

Borane-Catalyzed Metal-Free Hydrogenation of 2,7-Disubstituted 1,8-Naphthydines

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Supporting Information

General information: All air-sensitive compounds were handled under an atmosphere of argon or in a nitrogen-filled glovebox. ^1H NMR and ^{13}C NMR spectra were recorded on Bruker AV 400 at ambient temperature with CDCl_3 as solvent and TMS as internal standard. Chemical shifts (δ) were given in ppm, referenced to the residual proton resonance of TMS (0), to the carbon resonance of the CDCl_3 (77.23). Coupling constants (J) were given in Hertz (Hz). IR spectrums were recorded on Perkin-Elmer-983 spectrometer. Column chromatography was performed on silica gel (200-300 mesh). All solvents were purified by conventional methods, distilled before use. Commercially available reagents were used without further purification.

Representative procedure for the synthesis of 1,8-naphthyridines (1a-1j): see the reference: P. Ehlers, A. Petrosyan, T. V. Ghochikyan, A. S. Saghyan, A. Neubauer, S. Lochbrunner and P. Langer, *Synlett*, 2013, 359-362.

Representative procedure for the synthesis of 1,8-naphthyridines (1k-1y): A solution of 2-aminonicotinaldehyde (50 mmol, 6.1 g), acetone (150 mmol, 15 mL), and L-proline (55 mmol, 6.4 g) in ethanol (70 mL) was stirred at reflux over night. The reaction solution was then cooled to room temperature, concentrated and the residue was dissolved in dichloromethane (70 mL) and filtrated. The residue was then concentrated under reduced pressure, and the residue was purified by flash chromatography on silica gel using ethyl acetate as the eluent to give 2-methyl-1,8-naphthyridine as a yellow solid (7.2 g, 99% yield). K. Leonard, W. Pan, B. Anaclerio, J. Gushue, Z. Guo, R. DesJarlais, M. Chaikin, J. Lattanze, C. Crysler, C. Manthey, B. Tomczuk and J. Marugan, *Bioorg. Med. Chem. Lett.*, 2005, **15**, 2679-2684.

To a stirred solution of 2-methyl-1,8-naphthyridine (0.72 g, 5 mmol) in tetrahydrofuran (10 mL) cooled at -78 °C was slowly added a solution of 1.0 M phenyllithium in ether (7.5 mL, 7.5 mmol) under argon atmosphere. The solution was stirred for 15 min, and then warmed to room temperature and stirred over night. A solution of saturated ammonium chloride (5 mL) was added to quench the reaction and then water (5 mL) was added. The organic layers were separated and the aqueous phase was extracted with dichloromethane (2 x 10 mL). The combined organic layer was dried over anhydrous sodium sulphate, filtered, and condensed by evaporation under reduced pressure. Then, acetone (10 mL) and an excess acetone solution of KMnO₄ were added. The mixture was stirred under room temperature over night. Then, the mixture was filtered and evaporated. The resulting residue was purified by silical gel column chromatography using petroleum ether/dichloromethane as the eluent to give **1k** as gray solid (0.66 g, 60% yield).

Representative procedure for hydrogenation of 1,8-naphthyridines: To a glass test tube (10 mL) was added HB(C₆F₅)₂ (0.0086 g, 0.025 mmol), 1,2,3,4,5-pentafluorostyrene (0.0049 g, 0.025 mmol) and dry toluene (0.5 mL) in a nitrogen atmosphere glovebox. The resulting mixture was stirred at room temperature for 5 min followed by addition 2,7-diphenyl-1,8-naphthyridine (**1a**) (0.0706 g, 0.25 mmol). The tube was then moved to a stainless-steel autoclave. After being sealed, the autoclave was purged three times with H₂ and the final pressure of hydrogen was adjusted to 30 bar. The reaction mixture was stirred at 40 °C for 20 h. After cooling to ambient temperature, the solvent was removed under reduced pressure. The crude residue was purified by column chromatography on silica gel using petroleum ether/ethyl acetate as the eluent to give 2,7-diphenyl-1,2,3,4-tetrahydro-

1,8-naphthyridine (**3a**) as a light yellow oil (0.0688 g, 96% yield).

Representative procedure for the metal-free catalytic asymmetric hydrogenation of 1,8-naphthyridines: To a glass test tube (10 mL) was added $\text{HB}(\text{C}_6\text{F}_5)_2$ (0.0087 g, 0.025 mmol), chiral diene **4d** (0.0082 g, 0.0125 mmol), dry hexane (0.25 mL), and dry toluene (0.75 mL) in a nitrogen atmosphere glovebox. The resulting mixture was stirred for 10 min at room temperature followed by addition of 1,8-naphthyridine **1k** (0.0551 g, 0.25 mmol). The tube was then moved to a stainless-steel autoclave. After being sealed, the autoclave was purged three times with H_2 and the final pressure of hydrogen was adjusted to 30 bar. The reaction mixture was stirred at room temperature for 20 h, and the solvent was removed under reduced pressure. The crude residue was purified by flash chromatography on silica gel using petroleum ether/ethyl acetate as the eluent to give the desired chiral **3k** as a yellow oil (0.0521 g, 93% yield, 47% ee).

Table S1 Optimization of reaction conditions for hydrogenation of **1a**^a

entry	temp. (°C)	time (h)	solvent	convn (%) ^b
1	25	12	Toluene	63
2	25	12	DCM	nr ^c
3	25	12	Dioxane	nr ^c
4	25	12	MTBE	nr ^c
5	25	12	Hexane	60
6	25	12	$\text{C}_6\text{H}_5\text{Cl}$	61
7	40	12	Toluene	90
8 ^d	40	12	Toluene	95
9 ^d	40	20	Toluene	>99

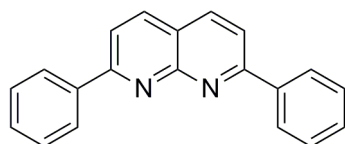
^a Conditions: **1a** (0.1 mmol) in solvent (0.4 mL) under H_2 (30 bar). ^b Determined by ^1H NMR analysis of the crude reaction mixtures. ^c No reaction. ^d In solvent (0.2 mL).

Table 2 Optimization of the asymmetric hydrogenation^a

entry	solvent	conc. (mol/L)	convn (%) ^b	ee (%) ^c
1	Hexane	0.25	68	50
2	Toluene	0.25	>99	43
3	C ₆ H ₅ Cl	0.25	84	26
4	Toluene	0.125	>99	41
5	Toluene	0.5	>99	37
6	Toluene:Hexane = 1:1	0.25	90	50
7	Toluene:Hexane = 3:1	0.25	>99	48
8 ^d	Toluene	0.25	>99	46
9 ^d	Toluene:Hexane = 3:1	0.25	>99	47

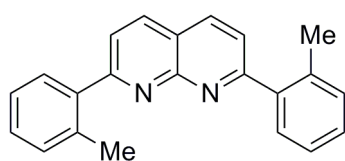
^a All reactions were carried out with **1u** (0.10 mmol), HB(C₆F₅)₂ (0.010 mmol), chiral diene **4c** (0.005 mmol) under H₂ (30 bar) at room temperature. ^b Determined by ¹H NMR spectroscopy of the crude reaction mixture. ^c Determined by HPLC using a Chiralcel OD-H column. ^d **1k** (0.10 mmol), chiral diene **4d** (0.005 mmol).

Characterization data of 1,8-naphthyridines



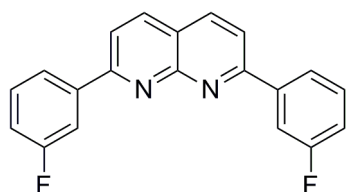
1a, 1.05 g (74% yield); white solid; ¹H NMR (400 MHz, CDCl₃, ppm): δ 8.31 (d, *J* = 6.8 Hz, 4H), 8.23 (d, *J* = 8.4 Hz, 2H), 7.96 (d, *J* = 8.4 Hz, 2H), 7.59-7.44 (m, 6H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 161.1, 156.4, 139.0, 137.6, 130.2, 128.9, 128.3, 120.8, 119.8.

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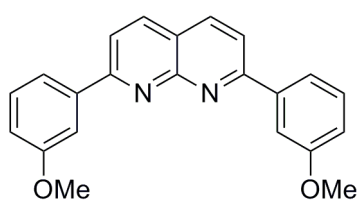


1b, 0.98 g (63% yield); light yellow solid; m.p. 207-209 °C; IR (film): 1598, 1525, 1482 cm⁻¹;

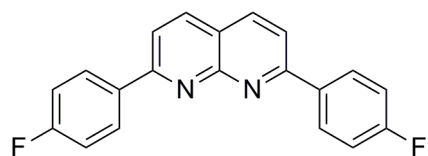
^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.28 (d, $J = 8.4$ Hz, 2H), 7.67 (d, $J = 8.4$ Hz, 2H), 7.62 (dd, $J = 8.4, 2.0$ Hz, 2H), 7.37-7.28 (m, 6H), 2.49 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 164.0, 155.8, 140.4, 136.8, 136.3, 131.0, 130.5, 129.0, 126.1, 123.6, 119.8, 20.8; HRMS (ESI) Calcd. for $\text{C}_{22}\text{H}_{19}\text{N}_2$ (M+H): 311.1543, Found: 311.1539.



1c, 1.16 g (73% yield); light yellow solid; m.p. 197-199 °C; IR (film): 1607, 1532, 1435 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.30 (d, $J = 8.4$ Hz, 2H), 8.06 (d, $J = 8.4$ Hz, 4H), 7.97 (d, $J = 8.4$ Hz, 2H), 7.56-7.45 (m, 2H), 7.24-7.15 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.5 (d, $J_{\text{C-F}} = 244.0$ Hz), 160.0, 156.2, 141.2 (d, $J_{\text{C-F}} = 2.0$ Hz), 138.0, 130.5 (d, $J_{\text{C-F}} = 8.0$ Hz), 123.8 (d, $J_{\text{C-F}} = 3.0$ Hz), 121.3, 119.9, 117.2 (d, $J_{\text{C-F}} = 21.0$ Hz), 115.3 (d, $J_{\text{C-F}} = 23.0$ Hz); HRMS (ESI) Calcd. for $\text{C}_{20}\text{H}_{13}\text{N}_2\text{F}_2$ (M+H): 319.1041, Found: 319.1037.

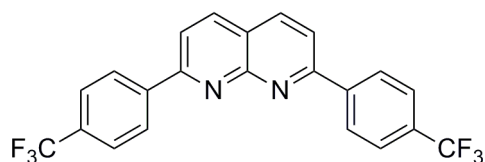


1d, 1.29 g (75% yield); yellow solid; m.p. > 250 °C; IR (film): 1607, 1526, 1037 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.25 (d, $J = 8.4$ Hz, 2H), 7.96 (d, $J = 8.4$ Hz, 2H), 7.94 (d, $J = 2.4$ Hz, 2H), 7.80 (d, $J = 8.0$ Hz, 2H), 7.45 (dd, $J = 8.0, 8.0$ Hz, 2H), 7.05 (ddd, $J = 8.4, 2.4, 0.6$ Hz, 2H), 3.96 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 161.0, 160.4, 156.3, 140.5, 137.6, 129.9, 121.0, 120.6, 120.0, 116.8, 112.9, 55.8; HRMS (ESI) Calcd. for $\text{C}_{22}\text{H}_{19}\text{O}_2\text{N}_2$ (M+H): 343.1441, Found: 343.1437.



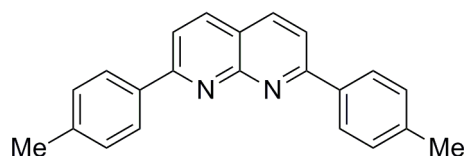
1e, 1.03 g (65% yield); white solid; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.34-8.28 (m, 4H), 8.26 (d, $J = 8.4$ Hz, 2H), 7.94 (d, $J = 8.4$ Hz, 2H), 7.25-7.19 (m, 4H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 164.5 (d, $J_{\text{C-F}} = 249.0$ Hz), 160.2, 156.3, 137.8, 135.1 (d, $J_{\text{C-F}} = 3.0$ Hz), 130.2 (d, $J_{\text{C-F}} = 9.0$ Hz), 120.6, 119.5, 116.0 (d, $J_{\text{C-F}} = 22.0$ Hz).

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1f, 1.57 g (75% yield); light yellow solid; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.43 (d, $J = 8.0$ Hz, 4H), 8.36 (d, $J = 8.4$ Hz, 2H), 8.04 (d, $J = 8.4$ Hz, 2H), 7.81 (d, $J = 8.4$ Hz, 4H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 159.9, 156.2, 142.1, 138.2, 132.0 (q, $J J_{\text{C-F}} = 32.0$ Hz), 128.6, 126.0 (q, $J_{\text{C-F}} = 3.0$ Hz), 124.3 (q, $J_{\text{C-F}} = 270.6$ Hz), 121.5, 120.2.

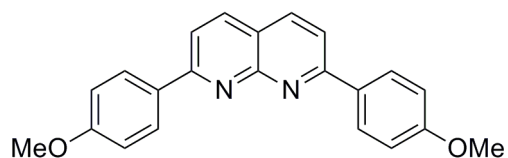
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1g, 1.26 g (81% yield); white solid; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.22 (d, $J = 8.4$ Hz, 4H), 8.21 (d, $J = 8.4$ Hz, 2H), 7.94 (d, $J = 8.4$ Hz, 2H), 7.34 (d, $J = 8.0$ Hz, 4H), 2.44 (s, 6H);

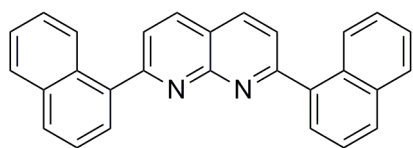
^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 161.0, 156.5, 140.3, 137.4, 136.2, 129.7, 128.2, 120.6, 119.4, 21.6.

P. Ehlers, A. Petrosyan, T. V. Ghochikyan, A. S. Saghyan, A. Neubauer, S. Lochbrunner and P. Langer, *Synlett*, 2013, 359-362.

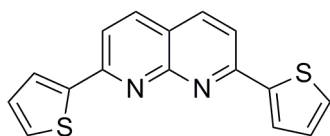


1h, 1.42 g (83% yield); yellow solid; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.30 (dd, $J = 6.8$, 2.0 Hz, 4H), 8.19 (d, $J = 8.4$ Hz, 2H), 7.91 (d, $J = 8.4$ Hz, 2H), 7.06 (dd, $J = 6.8$, 2.0 Hz, 4H), 3.91 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 161.5, 160.5, 156.5, 137.4, 131.6, 129.7, 120.2, 118.9, 114.3, 55.6.

P. Ehlers, A. Petrosyan, T. V. Ghochikyan, A. S. Saghyan, A. Neubauer, S. Lochbrunner and P. Langer, *Synlett*, 2013, 359-362.

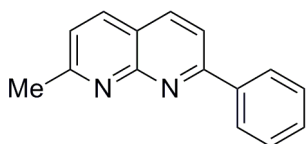


1i, 1.92 g (85% yield); white solid; m.p. 231-232 °C; IR (film): 1600, 1524 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.40 (d, $J = 8.4$ Hz, 2H), 8.29 (d, $J = 8.0$ Hz, 2H), 8.00-7.92 (m, 4H), 7.92-7.85 (m, 4H), 7.61 (dd, $J = 8.0$, 7.2 Hz, 2H), 7.50 (ddd, $J = 14.0$, 6.8, 1.4 Hz, 4H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.3, 156.4, 138.3, 137.0, 134.1, 131.3, 129.8, 128.9, 128.7, 127.0, 126.2, 125.9, 125.6, 124.6, 120.4; HRMS (ESI) Calcd. for $\text{C}_{28}\text{H}_{19}\text{N}_2$ (M+H): 383.1543, Found: 383.1547.



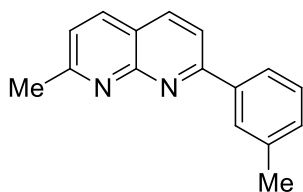
1j, 1.18 g (80% yield); yellow solid; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.11 (d, $J = 8.4$ Hz, 2H), 7.87 (dd, $J = 3.6, 0.8$ Hz, 2H), 7.83 (d, $J = 8.4$ Hz, 2H), 7.54 (dd, $J = 5.2, 0.8$ Hz, 2H), 7.18 (dd, $J = 6.0, 3.6$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.2, 144.7, 137.5, 130.0, 128.3, 127.4, 120.9, 118.4.

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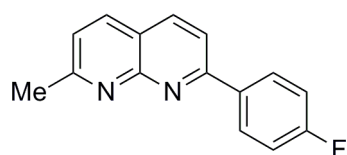
1k, 0.66 g (60% yield); gray solid; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.33 (d, $J = 6.8$ Hz, 2H), 8.20 (d, $J = 8.4$ Hz, 1H), 8.08 (d, $J = 8.0$ Hz, 1H), 7.96 (d, $J = 8.0$ Hz, 1H), 7.58-7.46 (m, 3H), 7.36 (d, $J = 8.4$ Hz, 1H), 2.84 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.5, 160.2, 156.1, 138.8, 137.5, 136.7, 130.1, 128.9, 128.1, 122.8, 119.8, 119.0, 25.9.

P. Galatsis, K. Yamagata, J. A. Wendt, C. J. Connolly, J. W. Mickelson, J. B. J. Milbank, S. E. Bove, C. S. Knauer, R. M. Brooker, C. E. Augelli-Szafran, R. D. Schwarz, J. J. Kinsora and K. S. Kilgore, *Bioorg. Med. Chem. Lett.*, 2007, **17**, 6525-6528.

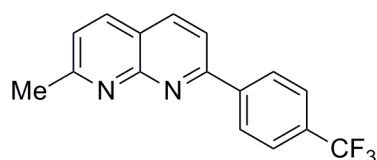


1l, 0.49 g (42% yield); white solid; m.p. 131-133 $^\circ\text{C}$; IR (film): 1603, 1508, 1303 cm^{-1} ; ^1H

NMR (400 MHz, CDCl₃, ppm): δ 8.24 (s, 1H), 8.10 (d, J = 8.0 Hz, 1H), 8.02 (d, J = 7.6 Hz, 1H), 7.98 (d, J = 8.0 Hz, 1H), 7.88 (d, J = 8.0 Hz, 1H), 7.38 (dd, J = 7.2, 7.2 Hz, 1H), 7.29 (s, 2H), 2.81 (s, 3H), 2.45 (s, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 163.3, 160.1, 155.9, 138.6, 138.5, 137.3, 136.6, 130.8, 128.7, 128.6, 124.9, 122.6, 119.6, 118.9, 25.7, 21.5; HRMS (ESI) Calcd. for C₁₆H₁₅N₂ ((M+H)⁺): 235.1230, Found: 235.1230.

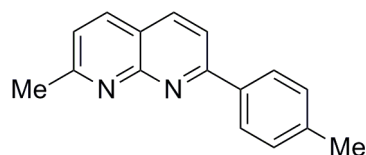


1m, 0.73 g (61% yield); white solid; m.p. 235-237 °C; IR (film): 1609, 1596, 1516, 1224 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): δ 8.31 (dd, J = 8.4, 3.2 Hz, 2H), 8.18 (d, J = 8.4 Hz, 1H), 8.05 (d, J = 8.4 Hz, 1H), 7.89 (d, J = 8.8 Hz, 1H), 7.35 (d, J = 8.0 Hz, 1H), 7.19 (dd, J = 8.8, 8.4 Hz, 2H), 2.83 (s, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 164.3 (d, J_{C-F} = 249.0 Hz), 163.7, 159.0, 156.0, 137.7, 136.7, 135.0 (d, J_{C-F} = 5.0 Hz), 130.0 (d, J_{C-F} = 8.0 Hz), 122.9, 119.7, 118.6, 115.8 (d, J_{C-F} = 21.0 Hz), 25.9; HRMS (ESI) Calcd. for C₁₅H₁₂N₂F (M+H): 239.0979, Found: 239.0977.

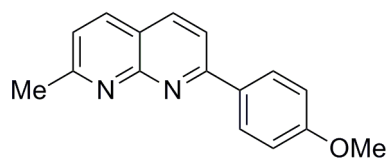


1n, 0.82 g (57% yield); white solid; m.p. 267-268 °C; IR (film): 1614, 1537, 1328, 1124 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): δ 8.36 (d, J = 7.2 Hz, 2H), 8.12 (d, J = 7.6 Hz, 1H), 8.00 (d, J = 7.6 Hz, 1H), 7.83 (d, J = 7.6 Hz, 1H), 7.71 (d, J = 7.2 Hz, 2H), 7.32 (d, J = 7.6 Hz, 1H), 2.81 (s, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 163.7, 158.0, 155.6, 141.8, 137.8, 136.6,

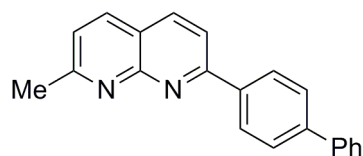
131.4 (q, J_{C-F} = 32.0 Hz), 128.0, 125.6 (q, J_{C-F} = 3.0 Hz), 124.1 (q, J_{C-F} = 270.4 Hz), 123.1, 120.0, 118.6, 25.6; HRMS (ESI) Calcd. for $C_{16}H_{12}N_2F_3$ (M+H): 289.0947, Found: 289.0944.



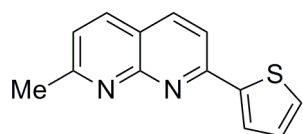
1o, 0.52 g (44% yield); light yellow solid; m.p. 183-185 °C; IR (film): 1602, 1500 cm^{-1} ; 1H NMR (400 MHz, $CDCl_3$, ppm): δ 8.24 (d, J = 8.0 Hz, 2H), 8.17 (d, J = 8.4 Hz, 1H), 8.06 (d, J = 8.0 Hz, 1H), 7.94 (d, J = 8.4 Hz, 1H), 7.37-7.31 (m, 3H), 2.84 (s, 3H), 2.44 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm): δ 163.4, 160.2, 156.2, 140.4, 137.4, 136.7, 136.1, 129.7, 128.0, 122.6, 119.8, 118.9, 25.9, 21.6; HRMS (ESI) Calcd. for $C_{16}H_{15}N_2$ (M+H): 235.1230, Found: 235.1231.



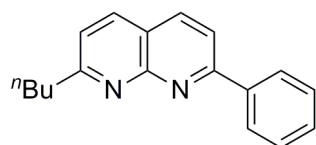
1p, 0.50 g (40% yield); white solid; m.p. 164-165 °C; IR (film): 1599, 1499, 1252, 1174 cm^{-1} ; 1H NMR (400 MHz, $CDCl_3$, ppm): δ 8.31 (d, J = 8.4 Hz, 2H), 8.13 (d, J = 8.0 Hz, 1H), 8.03 (d, J = 8.0 Hz, 1H), 7.89 (d, J = 8.4 Hz, 1H), 7.31 (d, J = 8.0 Hz, 1H), 7.03 (d, J = 8.4 Hz, 2H), 3.88 (s, 3H), 2.82 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$, ppm): δ 163.3, 161.5, 159.8, 156.1, 137.3, 136.7, 131.4, 129.5, 122.4, 119.5, 118.5, 114.3, 55.6, 25.8; HRMS (ESI) Calcd. for $C_{16}H_{15}ON_2$ (M+H): 251.1179, Found: 251.1175.



1q, 0.74 g (50% yield); white solid; m.p. > 250 °C; IR (film): 1601, 1486, 1305 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.43 (d, $J = 8.4$ Hz, 2H), 8.22 (d, $J = 8.4$ Hz, 1H), 8.09 (d, $J = 8.0$ Hz, 1H), 8.02 (d, $J = 8.4$ Hz, 1H), 7.77 (d, $J = 8.4$ Hz, 2H), 7.70 (d, $J = 8.4$ Hz, 2H), 7.53-7.46 (m, 2H), 7.43-7.34 (m, 2H), 2.86 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.6, 159.7, 156.2, 142.9, 140.6, 137.7, 137.6, 136.8, 129.1, 128.5, 127.9, 127.6, 127.4, 122.8, 119.9, 118.9, 25.9; HRMS (ESI) Calcd. for $\text{C}_{21}\text{H}_{17}\text{N}_2$ (M+H): 297.1386, Found: 297.1383.

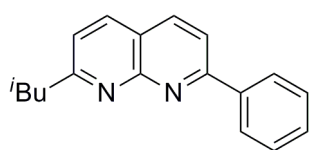


1r, 0.27 g (24% yield); yellow solid; m.p. 105-106 °C; IR (film): 1601, 1534, 1501, 1439 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.11 (d, $J = 8.0$ Hz, 1H), 8.01 (d, $J = 8.4$ Hz, 1H), 7.87-7.80 (m, 2H), 7.50 (d, $J = 5.2$ Hz, 1H), 7.31 (d, $J = 8.2$ Hz, 1H), 7.20-7.13 (m, 1H), 2.82 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.7, 156.0, 155.5, 145.0, 137.5, 136.7, 129.9, 128.3, 127.1, 122.6, 119.9, 118.1, 25.9; HRMS (ESI) Calcd. for $\text{C}_{13}\text{H}_{11}\text{N}_2\text{S}$ (M+H): 227.0638, Found: 227.0640.

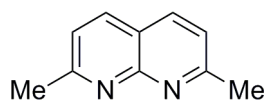


1s, 0.41 g (31% yield); white solid; m.p. 49-50 °C; IR (film): 2956, 1603, 1510 cm^{-1} ; ^1H NMR

(400 MHz, CDCl₃, ppm): δ 8.33 (d, J = 7.2 Hz, 2H), 8.21 (d, J = 8.8 Hz, 1H), 8.10 (d, J = 8.0 Hz, 1H), 7.96 (d, J = 8.4 Hz, 1H), 7.58-7.44 (m, 3H), 7.37 (d, J = 8.4 Hz, 1H), 3.08 (t, J = 8.0 Hz, 2H), 1.93-1.81 (m, 2H), 1.53-1.40 (m, 2H), 0.97 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 167.7, 160.3, 156.3, 139.0, 137.6, 136.8, 130.1, 128.9, 128.2, 122.3, 120.1, 119.1, 39.5, 32.3, 22.9, 14.2; HRMS (ESI) Calcd. for C₁₈H₁₉N₂ (M+H): 263.1543, Found: 263.1547.

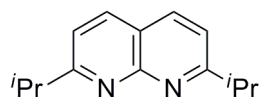


1t, 0.30 g (23% yield); white solid; m.p. 75-76 °C; IR (film): 2955, 1603, 1511, 1302 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): δ 8.32 (dd, J = 8.0, 1.2 Hz, 2H), 8.21 (d, J = 8.4 Hz, 1H), 8.09 (d, J = 8.0 Hz, 1H), 7.96 (d, J = 8.4 Hz, 1H), 7.58-7.44 (m, 3H), 7.34 (d, J = 8.4 Hz, 1H), 2.95 (d, J = 7.2 Hz, 2H), 2.33 (heptet, J = 6.8 Hz, 1H), 1.00 (d, J = 6.8 Hz, 6H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 166.8, 160.4, 156.3, 139.0, 137.6, 136.6, 130.1, 128.9, 128.3, 122.9, 120.1, 119.2, 48.7, 29.7, 22.8; HRMS (ESI) Calcd. for C₁₈H₁₉N₂ (M+H): 263.1543, Found: 263.1546.

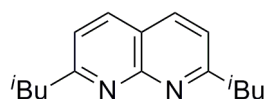


1u, 0.48 g (61% yield); brown solid; ¹H NMR (400 MHz, CDCl₃, ppm): δ 8.01 (d, J = 8.4 Hz, 2H), 7.30 (d, J = 8.0 Hz, 2H), 2.78 (s, 6H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 162.6, 155.6, 136.4, 122.1, 118.6, 25.6.

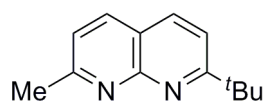
G. R. Newknow, K. J. Theriot, V. K. Majestic, P. A. Spruell and J. R. Baker, *J. Org. Chem.*, 1990, **55**, 2838-2842.



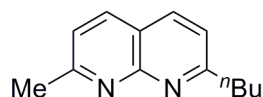
1v, 0.34 g (32% yield); white solid; m.p. 62-64 °C. IR (film): 2964, 1607, 1541 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.07 (d, $J = 8.4$ Hz, 2H), 7.38 (d, $J = 8.4$ Hz, 2H), 3.34 (heptet, $J = 6.8$ Hz, 2H), 1.42 (d, $J = 6.8$ Hz, 12H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 171.5, 155.7, 137.1, 119.8, 119.7, 37.7, 22.7; HRMS (ESI) Calcd. for $\text{C}_{14}\text{H}_{19}\text{N}_2$ (M+H): 215.1543, Found: 215.1540.



1w, 0.87 g (72% yield); white solid; m.p. 90-91 °C; IR (film): 2955, 1606, 1539 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.03 (d, $J = 8.0$ Hz, 2H), 7.30 (d, $J = 8.4$ Hz, 2H), 2.90 (d, $J = 7.2$ Hz, 4H), 2.33 (heptet, $J = 6.8$ Hz, 2H), 0.98 (d, $J = 6.8$ Hz, 12H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 166.0, 156.0, 136.5, 122.4, 119.2, 48.7, 29.5, 22.8; HRMS (ESI) Calcd. for $\text{C}_{16}\text{H}_{23}\text{N}_2$ (M+H): 243.1856, Found: 243.1853.

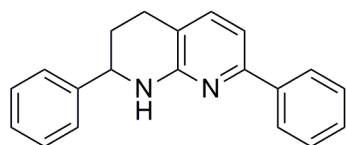


1x, 0.13 g (13% yield); light yellow solid; m.p. 84-85 °C; IR (film): 2957, 1607, 1507 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.07 (d, $J = 8.4$ Hz, 1H), 8.03 (d, $J = 8.4$ Hz, 1H), 7.57 (d, $J = 8.8$ Hz, 1H), 7.32 (d, $J = 8.4$ Hz, 1H), 2.82 (s, 3H), 1.51 (s, 9H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 173.3, 162.8, 155.4, 136.7, 136.6, 122.4, 118.8, 118.6, 38.6, 30.3, 25.8; HRMS (ESI) Calcd. for $\text{C}_{13}\text{H}_{17}\text{N}_2$ (M+H): 201.1386, Found: 201.1384.

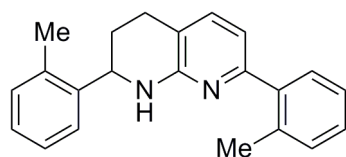


1y, 0.35 g (35% yield); white solid; m.p. 52-53 °C; IR (film): 2956, 1607, 1507 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): δ 8.01 (d, $J = 8.4$ Hz, 1H), 7.99 (d, $J = 8.0$ Hz, 1H), 7.30 (d, $J = 8.0$ Hz, 1H), 7.29 (d, $J = 8.0$ Hz, 1H), 3.01 (t, $J = 7.6$ Hz, 2H), 2.78 (s, 3H), 1.93-1.80 (m, 2H), 1.51-1.37 (m, 2H), 0.95 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 166.7, 162.6, 155.7, 136.51, 136.49, 122.1, 121.7, 118.8, 39.1, 31.7, 25.6, 22.6, 14.0; HRMS (ESI) Calcd. for $\text{C}_{13}\text{H}_{17}\text{N}_2$ (M+H): 201.1386, Found: 201.1384.

Characterization data of 1,2,3,4-tetrahydro-1,8-naphthyridines

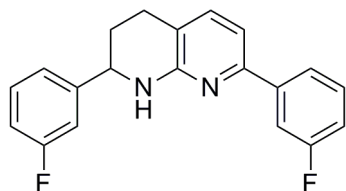


3a, 0.0688 g (96% yield); yellow oil; IR (film): 3406, 1597, 1461 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.85 (d, $J = 7.2$ Hz, 2H), 7.45-7.28 (m, 9H), 6.99 (d, $J = 7.6$ Hz, 1H), 5.65 (br s, 1H), 4.65 (dd, $J = 7.2, 2.8$ Hz, 1H), 2.90-2.80 (m, 1H), 2.77-2.67 (m, 1H), 2.23-2.13 (m, 1H), 2.06-1.94 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.2, 154.5, 144.2, 140.1, 137.1, 128.8, 128.7, 128.4, 127.7, 126.8, 126.6, 114.6, 110.3, 56.2, 30.6, 25.3; HRMS (ESI) Calcd. for $\text{C}_{20}\text{H}_{19}\text{N}_2$ (M+H): 287.1543, Found: 287.1539.

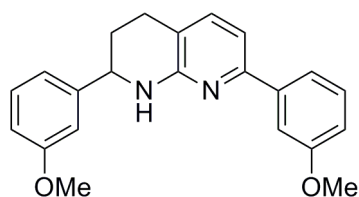


3b, 0.0726 g (92% yield); light yellow oil; IR (film): 3223, 1600, 1459 cm^{-1} ; ^1H NMR (400

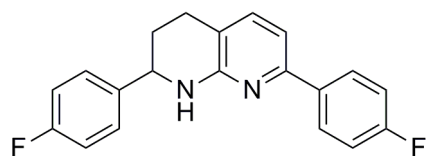
MHz, CDCl₃, ppm): 7.47 (dd, $J = 6.4, 1.6$ Hz, 1H), 7.41-7.35 (m, 1H), 7.27 (d, $J = 7.6$ Hz, 1H), 7.27-7.14 (m, 6H), 6.63 (d, $J = 7.6$ Hz, 1H), 5.12 (s, 1H), 4.84 (dd, $J = 8.4, 2.4$ Hz, 1H), 2.93-2.81 (m, 1H), 2.78-2.69 (m, 1H), 2.39 (s, 3H), 2.38 (s, 3H), 2.19-2.10 (m, 1H), 1.95-1.83 (m, 1H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 156.8, 156.0, 141.9, 141.1, 136.4, 135.9, 134.6, 130.77, 130.75, 129.5, 127.9, 127.3, 126.6, 126.1, 125.9, 113.8, 113.4, 52.3, 28.6, 25.5, 20.6, 19.2; HRMS (ESI) Calcd. for C₂₂H₂₃N₂ (M+H): 315.1856, Found: 315.1859.



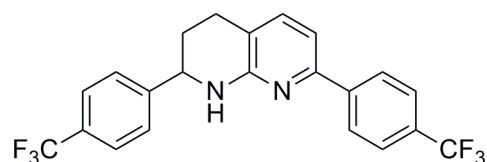
3c, 0.0757 g (94% yield); light brown oil; IR (film): 3243, 1598, 1576, 1463 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.71-7.62 (m, 2H), 7.32-7.25 (m, 1H), 7.32-7.25 (m, 2H), 7.14 (d, $J = 7.6$ Hz, 1H), 7.08 (d, $J = 10.0$ Hz, 1H), 7.06-6.93 (m, 3H), 5.29 (s, 1H), 4.63 (d, $J = 6.0$ Hz, 1H), 2.88-2.76 (m, 1H), 2.72-2.62 (m, 1H), 2.20-2.09 (m, 1H), 2.01-1.90 (m, 1H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 163.4 (d, $J_{C-F} = 243.0$ Hz), 162.3 (d, $J_{C-F} = 245.0$ Hz), 155.9, 153.0 (d, $J_{C-F} = 3.0$ Hz), 146.8 (d, $J_{C-F} = 7.0$ Hz), 142.4 (d, $J_{C-F} = 8.0$ Hz), 137.1, 130.3 (d, $J_{C-F} = 8.0$ Hz), 130.1 (d, $J_{C-F} = 8.0$ Hz), 122.3 (d, $J_{C-F} = 3.0$ Hz), 122.1 (d, $J_{C-F} = 3.0$ Hz), 115.3 (d, $J_{C-F} = 7.0$ Hz), 115.1, 114.6 (d, $J_{C-F} = 21.0$ Hz), 113.7 (d, $J_{C-F} = 20.0$ Hz), 113.5 (d, $J_{C-F} = 19.0$ Hz), 110.4, 55.6 (d, $J_{C-F} = 1.0$ Hz), 30.3, 25.0; HRMS (ESI) Calcd. for C₂₀H₁₇N₂F₂ (M+H): 323.1354, Found: 323.1352.



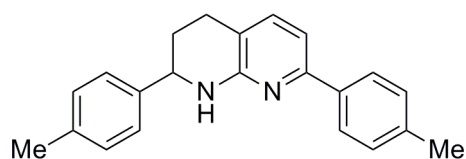
3d, 0.0830 g (96% yield); light brown oil; IR (film): 3394, 1598, 1575, 1463, 1283 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.53-7.50 (m, 1H), 7.48 (d, $J = 7.6$ Hz, 1H), 7.33 (d, $J = 8.4$ Hz, 1H), 7.31-7.26 (m, 2H), 7.00 (d, $J = 7.6$ Hz, 1H), 6.97-6.94 (m, 2H), 6.90 (dd, $J = 8.2$, 2.0 Hz, 1H), 6.83 (dd, $J = 8.2$, 2.0 Hz, 1H), 5.20 (s, 1H), 4.61 (dd, $J = 8.0$, 2.0 Hz, 1H), 3.86 (s, 3H), 3.80 (s, 3H), 2.90-2.78 (m, 1H), 2.76-2.66 (m, 1H), 2.20-2.10 (m, 1H), 2.04-1.92 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 160.08, 160.06, 156.0, 154.1, 145.9, 141.6, 137.0, 129.8, 129.6, 119.3, 118.9, 114.8, 114.5, 113.1, 112.1, 111.9, 110.4, 56.1, 55.49, 55.46, 30.6, 25.3; HRMS (ESI) Calcd. for $\text{C}_{22}\text{H}_{23}\text{O}_2\text{N}_2$ (M+H): 347.1754, Found: 347.1750.



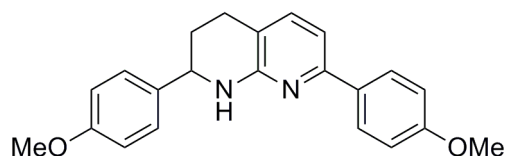
3e, 0.0747 g (93% yield); light brown oil; IR (film): 3250, 1601, 1509, 1460 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.89 (d, $J = 5.6$ Hz, 1H), 7.87 (d, $J = 6.0$ Hz, 1H), 7.33 (d, $J = 5.6$ Hz, 1H), 7.31 (d, $J = 5.6$ Hz, 1H), 7.26 (d, $J = 8.0$ Hz, 1H), 7.09 (d, $J = 8.8$ Hz, 1H), 7.07 (d, $J = 8.4$ Hz, 1H), 7.03 (d, $J = 8.8$ Hz, 1H), 7.01 (d, $J = 8.4$ Hz, 1H), 6.94 (d, $J = 7.2$ Hz, 1H), 5.24 (s, 1H), 4.59 (d, $J = 5.6$ Hz, 1H), 2.89-2.77 (m, 1H), 2.74-2.62 (m, 1H), 2.18-2.06 (m, 1H), 2.00-1.86 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.3 (d, $J_{\text{C-F}} = 246.0$ Hz), 162.3 (d, $J_{\text{C-F}} = 244.0$ Hz), 156.0, 153.3, 139.8 (d, $J_{\text{C-F}} = 3.0$ Hz), 137.2, 136.1 (d, $J_{\text{C-F}} = 3.0$ Hz), 128.5 (d, $J_{\text{C-F}} = 8.0$ Hz), 128.1 (d, $J_{\text{C-F}} = 8.0$ Hz), 115.7 (d, $J_{\text{C-F}} = 10.0$ Hz), 115.4 (d, $J_{\text{C-F}} = 11.0$ Hz), 114.5, 110.0, 55.5, 30.6, 25.1; HRMS (ESI) Calcd. for $\text{C}_{20}\text{H}_{17}\text{N}_2\text{F}_2$ (M+H): 323.1354, Found: 323.1356.



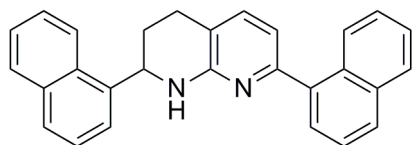
3f, 0.0951 g (90% yield); light yellow oil; IR (film): 3246, 1599, 1324, 1122 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 8.00 (d, $J = 8.4$ Hz, 2H), 7.63 (d, $J = 8.4$ Hz, 2H), 7.56 (d, $J = 8.0$ Hz, 2H), 7.42 (d, $J = 8.0$ Hz, 2H), 7.29 (d, $J = 7.6$ Hz, 1H), 7.02 (d, $J = 7.6$ Hz, 1H), 5.63 (s, 1H), 4.63 (d, $J = 5.6$ Hz, 1H), 2.90-2.78 (m, 1H), 2.72-2.63 (m, 1H), 2.20-2.09 (m, 1H), 2.00-1.88 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.1, 152.7, 148.0, 143.2, 137.2, 130.1 (q, $J_{\text{C-F}} = 32.0$ Hz), 129.9 (q, $J_{\text{C-F}} = 32.0$ Hz), 127.0, 126.8, 125.7 (q, $J_{\text{C-F}} = 3.0$ Hz), 125.6 (q, $J_{\text{C-F}} = 4.0$ Hz), 124.5 (q, $J_{\text{C-F}} = 271.0$ Hz), 124.3 (q, $J_{\text{C-F}} = 271.0$ Hz), 115.6, 110.8, 55.6, 30.3, 24.9; HRMS (ESI) Calcd. for $\text{C}_{22}\text{H}_{17}\text{N}_2\text{F}_6$ (M+H): 423.1290, Found: 423.1285.



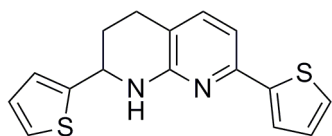
3g, 0.0771 g (98% yield); yellow solid; m.p. 240-242 $^\circ\text{C}$; IR (film): 3408, 1596, 1461 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.81 (d, $J = 8.4$ Hz, 2H), 7.27 (d, $J = 8.0$ Hz, 2H), 7.23-7.18 (m, 3H), 7.14 (d, $J = 7.6$ Hz, 2H), 6.96 (d, $J = 7.6$ Hz, 1H), 5.14 (s, 1H), 4.57 (dd, $J = 8.4, 2.4$ Hz, 1H), 2.88-2.76 (m, 1H), 2.74-2.63 (m, 1H), 2.37 (s, 3H), 2.34 (s, 3H), 2.16-2.06 (m, 1H), 2.00-1.88 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.1, 154.4, 141.2, 138.2, 137.3, 137.28, 137.0, 129.42, 129.37, 126.6, 126.5, 114.3, 109.8, 55.9, 30.7, 25.4, 21.4, 21.3; HRMS (ESI) Calcd. for $\text{C}_{22}\text{H}_{23}\text{N}_2$ (M+H): 315.1856, Found: 315.1852.



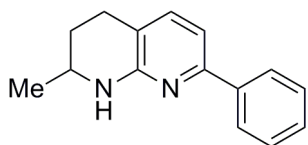
3h, 0.0820 g (95% yield); yellow solid; m.p. 152-153 °C; IR (film): 3404, 1594, 1460, 1247 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.87 (d, $J = 8.8$ Hz, 2H), 7.30 (d, $J = 8.4$ Hz, 2H), 7.24 (d, $J = 7.2$ Hz, 1H), 6.97-6.92 (m, 3H), 6.88 (d, $J = 8.8$ Hz, 2H), 5.09 (s, 1H), 4.56 (dd, $J = 8.4, 2.4$ Hz, 1H), 3.83 (s, 3H), 3.80 (s, 3H), 2.90-2.77 (m, 1H), 2.75-2.64 (m, 1H), 2.17-2.06 (m, 1H), 2.00-1.88 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 160.1, 159.2, 156.1, 154.0, 137.0, 136.3, 132.8, 128.0, 127.7, 114.1, 114.0, 113.9, 109.4, 55.7, 55.5, 30.8, 25.4; HRMS (ESI) Calcd. for $\text{C}_{22}\text{H}_{23}\text{O}_2\text{N}_2$ (M+H): 347.1754, Found: 347.1756.



3i, 0.0917 g (95% yield); white solid; m.p. 152-153 °C; IR (film): 3226, 1599, 1470 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 8.26-8.16 (m, 1H), 8.11 (d, $J = 8.0$ Hz, 1H), 7.94-7.83 (m, 3H), 7.78 (d, $J = 7.6$ Hz, 1H), 7.67(d, $J = 6.0$ Hz, 1H), 7.60 (d, $J = 6.8$ Hz, 1H), 7.58-7.42 (m, 6H), 7.38 (d, $J = 7.2$ Hz, 1H), 6.58 (d, $J = 6.8$ Hz, 1H), 5.54 (s, 1H), 5.36 (s, 1H), 3.00-2.86 (m, 1H), 2.83-2.69 (m, 1H), 2.55-2.35 (m, 1H), 2.27-2.14 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.1, 155.7, 139.2, 139.0, 136.8, 134.1, 131.5, 130.3, 129.3, 129.2, 128.5, 128.4, 128.0, 127.1, 126.3, 126.2, 125.9, 125.8, 125.7, 125.5, 123.7, 122.7, 114.5, 51.9, 28.4, 24.9; HRMS (ESI) Calcd. for $\text{C}_{28}\text{H}_{23}\text{N}_2$ (M+H): 387.1856, Found: 387.1859.

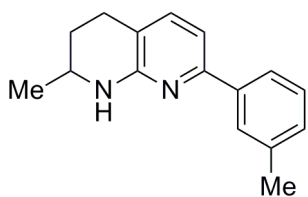


3j, 0.0670 g (90% yield); light oil; IR (film): 3398, 1592, 1462 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.47 (d, $J = 3.2$ Hz, 1H), 7.28 (d, $J = 5.2$ Hz, 1H), 7.23 (d, $J = 5.2$ Hz, 1H), 7.21 (d, $J = 7.6$ Hz, 1H), 7.07-7.03 (m, 1H), 7.02 (d, $J = 3.2$ Hz, 1H), 6.99-6.94 (m, 2H), 5.23 (s, 1H), 4.91 (d, $J = 6.8$ Hz, 1H), 2.87-2.77 (m, 1H), 2.77-2.69 (m, 1H), 2.26-2.16 (m, 1H), 2.14-2.03 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 155.2, 149.4, 148.0, 145.6, 137.0, 127.9, 126.9, 126.4, 124.5, 123.8, 114.5, 109.0, 51.9, 31.0, 25.1; HRMS (ESI) Calcd. for $\text{C}_{16}\text{H}_{15}\text{N}_2\text{S}_2$ (M+H): 299.0671, Found: 299.0674.

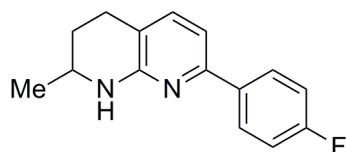


3k, 0.0521 g (93% yield); yellow oil; $[\alpha]_{\text{D}}^{24} = +17.5$ (c 1.03, CHCl_3) (47% ee); ^1H NMR (400 MHz, CDCl_3 , ppm): 7.89 (d, $J = 8.0$ Hz, 2H), 7.41 (d, $J = 8.0$ Hz, 1H), 7.39 (d, $J = 7.2$ Hz, 1H), 7.36-7.30 (m, 1H), 7.23 (d, $J = 7.6$ Hz, 1H), 6.94 (d, $J = 7.6$ Hz, 1H), 4.83 (s, 1H), 3.63-3.51 (m, 1H), 2.85-2.69 (m, 2H), 2.02-1.92 (m, 1H), 1.67-1.52 (m, 1H), 1.26 (d, $J = 6.4$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.2, 154.2, 140.2, 136.9, 128.6, 128.3, 126.8, 114.7, 109.9, 47.4, 29.7, 25.9, 22.7.

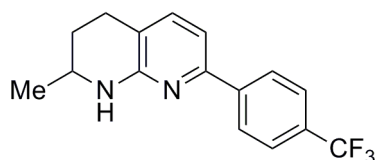
B. Xiong, Y. Li, W. Lv, Z. Tan, H. Jiang and M. Zhang, *Org. Lett.*, 2015, **17**, 4054-4057.



3l, 0.0559 g (94% yield); light brown oil; $[\alpha]_D^{24} = +23.8$ (*c* 1.03, CHCl₃) (52% ee); IR (film): 3251, 1597, 1464, cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.72 (s, 1H), 7.65 (d, *J* = 8.0 Hz, 1H), 7.29 (dd, *J* = 7.8, 7.8 Hz, 1H), 7.23 (d, *J* = 7.6 Hz, 1H), 7.15 (d, *J* = 7.6 Hz, 1H), 6.93 (d, *J* = 7.6 Hz, 1H), 4.84 (s, 1H), 3.64-3.54 (m, 1H), 2.86-2.70 (m, 2H), 2.40 (s, 3H), 2.01-1.92 (m, 1H), 1.65-1.54 (m, 1H), 1.27 (d, *J* = 6.0 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 156.1, 154.4, 140.1, 138.2, 136.9, 129.1, 128.6, 127.5, 123.9, 114.6, 110.0, 47.4, 29.7, 25.9, 22.7, 21.8; HRMS (ESI) Calcd. for C₁₆H₁₉N₂ (M+H): 239.1543, Found: 239.1539.

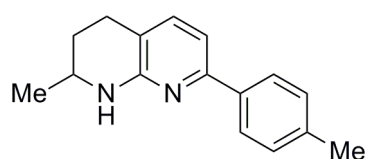


3m, 0.0582 g (96% yield); brown oil; $[\alpha]_D^{24} = +12.0$ (*c* 1.06, CHCl₃) (52% ee); IR (film): 3424, 1602, 1465 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.90-7.84 (m, 2H), 7.20 (d, *J* = 7.2 Hz, 1H), 7.12-7.03 (m, 2H), 6.87 (d, *J* = 7.2 Hz, 1H), 4.87 (s, 1H), 3.61-3.51 (m, 1H), 2.84-2.68 (m, 2H), 2.00-1.90 (m, 1H), 1.62-1.51 (m, 1H), 1.24 (d, *J* = 6.4 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 161.7 (d, *J*_{C-F} = 245.0 Hz), 156.1, 153.1, 136.9, 136.3 (d, *J*_{C-F} = 3.0 Hz), 128.4 (d, *J*_{C-F} = 8.0 Hz), 115.4 (d, *J*_{C-F} = 21.0 Hz), 114.6, 109.5, 47.4, 29.6, 25.8, 22.6; HRMS (ESI) Calcd. for C₁₅H₁₆N₂F (M+H): 243.1292, Found: 243.1289.



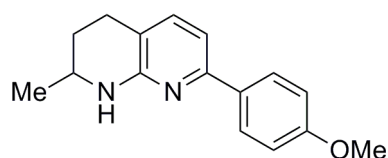
3n, 0.0693 g (95% yield); white solid; m.p. 103-105 °C; $[\alpha]_D^{24} = +0.3$ (*c* 1.14, CHCl₃) (23% ee); IR (film): 3415, 1596, 1465, 1325, 1123 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 8.00 (d, *J* = 8.4 Hz, 2H), 7.64 (d, *J* = 8.4 Hz, 2H), 7.24 (d, *J* = 8.0 Hz, 1H), 6.96 (d, *J* = 7.6 Hz, 1H),

4.89 (s, 1H), 3.62-3.52 (m, 1H), 2.85-2.70 (m, 2H), 2.02-1.92 (m, 1H), 1.64-1.52 (m, 1H), 1.25 (d, $J = 6.4$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.3, 152.4, 143.5, 136.9, 130.1 (q, $J_{\text{C-F}} = 32.0$ Hz), 126.9, 125.6 (q, $J_{\text{C-F}} = 4.0$ Hz), 124.6 (q, $J_{\text{C-F}} = 270.0$ Hz), 115.8, 110.1, 47.4, 29.5, 25.9, 22.6; HRMS (ESI) Calcd. for $\text{C}_{16}\text{H}_{16}\text{N}_2\text{F}_3$ (M+H): 293.1260, Found: 293.1257.

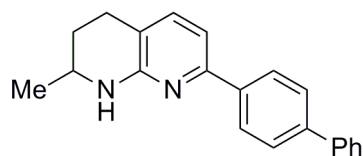


3o, 0.0536 g (90% yield); light yellow solid; $[\alpha]_{\text{D}}^{24} = +22.4$ (c 1.06, CHCl_3) (64% ee); ^1H NMR (400 MHz, CDCl_3 , ppm): 7.79 (d, $J = 8.0$ Hz, 2H), 7.24-7.17 (m, 3H), 6.92 (d, $J = 7.6$ Hz, 1H), 4.85 (s, 1H), 3.65-3.53 (m, 1H), 2.84-2.67 (m, 2H), 2.37 (s, 3H), 2.03-1.89 (m, 1H), 1.65-1.53 (m, 1H), 1.26 (d, $J = 6.4$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 156.1, 154.1, 138.2, 137.3, 137.0, 129.4, 126.6, 114.4, 109.6, 47.4, 29.7, 25.9, 22.7, 21.4.

