Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Supporting Information

Chiral Phosphoric Acid-Catalyzed Asymmetric Transfer Hydrogenation of 3-Trifluoromethylthioquinoline

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1. General:

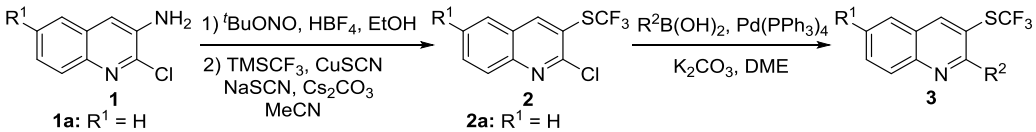
Commercially available reagents were used without further purification. Solvents were treated prior to use according to the standard methods. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded at room temperature in $CDCl_3$ on 400 MHz instrument with tetramethylsilane (TMS) as internal standard. Enantiomeric excess was determined by HPLC analysis, using chiral column described below in detail. Optical rotations were measured by polarimeter. Flash column chromatography was performed on silica gel (200-300 mesh).

2. Synthesis of 3-Trifluoromethylthioquinolines

3-Trifluoromethylthioquinoline derivatives can be synthesized by **Path A** and **B**. The **Path A** starts from quinoline *N*-oxide, which can be transformed to 2-chloro-3-aminoquinolines **1** according to the known literatures.[1-3] The compound **1** was then successfully converted to 2-chloro-3-trifluoromethylthioquinoline **2** following the report by Goossen's group.[4] Lastly, we coupled compound **2** with boronic acids to give the 2-substituted 3-trifluoromethylthioquinoline **3**. The **Path B** starts from the 3-aminoquinoline **4**, formal substitution of amino by SCF_3 group to give the 3-trifluoromethylthioquinoline **3k**. The compound **3k** was oxidized by 3-choroperbenzoic to get 3-trifluoromethylthioquinoline *N*-oxide and then reacted with aryl boronic acids in dimethyl sulfoxide to give 2-substituted 3-trifluoromethylthioquinoline **3**.[5] The compound 2-chloro-3-aminoquinoline **1**,[6] 3-(trifluoromethylthio)quinoline **3k**,[4] 3-aminoquinoline **4** [7] are known.

2.1. Synthesis of 2-Substituted 3-Trifluoromethylthioquinolines *via* Path A

Path A:

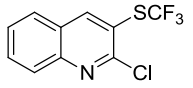


In a 50 mL round-bottom flask, 2-chloro-3-aminoquinoline **1a** (7.081 g, 40 mmol) was dissolved in a mixture of absolute ethanol (12.0 mL) and the aqueous solution of HBF_4 (40%, 13.9 mL, 80 mmol), then the *tert*-butyl nitrite (10.6 mL, 5.250g, 80 mmol) was added dropwise to the mixture at 0 ^{o}C. The reaction was stirred at room temperature for 1 h and 30 mL diethyl ether was added to precipitate the arenediazonium tetrafluoroborate which was filtered off and washed with diethyl ether (10 mL×5). The arenediazonium tetrafluoroborate was dried in *vacuo* and was then directly used without further purification.

Under nitrogen atmosphere, to a 250 mL Schlenk flask was added copper thiocyanate (2.156 g, 17.6 mmol), sodium thiocyanate (4.356 g, 52.7 mmol), cesium carbonate (23.104 g, 70.2 mmol) and acetonitrile (90 mL), the resulting suspension was stirred at room temperature for 20 minutes. The solution of the arenediazonium tetrafluoroborate (9.720 g, 35.1 mmol) in acetonitrile (110 mL) was added dropwise and the reaction mixture was stirred for 1 h. Trifluoromethyltrimethylsilane (10.3 mL, 70.2 mmol) was added at once and the mixture was stirred at room temperature for 36 h. The resulting mixture was filtered and rinsed with diethyl ether. The organic solution was then washed with water (50 mL) and brine (50 mL). The organic layer was dried with sodium sulfate, filtered and concentrated. The residue was further purified by silica gel column chromatography to get the 2-chloro-3-trifluoromethylthioquinoline **2a** 2.795 g in 26% yield (eluent: petroleum

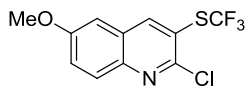
ether/ethyl acetate).

2-Chloro-3-(trifluoromethyl)quinoline (2a): unknown compound, 2.795 g, 26% yield, white solid, mp 76-77 °C, R_f = 0.60 (petroleum ether/ethyl acetate 10:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ



8.59 (s, 1H), 8.05 (d, *J* = 8.4 Hz, 1H), 7.93-7.77 (m, 2H), 7.72-7.56 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ =153.2, 148.2, 148.0, 132.9, 129.2 (q, $^1J_{FC}$ = 308 Hz), 128.8, 128.3, 128.1, 127.2, 119.1 (q, $^3J_{FC}$ = 2.0 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.0; HRMS (ESI) *m/z* Calculated for $C_{10}H_6ClF_3NS$ $[M+H]^+$ 263.9856, found 263.9860.

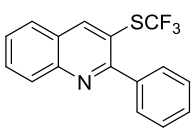
6-Methoxy-2-chloro-3-(trifluoromethylthio)quinoline (2b): unknown compound, 190 mg, 18% yield, white solid, mp 83-84 °C, R_f = 0.65 (petroleum ether/ethyl acetate 10:1). ^{1}H NMR (400



MHz, $CDCl_3$) δ 8.47 (s, 1H), 7.94 (d, *J* = 9.2 Hz, 1H), 7.47 (dd, *J* = 9.2, 2.8 Hz, 1H), 7.09 (d, *J* = 2.8 Hz, 1H), 3.95 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 159.0, 150.4, 146.4, 144.3, 130.1, 129.2 (q, $^1J_{FC}$ = 308 Hz), 128.5, 125.7, 119.2 (d, $^3J_{FC}$ = 2.0 Hz), 105.2, 55.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -41.9. HRMS (ESI) *m/z* Calculated for $C_{11}H_8ClF_3NOS$ $[M+H]^+$ 293.9967, found 293.9970.

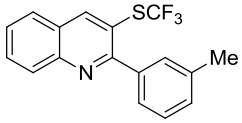
A mixture of 2-chloro-3-trifluoromethylthioquinoline **2a** (263.7 mg, 1.0 mmol), boronic acid (1.2 mmol, 1.2 equiv), $Pd(PPh_3)_4$ (58 mg, 0.05 mmol, 5 mol%) and potassium carbonate (415 mg, 3.0 mmol, 3.0 equiv) in DME (12 mL) was stirred at reflux. When the reaction was complete (determined by TLC), the reaction mixture was diluted with water (15 mL), then extracted with dichloromethane (50 mL×4). The combined organic layer was dried with sodium sulfate. After filtration, the solvent was removed under the reduced pressure and the residue was purified by flash chromatography on silica gel to provide the product 3-trifluoromethylthioquinolines **3** (eluent: petroleum ether/dichloromethane).

2-Phenyl-3-(trifluoromethyl)quinoline (3a): unknown compound, 371 mg, 81% yield, white solid, mp 87-88 °C, R_f = 0.60 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$)



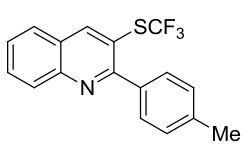
δ 8.66 (s, 1H), 8.19 (d, *J* = 8.5 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.84 (ddd, *J* = 8.4, 7.0, 1.4 Hz, 1H), 7.71-7.57 (m, 3H), 7.57-7.41 (m, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.1, 148.3, 146.1, 139.6, 132.0, 129.8, 129.8, 129.4 (q, $^1J_{FC}$ = 307 Hz), 129.1, 128.3, 127.9, 127.8, 127.3, 118.2 (d, $^3J_{FC}$ = 1.8 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.0; HRMS (ESI) *m/z* Calculated for $C_{16}H_{11}F_3NS$ $[M+H]^+$ 306.0559, found 306.0561.

2-*m*-Tolyl-3-(trifluoromethylthio)quinoline (3b): unknown compound, 242 mg, 76% yield, white solid, mp 43-44 °C, R_f = 0.60 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz,



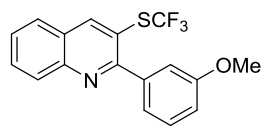
$CDCl_3$) δ 8.65 (s, 1H), 8.20 (d, *J* = 8.5 Hz, 1H), 7.90 (d, *J* = 8.2 Hz, 1H), 7.87-7.79 (m, 1H), 7.64 (t, *J* = 7.5 Hz, 1H), 7.41 (dd, *J* = 16.1, 11.2 Hz, 3H), 7.31 (d, *J* = 4.3 Hz, 1H), 2.47 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.2, 148.2, 145.7, 139.5, 138.1, 131.9, 130.3, 129.8, 129.8, 129.4 (q, $^1J_{FC}$ = 308 Hz), 128.1, 127.8, 127.7, 127.3, 126.9, 118.4 (d, $^3J_{FC}$ = 1.8 Hz), 21.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -41.9. HRMS (ESI) *m/z* Calculated for $C_{17}H_{13}F_3NS$ $[M+H]^+$ 320.0715, found 330.0716.

2-*p*-Tolyl-3-(trifluoromethylthio)quinoline (3c): unknown compound**,** 200 mg, 63% yield, white solid, mp 97-98 °C, R_f = 0.50 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$)

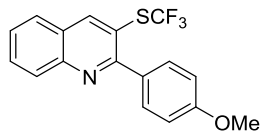


δ 8.65 (s, 1H), 8.19 (d, *J* = 8.5 Hz, 1H), 7.89 (d, *J* = 8.1 Hz, 1H), 7.83 (t, *J* = 7.5 Hz, 1H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.55 (d, *J* = 7.7 Hz, 2H), 7.33 (d, *J* = 7.7 Hz, 2H), 2.46 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.1, 148.3, 145.8, 139.0, 136.7, 131.8, 129.8, 129.8, 129.4 (q, $^1J_{FC}$ = 307 Hz), 129.0, 127.8, 127.6, 127.2, 118.2 (d, $^3J_{FC}$ = 1.8 Hz), 21.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.0; HRMS (ESI) *m/z* Calculated for $C_{17}H_{13}F_3NS$ $[M+H]^+$ 320.0715, found 320.0718.

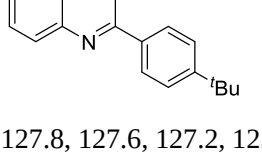
2-(3-Methoxyphenyl)-3-(trifluoromethylthio)quinoline (3d): unknown compound, 168 mg, 79% yield, white solid, mp 53-54 °C, R_f = 0.40 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.65 (s, 1H), 8.19 (d, *J* = 8.5 Hz, 1H), 7.89 (d, *J* = 8.2 Hz, 1H), 7.83 (t, *J* = 7.7 Hz, 1H), 7.63 (t, *J* = 7.5 Hz, 1H), 7.41 (t, *J* = 7.9 Hz, 1H), 7.17 (d, *J* = 7.6 Hz, 2H), 7.03 (d, *J* = 8.5 Hz, 1H), 3.87 (s, 3H++); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.8, 159.5, 148.1, 145.8, 140.8, 131.9, 129.7, 129.4, 129.4 (q, $^1J_{FC}$ = 307 Hz), 127.8, 127.8, 127.3, 122.2, 118.2 (d, $^3J_{FC}$ = 1.8 Hz), 115.1, 115.0, 55.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -41.9. HRMS (ESI) *m/z* Calculated for $C_{17}H_{13}F_3NOS$ $[M+H]^+$ 336.0664, found 336.0666.



2-(4-Methoxyphenyl)-3-(trifluoromethylthio)quinoline (3e): unknown compound, 281 mg, 84% yield, white solid, mp 136-137 °C, R_f = 0.50 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.63 (s, 1H), 8.18 (d, *J* = 8.5 Hz, 1H), 7.88 (d, *J* = 8.2 Hz, 1H), 7.82 (t, *J* = 7.7 Hz, 1H), 7.62 (dd, *J* = 12.4, 5.7 Hz, 3H), 7.04 (d, *J* = 8.7 Hz, 2H), 3.89 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.6, 160.4, 148.3, 146.0, 132.0, 131.8, 131.4, 129.7, 127.8, 127.5, 129.4 (q, $^1J_{FC}$ = 308 Hz), 127.1, 118.2 (d, $^3J_{FC}$ = 1.7 Hz), 113.8, 55.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.0. HRMS (ESI) *m/z* Calculated for $C_{17}H_{13}F_3NOS$ $[M+H]^+$ 336.0664, found 336.0666.

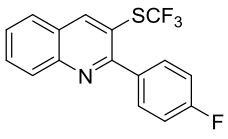


2-(4-*tert*-Butylphenyl)-3-(trifluoromethylthio)quinoline (3f): unknown compound, 286 mg, 79% yield, white solid, mp 124-125 °C, R_f = 0.55 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.63 (s, 1H), 8.17 (d, *J* = 8.5 Hz, 1H), 7.88 (d, *J* = 8.2 Hz, 1H), 7.80 (ddd, *J* = 8.4, 7.0, 1.4 Hz, 1H), 7.63-7.55 (m, 3H), 7.54-7.49 (m, 2H), 1.38 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.2, 152.1, 148.3, 145.7, 136.7, 131.8, 129.8, 129.6, 129.5 (q, $^1J_{FC}$ = 307 Hz), 127.8, 127.6, 127.2, 125.3, 118.3, 35.0, 31.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -41.9. HRMS (ESI) *m/z* Calculated for $C_{20}H_{19}F_3NS$ $[M+H]^+$ 362.1185, found 362.1187.



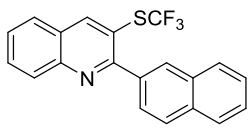
3-(Trifluoromethylthio)-2+-(4-(trifluoromethyl)phenyl)-quinoline (3g): unknown compound, 517 mg, 92% yield, white solid, mp 118-119 °C, R_f = 0.65 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.71 (s, 1H), 8.19 (d, *J* = 8.5 Hz, 1H), 7.94 (d, *J* = 8.1 Hz, 1H), 7.88 (t, *J* = 7.5 Hz, 1H), 7.77 (s, 4H), 7.69 (d, *J* = 7.5 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 160.9, 148.4, 147.1, 143.1, 131.2, 130.9, 129.9, 129.3 (q, $^1J_{FC}$ = 206 Hz), 129.2 (q, $^1J_{FC}$ = 308 Hz), 128.0, 127.5, 125.7, 125.3 (q, $^1J_{FC}$ = 3.8 Hz), 123.0, 117.6 (d, $^3J_{FC}$ = 1.8 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.1, -62.7. HRMS (ESI) *m/z* Calculated for $C_{17}H_{10}F_6NS$ $[M+H]^+$ 374.0433, found 374.0435.

2-(4-Fluorophenyl)-3-(trifluoromethylthio)quinoline (3h): unknown compound, 268 mg, 83% yield, white solid, mp 86-87 °C, R_f = 0.45 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400



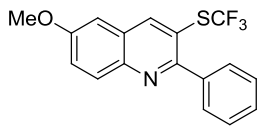
MHz, $CDCl_3$) δ 8.66 (s, 1H), 8.17 (d, *J* = 8.5 Hz, 1H), 7.90 (d, *J* = 8.2 Hz, 1H), 7.84 (t, *J* = 7.7 Hz, 1H), 7.70-7.53 (m, 3H), 7.19 (t, *J* = 8.7 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 164.7, 162.2, 161.1, 148.4, 146.6, 135.6, 132.0, 131.9, 131.0 (q, $^1J_{FC}$ = 242 Hz), 129.3 (q, $^1J_{FC}$ = 308 Hz), 127.9, 127.9, 117.9 (d, $^3J_{FC}$ = 1.7 Hz), 115.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.1, -112.5. HRMS (ESI) *m/z* Calculated for $C_{16}H_{10}F_4NS$ $[M+H]^+$ 324.0465, found 324.0467.

2-(Naphthalen-2-yl)-3-(trifluoromethylthio)quinoline (3i): unknown compound, 432 mg, 81% yield, white solid, mp 114-115 °C, R_f = 0.50 (petroleum ether/dichloromethane 1:1). ^1H NMR



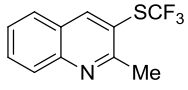
(400 MHz, $CDCl_3$) δ 8.69 (s, 1H), 8.21 (d, *J* = 8.3 Hz, 1H), 8.11 (s, 1H), 8.03-7.80 (m, 5H), 7.75 (d, *J* = 8.1 Hz, 1H), 7.64 (t, *J* = 7.3 Hz, 1H), 7.59-7.43 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 162.0, 148.4, 146.1, 137.0, 133.5, 133.1, 132.0, 129.8, 129.7, 129.4 (q, $^1J_{FC}$ = 308 Hz), 128.8, 128.0, 128.0, 127.9, 127.3, 127.3, 127.0, 126.6, 125.3, 118.4 (d, $^3J_{FC}$ = 1.8 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.0. HRMS (ESI) *m/z* Calculated for $C_{20}H_{13}F_3NS$ $[M+H]^+$ 356.0715, found 356.0712.

6-Methoxy-2-phenyl-3-(trifluoromethylthio)quinoline (3j): unknown compound, 128 mg, 80% yield, white solid, mp 143-144 °C, R_f = 0.50 (petroleum ether/dichloromethane 1:1). ^1H NMR (400



MHz, $CDCl_3$) δ 8.53 (s, 1H), 8.07 (d, *J* = 9.2 Hz, 1H), 7.60 (d, *J* = 6.3 Hz, 2H), 7.48 (t, *J* = 6.1 Hz, 4H), 7.13 (d, *J* = 2.2 Hz, 1H), 3.96 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 159.6, 158.7, 144.5, 144.4, 139.6, 131.2, 129.9, 129.4 (q, $^1J_{FC}$ = 308 Hz), 128.8, 128.4, 128.3, 125.0, 118.4 (d, $^3J_{FC}$ = 1.7 Hz), 104.8, 55.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.0. HRMS (ESI) *m/z* Calculated for $C_{17}H_{13}F_3NOS$ $[M+H]^+$ 336.0664, found 336.0666.

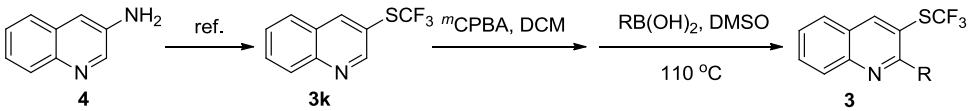
2-Methyl-3-(trifluoromethyl)quinoline (3l): unknown compound, 168 mg, 70% yield, white solid, mp 70-71 °C, R_f = 0.25 (petroleum ether/dichloromethane 1:1). ^1H NMR (400 MHz, $CDCl_3$) δ



8.49 (s, 1H), 8.05 (d, *J* = 8.4 Hz, 1H), 7.79 (dd, *J* = 14.1, 7.7 Hz, 2H), 7.55 (t, *J* = 7.5 Hz, 1H), 2.94 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 161.8, 148.7, 147.0, 131.9, 129.6 (q, $^1J_{FC}$ = 307 Hz), 128.9, 127.9, 127.2, 127.0, 118.4 (q, $^3J_{FC}$ = 1.9 Hz), 24.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -42.3. HRMS (ESI) *m/z* Calculated for $C_{11}H_9F_3NS$ $[M+H]^+$ 244.0402, found 244.0402.

2.2. Synthesis of 2-Substituted 3-Trifluoromethylthioquinolines *via* Path B

Path B:



3-Trifluoromethylthioquinoline **3k** was prepared according to the known procedure starting from the 3-aminoquinoline **4**.[4]

To the solution of 3-trifluoromethylthioquinoline **3k** (1.000 g, 4.4 mmol) in dichloromethane (40 mL), 3-chloroperbenzoic acid (1.307 g, 5.3 mmol) was added and the reaction was stirred for 24 h at room temperature. Afterwards residual 3-chloroperbenzoic acid was removed by adding sodium hydroxide solution (1.0 M, 30 mL×3). The aqueous phase was extracted three times with dichloromethane and the combined organic layers were dried over sodium sulfate. The mixture

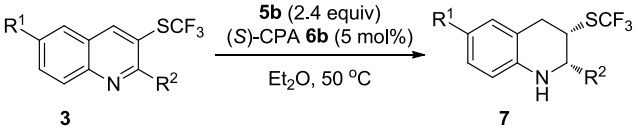
was treated in a usual manner to give a crude product and the resulting solid was purified by silica gel column chromatography to provide the 3-(trifluoromethylthio)quinoline *N*-oxide 936 mg in 87% yield (eluent: ethyl acetate/methanol).

Under nitrogen atmosphere, to the solution of 3-(trifluoromethylthio)quinoline *N*-oxide (0.6 mmol, 147 mg) in dimethyl sulfoxide (1.0 mL), aryl boronic acid (1.8 mmol, 3.0 eq.) was added and the reaction was stirred at 110 ^{o}C. Afterwards, the reaction was cooled to room temperature and diluted with dichloromethane. Column chromatography of the reaction mixture provided the pure product **3** (eluent: petroleum ether/dichloromethane).

Table S1. The Results for the Final Step of **Path B**

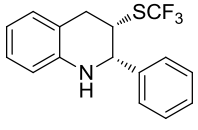
Entry	R	Weight (mg)	Yield (%)
1	Ph	50	28 (**3a**)
2	3-MeC_6H_4	68	36 (**3b**)
3	4-MeC_6H_4	70	37 (**3c**)
4	3-MeOC_6H_4	25	12 (**3d**)
5	4-MeOC_6H_4	78	39 (**3e**)
6	4-^{t}BuC_6H_4	98	45 (**3f**)
7	4-$CF_3C_6H_4$	93	42 (**3g**)
8	4-FC_6H_4	80	42 (**3h**)
9	2-Naphthyl	87	41 (**3i**)

3. Asymmetric Transfer Hydrogenation of 3-Trifluoromethylthioquinlines



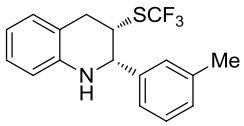
The mixture of 3-trifluoromethylthioquinolines **3** (0.15 mmol), Hantzsch ester **5b** (81 mg, 0.36 mmol, 2.4 equiv), and chiral phosphoric acid (*S*)-**6b** (5.6 mg, 0.005 mmol, 5 mol%) in diethyl ether (4.5 mL) was stirred under nitrogen for 36-72 h at 50 ^{o}C. After the reaction was complete (determined by TLC), the solvent was removed under reduced pressure. Purification was performed by silica gel column eluted with petroleum ether/dichloromethane to give the desired products **7**. The enantiomeric excesses were determined by chiral HPLC.

(2*S*,3*S*)-(+)-2-Phenyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7a): 44 mg, 94% yield, unknown compound, 99% ee, white solid, mp 69-70 ^{o}C, $[\alpha]^{20}_{D}$ = +38.30 (*c* 0.53, $CHCl_3$), R_f = 0.65 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52-7.28 (m, 5H), 7.07 (dd, *J* = 16.0, 7.8 Hz, 2H), 6.76 (t, *J* = 7.4 Hz, 1H), 6.61 (d, *J* = 7.9 Hz, 1H), 4.80 (s, 1H), 4.13 (s, 1H), 3.89 (dd, *J* = 7.0, 4.5 Hz, 1H), 3.51 (dd, *J* = 16.6, 4.3 Hz, 1H), 3.16 (dd, *J* = 16.6, 5.1 Hz, 1H); ^{13}C

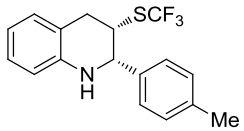


NMR (100 MHz, $CDCl_3$) δ = 143.7, 140.1, 130.2, 128.6, 128.6 (q, $^1J_{FC}$ = 306 Hz), 128.5, 127.9, 127.4, 119.0, 118.1, 114.9, 59.0, 46.0, 35.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.6. HRMS (ESI) *m/z* Calculated for $C_{16}H_{15}F_3NS$ $[M+H]^+$ 310.0872, found 310.0866. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 14.4 min and 21.5 min (major).

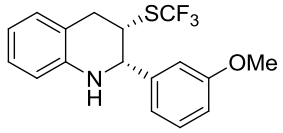
(2*S*,3*S*)-(+)-2-*m*-Tolyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7b): 46 mg, 95% yield, unknown compound, 96% ee, white solid, mp 95-96 °C, $[\alpha]^{20}_D$ = +41.74 (*c* 0.92, $CHCl_3$), R_f = 0.80 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29-7.22 (m, 1H), 7.22-7.12 (m, 3H), 7.11-7.01 (m, 2H), 6.76 (td, *J* = 7.4, 1.0 Hz, 1H), 6.62 (t, *J* = 8.4 Hz, 1H), 4.76 (s, 1H), 4.09 (s, 1H), 3.88 (dd, *J* = 7.2, 4.5 Hz, 1H), 3.51 (dd, *J* = 16.6, 4.3 Hz, 1H), 3.16 (dd, *J* = 16.6, 4.8 Hz, 1H), 2.37 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 143.8, 140.0, 138.3, 130.2, 129.2, 128.7 (q, $^1J_{FC}$ = 305 Hz), 128.5, 128.0, 127.9, 124.4, 119.0, 118.2, 114.9, 59.0, 46.0, 35.7, 21.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.5. HRMS (ESI) *m/z* Calculated for $C_{17}H_{17}F_3NS$ $[M+H]^+$ 324.1028, found 324.1021. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 11.3 min and 14.1 min (major).



(2*S*,3*S*)-(+)-2-*p*-Tolyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7c): 47 mg, 97% yield, unknown compound, 99% ee, colorless oil, $[\alpha]^{20}_D$ = +31.50 (*c* 0.80, $CHCl_3$), R_f = 0.80 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.26 (d, *J* = 7.8 Hz, 2H), 7.17 (d, *J* = 7.8 Hz, 2H), 7.06 (dd, *J* = 15.7, 7.8 Hz, 2H), 6.74 (t, *J* = 7.3 Hz, 1H), 6.58 (d, *J* = 7.8 Hz, 1H), 4.74 (s, 1H), 4.07 (s, 1H), 3.86 (dd, *J* = 7.2, 4.6 Hz, 1H), 3.48 (dd, *J* = 16.6, 4.3 Hz, 1H), 3.14 (dd, *J* = 16.6, 5.3 Hz, 1H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 143.8, 138.2, 137.1, 130.1, 129.3, 128.7 (q, $^1J_{FC}$ = 305 Hz), 127.9, 127.3, 118.9, 118.2, 114.8, 58.7, 45.8, 35.4, 21.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.5. HRMS (ESI) *m/z* Calculated for $C_{17}H_{17}F_3NS$ $[M+H]^+$ 324.1028, found 324.1032. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 11.4 min and 19.5 min (major).

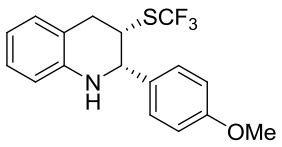


(2*S*,3*S*)-(+)-2-(3-Methoxyphenyl)-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7d): 46 mg, 90% yield, unknown compound, 99% ee, colorless oil, $[\alpha]^{20}_D$ = +56.31 (*c* 0.82, $CHCl_3$), R_f = 0.85 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 (t, *J* = 7.9 Hz, 1H), 7.07 (dd, *J* = 16.1, 7.8 Hz, 2H), 6.97 (d, *J* = 7.9 Hz, 2H), 6.87 (dd, *J* = 8.3, 1.8 Hz, 1H), 6.76 (t, *J* = 7.4 Hz, 1H), 6.61 (d, *J* = 8.1 Hz, 1H), 4.76 (s, 1H), 4.12 (s, 1H), 3.89 (dd, *J* = 7.2, 4.5 Hz, 1H), 3.81 (s, 3H), 3.51 (dd, *J* = 16.6, 4.3 Hz, 1H), 3.16 (dd, *J* = 16.6, 5.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 159.8, 143.7, 141.7, 130.2, 129.7, 128.7 (q, $^1J_{FC}$ = 305 Hz), 127.9, 119.7, 119.1, 118.2, 114.9, 113.6, 113.3, 58.9, 55.5, 45.9, 35.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.5. HRMS (ESI) *m/z* Calculated for $C_{17}H_{17}F_3NOS$ $[M+H]^+$ 340.0977, found 340.0976. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 85/15, flow = 0.7 mL/min, retention time 37.9 min and 40.6 min (major).

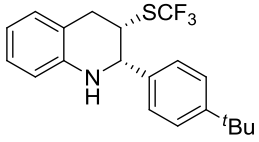


(2*S*,3*S*)-(+)-2-(4-Methoxyphenyl)-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7e): 50 mg, 98% yield, unknown compound, 99% ee, white solid, mp 65-66 °C, $[\alpha]^{20}_D$ = +26.80 (*c* 1.0, $CHCl_3$), R_f = 0.65 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35-7.27 (m, 2H), 7.12-7.01 (m, 2H), 6.93-6.86 (m, 2H), 6.75 (td, *J* = 7.5, 1.1 Hz, 1H), 6.59 (dd,

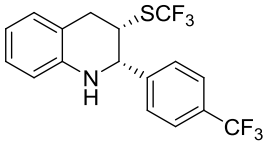
J = 7.9, 0.7 Hz, 1H), 4.74 (s, 1H), 4.09 (s, 1H), 3.87-3.83 (m, 1H), 3.81 (s, 3H), 3.48 (dd, *J* = 16.6, 4.4 Hz, 1H), 3.14 (dd, *J* = 16.6, 5.3 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 159.7, 143.8, 132.2, 130.2, 128.7 (q, $^1J_{FC}$ = 305 Hz), 128.6, 127.9, 118.9, 118.1, 114.8, 113.9, 58.5, 55.5, 46.2, 35.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.5. HRMS (ESI) *m/z* Calculated for $C_{17}H_{17}F_3NOS$ $[M+H]^+$ 340.0977, found 340.0978. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 15.7 min and 21.1 min (major).



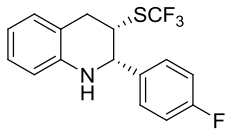
(2*S*,3*S*)-(+)-2-(4-*tert*-Butylphenyl)-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7f): 53 mg, 97% yield, unknown compound, 98% ee, colorless oil, $[\alpha]^{20}_D$ = +37.37 (*c* 0.80, $CHCl_3$), R_f = 0.95 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.43-7.27 (m, 4H), 7.06 (dd, *J* = 14.9, 7.3 Hz, 2H), 6.75 (td, *J* = 7.5, 1.0 Hz, 1H), 6.59 (d, *J* = 7.9 Hz, 1H), 4.77 (s, 1H), 4.12 (s, 1H), 3.89 (dd, *J* = 7.4, 4.8 Hz, 1H), 3.48 (dd, *J* = 16.6, 4.4 Hz, 1H), 3.15 (dd, *J* = 16.6, 5.4 Hz, 1H), 1.33 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 151.5, 143.8, 137.1, 133.3, 130.1, 128.7 (q, $^1J_{FC}$ = 306 Hz), 127.9, 127.1, 125.5, 118.9, 114.8, 58.7, 45.8, 35.3, 34.8, 31.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.5. HRMS (ESI) *m/z* Calculated for $C_{20}H_{23}F_3NS$ $[M+H]^+$ 366.1498, found 366.1503. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 8.3 min and 9.7 min (major).



(2*S*,3*S*)-(+)-3-(trifluoromethylthio)-2-(4-(trifluoromethyl)phenyl)-1,2,3,4-tetrahydroquinoline (7g): 52 mg, 92% yield, unknown compound, 99% ee, colorless oil, $[\alpha]^{20}_D$ = +45.71 (*c* 1.0, $CHCl_3$), R_f = 0.90 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.2 Hz, 2H), 7.54 (t, *J* = 6.8 Hz, 2H), 7.16-6.98 (m, 2H), 6.79 (t, *J* = 7.4 Hz, 1H), 6.64 (d, *J* = 7.9 Hz, 1H), 4.87 (s, 1H), 4.13 (s, 1H), 3.89 (d, *J* = 2.4 Hz, 1H), 3.53 (dd, *J* = 16.6, 4.4 Hz, 1H), 3.14 (dd, *J* = 16.7, 5.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 144.0, 143.3, 129.9, 129.8 (q, $^1J_{FC}$ = 210 Hz), 129.7, 129.0 (q, $^1J_{FC}$ = 307 Hz), 128.1, 127.9, 125.6 (q, $^2J_{FC}$ = 4 Hz), 119.4, 118.0, 115.0, 58.7, 45.6, 35.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.8, -62.6. HRMS (ESI) *m/z* Calculated for $C_{17}H_{14}F_6NS$ $[M+H]^+$ 378.0746, found 378.0758. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 14.5 min and 22.1 min (major).

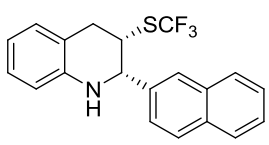


(2*S*,3*S*)-(+)-2-(4-Fluorophenyl)-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7h): 46 mg**,** 94% yield, unknown compound, 99% ee, colorless oil, $[\alpha]^{20}_D$ = +38.89 (*c* 0.72, $CHCl_3$), R_f = 0.85 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45-7.32 (m, 2H), 7.06 (dd, *J* = 9.6, 7.8 Hz, 4H), 6.78 (dd, *J* = 7.5, 1.1 Hz, 1H), 6.61 (dd, *J* = 7.9, 0.7 Hz, 1H), 4.78 (s, 1H), 4.08 (s, 1H), 3.83 (dd, *J* = 7.3, 4.7 Hz, 1H), 3.51 (dd, *J* = 16.6, 4.4 Hz, 1H), 3.13 (dd, *J* = 16.6, 5.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 143.6, 131.5 (q, $^1J_{FC}$ = 294 Hz), 129.2, 129.1, 128.6 (q, $^1J_{FC}$ = 305 Hz), 128.0, 119.2, 118.0, 115.6, 115.4, 114.9, 58.4, 46.0, 35.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.7, -113.7. HRMS (ESI) *m/z* Calculated for $C_{16}H_{14}F_4NS$ $[M+H]^+$ 328.0778, found 328.0776. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 13.8 min and 21.6 min (major).

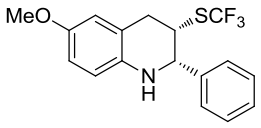


(2*S*,3*S*)-(+)-2-(Naphthalen-2-yl)-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7i): 50 mg, 93% yield, unknown compound, 99% ee, colorless oil, $[\alpha]^{20}_D$ = +32.19 (*c* 0.92, $CHCl_3$), R_f =

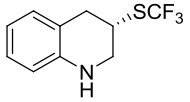
0.90 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98-7.73 (m, 4H), 7.56- 7.37 (m, 3H), 7.10 (dd, *J* = 16.0, 7.7 Hz, 2H), 6.79 (dd, *J* = 10.8, 4.0 Hz, 1H), 6.66 (d, *J* = 7.9 Hz, 1H), 4.95 (s, 1H), 4.22 (s, 1H), 3.98 (dd, *J* = 7.2, 4.5 Hz, 1H), 3.56 (dd, *J* = 16.6, 4.3 Hz, 1H), 3.21 (dd, *J* = 16.7, 4.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 143.8, 137.5, 134.1, 133.4, 130.3, 128.7 (q, $^1J_{FC}$ = 307 Hz), 128.5, 128.4, 128.0, 127.9, 126.6, 126.5, 126.3, 125.3, 119.2, 118.2, 115.0, 59.1, 46.1, 35.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.5. HRMS (ESI) *m/z* Calculated for $C_{20}H_{17}F_3NS$ $[M+H]^+$ 360.1034, found 360.1031. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 75/25, flow = 0.7 mL/min, retention time 22.0 min and 33.1 min (major).



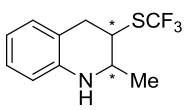
(2*S*,3*S*)-(+)-6-Methoxy-2-phenyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7j): 41 mg, 81% yield, unknown compound, 99% ee, white solid, mp 80-81 °C, $[\alpha]^{20}_D$ = +28.71 (*c* 0.80, $CHCl_3$), R_f = 0.85 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.28 (dd, *J* = 11.9, 5.0 Hz, 4H), 7.17-7.07 (m, 2H), 6.85 (dd, *J* = 9.0, 2.8 Hz, 1H), 6.74 (d, *J* = 2.7 Hz, 1H), 6.61 (s, 1H), 4.32 (dd, *J* = 15.0, 6.0 Hz, 1H), 3.83 (s, 3H), 3.43 (dd, *J* = 16.8, 6.1 Hz, 1H), 3.08 (dd, *J* = 16.8, 9.5 Hz, 1H), 1.25 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 158.5, 129.1, 129.0, 128.9, 128.6 (q, $^1J_{FC}$ = 305 Hz), 128.3, 114.0, 114.0, 113.9, 113.9, 113.8, 66.6, 55.7, 43.3, 33.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -40.1. HRMS (ESI) *m/z* Calculated for $C_{17}H_{17}F_3NOS$ $[M+H]^+$ 340.0983, found 340.0981. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.7 mL/min, retention time 8.5 min (major) and 9.4 min.



(3*S*)-(+)-3-(Trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7k): unknown compound, 33 mg, 94% yield, 67% ee, colorless oil, $[\alpha]^{20}_D$ = +11.23 (*c* 0.60, $CHCl_3$), R_f = 0.65 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.04 (ddd, *J* = 8.0, 1.3, 0.7 Hz, 1H), 6.97 (d, *J* = 7.5 Hz, 1H), 6.70 (td, *J* = 7.4, 1.0 Hz, 1H), 6.54 (d, *J* = 8.0 Hz, 1H), 3.93 (s, 1H), 3.87-3.76 (m, 1H), 3.66 (d, *J* = 11.7 Hz, 1H), 3.39 (ddd, *J* = 11.7, 7.2, 1.1 Hz, 1H), 3.26 (dd, *J* = 16.4, 4.9 Hz, 1H), 2.94 (dd, *J* = 16.4, 7.2 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 143.3, 130.0, 128.4 (q, $^1J_{FC}$ = 307 Hz), 127.9, 118.4, 118.2, 114.7, 47.6, 38.7, 34.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.4. HRMS (ESI) *m/z* Calculated for $C_{10}H_{11}F_3NS$ $[M+H]^+$ 234.0559, found 234.0566. HPLC: Chiracel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 70/30, flow = 0.7 mL/min, retention time 9.1 min and 12.4 min (major).



2-Methyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (7l): unknown compound, 31 mg, 84% yield (inseparable mixture of two diastereoisomers), 72/28 d.r., 67% and 50% ee, colorless oil, R_f = 0.75 (petroleum ether/dichloromethane 1:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.03 (dq, *J* = 14.1, 7.2 Hz, 2H), 6.71 (dtd, *J* = 8.3, 7.4, 1.0 Hz, 1H), 6.52 (d, *J* = 8.1 Hz, 1H), 4.00-3.80 (m, 1H), 3.80-3.70 (m, 1H), 3.67 (dd, *J* = 6.3, 3.4 Hz, 1H), 3.44-3.36 (m, 0.8H), 3.37-3.28 (m, 0.3H), 3.12 (dd, *J* = 16.7, 3.5 Hz, 0.72H), 3.05 (dd, *J* = 16.8, 6.9 Hz, 0.28H), 1.35 (d, *J* = 6.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ = 143.7, 143.6, 130.3, 129.7, 129.1 (q, $^1J_{FC}$ = 306 Hz), 129.0 (q, $^1J_{FC}$ = 306 Hz), 127.9, 127.7, 118.8, 118.1, 117.9, 117.8, 114.6, 114.4, 51.7, 50.4, 45.5, 44.6, 36.2, 33.0, 21.6, 19.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ = -39.1, -39.3. HRMS (ESI) *m/z* Calculated for $C_{11}H_{13}F_3NS$ $[M+H]^+$ 248.0715, found 248.0718. HPLC: Chiracel OG-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10,



flow = 0.7 mL/min, retention time (for 67% ee) 6.7 min and 7.5 min (major); retention time (for 50% ee) 8.8 min and 10.9 min (major).

4. The Determination of the Absolute Configuration of (+)-7b

In order to determine the absolute configuration of the product 2-*m*-tolyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (+)-**7b** (50 mg, >99% ee) was dissolved in dichloromethane (0.1 mL) at 50 ^{o}C, then *n*-hexane (3.0 mL) was added and the solution was cooled down to room temperature. The single crystal of (+)-**7b** was grown from the solution, the absolute configuration of which was determined to be *cis*-(2*S*,3*S*) based on single-crystal X-ray diffraction analysis. CCDC 1439307 contains the supplementary crystallographic data for this paper. These can be obtained free of charge from The Cambridge Crystallographic Data Centre *via* www.ccdc.cam.ac. uk.

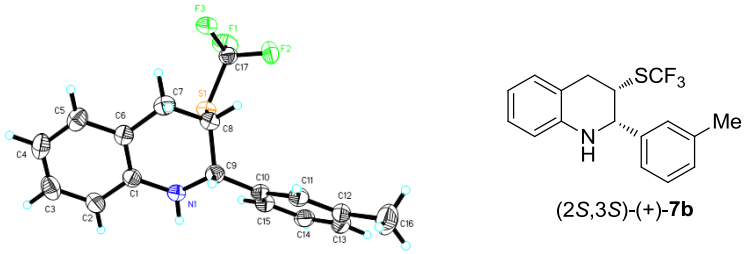


Figure S1. The Absolute Configuration of 2-*m*-Tolyl-3-(trifluoromethylthio)-1,2,3,4-tetrahydroquinoline (+)-**7b**

5. References

[1] N. Shakya, K. K. Roy, A. K. Saxena, *Bioorgan. Med. Chem*. **2009**, *17*, 830.

[2] K. S. Sharma, *Synthesis* **1981**, 316.

[3] A.-H. Li, M. J. Mulvihill, *Org. Biomol. Chem*. **2007**, *5*, 61.

[4] G. Danoun, B. Bayarmagnai, M. F. Grünberg, L. J. Goossen, *Chem. Sci.* **2014**, *5*, 1312.

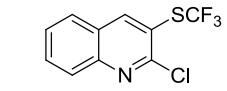
[5] B. Luis, P. A. Andrey, *Org. Lett*. **2015**, *17*, 3134.

[6] H. P. Kokatla, D. Sil, H. Tanji, U. Ohto, S. S. Malladi, L. M. Fox, T. Shimizu, S. A. David, *ChemMedChem* **2014**, *9*, 719.

[7] M.-Y. Fan, W. Zhou, Y.-W. Jiang, D.-W. Ma, *Org. Lett*. **2015**, *17*, 5934.

