Electronic Supplementary Material (ESI) for ChemComm.

Supporting Information

Bifunctional Squaramide-catalyzed Synthesis of Chiral Dihydrocoumarins *via* the *ortho*-Quinone Methides Generated from 2-(1-Tosylalkyl)phenols

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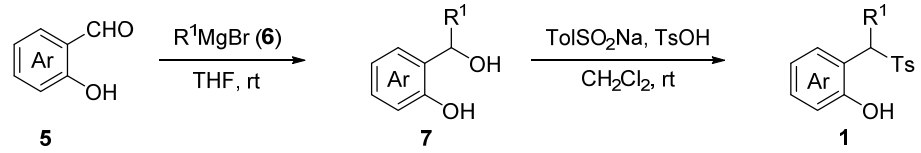
1. General

All reactions were carried out under an atmosphere of nitrogen using standard Schlenk techniques, unless otherwise noted. Commercially available reagents were used without further purification. Solvents were treated prior to use according to the standard methods. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded at room temperature in $CDCl_3$ on 400 MHz instrument with tetramethylsilane (TMS) as internal standard. Flash column chromatography was performed on silica gel (200-300 mesh). All reactions were monitored by TLC analysis. The chiral thiourea and squaramide organocatalysts were prepared according to the known methods.[1]

2. General Procedure for Synthesis of 2-(1-Tosylalkyl)phenols 1

2-(1-Tosylalkyl)phenols **1** were prepared according to the known methods, among them, **1a-1b**, **1d-1f**, **1i-1m** are the known compounds.[2]

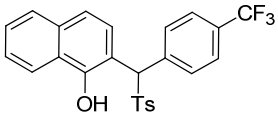


5 **7** **1**

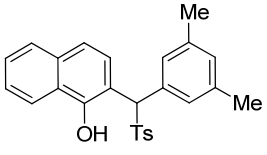
Under an atmosphere of nitrogen, a solution of 2-hydroxybenzaldehyde **5** (4.0 mmol) in tetrahydrofuran (10 mL) was added to a solution of Grignard reagent **6** (10.0 mmol), the mixture was stirred at room temperature for 4 hours. The reaction mixture was quenched by saturated ammonium chloride (20 mL) and extracted with dichloromethane (50 mL×3). Then the combined organic layer was dried over anhydrous sodium sulfate, concentrated in *vacuo*. A short silica gel column filtration of the crude mixture afforded 2-hydroxyalkylphenols **7**.

A reaction mixture of sodium *p*-toluenesulfinate tetrahydrate (1.001 g, 4.0 mmol) and *p*-toluenesulfonic acid monohydrate (1.141 g, 6.0 mmol) in dichloromethane (20 mL) was stirred at room temperature for 20 min. Then, a solution of 2-hydroxyalkylphenol **7** in dichloromethane (10 mL) was added to the resulting slurry, the suspension was stirred at room temperature for 24 hours. The reaction mixture was quenched and adjusted to pH = 8 by saturated sodium bicarbonate. After being extracted with dichloromethane (50 mL×3), the combined organic layer was dried over anhydrous sodium sulfate, concentrated in *vacuo*. The crude mixture was recrystallized from dichloromethane and hexanes, giving the product 2-(1-tosylalkyl)phenols **1**.

2-(Tosyl(4-(trifluoromethyl)phenyl)methyl)naphthalen-1-ol (1c): 604 mg, 44% yield, new compound, orange solid, mp = 65-66 °C, R_f = 0.35 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.35-8.19 (m, 1H), 7.93 (s, 1H), 7.74 (d, *J* = 7.7 Hz, 3H), 7.67-7.46 (m, 6H), 7.34 (d, *J* = 8.7 Hz, 1H), 7.24-7.06 (m, 3H), 6.00 (s, 1H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.5, 145.6, 136.1, 134.9, 134.4, 130.8, 129.9, 129.0, 127.8, 127.6, 127.4, 126.4, 126.2, 125.9 (q, *J* = 3.6 Hz), 122.6, 121.6, 113.3, 72.8, 21.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.81. HRMS Calculated for $C_{25}H_{23}F_3NO_3S$ $[M+NH_4]^+$ 474.1345, found 474.1346.

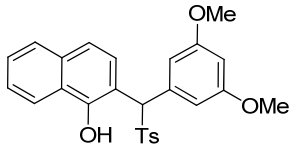


2-((3,5-Dimethylphenyl)(tosyl)methyl)naphthalen-1-ol (1g): 672 mg, 54% yield, new compound, white solid, mp = 164-165 °C, R_f = 0.30 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.39-8.28 (m, 1H), 8.18 (s, 1H), 7.72 (dd, *J* = 6.4, 3.1 Hz, 1H), 7.61 (d, *J* = 8.3 Hz, 2H), 7.53-7.42 (m, 2H), 7.29 (dd, *J* = 21.9, 8.7 Hz, 2H), 7.20-7.09 (m, 4H), 6.92 (s, 1H), 5.88 (s, 1H), 2.32 (s, 3H), 2.25 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.6, 145.1, 138.5, 134.8,



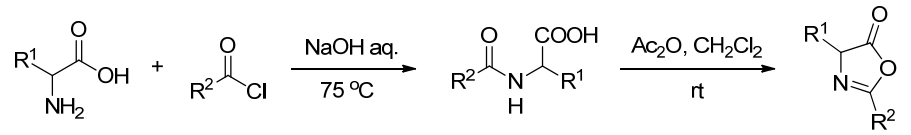
134.8, 131.8, 130.7, 129.6, 129.1, 128.1, 127.9, 127.6, 127.3, 126.6, 125.9, 122.9, 121.2, 114.1, 73.4, 21.8, 21.5. HRMS Calculated for $C_{26}H_{28}NO_3S$ $[M+NH_4]^+$ 434.1784, found 434.1784.

2-((3,5-Dimethoxylphenyl)(tosyl)methyl)naphthalen-1-ol (1h): 1.598 g, 94% yield, new compound, yellow solid, mp = 188-189 °C, R_f = 0.40 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.37-8.30 (m, 1H), 8.16 (s, 1H), 7.73 (dt, *J* = 6.4, 2.7 Hz, 1H), 7.65 (d, *J* = 8.3 Hz, 2H), 7.54-7.46 (m, 2H), 7.33 (q, *J* = 8.7 Hz, 2H), 7.17 (d, *J* = 8.1 Hz, 2H), 6.74 (d, *J* = 2.2 Hz, 2H), 6.39 (t, *J* = 2.2 Hz, 1H), 5.91 (s, 1H), 3.73 (s, 6H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.0, 151.6, 145.3, 134.8, 134.7, 134.1, 129.7, 129.2, 127.6, 127.6, 127.4, 126.7, 126.0, 123.0, 121.4, 113.9, 108.6, 101.0, 73.1, 55.6, 21.8. HRMS Calculated for $C_{26}H_{24}NaO_5S$ $[M+Na]^+$ 471.1237, found 471.1231.



3. General Procedure for Synthesis of azlactones 2

Azlactones **2** were prepared according to the known procedure with minor modification, among them, **2a-2g**, **2i-2l** are the known compounds. [3]

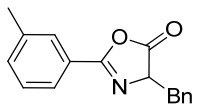


8 **9** **10** **2**

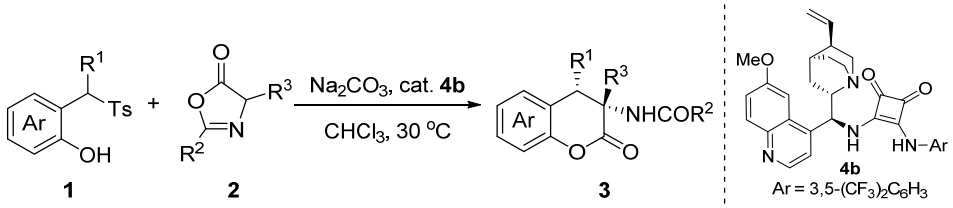
To a vigorously stirred solution containing amino acid **8** (10.0 mmol, 1 equiv.) and NaOH (20.0 mmol, 800 mg, 2 equiv.) in 40 mL of water at 75 °C was added acyl chloride **9** (11.0 mmol, 1.1 equiv.) in small portions during 10 min, the mixture was stirred an additional 12 hours, then cooled to 0 °C and acidified to pH = 1-2 with 2 N HCl. The residue was extracted into ethyl acetate (50 mL×3) and dried with anhydrous sodium sulfate. Then, the solvent was removed in *vacuo*. The crude products was purified through a short column of silica gel using hexane/EtOAc = 1:1 (and then with 10% CH_3OH/CH_2Cl_2) as an eluent to give *N*-acylalanine **10**.

The anhydrous acetic anhydride (21.0 mmol, 3 equiv.) was added dropwise to the solution of *N*-acylalanine **10** (7.0 mmol, 1 equiv.) in dichloromethane (20 mL) at room temperature, the reaction was stirred for 16 hours at which point TLC analysis indicated total consumption of the starting material. The mixture was washed with saturated sodium bicarbonate solution (20 mL×3) and extracted into dichloromethane (50 mL×3), the combined organic layer was dried over anhydrous sodium sulfate, concentrated in *vacuo*. The crude mixture was recrystallized from dichloromethane and hexanes, giving the corresponding product **2**.

4-benzyl-2-(*m*-tolyl)oxazol-5(4*H*)-one (2h): 1.791 g, 79% yield, new compound, colorless oil, R_f = 0.90 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80-7.66 (m, 2H), 7.39-7.31 (m, 2H), 7.31-7.18 (m, 5H), 4.81-4.56 (m, 1H), 3.38 (dd, *J* = 14.0, 4.9 Hz, 1H), 3.20 (dd, *J* = 14.0, 6.7 Hz, 1H), 2.40 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 177.8, 162.0, 138.8, 135.5, 133.7, 129.8, 128.8, 128.6, 128.5, 127.4, 125.8, 125.3, 66.7, 37.5, 21.4. HRMS Calculated for $C_{17}H_{16}NO_2$ $[M+H]^+$ 266.1176, found 266.1182.

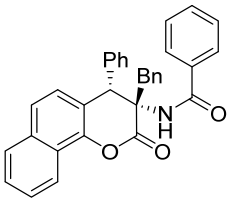


4. General Procedure for Synthesis of Chiral 3,4-Dihydrocoumarins 3

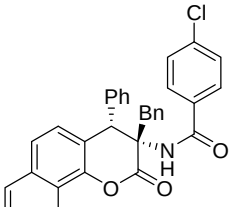


A reaction mixture of **1** (0.20 mmol), **2** (0.20 mmol), sodium carbonate (0.24 mmol, 25.4 mg) and bifunctional squaramide organocatalyst **4b** (0.02 mmol, 12.6 mg) in chloroform (3.0 mL) was stirred at 30 °C for 72-96 hours. Then the crude product was purified by flash chromatography on silica gel using hexanes and ethyl acetate to give the corresponding product dihydrocoumarins **3**.

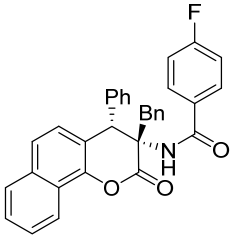
(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3aa): new compound, 91% yield, 96% ee, 88 mg, $[\alpha]^{20}_D$ = +276.36 (*c* 1.0, $CHCl_3$), pale yellow solid, mp = 227-228 °C, R_f = 0.65 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.49 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.1 Hz, 1H), 7.73 (t, *J* = 7.0 Hz, 2H), 7.65 (t, *J* = 7.5 Hz, 1H), 7.52-7.42 (m, 3H), 7.42-7.31 (m, 3H), 7.26-7.13 (m, 8H), 7.11 (dd, *J* = 6.5, 2.5 Hz, 2H), 6.84 (s, 1H), 5.61 (s, 1H), 4.27 (d, *J* = 14.0 Hz, 1H), 3.21 (d, *J* = 13.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 168.3, 145.0, 138.1, 135.4, 135.0, 134.1, 131.8, 130.1, 129.0, 128.8, 128.6, 128.3, 128.1, 128.0, 127.6, 127.4, 127.3, 126.9, 126.7, 125.7, 123.3, 121.2, 120.3, 66.1, 50.8, 38.7. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.5 min and 8.1 min (maj). HRMS Calculated for $C_{33}H_{26}NO_3$ $[M+H]^+$ 484.1907, found 484.1901.



(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-4-chloroben zamide (3ab): new compound, 85% yield, 94% ee, 88 mg, $[\alpha]^{20}_D$ = +263.58 (*c* 1.0, $CHCl_3$), pale yellow solid, mp = 242-243 °C, R_f = 0.95 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 8.4 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.71 (dt, *J* = 8.2, 1.7 Hz, 2H), 7.66-7.58 (m, 1H), 7.45-7.27 (m, 5H), 7.24-7.09 (m, 8H), 7.05 (dd, *J* = 6.5, 2.9 Hz, 2H), 6.76 (s, 1H), 5.54 (s, 1H), 4.19 (d, *J* = 14.0 Hz, 1H), 3.18 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 167.1, 145.0, 138.1, 138.0, 134.9, 134.1, 133.6, 130.1, 129.1, 129.1, 128.6, 128.3, 128.2, 128.1, 128.1, 127.7, 127.4, 127.4, 126.7, 125.8, 123.4, 121.2, 120.1, 66.2, 50.9, 38.7. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.6 min and 7.6 min (maj). HRMS Calculated for $C_{33}H_{25}{}^{35}ClNO_3$ $[M+H]^+$ 518.1517, found 518.1518; HRMS Calculated for $C_{33}H_{25}{}^{37}ClNO_3$ $[M+H]^+$ 520.1517, found 520.1502.

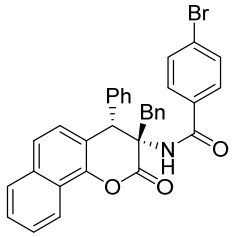


(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-4-fluorobenz amide (3ac): new compound, 90% yield, 95% ee, 90 mg, $[\alpha]^{20}_D$ = +289.18 (*c* 1.0, $CHCl_3$), yellow solid, mp = 245-246 °C, R_f = 0.95 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 8.4 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.70 (dd, *J* = 7.6, 5.8 Hz, 2H), 7.65-7.58 (m, 1H), 7.44 (dd, *J* = 8.2, 5.7 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 1H), 7.23-7.11 (m, 8H), 7.10-6.93 (m, 4H), 6.75 (s, 1H), 5.55 (s, 1H), 4.20 (d, *J* = 14.0 Hz, 1H), 3.17 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 167.1, 165.0 (d, J_{C-F} = 250.6 Hz),



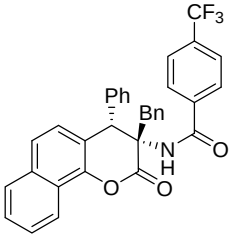
145.0, 138.1, 135.0, 134.1, 131.5 (d, $J_{C\text{-}F}$ = 3.1 Hz), 130.1, 129.2 (d, $J_{C\text{-}F}$ = 9.0 Hz), 129.0, 128.6, 128.3, 128.1, 128.1, 127.6, 127.4, 127.4, 126.7, 125.7, 123.4, 121.2, 120.2, 115.9 (d, $J_{C\text{-}F}$ = 21.8 Hz), 66.2, 50.9, 38.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -107.78. HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.5 min and 7.6 min (maj). HRMS Calculated for $C_{33}H_{25}FNO_3$ $[M+H]^+$ 502.1813, found 502.1818.

(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-4-bromoben zamide (3ad): new compound, 91% yield, 92% ee, 102 mg, $[\alpha]^{20}_D$ = +297.48 (*c* 1.0, $CHCl_3$), yellow solid, mp = 250-251 ^{o}C, R_f = 0.85 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$)



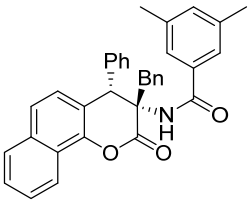
δ 8.45 (d, *J* = 8.3 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.78-7.66 (m, 2H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.47 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 1H), 7.30 (d, *J* = 8.4 Hz, 2H), 7.18 (dt, *J* = 7.9, 4.4 Hz, 8H), 7.10-7.00 (m, 2H), 6.76 (s, 1H), 5.54 (s, 1H), 4.19 (d, *J* = 14.0 Hz, 1H), 3.18 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 167.2, 145.0, 138.0, 134.9, 134.2, 134.1, 132.1, 130.1, 129.1, 128.6, 128.5, 128.2, 128.1, 128.1, 127.7, 127.4 127.4, 126.7, 126.5, 125.8, 123.4, 121.2, 120.1, 66.2, 50.9, 38.7. HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.7 min and 7.6 min (maj). HRMS Calculated for $C_{33}H_{25}{}^{79}BrNO_3$ $[M+H]^+$ 562.1012, found 562.1003; HRMS Calculated for $C_{33}H_{25}{}^{81}BrNO_3$ $[M+H]^+$ 564.1012, found 564.0982.

(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-4-(trifluoro methyl)benzamide (3ae): new compound, 91% yield, 92% ee, 100 mg, $[\alpha]^{20}_D$ = +291.66 (*c* 1.0, $CHCl_3$), pale yellow solid, mp = 243-244 ^{o}C, R_f = 0.75 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400



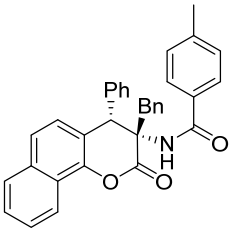
MHz, $CDCl_3$) δ 8.46 (d, *J* = 8.3 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.79-7.67 (m, 2H), 7.63 (dd, *J* = 13.6, 7.9 Hz, 3H), 7.51 (d, *J* = 8.0 Hz, 2H), 7.36 (d, *J* = 8.4 Hz, 1H), 7.25-7.12 (m, 8H), 7.11-7.00 (m, 2H), 6.82 (s, 1H), 5.54 (s, 1H), 4.19 (d, *J* = 14.0 Hz, 1H), 3.21 (d, *J* = 14.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 167.0, 145.0, 144.7, 138.5, 138.0, 134.8, 134.2, 133.7, 133.4, 130.1, 129.1, 128.7, 128.2, 128.2, 127.8, 127.5, 127.4, 126.7, 125.9 (q, *J* = 3.6 Hz), 125.8, 125.1, 123.4, 121.2, 120.0, 66.2, 50.9, 38.8; ^{19}F NMR (376 MHz, $CDCl_3$) δ -63.01. HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 5.8 min and 6.4 min (maj). HRMS Calculated for $C_{34}H_{25}F_3NO_3$ $[M+H]^+$ 552.1781, found 552.1787.

(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-3,5-dimethyl benzamide (3af): new compound, 95% yield, 97% ee, 97 mg, $[\alpha]^{20}_D$ = +302.18 (*c* 1.0, $CHCl_3$), yellow solid, mp = 239-240 ^{o}C, R_f = 0.90 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$)

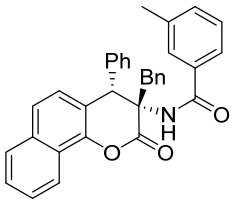


δ 8.46 (d, *J* = 8.4 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.70 (dd, *J* = 10.4, 4.6 Hz, 2H), 7.65-7.57 (m, 1H), 7.36 (d, *J* = 8.4 Hz, 1H), 7.19 (ddd, *J* = 17.0, 6.1, 2.0 Hz, 8H), 7.07 (dd, *J* = 6.1, 3.2 Hz, 3H), 7.02 (s, 2H), 6.77 (s, 1H), 5.57 (s, 1H), 4.23 (d, *J* = 14.0 Hz, 1H), 3.16 (d, *J* = 13.9 Hz, 1H), 2.28 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 168.6, 145.1, 138.5, 138.2, 135.4, 135.1, 134.1, 133.4, 130.2, 129.0, 128.6, 128.3, 128.1, 127.9, 127.6, 127.3, 127.3, 126.8, 125.6, 124.7, 123.4, 121.2, 120.4, 66.1, 50.9, 38.7, 21.4. HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 5.8 min and 7.4 min (maj). HRMS Calculated for $C_{35}H_{30}NO_3$ $[M+H]^+$ 512.2220, found 512.2228.

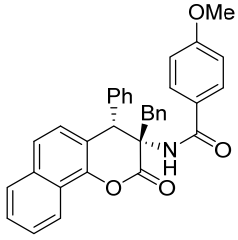
(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-4-methylbenzamide (3ag): new compound, 95% yield, 88% ee, 95 mg, $[\alpha]^{20}_D$ = +227.68 (*c* 1.0, $CHCl_3$), white solid, mp = 209-210 °C, R_f = 0.85 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.46 (d, *J* = 8.4 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.74-7.65 (m, 2H), 7.61 (t, *J* = 7.5 Hz, 1H), 7.35 (d, *J* = 8.0 Hz, 3H), 7.17 (dd, *J* = 21.4, 6.0 Hz, 10H), 7.10-7.02 (m, 2H), 6.78 (s, 1H), 5.58 (s, 1H), 4.24 (d, *J* = 14.0 Hz, 1H), 3.16 (d, *J* = 13.9 Hz, 1H), 2.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 168.2, 145.1, 142.2, 138.1, 135.1, 134.1, 132.5, 130.2, 129.4, 129.0, 128.6, 128.3, 128.1, 128.0, 127.5, 127.3, 127.3, 126.9, 126.8, 125.6, 123.4, 121.2, 120.4, 66.1, 50.9, 38.7, 21.6. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.5 min and 8.1 min (maj). HRMS Calculated for $C_{34}H_{28}NO_3$ $[M+H]^+$ 498.2064, found 498.2069.



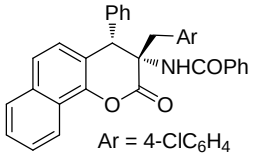
(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-3-methylbenzamide (3ah): new compound, 95% yield, 82% ee, 95 mg, $[\alpha]^{20}_D$ = +260.82 (*c* 0.6, $CHCl_3$), yellow solid, mp = 110-111 °C, R_f = 0.70 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.49 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.1 Hz, 1H), 7.73 (t, *J* = 7.0 Hz, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.39 (d, *J* = 8.4 Hz, 1H), 7.30-7.14 (m, 12H), 7.10 (dd, *J* = 6.5, 2.7 Hz, 2H), 6.82 (s, 1H), 5.60 (s, 1H), 4.26 (d, *J* = 14.0 Hz, 1H), 3.19 (d, *J* = 14.0 Hz, 1H), 2.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 168.5, 145.0, 138.7, 138.1, 135.4, 135.1, 134.1, 132.5, 130.2, 129.0, 128.7, 128.6, 128.3, 128.1, 128.0, 127.6, 127.6, 127.4, 127.3, 126.8, 125.7, 123.9, 123.4, 121.2, 120.3, 66.1, 50.9, 38.7, 21.5. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.1 min and 7.3 min (maj). HRMS Calculated for $C_{34}H_{28}NO_3$ $[M+H]^+$ 498.2064, found 498.2067.



(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-4-methoxybenzamide (3ai): new compound, 94% yield, 95% ee, 97 mg, $[\alpha]^{20}_D$ = +278.31 (*c* 0.60, $CHCl_3$), yellow solid, mp = 219-220 °C, R_f = 0.50 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 8.4 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.73-7.65 (m, 2H), 7.62 (t, *J* = 7.3 Hz, 1H), 7.44 (d, *J* = 8.7 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 1H), 7.17 (ddd, *J* = 12.1, 6.6, 2.5 Hz, 8H), 7.05 (dd, *J* = 6.4, 2.7 Hz, 2H), 6.83 (d, *J* = 8.7 Hz, 2H), 6.73 (s, 1H), 5.57 (s, 1H), 4.23 (d, *J* = 14.0 Hz, 1H), 3.81 (s, 3H), 3.15 (d, *J* = 13.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.8, 167.7, 162.5, 145.1, 138.1, 135.1, 134.1, 130.2, 129.0, 128.8, 128.6, 128.3, 128.1, 127.9, 127.6, 127.5, 127.3, 127.3, 126.8, 125.6, 123.3, 121.2, 120.4, 114.0, 66.1, 55.6, 50.8, 38.7. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 9.2 min and 11.5 min (maj). HRMS Calculated for $C_{34}H_{28}NO_4$ $[M+H]^+$ 514.2013, found 514.2014.

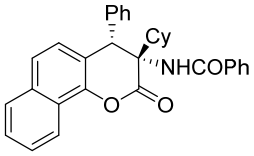


(+)-*N*-((3*S*,4*S*)-3-(4-chlorobenzyl)-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3aj): new compound, 98% yield, 93% ee, 101 mg, $[\alpha]^{20}_D$ = +335.14 (*c* 0.60, $CHCl_3$), yellow solid, mp = 231-232 °C, R_f = 0.70 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.44 (d, *J* = 8.3 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.76-7.66 (m, 2H), 7.63 (dd, *J* = 11.1, 3.9 Hz, 1H), 7.46 (dd, *J* = 14.3, 7.2 Hz, 3H), 7.40-7.29 (m, 3H), 7.24-7.06 (m, 7H), 7.00 (d, *J* = 8.3 Hz, 2H), 6.79 (s, 1H), 5.55 (s, 1H), 4.22 (d, *J* = 14.1 Hz, 1H), 3.15 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR



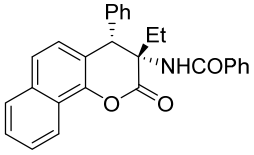
(100 MHz, $CDCl_3$) δ 168.5, 168.3, 145.0, 137.9, 135.1, 134.1, 133.6, 133.5, 131.9, 131.4, 129.1, 128.9, 128.8, 128.2, 128.2, 128.1, 127.5, 127.4, 126.8, 126.7, 125.8, 123.3, 121.1, 120.1, 66.0, 50.8, 38.0. HPLC: Chiralcel OD-H column, 254 nm, 30 ^oC, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.7 min and 8.4 min (maj). HRMS Calculated for $C_{33}H_{25}ClNO_3$ $[M+H]^+$ 518.1517, found 518.1513.

(+)-*N*-((3*S*,4*S*)-3-cyclohexyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3ak): new compound, 89% yield, 90% ee, 85 mg, $[\alpha]^{20}_D$ = +361.47 (*c* 0.80, $CHCl_3$), colorless oil, R_f = 0.60 (hexanes/ethyl acetate 5/1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, *J* = 8.3 Hz, 1H), 7.86 (d, *J* = 8.1 Hz, 1H), 7.65 (dd, *J* = 9.8, 5.5 Hz, 2H), 7.58 (t, *J* = 7.4 Hz, 1H), 7.52-7.42 (m, 3H),



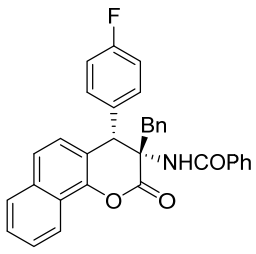
7.40-7.26 (m, 5H), 7.19 (s, 1H), 7.17-7.08 (m, 3H), 5.64 (s, 1H), 2.24 (t, *J* = 9.0 Hz, 1H), 2.07 (d, *J* = 12.6 Hz, 1H), 1.68 (dd, *J* = 19.5, 6.8 Hz, 3H), 1.52 (d, *J* = 9.9 Hz, 1H), 1.17-0.83 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.1, 167.4, 145.0, 139.2, 135.5, 133.9, 131.6, 128.8, 128.7, 128.3, 128.0, 127.7, 127.1, 127.1, 126.8, 126.4, 125.7, 123.2, 121.3, 120.7, 66.9, 47.5, 44.8, 29.1, 29.0, 27.0, 26.7, 26.0. HPLC: Chiralcel IC column, 254 nm, 30 ^oC, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 8.3 min (maj) and 9.3 min. HRMS Calculated for $C_{32}H_{30}NO_3$ $[M+H]^+$ 476.2220, found 476.2226.

(+)-*N*-((3*S*,4*S*)-3-ethyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3al): new compound, 95% yield, 90% ee, 80 mg, $[\alpha]^{20}_D$ = +677.79 (*c* 0.60, $CHCl_3$), pale yellow solid, mp = 79-80 ^oC, R_f = 0.65 (hexanes/ethyl acetate 5/1). ^1H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, *J* = 8.3 Hz, 1H), 7.87 (d, *J* = 8.0 Hz, 1H), 7.70-7.52 (m, 5H), 7.48 (t, *J* = 7.3 Hz, 1H), 7.39 (t, *J* =



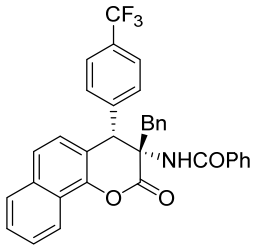
7.5 Hz, 2H), 7.30 (d, *J* = 8.4 Hz, 1H), 7.17 (s, 5H), 7.03 (s, 1H), 5.40 (s, 1H), 2.98 (dq, *J* = 15.0, 7.5 Hz, 1H), 1.97 (dq, *J* = 14.6, 7.3 Hz, 1H), 0.94 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ. 169.7, 167.6, 145.1, 138.5, 135.1, 134.0, 131.8, 129.0, 128.8, 128.2, 128.0, 127.9, 127.2, 127.1, 126.9, 126.8, 125.5, 123.2, 121.3, 120.2, 65.4, 50.9, 26.5, 9.0. HPLC: Chiralcel IC column, 254 nm, 30 ^oC, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 13.3 min and 14.9 min (maj). HRMS Calculated for $C_{28}H_{24}NO_3$ $[M+H]^+$ 422.1751, found 422.1752.

(+)-*N*-((3*S*,4*S*)-3-benzyl-4-(4-fluorophenyl)-2-oxo-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3ba): new compound, 95% yield, 95% ee, 98 mg, $[\alpha]^{20}_D$ = +266.98 (*c* 0.80, $CHCl_3$), pale yellow solid, mp = 189-190 ^oC, R_f = 0.50 (hexanes/ethyl acetate 5/1). ^1H NMR (400 MHz, $CDCl_3$)

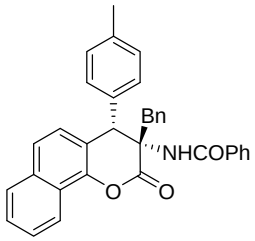


δ 8.47 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.1 Hz, 1H), 7.72 (dd, *J* = 7.9, 5.6 Hz, 2H), 7.65 (t, *J* = 7.4 Hz, 1H), 7.49 (dd, *J* = 7.3, 4.9 Hz, 3H), 7.38 (dd, *J* = 15.8, 7.9 Hz, 3H), 7.20 (ddd, *J* = 11.9, 5.9, 3.0 Hz, 5H), 7.08 (dd, *J* = 6.4, 2.7 Hz, 2H), 6.96-6.74 (m, 3H), 5.61 (s, 1H), 4.21 (d, *J* = 14.0 Hz, 1H), 3.18 (d, *J* = 13.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.5, 168.2, 162.4 (d, J_{C-F} = 245.4 Hz), 145.0, 135.1, 134.9, 134.2, 133.9 (d, J_{C-F} = 3.2 Hz), 131.9, 130.1, 130.0 (d, J_{C-F} = 8.1 Hz), 128.9, 128.6, 128.2, 127.7, 127.5, 126.9, 126.8, 126.6, 125.8, 123.3, 121.2, 120.1, 115.9 (d, J_{C-F} = 21.3 Hz), 66.2, 50.0, 38.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -114.11. HPLC: Chiralcel IC column, 254 nm, 30 ^oC, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 10.9 min and 14.4 min (maj). HRMS Calculated for $C_{33}H_{25}FNO_3$ $[M+H]^+$ 502.1813, found 502.1818.

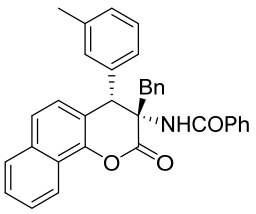
(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-(4-(trifluoromethyl)phenyl)-3,4-dihydro-2*H*-benzo[*h*]chrom en-3-yl)benzamide (3ca): new compound, 95% yield, 95% ee, 105 mg, $[\alpha]^{20}_D$ = +312.78 (*c* 1.0, $CHCl_3$), yellow solid, mp = 160-161 °C, R_f = 0.65 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.47 (d, *J* = 8.3 Hz, 1H), 7.92 (d, *J* = 8.1 Hz, 1H), 7.79-7.68 (m, 2H), 7.65 (dd, *J* = 11.1, 3.9 Hz, 1H), 7.55-7.29 (m, 10H), 7.24-7.15 (m, 3H), 7.06 (dd, *J* = 6.4, 2.9 Hz, 2H), 6.85 (s, 1H), 5.68 (s, 1H), 4.21 (d, *J* = 14.0 Hz, 1H), 3.18 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.3, 168.3, 145.1, 142.2, 134.9, 134.6, 134.3, 132.1, 130.1, 130.1, 128.9, 128.8, 128.7, 128.2, 127.8, 127.7, 127.6, 126.9, 126.4, 126.0 (q, *J* = 3.6 Hz), 125.4, 123.3, 122.7, 121.2, 119.4, 65.9, 50.5, 38.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.69. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 8.1 min and 10.5 min (maj). HRMS Calculated for $C_{34}H_{25}F_3NO_3$ $[M+H]^+$ 552.1781, found 552.1769.



(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-(p-tolyl)-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3da): new compound, 94% yield, 95% ee, 94 mg, $[\alpha]^{20}_D$ = +234.38 (*c* 0.50, $CHCl_3$), white solid, mp = 210-211 °C, R_f = 0.70 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 8.3 Hz, 1H), 7.90 (d, *J* = 8.1 Hz, 1H), 7.70 (t, *J* = 7.4 Hz, 2H), 7.62 (t, *J* = 7.5 Hz, 1H), 7.46 (dd, *J* = 8.2, 6.9 Hz, 3H), 7.35 (dd, *J* = 7.7, 6.0 Hz, 3H), 7.20 (dd, *J* = 4.8, 1.5 Hz, 3H), 7.12-7.03 (m, 4H), 6.96 (d, *J* = 8.0 Hz, 2H), 6.81 (s, 1H), 5.55 (s, 1H), 4.21 (d, *J* = 14.0 Hz, 1H), 3.16 (d, *J* = 14.0 Hz, 1H), 2.19 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 168.2, 145.0, 137.7, 135.5, 135.1, 135.0, 134.1, 131.7, 130.2, 129.7, 128.8, 128.6, 128.2, 128.1, 127.6, 127.3, 127.3, 127.0, 126.7, 125.7, 123.4, 121.2, 120.6, 66.2, 50.4, 38.6, 21.2. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 14.7 min and 16.6 min (maj). HRMS Calculated for $C_{34}H_{28}NO_3$ $[M+H]^+$ 498.2064, found 498.2069.

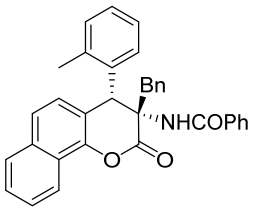


(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-(m-tolyl)-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3ea): new compound, 89% yield, 96% ee, 88 mg, $[\alpha]^{20}_D$ = +337.98 (*c* 1.0, $CHCl_3$), white solid, mp = 206-207 °C, R_f = 0.65 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.46 (d, *J* = 8.3 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.75-7.65 (m, 2H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.51-7.41 (m, 3H), 7.35 (t, *J* = 7.7 Hz, 3H), 7.24-7.17 (m, 3H), 7.08 (dd, *J* = 6.6, 2.7 Hz, 2H), 7.03 (d, *J* = 7.7 Hz, 2H), 6.95 (d, *J* = 7.2 Hz, 2H), 6.77 (s, 1H), 5.53 (s, 1H), 4.24 (d, *J* = 14.0 Hz, 1H), 3.16 (d, *J* = 14.0 Hz, 1H), 2.14 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 168.4, 145.1, 138.6, 137.9, 135.6, 135.1, 134.1, 131.7, 130.2, 129.1, 128.9, 128.8, 128.8, 128.6, 128.1, 127.6, 127.3, 127.3, 126.9, 126.8, 125.7, 125.2, 123.4, 121.2, 120.4, 66.2, 50.7, 38.7, 21.5. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 14.1 min (maj) and 16.4 min. HRMS Calculated for $C_{34}H_{28}NO_3$ $[M+H]^+$ 498.2064, found 498.2072.

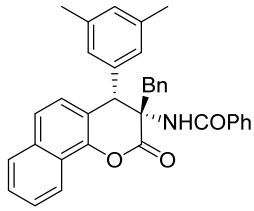


(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-(o-tolyl)-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3fa): new compound, 95% yield, 91% ee, 95 mg, $[\alpha]^{20}_D$ = +327.38 (*c* 1.0, $CHCl_3$), white solid, mp = 160-161 °C, R_f = 0.65 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.45 (d, *J* = 8.4 Hz, 1H), 7.86 (d, *J* = 8.1 Hz, 1H), 7.63 (tt, *J* = 14.5, 7.2 Hz, 3H), 7.44-7.27 (m, 6H), 7.22 (dd, *J* =

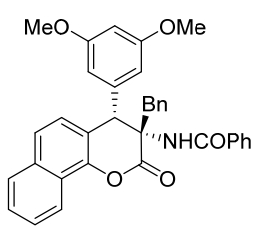
5.1, 1.6 Hz, 3H), 7.10 (dd, *J* = 6.8, 2.6 Hz, 3H), 7.00 (dd, *J* = 5.8, 3.5 Hz, 3H), 6.80 (s, 1H), 5.79 (s, 1H), 4.38 (d, *J* = 13.9 Hz, 1H), 3.25 (d, *J* = 13.9 Hz, 1H), 2.72 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.3, 168.0, 144.1, 137.9, 136.9, 135.4, 134.9, 133.9, 131.7, 131.6, 130.2, 128.7, 128.6, 128.0, 127.6, 127.5, 127.3, 127.2, 127.1, 127.0, 126.8, 126.2, 125.6, 123.6, 121.4, 121.2, 65.3, 47.3, 38.9, 20.4. HPLC: Chiralcel IA column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 10.9 min and 17.3 min (maj). HRMS Calculated for $C_{34}H_{28}NO_3$ $[M+H]^+$ 498.2064, found 498.2069.



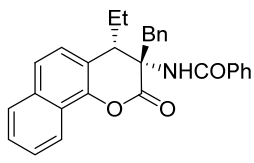
(+)-*N*-((3*S*,4*S*)-3-benzyl-4-(3,5-dimethylphenyl)-2-oxo-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3ga): new compound, 97% yield, 97% ee, 99 mg, $[\alpha]^{20}_D$ = +171.79 (*c* 1.0, $CHCl_3$), white solid, mp = 181-182 °C, R_f = 0.55 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.46 (d, *J* = 8.3 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.71 (t, *J* = 7.1 Hz, 2H), 7.63 (t, *J* = 7.5 Hz, 1H), 7.45 (t, *J* = 6.5 Hz, 3H), 7.40-7.29 (m, 3H), 7.22 (dd, *J* = 5.0, 1.6 Hz, 3H), 7.08 (dd, *J* = 6.6, 2.5 Hz, 2H), 6.88-6.57 (m, 4H), 5.48 (s, 1H), 4.24 (d, *J* = 14.0 Hz, 1H), 3.14 (d, *J* = 14.0 Hz, 1H), 2.10 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.7, 168.5, 145.2, 138.5, 137.7, 135.7, 135.2, 134.1, 131.7, 130.2, 129.8, 129.8 128.8, 128.6, 128.1, 127.6, 127.3, 127.3, 126.9, 126.1, 125.6, 123.4, 121.3, 120.4, 66.3, 50.6, 38.6, 21.4. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 12.3 min (maj) and 15.3 min. HRMS Calculated for $C_{35}H_{30}NO_3$ $[M+H]^+$ 512.2220, found 512.2222.



(+)-*N*-((3*S*,4*S*)-3-benzyl-4-(3,5-dimethoxyphenyl)-2-oxo-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3ha): new compound, 94% yield, 96% ee, 102 mg, $[\alpha]^{20}_D$ = +230.82 (*c* 0.60, $CHCl_3$), pale yellow solid, mp = 178-179 °C, R_f = 0.50 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.44 (d, *J* = 8.3 Hz, 1H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.69 (dd, *J* = 11.7, 4.6 Hz, 2H), 7.65-7.57 (m, 1H), 7.54-7.44 (m, 3H), 7.37 (t, *J* = 7.7 Hz, 3H), 7.23-7.16 (m, 3H), 7.06 (dd, *J* = 6.5, 2.9 Hz, 2H), 6.88 (s, 1H), 6.36 (d, *J* = 2.2 Hz, 2H), 6.23 (s, 1H), 5.50 (s, 1H), 4.22 (d, *J* = 14.0 Hz, 1H), 3.57 (s, 6H), 3.14 (d, *J* = 13.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.5, 168.2, 161.0, 145.1, 140.2, 135.2, 135.0, 134.2, 131.9, 130.2, 128.8, 128.6, 128.1, 127.6, 127.4, 127.3, 127.0, 126.6, 125.7, 123.4, 121.3, 120.1, 106.4, 100.0, 66.1, 55.4, 50.8, 38.6. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 26.0 min (maj) and 48.8 min. HRMS Calculated for $C_{35}H_{30}NO_5$ $[M+H]^+$ 544.2118, found 544.2111.

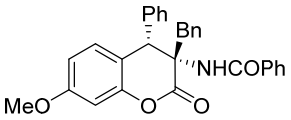


(+)-*N*-((3*S*,4*S*)-3-benzyl-4-ethyl-2-oxo-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3ia): new compound, 91% yield, 85% ee, 79 mg, $[\alpha]^{20}_D$ = +2.0 (*c* 0.50, $CHCl_3$), white solid, mp = 142-143 °C, R_f = 0.60 (hexanes/ethyl acetate 10/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.35 (d, *J* = 8.3 Hz, 1H), 7.92 (d, *J* = 8.0 Hz, 1H), 7.85-7.70 (m, 3H), 7.69-7.51 (m, 3H), 7.47 (t, *J* = 7.5 Hz, 2H), 7.40 (d, *J* = 8.3 Hz, 1H), 7.23 (s, 1H), 7.19 (dd, *J* = 4.9, 1.7 Hz, 3H), 6.97 (dd, *J* = 6.5, 2.9 Hz, 2H), 4.33 (dd, *J* = 10.1, 3.9 Hz, 1H), 3.85 (d, *J* = 14.0 Hz, 1H), 2.97 (d, *J* = 14.0 Hz, 1H), 1.95 (ddd, *J* = 13.5, 7.5, 3.9 Hz, 1H), 1.43 (ddd, *J* = 13.6, 10.1, 7.2 Hz, 1H), 0.88 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.7, 167.2, 144.6, 135.1, 134.7, 134.0, 132.1, 130.1, 129.0,

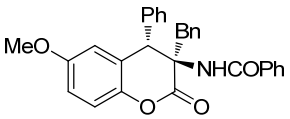


128.5, 128.0, 127.5, 127.4, 127.2, 127.2, 127.0, 124.8, 123.3, 121.0, 120.6, 65.0, 45.5, 38.4, 24.4, 11.2. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 11.5 min and 14.6 min (maj). HRMS Calculated for $C_{29}H_{26}NO_3$ $[M+H]^+$ 436.1907, found 436.1909.

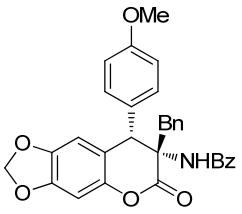
(+)-*N*-((3*S*,4*S*)-3-benzyl-7-methoxy-2-oxo-4-phenylchroman-3-yl)benzamide (3ja): new compound, 97% yield, 90% ee, 90 mg, $[\alpha]^{20}_D$ = +52.50 (*c* 0.6, $CHCl_3$), white solid, mp = 137-138 °C, R_f = 0.75 (hexanes/ethyl acetate 4/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (dd, *J* = 15.8, 7.3 Hz, 3H), 7.32 (t, *J* = 7.6 Hz, 2H), 7.24-7.11 (m, 9H), 7.07 (dd, *J* = 6.6, 2.8 Hz, 2H), 6.85 (d, *J* = 2.4 Hz, 1H), 6.76 (dd, *J* = 8.4, 2.5 Hz, 1H), 6.71 (s, 1H), 5.40 (s, 1H), 4.17 (d, *J* = 14.0 Hz, 1H), 3.87 (s, 3H), 3.13 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 168.2, 160.6, 151.0, 138.9, 135.5, 135.1, 131.7, 130.8, 130.1, 129.0, 128.8, 128.6, 128.0, 127.8, 127.6, 126.9, 117.3, 112.0, 102.3, 66.3, 55.9, 49.7, 38.6. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 7.4 min and 9.3 min (maj). HRMS Calculated for $C_{30}H_{26}NO_4$ $[M+H]^+$ 464.1856, found 464.1867.



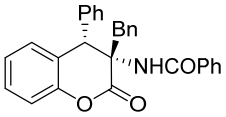
(+)-*N*-((3*S*,4*S*)-3-benzyl-6-methoxy-2-oxo-4-phenylchroman-3-yl)benzamide (3ka): new compound, 97% yield, 93% ee, 90 mg, $[\alpha]^{20}_D$ = +54.68 (*c* 0.64, $CHCl_3$), white solid, mp = 122-123 °C, R_f = 0.50 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 (dt, *J* = 8.5, 4.4 Hz, 3H), 7.33 (t, *J* = 7.6 Hz, 2H), 7.26-7.11 (m, 9H), 7.07 (dd, *J* = 6.6, 2.9 Hz, 2H), 6.93 (dd, *J* = 8.9, 3.0 Hz, 1H), 6.81 (d, *J* = 2.9 Hz, 1H), 6.74 (s, 1H), 5.42 (s, 1H), 4.16 (d, *J* = 14.0 Hz, 1H), 3.79 (s, 3H), 3.13 (d, *J* = 13.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 168.3, 157.3, 144.1, 138.3, 135.4, 135.1, 131.2, 130.1, 129.0, 128.8, 128.6, 128.1, 128.0, 127.6, 126.9, 126.3, 117.6, 115.2, 114.5, 66.1, 55.9, 50.5, 38.4. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 7.5 min and 9.2 min (maj). HRMS Calculated for $C_{30}H_{26}NO_4$ $[M+H]^+$ 464.1856, found 464.1860.



(+)-*N*-((7*S*,8*S*)-7-benzyl-8-(4-methoxyphenyl)-6-oxo-7,8-dihydro-6*H*-[1,3]dioxolo[4,5-*g*]chromen-7-yl)benzamide (3la): known compound, 88% yield, 92% ee, 101 mg, $[\alpha]^{20}_D$ = +104.73 (*c* 0.19, CH_2Cl_2) [lit.[4]: (-)-(*7R,8R*) $[\alpha]^{21}_D$ = -203.2 (*c* 0.19, CH_2Cl_2) for 91% ee], pale yellow solid, R_f = 0.50 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52-7.41 (m, 3H), 7.39-7.30 (m, 2H), 7.25-7.15 (m, 3H), 7.06 (d, *J* = 8.5 Hz, 4H), 6.82 (s, 1H), 6.76-6.64 (m, 4H), 6.01 (d, *J* = 15.2 Hz, 2H), 5.29 (s, 1H), 4.14 (d, *J* = 14.0 Hz, 1H), 3.69 (s, 3H), 3.17 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 168.2, 159.2, 148.2, 145.5, 144.5, 135.3, 135.2, 131.8, 130.3, 130.1, 129.1, 128.8, 128.6, 127.6, 126.9, 117.9, 114.3, 108.8, 102.2, 98.7, 66.1, 55.4, 49.3, 38.3. HPLC: Chiralcel IC column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.7 min and 11.2 min (maj).

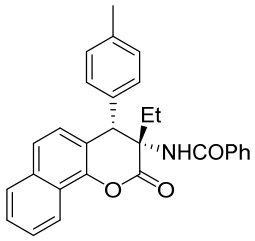


(+)-*N*-((3*S*,4*S*)-3-benzyl-2-oxo-4-phenylchroman-3-yl)benzamide (3ma): new compound, 95% yield, 84% ee, 82 mg, $[\alpha]^{20}_D$ = +148.32 (*c* 0.30, $CHCl_3$), white solid, mp = 69-70 °C, R_f = 0.65 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49-7.37 (m, 4H), 7.37-7.28 (m, 4H), 7.24-7.11 (m, 9H), 7.07 (dd, *J* = 6.6, 2.9 Hz, 2H), 6.73 (s, 1H), 5.48 (s, 1H), 4.18 (d, *J* = 14.0 Hz, 1H), 3.11 (d, *J* = 14.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 168.6, 168.2, 150.3, 138.4, 135.4,

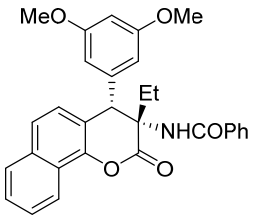


135.0, 131.8, 130.3, 130.1, 129.5, 129.0, 128.8, 128.6, 128.1, 127.9, 127.6, 126.9, 126.0, 125.4, 116.7, 66.1, 50.3, 38.5. HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 90/10, flow = 0.8 mL/min, retention time 6.5 min and 7.4 min (maj). HRMS Calculated for $C_{29}H_{24}NO_3$ $[M+H]^+$ 434.1751, found 434.1750.

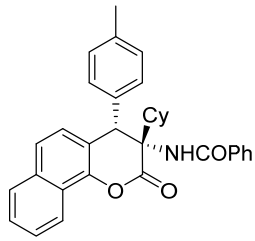
(+)-*N*-((3*S*,4*S*)-3-ethyl-2-oxo-4-(p-tolyl)-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3dl): new compound, 90% yield, 84% ee, 78 mg, $[\alpha]^{20}_D$ = +358.14 (*c* 0.60, $CHCl_3$), yellow solid, mp = 240-241 ^{o}C, R_f = 0.65 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 8.3 Hz, 1H), 7.85 (d, *J* = 8.0 Hz, 1H), 7.68-7.53 (m, 5H), 7.48 (t, *J* = 7.4 Hz, 1H), 7.39 (t, *J* = 7.5 Hz, 2H), 7.27 (d, *J* = 8.4 Hz, 1H), 7.04 (d, *J* = 8.0 Hz, 3H), 6.95 (d, *J* = 8.0 Hz, 2H), 5.35 (s, 1H), 2.94 (dq, *J* = 15.1, 7.6 Hz, 1H), 2.20 (s, 3H), 1.94 (dq, *J* = 14.5, 7.3 Hz, 1H), 0.92 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.8, 167.5, 145.1, 137.6, 135.4, 135.1, 134.0, 131.8, 129.7, 128.8, 128.0, 128.0, 127.1, 127.1, 127.0, 126.8, 125.5, 123.2, 121.3, 120.5, 65.5, 50.5, 26.4, 21.2, 9.0. HPLC: Chiralcel IC column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 12.6 min and 14.2 min (maj). HRMS Calculated for $C_{29}H_{26}NO_3$ $[M+H]^+$ 436.1907, found 436.1907.



