Supporting Information

Copper(I) catalyzed diastereoselective multicomponent synthesis of spiroindolo-pyrrolidines/-imidazolidines/-triazolidines from diazoamides via azomethine ylides

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Characterization of compounds 5e-i, 7f-l, 9f-j

Dimethyl 1-allyl-5'-(2,3-dimethoxyphenyl)-2-oxo-1'-phenylspiro[indoline-3,2'-pyrrolidine]-3',4'-dicarboxylate (**5e**). According to the general procedure, to a solution of aldehyde **2c** (90 mg, 0.54 mmol), amine **3a** (50 mg, 0.54 mmol), DMAD **4c** (85 mg, 0.60 mmol) and copper(I) thiophenecarboxylate (1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1d** (100 mg, 0.50 mmol). Purification furnished the corresponding spiroindolodihydropyrrole **5e** as a white solid; yield: 211 mg (76%): R_f = 0.42 (hexane/EtOAc, 9:1); mp 167-169 ºC; IR (neat): ν_{max} 3042, 2824, 2804, 1788, 1673, 1623, 1592, 1432, 1310, 1261, 1176, 732, 678 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.46-7.56 (dd, J_1 = 1.2 Hz, J_2 = 7.6 Hz, 1H, ArH), 7.3-7.34 (td, J_1 = 0.8 Hz, J_2 = 6.8 Hz, 1H, ArH), 7.17 (d, J_1 = 1.2 Hz, 2H, ArH), 7.10-7.06 (td, J_1 = 0.8 Hz, J_2 = 6.8 Hz, 1H, ArH), 6.98 (t, J = 8 Hz, 1H, ArH), 6.89-6.84 (m, 3H, ArH), 6.75-6.79 (m, 1H, ArH), 6.63 (s, 1H, ArH), 6.57 (t, J = 7.2 Hz, 1H, ArH), 6.36 (d, J = 8.0 Hz, 2H, ArH), 5.67-5.77 (m, 1H, CH), 5.23 (ddt, 2H, J_1 = 17.2 Hz, J_2 = 10.4 Hz, J_3 = 1.2 Hz, CH_2), 4.31 (ddt, 2H, J_1 = 17.2 Hz, J_2 = 10.4 Hz, J_3 = 1.2 Hz, CH_2), 3.93 (s, 3H, OCH_3), 3.81 (s, 3H, OCH_3), 3.62 (s, 3H, OCH_3), 3.44 (s, 3H, OCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.28 (*C*=O), 165.34 (*C*=O), 163.30 (*C*=O), 154.34 (*quat-C*), 148.92 (*quat-C*), 146.64 (*quat-C*), 145.74 (*quat-C*), 145.05 (*quat-C*), 135.00 (*C*H), 133.53 (*C*H), 133.34 (*C*H), 132.10 (*C*H), 131.09 (*quat-C*), 130.91 (*C*H), 126.67 (*C*H), 126.22 (*C*H), 125.25 (*C*H), 121.64 (*C*H), 121.46 (*C*H), 120.24 (*C*H), 117.45 (*C*H), 114.34 (*C*H), 111.79 (*C*H), 66.3 (O*C*H_3), 62.87 (O*C*H_3), 57.72 (O*C*H_3), 54.34 (O*C*H_3), 54.22 (O*C*H_3), 45.04 (N*C*H_2); HRMS (ESI) Calcd for $C_{32}H_{30}N_2O_7$ [$(M+H)^+$] 555.2131, found 555.2144.

tert-Butyl 3'-(naphthalen-1-yl)-2,4',6'-trioxo-2',5'-diphenyl-3',3a',4',5',6',6a'-hexahydro-2'H-spiro[indoline-3,1'-pyrrolo[3,4-c]pyrrole]-1-carboxylate (**5f**). According to the general procedure, to a solution of aldehyde **2d** (65 mg, 0.42 mmol), amine **3a** (40 mg, 0.43 mmol), *N*-phenylmaleimide **4a** (80 mg, 0.46 mmol) and copper(I) thiophenecarboxylate (0.7 mg, 1

mol %) in dichloroethane was transferred diazoamide **1e** (100 mg, 0.39 mmol). Purification furnished the corresponding spiroindolopyrrolidine **5f** as a white solid; yield: 196 mg (79%). R_f = 0.44 (hexane/EtOAc, 9:1); mp 167-169 ºC; IR (neat): 3059, 2932, 2864, 1778, 1721, 1653, 1587, 1492, 1468, 1380, 1261, 1176, 1075, 1103, 732, 693, 667 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.88 (s, 1H, ArH), 7.63-7.74 (m, 6H, ArH), 7.28-7.40 (m, 9H, ArH), 6.82 (t, *J* = 7.5 Hz, 2H, ArH), 6.64-6.69 (m, 3H, ArH), 5.90 (d, *J* = 6.0 Hz, 1H, CH), 3.98 (d, *J* = 10 Hz, 1H, CH), 3.61-3.65 (dd, J_1 = 6.0 Hz, J_2 = 10 Hz, 1H, CH), 1.42 (s, 9H, N*boc*); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.61 (*C*=O), 174.45 (*C*=O), 173.83 (*C*=O), 148.19 (*quat-C*), 142.28 (*quat-C*), 140.53 (*quat-C*), 137.95 (*quat-C*), 133.37 (*quat-C*), 133.11 (*C*H), 131.82 (*quat-C*), 130.59 (*C*H), 129.08 (*C*H), 128.89 (*C*H), 128.8 (*C*H), 128.52 (*C*H), 128.09 (*C*H), 128.03 (*C*H), 127.64 (*C*H), 126.98 (*C*H), 126.5 (*C*H), 126.17 (*C*H), 126.0 (*C*H), 125.32 (*C*H), 124.38 (*C*H), 124.14 (*C*H), 123.36 (CH), 115.98 (*C*H), 84.38 (*quat-C*), 74.74 (*quat-C*), 66.0 (*C*H), 53.88 (*C*H), 52.04 (*C*H), 27.93 (N*boc*); HRMS (ESI) Calcd for $C_{40}H_{33}N_3O_5$ $[(M+Na)^+]$ 658.2318, found 658.2320.

1-Methyl-3'-(4-nitrophenyl)-2',5'-diphenyl-3',3a'-dihydro-2'H-spiro[indoline-3,1'-pyrrolo[3,4-c]pyrrole]-2,4',6'(5'H,6a'H)-trione (**5g**). According to the general procedure, to a solution of aldehyde **2e** (95 mg, 0.63 mmol), amine **3a** (60 mg, 0.64 mmol), *N*-phenylmaleimide **4a** (120 mg, 0.69 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification yielded the corresponding spiroindolopyrrolidine **5g** as a white solid; yield : 132 mg (42%): R_f = 0.41 (hexane/EtOAc, 8:2); mp 157-159 ºC; IR (neat): 3038, 2918, 2799, 1758, 1728, 1652, 1622, 1398, 1250, 1075, 1025, 732 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.51 (d, *J* = 1.6 Hz, 2H, ArH), 7.39-7.43 (m, 2H, ArH), 7.28-7.35 (m, 3H, ArH), 7.20-7.24 (m, 4H, ArH), 7.13-7.18 (m, 1H, ArH), 6.81-6.85 (m, 2H, ArH), 6.71-6.75 (m, 1H, ArH), 6.61-6.65 (m, 3H, ArH), 5.83 (d, *J* = 6.0 Hz, 1H, CH_2), 4.0 (d, *J* = 10.0 Hz, 1H, CH), 3.60-3.64 (dd, J_1 = 6.0

Hz, J_2 = 10.0 Hz, 1H, CH), 2.85 (s, 3H, NCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 176.20 (*C*=O), 175.83 (*C*=O), 174.78 (*C*=O), 144.11 (*quat-C*), 142.88 (*quat-C*), 140.84 (*quat-C*), 131.87 (*quat-C*), 130.33 (*C*H), 129.27 (*quat-C*), 129.15 (*C*H), 128.80 (*C*H), 128.77 (*C*H), 128.32 (*C*H), 127.73 (*C*H), 127.01 (*C*H), 126.94 (*C*H), 124.15 (*C*H), 123.97 (CH), 123.51 (CH), 123.23 (CH), 109.04 (*C*H), 74.51 (*quat-C*), 65.64 (*C*H), 53.09 (*C*H), 52.29 (*C*H), 29.71 (CH), 25.83 (CH_3). HRMS (ESI) Calculated for $C_{32}H_{24}N_4O_5$ $(M+H)^+$: 545.1825 found: 545.1817.

3'-(4-Bromophenyl)-1-ethyl-2',5'-diphenyl-3',3a'-dihydro-2'H-spiro[indoline-3,1'-pyrrolo[3,4-c]pyrrole]-2,4',6'(5'H,6a'H)-trione (**5h**). According to the general procedure, to a solution of aldehyde **2f** (110 mg, 0.59 mmol), amine **3a** (55 mg, 0.59 mmol), *N*-phenylmaleimide **4a** (110 mg, 0.64 mmol) and copper(I) thiophenecarboxylate (1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1b** (100 mg, 0.53 mmol). Purification furnished the corresponding spiroindolopyrrolidine **5h** as a white solid; yield : 229 mg (73%): R_f = 0.42 (hexane/EtOAc, 7:3); mp 167-169 ºC; IR (neat): 3152, 2959, 2912, 2895, 1698, 1653, 1602, 1598, 1398, 1176, 1105, 732, 686 cm^{-1}. ^1H NMR ($CDCl_3$, 400 MHz) δ 8.13 (d, *J* = 7.2 Hz, 1H, ArH), 7.73 (d, *J* = 7.6 Hz, 2H, ArH), 7.59 (t, *J* = 8 Hz, 1H, ArH), 7.51 (d, *J* = 7.6 Hz, 1H, ArH), 7.33-7.46 (m, 3H, ArH), 7.22 (t, *J* = 10 Hz, 1H, ArH), 7.04 (d, *J* = 8.4 Hz, 2H, ArH), 6.96 (t, *J* = 8.4 Hz, 2H, ArH), 6.66-6.74 (m, 3H, ArH), 6.42 (s, 1H, ArH), 6.14 (d, *J* = 6 Hz, 2H, CH_2), 3.98 (d, *J* = 10 Hz, 1H, CH), 3.58-3.62 (dd, J_1 = 6 Hz, J_2 = 10 Hz, 1H, CH), 3.50-3.59 (m, 1H, NCH_2), 3.25-3.16 (m, 1H, NCH_2), 0.61 (t, *J* = 7.2 Hz, 3H, CH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 176.20 (*C*=O), 175.70 (*C*=O), 174.64 (*C*=O), 160.38 (*quat-C*), 148.73 (*quat-C*), 143.70 (*quat-C*), 142.02 (*quat-C*), 132.47 (*quat-C*), 131.72 (*C*H), 130.56 (*quat-C*), 130.41 (*C*H), 129.27 (*C*H), 129.03 (*C*H), 128.42 (*C*H), 127.0 (*C*H), 125.00 (*C*H), 123.75 (*C*H), 123.65 (*C*H), 119.14 (CH), 114.40 (CH), 114.32 (CH), 108.94 (*C*H), 93.21

(*quat-C*), 79.10 (*quat-C*), 74.56 (*C*H), 53.46 (*C*H), 52.67 (*C*H), 34.25 (CH_2), 12.04 (CH_3). HRMS (ESI) Calcd for $C_{32}H_{26}BrN_3O_3$ [$(M+Na)^+$] 614.1055, found 614.1049.

tert-Butyl 2'-methyl-2,4',6'-trioxo-3',5'-diphenyl-3',3a',4',5',6',6a'-hexahydro-2'H-spiro[indoline-3,1'-pyrrolo[3,4-c]pyrrole]-1-carboxylate (**5i**). According to the general procedure, to a solution of aldehyde **2a** (45 mg, 0.42 mmol), amine **3b** (30 mg, 0.45 mmol), *N*-phenylmaleimide **4a** (80 mg, 0.46 mmol) and copper(I) thiophenecarboxylate (0.7 mg, 1 mol %) in dichloroethane was transferred diazoamide **1e** (100 mg, 0.39 mmol). Purification furnished the corresponding spiroindolopyrrolidine **5i** as a white solid; yield: 159 mg (78%): R_f = 0.48 (hexane/EtOAc, 7:3); mp 153-154 ºC. IR (neat): 3062, 2923, 2854, 1780, 1713, 1613, 1264, 1166, 1025, 1003, 731, 690, 687 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.81 (d, J = 8 Hz, 1H, ArH), 7.45-7.48 (m, 3H, ArH), 7.33-7.37 (m, 6H, ArH), 7.22-7.32 (m, 4H, ArH), 4.76 (d, J = 6.4 Hz, 1H, CH), 3.75 (d, J = 10 Hz, 1H, CH), 3.43-3.48 (dd, J_1 = 6.4 Hz, J_2 = 10 Hz, 1H, CH), 1.87 (s, 3H, NCH_3), 1.54 (s, 9H, N*boc*); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.69 (*C*=O), 174.92 (*C*=O), 174.07 (*C*=O), 148.59 (*quat-C*), 140.9 (*quat-C*), 140.51 (*quat-C*), 131.89 (*quat-C*), 130.43 (*C*H), 129.05 (*C*H), 128.99 (*C*H), 128.75 (*C*H), 128.22 (*C*H), 127.38 (*C*H), 127.02 (*C*H), 126.72 (*C*H), 125.41 (*C*H), 123.92 (*C*H), 115.47 (*C*H), 84.7 (*quat-C*), 73.85 (*C*H), 68.73 (*C*H), 53.66 (*C*H), 52.63 (*C*H), 32.54 (*C*H), 28.12 (N*boc*); HRMS (ESI) Calcd for $C_{31}H_{29}N_3O_5$ [$(M+Na)^+$] 546.2005, found 546.2018.

1'-Allyl-2-(3,4-dimethoxyphenyl)-1,5-bis(4-nitrophenyl)-3-phenylspiro[imidazolidine-4,3'-indolin]-2'-one (**7f**). According to the general procedure, to a solution of aldehyde **2c** (90 mg, 0.54 mmol), amine **3a** (50 mg, 0. 54 mmol), (*E*)-4-nitro-*N*-(4-nitrobenzylidene)aniline **6b** (160 mg, 0.6 mmol) and copper(I) thiophenecarboxylate (1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1d** (100 mg, 0.5 mmol). Purification furnished the corresponding spiroindoloimidazolidine **7f** as a white solid; yield: 281 mg (82%): R_f = 0.42 (hexane/EtOAc, 9:1). mp 167-169 ºC. IR (neat): ν_{max} 3059, 2932, 2864, 1778, 1721, 1653, 1587, 1492, 1468,

1380, 1261, 1176, 1075, 1103, 732, 693, 667 cm^{-1}. ^1H NMR ($CDCl_3$, 400 MHz) δ 7.16-7.43 (dd, J_1 = 1.2 Hz, J_2 = 7.6 Hz, 2H, ArH), 6.93-6.89 (td, J_1 = 0.8 Hz, J_2 = 6.8 Hz, 2H, ArH), 6.75 (d, J_1 = 1.2 Hz, 3H, ArH), 6.70-6.66 (td, J_1 = 0.8 Hz, J_2 = 6.8 Hz, 2H, ArH), 6.58 (t, J = 8 Hz, 1H, ArH), 6.44-6.49 (m, 4H, ArH), 6.37-6.39 (m, 2H, ArH), 6.23 (s, 1H, ArH), 6.17 (t, J = 7.2 Hz, 1H, ArH), 5.96 (d, J = 8.0 Hz, 3H, ArH), 5.35-5.27 (m, 1H, CH), 4.82 (ddt, 3H, J_1 = 17.2 Hz, J_2 = 10.4 Hz, J_3 = 1.2 Hz, CH_2), 3.88 (ddt, 2H, J_1 = 17.2 Hz, J_2 = 10.4 Hz, J_3 = 1.2 Hz, CH_2), 3.53 (s, 3H, OCH_3), 3.40 (s, 3H, OCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.28 (*C*=O), 165.34 (*C*=O), 163.30 (*C*=O), 154.34 (*quat-C*), 150.50 (*quat-C*), 149.69 (*quat-C*), 149.01 (*quat-C*), 148.92 (*quat-C*), 146.64 (*quat-C*), 145.74 (*quat-C*), 145.05 (*quat-C*), 135.00 (*C*H), 133.53 (*C*H), 133.34 (*C*H), 132.10 (*C*H), 131.09 (*quat-C*), 130.91 (*C*H), 126.67 (*C*H), 126.22 (*C*H), 125.25 (*C*H), 121.64 (*C*H), 121.46 (*C*H), 120.24 (*C*H), 117.45 (*C*H), 114.34 (*C*H), 111.79 (*C*H), 66.3 (*C*H), 62.87 (*C*H), 57.72 (*C*H), 54.34 (O*C*H_3), 54.22 (O*C*H_3), 45.04 (N*C*H_2); HRMS (ESI) Calcd for $C_{39}H_{33}N_5O_7$ [$(M+H)^+$] 684.2458, found 684.2463.

Ethyl 1'-methyl-2-(naphthalen-1-yl)-5-(4-nitrophenyl)-2'-oxo-3-phenylspiro[imidazolidine-4,3'-indoline]-1-carboxylate (**7g**). According to the general procedure, to a solution of aldehyde **2d** (100 mg, 0.64 mmol), amine **3a** (60 mg, 0.64 mmol), (*E*)-ethyl 4-nitrobenzylidenecarbamate **6c** (155 mg, 0.69 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification furnished the corresponding spiroindoloimidazolidine **7g** as a white solid; yield: 285 mg (82%): R_f = 0.42 (hexane/EtOAc, 9:1). mp 167-169 ºC. IR (neat): ν_{max} 3058, 2835, 2815, 1784, 1712, 1673, 1597, 1498, 1472, 1477, 1176, 1097, 1102, 753, 685, 653 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.42 (d, J = 2.8, 1H, ArH), 7.24-7.30 (m, 1H, ArH), 7.18-7.17 (m, 9H, ArH), 7.00-7.04 (m, 1H, ArH), 6.83-6.87 (m, 2H, ArH), 6.58-6.73 (m, 6H, ArH), 5.82 (d, J = 9.6 Hz, 1H, CH), 4.27 (d, J = 9.2 Hz, 1H, CH), 3.45-3.51 (m, 2H), 2.88 (s, 3H, OCH_3),

0.89 (t, *J* = 9.2 Hz, 3H, NCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 174.89 (*C*=O), 157.58 (*C*=O), 142.74 (*C*=O), 141.25 (*quat-C*), 135.50 (*quat-C*), 134.95 (*quat-C*), 134.33 (*quat-C*), 132.75 (*quat-C*), 131.93 (*quat-C*), 131.89 (*quat-C*), 131.23 (*C*H), 131.17 (*C*H), 130.40 (*C*H), 128.62 (*C*H), 127.90 (*C*H), 127.65 (CH), 127.48 (CH), 127.33 (CH), 126.90 (CH), 126.35 (*C*H), 122.95 (*quat-C*), 122.14 (*C*H), 121.47 (*C*H), 112.65 (CH), 107.14 (*C*H), 67.95 (*quat-C*), 57.62 (*C*H), 54.01 (*C*H), 28.23 (*C*H), 25.29 (*C*H), 11.01 (CH_3); HRMS (ESI) Calcd for $C_{36}H_{30}N_4O_5$ [$(M+H)^+$] 599.2294, found 599.2311.

1'-Methyl-1,5-bis(4-nitrophenyl)-3-phenyl-2-(thiophen-2-yl)spiro[imidazolidine-4,3'-indolin]-2'-one (**7h**). According to the general procedure, to a solution of aldehyde **2g** (70 mg, 0.63 mmol), amine **3a** (60 mg, 0. 64 mmol), (*E*)-4-nitro-*N*-(4-nitrobenzylidene)aniline **6b** (190 mg, 0.70 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification furnished the corresponding spiroindoloimidazolidine **7h** as a white solid; yield: 287 mg (82 %): R_f = 0.42 (hexane/EtOAc, 7:3); R_f = 0.48 (hexane/EtOAc, 7:3); mp 153-154 ºC. IR (neat): ν_{max} 3095, 2913, 2843, 1779, 1710, 1611, 1155, 1027, 1013, 690, 687 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.61 (t, *J* = 3.6 Hz, 3H, ArH), 7.45 (t, *J* = 7.6 Hz, 2H, ArH), 7.29-7.33 (m, 6H, ArH), 7.17 (t, *J* = 7.6 Hz, 3H, ArH), 7.02-7.10 (m, 7H, ArH), 5.19 (s, 1H, CH), 3.54 (s, 3H, NCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 173.02 (*C*=O), 160.38 (*C*=O), 155.7 (*C*=O), 150.67 (*quat-C*), 148.99 (*quat-C*), 148.73 (*quat-C*), 143.7 (*quat-C*), 142.02 (CH), 132.47 (CH), 131.72 (*quat-C*), 130.56 (*C*H), 130.41 (*C*H), 129.27 (*C*H), 129.03 (*C*H), 128.42 (*C*H), 127.00 (*quat-C*), 125.00 (CH), 123.75 (CH), 123.65 (CH), 119.14 (CH), 114.40 (*C*H), 114.32 (CH), 108.94 (*C*H), 79.1 (*C*H), 74.56 (*quat-C*), 55.41 (*C*H), 34.25 (CH_3); HRMS (ESI) Calcd for $C_{33}H_{25}N_5O_5S$ [$(M+Na)^+$] 626.1474, found 626.1487.

tert-Butyl 2-(4-nitrophenyl)-2'-oxo-3,5-diphenyl-1-tosylspiro[imidazolidine-4,3'-indoline]-1'-carboxylate (**7i**). According to the general procedure, to a solution of aldehyde **2e** (65 mg,

0.42 mmol), amine **3a** (40 mg, 0. 43 mmol), *N*-benzylidene benzenesulfonamide **6a** (120 mg, 0.46 mmol) and copper(I) thiophenecarboxylate (0.7 mg, 1 mol %) catalyst in dichloroethane was transferred diazoamide **1e** (100 mg, 0.39 mmol). Purification gave the corresponding product spiroindoloimidazolidine **7i** as a white solid; yield : 229 mg (82%); mp 167-169 ºC; IR (neat): ν_{max} 3062, 2942, 2934, 1768, 1728, 1647, 1636, 1393, 1380, 1261, 1075, 1103, 732, 676 cm^{-1}; ^1H NMR ($CDCl_3$, 400MHz) δ 7.55-7.61 (m, 3H, ArH), 7.38-7.51 (m, 8H, ArH), 7.29 (s, 1H, ArH), 7.16-7.20 (m, 3H, ArH), 7.00-7.06 (m, 3H, ArH), 6.94 (d, *J* = 7.6 Hz, 2H, ArH), 6.80 (d, *J* = 7.6 Hz, 2H, ArH), 6.61-6.63 (m, 1H, ArH), 5.58 (s, 1H, CH), 2.62 (s, 3H, CH_3), 0.79 (s, 9H, N*boc*); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 174.10 (C=O), 148.63 (C=O), 144.76 (C=O), 144.31 (*quat-C*), 140.58 (*quat-C*), 136.39 (*quat-C*), 133.51 (*quat-C*), 131.76 (CH), 130.47 (CH), 130.36 (CH), 130.23 (*quat-C*), 130.13 (*quat-C*), 129.99 (CH), 128.29 (*quat-C*), 126.23 (CH), 124.90 (CH), 124.71 (CH), 122.43 (CH), 120.45 (CH), 115.32 (CH), 110.21 (CH), 94.63 (CH), 86.54 (*quat-C*), 78.19 (CH), 75.62 (*quat-C*), 26.96 (CH), 19.27 (N*boc*); HRMS (ESI) Calcd for $C_{40}H_{36}N_4O_7S$ [$(M+Na)^+$] 739.2202, found 739.2219.

2-(4-Bromophenyl)-1'-methyl-3,5-diphenyl-1-tosylspiro[imidazolidine-4,3'-indolin]-2'-one (**7j**). According to the general procedure, to a solution of aldehyde **2f** (120 mg, 0.65 mmol), amine **3a** (60 mg, 0. 64 mmol), *N*-benzylidene benzenesulfonamide **6a** (180 mg, 0.69 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloromethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification furnished the corresponding spiroindoloimidazolidine **7j** as a white solid; yield: 297 mg (77%); Eluent: hexane/EtOAc, 90:10. mp 163-165 ºC; IR (neat): ν_{max} 3062, 2924, 2854, 1780, 1711, 1613, 1597, 1492, 1455, 1435, 1379, 1310, 1261, 1176, 1029, 732, 693, 667 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) *δ* 7.75-7.83 (m, 3H, ArH), 7.53-7.71 (m, 10H, ArH), 7.49 (s, 1H, ArH), 7.20-7.40 (m, 4H, ArH), 7.12 (d, *J* = 7.2 Hz, 2H, ArH), 7.01 (d, *J* = 8 Hz, 2H, ArH), 6.81-6.83 (m, 1H, ArH), 5.78 (s, 1H, CH), 3.28 (s, 3H, CH_3), 2.81 (s, 3H, NCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 172.16

(C=O), 146.69 (C=O), 142.83 (C=O), 142.37 (*quat-C*), 138.64 (*quat-C*), 134.45 (*quat-C*), 131.57 (CH), 129.82 (CH), 128.53 (CH), 128.42 (CH), 128.29 (*quat-C*), 128.19 (CH), 128.05 (CH), 126.35 (CH), 124.29 (*quat-C*), 122.78 (CH), 122.97 (*quat-C*), 122.78 (CH), 120.49 (CH), 118.51 (CH), 113.38 (CH), 108.27 (CH), 92.69 (CH), 84.61 (*quat-C*), 75.93 (CH), 73.68 (*quat-C*), 31.10 (CH), 25.02 (NCH_3); HRMS (ESI) Calcd for $C_{36}H_{30}BrN_3O_3S$ [$(M+H)^+$] : 664.1270 found 664.1282.

Ethyl 1'-benzyl-3-methyl-5-(4-nitrophenyl)-2'-oxo-2-phenylspiro[imidazolidine-4,3'-indoline]-1-carboxylate (**7k**). According to the general procedure, to a solution of aldehyde **2a** (45 mg, 0.43 mmol), amine **3b** (30 mg, 0.45 mmol), (*E*)-ethyl 4-nitrobenzylidenecarbamate **6c** (107 mg, 0.48 mmol) and copper(I) thiophenecarboxylate (0.8 mg, 1 mol %) in dichloroethane was transferred diazoamide **1a** (100 mg, 0.4 mmol). Purification furnished the corresponding spiroindoloimidazolidine **7k** as a white solid; yield: 164 mg (73%). mp 153-154 ºC. IR (neat): ν_{max} 3062, 2915, 2874, 1780, 1713, 1613, 1264, 1166, 1025, 1003, 731, 690, 687 cm^{-1}. ^1H NMR ($CDCl_3$, 400 MHz) δ 8.12 (d, *J* = 7.2 Hz, 1H, ArH), 7.80-7.56 (m, 2H, ArH), 7.65-7.47 (m, 6H, ArH), 7.61-7.64 (m, 4H, ArH), 7.50-7.54 (m, 1H, ArH), 6.23-6.37 (m, 3H, ArH), 7.10-7.19 (m, 6H, ArH), 6.31 (d, *J* = 9.2 Hz, 1H, CH), 5.79 (m, 2H, CH), 3.45-3.51 (d, *J* = 9.2 Hz, 1H, CH), 2.13 (s, 3H, CH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 174.89 (*C*=O), 157.57 (*C*=O), 142.73 (*C*=O), 141.25 (*quat-C*), 135.49 (*quat-C*), 134.95 (*quat-C*), 134.33 (*quat-C*), 132.75 (*quat-C*), 131.93 (*quat-C*), 131.89 (*quat-C*), 131.22 (*C*H), 131.17 (*C*H), 130.39 (*C*H), 128.61 (*C*H), 127.90 (*C*H), 127.64 (CH), 127.48 (CH), 127.32 (CH), 126.90 (CH), 126.34 (*quat-C*), 122.95 (*C*H), 122.14 (*C*H), 121.46 (*C*H), 112.64 (CH), 107.14 (*C*H), 67.95 (CH), 62.81 (*quat-C*), 57.62 (*C*H), 54.01 (*C*H), 28.22 (CH_2), 11.01 (CH_3); HRMS (ESI) Calcd for $C_{33}H_{30}N_4O_5$ [$(M+H)^+$] 563.2294, found 563.2305.

Ethyl 1'-benzyl-3-(4-bromophenyl)-5-(4-nitrophenyl)-2'-oxo-2-phenylspiro[imidazolidine-4,3'-indoline]-1-carboxylate (**7l**). According to the general procedure, to a solution of aldehyde **2a** (45 mg, 0.42 mmol), amine **3c** (75 mg, 0. 44 mmol), (*E*)-ethyl 4-nitrobenzylidenecarbamate **6c** (105 mg, 0.47 mmol) and copper(I) thiophenecarboxylate (0.8 mg, 1 mol %) in dichloroethane was transferred diazoamide **1a** (100 mg, 0.4 mmol). Purification furnished the corresponding spiroindoloimidazolidine **7l** as a white solid; yield: 205 mg (73%). R_f = 0.42 (hexane/EtOAc, 9:1); mp 167-169 ºC. IR (neat): ν_{max} 3052, 2911, 2862, 1780, 1711, 1613, 1486, 1455, 1379, 1342, 1261, 1035, 863, 685, 672 cm^{-1}. ^1H NMR ($CDCl_3$, 400 MHz) δ 7.41 (d, *J* = 4.8 Hz, 1H, ArH), 7.24-7.30 (m, 2H, ArH), 7.11-7.21 (m, 10H, ArH), 7.02 (t, *J* = 4.8 Hz, 1H, ArH), 6.83-6.87 (m, 2H, ArH), 6.67-6.73 (m, 5H, ArH), 6.01 (d, *J* = 5.2 Hz, 1H, ArH), 5.81 (d, *J* = 9.2 Hz, 1H, CH), 5.29-5.28 (m, 2H, CH_2), 4.28 (d, *J* = 9.6 Hz, 1H, CH), 3.45-3.51 (m, 2H, CH), 0.89 (t, *J* = 4 Hz, 3H, CH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.88 (*C*=O), 158.57 (*C*=O), 143.73 (*C*=O), 1421.24 (*quat-C*), 136.49 (*quat-C*), 134.94 (*quat-C*), 135.32 (*quat-C*), 133.75 (*quat-C*), 132.92 (*quat-C*), 132.88 (*quat-C*), 132.22 (*C*H), 131.16 (*C*H), 131.39 (*C*H), 129.61 (*C*H), 128.89 (*C*H), 127.64 (CH), 127.47 (CH), 127.32 (CH), 127.89 (CH), 127.34 (*quat-C*), 123.94 (*C*H), 123.13 (*C*H), 122.46 (*C*H), 113.64 (CH), 108.14 (*C*H), 68.94 (CH), 63.81 (*quat-C*), 58.62 (*C*H), 28.22 (CH_2), 26.28 (CH_2), 11.99 (CH_3). HRMS (ESI) Calcd for $C_{38}H_{31}BrN_4O_5$ [$(M+H)^+$] 703.1556, found 703.1569.

Diethyl 4'-(4-nitrophenyl)-1-methyl-2-oxo-5'-phenylspiro[indoline-3,3'-[1,2,4]triazolidine]-1',2'-dicarboxylate (**9f**). According to the general procedure, to a solution of aldehyde **2e** (95 mg, 0.63 mmol), amine **3a** (60 mg, 0.64 mmol), DEAD **8b** (120 mg, 0.69 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification furnished the corresponding spiroindolotriazolidine **9f** as a white solid; yield: 237 mg (73 %): R_f = 0.32 (hexane/EtOAc, 8:2); mp 167-169 ºC. IR (neat): ν_{max} 3062, 2924, 2854, 1780, 1711, 1613, 1597, 1492, 1455,

1435, 1379, 1310, 1261, 1176, 1029, 732, 693, 667 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 8.03-8.05 (m, 2H, ArH), 7.81 (d, *J* = 7.6 Hz, 1H, ArH), 7.48-7.57 (m, 2H, ArH), 7.39-7.42 (m, 5H, ArH), 7.22-7.27 (m, 4H, ArH), 6.95-7.22 (m, 2H, ArH), 6.84 (d, *J* = 8.0 Hz, 2H, ArH), 4.53 (s, 1H, CH), 3.09 (s, 3H, NCH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 176.07 (*C*=O), 171.84 (*C*=O), 163.66 (*C*=O), 143.81 (*quat-C*), 137.09 (*quat-C*), 134.78 (*quat-C*), 133.99 (*C*H), 130.49 (*quat-C*), 130.07 (CH), 129.73 (*quat-C*), 129.56 (*quat-C*), 129.31 (*quat-C*), 129.18 (*quat-C*), 128.77 (*quat-C*), 128.70 (*quat-C*), 128.63 (*C*H), 127.82 (*quat-C*), 125.53 (*C*H), 122.85 (*C*H), 108.63 (*C*H), 52.42 (OCH_3), 35.22 (NCH_3); HRMS (ESI) Calcd for $C_{30}H_{22}N_6O_5$ [$(M+Na)^+$] 569.1549, found 569.1562.

Diethyl 4'-(4-bromophenyl)-1-ethyl-5-nitro-2-oxo-5'-phenylspiro[indoline-3,3'-[1,2,4]triazolidine]-1',2'-dicarboxylate (**9g**). According to the general procedure, to a solution of aldehyde **2f** (110 mg, 0.60 mmol), amine **3a** (55 mg, 0.59 mmol), DEAD **8b** (110 mg, 0.63 mmol) and copper(I) thiophenecarboxylate (1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1b** (100 mg, 0.53 mmol). Purification furnished the corresponding spiroindolotriazolidine **9g** as a white solid; yield: 233 mg (74 %): R_f = 0.42 (hexane/EtOAc, 9:1; mp 167-169 ºC. IR (neat): ν_{max} 3059, 2932, 2864, 1778, 1721, 1653, 1587, 1492, 1468, 1380, 1261, 1176, 1075, 1103, 732, 693, 667 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 8.03-8.06 (m, 2H, ArH), 7.55 (d, *J* = 5.6 Hz, 2H, ArH), 7.51-7.54 (m, 3H, ArH), 7.38-7.42 (m, 5H, ArH), 7.22-7.27 (m, 4H, ArH), 6.95-7.21 (m, 1H, ArH), 6.85 (d, *J* = 8.0 Hz, 1H, ArH), 4.53 (s, 1H, CH), 3.73 (q, *J* = 7.2 Hz, 2H, NCH_2), 1.23 (t, *J* = 7.2 Hz, 3H, CH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.78 (*C*=O), 171.56 (*C*=O), 161.22 (*C*=O), 143.53 (*quat-C*), 136.81 (*quat-C*), 133.71 (*C*H), 130.20 (*C*H), 129.78 (CH), 129.44 (*quat-C*), 129.28 (*quat-C*), 129.02 (CH), 128.89 (CH), 128.49 (CH), 128.42 (CH), 128.35 (CH), 127.54 (*C*H), 125.24 (*C*H), 122.57 (*C*H), 108.35 (*C*H), 52.14 (*C*H), 34.94 (CH_2), 12.72 (CH_3); HRMS (ESI) Calcd for $C_{31}H_{24}BrN_5O_3$ [$(M+Na)^+$] 616.0960, found 616.0978.

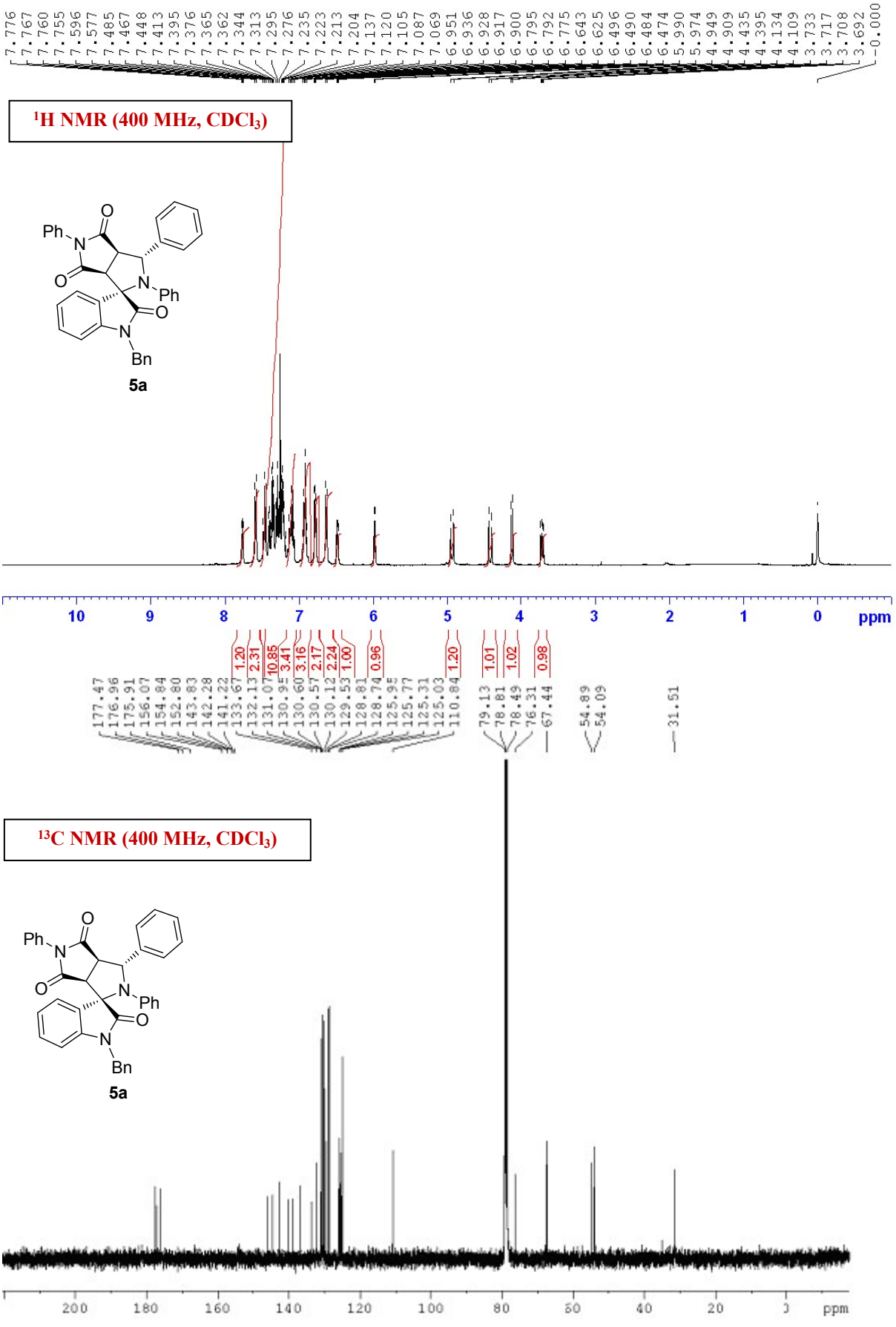
Diethyl 1,4'-dimethyl-2-oxo-5'-phenylspiro[indoline-3,3'-[1,2,4]triazolidine]-1',2'-dicarboxylate (**9h**). According to the general procedure, to a solution of aldehyde **2a** (65 mg, 0.61 mmol), amine **3b** (45 mg, 0.67 mmol), DEAD **8b** (120 mg, 0.69 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification furnished the corresponding spiroindolotriazolidine **9h** as a white solid; yield: 180 mg (71 %): R_f = 0.27 (hexane/EtOAc, 7:3); mp 153-154 ºC. IR (neat): ν_{max} 3048, 2935, 2565, 1879, 1723, 1623, 1274, 1168, 1024, 1008, 690, 687 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.81 (d, *J* = 8 Hz, 1H, ArH), 7.45-7.48 (m, 2H, ArH), 7.33-7.37 (m, 3H, ArH), 7.22-7.32 (m, 3H, ArH), 4.76 (d, *J* = 6.4 Hz, 1H, CH), 4.75 (q, *J* = 7.2 Hz, 2H, CH), 3.86 (d, *J* = 7.2 Hz, 1H, CH), 3.59 (d, *J* = 7.2 Hz, 1H, CH), 2.74 (s, 3H, CH_3), 1.87 (s, 3H, NCH_3), 1.24 (t, *J* = 7.2 Hz, 3H, CH_3), 1.11 (t, *J* = 7.2 Hz, 3H, CH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 175.69 (*C*=O), 174.92 (*C*=O), 174.07 (*C*=O), 148.59 (*quat-C*), 140.90 (*quat-C*), 140.51 (*quat-C*), 131.89 (*quat-C*), 130.43 (*C*H), 129.05 (*C*H), 128.99 (*C*H), 128.75 (*C*H), 128.22 (*C*H), 127.38 (*C*H), 127.02 (*C*H), 126.72 (*C*H), 125.41 (*C*H), 123.92 (*C*H), 115.47 (*C*H), 73.85 (*quat-C*), 68.73 (*C*H), 53.66 (*C*H), 52.63 (*C*H), 32.54 (N*C*H_3), 28.12 (CH_3), 14.64 (CH), 13.27 (CH); HRMS (ESI) Calcd for $C_{23}H_{26}N_4O_5$ [$(M+Na)^+$] 461.1801, found 461.1817.

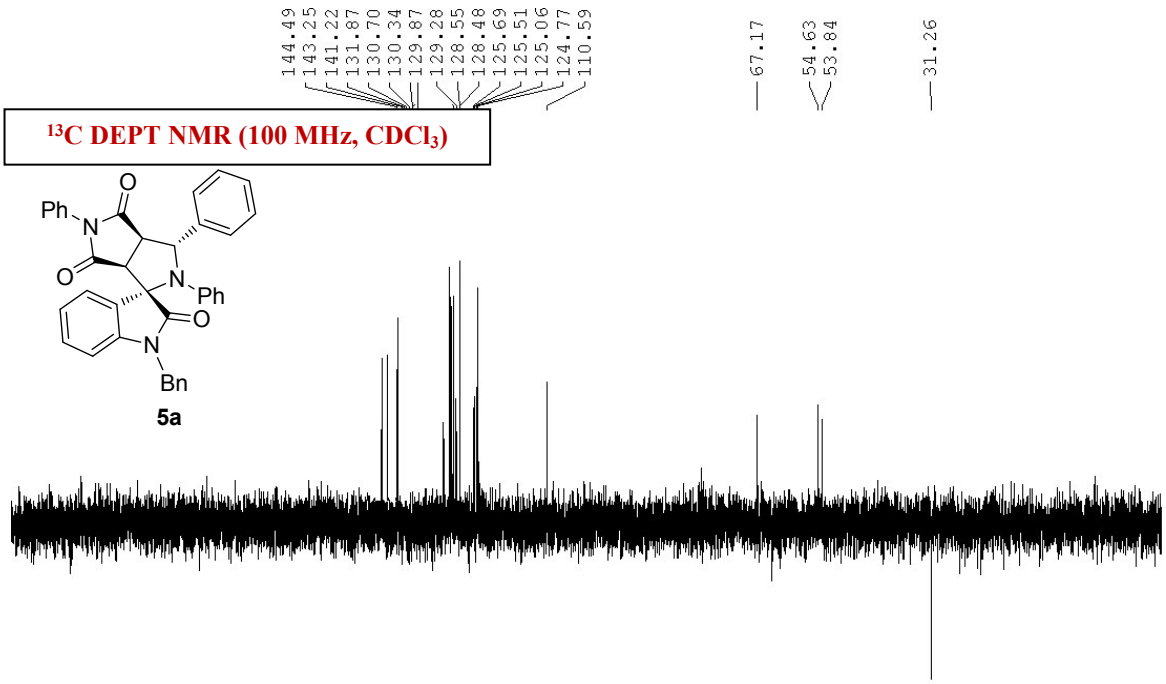
tert-Butyl 1',2'-diethyl 4'-(4-bromophenyl)-5-nitro-2-oxo-5'-phenylspiro[indoline-3,3'-[1,2,4]triazolidine]-1,1',2'-tricarboxylate (**9i**). According to the general procedure, to a solution of aldehyde **2a** (45 mg, 0.4 mmol), amine **3c** (80 mg, 0.4 mmol), DEAD **8b** (80 mg, 0.46 mmol) and copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1i** (100 mg, 0.33 mmol). Purification furnished the corresponding spiroindolotriazolidine **9i** as a white solid; yield : 214 mg (77%): R_f = 0.44 (hexane/EtOAc, 9:1); mp 167-169 ºC; IR (neat): ν_{max} 3059, 2932, 2864, 1778, 1721, 1653, 1587, 1492, 1468, 1380, 1261, 1176, 1075, 1103, 732, 693, 667 cm^{-1}; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.59 (t, *J* =

7.6 Hz, 2H, ArH), 7.38 (t, *J* = 7.6 Hz, 2H, ArH), 7.30 (d, *J* = 8.0 Hz, 2H, ArH), 7.09-7.17 (m, 2H), 7.90-7.09 (m, 3H), 6.75 (d, *J* = 7.6 Hz, 1H, ArH), 7.64 (d, *J* = 7.6 Hz, 1H, ArH), 3.78-3.87 (m, 4H, CH_2), 1.30-1.35 (m, 6H, CH_3), 0.80 (s, 9H, N*boc*); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 171.45 (*C*=O), 167.51 (*C*=O), 161.92 (*C*=O), 143.89 (*quat-C*), 137.17 (*quat-C*), 132.56 (*quat-C*), 132.15 (CH), 129.95 (CH), 129.50 (*C*H), 128.91 (CH), 128.66 (*C*H), 125.74 (*C*H), 125.56 (*C*H), 123.53 (*C*H), 123.19 (*C*H), 118.16 (*C*H), 110.04 (*C*H), 78.18 (*quat-C*), 69.66 (*quat-C*), 63.22 (*C*H), 36.11 (*C*H), 14.64 (*C*H), 13.27 (*C*H), 10.99 (*C*H); HRMS (ESI) Calcd for $C_{32}H_{32}BrN_5O_9$ [(M+Na)$^+$] 732.1281, found 732.1296.

Diethyl 4'-(4-bromophenyl)-1-methyl-2-oxo-5'-phenylspiro[indoline-3,3'-[1,2,4]triazolidine]-1',2'-dicarboxylate (**9j**). According to the general procedure, to a solution of aldehyde **2a** (70 mg, 0.66 mmol), amine **3c** (120 mg, 0.65 mmol), DEAD **8b** (120 mg, 0.69 mmol), copper(I) thiophenecarboxylate (1.1 mg, 1 mol %) in dichloroethane was transferred diazoamide **1c** (100 mg, 0.58 mmol). Purification furnished the corresponding spiroindolotriazolidine **9j** as a white solid; yield: 282 mg (84 %). R_f = 0.41 (hexane/EtOAc, 9:1);; mp 163-165 ºC; IR (neat): ν_{max} 3072, 2954, 2834, 1740, 1721, 1623, 1584, 1495, 1465, 1379, 1331, 116, 732, 669 cm^{-1}; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.61 (t, *J* = 7.2 Hz, 2H, ArH), 7.46 (t, *J* = 8.0 Hz, 1H, ArH), 7.30-7.33 (m, 4H, ArH), 7.18 (t, *J* = 8.0 Hz, 2H, ArH), 7.00-7.10 (m, 5H, ArH), 4.07 (q, *J* = 7.2 Hz, 2H, NCH_2), 3.82-3.91 (m, 1H, NCH), 3.54-3.63 (m, 1H, NCH), 2.73 (s, 3H, NCH_3), 1.27 (t, *J* = 7.2 Hz, 3H, CH_3), 1.12 (t, *J* = 7.2 Hz, 3H, CH_3); ^{13}C NMR ($CDCl_3$, 100 MHz) δ 170.65 (*C*=O), 166.71 (*C*=O), 161.12 (*C*=O), 143.09 (*quat-C*), 136.37 (*quat-C*), 131.76 (*quat-C*), 137.35 (*quat-C*), 129.15 (*quat-C*), 128.70 (*C*H), 128.11 (*C*H), 127.86 (*C*H), 124.94 (*C*H), 124.78 (*C*H), 122.73 (*C*H), 122.39 (*C*H), 117.36 (*C*H), 109.24 (*C*H), 77.38 (*quat-C*), 76.43 (CH), 68.86 (*C*H_2), 62.42 (*C*H), 35.31 (*C*H_2), 25.02 (*C*H_3), 13.84 (*C*H_3), 12.47 (*C*H_3); HRMS (ESI) Calcd for $C_{28}H_{27}BrN_4O_5$ [(M+H)$^+$] 579.1243, found 579.1252.

