Supporting Information

Friedel–Crafts Alkylation with Carbenium Ions Generated by Electrochemical Oxidation of Stannylmethyl Ethers

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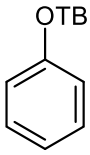
Contents

1. Synthesis of starting materials

Nucleophiles were prepared according to known literature procedures from commercially available alcohols and amines.

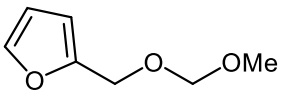
Tert-butyldimethyl(phenoxy)silane



The compound was synthesized according to a literature procedure. [1]

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.23 (m, 2H), 6.94 (m, 1H), 6.88 – 6.79 (m, 2H), 0.99 (s, 9H), 0.20 (s, 6H).

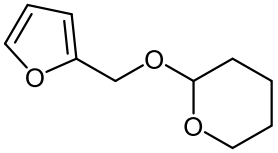
2-((Methoxymethoxy)methyl)furan



The compound was synthesized according to a literature procedure. [2]

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.42 (s, 1H), 6.34 (m, 2H), 4.68 (s, 2H), 4.54 (s, 2H), 3.40 (s, 3H).

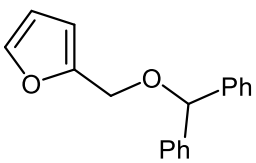
2-(Furan-2-ylmethoxy)tetrahydro-2*H*-pyran



The compound was synthesized according to a literature procedure.[3] Product has been reported in literature.[4]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 (s, 1H), 6.33 (s, 2H), 4.71 (m, 1H), 4.66 (m, J = 12.8 Hz, 1H), 4.49 (d, J = 12.8 Hz, 1H), 3.98 – 3.84 (m, 1H), 3.54 (m, 1H), 1.92 – 1.45 (m, 6H).

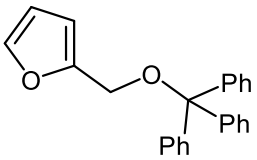
2-((Benzhydryloxy)methyl)furan



To a stirred solution of furfuryl alcohol (1.00 mL, 11.67 mmol) in dry DMF, sodium hydride (60% in oil, 0.70 g, 17.35 mmol) was added in portions under Ar at 0 ˚C. The solution was stirred for 30 min at room temperature. Then, benzhydryl bromide (3.00 g, 12.15 mmol) was added in portions, and the solution was stirred overnight. Afterwards, the reaction mixture was quenched with water and the aqueous layer was washed with EtOAc (2x), the combined organic layers were washed with water and brine, dried over Na_2SO_4 and the solvent was evaporated in vacuum. The

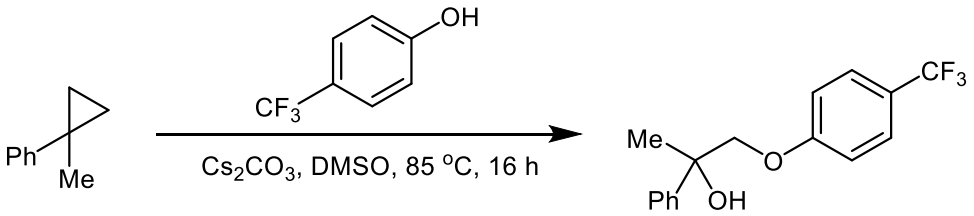
crude mixture was purified by flash column chromatography on silica gel (eluent petroleum ether/EtOAc 8:1), yielding 2.05 g (66%) of product as a yellow oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.42 (m, 1H), 7.39 – 7.21 (m, 11H including residual $CHCl_3$), 6.34 (m, 1H), 6.30 (m, 1H), 5.46 (s, 1H), 4.49 (s, 2H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 151.94, 142.93, 141.90, 128.55, 127.66, 127.36, 110.36, 109.58, 82.27, 62.71.
HR-MS (ESI-TOF) m/z: calcd. for $C_{18}H_{25}O_2$ $[M–1]^+$ 263.1072; found: 263.1076.

2-((Trityloxy)methyl)furan



2-((Trityloxy)methyl)furan was synthesized according to a literature procedure[5] from furfuryl alcohol (0.50 mL, 5.78 mmol), trityl chloride (1.77 g, 6.36 mmol), triethylamine (1.37 mL, 9.83 mmol), and DMAP (56.5 mg, 0.46 mmol). Purification by flash column chromatography on silica gel (eluent petroleum ether/EtOAc 8:1) afforded 1.32 g (67%) of product as a white solid. Product has been reported in literature.[6]
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.52 (d, J = 7.0 Hz, 6H), 7.43 (m, 1H), 7.37 – 7.18 (m, 13H including residual $CHCl_3$), 6.34 (m, 1H), 6.25 (d, J = 3.1 Hz, 1H), 4.07 (s, 2H).

Synthesis of starting alcohol S1

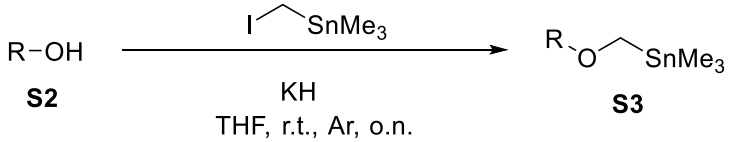


S1

Synthesized according to a literature method[7] from 2-methyl-2-phenoxirane (1.45 g, 10.80 mmol), 4-(trifluoromethyl)phenol (1.84 g, 11.34 mmol), and cesium carbonate (3.87 g, 11.88 mmol). Purification by flash column chromatography on silica gel (eluent petroleum ether/EtOAc 4:1) afforded 1.21 g (38%) of product as a yellow oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.62 – 7.30 (m, 7H), 7.02 – 6.93 (m, 2H), 4.12 (d, J = 19.9 Hz, 2H), 2.64 (d, J = 15.0 Hz, 1H), 1.70 (s, 3H).

Synthesis of stannylmethylethers

The synthesis of substrates **1b-d**, **1i**, **1k** has been described before.[8]
Substrates were synthesized according to the general procedure. Synthesis method was adapted from previous studies.[8]



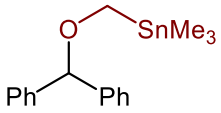
S2 **S3**

Oven-dried flask was charged with 30% KH suspension in oil (1.50 equiv) in dry THF under argon. Alcohol **S2** (1.00 equiv) was added to the suspension in portions and the solution was stirred for 10 min at room temperature. Afterwards, (iodomethyl)trimethylstannane (1.10 equiv) was added and the reaction mixture was stirred overnight. Then, the excess KH was quenched by slow addition of water, the reaction mixture was diluted with diethyl ether and washed with water and brine. The

organic phase was dried over Na_2SO_4 and the solvent was evaporated to afford a crude mixture which was purified by flash column chromatography on silica gel to obtain product **S3**.

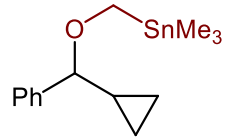
Note on handling trimethyltin compounds. Organotin compounds are known to be very toxic for animals and humans. Organotin compounds can impact the CNS, cause damage to respiratory system, act as endocrine-disrupting chemicals. Volatile organotin compounds, including trimethyltin derivatives, can cause persistent headaches, epileptiform convulsions, narcosis, and respiratory paralysis.[9] Care should be taken when handling organotin compounds: they should be handled only in a fumehood in PPE by trained personnel.
After the electrolysis, solid trimethyltin derivatives form that are removed by silica gel which should be disposed as hazardous waste.[10]

((Benzhydryloxy)methyl)trimethylstannane (1a)



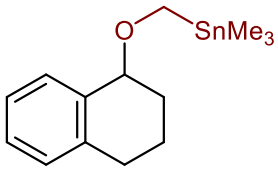
Prepared according to the general method from benzhydrol (5.00 g, 2.70 mmol), potassium hydride (30% in oil, 0.54 g, 4.05 mmol), and (iodomethyl)trimethylstannane (0.90 g, 2.97 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/EtOAc 20:1) afforded 0.75 g (77%) of product as a colourless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.32 – 7.27 (m, 8H), 7.24 – 7.19 (m, 2H), 5.16 (s, 1H), 3.66 (s, $J(^{117/119}Sn\text{-}^1H)$ = 9.3 Hz, 2H), 0.15 (s, $J(^{117/119}Sn\text{-}^1H)$ = 26.0/27.2 Hz, 9H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 142.82, 128.41, 127.39, 127.12, 87.68 (s, $J(^{117/119}Sn\text{-}^1H)$ = 24.4/25.4 Hz), 60.94 (s, $J(^{117/119}Sn\text{-}^1H)$ = 206.6/215.5 Hz), -10.21(s, $J(^{117/119}Sn\text{-}^1H)$ =157.6/165.4 Hz).
HR-MS (ESI-TOF) m/z: calcd. for $C_{16}H_{19}OSn$ $[M–Me]^+$ 347.0458; found: 347.0471.

((Cyclopropyl(phenyl)methoxy)methyl)trimethylstannane (1e)



Prepared according to the general method from *α*-cyclopropylbenzyl alcohol (0.67 g, 4.55 mmol), potassium hydride (30% in oil, 0.91 g, 6.82 mmol), and (iodomethyl)trimethylstannane (2.16 g, 5.00 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/DCM 9:1) afforded 1.30 g (88%) of product as a colourless oil.
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 – 7.24 (m, 5H), 3.67 – 3.49 (m, 3H), 1.10 (m, 1H), 0.57 (m, 1H), 0.52 – 0.37 (m, 2H), 0.28 (m, 1H), 0.11 (s, $J(^{117/119}Sn\text{-}^1H)$ = 25.9/27.3, 9H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 142.71, 128.34, 127.46, 127.05, 88.95 (s, $J(^{117/119}Sn\text{-}^{13}C)$ =21.0/21.9 Hz), 60.73 (s, $J(^{117/119}Sn\text{-}^{13}C)$ = 209.3/217.7 Hz), 17.92, 3.88, 2.07, -10.17 (s, $J(^{117/119}Sn\text{-}^{13}C)$ =156.3/163.6 Hz).
HR-MS (ESI-TOF) m/z: calcd. for $C_{14}H_{23}OSn$ $[M+1]^+$ 327.0771; found: 327.0779.

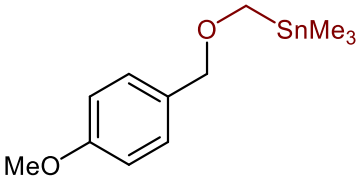
Trimethyl(((1,2,3,4-tetrahydronaphthalen-1-yl)oxy)methyl)stannane (1f)



Prepared according to the general method from 1,2,3,4-tetrahydronaphthalen-1-ol (0.30 g, 2.00 mmol), potassium hydride (30% in oil, 0.40 g, 3.00 mmol), and (iodomethyl)trimethylstannane (0.67 g, 2.20 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/EtOAc 10:1) afforded 0.47 g (73%) of product as a colourless oil.
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.35 (m, 1H), 7.24 – 7.14 (m, 2H), 7.14 – 7.00 (m, 1H), 4.25 (t, J = 4.9 Hz, 1H), 3.89&3.70 (d&d, J = 10.2 Hz, $J(^{117/119}Sn\text{-}^1H)$ = 9.3/9.7 Hz, 1H), 3.77 – 3.63 (m, 1H), 2.89 – 2.60 (m, 2H), 2.07 – 1.91 (m, 3H), 1.80 – 1.65 (m, 1H), 0.27 – 0.05 (s, $J(^{117/119}Sn\text{-}^1H)$ = 26.0/27.2 Hz, 9H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 137.65, 137.32, 129.22, 128.94, 127.39, 125.67, 79.24 (s, J($^{117/119}$Sn-^{1}H) = 22.7 Hz), 59.90 (s, J($^{117/119}$Sn-^{1}H) = 209.8/219.2 Hz), 57.72, 29.39, 27.45, 19.26, -10.17 (s, J($^{117/119}$Sn-^{1}H) = 156.2/163.3 Hz).
HR-MS (ESI-TOF) m/z: calcd. for $C_{13}H_{19}OSn$ $[M–Me]^+$ 311.0458; found: 311.0456.

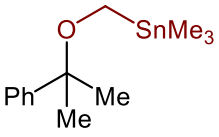
(((4-Methoxybenzyl)oxy)methyl)trimethylstannane (1g)



Prepared according to the general method from 4-methoxybenzyl alcohol (0.31 mL, 2.50 mmol), potassium hydride (30% in oil, 0.50 g, 3.75 mmol), and (iodomethyl)trimethylstannane (0.84 g, 2.75 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/EtOAc 20:1) afforded 0.65 g (82%) of product as a colourless oil.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 (m, 2H), 6.88 (m, 2H), 4.37 (s, 2H), 3.80 (s, 3H), 3.71 (s, J($^{117/119}$Sn-^{1}H) = 8.3 Hz, 2H), 0.15 (s, J($^{117/119}$Sn-^{1}H) = 26.0/27.3 Hz, 9H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 159.20, 130.90, 129.31, 113.80, 62.21, 55.38 (s, J($^{117/119}$Sn-^{1}H) = 205.1/214.9 Hz), -10.19 (s, J($^{117/119}$Sn-^{1}H) = 156.7/163.8 Hz).
HR-MS (ESI-TOF) m/z: calcd. for $C_{11}H_{17}O_2Sn$ $[M–Me]^+$ 301.0251; found: 301.0253.

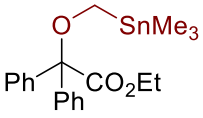
Trimethyl(((2-phenylpropan-2-yl)oxy)methyl)stannane (1j)



Prepared according to the general method from 2-phenyl-2-propanol (0.35 mL, 2.50 mmol), potassium hydride (30% in oil, 0.50 g, 3.75 mmol), and (iodomethyl)trimethylstannane (0.84 g, 2.75 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/EtOAc 20:1) afforded 0.50 g (64 %) of product as a lightly yellow oil.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 – 7.29 (m, 4H), 7.26 – 7.21 (m, 1H), 3.30 (s, J($^{117/119}$Sn-^{1}H) = 11.2/11.6 Hz, 2H), 1.49 (s, 6H), 0.11 (s, J($^{117/119}$Sn-^{1}H) = 26.0/27.2 Hz, 9H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 146.92, 128.17, 126.73, 126.14, 78.27 (s, J($^{117/119}$Sn-^{1}H) = 23.8 Hz), 53.39 (s, J($^{117/119}$Sn-^{1}H) = 217.0/227.2 Hz), 27.85, -10.41(s, J($^{117/119}$Sn-^{1}H) = 156.9/163.9 Hz).
HR-MS (ESI-TOF) m/z: calcd. for $C_{12}H_{19}OSn$ $[M–Me]^+$ 299.0458; found: 299.0464.

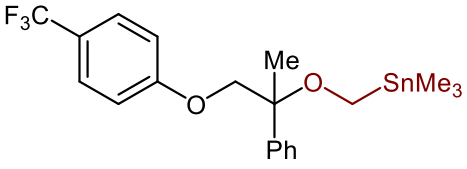
Ethyl 2,2-diphenyl-2-((trimethylstannyl)methoxy)acetate (1l)



Prepared according to the general method from ethyl benzilate (0.28 g, 1.09 mmol), potassium hydride (30% in oil, 0.19 g, 1.4 mmol), and (iodomethyl)trimethylstannane (0.37 g, 1.20 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/EtOAc 10:1) afforded 0.09 g (18%) of product as a colourless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.86 – 7.78 (m, 3H), 7.64 – 7.55 (m, 2H), 7.55 – 7.38 (m, 7H), 7.38 – 7.27 (m, 6H), 4.22 (q, J = 7.1 Hz, 2H), 3.35 (s, J($^{117/119}$Sn-^{1}H) = 11.5 Hz, 2H), 1.43 (s, 2H), 1.22 (t, J = 7.1 Hz, 3H), 0.27 – -0.05 (m, J($^{117/119}$Sn-^{1}H) = 27.2 Hz, 9H).
HR-MS (ESI-TOF) m/z: calcd. for $C_{19}H_{23}O_3Sn$ $[M–Me]^+$ 419.0669; found: 419.0669.

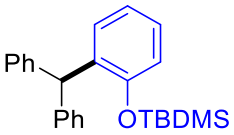
Trimethyl(((2-phenyl-1-(4-(trifluoromethyl)phenoxy)propan-2-yl)oxy)methyl)stannane (1m)



Prepared according to the general method from 2-phenyl-1-(4-(trifluoromethyl)phenoxy)propan-2-ol (1.00 g, 3.38 mmol), potassium hydride (30% in oil, 0.68 g, 5.06 mmol), and (iodomethyl)trimethylstannane (1.13 g, 3.71 mmol). Purification by column chromatography on silica gel (eluent petroleum ether/DCM 2:1) afforded 0.60 g (38%) of product as a colourless oil.

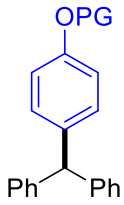
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (m, 2H), 7.47 – 7.35 (m, 4H), 7.35 – 7.27 (m, 1H), 6.95 (d, J = 8.6 Hz, 2H), 4.10 & 3.99 (d&d, J = 9.5 Hz, 2H, 3.50 (d, J = 9.7 Hz, $J(^{117/119}Sn\text{-}^{1}H)$ = 10.0 Hz, 1H), 3.28 (d, J = 9.8 Hz, $J(^{117/119}Sn\text{-}^{1}H)$ = 12.8 Hz, 1H), 1.72 (s, 3H), 0.13 (s, $J(^{117/119}Sn\text{-}^{1}H)$ = 26.0/27.2 Hz, 9H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 161.8 (q, $^{5}J_{CF}$ = 1.2 Hz), 142.6, 128.4, 127.6, 127.0, 126.9 (q, $^{3}J_{CF}$ = 3.8 Hz), 124.6 (q, $^{1}J_{CF}$ = 270.9 Hz), 123.0 (q, $^{2}J_{CF}$ = 33.6 Hz), 115.0, 80.228 (s, $J(^{117/119}Sn\text{-}^{13}C$ = 24.1 Hz), 75.9, 53.4, 20.00, -8.8 (s, $J(^{117/119}Sn\text{-}^{13}C$ = 158.5/165.0 Hz).
^{19}F NMR (376 MHz, $CDCl_3$) δ -62.48.

Side product
(2-Benzhydrylphenoxy)(*tert*-butyl)dimethylsilane (5)

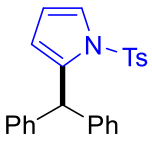


Isolated as a minor product in the synthesis of (4-benzhydrylphenoxy)(*tert*-butyl)dimethylsilane (**3.1**). White solid, 1.5 mg (2%).
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 (m, 4H), 7.18 (m, 2H), 7.11 (m, 1H), 7.04 (m, 4H), 6.82 (s, 3H), 5.90 (s, 1H), 0.86 (s, 9H), 0.10 (s, 6H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 153.55, 144.16, 134.46, 131.13, 129.71, 128.23, 127.37, 126.15, 120.80, 50.06, 25.87, 18.36, -4.02.
HR-MS (ESI-TOF) m/z: calcd. for $C_{25}H_{31}OSi$ $[M+1]^+$ 375.2144; found: 375.2134.

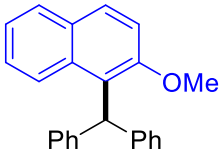
Low yields (determined by qNMR)



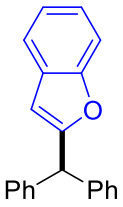
3.28 PG = *t*Bu (25%)
3.29 PG = MOM (35%)



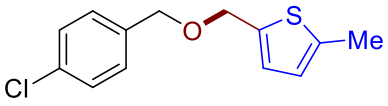
3.30 (26%)



3.40 (11%)



3.41 (30%)



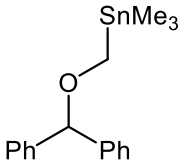
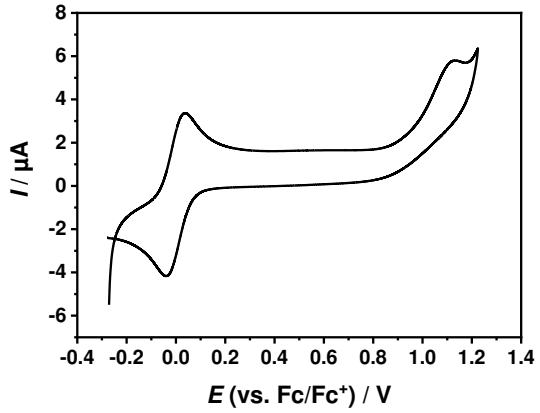
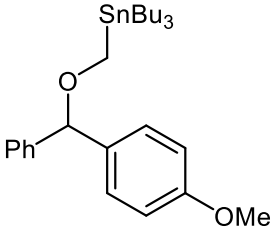
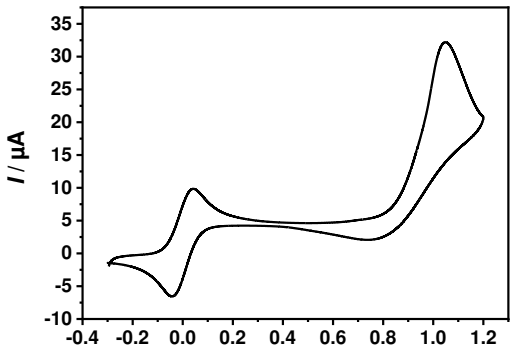
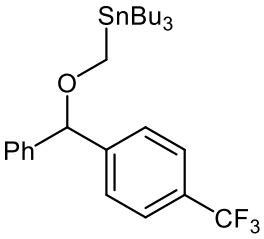
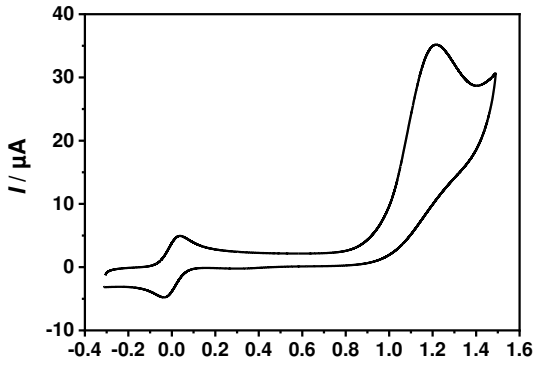
3.42 (35%)

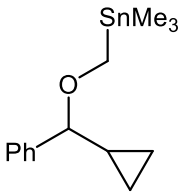
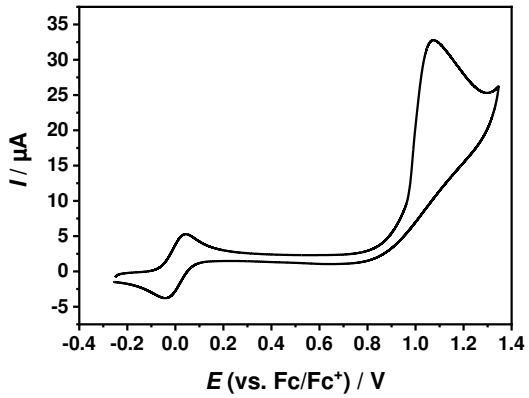
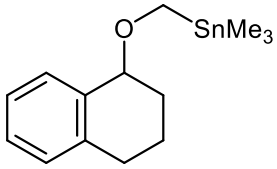
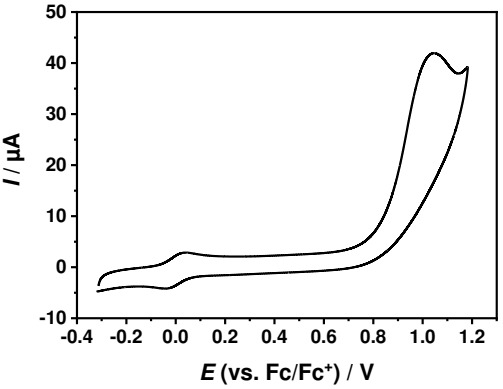
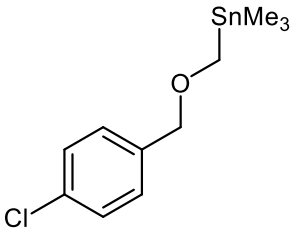
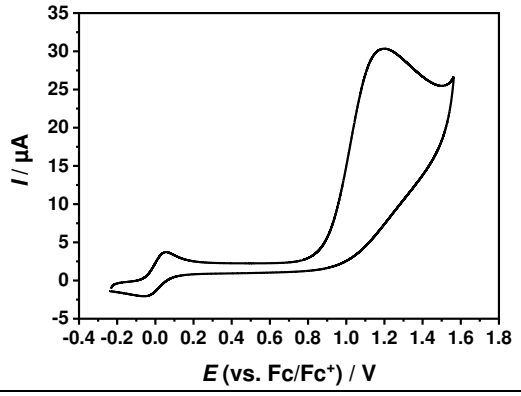
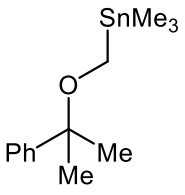
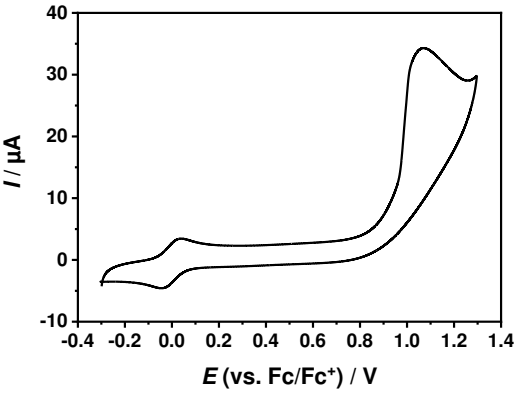
2. Electrochemical characterization of substrates

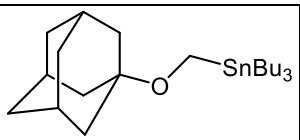
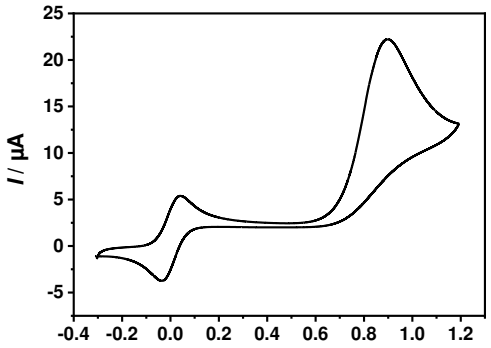
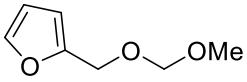
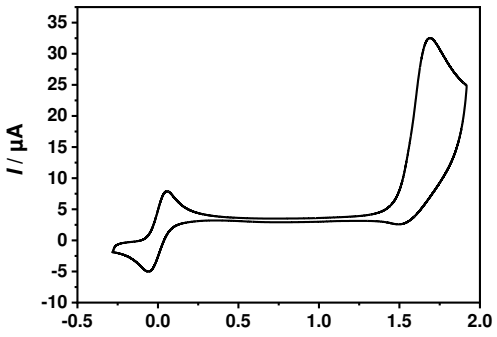
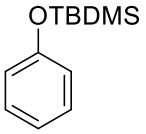
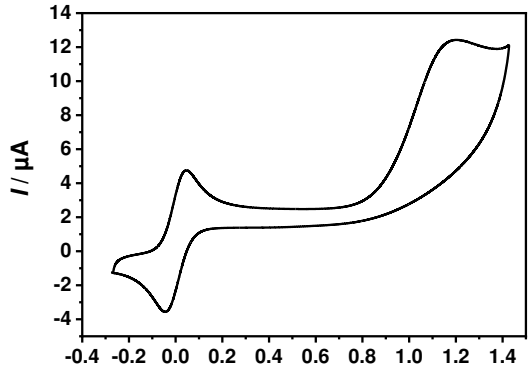
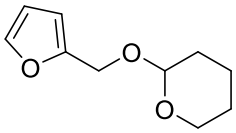
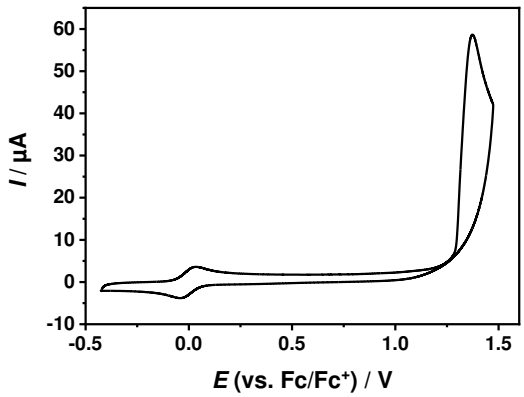
Cyclic voltammetry was performed for selected substrates in conditions close to those used for the Friedel-Crafts reaction: 0.1 M $TBABF_4$/DCM+17vol% HFIP, 40 mg $NaHCO_3$, working electrode: glassy carbon disc (⌀3 mm), supporting electrode: Pt wire, reference electrode : Ag/AgCl, internal standard: ferrocene, scan rate 50 mV/s, substrate conc. 2 mM, potentiostat: Reference 600 (Gamry Instruments). Potentials are given vs. Fc/Fc^+ (unmeasured amount).

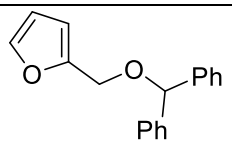
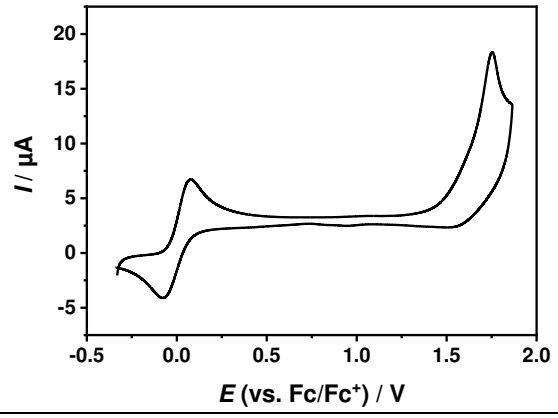
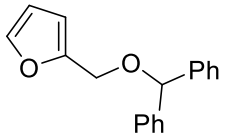
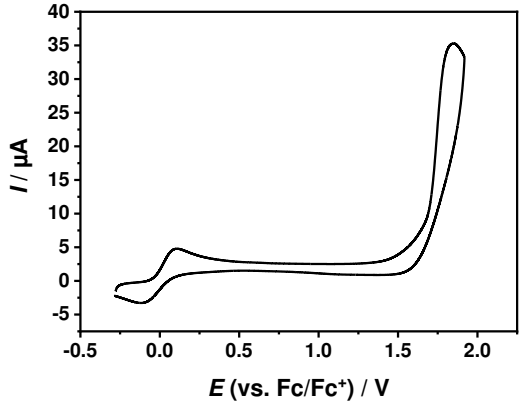
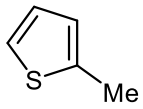
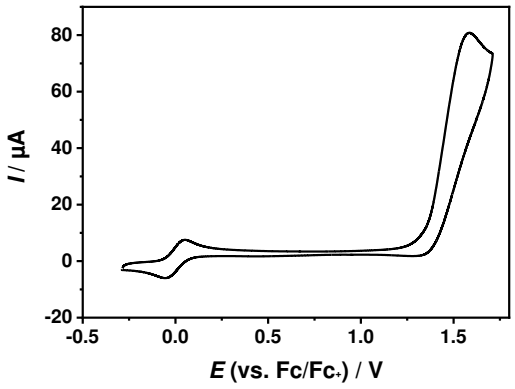
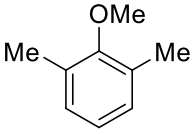
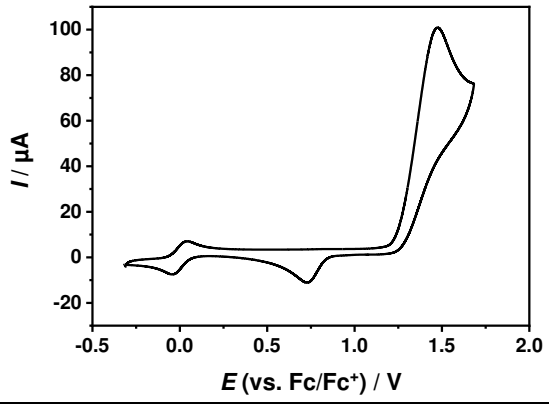
The results are given in Table 1.