(+)-*N*-((3*S*,4*S*)-4-(3,5-dimethoxyphenyl)-3-ethyl-2-oxo-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3hl): new compound, 95% yield, 88% ee, 91 mg, $[\alpha]^{20}_D$ = +312.88 (*c* 1.0, $CHCl_3$), yellow oil, R_f = 0.50 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 8.2 Hz, 1H), 7.87 (d, *J* = 8.0 Hz, 1H), 7.70-7.58 (m, 5H), 7.51 (t, *J* = 7.2 Hz, 1H), 7.42 (t, *J* = 7.4 Hz, 2H), 7.31 (d, *J* = 8.4 Hz, 1H), 7.11 (s, 1H), 6.34 (d, *J* = 1.6 Hz, 2H), 6.26 (s, 1H), 5.32 (s, 1H), 3.57 (s, 6H), 2.97 (dq, *J* = 14.9, 7.5 Hz, 1H), 1.95 (dt, *J* = 14.5, 7.2 Hz, 1H), 0.94 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.5, 167.4, 161.0, 145.2, 140.7, 134.9, 134.0, 131.9, 128.8, 128.0, 127.2, 127.1, 127.0, 126.6, 125.5, 123.2, 121.3, 120.0, 106.2, 100.0, 65.4, 55.3, 50.9, 26.5, 9.0. HPLC: Chiralcel IC column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 22.6 min (maj) and 30.9 min. HRMS Calculated for $C_{30}H_{28}NO_5$ $[M+H]^+$ 482.1962, found 482.1961.

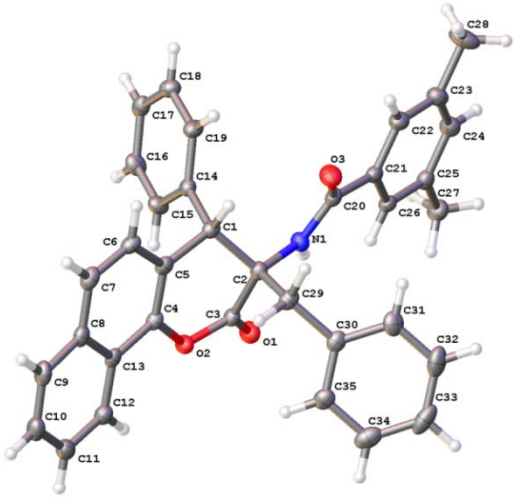


(+)-*N*-((3*S*,4*S*)-3-cyclohexyl-2-oxo-4-(*p*-tolyl)-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)benzamide (3dk): new compound, 92% yield, 85% ee, 90 mg, $[\alpha]^{20}_D$ = +314.28 (*c* 1.0, $CHCl_3$), yellow oil, R_f = 0.65 (hexanes/ethyl acetate 5/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, *J* = 8.3 Hz, 1H), 7.87 (d, *J* = 8.1 Hz, 1H), 7.60 (ddd, *J* = 31.4, 16.2, 7.5 Hz, 5H), 7.46 (t, *J* = 7.2 Hz, 1H), 7.38 (t, *J* = 7.5 Hz, 2H), 7.30 (d, *J* = 8.4 Hz, 1H), 7.20 (s, 1H), 7.15 (d, *J* = 7.9 Hz, 2H), 6.95 (d, *J* = 7.9 Hz, 2H), 5.62 (s, 1H), 2.37-2.20 (m, 1H), 2.18 (s, 3H), 2.11-2.03 (m, 1H), 1.75-1.61 (m, 4H), 1.52 (d, *J* = 9.9 Hz, 1H), 1.16-0.84 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.2, 167.4, 145.0, 137.4, 136.1, 135.6, 133.8, 131.5, 129.5, 128.7, 128.2, 128.0, 127.0, 127.0, 126.9, 126.4, 125.7, 123.2, 121.3, 120.9, 67.0, 47.0, 44.8, 29.2, 29.0, 27.0, 26.7, 26.0, 21.1. HPLC: Chiralcel IC column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 98/2, flow = 0.7 mL/min, retention time 8.0 min (maj) and 8.9 min. HRMS Calculated for $C_{33}H_{32}NO_3$ $[M+H]^+$ 490.2377, found 490.2376.



4. The determination of Absolute Configuration of (+)-3af

The *n*-hexane (5 mL) and toluene (0.5 mL) was slowly added into solution of (+)-*N*-3-benzyl-2-oxo-4-phenyl-3,4-dihydro-2*H*-benzo[*h*]chromen-3-yl)-3,5-dimethylbenzamide (**3af**) in dichloromethane (0.5 mL), then the solvent was slowly evaporated and single crystal of **3af** was obtained after 4 days. The structure showed the absolute configuration of (+)-**3af** is (3*S*,4*S*). The CCDC number is 1516157. These details can be obtained free of charge *via* www.ccdc.com.ac.uk/data_request/cif from the Cambridge Crystallographic Data Centre.



X-ray Single Crystal Structure of 3,4-dihydrocoumarin (+)-**3af**

5. References

[1]. (a) Asano, K.; Matsubara, S. *Org. Lett.* **2012**, *14*, 1620; (b) Yang, W.; Du, D.-M. *Org. Lett.* **2010**, *12*, 5450; (c) Bae, H. Y.; Some, S.; Lee, J. H.; Kim, J.-Y.; Song, M. J.; Lee, S.; Zhang, Y. J.; Song, C. E. *Adv. Synth. Catal.* **2011**, *353*, 3196.

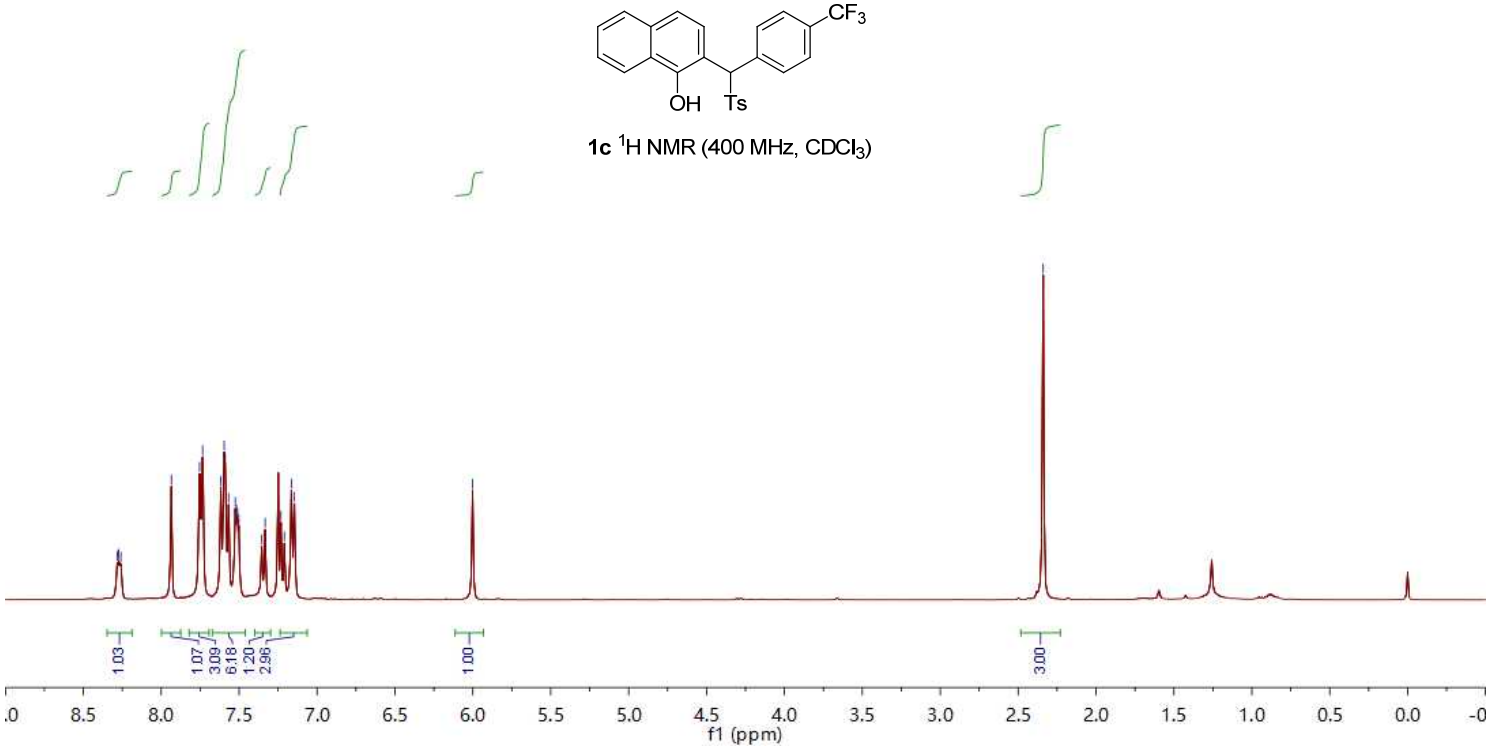
[2]. (a) Chen, M.-W.; Cao, L.-L.; Ye, Z.-S.; Jiang, G.-F.; Zhou, Y.-G. *Chem. Commun.* **2013**, *49*, 1660; (b) Wu, B.; Gao, X.; Chen, M.-W.; Zhou, Y.-G. *Chin. J. Chem.* **2014**, *32*, 981; (c) Wu, B.; Gao, X.; Yan, Z.; Huang, W.-X.; Zhou, Y.-G. *Tetrahedron Lett.* **2015**, *56*, 4334.

[3]. (a) Zhou, H.; Yang, H.; Liu, M.; Xia, C.; Jiang, G. *Org, Lett*. **2014**, *16*, 5350; (b) Shaw, S. A.; Aleman, P.; Christy, J.; Kampf, J. W.; Va, P.; Vedejs, E. *J. Am. Chem. Soc*. **2006**, *128*, 925.

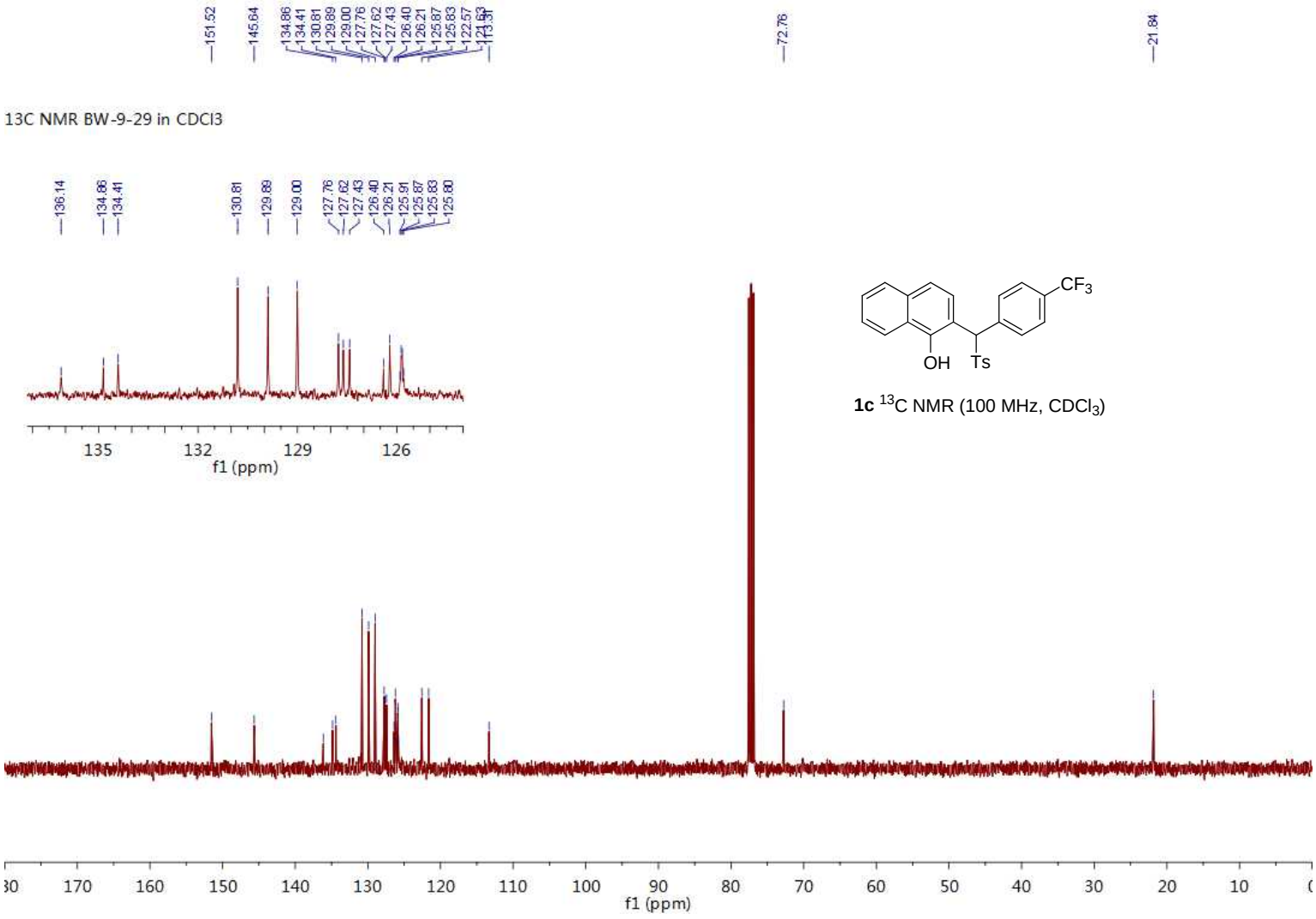
[4]. Hu, H.; Liu, Y.; Guo, J.; Lin, L.; Xu, Y.; Liu, X.; Feng, X. *Chem. Commun*. **2015**, *51*, 3835.

6. Copy of NMR and HPLC for the Compounds

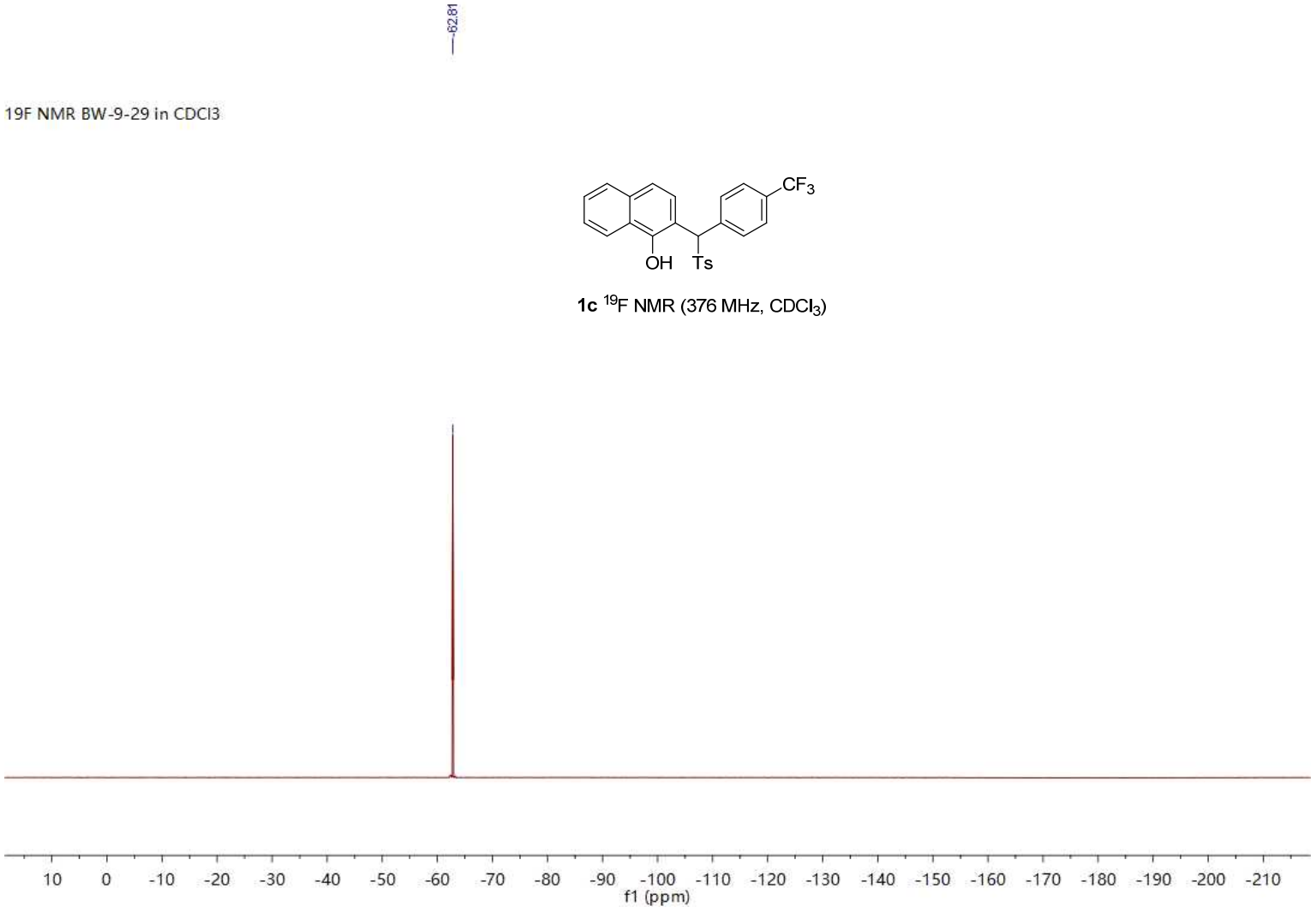
1H NMR BW-9-29 in CDCl3



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

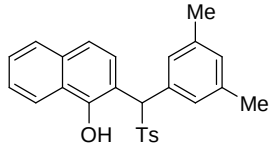


1c ^{13}C NMR (100 MHz, $CDCl_3$)

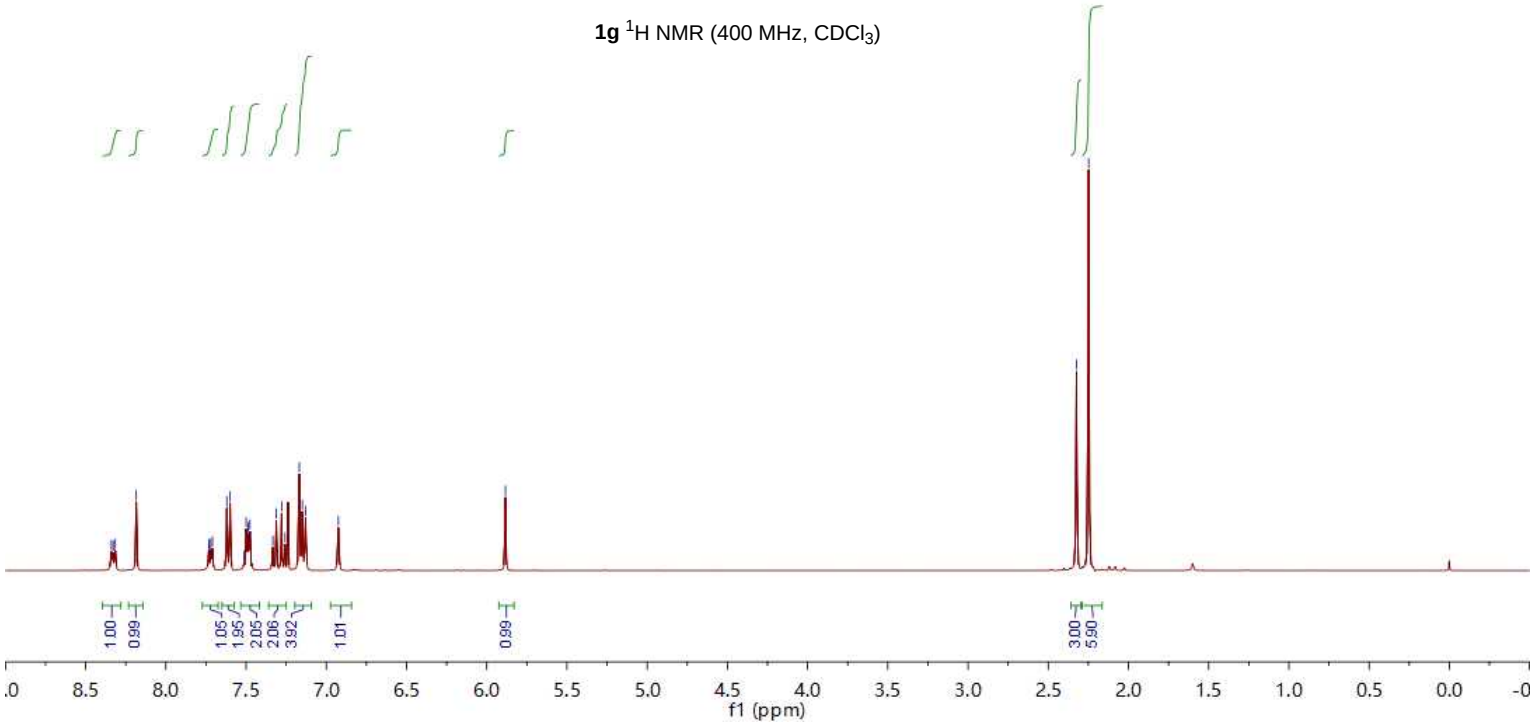


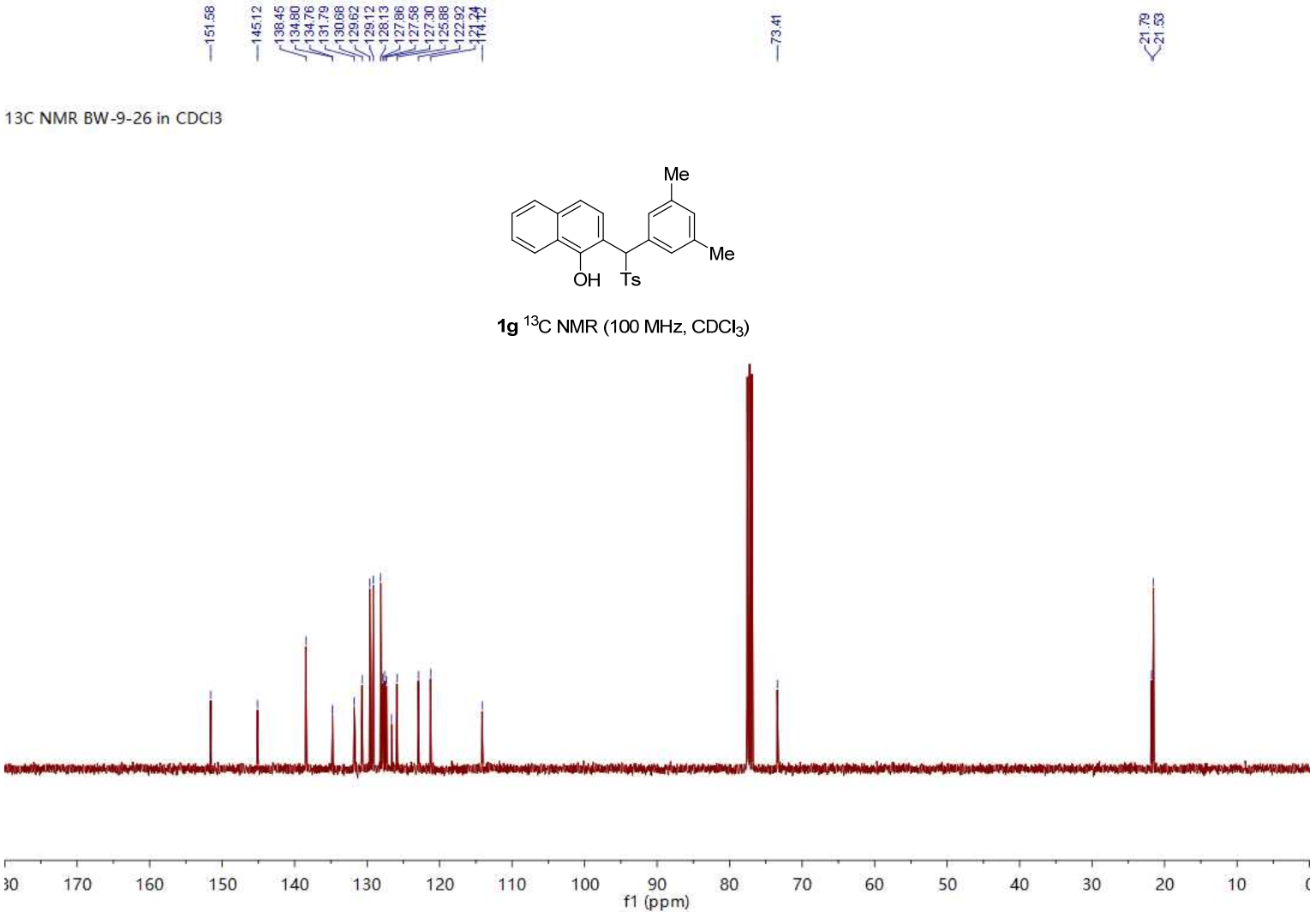
1c ^{19}F NMR (376 MHz, $CDCl_3$)

1H NMR BW-9-26 in CDCl3

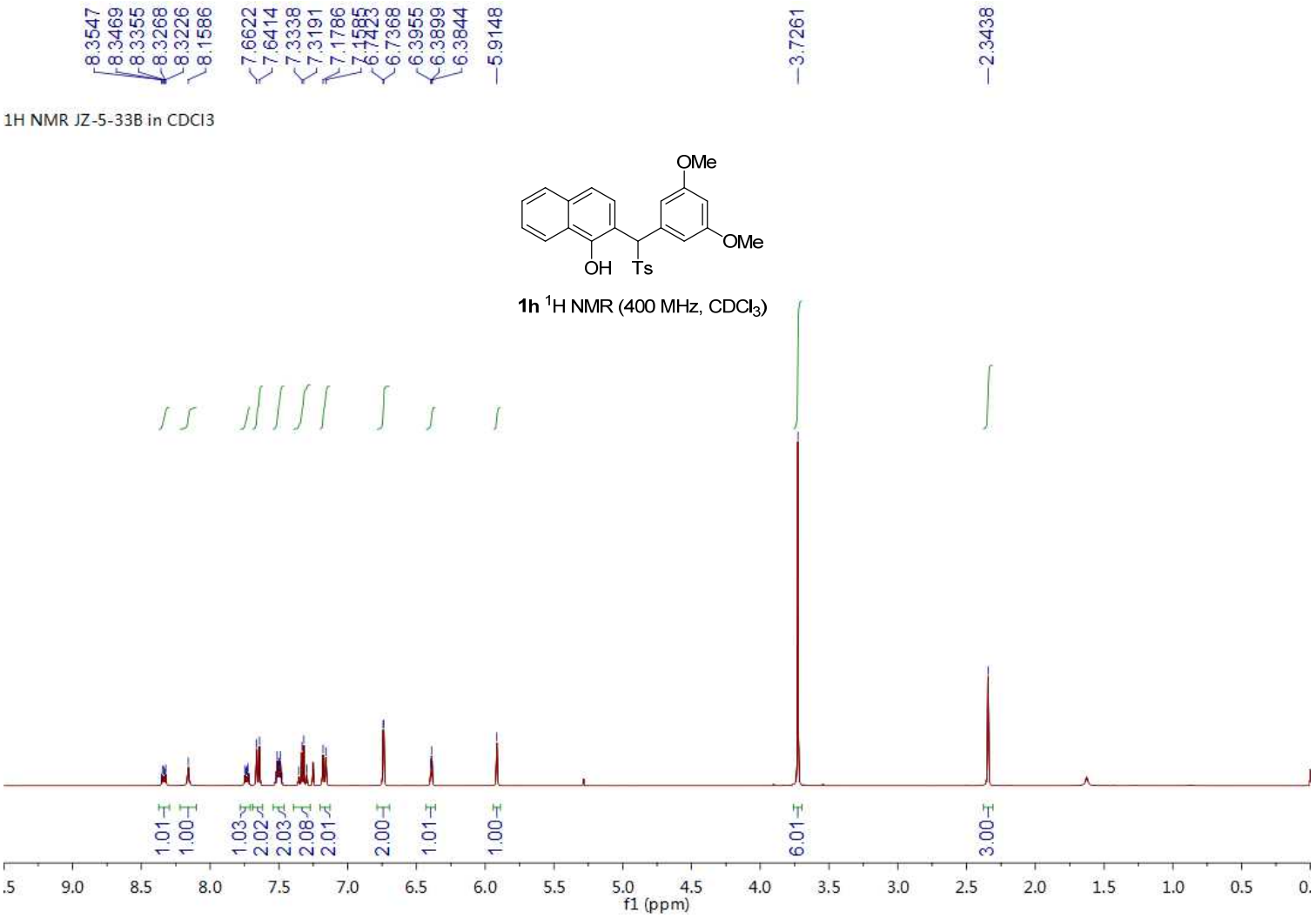


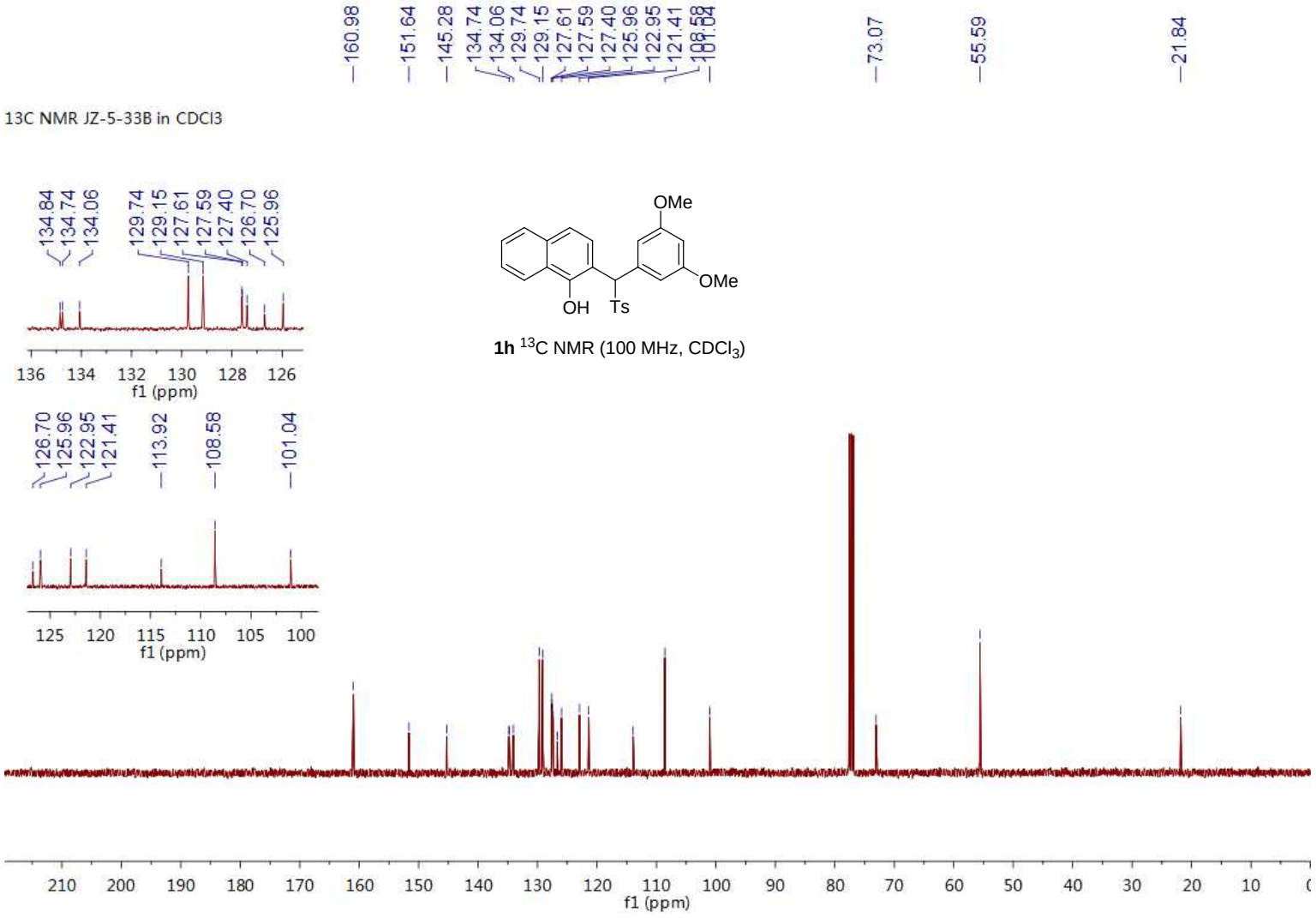
1g ^{1}H NMR (400 MHz, $CDCl_3$)



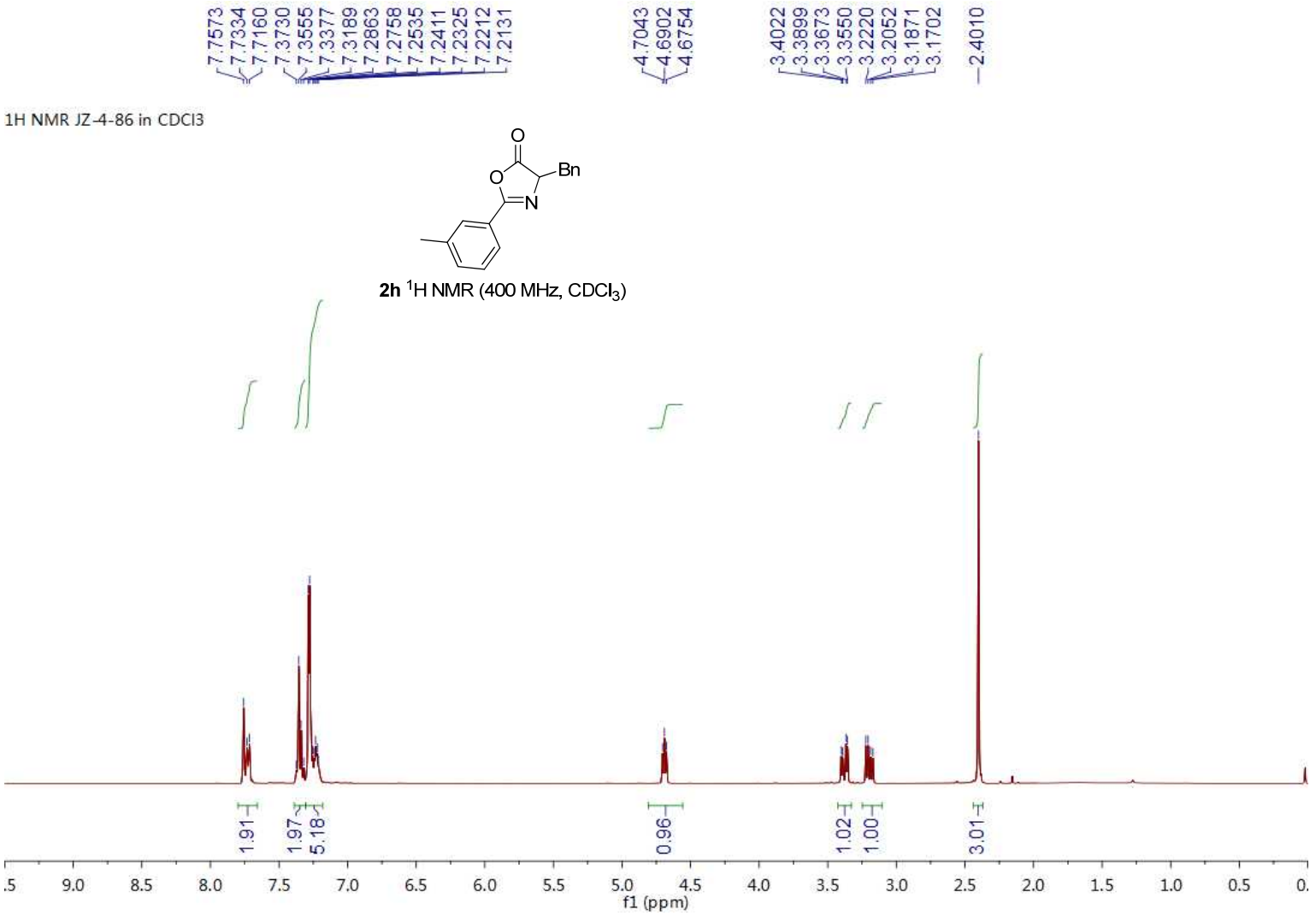


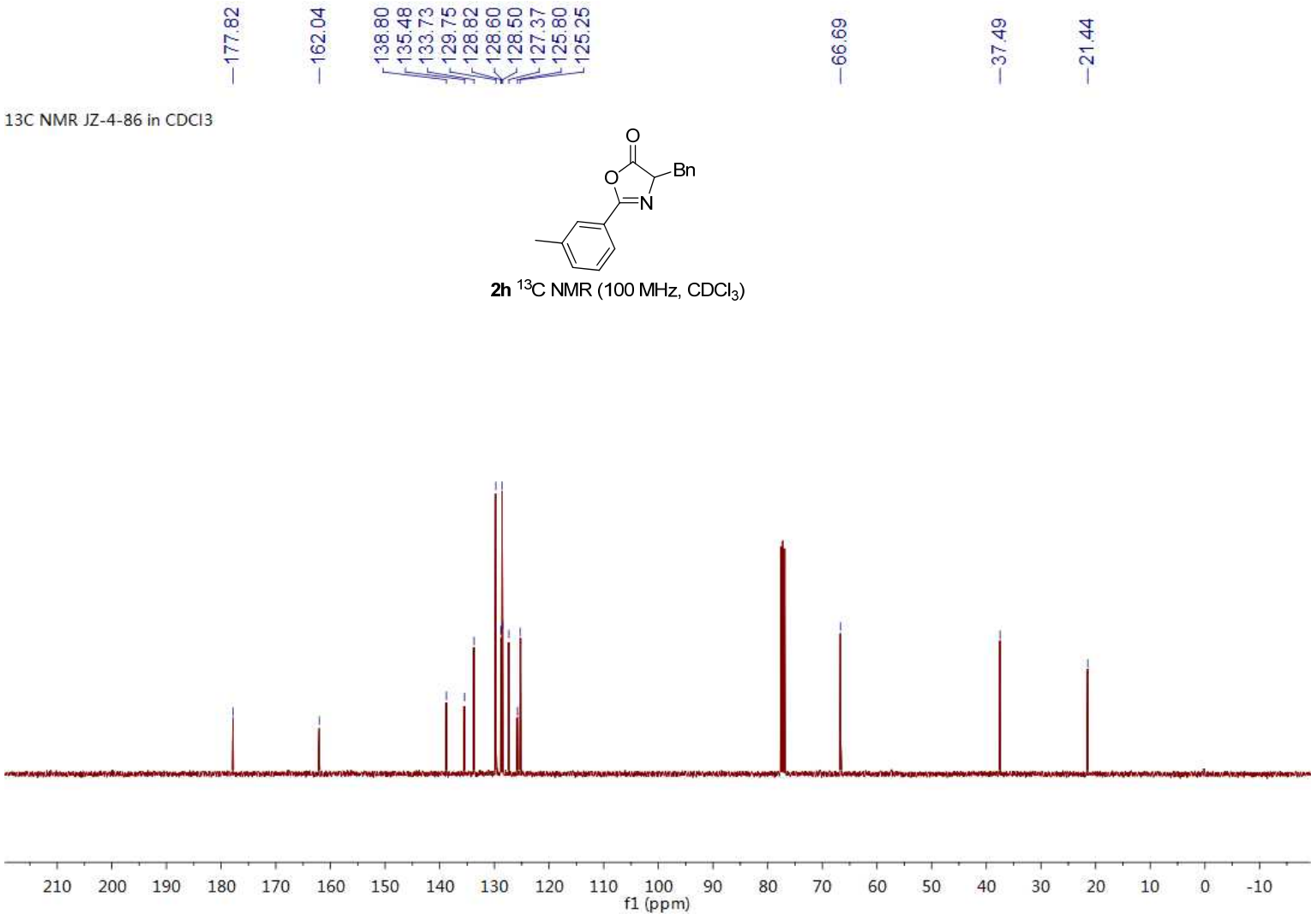
1g ^{13}C NMR (100 MHz, $CDCl_3$)


8.3547
8.3469
8.3355
8.3268
8.3226
8.1586
7.6622
7.6414
7.3338
7.3191
7.1786
6.7423
6.7368
6.3955
6.3899
6.3844
5.9148
3.7261
2.3438
1H NMR JZ-5-33B in CDCl3
OMe
OMe
OH
Ts
1h 1H NMR (400 MHz, CDCl3)
1.01
1.00
1.03
2.02
2.03
2.08
2.01
2.00
1.01
1.00
6.01
3.00
f1 (ppm)

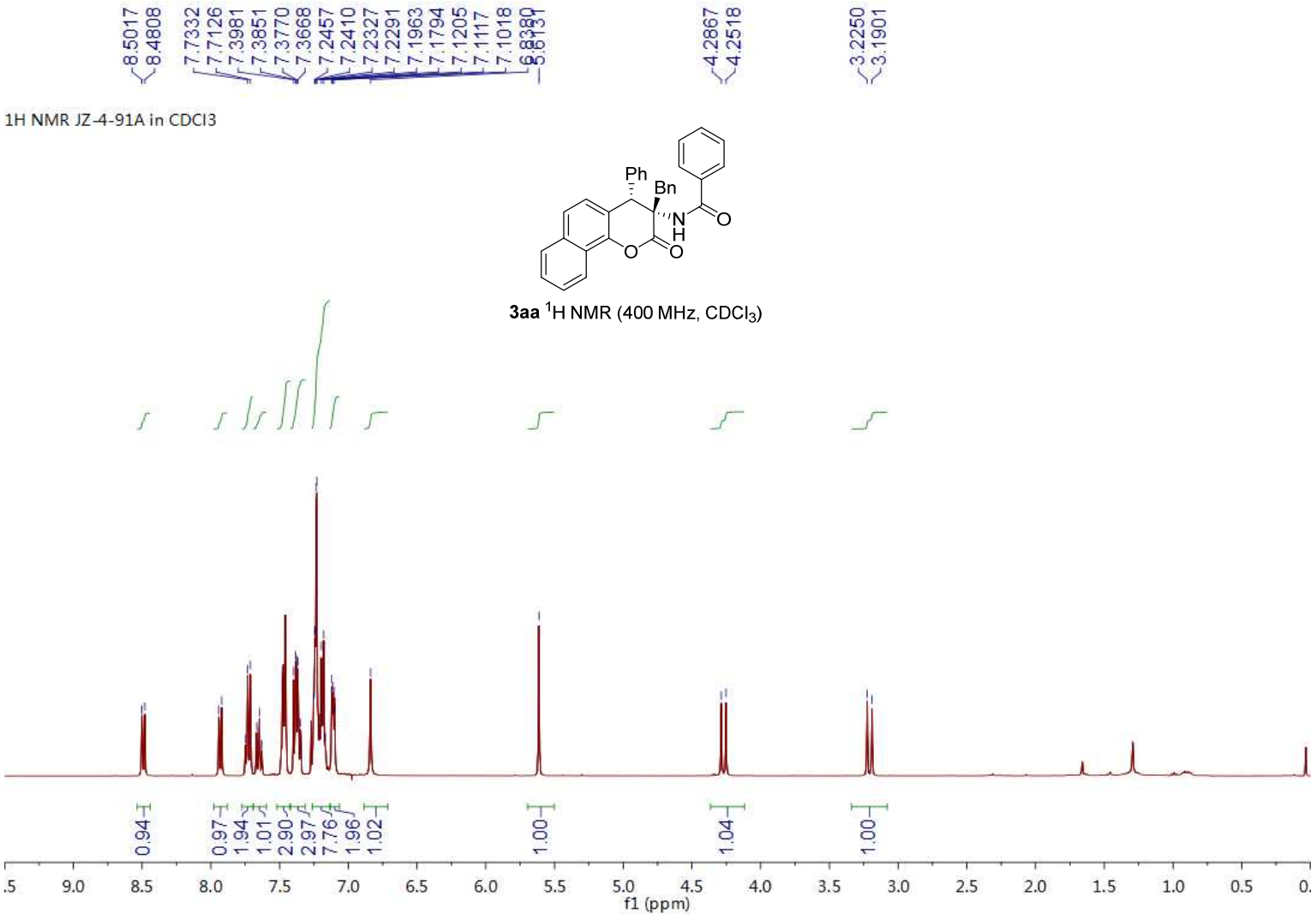


1h ^{13}C NMR (100 MHz, $CDCl_3$)

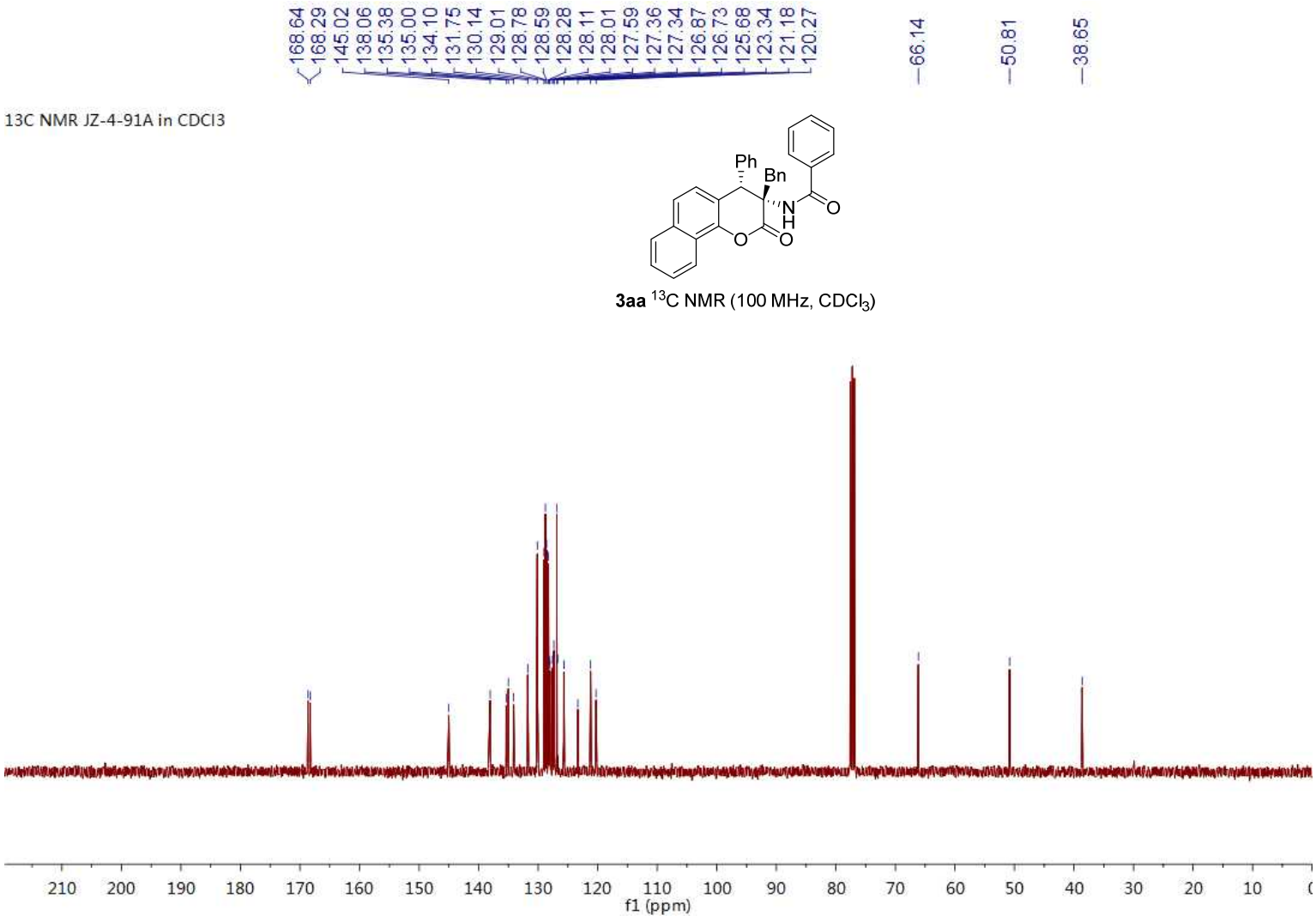

7.7573
7.7334
7.7160
7.3730
7.3555
7.3377
7.3189
7.2863
7.2758
7.2535
7.2411
7.2325
7.2212
7.2131
4.7043
4.6902
4.6754
3.4022
3.3899
3.3673
3.3550
3.2220
3.2052
3.1871
3.1702
2.4010
1H NMR JZ-4-86 in CDCl3
O
O
N
Bn
2h 1H NMR (400 MHz, CDCl3)
1.91
1.97
5.18
0.96
1.02
1.00
3.01
f1 (ppm)



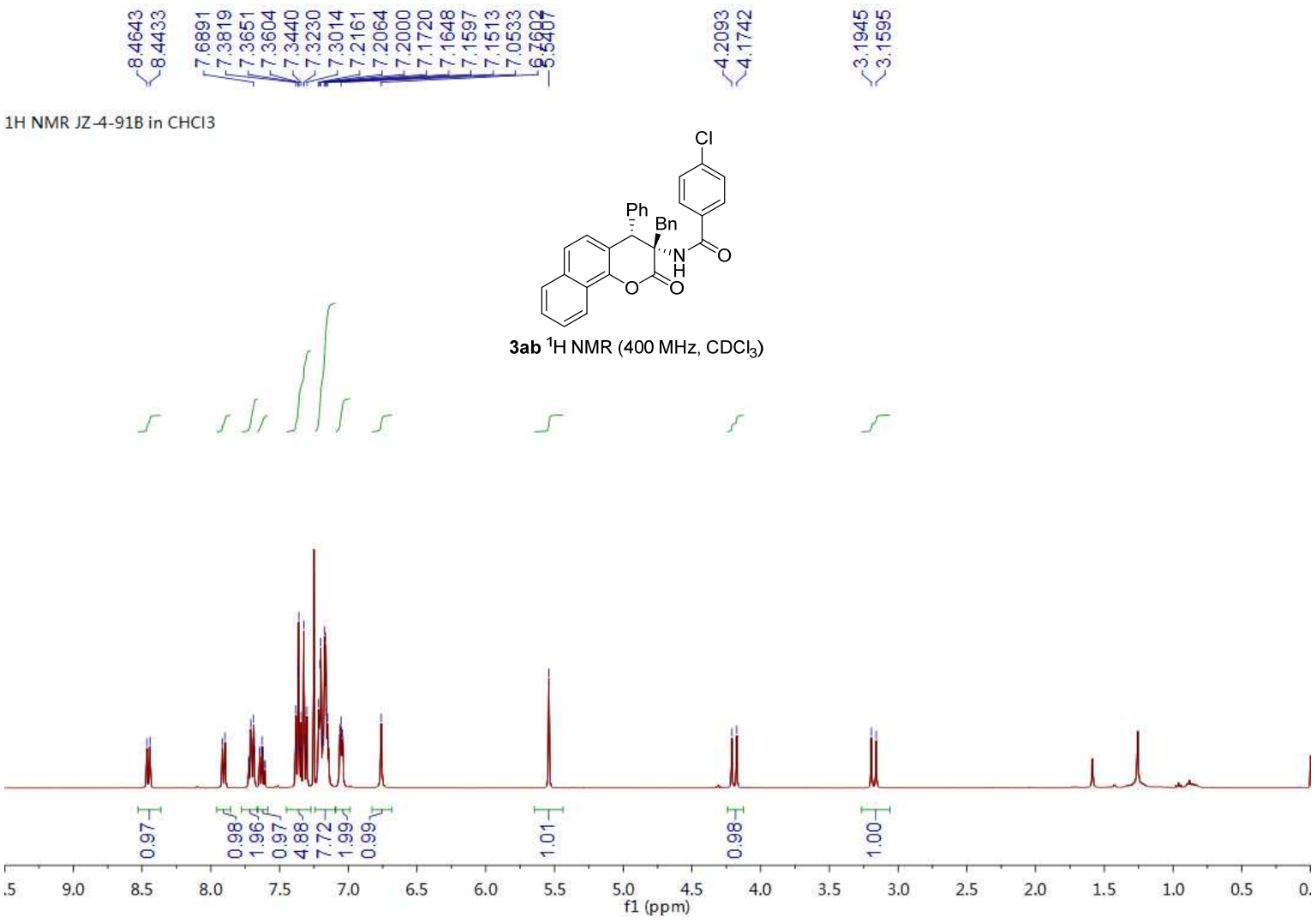
2h ^{13}C NMR (100 MHz, $CDCl_3$)

