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Supporting Information

Palladium-Catalyzed Asymmetric Hydrogenation of 2-Aryl Cyclic Ketones for the Synthesis of *trans* Cycloalkanols through Dynamic Kinetic Resolution under Acidic Conditions

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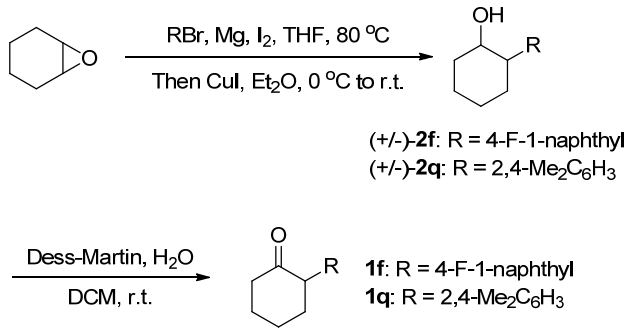
1. General and Materials

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 TMS (tetramethylsilane) 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). All reactions were monitored by TLC analysis or NMR analysis.

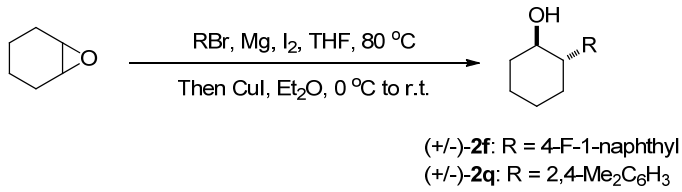
Materials: Commercially available reagents were used throughout without further purification. The anhydrous solvents for asymmetric hydrogenation were also purchased without the further purification.

2. General Procedure for Synthesis of 2-Aryl Cyclic Ketones

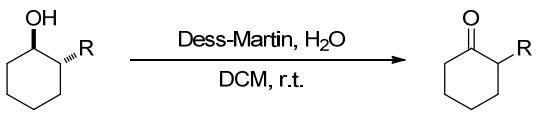
2-Aryl cyclic ketones **1a-1q**, **1s-1t** can be conveniently synthesized according to the known literature procedures.[1] The compound **1r** is commercially available. The compounds **1a-1e**, **1g-1p**, **1s-1t** are the known compounds.[2] The compounds **1f**, **1q** are the new compounds.



The 2-aryl cyclic ketones **1** could be synthesized from 2-aryl cyclic alcohols **2** and Dess-Martin periodinane according to the known literature procedure. The intermediate 2-aryl cyclic alcohols **2** were synthesized from the commercially available 7-oxabicyclo[4.1.0]-heptane and arylmagnesium bromide in the presence of cuprous iodide according to the known literature procedure. [1]



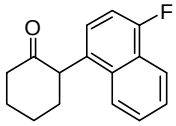
Magnesium shavings (0.432 g, 18.0 mmol) were stirred in dry tetrahydrofuran (5 mL) and iodine (trace amount) was added. RBr solution (15.0 mmol, 25 mL THF) was added dropwise under nitrogen atmosphere. The reaction was stirred at 80 °C for 4 hours. The solution was cooled to 0 °C and then cuprous iodide (0.095 g, 0.5 mmol) was added. 7-Oxabicyclo[4.1.0]heptane (1.0 mL, 10.0 mmol) was dissolved in 20 mL of ether and added dropwise to the reaction mixture. The resultant solution was stirred for overnight, and then quenched with water (10 mL). The reaction mixture was transferred to a separatory funnel containing 100 mL of water. The organic phase was collected and the aqueous phase was extracted with ether (50 mL×3). The combined organic solution was dried over anhydrous sodium sulphate, and concentrated under the reduced pressure. Purification was performed by flash column chromatography on silica gel using hexanes/ethyl acetate (30/1-20/1) as eluent to provide the pure trans compounds (+/-)-**2**.



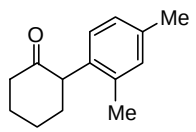
1f: R = 4-F-1-naphthyl
1q: R = 2,4-$Me_2C_6H_3$

The above compounds (+/-)-**2f** (1.300 g, 5.3 mmol) and Dess-Martin periodinane (3.371 g, 8.0 mmol) were dissolved in dichloromethane (10 mL) and stirred. Dichloromethane (5 mL) was saturated with water (0.53 mmol) and added dropwise as the solution slowly became clear. The resultant solution was stirred for overnight. When TLC indicated that the reaction was finished, then quenched with saturated sodium thiosulfate solution (10 mL). The two phases were separated, and the aqueous phase was extracted with dichloromethane (10 mL×3). The combined organic phases were dried by anhydrous sodium sulfate and concentrated under reduced pressure. Purification was performed by column chromatography on silica gel using hexanes and ethyl acetate as eluent to provide the pure compounds **1f**. Using the analogous experimental procedures, its congener **1q** was prepared.

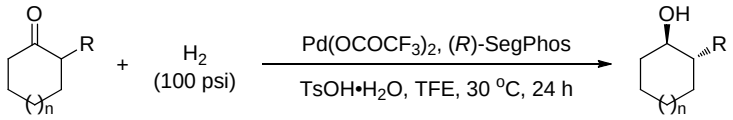
2-(4-Fluoronaphthalen-1-yl)cyclohexan-1-one (1f): The reaction was conducted by using 2-(4-fluoronaphthalen-1-yl)cyclohexan-1-ol (+/-)-**2f** (1.300 g, 5.3 mmol), affording the **1f** 0.870 g, 68%, white solid, mp = 146-147 ^{o}C, known compound,[2a] R_f = 0.37 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20-8.09 (m, 1H), 7.75-7.63 (m, 1H), 7.57-7.47 (m, 2H), 7.29-7.25 (m, 1H), 7.17-7.08 (m, 1H), 4.33-4.24 (m, 1H), 2.69-2.57 (m, 2H), 2.45-2.33 (m, 1H), 2.30-2.17 (m, 2H), 2.16-2.08 (m, 1H), 2.01-1.80 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.1, 158.2 (d, J = 249.0 Hz), 133.2 (d, J = 4.0 Hz), 131.2 (d, J = 4.0 Hz), 127.0, 125.8 (d, J = 2.0 Hz), 125.1 (d, J = 8.0 Hz), 124.1 (d, J = 16.0 Hz), 123.5 (d, J = 3.0 Hz), 121.5 (d, J = 6.0 Hz), 109.0 (d, J = 20.0 Hz), 53.2, 42.8, 34.5, 28.0, 26.1. ^{19}F NMR (376 MHz, $CDCl_3$) δ -124.54. HRMS: Calculated for $C_{16}H_{16}FO$ $[M+H]^+$ 243.1180, found: 243.1178.



2-(2,4-Dimethylphenyl)cyclohexan-1-one (1q): The reaction was conducted by using 2-(2,4-dimethylphenyl)cyclohexan-1-ol (+/-)-**2q** (1.432 g, 7.0 mmol), affording the **1q** 1.166 g, 82%, yellow oil, new compound, R_f = 0.51 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.09-6.93 (m, 3H), 3.80-3.66 (m, 1H), 2.59-2.41 (m, 2H), 2.29 (s, 3H), 2.27-2.17 (m, 2H), 2.16 (s, 3H), 2.09-1.96 (m, 2H), 1.90-1.71 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.3, 136.4, 136.0, 134.4, 131.3, 127.6, 126.8, 53.6, 42.6, 34.3, 27.9, 26.0, 21.1, 19.8. HRMS: Calculated for $C_{14}H_{19}O$ $[M+H]^+$ 203.1430, found: 203.1432.



3. Pd-Catalyzed Hydrogenation of 2-Aryl Cyclic Ketones

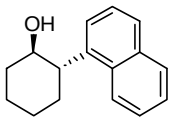


1 (n = 0, 1, 2) **2**

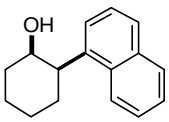
$Pd(OCOCF_3)_2$ (5.0 mg, 0.015 mmol) and (*R*)-SegPhos (11.0 mg, 0.018 mmol) were placed in a dried Schlenk tube under nitrogen atmosphere, and degassed anhydrous acetone was added. The mixture was stirred at room temperature for 1 hour. The solvent was removed under vacuum to give the catalyst. This catalyst was taken into a glove box filled with nitrogen and dissolved in 2,2,2-trifluoroethanol (TFE, 1.0 mL). To the mixture of 2-aryl cyclic ketones **1** (0.3 mmol) and *p*-toluenesulfonic acid monohydrate (28.5 mg, 0.15 mmol) in 2,2,2-trifluoroethanol (2.0 mL) was added this catalyst solution, and then the mixture was transferred to an autoclave, which was charged hydrogen gas (100 psi). The autoclave was stirred at 30 °C for 24 hours. After release of the hydrogen gas, the autoclave was opened and the reaction mixture was evaporated. Purification was performed by column chromatography on silica gel using hexanes/dichloromethane/ethyl acetate (2/2/0.1) as the eluent to give the chiral reductive products **2**.

Racemates of **2** were prepared by the reduction of the corresponding 2-aryl cyclic ketones **1** catalyzed by palladium catalyst with racemic ligand.

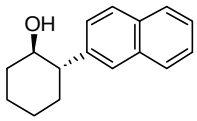
(-)-(1*R*,2*S*)-2-(Naphthalen-1-yl)cyclohexan-1-ol (2a): 62 mg, 91% yield, white solid, known compound,[3a] R_f = 0.44 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 97% ee, $[\alpha]^{20}_D$ = -75.32 (*c* 1.24, MeOH), [lit.[3a]: $[\alpha]^{20}_D$ = -60 (*c* 1.46, MeOH) for 85% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20 (d, *J* = 8.4 Hz, 1H), 7.92-7.84 (m, 1H), 7.79-7.72 (m, 1H), 7.56-7.45 (m, 4H), 4.11-3.86 (m, 1H), 3.53-3.26 (m, 1H), 2.29-2.16 (m, 1H), 2.04-1.89 (m, 2H), 1.86-1.77 (m, 1H), 1.64-1.46 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.7, 134.2, 132.7, 129.0, 127.1, 126.1, 125.8, 125.7, 123.3, 122.8, 74.3, 46.7, 34.8, 34.0, 26.5, 25.2. HPLC: Chiracel IC column, 230 nm, 30 °C, *n*-Hexane/*i*-PrOH = 96/4, flow = 0.7 mL/min, retention time 19.1 min (major) and 20.4 min.



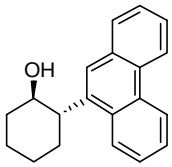
***cis*-2-(Naphthalen-1-yl)cyclohexan-1-ol (2a'):** the known compound,[3b] R_f = 0.50 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.04 (d, *J* = 8.2 Hz, 1H), 7.91-7.85 (m, 1H), 7.76 (d, *J* = 7.8 Hz, 1H), 7.58-7.41 (m, 4H), 4.21-4.13 (m, 1H), 3.68-3.59 (m, 1H), 2.39-2.26 (m, 1H), 2.11-1.94 (m, 2H), 1.89-1.73 (m, 2H), 1.71-1.48 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.5, 134.3, 131.5, 129.3, 127.4, 126.1, 125.7, 125.6, 124.4, 123.1, 69.1, 43.3, 32.9, 26.9, 25.0, 20.0.



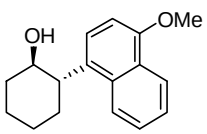
(-)-2-(Naphthalen-2-yl)cyclohexan-1-ol (2b): 64 mg, 94% yield, white solid, the known compound,[3a] R_f = 0.32 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 82% ee, $[\alpha]^{20}_D$ = -21.09 (*c* 1.28, $CHCl_3$), [lit.[3a]: $[\alpha]^{20}_D$ = -20.2 (*c* 1.035, $CHCl_3$) for 70% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87-7.73 (m, 3H), 7.72-7.66 (m, 1H), 7.50-7.40 (m, 2H), 7.38 (dd, *J* = 8.5, 1.6 Hz, 1H), 3.81-3.67 (m, 1H), 2.65-2.51 (m, 1H), 2.20-2.07 (m, 1H), 1.96-1.71 (m, 3H), 1.68-1.53 (m, 2H), 1.51-1.29 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.8, 133.7, 132.7, 128.6, 127.74, 127.71, 126.8, 126.2, 126.0, 125.6, 74.3, 53.4, 34.6, 33.4, 26.2, 25.2. HPLC: Chiracel IC column, 230 nm, 30 °C, *n*-Hexane/*i*-PrOH = 98/2, flow = 0.8 mL/min, retention time 33.3 min (major) and 36.5 min.



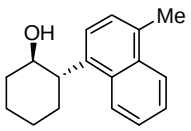
(-)-2-(Phenanthren-9-yl)cyclohexan-1-ol (2c): 69 mg, 83% yield, white solid, the known compound,[4a] R_f = 0.42 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 91% ee, $[\alpha]^{20}_D$ = -109.85 (*c* 1.36, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.75-8.70 (m, 1H), 8.64 (d, *J* = 8.0 Hz, 1H), 8.29-8.20 (m, 1H), 7.87-7.80 (m, 1H), 7.74-7.69 (m, 1H), 7.68-7.53 (m, 4H), 4.17-4.01 (m, 1H), 3.48-3.29 (m, 1H), 2.28-2.17 (m, 1H), 2.11-1.99 (m, 1H), 1.97-1.74 (m, 3H), 1.63-1.43 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 137.8, 131.8, 131.7, 131.0, 129.7, 128.4, 126.82, 126.78, 126.49, 126.46, 123.9, 123.4, 122.6, 73.8, 46.8, 34.8, 34.0, 26.5, 25.2. HPLC: Chiracel IC column, 254 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 19.2 min (major) and 21.2 min.



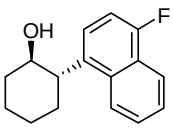
(-)-2-(4-Methoxynaphthalen-1-yl)cyclohexan-1-ol (2d): 64 mg, 83% yield, white solid, mp = 108-109 ^{o}C, new compound, R_f = 0.38 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 97% ee, $[\alpha]^{20}_D$ = -77.73 (*c* 1.28, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (dd, *J* = 8.3, 1.1 Hz, 1H), 8.13 (d, *J* = 8.4 Hz, 1H), 7.57-7.45 (m, 2H), 7.37 (d, *J* = 8.0 Hz, 1H), 6.81 (d, *J* = 8.0 Hz, 1H), 3.98 (s, 3H), 3.97-3.86 (m, 1H), 3.35-3.21 (m, 1H), 2.26-2.16 (m, 1H), 1.99-1.86 (m, 2H), 1.84-1.75 (m, 1H), 1.73-1.67 (m, 1H), 1.57-1.40 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.3, 133.5, 131.2, 126.6, 126.1, 125.1, 123.1, 122.7, 103.7, 74.3, 55.5, 46.2, 34.8, 34.1, 26.5, 25.2. HPLC: Chiracel IC column, 230 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 20.8 min (major) and 31.4 min. HRMS: Calculated for $C_{17}H_{24}NO_2$ $[M+NH_4]^+$ 274.1802, found: 274.1803.



(-)-2-(4-Methylnaphthalen-1-yl)cyclohexan-1-ol (2e): 64 mg, 89% yield, colorless oil, new compound, R_f = 0.37 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 98% ee, $[\alpha]^{20}_D$ = -80.23 (*c* 1.26, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24-8.18 (m, 1H), 8.05-8.00 (m, 1H), 7.56-7.49 (m, 2H), 7.36 (d, *J* = 7.3 Hz, 1H), 7.31 (d, *J* = 7.4 Hz, 1H), 4.03-3.84 (m, 1H), 3.45-3.27 (m, 1H), 2.67 (s, 3H), 2.25-2.14 (m, 1H), 2.01 -1.86 (m, 2H), 1.82-1.75 (m, 1H), 1.71-1.64 (m, 1H), 1.59-1.41 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 137.7, 133.2, 132.9, 132.7, 126.6, 125.7, 125.5, 125.0, 123.8, 122.4, 74.2, 46.5, 34.8, 34.1, 26.5, 25.2, 19.6. HPLC: Chiracel IC column, 230 nm, 30 ^{o}C, *n*-Hexane/ *i*-PrOH = 95/5, flow = 0.8 mL/min, retention time 13.0 min (major) and 16.9 min. HRMS: Calculated for $C_{17}H_{24}NO$ $[M+NH_4]^+$ 258.1852, found: 258.1851.

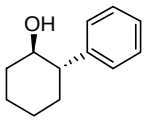


(-)-2-(4-Fluoronaphthalen-1-yl)cyclohexan-1-ol (2f): 64 mg, 88% yield, colorless oil, new compound, R_f = 0.39 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 97% ee, $[\alpha]^{20}_D$ = -57.58 (*c* 1.24, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24-8.11 (m, 2H), 7.62-7.51 (m, 2H), 7.42-7.34 (m, 1H), 7.19-7.09 (m, 1H), 4.00-3.82 (m, 1H), 3.40-3.22 (m, 1H), 2.26-2.13 (m, 1H), 2.00-1.72 (m, 3H), 1.64-1.60 (m, 1H), 1.59-1.39 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.7 (d, *J* = 249.0 Hz), 135.5, 134.0, 127.0, 126.1, 124.3 (d, *J* = 16.0 Hz), 123.4, 122.6, 121.3 (d, *J* = 6.0 Hz), 109.2 (d, *J* = 19.0 Hz), 74.4, 46.4, 35.0, 34.1, 26.4, 25.2. ^{19}F NMR (376 MHz, $CDCl_3$) δ -125.05. HPLC: Chiracel IC column, 230 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 8.9 min (major) and 10.0 min. HRMS: Calculated for $C_{16}H_{21}FNO$ $[M+NH_4]^+$ 262.1602, found: 262.1601.

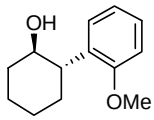


(-)-2-Phenylcyclohexan-1-ol (2g): 48 mg, 91% yield, white solid, the known compound,[4b] R_f = 0.45 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 88% ee, $[\alpha]^{20}_D$ = -26.74 (*c* 0.92, $CHCl_3$), [lit.[4b]: $[\alpha]^{23}_D$ = -20.9 (*c* 1.0, $CHCl_3$) for 86% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38-7.28 (m,

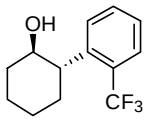
2H), 7.27-7.19 (m, 3H), 3.69-3.58 (m, 1H), 2.48-2.35 (m, 1H), 2.15-2.03 (m, 1H), 1.91-1.80 (m, 2H), 1.79-1.71 (m, 1H), 1.67-1.57 (m, 1H), 1.56-1.43 (m, 1H), 1.42-1.24 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.4, 128.8, 128.0, 126.9, 74.5, 53.3, 34.5, 33.4, 26.2, 25.2. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 99/1, flow = 1.0 mL/min, retention time 11.6 min (major) and 12.6 min.



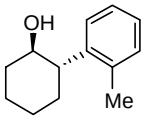
(-)-2-(2-Methoxyphenyl)cyclohexan-1-ol (2h): 48 mg, 77% yield, colorless oil, known compound,[3a] R_f = 0.28 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 93% ee, $[\alpha]^{20}_D$ = -64.75 (*c* 0.82, MeOH), [lit.[3a]: $[\alpha]^{20}_D$ = -5 (*c* 1.52, MeOH) for 15% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27-7.17 (m, 2H), 7.00-6.92 (m, 1H), 6.89 (d, *J* = 8.2 Hz, 1H), 3.82 (s, 3H), 3.78-3.69 (m, 1H), 3.06-2.95 (m, 1H), 2.18-2.08 (m, 1H), 1.88-1.70 (m, 4H), 1.55-1.32 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.8, 131.6, 127.5, 127.4, 121.1, 110.9, 74.1, 55.6, 45.1, 35.3, 32.5, 26.3, 25.2. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 97/3, flow = 0.7 mL/min, retention time 17.1 min (major) and 18.1 min.



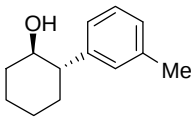
(-)-2-(2-(Trifluoromethyl)phenyl)cyclohexan-1-ol (2i): 29 mg, 40% yield, colorless oil, new compound, R_f = 0.35 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 86% ee, $[\alpha]^{20}_D$ = -54.78 (*c* 0.46, MeOH). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 (d, *J* = 7.9 Hz, 1H), 7.58-7.48 (m, 2H), 7.35-7.28 (m, 1H), 3.90-3.79 (m, 1H), 2.99-2.85 (m, 1H), 2.21-2.11 (m, 1H), 1.95-1.84 (m, 2H), 1.79-1.70 (m, 1H), 1.51-1.29 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.1, 132.3, 129.7 (q, *J* = 29.0 Hz), 127.7, 126.5, 126.2 (q, *J* = 6.0 Hz), 124.7 (q, *J* = 272.0 Hz), 74.3, 48.3, 35.5, 34.8, 26.0, 25.2. ^{19}F NMR (376 MHz, $CDCl_3$) δ -57.98. HPLC: Chiracel IA column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 96/4, flow = 0.7 mL/min, retention time 13.4 min and 16.3 min (major). HRMS: Calculated for $C_{13}H_{19}F_3NO$ $[M+NH_4]^+$ 262.1413, found: 262.1414.



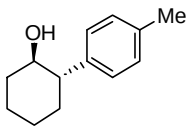
(-)-2-(*o*-Tolyl)cyclohexan-1-ol (2j): 49 mg, 86% yield, colorless oil, known compound,[3a] R_f = 0.36 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 94% ee, $[\alpha]^{20}_D$ = -64.49 (*c* 0.98, $CHCl_3$), [lit.[3a]: $[\alpha]^{20}_D$ = -42 (*c* 1.28, $CHCl_3$) for 65% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27-7.23 (m, 1H), 7.22-7.14 (m, 2H), 7.13-7.08 (m, 1H), 3.83-3.71 (m, 1H), 2.83-2.68 (m, 1H), 2.36 (s, 3H), 2.18-2.07 (m, 1H), 1.94-1.70 (m, 3H), 1.69-1.59 (m, 1H), 1.51-1.27 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 141.5, 137.2, 130.7, 126.6, 126.4, 125.6, 74.4, 47.9, 34.6, 33.2, 26.4, 25.2, 20.0. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 97/3, flow = 0.7 mL/min, retention time 9.8 min (major) and 10.9 min.



(-)-2-(*m*-Tolyl)cyclohexan-1-ol (2k): 45 mg, 79% yield, colorless oil, known compound,[3a] R_f = 0.42 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 89% ee, $[\alpha]^{20}_D$ = -35.28 (*c* 0.36, $CHCl_3$), [lit.[3a]: $[\alpha]^{20}_D$ = -9 (*c* 0.90, $CHCl_3$) for 36% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.26-7.18 (m, 1H), 7.09-7.01 (m, 3H), 3.70-3.58 (m, 1H), 2.43-2.35 (m, 1H), 2.34 (s, 3H), 2.14-2.06 (m, 1H), 1.88-1.71 (m, 3H), 1.68-1.60 (m, 1H), 1.56-1.28 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 143.3, 138.4, 128.8, 128.7, 127.7, 125.0, 74.5, 53.3, 34.5, 33.4, 26.2, 25.2, 21.6. HPLC: Chiracel IA column, 220 nm, 30 ^{o}C, *n*-Hexane/ *i*-PrOH = 96/4, flow = 0.7 mL/min, retention time 15.2 min (major) and 17.4 min.

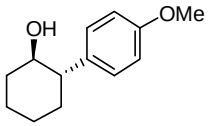


(-)-2-(*p*-Tolyl)cyclohexan-1-ol (2l): 49 mg, 86% yield, white solid, known compound,[5a] R_f = 0.41 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 92% ee, $[\alpha]^{20}_D$ = -48.47 (*c* 0.98, MeOH), [lit.[5a]: $[\alpha]^{23}_D$ = -58.05 (*c* 1.0, MeOH) for > 99% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.17-7.10 (m,



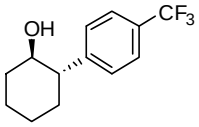
4H), 3.66-3.57 (m, 1H), 2.43-2.35 (m, 1H), 2.33 (s, 3H), 2.14-2.06 (m, 1H), 1.90-1.79 (m, 2H), 1.78-1.71 (m, 1H), 1.63-1.56 (m, 1H), 1.55-1.25 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.3, 136.5, 129.6, 127.9, 74.6, 52.9, 34.5, 33.5, 26.2, 25.2, 21.1. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/ *i*-PrOH = 97/3, flow = 0.7 mL/min, retention time 13.1 min (major) and 13.8 min.

(-)-2-(4-Methoxyphenyl)cyclohexan-1-ol (2m): 51 mg, 82% yield, white solid, the known compound,[3a] R_f = 0.27 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 88% ee, $[\alpha]^{20}_D$ = -55.35



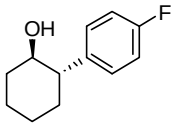
(*c* 0.84, MeOH). [lit.[3a]: $[\alpha]^{20}_D$ = -24 (*c* 1.46, MeOH) for 44% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.21-7.12 (m, 2H), 6.91-6.83 (m, 2H), 3.79 (s, 3H), 3.65-3.52 (m, 1H), 2.44-2.31 (m, 1H), 2.16-2.03 (m, 1H), 1.91-1.71 (m, 3H), 1.69-1.60 (m, 1H), 1.54-1.23 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.6, 135.3, 128.9, 114.3, 74.7, 55.4, 52.4, 34.5, 33.6, 26.2, 25.2. HPLC: Chiracel OJ-H column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 16.5 min and 18.5 min (major).

(-)-2-(4-(Trifluoromethyl)phenyl)cyclohexan-1-ol (2n): 61 mg, 84% yield, white solid, the known compound,[5b] R_f = 0.45 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 82% ee, $[\alpha]^{20}_D$ =



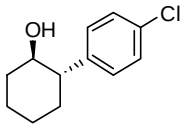
-40.60 (*c* 1.16, MeOH), [lit.[5b]: $[\alpha]^{20}_D$ = -42.9 (*c* 1.0, MeOH) for > 99% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 8.1 Hz, 2H), 7.36 (d, *J* = 8.0 Hz, 2H), 3.76-3.58 (m, 1H), 2.61-2.41 (m, 1H), 2.16-2.03 (m, 1H), 1.97-1.72 (m, 3H), 1.58-1.23 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 148.0, 129.1 (q, *J* = 32.0 Hz), 128.3, 125.7 (q, *J* = 4.0 Hz), 124.4 (q, *J* = 270.0 Hz), 74.3, 53.1, 35.0, 33.4, 26.0, 25.1. ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.39. HPLC: Chiracel AD-H column, 220 nm, 30 ^{o}C, *n*-Hexane/ *i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 8.7 min and 12.6 min (major).

(-)-2-(4-Fluorophenyl)cyclohexan-1-ol (2o): 42 mg, 72% yield, white solid, known compound,[3a] R_f = 0.39 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 81% ee, $[\alpha]^{20}_D$ = -49.16 (*c*



0.60, MeOH). [lit.[3a]: $[\alpha]^{20}_D$ = -12.3 (*c* 1.52, MeOH) for 53% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25-7.16 (m, 2H), 7.07-6.96 (m, 2H), 3.67-3.53 (m, 1H), 2.48-2.35 (m, 1H), 2.16-2.05 (m, 1H), 1.91-1.71 (m, 3H), 1.60-1.53 (m, 1H), 1.52-1.25 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.8 (d, *J* = 243.0 Hz), 139.1 (d, *J* = 3.0 Hz), 129.3 (d, *J* = 7.0 Hz), 115.6 (d, *J* = 21.0 Hz), 74.6, 52.5, 34.7, 33.6, 26.1, 25.1. ^{19}F NMR (376 MHz, $CDCl_3$) δ -116.35. HPLC: Chiracel AD-H column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 9.5 min and 11.1 min (major).

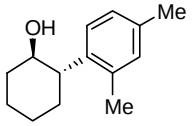
(-)-2-(4-Chlorophenyl)cyclohexan-1-ol (2p): 58 mg, 92% yield, white solid, known compound,[5c] R_f = 0.43 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 83% ee, $[\alpha]^{20}_D$ = -46.25 (*c*



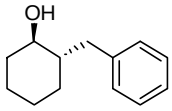
1.12, MeOH). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.32-7.26 (m, 2H), 7.21-7.15 (m, 2H), 3.66-3.54 (m, 1H), 2.47-2.33 (m, 1H), 2.14-2.04 (m, 1H), 1.91-1.71 (m, 3H), 1.65-1.53 (m, 1H), 1.52-1.24 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.1, 132.5, 129.3, 128.9, 74.4, 52.6, 34.8, 33.5, 26.0, 25.1. HPLC: Chiracel AD-H column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 10.6 min and 13.3 min (major).

(-)-2-(2,4-Dimethylphenyl)cyclohexan-1-ol (2q): 56 mg, 92% yield, colorless oil, new compound, R_f = 0.52 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 95% ee, $[\alpha]^{20}_D$ = -61.98 (*c* 1.06, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.14 (d, *J* = 7.8 Hz, 1H), 7.05-6.97 (m, 2H), 3.81-3.68 (m,

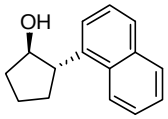
1H), 2.79-2.65 (m, 1H), 2.32 (s, 3H), 2.28 (s, 3H), 2.15-2.07 (m, 1H), 1.90- 1.83 (m, 1H), 1.80-1.71 (m, 2H), 1.68-1.63 (m, 1H), 1.47-1.28 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 138.4, 137.1, 135.8, 131.6, 127.3, 125.5, 74.5, 47.6, 34.6, 33.4, 26.4, 25.2, 21.0, 19.9. HPLC: Chiracel AD-H column, 220 nm, 30 ^{o}C, *n*-Hexane/ *i*-PrOH = 97/3, flow = 0.7 mL/min, retention time 11.6 min and 12.3 min (major). HRMS: Calculated for $C_{14}H_{24}NO$ $[M+NH_4]^+$ 222.1852, found: 222.1851.



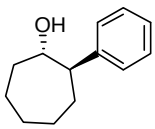
(-)-2-Benzylcyclohexan-1-ol (2r): 16 mg, 28% yield, white solid, known compound,[5d] R_f = 0.30 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 9% ee, $[\alpha]^{20}_D$ = -5.62 (*c* 0.32, $CHCl_3$). [lit.[5d]: $[\alpha]^{20}_D$ = -41.6 (*c* 1.00, $CHCl_3$) for 99% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.25 (m, 2H), 7.21-7.16 (m, 3H), 3.35-3.25 (m, 1H), 3.17 (dd, *J* = 13.3, 4.0 Hz, 1H), 2.36 (dd, *J* = 13.3, 9.2 Hz, 1H), 2.03-1.95 (m, 1H), 1.74-1.46 (m, 5H), 1.34-1.18 (m, 2H), 1.15-1.02 (m, 1H), 0.97-0.85 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 140.9, 129.6, 128.3, 125.9, 74.7, 47.2, 39.2, 36.0, 30.1, 25.6, 25.1. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 98/2, flow = 0.7 mL/min, retention time 17.8 min (major) and 21.9 min.



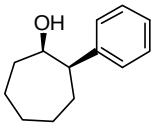
(-)-2-(Naphthalen-1-yl)cyclopentan-1-ol (2s): 40 mg, 63% yield, colorless oil, the known compound,[5e] R_f = 0.40 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 77% ee, $[\alpha]^{20}_D$ = -26.48 (*c* 0.74, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20 (d, *J* = 8.2 Hz, 1H), 7.84 (d, *J* = 7.8 Hz, 1H), 7.71 (d, *J* = 8.0 Hz, 1H), 7.55-7.33 (m, 4H), 4.49-4.34 (m, 1H), 3.80-3.68 (m, 1H), 2.40-2.27 (m, 1H), 2.19-2.07 (m, 1H), 2.03-1.69 (m, 5H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.6, 134.1, 132.6, 128.9, 126.9, 126.0, 125.7, 125.6, 123.9, 122.6, 79.5, 49.3, 34.2, 31.9, 22.1. HPLC: Chiracel IC column, 230 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 95/5, flow = 1.0 mL/min, retention time 10.1 min (major) and 11.2 min.



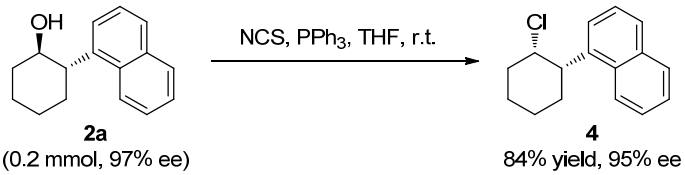
(+)-2-Phenylcycloheptan-1-ol (*trans*-2t): 22 mg, 39% yield, colorless oil, known compound,[4c] R_f = 0.30 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 72% ee, $[\alpha]^{20}_D$ = +3.95 (*c* 0.38, $CHCl_3$). [lit.[4c]: $[\alpha]^{20}_D$ = -0.852 (*c* 7.06, $CHCl_3$) for 84% ee]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36-7.28 (m, 2H), 7.26-7.18 (m, 3H), 3.83-3.71 (m, 1H), 2.62-2.50 (m, 1H), 2.08-1.97 (m, 1H), 1.89-1.51 (m, 10H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 146.0, 128.9, 127.8, 126.8, 77.7, 55.5, 35.5, 32.2, 27.5, 26.9, 22.0. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 99/1, flow = 0.5 mL/min, retention time 21.9 min (major) and 23.7 min.



(-)-2-Phenylcycloheptan-1-ol (*cis*-2t'): 8 mg, 14% yield, colorless oil, the known compound,[5f] R_f = 0.41 (hexanes/dichloromethane/ethyl acetate 2/2/0.1), 73% ee, $[\alpha]^{20}_D$ = -21.25 (*c* 0.16, $CHCl_3$). [lit.[5f]: $[\alpha]^{20}_D$ = -98.8 (*c* 1.14, $CHCl_3$) for > 99:1 er]. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36-7.29 (m, 2H), 7.26-7.19 (m, 3H), 4.06-3.95 (m, 1H), 2.92-2.81 (m, 1H), 2.21-2.07 (m, 1H), 2.01-1.69 (m, 6H), 1.64-1.58 (m, 1H), 1.56-1.42 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.6, 128.7, 128.2, 126.5, 73.8, 51.8, 35.3, 29.0, 28.2, 26.9, 21.7. HPLC: Chiracel IC column, 220 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 99/1, flow = 0.5 mL/min, retention time 14.5 min and 15.6 min (major).

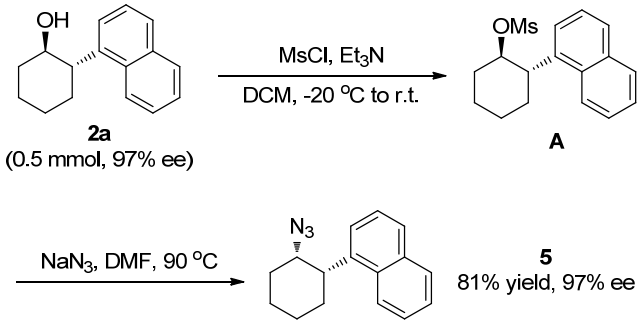


4. Synthetic Transformations



To a stirred mixture of *trans*-(-)-2-(naphthalen-1-yl)cyclohexan-1-ol **2a** (45.2 mg, 0.2 mmol), NCS (53.4 mg, 0.4 mmol) and triphenylphosphine (78.7 mg, 0.3 mmol) were added dry THF (2 mL). The mixture was stirred at room temperature for one hour. The THF was removed by rotary evaporation and the resulting residue was purified by silica gel column chromatography (hexanes/ ethyl acetate 50/1) to provide pure (+)-1-(2-chlorocyclohexyl)naphthalene **4**. [6a]

(*S*,*S*)-(+)-1-(2-Chlorocyclohexyl)naphthalene (4): 41 mg, 84% yield, white solid, the known com- pound,[6b] R_f = 0.80 (hexanes/ethyl acetate 20/1), 95% ee, $[\alpha]^{20}_D$ = +167.67 (*c* 0.56, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 (d, *J* = 8.4 Hz, 1H), 7.90-7.84 (m, 1H), 7.75 (d, *J* = 8.1 Hz, 1H), 7.54-7.43 (m, 3H), 7.40 (d, *J* = 7.0 Hz, 1H), 4.74-4.67 (m, 1H), 3.82-3.74 (m, 1H), 2.48-2.35 (m, 1H), 2.25-2.08 (m, 2H), 2.06-1.87 (m, 2H), 1.78-1.64 (m, 2H), 1.63-1.53 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 138.6, 134.0, 131.2, 129.5, 127.4, 126.1, 125.4, 125.3, 122.3, 64.8, 43.3, 35.2, 26.7, 25.4, 20.0. HPLC: Chiracel AD-H column, 230 nm, 30 ^{o}C, *n*-Hexane/*i*-PrOH = 99.5/0.5, flow = 0.5 mL/min, retention time 10.5 min (major) and 11.9 min.



To a stirred mixture of *trans*-(-)-2-(naphthalen-1-yl)cyclohexan-1-ol **2a** (113.1 mg, 0.5 mmol, 97% ee) and triethylamine (0.28 mL, 2.0 mmol) in dry dichloromethane (4 mL) were cooled at -20 ^{o}C, and methanesulfonyl chloride ($MeSO_2Cl$, 117.0 μL, 1.5 mmol) was added dropwise while the temperature was maintained -20 ^{o}C for 3 hours. After the reaction was moved to room temperature for 18 hours. The solvent was removed by rotary evaporation and the residue was purified by silica gel column chromatography (hexanes/dichloromethane/ethyl acetate 2/2/0.1) to provide the pure compound **A** (149.0 mg, 98%) for the next step.

A mixture of compound **A** (149.0 mg, 0.49 mmol) and sodium azide (96.0 mg, 1.47 mmol) in reagent grade DMF (4 mL) was heated at 90 °C for 69 hours. The mixture was diluted with water (5 mL), and then extracted with dichloromethane (5 mL×3). The organic layer was separated and washed repeatedly with water (10 mL×3) to remove the DMF, dried by anhydrous sodium sulfate and filtered. The solvent was removed in *vacuo*, and the residue was purified by silica gel column chromatography (hexanes/ethyl acetate 20/1) to provide the pure compound **5** (102.0 mg, 83%).[7]

(*S*,*S*)-(+)-1-(2-Azidocyclohexyl)naphthalene (5): 102 mg, 81% yield (two steps), colorless oil, new compound, R_f = 0.80 (hexanes/ethyl acetate 10/1), 97% ee, $[\alpha]^{20}_D$ = +175.59 (*c* 1.98, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (d, *J* = 8.4 Hz, 1H), 7.87 (d, *J* = 7.9 Hz, 1H), 7.79-7.74 (m, 1H), 7.55-7.42 (m, 4H), 4.14-4.10 (m, 1H), 3.65-3.56 (m, 1H), 2.32-2.18 (m, 1H), 2.15-2.06 (m,

1H), 2.02-1.94 (m, 1H), 1.92-1.82 (m, 1H), 1.76-1.63 (m, 3H), 1.58-1.44 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 138.6, 134.0, 131.2, 129.5, 127.4, 126.1, 125.6, 125.4, 125.0, 122.5, 62.9, 42.0, 31.1, 26.6, 25.9, 20.6. HPLC: Chiracel OD-H column, 230 nm, 30 ^{o}C, *n*-Hexane /*i*-PrOH = 99/1, flow = 0.7 mL/min, retention time 12.0 min and 14.9 min (major). HRMS: Calculated for $C_{16}H_{21}N_4$ $[M+NH_4]^+$ 269.1761, found: 269.1744.

