

# "Palladium-Catalyzed Tsuji–Trost-Type Reaction of 3-Indolylmethylacetates with O, and S Soft Nucleophiles"

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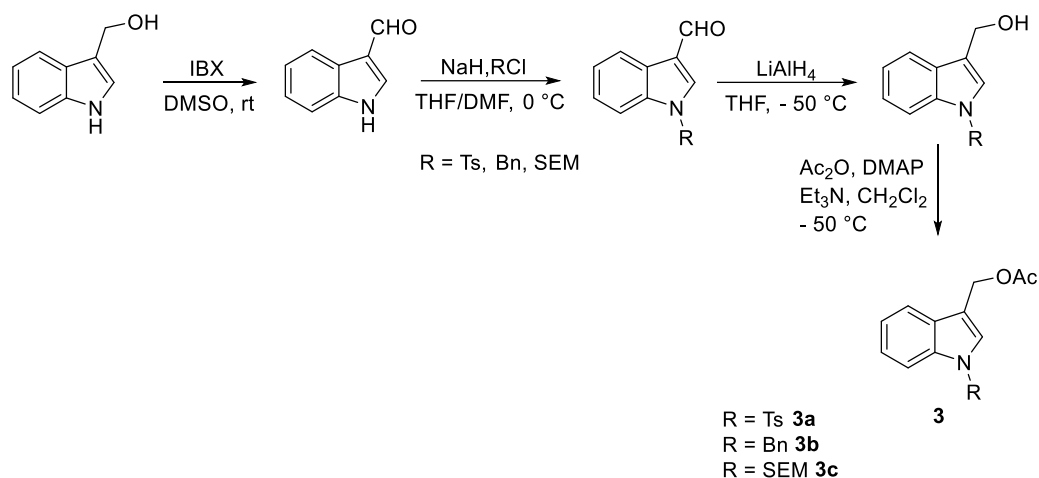
## 1. GENERAL INFORMATION

### 1.1. Reagents and methods

All of the commercially available reagents, catalysts, bases and solvents were used as purchased, without further purification. Starting materials and reaction products were purified by flash chromatography using SiO<sub>2</sub> as stationary phase, eluting with *n*-hexane/ethyl acetate. <sup>1</sup>H NMR (400.13 MHz), <sup>13</sup>C NMR (100.6 MHz), and <sup>19</sup>F spectra (376.5 MHz) were recorded with a Bruker Avance 400 spectrometer. Splitting patterns are designed as s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet), or bs (broad singlet). IR spectra were recorded with a Jasco FT/IR-430 spectrometer. Mass spectra were determined with a Shimadzu QP2010 Gas Chromatograph Mass spectrometer (EI ion source) or with a Shimadzu QP2010-Plus Gas Chromatograph Mass spectrometer (CI ion source/ NCI ion source, DI). HRMS were recorded with an Orbitrap Exactive Mass spectrometer with ESI source. Melting points were determined with a Büchi B-545 apparatus and are uncorrected.

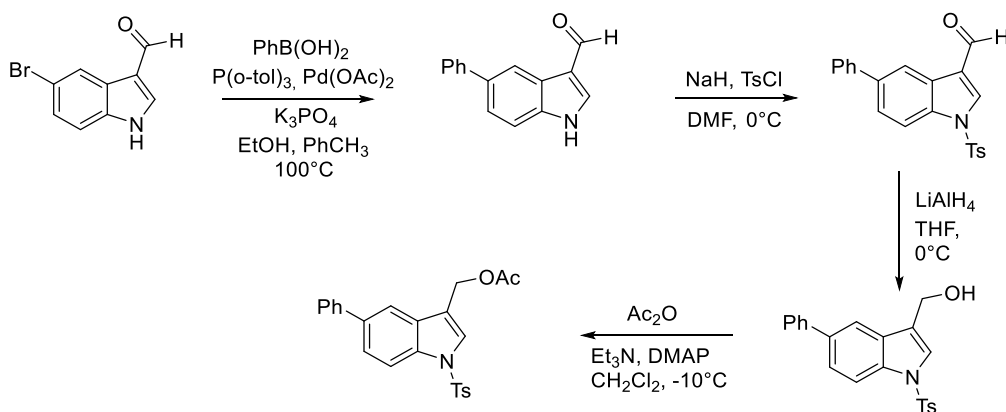
## 2. SYNTHETIC PROCEDURES FOR STARTING MATERIALS

Starting materials **3a-3d** and **3f-3g** were prepared according to literature procedures<sup>1,2,3</sup> through the four-step sequence of reactions depicted in the following scheme.



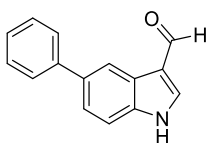
### 2.1 Typical procedure for the preparation of the 5-phenyl(1-tosyl-1H-indol-3-yl)methyl acetate **3e**:

Starting materials **3e** was prepared through the four-step sequence of reactions depicted in the following scheme.



#### 2.2.1 Typical procedure for the preparation of the 5-phenyl-1H-indole-3-carbaldehyde:

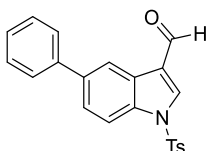
In a 100 ml two-necked round bottom flask equipped with a stirring bar P(o-tol)<sub>3</sub> (0.220 g, 0.725 mmol, 0.10 equiv.) and Pd(OAc)<sub>2</sub> (0.081 g, 0.363 mmol, 0.05 equiv.) were dissolved in ethanol (10 ml) and toluene (5 ml) under inert atmosphere. Then, 5-bromo-1H-indole-3-carbaldehyde (1.62 g, 7.250 mmol, 1.00 equiv.), phenylboronic acid (1.75 g, 14.50 mmol, 2.00 equiv.) and K<sub>3</sub>PO<sub>4</sub> (3.07 g, 14.50 mmol, 2.00 equiv) were added to the mixture. The reaction was allowed to stir until disappearance of the starting material (monitored by HPLC), then toluene and ethanol were removed under reduced pressure. The residue was diluted with Et<sub>2</sub>O, washed with a KHSO<sub>4</sub> solution (10% w/w) and brine (2x). The organic layer was dried over Na<sub>2</sub>SO<sub>4</sub>, filtered and concentrated under reduced pressure, then the crude was purified by flash chromatography (silica gel, *n*-hexane/AcOEt 85/15 v/v, *R<sub>f</sub>* = 0.22) to afford 1.55 g of 5-phenyl-1H-indole-3-carbaldehyde in 95% yield.



**5-phenyl-1H-indole-3-carbaldehyde:** known compound; 95% yield; orange solid; mp: 255-257 °C; lit.<sup>4</sup> mp: 257-258 °C;  $R_f$  = 0.21 (*n*-hexane/AcOEt, 75:25); IR (neat): 3330, 2360, 1732, 1582, 1082, 812  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) ( $\text{DMSO}-d_6$ ):  $\delta$  11.7 (s, 1H), 9.43 (s, 1H), 7.81 - 7.76 (m, 2H), 7.13 - 7.11 (m, 2H), 7.08 - 7.00 (m, 2H), 6.95 - 6.91 (m, 2H) 6.82 - 6.78 (m, 1H);  $^{13}\text{C}$  NMR (100.6 MHz) ( $\text{DMSO}-d_6$ ):  $\delta$  185.1 (CH), 141.2 (C), 139.1 (CH), 136.6 (C), 134.8 (C), 128.9 (CH), 126.9 (CH), 126.8 (CH), 124.8 (C), 122.8 (CH), 118.8 (CH), 118.4 (C), 112.9 (CH); HRMS:  $m/z$   $[\text{M} + \text{H}]^+$  calcd for  $\text{C}_{15}\text{H}_{11}\text{NO}$ : 221.0800; found: 221.0801.

### 2.2.2 Typical procedure for the preparation of ethyl 5-phenyl-1-tosyl-1H-indole-3-carbaldehyde:

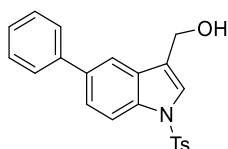
To a stirred solution of NaH (60% dispersion in mineral oil, 0.33 g, 8.27 mmol, 1.2 equiv.) in dry THF (5 mL) 5-phenyl-1H-indole-3-carbaldehyde (1.52 g, 6.89 mmol, 1.0 equiv.), dissolved in anhydrous DMSO (7.5 mL), was added dropwise at 0°C under argon. The reaction mixture was warmed to room temperature, stirred for 5 minutes and, after cooling to 0°C, a solution of TsCl (1.45 g, 7.58 mmol, 1.1 equiv.) in anhydrous THF (25 mL) was added dropwise. The reaction mixture was allowed to warm to room temperature again and stirred for 5h. After the consumption of the substrate (TLC, *n*-hexane/AcOEt, 80:20), the reaction was quenched with the addition of  $\text{H}_2\text{O}$ , diluted with  $\text{Et}_2\text{O}$ , washed with a solution of  $\text{KHSO}_4$  (10% w/w), a saturated solution of  $\text{NaHCO}_3$ , and brine. The organic layer was dried over  $\text{Na}_2\text{SO}_4$ , filtered, and concentrated under vacuum. The residue was purified by chromatography on  $\text{SiO}_2$  (25-40  $\mu\text{m}$ ), eluting with 85/15 (v/v) *n*-hexane/AcOEt mixture ( $R_f$  = 0.23) to obtain 1.87 g (73% yield) of 1-tosyl-1H-indole-3-carbaldehyde.



**5-phenyl-1-tosyl-1H-indole-3-carbaldehyde:** 73% yield; white solid; mp: 204-206 °C;  $R_f$  = 0.23 (*n*-hexane/AcOEt 85:15); IR (neat): 3123, 2830, 1676, 1495, 1230, 972  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz) ( $\text{CDCl}_3$ ):  $\delta$  10.12 (s, 1H), 8.48 (d,  $J$  = 1.4 Hz, 1H), 8.25 (s, 1H), 8.01 (d,  $J$  = 8.7 Hz, 1H), 7.88 (d,  $J$  = 8.3 Hz, 2H), 7.67 - 7.60 (m, 3H), 7.46 - 7.42 (m, 2H), 7.35 (tt,  $J_1$  = 7.3 Hz,  $J_2$  = 1.6 Hz, 1H), 7.31 (d,  $J$  = 8.3 Hz, 2H), 2.38 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) ( $\text{CDCl}_3$ ):  $\delta$  185.6 (CH), 146.4 (C), 140.8 (C), 138.8 (C), 136.8 (CH), 134.7 (C), 134.5 (C), 130.5 (CH), 128.9 (CH), 127.6 (CH), 127.5 (CH), 127.4 (CH), 126.0 (CH), 122.6 (C), 121.1 (CH), 113.6 ( $\text{CH}_3$ ); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for  $\text{C}_{22}\text{H}_{17}\text{NNaO}_3\text{S}$ :  $[\text{M} + \text{Na}]^+$  398.0827, Found: 398.0829.

### 2.2.3 Typical procedure for the preparation of the 5-phenyl(1-tosyl-1H-indol-3-yl)methanol:

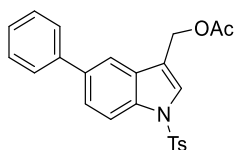
A flame-dried three-necked round bottom flask, equipped with a magnetic stirring bar, was charged with 1-tosyl-1H-indole-3-carbaldehyde (1.87 g, 4.98 mmol, 1.0 equiv.) dissolved in anhydrous THF (20 mL) under argon. The resulting solution was cooled to -50 °C before adding dropwise a solution of  $\text{LiAlH}_4$  in THF (2 M, 1.50 mL, 2.99 mmol, 0.6 equiv.) and was stirred for 15 minutes. After consuming the starting material (TLC, *n*-hexane/AcOEt, 70/30), the reaction was quenched by slow addition of an 80% aqueous MeOH solution at 0 °C. The resulting mixture was extracted with  $\text{Et}_2\text{O}$ , washed with a solution of  $\text{NaHSO}_4$  (10% w/w), brine, and the organic layer was dried over  $\text{Na}_2\text{SO}_4$ , filtered, and concentrated under reduced pressure at 30°C. The resulting crude product was used in the next step without further purification (1.63 g, 87% yield)



**5-phenyl(1-tosyl-1H-indol-3-yl)methanol:** 87% yield; yellow solid; mp: 93-95 °C;  $R_f$  = 0.20 (*n*-hexane/AcOEt 70:30); IR (neat): 2981, 1676, 1453, 1230, 1032, 816  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) ( $\text{CDCl}_3$ ):  $\delta$  8.04 (d,  $J$  = 8.6 Hz, 1H), 7.83 - 7.77 (m, 3H), 8.62 - 7.54 (m, 4H), 7.45 - 7.41 (m, 2H), 7.35 - 7.32 (m, 1H), 7.23 (d,  $J$  = 8.1 Hz, 2H), 4.85 (s, 3H), 2.34 (s, 3H), 1.68 (s, 1H);  $^{13}\text{C}$  NMR (100.6 MHz) ( $\text{CDCl}_3$ ):  $\delta$  145.2 (C), 141.3 (C), 137.0 (C), 135.3 (C), 134.9 (C), 130.1 (CH), 128.9 (CH) overlapping, 127.5 (CH), 127.2 (CH), 127.0 (CH), 124.7 (CH), 124.5 (CH), 122.6 (C), 118.5 (CH), 114.5 (CH), 57.3 ( $\text{CH}_2$ ), 21.7 ( $\text{CH}_3$ ); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for  $\text{C}_{22}\text{H}_{19}\text{KNO}_3\text{S}$ :  $[\text{M}+\text{K}]^+$  416.0723, Found: 416.0718.