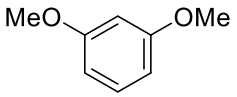
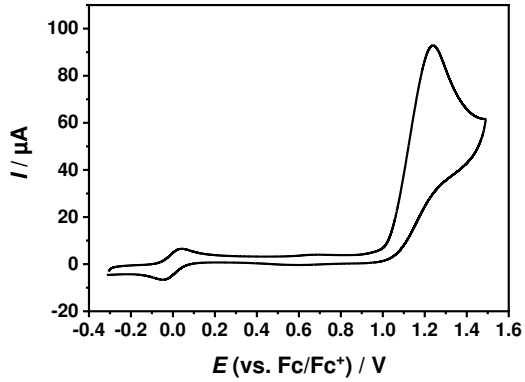
Table 1

Compound	E^{peak}, V vs Fc/Fc^{+} [11]	CV
 **1a**	1.12	
 **1b**	1.05	
 **1c**	1.22	

 **1e**	1.07	
 **1f**	1.04	
 **1h**	1.20	
 **1j**	1.07	

 **1n**	0.90	
 **2-((Methoxymethoxy)-methyl)furan**	1.69	
 **4**	1.2	
 **2-(Furan-2-ylmethoxy)-tetrahydro-2*H*-pyran**	1.37	

 **2-((Benzhydryloxy)-methyl)furan**	1.75	
 **2-((Benzhydryloxy)-methyl)furan**	1.85	
 **2-Methylthiophene**	1.59	
 **2,4-Dimethylanisole**	1.47	

 **1,3-Dimethoxybenzene**	1.24	

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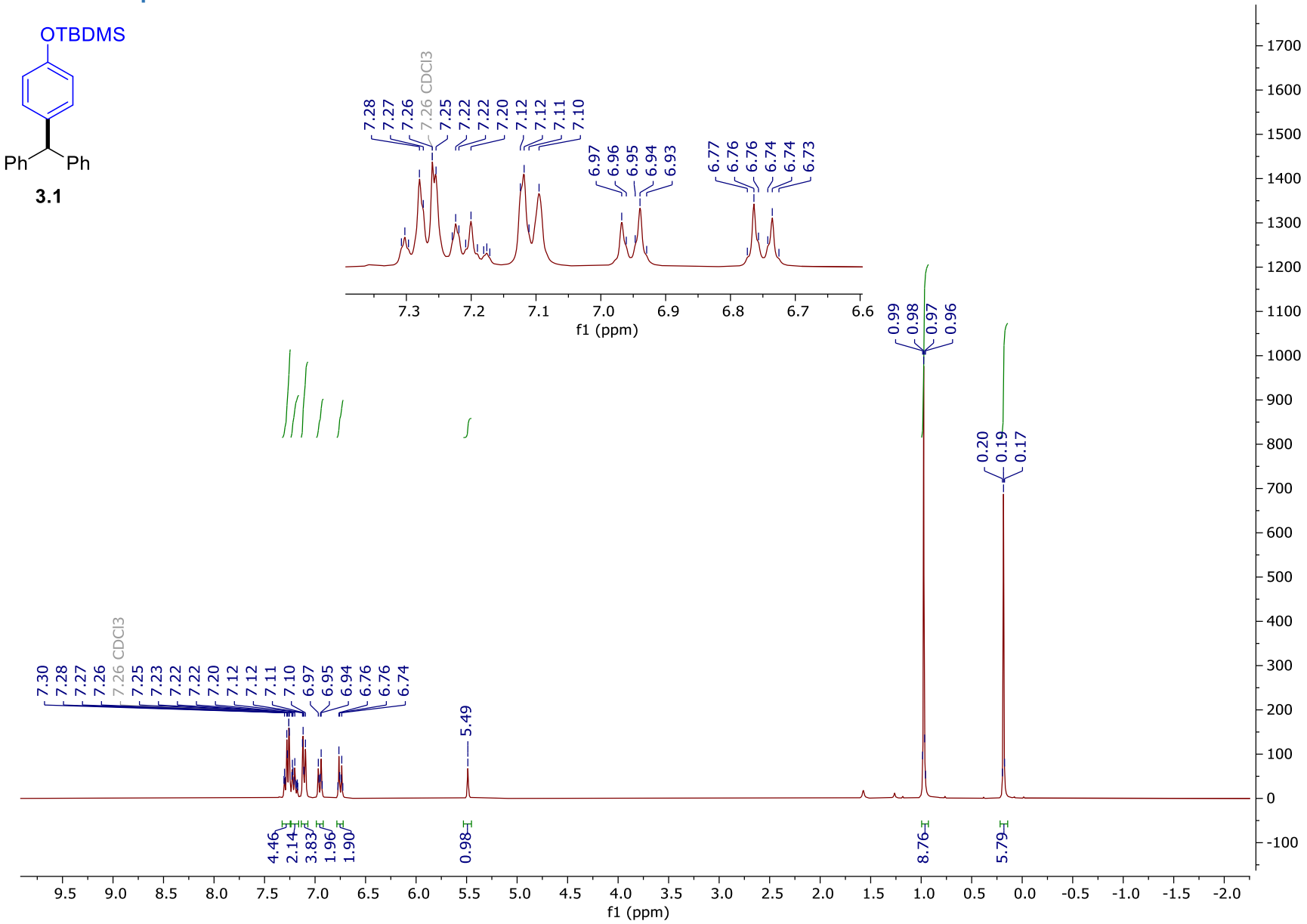
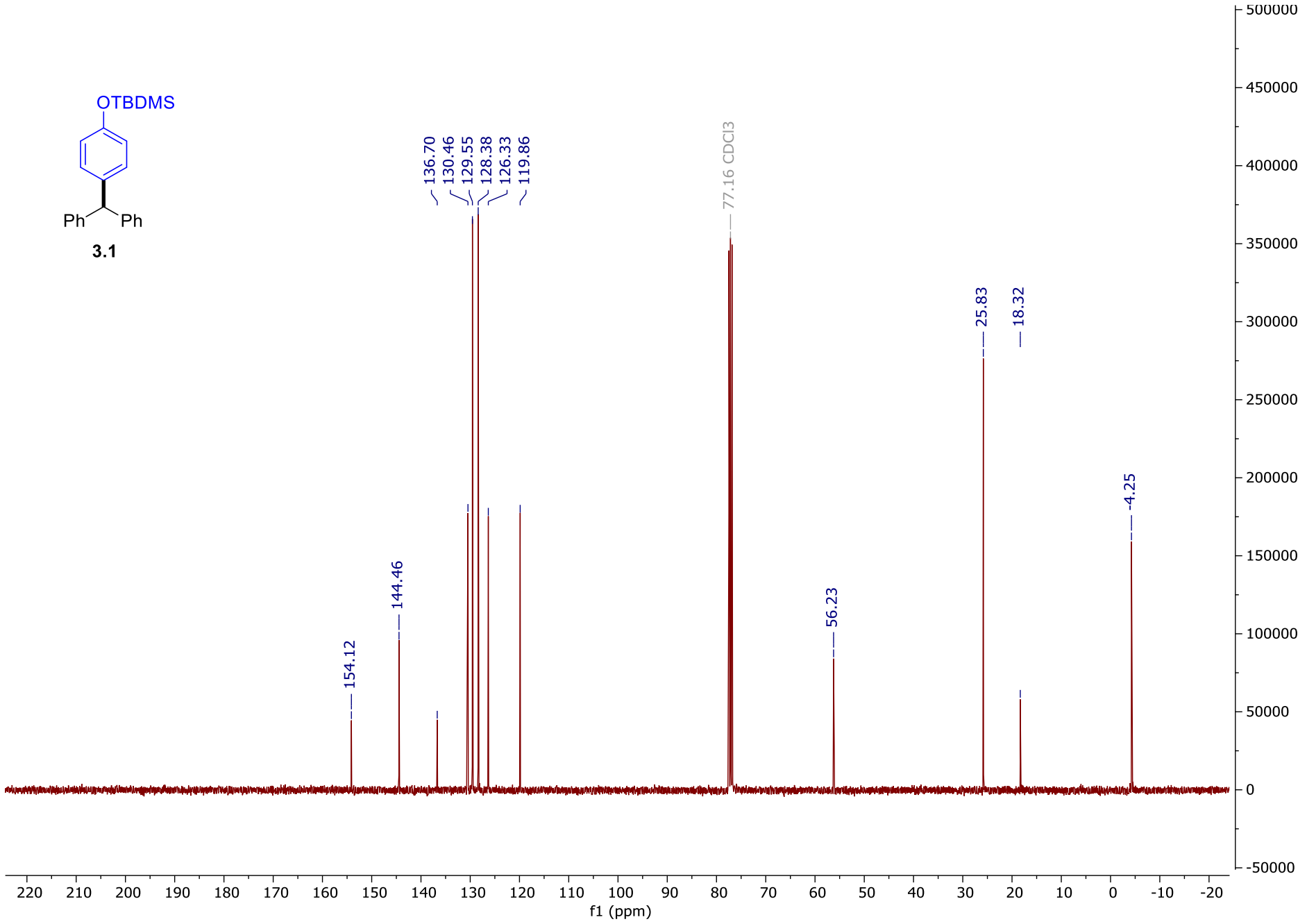
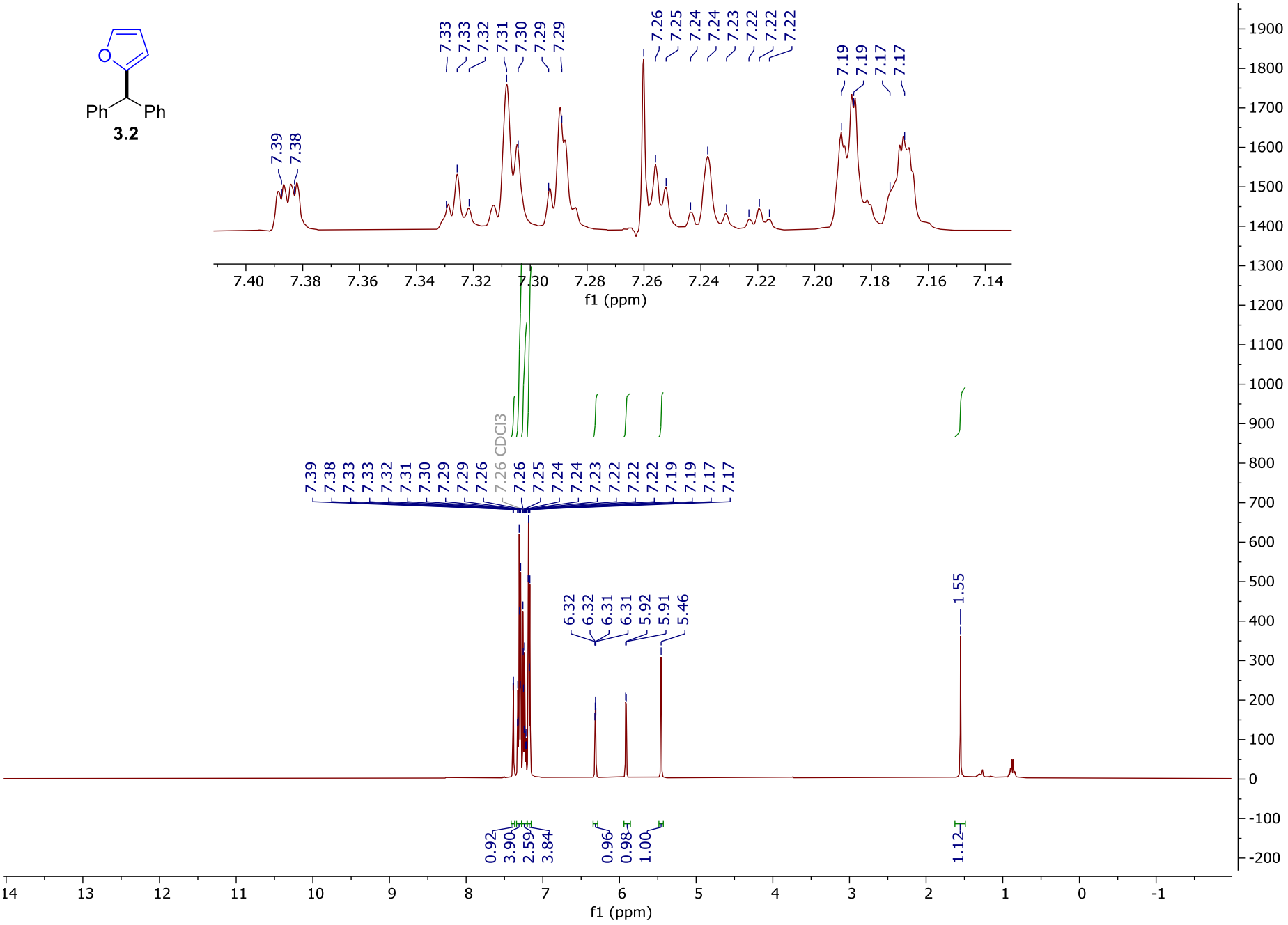
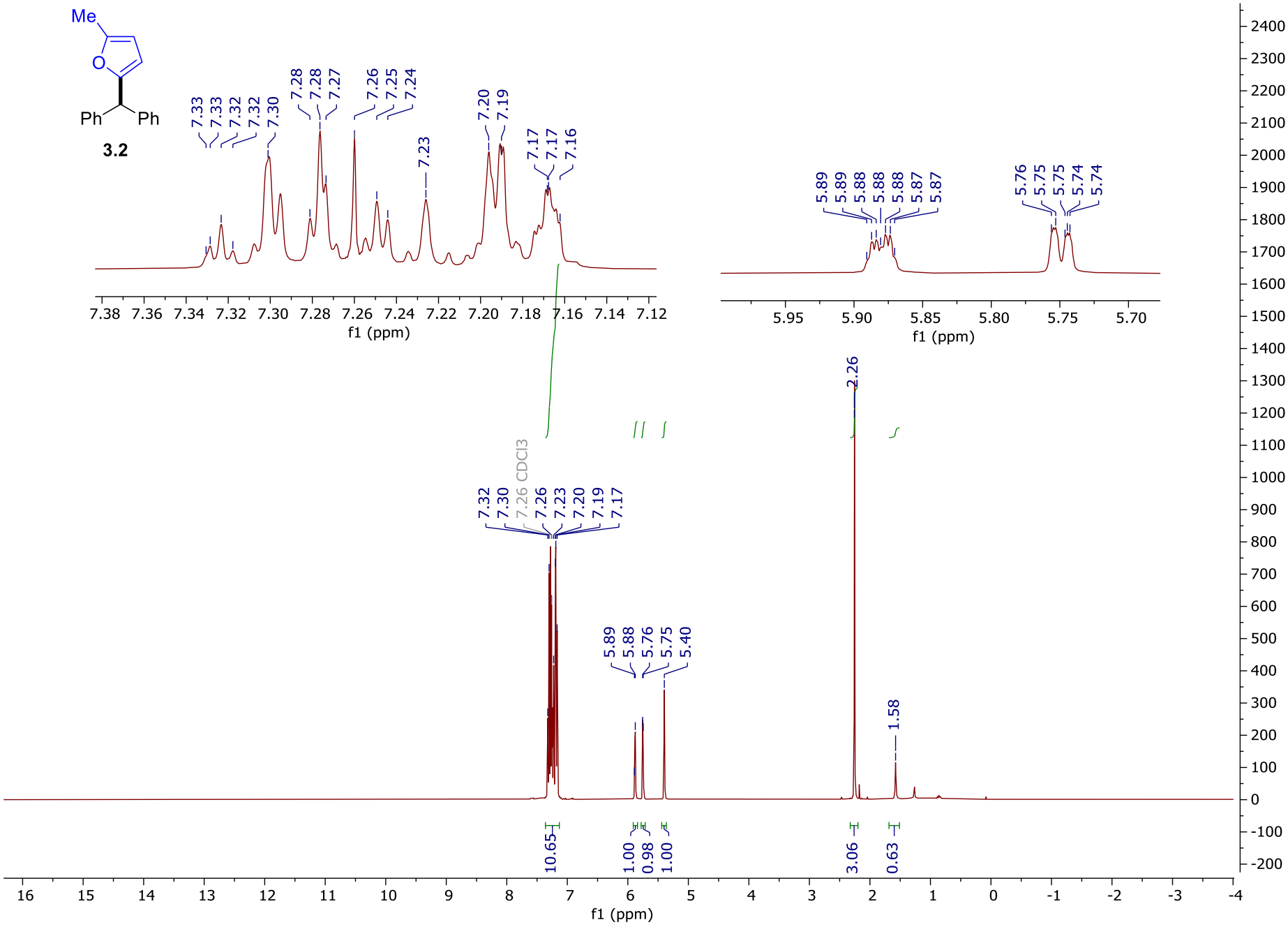
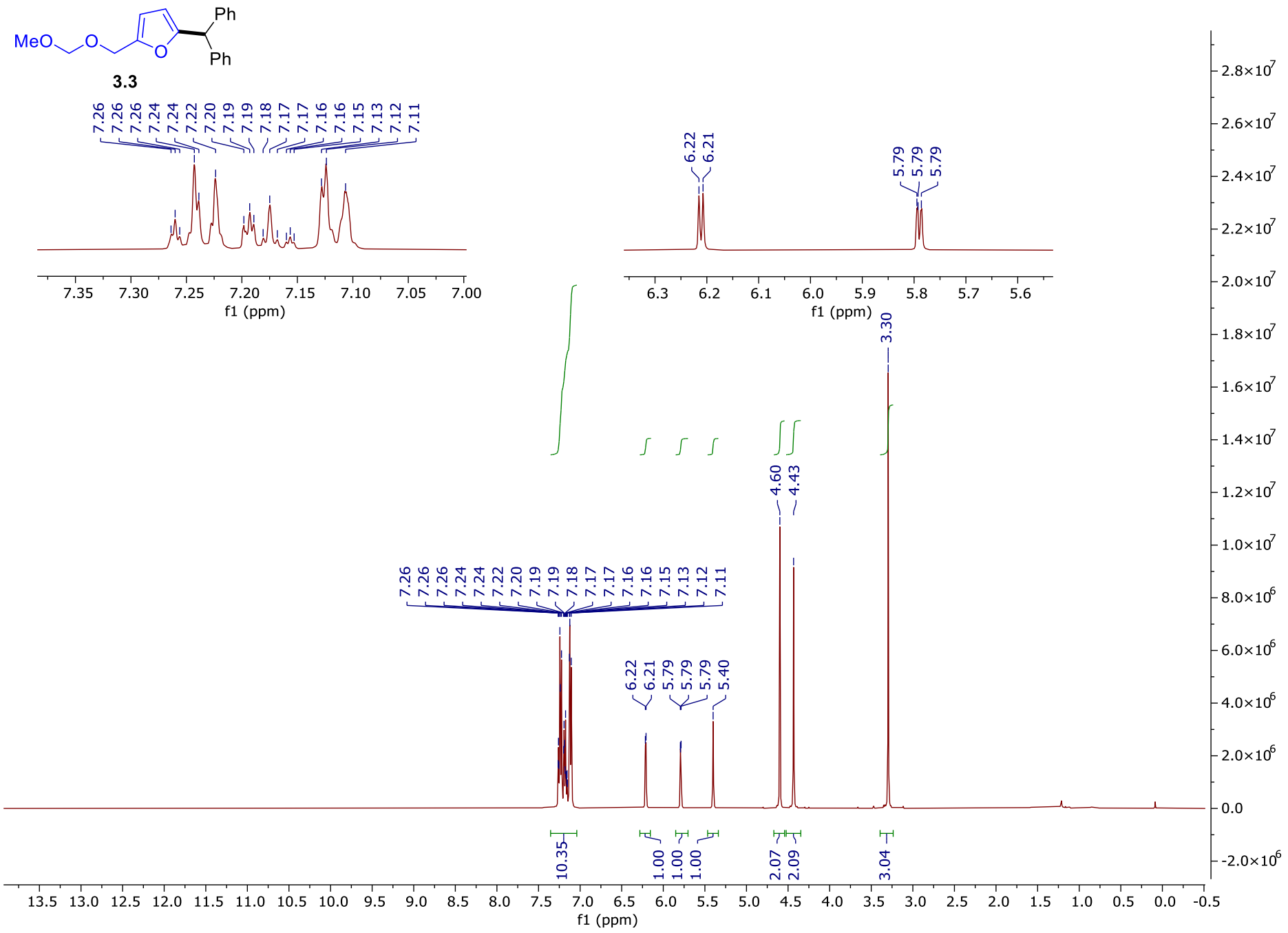
3. Copies of NMR spectra

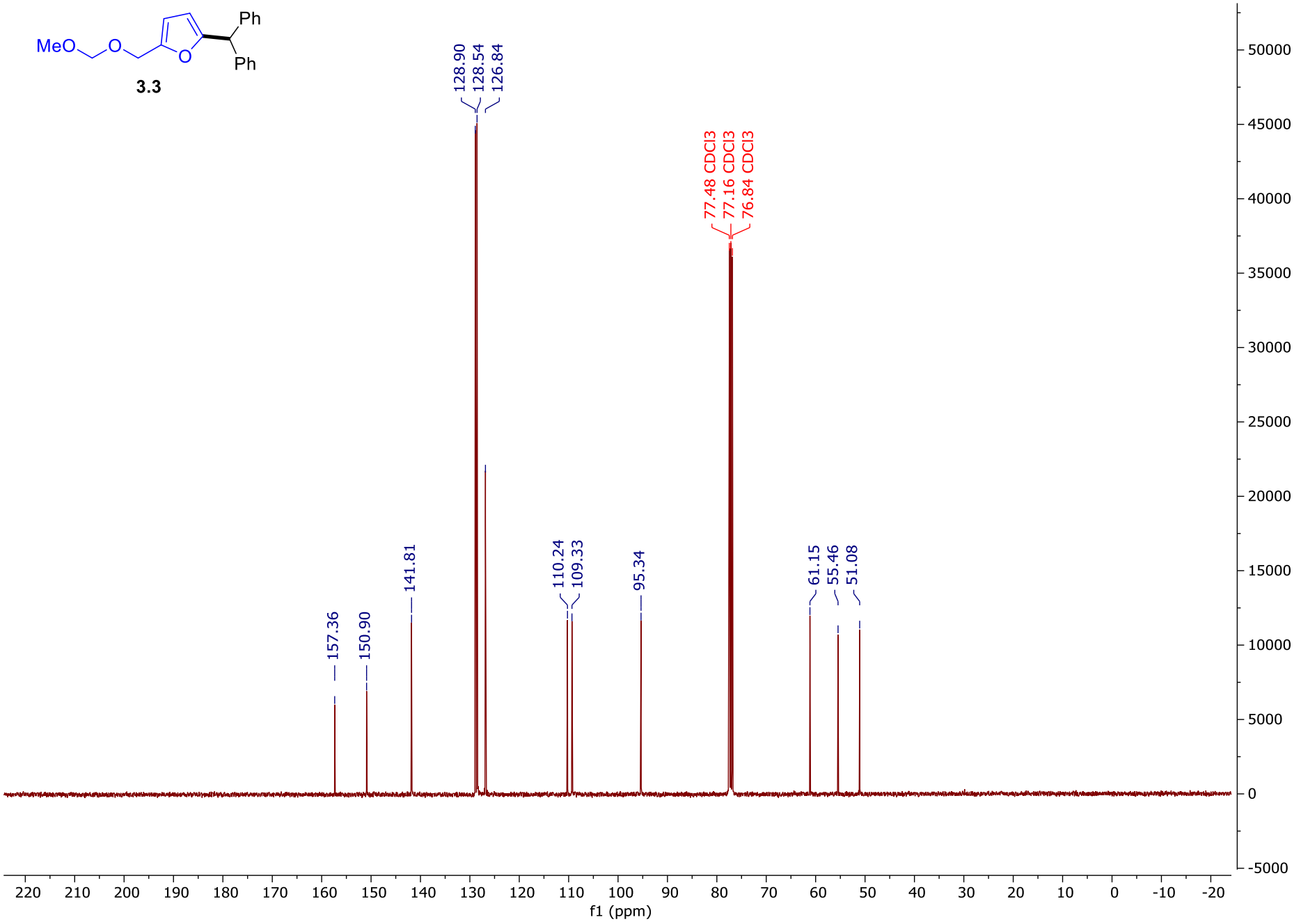


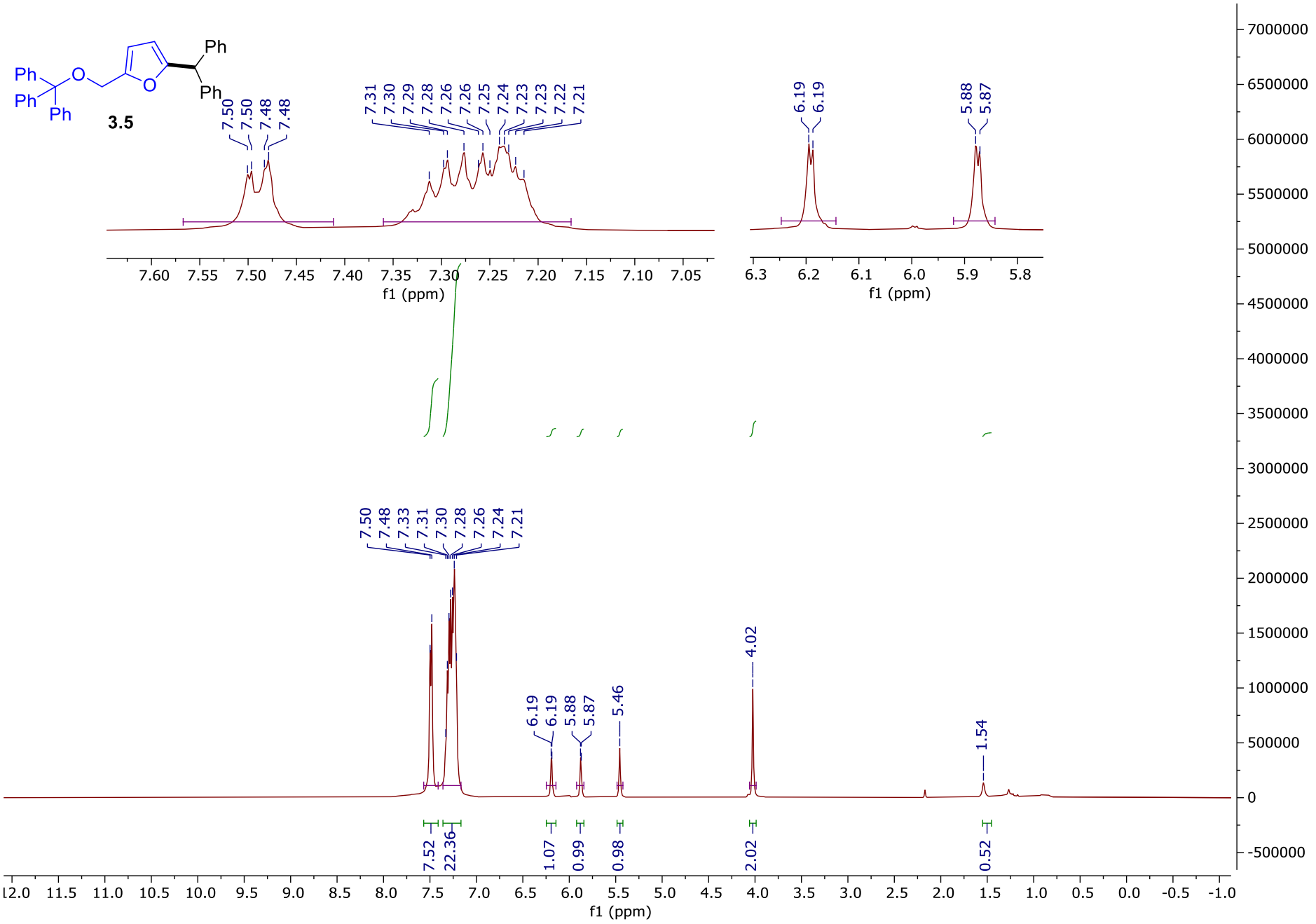

OTBDMS
Ph
Ph
3.1
136.70
130.46
129.55
128.38
126.33
119.86
77.16 CDCl3
25.83
18.32
-4.25
154.12
144.46
56.23
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
-50000
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)

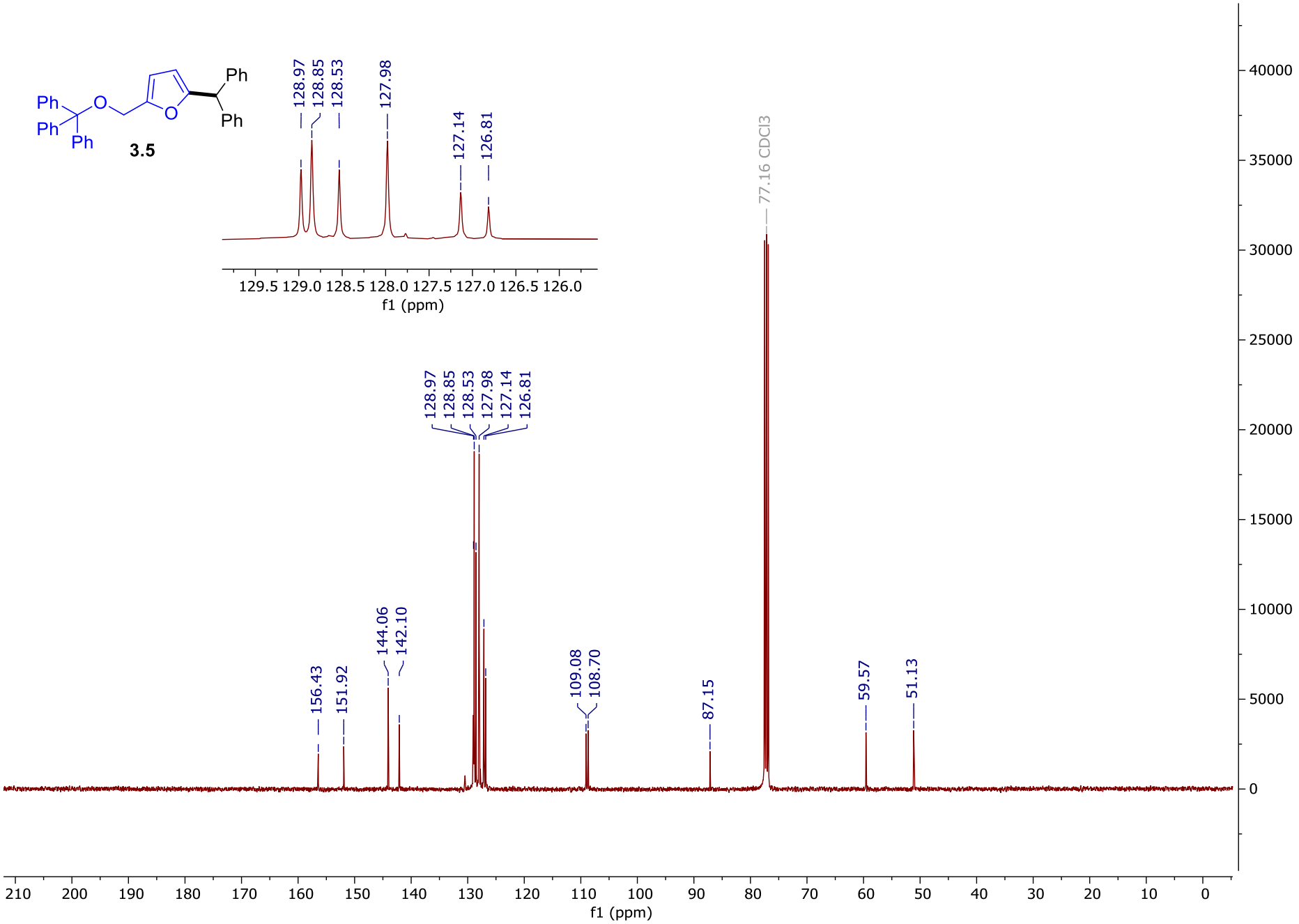

Ph
Ph
O
3.2
7.39
7.38
7.33
7.33
7.32
7.31
7.30
7.29
7.29
7.26
7.25
7.24
7.24
7.23
7.22
7.22
7.22
7.19
7.19
7.17
7.17
f1 (ppm)
CDCl3
7.26
6.32
6.32
6.31
6.31
5.92
5.91
5.46
1.55
0.92
3.90
2.59
3.84
0.96
0.98
1.00
1.12

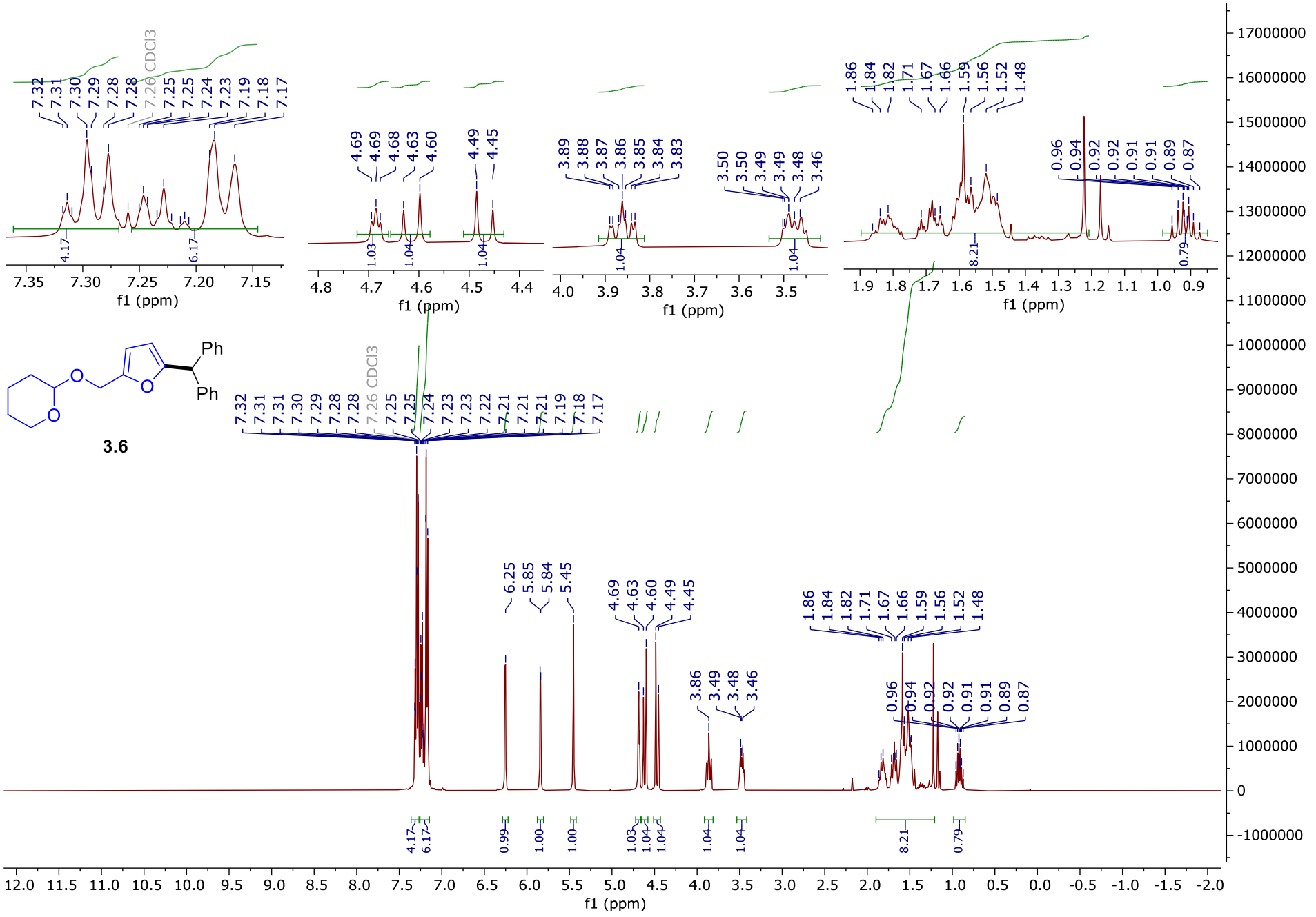

Me
O
Ph
Ph
3.2
7.33
7.33
7.32
7.32
7.30
7.28
7.28
7.27
7.26
7.25
7.24
7.23
7.20
7.19
7.17
7.17
7.16
7.38 7.36 7.34 7.32 7.30 7.28 7.26 7.24 7.22 7.20 7.18 7.16 7.14 7.12
f1 (ppm)
5.89
5.89
5.88
5.88
5.88
5.87
5.87
5.76
5.75
5.75
5.74
5.74
5.95 5.90 5.85 5.80 5.75 5.70
f1 (ppm)
2.26
7.32
7.30
7.26 CDCl3
7.26
7.23
7.20
7.19
7.17
5.89
5.88
5.76
5.75
5.40
1.58
10.65
1.00
0.98
1.00
3.06
0.63
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -4
f1 (ppm)
2400 2300 2200 2100 2000 1900 1800 1700 1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200 100 0 -100 -200

