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Supporting Information

Enantioselective Palladium-Catalyzed C-H Functionalization of Pyrroles Using an Axially Chiral 2,2'-Bipyridine Ligand

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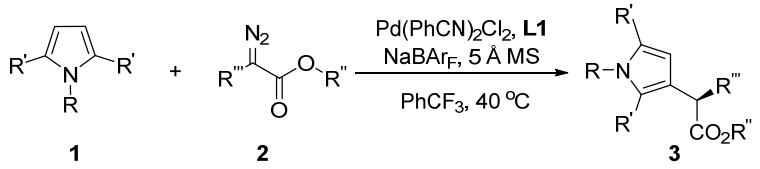
1. General

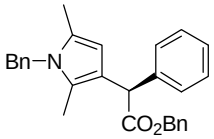
All reactions were carried out under an atmosphere of nitrogen using the standard Schlenk techniques, unless otherwise noted. Commercially available reagents were used without further purification. Solvents were treated prior to use according to the standard methods. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded at room temperature in $CDCl_3$ on 400 MHz instrument with tetramethylsilane (TMS) as internal standard. Optical rotations were measured with MCP 200 polarimeter. Flash column chromatography was performed on silica gel (200-300 mesh). All reactions were monitored by TLC analysis. *N*-protected pyrroles **1** could be synthesized according to the known literature procedures.[1] The α-aryl-α-diazoactates **2** were synthesized from the corresponding arylacetates according to the known literature procedures.[2,3]

2. Pd-Catalyzed Enantioselective C-H Functionalization of Pyrroles

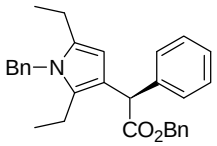


General Procedure: The powdered $Pd(PhCN)_2Cl_2$ (3.8 mg, 0.01 mmol, 5 mol%), (R_a,*S*,*S*)-C3-ACBP **L1** (3.1 mg, 0.012 mmol, 6 mol%), $NaBAr_F$ (21.3 mg, 0.024 mmol, 12 mol%) and 200 mg 5Å molecular sieves were introduced into an oven-dried Schlenk tube under nitrogen. After benzotrifluoride (2.0 mL) was injected into the Schlenk tube, the solution was stirred at 40 °C under nitrogen for 2 h. Protected pyrroles **1** (0.30 mmol) and α-diazoactates **2** (0.20 mmol) was then introduced in one portion. The resulting mixture was stirred at 40 °C until the full consumption of **2**. After filtrating and removing the solvent in vacuum, flash chromatography on silica gel using hexanes/ethyl acetate (40/1) as the eluent gave the products **3**.

Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-phenylacetate (3aa): 71 mg, 86% yield, 86% ee, $[\alpha]^{20}_D$ = -7.61 (*c* 1.42, $CHCl_3$), new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40-7.34 (m, 2H), 7.32-7.19 (m, 11H), 6.85 (d, *J* = 7.2 Hz, 2H), 5.95 (s, 1H), 5.17 (s, 2H), 4.97-4.95 (m, 3H), 2.10 (s, 3H), 1.99 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 139.9, 138.4, 136.2, 128.8, 128.5, 128.4, 128.1, 128.0, 127.3, 127.1, 126.8, 125.7, 124.9, 115.8, 106.4, 66.5, 49.4, 46.9, 12.4, 10.2; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.7 min (maj) and 10.9 min; HRMS calculated for $C_{28}H_{28}NO_2$ $[M+H]^+$ 410.2115, found 410.2117.

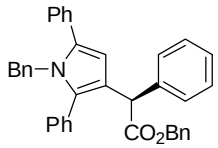


Benzyl (*R*)-2-(1-benzyl-2,5-diethyl-1*H*-pyrrol-3-yl)-2-phenylacetate (3ba): 72 mg, 82% yield, 62% ee, $[\alpha]^{20}_D$ = -10.40 (*c* 1.24, $CHCl_3$), new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 7.6 Hz, 2H), 7.32-7.15 (m, 11H), 6.82 (d, *J* = 7.4 Hz, 2H), 6.02 (s, 1H), 5.18 (s, 2H), 4.99 (s, 3H), 2.53-2.34 (m, 4H), 1.14 (t, *J* = 7.5 Hz, 3H), 0.85 (t, *J* = 7.5 Hz, 3H); ^{13}C NMR (100 MHz, CDCl3) δ 173.6, 140.4, 139.0, 136.4, 133.7, 131.2, 128.8, 128.6, 128.5, 128.1, 127.1, 126.9, 125.7, 125.6, 115.5, 104.7, 66.6, 49.5, 46.7, 19.8, 17.9, 15.4, 12.6; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow =

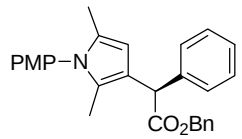


0.7 mL/min, retention time 7.0 min (maj) and 9.2 min; HRMS Calculated for $C_{30}H_{32}NO_2$ $[M+H]^+$ 438.2428, found 438.2430.

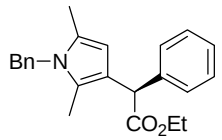
Benzyl (*R*)-2-(1-benzyl-2,5-diphenyl-1*H*-pyrrol-3-yl)-2-phenylacetate (3ca): 87 mg, 82% yield, 72% ee, $[\alpha]^{20}_D$ = -1.09 (*c* 1.74, $CHCl_3$), new compound, yellow oil, R_f = 0.30 (hexanes/ ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45-7.24 (m, 18H), 7.22-7.16 (m, 2H), 7.16-7.07 (m, 3H), 6.73-6.63 (m, 2H), 6.59 (s, 1H), 5.23-5.13 (m, 4H), 4.93 (s, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.2, 140.2, 139.3, 136.3, 135.4, 134.2, 133.6, 132.1, 131.2, 129.1, 128.6, 128.5, 128.5, 128.5, 128.4, 128.4, 128.1, 128.1, 127.9, 127.1, 127.0, 126.9, 126.1, 119.6, 110.0, 66.6, 49.4, 48.8; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 98/02, flow = 0.6 mL/min, retention time 15.0 min and 16.1 min (maj); HRMS Calculated for $C_{38}H_{32}NO_2$ $[M+H]^+$ 534.2428, found 534.2427.



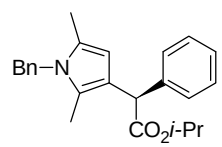
Benzyl (*R*)-2-(1-(4-methoxyphenyl)-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-phenylacetate (3da): 71 mg, 84% yield, 46% ee, $[\alpha]^{20}_D$ = +4.36 (*c* 1.40, $CHCl_3$), new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44-7.38 (m, 2H), 7.33-7.27 (m, 7H), 7.25-7.21 (m, 1H), 7.08 (d, *J* = 8.3 Hz, 2H), 6.96-6.90 (m, 2H), 5.98 (s, 1H), 5.17 (s, 2H), 4.95 (s, 1H), 3.82 (s, 3H), 1.96 (s, 3H), 1.89 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 159.0, 140.0, 136.4, 131.9, 129.5, 128.6, 128.6, 128.5, 128.3, 128.2, 128.2, 126.9, 126.0, 115.9, 114.3, 106.3, 66.7, 55.6, 49.7, 13.1, 11.0; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 95/05, flow = 0.7 mL/min, retention time 12.1 min (maj) and 13.1 min; HRMS Calculated for $C_{28}H_{28}NO_3$ $[M+H]^+$ 426.2064, found 426.2065.



Ethyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-phenylacetate (3ab):: 60 mg, 86% yield, 86% ee, $[\alpha]^{20}_D$ = -4.44 (*c* 2.41, $CHCl_3$), new compound, yellow solid, m.p. 58-59 °C; R_f = 0.40 (hexanes/ethyl acetate 20/1), ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45-7.34 (m, 2H), 7.31-7.18 (m, 6H), 6.85 (d, *J* = 7.2 Hz, 2H), 5.97 (s, 1H), 4.96 (s, 2H), 4.89 (s, 1H), 4.18 (qd, *J* = 7.1, 0.8 Hz, 2H), 2.10 (s, 3H), 2.01 (s, 3H), 1.24 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.6, 140.3, 138.5, 128.8, 128.4, 127.3, 127.1, 126.8, 125.8, 124.9, 116.1, 106.5, 60.9, 49.6, 47.0, 14.4, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 7.9 min (maj) and 8.5 min. HRMS Calculated for $C_{23}H_{26}NO_2$ $[M+H]^+$ 348.1958, found 348.1957.

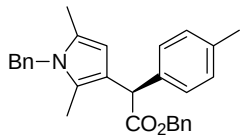


Isopropyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-phenylacetate (3ac): 66 mg, 91% yield, 87% ee, $[\alpha]^{20}_D$ = -2.71 (*c* 1.44, $CHCl_3$), new compound, yellow oil, R_f = 0.40 (hexanes /ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39-7.17 (m, 8H), 6.85 (d, *J* = 7.5 Hz, 2H), 5.95 (s, 1H), 5.09-5.00 (m, 1H), 4.99 (s, 2H), 4.85 (s, 1H), 2.10 (s, 3H), 2.01 (s, 3H), 1.22 (dd, *J* = 6.3, 2.5 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.1, 140.4, 138.7, 128.9, 128.5, 128.4, 127.2, 127.2, 126.7, 125.8, 124.9, 116.3, 106.6, 68.2, 49.8, 47.0, 22.0, 21.9, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 6.3 min and 7.0 min (maj). HRMS Calculated for $C_{24}H_{28}NO_2$ $[M+H]^+$ 362.2115, found 362.2114.

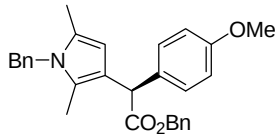


Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(*p*-tolyl)acetate (3ad): 73 mg, 86% yield, 86% ee, $[\alpha]^{20}_D$ = -3.10 (*c* 1.00, $CHCl_3$), new compound, yellow oil, R_f = 0.30 (hexanes/ethyl

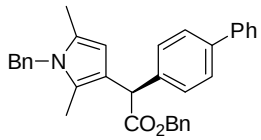
acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44-7.15 (m, 10H), 7.09 (d, *J* = 7.8 Hz, 2H), 6.84 (d, *J* = 7.4 Hz, 2H), 5.95 (s, 1H), 5.16 (s, 2H), 4.94-4.92 (m, 3H), 2.30 (s, 3H), 2.08 (s, 3H), 1.98 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.6, 138.6, 137.1, 136.4, 136.4, 129.2, 128.8, 128.5, 128.4, 128.2, 128.1, 127.3, 127.1, 125.8, 124.8, 116.1, 106.6, 66.6, 49.2, 47.0, 21.2, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 8.4 (maj) min and 9.7 min; HRMS Calculated for $C_{29}H_{30}NO_2$ $[M+H]^+$ 424.2271, found 424.2272.



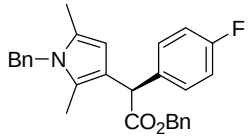
Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(4-methoxyphenyl)acetate (3ae): 82 mg, 93% yield, 82% ee, $[\alpha]^{20}_D$ = -5.59 (*c* 1.70, $CHCl_3$), new compound, yellow oil, R_f = 0.20 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35-7.15 (m, 10H), 6.85-6.82 (m, 4H), 5.94 (s, 1H), 5.16 (s, 2H), 4.95 (s, 2H), 4.90 (s, 1H), 3.75 (s, 3H), 2.09 (s, 3H), 1.98 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.7, 158.6, 138.5, 136.4, 132.3, 129.5, 128.9, 128.6, 128.2, 128.1, 127.3, 127.1, 125.8, 124.8, 116.2, 113.9, 106.5, 66.6, 55.4, 48.7, 47.0, 12.5, 10.3; HPLC: Chiralcel AD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 11.6 min (maj) and 13.6 min. HRMS Calculated for $C_{29}H_{30}NO_3$ $[M+H]^+$ 440.2220, found 440.2220.



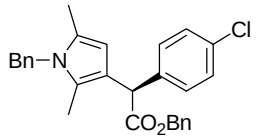
Benzyl (*R*)-2-([1,1'-biphenyl]-4-yl)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)acetate (3af): 88 mg, 91% yield, 90% ee, $[\alpha]^{20}_D$ = +11.09 (*c* 1.74, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.59-7.51 (m, 4H), 7.46-7.37 (m, 4H), 7.32-7.17 (m, 9H), 6.85 (d, *J* = 7.0 Hz, 2H), 6.01 (s, 1H), 5.19 (s, 2H), 5.00 (s, 1H), 4.96 (s, 2H), 2.10 (s, 3H), 2.02 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.5, 141.1, 139.8, 139.1, 138.5, 136.3, 128.9, 128.9, 128.6, 128.2, 128.2, 127.5, 127.3, 127.2, 127.2, 125.8, 125.0, 115.8, 106.5, 66.7, 49.2, 47.0, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.7 mL/min, retention time 14.5 (maj) min and 18.2 min. HRMS Calculated for $C_{34}H_{32}NO_2$ $[M+H]^+$ 486.2428, found 486.2430.



Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(4-fluorophenyl)acetate (3ag): 75 mg, 88% yield, 84% ee, $[\alpha]^{20}_D$ = -18.46 (*c* 1.56, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42-7.06 (m, 10H), 6.96-6.92 (m, 2H), 6.82 (d, *J* = 7.3 Hz, 2H), 5.91 (s, 1H), 5.14 (s, 2H), 4.94-4.91 (m, 3H), 2.08 (s, 3H), 1.96 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 161.9 (d, J_{C-F} = 243.3 Hz), 138.4, 136.2, 135.8 (d, J_{C-F} = 3.2 Hz), 130.1 (d, J_{C-F} = 7.9 Hz), 128.9, 128.6, 128.3, 127.5, 127.2, 125.8, 125.0, 115.3 (d, J_{C-F} = 21.2 Hz), 115.2, 106.3, 66.8, 48.8, 47.0, 12.5, 10.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -116.35. HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 8.7 (maj) min and 10.0 min. HRMS Calculated for $C_{28}H_{27}FNO_2$ $[M+H]^+$ 428.2020, found 428.2022.

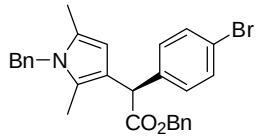


Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(4-chlorophenyl)acetate (3ah): 75 mg, 84% yield, 88% ee, $[\alpha]^{20}_D$ = -8.61 (*c* 1.58, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47-7.11 (m, 12H), 6.84 (d, *J* = 7.3 Hz, 2H), 5.91 (s, 1H), 5.16 (s, 2H), 4.96 (s, 2H), 4.91 (s, 1H), 2.10 (s, 3H), 1.97 (s, 3H); ^{13}C NMR

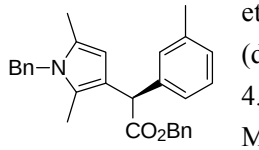


(100 MHz, $CDCl_3$) δ 173.1, 138.6, 138.4, 136.1, 132.7, 129.9, 128.9, 128.6, 128.3, 127.6, 127.2, 125.7, 125.0, 115.5, 106.3, 66.8, 48.9, 47.0, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 ^oC, *n*-hexane/ *i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.4 min (maj) and 10.5 min. HRMS Calculated for $C_{28}H_{27}ClNO_2$ $[M+H]^+$ 444.1725, found 444.1725.

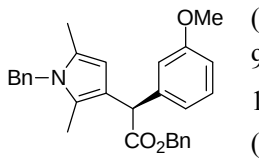
Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(4-bromophenyl)acetate (3ai): 81 mg, 83% yield, 88% ee, $[\alpha]^{20}_D$ = -2.99 (*c* 1.37, $CHCl_3$) new compound, yellow oil, R_f = 0.35 (hexanes/ethyl acetate 20/1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 8.4 Hz, 2H), 7.37-7.22 (m, 10H), 6.89 (d, *J* = 7.3 Hz, 2H), 5.95 (s, 1H), 5.21 (s, 2H), 5.01 (s, 2H), 4.94 (s, 1H), 2.15 (s, 3H), 2.02 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 139.0, 138.3, 136.0, 131.5, 130.2, 128.8, 128.5, 128.2, 127.5, 127.1, 125.62, 124.9, 120.8, 115.3, 106.2, 66.7, 48.9, 46.9, 12.4, 10.2; HPLC: Chiralcel OD-H column, 254 nm, 30 ^oC, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.2 min (maj) and 10.6 min. HRMS Calculated for $C_{28}H_{27}BrNO_2$ $[M+H]^+$ 488.1220, found 488.1219.



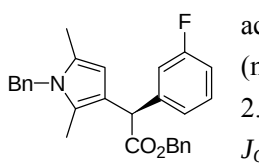
Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(*m*-tolyl)acetate (3aj): 74 mg, 87% yield, 82% ee, $[\alpha]^{20}_D$ = -1.10 (*c* 1.00, $CHCl_3$), new compound, yellow oil, R_f = 0.30 (hexanes/ ethyl acetate 20/1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.40-7.09 (m, 11H), 7.02 (d, *J* = 5.5 Hz, 1H), 6.84 (d, *J* = 7.4 Hz, 2H), 5.95 (s, 1H), 5.16 (s, 2H), 4.95-4.92 (m, 3H), 2.30 (s, 3H), 2.09 (s, 3H), 1.99 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.5, 139.9, 138.6, 138.0, 136.4, 129.2, 128.8, 128.5, 128.4, 128.2, 128.1, 127.7, 127.3, 127.1, 125.7, 125.6, 124.9, 116.0, 106.6, 66.6, 49.5, 47.0, 21.7, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 ^oC, *n*-hexane/ *i*-propanol = 80/20, flow = 0.7 mL/min, retention time 8.9 min (maj) and 10.0 min. HRMS Calculated for $C_{29}H_{30}NO_2$ $[M+H]^+$ 424.2271, found 424.2272.



Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(3-methoxyphenyl)acetate (3ak): 78 mg, 89% yield, 89% ee, $[\alpha]^{20}_D$ = -2.41 (*c* 1.74, $CHCl_3$), new compound, yellow oil, R_f = 0.20 (hexanes/ethyl acetate 20/1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.31-7.14 (m, 9H), 6.98-6.86 (m, 2H), 6.82 (d, *J* = 7.3 Hz, 2H), 6.73 (dd, *J* = 8.2, 2.2 Hz, 1H), 5.95 (s, 1H), 5.14 (s, 2H), 4.92 (s, 3H), 3.68 (s, 3H), 2.06 (s, 3H), 1.96 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.2, 159.7, 141.5, 138.5, 136.3, 129.4, 128.8, 128.5, 128.2, 128.1, 127.3, 127.1, 125.7, 124.9, 120.9, 115.6, 114.2, 112.4, 106.6, 66.6, 55.2, 49.5, 46.9, 12.4, 10.2; HPLC: Chiralcel AD-H column, 254 nm, 30 ^oC, *n*-hexane /*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 10.2 min (maj) and 11.5 min. HRMS Calculated for $C_{29}H_{30}NO_3$ $[M+H]^+$ 440.2220, found 440.2222.

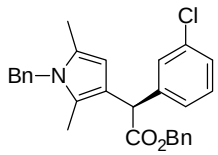


Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(3-fluorophenyl)acetate (3al): 75 mg, 88% yield, 89% ee, $[\alpha]^{20}_D$ = -16.51 (*c* 1.06, $CHCl_3$) new compound, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^1H NMR (400 MHz, $CDCl_3$) δ 7.40-7.20 (m, 9H), 7.15-7.04 (m, 2H), 6.95-6.76 (m, 3H), 5.94 (s, 1H), 5.18 (s, 2H), 4.97-4.94 (m, 3H), 2.11 (s, 3H), 1.99 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.0, 163.0 (d, J_{C-F} = 243.8 Hz), 142.6 (d, J_{C-F} = 7.3 Hz), 138.4, 136.1, 129.8 (d, J_{C-F} = 8.3 Hz), 128.9, 128.6, 128.3, 128.3, 127.7, 127.3, 125.8, 125.2, 124.2 (d, J_{C-F} = 3.1 Hz), 115.6 (d, J_{C-F} = 22.2 Hz), 115.3, 113.9 (d, J_{C-F} = 21.1 Hz), 106.4, 66.9, 49.2 (d, J_{C-F} = 2.0 Hz), 47.1, 12.5, 10.3;

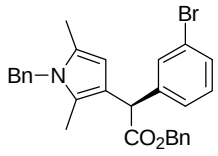


^{19}F NMR (376 MHz, $CDCl_3$) δ -113.24. HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.4 min (maj) and 10.7 min. HRMS Calculated for $C_{28}H_{27}FNO_2$ $[M+H]^+$ 428.2020, found 428.2023.

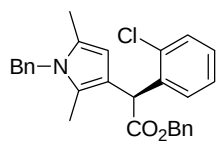
Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(3-chlorophenyl)acetate (3am): 77 mg, 87% yield, 88% ee, $[\alpha]^{20}_D$ = -8.64 (*c* 1.40, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36-7.15 (m, 12H), 6.84 (d, *J* = 7.3 Hz, 2H), 5.93 (s, 1H), 5.17 (s, 2H), 4.96 (s, 2H), 4.91 (s, 1H), 2.10 (s, 3H), 1.97 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 142.1, 138.4, 136.2, 134.3, 129.7, 128.9, 128.8, 128.6, 128.3, 128.3, 127.7, 127.3, 127.1, 126.8, 125.8, 125.2, 115.2, 106.5, 66.9, 49.2, 47.1, 12.5, 10.23; HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.4 min (maj) and 11.2 min. HRMS Calculated for $C_{28}H_{27}ClNO_2$ $[M+H]^+$ 444.1725, found 444.1725.



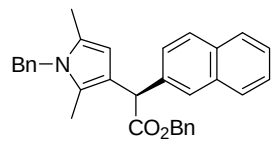
Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(3-bromophenyl)acetate (3an): 84 mg, 86% yield, 89% ee, $[\alpha]^{20}_D$ = -6.93 (*c* 1.40, $CHCl_3$) new compound, yellow solid, m.p. R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (t, *J* = 1.7 Hz, 1H), 7.37-7.19 (m, 10H), 7.15 (t, *J* = 7.8 Hz, 1H), 6.84 (d, *J* = 7.1 Hz, 2H), 5.92 (s, 1H), 5.17 (s, 2H), 4.97 (s, 2H), 4.91 (s, 1H), 2.10 (s, 3H), 1.97 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 142.3, 138.4, 136.1, 131.6, 130.1, 130.0, 128.9, 128.7, 128.3, 127.7, 127.2, 127.2, 125.7, 125.2, 122.6, 115.1, 106.4, 66.9, 49.2, 47.0, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 9.8 min (maj) and 11.9 min. HRMS Calculated for $C_{28}H_{27}BrNO_2$ $[M+H]^+$ 488.1220, found 488.1224.



Benzyl (*S*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(2-chlorophenyl)acetate (3ao): 79 mg, 89% yield, 37% ee, $[\alpha]^{20}_D$ = -13.87 (*c* 1.68, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42-7.37 (m, 1H), 7.33 (dd, *J* = 7.6, 1.3 Hz, 1H), 7.31-7.11 (m, 10H), 6.84 (d, *J* = 7.8 Hz, 2H), 5.87 (s, 1H), 5.35 (s, 1H), 5.24-5.14 (m, 2H), 4.97 (s, 2H), 2.10 (s, 3H), 1.99 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.9, 138.4, 137.9, 136.3, 134.0, 130.5, 129.3, 128.9, 128.5, 128.3, 128.2, 128.1, 127.6, 127.2, 126.9, 125.7, 125.6, 114.3, 106.7, 66.8, 47.1, 46.6, 12.5, 10.3; HPLC: Chiralcel AD-H column, 254 nm, 30 ^{o}C, *n*-hexane/ *i*-propanol = 80/20, flow = 0.7 mL/min, retention time 7.9 min (maj) and 10.3. min. HRMS Calculated for $C_{28}H_{27}ClNO_2$ $[M+H]^+$444.1725, found 444.1722.

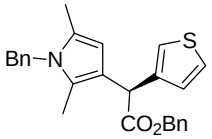


Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(naphthalen-2-yl)acetate (3ap): 83 mg, 90% yield, 88% ee, $[\alpha]^{20}_D$ = +12.77 (*c* 2.02, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82-7.70 (m, 4H), 7.51 (d, *J* = 8.6 Hz, 1H), 7.43-7.38 (m, 2H), 7.32-7.15 (m, 8H), 6.85 (d, *J* = 7.5 Hz, 2H), 5.98 (s, 1H), 5.19 (s, 2H), 5.12 (s, 1H), 4.95 (s, 2H), 2.09 (s, 3H), 2.00 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 138.5, 137.6, 136.3, 133.6, 132.6, 128.9, 128.6, 128.3, 128.2, 128.1, 128.1, 127.7, 127.4, 127.2, 127.1, 126.9, 126.0, 125.8, 125.8, 125.1, 115.9, 106.7, 66.7, 49.8, 47.0, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 ^{o}C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min,

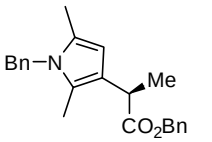


retention time 11.8 min (maj) and 13.7 min. HRMS Calculated for $C_{32}H_{30}NO_2$ $[M+H]^+$ 460.2271, found 460.2275.

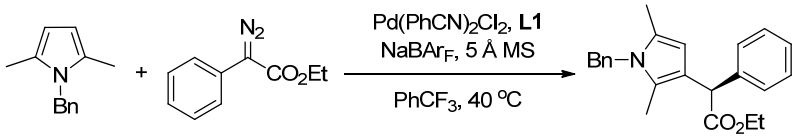
Benzyl (*S*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-(thiophen-3-yl)acetate (3aq): 75 mg, 90% yield, 88% ee, $[\alpha]^{20}_D$ = -5.96 (*c* 1.04, $CHCl_3$) new compound, yellow oil, R_f = 0.30 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.20 (m, 9H), 7.17-7.12 (m, 1H), 7.08 (dd, *J* = 5.0, 1.2 Hz, 1H), 6.91-6.81 (m, 2H), 5.93 (s, 1H), 5.17 (s, 2H), 4.99 (s, 1H), 4.97 (s, 2H) 2.10 (s, 3H), 2.03 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.1, 140.3, 138.5, 136.3, 128.9, 128.6, 128.3, 128.2, 128.2, 127.50, 127.2, 125.8, 125.5, 124.9, 122.2, 115.8, 106.3, 66.7, 47.0, 45.1, 12.5, 10.3; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 90/10, flow = 0.7 mL/min, retention time 13.9 min (maj) and 15.5 min. HRMS Calculated for $C_{26}H_{26}NO_2S$ $[M+H]^+$ 416.1679, found 416.1682.



Benzyl (*R*)-2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)propanoate (3ar): 56 mg, 81% yield, 15% ee, $[\alpha]^{20}_D$ = -7.78 (*c* 0.54, $CHCl_3$) new compound, yellow oil, R_f = 0.40 (hexanes/ethyl acetate 20/1). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37-7.23 (m, 8H), 6.85 (d, *J* = 7.1 Hz, 2H), 5.90 (s, 1H), 5.11 (s, 2H), 4.97 (s, 2H), 3.69 (q, *J* = 7.1 Hz, 1H), 2.11 (s, 3H), 2.05 (s, 3H), 1.47 (d, *J* = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.6, 138.7, 136.7, 128.9, 128.6, 128.0, 127.9, 127.4, 127.2, 125.8, 124.5, 118.0, 104.8, 66.2, 47.0, 37.5, 18.4, 12.5, 10.2; HPLC: Chiralcel OD-H column, 254 nm, 30 °C, *n*-hexane/*i*-propanol = 80/20, flow = 0.7 mL/min, retention time 8.1 min and 9.5 min (maj). HRMS Calculated for $C_{23}H_{25}NO_2$ $[M+H]^+$ 348.1958, found 348.1958.



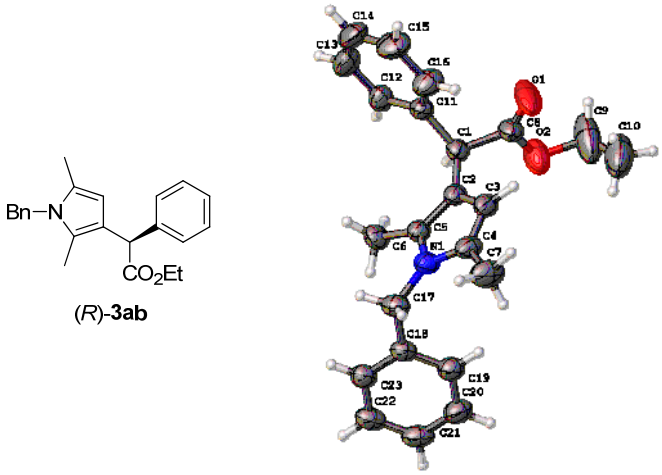
3. Gram Scale Experiment



1a **2b** (*R*)-**3ab**, 1.265 g 91%, 83% ee

The powdered $Pd(PhCN)_2Cl_2$ (0.077 g, 0.2 mmol, 5 mol%), (R_a,*S*,*S*)-C3-ACBP **L1** (0.051 g, 0.2 mmol, 5 mol%), $NaBAr_F$ (0.355 g, 0.4 mmol, 10 mol%) and 4.0 g 5Å molecular sieves were introduced into an oven-dried Schlenk tube under nitrogen. After benzotrifluoride (20 mL) was injected into the Schlenk tube, the solution was stirred at 40 °C under nitrogen for 2 h. Protected Pyrrole **1a** (1.112 g, 6 mmol) and α-aryl-α-diazoactates **2b** (0.761 g, 4 mmol) was then introduced in one portion. The resulting mixture was stirred at 40 °C until the full consumption of **2b**. After filtrating and removing the solvent in vacuum, flash chromatography on silica gel using hexanes/ethyl acetate (40/1) as the eluent gave the product **3ab** as yellow solid (1.265 g, 91% yield, 83% ee).

4. Determination of the Absolute Configuration



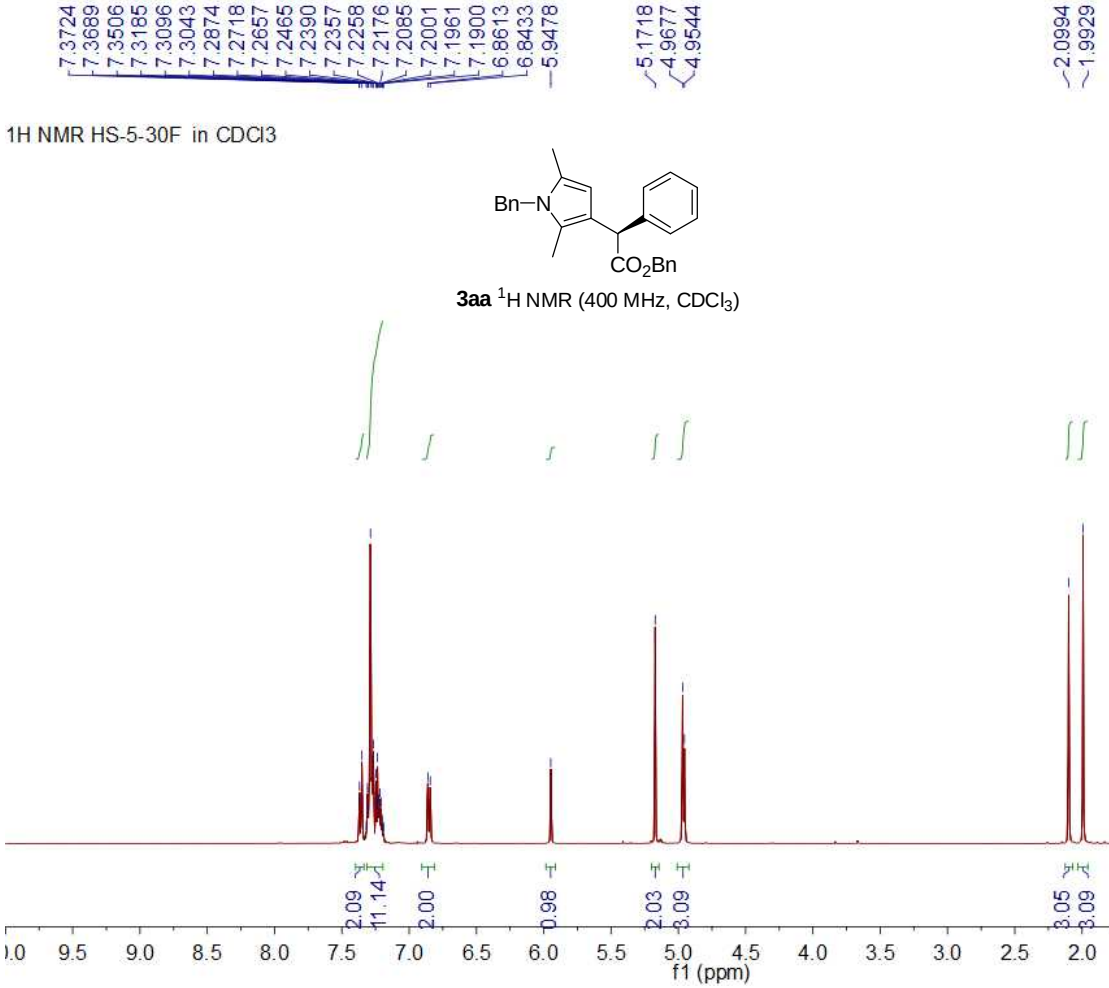
X-ray Single Crystal Structure of (-)-**3ab**

The *n*-hexane (5 mL) was slowly added into solution of (-)-ethyl -2-(1-benzyl-2,5-dimethyl-1*H*-pyrrol-3-yl)-2-phenylacetate (**3ab**) in dichloromethane (0.5 mL), then the solvent was slowly evaporated and single crystal of **3ab** was obtained after 4 days. The structure showed the absolute configuration of (-)-**3ab** is (*R*). The CCDC number is 1566708. These details can be obtained free of charge *via* www.ccdc.com. ac.uk/data_request/cif from the Cambridge Crystallographic Data Centre.

