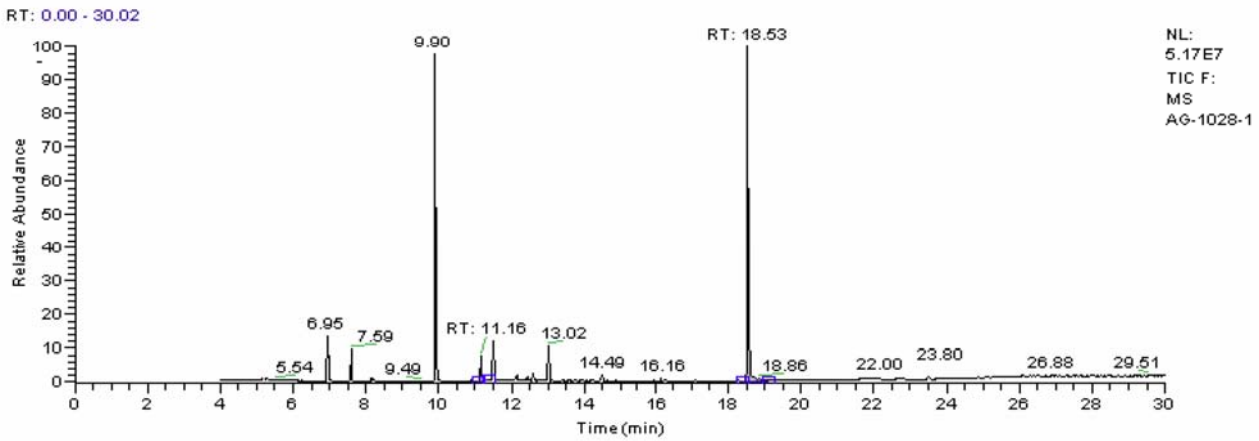
Apex RT	Start RT	End RT	Area	%Area
7,74	7,7	8,06	14248523	98,49
12,1	12,07	12,13	219050	1,51