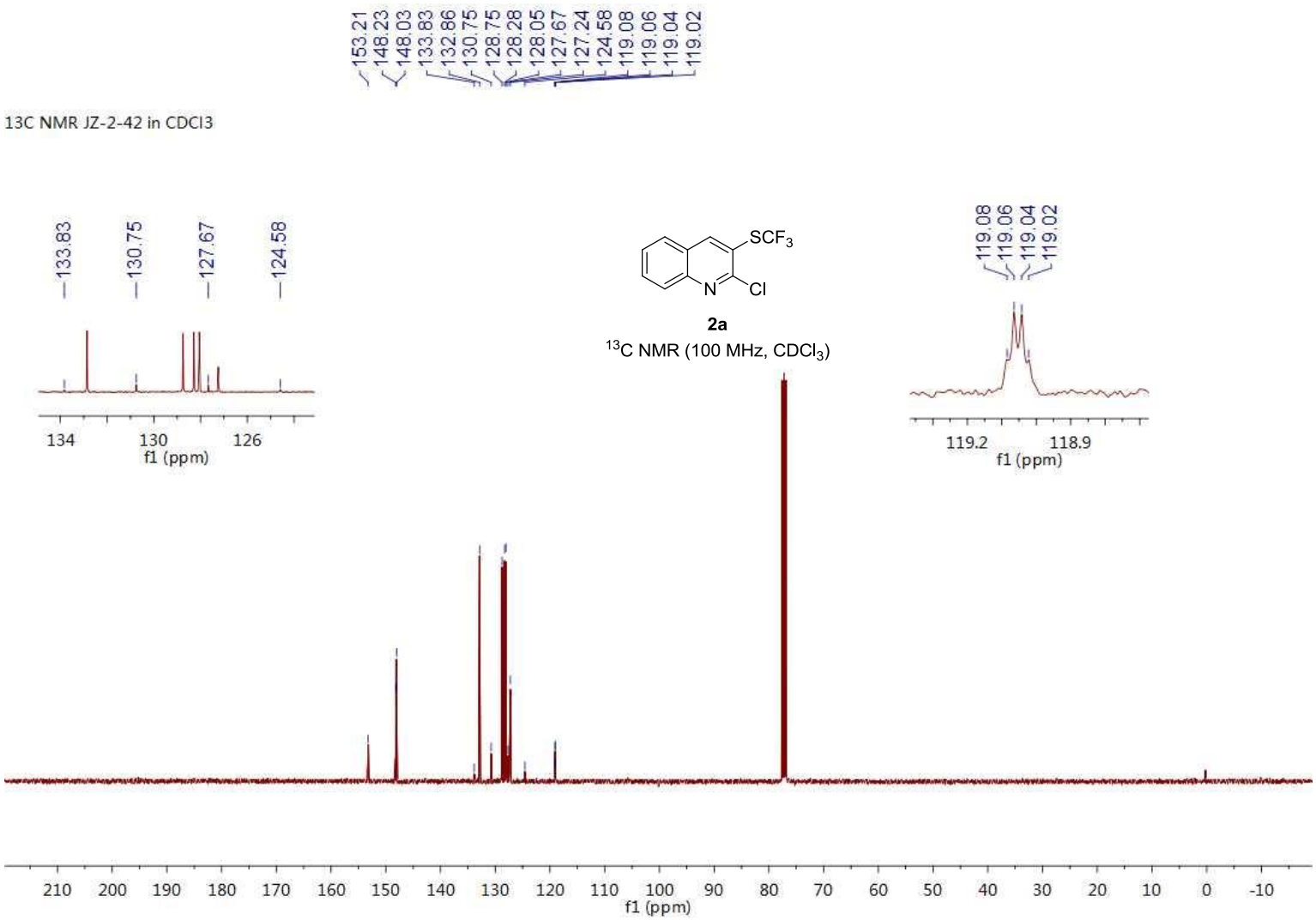
6. Copy of NMR and HPLC for Racemic and Chiral Compounds

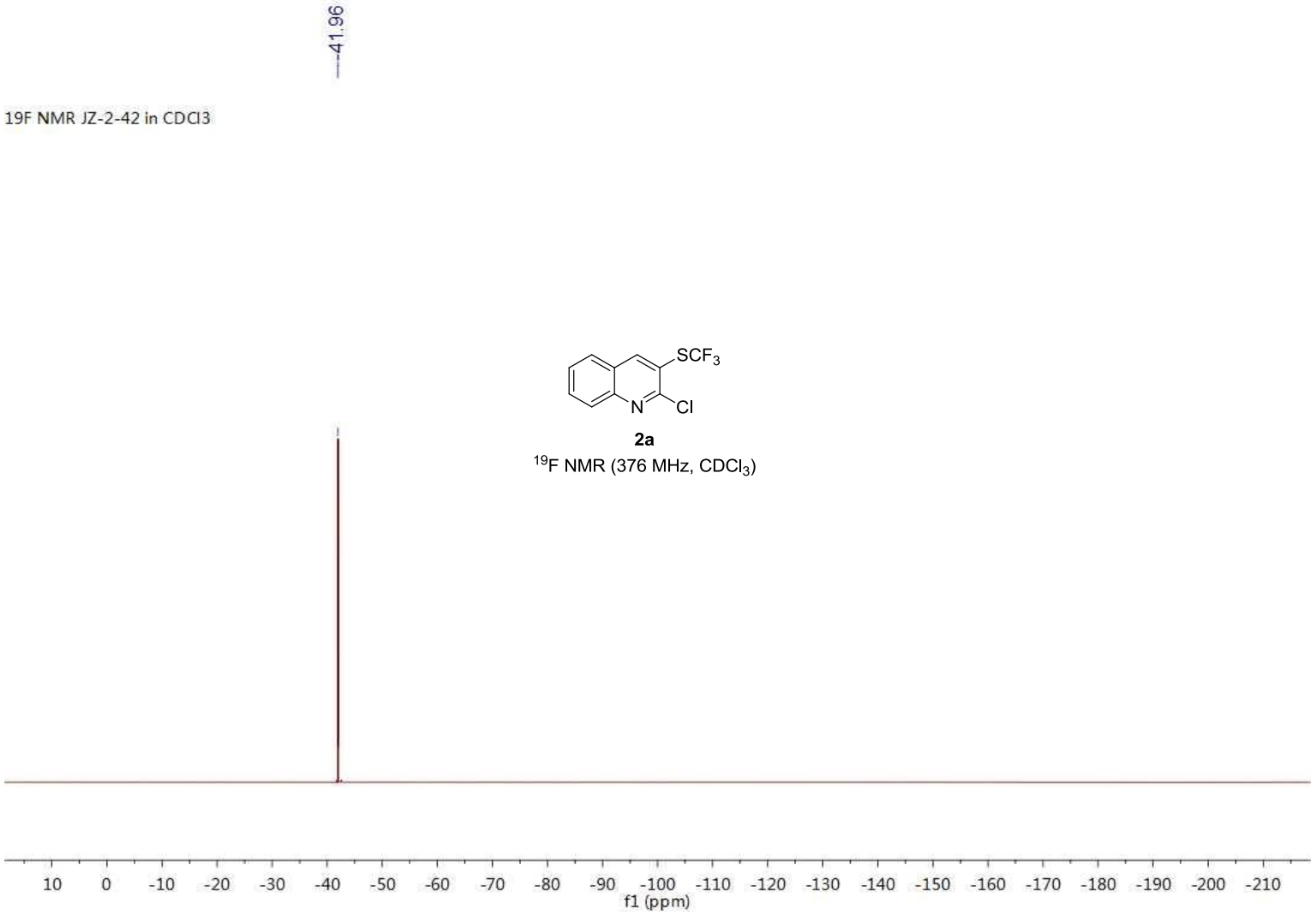
1H NMR JZ-2-42 in CDCl3



2a

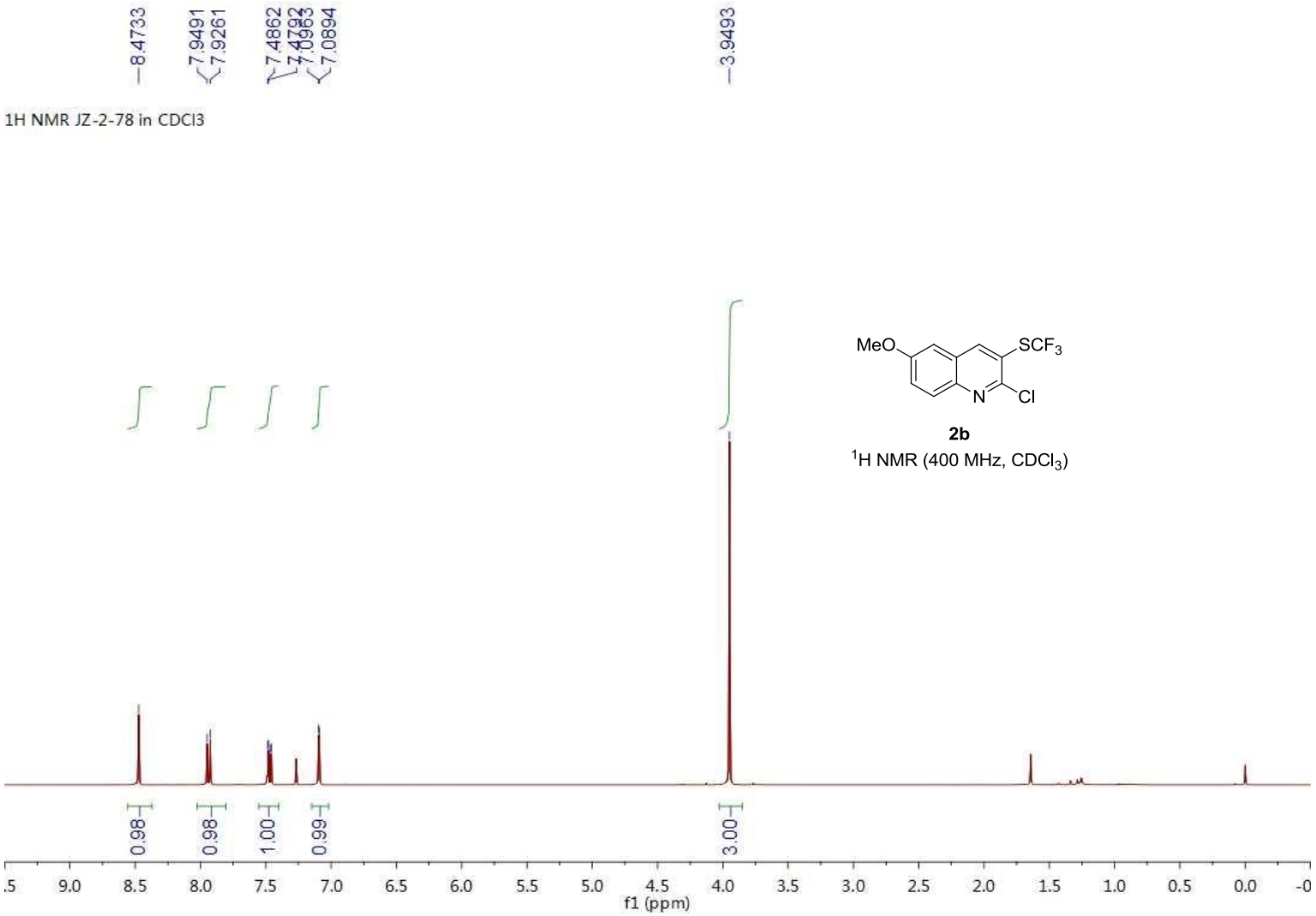
^{1}H NMR (400 MHz, $CDCl_3$)

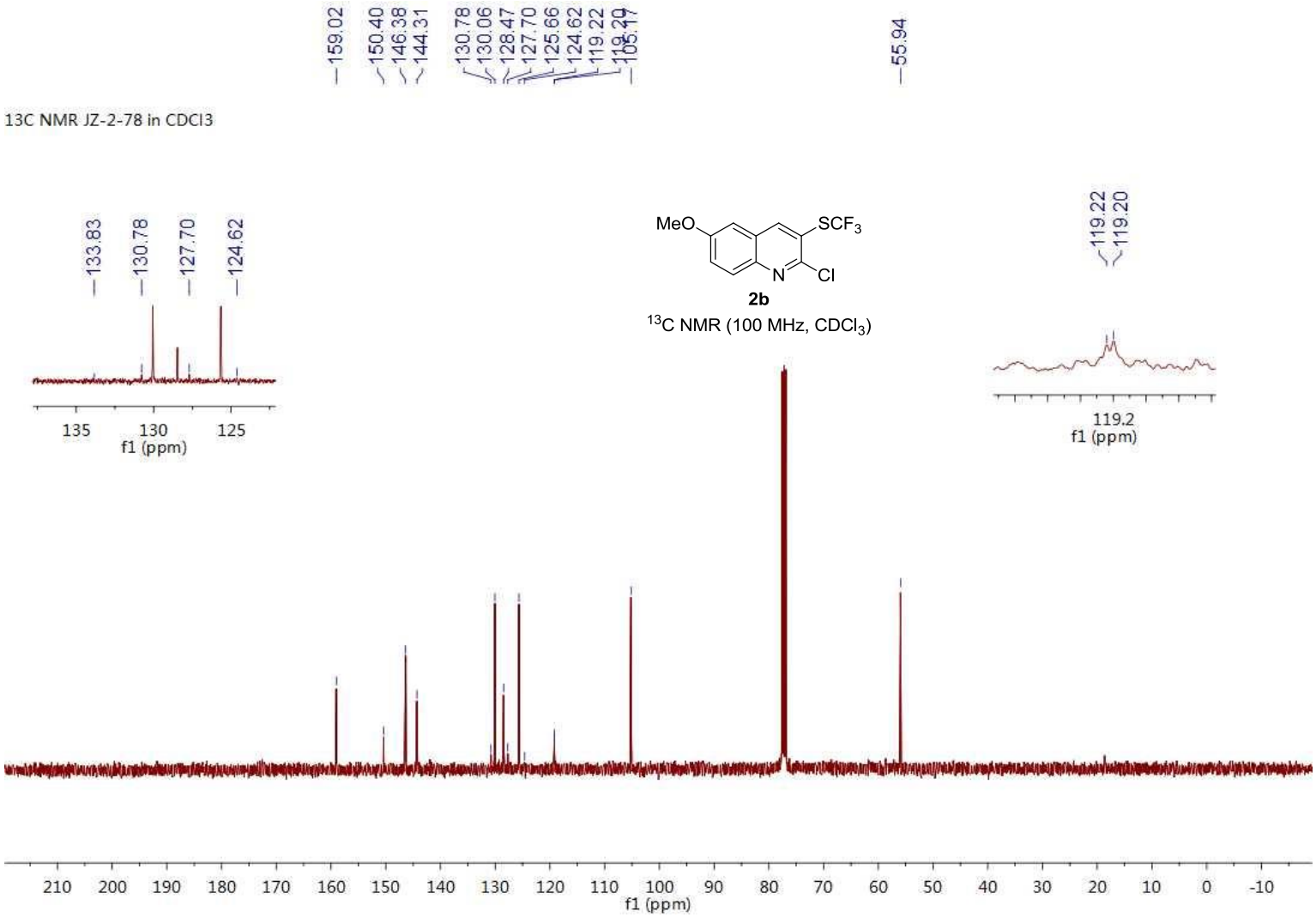

153.21
148.23
148.03
133.83
132.86
130.75
128.75
128.28
128.05
127.67
127.24
124.58
119.08
119.06
119.04
119.02
13C NMR JZ-2-42 in CDCl3
133.83
130.75
127.67
124.58
134
130
126
f1 (ppm)
SCF3
N
Cl
2a
13C NMR (100 MHz, CDCl3)
119.08
119.06
119.04
119.02
119.2
118.9
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

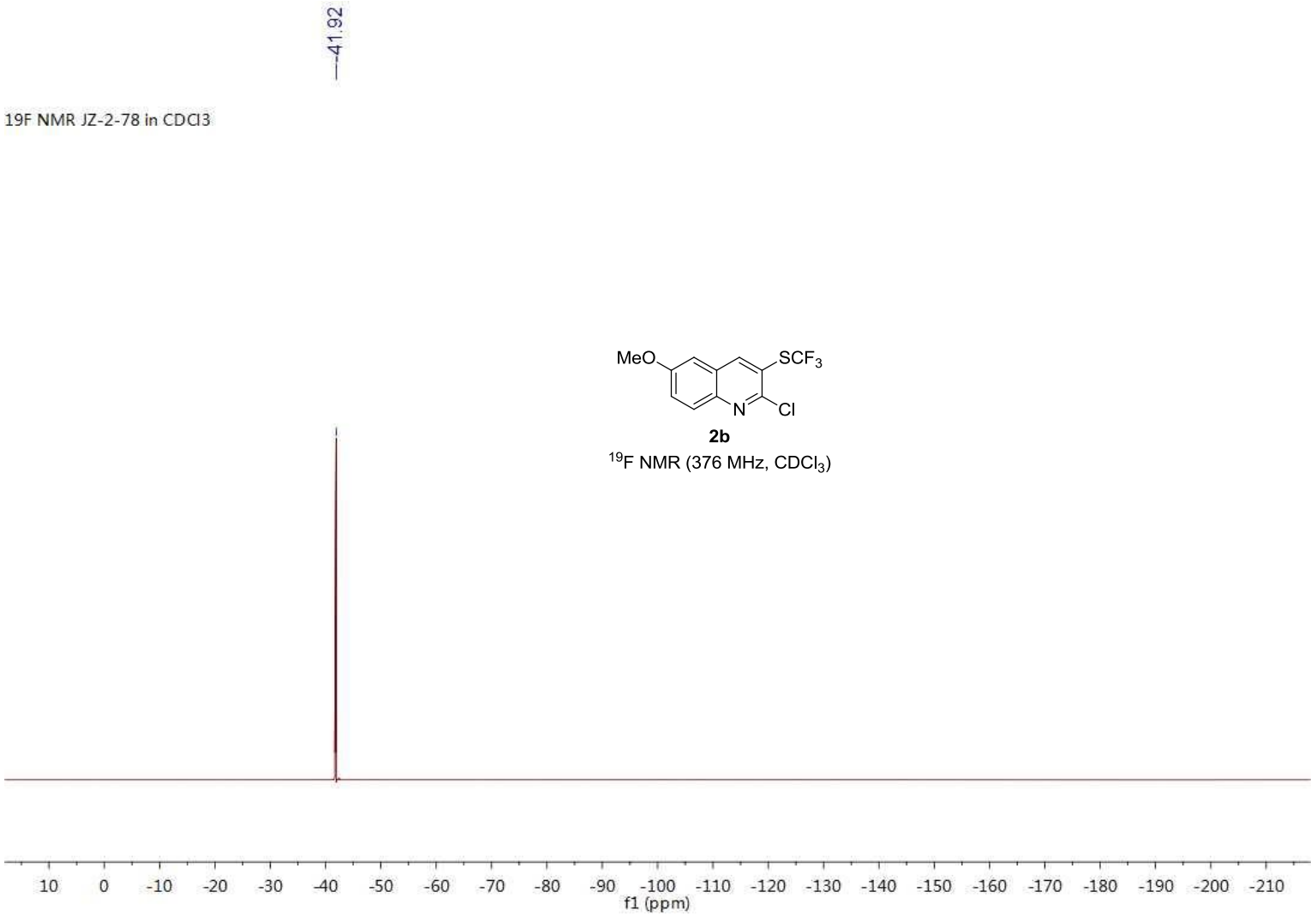


2a

^{19}F NMR (376 MHz, $CDCl_3$)

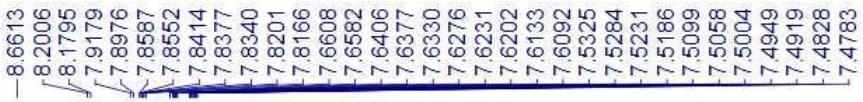

8.4733
7.9491
7.9261
7.4862
7.4792
7.0963
7.0894
3.9493
1H NMR JZ-2-78 in CDCl3
MeO
SCF3
N
Cl
2b
1H NMR (400 MHz, CDCl3)
0.98
0.98
1.00
0.99
3.00
f1 (ppm)


159.02
150.40
146.38
144.31
130.78
130.06
128.47
127.70
125.66
124.62
119.22
119.20
105.17
55.94
13C NMR JZ-2-78 in CDCl3
133.83
130.78
127.70
124.62
135
130
125
f1 (ppm)
MeO
SCF3
N
Cl
2b
13C NMR (100 MHz, CDCl3)
119.22
119.20
119.2
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

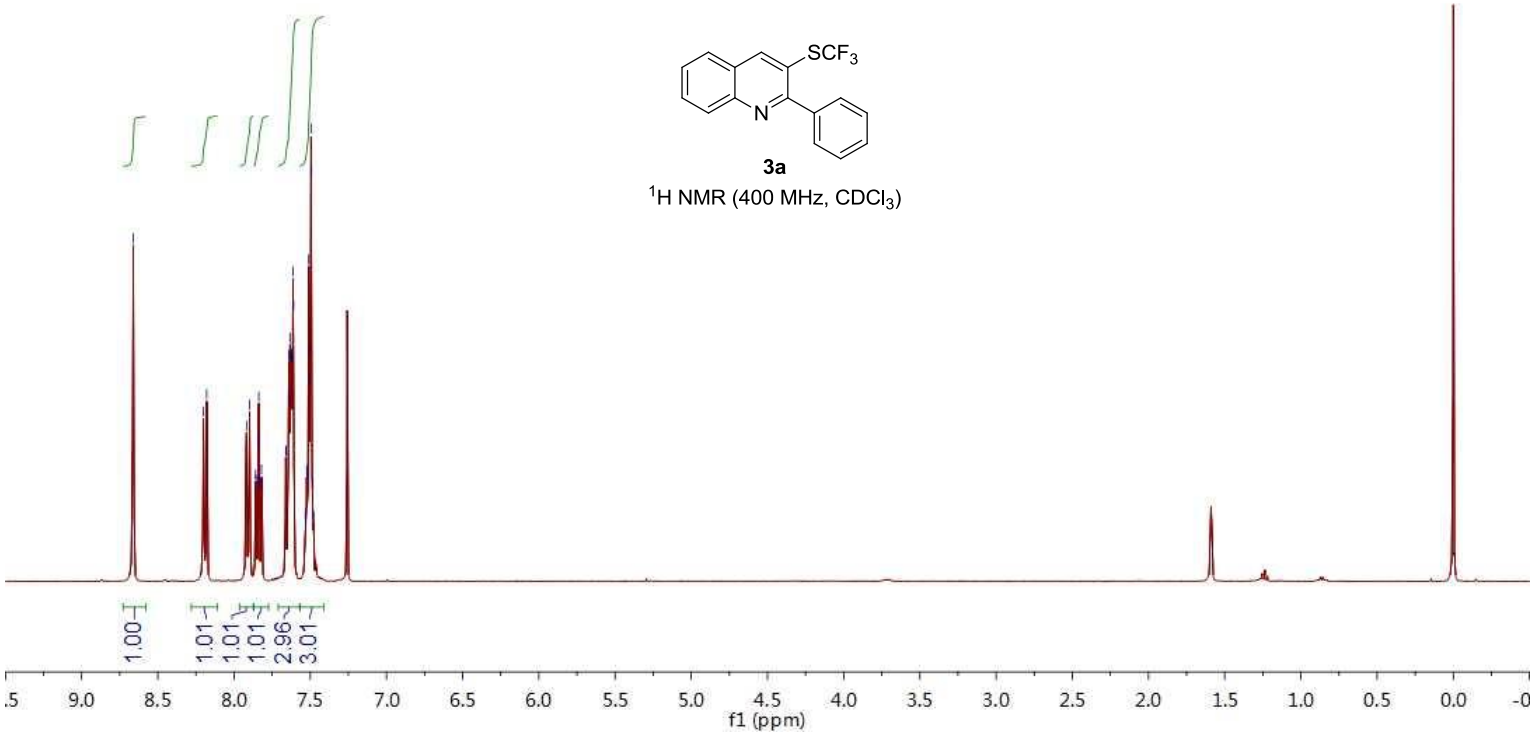


2b

^{19}F NMR (376 MHz, $CDCl_3$)

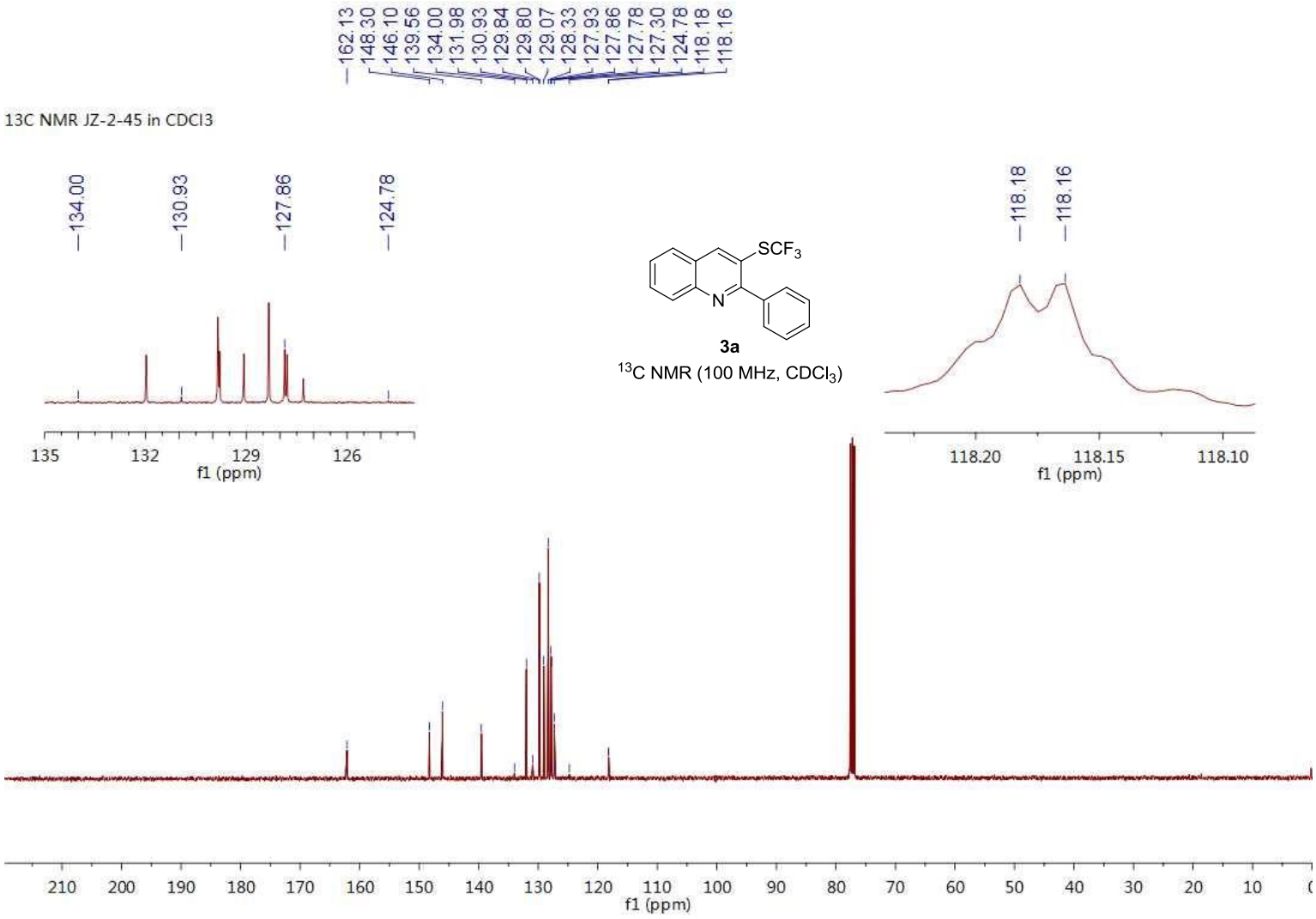


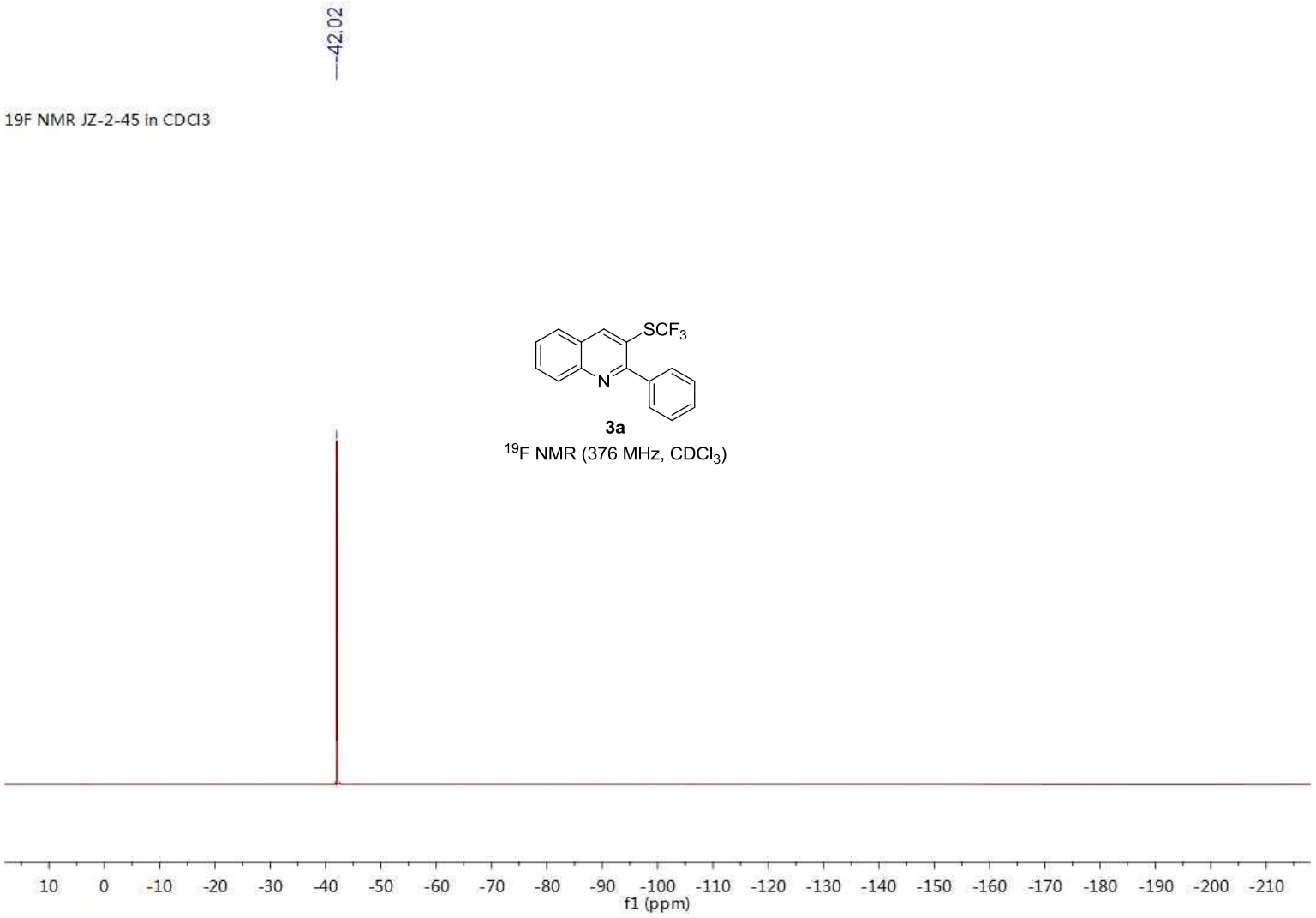
1H NMR JZ-2-45 in CDCl3



3a

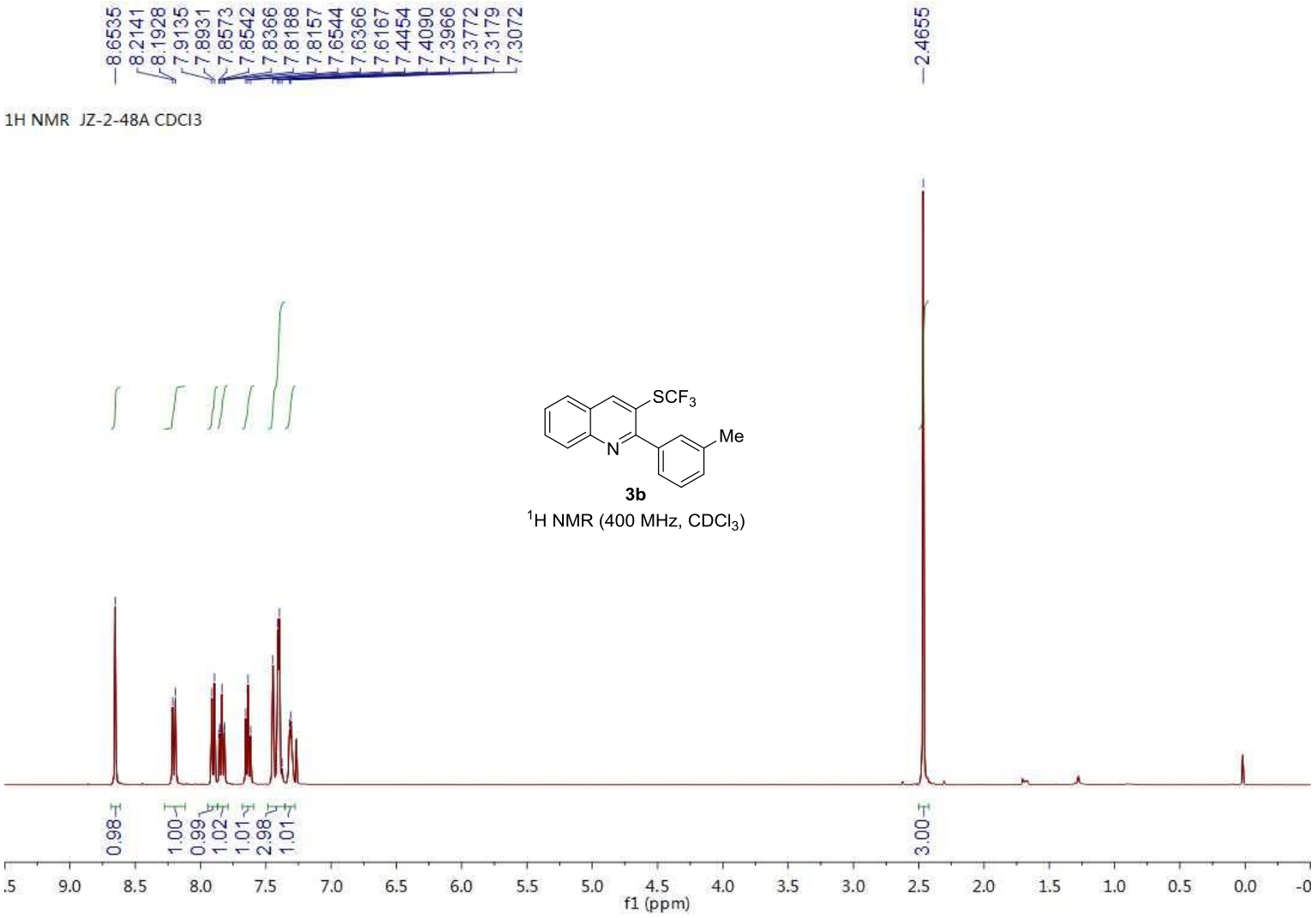
^{1}H NMR (400 MHz, $CDCl_3$)


162.13
148.30
146.10
139.56
134.00
131.98
130.93
129.84
129.80
129.07
128.33
127.93
127.86
127.78
127.30
124.78
118.18
118.16
13C NMR JZ-2-45 in CDCl3
134.00
130.93
127.86
124.78
135
132
129
126
f1 (ppm)
SCF3
N
3a
13C NMR (100 MHz, CDCl3)
118.18
118.16
118.20
118.15
118.10
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



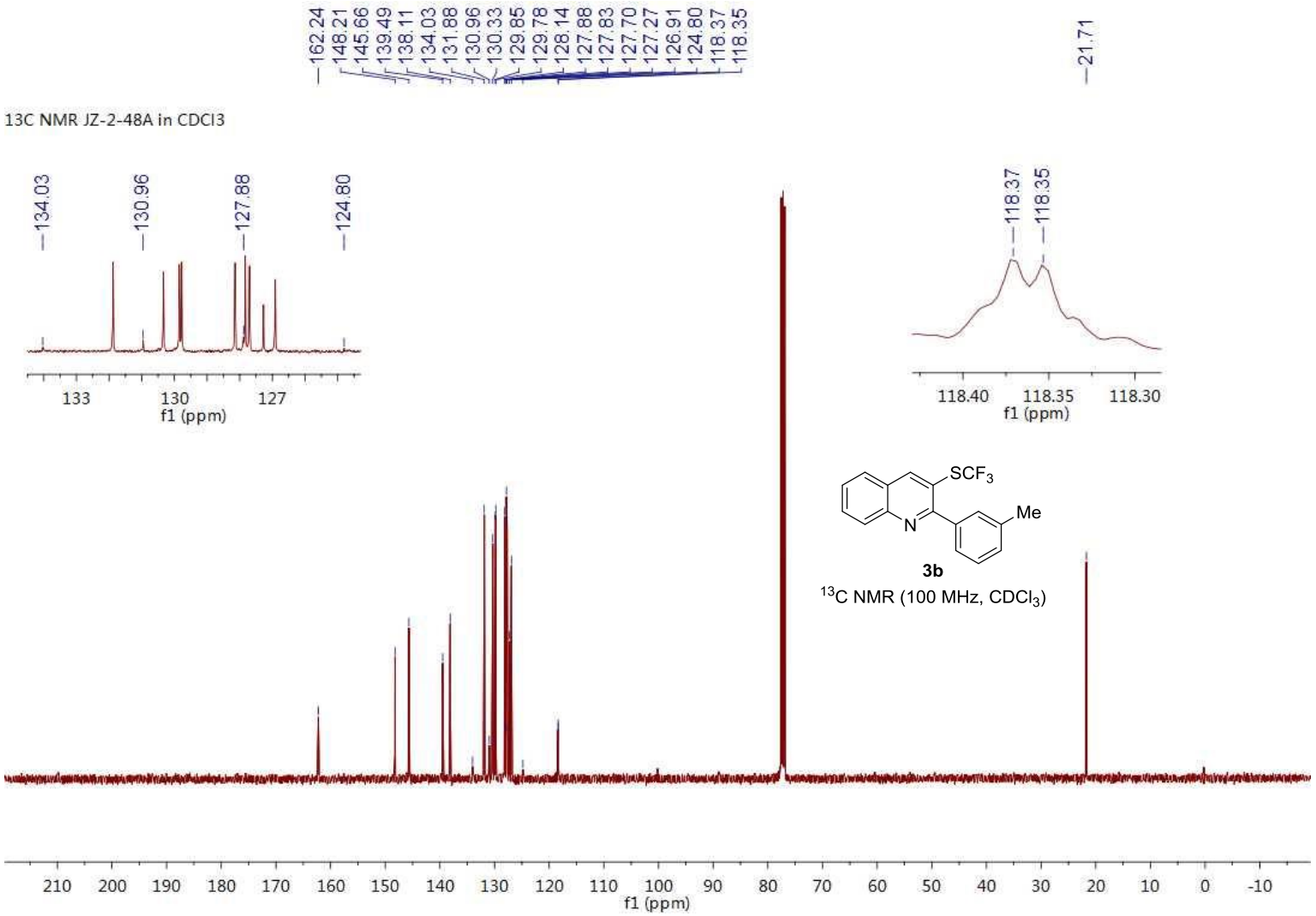
3a

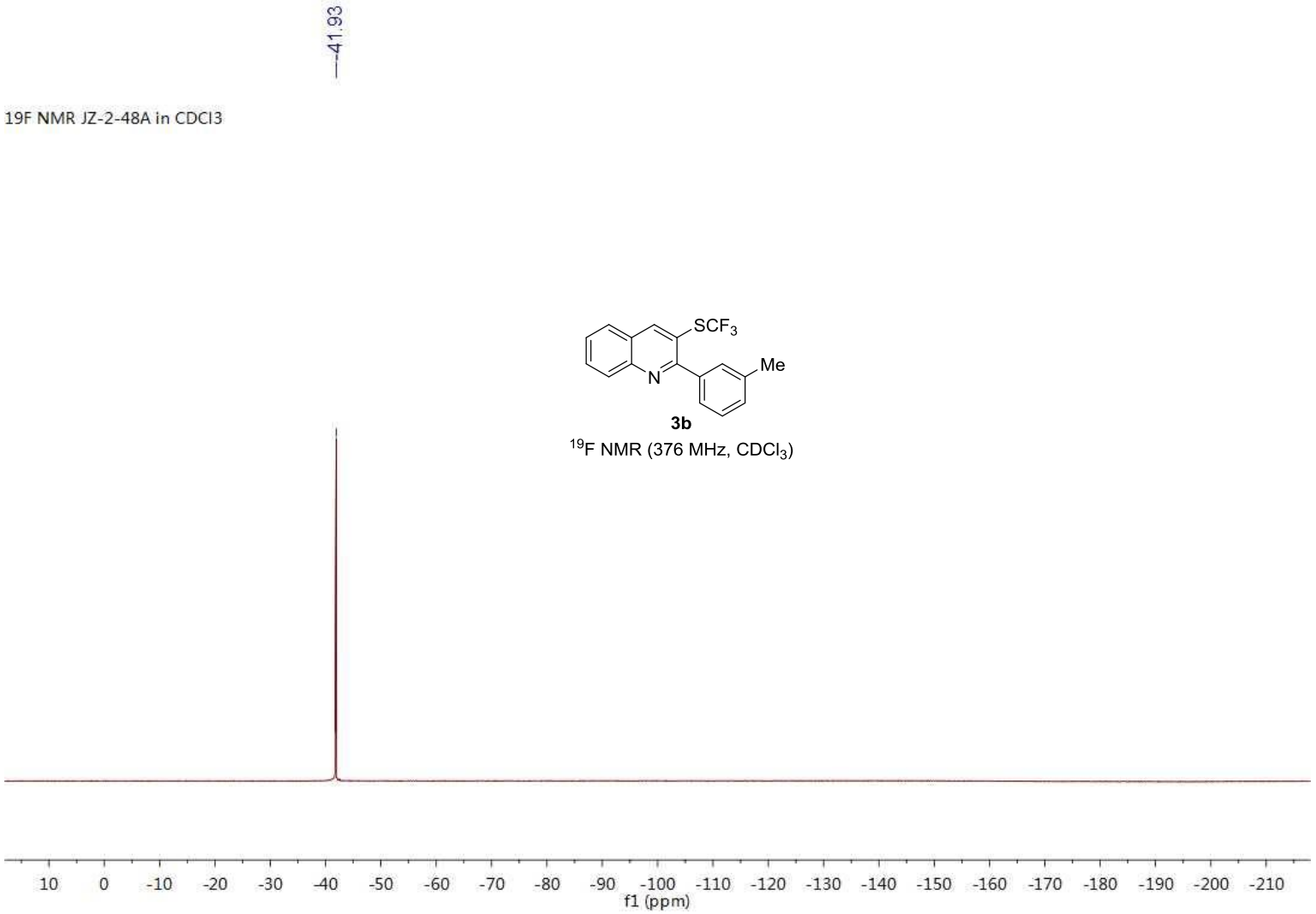
^{19}F NMR (376 MHz, $CDCl_3$)

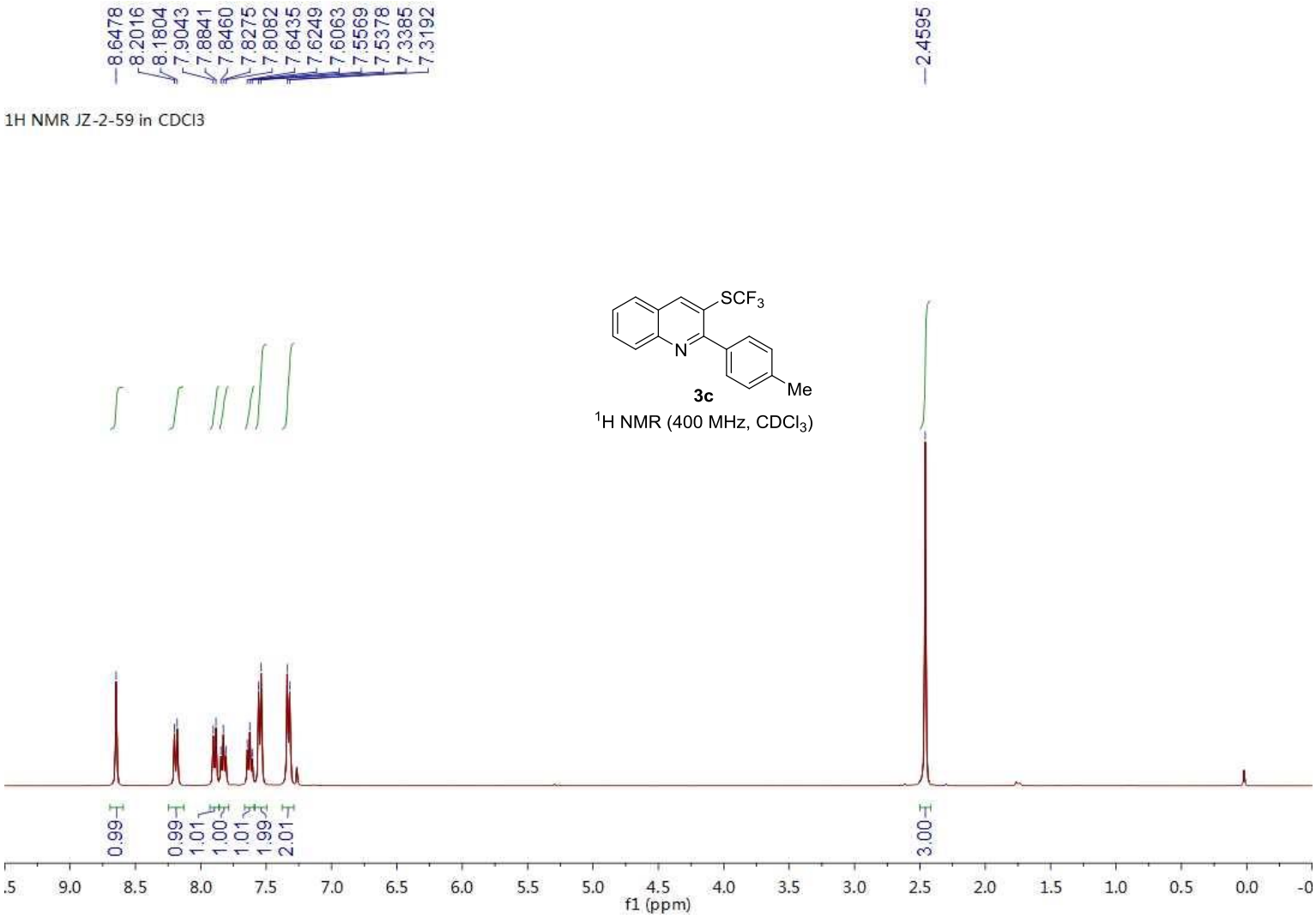


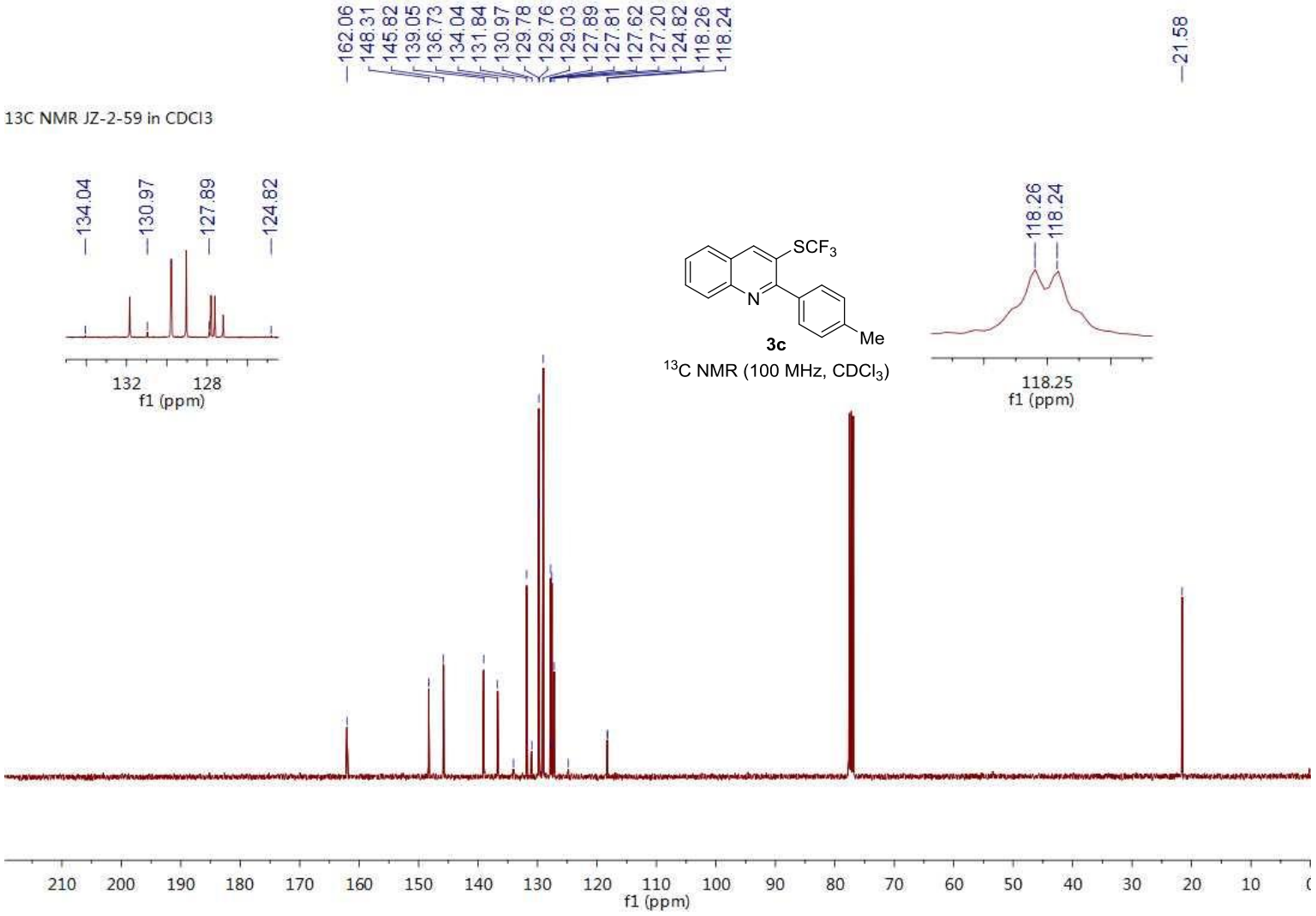
3b

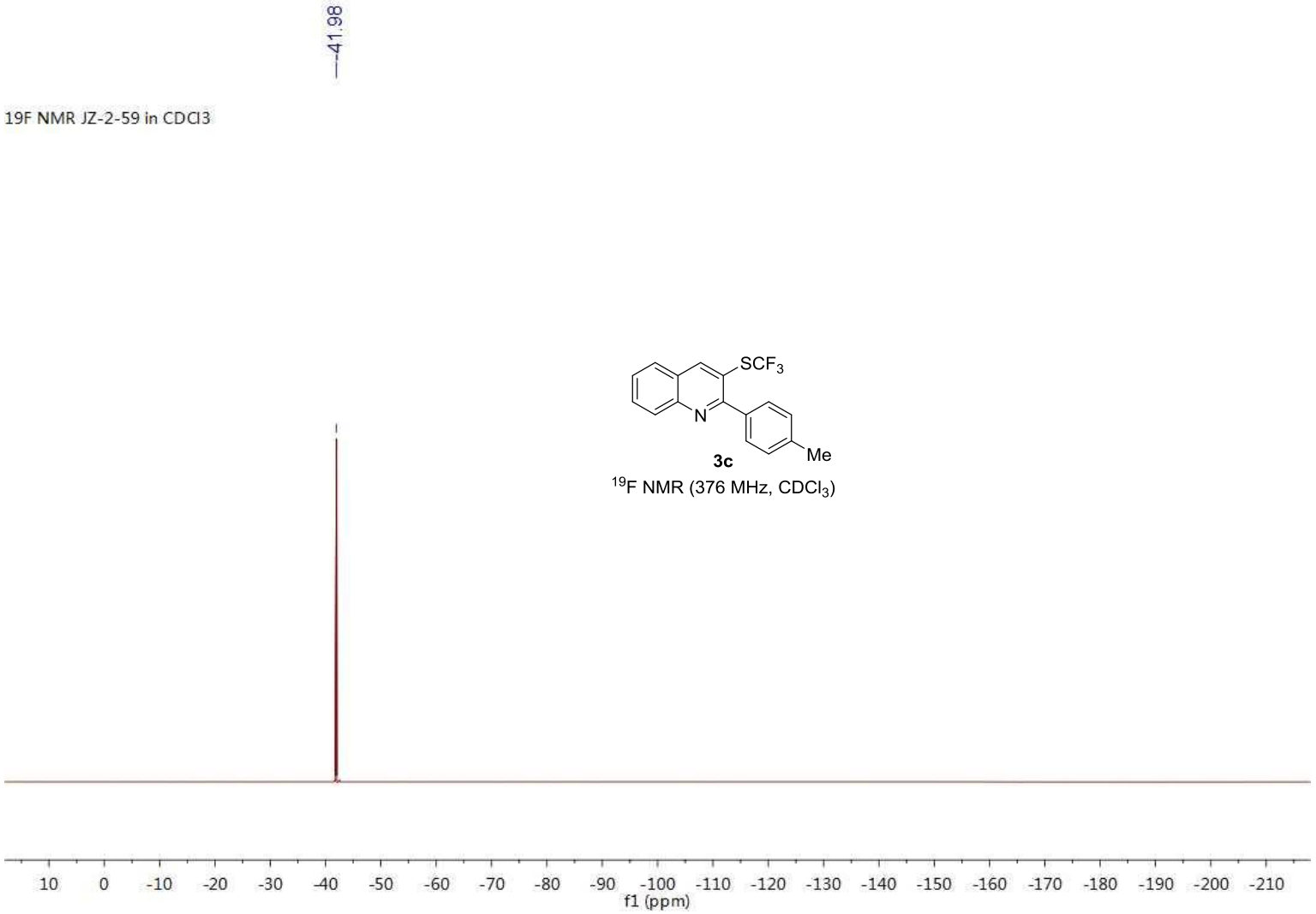
^{1}H NMR (400 MHz, $CDCl_3$)