5. References

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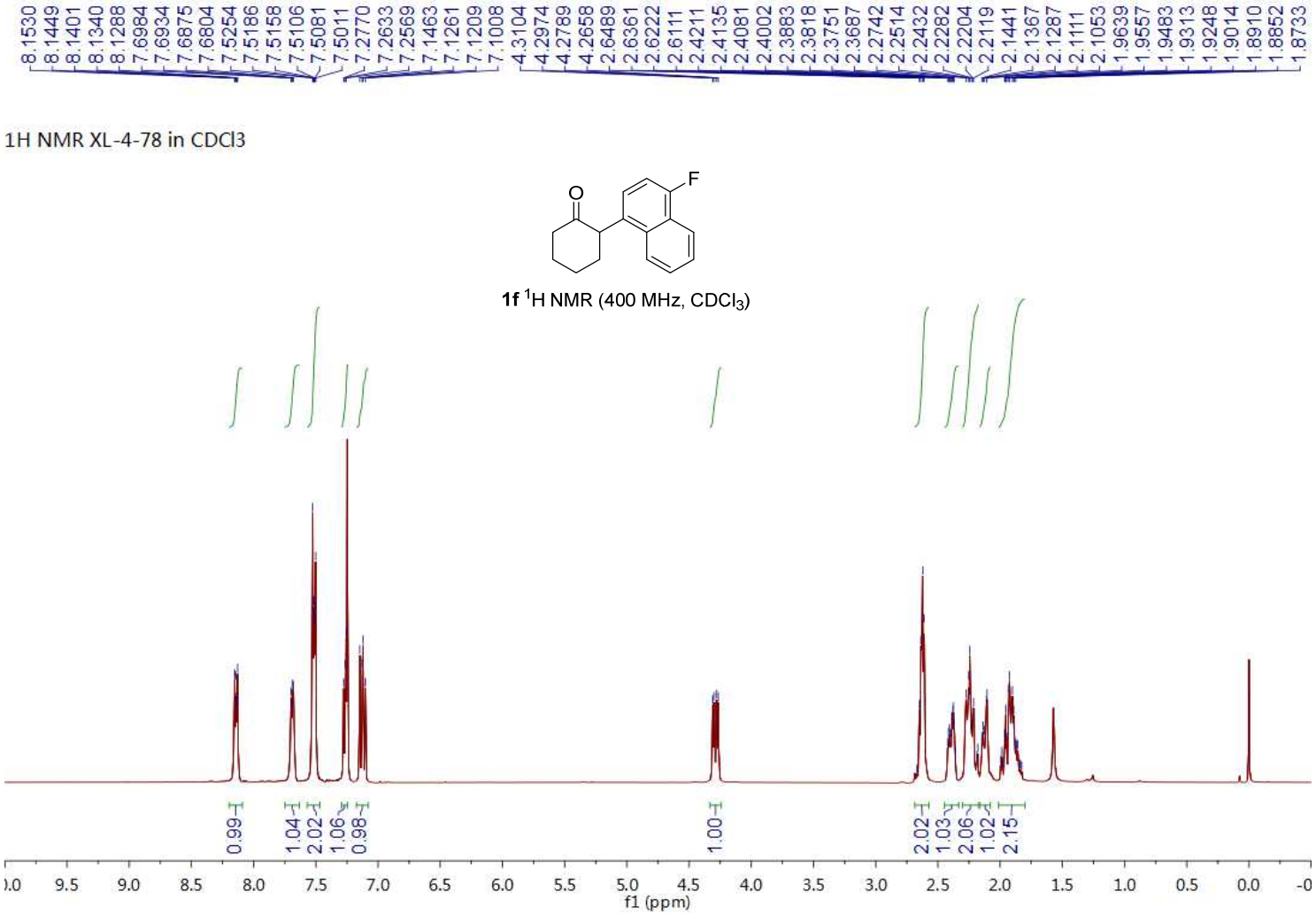
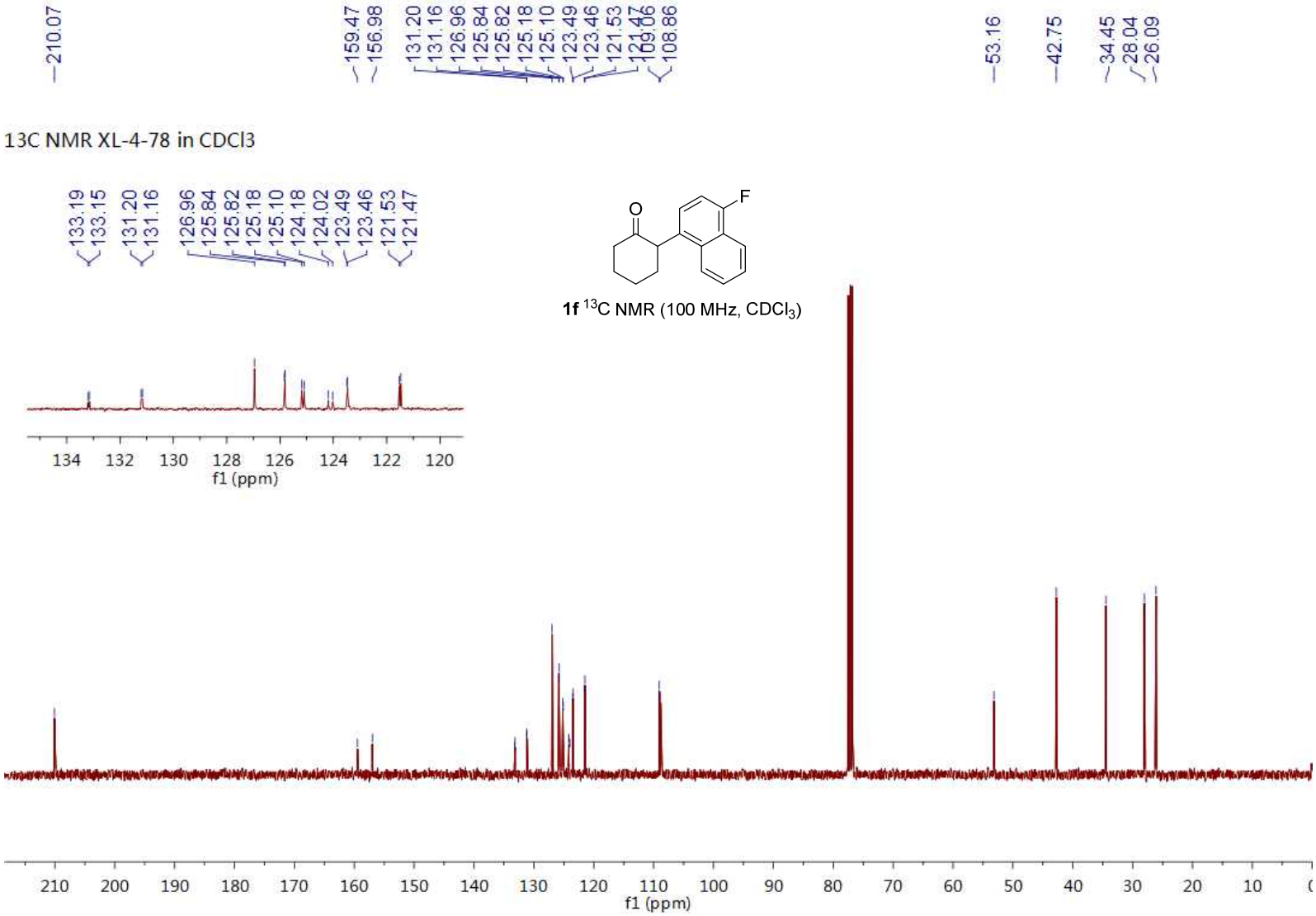
6. Copy of NMR and HPLC

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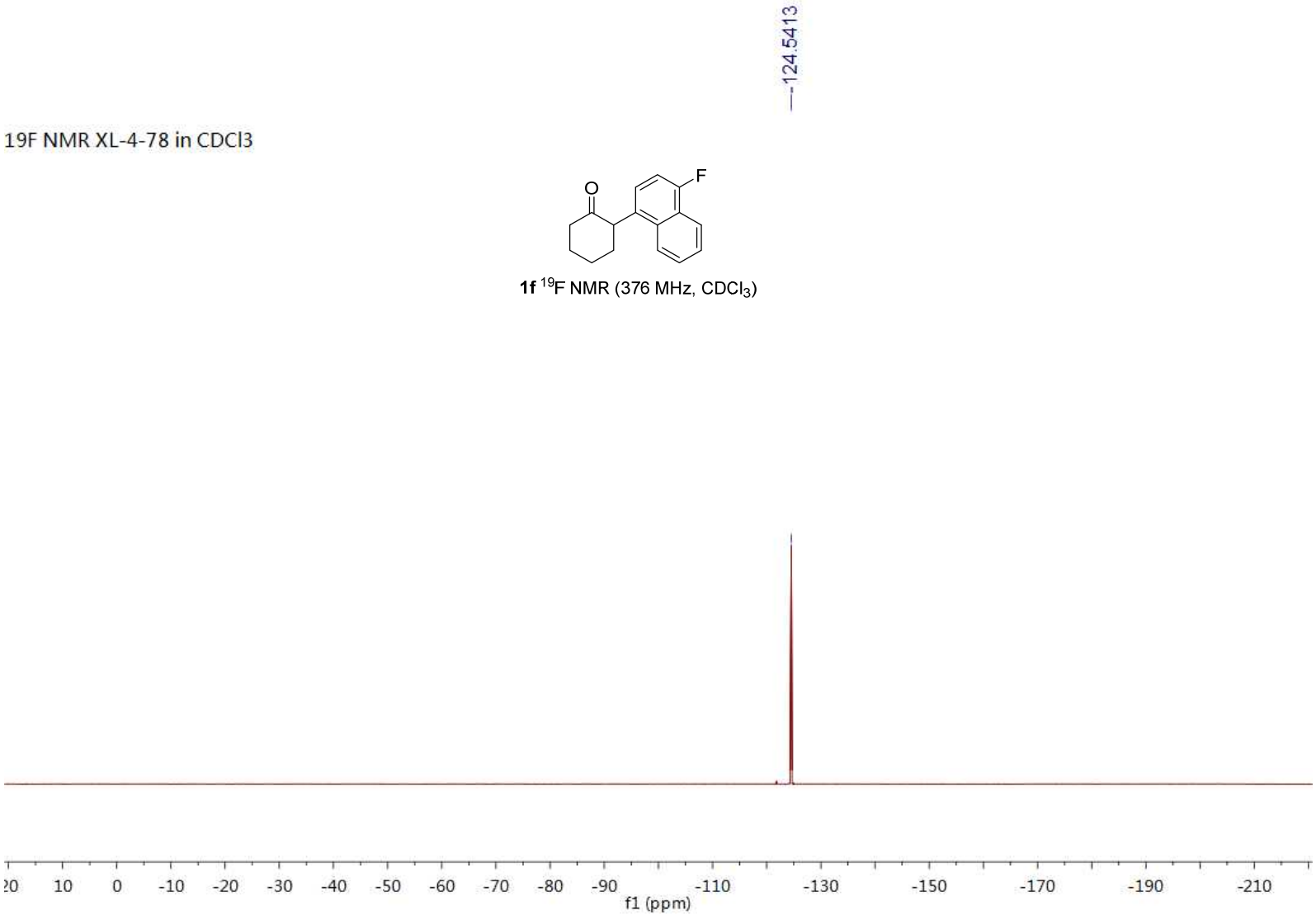
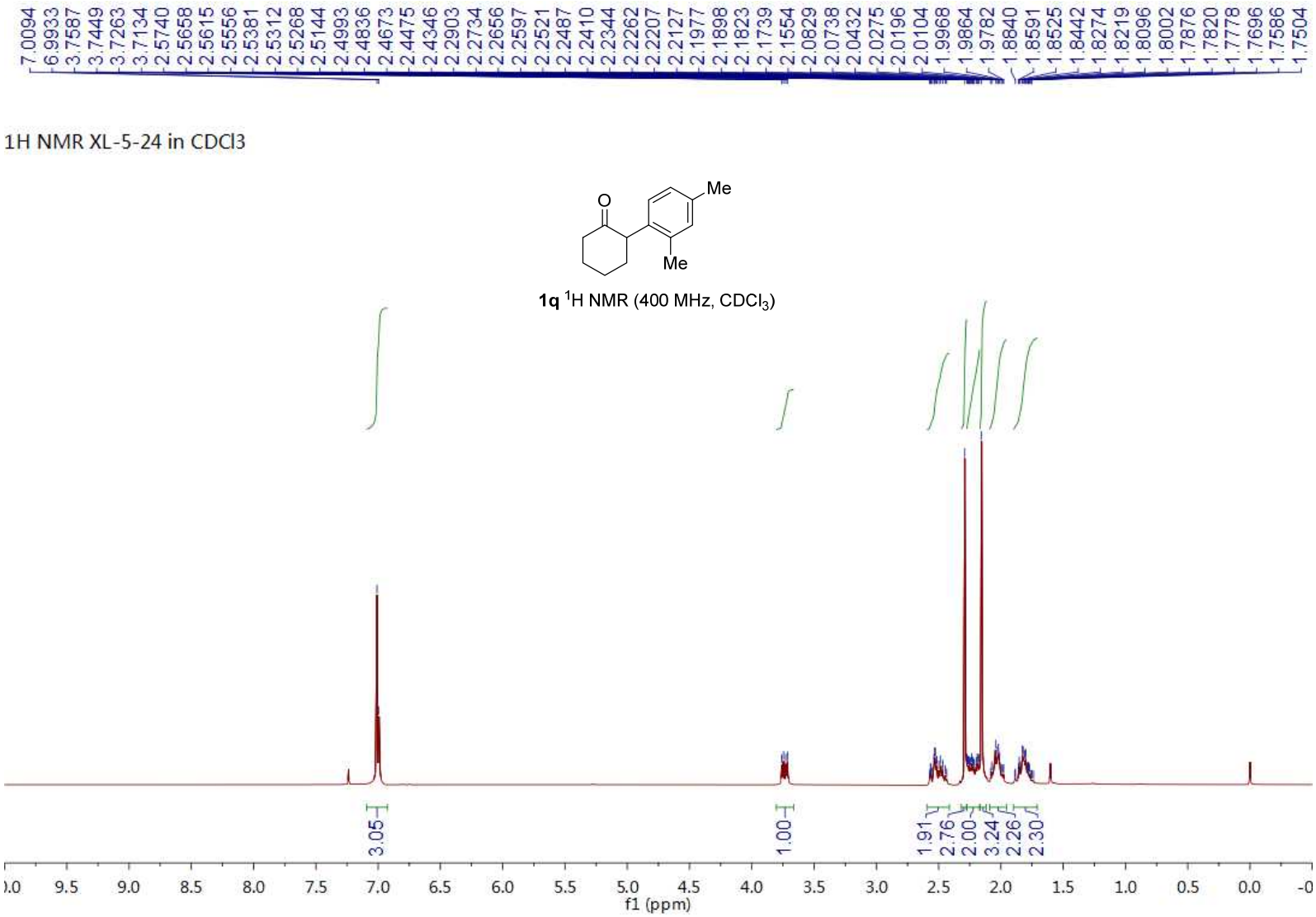
121.53
121.47
109.06
108.86
53.16
42.75
34.45
28.04
26.09
13C NMR XL-4-78 in CDCl3
133.19
133.15
131.20
131.16
126.96
125.84
125.82
125.18
125.10
124.18
124.02
123.49
123.46
121.53
121.47
O
F
1f 13C NMR (100 MHz, CDCl3)
134 132 130 128 126 124 122 120
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

19F NMR XL-4-78 in CDCl3

1f ^{19}F NMR (376 MHz, $CDCl_3$)

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Me
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2.00
3.24
2.26
2.30
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8.5
8.0
7.5
7.0
6.5
6.0
5.5
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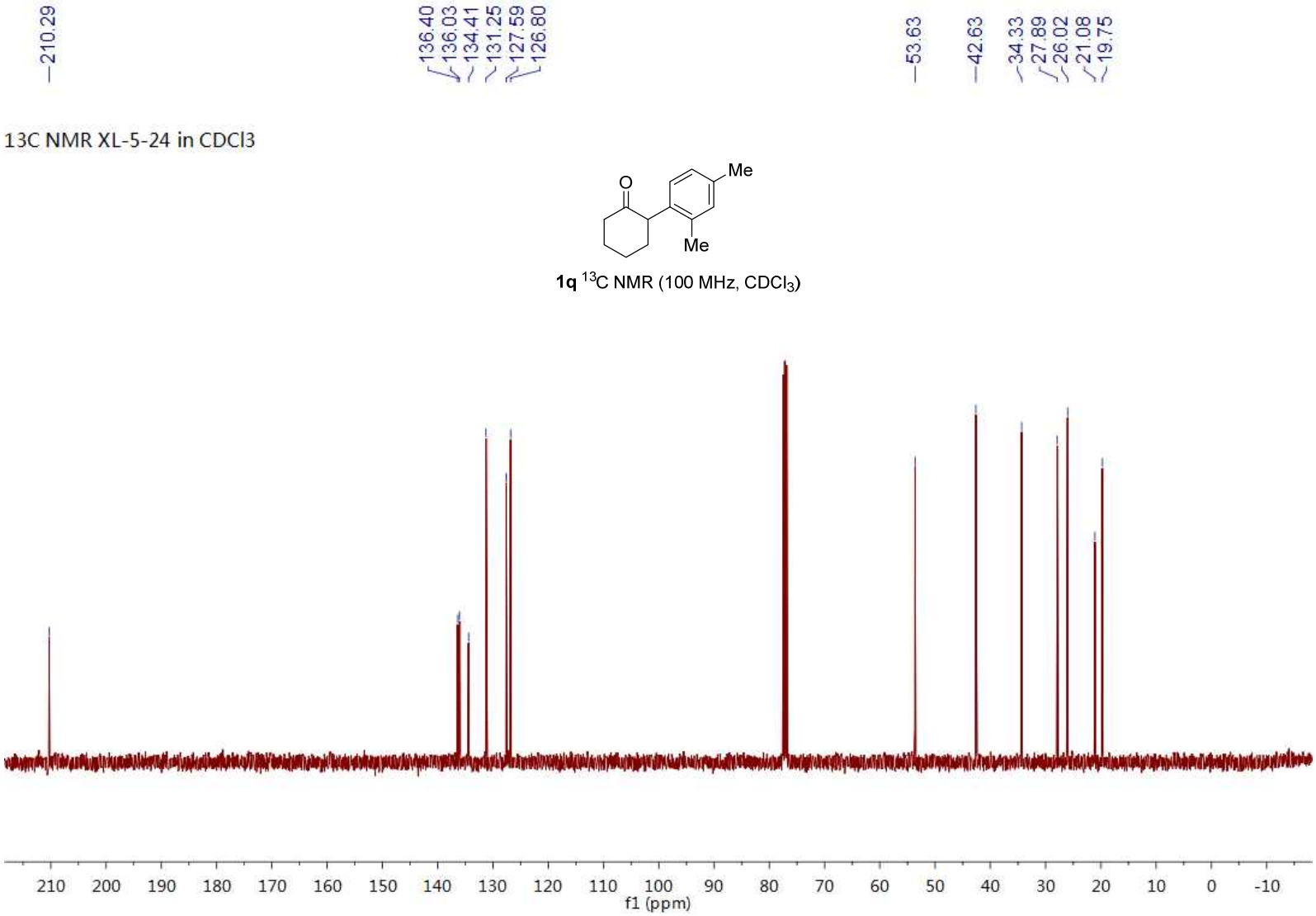
f1 (ppm)



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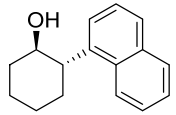

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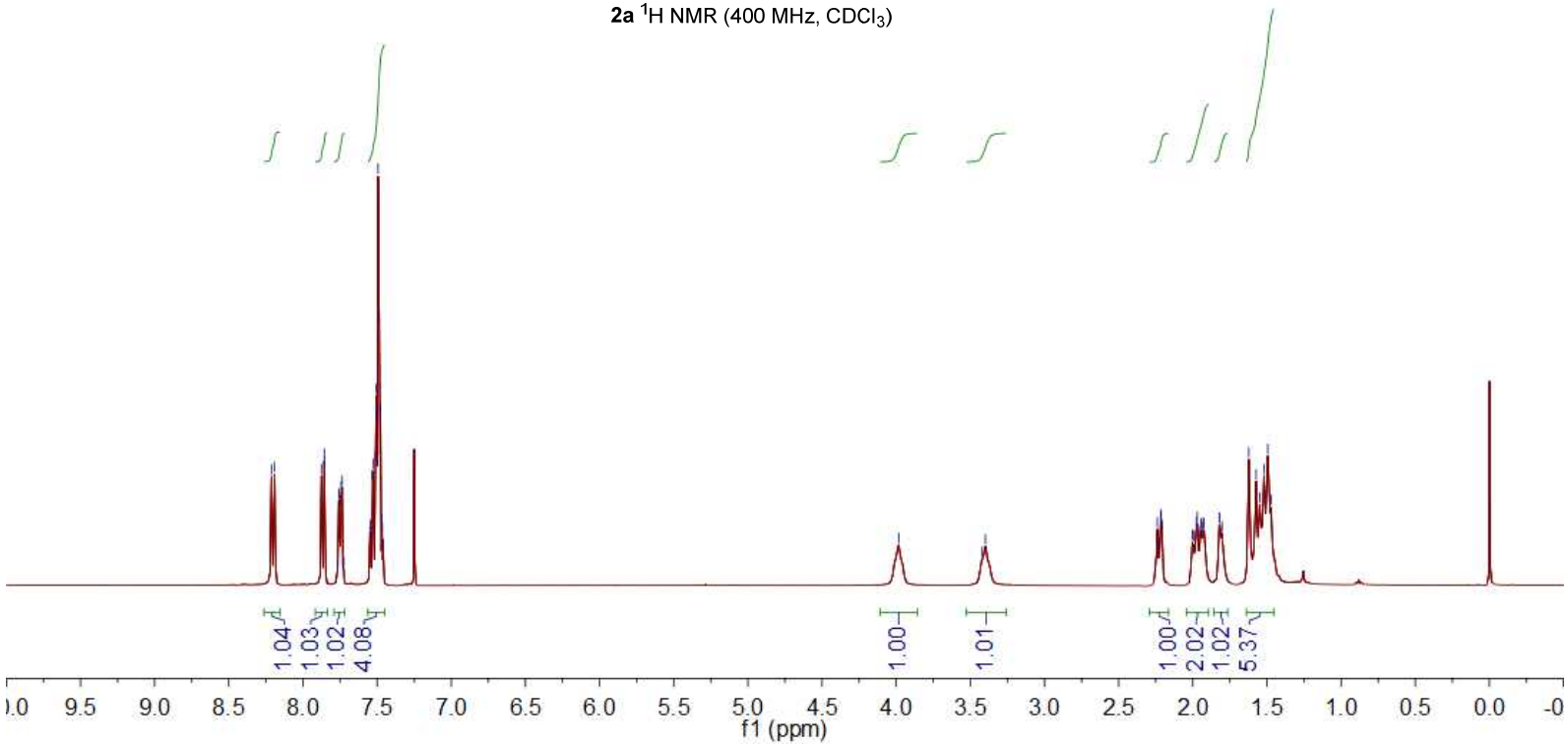

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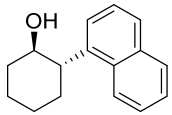

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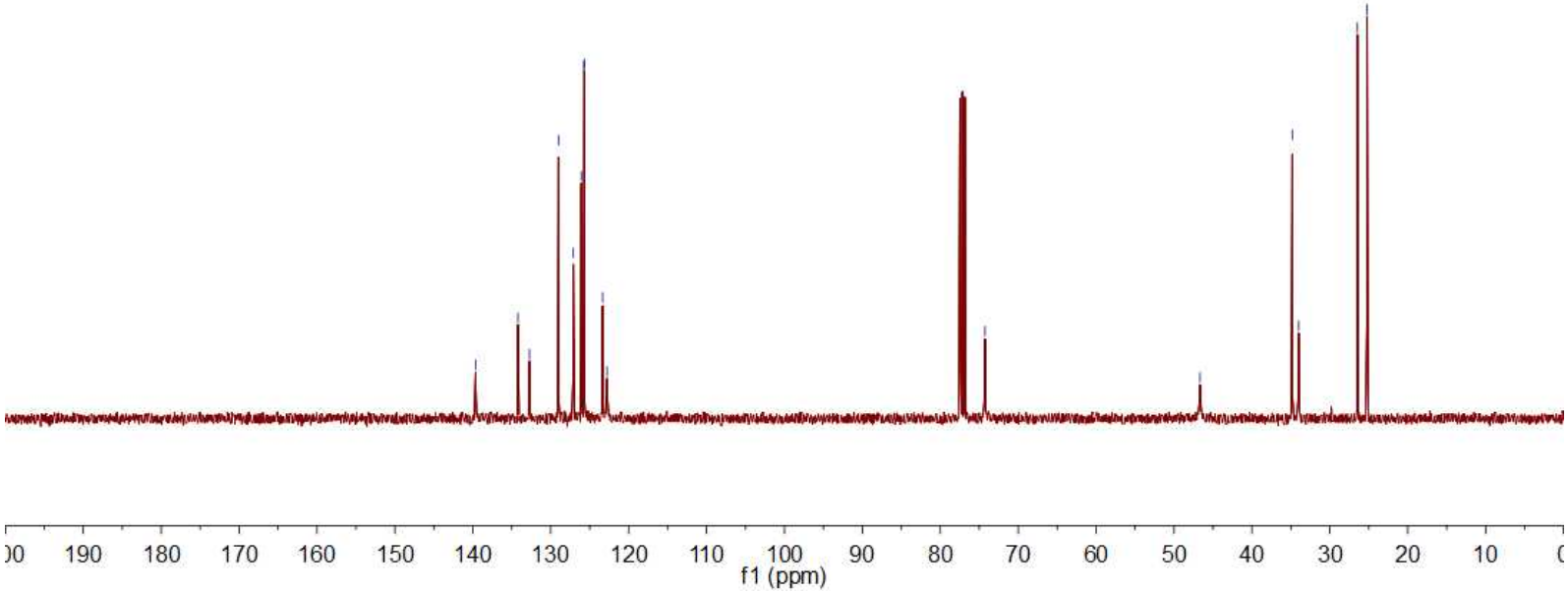

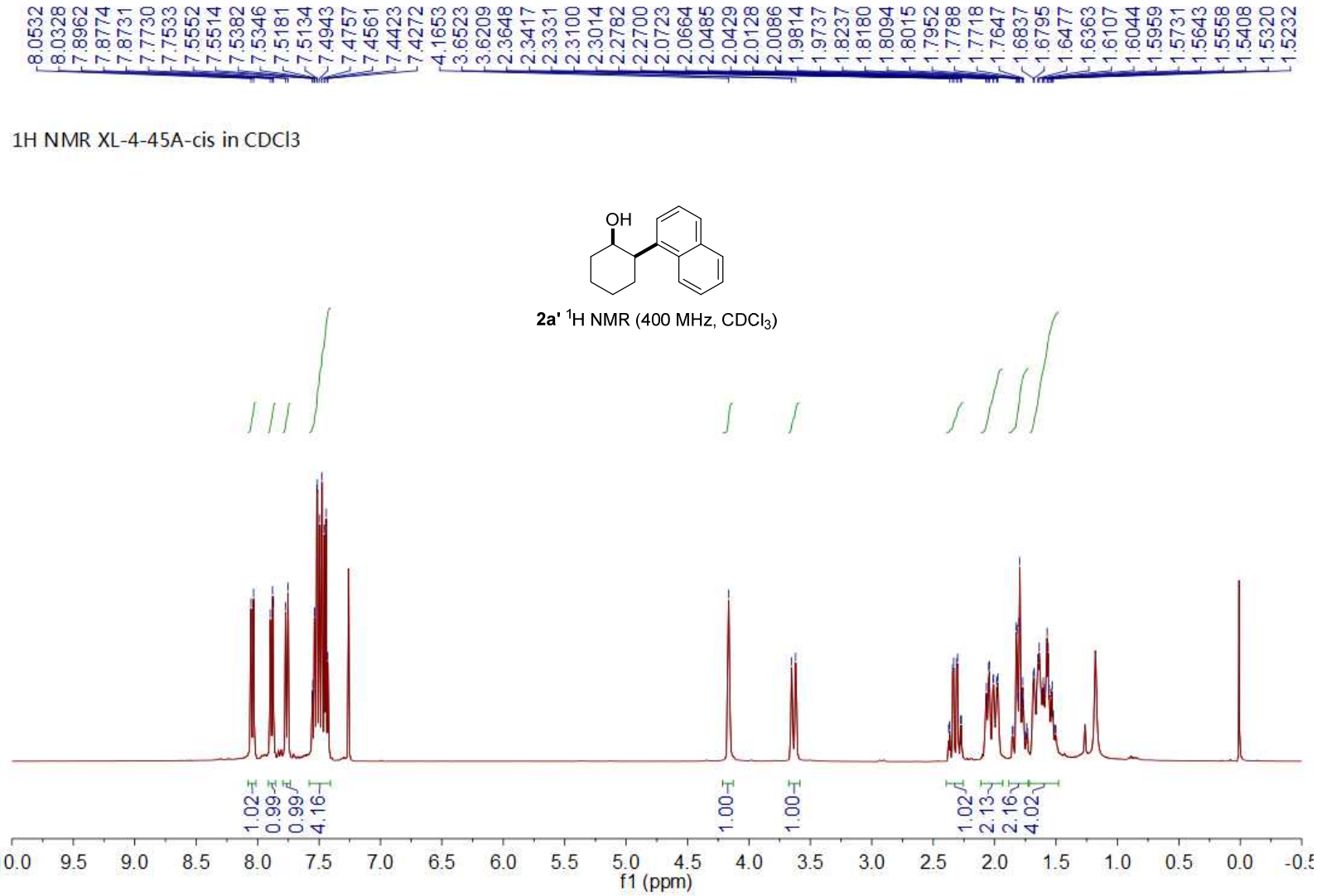
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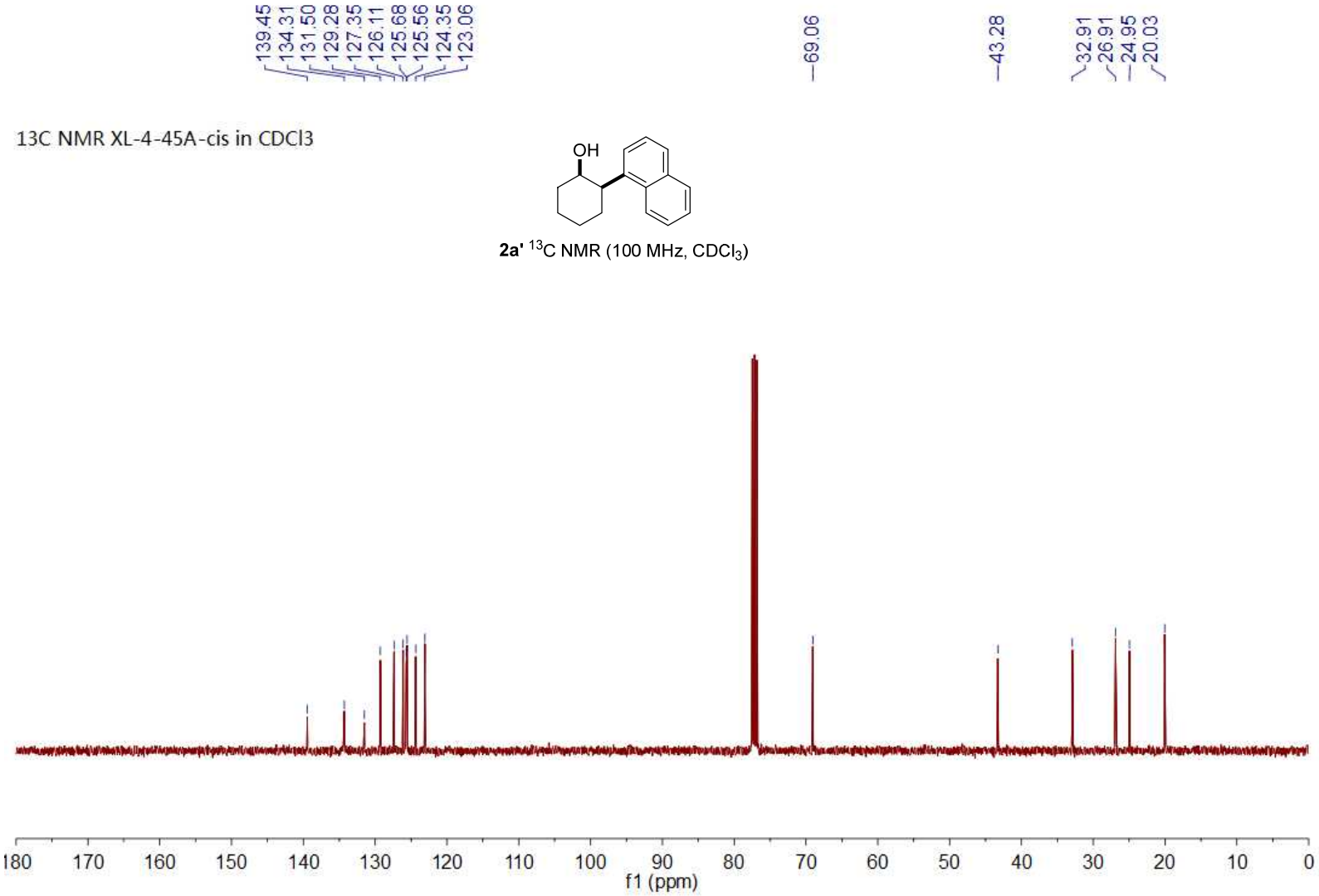
f1 (ppm)



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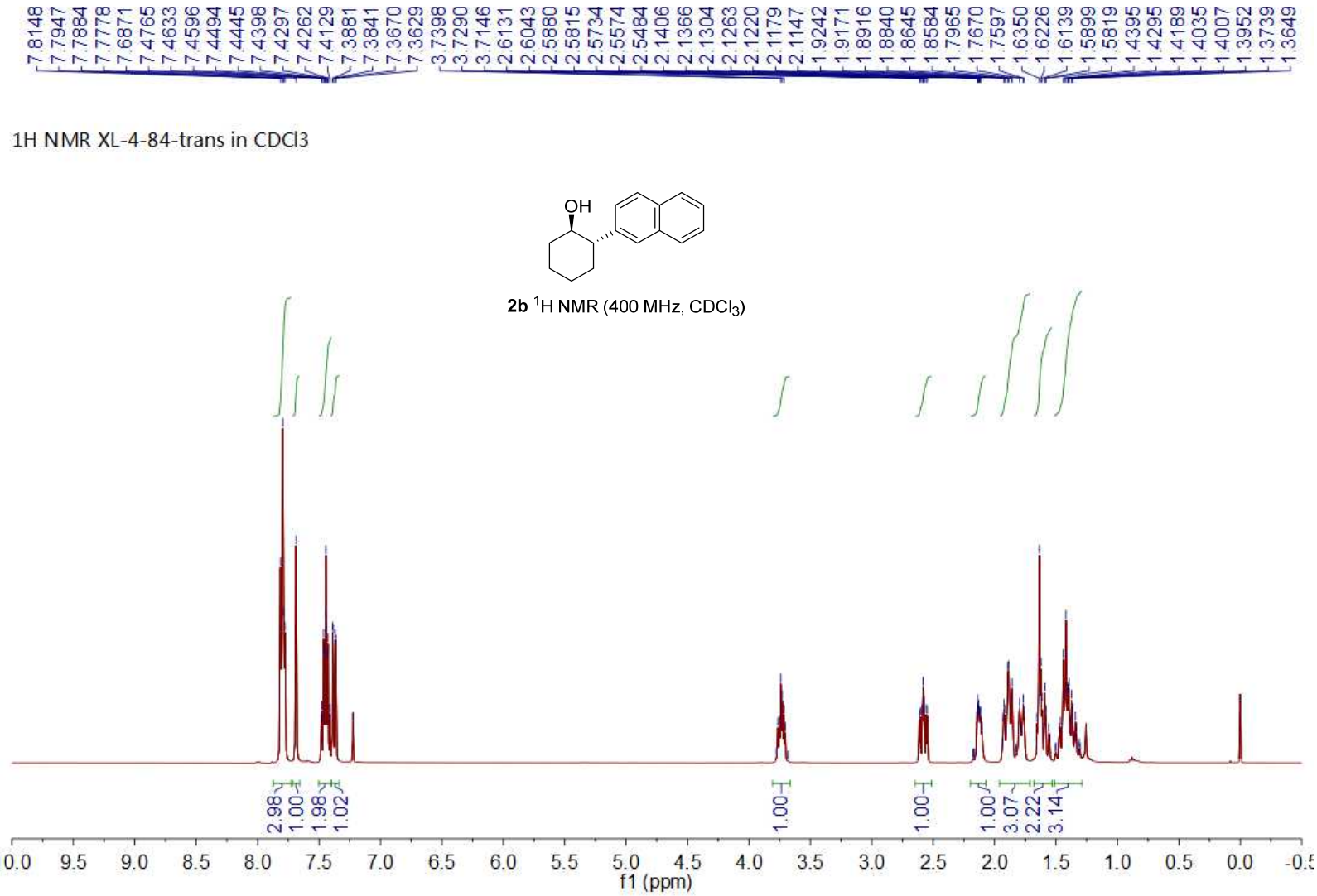
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OH
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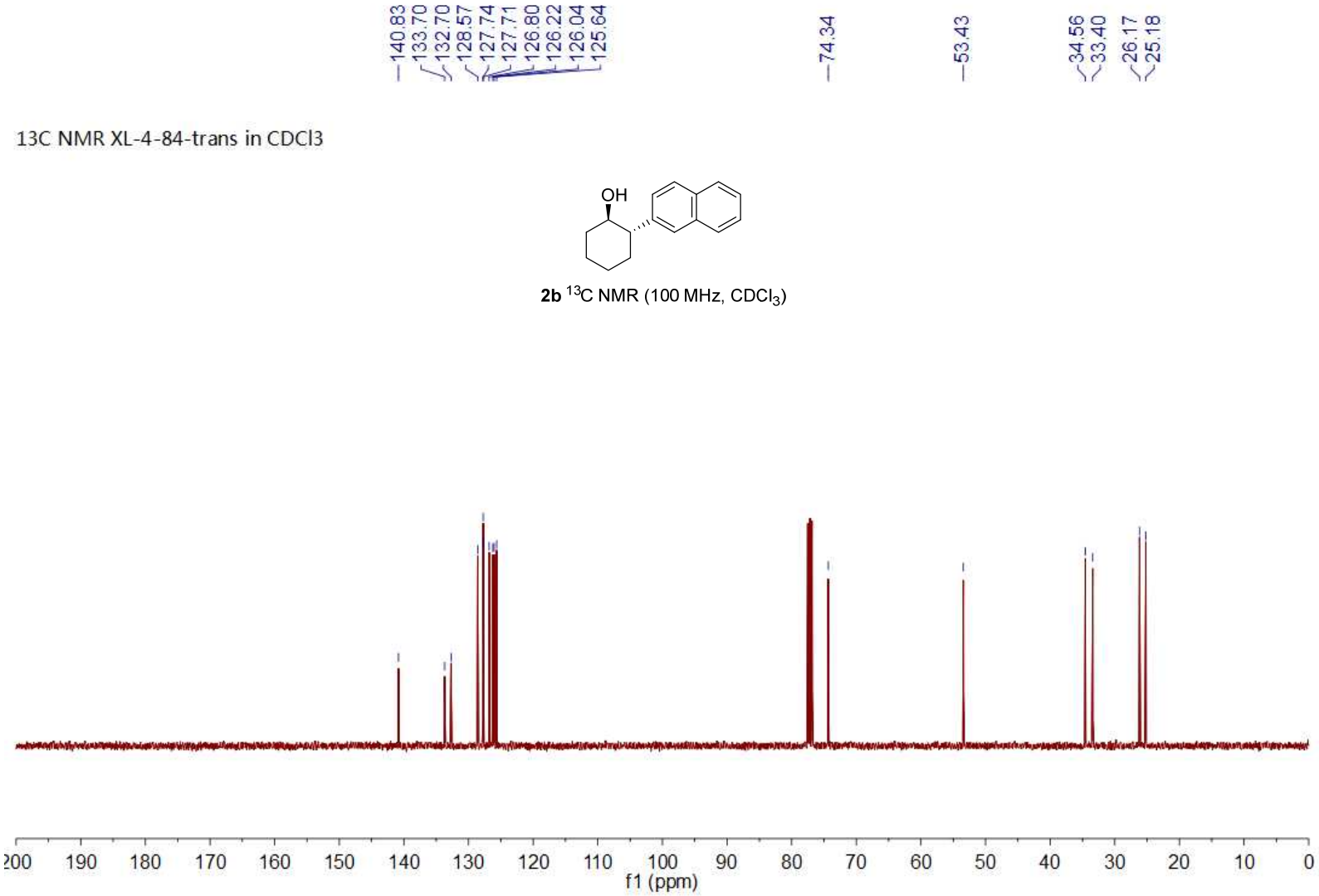
2.98
1.00
1.98
1.02
1.00
1.00
1.00
3.07
2.22
3.14
0.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)