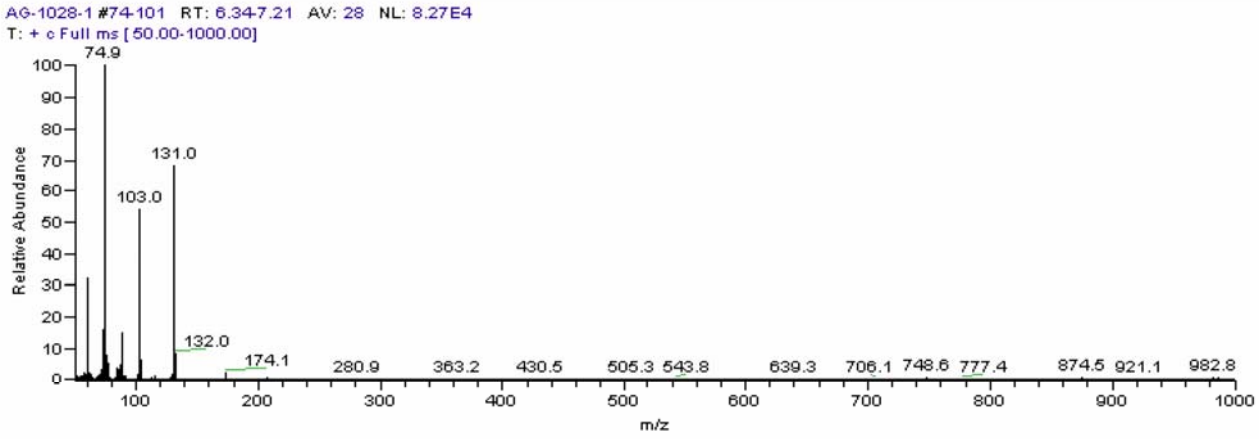
Table 3, entry 2



21 **22**

C:\Xcalibur\data\AG\AG-1028-1 9/10/2008 5:04:07 PM AG-1028-1

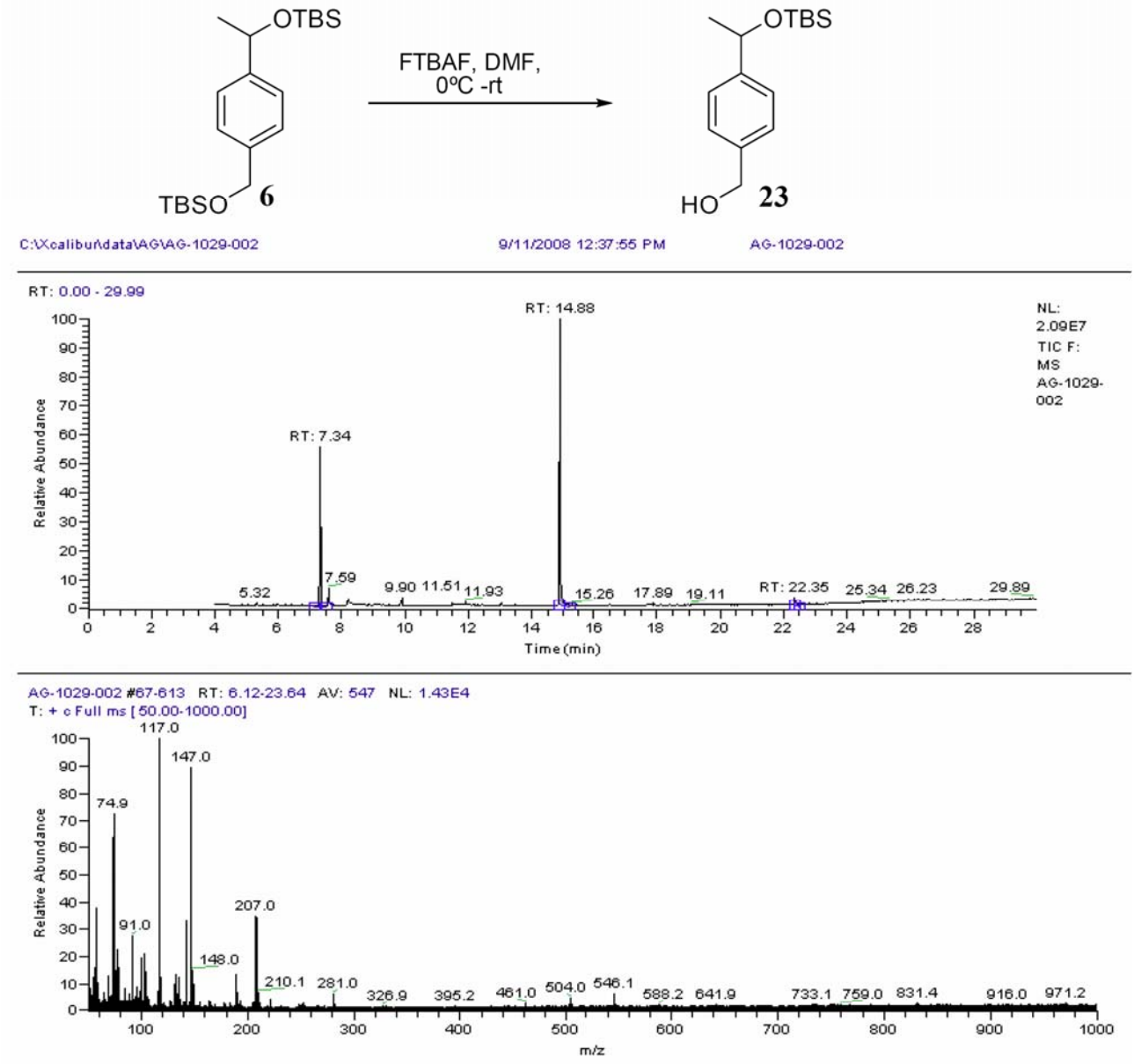




PEAK LIST
AG-1028-1.RAW
RT: 10.24 - 23.52
Number of detected peaks: 2

Apex RT	Start RT	End RT	Area	%Area	
11,16	11,09	11,35	11398997	7,95	**free diol**
18,53	18,37	19,11	1,32E+08	92,05	**TIPSOCH2PhCH2OH**
22				0	sm

Table 3, entry 3



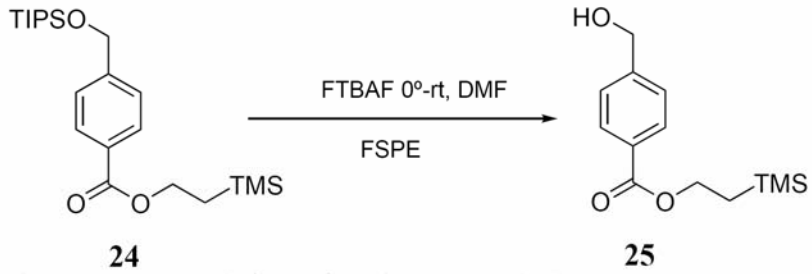
PEAK LIST
AG-1029-002.RAW
RT: 0.00 - 29.99
Number of detected peaks: 3

Apex RT	Start RT	End RT	Area	%Area	Height	%Height
7,34	7,15	7,5	28736268	36,25	11478763	35,13
14,88	14,85	15,17	48141418	60,73	20583052	62,99
22,35	22,32	22,48	2397450	3,02	614549,2	1,88