162.24
148.21
145.66
139.49
138.11
134.03
131.88
130.96
130.33
129.85
129.78
128.14
127.88
127.83
127.70
127.27
126.91
124.80
118.37
118.35
21.71
13C NMR JZ-2-48A in CDCl3
134.03
130.96
127.88
124.80
133
130
127
f1 (ppm)
118.37
118.35
118.40
118.35
118.30
f1 (ppm)
SCF3
N
Me
3b
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


-41.93
19F NMR JZ-2-48A in CDCl3
SCF3
N
Me
3b
19F NMR (376 MHz, CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

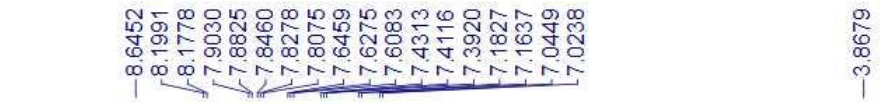

8.6478
8.2016
8.1804
7.9043
7.8841
7.8460
7.8275
7.8082
7.6435
7.6249
7.6063
7.5569
7.5378
7.3385
7.3192
2.4595
1H NMR JZ-2-59 in CDCl3
SCF3
N
Me
3c
1H NMR (400 MHz, CDCl3)
0.99
0.99
1.01
1.00
1.01
1.99
2.01
3.00
f1 (ppm)


162.06
148.31
145.82
139.05
136.73
134.04
131.84
130.97
129.78
129.76
129.03
127.89
127.81
127.62
127.20
124.82
118.26
118.24
21.58
13C NMR JZ-2-59 in CDCl3
134.04
130.97
127.89
124.82
132
128
f1 (ppm)
SCF3
N
Me
3c
13C NMR (100 MHz, CDCl3)
118.26
118.24
118.25
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

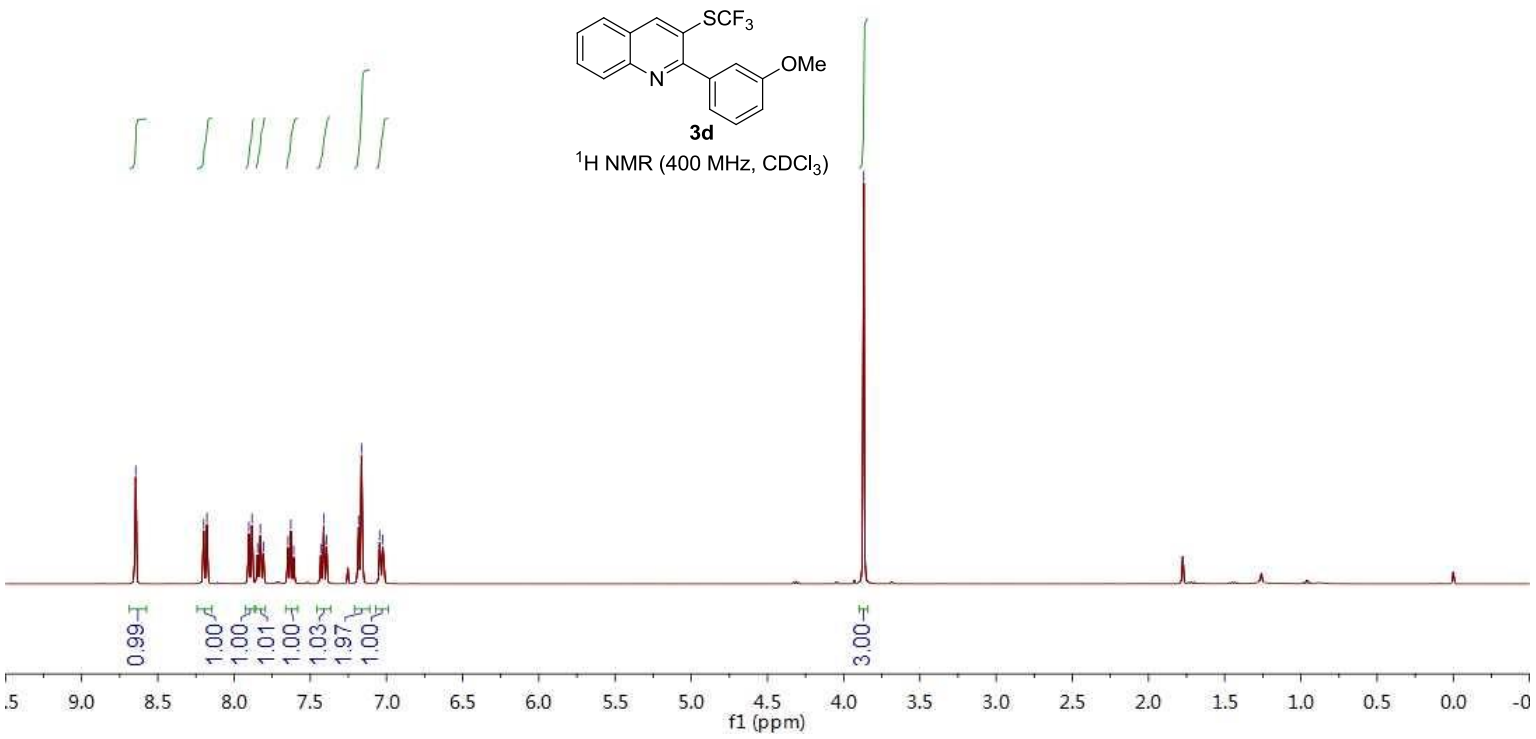


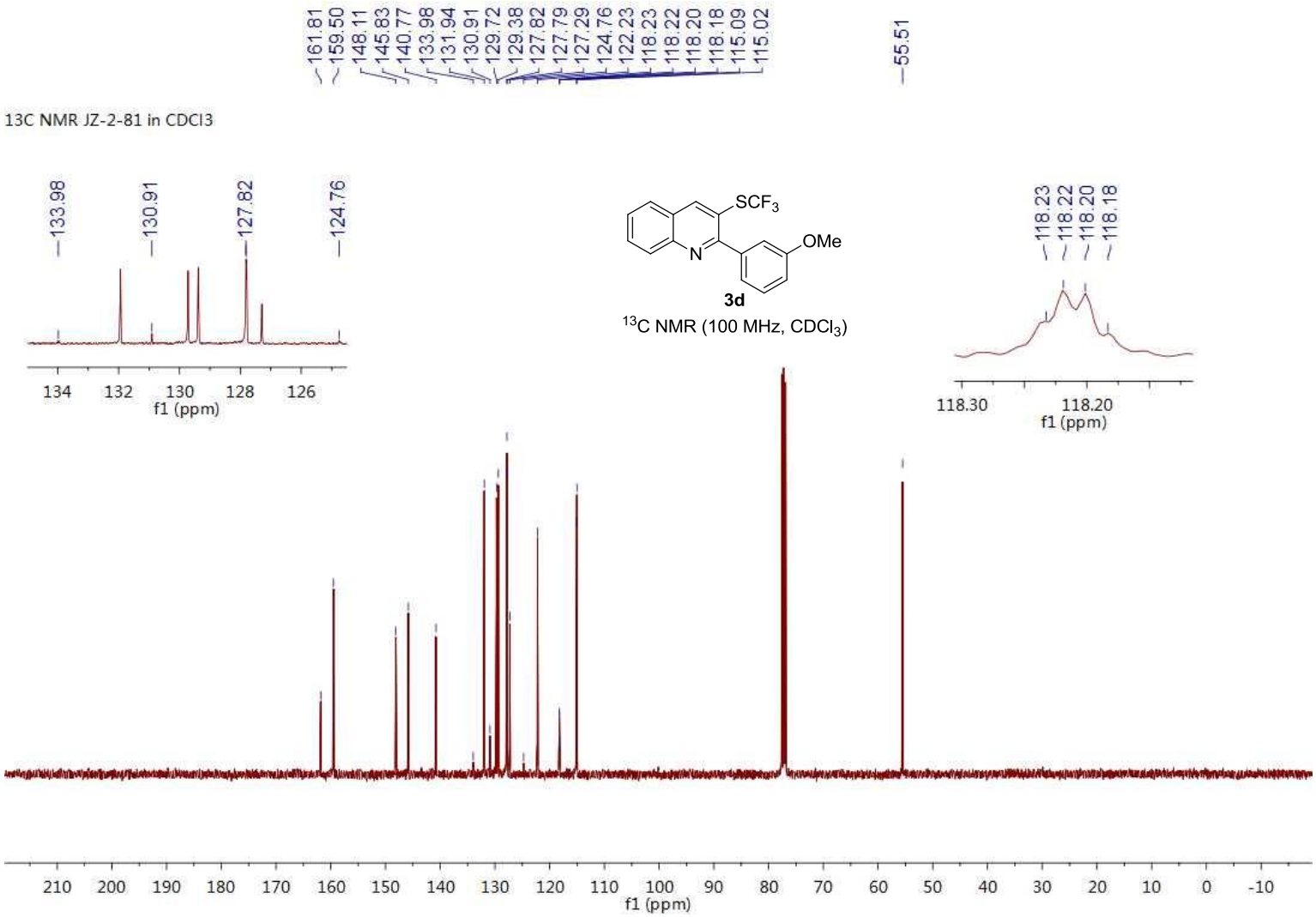
3c

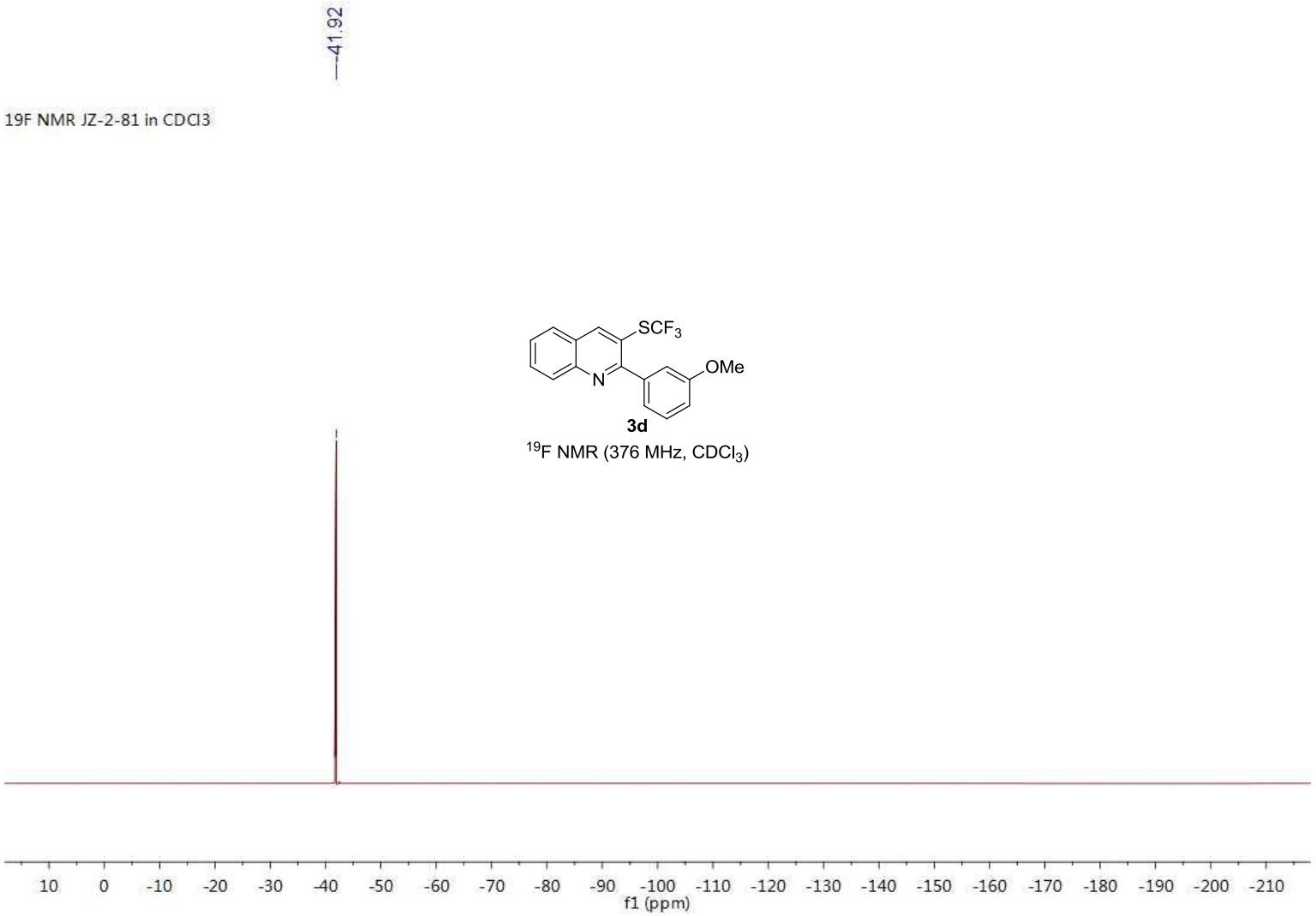
^{19}F NMR (376 MHz, $CDCl_3$)



1H NMR JZ-2-81 in CDCl3

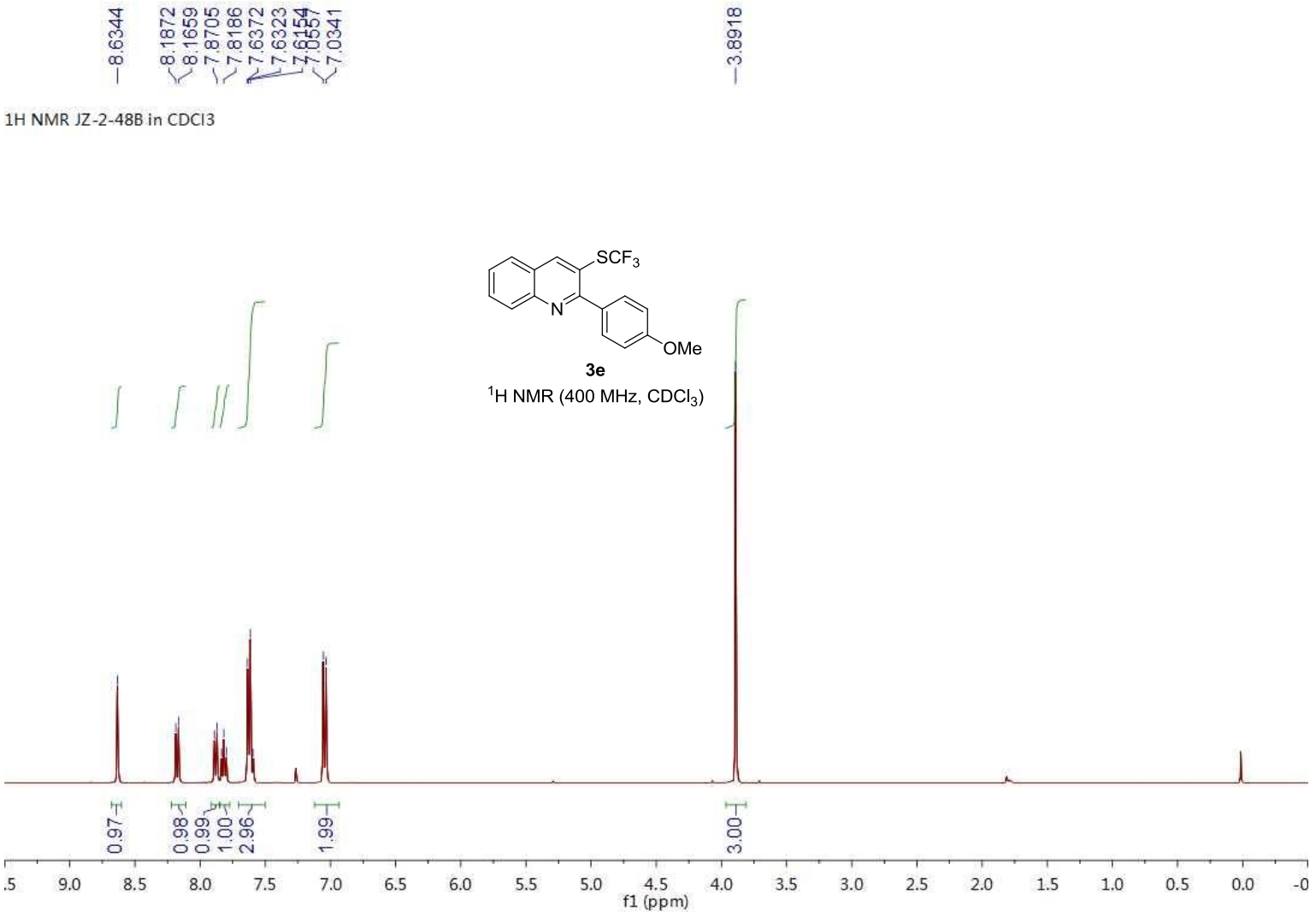


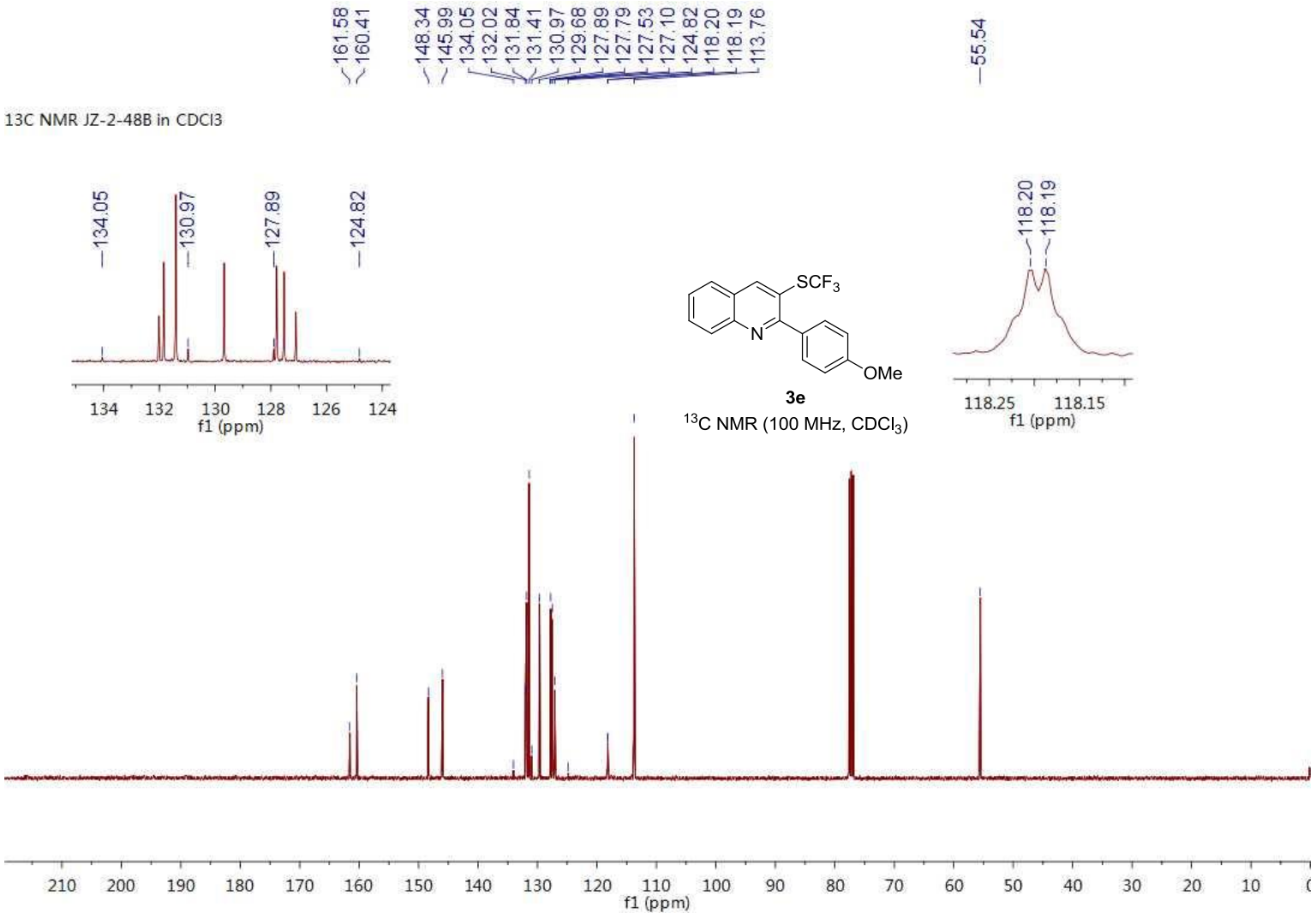

161.81
159.50
148.11
145.83
140.77
133.98
131.94
130.91
129.72
129.38
127.82
127.79
127.29
124.76
122.23
118.23
118.22
118.20
118.18
115.09
115.02
55.51
13C NMR JZ-2-81 in CDCl3
133.98
130.91
127.82
124.76
134
132
130
128
126
f1 (ppm)
SCF3
N
OMe
3d
13C NMR (100 MHz, CDCl3)
118.23
118.22
118.20
118.18
118.30
118.20
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

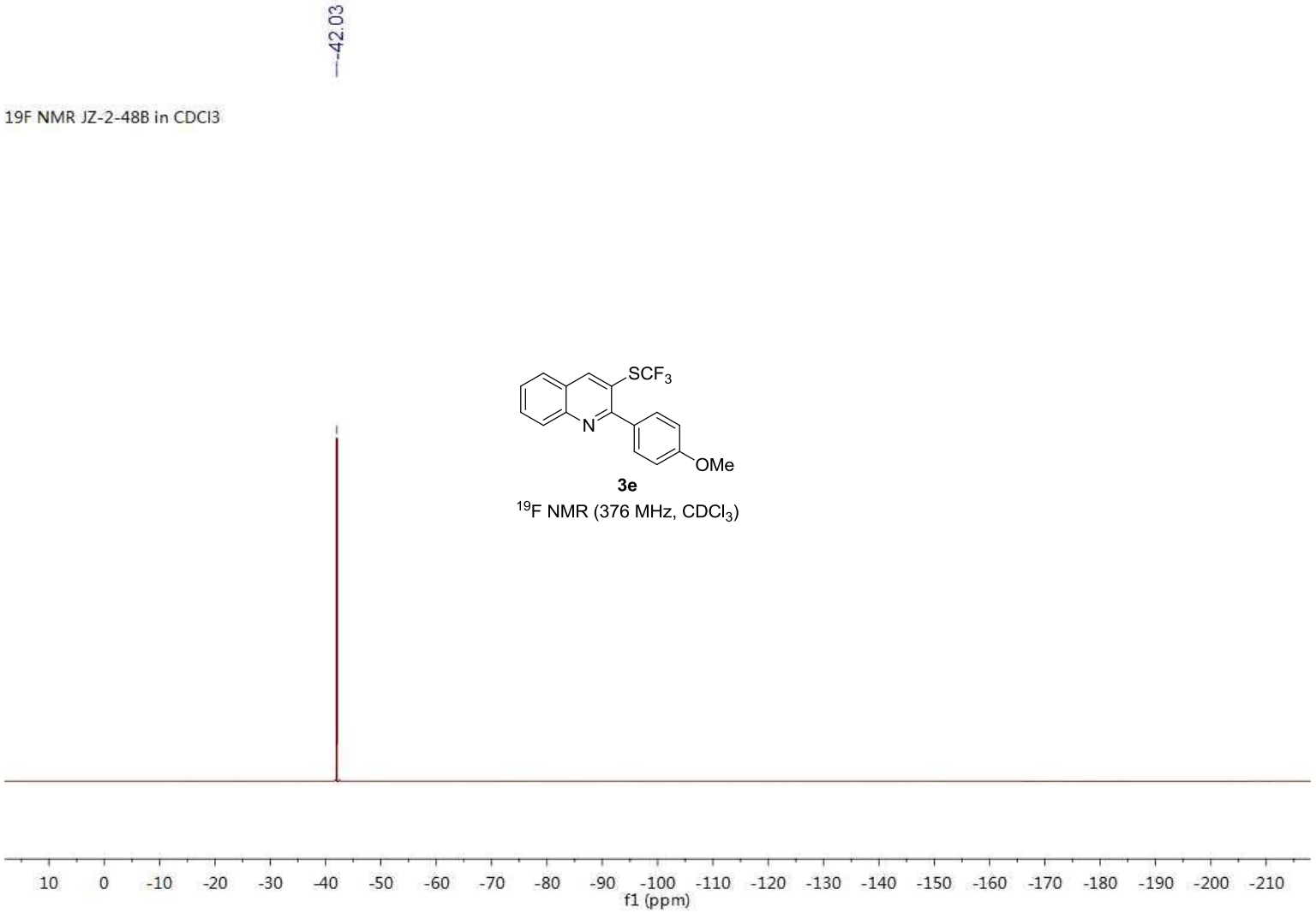


3d

^{19}F NMR (376 MHz, $CDCl_3$)

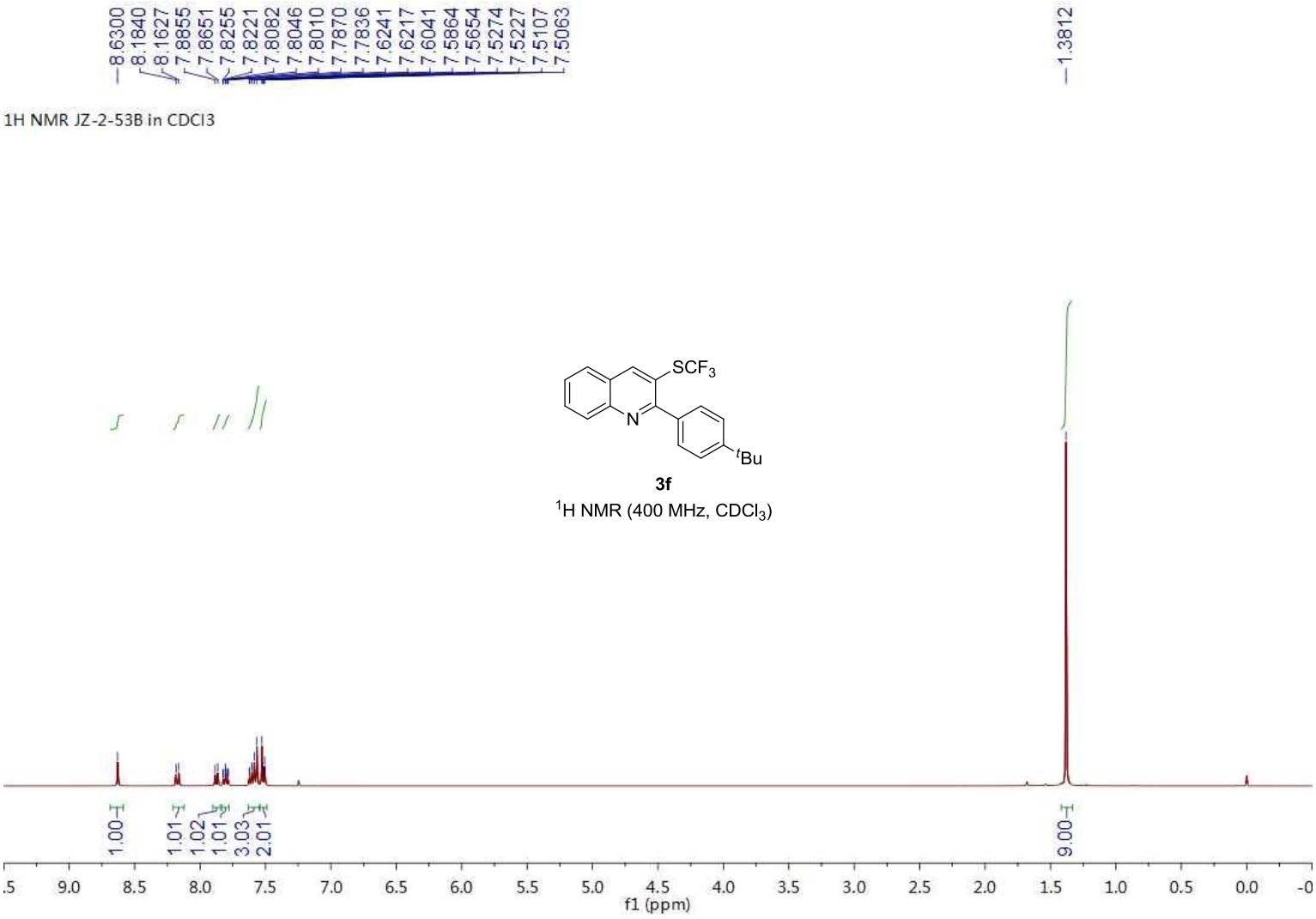

8.6344
8.1872
8.1659
7.8705
7.8186
7.6372
7.6323
7.6154
7.6057
7.0341
3.8918
1H NMR JZ-2-48B in CDCl3
SCF3
N
OMe
3e
1H NMR (400 MHz, CDCl3)
0.97
0.98
0.99
1.00
2.96
1.99
3.00
f1 (ppm)

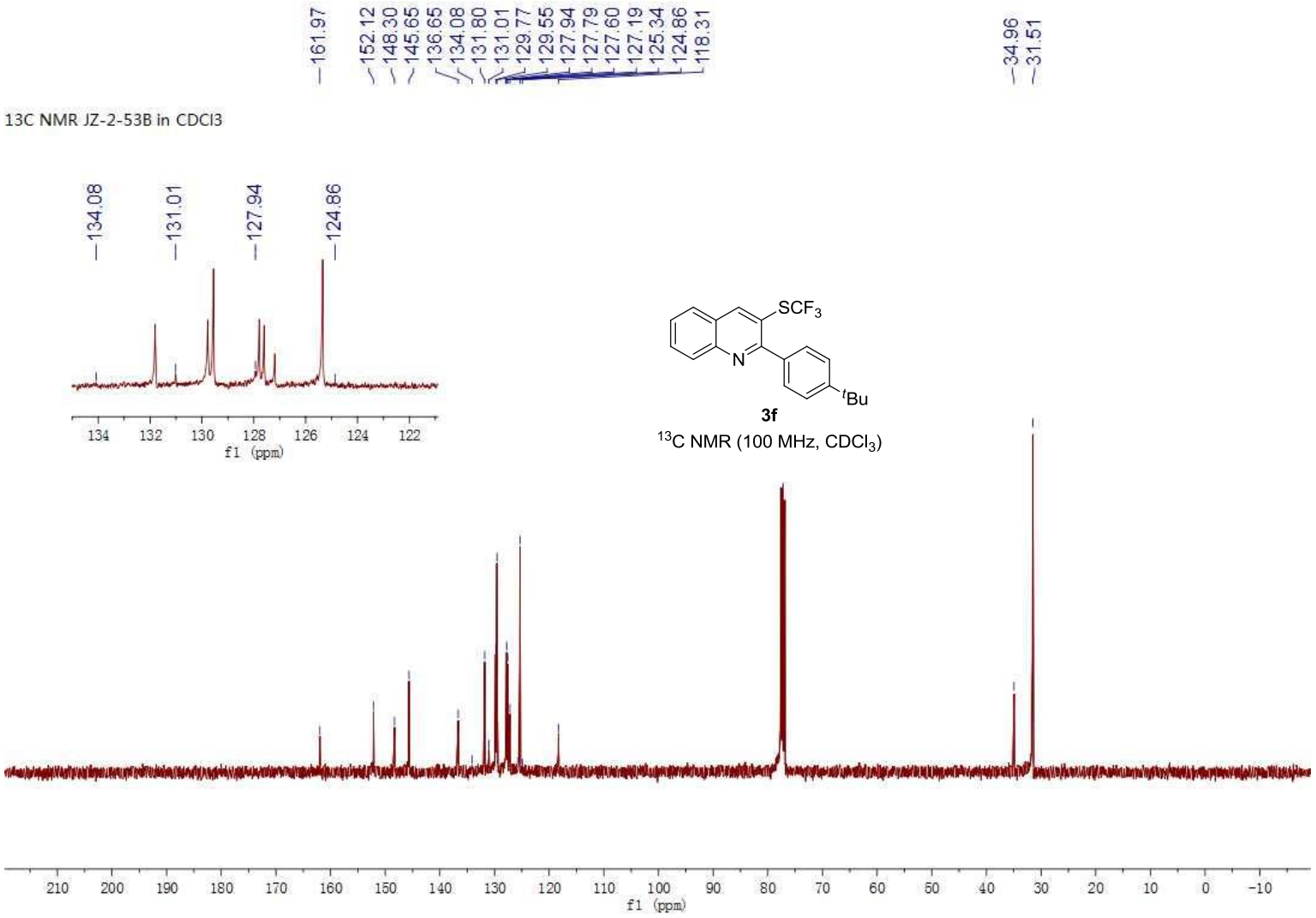

161.58
160.41
148.34
145.99
134.05
132.02
131.84
131.41
130.97
129.68
127.89
127.79
127.53
127.10
124.82
118.20
118.19
113.76
55.54
13C NMR JZ-2-48B in CDCl3
134.05
130.97
127.89
124.82
134
132
130
128
126
124
f1 (ppm)
SCF3
N
OMe
3e
13C NMR (100 MHz, CDCl3)
118.20
118.19
118.25
118.15
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

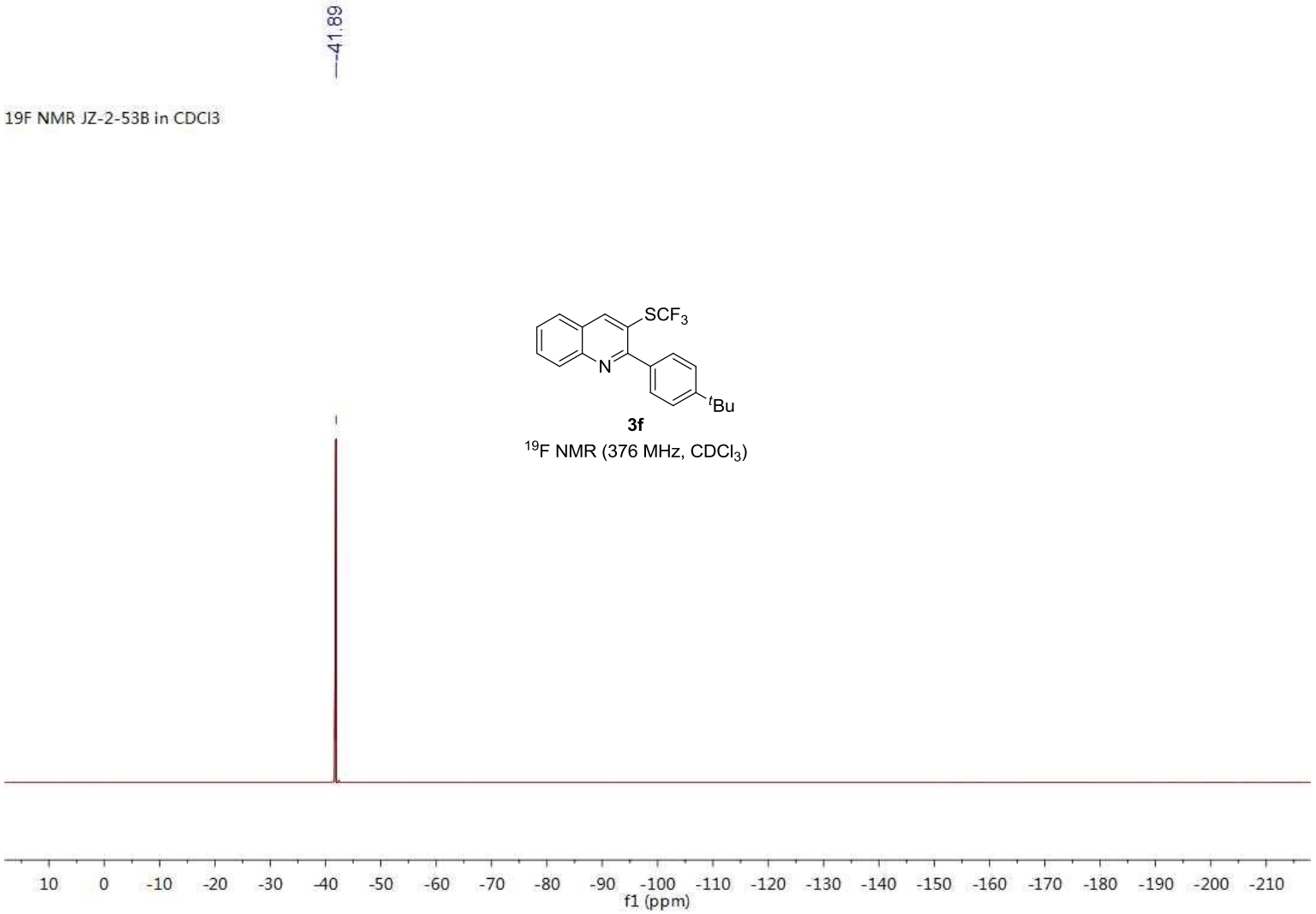


3e

^{19}F NMR (376 MHz, $CDCl_3$)

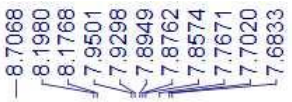

8.6300
8.1840
8.1627
7.8855
7.8651
7.8255
7.8221
7.8082
7.8046
7.8010
7.7870
7.7836
7.6241
7.6217
7.6041
7.5864
7.5654
7.5274
7.5227
7.5107
7.5063
1.3812
1H NMR JZ-2-53B in CDCl3
SCF3
N
tBu
3f
1H NMR (400 MHz, CDCl3)
1.00
1.01
1.02
1.01
3.03
2.01
9.00
f1 (ppm)


161.97
152.12
148.30
145.65
136.65
134.08
131.80
131.01
129.77
129.55
127.94
127.79
127.60
127.19
125.34
124.86
118.31
34.96
31.51
13C NMR JZ-2-53B in CDCl3
134.08
131.01
127.94
124.86
134
132
130
128
126
124
122
f1 (ppm)
SCF3
N
tBu
3f
13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)

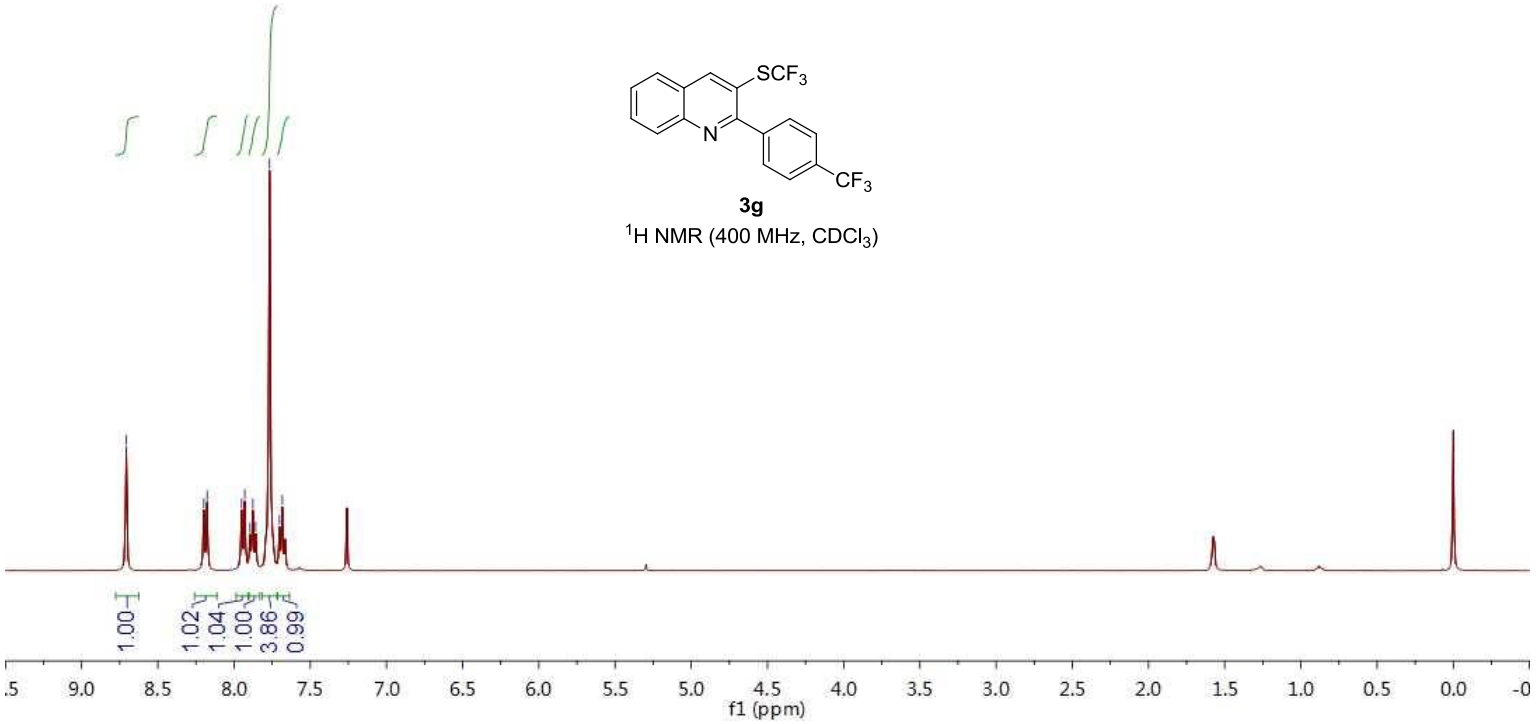


3f

^{19}F NMR (376 MHz, $CDCl_3$)