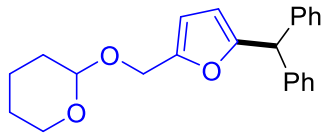

MeO
O
O
Ph
Ph
3.3
7.26 7.26 7.26 7.24 7.24 7.22 7.20 7.19 7.19 7.18 7.17 7.17 7.16 7.16 7.15 7.13 7.12 7.11
7.35 7.30 7.25 7.20 7.15 7.10 7.05 7.00
f1 (ppm)
6.22 6.21
5.79 5.79 5.79
6.3 6.2 6.1 6.0 5.9 5.8 5.7 5.6
f1 (ppm)
3.30
4.60 4.43
7.26 7.26 7.26 7.24 7.24 7.22 7.20 7.19 7.19 7.18 7.17 7.17 7.16 7.16 7.15 7.13 7.12 7.11
6.22 6.21 5.79 5.79 5.79 5.40
10.35 1.00 1.00 1.00 2.07 2.09 3.04
2.8×10^7 2.6×10^7 2.4×10^7 2.2×10^7 2.0×10^7 1.8×10^7 1.6×10^7 1.4×10^7 1.2×10^7 1.0×10^7 8.0×10^6 6.0×10^6 4.0×10^6 2.0×10^6 0.0 -2.0×10^6
13.5 13.0 12.5 12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


MeO
O
O
Ph
Ph
3.3
128.90
128.54
126.84
77.48 CDCl3
77.16 CDCl3
76.84 CDCl3
157.36
150.90
141.81
110.24
109.33
95.34
61.15
55.46
51.08
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)


Ph
Ph
O
Ph
Ph
O
Ph
3.5
7.50
7.50
7.48
7.48
7.31
7.30
7.29
7.28
7.26
7.26
7.25
7.24
7.23
7.23
7.22
7.21
6.19
6.19
5.88
5.87
7.60 7.55 7.50 7.45 7.40 7.35 7.30 7.25 7.20 7.15 7.10 7.05
f1 (ppm)
6.3 6.2 6.1 6.0 5.9 5.8
f1 (ppm)
7.50
7.48
7.33
7.31
7.30
7.28
7.26
7.24
7.21
6.19
6.19
5.88
5.87
5.46
4.02
1.54
7.52
22.36
1.07
0.99
0.98
2.02
0.52
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)
7000000
6500000
6000000
5500000
5000000
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
-500000

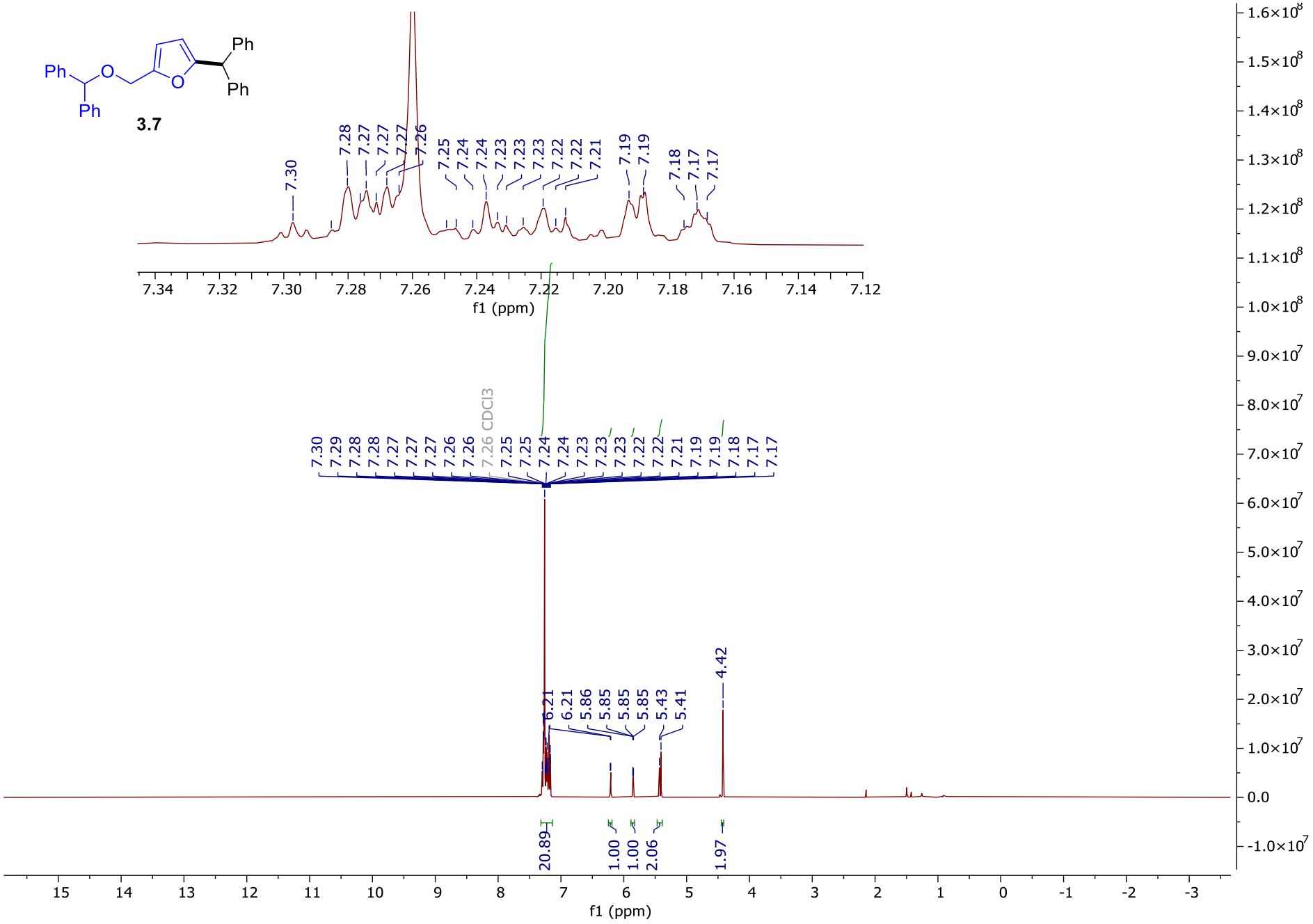

Ph
Ph
Ph
O
O
Ph
Ph
3.5
128.97
128.85
128.53
127.98
127.14
126.81
129.5 129.0 128.5 128.0 127.5 127.0 126.5 126.0
f1 (ppm)
77.16 CDCl3
156.43
151.92
144.06
142.10
109.08
108.70
87.15
59.57
51.13
40000
35000
30000
25000
20000
15000
10000
5000
0
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

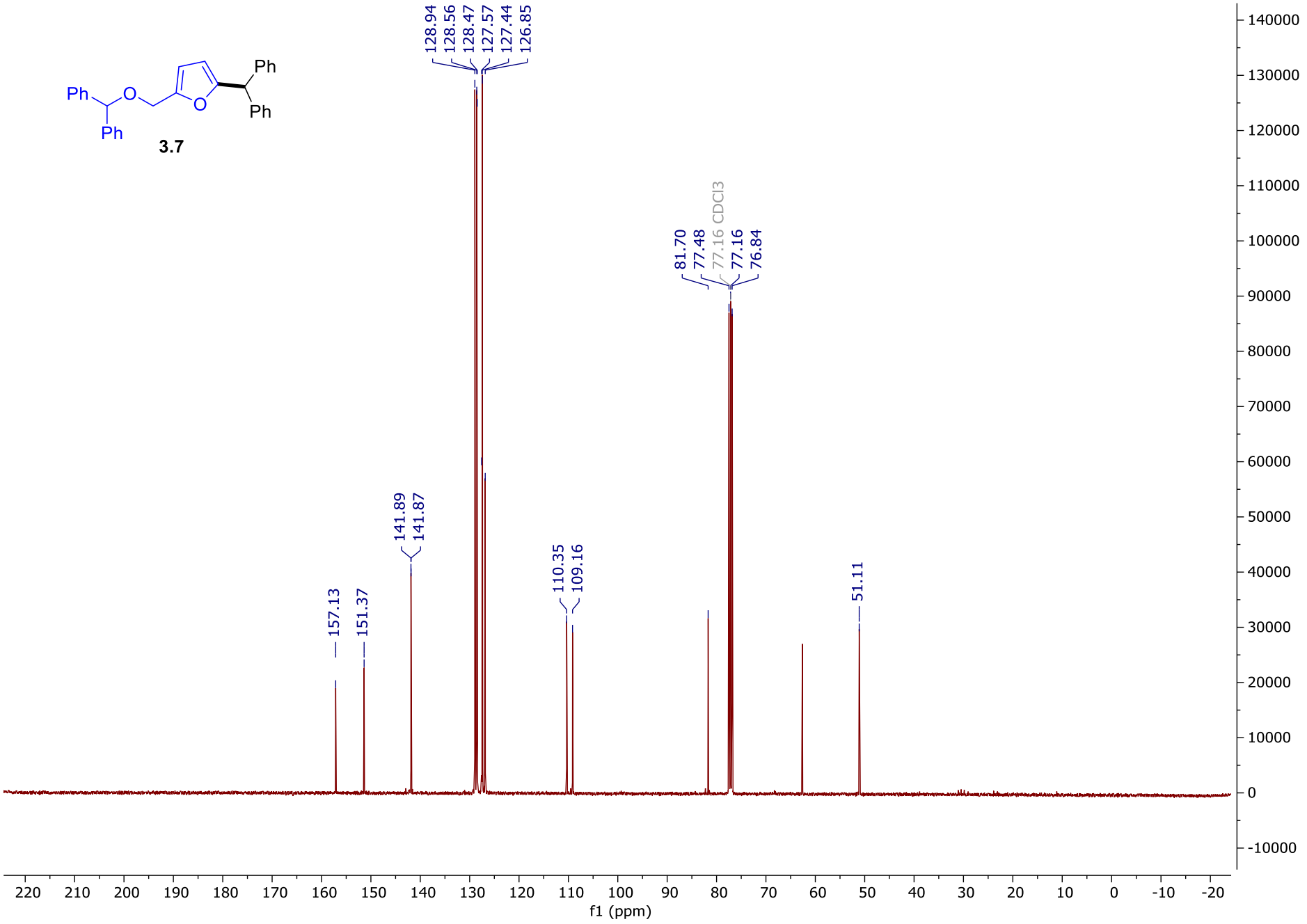

7.32 7.31 7.30 7.29 7.28 7.28 7.26 CDCl3 7.25 7.25 7.24 7.23 7.19 7.18 7.17
4.17 6.17
7.35 7.30 7.25 7.20 7.15
f1 (ppm)
4.69 4.69 4.68 4.63 4.60 4.49 4.45
1.03 1.04 1.04
4.8 4.7 4.6 4.5 4.4
f1 (ppm)
3.89 3.88 3.87 3.86 3.85 3.84 3.83 3.50 3.50 3.49 3.49 3.48 3.46
1.04 1.04
4.0 3.9 3.8 3.7 3.6 3.5
f1 (ppm)
1.86 1.84 1.82 1.71 1.67 1.66 1.59 1.56 1.52 1.48 0.96 0.94 0.92 0.92 0.91 0.91 0.89 0.87
8.21 0.79
1.9 1.8 1.7 1.6 1.5 1.4 1.3 1.2 1.1 1.0 0.9
f1 (ppm)
Ph
Ph
O
O
O
3.6
7.32 7.31 7.31 7.30 7.29 7.28 7.28 7.26 CDCl3 7.25 7.25 7.24 7.23 7.23 7.22 7.21 7.21 7.21 7.19 7.18 7.17
6.25 5.85 5.84 5.45
4.69 4.63 4.60 4.49 4.45
3.86 3.49 3.48 3.46
1.86 1.84 1.82 1.71 1.67 1.66 1.59 1.56 1.52 1.48
0.96 0.94 0.92 0.92 0.91 0.91 0.89 0.87
4.17 6.17 0.99 1.00 1.00 1.03 1.04 1.04 1.04 1.04 8.21 0.79
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5 -2.0
f1 (ppm)
17000000 16000000 15000000 14000000 13000000 12000000 11000000 10000000 9000000 8000000 7000000 6000000 5000000 4000000 3000000 2000000 1000000 0 -1000000

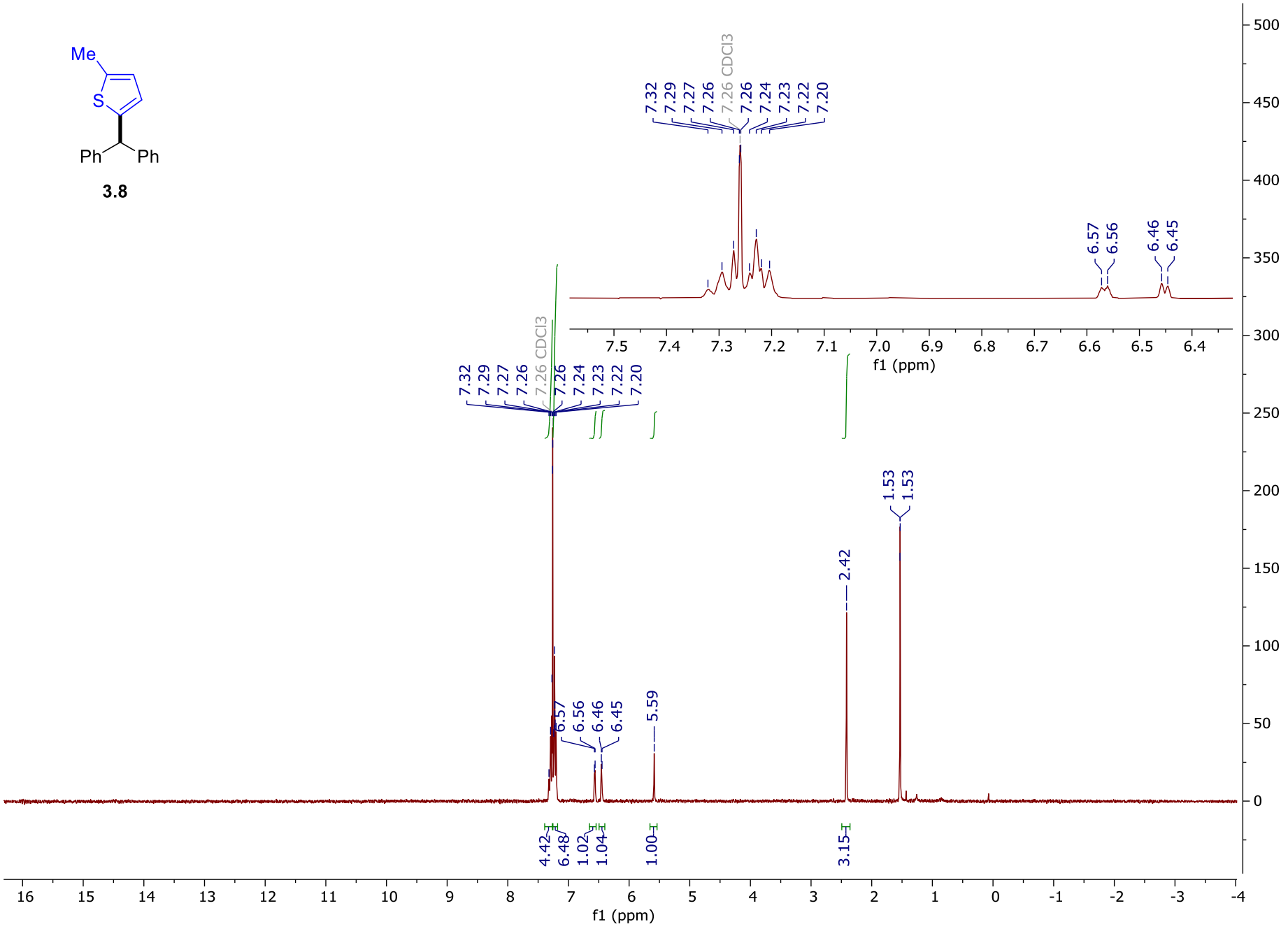

Ph
Ph
O
O
O

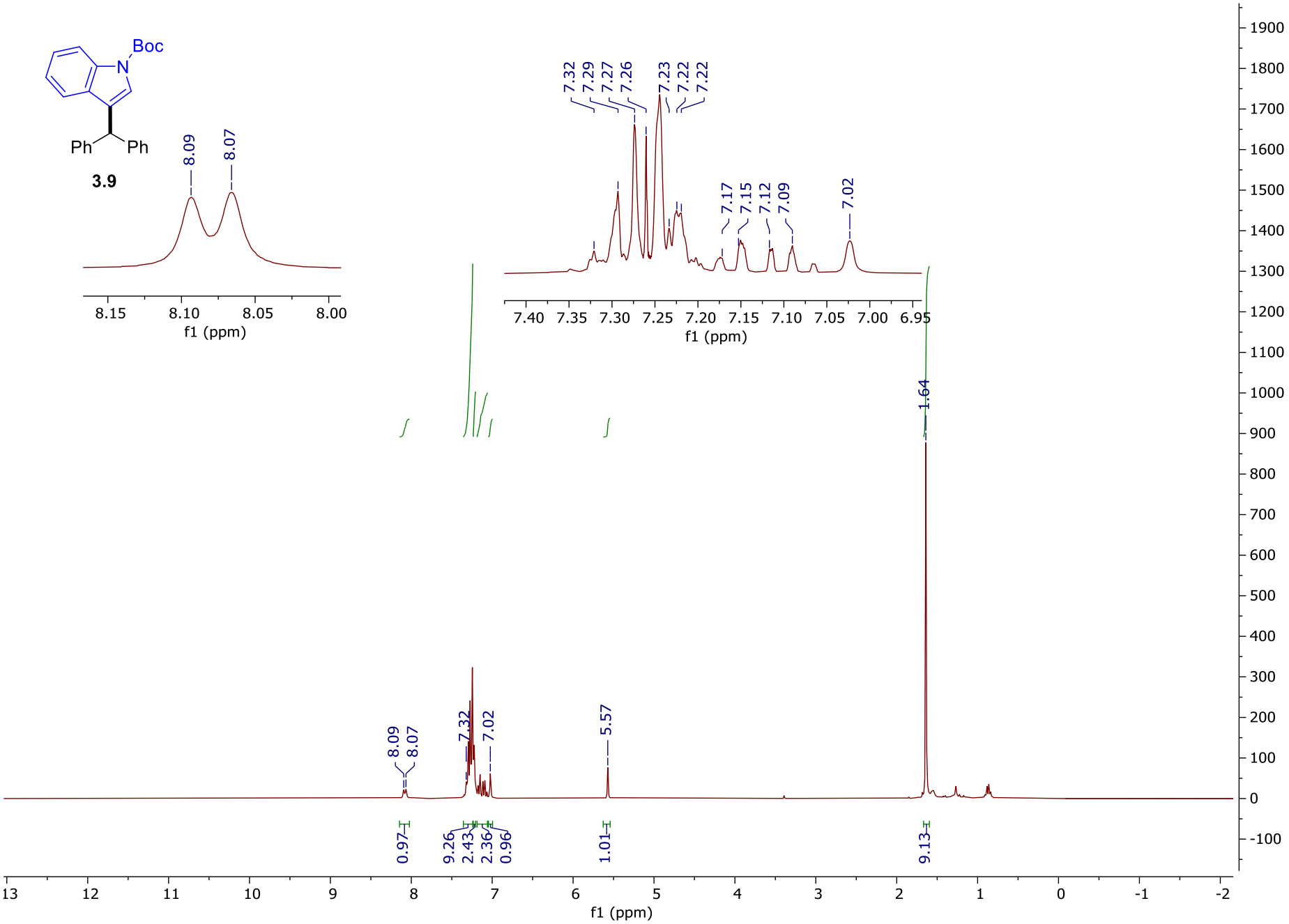
3.6

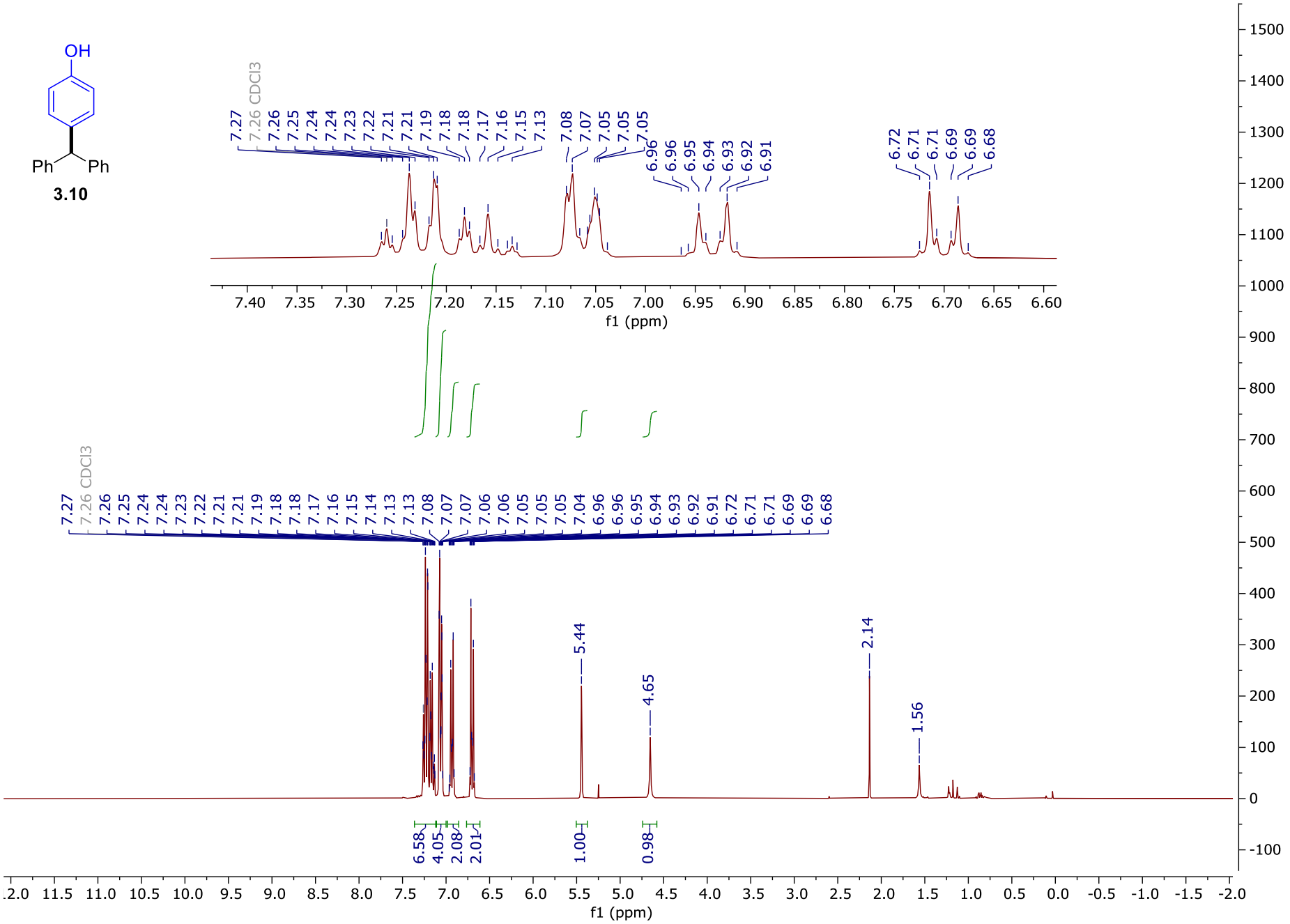
157.11
151.33
141.90
128.93
128.51
126.81
110.04
109.26
97.29
77.16 CDCl3
62.16
60.87
51.08
30.53
25.55
19.37
f1 (ppm)

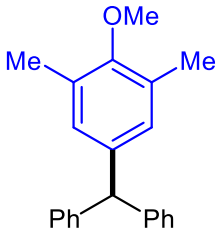

Ph
O
Ph
Ph
O
Ph
3.7
7.30
7.28
7.27
7.27
7.27
7.26
7.25
7.24
7.24
7.23
7.23
7.23
7.22
7.22
7.21
7.19
7.19
7.18
7.17
7.17
7.34
7.32
7.30
7.28
7.26
7.24
7.22
7.20
7.18
7.16
7.14
7.12
f1 (ppm)
7.30
7.29
7.28
7.28
7.27
7.27
7.27
7.26
7.26
7.26 CDCl3
7.25
7.25
7.24
7.24
7.23
7.23
7.23
7.22
7.22
7.21
7.19
7.19
7.18
7.17
7.17
6.21
6.21
5.86
5.85
5.85
5.85
5.43
5.41
4.42
20.89
1.00
1.00
2.06
1.97
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
f1 (ppm)
1.6×10^8
1.5×10^8
1.4×10^8
1.3×10^8
1.2×10^8
1.1×10^8
1.0×10^8
9.0×10^7
8.0×10^7
7.0×10^7
6.0×10^7
5.0×10^7
4.0×10^7
3.0×10^7
2.0×10^7
1.0×10^7
0.0
-1.0×10^7


Ph
O
Ph
O
Ph
Ph
3.7
128.94
128.56
128.47
127.57
127.44
126.85
81.70
77.48
77.16 CDCl3
77.16
76.84
157.13
151.37
141.89
141.87
110.35
109.16
51.11
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)


Me
S
Ph
Ph
3.8
7.32
7.29
7.27
7.26
7.26 CDCl3
7.26
7.24
7.23
7.22
7.20
6.57
6.56
6.46
6.45
5.59
2.42
1.53
1.53
4.42
6.48
1.02
1.04
1.00
3.15
f1 (ppm)

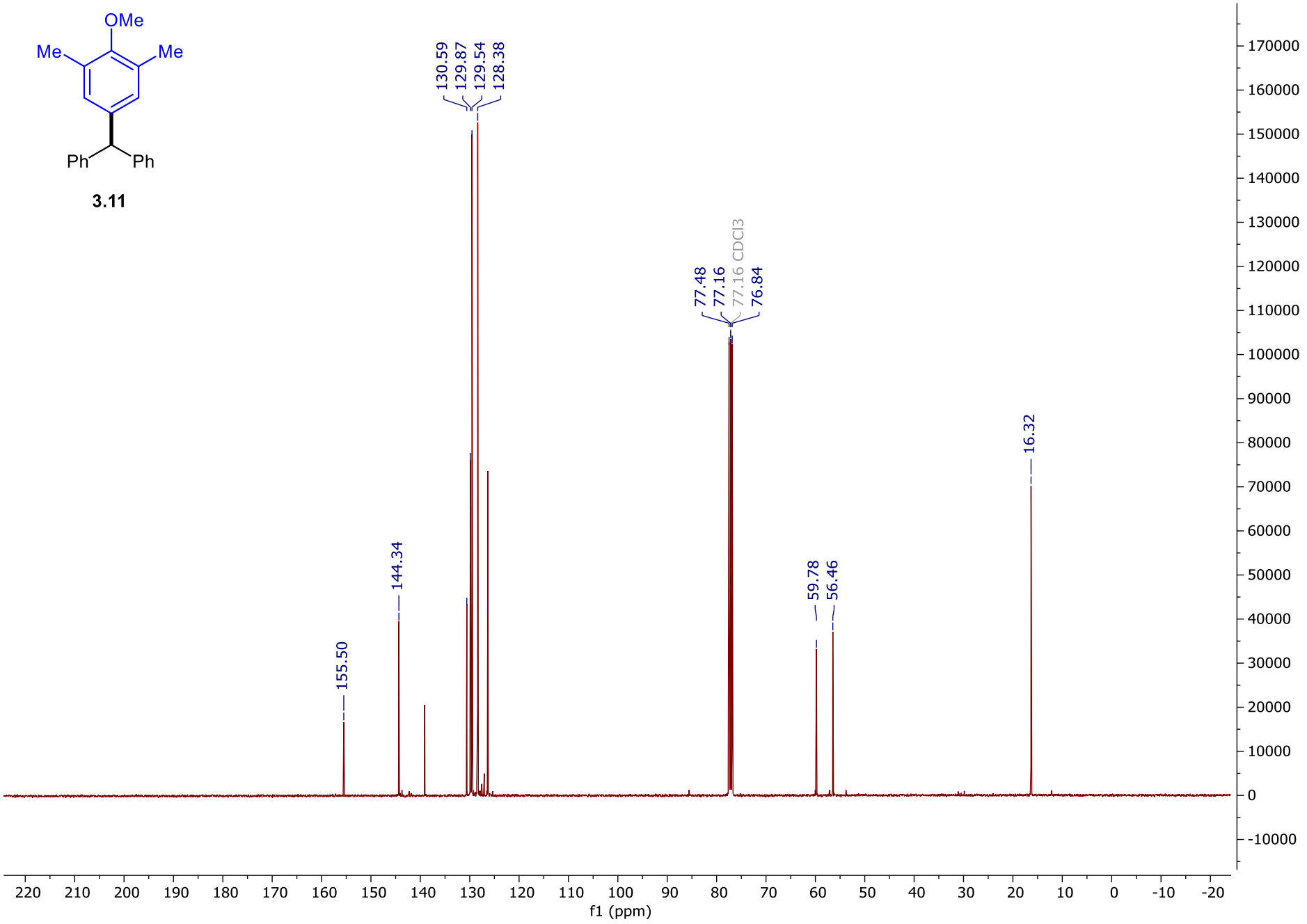

Boc
N
Ph
Ph
3.9
8.09
8.07
8.15
8.10
8.05
8.00
f1 (ppm)
7.32
7.29
7.27
7.26
7.23
7.22
7.22
7.17
7.15
7.12
7.09
7.02
7.40 7.35 7.30 7.25 7.20 7.15 7.10 7.05 7.00 6.95
f1 (ppm)
1.64
8.09
8.07
7.32
7.02
5.57
0.97
9.26
2.43
2.36
0.96
1.01
9.13
1900 1800 1700 1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200 100 0 -100
13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2
f1 (ppm)