#### 2.2.4 Typical procedure for the preparation of the 5 phenyl(1-tosyl-1H-indol-3-yl)methyl acetate 3e:

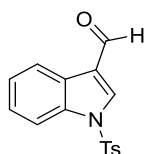
To a stirred solution of 5-phenyl(1-tosyl-1H-indol-3-yl)methanol (1.63 g, 4.33 mmol, 1.0 equiv.) in  $\text{CH}_2\text{Cl}_2$  (10 mL) DMAP (0.052 g, 0.43 mmol, 0.1 equiv.), triethylamine (0.933 mL, 6.50 mmol, 1.5 equiv.) and acetic anhydride (0.61 mL, 6.50 mmol, 1.5 equiv.) were added at -50 °C and the resulting reaction mixture was stirred for 15 minutes. After the consumption of substrate (TLC, *n*-hexane/AcOEt, 85:15), the reaction was diluted with  $\text{Et}_2\text{O}$ , washed with a saturated  $\text{NaHCO}_3$  solution, and with brine. The combined organic layer was dried over  $\text{Na}_2\text{SO}_4$ , filtered, and concentrated under reduced pressure. The resulting compound **3e** was used in the next step without further purification (1.63 g, 90% yield).



**5 phenyl(1-tosyl-1H-indol-3-yl)methyl acetate 3e:** 90% yield; pale pink solid; mp: 112-114 °C;  $R_f$  = 0.22 (*n*-hexane/AcOEt 85:15); IR (neat): 3679, 2980, 1732, 1455, 1214, 1003, 885  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz) ( $\text{CDCl}_3$ ):  $\delta$  8.03 (d,  $J$  = 8.6 Hz, 1H), 7.82 (d,  $J$  = 8.3 Hz, 2H), 7.75 (d,  $J$  = 1.2 Hz, 1H), 7.65 (s, 1H), 7.61 - 7.56 (m, 3H), 7.46 - 7.42 (m, 2H), 7.36 - 7.33 (m, 1H), 7.25 (d,  $J$  = 8.3 Hz, 2H), 5.27 (s, 2H), 2.35 (s, 3H), 2.08 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) ( $\text{CDCl}_3$ ):  $\delta$  145.3 (C), 141.2 (C), 137.1 (C), 135.3 (C), 134.6 (C), 130.1 (CH), 128.9 (CH), 127.5 (CH), 127.3 (CH), 127.1 (CH), 126.4 (CH), 124.8 (CH), 118.2 (CH), 117.6 (C), 114.0 (CH), 57.9 ( $\text{CH}_2$ ), 21.7 ( $\text{CH}_3$ ), 21.1 ( $\text{CH}_3$ ); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for  $\text{C}_{24}\text{H}_{21}\text{KNO}_4\text{S}$ :  $[\text{M}+\text{K}]^+$  458.0828, Found: 458.0830.

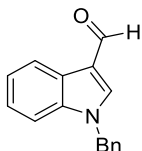
## 4. CHARACTERIZATION DATA OF STARTING MATERIAL

### 4.1. Characterization data of substituted 1-tosyl-1H-indole-3-carbaldehydes:

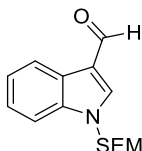


**1-tosyl-1H-indole-3-carbaldehyde:** known compound; 95% yield; pink solid; mp: 138-140 °C; lit.<sup>1</sup> mp: 138-140 °C;  $R_f$  = 0.21 (*n*-hexane/AcOEt, 75:25); IR (neat): 2981, 1663, 1396, 1161, 780  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz)

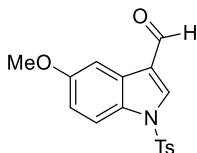
(CDCl<sub>3</sub>):  $\delta$  10.09 (s, 1H), 8.26 - 8.24 (m, 1H), 8.23 (s, 1H), 7.96 - 7.94 (m, 1H), 7.85 (d,  $J$  = 8.4 Hz, 2H), 7.41 (td,  $J_1$  = 7.3 Hz,  $J_2$  = 1.36 Hz, 1H), 7.36 (td,  $J_1$  = 7.3 Hz,  $J_2$  = 1.4 Hz, 1H), 7.29 (d,  $J$  = 8.4 Hz, 2H), 2.37 (s, 3H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>):  $\delta$  185.3 (CH), 146.2 (C), 136.24 (C), 136.21 (CH), 135.2 (C), 134.3 (C), 130.3 (CH), 127.2 (CH), 126.3 (CH), 125.1 (CH), 122.6 (CH), 122.3 (C), 113.3 (CH), 21.7 (CH<sub>3</sub>); HRMS:  $m/z$  [M + Na]<sup>+</sup> calcd for C<sub>16</sub>H<sub>13</sub>NO<sub>3</sub>Na: 322.0508; found: 322.0509.



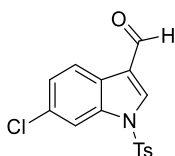
*1-benzyl-1H-indole-3-carbaldehyde*: known compound; 95% yield; yellow solid; mp: 101-103 °C lit.<sup>1</sup>, mp: 101-103 °C;  $R_f$  = 0.27 (*n*-hexane/AcOEt, 75:25); IR (neat): 3460, 3278, 2933, 1649, 1353, 1018 cm<sup>-1</sup>; <sup>1</sup>H NMR (400.13 MHz) (CDCl<sub>3</sub>):  $\delta$  9.94 (s, 1H), 8.27 - 8.25 (m, 1H), 7.64 (s, 1H), 7.30 - 7.22 (m, 6H), 7.11 (d,  $J$  = 7.3 Hz, 2H), 5.29 (s, 2H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>):  $\delta$  184.7 (CH), 138.6 (C), 137.5 (C), 135.4 (C), 129.1 (CH), 128.4 (CH), 127.3 (CH), 125.5 (C), 124.2 (CH), 123.1 (CH), 122.2 (CH), 118.5 (C), 110.4 (CH), 50.9 (CH<sub>2</sub>).



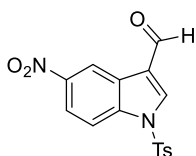
*1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indole-3-carbaldehyde*: known compound;<sup>1</sup> 97% yield; yellow oil;  $R_f$  = 0.22 (*n*-hexane/AcOEt, 85:15); IR (neat): 2953, 2892, 1660, 1081, 744 cm<sup>-1</sup>; <sup>1</sup>H NMR (400.13 MHz) (CDCl<sub>3</sub>):  $\delta$  10.04 (s, 1H), 8.32 - 8.30 (m, 1H), 7.79 (s, 1H), 7.54 - 7.52 (m, 1H), 7.39 - 7.32 (m, 2H), 5.53 (s, 3H), 3.51 (t,  $J$  = 8.0 Hz, 2H), 0.91 (t,  $J$  = 8.0 Hz, 2H), -0.05 (s, 9H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>):  $\delta$  185.1 (CH), 138.3 (CH), 137.3 (C), 125.7 (C), 124.5 (CH), 123.5 (CH), 122.2 (CH), 119.0 (C), 110.8 (CH), 76.6 (CH<sub>2</sub>), 66.7 (CH<sub>2</sub>), 17.8 (CH<sub>2</sub>), -1.33 (CH<sub>3</sub>).



*5-methoxy-1-tosyl-1H-indole-3-carbaldehyde*: known compound; quantitative yield; white solid; mp: 103-105 °C lit.<sup>3</sup> mp: 128-130 °C; IR (neat): 3662, 2830, 1678, 1251, 1094, 848 cm<sup>-1</sup>; <sup>1</sup>H NMR (400.13 MHz) (DMSO-*d*<sub>6</sub>):  $\delta$  10.1 (s, 1H), 8.82 (s, 1H), 7.98 (d,  $J$  = 8.4 Hz, 2H), 7.85 (d,  $J$  = 9.1 Hz, 1H), 7.58 (d,  $J$  = 2.5 Hz, 1H), 7.44 (d,  $J$  = 8.2 Hz, 2H), 7.05 (dd,  $J_1$  = 9.1 Hz,  $J_2$  = 2.6 Hz, 1H), 3.78 (s, 3H), 2.34 (s, 3H); <sup>13</sup>C NMR (100.6 MHz) (DMSO-*d*<sub>6</sub>):  $\delta$  187.2 (CH), 157.7 (C), 146.9 (C), 139.4 (CH), 133.8 (C), 131.0 (CH), 129.3 (C), 127.7 (CH), 127.4 (C), 121.9 (C), 115.6 (CH), 114.6 (CH), 104.3 (CH), 21.5 (CH<sub>3</sub>); HRMS:  $m/z$  [M + Na]<sup>+</sup> calcd for C<sub>17</sub>H<sub>15</sub>NO<sub>4</sub>Na: 352.0614; found: 352.0614.

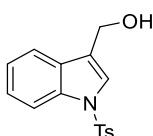


**6-chloro-1-tosyl-1H-indole-3-carbaldehyde:** known compound; 96% yield; orange solid; mp: 149-151 °C lit.<sup>3</sup>; mp: 149-151 °C; IR (neat): 2914, 1698, 1420, 1223, 1045 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz) (CDCl<sub>3</sub>): δ 10.0 (s, 1H), 8.20 (s, 1H), 8.16 (d, *J* = 8.5 Hz, 1H), 7.96 (d, *J* = 1.7 Hz, 1H), 7.84 (d, *J* = 8.5 Hz, 2H), 7.34 - 7.32 (m, 3H), 2.40 (s, 3H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>): δ 185.1 (CH), 146.6 (C), 136.5 (CH), 135.7 (C), 134.2 (C), 132.5 (C), 130.6 (CH), 127.4 (CH), 125.9 (CH), 124.9 (C), 123.6 (CH), 122.1 (C), 113.6 (CH), 21.8 (CH<sub>3</sub>); HRMS: *m/z* [M + H]<sup>+</sup> calcd for C<sub>16</sub>H<sub>13</sub>ClNO<sub>3</sub>S: 334.0299; found: 334.0295.

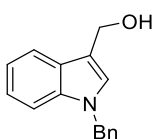


**5-nitro-1-tosyl-1H-indole-3-carbaldehyde:** known compound; 90% yield; orange solid; mp: 165-167 °C; lit.<sup>2</sup> mp: 165-167 °C; *R<sub>f</sub>* = 0.17 (*n*-hexane/AcOEt, 75:25); IR (neat): 3052, 2830, 1736, 1255, 984 cm<sup>-1</sup>; <sup>1</sup>H NMR (400.13 MHz) (DMSO-*d*<sub>6</sub>): δ 10.11 (s, 1H), 9.13 (s, 1H), 8.87 (s, 1H), 8.30 (dd, *J*<sub>1</sub> = 9.3 Hz, *J*<sub>2</sub> = 2.2 Hz, 1H), 8.21 (d, *J* = 9.3 Hz, 1H), 8.08 (d, *J* = 8.5 Hz, 2H), 7.50 (d, *J* = 8.5 Hz, 2H), 2.36 (s, 3H); <sup>13</sup>C NMR (100.6 MHz) (DMSO-*d*<sub>6</sub>): δ 187.2 (CH), 147.7 (C), 145.3 (C), 141.3 (CH), 137.6 (C), 133.3 (C), 131.3 (CH), 128.0 (CH), 121.83 (CH), 121.79 (C), 118.0 (CH), 114.7 (CH), 21.6 (CH<sub>3</sub>); HRMS: *m/z* (MALDI-TOF) positive ion, calculated for C<sub>16</sub>H<sub>12</sub>N<sub>2</sub>NaO<sub>5</sub>S: [M+Na]<sup>+</sup> 367.0365, Found: 367.0367.

