

## **Supporting Information**

### **Total Synthesis of (+)-CC-1065 Utilizing Ring Expansion Reaction of Benzocyclobutenone Oxime Sulfonate**

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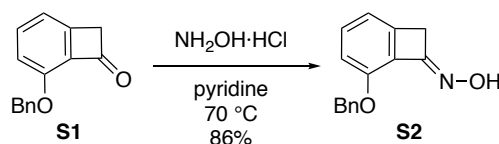
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### General Remarks

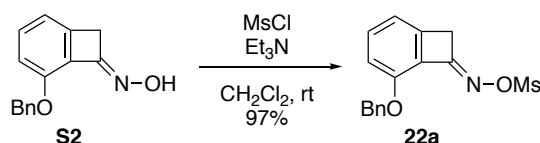
All moisture or air sensitive reactions were carried out under a positive atmosphere of argon in oven-dried glassware. Commercial reagents were obtained from commercial suppliers and used without further purification unless otherwise mentioned. Toluene, DMF, DMSO, pyridine, and Et<sub>3</sub>N were distilled from CaH<sub>2</sub>. Anhydrous THF, Et<sub>2</sub>O, MeCN, and CH<sub>2</sub>Cl<sub>2</sub> were purchased from KANTO CHEMICAL CO., INC. Flash column chromatography was performed on Silica Gel 60N (neutral, 40–50 μm) using the indicated eluent. Preparative TLC and analytical TLC were performed on Merck 60 F<sub>254</sub> glass plates precoated with a 0.25 mm thickness of silica gel. NMR spectra were recorded on a JNM-AL400 spectrometer. Chemical shifts are expressed in parts per million (ppm) downfield from internal standard (tetramethylsilane, 0.00 ppm), and coupling constants (*J*) are reported as hertz (Hz). Splitting patterns are indicated as follows: s = singlet, d = doublet, t = triplet, m = multiplet, br = broad. IR spectra were measured on a SHIMADZU FTIR–8300 spectrometer. High-resolution mass spectra (HRMS) were measured on a Bruker micrOTOF II (ESI). Optical rotations were measured on a JASCO P-2200. Melting point determinations were performed by using a Yanaco MP-500 instrument.

## Oxime S2



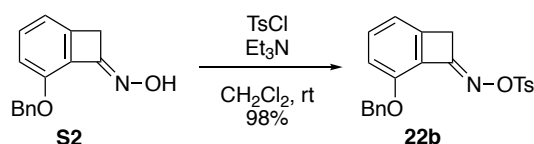
To a solution of ketone **S1**<sup>1</sup> (721 mg, 3.22 mmol) in pyridine (6.4 mL) was added hydroxylamine hydrochloride (557 mg, 8.02 mmol) at room temperature. After stirring at  $70^\circ\text{C}$  for 5 h, the reaction was quenched with 2 M aqueous HCl, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with 2 M aqueous HCl and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by trituration (hexanes) to afford oxime **S2** (687 mg, 2.87 mmol, 86%). A yellow solid; mp  $135\text{--}137^\circ\text{C}$  (hexanes-EtOAc, colorless prisms); IR (film): 3308, 1583, 1480, 1455, 1384, 1267, 1166, 1064, 977, 922, 784, 765, 723, 698  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.43 (d, 2H,  $J = 7.2$  Hz), 7.40–7.18 (m, 4H), 6.90–6.78 (m, 2H), 5.42 (s, 2H), 3.86 (s, 2H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  153.2, 151.7, 145.1, 136.9, 133.4, 128.4, 127.9, 127.6, 125.3, 116.1, 115.5, 72.0, 38.0; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{15}\text{H}_{14}\text{NO}_2$  240.1019  $[\text{M}+\text{H}^+]$  found 240.1029.

## Sulfonate 22a



To a solution of oxime **S2** (27.8 mg, 116  $\mu\text{mol}$ ) and  $\text{MsCl}$  (22.5  $\mu\text{L}$ , 290  $\mu\text{mol}$ ) in  $\text{CH}_2\text{Cl}_2$  (0.58 mL) was added  $\text{Et}_3\text{N}$  (97.0  $\mu\text{L}$ , 697  $\mu\text{mol}$ ) at room temperature. After stirring at room temperature for 1 h, the reaction was quenched with 1 M aqueous HCl, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with 1 M aqueous HCl and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (hexanes-EtOAc = 3:1) to afford sulfonate **22a** (35.7 mg, 112  $\mu\text{mol}$ , 97%). A yellow amorphous; IR (film): 2917, 2849, 1598, 1480, 1367, 1278, 1183, 837, 747  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.44–7.31 (m, 6H), 6.19–6.88 (m, 2H), 5.43 (s, 2H), 3.98 (s, 2H), 3.17 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  161.0, 145.2, 136.4, 136.2, 128.6, 128.2, 127.5, 122.3, 116.9, 115.7, 114.2, 72.1, 39.6, 36.4; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{16}\text{H}_{15}\text{NNaO}_4\text{S}$  340.0614  $[\text{M}+\text{Na}^+]$  found 340.0599.

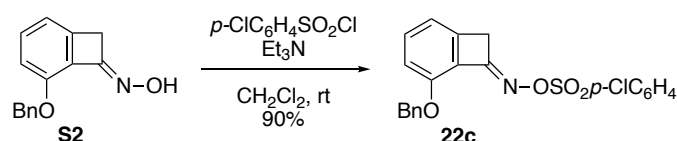
## Sulfonate 22b



To a solution of oxime **S2** (15.0 mg, 62.7  $\mu\text{mol}$ ) and  $\text{TsCl}$  (30.0 mg, 157  $\mu\text{mol}$ ) in  $\text{CH}_2\text{Cl}_2$  (2.0 mL) was added  $\text{Et}_3\text{N}$  (100  $\mu\text{L}$ , 700  $\mu\text{mol}$ ) at room temperature. After stirring at room

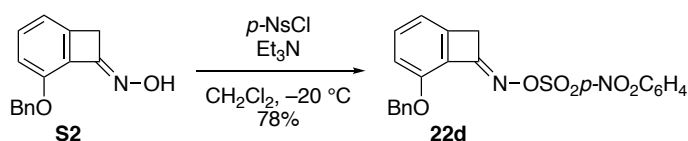
temperature for 1 h, the reaction was quenched with 1 M aqueous HCl, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with 1 M aqueous HCl and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (hexanes-EtOAc = 3:1) to afford sulfonate **22b** (23.9 mg, 61.2  $\mu$ mol, 98%). A colorless amorphous; IR (film): 1595, 1478, 1373, 1277, 1456, 1376, 1157, 1094, 833, 750, 664  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.86 (d, 2H,  $J$  = 8.4 Hz), 7.37–7.22 (m, 8H), 6.85–6.82 (m, 2H), 5.30 (s, 2H), 3.91 (s, 2H), 2.34 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  159.9, 152.8, 145.0, 136.5, 135.8, 132.5, 129.5, 129.0, 128.5, 128.1, 127.6, 127.0, 122.4, 117.3, 115.5, 72.3, 39.4, 21.6; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{22}\text{H}_{20}\text{NO}_4\text{S}$  394.1108 [ $\text{M}+\text{H}^+$ ] found 394.1124.

### Sulfonate **22c**



To a solution of oxime **S2** (102 mg, 424  $\mu$ mol) and  $p\text{-ClC}_6\text{H}_4\text{SO}_2\text{Cl}$  (229 mg, 1.08 mmol) in  $\text{CH}_2\text{Cl}_2$  (4.2 mL) was added  $\text{Et}_3\text{N}$  (360  $\mu\text{L}$ , 2.55 mmol) at room temperature. After stirring at room temperature for 22 h, the reaction was quenched with 1 M aqueous HCl, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with 1 M aqueous HCl and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by silica gel column chromatography (hexanes- $\text{CH}_2\text{Cl}_2$  = 2:3) to afford sulfonate **22c** (158 mg, 382  $\mu$ mol, 90%). A colorless solid; mp 97–99  $^\circ\text{C}$  (hexanes-EtOAc, colorless prisms); IR (film): 1586, 1558, 1475, 1456, 1376, 1279, 1191, 830, 757, 615, 549  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.89 (d, 2H,  $J$  = 8.8 Hz), 7.42–7.27 (m, 8H), 6.87–6.78 (m, 2H), 5.28 (s, 2H), 3.90 (s, 2H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  160.3, 152.8, 145.0, 140.7, 136.2, 136.0, 133.8, 130.4, 129.2, 128.5, 128.2, 127.5, 122.1, 117.1, 115.5, 72.2, 39.4; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{21}\text{H}_{17}\text{ClNO}_4\text{S}$  414.0561 [ $\text{M}+\text{H}^+$ ] found 414.0551.

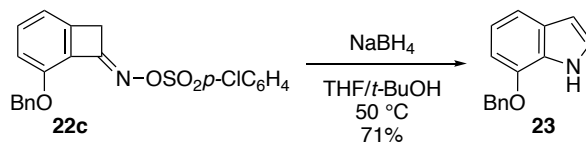
### Sulfonate **22d**



To a solution of oxime **S2** (99.4 mg, 415  $\mu$ mol) and  $p\text{-NsCl}$  (110 mg, 496  $\mu$ mol) in  $\text{CH}_2\text{Cl}_2$  (4.2 mL) was added  $\text{Et}_3\text{N}$  (160  $\mu\text{L}$ , 1.18 mmol) at  $-20\text{ }^\circ\text{C}$ . After stirring at  $-20\text{ }^\circ\text{C}$  for 15 min, the reaction was quenched with 1 M aqueous HCl, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with 1 M aqueous HCl and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes- $\text{CH}_2\text{Cl}_2$  = 1:1) to afford sulfonate **22d** (138 mg, 324  $\mu$ mol, 78%). A colorless solid; mp 156–157  $^\circ\text{C}$  (hexanes-EtOAc, colorless prisms); IR (film): 1535, 1382, 1348, 1192, 1173, 854, 737,

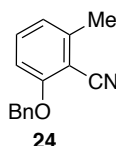
678, 594, 563  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.25 (d, 2H,  $J = 6.8$  Hz), 8.14 (d, 2H,  $J = 6.8$  Hz), 7.40–7.30 (m, 6H), 6.88 (d, 1H,  $J = 7.6$  Hz), 6.85 (d, 1H,  $J = 8.8$  Hz), 5.26 (s, 2H), 3.95 (s, 2H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  161.0, 153.0, 150.8, 145.0, 141.1, 136.4, 136.1, 130.4, 128.7, 128.5, 127.5, 124.0, 121.9, 117.0, 115.7, 72.2, 39.6; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{21}\text{H}_{16}\text{N}_2\text{NaO}_6\text{S}$  447.0621  $[\text{M}+\text{Na}^+]$  found 447.0623.

### Indole 23



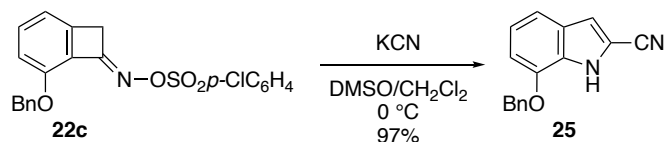
To a solution of sulfonate **22c** (20.7 mg, 50.0  $\mu\text{mol}$ ) in THF (0.4 mL) and *t*-BuOH (0.1 mL) was added  $\text{NaBH}_4$  (18.7 mg, 494  $\mu\text{mol}$ ) at room temperature. After stirring at 50  $^\circ\text{C}$  for 11 h, the reaction was quenched with  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (hexanes- $\text{CHCl}_3 = 1:1$ ) to afford indole **23** (7.90 mg, 35.3  $\mu\text{mol}$ , 71%). A colorless solid; mp 58–60  $^\circ\text{C}$  (hexanes-EtOAc, colorless prisms); IR (film): 3432, 1578, 1490, 1415, 1339, 1288, 1253, 1067, 783, 724  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.35 (br s, 1H), 7.46 (d, 1H,  $J = 6.8$  Hz), 7.43–7.30 (m, 4H), 7.27 (d, 1H,  $J = 7.6$  Hz), 7.12 (dd, 1H,  $J = 2.4, 2.4$  Hz), 7.01 (dd, 1H,  $J = 7.6, 7.6$  Hz), 6.70 (d, 1H,  $J = 7.6$  Hz), 6.52 (dd, 1H,  $J = 2.4, 2.4$  Hz), 5.18 (s, 2H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  145.4, 137.1, 129.3, 128.6, 128.1, 127.8, 126.5, 123.7, 120.1, 113.6, 102.9, 102.8, 70.1; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{15}\text{H}_{14}\text{NO}$  224.1070  $[\text{M}+\text{H}^+]$  found 224.1073. Spectroscopic data were identical with those previously reported.<sup>2</sup>

### Benzonitrile 24



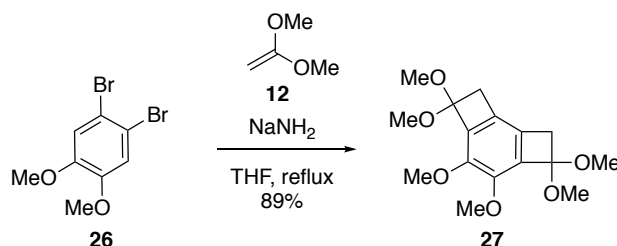
Mp 118–120  $^\circ\text{C}$  (hexanes-EtOAc, colorless prisms); IR (film): 2222, 1597, 1580, 1473, 1453, 1289, 1092, 1065, 776, 736  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.47 (d, 2H,  $J = 7.6$  Hz), 7.41–7.37 (m, 2H), 7.34 (d, 2H,  $J = 7.6$  Hz), 6.87 (d, 1H,  $J = 7.6$  Hz), 6.81 (d, 1H,  $J = 8.4$  Hz), 5.20 (s, 2H), 2.52 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  160.6, 144.0, 135.8, 133.4, 128.7, 128.1, 126.9, 122.3, 115.6, 109.8, 103.0, 70.5, 20.5; HRMS (EI)  $m/z$ : calcd. for  $\text{C}_{15}\text{H}_{13}\text{NO}$  223.0997  $[\text{M}^+]$  found 223.0981.

## Indole 25



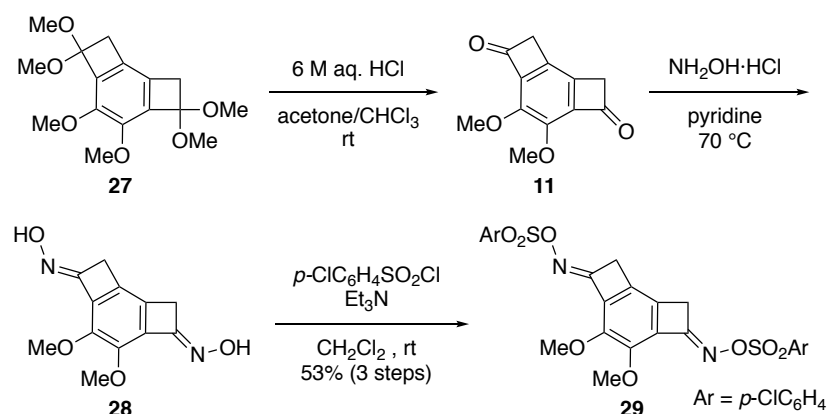
To a solution of sulfonate **22c** (22.2 mg, 53.6  $\mu$ mol) in DMSO (0.40 mL) and  $\text{CH}_2\text{Cl}_2$  (0.13 mL) was added potassium cyanide (34.9 mg, 536  $\mu$ mol) at 0 °C. After stirring at 0 °C for 1 h, the reaction was quenched with  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (hexanes-EtOAc = 3:1) to afford indole **25** (12.7 mg, 51.1  $\mu$ mol, 95%). A colorless solid; mp 110–112 °C (hexanes-EtOAc, colorless prisms); IR (film): 3308, 2227, 1582, 1530, 1497, 1406, 1326, 1259, 1238, 1089, 812, 735, 696, 645, 583  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.90 (br s, 1H), 7.46–7.33 (m, 5H), 7.24 (d, 1H,  $J$  = 8.4 Hz), 7.11 (d, 1H,  $J$  = 2.4 Hz), 7.09 (dd, 1H,  $J$  = 8.4, 8.4 Hz), 6.82 (d, 1H,  $J$  = 7.6 Hz), 5.18 (s, 2H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  145.3, 136.3, 128.8, 128.5, 128.3, 127.9, 127.5, 122.3, 114.46, 114.45, 113.9, 106.2, 106.0, 70.5; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{16}\text{H}_{12}\text{N}_2\text{NaO}$  271.0842  $[\text{M}+\text{Na}^+]$  found 271.0845.

## Bis-acetal 27



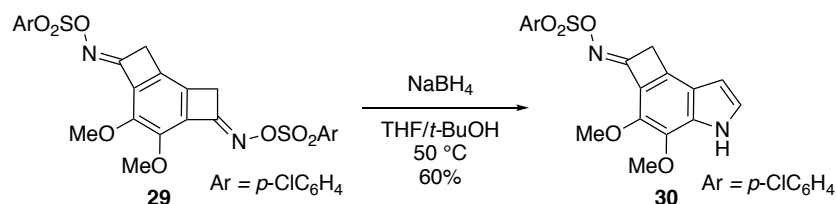
To a solution of **26**<sup>3</sup> (1.30 g, 4.40 mmol) and ketene dimethyl acetal **12**<sup>4</sup> (2.09 mL, 22.0 mmol) in THF (13 mL) was added sodium amide (684 mg, 17.5 mmol) at room temperature. After stirring at reflux for 45 h, the reaction was quenched with  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with  $\text{H}_2\text{O}$  and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by silica gel column chromatography (EtOAc) to afford bis-acetal **27** (1.21 g, 3.90 mmol, 89%). A colorless oil; IR (film): 2937, 2832, 1474, 1414, 1278, 1177, 1167, 1138, 1071, 1053, 1036, 852  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  3.96 (s, 6H), 3.42 (s, 12H), 3.22 (s, 4H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  144.7, 135.7, 129.4, 105.6, 60.2, 52.0, 39.0; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{16}\text{H}_{22}\text{NaO}_6$  333.1309  $[\text{M}+\text{Na}^+]$  found 333.1293.

## Sulfonate 29



To a solution of bis-acetal **27** (115 mg, 370  $\mu$ mol) in acetone (1.1 mL) and CHCl<sub>3</sub> (1.1 mL) was added 6 M aqueous HCl (0.37 mL) at room temperature. After stirring at room temperature for 2 h, acetone (1.1 mL) and 6 M aqueous HCl (0.37 mL) were added, and the mixture was stirred at room temperature for 10.5 h. All organic solvents were removed under reduced pressure, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with H<sub>2</sub>O and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **11**, which was used to the next reaction without further purification. To a solution of the crude **11** in pyridine (3.7 mL) was added hydroxylamine hydrochloride (257 mg, 3.70 mmol) at room temperature. After stirring at 70 °C for 22 h, pyridine was removed under reduced pressure. To the residue was added H<sub>2</sub>O, and the mixture was extracted with EtOAc six times. The combined organic extracts were dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **28**, which was used to the next reaction without further purification. To a solution of the crude **28** and Et<sub>3</sub>N (155  $\mu$ L, 1.11 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (3.7 mL) was added *p*-ClC<sub>6</sub>H<sub>4</sub>SO<sub>2</sub>Cl (196 mg, 929  $\mu$ mol) at room temperature. After stirring at room temperature for 3.5 h, precipitates were collected by filtration and purified by trituration (CH<sub>2</sub>Cl<sub>2</sub>) to afford sulfonate **29** (118 mg, 197  $\mu$ mol, 53%, 3 steps). A colorless solid; mp 197–198 °C, decomposition, (hexanes-THF, colorless prisms); IR (film): 1494, 1385, 1292, 1240, 1190, 1095, 1084, 1015, 840, 812, 791, 754, 666, 616, 556, 544 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz, DMSO-*d*<sub>6</sub>):  $\delta$  7.90 (d, 4H, *J* = 8.8 Hz), 7.53 (d, 4H, *J* = 8.8 Hz), 4.06 (s, 6H), 3.83 (s, 4H); <sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>):  $\delta$  160.3, 144.2, 140.0, 133.1, 130.5, 129.8, 128.6, 127.2, 59.3, 38.0; HRMS (ESI) *m/z*: calcd. for C<sub>24</sub>H<sub>19</sub>Cl<sub>2</sub>N<sub>2</sub>O<sub>8</sub>S<sub>2</sub> 596.9954 [M+H<sup>+</sup>] found 596.9937.

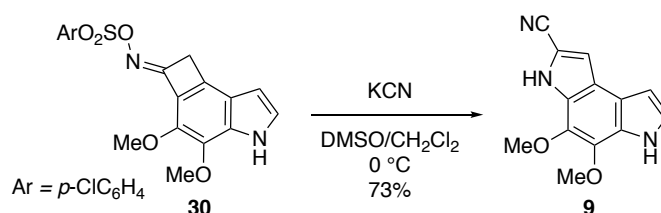
## Indole 30



To a solution of sulfonate **29** (500 mg, 837  $\mu$ mol) in THF (15 mL) and *t*-BuOH (1.5 mL) was added NaBH<sub>4</sub> (95.0 mg, 2.51 mmol) at room temperature. After stirring at 50 °C for 7 h, the

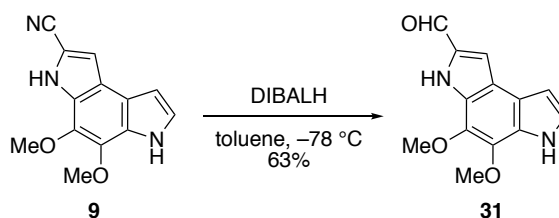
reaction was quenched with H<sub>2</sub>O, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with H<sub>2</sub>O and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (toluene-EtOAc = 5:1) to afford indole **30** (206 mg, 506  $\mu$ mol, 60%). A colorless amorphous; IR (film): 3398, 2360, 1606, 1498, 1397, 1370, 1332, 1260, 1189, 1164, 839, 819, 754, 670, 616, 551, 545 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  8.51 (br s, 1H), 7.95 (d, 2H, *J* = 8.8 Hz), 7.52 (d, 2H, *J* = 8.8 Hz), 7.18 (s, 1H), 6.41 (s, 1H), 4.05 (s, 3H), 3.97 (s, 2H), 3.94 (s, 3H); <sup>13</sup>C NMR (100 MHz, DMSO-*d*<sub>6</sub>):  $\delta$  160.7, 140.3, 139.6, 135.7, 135.3, 133.7, 131.9, 130.4, 129.7, 127.7, 119.6, 116.1, 100.3, 60.8, 59.1, 37.8; HRMS (ESI) *m/z*: calcd. for C<sub>18</sub>H<sub>16</sub>ClN<sub>2</sub>O<sub>5</sub>S 407.0463 [M+H<sup>+</sup>] found 407.0452.

## Pyrroloindole 9



To a solution of sulfonate **30** (517 mg, 1.27 mmol) in DMSO (9.5 mL) and CH<sub>2</sub>Cl<sub>2</sub> (3.2 mL) was added potassium cyanide (827 mg, 12.7 mmol) at 0 °C. After stirring at 0 °C for 29 h, the reaction was quenched with H<sub>2</sub>O, and the mixture was extracted with Et<sub>2</sub>O three times. The combined organic extracts were washed with H<sub>2</sub>O and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes-EtOAc = 1:1) to afford pyrroloindole **9** (225 mg, 932  $\mu$ mol, 73%). A colorless solid; mp 186–187 °C (hexanes-EtOAc, colorless prisms); IR (film): 3325, 2220, 1521, 1370, 1353, 1288, 1252, 1150, 1130, 1074, 1053, 956, 772, 733 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  8.87 (br s, 1H), 8.53 (br s, 1H), 7.34 (d, 1H, *J* = 2.4 Hz), 7.22 (dd, 1H, *J* = 2.4, 2.4 Hz), 6.73 (dd, 1H, *J* = 2.4, 2.4 Hz), 4.11 (s, 3H), 4.04 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  137.8, 133.1, 128.3, 125.7, 122.7, 116.5, 115.6, 115.0, 113.2, 103.4, 102.0, 61.4, 61.2; HRMS (ESI) *m/z*: calcd. for C<sub>13</sub>H<sub>12</sub>N<sub>3</sub>O<sub>2</sub> 242.0924 [M+H<sup>+</sup>] found 242.0917.

## Aldehyde 31

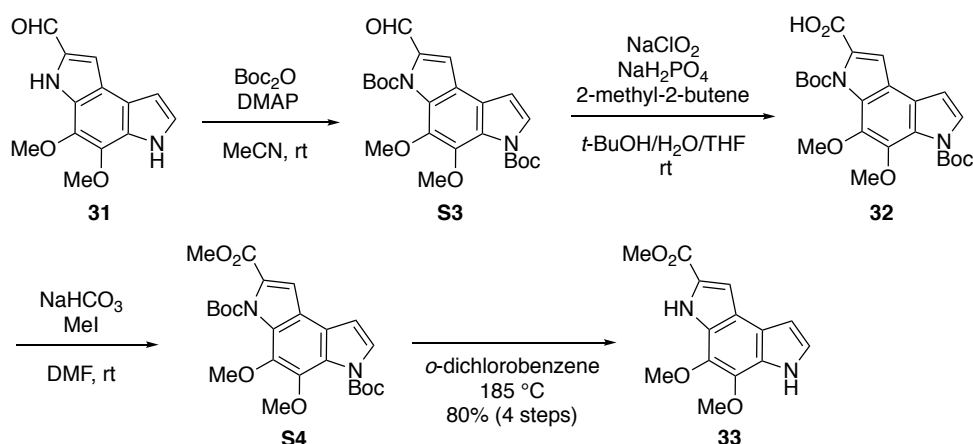


To a solution of nitrile **9** (100 mg, 415  $\mu$ mol) in toluene (1.3 mL) was added DIBALH (1.00 M in toluene, 1.25 mL, 1.25 mmol) at –78 °C. After stirring at –78 °C for 2.5 h, the reaction was quenched with saturated aqueous Rochelle salt, and the mixture was stirred for 20 h. The mixture was extracted with EtOAc three times. The combined organic extracts were washed with saturated aqueous Rochelle salt, H<sub>2</sub>O and brine, dried over anhydrous sodium sulfate, and filtered. The



organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (toluene-EtOAc = 5:1) to afford aldehyde **31** (63.4 mg, 260  $\mu$ mol, 63%). A yellow oil; IR (film): 3308, 2360, 2340, 1652, 1615, 1519, 1288, 1130, 1098, 1074, 1055  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  9.74 (s, 1H), 9.22 (br s, 1H), 8.57 (br s, 1H), 7.43 (d, 1H,  $J = 2.0$  Hz), 7.22 (dd, 1H,  $J = 2.8, 2.8$  Hz), 6.77 (dd, 1H,  $J = 2.8, 2.8$  Hz), 4.14 (s, 3H), 4.01 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  180.4, 139.1, 134.5, 133.1, 130.4, 125.4, 122.6, 117.5, 117.1, 113.9, 102.2, 61.4, 61.1; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{13}\text{H}_{13}\text{N}_2\text{O}_3$  245.0921  $[\text{M}+\text{H}^+]$  found 245.0924.