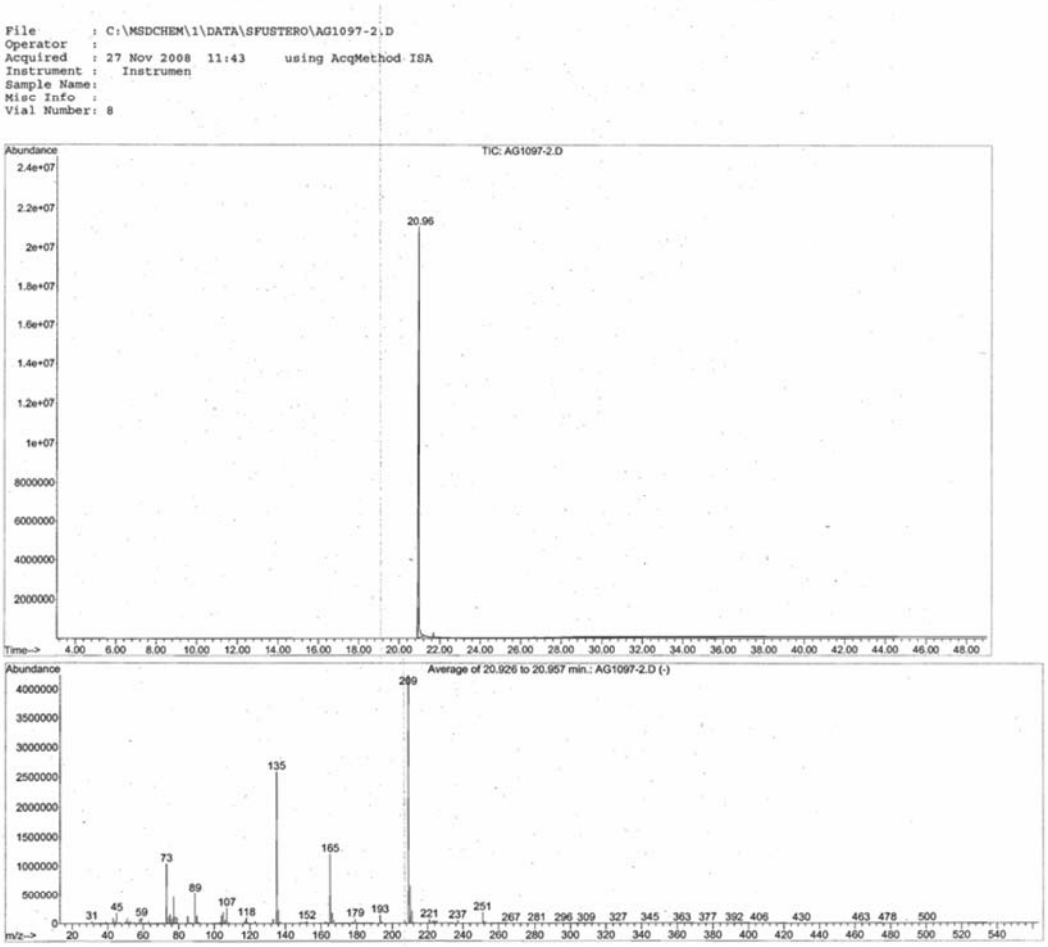
PEAK LIST
AG-1029-002.RAW
RT: 0.00 - 29.99
Number of detected peaks: 2

Apex RT	Start RT	End RT	Area	%Area	
9,9	9,87	9,94	1174207	2,25	sm
14,88	14,75	15,42	50953669	97,75	monoprotected compound