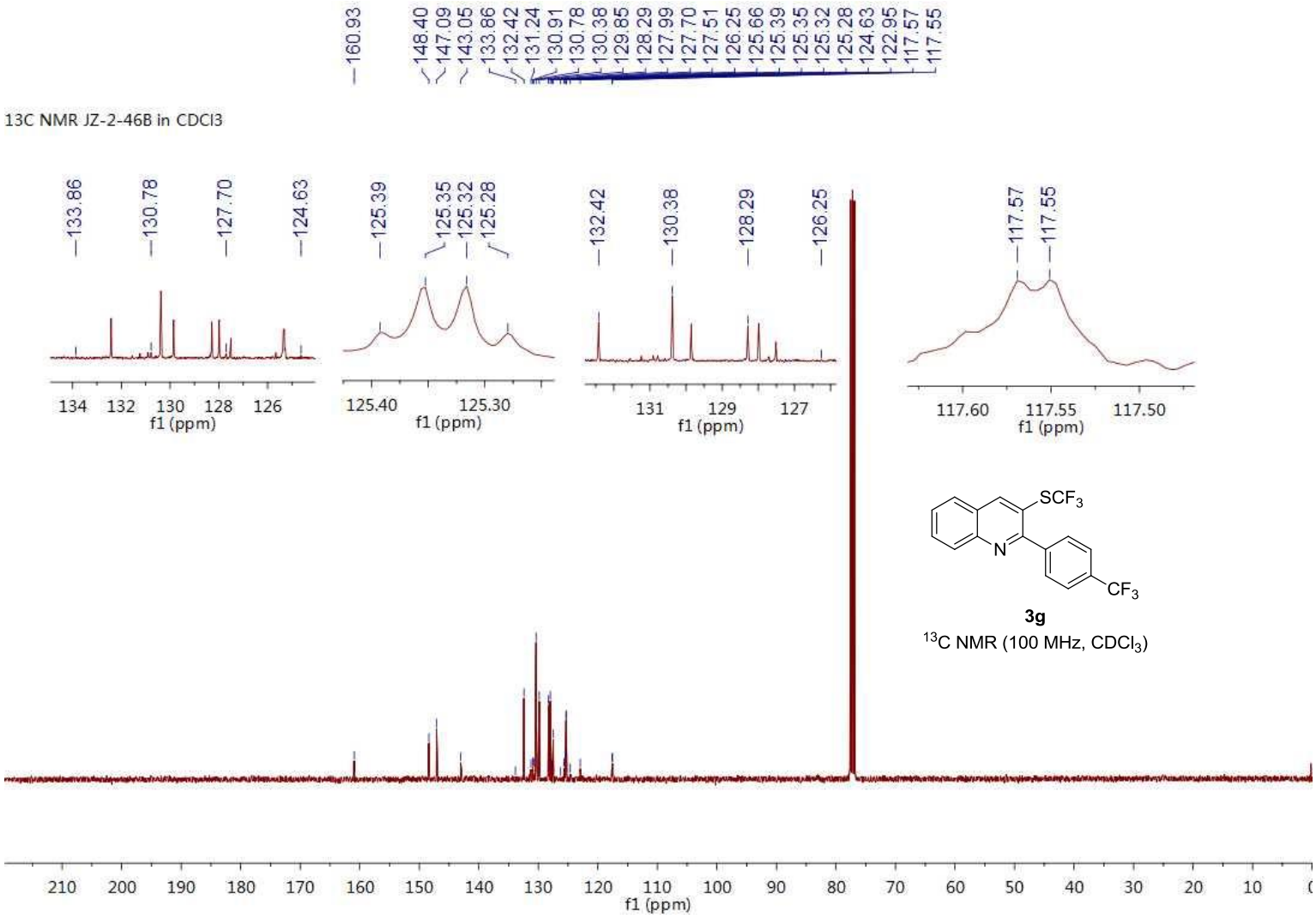


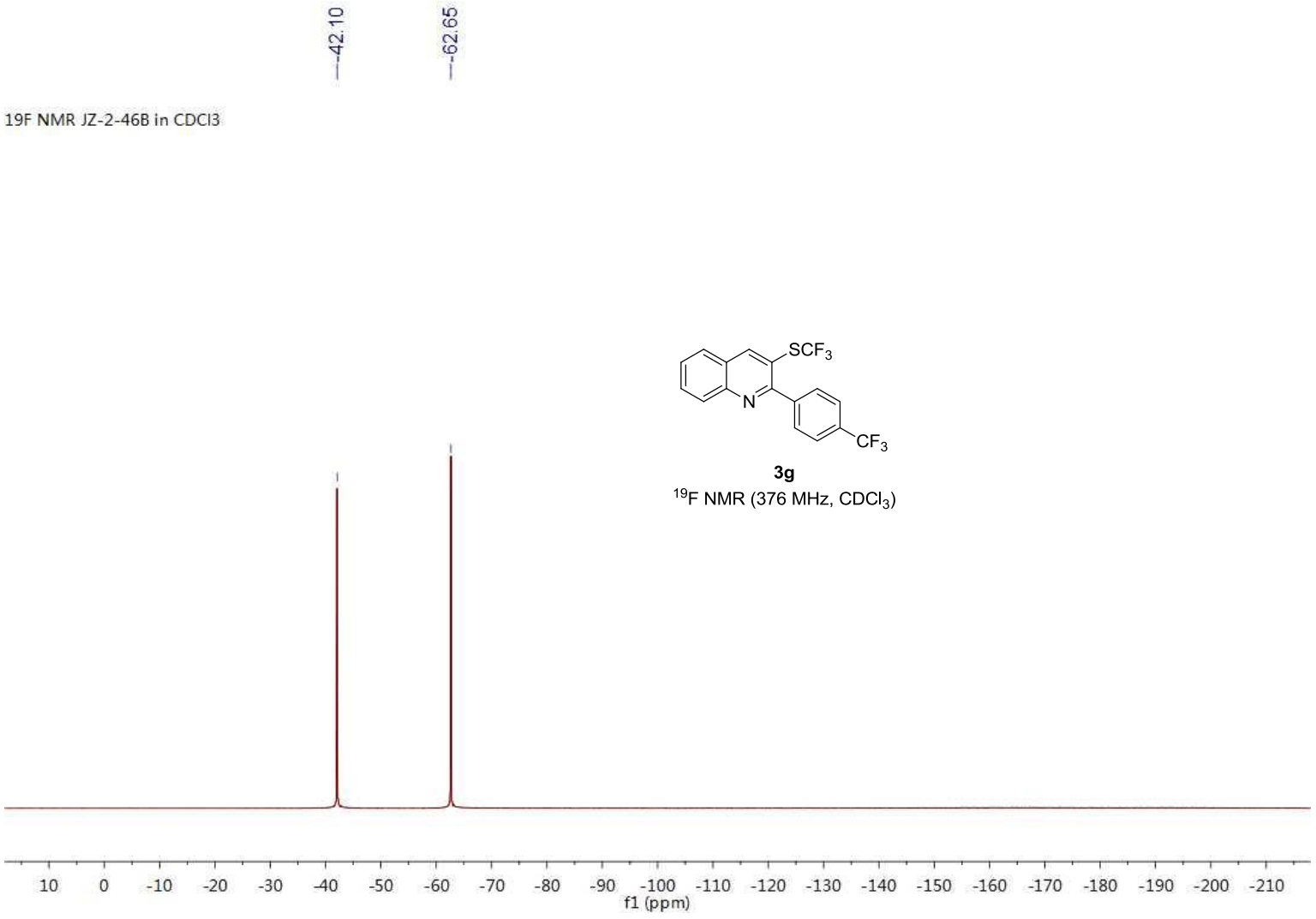
1H NMR JZ-2-46B in CDCl3



3g

^{1}H NMR (400 MHz, $CDCl_3$)

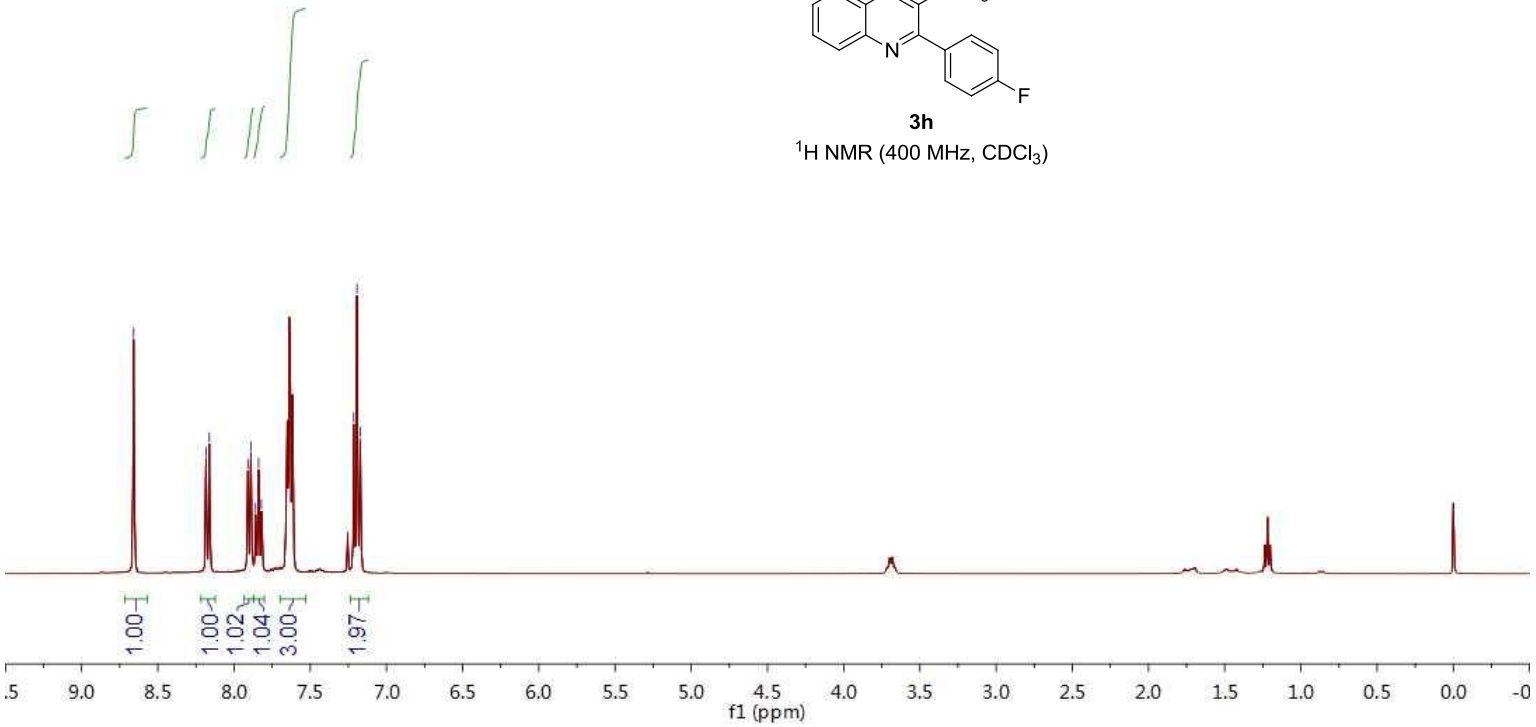

160.93
148.40
147.09
143.05
133.86
132.42
131.24
130.91
130.78
130.38
129.85
128.29
127.99
127.70
127.51
126.25
125.66
125.39
125.35
125.32
125.28
124.63
122.95
117.57
117.55
13C NMR JZ-2-46B in CDCl3
133.86
130.78
127.70
124.63
125.39
125.35
125.32
125.28
132.42
130.38
128.29
126.25
117.57
117.55
134 132 130 128 126
f1 (ppm)
125.40 125.30
f1 (ppm)
131 129 127
f1 (ppm)
117.60 117.55 117.50
f1 (ppm)
SCF3
N
CF3
3g
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)



3g

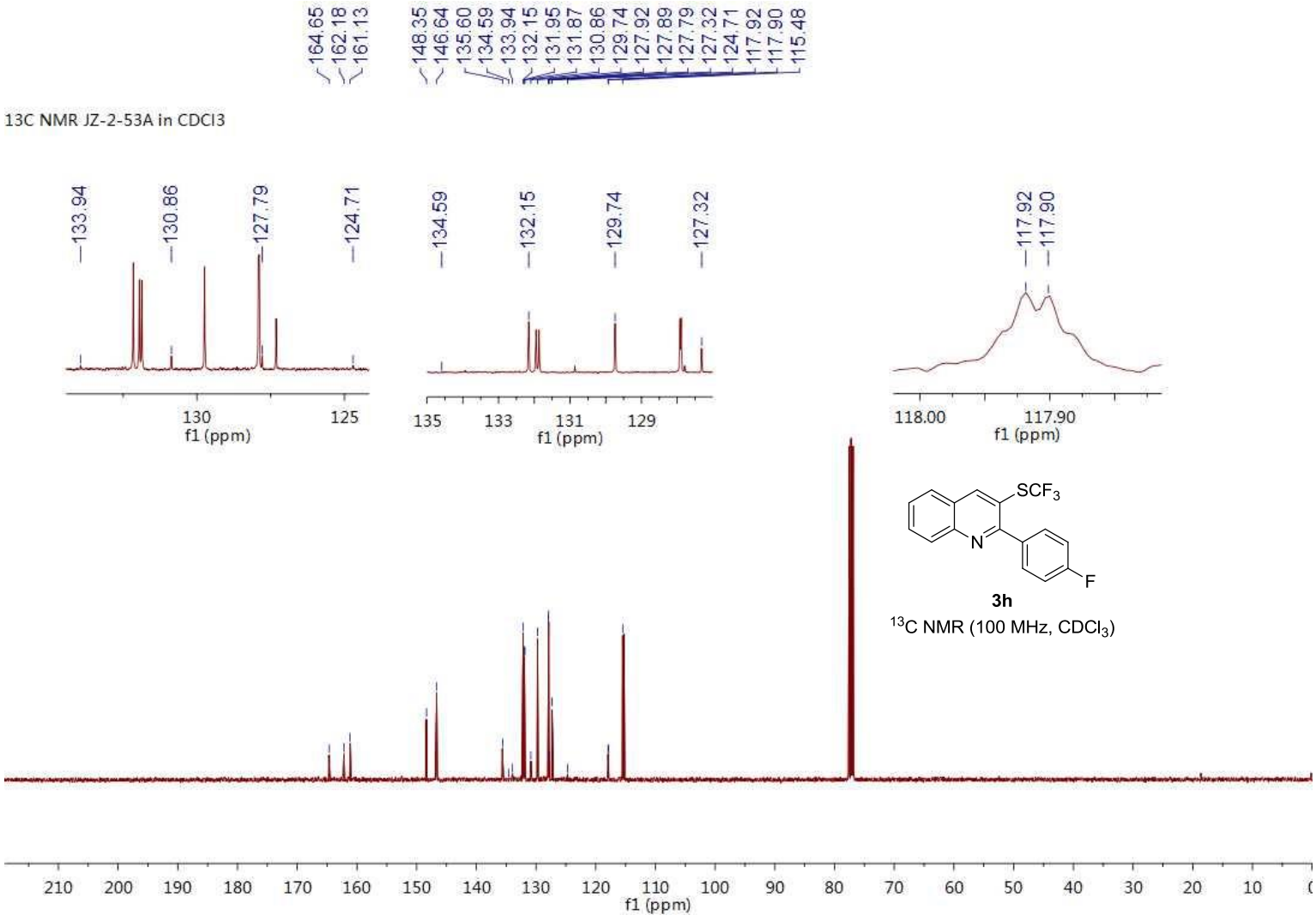
^{19}F NMR (376 MHz, $CDCl_3$)

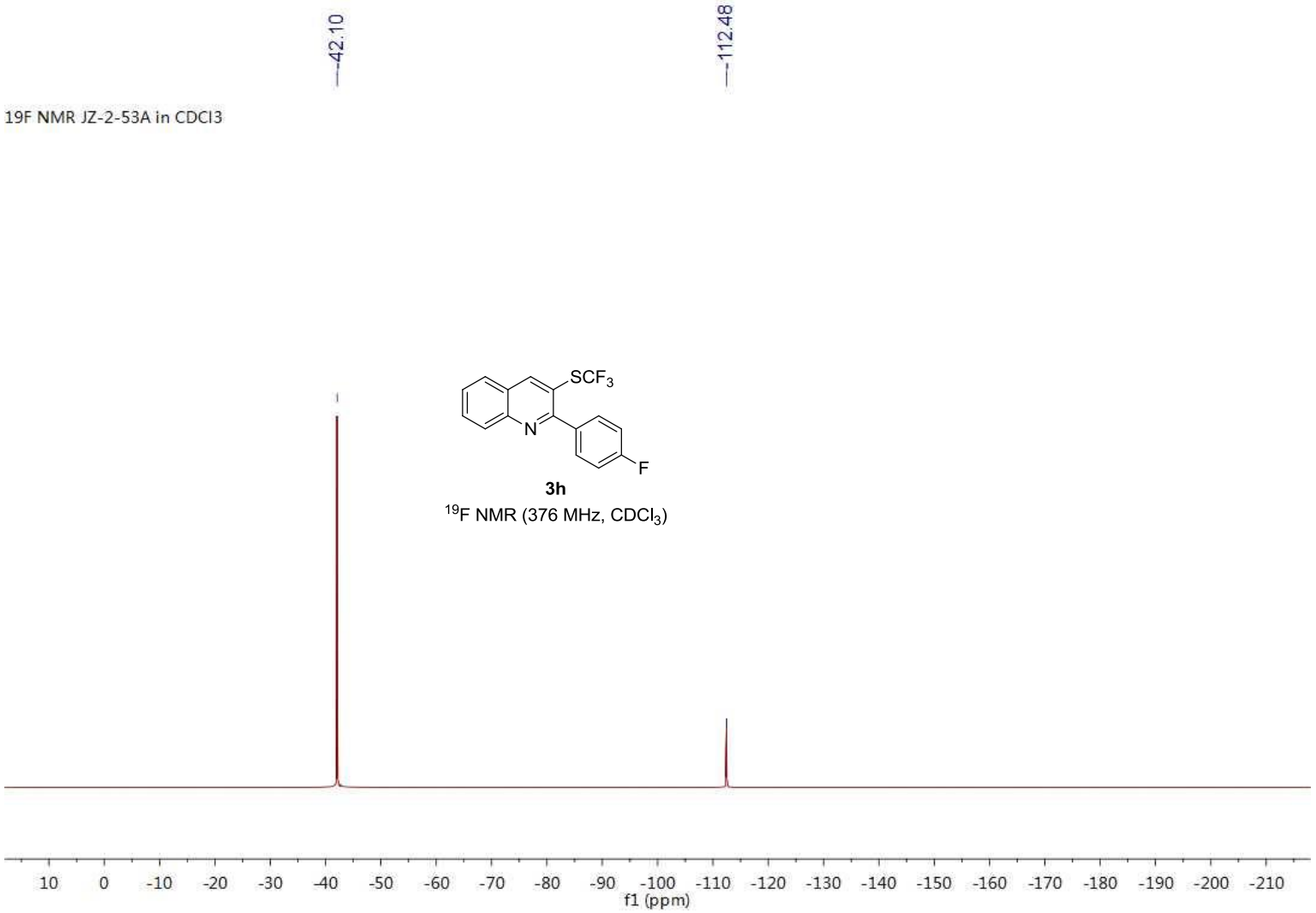
1H NMR JZ-2-53A in CDCl3



3h

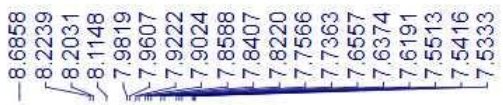
^{1}H NMR (400 MHz, $CDCl_3$)


164.65
162.18
161.13
148.35
146.64
135.60
134.59
133.94
132.15
131.95
131.87
130.86
129.74
127.92
127.89
127.79
127.32
124.71
117.92
117.90
115.48
13C NMR JZ-2-53A in CDCl3
133.94
130.86
127.79
124.71
130
125
f1 (ppm)
134.59
132.15
129.74
127.32
135
133
131
129
f1 (ppm)
117.92
117.90
118.00
117.90
f1 (ppm)
SCF3
N
F
3h
13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

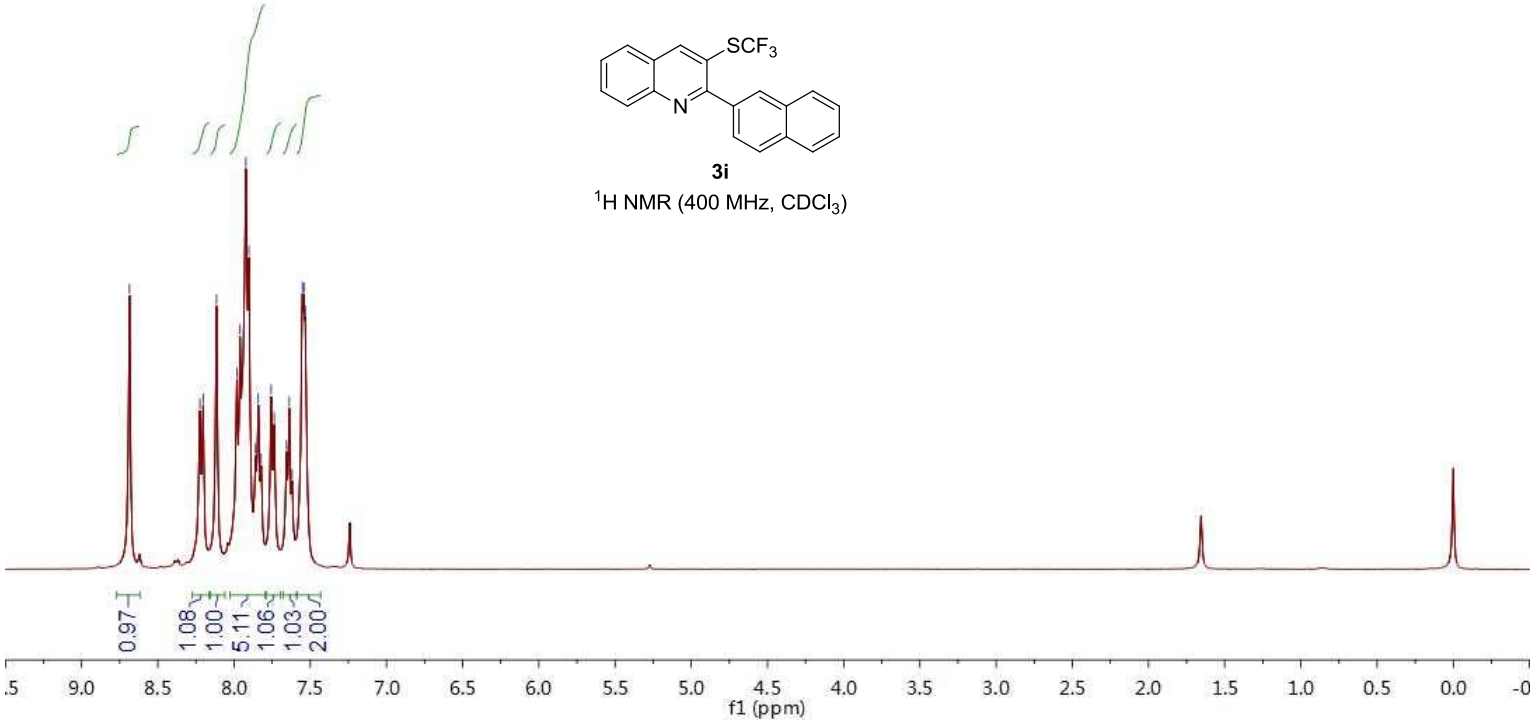


3h

^{19}F NMR (376 MHz, $CDCl_3$)

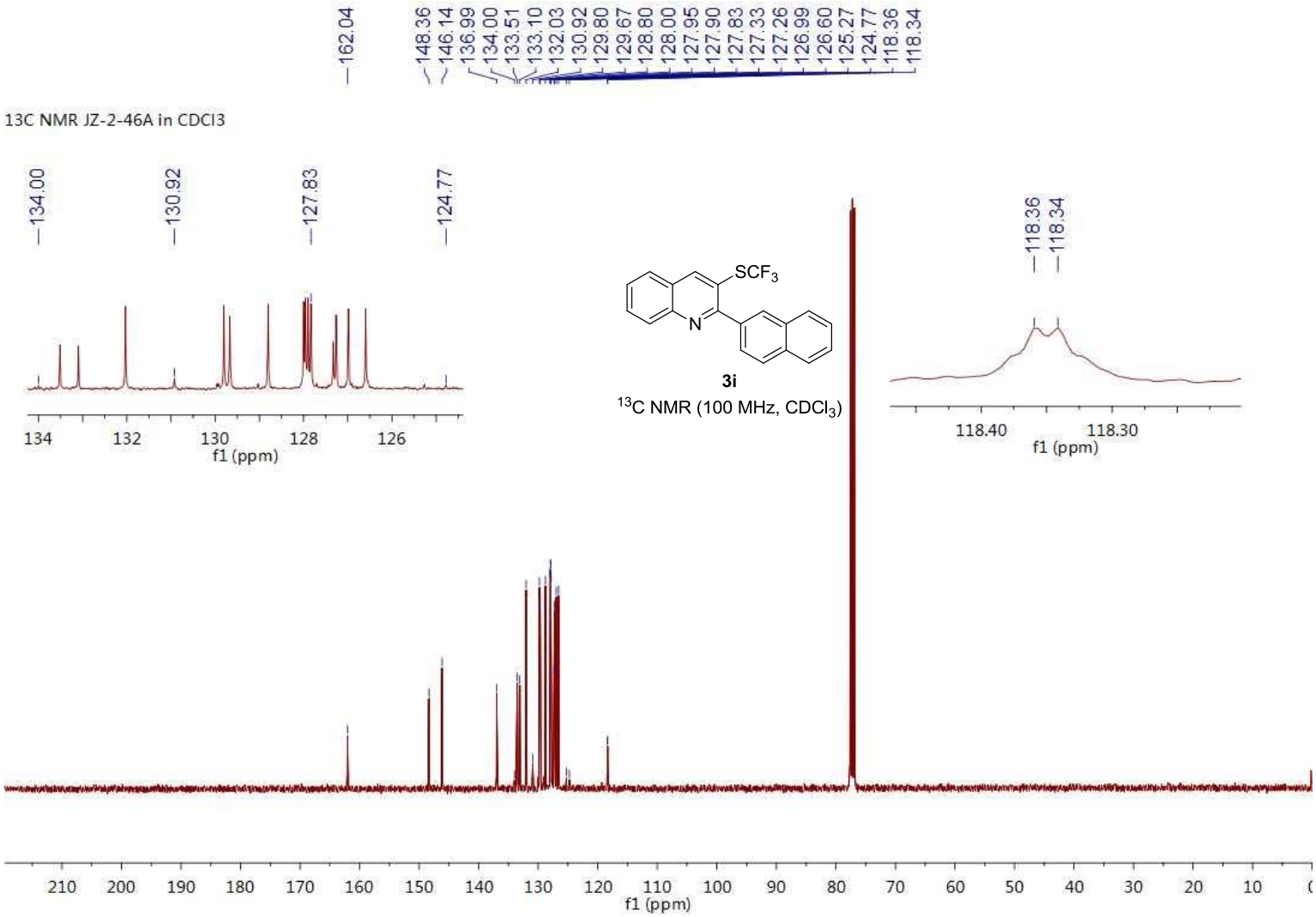


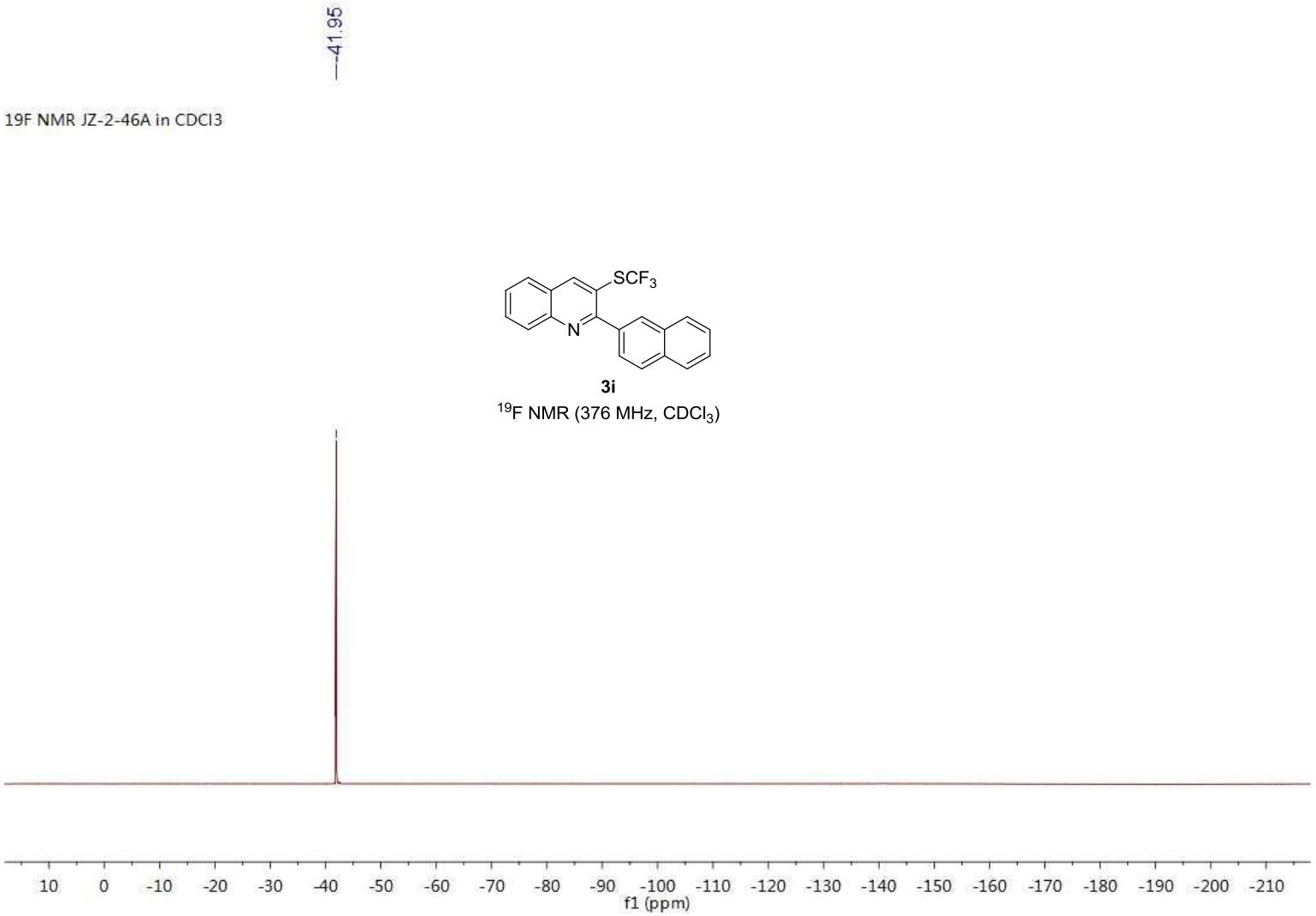
1H NMR JZ-2-46A in CDCl3



3i

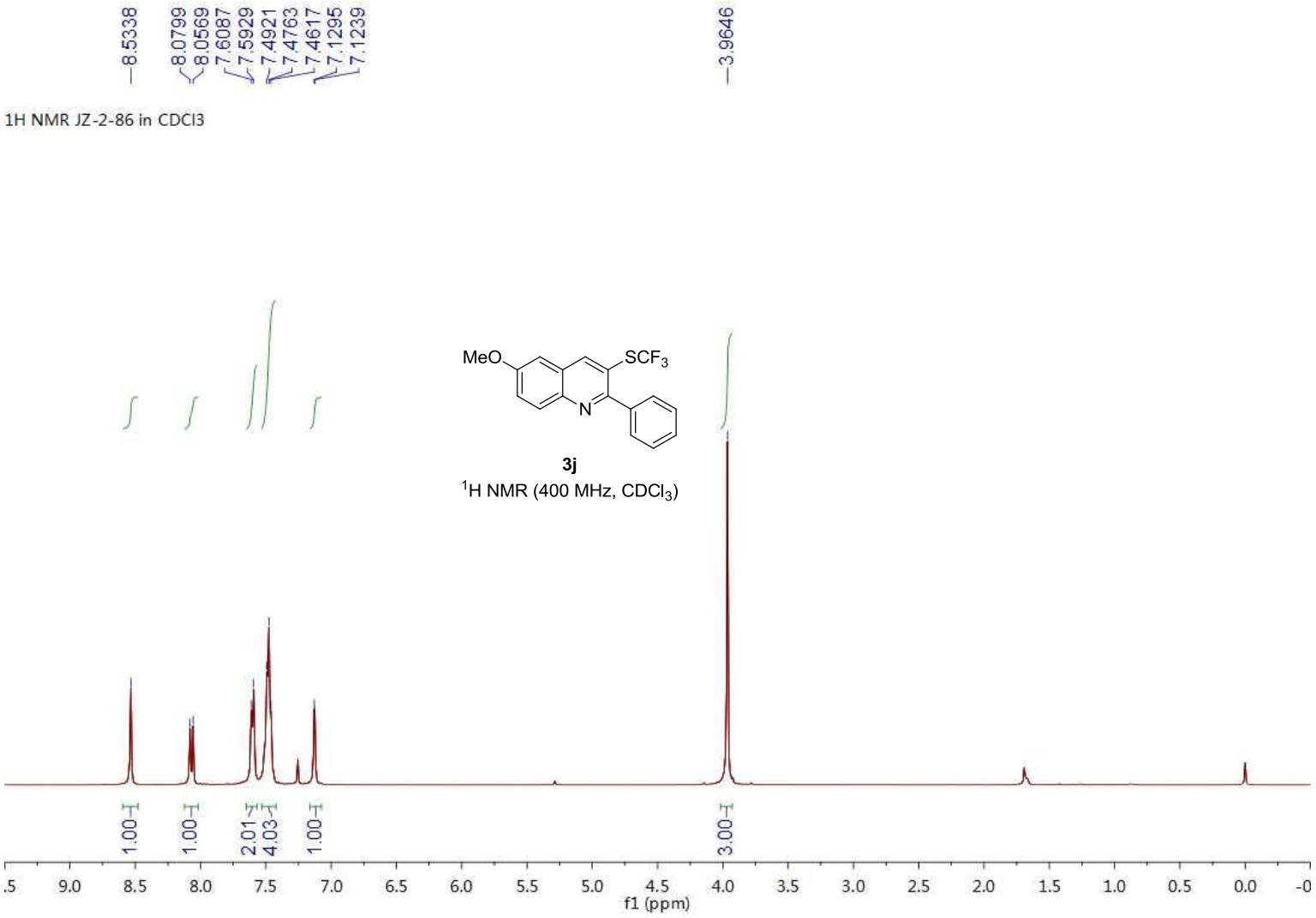
^{1}H NMR (400 MHz, $CDCl_3$)

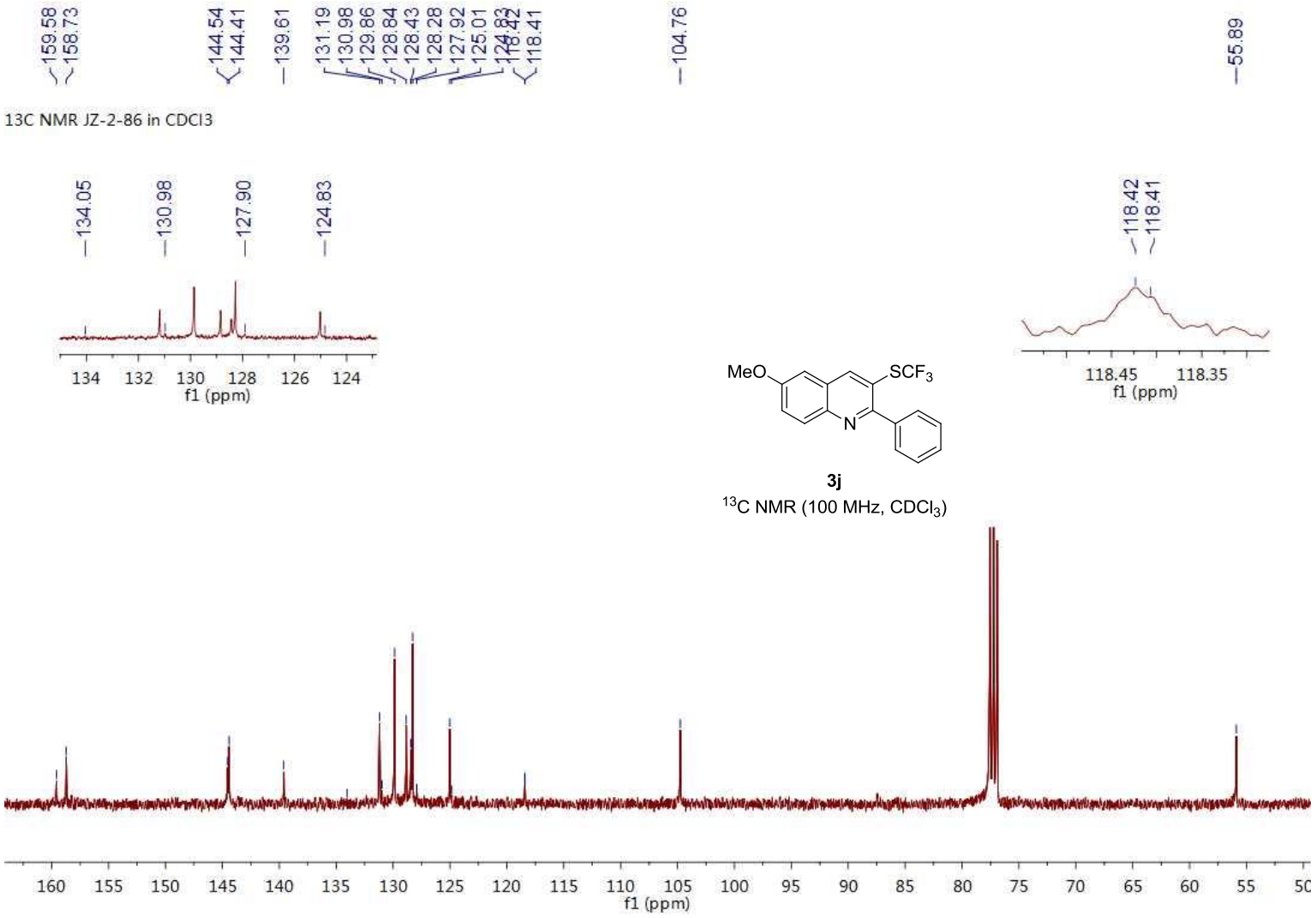

13C NMR JZ-2-46A in CDCl3
162.04
148.36
146.14
136.99
134.00
133.51
133.10
132.03
130.92
129.80
129.67
128.80
128.00
127.95
127.90
127.83
127.33
127.26
126.99
126.60
125.27
124.77
118.36
118.34
134.00
130.92
127.83
124.77
134
132
130
128
126
f1 (ppm)
SCF3
N
3i
13C NMR (100 MHz, CDCl3)
118.36
118.34
118.40
118.30
f1 (ppm)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

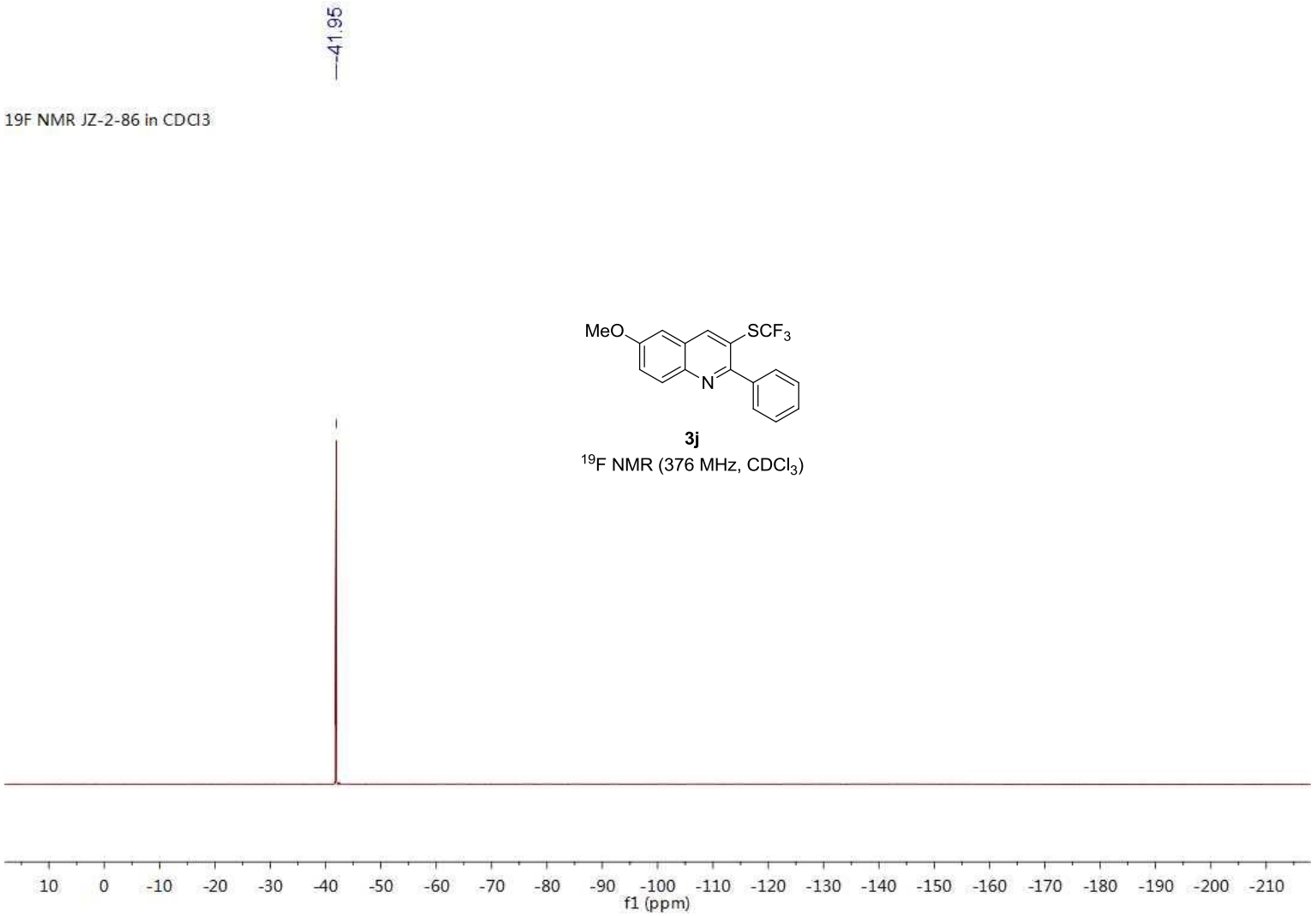


3i

^{19}F NMR (376 MHz, $CDCl_3$)

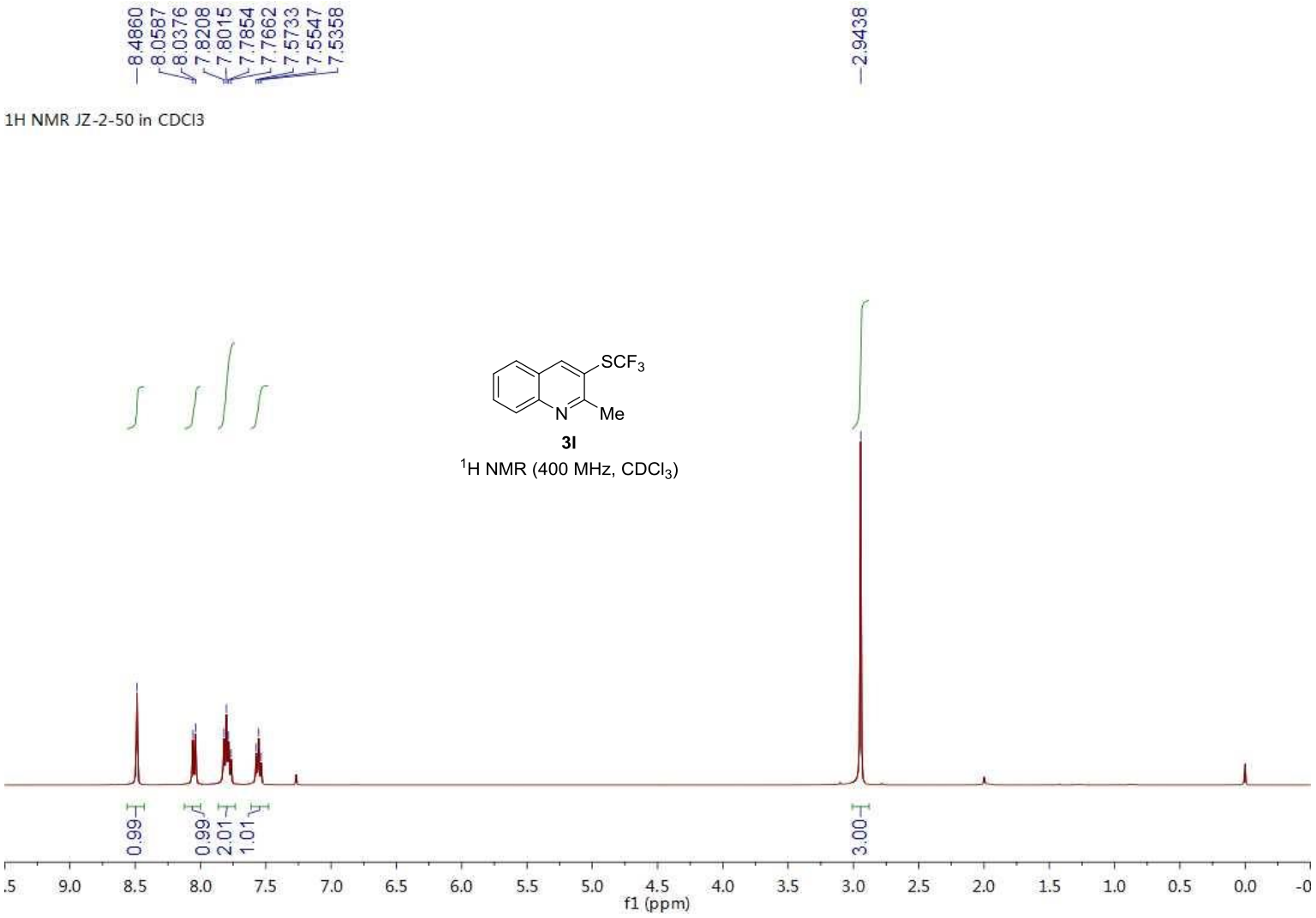

8.5338
8.0799
8.0569
7.6087
7.5929
7.4921
7.4763
7.4617
7.1295
7.1239
3.9646
1H NMR JZ-2-86 in CDCl3
MeO
SCF3
N
3j
1H NMR (400 MHz, CDCl3)
1.00
1.00
2.01
4.03
1.00
3.00
f1 (ppm)


159.58
158.73
144.54
144.41
139.61
131.19
130.98
129.86
128.84
128.43
128.28
127.92
125.01
124.83
118.42
118.41
104.76
55.89
13C NMR JZ-2-86 in CDCl3
134.05
130.98
127.90
124.83
134 132 130 128 126 124
f1 (ppm)
118.42
118.41
118.45 118.35
f1 (ppm)
MeO
SCF3
N
3j
13C NMR (100 MHz, CDCl3)
160 155 150 145 140 135 130 125 120 115 110 105 100 95 90 85 80 75 70 65 60 55 50
f1 (ppm)