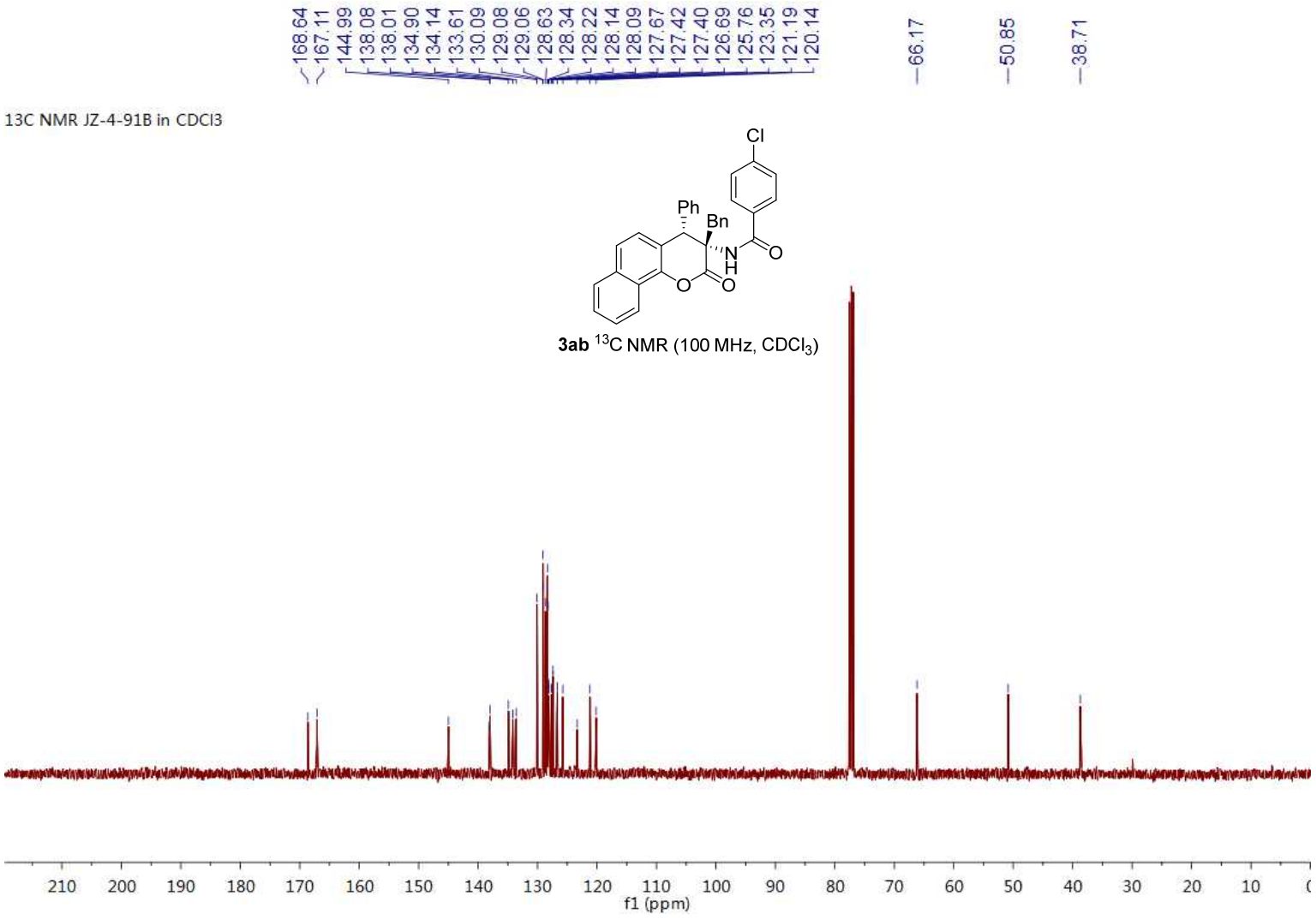


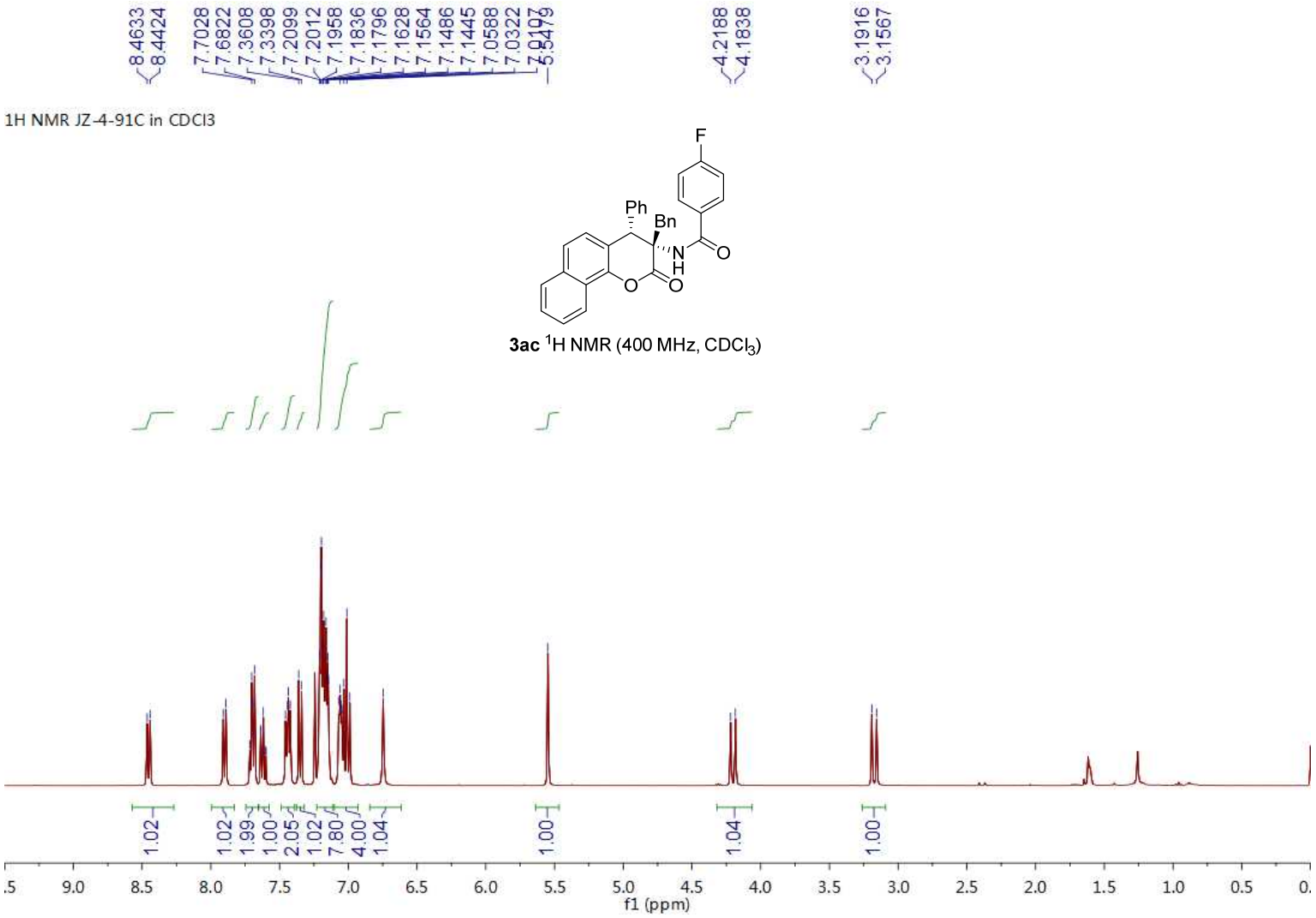
3aa ^{1}H NMR (400 MHz, $CDCl_3$)



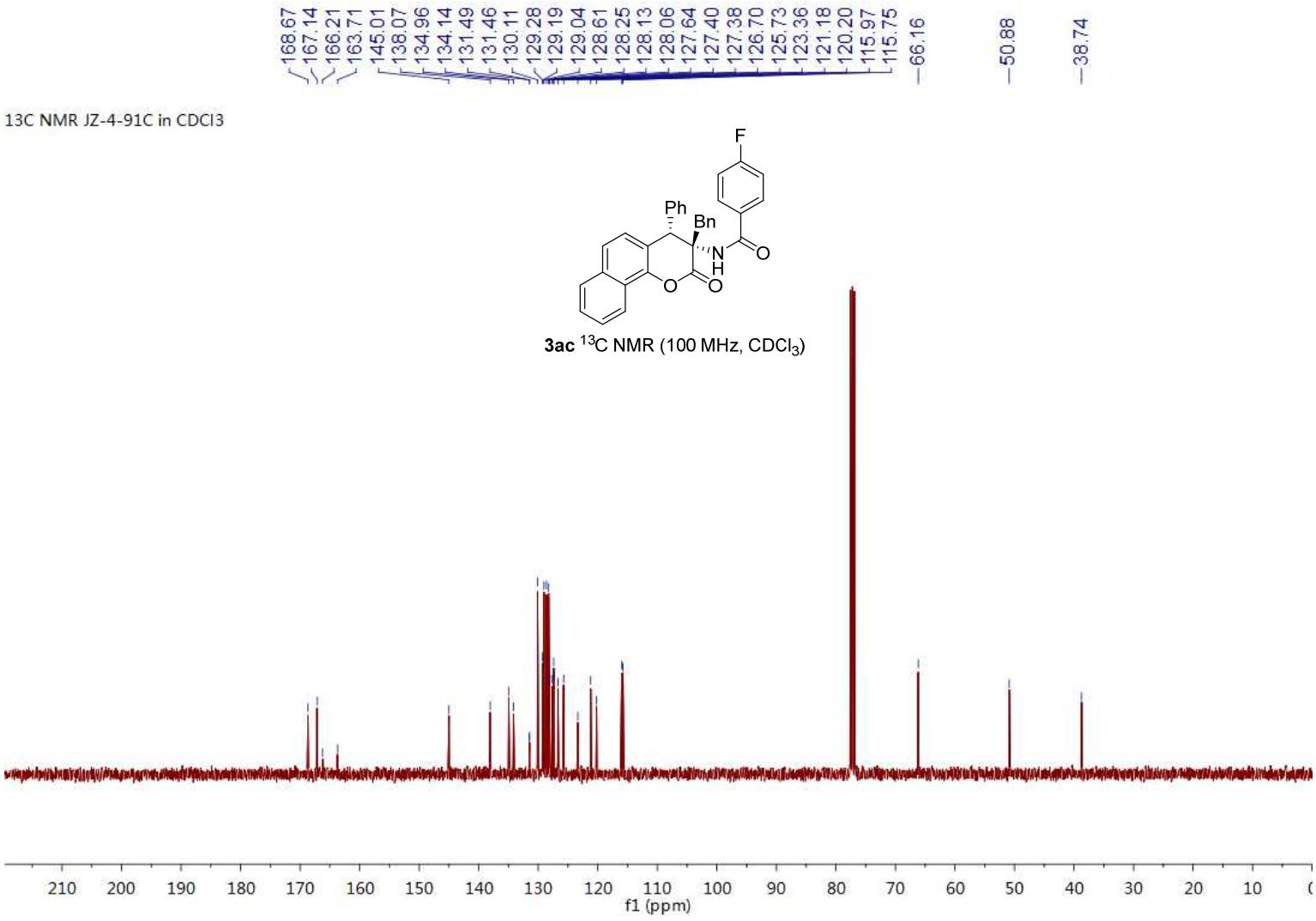
3aa ^{13}C NMR (100 MHz, $CDCl_3$)


8.4643
8.4433
7.6891
7.3819
7.3651
7.3604
7.3440
7.3230
7.3014
7.2161
7.2064
7.2000
7.1720
7.1648
7.1597
7.1513
7.0533
4.2093
4.1742
3.1945
3.1595
1H NMR JZ-4-91B in CHCl3
Cl
Ph
Bn
N
H
O
O
O
3ab 1H NMR (400 MHz, CDCl3)
0.97
0.98
1.96
0.97
4.88
7.72
1.99
0.99
1.01
0.98
1.00
f1 (ppm)


168.64
167.11
144.99
138.08
138.01
134.90
134.14
133.61
130.09
129.08
129.06
128.63
128.34
128.22
128.14
128.09
127.67
127.42
127.40
126.69
125.76
123.35
121.19
120.14
66.17
50.85
38.71
13C NMR JZ-4-91B in CDCl3
Cl
Ph
Bn
N
H
O
O
O
3ab 13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



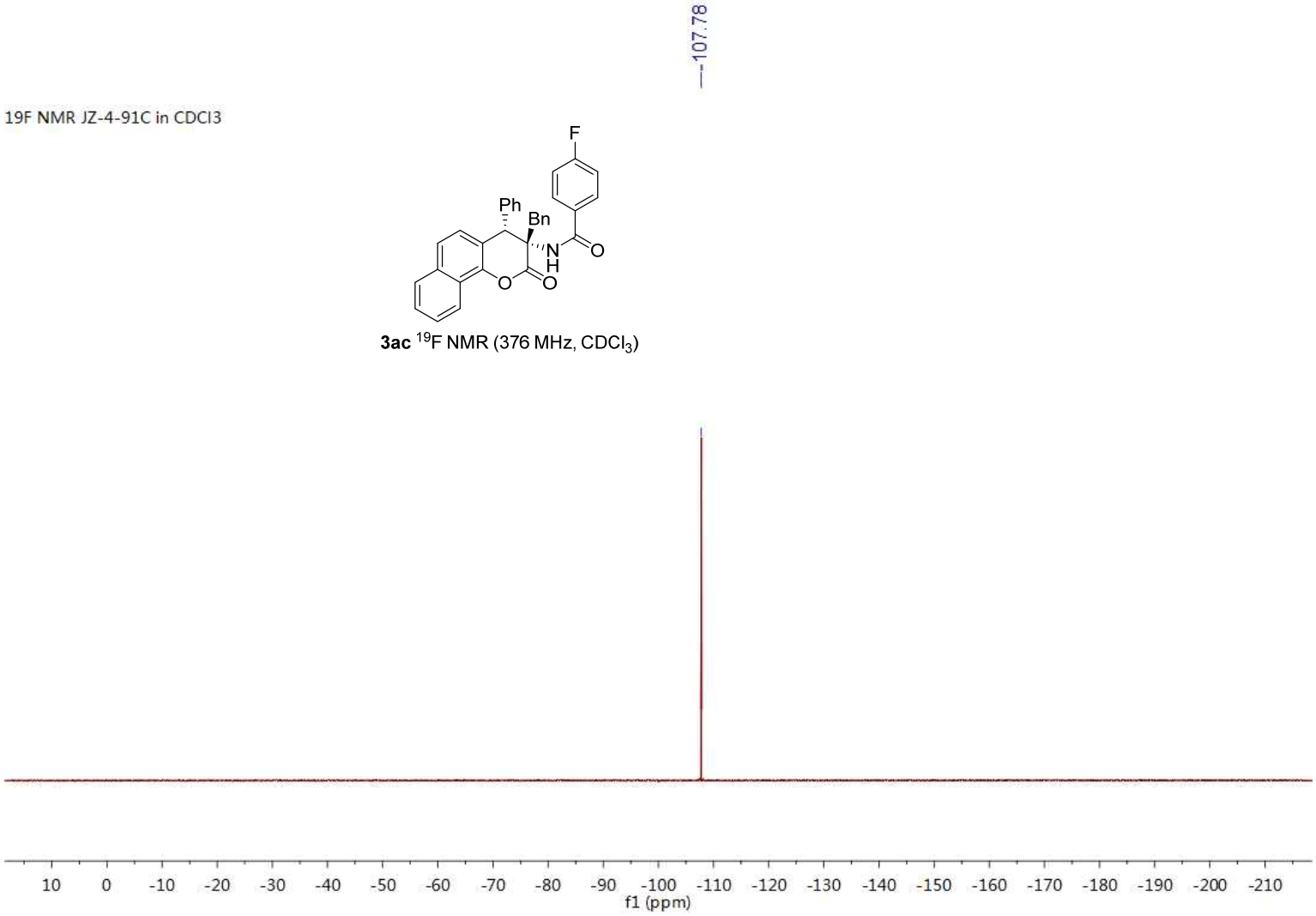
3ac ^{1}H NMR (400 MHz, $CDCl_3$)

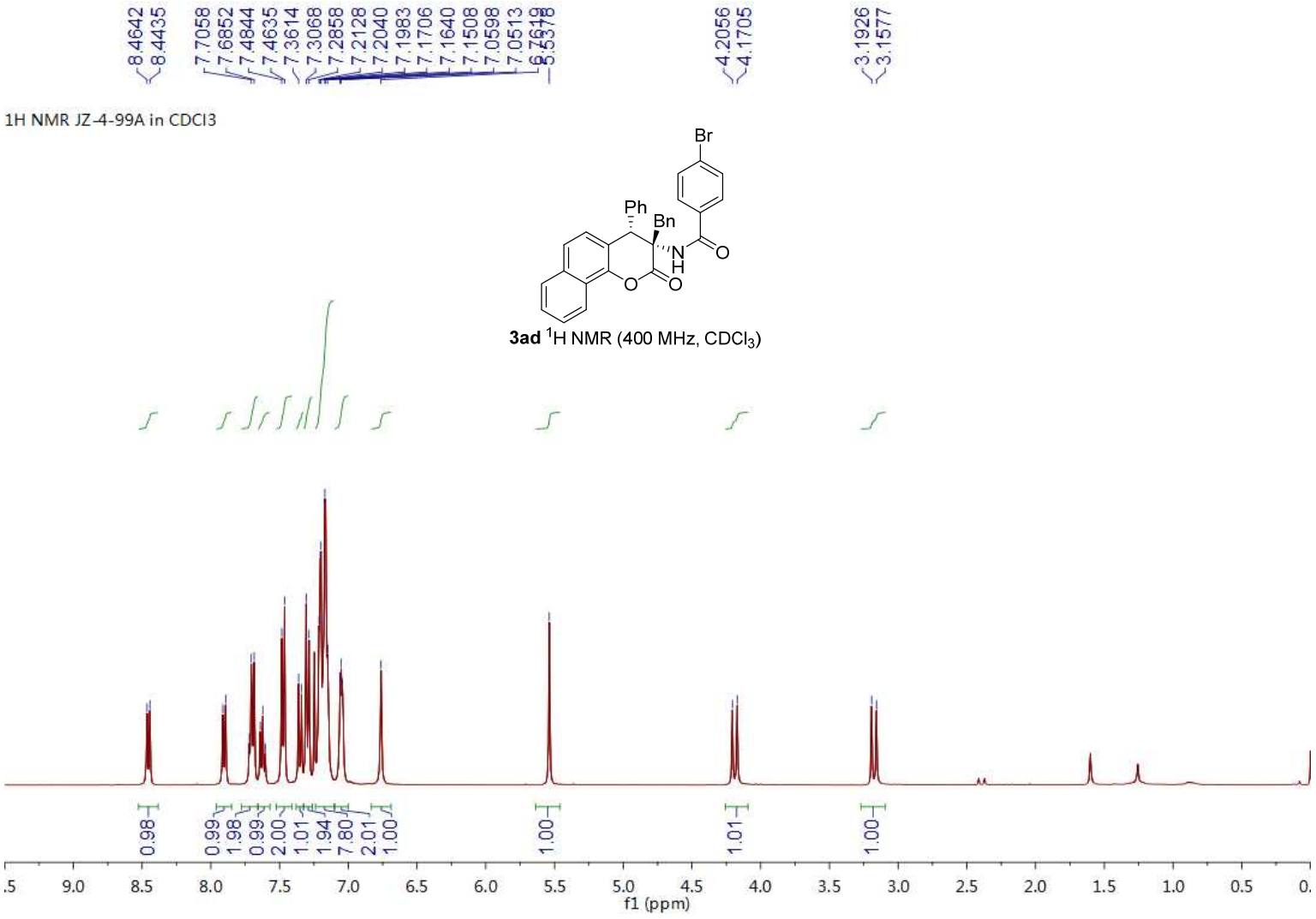


3ac ^{13}C NMR (100 MHz, $CDCl_3$)

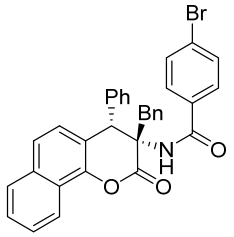
19F NMR JZ-4-91C in CDCl3

3ac ^{19}F NMR (376 MHz, $CDCl_3$)

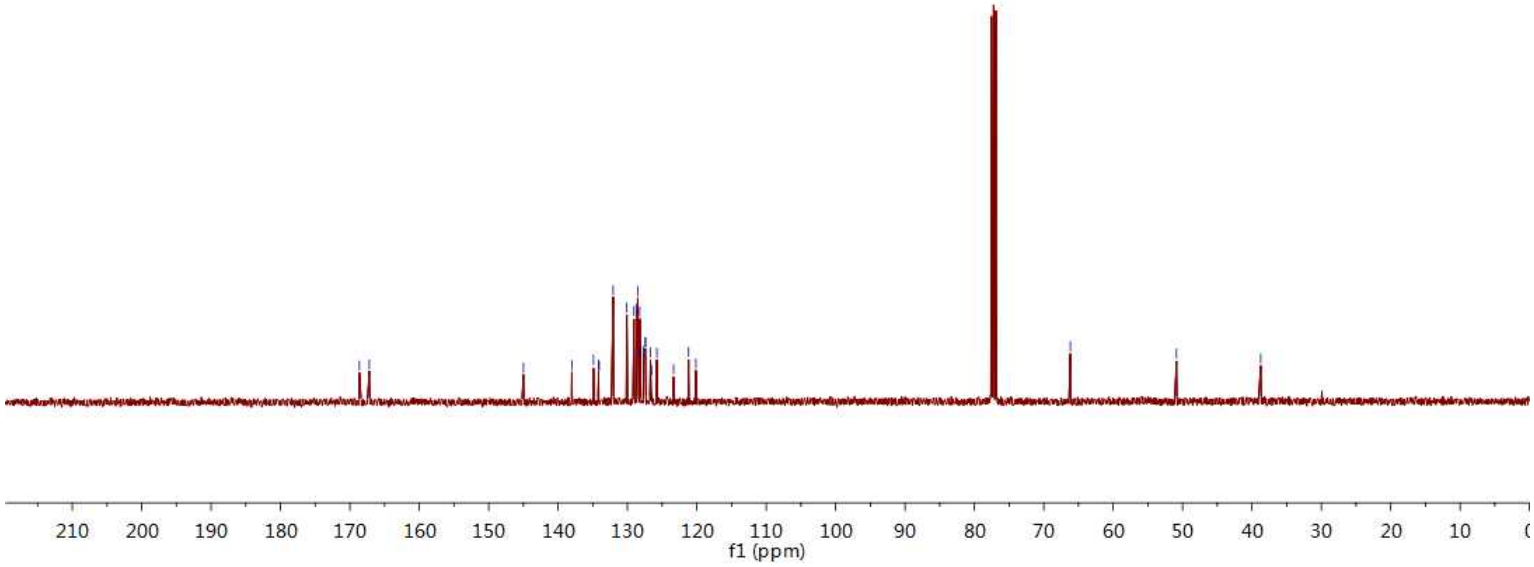


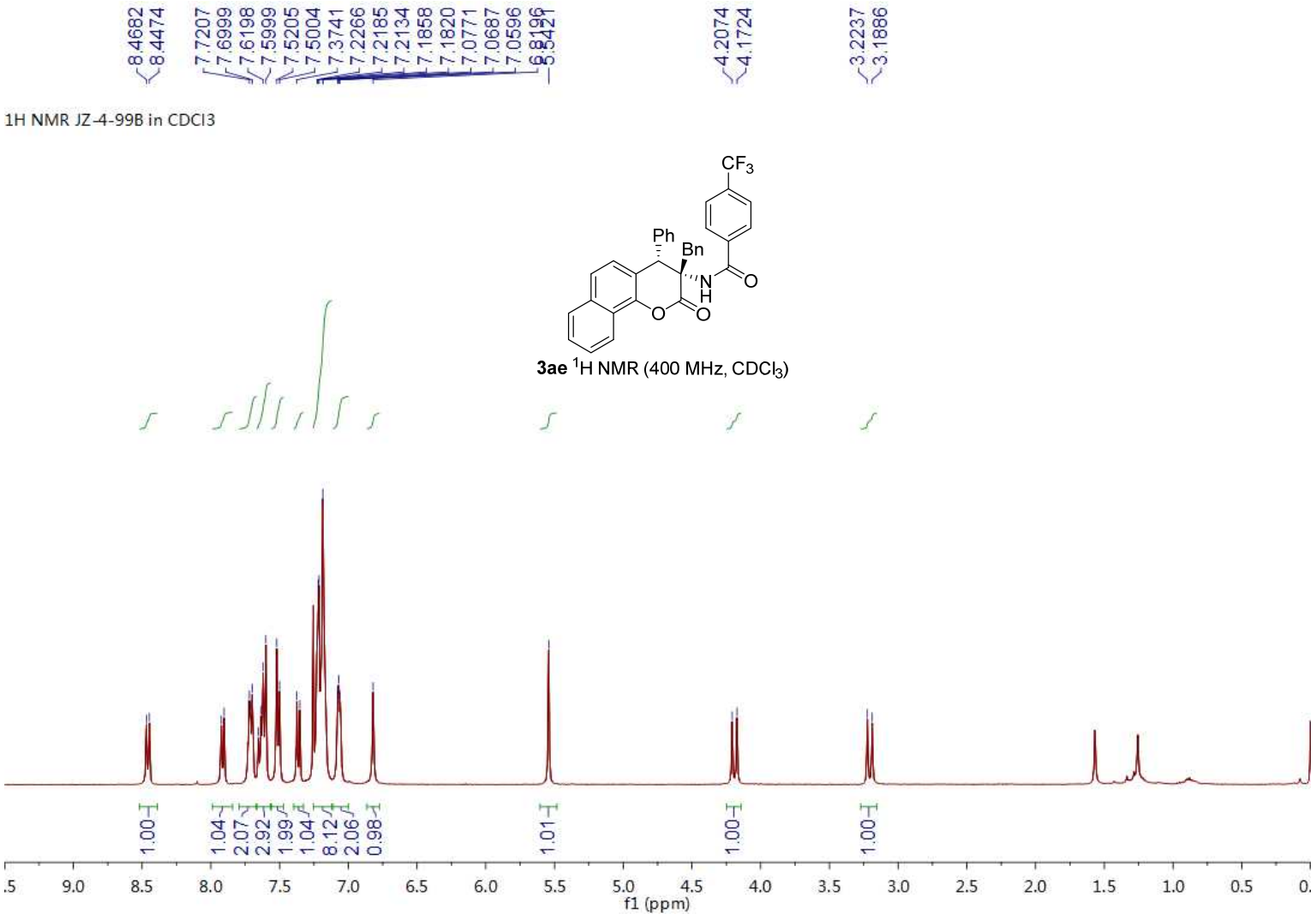

8.4642
8.4435
7.7058
7.6852
7.4844
7.4635
7.3614
7.3068
7.2858
7.2128
7.2040
7.1983
7.1706
7.1640
7.1508
7.0598
7.0513
4.2056
4.1705
3.1926
3.1577
1H NMR JZ-4-99A in CDCl3
Br
Ph
Bn
N
H
O
O
O
3ad 1H NMR (400 MHz, CDCl3)
0.98
0.99
1.98
0.99
2.00
1.01
1.94
7.80
2.01
1.00
1.00
1.01
1.00
f1 (ppm)

13C NMR JZ-4-99A in CDCl3

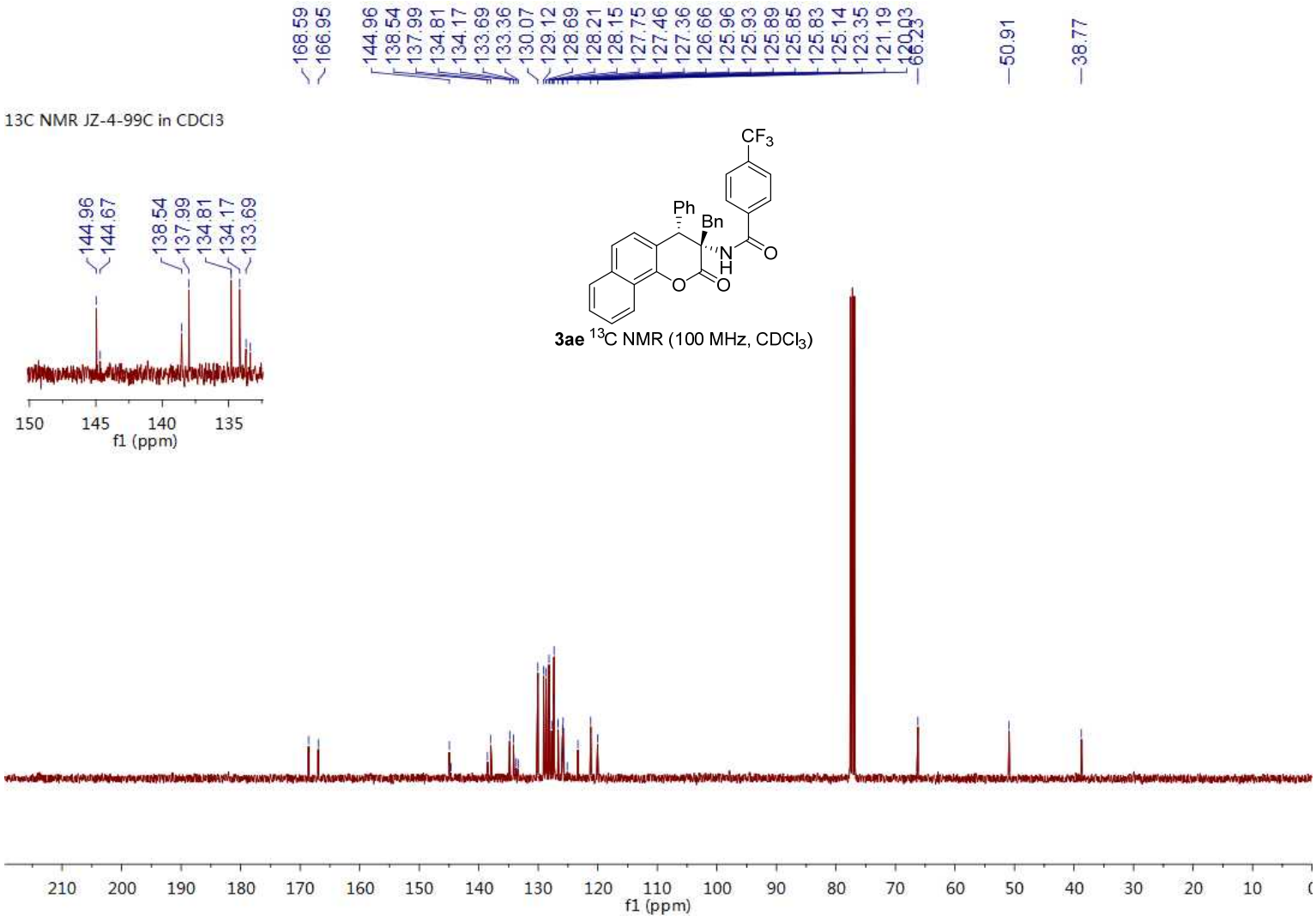


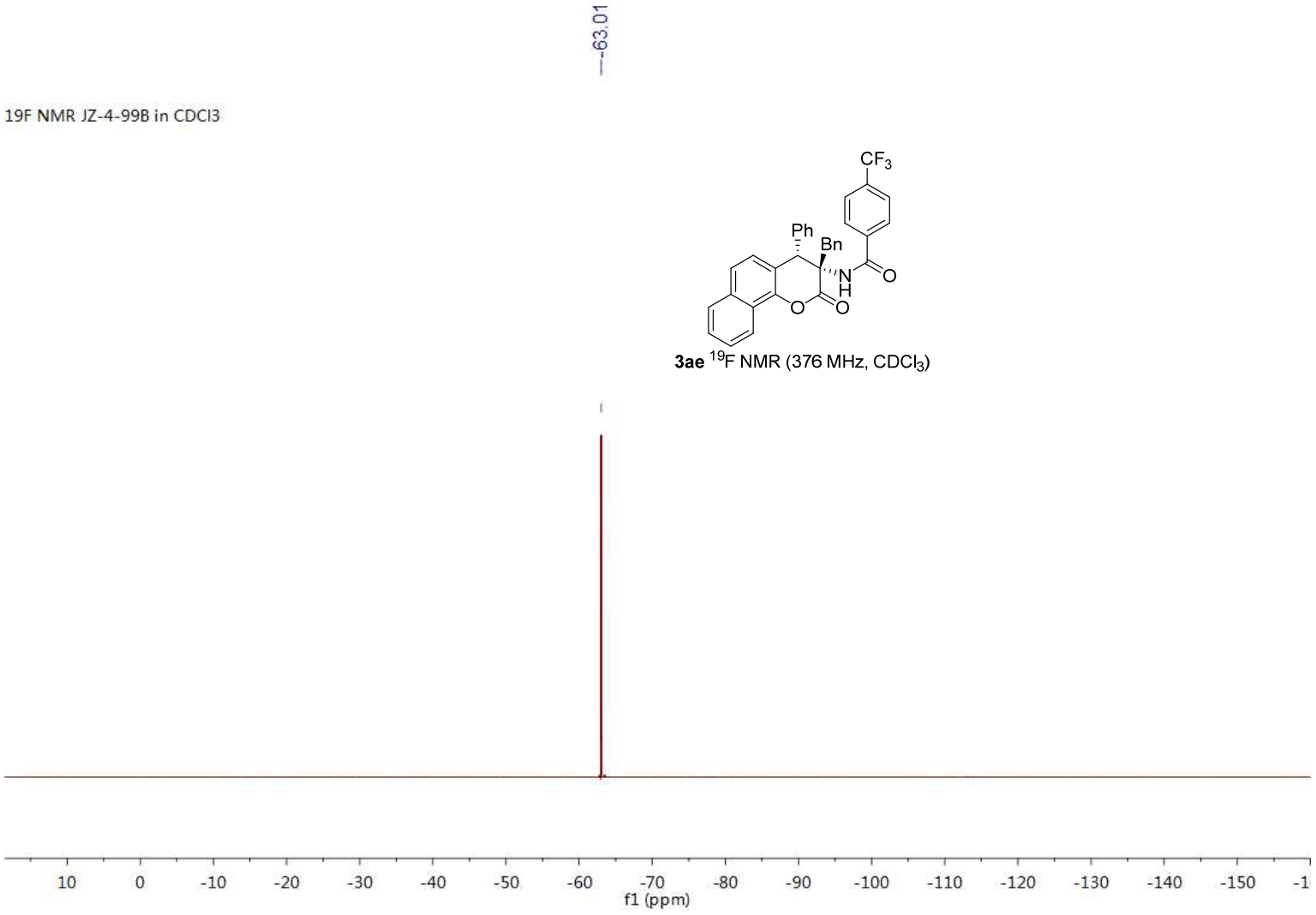
3ad ^{13}C NMR (100 MHz, $CDCl_3$)



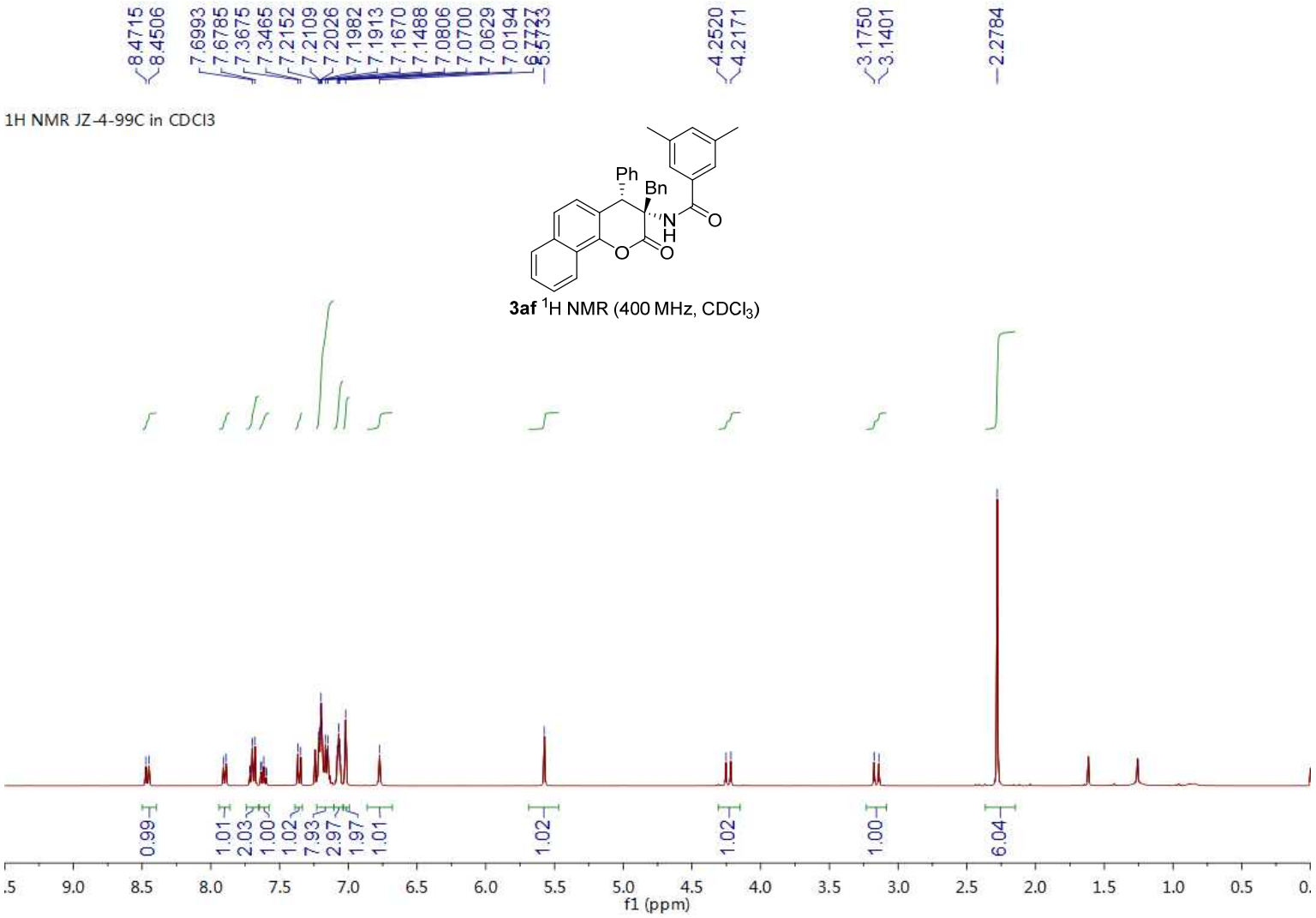


3ae ^{1}H NMR (400 MHz, $CDCl_3$)

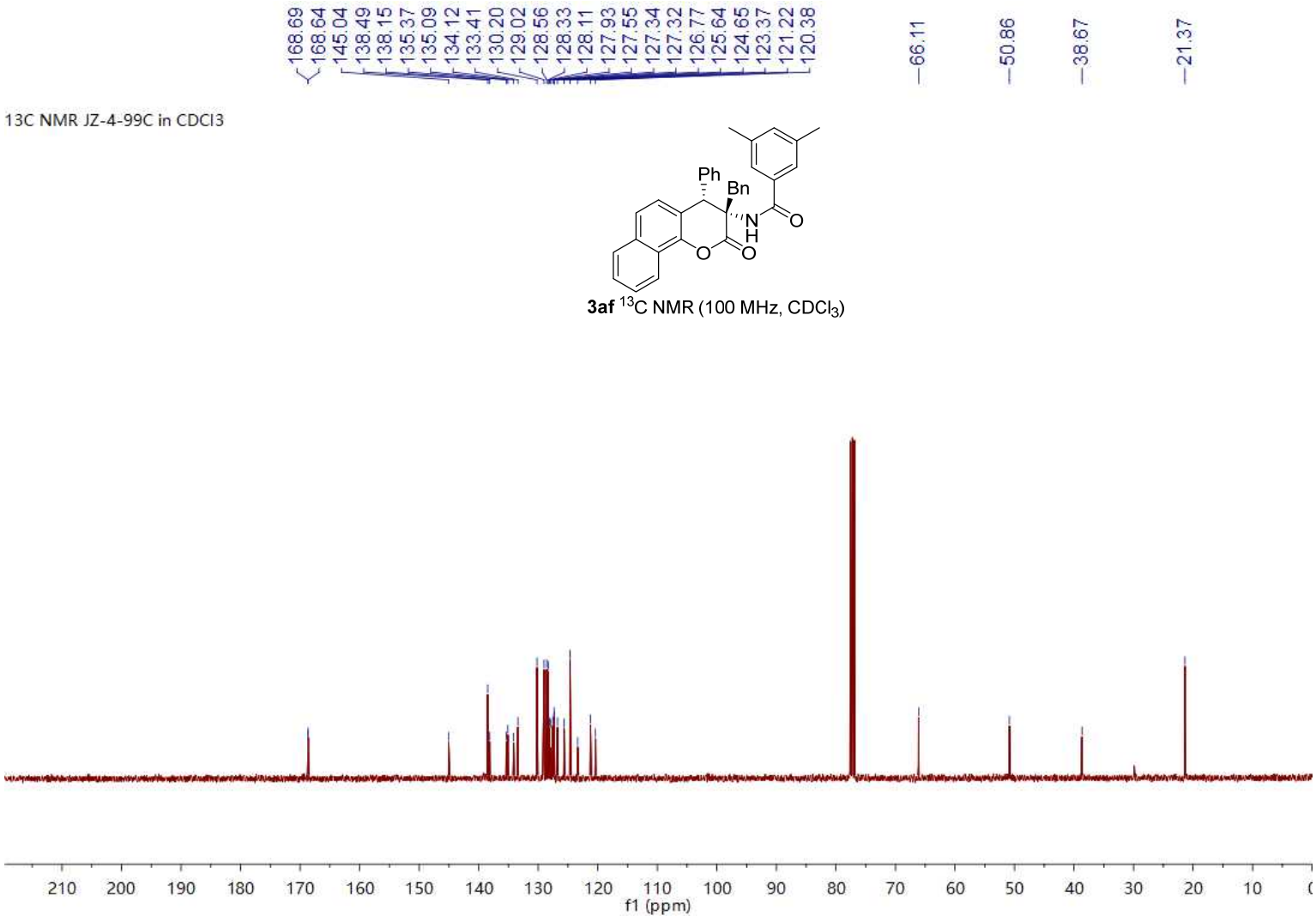

13C NMR JZ-4-99C in CDCl3
168.59
166.95
144.96
138.54
137.99
134.81
134.17
133.69
133.36
130.07
129.12
128.69
128.21
128.15
127.75
127.46
127.36
126.66
125.96
125.93
125.89
125.85
125.83
125.14
123.35
121.19
120.03
66.23
50.91
38.77
144.96
144.67
138.54
137.99
134.81
134.17
133.69
150
145
140
135
f1 (ppm)
CF3
Ph
Bn
N
H
O
O
O
3ae 13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



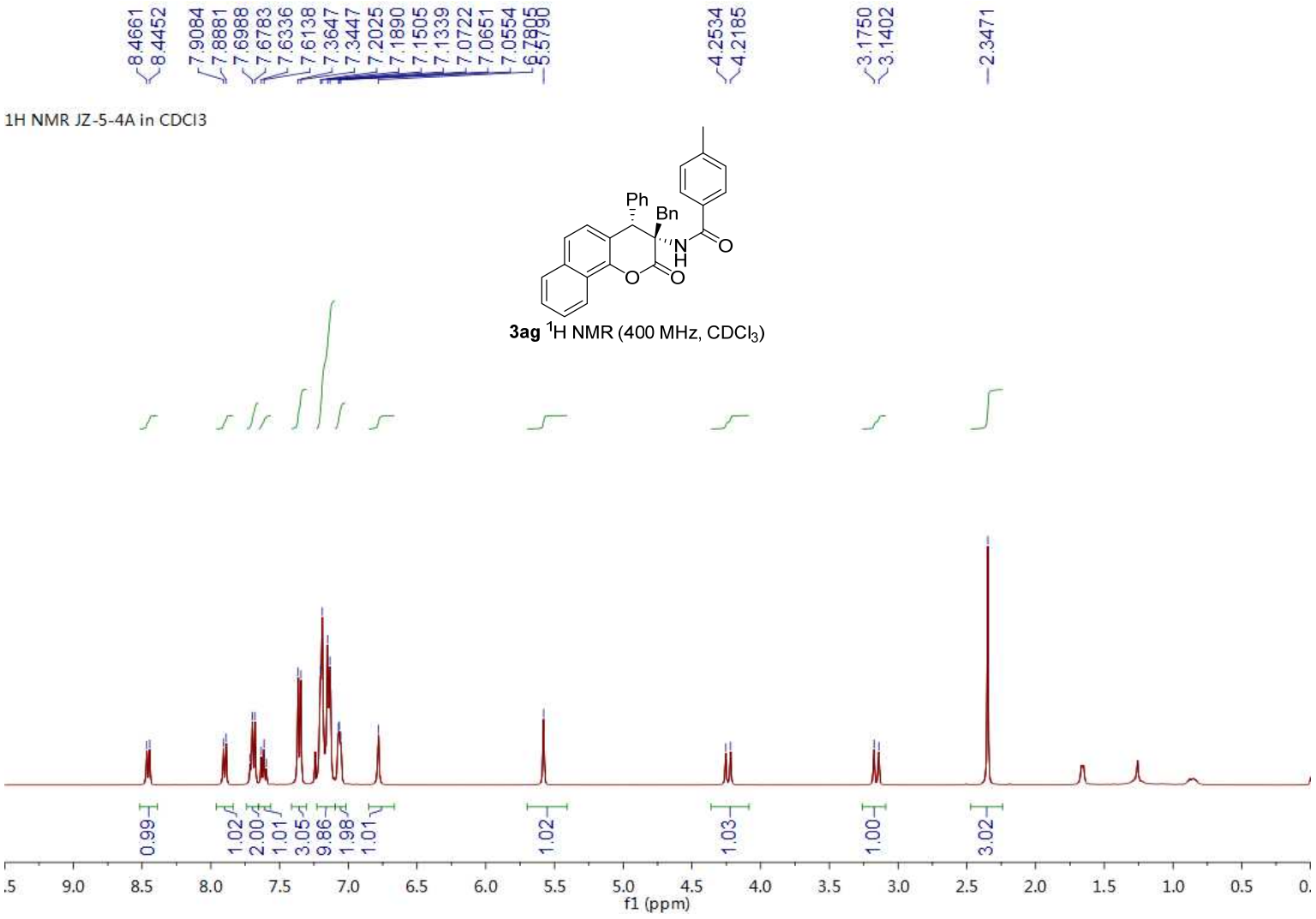
3ae ^{19}F NMR (376 MHz, $CDCl_3$)



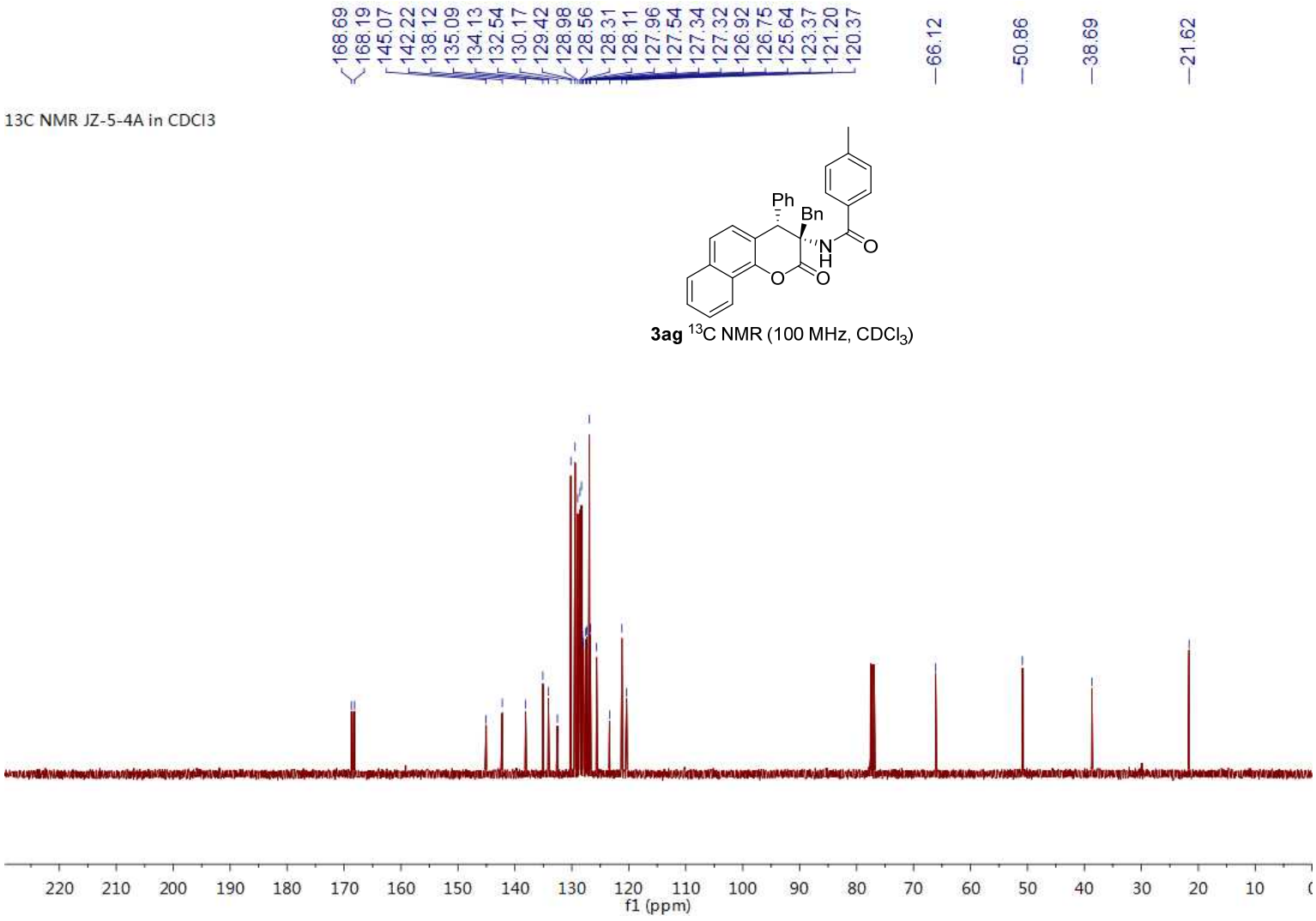
3af ^{1}H NMR (400 MHz, $CDCl_3$)