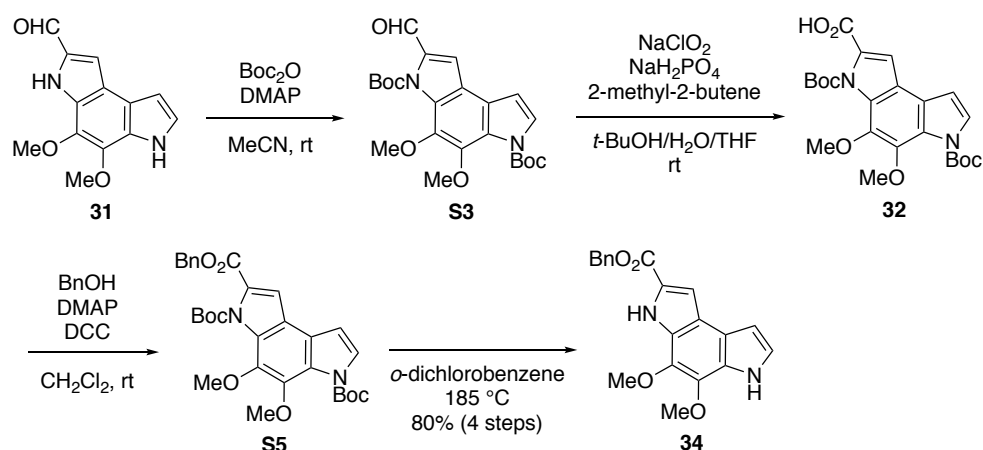
### Methyl ester **33**



To a solution of aldehyde **31** (250 mg, 1.02 mmol) and DMAP (12.5 mg, 0.102 mmol) in MeCN (10 mL) was added  $\text{Boc}_2\text{O}$  (1.12 g, 5.11 mmol) at room temperature. After stirring at room temperature for 1 h, MeCN was removed under reduced pressure. The residue was purified by passing through a silica gel short column chromatography (toluene-EtOAc = 3:1) to afford Boc carbamate **S3** as a mixture containing an unidentified byproduct, which was used to the next reaction without further purification. To a solution of the crude **S3** in  $t\text{-BuOH}$  (2.0 mL),  $\text{H}_2\text{O}$  (8.0 mL), and THF (8.0 mL) were added  $\text{NaH}_2\text{PO}_4$  (957 mg, 6.13 mmol), 2-methyl-2-butene (2.17 mL, 20.4 mmol), and  $\text{NaClO}_2$  (277 mg, 3.07  $\mu$ mol) at room temperature. After stirring at room temperature for 12 h, the mixture was diluted by  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **32**, which was used to the next reaction without further purification. To a solution of the crude **32** and  $\text{NaHCO}_3$  (171 mg, 2.04 mmol) in DMF (10.0 mL) was added MeI (127  $\mu$ L, 2.04 mmol) at room temperature. After stirring at room temperature for 2.5 h, the reaction was quenched with  $\text{H}_2\text{O}$ , and the mixture was extracted with  $\text{Et}_2\text{O}$  five times. The combined organic extracts were dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **S4**, which was used to the next reaction without further purification. A solution of the crude **S4** in  $o$ -dichlorobenzene (10 mL) was stirred at  $185^\circ\text{C}$  for 7.5 h, and the mixture was directly applied to silica gel short column chromatography (100% hexanes to 100% EtOAc) to give a crude material. The crude material was purified by flash silica gel column chromatography (toluene-EtOAc = 7:1)

to afford methyl ester **33** (224 mg, 818  $\mu$ mol, 80%, 4 steps). A yellow solid; mp 189–190 °C (hexanes-EtOAc, colorless prisms); IR (film): 3335, 2939, 1693, 1518, 1443, 1379, 1288, 1265, 1202, 1169, 1148, 1053  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  9.15 (br s, 1H), 8.56 (br s, 1H), 7.41 (br s, 1H), 7.17 (br s, 1H), 6.73 (br s, 1H), 4.08 (s, 3H), 4.01 (s, 3H), 3.93 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  162.4, 137.4, 133.5, 128.3, 125.4, 124.9, 122.3, 117.2, 116.9, 108.0, 101.9, 61.3, 61.1, 51.7; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{14}\text{H}_{15}\text{N}_2\text{O}_4$  275.1026  $[\text{M}+\text{H}^+]$  found 275.1014. Spectroscopic data were identical with those previously reported.<sup>5</sup>

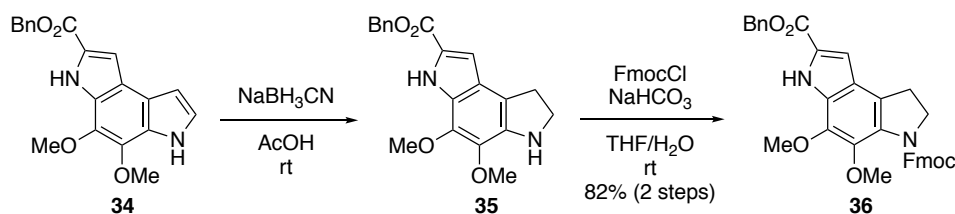
### Benzyl ester **34**



To a solution of aldehyde **31** (159 mg, 0.651 mmol) and DMAP (8.0 mg, 65.2  $\mu$ mol) in MeCN (6.5 mL) was added  $\text{Boc}_2\text{O}$  (711 mg, 3.26 mmol) at room temperature. After stirring at room temperature for 50 min, MeCN was removed under reduced pressure. The residue was purified by passing through a silica gel short column chromatography (toluene-EtOAc = 3:1) to afford Boc carbamate **S3** as a mixture containing an unidentified byproduct, which was used to the next reaction without further purification. To a solution of the crude **S3** in  $t\text{-BuOH}$  (1.3 mL),  $\text{H}_2\text{O}$  (5.2 mL), and THF (5.2 mL) were added  $\text{NaH}_2\text{PO}_4$  (610 mg, 3.91 mmol), 2-methyl-2-butene (1.39 mL, 13.0 mmol), and  $\text{NaClO}_2$  (177 mg, 1.96 mmol) at room temperature. After stirring at room temperature for 20 h, the reaction was diluted by  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **32**, which was used to the next reaction without further purification. To a solution of the crude **32** in  $\text{CH}_2\text{Cl}_2$  (4.2 mL) were added BnOH (80.0  $\mu$ L, 0.781 mmol), DCC (136 mg, 0.658 mmol), and DMAP (15.9 mg, 0.130 mmol) at room temperature. After stirring at room temperature for 8 h, the mixture was filtered through a pad of Celite® ( $\text{CH}_2\text{Cl}_2$ ), and the filtrate was concentrated under reduced pressure. The residue was diluted by EtOAc and washed with brine. The combined organic solvents were dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **S5**, which was purified by flash silica gel column chromatography (hexanes-EtOAc = 6:1) to afford **S5** as a mixture containing unidentified byproduct. A solution of the crude **S5** in  $o$ -dichlorobenzene (6.5 mL) was stirred at 185 °C for 8.5 h, and the mixture was directly applied to silica gel short column chromatography (100% hexane to 100% EtOAc) to give a

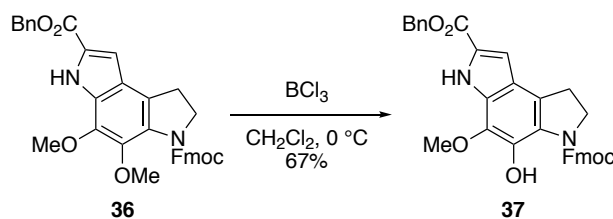
crude material. The crude material was purified by flash silica gel column chromatography (hexanes-EtOAc = 2:1) to afford benzyl ester **34** (183 mg, 0.522 mmol, 80%, 4 steps). A colorless amorphous; IR (film): 3431, 3338, 3032, 3006, 2937, 1690, 1518, 1454, 1389, 1351, 1287, 1262, 1195, 1168, 1074, 1053, 758, 697, 569  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  9.06 (br s, 1H), 8.47 (br s, 1H), 7.49–7.35 (m, 6H), 7.18 (dd, 1H,  $J = 2.4, 2.4$  Hz), 6.72 (dd, 1H,  $J = 2.4, 2.4$  Hz), 5.40 (s, 2H), 4.09 (s, 3H), 4.02 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  161.8, 137.5, 136.1, 133.5, 128.6, 128.4, 128.3, 128.2, 125.5, 124.8, 122.2, 117.2, 116.9, 108.4, 102.0, 66.3, 61.4, 61.1; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{20}\text{H}_{19}\text{N}_2\text{O}_4$  351.1339  $[\text{M}+\text{H}^+]$  found 351.1351.

### Carbamate **36**



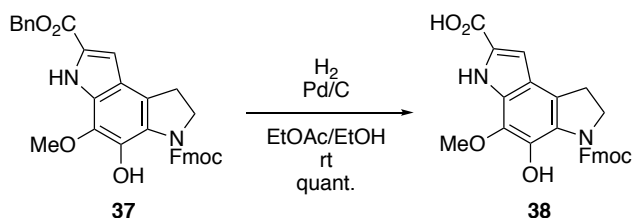
To a solution of **34** (105 mg, 300  $\mu\text{mol}$ ) in AcOH (0.8 mL) was added  $\text{NaBH}_3\text{CN}$  (94.3 mg, 1.50 mmol) at room temperature. After stirring at room temperature for 10 h, the reaction was quenched with saturated aqueous  $\text{NaHCO}_3$ , and the mixture was extracted with  $\text{CH}_2\text{Cl}_2$  three times. The combined organic extracts were washed with saturated aqueous  $\text{NaHCO}_3$  and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **35**, which was used to the next reaction without further purification. To a solution of the crude **35** and  $\text{NaHCO}_3$  (75.6 mg, 900  $\mu\text{mol}$ ) in THF (1.5 mL) and  $\text{H}_2\text{O}$  (0.5 mL) was added FmocCl (85.4 mg, 330  $\mu\text{mol}$ ) at room temperature. After stirring at room temperature for 20 min, the mixture was extracted with EtOAc three times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes-EtOAc = 3:1) to afford **36** (142 mg, 406  $\mu\text{mol}$ , 82%, 2 steps). A yellow amorphous; IR (film): 3447, 3314, 2944, 2897, 2848, 1707, 1532, 1506, 1450, 1415, 1326, 1286, 1253, 1209, 1191, 1156, 757, 739, 698  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.97 (br s, 1H), 7.74 (d, 2H,  $J = 8.0$  Hz), 7.57 (d, 2H,  $J = 7.6$  Hz), 7.47–7.36 (m, 7H), 7.27 (dd, 2H,  $J = 7.2, 7.2$  Hz), 7.10 (d, 1H,  $J = 2.0$  Hz), 5.39 (s, 2H), 4.56 (d, 2H,  $J = 6.8$  Hz), 4.31 (t, 1H,  $J = 6.8$  Hz), 4.17 (t, 2H,  $J = 8.0$  Hz), 3.99 (s, 3H), 3.88 (s, 3H), 3.08 (t, 2H,  $J = 8.0$  Hz);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  161.4, 155.1, 144.0, 142.2, 141.3, 137.6, 135.7, 130.9, 130.1, 128.7, 128.43, 128.36, 127.66, 127.63, 127.0, 125.1, 121.8, 120.5, 119.9, 107.4, 67.6, 66.7, 61.1, 60.3, 51.8, 47.4, 28.6; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{35}\text{H}_{31}\text{N}_2\text{O}_6$  575.2177  $[\text{M}+\text{H}^+]$  found 575.2160.

## Phenol **37**



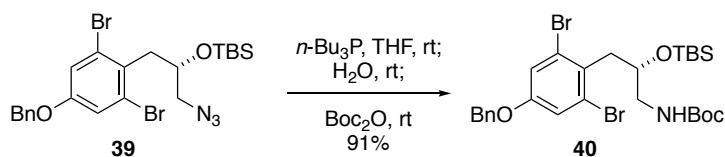
To a solution of **36** (142 mg, 247  $\mu\text{mol}$ ) in  $\text{CH}_2\text{Cl}_2$  (4.7 mL) was added  $\text{BCl}_3$  (1.0 M in  $\text{CH}_2\text{Cl}_2$ , 247  $\mu\text{L}$ , 247  $\mu\text{mol}$ ) at 0  $^\circ\text{C}$ . After stirring at 0  $^\circ\text{C}$  for 20 min, additional amount of  $\text{BCl}_3$  (1.0 M in  $\text{CH}_2\text{Cl}_2$ , 130  $\mu\text{L}$ , 130  $\mu\text{mol}$ ) was added to the reaction mixture at 0  $^\circ\text{C}$ , and the mixture was stirred for 20 min. The reaction was quenched with saturated aqueous  $\text{NH}_4\text{Cl}$ , and the mixture was extracted with  $\text{CH}_2\text{Cl}_2$  four times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes-EtOAc-acetone = 4:1:1) to afford phenol **37** (92.5 mg, 165  $\mu\text{mol}$ , 67%). A colorless amorphous; IR (film): 3453, 3319, 3065, 3016, 2937, 2835, 1696, 1663, 1469, 1452, 1337, 1289, 1255, 1152, 750, 697, 541  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  11.21 (s, 1H), 8.82 (br s, 1H), 7.79 (d, 2H,  $J = 7.2$  Hz), 7.62 (d, 2H,  $J = 8.0$  Hz), 7.45–7.34 (m, 9H), 7.06 (d, 1H,  $J = 2.0$  Hz), 5.37 (s, 2H), 4.60 (d, 2H,  $J = 7.2$  Hz), 4.33 (t, 1H,  $J = 7.2$  Hz), 4.09 (t, 2H,  $J = 8.8$  Hz), 4.01 (s, 3H), 3.19 (t, 2H,  $J = 8.6$  Hz);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  161.3, 155.1, 143.4, 141.3, 138.1, 135.8, 132.77, 132.76, 130.6, 128.6, 128.3, 127.8, 127.1, 126.7, 125.7, 124.8, 120.0, 119.4, 117.6, 107.4, 68.7, 66.5, 60.6, 49.2, 47.0, 26.6; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{34}\text{H}_{29}\text{N}_2\text{O}_6$  561.2020  $[\text{M}+\text{H}^+]$  found 561.2001.

## Middle segment **38**



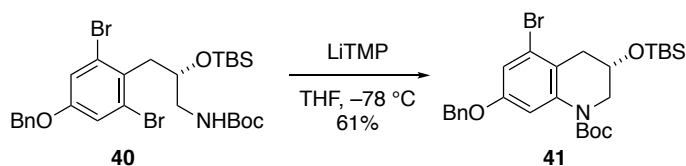
A solution of **37** (92.5 mg, 165  $\mu\text{mol}$ ) and 10% palladium on activated carbon (17.6 mg, 16.5  $\mu\text{mol}$ ) in a mixture of EtOAc (0.8 mL) and EtOH (0.8 mL) was stirred under a hydrogen atmosphere (1 atm) at room temperature for 17 h. The reaction mixture was filtered through a pad of Celite<sup>®</sup> and the filtrate was concentrated under reduced pressure to give the middle segment **38** (77.6 mg, quant). A colorless amorphous; IR (film): 2938, 2907, 2834, 1660, 1468, 1446, 1337, 1291, 1266, 1159, 1138, 739  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  11.3 (s, 1H), 8.86 (s, 1H), 7.80 (d, 2H,  $J = 7.2$  Hz), 7.62 (d, 2H,  $J = 7.6$  Hz), 7.43 (dd, 2H,  $J = 7.2, 7.6$  Hz), 7.35 (dd, 2H,  $J = 7.2, 7.6$  Hz), 7.13 (d, 1H,  $J = 2.0$  Hz), 4.60 (d, 2H,  $J = 6.8$  Hz), 4.33 (t, 1H,  $J = 6.8$  Hz), 4.11 (t, 2H,  $J = 8.8$  Hz), 4.03 (s, 3H), 3.22 (t, 2H,  $J = 8.8$  Hz);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  165.3, 155.3, 143.5, 141.4, 138.6, 132.8, 131.1, 128.0, 127.2, 126.1, 125.8, 124.9, 120.2, 119.7, 117.7, 109.0, 68.9, 60.8, 49.4, 47.1, 26.8; HRMS (ESI<sup>-</sup>)  $m/z$ : calcd. for  $\text{C}_{27}\text{H}_{21}\text{N}_2\text{O}_6$  469.1405  $[\text{M}-\text{H}^+]$  found 469.1385.

## Carbamate **40**



To a solution of **39**<sup>6</sup> (22.7 g, 46.3 mmol) in THF (116 mL) was added tri-*n*-butylphosphine (12.9 mL, 51.6 mmol) at room temperature. After stirring at room temperature for 20 min,  $\text{H}_2\text{O}$  (46 mL) was added to the mixture, and the resulting solution was stirred for 30 min at room temperature. To the pale-yellow solution was added  $\text{Boc}_2\text{O}$  (11.8 g, 54.1 mmol) at room temperature. After stirring at room temperature for 20 min, to the mixture was added  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by silica gel column chromatography (hexanes-EtOAc = 6:1) to afford *N*-Boc carbamate **40** (26.5 g, 42.0 mmol, 91%). A colorless oil;  $[\alpha]_{\text{D}}^{27} -16.5$  ( $c$  0.81,  $\text{CHCl}_3$ ); IR (film): 2953, 2929, 1715, 1594, 1543, 1499, 1470, 1453, 1365, 1253, 1171, 1107, 836, 776  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.40–7.33 (m, 5H), 7.17 (s, 2H), 5.00 (s, 2H), 4.82 (br, 1H), 4.25–4.21 (m, 1H), 3.23–3.17 (m, 3H), 3.02 (dd, 1H,  $J = 13.6, 6.0$  Hz), 1.44 (s, 9H), 0.84 (s, 9H),  $-0.02$  (s, 3H),  $-0.25$  (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  157.6, 156.0, 135.9, 129.7, 128.7, 128.3, 127.5, 126.0, 119.2, 79.1, 70.5, 70.0, 46.0, 40.6, 28.4, 25.8, 17.9,  $-4.9$ ,  $-5.0$ ; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{27}\text{H}_{39}^{79}\text{Br}_2\text{NNaO}_4\text{Si}$  650.0907 [ $\text{M}+\text{Na}^+$ ] found 650.0897.

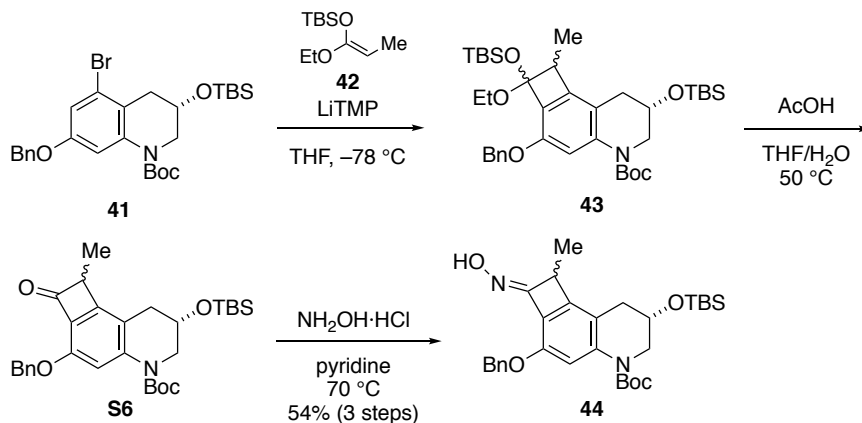
## Tetrahydroquinoline **41**



To a solution of carbamate **40** (26.4 g, 41.9 mmol) in THF (720 mL) was added LiTMP (1.00 M in *n*-hexane and THF, 210 mL, 210 mmol) at  $-78^\circ\text{C}$ . After stirring at  $-78^\circ\text{C}$  for 10 min, the reaction was quenched with saturated aqueous  $\text{NH}_4\text{Cl}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with saturated aqueous  $\text{NH}_4\text{Cl}$  and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by silica gel column chromatography (hexanes- $\text{CH}_2\text{Cl}_2$  = 2:1) to afford tetrahydroquinoline **41** (13.9 g, 25.4 mmol, 61%). A colorless solid;  $[\alpha]_{\text{D}}^{27} +23.7$  ( $c$  0.81,  $\text{CHCl}_3$ ); mp  $66\text{--}69^\circ\text{C}$  (hexanes-EtOAc, colorless prisms); IR (film): 1705, 1604, 1472, 1464, 1455, 1366, 1315, 1252, 1223, 1154, 1118, 1098, 837, 775  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.43–7.28 (m, 6H), 7.00 (d, 1H,  $J = 2.4$  Hz), 5.01 (s, 2H), 4.13–4.04 (m, 1H), 3.89 (dd, 1H,  $J = 12.0, 3.2$  Hz), 3.35 (dd, 1H,  $J = 12.0, 8.0$  Hz), 2.99 (dd, 1H,  $J = 16.8, 6.0$  Hz), 2.61 (dd, 1H,  $J = 16.8, 6.8$  Hz), 1.52 (s, 9H), 0.91 (s, 9H), 0.13 (s, 6H);  $^{13}\text{C}$  NMR (100 MHz,

CDCl<sub>3</sub>):  $\delta$  156.8, 153.4, 140.1, 136.6, 128.6, 128.0, 127.5, 124.7, 120.1, 115.2, 110.2, 81.3, 70.3, 65.6, 49.9, 38.2, 28.3, 25.9, 18.2, -4.7, -4.8; HRMS (ESI)  $m/z$ : calcd. for C<sub>27</sub>H<sub>38</sub><sup>79</sup>BrNNaO<sub>4</sub>Si 570.1646 [M+Na<sup>+</sup>] found 570.1638.

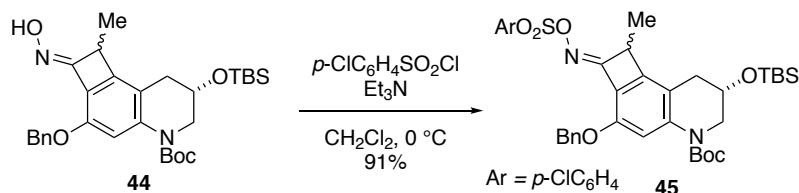
## Oxime 44



To a solution of bromide **41** (190 mg, 346  $\mu$ mol) and ketene silyl acetal **42** (437  $\mu$ L, 1.73 mmol, freshly prepared from propanoic acid ethyl ester)<sup>7</sup> in THF (1.4 mL) was added LiTMP (0.500 M in *n*-hexane and THF, 2.08 mL, 1.04 mmol) at -78 °C. After stirring at -78 °C for 15 min, the reaction was quenched with H<sub>2</sub>O at -78 °C, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **43**, which was used to the next reaction without further purification. To a solution of the crude **43** in THF (0.34 mL) and H<sub>2</sub>O (0.34 mL) was added AcOH (1.0 mL) at room temperature. After stirring at 50 °C for 1.5 h, the reaction was quenched with saturated aqueous NaHCO<sub>3</sub>, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with saturated aqueous NaHCO<sub>3</sub> and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude **S6**, which was used to the next reaction without further purification. To a solution of the crude **S6** in pyridine (3.5 mL) was added hydroxylamine hydrochloride (63.4 mg, 912  $\mu$ mol) at room temperature. After stirring at 70 °C for 8 h, the reaction was quenched with 1 M aqueous HCl, and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with 1 M aqueous HCl and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes-EtAOc = 5:1) to afford oxime **44** (102 mg, 189  $\mu$ mol, 54%, 3 steps). A colorless solid;  $[\alpha]_D^{27} +36.9$  (*c* 1.73, CHCl<sub>3</sub>); mp 147–148 °C (hexanes-EtOAc, colorless prisms); IR (film): 3393, 2956, 2929, 1714, 1699, 1684, 1488, 1367, 1154, 754 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>):  $\delta$  7.43 (d, 2H, *J* = 7.6 Hz), 7.38–7.32 (m, 3H), 7.22 (d, 1H, *J* = 8.0 Hz), 6.85 (br s, 1H), 5.35 (s, 2H), 4.24–4.15 (m, 1H), 4.14–4.03 (m, 1H), 4.00 (dd, 0.5H, *J* = 12.8, 2.8 Hz), 3.92 (dd, 0.5H, *J* = 12.4, 2.4 Hz), 3.40 (dd, 0.5H, *J* = 12.8, 8.4 Hz), 3.32 (dd, 0.5H, *J* = 12.4, 8.4 Hz), 2.91 (dd, 0.5H, *J* = 4.4, 4.4 Hz), 2.87 (dd, 0.5H, *J* = 4.8, 4.8 Hz), 2.58 (dd, 1H, *J* = 6.8, 6.8 Hz), 2.54 (dd, 1H, *J* = 6.8, 6.8 Hz), 1.57 (d, 3H, *J* = 6.8 Hz), 1.51 (s, 9H), 0.91 (s, 4.5H), 0.90 (s, 4.5H), 0.121 (s, 3H), 0.115 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>):  $\delta$  156.2, 153.4, 150.4, 148.5, 142.50, 142.47, 137.2, 128.4, 127.8,

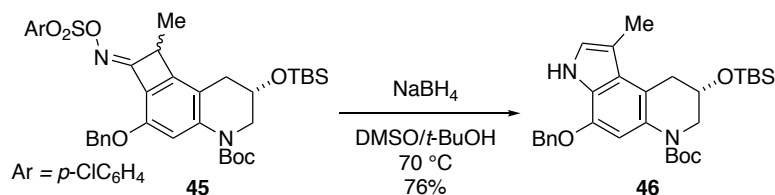
127.7, 119.13, 119.12, 115.18, 115.19, 112.1, 112.0, 81.40, 81.37, 71.9, 65.11, 65.05, 50.52, 50.47, 46.5, 46.4, 32.75, 32.65, 28.3, 25.8, 18.2, 15.9, 15.8, -4.70, -4.73, -4.81, -4.83; HRMS (ESI)  $m/z$ : calcd. for  $C_{30}H_{43}N_2O_5Si$  539.2936  $[M+H]^+$ , found 539.2935.

## Sulfonate **45**



To a solution of oxime **44** (201 mg, 373  $\mu\text{mol}$ ) and  $p\text{-ClC}_6\text{H}_4\text{SO}_2\text{Cl}$  (118 mg, 560  $\mu\text{mol}$ ) in  $\text{CH}_2\text{Cl}_2$  (3.7 mL) was added  $\text{Et}_3\text{N}$  (104  $\mu\text{L}$ , 746  $\mu\text{mol}$ ) at 0 °C. After stirring at 0 °C for 1.5 h, the reaction was quenched with  $\text{H}_2\text{O}$ , and the mixture was extracted with  $\text{CH}_2\text{Cl}_2$  three times. The combined organic extracts were washed with  $\text{H}_2\text{O}$  and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (petroleum ether-acetone = 30:1) to afford sulfonate **45** (242 mg, 339  $\mu\text{mol}$ , 91%). A yellow solid;  $[\alpha]_D^{27} +12.8$  ( $c$  1.69,  $\text{CHCl}_3$ ); mp 59–60 °C (hexanes-EtOAc, colorless prisms); IR (film): 1707, 1488, 1370, 1313, 1253, 1228, 1191, 1173, 1153, 1097, 836, 819, 775, 761  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.89 (d, 2H,  $J = 8.8$  Hz), 7.45–7.30 (m, 8H), 5.21 (s, 2H), 4.28–4.20 (m, 1H), 4.15–4.05 (m, 1H), 3.93 (dd, 0.5H,  $J = 13.2$ , 2.8 Hz), 3.84 (dd, 0.5H,  $J = 12.8$ , 3.2 Hz), 3.46 (dd, 0.5H,  $J = 12.4$ , 7.6 Hz), 3.38 (dd, 0.5H,  $J = 12.4$ , 8.0 Hz), 2.83–2.78 (m, 1H), 2.54 (dd, 1H,  $J = 6.4$ , 6.4 Hz), 2.50 (dd, 1H,  $J = 6.4$ , 6.4 Hz), 1.57 (d, 3H,  $J = 6.8$  Hz), 1.50 (s, 9H), 0.89 (s, 4.5H), 0.88 (s, 4.5H), 0.11 (s, 3H), 0.10 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  163.2, 153.2, 153.1, 151.6, 148.5, 145.2, 145.1, 140.6, 136.6, 134.0, 130.4, 129.2, 128.5, 128.1, 127.5, 115.54, 115.46, 115.1, 115.0, 112.7, 112.6, 81.81, 81.78, 72.1, 64.6, 64.5, 50.5, 50.4, 47.8, 32.5, 32.4, 28.2, 25.8, 18.1, 16.0, 15.9, -4.76, -4.85; HRMS (ESI)  $m/z$ : calcd. for  $C_{36}H_{46}ClN_2O_7SSi$  713.2478  $[M+H]^+$  found 713.2475.

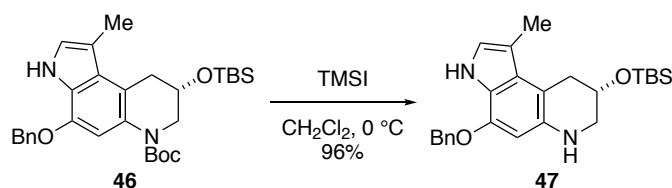
## Indole **46**



To a solution of sulfonate **45** (20.5 mg, 28.7  $\mu\text{mol}$ ) in DMSO (0.2 mL) and  $t\text{-BuOH}$  (0.6 mL) was added  $\text{NaBH}_4$  (10.9 mg, 288  $\mu\text{mol}$ ) at room temperature. After stirring at 70 °C for 2 h, the reaction was quenched with  $\text{H}_2\text{O}$  at room temperature, and the mixture was extracted with  $\text{Et}_2\text{O}$  three times. The combined organic extracts were washed with  $\text{H}_2\text{O}$  and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (toluene) to afford indole **46** (11.4 mg, 21.8

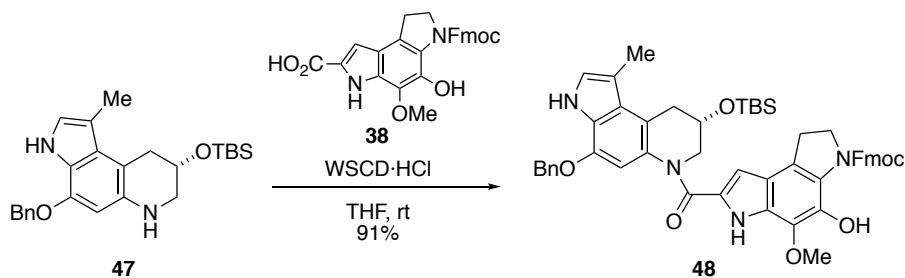
$\mu\text{mol}$ , 76%). A colorless solid;  $[\alpha]_{\text{D}}^{26} +41.7$  ( $c$  3.87,  $\text{CHCl}_3$ ); mp 144–145 °C (hexanes-EtOAc, colorless prisms); IR (film): 2953, 2928, 1698, 1685, 1507, 1457, 1363, 1253, 1189, 1157, 1095, 837  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  8.05 (br s, 1H), 7.47 (d, 2H,  $J$  = 6.8 Hz), 7.42–7.32 (m, 3H), 6.98 (br s, 1H), 6.84 (s, 1H), 5.16 (d, 1H,  $J$  = 11.2 Hz), 5.11 (d, 1H,  $J$  = 11.2 Hz), 4.20–4.05 (m, 2H), 3.56 (dd, 1H,  $J$  = 16.8, 6.8 Hz), 3.30–3.22 (m, 1H), 3.07 (dd, 1H,  $J$  = 16.8, 8.0 Hz), 2.45 (s, 3H), 1.52 (s, 9H), 0.94 (s, 9H), 0.16 (s, 3H), 0.15 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  154.2, 142.8, 137.1 130.2, 128.6, 128.0, 127.9, 126.0, 124.8, 122.0, 113.8, 112.9, 101.9, 80.3, 70.3, 66.5, 50.5, 35.3, 28.5, 25.9, 18.3, 13.0, –4.6, –4.7; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{30}\text{H}_{43}\text{N}_2\text{O}_4\text{Si}$  523.2987  $[\text{M}+\text{H}^+]$  found 523.2980.