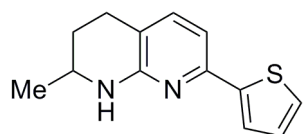
B. Xiong, Y. Li, W. Lv, Z. Tan, H. Jiang and M. Zhang, *Org. Lett.*, 2015, **17**, 4054-4057.



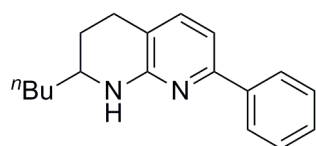
3p, 0.0592 g (93% yield); light yellow solid; m.p. 97-99 °C; $[\alpha]_{\text{D}}^{24} = +36.2$ (c 1.24, CHCl_3) (74% ee); IR (film): 3254, 1594, 1462, 1246 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.84 (d, $J = 8.8$ Hz, 2H), 7.20 (d, $J = 7.6$ Hz, 1H), 6.93 (d, $J = 8.8$ Hz, 2H), 6.88 (d, $J = 7.6$ Hz, 1H), 4.80 (s, 1H), 3.83 (s, 3H), 3.62-3.53 (m, 1H), 2.84-2.67 (m, 2H), 2.00-1.90 (m, 1H), 1.64-1.53 (m, 1H), 1.25 (d, $J = 6.0$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 160.0, 156.1, 153.9, 136.9, 132.9, 127.9, 114.0, 113.9, 109.2, 55.5, 47.4, 29.8, 25.9, 22.7; HRMS (ESI) Calcd. for $\text{C}_{16}\text{H}_{19}\text{N}_2\text{O}$ (M+H): 255.1492, Found: 255.1494.



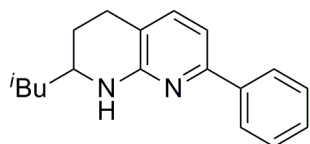
3q, 0.0710 g (94% yield); light yellow solid; m.p. 150-152 °C; $[\alpha]_D^{24} = +19.6$ (*c* 1.58, CHCl₃) (58% ee); IR (film): 3408, 1594, 1463 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.98 (d, *J* = 8.4 Hz, 2H), 7.68-7.60 (m, 4H), 7.46-7.40 (m, 2H), 7.36-7.30 (m, 1H), 7.22 (d, *J* = 7.2 Hz, 1H), 6.97 (d, *J* = 7.2 Hz, 1H), 4.87 (s, 1H), 3.61-3.52 (m, 1H), 2.84-2.69 (m, 2H), 1.98-1.90 (m, 1H), 1.64-1.52 (m, 1H), 1.24 (d, *J* = 6.4 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 156.2, 153.6, 141.0, 140.9, 139.1, 136.9, 128.9, 127.4, 127.3, 127.2, 127.1, 114.8, 109.8, 47.4, 29.7, 25.9, 22.6; HRMS (ESI) Calcd. for C₂₁H₂₁N₂ (M+H): 301.1699, Found: 301.1697.



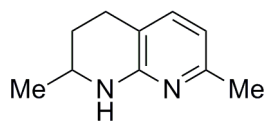
3r, 0.0523 g (92% yield); light orange oil; $[\alpha]_D^{22} = +14.1$ (*c* 1.01, CHCl₃) (33% ee); IR (film): 3401, 1592, 1490, 1463 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): δ 7.45 (d, *J* = 3.2 Hz, 1H), 7.27 (d, *J* = 4.8 Hz, 1H), 7.16 (d, *J* = 7.6 Hz, 1H), 7.07-7.01 (m, 1H), 6.89 (d, *J* = 7.6 Hz, 1H), 4.79 (s, 1H), 3.62-3.51 (m, 1H), 2.82-2.65 (m, 2H), 2.00-1.88 (m, 1H), 1.63-1.50 (m, 1H), 1.25 (d, *J* = 6.0 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 155.9, 149.1, 145.9, 136.7, 127.9, 126.1, 123.5, 114.6, 108.2, 47.4, 29.6, 26.0, 22.6; HRMS (ESI) Calcd. for C₁₃H₁₅N₂S (M+H): 231.0951, Found: 231.0954.



3s, 0.0619 g (93% yield); light oil; $[\alpha]_D^{23} = +0.3$ (*c* 1.58, CHCl₃) (14% ee); IR (film): 3268, 1597, 1461 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.88 (d, *J* = 7.6 Hz, 2H), 7.41 (d, *J* = 7.2 Hz, 1H), 7.39 (d, *J* = 7.6 Hz, 1H), 7.33 (d, *J* = 7.2 Hz, 1H), 7.23 (d, *J* = 7.6 Hz, 1H), 6.93 (d, *J* = 7.2 Hz, 1H), 4.93 (br s, 1H), 3.47-3.37 (m, 1H), 2.84-2.68 (m, 2H), 2.04-1.94 (m, 1H), 1.67-1.50 (m, 3H), 1.50-1.32 (m, 4H), 0.93 (t, *J* = 6.8 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 155.9, 153.7, 139.6, 137.2, 128.7, 128.5, 126.8, 115.4, 109.9, 51.8, 36.4, 28.0, 27.6, 25.7, 22.9, 14.2; HRMS (ESI) Calcd. for C₁₈H₂₃N₂ (M+H): 267.1856, Found: 267.1858.



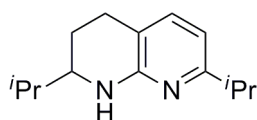
3t, 0.0639 g (96% yield); light oil; $[\alpha]_D^{24} = +8.5$ (*c* 1.70, CHCl₃) (17% ee); IR (film): 3270, 1596, 1461 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.86 (d, *J* = 7.6 Hz, 2H), 7.41 (d, *J* = 6.8 Hz, 1H), 7.39 (d, *J* = 7.6 Hz, 1H), 7.34 (d, *J* = 6.8 Hz, 1H), 7.24 (d, *J* = 8.0 Hz, 1H), 6.92 (d, *J* = 7.6 Hz, 1H), 5.10 (br s, 1H), 3.56-3.46 (m, 1H), 2.85-2.70 (m, 2H), 2.00-1.90 (m, 1H), 1.81 (heptet, *J* = 6.8 Hz, 1H), 1.66-1.54 (m, 1H), 1.53-1.43 (m, 1H), 1.40-1.32 (m, 1H), 0.96 (d, *J* = 6.4 Hz, 6H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 155.9, 153.8, 139.8, 137.2, 128.7, 128.5, 126.8, 115.3, 109.9, 49.5, 45.9, 28.1, 25.7, 24.6, 23.4, 22.4; HRMS (ESI) Calcd. for C₁₈H₂₃N₂ (M+H): 267.1856, Found: 267.1858.



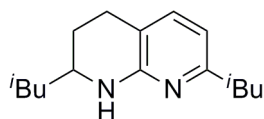
3u, 0.0382 g (94% yield); brown oil; $[\alpha]_D^{24} = +26.5$ (*c* 0.55, CHCl₃) (48% ee); ¹H NMR (400 MHz, CDCl₃, ppm): 7.08 (d, *J* = 7.2 Hz, 1H), 6.36 (d, *J* = 7.2 Hz, 1H), 4.79 (br s, 1H),

3.58-3.48 (m, 1H), 2.78-2.62 (m, 2H), 2.31 (s, 3H), 1.96-1.87 (m, 1H), 1.59-1.48 (m, 1H), 1.22 (d, $J = 6.4$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 155.4, 153.7, 137.1, 113.1, 112.0, 47.4, 29.5, 25.6, 23.6, 22.5.

A. Jean-Claude, D. Benedicte; D. Richard, L. Brempt and C. M. Paul, *PCT Int. Appl.*, 2007, WO2007141473.

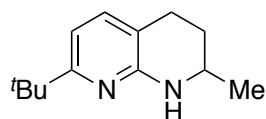


3v, 0.0535 g (98% yield); light oil; IR (film): 3413, 1600, 1473 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.12 (d, $J = 7.6$ Hz, 1H), 6.38 (d, $J = 7.2$ Hz, 1H), 4.93 (s, 1H), 3.21-3.11 (m, 1H), 2.79 (heptet, $J = 6.8$ Hz, 1H), 2.73-2.64 (m, 2H), 1.94-1.85 (m, 1H), 1.78-1.68 (m, 1H), 1.68-1.57 (m, 1H), 1.23 (d, $J = 6.8$ Hz, 6H), 1.01 (d, $J = 6.8$ Hz, 3H), 0.97 (d, $J = 6.8$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 163.5, 155.7, 137.0, 113.8, 108.7, 57.6, 35.9, 32.7, 25.8, 24.2, 22.9, 22.7, 18.7, 18.5; HRMS (ESI) Calcd. for $\text{C}_{14}\text{H}_{23}\text{N}_2$ (M+H): 210.1856, Found: 219.1852.

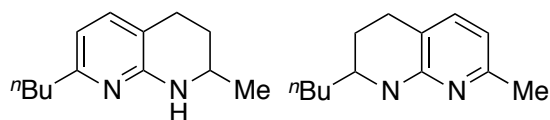


3w, 0.0584 g (95% yield); light oil; $[\alpha]_{\text{D}}^{24} = +33.0$ (c 1.21, CHCl_3) (37% ee); IR (film): 3324, 1600, 1468 cm^{-1} ; ^1H NMR (400 MHz, CDCl_3 , ppm): 7.08 (d, $J = 7.2$ Hz, 1H), 6.32 (d, $J = 7.6$ Hz, 1H), 4.86 (s, 1H), 3.50-3.42 (m, 1H), 2.78-2.63 (m, 2H), 2.40 (d, $J = 7.2$ Hz, 2H), 2.00 (heptet, $J = 6.8$ Hz, 1H), 1.96-1.90 (m, 1H), 1.78 (heptet, $J = 6.8$ Hz, 1H), 1.60-1.47 (m, 1H), 1.47-1.39 (m, 1H), 1.39-1.27 (m, 1H), 0.93 (d, $J = 6.8$ Hz, 6H), 0.91 (d, $J = 6.8$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3 , ppm): δ 157.5, 155.7, 136.7, 113.4, 112.5, 49.5, 47.3, 46.0, 29.1,

28.2, 25.7, 24.5, 23.4, 22.7, 22.4; HRMS (ESI) Calcd. for C₁₆H₂₇N₂ (M+H): 247.2169, Found: 247.2164.

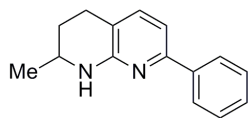


3x, 0.0505 g (98% yield); light oil; IR (film): 3310, 2957, 1605, 1465 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.10 (d, *J* = 7.6 Hz, 1H), 6.53 (d, *J* = 7.6 Hz, 1H), 4.71 (br s, 1H), 3.58-3.47 (m, 1H), 2.78-2.62 (m, 2H), 1.96-1.85 (m, 1H), 1.63-1.50 (m, 1H), 1.27 (s, 9H), 1.24 (d, *J* = 6.4 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 155.3, 136.6, 112.8, 108.0, 47.4, 36.8, 30.3, 29.9, 25.8, 22.6; HRMS (ESI) Calcd. for C₁₃H₂₁N₂ (M+H): 205.1699, Found: 205.1697.



3y and 3y', (ca. 77:23), 0.0484 g (94% yield); brown oil; IR (film): 3305, 1600, 1470 cm⁻¹; ¹H NMR (400 MHz, CDCl₃, ppm): 7.06-7.02 (m, 1.25H), 6.33-6.32 (m, 1.25H), 4.78-4.71 (m, 1.23H), 3.51-3.45 (m, 1H), 3.39-3.30 (m, 0.30H), 2.75-2.59 (m, 2.75H), 2.50 (t, *J* = 7.6 Hz, 2H), 2.28 (s, 0.87H), 1.95-1.85 (m, 1.31H), 1.65-1.55 (m, 2.25H), 1.55-1.45 (m, 1.74H), 1.40-1.27 (m, 3.38H), 1.20 (d, *J* = 6.4 Hz, 3H), 0.89 (t, *J* = 7.2 Hz, 3.92H); ¹³C NMR (100 MHz, CDCl₃, ppm): δ 158.8, 155.8, 155.7, 154.4, 136.73, 136.71, 113.0, 112.9, 112.0, 111.4, 51.7, 47.4, 37.9, 36.5, 32.4, 29.7, 28.0, 27.8, 25.8, 25.6, 24.0, 22.9, 22.8, 22.6, 14.3, 14.2; HRMS (ESI) Calcd. for C₁₃H₂₁N₂ (M+H): 205.1699, Found: 205.1695.

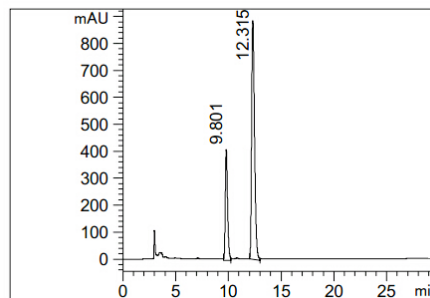
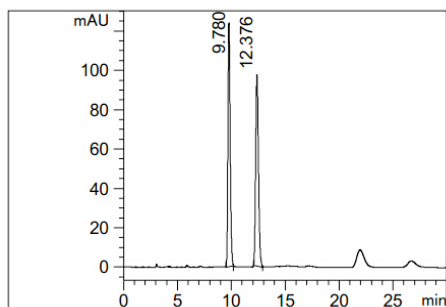
The chromatography for the determination of the enantiomeric excess



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., Eluent: Hexanes/IPA (95/5); Flow rate: 1.0 mL/min; Detection: UV 254 nm

Racemic

Chiral

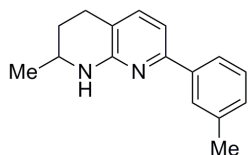


Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	9.780	50.177	1.774e3
2	12.376	49.823	1.761e3

Signal 1: VWD1 A, Wavelength=254 nm

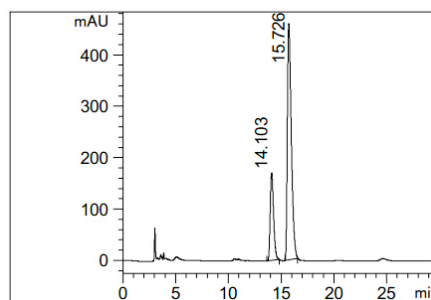
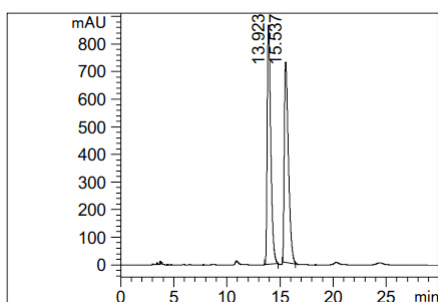
Peak #	RT [min]	Area %	Area
1	9.801	26.585	6.154e3
2	12.315	73.415	1.699e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., Eluent: Hexanes/IPA (99/1); Flow rate: 1.0 mL/min; Detection: UV 254 nm

Racemic

Chiral

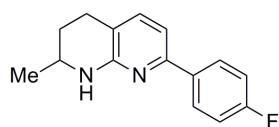


Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	13.923	50.725	2.025e4
2	15.537	49.275	1.967e4

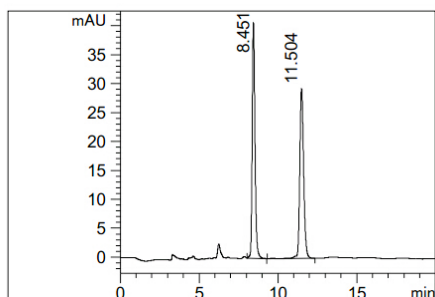
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	14.103	23.830	3.763e3
2	15.726	76.170	1.203e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (99/1); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

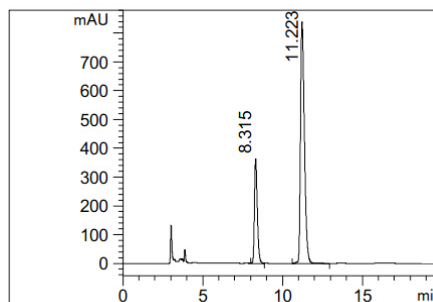
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

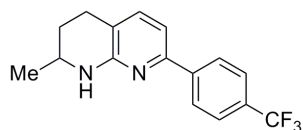
Peak #	RT [min]	Area %	Area
1	8.451	49.729	501.464
2	11.504	50.271	506.935

Chiral



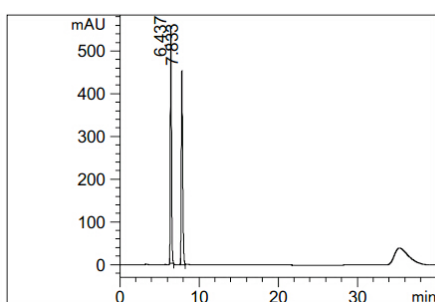
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	8.315	24.242	4.609e3
2	11.223	75.758	1.440e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (99/1); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

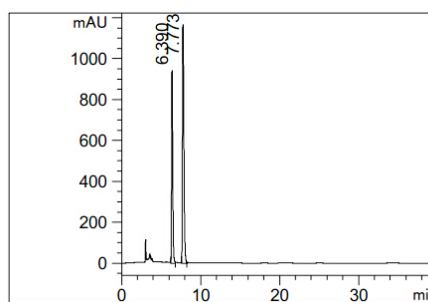
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

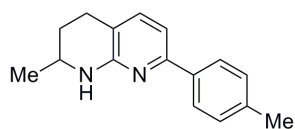
Peak #	RT [min]	Area %	Area
1	6.437	49.397	5.528e3
2	7.833	50.603	5.663e3

Chiral



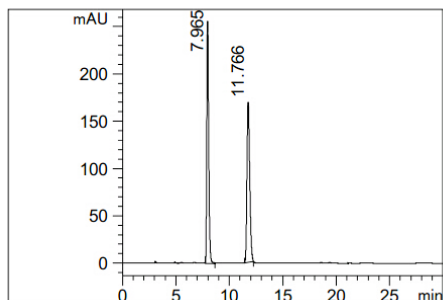
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	6.390	38.498	9.271e3
2	7.773	61.502	1.481e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (95/5); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

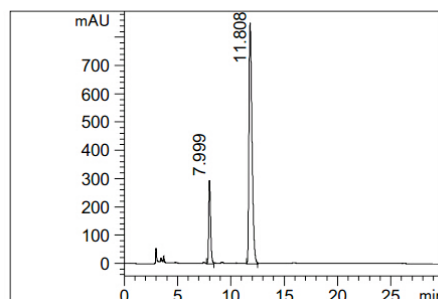
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

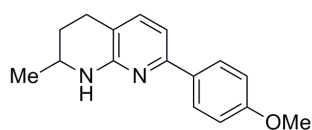
Peak #	RT [min]	Area %	Area
1	7.965	50.653	3.147e3
2	11.766	49.347	3.066e3

Chiral



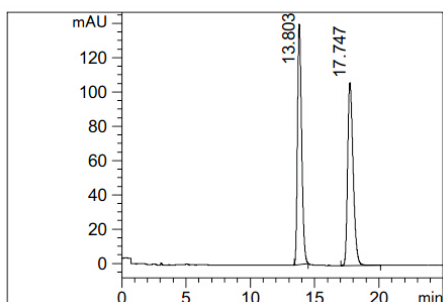
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	7.999	17.694	3.614e3
2	11.808	82.306	1.681e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (95/5); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

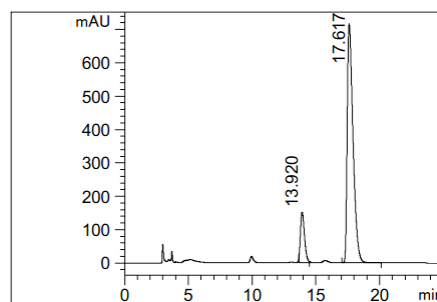
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

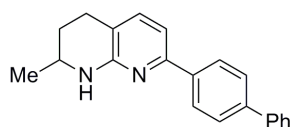
Peak #	RT [min]	Area %	Area
1	13.803	49.535	3.120e3
2	17.747	50.465	3.178e3

Chiral



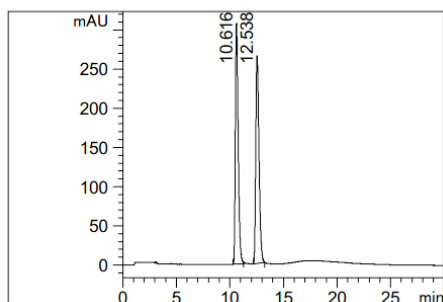
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	13.920	12.900	3.365e3
2	17.617	87.100	2.272e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (95/5); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

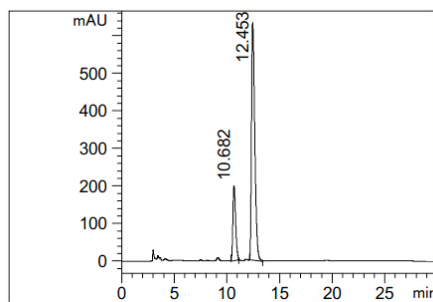
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

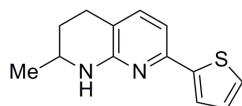
Peak #	RT [min]	Area %	Area
1	10.616	50.189	5.670e3
2	12.538	49.811	5.627e3

Chiral



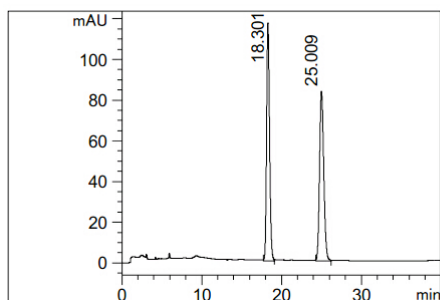
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	10.682	20.812	3.651e3
2	12.453	79.188	1.389e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (95/5); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

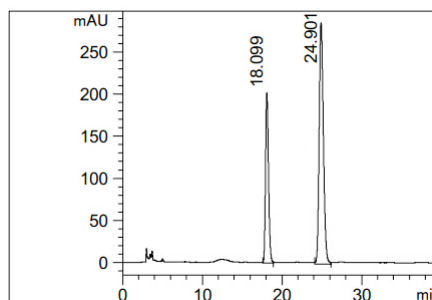
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

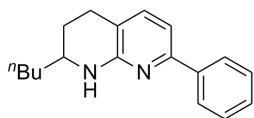
Peak #	RT [min]	Area %	Area
1	18.301	50.090	3.073e3
2	25.009	49.910	3.062e3

Chiral



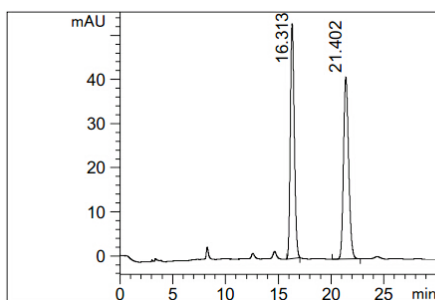
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	18.099	33.501	5.300e3
2	24.901	66.499	1.052e4



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (99/1); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

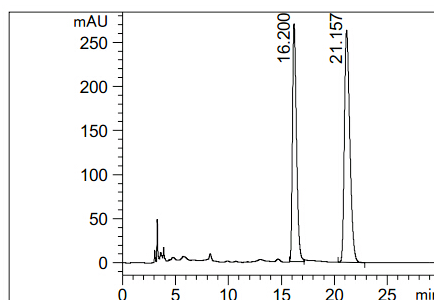
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

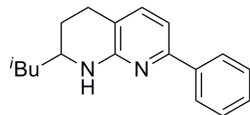
Peak #	RT [min]	Area %	Area
1	16.313	49.653	1.382e3
2	21.402	50.347	1.401e3

Chiral



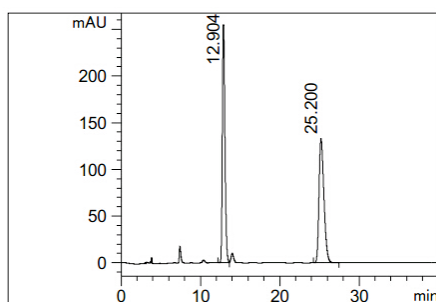
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	16.200	42.937	7.082e3
2	21.157	57.063	9.411e3



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (99/1); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

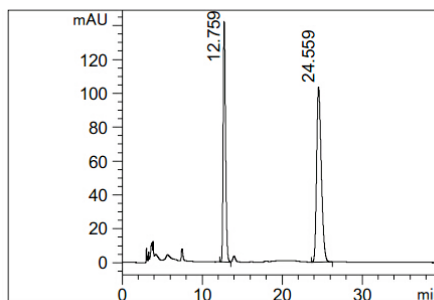
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

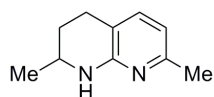
Peak #	RT [min]	Area %	Area
1	12.904	49.926	5.736e3
2	25.200	50.074	5.753e3

Chiral



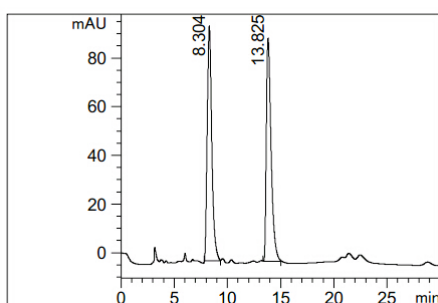
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	12.759	41.344	2.949e3
2	24.559	58.656	4.184e3



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (99/1); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

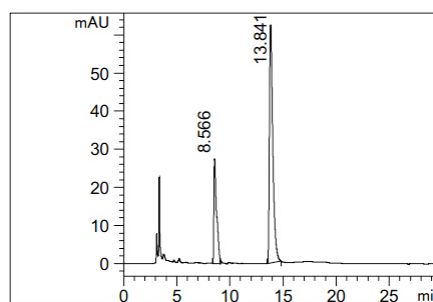
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

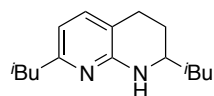
Peak #	RT [min]	Area %	Area
1	8.304	50.346	2.902e3
2	13.825	49.654	2.862e3

Chiral



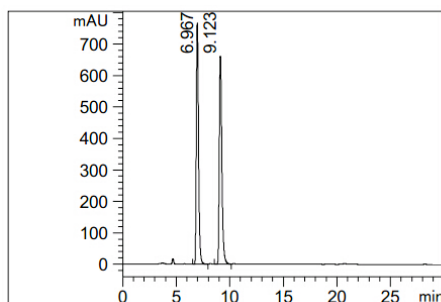
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	8.566	26.003	488.838
2	13.841	73.997	1.391e3



HPLC Conditions: Column: Chiralcel OD-H, Daicel Chemical Industries, Ltd., **Eluent:** Hexanes/IPA (99/1); **Flow rate:** 1.0 mL/min; **Detection:** UV 254 nm

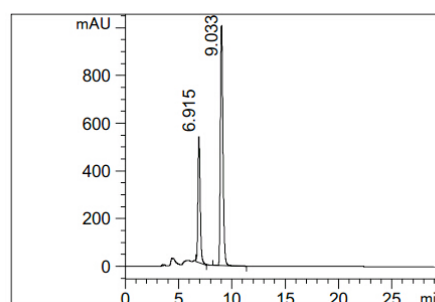
Racemic



Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	6.967	50.026	1.100e4
2	9.123	49.974	1.099e4

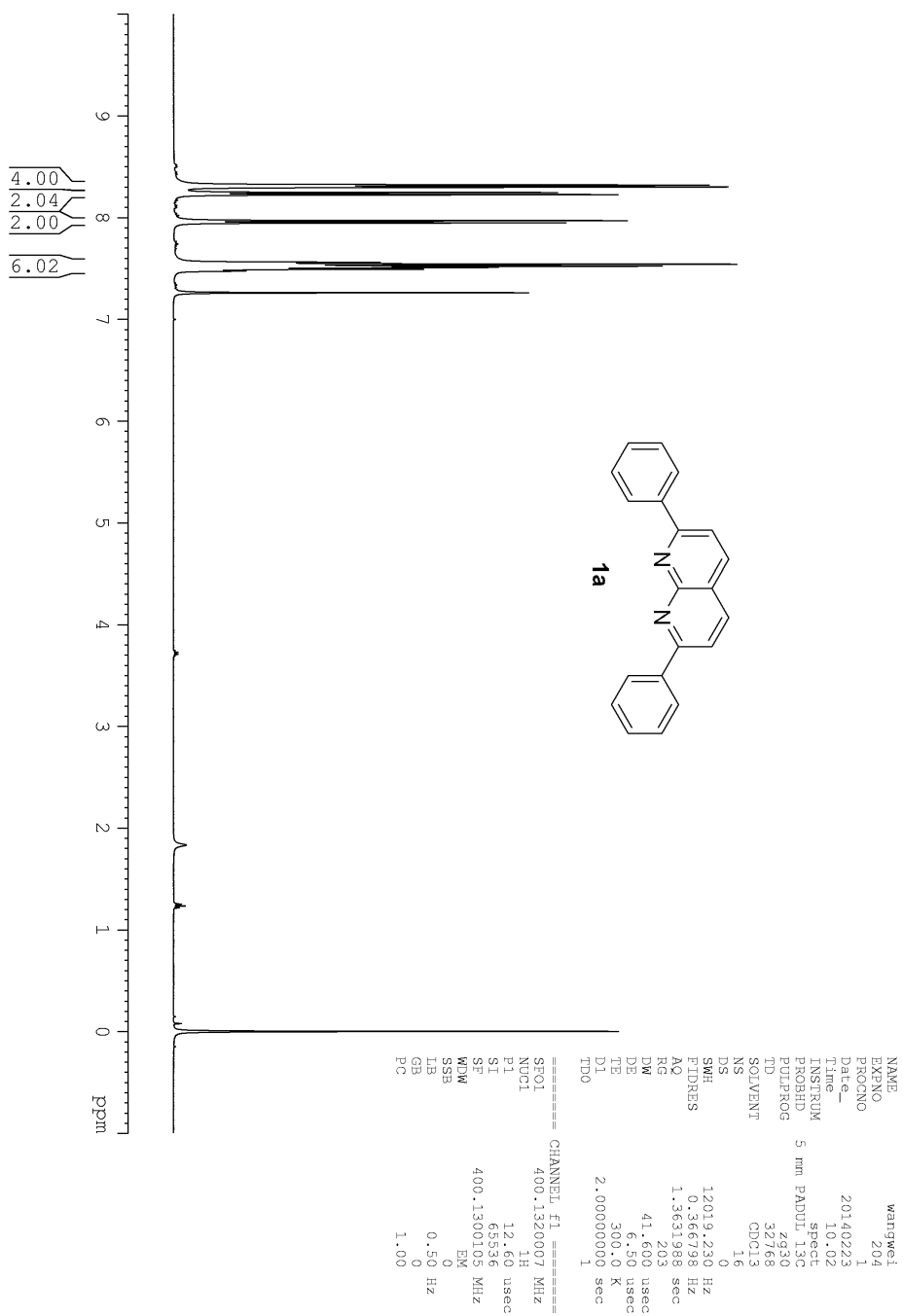
Chiral

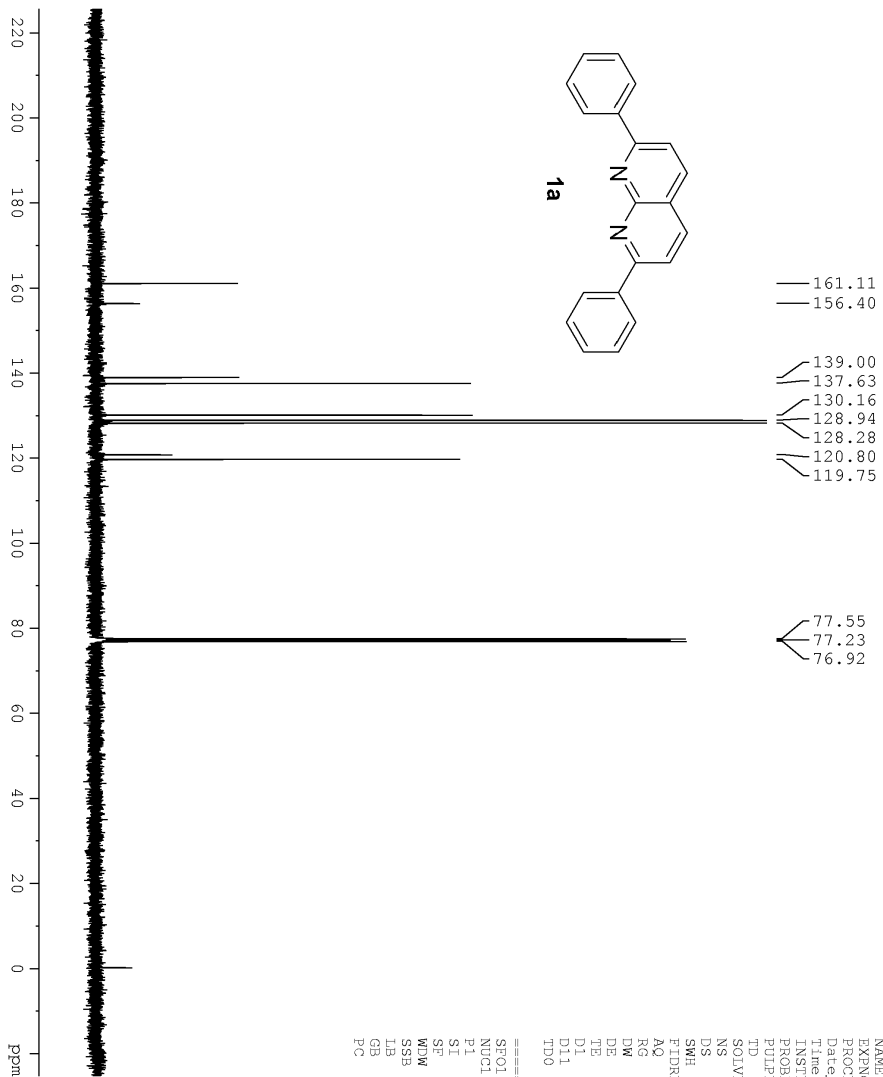


Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RT [min]	Area %	Area
1	6.915	31.651	7.797e3
2	9.033	68.349	1.684e4

NMR spectra for the substrates and products

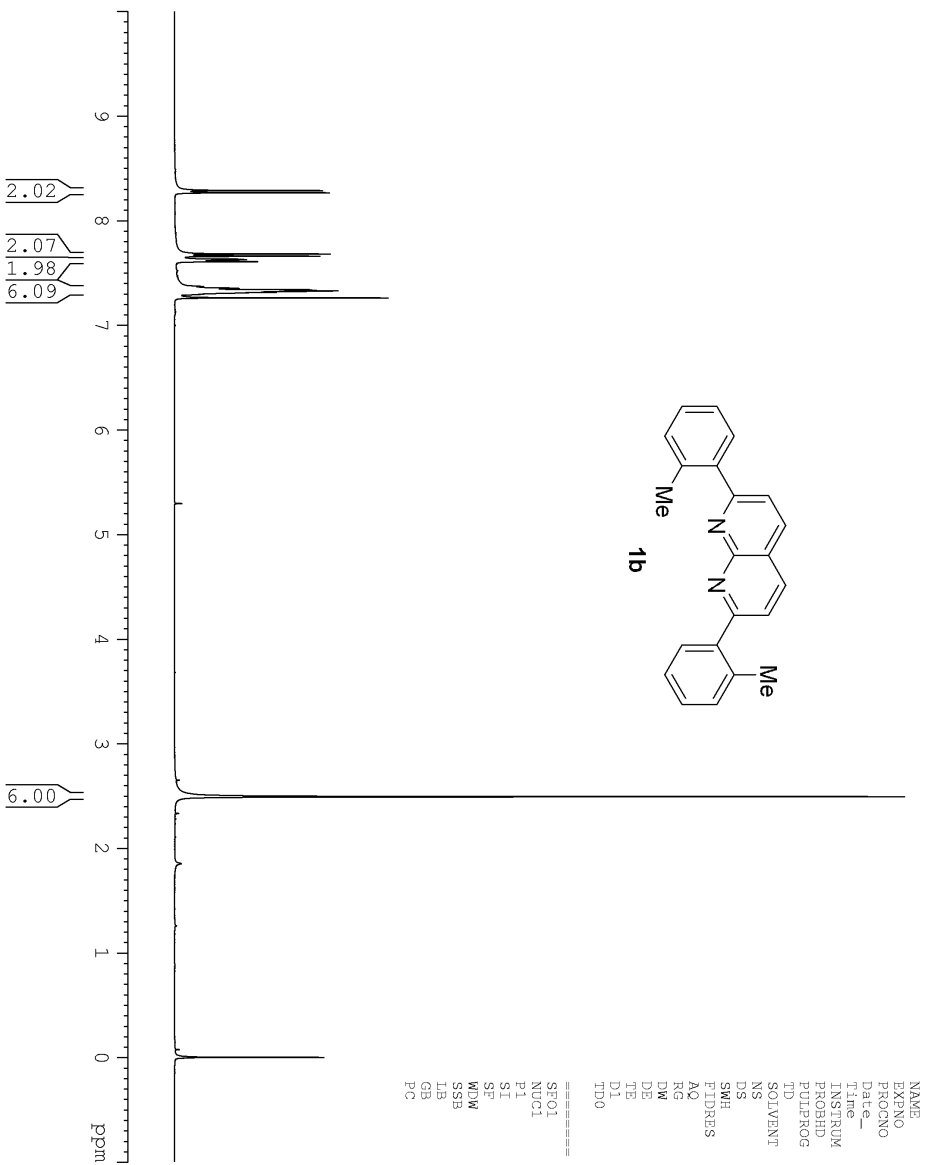
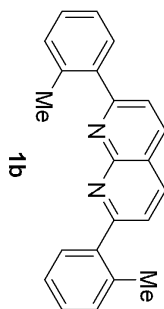




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NAME          wangwei-C
EXPNO         17
PROCNO        1
Date_         20140223
Time_         10.06
INSTRUM       5 mm PABD1
PROBHD        spect
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            261
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

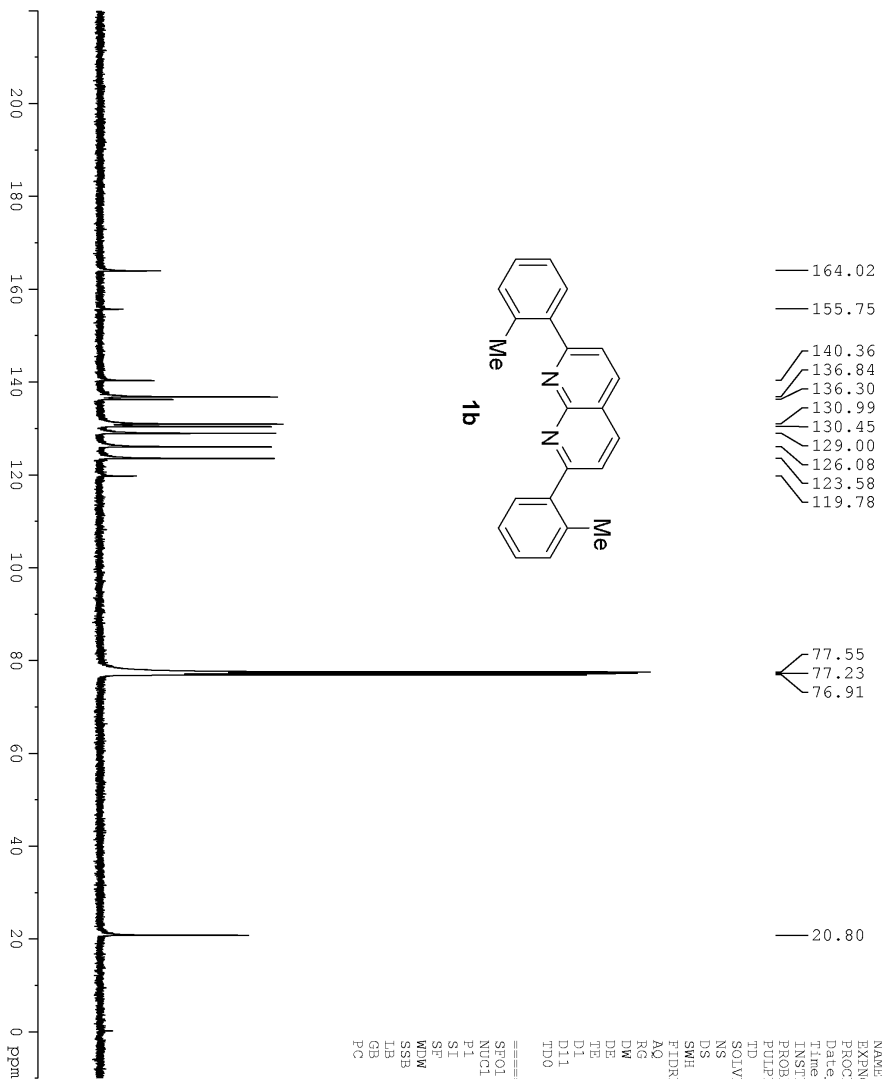
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NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127510 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         500
PROCNO        1
Date_         20140402
Time         8.18
INSTRUM       spect
PROBHD        5 mm PABULI 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            203
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

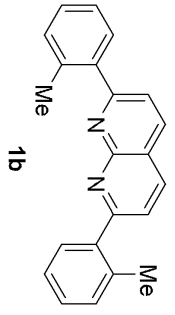
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P1            12.60 usec
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SF            400.1300099 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



164.02
155.75
140.36
136.84
136.30
130.99
130.45
129.00
126.08
123.58
119.78

77.55
77.23
76.91

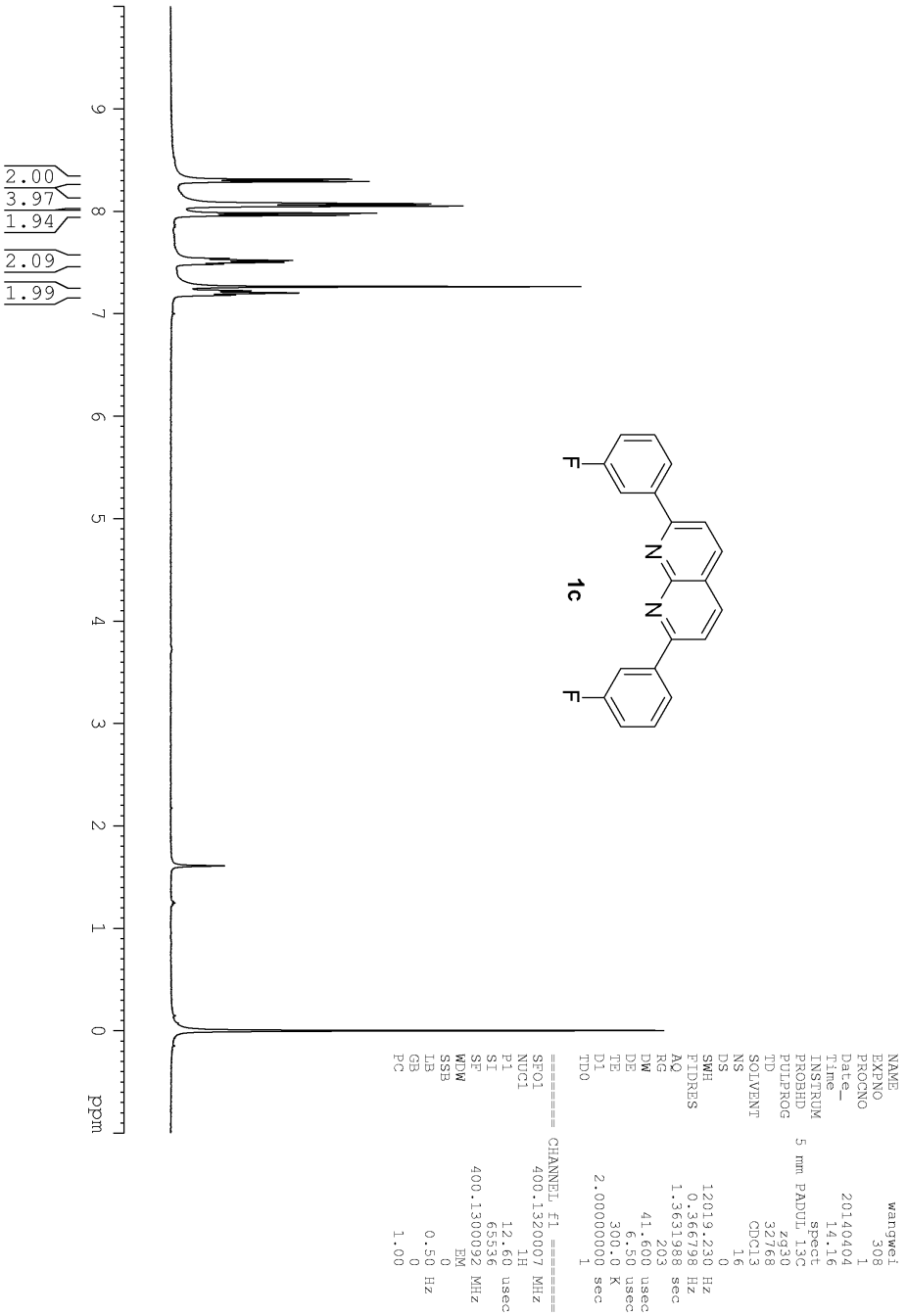
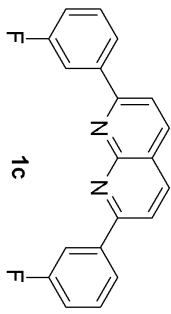
20.80



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NAME wangwei-C
EXPNO 1
PROCNO 1
Date_ 20140402
Time 23:22
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 12339
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 6.50 usec
TD0 1
===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
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SF 100.6127480 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

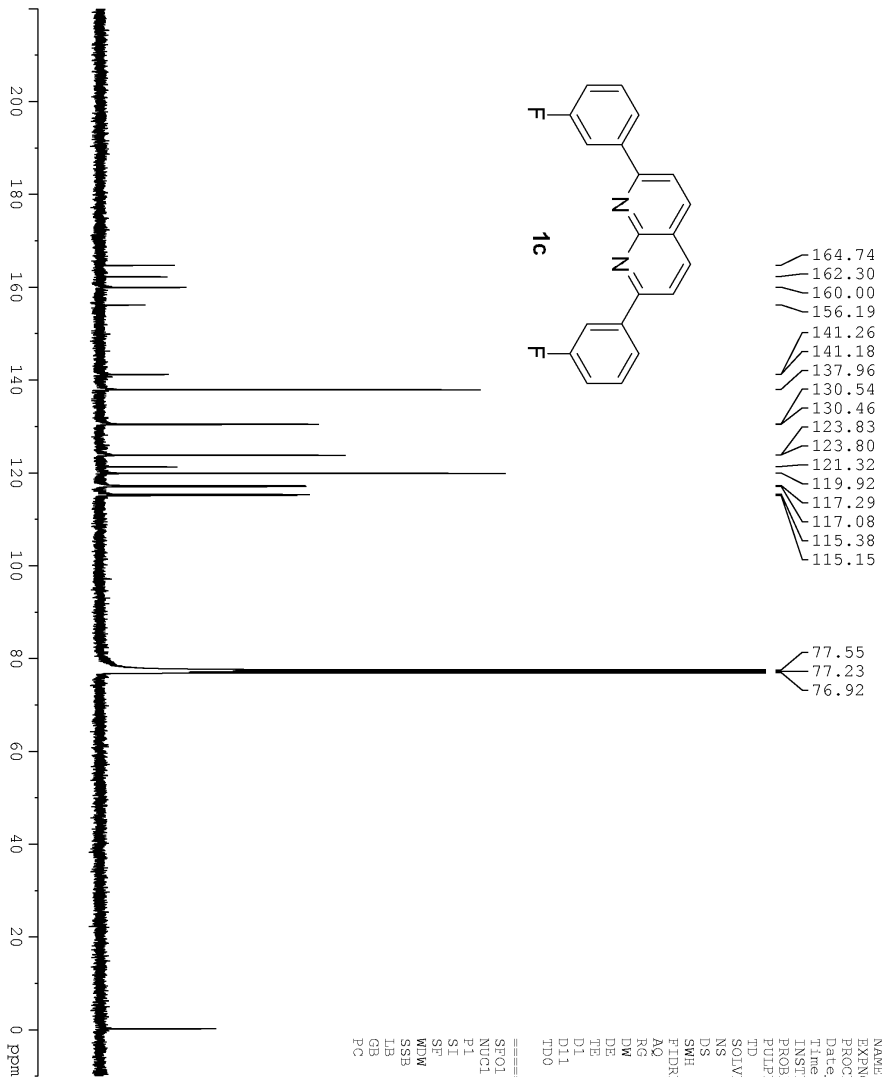
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```

NAME          wangwei
EXPNO         508
PROCNO        1
Date_         20140404
Time          14.16
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
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AQ            1.3631988 sec
RG            203
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

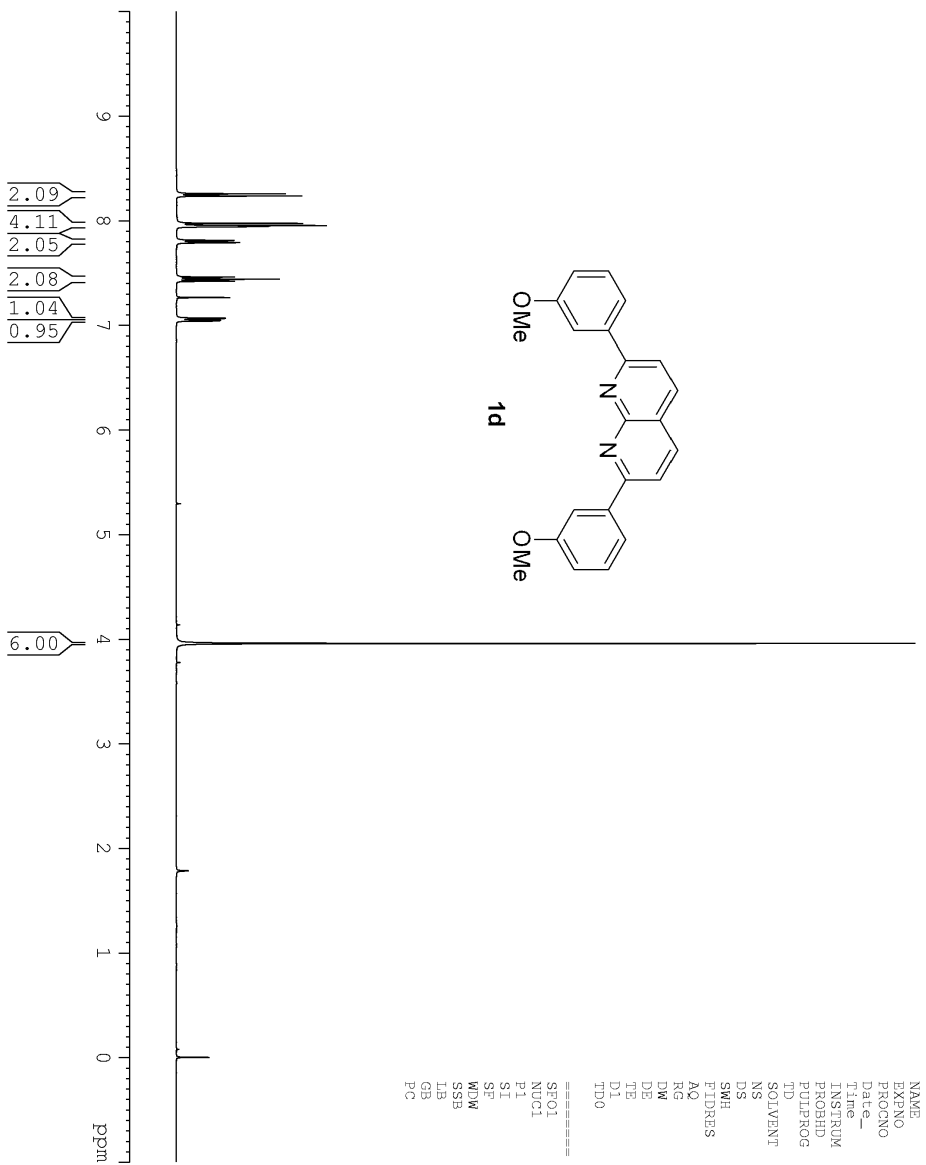
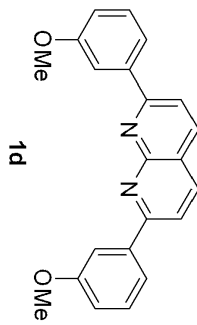
===== CHANNEL f1 =====
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NUC1          1H
P1            12.60 usec
SI            65536
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WDW           EM
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LB            0.50 Hz
GB            0
PC            1.00
  