^{1}H NMR and ^{13}C NMR, DEPT135 NMR Spectra of spiroindolopyrrolidines

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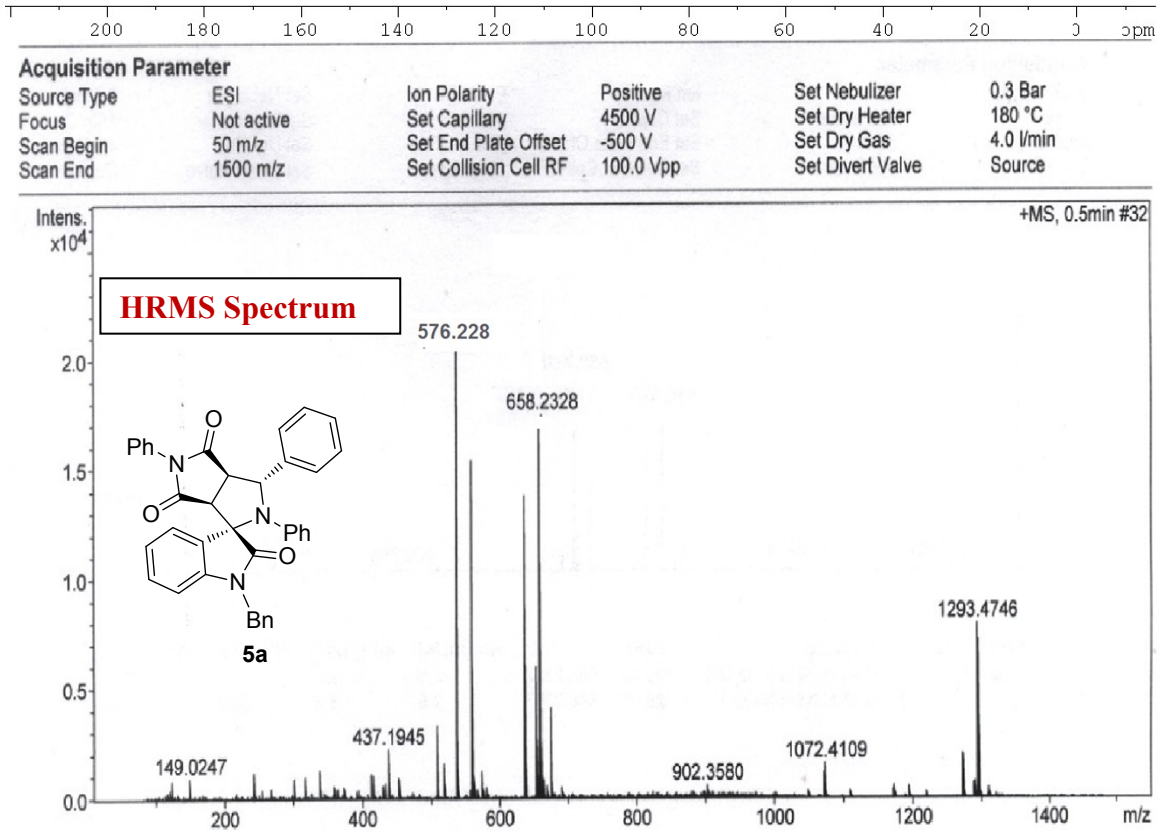
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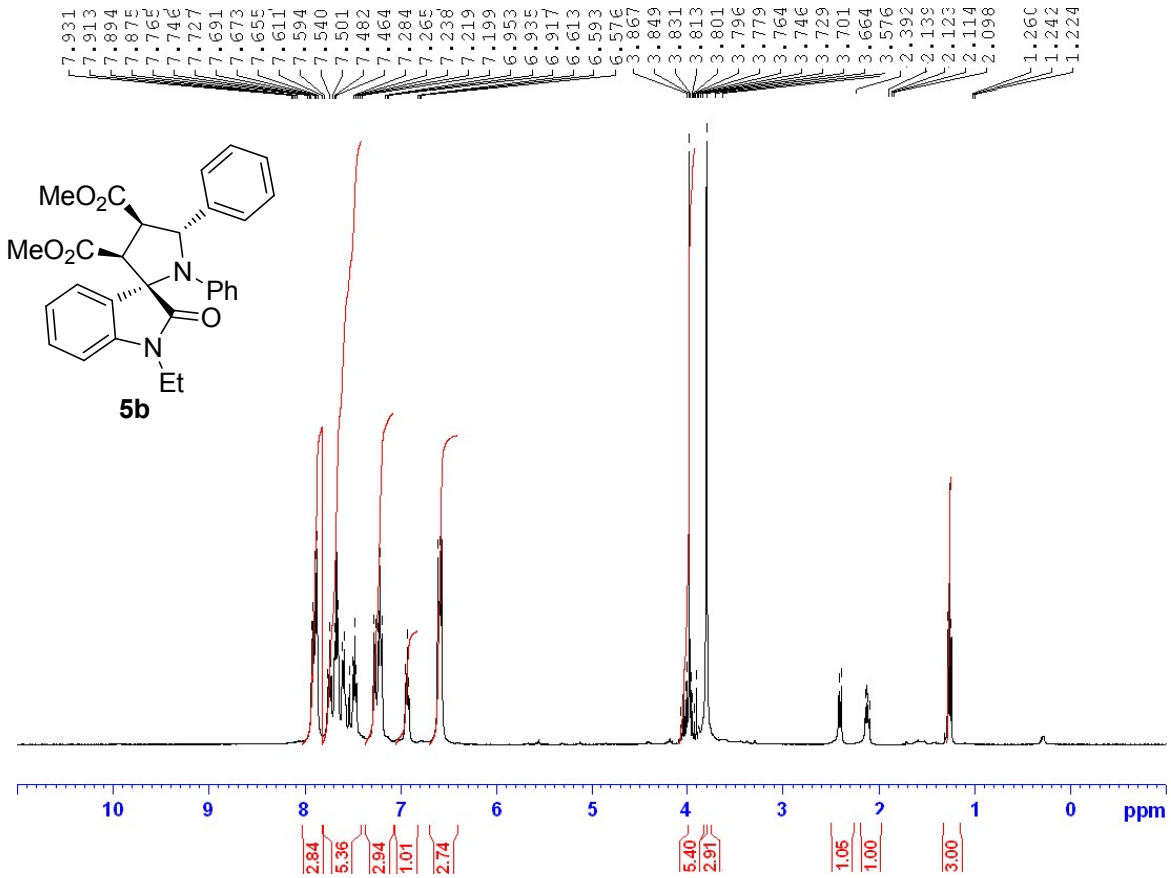
^{1}H NMR (100 MHz, $CDCl_3$)



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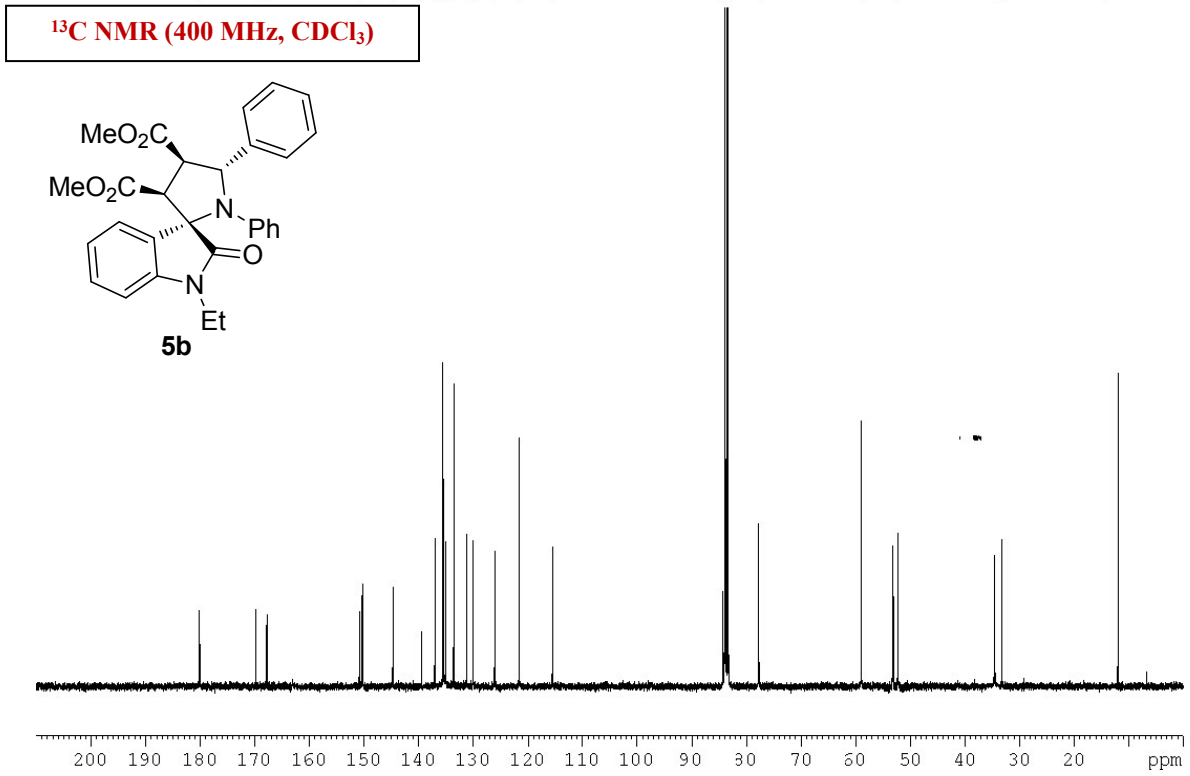

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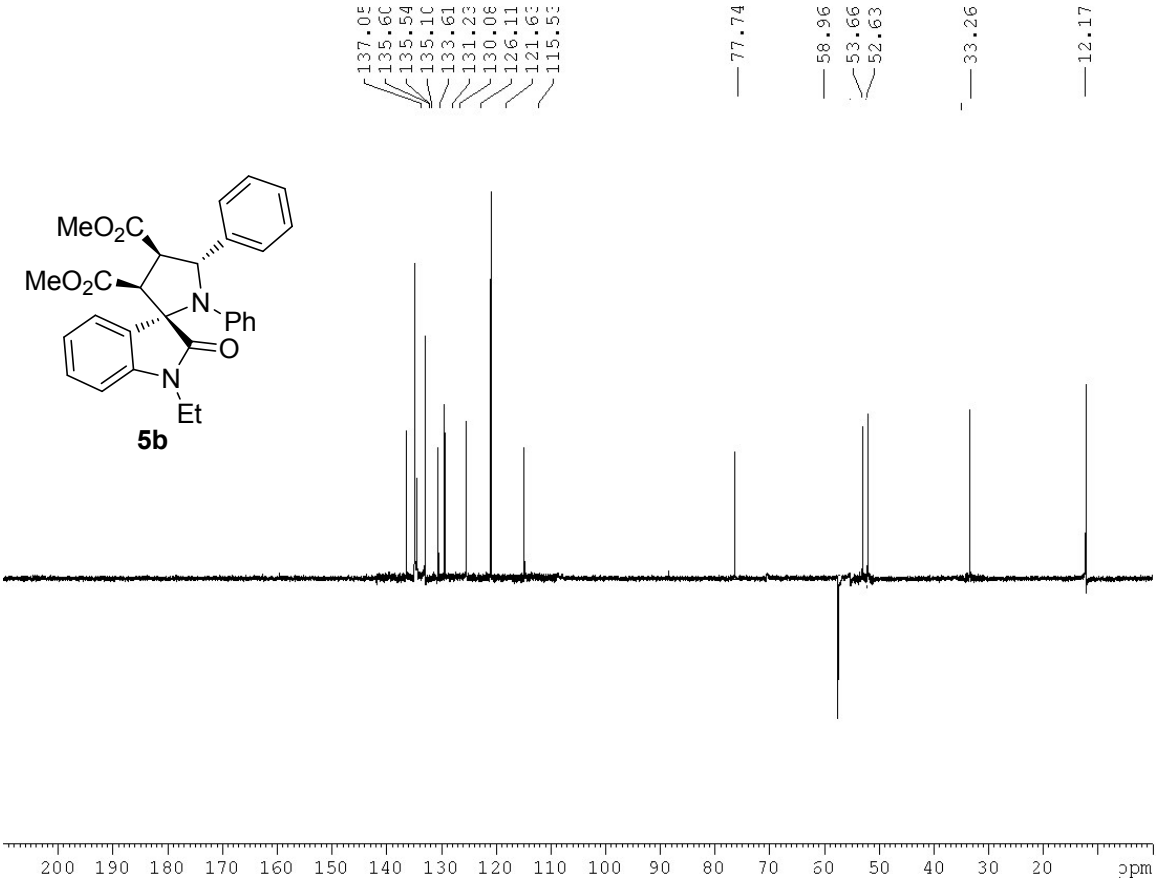

HRMS Spectrum

Analysis Info

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Comment			

Acquisition Parameter

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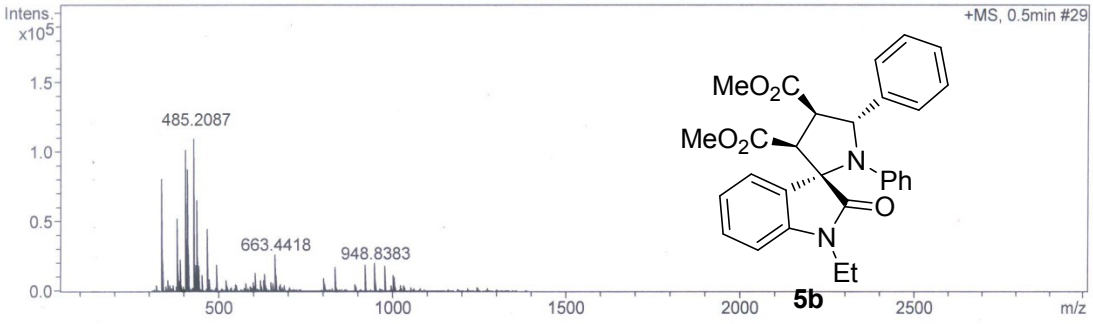
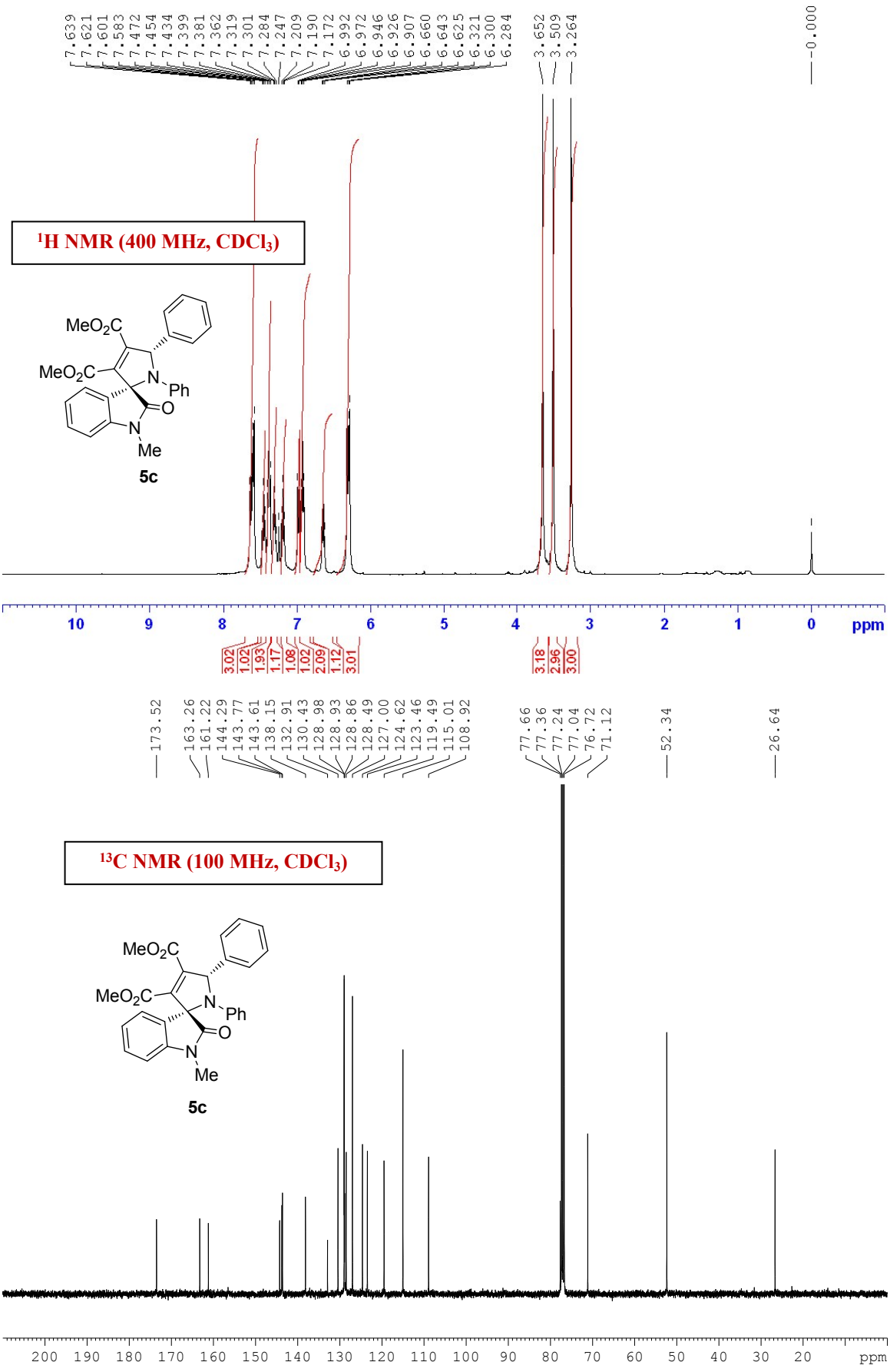
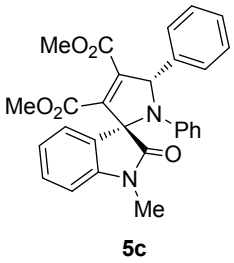
Scan End	3000 m/z	Set Collision Cell RF	600.0 Vpp	Set Divert Valve	Source




7.639
7.621
7.601
7.583
7.472
7.454
7.434
7.399
7.381
7.362
7.319
7.301
7.284
7.247
7.209
7.190
7.172
6.992
6.972
6.946
6.926
6.907
6.660
6.643
6.625
6.321
6.300
6.284
3.652
3.509
3.264
0.000
1H NMR (400 MHz, CDCl3)
MeO2C
MeO2C
N
Ph
O
N
Me
5c
10 9 8 7 6 5 4 3 2 1 0 ppm
3.02 1.02 1.93 1.17 1.08 1.02 2.09 1.12 3.01
3.18 2.96 3.00
173.52
163.26
161.22
144.29
143.77
143.61
138.15
132.91
130.43
128.98
128.93
128.86
128.49
127.00
124.62
123.46
119.49
115.01
108.92
77.66
77.36
77.24
77.04
76.72
71.12
52.34
26.64
13C NMR (100 MHz, CDCl3)
MeO2C
MeO2C
N
Ph
O
N
Me
5c
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 ppm

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

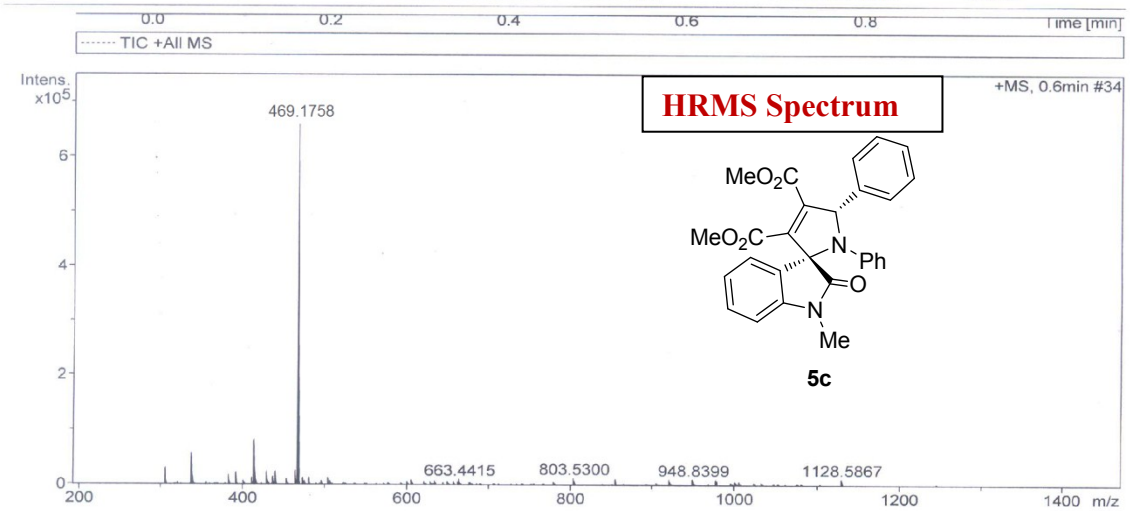


5c

Acquisition Parameter

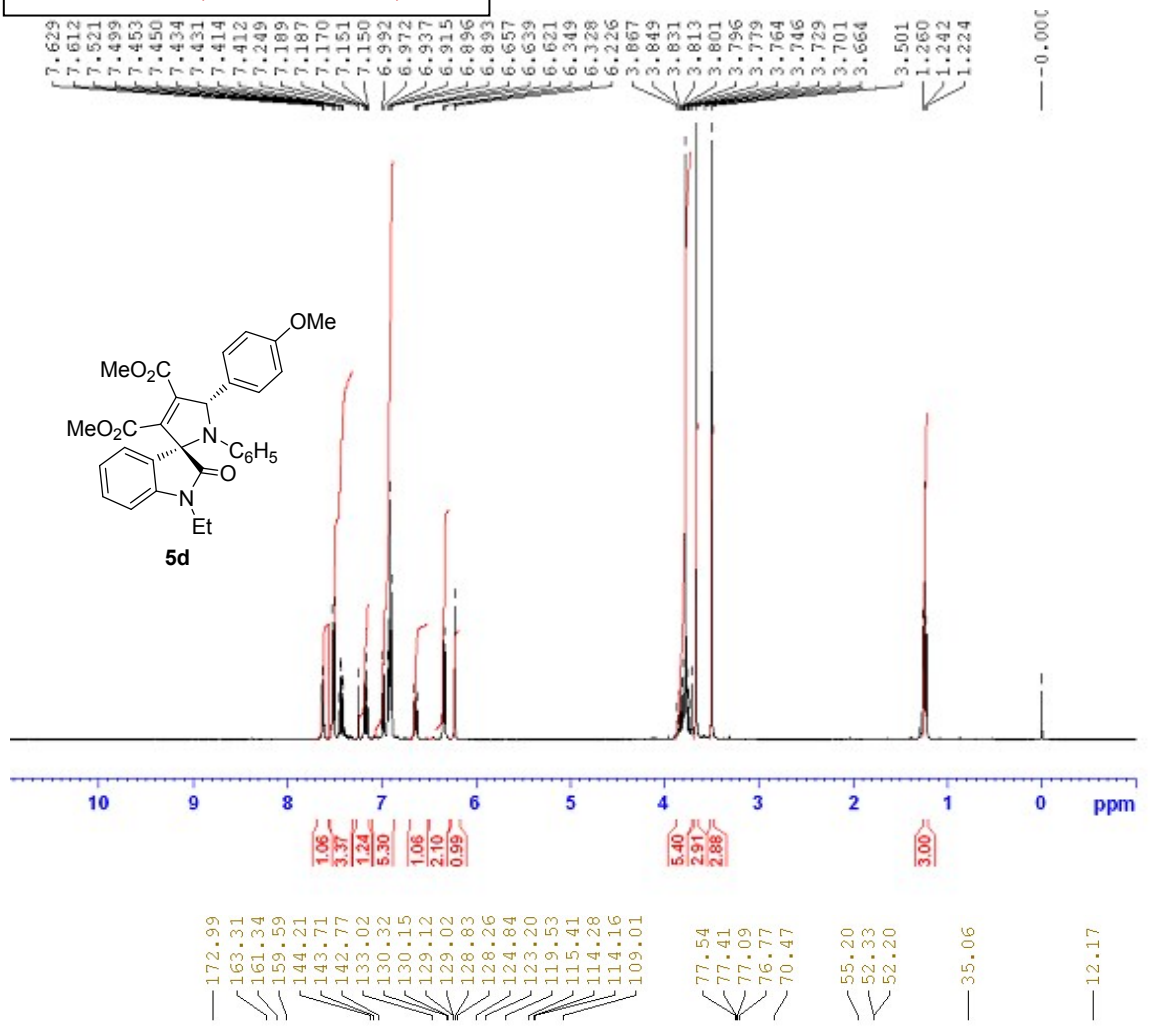
Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.3 Bar
Focus	Active	Set Capillary	4500 V	Set Dry Heater	180 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	3000 m/z	Set Collision Cell RF	600.0 Vpp	Set Divert Valve	Source

HRMS Spectrum

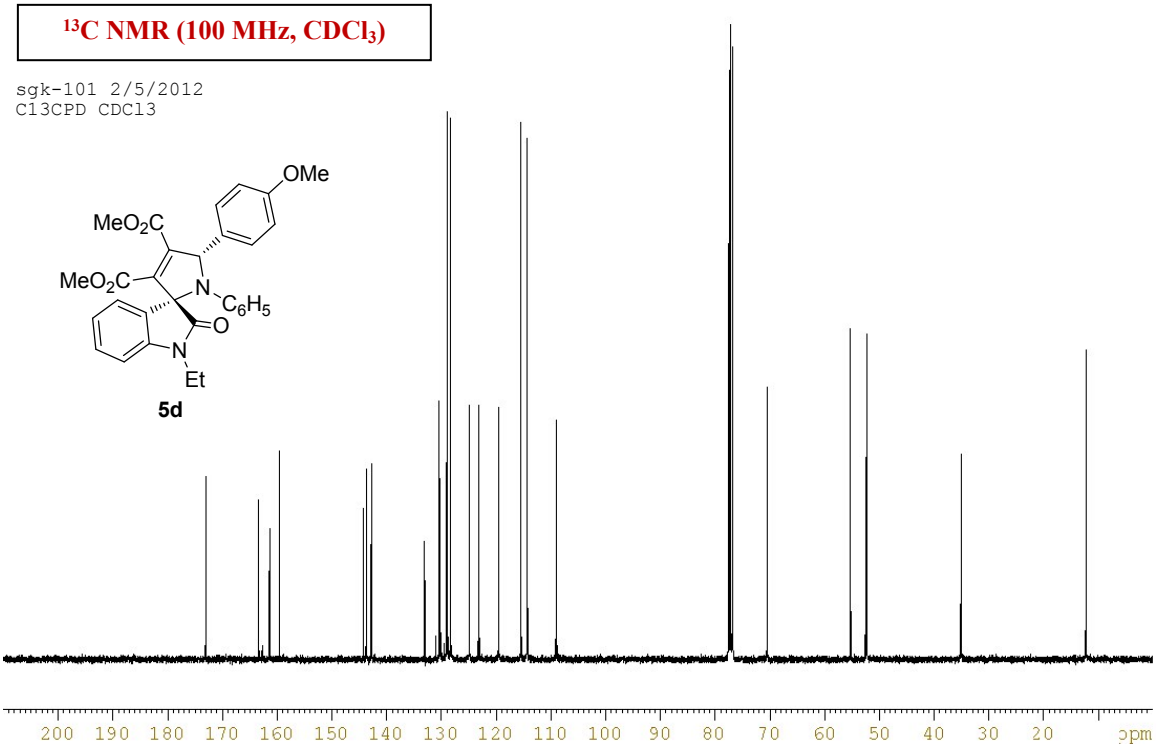


5c

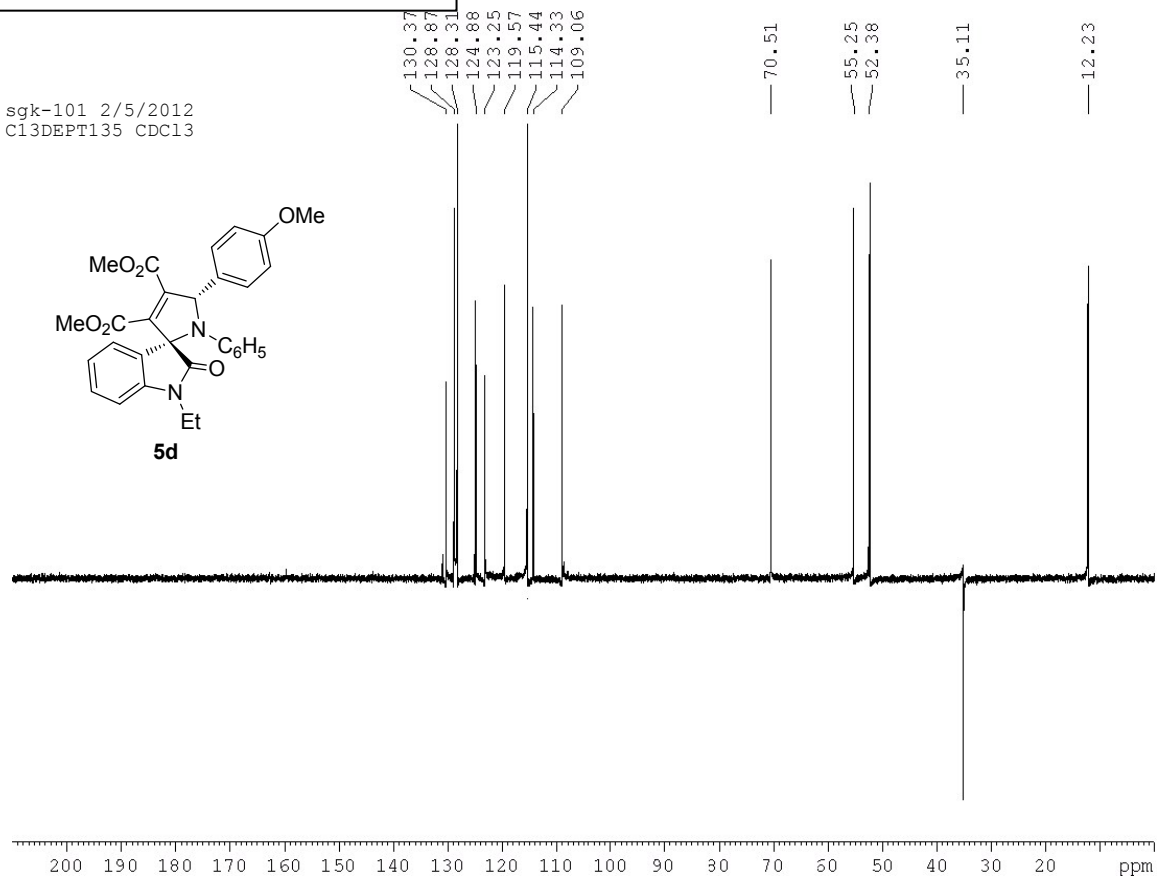
^{1}H NMR (400 MHz, $CDCl_3$)



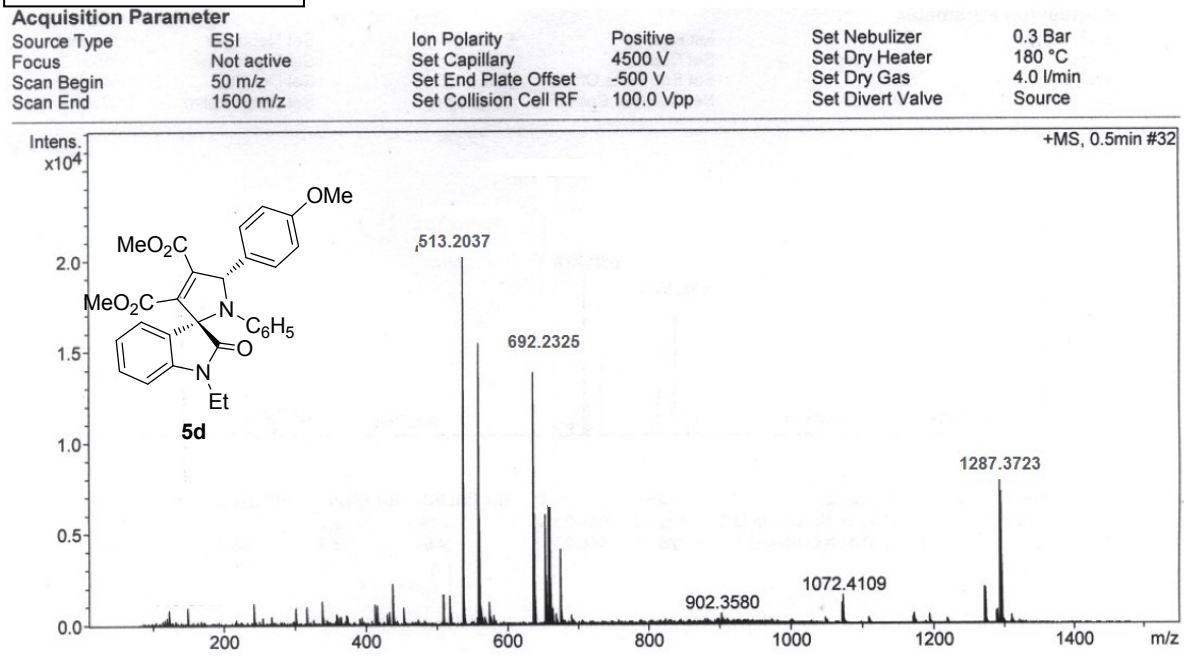
^{13}C NMR (100 MHz, $CDCl_3$)



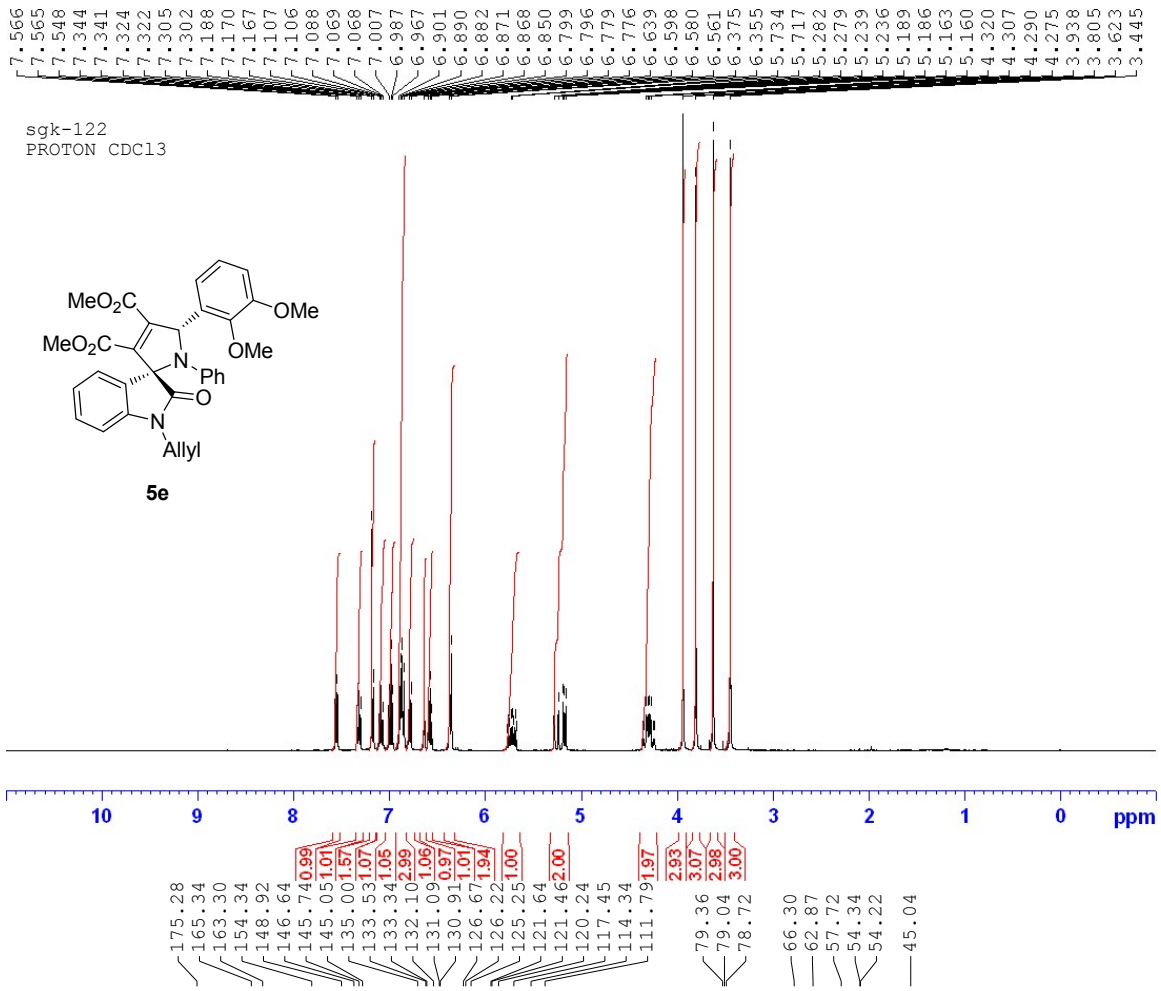
^{13}C DEPT NMR (100 MHz, $CDCl_3$)



HRMS Spectrum

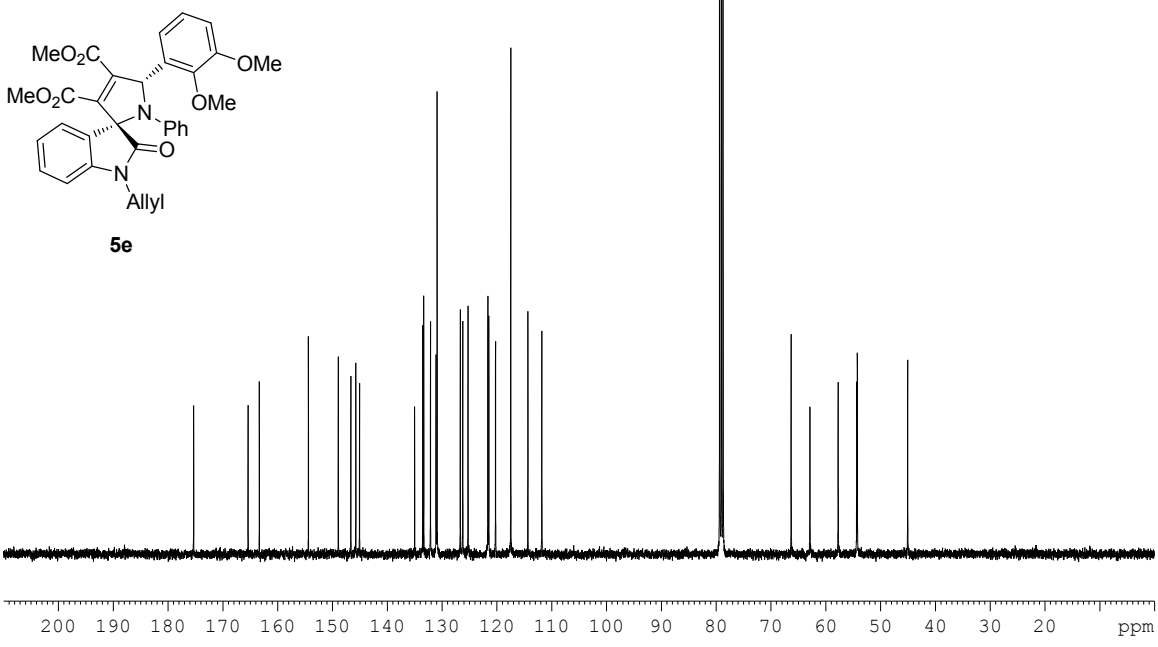


^{1}H NMR (400 MHz, $CDCl_3$)

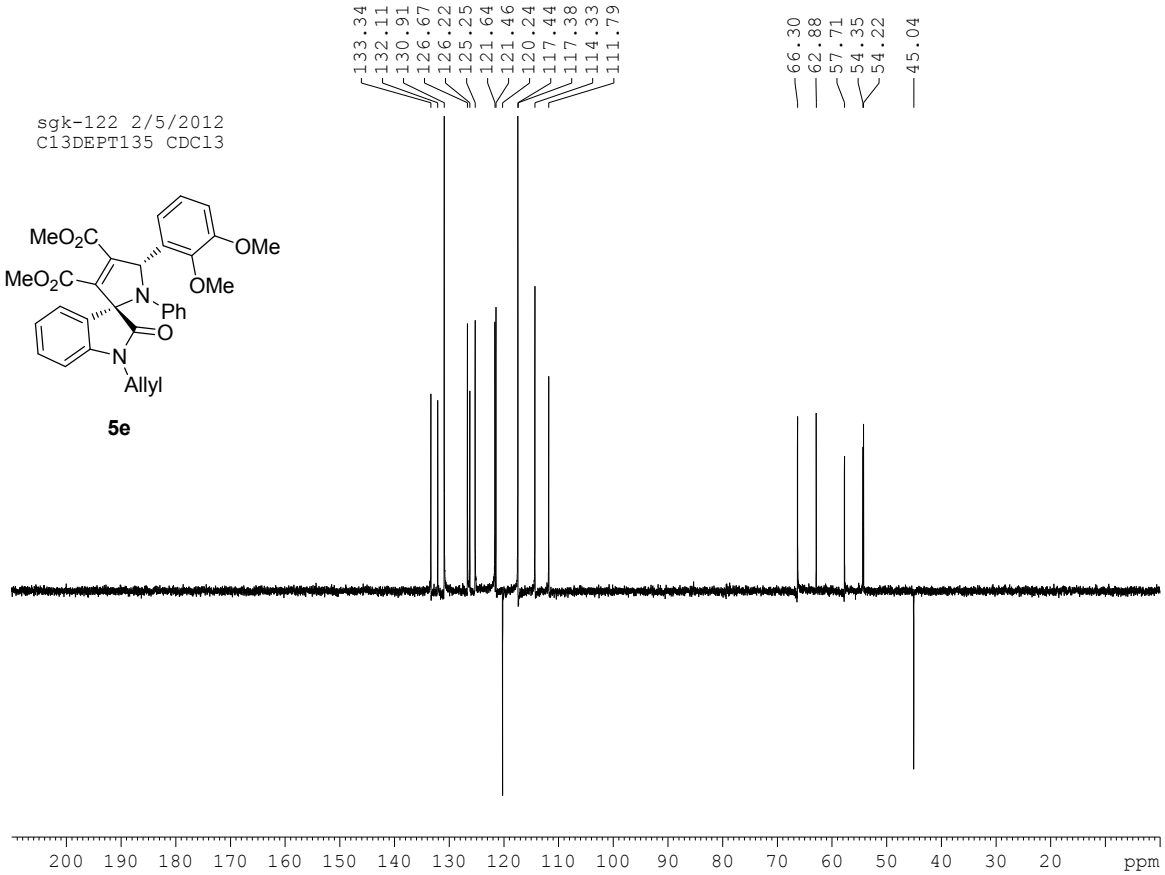


sgk-122 2/5/2012
C13CPD CDCl3

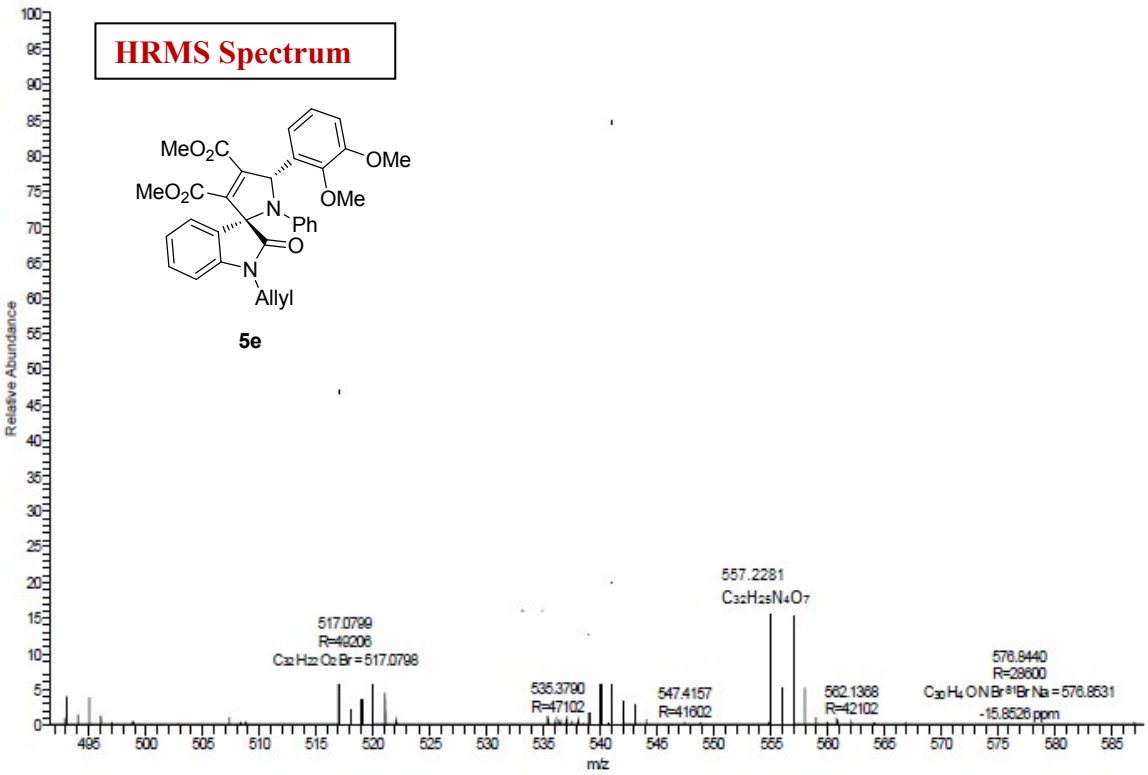
^{13}C NMR (100 MHz, $CDCl_3$)

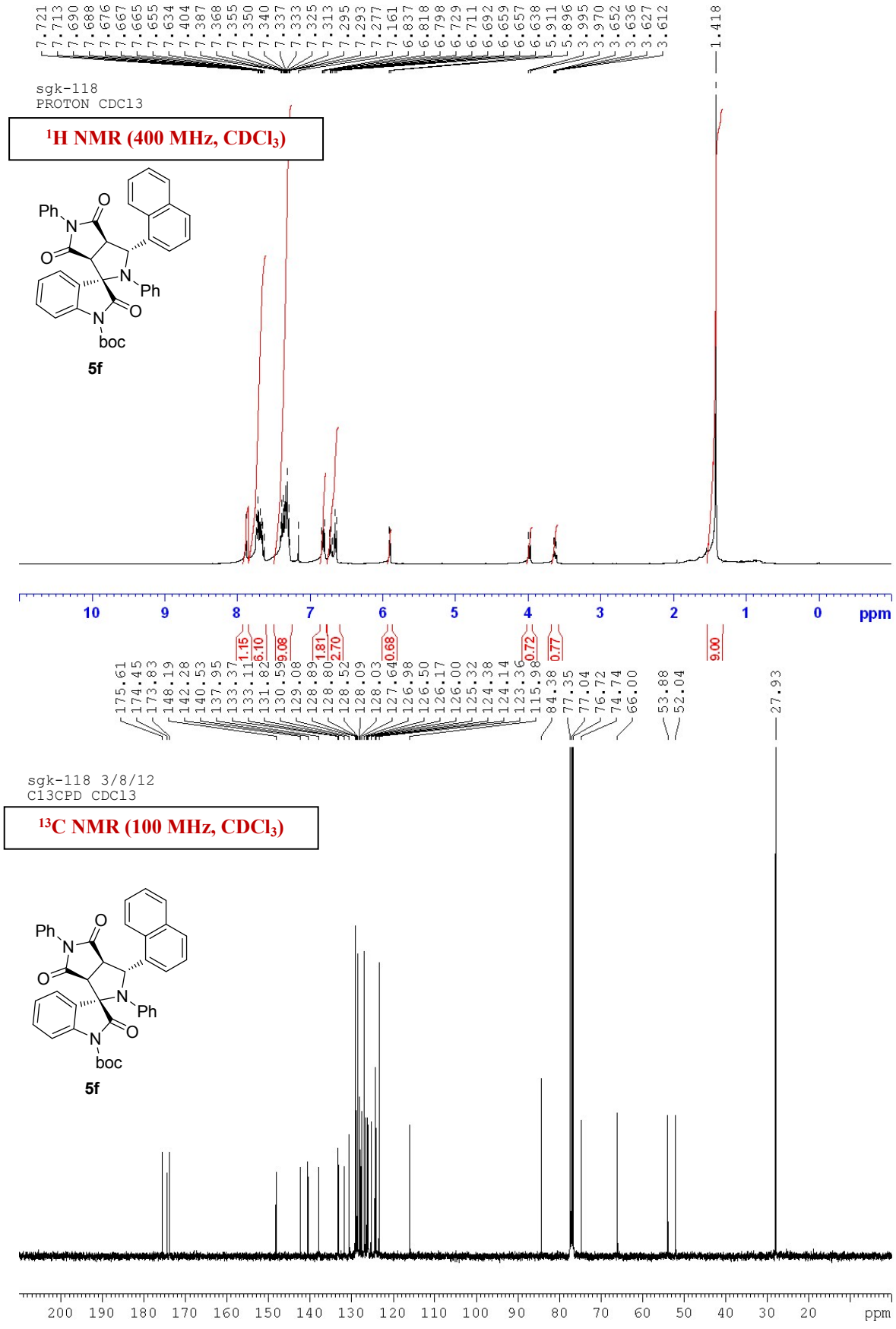


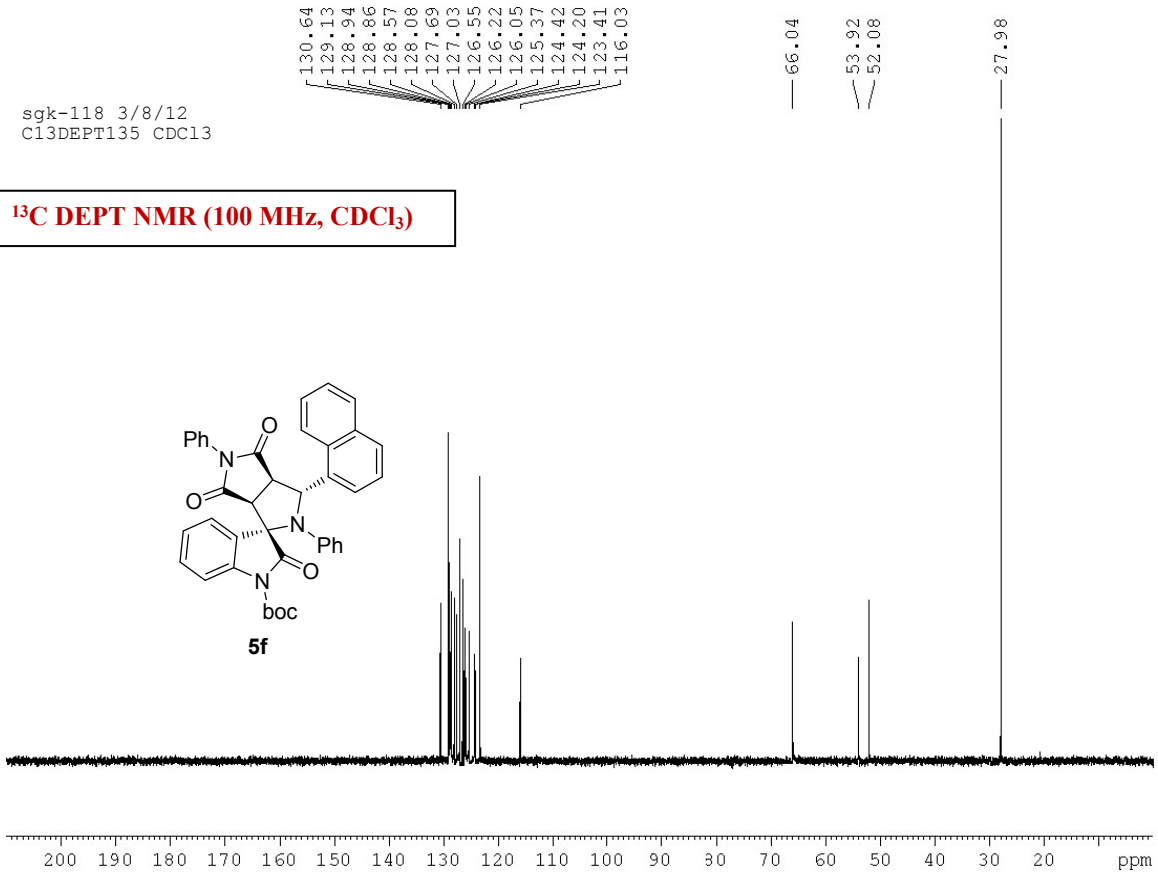
^{13}C DEPT NMR (100 MHz, $CDCl_3$)



5e



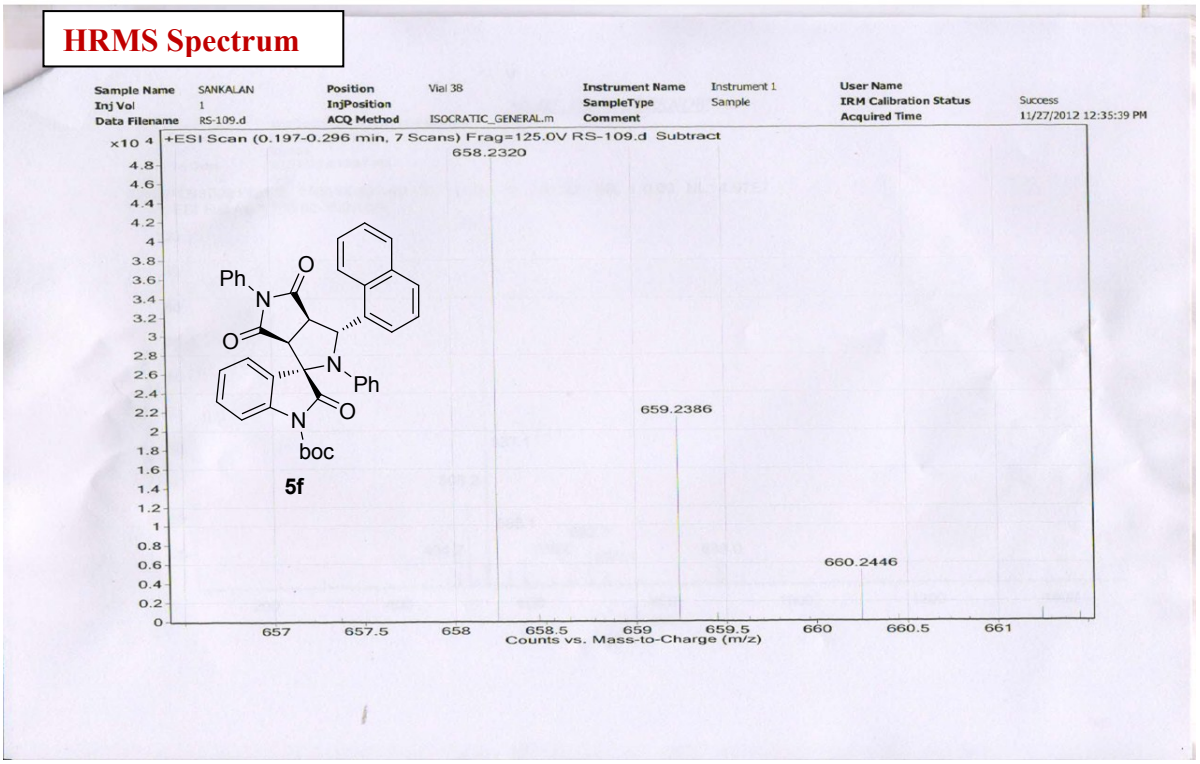

sgk-118
PROTON CDCl3
1H NMR (400 MHz, CDCl3)
Ph
N
O
O
N
Ph
O
N
boc
5f
10 9 8 7 6 5 4 3 2 1 0 ppm
sgk-118 3/8/12
C13CPD CDCl3
13C NMR (100 MHz, CDCl3)
Ph
N
O
O
N
Ph
O
N
boc
5f
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 ppm