### Pyrrolotetrahydroquinoline 47



To a solution of carbamate **46** (53.8 mg, 103  $\mu\text{mol}$ ) in  $\text{CH}_2\text{Cl}_2$  (1.0 mL) was added TMSI (22.0  $\mu\text{L}$ , 155  $\mu\text{mol}$ ) at 0 °C. After stirring at 0 °C for 25 min, the reaction was quenched with saturated aqueous  $\text{NaHCO}_3$ , and the mixture was extracted with  $\text{CH}_2\text{Cl}_2$  three times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes-EtOAc = 3:1) to afford left segment **47** (41.9 mg, 98.9  $\mu\text{mol}$ , 96%). A brown amorphous;  $[\alpha]_{\text{D}}^{27} +56.1$  ( $c$  2.97,  $\text{CHCl}_3$ ); mp 141–143 °C (hexanes-EtOAc, colorless prisms); IR (film): 2952, 2928, 2856, 1593, 1454, 1147, 1109, 873, 836, 776  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  7.89 (br s, 1H), 7.44–7.30 (m, 5H), 6.80 (s, 1H), 6.05 (br s, 1H), 5.09 (br s, 2H), 4.20–4.15 (m, 1H), 3.49 (dd, 1H, d, 1H,  $J$  = 16.8, 5.6 Hz), 3.28 (br, 1H), 3.09–3.00 (m, 2H), 2.44 (s, 3H), 0.93 (s, 9H), 0.13 (s, 6H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  144.2, 137.2, 136.3 128.5, 127.9, 127.8, 127.6, 122.2, 111.9, 104.6, 95.3, 70.1, 66.8, 49.6, 34.5, 25.9, 18.2, 12.8, –4.5, –4.6 (One signal is missing due to overlap.); HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{25}\text{H}_{35}\text{N}_2\text{O}_2\text{Si}$  423.2462  $[\text{M}+\text{H}^+]$ , found 423.2450.

### Amide 48

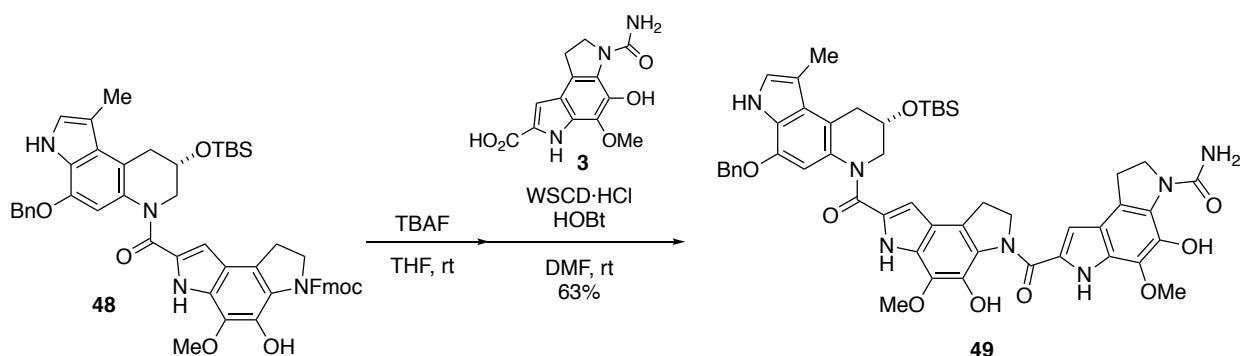


To a solution of left segment **47** (50.4 mg, 119  $\mu\text{mol}$ ), and the carboxylic acid **38** (67.3 mg, 143  $\mu\text{mol}$ ) in THF (1.2 mL) was added WSCD·HCl (91.4 mg, 477  $\mu\text{mol}$ ) at room temperature.



After stirring at room temperature for 10 h, the reaction was quenched with saturated aqueous  $\text{NH}_4\text{Cl}$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with  $\text{H}_2\text{O}$  and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by flash silica gel column chromatography (hexanes-EtOAc = 2:1) to afford amide **48** (94.8 mg, 108  $\mu\text{mol}$ , 91%). A pale yellow solid;  $[\alpha]_{\text{D}}^{24} +16.2$  ( $c$  1.28,  $\text{CHCl}_3$ ); mp 139–142 °C (hexanes-EtOAc, colorless prisms); IR (film): 3456, 3005, 2952, 2928, 2898, 2855, 1663, 1604, 1452, 1353, 1331, 1251, 773, 757, 741  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ):  $\delta$  11.03 (s, 1H), 8.83 (s, 1H), 8.14 (s, 1H), 7.79 (d, 2H,  $J = 7.2$  Hz), 7.61 (d, 2H,  $J = 7.2$  Hz), 7.42 (dd, 2H,  $J = 7.2$ , 7.2 Hz), 7.35 (dd, 2H,  $J = 7.2$ , 7.2 Hz), 7.25–7.15 (m, 5H), 6.94 (s, 1H), 6.51 (s, 1H), 6.13 (s, 1H), 4.85 (s, 2H), 4.58 (d, 2H,  $J = 7.2$  Hz), 4.38–4.28 (m, 2H), 4.18–4.08 (m, 1H), 4.03 (t, 2H,  $J = 8.8$  Hz), 3.94 (s, 3H), 3.98–3.87 (m, 1H), 3.56 (dd, 1H,  $J = 16.0$ , 6.4 Hz), 3.17 (dd, 1H,  $J = 16.0$ , 6.0 Hz), 2.98 (t, 2H,  $J = 8.8$  Hz), 2.52 (s, 3H), 0.83 (s, 9H), 0.10 (s, 3H), 0.06 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ):  $\delta$  162.6, 155.1, 143.5, 142.8, 141.3, 137.2, 136.6, 132.8, 130.5, 130.4, 129.2, 128.3, 127.9, 127.3, 127.2, 126.5, 125.8, 125.2, 124.9, 122.5, 120.1, 119.1, 117.7, 114.9, 113.0, 106.0, 102.7, 70.4, 68.7, 67.3, 60.6, 51.6, 49.3, 47.1, 34.4, 26.8, 25.7, 18.0, 13.0, –4.7, –4.8 (One signal is missing due to overlap.); HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{52}\text{H}_{55}\text{N}_4\text{O}_7\text{Si}$  875.3835  $[\text{M}+\text{H}^+]$  found 875.3806.

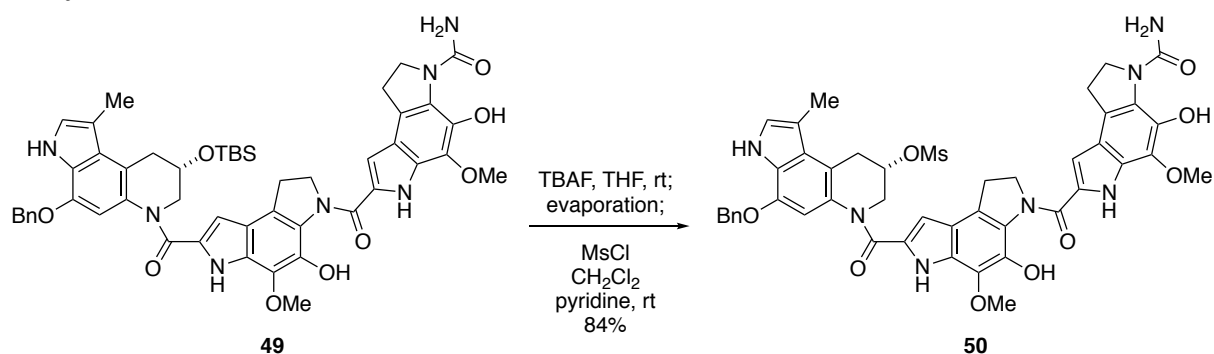
## Amide 49



To a solution of **48** (34.1 mg, 39.0  $\mu\text{mol}$ ) in THF (0.35 mL) was added TBAF (1.0 M in THF, 30  $\mu\text{L}$ , 30  $\mu\text{mol}$ , 30  $\mu\text{L}$ , 30  $\mu\text{mol}$ , 10  $\mu\text{L}$ , 10  $\mu\text{mol}$ , 5  $\mu\text{L}$ , 5  $\mu\text{mol}$ , addition to every 10 min) at room temperature. Then, WSCD·HCl (29.9 mg, 156  $\mu\text{mol}$ ), **3** (11.4 mg, 39.0  $\mu\text{mol}$ ) and DMF (0.7 mL) were added to the mixture at room temperature, and the resulting solution was stirred for 4 h at room temperature. To the mixture was added HOBt (21.0 mg, 156  $\mu\text{mol}$ ) at room temperature. After stirring at room temperature for 1 h, the reaction was quenched with saturated aqueous  $\text{NaHCO}_3$ , and the mixture was extracted with EtOAc three times. The combined organic extracts were washed with  $\text{H}_2\text{O}$  twice and brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (EtOAc-MeOH-10% aqueous ammonium hydroxide = 10:1:1) to afford **49** (22.7 mg, 24.5  $\mu\text{mol}$ , 63%). A yellow solid;  $[\alpha]_{\text{D}}^{27} +18$  ( $c$  0.65, DMF); mp 172–174 °C (hexanes-EtOAc, colorless prisms); IR (film): 3344, 2952, 2931, 1733, 1652, 1645, 1634, 1614, 1575, 1568, 1515, 1463, 1456, 1443, 1421, 1331, 1250, 547  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz, acetone- $d_6$ ):  $\delta$  12.82 (s, 1H), 10.92 (br s, 1H), 10.28 (br s, 1H), 10.10 (br s, 1H), 10.04 (br s, 1H), 7.36–7.16 (m, 5H), 7.05–7.00 (m, 2H), 6.53 (s, 1H), 6.30 (br s, 1H), 6.25 (br s, 2H), 4.83 (s, 2H), 4.65 (t, 2H,  $J = 8.0$  Hz), 4.47–4.38 (m,

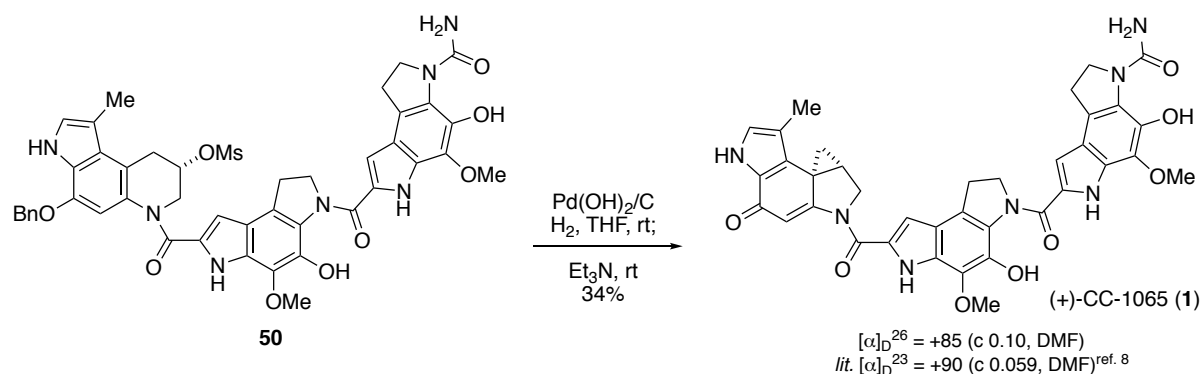
1H), 4.16 (t, 2H,  $J = 8.4$  Hz), 4.09 (dd, 1H,  $J = 11.2, 2.8$  Hz), 4.00–3.90 (m, 1H), 3.92 (s, 3H), 3.88 (s, 3H), 3.60 (dd, 1H,  $J = 16.8, 6.0$  Hz), 3.29 (t, 2H,  $J = 8.4$  Hz), 3.20–3.10 (m, 3H), 2.48 (s, 3H), 0.85 (s, 9H), 0.14 (s, 3H), 0.08 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz, acetone- $d_6$ ):  $\delta$  163.3, 161.3, 158.5, 143.8, 139.7, 139.2, 138.2, 134.3, 133.5, 132.7, 131.3, 131.1, 130.6, 130.0, 129.0, 128.8, 128.4, 128.3, 128.1, 127.6, 126.6, 124.2, 121.3, 119.2, 118.62, 118.60, 114.9, 112.8, 106.9, 105.9, 103.2, 70.7, 68.0, 60.6, 60.4, 53.9, 52.0, 50.3, 35.2, 28.4, 27.4, 26.2, 18.6, 13.2, –4.5, –4.6; HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{50}\text{H}_{56}\text{N}_7\text{O}_9\text{Si}$  926.3903  $[\text{M}+\text{H}^+]$  found 926.3911.

## Mesylate **50**



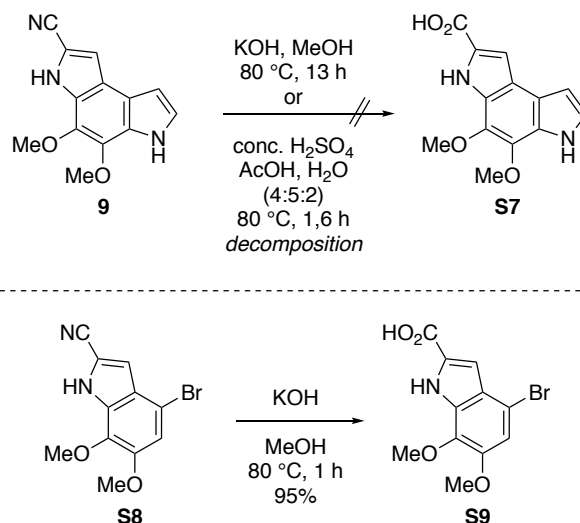
To a solution of **49** (17.4 mg, 18.8  $\mu\text{mol}$ ) in THF (0.2 mL) was added TBAF (1.0 M in THF, 22.5  $\mu\text{L}$ , 22.5  $\mu\text{mol}$ ) at room temperature. After stirring at room temperature for 15 min, TBAF (1.0 M in THF, 22.5  $\mu\text{L}$ , 22.5  $\mu\text{mol}$ ) was added to the reaction mixture at room temperature, and the resulting mixture was stirred for 3 h at room temperature. THF was removed under reduced pressure, and the residue was dissolved in a mixture of  $\text{CH}_2\text{Cl}_2$  (0.2 mL) and pyridine (30.4  $\mu\text{L}$ , 376  $\mu\text{mol}$ ). To the mixture was added MsCl (14.6  $\mu\text{L}$ , 188  $\mu\text{mol}$ ) at 0  $^\circ\text{C}$ , and the resulting mixture was stirred for 40 min at room temperature. To the mixture were added pyridine (30.4  $\mu\text{L}$ , 376  $\mu\text{mol}$ ) and MsCl (14.6  $\mu\text{L}$ , 188  $\mu\text{mol}$ ) at room temperature. After stirring at room temperature for 3.5 h, the reaction was quenched with  $\text{H}_2\text{O}$ , and the mixture was extracted with EtOAc four times. The combined organic extracts were washed with brine, dried over anhydrous sodium sulfate, and filtered. The organic solvents were removed under reduced pressure to give a crude material, which was purified by preparative TLC (EtOAc-MeOH-10% aqueous ammonium hydroxide = 10:1:1) to afford **50** (14.1 mg, 15.8  $\mu\text{mol}$ , 84%). A yellow solid;  $[\alpha]_{\text{D}}^{26} -21$  ( $c$  0.27, DMF); mp 219–220  $^\circ\text{C}$ , decomposition, (hexanes-THF, colorless prisms); IR (film): 3353, 2917, 2848, 1634, 1417, 1328, 1171, 1154, 1123, 746  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz, acetone- $d_6$ ):  $\delta$  12.81 (s, 1H), 10.94 (s, 1H), 10.25 (br s, 1H), 10.23–10.13 (m, 2H), 7.30–7.10 (m, 5H), 7.10–7.00 (m, 2H), 6.54 (s, 1H), 6.30–6.20 (m, 1H), 6.13 (br s, 2H), 5.45–5.35 (m, 1H), 4.86 (s, 2H), 4.65 (t, 2H,  $J = 8.0$  Hz), 4.42 (dd, 1H,  $J = 13.2, 4.4$  Hz), 4.17 (m, 3H), 3.92 (s, 3H), 3.90 (s, 3H), 3.76 (dd, 1H,  $J = 17.2, 6.0$  Hz), 3.55 (dd, 1H,  $J = 17.2, 4.4$  Hz), 3.31 (t, 2H,  $J = 8.8$  Hz), 3.16 (m, 2H), 2.98 (s, 3H), 2.49 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz, acetone- $d_6$ ):  $\delta$  163.3, 161.4, 158.5, 144.2, 139.7, 139.4, 138.1, 134.3, 133.6, 132.1, 131.3, 130.6, 130.0, 129.0, 128.8, 128.5, 128.4, 128.1, 127.4, 126.8, 124.5, 121.4, 119.2, 118.6, 113.3, 112.7, 106.9, 106.2, 103.0, 77.1, 70.7, 60.6, 60.4, 53.9, 50.3, 49.2, 43.4, 38.4, 31.6, 28.4, 27.5, 13.0 (One signal is missing due to overlap); HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{45}\text{H}_{44}\text{N}_7\text{O}_{11}\text{S}$  890.2814  $[\text{M}+\text{H}^+]$  found 890.2786.

**(+)-CC-1065 (1)**



A solution of **50** (9.3 mg, 10  $\mu\text{mol}$ ) and palladium hydroxide on activated carbon (Pd 20%, wetted with ca. 50%  $\text{H}_2\text{O}$ , 14.7 mg) in THF (0.2 mL) was stirred under hydrogen atmosphere (1 atm). After stirring at room temperature for 20 min,  $\text{Et}_3\text{N}$  (22.5  $\mu\text{L}$ , 161  $\mu\text{mol}$ ) was added to the mixture at room temperature. After stirring at room temperature for 1 h, palladium hydroxide on activated carbon was removed by filtration through a pad of Celite<sup>®</sup>, and filtrate was concentrated under reduced pressure to give a crude material, which was purified by preparative TLC (EtOAc-MeOH-10% aqueous ammonium hydroxide = 10:1:1) to afford **1** (2.4 mg, 3.4  $\mu\text{mol}$ , 34%). A yellow solid;  $[\alpha]_{\text{D}}^{26} +85$  (c 0.10, DMF); mp 225–226  $^{\circ}\text{C}$ , decomposition, (hexanes-THF, colorless prisms); IR (film): 3273, 2917, 2848, 1632, 1600, 1576, 1540, 1465, 1441, 1417, 1397, 1374, 1302, 1265, 1120  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  12.9 (s, 1H), 11.7 (s, 1H), 11.5 (s, 1H), 11.4 (s, 1H), 11.04 (s, 1H), 7.06 (m, 2H), 6.87 (m, 3H), 6.43 (s, 1H), 4.68 (t, 2H,  $J = 8.0$  Hz), 4.43 (dd, 1H,  $J = 10.8, 5.2$  Hz), 4.33 (d, 1H,  $J = 10.8$  Hz), 4.03 (t, 2H,  $J = 8.8$  Hz), 3.85 (s, 3H), 3.81 (s, 3H), 3.30–3.10 (m, 5H), 1.99 (m, 4H), 1.44 (m, 1H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{DMSO}-d_6$ ):  $\delta$  176.4, 161.2, 160.7, 160.3, 157.5, 138.4, 138.0, 133.0, 132.3, 130.7, 130.4, 129.5, 129.0, 128.8, 127.5, 127.3, 123.5, 121.3, 118.2, 117.7, 117.3, 113.0, 110.6, 106.3, 105.9, 60.3, 60.0, 54.8, 53.4, 49.4, 31.5, 27.6, 26.5, 21.2, 20.9, 9.6 (One signal is missing due to overlap); HRMS (ESI)  $m/z$ : calcd. for  $\text{C}_{37}\text{H}_{34}\text{N}_7\text{O}_8$  704.2463  $[\text{M}+\text{H}^+]$  found 704.2433. Spectroscopic data were identical with those previously reported.<sup>8</sup>

## Acidic or basic hydrolysis of Pyrroloindole 9

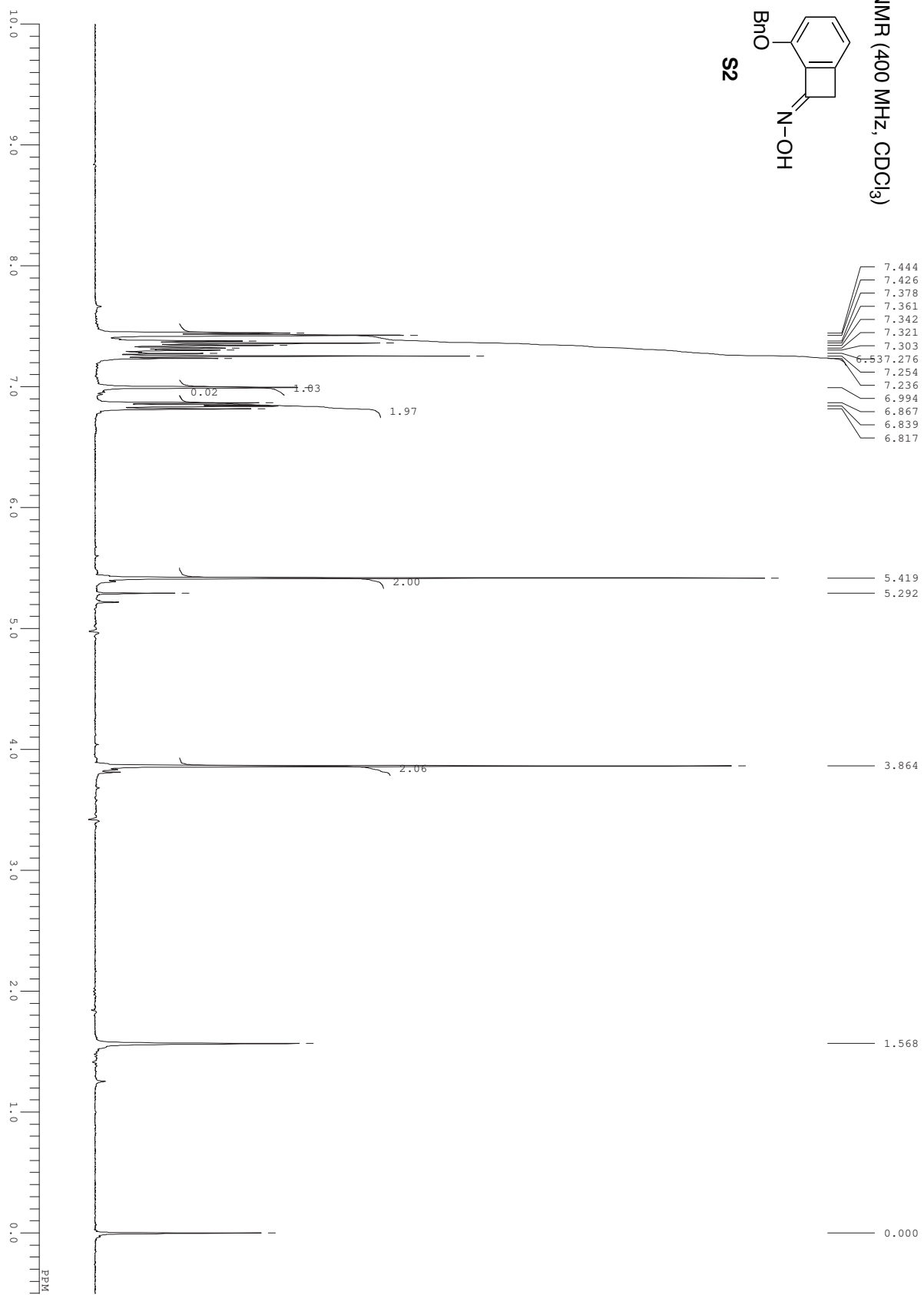
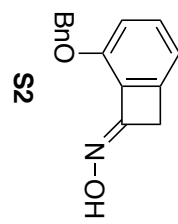


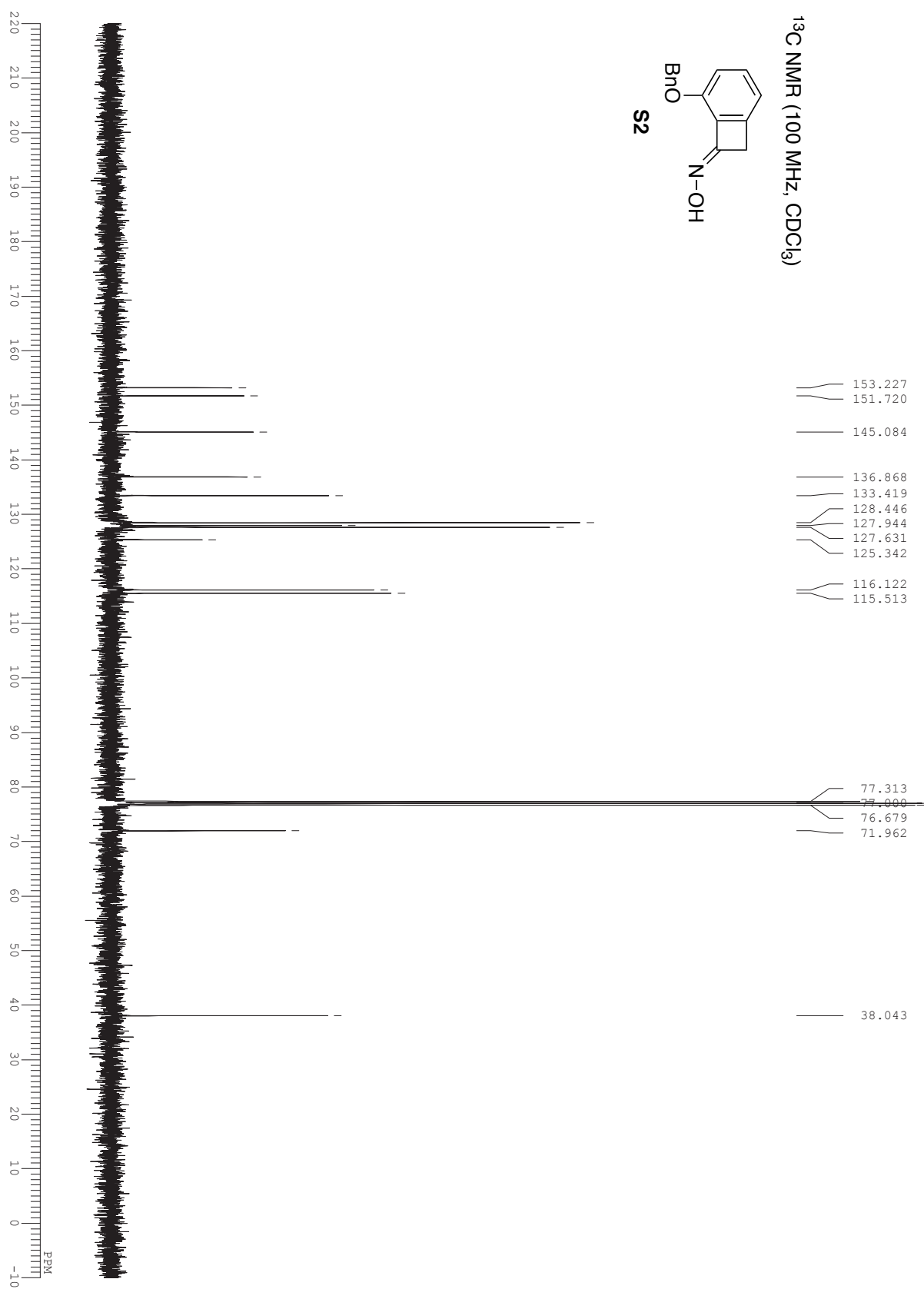
Hydrolysis of pyrroloindole **9** under basic (KOH, MeOH, 80 °C) or acidic (conc. H<sub>2</sub>SO<sub>4</sub>, AcOH, H<sub>2</sub>O) condition caused decomposition. These results suggested that electron rich nature of unprotected pyrroloindole skeleton would contribute to oxidative degradation. In contrast, hydrolysis of 2-cyanoindole **S8** possessing electron withdrawing Br group at C4 position cleanly furnished carboxylic acid **S9** in 95% yield.