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```

NAME          wangwei-C
EXPNO         49
PROCNO        1
Date_         20140405
Time         11.08
INSTRUM       spect
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PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            13884
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

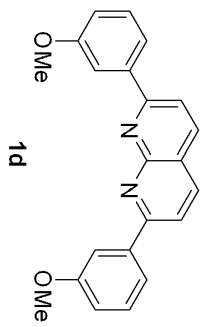
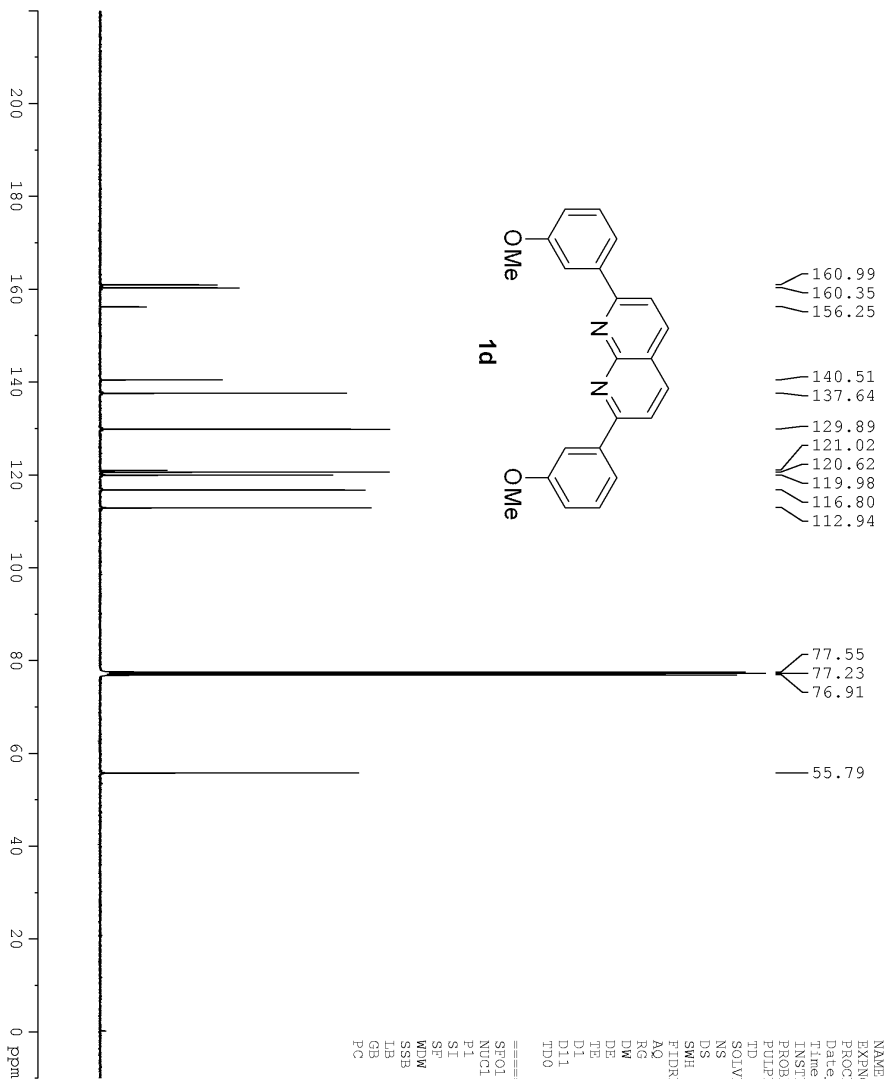
===== CHANNEL f1 =====
SFO1          100.62828298 MHz
NUC1          13C
P1            9.40 usec
SI           32768
SF           100.6127479 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         277
PROCNO        1
Date_         20140322
Time         15.02
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            203
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

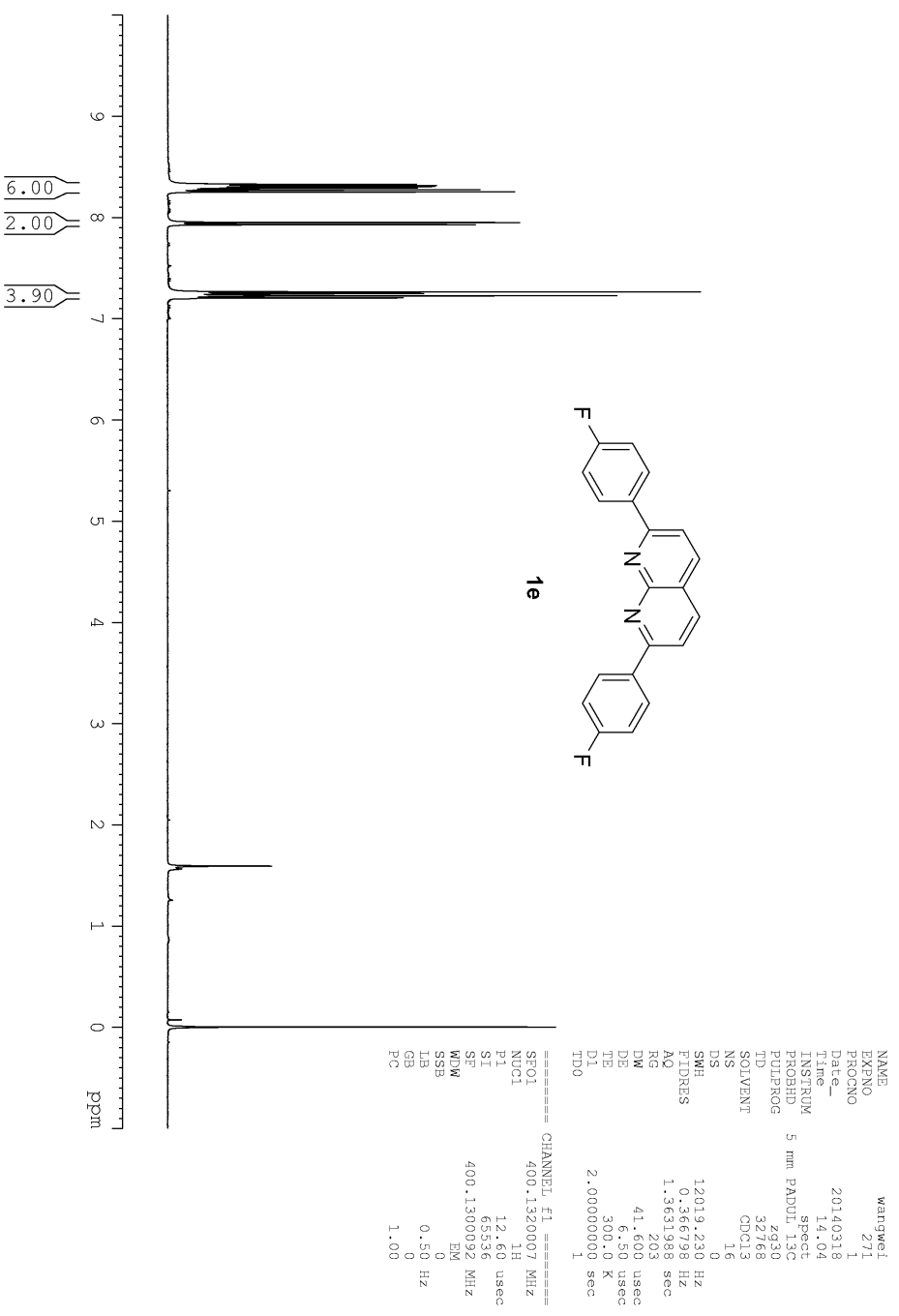
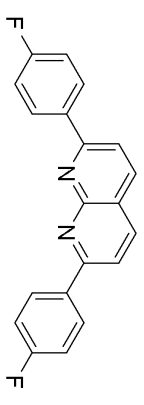
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300087 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



```

NAME          wangwei-C
EXPNO         37
PROCNO        1
Date_         20140322
Time_         15:05
INSTRUM       5 mm PABDJI_13C
PROBHD        zgpg30
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            11017
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

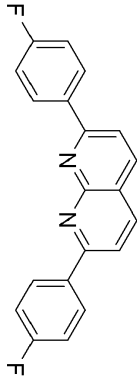
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127502 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

```

NAME          wangwei
EXPNO         271
PROCNO        1
Date_         20140318
Time         14.04
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            203
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

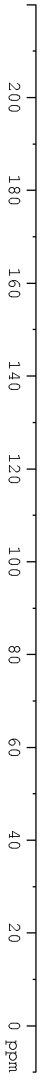
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300092 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



1e

- 165.71
- 163.22
- 160.17
- 156.33
- 137.81
- 135.14
- 135.11
- 130.29
- 130.20
- 120.64
- 119.49
- 116.11
- 115.89

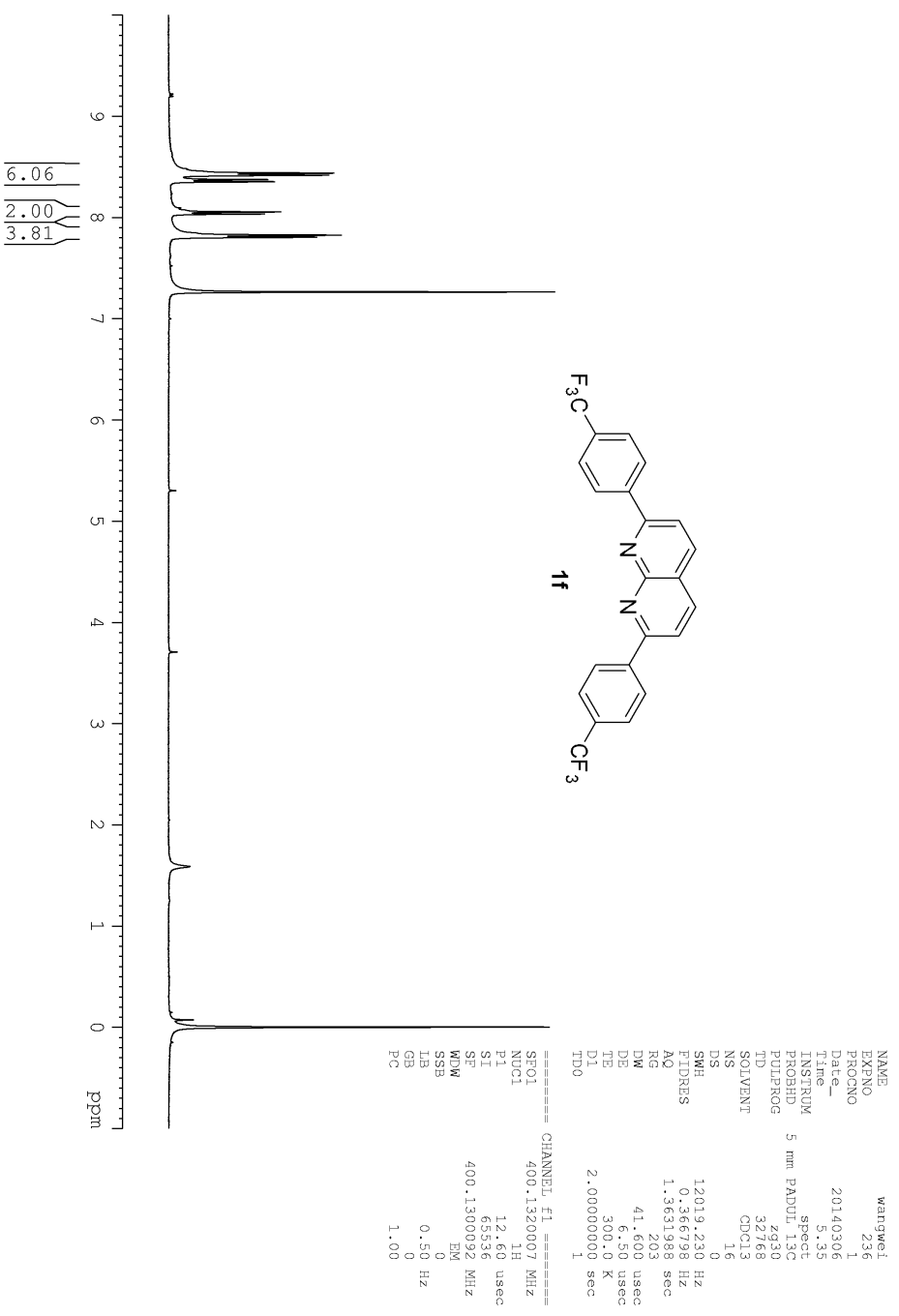
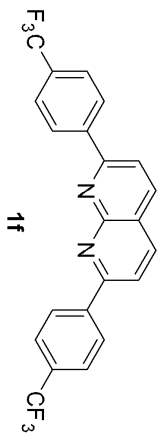
- 77.55
- 77.23
- 76.92



```

NAME          wangwei-C
EXPNO         33
PROCNO        1
Date_         20140318
Time         15:00
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            1185
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         100.628298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127472 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```

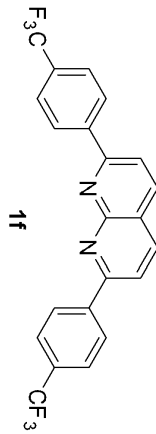


```

NAME          wangwei
EXPNO         236
PROCNO        1
Date_         20140306
Time         5.35
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            203
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1
  
```

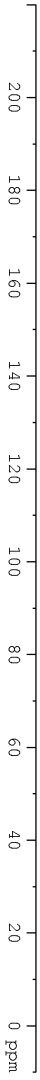
```

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300092 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



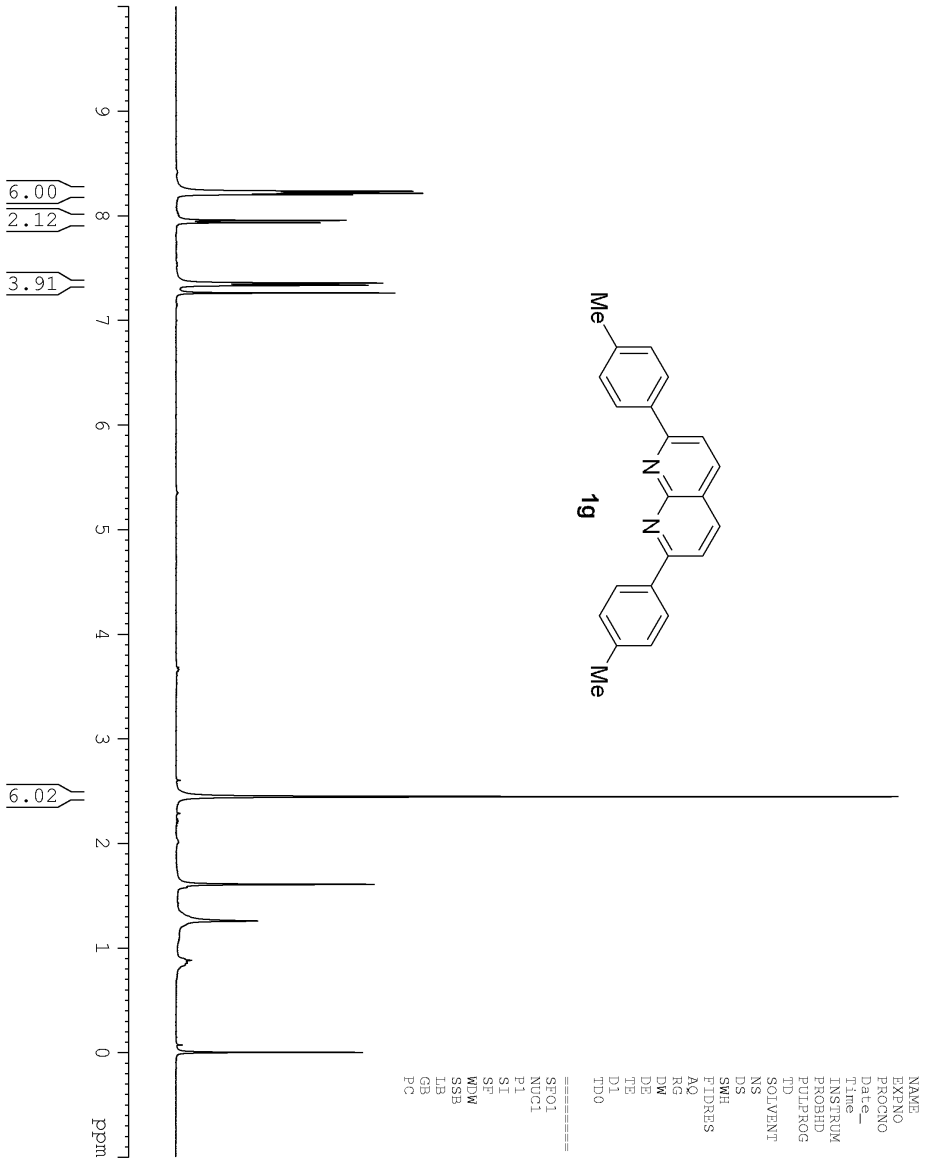
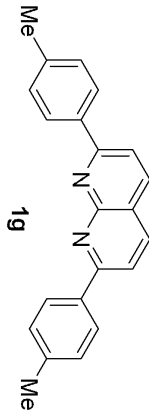
- 159.87
- 156.18
- 142.05
- 138.19
- 132.50
- 132.18
- 131.85
- 131.53
- 128.57
- 126.00
- 125.97
- 125.93
- 125.89
- 125.63
- 122.93
- 121.51
- 120.18

- 77.55
- 77.23
- 76.91



```

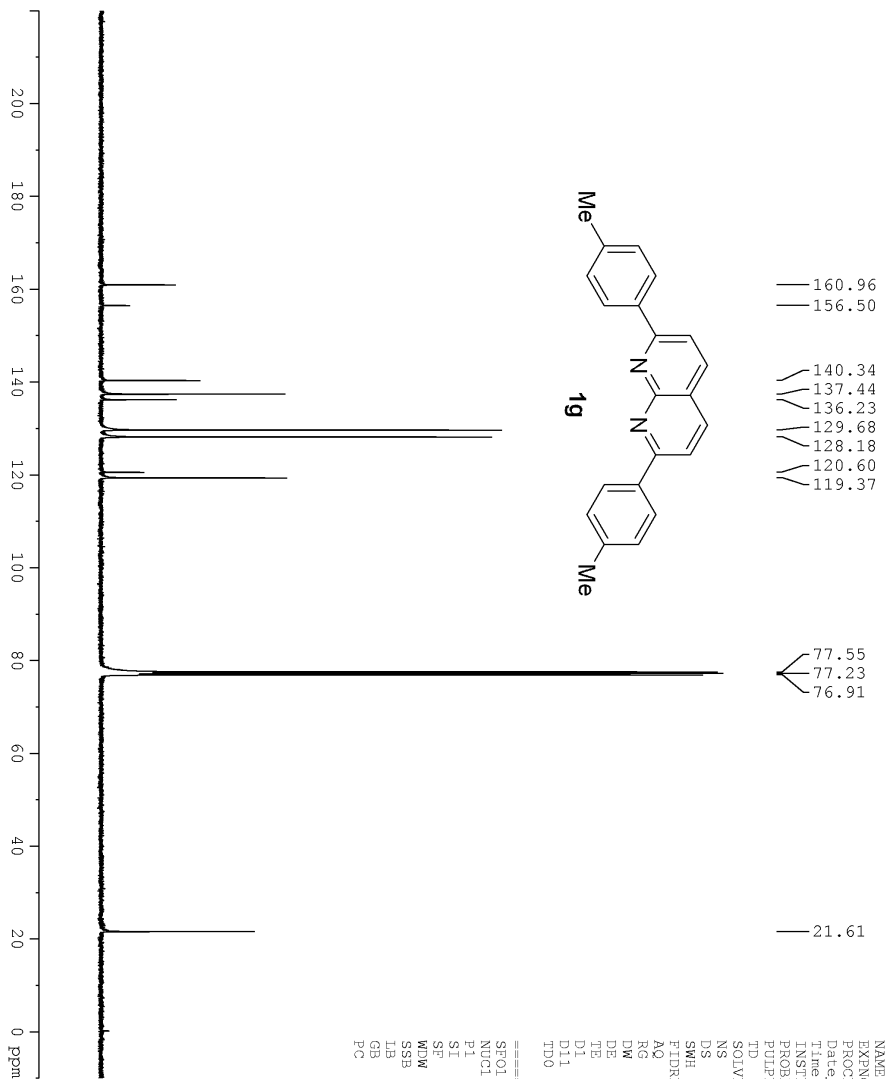
NAME wangwei-C
EXPNO 1
PROCNO 1
Date_ 20140505
Time_ 23:47
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 14359
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 6.50 usec
D1 300.0 K
D11 2.00000000 sec
TD0 0.03000000 sec
===== CHANNEL f1 =====
SFO1 100.6282898 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127495 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
  
```



```

NAME          wangwei
EXPNO         541
PROCNO        1
Date_         20140827
Time          8.02
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 HZ
FIDRES        0.366798 HZ
AQ            1.3631988 sec
RG            203
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

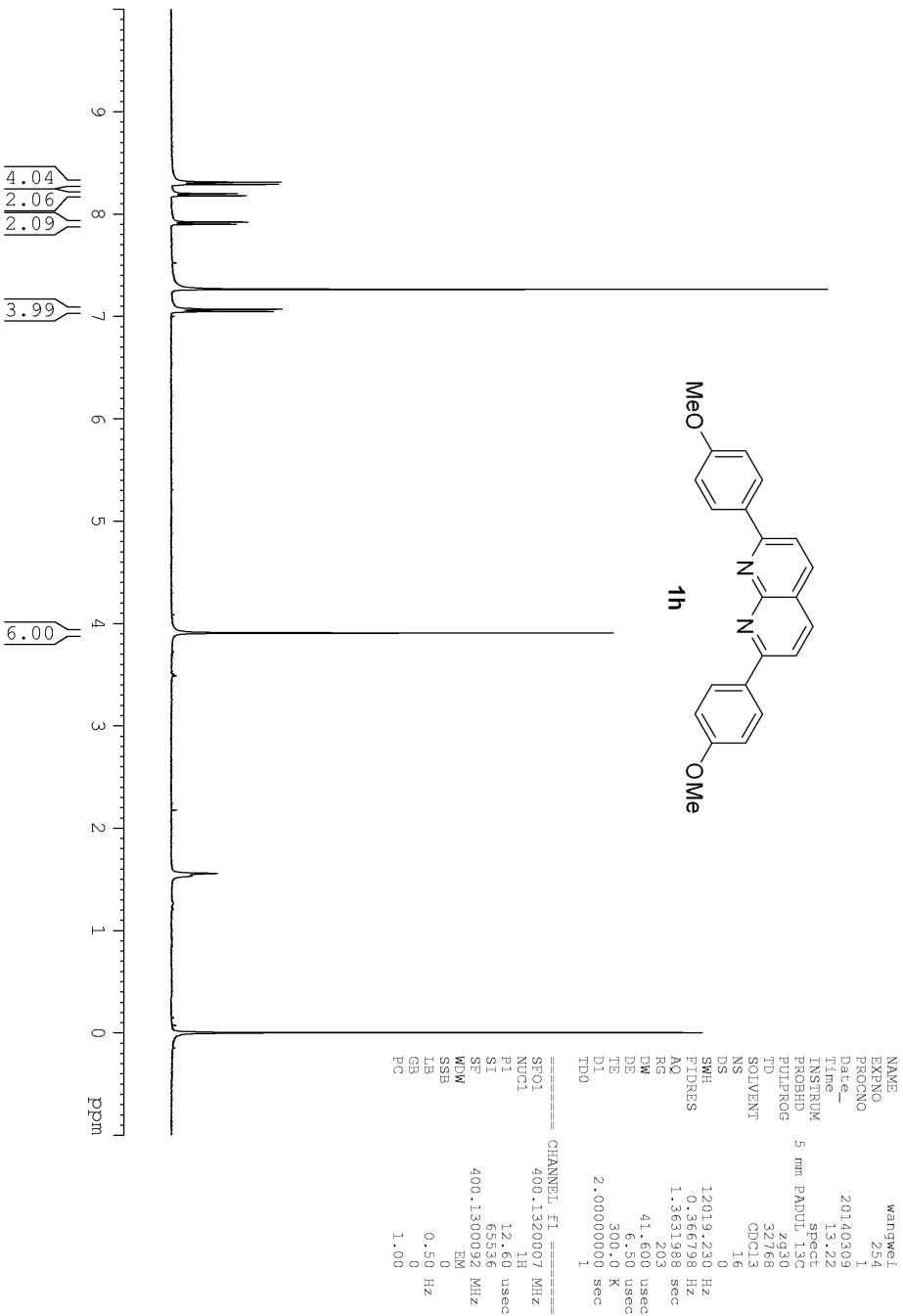
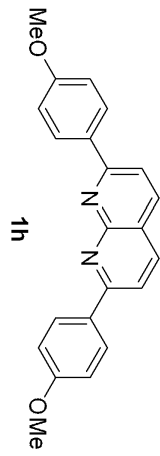
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300101 MHz
WDW           EM
SSB           0
LB            0.50 HZ
GB            0
PC            1.00
  
```



```

NAME          wangwei-C
EXPNO         30
PROCNO        1
Date_         20140312
Time         14.10
INSTRUM       spect
PROBHD        5 mm PABD1-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            13224
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

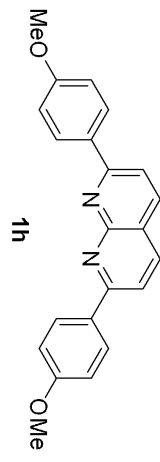
===== CHANNEL f1 =====
SFO1         100.6228298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127495 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```



```

NAME          wangwei
EXPNO         254
PROCNO        1
Date_         20140309
Time         13.22
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG            203
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300092 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```



- 161.52
- 160.52
- 137.37
- 131.64
- 129.72
- 120.17
- 118.89
- 114.31

- 77.55
- 77.23
- 76.91

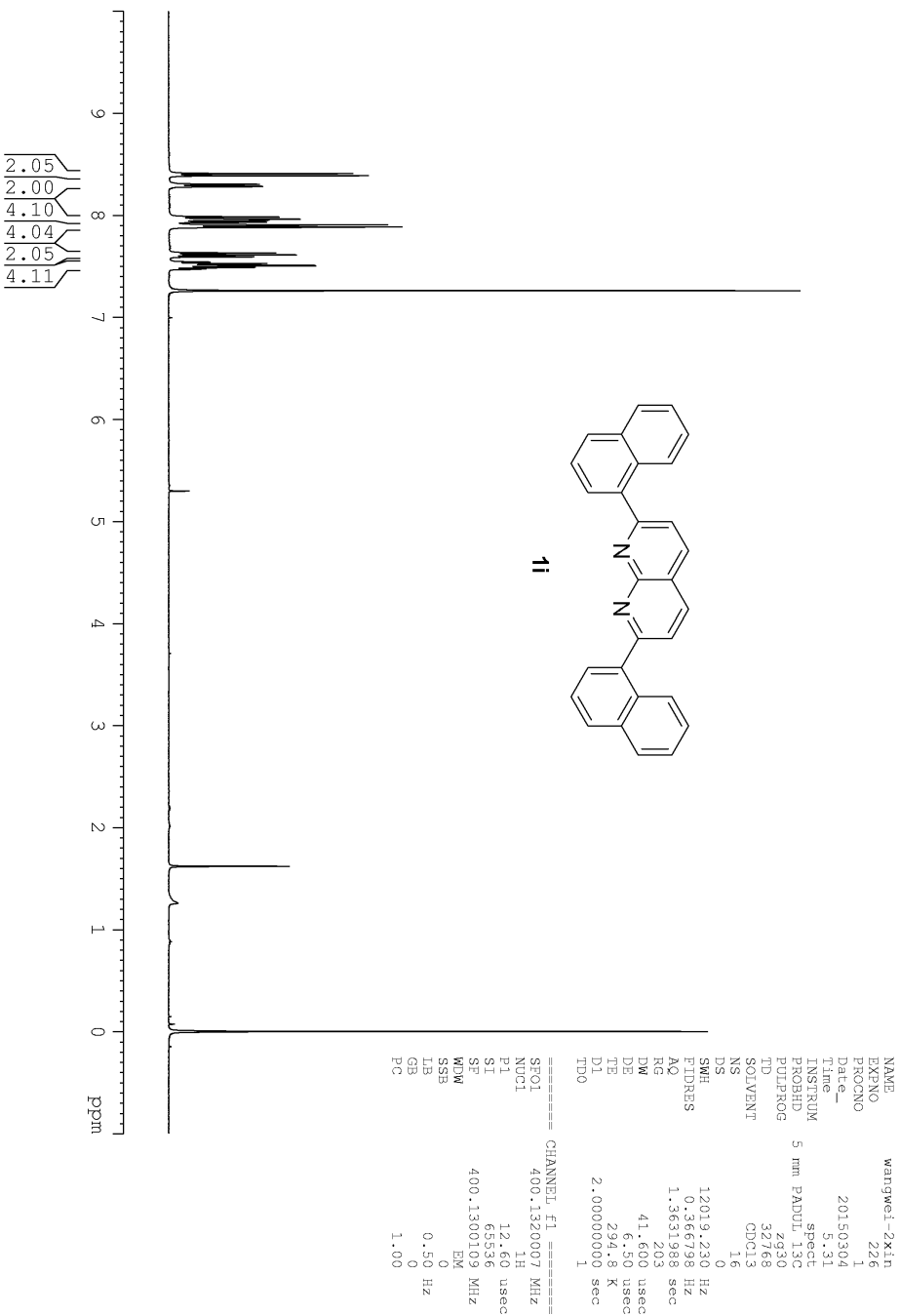
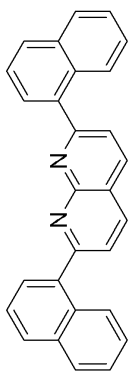
- 55.62



```

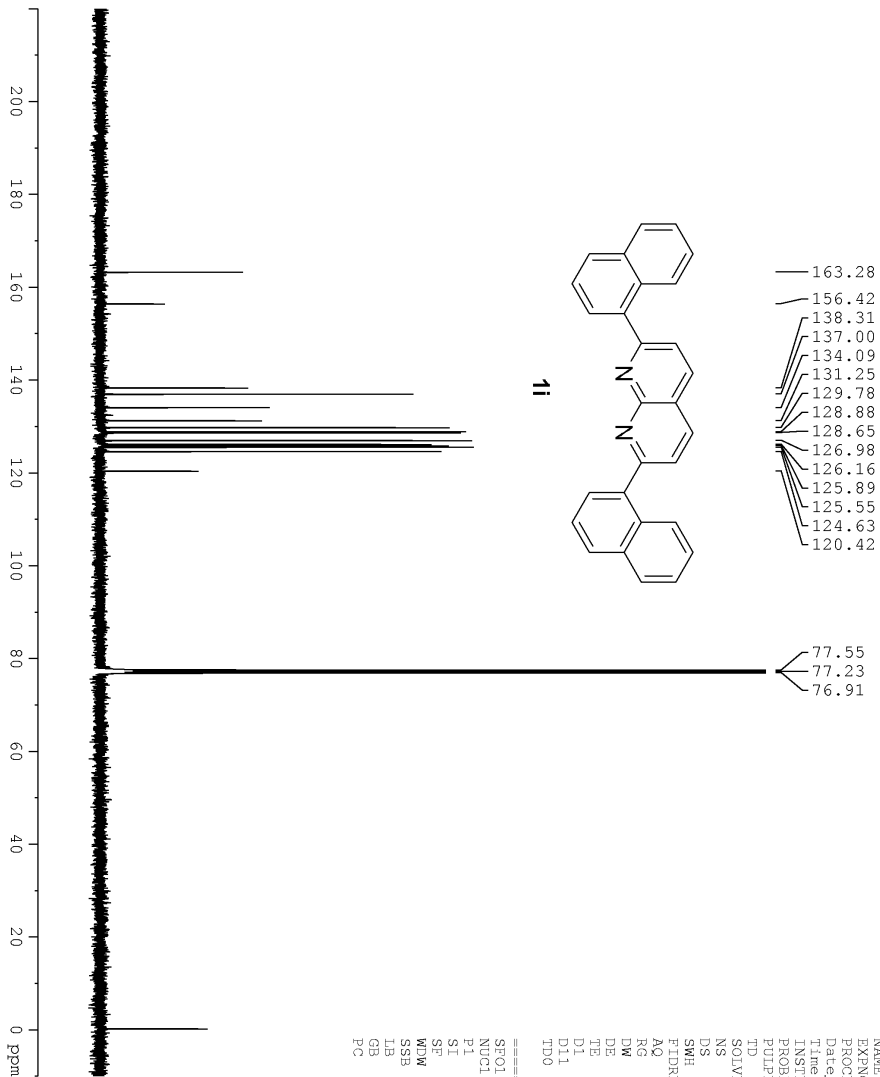
NAME wangwei-C
EXPNO 1
PROCNO 1
Date_ 20140309
Time 14:26
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 11497
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127479 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
  
```

```

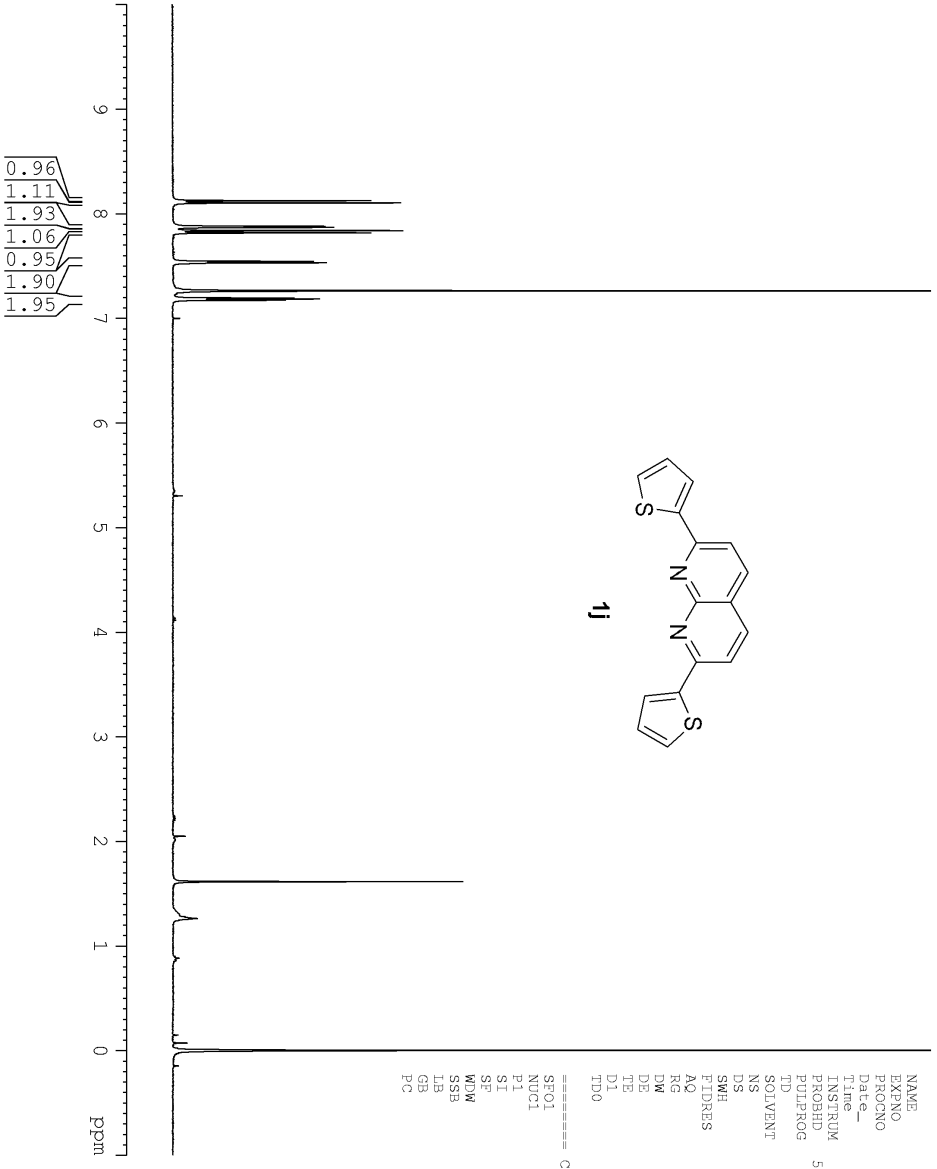
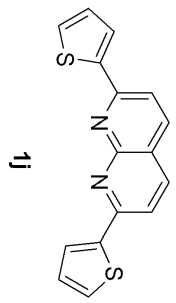
NAME      wangwei_2x.in
EXPNO     1
PROCNO    1
Date_     20150304
Time      5.31
INSTRUM   spect
PROBHD    5 mm PABUL 13C
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         16
DS         0
SWH        12019.230 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         203
DE         41.600 usec
TE         6.50 usec
TD0        294.8 K
DI         2.0000000 sec
===== CHANNEL f1 =====
SFO1      400.1320007 MHz
NUC1      13C
P1        12.60 usec
SI        65536
SF        400.1300109 MHz
WDW       EM
SSB       0
LB        0.50 Hz
GB        0
PC        1.00
  
```



```

NAME          wangwei-C-1 HUIFU
EXPNO         31
PROCNO        1
Date_         20150304
Time_         12:49
INSTRUM       spect
PROBHD        5 mm PABD1-13C
PULPROG       zgpg30
TD             32768
SOLVENT       CDCl3
NS             5790
DS             0
SWH            25252.525 Hz
FIDRES        0.770646 Hz
AQ             0.6488564 sec
RG             203
DE             19.800 usec
TE             295.9 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0            1

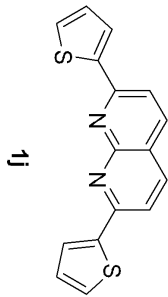
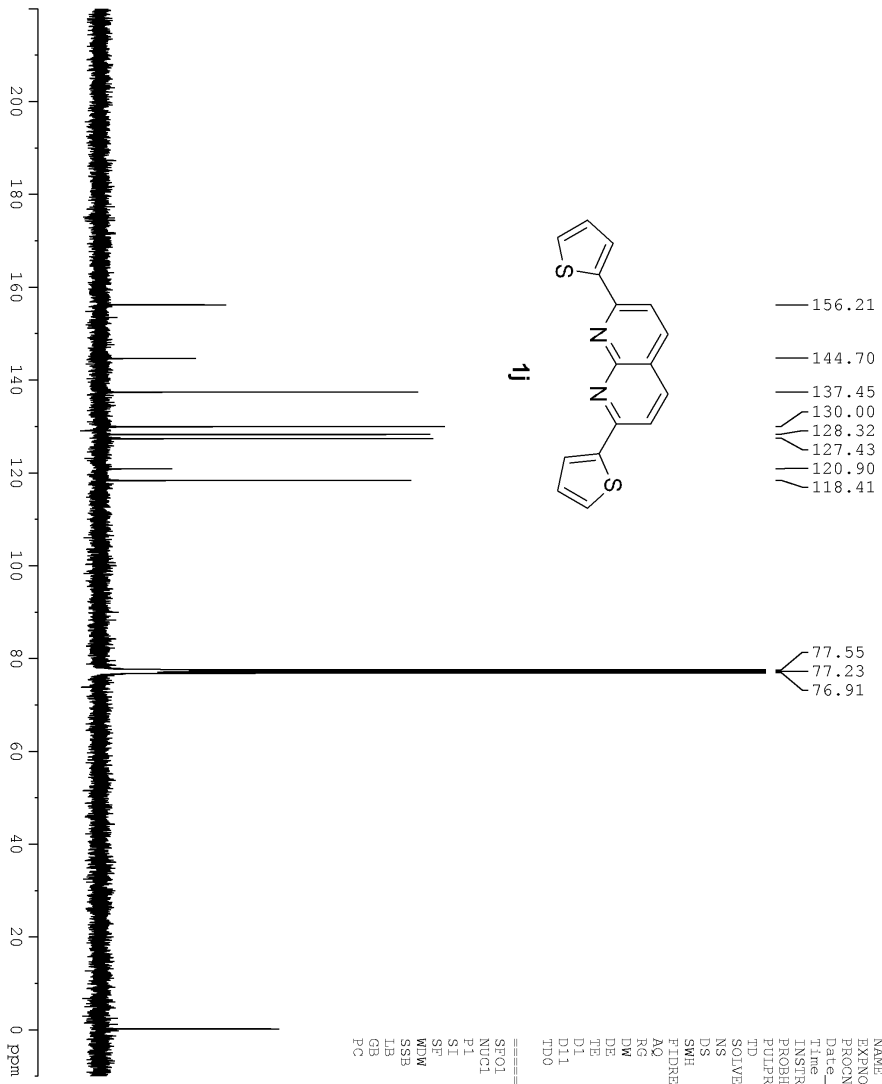
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127487 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei-2x1n
EXPNO         222
PROCNO        1
Date_         20150303
Time         5.41
INSTRUM       spect
PROBHD        5 mm PABULI 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 HZ
FIDRES       0.366798 HZ
AQ           1.3631988 sec
RG            203
DE           41.600 usec
TE           295.3 K
D1           2.00000000 sec
TD0          1

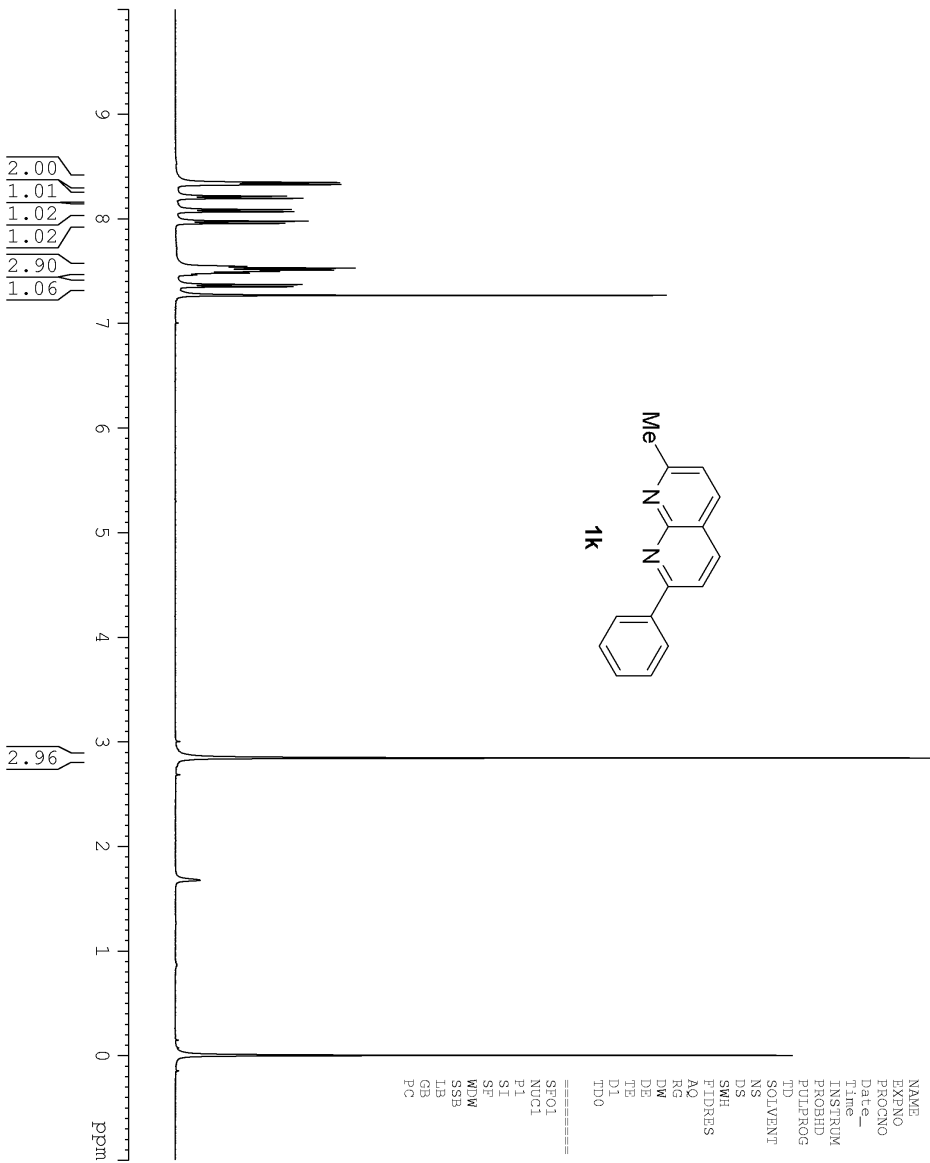
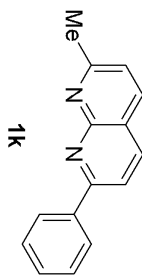
===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         13C
P1           12.60 usec
SI           65536
SF           400.1300098 MHz
WDW          EM
SSB          0
LB           0.50 HZ
GB           0
PC           1.00
  
```



```

NAME          wangwei-C-1_HUJFU
EXPNO         23
PROCNO        1
Date_         20150303
Time_         13.11
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            7900
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            296.5 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

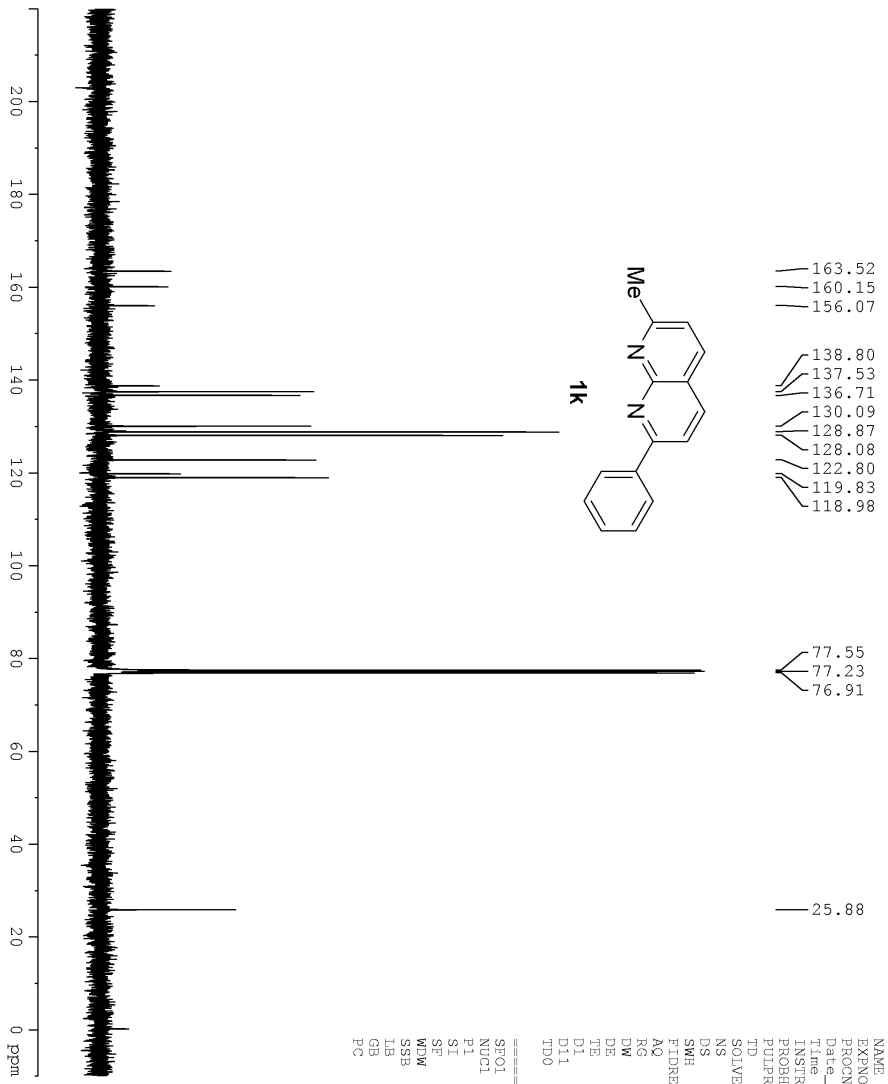
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127479 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         202
PROCNO       20140222
Date_        7.47
Time         spect
INSTRUM      5 mm PABUL
PROBHD       13C
PULPROG      zg30
TD           32768
SOLVENT      CDCl3
NS           16
DS           0
SWH          12019.230 HZ
FIDRES      0.366798 HZ
AQ          1.3631988 sec
RG           203
DW          41.600 usec
DE          6.50 usec
TE           300.0 K
D1          2.00000000 sec
TD0         1

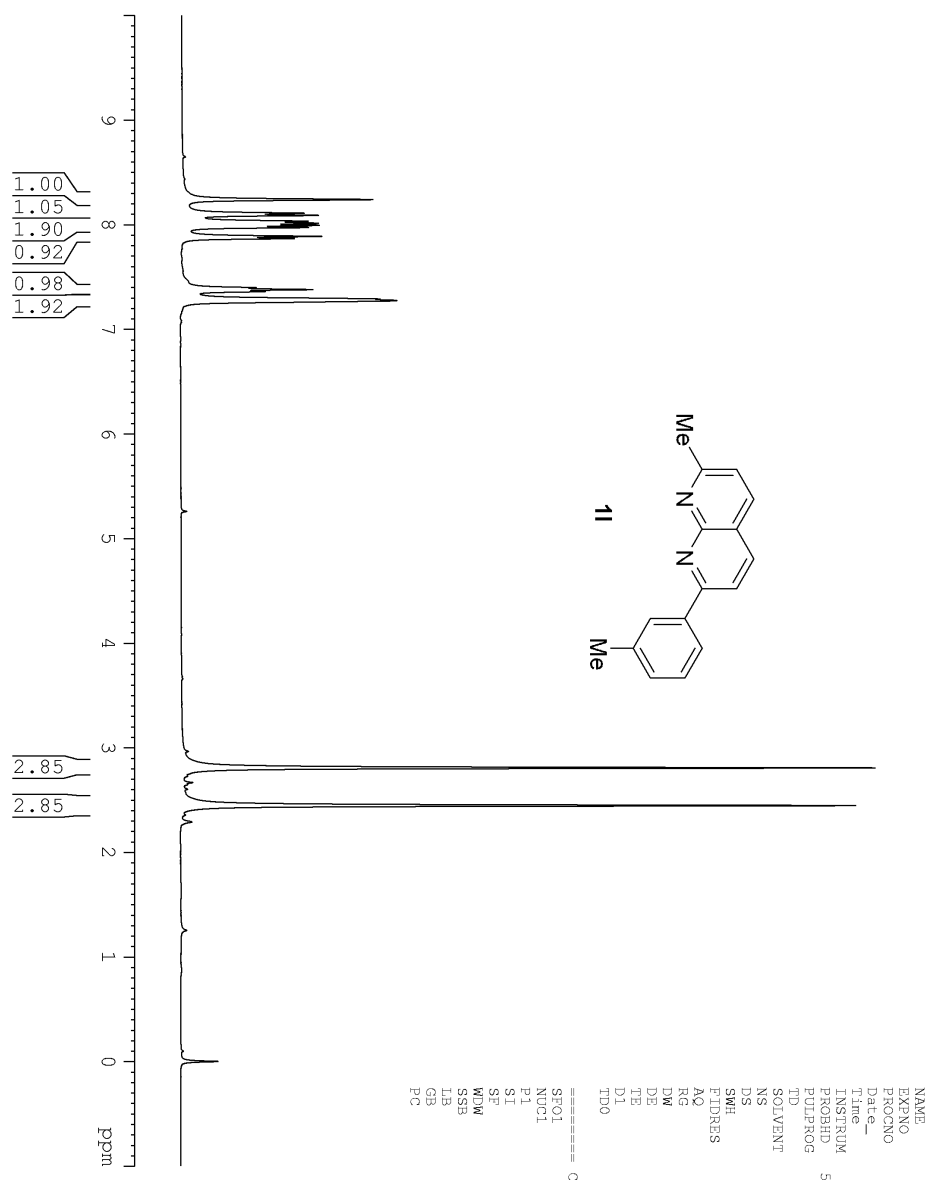
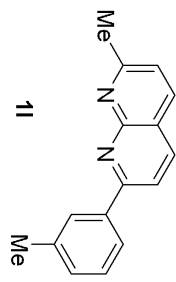
===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1          12.60 usec
SI          65536
SF          400.1300081 MHz
WDW          EM
SSB          0
LB          0.50 HZ
GB          0
PC          1.00
  