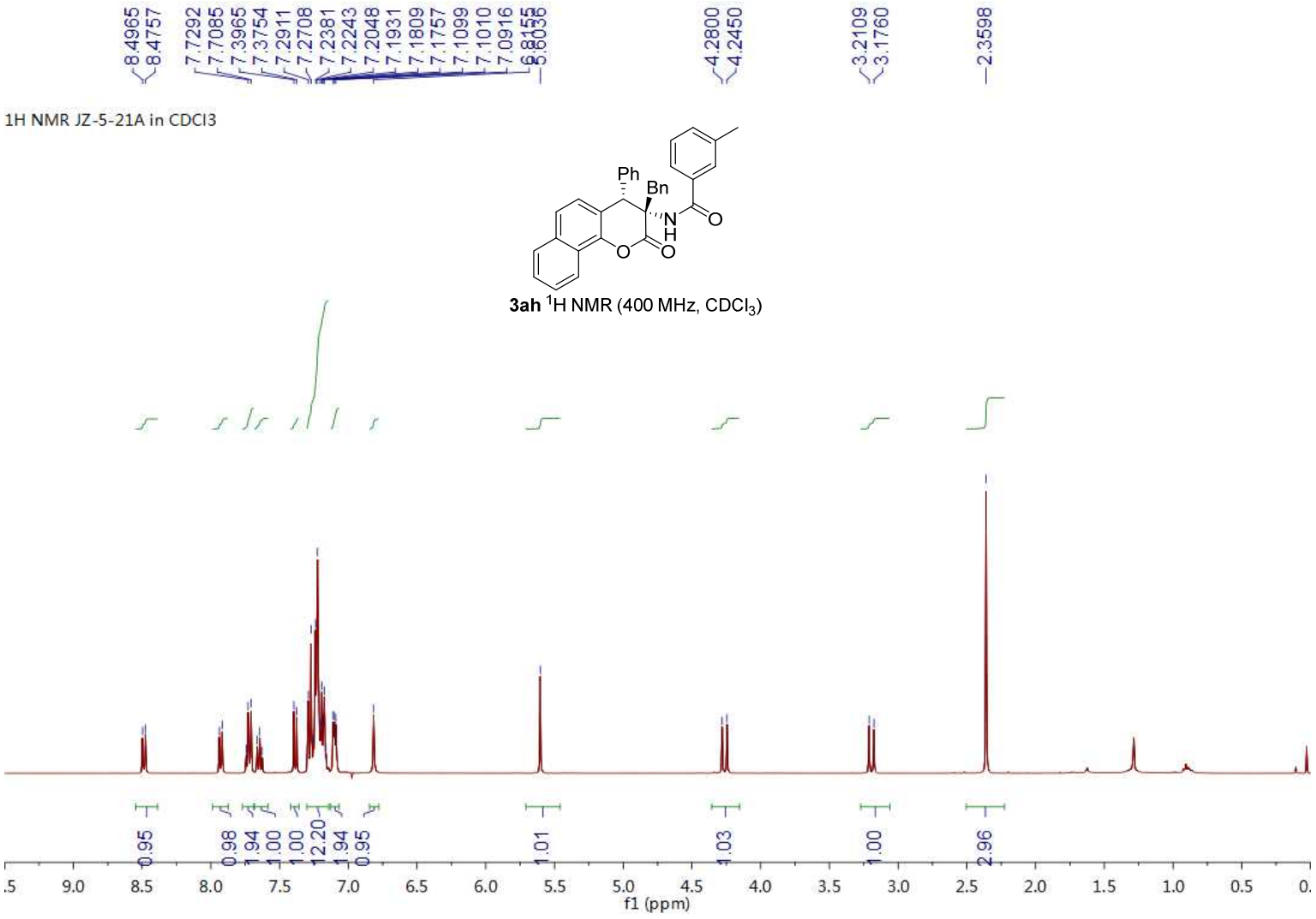
3af ^{13}C NMR (100 MHz, $CDCl_3$)



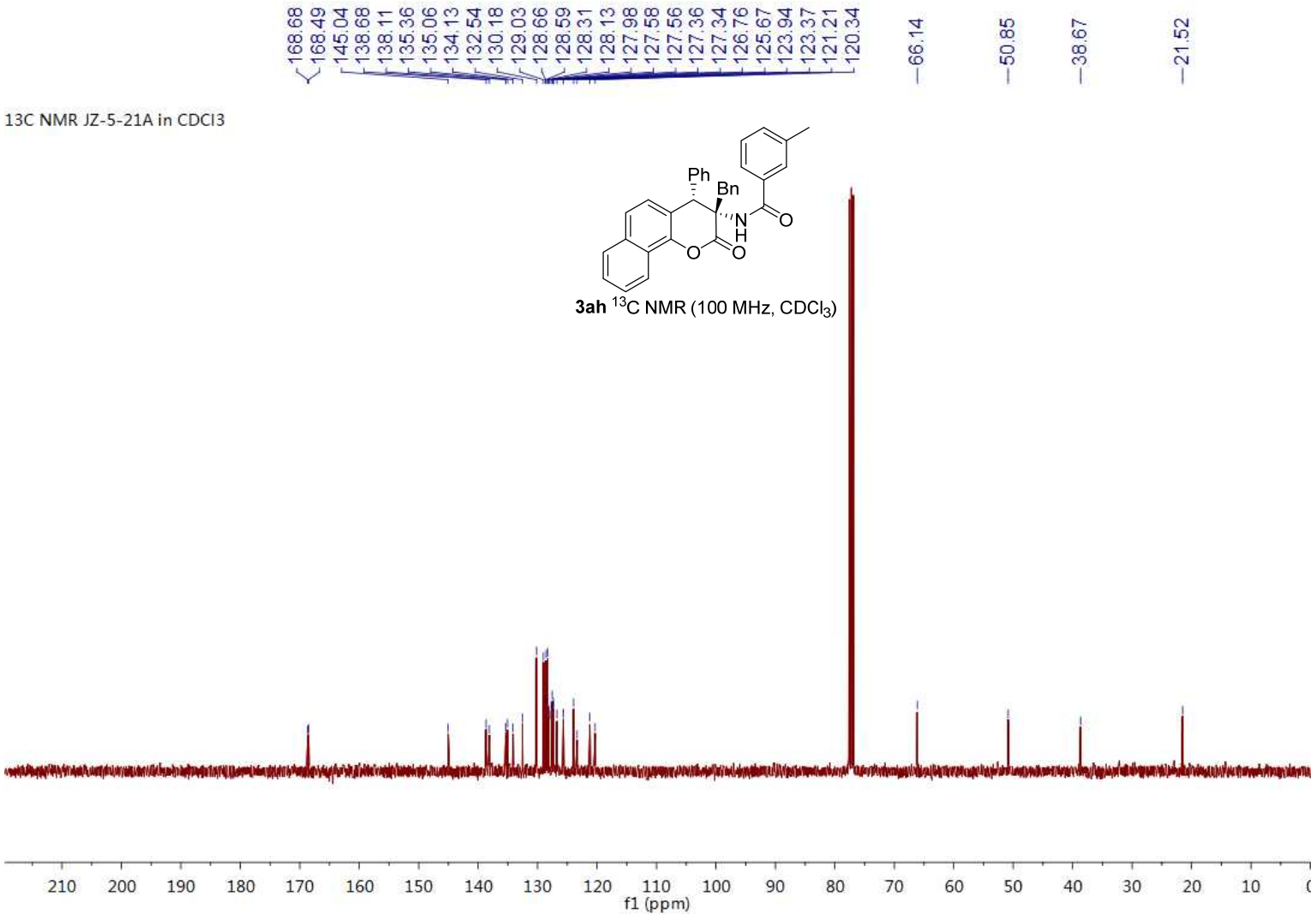
3ag ^{1}H NMR (400 MHz, $CDCl_3$)

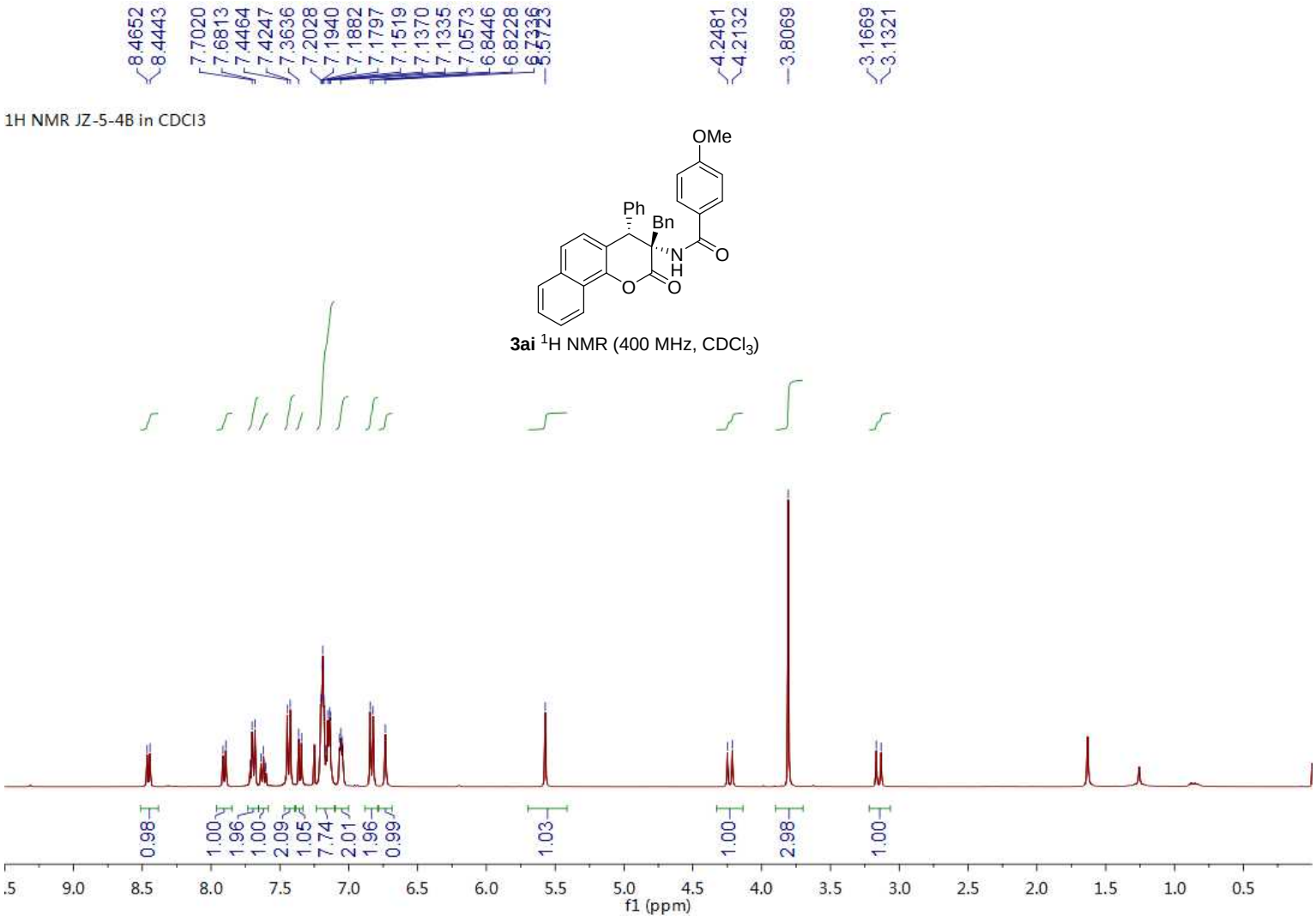


3ag ^{13}C NMR (100 MHz, $CDCl_3$)

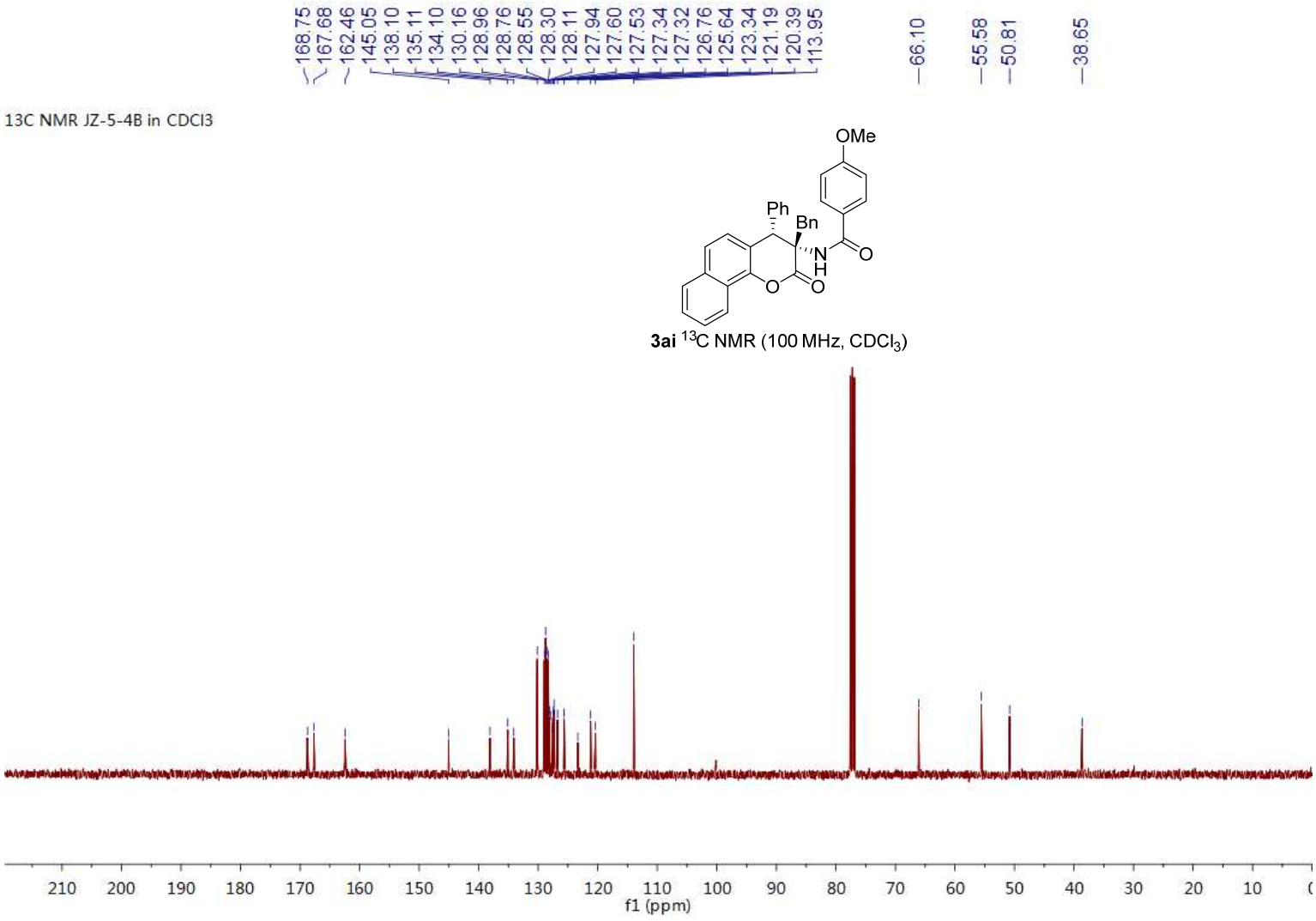


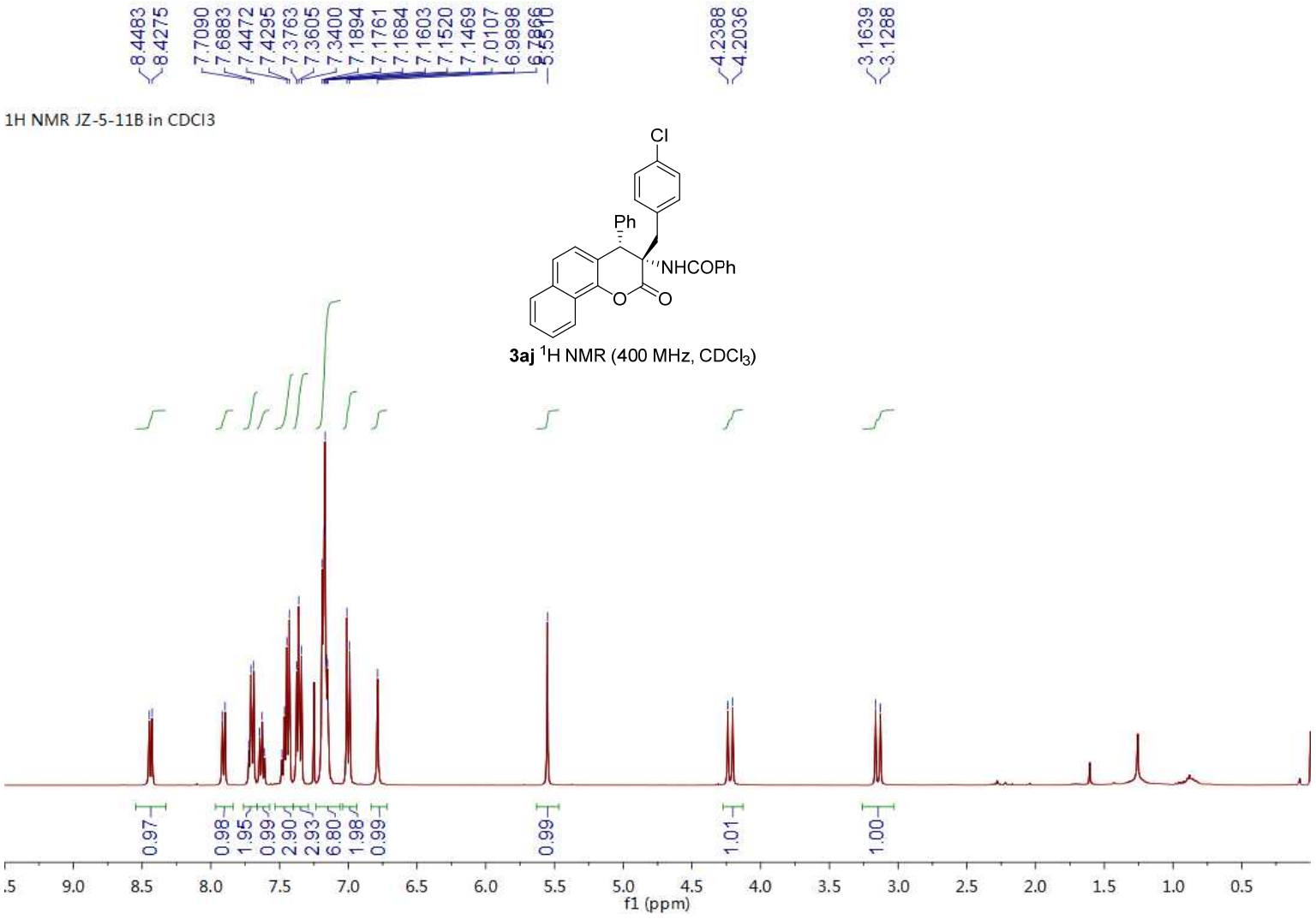
3ah ^{1}H NMR (400 MHz, $CDCl_3$)

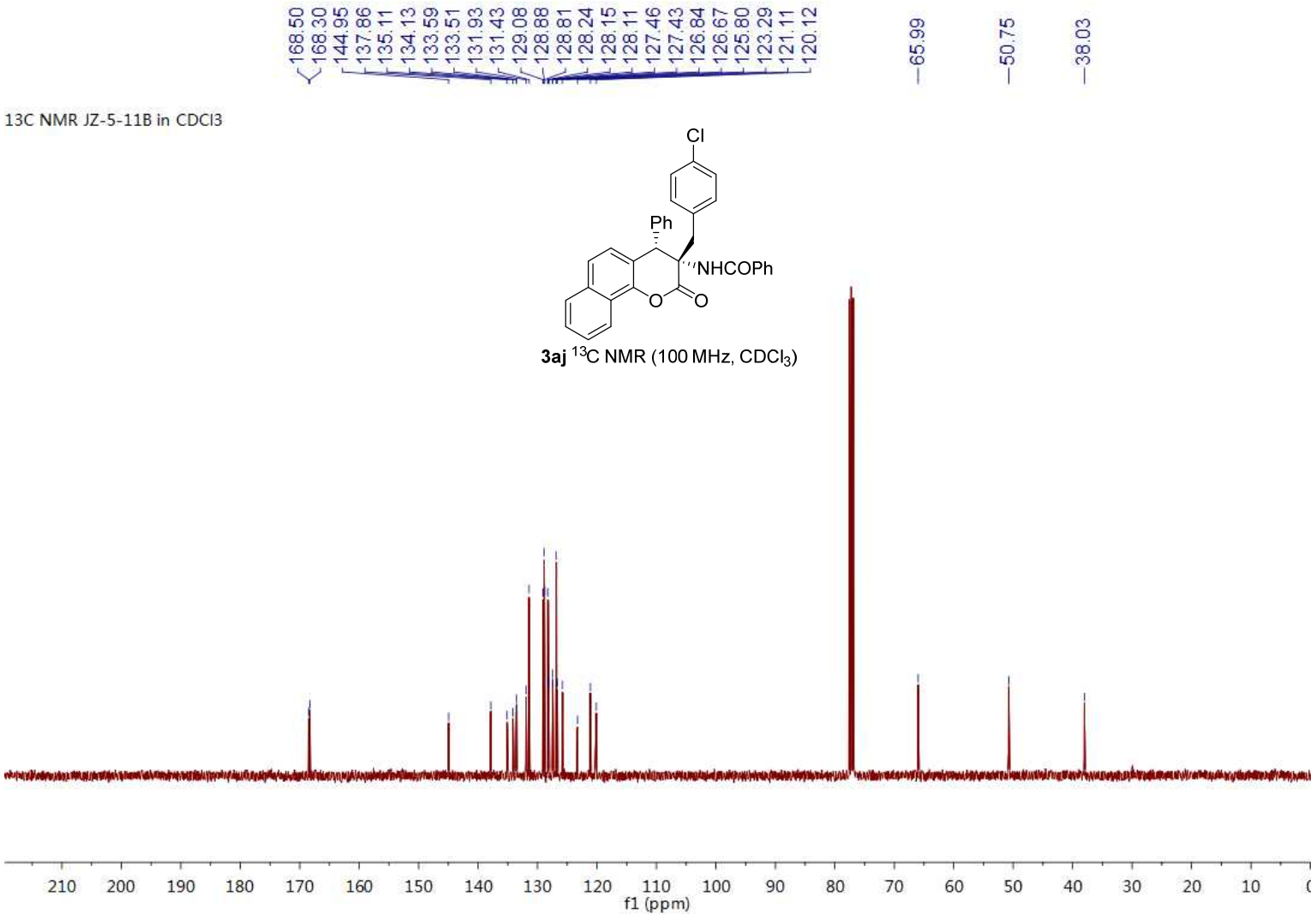

168.68
168.49
145.04
138.68
138.11
135.36
135.06
134.13
132.54
130.18
129.03
128.66
128.59
128.31
128.13
127.98
127.58
127.56
127.36
127.34
126.76
125.67
123.94
123.37
121.21
120.34
66.14
50.85
38.67
21.52
13C NMR JZ-5-21A in CDCl3
Ph
Bn
N
H
O
O
O
3ah ^{13}C NMR (100 MHz, $CDCl_3$)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)



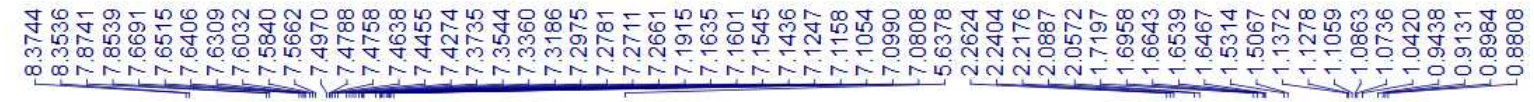
3ai ^{1}H NMR (400 MHz, $CDCl_3$)


168.75
167.68
162.46
145.05
138.10
135.11
134.10
130.16
128.96
128.76
128.55
128.30
128.11
127.94
127.60
127.53
127.34
127.32
126.76
125.64
123.34
121.19
120.39
113.95
66.10
55.58
50.81
38.65
13C NMR JZ-5-4B in CDCl3
OMe
Ph
Bn
N
H
O
O
O
3ai 13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

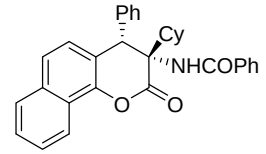

8.4483
8.4275
7.7090
7.6883
7.4472
7.4295
7.3763
7.3605
7.3400
7.1894
7.1761
7.1684
7.1603
7.1520
7.1469
7.0107
6.9898
4.2388
4.2036
3.1639
3.1288
1H NMR JZ-5-11B in CDCl3
Cl
Ph
NHCOPh
O
O
3aj 1H NMR (400 MHz, CDCl3)
0.97
0.98
1.95
0.99
2.90
2.93
6.80
1.98
0.99
0.99
1.01
1.00
f1 (ppm)



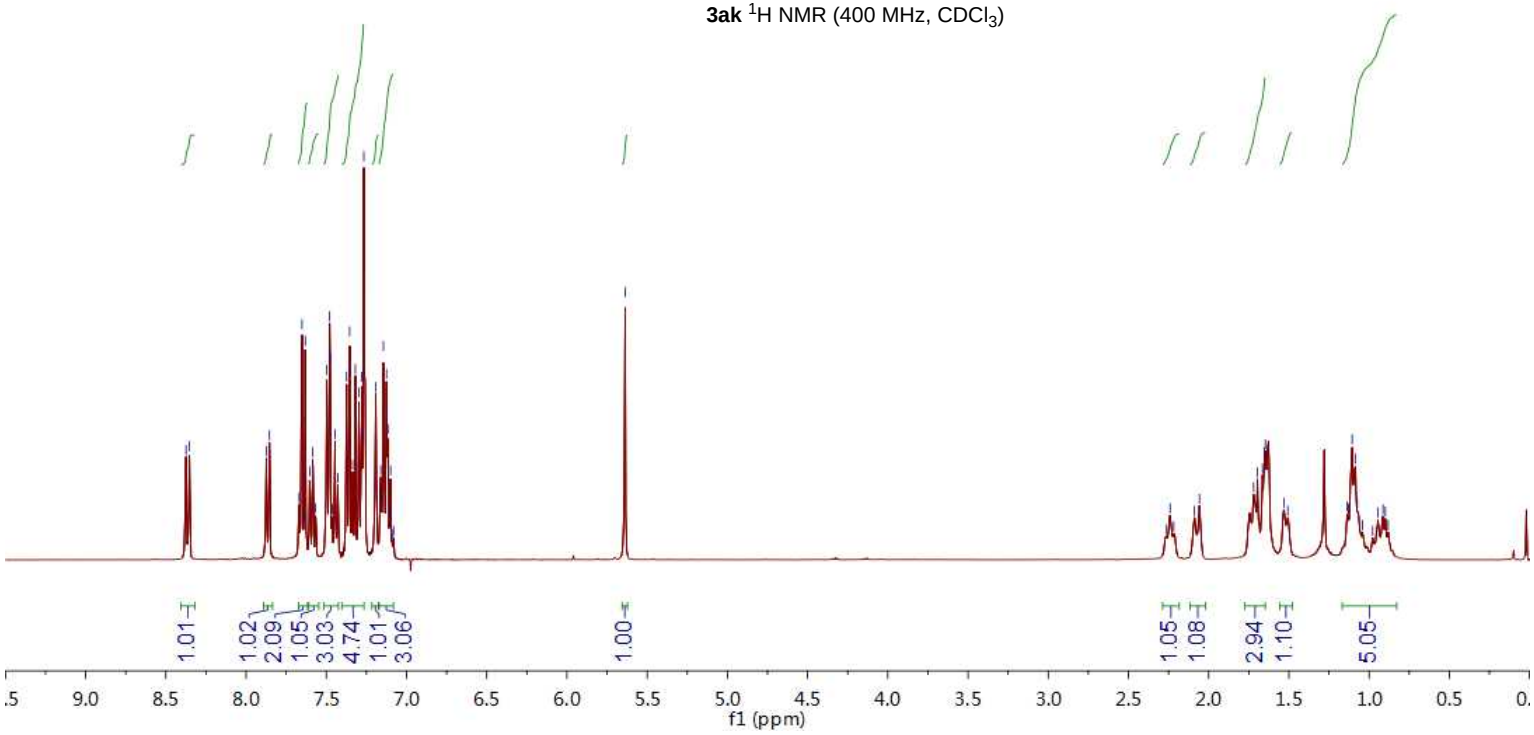
3aj ^{13}C NMR (100 MHz, $CDCl_3$)

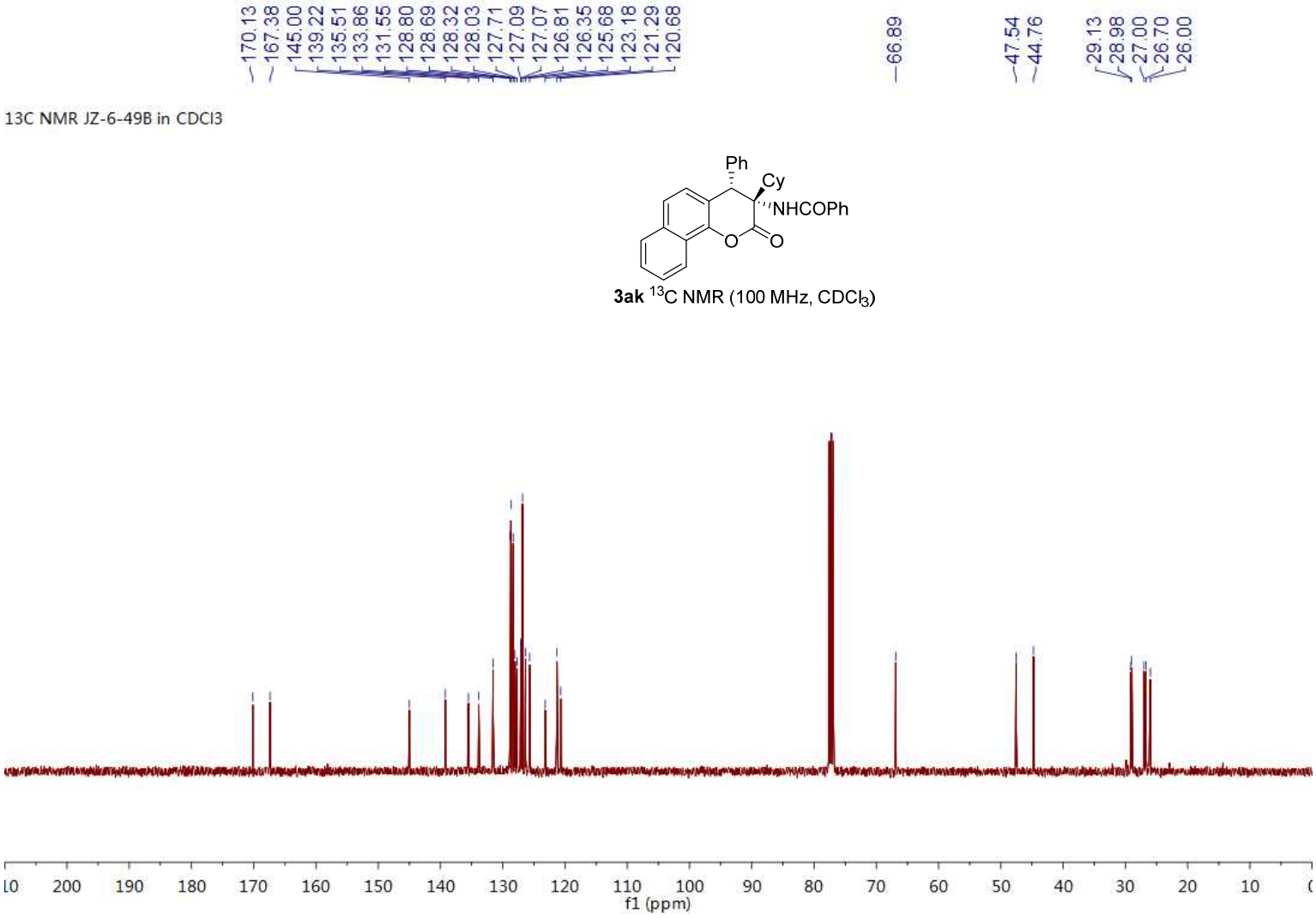


1H NMR JZ-6-49B in CDCl3

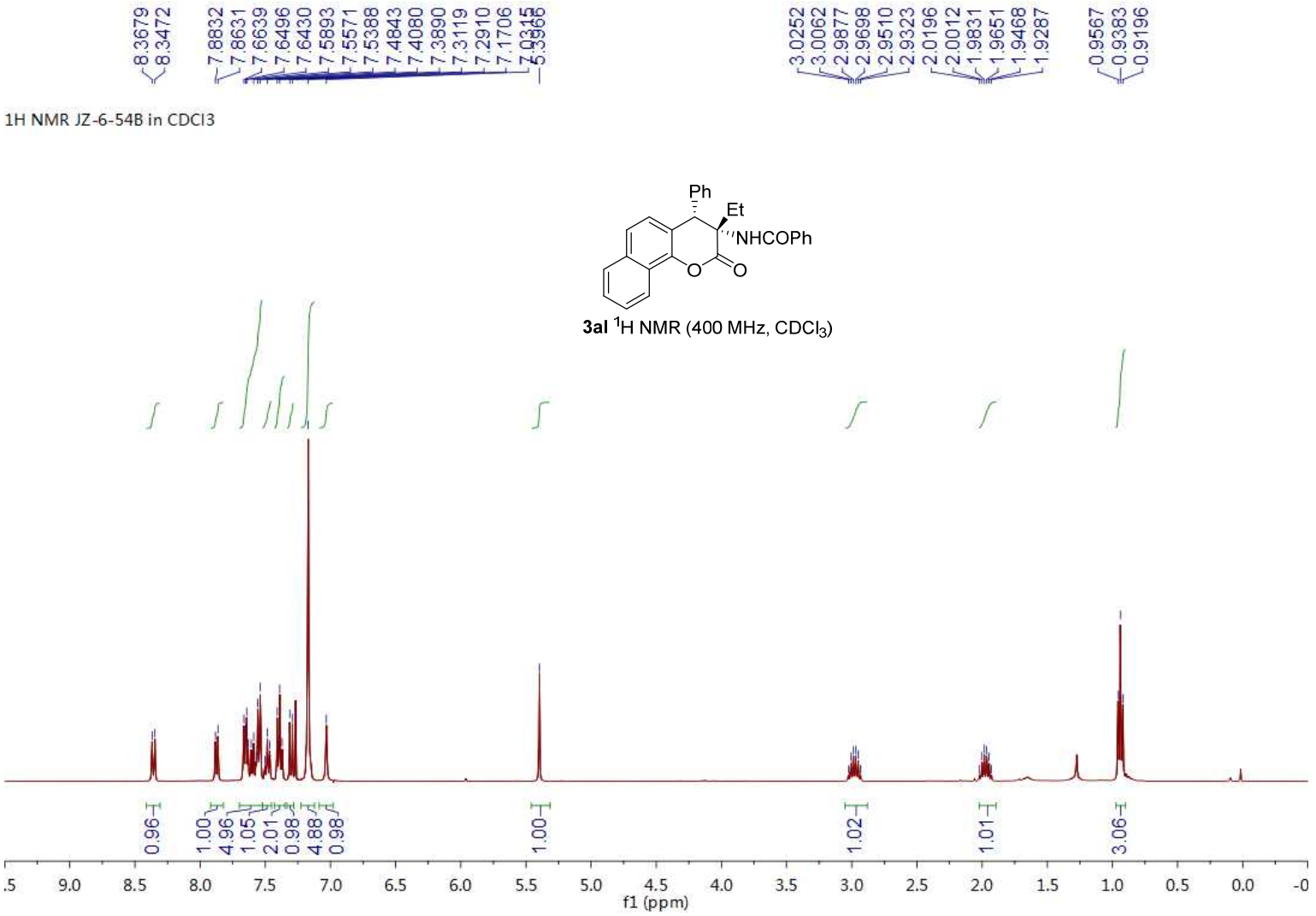


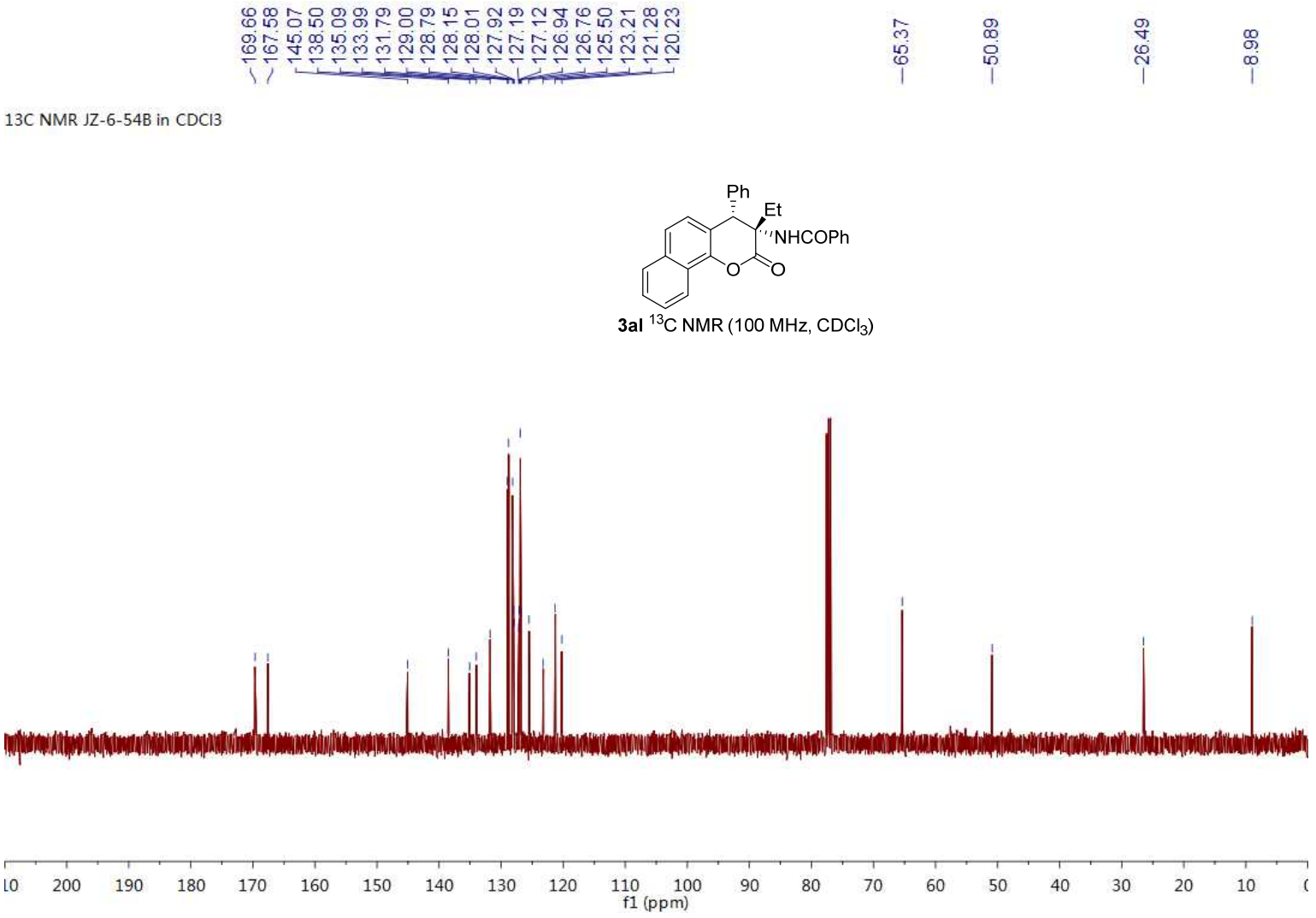
3ak ^{1}H NMR (400 MHz, $CDCl_3$)



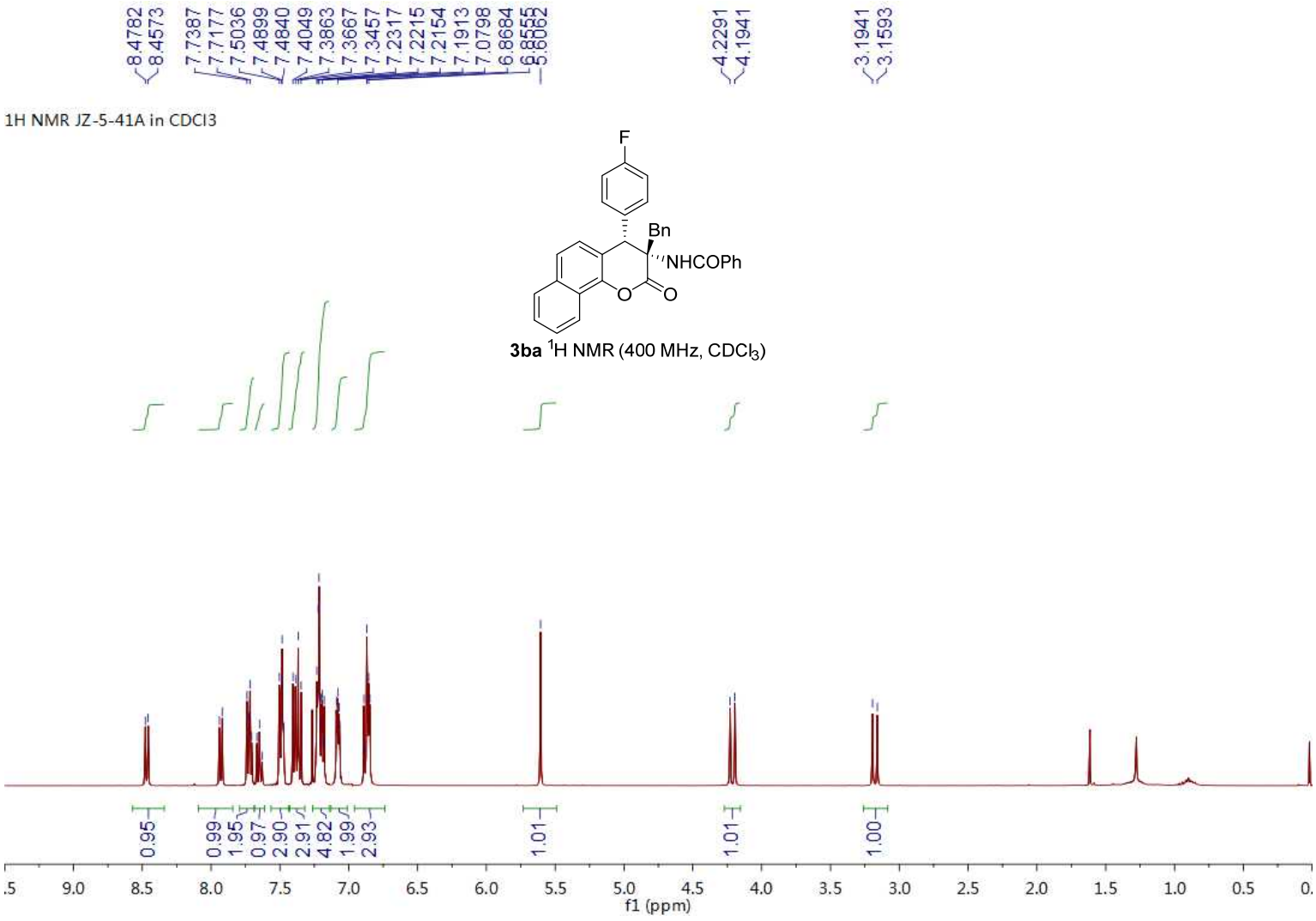


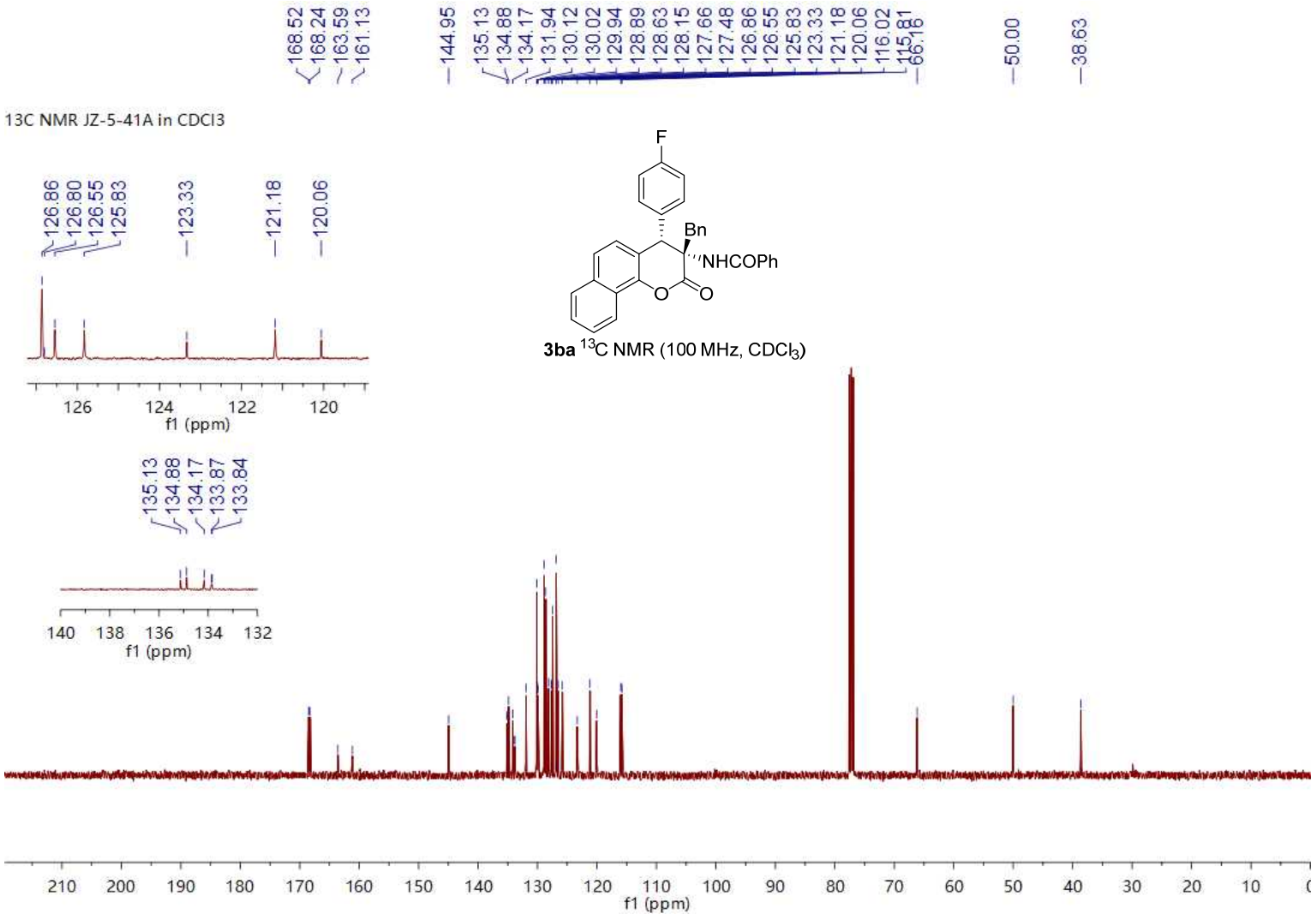
3ak ^{13}C NMR (100 MHz, $CDCl_3$)