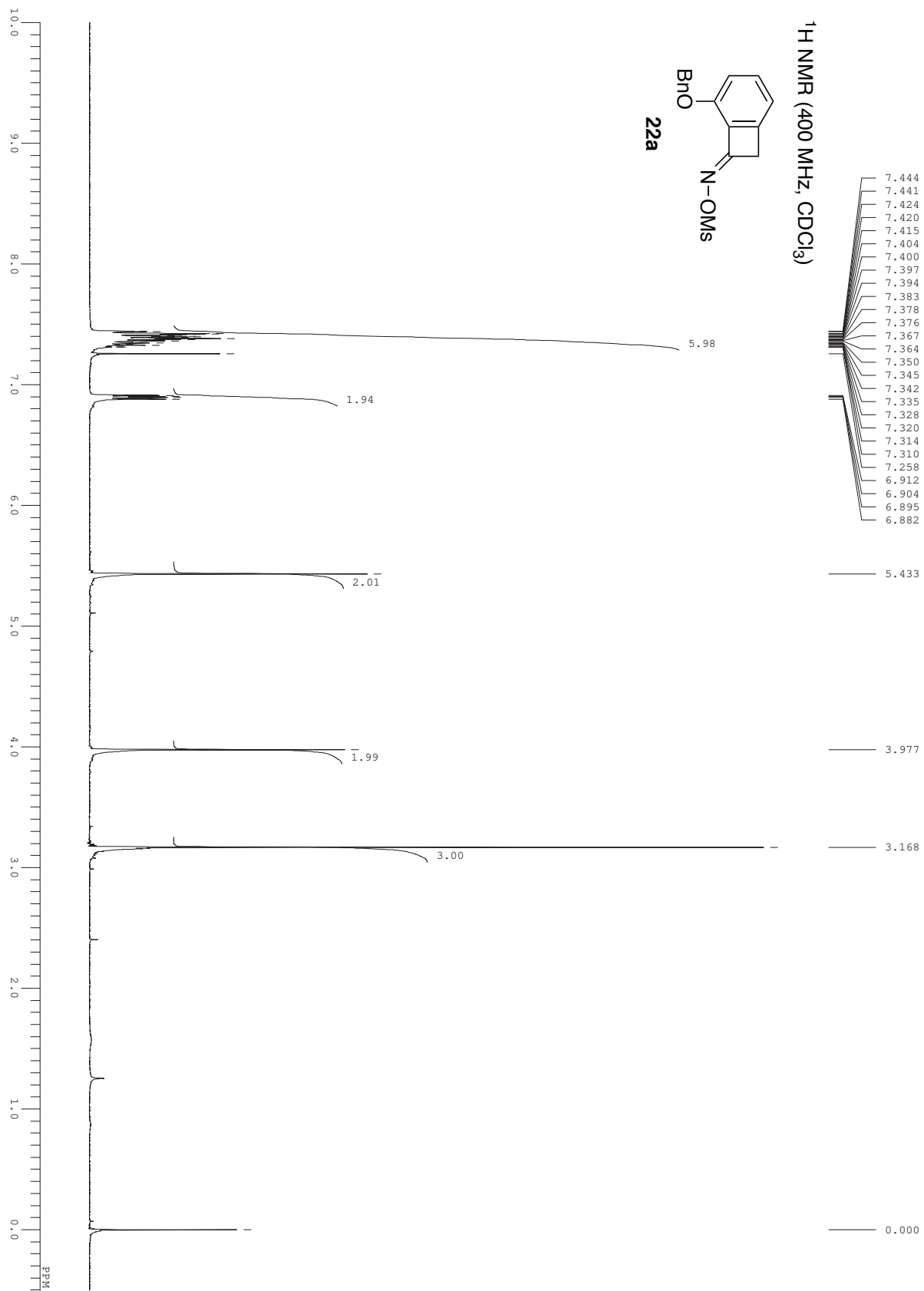
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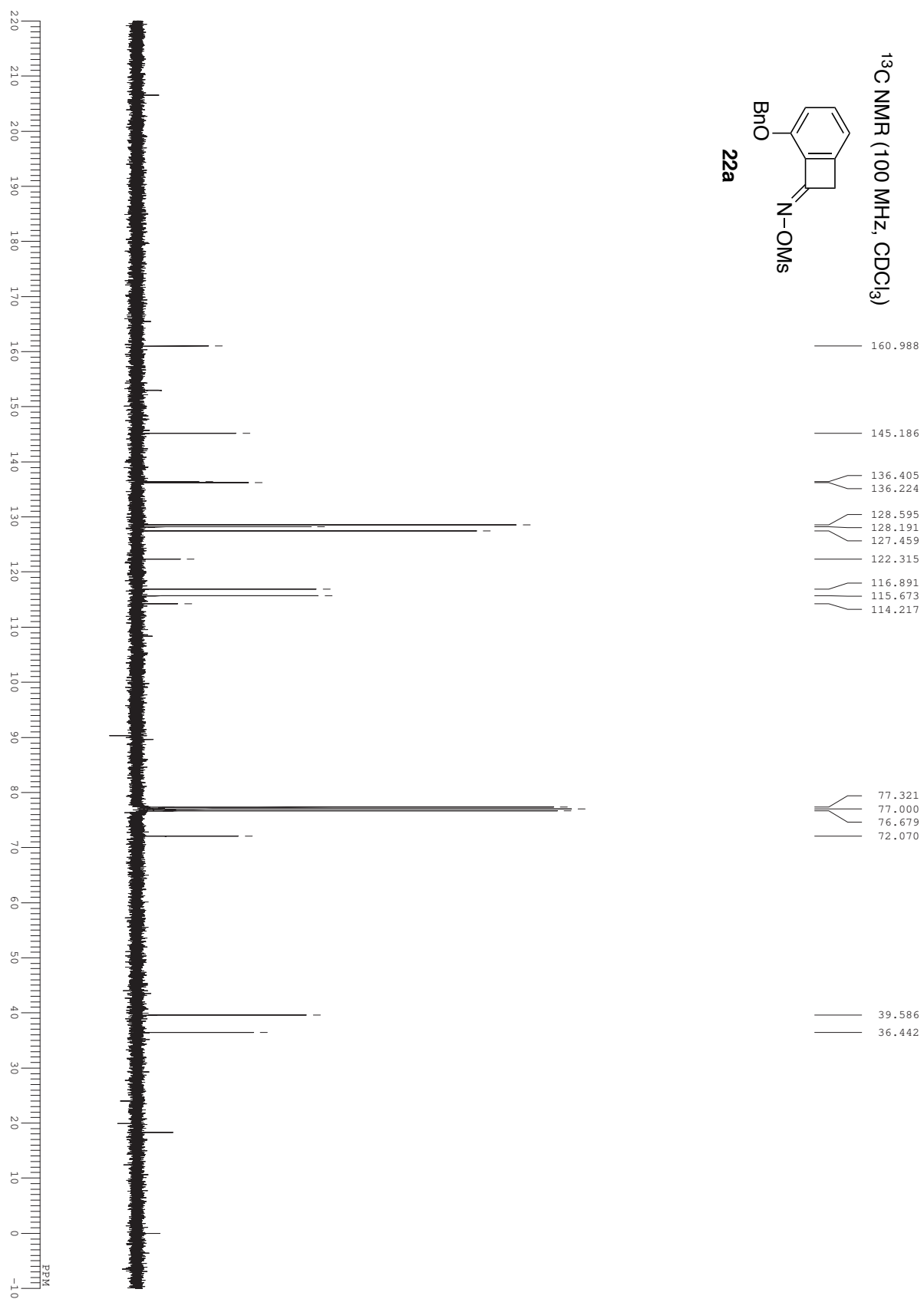
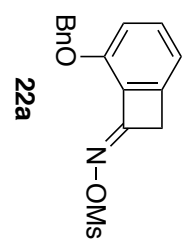
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)



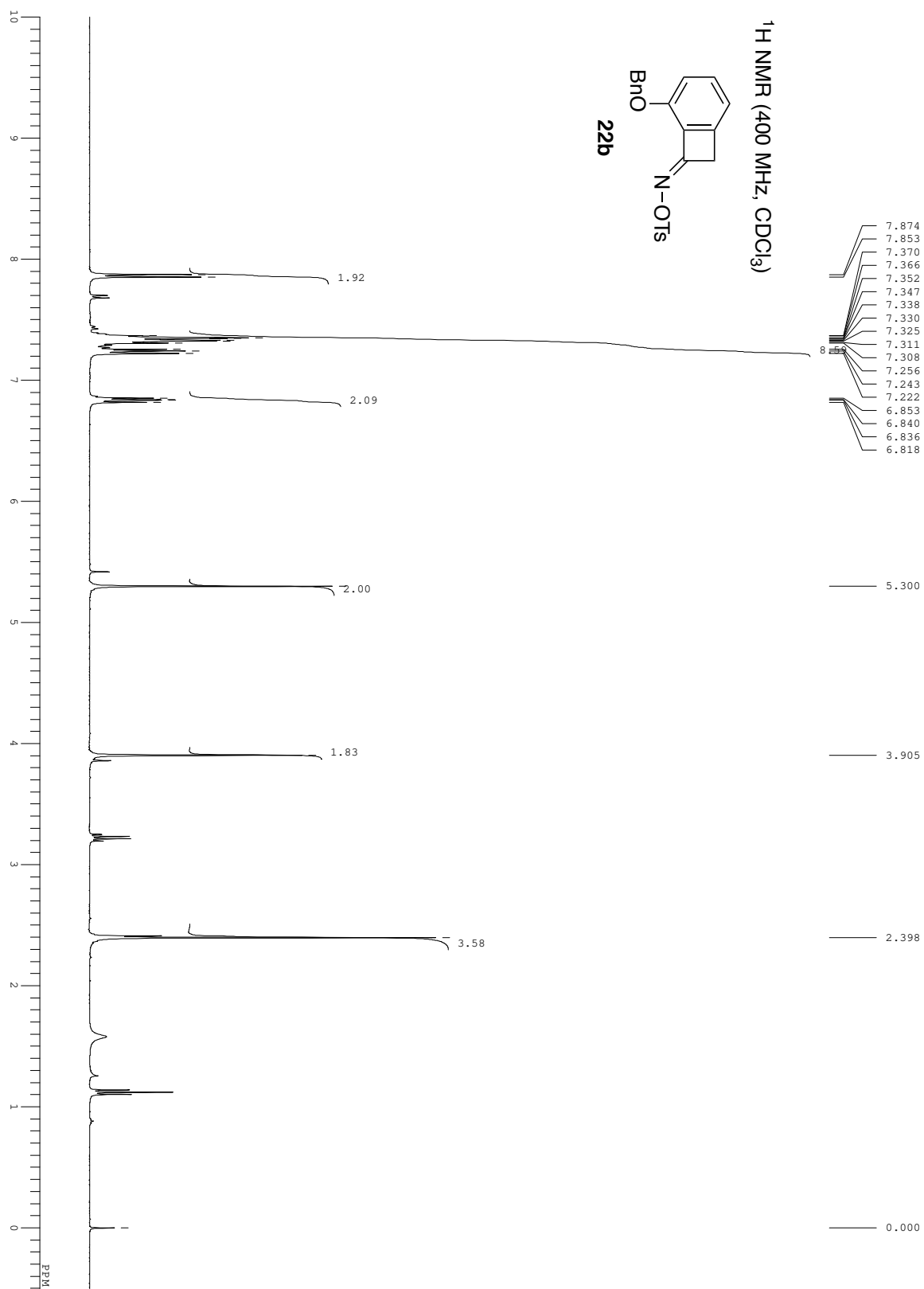


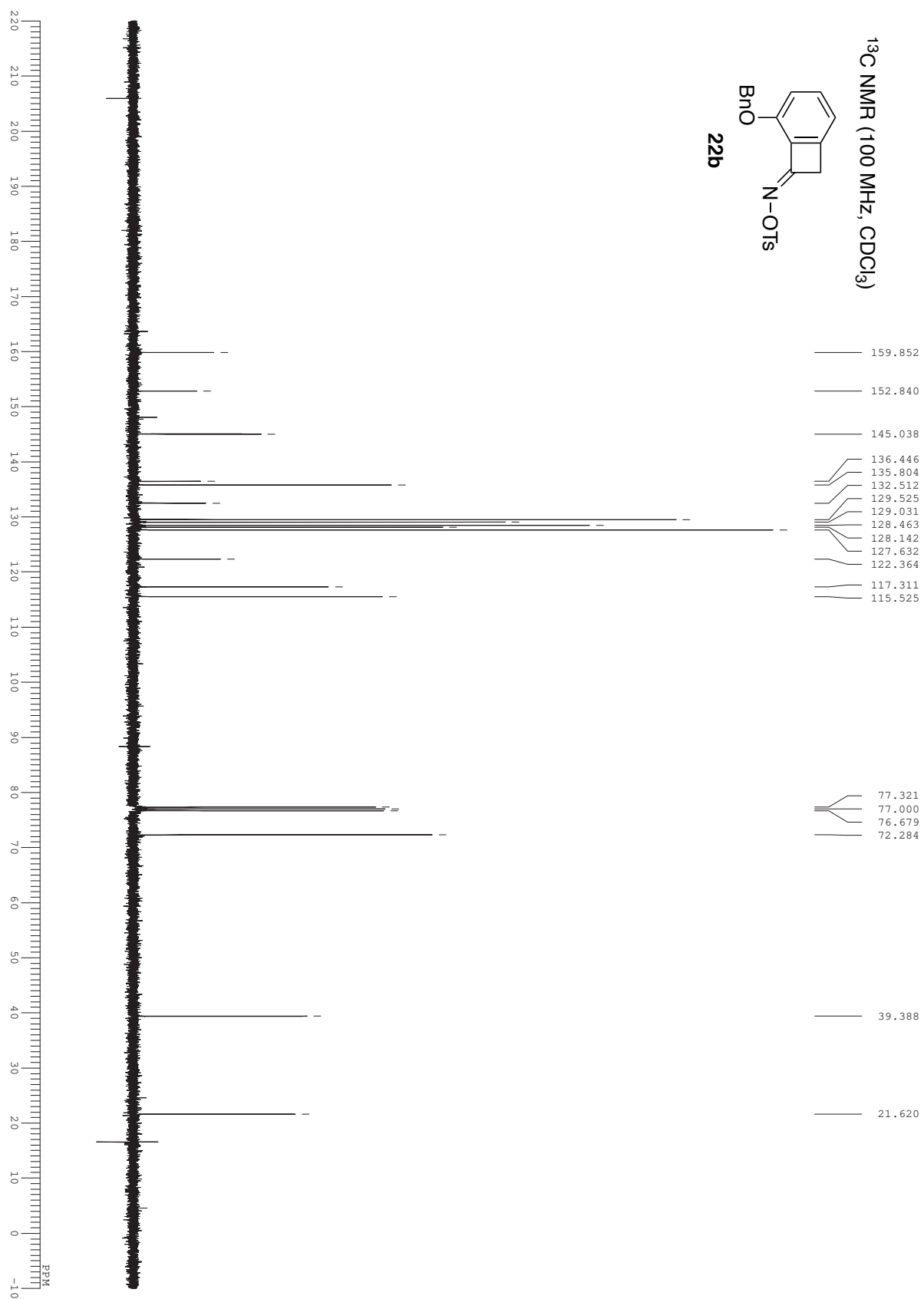


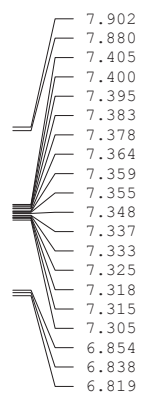
$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )











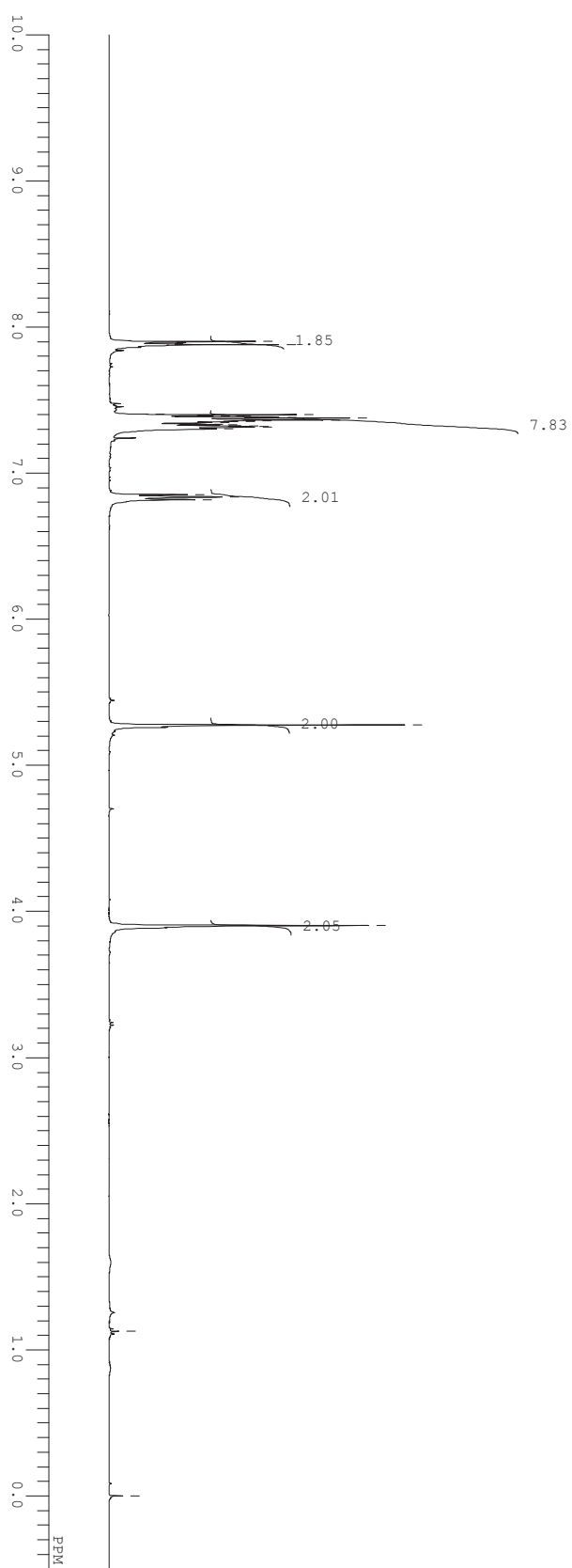
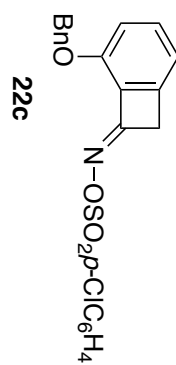
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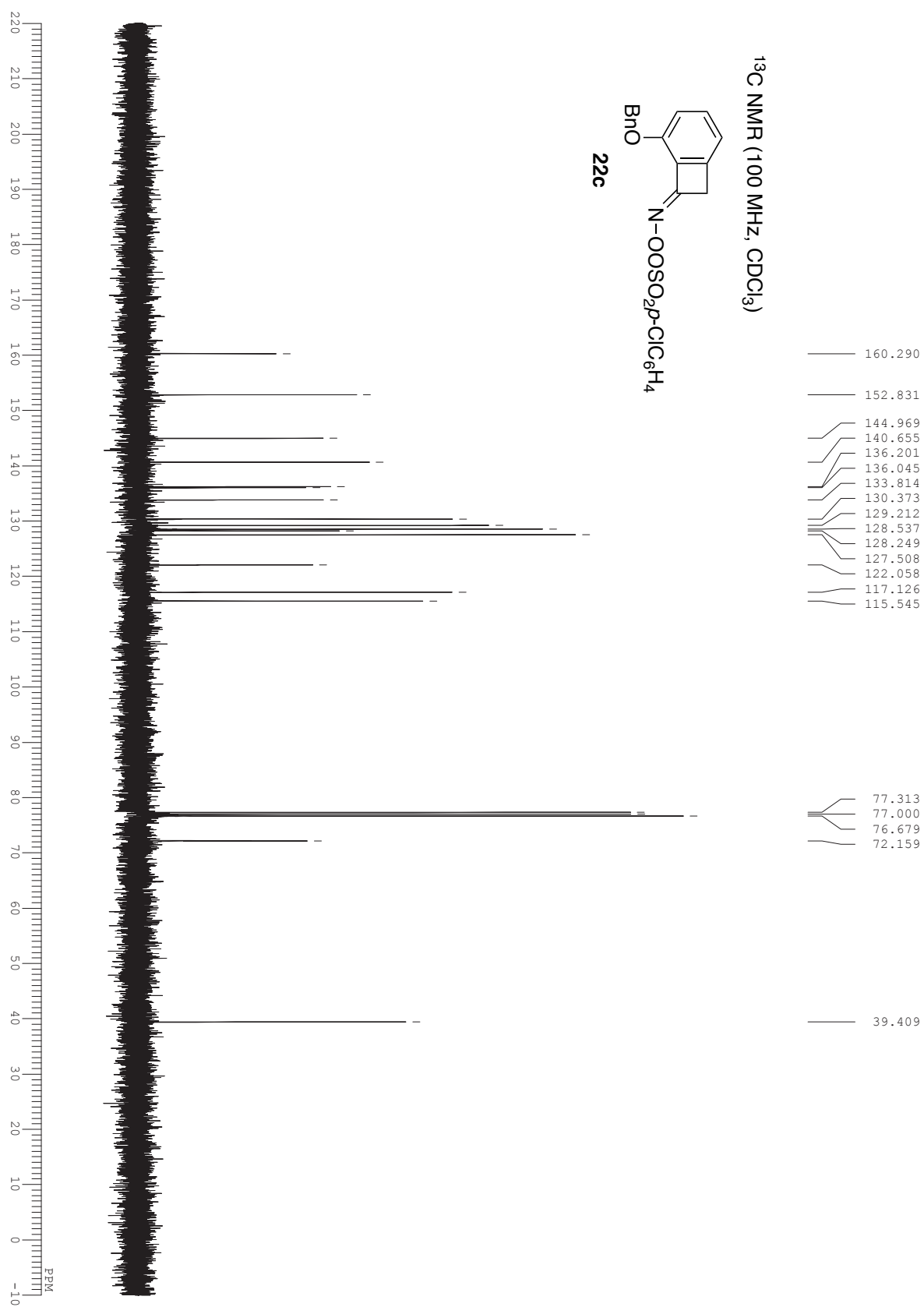
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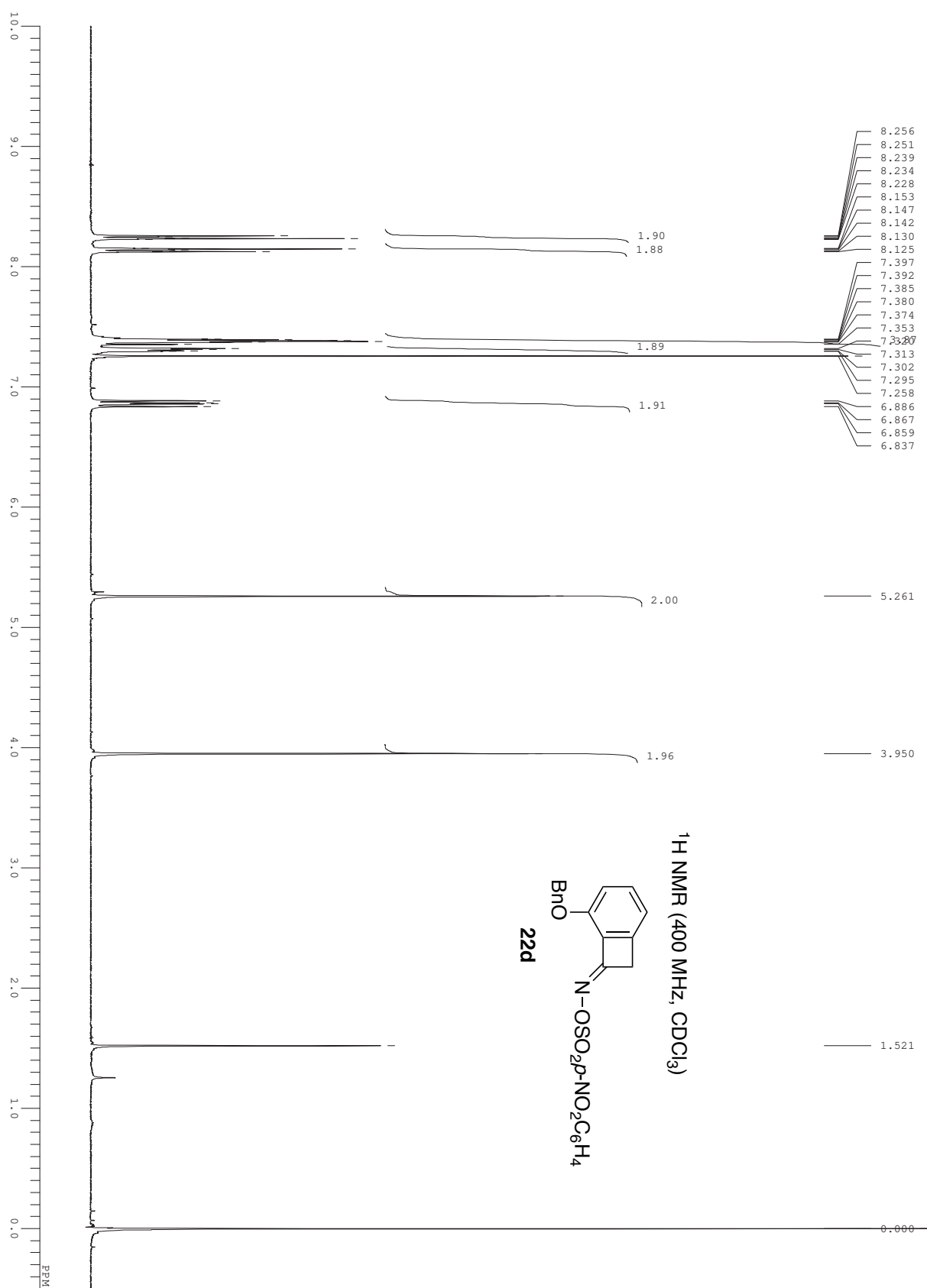
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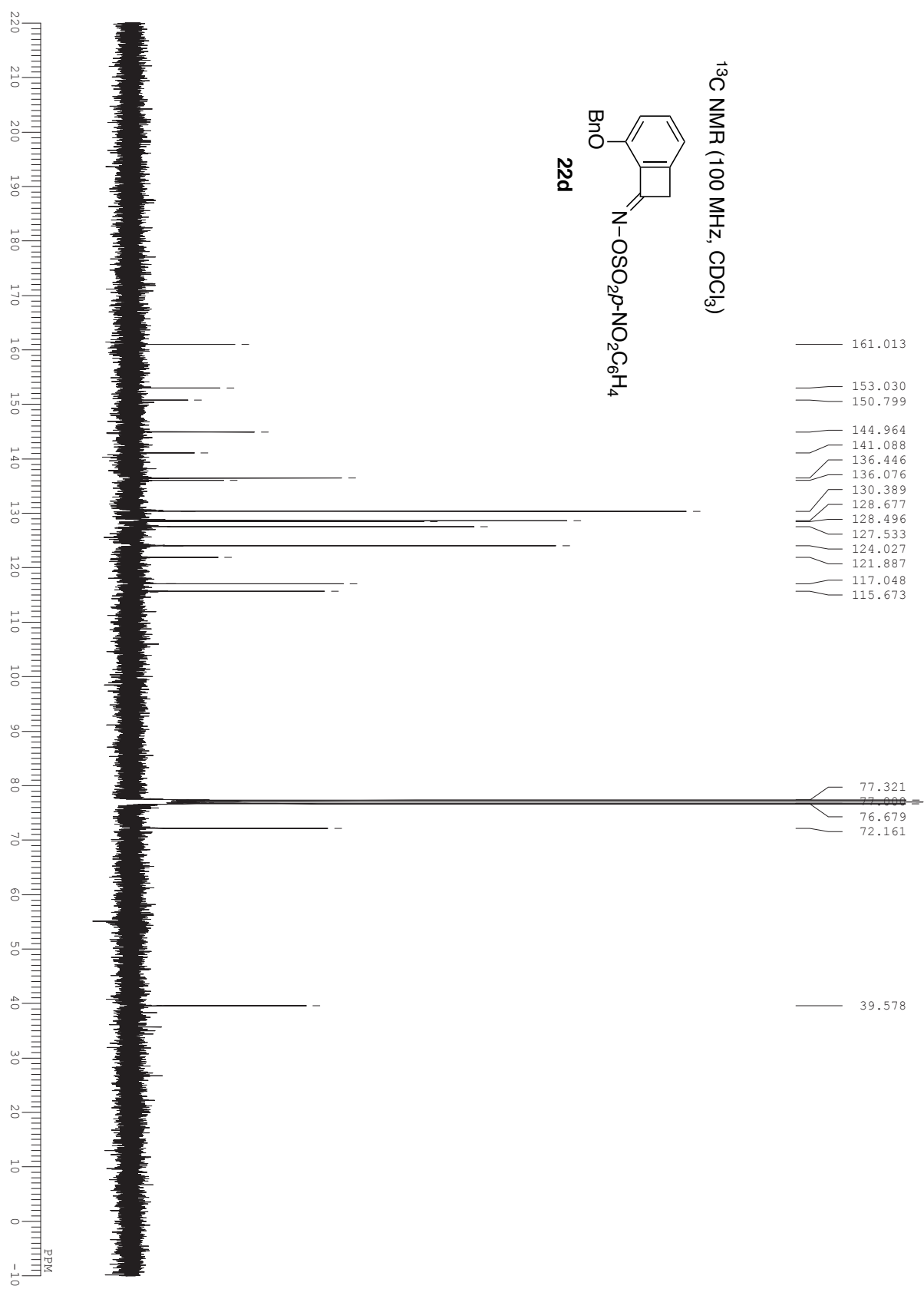
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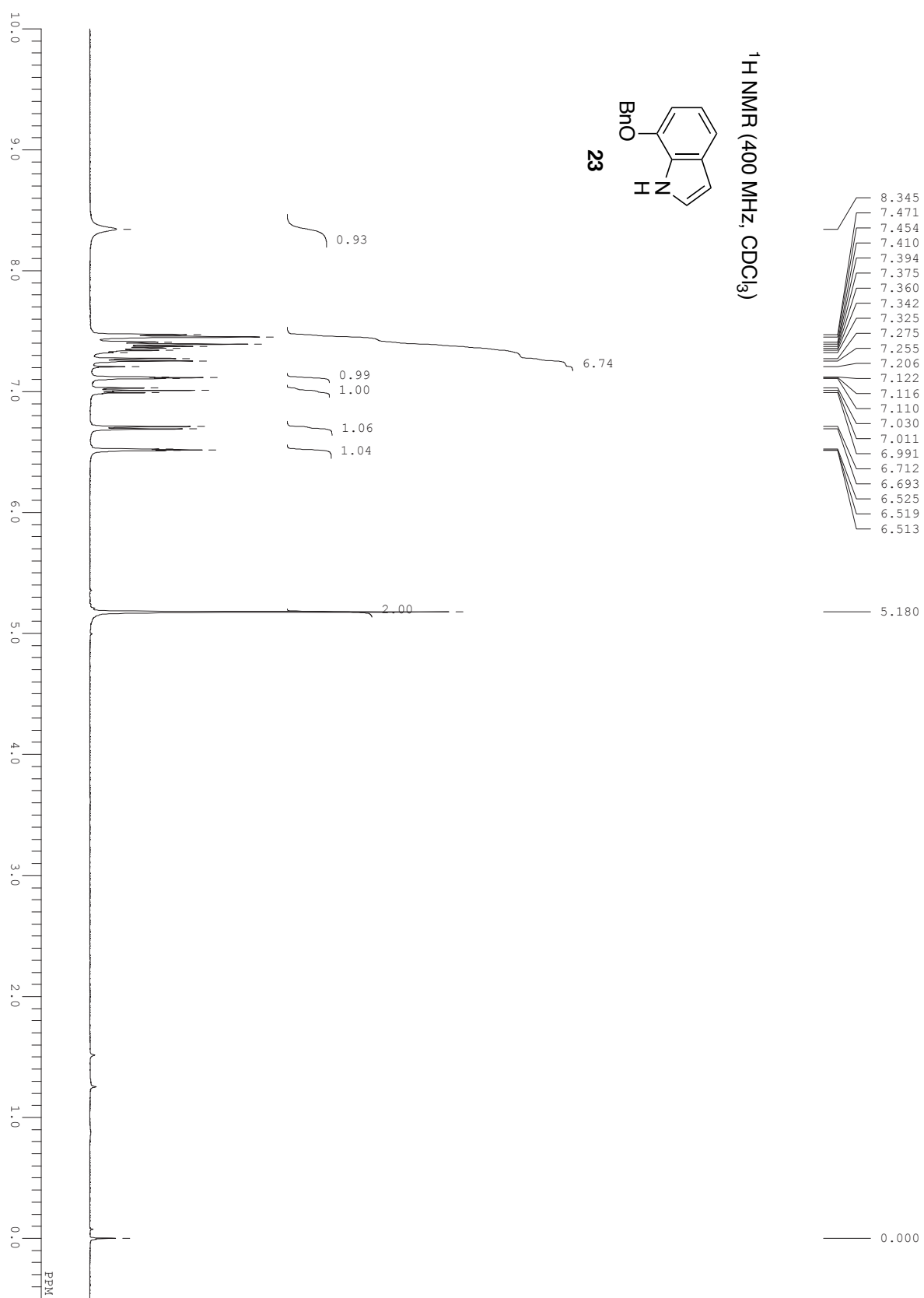
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)