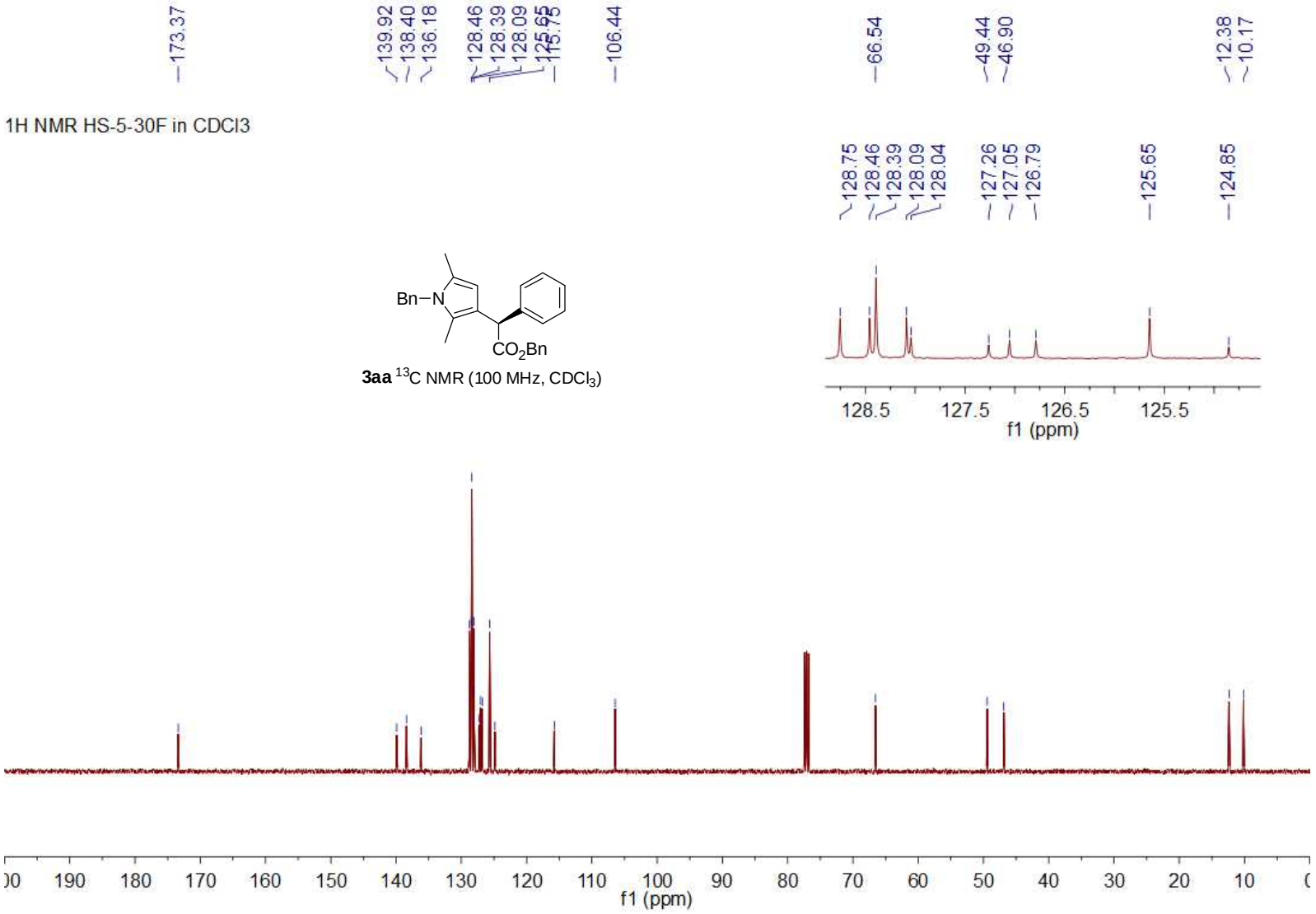
5. References

1. (a) J. Hamelin, B. Klein and F. Texier-Boullet, *Synthesis,* 1986, 409; (b) H. Cho, R. Madden, B. Nisanci and B. Török, *Green Chem*., 2015, **17**, 1088; (c) S. Petruso, S. Caronna and V. Sprio, *J. Heterocyclic Chem*., 1990, **27**, 1209.
2. (a) T. C. Maier and G. C. Fu, *J. Am. Chem. Soc.*, 2006, **128**, 4594; (b) X.-L. Xie, S.-F. Zhu, J.-X. Guo, Y. Cai and Q.-L. Zhou, *Angew. Chem. Int. Ed.,* 2014, **53**, 2978; (c) J.-C. Wang, Y. Zhang, Z.-J. Xu, V. K.-Y. Lo and C.-M. Che, *ACS Catalysis*, 2013, **3**, 1144; (d) P. Gu, Y. Su, X.-P. Wu, J. Sun, W. Liu, P. Xue and R. Li, *Org. Lett*., 2012, **14**, 2246.
3. (a) X. Gao, B. Wu, W.-X. Huang, M.-W. Chen and Y.-G. Zhou, *Angew. Chem. Int. Ed.,* 2015, **54**, 11956; (b) X. Gao, B. Wu, Z. Yan and Y.-G. Zhou, *Org. Biomol. Chem*., 2016, **14**, 55.

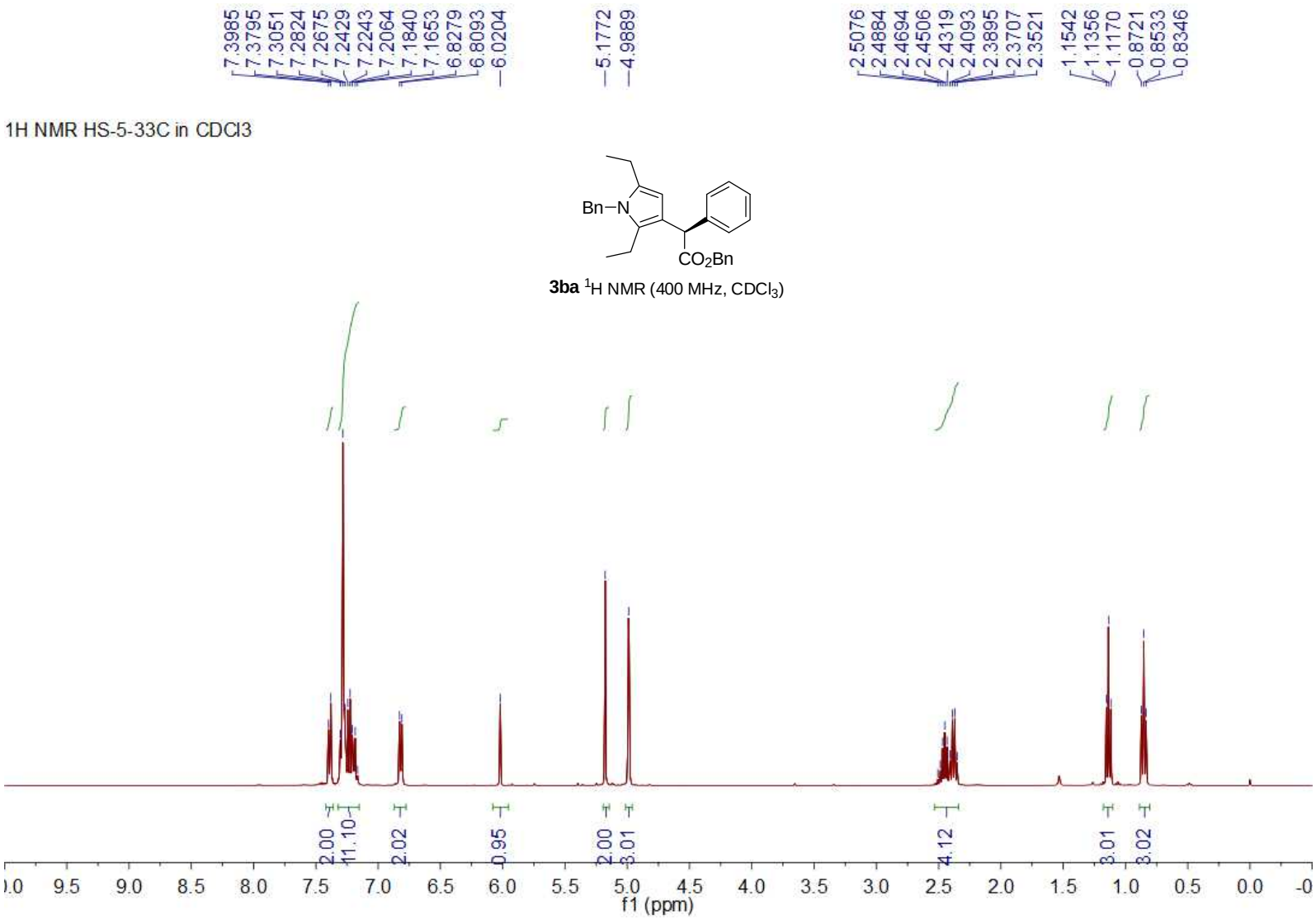
6. Copy of NMR and HPLC for the Compounds



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

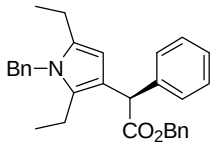


3aa ^{13}C NMR (100 MHz, $CDCl_3$)

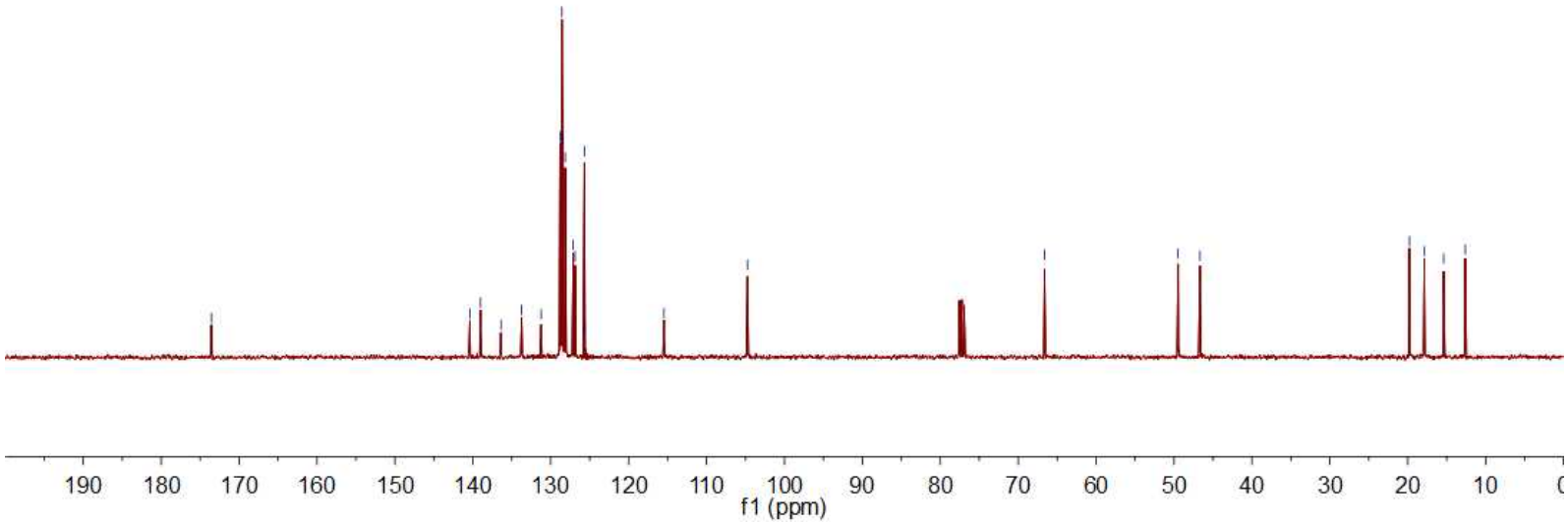


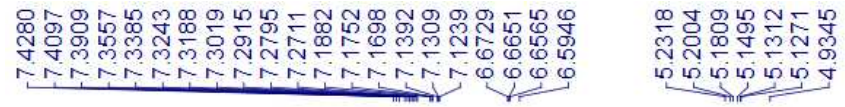
3ba ^{1}H NMR (400 MHz, $CDCl_3$)

13C NMR HS-5-33C in CDCl3

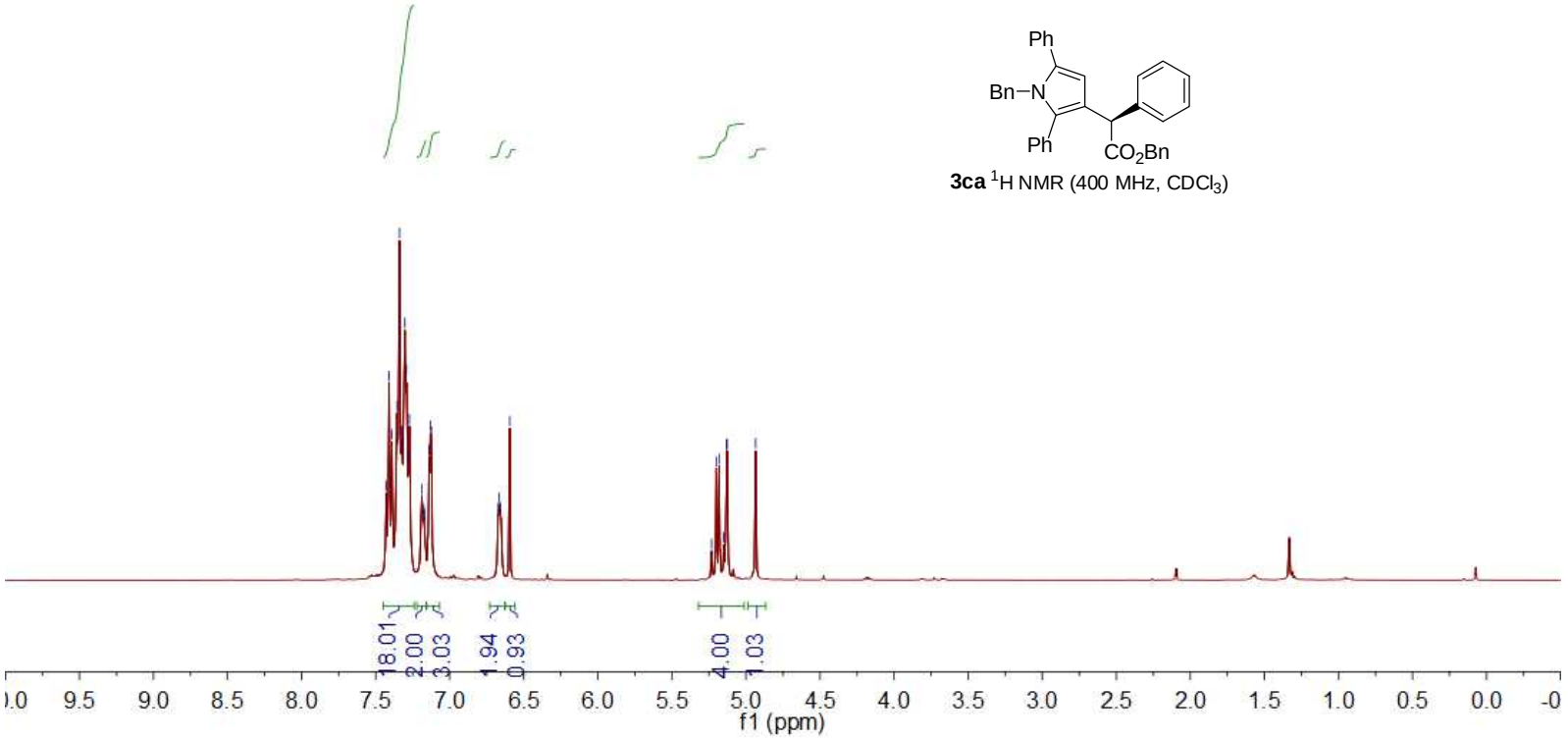


3ba ^{13}C NMR (100 MHz, $CDCl_3$)

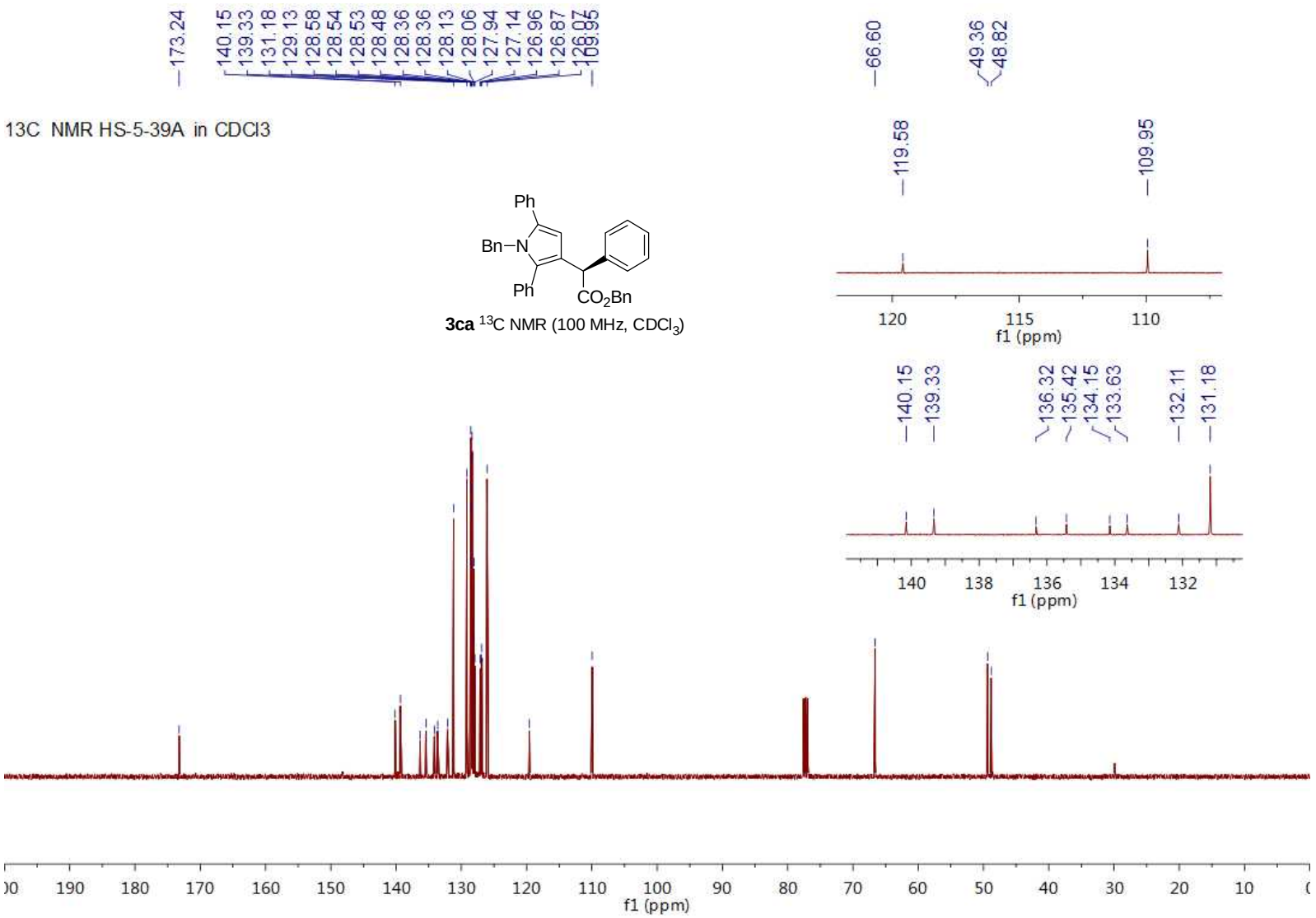




1H NMR HS-5-39A in CDCl3

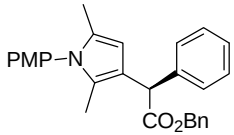


3ca ^{1}H NMR (400 MHz, $CDCl_3$)

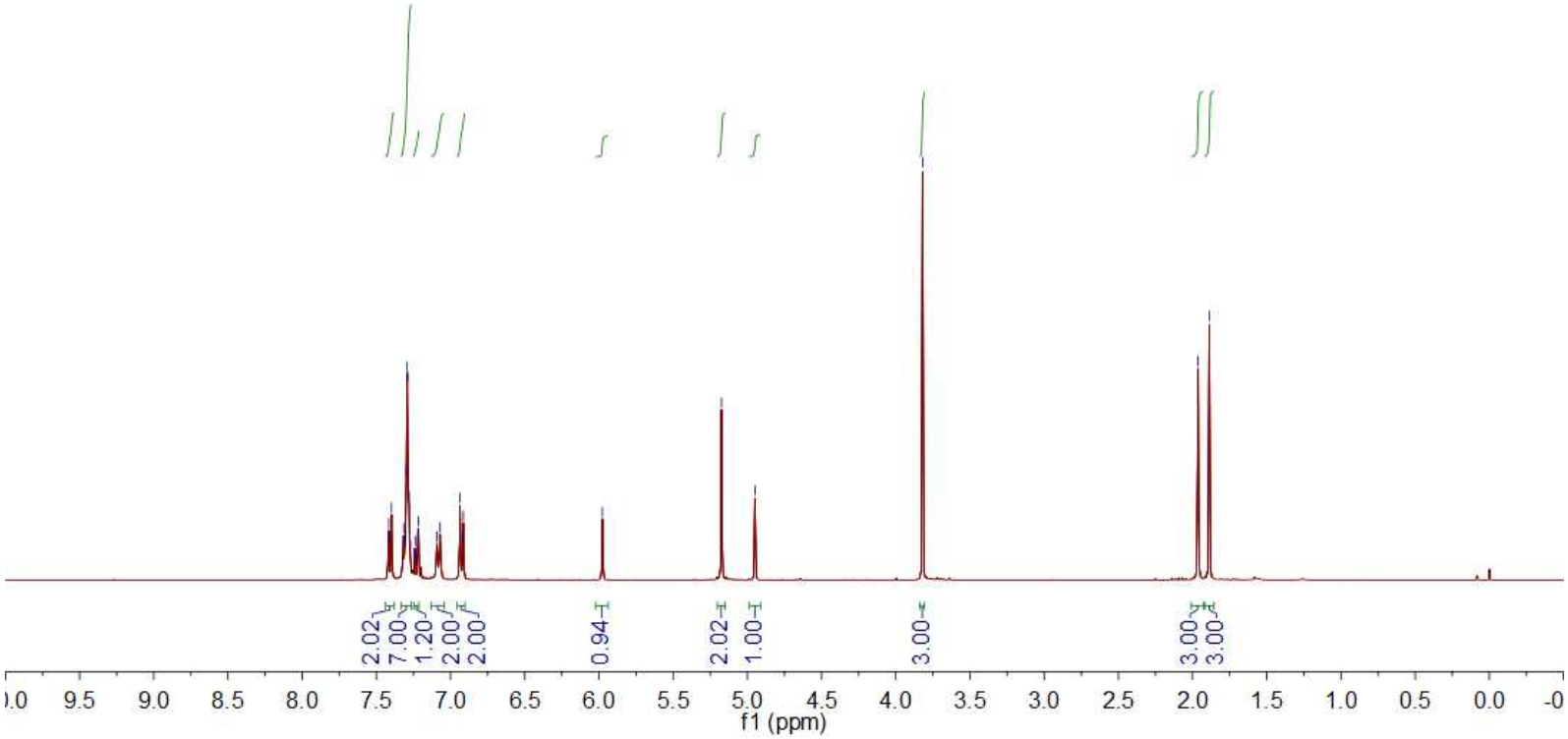


3ca ^{13}C NMR (100 MHz, $CDCl_3$)

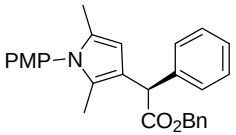
1H NMR HS-5-46A in CDCl3



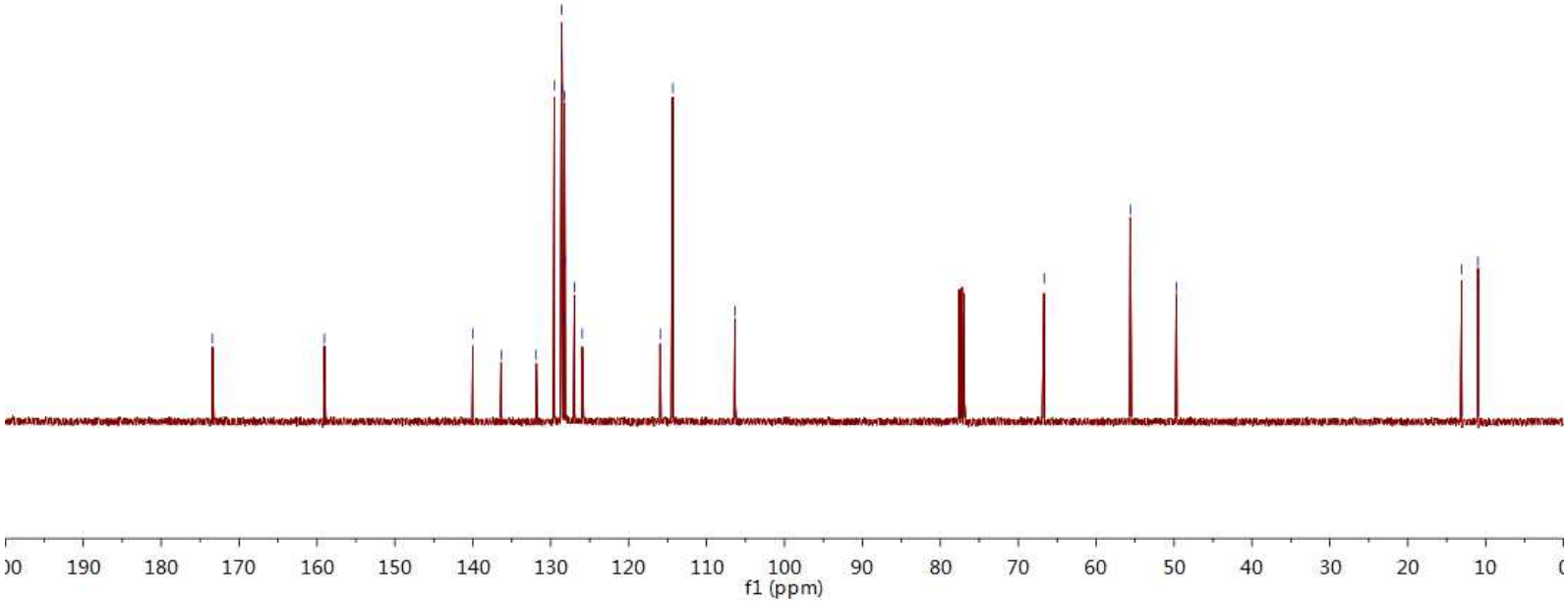
3da ^{1}H NMR (400 MHz, $CDCl_3$)



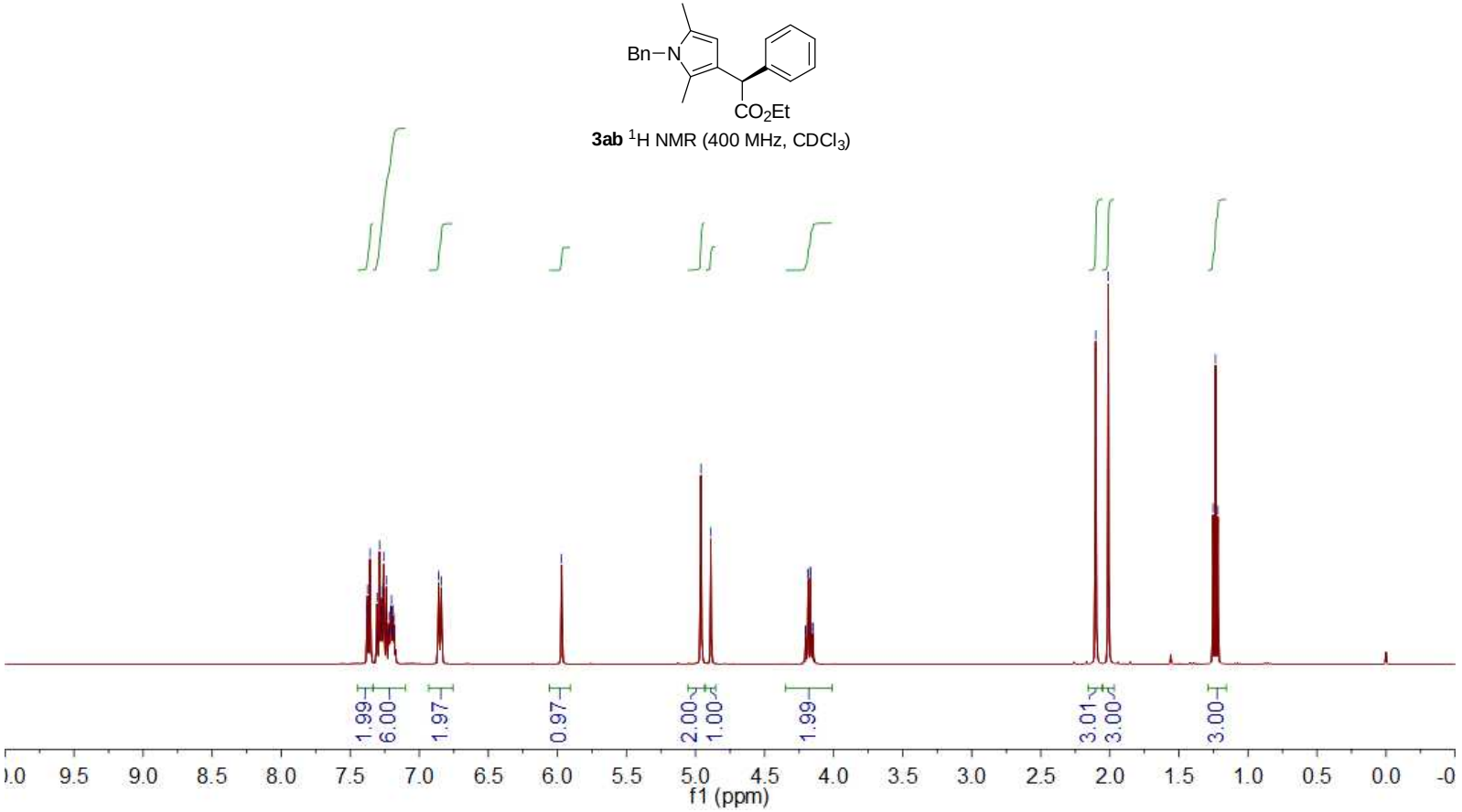
13C NMR HS-5-46A in CDCl3



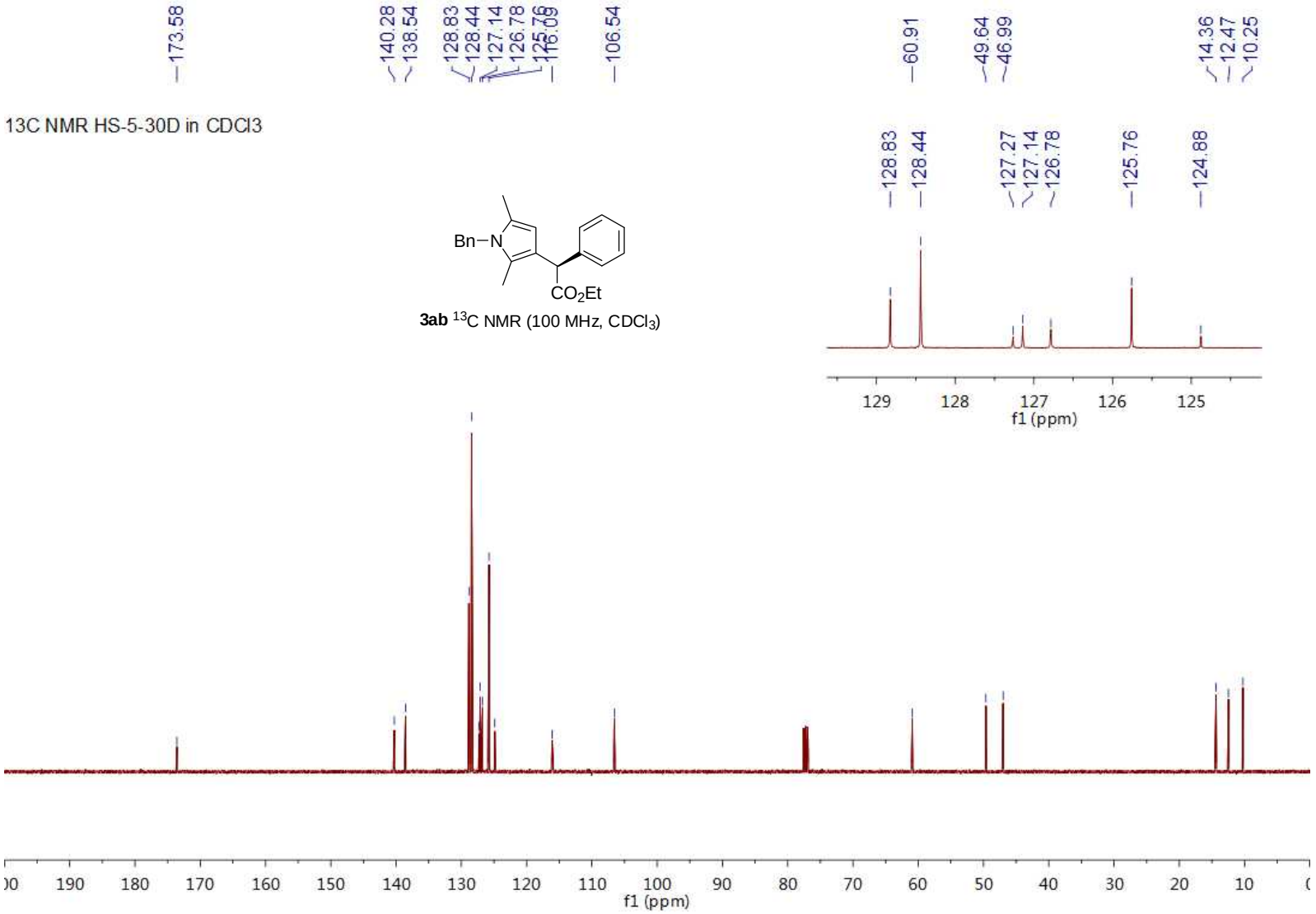
3da ^{13}C NMR (100 MHz, $CDCl_3$)