Table 3, entry 4

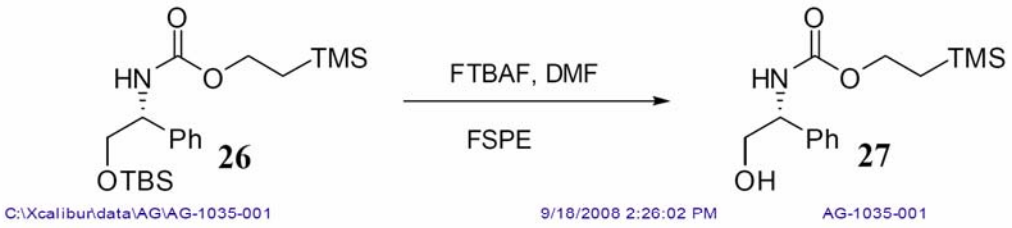


24 **25**

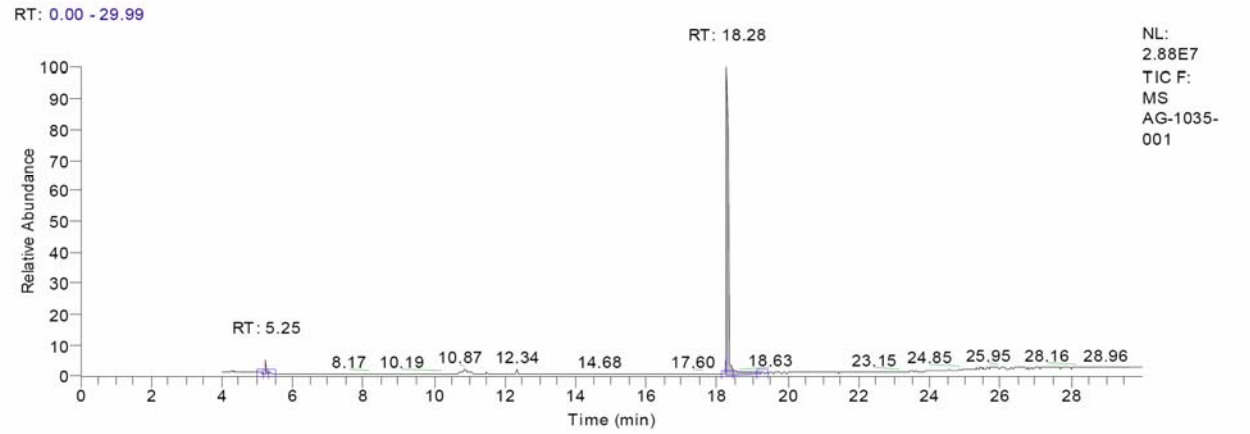


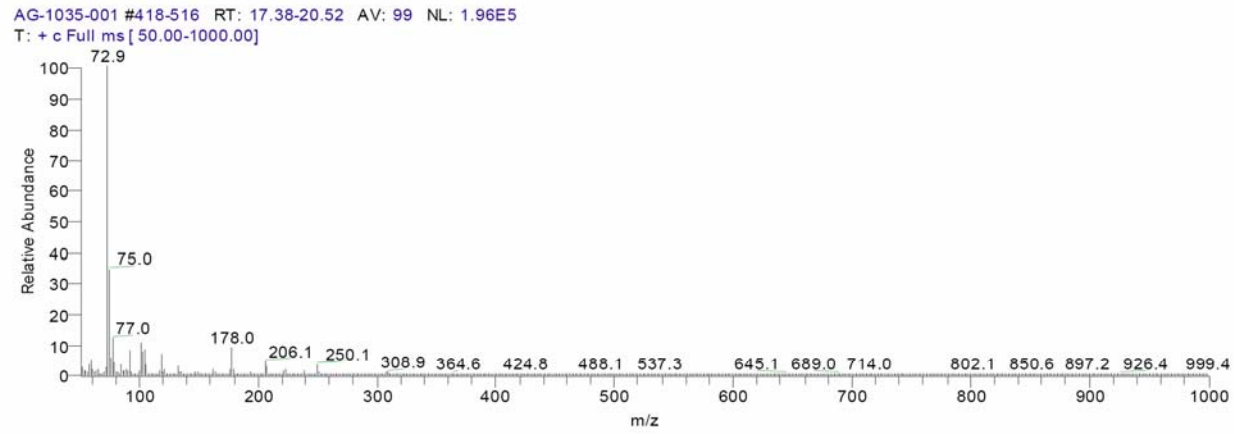

```
Data File : C:\MSDCHEM\1\DATA\sfustero\AG1097-2.D        Vial: 8
Acq On    : 27 Nov 2008  11:43                        Operator:
Sample    :                                           Inst    : Instrumen
Misc      :                                           Multiplr: 1.00
                                                  Sample Amount: 0.00
MS Integration Params: autoint1.e

Method    : C:\MSDCHEM\1\METHODS\ISA.M (Chemstation Integrator)
Title     :

Signal    : TIC

peak  R.T. first  max last  PK   peak      corr.    corr.    % of
  #   min   scan scan scan  TY  height     area     % max.   total
---  ----- ----- ---- ---- --- -------   -------  ------  -------
 1  20.957  5675 5708 5802 BB 2 21543233 513577622 100.00% 100.000%

                        Sum of corrected areas:   513577622
```

Table 3, entry 5



C:\Xcalibur\data\AG\AG-1035-001 9/18/2008 2:26:02 PM AG-1035-001





PEAK LIST
AG-1035-001.RAW
RT: 0.00 - 29.99
Number of detected peaks: 2

Apex RT	Start RT	End RT	Area	%Area
5,25	5,16	5,32	3108155,098	2,52
18,28	18,25	19,27	120114903,5	97,48