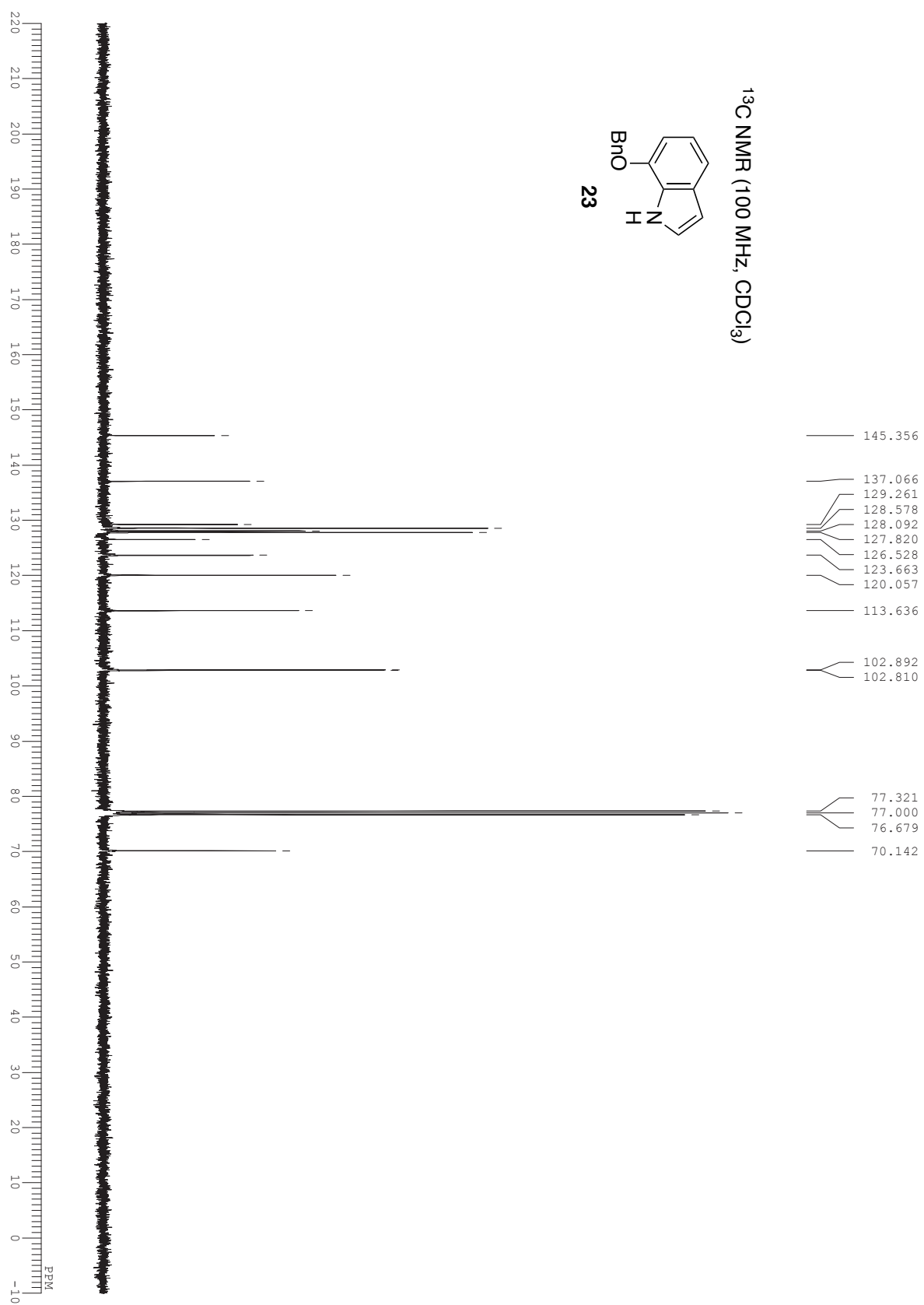
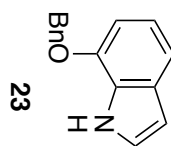




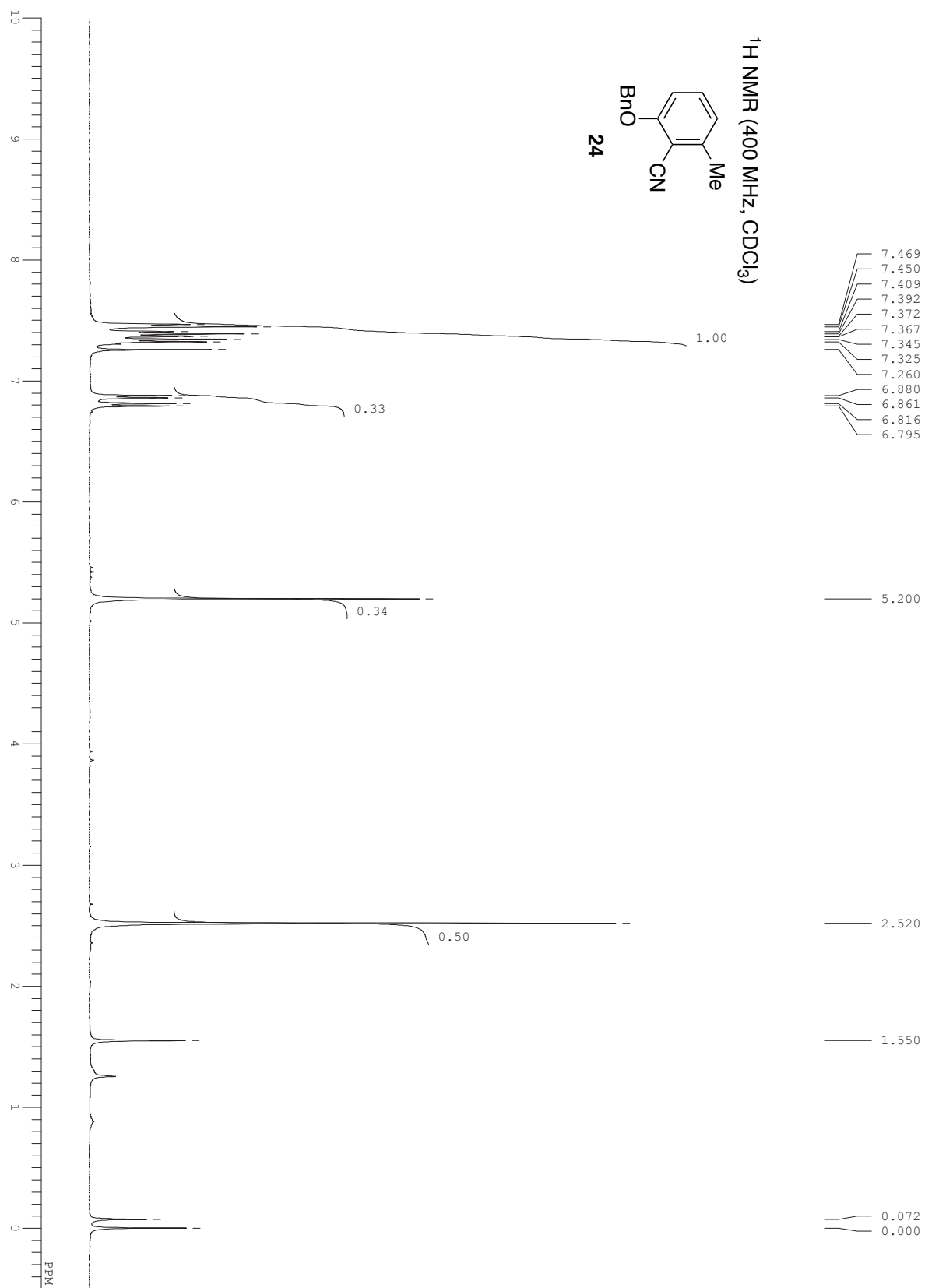


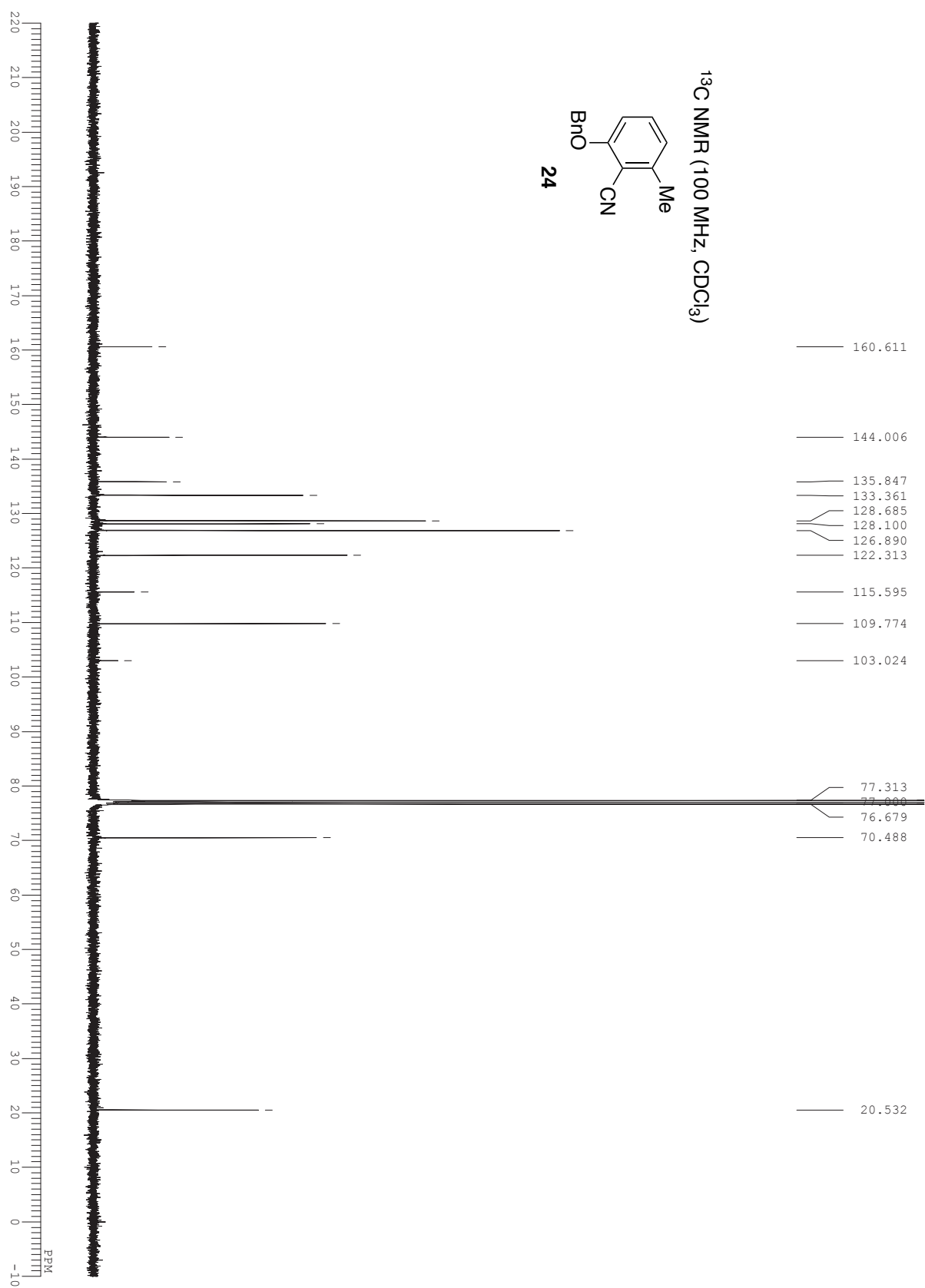


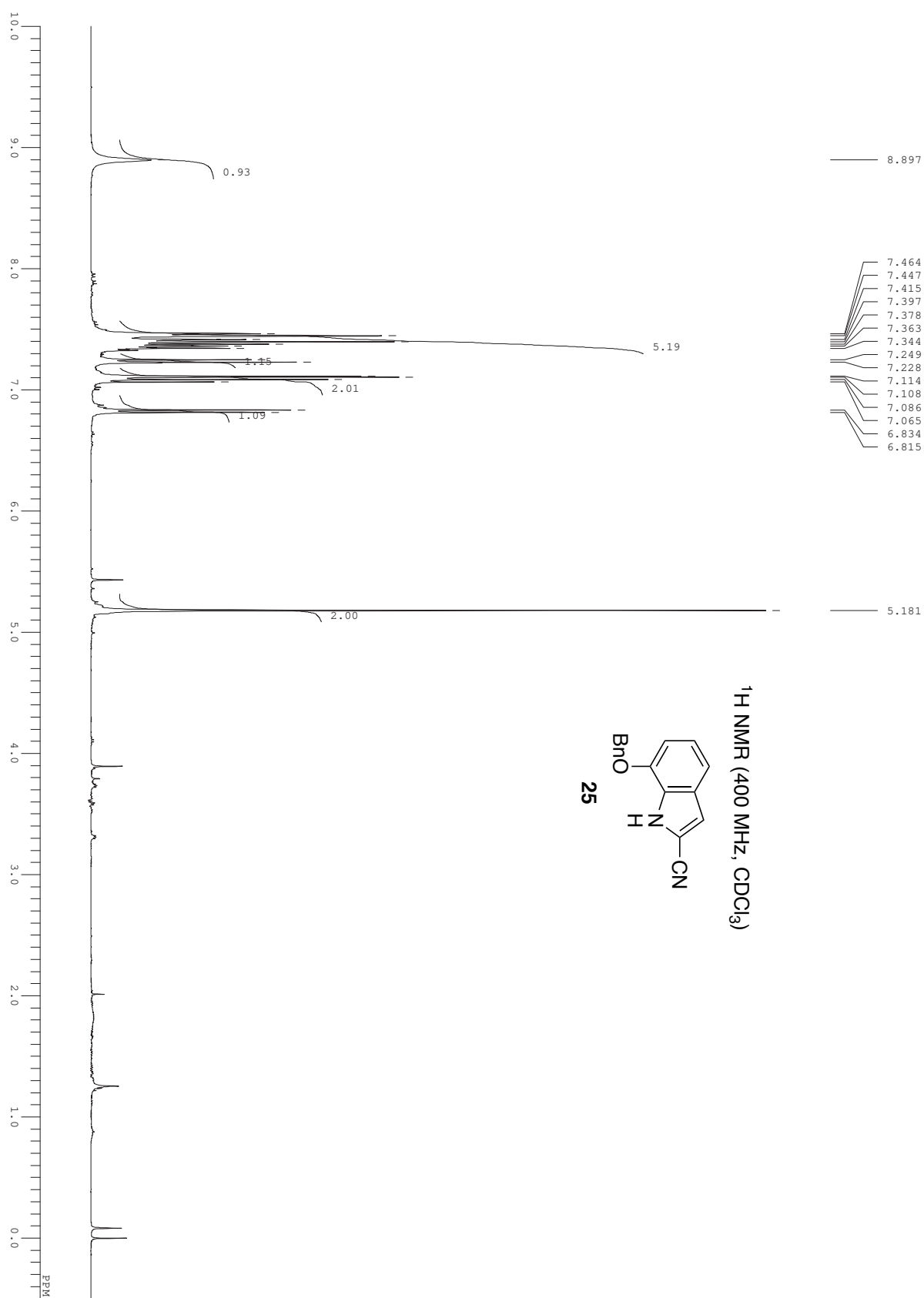
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)