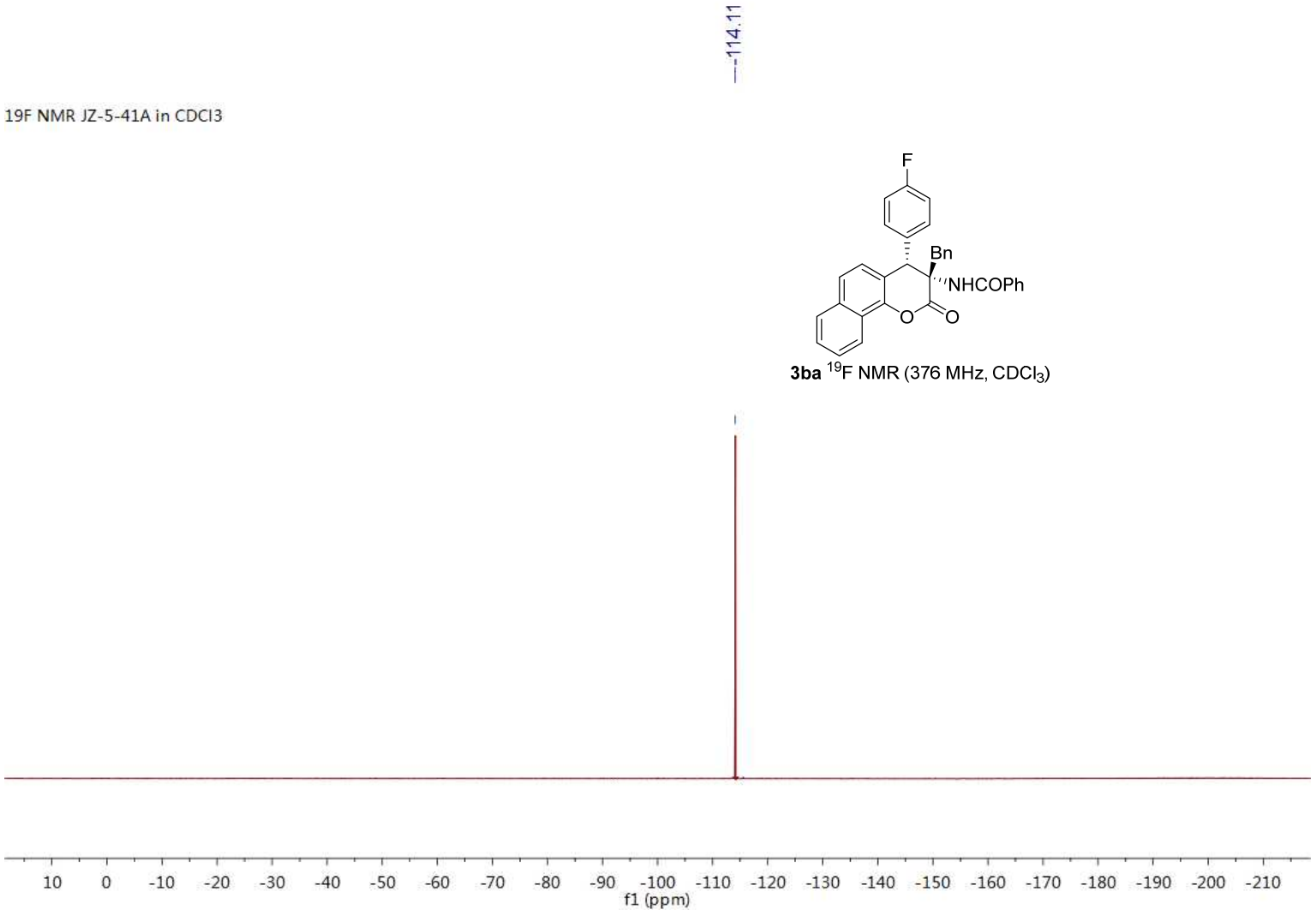

8.3679
8.3472
7.8832
7.8631
7.6639
7.6496
7.6430
7.5893
7.5571
7.5388
7.4843
7.4080
7.3890
7.3119
7.2910
7.1706
3.0252
3.0062
2.9877
2.9698
2.9510
2.9323
2.0196
2.0012
1.9831
1.9651
1.9468
1.9287
0.9567
0.9383
0.9196
1H NMR JZ-6-54B in CDCl3
Ph
Et
NHCOPh
O
O
3al 1H NMR (400 MHz, CDCl3)
0.96
1.00
4.96
1.05
2.01
0.98
4.88
0.98
1.00
1.02
1.01
3.06
f1 (ppm)



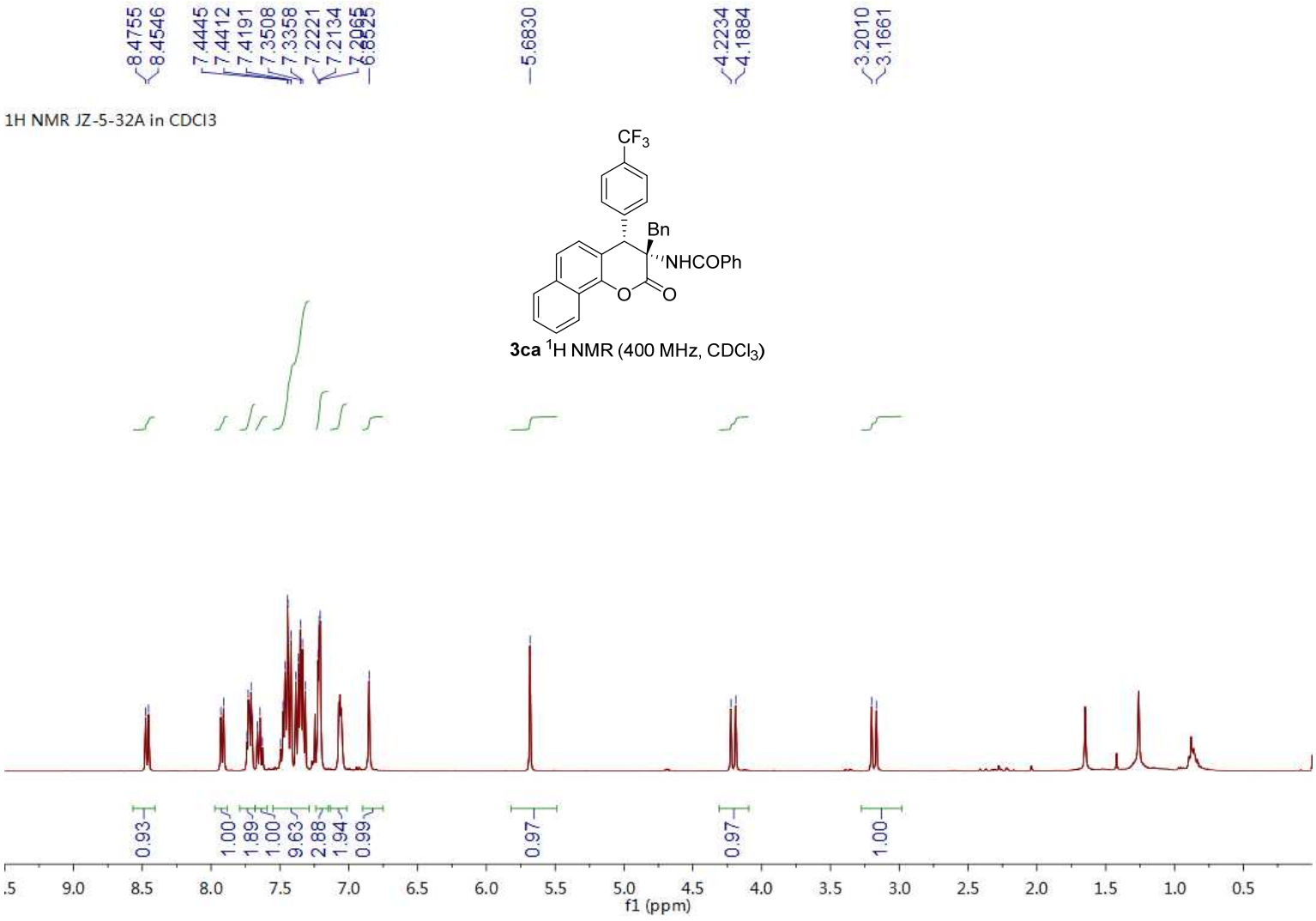
3al ^{13}C NMR (100 MHz, $CDCl_3$)

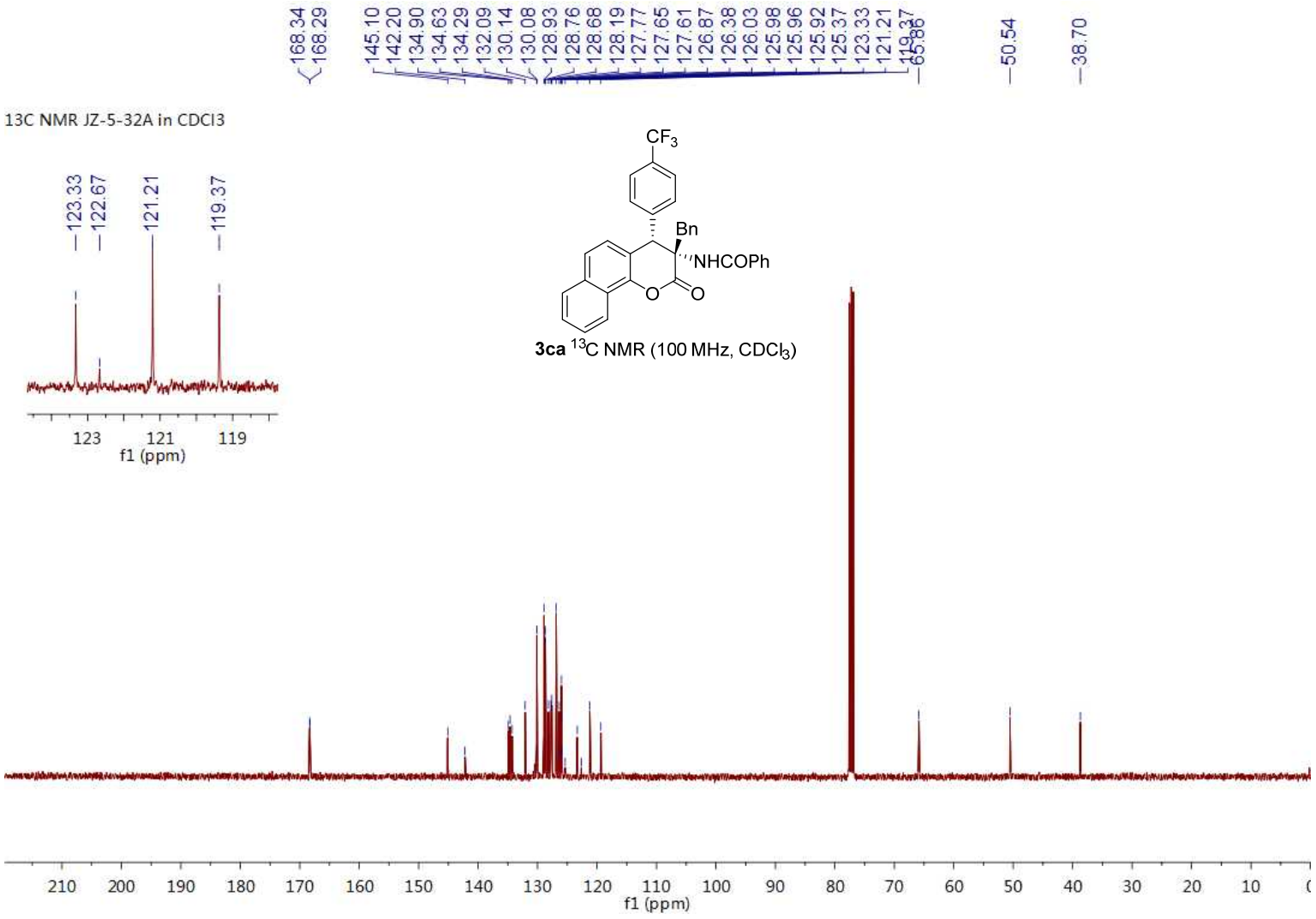

8.4782
8.4573
7.7387
7.7177
7.5036
7.4899
7.4840
7.4049
7.3863
7.3667
7.3457
7.2317
7.2215
7.2154
7.1913
7.0798
6.8684
6.8555
6.8062
4.2291
4.1941
3.1941
3.1593
1H NMR JZ-5-41A in CDCl3
F
Bn
NHCOPh
O
O
3ba 1H NMR (400 MHz, CDCl3)
0.95
0.99
1.95
0.97
2.90
2.91
4.82
1.99
2.93
1.01
1.01
1.00
9.0
8.5
8.0
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
f1 (ppm)

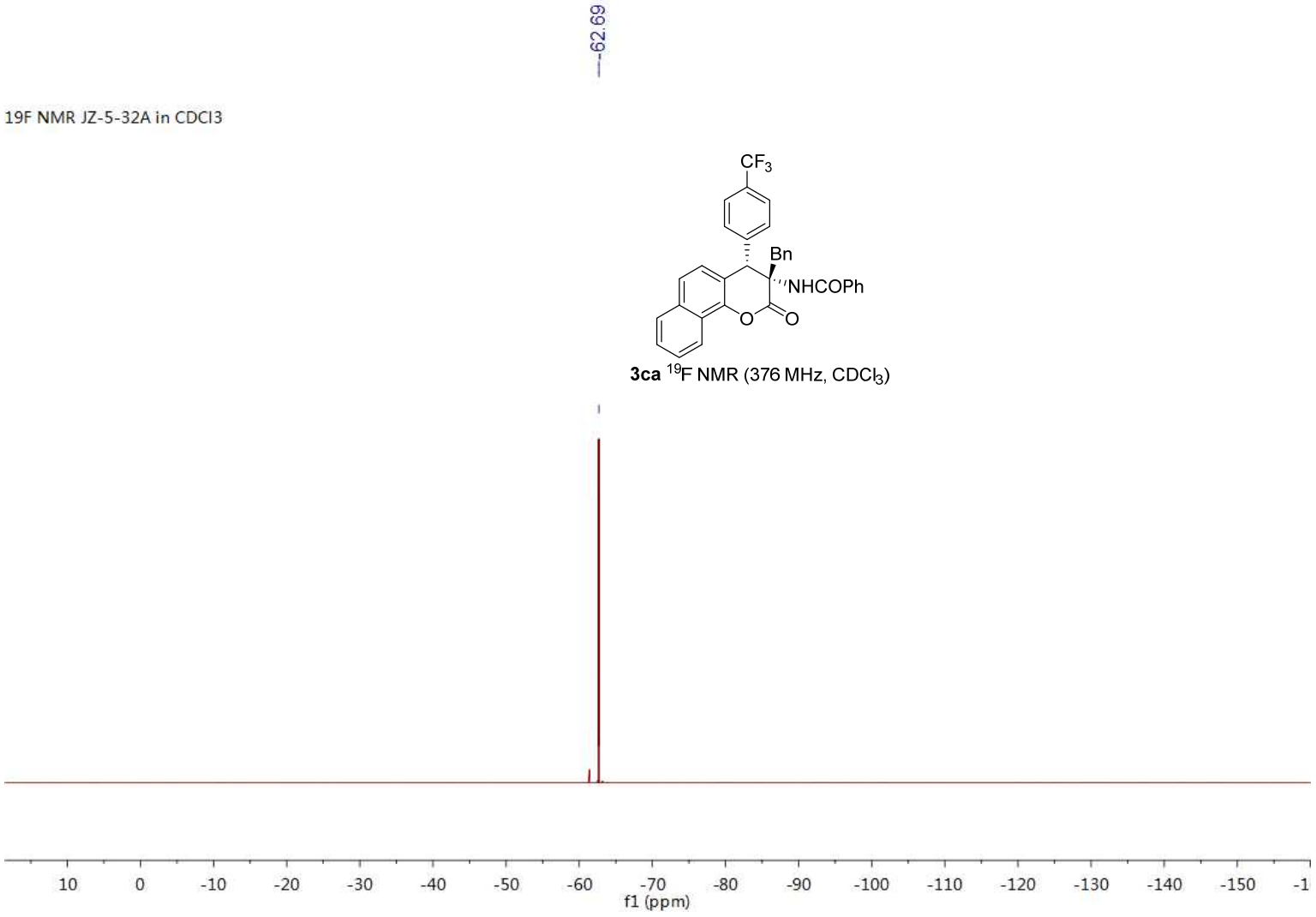

168.52
168.24
163.59
161.13
144.95
135.13
134.88
134.17
131.94
130.12
130.02
129.94
128.89
128.63
128.15
127.66
127.48
126.86
126.55
125.83
123.33
121.18
116.02
115.81
66.16
50.00
38.63
13C NMR JZ-5-41A in CDCl3
F
Bn
NHCOPh
O
O
3ba 13C NMR (100 MHz, CDCl3)
126.86
126.80
126.55
125.83
123.33
121.18
120.06
126
124
122
120
f1 (ppm)
135.13
134.88
134.17
133.87
133.84
140
138
136
134
132
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)

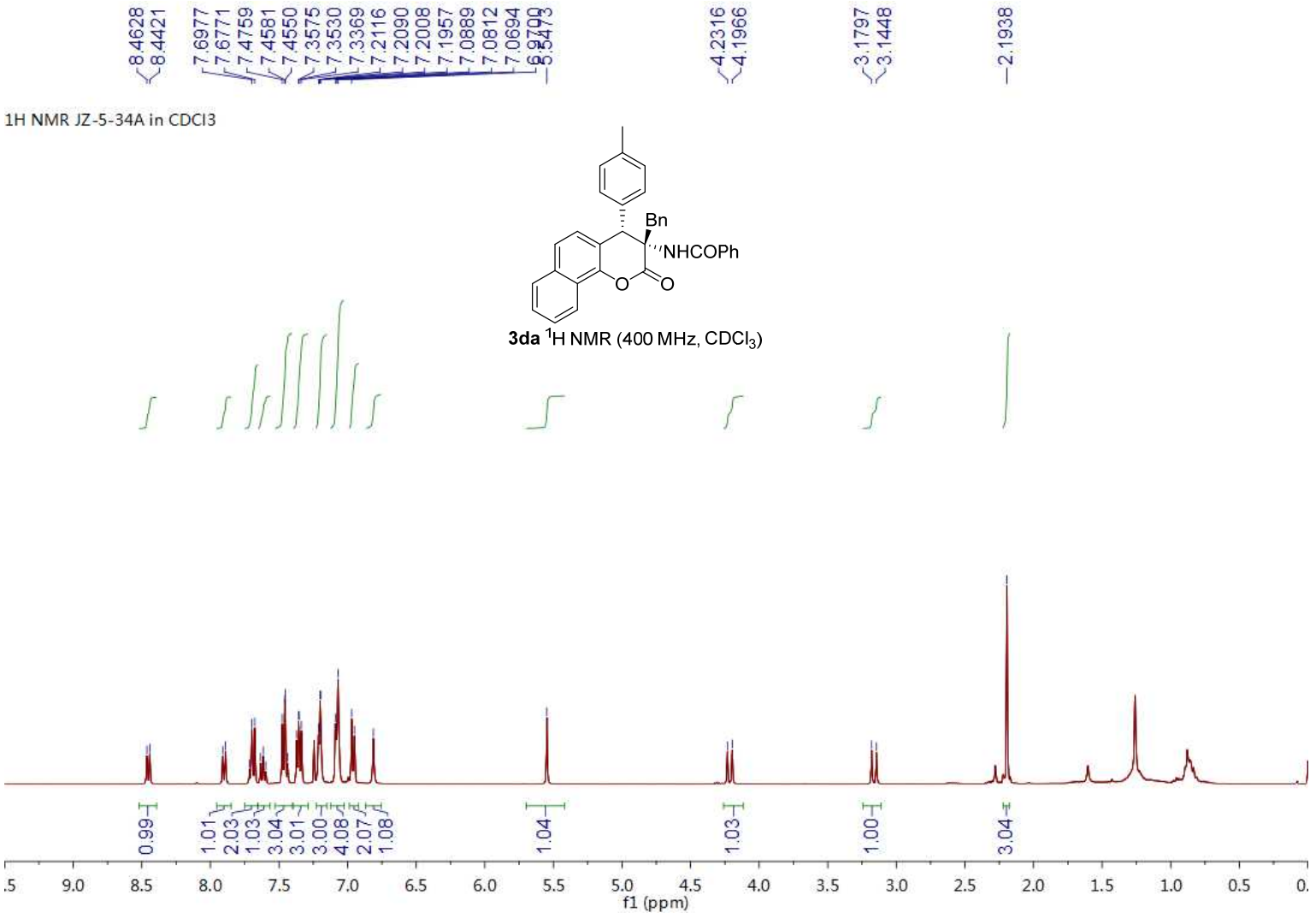


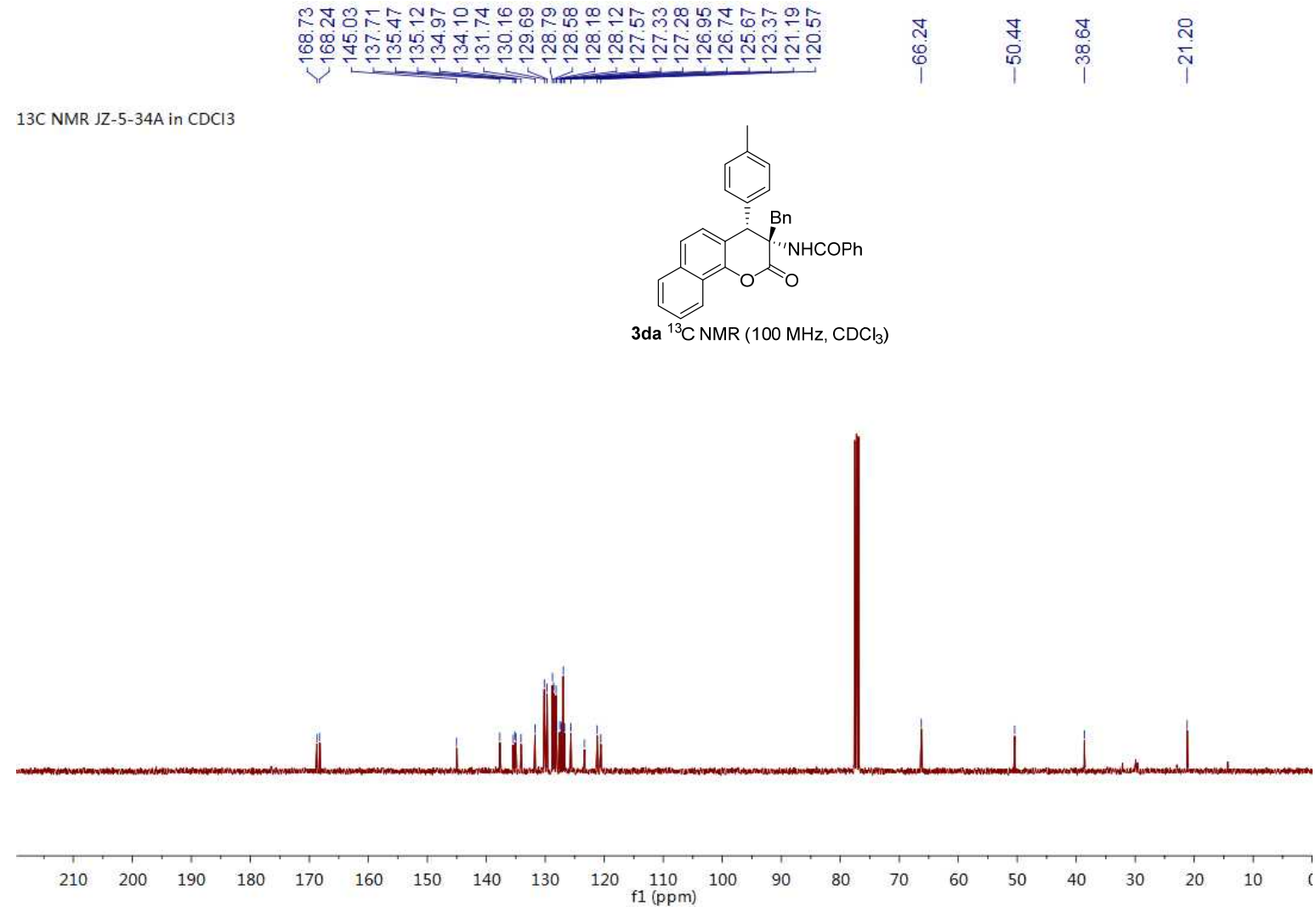
3ba ^{19}F NMR (376 MHz, $CDCl_3$)


8.4755
8.4546
7.4445
7.4412
7.4191
7.3508
7.3358
7.2221
7.2134
5.6830
4.2234
4.1884
3.2010
3.1661
1H NMR JZ-5-32A in CDCl3
CF3
Bn
NHCOPh
O
O
3ca 1H NMR (400 MHz, CDCl3)
0.93
1.00
1.89
1.00
9.63
2.88
1.94
0.99
0.97
0.97
1.00
f1 (ppm)

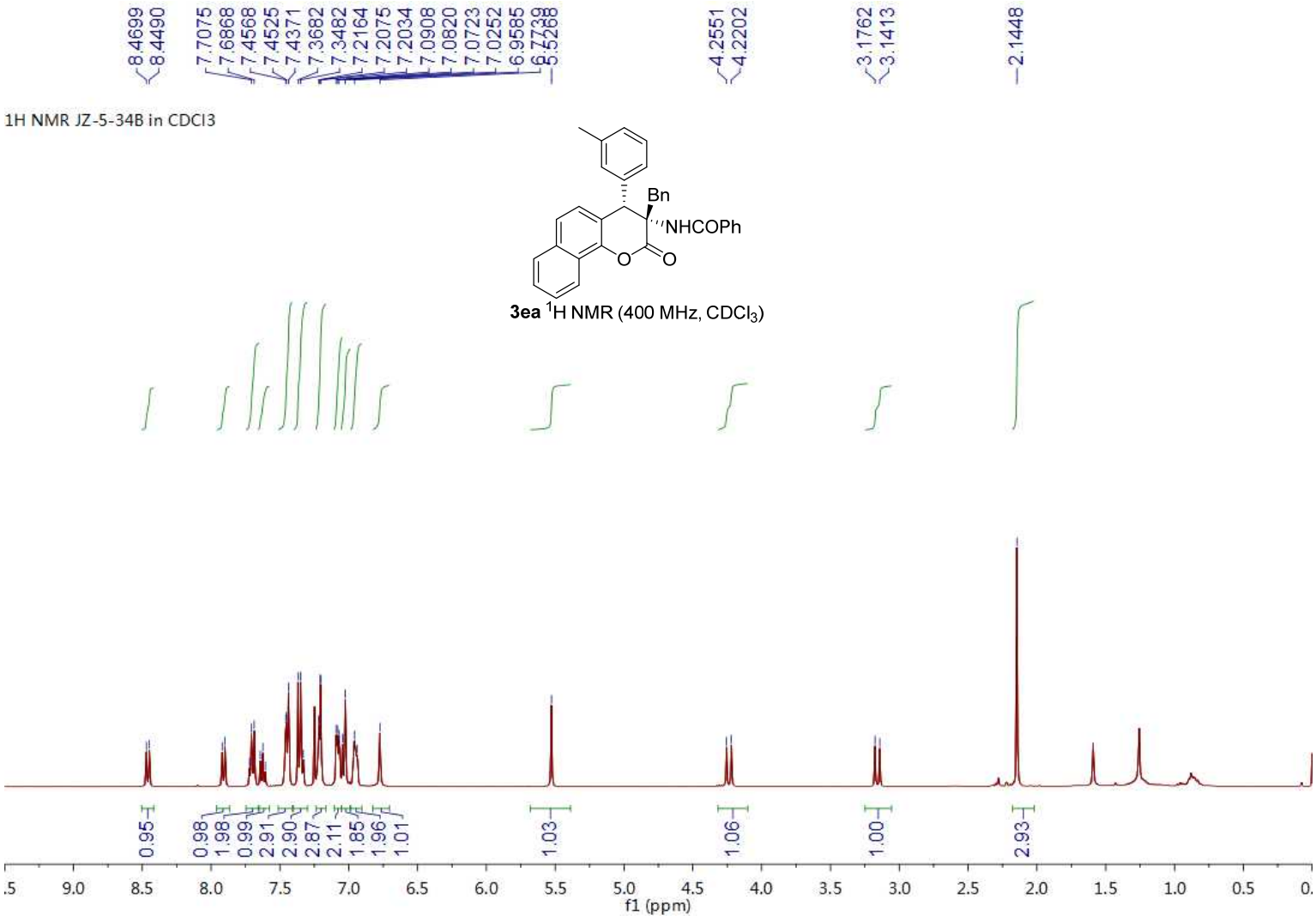

13C NMR JZ-5-32A in CDCl3
168.34
168.29
145.10
142.20
134.90
134.63
134.29
132.09
130.14
130.08
128.93
128.76
128.68
128.19
127.77
127.65
127.61
126.87
126.38
126.03
125.98
125.96
125.92
125.37
123.33
121.21
119.37
65.86
50.54
38.70
123.33
122.67
121.21
119.37
123
121
119
f1 (ppm)
CF3
Bn
NHCOPh
O
O
3ca 13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

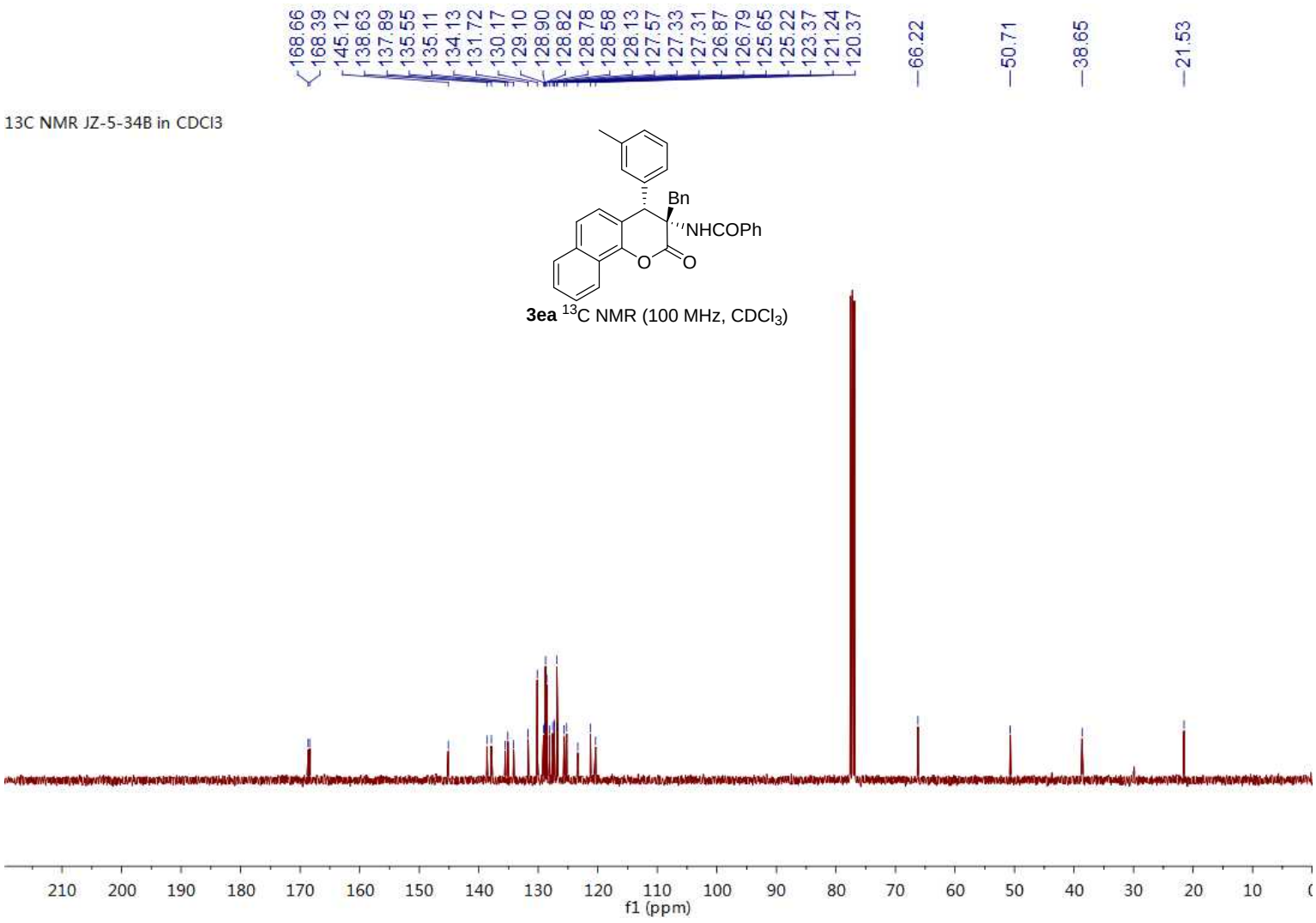

-62.69
19F NMR JZ-5-32A in CDCl3
CF3
Bn
NHCOPh
O
O
3ca 19F NMR (376 MHz, CDCl3)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-1
f1 (ppm)


8.4628
8.4421
7.6977
7.6771
7.4759
7.4581
7.4550
7.3575
7.3530
7.3369
7.2116
7.2090
7.2008
7.1957
7.0889
7.0812
7.0694
4.2316
4.1966
3.1797
3.1448
2.1938
1H NMR JZ-5-34A in CDCl3
Bn
NHCOPh
O
O
3da 1H NMR (400 MHz, CDCl3)
0.99
1.01
2.03
1.03
3.04
3.01
3.00
4.08
2.07
1.08
1.04
1.03
1.00
3.04
f1 (ppm)

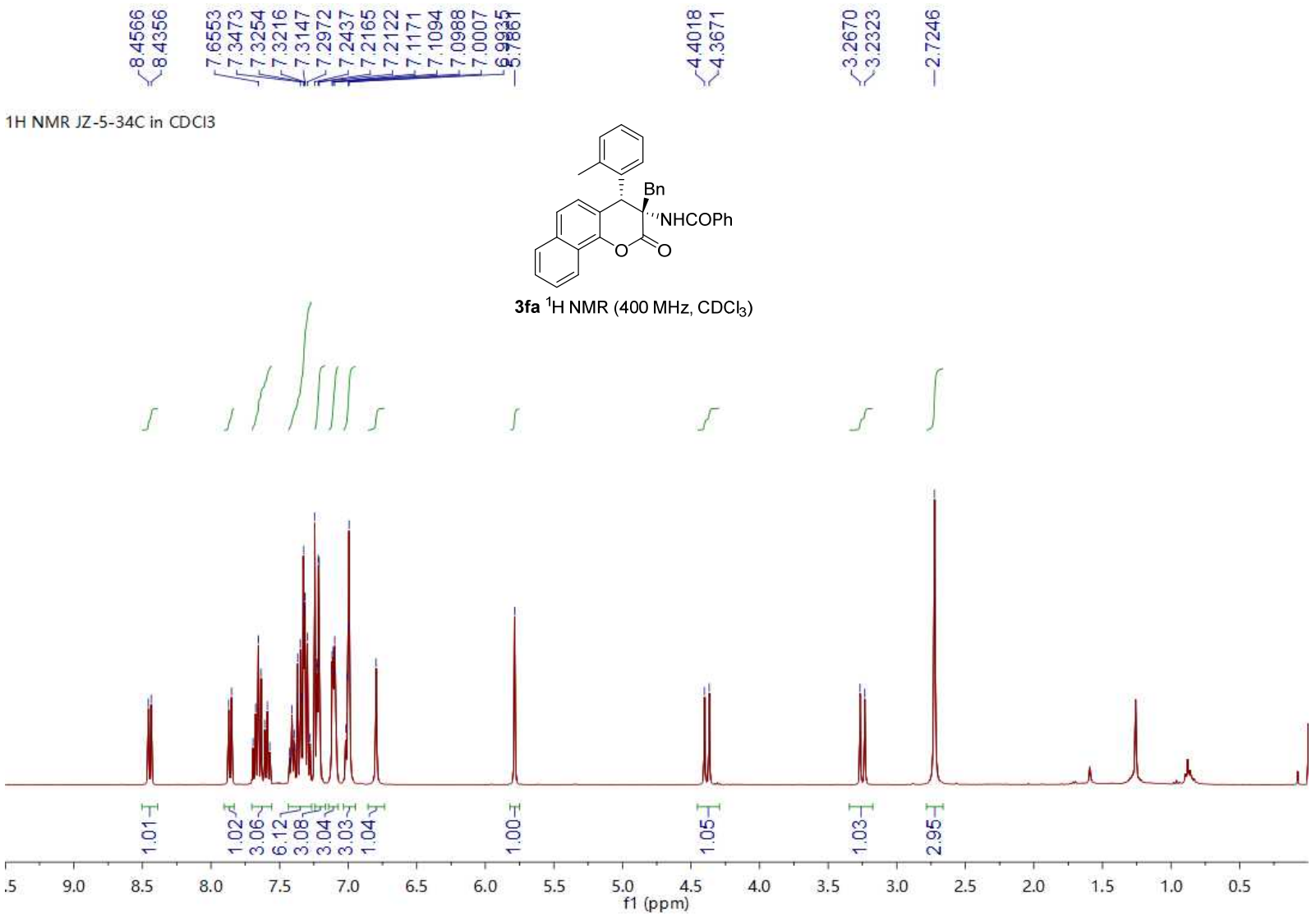


3da ^{13}C NMR (100 MHz, $CDCl_3$)

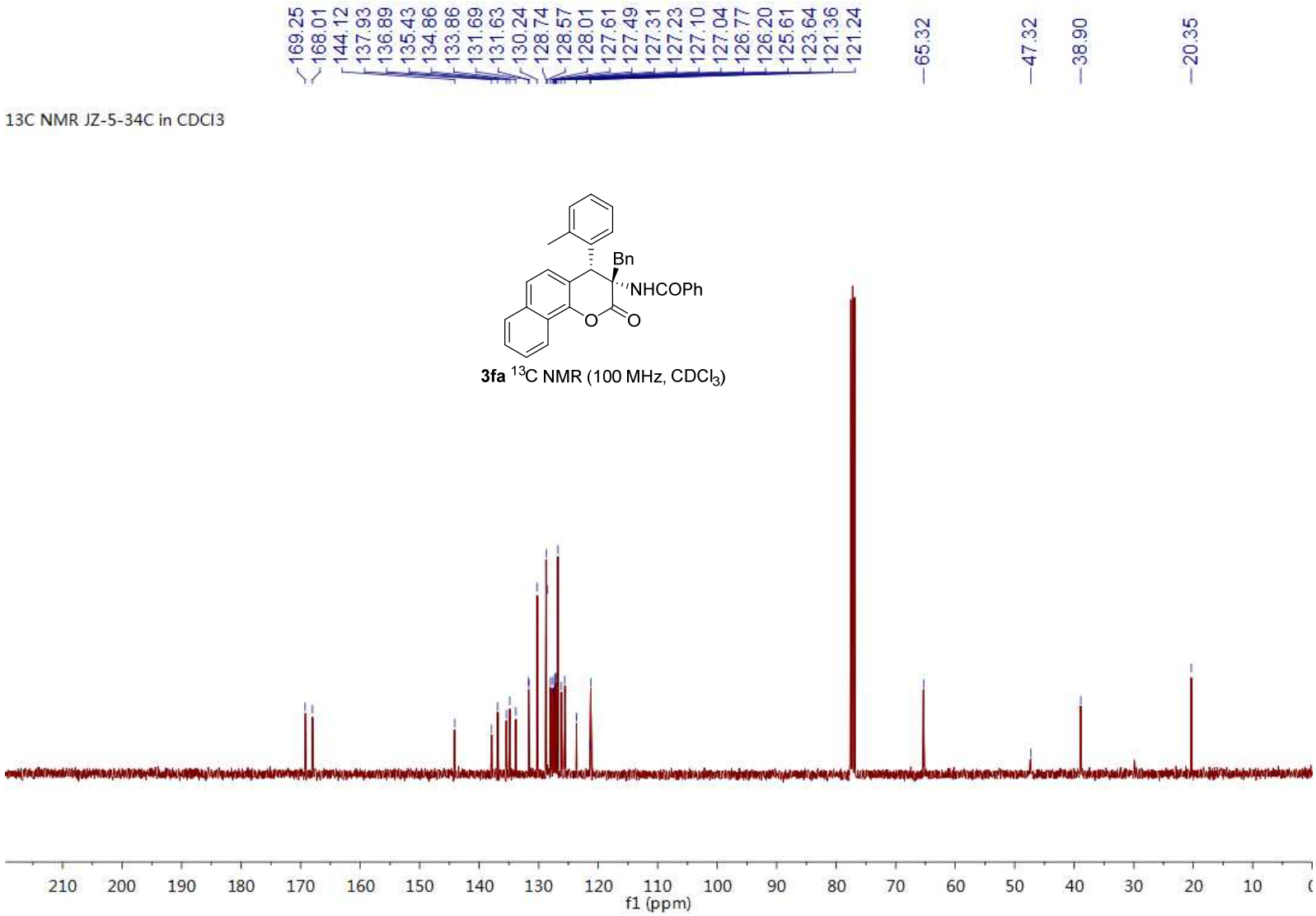

8.4699
8.4490
7.7075
7.6868
7.4568
7.4525
7.4371
7.3682
7.3482
7.2164
7.2075
7.2034
7.0908
7.0820
7.0723
7.0252
6.9585
5.5288
4.2551
4.2202
3.1762
3.1413
2.1448
1H NMR JZ-5-34B in CDCl3
Bn
NHCOPh
O
O
3ea 1H NMR (400 MHz, CDCl3)
0.95
0.98
1.98
0.99
2.91
2.90
2.87
2.11
1.85
1.96
1.01
1.03
1.06
1.00
2.93
f1 (ppm)



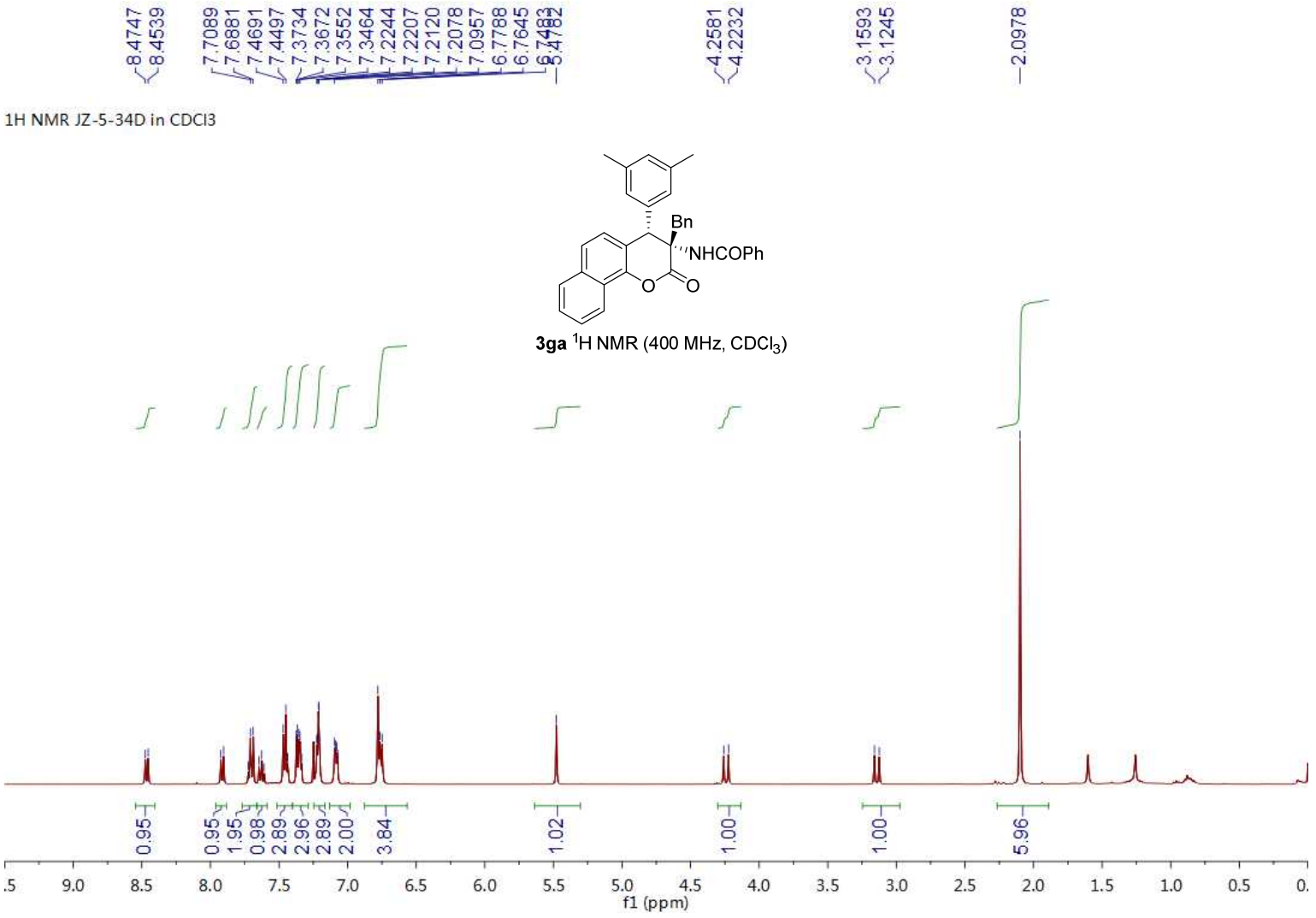
3ea ^{13}C NMR (100 MHz, $CDCl_3$)



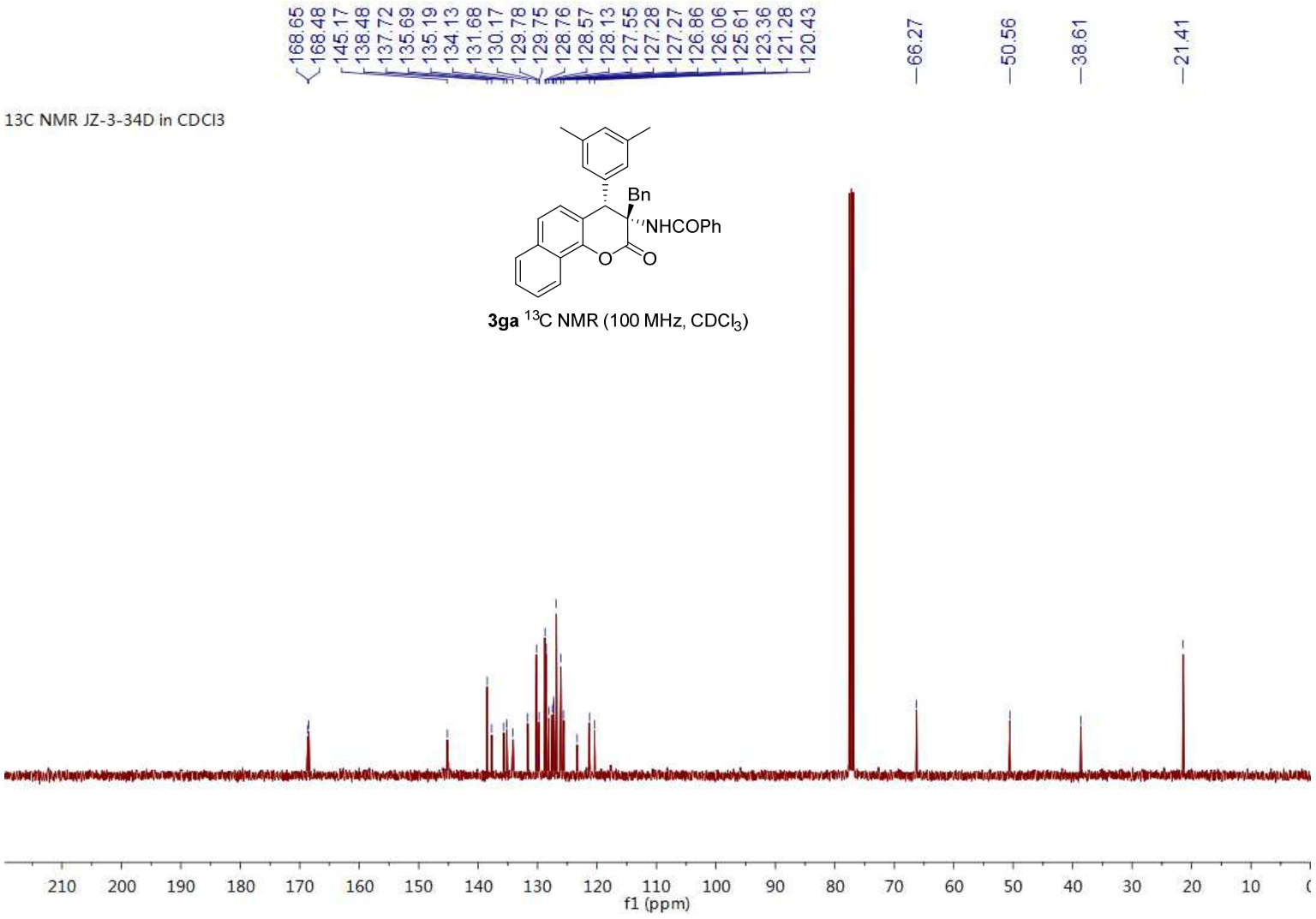
3fa ^{1}H NMR (400 MHz, $CDCl_3$)



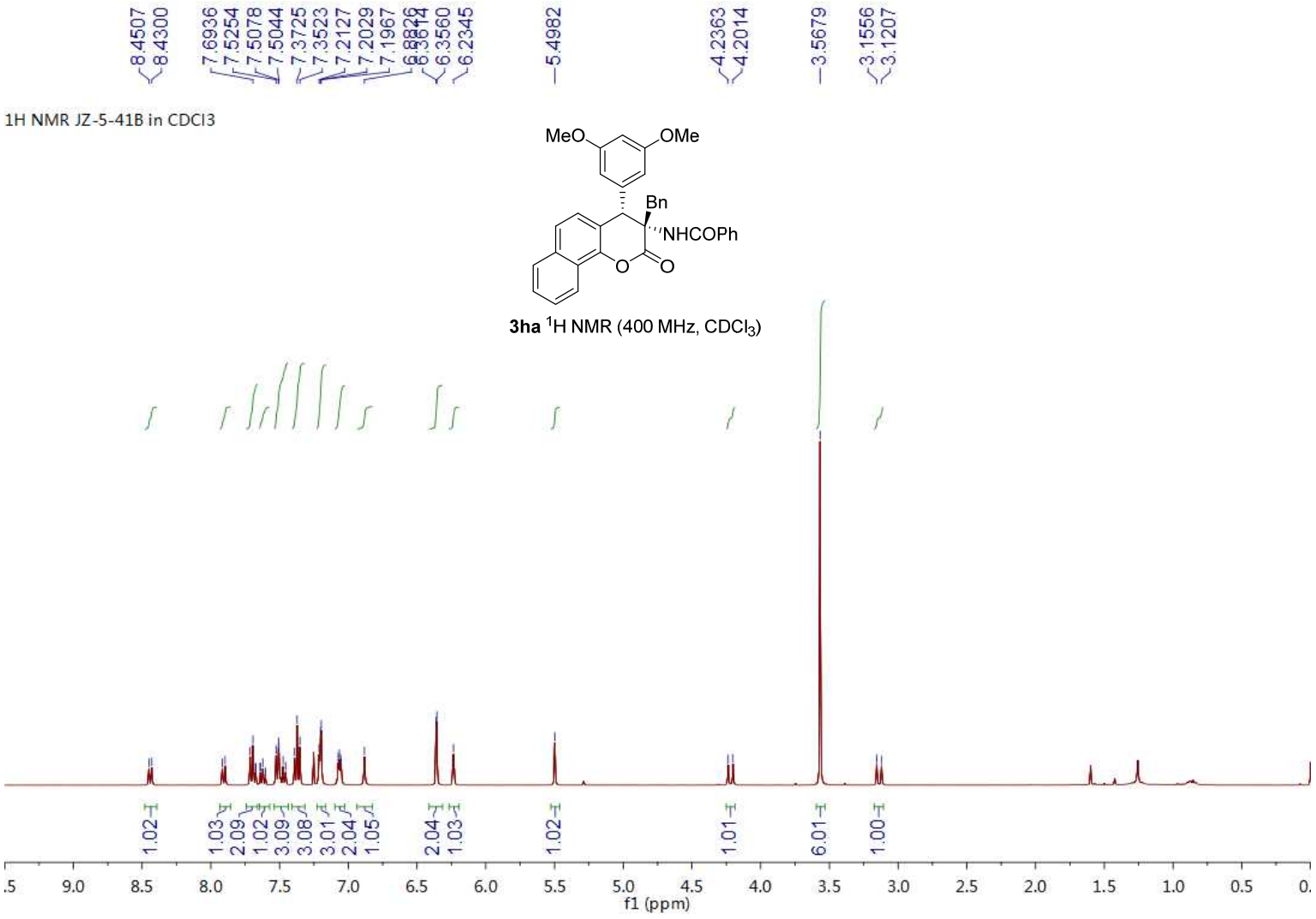
3fa ^{13}C NMR (100 MHz, $CDCl_3$)