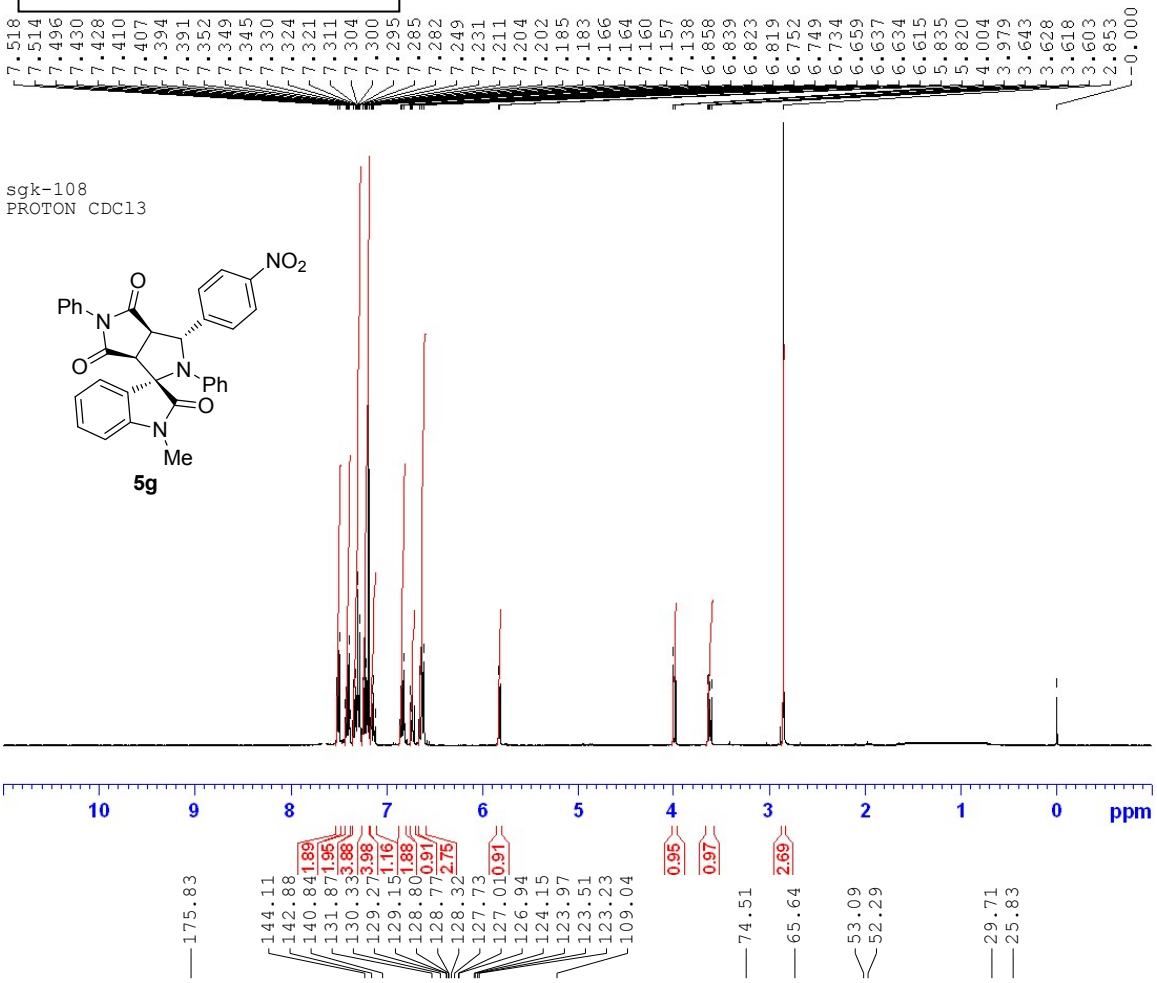
^{13}C DEPT NMR (100 MHz, $CDCl_3$)

5f

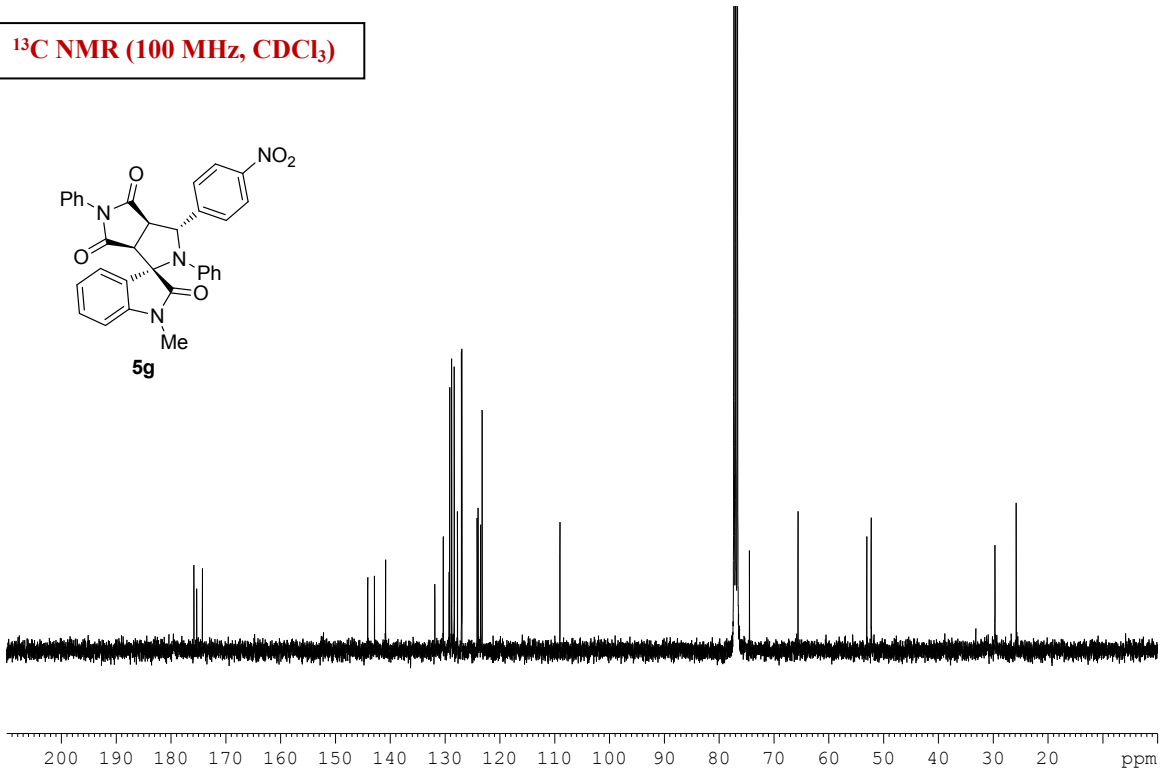
HRMS Spectrum



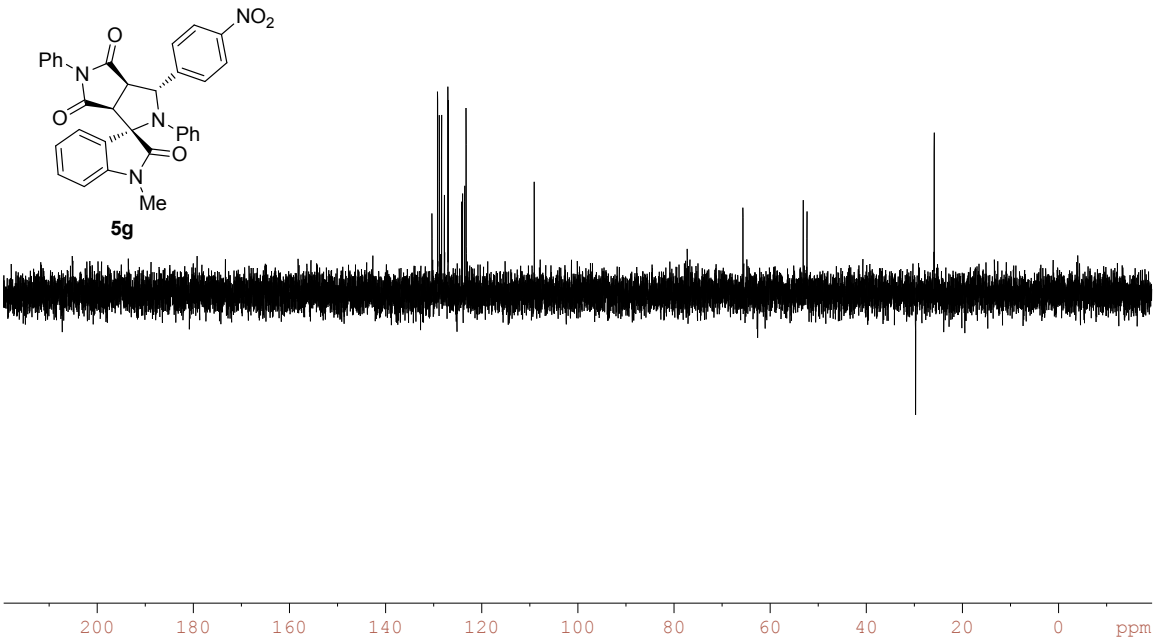
^{1}H NMR (400 MHz, $CDCl_3$)



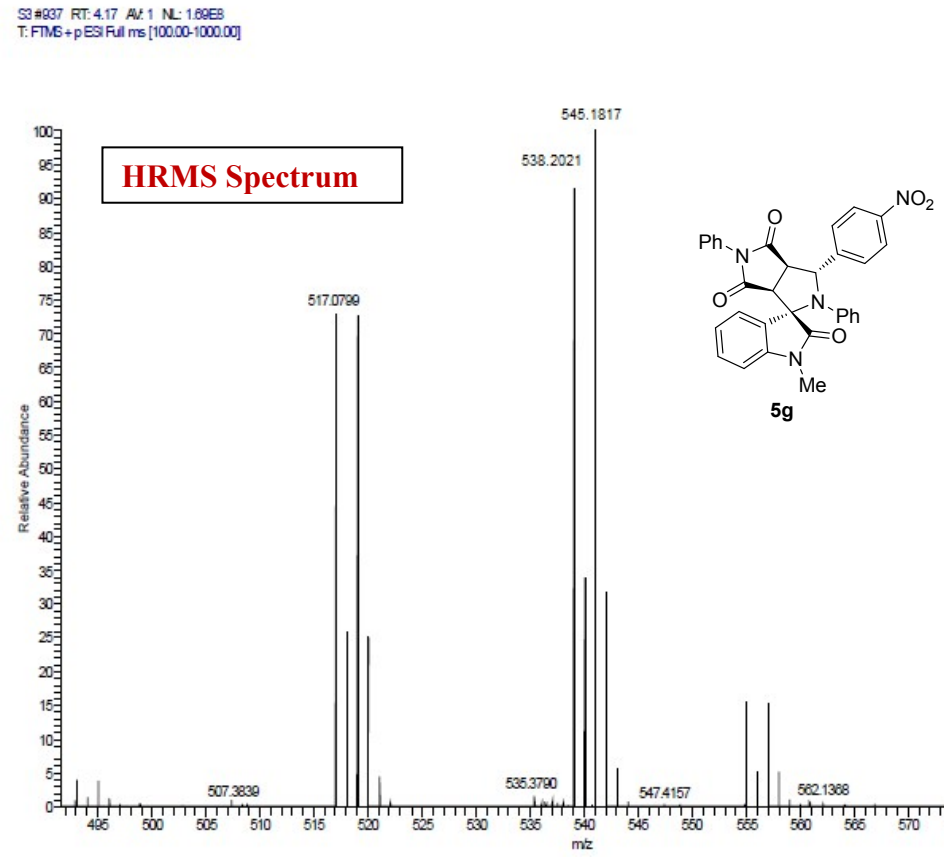
^{13}C NMR (100 MHz, $CDCl_3$)



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

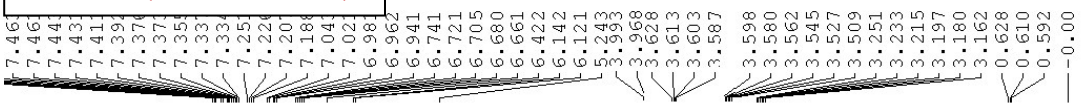


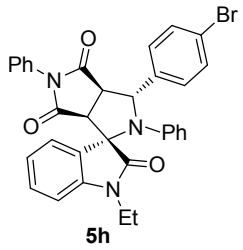
5g



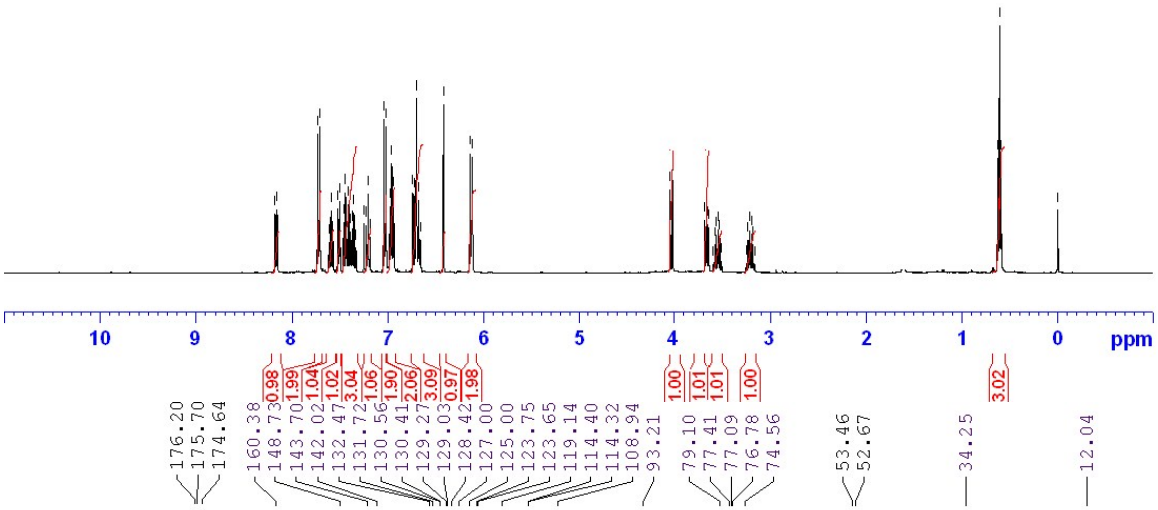
5g

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

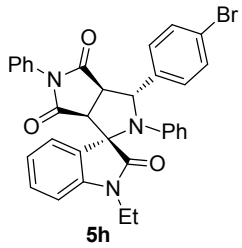




5h

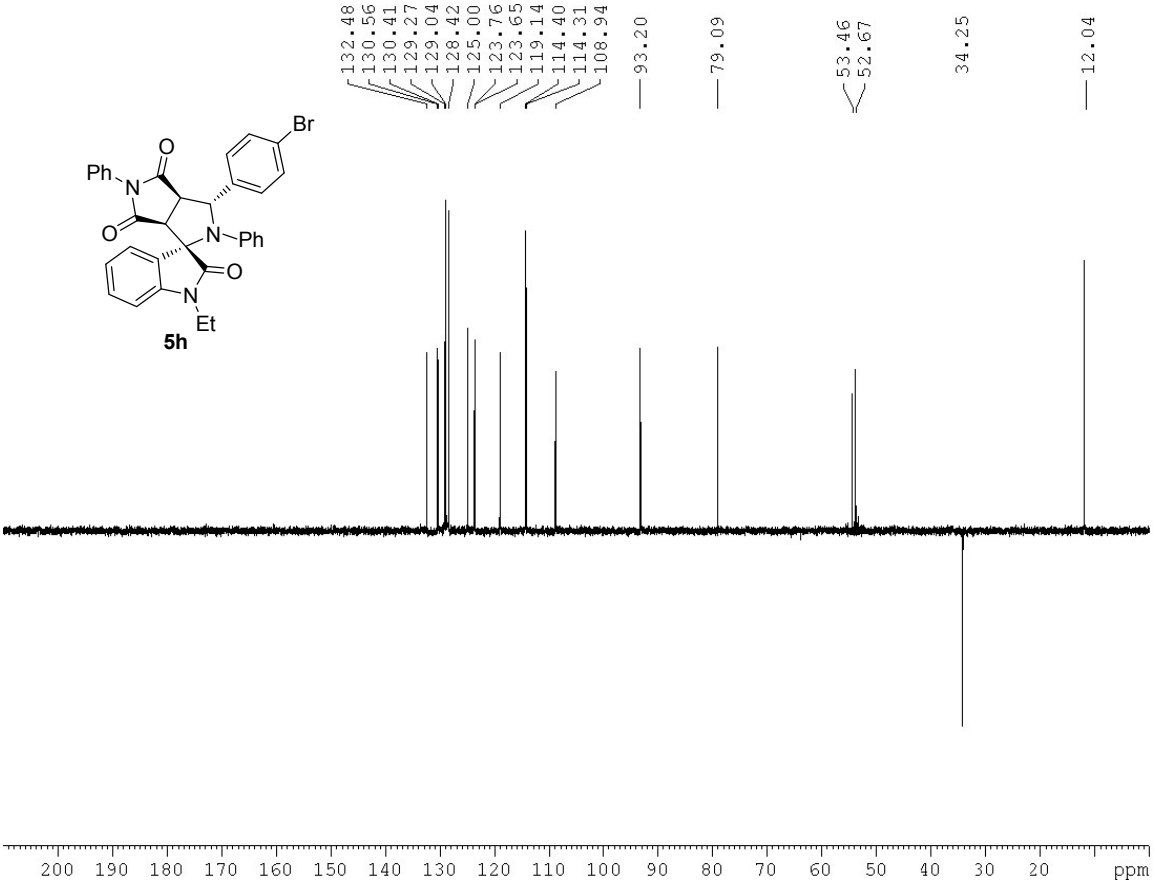


^{13}C NMR (100 MHz, $CDCl_3$)

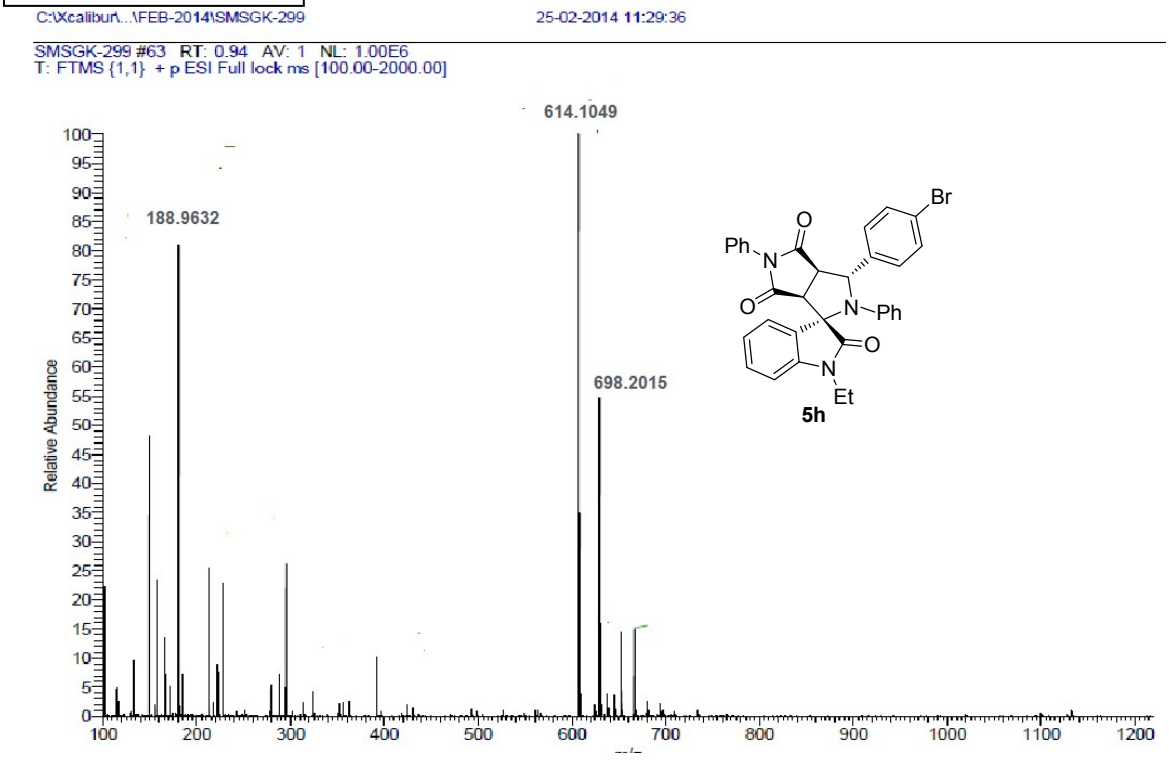


5h

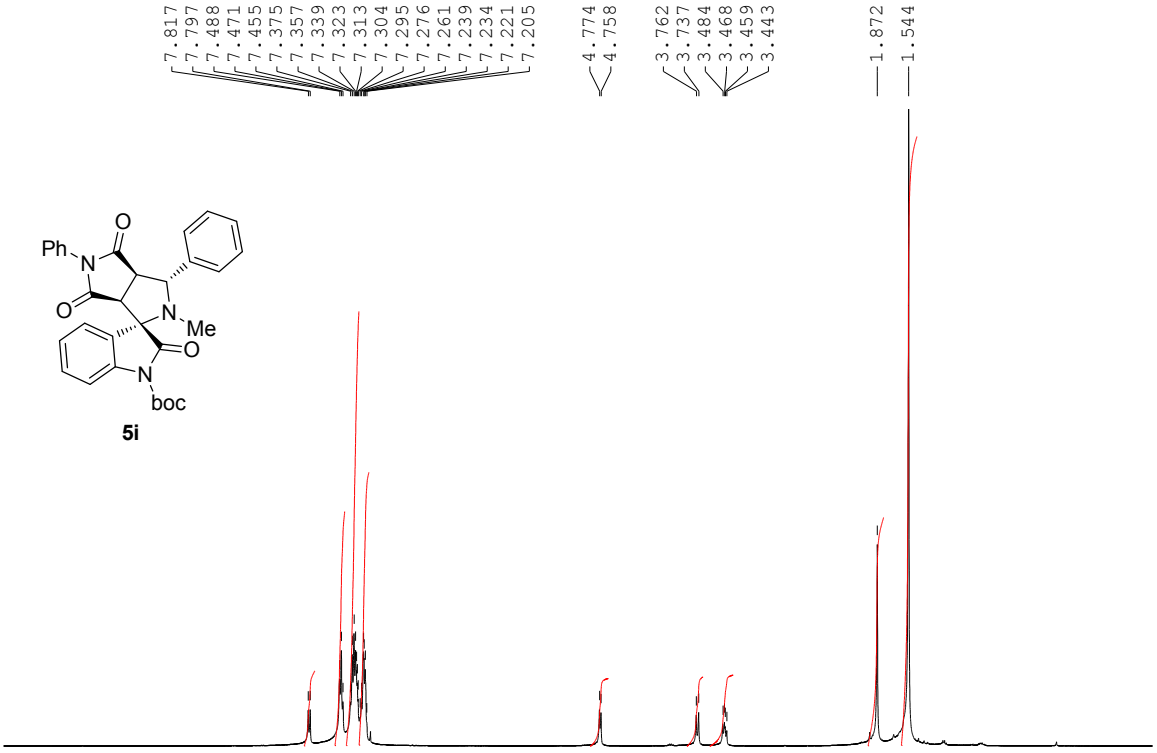
^{13}C DEPT NMR (100 MHz, $CDCl_3$)



HRMS Spectrum

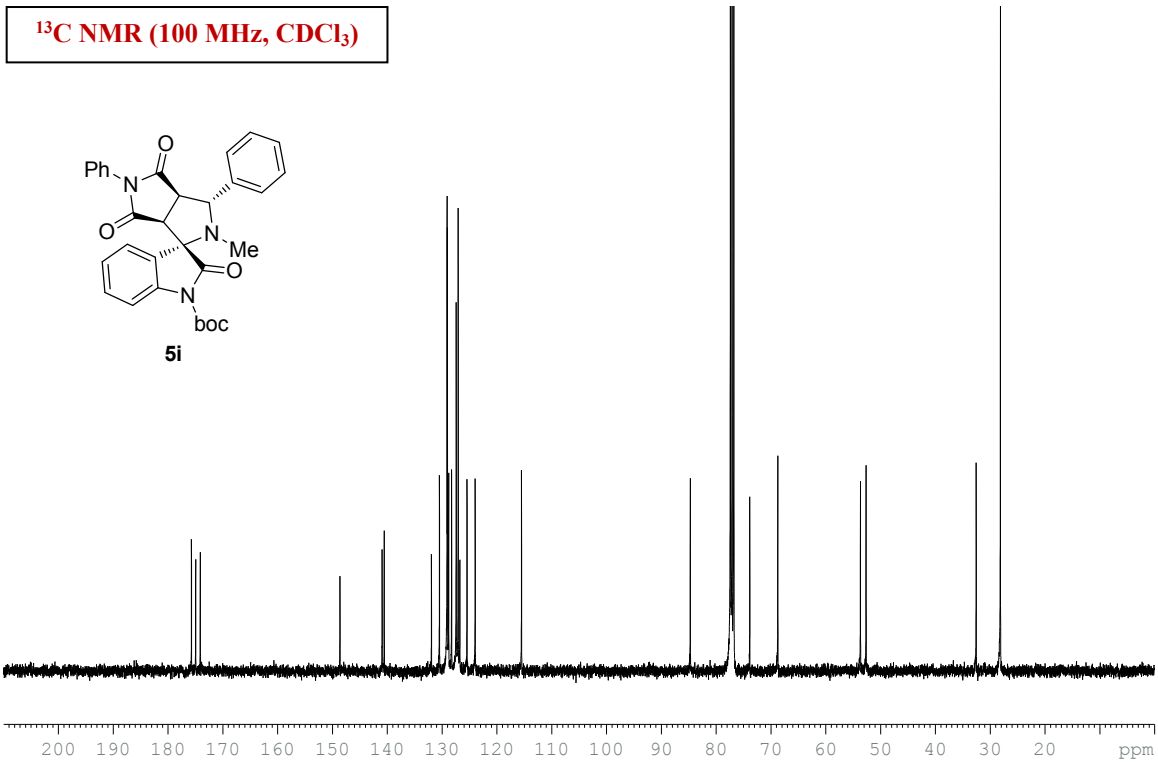


^{1}H NMR (400 MHz, $CDCl_3$)



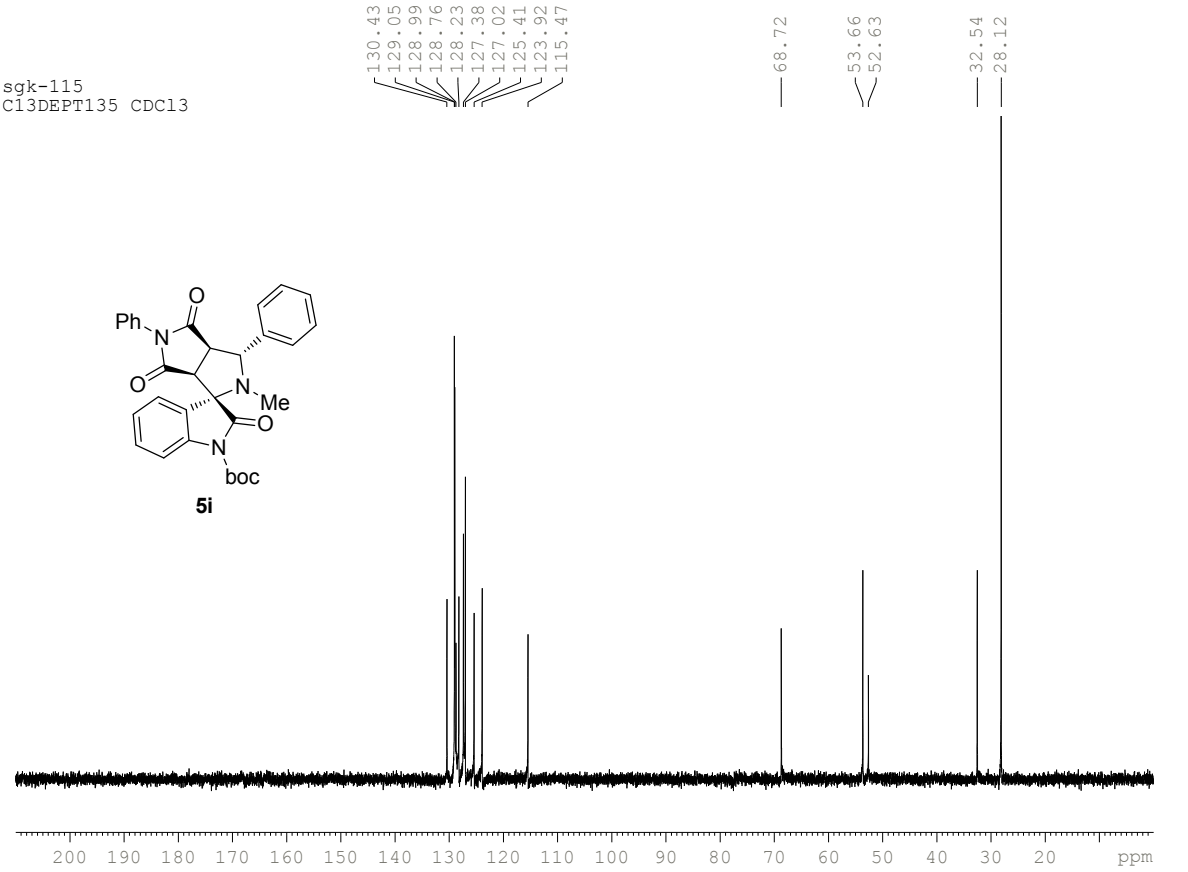
5i

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

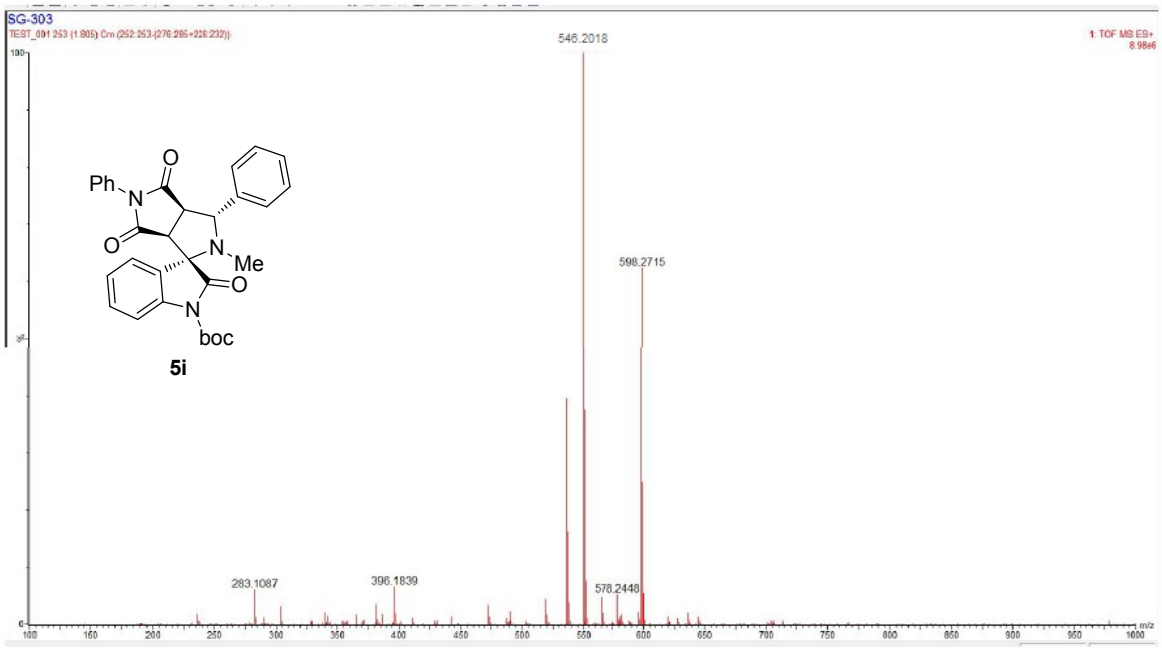


5i

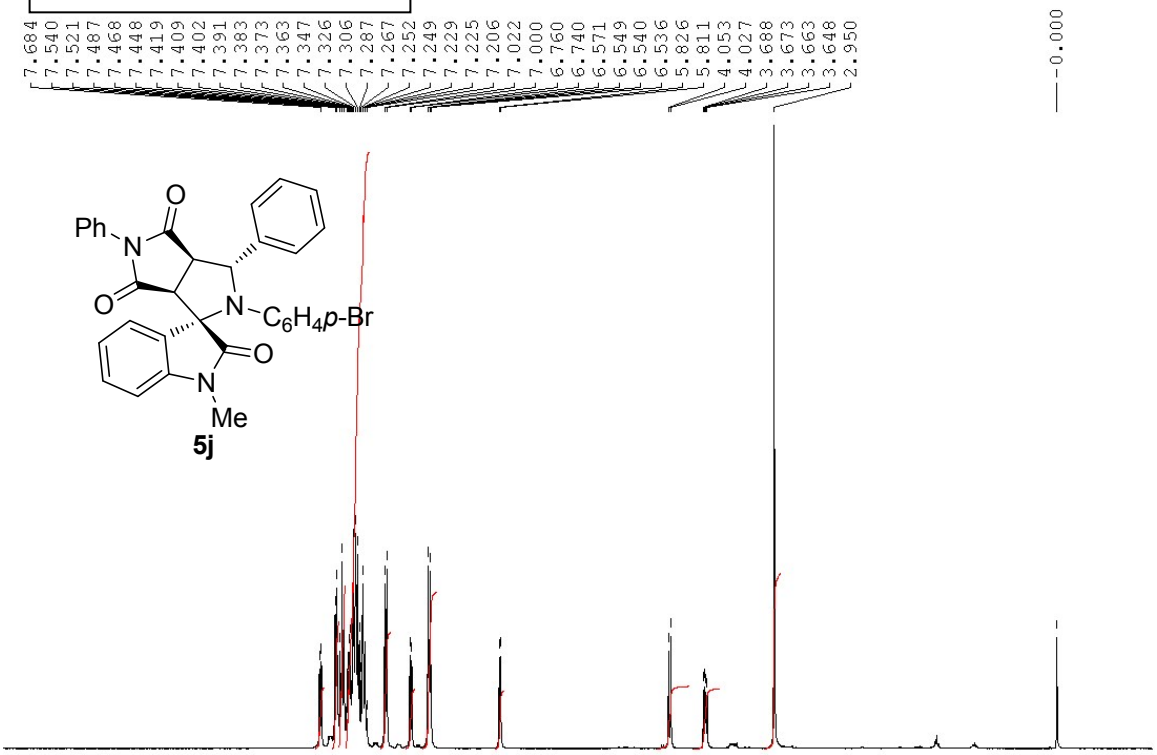
^{13}C DEPT NMR (100 MHz, $CDCl_3$)



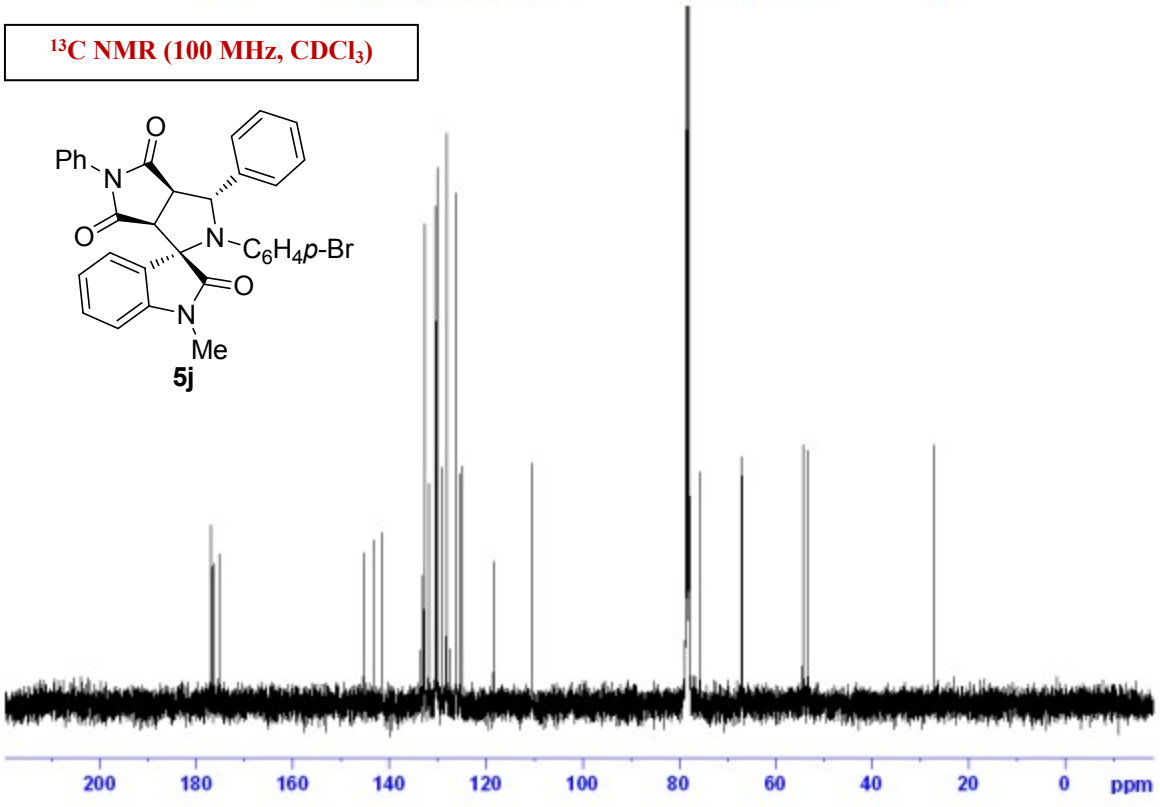
HRMS Spectrum



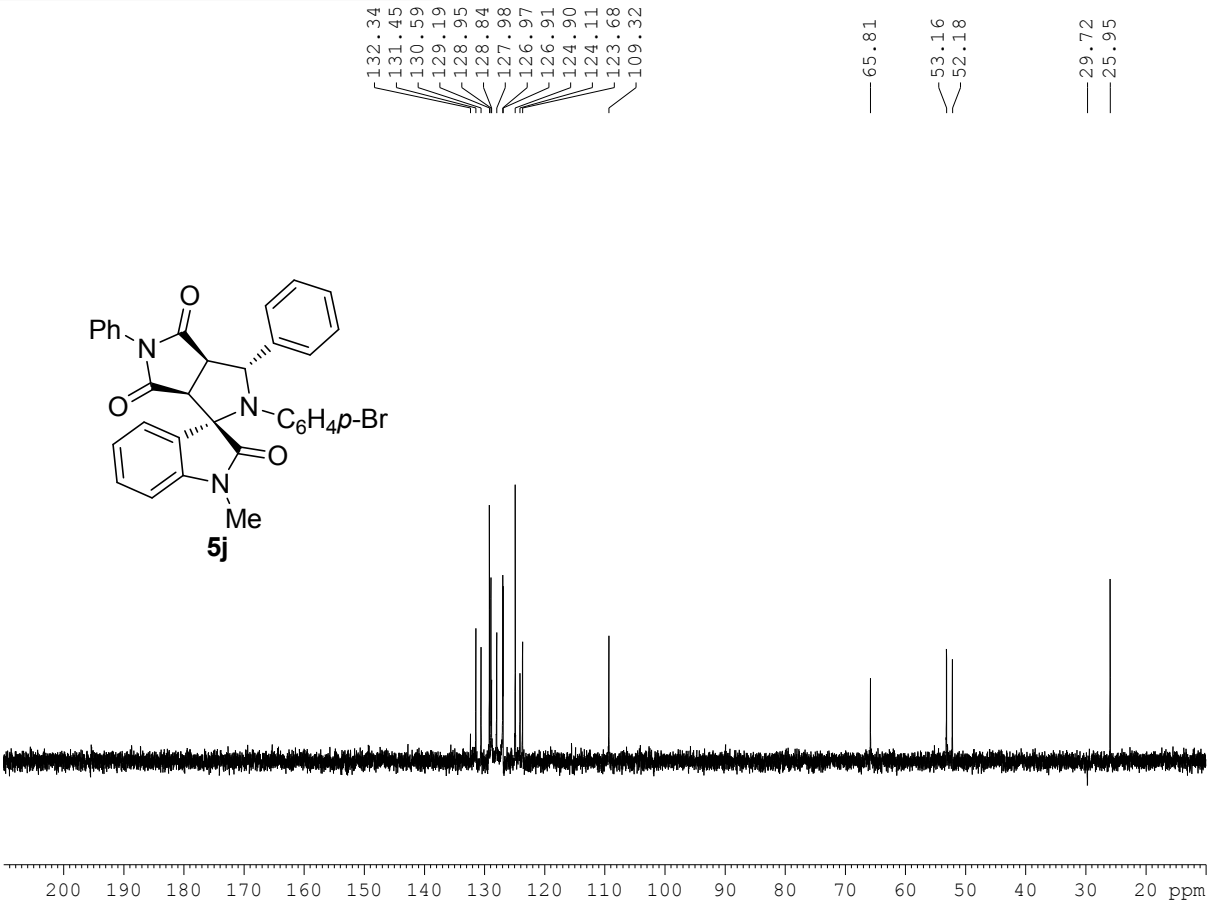
^{1}H NMR (400 MHz, $CDCl_3$)

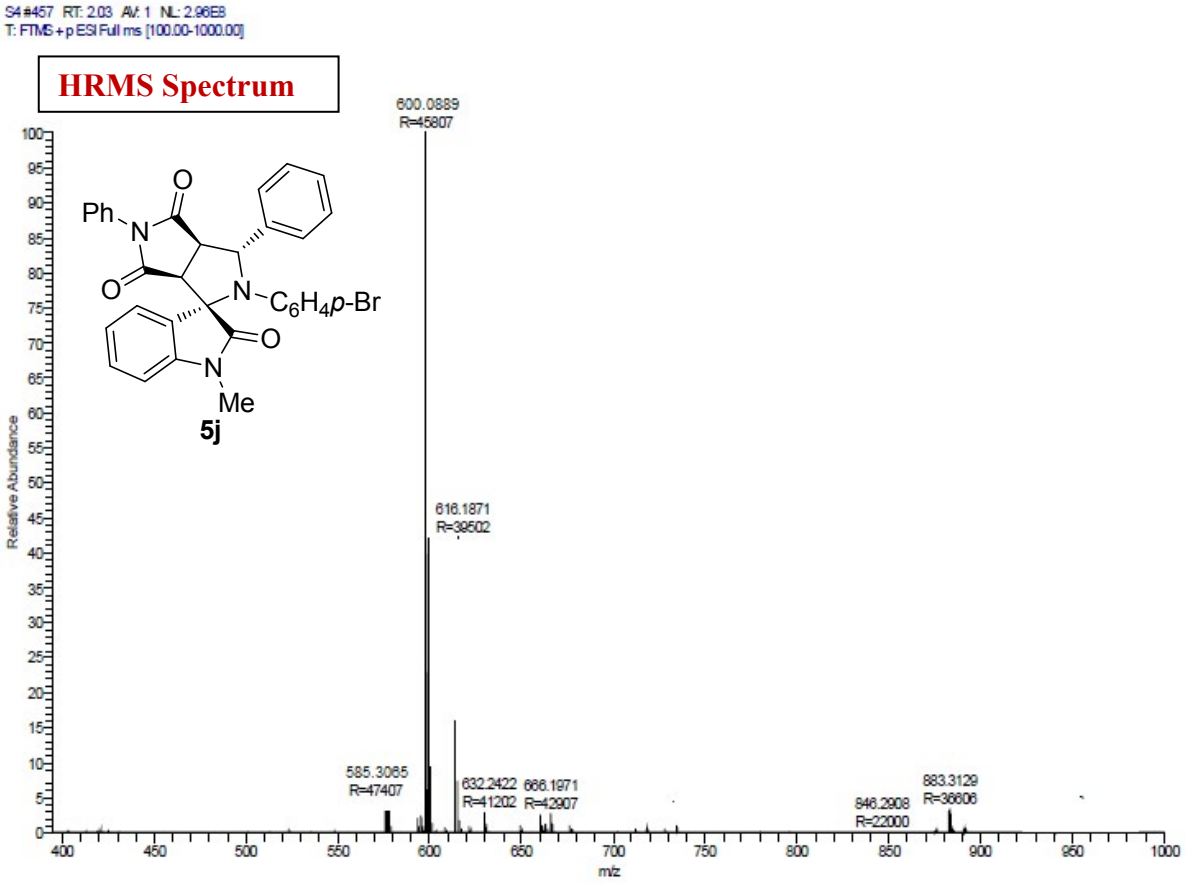


^{13}C NMR (100 MHz, $CDCl_3$)

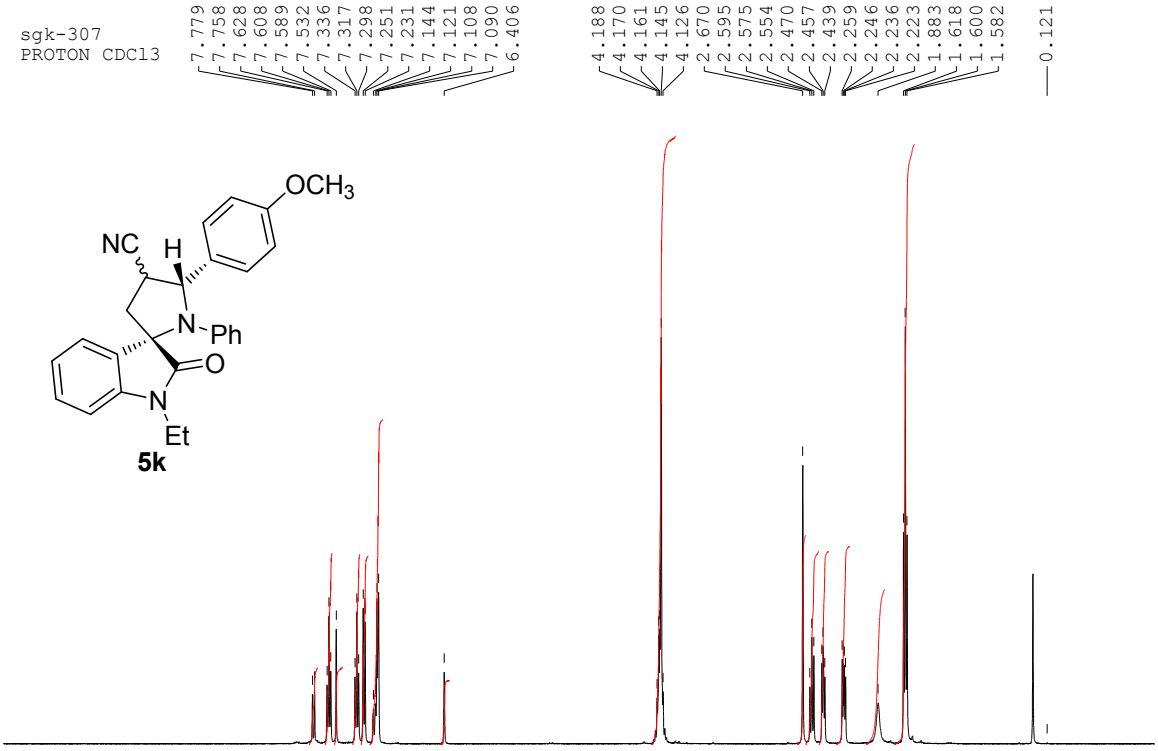


^{13}C DEPT NMR (100 MHz, $CDCl_3$)

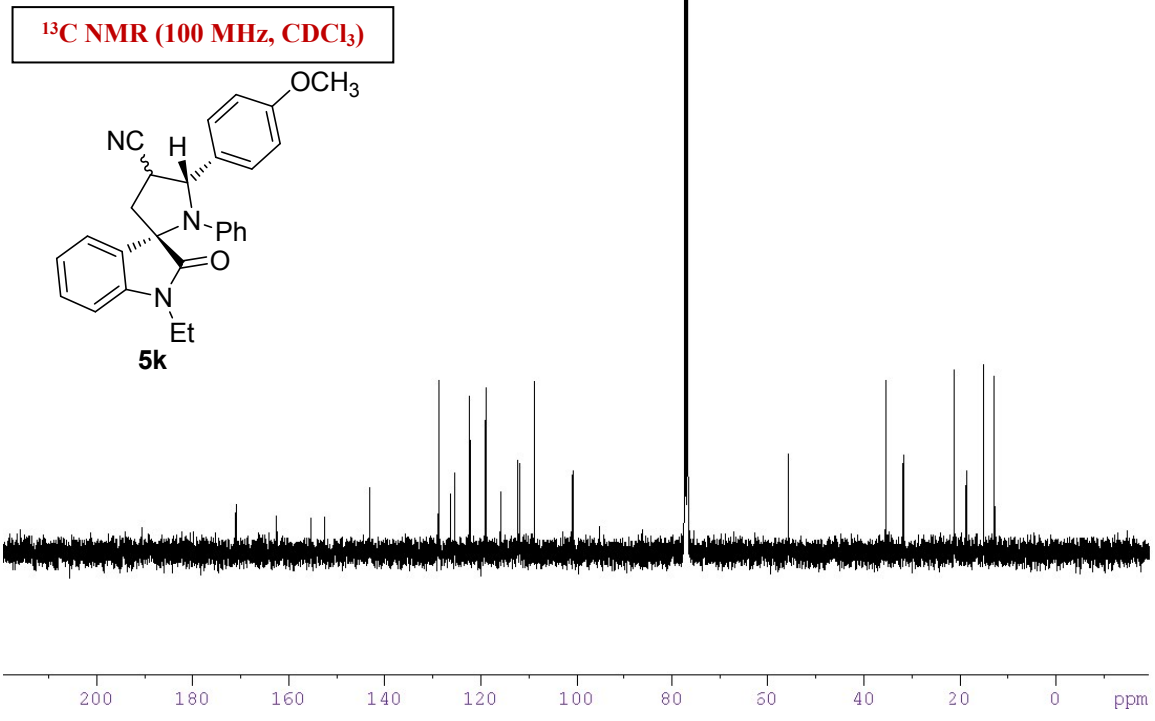




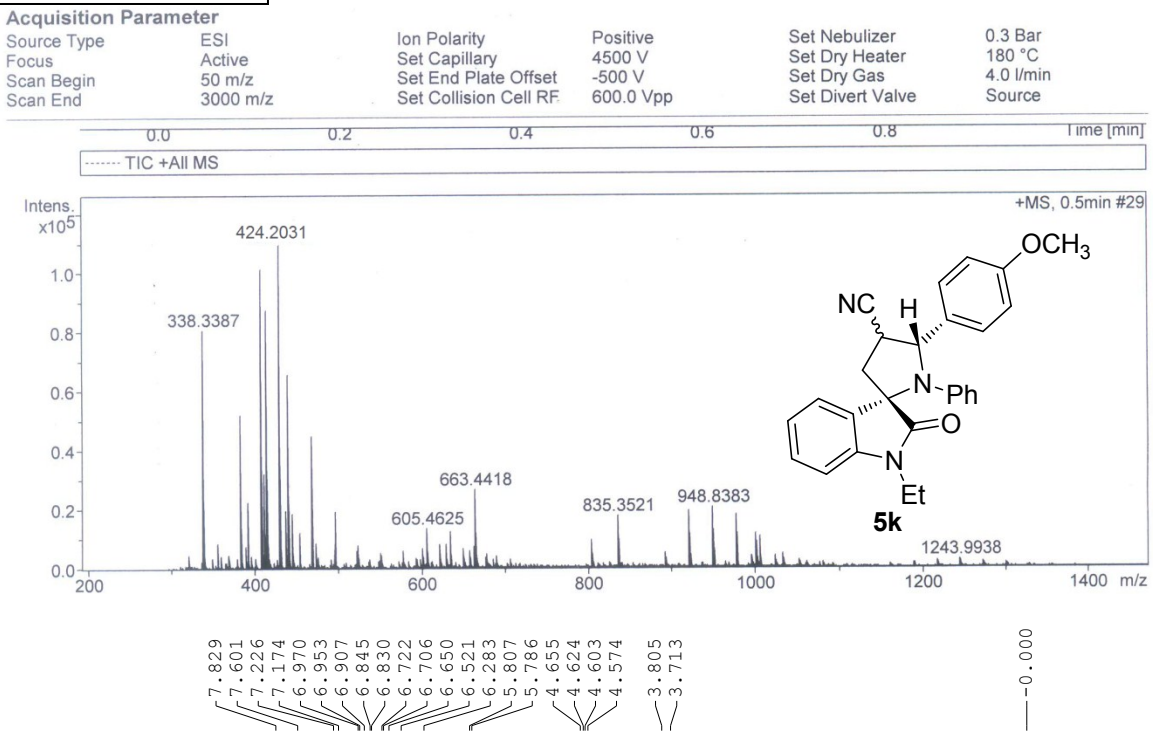
^{1}H NMR (400 MHz, $CDCl_3$)