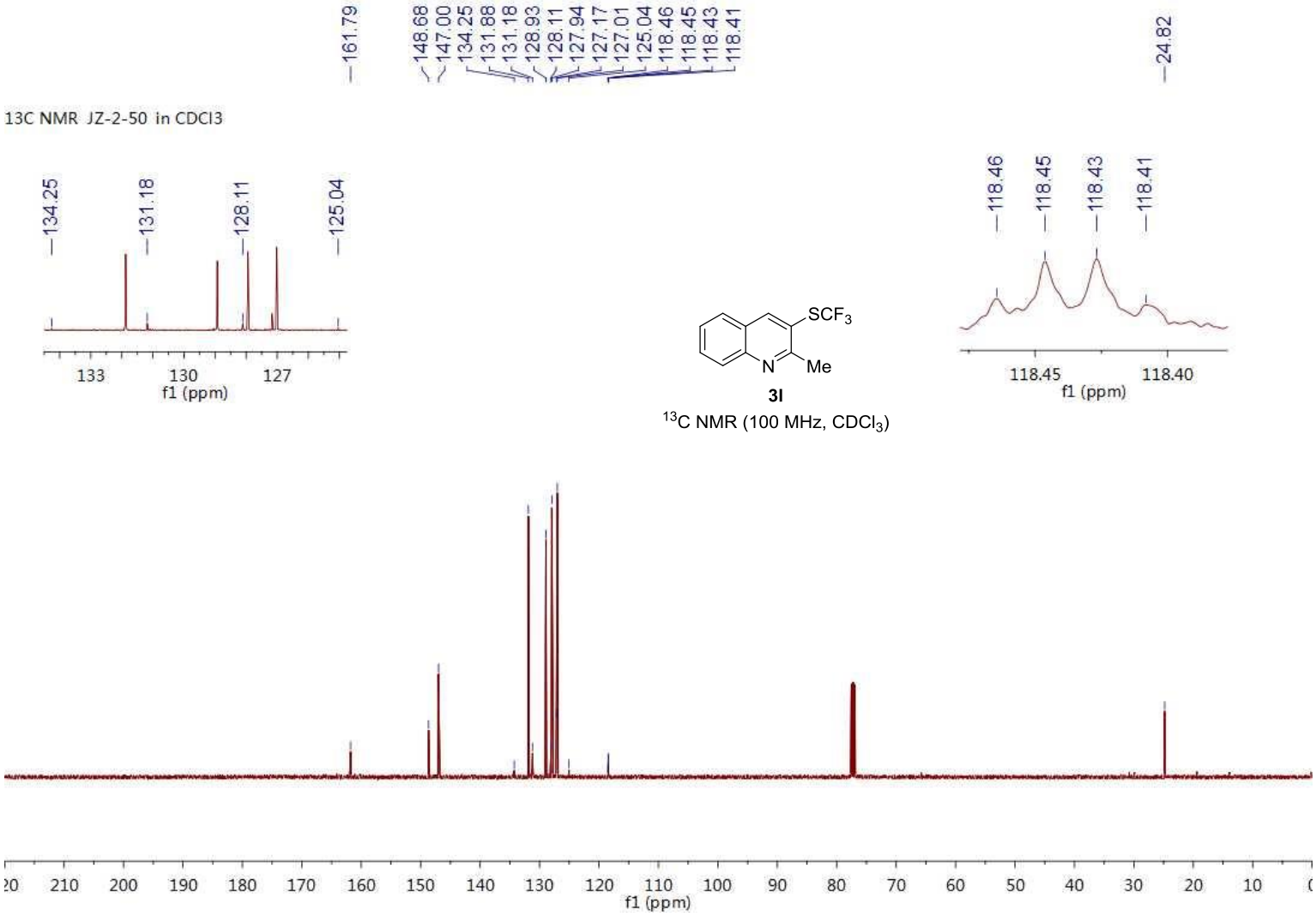
3j

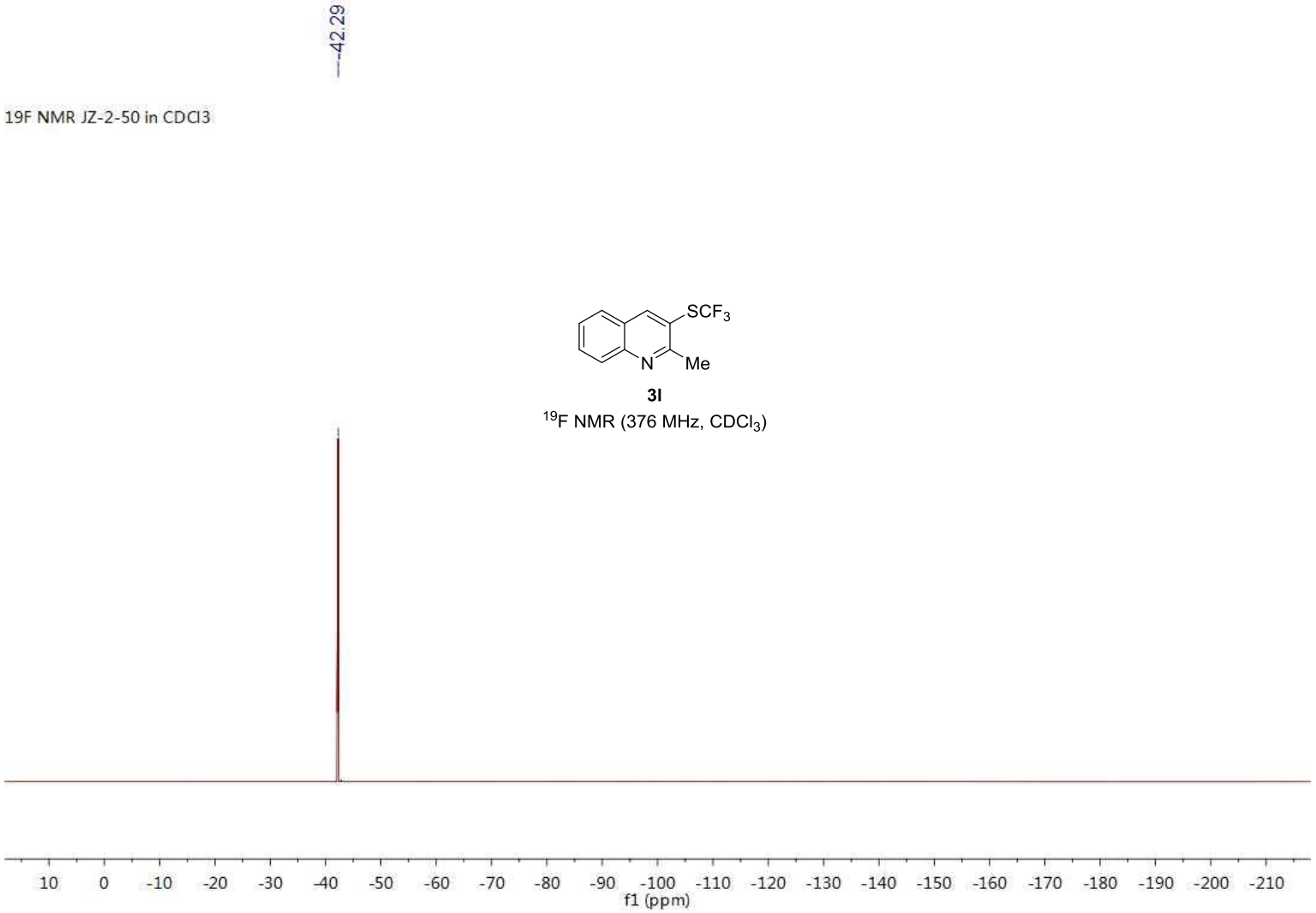
^{19}F NMR (376 MHz, $CDCl_3$)



3l

^{1}H NMR (400 MHz, $CDCl_3$)

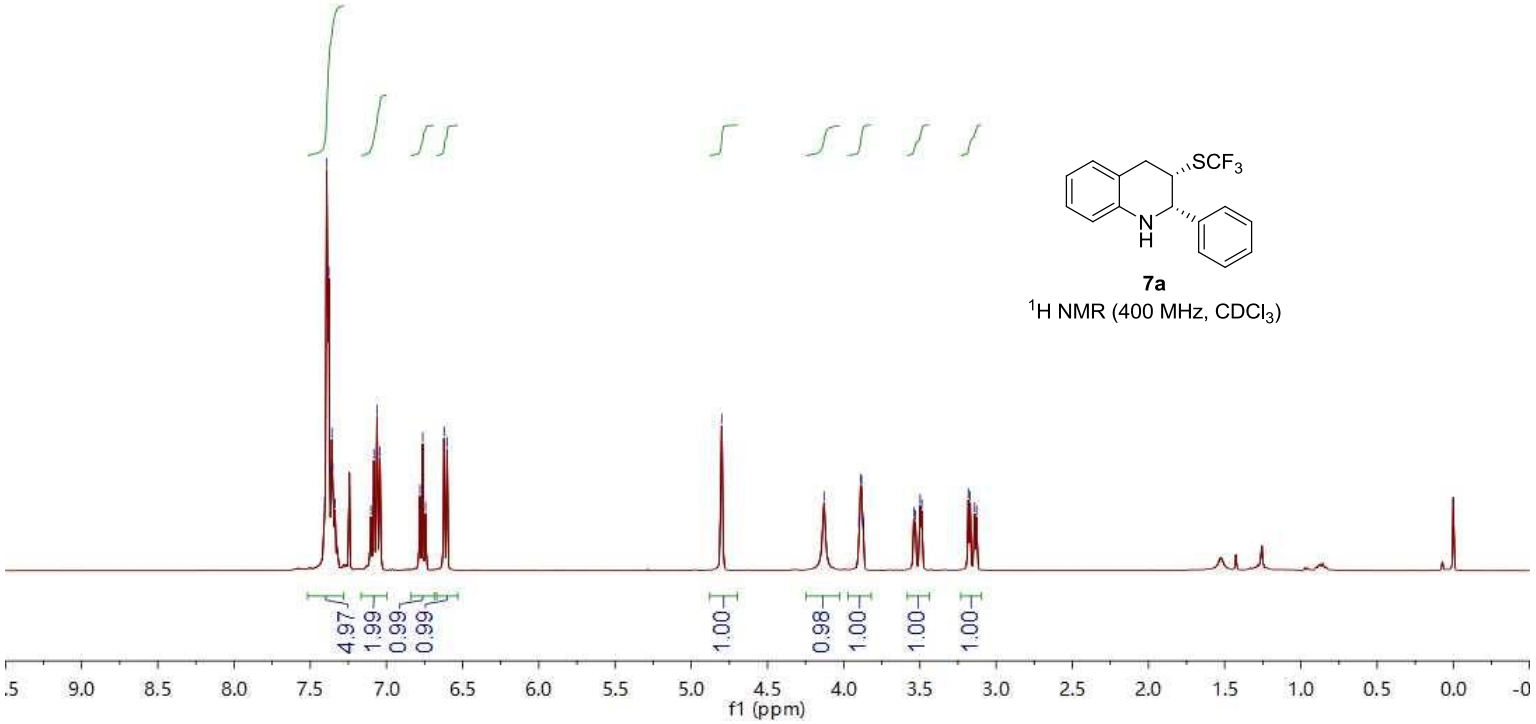

161.79
148.68
147.00
134.25
131.88
131.18
128.93
128.11
127.94
127.17
127.01
125.04
118.46
118.45
118.43
118.41
24.82
13C NMR JZ-2-50 in CDCl3
134.25
131.18
128.11
125.04
133
130
127
f1 (ppm)
SCF3
N
Me
3l
118.46
118.45
118.43
118.41
118.45
118.40
f1 (ppm)
13C NMR (100 MHz, CDCl3)
f1 (ppm)



3l

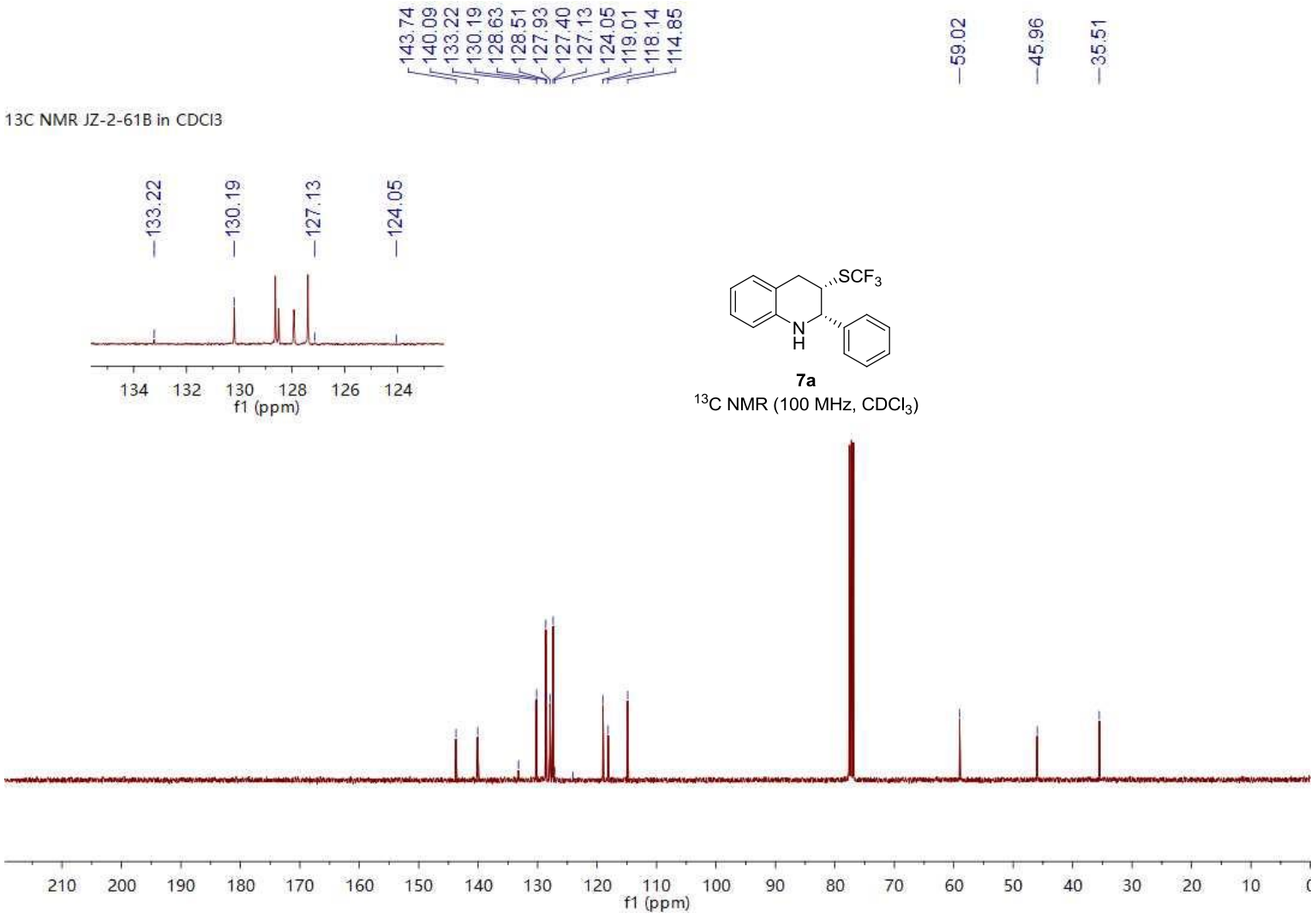
^{19}F NMR (376 MHz, $CDCl_3$)

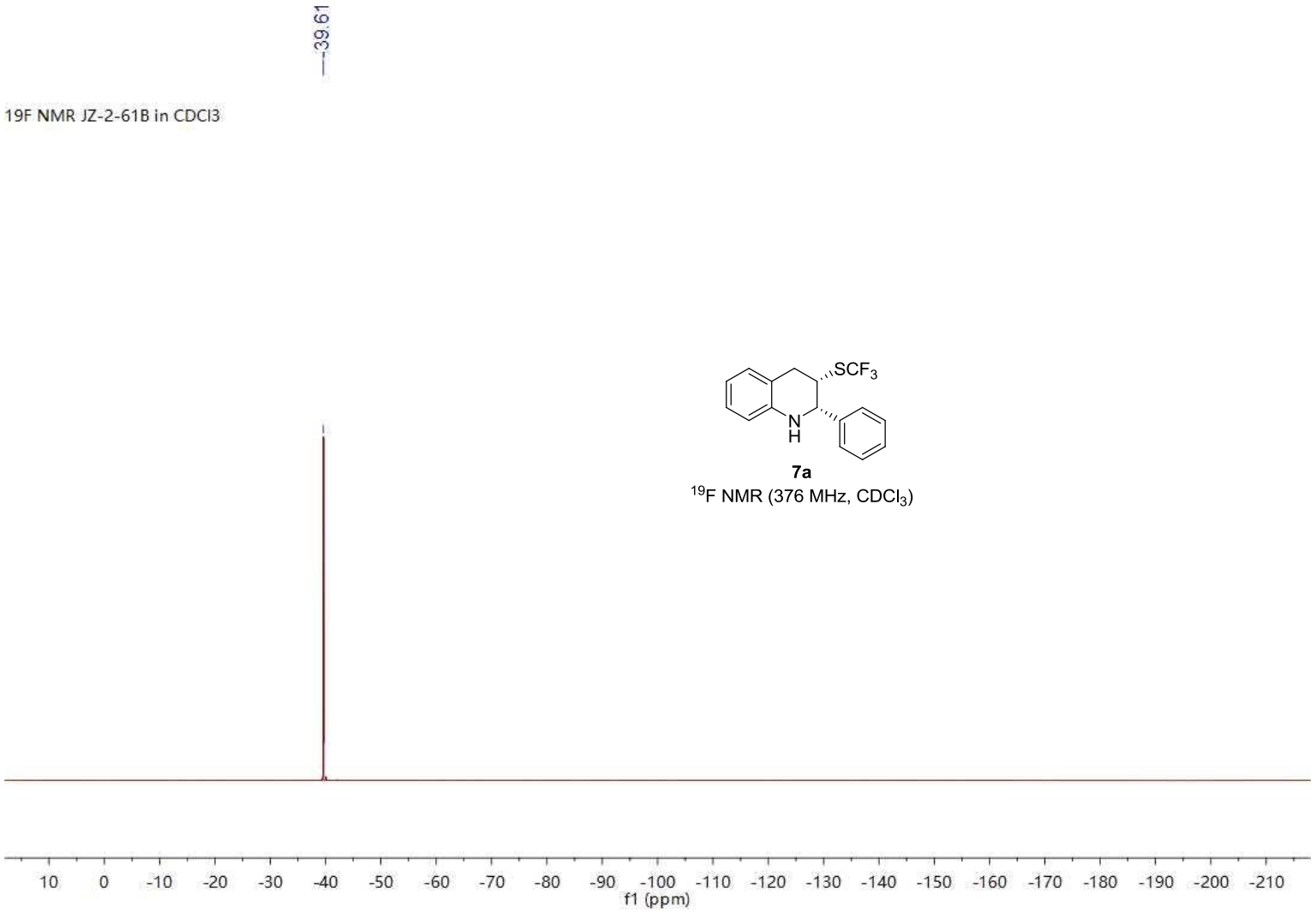
1H NMR JZ-2-61B in CDCl3



7a

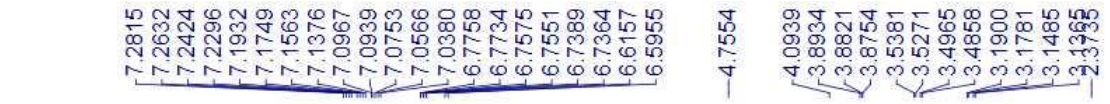
^{1}H NMR (400 MHz, $CDCl_3$)


143.74
140.09
133.22
130.19
128.63
128.51
127.93
127.40
127.13
124.05
119.01
118.14
114.85
59.02
45.96
35.51
13C NMR JZ-2-61B in CDCl3
133.22
130.19
127.13
124.05
134 132 130 128 126 124
f1 (ppm)
SCF3
N
H
7a
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

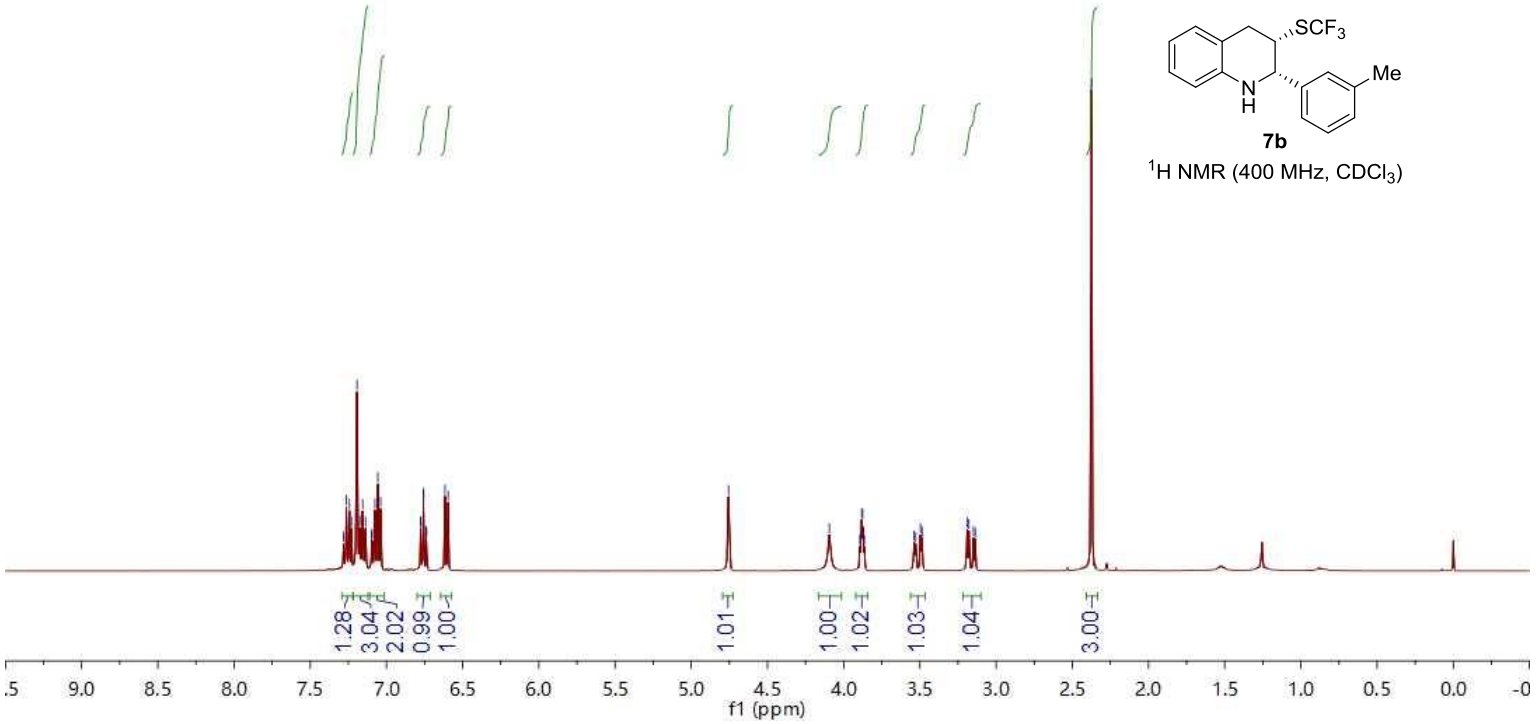


7a

^{19}F NMR (376 MHz, $CDCl_3$)

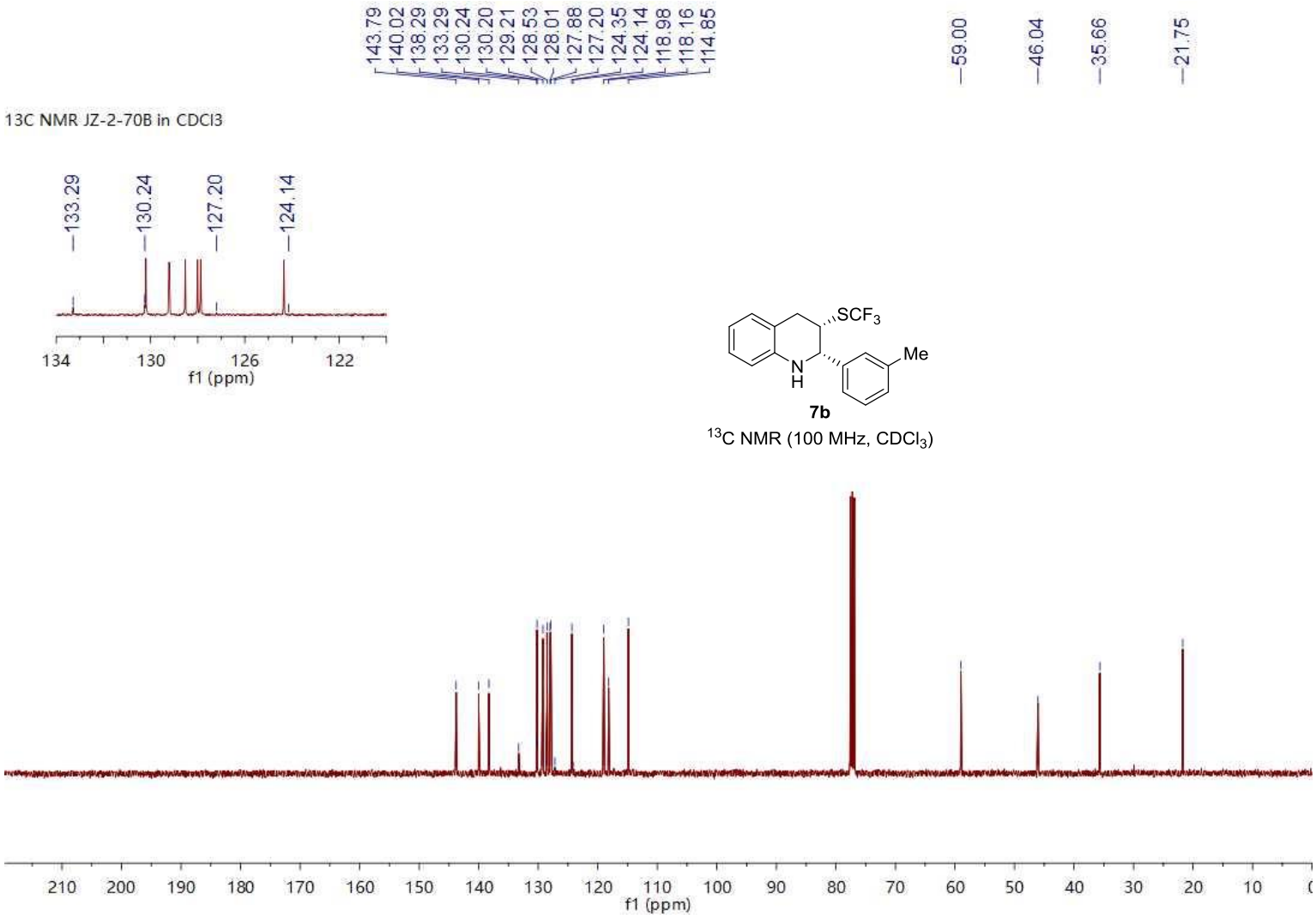


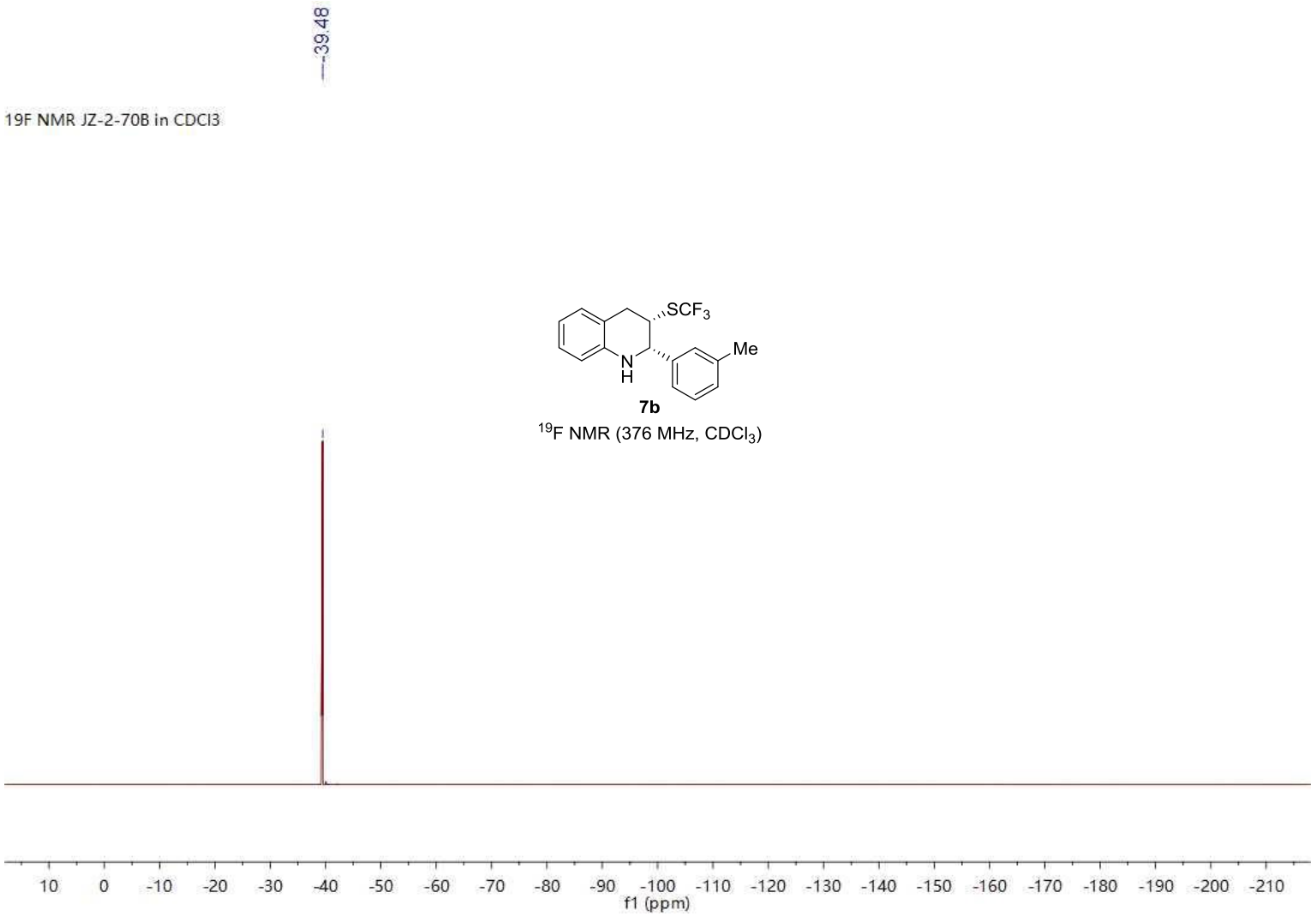
1H NMR JZ-2-70B in CDCl3



7b

^{1}H NMR (400 MHz, $CDCl_3$)

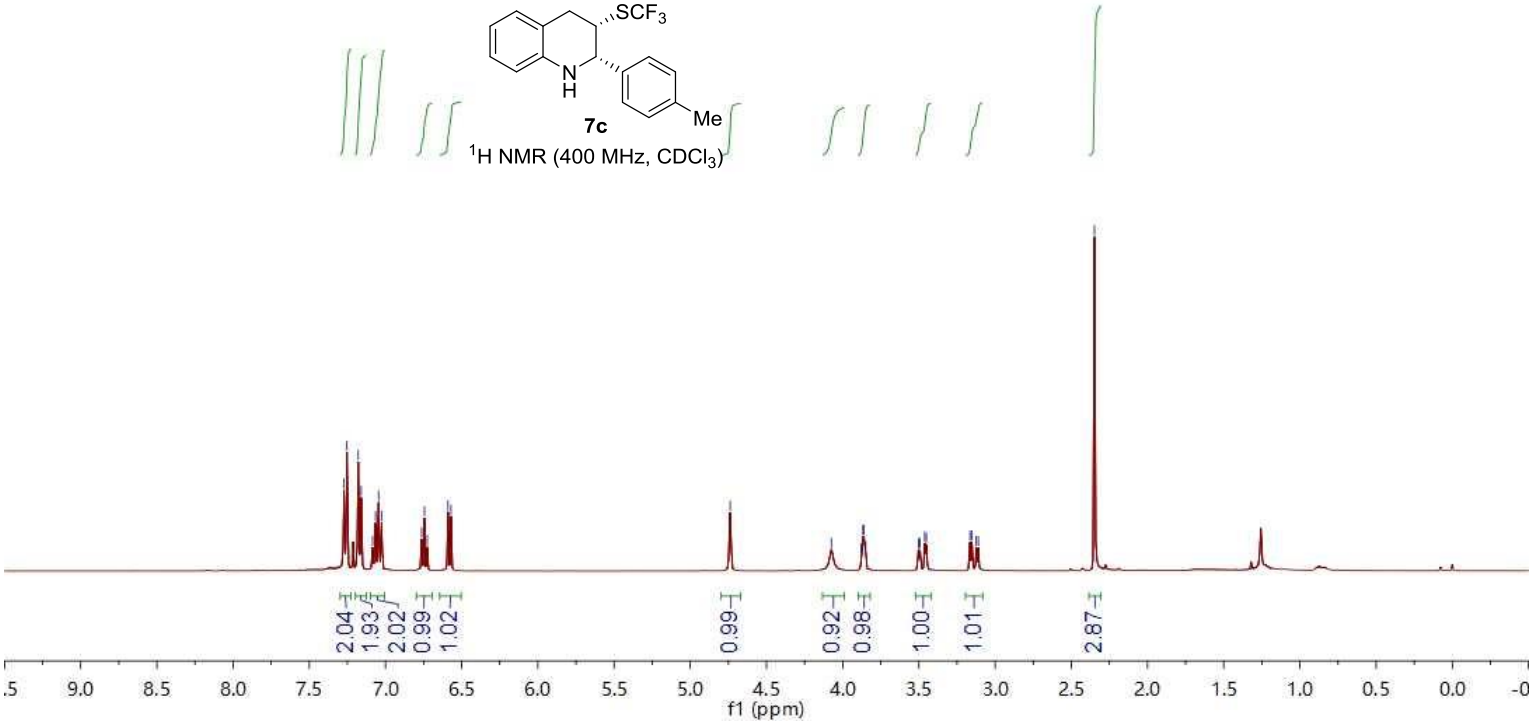

143.79
140.02
138.29
133.29
130.24
130.20
129.21
128.53
128.01
127.88
127.20
124.35
124.14
118.98
118.16
114.85
59.00
46.04
35.66
21.75
13C NMR JZ-2-70B in CDCl3
133.29
130.24
127.20
124.14
134
130
126
122
f1 (ppm)
SCF3
Me
N
H
7b
13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

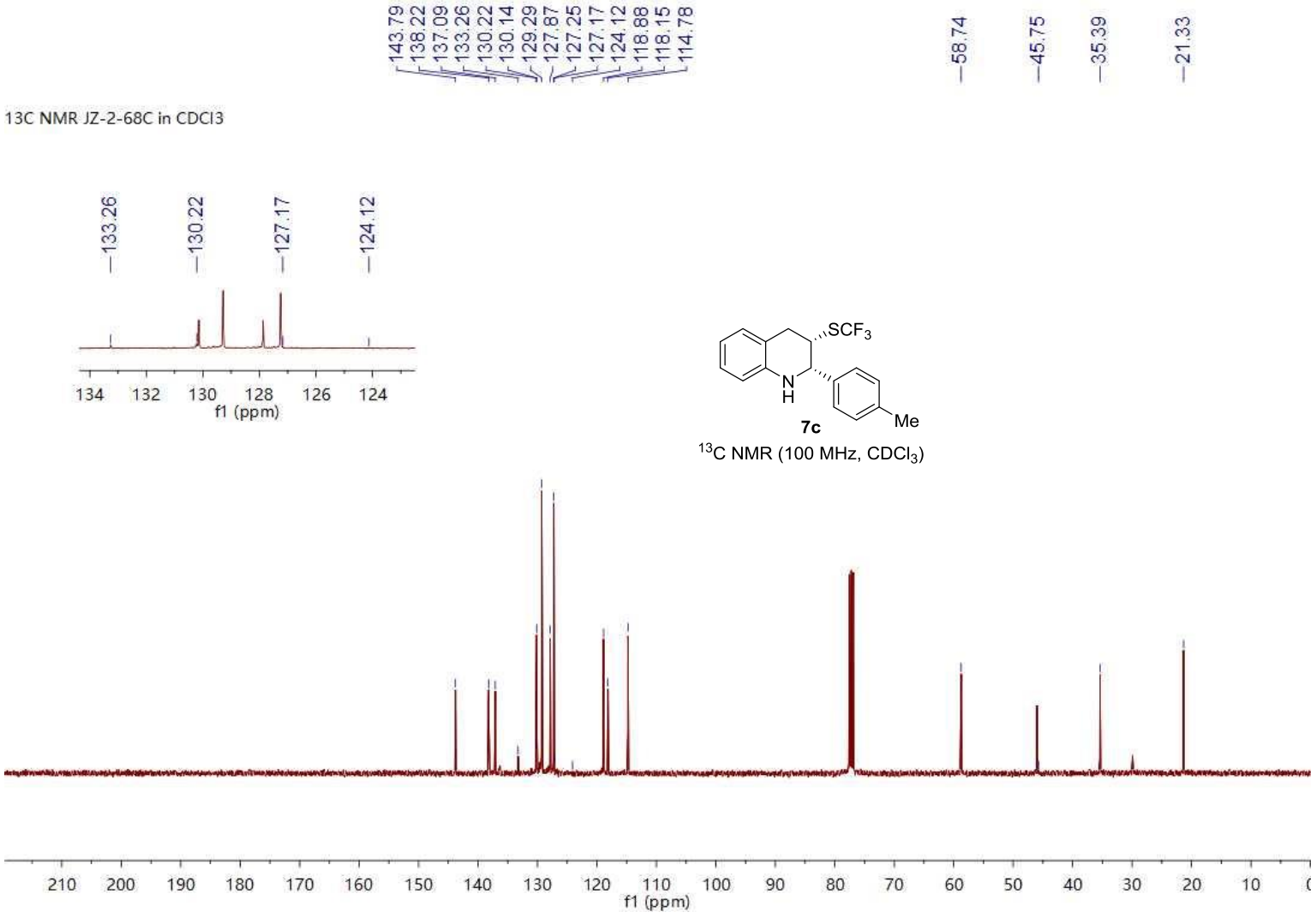


7b

^{19}F NMR (376 MHz, $CDCl_3$)

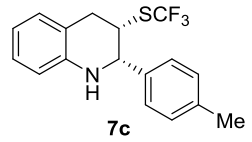
1H NMR JZ-2-68C in CDCl3




143.79
138.22
137.09
133.26
130.22
130.14
129.29
127.87
127.25
127.17
124.12
118.88
118.15
114.78
58.74
45.75
35.39
21.33
13C NMR JZ-2-68C in CDCl3
133.26
130.22
127.17
124.12
134 132 130 128 126 124
f1 (ppm)
SCF3
N
H
Me
7c
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

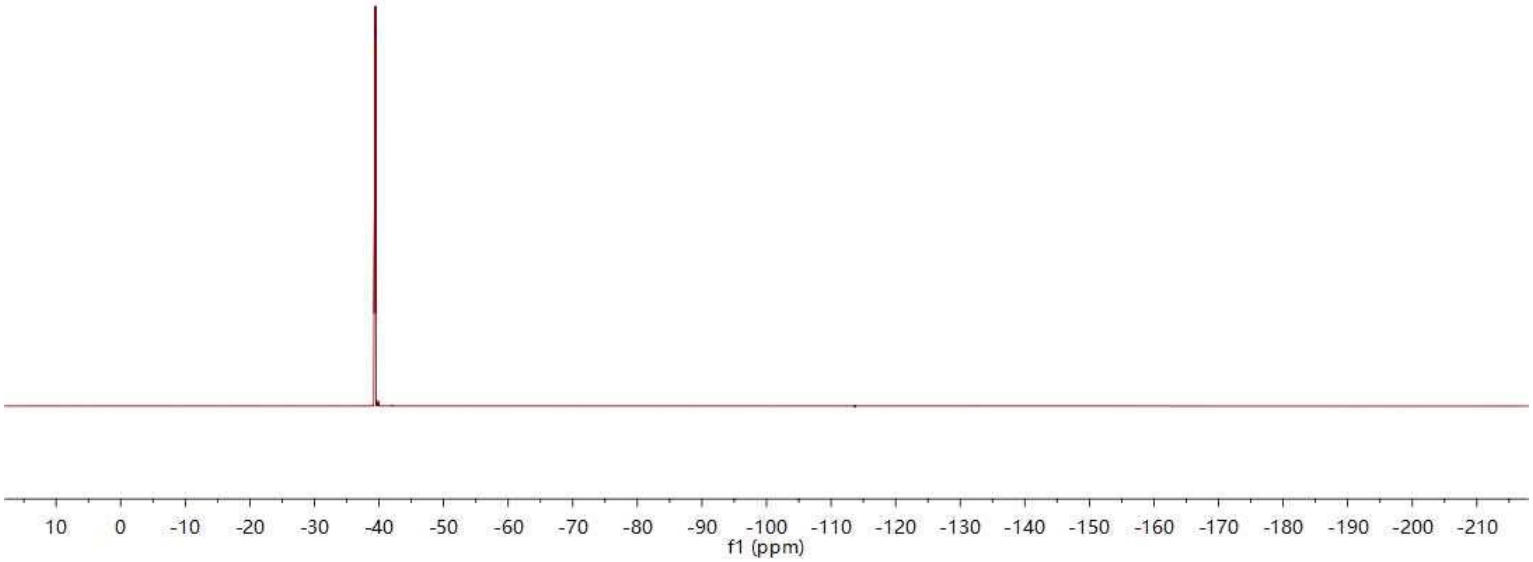
-39.45

19F NMR JZ-2-68C in CDCl3

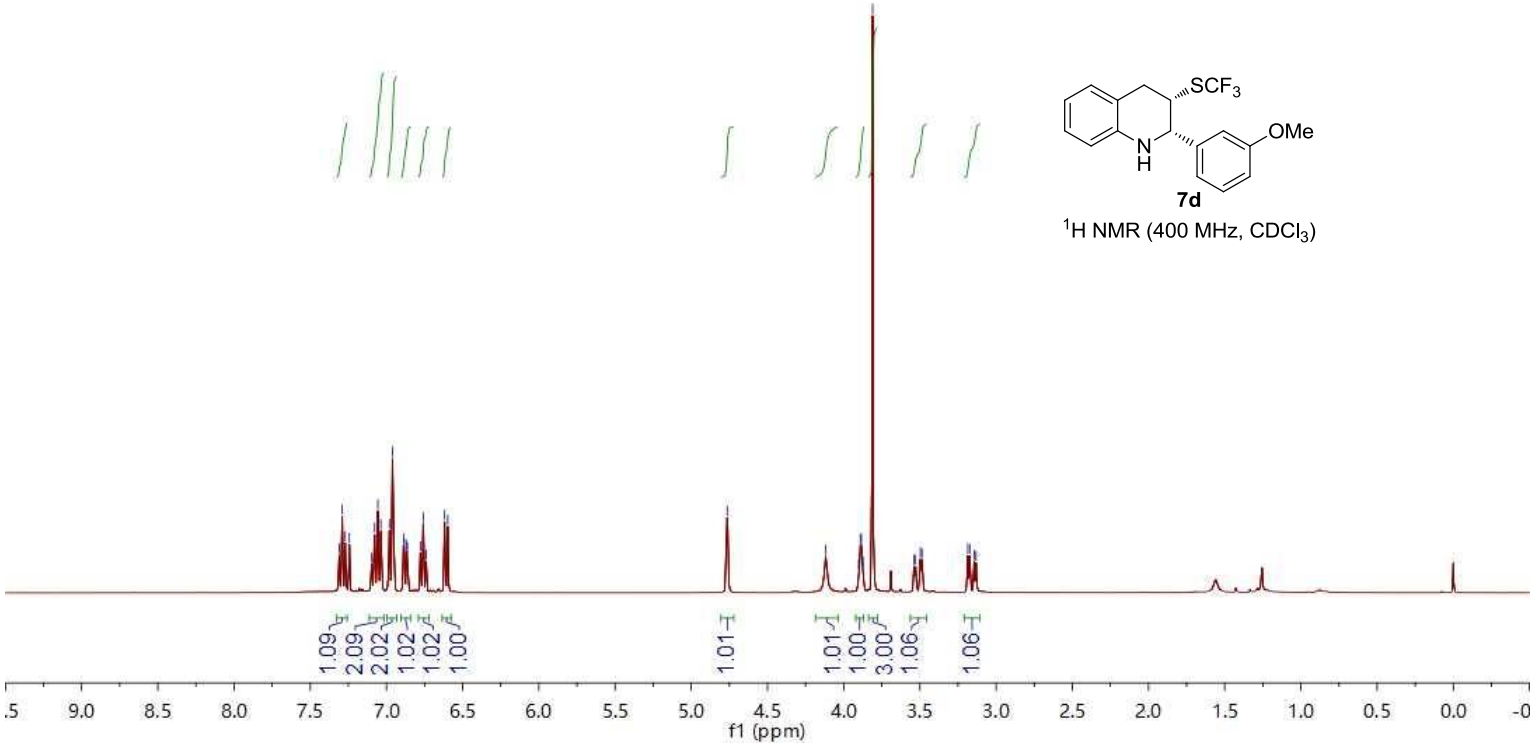


7c

^{19}F NMR (376 MHz, $CDCl_3$)