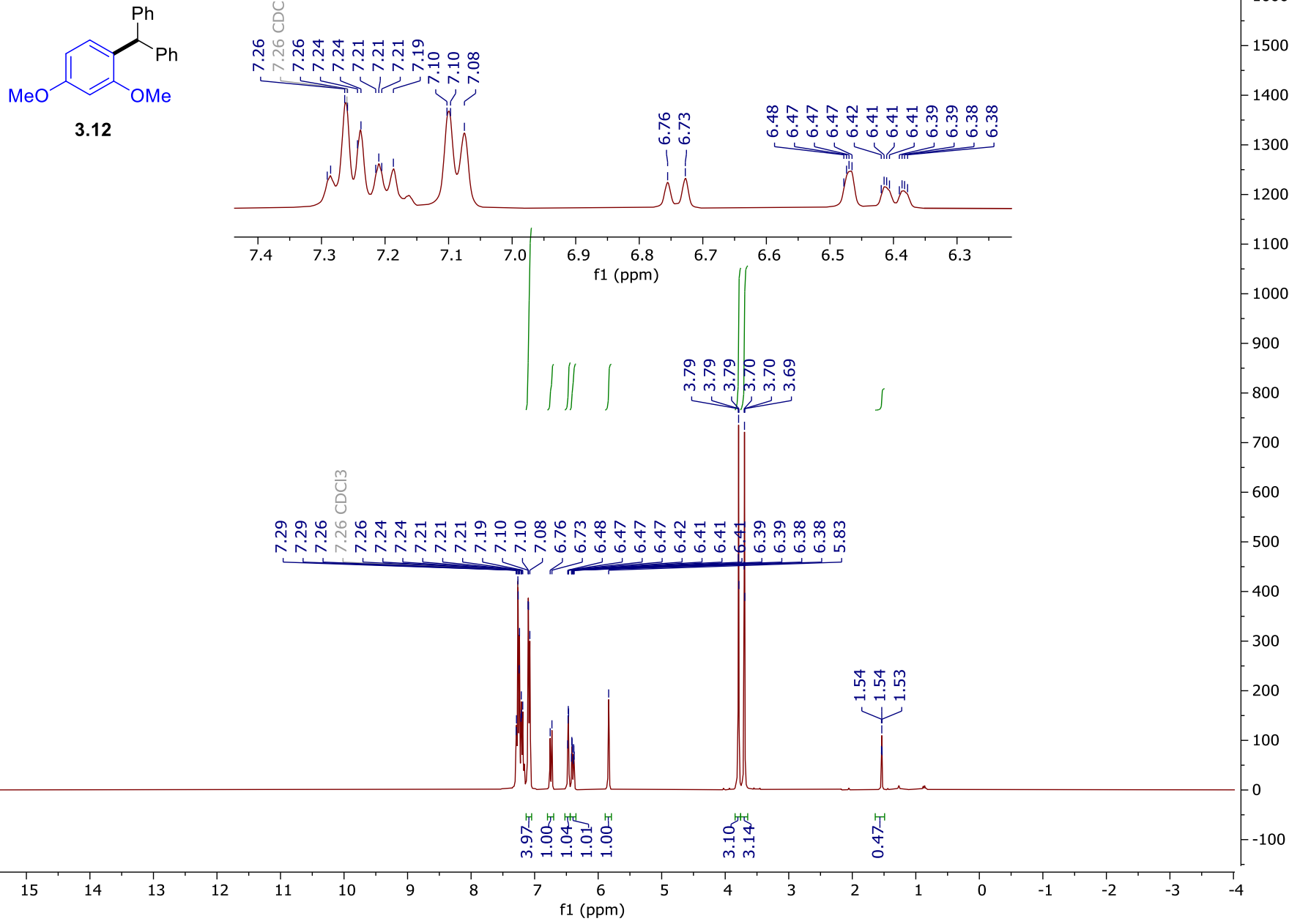

OH
Ph
Ph
3.10
7.26 CDCl3
f1 (ppm)
5.44
4.65
2.14
1.56
6.58
4.05
2.08
2.01
1.00
0.98

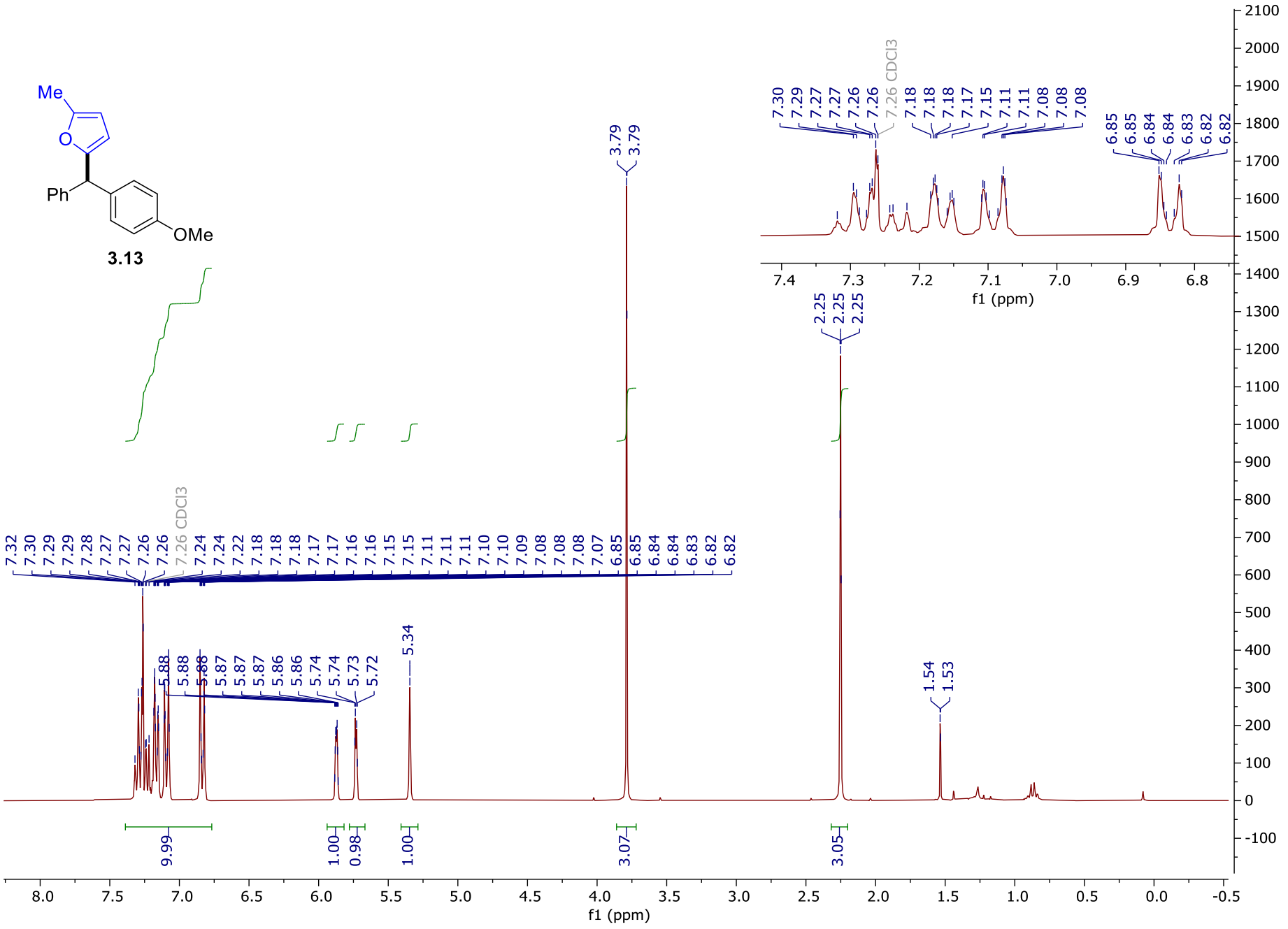

OMe
Me
Me
Ph
Ph

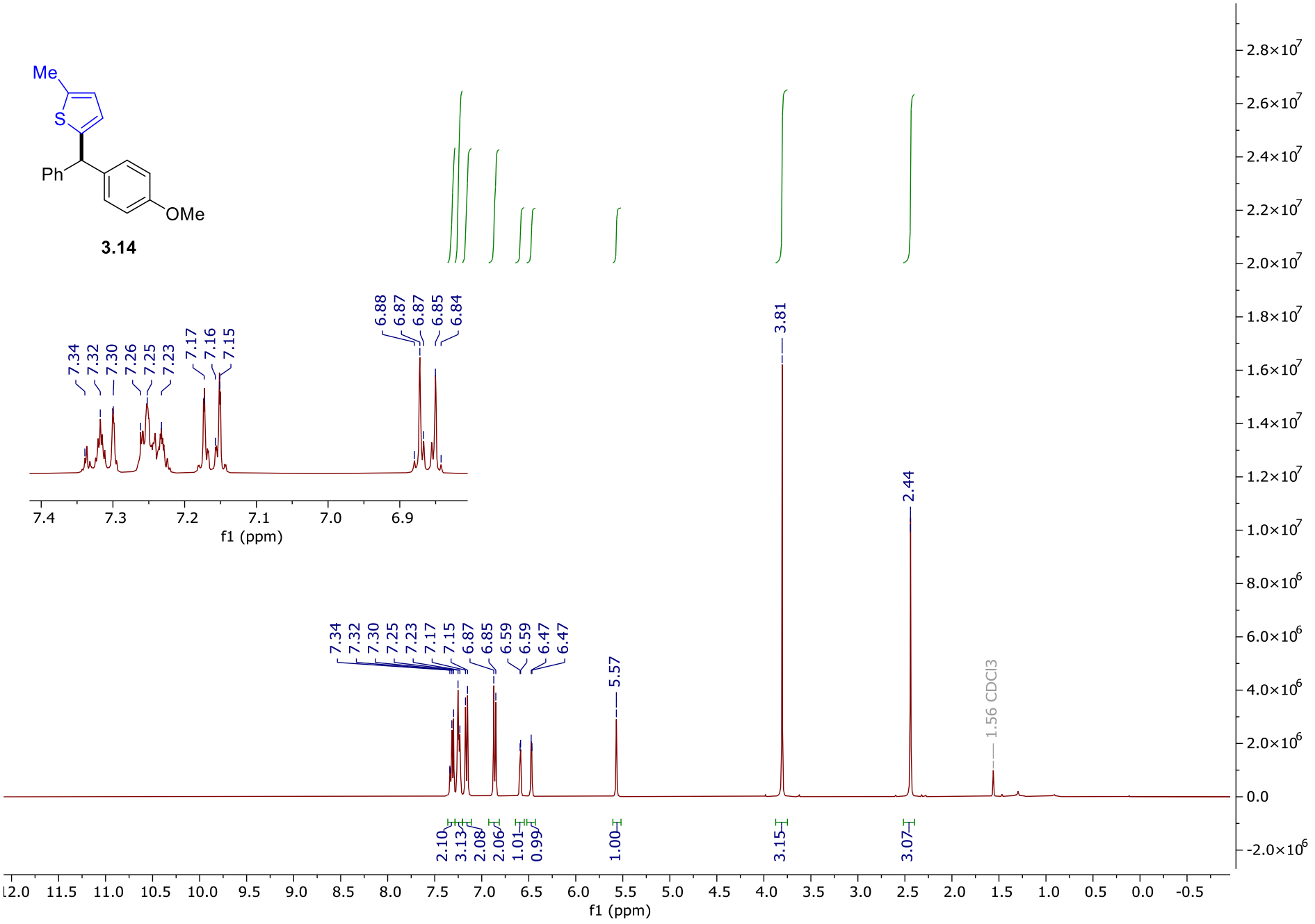
3.11

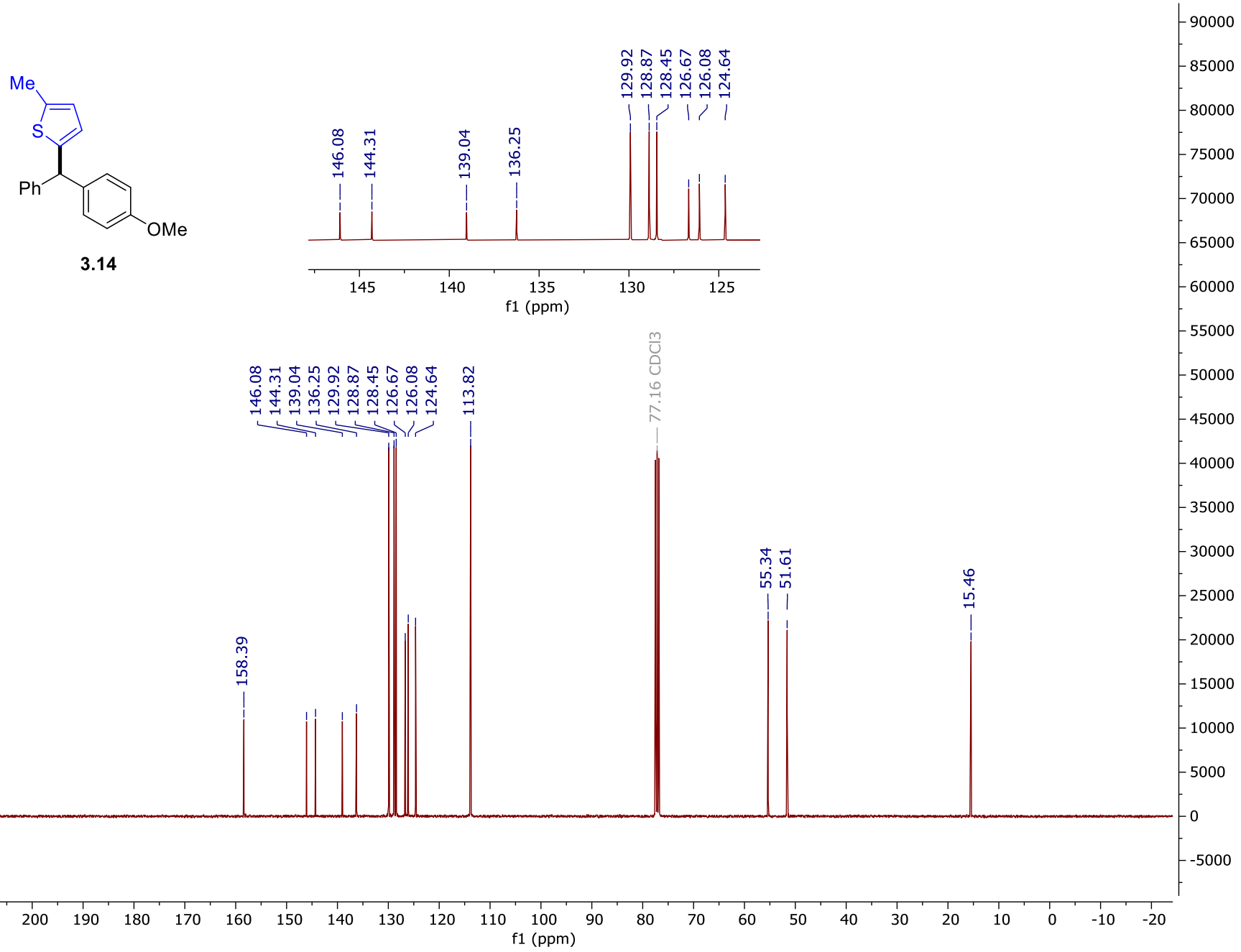
7.31
7.31
7.31
7.30
7.30
7.28
7.28
7.28
7.28
7.26
7.25
7.23
7.22
7.22
7.20
7.18
7.13
7.12
7.10
7.35
7.30
7.25
7.20
7.15
7.10
7.05
f1 (ppm)
2.24
7.34
7.33
7.31
7.29
7.28
7.26
7.25
7.25
7.24
7.23
7.21
7.16
7.15
7.13
6.77
5.46
1.59 CDCl3
10.97
1.97
1.00
3.05
5.89
0.93
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
f1 (ppm)
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-200

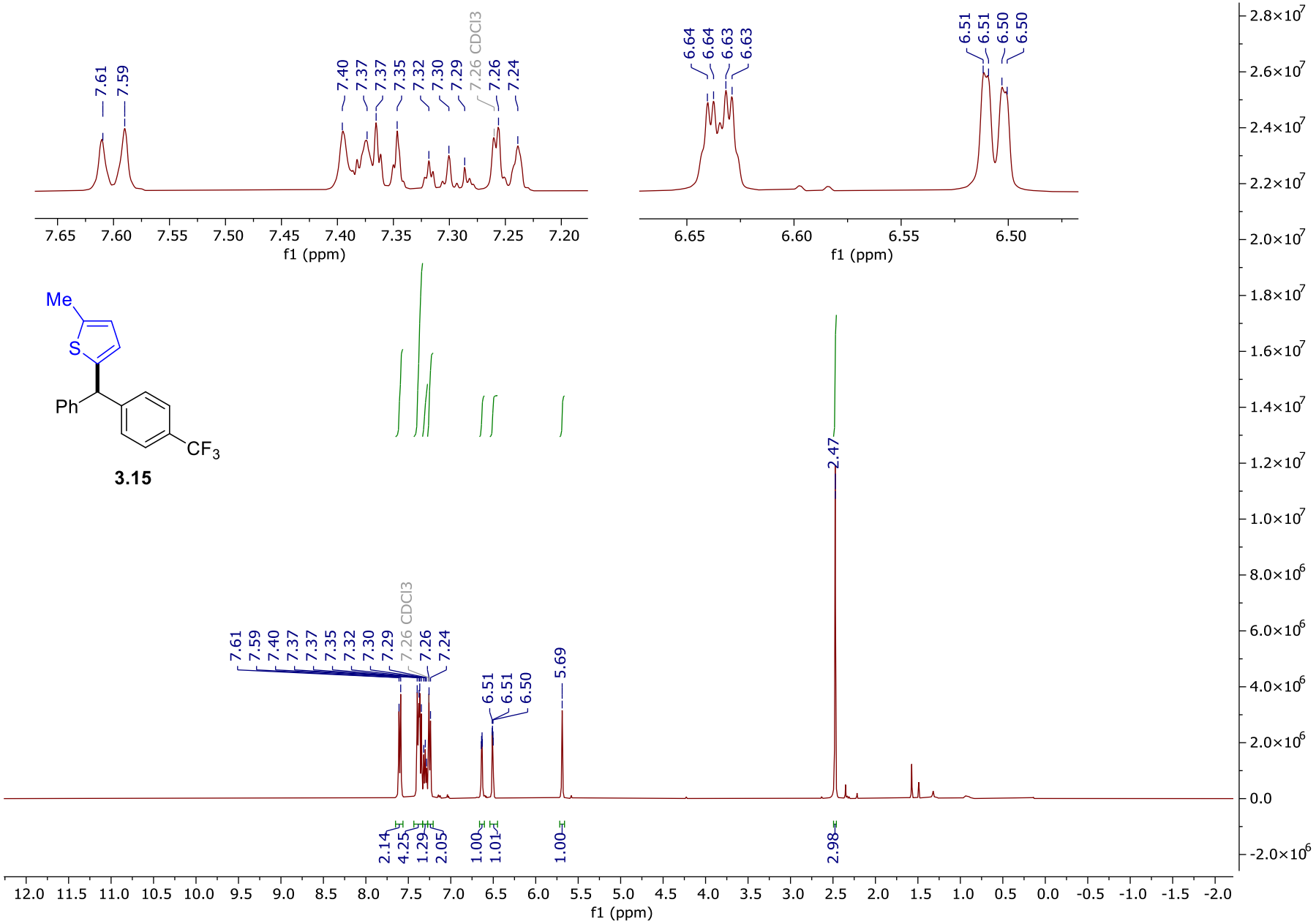

OMe
Me
Me
Ph
Ph
3.11
130.59
129.87
129.54
128.38
77.48
77.16
77.16 CDCl3
76.84
155.50
144.34
59.78
56.46
16.32
f1 (ppm)

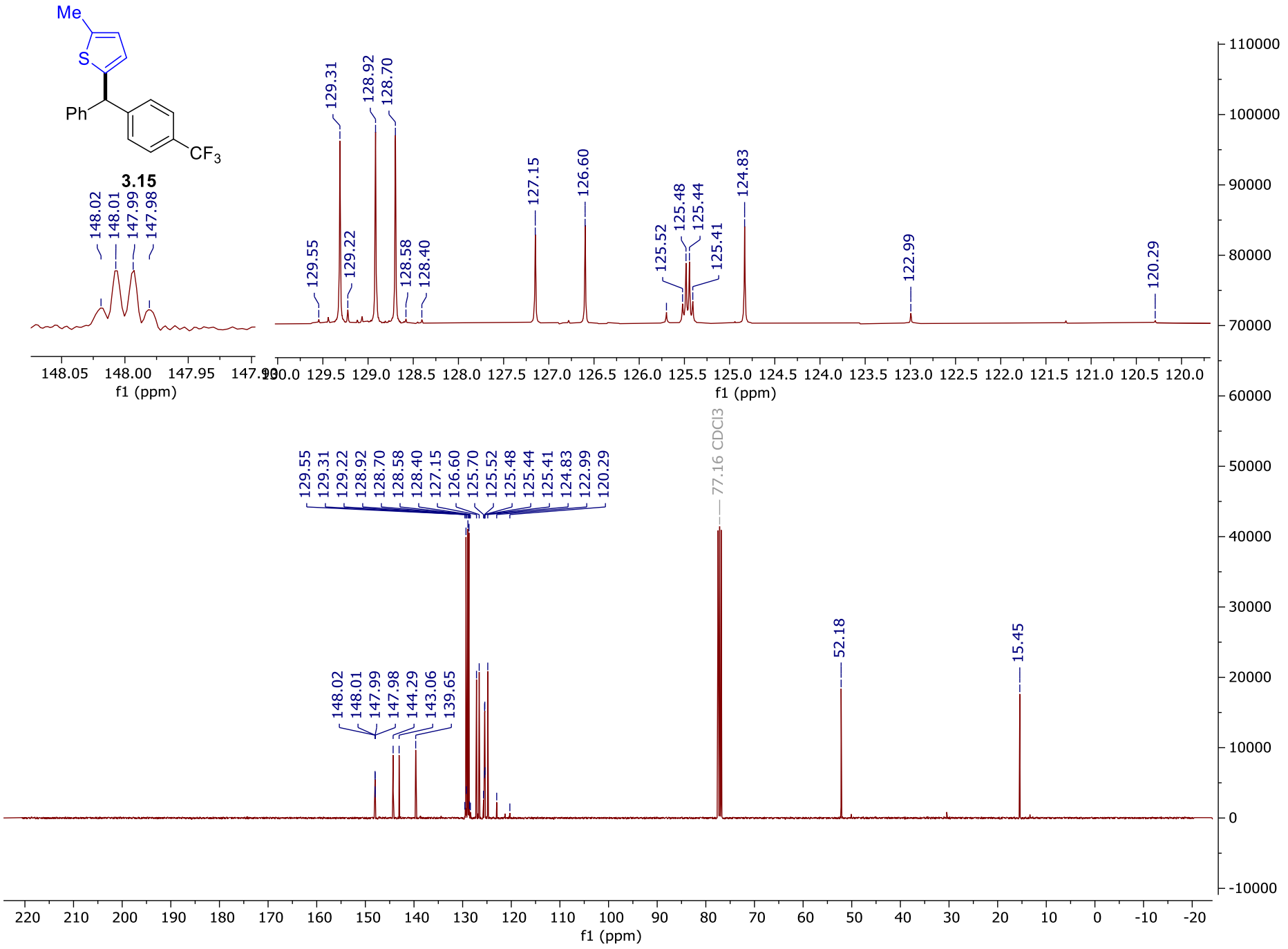

Ph
Ph
MeO
OMe
3.12
f1 (ppm)

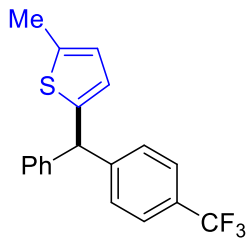

Me
O
Ph
OMe
3.13
f1 (ppm)


Me
S
Ph
OMe
3.14
7.34
7.32
7.30
7.26
7.25
7.23
7.17
7.16
7.15
6.88
6.87
6.87
6.85
6.84
7.4
7.3
7.2
7.1
7.0
6.9
f1 (ppm)
3.81
2.44
1.56 CDCl3
5.57
6.59
6.59
6.47
6.47
2.10
3.13
2.08
2.06
1.01
0.99
1.00
3.15
3.07
2.8×10^7
2.6×10^7
2.4×10^7
2.2×10^7
2.0×10^7
1.8×10^7
1.6×10^7
1.4×10^7
1.2×10^7
1.0×10^7
8.0×10^6
6.0×10^6
4.0×10^6
2.0×10^6
0.0
-2.0×10^6
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)


Me
S
Ph
OMe
3.14
146.08
144.31
139.04
136.25
129.92
128.87
128.45
126.67
126.08
124.64
145
140
135
130
125
f1 (ppm)
158.39
146.08
144.31
139.04
136.25
129.92
128.87
128.45
126.67
126.08
124.64
113.82
77.16 CDCl3
55.34
51.61
15.46
90000
85000
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
f1 (ppm)

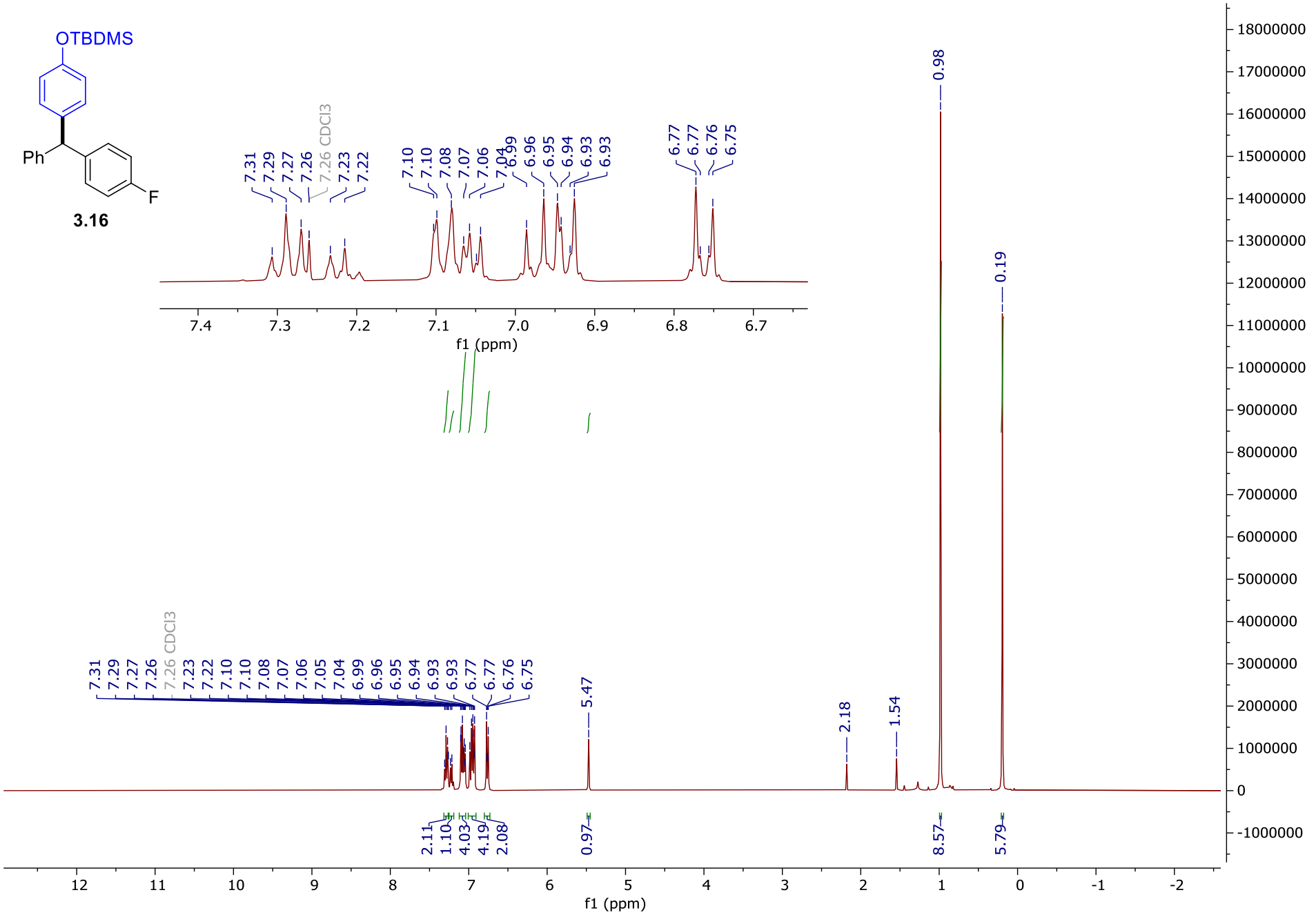

7.61
7.59
7.40
7.37
7.37
7.35
7.32
7.30
7.29
7.26 CDCl3
7.26
7.24
6.64
6.64
6.63
6.63
6.51
6.51
6.50
6.50
f1 (ppm)
Me
S
Ph
CF3
3.15
5.69
2.47
2.14
4.25
1.29
2.05
1.00
1.01
1.00
2.98

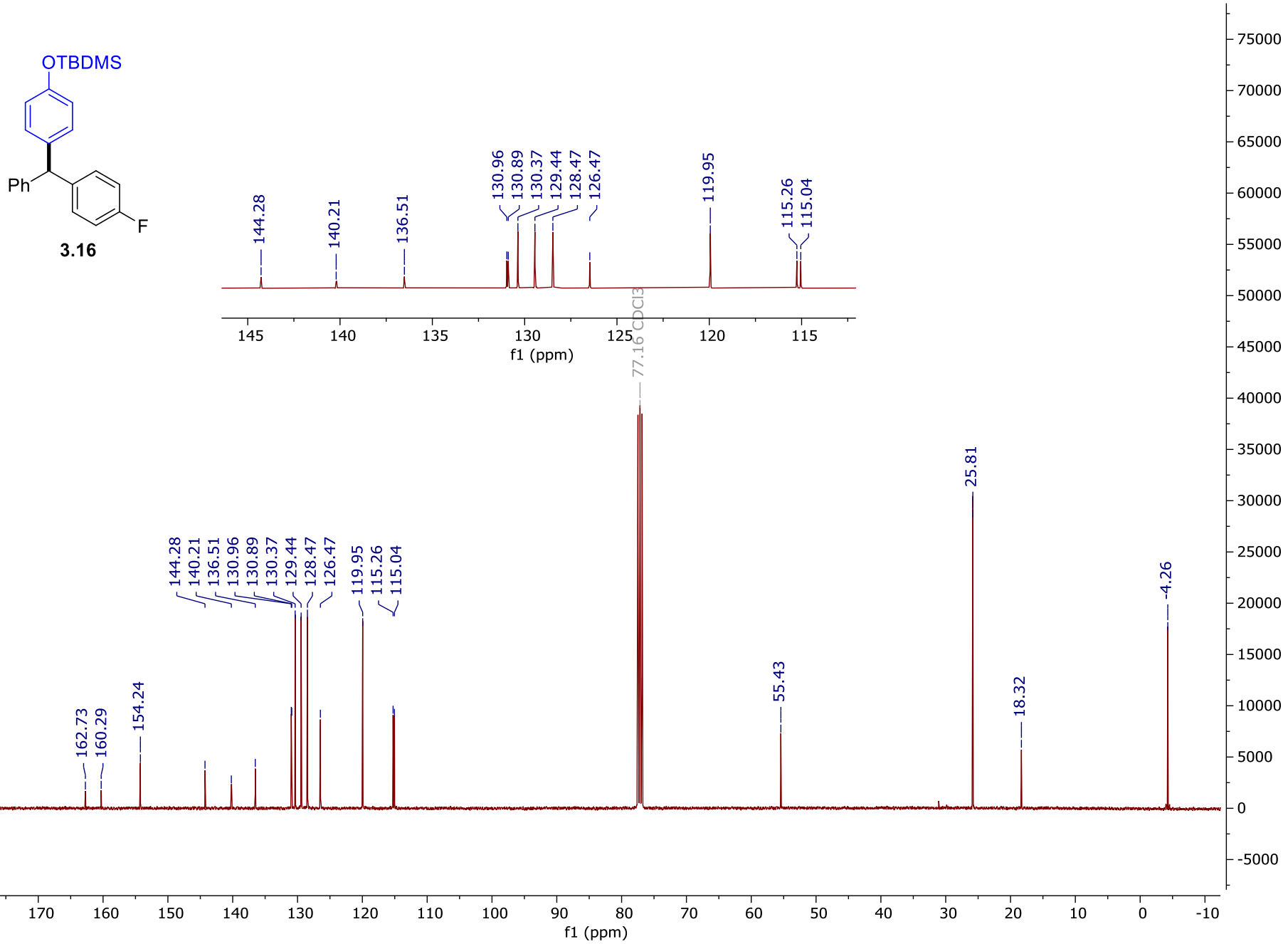

Me
S
Ph
CF3
3.15
148.02
148.01
147.99
147.98
129.55
129.31
129.22
128.92
128.70
128.58
128.40
127.15
126.60
125.52
125.48
125.44
125.41
124.83
122.99
120.29
77.16 CDCl3
144.29
143.06
139.65
52.18
15.45
f1 (ppm)