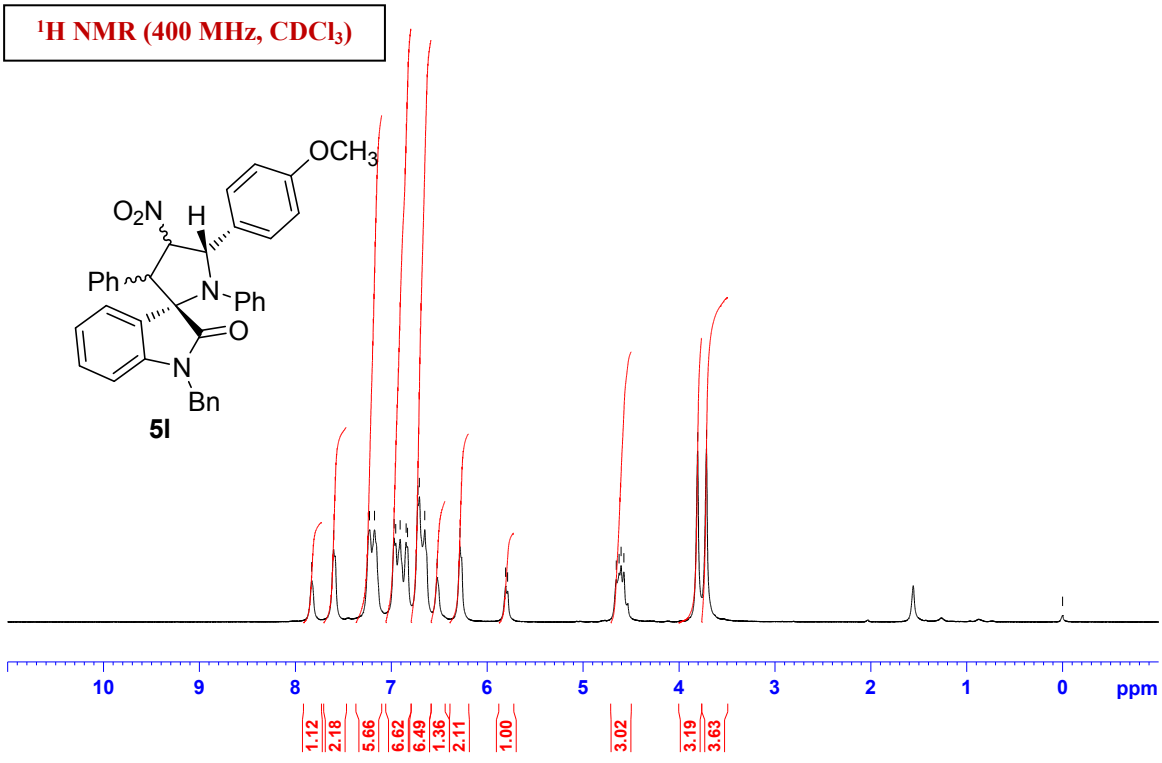
^{13}C NMR (100 MHz, $CDCl_3$)

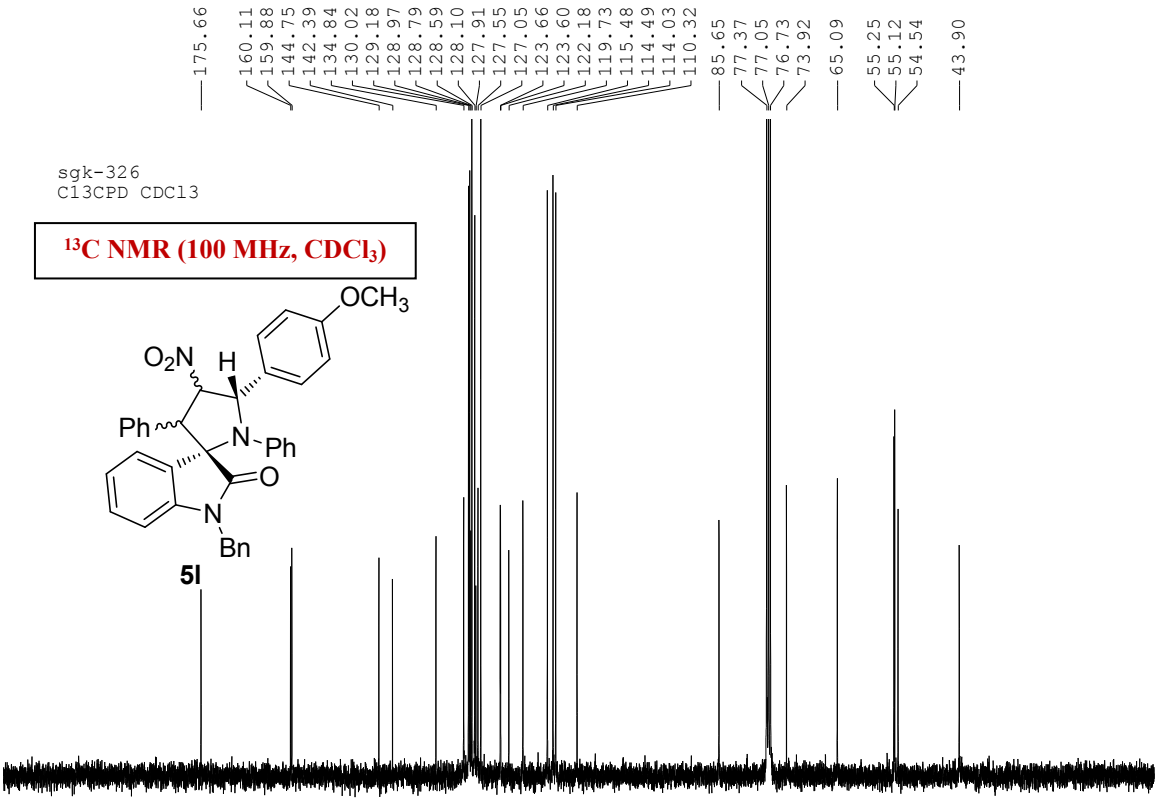


HRMS Spectrum



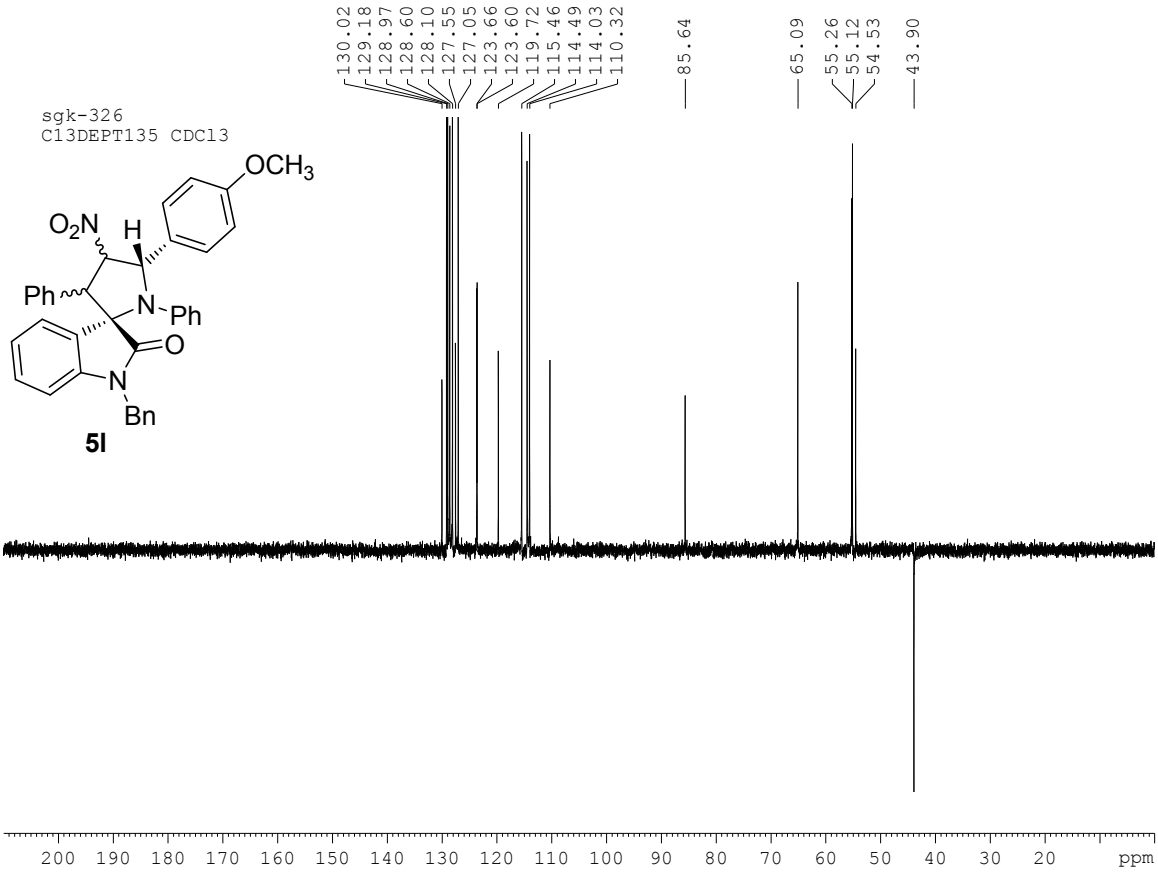
^{1}H NMR (400 MHz, $CDCl_3$)





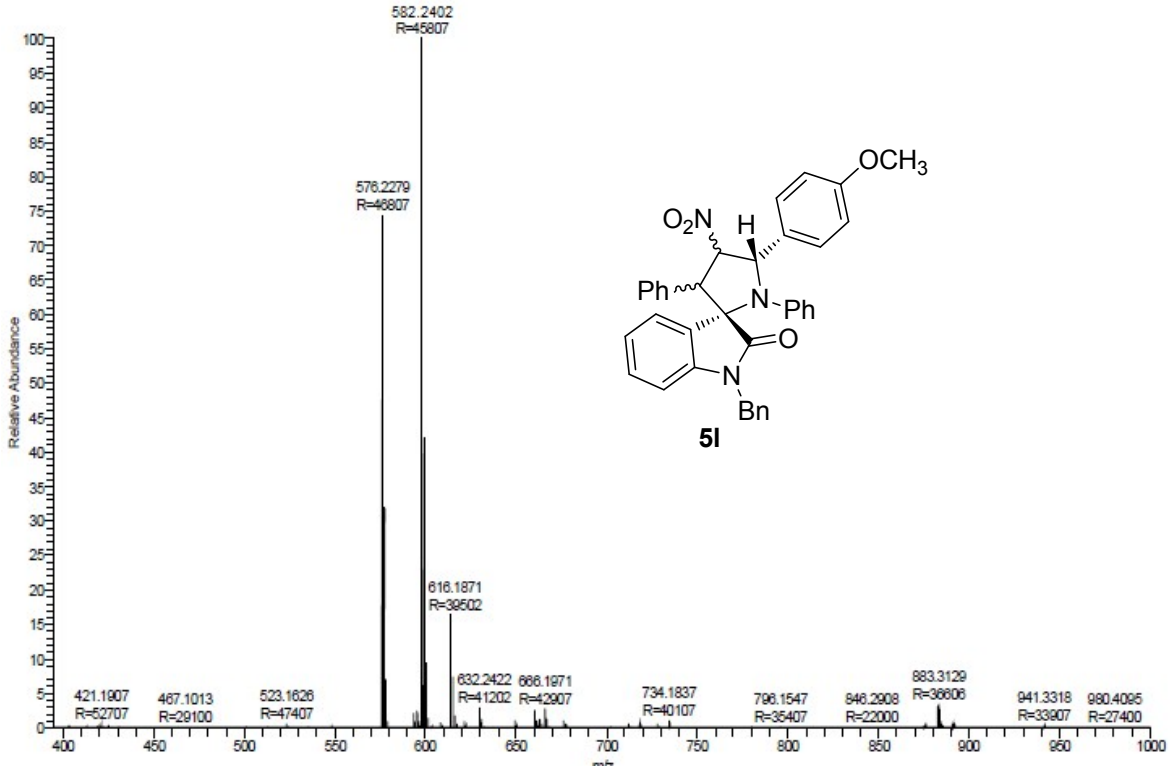
^{13}C NMR (100 MHz, $CDCl_3$)

^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



HRMS Spectrum

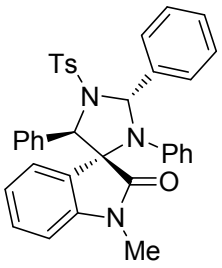
S4 #457 RT: 2.03 AV: 1 NL: 2.96E8
T: FTMS + p ESI Full ms [100.00-1000.00]



5l

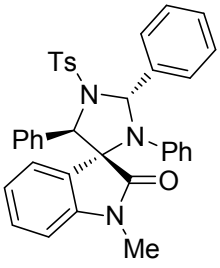
1H, 13C, DEPT135 NMR and HRMS spectra of spiroindoloimidazolidines

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



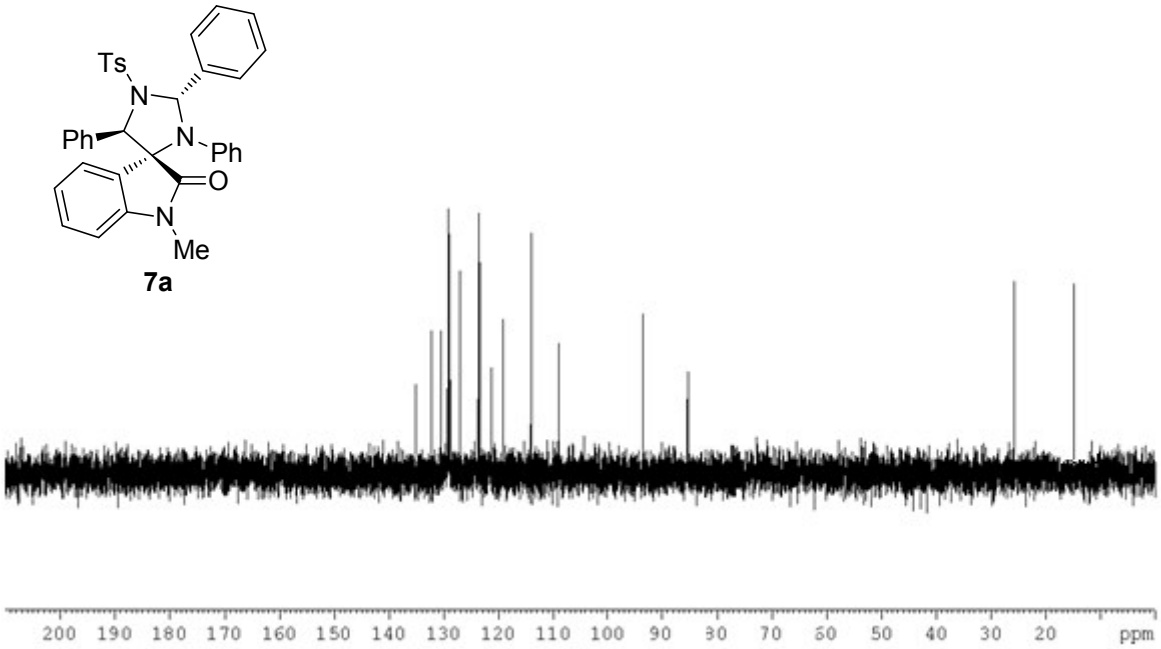
7a

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

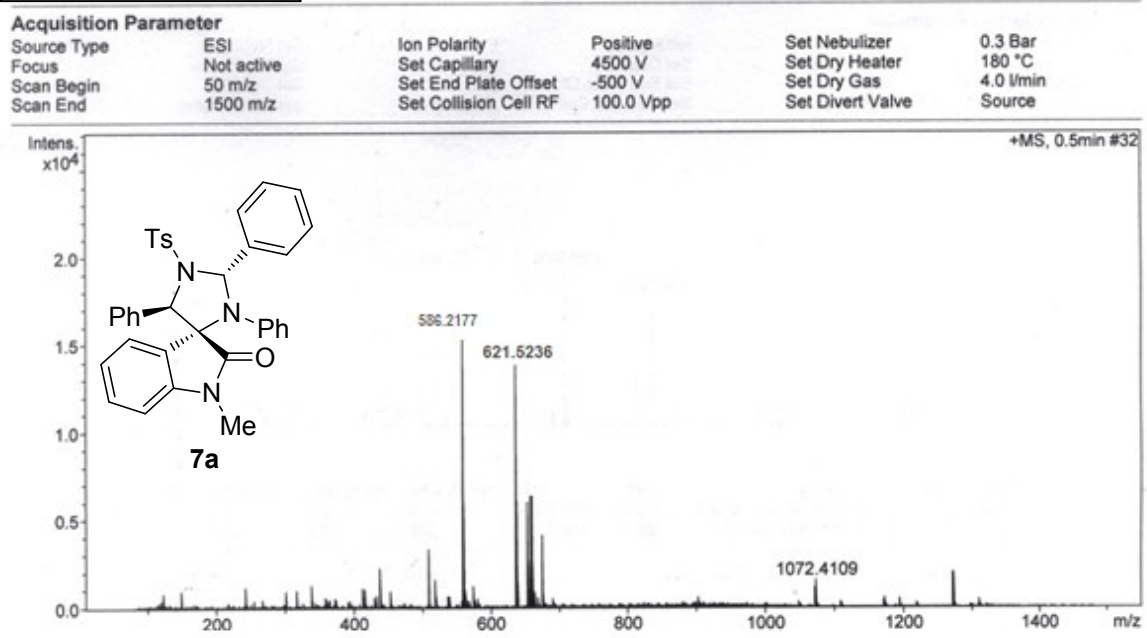


7a

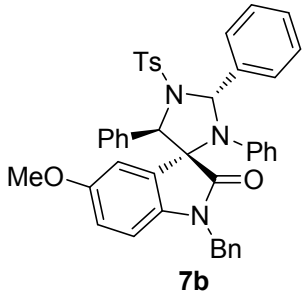
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



HRMS Spectrum

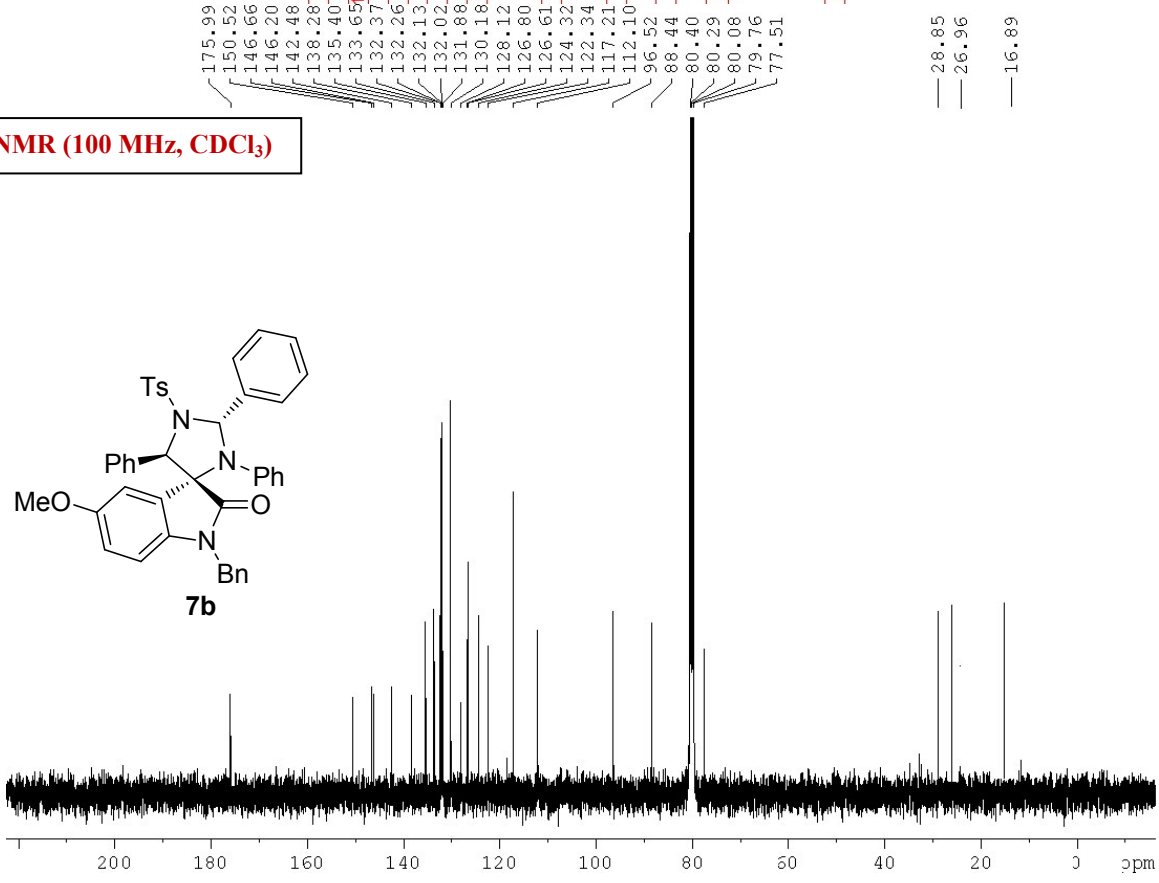


^{1}H NMR (400 MHz, $CDCl_3$)



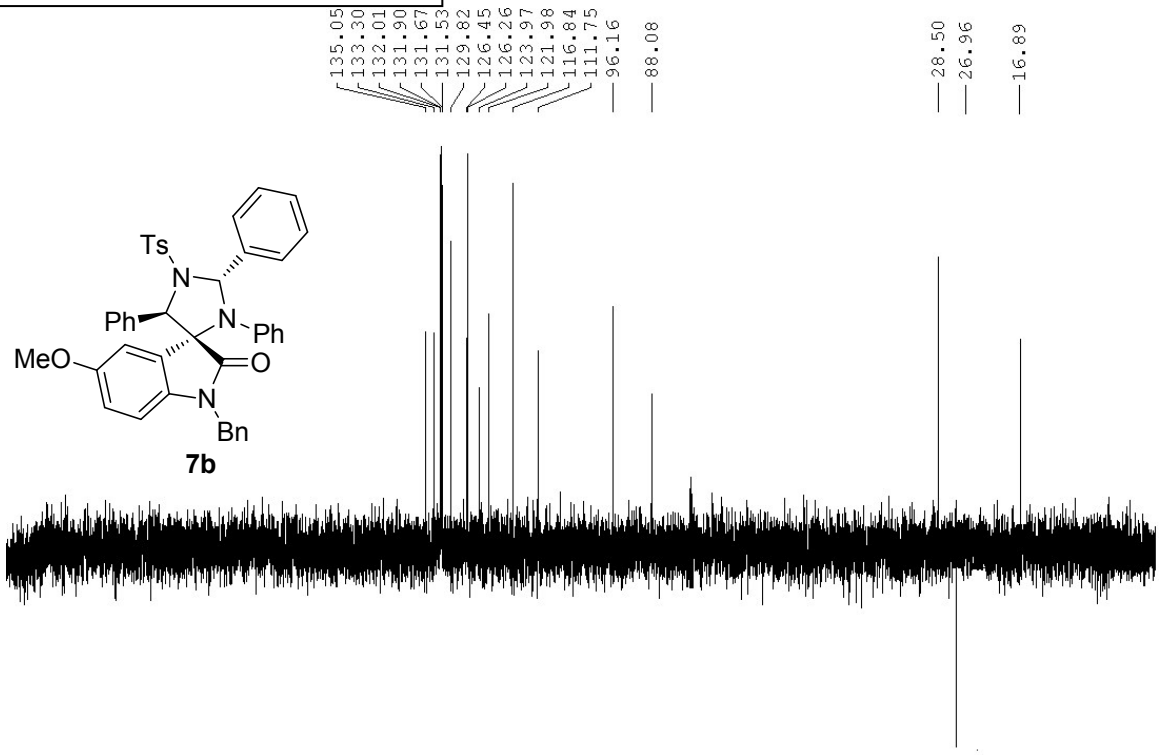
7b

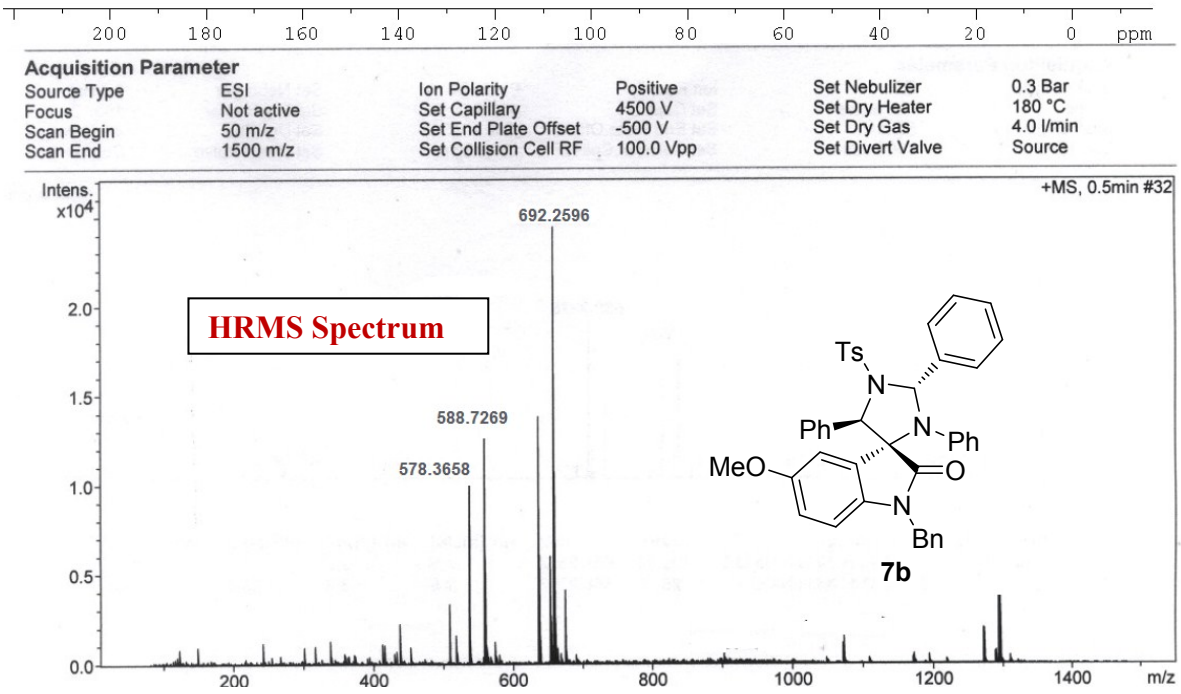
^{13}C NMR (100 MHz, $CDCl_3$)



7b

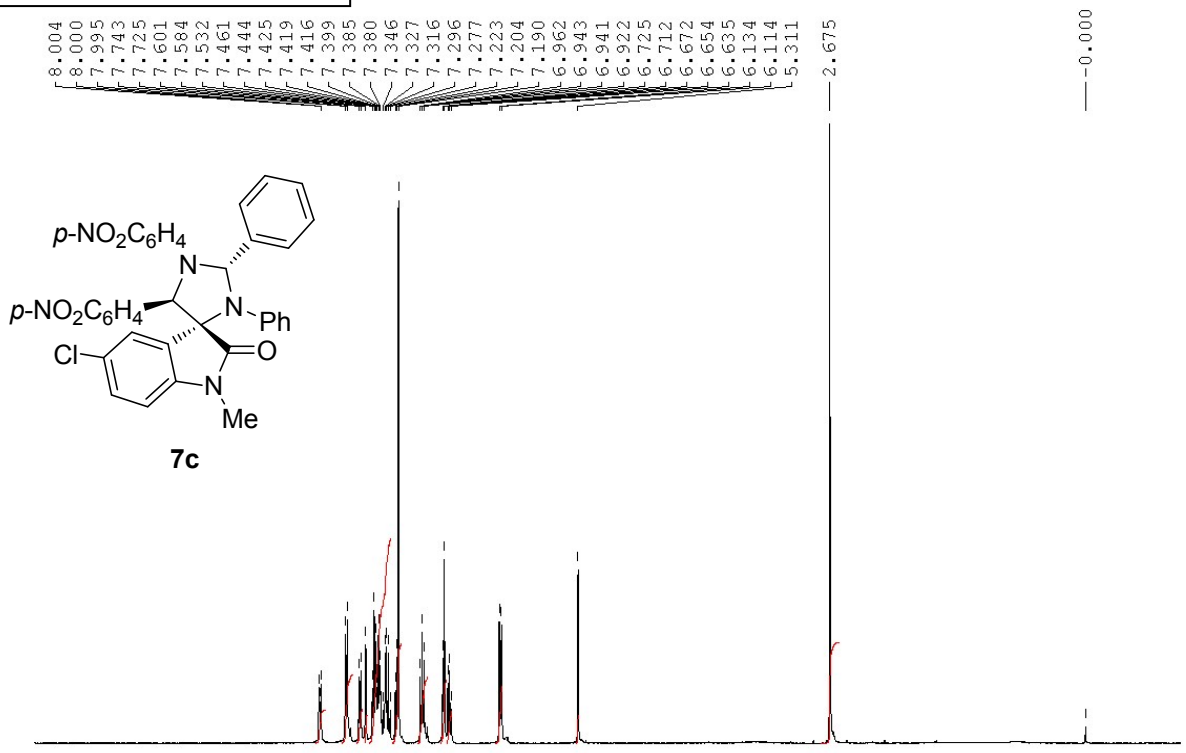
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)

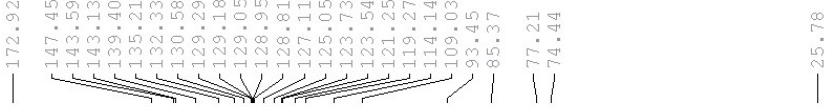




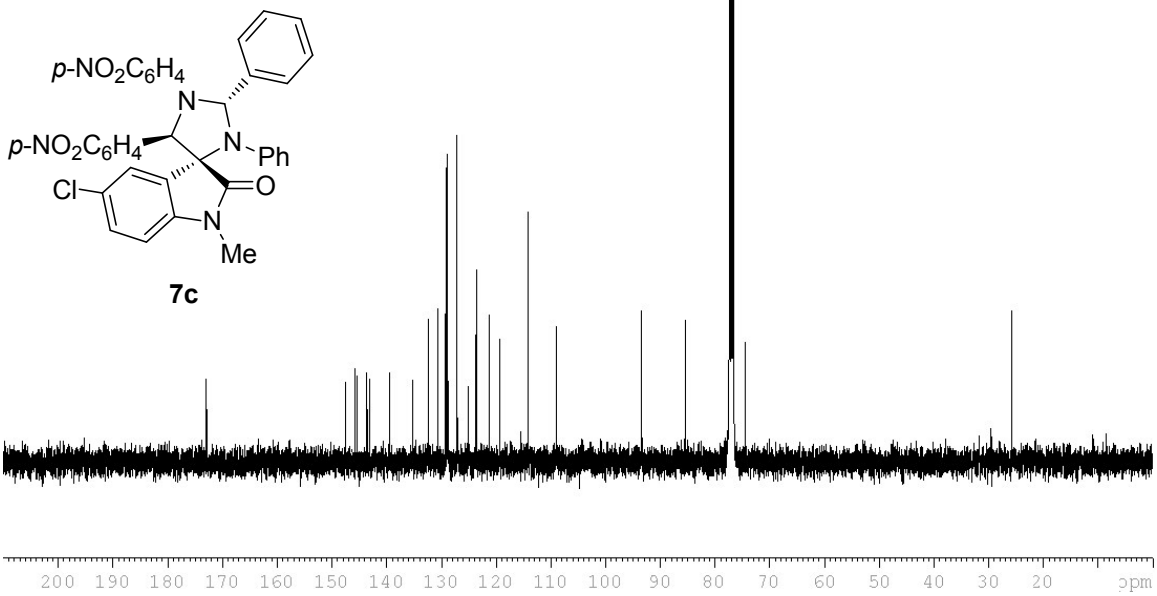
HRMS Spectrum

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

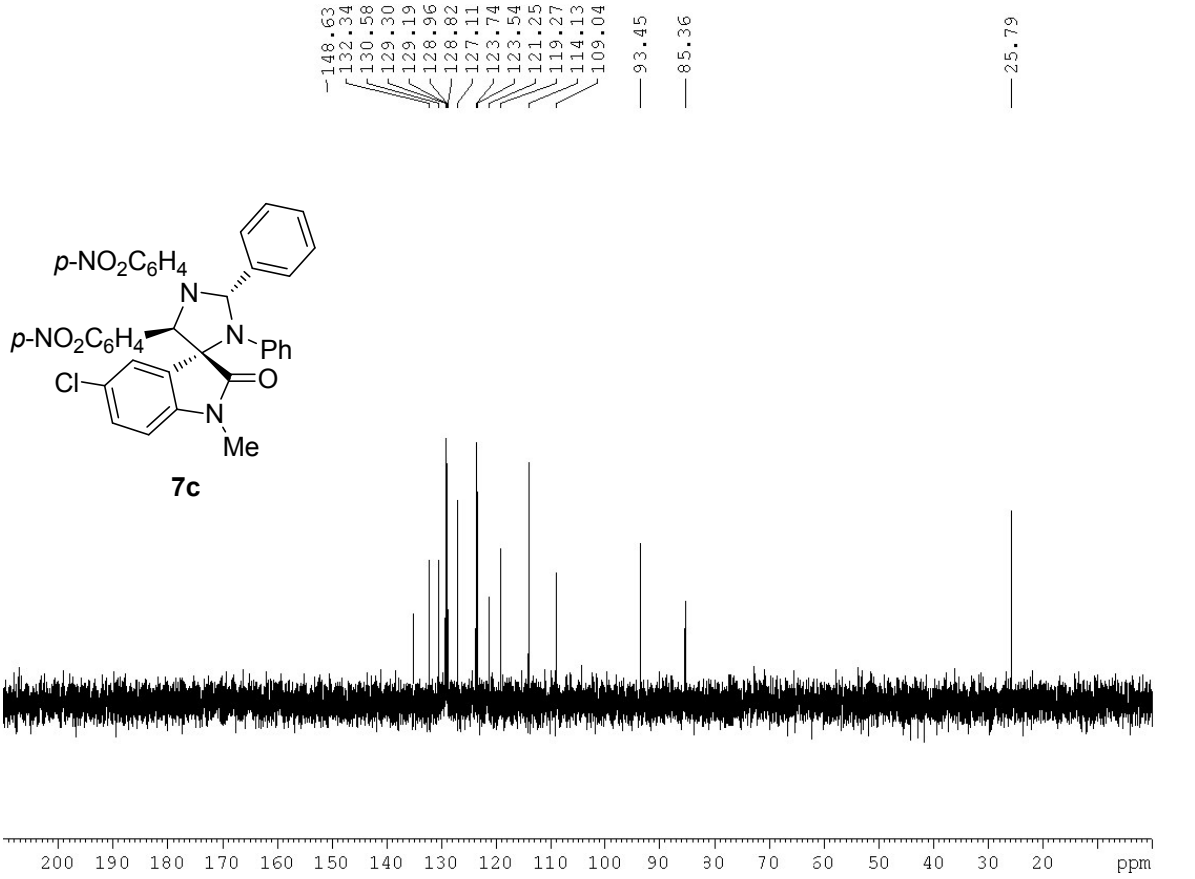




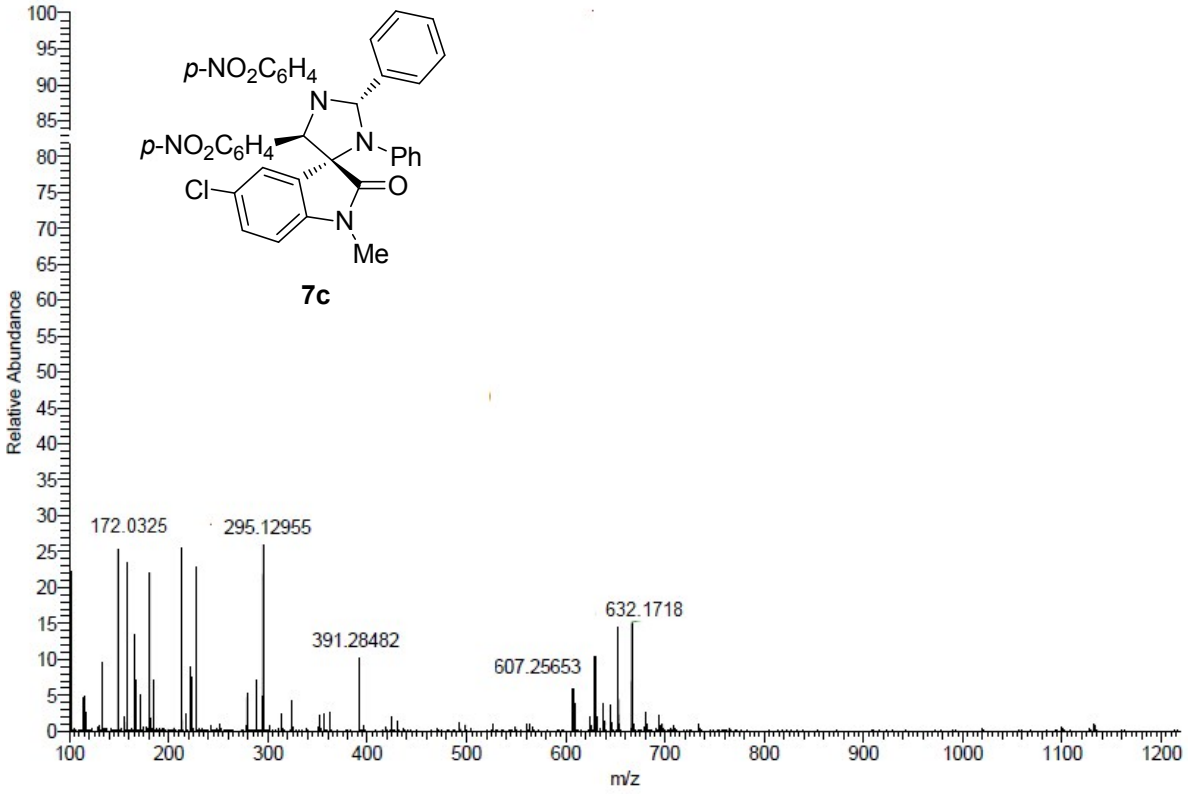
^{13}C NMR (100 MHz, $CDCl_3$)

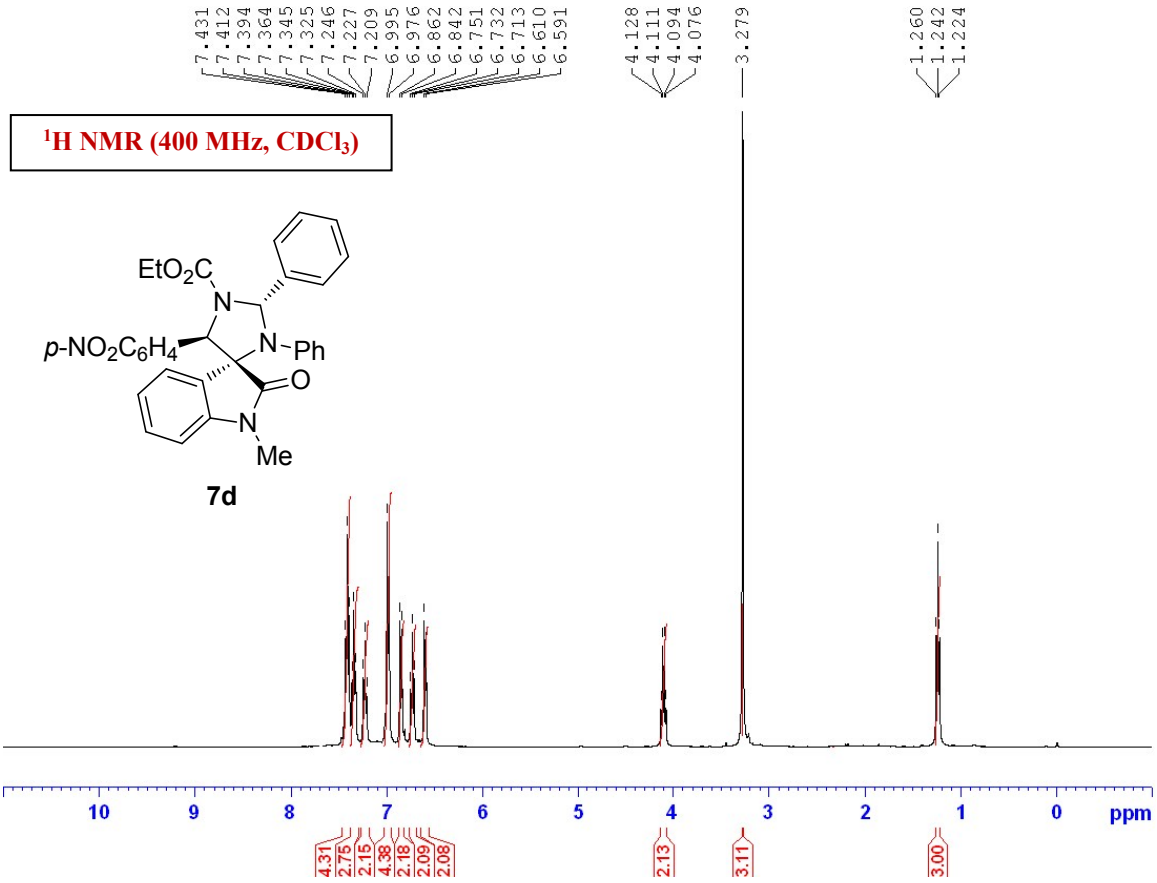


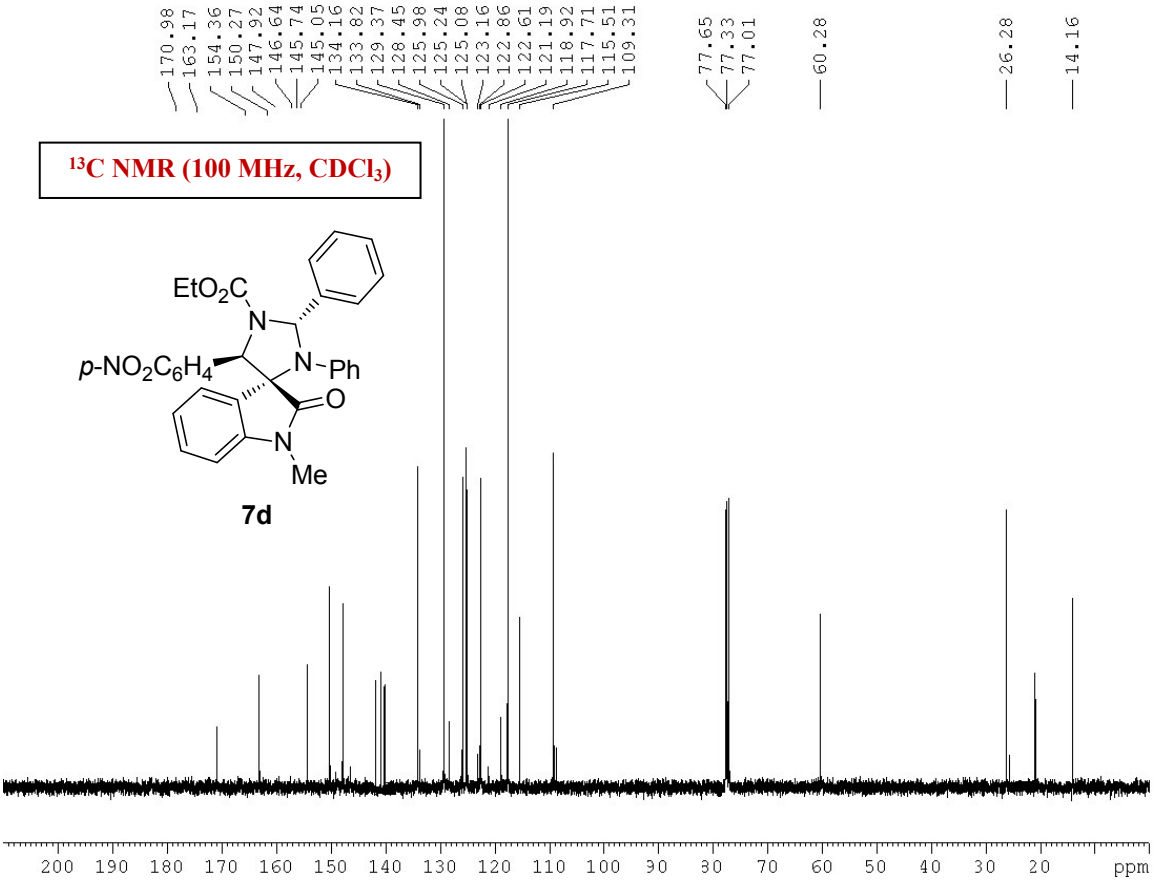
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



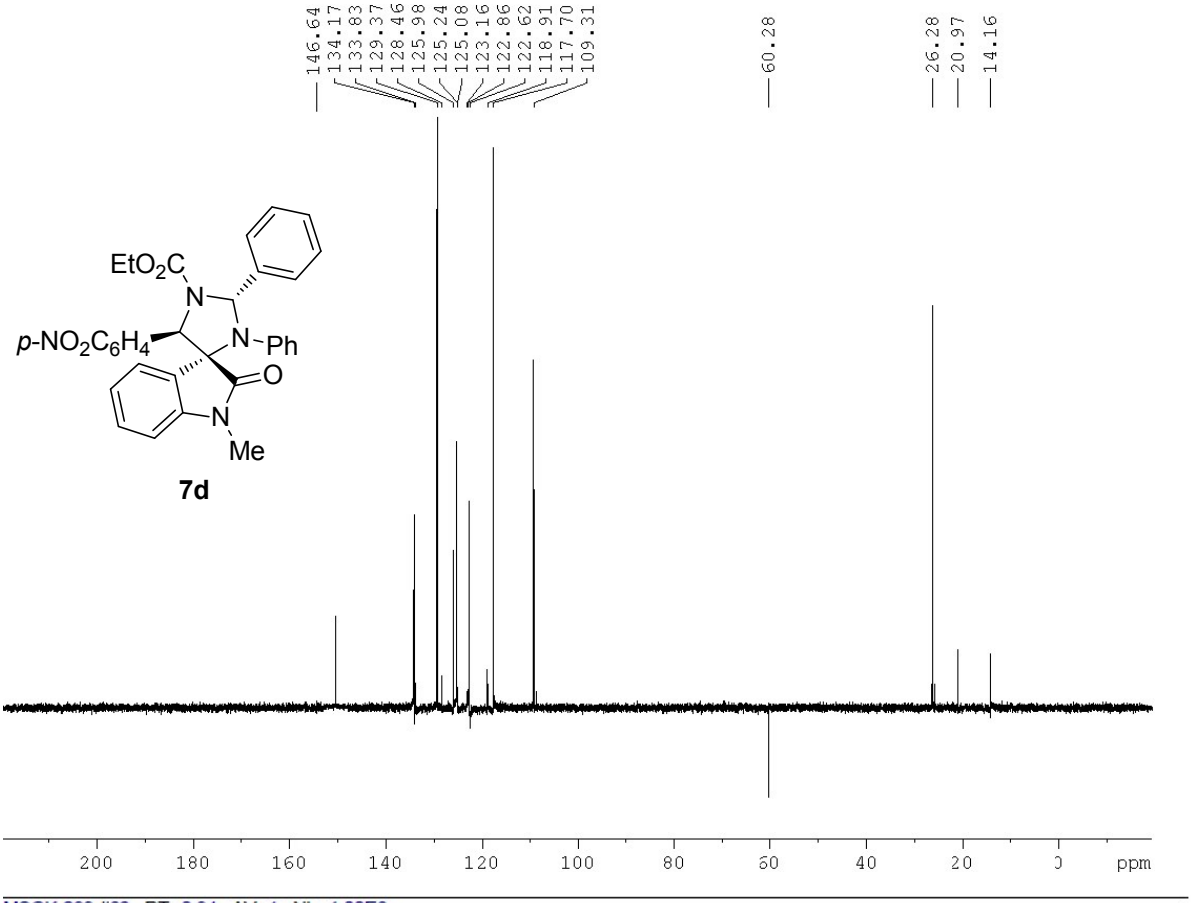
HRMS Spectrum




7.431
7.412
7.394
7.364
7.345
7.325
7.246
7.227
7.209
6.995
6.976
6.862
6.842
6.751
6.732
6.713
6.610
6.591
4.128
4.111
4.094
4.076
3.279
1.260
1.242
1.224
¹H NMR (400 MHz, CDCl₃)
EtO2C
N
p-NO2C6H4
N-Ph
O
N
Me
7d
10
9
8
7
6
5
4
3
2
1
0
ppm
4.31
2.75
2.15
4.38
2.18
2.09
2.08
2.13
3.11
3.00