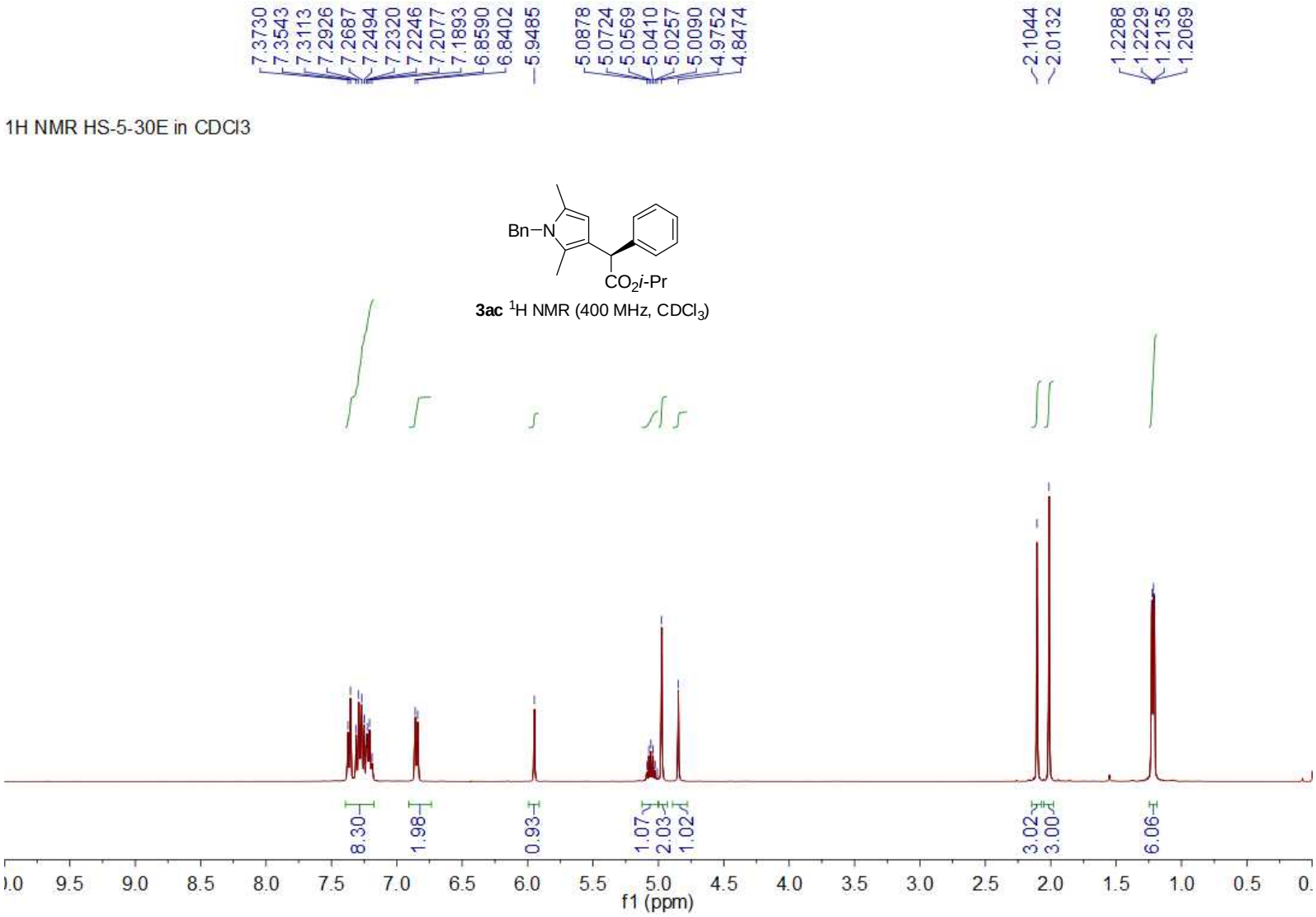
1H NMR HS-5-30D in CDCl3



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



3ab ^{13}C NMR (100 MHz, $CDCl_3$)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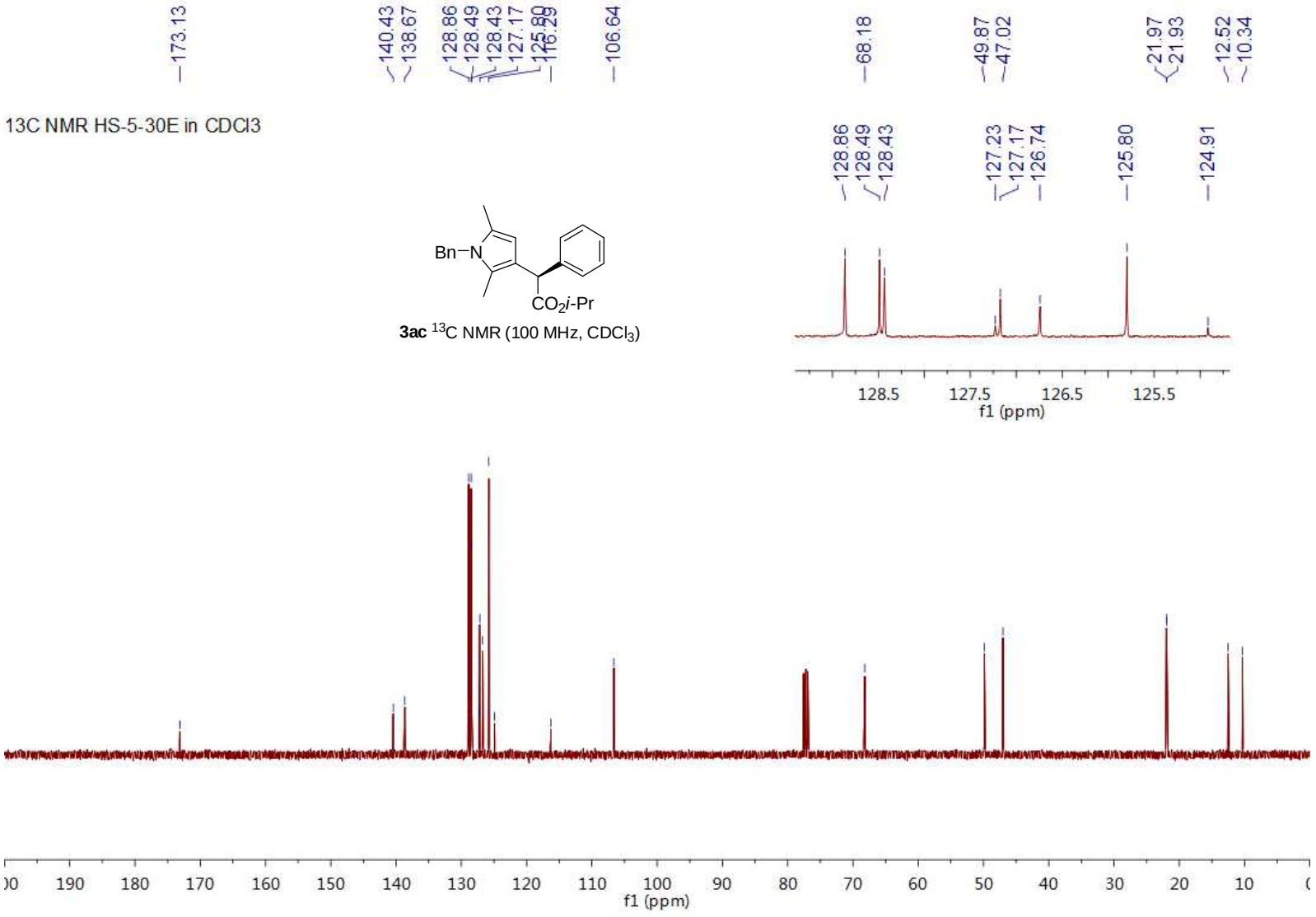
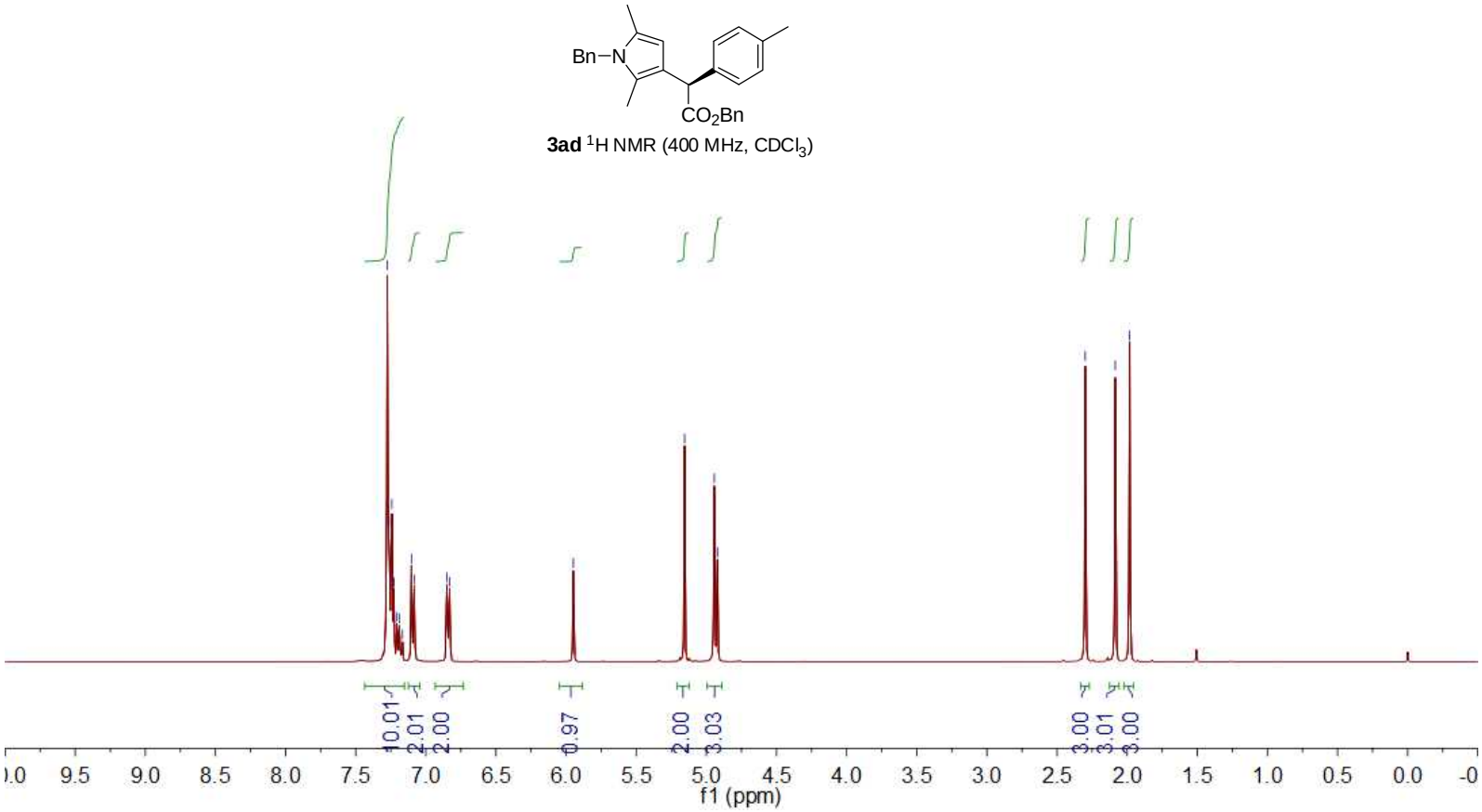
7.3113
7.2926
7.2687
7.2494
7.2320
7.2246
7.2077
7.1893
6.8590
6.8402
5.9485
5.0878
5.0724
5.0569
5.0410
5.0257
5.0090
4.9752
4.8474
2.1044
2.0132
1.2288
1.2229
1.2135
1.2069
1H NMR HS-5-30E in CDCl3
Bn−N
CO2i-Pr
3ac 1H NMR (400 MHz, CDCl3)
8.30
1.98
0.93
1.07
2.03
1.02
3.02
3.00
6.06
f1 (ppm)

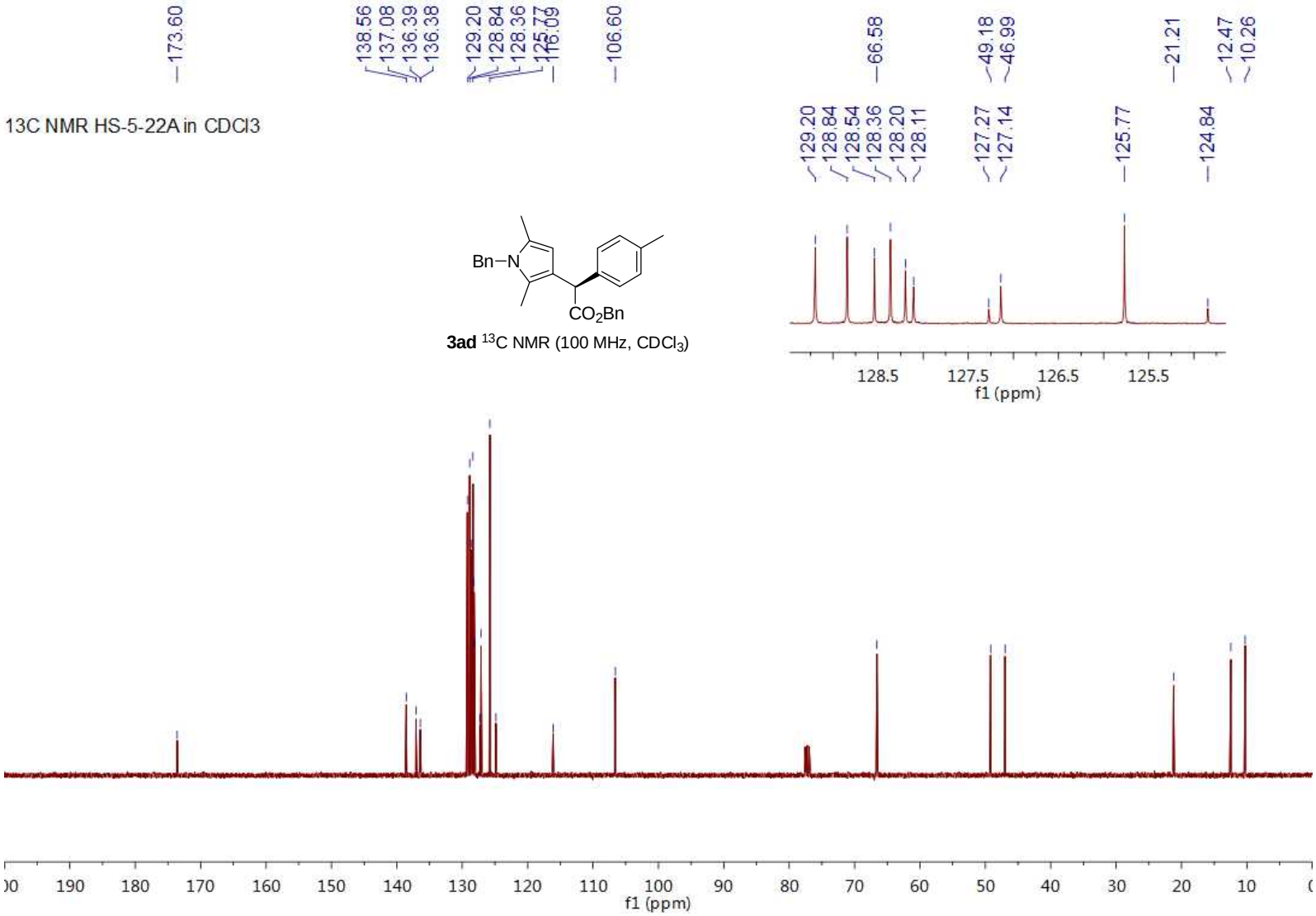


3ac ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR HS-5-22A in CDCl3

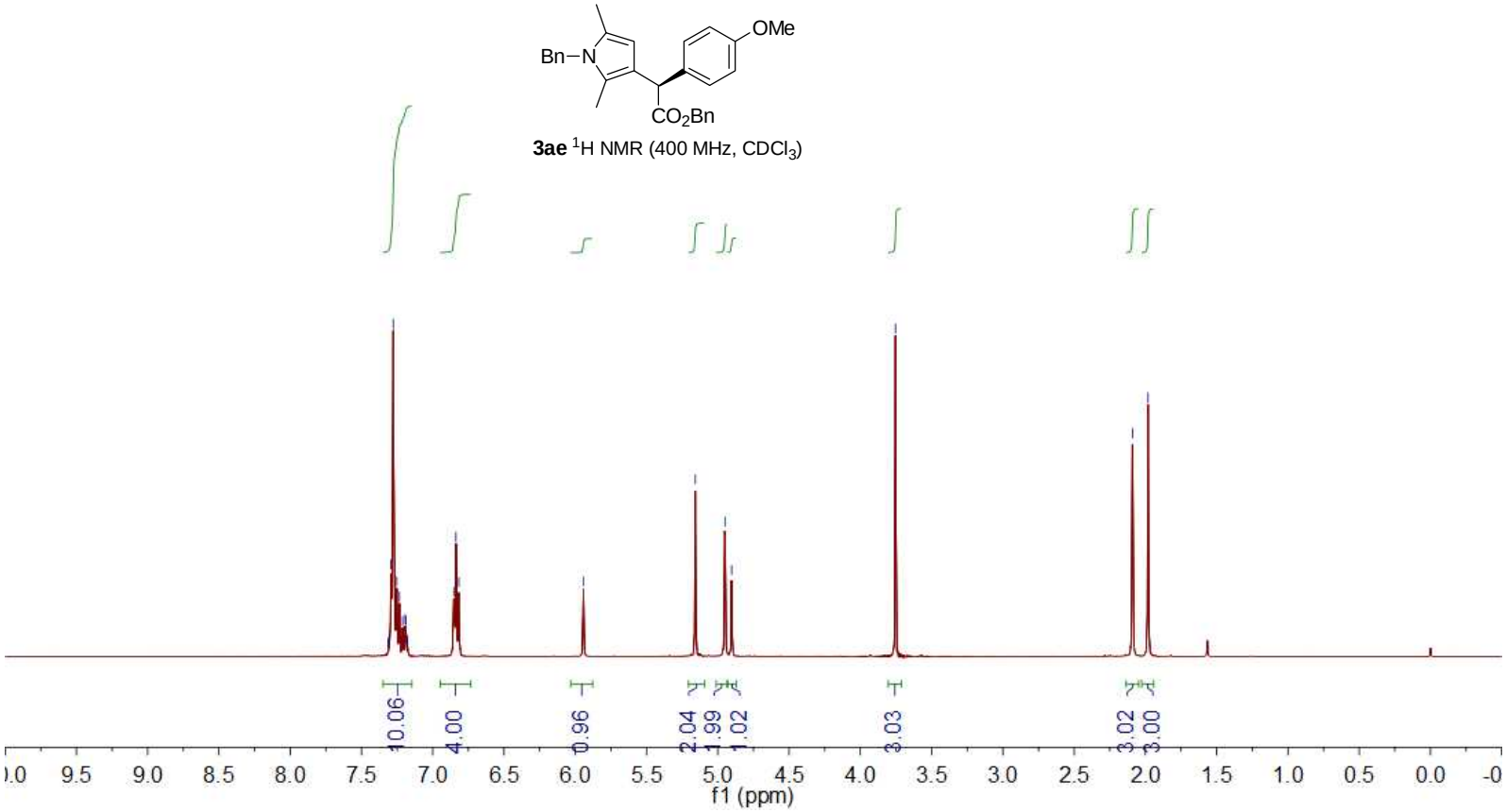


3ad ^{1}H NMR (400 MHz, $CDCl_3$)

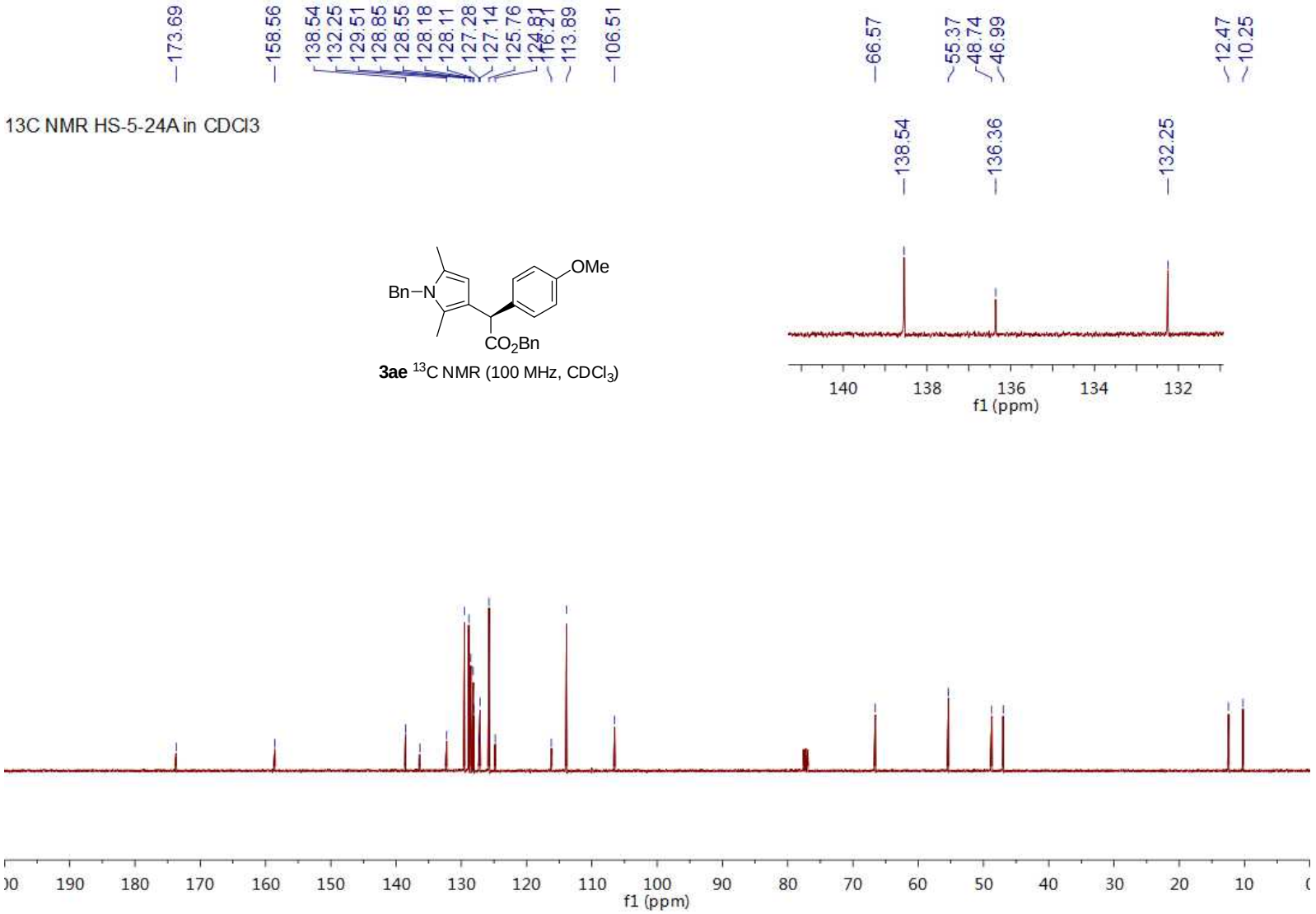


3ad ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR HS-5-24A in CDCl3

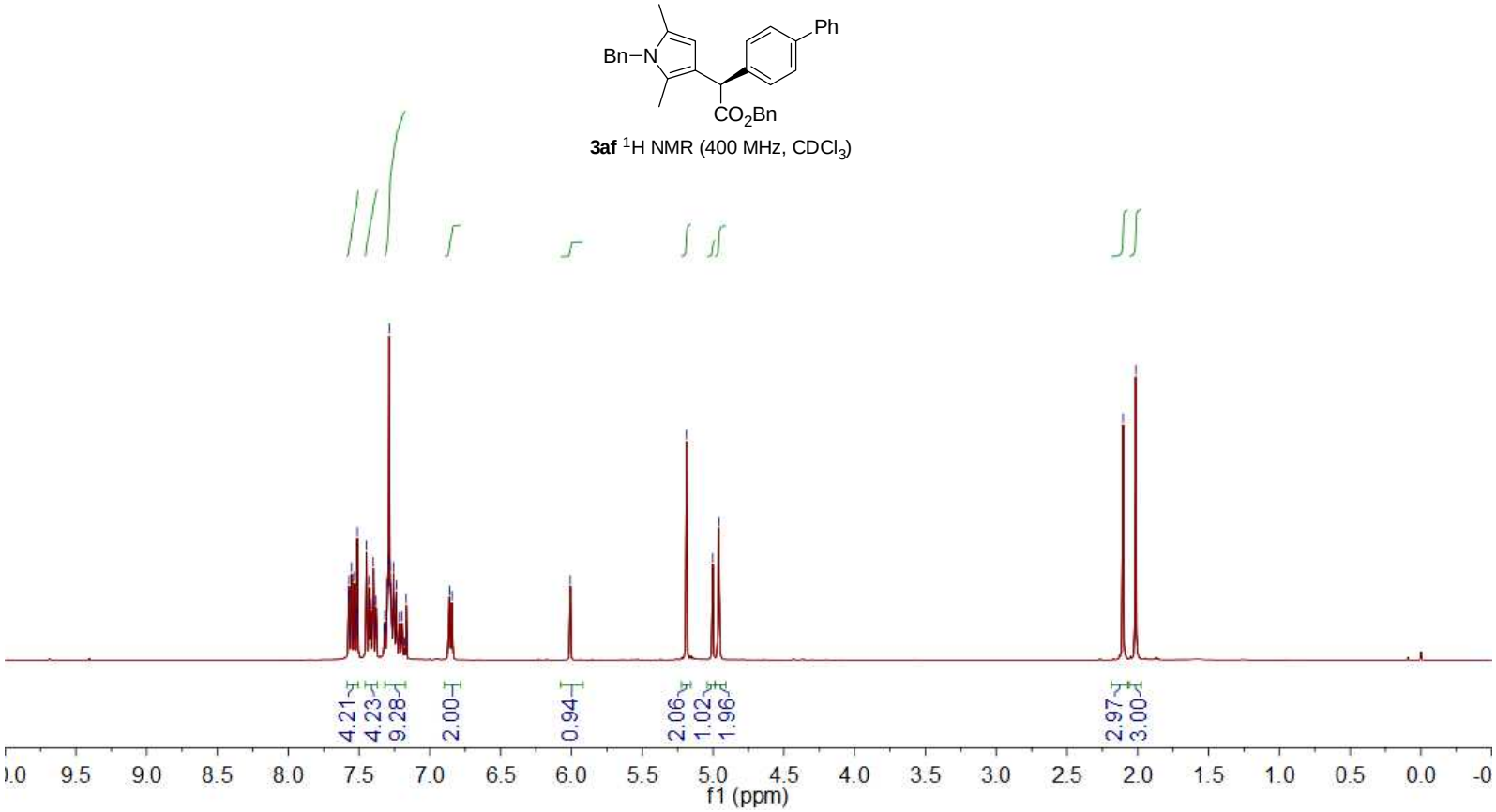


3ae ^{1}H NMR (400 MHz, $CDCl_3$)