```



```

NAME          wangwei-C
EXPNO         15
PROCNO        1
Date_         20140223
Time_         7.44
INSTRUM       spect
PROBHD        5 mm PABD1-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            221
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

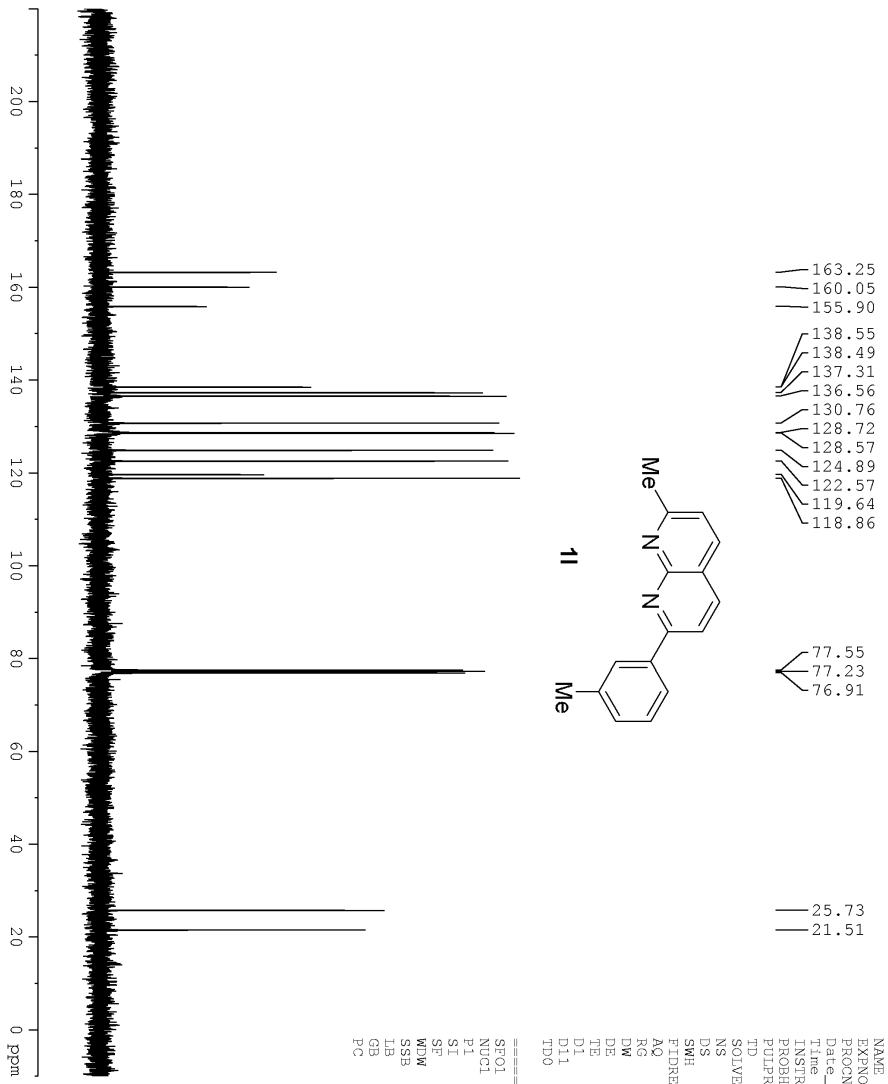
===== CHANNEL f1 =====
SFO1          100.628298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127525 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         348
PROCNO       1
Date_        20140423
Time         9.39
INSTRUM      spect
PROBHD       5 mm PABUL 13C
PULPROG      zg30
TD           32768
SOLVENT      CDCl3
NS           16
DS           0
SWH          12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           64
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1299960 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```

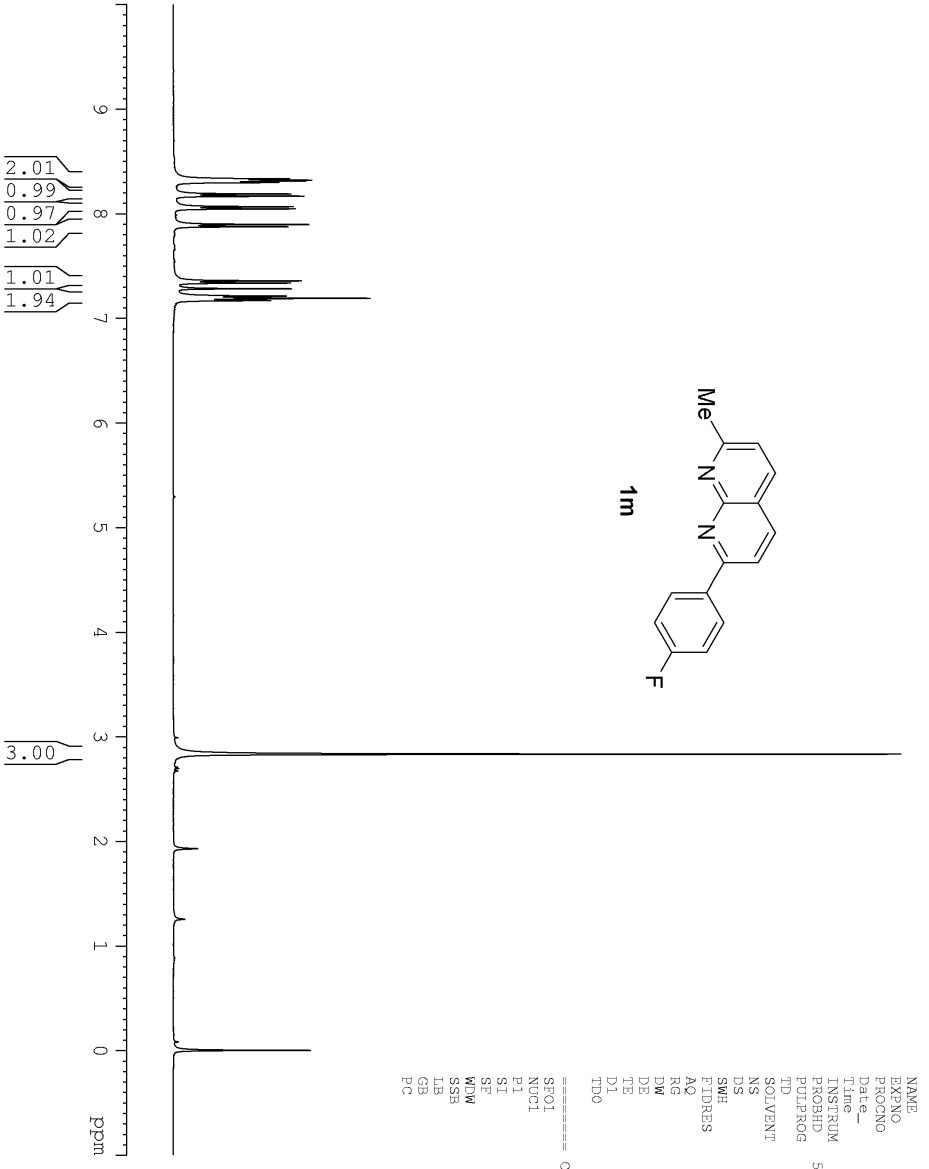
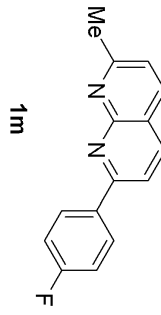


```

NAME          wangwei-C
EXPNO         63
PROCNO        1
Date_         20140423
Time_         9.37
INSTRUM       spect
PROBHD        5 mm PABD11-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            67
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

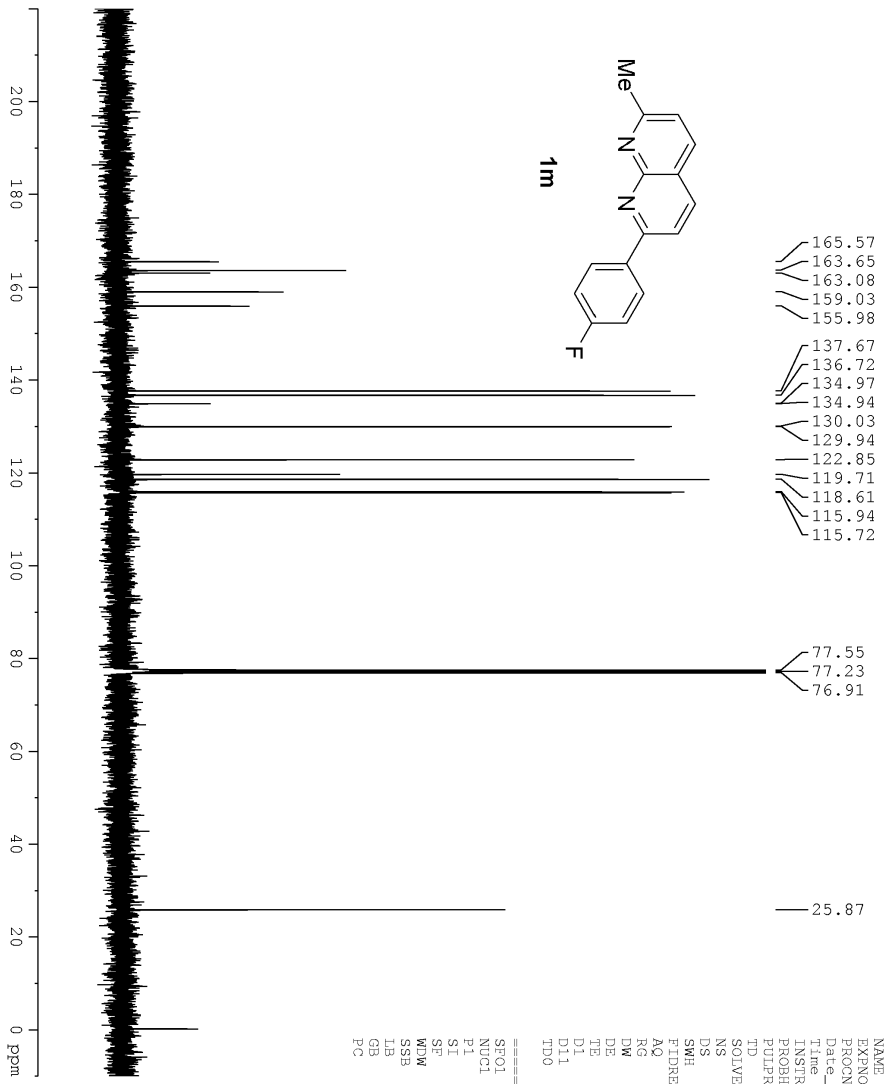
===== CHANNEL f1 =====
SFO1         100.628298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127626 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40

```

```

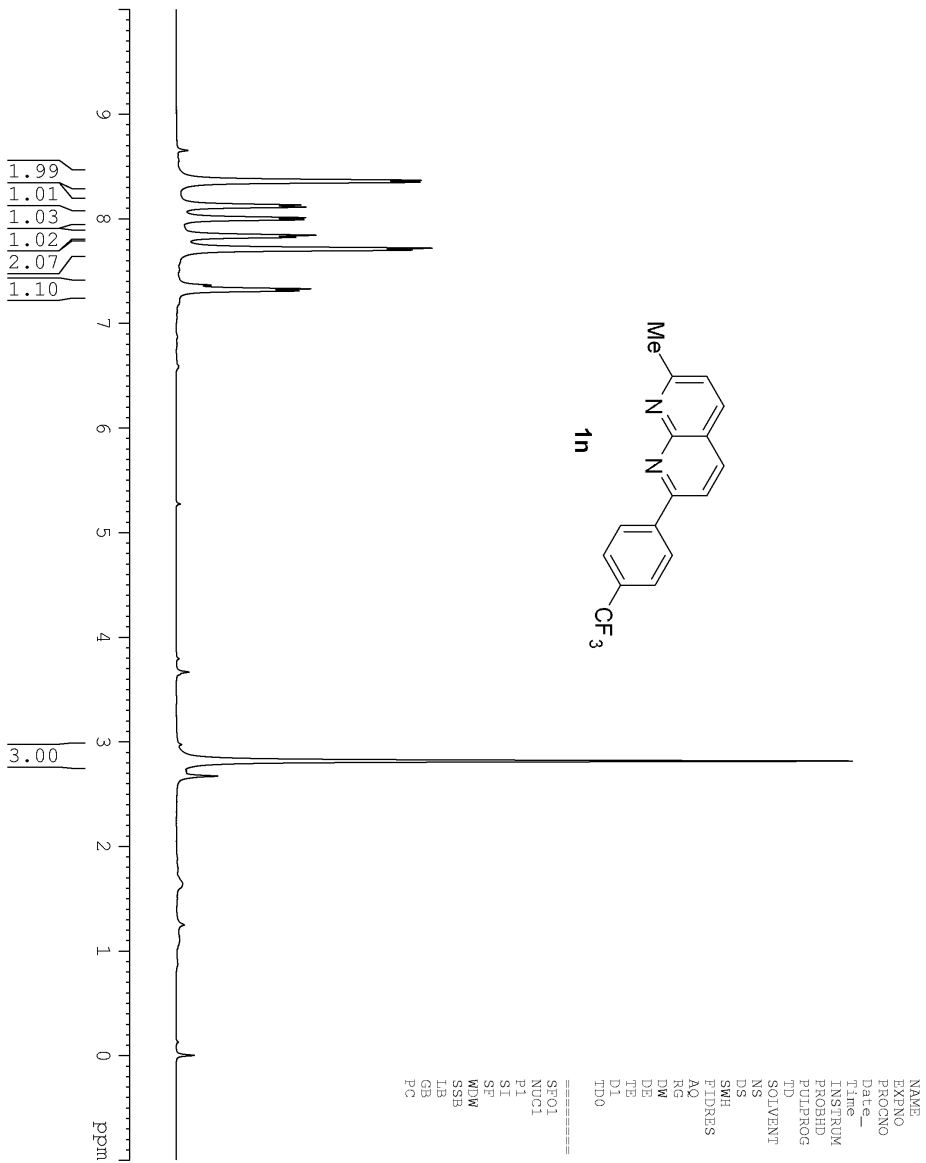
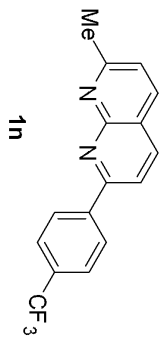
NAME          wangwei
EXPNO         341
PROCNO       1
Date_        20140420
Time         8.36
INSTRUM      spect
PROBHD       5 mm PABUL 13C
PULPROG      zg30
TD           2930
SOLVENT      CDCl3
NS           16
DS           0
SWH          12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           161
DE           41.600 usec
TE           6.50 usec
D1           300.0 K
TD0          2.00000000 sec
===== CHANNEL f1 =====
SF01         400.1320007 MHz
NUC1         13C
P1           12.60 usec
SI           65536
SF           400.1300019 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```



```

NAME          wangwei-C
EXPNO         60
PROCNO        1
Date_         20140420
Time_         8.39
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            343
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

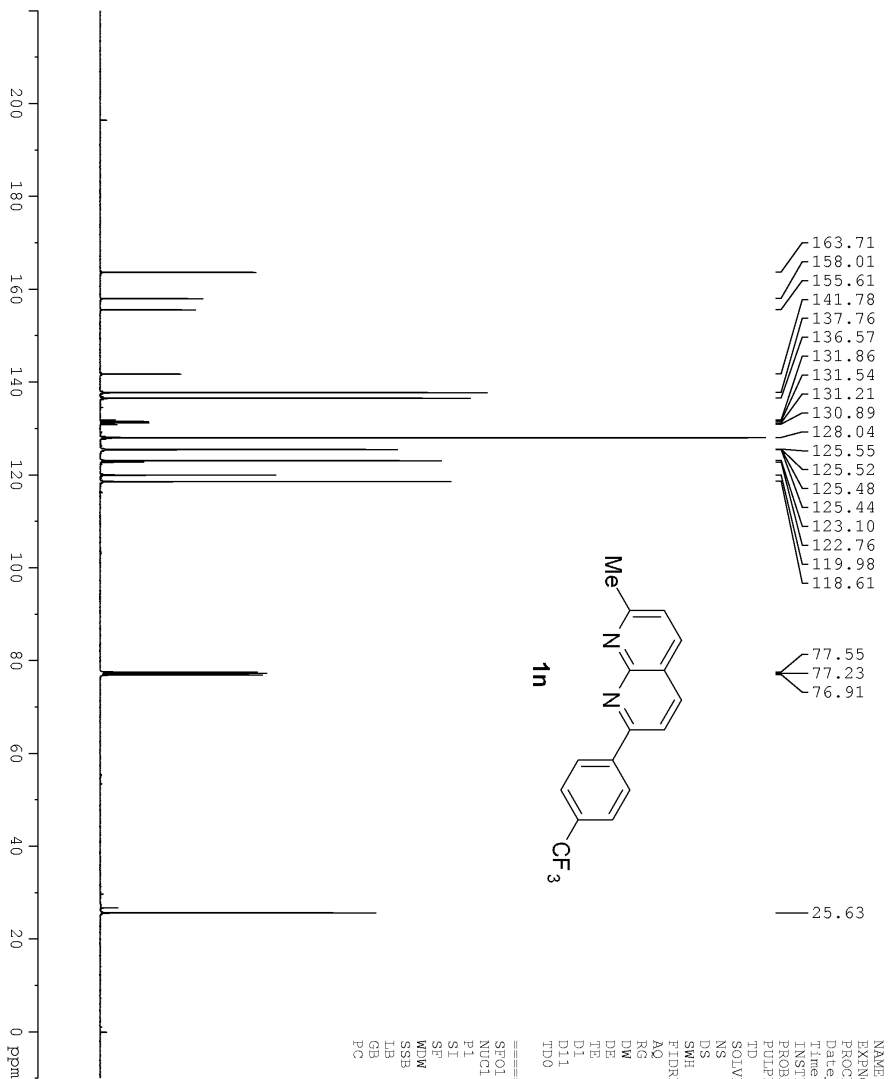
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127526 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         345
PROCNO        1
Date_         20140422
Time          12.26
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1299689 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```

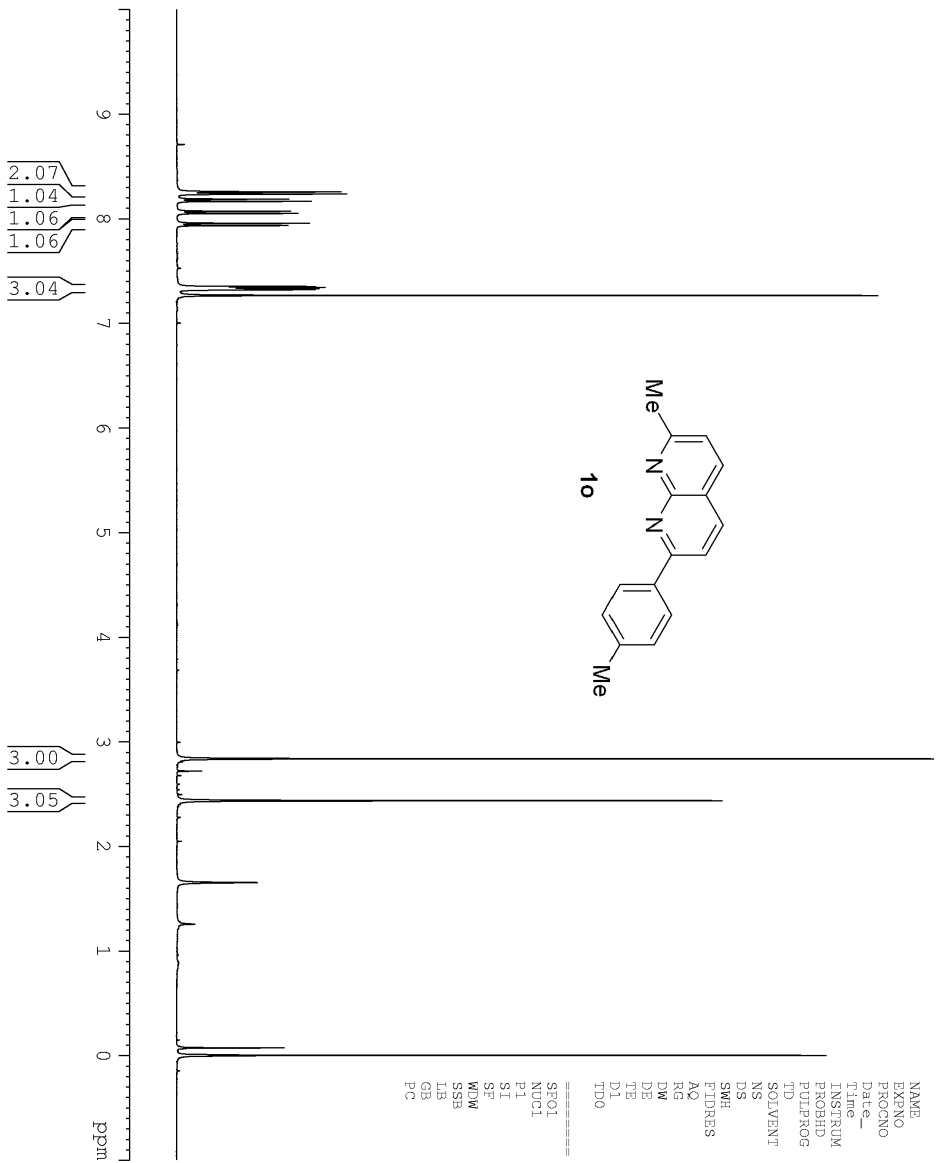
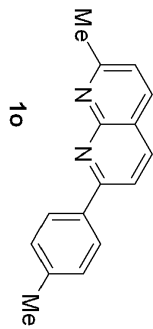


```

NAME          wangwei-C
EXPNO         62
PROCNO        1
Date_         20140422
Time_         23.34
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            12922
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127648 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40

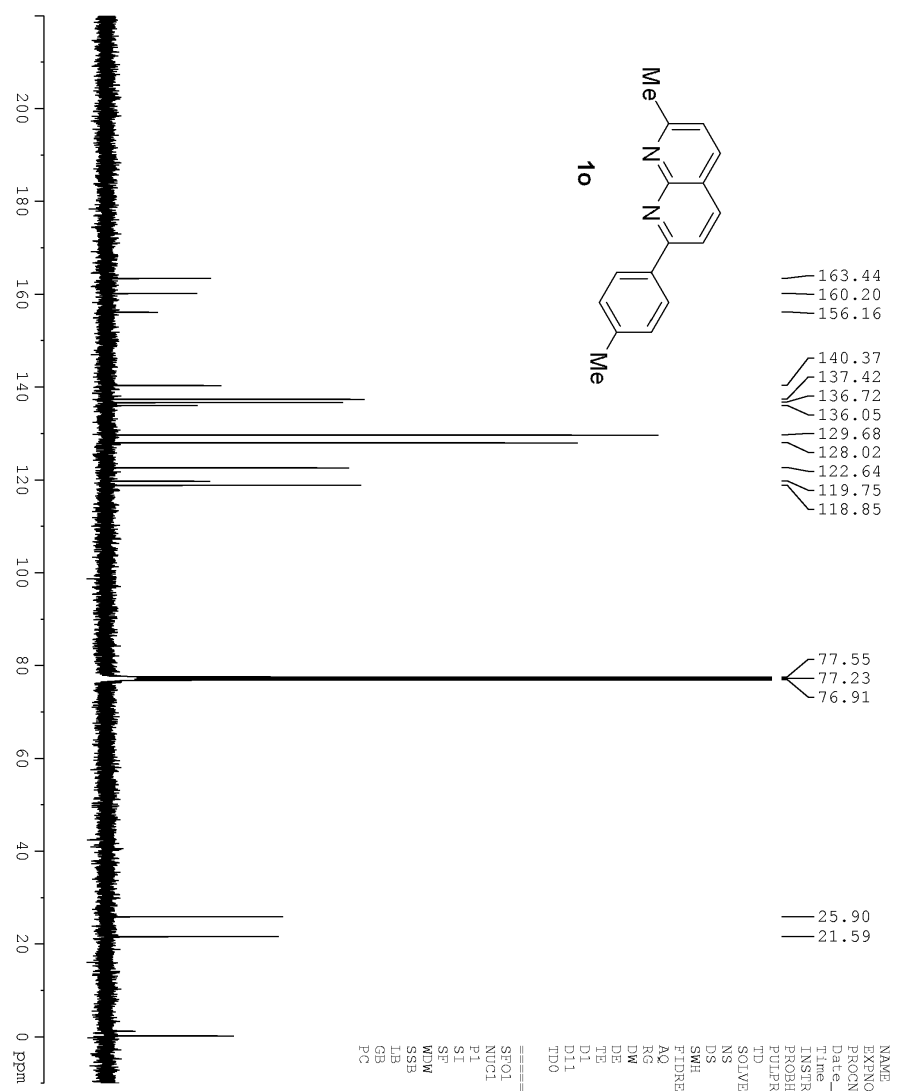
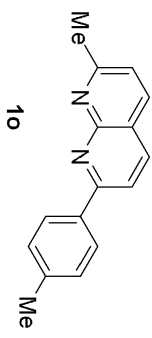
```



```

NAME          wangwei
EXPNO         302
PROCNO       1
Date_         20140403
Time         1.55
INSTRUM      spect
PROBHD       5 mm PABU1 13C
PULPROG      zg30
TD           32768
SOLVENT      CDCl3
NS           16
DS           0
SWH          12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           203
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         13C
P1           12.60 usec
SF           65536
SFO2         400.1300083 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```

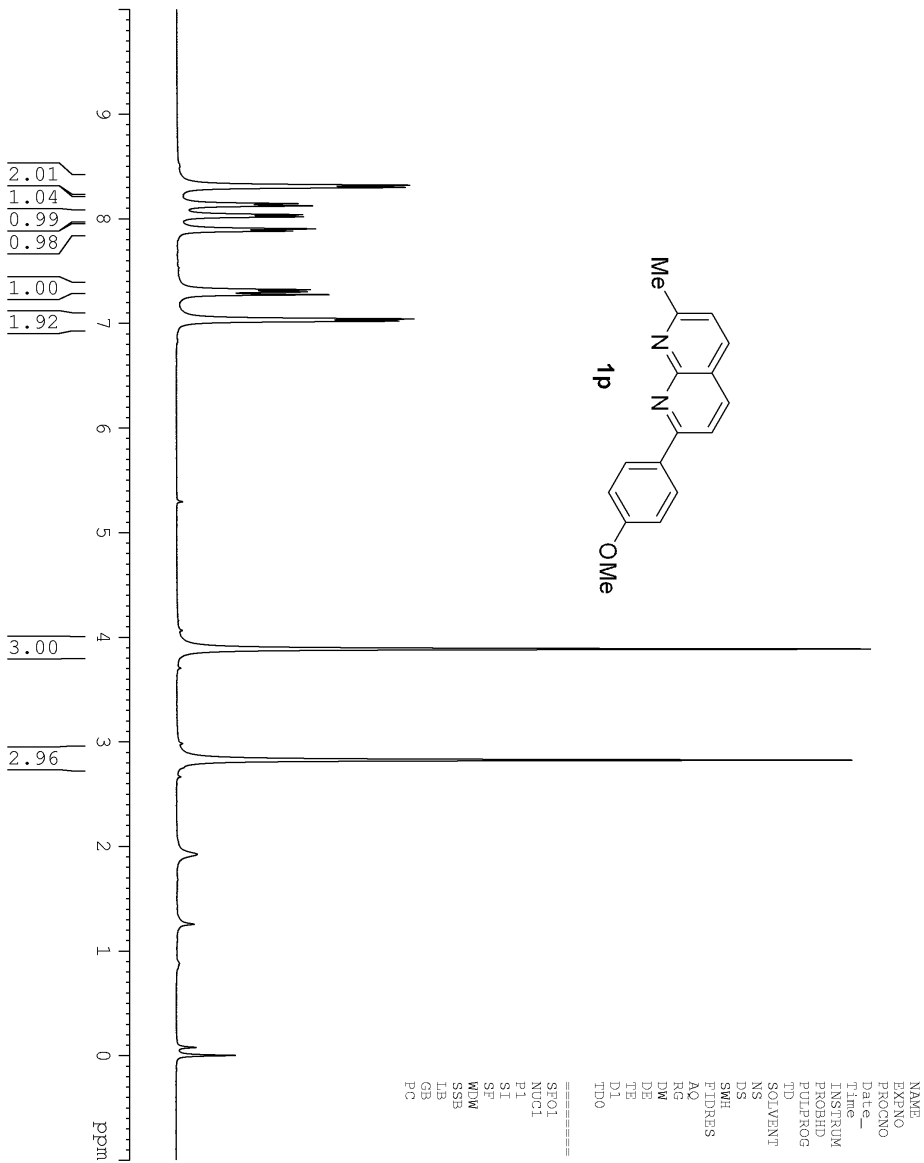
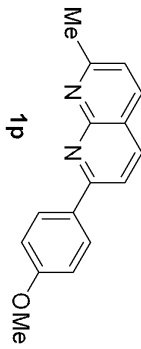


```

NAME wangwei-C
EXPNO 1
PROCNO 1
Date_ 20140403
Time_ 4.00
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 233
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127487 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

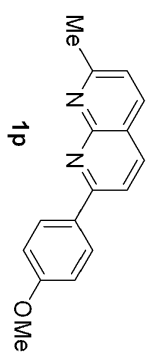
```



```

NAME          wangwei
EXPNO         311
PROCNO        1
Date_         20140408
Time         13.57
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            181
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SF01          400.1320007 MHz
NUC1          13C
P1            12.60 usec
SI            65536
SF            400.1300053 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```

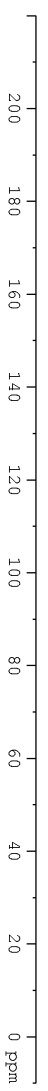


- 163.31
- 161.50
- 159.76
- 156.12
- 137.33
- 136.71
- 131.36
- 129.53
- 122.40
- 119.47
- 118.49
- 114.25

- 77.55
- 77.23
- 76.91

- 55.57

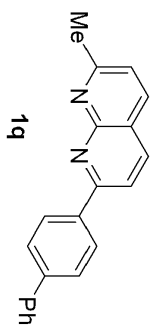
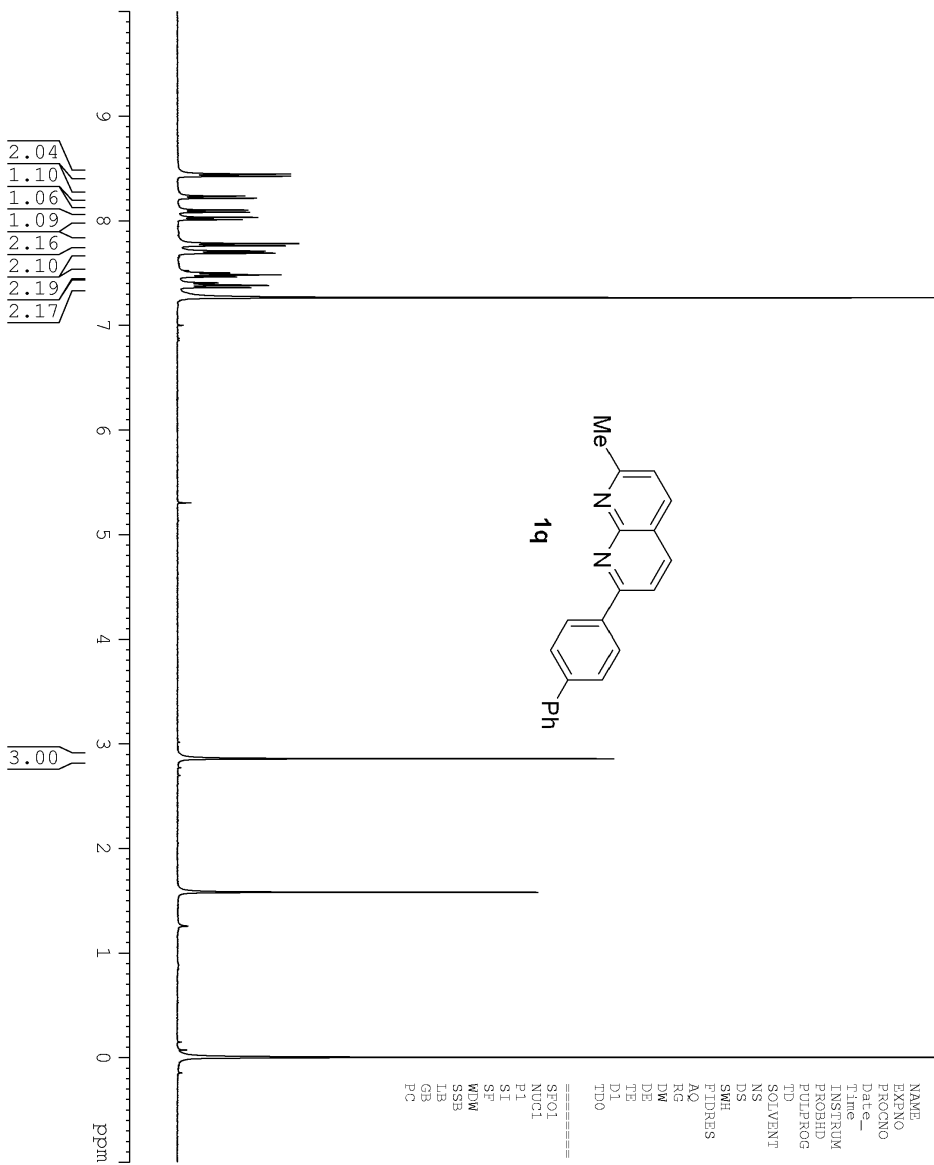
- 25.84



```

NAME          wangwei-C
EXPNO         1
PROCNO        1
Date_         20140408
Time_        14.01
INSTRUM       spect
PROBHD        5 mm PABD11-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            13201
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

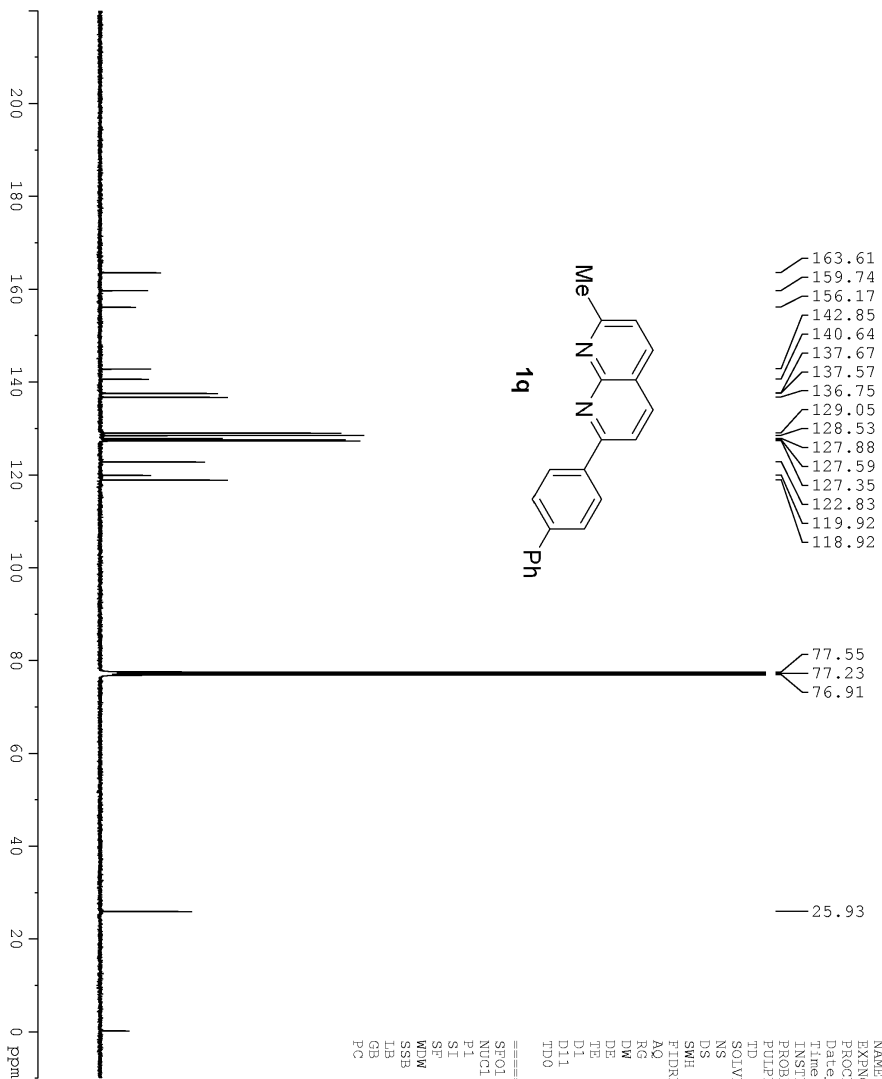
===== CHANNEL f1 =====
SFO1          100.628298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127510 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

```

NAME          wangwei
EXPNO         330
PROCNO       1
Date_        20140417
Time         11.27
INSTRUM     spect
PROBHD      5 mm PABUL 13C
PULPROG     zg30
TD          32768
SOLVENT     CDCl3
NS          16
DS          0
SWH         12019.230 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG          203
DE         41.600 usec
TE         300.0 K
D1         2.00000000 sec
TD0        1

===== CHANNEL f1 =====
SF01        400.1320007 MHz
NUC1        1H
P1         12.60 usec
SI         65536
SF         400.1300090 MHz
WDW        EM
SSB        0
LB         0.50 Hz
GB         0
PC         1.00
  
```

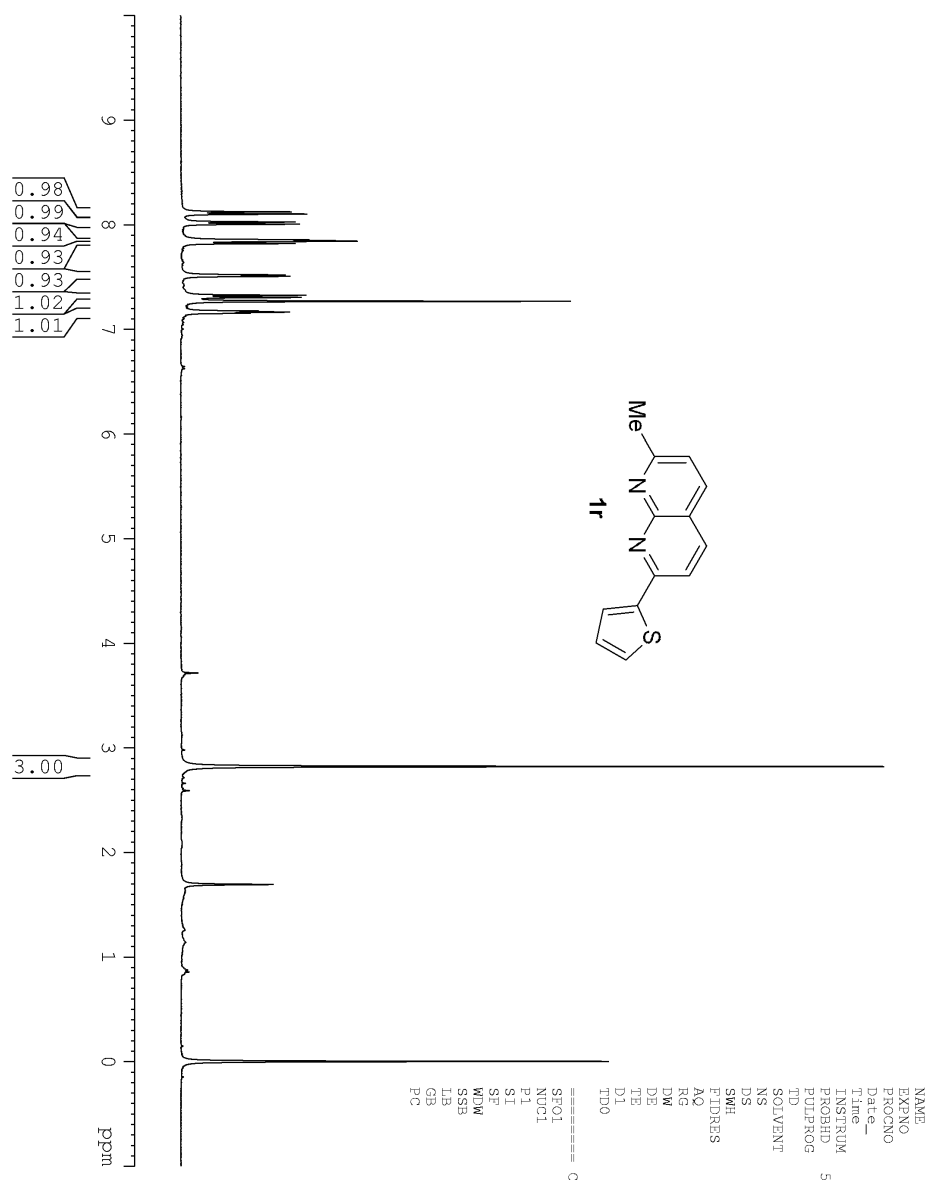
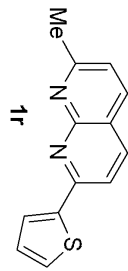


```

NAME          wangwei-C
EXPNO         57
PROCNO        1
Date_         20140417
Time         23:28
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            10298
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127495 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40

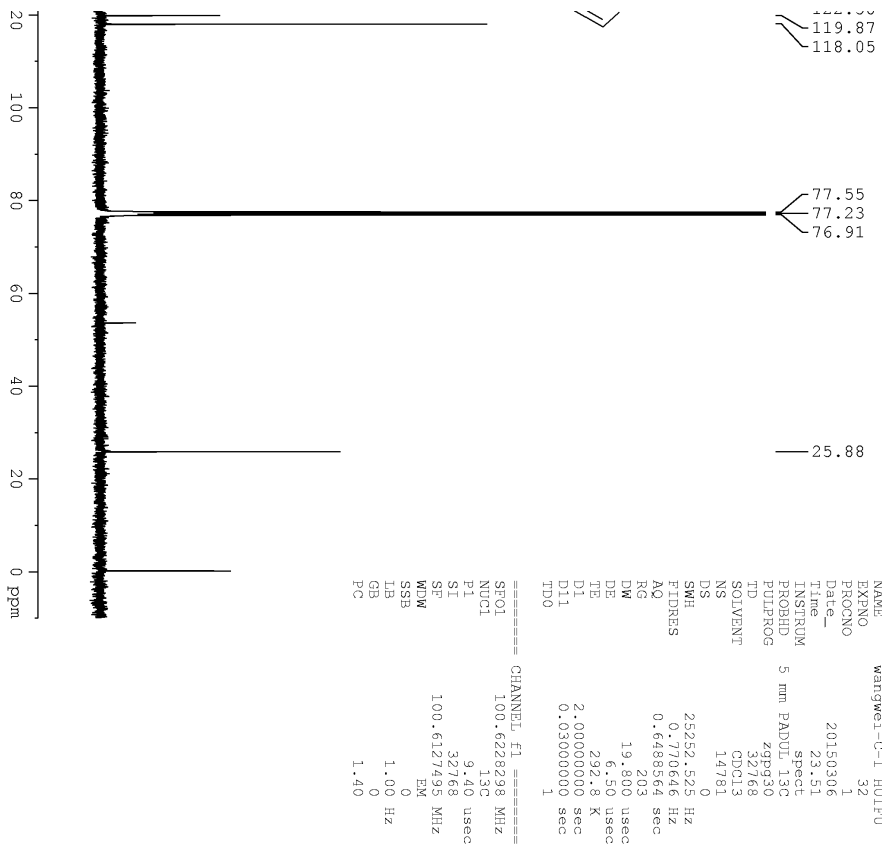
```



```

NAME      wangwei_2x.in
EXPNO     235
PROCNO    1
Date_     20150306
Time      11.41
INSTRUM   spect
PROBHD    5 mm PABUL 13C
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         16
DS         0
SWH        12019.230 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         203
DE         41.600 usec
TE         294.6 K
D1         2.00000000 sec
TD0        1

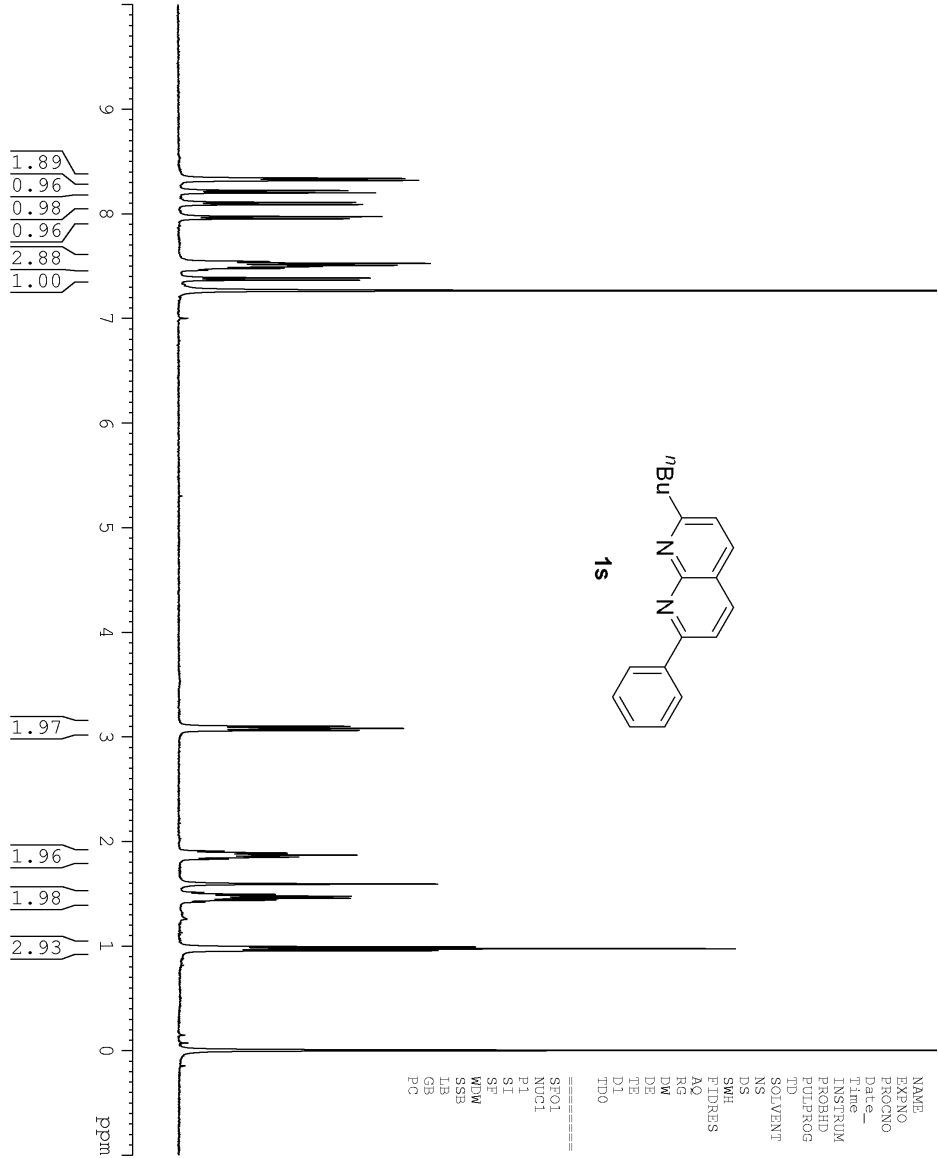
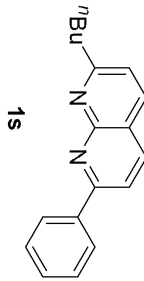
===== CHANNEL f1 =====
SF01      400.1320007 MHz
NUC1      1H
P1        12.60 usec
SI        65536
SF        400.1300082 MHz
WDW       EM
SSB       0
LB        0.50 Hz
GB        0
PC        1.00
  
```



```

NAME          wangwei-C-1_HU1FU
EXPNO         32
PROCNO        1
Date_         20150306
Time_         23.51
INSTRUM       spect
PROBHD        5 mm PABDUI_13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            14781
DS            0
SMH           25252.525 HZ
FIDRES        0.770646 HZ
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            6.50 usec
D1            232.8 K
D11           0.03000000 sec
TD0           1

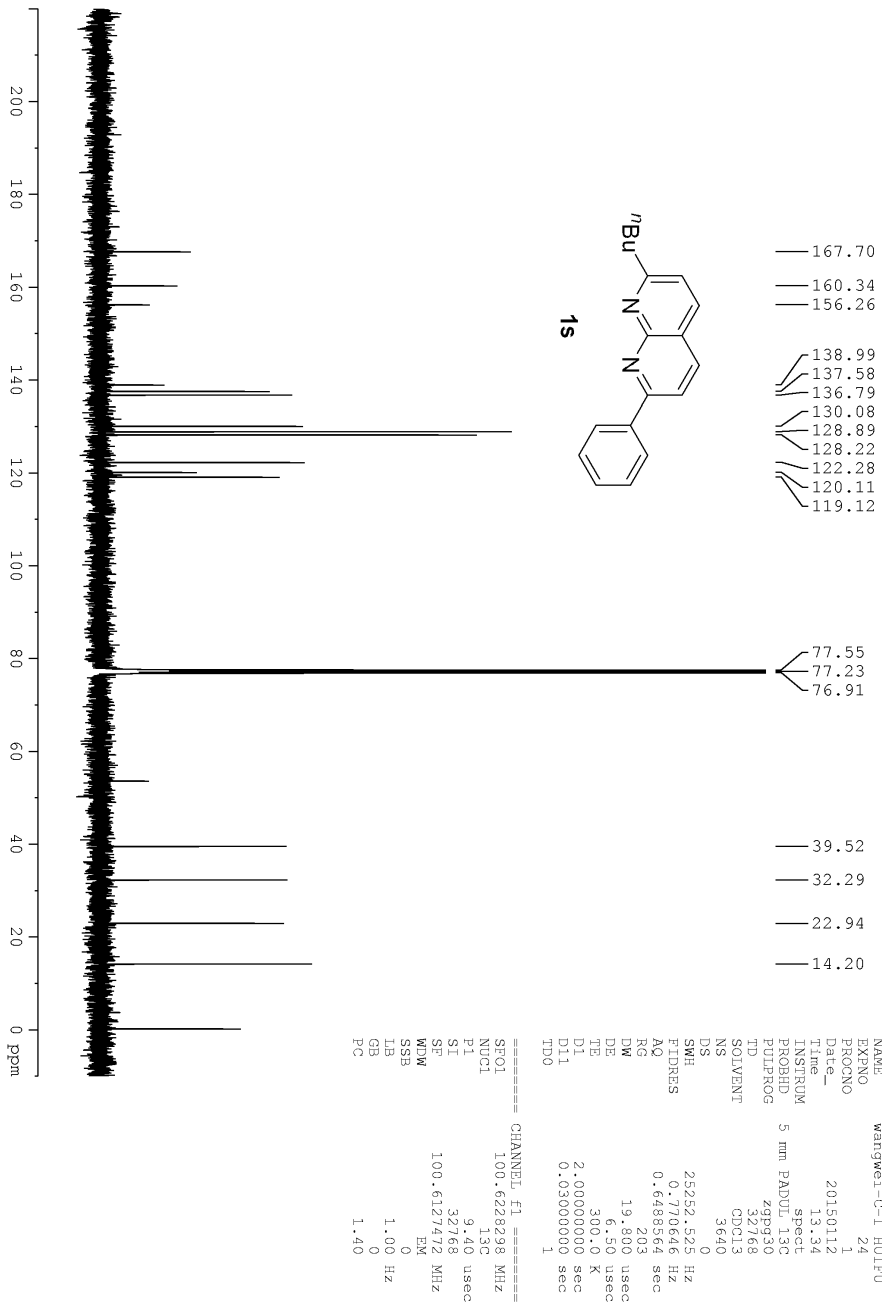
===== CHANNEL f1 =====
SFO1          100.62828298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127495 MHz
WDW           EM
SSB           0
IB            0
GB            0
PC            1.40
  