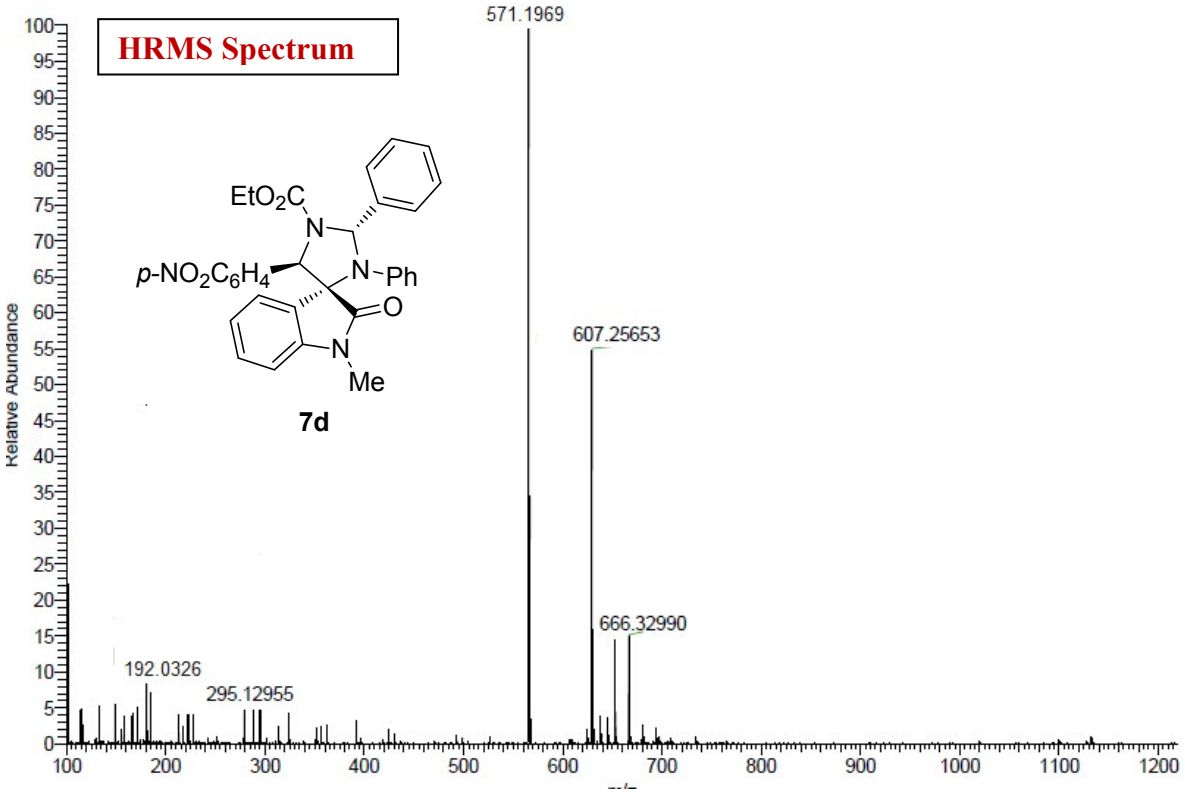

170.98
163.17
154.36
150.27
147.92
146.64
145.74
145.05
134.16
133.82
129.37
128.45
125.98
125.24
125.08
123.16
122.86
122.61
121.19
118.92
117.71
115.51
109.31
77.65
77.33
77.01
60.28
26.28
14.16
¹³C NMR (100 MHz, CDCl₃)
EtO2C
N
p-NO2C6H4
N-Ph
O
N
Me
7d
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
ppm

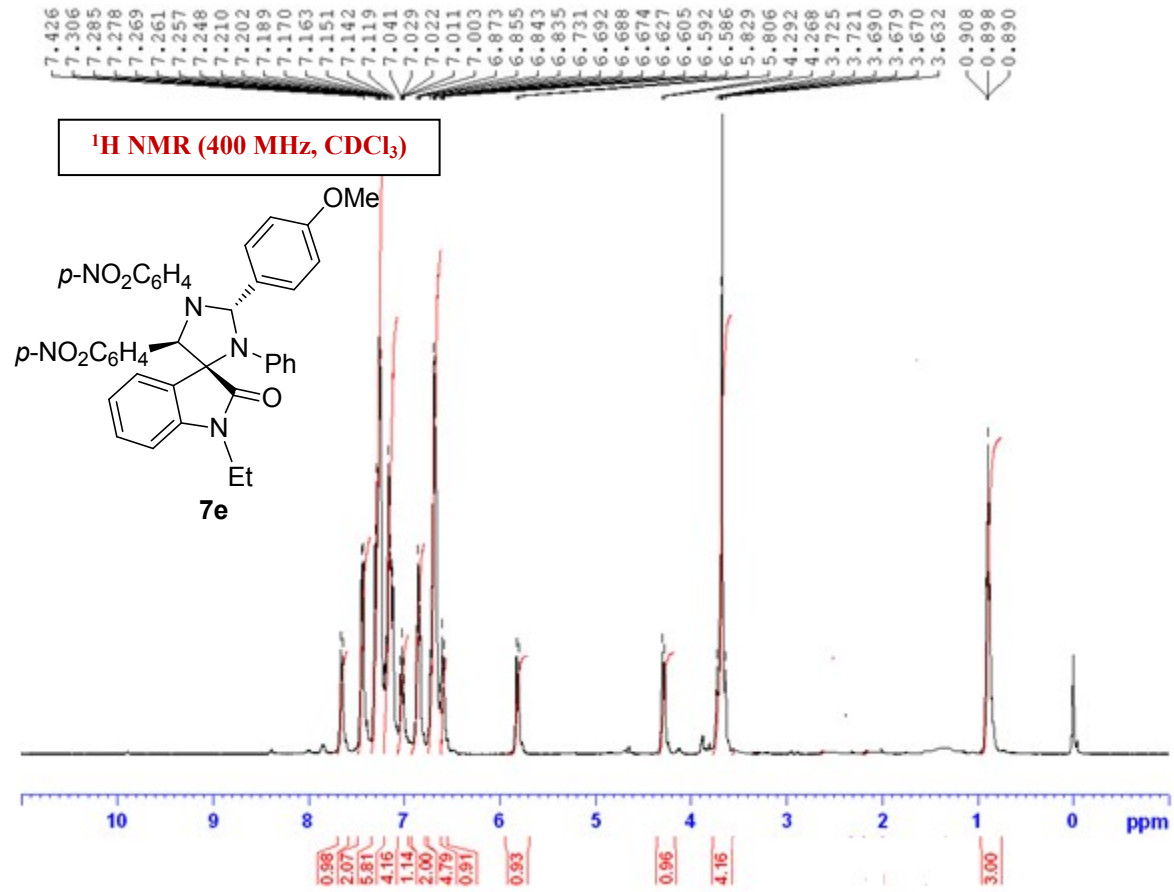
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)

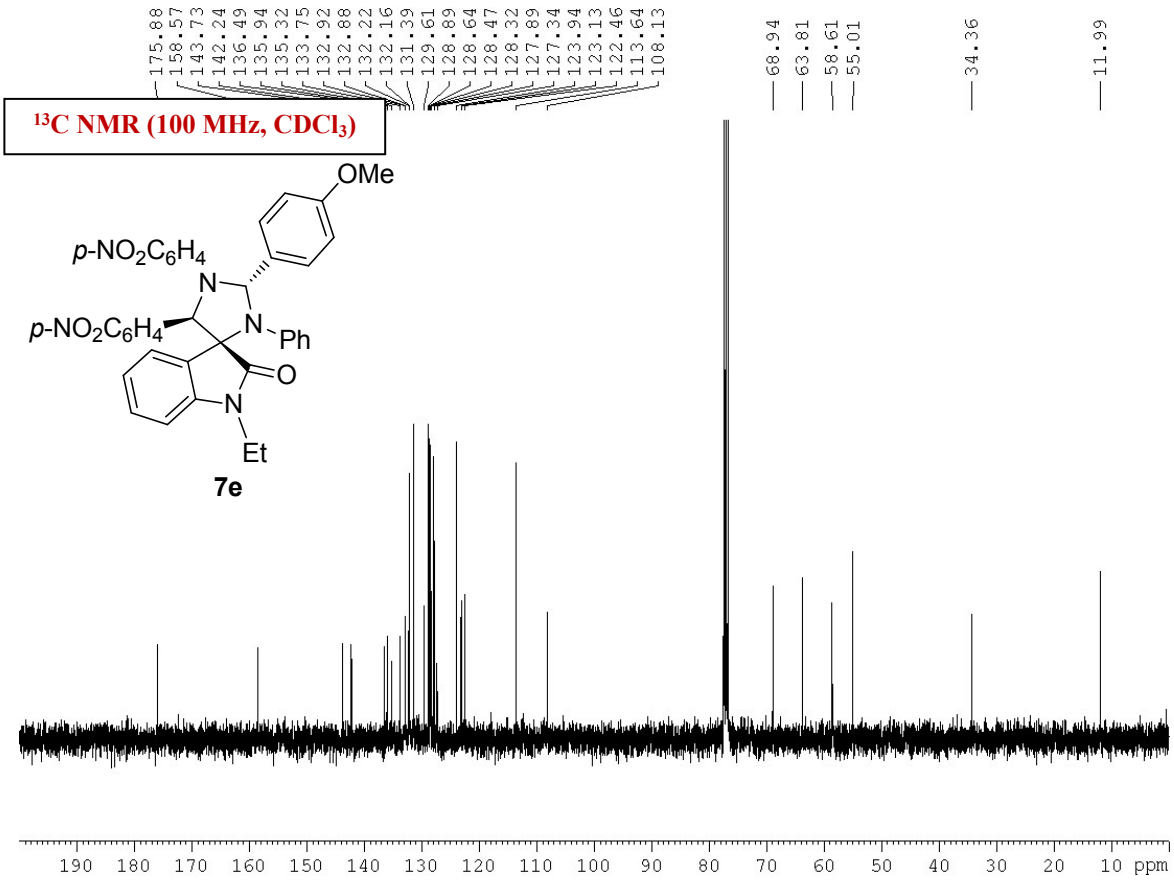


MSGK-299 #63 RT: 0.94 AV: 1 NL: 1.00E6
: FTMS {1,1} + p ESI Full lock ms [100.00-2000.00]

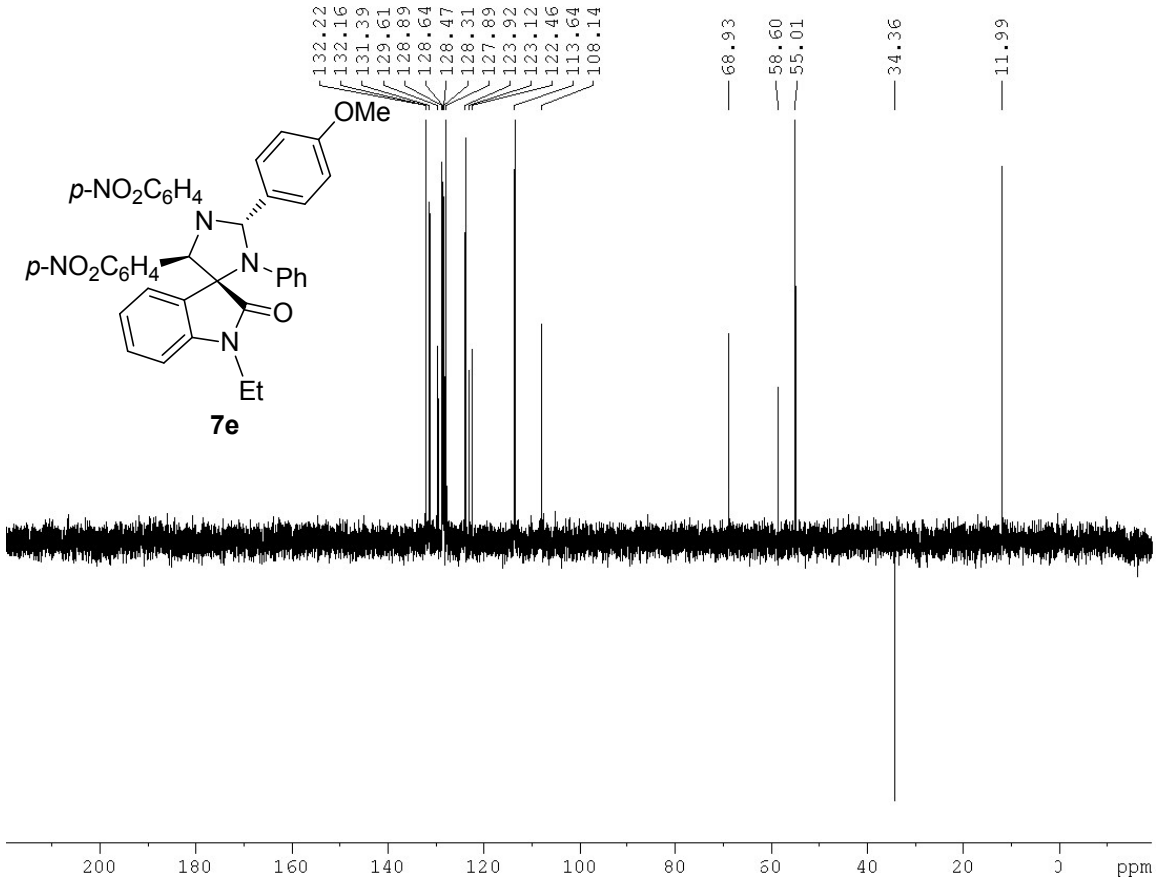
HRMS Spectrum



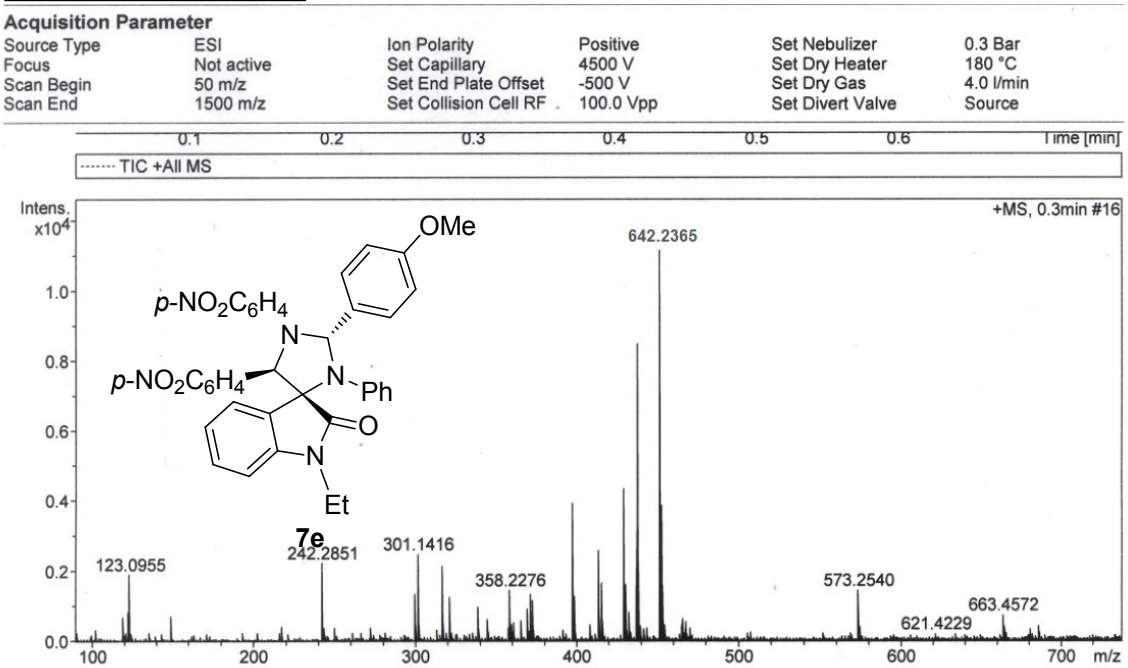

7.426
7.306
7.285
7.278
7.269
7.261
7.257
7.248
7.210
7.202
7.189
7.170
7.163
7.151
7.142
7.119
7.041
7.029
7.022
7.011
7.003
6.873
6.855
6.843
6.835
6.731
6.692
6.688
6.674
6.627
6.605
6.592
6.586
5.829
5.806
4.292
4.268
3.725
3.721
3.690
3.679
3.670
3.632
0.908
0.898
0.890
1H NMR (400 MHz, CDCl3)
OMe
p-NO2C6H4
N
p-NO2C6H4
N
Ph
O
N
Et
7e
10
9
8
7
6
5
4
3
2
1
0
ppm
0.98
2.07
5.81
4.16
1.14
2.00
4.79
0.91
0.93
0.96
4.16
3.00


175.88
158.57
143.73
142.24
136.49
135.94
135.32
133.75
132.92
132.88
132.22
132.16
131.39
129.61
128.89
128.64
128.47
128.32
127.89
127.34
123.94
123.13
122.46
113.64
108.13
68.94
63.81
58.61
55.01
34.36
11.99
13C NMR (100 MHz, CDCl3)
OMe
p-NO2C6H4
N
p-NO2C6H4
N
Ph
O
N
Et
7e
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10 ppm

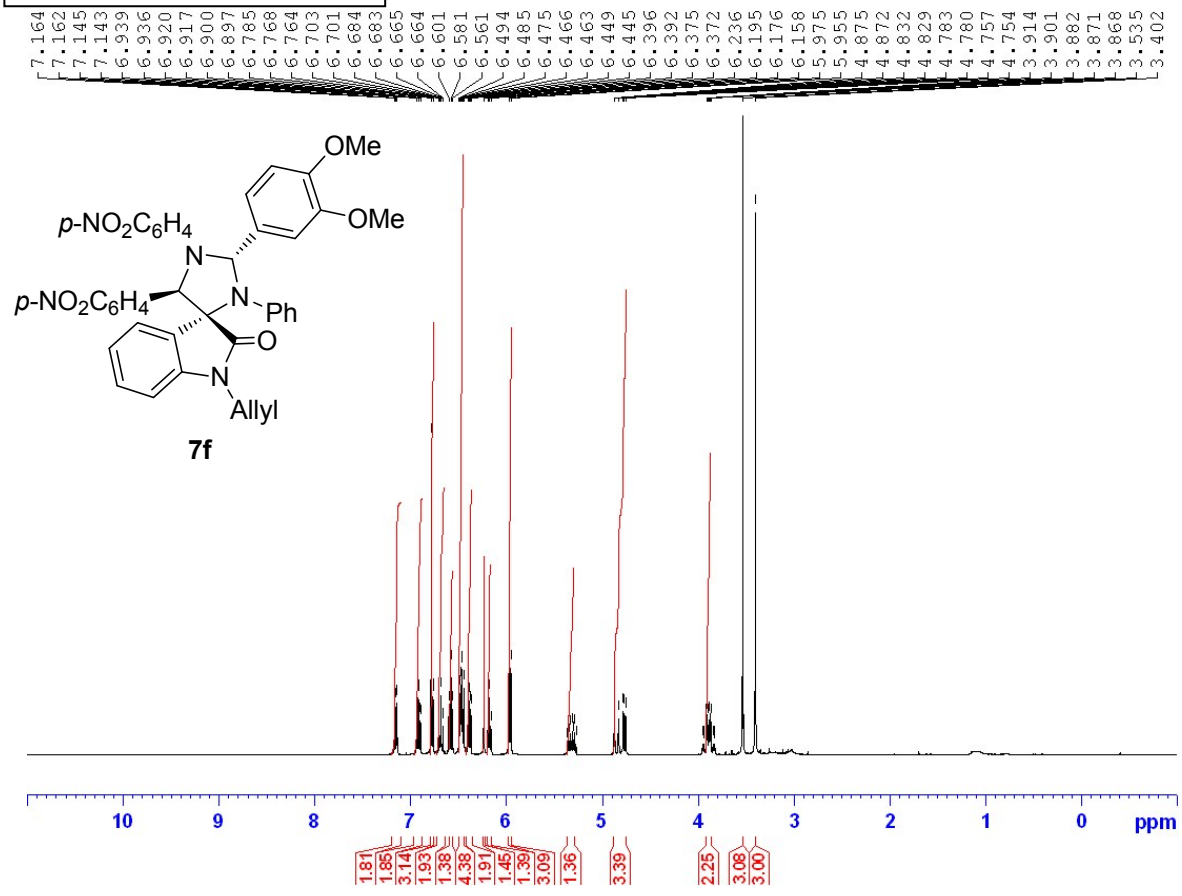
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



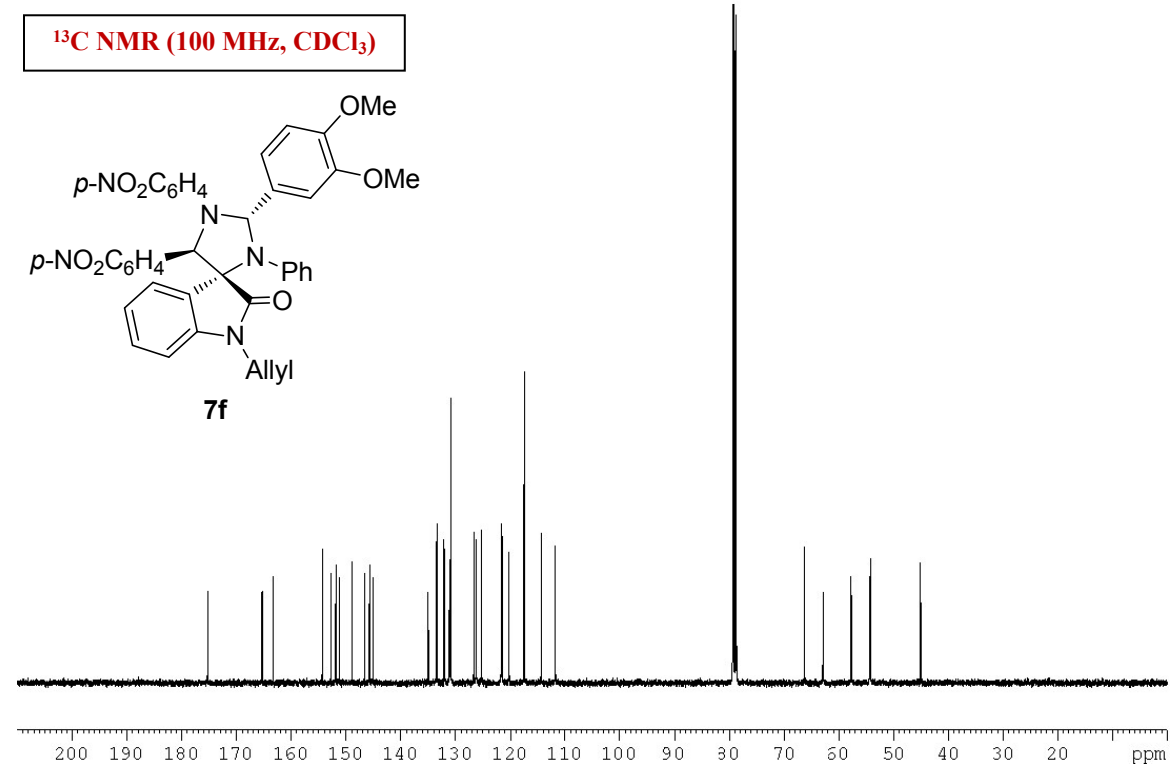
HRMS Spectrum



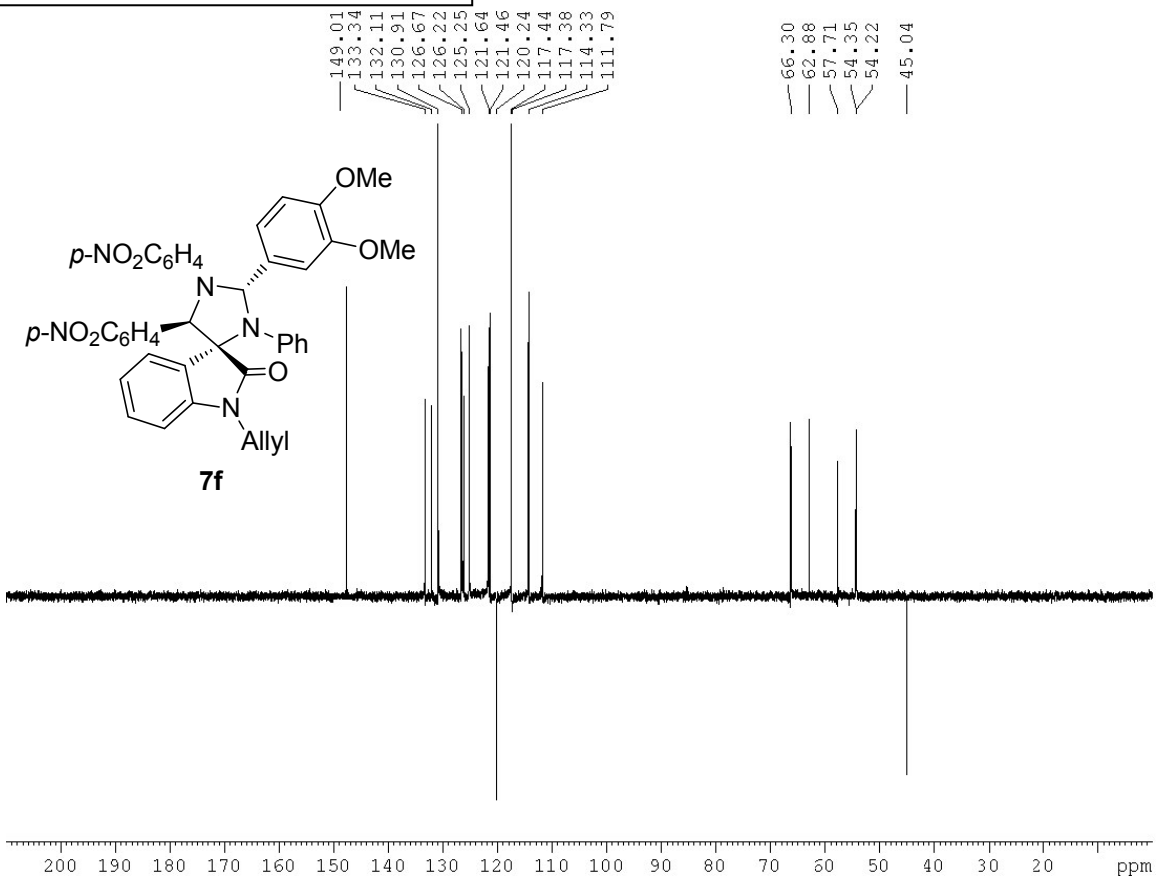
^{1}H NMR (400 MHz, $CDCl_3$)



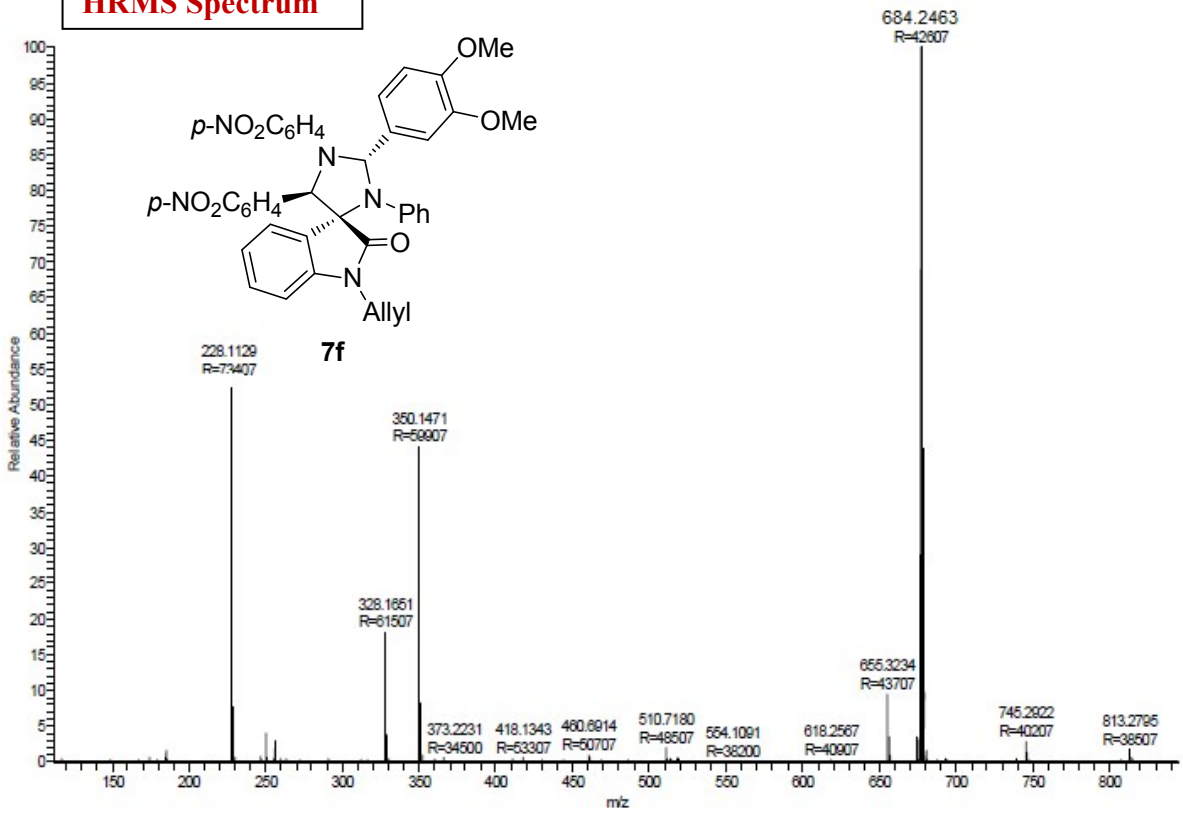
^{13}C NMR (100 MHz, $CDCl_3$)



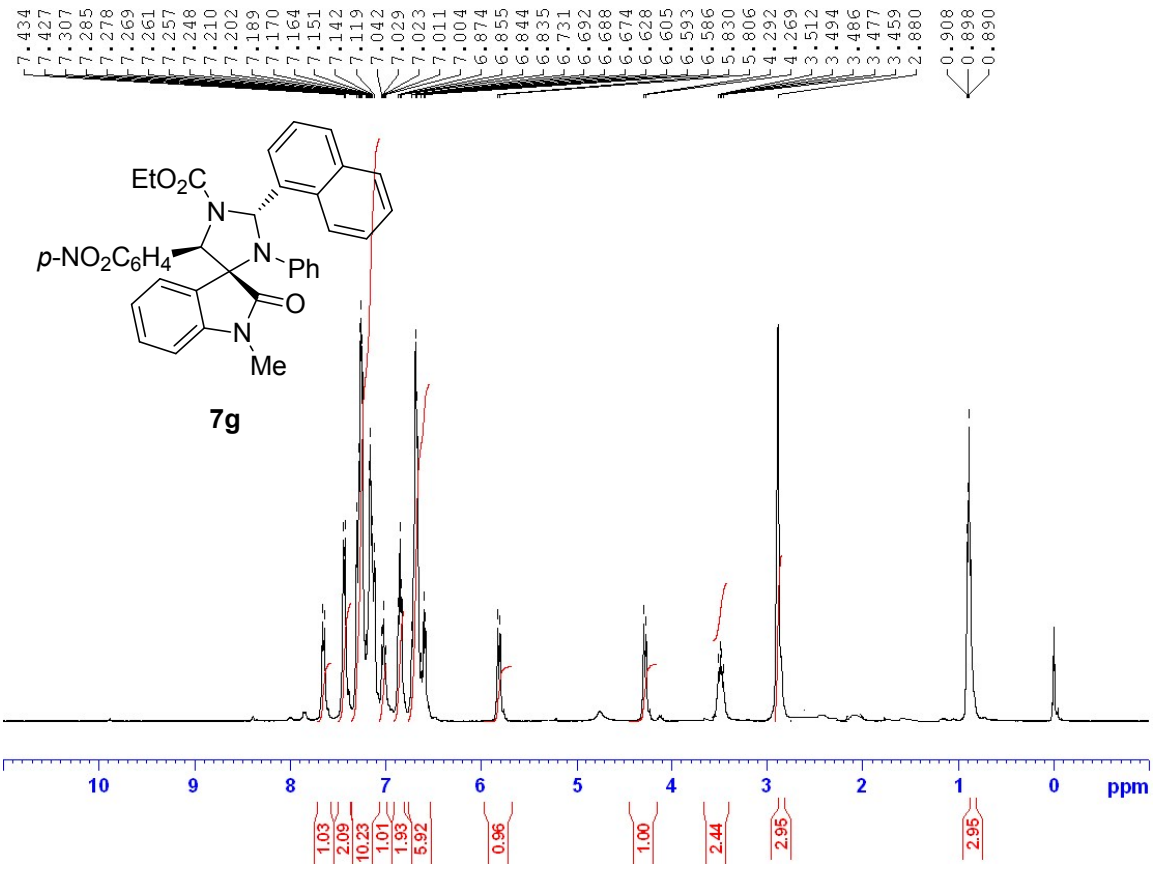
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



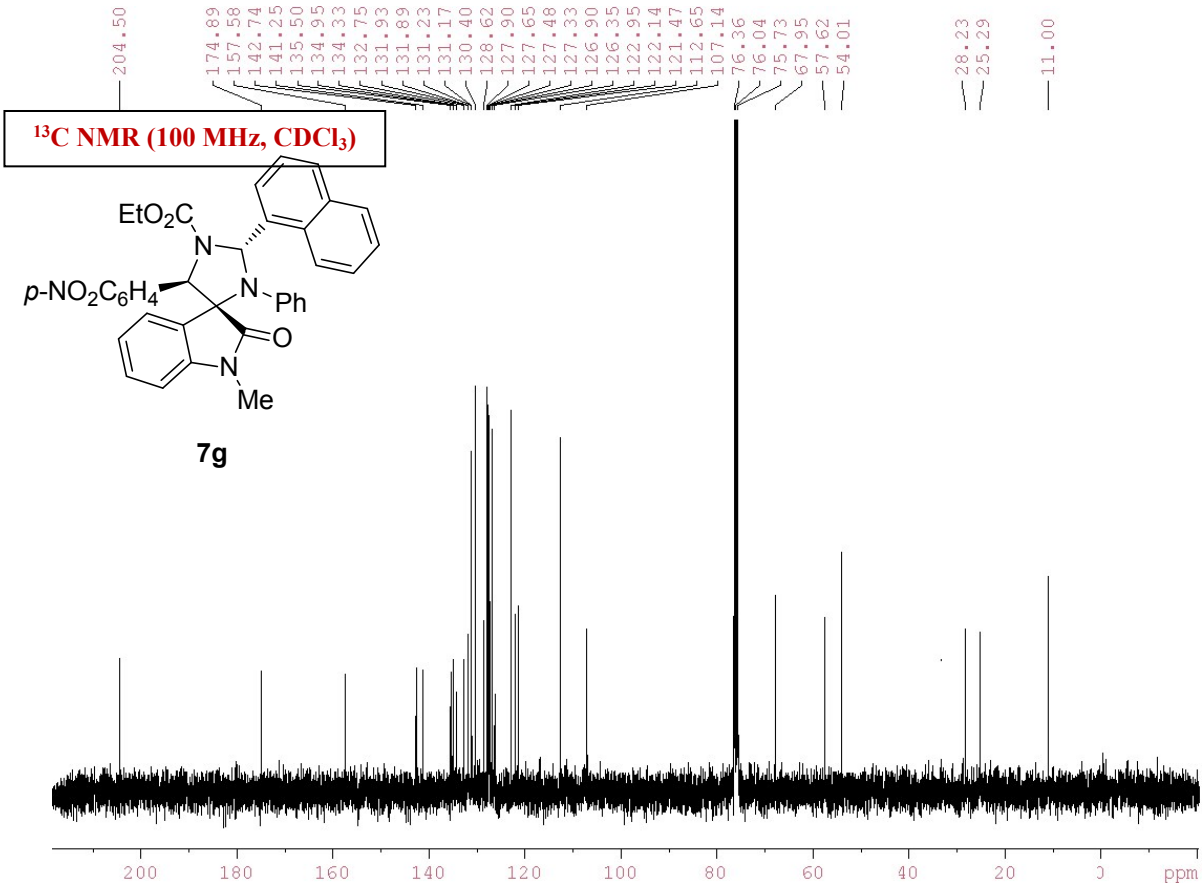
HRMS Spectrum



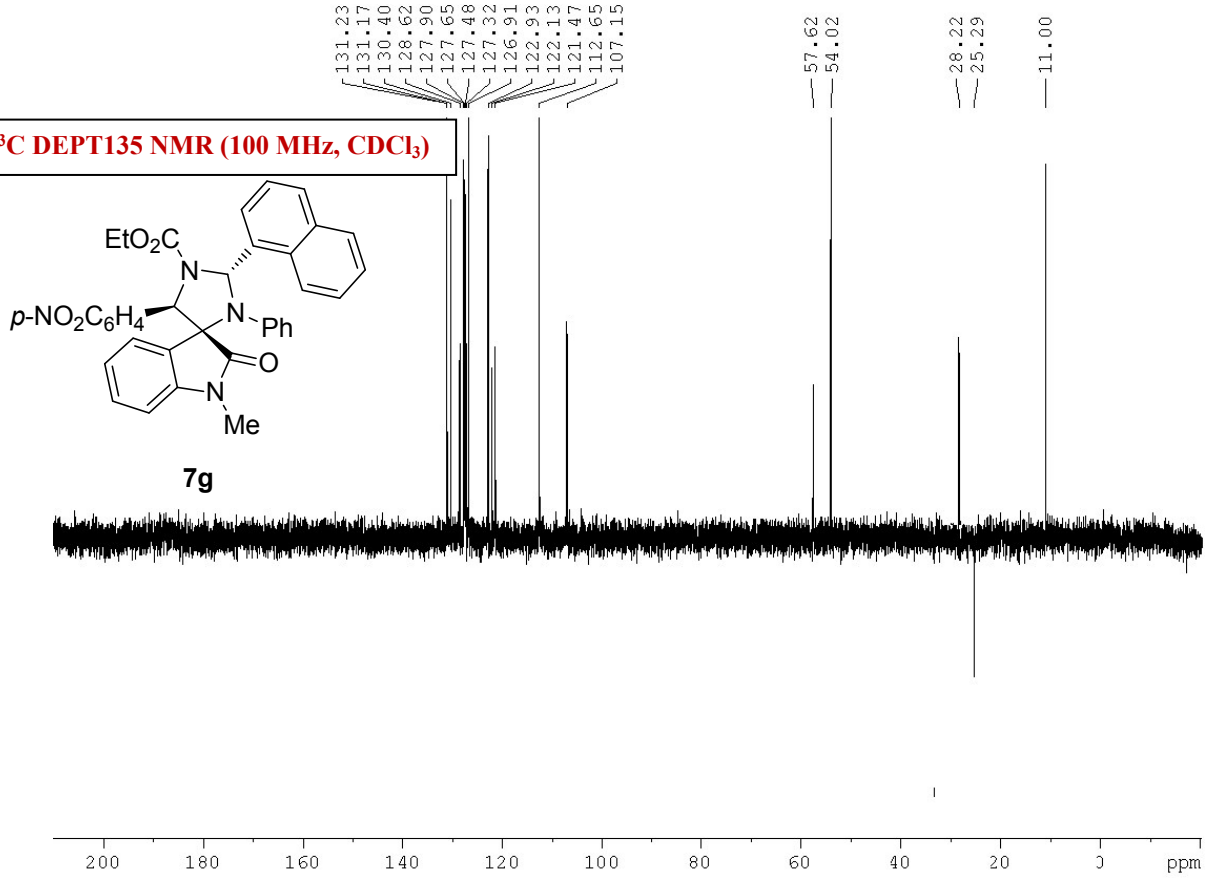
^{1}H NMR (400 MHz, $CDCl_3$)



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

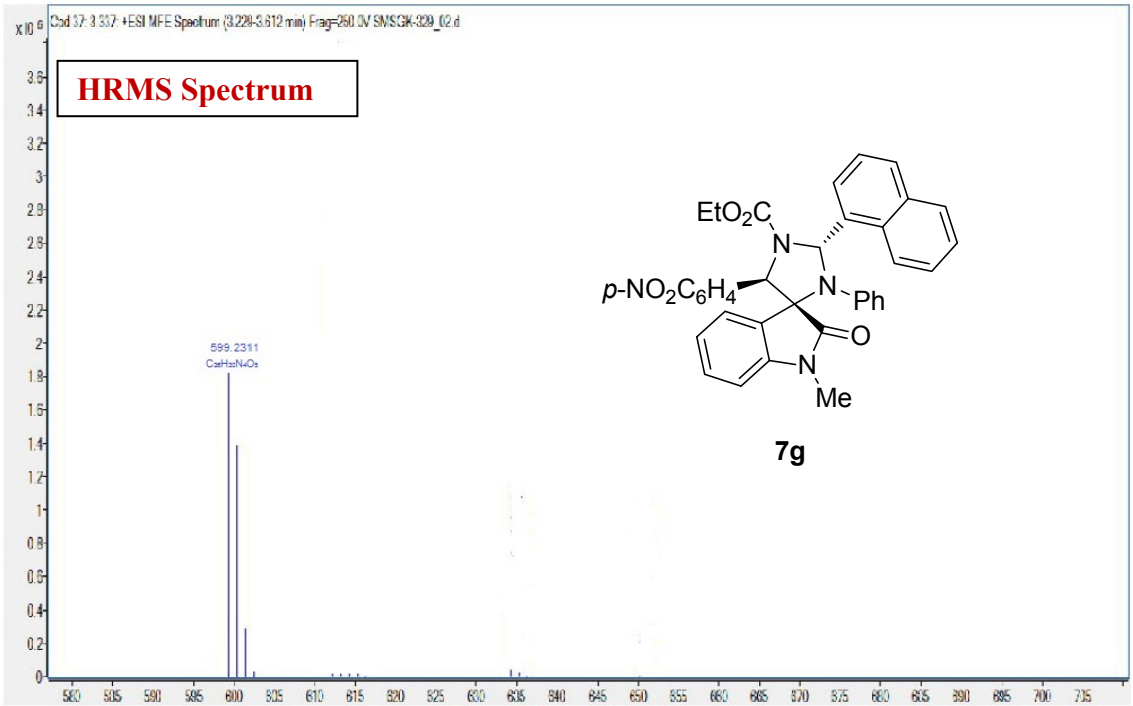


^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



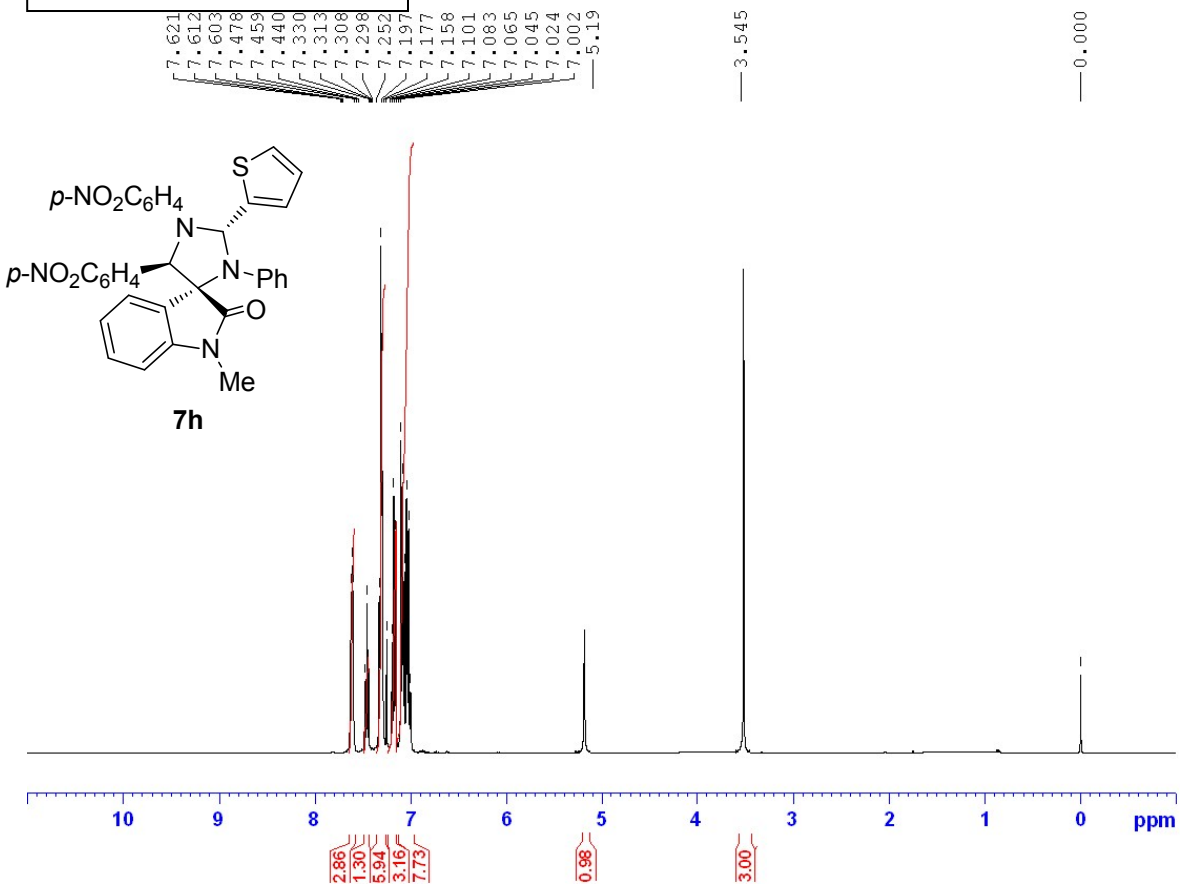
7g

HRMS Spectrum



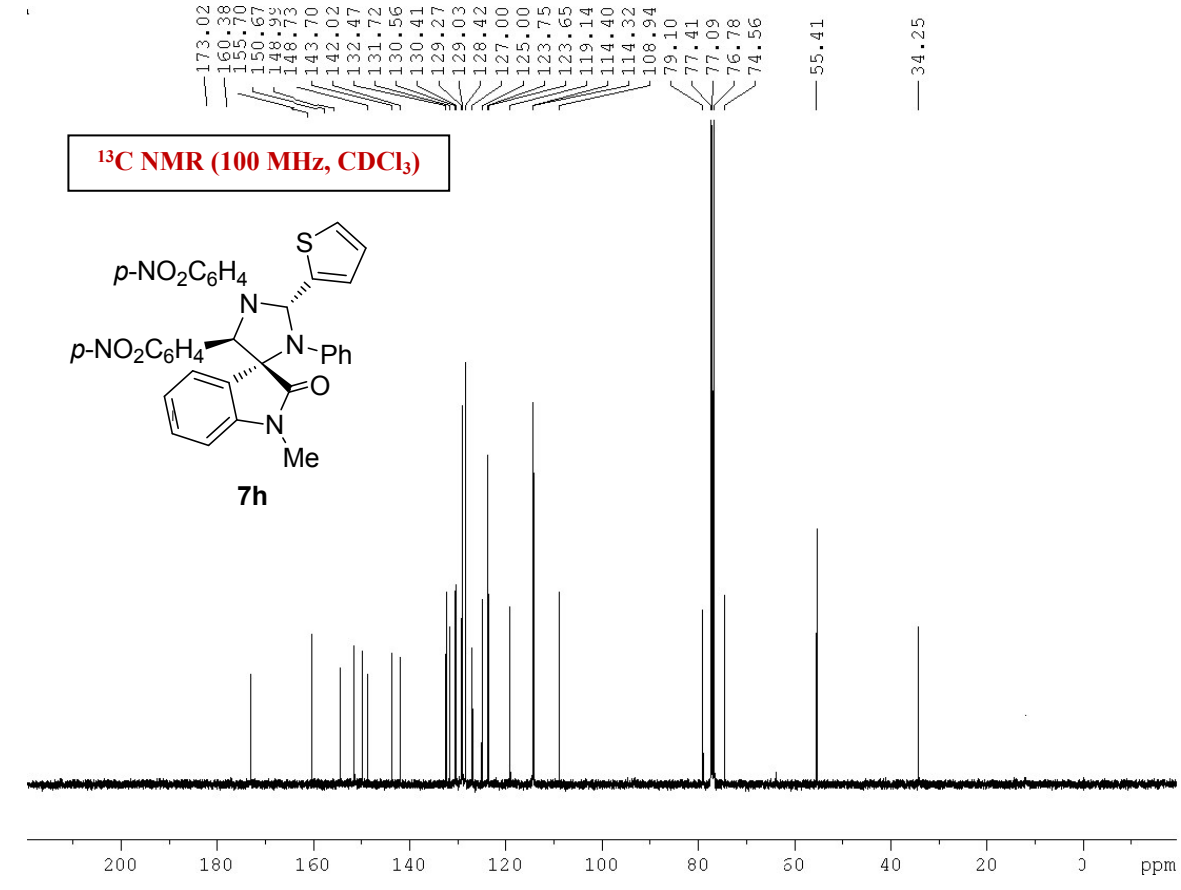
7g

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



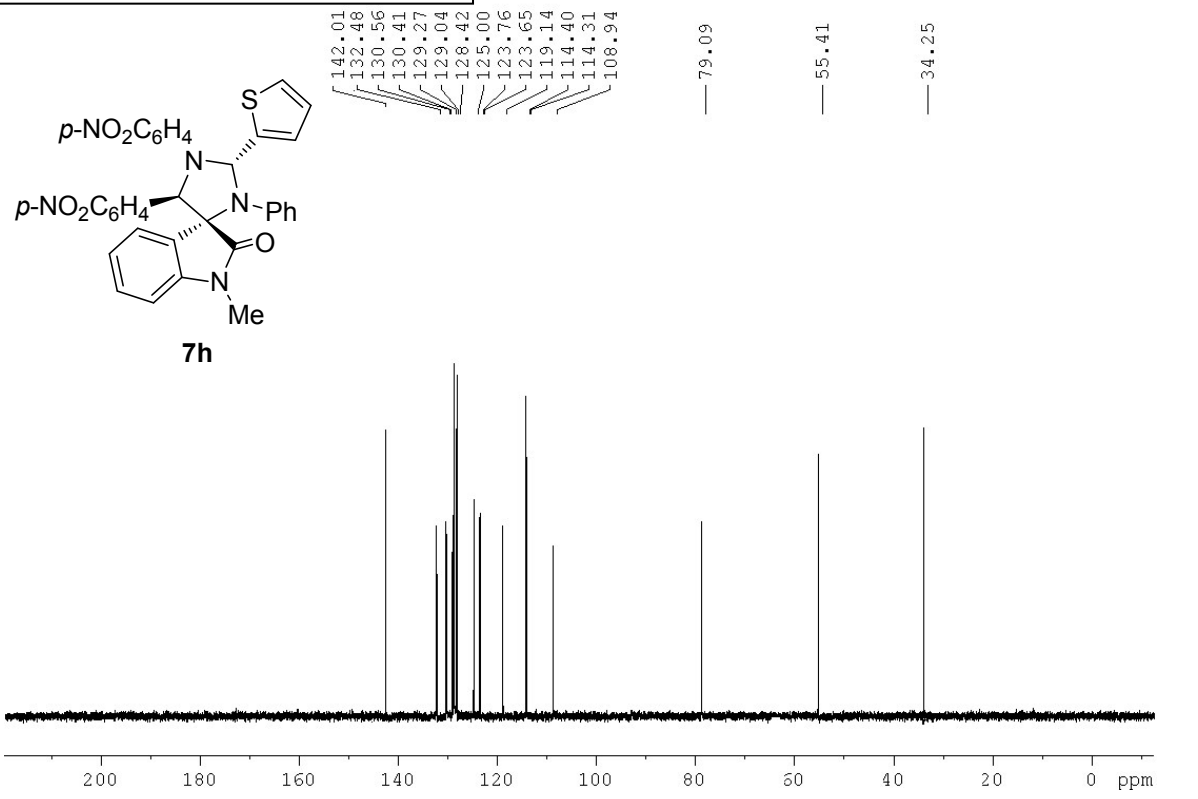
7h

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



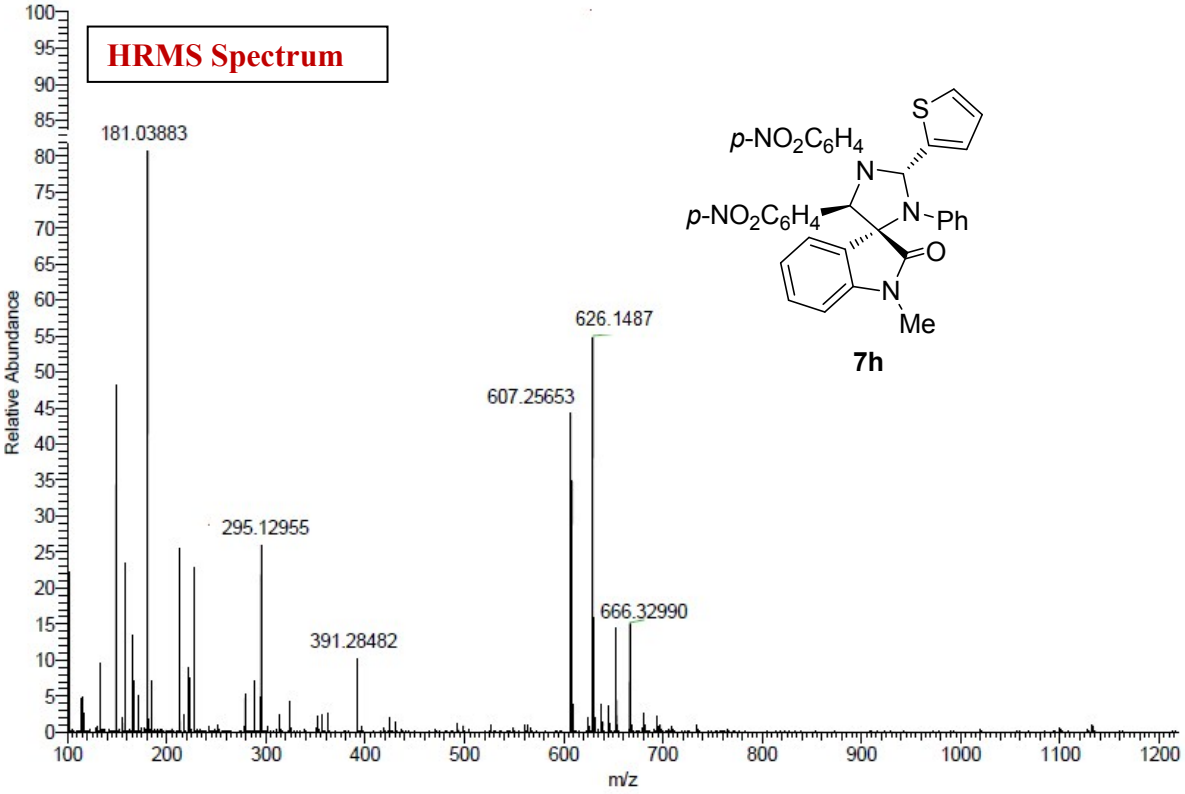
7h

^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)