#### 4.2. Characterization data of substituted (1-tosyl-1H-indol-3-yl)methanols:

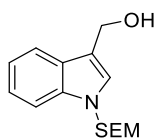


**(1-tosyl-1H-indol-3-yl)methanol:** known compound; 98% yield; pink solid; mp: 104-105 °C; lit.<sup>1</sup> mp: 104-105 °C; *R<sub>f</sub>* = 0.24 (*n*-hexane/AcOEt, 70:30); <sup>1</sup>H NMR (400.13 MHz) (CDCl<sub>3</sub>): δ 7.92 (d, *J* = 8.3 Hz, 1H), 7.70 (d, *J* = 8.3 Hz, 2H), 7.53 (d, *J* = 7.8 Hz, 1H), 7.47 (s, 1H), 7.26 (dt, *J*<sub>1</sub> = 8.2 Hz, *J*<sub>2</sub> = 1.0 Hz, 1H), 7.20 - 7.13 (m, 3H), 4.75 (s, 2H), 2.26 (s, 3H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>): δ 145.1 (C), 135.6 (C), 135.4 (C), 130.0 (CH), 129.6 (C), 127.0 (CH), 125.1 (CH), 123.9 (CH), 123.4 (CH), 122.4 (C), 120.0 (CH), 113.9 (CH), 57.3 (CH<sub>2</sub>), 21.7 (CH<sub>3</sub>); HRMS: *m/z* [M + Na]<sup>+</sup> calcd for C<sub>16</sub>H<sub>15</sub>NO<sub>3</sub>SNa: 324.0665; found: 324.0663

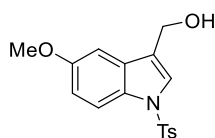


**(1-benzyl-1H-indol-3-yl)methanol:** known compound; 97% yield; yellow solid; mp: 87-89 °C; lit.<sup>1</sup> mp: 87-89 °C; *R<sub>f</sub>* = 0.28 (*n*-hexane/AcOEt, 70:30); <sup>1</sup>H NMR (400.13 MHz) (CDCl<sub>3</sub>): δ 7.78 (d, *J* = 7.6 Hz, 1H), 7.35 - 7.29 (m, 4H), 7.24 (td, *J*<sub>1</sub> = 7.6 Hz, *J*<sub>2</sub> = 1.1 Hz, 1H), 7.20 - 7.15 (m, 4H), 5.32 (s, 2H), 4.91 (d, *J* = 4.1 Hz, 2H), 1.55 (bs, 1H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>): δ 137.2 (C), 136.9 (C), 128.8 (CH), 127.7 (CH), 127.2 (C), 127.0 (CH),

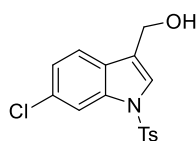
126.9 (CH), 122.3 (CH), 119.7 (CH), 119.2 (CH), 115.4 (C), 109.9 (CH), 57.3 (CH<sub>2</sub>), 50.0 (CH<sub>2</sub>); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for C<sub>16</sub>H<sub>15</sub>KNO: [M+K]<sup>+</sup> 276.0791, Found: 276.0790.



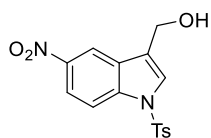
(1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methanol: known compound<sup>1</sup>; 98% yield; yellow oil;  $R_f$  = 0.23 (*n*-hexane/AcOEt, 85:15); <sup>1</sup>H NMR (400.13 MHz) (DMSO-*d*<sub>6</sub>): δ 7.69 (d, *J* = 8.0 Hz, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.42 (s, 1H), 7.24 (t, *J* = 7.4 Hz, 1H), 7.14 (t, *J* = 7.4 Hz, 1H), 5.57 (s, 2H), 4.92 (t, *J* = 5.1 Hz, 1H), 4.71 (d, *J* = 5.1 Hz, 2H), 3.53 (t, *J* = 8.0 Hz, 2H), 0.89 (t, *J* = 8.0 Hz, 2H), 0.00 (s, 9H); <sup>13</sup>C NMR (100.6 MHz) (DMSO-*d*<sub>6</sub>): δ 137.4 (C), 128.4 (C), 127.7 (CH), 122.4 (CH), 120.14 (CH), 120.11 (CH), 117.3 (C), 111.0 (CH), 75.5 (CH<sub>2</sub>), 65.7 (CH<sub>2</sub>), 56.1 (CH<sub>2</sub>), 18.1 (CH<sub>2</sub>), -0.50 (CH<sub>3</sub>); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for C<sub>15</sub>H<sub>23</sub>KNO<sub>2</sub>Si: [M+K]<sup>+</sup> 316.1135, Found: 316.1140.



(5-methoxy-1-tosyl-1H-indol-3-yl)methanol: known compound; quantitative yield; brown solid; mp: 122-124 °C; lit.<sup>3</sup> mp: 112-124; IR (neat): 3636, 2364, 1710, 1434, 1078 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz) (CDCl<sub>3</sub>): δ 7.86 (d, *J* = 9.0 Hz, 1H), 7.73 (d, *J* = 8.3 Hz, 2H), 7.48 (s, 1H), 7.20 (d, *J* = 8.3 Hz, 2H), 7.03 (d, *J* = 2.4 Hz, 1H), 6.94 (dd, *J*<sub>1</sub> = 9.0 Hz, *J*<sub>2</sub> = 2.5 Hz, 1H), 4.77 (s, 2H), 3.81 (s, 3H), 2.33 (s, 3H); <sup>1</sup>H NMR (100.6 MHz) (CDCl<sub>3</sub>): δ 156.6 (C), 145.0 (C), 135.3 (C), 130.6 (C), 130.2 (C), 130.0 (CH), 126.9 (CH), 124.7 (CH), 122.4 (C), 114.8 (CH), 114.3 (CH), 102.3 (CH), 57.3 (CH<sub>2</sub>), 55.8 (CH<sub>3</sub>), 21.7 (CH<sub>3</sub>); HRMS:  $m/z$  [M + Na]<sup>+</sup> calcd for C<sub>17</sub>H<sub>17</sub>NO<sub>4</sub>Na : 354.0770; found: 354.0771.

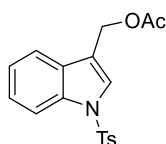


(6-chloro-1-tosyl-1H-indol-3-yl)methanol: known compound; quantitative yield; pink solid; mp: 123-125 °C; lit.<sup>3</sup> mp: 123-125 °C; IR (neat): 3357, 2871, 1725, 1169, 1084, 908 cm<sup>-1</sup>; <sup>1</sup>H NMR (400 MHz) (CDCl<sub>3</sub>): δ 7.93 (d, *J* = 1.7 Hz, 1H), 7.69 (d, *J* = 8.4 Hz, 2H), 7.45 - 7.43 (m, 2H), 7.19 - 7.13 (m, 3H), 4.71 (s, 2H), 2.28 (s, 3H), 1.65 (s, 1H); <sup>13</sup>C NMR (100.6 MHz) (CDCl<sub>3</sub>): δ 145.5 (C), 135.9 (C), 135.1 (C), 131.2 (C), 130.2 (CH), 128.0 (C), 127.0 (CH), 124.3 (CH), 124.1 (CH), 122.2 (q), 120.9 (CH), 114.0 (CH), 57.1 (CH<sub>2</sub>), 21.7 (CH<sub>3</sub>); HRMS:  $m/z$  [M - H]<sup>-</sup> calcd for C<sub>16</sub>H<sub>13</sub>ClNO<sub>3</sub>S: 334.0310; found: 334.0304.

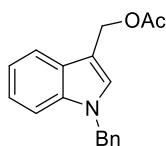


(5-nitro-1-tosyl-1H-indol-3-yl)methanol: known compound; 98% yield; yellow solid; mp: 120-122°C; lit<sup>2</sup> mp: 120-122°C;  $R_f$  = 0.17 (*n*-hexane/AcOEt, 65:35); IR (neat): 3014, 1731, 1143, 1064  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) (DMSO- $d_6$ ):  $\delta$  8.60 (d,  $J$  = 2.2 Hz, 1H), 8.23 (dd,  $J_1$  = 9.2 Hz,  $J_2$  = 2.2 Hz, 1H), 8.16 (d,  $J$  = 9.2 Hz, 1H), 7.95 - 7.92 (m, 3H), 7.42 (d,  $J$  = 8.1 Hz, 2H), 4.68 (d,  $J$  = 0.7 Hz, 2H), 2.33 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) (DMSO- $d_6$ ):  $\delta$  146.7 (C), 143.9 (C), 138.0 (C), 134.2 (C), 131.0 (CH), 130.0 (C), 127.3 (CH), 126.9 (CH), 125.0 (C), 120.4 (CH), 117.4 (CH), 114.3 (CH), 55.1 ( $\text{CH}_2$ ), 21.5 ( $\text{CH}_3$ ); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for  $\text{C}_{16}\text{H}_{12}\text{N}_2\text{NaO}_5\text{S}$ :  $[\text{M}+\text{Na}]^+$  367.0365, Found: 367.0367.

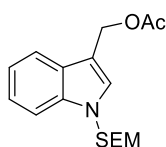
#### 4.3. Characterization data of (1-tosyl-1H-indol-3-yl)methyl acetates 3a-3d and 3f-3g:



(1-tosyl-1H-indol-3-yl)methyl acetate **3a**: known compound; 98% yield; pale pink solid; mp: 138-140°C; lit.<sup>1</sup> mp: 138-140 °C;  $R_f$  = 0.20 (*n*-hexane/AcOEt, 85:15); IR (neat): 2982, 1662, 1538, 1368, 1099, 968  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) ( $\text{CDCl}_3$ ):  $\delta$  7.90 (d,  $J$  = 8.3 Hz, 1H), 7.71 (d,  $J$  = 8.3 Hz, 2H), 7.55 (s, 1H), 7.49 (d,  $J$  = 7.7 Hz, 1H), 7.27 (td,  $J_1$  = 8.3 Hz,  $J_2$  = 1 Hz, 1H), 7.21-7.15 (m, 3H); 5.16 (s, 2H), 2.27 (s, 3H), 2.00 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) ( $\text{CDCl}_3$ ):  $\delta$  171.0 (C), 145.2 (C), 135.34 (C), 135.28 (C), 130.1 (CH), 129.6 (C), 127.1 (CH), 125.8 (CH), 125.2 (CH), 123.6 (CH), 119.8 (CH), 117.4 (C), 113.8 (CH), 57.9 ( $\text{CH}_2$ ), 21.7 ( $\text{CH}_3$ ), 21.1 ( $\text{CH}_3$ ); HRMS:  $m/z$   $[\text{M} + \text{Na}]^+$  calcd for  $\text{C}_{18}\text{H}_{17}\text{NO}_4\text{SNa}$ : 366.0770; found: 366.0768.

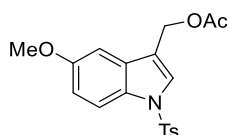


(1-benzyl-1H-indol-3-yl)methyl acetate **3b**: known compound;<sup>1</sup> 98% yield; orange oil;  $R_f$  = 0.24 (*n*-hexane/AcOEt, 75:25); IR (neat): 3032, 2933, 1730, 1468, 1226, 943  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) ( $\text{CDCl}_3$ ):  $\delta$  7.61 (d,  $J$  = 7.6 Hz, 1H), 7.19 - 7.15 (m, 4H), 7.12 - 7.09 (m, 3H), 7.07 - 7.01 (m, 2H), 5.23 (s, 2H), 5.16 (s, 2H), 1.95 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) ( $\text{CDCl}_3$ ):  $\delta$  171.4 (C), 137.1 (q), 136.8 (C), 129.0 (CH), 128.9 (CH), 127.8 (CH), 127.7 (C), 127.0 (CH), 122.4 (CH), 120.1 (CH), 119.3 (CH), 110.3 (C), 110.0 (CH), 58.6 ( $\text{CH}_2$ ), 50.2 ( $\text{CH}_2$ ), 21.3 ( $\text{CH}_3$ ); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for  $\text{C}_{18}\text{H}_{17}\text{KNO}_2$ :  $[\text{M}+\text{K}]^+$  318.0896, Found: 318.0898.