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

1H NMR HS-5-29A in CDCl3



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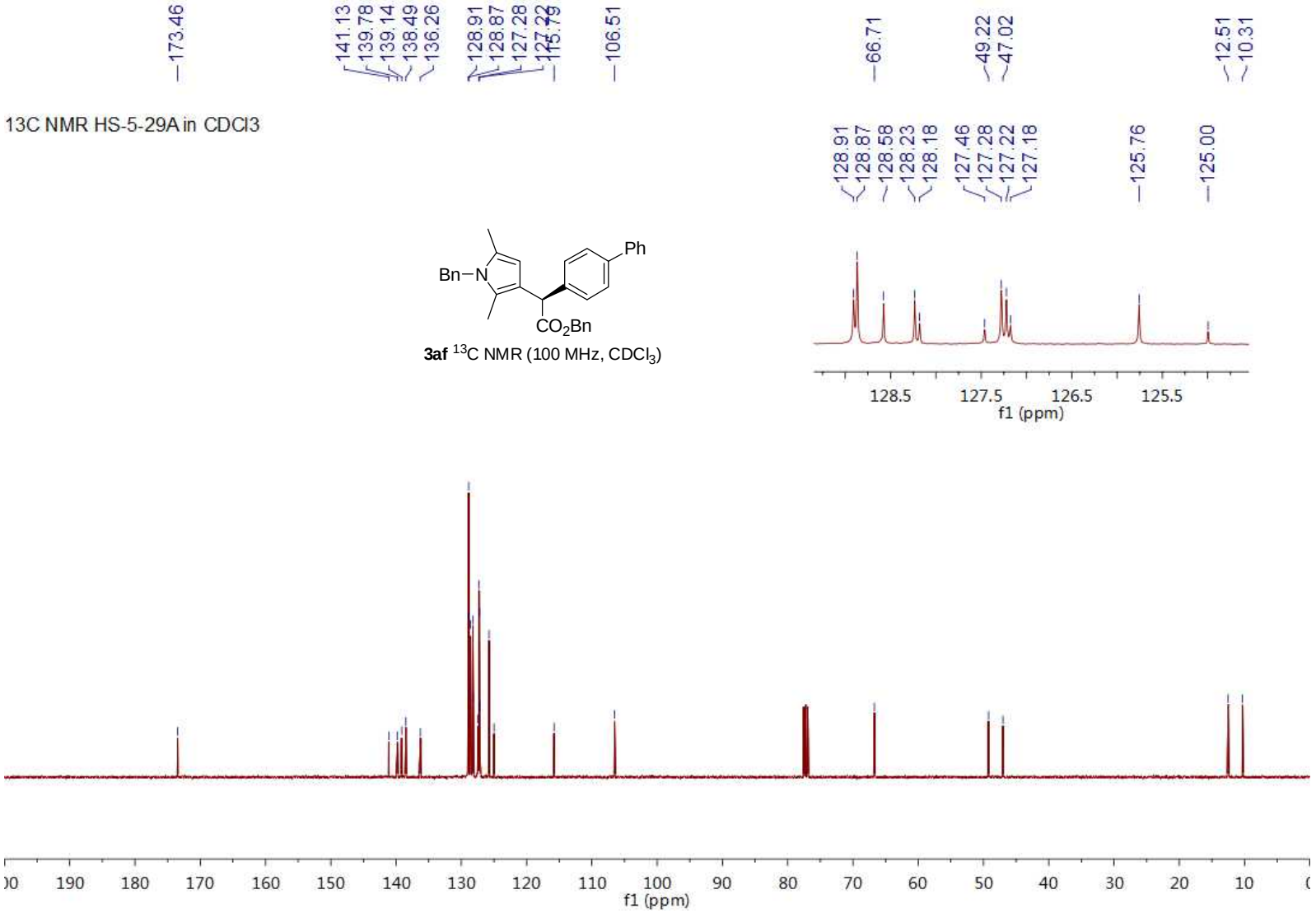
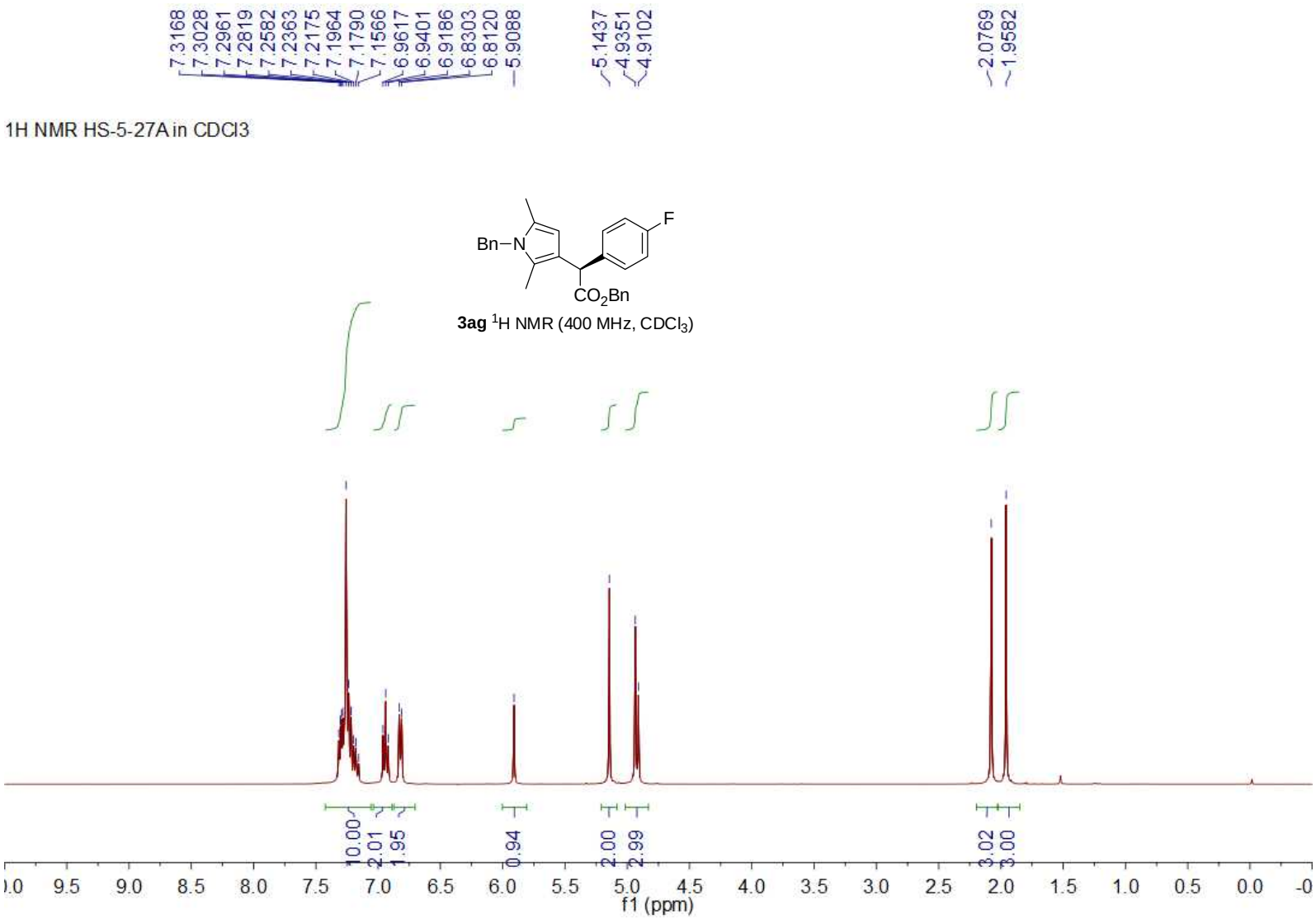
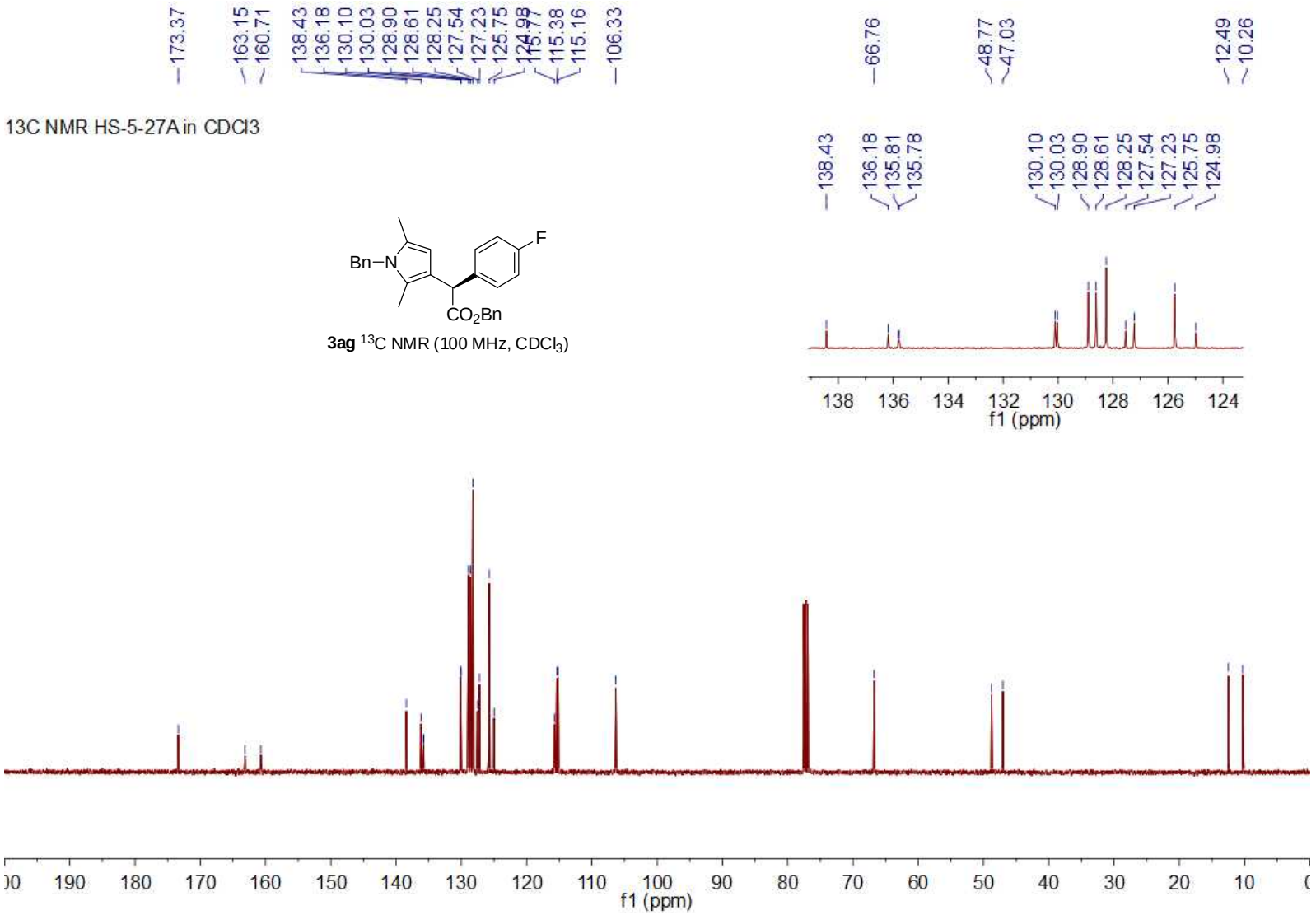

173.46
141.13
139.78
139.14
138.49
136.26
128.91
128.87
127.28
127.22
115.79
106.51
66.71
49.22
47.02
12.51
10.31
13C NMR HS-5-29A in CDCl3
Bn–N
Ph
CO2Bn
3af 13C NMR (100 MHz, CDCl3)
128.91
128.87
128.58
128.23
128.18
127.46
127.28
127.22
127.18
125.76
125.00
128.5
127.5
126.5
125.5
f1 (ppm)
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

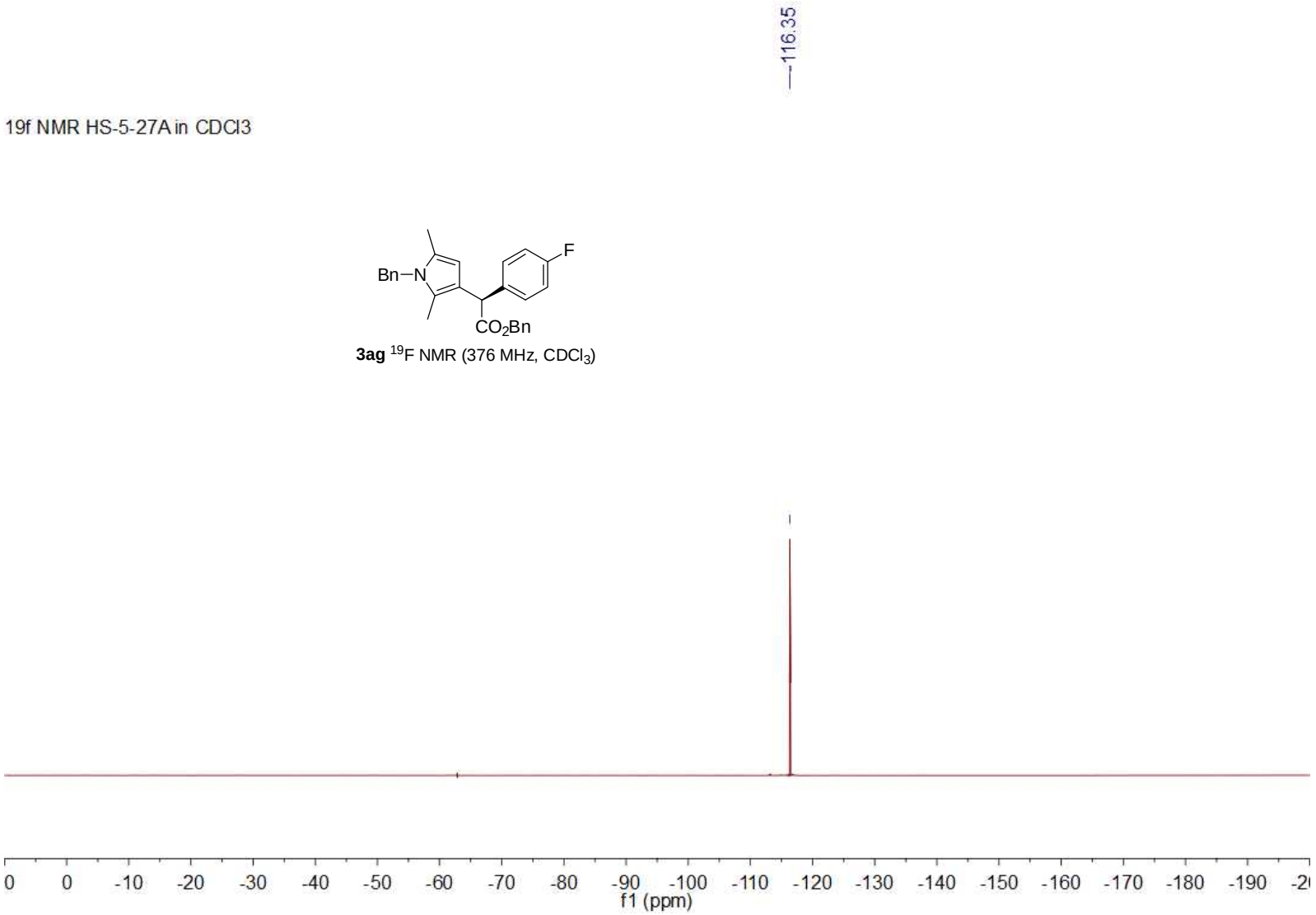

7.3168
7.3028
7.2961
7.2819
7.2582
7.2363
7.2175
7.1964
7.1790
7.1566
6.9617
6.9401
6.9186
6.8303
6.8120
5.9088
5.1437
4.9351
4.9102
2.0769
1.9582
1H NMR HS-5-27A in CDCl3
Bn−N
F
CO2Bn
3ag 1H NMR (400 MHz, CDCl3)
10.00
2.01
1.95
0.94
2.00
2.99
3.02
3.00
f1 (ppm)

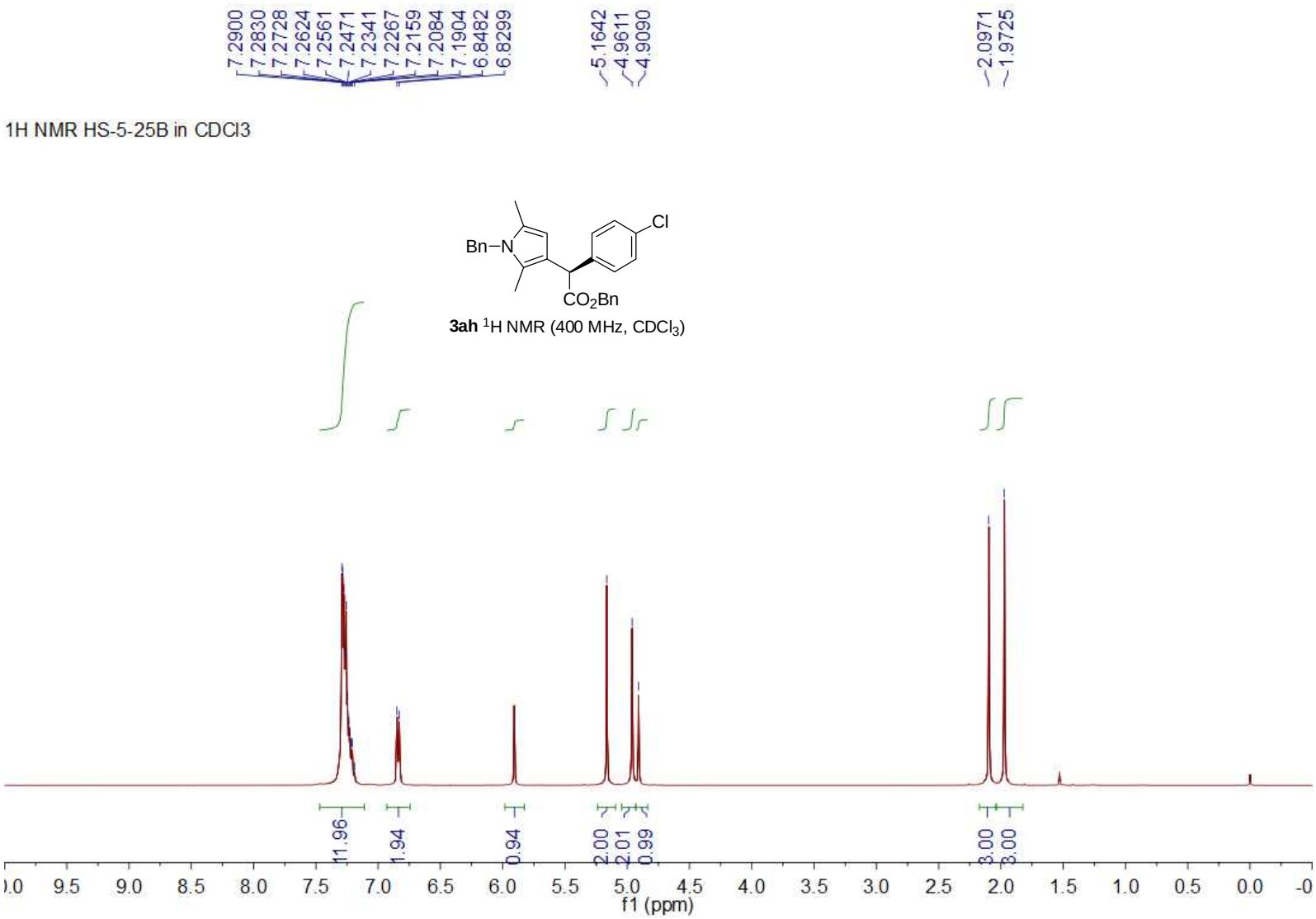


3ag ^{13}C NMR (100 MHz, $CDCl_3$)

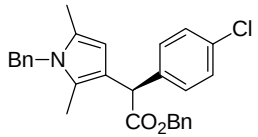
19f NMR HS-5-27A in CDCl3

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

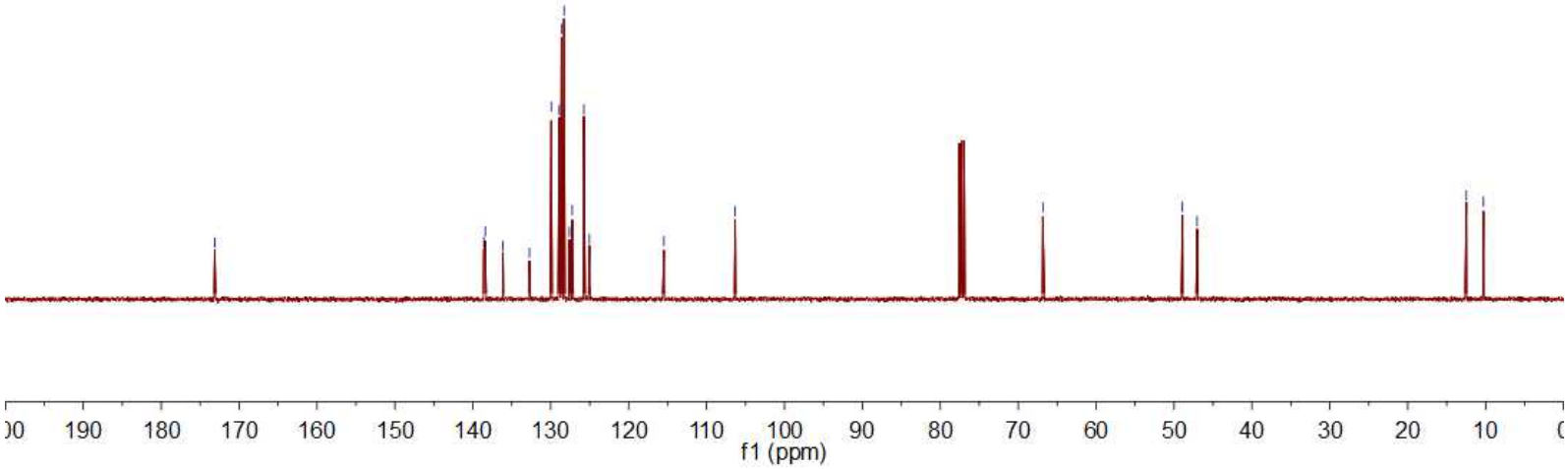



7.2900
7.2830
7.2728
7.2624
7.2561
7.2471
7.2341
7.2267
7.2159
7.2084
7.1904
6.8482
6.8299
5.1642
4.9611
4.9090
2.0971
1.9725
1H NMR HS-5-25B in CDCl3
Bn–N
Cl
CO2Bn
3ah 1H NMR (400 MHz, CDCl3)
11.96
1.94
0.94
2.00
2.01
0.99
3.00
3.00
f1 (ppm)

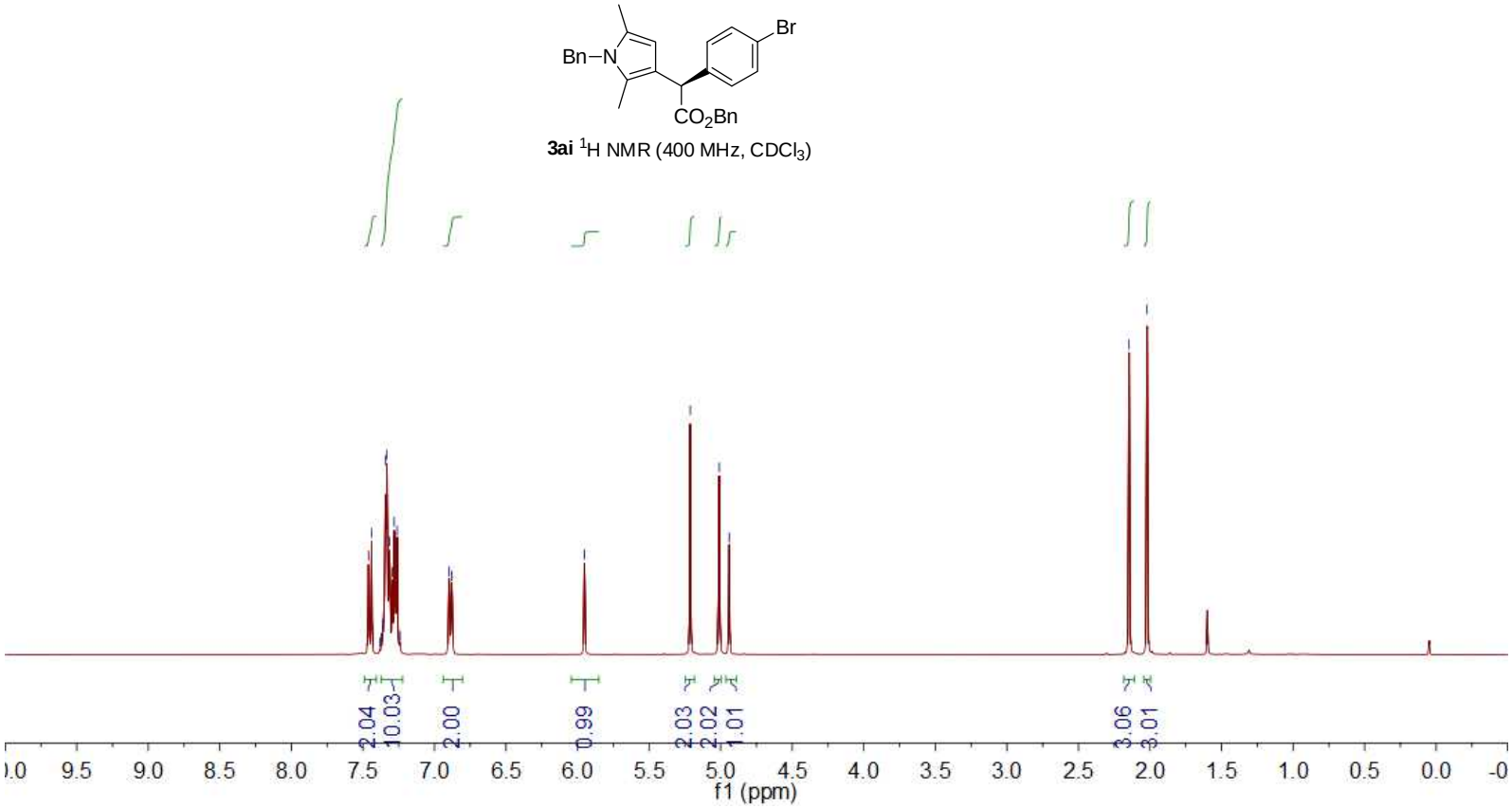
13C NMR HS-5-25B in CDCl3



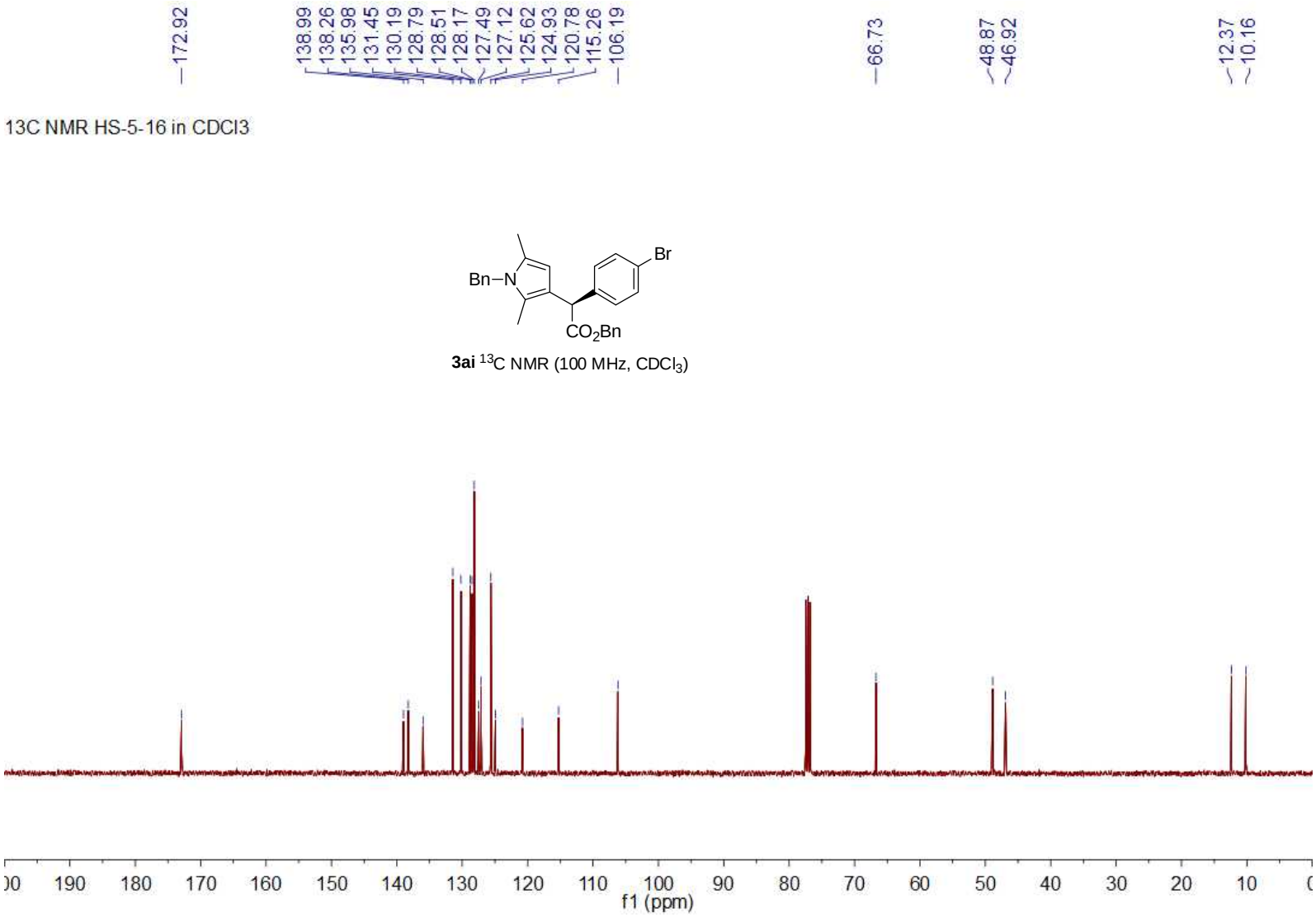
3ah ^{13}C NMR (100 MHz, $CDCl_3$)



1H NMR HS-5-16 in CDCl3

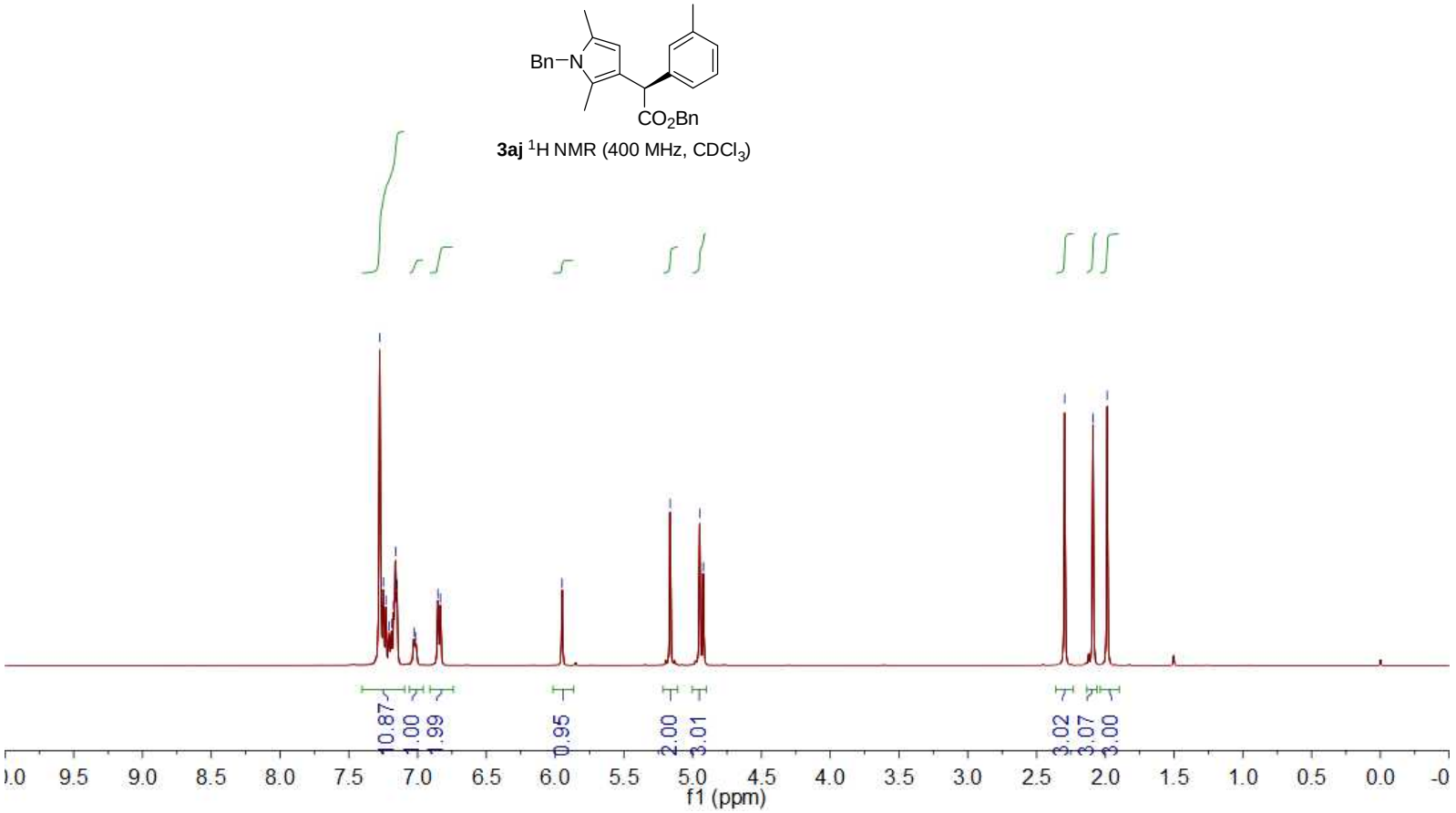


3ai ^{1}H NMR (400 MHz, $CDCl_3$)