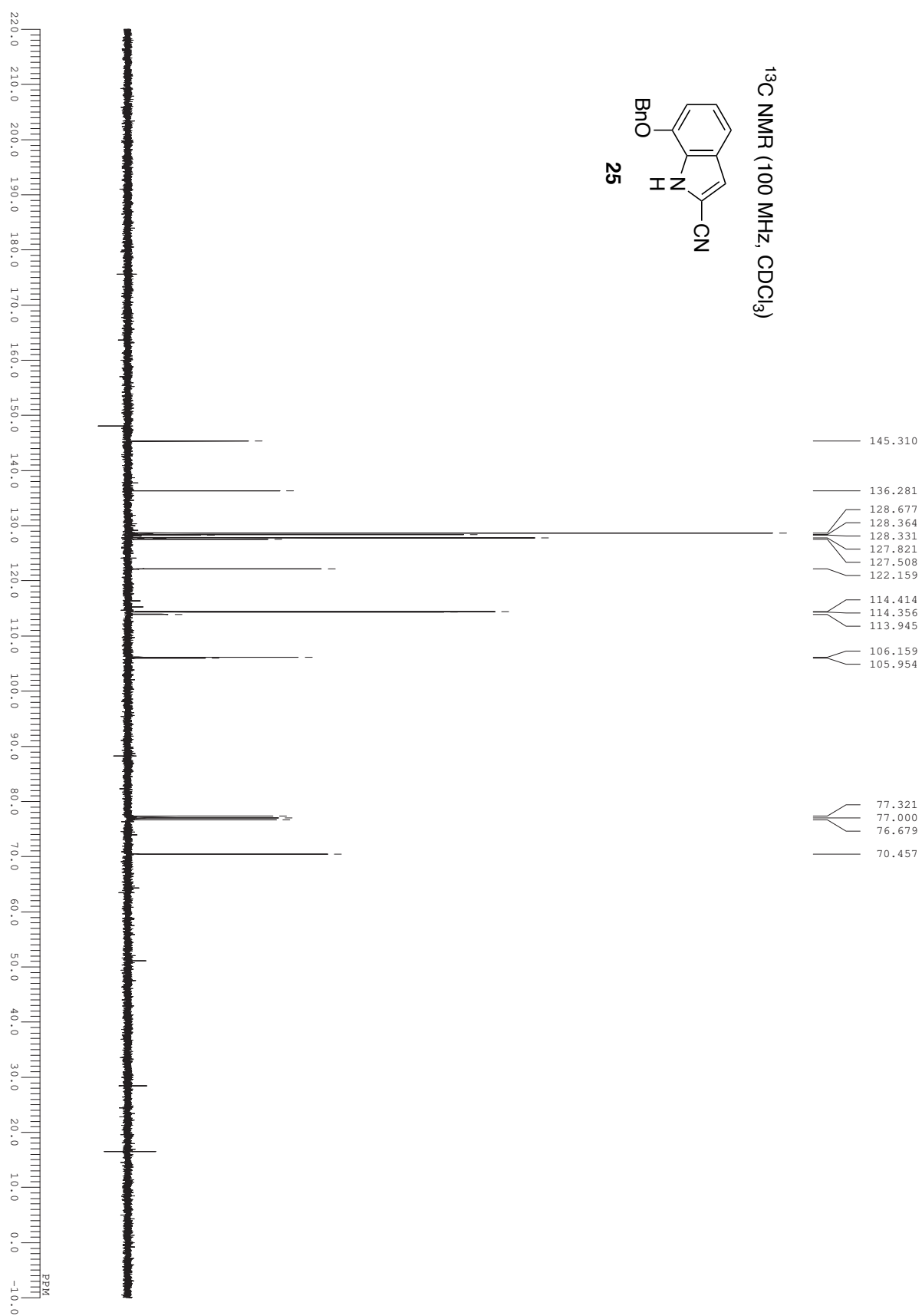




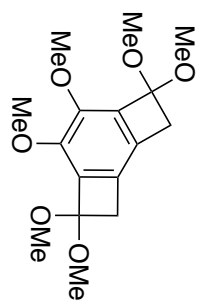




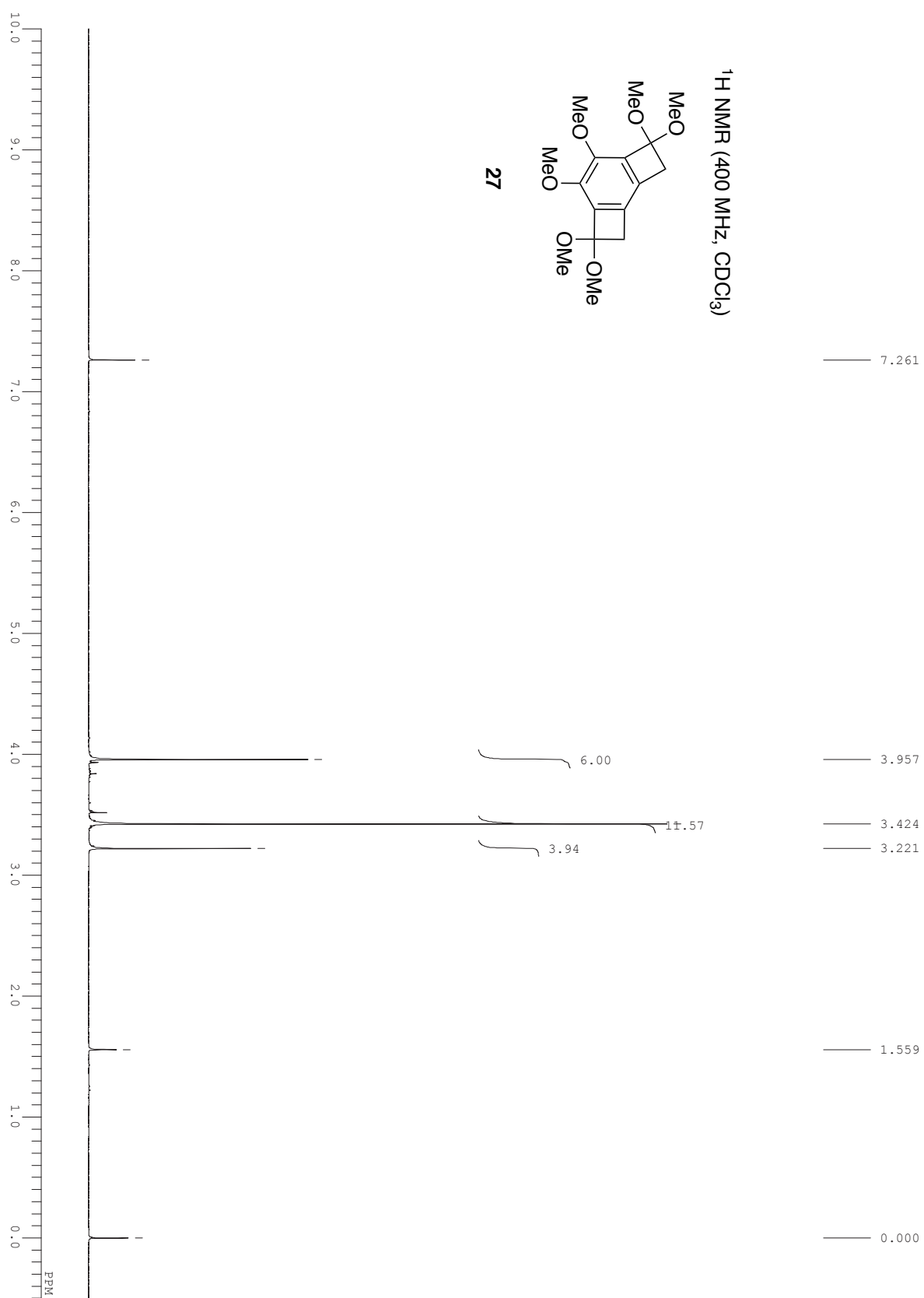




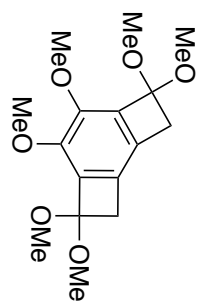
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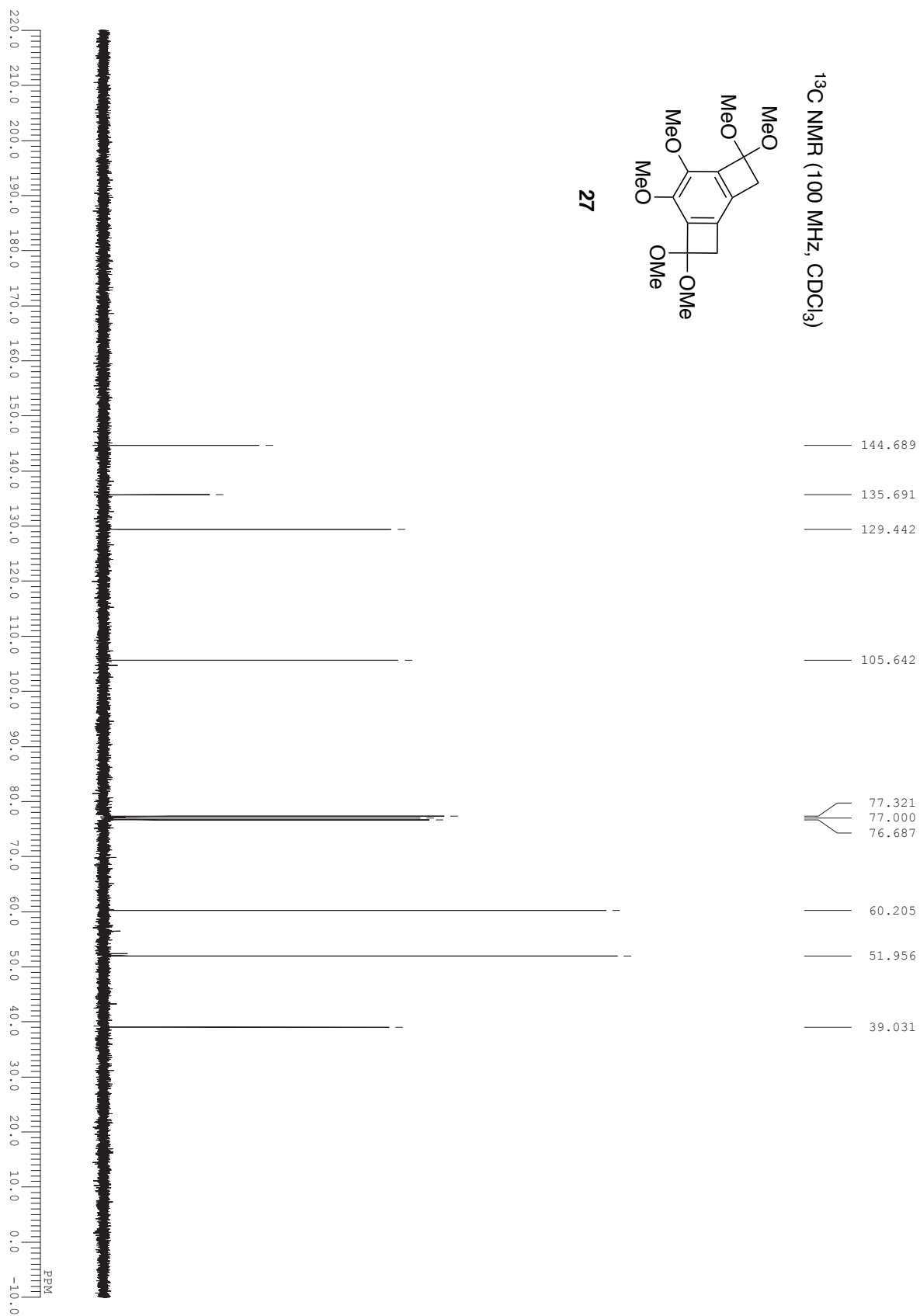
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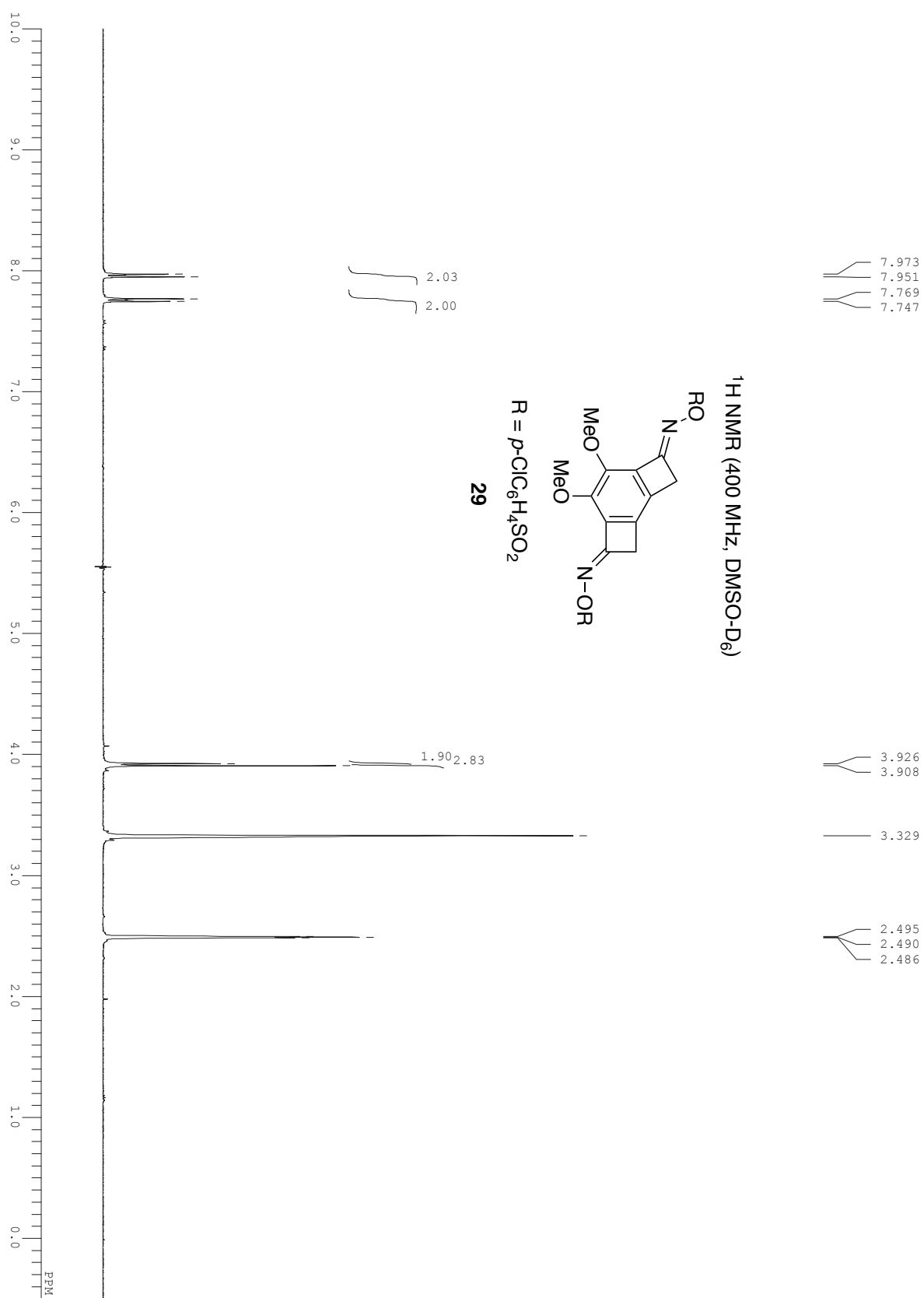


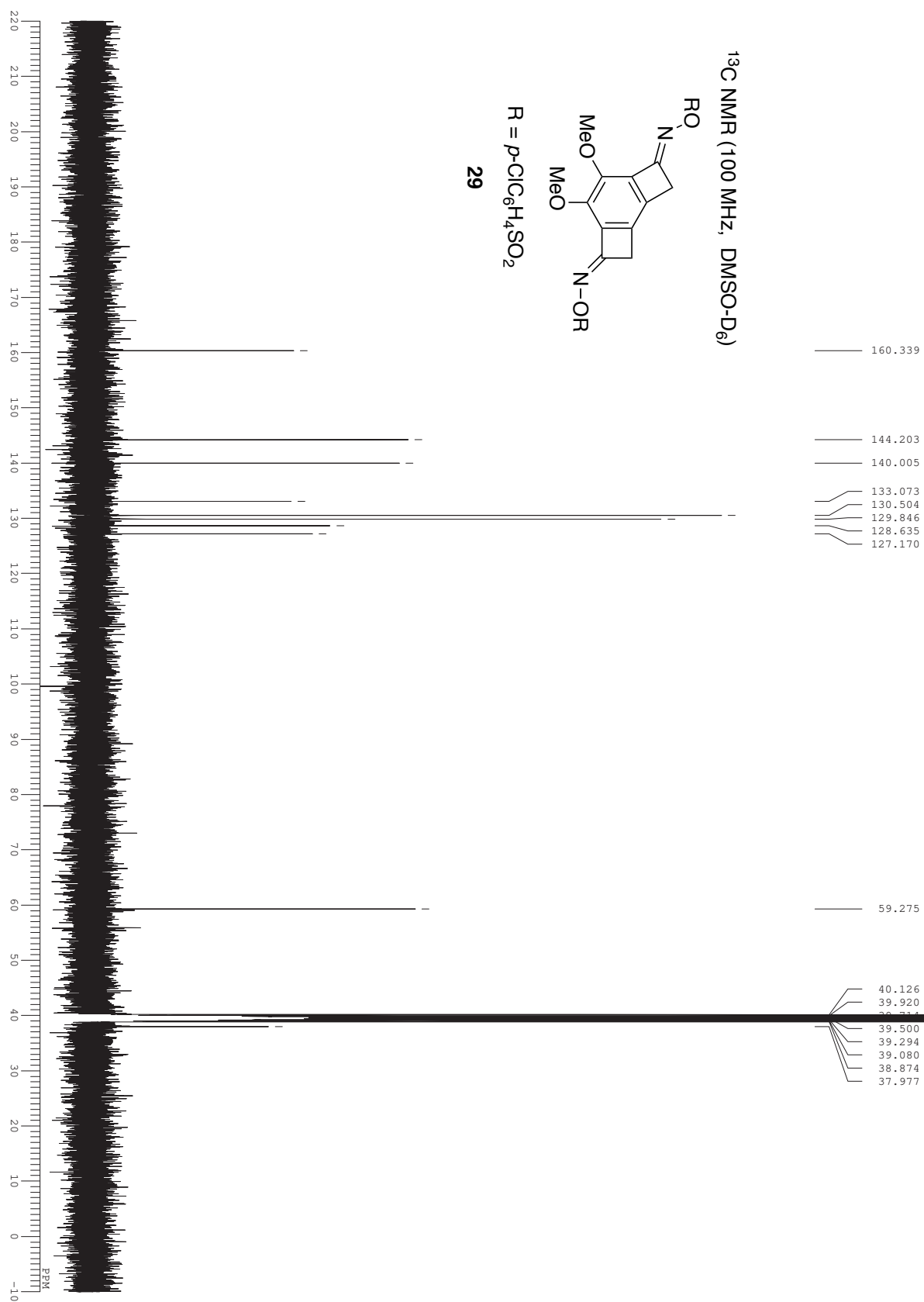
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)



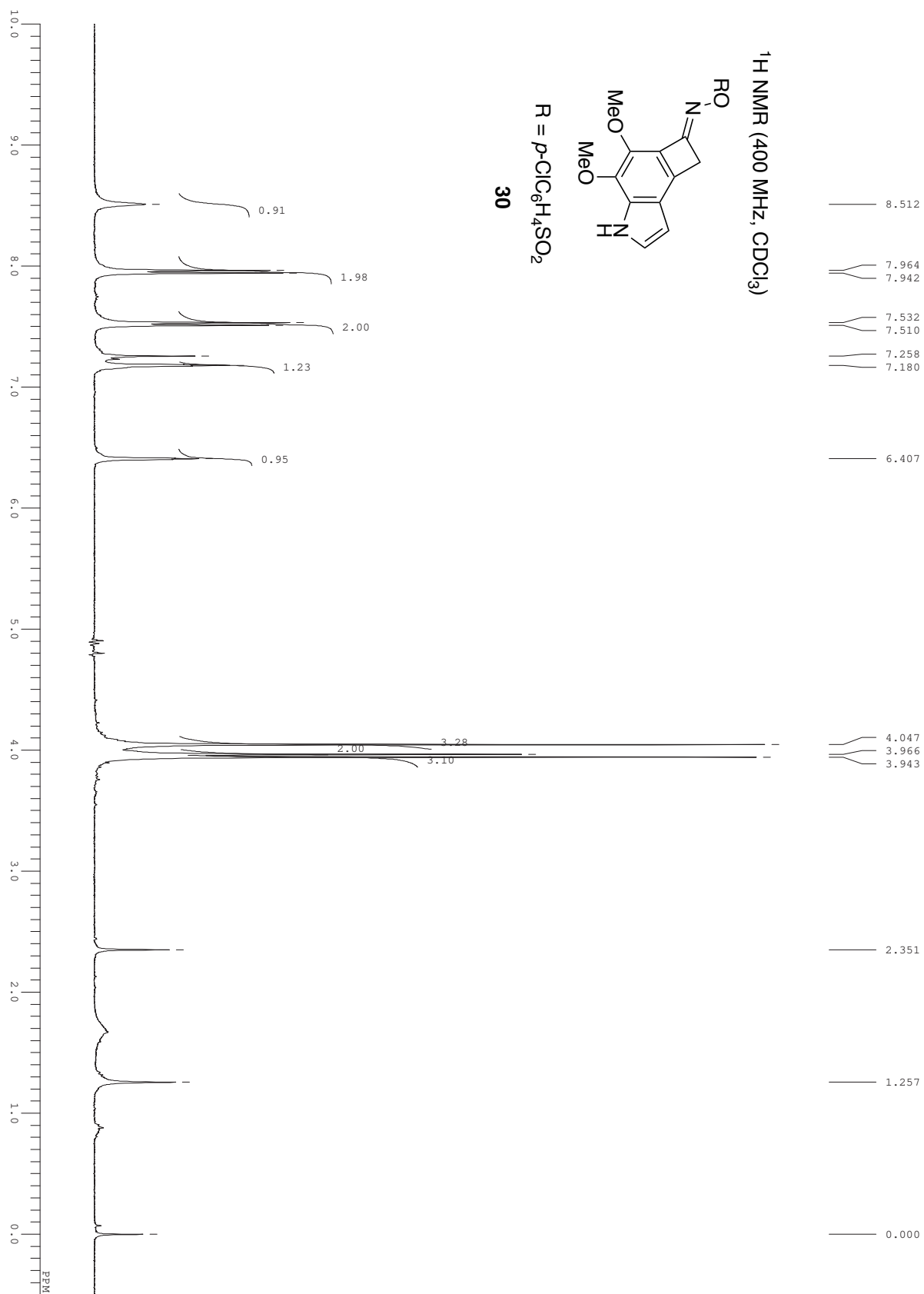
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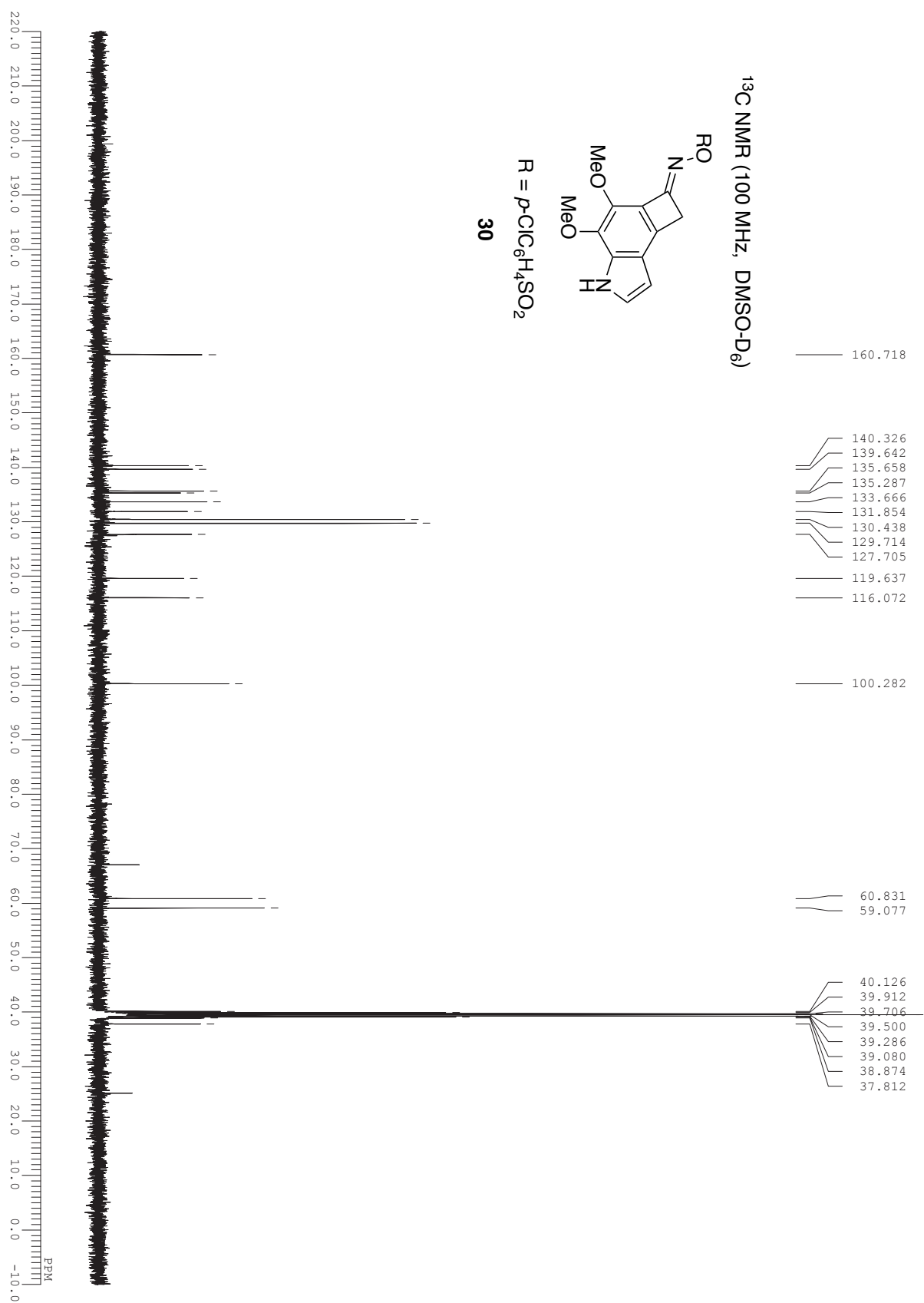