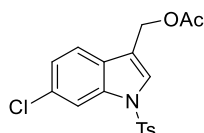




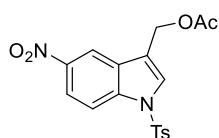
(1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl acetate **3c**: known compound;<sup>1</sup> yellow oil; 98% yield;  $R_f = 0.18$  (*n*-hexane/ACOEt, 85:15); IR (neat): 2954, 1735, 1245, 1077, 833  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) (DMSO- $d_6$ ):  $\delta$  7.70 (d,  $J = 8.0$  Hz, 1H), 7.65 - 7.63 (m, 2H), 7.29 (t,  $J = 7.4$  Hz, 1H), 7.20 (t,  $J = 7.4$  Hz, 1H), 5.62 (s, 2H), 5.33 (s, 2H), 3.53 (t,  $J = 8.0$  Hz, 2H), 2.09 (s, 3H), 0.90 (t,  $J = 8.0$  Hz, 2H), 0.00 (s, 9H);  $^{13}\text{C}$  NMR (100.6 MHz) (DMSO- $d_6$ ):  $\delta$  171.3 (C), 137.2 (C), 130.6 (CH), 128.4 (C), 122.9 (CH), 120.9 (CH), 119.8 (CH), 111.4 (CH), 111.0 (C), 75.6 (CH<sub>2</sub>), 65.8 (CH<sub>2</sub>), 58.6 (CH<sub>2</sub>), 21.7 (CH<sub>3</sub>), 18.0 (CH<sub>2</sub>), -0.50 (CH<sub>3</sub>); HRMS:  $m/z$  (MALDI-TOF) positive ion, calculated for C<sub>17</sub>H<sub>25</sub>KNO<sub>3</sub>Si: [M+K]<sup>+</sup> 358.1241, Found: 358.1244.



(5-methoxy-1-tosyl-1H-indol-3-yl)methyl acetate **3d**: known compound; quantitative yield; brown solid; mp: 163-165 °C; lit.<sup>3</sup> mp: 163-165 °C; IR (neat): 3553, 2365, 1785, 1529, 1168, 1014  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.16 MHz) (DMSO- $d_6$ ):  $\delta$  7.84 - 7.81 (m, 4H), 7.38 (d,  $J = 8.2$  Hz, 2H), 7.13 (d,  $J = 2.4$  Hz, 1H), 6.98 (dd,  $J_1 = 9.0$  Hz,  $J_2 = 2.4$  Hz, 1H), 5.18 (s, 2H), 3.77 (s, 3H), 2.31 (s, 3H), 2.04 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) (DMSO- $d_6$ ):  $\delta$  170.9 (C), 156.6 (C), 146.0 (C), 134.5 (C), 130.9 (C), 130.7 (CH), 129.4 (C), 127.4 (CH), 127.1 (CH), 118.2 (C), 114.6 (CH), 114.4 (CH), 103.2 (CH), 57.7 (CH<sub>2</sub>), 55.9 (CH<sub>3</sub>), 21.5 (CH<sub>3</sub>), 21.1 (CH<sub>3</sub>); HRMS:  $m/z$  [M + Na]<sup>+</sup> calcd for C<sub>19</sub>H<sub>19</sub>NO<sub>4</sub>Na: 396.0876; found: 396.0871.



(6-chloro-1-tosyl-1H-indol-3-yl)methyl acetate **3f**: known compound; 95% yield (1.36 mmol scale, 0.51 g); yellow solid; mp: 104-106 °C; lit.<sup>3</sup> mp: 104-106 °C; IR (neat): 2965, 2364, 1877, 1593, 1104, 950  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400 MHz) (CDCl<sub>3</sub>):  $\delta$  7.92 (d,  $J = 1.5$  Hz, 1H), 7.71 (d,  $J = 8.4$  Hz, 2H), 7.52 (s, 1H), 7.41 (d,  $J = 8.4$  Hz, 1H), 7.20 (d,  $J = 7.5$  Hz, 2H), 7.16 (dd,  $J_1 = 8.4$  Hz,  $J_2 = 1.8$  Hz, 1H), 5.12 (s, 2H), 2.29 (s, 3H), 2.00 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) (CDCl<sub>3</sub>):  $\delta$  170.9 (C), 145.6 (C), 135.6 (C), 135.0 (C), 131.3 (C), 130.3 (CH), 128.1 (C), 127.0 (CH), 126.3 (CH), 124.3 (CH), 120.7 (CH), 117.3 (C), 114.0 (CH), 57.6 (CH<sub>2</sub>), 21.7 (CH<sub>3</sub>), 21.0 (CH<sub>3</sub>); HRMS:  $m/z$  [M + Na]<sup>+</sup> calcd for C<sub>18</sub>H<sub>16</sub>ClNO<sub>4</sub>Na: 400.0381; found: 400.0382.



(5-nitro-1-tosyl-1H-indol-3-yl)methyl acetate **3g**: known compound; 73% yield (6.22 mmol scale, 1.76 g); yellow solid; mp: 163-165 °C; lit.<sup>2</sup> mp: 163-165 °C;  $R_f = 0.25$  (*n*-hexane/AcOEt, 65:35); IR (neat): 2952, 2790, 1710, 1247, 1078  $\text{cm}^{-1}$ ;  $^1\text{H}$  NMR (400.13 MHz) (DMSO- $d_6$ ):  $\delta$  8.76 (d,  $J = 2.1$  Hz, 1H), 8.40 (dd,  $J_1 = 9.2$  Hz,  $J_2 = 2.1$  Hz, 1H), 8.35 (s, 1H), 8.33 (d,  $J = 9.2$  Hz, 1H), 8.12 (d,  $J = 8.4$  Hz, 2H), 7.60 (d,  $J = 8.4$  Hz, 2H), 5.45 (s, 2H), 2.49 (s, 3H), 2.20 (s, 3H);  $^{13}\text{C}$  NMR (100.6 MHz) (DMSO- $d_6$ ):  $\delta$  170.8 (C), 146.9 (C), 144.2 (C), 137.6 (C), 134.0 (C), 131.0 (CH), 129.8 (CH), 129.6 (C), 127.5 (CH), 120.6 (CH), 118.8 (C), 117.1 (CH), 114.4 (CH), 57.2 (CH<sub>2</sub>),

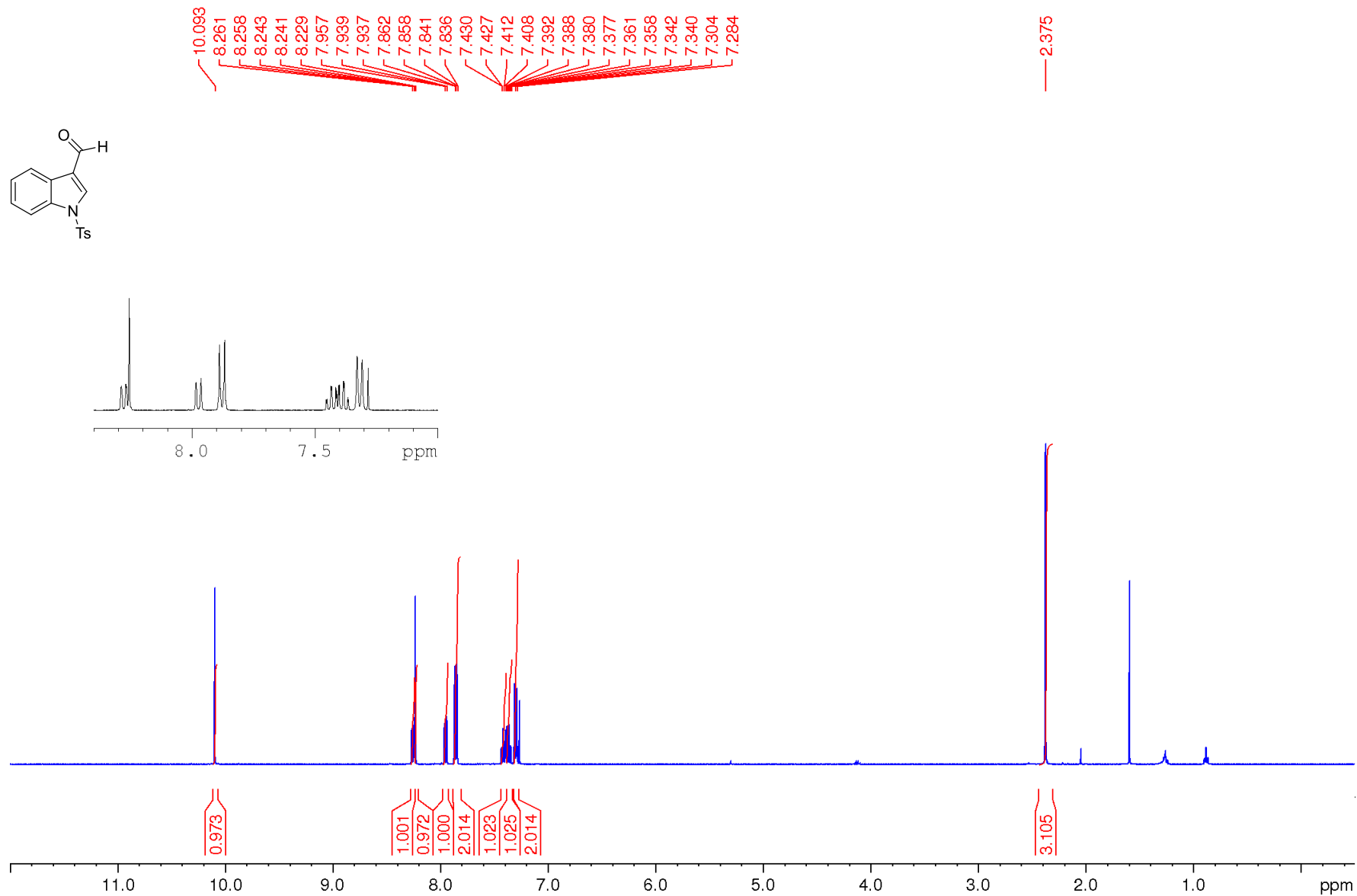
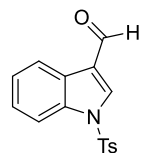
21.5 (CH<sub>3</sub>), 21.1 (CH<sub>3</sub>). HRMS: *m/z* (MALDI-TOF) positive ion, calculated for C<sub>18</sub>H<sub>17</sub>N<sub>2</sub>O<sub>6</sub>S: [M+H]<sup>+</sup> 389.0807, Found: 389.0810.

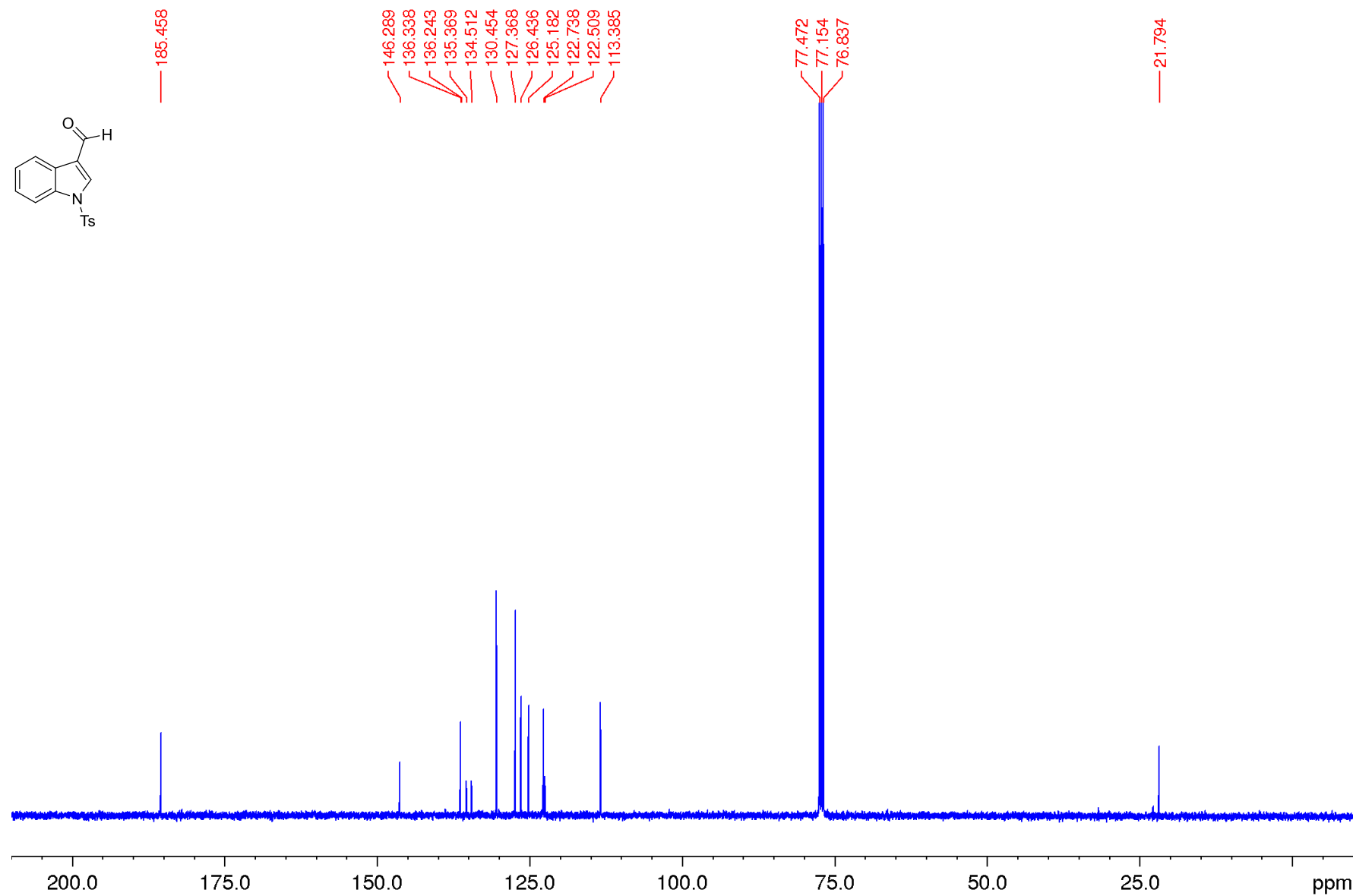
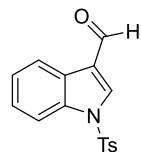
## 5. REFERENCES