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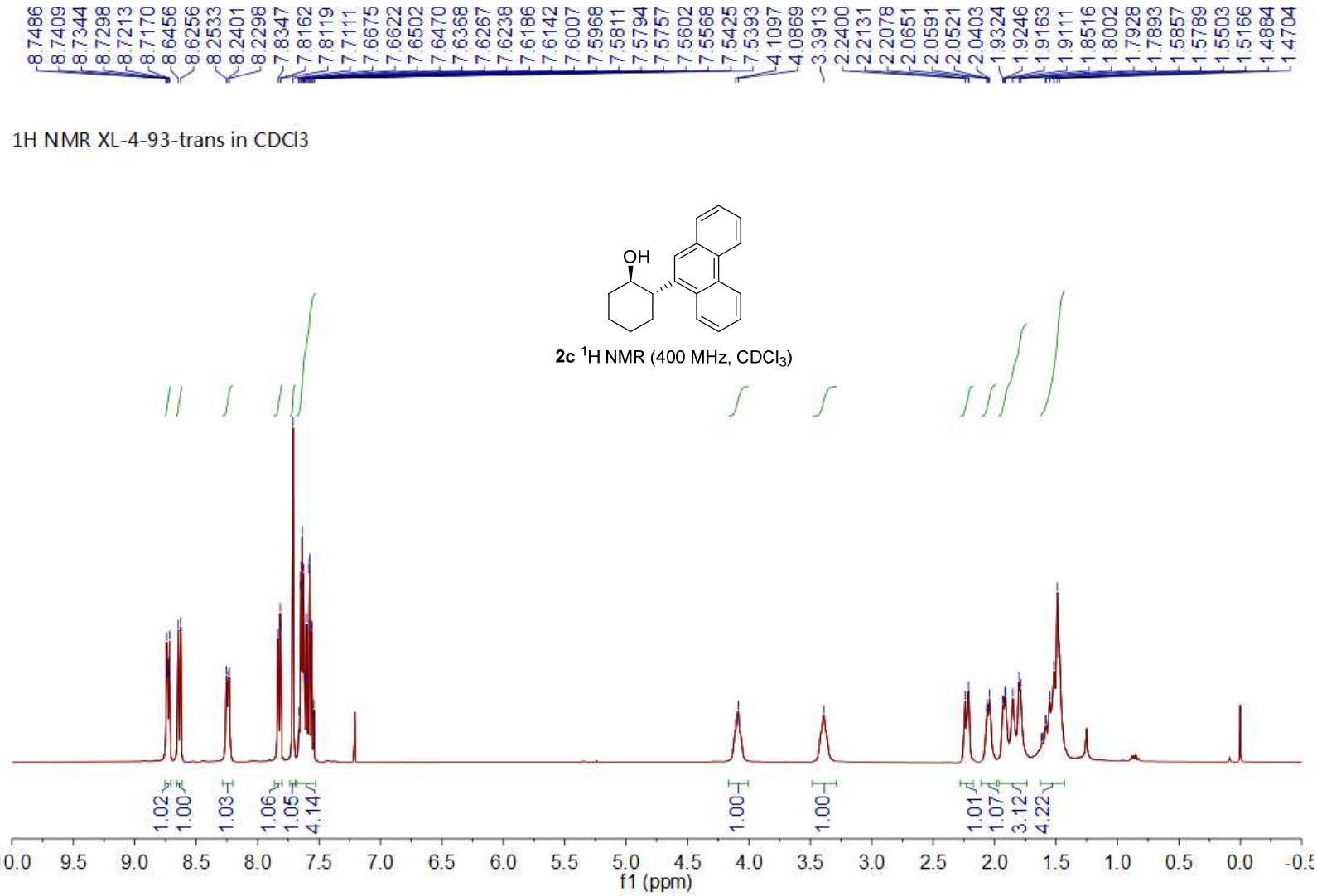
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1H NMR XL-4-93-trans in CDCl3
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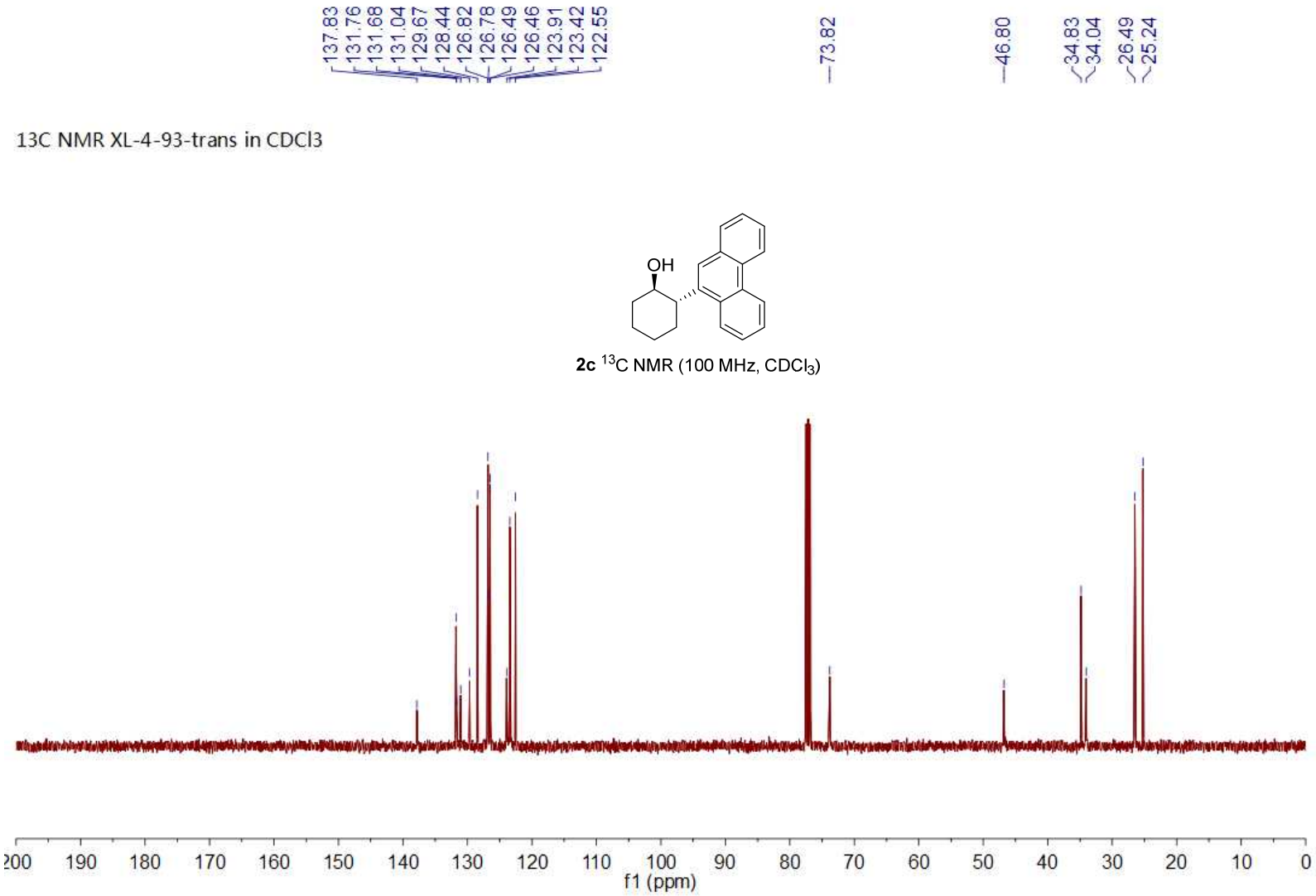
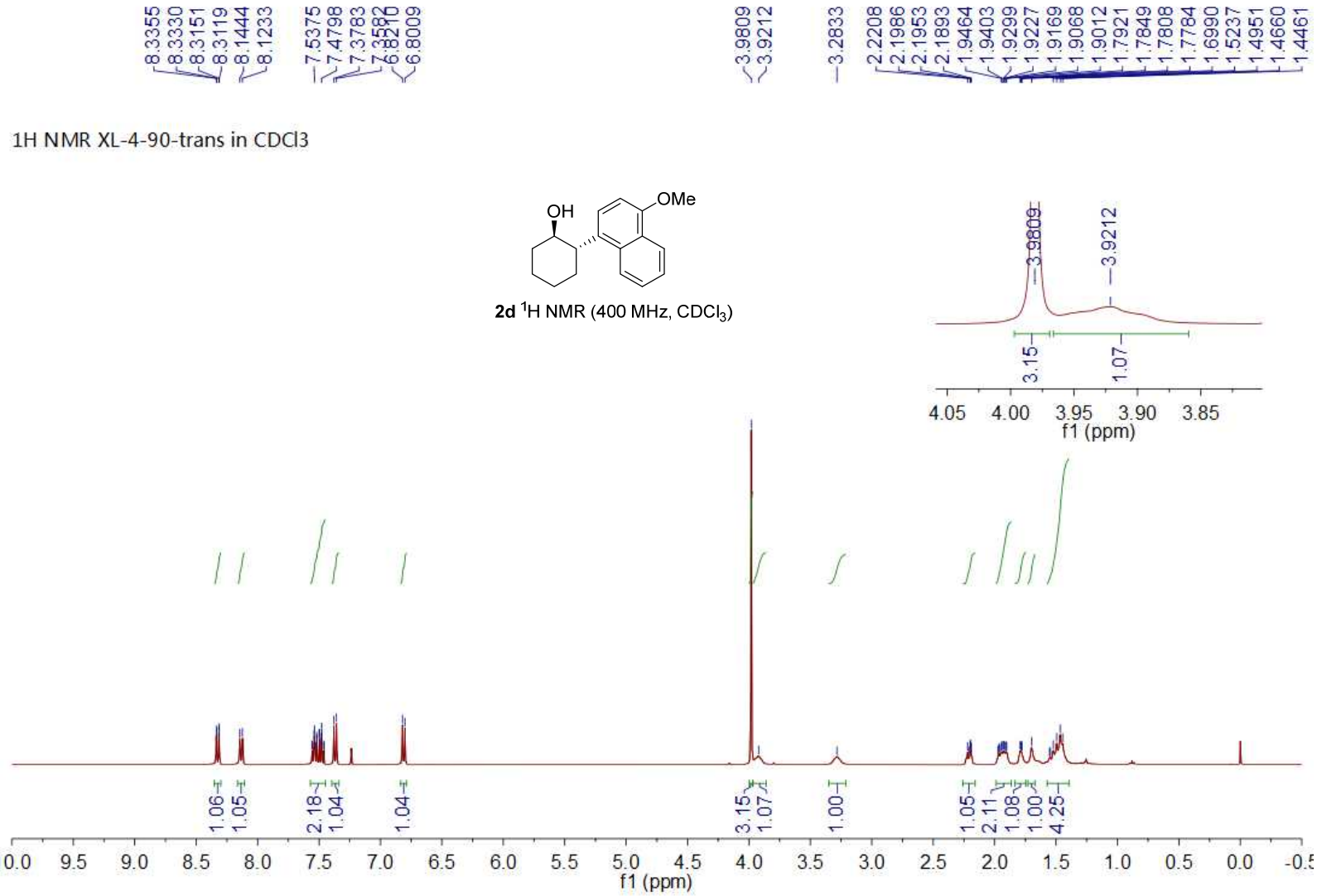
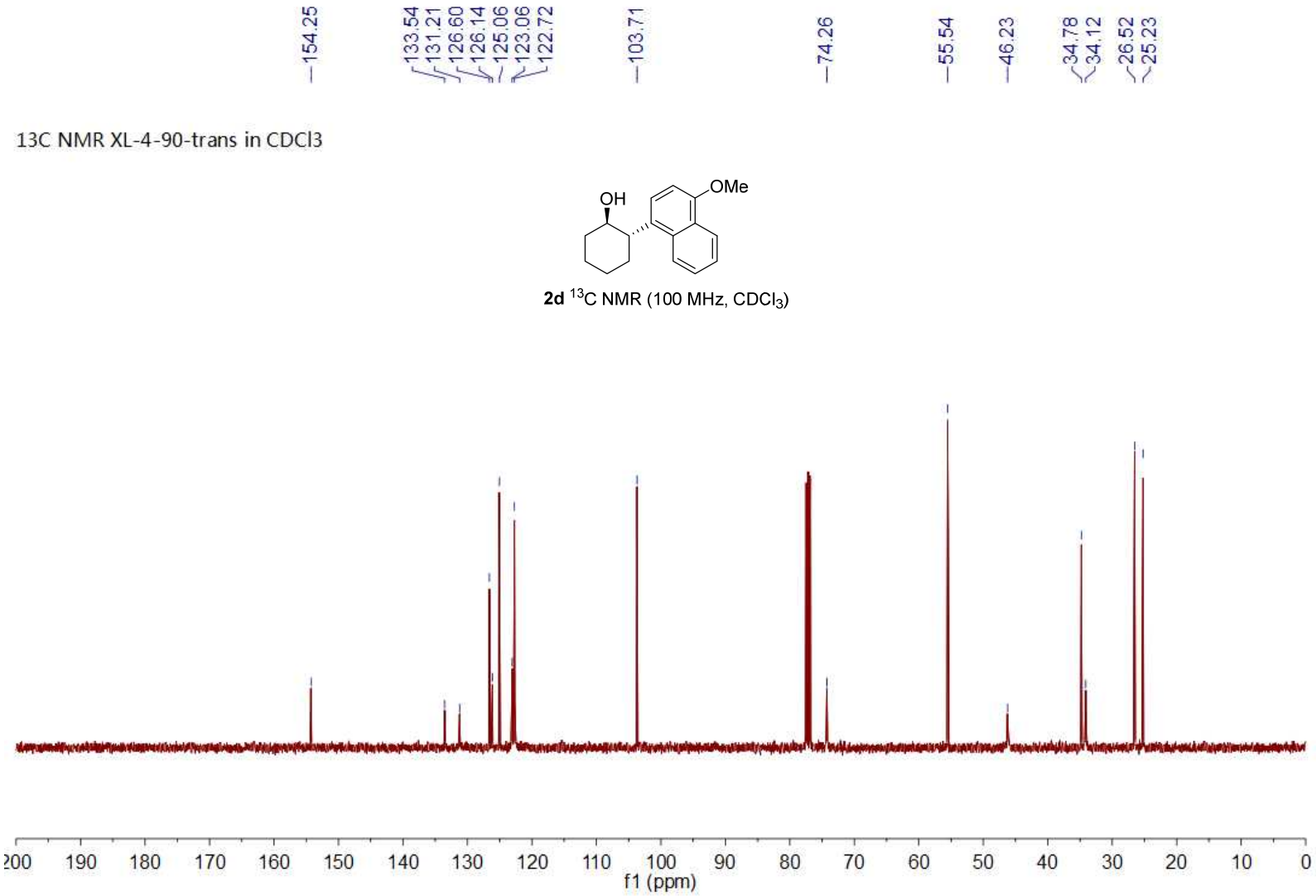
1.02
1.00
1.03
1.06
1.05
4.14
1.00
1.00
1.01
1.07
3.12
4.22
0.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

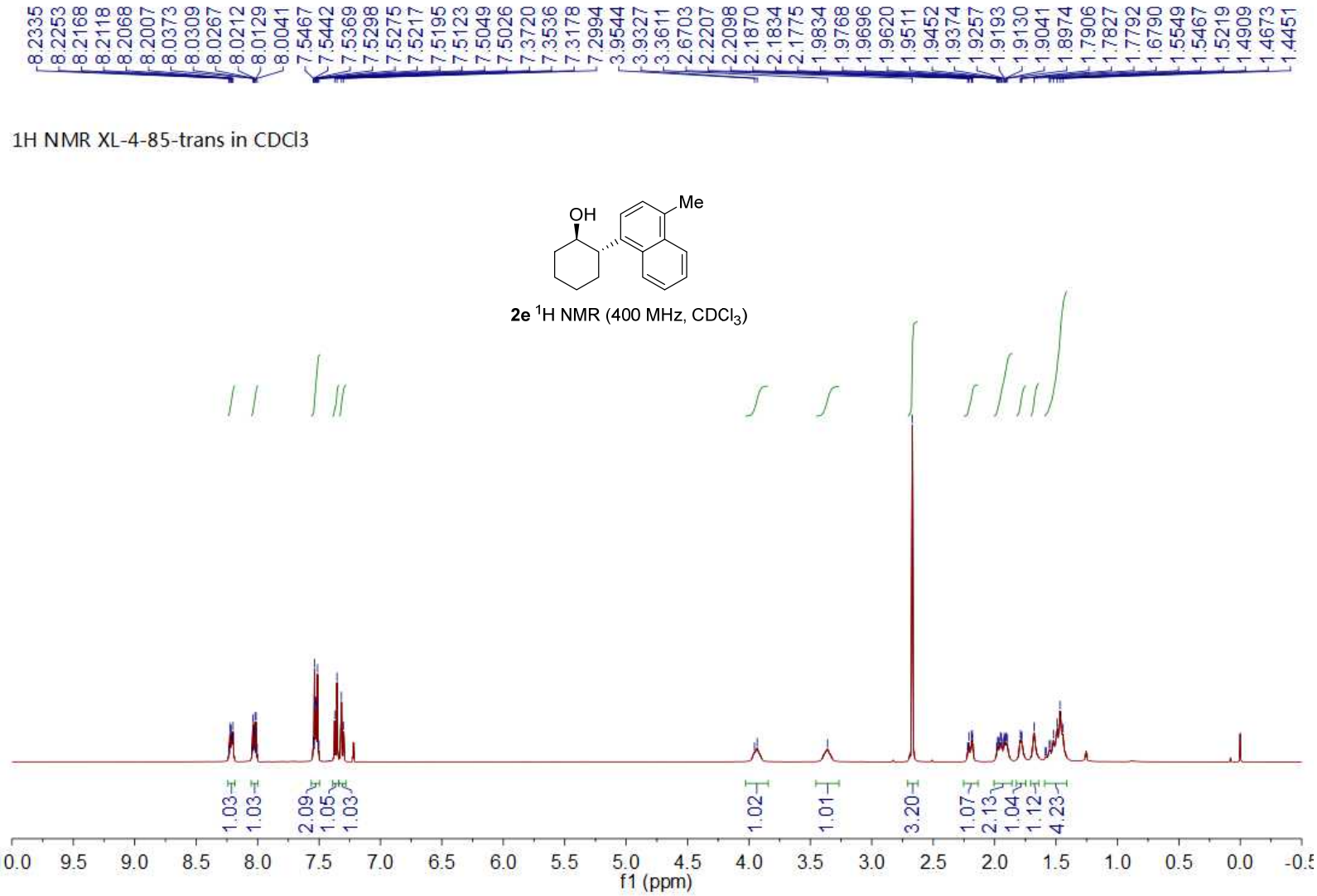

137.83
131.76
131.68
131.04
129.67
128.44
126.82
126.78
126.49
126.46
123.91
123.42
122.55
73.82
46.80
34.83
34.04
26.49
25.24
13C NMR XL-4-93-trans in CDCl3
OH
2c 13C NMR (100 MHz, CDCl3)
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

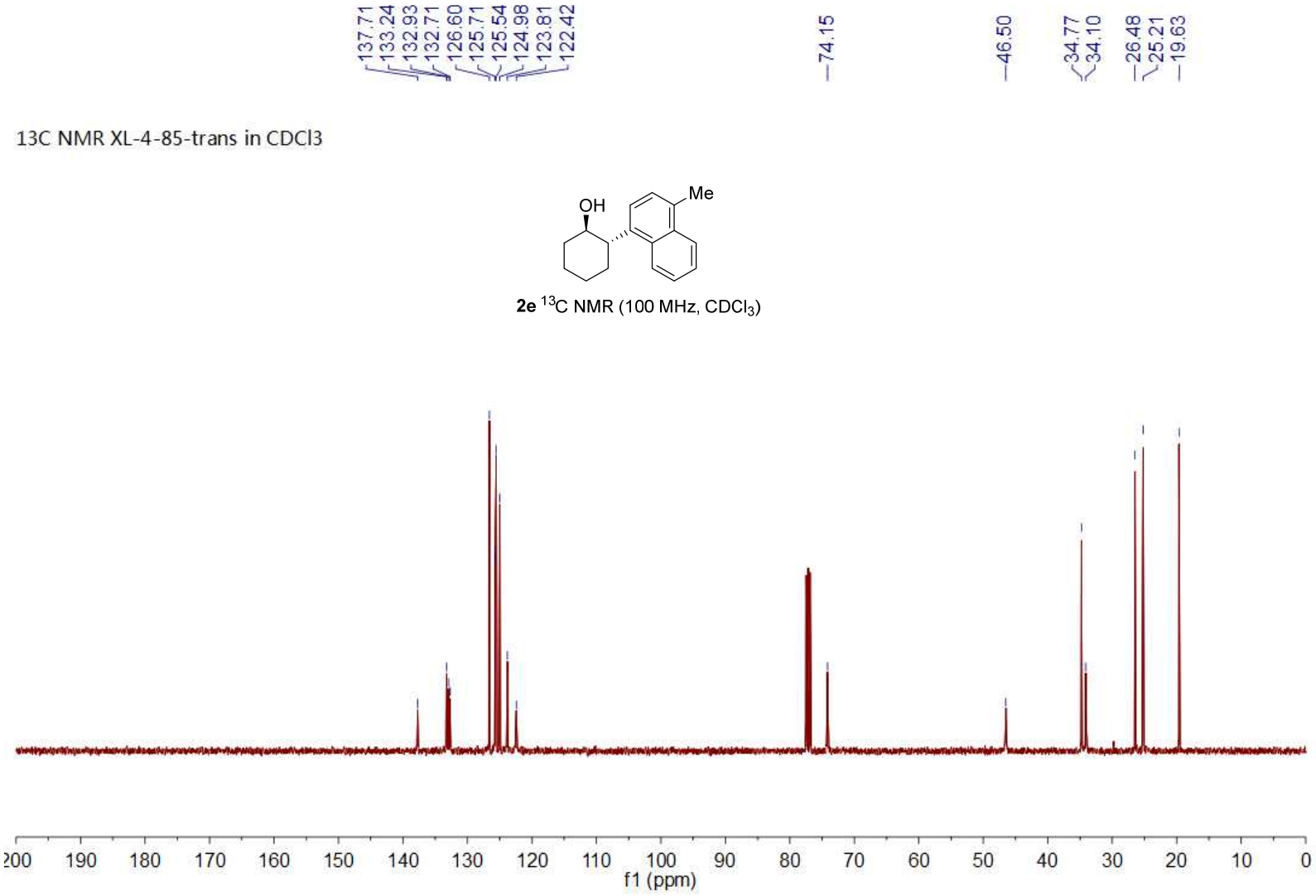
1H NMR XL-4-90-trans in CDCl3



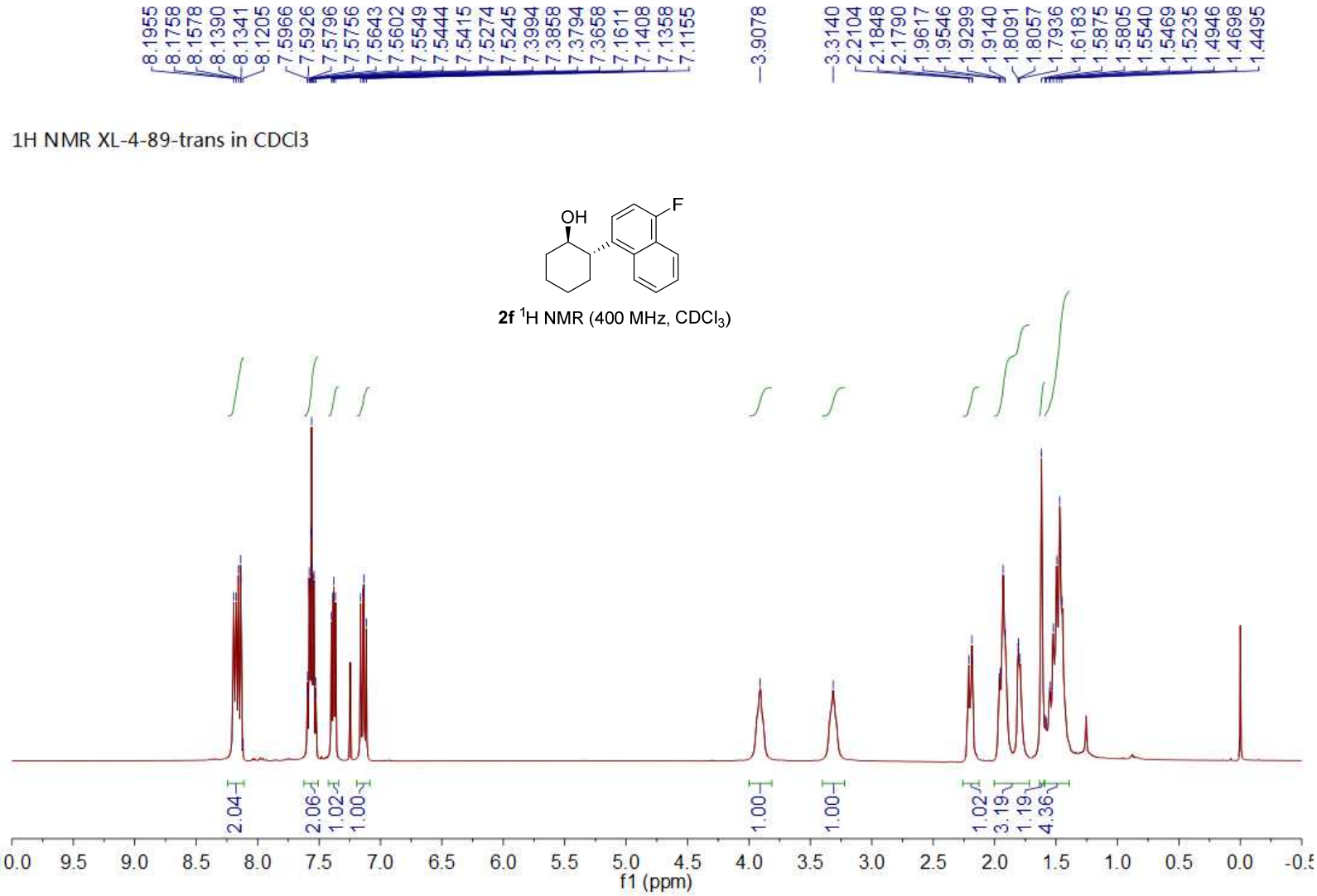


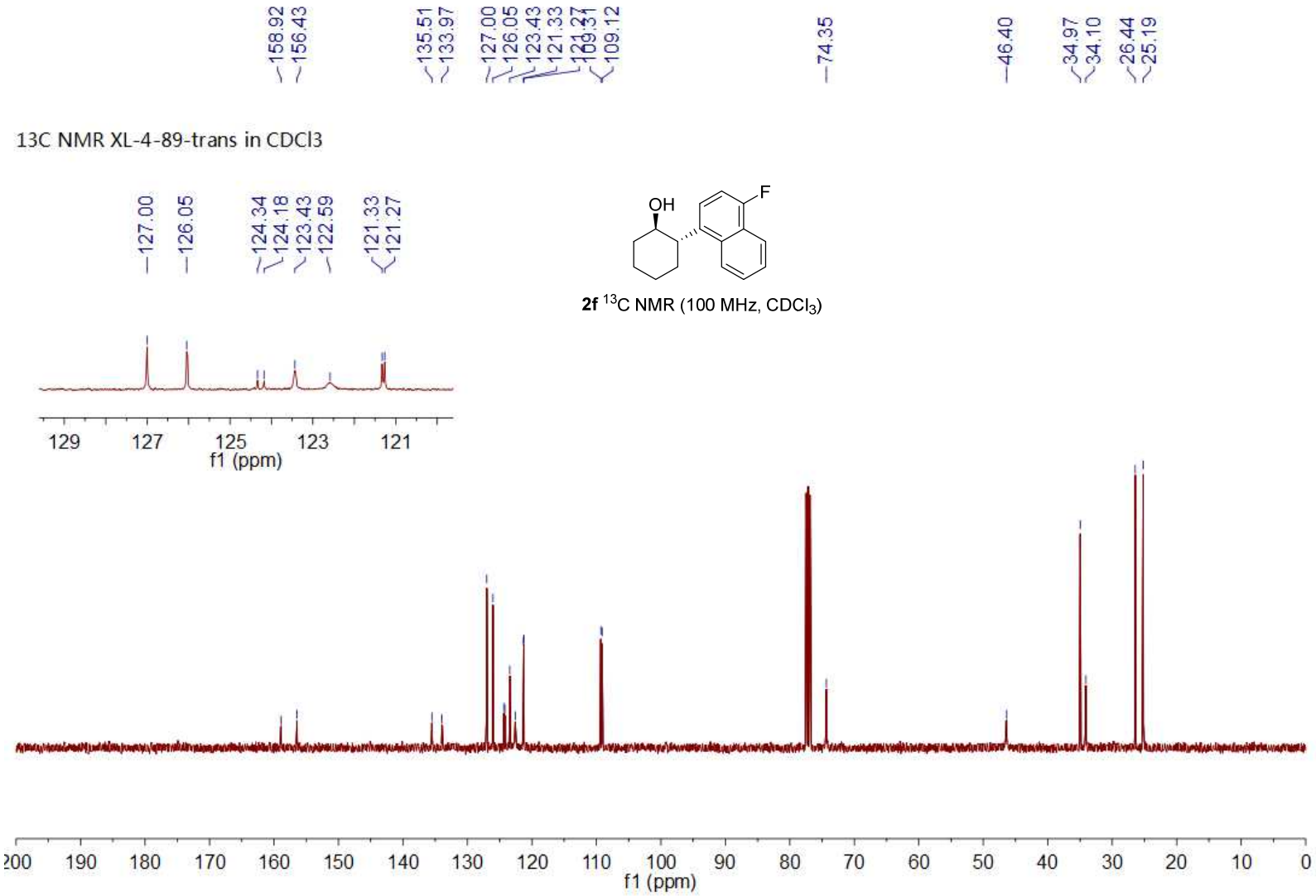
2d ^{13}C NMR (100 MHz, $CDCl_3$)


8.2335
8.2253
8.2168
8.2118
8.2068
8.2007
8.0373
8.0309
8.0267
8.0212
8.0129
8.0041
7.5467
7.5442
7.5369
7.5298
7.5275
7.5217
7.5195
7.5123
7.5049
7.5026
7.3720
7.3536
7.3178
7.2994
3.9544
3.9327
3.3611
2.6703
2.2207
2.2098
2.1870
2.1834
2.1775
1.9834
1.9768
1.9696
1.9620
1.9511
1.9452
1.9374
1.9257
1.9193
1.9130
1.9041
1.8974
1.7906
1.7827
1.7792
1.6790
1.5549
1.5467
1.5219
1.4909
1.4673
1.4451
1H NMR XL-4-85-trans in CDCl3
OH
Me
2e 1H NMR (400 MHz, CDCl3)
1.03
1.03
2.09
1.05
1.03
1.02
1.01
3.20
1.07
2.13
1.04
1.12
4.23
0.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)



2e ^{13}C NMR (100 MHz, $CDCl_3$)

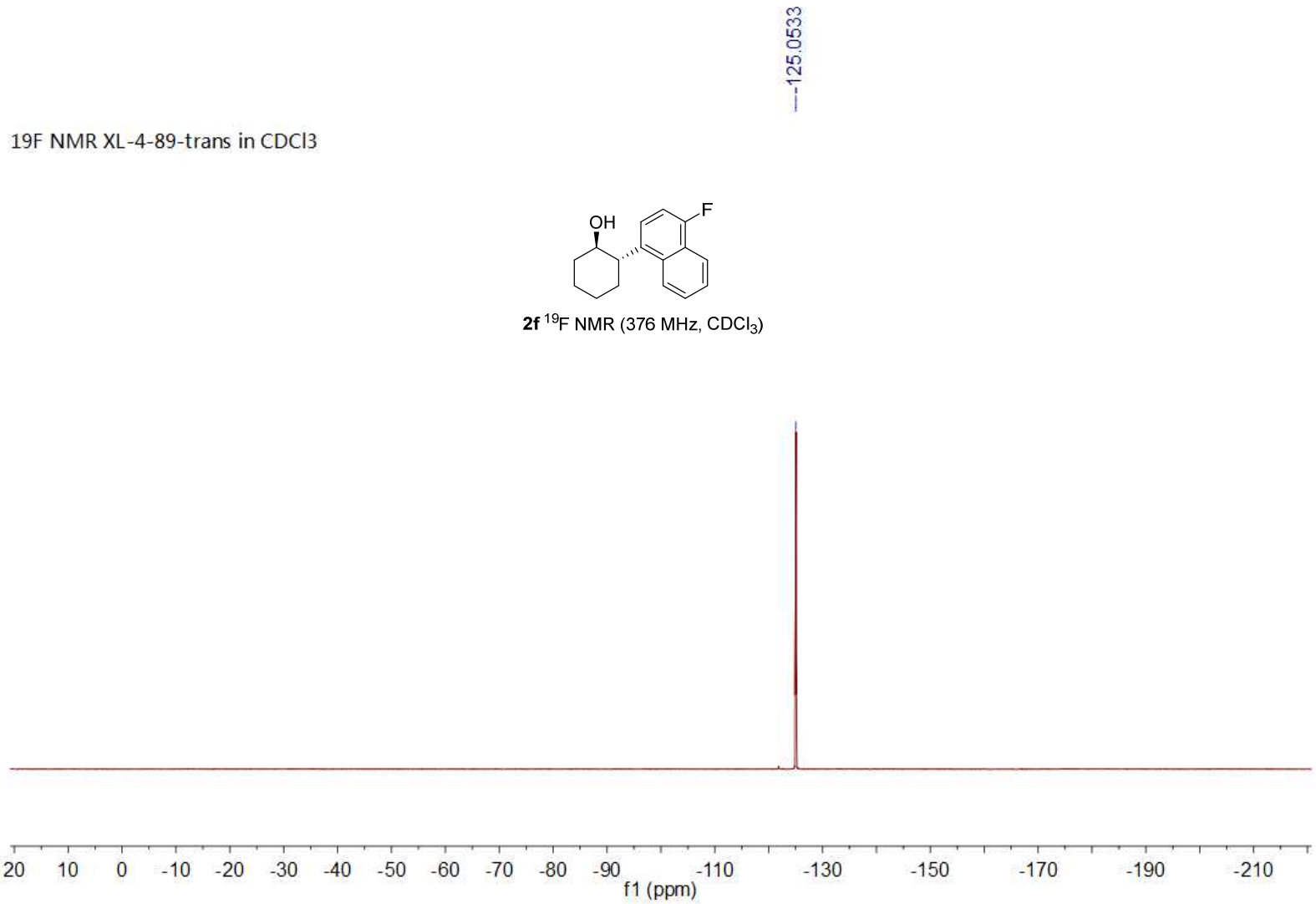

8.1955
8.1758
8.1578
8.1390
8.1341
8.1205
7.5966
7.5926
7.5796
7.5756
7.5643
7.5602
7.5549
7.5444
7.5415
7.5274
7.5245
7.3994
7.3858
7.3794
7.3658
7.1611
7.1408
7.1358
7.1155
3.9078
3.3140
2.2104
2.1848
2.1790
1.9617
1.9546
1.9299
1.9140
1.8091
1.8057
1.7936
1.6183
1.5875
1.5805
1.5540
1.5469
1.5235
1.4946
1.4698
1.4495
1H NMR XL-4-89-trans in CDCl3
OH
F
2f 1H NMR (400 MHz, CDCl3)
2.04
2.06
1.02
1.00
1.00
1.00
1.02
3.19
1.19
4.36
0.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

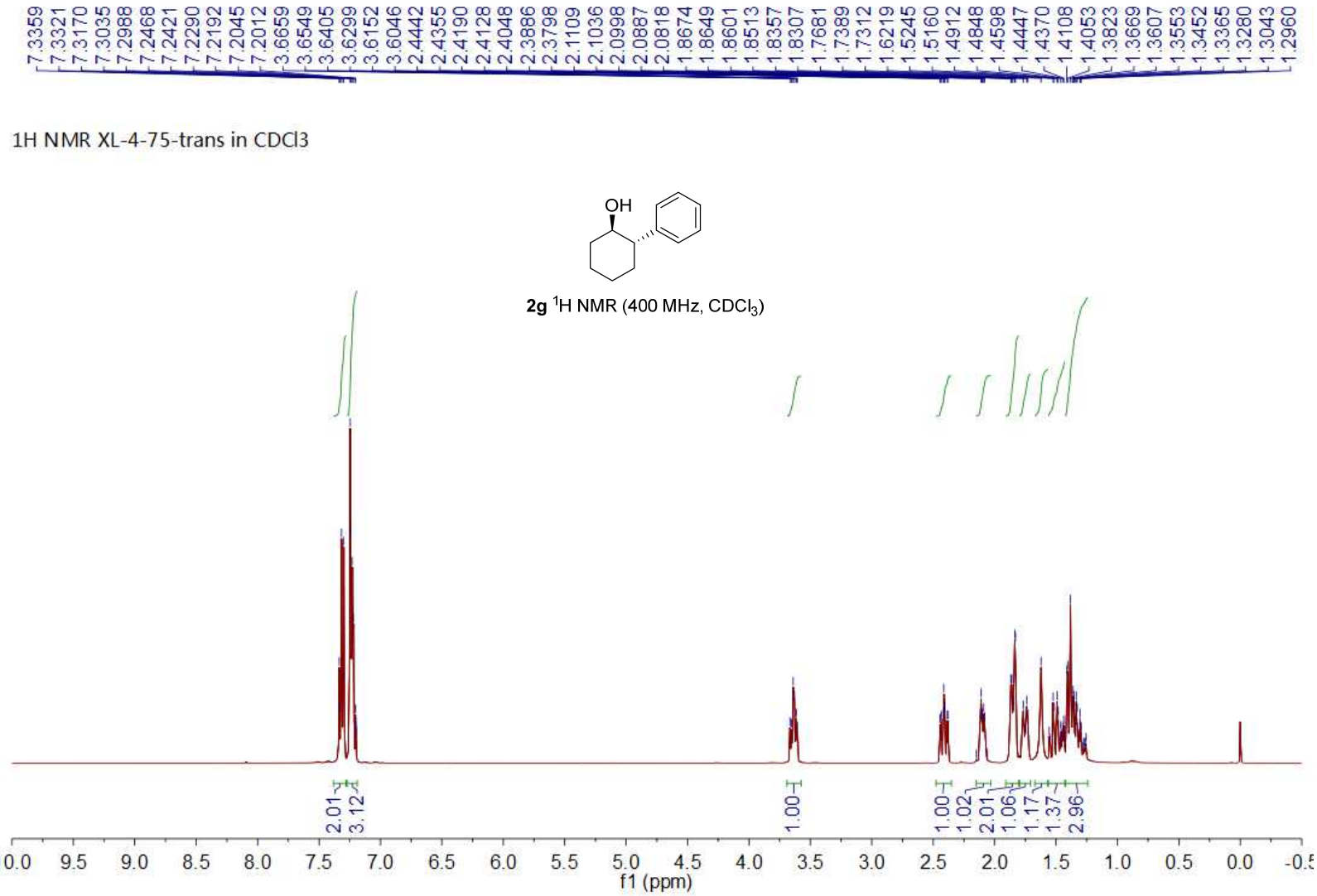


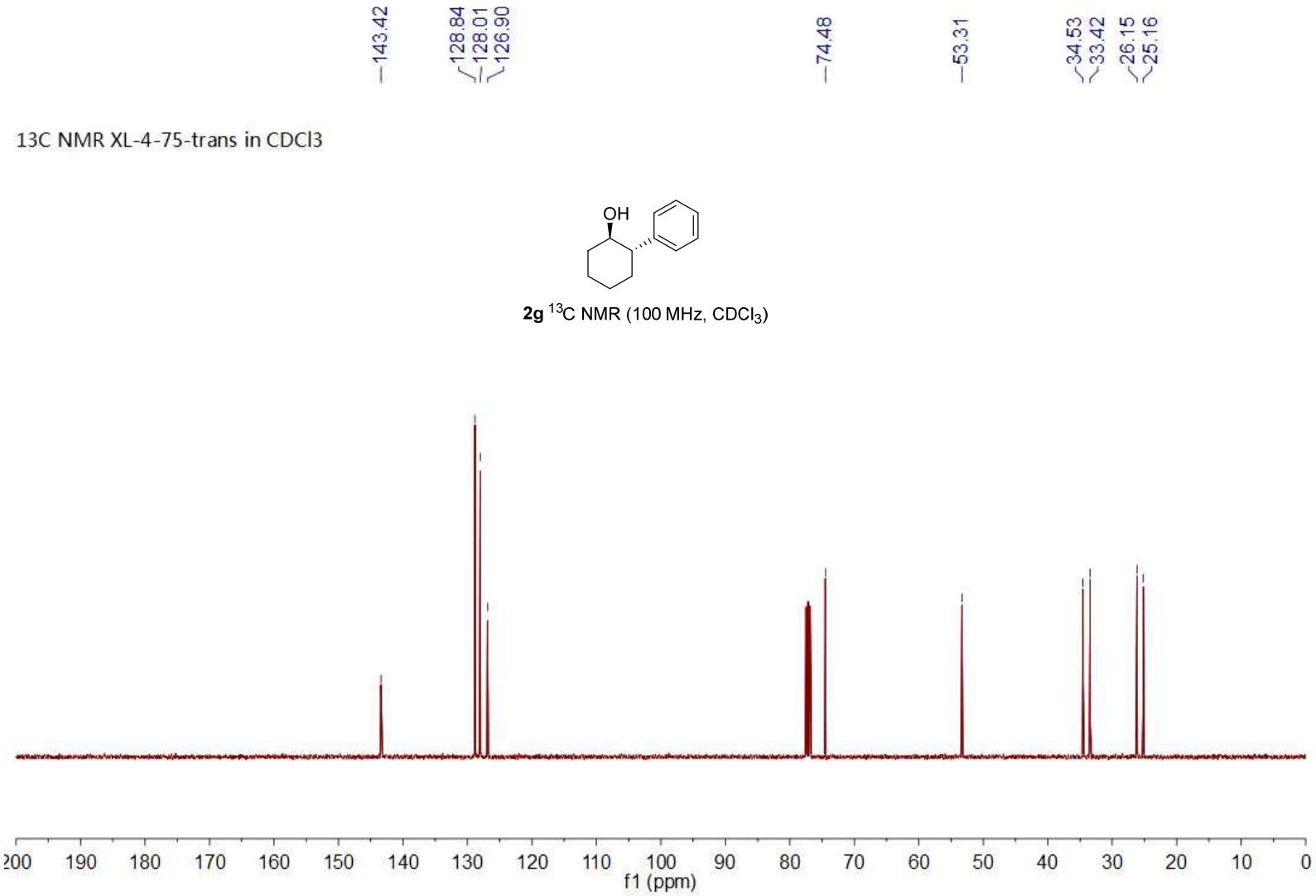
2f ^{13}C NMR (100 MHz, $CDCl_3$)