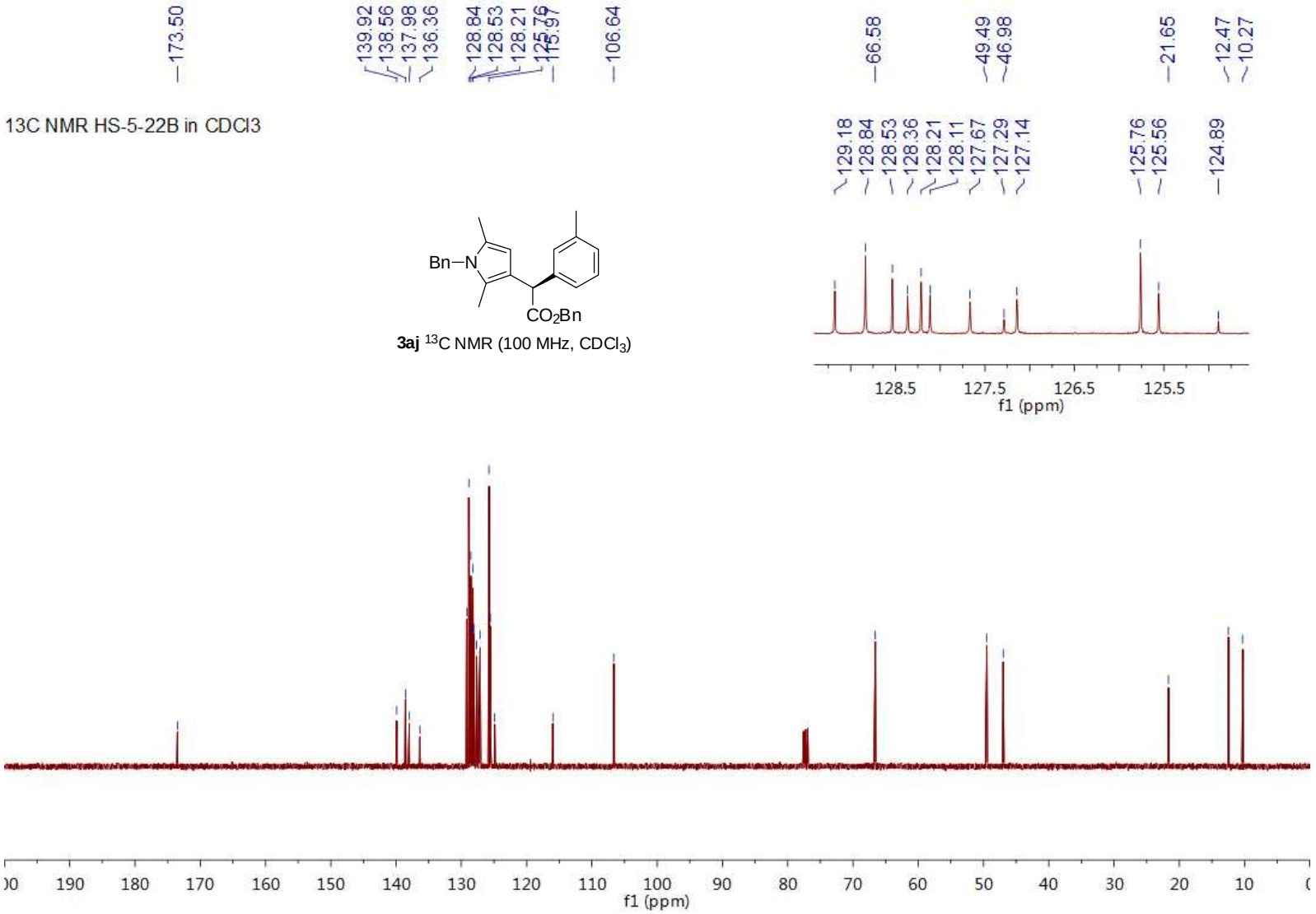


3ai ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR HS-5-22B in CDCl3

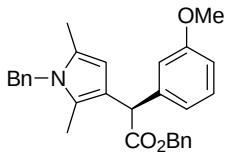


3aj ^{1}H NMR (400 MHz, $CDCl_3$)

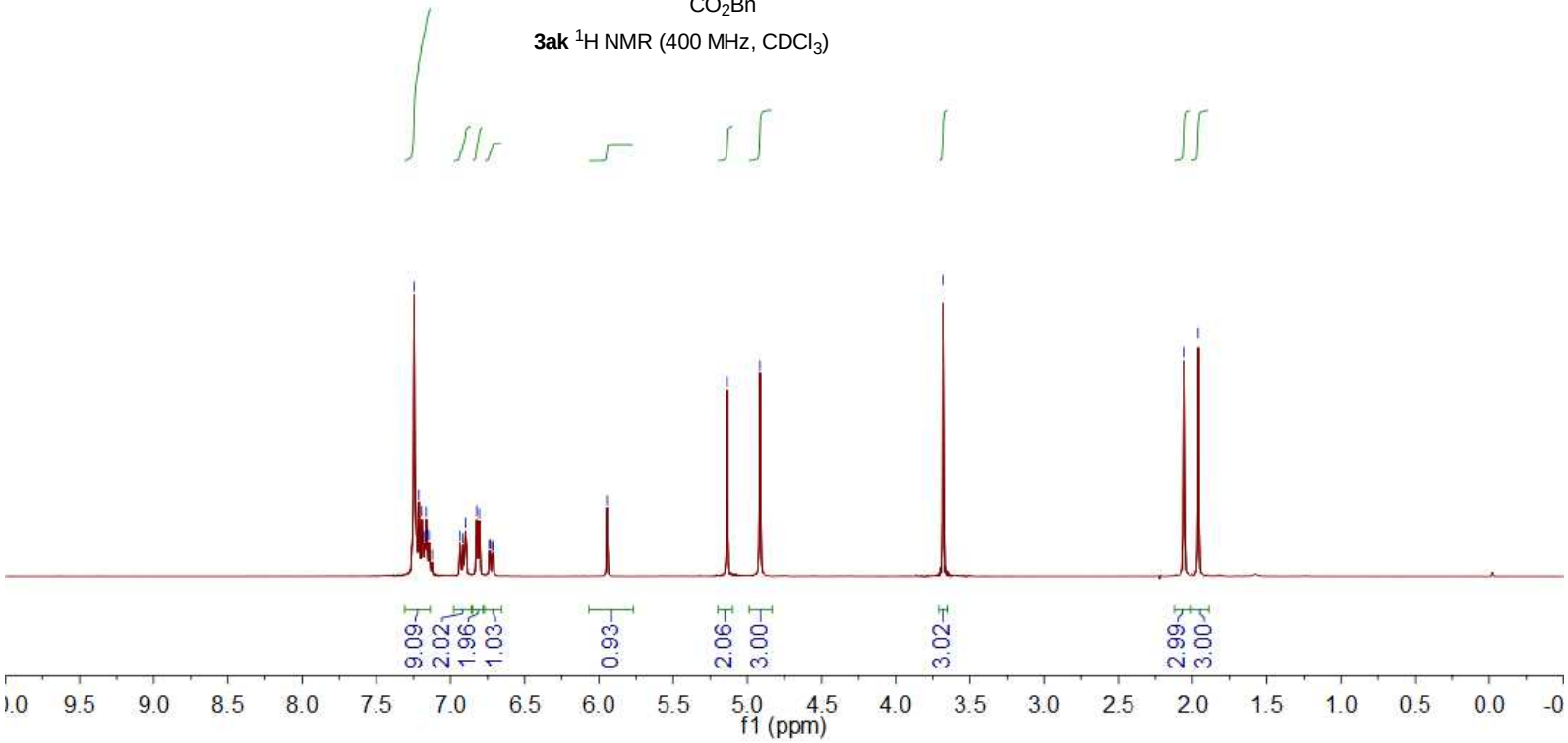


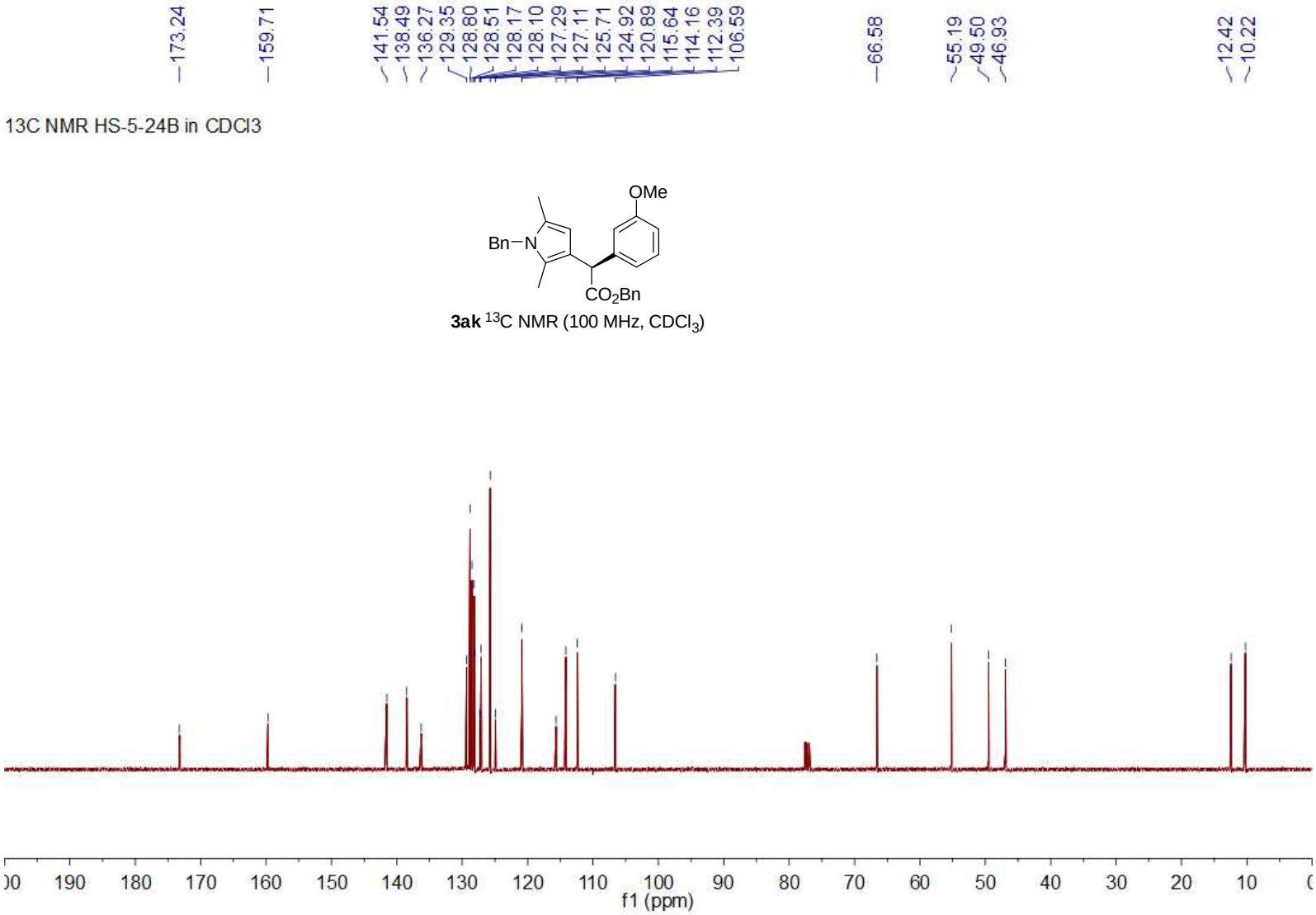
3aj ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR HS-5-24B in CDCl3



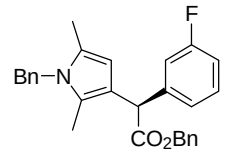
3ak ^{1}H NMR (400 MHz, $CDCl_3$)



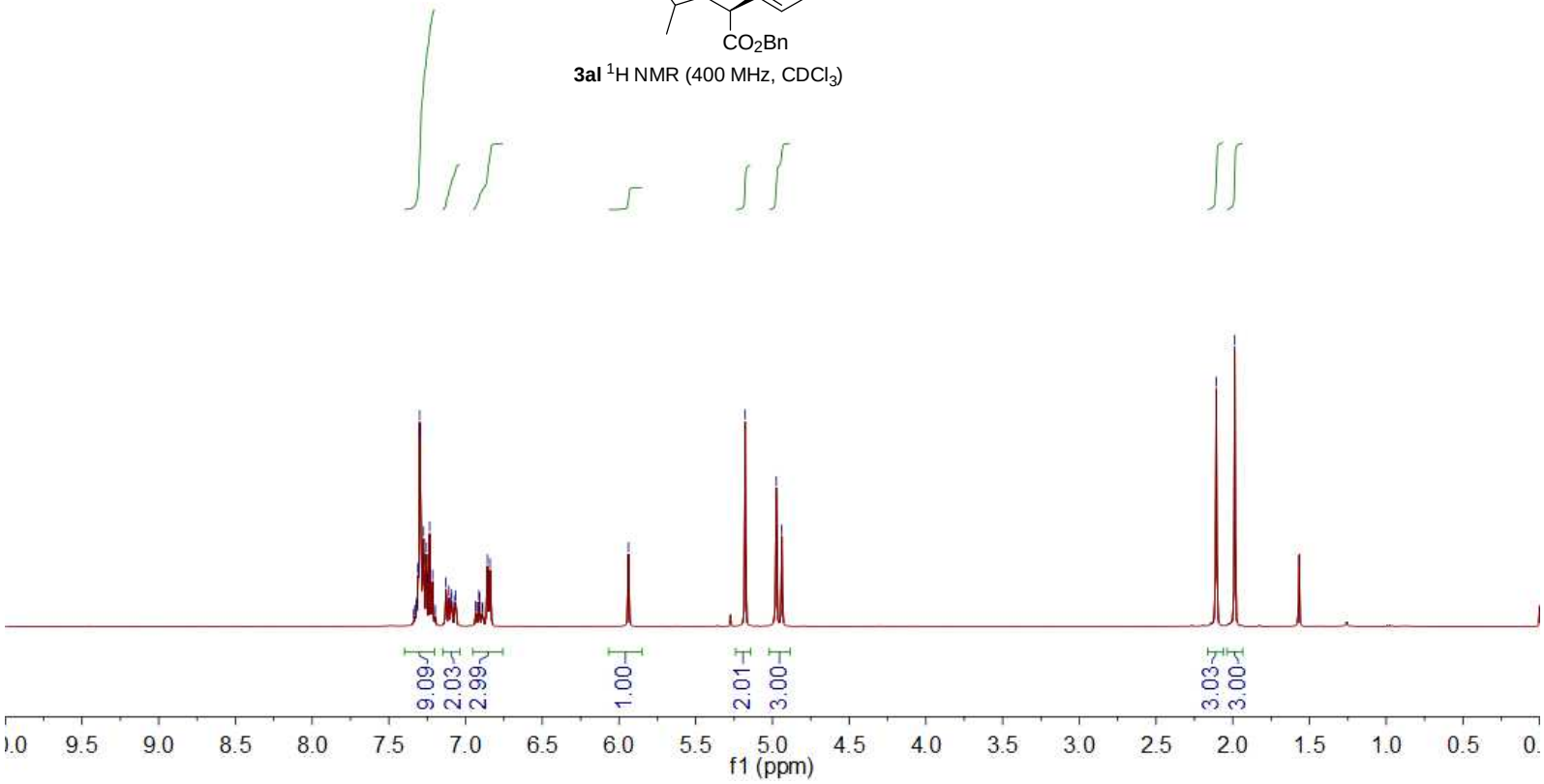


3ak ^{13}C NMR (100 MHz, $CDCl_3$)

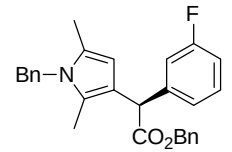
1H NMR HS-5-33A in CDCl3



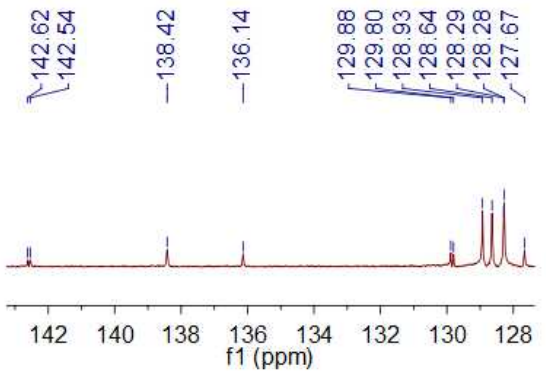
3al ^{1}H NMR (400 MHz, $CDCl_3$)

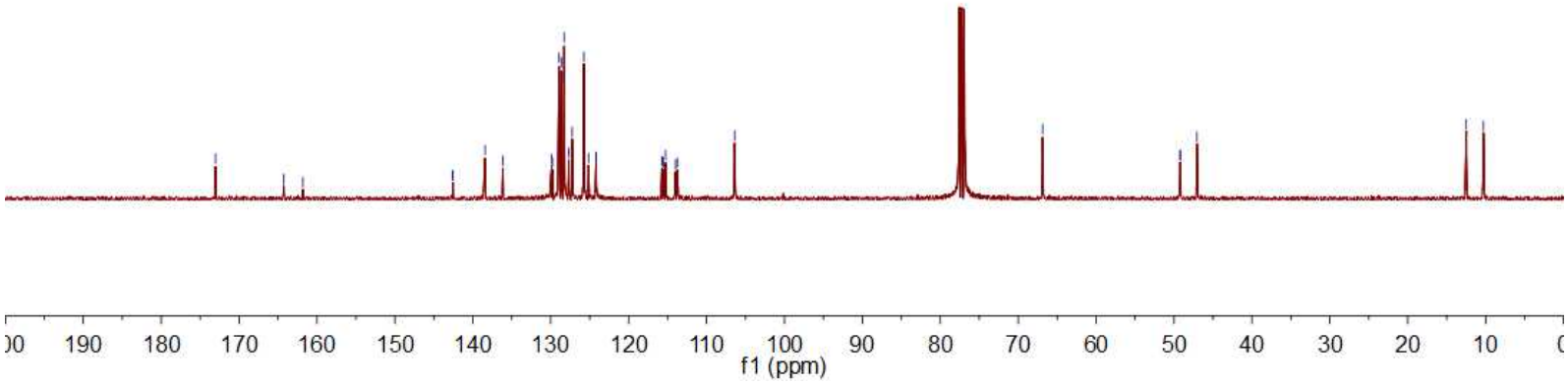


13C NMR HS-5-33A in CDCl3



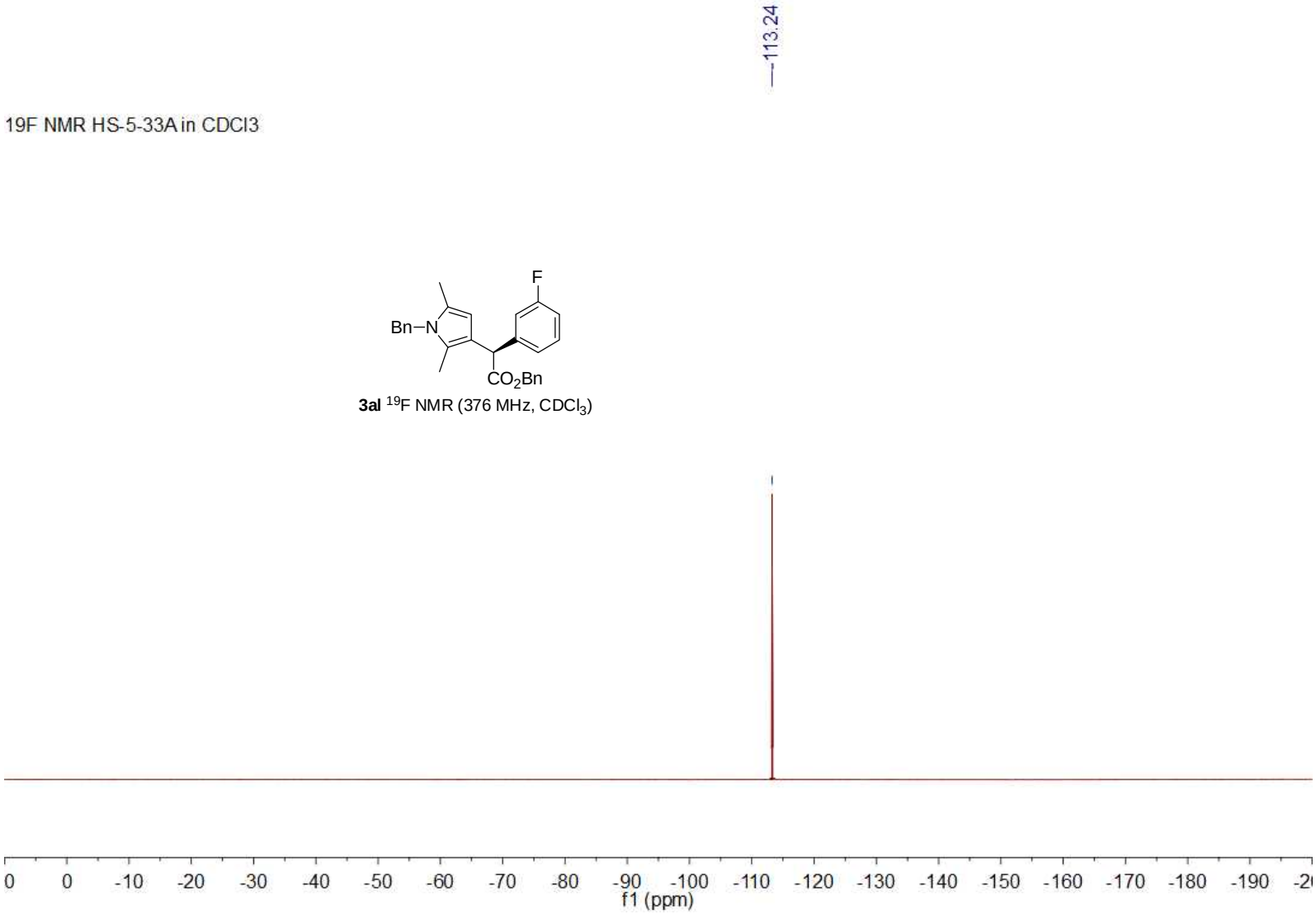
3al ^{13}C NMR (100 MHz, $CDCl_3$)



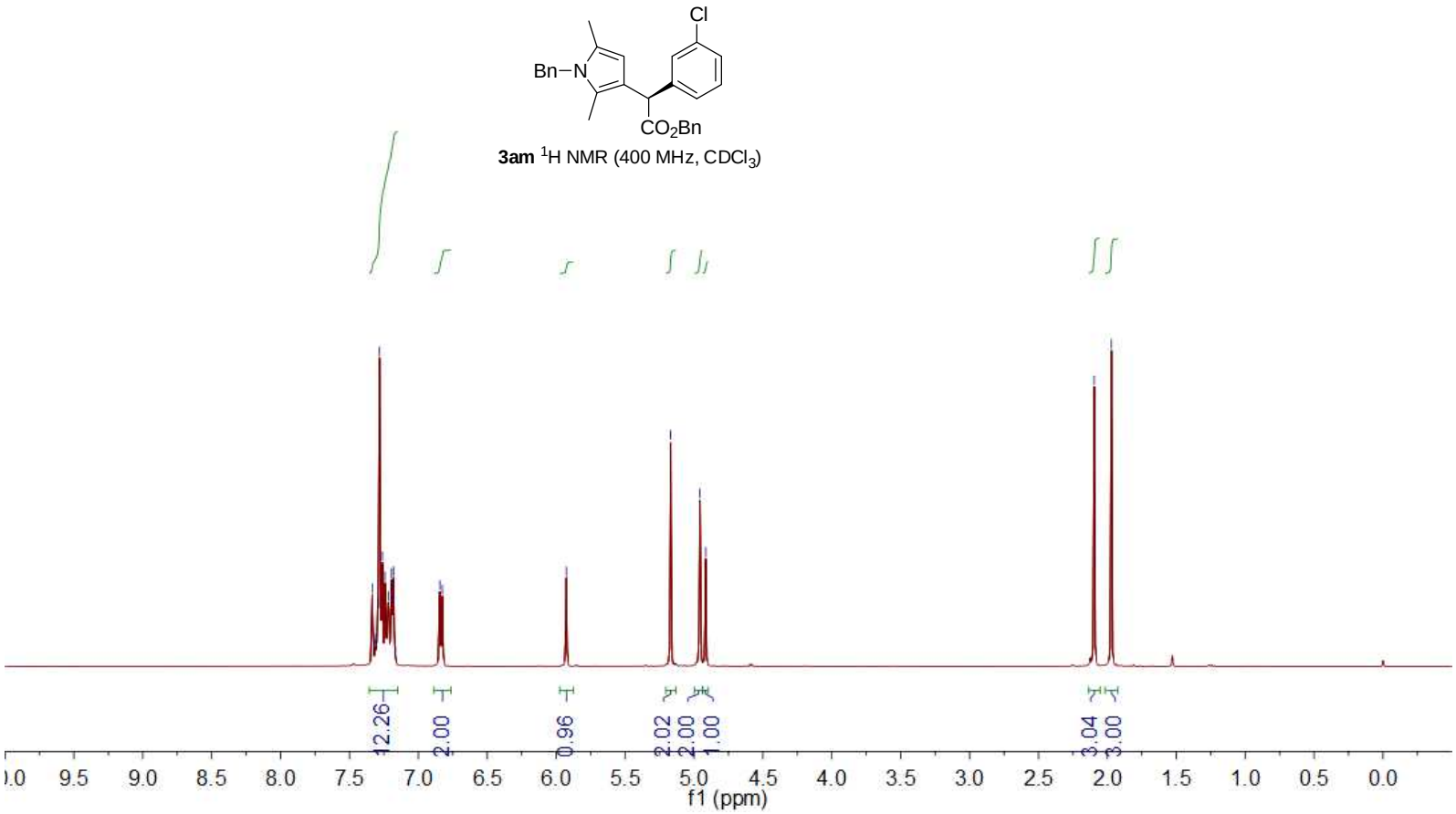


19F NMR HS-5-33A in CDCl3

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



1H NMR HS-5-35 in CDCl3



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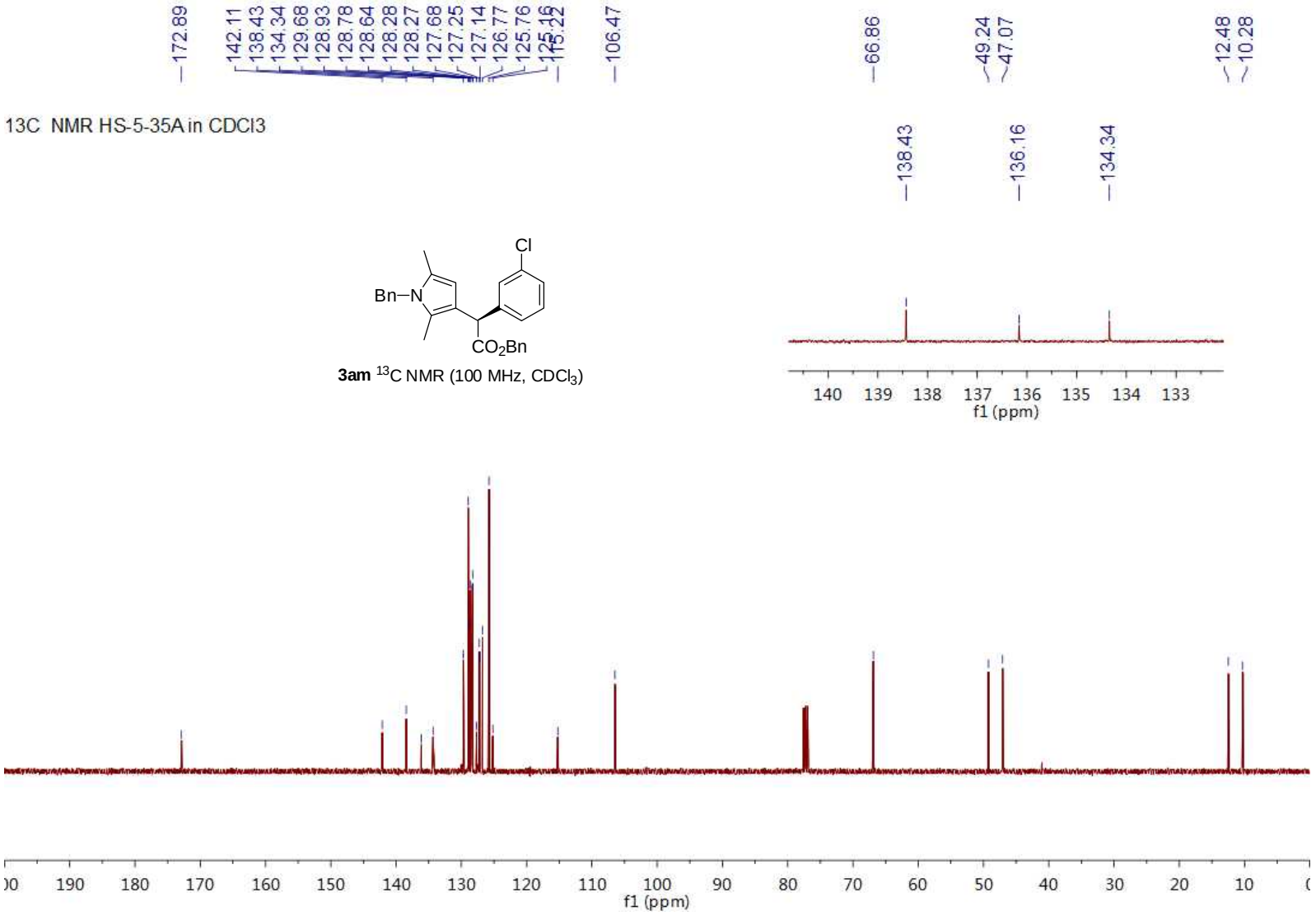
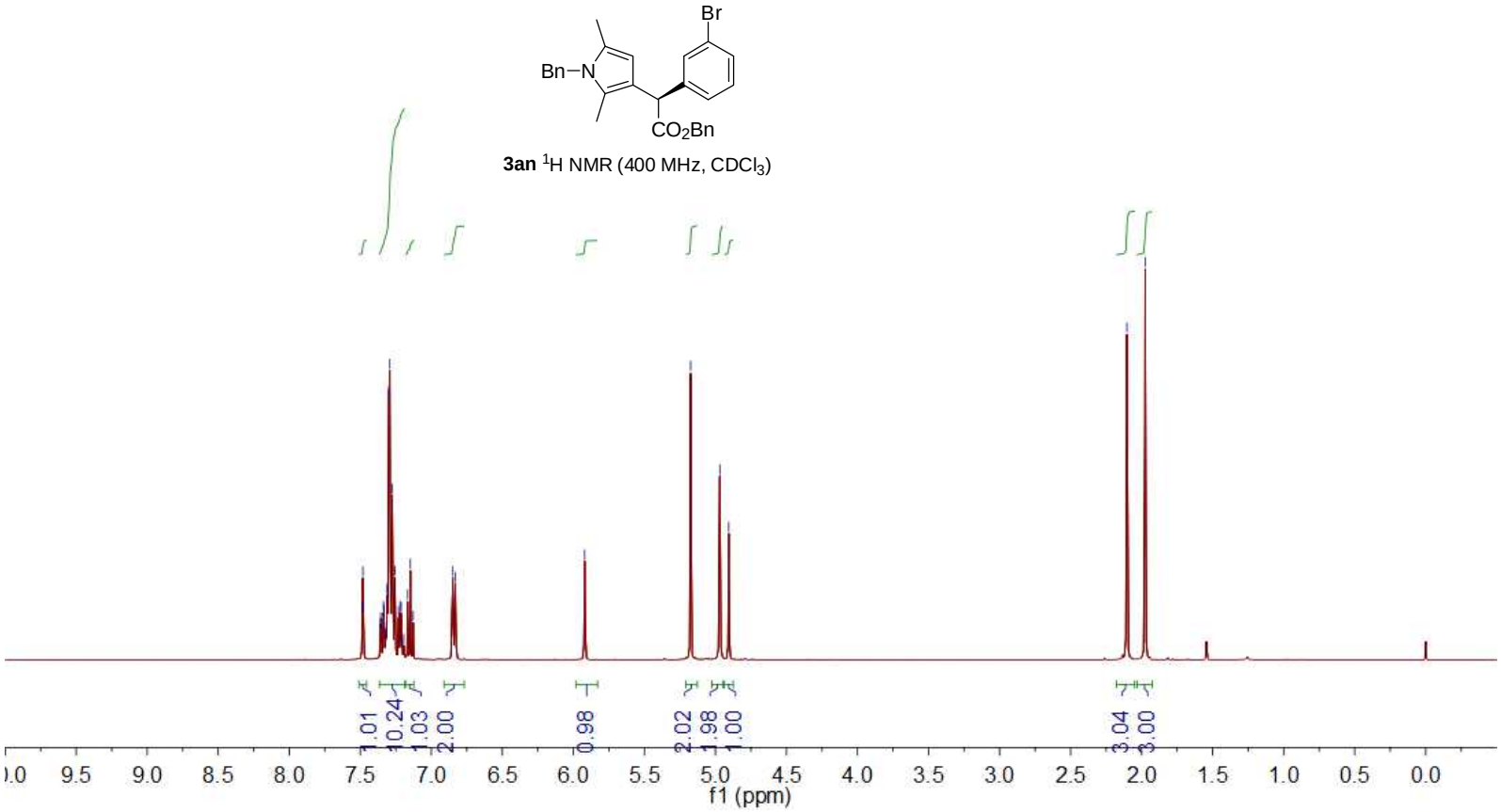