Me
S
Ph
CF3

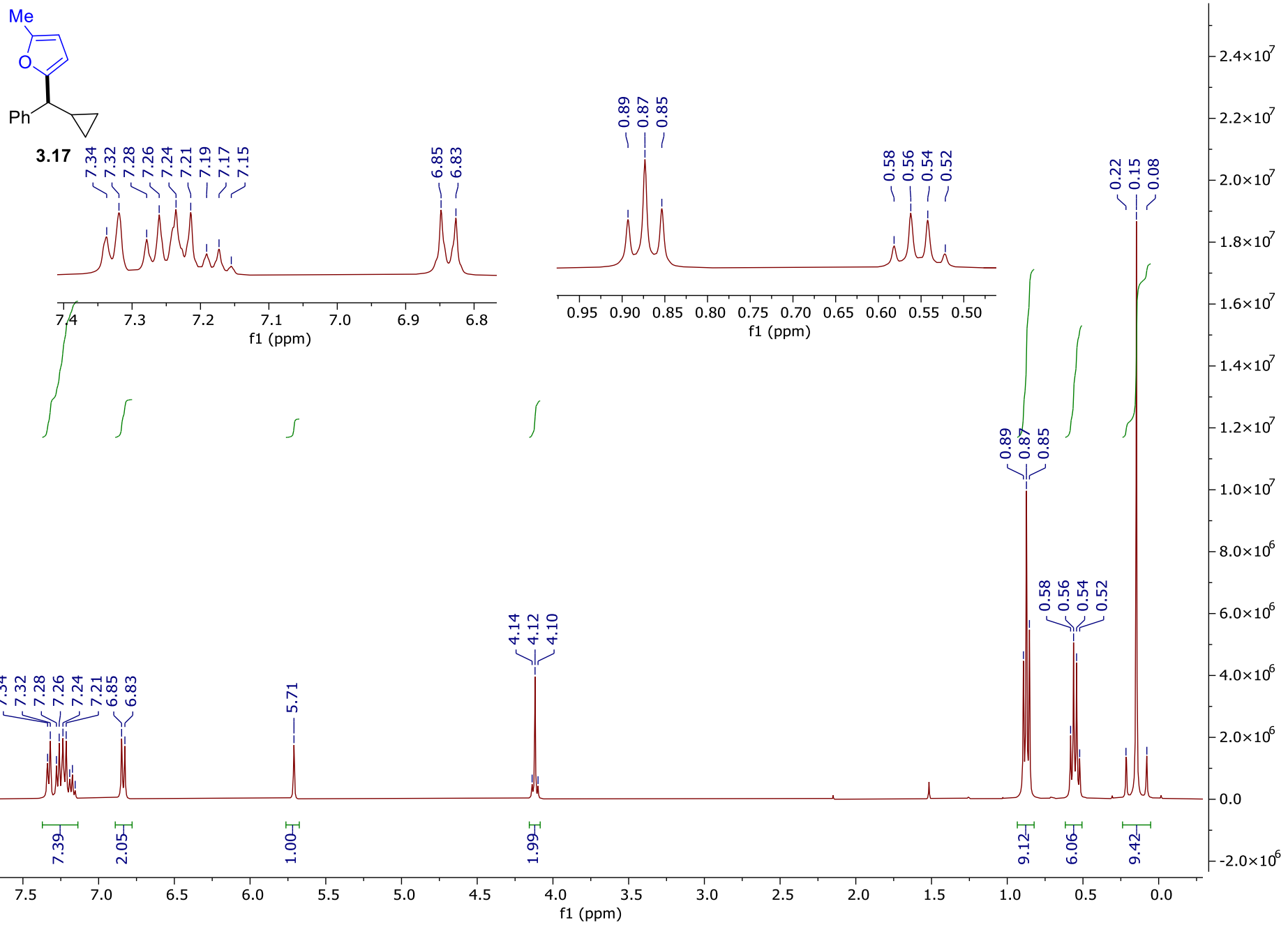
3.15

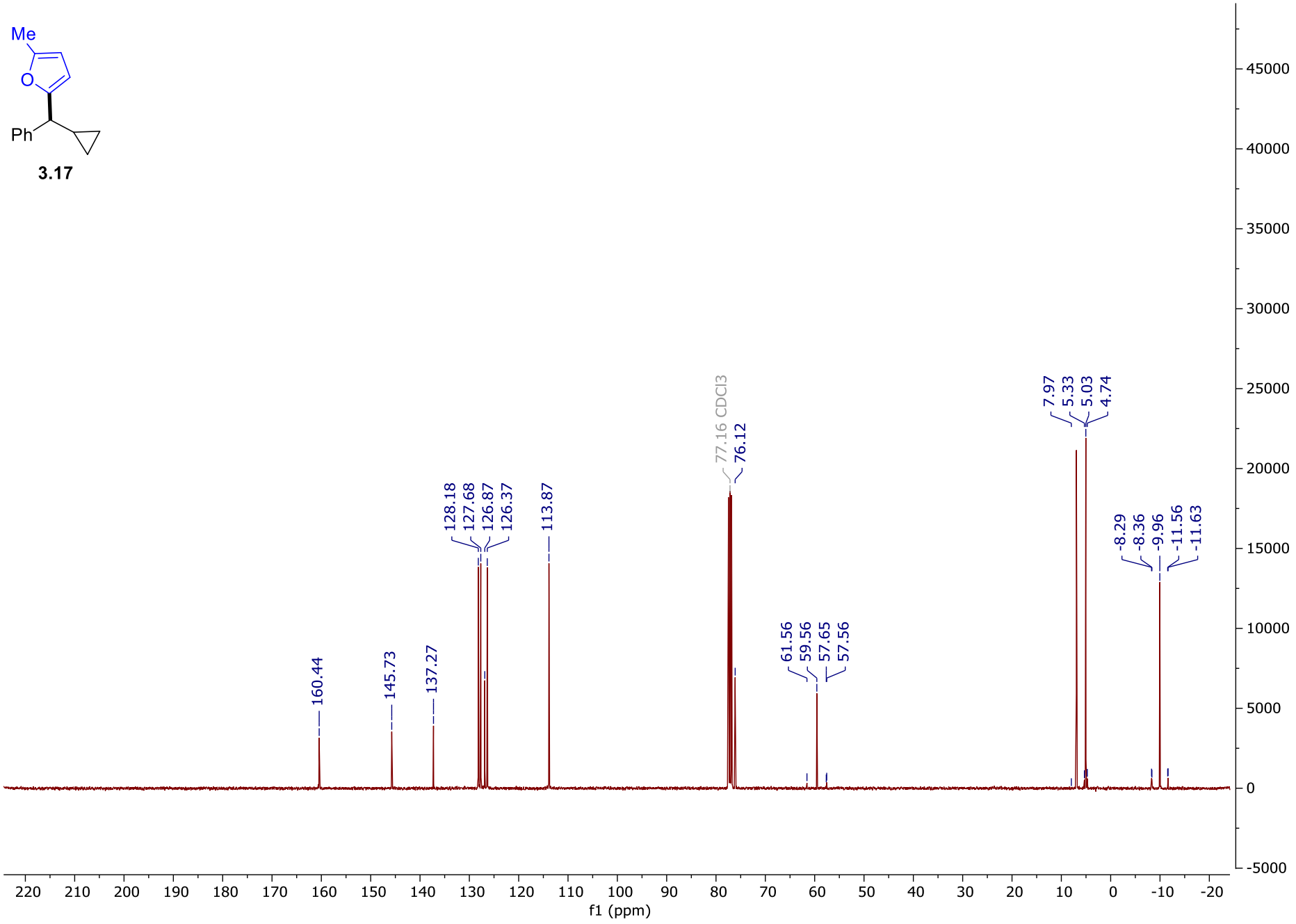
-62.36
19000000
18000000
17000000
16000000
15000000
14000000
13000000
12000000
11000000
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
-1000000
70
50
30
10
-10
-30
-50
-70
-90
-110
-130
-150
-170
-190
-210
-230
-250
-270
f1 (ppm)

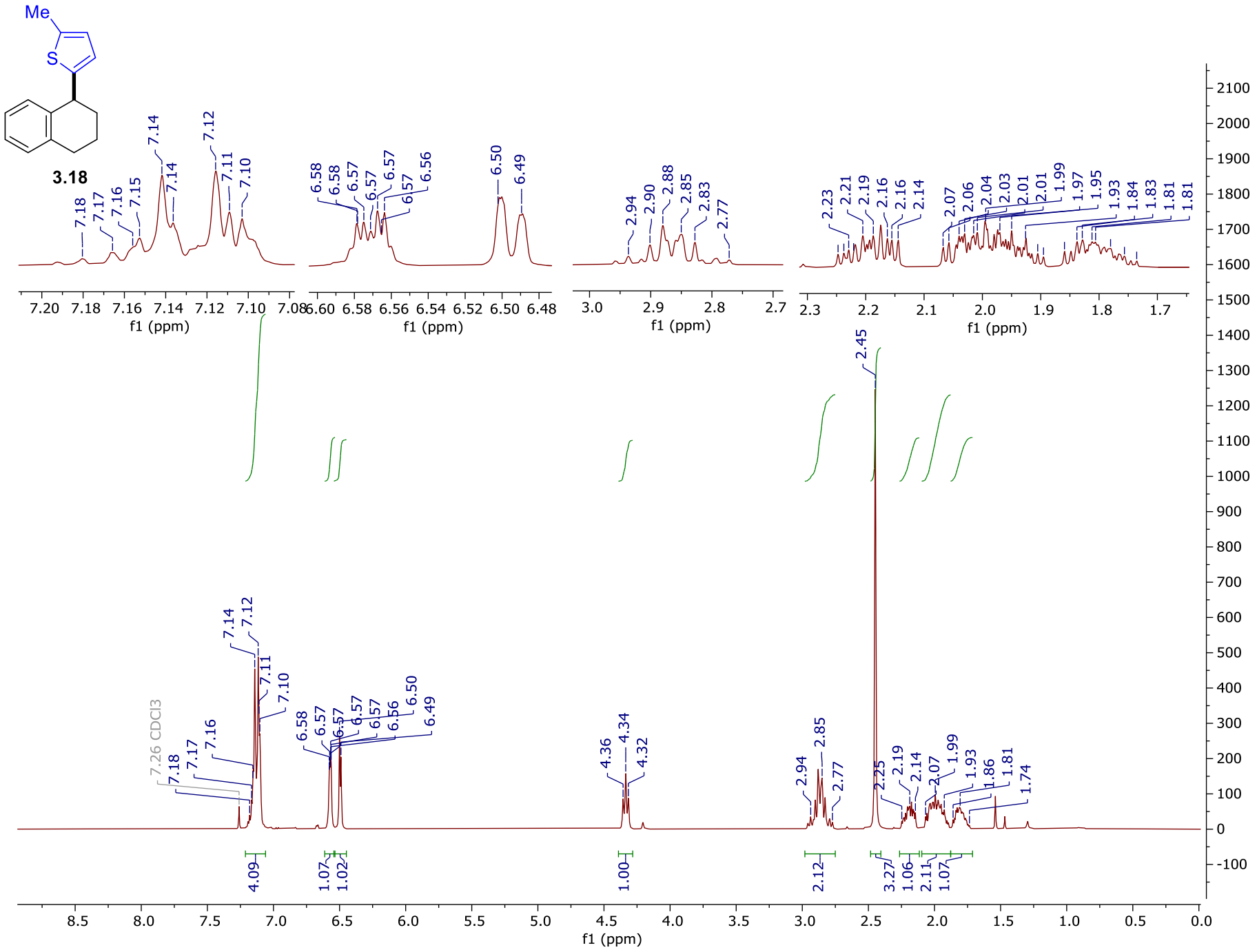

OTBDMS
Ph
F
3.16
7.31
7.29
7.27
7.26
7.26 CDCl3
7.23
7.22
7.10
7.10
7.08
7.07
7.06
7.04
6.99
6.96
6.95
6.94
6.93
6.93
6.77
6.77
6.76
6.75
f1 (ppm)
0.98
0.19
5.47
2.18
1.54
2.11
1.10
4.03
4.19
2.08
0.97
8.57
5.79

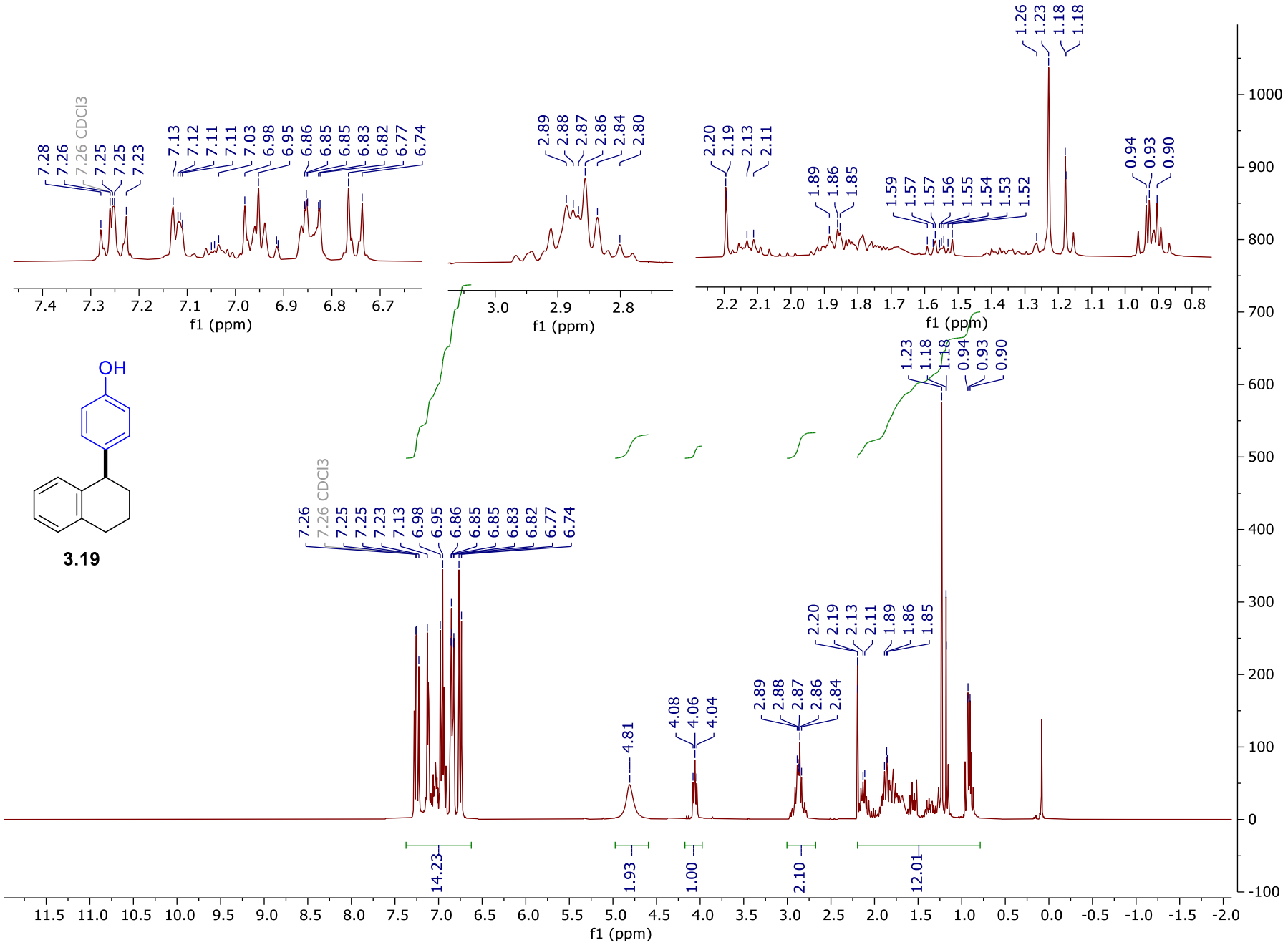

OTBDMS
Ph
F
3.16
144.28
140.21
136.51
130.96
130.89
130.37
129.44
128.47
126.47
119.95
115.26
115.04
f1 (ppm)
77.16 CDCl3
25.81
-4.26
55.43
18.32
162.73
160.29
154.24
f1 (ppm)

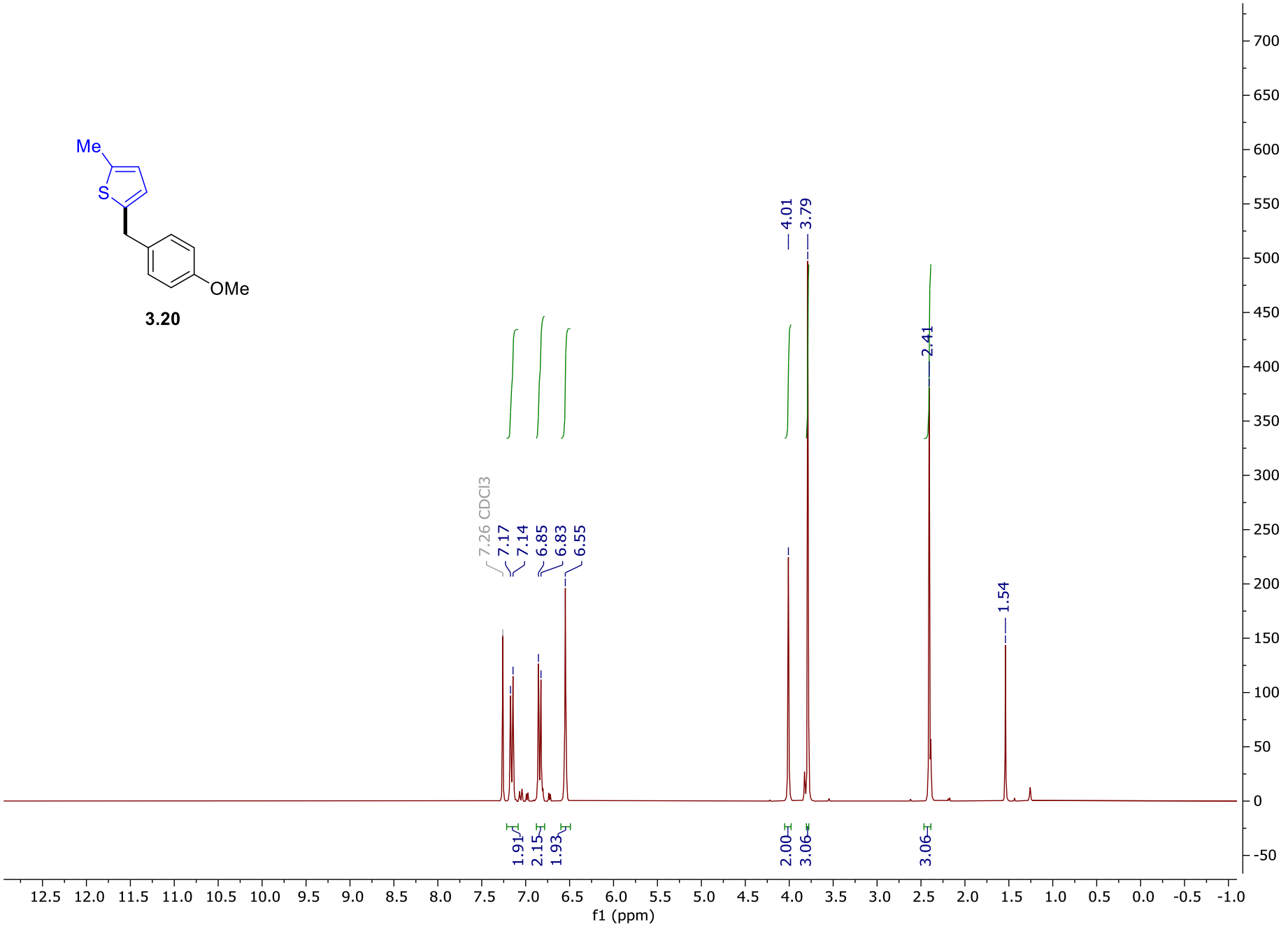

OTBDMS
Ph
F
3.16
-117.01
-117.02
-117.03
-117.05
-117.06
-117.07
-117.08
A (td)
-117.05
1.01
10000000
9000000
8000000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
-1000000
-45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140 -145 -150 -155
f1 (ppm)

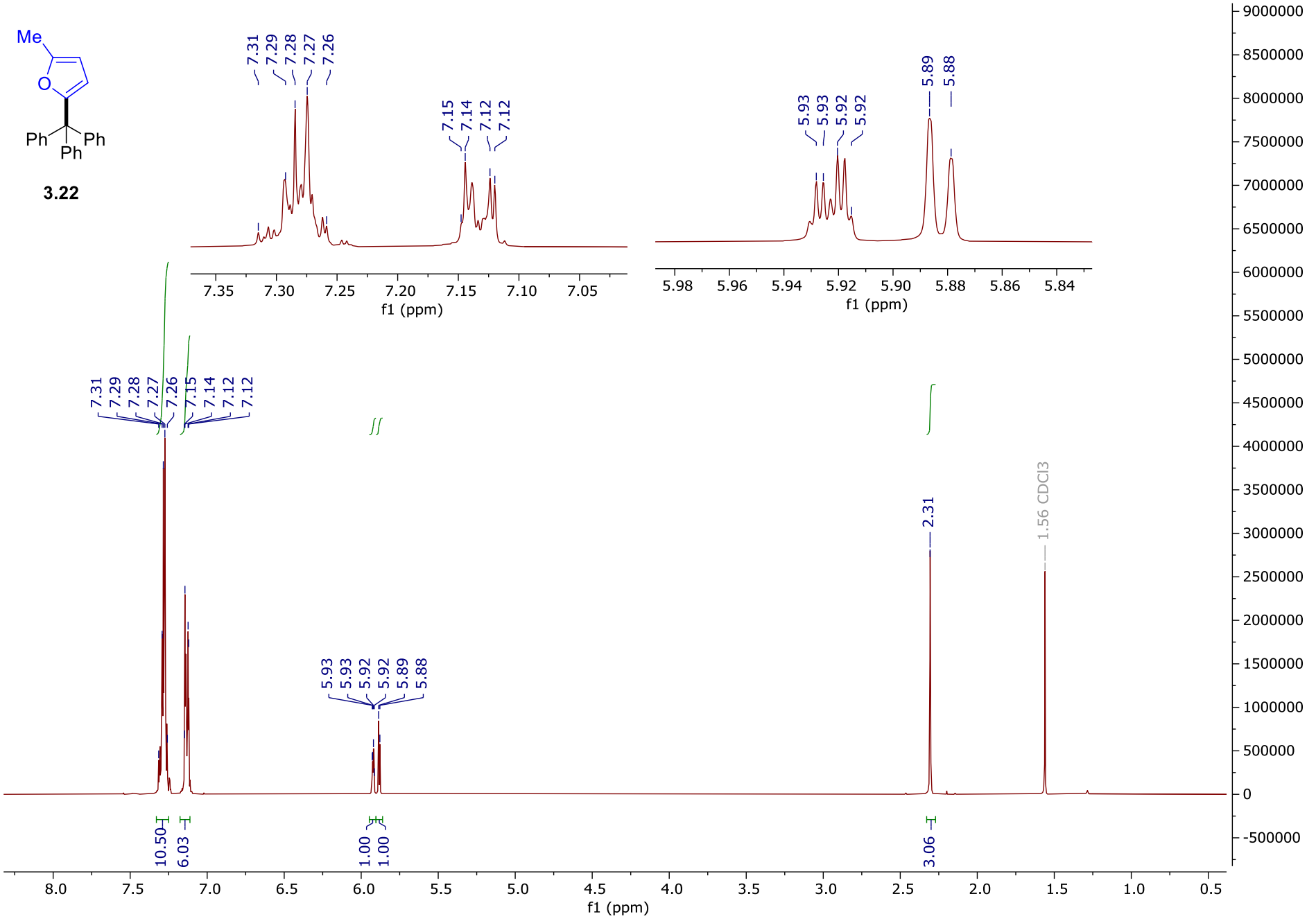

Me
O
Ph
3.17
7.34
7.32
7.28
7.26
7.24
7.21
7.19
7.17
7.15
6.85
6.83
0.89
0.87
0.85
0.58
0.56
0.54
0.52
f1 (ppm)
5.71
4.14
4.12
4.10
0.22
0.15
0.08
7.39
2.05
1.00
1.99
9.12
6.06
9.42

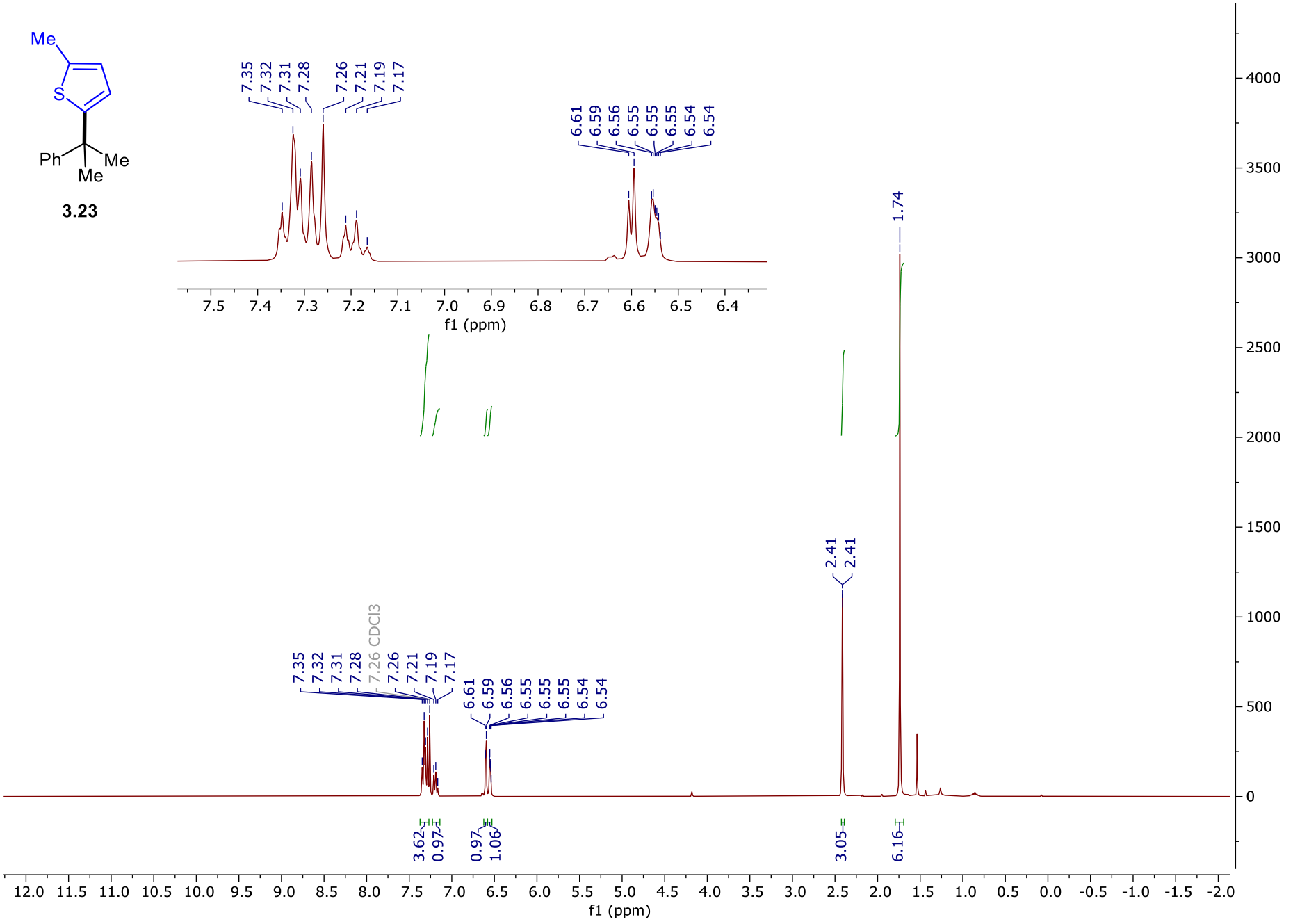

Me
O
Ph
3.17
160.44
145.73
137.27
128.18
127.68
126.87
126.37
113.87
77.16 CDCl3
76.12
61.56
59.56
57.65
57.56
7.97
5.33
5.03
4.74
-8.29
-8.36
-9.96
-11.56
-11.63
f1 (ppm)

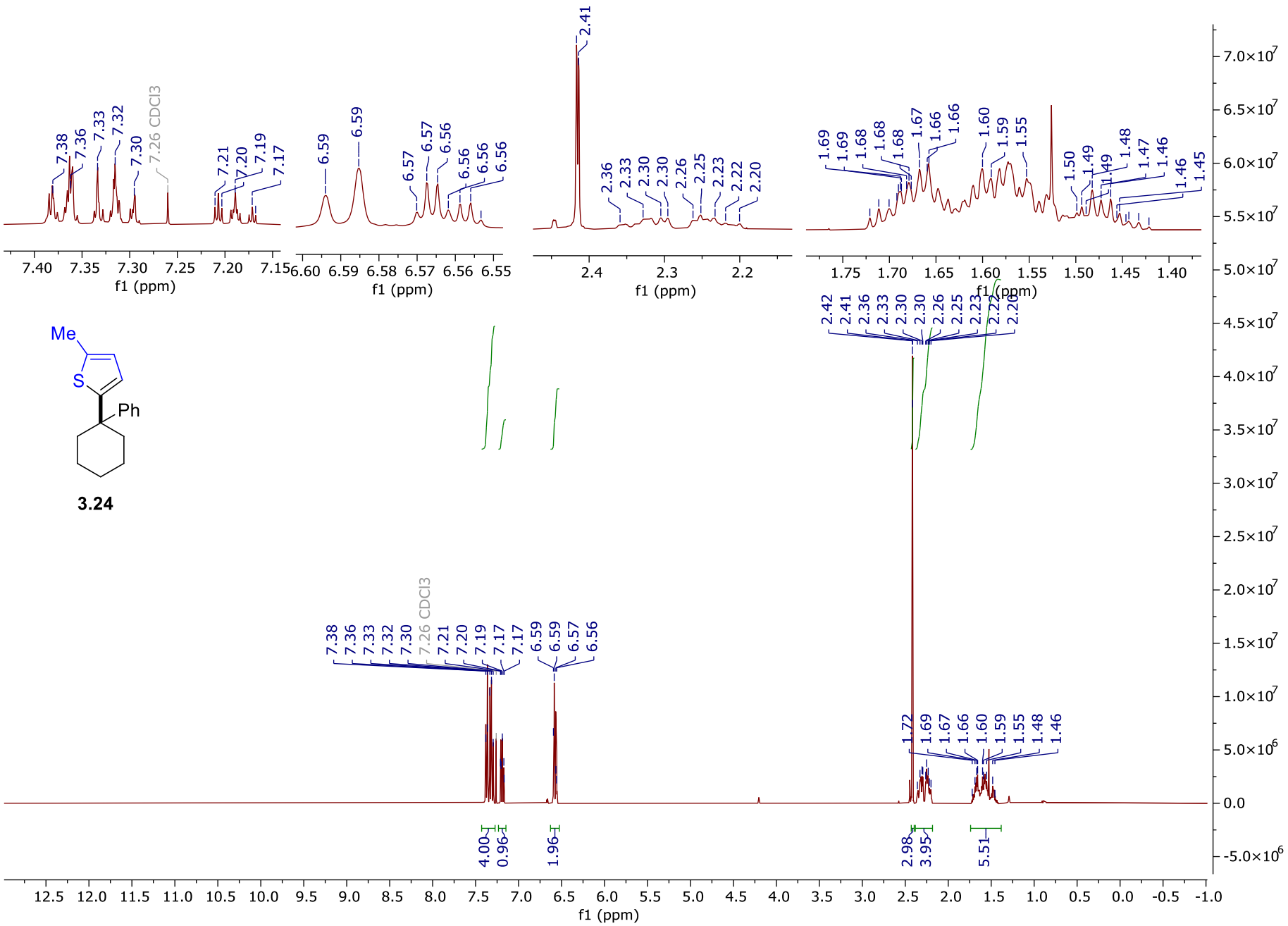

Me
S
3.18
7.26 CDCl3
f1 (ppm)

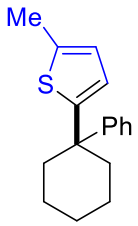

OH
3.19
7.26 CDCl3
f1 (ppm)
14.23
1.93
1.00
2.10
12.01


Me
S
OMe
3.20
7.26 CDCl3
7.17
7.14
6.85
6.83
6.55
4.01
3.79
2.41
1.54
1.91
2.15
1.93
2.00
3.06
3.06
f1 (ppm)


Me
O
Ph
Ph
Ph
3.22
7.31
7.29
7.28
7.27
7.26
7.15
7.14
7.12
7.12
5.93
5.93
5.92
5.92
5.89
5.88
2.31
1.56 CDCl3
10.50
6.03
1.00
1.00
3.06
f1 (ppm)

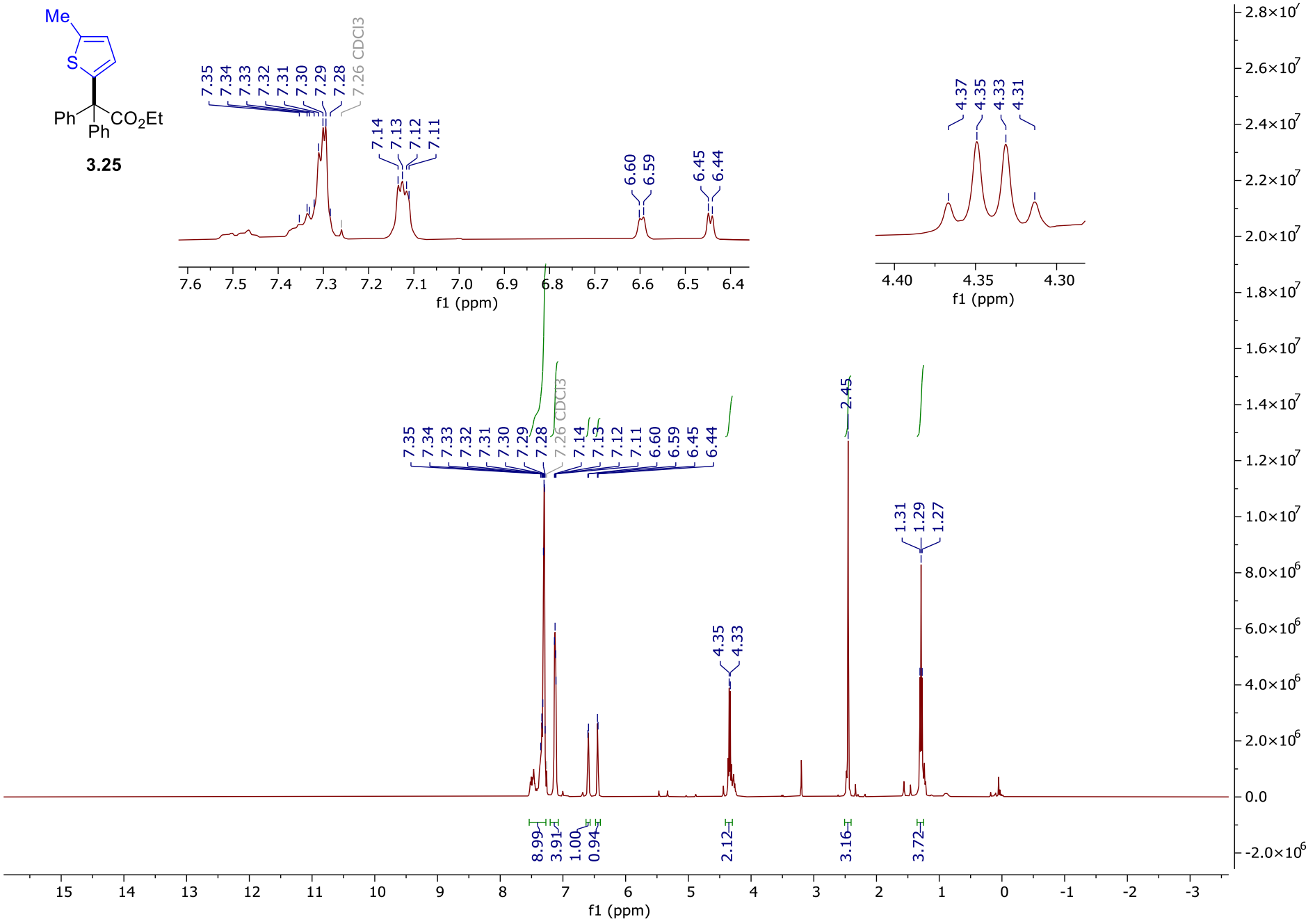

Me
S
Ph
Me
Me
3.23
7.35
7.32
7.31
7.28
7.26
7.21
7.19
7.17
6.61
6.59
6.56
6.55
6.55
6.55
6.54
6.54
f1 (ppm)
7.26 CDCl3
2.41
2.41
1.74
3.62
0.97
0.97
1.06
3.05
6.16
f1 (ppm)