19F NMR XL-4-89-trans in CDCl3

2f ^{19}F NMR (376 MHz, $CDCl_3$)

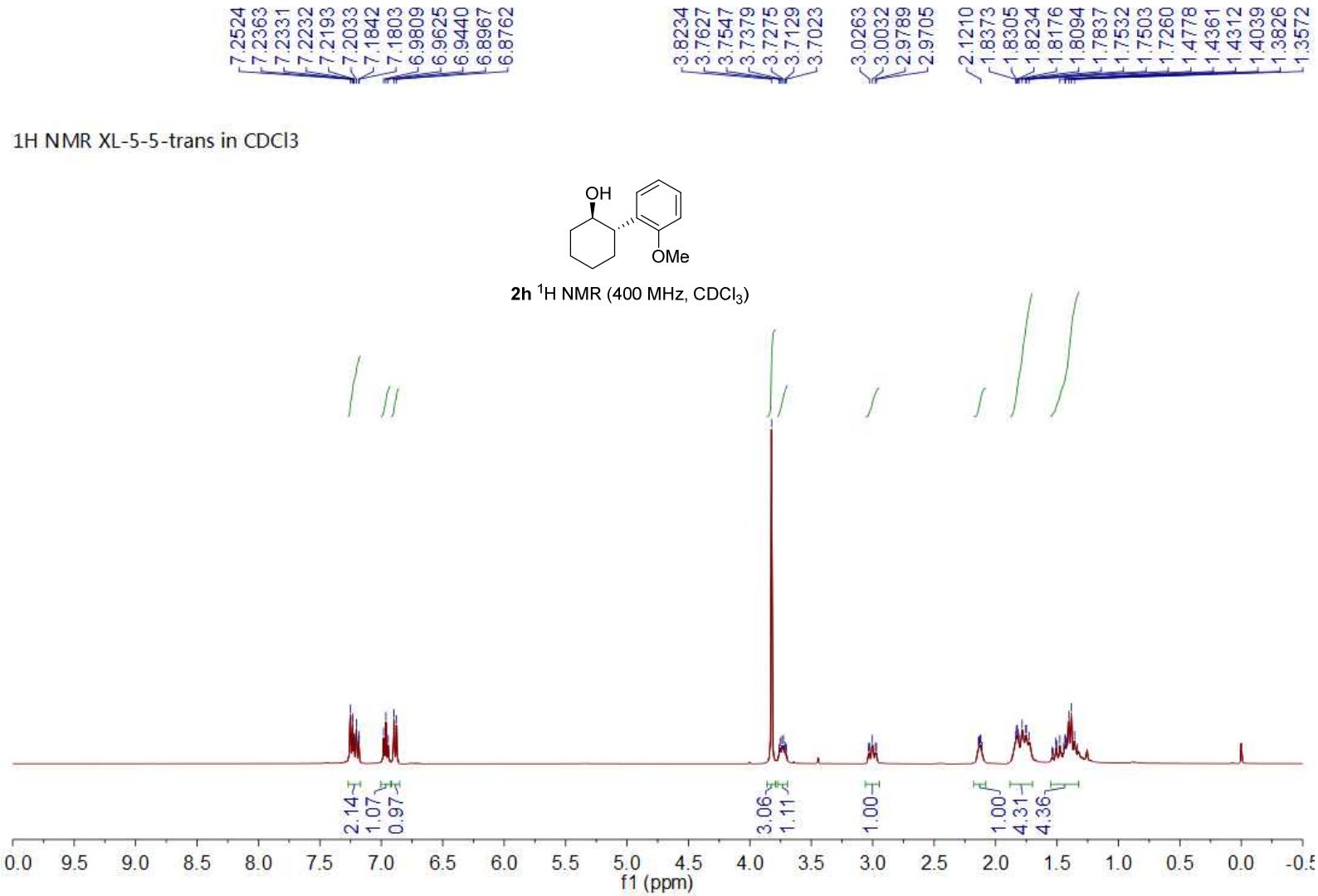



7.3359
7.3321
7.3170
7.3035
7.2988
7.2468
7.2421
7.2290
7.2192
7.2045
7.2012
3.6659
3.6549
3.6405
3.6299
3.6152
3.6046
2.4442
2.4355
2.4190
2.4128
2.4048
2.3886
2.3798
2.1109
2.1036
2.0998
2.0887
2.0818
1.8674
1.8649
1.8601
1.8513
1.8357
1.8307
1.7681
1.7389
1.7312
1.6219
1.5245
1.5160
1.4912
1.4848
1.4598
1.4447
1.4370
1.4108
1.4053
1.3823
1.3669
1.3607
1.3553
1.3452
1.3365
1.3280
1.3043
1.2960
1H NMR XL-4-75-trans in CDCl3
OH
2g 1H NMR (400 MHz, CDCl3)
2.01
3.12
1.00
1.00
1.02
2.01
1.06
1.17
1.37
2.96
0.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)



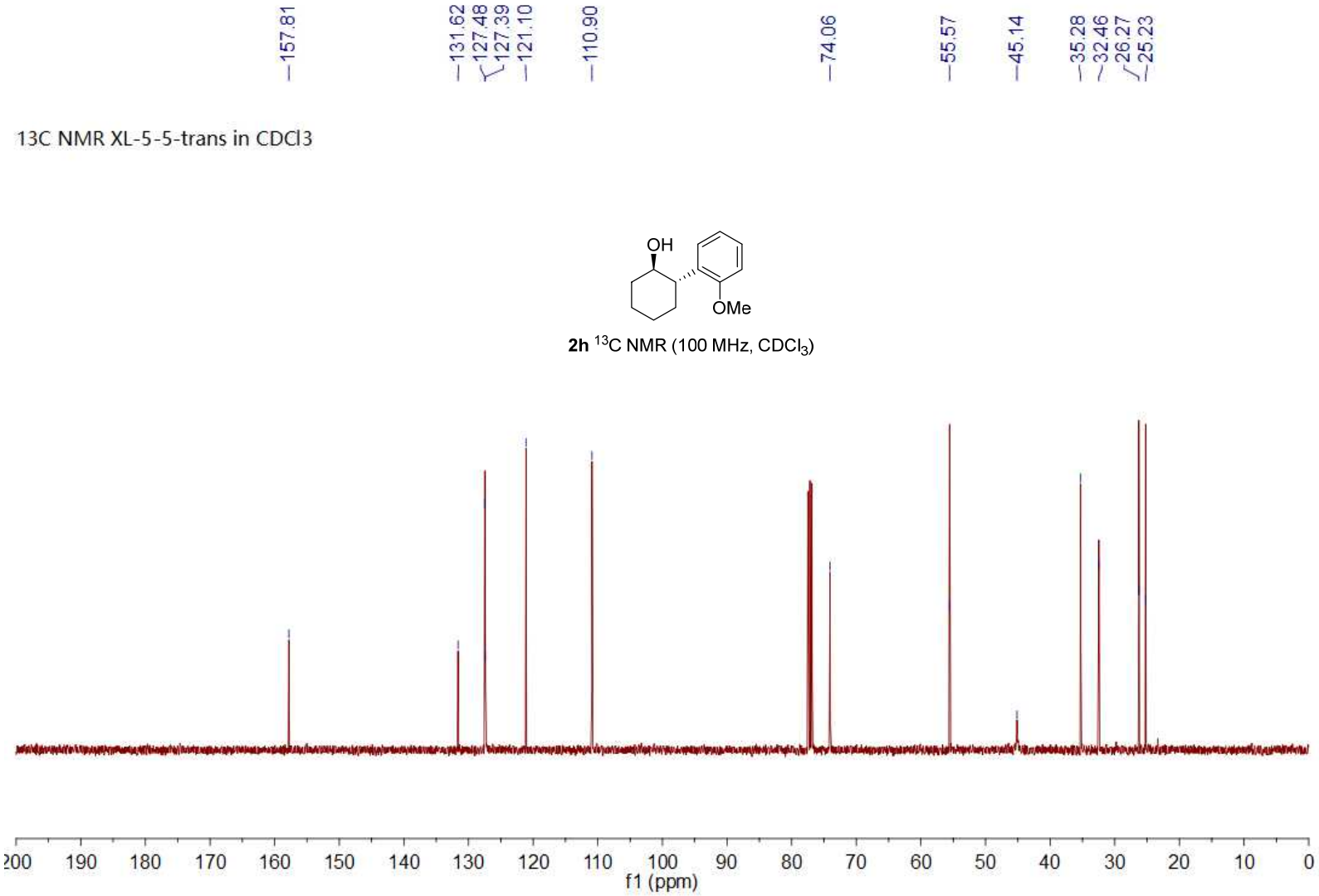
2g ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR XL-5-5-trans in CDCl3



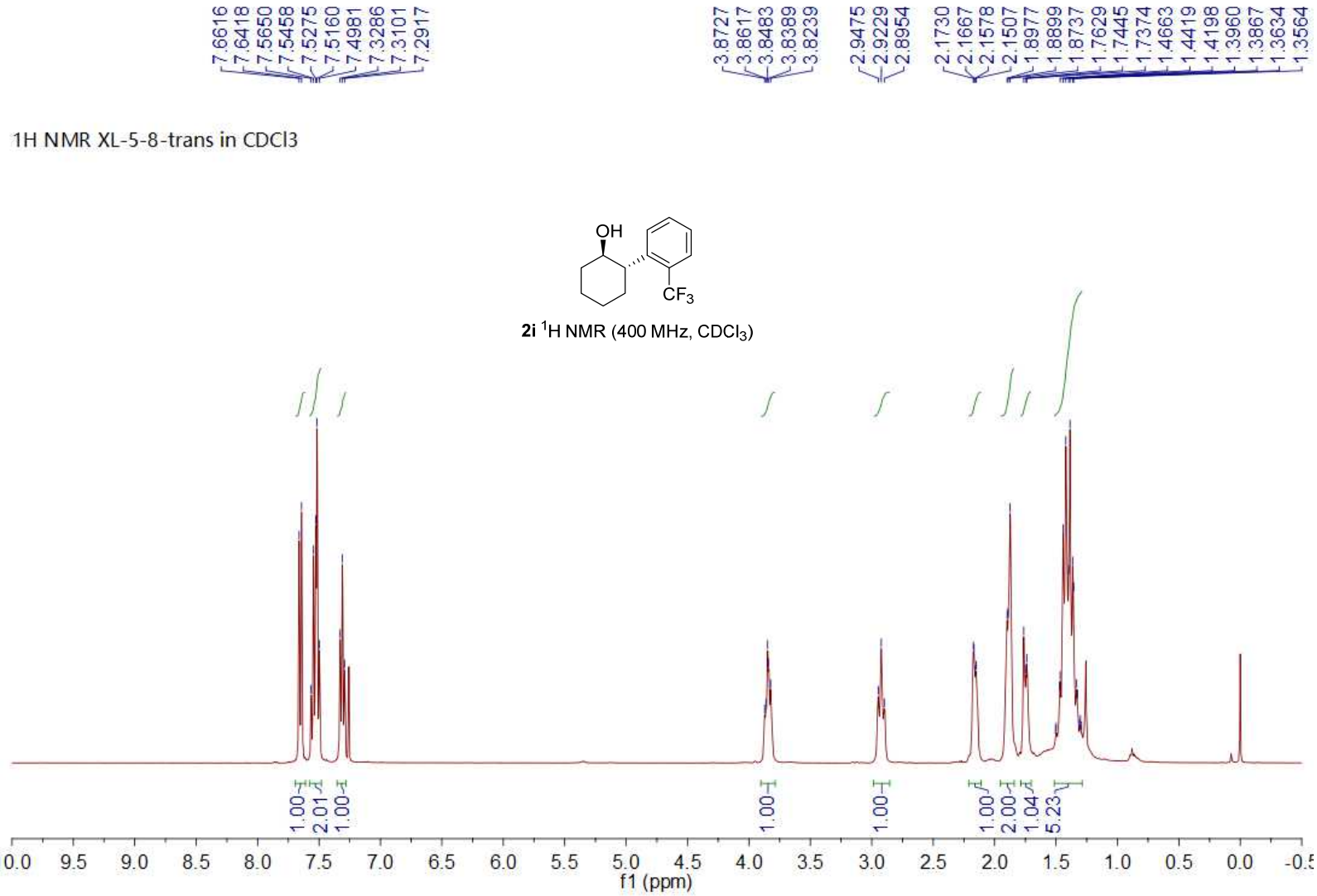
2h ^{1}H NMR (400 MHz, $CDCl_3$)

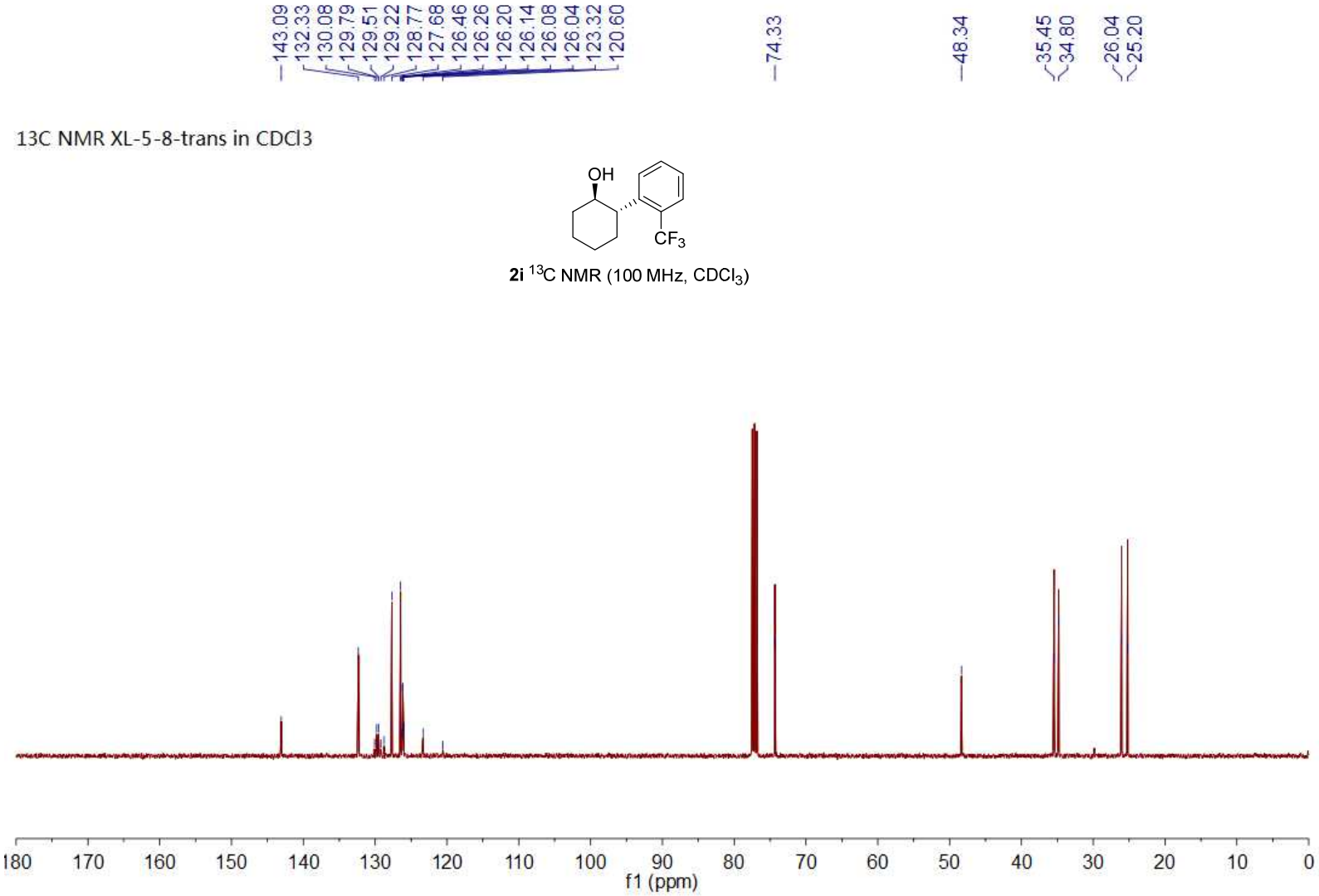
13C NMR XL-5-5-trans in CDCl3



2h ^{13}C NMR (100 MHz, $CDCl_3$)

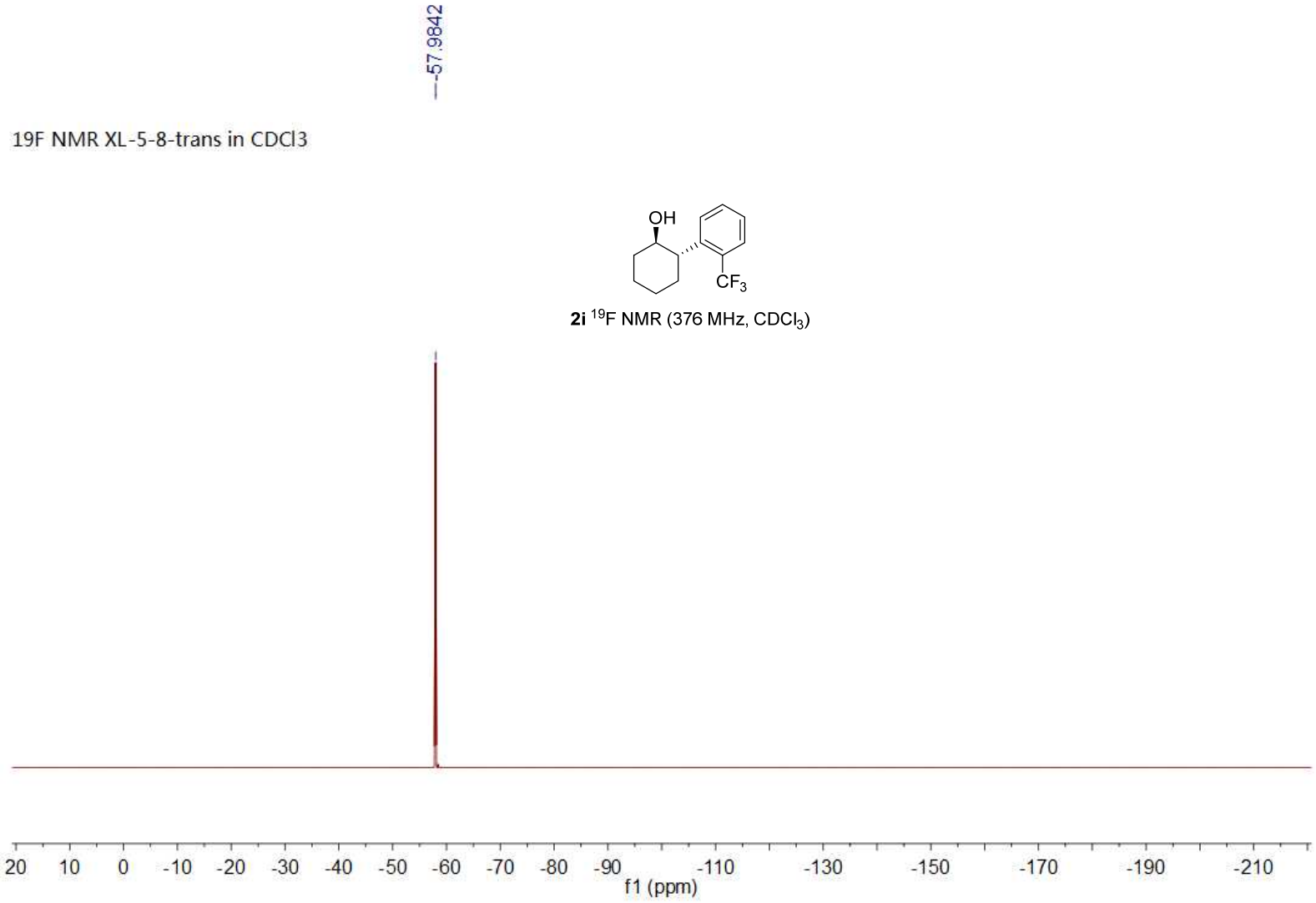
1H NMR XL-5-8-trans in CDCl3





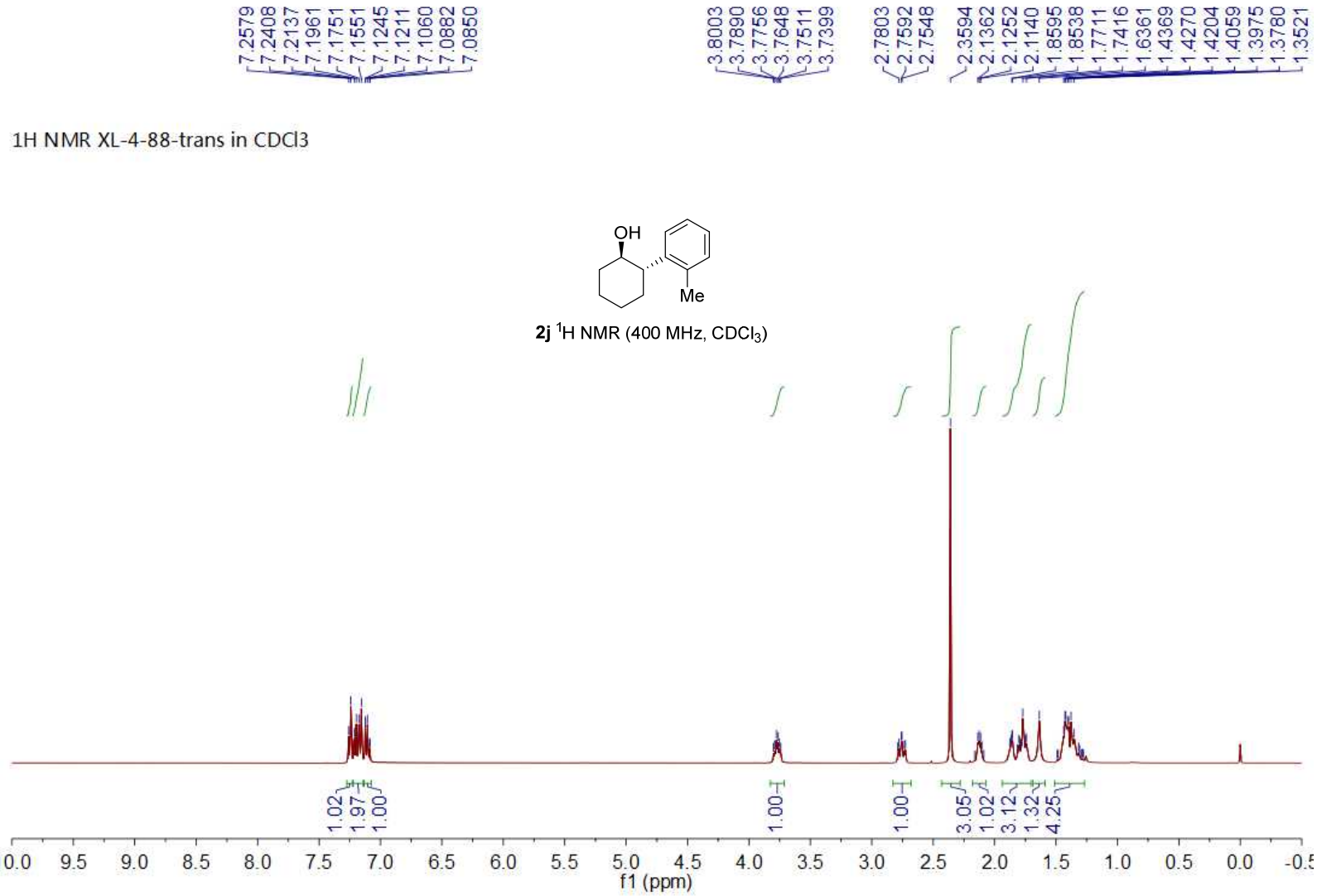
2i ^{13}C NMR (100 MHz, $CDCl_3$)

19F NMR XL-5-8-trans in CDCl3

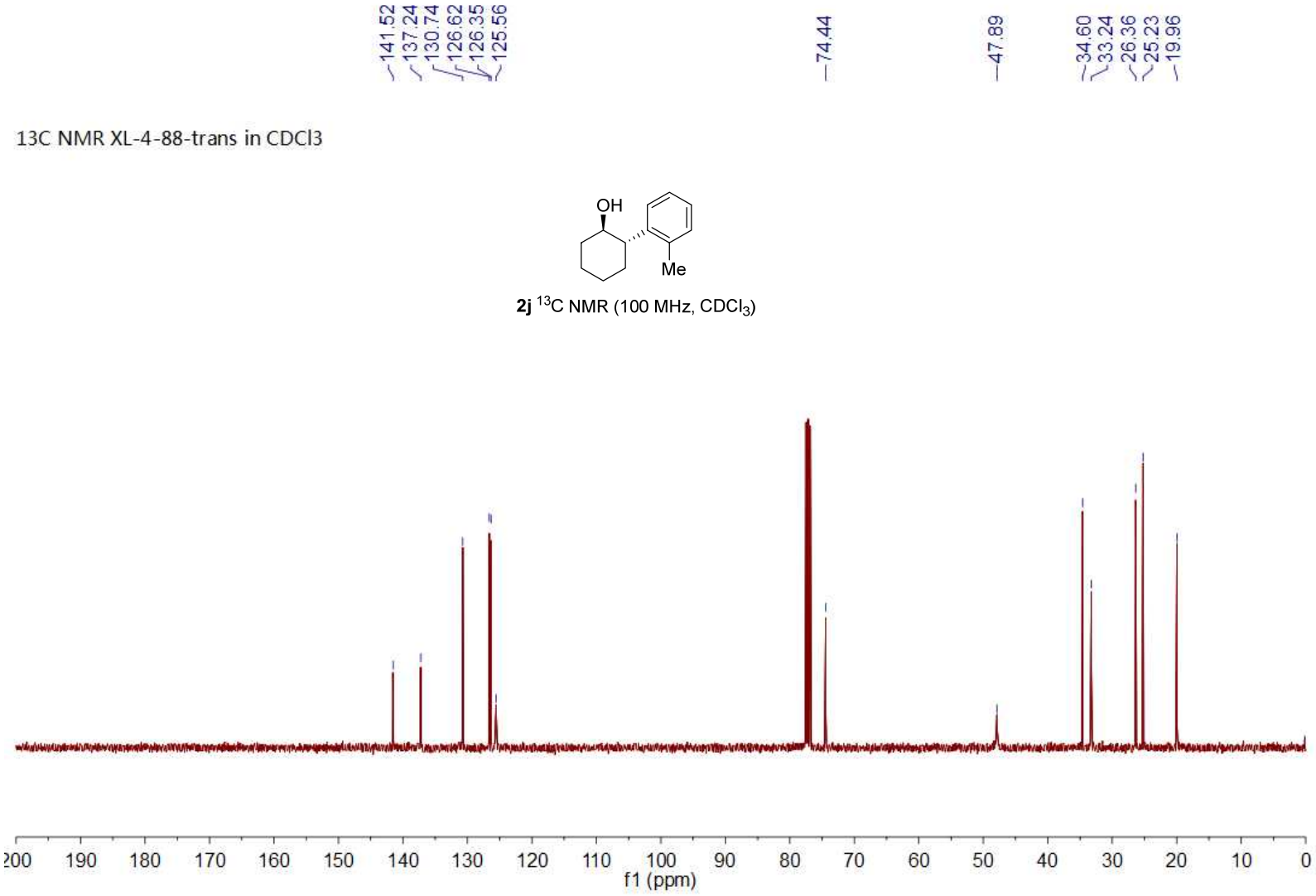


2i ^{19}F NMR (376 MHz, $CDCl_3$)

1H NMR XL-4-88-trans in CDCl3



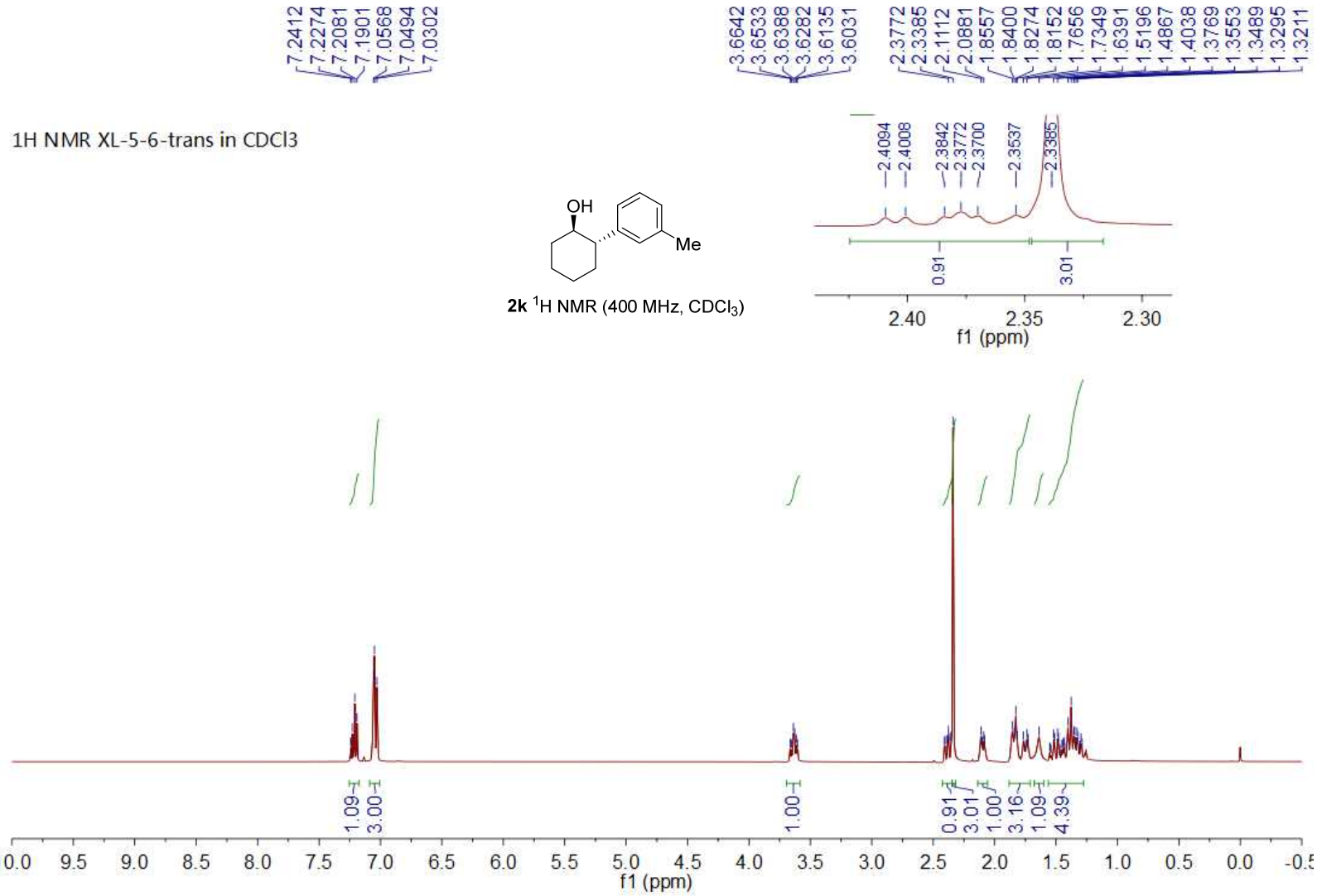
2j ^{1}H NMR (400 MHz, $CDCl_3$)

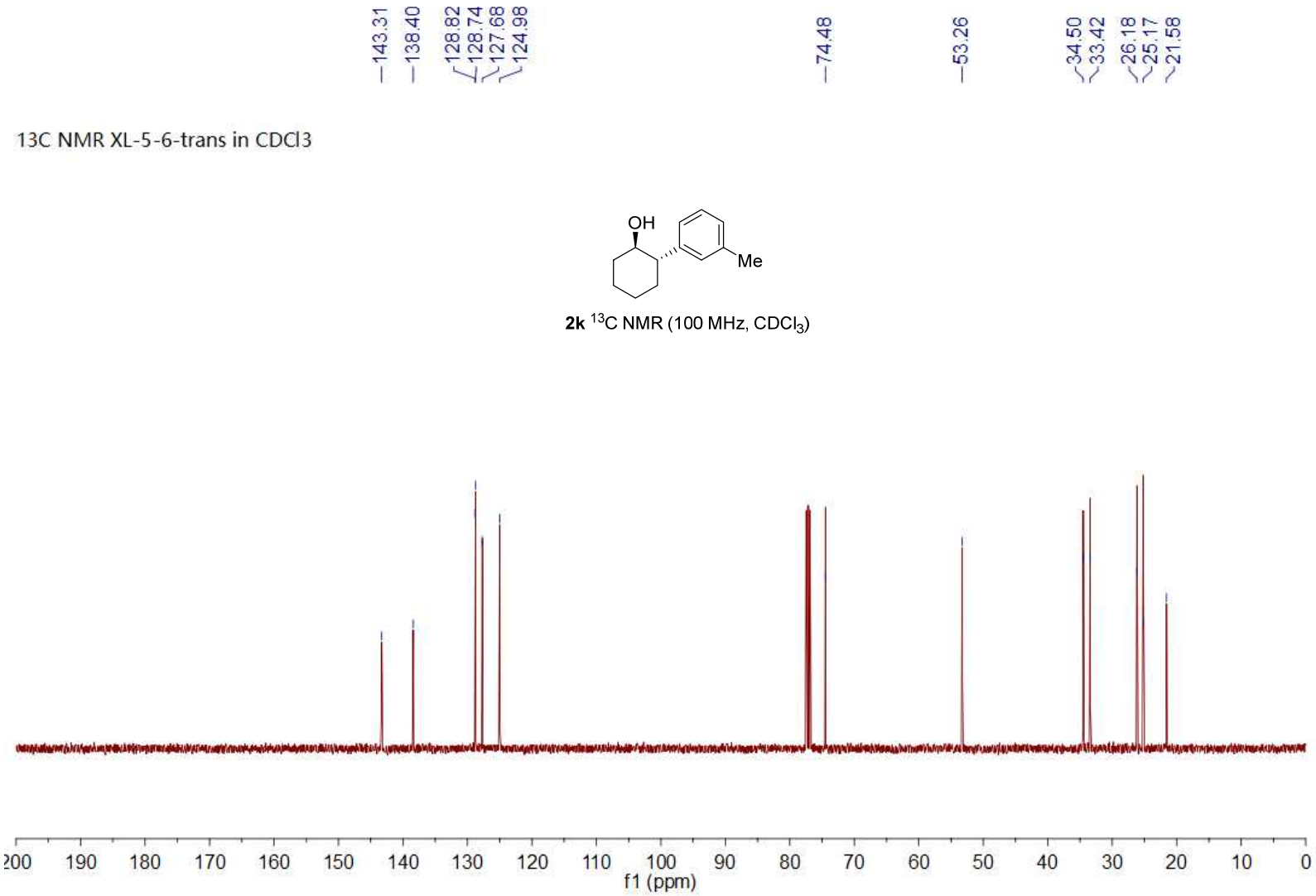


2j ^{13}C NMR (100 MHz, $CDCl_3$)

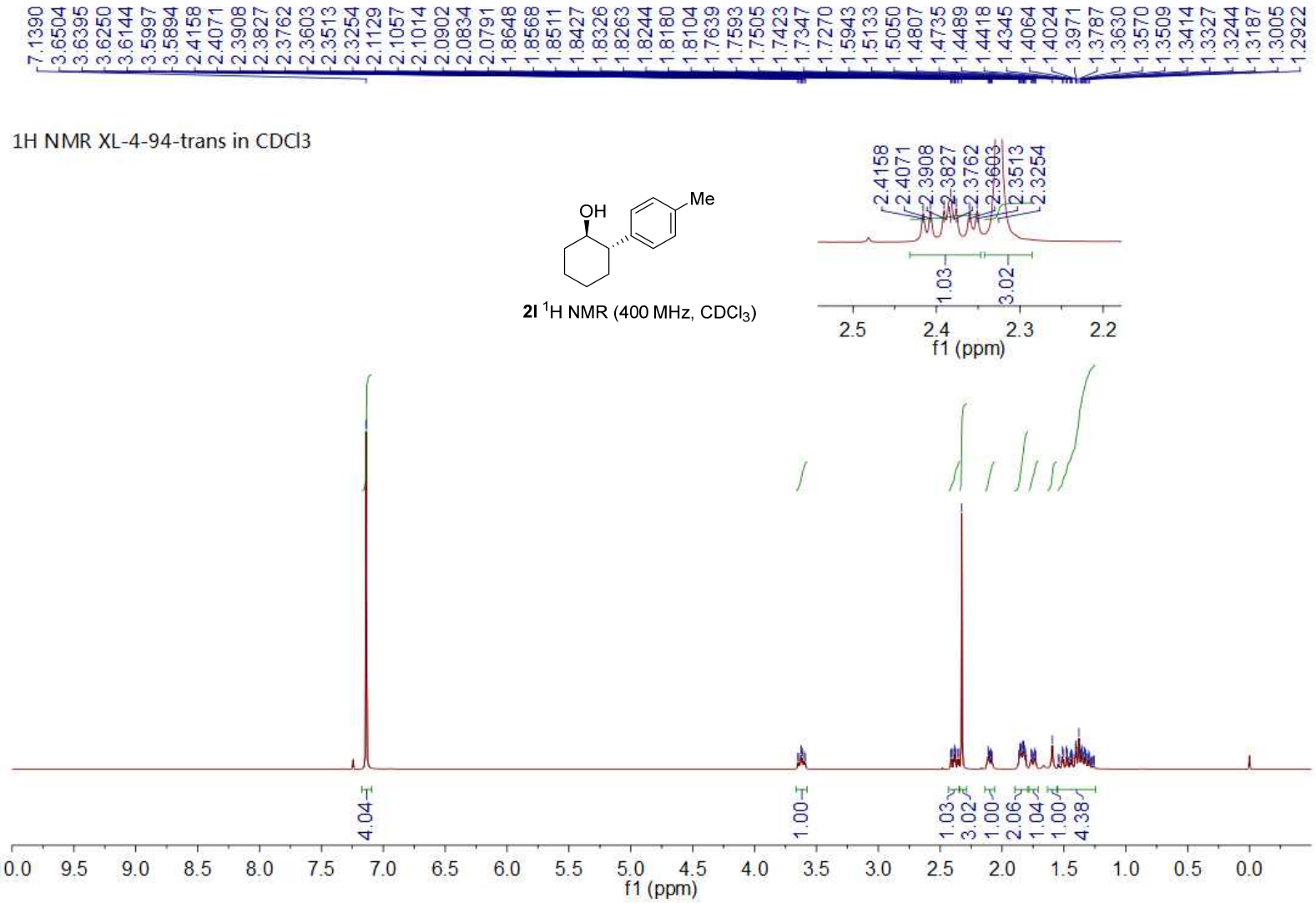
1H NMR XL-5-6-trans in CDCl3

2k ^{1}H NMR (400 MHz, $CDCl_3$)