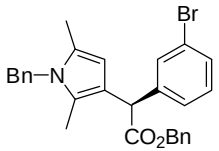
3am ^{13}C NMR (100 MHz, $CDCl_3$)

1H NMR HS-5-33B in CDCl3

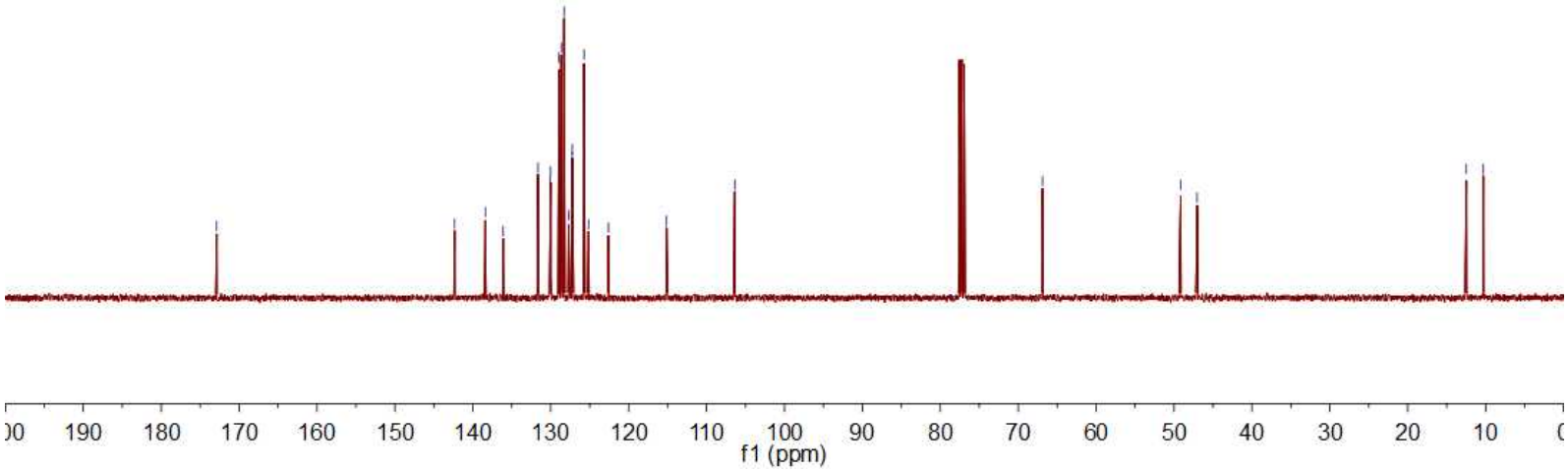


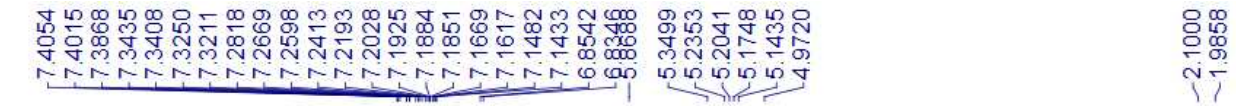
3an ^{1}H NMR (400 MHz, $CDCl_3$)

13C NMR HS-5-33B in CDCl3

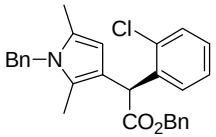


3an ^{13}C NMR (100 MHz, $CDCl_3$)





1H NMR HS-5-25C in CDCl3



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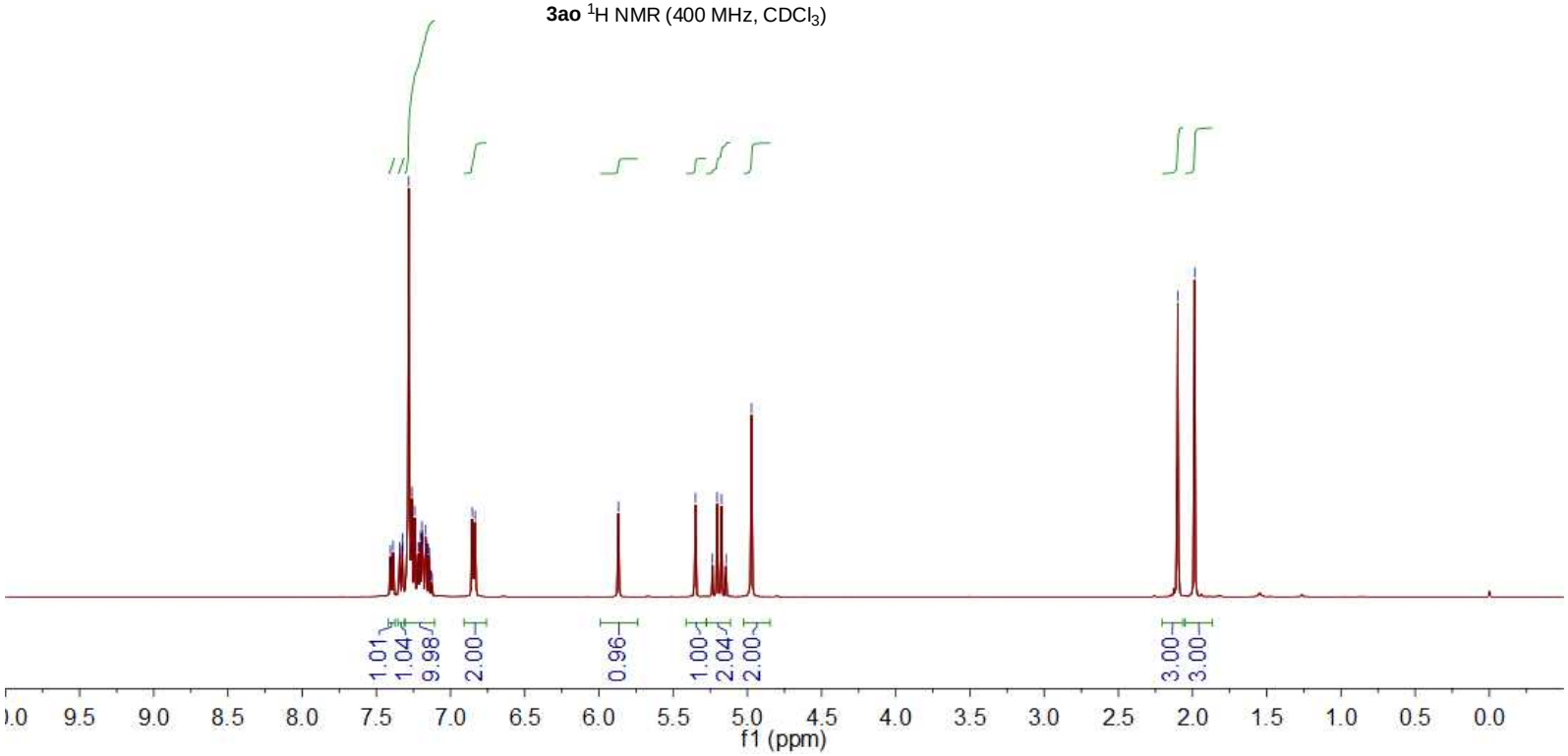
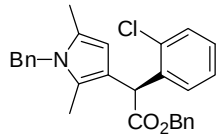
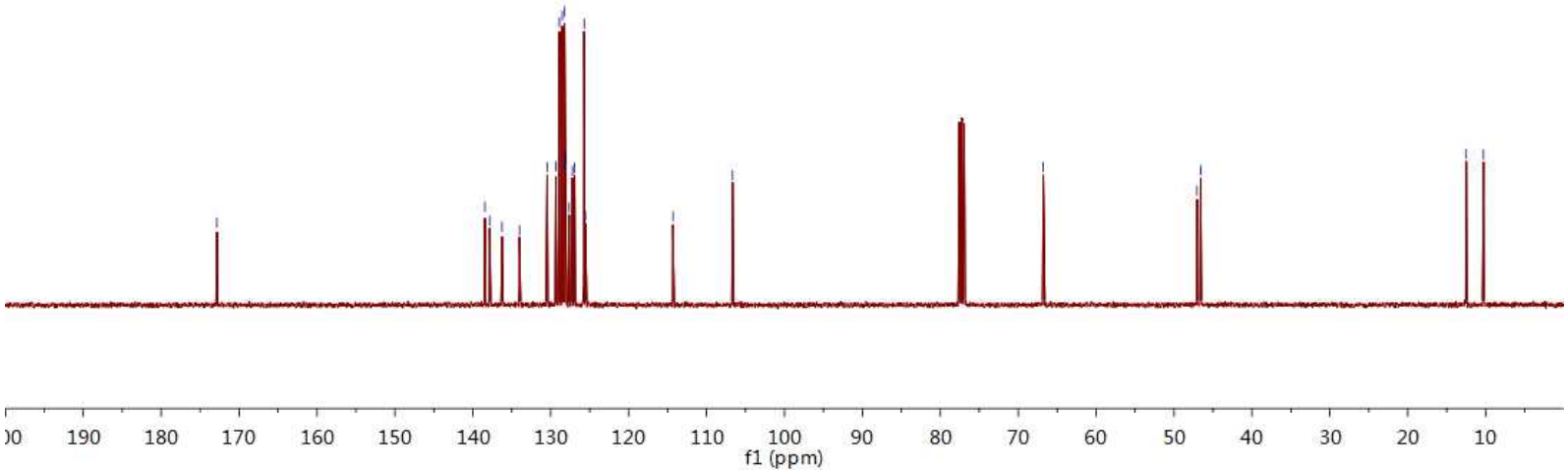


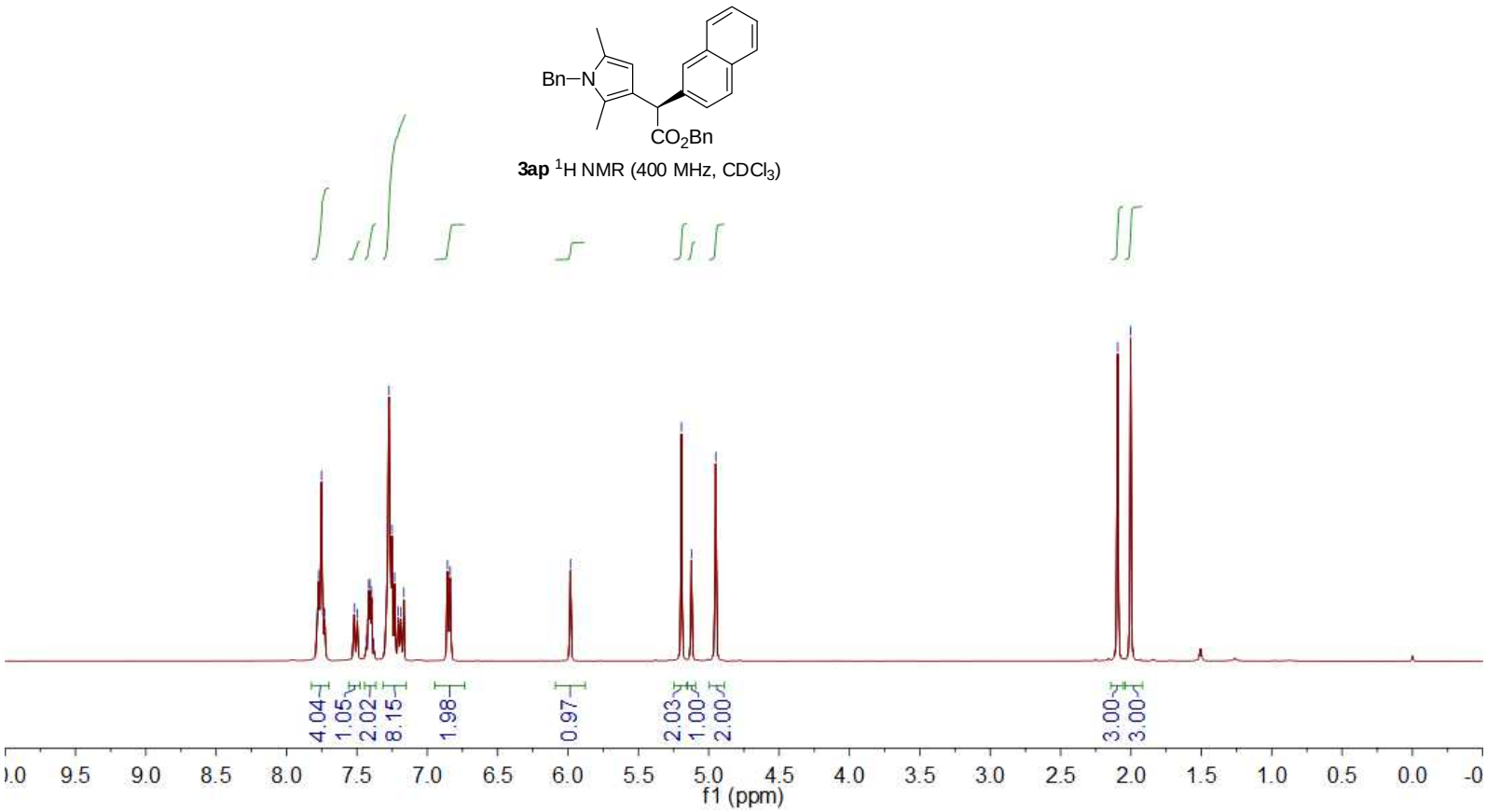
13C NMR HS-5-25C in CDCl3



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



1H NMR HS-5-35B in CDCl3



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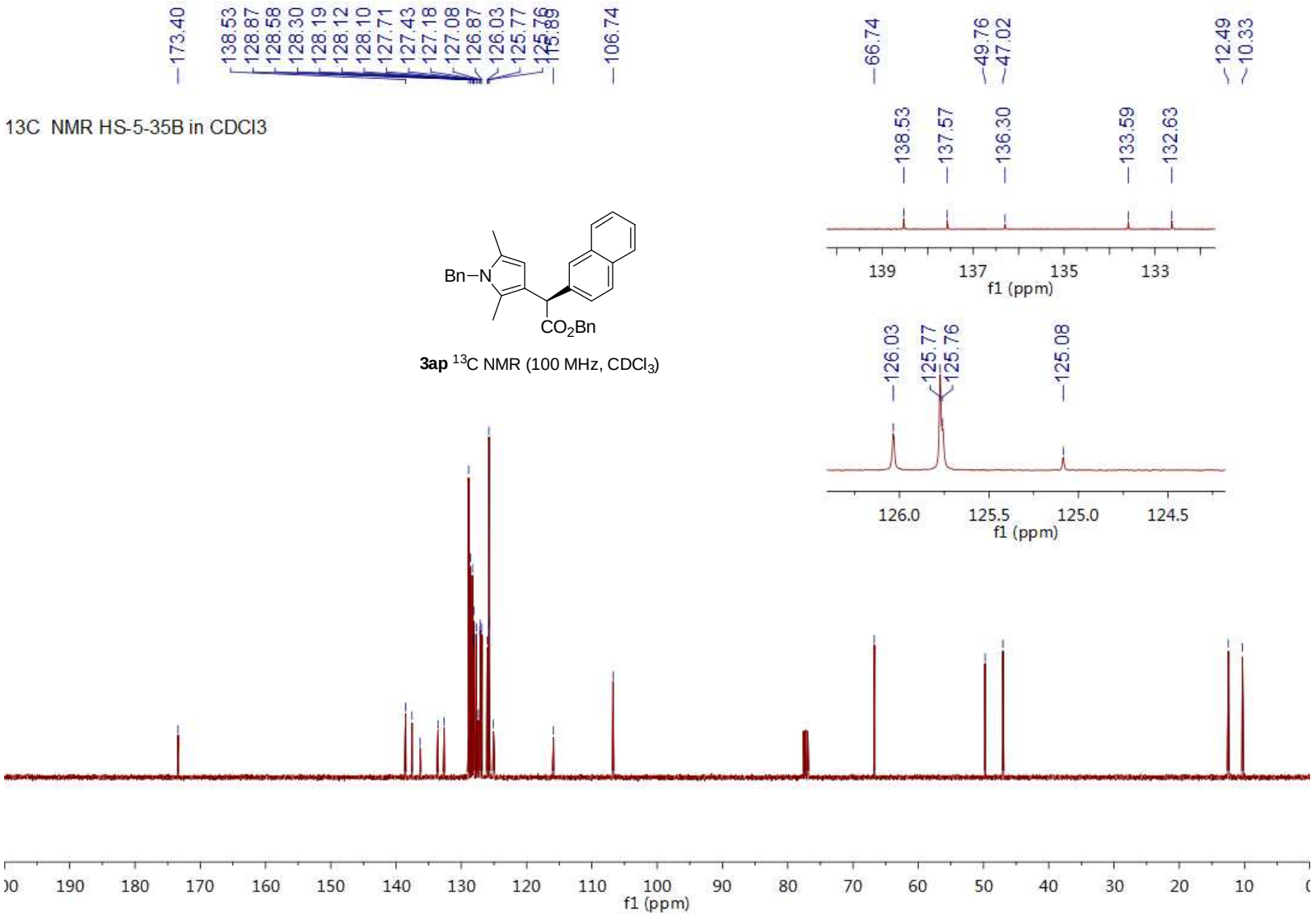
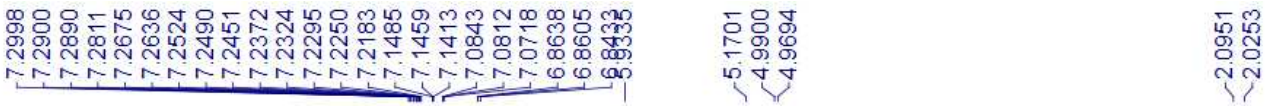
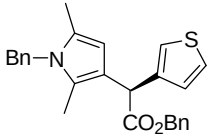


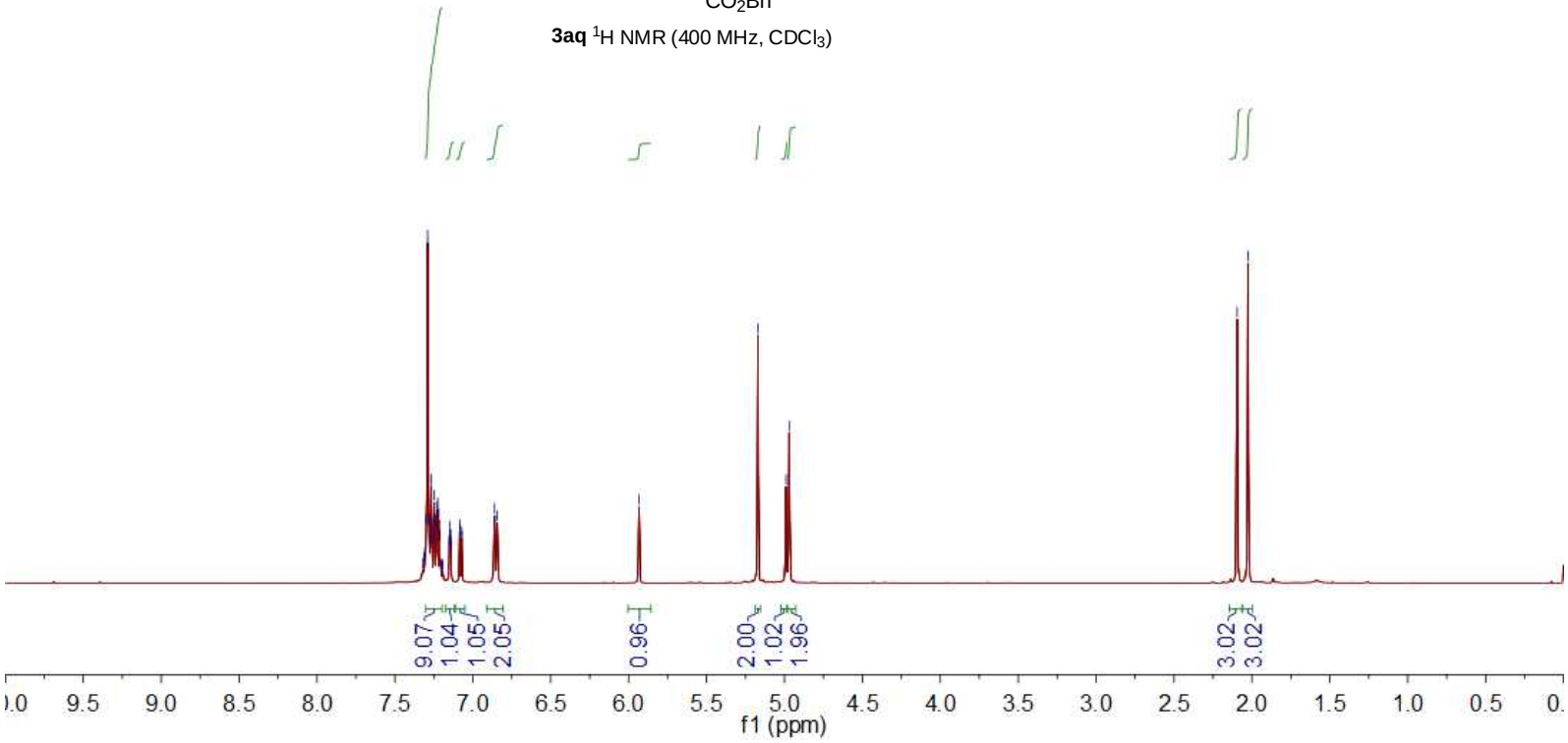
3ap ^{13}C NMR (100 MHz, $CDCl_3$)

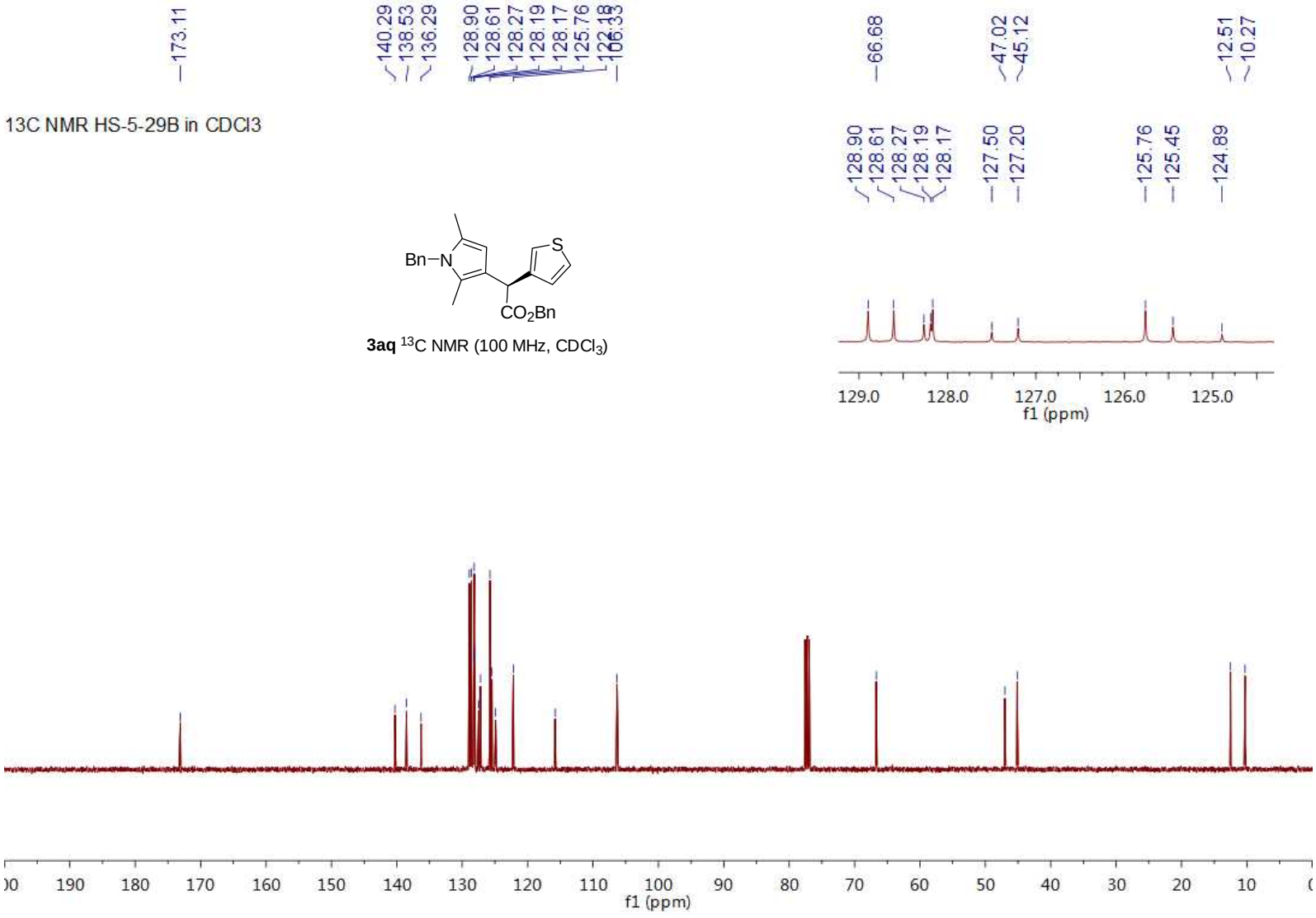


1H NMR HS-5-29B in CDCl3

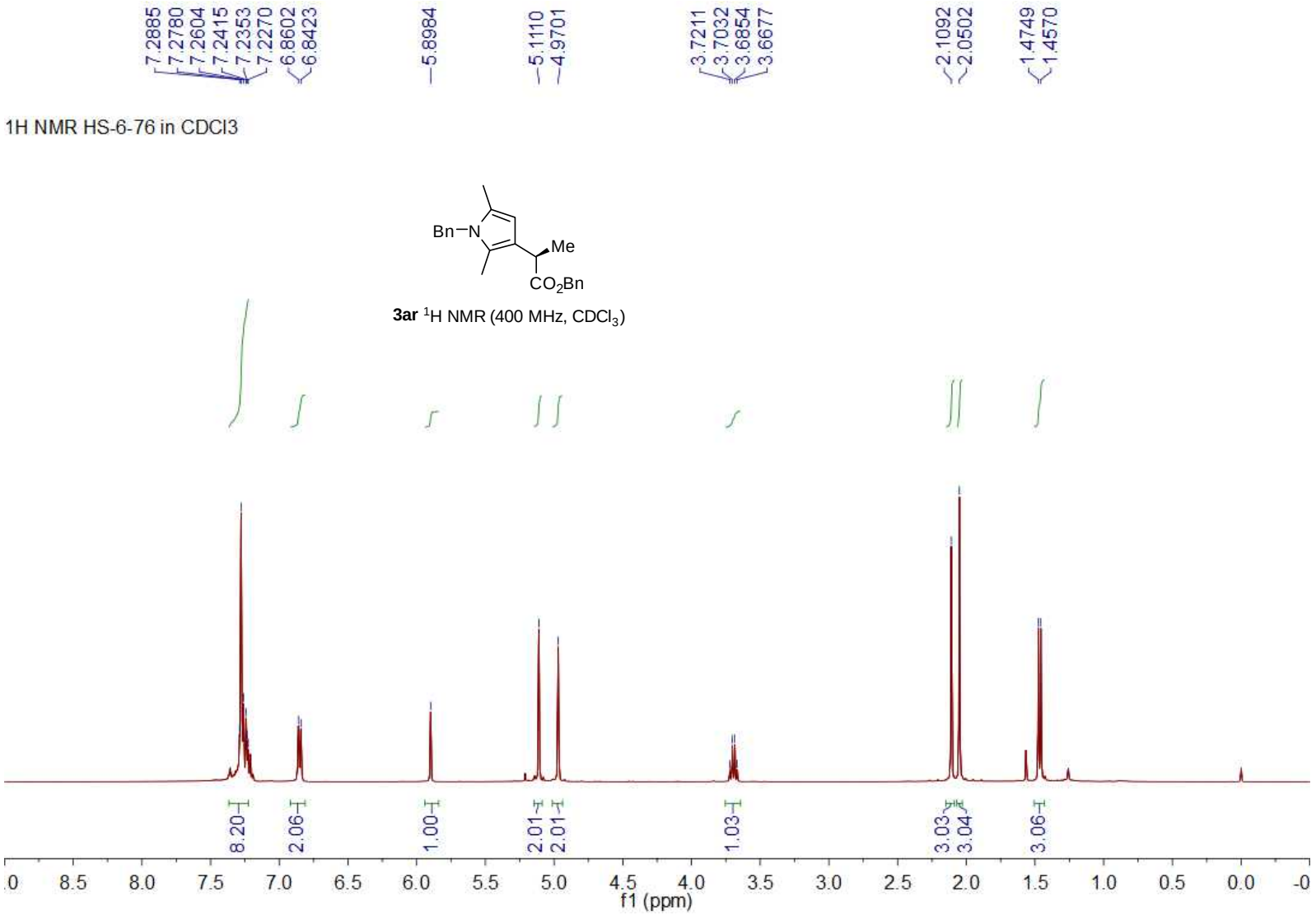


3aq ^{1}H NMR (400 MHz, $CDCl_3$)

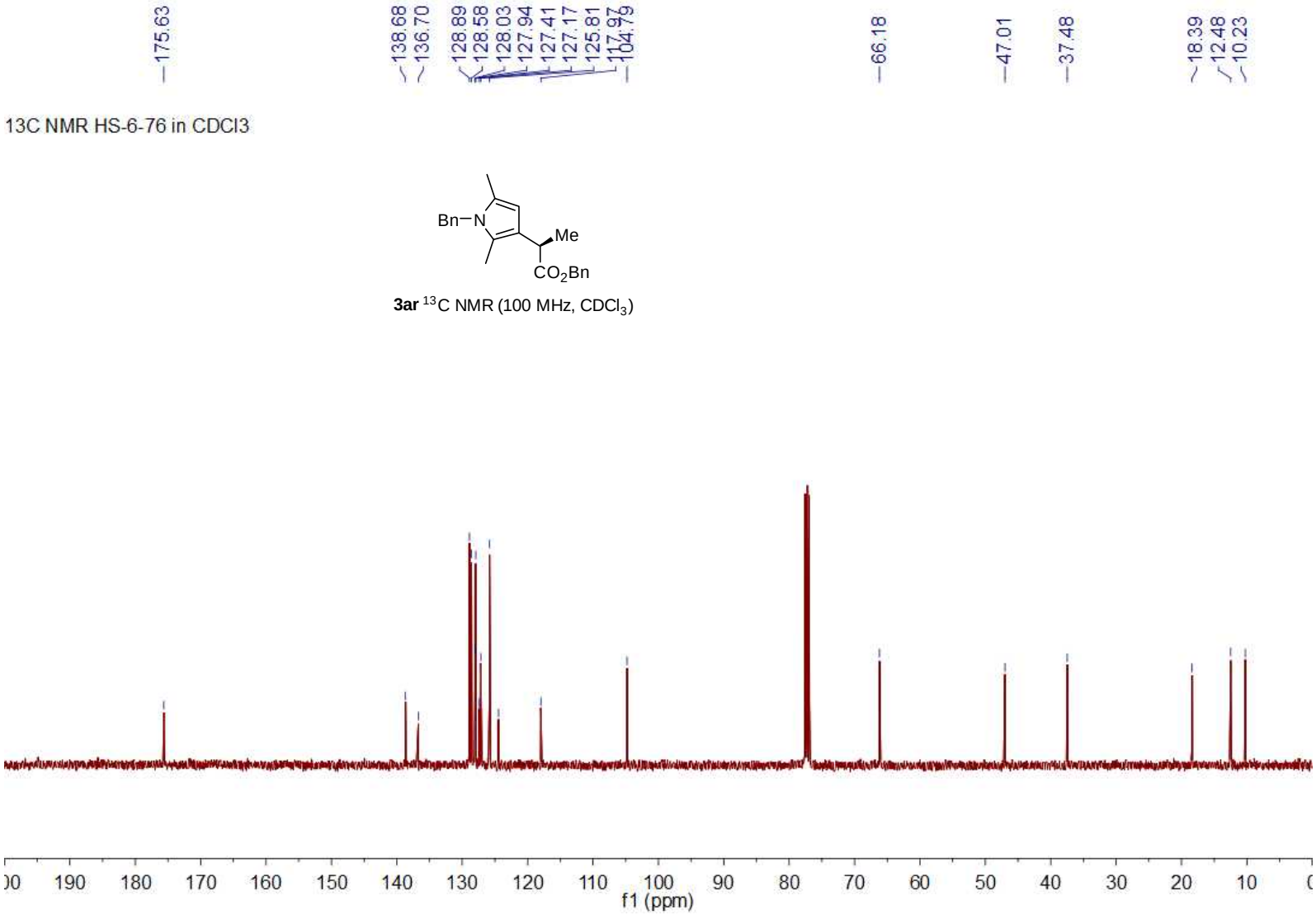




3aq ^{13}C NMR (100 MHz, $CDCl_3$)