3ga ^{1}H NMR (400 MHz, $CDCl_3$)

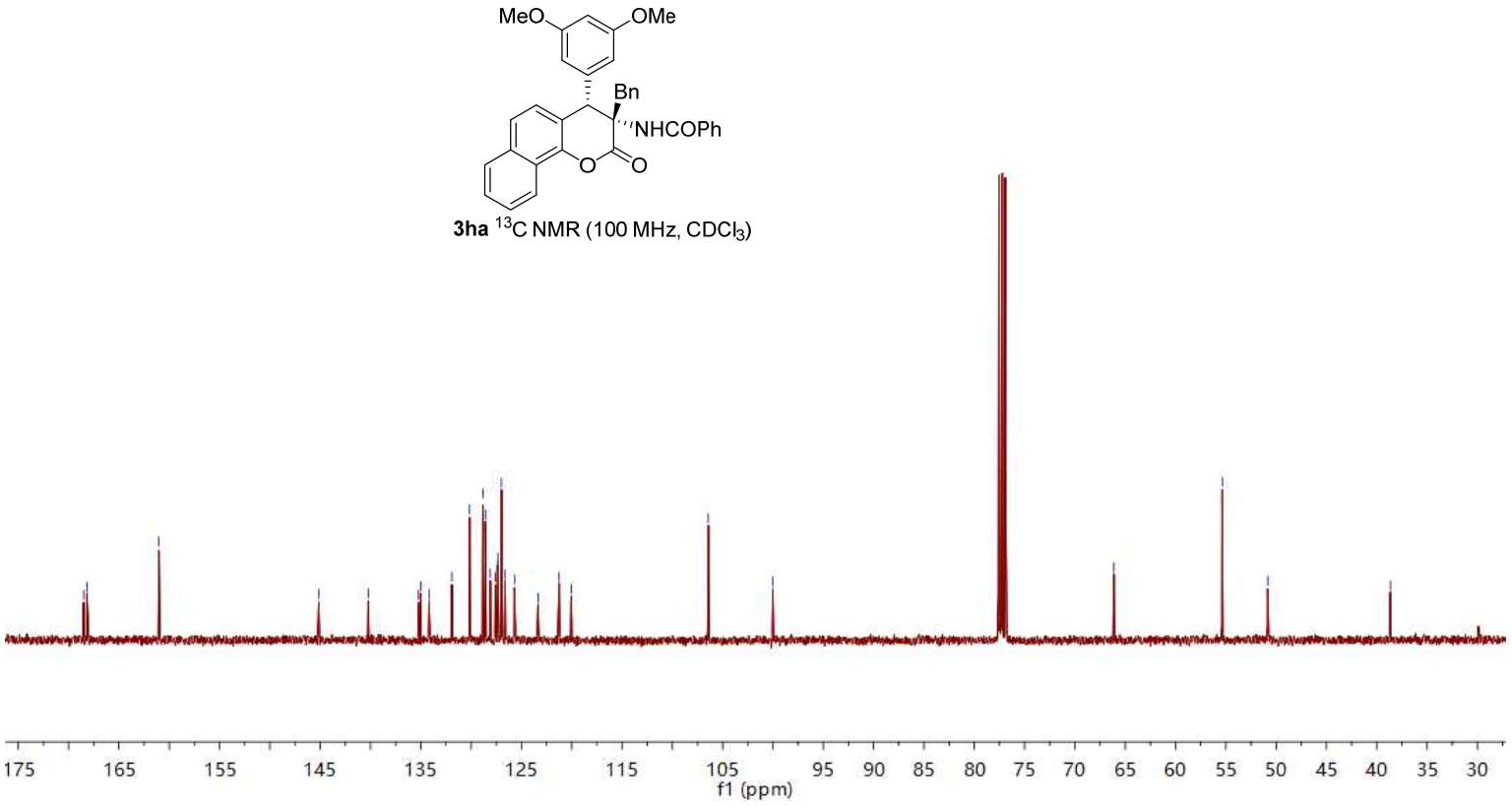


3ga ^{13}C NMR (100 MHz, $CDCl_3$)

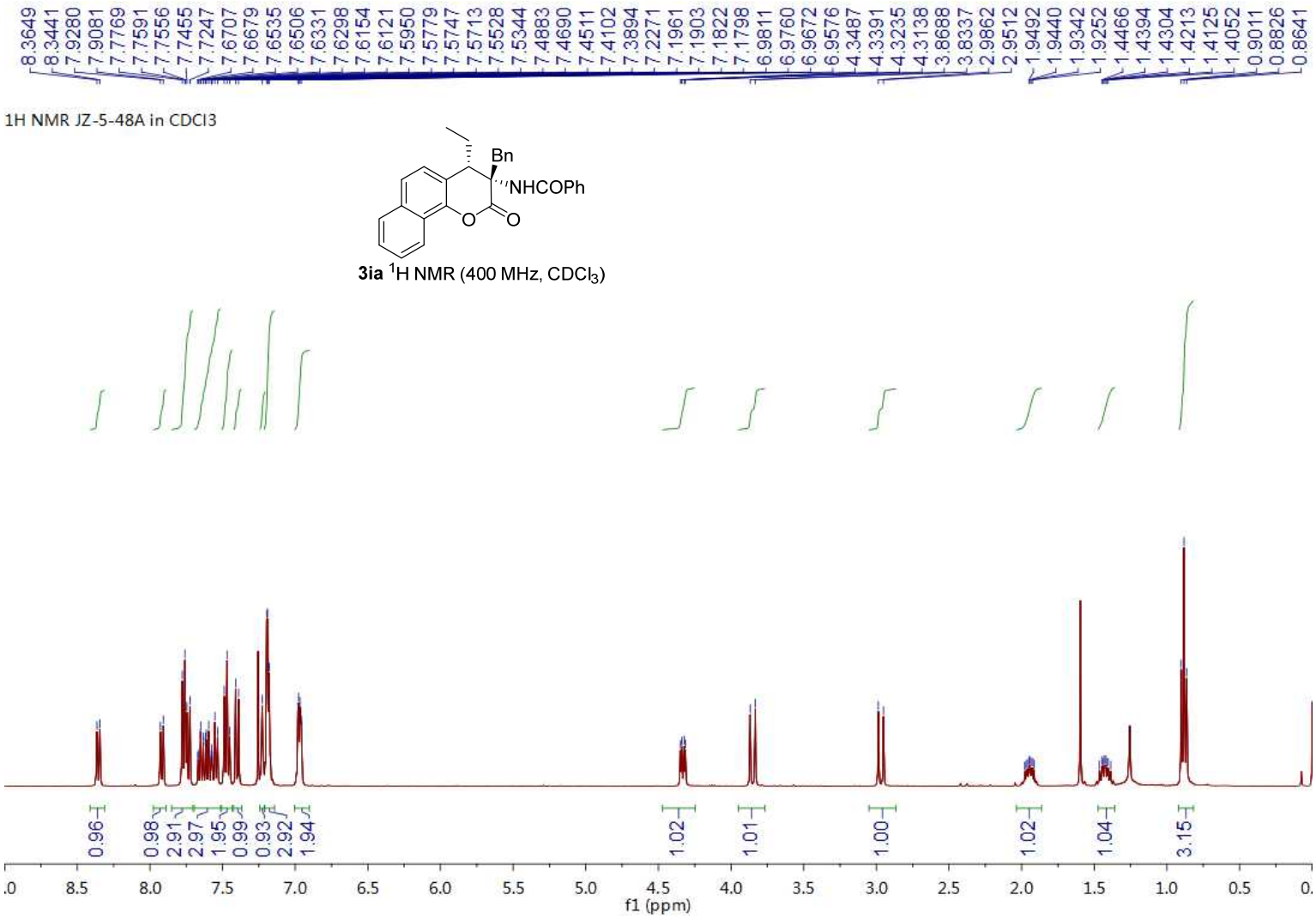


3ha ^{1}H NMR (400 MHz, $CDCl_3$)

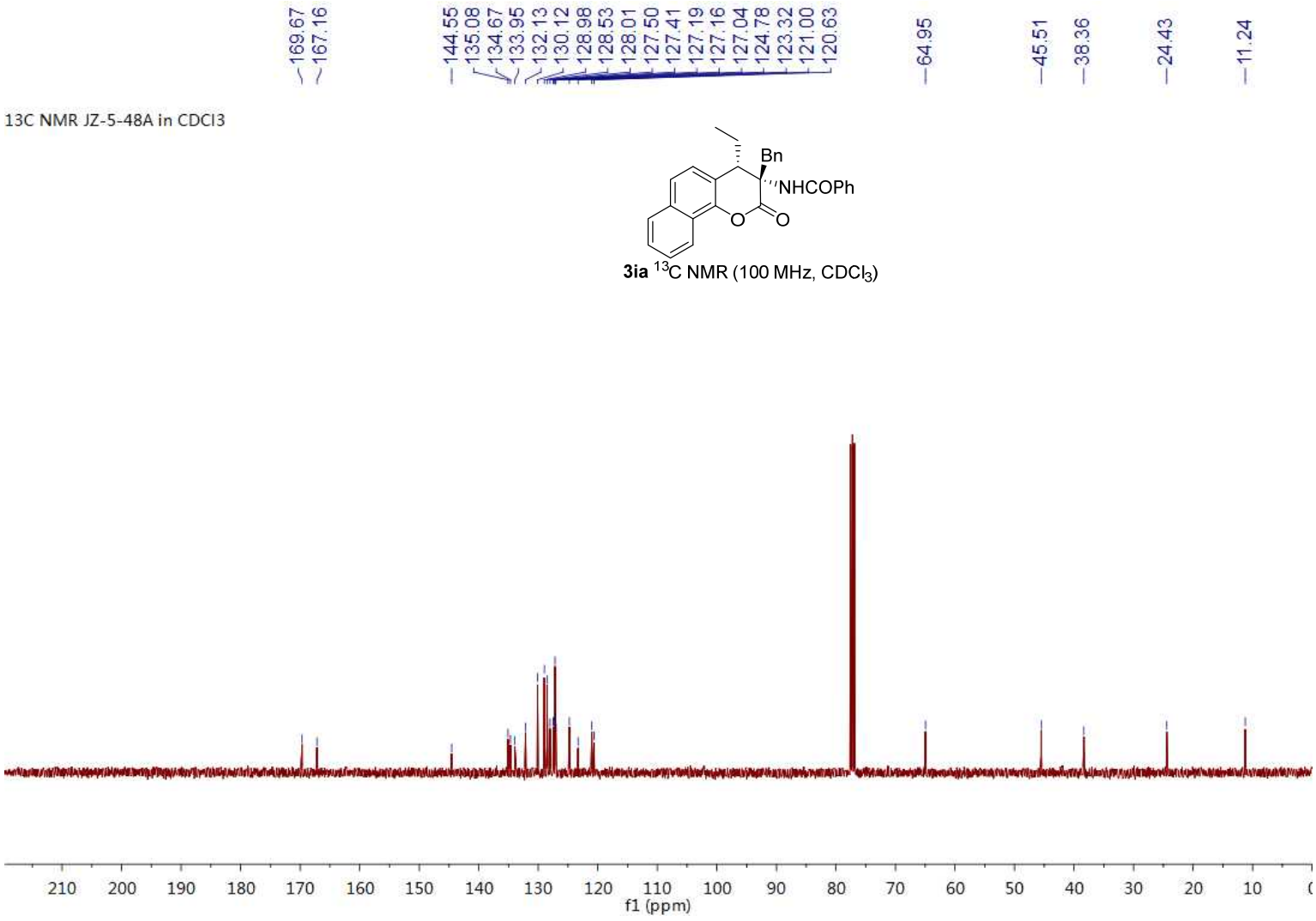
13C NMR JZ-5-41B in CDCl3



3ha ^{13}C NMR (100 MHz, $CDCl_3$)

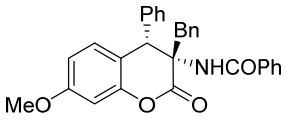


3ia ^{1}H NMR (400 MHz, $CDCl_3$)

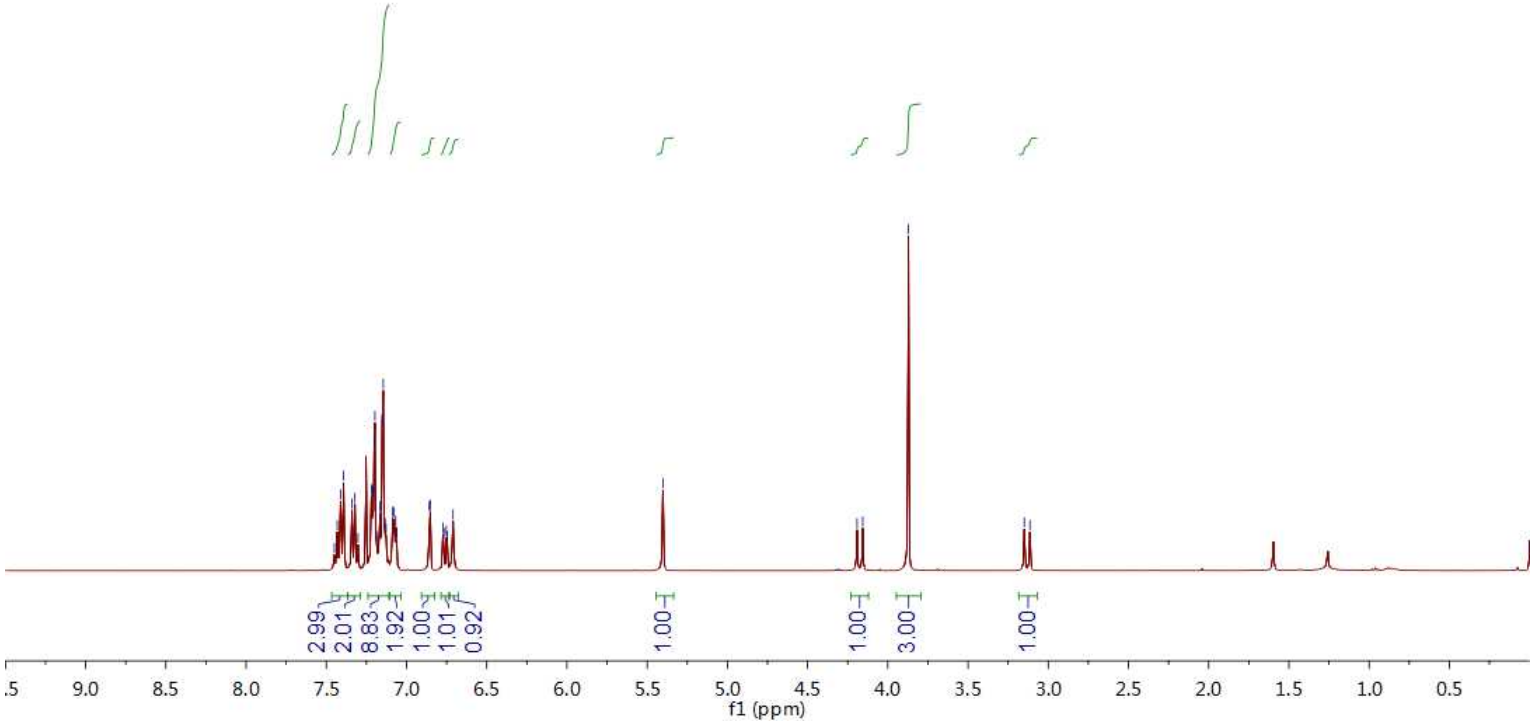


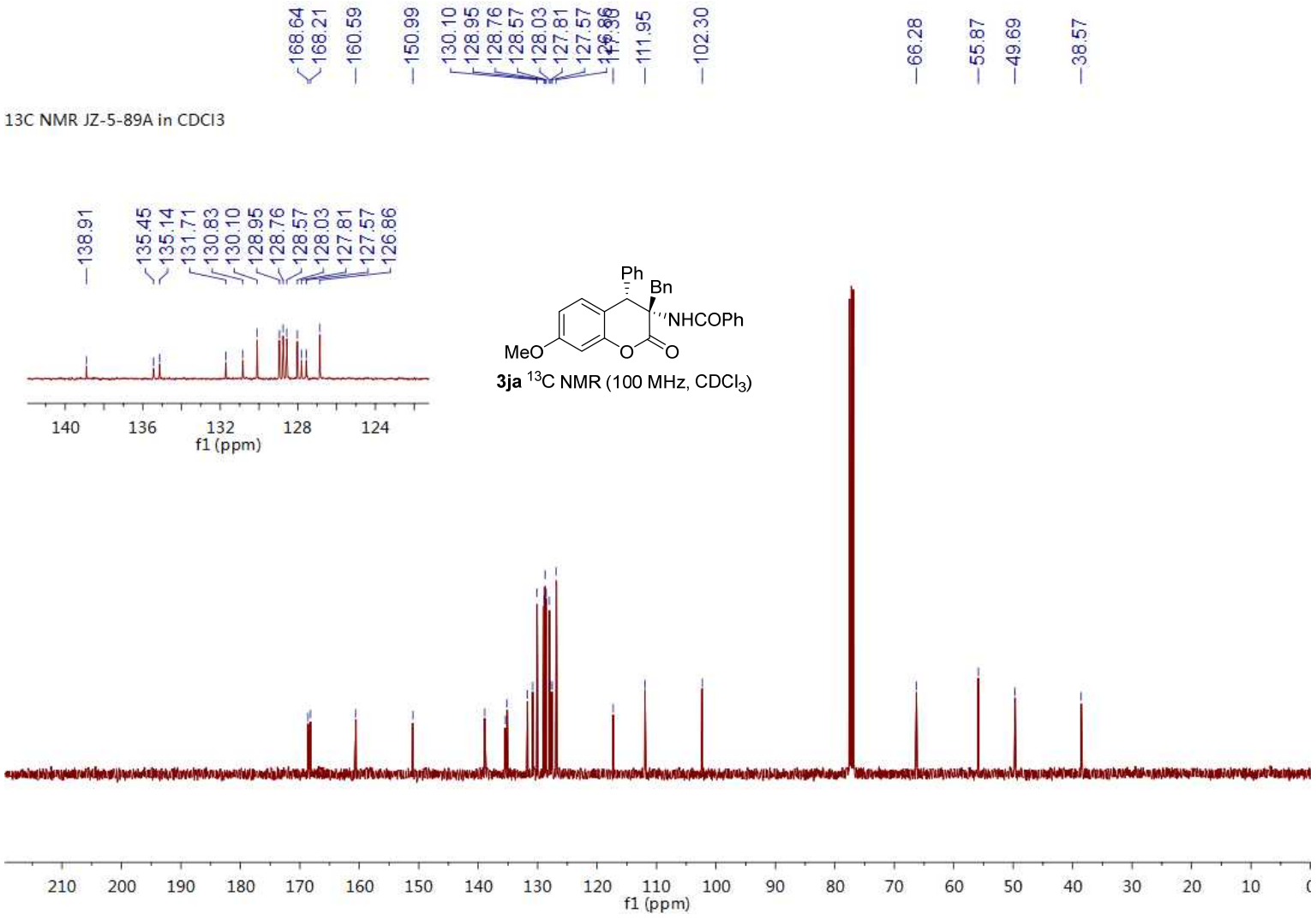
3ia ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR JZ-5-89A in CDCl3

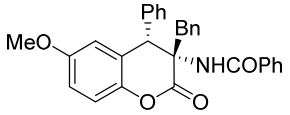


3ja ^{1}H NMR (400 MHz, $CDCl_3$)

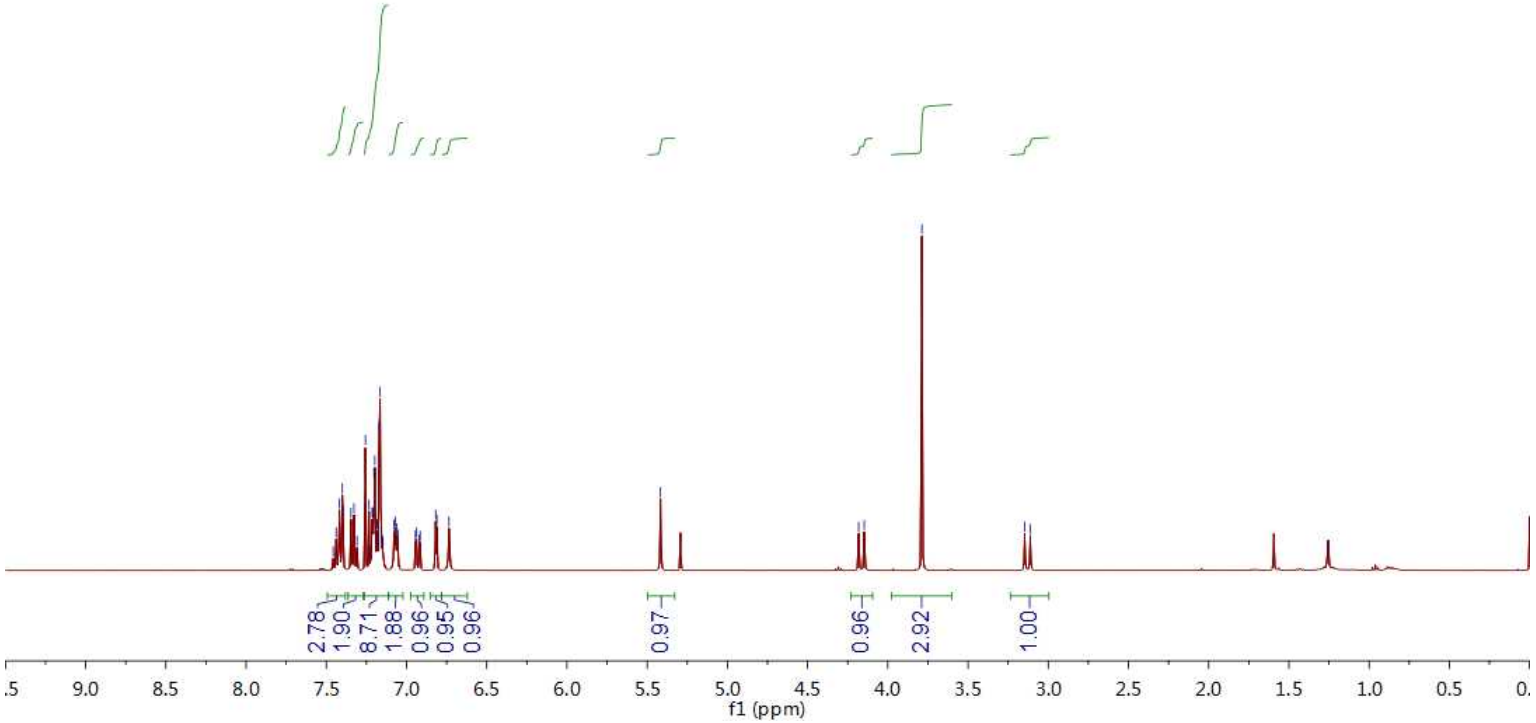


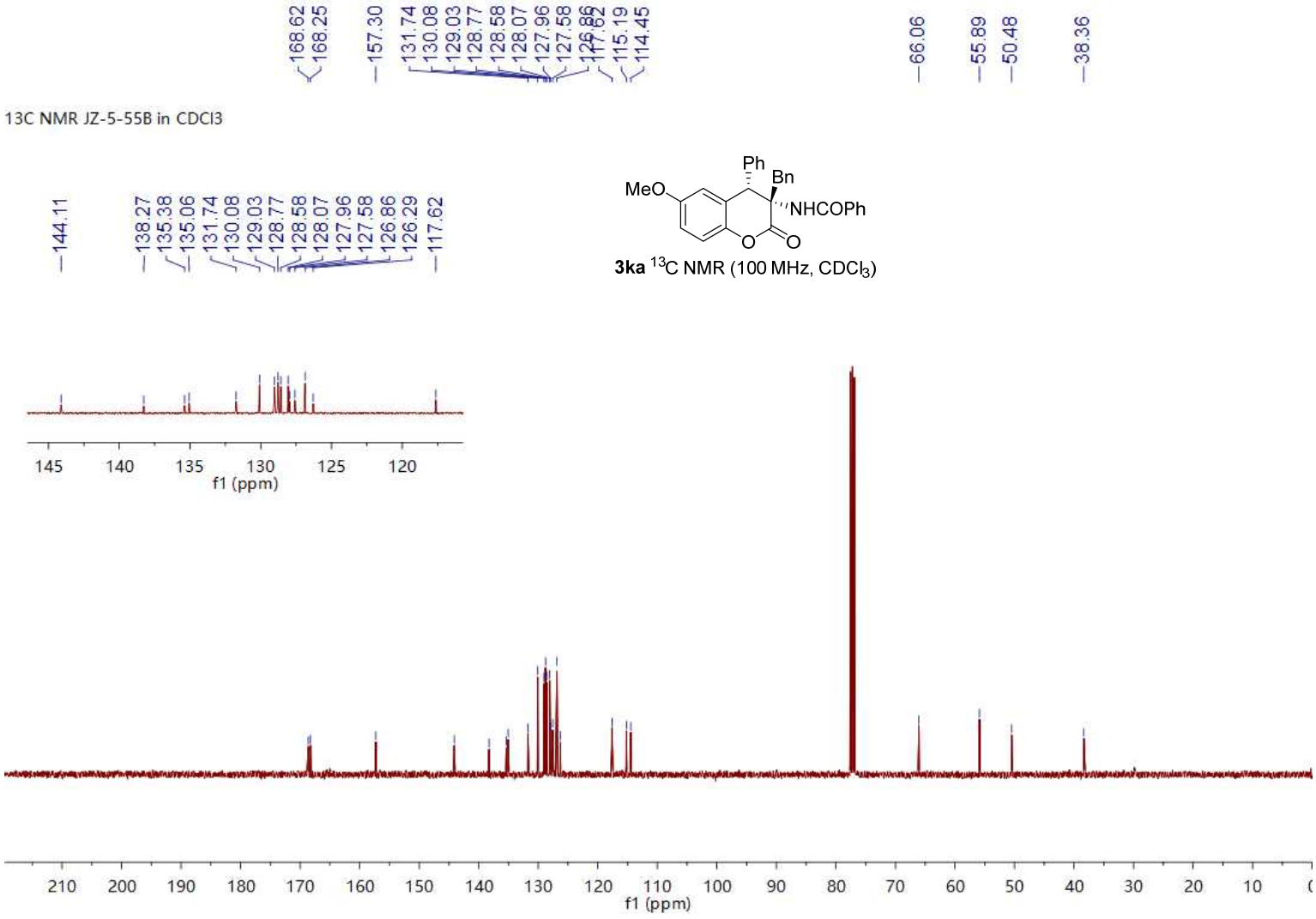

168.64
168.21
160.59
150.99
130.10
128.95
128.76
128.57
128.03
127.81
127.57
111.95
102.30
66.28
55.87
49.69
38.57
13C NMR JZ-5-89A in CDCl3
138.91
135.45
135.14
131.71
130.83
130.10
128.95
128.76
128.57
128.03
127.81
127.57
126.86
140
136
132
128
124
f1 (ppm)
Ph
Bn
NHCOPh
MeO
O
O
3ja 13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

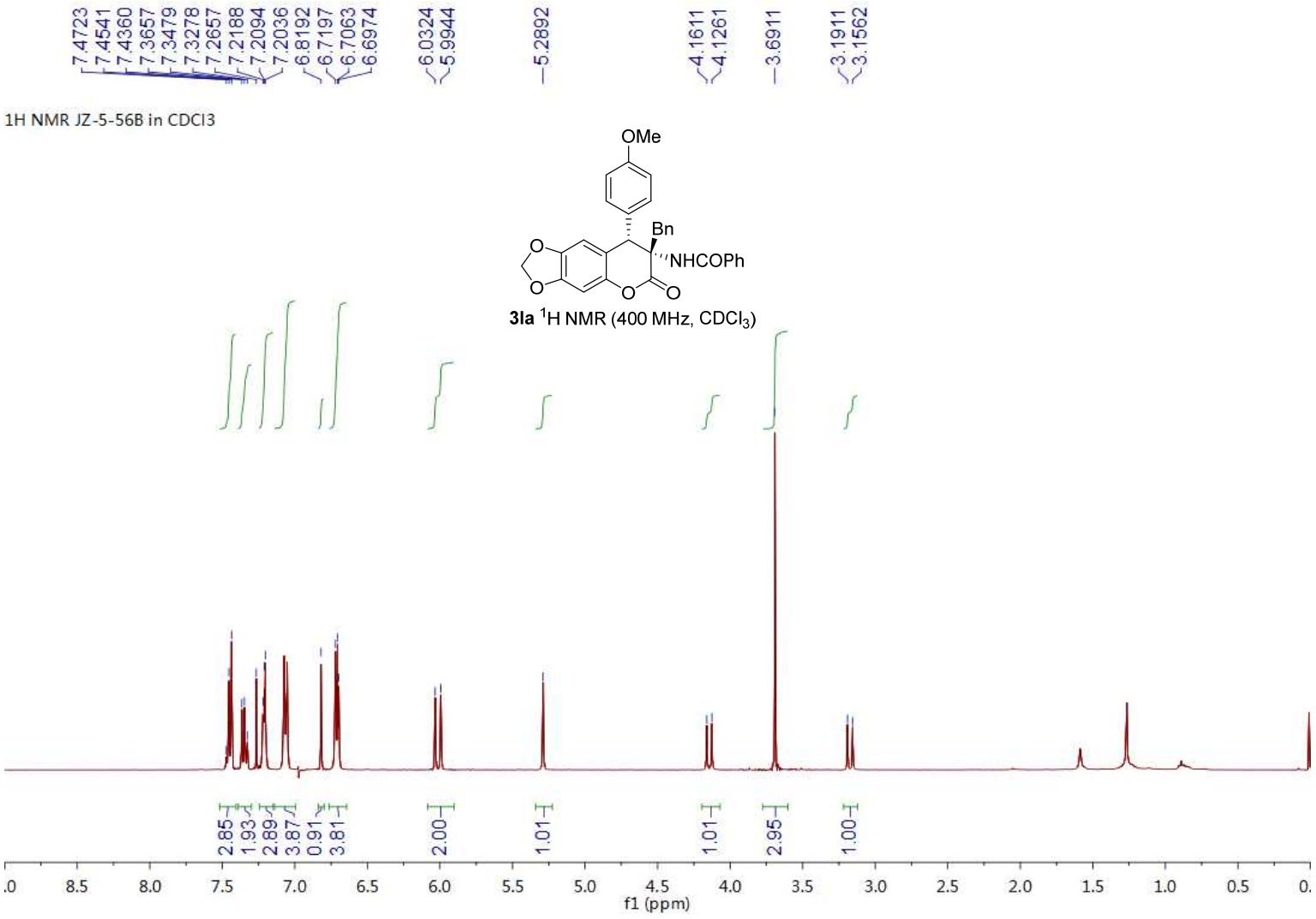
1H NMR JZ-5-55B in CDCl3



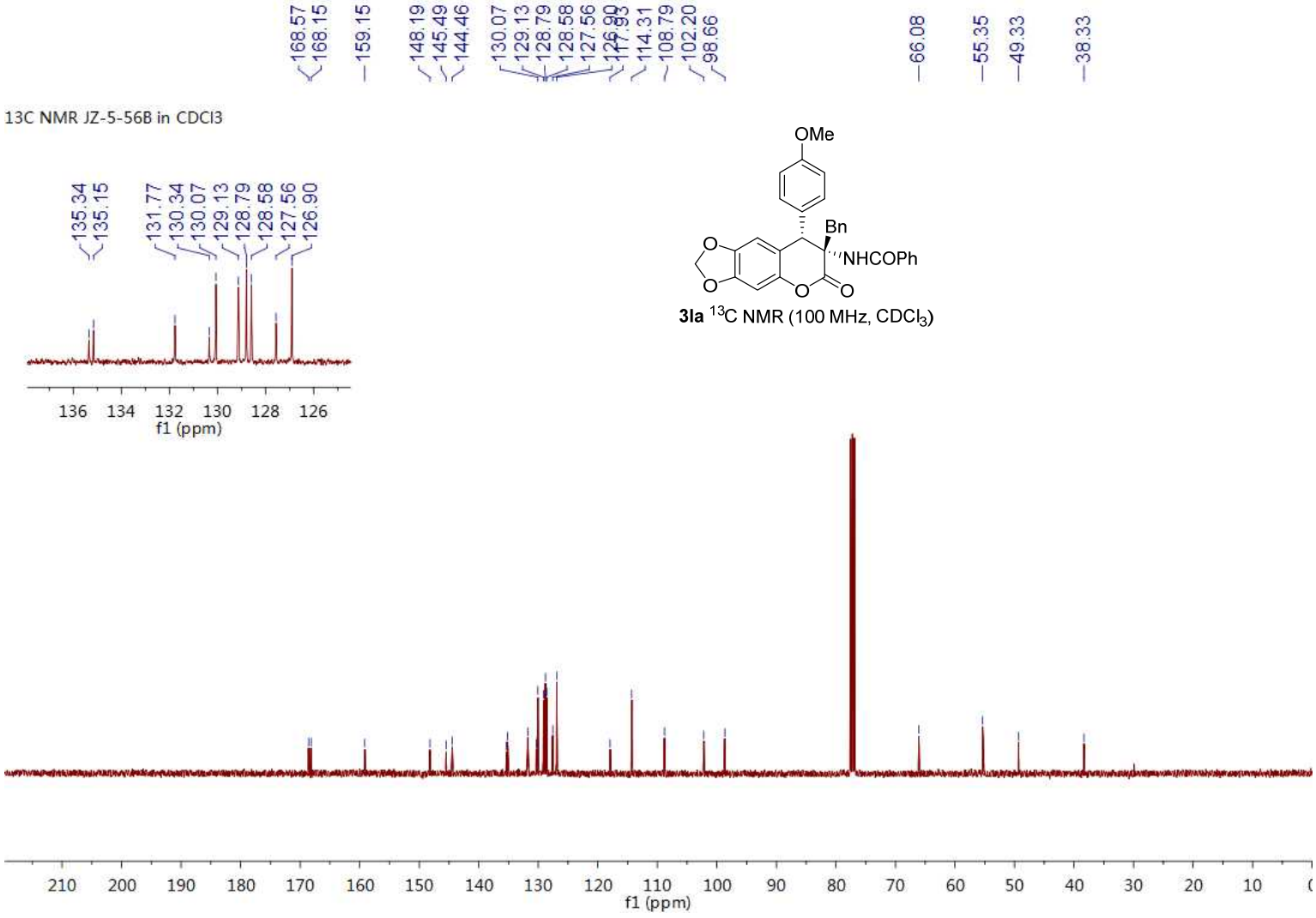
3ka ^{1}H NMR (400 MHz, $CDCl_3$)



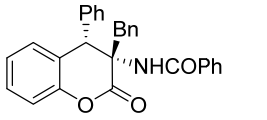

168.62
168.25
157.30
131.74
130.08
129.03
128.77
128.58
128.07
127.96
127.58
126.86
117.62
115.19
114.45
66.06
55.89
50.48
38.36
13C NMR JZ-5-55B in CDCl3
144.11
138.27
135.38
135.06
131.74
130.08
129.03
128.77
128.58
128.07
127.96
127.58
126.86
126.29
117.62
Ph
Bn
MeO
NHCOPh
O
O
3ka 13C NMR (100 MHz, CDCl3)
145
140
135
130
125
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)



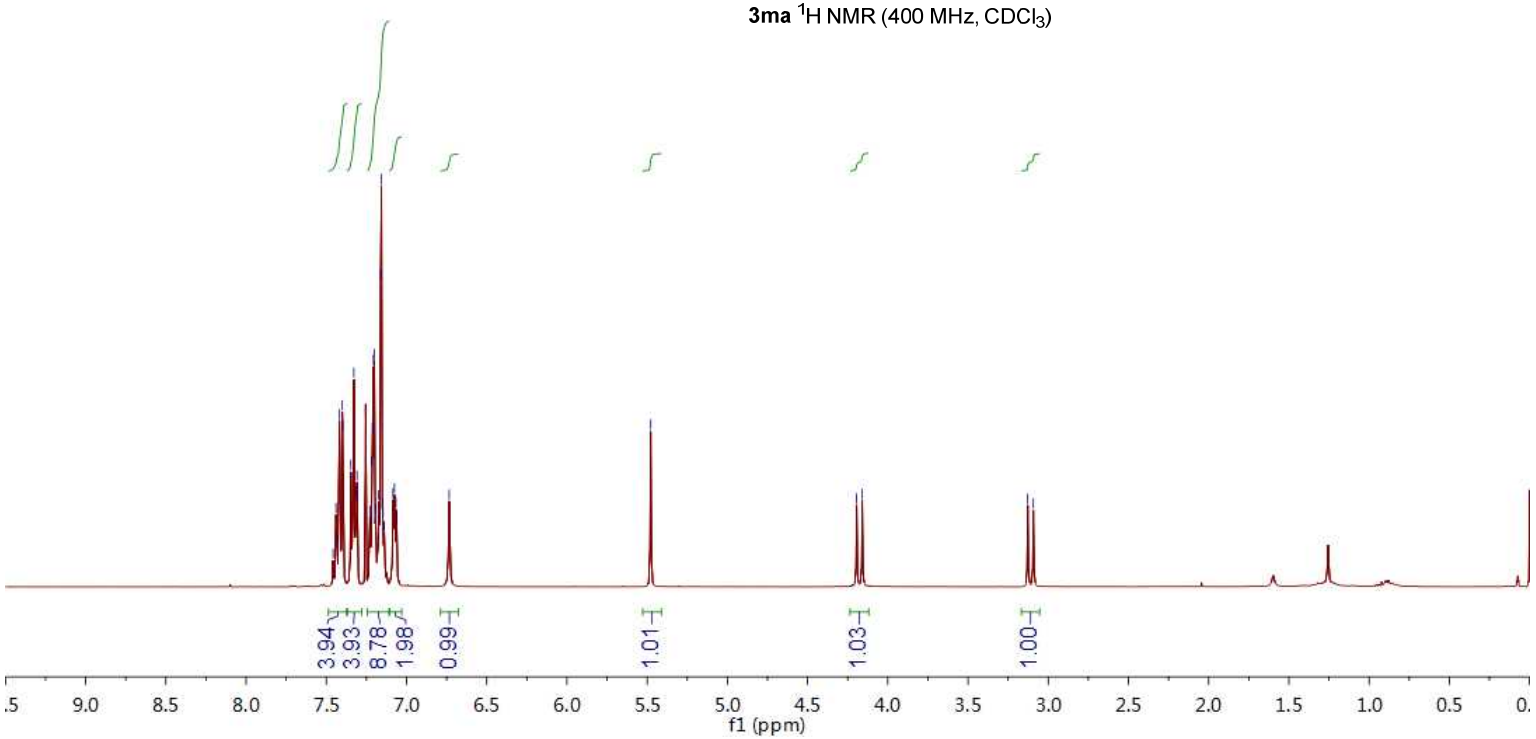
3la ^{1}H NMR (400 MHz, $CDCl_3$)

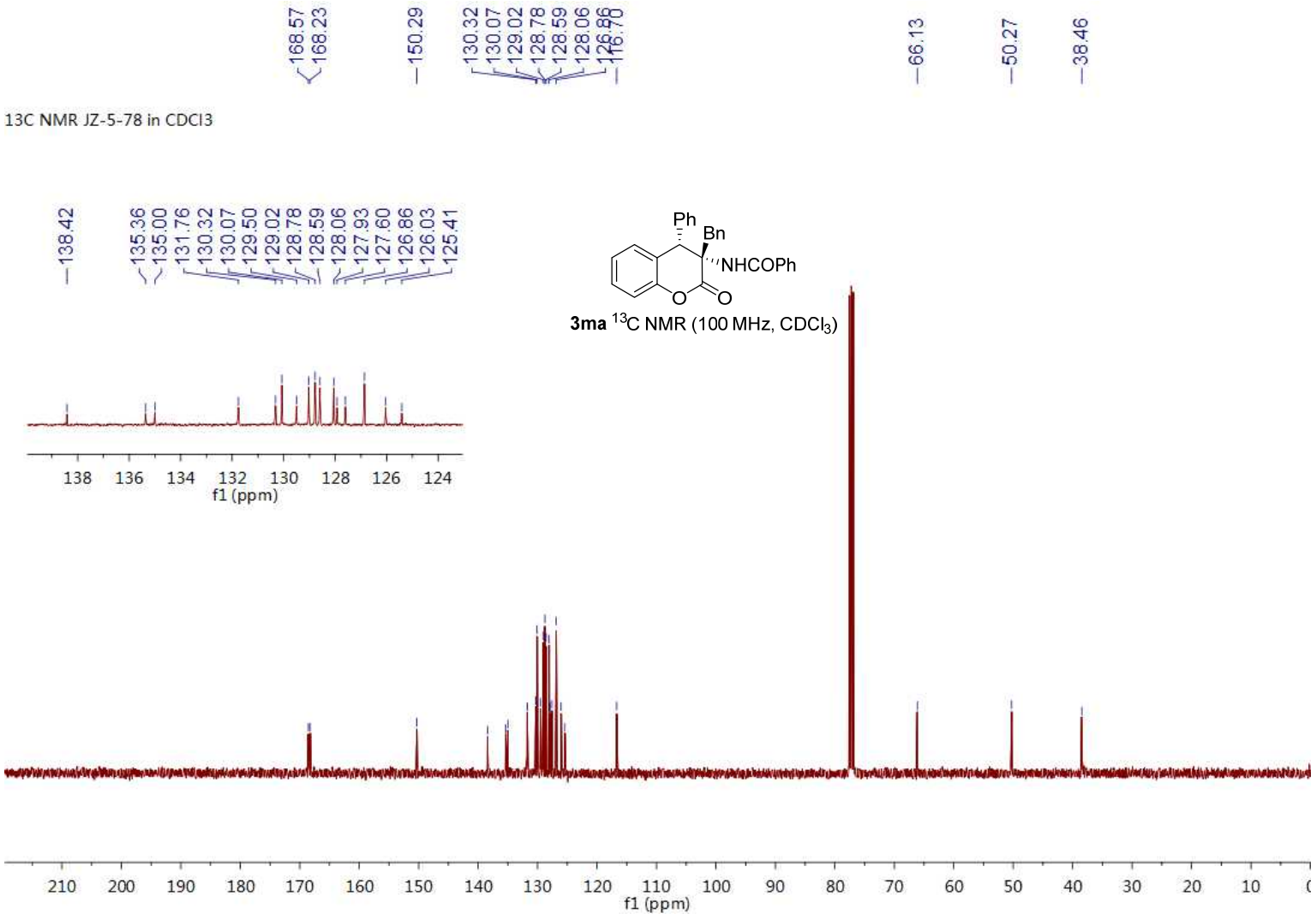

168.57
168.15
159.15
148.19
145.49
144.46
130.07
129.13
128.79
128.58
127.56
126.90
117.93
114.31
108.79
102.20
98.66
66.08
55.35
49.33
38.33
13C NMR JZ-5-56B in CDCl3
135.34
135.15
131.77
130.34
130.07
129.13
128.79
128.58
127.56
126.90
136 134 132 130 128 126
f1 (ppm)
OMe
Bn
NHCOPh
O
O
O
O
3la 13C NMR (100 MHz, CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

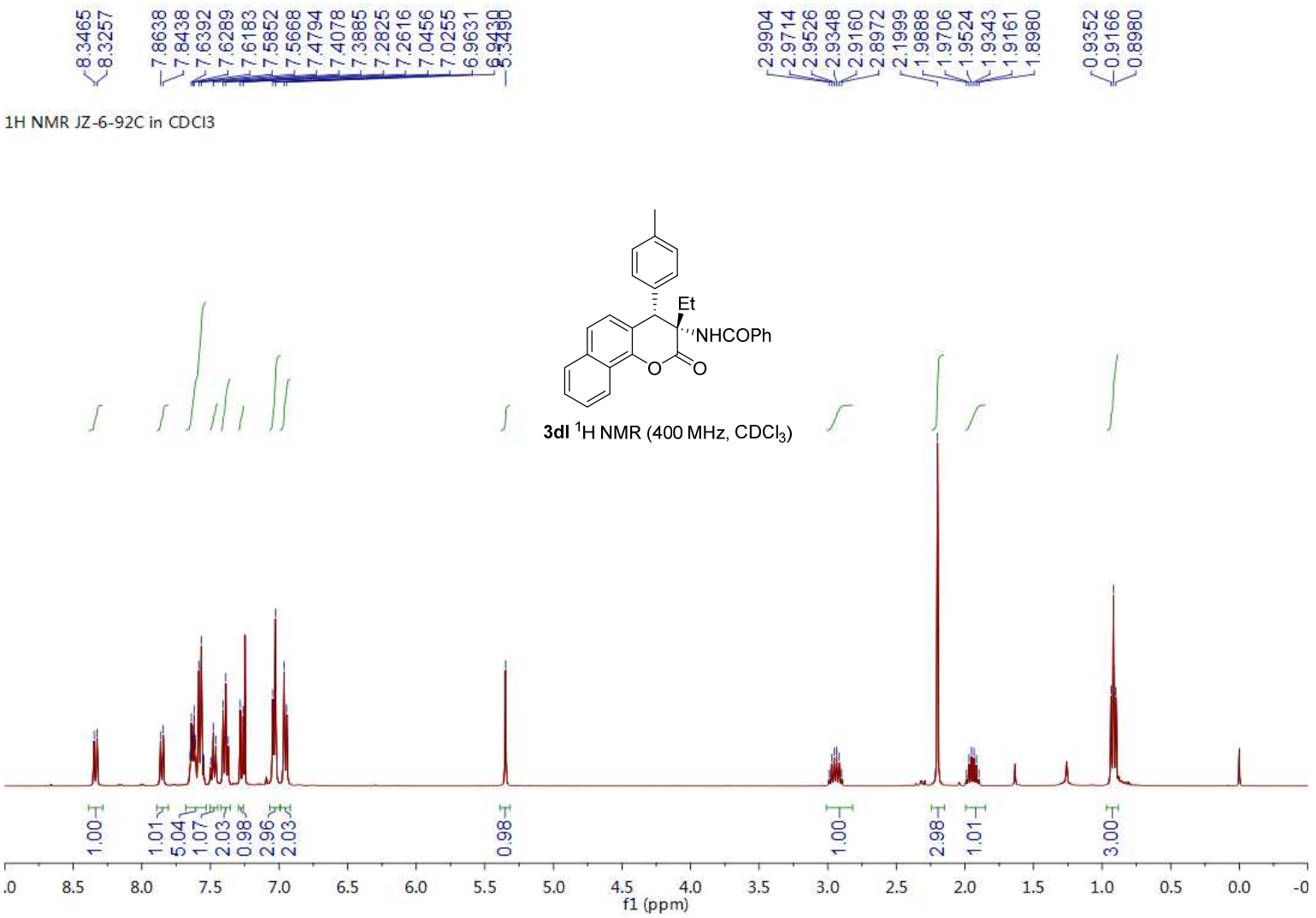
1H NMR JZ-5-78 in CDCl3

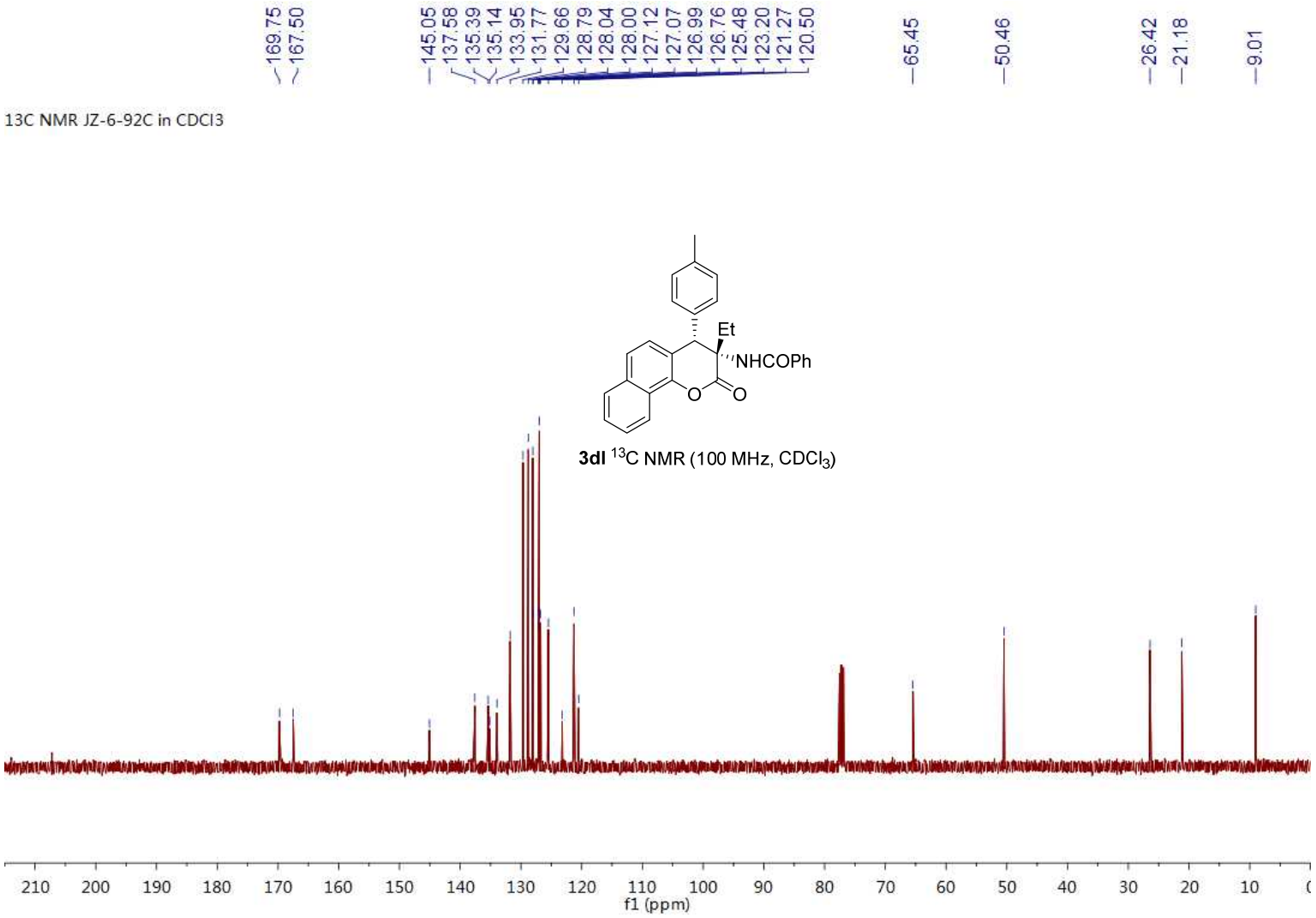


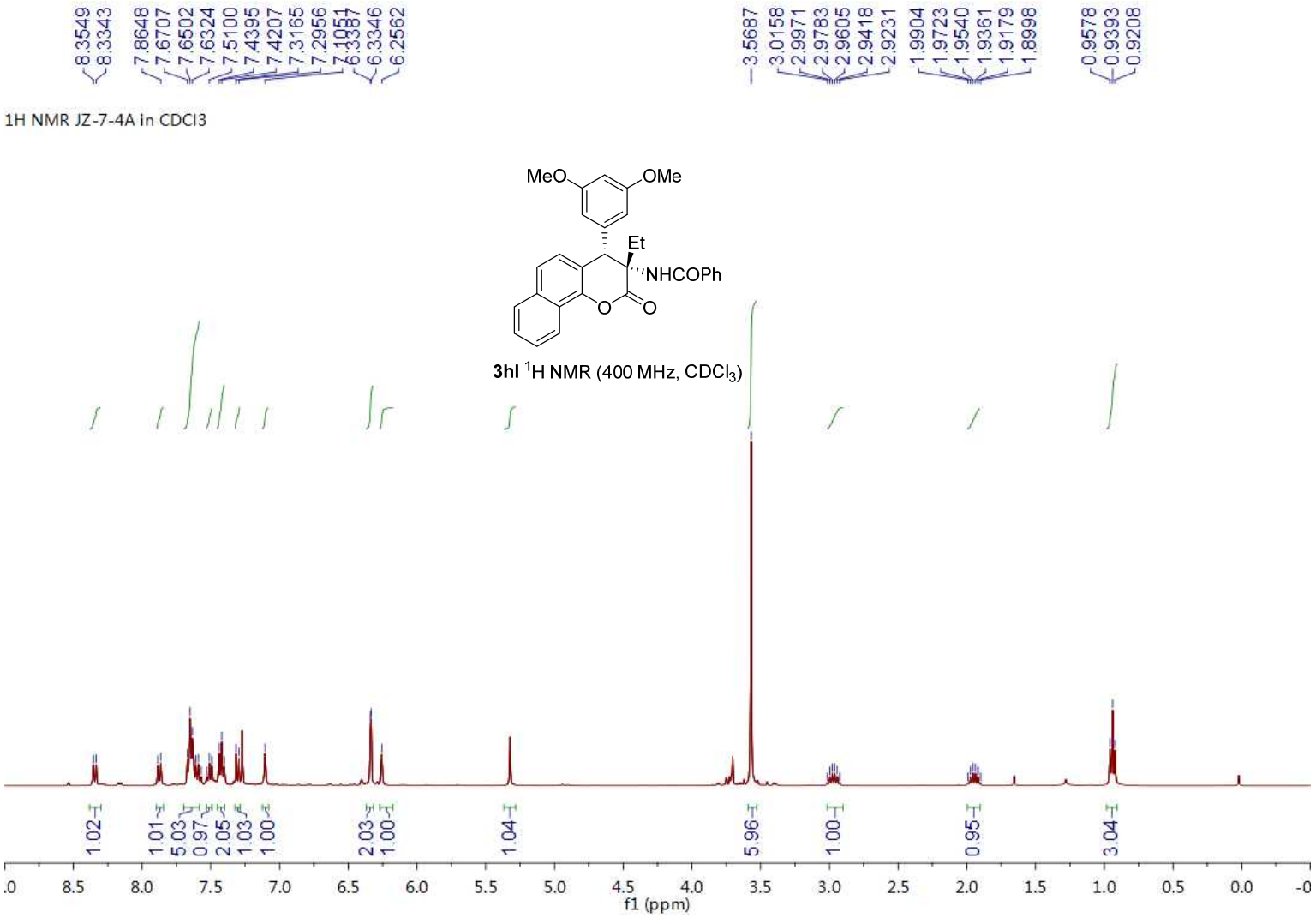
3ma ^{1}H NMR (400 MHz, $CDCl_3$)