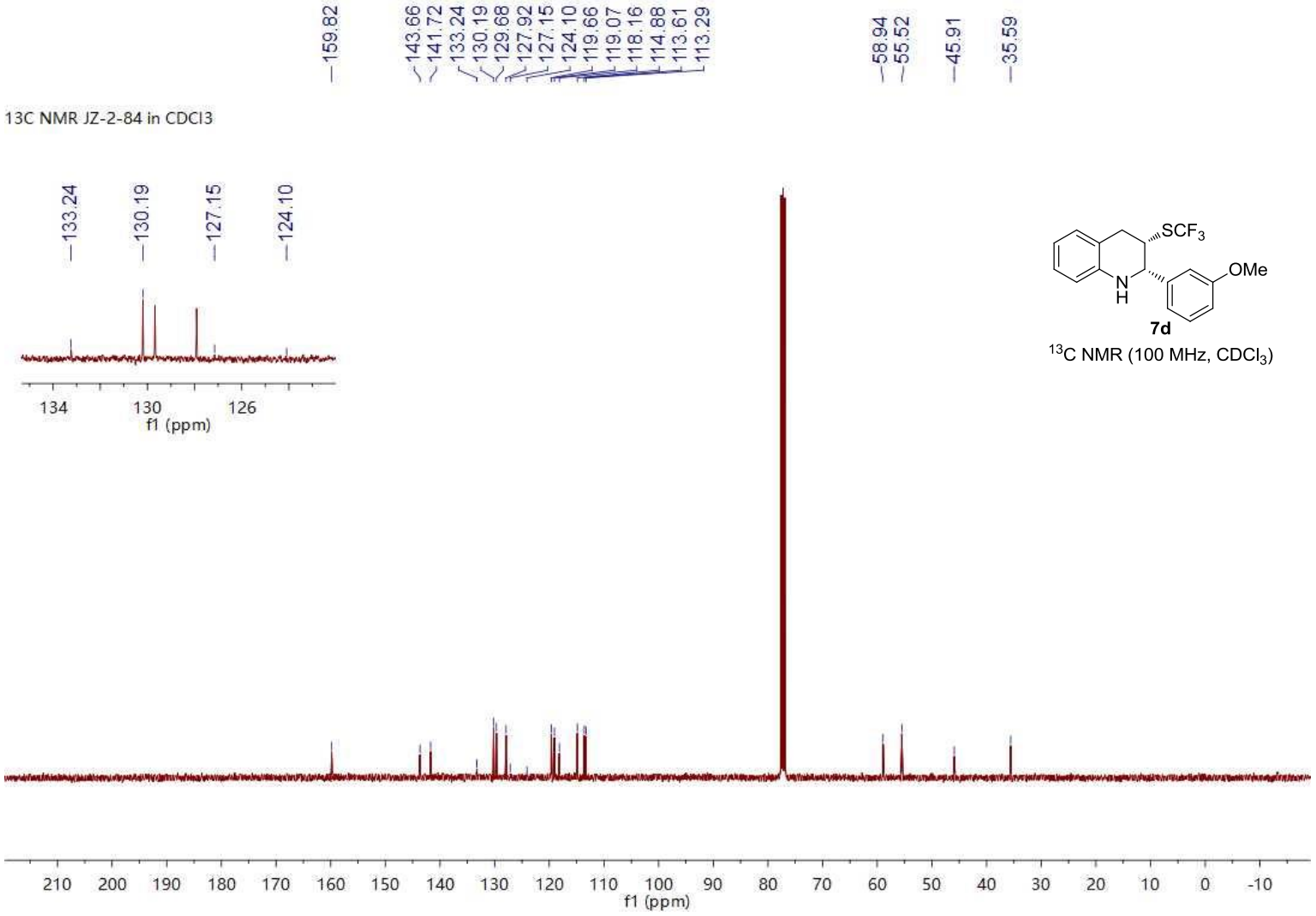


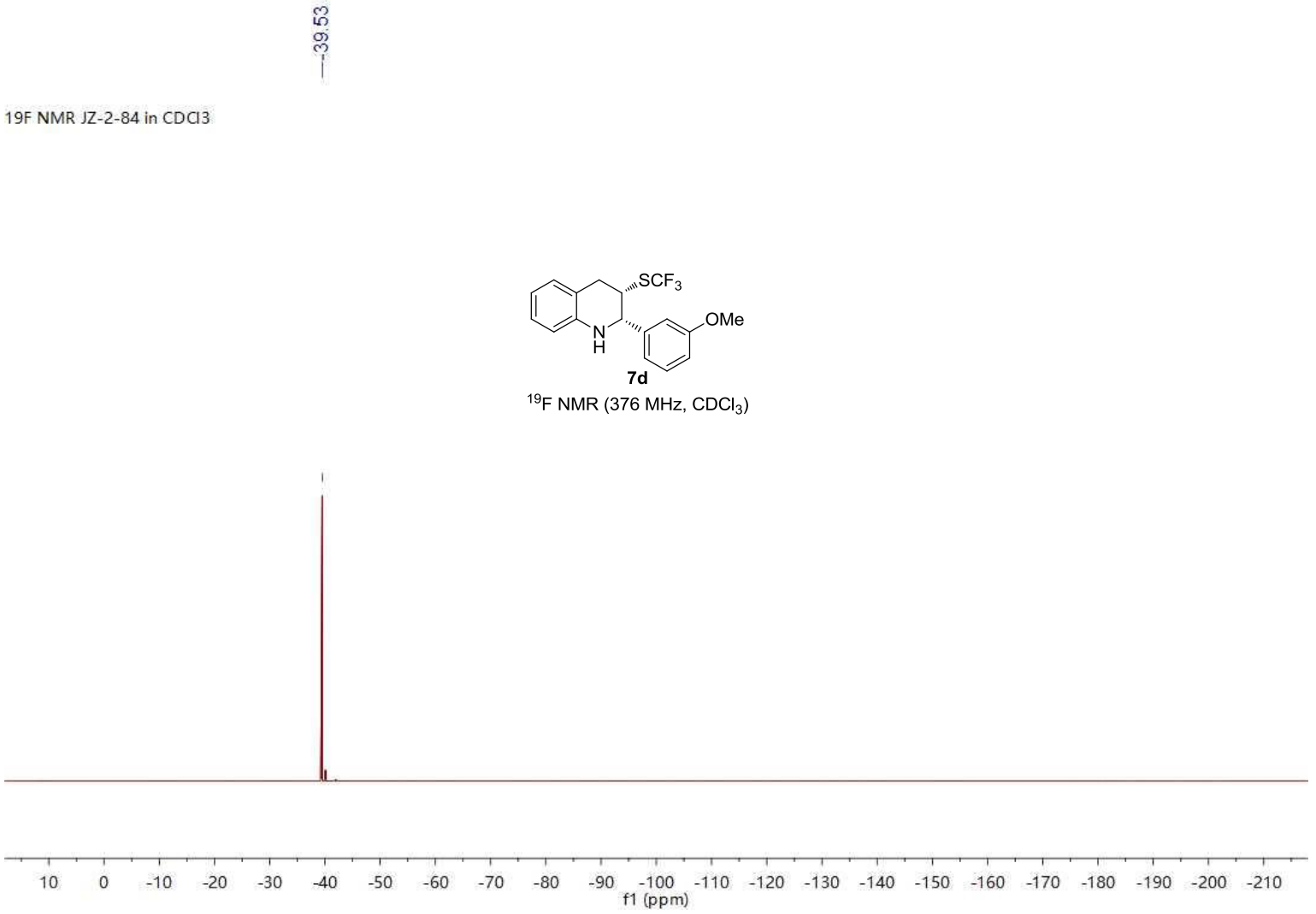
1H NMR JZ-2-84 in CDCl3



7d

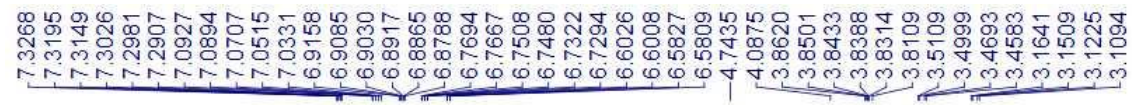
^{1}H NMR (400 MHz, $CDCl_3$)


159.82
143.66
141.72
133.24
130.19
129.68
127.92
127.15
124.10
119.66
119.07
118.16
114.88
113.61
113.29
58.94
55.52
45.91
35.59
13C NMR JZ-2-84 in CDCl3
133.24
130.19
127.15
124.10
134
130
126
f1 (ppm)
SCF3
OMe
N
H
7d
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

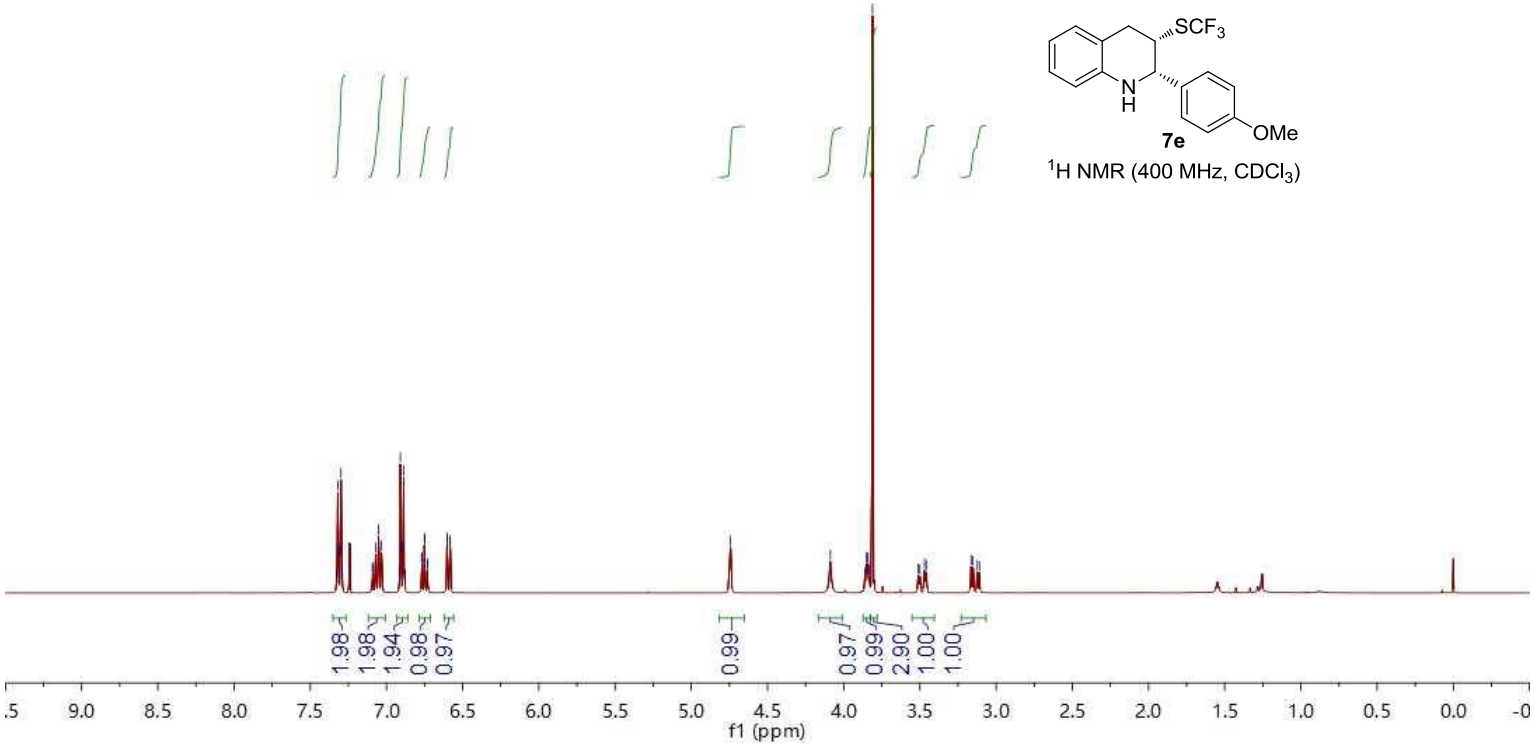


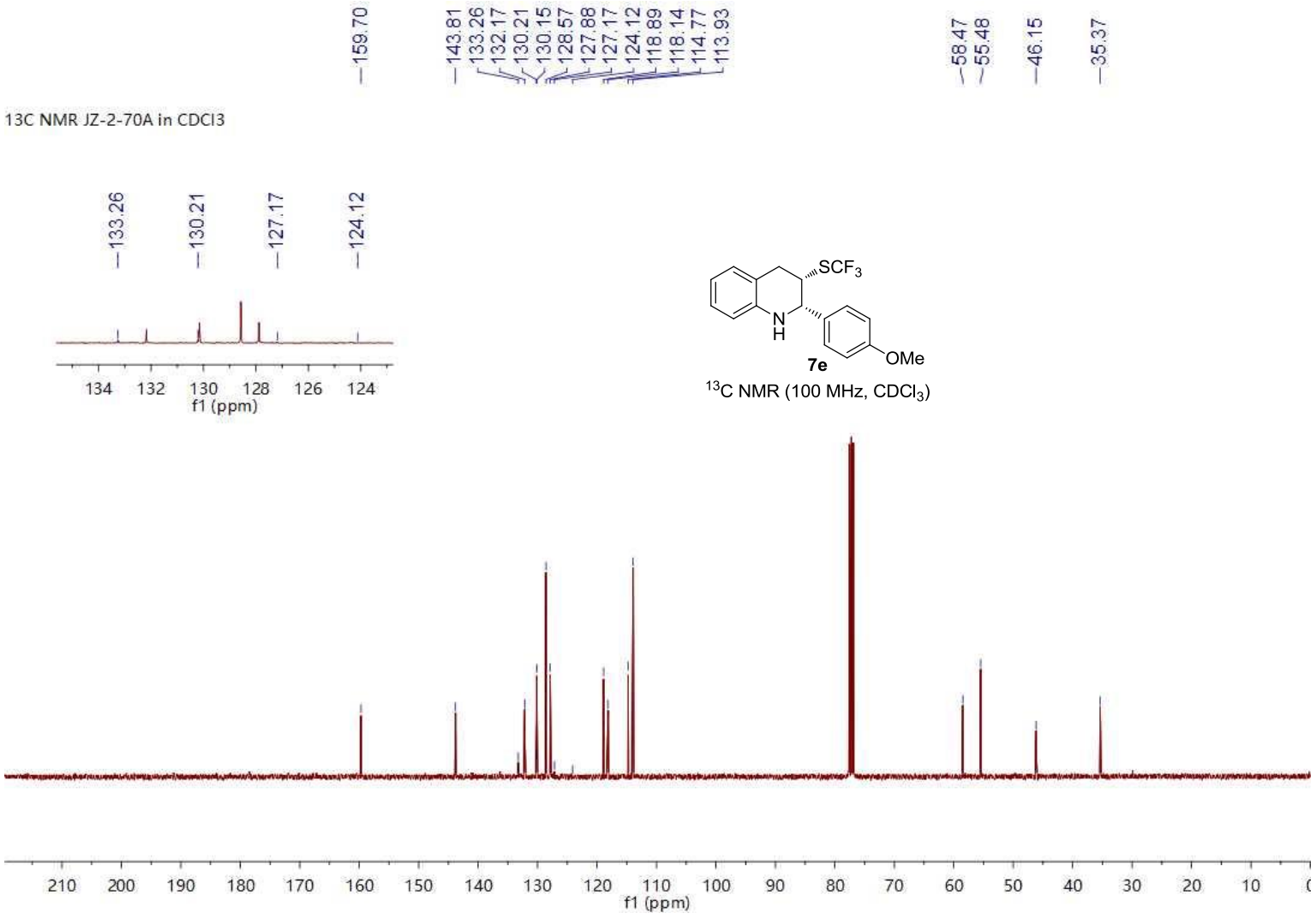
7d

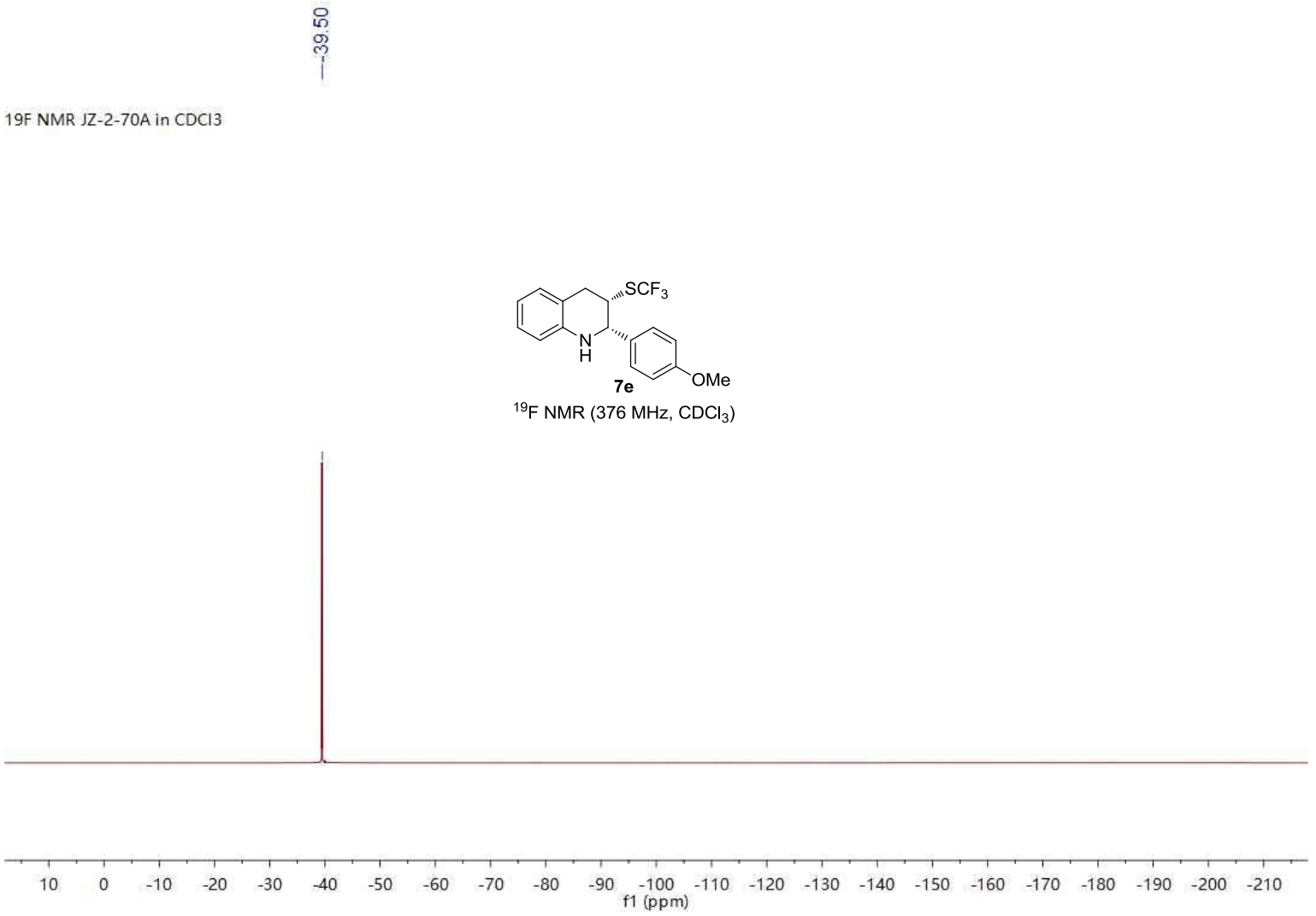
^{19}F NMR (376 MHz, $CDCl_3$)

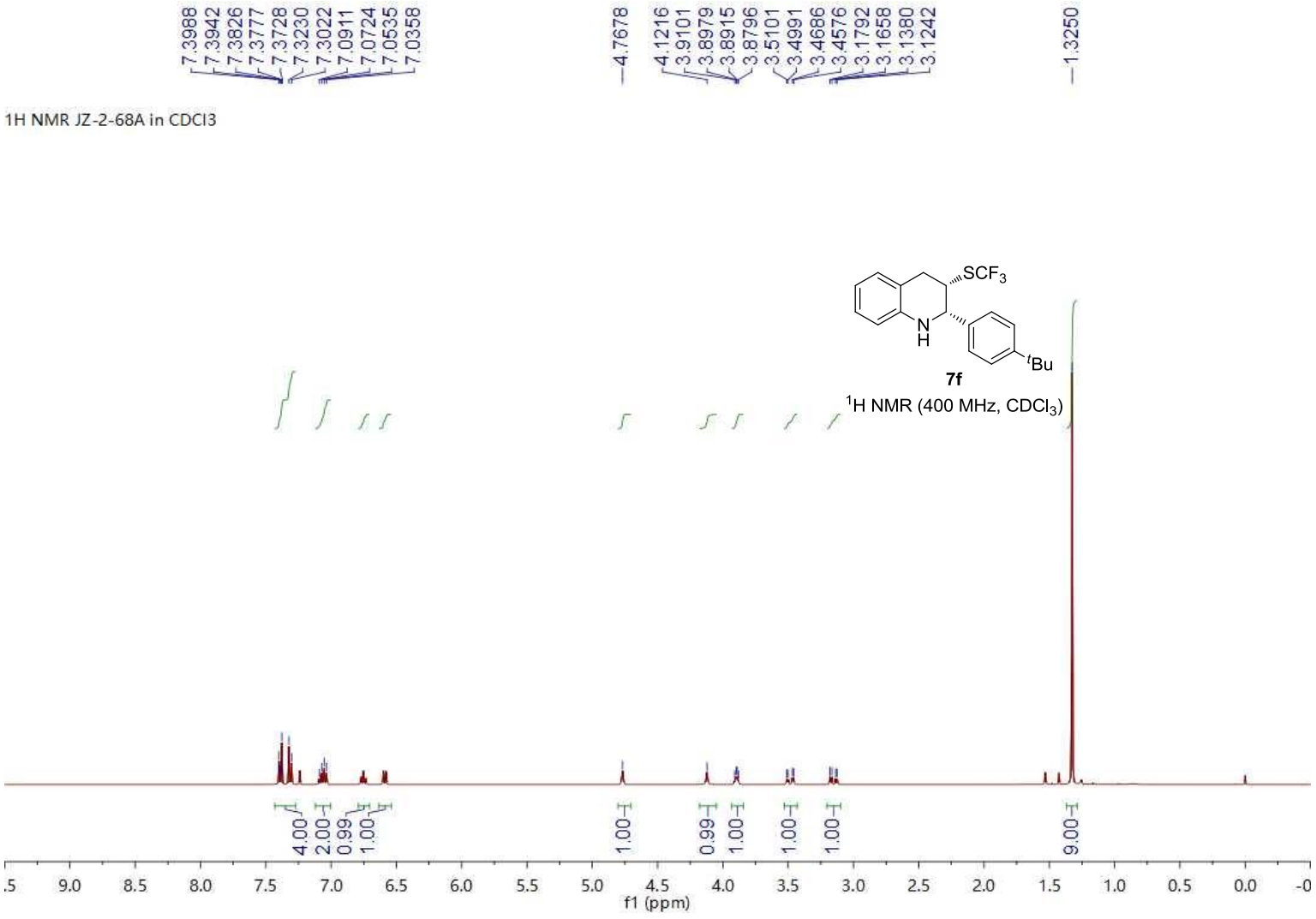


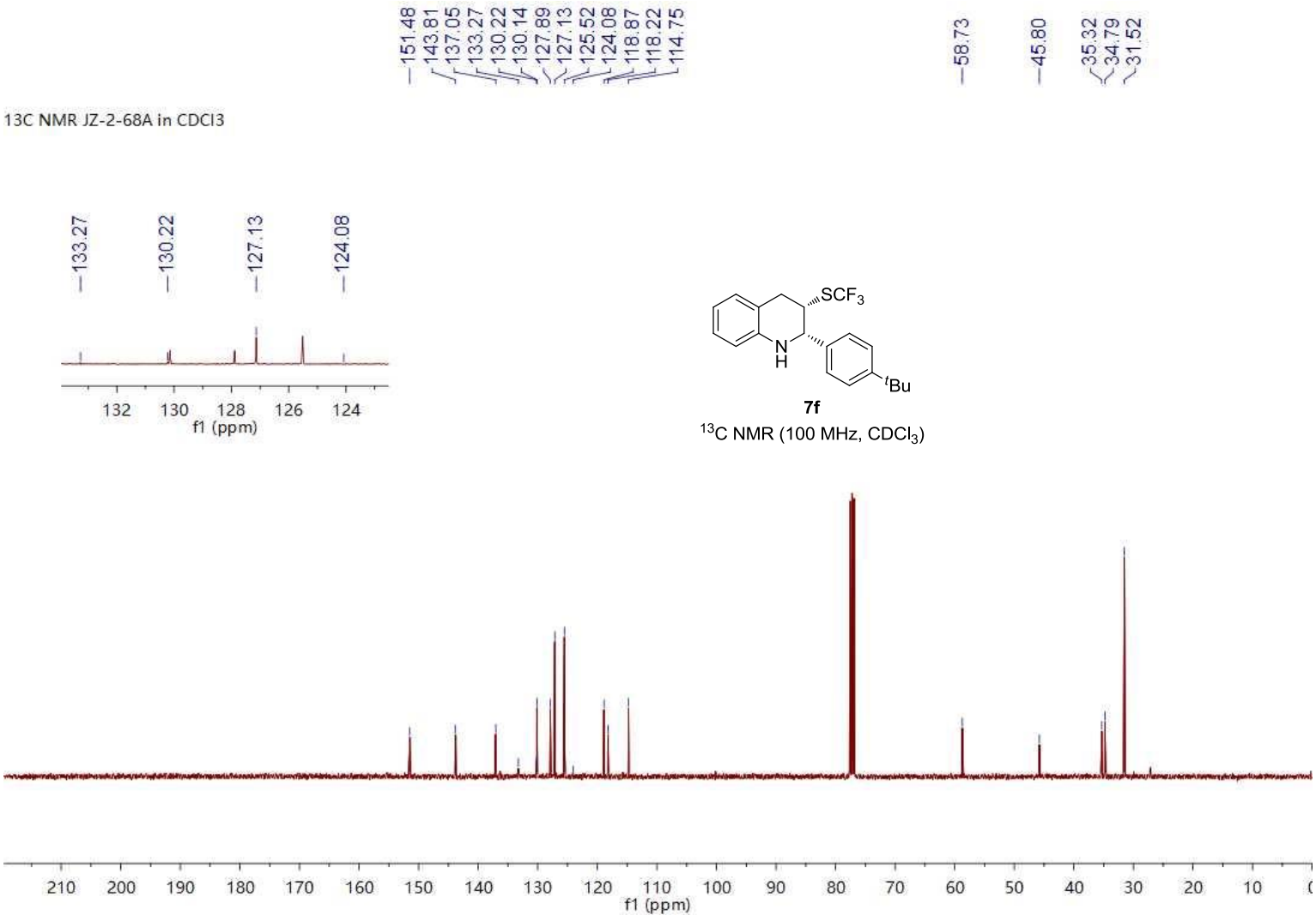
1H NMR JZ-2-70A in CDCl3

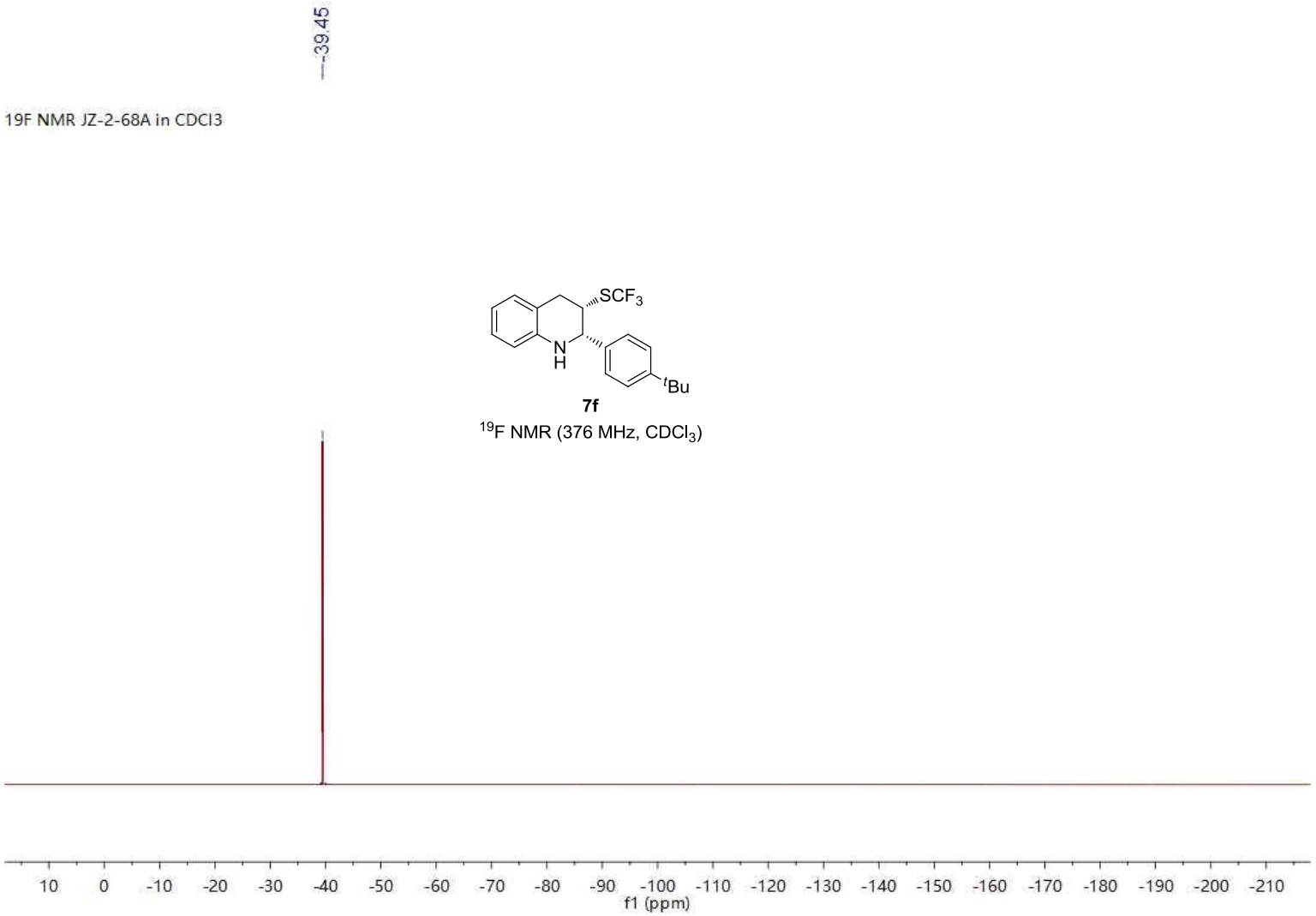



159.70
143.81
133.26
132.17
130.21
130.15
128.57
127.88
127.17
124.12
118.89
118.14
114.77
113.93
58.47
55.48
46.15
35.37
13C NMR JZ-2-70A in CDCl3
133.26
130.21
127.17
124.12
134 132 130 128 126 124
f1 (ppm)
SCF3
N
H
OMe
7e
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)


-39.50
19F NMR JZ-2-70A in CDCl3
SCF3
N
H
OMe
7e
19F NMR (376 MHz, CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


7.3988
7.3942
7.3826
7.3777
7.3728
7.3230
7.3022
7.0911
7.0724
7.0535
7.0358
4.7678
4.1216
3.9101
3.8979
3.8915
3.8796
3.5101
3.4991
3.4686
3.4576
3.1792
3.1658
3.1380
3.1242
1.3250
1H NMR JZ-2-68A in CDCl3
SCF3
N
H
tBu
7f
1H NMR (400 MHz, CDCl3)
4.00
2.00
0.99
1.00
1.00
0.99
1.00
1.00
1.00
9.00
f1 (ppm)

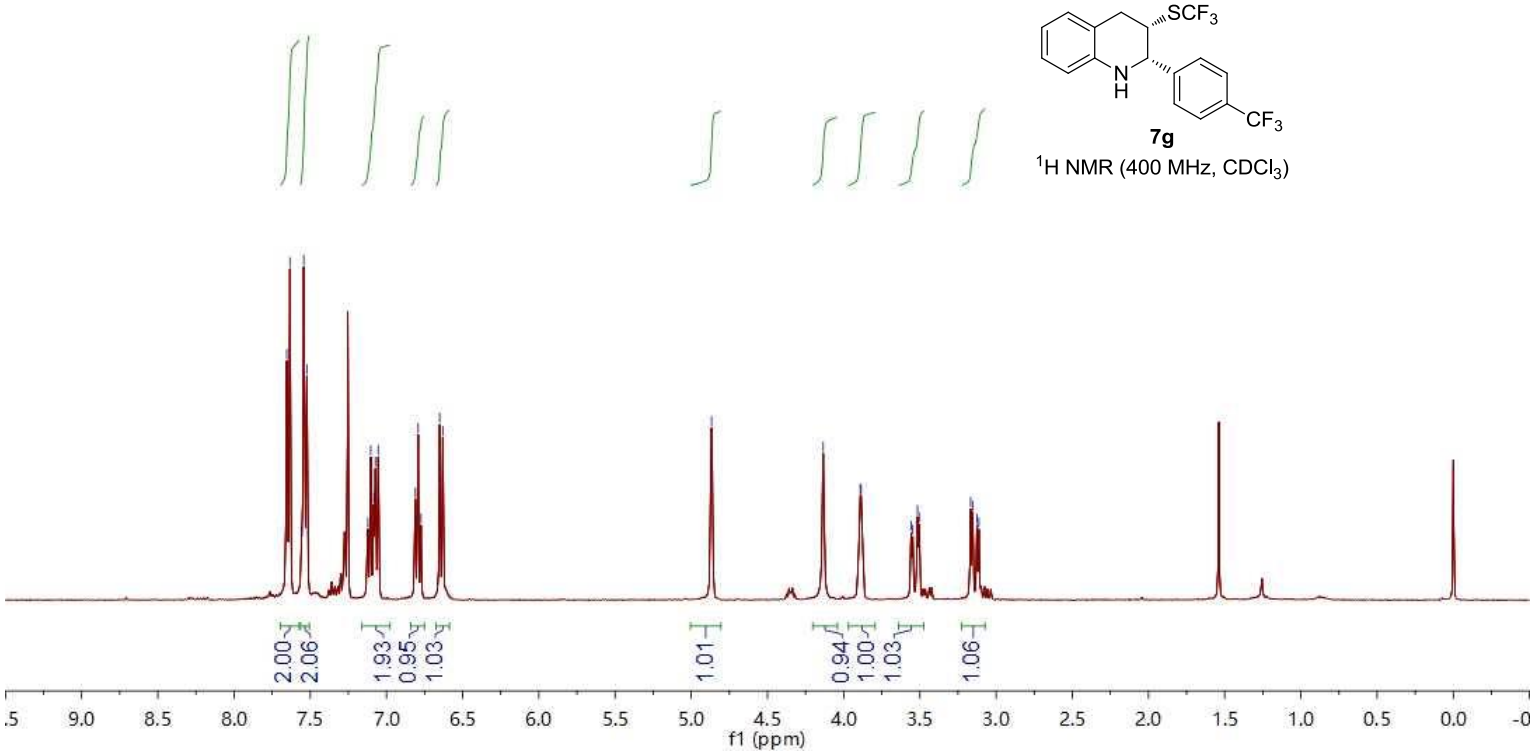

151.48
143.81
137.05
133.27
130.22
130.14
127.89
127.13
125.52
124.08
118.87
118.22
114.75
58.73
45.80
35.32
34.79
31.52
13C NMR JZ-2-68A in CDCl3
133.27
130.22
127.13
124.08
132
130
128
126
124
f1 (ppm)
SCF3
N
H
tBu
7f
13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



7f

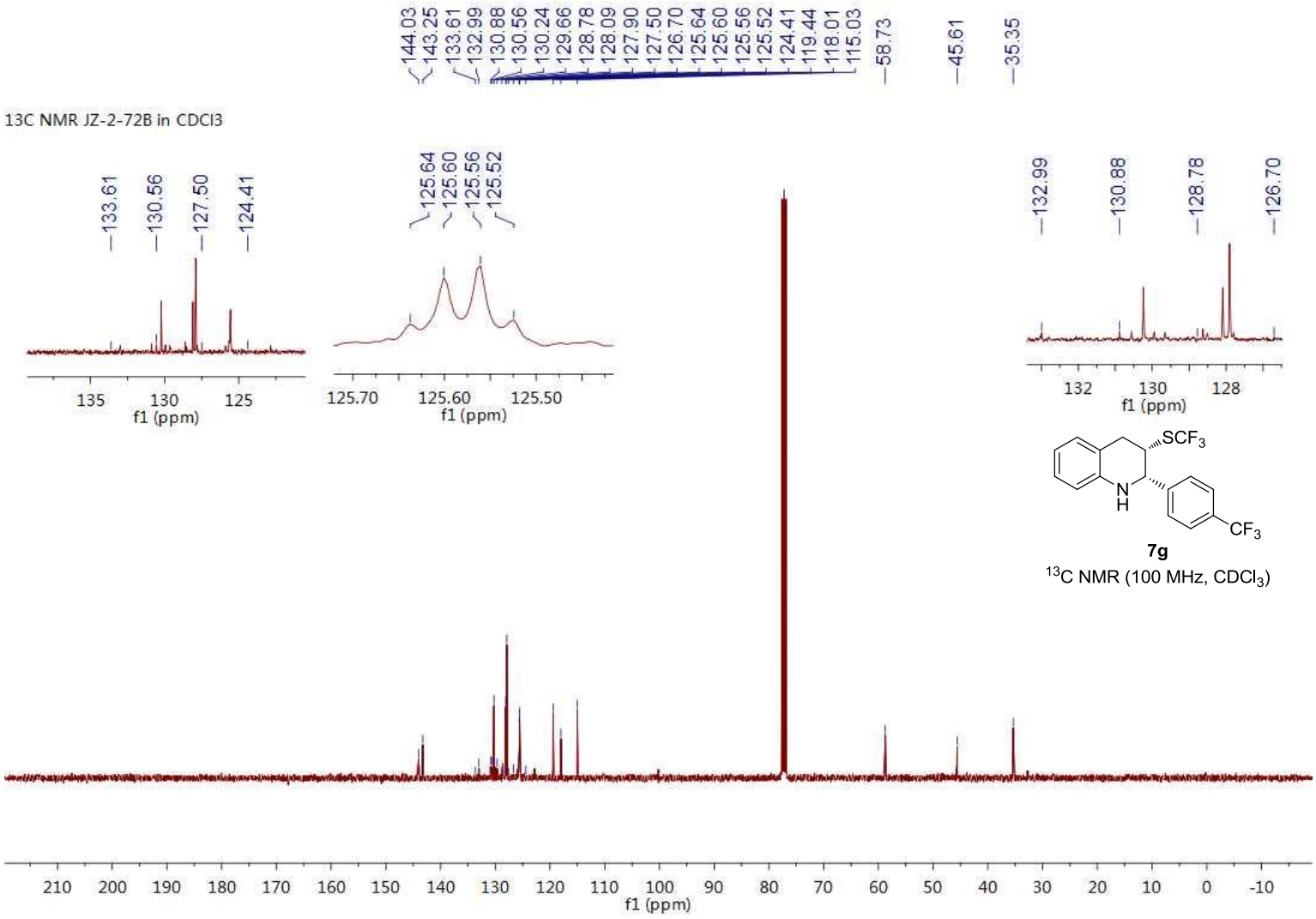
^{19}F NMR (376 MHz, $CDCl_3$)

1H NMR JZ-2-72B in CDCl3



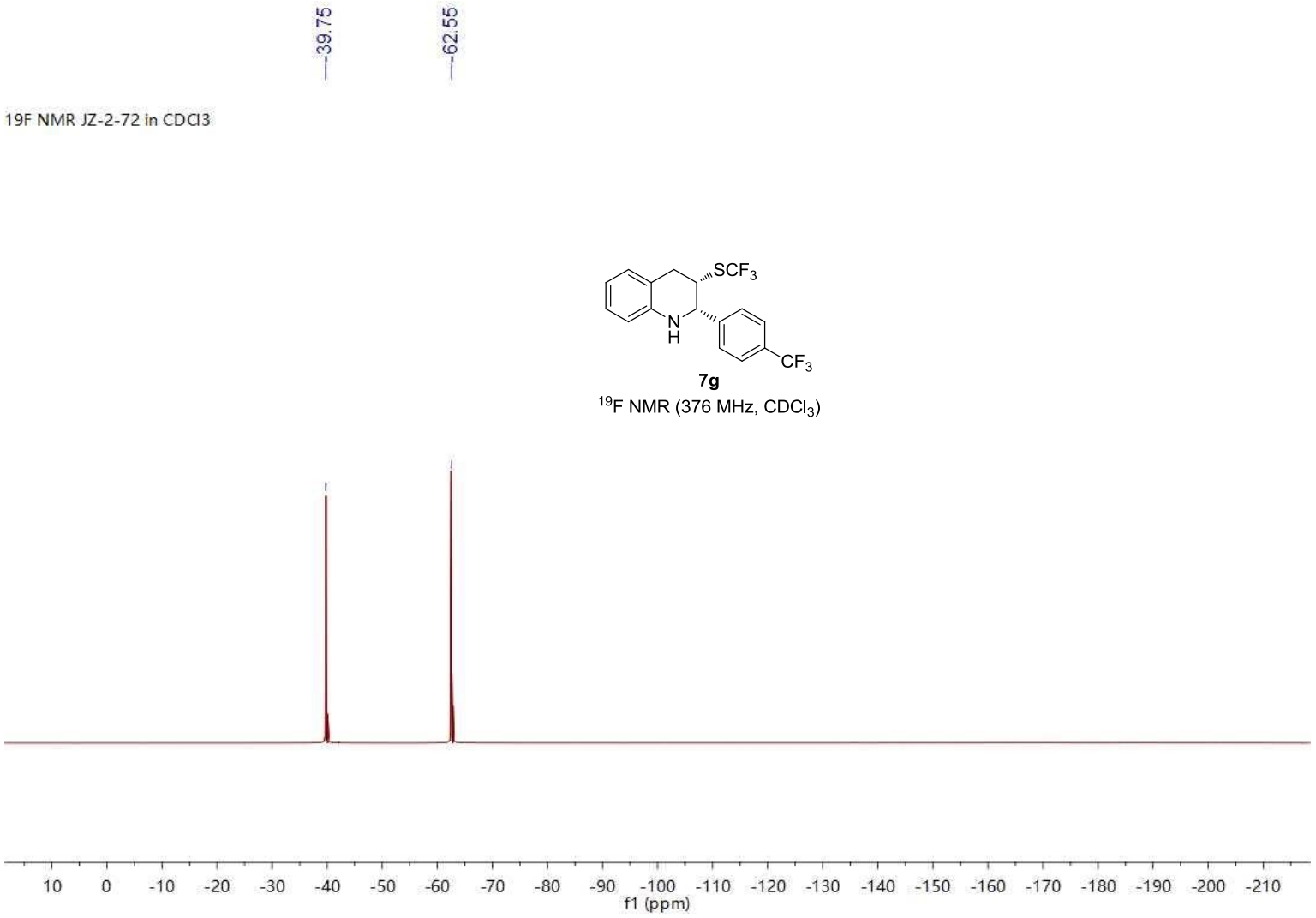
7g

^{1}H NMR (400 MHz, $CDCl_3$)



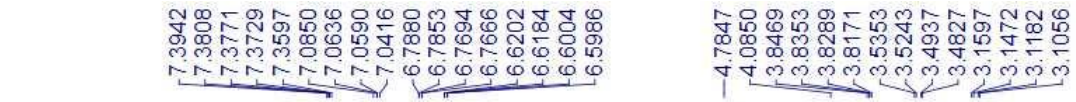
7g

^{13}C NMR (100 MHz, $CDCl_3$)

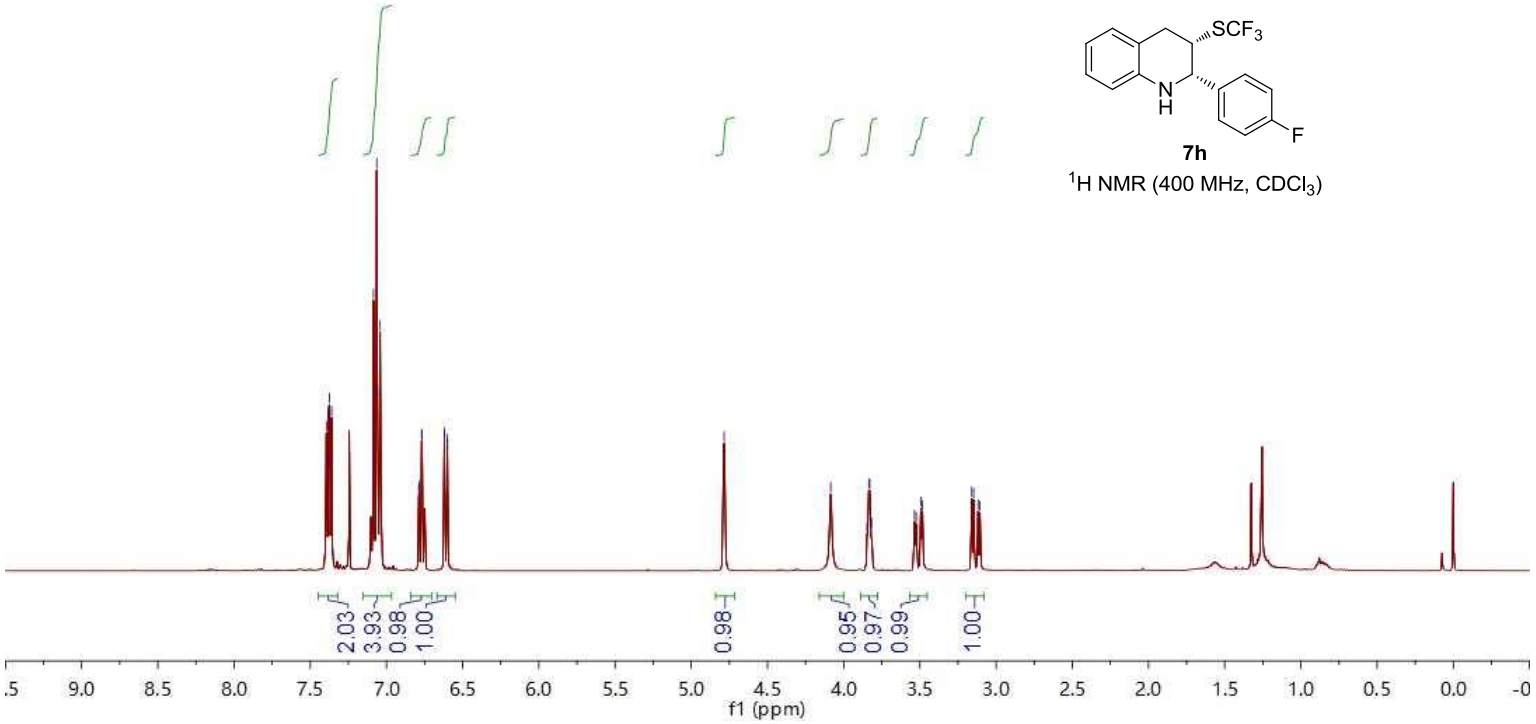


7g

^{19}F NMR (376 MHz, $CDCl_3$)