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



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

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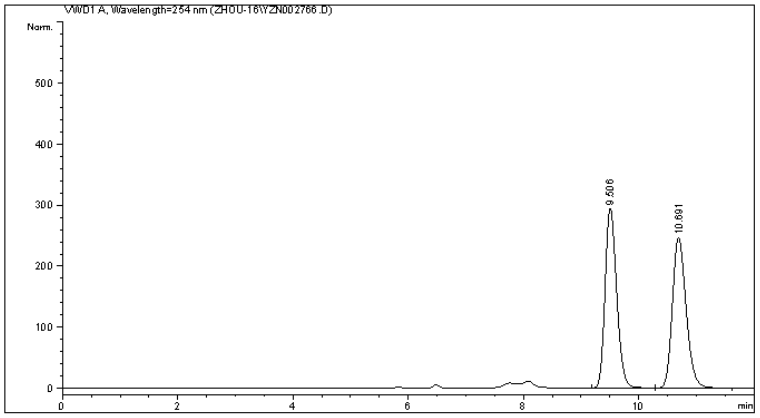
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/1/2017 8:48:34 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.8 mL/min, 30oC, 254 nm
```




```
Area Percent Report

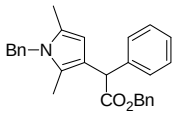
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   9.506 BV    0.2167 4113.75000  294.68439  50.0855
   2  10.691 VB    0.2566 4099.70996  246.49580  49.9145

Totals :                  8213.45996  541.18019

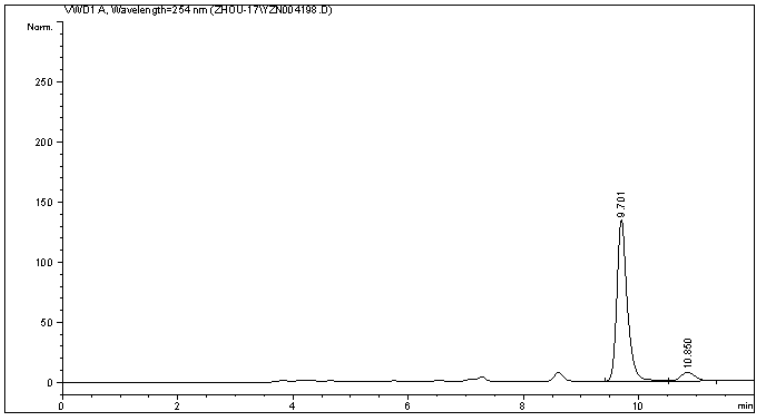
*** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004198.D
Sample Name: HS-5-30F

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/12/2017 2:00:05 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 5/12/2017 1:37:44 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:17:11 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
Area Percent Report

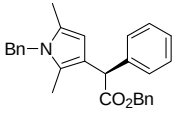
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   9.701 BV    0.1871 1680.26575  133.93739  93.0204
   2  10.850 VB    0.2654  126.07505    7.30674   6.9796

Totals :                  1806.34080  141.24414

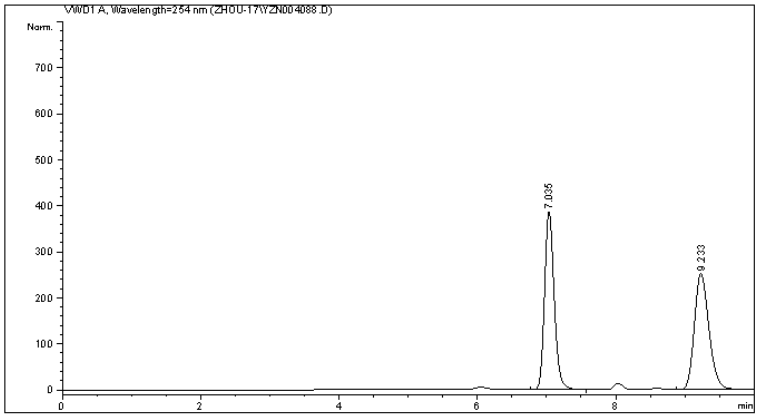
*** End of Report ***
```



(-)-**3aa**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004088.D
Sample Name: HS-5-33C+-

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/26/2017 2:08:29 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/26/2017 1:33:01 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:20:23 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

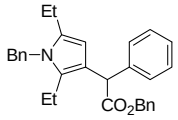
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   7.035 VB    0.1499 3758.28345  386.36017  50.3614
   2   9.233 VB    0.2266 3704.34277  252.26981  49.6386

Totals :                  7462.62622  638.62997

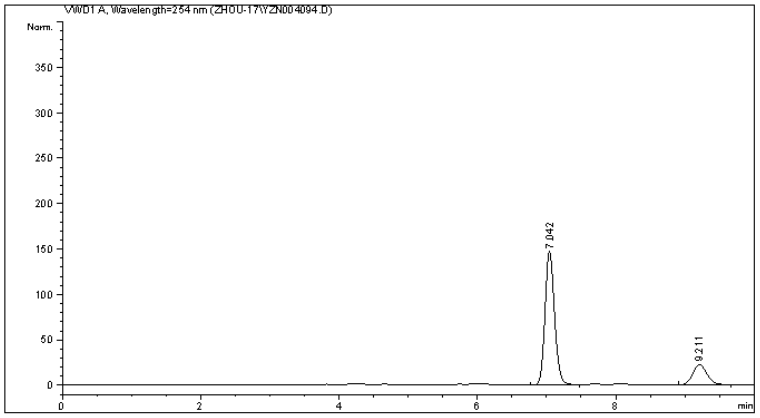
==========================================================================
                        *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004094.D
Sample Name: HS-5-33C

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/26/2017 3:35:34 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/26/2017 3:32:44 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:20:48 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

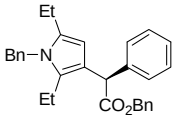
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   7.042 VB    0.1488 1415.79553  146.93127  80.9657
   2   9.211 BV    0.2294  332.84076   22.30725  19.0343

Totals :                  1748.63629  169.23853

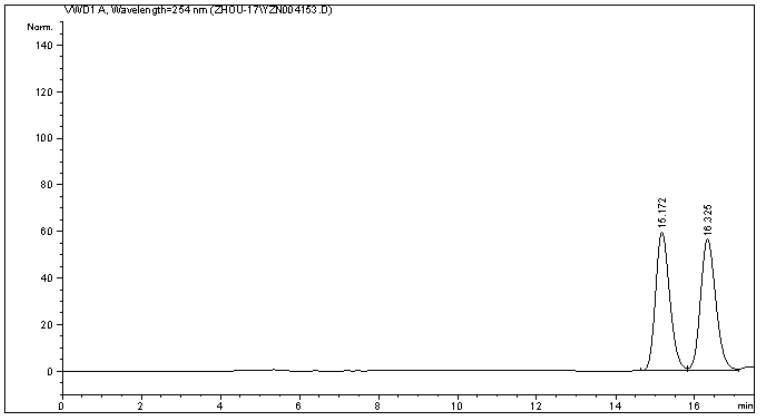
==========================================================================
                        *** End of Report ***
```



(-)-**3ba**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004153.D
Sample Name: HS-5-39A+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/6/2017 4:12:27 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 5/6/2017 4:02:50 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:25:47 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 98/02, 0.6 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

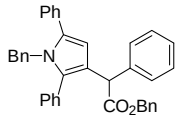
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min] mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  15.172 BV    0.3854 1484.38232   59.55260  49.4521
   2  16.325 VB    0.4173 1517.27527   56.38712  50.5479

Totals :                  3001.65759  115.93972

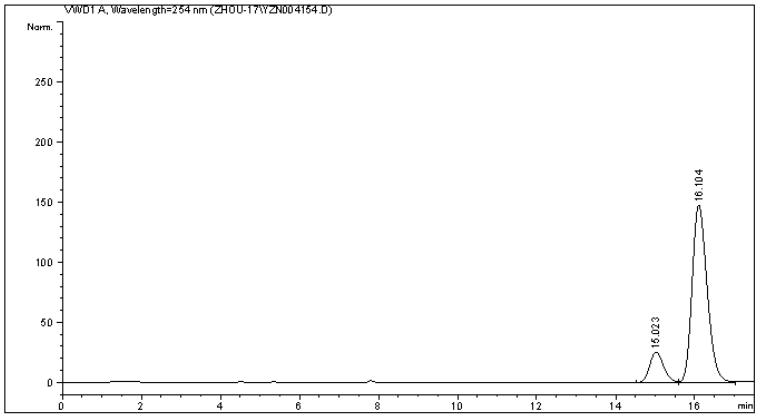
                          *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004154.D
Sample Name: HS-5-39A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/6/2017 4:35:10 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 5/6/2017 4:30:52 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:26:14 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 98/02, 0.6 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

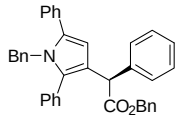
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min] mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  15.023 BV    0.3809  627.19214   25.43318  13.8587
   2  16.104 VB    0.4098 3898.42578  147.71082  86.1413

Totals :                  4525.61792  173.14400

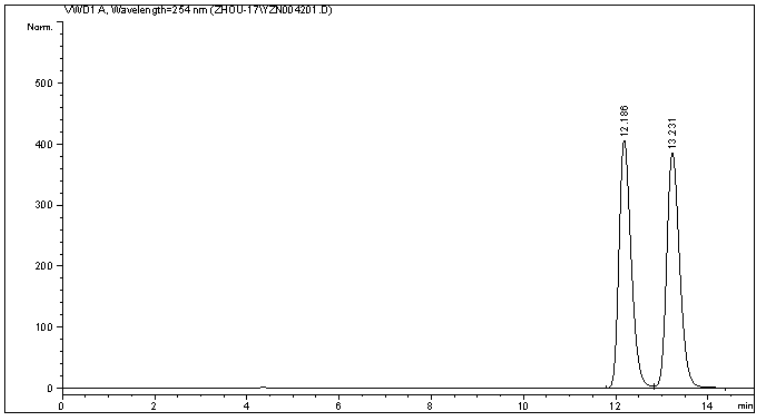
                          *** End of Report ***
```



(-)-**3ca**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004201.D
Sample Name: HS-5-46A+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/12/2017 3:04:04 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 5/12/2017 2:56:37 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:51:52 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 95/5, 0.7 mL/min,  30 oC, 254 nm
```




```
                        Area Percent Report

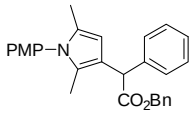
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  12.186 VV    0.2820 7426.71533  405.71841  49.7513
   2  13.231 VB    0.3012 7500.97070  385.63196  50.2487

Totals :                  1.49277e4   791.35037

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

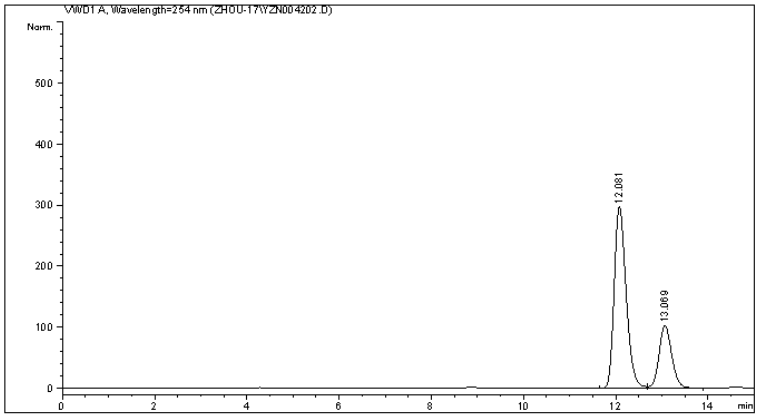


(+/-)-**3da**

Instrument 1 7/5/2017 8:51:54 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004202.D
Sample Name: HS-5-46A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 5/12/2017 3:22:40 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 5/12/2017 3:21:37 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:27:50 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 95/5, 0.7 mL/min,  30 oC, 254 nm
```




```
                        Area Percent Report

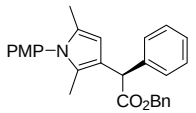
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1  12.081 VV    0.2773 5356.02051  297.12488  73.1162
   2  13.069 VB    0.2946 1969.33484  102.89351  26.8838

Totals :                  7325.35535  400.01839

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

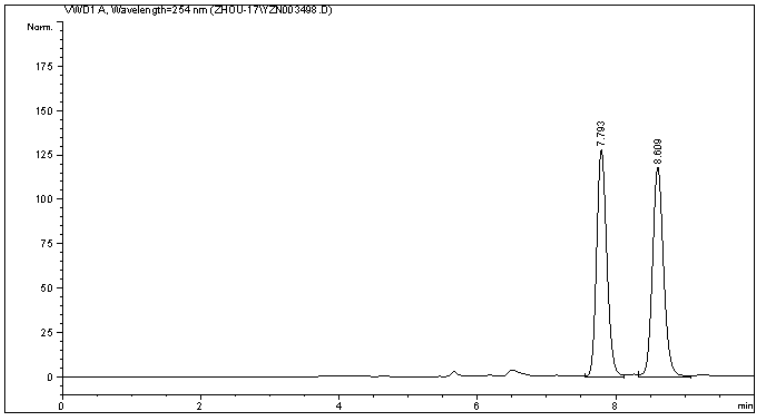


(+)-**3da**

Instrument 1 7/5/2017 8:27:55 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003498.D
Sample Name: HS-4-82A+-

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 3/6/2017 2:51:21 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 3/6/2017 2:50:54 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:11:07 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min, 30oC, 254 nm
```




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

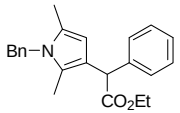
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.793 BV    0.1570 1307.07788  127.93888  49.7917
   2   8.609 VV    0.1710 1318.01196  118.05051  50.2083

Totals :                  2625.08984  245.98939

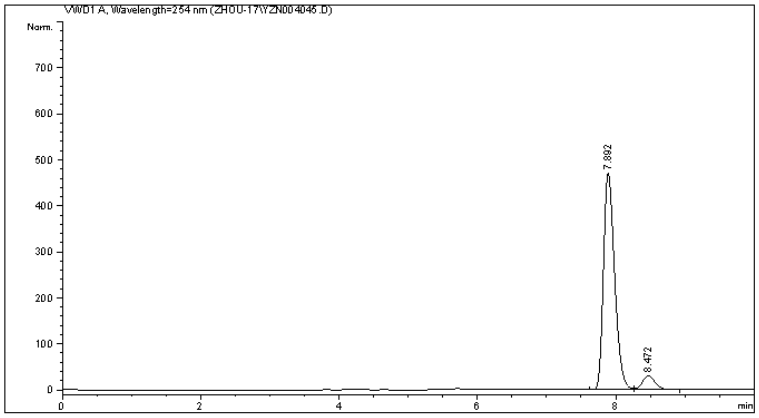
==========================================================================
                        *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004045.D
Sample Name: HS-5-30D

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/22/2017 4:39:05 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/22/2017 4:36:47 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:12:05 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254nm
```




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

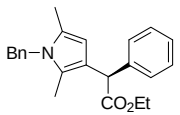
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #  [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|-------|
   1   7.892 VV    0.1714 5279.09180  471.62436  93.0431
   2   8.472 VB    0.1963  394.72421   30.76301   6.9569

Totals :                  5673.81601  502.38737

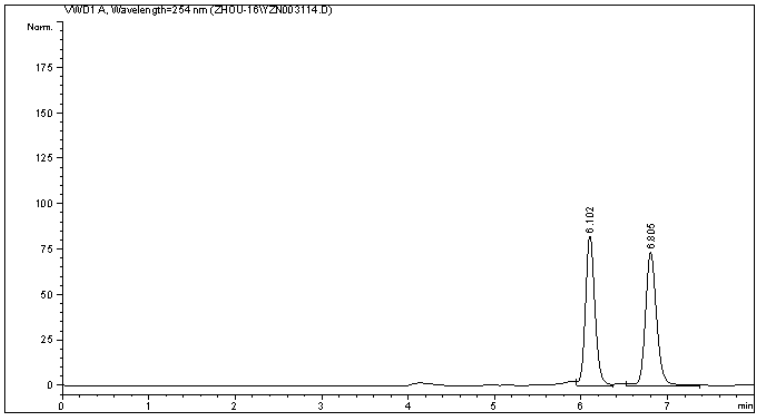
==========================================================================
                        *** End of Report ***
```



(-)-**3ab**

Data File C:\CHEM32\1\DATA\ZHOU-16\YZN003114.D
Sample Name: HS-4-5(+/-)

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 12/26/2016 9:51:24 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 12/26/2016 9:50:01 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 10:00:49 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min, 30oC, 254 nm
```




```
                          Area Percent Report

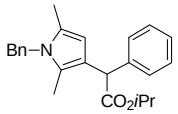
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   6.102 VV    0.1163  627.10425   82.50334  48.8013
   2   6.805 VB    0.1382  657.91095   73.27442  51.1987

Totals :                  1285.01520  155.77776

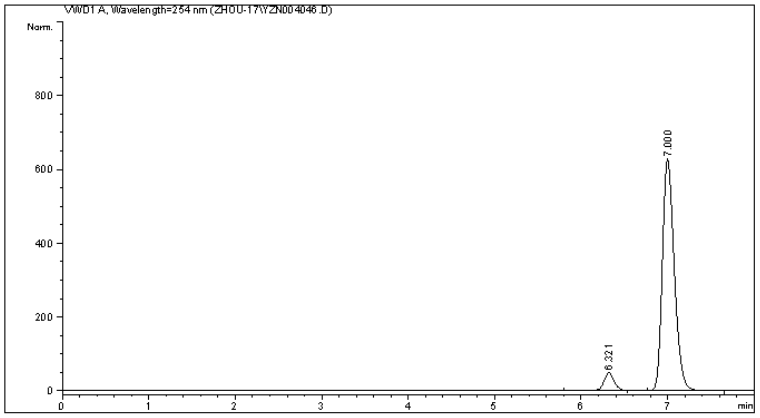
                          *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004046.D
Sample Name: HS-5-30E

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/22/2017 4:54:31 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/22/2017 4:51:07 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/1/2017 9:05:08 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254nm
```




```
                          Area Percent Report

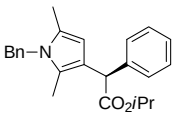
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   6.321 VV    0.1295  417.11639   48.48919   6.4870
   2   7.000 VB    0.1467 6012.94580  627.91180  93.5130

Totals :                  6430.06219  676.40099

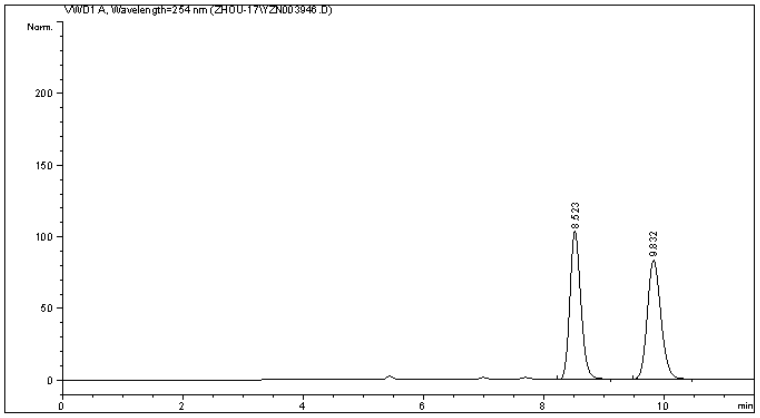
                          *** End of Report ***
```



(-)-**3ac**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003946.D
Sample Name: HS-5-22A+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/15/2017 8:38:32 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/15/2017 8:22:55 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:42:00 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

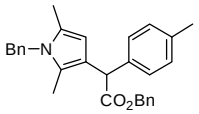
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.523 BB    0.1951 1300.93091  103.21279  50.0777
   2   9.832 BB    0.2421 1296.89392   82.94969  49.9223

Totals :                  2597.82483  186.16248

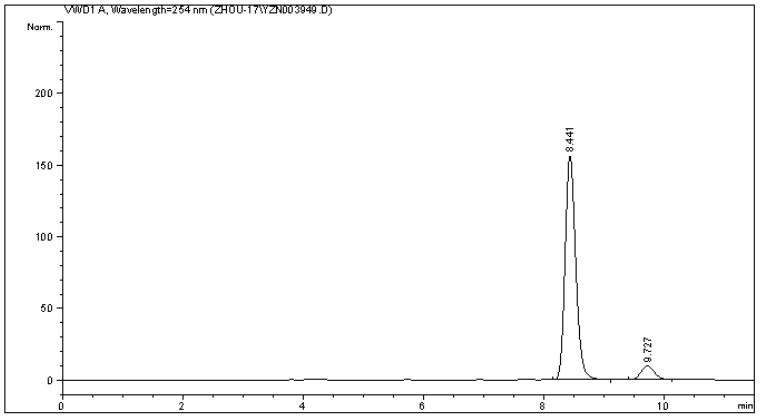
                          *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003949.D
Sample Name: HS-5-22A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/15/2017 9:28:35 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/15/2017 9:26:54 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:42:33 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

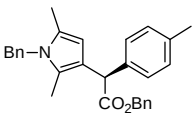
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.441 BB    0.1883 1920.57568  156.53091  92.7467
   2   9.727 BB    0.2407  150.20036    9.68049   7.2533

Totals :                  2070.77605  166.21141

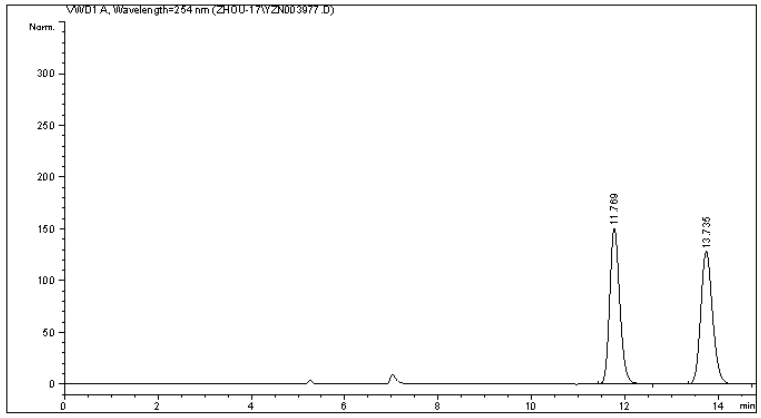
                          *** End of Report ***
```



(-)-**3ad**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003977.D
Sample Name: HS-5-24A+-

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/16/2017 4:54:52 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/16/2017 4:47:51 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/16/2017 11:01:12 PM by
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

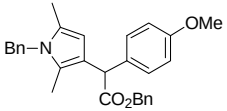
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  11.769 BB    0.2332 2262.66919  150.83603  50.0497
   2  13.735 BV    0.2696 2258.17529  128.18024  49.9503

Totals :                  4520.84448  279.01627

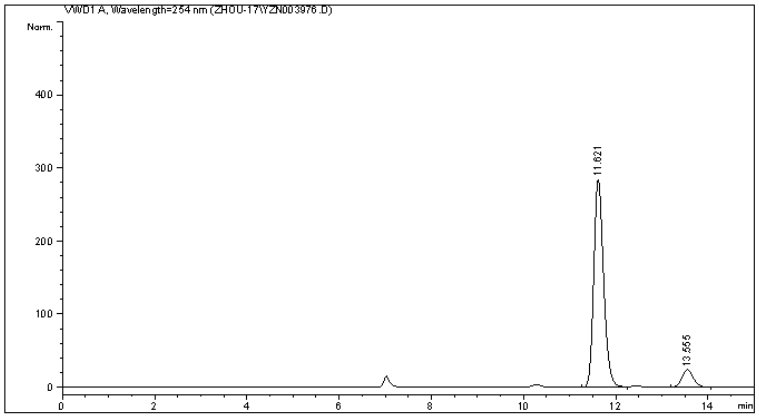
==================================================================
                      *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003976.D
Sample Name: HS-5-24A

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/16/2017 4:32:45 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/16/2017 4:31:29 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:47:44 PM by
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

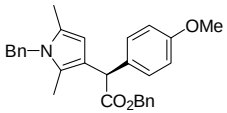
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  11.621 BV    0.2278 4199.35107  284.05780  91.1375
   2  13.555 BV    0.2651  408.35730   23.86804   8.8625

Totals :                  4607.70837  307.92584

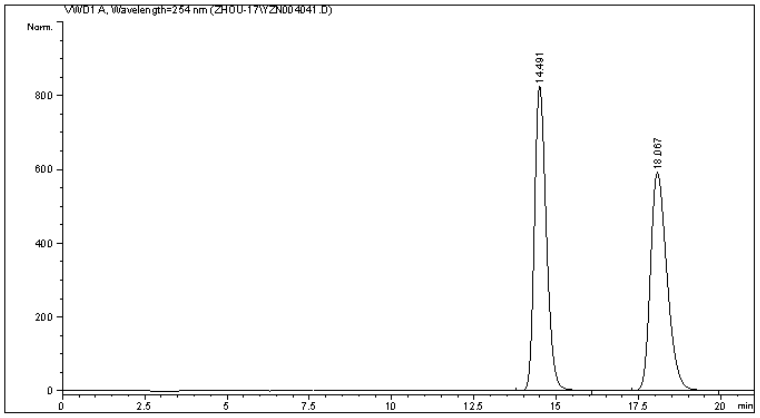
==================================================================
                      *** End of Report ***
```



(-)-**3ae**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004041.D
Sample Name: HS-5-29A+-

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/22/2017 3:05:11 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/22/2017 3:04:27 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:03:52 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.7 mL/min,  30 oC, 254nm
```




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

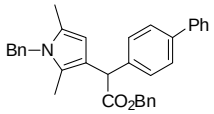
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  14.491 BB    0.3851 2.06146e4   823.83984  50.0955
   2  18.067 BB    0.5349 2.05360e4   591.05054  49.9045

Totals :                  4.11506e4  1414.89038

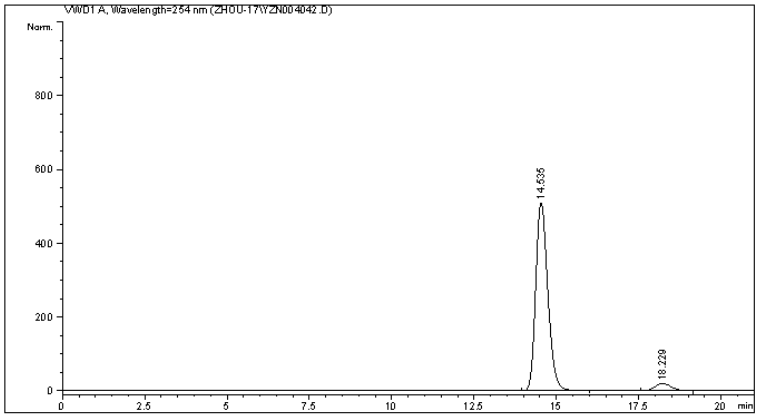
==========================================================================
                        *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004042.D
Sample Name: HS-5-29A

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/22/2017 3:27:53 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/22/2017 3:27:23 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:04:14 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.7 mL/min,  30 oC, 254nm
```




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

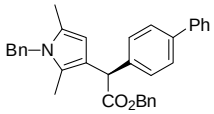
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1  14.535 BB    0.3933 1.30139e4   510.92328  95.1581
   2  18.229 BB    0.5226  662.17816   19.73098   4.8419

Totals :                  1.36761e4   530.65426

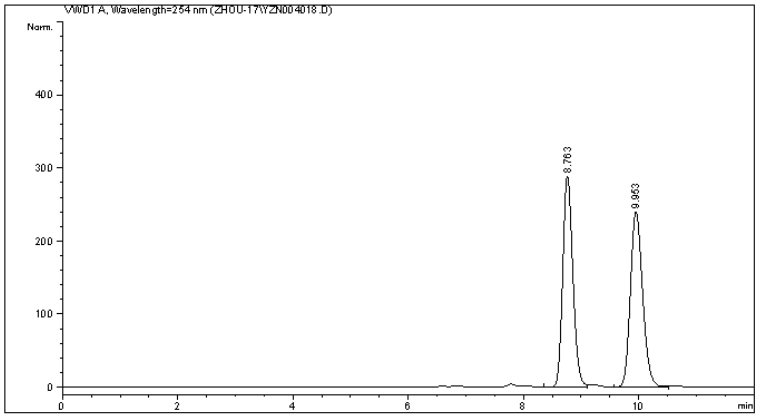
==========================================================================
                        *** End of Report ***
```



(+)-**3af**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004018.D
Sample Name: HS-5-27A+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/20/2017 3:16:23 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/20/2017 2:54:10 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:59:19 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

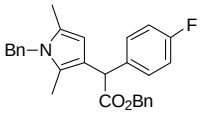
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   8.763 VV    0.1886 3518.69629  289.11218  49.7690
   2   9.953 BB    0.2295 3551.36426  239.83617  50.2310

Totals :                  7070.06055  528.94835

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

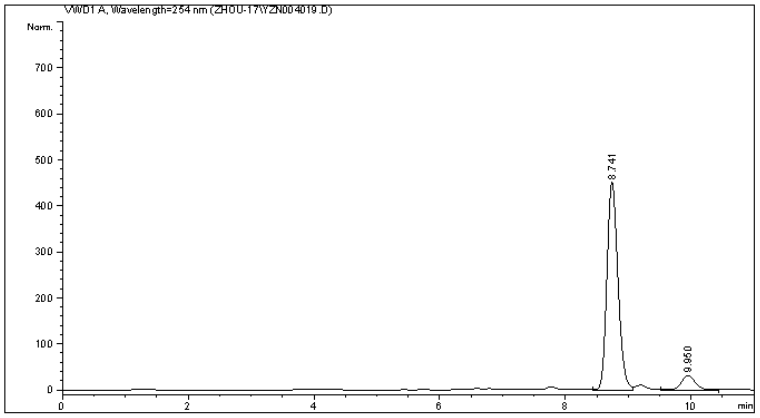


(+/-)-**3ag**

Instrument 1 7/5/2017 7:59:24 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004019.D
Sample Name: HS-5-27A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/20/2017 3:29:19 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/20/2017 3:28:54 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:00:36 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

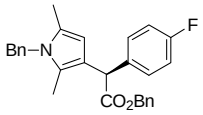
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   8.741 VV    0.1884 5481.49902  451.12158  91.9039
   2   9.950 VB    0.2348  482.88043   31.65481   8.0961

Totals :                  5964.37946  482.77639

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

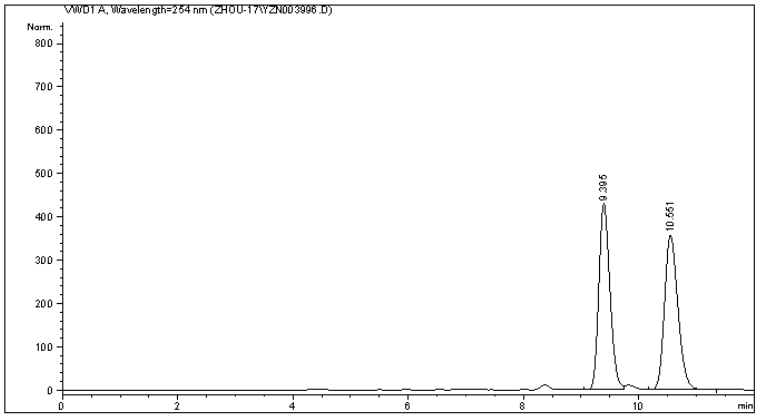


(-)-**3ag**

Instrument 1 7/5/2017 8:00:37 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003996.D
Sample Name: HS-5-25B+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/18/2017 3:44:36 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/18/2017 3:17:58 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:52:09 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

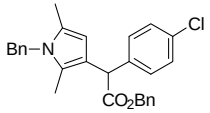
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   9.395 BV    0.2071 5752.22754  429.79019  49.9611
   2  10.551 VB    0.2498 5761.17871  356.25510  50.0389

Totals :                  1.15134e4   786.04529

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

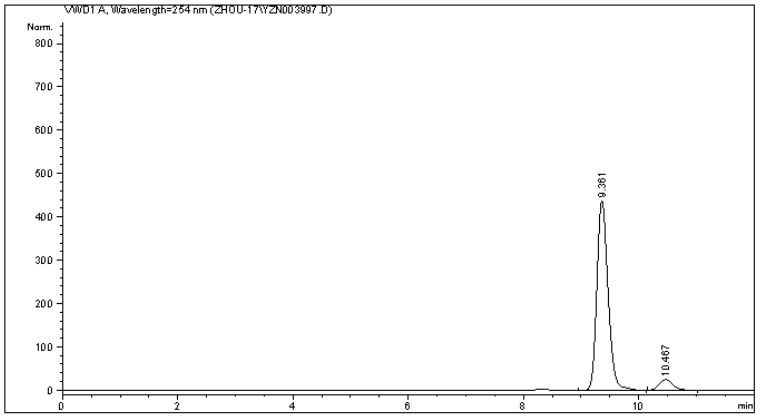


(+/-)-**3ah**

Instrument 1 7/5/2017 7:52:15 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003997.D
Sample Name: HS-5-25B