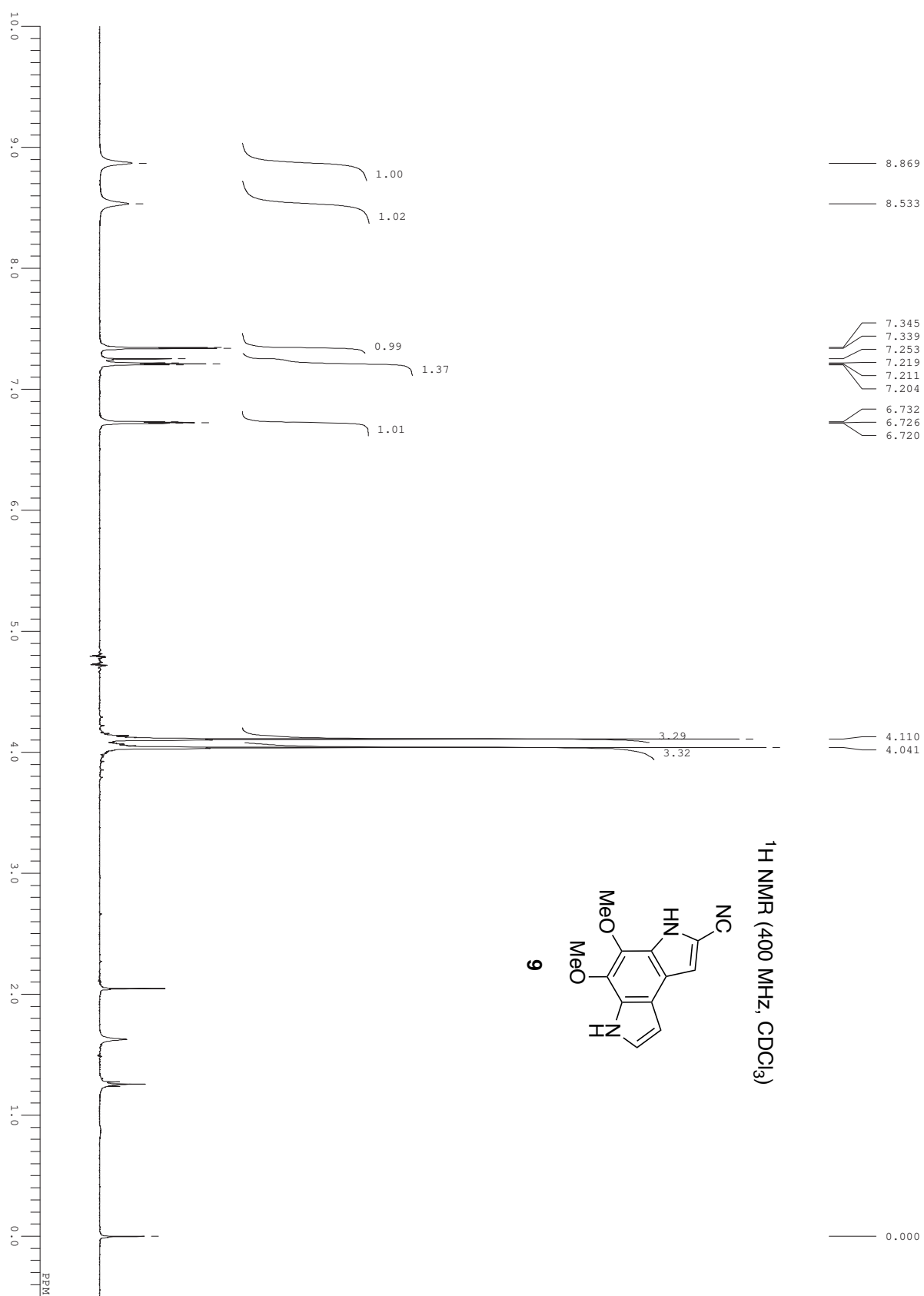


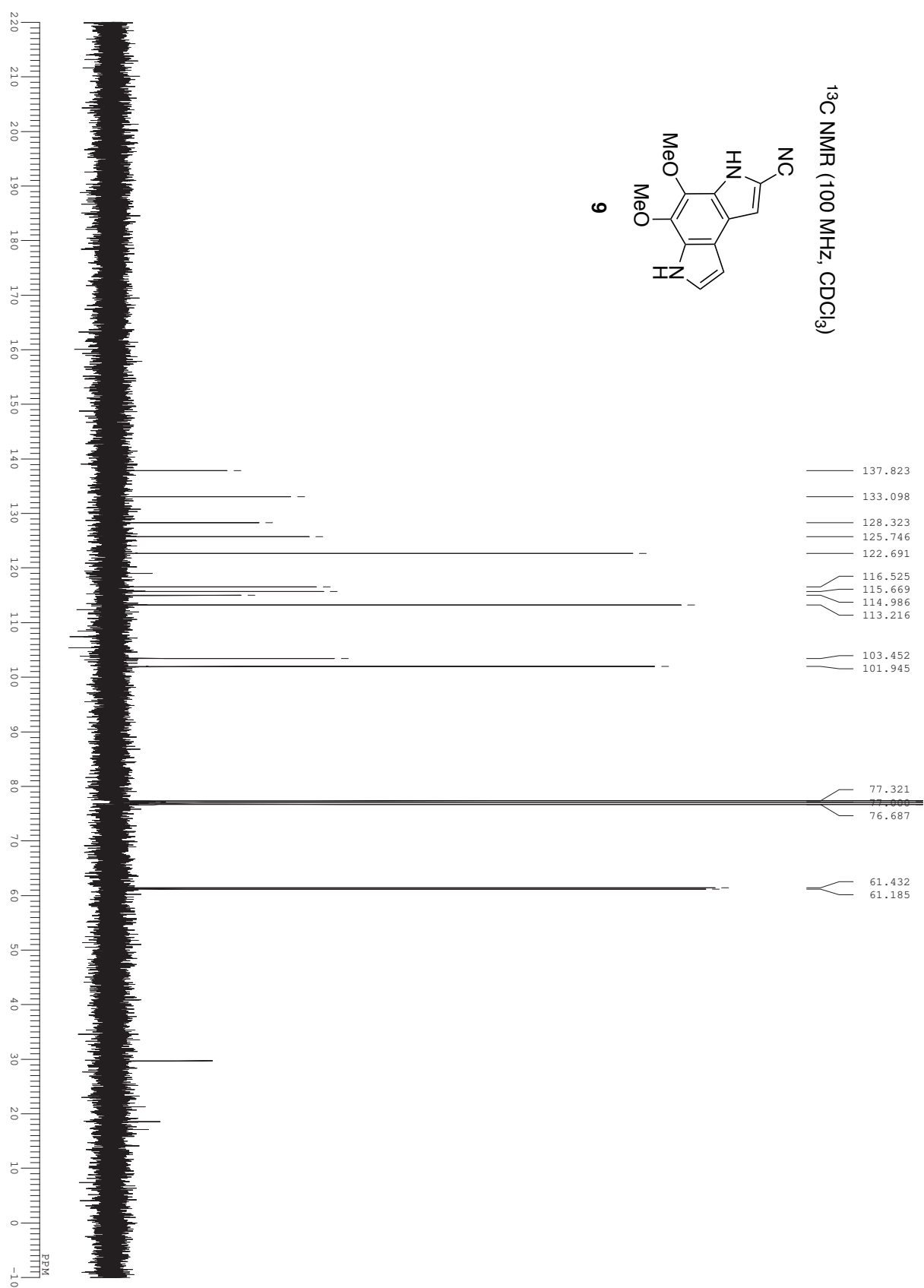


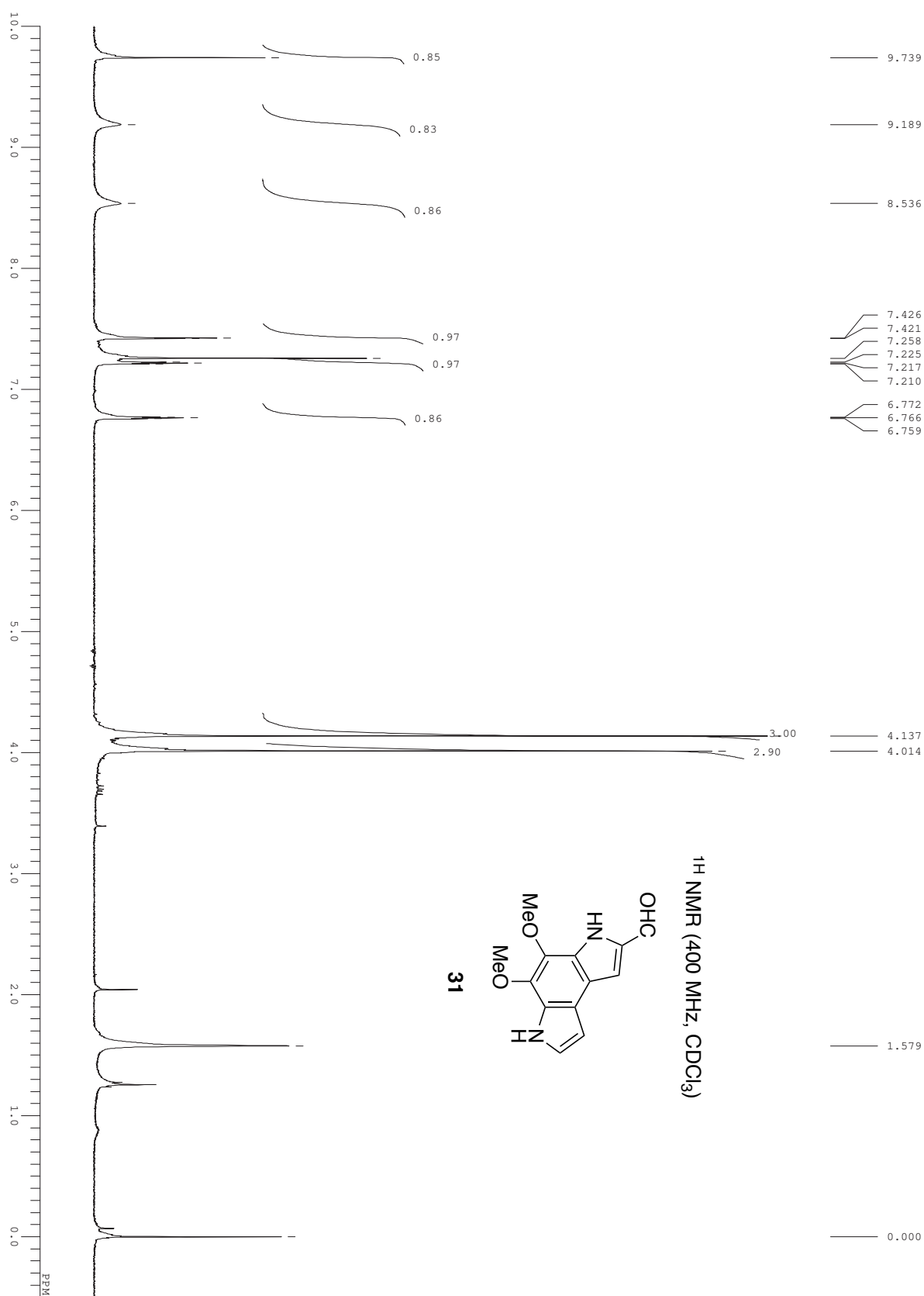


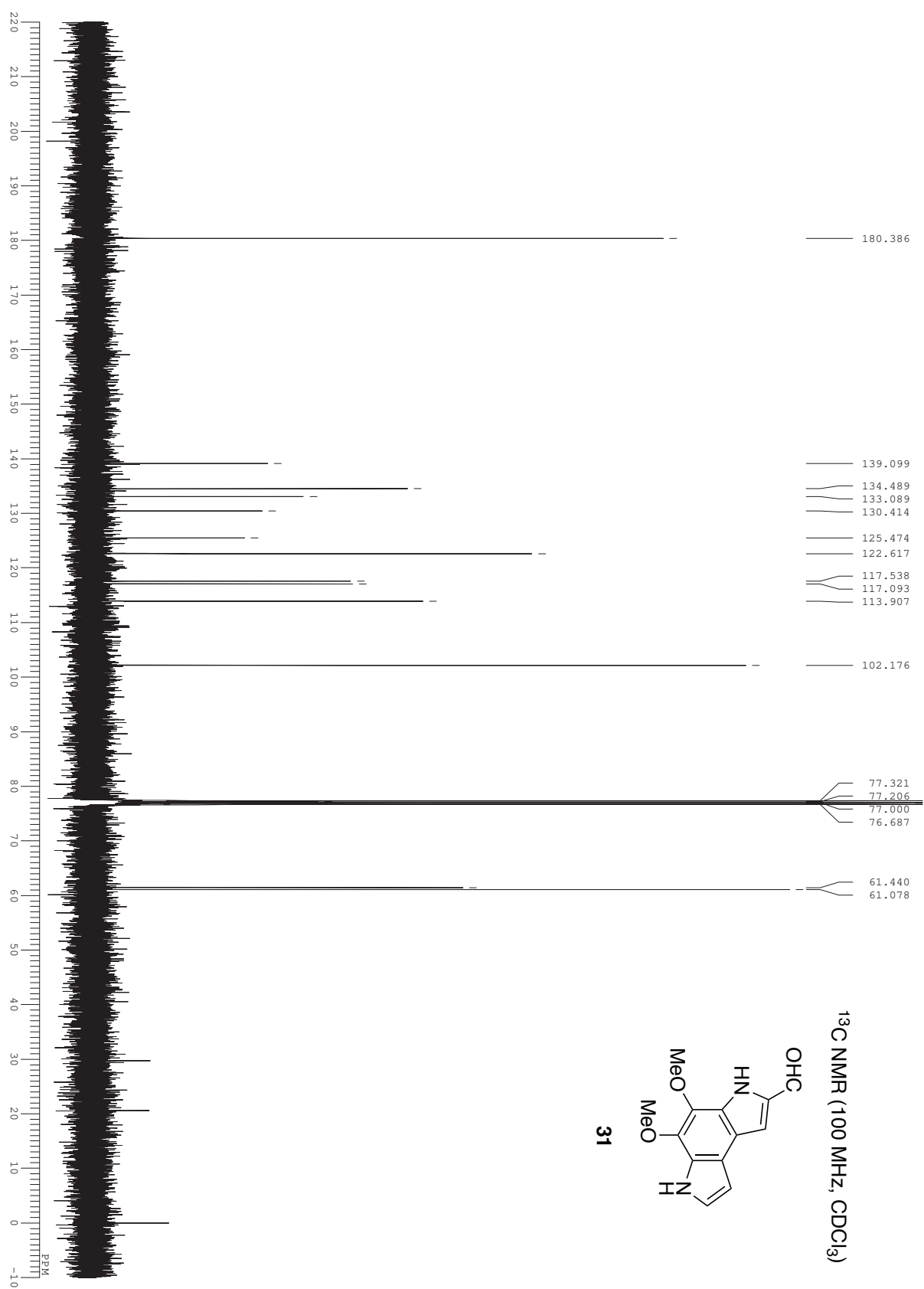


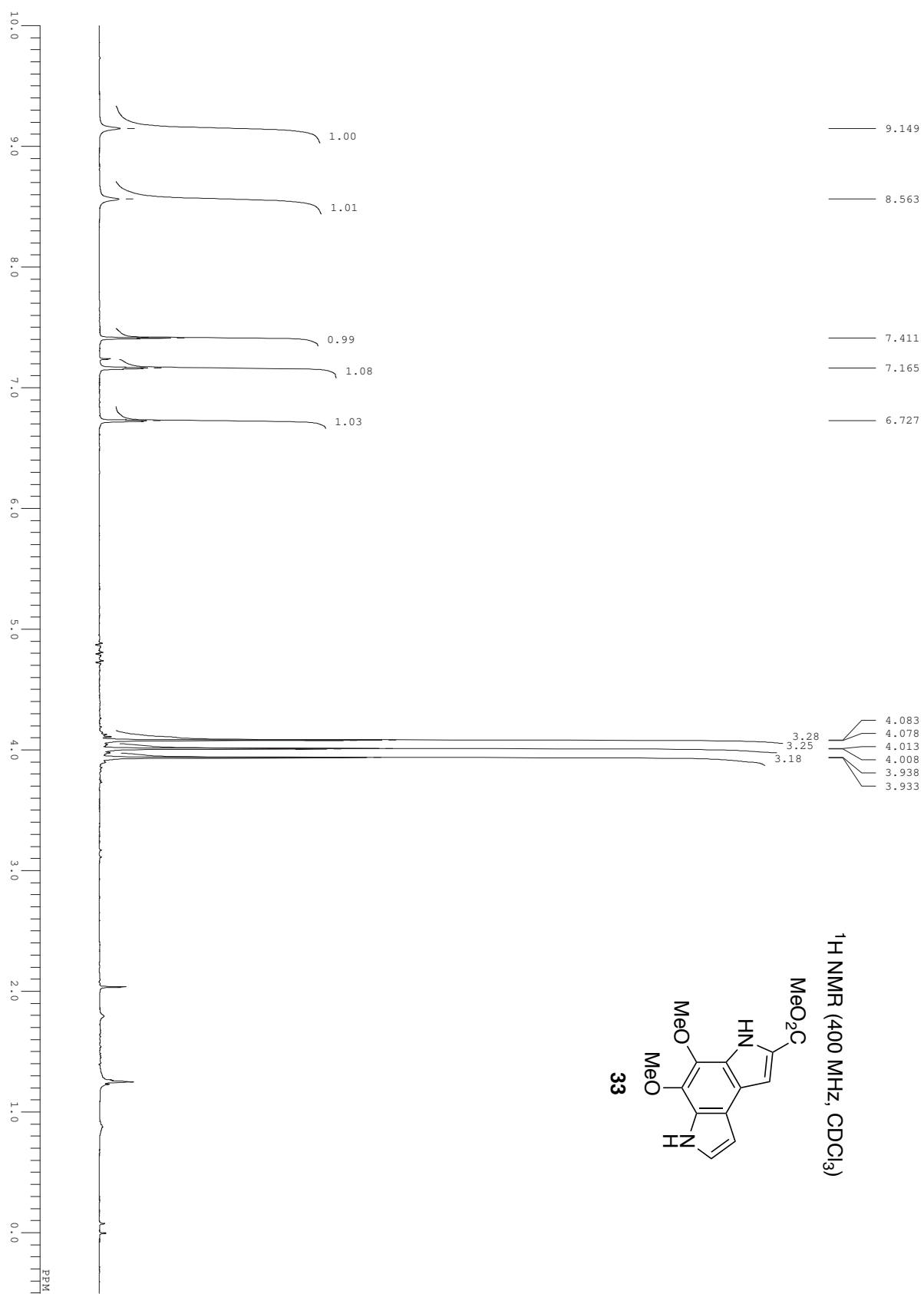


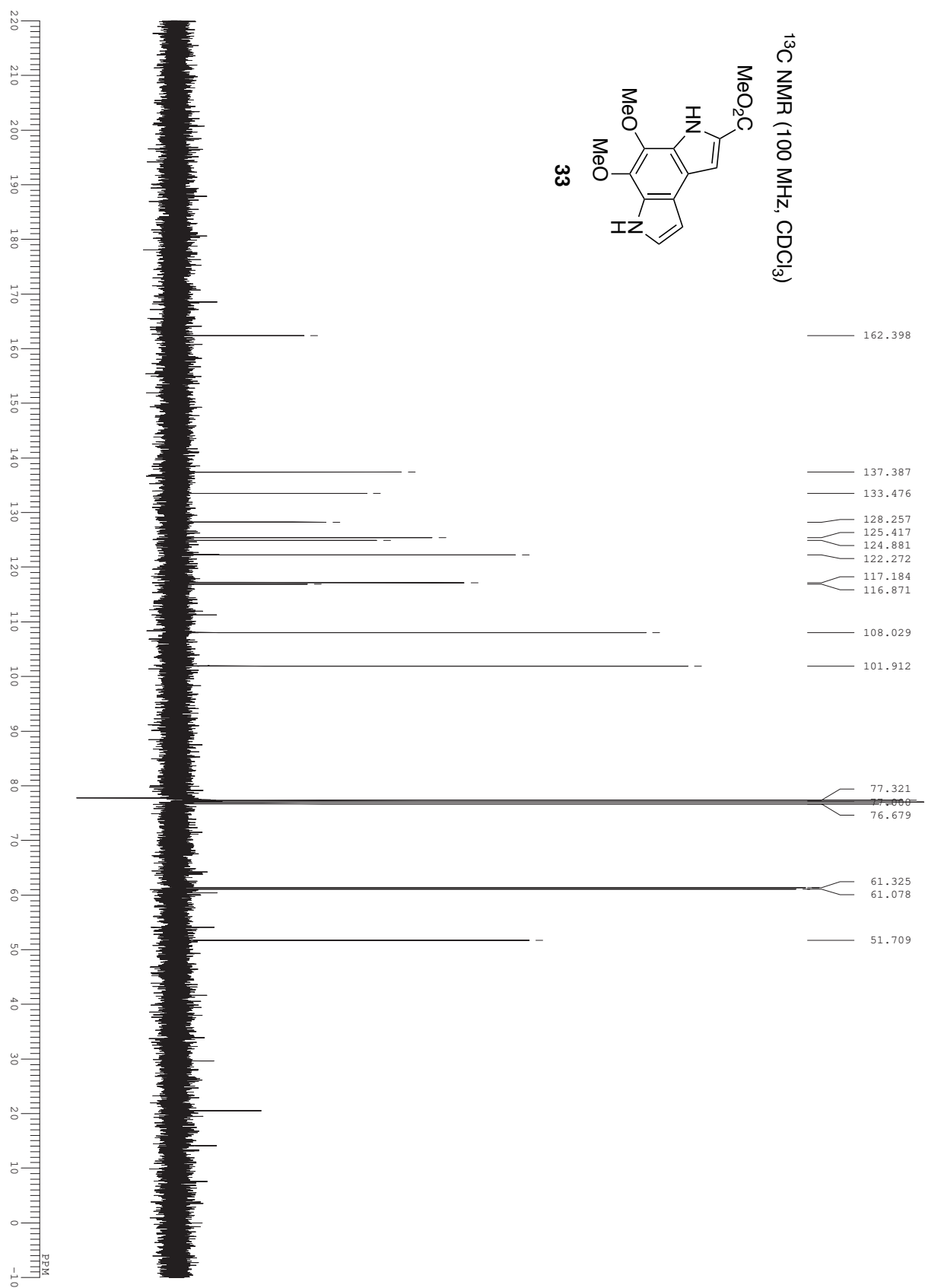




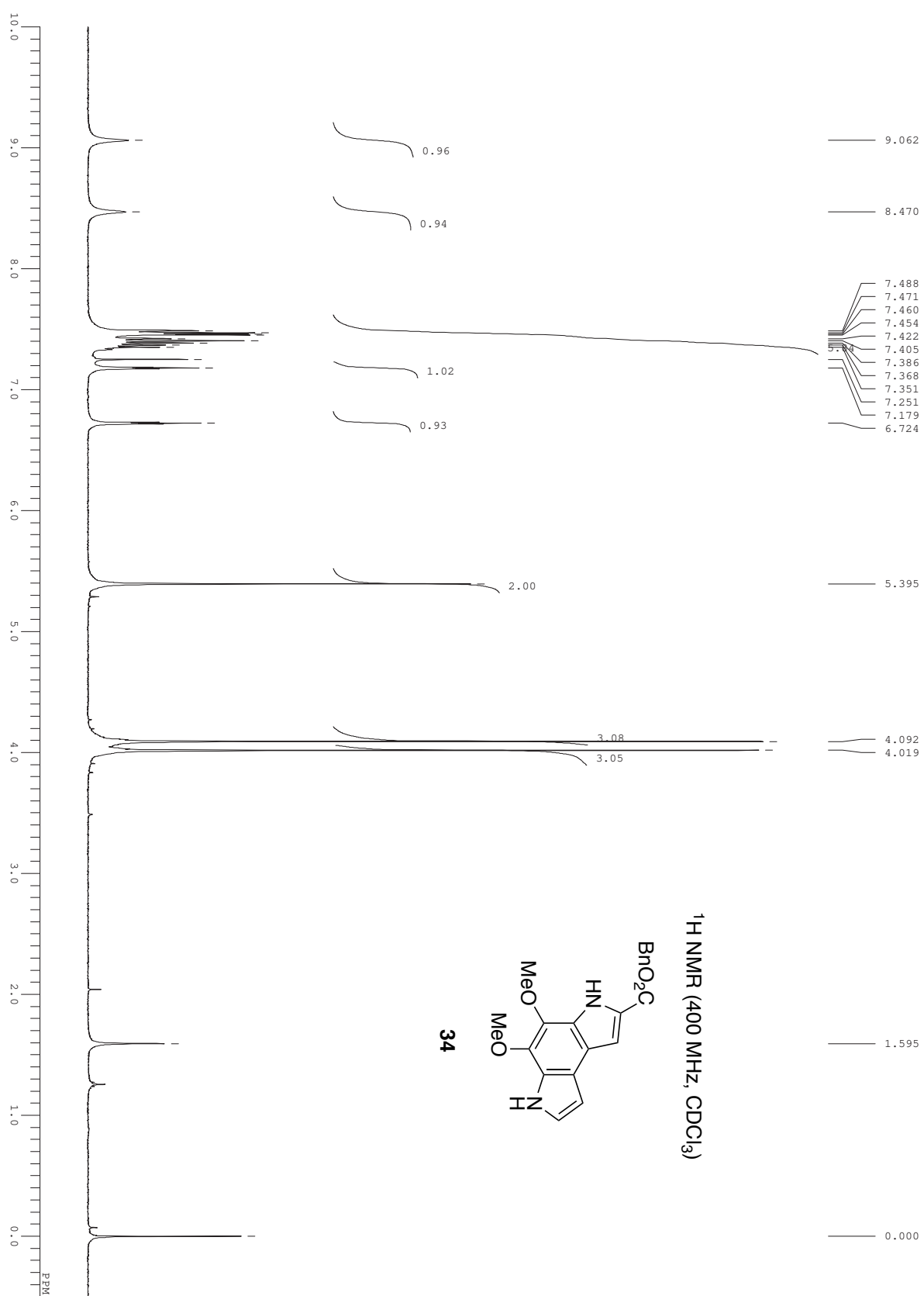


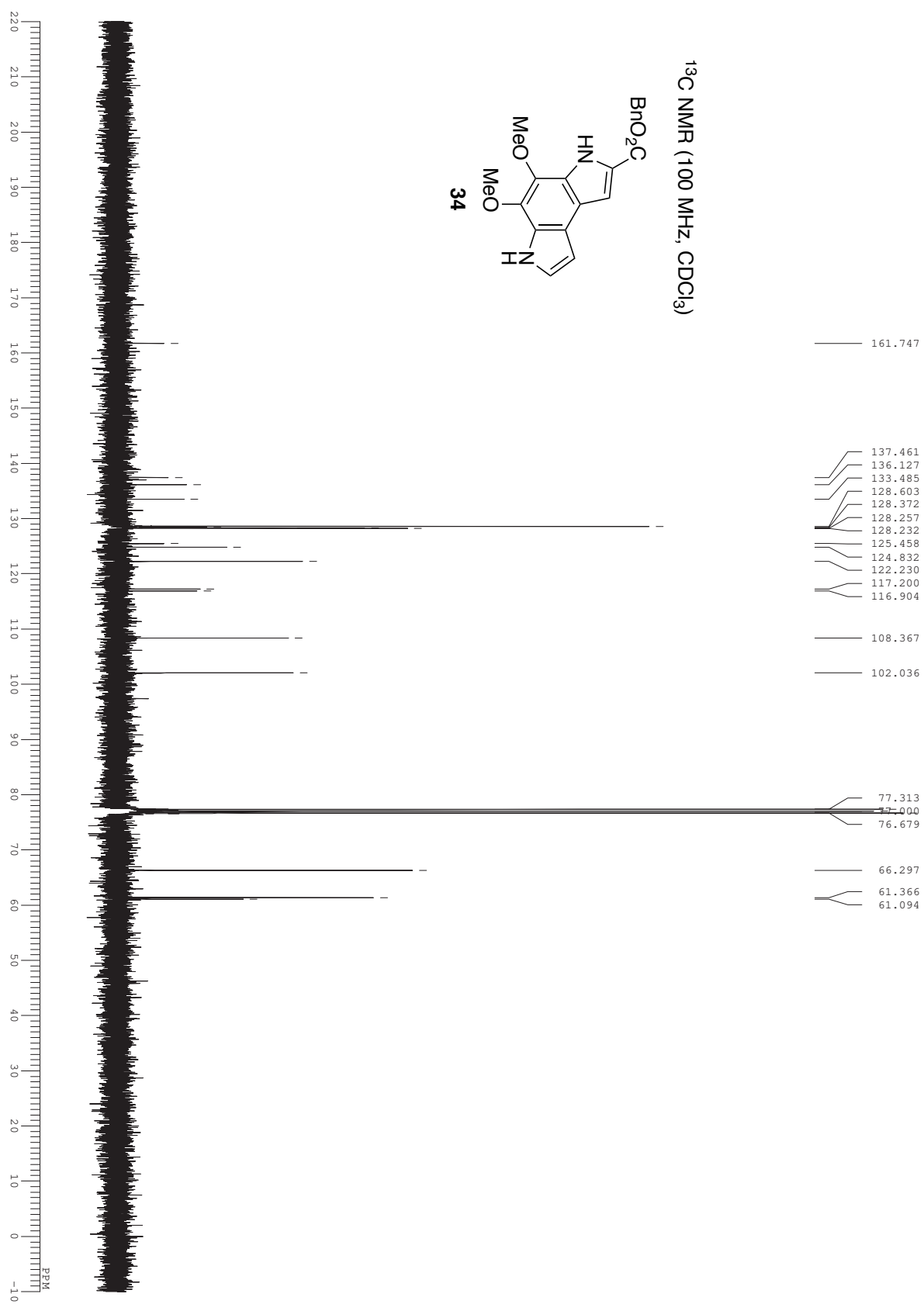


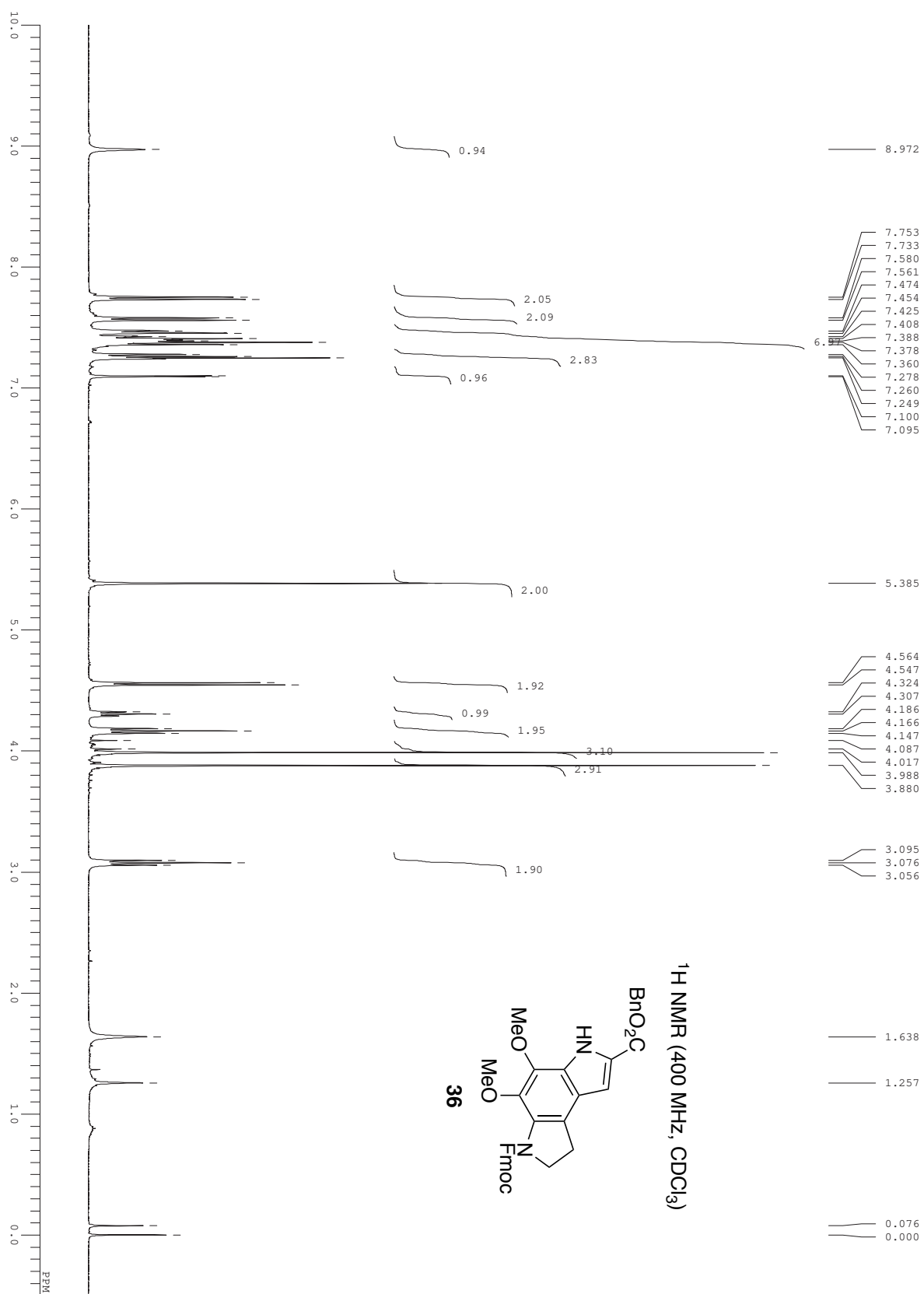


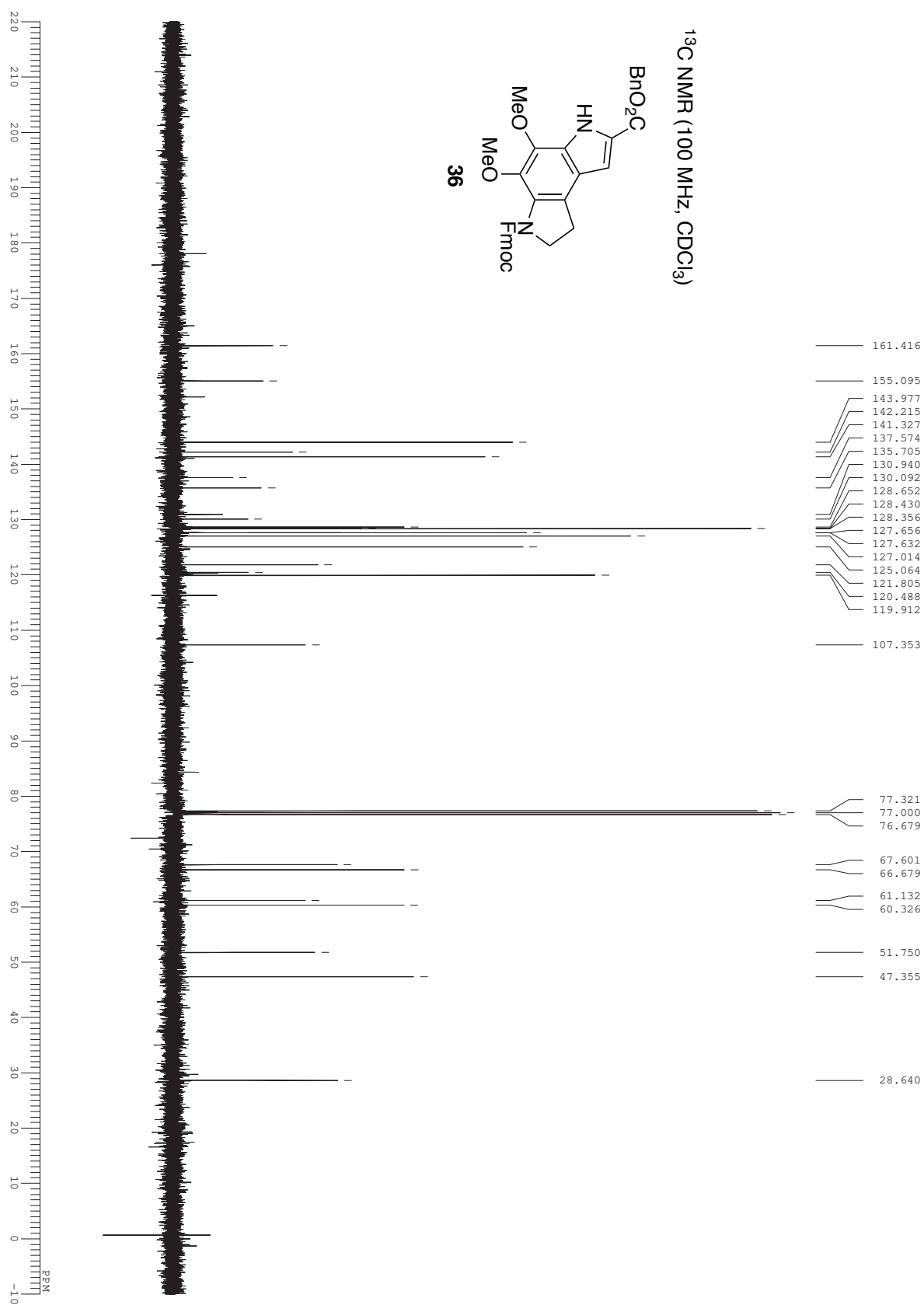