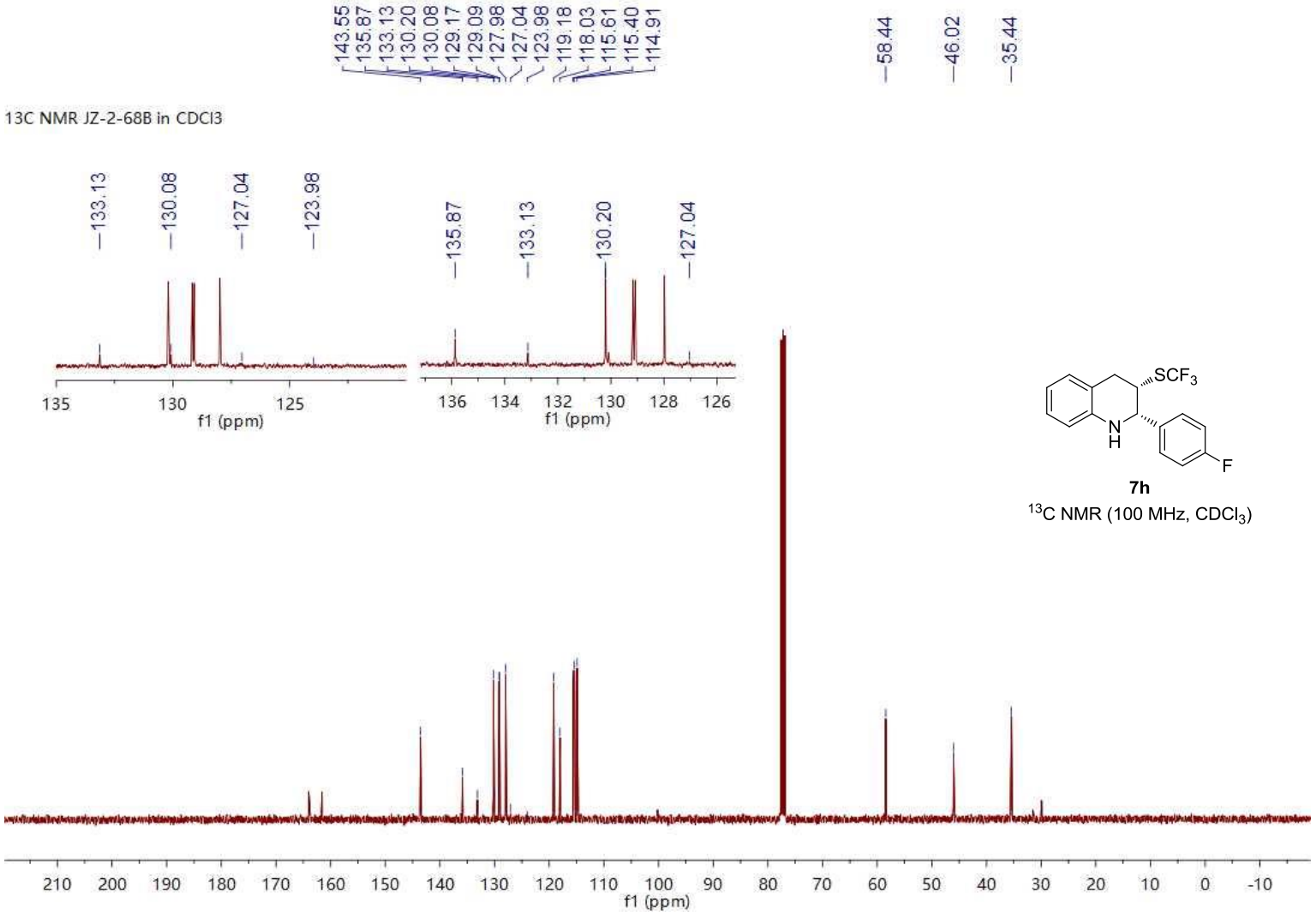


1H NMR JZ-2-68B in CDCl3



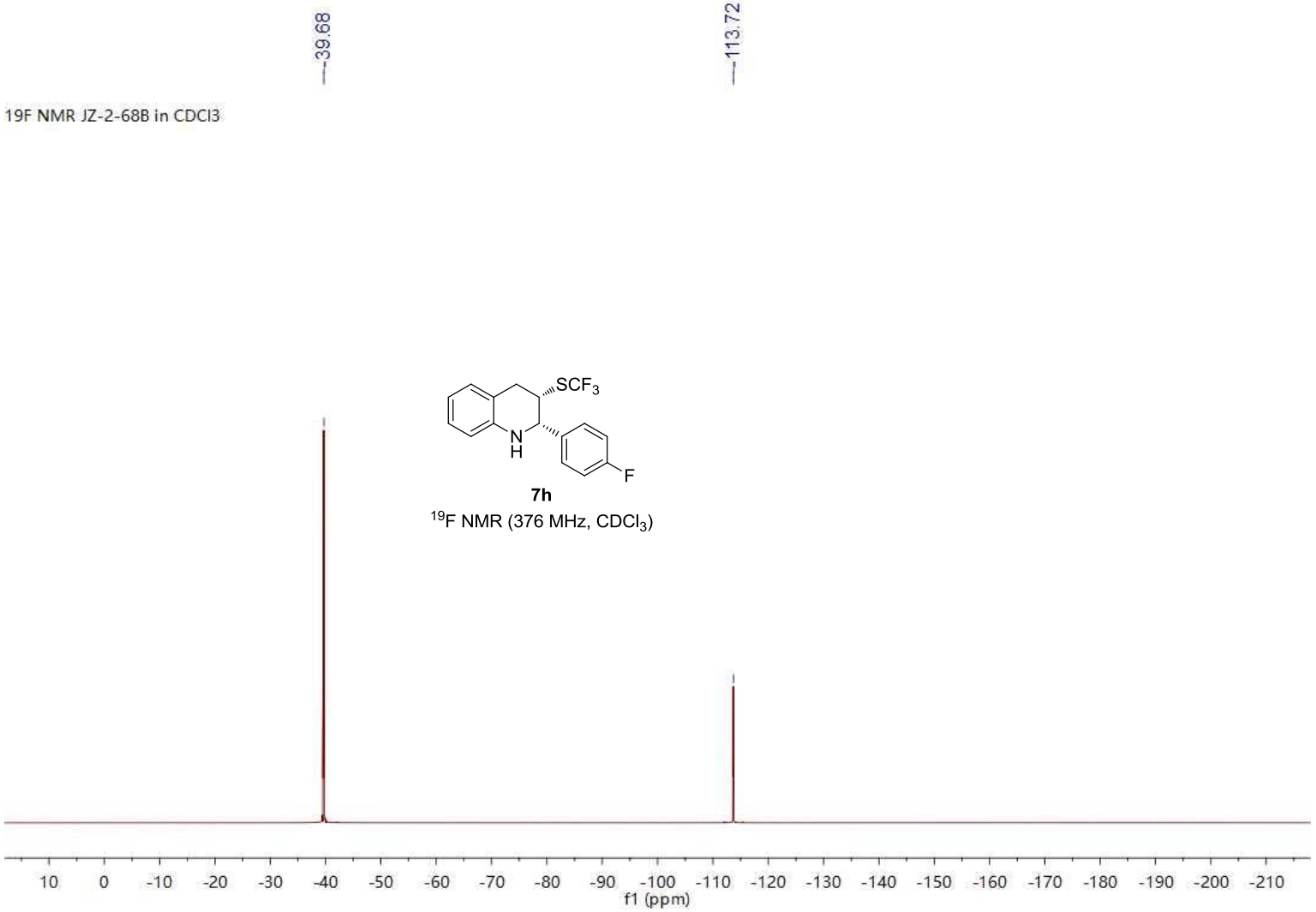
7h

^{1}H NMR (400 MHz, $CDCl_3$)



7h

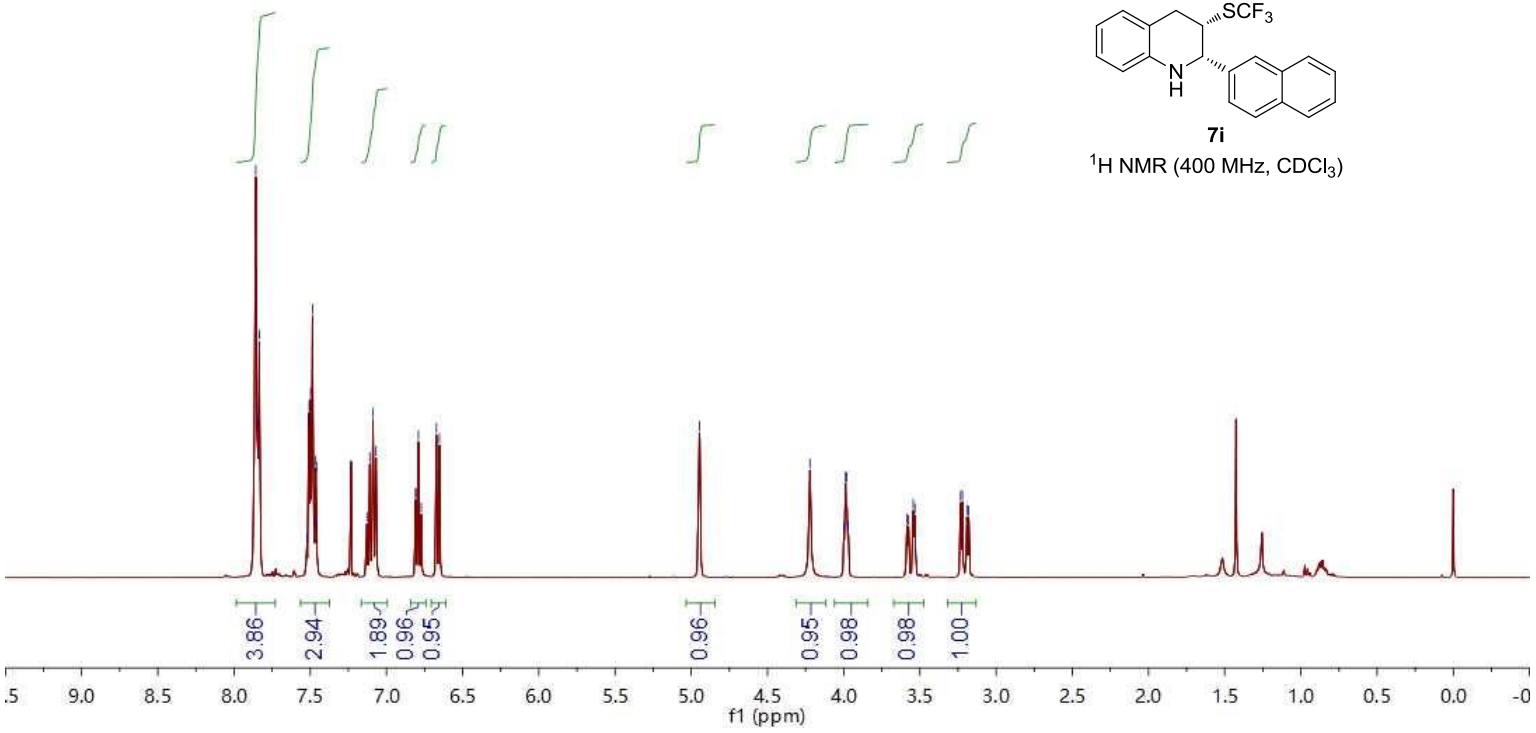
^{13}C NMR (100 MHz, $CDCl_3$)



7h

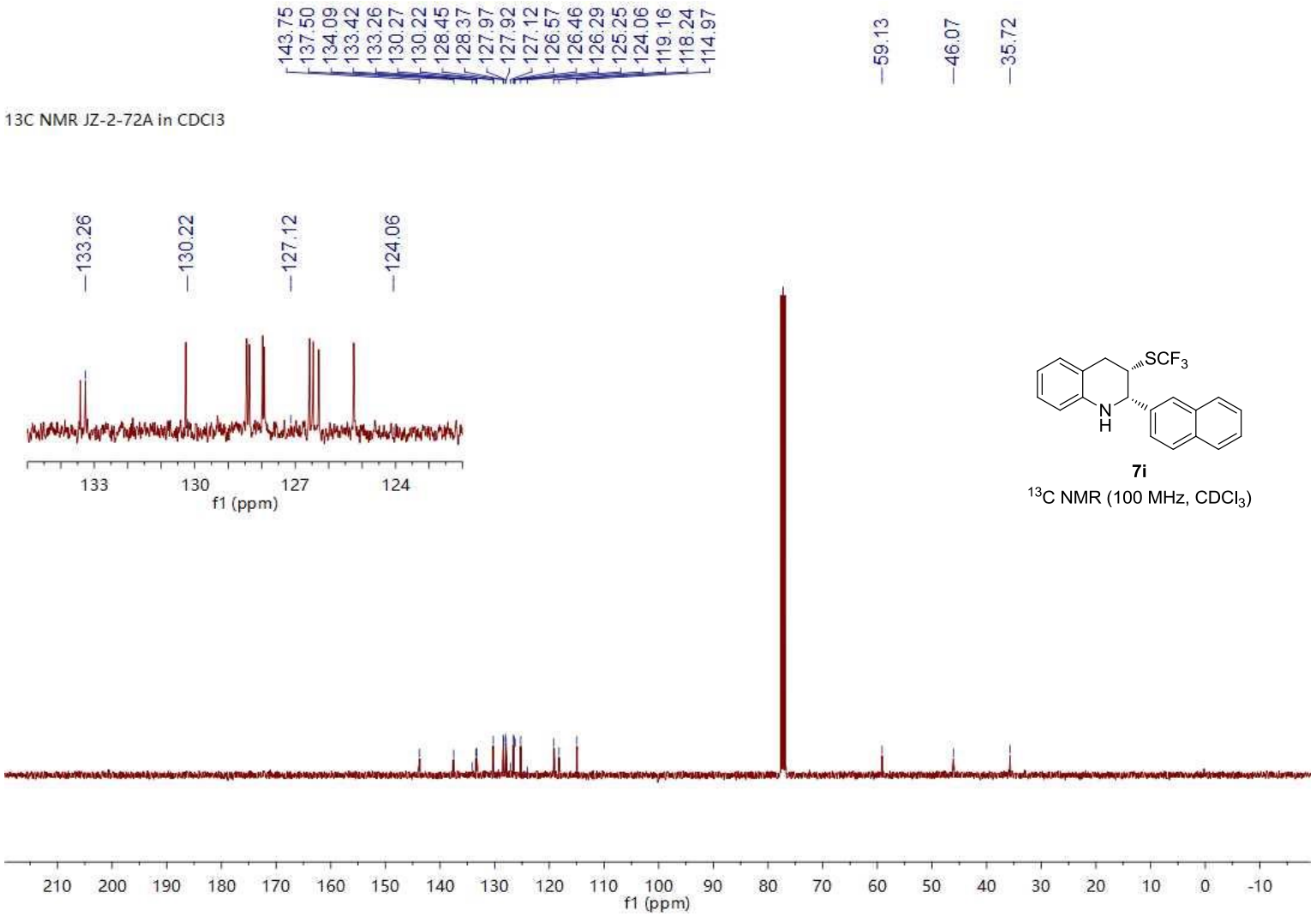
^{19}F NMR (376 MHz, $CDCl_3$)

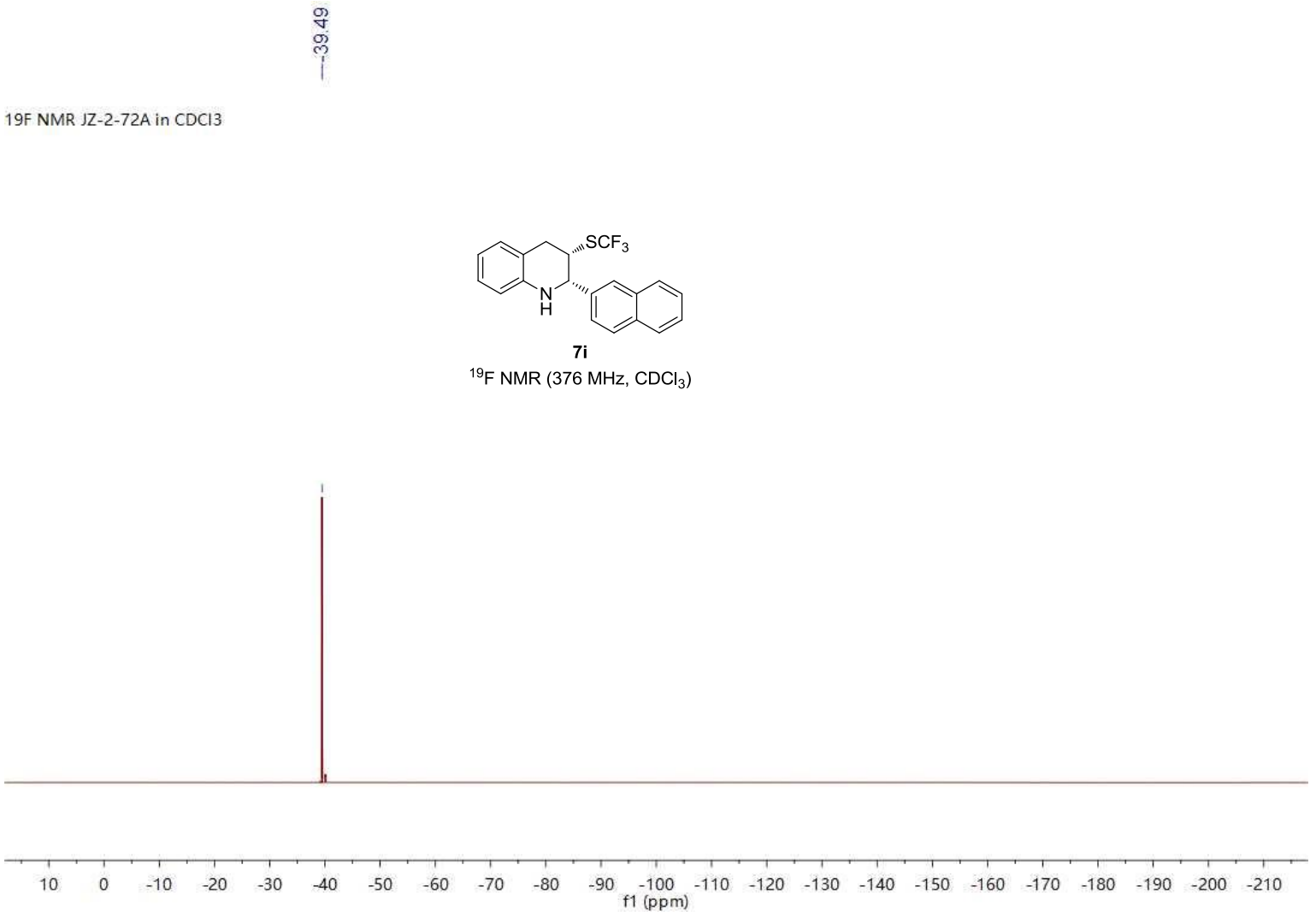
1H NMR JZ-2-72A in CDCl3



7i

^{1}H NMR (400 MHz, $CDCl_3$)

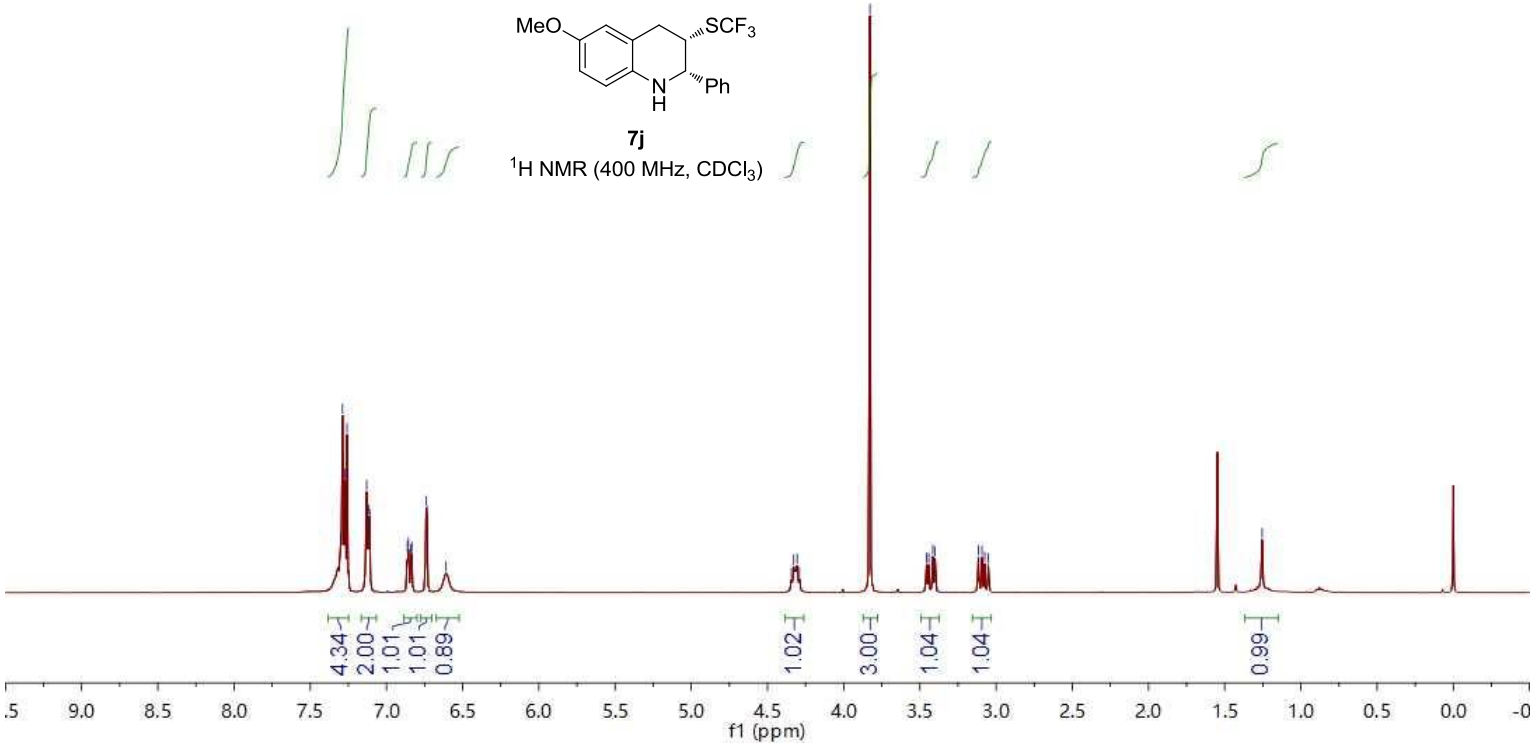

143.75
137.50
134.09
133.42
133.26
130.27
130.22
128.45
128.37
127.97
127.92
127.12
126.57
126.46
126.29
125.25
124.06
119.16
118.24
114.97
59.13
46.07
35.72
13C NMR JZ-2-72A in CDCl3
133.26
130.22
127.12
124.06
133
130
127
124
f1 (ppm)
SCF3
N
H
7i
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

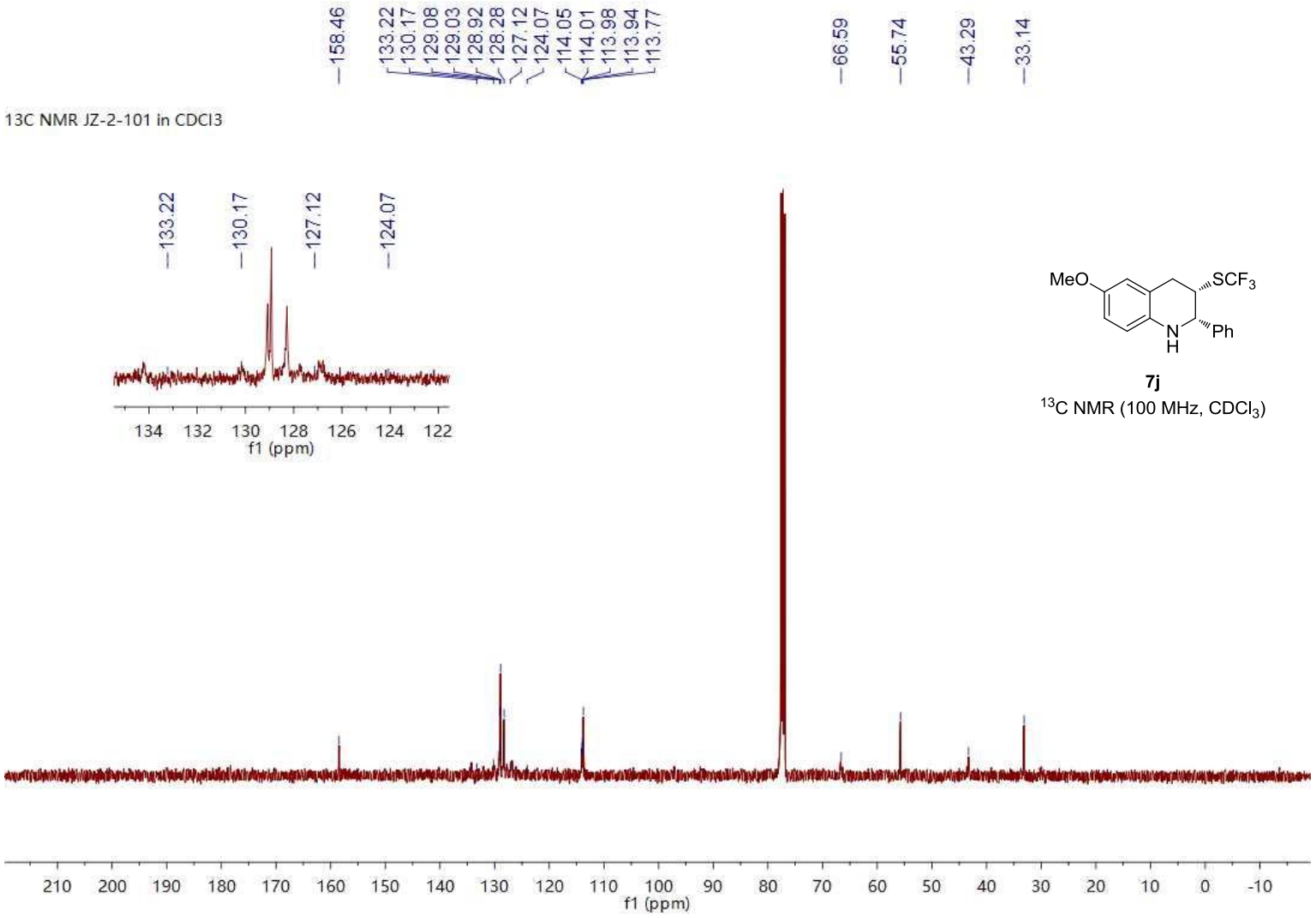


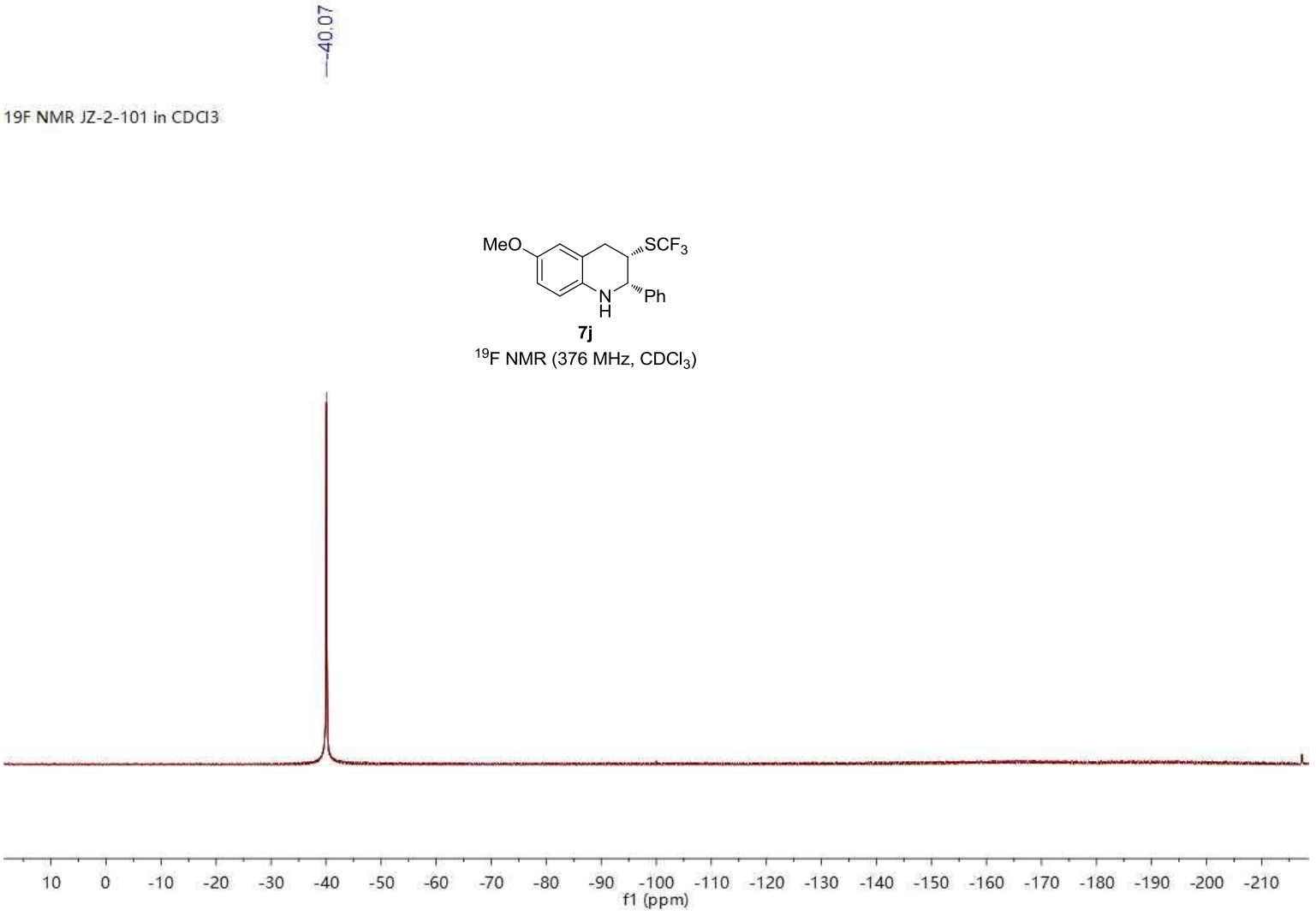
7i

^{19}F NMR (376 MHz, $CDCl_3$)

1H NMR JZ-2-101 in CDCl3

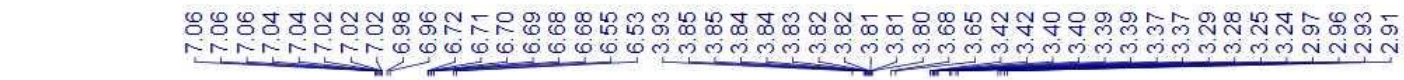



158.46
133.22
130.17
129.08
129.03
128.92
128.28
127.12
124.07
114.05
114.01
113.98
113.94
113.77
66.59
55.74
43.29
33.14
13C NMR JZ-2-101 in CDCl3
133.22
130.17
127.12
124.07
134 132 130 128 126 124 122
f1 (ppm)
MeO
SCF3
N
H
Ph
7j
13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

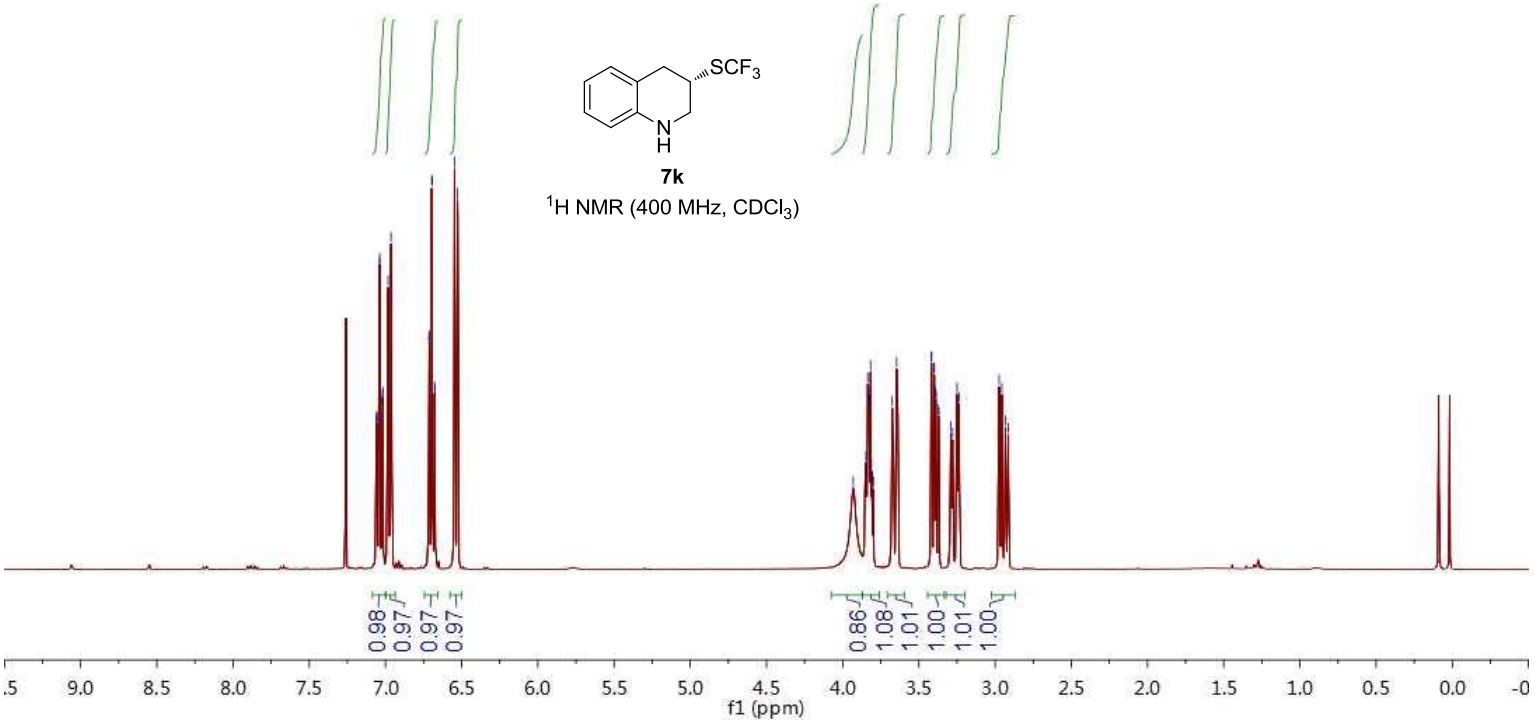


7j

^{19}F NMR (376 MHz, $CDCl_3$)

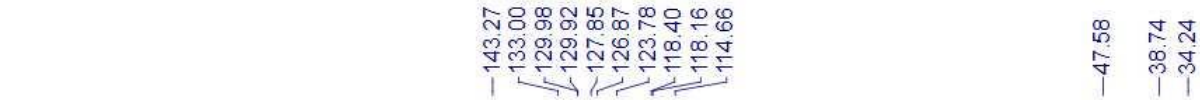


1H NMR JZ-3-5 in CDCl3

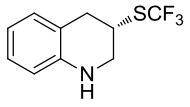


7k

^{1}H NMR (400 MHz, $CDCl_3$)

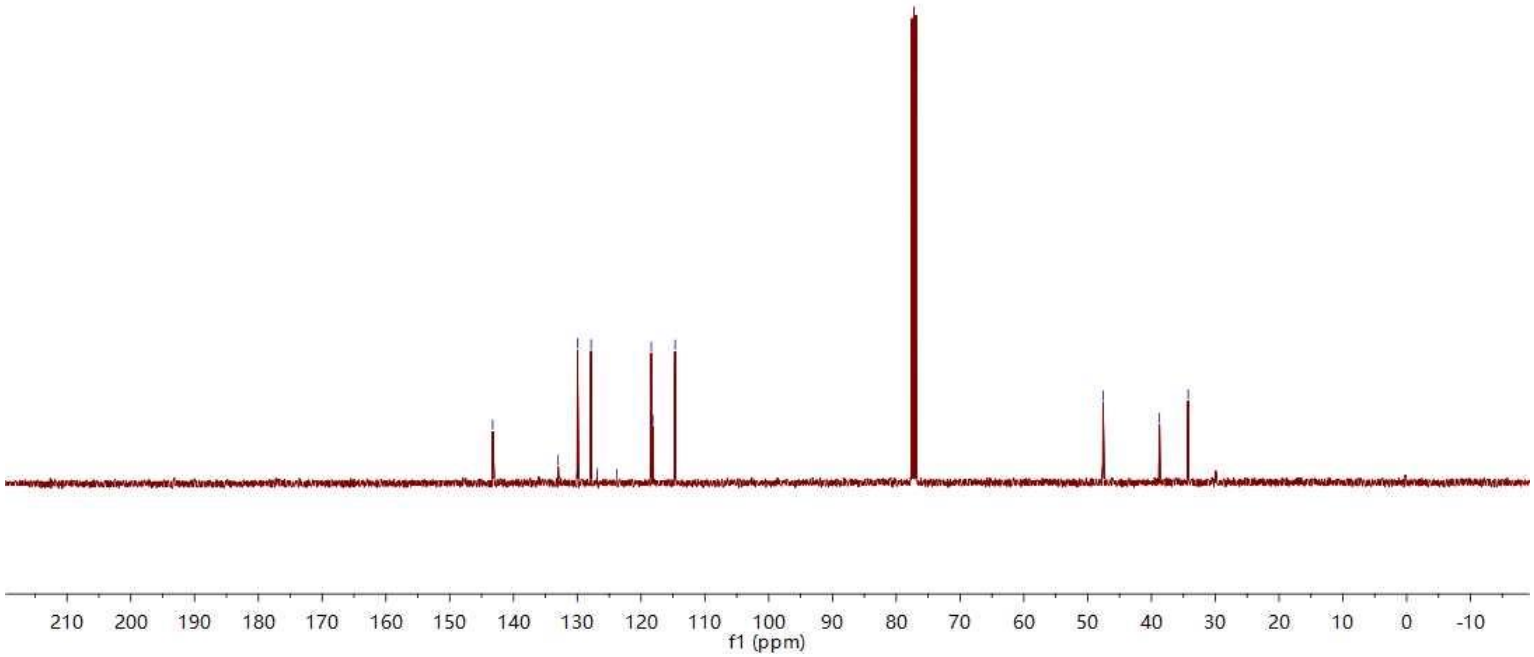


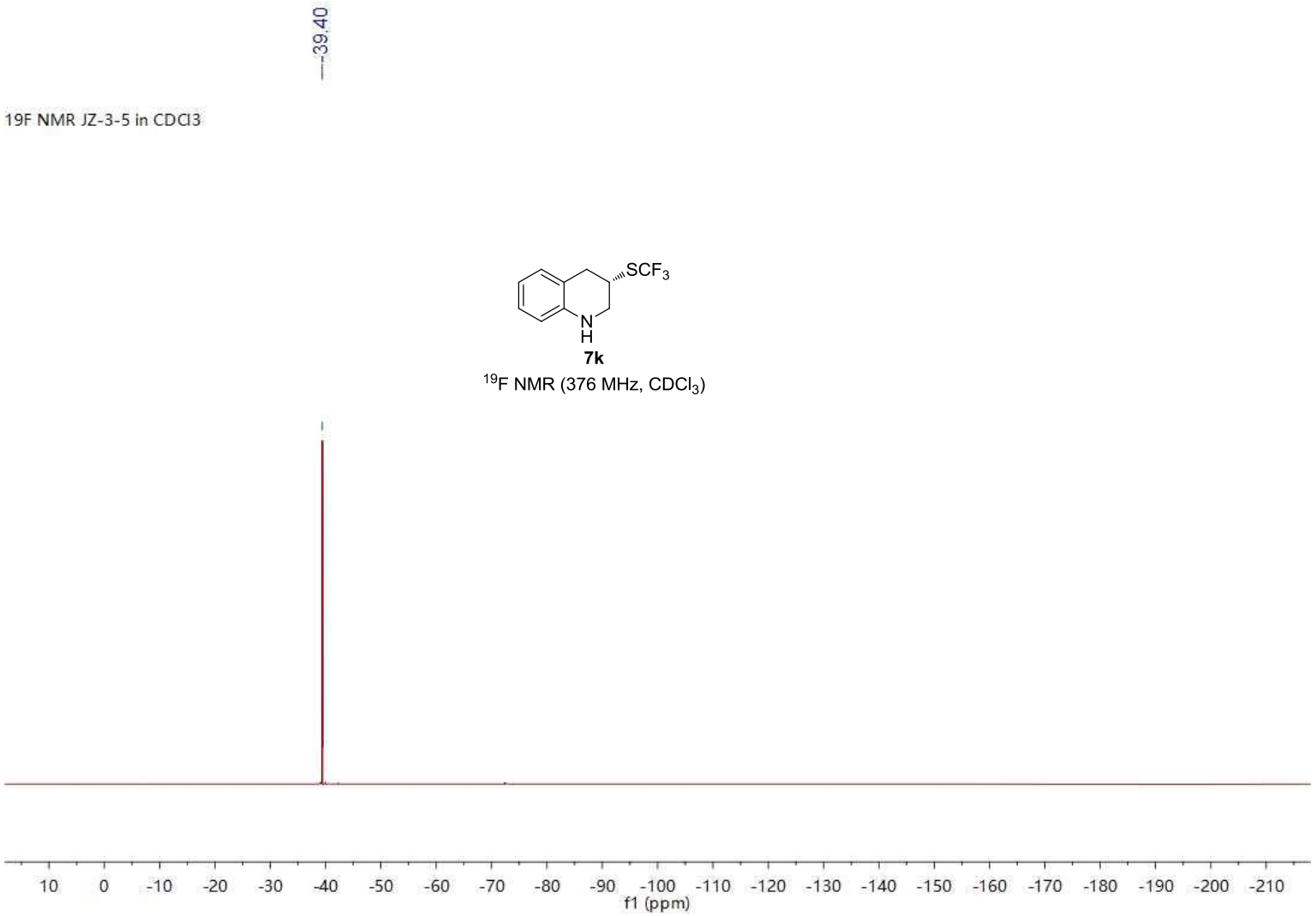
13C NMR JZ-3-5 in CDCl3



7k

^{13}C NMR (100 MHz, $CDCl_3$)

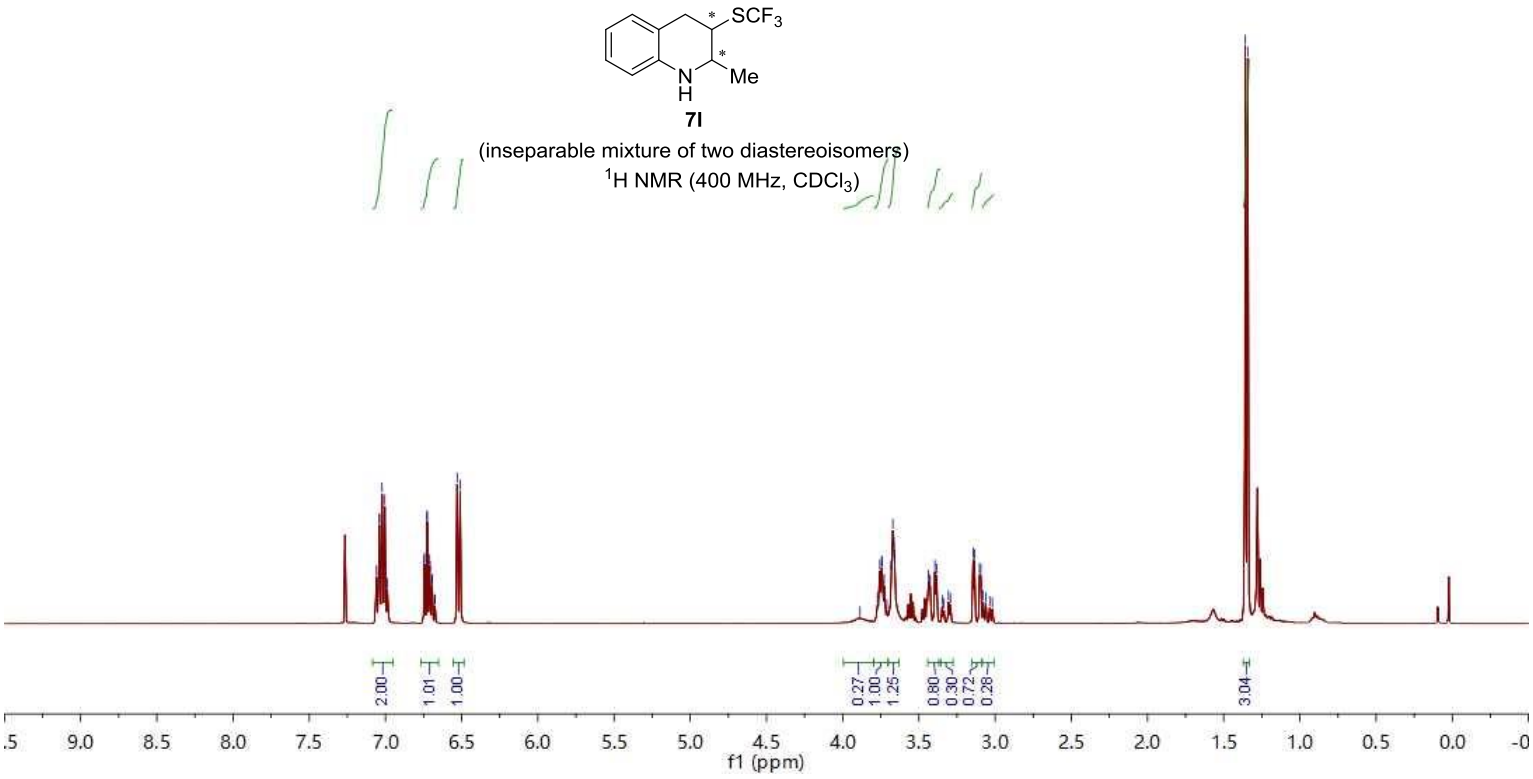




7k

^{19}F NMR (376 MHz, $CDCl_3$)