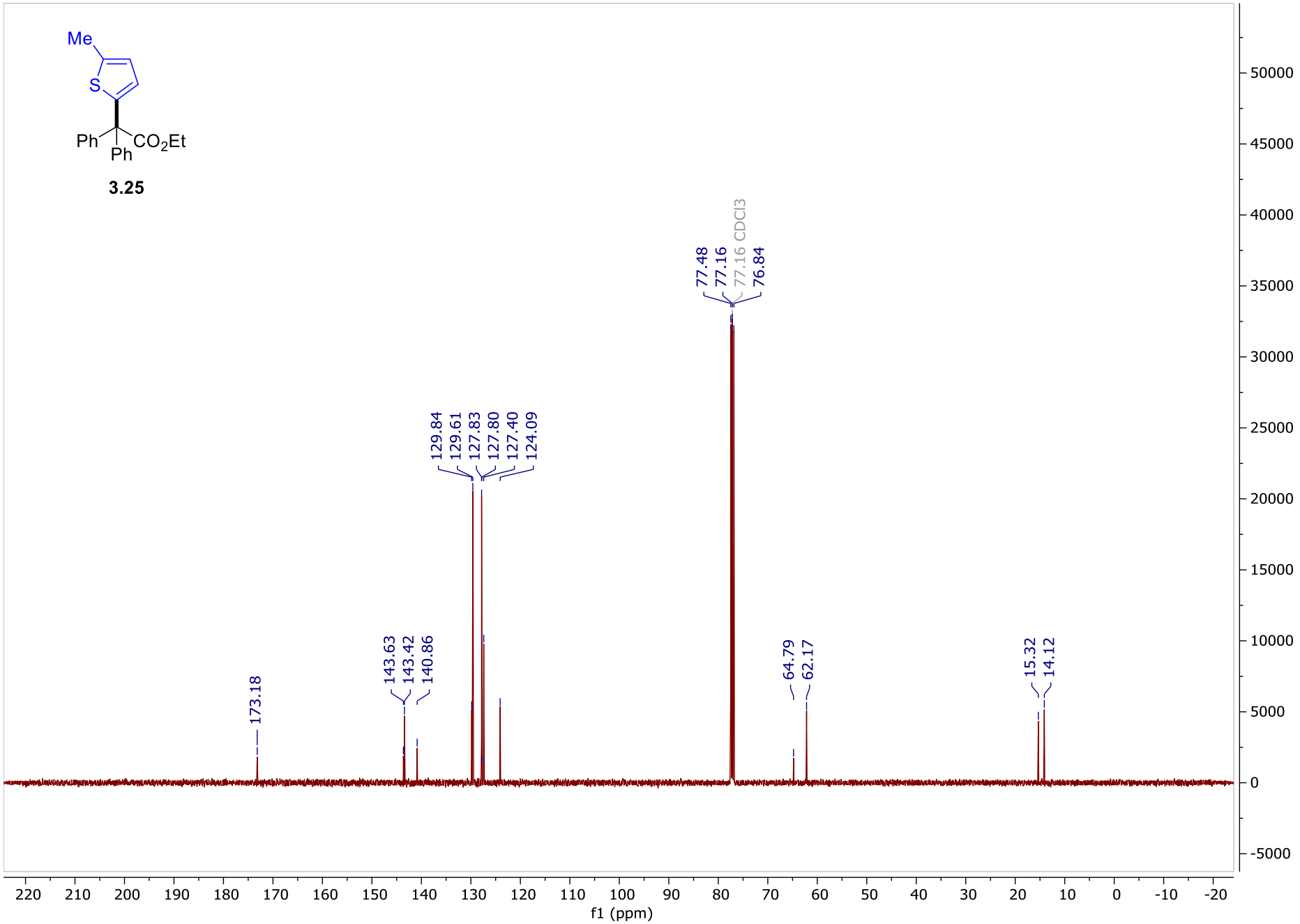

Me
S
Ph
3.24
f1 (ppm)

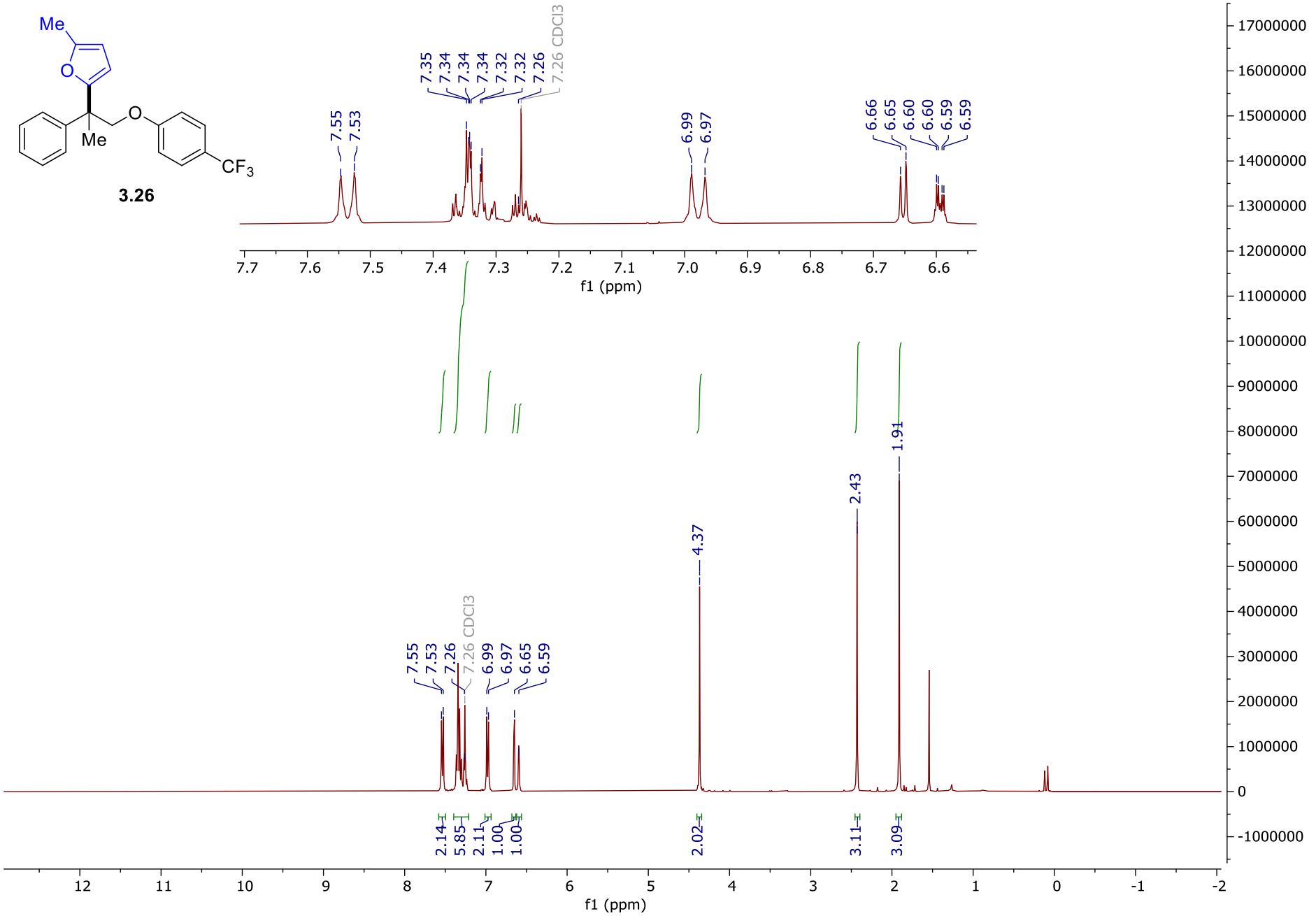

Me
S
Ph

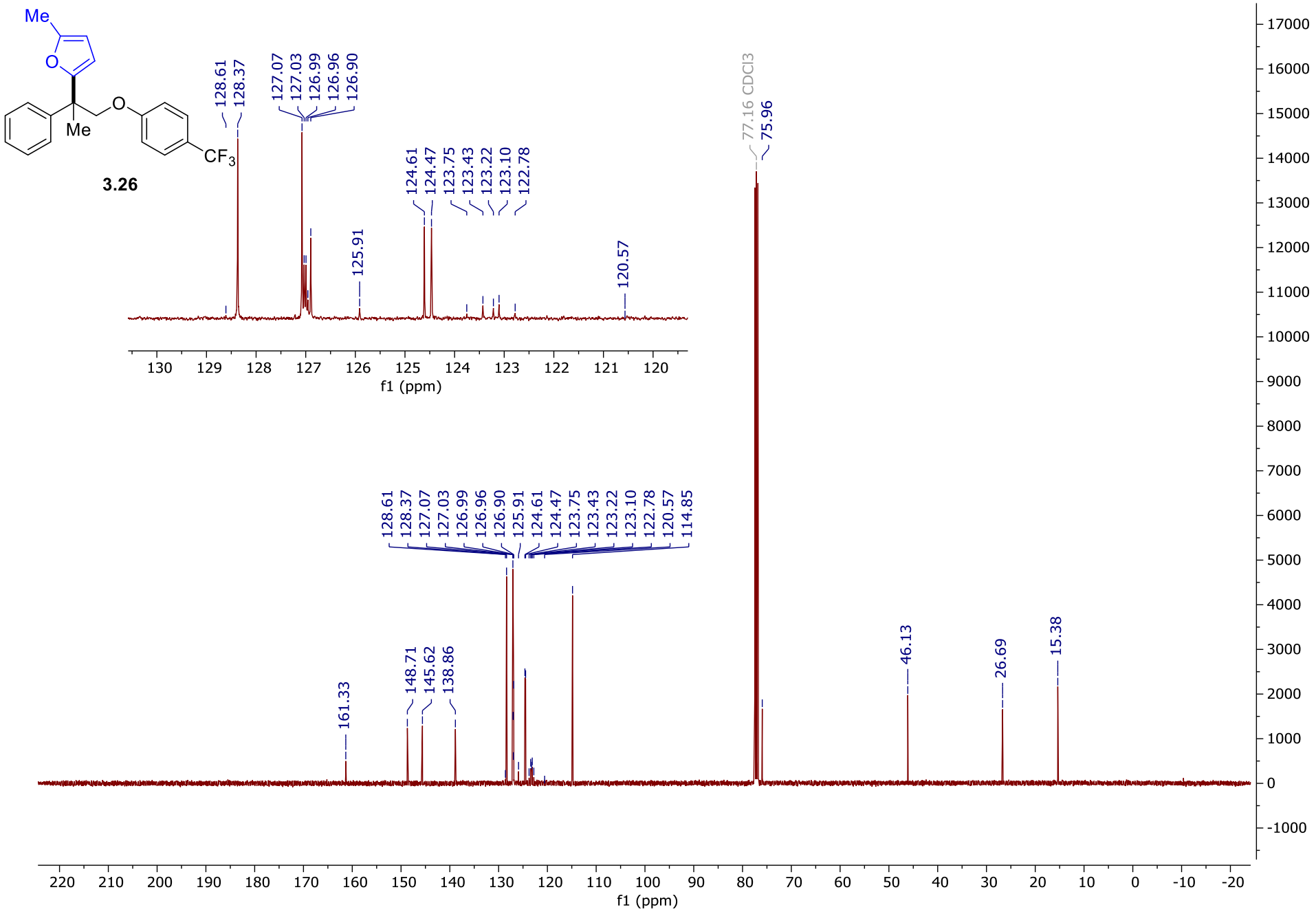
3.24

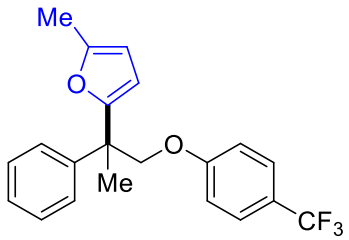
152.79
148.32
137.83
128.38
126.70
125.92
124.47
123.30
77.16 CDCl3
45.50
38.76
26.23
23.03
15.44
f1 (ppm)


Me
S
Ph
CO2Et
Ph
3.25
7.35
7.34
7.33
7.32
7.31
7.30
7.29
7.28
7.26 CDCl3
7.14
7.13
7.12
7.11
6.60
6.59
6.45
6.44
4.37
4.35
4.33
4.31
f1 (ppm)
2.45
1.31
1.29
1.27
4.35
4.33
8.99
3.91
1.00
0.94
2.12
3.16
3.72


Me
S
Ph
CO2Et
Ph
3.25
77.48
77.16
77.16 CDCl3
76.84
129.84
129.61
127.83
127.80
127.40
124.09
143.63
143.42
140.86
173.18
64.79
62.17
15.32
14.12
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20
f1 (ppm)

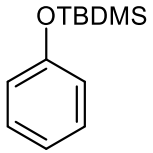

Me
O
Me
O
CF3
3.26
7.55
7.53
7.35
7.34
7.34
7.34
7.32
7.32
7.26
7.26 CDCl3
6.99
6.97
6.66
6.65
6.60
6.60
6.59
6.59
f1 (ppm)
7.55
7.53
7.26
7.26 CDCl3
6.99
6.97
6.65
6.59
4.37
2.43
1.91
2.14
5.85
2.11
1.00
1.00
2.02
3.11
3.09
f1 (ppm)


Me
O
Me
O
CF3
3.26
128.61
128.37
127.07
127.03
126.99
126.96
126.90
125.91
124.61
124.47
123.75
123.43
123.22
123.10
122.78
120.57
77.16 CDCl3
75.96
161.33
148.71
145.62
138.86
46.13
26.69
15.38
f1 (ppm)

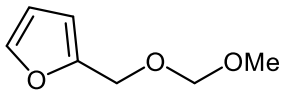

Me
O
Me
O
CF3

3.26

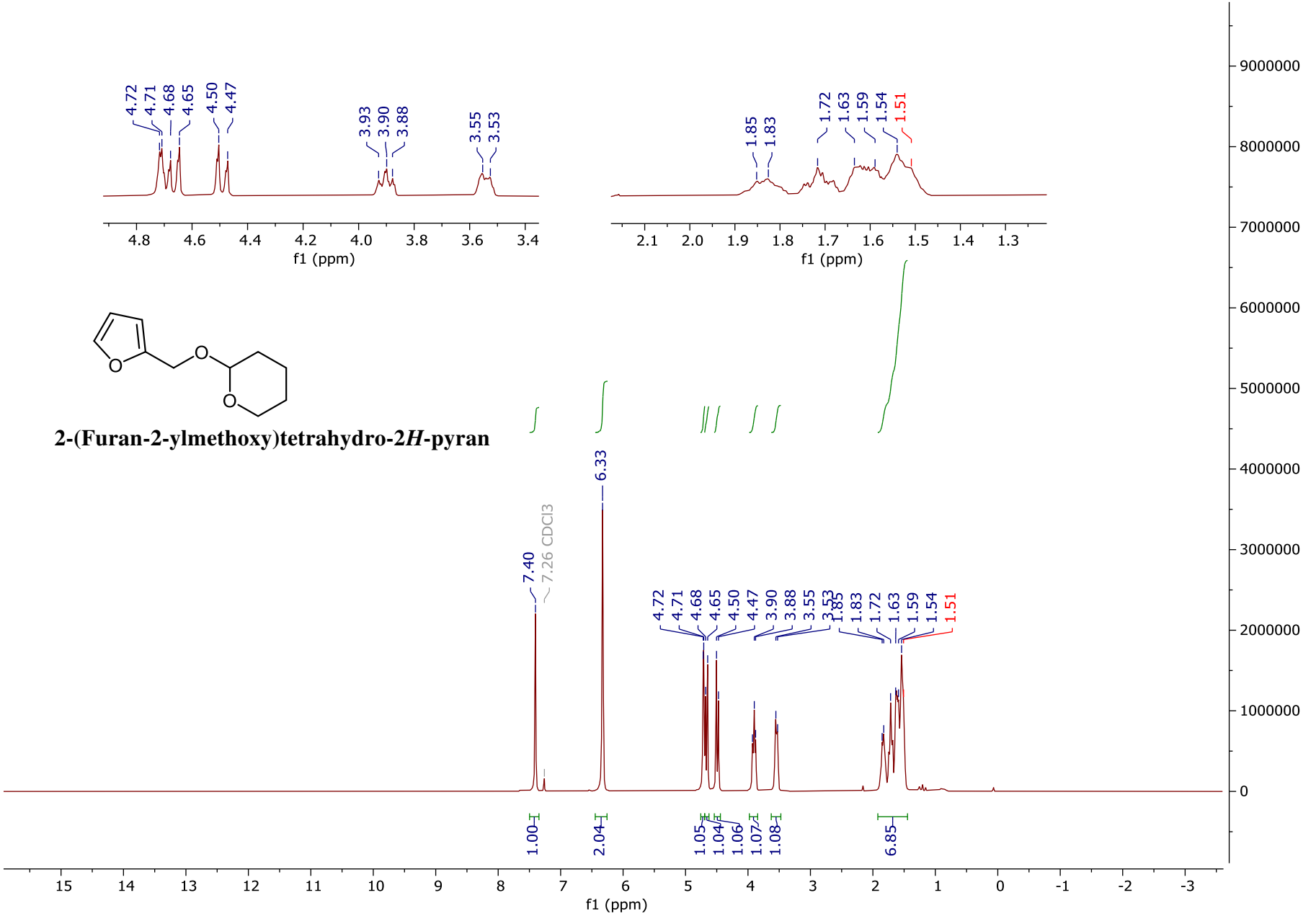
-61.49
2.8×10^7
2.6×10^7
2.4×10^7
2.2×10^7
2.0×10^7
1.8×10^7
1.6×10^7
1.4×10^7
1.2×10^7
1.0×10^7
8.0×10^6
6.0×10^6
4.0×10^6
2.0×10^6
0.0
-2.0×10^6
70 50 30 10 -10 -30 -50 -70 -90 -110 -130 -150 -170 -190 -210 -230 -250 -270
f1 (ppm)



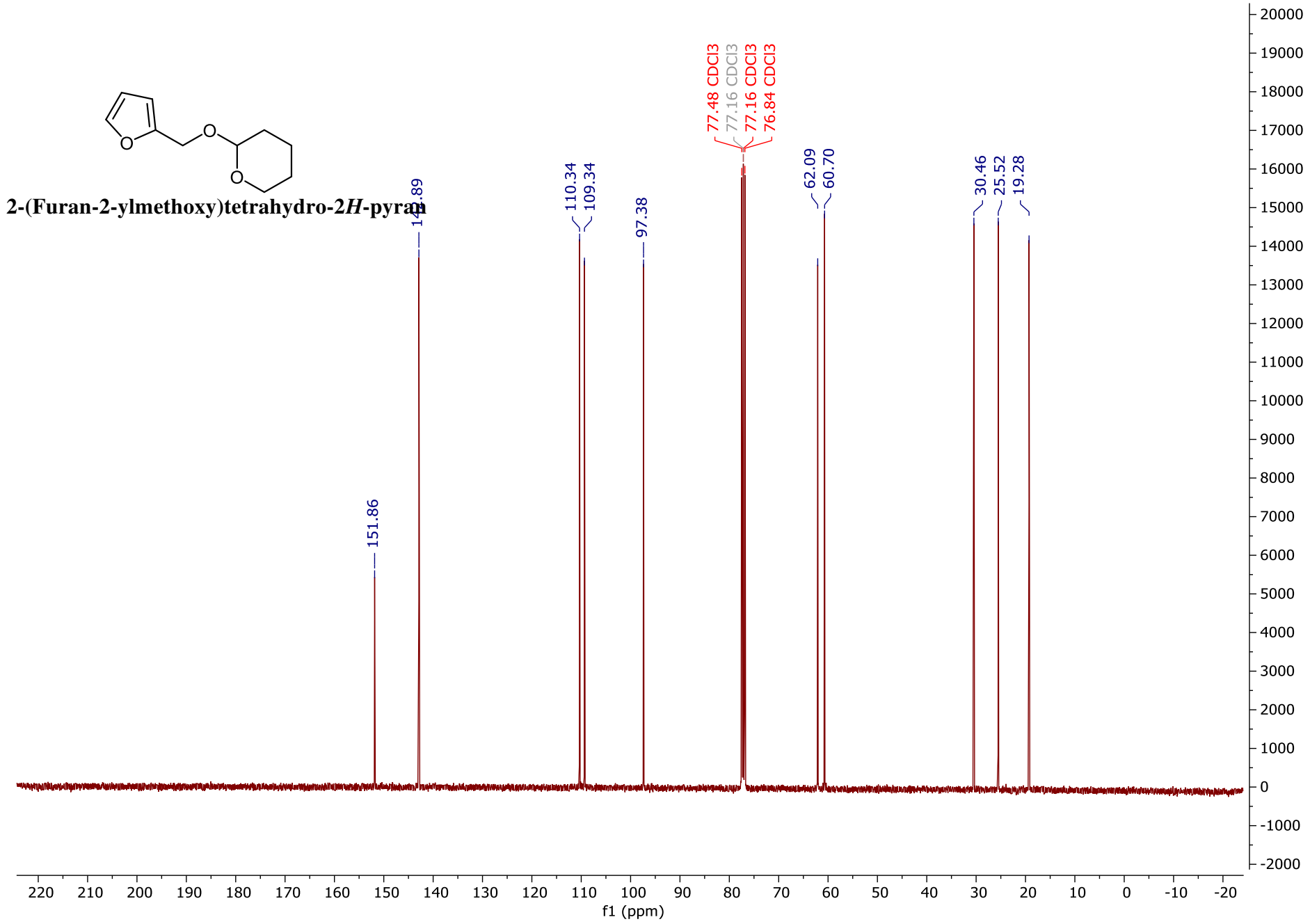
***Tert*-butyldimethyl(phenoxy)silane**

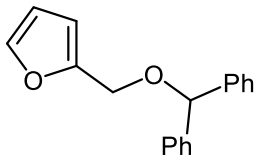


2-((Methoxymethoxy)methyl)furan

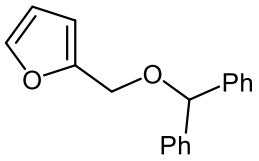


2-(Furan-2-ylmethoxy)tetrahydro-2*H*-pyran

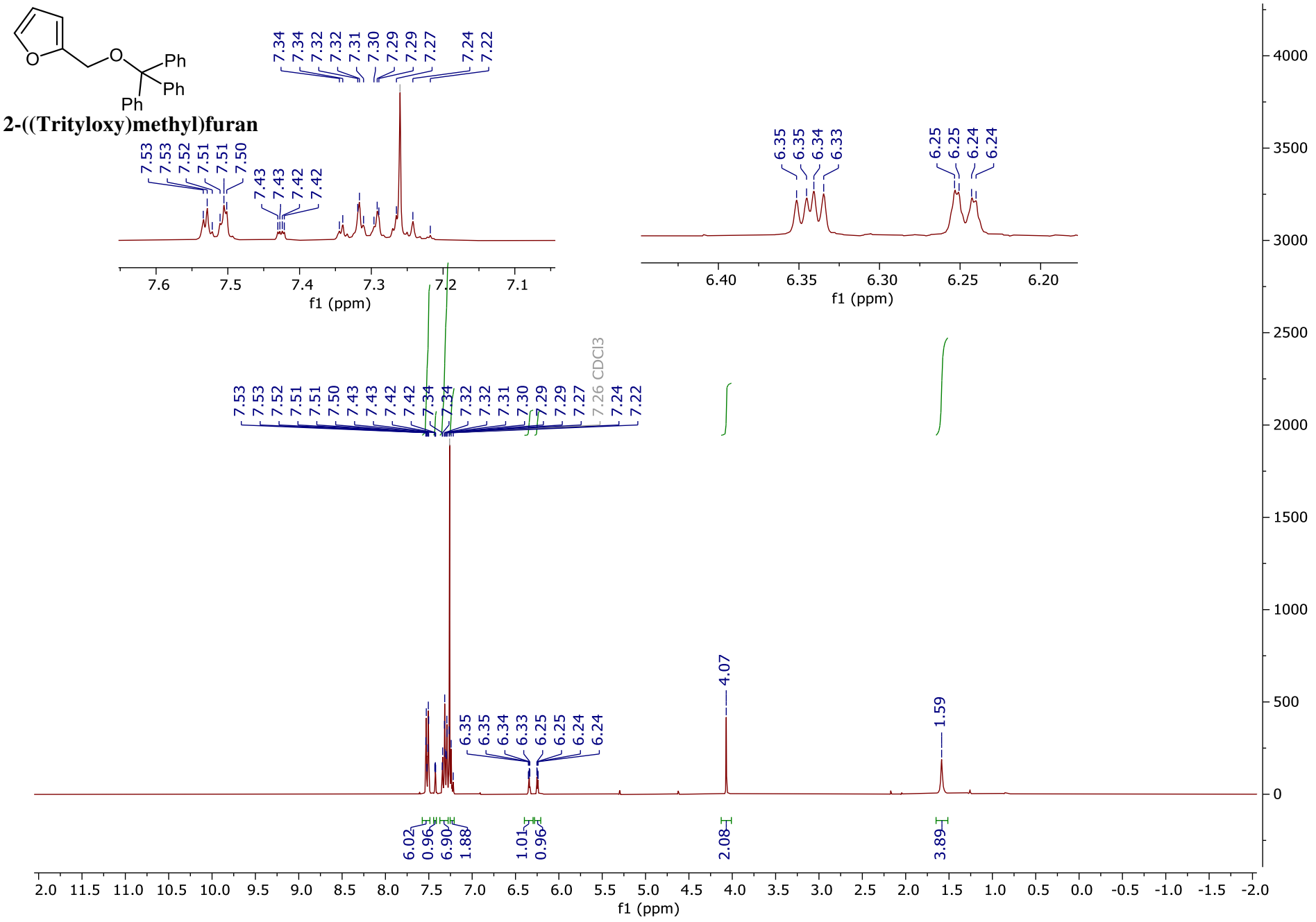

2-(Furan-2-ylmethoxy)tetrahydro-2H-pyran
151.86
142.89
110.34
109.34
97.38
77.48 CDCl3
77.16 CDCl3
77.16 CDCl3
76.84 CDCl3
62.09
60.70
30.46
25.52
19.28
f1 (ppm)