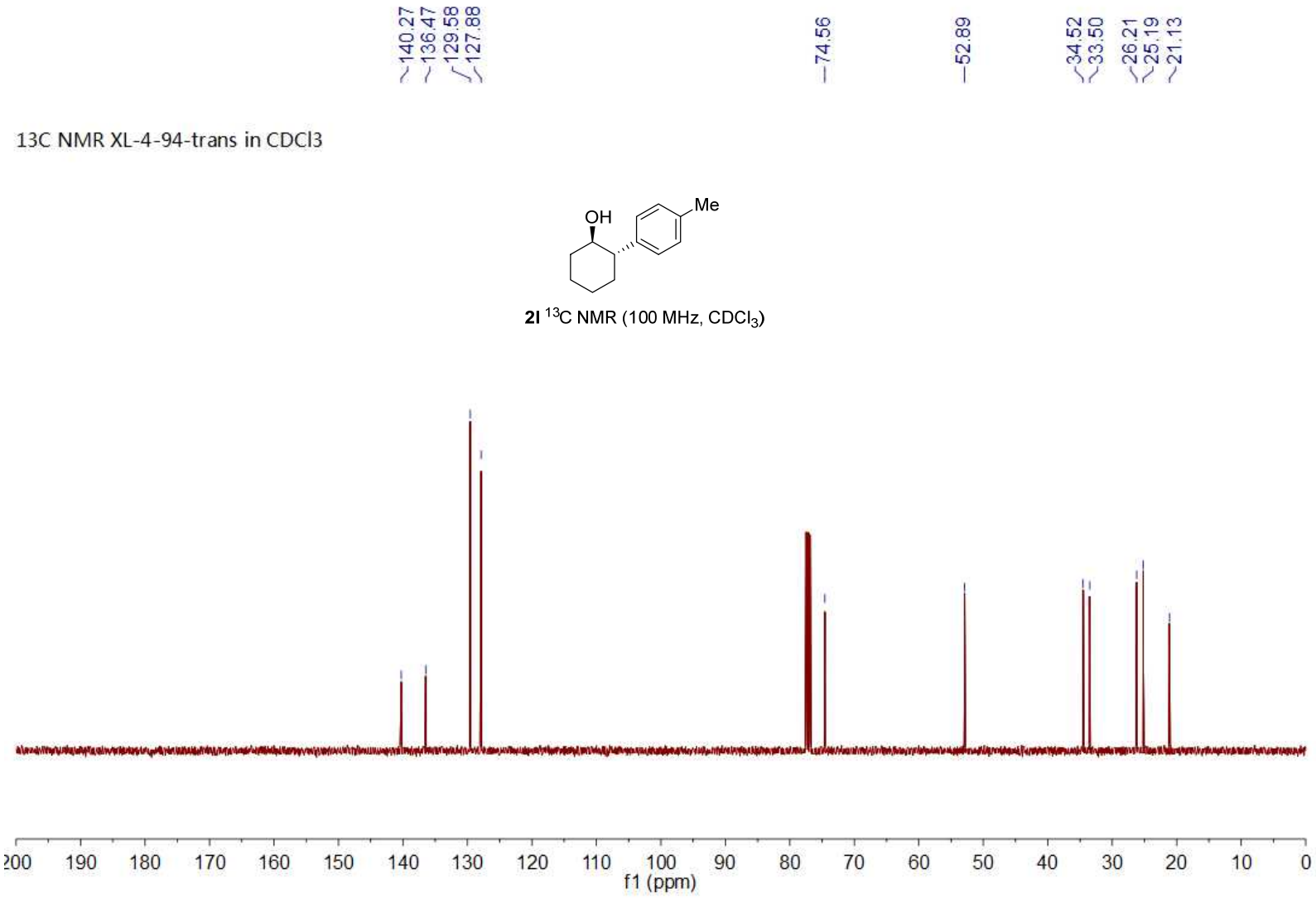




2k ^{13}C NMR (100 MHz, $CDCl_3$)

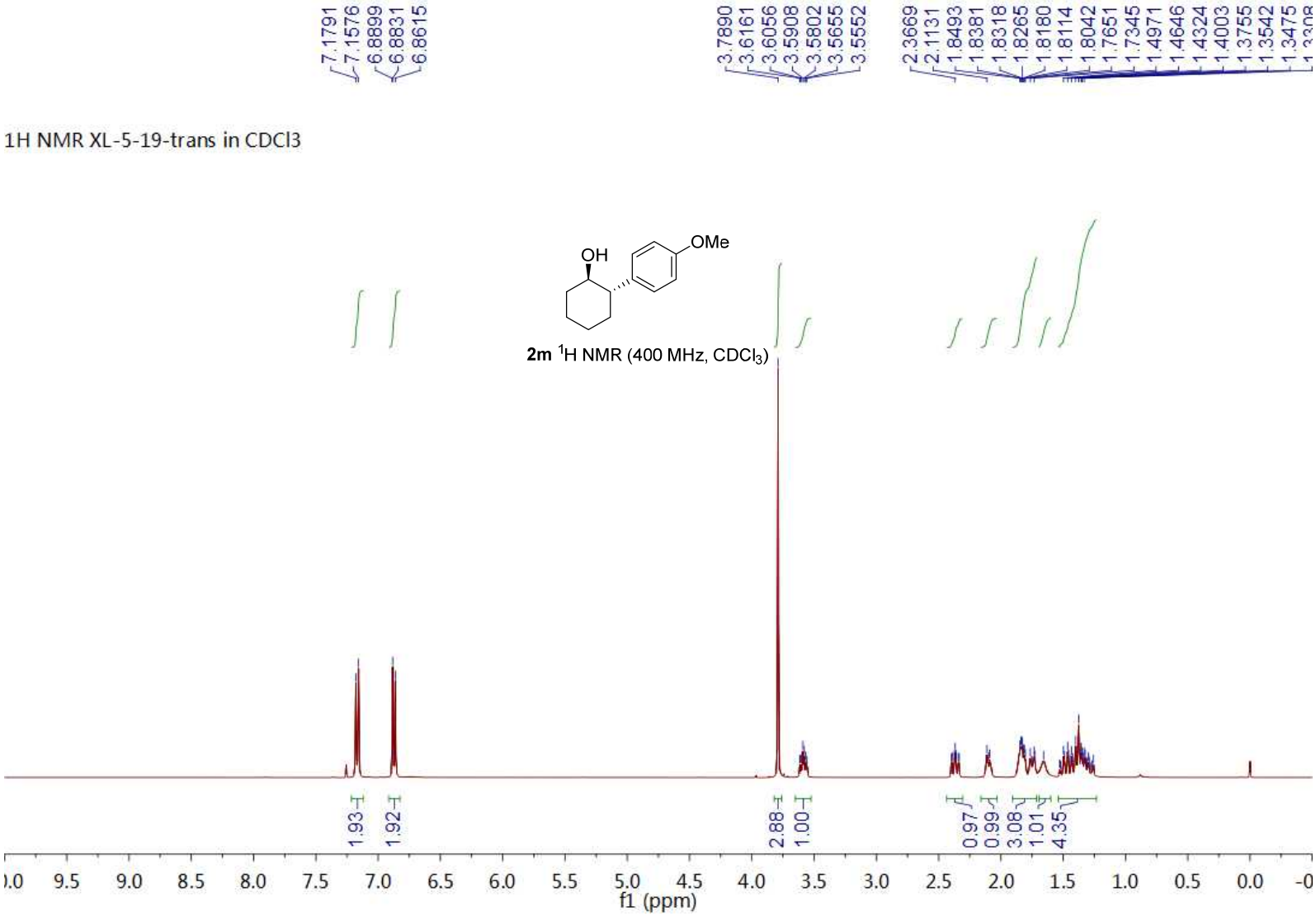


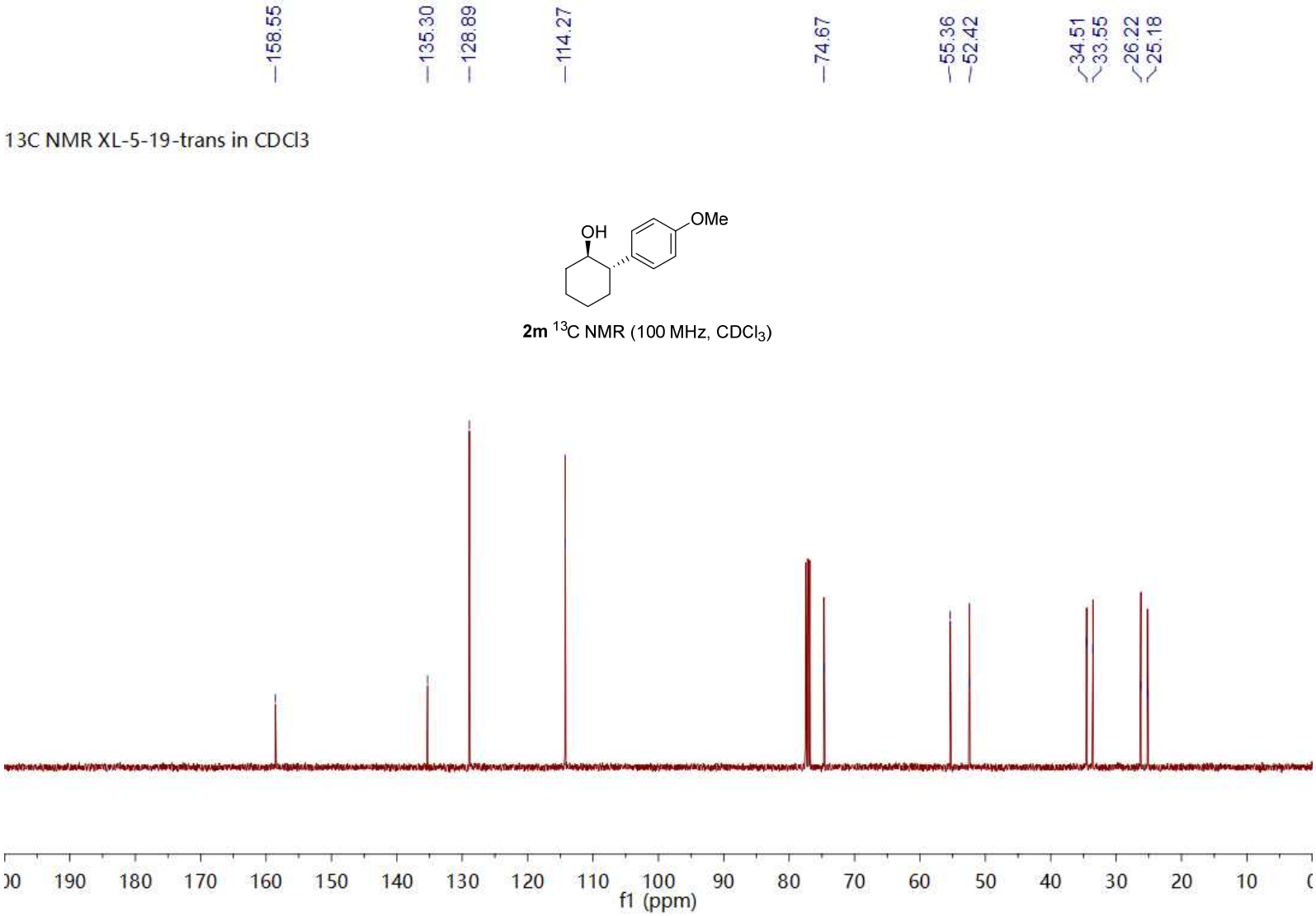
2l ^{1}H NMR (400 MHz, $CDCl_3$)



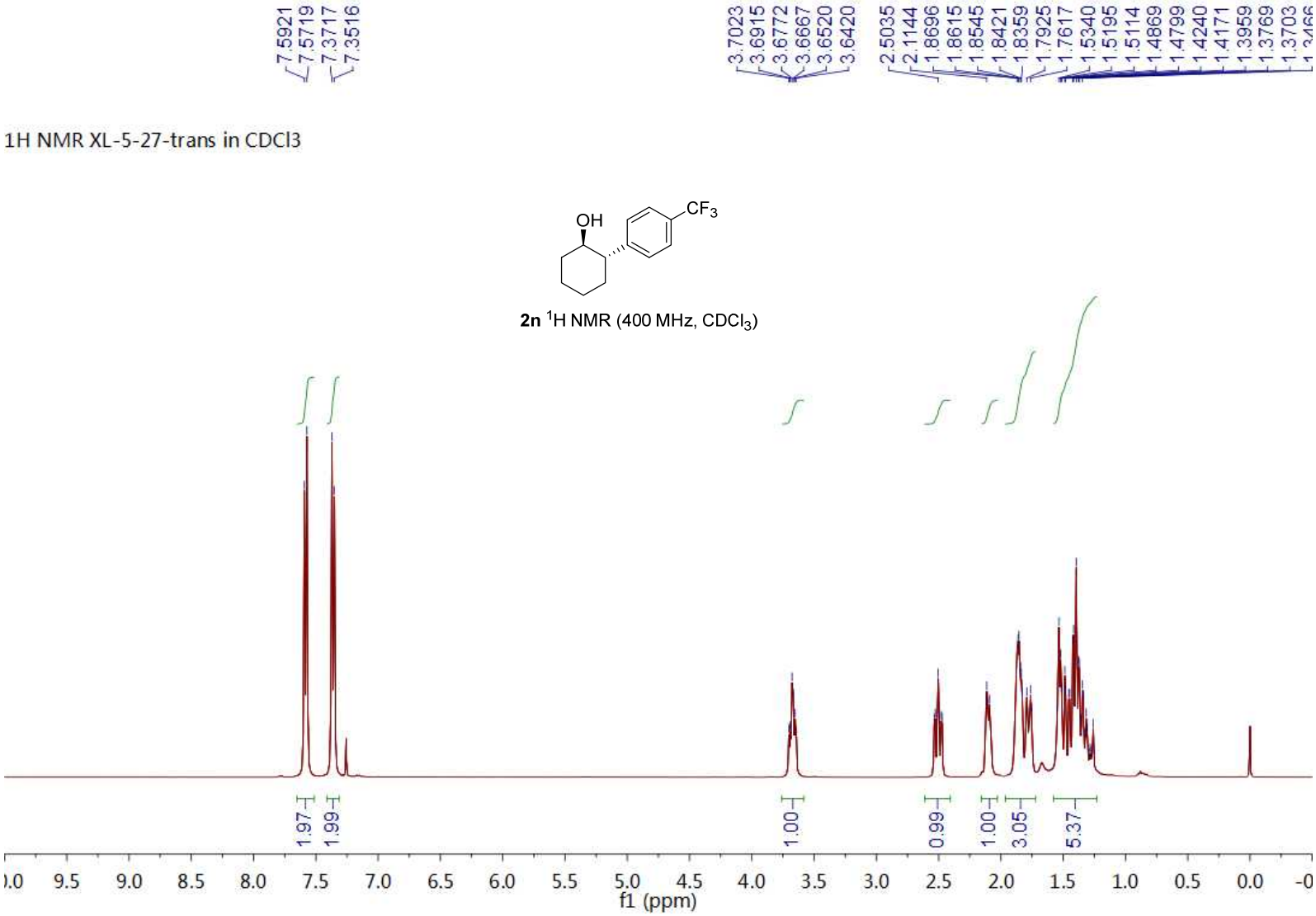
2l ^{13}C NMR (100 MHz, $CDCl_3$)

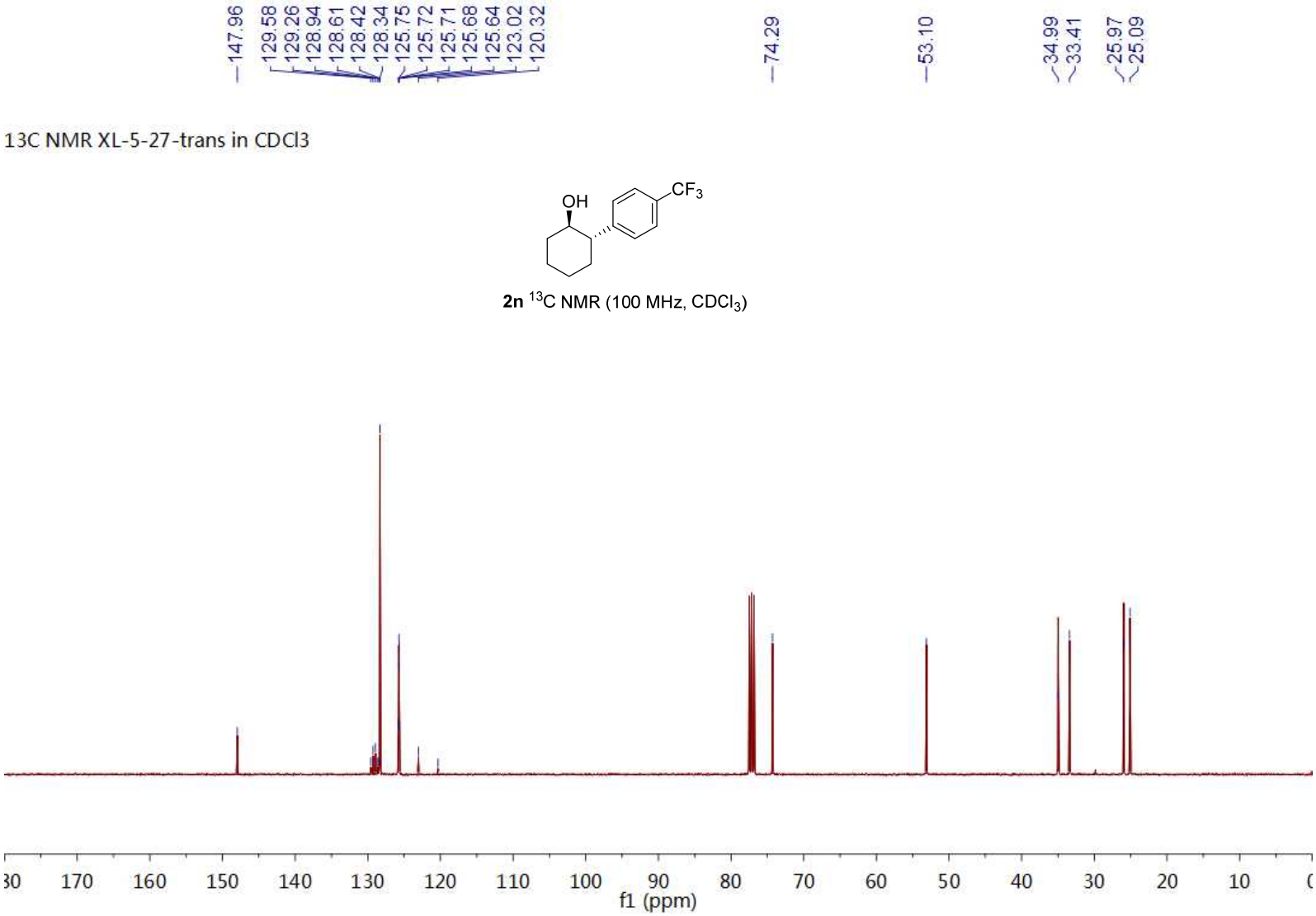
1H NMR XL-5-19-trans in CDCl3




158.55
135.30
128.89
114.27
74.67
55.36
52.42
34.51
33.55
26.22
25.18
13C NMR XL-5-19-trans in CDCl3
OH
OMe
2m 13C NMR (100 MHz, CDCl3)
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

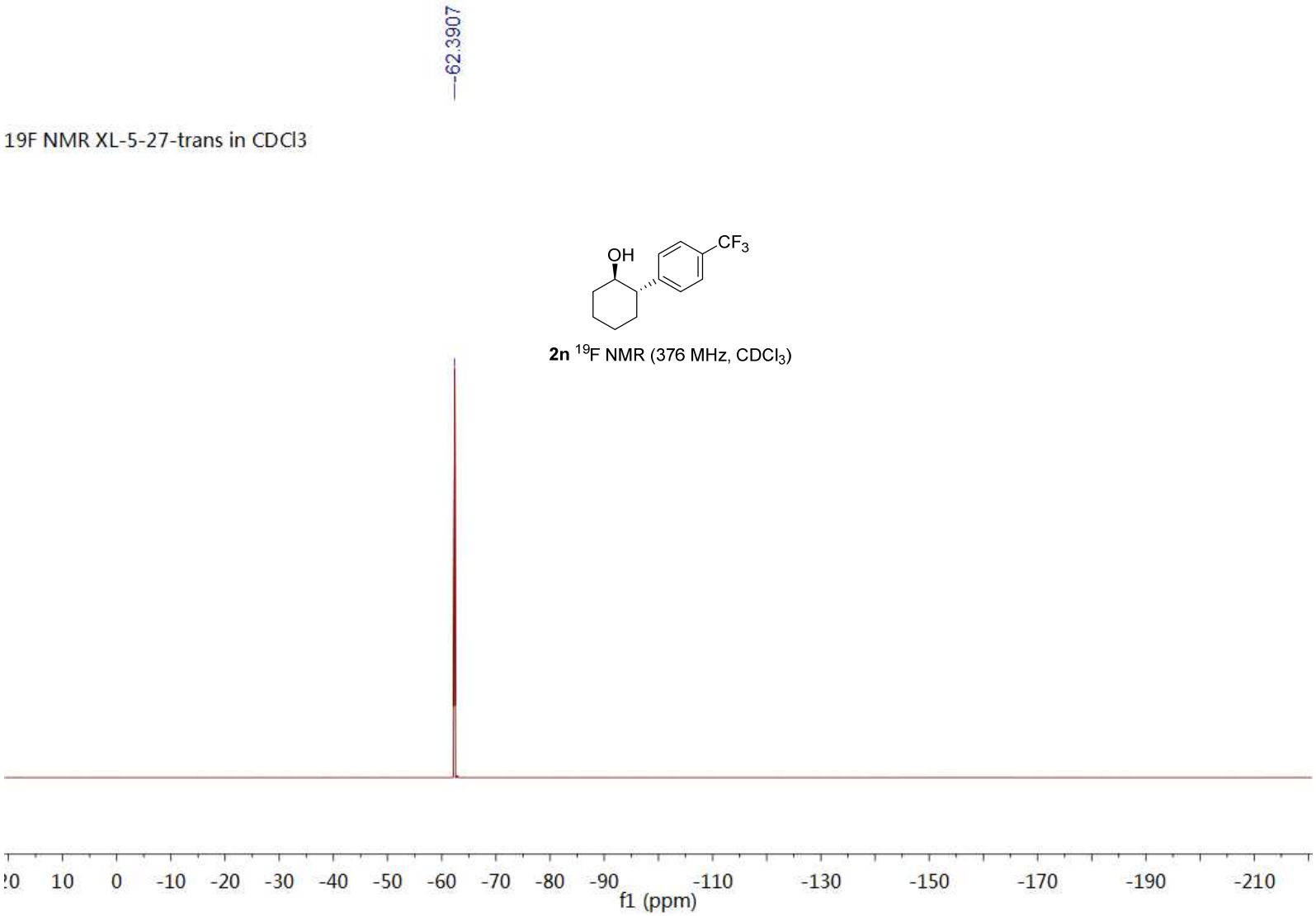
1H NMR XL-5-27-trans in CDCl3



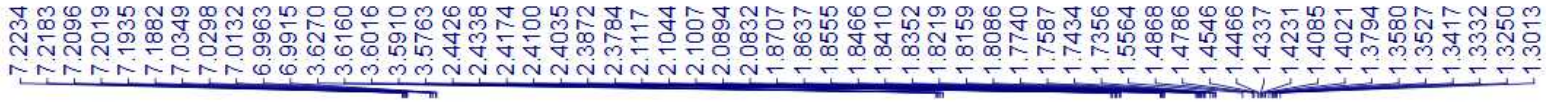


2n ^{13}C NMR (100 MHz, $CDCl_3$)

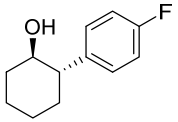
19F NMR XL-5-27-trans in CDCl3



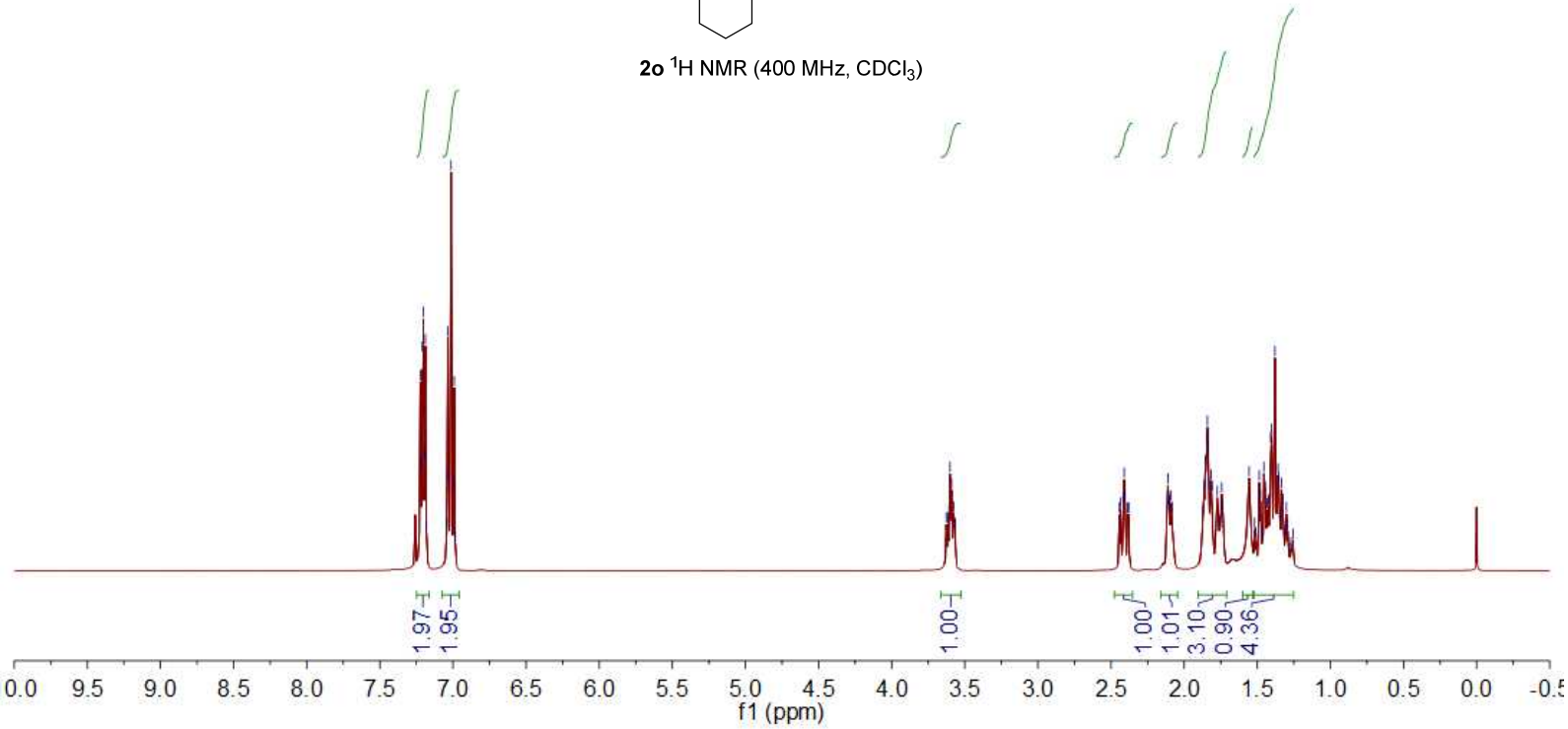
2n ^{19}F NMR (376 MHz, $CDCl_3$)

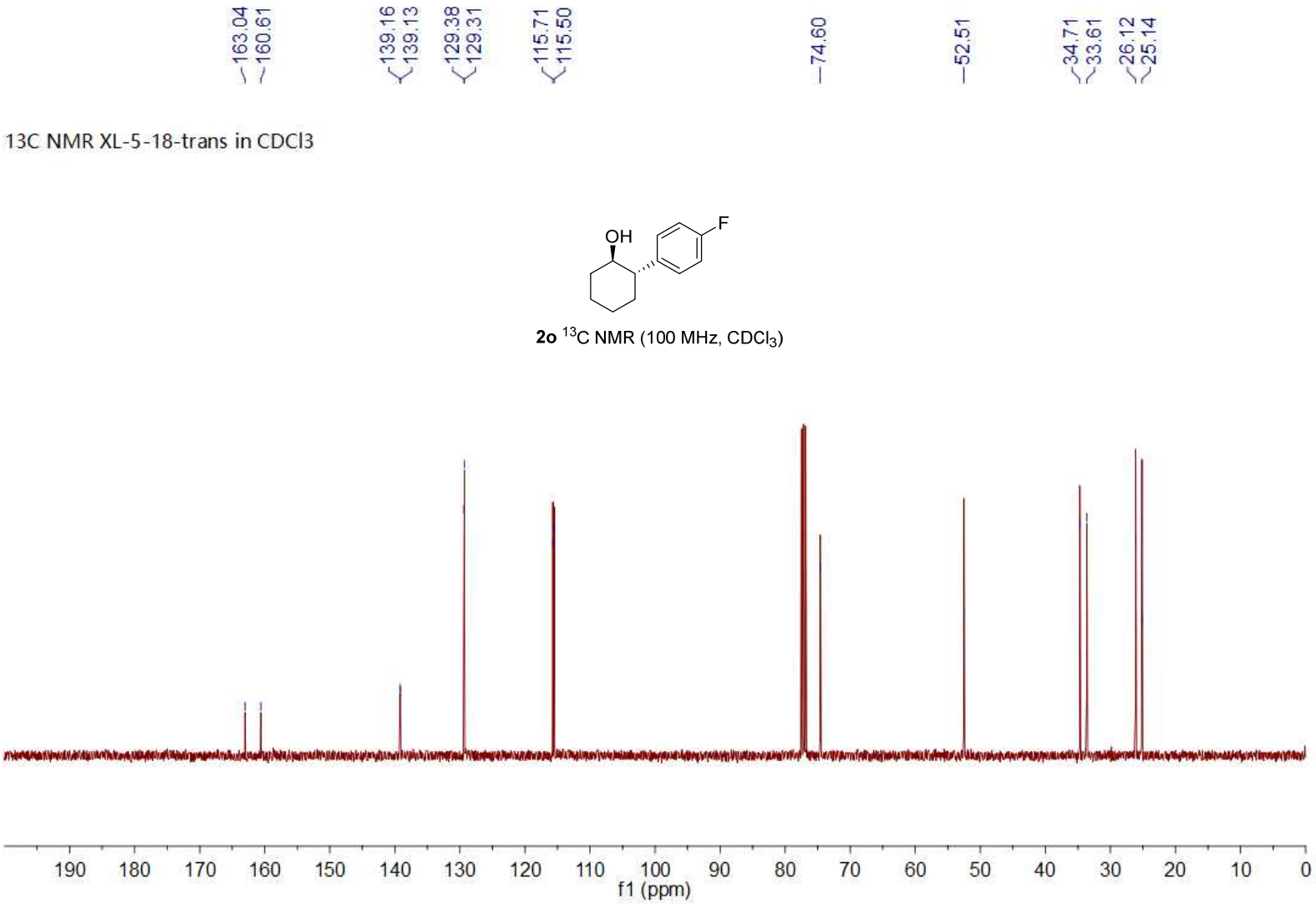


1H NMR XL-5-18-trans in CDCl3



2o ^{1}H NMR (400 MHz, $CDCl_3$)

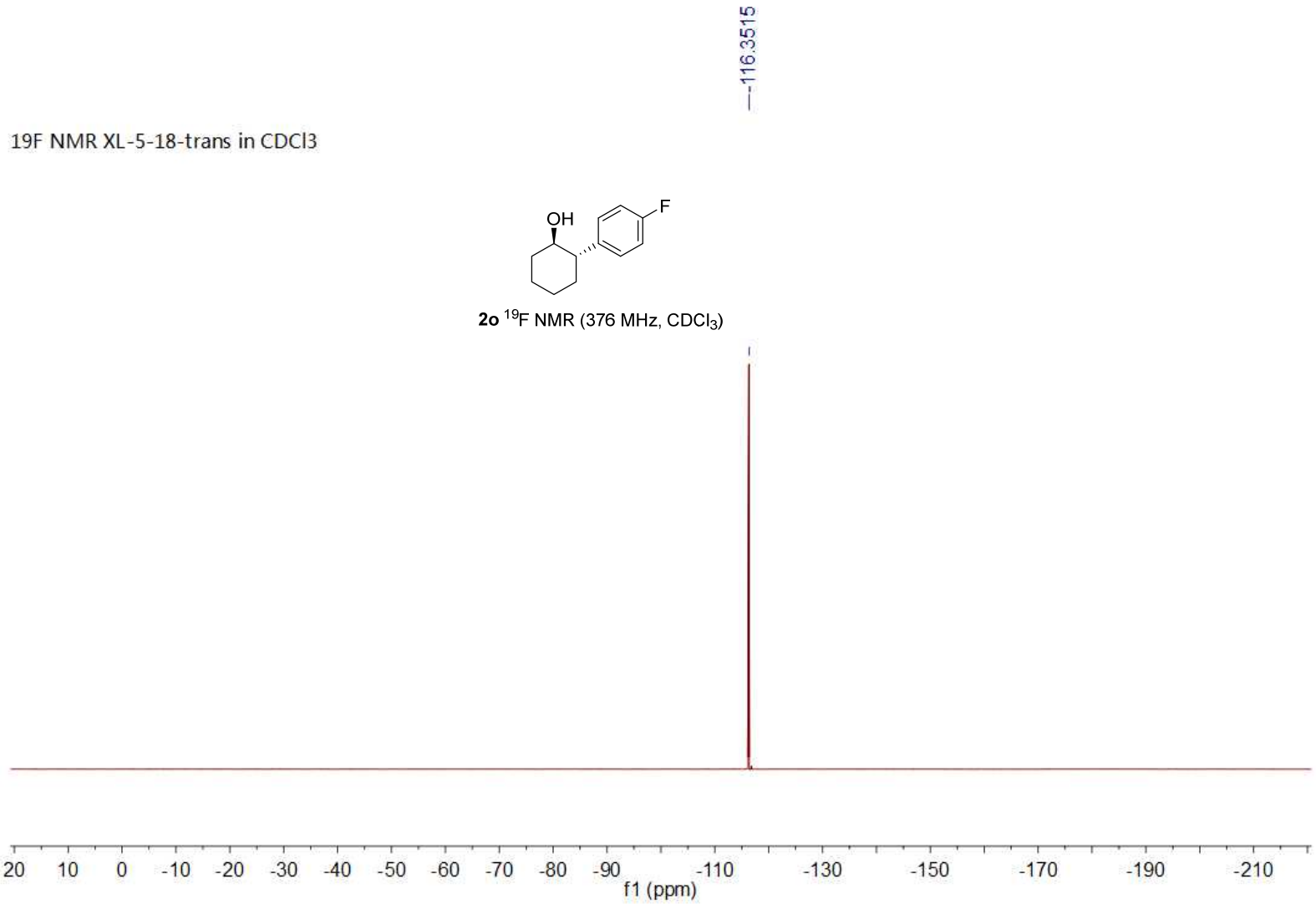




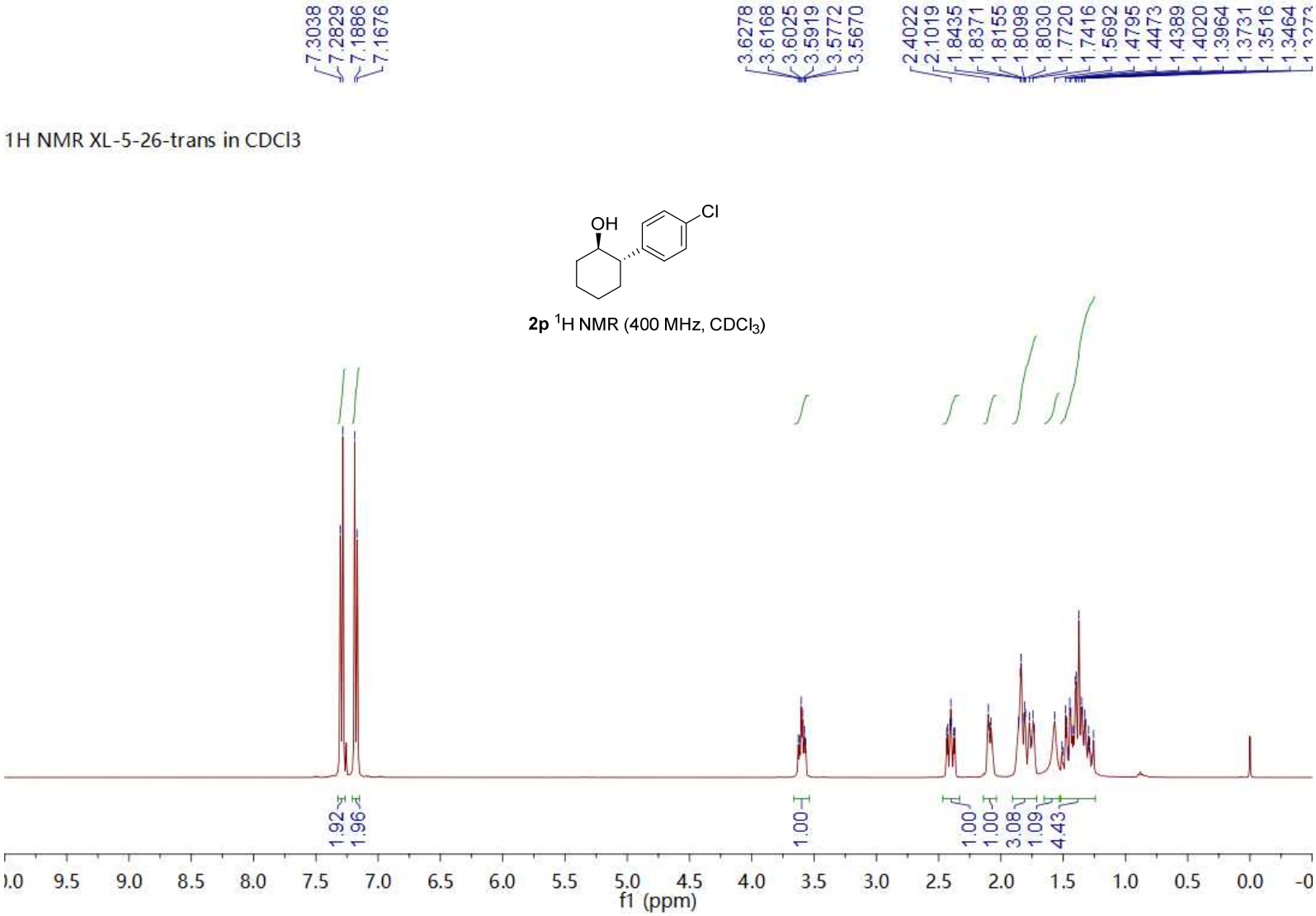
2o ^{13}C NMR (100 MHz, $CDCl_3$)

19F NMR XL-5-18-trans in CDCl3

2o ^{19}F NMR (376 MHz, $CDCl_3$)