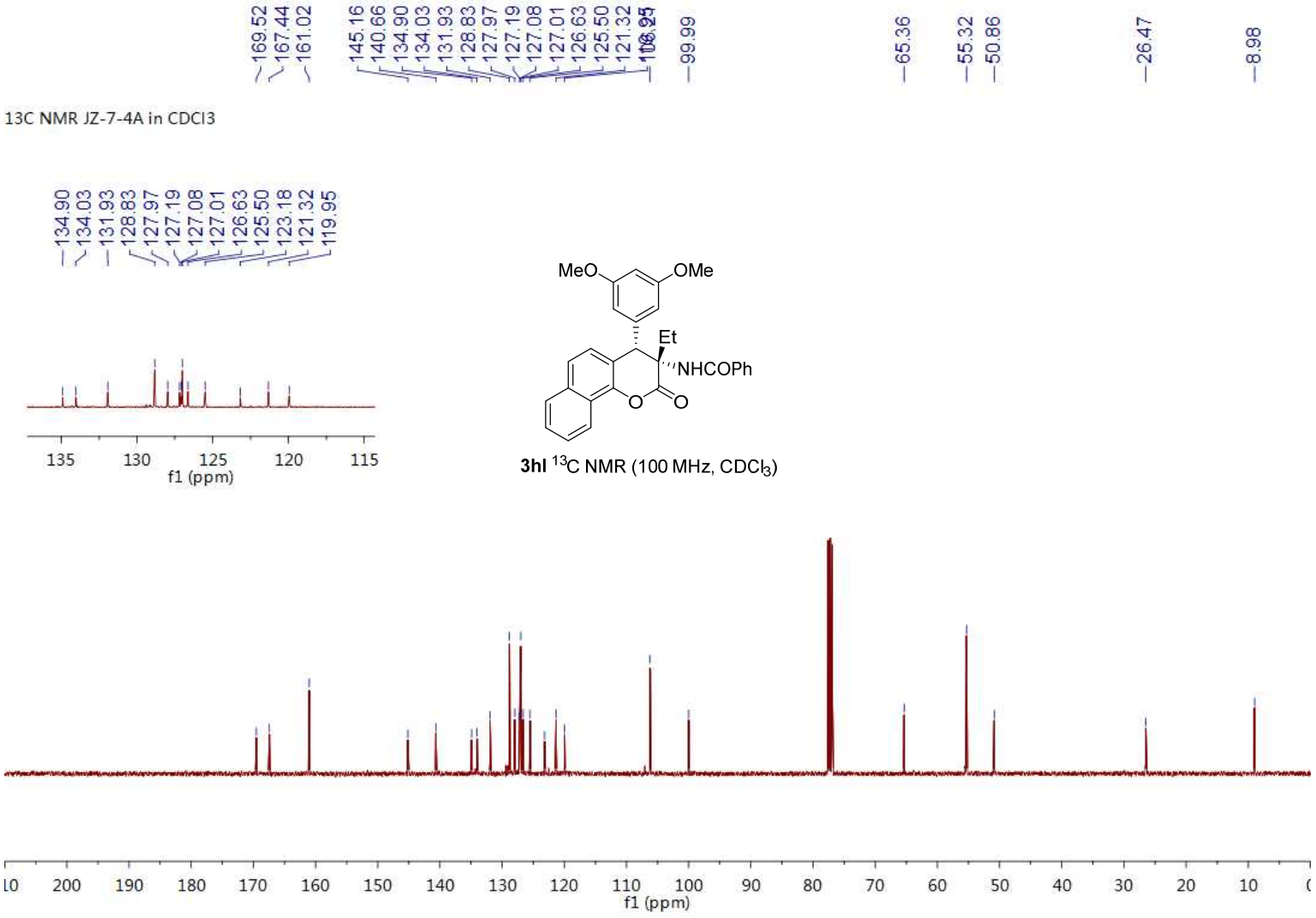



168.57
168.23
150.29
130.32
130.07
129.02
128.78
128.59
128.06
126.86
126.70
66.13
50.27
38.46
13C NMR JZ-5-78 in CDCl3
138.42
135.36
135.00
131.76
130.32
130.07
129.50
129.02
128.78
128.59
128.06
127.93
127.60
126.86
126.03
125.41
Ph
Bn
NHCOPh
O
O
3ma 13C NMR (100 MHz, CDCl3)
138 136 134 132 130 128 126 124
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)

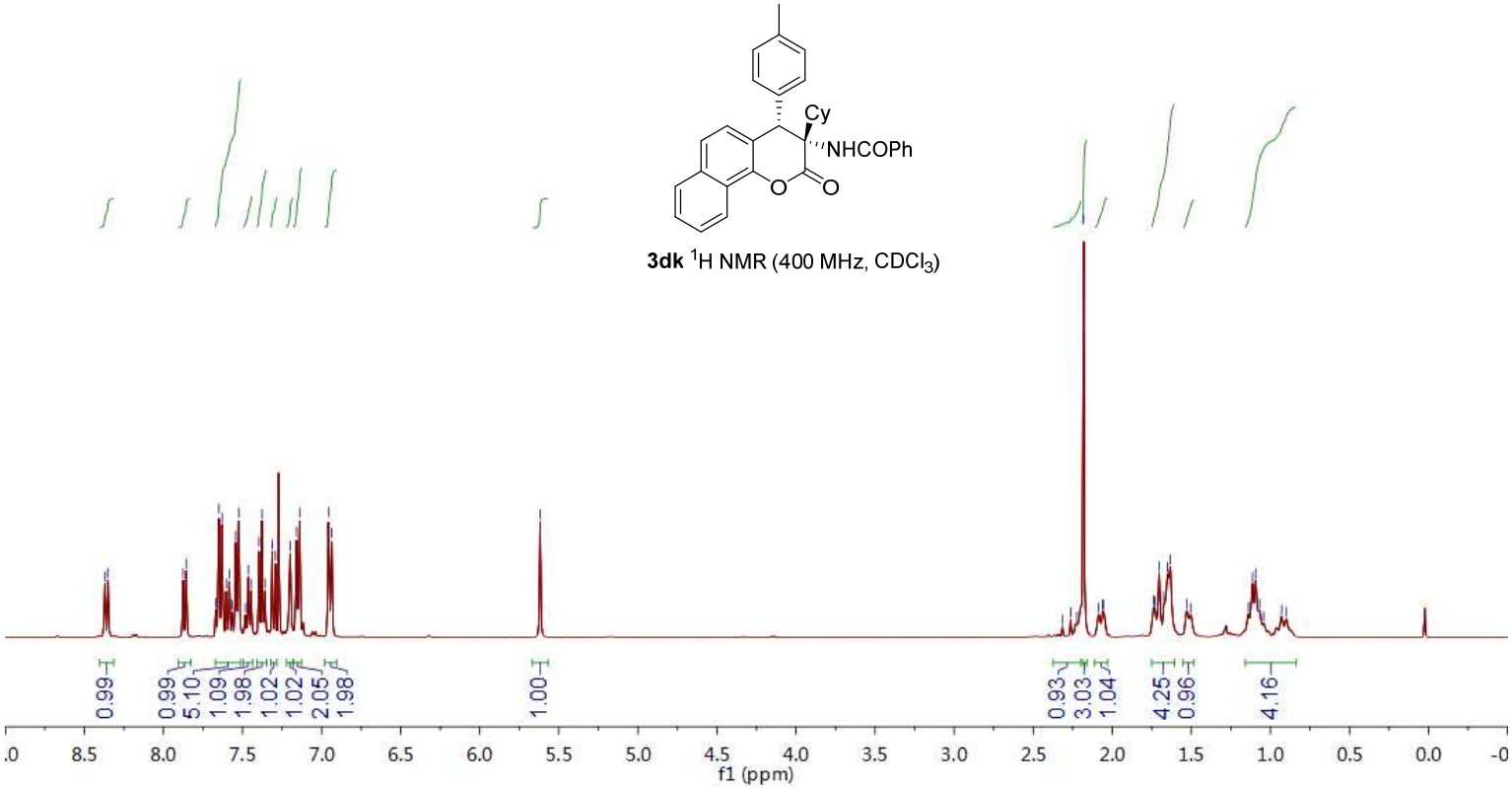

8.3465
8.3257
7.8638
7.8438
7.6392
7.6289
7.6183
7.5852
7.5668
7.4794
7.4078
7.3885
7.2825
7.2616
7.0456
7.0255
6.9631
2.9904
2.9714
2.9526
2.9348
2.9160
2.8972
2.1999
1.9888
1.9706
1.9524
1.9343
1.9161
1.8980
0.9352
0.9166
0.8980
1H NMR JZ-6-92C in CDCl3
Et
NHCOPh
O
O
3dl 1H NMR (400 MHz, CDCl3)
1.00
1.01
5.04
1.07
2.03
0.98
2.96
2.03
0.98
1.00
2.98
1.01
3.00
f1 (ppm)


169.75
167.50
145.05
137.58
135.39
135.14
133.95
131.77
129.66
128.79
128.04
128.00
127.12
127.07
126.99
126.76
125.48
123.20
121.27
120.50
65.45
50.46
26.42
21.18
9.01
13C NMR JZ-6-92C in CDCl3
Et
NHCOPh
O
O
3dl 13C NMR (100 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


8.3549
8.3343
7.8648
7.6707
7.6502
7.6324
7.5100
7.4395
7.4207
7.3165
7.2956
7.1051
6.3387
6.3346
6.2562
3.5687
3.0158
2.9971
2.9783
2.9605
2.9418
2.9231
1.9904
1.9723
1.9540
1.9361
1.9179
1.8998
0.9578
0.9393
0.9208
1H NMR JZ-7-4A in CDCl3
MeO
OMe
Et
NHCOPh
O
O
3hl 1H NMR (400 MHz, CDCl3)
1.02
1.01
5.03
0.97
2.05
1.03
1.00
2.03
1.00
1.04
5.96
1.00
0.95
3.04
f1 (ppm)

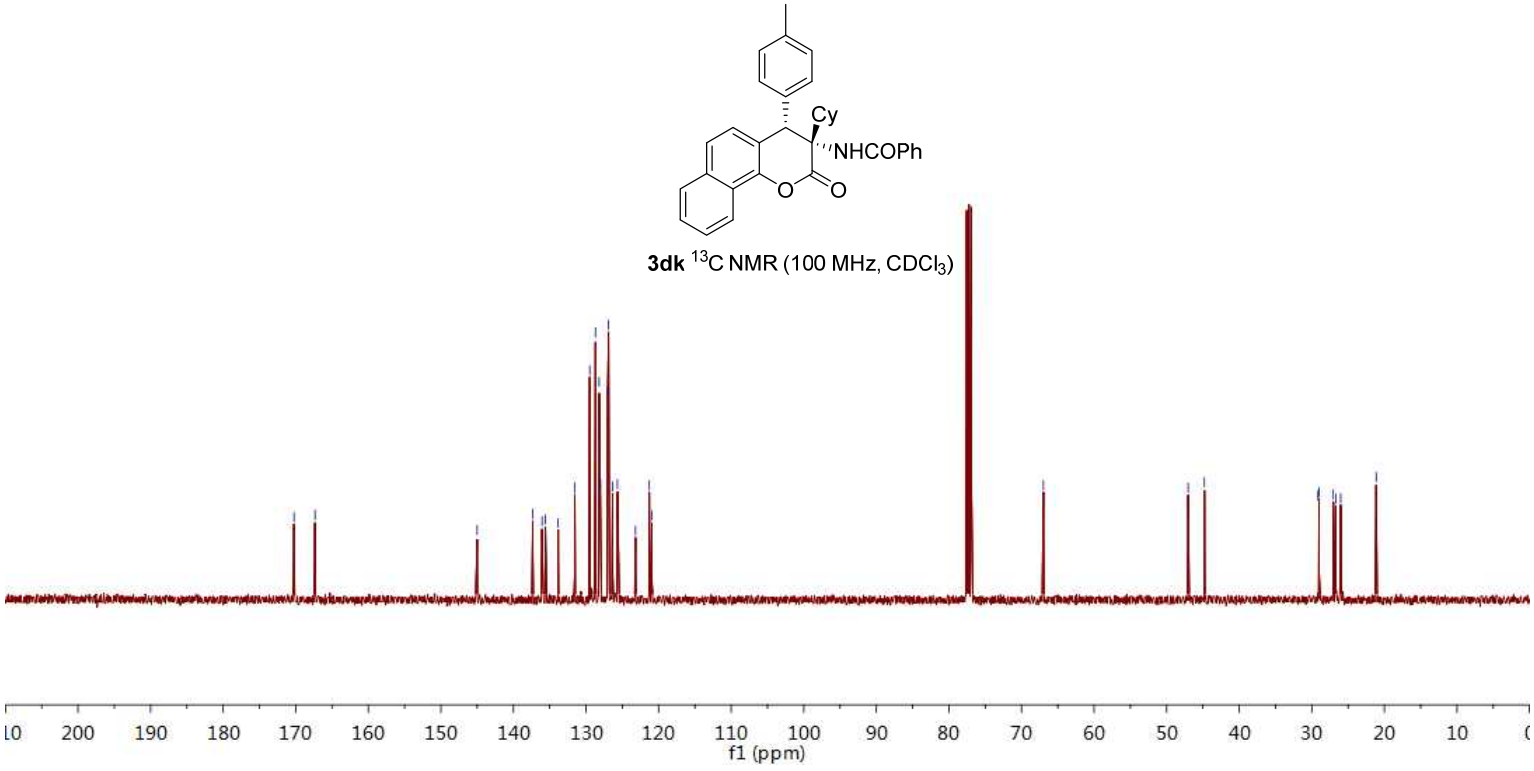

169.52
167.44
161.02
145.16
140.66
134.90
134.03
131.93
128.83
127.97
127.19
127.08
127.01
126.63
125.50
121.32
99.99
65.36
55.32
50.86
26.47
8.98
13C NMR JZ-7-4A in CDCl3
134.90
134.03
131.93
128.83
127.97
127.19
127.08
127.01
126.63
125.50
123.18
121.32
119.95
135
130
125
120
115
f1 (ppm)
MeO
OMe
Et
NHCOPh
O
O
3hl 13C NMR (100 MHz, CDCl3)
10
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

1H NMR JZ-7-4B in CDCl3



3dk ^{1}H NMR (400 MHz, $CDCl_3$)

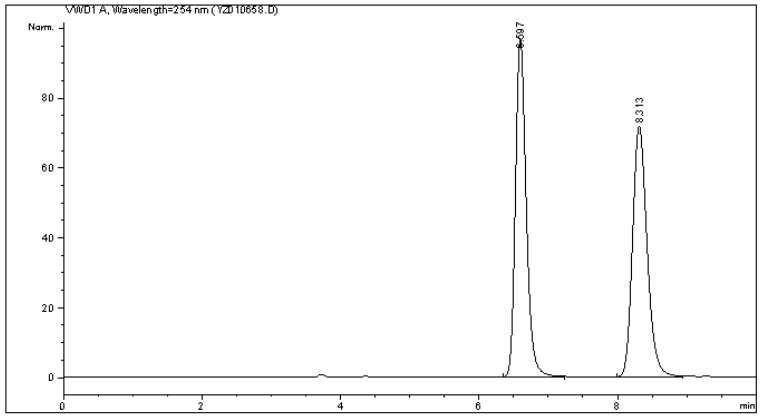
13C NMR JZ-7-4B in CDCl3



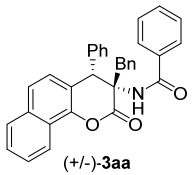
3dk ^{13}C NMR (100 MHz, $CDCl_3$)

Data File C:\CHEM32\1\DATA\YZ010658.D
Sample Name: JZ-4-51B

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 6/14/2016 12:09:49 PM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed    : 6/14/2016 12:00:08 PM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:01:11 PM by 0
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```



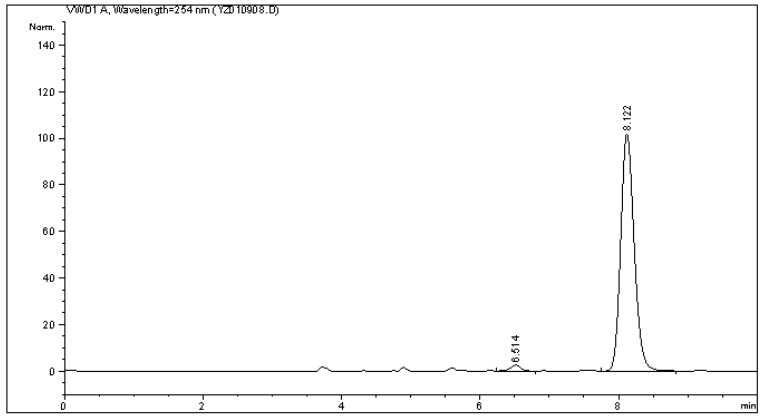

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.597 BB    0.1649 1042.31201   96.80540  49.9702
   2   8.313 BB    0.2237 1043.55359   71.67055  50.0298

Totals :                  2085.86560  168.47594

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



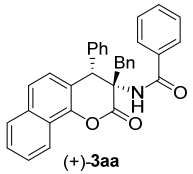
(+/-)-**3aa**

Data File C:\CHEM32\1\DATA\YZ010908.D
Sample Name: JZ-4-91A

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/30/2016 10:12:59 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/30/2016 9:42:59 AM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:03:55 PM by 0
                  (modified after loading)
Sample Info     : OD, H/i-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```



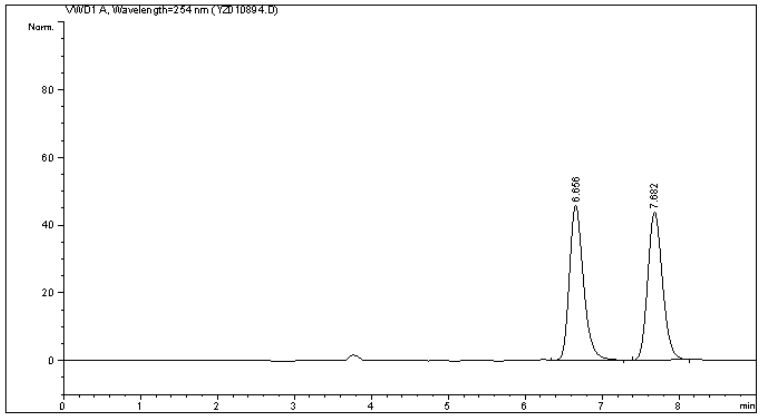

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.514 VB    0.1621   26.71480    2.50802   1.8983
   2   8.122 VB    0.2103 1380.58435  101.99632  98.1017

Totals :                  1407.29915  104.50434

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



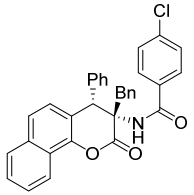
(+)-**3aa**

Data File C:\CHEM32\1\DATA\YZ010894.D
Sample Name: JZ-4-91B(+-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/28/2016 12:38:27 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/28/2016 12:36:49 AM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:06:00 PM by 0
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.656 VB    0.1952  583.38489   45.79784  50.1658
   2   7.682 BB    0.2058  579.52875   43.66334  49.8342

Totals :                  1162.91364   89.46118
```

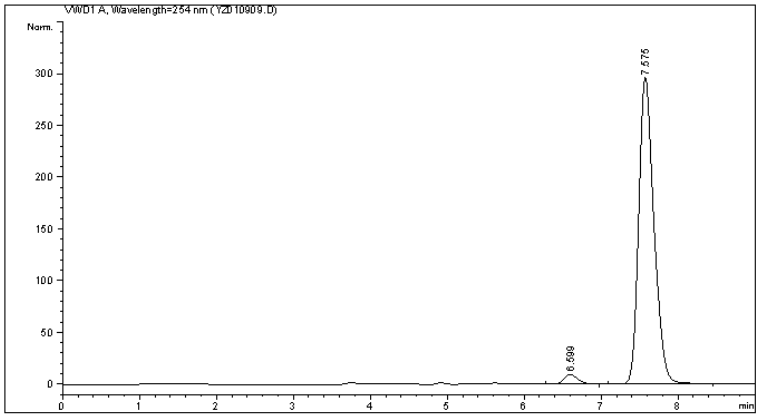


(+/-)-**3ab**

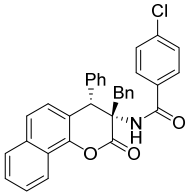
```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\YZ010909.D
Sample Name: JZ-4-91B

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/30/2016 10:31:40 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/30/2016 10:29:42 AM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:08:02 PM by 0
                  (modified after loading)
Sample Info     : OD, H/i-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.599 VB    0.1915  119.09901    9.49069   2.8385
   2   7.575 BB    0.2072 4076.81055  296.19855  97.1615

Totals :                  4195.90955  305.68924
```

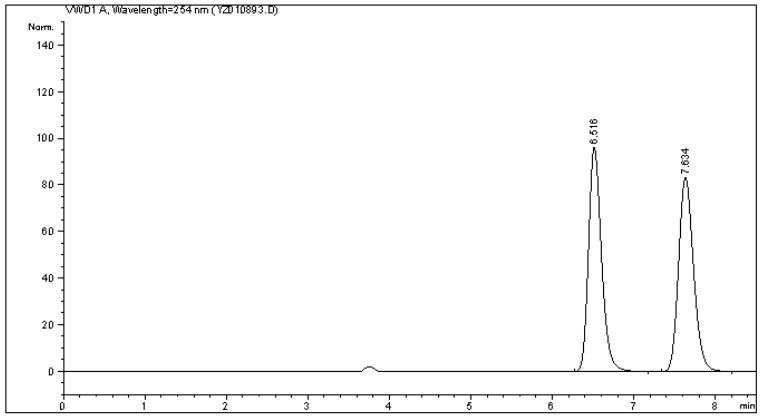


(+)-**3ab**

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

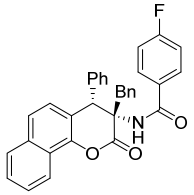
Data File C:\CHEM32\1\DATA\YZ010893.D
Sample Name: JZ-4-91C(+-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/28/2016 12:24:29 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/28/2016 12:23:07 AM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:10:46 PM by 0
                  (modified after loading)
Sample Info     : OD-H, H/i-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```



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 Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.516 VB    0.1706 1073.23132   96.43245  50.0599
   2   7.634 BB    0.1976 1070.66479   83.51003  49.9401

Totals :                  2143.89612  179.94247
```

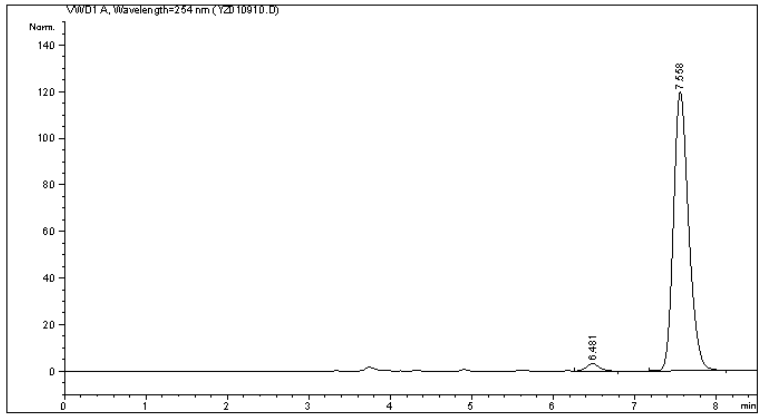


(+/-)-**3ac**

*** End of Report ***

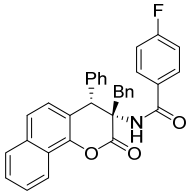
Data File C:\CHEM32\1\DATA\YZ010910.D
Sample Name: JZ-4-91C

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 7/30/2016 10:42:32 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 7/30/2016 10:41:08 AM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:10:46 PM by 0
                  (modified after loading)
Sample Info     : OD, H/i-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```



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 Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.481 VB    0.1729   35.93921    3.17243   2.2741
   2   7.558 BB    0.1971 1544.45764  119.71775  97.7259

Totals :                  1580.39685  122.89018
```

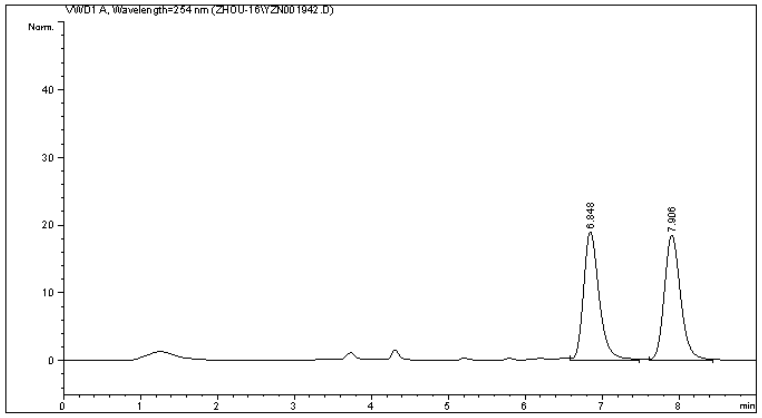


(+)-**3ac**

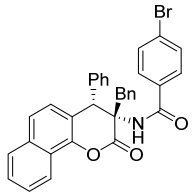
*** End of Report ***

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001942.D
Sample Name: JZ-4-99A(+-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2016 9:41:26 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/2/2016 9:39:06 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:16:18 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



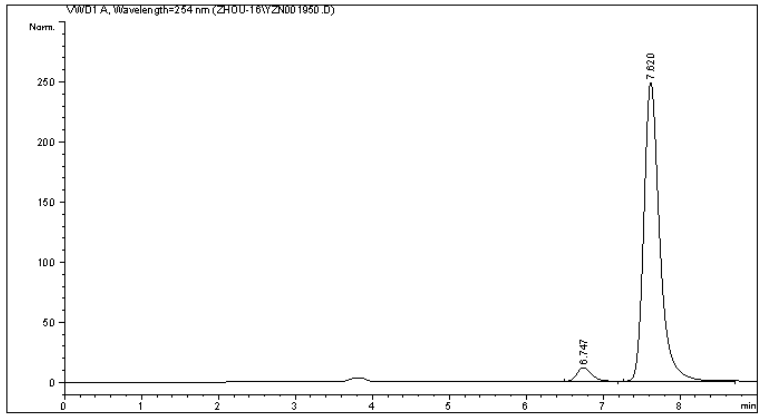

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.848 VB    0.2146  266.16974   18.98097  49.7762
   2   7.906 BB    0.2239  268.56326   18.42437  50.2238

Totals :                   534.73300   37.40534

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



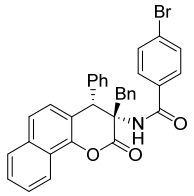
(+/-)-**3ad**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001950.D
Sample Name: JZ-4-99A

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/4/2016 8:41:52 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/4/2016 8:14:11 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:14:34 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



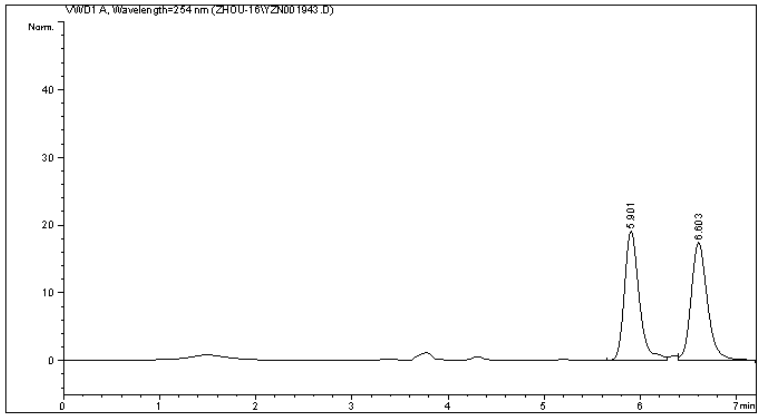

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.747 BB    0.2051  152.76852   11.45354   4.1361
   2   7.620 BB    0.2155 3540.74243  248.83588  95.8639

Totals :                  3693.51096  260.28941

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



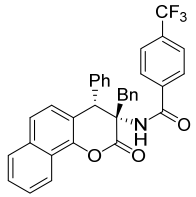
(+)-**3ad**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001943.D
Sample Name: JZ-4-99B(+-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2016 9:52:58 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/2/2016 9:51:32 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:22:50 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



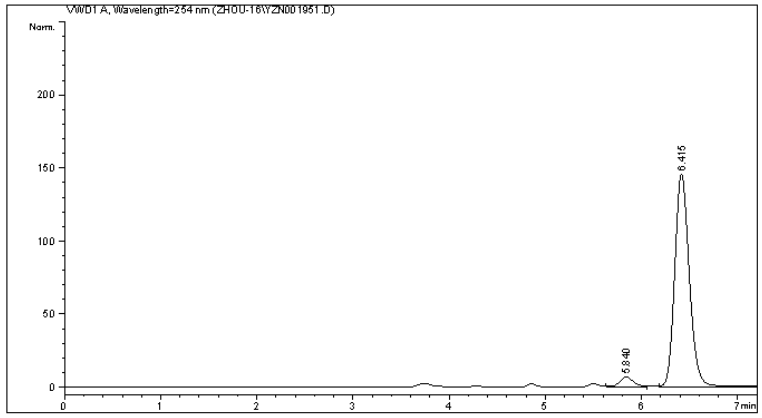

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   5.901 BV    0.1622  203.23901   19.06376  49.8485
   2   6.603 VB    0.1810  204.47464   17.37508  50.1515

Totals :                  407.71365   36.43884

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



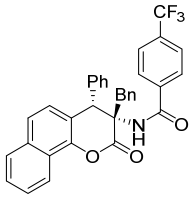
(+/-)-**3ae**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001951.D
Sample Name: JZ-4-99B

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/4/2016 8:54:37 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/4/2016 8:53:13 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:20:16 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



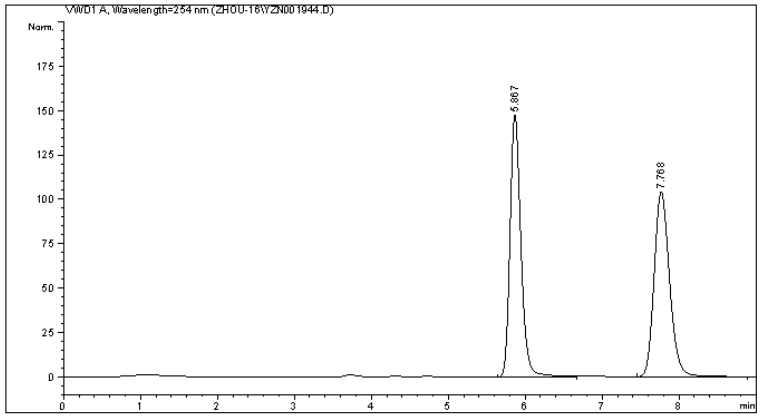

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   5.840 VV    0.1514   65.66459    6.57594   4.1014
   2   6.415 VV    0.1637 1535.37134  145.66673  95.8986

Totals :                  1601.03593  152.24267

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



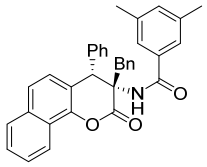
(+)-**3ae**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001944.D
Sample Name: JZ-4-99C(+-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/2/2016 10:04:54 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/2/2016 10:01:34 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:24:38 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



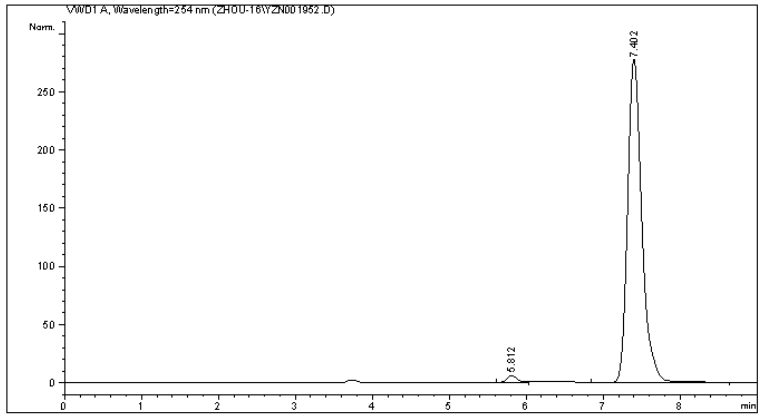

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   5.867 BV    0.1524 1450.74841  147.80040  49.9509
   2   7.768 BB    0.2149 1453.59949  104.40303  50.0491

Totals :                  2904.34790  252.20343

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



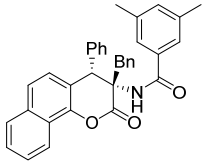
(+/-)-**3af**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001952.D
Sample Name: JZ-4-99C

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/4/2016 9:05:10 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/4/2016 9:03:24 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:26:40 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



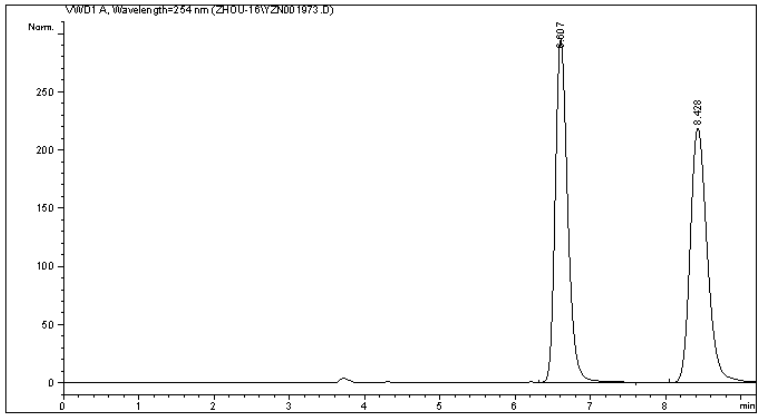

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   5.812 VV    0.1481   59.46905    6.13226   1.6333
   2   7.402 VB    0.2033 3581.51172  276.97421  98.3667

Totals :                  3640.98077  283.10647

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



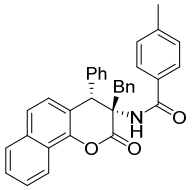
(+)-**3af**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001973.D
Sample Name: JZ-5-4A(+-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/16/2016 10:04:08 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/16/2016 9:39:54 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:28:28 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



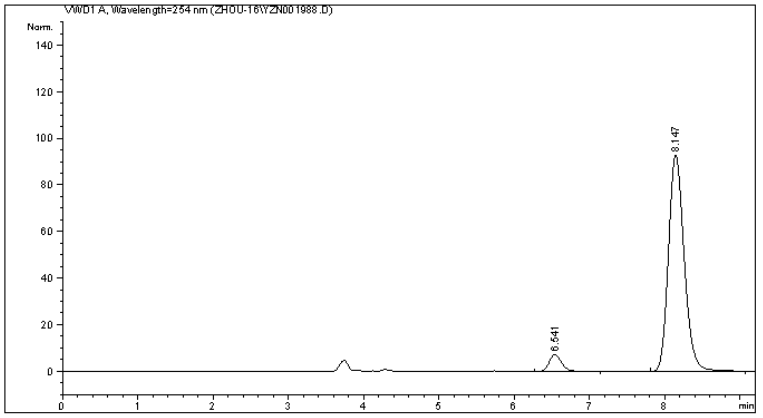

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.607 VV    0.1764 3416.55347  293.90829  49.8665
   2   8.428 VV    0.2414 3434.84326  218.74097  50.1335

Totals :                  6851.39673  512.64926

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



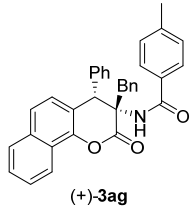
(+/-)-**3ag**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001988.D
Sample Name: JZ-5-4A

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/18/2016 9:11:59 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/18/2016 9:10:12 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:30:03 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



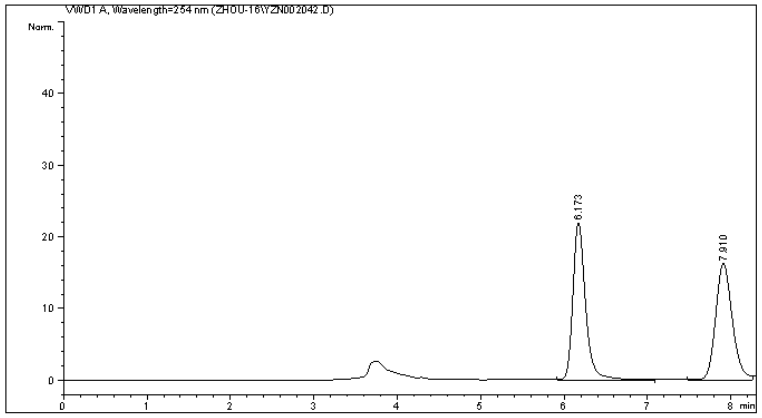

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.541 VB    0.1812   84.68954    7.33807   5.8705
   2   8.147 VV    0.2289 1357.93323   92.80769  94.1295

Totals :                  1442.62276  100.14575

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



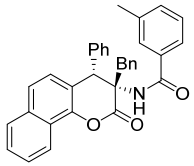
(+)-**3ag**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002042.D
Sample Name: JZ-5-14A(+-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/22/2016 2:34:14 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/22/2016 2:32:00 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:43:20 PM by 0
                  (modified after loading)
Sample Info     : OD-H, Hex/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```



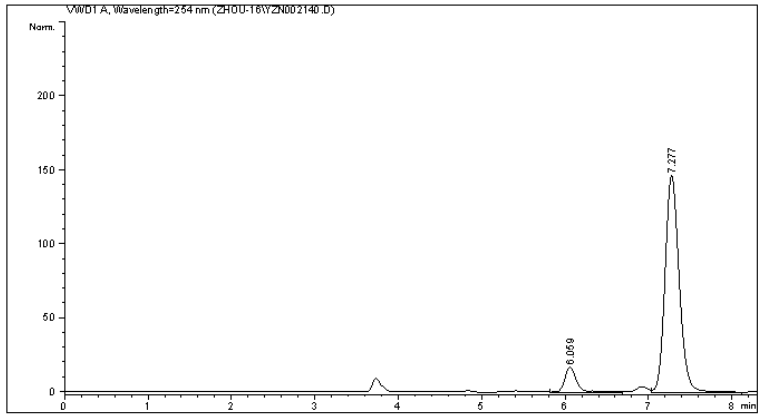

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.173 VB    0.1591  232.56683   21.86232  50.7833
   2   7.910 BV    0.2146  225.39282   16.21703  49.2167

Totals :                  457.95966   38.07934

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



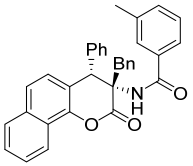
(+/-)-**3ah**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002140.D
Sample Name: JZ-5-21A

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/30/2016 8:50:04 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/30/2016 8:10:09 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:45:38 PM by 0
                  (modified after loading)
Sample Info     : OD-H, Hex/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```



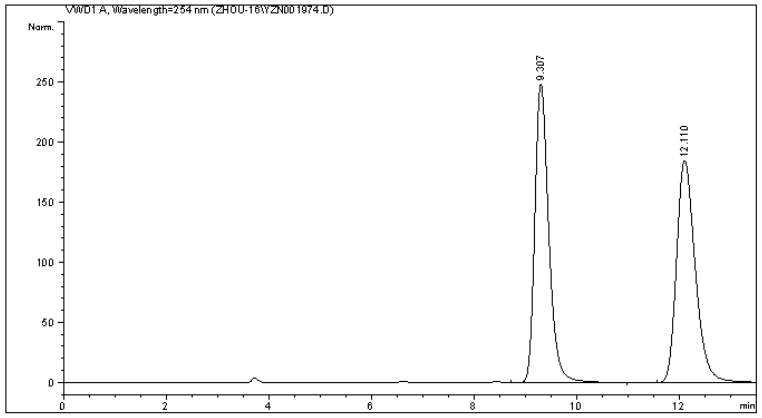

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.059 VB    0.1517  168.46339   16.83915   8.9013
   2   7.277 VV    0.1841 1724.11316  146.23972  91.0987

Totals :                  1892.57655  163.07887

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



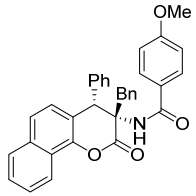
(+)-**3ah**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001974.D
Sample Name: JZ-5-4B(+-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/16/2016 10:16:04 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/16/2016 10:15:03 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:32:08 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



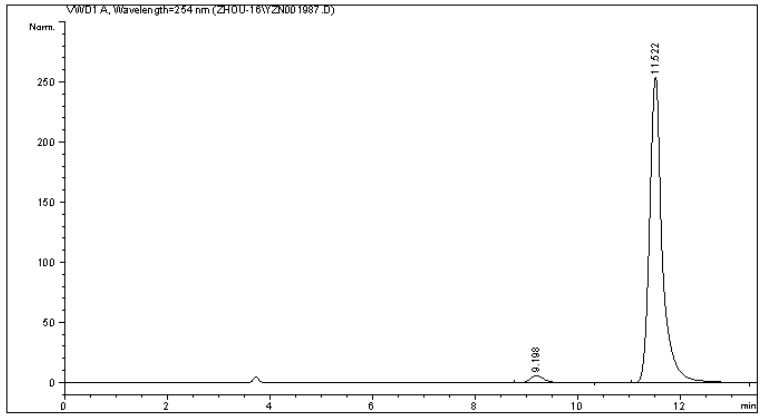

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   9.307 VB    0.2904 4695.96191  248.43547  50.0618
   2  12.110 BV    0.3889 4684.37061  184.81287  49.9382

Totals :                  9380.33252  433.24834

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



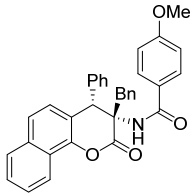
(+/-)-**3ai**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001987.D
Sample Name: JZ-5-4B

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/18/2016 8:55:32 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/18/2016 8:52:43 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:33:45 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```



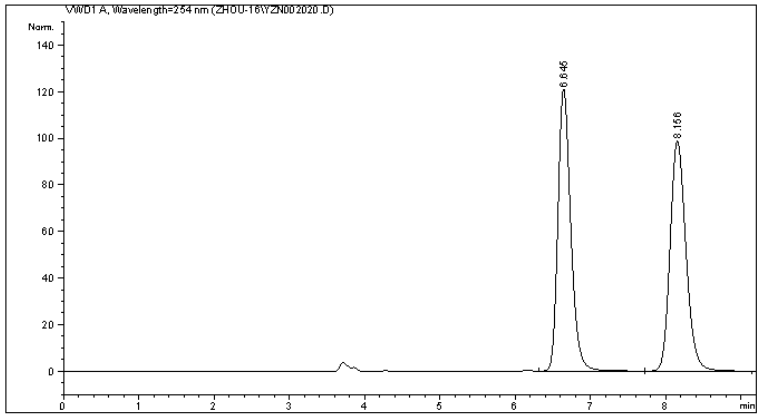

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   9.198 VB    0.2875  112.88904    6.05352   2.5205
   2  11.522 BB    0.2590 4365.85986  253.71648  97.4795

Totals :                  4478.74890  259.77000

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



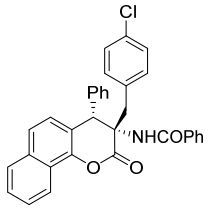
(+)-**3ai**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002020.D
Sample Name: JZ-5-11B(+-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/20/2016 9:31:02 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/20/2016 9:28:57 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:36:45 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.645 VV    0.1805 1449.43506  120.98392  49.8099
   2   8.156 VB    0.2306 1460.50037   98.85862  50.1901

Totals :                  2909.93542  219.84254
```

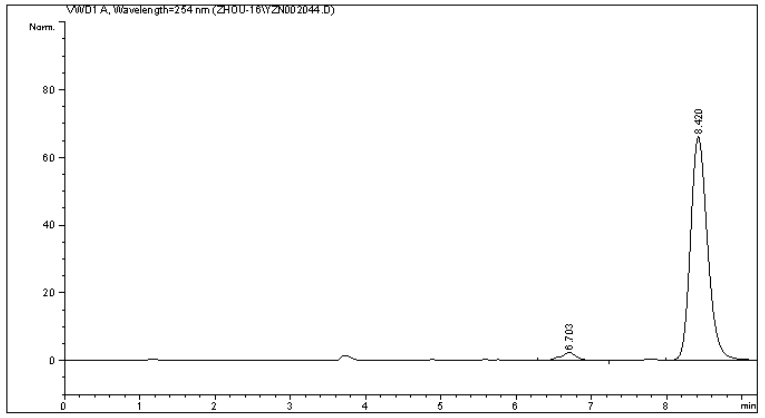


(+/-)-**3aj**

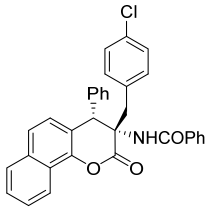
```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002044.D
Sample Name: JZ-5-11B

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/22/2016 3:05:36 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/22/2016 3:03:48 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:38:26 PM by 0
                  (modified after loading)
Sample Info     : OD-H, Hex/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.703 VB    0.2233   37.28828    2.38277   3.4558
   2   8.420 VV    0.2424 1041.70386   65.98378  96.5442

Totals :                  1078.99213   68.36655
```