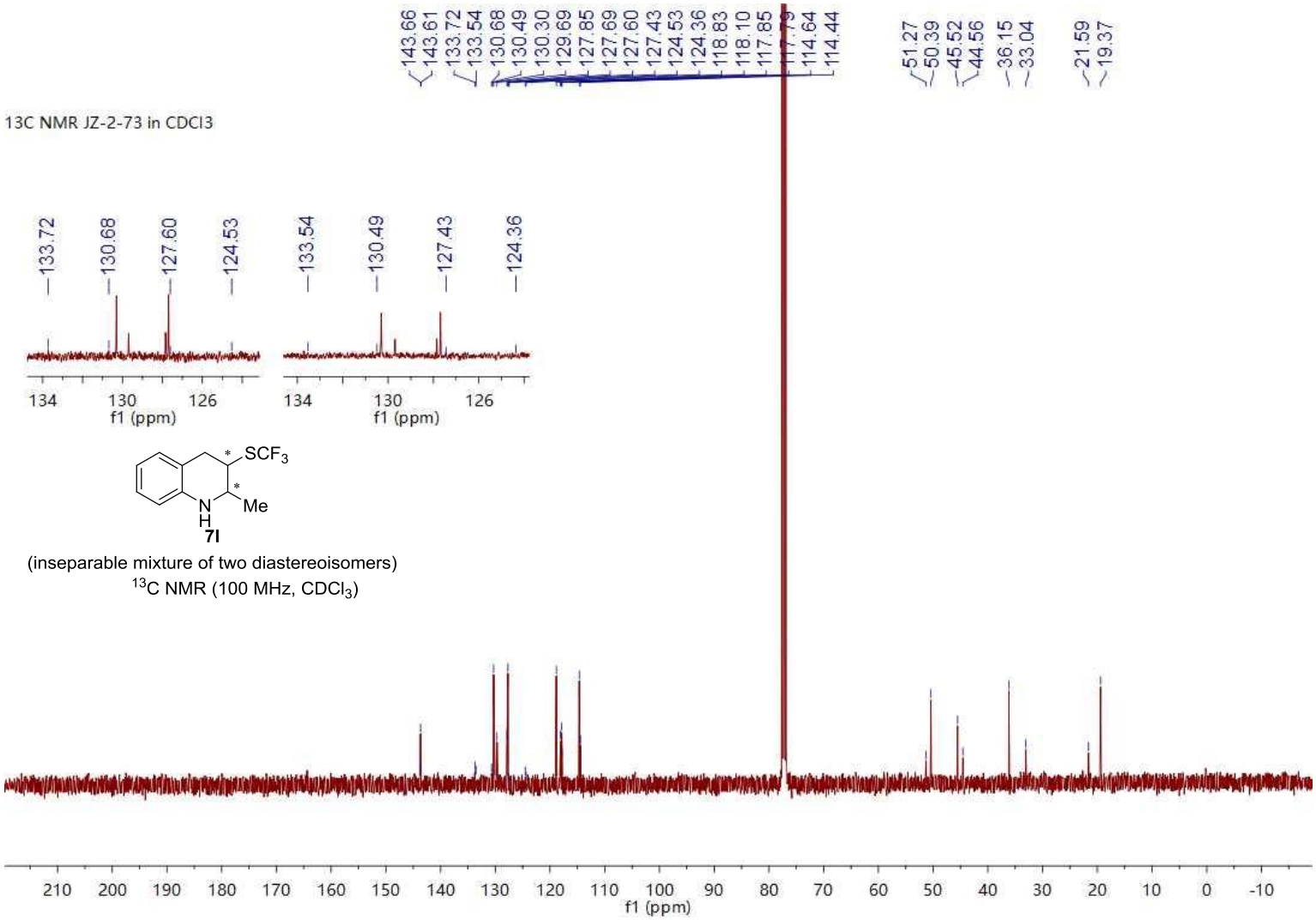
1H NMR JZ-2-73 In CDCl3



7l

(inseparable mixture of two diastereoisomers)

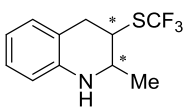
^{1}H NMR (400 MHz, $CDCl_3$)



(inseparable mixture of two diastereoisomers)

^{13}C NMR (100 MHz, $CDCl_3$)

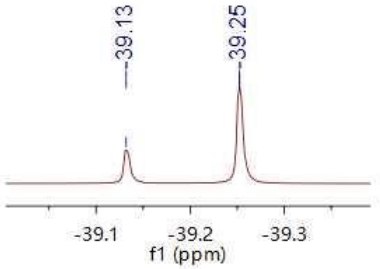
19F NMR JZ-2-73 in CDCl3

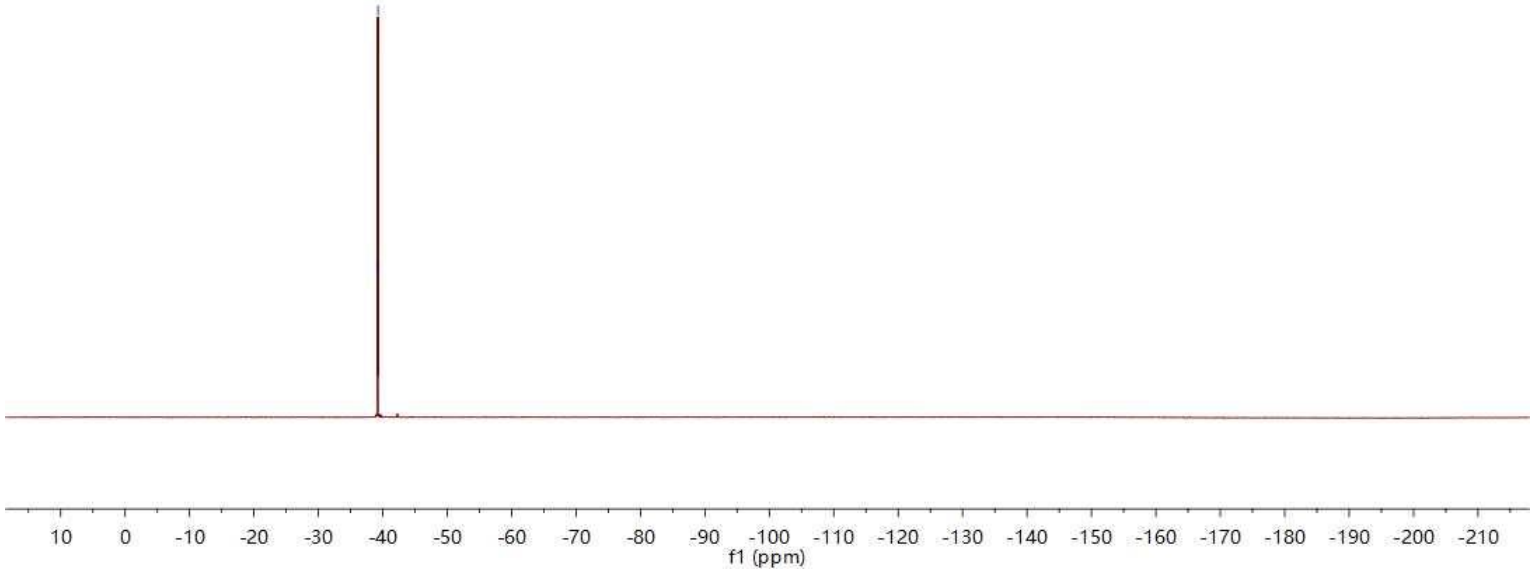


7l

(inseparable mixture of two diastereoisomers)

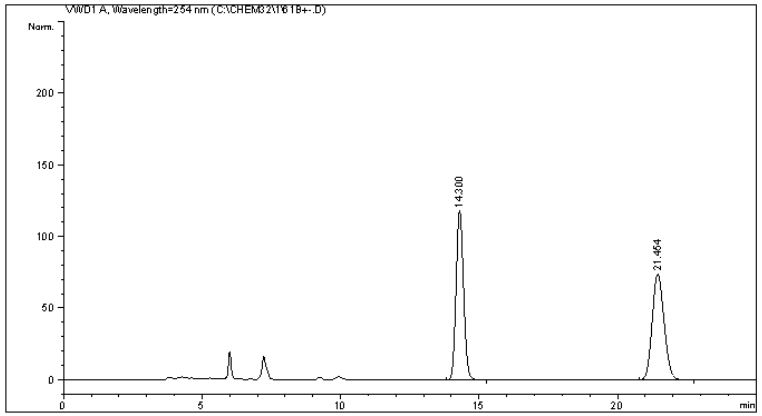
^{19}F NMR (376 MHz, $CDCl_3$)





Data File C:\CHEM32\1\61B+-.D
Sample Name: JZ-1-97(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/2/2015 12:34:08 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/1/2015 11:03:19 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:29:08 AM
                  (modified after loading)
Sample Info     : OD, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  14.300 BB    0.2919 2216.06421   118.00572  50.0578
   2  21.454 BB    0.4652 2210.94775    73.96561  49.9422

Totals :                  4427.01196  191.97133

                          *** End of Report ***
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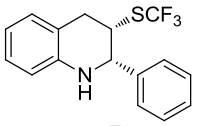
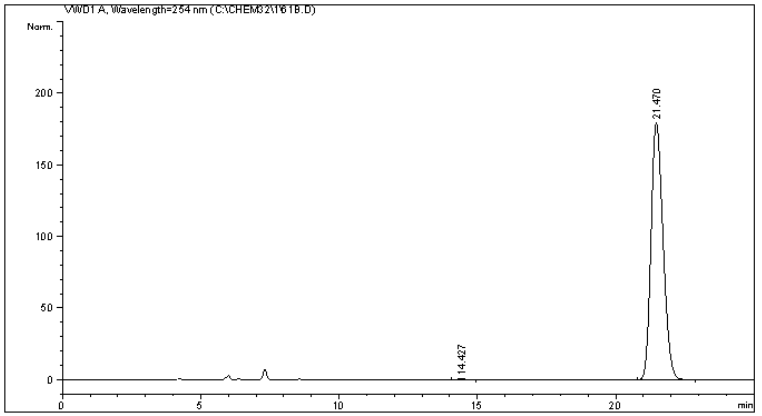


(+/-)-**7a**

Data File C:\CHEM32\1\61B.D
Sample Name: JZ-2-61B

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/26/2015 11:08:40 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 5/26/2015 10:00:33 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:29:08 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```

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                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  14.427 BB    0.3001   20.66220    1.07444   0.3784
   2  21.470 BB    0.4697 5439.21191  179.65277  99.6216

Totals :                  5459.87411  180.72721

                          *** End of Report ***
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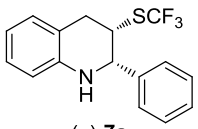
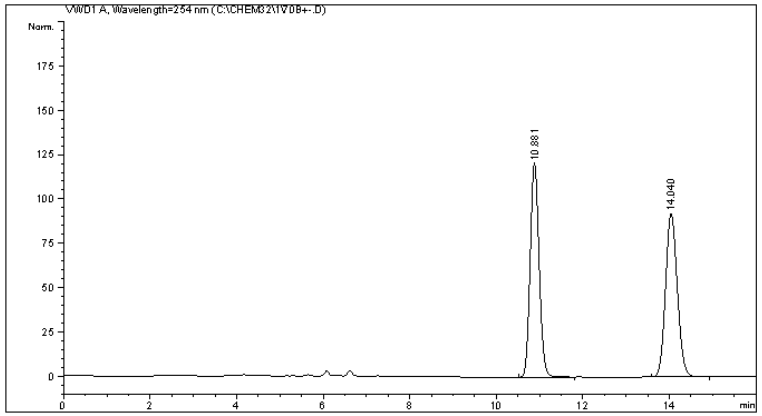


(+)-**7a**

Data File C:\CHEM32\1\70B+-.D
Sample Name: JZ-2-65B

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/27/2015 11:42:54 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/27/2015 11:25:59 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:48:53 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.881 BB    0.2234 1738.61902   120.70789  49.9562
   2  14.040 BB    0.2932 1741.66821    92.18960  50.0438

Totals :                  3480.28723   212.89749

==========================================================================
                          *** End of Report ***
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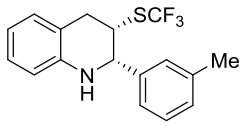
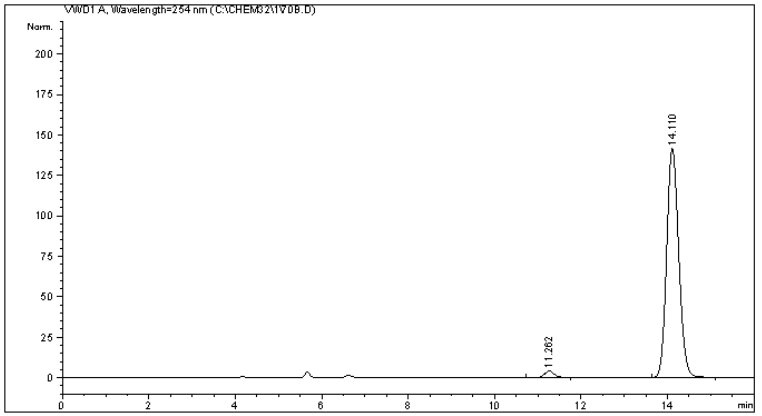


(+/-)-**7b**

Data File C:\CHEM32\1\70B.D
Sample Name: JZ-2-70B

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/8/2015 12:31:59 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/8/2015 11:22:52 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:49:34 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  11.262 BB    0.2377   58.84858    3.88809   2.1096
   2  14.110 BB    0.3010 2730.67871  141.38191  97.8904

Totals :                  2789.52729  145.27000

==========================================================================
                          *** End of Report ***
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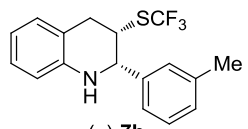
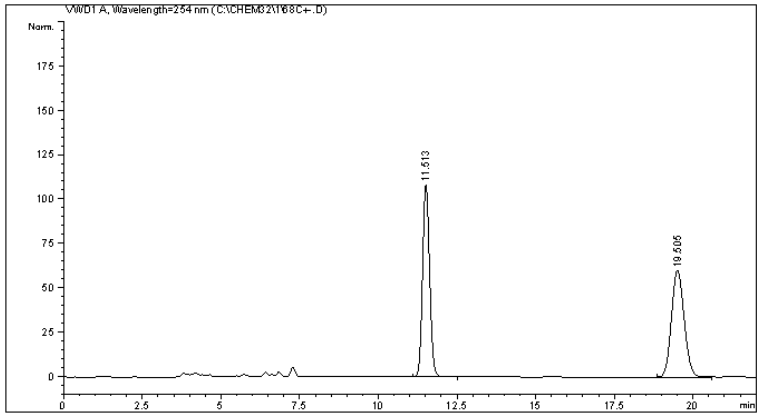


(+)-**7b**

Data File C:\CHEM32\1\68C+-.D
Sample Name: JZ-2-63C(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/30/2015 12:23:57 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 5/29/2015 11:04:01 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:44:16 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```



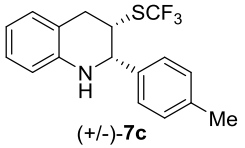

```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|---------|--------|
   1  11.513 BB    0.2426 1684.86804  108.34858  49.9749
   2  19.505 BB    0.4366 1686.56262   60.37208  50.0251

Totals :                  3371.43066  168.72066
```

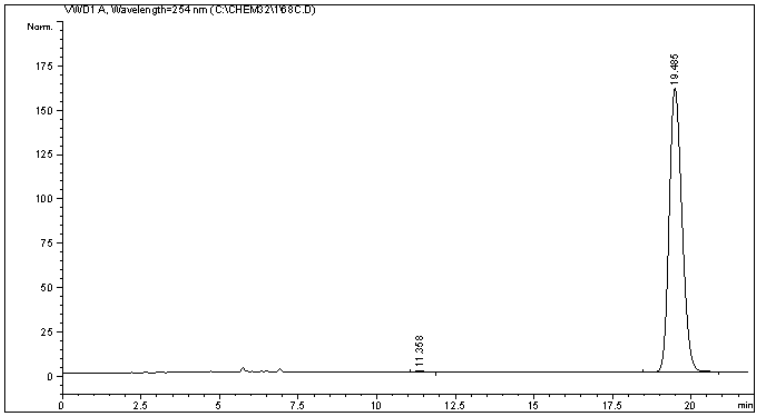


(+/-)-**7c**

```
                          *** End of Report ***
```


Data File C:\CHEM32\1\68C.D
Sample Name: JZ-2-68C

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/5/2015 12:21:55 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/5/2015 11:07:54 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:45:09 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```



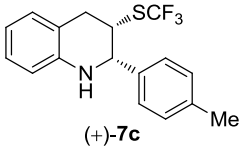

```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|---------|--------|
   1  11.358 BB    0.2442   16.92536    1.07896   0.3739
   2  19.485 BB    0.4396 4509.24023  159.92871  99.6261

Totals :                  4526.16560  161.00767
```

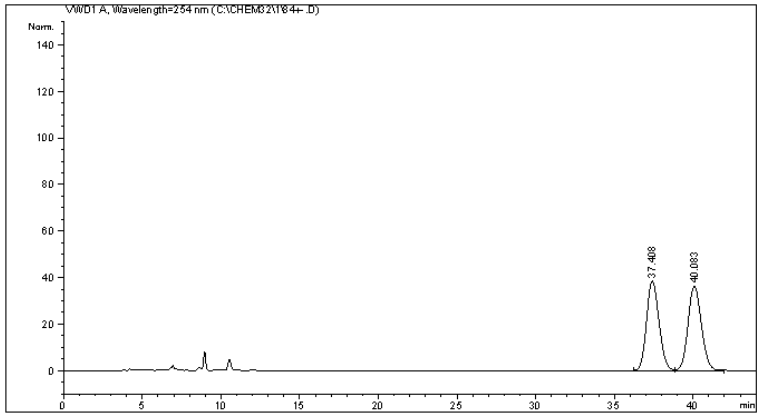


(+)-**7c**

```
                          *** End of Report ***
```

Data File C:\CHEM32\1\84+-.D
Sample Name: JZ-2-84(+-)

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/5/2015 6:10:17 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 7/5/2015 5:55:49 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 10:15:03 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 85/15, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

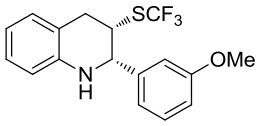
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  37.408 BV    0.8521 2130.92725   38.52382  49.8248
   2  40.083 VB    0.9223 2145.91016   36.16658  50.1752

Totals :                  4276.83740   74.69039

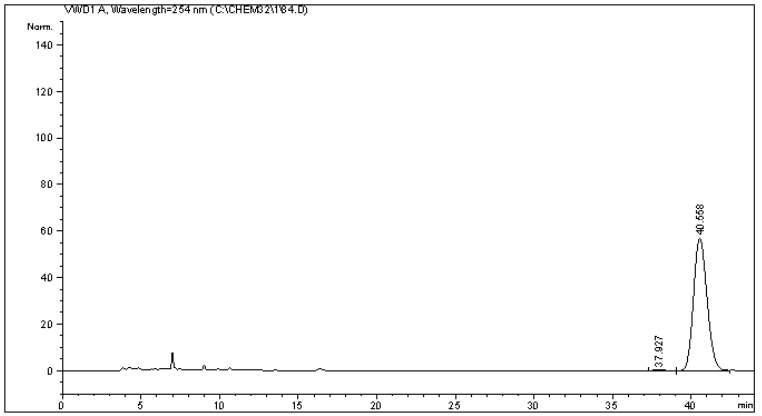
==========================================================================
                          *** End of Report ***
```



(+/-)-**7d**

Data File C:\CHEM32\1\84.D
Sample Name: JZ-2-84

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/5/2015 6:56:33 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 7/5/2015 5:55:49 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 10:15:03 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 85/15, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

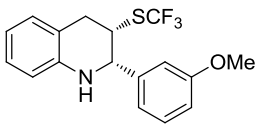
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  37.927 BV    0.6723   22.67941 4.17046e-1   0.6612
   2  40.558 VB    0.9318 3407.24023   56.88216  99.3388

Totals :                  3429.91964   57.29921

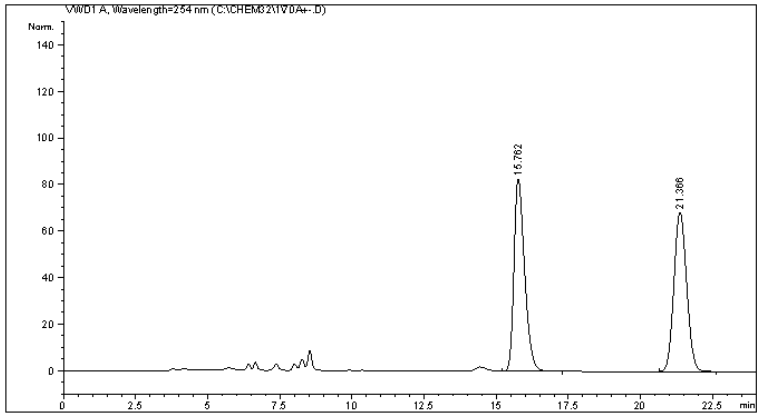
==========================================================================
                          *** End of Report ***
```



(+)-**7d**

Data File C:\CHEM32\1\70A+-.D
Sample Name: JZ-2-52A(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/16/2015 12:08:00 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 5/16/2015 11:47:32 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:47:08 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

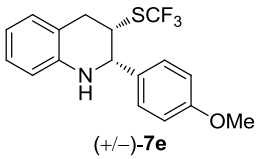
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|---------|--------|
   1  15.762 VB    0.3918 2121.56445   82.88079  50.1230
   2  21.366 BB    0.4811 2111.14868   68.63707  49.8770

Totals :                  4232.71313  151.51786

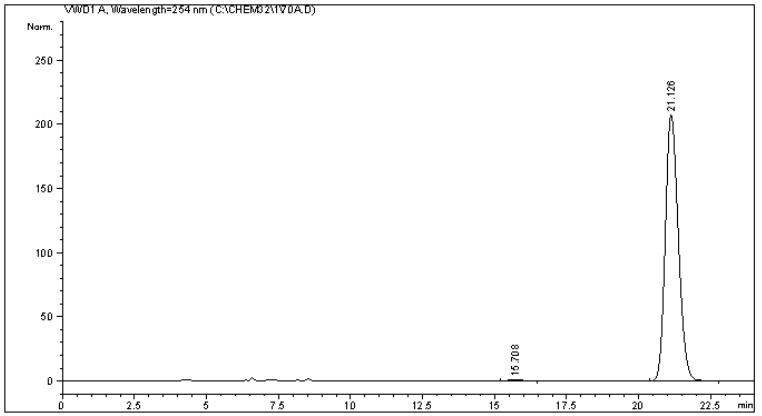
                          *** End of Report ***
```



(+/−)-**7e**

Data File C:\CHEM32\1\70A.D
Sample Name: JZ-2-70A

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/8/2015 11:44:42 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/8/2015 11:22:52 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:48:09 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

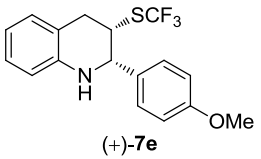
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|---------|--------|
   1  15.708 BB    0.4372   36.44908    1.31395   0.5592
   2  21.126 BB    0.4903 6482.07031  207.12946  99.4408

Totals :                  6518.51939  208.44341

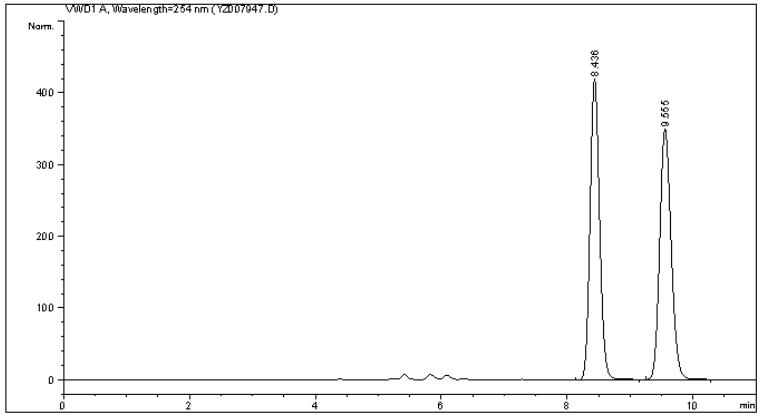
                          *** End of Report ***
```



(+)-**7e**

Data File C:\CHEM32\1\DATA\YZ007947.D
Sample Name: JZ-2-63A(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/29/2015 11:35:28 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 5/29/2015 11:04:01 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 3/14/2016 10:02:21 PM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```



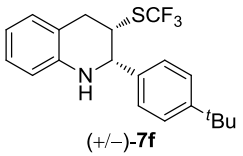

```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.436 VB    0.1631 4395.28418  419.25452  49.9626
   2   9.555 BB    0.1953 4401.86328  348.80331  50.0374

Totals :                  8797.14746  768.05783
```

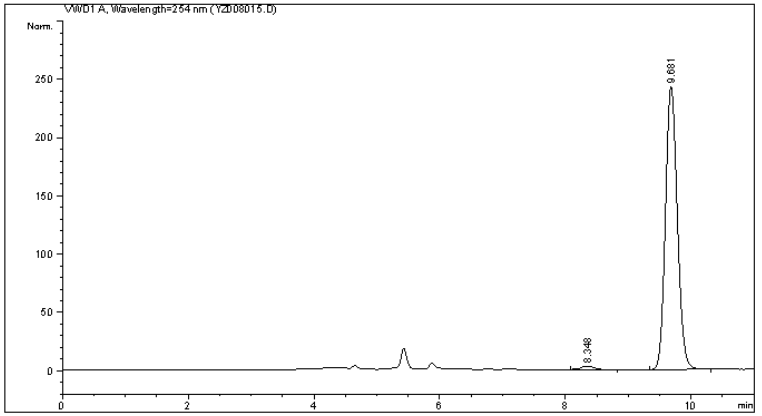


(+/−)-**7f**

```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\YZ008015.D
Sample Name: JZ-2-68A

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/5/2015 11:37:24 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/5/2015 11:07:54 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 3/14/2016 10:00:14 PM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```



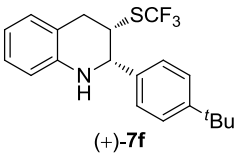

```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.348 BB    0.2165   39.76908    2.93139   1.2350
   2   9.681 BB    0.2038 3180.38818  242.71741  98.7650

Totals :                  3220.15726  245.64880
```

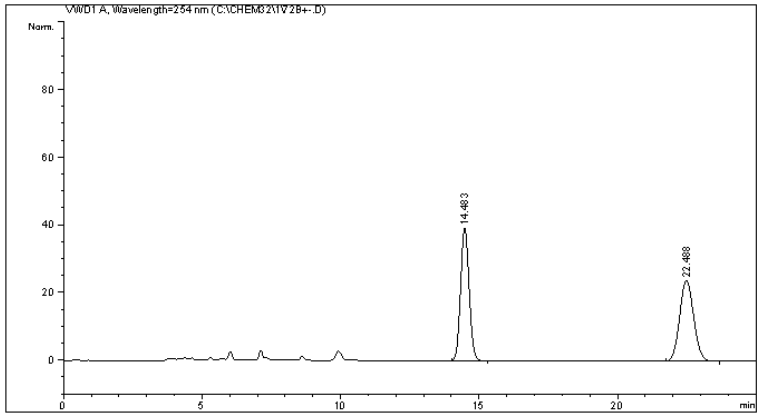


(+)-**7f**

```
                          *** End of Report ***
```

Data File C:\CHEM32\1\72B+-.D
Sample Name: JZ-2-65A(+-)

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/1/2015 11:37:20 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/1/2015 11:03:19 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:59:03 AM
                  (modified after loading)
Sample Info     : OD, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

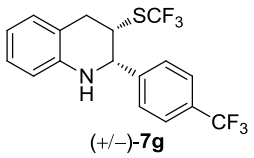
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|----------|--------|
   1  14.483 BB    0.3375  841.82031   39.25630  50.0041
   2  22.488 BB    0.5510  841.68146   23.88143  49.9959

Totals :                  1683.50177   63.13773

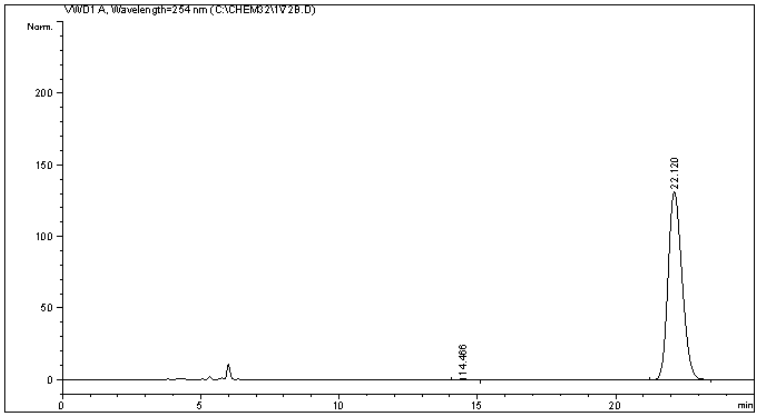
==========================================================================
                          *** End of Report ***
```



(+/–)-**7g**

Data File C:\CHEM32\1\72B.D
Sample Name: JZ-2-72B

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/11/2015 11:30:56 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/11/2015 11:14:23 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:59:49 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

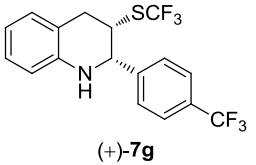
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|----------|--------|
   1  14.466 VB    0.3482   16.63230 7.27673e-1   0.3614
   2  22.120 BB    0.5477 4585.54883  131.16261  99.6386

Totals :                  4602.18113  131.89029

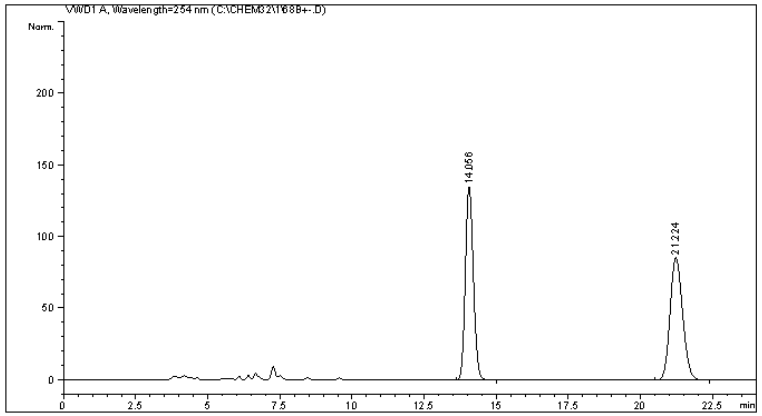
==========================================================================
                          *** End of Report ***
```



(+)-**7g**

Data File C:\CHEM32\1\68B+-.D
Sample Name: JZ-2-63B(+-)

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/29/2015 11:53:13 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 5/29/2015 11:04:01 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:41:19 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

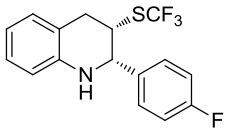
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  14.056 BB    0.2973 2599.08374  135.04184  50.0350
   2  21.224 BB    0.4733 2595.45166   85.55159  49.9650

Totals :                  5194.53540  220.59343

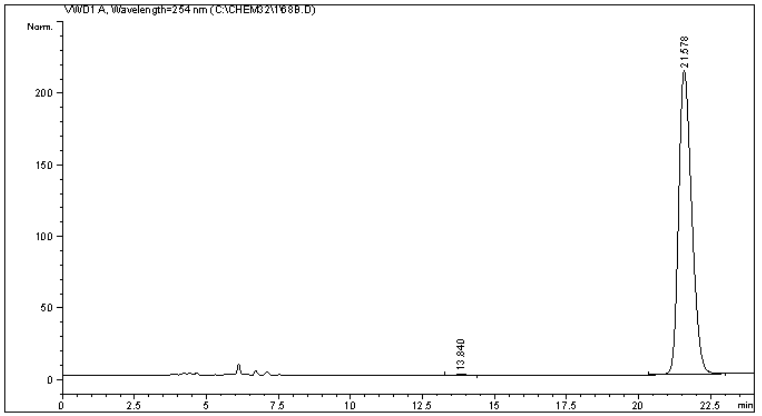
==========================================================================
                          *** End of Report ***
```



(+/−)-**7h**

Data File C:\CHEM32\1\68B.D
Sample Name: JZ-2-68B

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/5/2015 12:59:57 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/5/2015 11:07:54 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:41:19 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

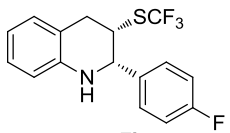
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  13.840 BB    0.3183   24.75752    1.16264   0.3675
   2  21.578 BB    0.4886 6711.12158  212.04829  99.6325

Totals :                  6735.87911  213.21094

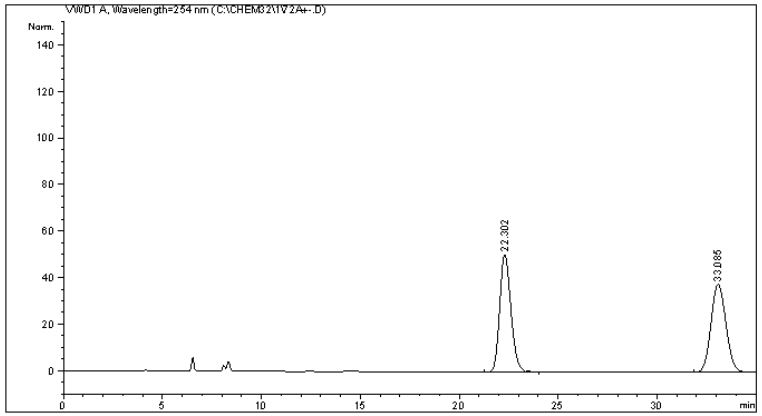
==========================================================================
                          *** End of Report ***
```



(+)-**7h**

Data File C:\CHEM32\1\72A+-.D
Sample Name: JZ-2-52B(+-)

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/16/2015 11:54:22 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 5/16/2015 11:18:59 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:50:47 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

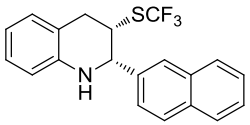
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  22.302 BB    0.6095 2000.68127   50.63852  49.9991
   2  33.085 BB    0.8316 2000.75012   37.88595  50.0009

Totals :                  4001.43140   88.52448

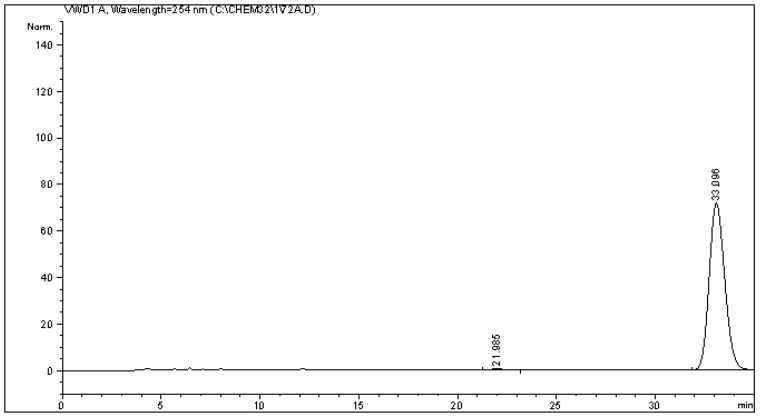
==========================================================================
                          *** End of Report ***
```



(+/−)-**7i**

Data File C:\CHEM32\1\72A.D
Sample Name: JZ-2-72A

```
==========================================================================
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/11/2015 11:23:52 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/11/2015 10:48:11 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 9:50:47 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 75/25, 0.7 mL/min, 30 oC, 254 nm
```




```
==========================================================================
                          Area Percent Report
==========================================================================

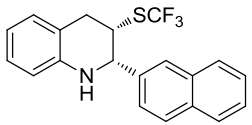
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  21.985 BB    0.5986   25.31996 5.77861e-1   0.6427
   2  33.096 BB    0.8532 3914.20264   71.60965  99.3573

Totals :                  3939.52259   72.18751

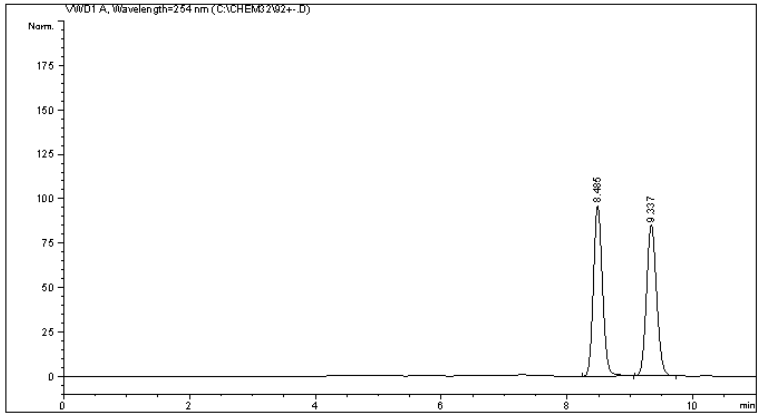
==========================================================================
                          *** End of Report ***
```



(+)-**7i**

Data File C:\CHEM32\92+-.D
Sample Name: JZ-2-92(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/23/2015 12:39:25 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 9/23/2015 12:31:52 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 3/5/2016 4:24:24 PM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

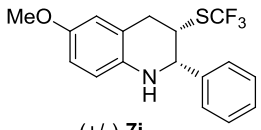
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|----------|--------|
   1   8.485 BB    0.1546  960.23840   95.97716  50.3600
   2   9.337 BB    0.1724  946.51123   84.80611  49.6400

Totals :                  1906.74963  180.78326

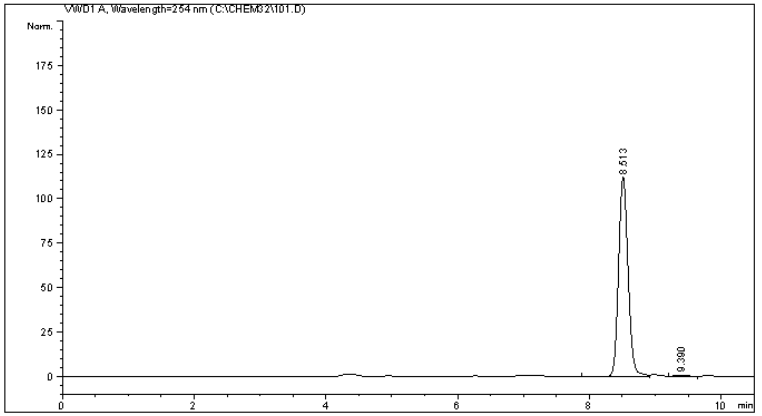
                          *** End of Report ***
```



(+/-)-**7j**

Data File C:\CHEM32\101.D
Sample Name: JZ-2-92

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/23/2015 1:09:46 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 9/23/2015 12:31:52 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 3/5/2016 4:27:41 PM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

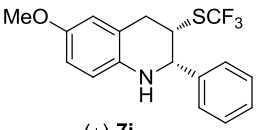
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|----------|----------|--------|
   1   8.513 VV    0.1577 1123.00818  112.05286  99.3113
   2   9.390 VV    0.2071    7.78755 5.56036e-1   0.6887

Totals :                  1130.79573  112.60890

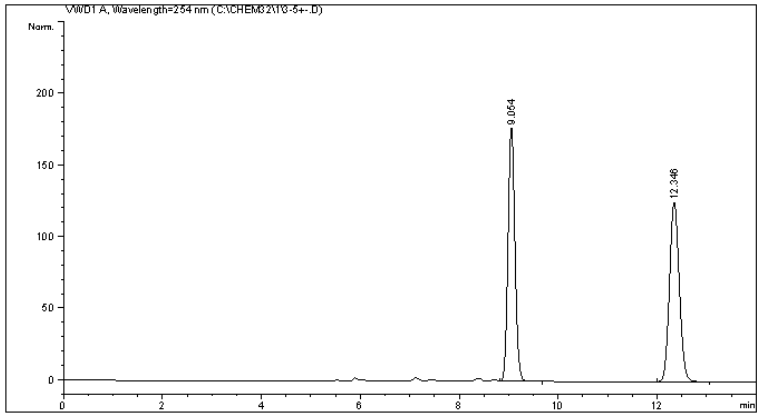
                          *** End of Report ***
```



(+)-**7j**

Data File C:\CHEM32\1\3-5+-.D
Sample Name: JZ-2-100(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/29/2015 11:22:31 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 9/29/2015 11:09:10 PM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 10:16:46 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

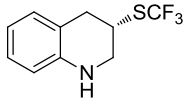
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.054 VB    0.1546 1727.93909  177.17149  50.0524
   2  12.346 BB    0.2162 1724.32410  125.06799  49.9476

Totals :                  3452.26318  302.23948

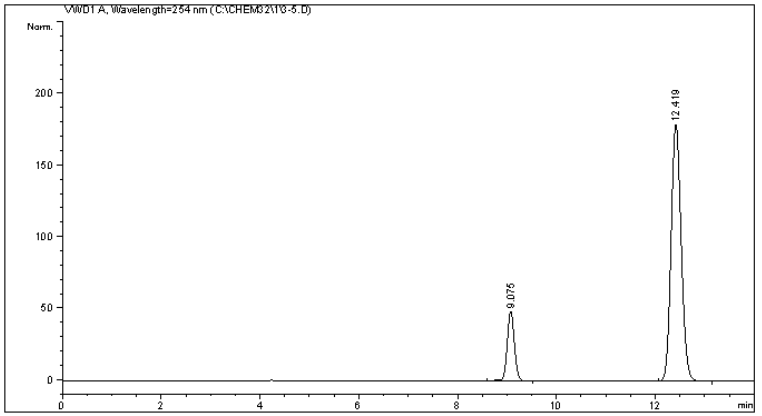
                          *** End of Report ***
```



(+/−)-**7k**

Data File C:\CHEM32\1\3-5.D
Sample Name: JZ-3-5

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 10/13/2015 10:39:56 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 10/13/2015 10:09:20 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 10:16:46 AM
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 70/30, 0.7 mL/min, 30 oC, 254 nm
```




```
                          Area Percent Report

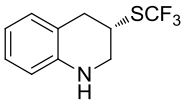
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :     1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.075 VB    0.1608  500.14172   48.61657  16.4065
   2  12.419 BB    0.2210 2548.30054  179.47720  83.5935

Totals :                  3048.44226  228.09377

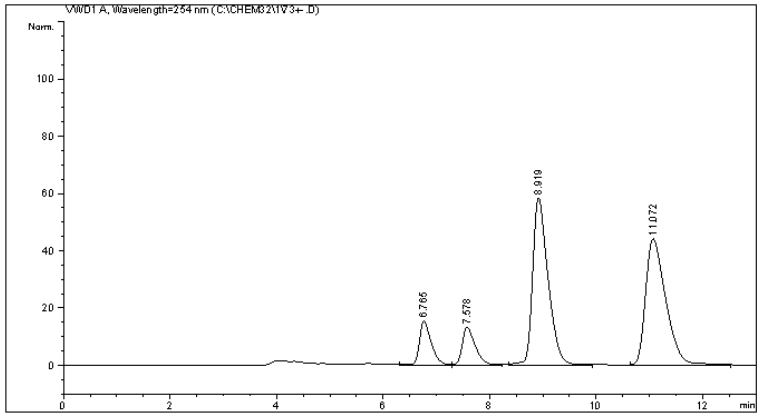
                          *** End of Report ***
```



(+)-**7k**

Data File C:\CHEM32\1\73+-.D
Sample Name: JZ-2-65C(+-)

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/3/2015 7:19:02 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/3/2015 7:04:58 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 10:01:02 AM
                  (modified after loading)
Sample Info     : OG-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm
```



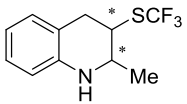

```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1   6.765 VV    0.2259  236.66074   15.39696   8.5086
   2   7.578 VB    0.2485  221.60580   13.18578   7.9673
   3   8.919 BB    0.3014 1171.56470   58.30450  42.1210
   4  11.072 BB    0.3955 1151.59546   44.01161  41.4030

Totals :                  2781.42670  130.89885
```

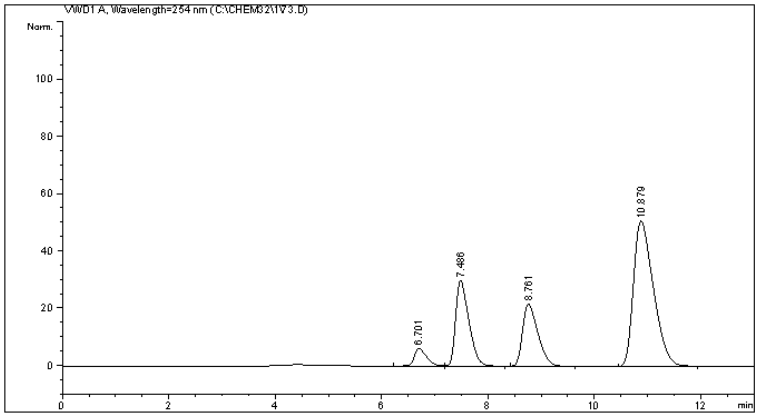


(+/−)-**7l**

```
                          *** End of Report ***
```


Data File C:\CHEM32\1\73.D
Sample Name: JZ-2-73

```
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/15/2015 11:59:18 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/15/2015 11:02:01 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 11/14/2015 10:01:02 AM
                  (modified after loading)
Sample Info     : OG, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm
```



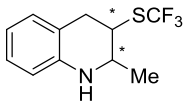

```
                          Area Percent Report

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Sample Amount:                :      1.00000  [ng/ul]   (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|------|---------|---------|-------|
   1   6.701 VV    0.2477  103.41326    6.27293   4.3389
   2   7.486 VB    0.2596  519.22223   30.08133  21.7849
   3   8.761 BB    0.3048  438.28934   21.76356  18.3892
   4  10.879 BB    0.3971 1322.47717   50.77504  55.4870

Totals :                  2383.40200  108.89285
```



7l

```
                          *** End of Report ***
```