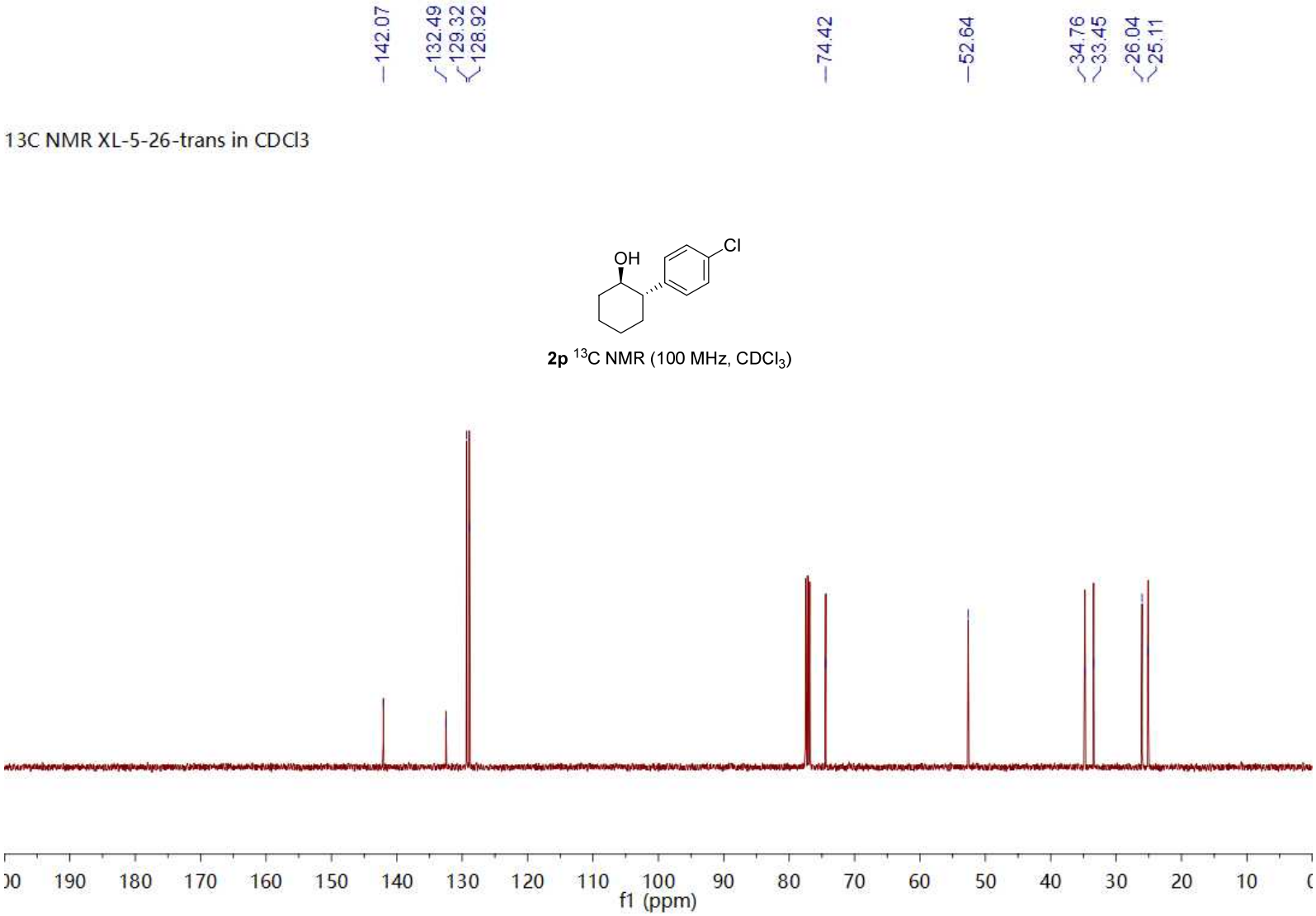


1H NMR XL-5-26-trans in CDCl3



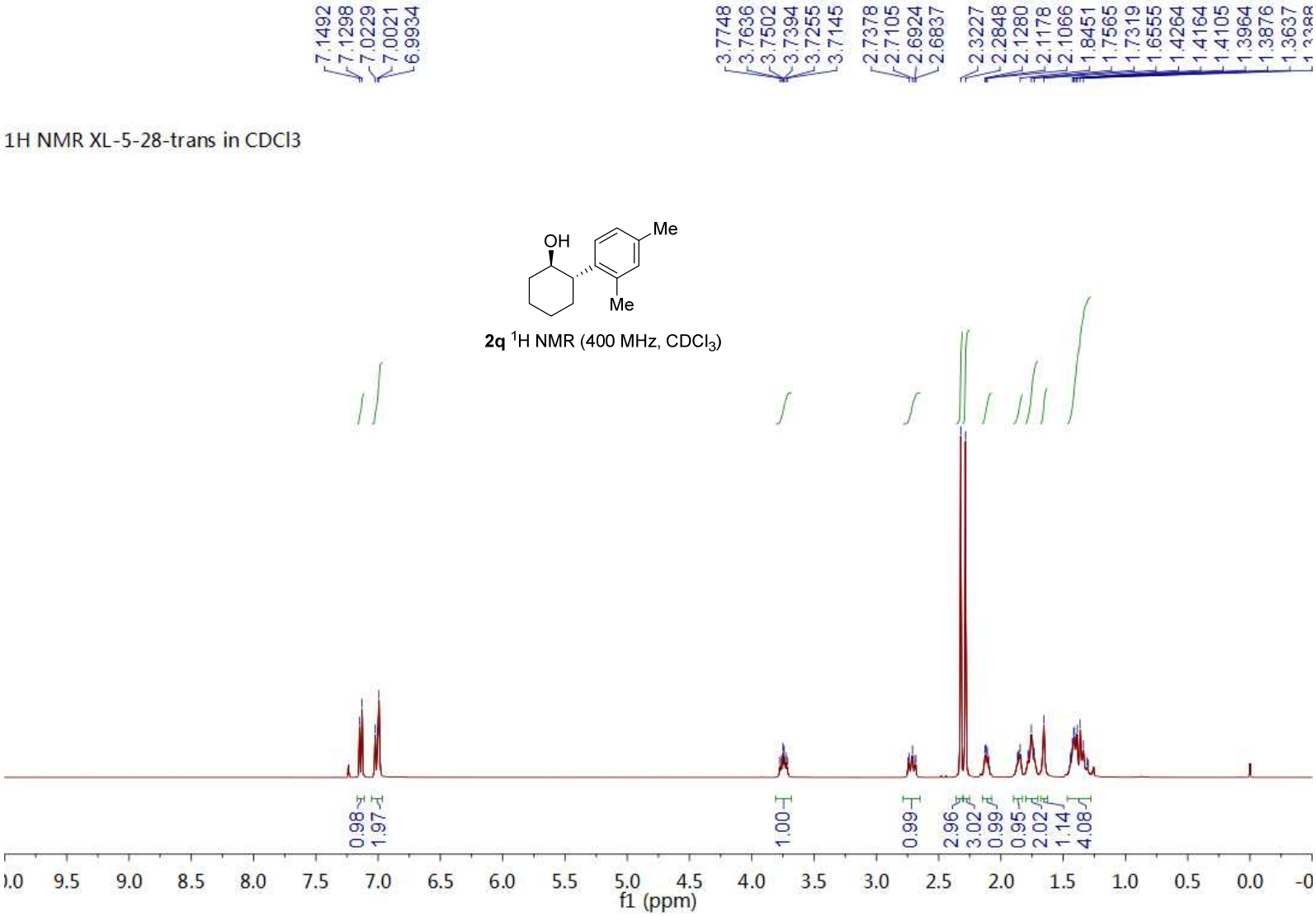
2p ^{1}H NMR (400 MHz, $CDCl_3$)

13C NMR XL-5-26-trans in CDCl3



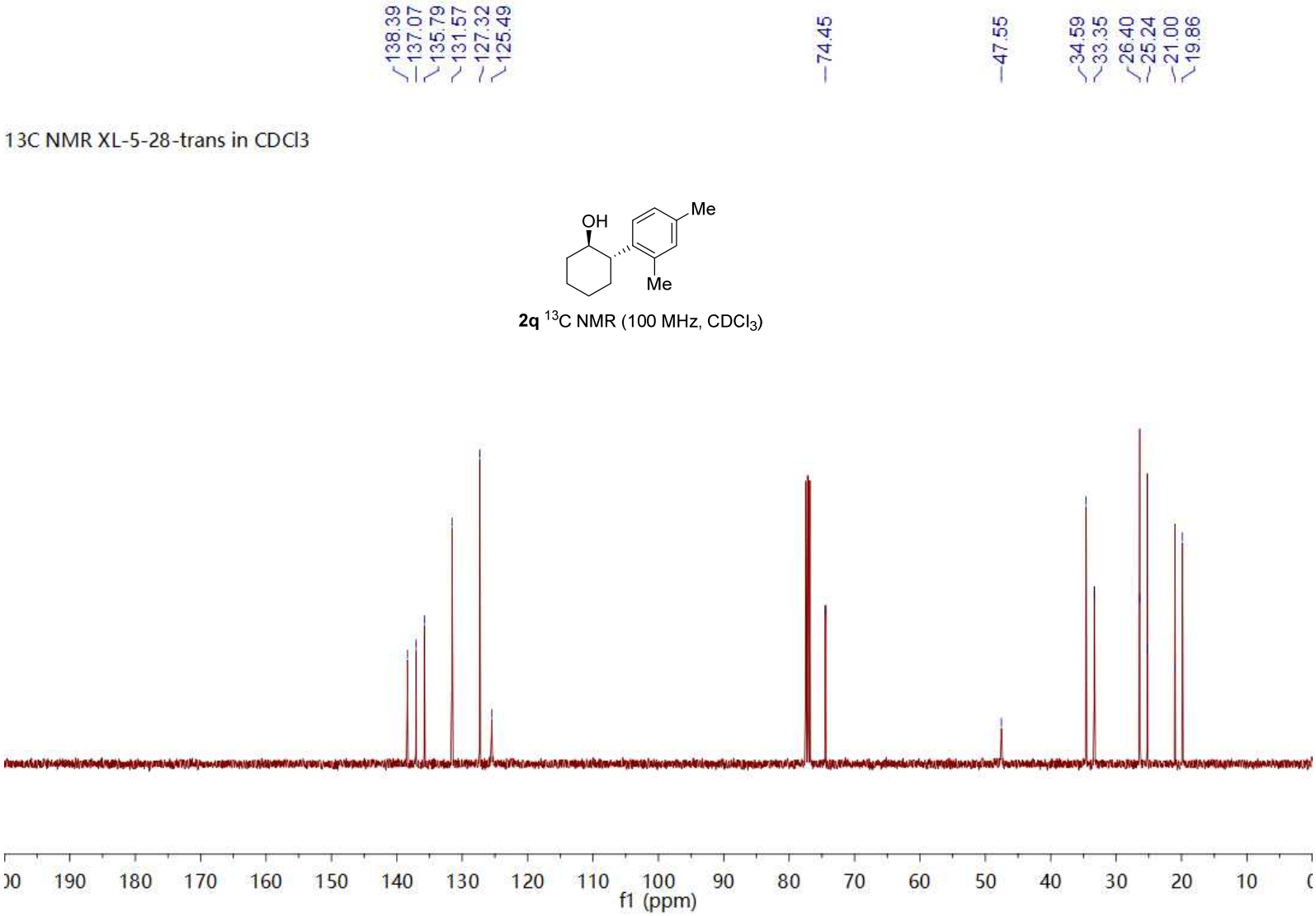
2p ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR XL-5-28-trans in CDCl3

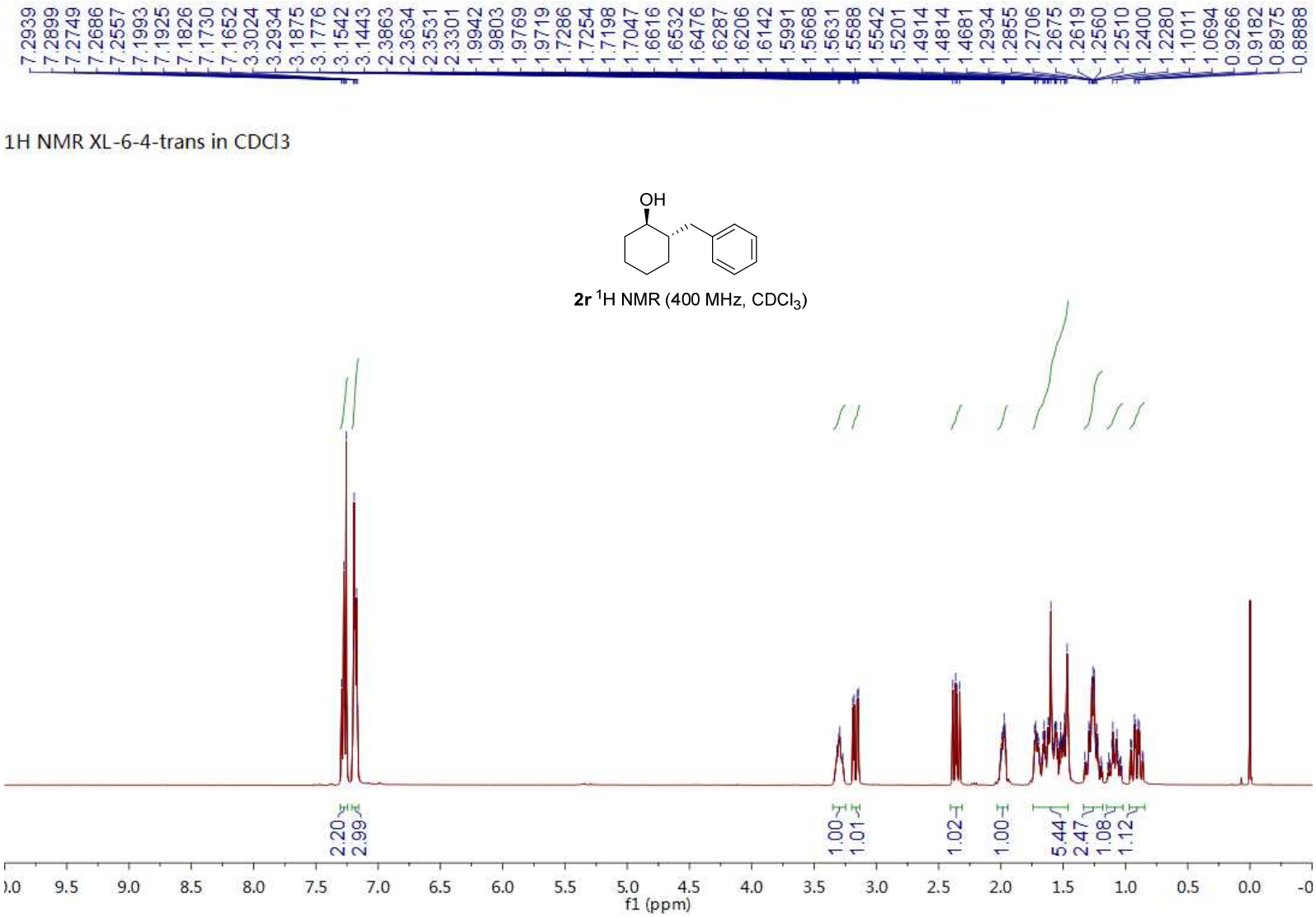


2q ^{1}H NMR (400 MHz, $CDCl_3$)

13C NMR XL-5-28-trans in CDCl3

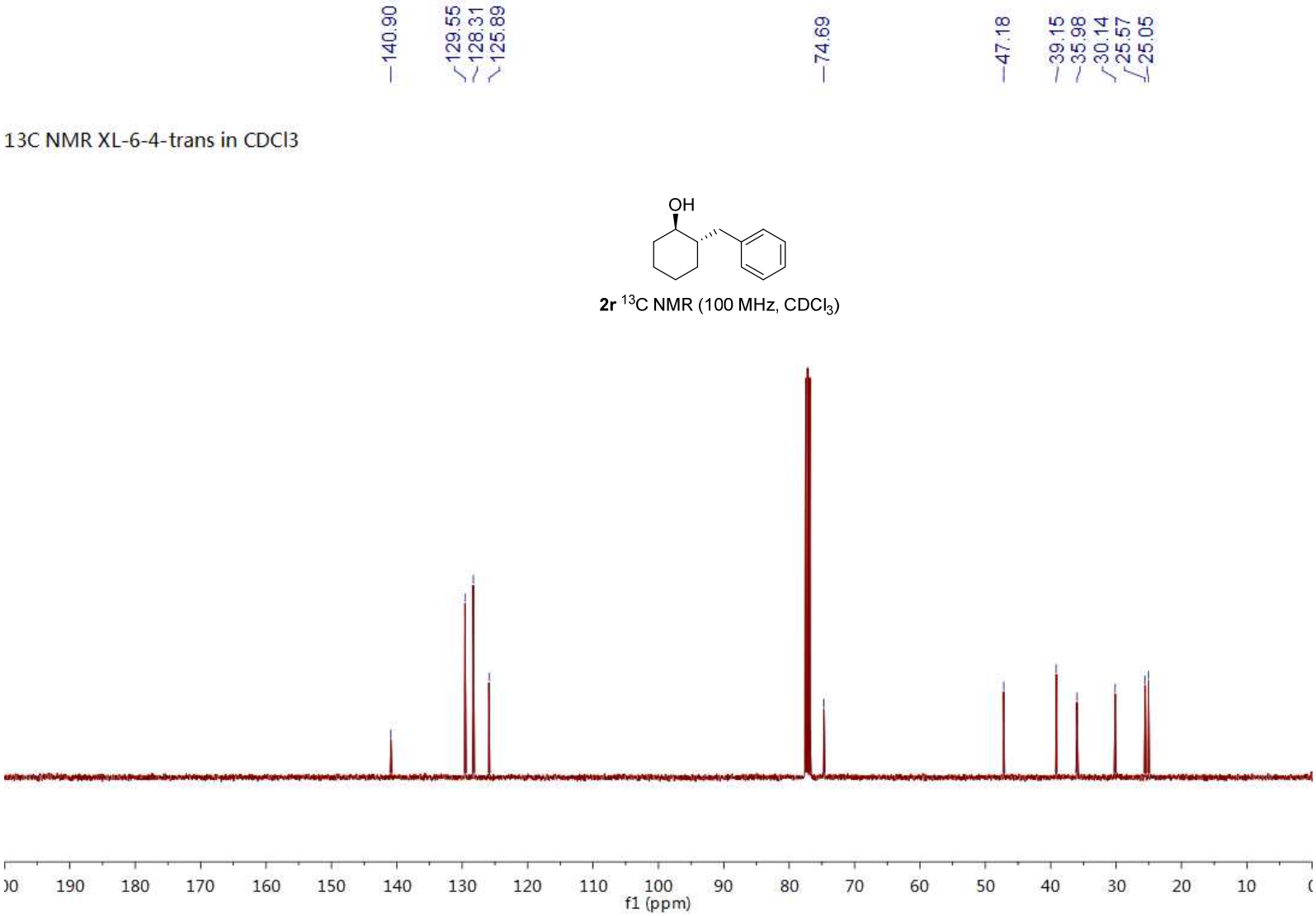


2q ^{13}C NMR (100 MHz, $CDCl_3$)

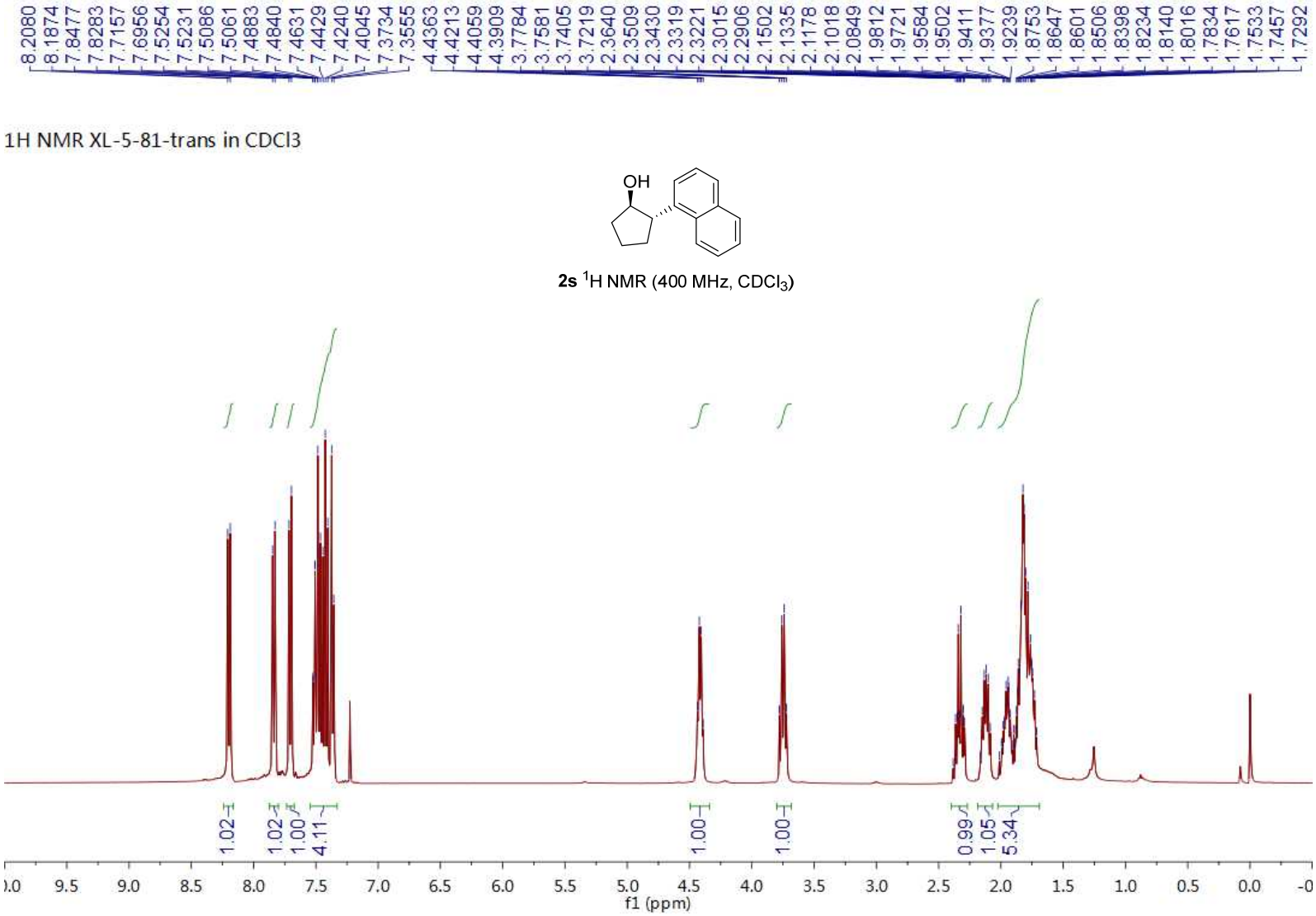


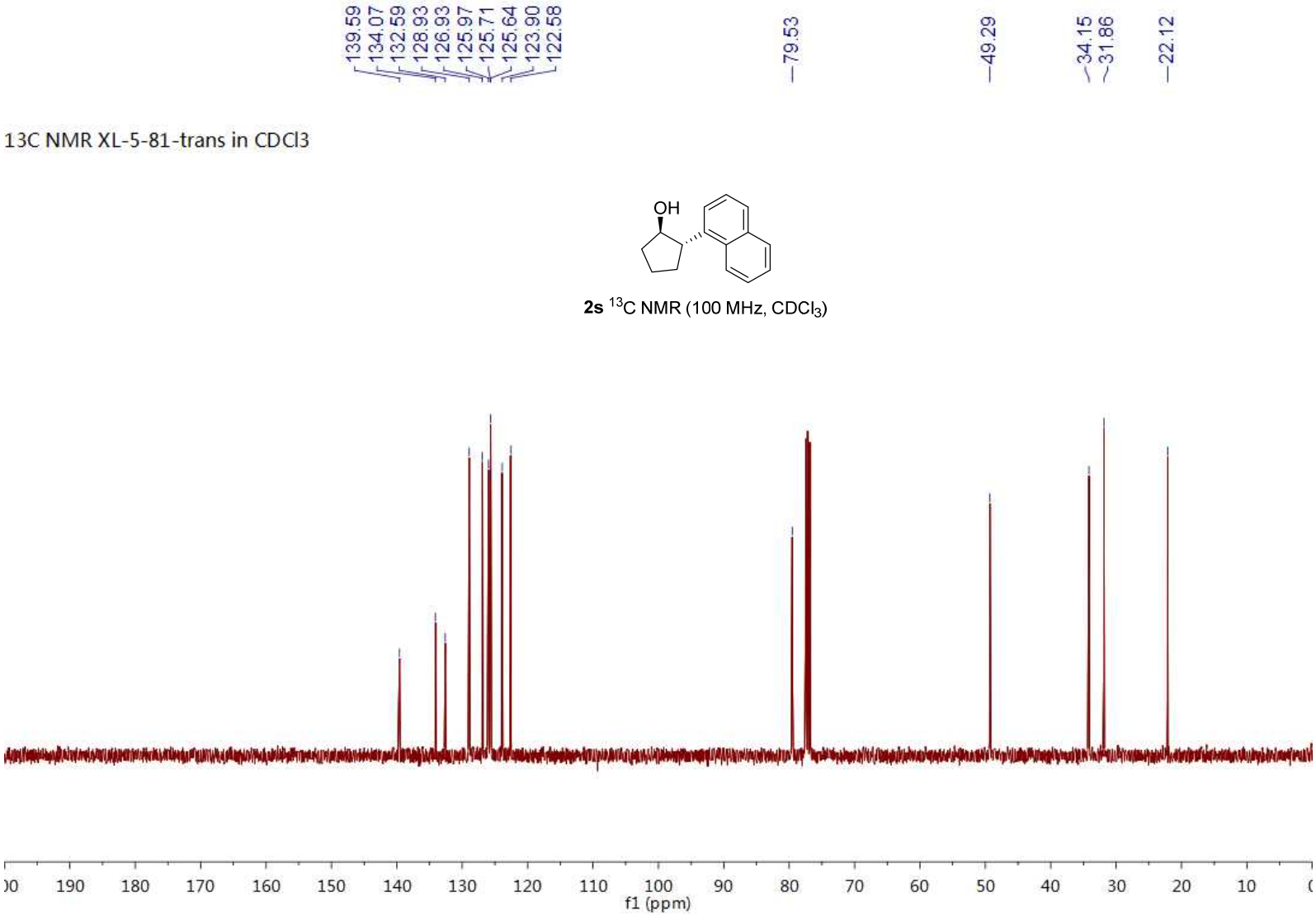
2r ^{1}H NMR (400 MHz, $CDCl_3$)

13C NMR XL-6-4-trans in CDCl3

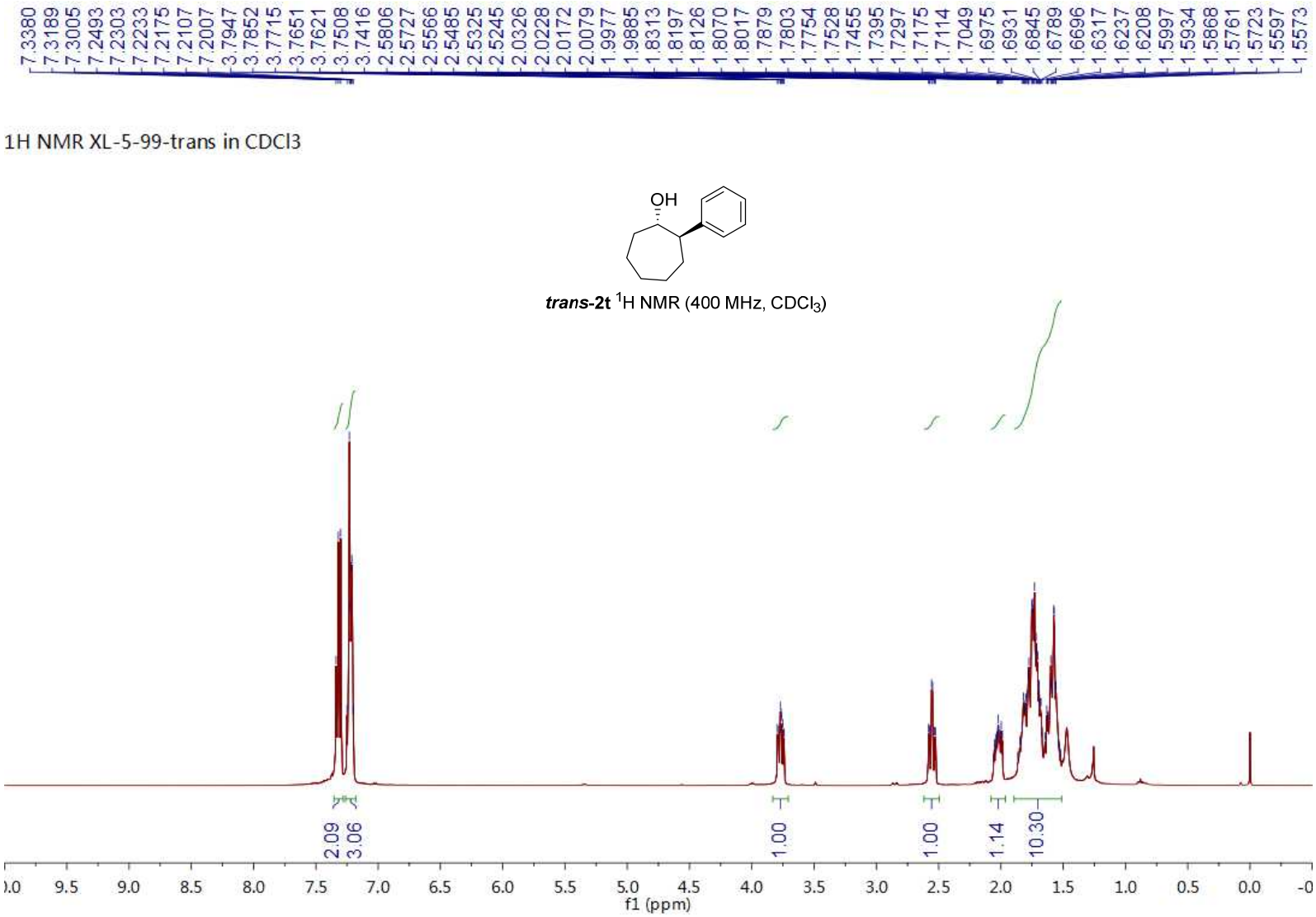


2r ^{13}C NMR (100 MHz, $CDCl_3$)

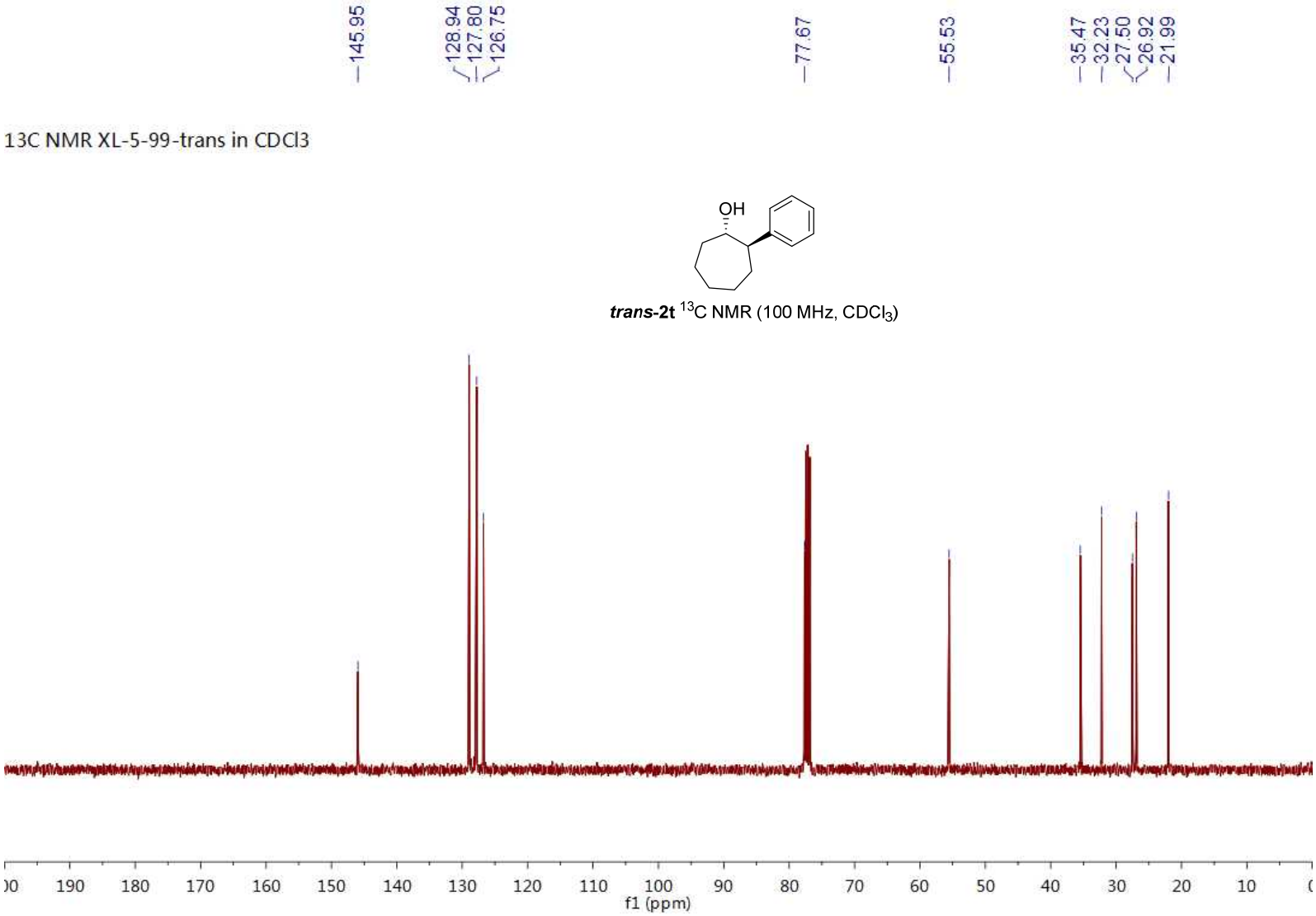

8.2080
8.1874
7.8477
7.8283
7.7157
7.6956
7.5254
7.5231
7.5086
7.5061
7.4883
7.4840
7.4631
7.4429
7.4240
7.4045
7.3734
7.3555
4.4363
4.4213
4.4059
4.3909
3.7784
3.7581
3.7405
3.7219
2.3640
2.3509
2.3430
2.3319
2.3221
2.3015
2.2906
2.1502
2.1335
2.1178
2.1018
2.0849
1.9812
1.9721
1.9584
1.9502
1.9411
1.9377
1.9239
1.8753
1.8647
1.8601
1.8506
1.8398
1.8234
1.8140
1.8016
1.7834
1.7617
1.7533
1.7457
1.7292
1H NMR XL-5-81-trans in CDCl3
OH
2s 1H NMR (400 MHz, CDCl3)
1.02
1.02
1.00
4.11
1.00
1.00
0.99
1.05
5.34
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)



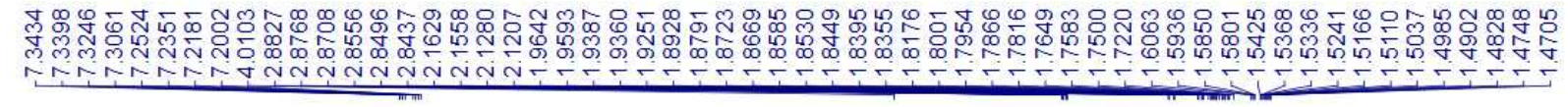
2s ^{13}C NMR (100 MHz, $CDCl_3$)



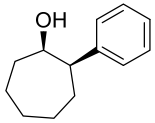
***trans*-2t** ^{1}H NMR (400 MHz, $CDCl_3$)



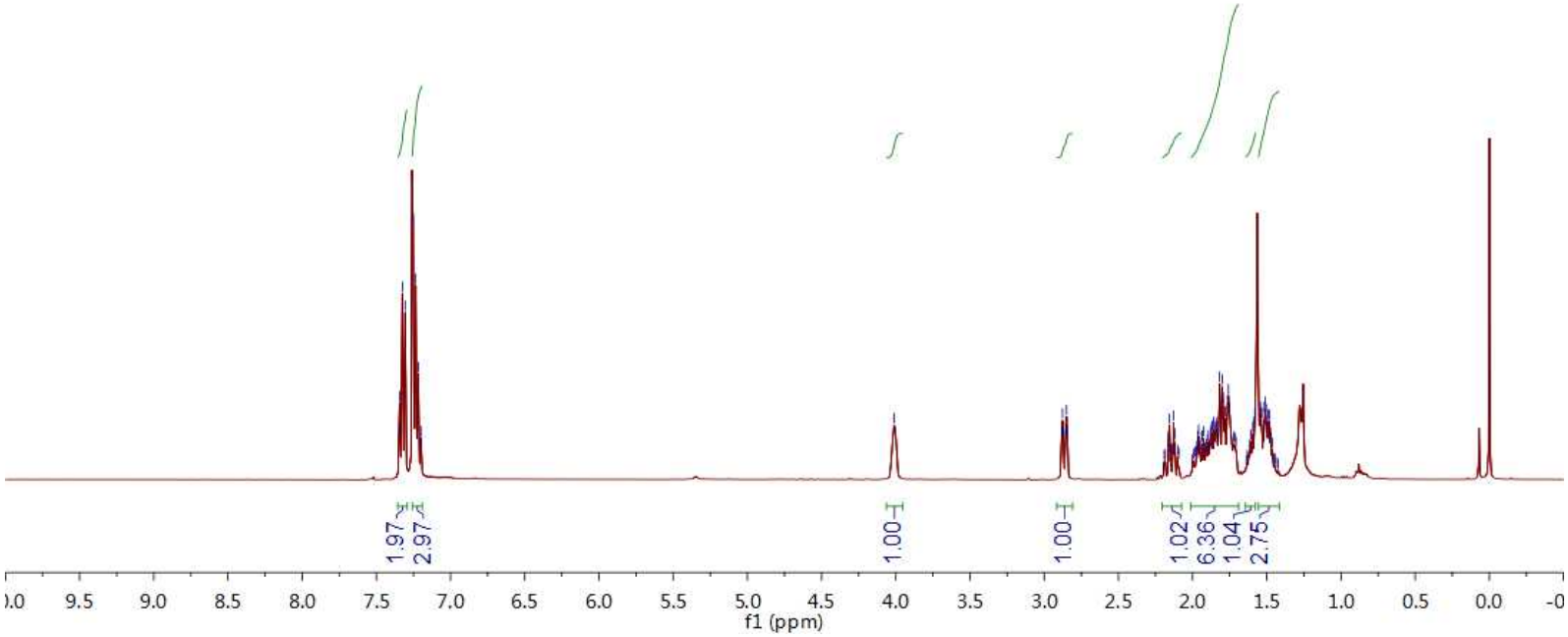
***trans*-2t** ^{13}C NMR (100 MHz, $CDCl_3$)