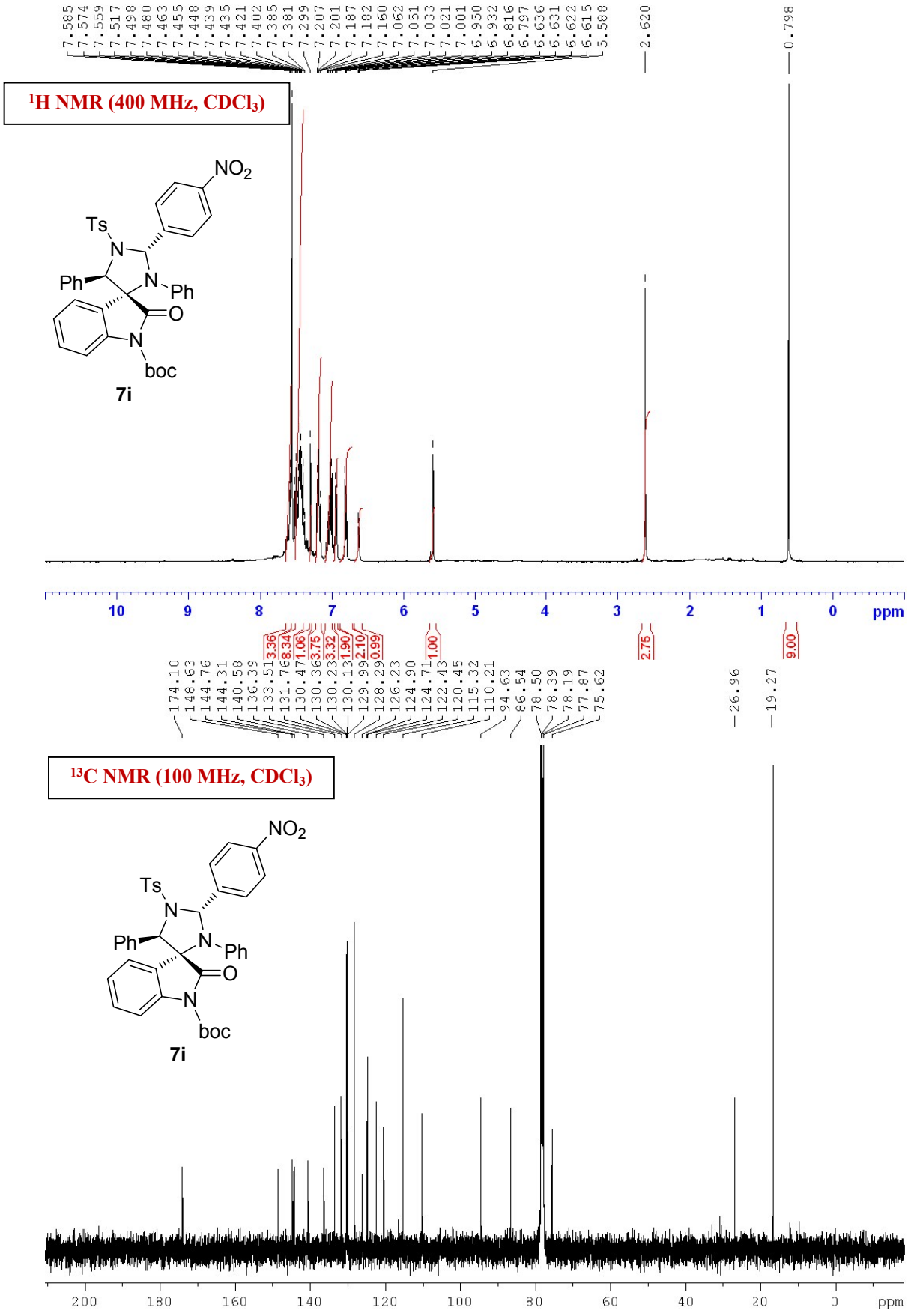


7h

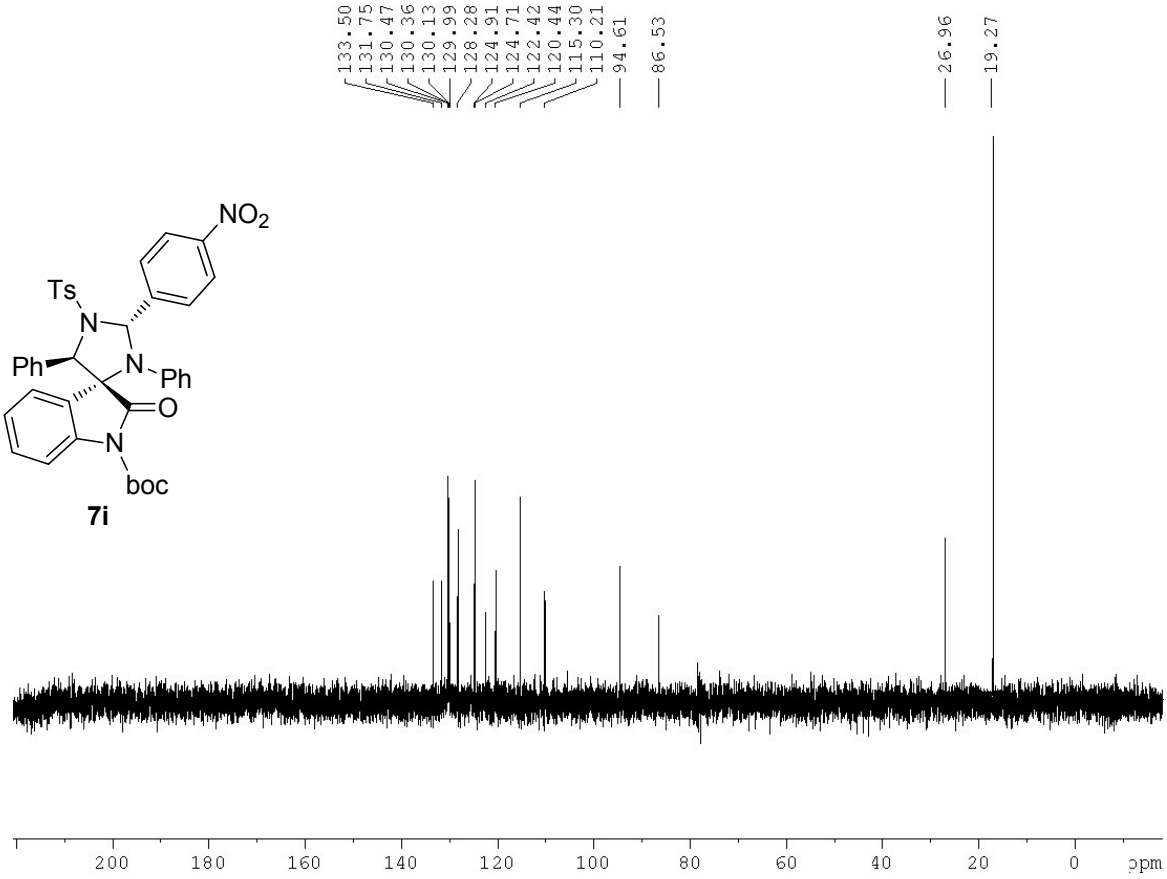
HRMS Spectrum



7h


7.585
7.574
7.559
7.517
7.498
7.480
7.463
7.455
7.448
7.439
7.435
7.421
7.402
7.385
7.381
7.299
7.207
7.201
7.187
7.182
7.160
7.062
7.051
7.033
7.021
7.001
6.950
6.932
6.816
6.797
6.636
6.631
6.622
6.615
5.588
2.620
0.798
1H NMR (400 MHz, CDCl3)
NO2
Ts
N
Ph
N
Ph
O
N
boc
7i
10
9
8
7
6
5
4
3
2
1
0
ppm
13.36
8.34
1.06
3.75
3.32
1.90
2.10
0.99
1.00
2.75
9.00
174.10
148.63
144.76
144.31
140.58
136.39
133.51
131.76
130.47
130.36
130.23
130.13
129.99
128.29
126.23
124.90
124.71
122.43
120.45
115.32
110.21
94.63
86.54
78.50
78.39
78.19
77.87
75.62
26.96
19.27
13C NMR (100 MHz, CDCl3)
NO2
Ts
N
Ph
N
Ph
O
N
boc
7i
200
180
160
140
120
100
30
60
40
20
0
ppm

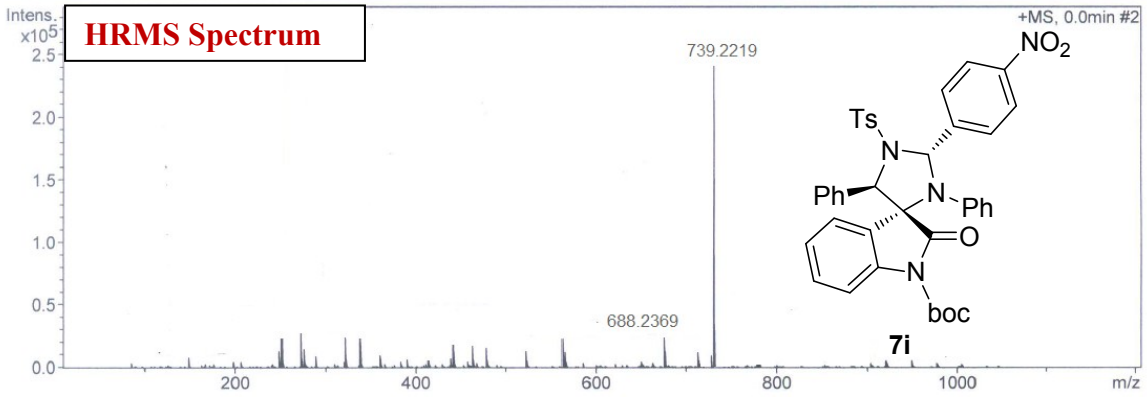
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



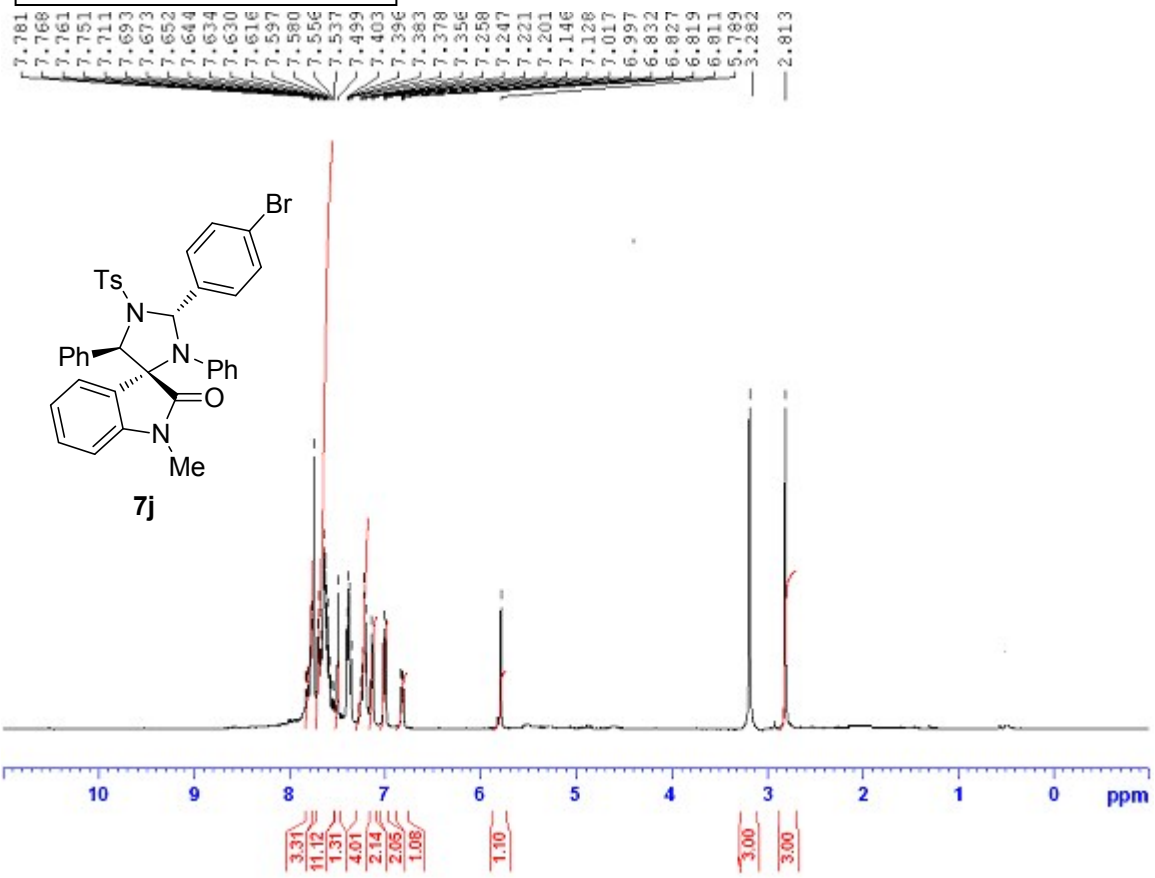
Acquisition Parameter

Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.3 Bar
Focus	Active	Set Capillary	4500 V	Set Dry Heater	190 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	1500 m/z	Set Collision Cell RF	100.0 Vpp	Set Divert Valve	Source

HRMS Spectrum

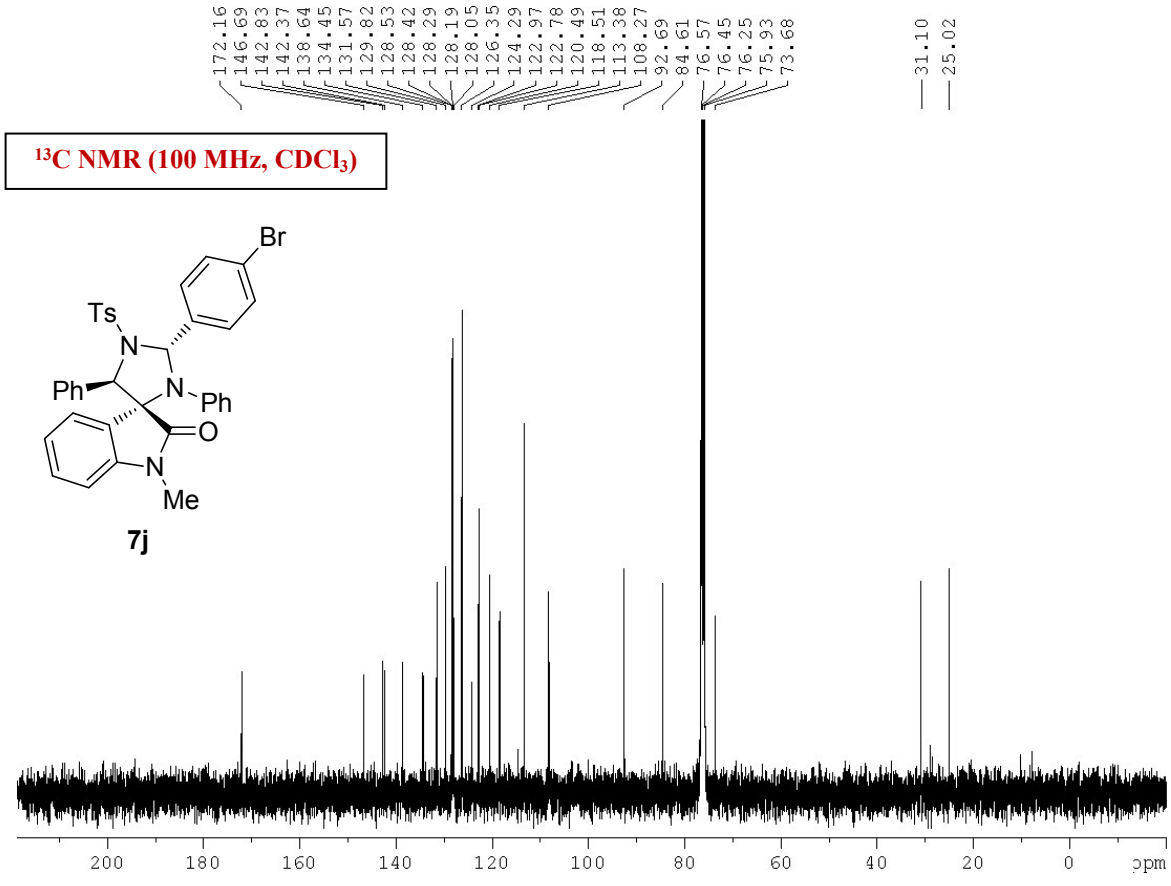


^{1}H NMR (400 MHz, $CDCl_3$)



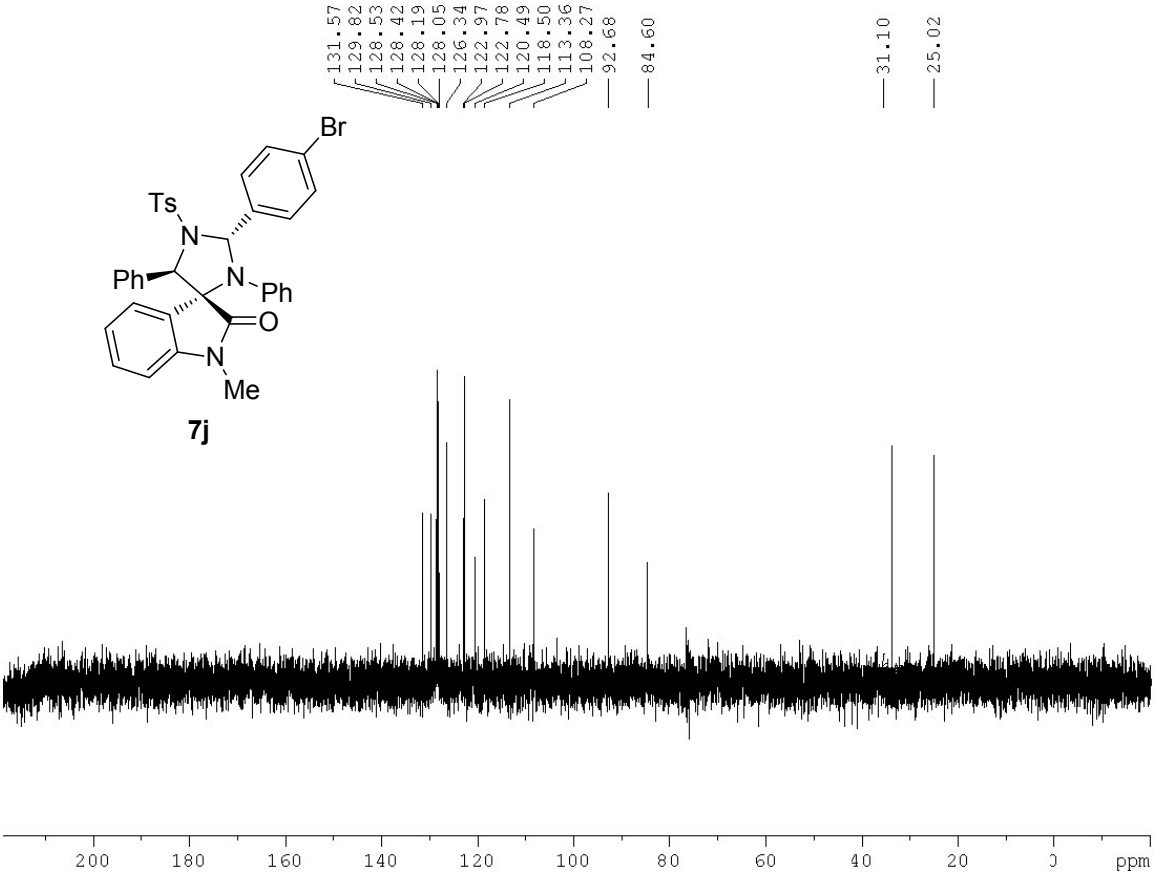
7j

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

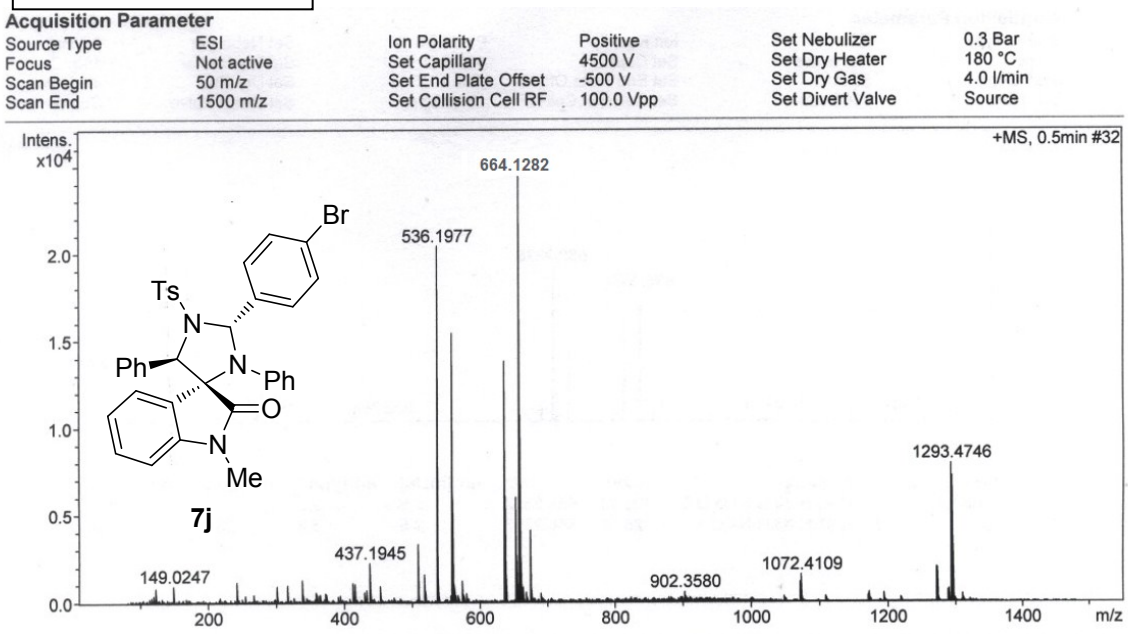


7j

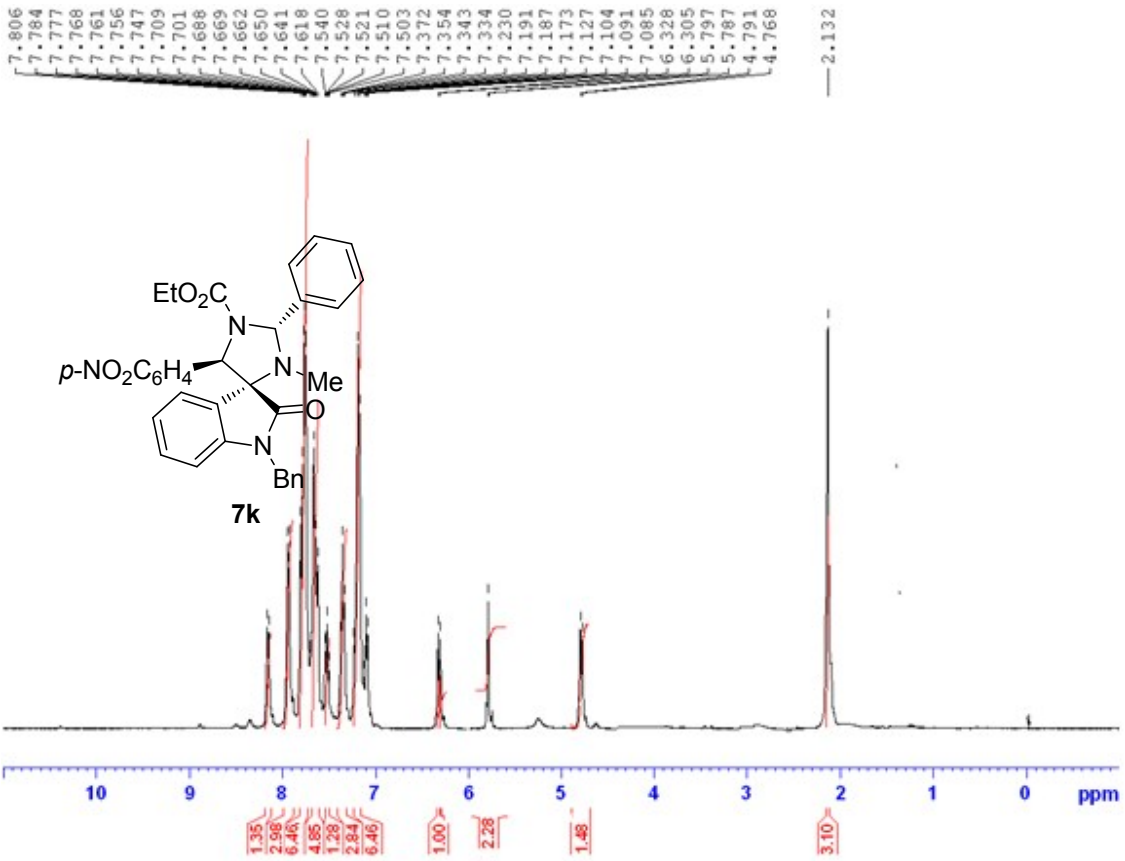
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



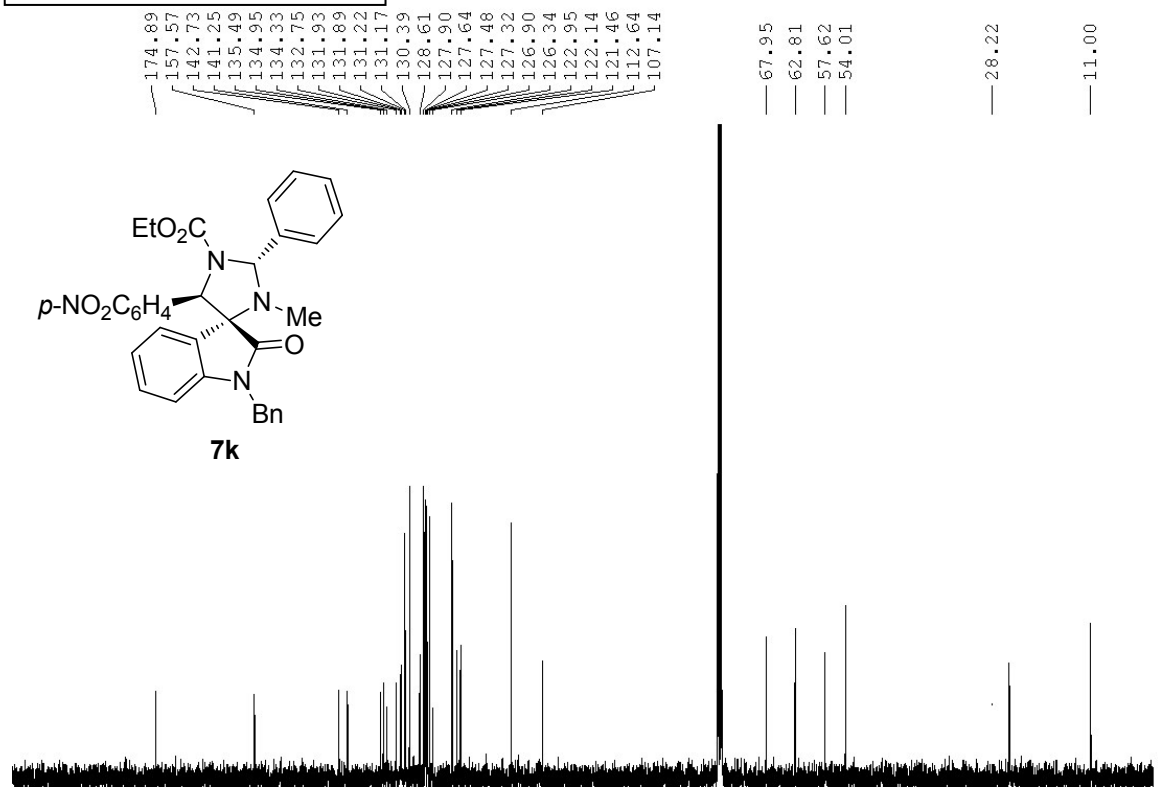
HRMS Spectrum



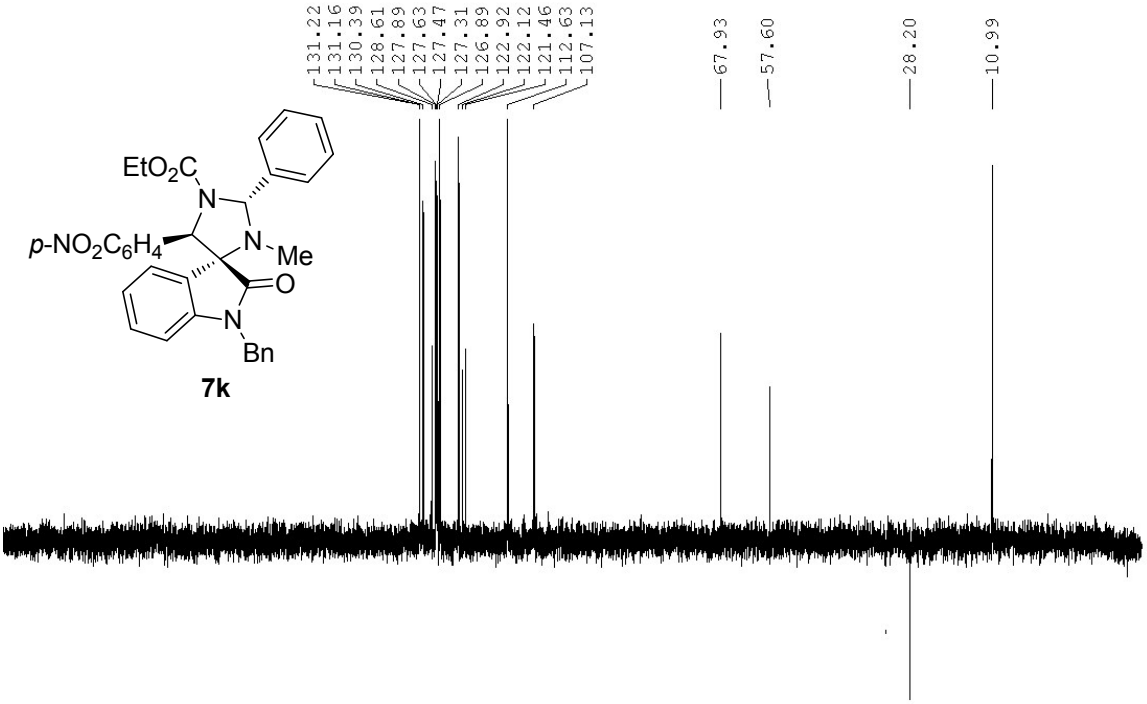
^{1}H NMR (400 MHz, $CDCl_3$)



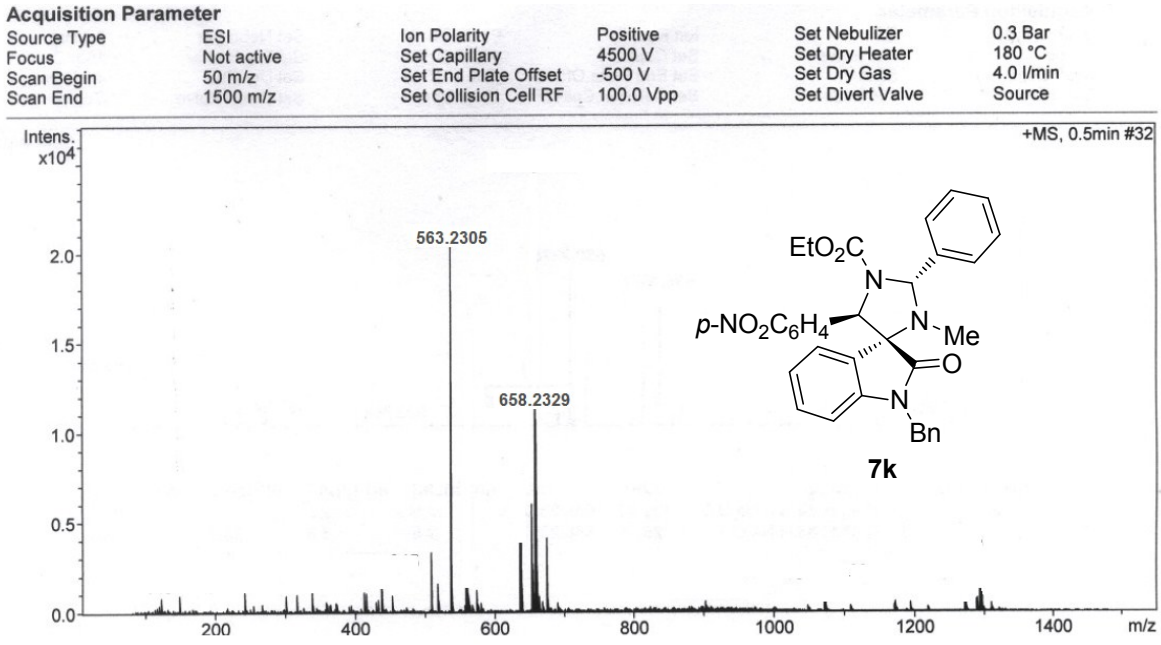
^{13}C NMR (100 MHz, $CDCl_3$)



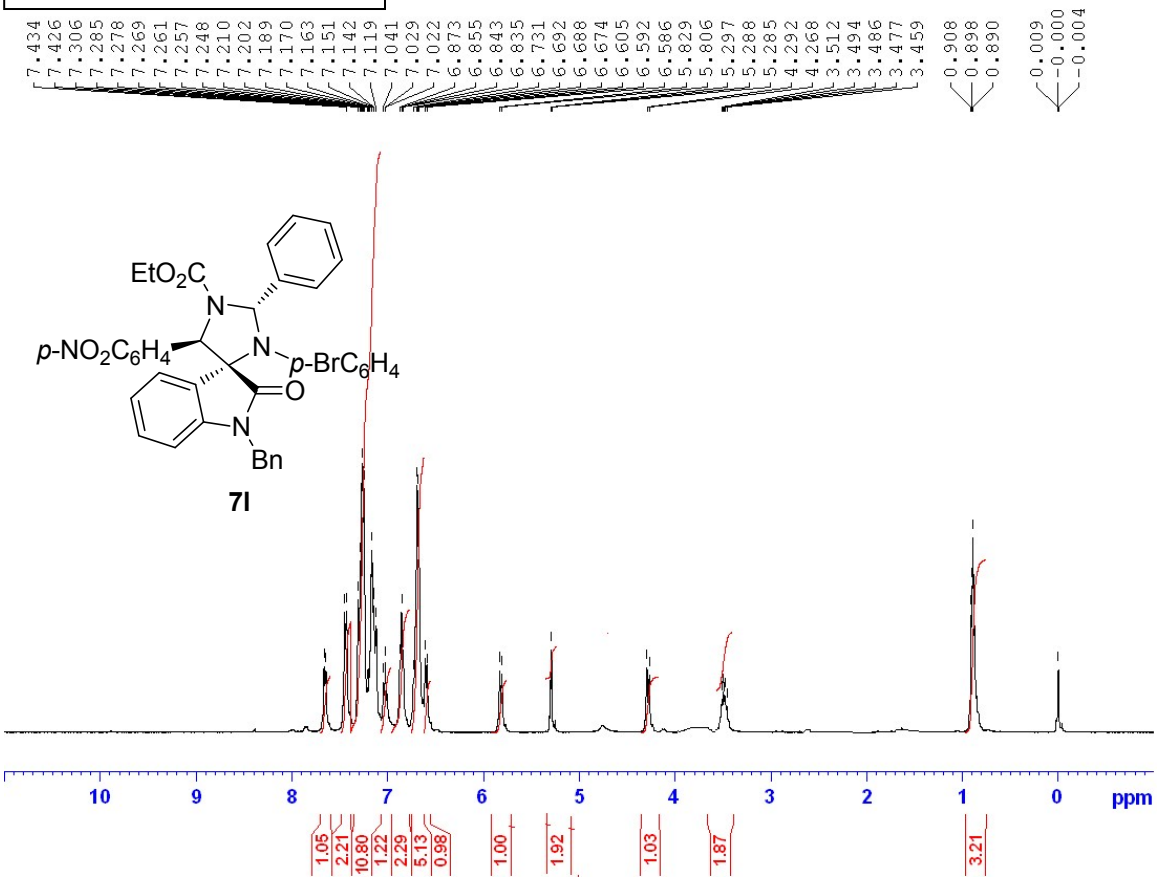
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



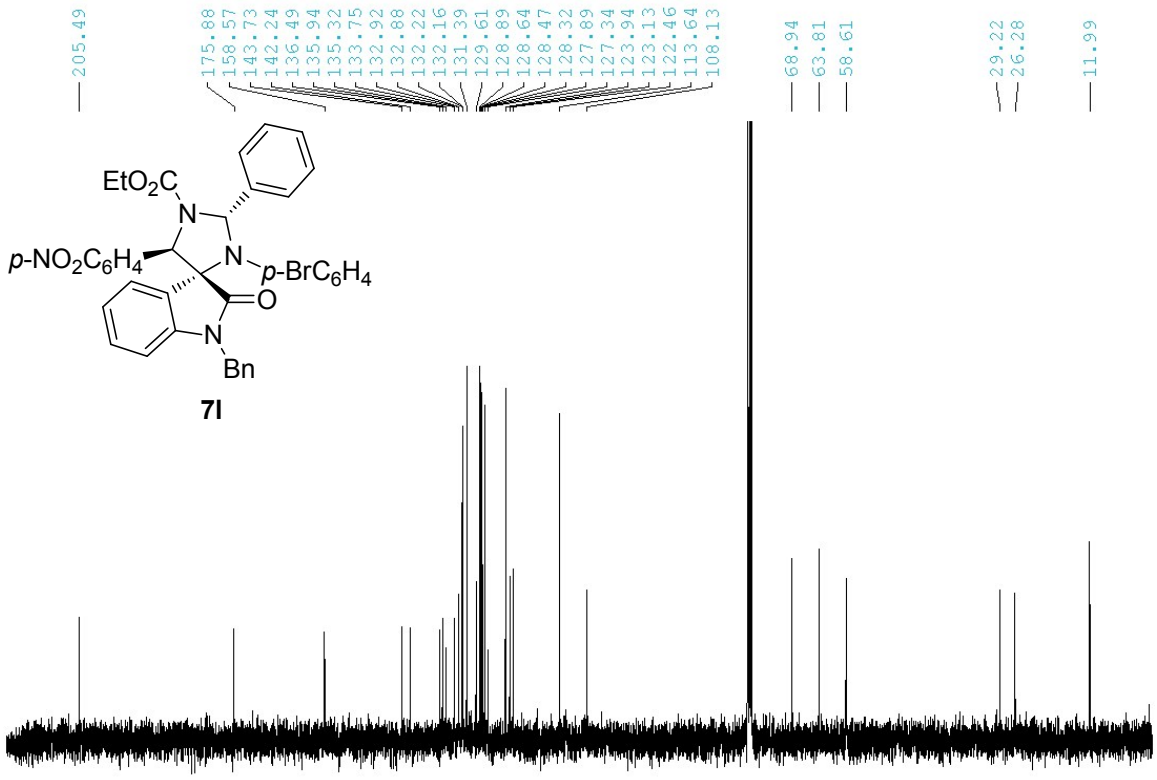
HRMS Spectrum



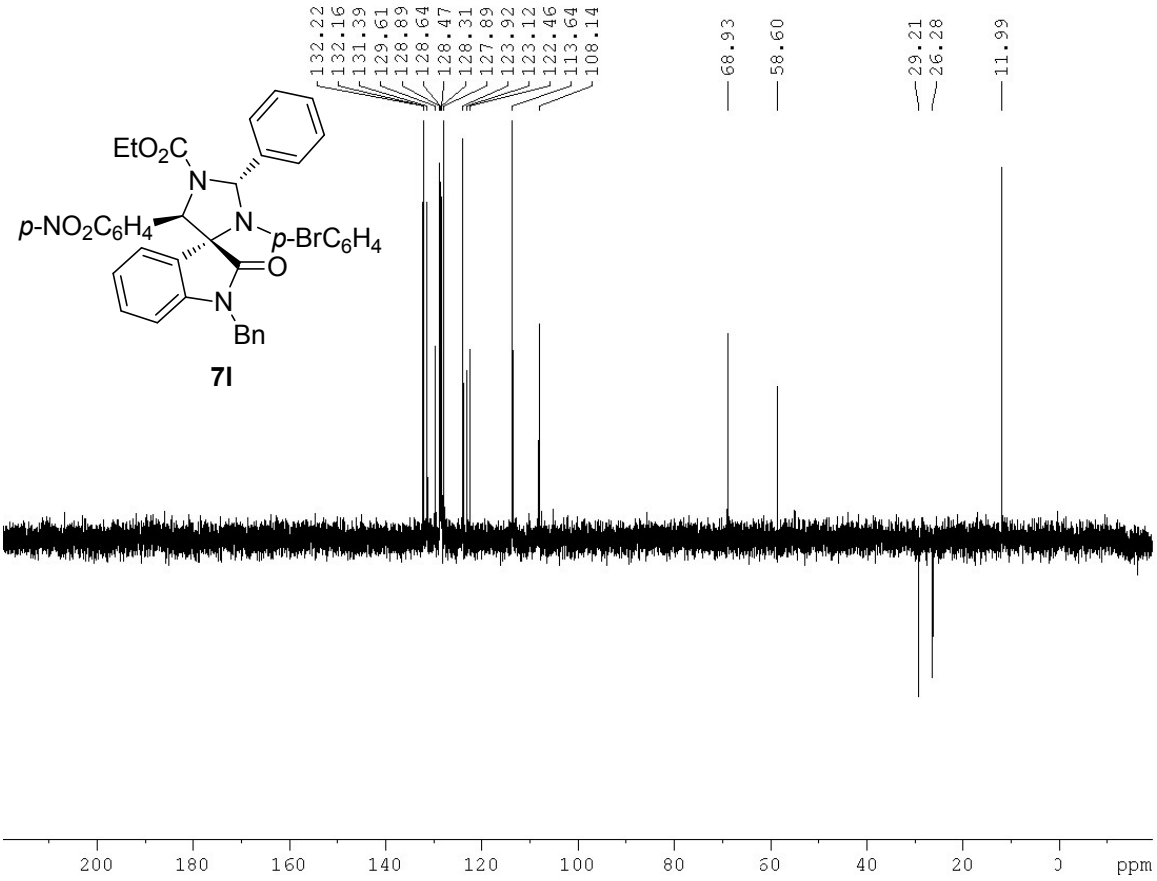
^{1}H NMR (100 MHz, $CDCl_3$)



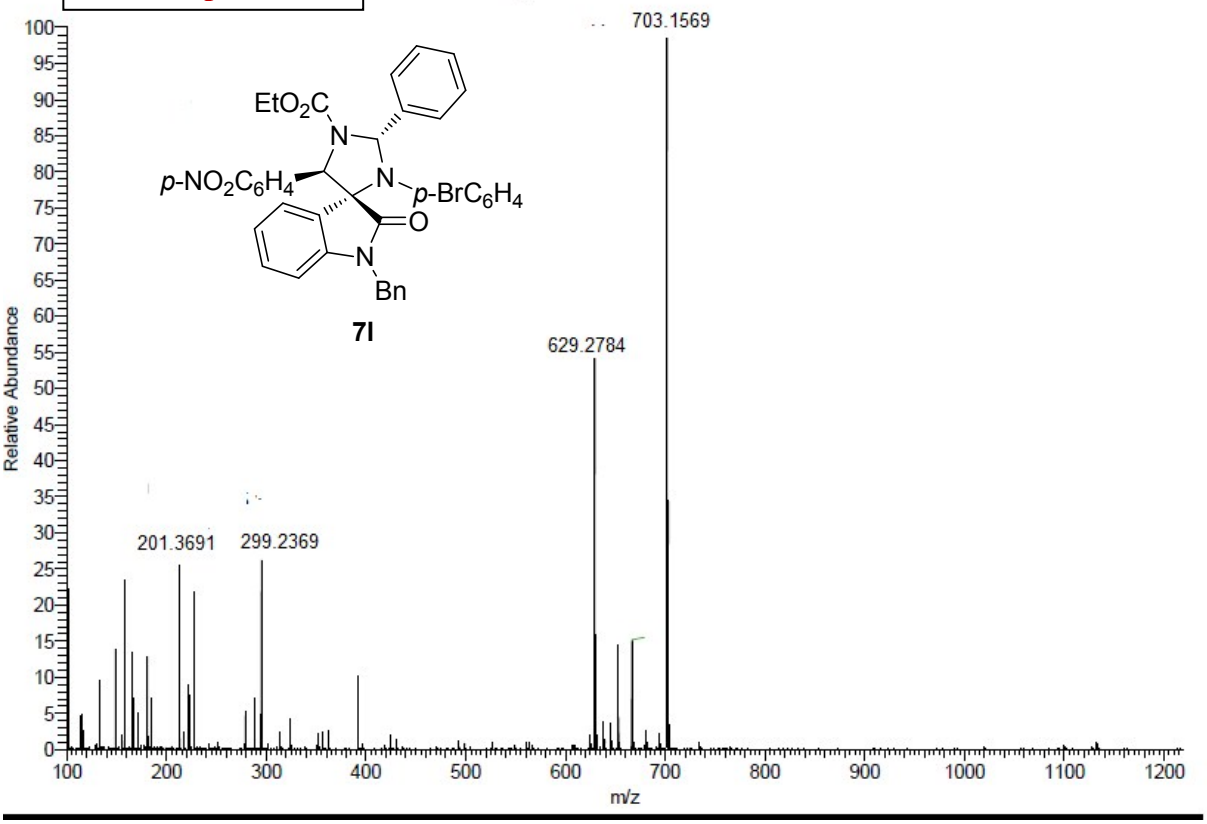
^{13}C NMR (100 MHz, $CDCl_3$)



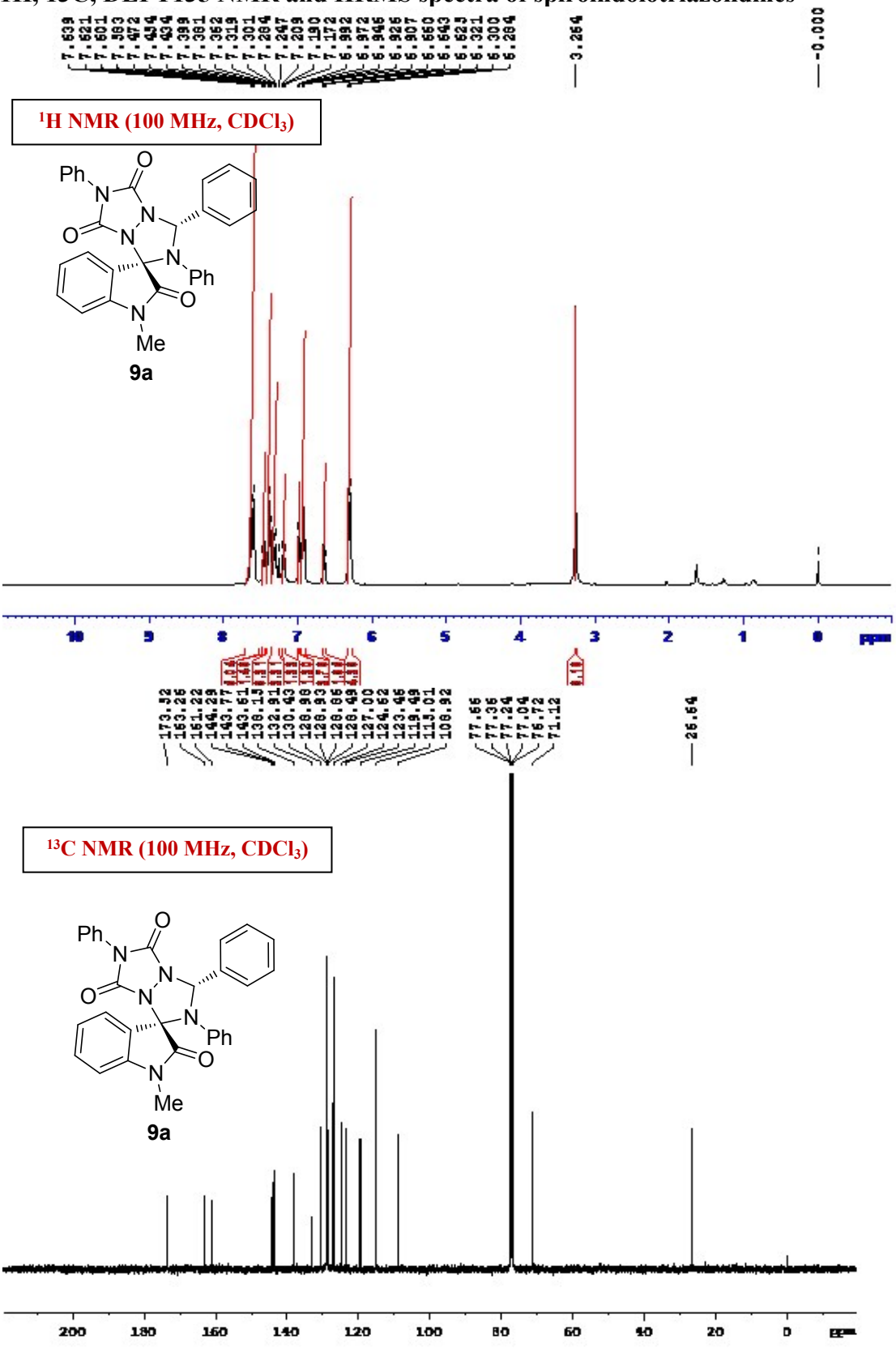
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