```

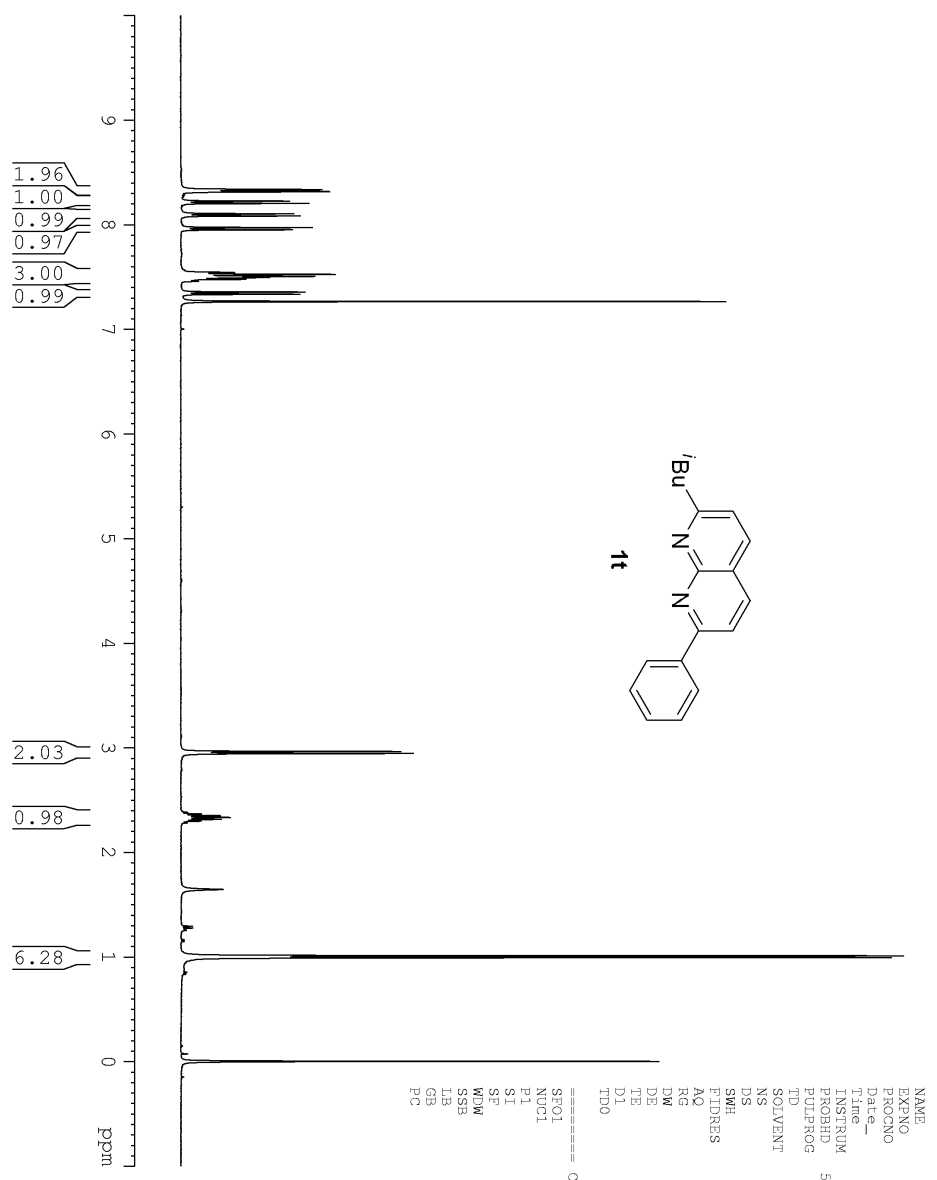
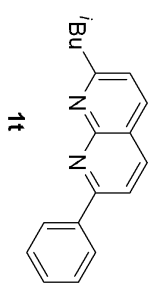


```

NAME      wangwei_2x.in
EXPNO     154
PROCNO    1
Date_     20150111
Time      7.29
INSTRUM   spect
PROBHD    5 mm PABUL13C
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         16
DS         0
SWH        12019.230 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         203
DE         41.600 usec
TE         300.0 K
D1         2.0000000 sec
TD0        1

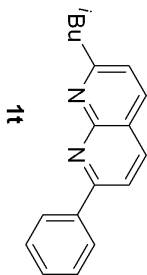
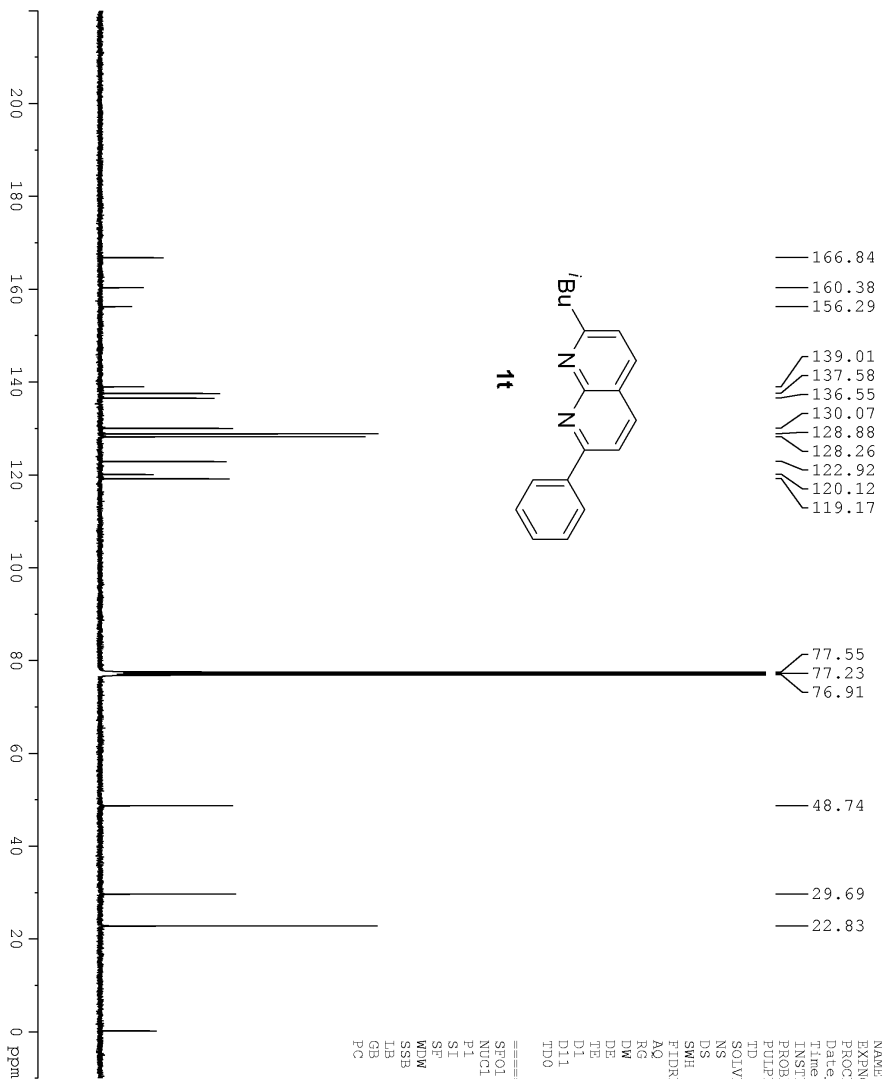
===== CHANNEL f1 =====
SFO1      400.1320007 MHz
NUC1      1H
P1         12.60 usec
SI         65536
SF         400.1300092 MHz
WOTW      EM
SSB        0
LB         0.50 Hz
GB         0
PC         1.00
  
```





```

NAME      wangwei_2x.in
EXPNO     1
PROCNO    1
Date_     20150129
Time      12.48
INSTRUM   spect
PROBHD    5 mm PABUL 13C
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         16
DS         0
SWH       12019.230 Hz
FIDRES    0.366798 Hz
AQ        1.3631988 sec
RG         203
DE        41.600 usec
TE        6.50 usec
TD0       300.0 K
DI        2.00000000 sec
===== CHANNEL f1 =====
SF01      400.1320007 MHz
NUC1      1H
P1        12.60 usec
SI        65536
SF        400.1300089 MHz
WDW       EM
SSB       0
LB        0.50 Hz
GB        0
PC        1.00
  
```



- 166.84
- 160.38
- 156.29
- 139.01
- 137.58
- 136.55
- 130.07
- 128.88
- 128.26
- 122.92
- 120.12
- 119.17

- 77.55
- 77.23
- 76.91

- 48.74

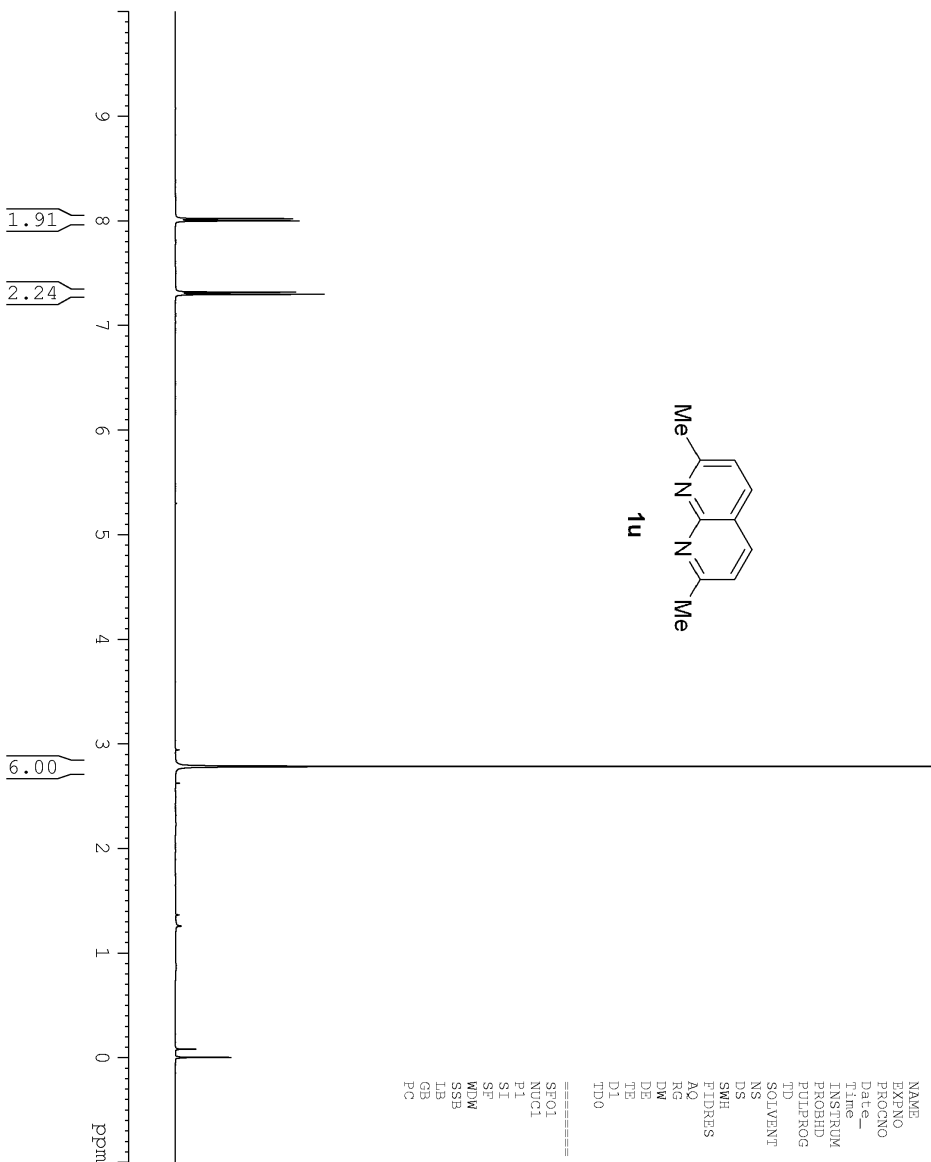
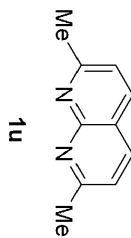
- 29.69

- 22.83

```

NAME          wangwei-C-1_HUJFU
EXPNO         27
PROCNO        1
Date_         20150129
Time_         12:51
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            13798
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

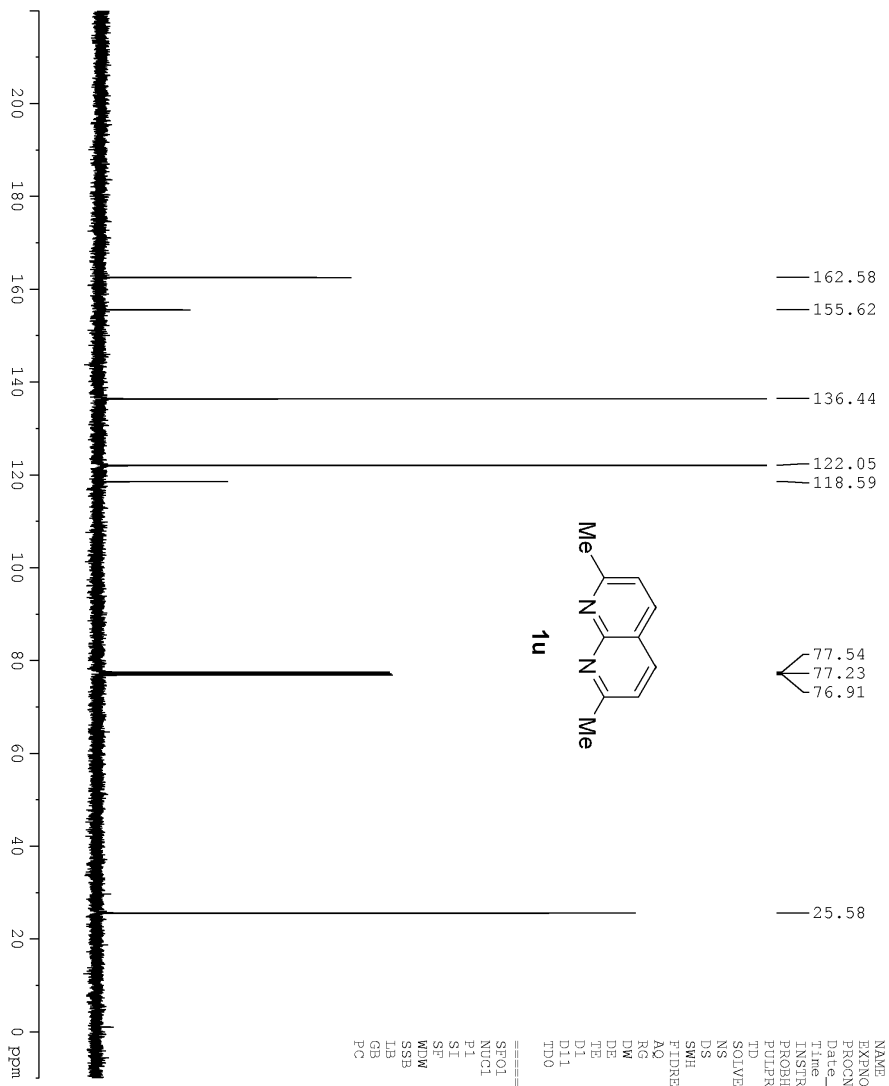
===== CHANNEL f1 =====
SFO1          100.628298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127479 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

```

NAME          wangwei
EXPNO         196
PROCNO        1
Date_         20140218
Time         0.56
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

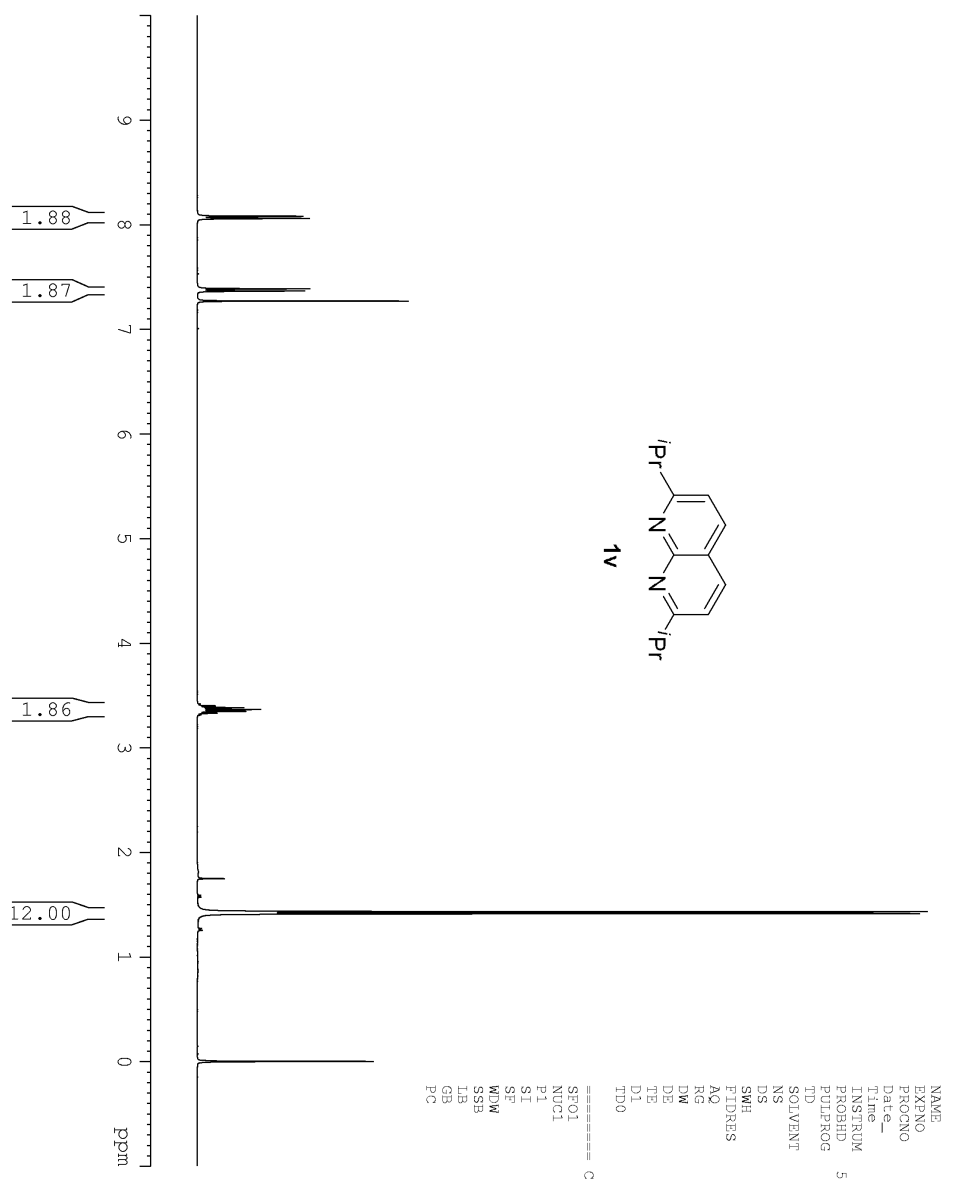
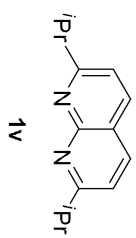
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1299960 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



```

NAME wangwei-C
EXPNO 12
PROCNO 1
Date_ 20140218
Time 12:59
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 78
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 6.50 usec
TD0 2.00000000 sec
D1 300.0 K
D11 0.03000000 sec
===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127633 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

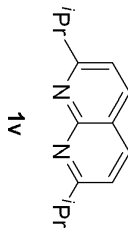
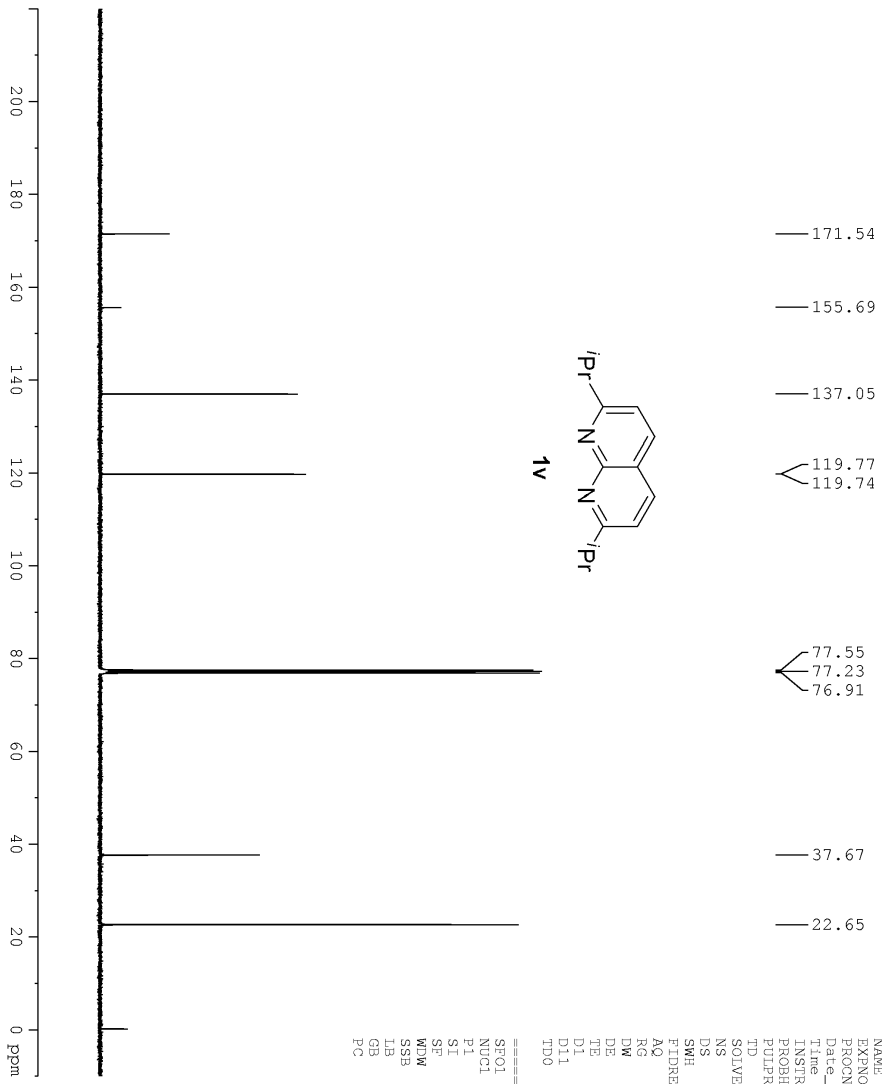
```



```

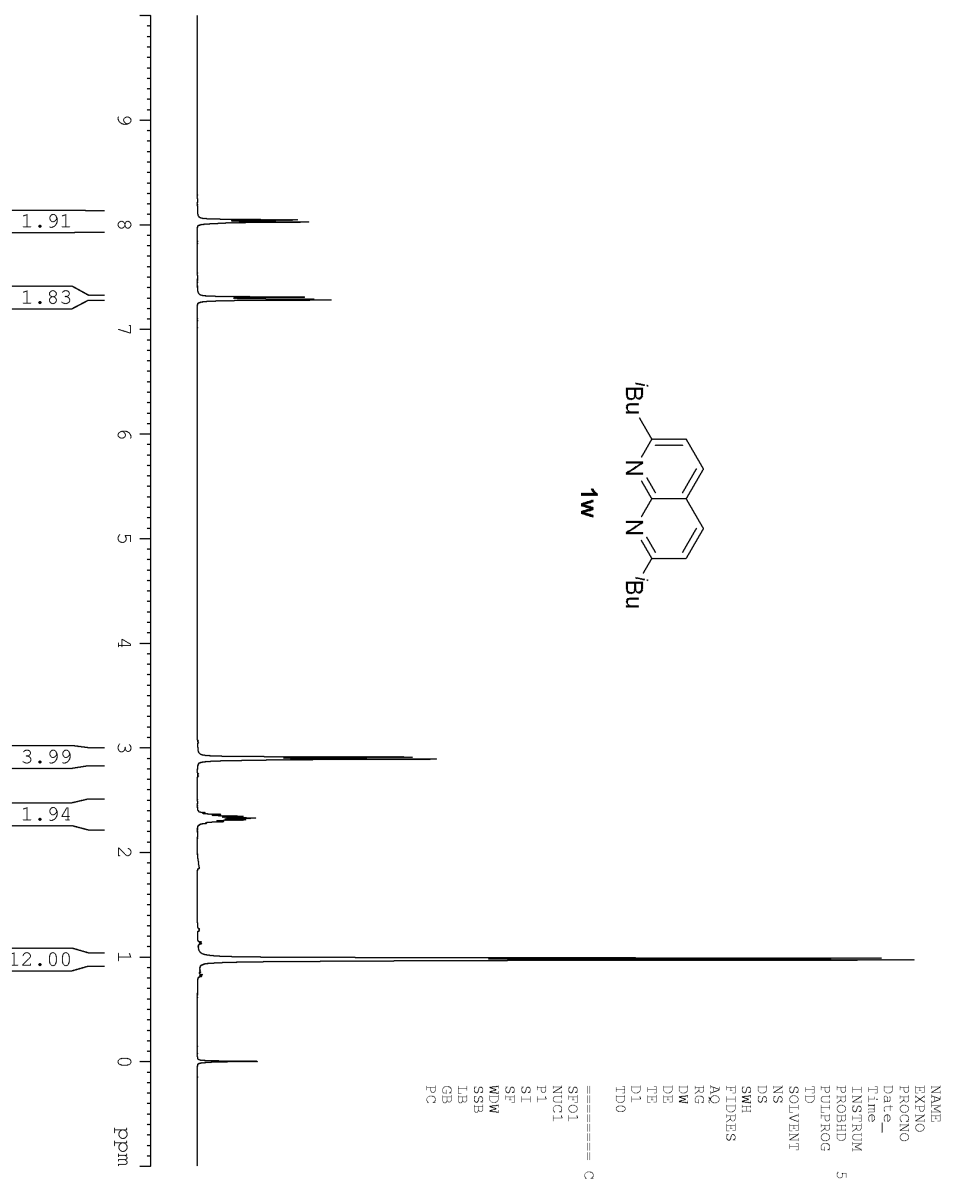
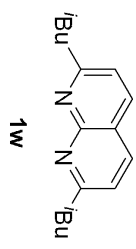
NAME          wangwei-2x.in
EXPNO         260
PROCNO        1
Date_         20150312
Time          11.05
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 HZ
FIDRES       0.366798 HZ
AQ           1.3631988 sec
RG           203
DE           41.600 usec
TE           294.9 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         13C
P1           12.60 usec
SI           65536
SF           400.1300070 MHz
WDW          EM
SSB          0
LB           0.50 HZ
GB           0
PC           1.00
  
```



```

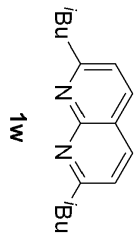
NAME          wangwei-C-1 HUIFU
EXPNO         38
PROCNO       1
Date_         20150312
Time_        12-12
INSTRUM      spect
PROBHD       5 mm PABD1-13C
PULPROG      zgpg30
TD           32768
SOLVENT      CDCl3
NS           3770
DS           0
SWH          25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE          19.800 usec
TE           6.50 usec
TD0          295.5 K
D1           2.00000000 sec
D11          0.03000000 sec
===== CHANNEL f1 =====
SFO1         100.6228298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF          100.6127488 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```



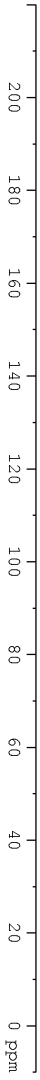
```

NAME          wangwei-2x1n
EXPNO         178
PROCNO       1
Date_         20150129
Time         12.36
INSTRUM      spect
PROBHD       5 mm PABUL 13C
PULPROG      zg30
TD           32768
SOLVENT      CDCl3
NS           16
DS           0
SWH          12019.230 Hz
FIDRES      0.366798 Hz
AQ          1.3631988 sec
RG          101
DW          41.600 usec
DE          6.50 usec
TE          300.0 K
D1          2.00000000 sec
TD0         1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1          12.60 usec
SI          65536
SF          400.1300034 MHz
WDW         EM
SSB         0
LB          0.50 Hz
GB          0
PC          1.00
  
```



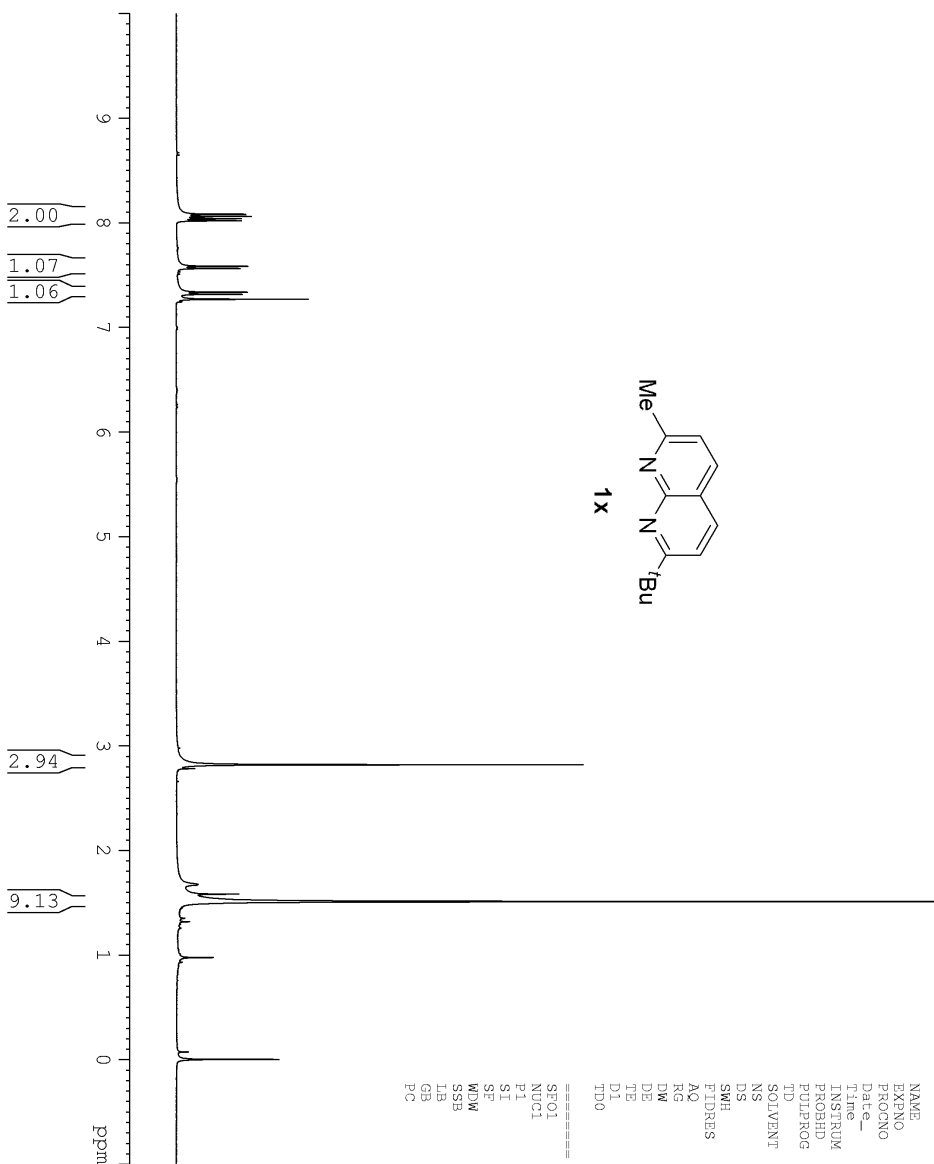
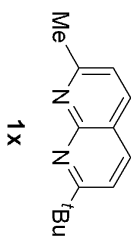
- 166.03
- 156.04
- 136.44
- 122.38
- 119.24
- 77.54
- 77.22
- 76.91
- 48.66
- 22.80



```

NAME wangwei-C-1 HUIFU
EXPNO 26
PROCNO 1
Date_ 20150129
Time 12.40
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 156
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 6.50 usec
TD0 2.00000000 sec
D1 300.0 K
D11 0.03000000 sec
===== CHANNEL f1 =====
SFO1 100.628298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127510 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

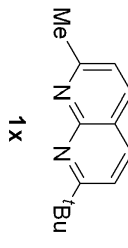
```



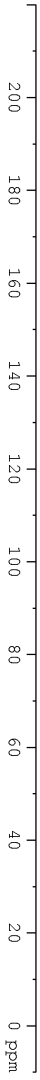
```

NAME          wangwei
EXPNO         267
PROCNO        1
Date_         20140318
Time         1.39
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            203
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300074 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



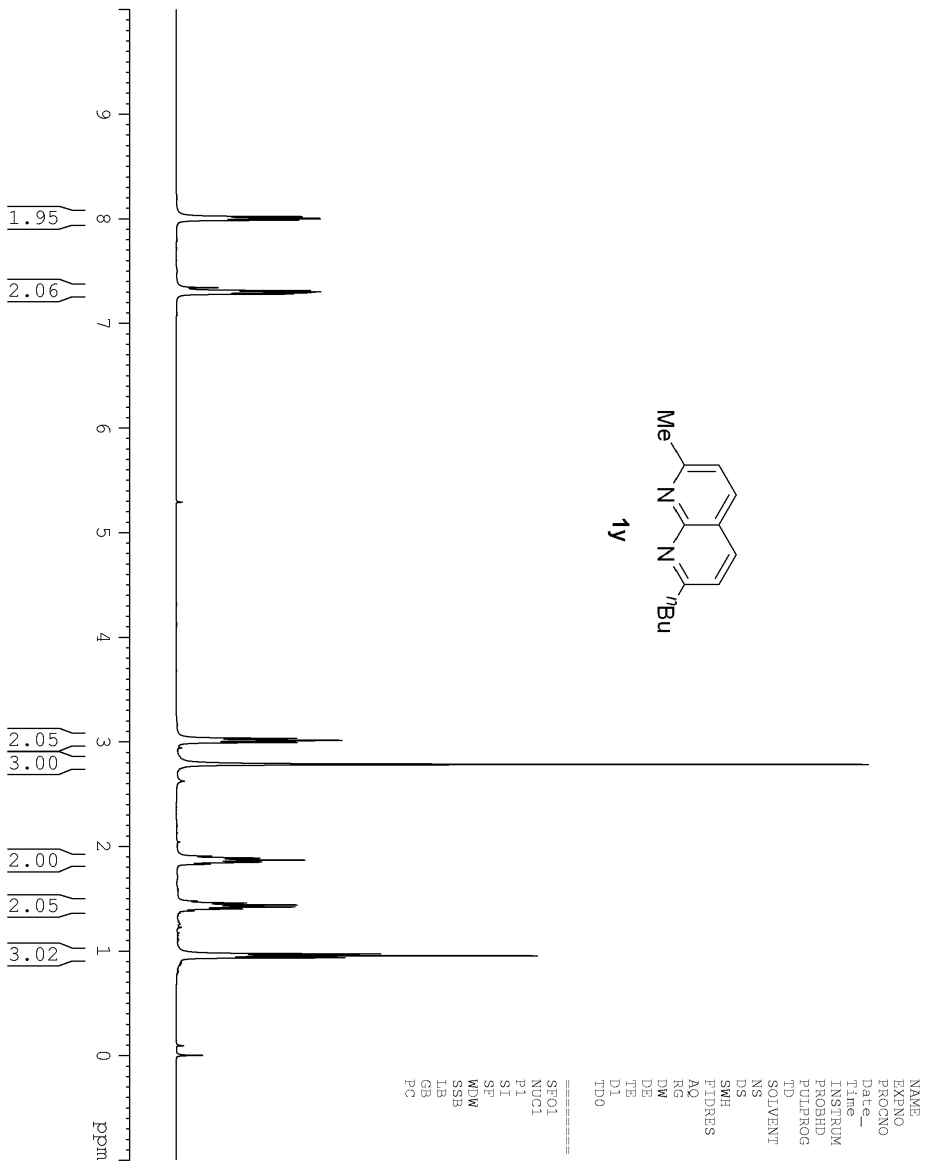
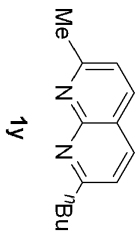
- 173.34
- 162.82
- 155.38
- ∨ 136.71
- ∨ 136.62
- ∨ 122.42
- ∨ 118.83
- ∨ 118.63
- ∨ 77.55
- ∨ 77.23
- ∨ 76.91
- 38.63
- 30.30
- 25.79



```

NAME          wangwei-C
EXPNO         36
PROCNO        1
Date_         20140321
Time_         15:06
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            1113
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

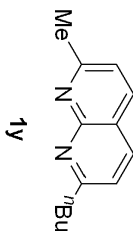
===== CHANNEL f1 =====
SFO1         100.628298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127517 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```

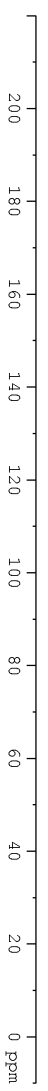
```

NAME          wangwei
EXPNO         366
PROCNO        1
Date_         20140507
Time_         10.57
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            50.8
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1299788 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



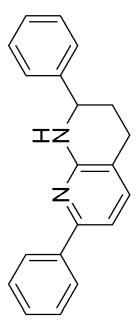
- 166.66
- 162.58
- 155.73
- 136.51
- 136.49
- 122.08
- 121.66
- 118.84
- 77.54
- 77.22
- 76.91
- 39.06
- 31.68
- 25.60
- 22.63
- 14.00



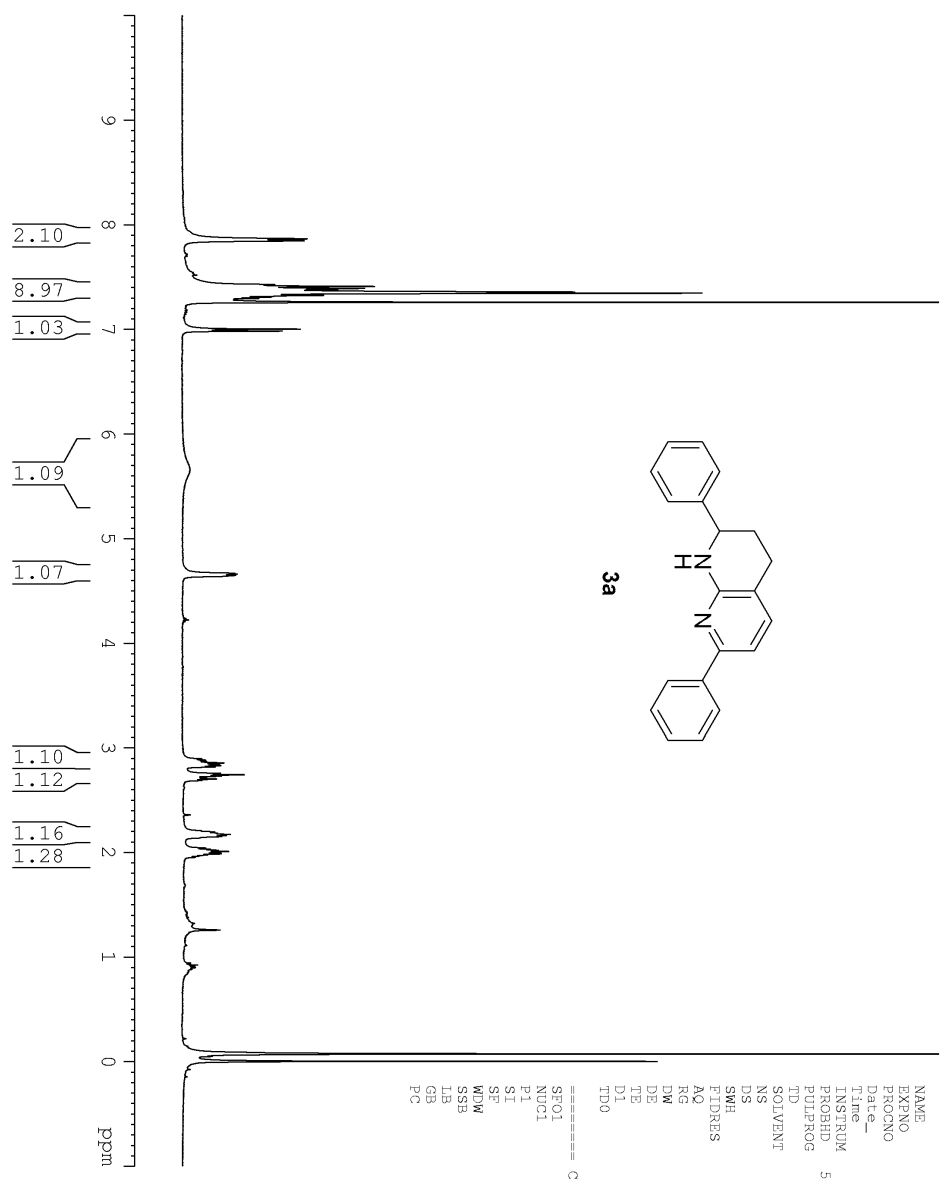
```

NAME          wangwei-C
EXPNO         74
PROCNO        1
Date_         20140507
Time_         11.04
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            75
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.62828298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127618 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



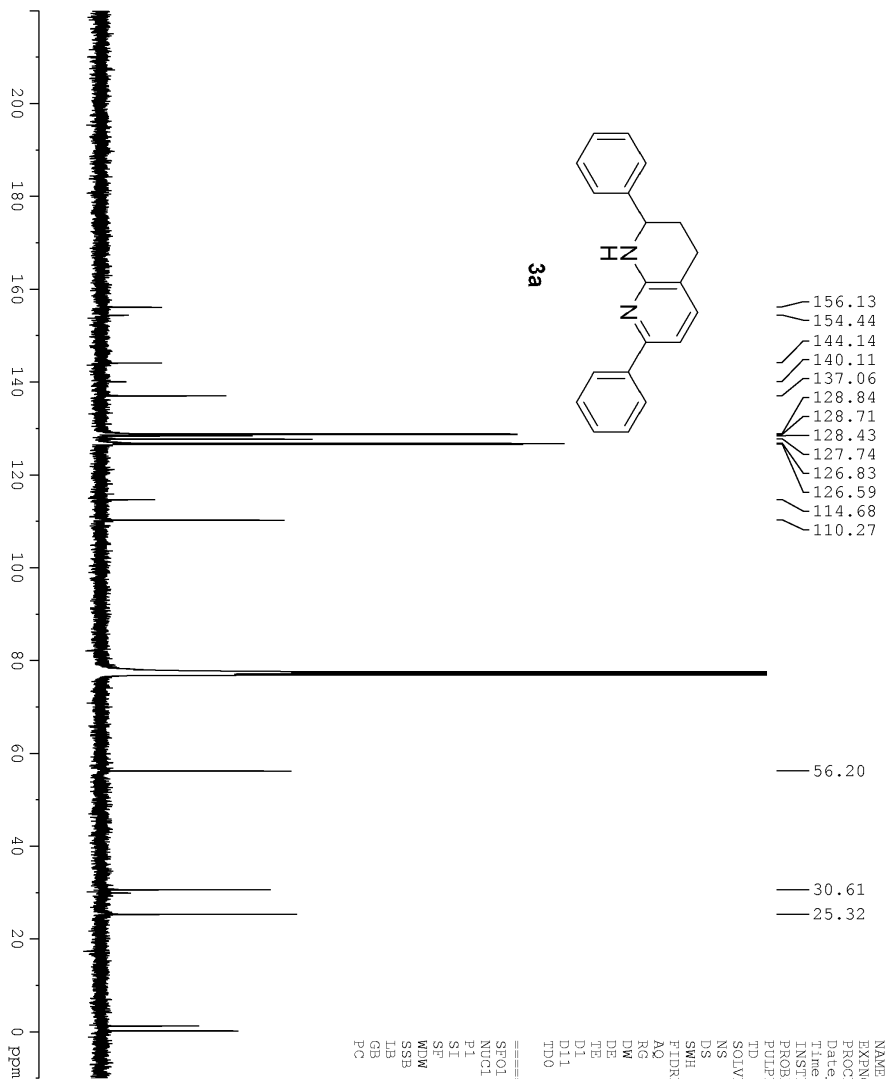
3a



```

NAME          wangwei
EXPNO         227
PROCNO        1
Date_         20140304
Time         13.52
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           203
DW           41.600 usec
DE           6.50 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300112 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```

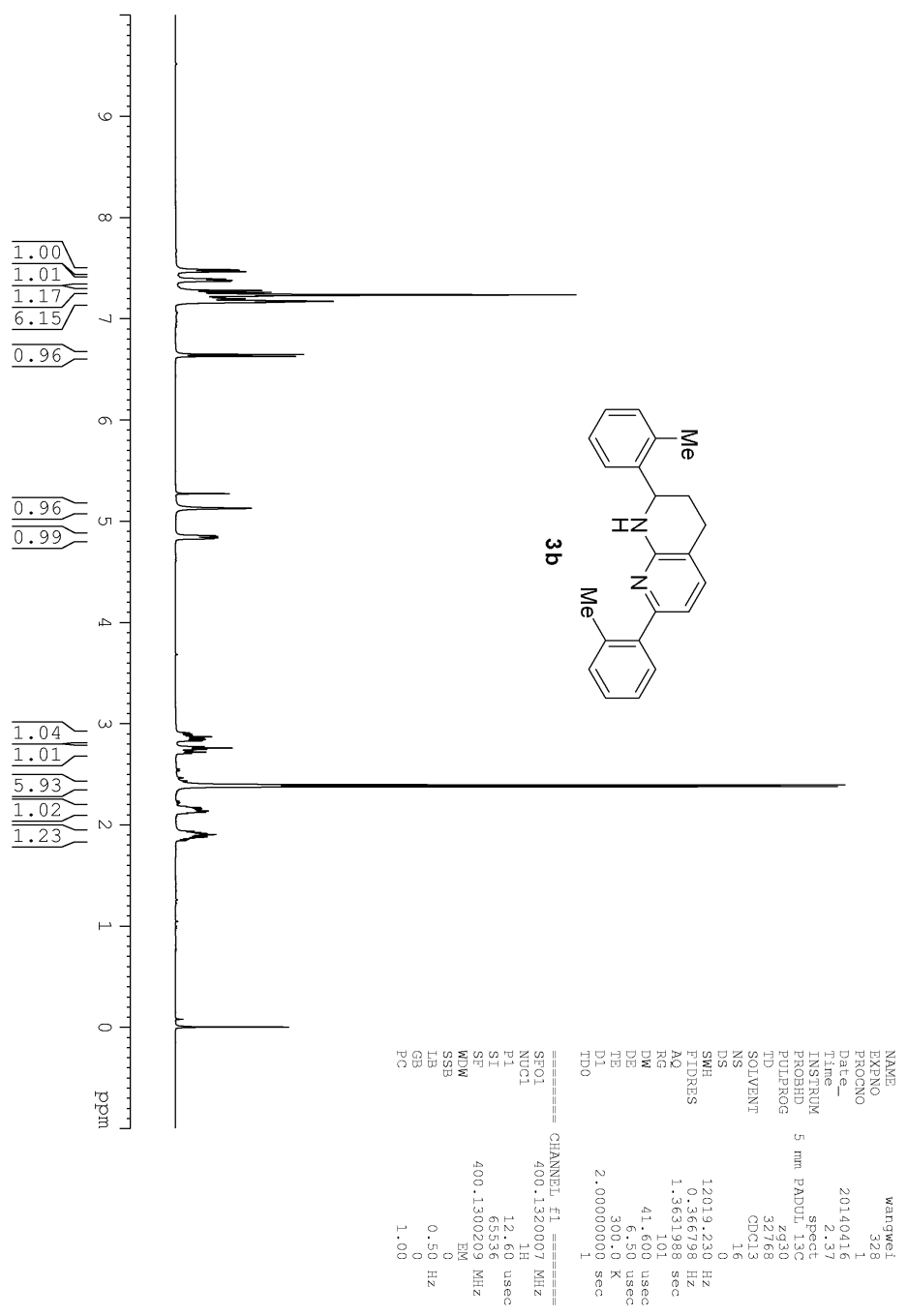
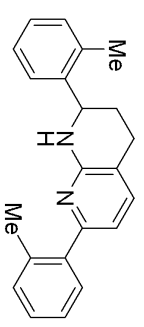


```

NAME          wangwei-C
EXPNO         1
PROCNO       1
Date_        20140305
Time         14:40
INSTRUM      spect
PROBHD       5 mm PABD113C
PULPROG      zgpg30
TD           32768
SOLVENT      CDCl3
NS           11797
DS           0
SWH          25252.525 Hz
FIDRES      0.770646 Hz
AQ          0.6488564 sec
RG          203
DE          19.800 usec
TE          300.0 K
D1          2.00000000 sec
D11         0.03000000 sec
TD0         1

===== CHANNEL f1 =====
SFO1        100.6228298 MHz
NUC1        13C
P1          9.40 usec
SI          32768
SF          100.6127479 MHz
WDW         EM
SSB         0
LB          1.00 Hz
GB          0
PC          1.40

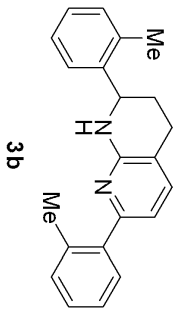
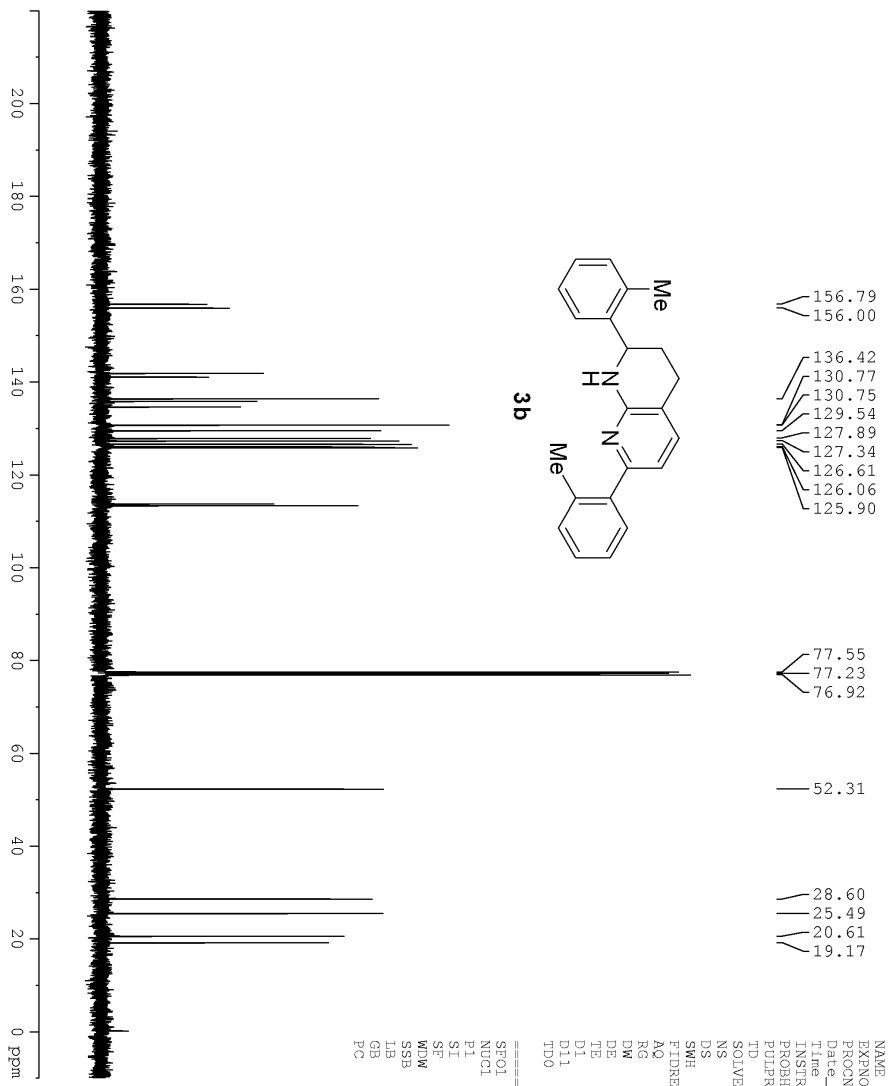
```



```

NAME          wangwei
EXPNO         328
PROCNO        1
Date_         20140416
Time          2.37
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300209 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```

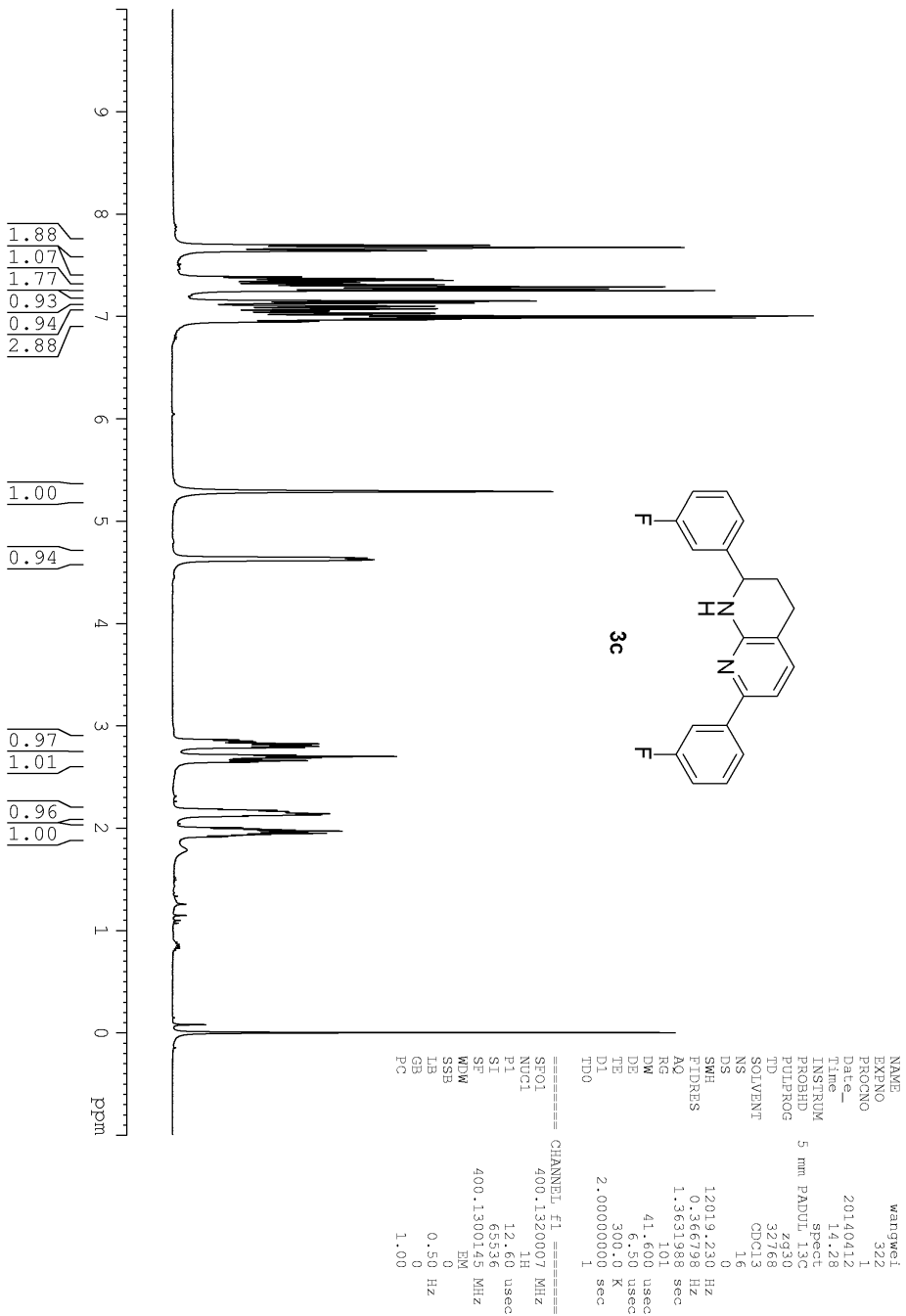
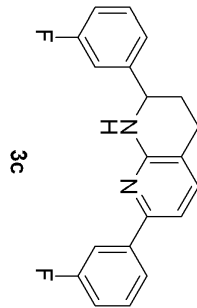


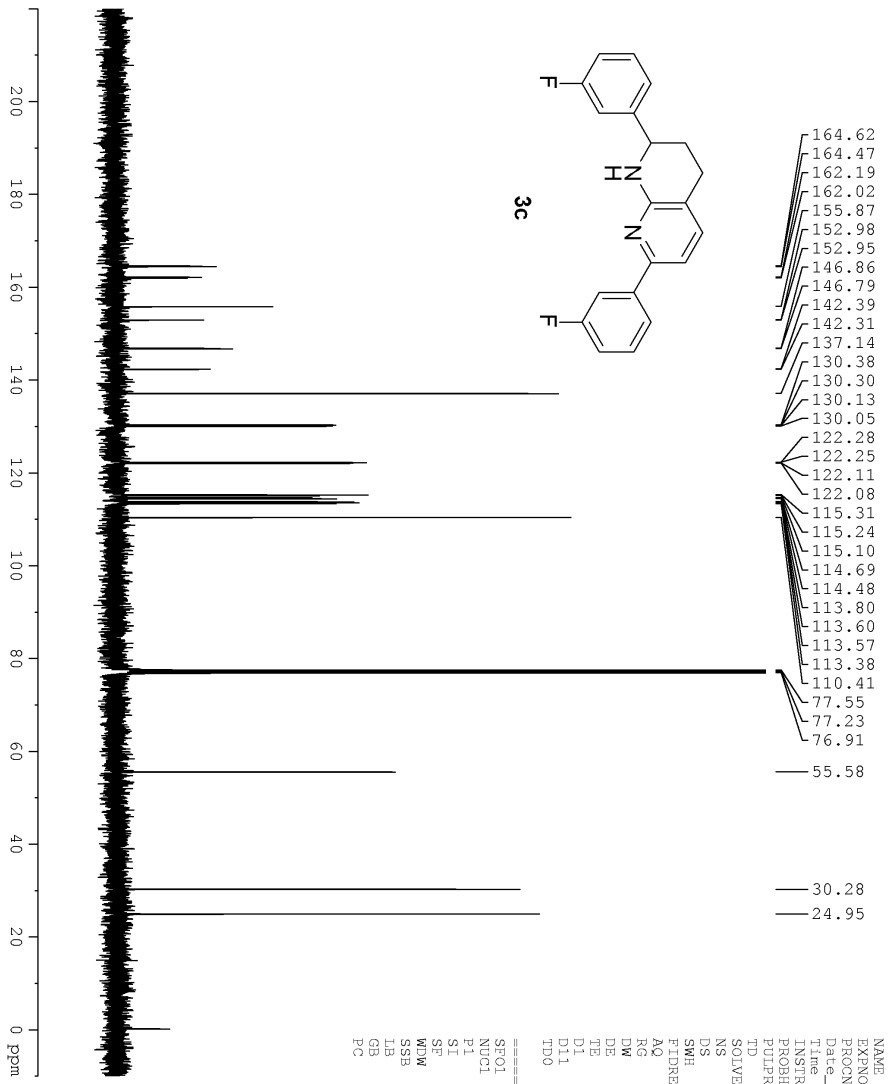
- 156.79
- 156.00
- 136.42
- 130.77
- 130.75
- 129.54
- 127.89
- 127.34
- 126.61
- 126.06
- 125.90
- 77.55
- 77.23
- 76.92
- 52.31
- 28.60
- 25.49
- 20.61
- 19.17