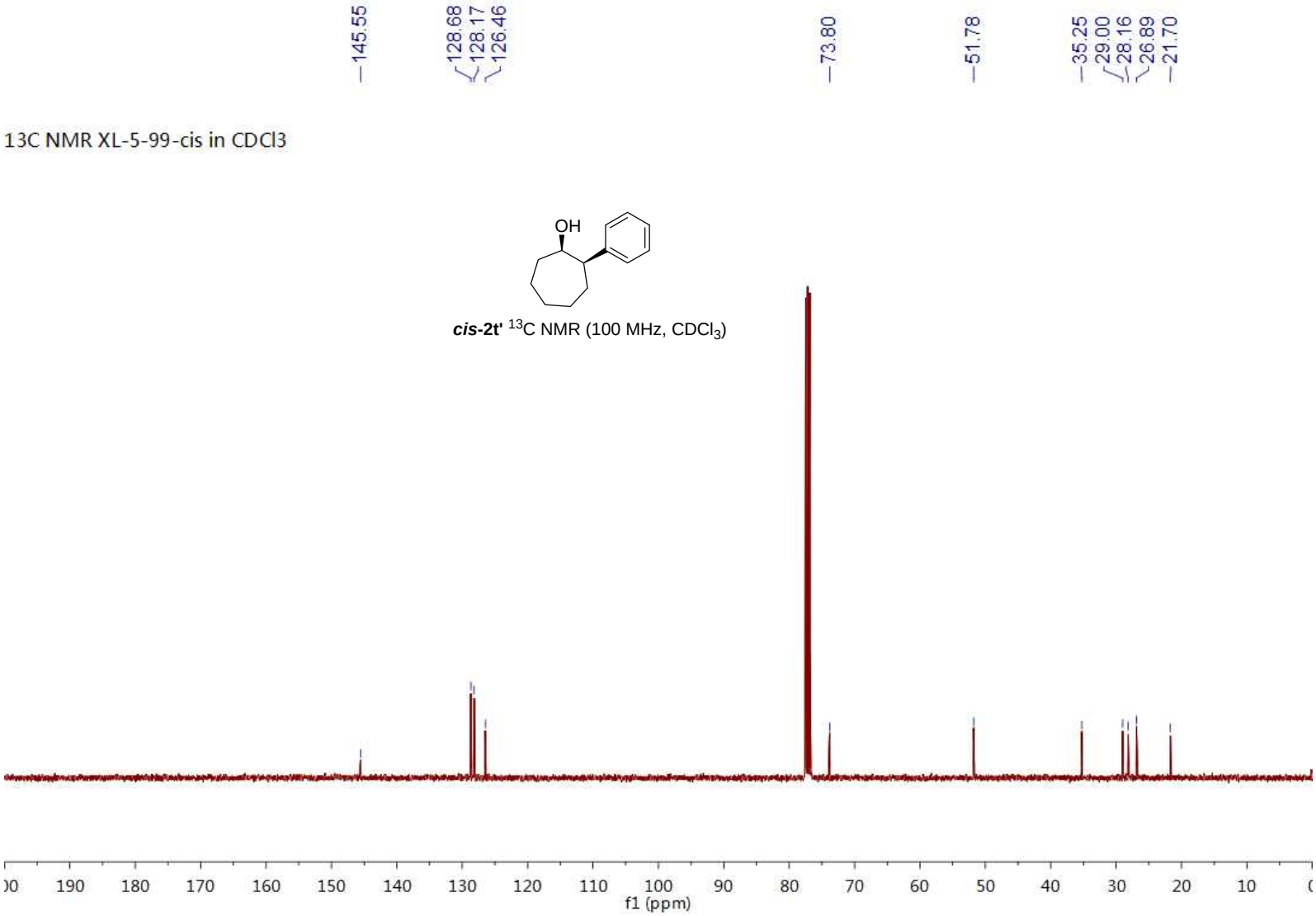
1H NMR XL-5-99-cis in CDCl3



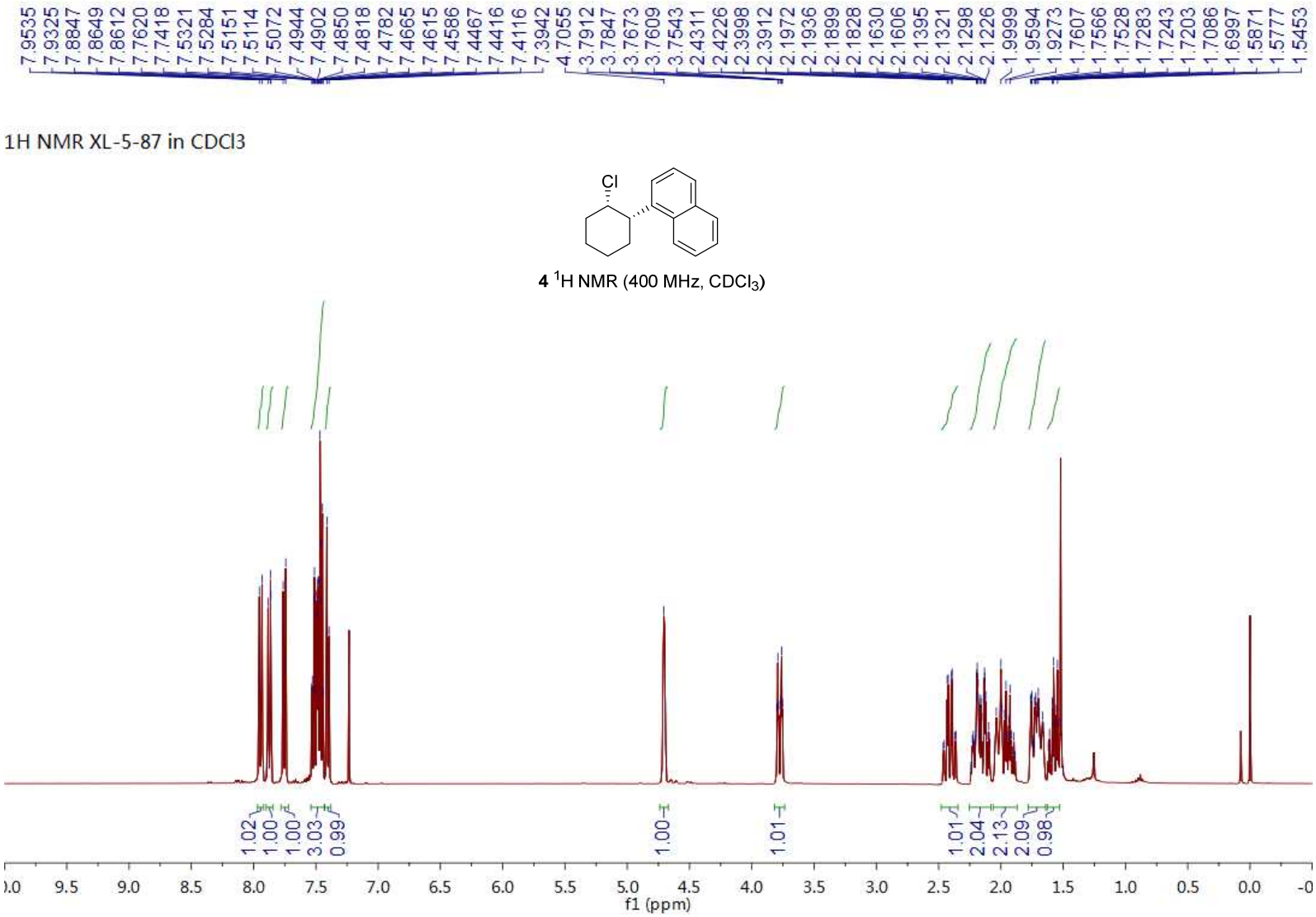
***cis*-2t'** ^{1}H NMR (400 MHz, $CDCl_3$)



13C NMR XL-5-99-cis in CDCl3



***cis*-2t'** ^{13}C NMR (100 MHz, $CDCl_3$)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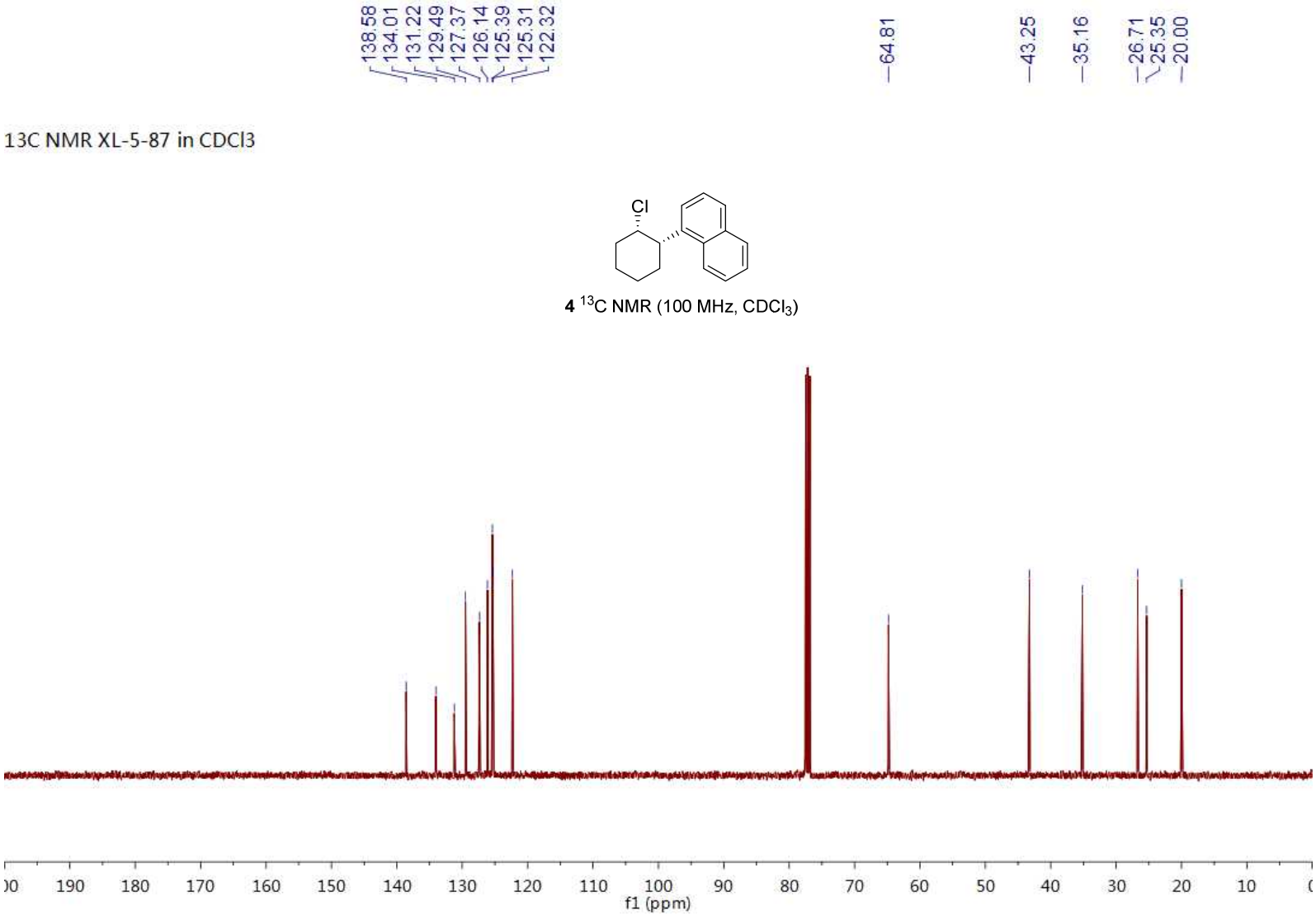
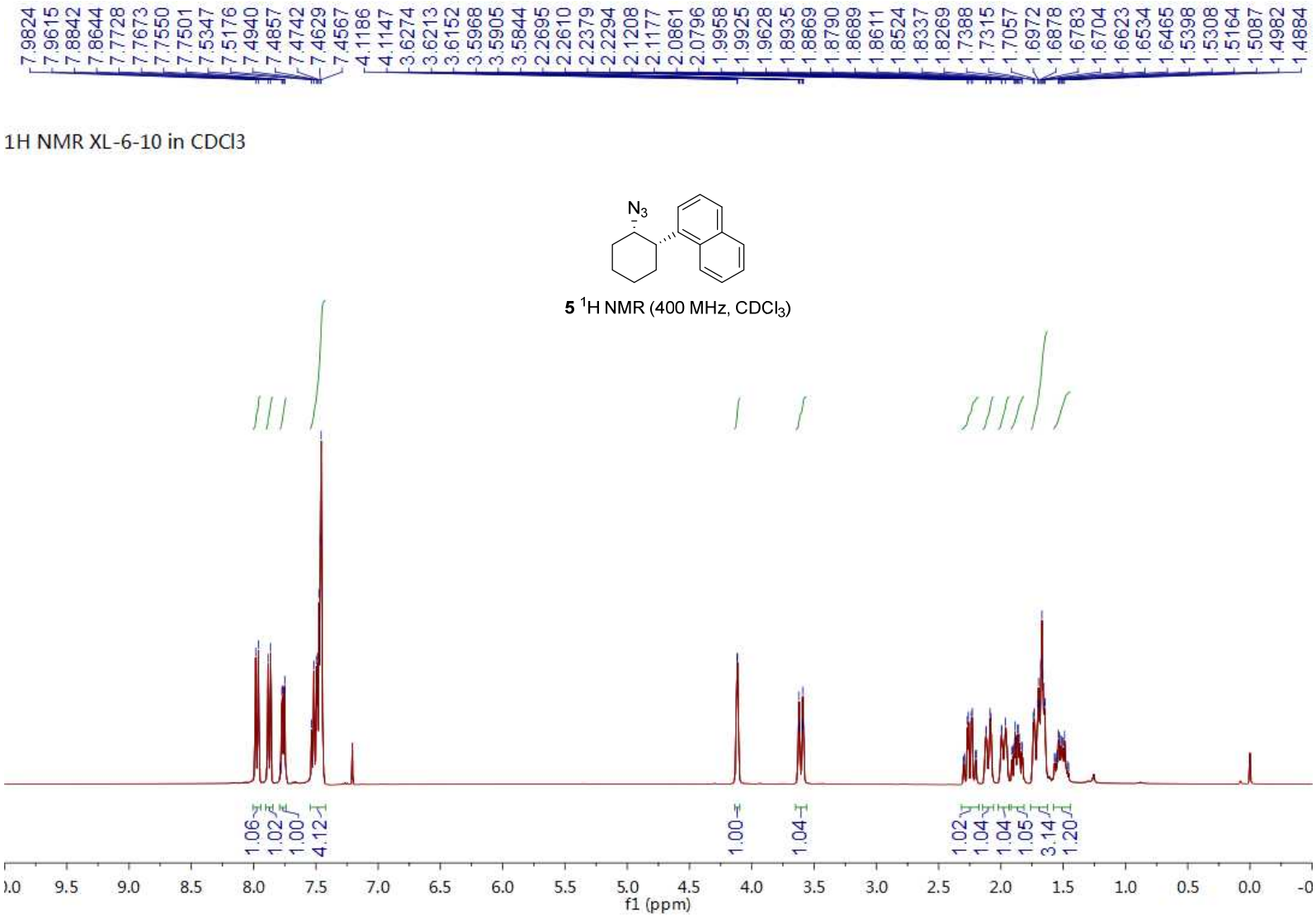
7.9325
7.8847
7.8649
7.8612
7.7620
7.7418
7.5321
7.5284
7.5151
7.5114
7.5072
7.4944
7.4902
7.4850
7.4818
7.4782
7.4665
7.4615
7.4586
7.4467
7.4416
7.4116
7.3942
4.7055
3.7912
3.7847
3.7673
3.7609
3.7543
2.4311
2.4226
2.3998
2.3912
2.1972
2.1936
2.1899
2.1828
2.1630
2.1606
2.1395
2.1321
2.1298
2.1226
1.9999
1.9594
1.9273
1.7607
1.7566
1.7528
1.7283
1.7243
1.7203
1.7086
1.6997
1.5871
1.5777
1.5453
1H NMR XL-5-87 in CDCl3
Cl
4 1H NMR (400 MHz, CDCl3)
1.02
1.00
1.00
3.03
0.99
1.00
1.01
1.01
2.04
2.13
2.09
0.98
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)



4 ^{13}C NMR (100 MHz, $CDCl_3$)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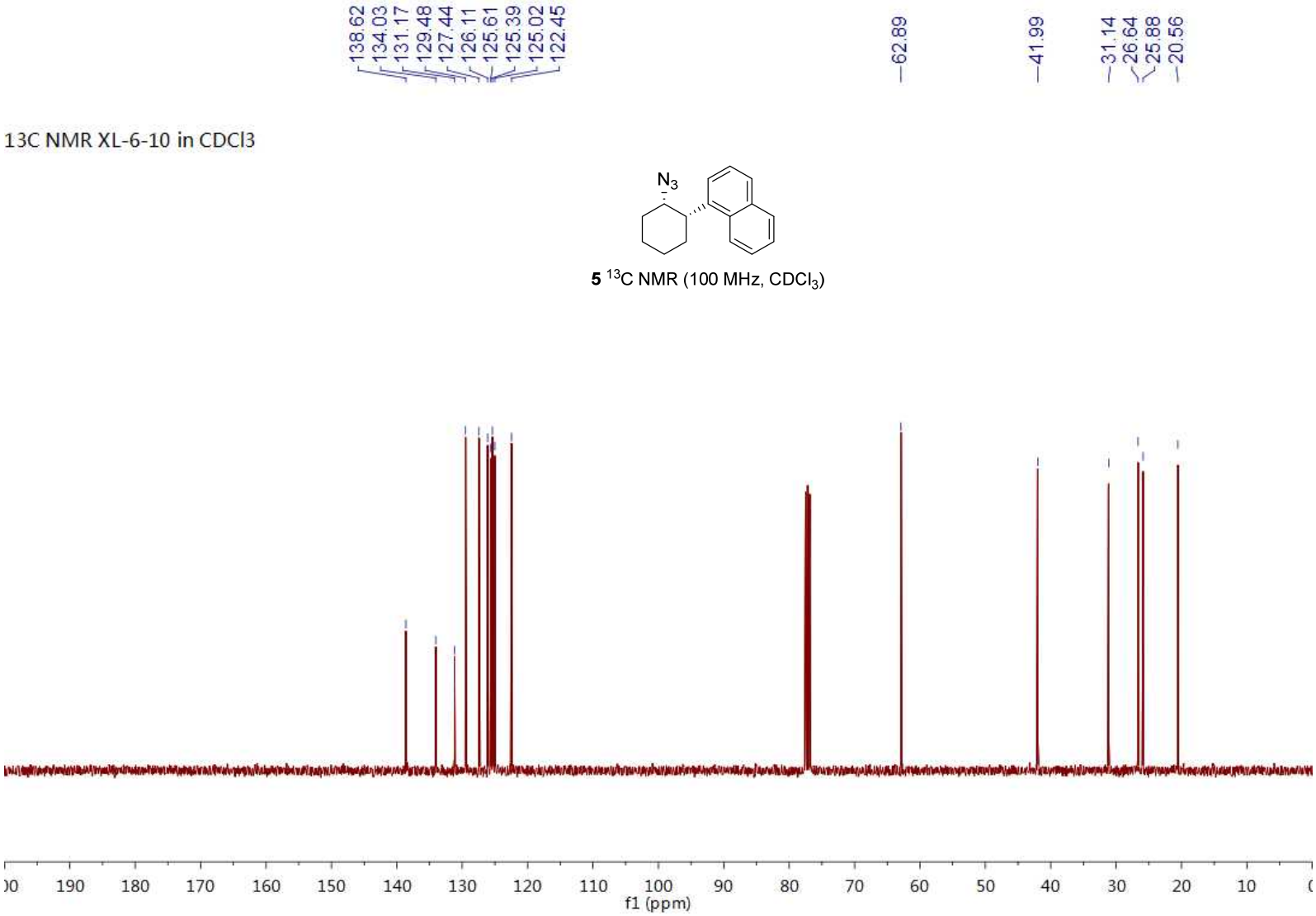
7.8842
7.8644
7.7728
7.7673
7.7550
7.7501
7.5347
7.5176
7.4940
7.4857
7.4742
7.4629
7.4567
4.1186
4.1147
3.6274
3.6213
3.6152
3.5968
3.5905
3.5844
2.2695
2.2610
2.2379
2.2294
2.1208
2.1177
2.0861
2.0796
1.9958
1.9925
1.9628
1.8935
1.8869
1.8790
1.8689
1.8611
1.8524
1.8337
1.8269
1.7388
1.7315
1.7057
1.6972
1.6878
1.6783
1.6704
1.6623
1.6534
1.6465
1.5398
1.5308
1.5164
1.5087
1.4982
1.4884
1H NMR XL-6-10 in CDCl3
N3
5 1H NMR (400 MHz, CDCl3)
1.06
1.02
1.00
4.12
1.00
1.04
1.02
1.04
1.04
1.05
3.14
1.20
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

13C NMR XL-6-10 in CDCl3

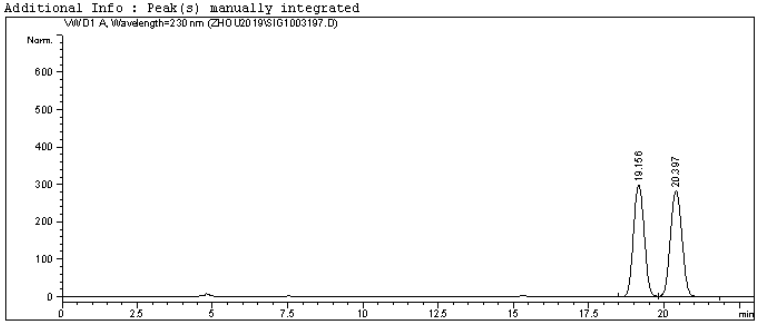


5 ^{13}C NMR (100 MHz, $CDCl_3$)

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003197.D
Sample Name: XL-4-81-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/21/19 10:45:00
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/21/19 10:28:54
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:17:10
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 96/4, 0.7 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



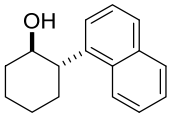
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.156	BV	0.3965	7362.20117	297.76758	49.5076
2	20.397	VB	0.4255	7508.63477	283.02451	50.4924

Totals : 1.48708e4 580.79208



(+/-)-**2a**

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

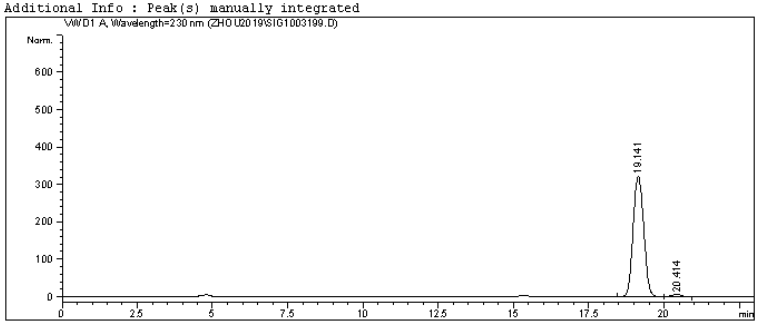
仪器 1 6/28/19 9:17:16

Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003199.D
Sample Name: XL-4-81-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/21/19 11:41:26
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/21/19 11:35:17
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:18:52
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 96/4, 0.7 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



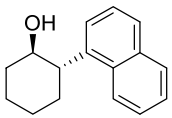
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.141	BV	0.3941	7891.43457	321.78186	98.2583
2	20.414	VV	0.3677	139.87982	5.91967	1.7417

Totals : 8031.31439 327.70153



(-)-**2a**

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

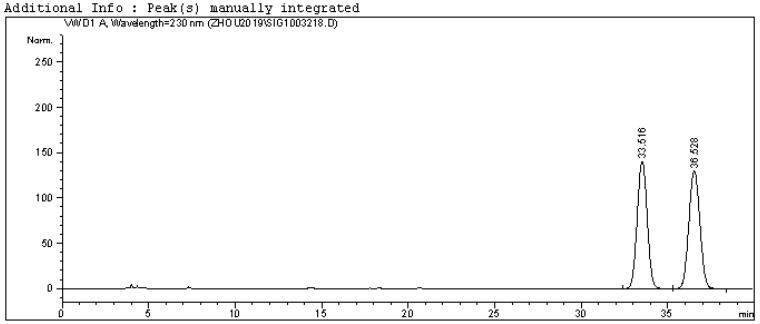
仪器 1 6/28/19 9:19:01

Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003218.D
Sample Name: XL-4-84-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/21/19 21:06:21
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/21/19 20:47:44
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:24:48
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 98/2, 0.8 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



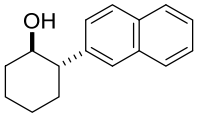
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	33.516	BV	0.6397	5689.17871	140.72205	49.7324
2	36.528	VB	0.6997	5750.40674	130.08957	50.2676

Totals : 1.14396e4 270.81161



(+/-)-**2b**

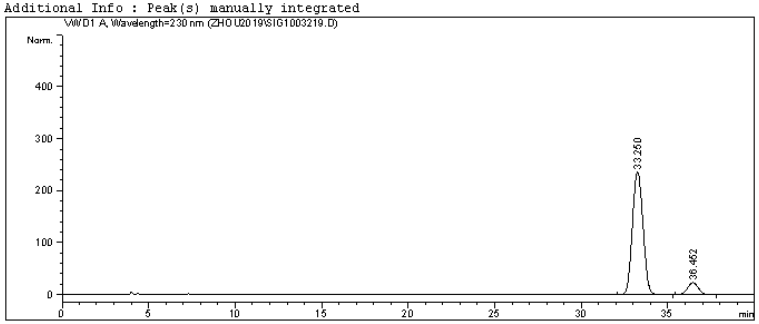
==========
*** End of Report ***

仪器 1 6/28/19 9:25:57 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003219.D
Sample Name: XL-4-84-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/21/19 21:48:12
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/21/19 21:46:30
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:27:51
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 98/2, 0.8 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



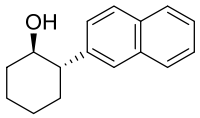
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	33.250	BB	0.6746	1.00238e4	236.43796	90.9140
2	36.452	BB	0.6742	1001.79291	23.27089	9.0860

Totals : 1.10256e4 259.70885



(-)-**2b**

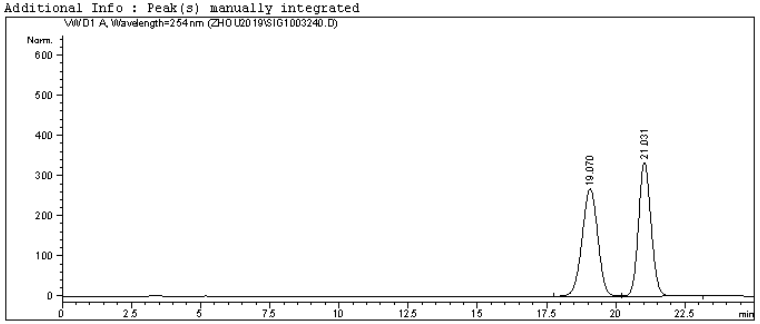
==========
*** End of Report ***

仪器 1 6/28/19 9:28:04 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003240.D
Sample Name: XL-4-93-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/26/19 14:31:22
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/26/19 14:29:44
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:51:22
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 254 nm

Additional Info : Peak(s) manually integrated



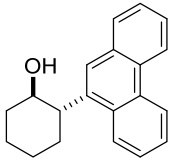
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.070	BV	0.6174	1.04565e4	266.71436	49.9965
2	21.031	VB	0.4861	1.04580e4	333.27765	50.0035

Totals : 2.09146e4 599.99200



(+/-)-**2c**

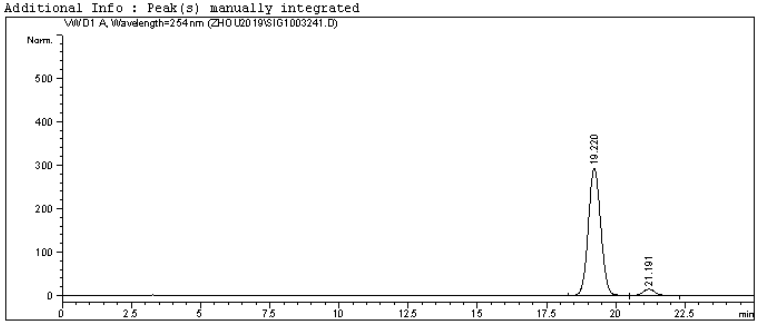
==========
*** End of Report ***

仪器 1 6/28/19 9:51:31 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003241.D
Sample Name: XL-4-93-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/26/19 14:59:47
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/26/19 14:57:09
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:52:48
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 254 nm

Additional Info : Peak(s) manually integrated



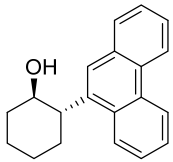
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.220	BV	0.4833	9126.65625	293.11798	95.3209
2	21.191	VB	0.4668	448.01294	14.90048	4.6791

Totals : 9574.66919 308.01846



(-)-**2c**

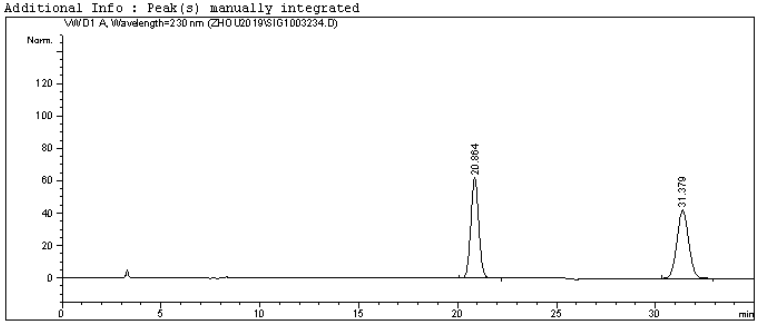
==========
*** End of Report ***

仪器 1 6/28/19 9:52:55 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003234.D
Sample Name: XL-4-90-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/25/19 16:03:45
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/25/19 16:02:19
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:44:44
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



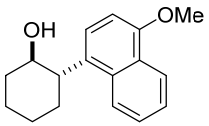
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.864	BB	0.4390	1733.68677	61.84821	50.0110
2	31.379	BB	0.6407	1732.92432	42.05746	49.9890

Totals : 3466.61108 103.90567



(+/-)-**2d**

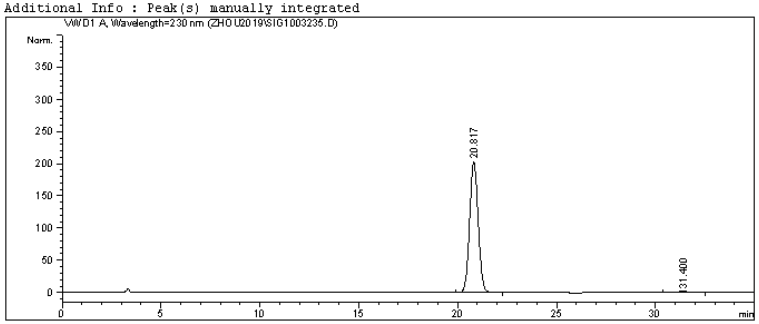
==========
*** End of Report ***

仪器 1 6/28/19 9:44:51 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003235.D
Sample Name: XL-4-90-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/25/19 16:42:47
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/25/19 16:39:39
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:47:24
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



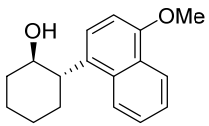
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.817	BB	0.4727	6152.81885	203.50984	98.2577
2	31.400	VB	0.7354	109.10273	2.22773	1.7423

Totals : 6261.92158 205.73757



(-)-**2d**

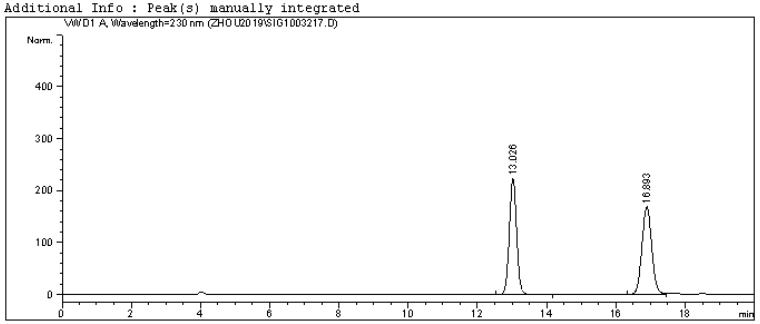
==========
*** End of Report ***

仪器 1 6/28/19 9:47:27 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003217.D
Sample Name: XL-4-85-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/21/19 20:25:08
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/21/19 20:22:54
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:29:36
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 0.8 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



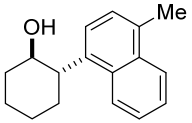
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.026	VB	0.2280	3296.76172	223.64194	49.7932
2	16.893	BV	0.3048	3324.14478	169.47569	50.2068

Totals : 6620.90649 393.11763



(+/-)-**2e**

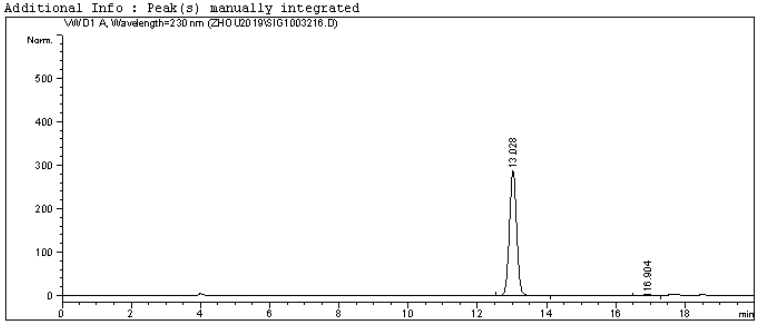
==========
*** End of Report ***

仪器 1 6/28/19 9:29:52 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003216.D
Sample Name: XL-4-85-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/21/19 20:02:05
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/21/19 19:59:25
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:32:24
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 0.8 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



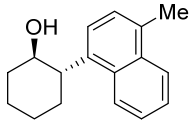
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.028	VB	0.2268	4205.44922	287.25571	99.1303
2	16.904	BV	0.3065	36.89512	1.90073	0.8697

Totals : 4242.34434 289.15644



(-)-**2e**

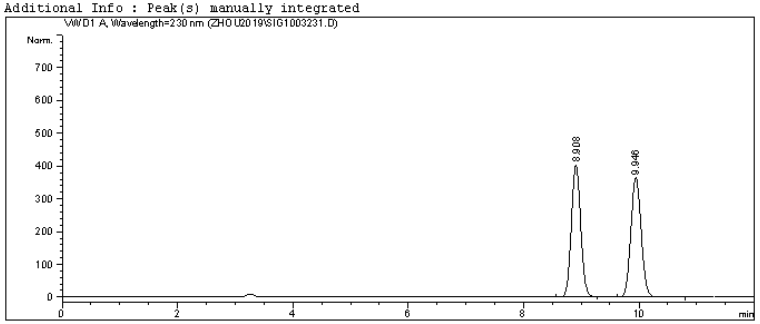
==========
*** End of Report ***

仪器 1 6/28/19 9:32:28 Page 1 of 1

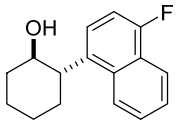
Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003231.D
Sample Name: XL-4-89-trans-(+/-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 6/25/19 15:07:44
                                                 Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 6/25/19 14:06:18
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 6/28/19 9:38:56
                  (modified after loading)
Sample Info     : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 230 nm
```

Additional Info : Peak(s) manually integrated




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.908 VV    0.1757 4548.74072  402.84103  49.9729
   2   9.946 VB    0.1941 4553.67871  363.73563  50.0271

Totals :                  9102.41943  766.57666


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



(+/-)-**2f**

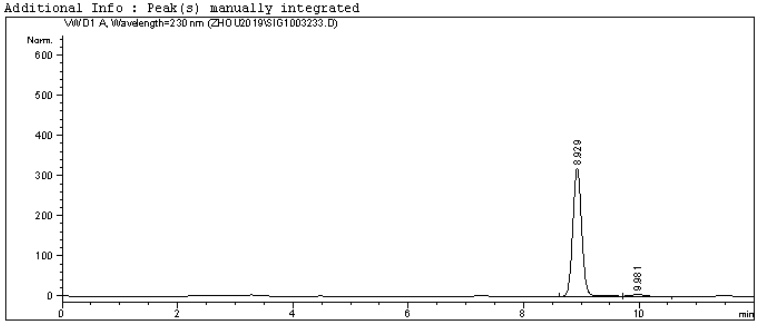
仪器 1 6/28/19 9:39:04

Page 1 of 1

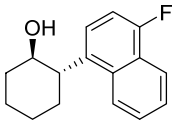
Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003233.D
Sample Name: XL-4-89-trans

```
==================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 6/25/19 15:45:28
                                                 Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 6/25/19 15:44:00
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 6/28/19 9:40:56
                  (modified after loading)
Sample Info     : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 230 nm
```

Additional Info : Peak(s) manually integrated




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.929 VV    0.1636 3369.32397  318.15842  98.2966
   2   9.981 VB    0.1910   58.38892    4.63287   1.7034

Totals :                  3427.71290  322.79129


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



(-)-**2f**

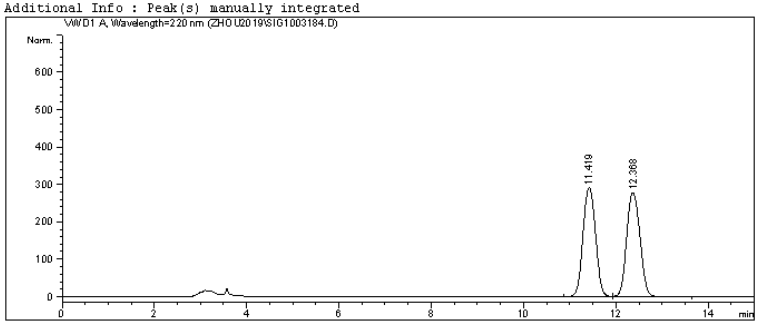
仪器 1 6/28/19 9:41:06

Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003184.D
Sample Name: XL-4-75-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/19/19 7:30:08
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/19/19 7:01:06
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:20:31
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 99/1, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



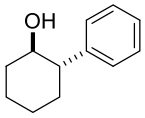
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.419	VV	0.3094	5535.31104	291.63318	49.7115
2	12.368	VB	0.3264	5599.56494	278.72961	50.2885

Totals : 1.11349e4 570.36279



(+/-)-**2g**

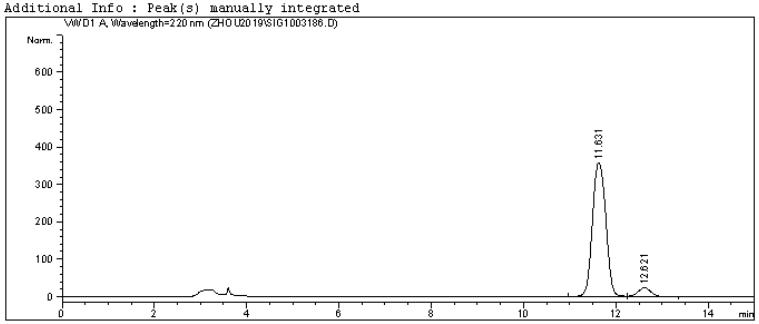
==========
*** End of Report ***

仪器 1 6/28/19 9:20:39 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003186.D
Sample Name: XL-4-75-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/19/19 8:12:22
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/19/19 8:09:28
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:22:08
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 99/1, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



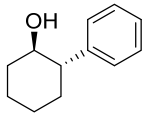
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.631	VV	0.3251	7166.99756	358.76599	94.2184
2	12.621	VB	0.2940	439.79196	23.53176	5.7816

Totals : 7606.78952 382.29775



(-)-**2g**

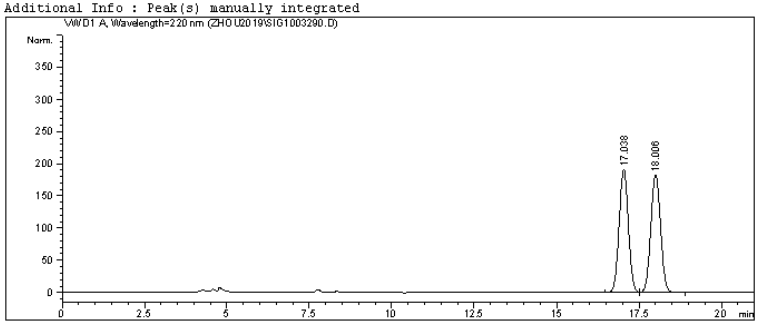
==========
*** End of Report ***

仪器 1 6/28/19 9:22:21 Page 1 of 1

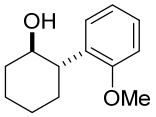
Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003290.D
Sample Name: XL-5-5-trans-(+/-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 7/2/19 17:55:22
                                                 Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/2/19 17:41:44
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/17/19 21:58:42
                  (modified after loading)
Sample Info     : IC, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm
```

Additional Info : Peak(s) manually integrated




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.038 BV    0.3091 3754.10449  191.13803  49.9313
   2  18.006 VB    0.3194 3764.43726  183.43190  50.0687

Totals :                  7518.54175  374.56993


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



(+/-)-**2h**

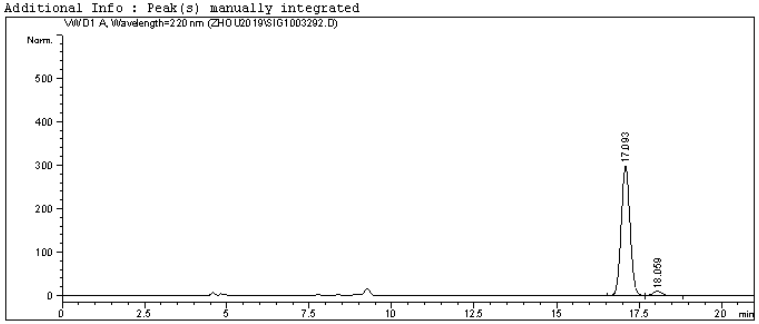
仪器 1 7/17/19 21:58:45

Page 1 of 1

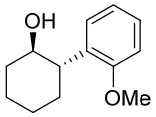
Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003292.D
Sample Name: XL-5-5-trans

```
==================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 7/2/19 18:58:33
                                                 Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/2/19 18:56:37
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/17/19 22:00:41
                  (modified after loading)
Sample Info     : IC, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm
```

Additional Info : Peak(s) manually integrated




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.093 BV    0.2898 5561.51074  297.91910  96.4934
   2  18.059 VB    0.3111  202.10715   10.02985   3.5066

Totals :                  5763.61789  307.94895


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



(-)-**2h**

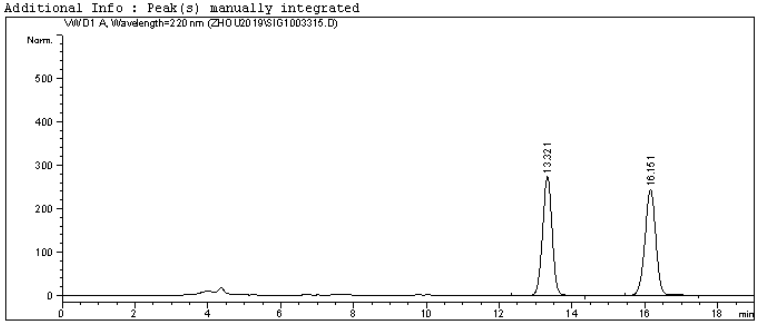
仪器 1 7/17/19 22:00:48

Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003315.D
Sample Name: XL-5-8-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/3/19 19:51:23
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/3/19 19:27:37
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:05:07
(modified after loading)
Sample Info : IA, n-hexane/i-PrOH = 96/4, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



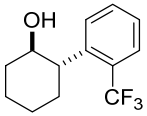
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.321	VB	0.2807	4998.34082	274.13882	49.4103
2	16.151	VV	0.3251	5117.64990	243.60944	50.5897