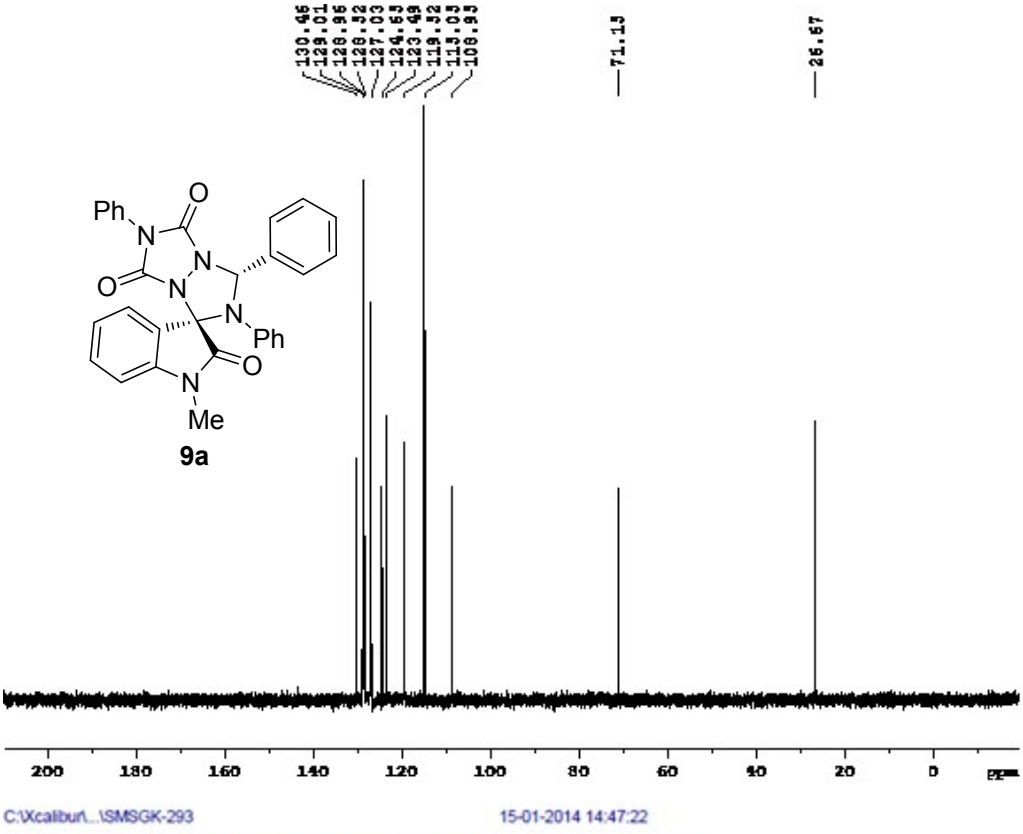
HRMS Spectrum



1H, 13C, DEPT135 NMR and HRMS spectra of spiroindolotriazolidines

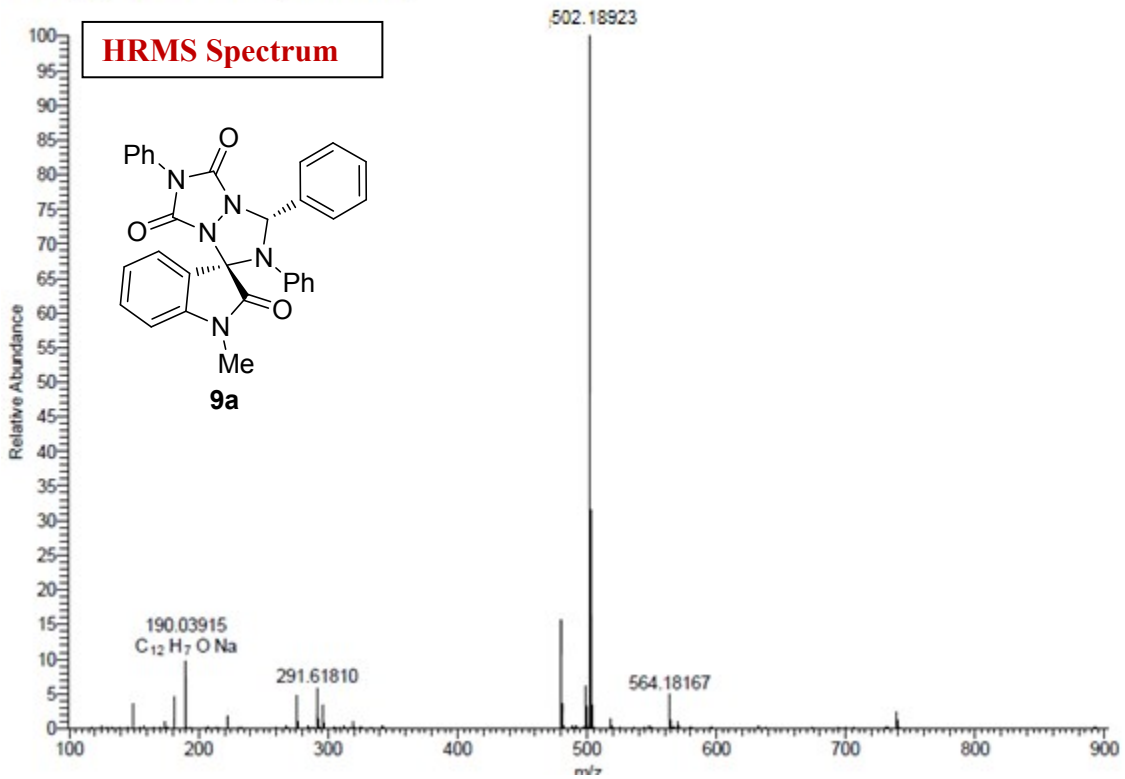


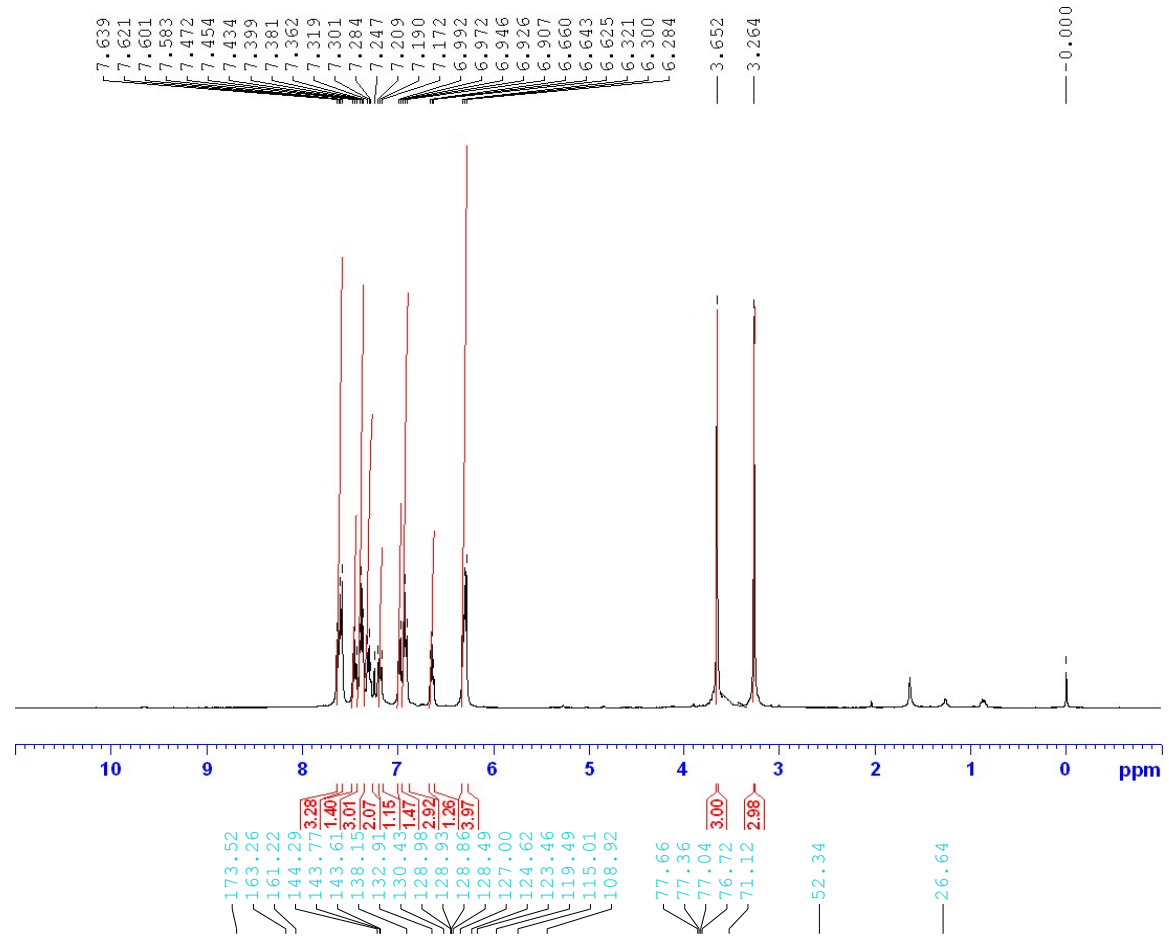
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



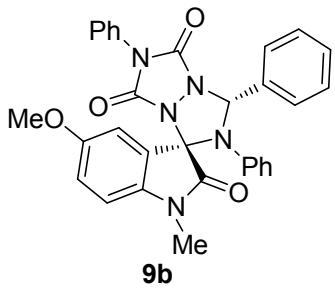
SMSGK-293 #61-73 RT: 0.87-1.03 AV: 13 SB: 322 0.03-0.84 , 1.15-4.95 NL: 8.87E6
T: FTMS {1,1} + p ESI Full lock ms [100.00-2000.00]

HRMS Spectrum





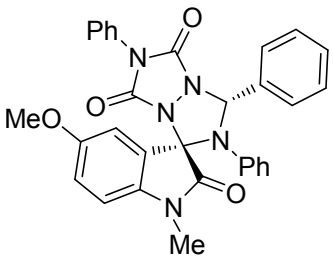
^{13}C NMR (100 MHz, $CDCl_3$)



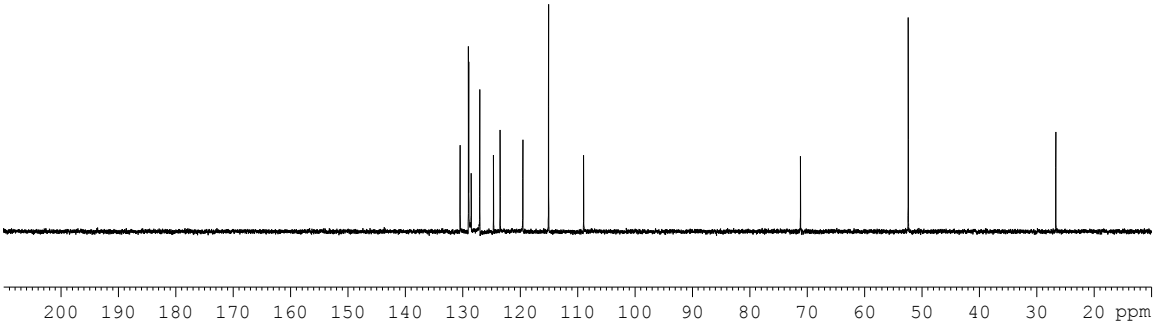
9b

^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)

130.46
129.01
128.96
128.70
128.52
127.03
124.65
123.49
119.52
115.05
108.95
71.15
52.37
26.67



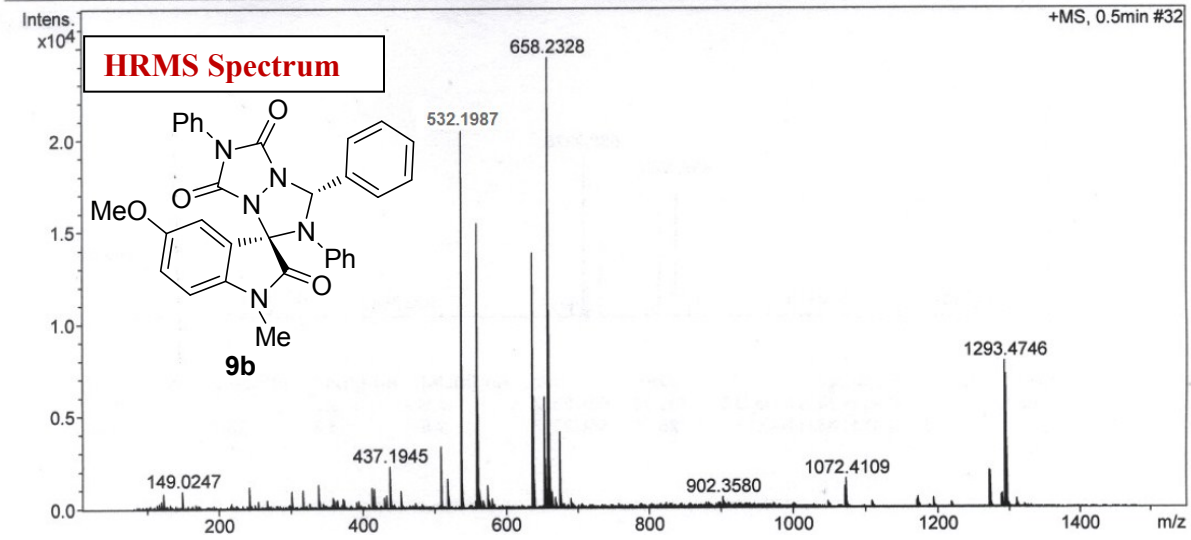
9b



Acquisition Parameter

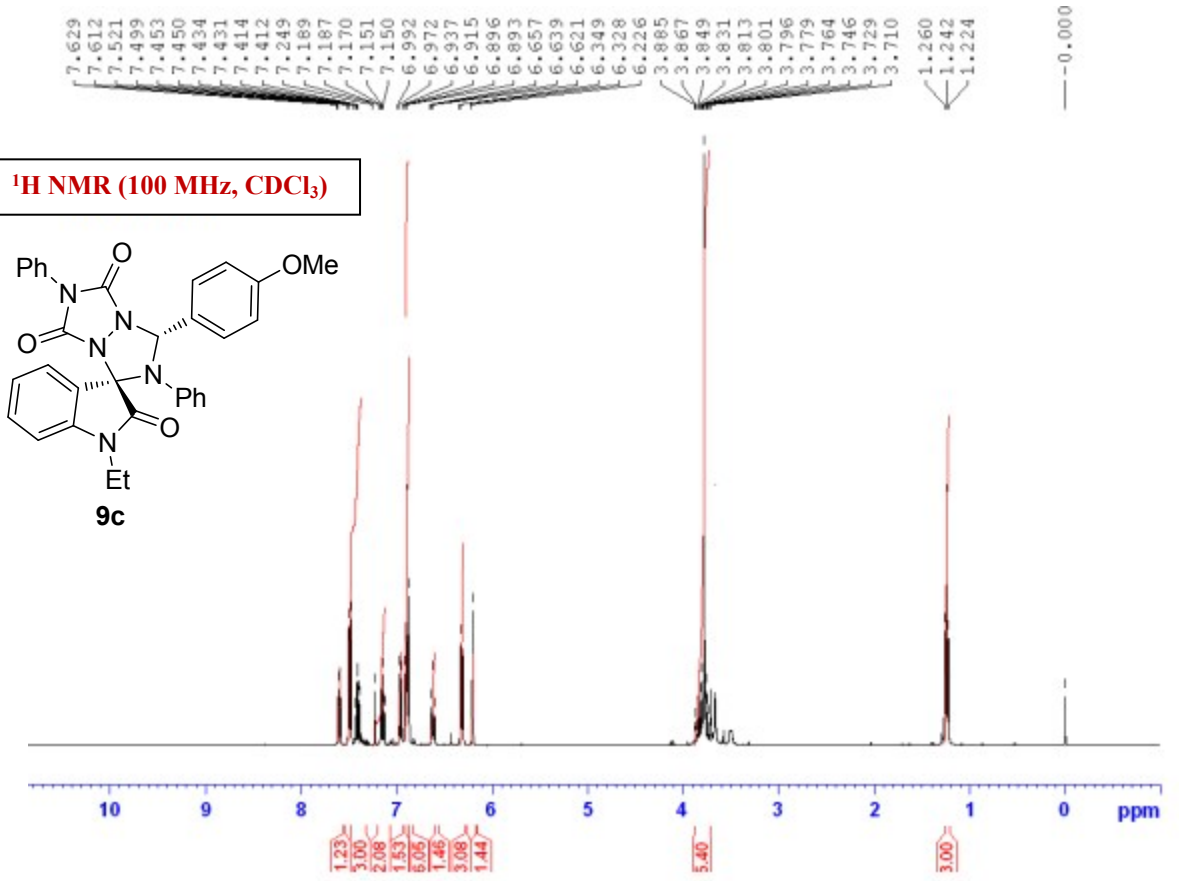
Source Type	ESI	Ion Polarity	Positive	Set Nebulizer	0.3 Bar
Focus	Not active	Set Capillary	4500 V	Set Dry Heater	180 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	4.0 l/min
Scan End	1500 m/z	Set Collision Cell RF	100.0 Vpp	Set Divert Valve	Source

HRMS Spectrum



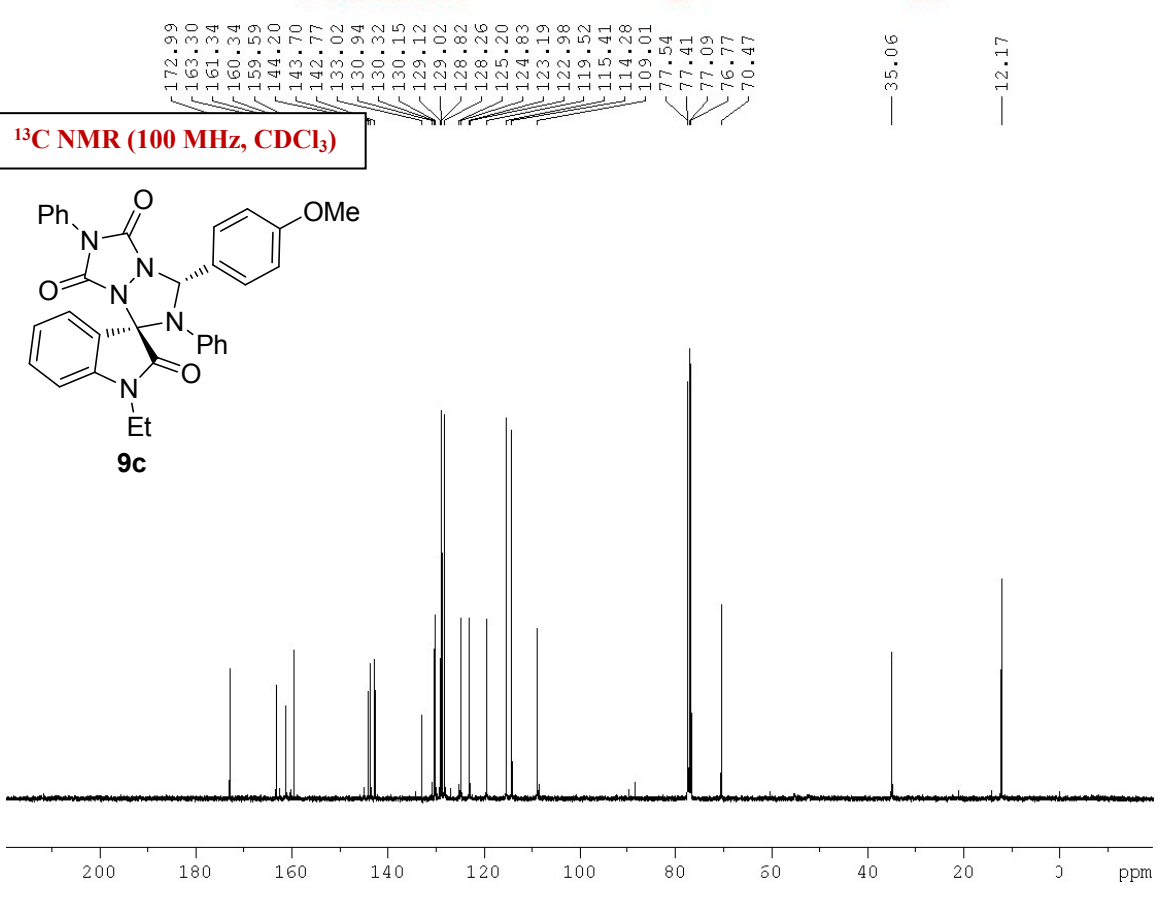
9b

^{1}H NMR (100 MHz, $CDCl_3$)



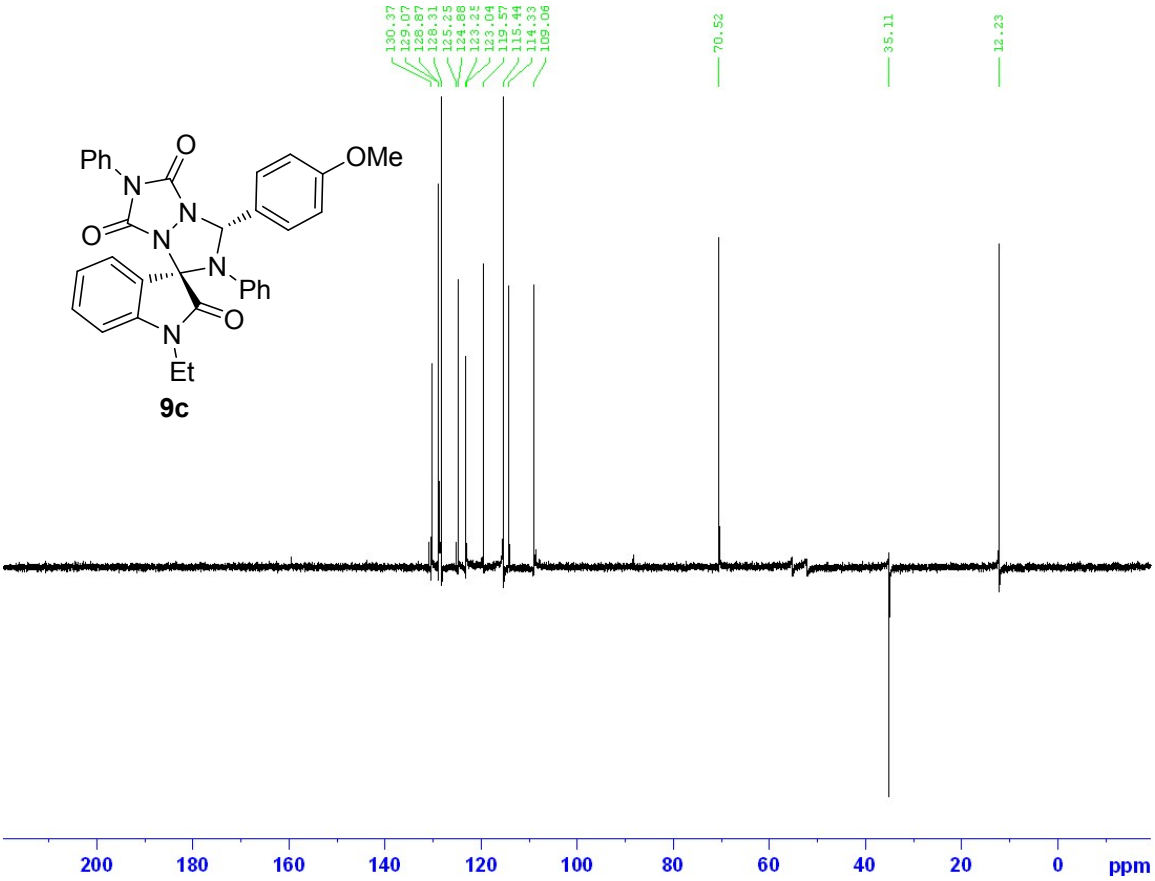
9c

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

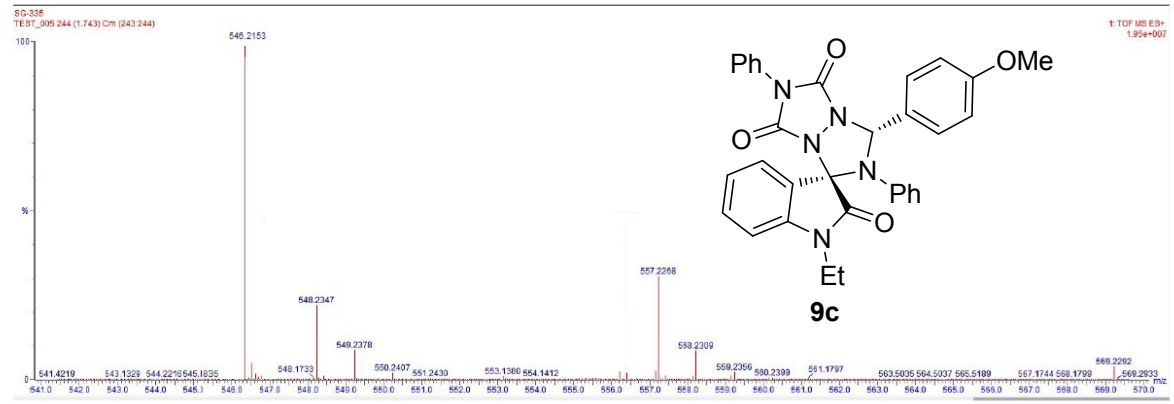


9c

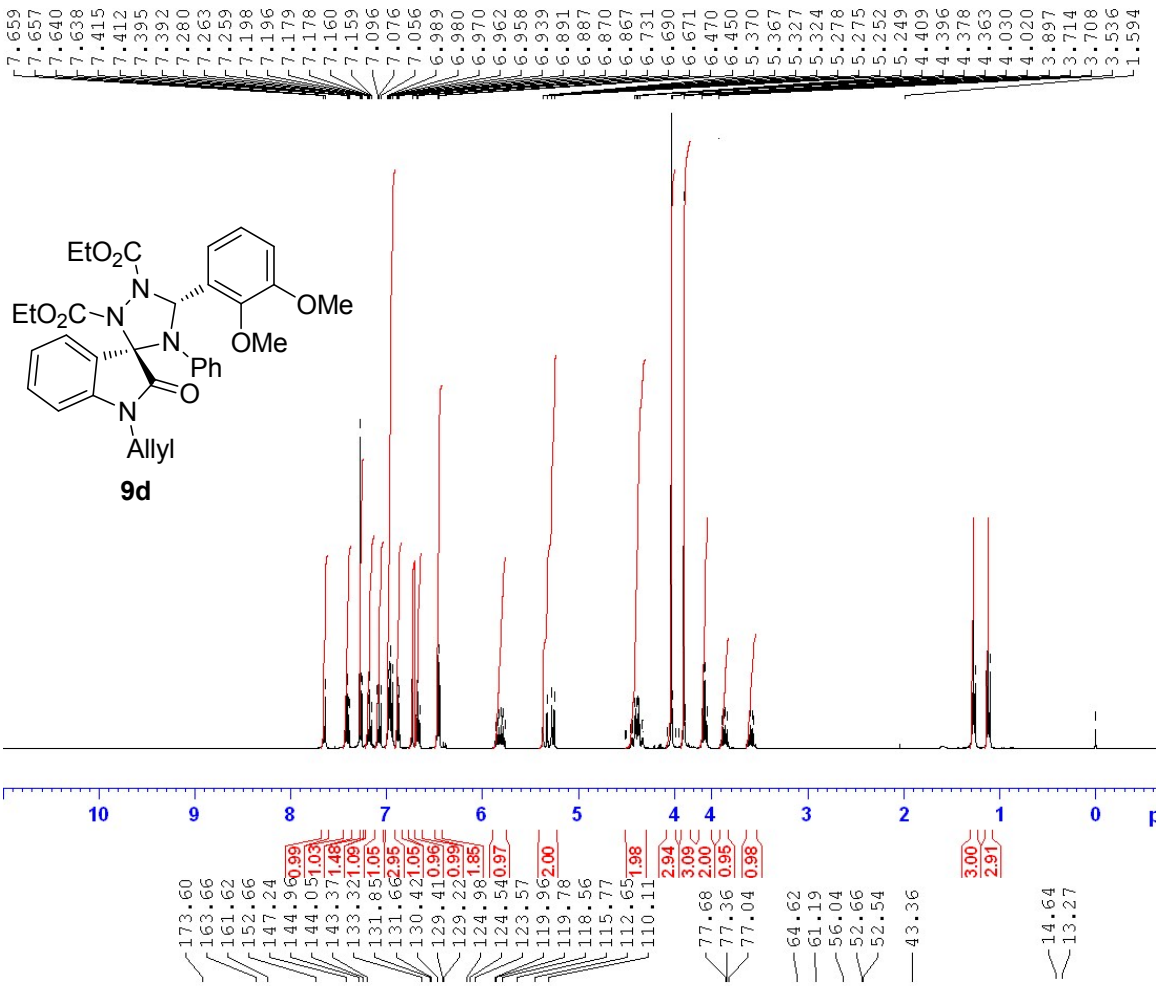
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



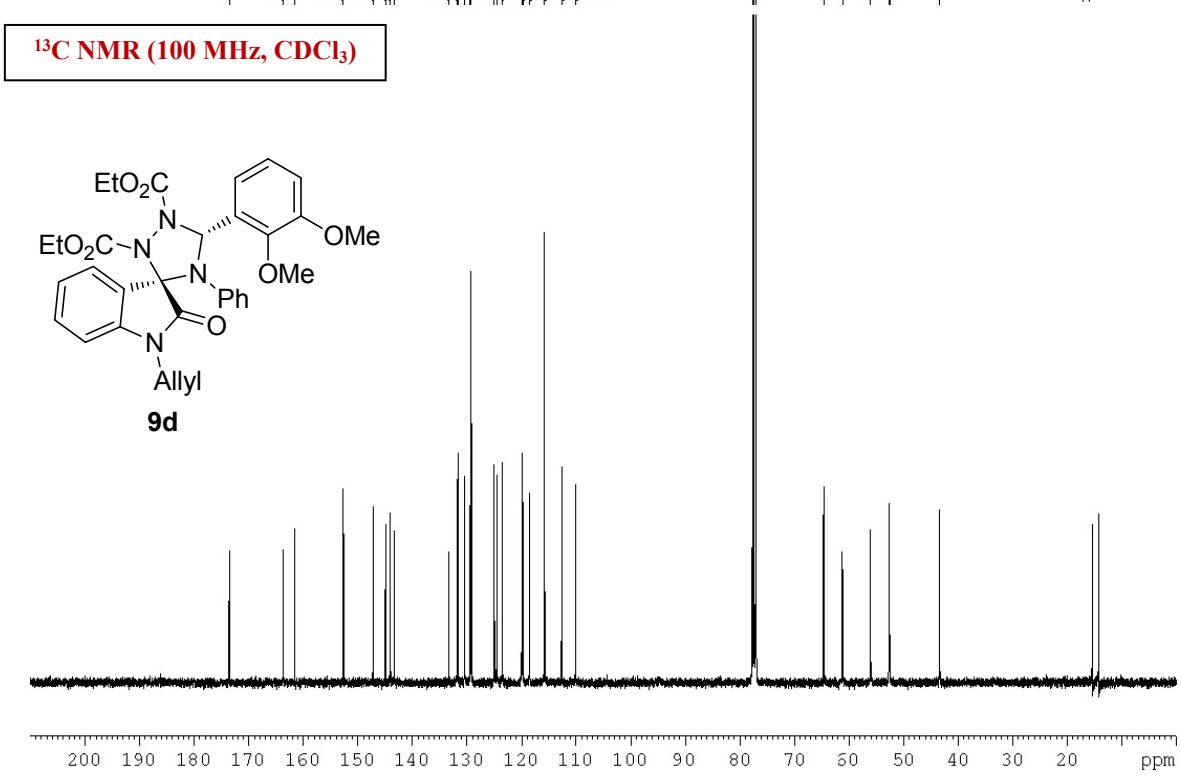
HRMS Spectrum



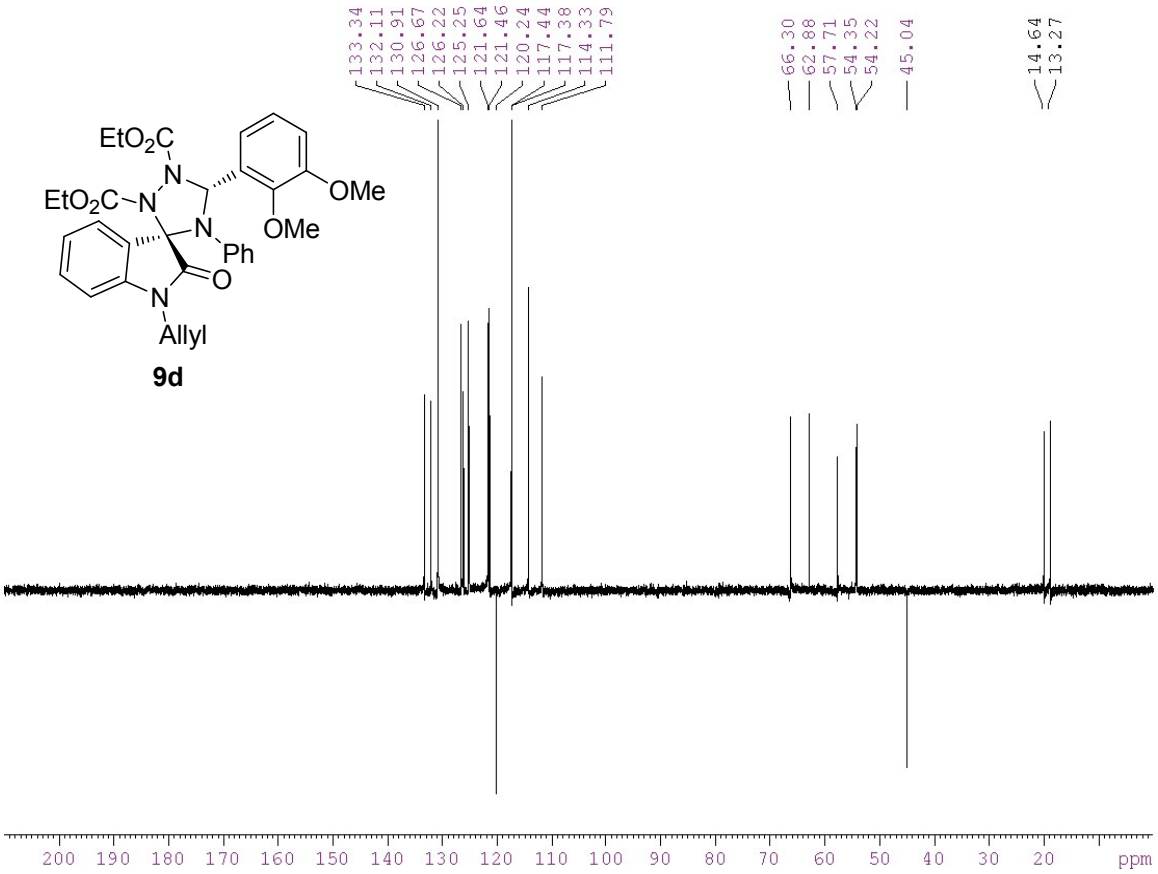
^{1}H NMR (100 MHz, $CDCl_3$)



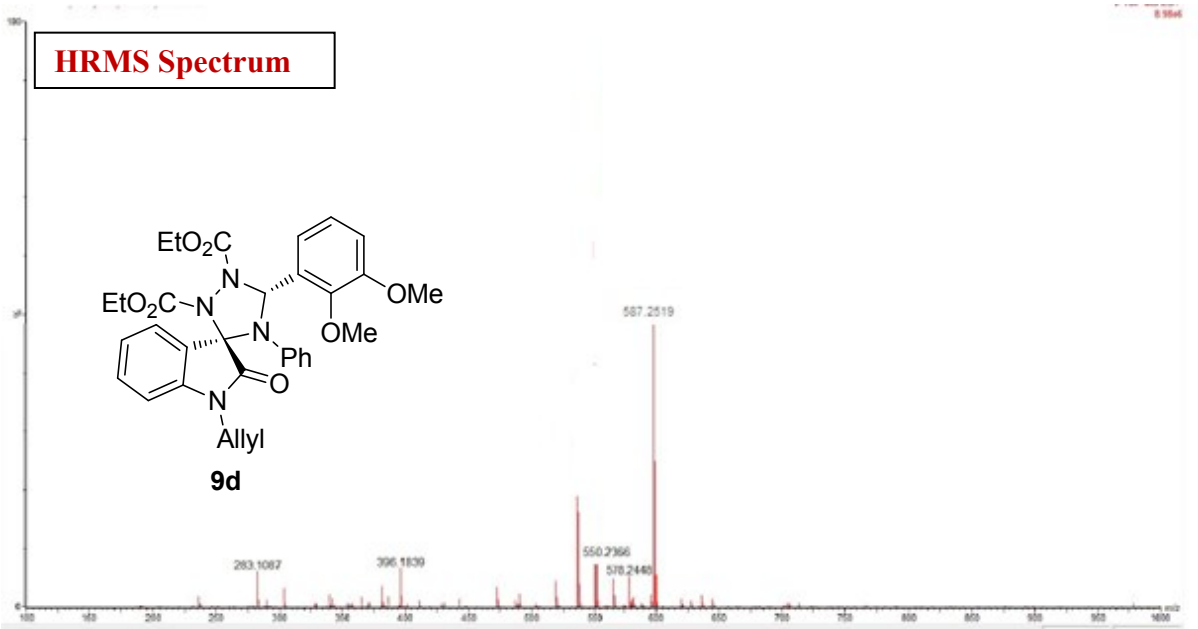
^{13}C NMR (100 MHz, $CDCl_3$)



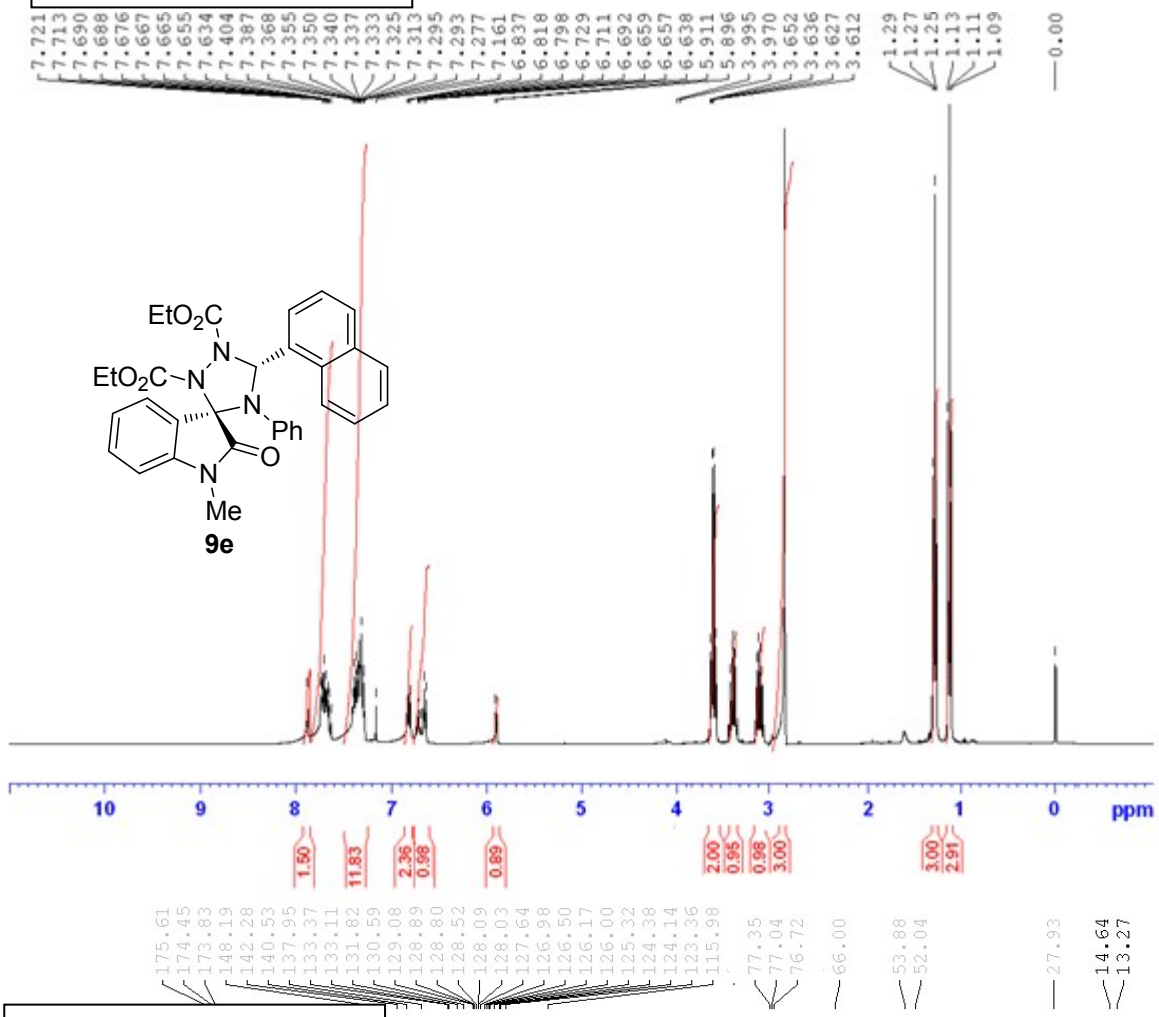
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



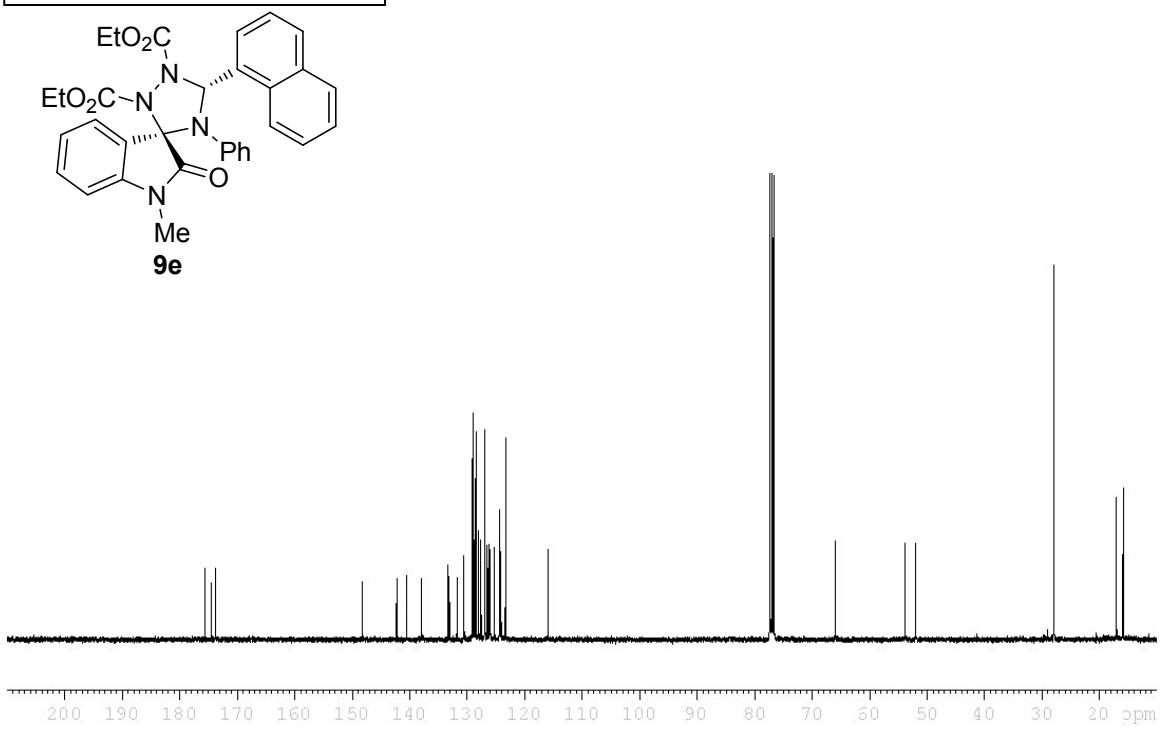
HRMS Spectrum



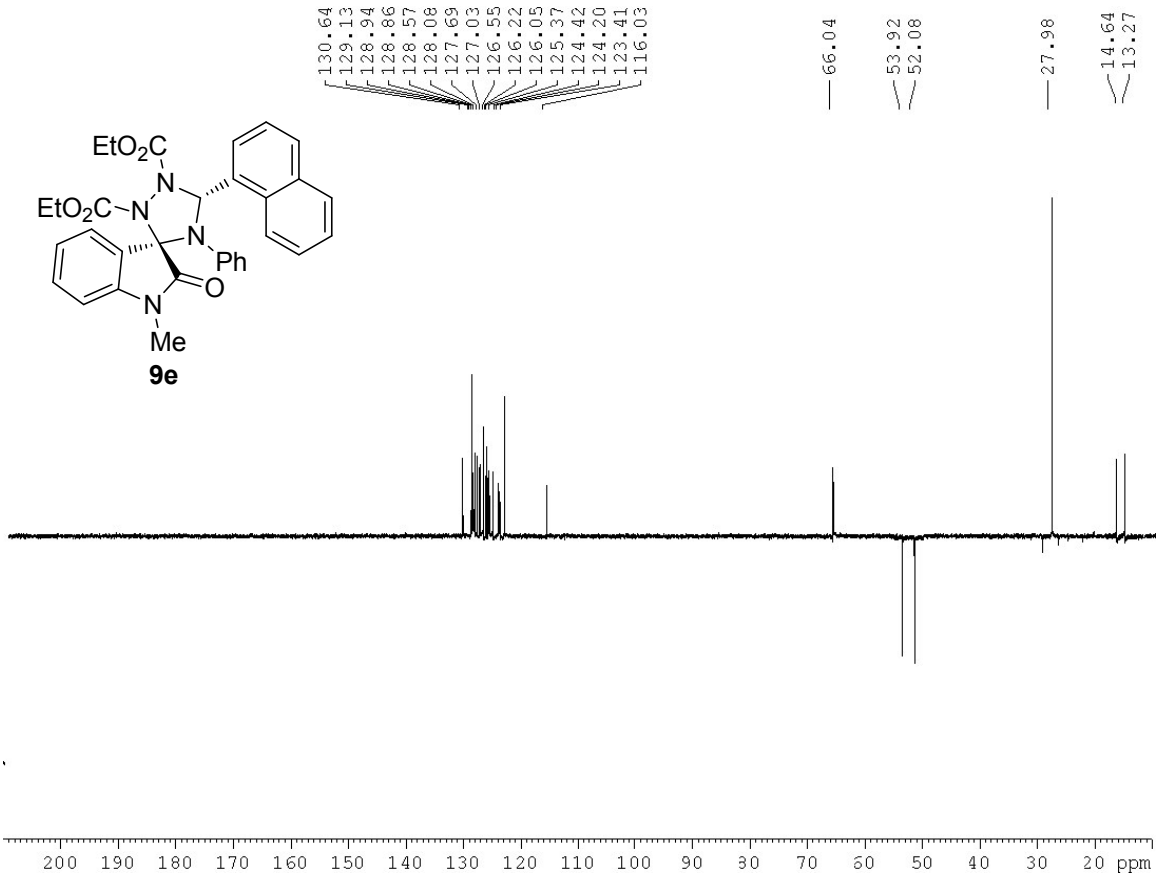
^{1}H NMR (100 MHz, $CDCl_3$)



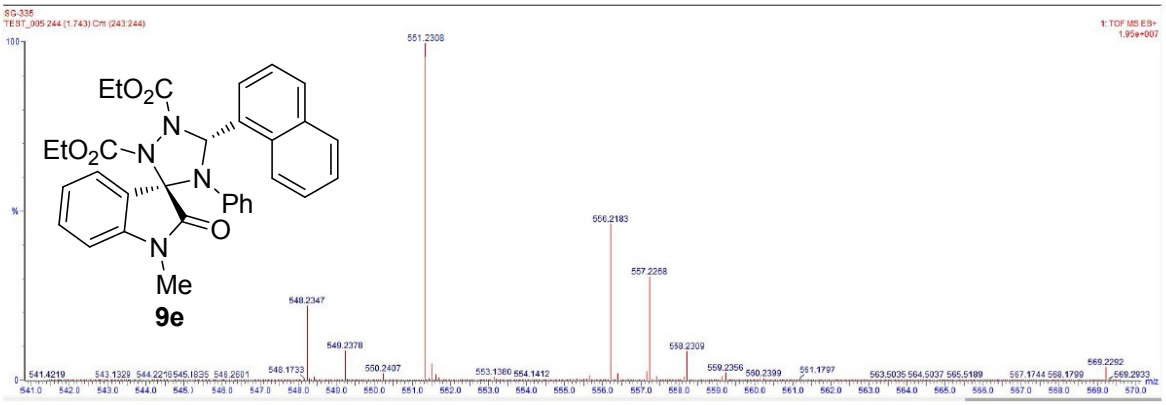
^{13}C NMR (100 MHz, $CDCl_3$)



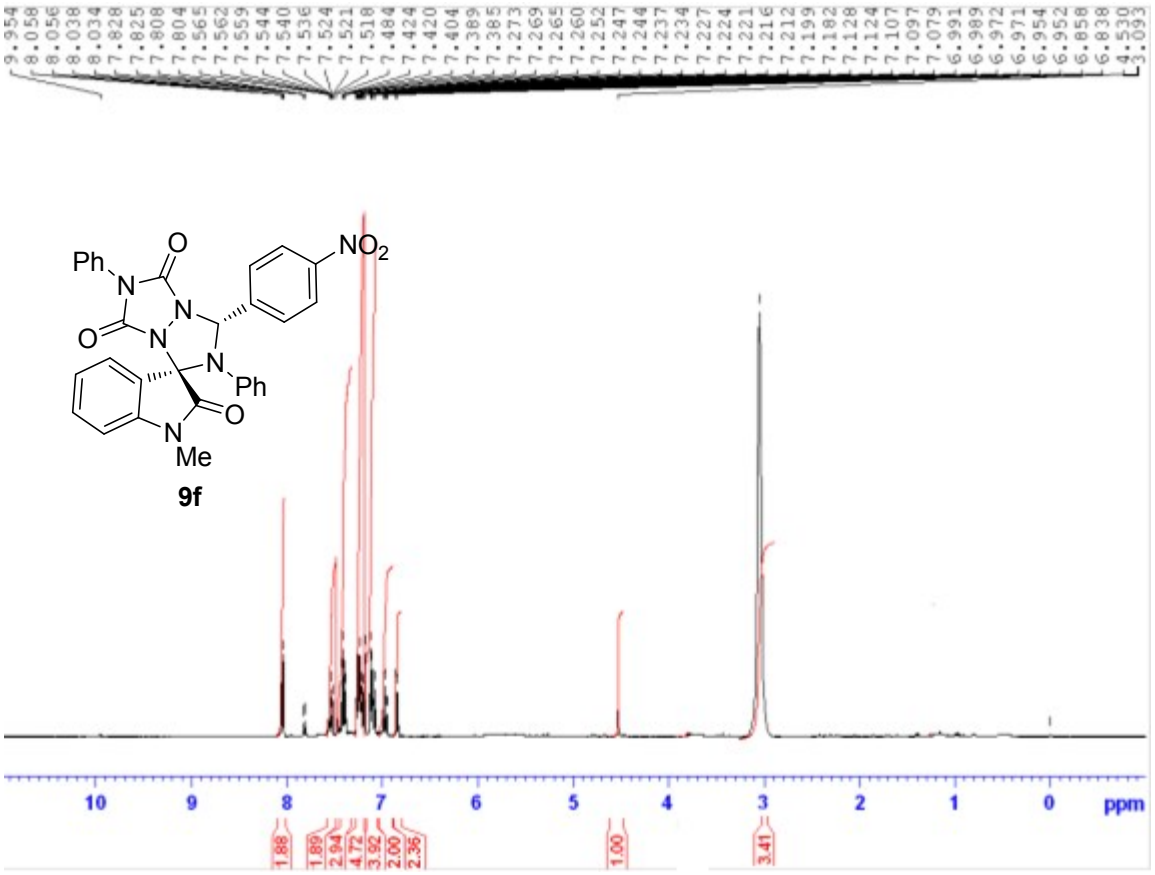
^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