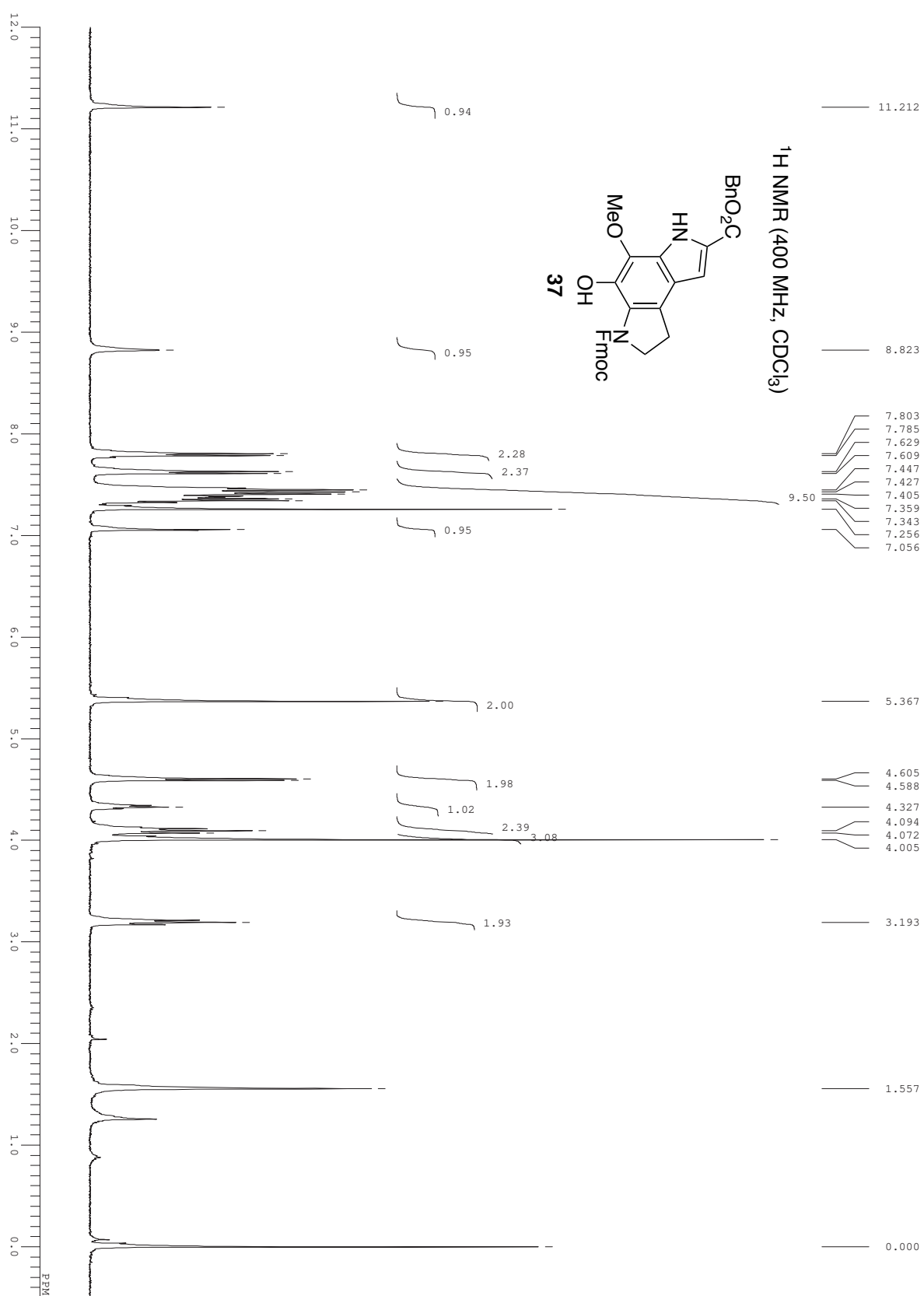


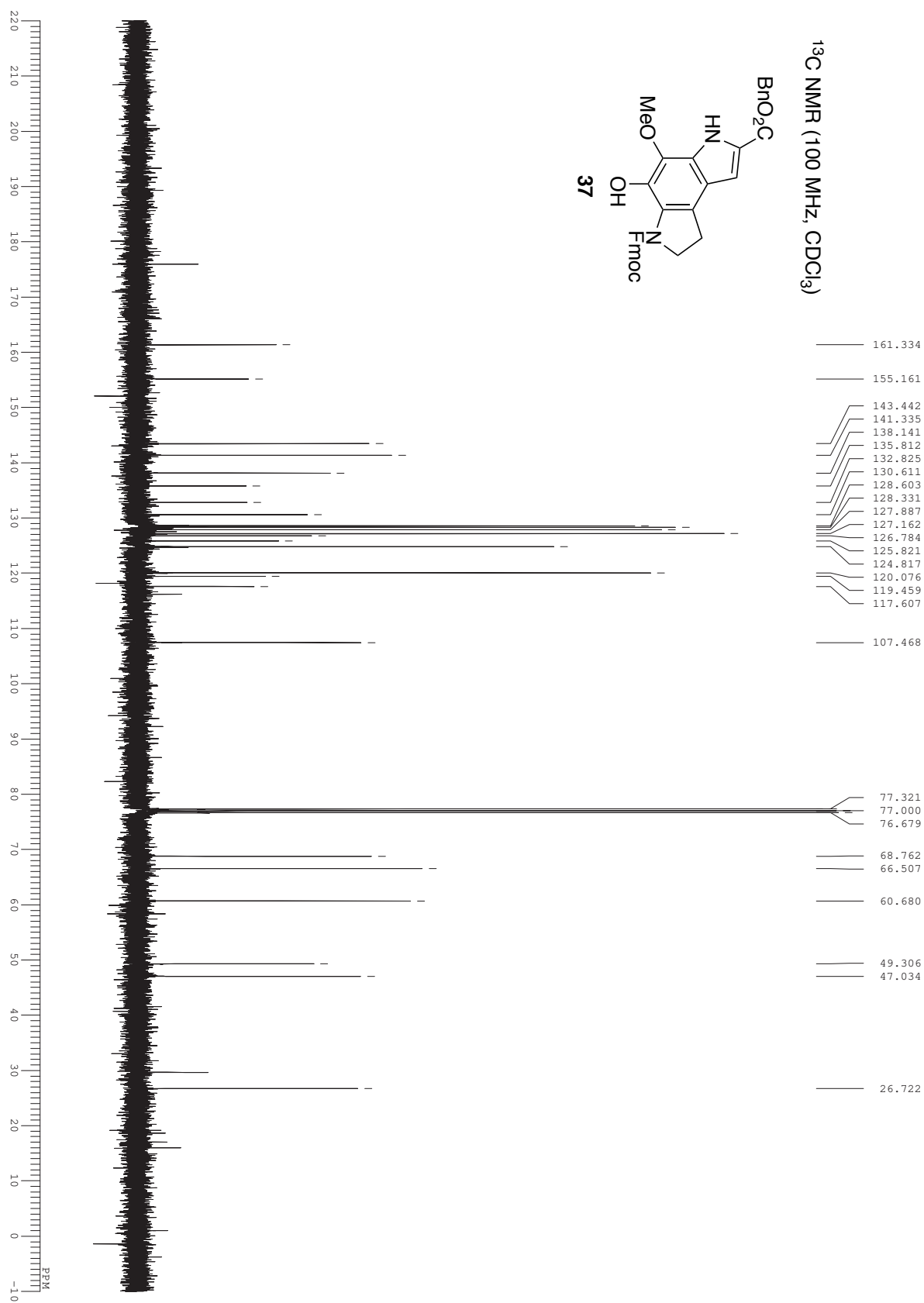


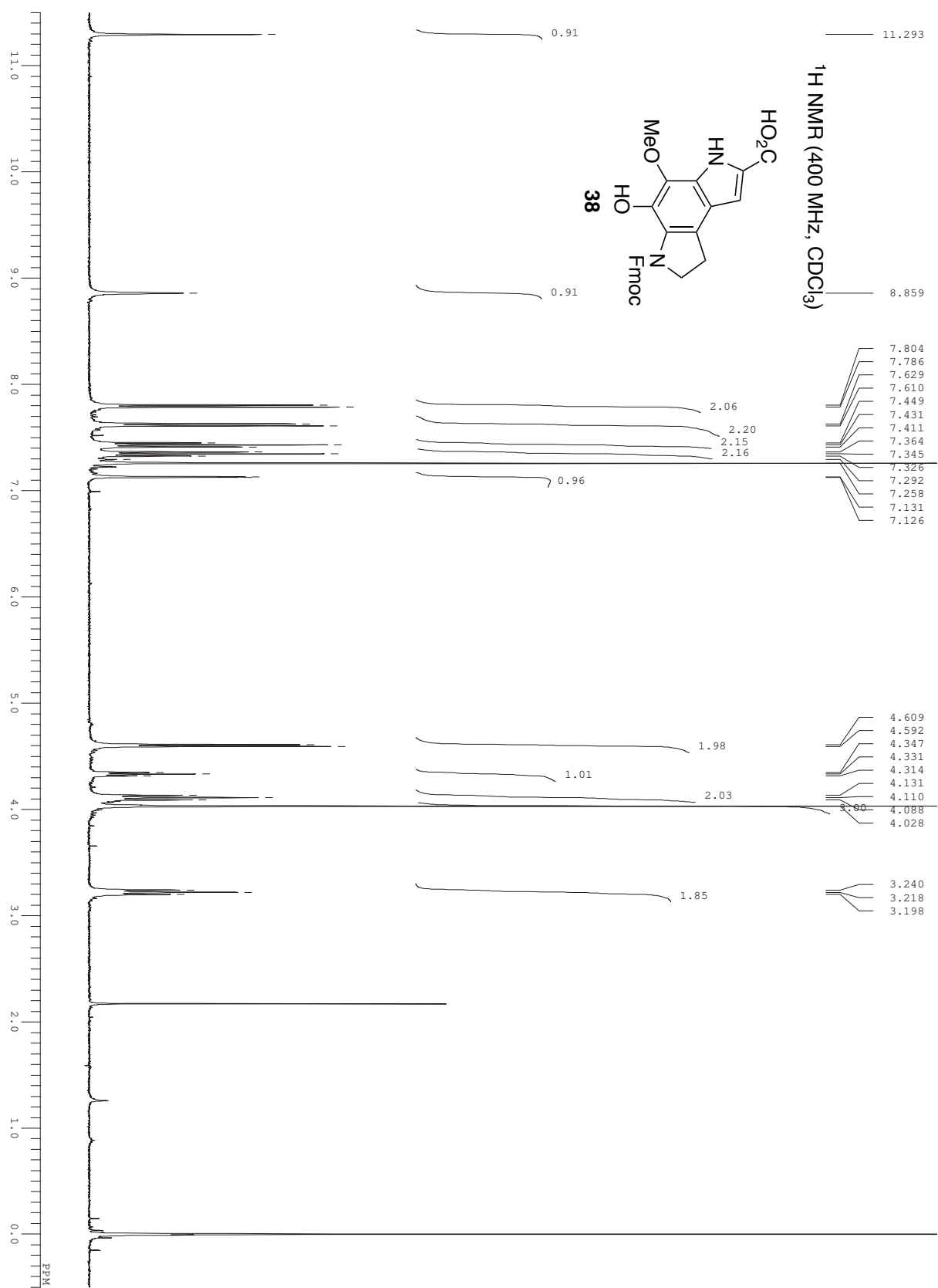


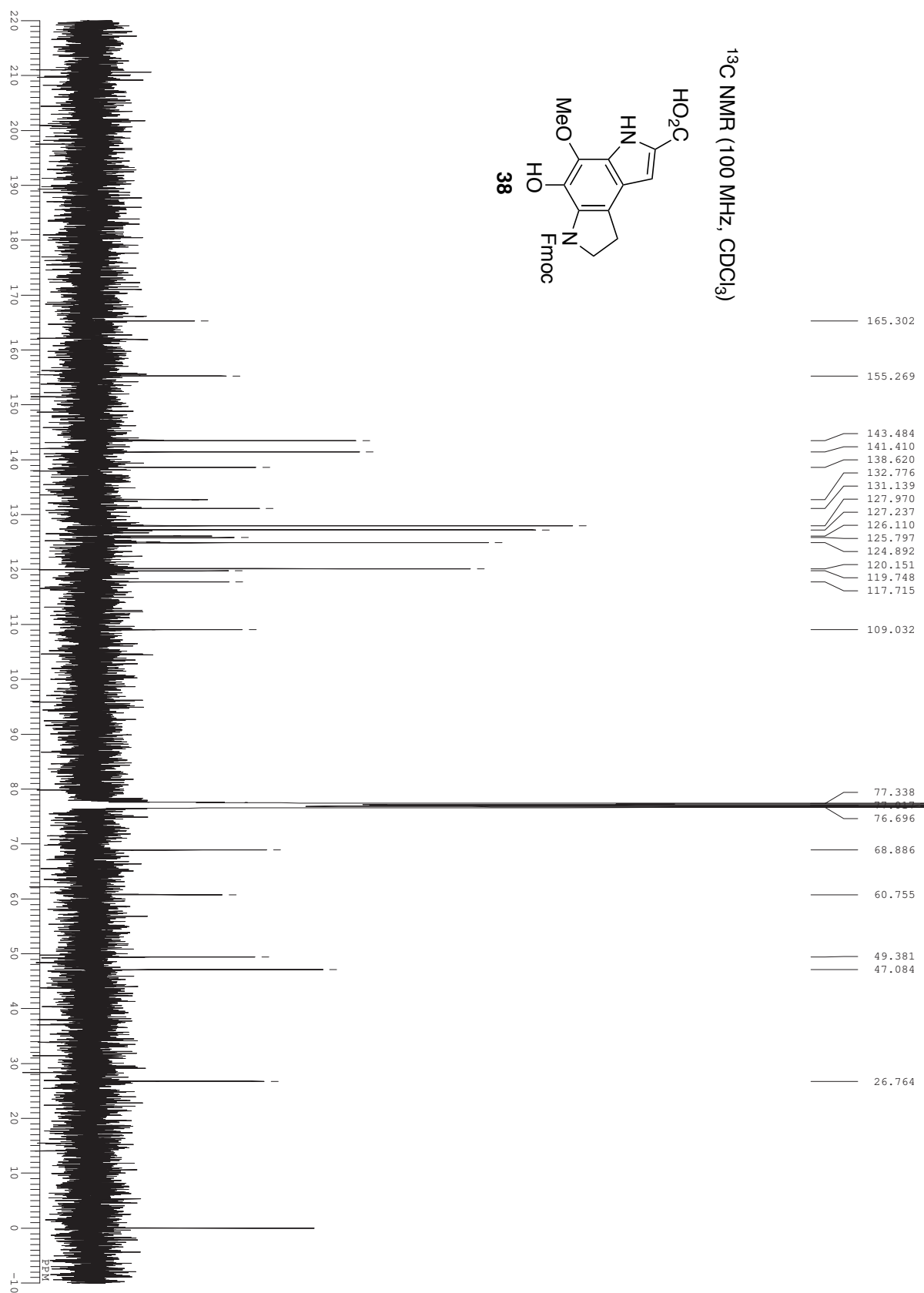












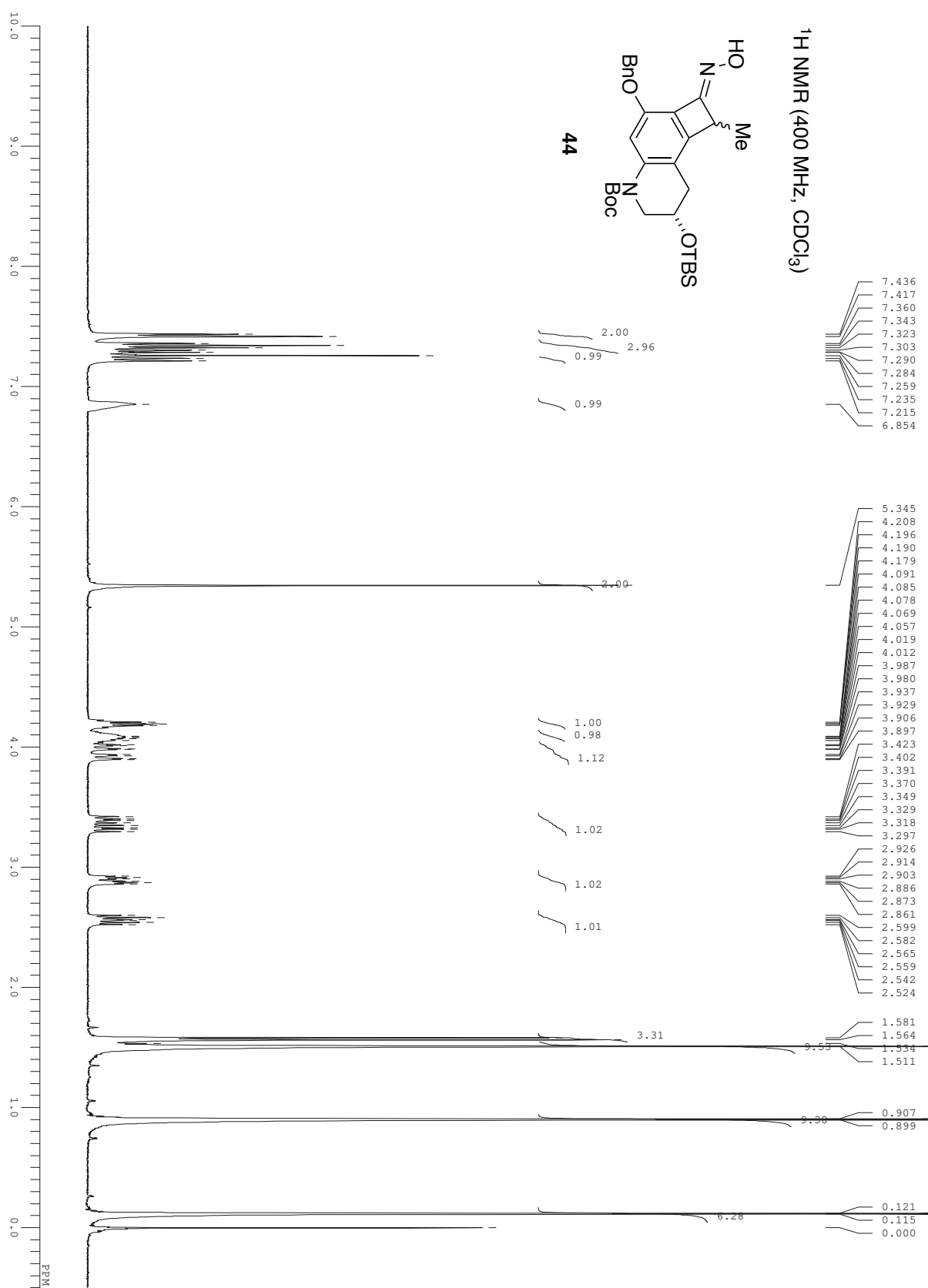


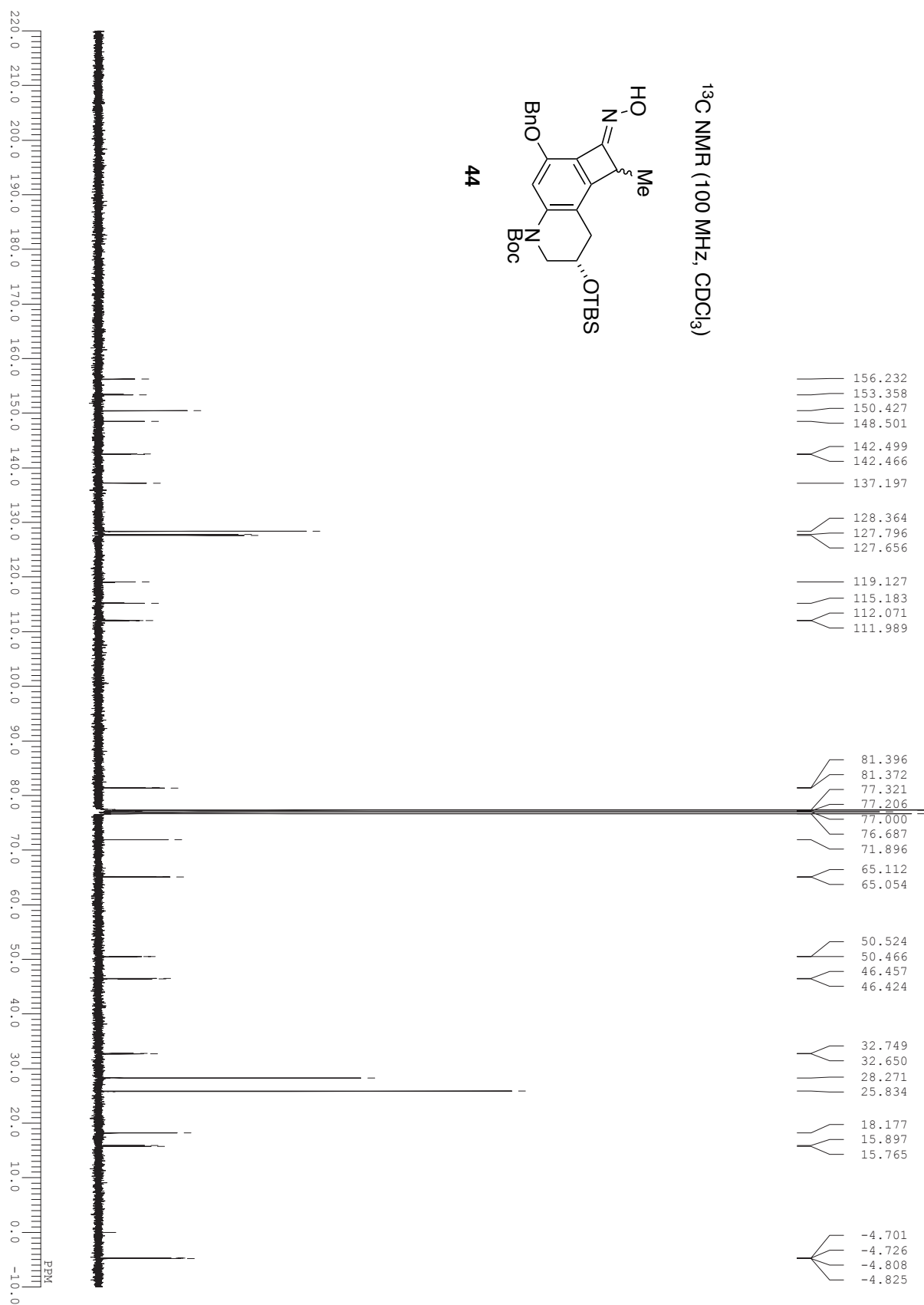


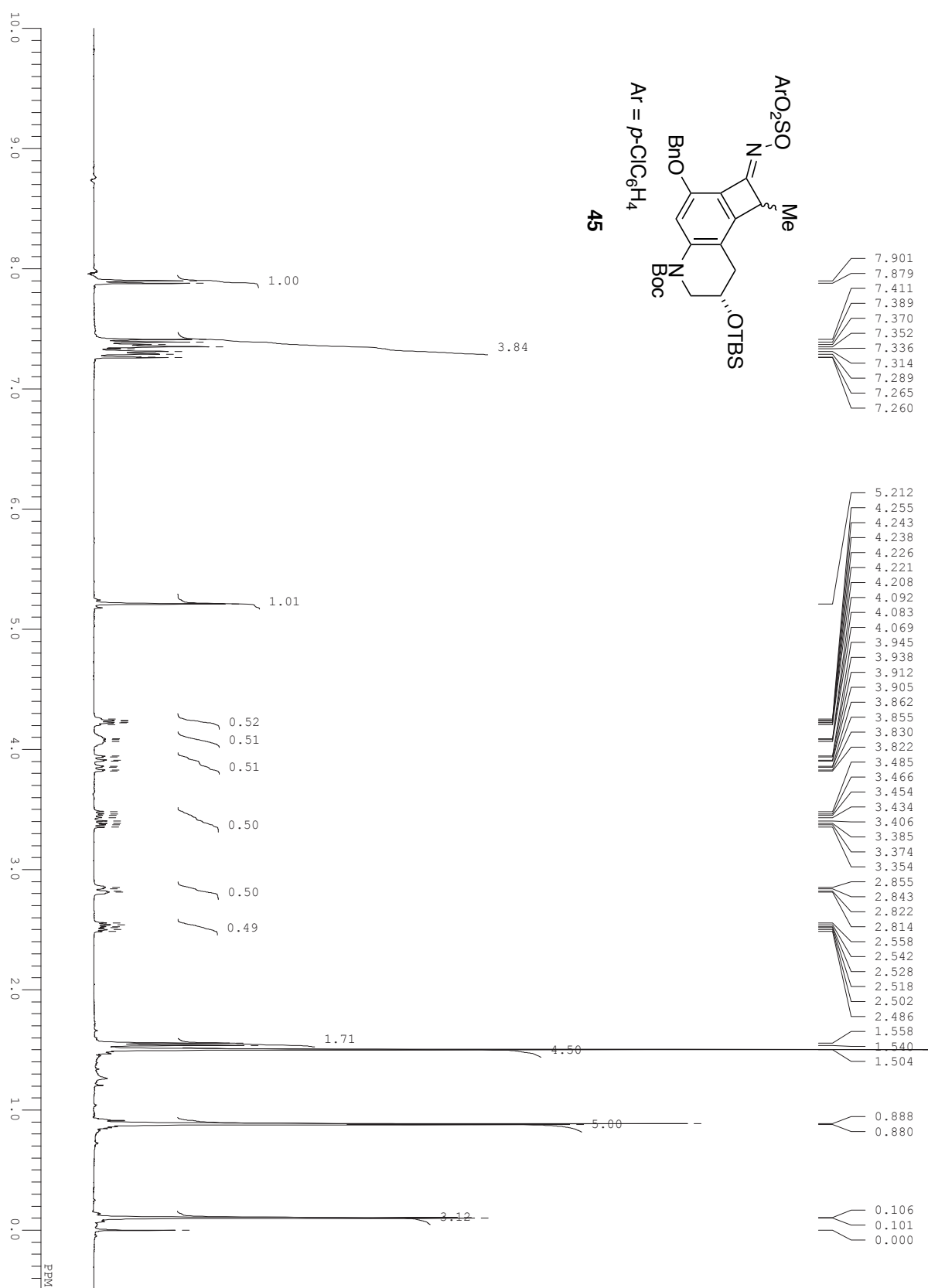








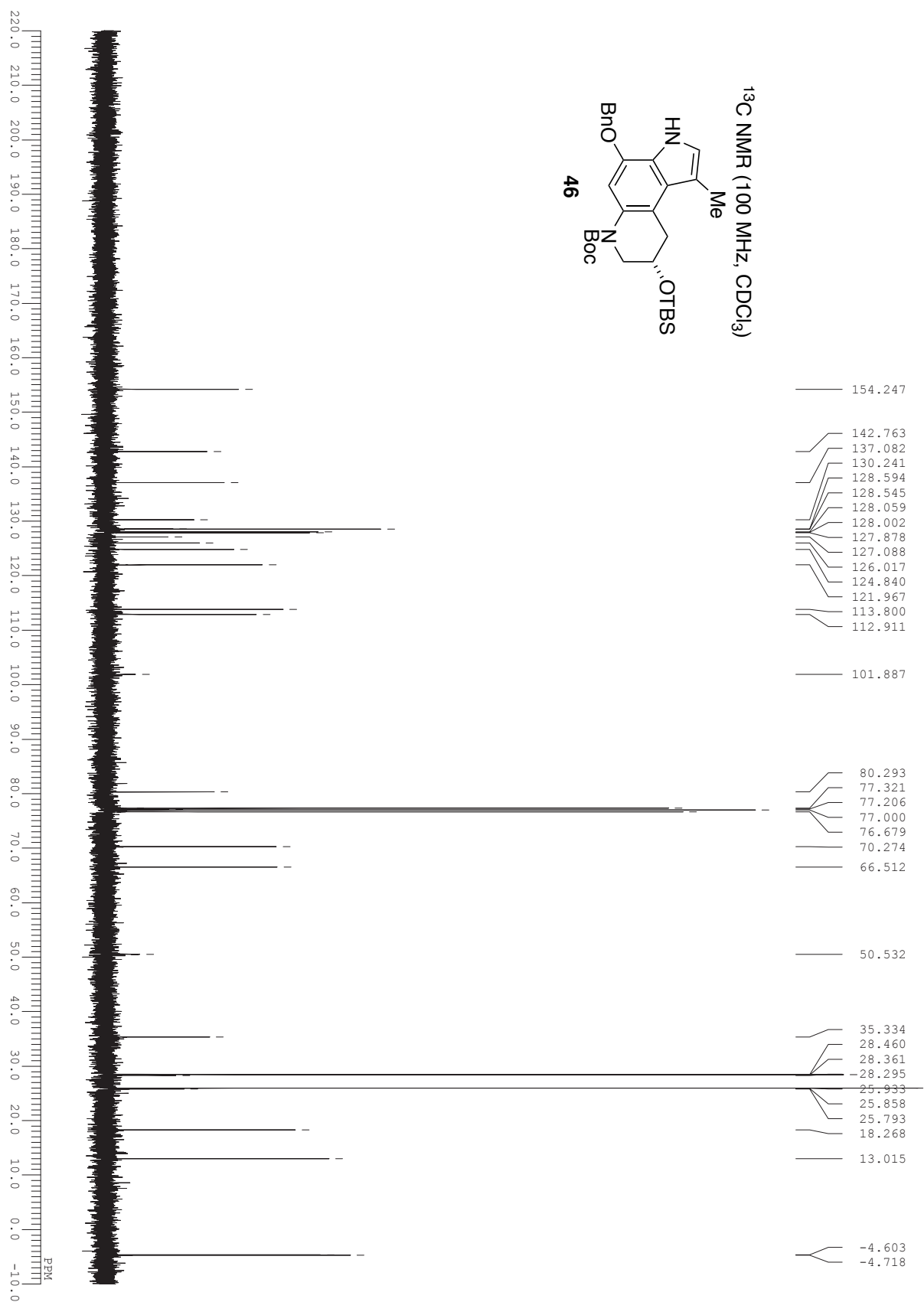












<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)