```

NAME          wangwei-1-C
EXPNO         56
PROCNO        1
Date_         20140416
Time_         2.43
INSTRUM       spect
PROBHD        5 mm PABD11-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            144
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         100.62828298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127541 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```



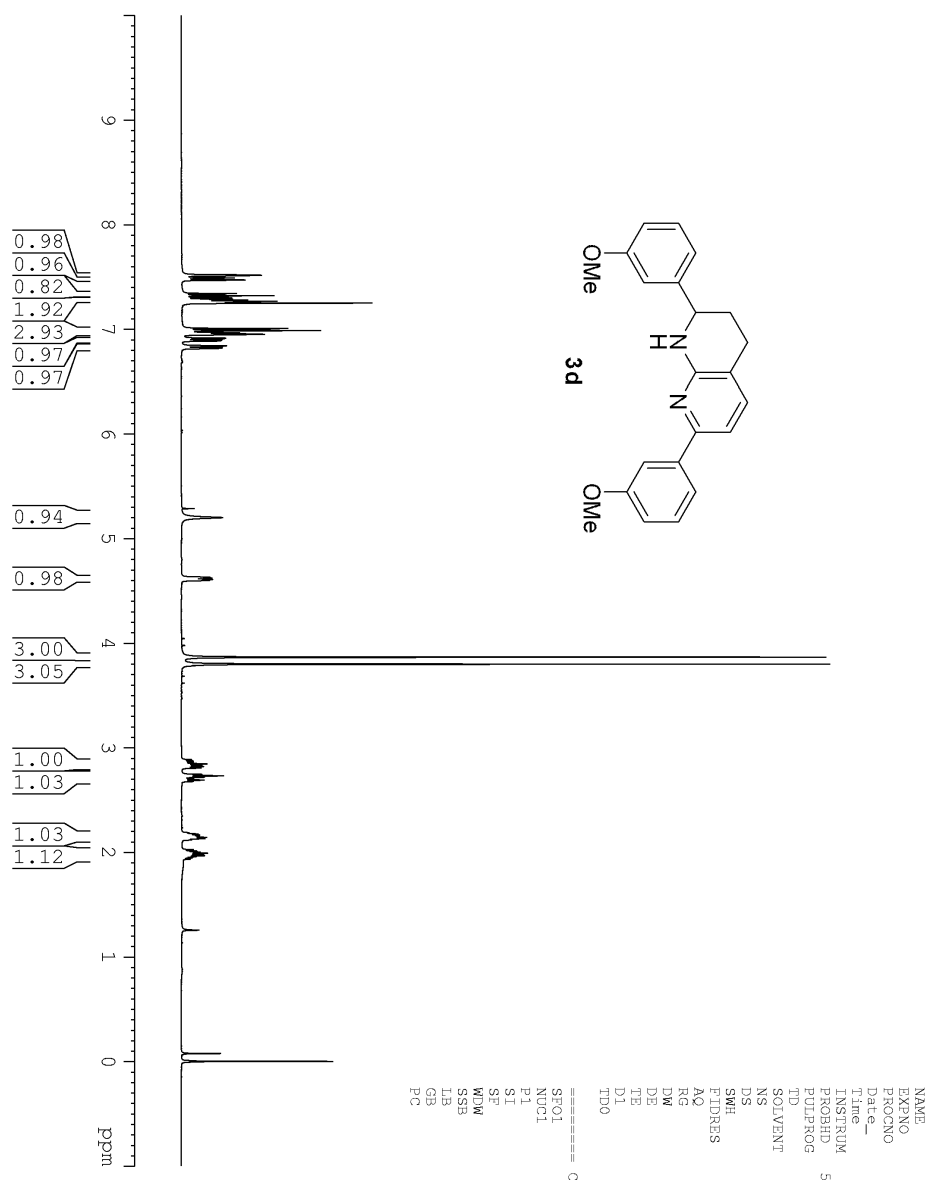
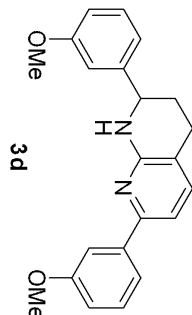


```

NAME wangwei-C
EXPNO 54
PROCNO 1
Date_ 20140412
Time_ 14:32
INSTRUM spect
PROBHD zgpg30
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 267
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127510 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

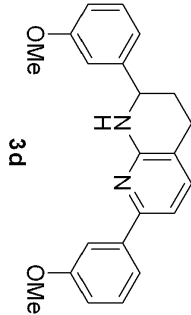
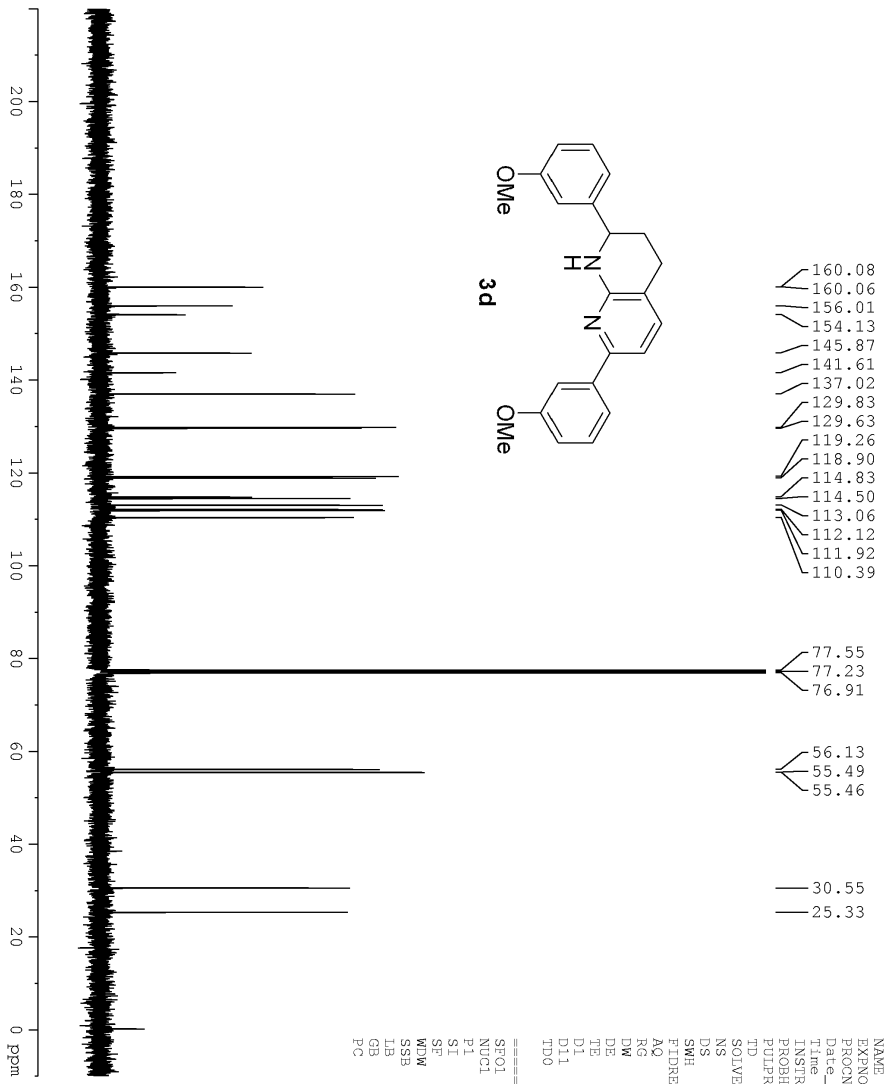
```

```

NAME          wangwei
EXPNO         295
PROCNO        1
Date_         20140330
Time         3.56
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG            101
RG            101
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300143 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```



160.08
160.06
156.01
154.13
145.87
141.61
137.02
129.83
129.63
119.26
118.90
114.83
114.50
113.06
112.12
111.92
110.39

77.55
77.23
76.91

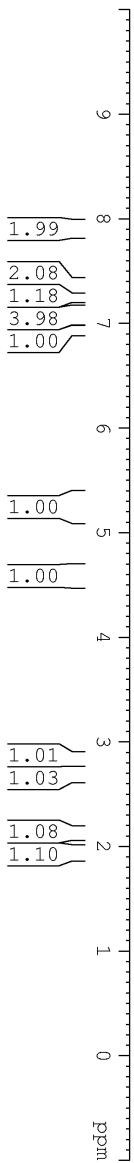
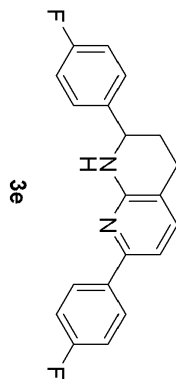
56.13
55.49
55.46

30.55
25.33

```

NAME          wangwei-C
EXPNO         43
PROCNO        1
Date_         20140330
Time         4.00
INSTRUM       5 mm PABDJI_13C
PROBHD        zgpg30
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            197
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

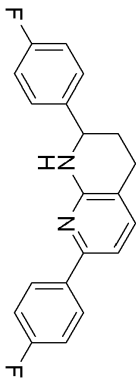
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127518 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



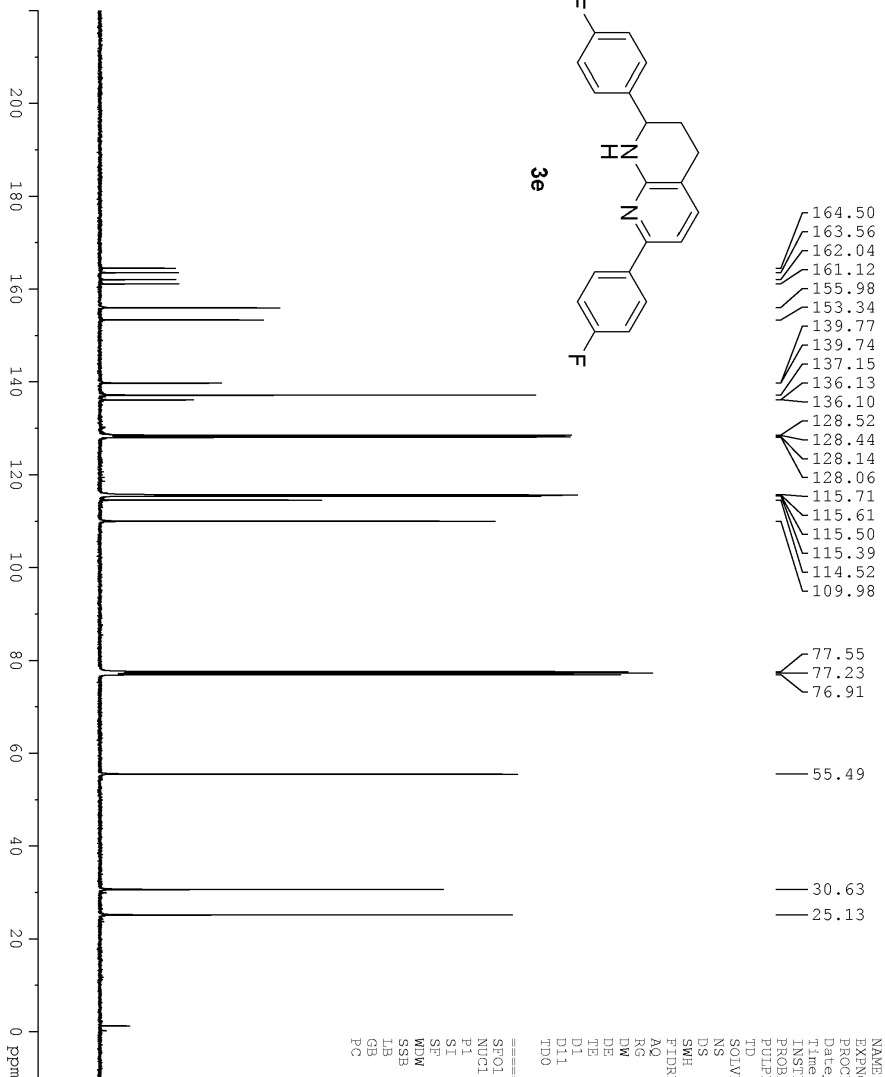
```

NAME          wangwei
EXPNO         286
PROCNO        1
Date_         20140327
Time         12.40
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300151 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



3e



- 164.50
- 163.56
- 162.04
- 161.12
- 155.98
- 153.34
- 139.77
- 139.74
- 137.15
- 136.13
- 136.10
- 128.52
- 128.44
- 128.14
- 128.06
- 115.71
- 115.61
- 115.50
- 115.39
- 114.52
- 109.98

- 77.55
- 77.23
- 76.91

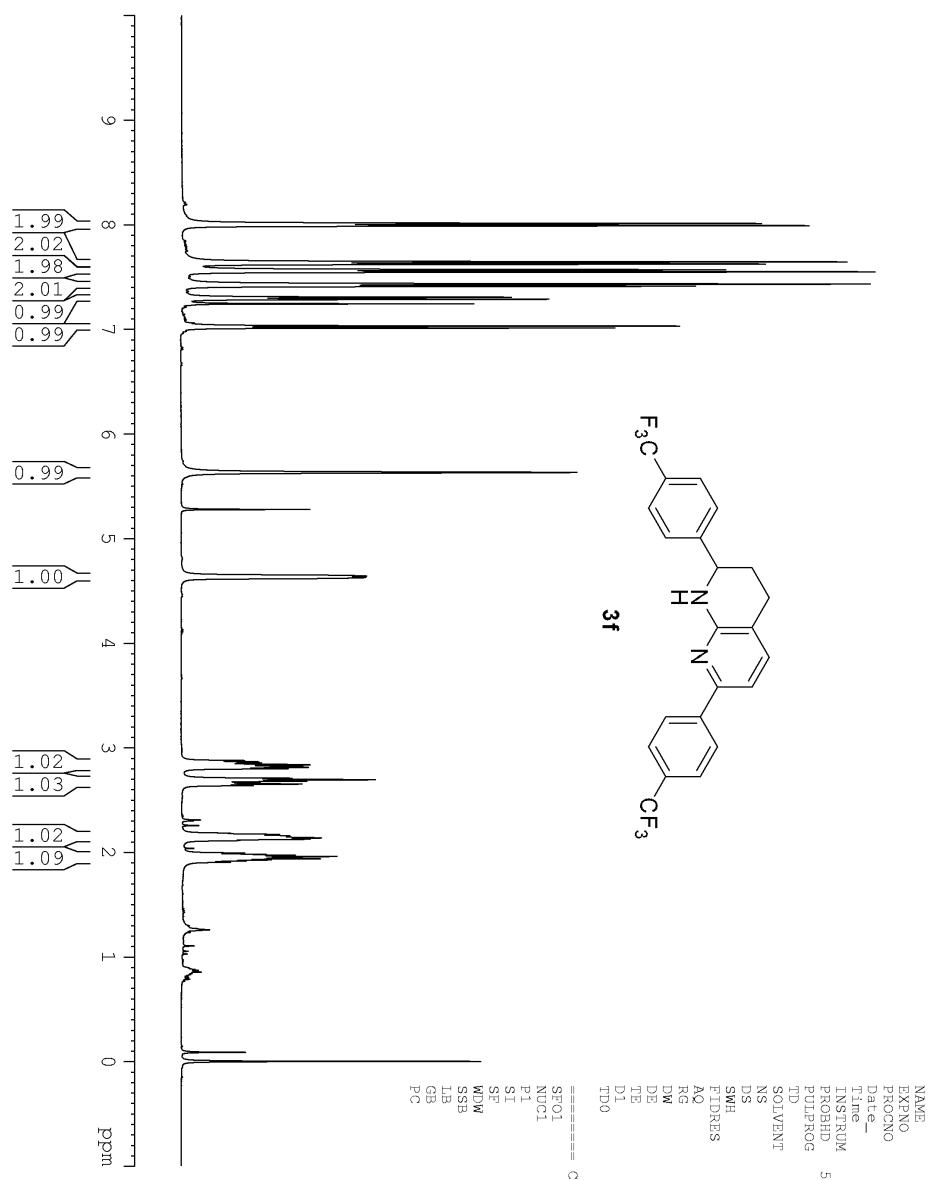
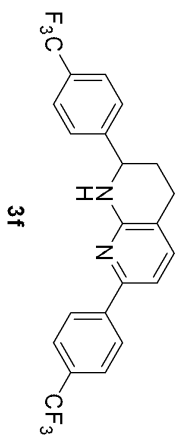
- 55.49

- 30.63
- 25.13

```

NAME wangwei-C
EXPNO 1
PROCNO 1
Date_ 20140327
Time 14:19
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 12241
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

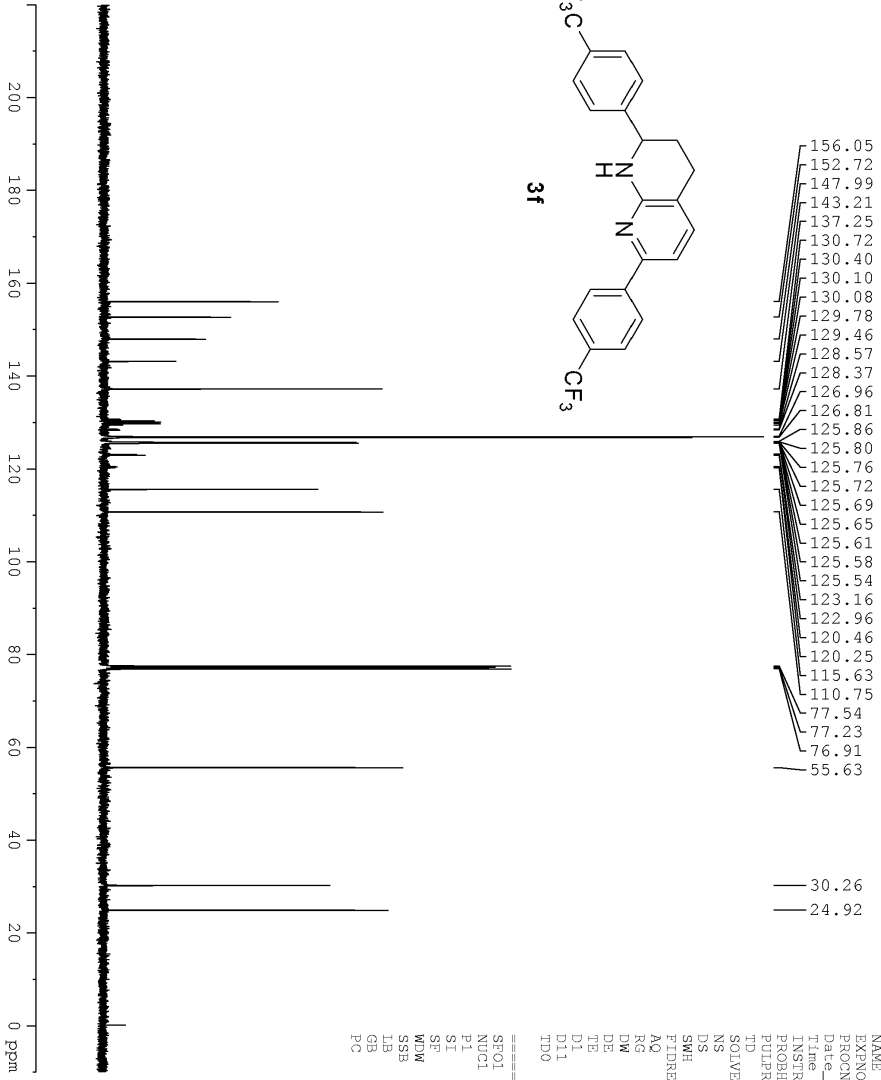
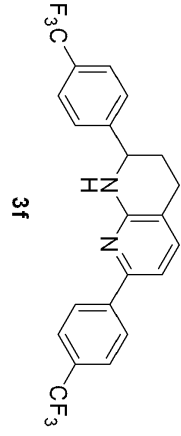
===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127518 MHz
WDW EM
SSB 0
LB 0
GB 0
PC 1.40
  
```



```

NAME          wangwei
EXPNO         339
PROCNO        1
Date_         20140420
Time          2.05
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           101
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

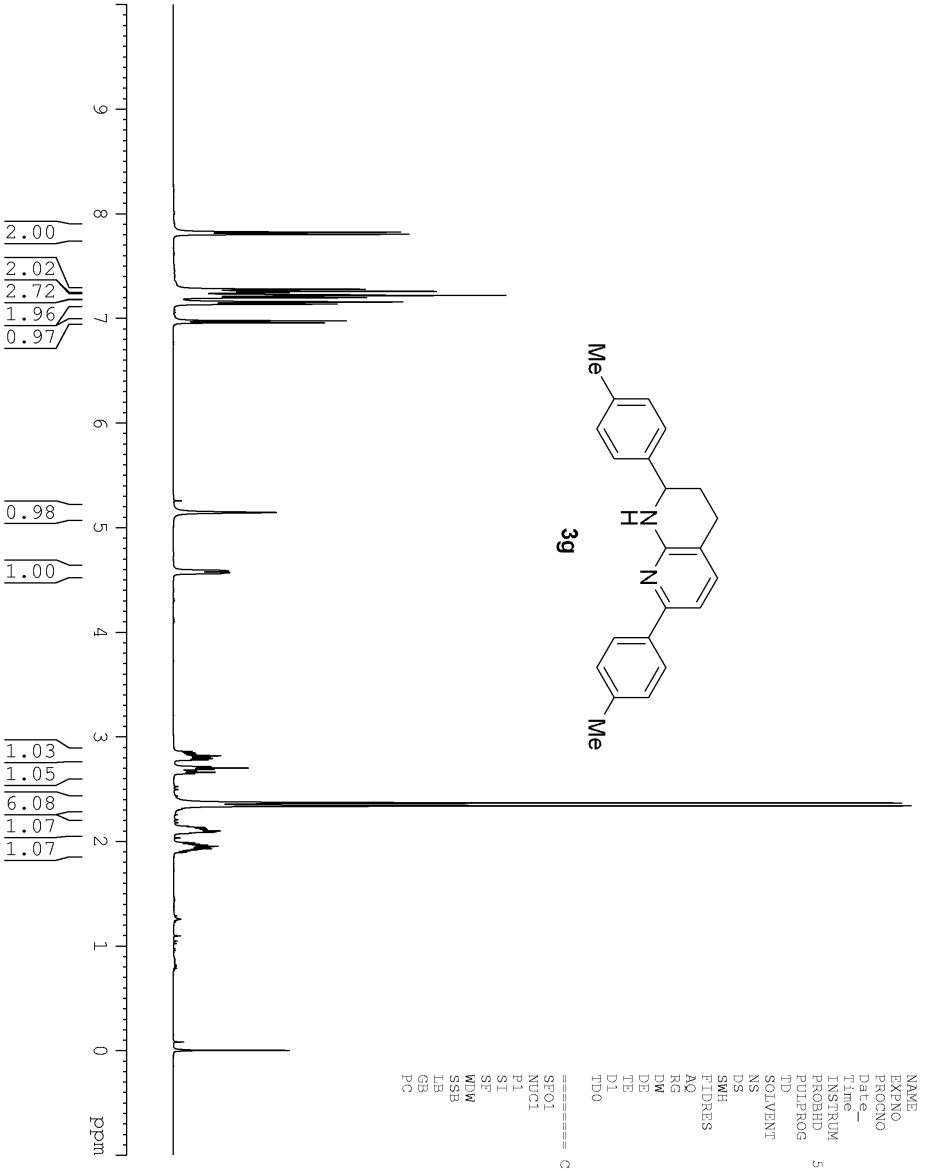
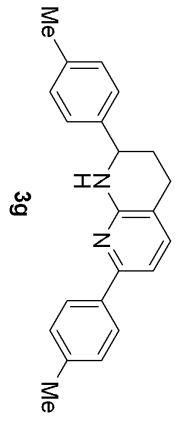
===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300171 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```



```

NAME          wangwei-C
EXPNO         59
PROCNO        1
Date_         20140424
Time_         6-23
INSTRUM       spect
PROBHD        5 mm PABD11-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            435
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

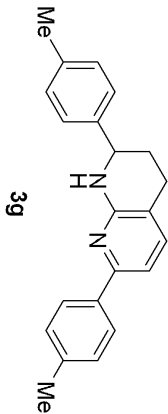
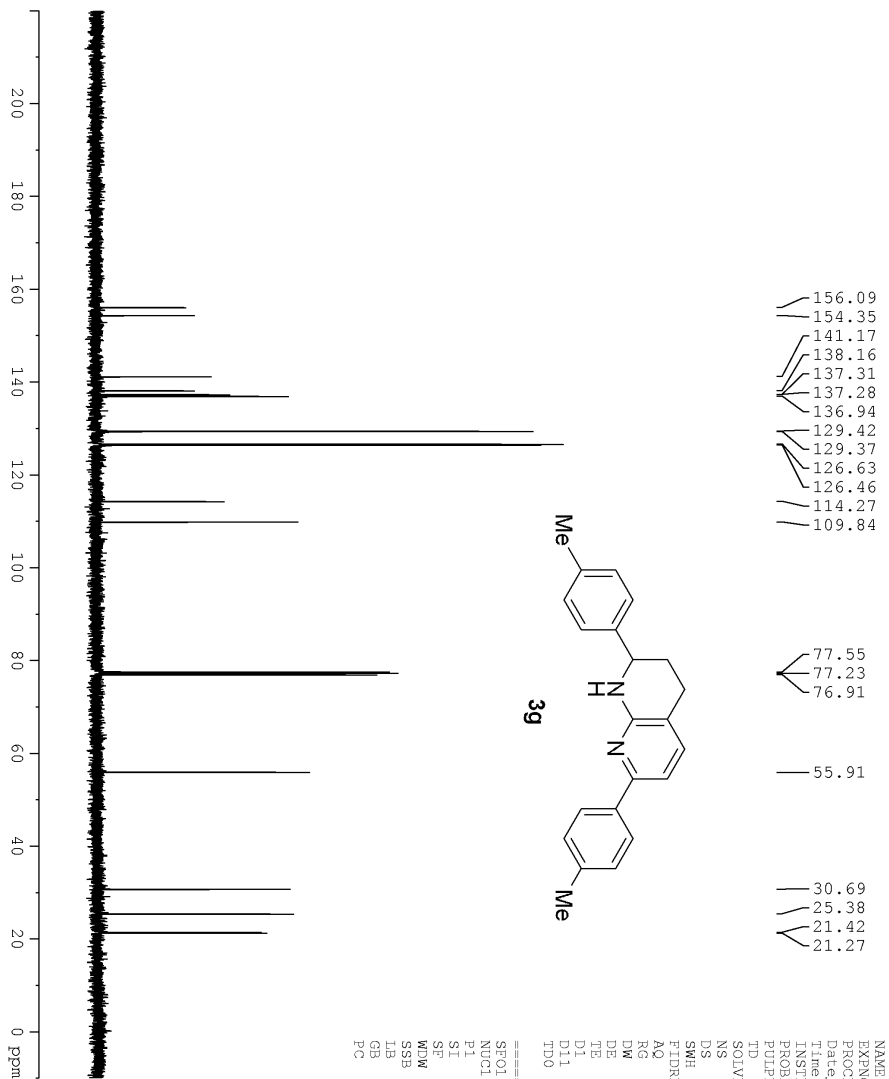
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127510 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         296
PROCNO        1
Date_         20140330
Time         8.47
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 HZ
FIDRES        0.366798 HZ
AQ            1.3631988 sec
RG            71.8
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

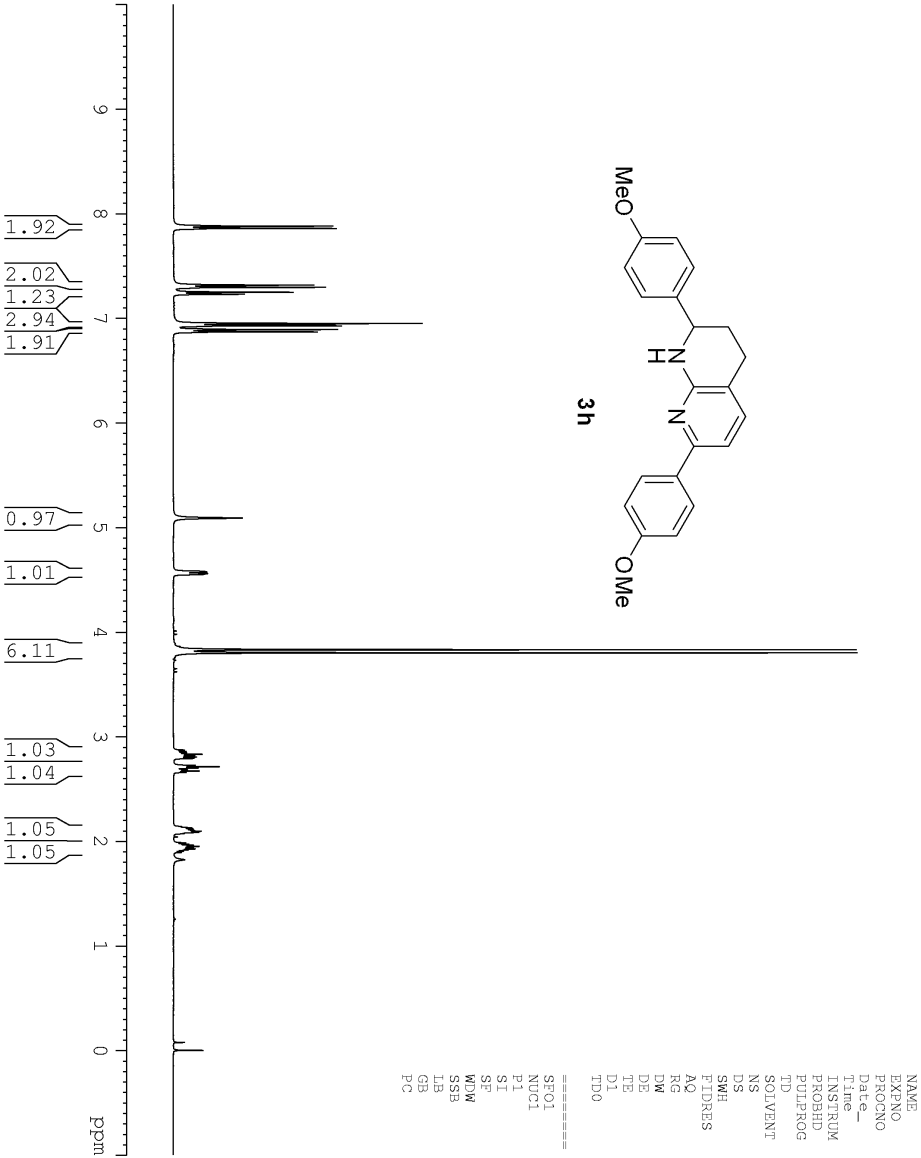
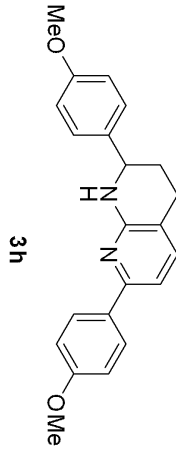
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300270 MHz
WDW           EM
SSB           0
LB            0.50 HZ
GB            0
PC            1.00
  
```



```

NAME          wangwei-C
EXPNO         44
PROCNO        1
Date_         20140330
Time_         8.49
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            68
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

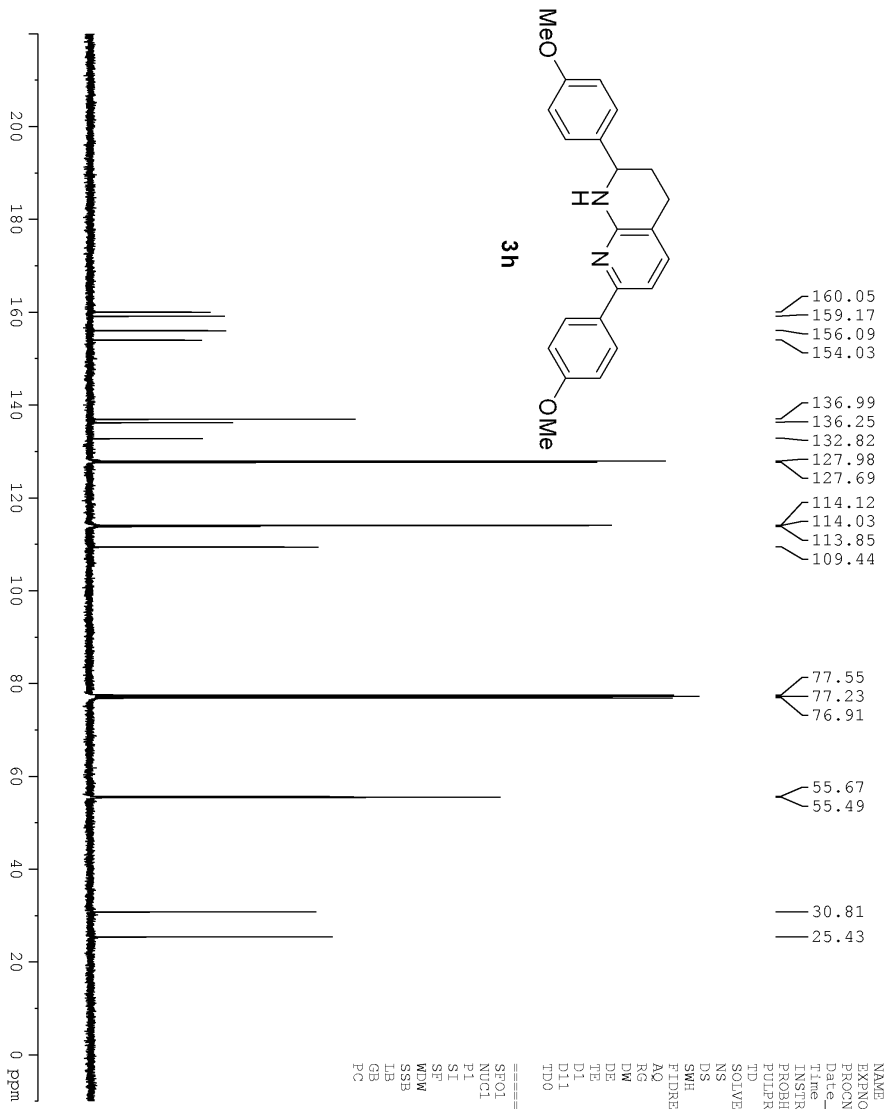
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127564 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

```

NAME          wangwei
EXPNO         279
PROCNO        1
Date_         20140325
Time         3.16
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           101
DW           41.600 usec
DE           6.50 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300149 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```



160.05
159.17
156.09
154.03

136.99
136.25
132.82
127.98
127.69

114.12
114.03
113.85
109.44

77.55
77.23
76.91

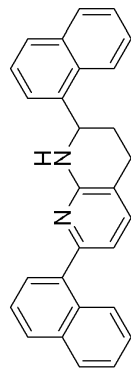
55.67
55.49

30.81
25.43

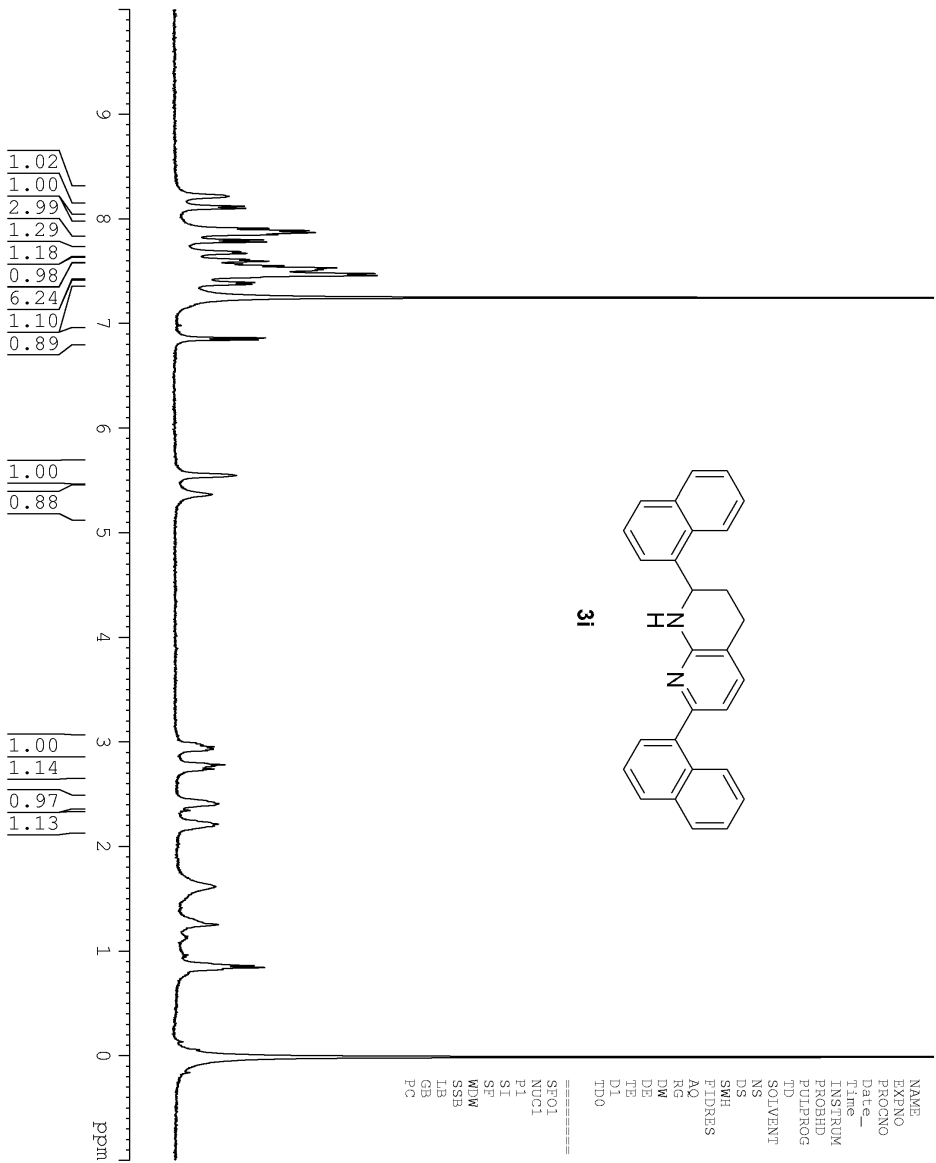
```

NAME          wangwei-C
EXPNO         39
PROCNO        1
Date_         20140325
Time          3.43
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            1074
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127518 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



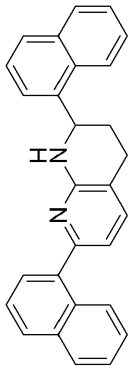
31



```

NAME          wangwei-2x1n
EXPNO         259
PROCNO        1
Date_         20150312
Time         11.01
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           203
DE           41.600 usec
TE           294.8 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300175 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```

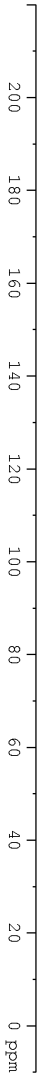


- 156.07
- 155.66
- 139.16
- 138.97
- 136.79
- 134.07
- 131.48
- 130.25
- 129.25
- 129.19
- 128.51
- 128.36
- 128.03
- 127.08
- 126.34
- 125.87
- 125.75
- 125.65
- 125.46
- 123.67
- 122.69
- 114.45

- 77.55
- 77.23
- 76.91

- 51.85

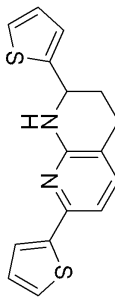
- 28.38
- 24.93



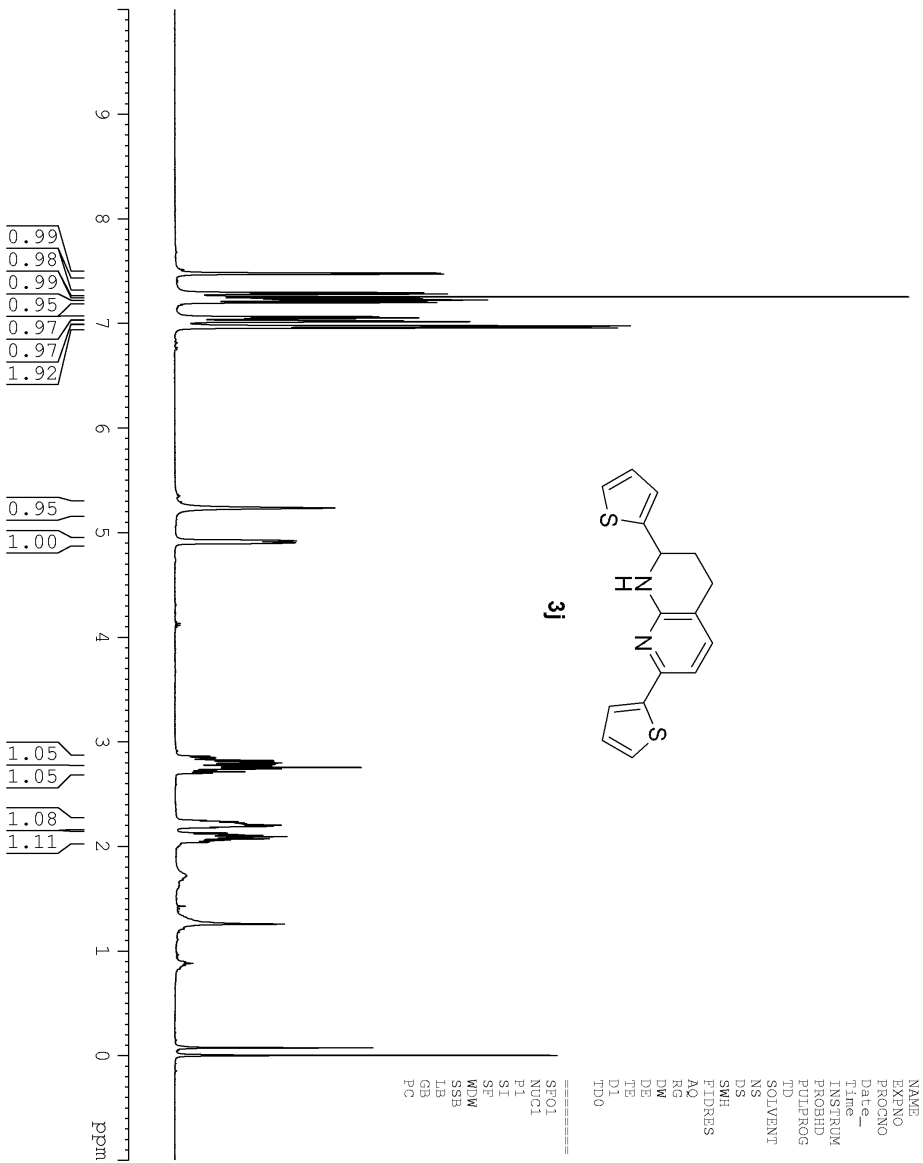
```

NAME          wangwei-C-1_HUIFU
EXPNO         37
PROCNO        1
Date_         20150312
Time_         8-13
INSTRUM       spect
PROBHD        5 mm PABD1-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            50
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            294.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.628298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127626 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



3j



```

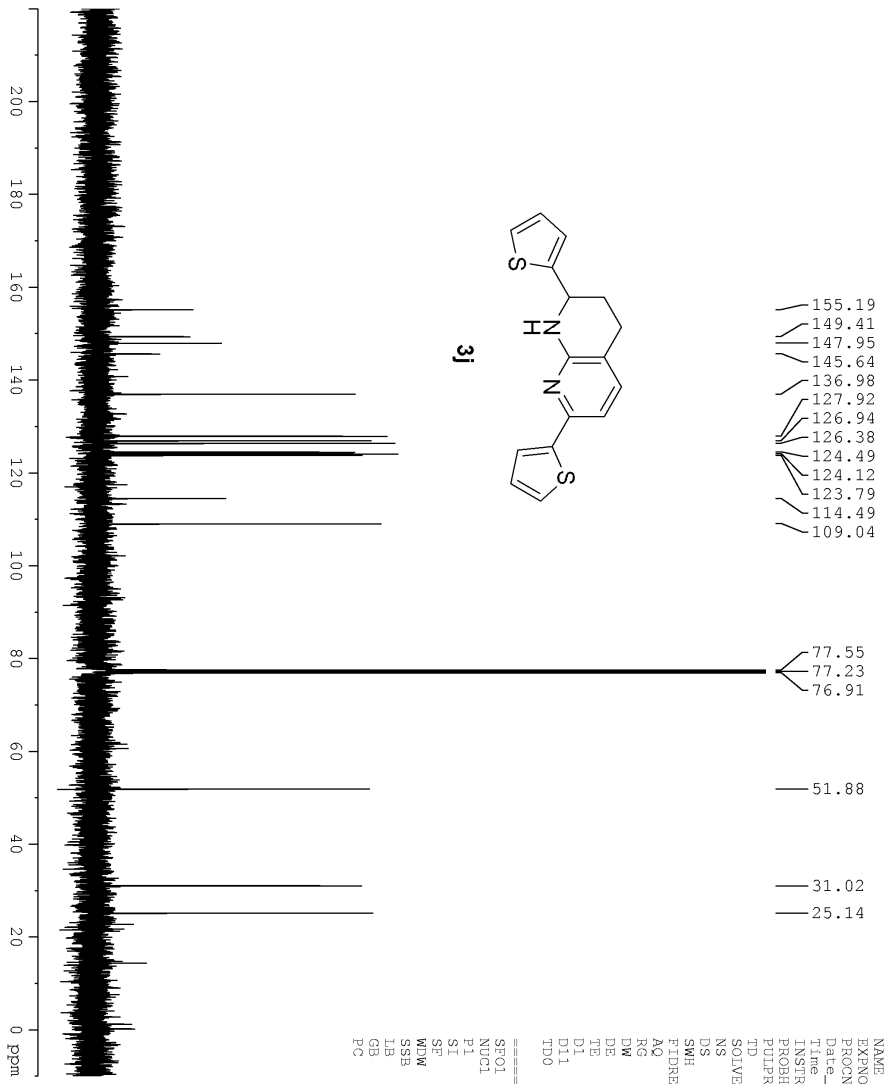
NAME wangwei-2x.in
EXPNO 306
PROCNO 1
Date_ 20150324
Time 3.16
INSTRUM spect
PROBHD 5 mm PABUL 13C
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 12019.230 HZ
FIDRES 0.366798 HZ
AQ 1.3631988 sec
RG 203
DE 41.600 usec
TE 294.9 K
D1 2.00000000 sec
TD0 1

```