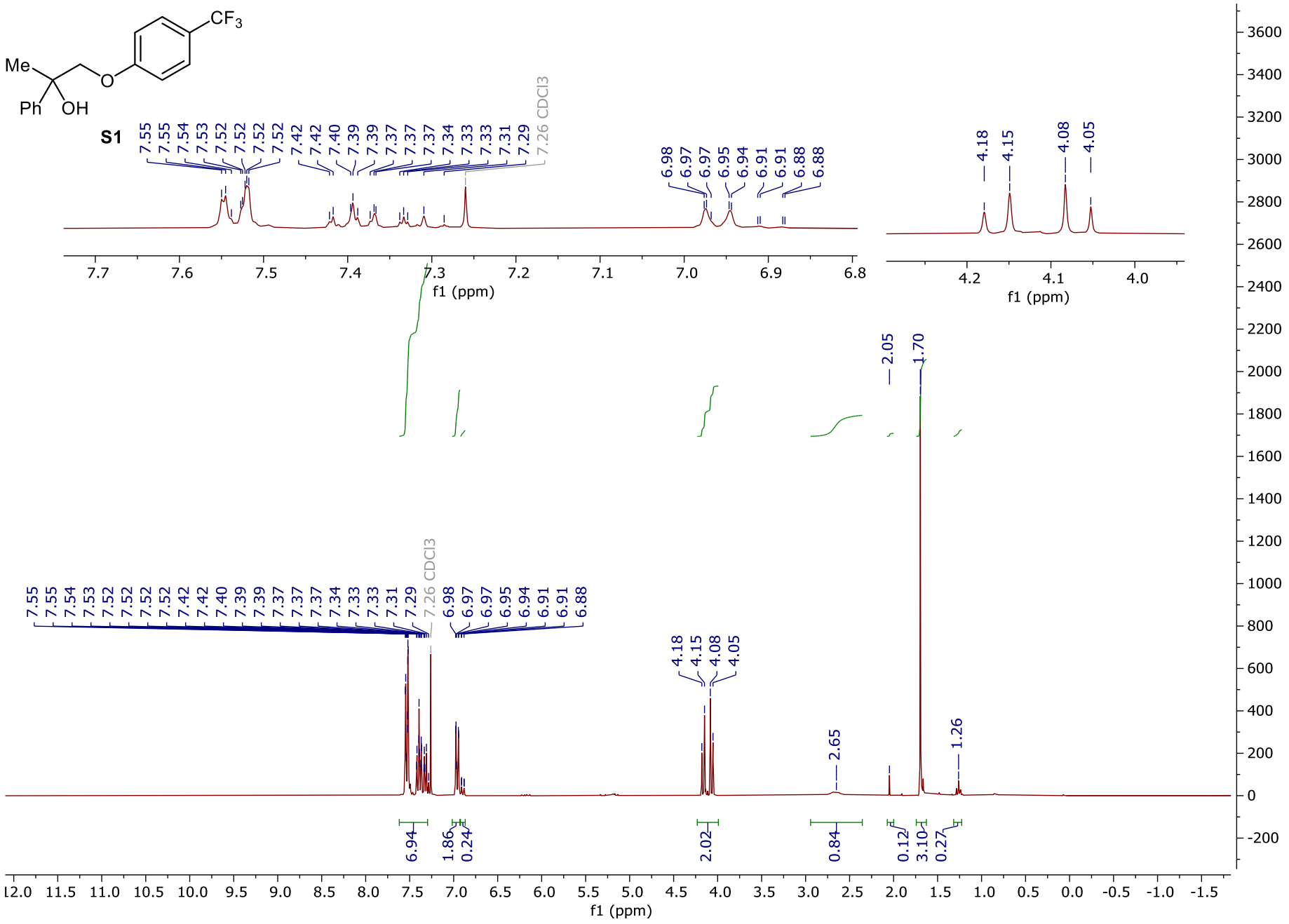


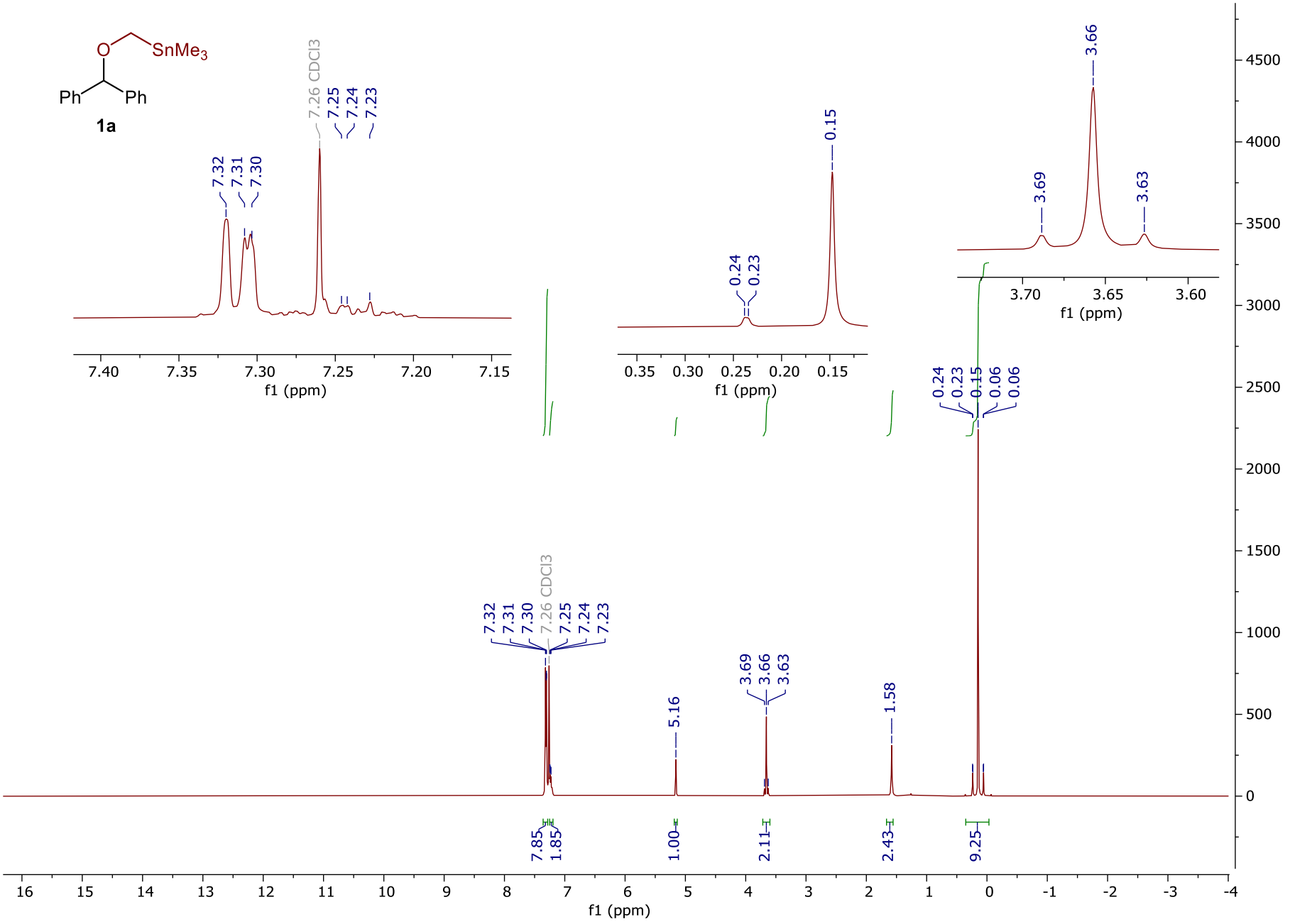
2-((Benzhydryloxy)methyl)furan

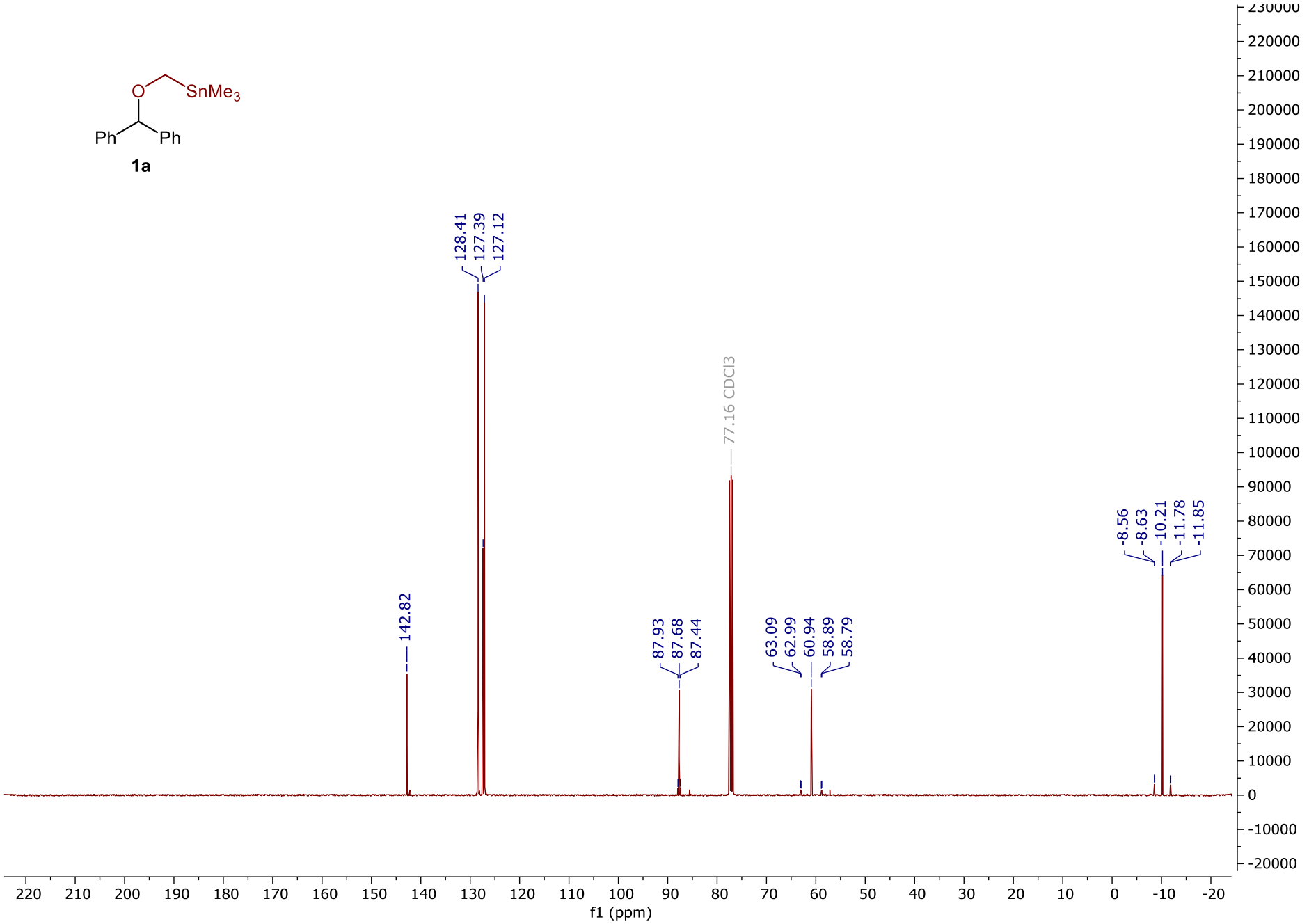


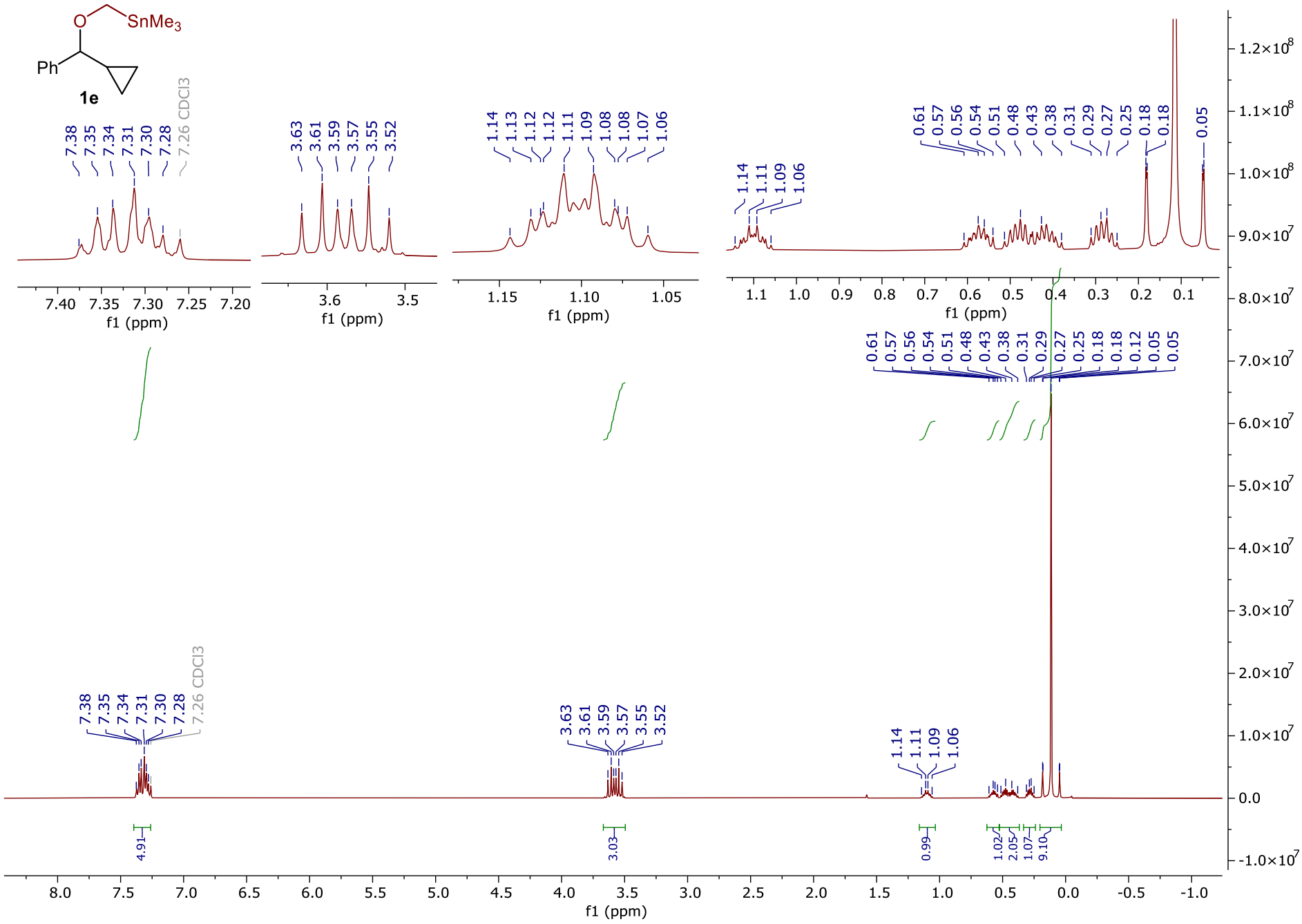
2-((Benzhydryloxy)methyl)furan

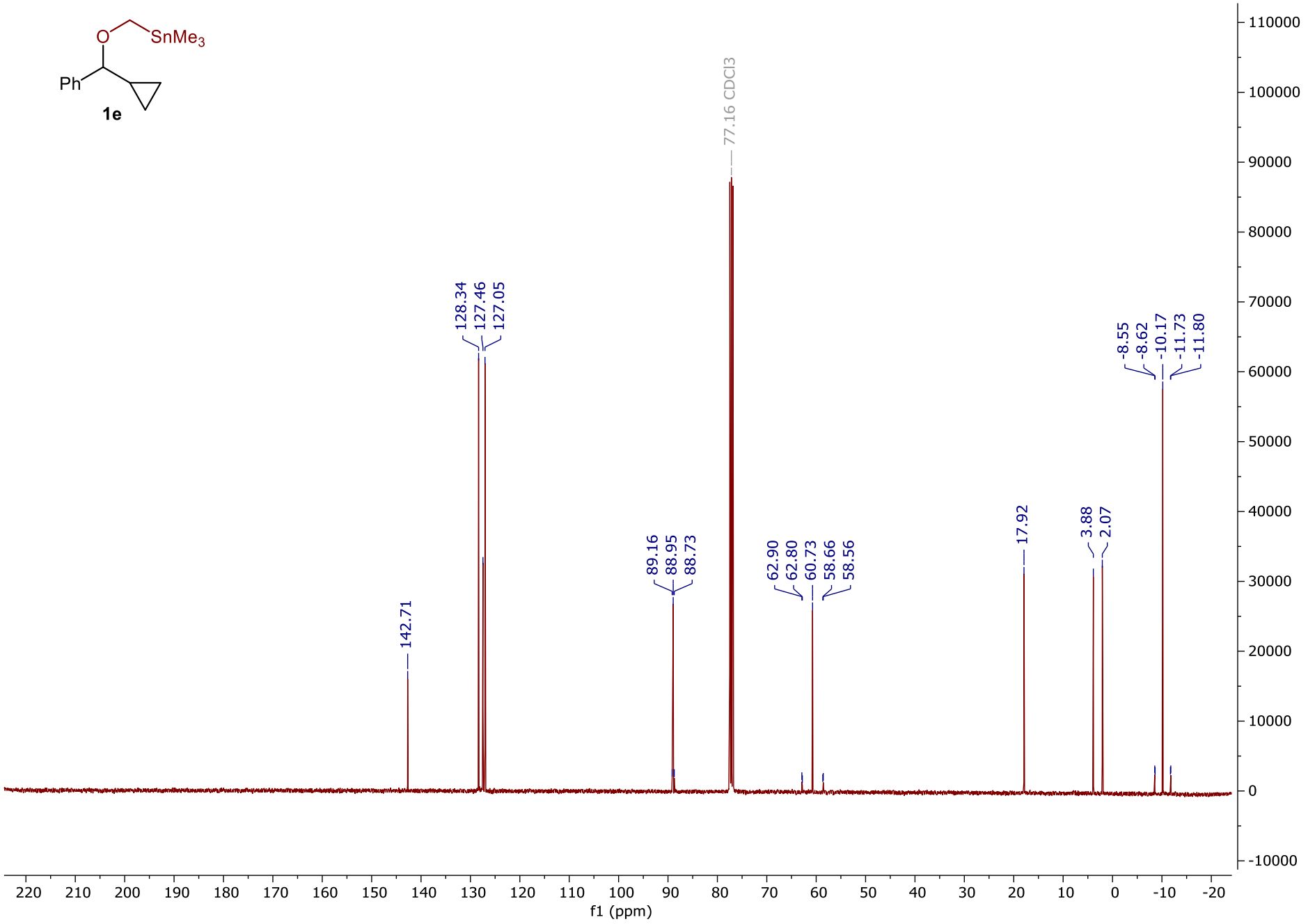

O
O
Ph
Ph
Ph
2-((Trityloxy)methyl)furan
7.34 7.34 7.32 7.32 7.31 7.30 7.29 7.29 7.27 7.24 7.22
7.53 7.53 7.52 7.51 7.51 7.50 7.43 7.43 7.42 7.42
7.6 7.5 7.4 7.3 7.2 7.1
f1 (ppm)
6.35 6.35 6.34 6.33 6.25 6.25 6.24 6.24
6.40 6.35 6.30 6.25 6.20
f1 (ppm)
7.26 CDCl3
6.02 0.96 6.90 1.88 1.01 0.96 2.08 3.89
4.07
1.59
6.35 6.35 6.34 6.33 6.25 6.25 6.24 6.24
4000 3500 3000 2500 2000 1500 1000 500 0
2.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5 -2.0
f1 (ppm)

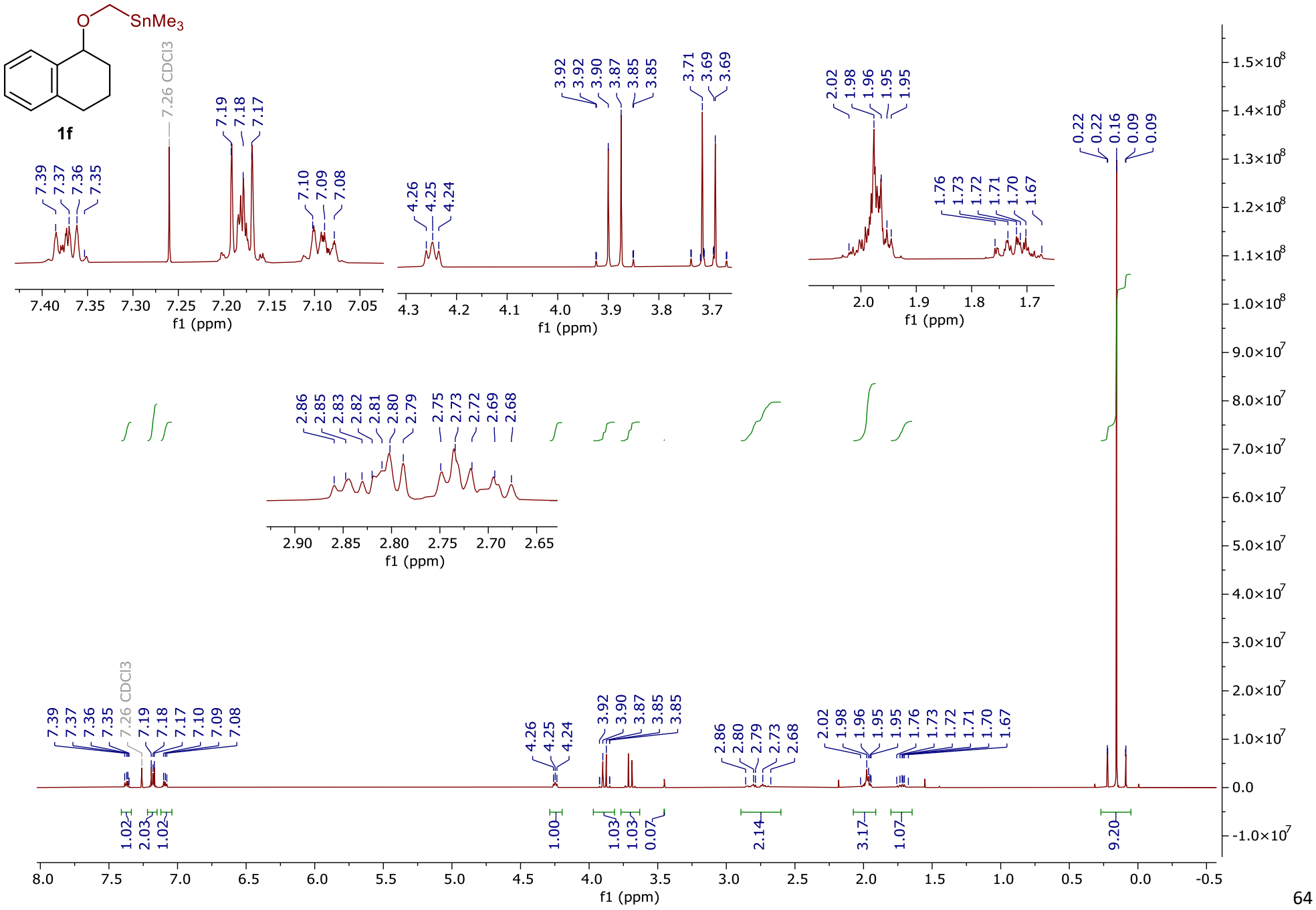

Me
Ph
OH
O
CF3
S1
7.55 7.55 7.54 7.53 7.52 7.52 7.52 7.52 7.42 7.42 7.40 7.39 7.39 7.37 7.37 7.37 7.34 7.33 7.33 7.31 7.29 7.26 CDCl3
6.98 6.97 6.97 6.95 6.94 6.91 6.91 6.88 6.88
4.18 4.15 4.08 4.05
f1 (ppm)
2.05 1.70
2.65 1.26
6.94 1.86 0.24 2.02 0.84 0.12 3.10 0.27

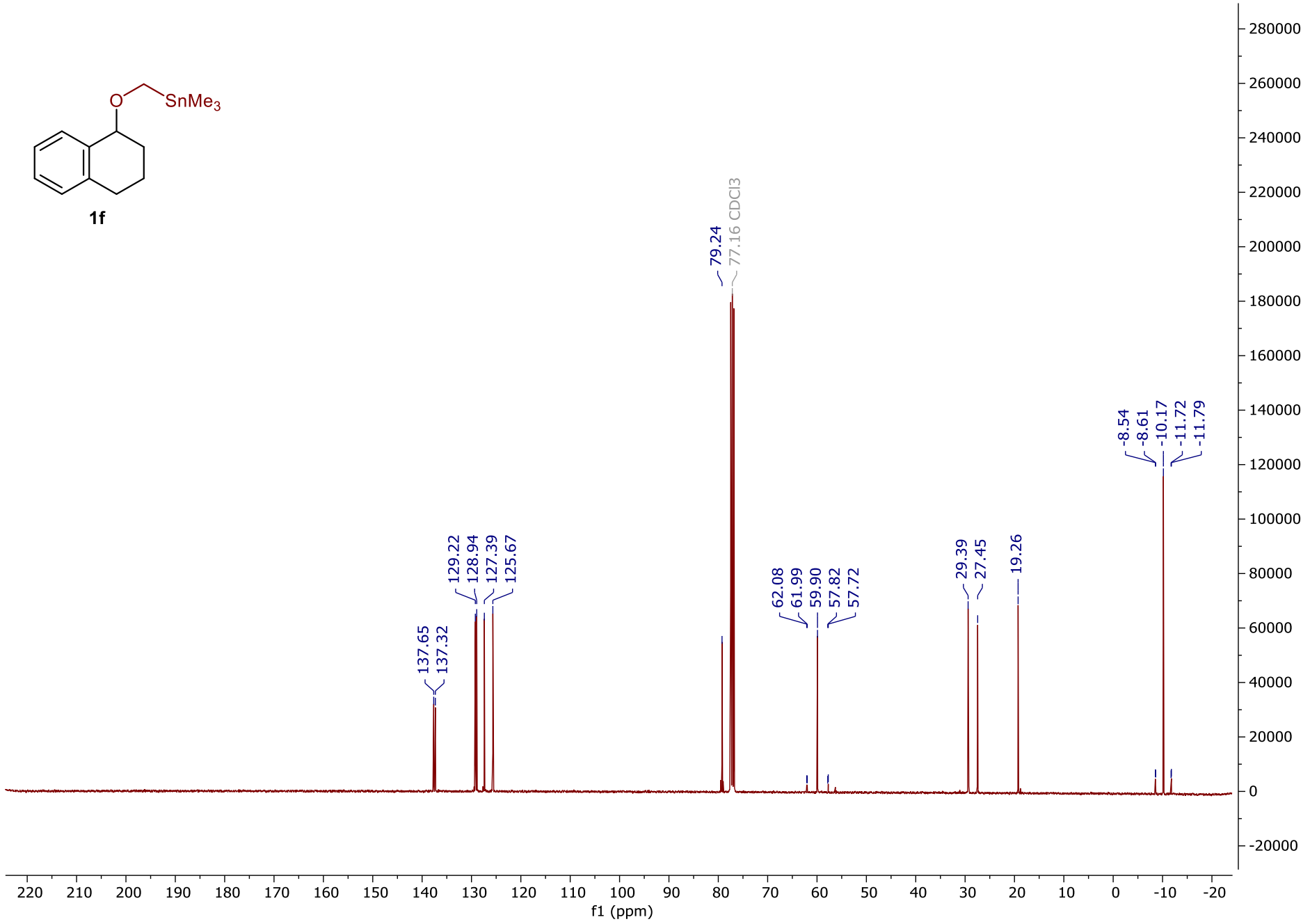

O
SnMe3
Ph
Ph
1a
7.32
7.31
7.30
7.26 CDCl3
7.25
7.24
7.23
7.40
7.35
7.30
7.25
7.20
7.15
f1 (ppm)
0.24
0.23
0.15
0.35
0.30
0.25
0.20
0.15
f1 (ppm)
3.69
3.66
3.63
3.70
3.65
3.60
f1 (ppm)
0.24
0.23
0.15
0.06
0.06
5.16
3.69
3.66
3.63
1.58
7.85
1.85
1.00
2.11
2.43
9.25
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
f1 (ppm)
4500
4000
3500
3000
2500
2000
1500
1000
500
0

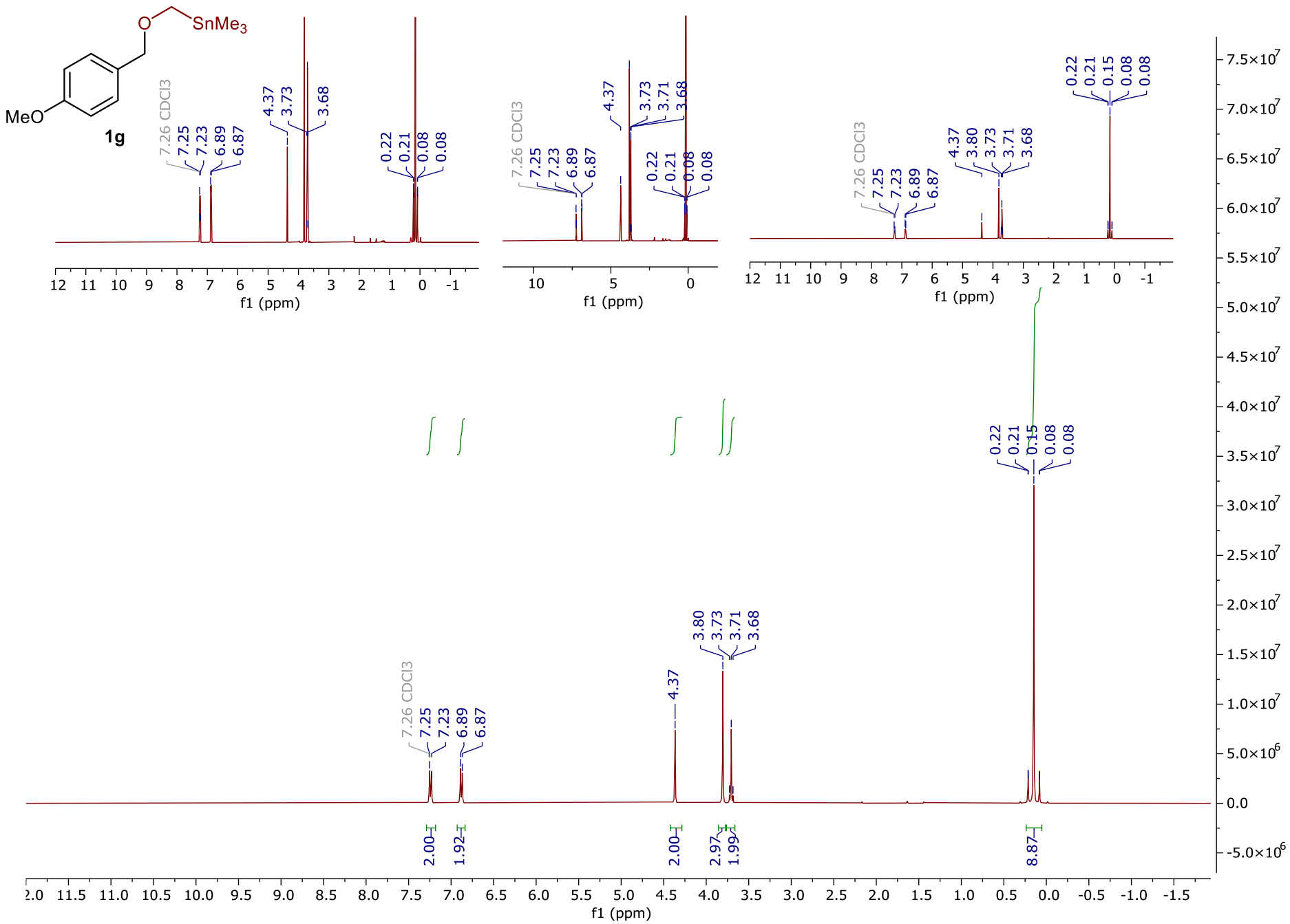

O
SnMe3
Ph
Ph
1a
128.41
127.39
127.12
142.82
87.93
87.68
87.44
77.16 CDCl3
63.09
62.99
60.94
58.89
58.79
-8.56
-8.63
-10.21
-11.78
-11.85
f1 (ppm)

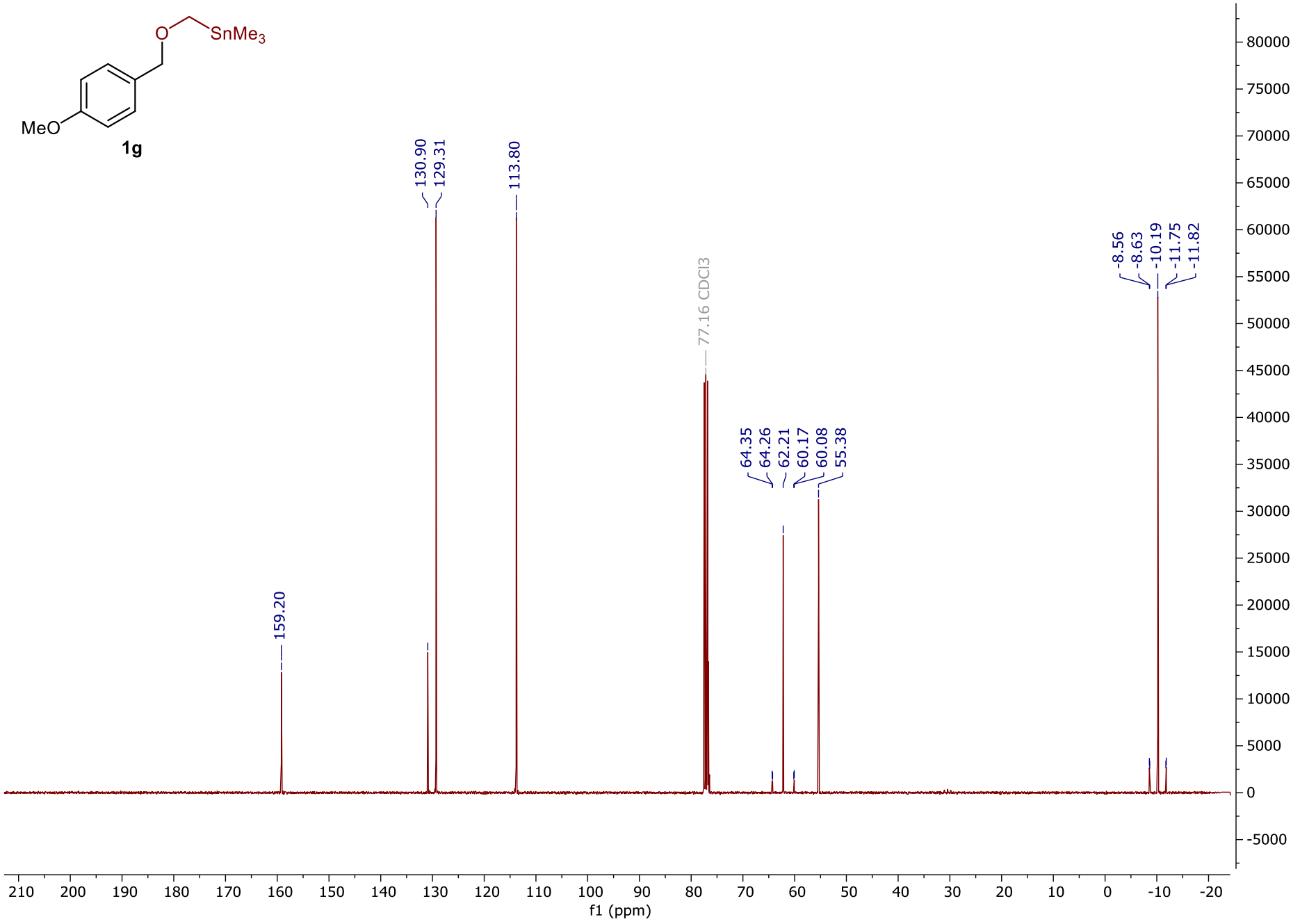

O
SnMe3
Ph
1e
7.38
7.35
7.34
7.31
7.30
7.28
7.26 CDCl3
3.63
3.61
3.59
3.57
3.55
3.52
1.14
1.13
1.12
1.12
1.11
1.09
1.08
1.08
1.07
1.06
0.61
0.57
0.56
0.54
0.51
0.48
0.43
0.38
0.31
0.29
0.27
0.25
0.18
0.18
0.12
0.05
0.05
f1 (ppm)
4.91
3.03
0.99
1.02
2.05
1.07
9.10

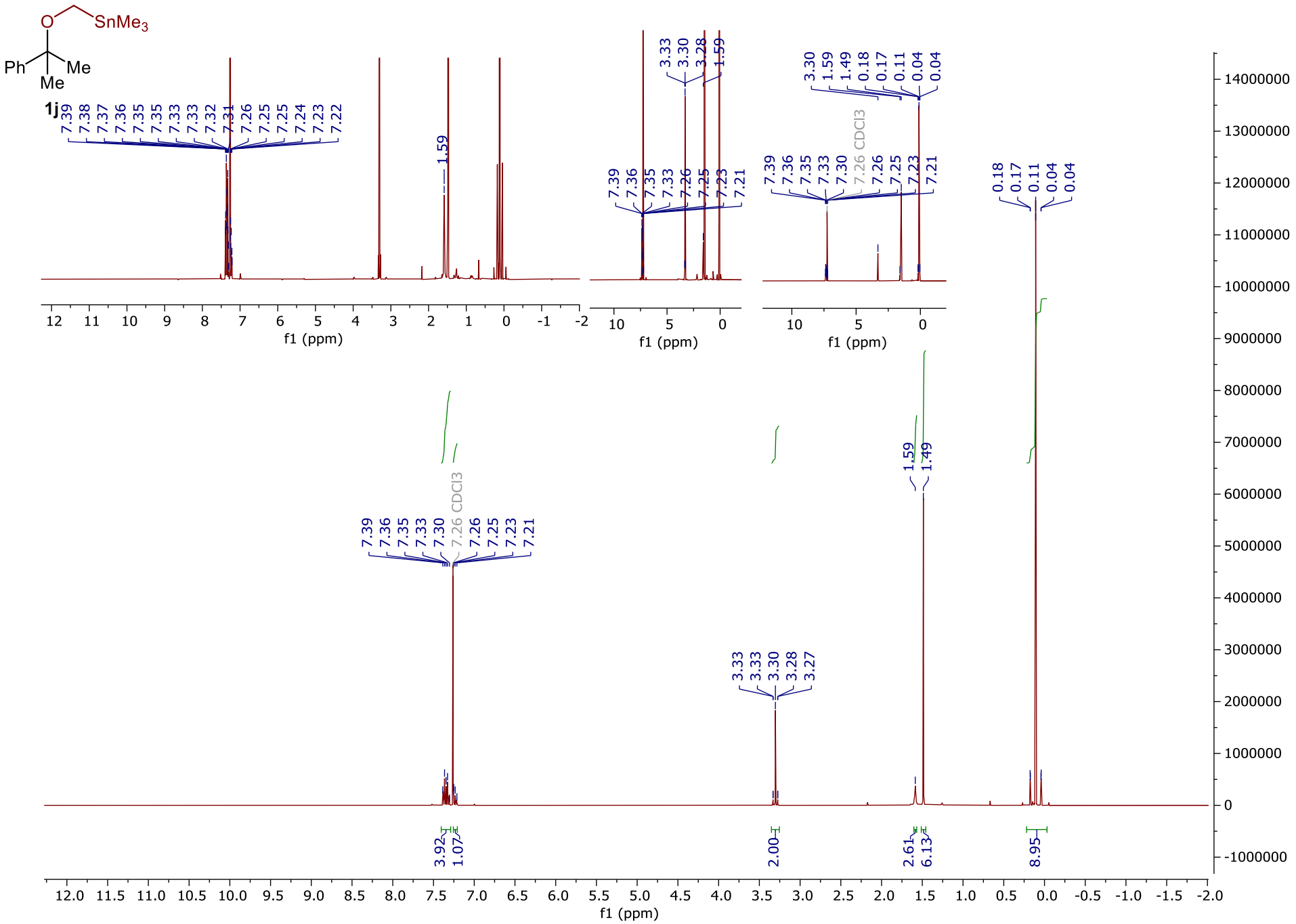

O
SnMe3
Ph
1e
77.16 CDCl3
128.34
127.46
127.05
142.71
89.16
88.95
88.73
62.90
62.80
60.73
58.66
58.56
17.92
3.88
2.07
-8.55
-8.62
-10.17
-11.73
-11.80
f1 (ppm)