Totals : 1.01160e4 517.74826



(+/-)-**2i**

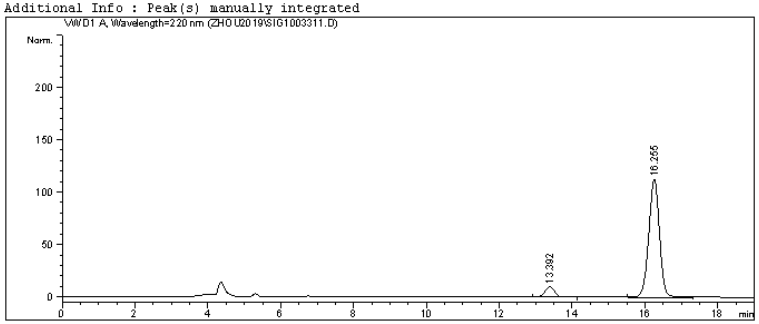
==========
*** End of Report ***

仪器 1 7/17/19 22:05:14 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003311.D
Sample Name: XL-5-8-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/3/19 16:30:02
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/3/19 16:27:54
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:07:33
(modified after loading)
Sample Info : IA, n-hexane/i-PrOH = 96/4, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



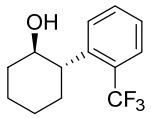
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.392	BB	0.2734	173.91650	9.87604	6.9844
2	16.255	VV	0.3160	2316.14990	112.58895	93.0156

Totals : 2490.06641 122.46499



(-)-**2i**

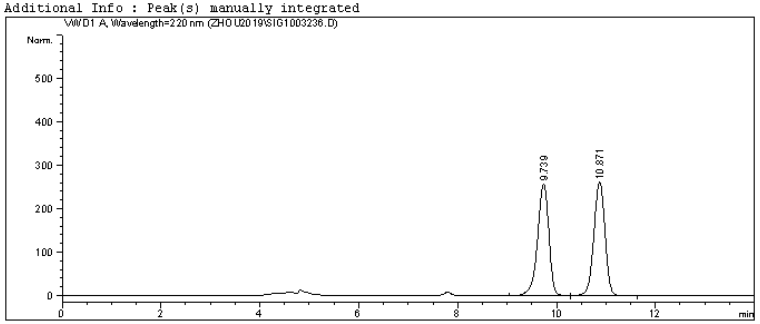
==========
*** End of Report ***

仪器 1 7/17/19 22:07:36 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003236.D
Sample Name: XL-4-88-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/25/19 18:33:24
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/25/19 18:08:10
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:34:17
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



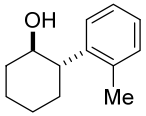
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.739	VV	0.2460	4095.52783	256.89310	49.9380
2	10.871	VB	0.2432	4105.69971	261.49719	50.0620

Totals : 8201.22754 518.39029



(+/-)-**2j**

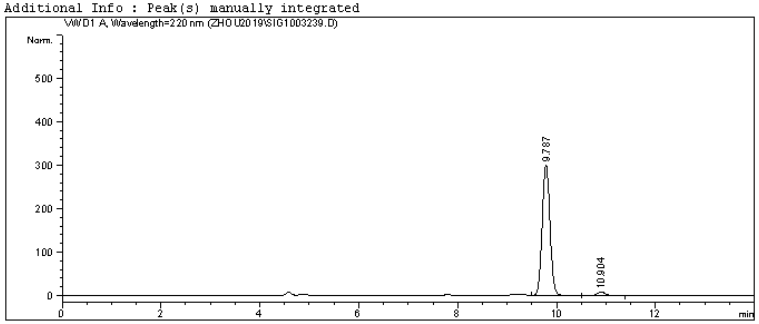
==========
*** End of Report ***

仪器 1 6/28/19 9:34:25 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003239.D
Sample Name: XL-4-88-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/25/19 19:54:36
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/25/19 19:54:08
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:36:52
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



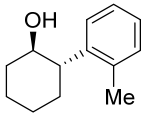
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.787	VV	0.1731	3326.18506	300.68719	96.9573
2	10.904	VB	0.1903	104.38012	8.55627	3.0427

Totals : 3430.56518 309.24346



(-)-**2j**

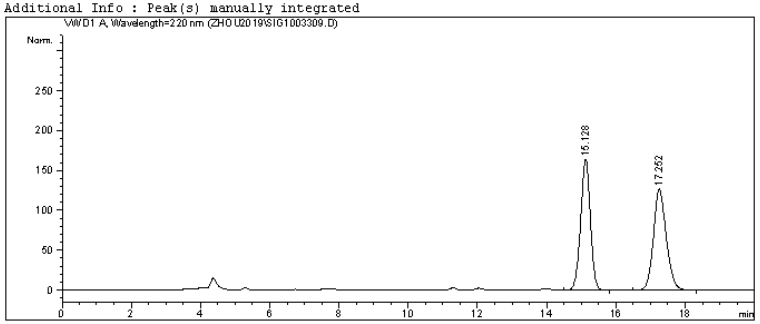
==========
*** End of Report ***

仪器 1 6/28/19 9:37:00 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003309.D
Sample Name: XL-5-6-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/3/19 15:41:21
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/3/19 15:39:30
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:02:19
(modified after loading)
Sample Info : IA, n-hexane/i-PrOH = 96/4, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated

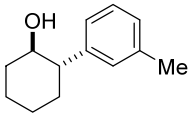


==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.128	VV	0.3024	3253.79468	164.74513	49.6434
2	17.252	VV	0.3861	3300.53711	127.45138	50.3566
Totals :				6554.33179	292.19651	



(+/-)-**2k**

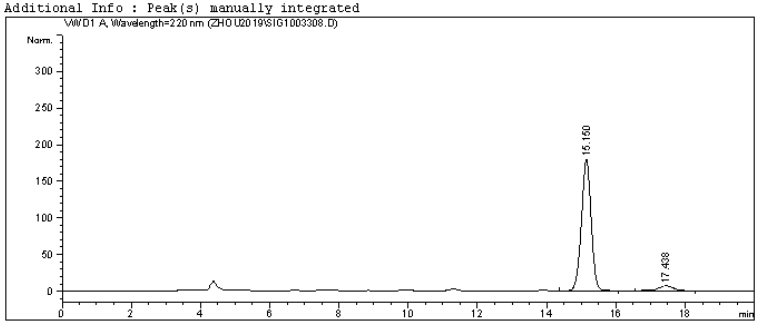
==========
*** End of Report ***

仪器 1 7/17/19 22:02:24 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003308.D
Sample Name: XL-5-6-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/3/19 15:13:45
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/3/19 14:58:30
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:03:32
(modified after loading)
Sample Info : IA, n-hexane/i-PrOH = 96/4, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated

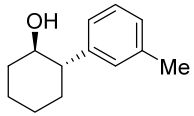


==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.150	VB	0.3061	3541.67896	179.54703	94.3046
2	17.438	BB	0.4551	213.89317	7.02799	5.6954
Totals :				3755.57213	186.57501	



(-)-**2k**

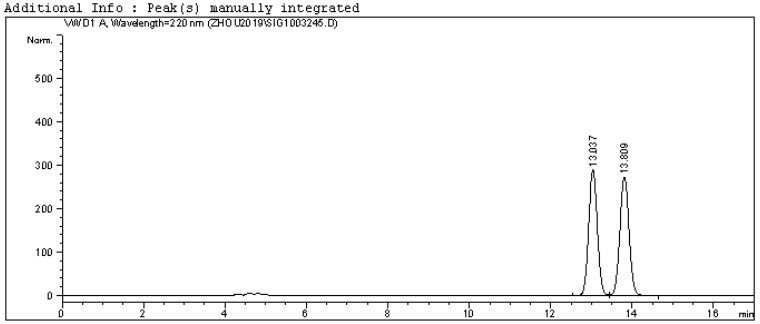
==========
*** End of Report ***

仪器 1 7/17/19 22:03:36 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003245.D
Sample Name: XL-4-94-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/26/19 17:04:14
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/26/19 16:36:08
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:53:56
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



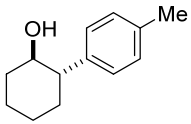
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.037	VV	0.2280	4267.92090	289.49487	49.9567
2	13.809	VB	0.2464	4275.31641	273.52252	50.0433

Totals : 8543.23730 563.01740



(+/-)-**2l**

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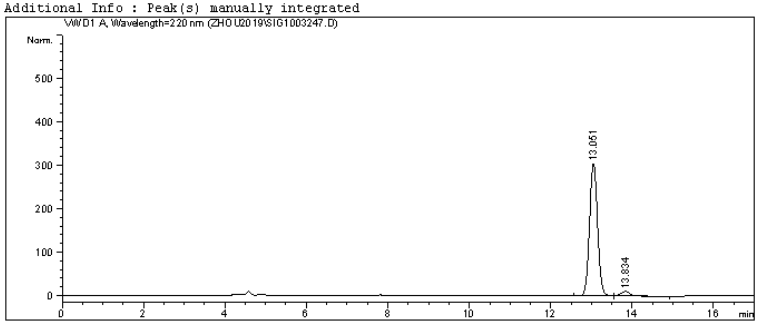
*** End of Report ***

仪器 1 6/28/19 9:54:05 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003247.D
Sample Name: XL-4-94-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 6/26/19 18:18:39
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/26/19 17:51:42
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 6/28/19 9:54:56
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



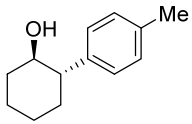
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.051	VV	0.2162	4182.93945	304.69910	96.0857
2	13.834	VB	0.2386	170.40170	10.88868	3.9143

Totals : 4353.34116 315.58778



(-)-**2l**

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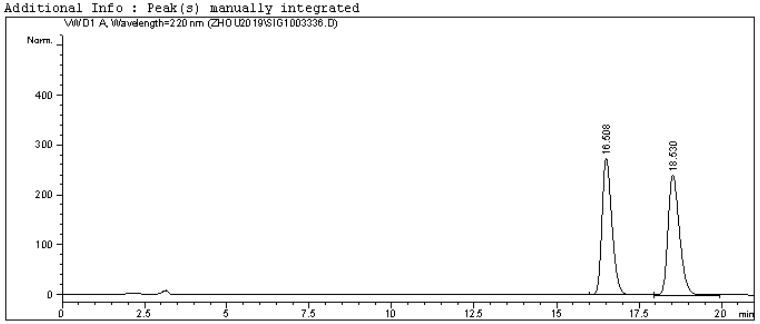
*** End of Report ***

仪器 1 6/28/19 9:55:12 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003336.D
Sample Name: XL-5-19-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/10/19 19:09:09
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/10/19 19:07:48
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:13:37
(modified after loading)
Sample Info : OJ-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



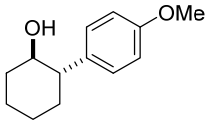
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.508	BV	0.3212	5744.62256	273.29813	49.7815
2	18.530	VB	0.3728	5795.04297	240.77853	50.2185

Totals : 1.15397e4 514.07666



(+/-)-**2m**

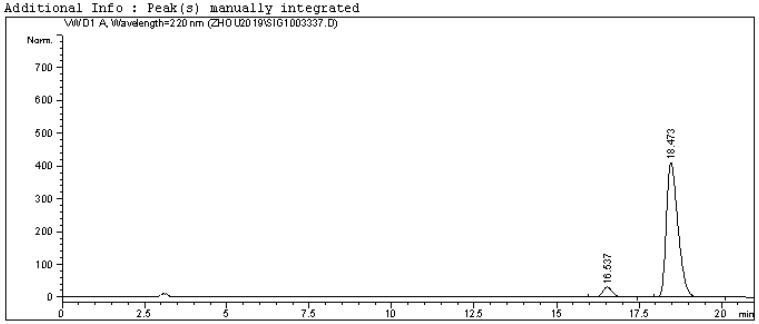
==========
*** End of Report ***

仪器 1 7/17/19 22:13:43 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003337.D
Sample Name: XL-5-19-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/10/19 19:34:35
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/10/19 19:33:28
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:15:40
(modified after loading)
Sample Info : OJ-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



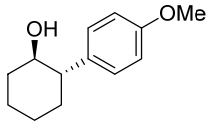
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.537	BB	0.3168	637.56384	30.89232	5.9837
2	18.473	BB	0.3773	1.00175e4	409.64166	94.0163

Totals : 1.06551e4 440.53399



(-)-**2m**

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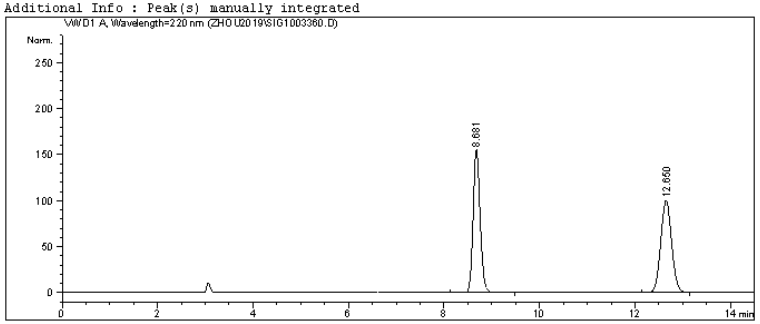
*** End of Report ***

仪器 1 7/17/19 22:15:51 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003360.D
Sample Name: XL-5-27-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/12/19 21:40:59
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/12/19 21:40:00
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:21:09
(modified after loading)
Sample Info : AD-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



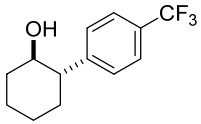
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.681	VB	0.1605	1598.49500	154.73796	50.0096
2	12.650	VV	0.2503	1597.87988	100.07896	49.9904

Totals : 3196.37488 254.81692



(+/-)-**2n**

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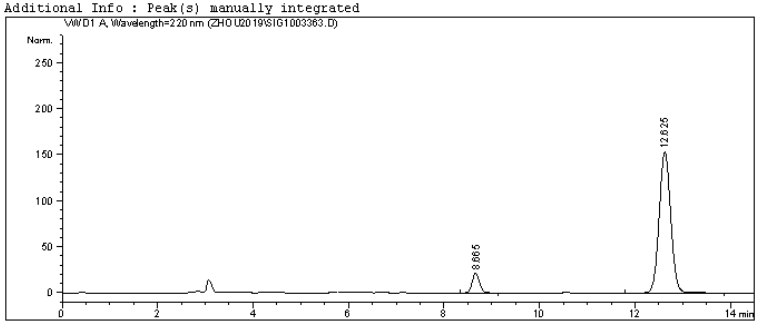
*** End of Report ***

仪器 1 7/17/19 22:21:12 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003363.D
Sample Name: XL-5-27-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/12/19 22:34:05
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/12/19 22:32:25
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:22:07
(modified after loading)
Sample Info : AD-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



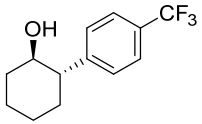
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.665	BB	0.1745	254.46422	22.06760	8.9031
2	12.625	VV	0.2617	2603.68140	153.67043	91.0969

Totals : 2858.14561 175.73802



(-)-**2n**

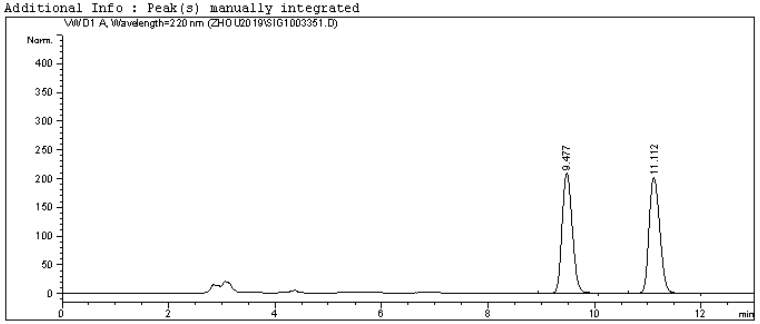
==========
*** End of Report ***

仪器 1 7/17/19 22:22:13 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003351.D
Sample Name: XL-5-18-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/12/19 11:12:56
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/12/19 10:49:59
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:09:35
(modified after loading)
Sample Info : AD-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



==========
Area Percent Report
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Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.477	VV	0.2129	2806.79126	208.76579	49.9091
2	11.112	VV	0.2190	2817.01587	201.57458	50.0909

Totals : 5623.80713 410.34038

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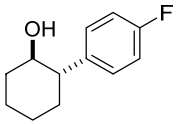
*** End of Report ***



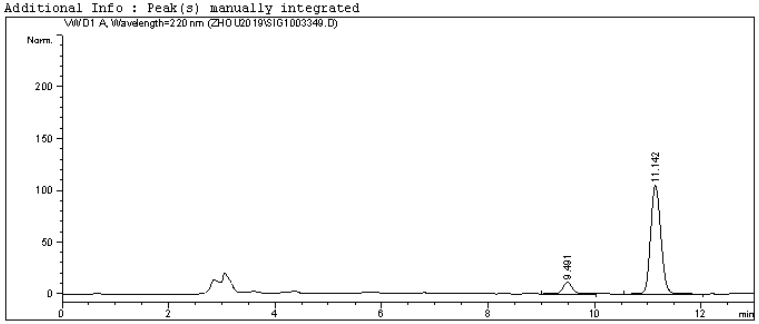
(+/-)-**2o**

仪器 1 7/17/19 22:09:42 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003349.D
Sample Name: XL-5-18-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/12/19 10:13:48
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/12/19 10:12:11
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:11:54
(modified after loading)
Sample Info : AD-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



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

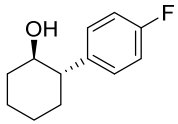
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.491	VV	0.1959	143.43979	11.31289	9.3289
2	11.142	VV	0.2113	1394.14258	104.73530	90.6711

Totals : 1537.58237 116.04819

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



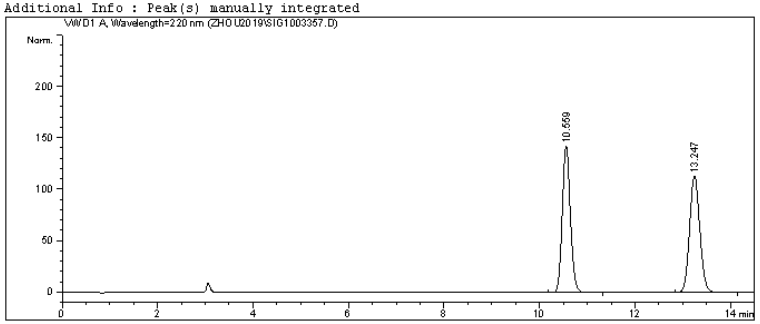
(-)-**2o**

仪器 1 7/17/19 22:11:57 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003357.D
Sample Name: XL-5-26-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/12/19 20:47:08
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/12/19 20:44:47
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:18:19
(modified after loading)
Sample Info : AD-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



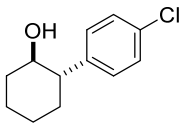
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.559	VV	0.1874	1707.32324	142.91576	50.0736
2	13.247	VB	0.2344	1702.30310	113.90498	49.9264

Totals : 3409.62634 256.82073



(+/-)-**2p**

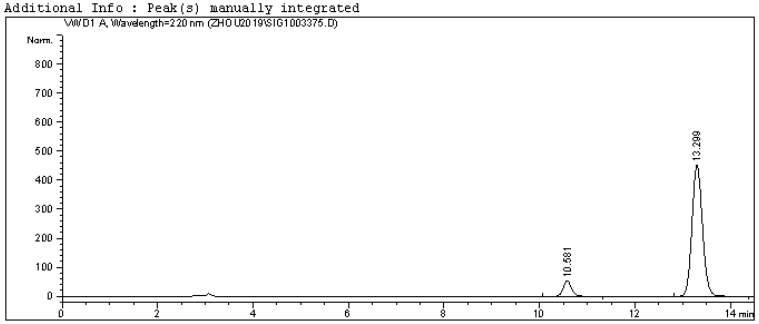
==========
*** End of Report ***

仪器 1 7/17/19 22:18:25 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003375.D
Sample Name: XL-5-26-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 7/4/19 11:31:49
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/4/19 11:29:24
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 7/17/19 22:19:30
(modified after loading)
Sample Info : AD-H, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



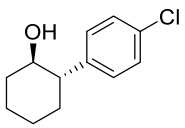
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.581	VV	0.1868	649.94934	53.11487	8.6734
2	13.299	VB	0.2369	6843.66064	451.34836	91.3266

Totals : 7493.60999 504.46323



(-)-**2p**

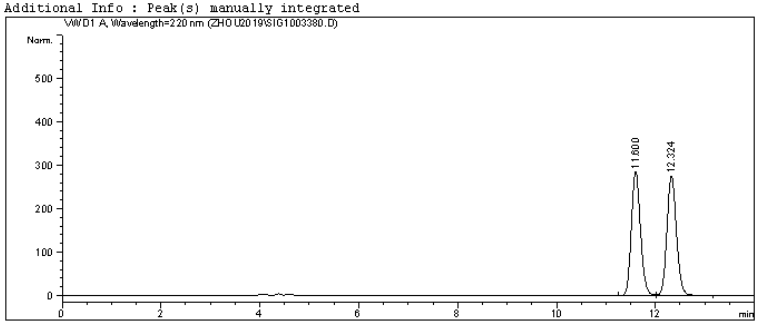
==========
*** End of Report ***

仪器 1 7/17/19 22:19:42 Page 1 of 1

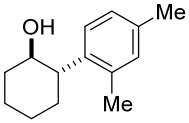
Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003380.D
Sample Name: XL-5-28-trans-(+/-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 7/4/19 13:17:10
                                                Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/4/19 13:15:42
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/17/19 22:23:49
                  (modified after loading)
Sample Info     : AD-H, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm
```

Additional Info : Peak(s) manually integrated




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.600 VV    0.1977 3654.83154  284.81558  49.7829
   2  12.324 VV    0.2080 3686.70435  275.72479  50.2171

Totals :                  7341.53589  560.54037

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



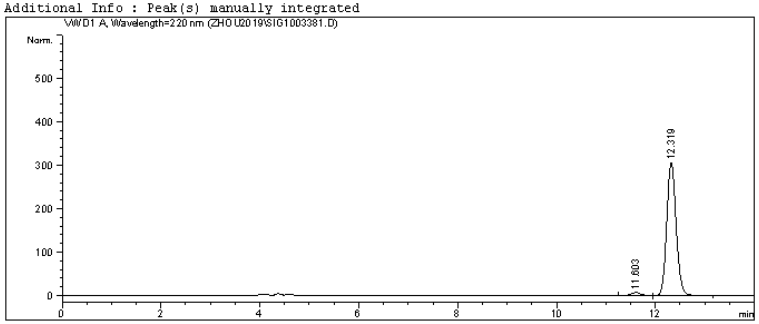
(+/-)-**2q**

仪器 1 7/17/19 22:24:00 Page 1 of 1

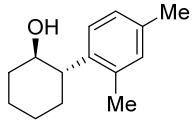
Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003381.D
Sample Name: XL-5-28-trans

```
==========================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 7/4/19 13:49:13
                                                Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/4/19 13:47:33
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 7/17/19 22:25:02
                  (modified after loading)
Sample Info     : AD-H, n-hexane/i-PrOH = 97/3, 0.7 mL/min, 30 oC, 220 nm
```

Additional Info : Peak(s) manually integrated




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.603 BV    0.2050   95.41880    7.09038   2.3040
   2  12.319 VV    0.2022 4045.96387  306.02545  97.6960

Totals :                  4141.38267  313.11583

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



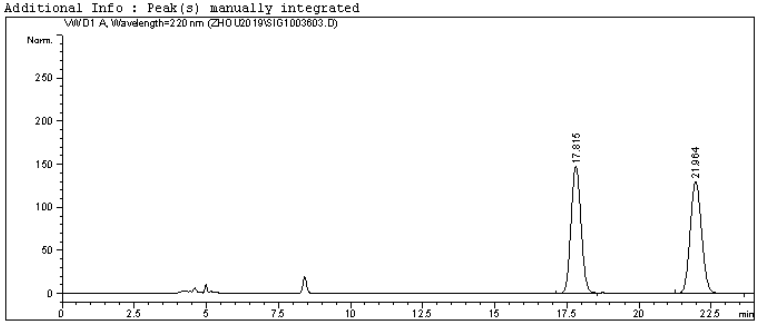
(-)-**2q**

仪器 1 7/17/19 22:25:10 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003603.D
Sample Name: XL-6-4-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 9/24/19 16:33:30
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 9/24/19 16:22:05
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 9:29:12
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 98/2, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



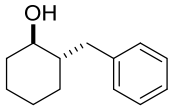
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.815	VV	0.3814	3545.07495	146.99234	49.7151
2	21.964	BB	0.4342	3585.71265	129.83318	50.2849

Totals : 7130.78760 276.82552



(+/-)-**2r**

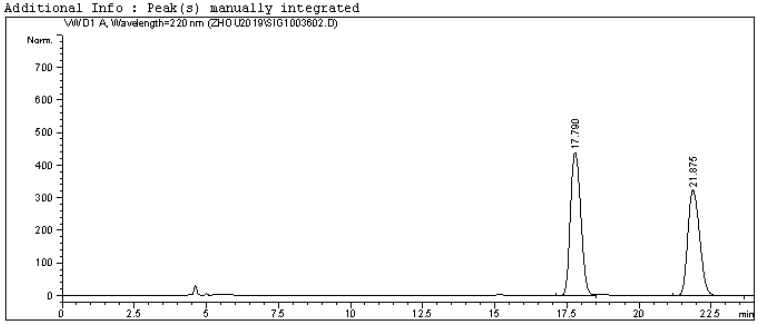
==========
*** End of Report ***

仪器 1 10/8/19 9:29:28 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003602.D
Sample Name: XL-6-4-trans

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 9/24/19 15:49:23
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 9/24/19 15:47:55
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 9:33:05
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 98/2, 0.7 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



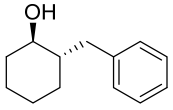
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.790	VV	0.4041	1.10111e4	439.71930	54.4174
2	21.875	VB	0.4520	9223.38867	324.11664	45.5826

Totals : 2.02345e4 763.83594



(-)-**2r**

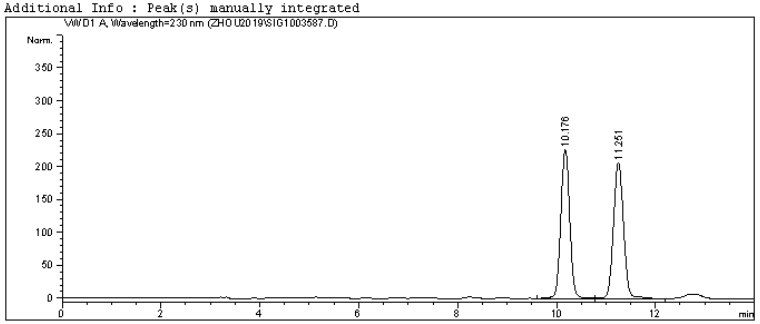
==========
*** End of Report ***

仪器 1 10/8/19 9:33:16 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003587.D
Sample Name: XL-5-81-trans-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 9/22/19 15:42:40
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 9/22/19 15:41:06
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 10:36:56
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



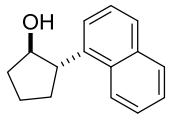
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.176	VV	0.1995	2861.28101	226.25533	49.4985
2	11.251	VV	0.2212	2919.26147	206.11963	50.5015

Totals : 5780.54248 432.37495



(+/-)-**2s**

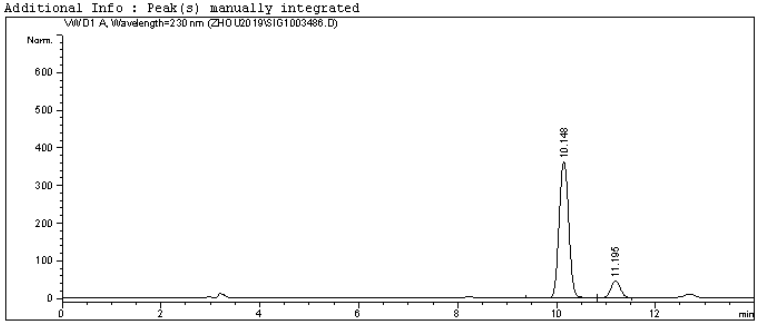
==========
*** End of Report ***

仪器 1 10/8/19 10:37:09 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003486.D
Sample Name: XL-5-81

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 9/5/19 19:10:21
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 9/5/19 19:09:11
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 10:35:27
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 95/5, 1.0 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



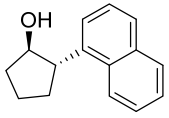
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.148	VV	0.2143	4924.25293	362.94012	88.5419
2	11.195	VV	0.2136	637.24048	46.01596	11.4581

Totals : 5561.49341 408.95608



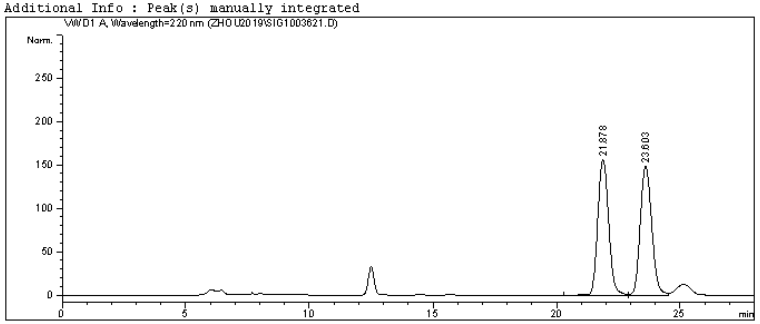
(-)-**2s**

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

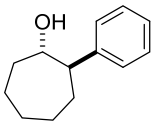
仪器 1 10/8/19 10:35:32 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003621.D
Sample Name: XL-6-7-trans-(+/-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 10/2/19 11:34:22
                                                 Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 10/2/19 11:08:33
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 10/8/19 9:23:52
                  (modified after loading)
Sample Info     : IC, n-hexane/i-PrOH = 99/1, 0.5 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated
```




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  21.878 BV    0.4865 4808.12744  156.46101  49.8703
   2  23.603 VV    0.5154 4833.14258  148.63693  50.1297

Totals :                  9641.27002  305.09795

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



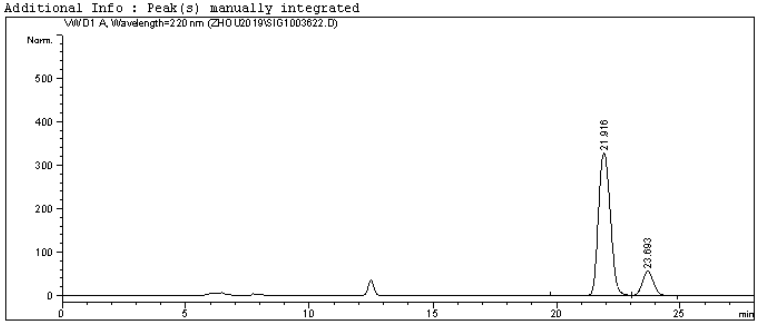
(+/-)-*trans*-2t

仪器 1 10/8/19 9:24:14

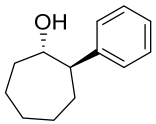
Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003622.D
Sample Name: XL-5-99-trans

```
==================================================================
Acq. Operator   :
Acq. Instrument : 仪器 1                          Location : Vial 1
Injection Date  : 10/2/19 12:32:03
                                                 Inj Volume : 5.000 µl
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 10/2/19 12:10:01
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 10/8/19 9:17:34
                  (modified after loading)
Sample Info     : IC, n-hexane/i-PrOH = 99/1, 0.5 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated
```




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  21.916 VV    0.5434 1.09892e4   327.52490  86.2139
   2  23.693 VV    0.4946 1757.22412   55.92520  13.7861

Totals :                  1.27464e4   383.45010

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



(+)-*trans*-2t

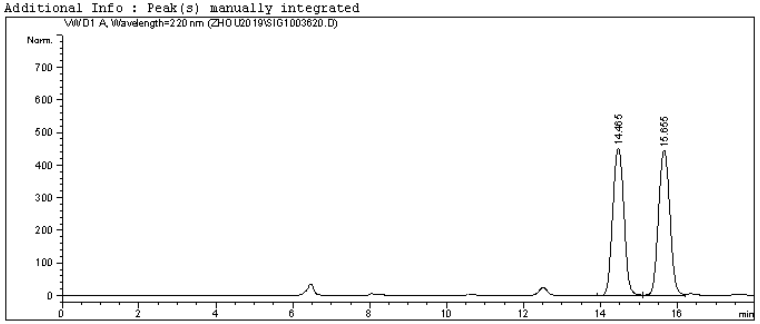
仪器 1 10/8/19 9:17:45

Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003620.D
Sample Name: XL-6-7-cis-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 10/2/19 10:24:16
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/2/19 9:44:13
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 9:21:53
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 99/1, 0.5 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



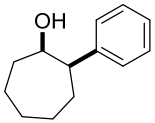
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.465	VV	0.3265	9087.60840	452.07718	49.6532
2	15.655	VV	0.3333	9214.54004	445.50217	50.3468

Totals : 1.83021e4 897.57935



(+/-)-*cis*-2t'

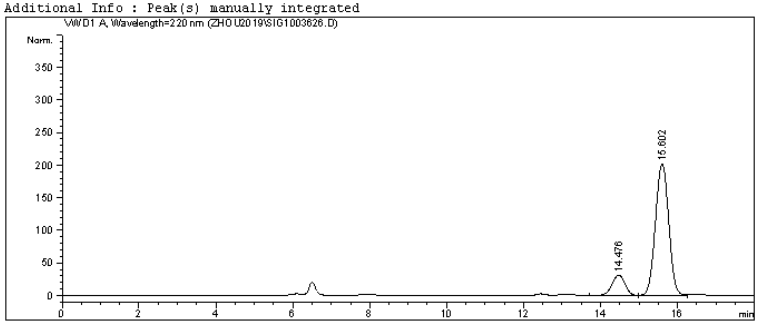
==========
*** End of Report ***

仪器 1 10/8/19 9:22:04 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003626.D
Sample Name: XL-5-99-cis

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 10/2/19 14:47:33
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/2/19 14:46:41
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 9:13:54
(modified after loading)
Sample Info : IC, n-hexane/i-PrOH = 99/1, 0.5 mL/min, 30 oC, 220 nm

Additional Info : Peak(s) manually integrated



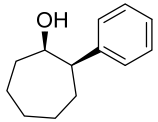
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=220 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.476	VV	0.3768	763.12323	31.70482	13.4931
2	15.602	VV	0.3818	4892.54199	202.58623	86.5069

Totals : 5655.66522 234.29105



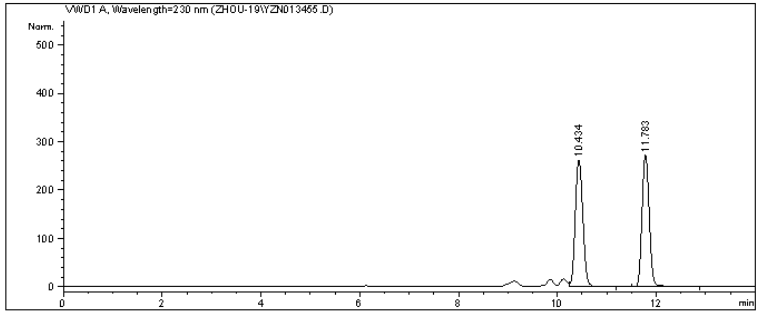
(-)-*cis*-2t'

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

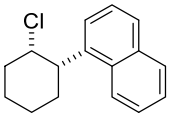
仪器 1 10/8/19 9:14:06 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-19\YZN013455.D
Sample Name: XL-5-87-(+/-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location :   -
Injection Date  : 9/12/2017 8:59:37 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 9/12/2017 8:58:26 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 10/8/2019 9:50:57 PM
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 99.5/0.5, 0.5 mL/min, 30 oC, 230
                  nm
```




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.434 VB    0.1684 2805.44092  262.47177  50.3294
   2  11.783 BB    0.1624 2768.71924  272.10767  49.6706

Totals :                  5574.16016  534.57944


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

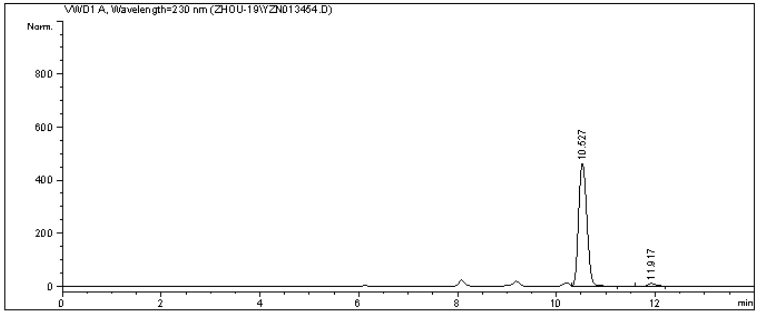


(+/-)-**4**

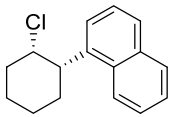
Instrument 1 10/8/2019 9:51:01 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-19\YZN013454.D
Sample Name: XL-5-87

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location :   -
Injection Date  : 9/12/2017 8:43:11 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 9/12/2017 8:40:47 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed    : 10/8/2019 9:55:58 PM
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 99.5/0.5, 0.5 mL/min, 30 oC, 230
                  nm
```




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

Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=230 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.527 VV    0.1887 5388.86963  461.43884  97.6985
   2  11.917 VV    0.1694  126.94441   10.78308   2.3015

Totals :                  5515.81404  472.22192


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



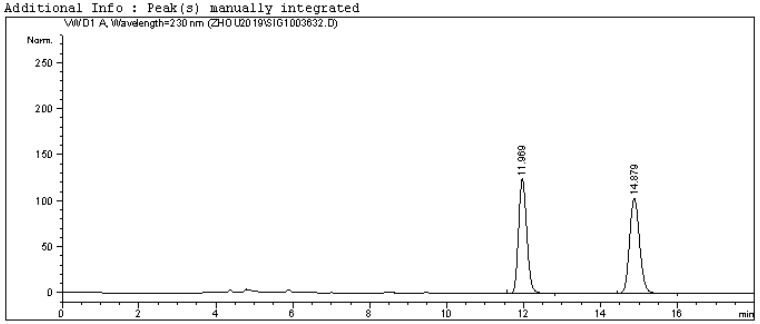
(+)-**4**

Instrument 1 10/8/2019 9:56:49 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003632.D
Sample Name: XL-6-10-(+/-)

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 10/6/19 12:53:56
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/6/19 12:42:44
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 9:40:38
(modified after loading)
Sample Info : OD-H, n-hexane/i-PrOH = 99/1, 0.7 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



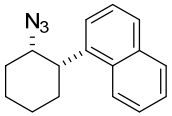
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.969	VB	0.2286	1835.77759	124.05562	49.5655
2	14.879	BB	0.2827	1867.96094	103.43277	50.4345

Totals : 3703.73853 227.48839



(+/-)-**5**

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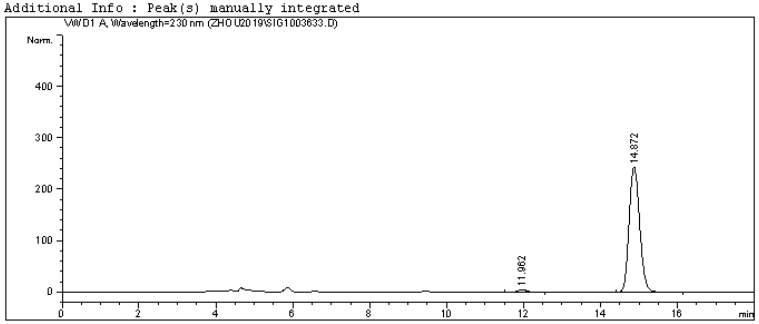
*** End of Report ***

仪器 1 10/8/19 9:40:52 Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU2019\SIG1003633.D
Sample Name: XL-6-10

==========
Acq. Operator :
Acq. Instrument : 仪器 1 Location : Vial 1
Injection Date : 10/6/19 13:15:26
Inj Volume : 5.000 µl
Acq. Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/6/19 13:13:40
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC11.M
Last changed : 10/8/19 9:44:09
(modified after loading)
Sample Info : OD-H, n-hexane/i-PrOH = 99/1, 0.7 mL/min, 30 oC, 230 nm

Additional Info : Peak(s) manually integrated



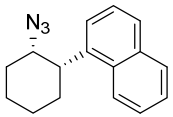
==========
Area Percent Report
==========

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=230 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.962	VB	0.2332	78.47814	5.05416	1.6646
2	14.872	BB	0.2980	4636.14355	243.63811	98.3354

Totals : 4714.62170 248.69227



(+)-**5**

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*** End of Report ***

仪器 1 10/8/19 9:44:14 Page 1 of 1