```

===== CHANNEL f1 =====
SFO1 400.1320007 MHz
NUC1 1H
P1 12.60 usec
SI 65536
SF 400.1300130 MHz
WDW EM
SSB 0
LB 0.50 HZ
GB 0
PC 1.00

```



- 155.19
- 149.41
- 147.95
- 145.64
- 136.98
- 127.92
- 126.94
- 126.38
- 124.49
- 124.12
- 123.79
- 114.49
- 109.04

- 77.55
- 77.23
- 76.91

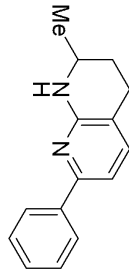
- 51.88

- 31.02
- 25.14

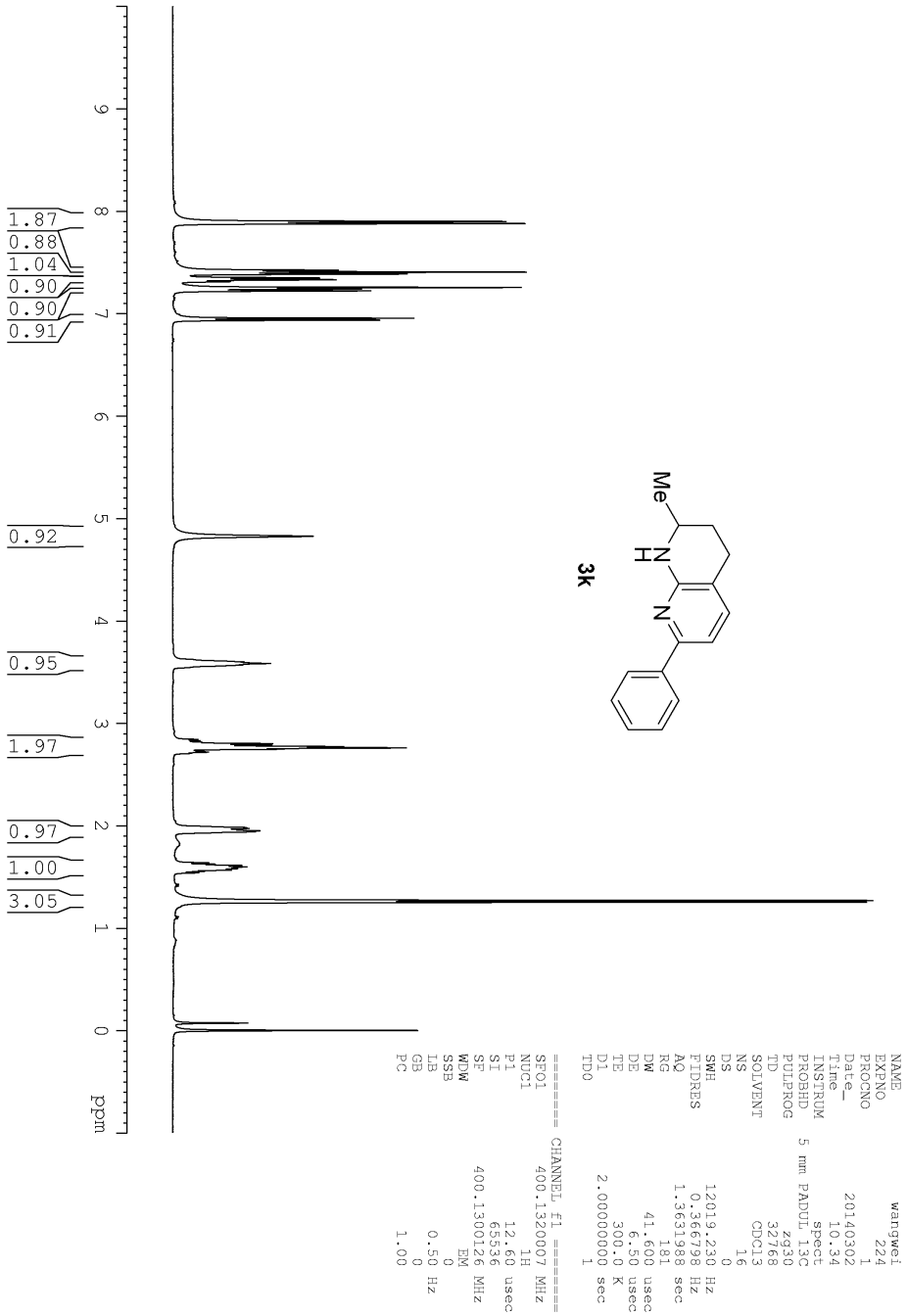
```

NAME      wangwei-C-1 HUIFU
EXPNO    43
PROCNO   1
Date_    20150324
Time     2.16
INSTRUM  spect
PROBHD   5 mm PABD1-13C
PULPROG  zgpg30
TD        32768
SOLVENT  CDCl3
NS        101
DS        0
SWH       25252.525 Hz
FIDRES   0.770646 Hz
AQ        0.6488564 sec
RG        203
DE        19.800 usec
TE        6.50 usec
TD0       235.5 K
D1        2.00000000 sec
D11       0.03000000 sec
===== CHANNEL f1 =====
SFO1     100.6282898 MHz
NUC1     13C
P1       9.40 usec
SI       32768
SF       100.6127510 MHz
WDW      EM
SSB      0
LB       1.00 Hz
GB       0
PC       1.40

```



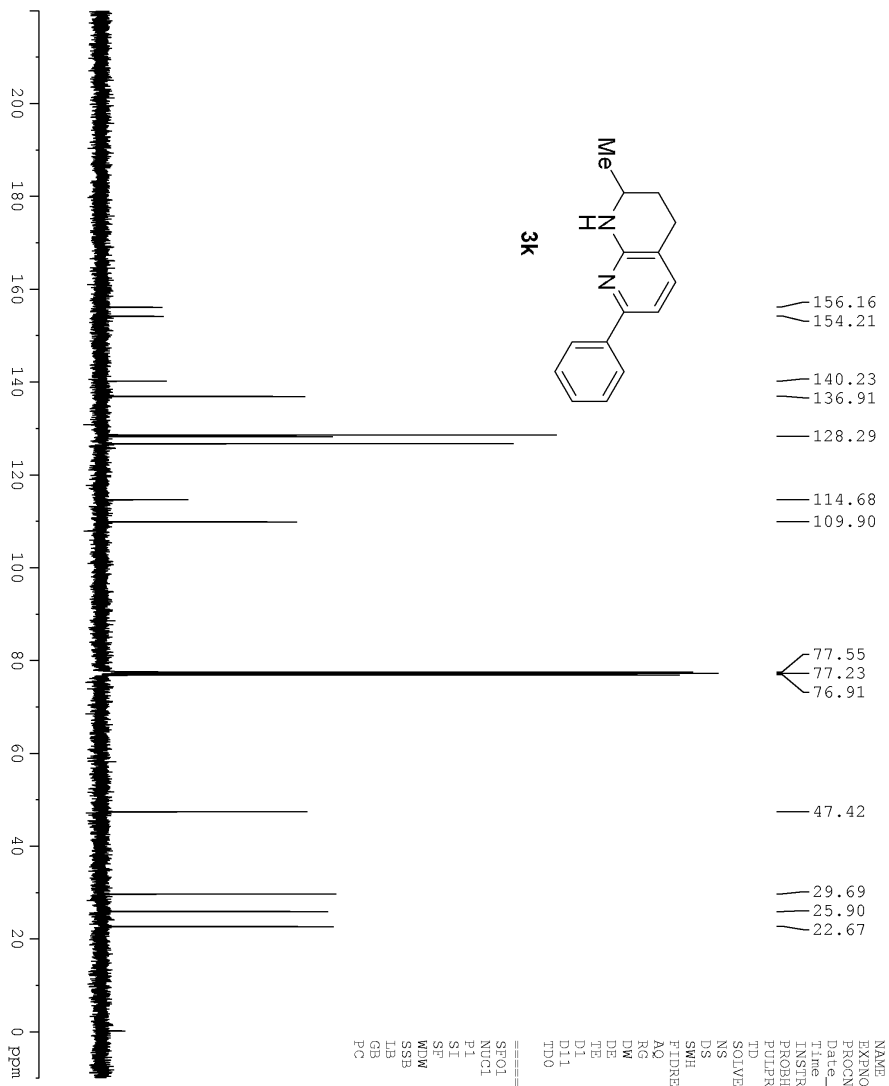
3k



```

NAME          wangwei
EXPNO         224
PROCNO        1
Date_         20140302
Time         10.34
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            181
DW            41.600 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

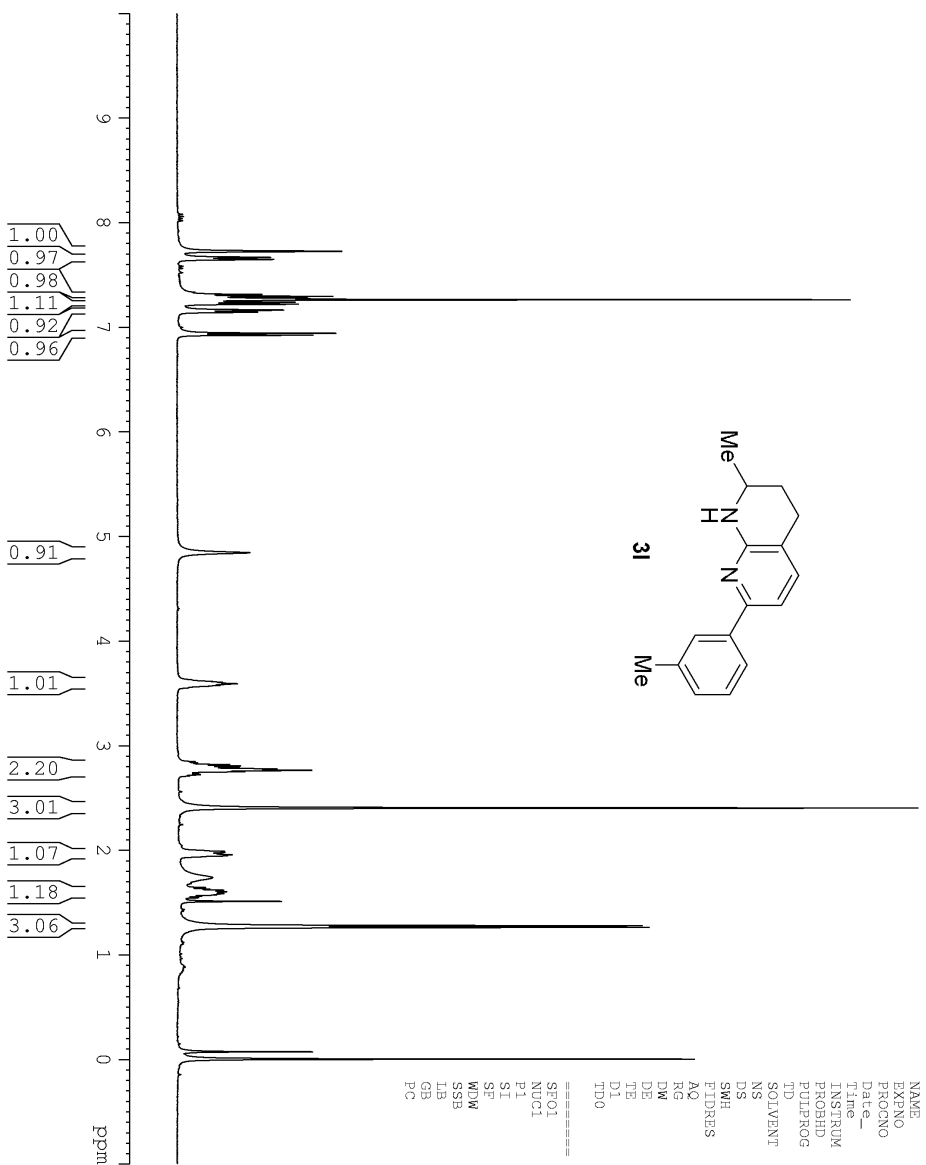
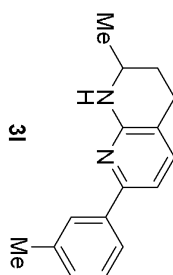
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300126 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



```

NAME          wangwei-C
EXPNO         19
PROCNO        1
Date_         20140302
Time_         10.41
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            249
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           300.0 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

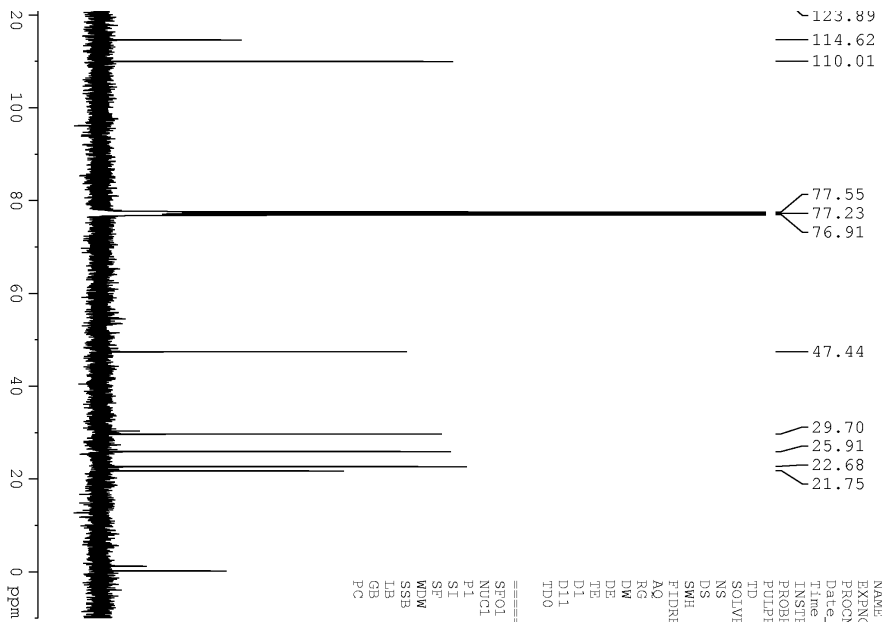
===== CHANNEL f1 =====
SFO1         100.628298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127502 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```

```

NAME          wangwei
EXPNO         361
PROCNO        1
Date_         20140429
Time         2.10
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 HZ
FIDRES       0.366798 HZ
AQ           1.3631988 sec
RG           203
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

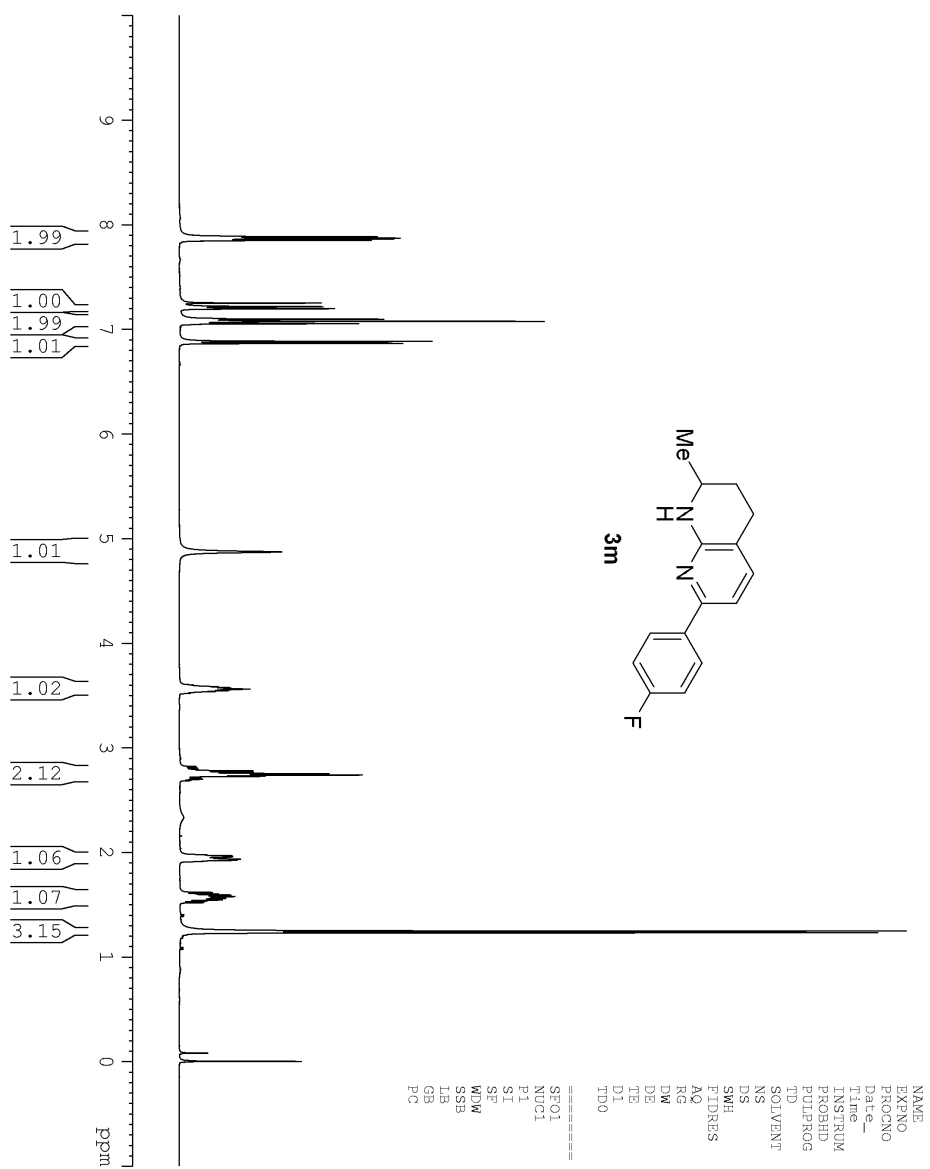
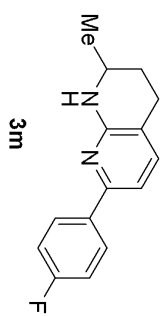
===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300103 MHz
WDW          EM
SSB          0
LB           0.50 HZ
GB           0
PC           1.00
  
```



```

NAME          wangwe1-C
EXPNO         70
PROCNO        1
Date_         20140423
Time_         6.04
INSTRUM       spect
PROBHD        zgpg30
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            3545
DS            0
SMH           25252.525 HZ
FIDRES        0.770646 HZ
AQ            0.6488564 sec
RG            203
DW            19.800 usec
DE            6.50 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

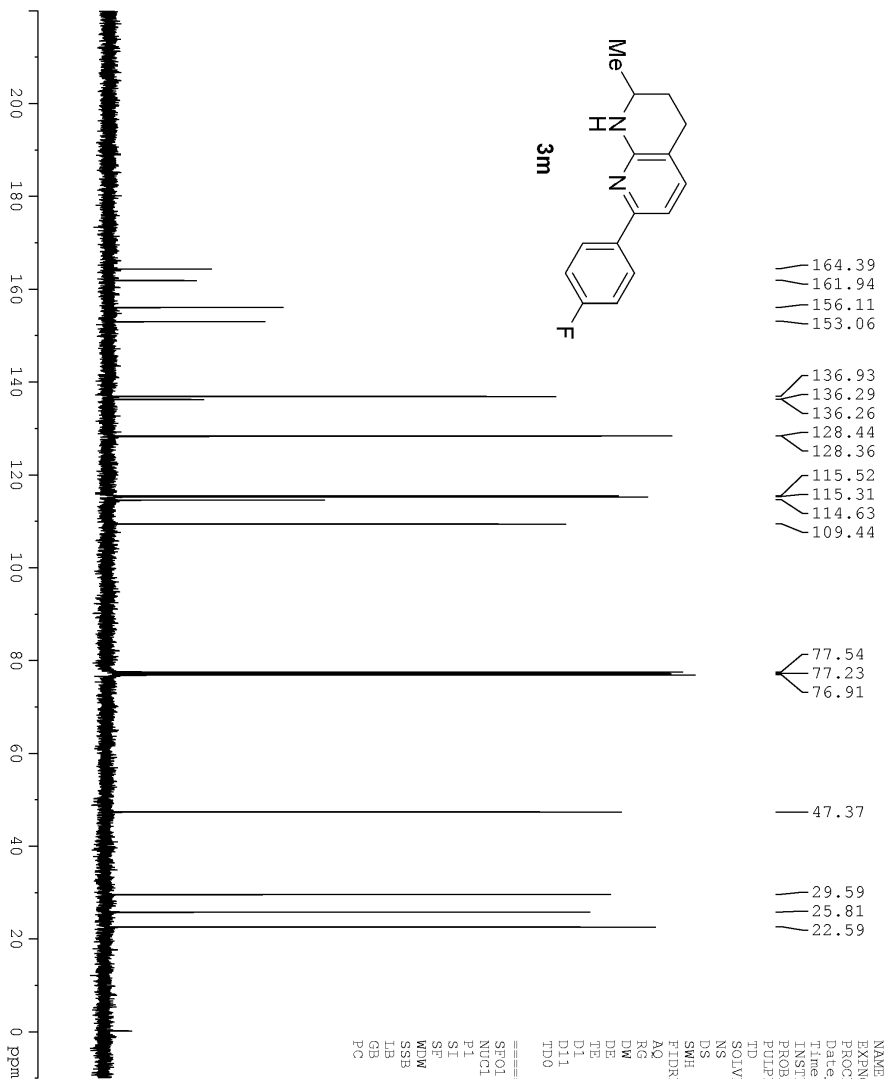
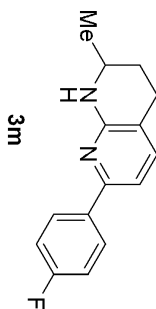
===== CHANNEL f1 =====
SFO1         100.62828298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127487 MHz
WDW          EM
SSB          0
IB           0
GB           0
PC           1.40
  
```



```

NAME          WANPWE1
EXPNO         353
PROCNO        1
Date_         20140425
Time_         4.46
INSTRUM       spect
PROBHD        5 mm PABDUL13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SMH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300143 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



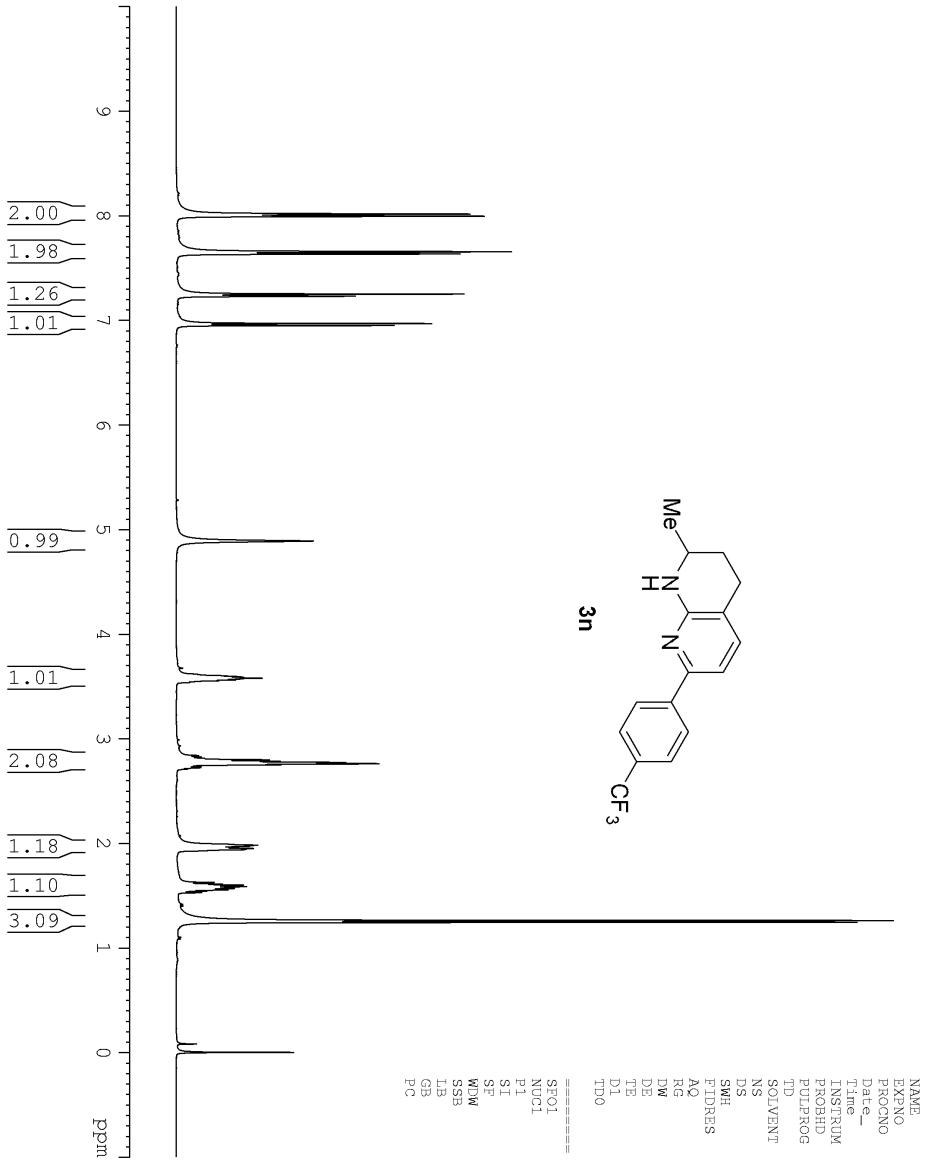
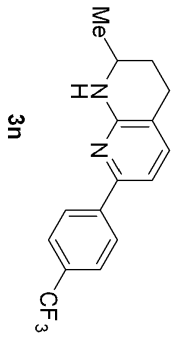
164.39
161.94
156.11
153.06
136.93
136.29
136.26
128.44
128.36
115.52
115.31
114.63
109.44

77.54
77.23
76.91
47.37
29.59
25.81
22.59

```

NAME          wangwei-C
EXPNO         66
PROCNO        1
Date_         20140425
Time_         4.49
INSTRUM       spect
PROBHD        5 mm PABD11-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            250
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE           19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

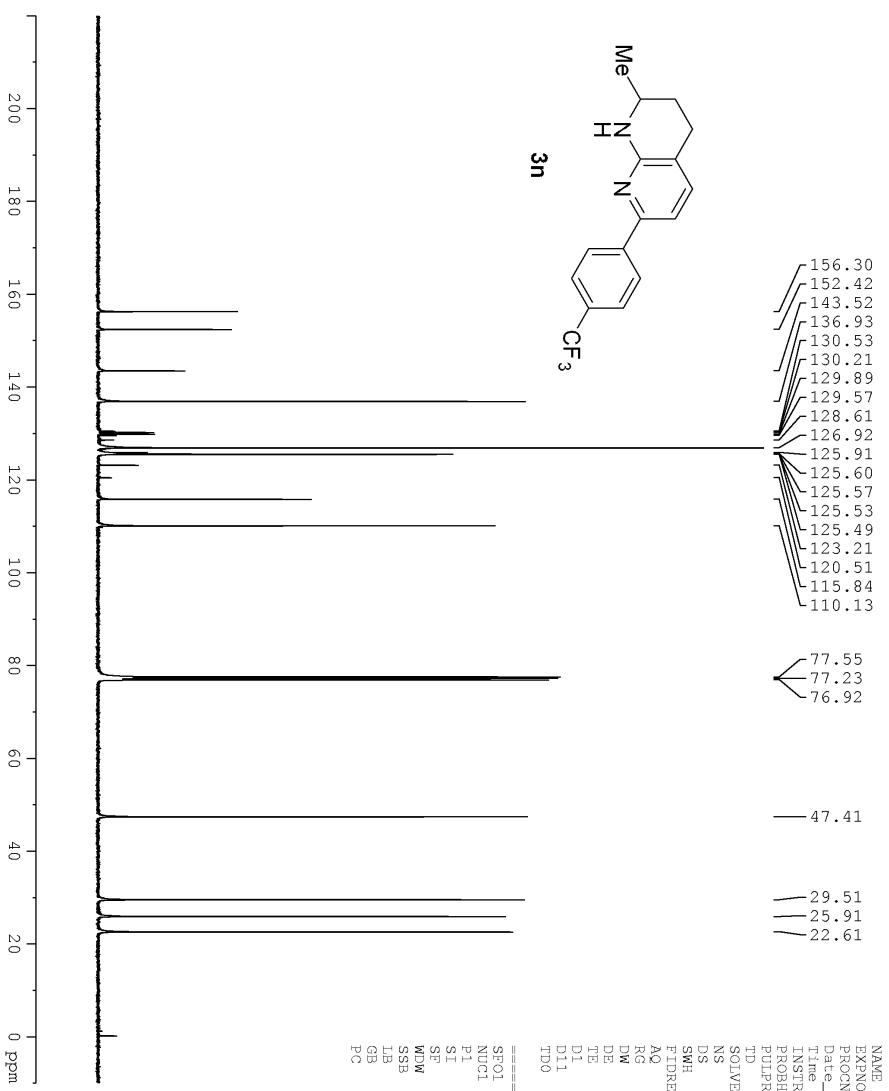
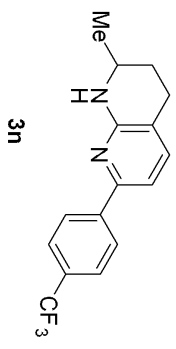
===== CHANNEL f1 =====
SFO1          100.628298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127541 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         357
PROCNO        1
Date_         20140426
Time         2.07
INSTRUM      spect
PROBHD       5 mm PABUL 13C
PULPROG      zg30
TD           32768
SOLVENT      CDCl3
NS           16
DS           0
SWH          12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           101
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

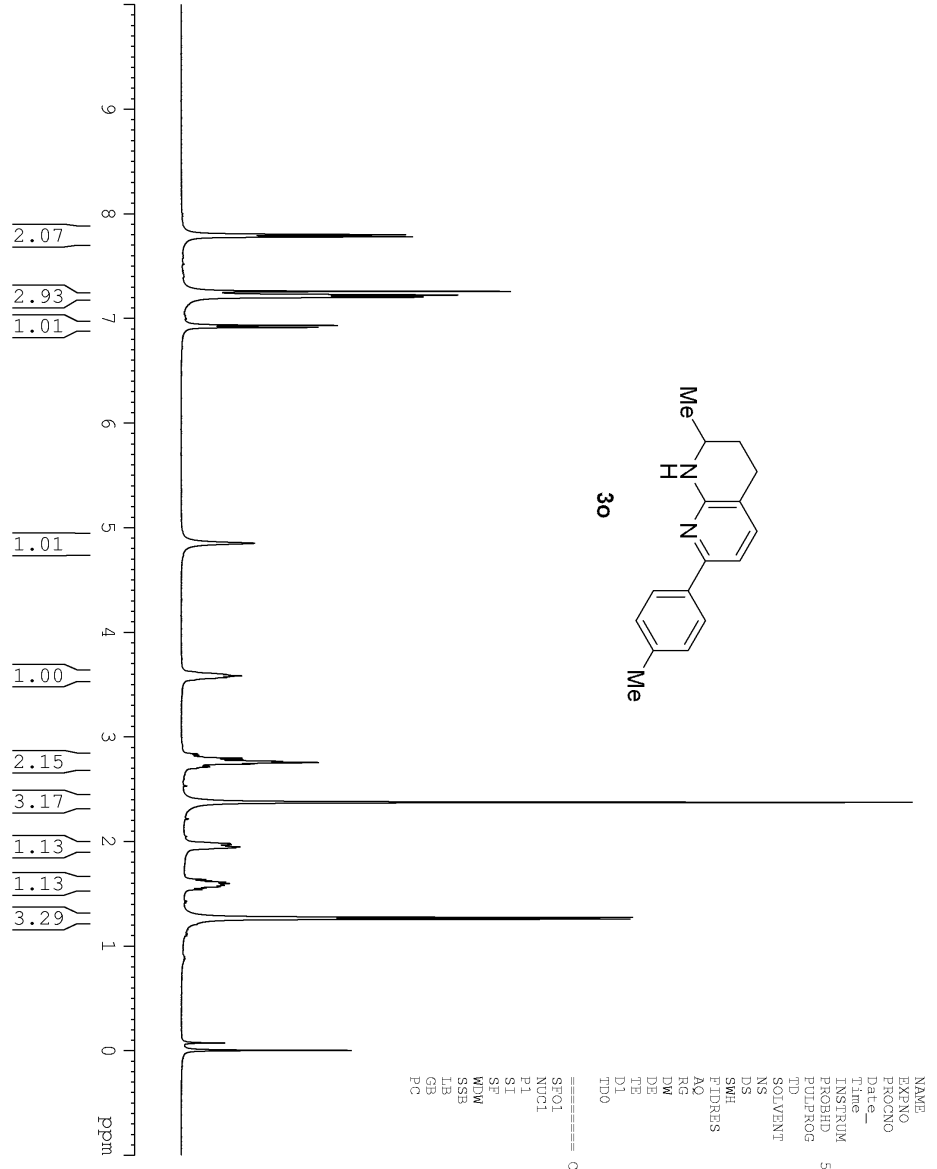
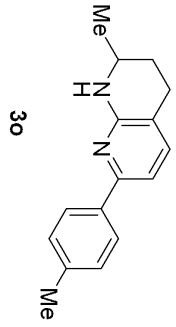
===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300142 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```



```

NAME          wangwei-C
EXPNO         68
PROCNO        1
Date_         20140426
Time_        13:40
INSTRUM       spect
PROBHD        5 mm PABDUL13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            14784
DS            0
SMH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

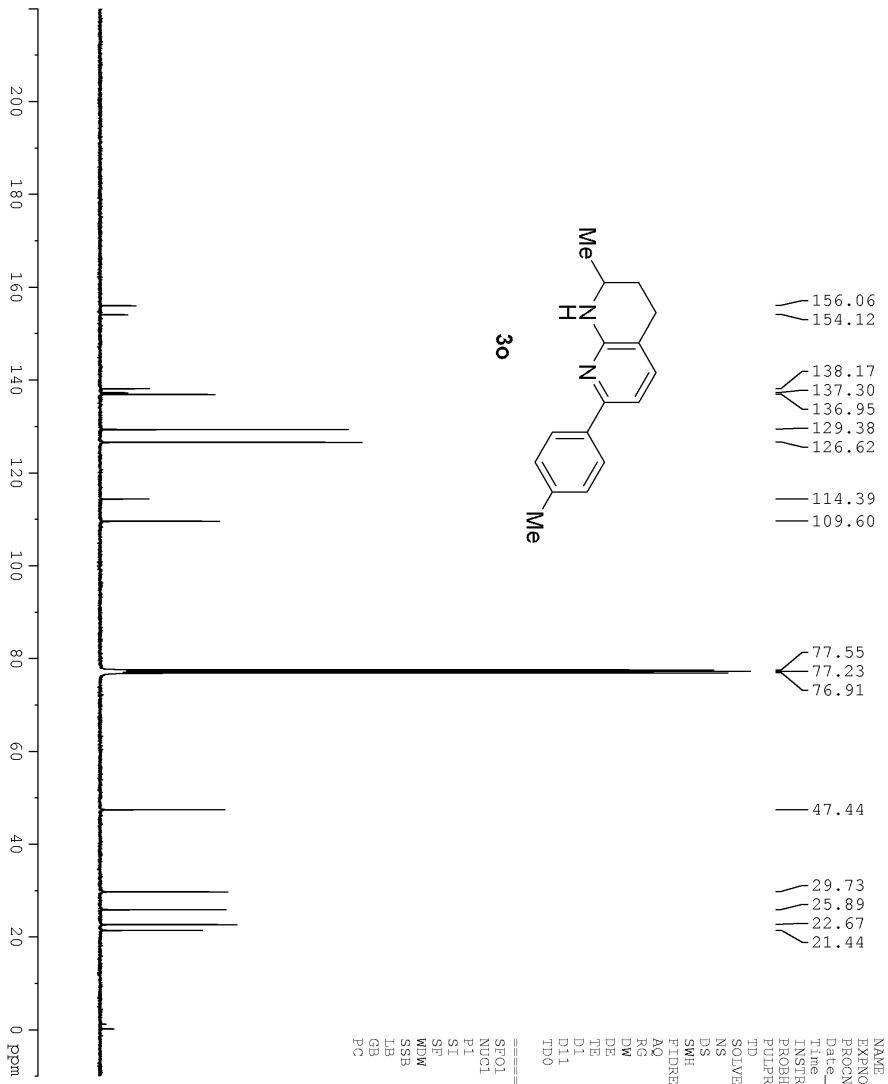
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127510 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```



```

NAME          wangwei
EXPNO         317
PROCNO       1
Date_        20140410
Time         13.27
INSTRUM     spect
PROBHD      5 mm PABUL 13C
PULPROG     zg30
TD          32768
SOLVENT     CDCl3
NS          16
DS          0
SWH         12019.230 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG          203
DE         41.600 usec
TE         300.0 K
D1         2.00000000 sec
TD0        1

===== CHANNEL f1 =====
SFO1        400.1320007 MHz
NUC1        1H
P1         12.60 usec
SI         65536
SF         400.1300116 MHz
WDW        EM
SSB        0
LB         0.50 Hz
GB         0
PC         1.00
  
```

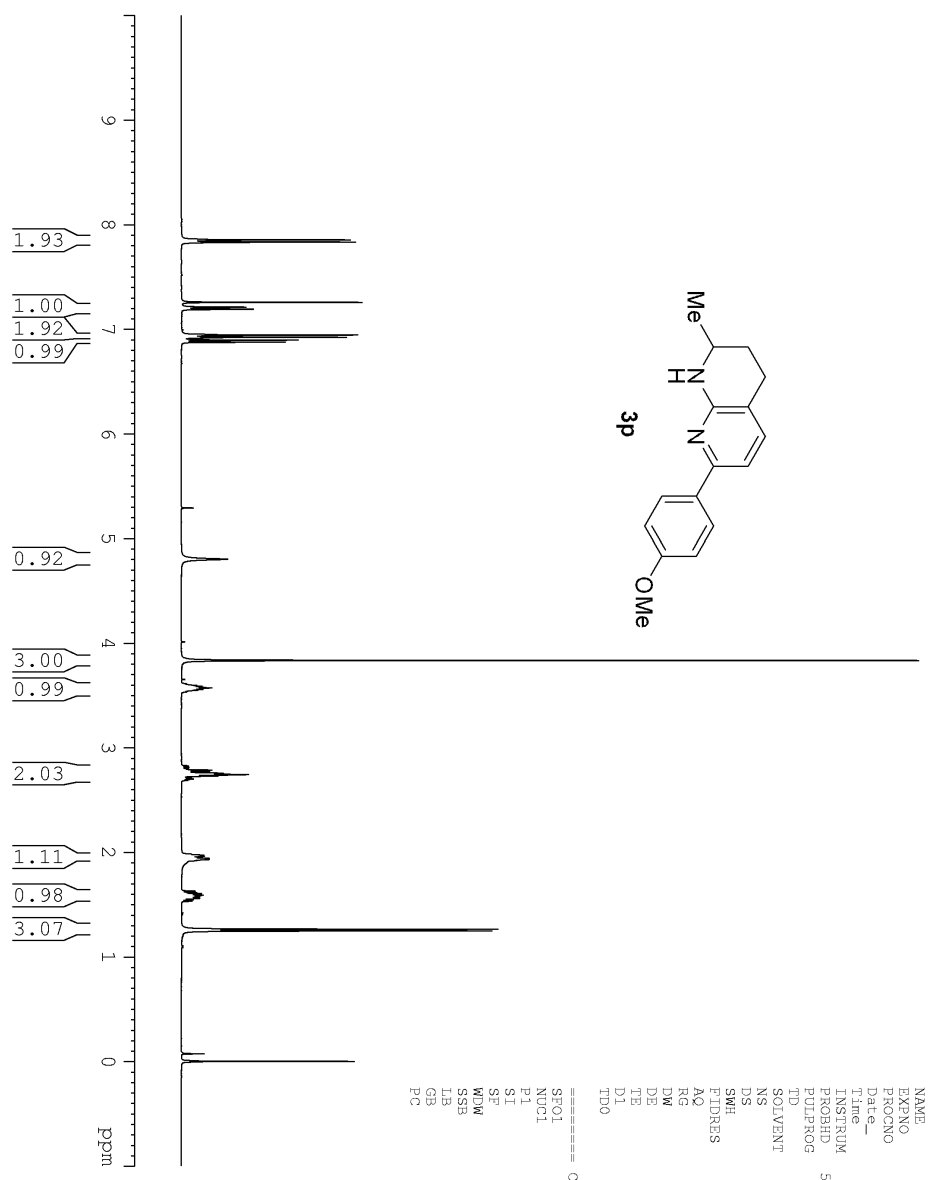
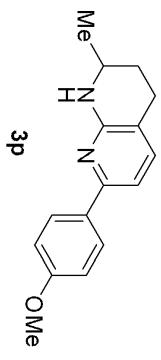


```

NAME          wangwei-C
EXPNO         53
PROCNO        1
Date_         20140410
Time          13.32
INSTRUM       spect
PROBHD        5 mm PABD11-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            13623
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            300.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127487 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40

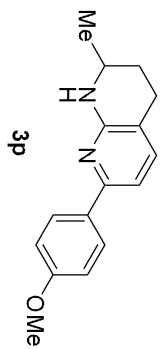
```

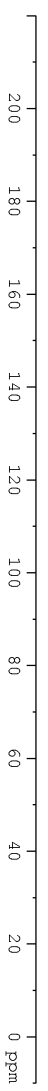
```

NAME          wangwei
EXPNO         327
PROCNO        1
Date_         20140415
Time         13.30
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            300.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300116 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



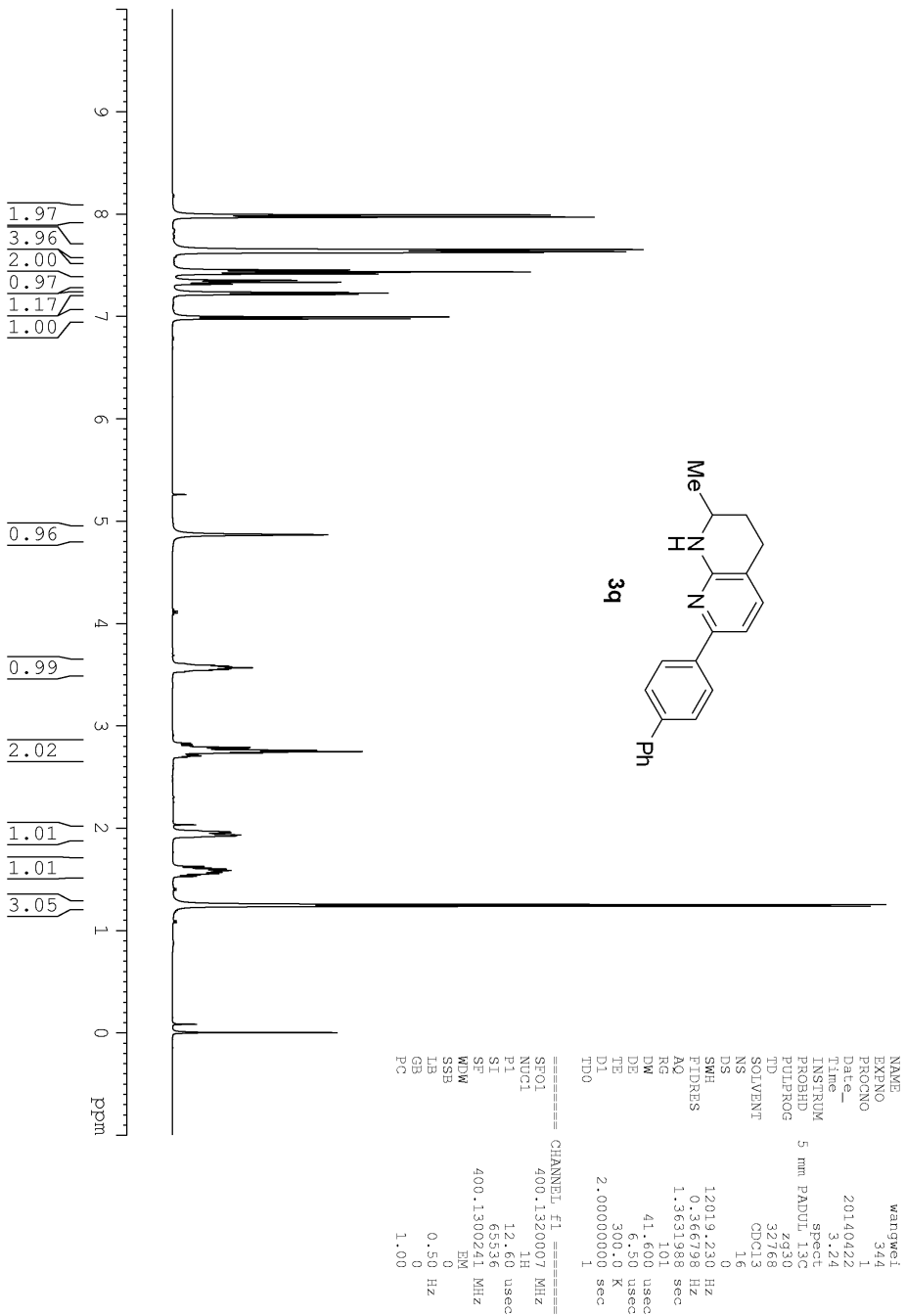
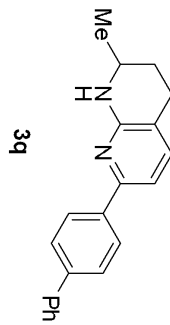
- 159.99
- 156.06
- 153.87
- 136.93
- 132.90
- 127.94
- 114.00
- 113.91
- 109.19
- 77.55
- 77.43
- 77.23
- 76.91
- 55.50
- 47.41
- 29.76
- 25.85
- 22.67

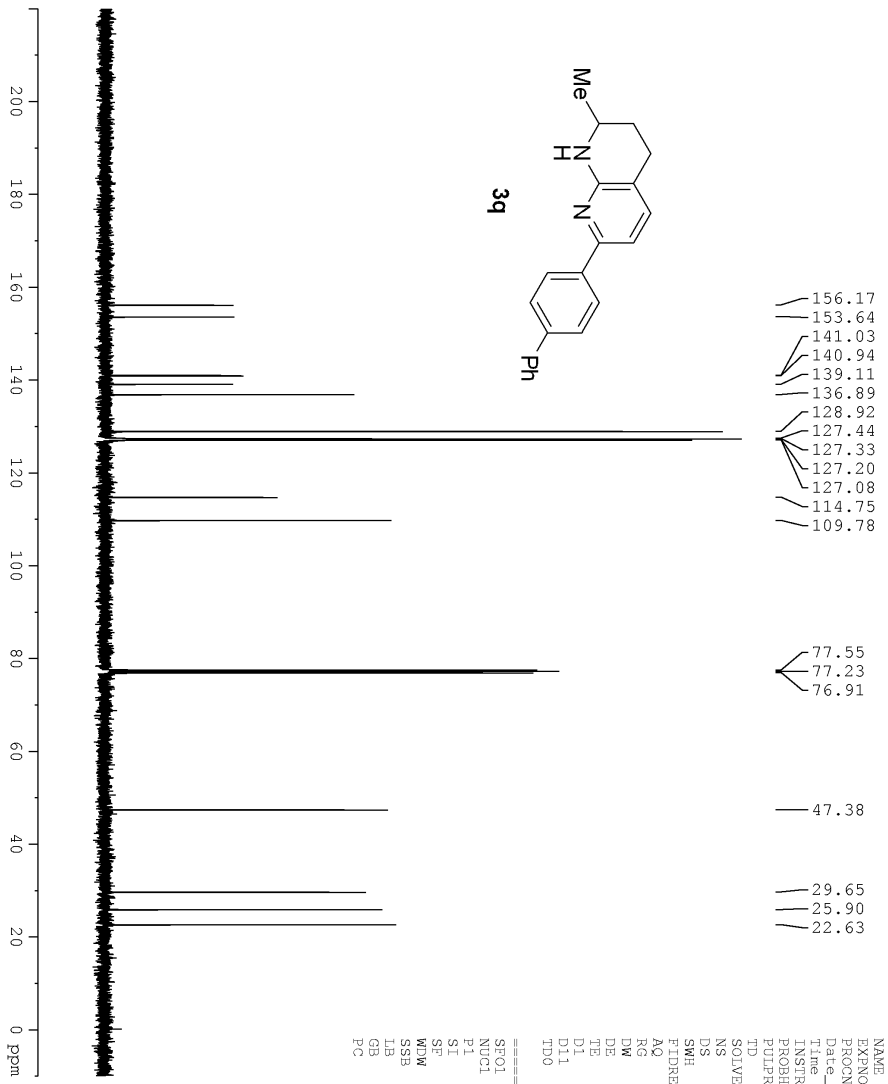


```

NAME wangwei-C
EXPNO 55
PROCNO 1
Date_ 20140415
Time 13.34
INSTRUM spect
PROBHD 5 mm PABD113C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 149
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 6.50 usec
TD0 2.00000000 sec
D1 300.0 K
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127503 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
  
```

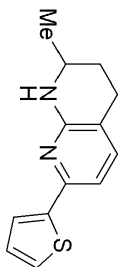




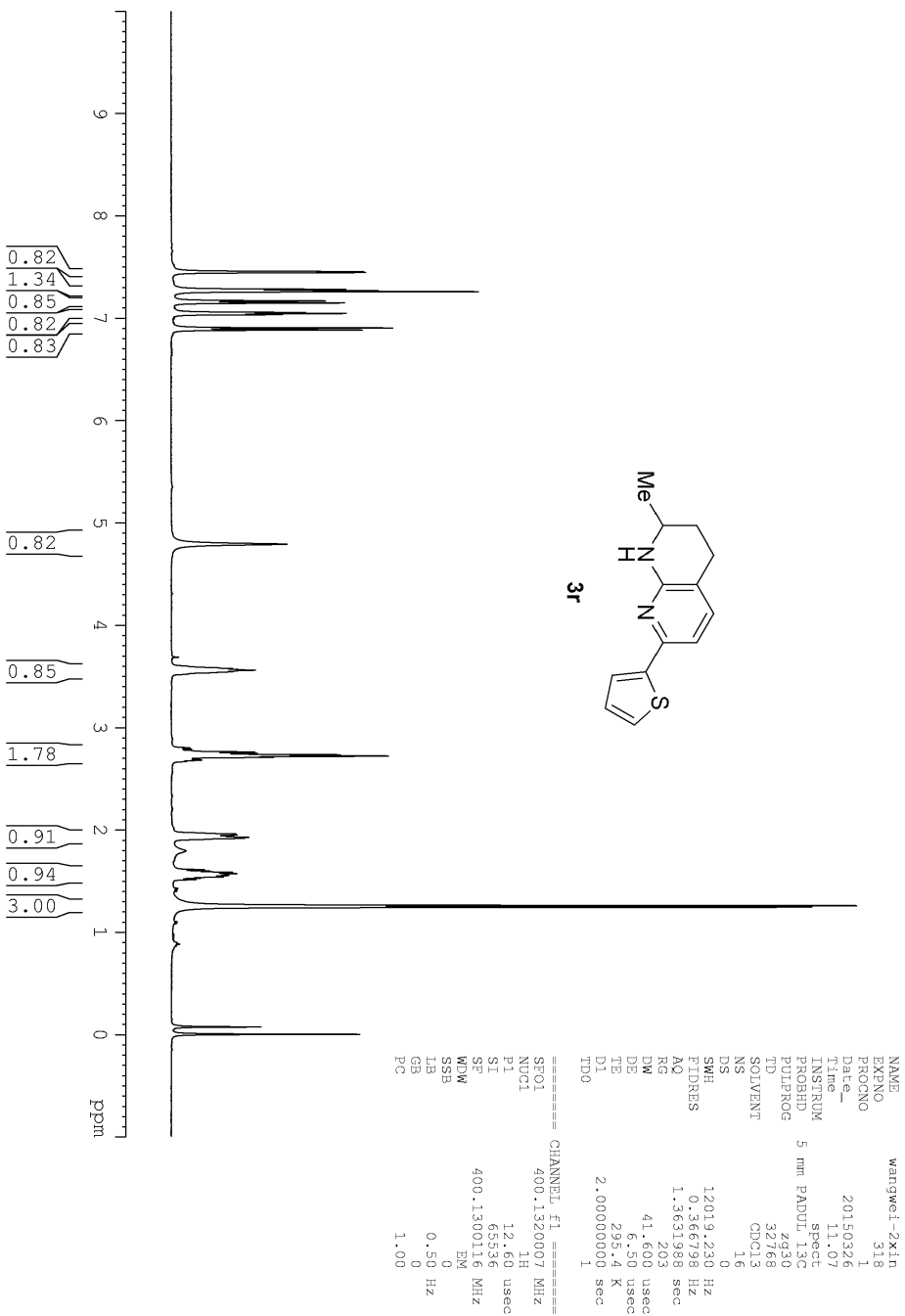
```