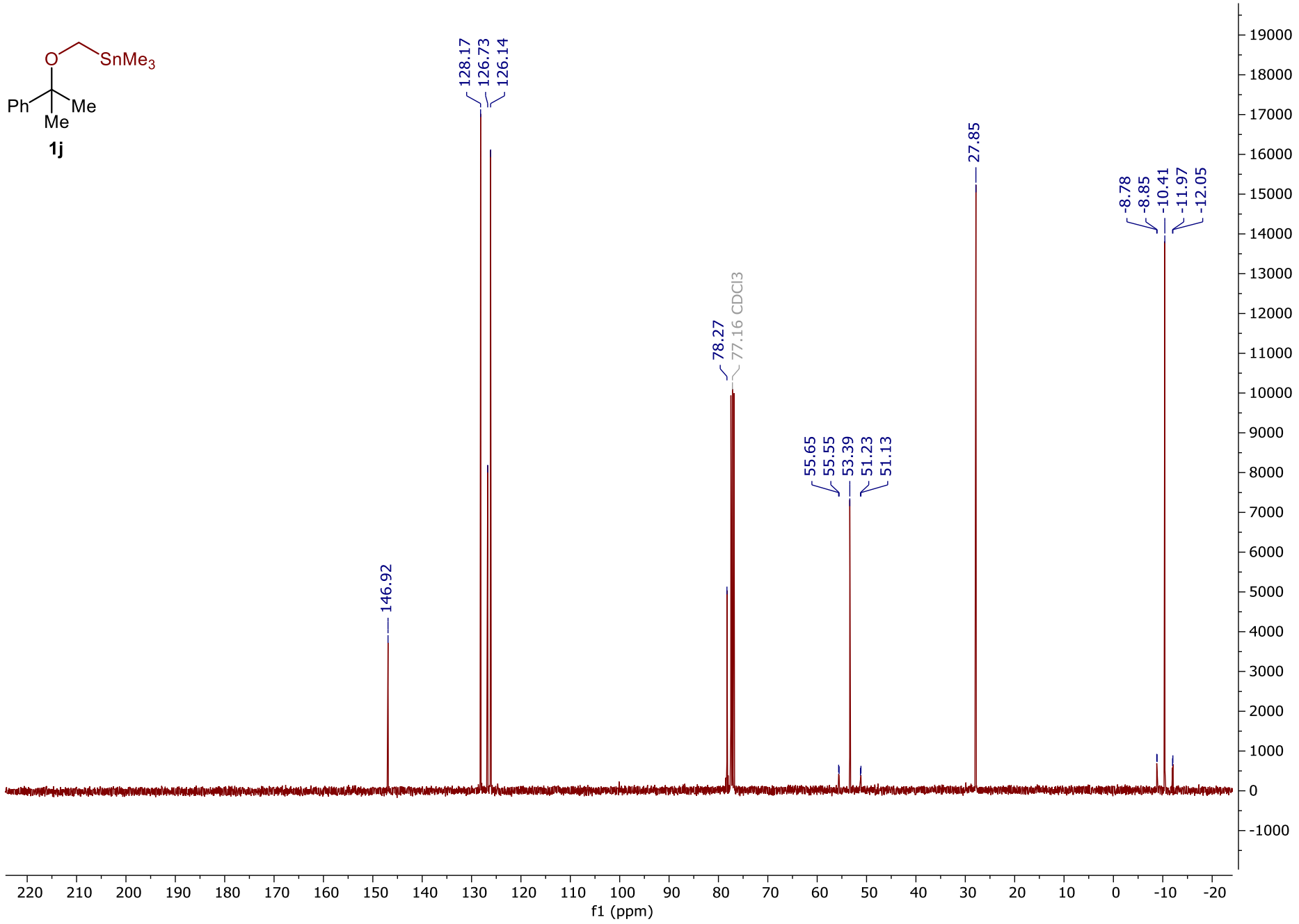

O
SnMe3
1f
7.26 CDCl3
7.39
7.37
7.36
7.35
7.19
7.18
7.17
7.10
7.09
7.08
4.26
4.25
4.24
3.92
3.92
3.90
3.87
3.85
3.85
3.71
3.69
3.69
2.86
2.85
2.83
2.82
2.81
2.80
2.79
2.75
2.73
2.72
2.69
2.68
2.02
1.98
1.96
1.95
1.95
1.76
1.73
1.72
1.71
1.70
1.67
0.22
0.22
0.16
0.09
0.09
f1 (ppm)
1.02
2.03
1.02
1.00
1.03
1.03
0.07
2.14
3.17
1.07
9.20

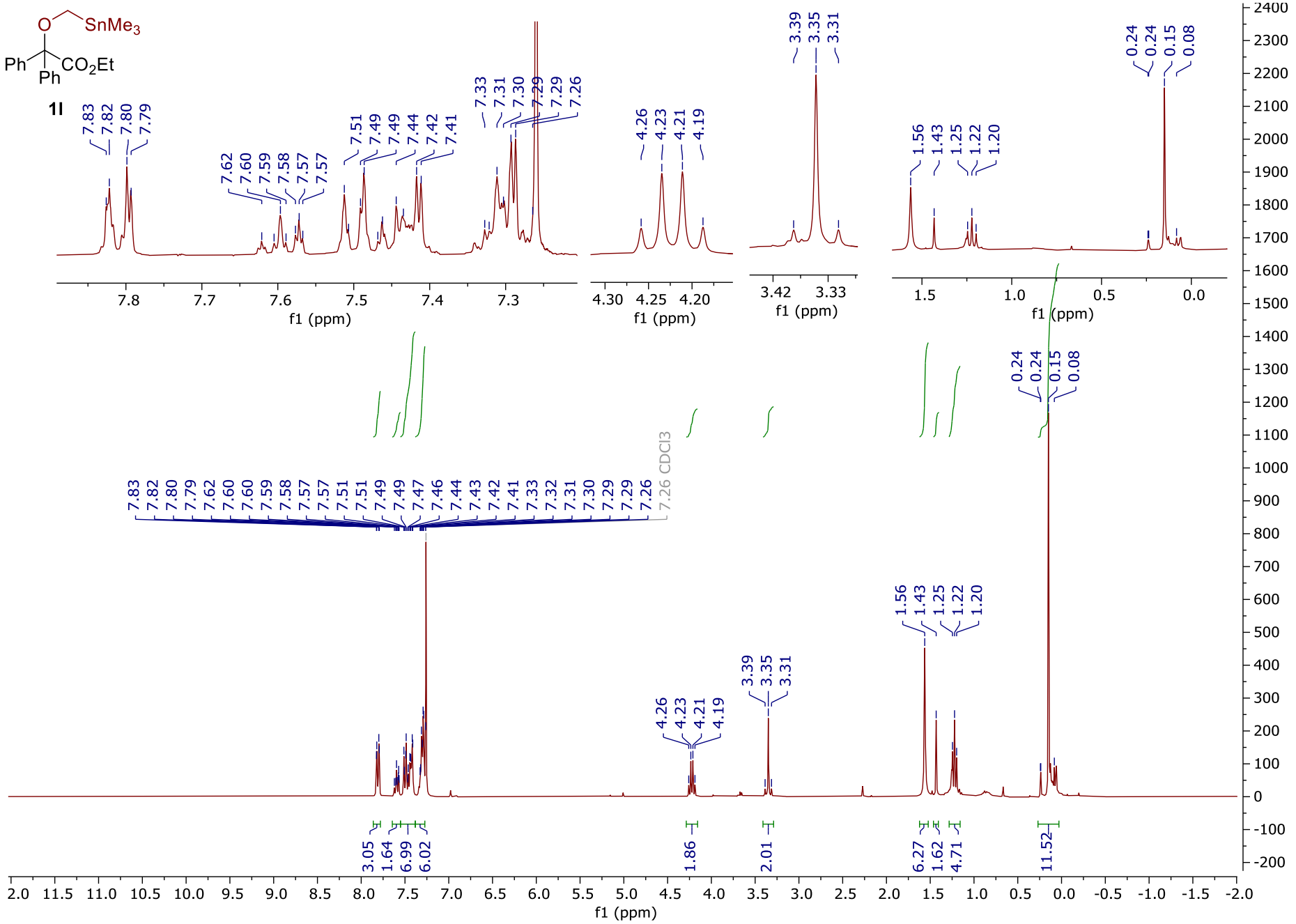

O
SnMe3
1f
79.24
77.16 CDCl3
137.65
137.32
129.22
128.94
127.39
125.67
62.08
61.99
59.90
57.82
57.72
29.39
27.45
19.26
-8.54
-8.61
-10.17
-11.72
-11.79
f1 (ppm)

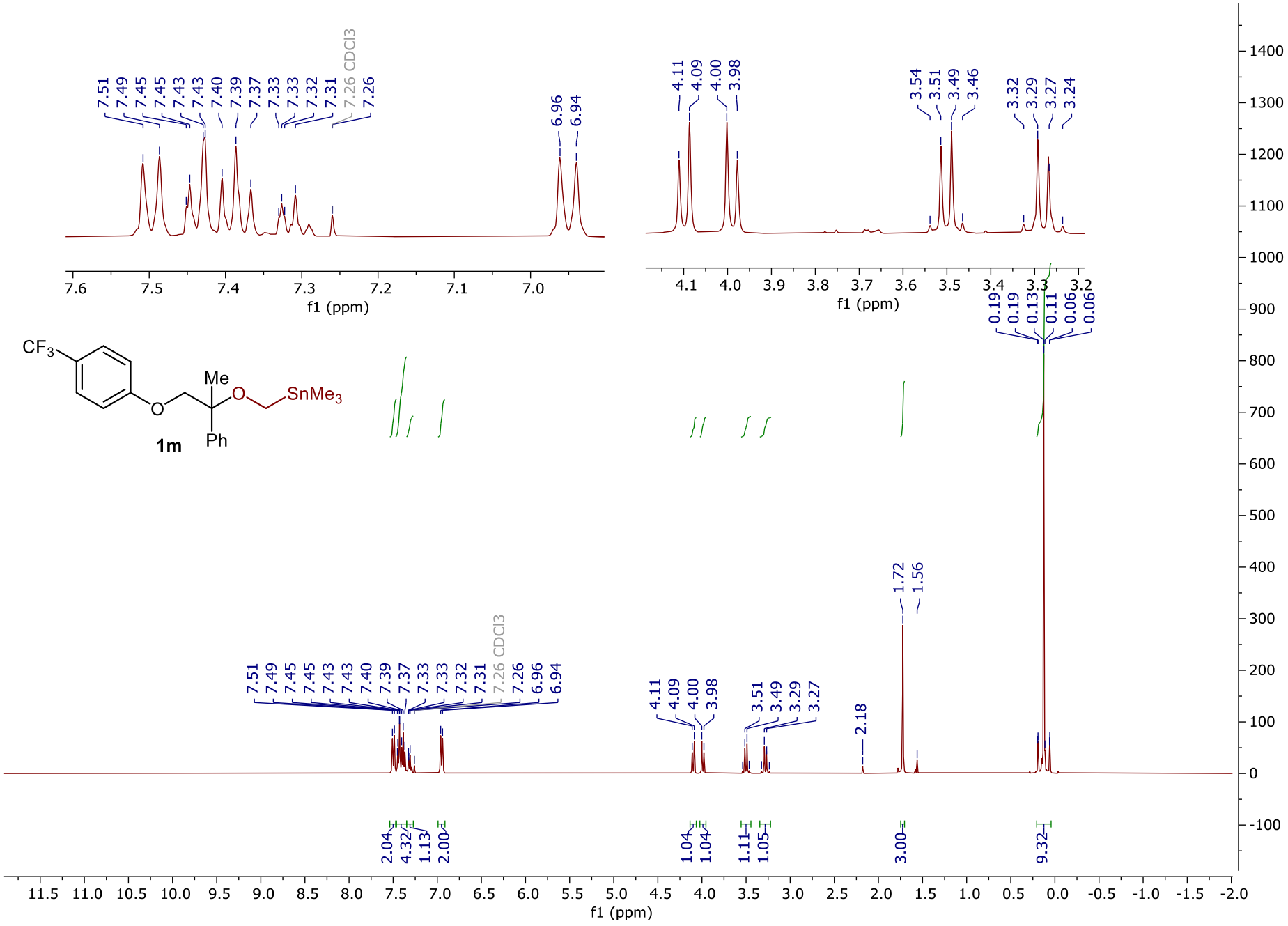

O
SnMe3
MeO
1g
7.26 CDCl3
7.25
7.23
6.89
6.87
4.37
3.73
3.68
0.22
0.21
0.08
0.08
f1 (ppm)
7.26 CDCl3
7.25
7.23
6.89
6.87
4.37
3.73
3.71
3.68
0.22
0.21
0.08
0.08
f1 (ppm)
7.26 CDCl3
7.25
7.23
6.89
6.87
4.37
3.80
3.73
3.71
3.68
0.22
0.21
0.15
0.08
0.08
f1 (ppm)
7.26 CDCl3
7.25
7.23
6.89
6.87
4.37
3.80
3.73
3.71
3.68
0.22
0.21
0.15
0.08
0.08
2.00
1.92
2.00
2.97
1.99
8.87
f1 (ppm)

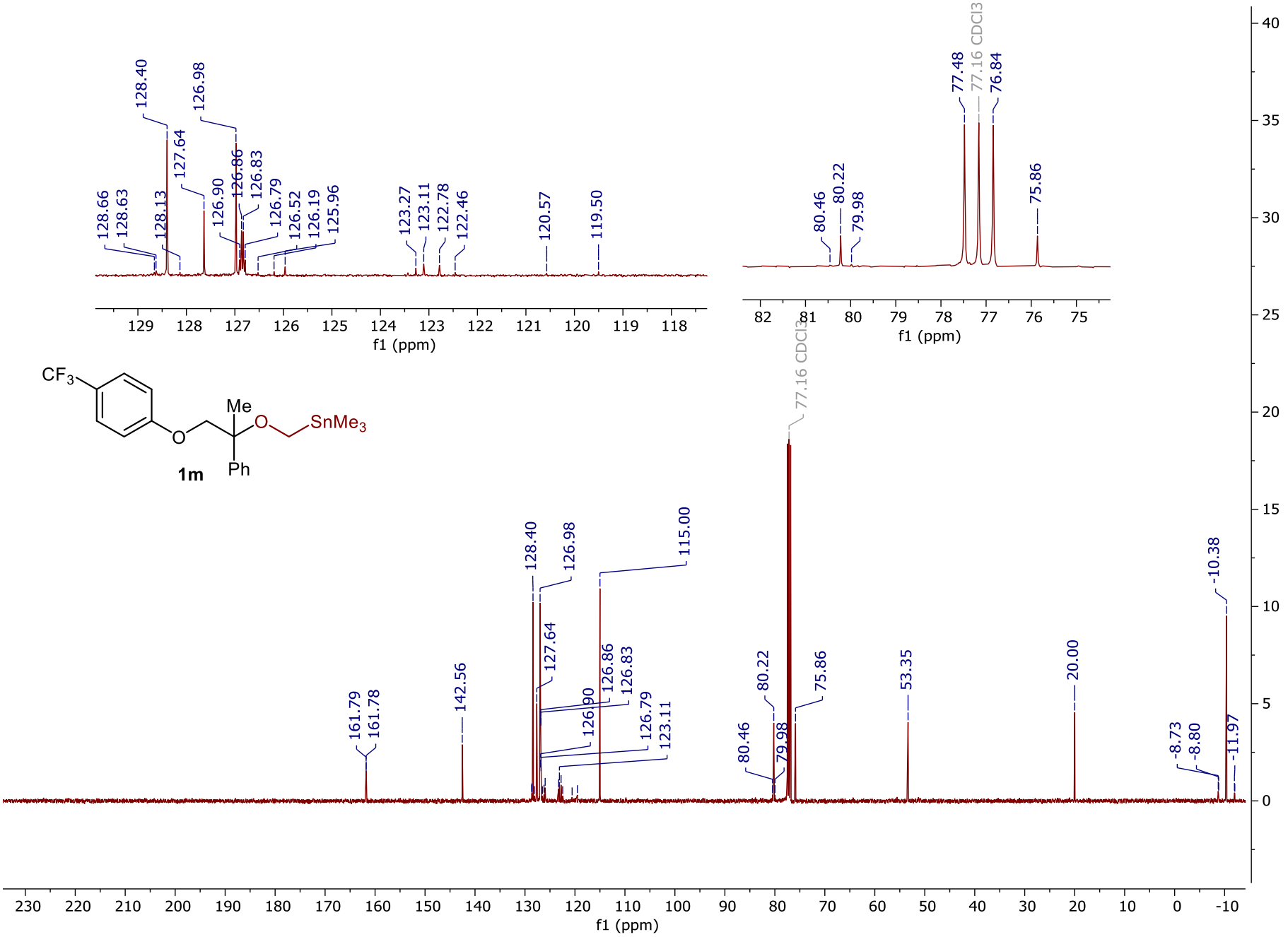

O
SnMe3
MeO
1g
159.20
130.90
129.31
113.80
77.16 CDCl3
64.35
64.26
62.21
60.17
60.08
55.38
-8.56
-8.63
-10.19
-11.75
-11.82
f1 (ppm)

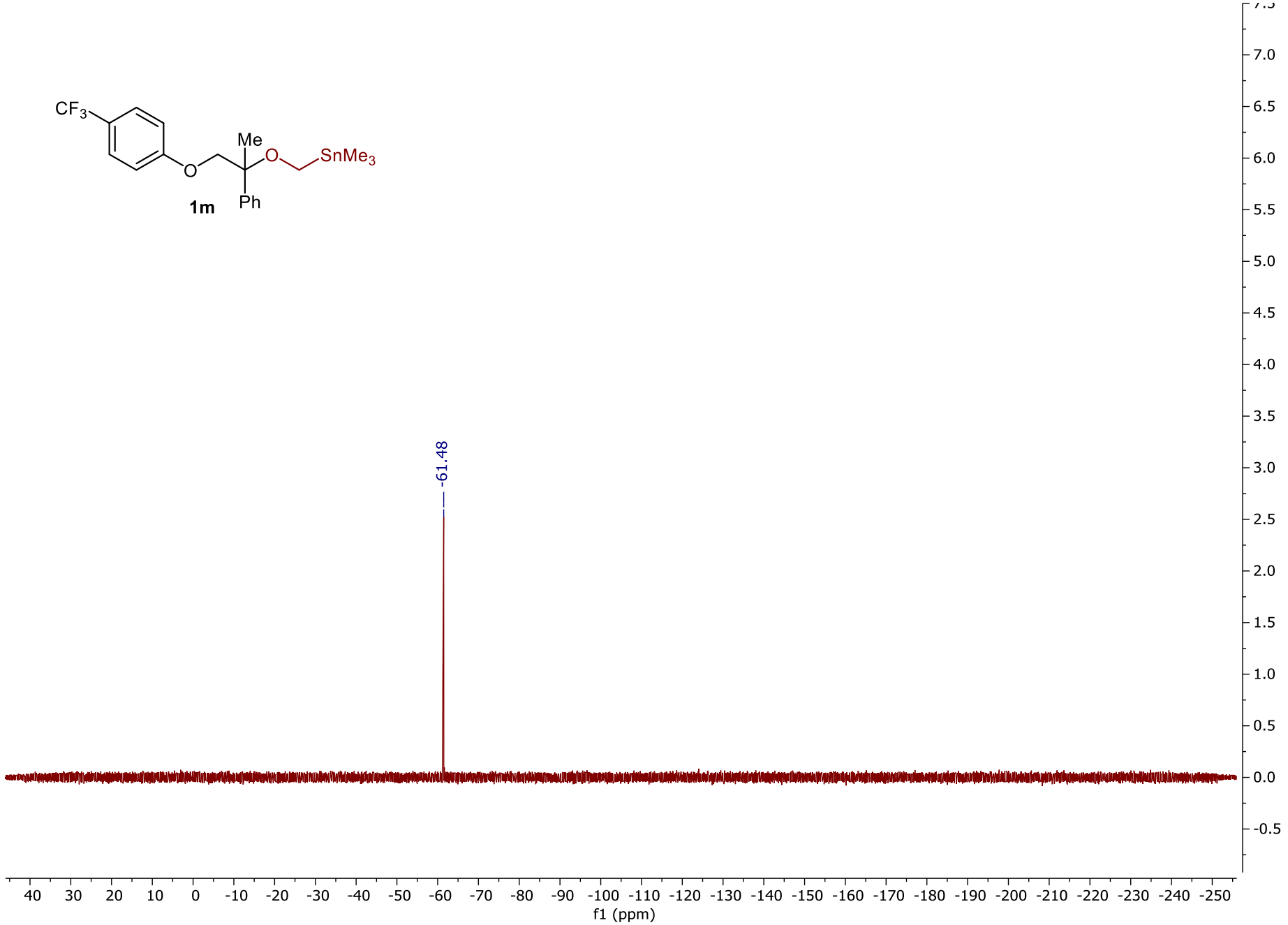

O
SnMe3
Ph
Me
Me
1j
7.39 7.38 7.37 7.36 7.35 7.35 7.33 7.33 7.32 7.31 7.26 7.25 7.25 7.24 7.23 7.22
1.59
3.33 3.30 3.28 1.59
7.39 7.36 7.35 7.33 7.26 7.25 7.23 7.21
3.30 1.59 1.49 0.18 0.17 0.11 0.04 0.04
7.26 CDCl3
7.39 7.36 7.35 7.33 7.30 7.26 7.25 7.23 7.21
0.18 0.17 0.11 0.04 0.04
f1 (ppm)
7.39 7.36 7.35 7.33 7.30 7.26 CDCl3 7.26 7.25 7.23 7.21
3.33 3.33 3.30 3.28 3.27
1.59 1.49
3.92 1.07 2.00 2.61 6.13 8.95
f1 (ppm)

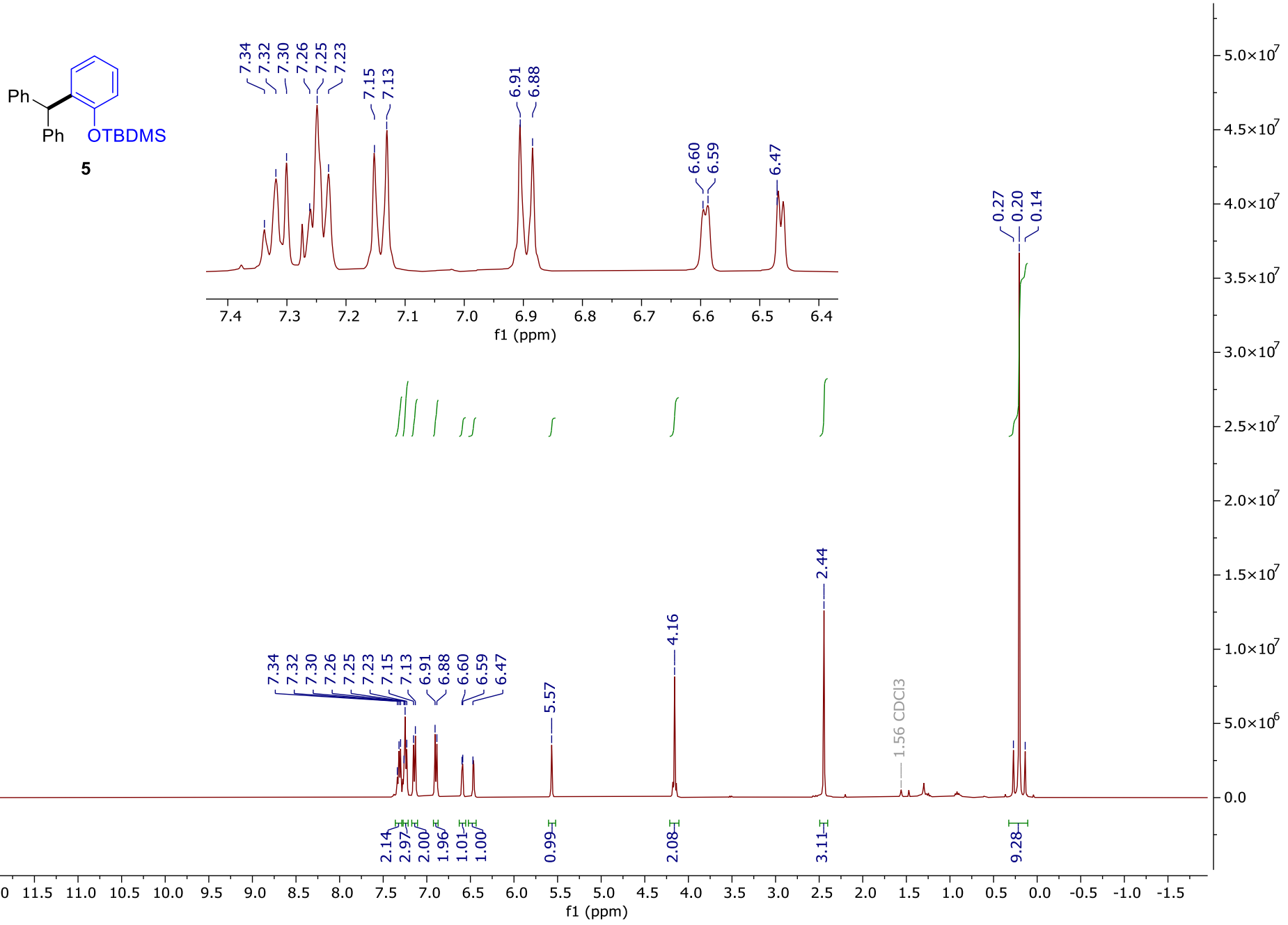

O
SnMe3
Ph
Me
Me
1j
128.17
126.73
126.14
146.92
78.27
77.16 CDCl3
55.65
55.55
53.39
51.23
51.13
27.85
-8.78
-8.85
-10.41
-11.97
-12.05
f1 (ppm)

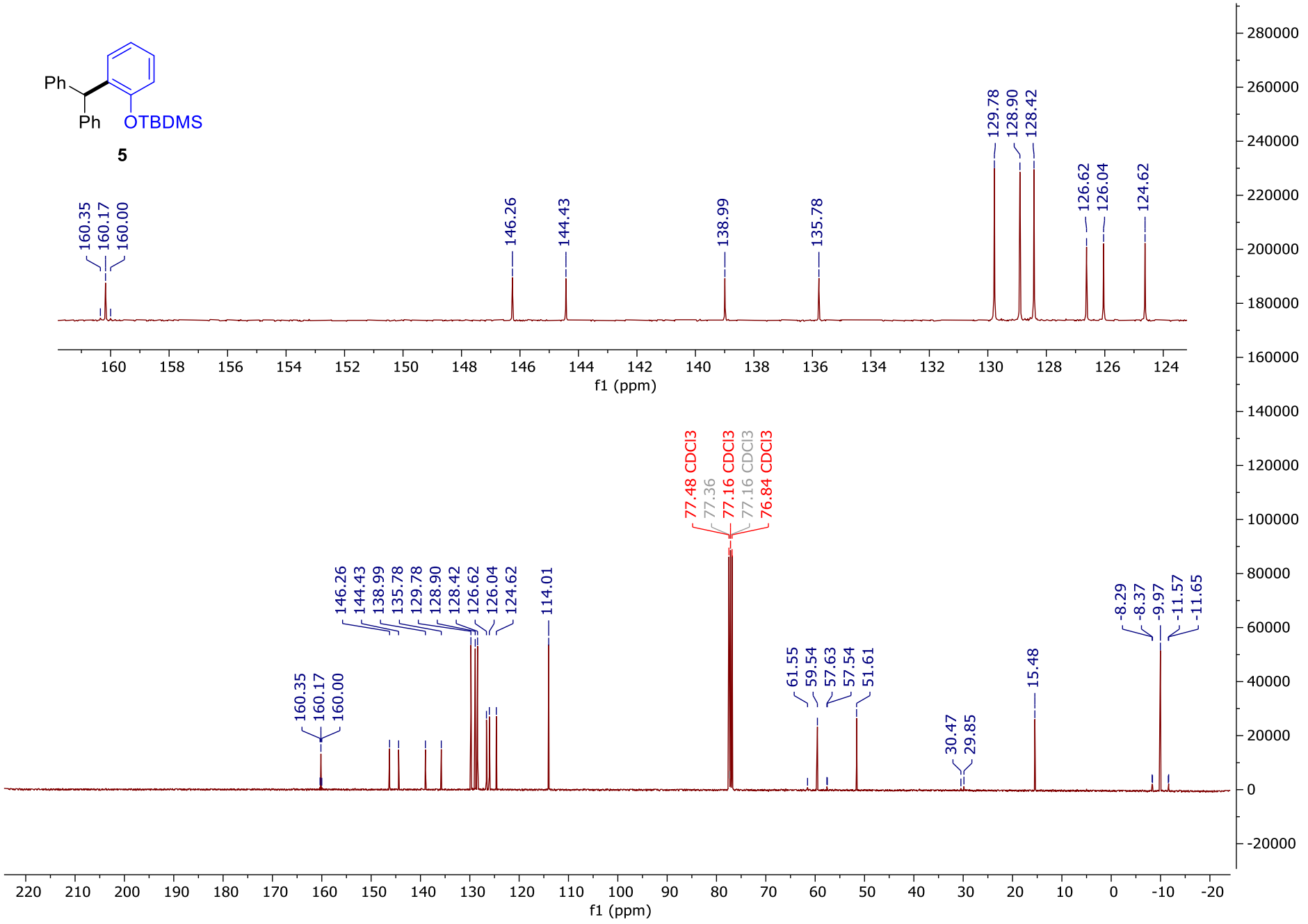

O
SnMe3
Ph
CO2Et
Ph
1l
7.83 7.82 7.80 7.79
7.62 7.60 7.59 7.58 7.57 7.57
7.51 7.49 7.49 7.44 7.42 7.41
7.33 7.31 7.30 7.29 7.29 7.26
4.26 4.23 4.21 4.19
3.39 3.35 3.31
1.56 1.43 1.25 1.22 1.20
0.24 0.24 0.15 0.08
7.26 CDCl3
f1 (ppm)
3.05 1.64 6.99 6.02 1.86 2.01 6.27 1.62 4.71 11.52


7.51
7.49
7.45
7.45
7.43
7.43
7.40
7.39
7.37
7.33
7.33
7.32
7.31
7.26 CDCl3
7.26
6.96
6.94
f1 (ppm)
4.11
4.09
4.00
3.98
3.54
3.51
3.49
3.46
3.32
3.29
3.27
3.24
f1 (ppm)
CF3
Me
O
SnMe3
O
Ph
1m
0.19
0.19
0.13
0.11
0.06
0.06
1.72
1.56
2.18
2.04
4.32
1.13
2.00
1.04
1.04
1.11
1.05
3.00
9.32
f1 (ppm)


128.66
128.63
128.40
128.13
127.64
126.98
126.90
126.86
126.83
126.79
126.52
126.19
125.96
123.27
123.11
122.78
122.46
120.57
119.50
f1 (ppm)
77.48
77.16 CDCl3
76.84
80.46
80.22
79.98
75.86
f1 (ppm)
CF3
Me
O
SnMe3
O
Ph
1m
77.16 CDCl3
161.79
161.78
142.56
128.40
126.98
127.64
126.90
126.86
126.83
126.79
123.11
115.00
80.46
80.22
79.98
75.86
53.35
20.00
-8.73
-8.80
-10.38
-11.97
f1 (ppm)


CF3
Me
O
SnMe3
O
Ph
1m
-61.48
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220 -230 -240 -250
f1 (ppm)


Ph
Ph
OTBDMS
5
7.34
7.32
7.30
7.26
7.25
7.23
7.15
7.13
6.91
6.88
6.60
6.59
6.47
f1 (ppm)
0.27
0.20
0.14
2.44
4.16
5.57
1.56 CDCl3
2.14
2.97
2.00
1.96
1.01
1.00
0.99
2.08
3.11
9.28
f1 (ppm)


Ph
Ph
OTBDMS
5
160.35
160.17
160.00
146.26
144.43
138.99
135.78
129.78
128.90
128.42
126.62
126.04
124.62
f1 (ppm)
77.48 CDCl3
77.36
77.16 CDCl3
77.16 CDCl3
76.84 CDCl3
114.01
61.55
59.54
57.63
57.54
51.61
30.47
29.85
15.48
-8.29
-8.37
-9.97
-11.57
-11.65
f1 (ppm)