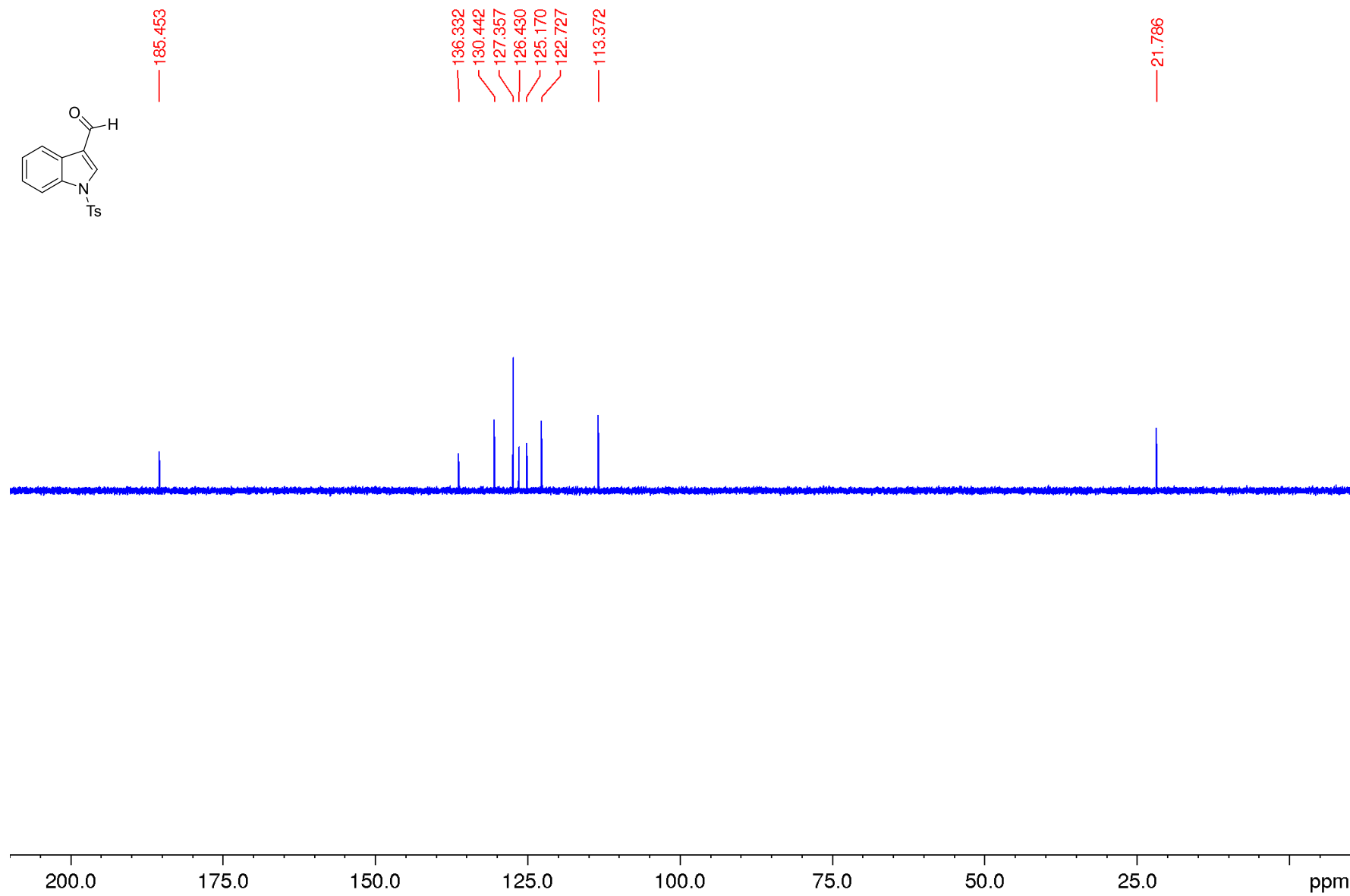
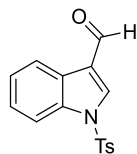
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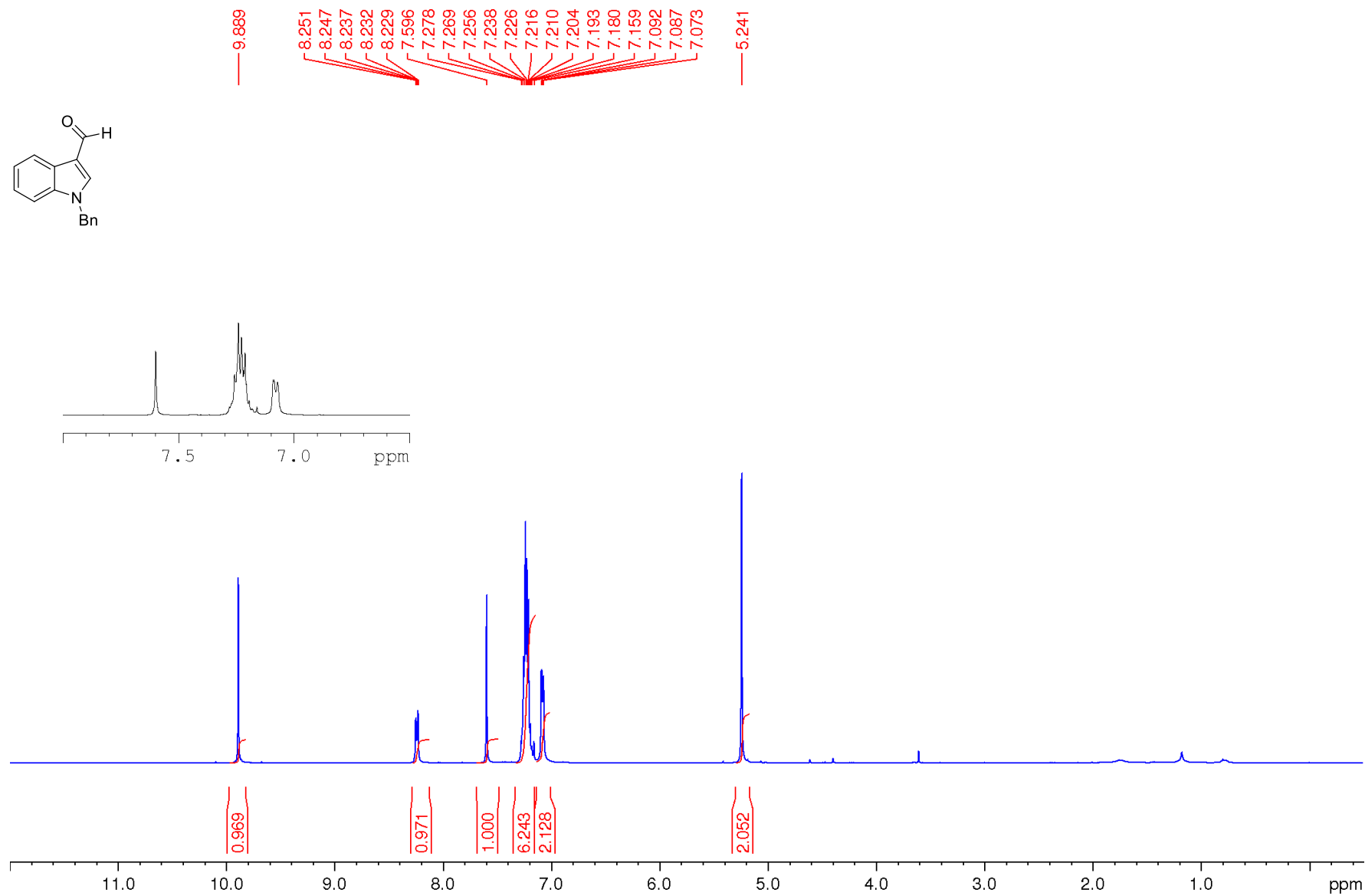
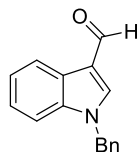
- <sup>1</sup> Arcadi, A.; Calcaterra, A.; Chiarini, M.; Fabrizi, G.; Fochetti, A.; Goggiamani, A.; Iazzetti, A.; Marrone, F.; Marsicano, V.; Serraiocco, A., Synthesis of Indole/Benzofuran-Containing Diarylmethanes through Palladium-Catalyzed Reaction of Indolylmethyl or Benzofuranylmethyl Acetates with Boronic Acids. *Synthesis* **2021**, 54 (03), 741-753. DOI: 10.1055/s-0041-1737275.
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- <sup>3</sup> Arcadi, A.; Berden, G.; Ciogli, A.; Corinti, D.; Crestoni, M. E.; De Angelis, M.; Fabrizi, G.; Goggiamani, A.; Iazzetti, A.; Marrone, F.; Marsicano, V.; Oomens, J.; Serraiocco, A. Reactivity of Indolylmethylacetates with N, O, and S Soft Nucleophiles: Evidence of 2-Alkylideneindolenines and 3-Alkylideneindoleninium Generation by ESI-MS and IRMPD Spectroscopy. *European Journal of Organic Chemistry* **2022**, 2022 (43), e202201166. <https://doi.org/10.1002/ejoc.202201166>
- <sup>4</sup> Moseley, J. D.; Murray, P. M.; Turp, E. R.; Tyler, S. N. G.; Burn, R. T., A mild robust generic protocol for the Suzuki reaction using an air stable catalyst. *Tetrahedron* **2012**, 68 (30), 6010-6017. <https://doi.org/10.1016/j.tet.2012.05.030>