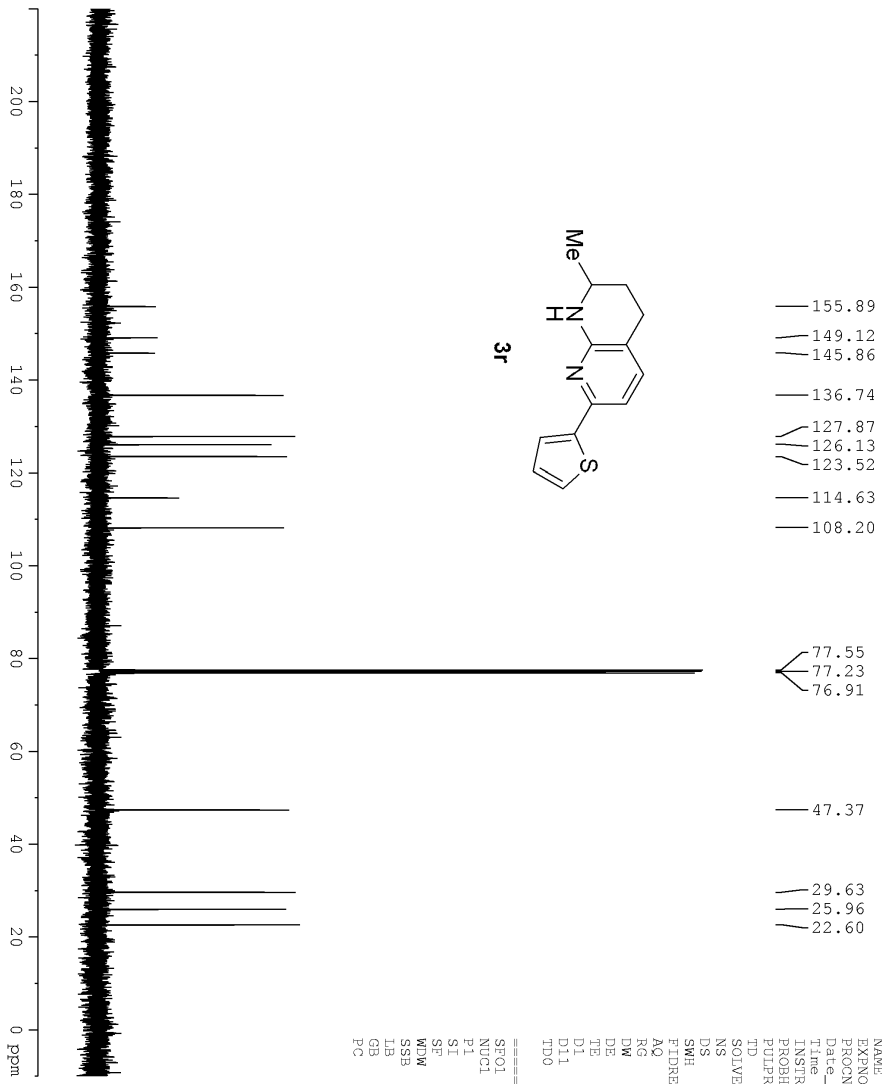
NAME          wangwei-C
EXPNO         61
PROCNO        1
Date_         20140422
Time         3.28
INSTRUM      spect
PROBHD       5 mm PABD1-13C
PULPROG      zgpg30
TD           32768
SOLVENT      CDCl3
NS           128
DS           0
SWH          25252.525 Hz
FIDRES      0.770646 Hz
AQ          0.6488564 sec
RG          203
DE          19.800 usec
TE          300.0 K
D1          2.00000000 sec
D11         0.03000000 sec
TD0         1

===== CHANNEL f1 =====
SFO1        100.6282898 MHz
NUC1        13C
P1          9.40 usec
SI          32768
SF          100.6127564 MHz
WDW         EM
SSB         0
LB          1.00 Hz
GB          0
PC          1.40
  
```



3r

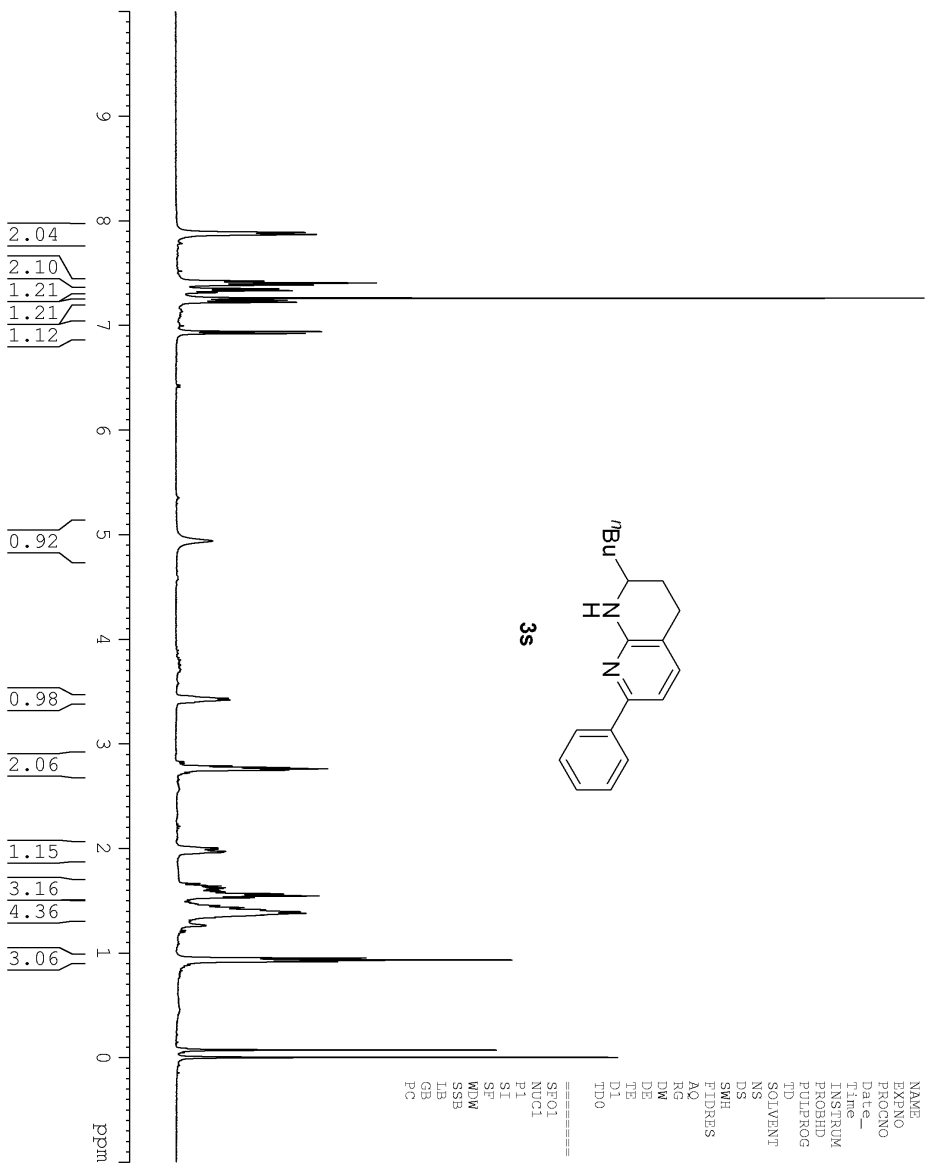




```

NAME          wangwei-C-1 HUIFU
EXPNO         45
PROCNO        1
Date_         20150326
Time_        11.09
INSTRUM       spect
PROBHD        5 mm PABD1-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            102
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DE            19.800 usec
TE            6.50 usec
TD0           236.0 K
D1            2.00000000 sec
D11           0.03000000 sec
===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127510 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40

```

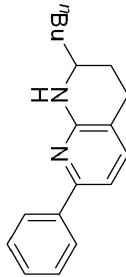
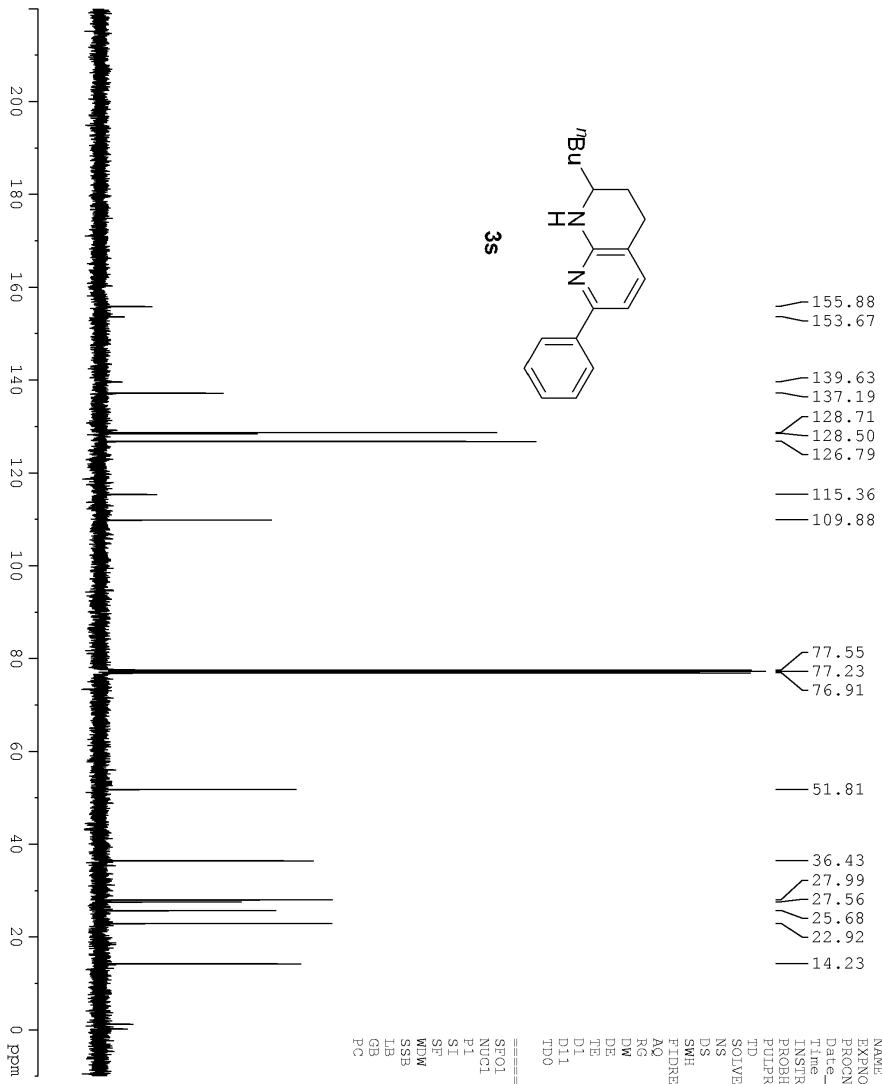


```

NAME wangwei-2x1n
EXPNO 158
PROCNO 1
Date_ 20150113
Time 13.05
INSTRUM spect
PROBHD 5 mm PABUL 13C
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 10
DS 0
SWH 12019.230 HZ
FIDRES 0.366798 HZ
AQ 1.3631988 sec
RG 203
DE 41.600 usec
TE 300.0 K
D1 2.00000000 sec
TD0 1

===== CHANNEL f1 =====
SF01 400.1320007 MHz
NUC1 1H
P1 12.60 usec
SI 65536
SF 400.1300112 MHz
WDW EM
SSB 0
LB 0.50 HZ
GB 0
PC 1.00

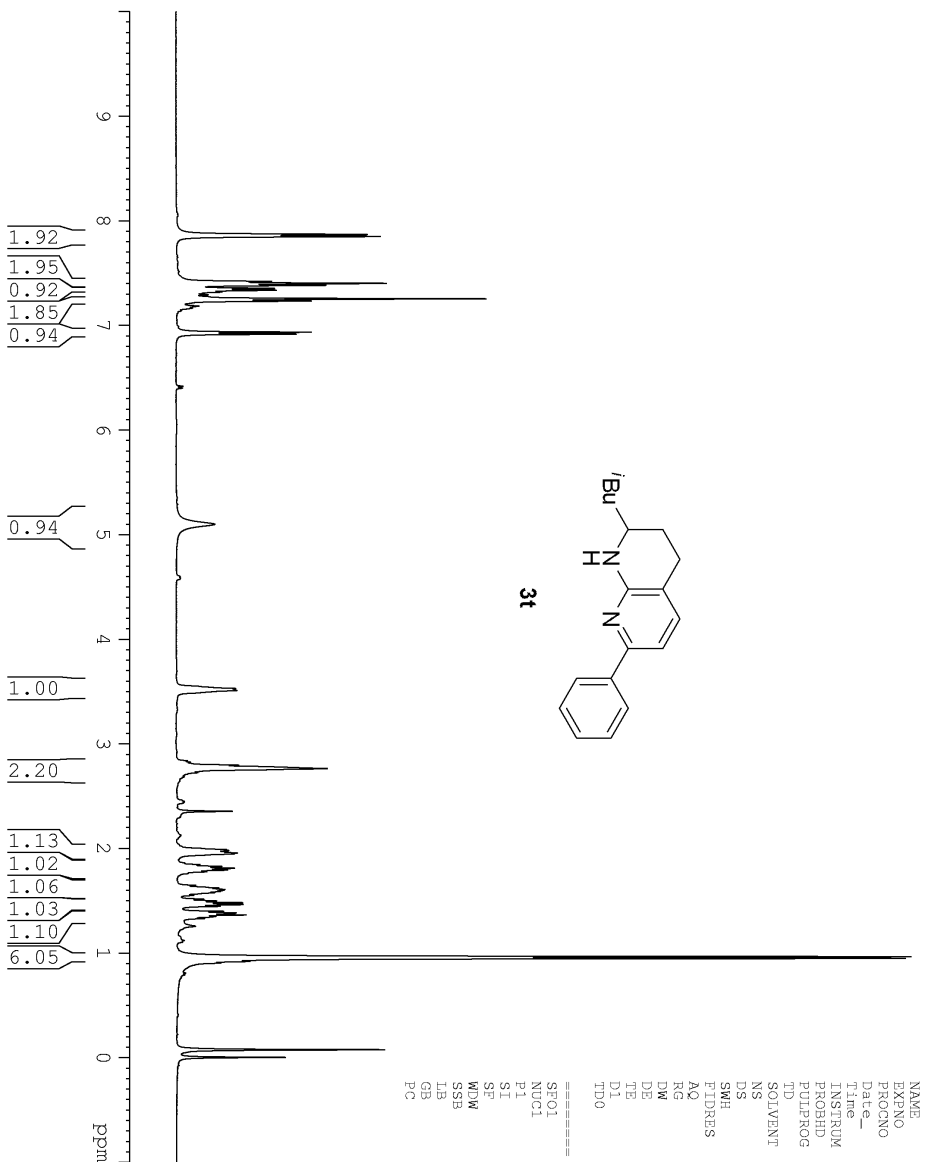
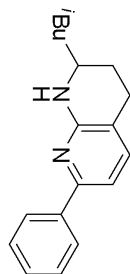
```



```

NAME          wangwei-C-1 HUIFU
EXPNO         47
PROCNO        1
Date_         20150327
Time         13.39
INSTRUM       spect
PROBHD        5 mm PABD1-13C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            289
DS            0
SWH           25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           203
DE           19.800 usec
TE           6.50 usec
D1           236.1 K
D11          0.03000000 sec
TD0          1

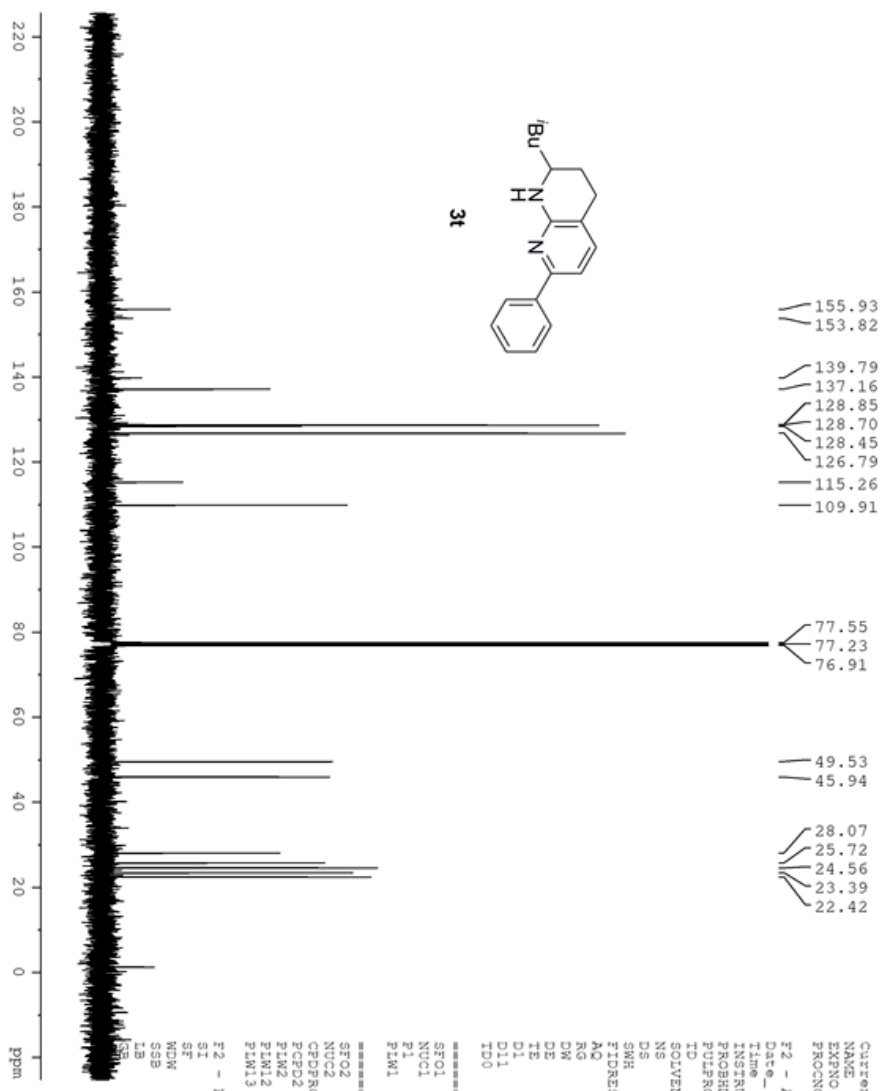
===== CHANNEL f1 =====
SFO1         100.6228298 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127502 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```

```

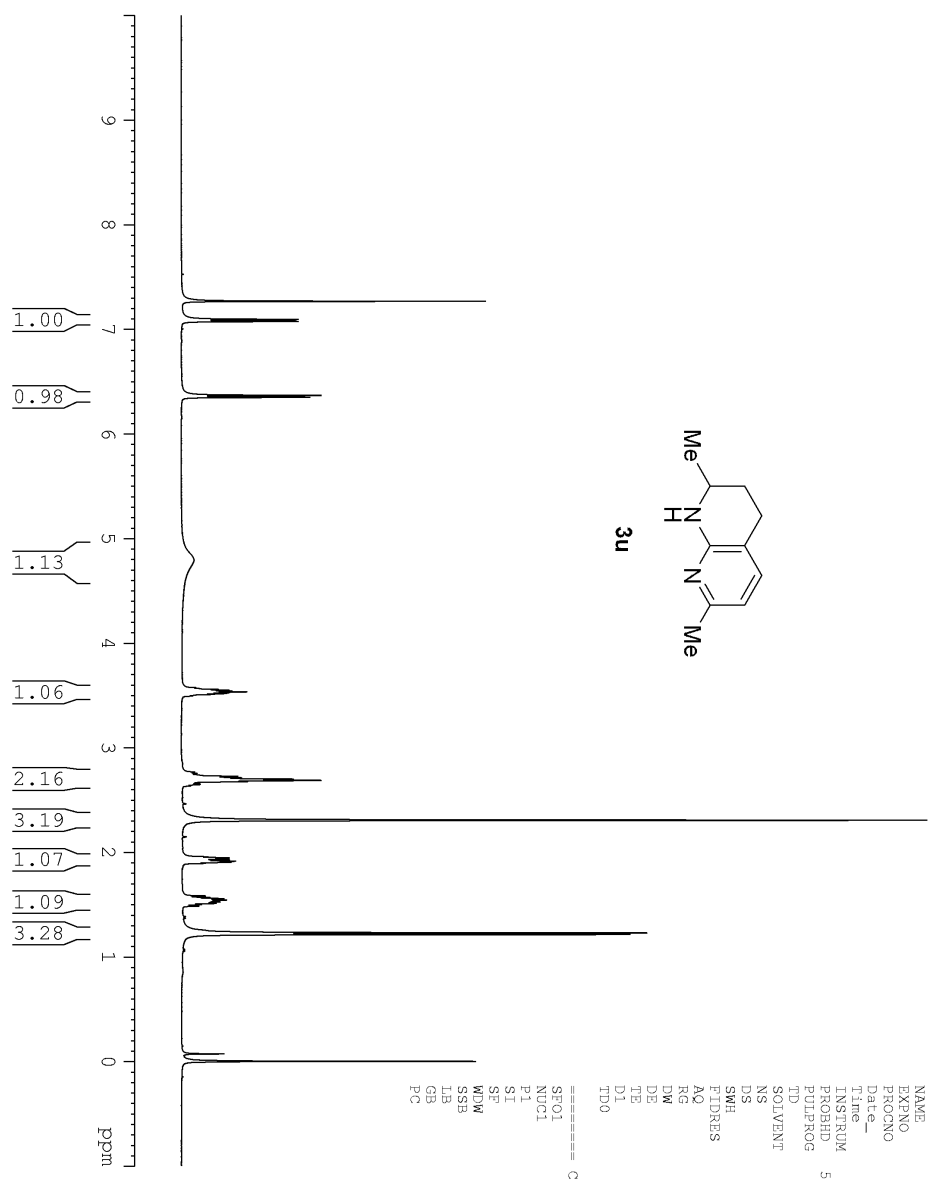
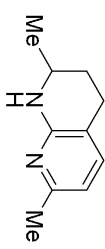
NAME          wangwei-2x1n
EXPNO         322
PROCNO        1
Date_         20150327
Time         13.10
INSTRUM       spect
PROBHD        5 mm PABUL 13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 HZ
FIDRES       0.366798 HZ
AQ           1.3631988 sec
RG           101
DW           41.600 usec
DE           6.50 usec
TE           295.7 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300131 MHz
WDW          EM
SSB          0
LB           0.50 HZ
GB           0
PC           1.00
  
```



```

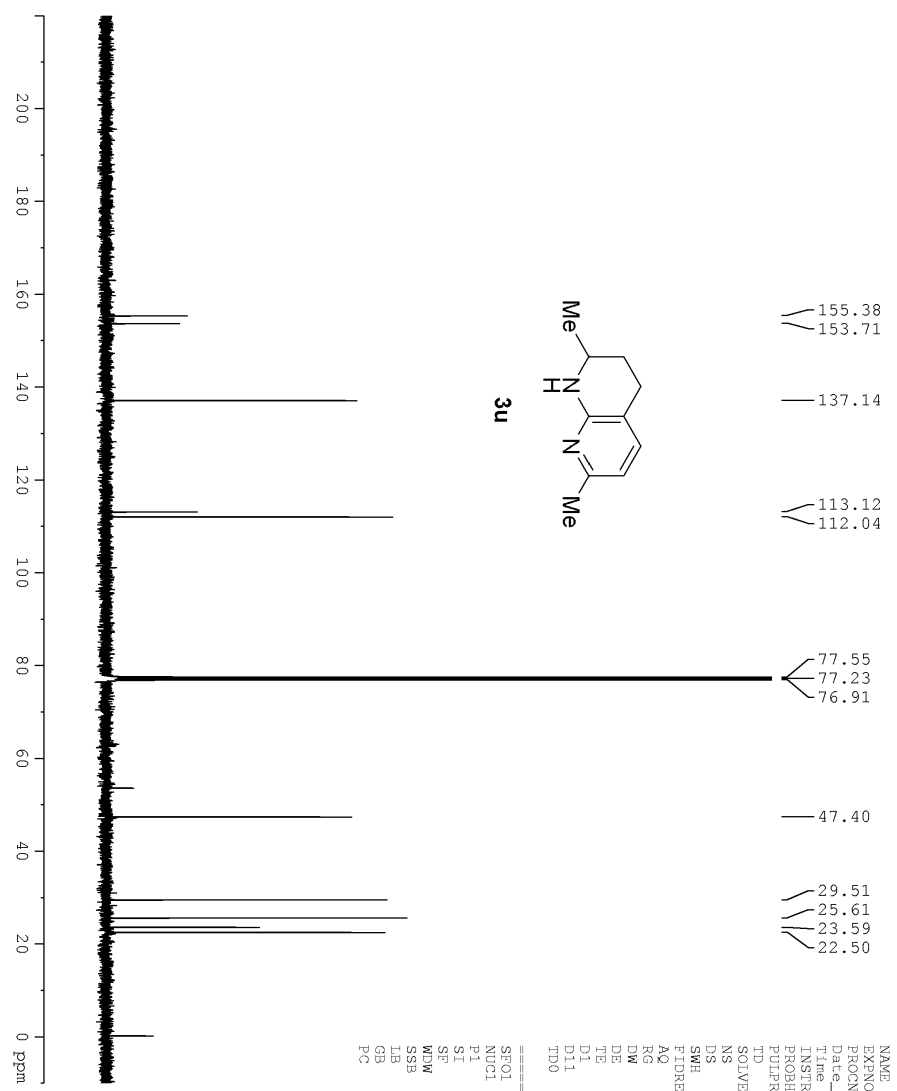
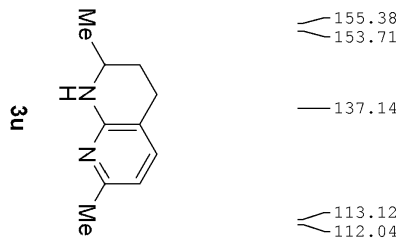
Current Data Parameters
NAME          1s11NMNR
EXPNO        49
PROCNO       1
-----
F2 - Acquisition Parameters
Date_        20150327
Time         13.13
INSTRUM     spect
PROBHD      5 mm PABD
PULPROG     zgpg30
TD          65536
SOLVENT     CDCl3
NS          204
DS           0
SWH          25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488054 sec
RG           327.203
DM           19.800 usec
DE           6.50 usec
TE           296.1 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1
-----
CHANNEL f1
SFO1         100.628298 MHz
NUC1         13C
P1           9.40 usec
P1M1        43.63899994 W
-----
CHANNEL f2
SFO2         400.131605 MHz
NUC2         1H
CPCPRG12    waltz16
PCPD2       90.00 usec
P1M2        13.06000042 W
P1M12       0.25598001 W
P1M13       0.20734000 W
-----
F2 - Processing parameters
SI           32768
SF           100.6127503 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```



```

NAME          wangwei
EXPNO         218
PROCNO        1
Date_         20140301
Time         9.28
INSTRUM       spect
PROBHD        5 mm PABUL-13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES       0.366798 Hz
AQ           1.3631988 sec
RG           203
DE           41.600 usec
TE           300.0 K
D1           2.00000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         400.1320007 MHz
NUC1         1H
P1           12.60 usec
SI           65536
SF           400.1300076 MHz
WDW          EM
SSB          0
LB           0.50 Hz
GB           0
PC           1.00
  
```

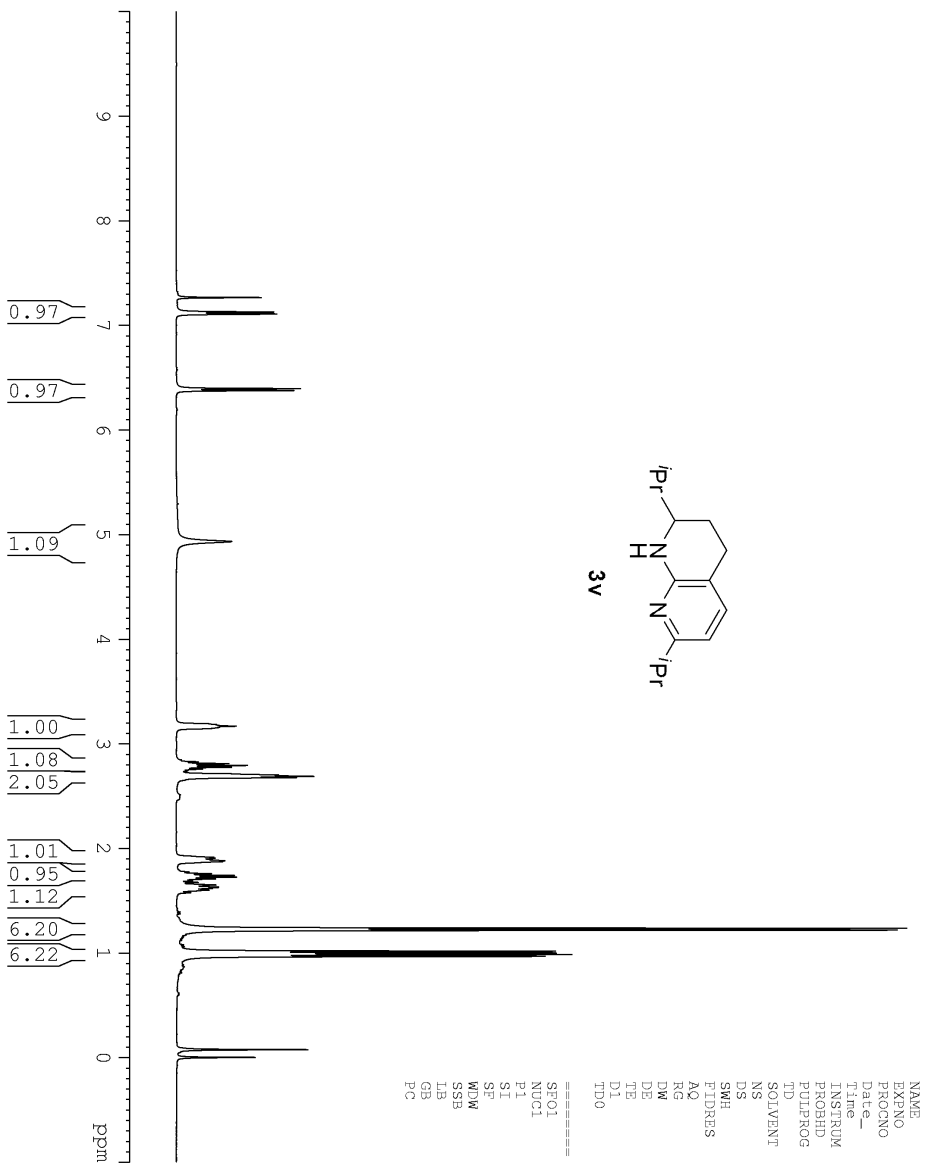
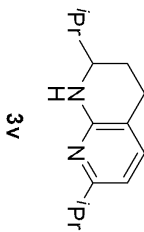


```

NAME wangwei-C
EXPNO 1
PROCNO 1
Date_ 20140302
Time_ 11.42
INSTRUM spect
PROBHD 5 mm PABD1-13C
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 941
DS 0
SWH 25252.525 Hz
FIDRES 0.770646 Hz
AQ 0.6488564 sec
RG 203
DE 19.800 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
SFO1 100.6228298 MHz
NUC1 13C
P1 9.40 usec
SI 32768
SF 100.6127487 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

```



```

NAME          wangwei-2x1n
EXPNO         347
PROCNO        1
Date_         20150403
Time          8.51
INSTRUM       spect
PROBHD        5 mm PABUL13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DW            41.600 usec
DE            6.50 usec
TE            296.5 K
D1            2.00000000 sec
TD0           1

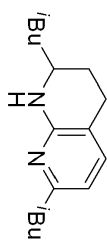
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300088 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



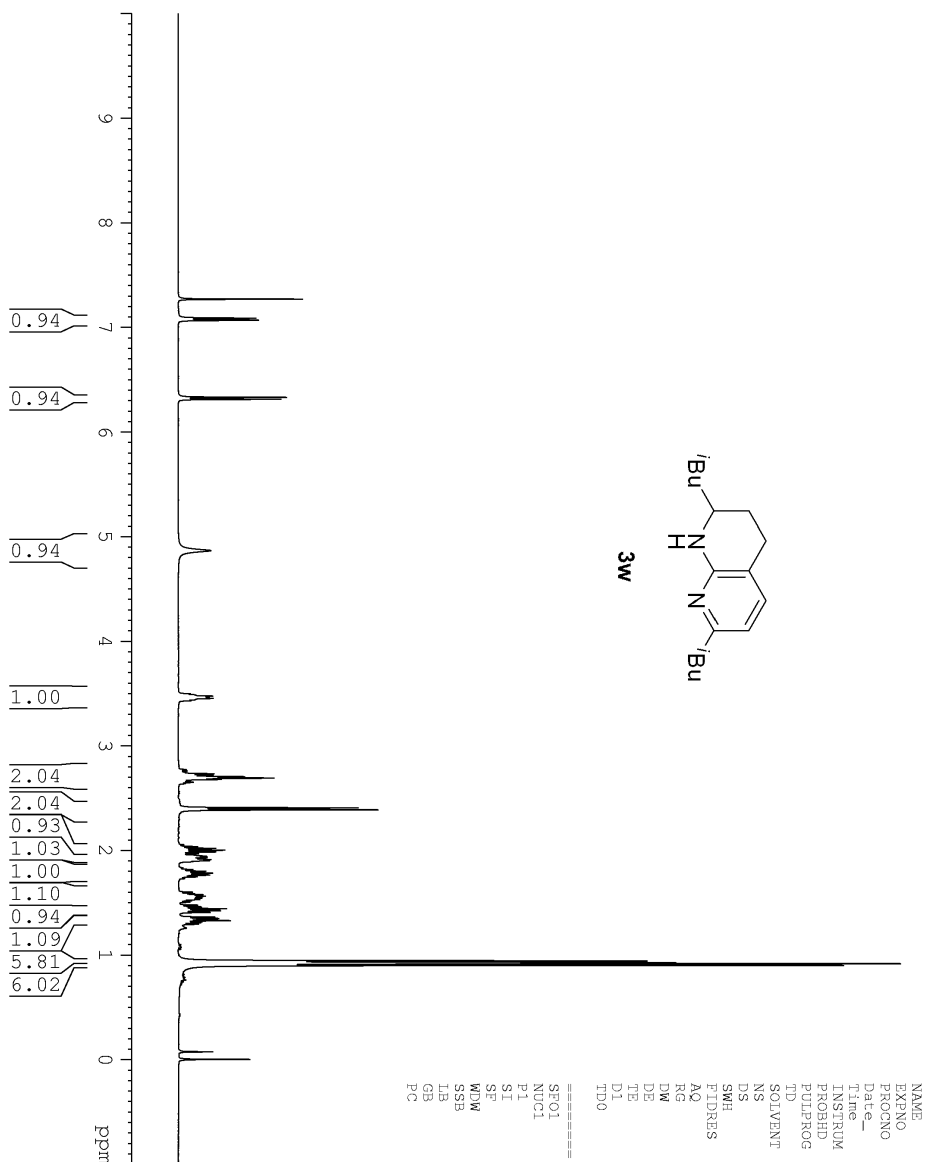
```

NAME      wangwei-C-1_HU1FU
EXPNO     52
PROCNO    1
Date_     20150403
Time      8:54
INSTRUM   spect
PROBHD    zpp930
PULPROG   zgpg30
TD         32768
SOLVENT   CDCl3
NS         63
DS         0
SWH        25252.525 Hz
FIDRES     0.770646 Hz
AQ         0.6488564 sec
RG         203
DW         19.800 usec
DE         6.50 usec
TE         297.1 K
D1         2.0000000 sec
D11        0.03000000 sec
TD0        1

===== CHANNEL f1 =====
SFO1      100.6282898 MHz
NUC1      13C
P1        9.40 usec
SI        32768
SF        100.6127501 MHz
WDW       EM
SSB       0
IB        0
GB        0
PC        1.40
  
```



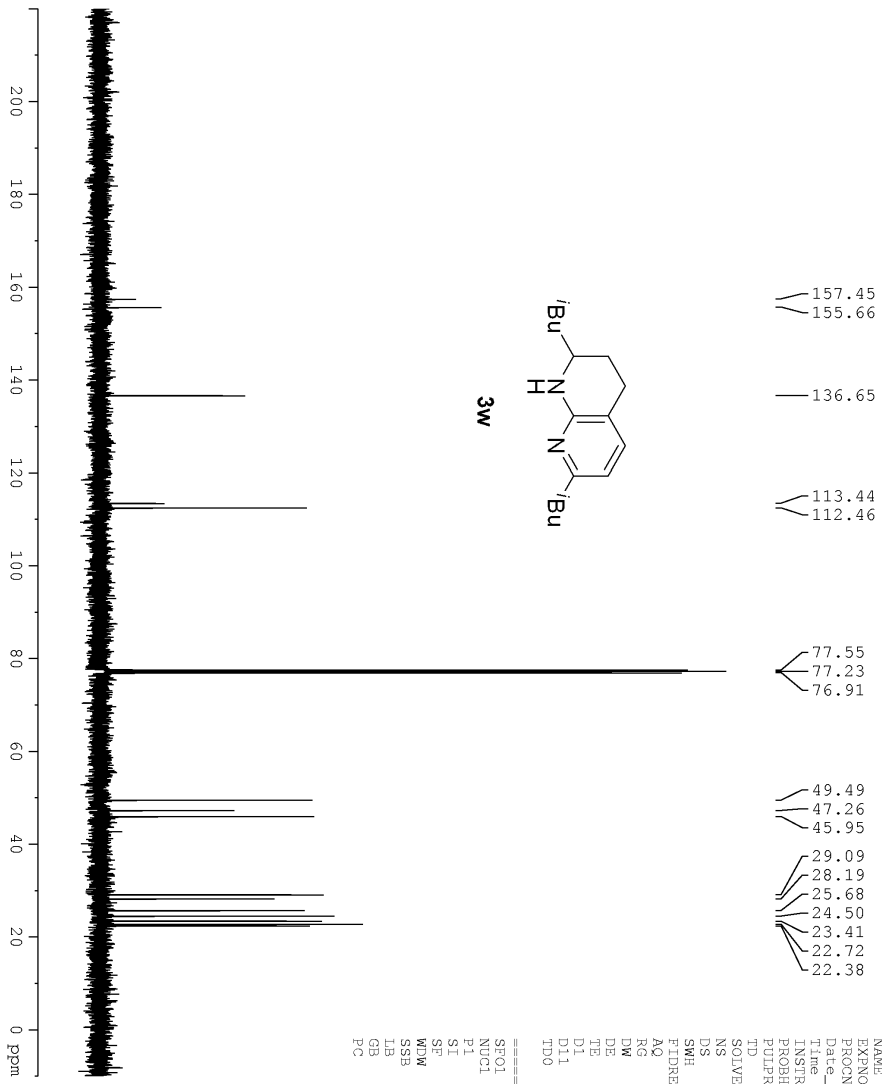
3w



```

NAME          wangwei-2k1h
EXPNO         344
PROCNO        1
Date_         20150402
Time_         5.24
INSTRUM       spect
PROBHD        5 mm PABDUL13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SMH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            295.5 K
D1            2.00000000 sec
TD0           1

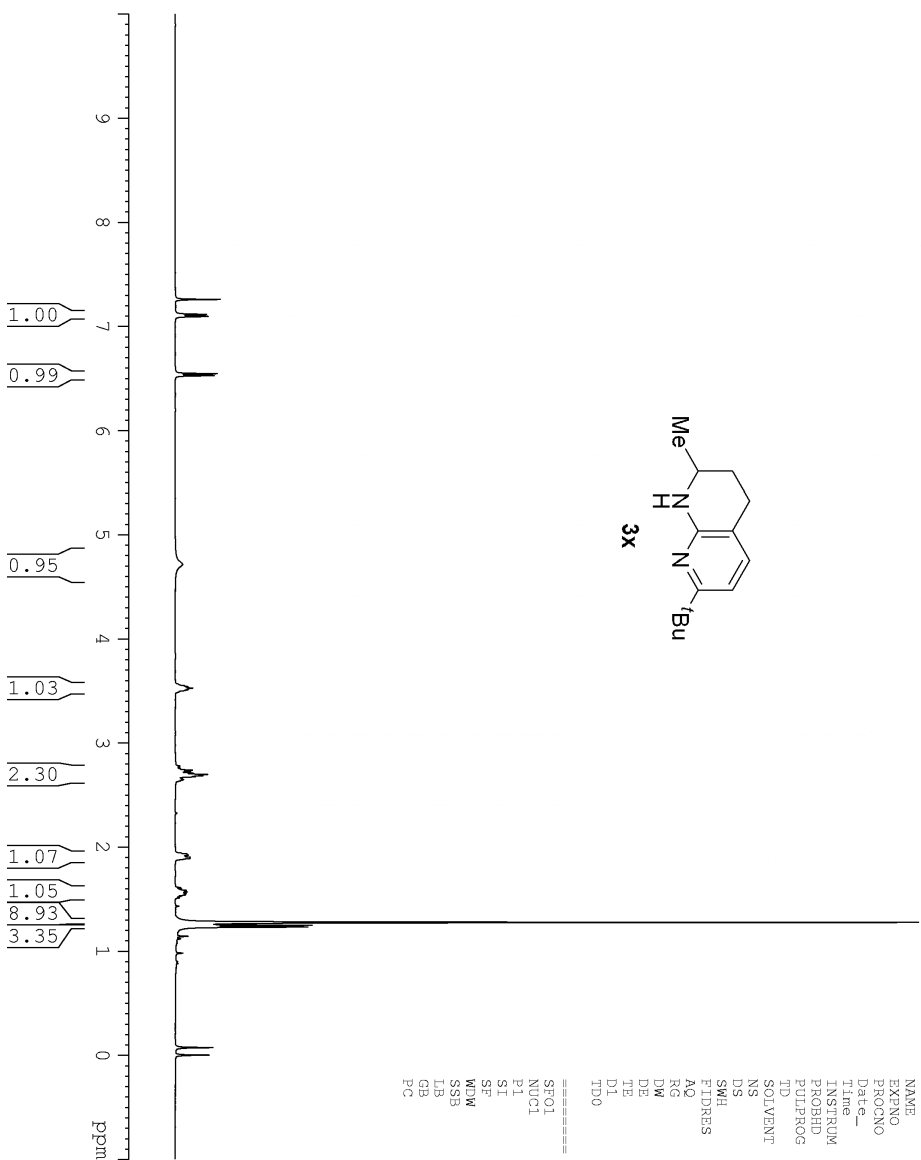
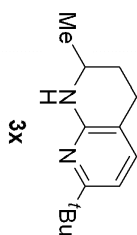
===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300072 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```



```

NAME          wangwei-C-1_HUJFU
EXPNO         51
PROCNO        1
Date_         20150402
Time_         5-28
INSTRUM       spect
PROBHD        5 mm PABD113C
PULPROG       zgpg30
TD            32768
SOLVENT       CDCl3
NS            93
DS            0
SWH           25252.525 Hz
FIDRES        0.770646 Hz
AQ            0.6488564 sec
RG            203
DW            19.800 usec
DE            6.50 usec
TE            296.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          100.6228298 MHz
NUC1          13C
P1            9.40 usec
SI            32768
SF            100.6127494 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

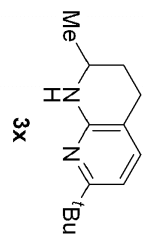
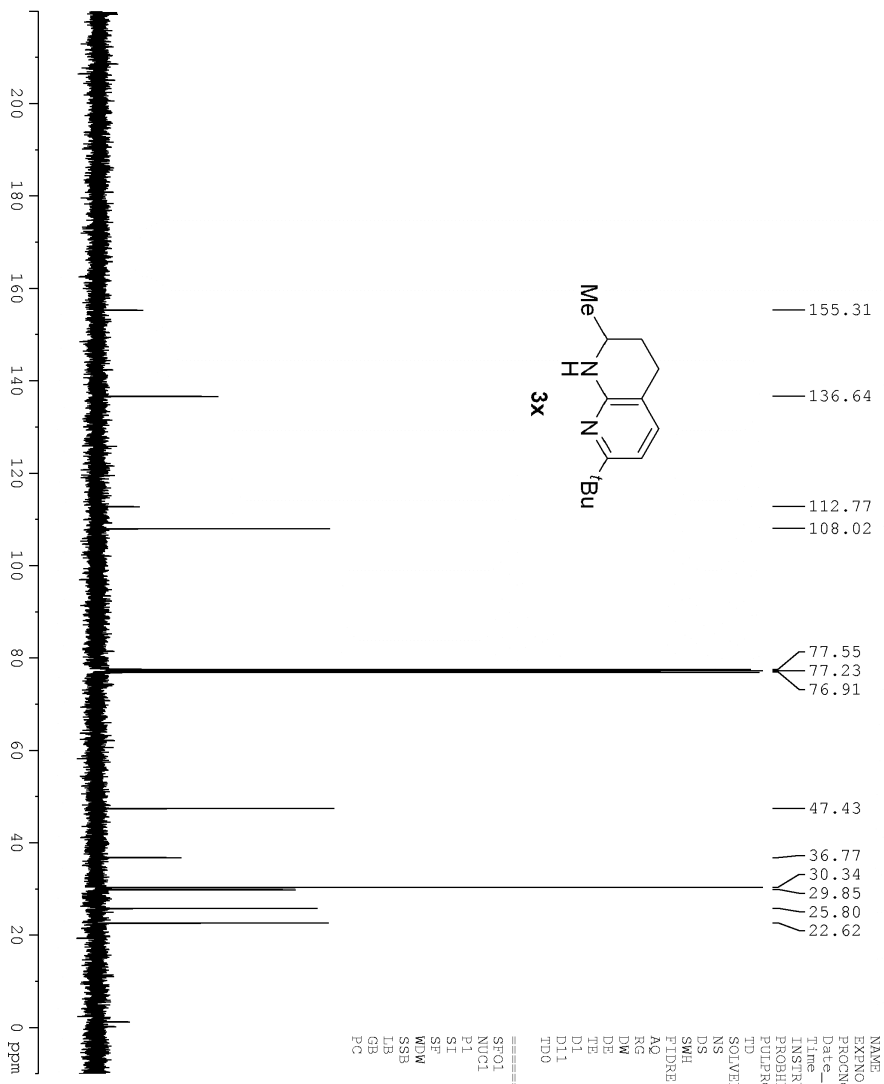



```

NAME          Wangwei-2x1n
EXPNO         369
PROCNO        1
Date_         20150405
Time          6.11
INSTRUM       spect
PROBHD        5 mm PABDUL13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            294.6 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SF01          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300112 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00

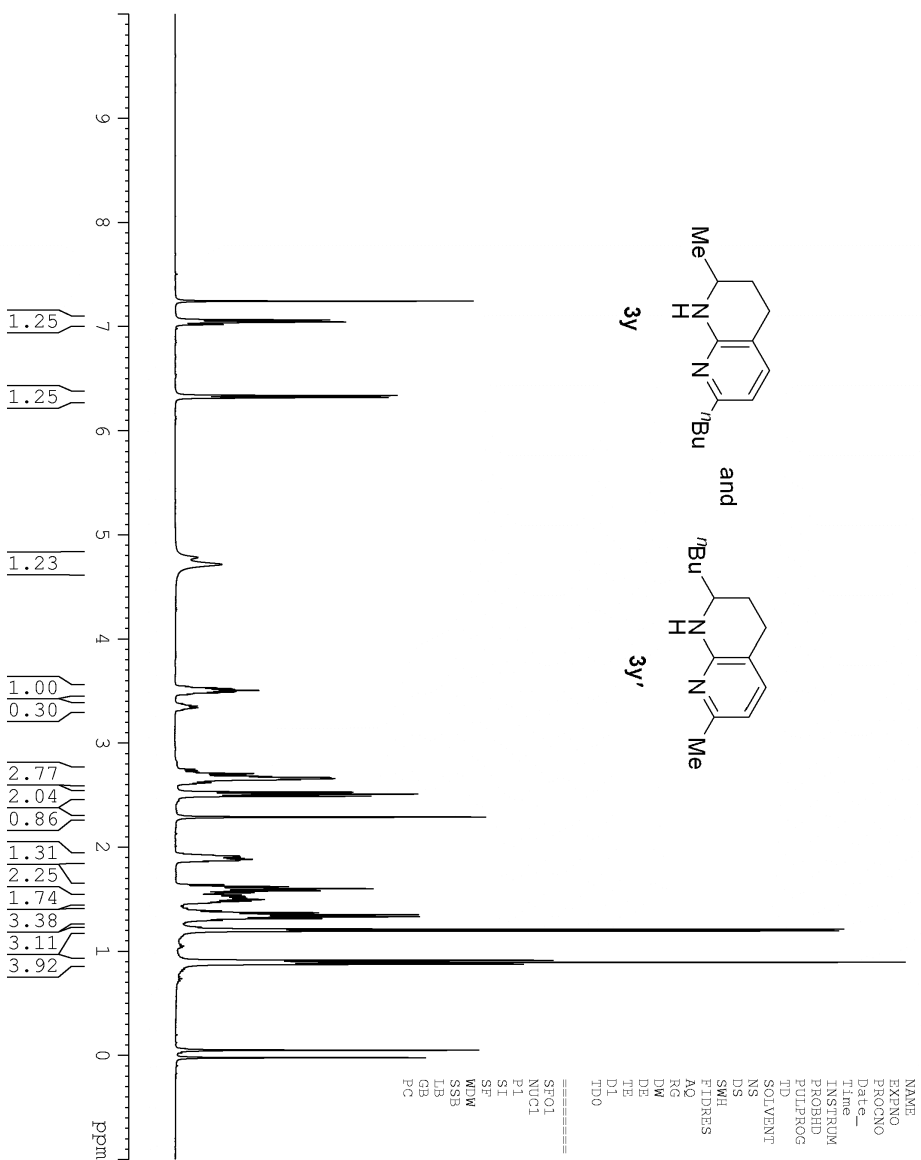
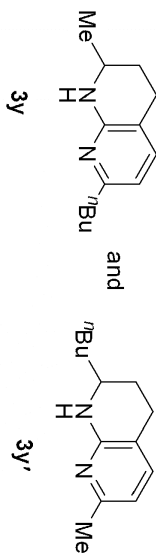
```



```

NAME          wangwei-C-1_HUFTD
EXPNO         56
PROCNO       20150402
Date_        6.14
Time         spect
INSTRUM      5 mm PABUL
PROBHD       zgpg30
PULPROG      zgpg30
TD           65536
SOLVENT      CDCl3
NS           143
DS           4
SFO1         25252.525 Hz
FIDRES       0.770646 Hz
AQ           0.6488564 sec
RG           655
RC           19.800 usec
DE           6.50 usec
TE           295.1 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

===== CHANNEL f1 =====
SFO1         100.6228238 MHz
NUC1         13C
P1           9.40 usec
SI           32768
SF           100.6127435 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```



```

NAME          Wangwei-2x1n
EXPNO         364
PROCNO        1
Date_         20150405
Time          6.400
INSTRUM       spect
PROBHD        5 mm PABDUL13C
PULPROG       zg30
TD            32768
SOLVENT       CDCl3
NS            16
DS            0
SWH           12019.230 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            101
DE            41.600 usec
TE            296.0 K
D1            2.00000000 sec
TD0           1

===== CHANNEL f1 =====
SFO1          400.1320007 MHz
NUC1          1H
P1            12.60 usec
SI            65536
SF            400.1300175 MHz
WDW           EM
SSB           0
LB            0.50 Hz
GB            0
PC            1.00
  
```