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/18/2017 4:06:48 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/18/2017 4:04:15 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:53:17 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

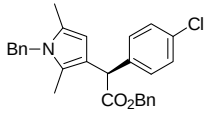
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   9.361 VB    0.2078 5886.20361  437.81775  93.7534
   2  10.467 BB    0.2468  392.18320   24.65007   6.2466

Totals :                  6278.38681  462.46782

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

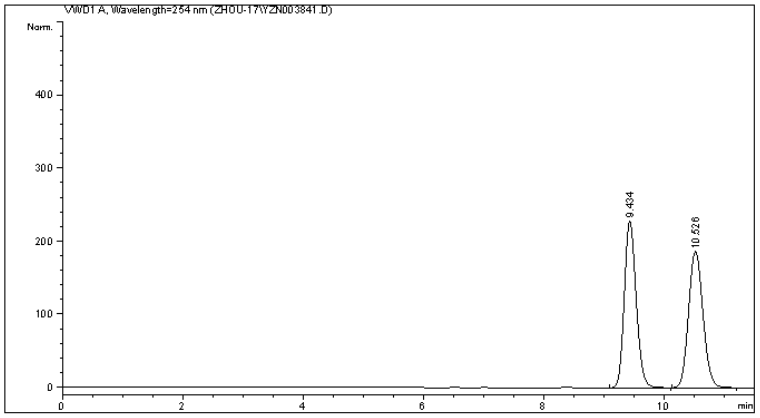


(-)-**3ah**

Instrument 1 7/5/2017 7:53:19 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003841.D
Sample Name: HS-5-16+-

```
    ======================================================================
    Acq. Operator   : 0
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 4/7/2017 3:02:59 PM
    Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
    Last changed    : 4/7/2017 3:01:45 PM by 0
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
    Last changed    : 7/5/2017 7:40:42 PM by
                      (modified after loading)
    Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

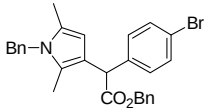
    Sorted By             :      Signal
    Multiplier:                   :      1.0000
    Dilution:                     :      1.0000
    Use Multiplier & Dilution Factor with ISTDs


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s   [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1   9.434 BB    0.2125 3134.75684  228.50589  50.1470
       2  10.526 BB    0.2607 3116.38062  186.30151  49.8530

    Totals :                  6251.13745  414.80740

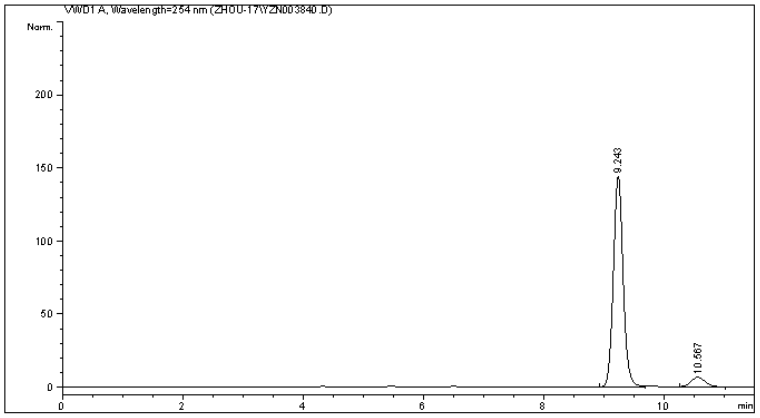
    ======================================================================
                              *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003840.D
Sample Name: HS-5-16

```
    ======================================================================
    Acq. Operator   : 0
    Acq. Instrument : Instrument 1                    Location : Vial 1
    Injection Date  : 4/7/2017 2:27:38 PM
    Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
    Last changed    : 4/7/2017 2:08:54 PM by 0
                      (modified after loading)
    Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
    Last changed    : 7/5/2017 7:39:35 PM by
                      (modified after loading)
    Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

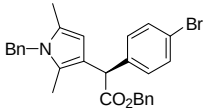
    Sorted By             :      Signal
    Multiplier:                   :      1.0000
    Dilution:                     :      1.0000
    Use Multiplier & Dilution Factor with ISTDs


    Signal 1: VWD1 A, Wavelength=254 nm

    Peak RetTime Type  Width     Area      Height     Area
      #   [min]        [min]  mAU   *s   [mAU   ]      %
    ----|-------|----|-------|----------|----------|--------|
       1   9.243 BB    0.1738 1625.67102  144.13725  94.0043
       2  10.567 BB    0.2452  103.68719    6.57193   5.9957

    Totals :                  1729.35821  150.70919

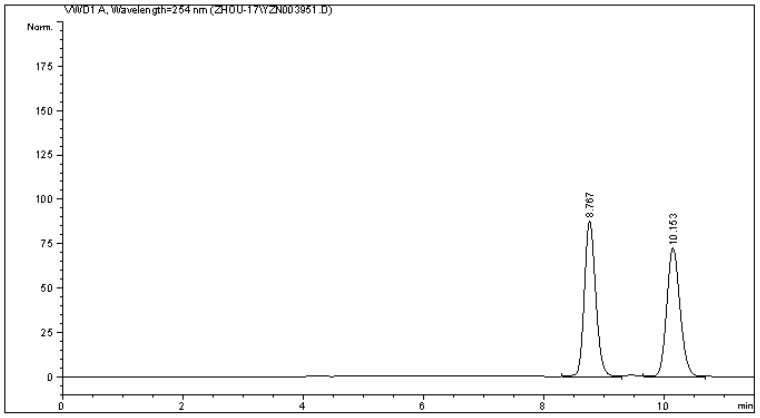
    ======================================================================
                              *** End of Report ***
```



(-)-**3ai**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003951.D
Sample Name: HS-5-22B+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/15/2017 9:55:29 AM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/15/2017 9:53:07 AM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:43:37 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

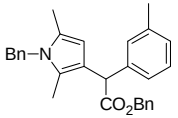
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.767 BB    0.2017 1143.48108   87.66626  50.6037
   2  10.153 VB    0.2400 1116.19934   72.21803  49.3963

Totals :                  2259.68042  159.88428

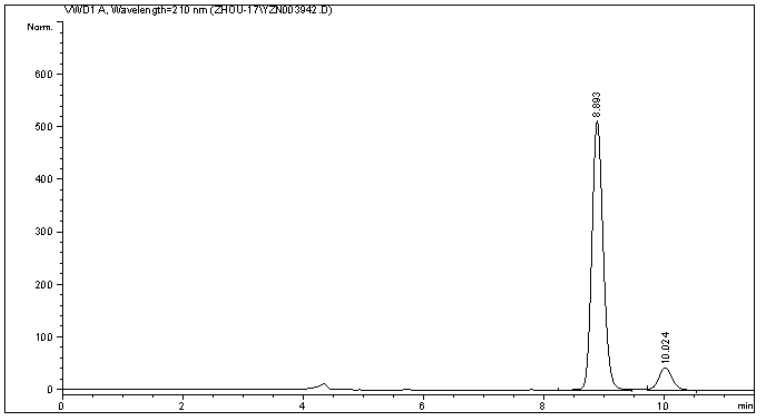
                          *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003942.D
Sample Name: HS-5-22B

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/14/2017 10:20:59 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/14/2017 10:20:30 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:45:51 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

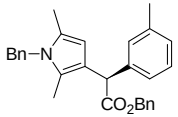
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=210 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   8.893 VV    0.2017 6697.23291  513.22040  91.0130
   2  10.024 VB    0.2390  661.31073   42.68283   8.9870

Totals :                  7358.54364  555.90323

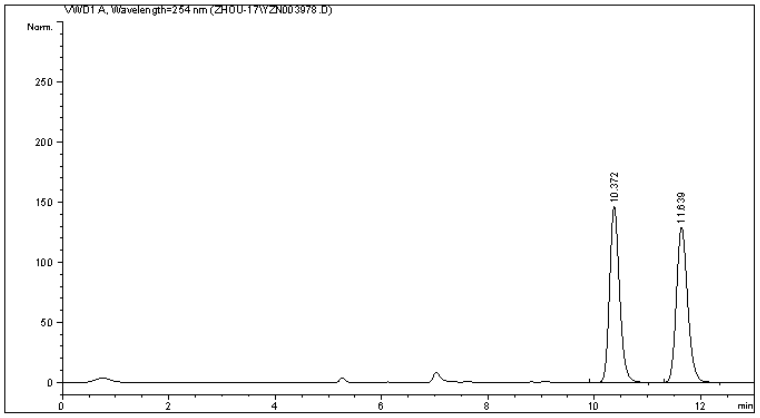
                          *** End of Report ***
```



(-)-**3aj**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003978.D
Sample Name: HS-5-24B+-

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/16/2017 5:10:44 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/16/2017 5:10:03 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:48:21 PM by
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

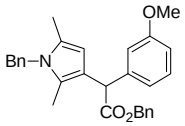
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  10.372 BB    0.1992 1897.51501  146.47476  50.0125
   2  11.639 BB    0.2250 1896.56555  129.33473  49.9875

Totals :                  3794.08057  275.80949

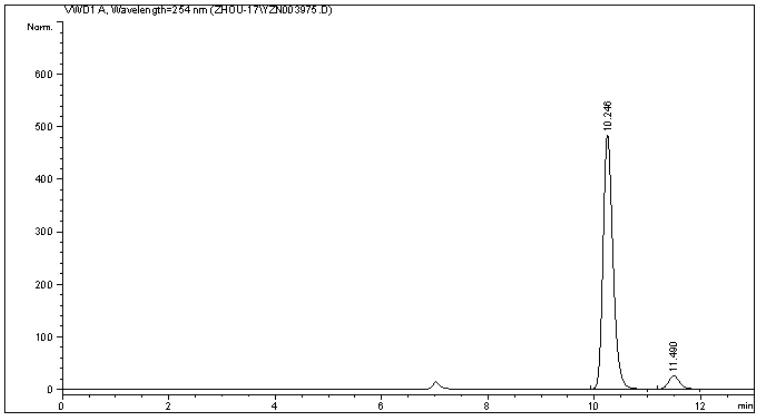
==========================================================================
                        *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN003975.D
Sample Name: HS-5-24B

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/16/2017 4:18:20 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/16/2017 4:13:59 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:49:09 PM by
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

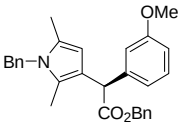
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  10.246 VB    0.1989 6261.73584  484.21274  94.4478
   2  11.490 BB    0.2235  368.10187   25.32001   5.5522

Totals :                  6629.83771  509.53275

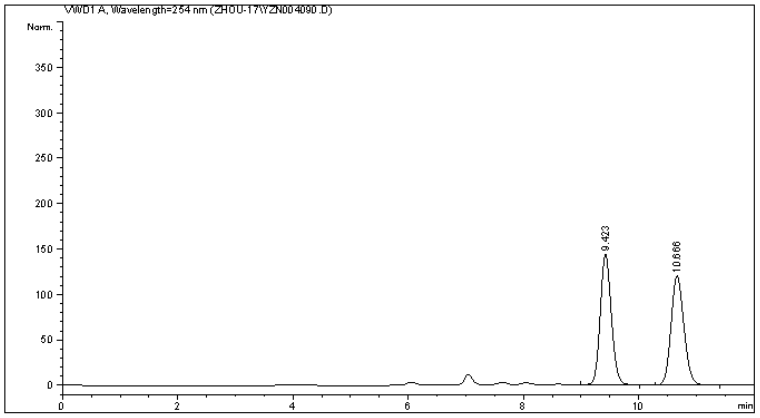
==========================================================================
                        *** End of Report ***
```



(-)-**3ak**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004090.D
Sample Name: HS-5-33A+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/26/2017 2:33:10 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/26/2017 2:31:17 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:17:50 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

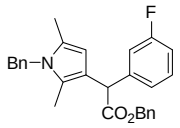
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   9.423 VB    0.2062 1934.06274  144.02768  50.8724
   2  10.666 BB    0.2413 1867.73035  120.00558  49.1276

Totals :                  3801.79309  264.03326

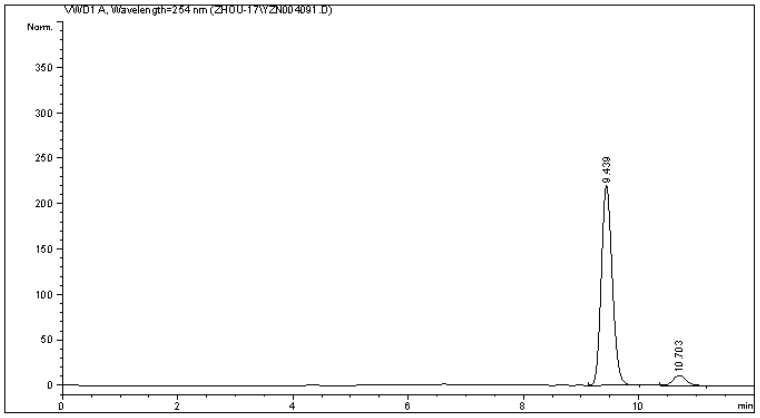
                          *** End of Report ***
```



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

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004091.D
Sample Name: HS-5-33A

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/26/2017 2:47:19 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/26/2017 2:45:45 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:18:24 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

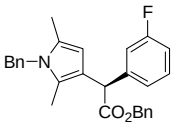
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   9.439 BB    0.2050 2901.73242  219.83241  94.3994
   2  10.703 BB    0.2419  172.15514   11.11456   5.6006

Totals :                  3073.88756  230.94698

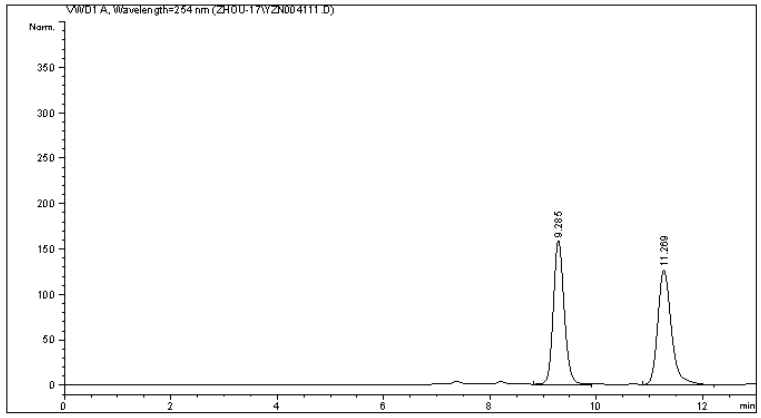
                          *** End of Report ***
```



(-)-**3al**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004111.D
Sample Name: HS-5-35A+-

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/28/2017 2:55:10 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/28/2017 2:44:13 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/2/2017 10:10:58 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

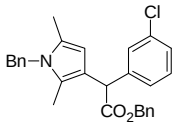
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.285 VB    0.2186 2260.65674  158.72771  50.3340
   2  11.269 VB    0.2719 2230.65405  126.08338  49.6660

Totals :                  4491.31079  284.81109

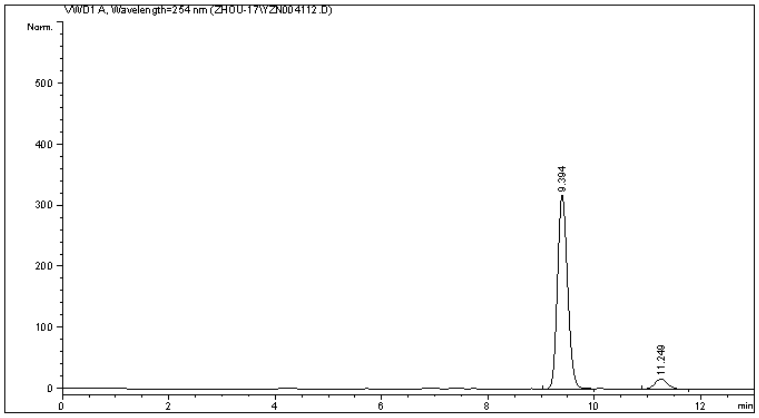
==================================================================
                      *** End of Report ***
```



(+/-)-**3am**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004112.D
Sample Name: HS-5-35A

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/28/2017 3:09:58 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/28/2017 3:09:41 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/2/2017 10:09:44 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

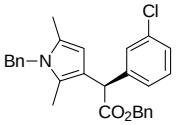
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.394 VV    0.2059 4210.83154  317.16205  93.7975
   2  11.249 BB    0.2603  278.44974   16.67896   6.2025

Totals :                  4489.28128  333.84101

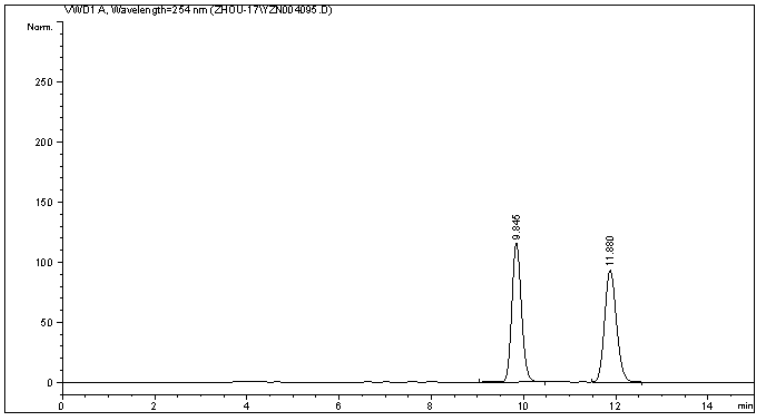
==================================================================
                      *** End of Report ***
```



(-)-**3am**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004095.D
Sample Name: HS-5-33B+-

```
Acq. Operator   : O
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/26/2017 4:29:05 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/26/2017 4:06:16 PM by O
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:18:56 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

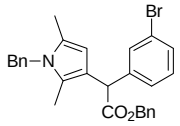
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.845 BB    0.2237 1672.61890  115.87883  50.1548
   2  11.880 BB    0.2767 1662.29529   93.09954  49.8452

Totals :                  3334.91418  208.97837

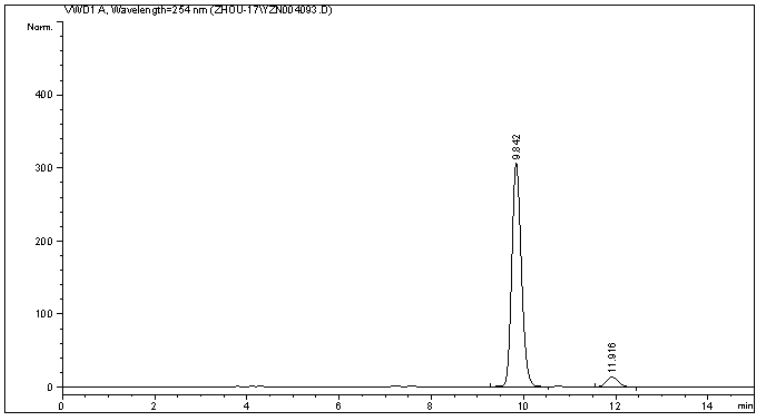
                          *** End of Report ***
```



(+/-)-**3an**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004093.D
Sample Name: HS-5-33B

```
Acq. Operator   : O
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/26/2017 3:16:46 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/26/2017 3:15:13 PM by O
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/1/2017 9:12:31 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

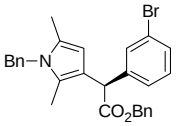
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   9.842 BB    0.2251 4455.12305  306.19049  94.6566
   2  11.916 BB    0.2782  251.49101   13.98412   5.3434

Totals :                  4706.61406  320.17461

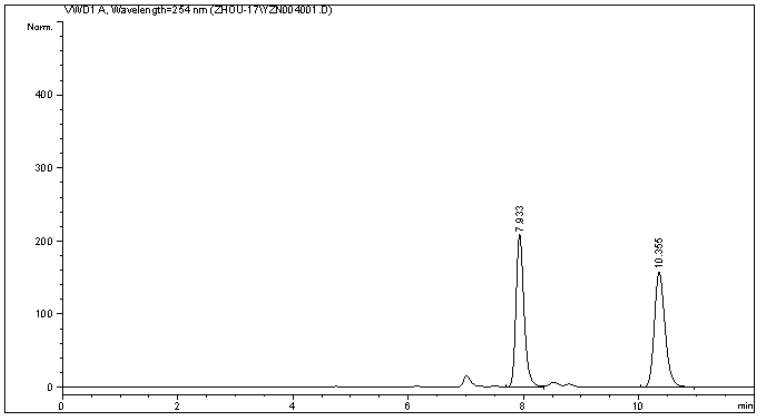
                          *** End of Report ***
```



(-)-**3an**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004001.D
Sample Name: HS-5-25C+-

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/18/2017 6:37:07 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/18/2017 6:16:51 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 8/14/2017 9:08:35 PM by
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

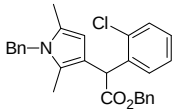
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   7.933 VV    0.1484 2030.11218  208.75085  50.1128
   2  10.355 VB    0.1979 2020.97363  157.29790  49.8872

Totals :                  4051.08582  366.04875

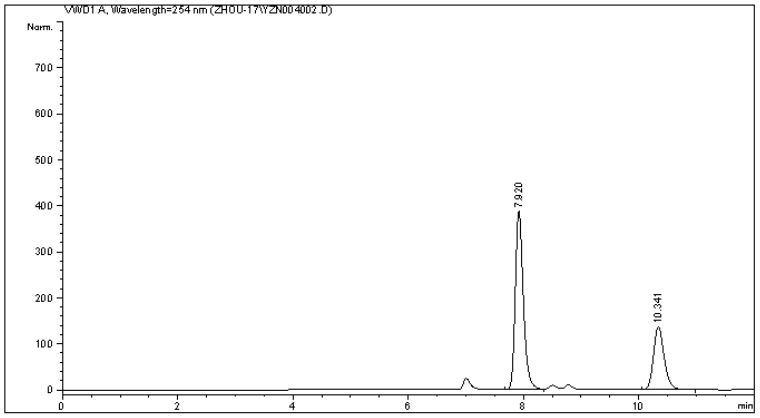
==================================================================
                        *** End of Report ***
```



(+/-)-**3ao**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004002.D
Sample Name: HS-5-25C

```
==================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/18/2017 6:56:50 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/18/2017 6:54:58 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 7:57:44 PM by
                  (modified after loading)
Sample Info     : AD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




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

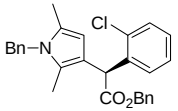
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   7.920 VV    0.1489 3793.77515  388.36407  68.2500
   2  10.341 BB    0.1986 1764.87317  136.79100  31.7500

Totals :                  5558.64832  525.15508

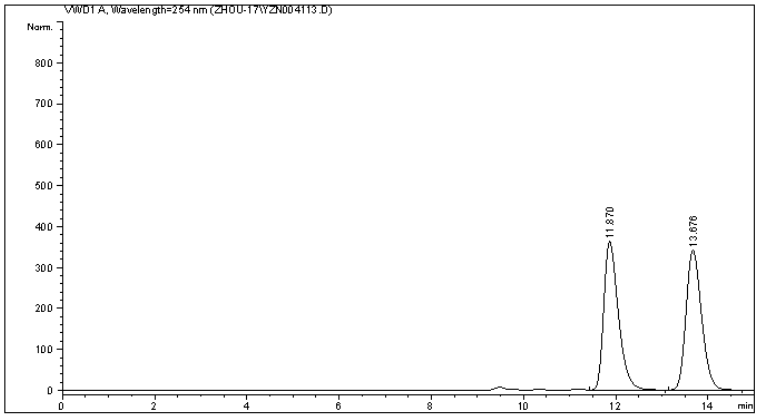
==================================================================
                        *** End of Report ***
```



(-)-**3ao**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004113.D
Sample Name: HS-5-35B+-

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/28/2017 3:27:12 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/28/2017 3:25:58 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:23:55 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

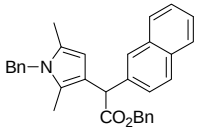
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  11.870 VB    0.3362 8012.55518  362.87082  50.0423
   2  13.676 BB    0.3635 7999.02002  341.50153  49.9577

Totals :                  1.60116e4   704.37234

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

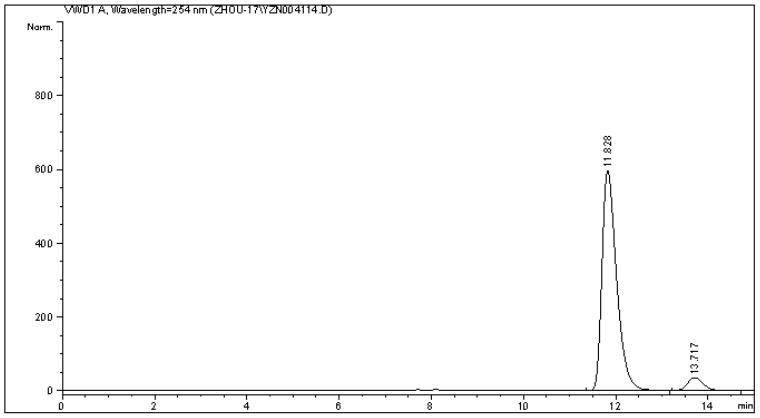


(+/-)-**3ap**

Instrument 1 7/5/2017 8:23:58 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004114.D
Sample Name: HS-5-35B

```
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/28/2017 3:44:06 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/28/2017 3:43:53 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:24:18 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

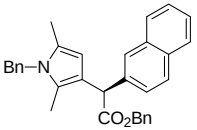
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  11.828 VB    0.3359 1.31755e4   597.50415  93.8649
   2  13.717 BB    0.3706  861.15692   35.65383   6.1351

Totals :                  1.40367e4   633.15798

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

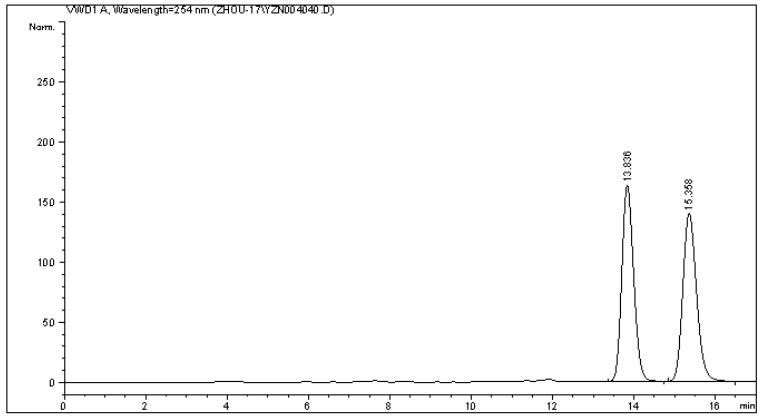


(+)-**3ap**

Instrument 1 7/5/2017 8:24:20 PM Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004040.D
Sample Name: HS-5-29B+-

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/22/2017 2:46:22 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/22/2017 2:43:59 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:05:14 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.7 mL/min,  30 oC, 254nm
```




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

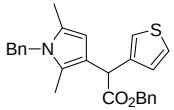
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  13.836 VB    0.3127 3298.20825  163.38794  50.0787
   2  15.358 BB    0.3647 3287.83643  139.78996  49.9213

Totals :                  6586.04468  303.17790

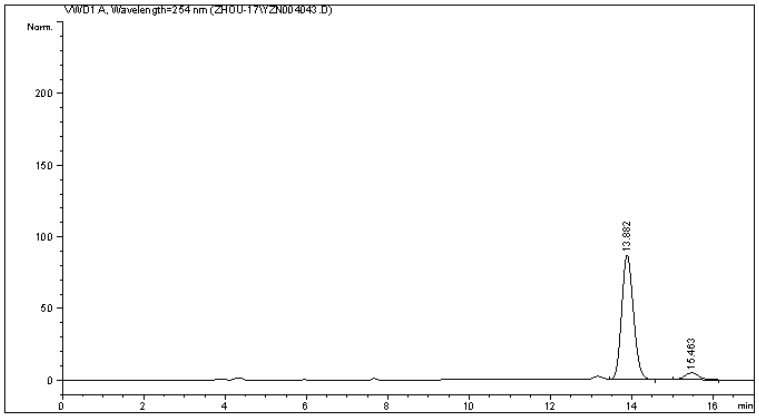
==========================================================================
                        *** End of Report ***
```



(+/-)-**3aq**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN004043.D
Sample Name: HS-5-29B

```
==========================================================================
Acq. Operator   : 0
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 4/22/2017 3:51:07 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 4/22/2017 3:49:00 PM by 0
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed    : 7/5/2017 8:06:05 PM by
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH = 90/10, 0.7 mL/min,  30 oC, 254nm
```




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

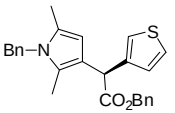
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1  13.882 VB    0.3136 1747.85254   86.79555  93.7729
   2  15.463 BB    0.3745  116.06790    4.76377   6.2271

Totals :                  1863.92044   91.55932

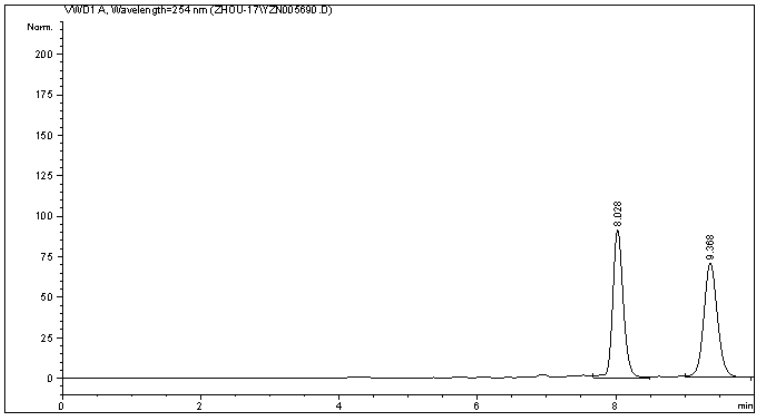
==========================================================================
                        *** End of Report ***
```



(-)-**3aq**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN005690.D
Sample Name: HS-6-76(+/-)

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 10/13/2017 3:33:34 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 10/13/2017 3:16:31 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 10/18/2017 9:13:07 PM
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH =80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

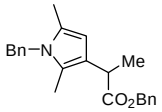
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   8.028 VB    0.1619  958.98041   91.23265  49.5578
   2   9.368 VB    0.2119  976.09344   70.76971  50.4422

Totals :                  1935.07385  162.00237

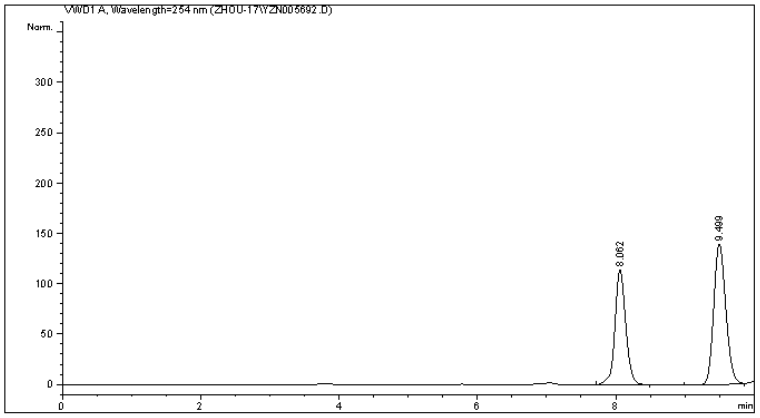
                          *** End of Report ***
```



(+/-)-**3ar**

Data File C:\CHEM32\1\DATA\ZHOU-17\YZN005692.D
Sample Name: HS-6-76

```
Acq. Operator   :
Acq. Instrument : Instrument 1                    Location : Vial 1
Injection Date  : 10/13/2017 4:15:49 PM
Acq. Method     : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 10/13/2017 4:14:02 PM
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF_LC.M
Last changed    : 10/18/2017 9:26:41 PM
                  (modified after loading)
Sample Info     : OD-H, Hexane/i-PrOH =80/20, 0.7 mL/min,  30 oC, 254 nm
```




```
                          Area Percent Report

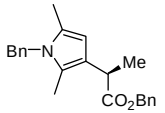
Sorted By             :      Signal
Multiplier:                   :      1.0000
Dilution:                     :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|---------|---------|--------|
   1   8.062 VB    0.1646 1243.57690  114.45578  42.3570
   2   9.499 VV    0.1884 1692.36511  139.27414  57.6430

Totals :                  2935.94202  253.72992

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



(-)-**3ar**