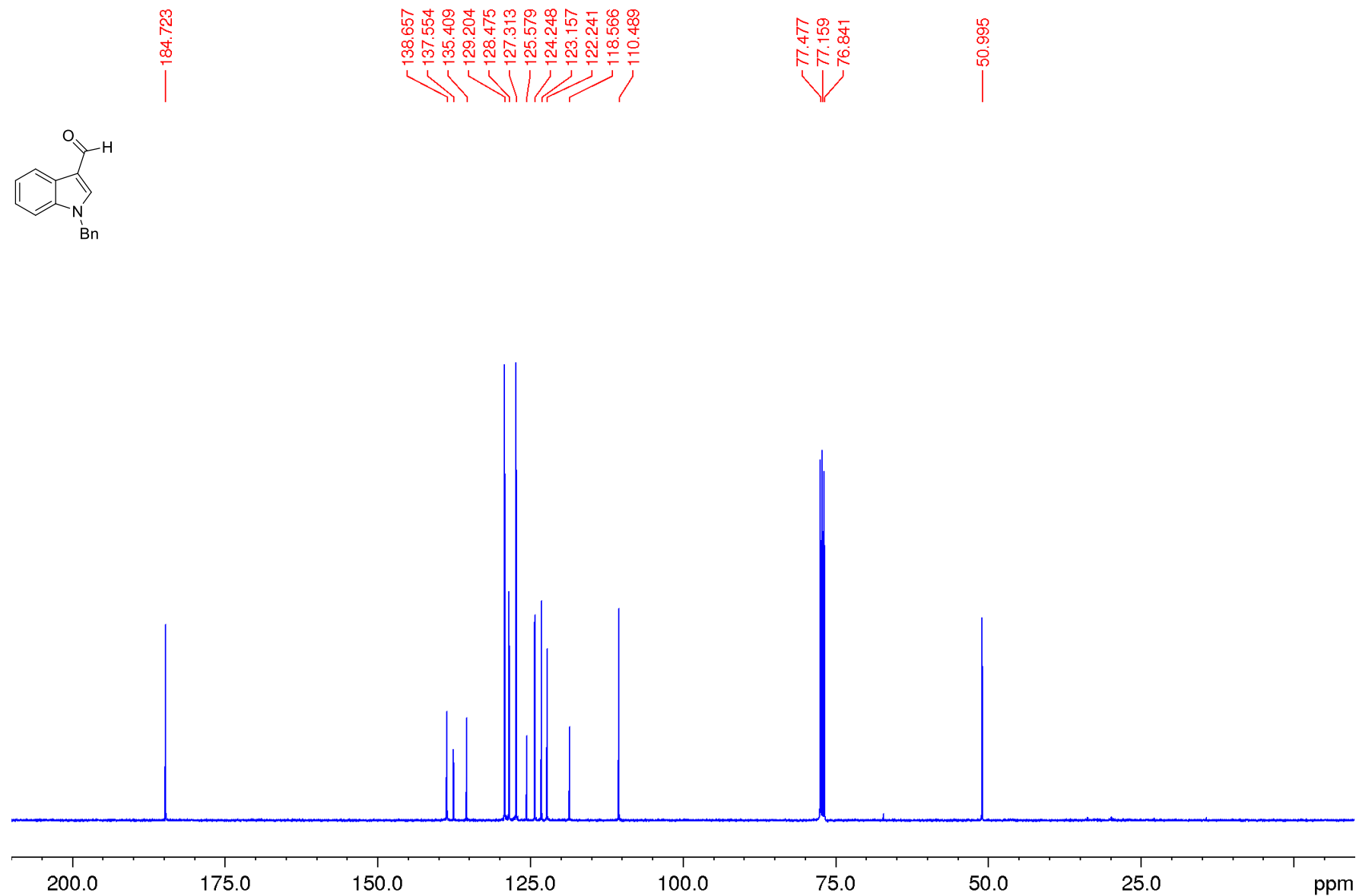
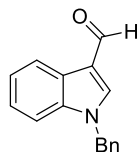
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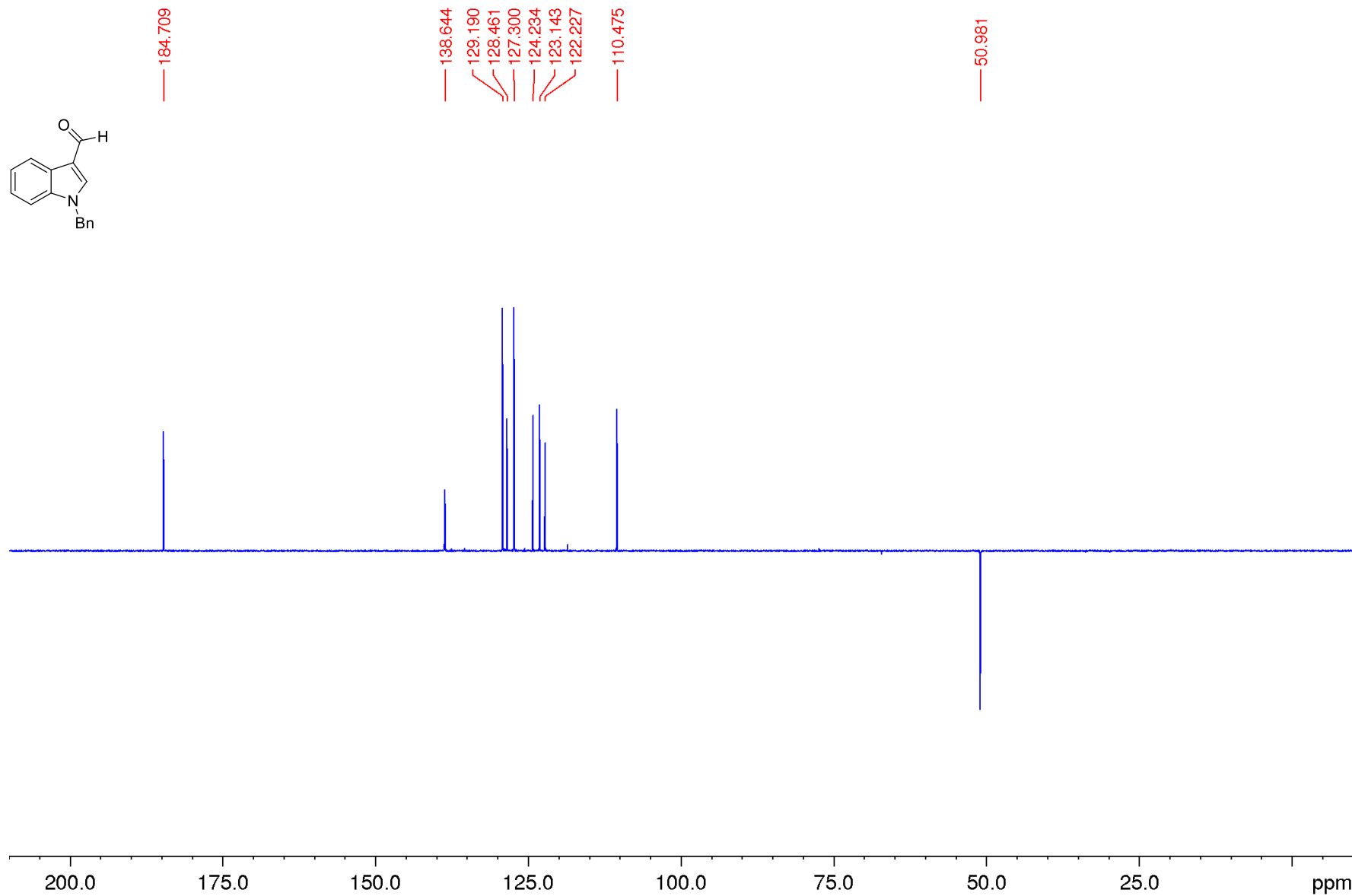
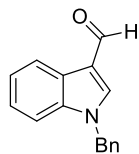






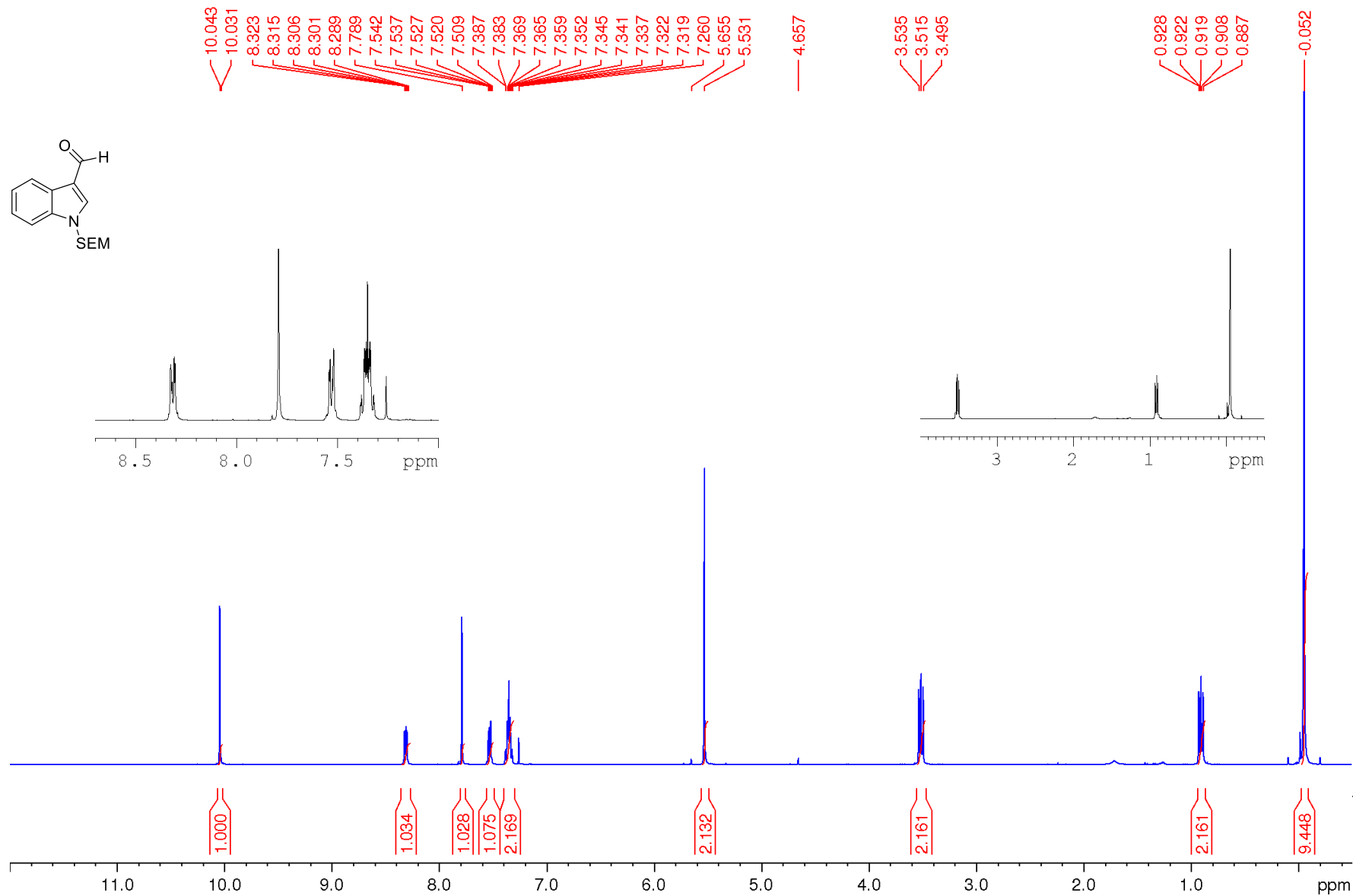
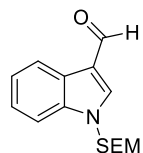






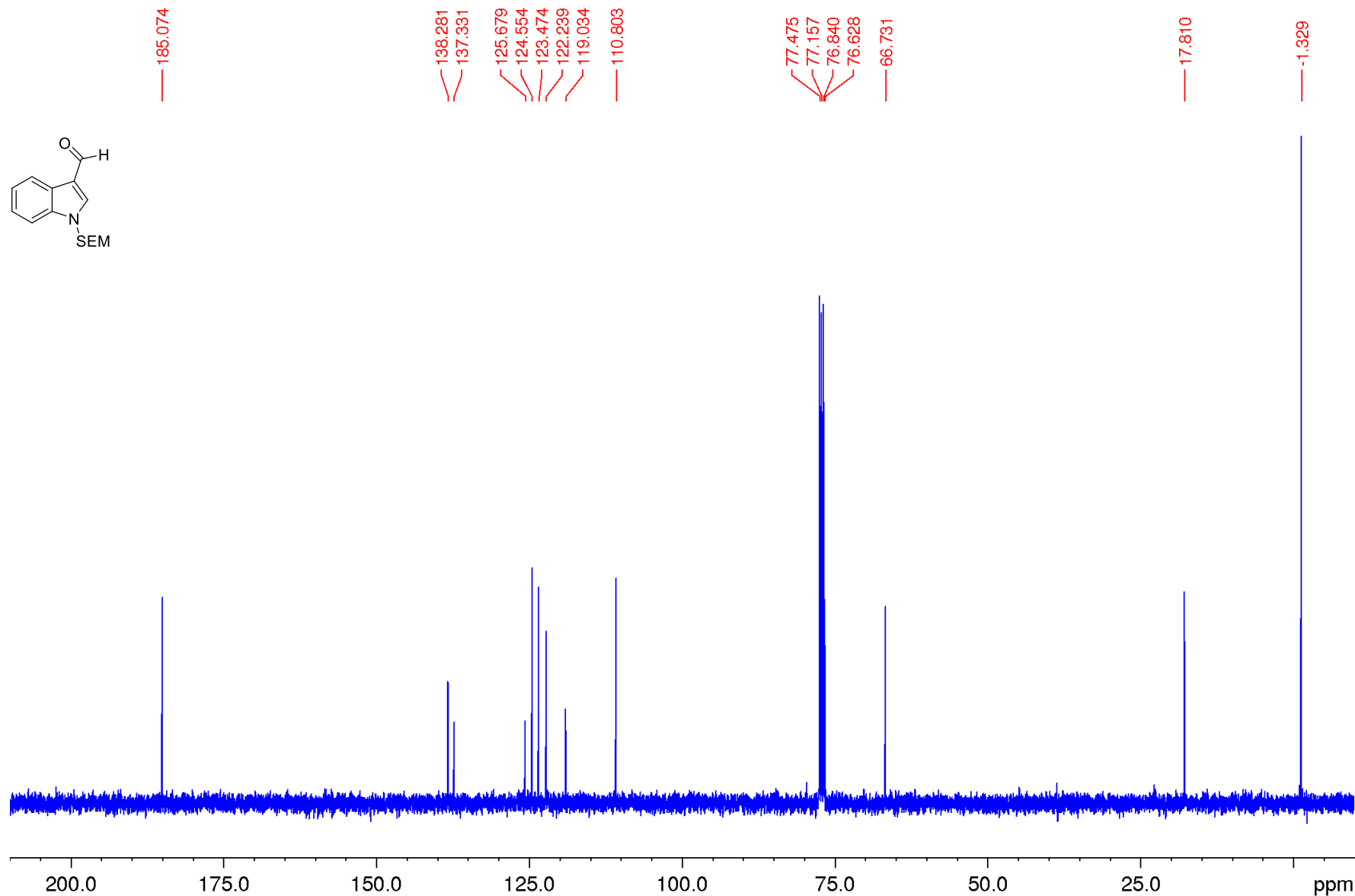
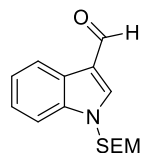
1-tosyl-1H-indole-3-carbaldehyde