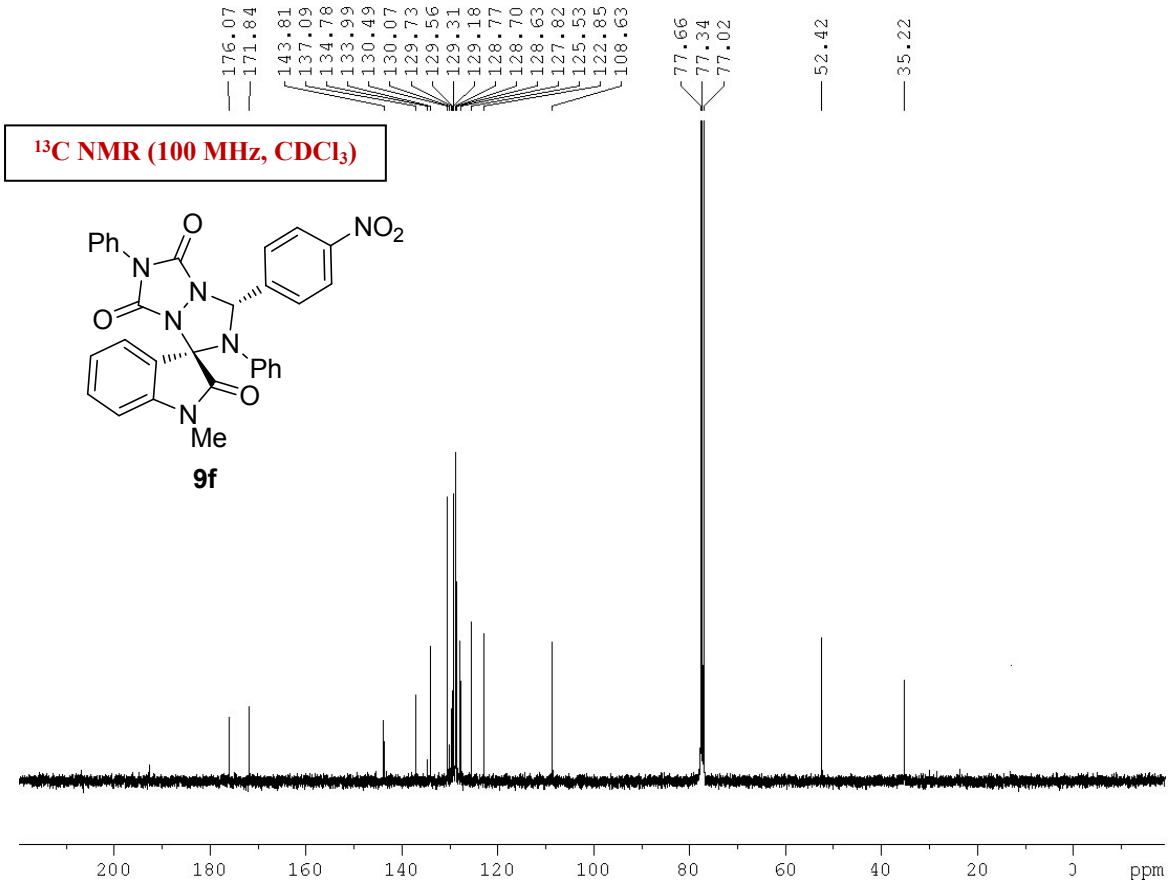
HRMS Spectrum



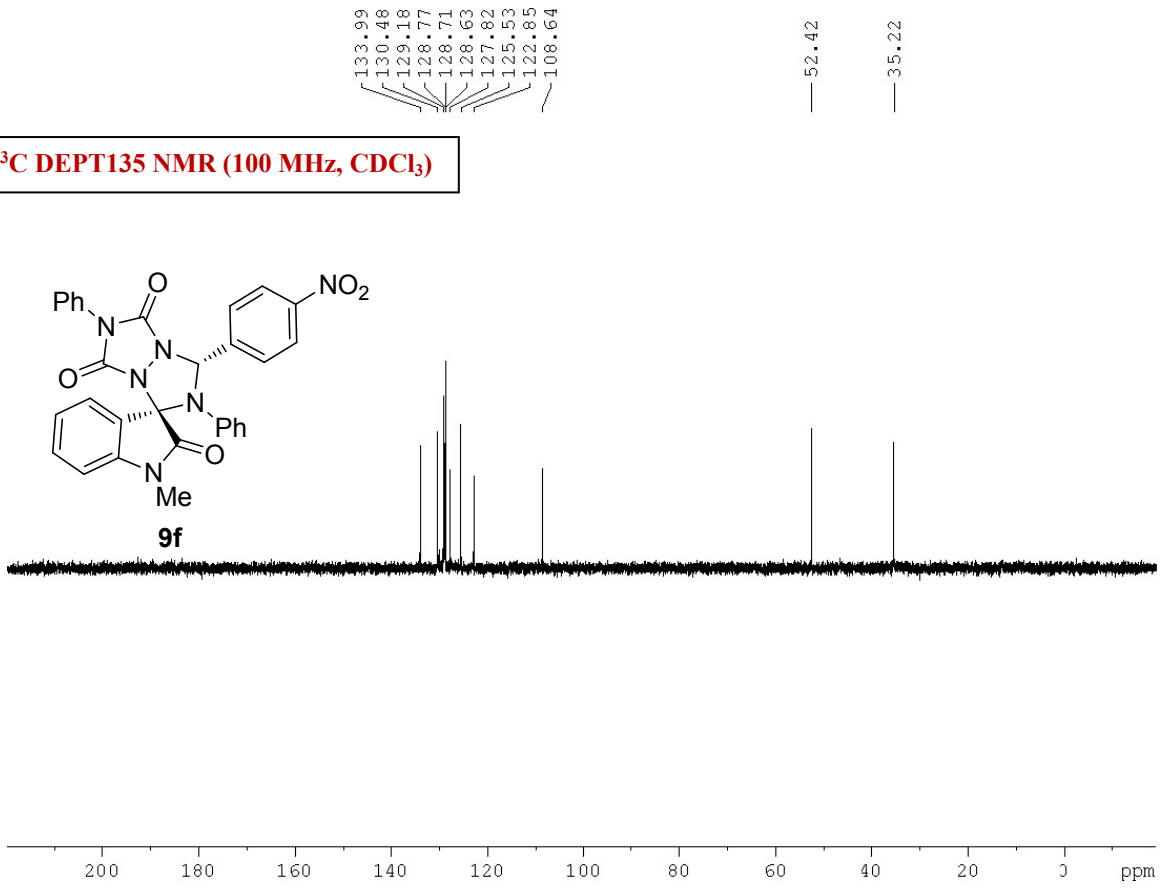
^{1}H NMR (400 MHz, $CDCl_3$)



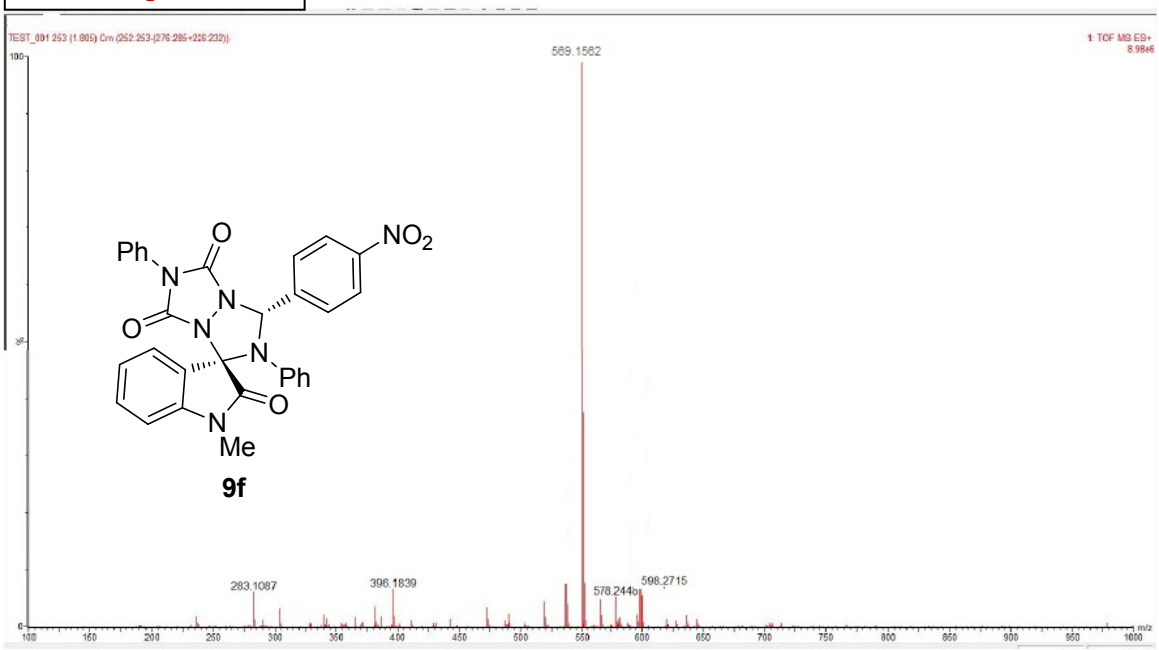
^{13}C NMR (100 MHz, $CDCl_3$)

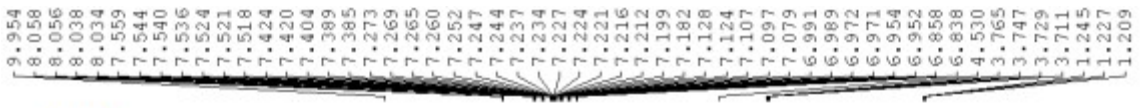


^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)

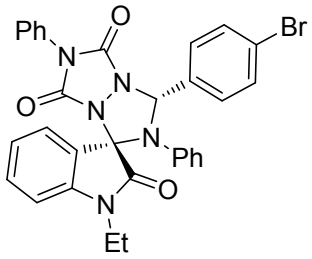


HRMS Spectrum



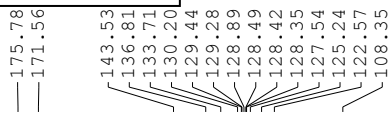


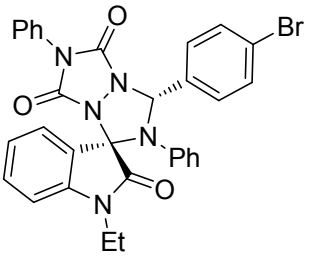
^{1}H NMR (400 MHz, $CDCl_3$)



9g

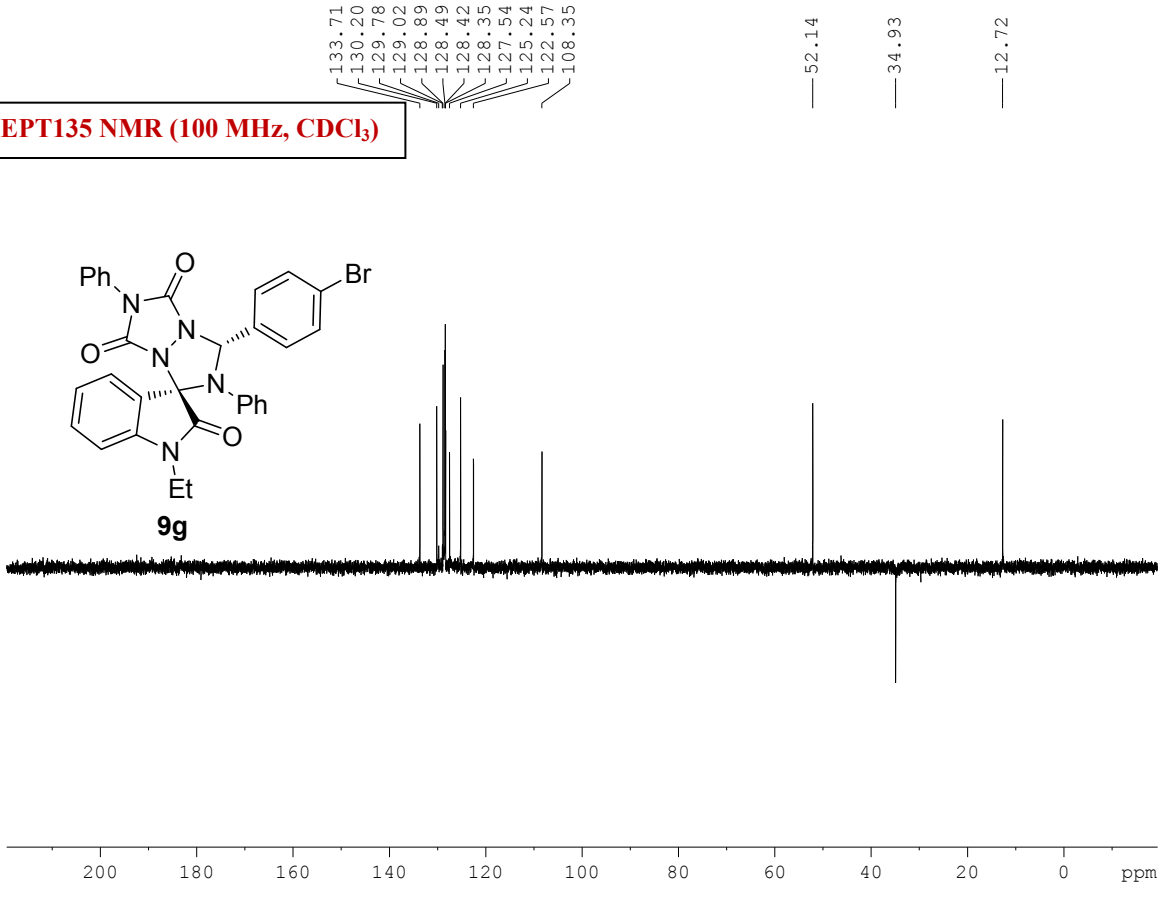
^{13}C NMR (100 MHz, $CDCl_3$)

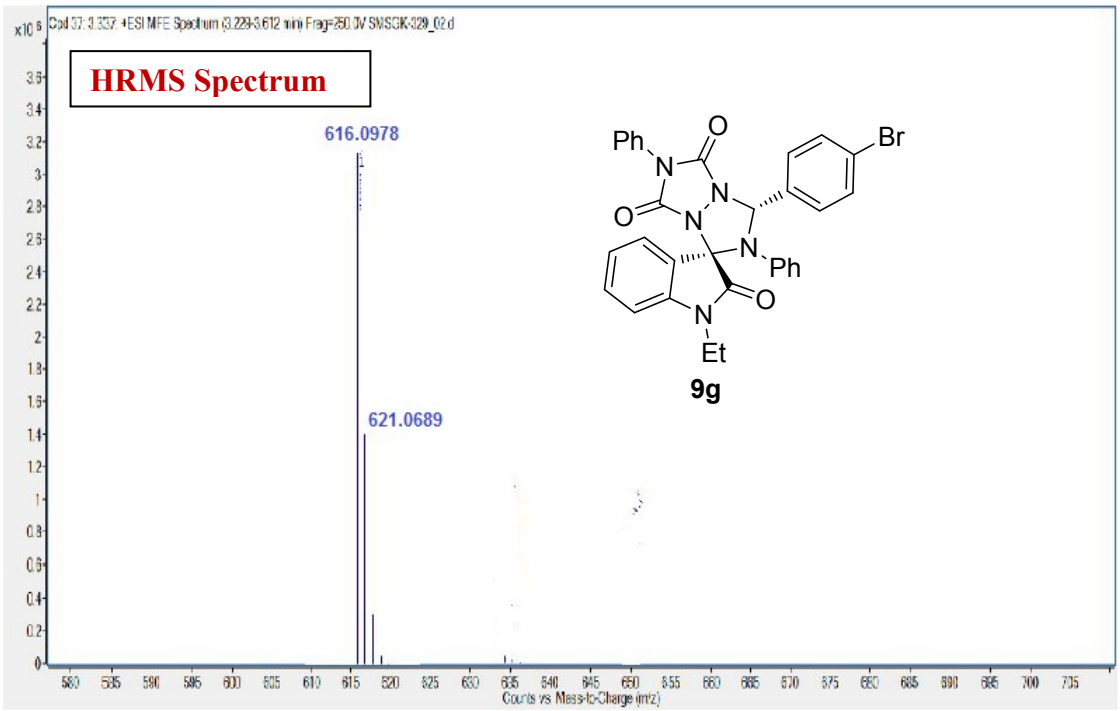




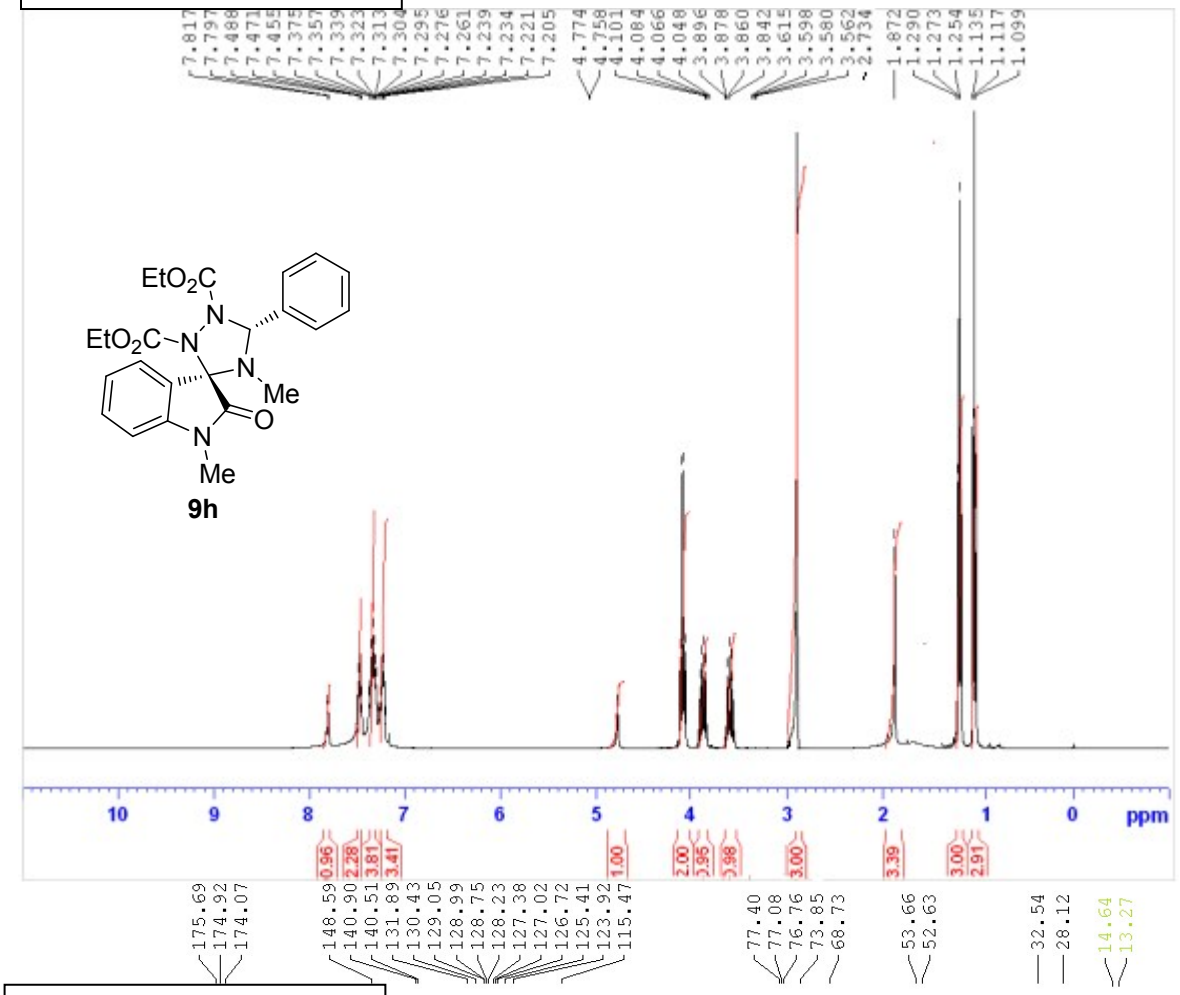
9g

^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)

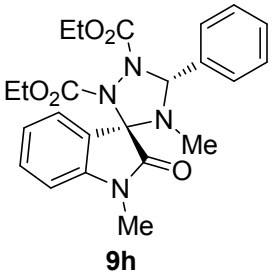


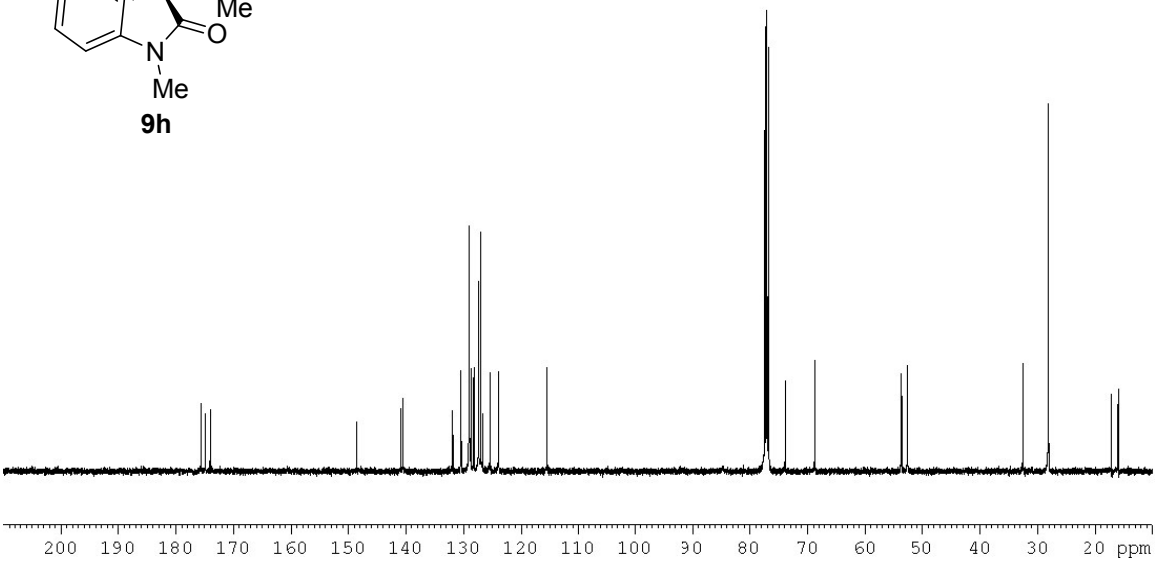


^{1}H NMR (400 MHz, $CDCl_3$)

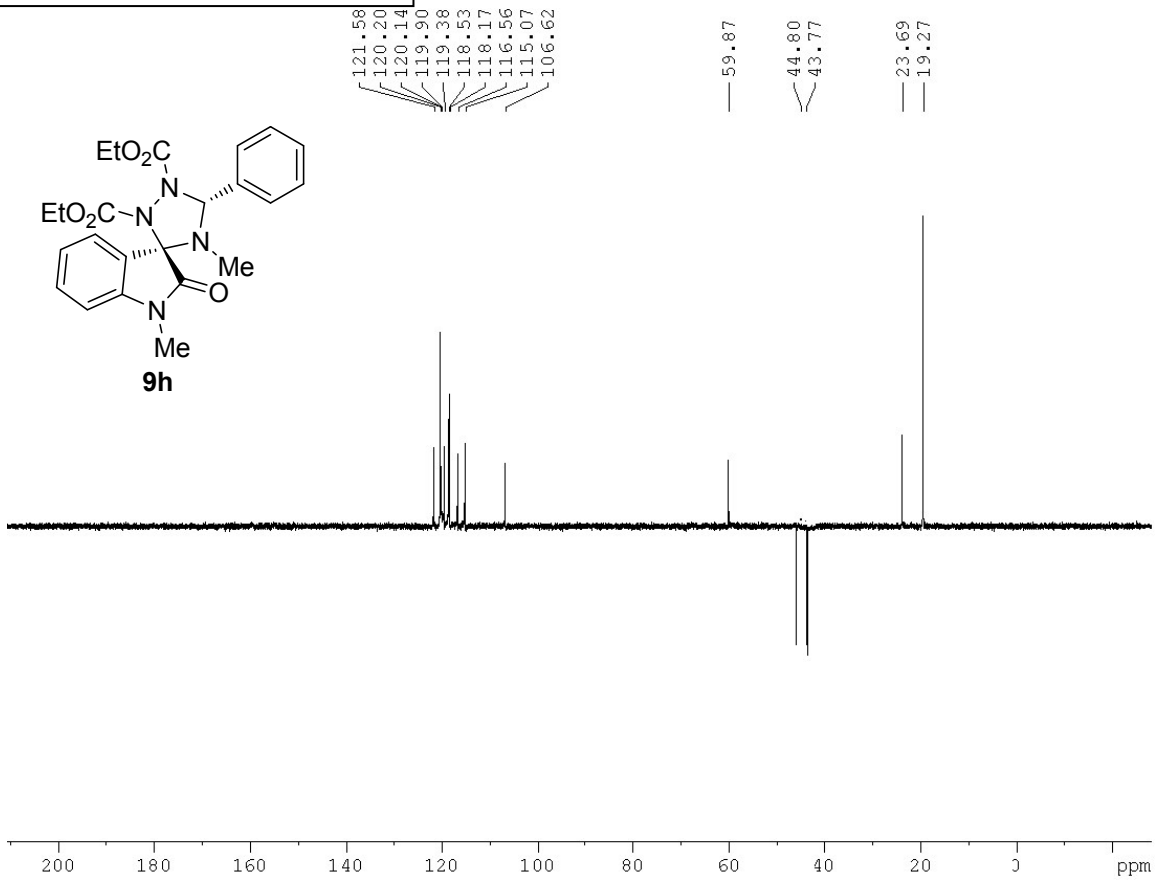


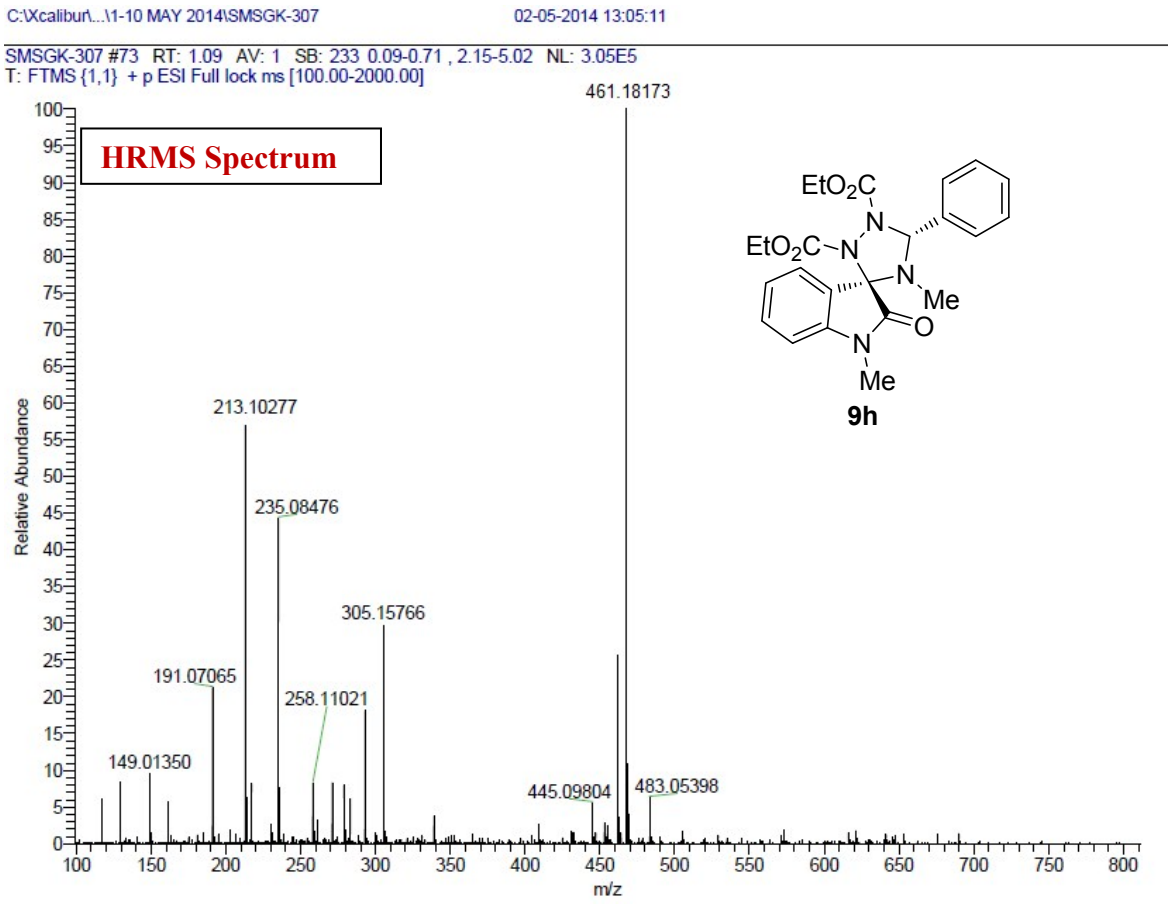
^{13}C NMR (100 MHz, $CDCl_3$)



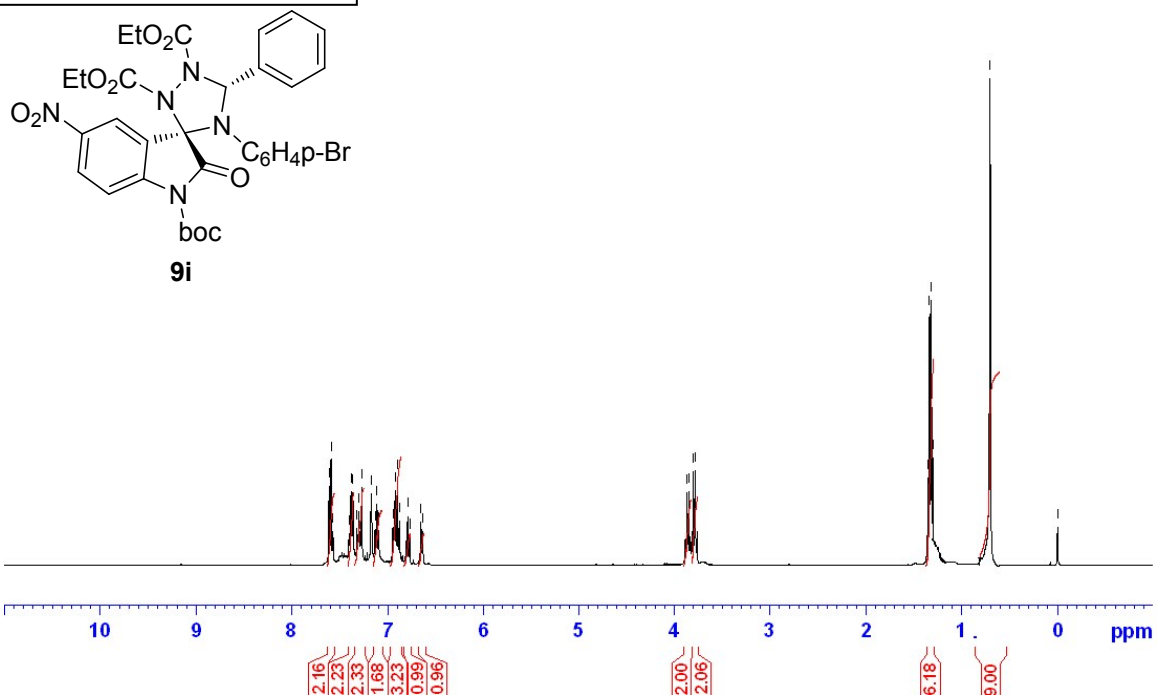


^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



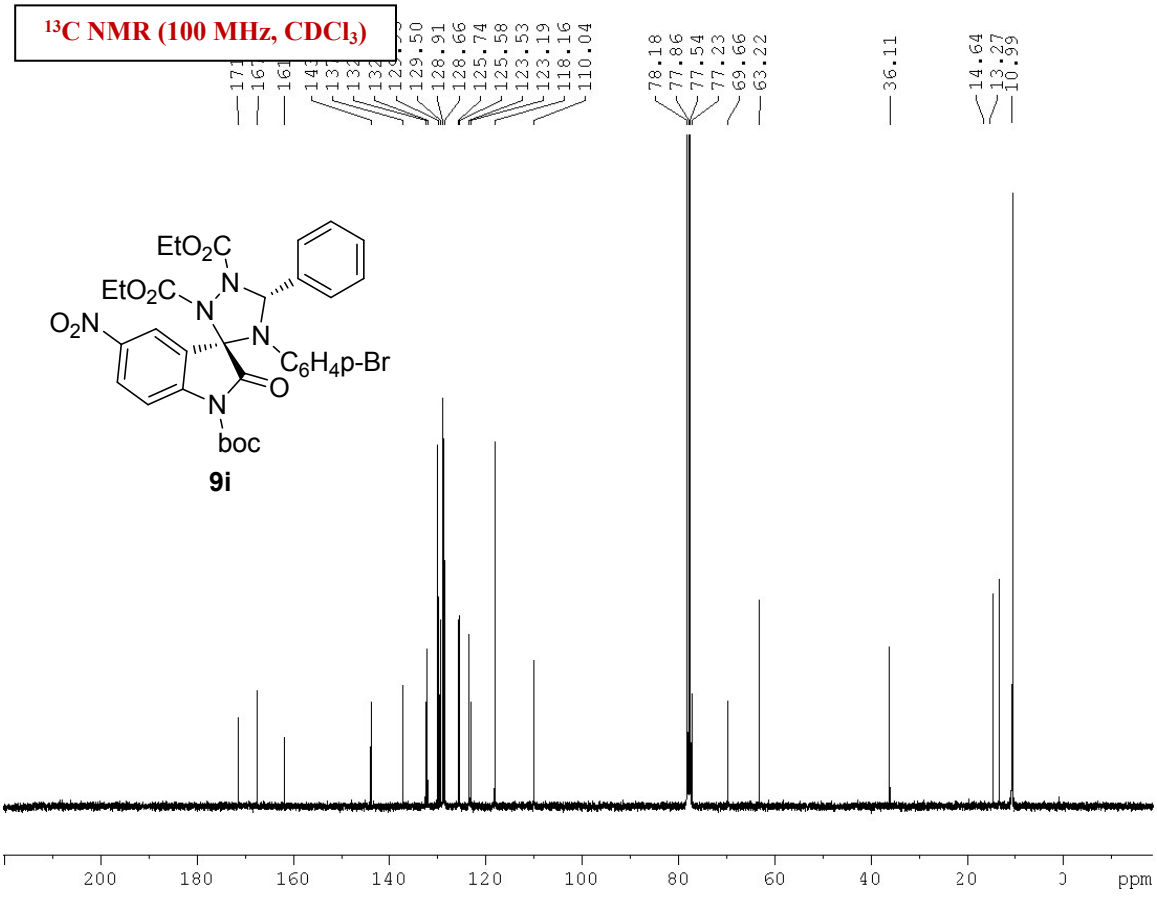


^{1}H NMR (400 MHz, $CDCl_3$)



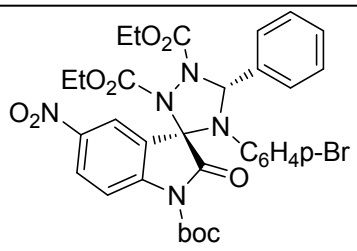
9i

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



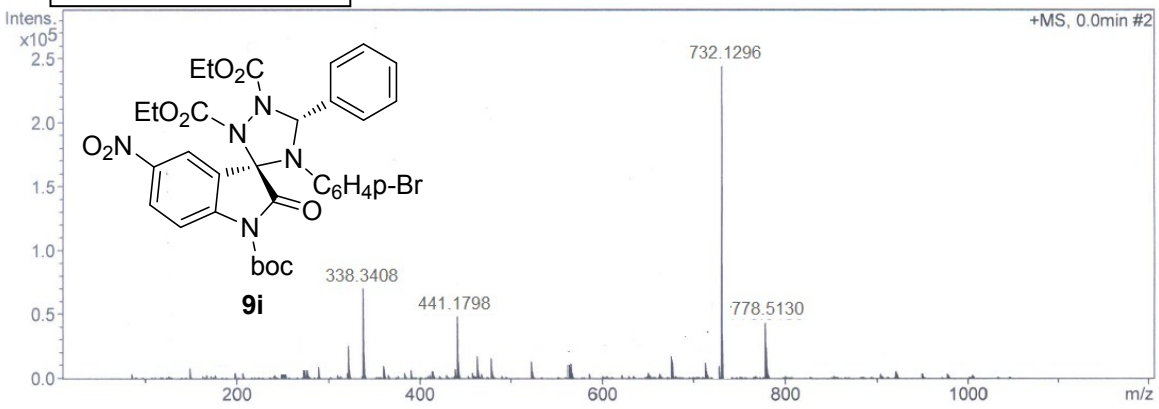
9i

^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



9i

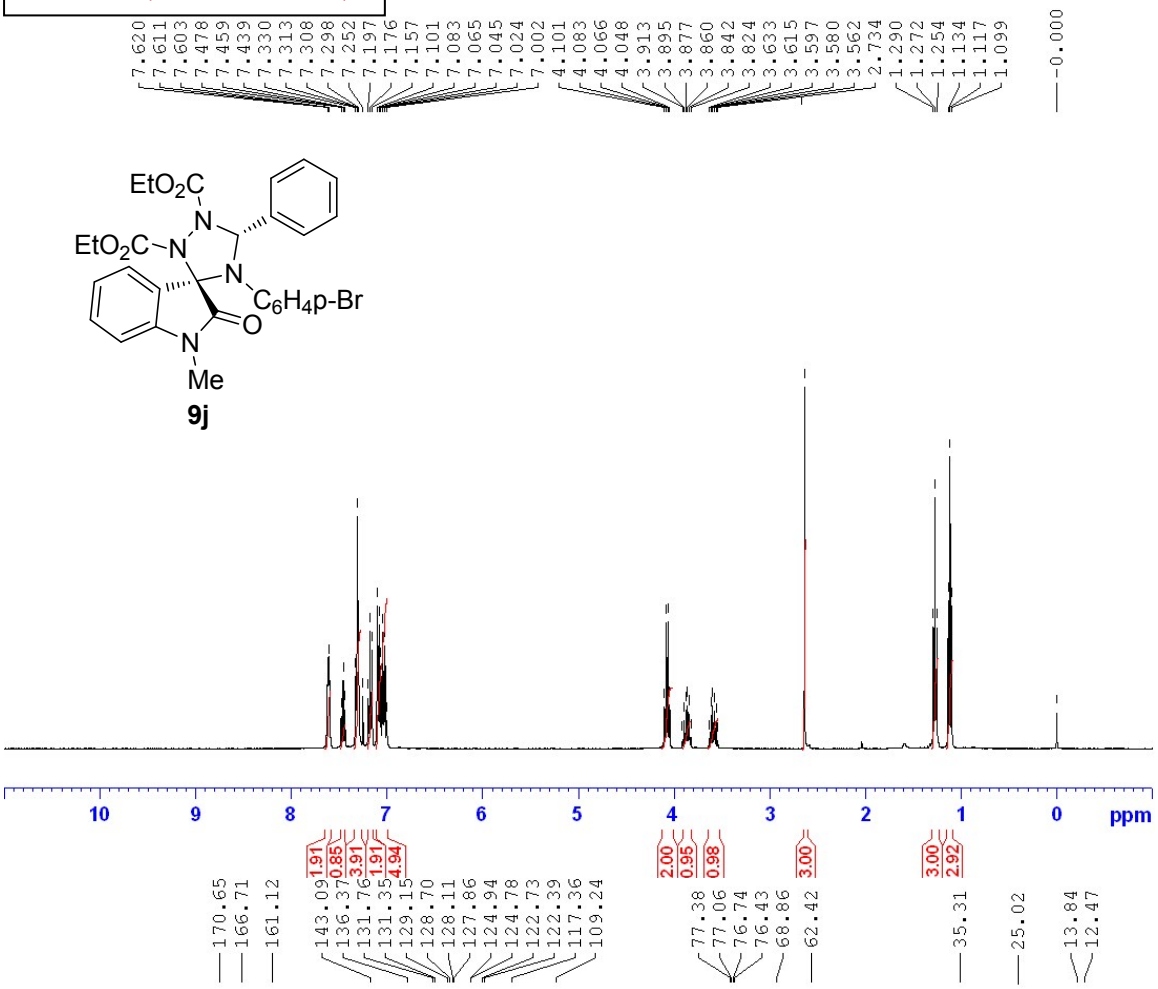
HRMS Spectrum



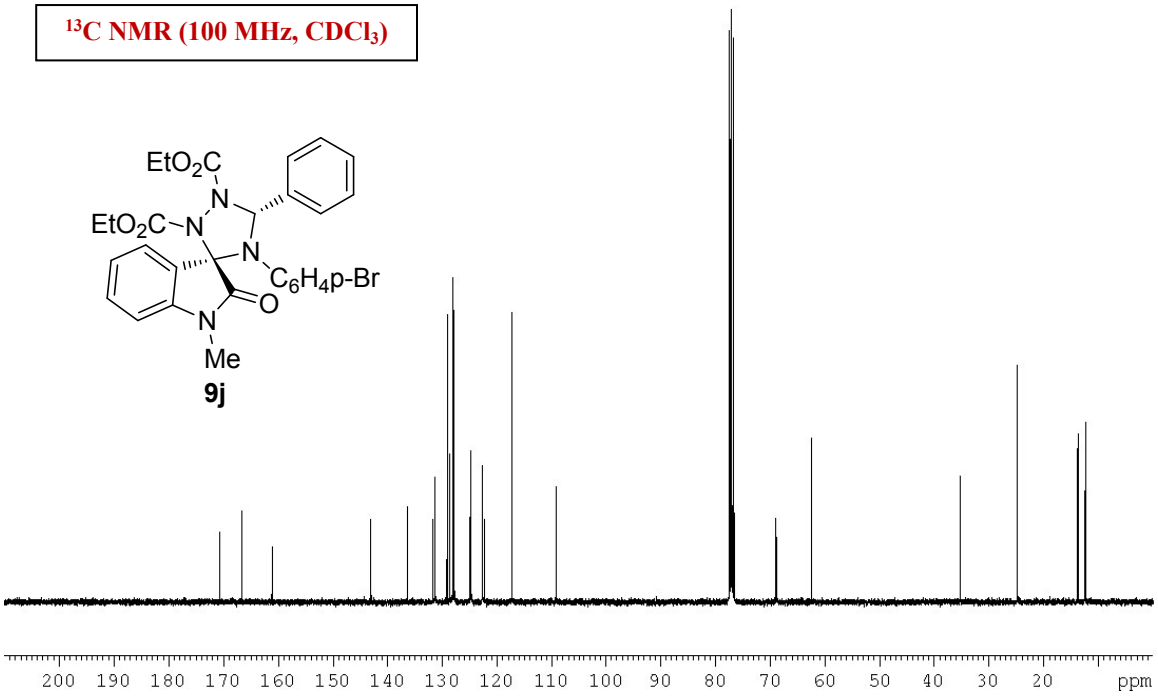
EtO2C
EtO2C
N
N
O2N
N
C6H4p-Br
O
N
boc

9i

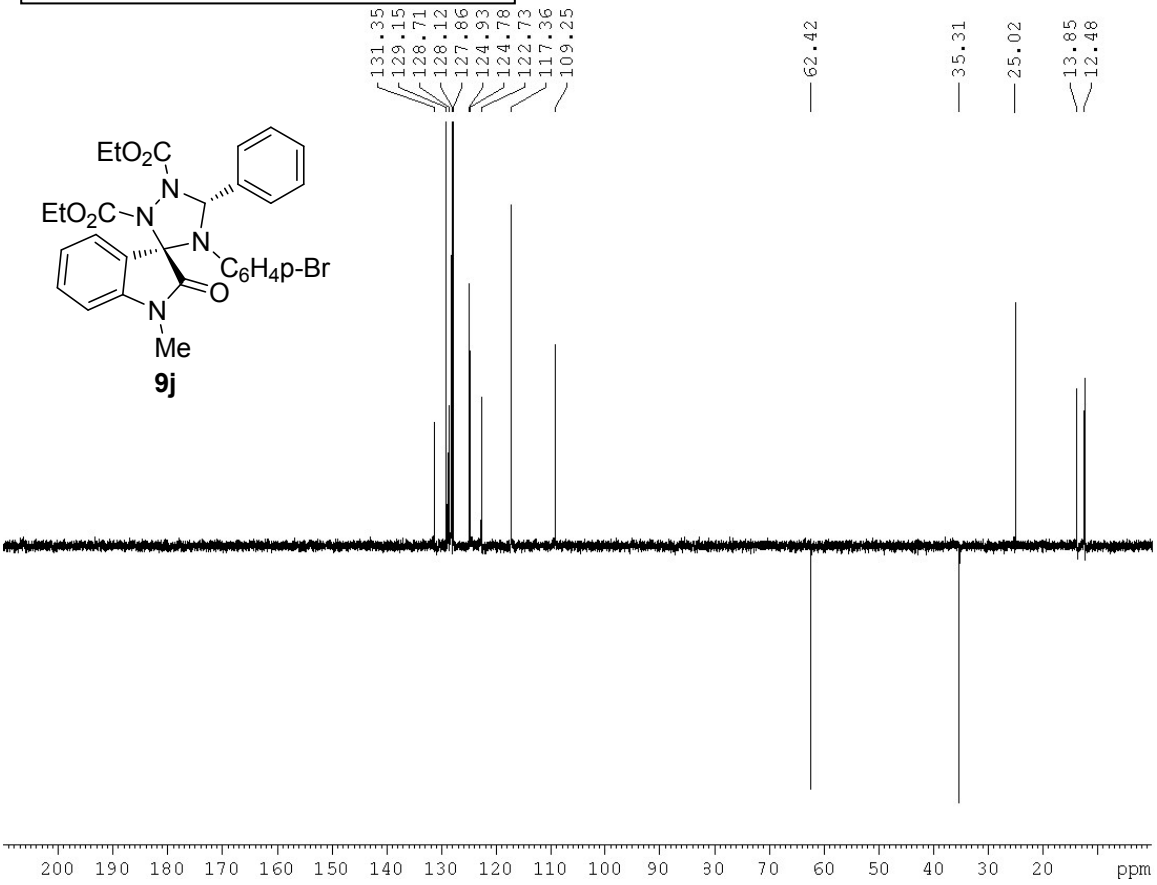
^{1}H NMR (400 MHz, $CDCl_3$)



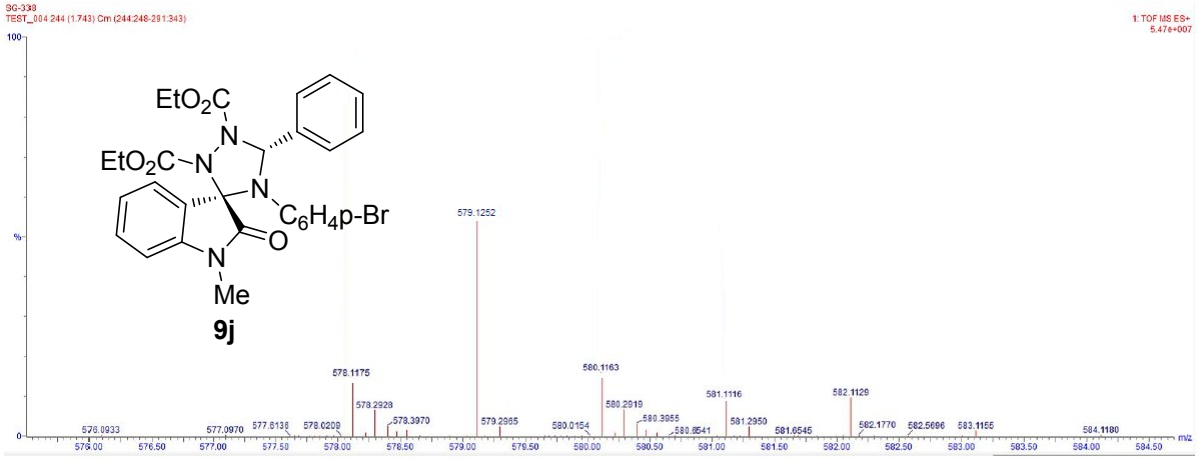
^{13}C NMR (100 MHz, $CDCl_3$)



^{13}C DEPT135 NMR (100 MHz, $CDCl_3$)



HRMS Spectrum

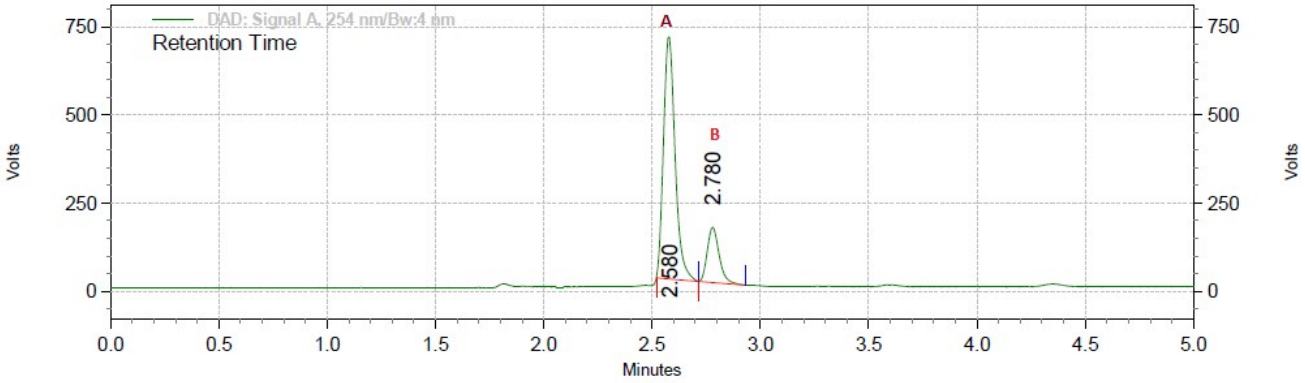


HPLC data for compound 5k

Area % Report

Data File: D:\Ezchrom\hplc data\sgk307-100acn2014_04_msk_100acn.met.rslt\186.dat

Acquired: 4/9/2014 12:21:53 PM (GMT +05:30)



DAD: Signal

A, 254 nm/Bw: 4 nm

Results

Retention Time	Area	Area %	Height	Height %	Name
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2.780	1250371	18.89	329901	18.64	**B**
Totals	6617937	100.00	1769430	100.00	