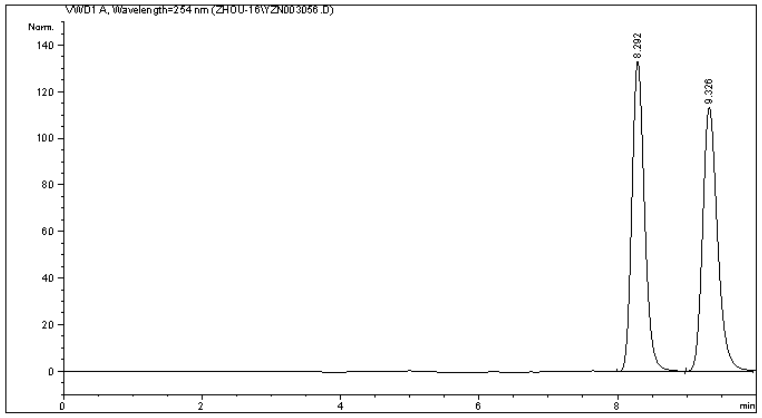


(+/-)-**3aj**

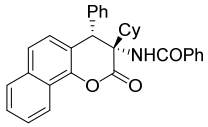
```
                          *** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN003056.D
Sample Name: JZ-6-49B(+-)

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 12/20/2016 2:19:10 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/20/2016 2:15:46 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/27/2016 2:54:52 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



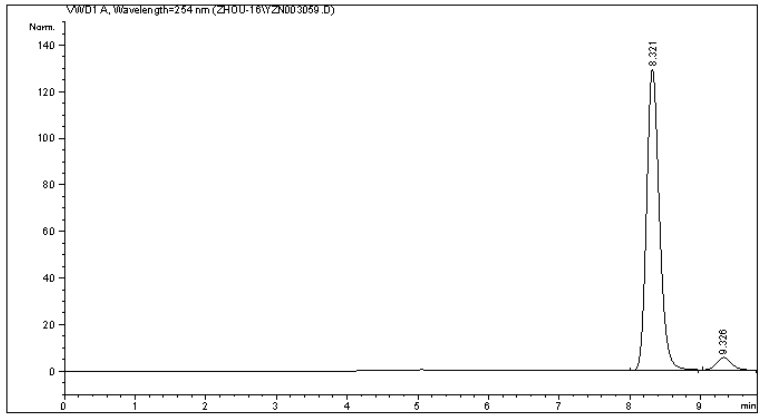

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   8.292 BB    0.1953 1699.98291  133.36140  49.9726
   2   9.326 BB    0.2301 1701.84912  113.61660  50.0274

Totals :                  3401.83203  246.97800

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



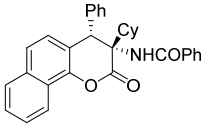
(+/-)-**3ak**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN003059.D
Sample Name: JZ-6-49B

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 12/20/2016 3:29:33 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/20/2016 3:10:12 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/27/2016 2:59:35 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



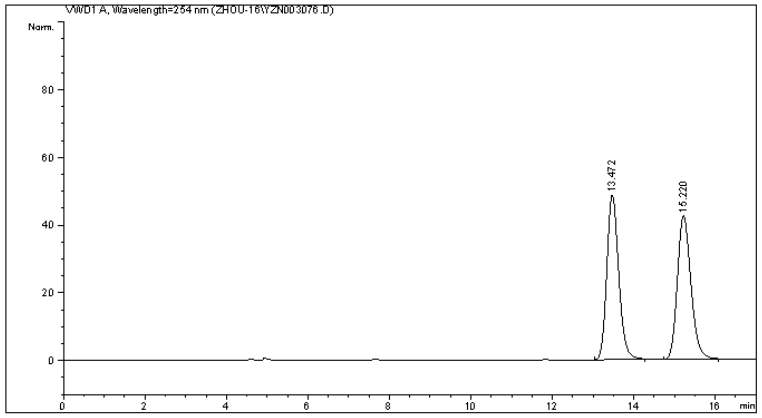

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   8.321 BB    0.1942 1636.71423  129.40070  94.7957
   2   9.326 BB    0.2418   89.85627    5.62275   5.2043

Totals :                  1726.57050  135.02344

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



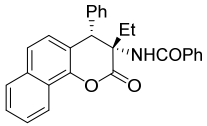
(+)-**3ak**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN003076.D
Sample Name: JZ-6-54B(+-)

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 12/22/2016 8:52:24 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/22/2016 8:26:43 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/27/2016 3:01:03 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



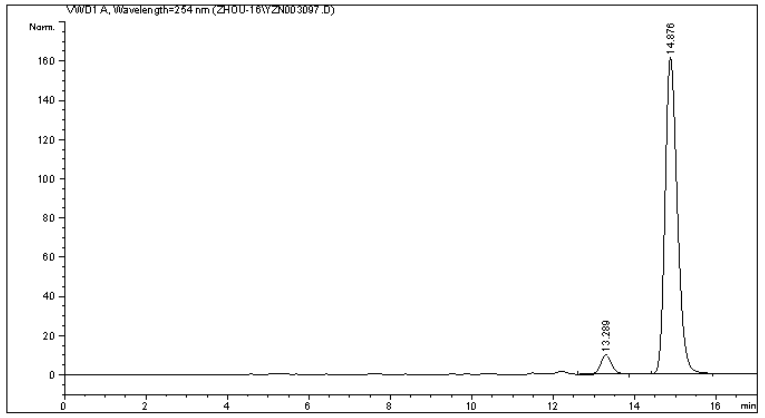

```
                          Area Percent Report

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

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  13.472 BB    0.3119  983.72260   48.59917  50.0816
   2  15.220 BB    0.3572  980.51843   42.39412  49.9184

Totals :                  1964.24103   90.99329

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



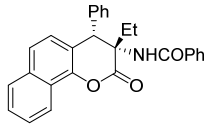
(+/-)-**3al**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN003097.D
Sample Name: JZ-6-54B

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 12/23/2016 9:29:49 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/23/2016 9:28:12 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/27/2016 3:01:38 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



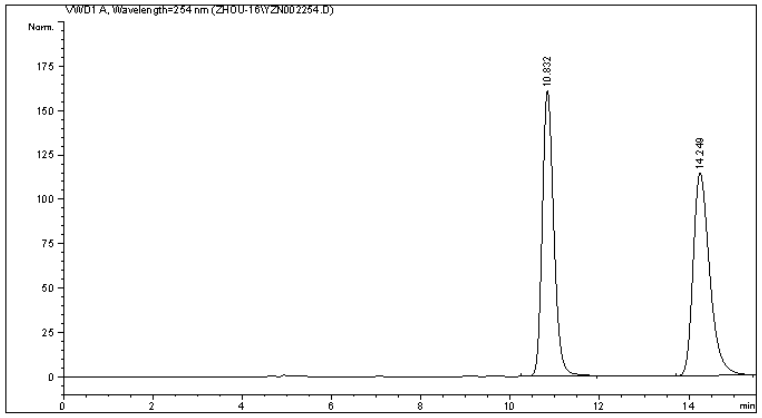

```
                          Area Percent Report

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

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  13.289 VB    0.2893  184.67227    9.81940   5.2310
   2  14.876 BB    0.3207 3345.66821  161.26808  94.7690

Totals :                  3530.34048  171.08748

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



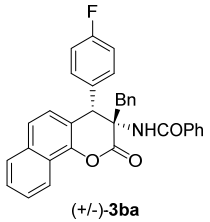
(+)-**3al**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002254.D
Sample Name: JZ-5-40A(+-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/7/2016 8:36:42 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/7/2016 7:53:38 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/27/2016 9:07:39 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



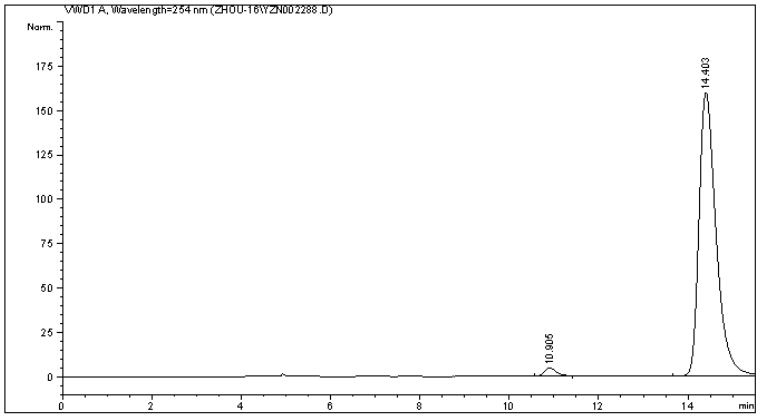

```
==================================================================
                        Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.832 BB    0.2778 2888.04663  160.93857  49.6466
   2  14.249 BB    0.3916 2929.16797  114.50182  50.3534

Totals :                  5817.21460  275.44039

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



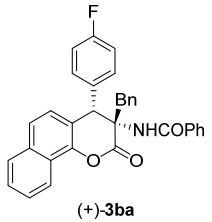
(+/-)-**3ba**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002288.D
Sample Name: JZ-5-40A

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/9/2016 8:23:17 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/9/2016 7:54:56 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/27/2016 9:07:52 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



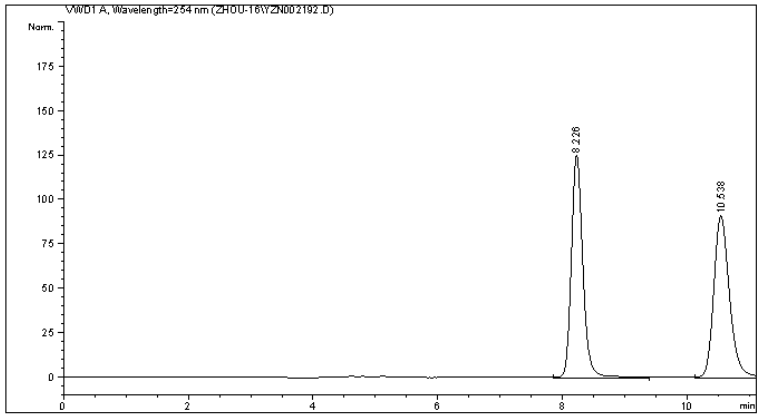

```
==================================================================
                        Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  10.905 BB    0.2859   84.39774    4.52673   1.9490
   2  14.403 BB    0.4058 4245.95605  159.96333  98.0510

Totals :                  4330.35379  164.49007

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



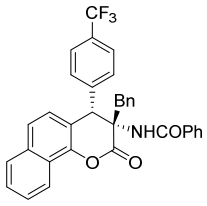
(+)-**3ba**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002192.D
Sample Name: JZ-5-32A(+-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/2/2016 3:23:02 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/2/2016 3:18:29 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:59:09 PM by 0
                  (modified after loading)
Sample Info     : IC, Hex/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



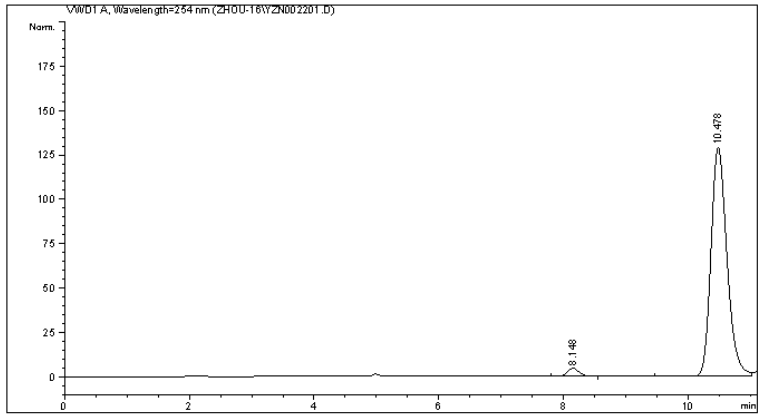

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   8.226 VV    0.1965 1609.39648  125.24795  50.2054
   2  10.538 VV    0.2682 1596.22559   91.22029  49.7946

Totals :                  3205.62207  216.46824

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



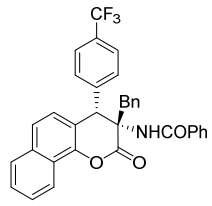
(+/-)-**3ca**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002201.D
Sample Name: JZ-5-32A

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/3/2016 9:28:27 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/3/2016 9:10:00 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/28/2016 8:57:55 PM by 0
                  (modified after loading)
Sample Info     : IC, Hex/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254nm
```



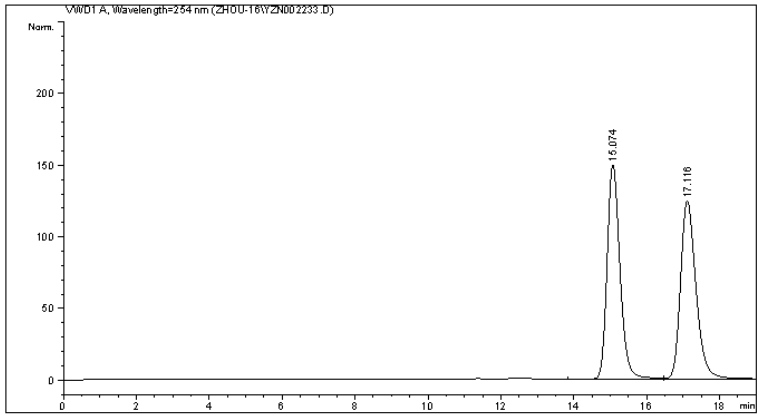

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   8.148 VV    0.2032   61.13138    4.55471   2.5930
   2  10.478 BV    0.2777 2296.41431  128.92203  97.4070

Totals :                  2357.54568  133.47674

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



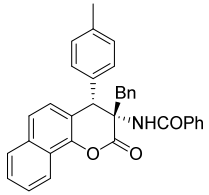
(+)-**3ca**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002233.D
Sample Name: JZ-5-34A(+-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/6/2016 8:48:05 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/6/2016 8:43:41 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:16:38 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



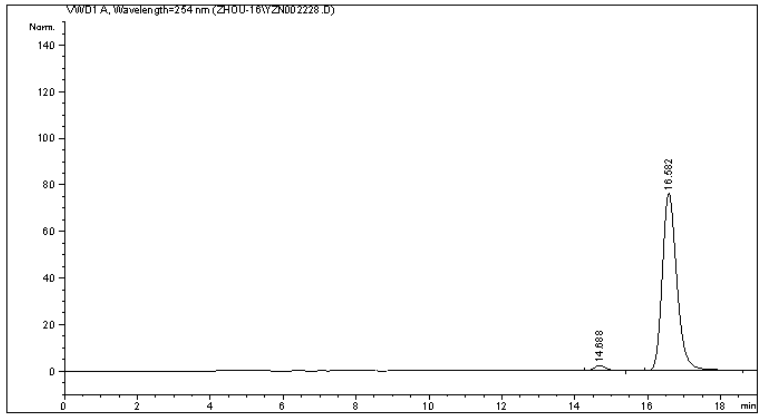

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  15.074 BV    0.3772 3684.35132  149.82140  50.0663
   2  17.116 VB    0.4522 3674.59424  124.44560  49.9337

Totals :                  7358.94556  274.26700

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



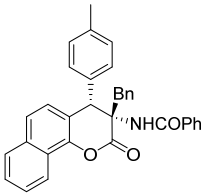
(+/-)-**3da**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002228.D
Sample Name: JZ-5-34A

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/5/2016 9:27:17 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/5/2016 9:25:05 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:18:06 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254nm
```



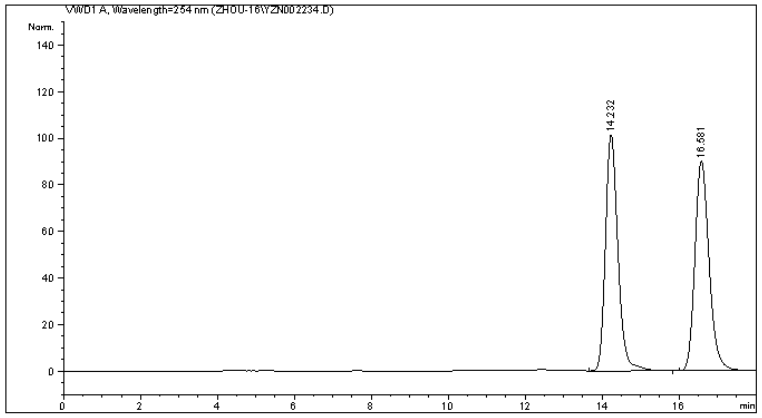

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  14.688 VB    0.3459   53.26866    2.35087   2.4548
   2  16.582 BB    0.4262 2116.75269   76.14856  97.5452

Totals :                  2170.02135   78.49943

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



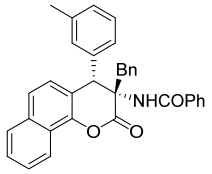
(+)-**3da**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002234.D
Sample Name: JZ-5-34B(+-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/6/2016 9:16:05 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/6/2016 9:12:03 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:24:12 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  14.232 VB    0.3478 2290.65649  101.46764  49.7846
   2  16.581 BB    0.3954 2310.47852   90.07019  50.2154

Totals :                  4601.13501  191.53783
```

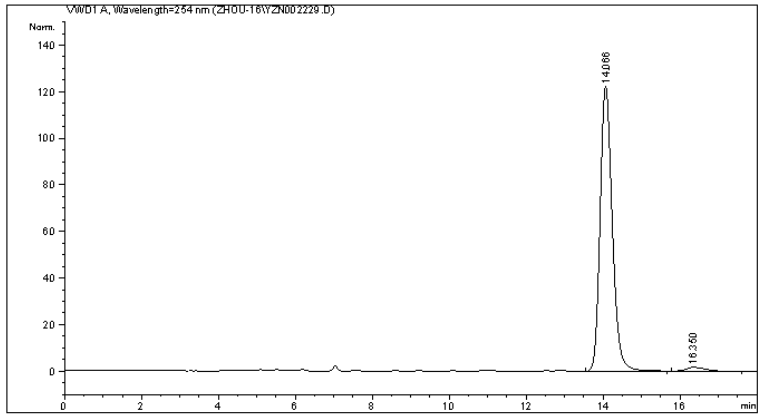


(+/-)-**3ea**

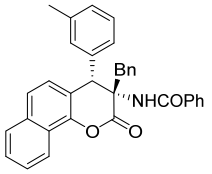
```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002229.D
Sample Name: JZ-5-34B

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/5/2016 9:47:25 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/5/2016 9:46:22 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:24:12 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  14.066 BB    0.3413 2690.89893  122.22297  97.7686
   2  16.350 BB    0.5171   61.41639    1.71394   2.2314

Totals :                  2752.31532  123.93691
```

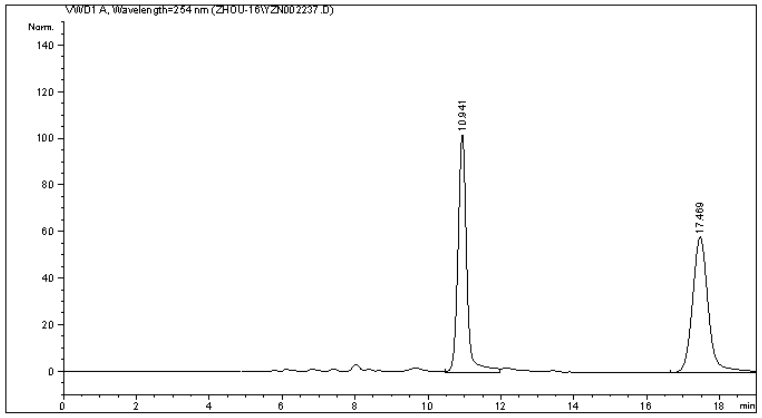


(+)-**3ea**

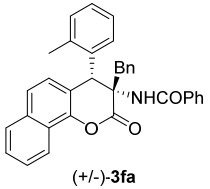
```
                          *** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002237.D
Sample Name: JZ-5-34C(+-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/6/2016 10:41:11 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/6/2016 10:26:32 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:27:49 AM by 0
                  (modified after loading)
Sample Info     : IA, Hexane/i-PrOH = 80/20, 0.7 mL/min, 30oC, 254 nm
```



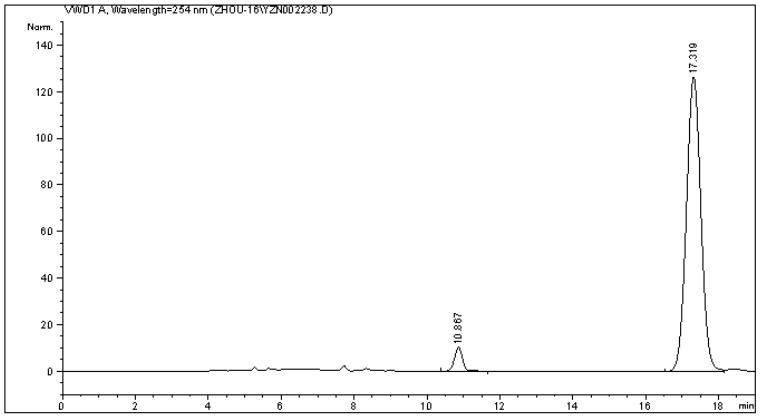

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  10.941 VV    0.2528 1703.81250  102.15755  49.0954
   2  17.469 BBA   0.4612 1766.60059   58.30376  50.9046

Totals :                  3470.41309  160.46132

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



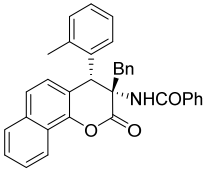
(+/-)-**3fa**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002238.D
Sample Name: JZ-5-34C

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/6/2016 11:03:51 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/6/2016 11:01:05 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:27:49 AM by 0
                  (modified after loading)
Sample Info     : IA, Hexane/i-PrOH = 80/20, 0.7 mL/min, 30oC, 254 nm
```



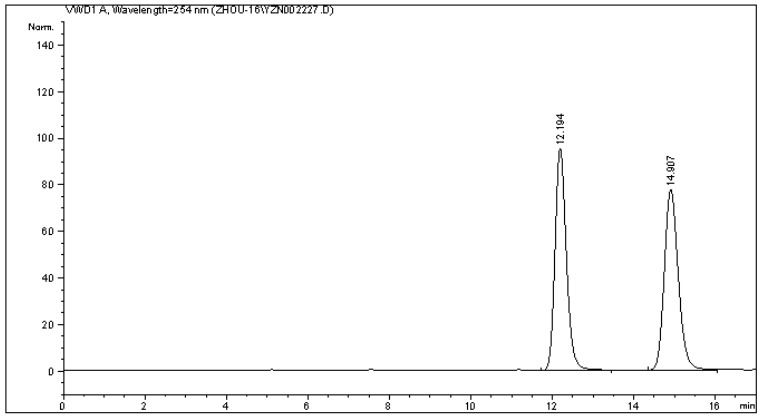

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  10.867 BB    0.2386  161.45363   10.27805   4.4042
   2  17.319 BV    0.4280 3504.44263  126.50359  95.5958

Totals :                  3665.89626  136.78164

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



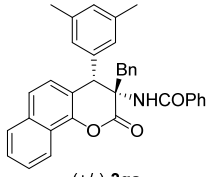
(+)-**3fa**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002227.D
Sample Name: JZ-5-34D(+-)

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/5/2016 9:06:43 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/5/2016 9:04:58 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:30:40 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254nm
```



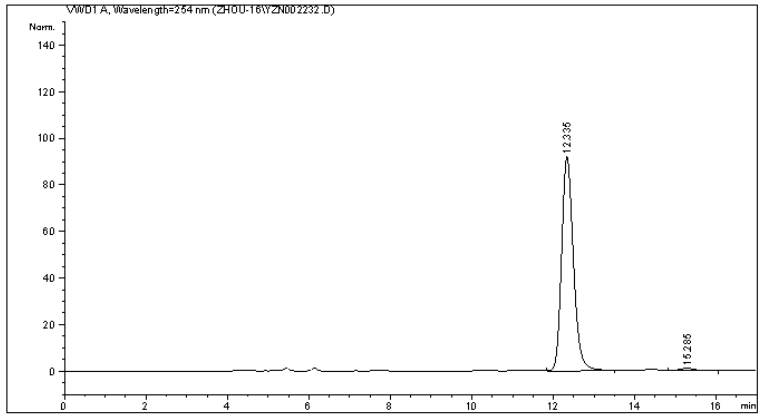

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  12.194 VB    0.2979 1836.41675   95.18201  49.9415
   2  14.907 VB    0.3673 1840.71887   77.50850  50.0585

Totals :                  3677.13562  172.69051

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



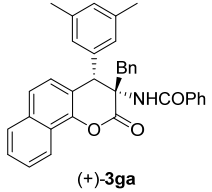
(+/-)-**3ga**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002232.D
Sample Name: JZ-5-34D

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/6/2016 8:26:49 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/6/2016 8:24:25 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:30:40 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



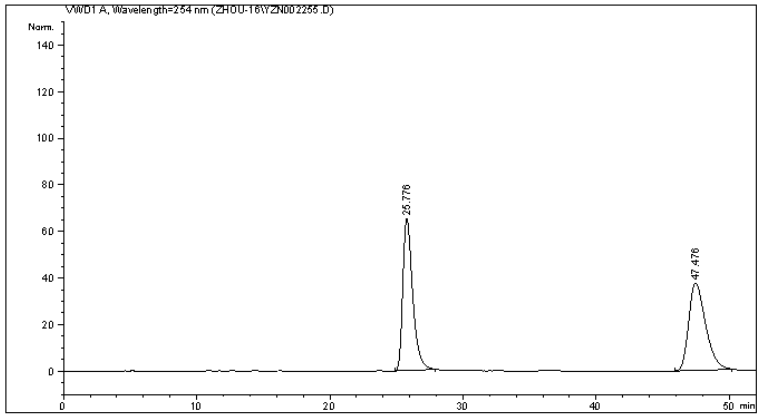

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  12.335 VV    0.3108 1852.41772   91.94627  98.4921
   2  15.285 VB    0.4152   28.35965    1.01827   1.5079

Totals :                  1880.77738   92.96454

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



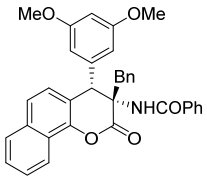
(+)-**3ga**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002255.D
Sample Name: JZ-5-40B(+-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/7/2016 9:00:34 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/7/2016 8:58:22 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/27/2016 9:09:28 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



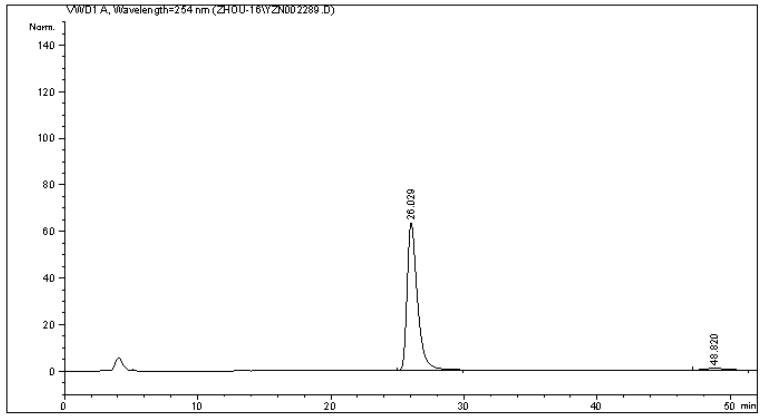

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  25.776 BB    0.7835 3365.26147   65.11493  50.3661
   2  47.476 BB    1.3161 3316.33911   37.58886  49.6339

Totals :                  6681.60059  102.70378

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



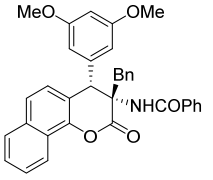
(+/-)-**3ha**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002289.D
Sample Name: JZ-5-40B

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/9/2016 8:41:30 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/9/2016 8:40:39 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/27/2016 9:14:53 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



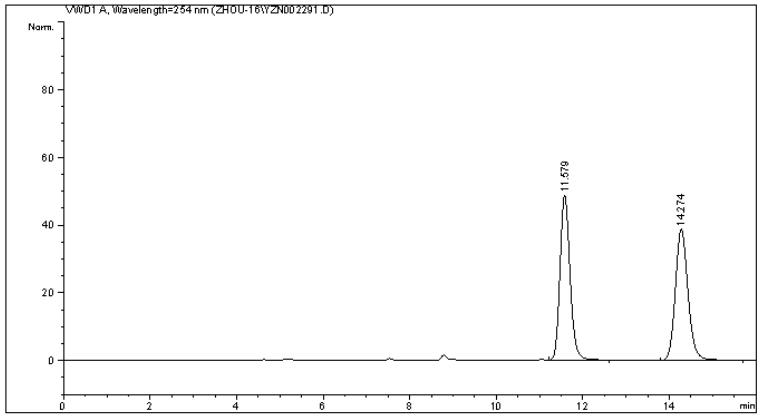

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  26.029 BB    0.8025 3399.94946   63.18966  98.0175
   2  48.820 BB    1.4037   68.76678 7.24943e-1   1.9825

Totals :                  3468.71625   63.91460

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



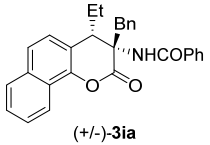
(+)-**3ha**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002291.D
Sample Name: JZ-5-48A

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/9/2016 10:34:07 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/9/2016 10:32:30 AM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:37:41 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



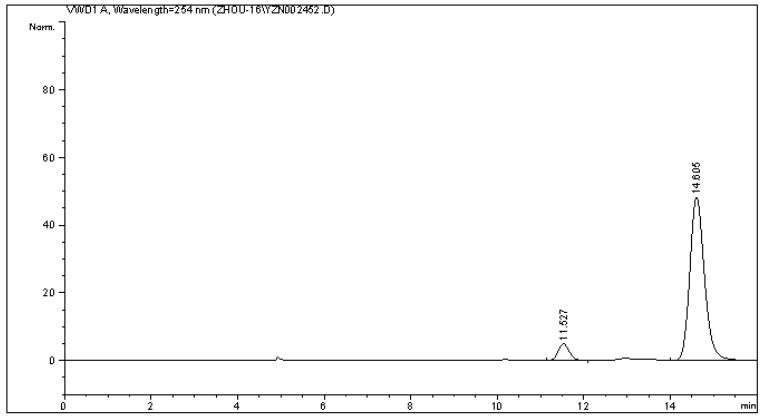

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  11.579 VB    0.2470  787.87585   48.70548  50.0594
   2  14.274 BB    0.3126  786.00452   38.70943  49.9406

Totals :                  1573.88037   87.41491

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



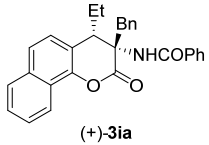
(+/-)-**3ia**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002452.D
Sample Name: JZ-5-48A

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/22/2016 8:20:27 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/22/2016 7:49:23 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:39:06 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



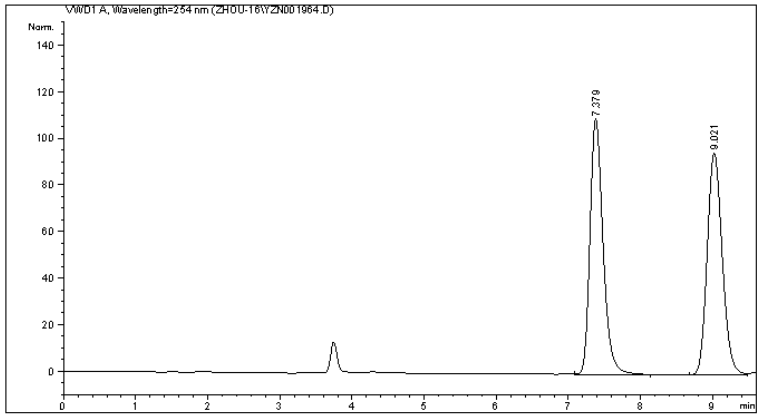

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  11.527 BB    0.2837   92.83636    4.99688   7.5385
   2  14.605 VB    0.3625 1138.66174   48.28755  92.4615

Totals :                  1231.49810   53.28443

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



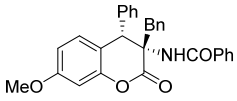
(+)-**3ia**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN001964.D
Sample Name: JZ-4-101A

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 8/15/2016 9:02:39 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 8/15/2016 8:18:21 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 11/25/2016 6:13:45 PM by 0
                  (modified after loading)
Sample Info     : OD-H,  Hex/i-PrOH =90/10, 0.8 mL/min, 30oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.379 VB    0.1920 1381.59985  109.75514  50.1253
   2   9.021 VV    0.2253 1374.69446   95.18771  49.8747

Totals :                  2756.29431  204.94286
```

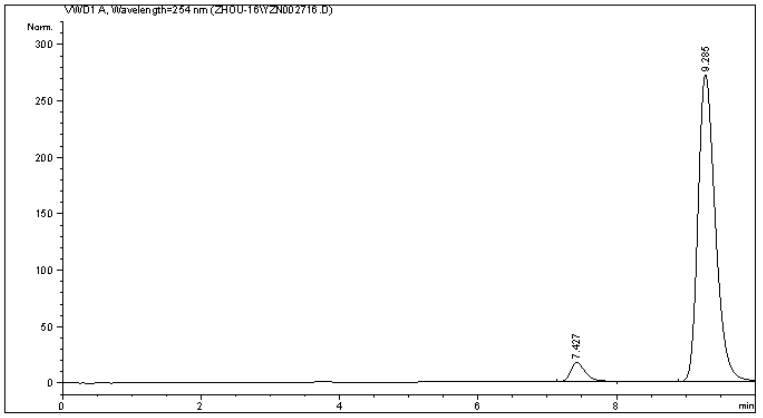


(+/-)-**3ja**

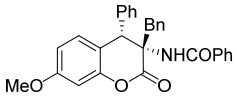
```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002716.D
Sample Name: JZ-5-89A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 11/3/2016 10:54:48 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 11/3/2016 10:32:29 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 11/25/2016 6:15:40 PM by 0
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```




```
                          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 Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.427 BB    0.2210  254.36017   17.30248   5.1281
   2   9.285 BB    0.2662 4705.80273  271.55875  94.8719

Totals :                  4960.16290  288.86123
```

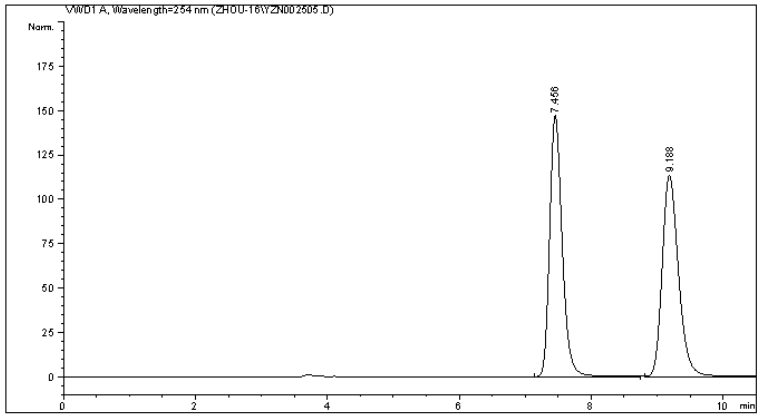


(+)-**3ja**

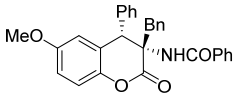
```
                          *** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002505.D
Sample Name: JZ-5-55B(+-)

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/27/2016 8:50:03 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 9/27/2016 8:48:04 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:41:01 AM by 0
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```



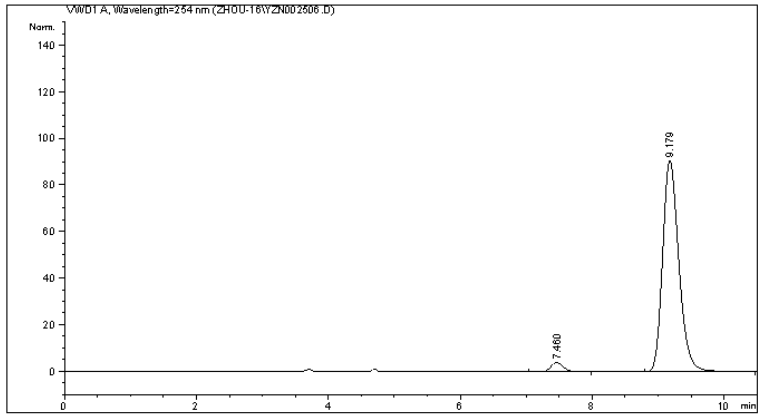

```
                          Area Percent Report

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

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.456 BB    0.2037 1944.94385  147.20042  49.9567
   2   9.188 BB    0.2643 1948.31702  113.50363  50.0433

Totals :                  3893.26086  260.70406

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



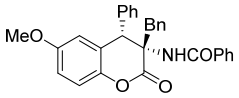
(+/-)-**3ka**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002506.D
Sample Name: JZ-5-55B

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/27/2016 9:03:45 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 9/27/2016 9:02:07 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:42:08 AM by 0
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```



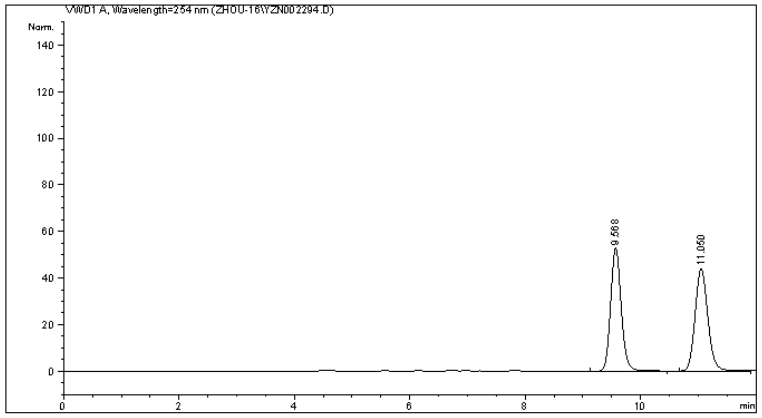

```
                          Area Percent Report

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

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.460 VB    0.2077   54.28764    4.00452   3.3746
   2   9.179 BB    0.2639 1554.42725   90.75507  96.6254

Totals :                  1608.71489   94.75959

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



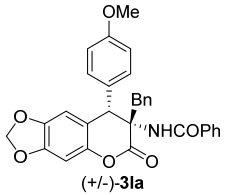
(+)-**3ka**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002294.D
Sample Name: JZ-4-101B

```
==========================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/9/2016 1:31:20 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/9/2016 1:17:49 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:45:56 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 80/20, 0.7 mL/min, 30oC, 254 nm
```



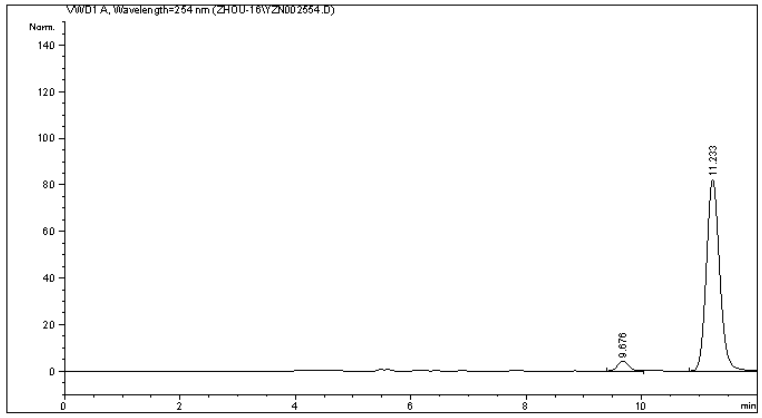

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.568 BB    0.1951  672.16626   52.82224  49.9795
   2  11.050 BB    0.2371  672.71686   43.86987  50.0205

Totals :                  1344.88312   96.69211

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



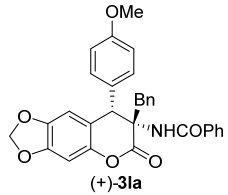
(+/-)-3la

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002554.D
Sample Name: JZ-5-56B

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 10/9/2016 1:34:55 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/9/2016 1:06:54 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:47:42 AM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 80/20, 0.7 mL/min, 30oC, 254 nm
```



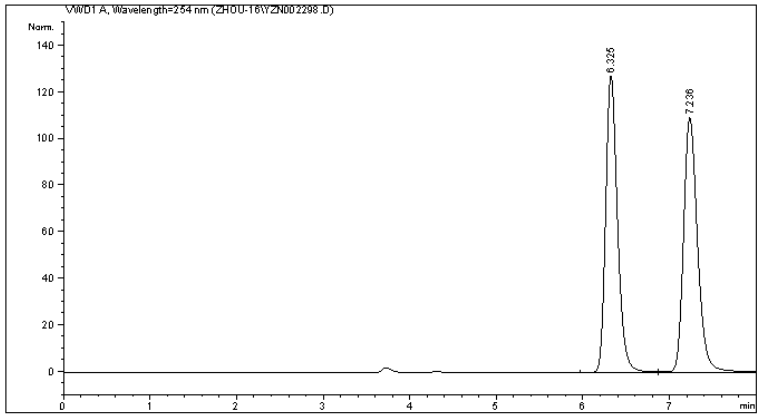

```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.676 BV    0.2031   56.56958    4.29763   4.1291
   2  11.233 BB    0.2476 1313.45642   82.20528  95.8709

Totals :                  1370.02600   86.50290

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



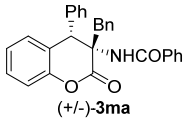
(+)-3la

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN002298.D
Sample Name: JZ-5-44(+-)

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 9/9/2016 3:22:21 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 9/9/2016 3:20:34 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:50:15 AM by 0
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.8 mL/min, 30oC, 254 nm
```



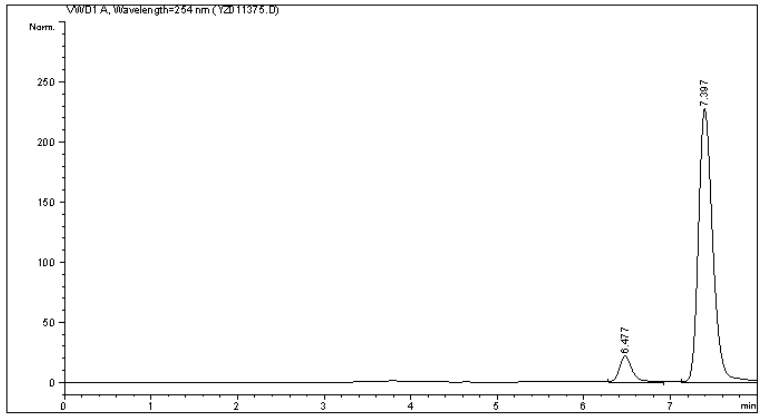

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.325 VV    0.1458 1210.96545  127.46946  49.5500
   2   7.236 VV    0.1721 1232.95984  109.55133  50.4500

Totals :                  2443.92529  237.02079

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



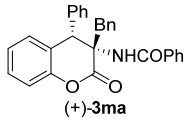
(+/-)-**3ma**

Data File C:\CHEM32\1\DATA\YZ011375.D
Sample Name: JZ-5-78

```
==================================================================
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 10/22/2016 12:36:15 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF LC1.M
Last changed    : 10/22/2016 12:18:11 AM by
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 10/29/2016 10:51:47 AM by 0
                  (modified after loading)
Sample Info     : OD-H, Hexane/iPrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
```



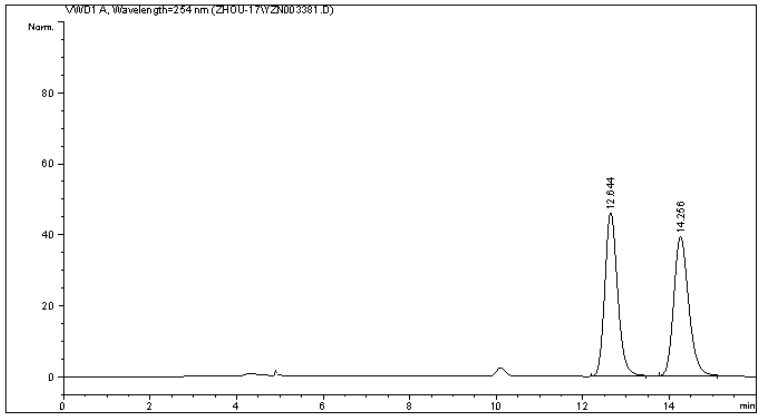

```
==================================================================
                      Area Percent Report
==================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   6.477 VV    0.1600  227.83052   21.75549   7.9871
   2   7.397 VV    0.1784 2624.65430  227.36778  92.0129

Totals :                  2852.48482  249.12327

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



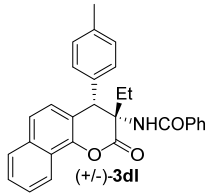
(+)-**3ma**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003381.D
Sample Name: JZ-6-92C(+-)

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2/23/2017 5:59:39 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 2/23/2017 5:43:22 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/1/2017 12:27:40 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254nm
```



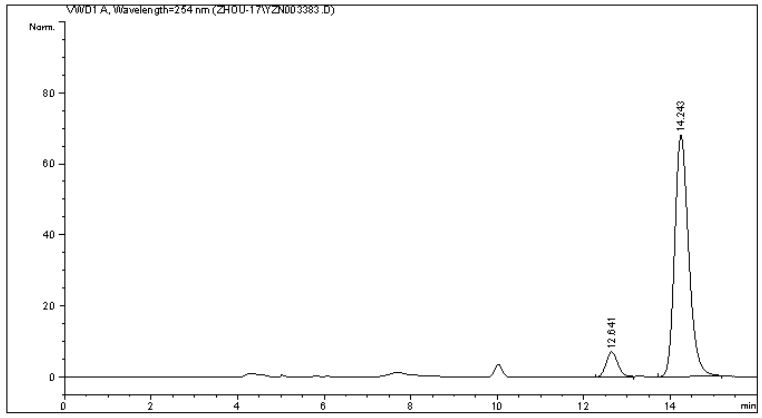

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  12.644 BB    0.3161  944.22351   46.09739  50.1841
   2  14.256 BB    0.3670  937.29681   39.31285  49.8159

Totals :                  1881.52032   85.41024
```



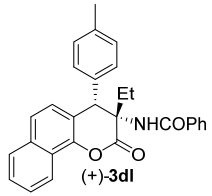

```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003383.D
Sample Name: JZ-6-92C

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2/23/2017 6:33:30 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 2/23/2017 6:31:50 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/1/2017 12:27:40 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254nm
```



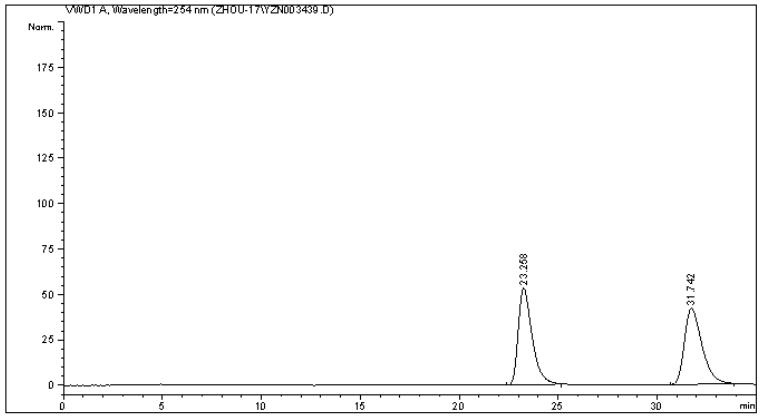

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  12.641 BB    0.2866  131.04424    7.05480   7.9070
   2  14.243 BB    0.3448 1526.26672   68.01090  92.0930

Totals :                  1657.31096   75.06570
```



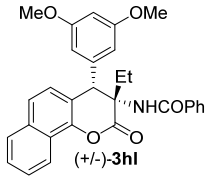

```
                          *** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003439.D
Sample Name: JZ-7-4A(+-)

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2/28/2017 9:00:19 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 2/28/2017 8:22:11 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/1/2017 12:31:40 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



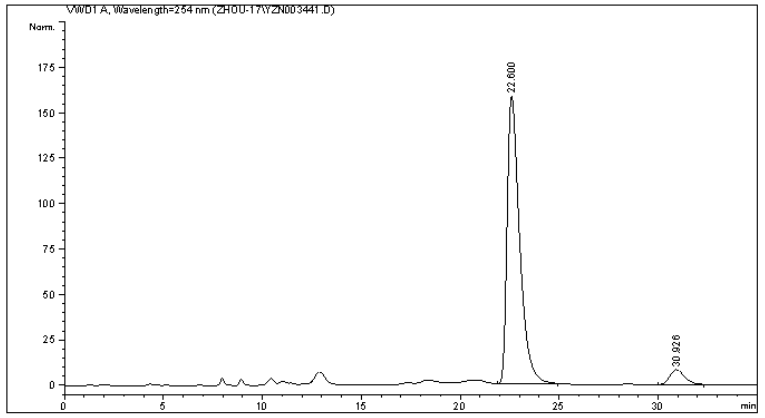

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  23.258 BB    0.7341 2586.95166   53.26295  50.0294
   2  31.742 BB    0.9357 2583.91016   41.77482  49.9706

Totals :                  5170.86182   95.03777
```



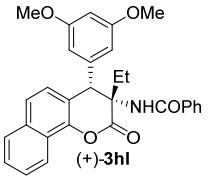

```
                          *** End of Report ***
```


Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003441.D
Sample Name: JZ-7-4A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2/28/2017 9:58:34 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 2/28/2017 9:49:58 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/1/2017 12:31:40 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```



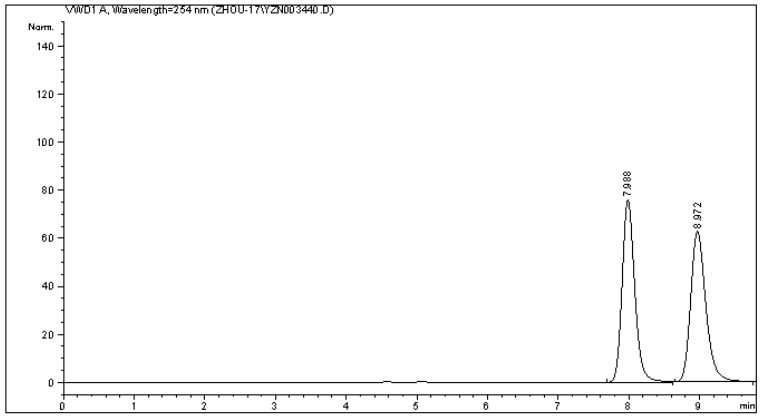

```
                          Area Percent Report

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  22.600 VB    0.6665 6968.57373  158.30095  94.1214
   2  30.926 BB    0.7861  435.23764    8.26539   5.8786

Totals :                  7403.81137  166.56634
```



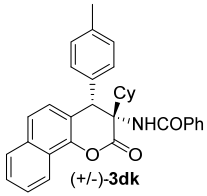

```
                          *** End of Report ***
```

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003440.D
Sample Name: JZ-7-4B(+-)

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2/28/2017 9:37:23 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 2/28/2017 9:36:22 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/1/2017 12:34:37 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```

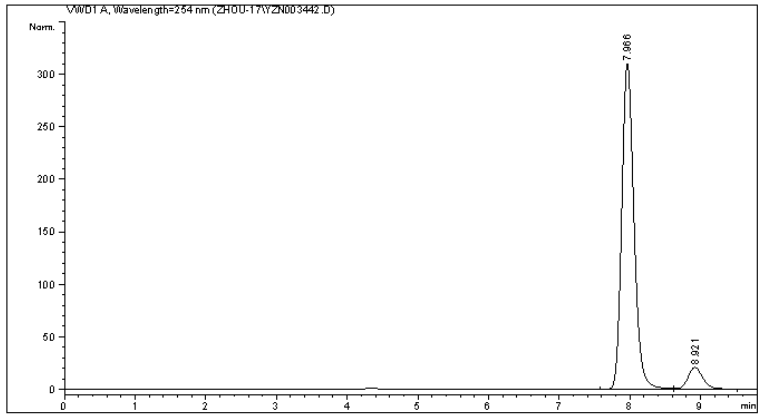



```
==========================================================================
                        Area Percent Report
==========================================================================

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


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.988 BB    0.1914  941.27039   75.81001  50.0605
   2   8.972 BB    0.2288  938.99457   62.63163  49.9395

Totals :                  1880.26495  138.44164

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



Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003442.D
Sample Name: JZ-7-4B

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 2/28/2017 10:38:46 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 2/28/2017 10:37:38 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/1/2017 12:35:40 PM by 0
                  (modified after loading)
Sample Info     : IC, Hexane/i-PrOH = 98/2, 0.7 mL/min, 30oC, 254 nm
```




```
==========================================================================
                        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 Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.966 VV    0.1855 3735.71704  310.57559  92.3340
   2   8.921 VB    0.2274  310.15833   20.85519   7.6660

Totals :                  4045.87537  331.43079

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