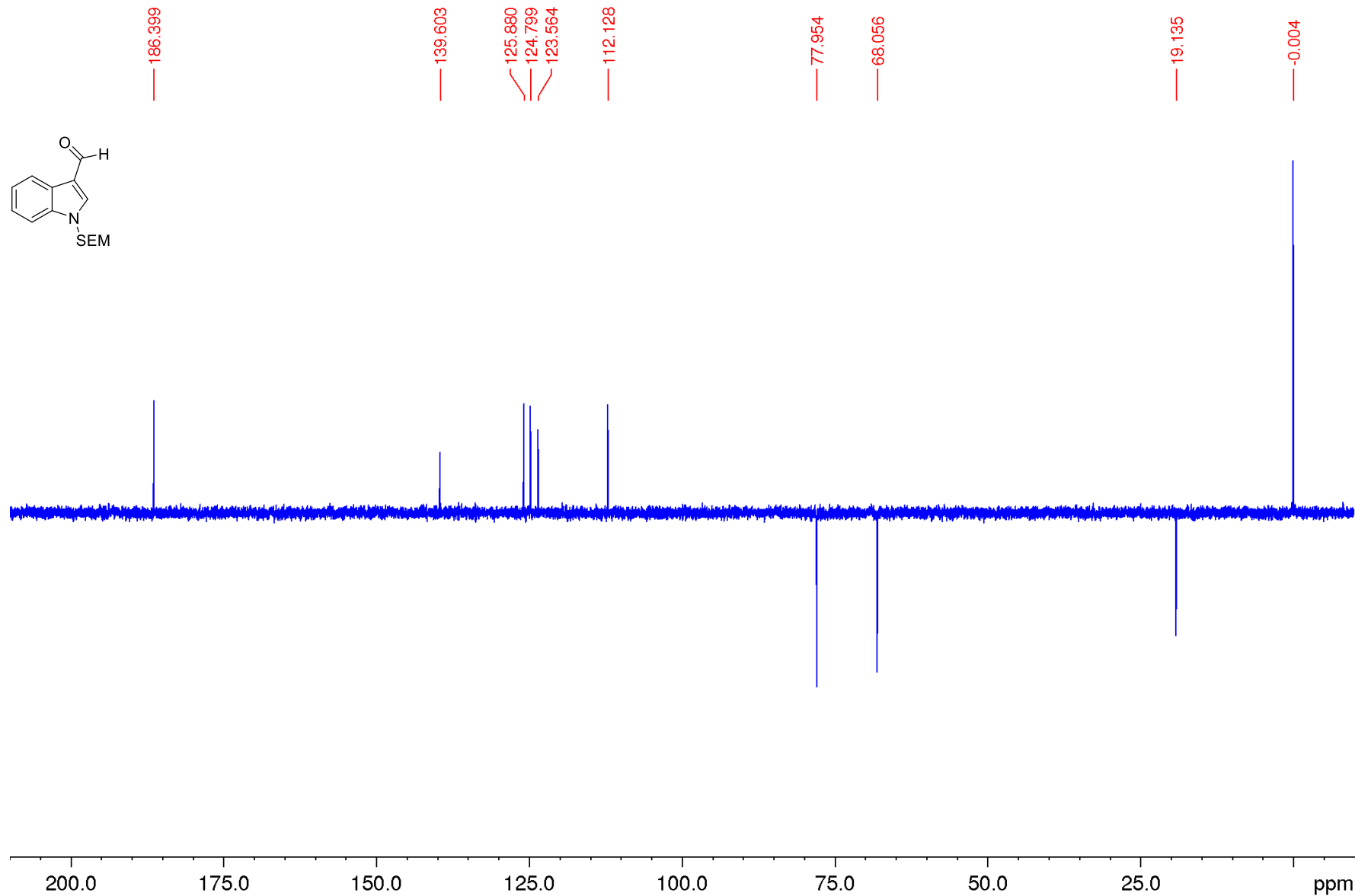
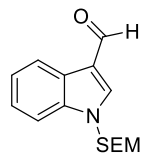
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



1-tosyl-1H-indole-3-carbaldehyde

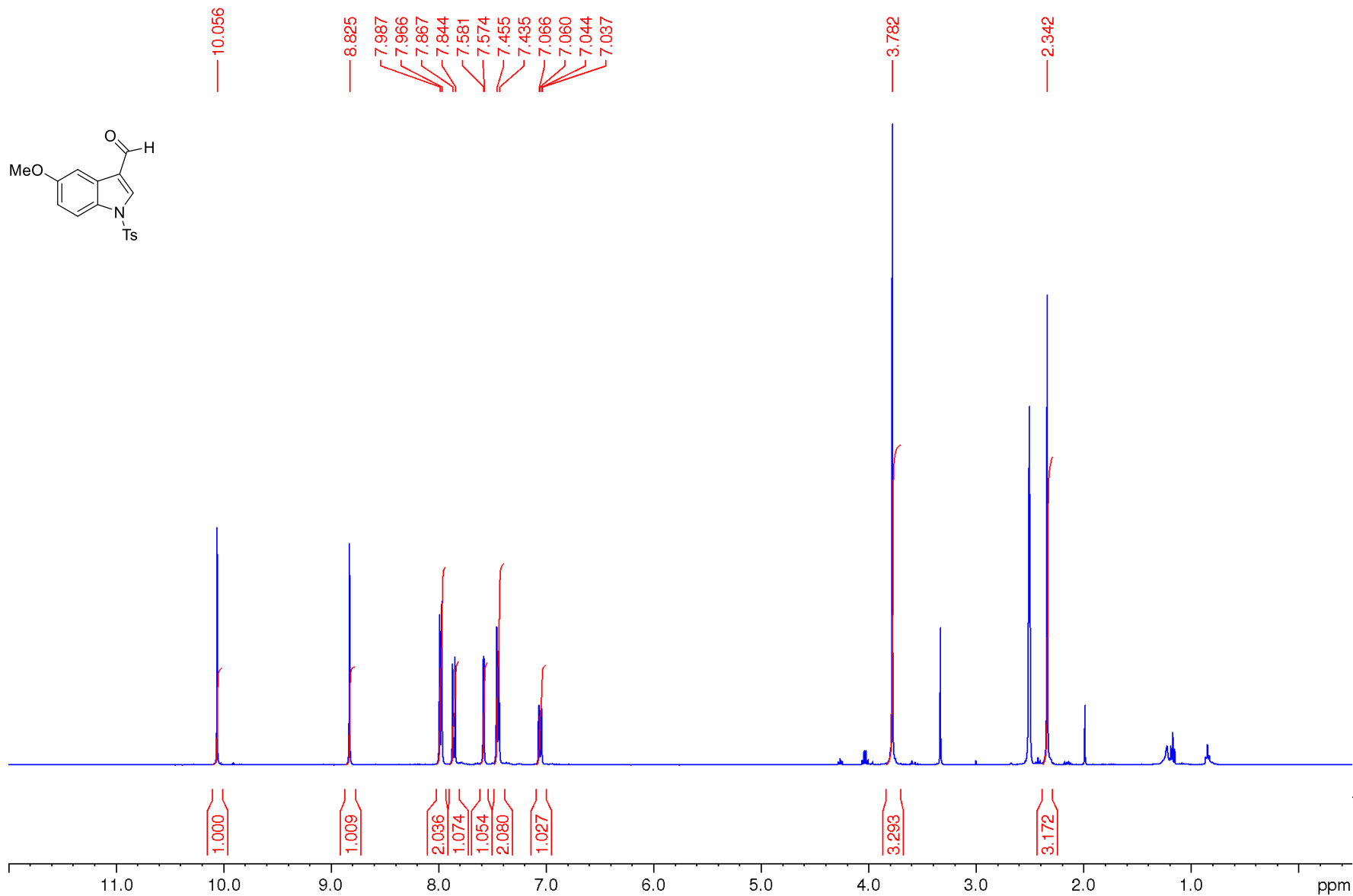
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )

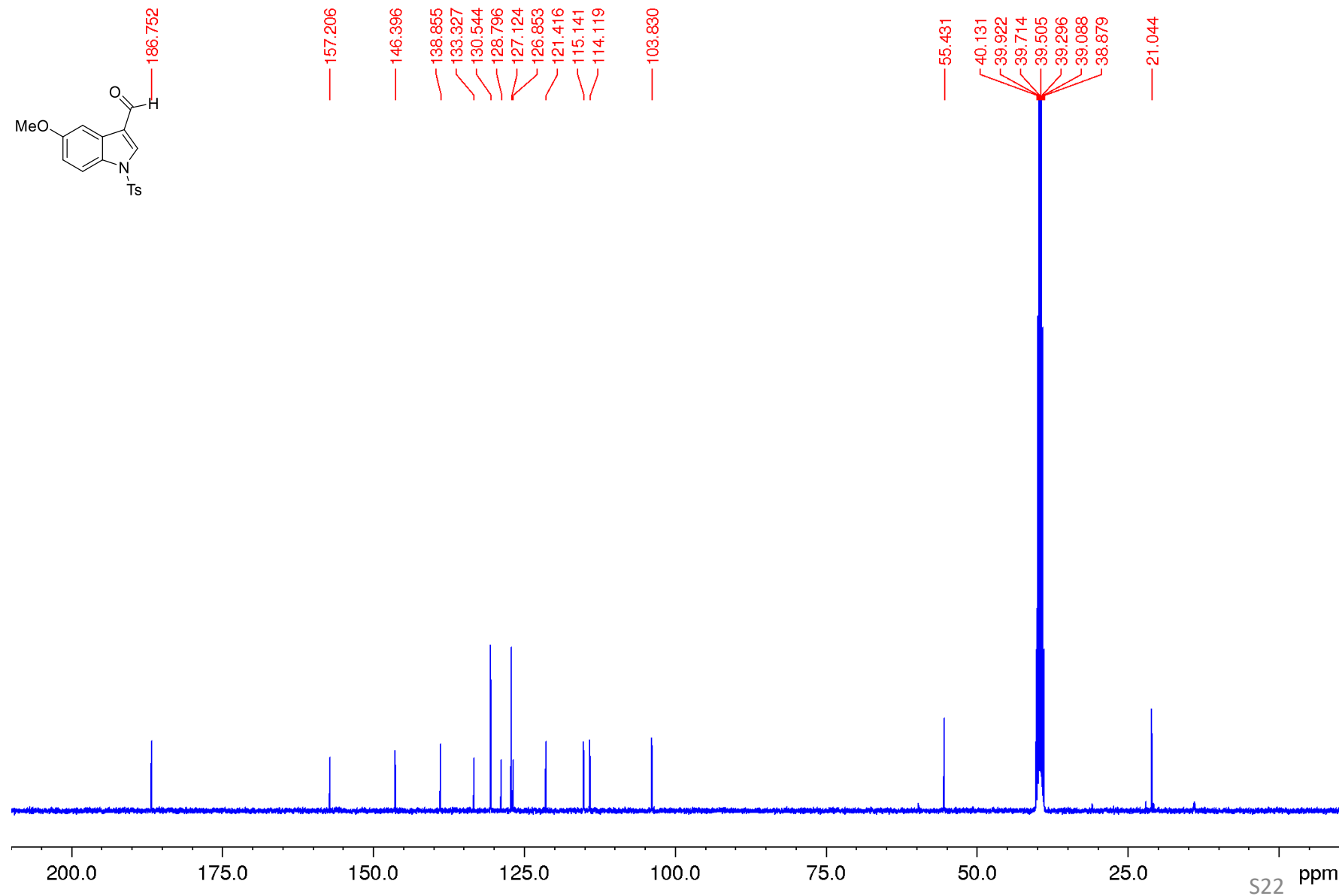
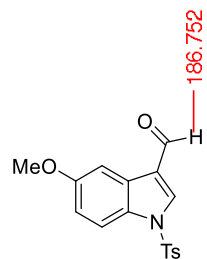


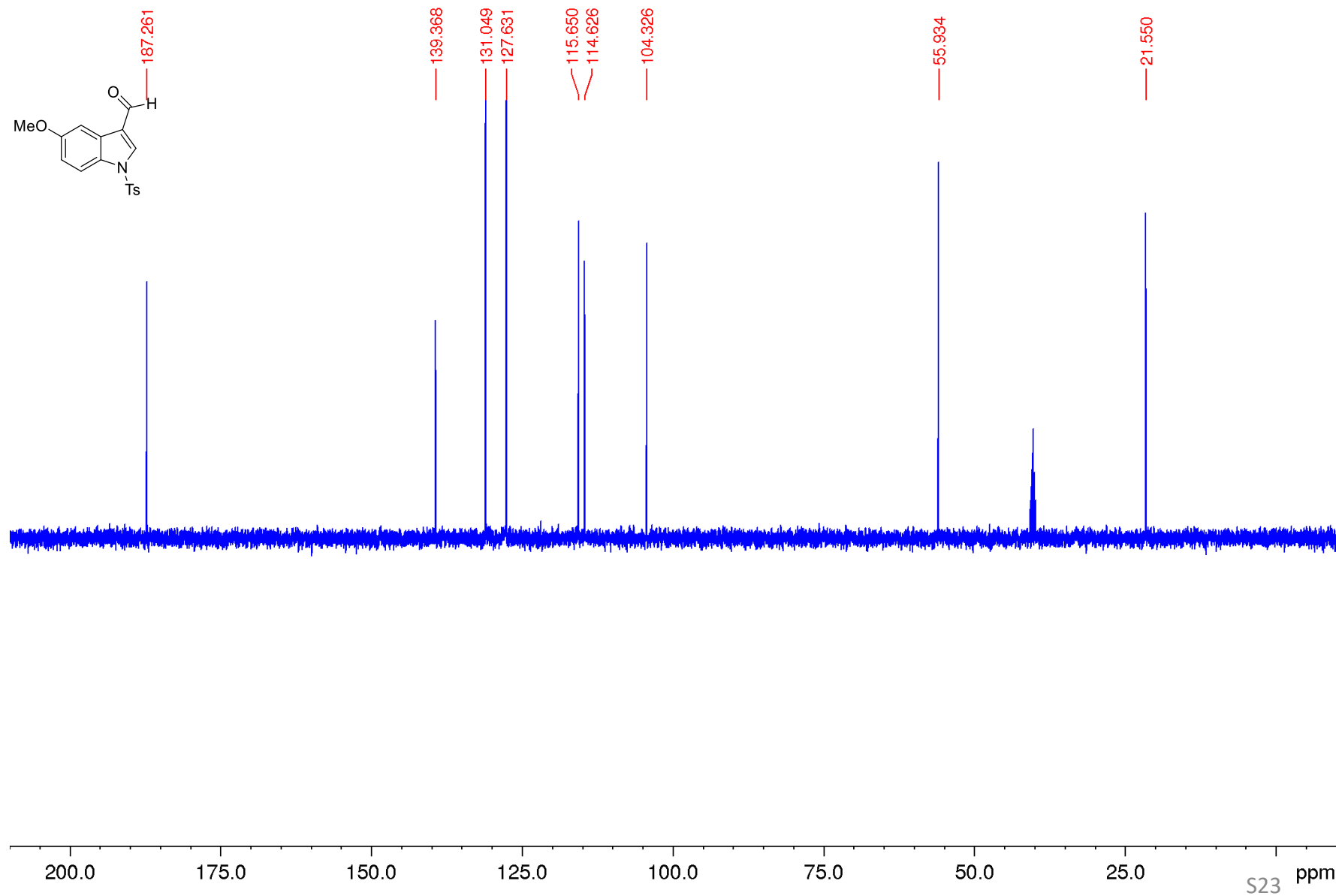
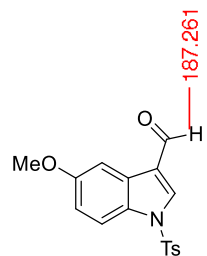


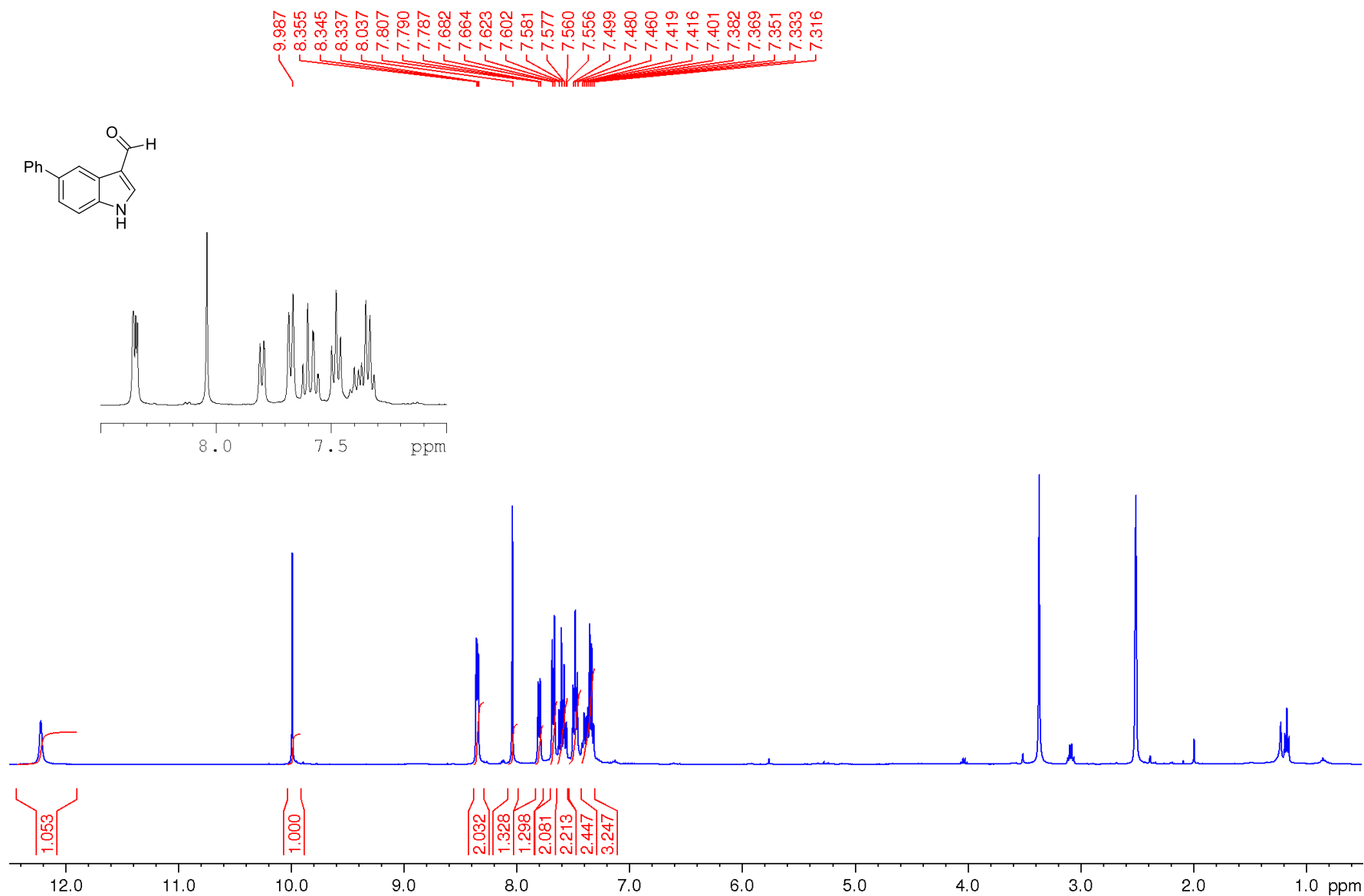
5-methoxy-1-tosyl-1H-indole-3-carbaldehyde

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO}-d_6$ )





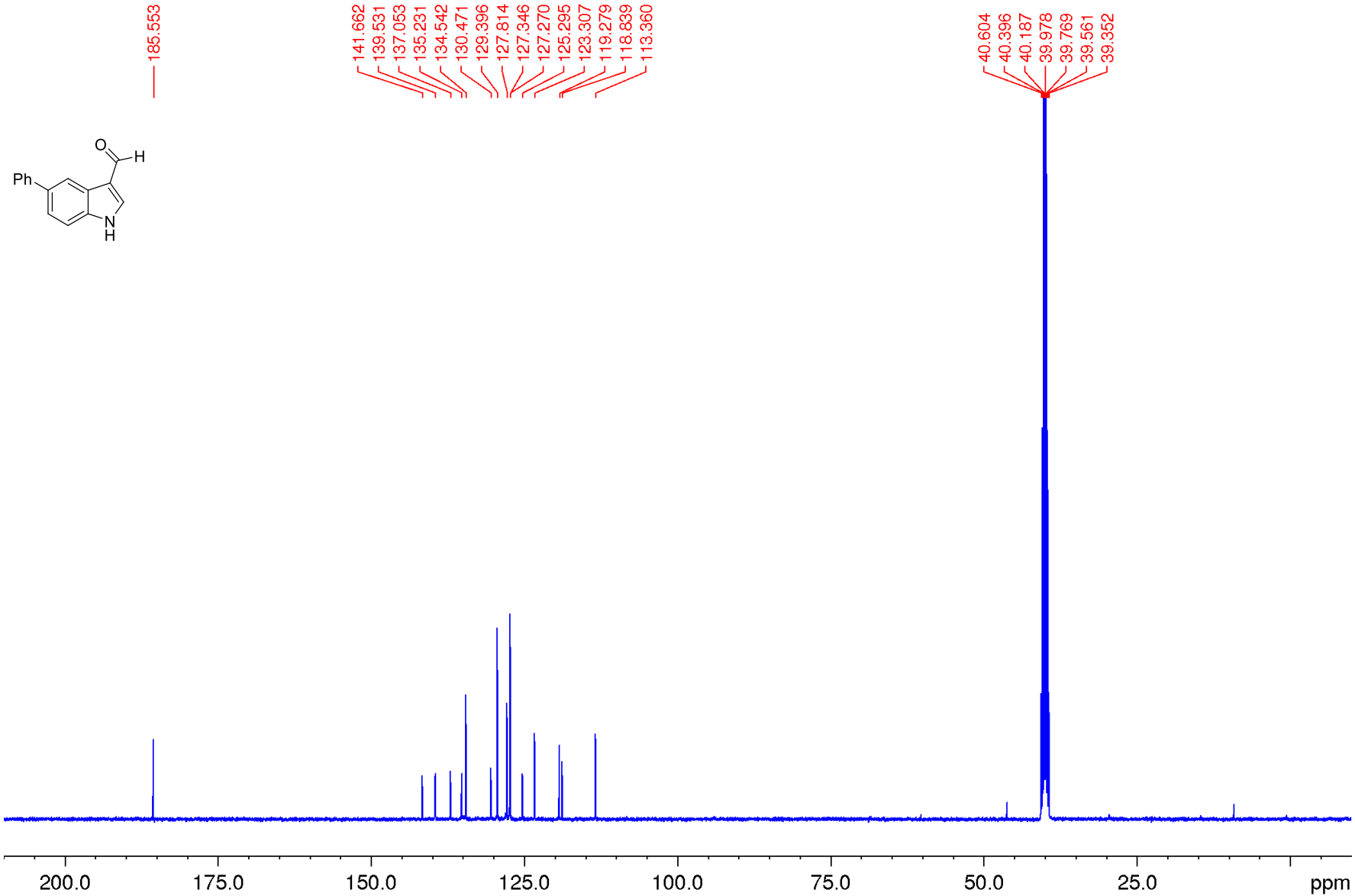


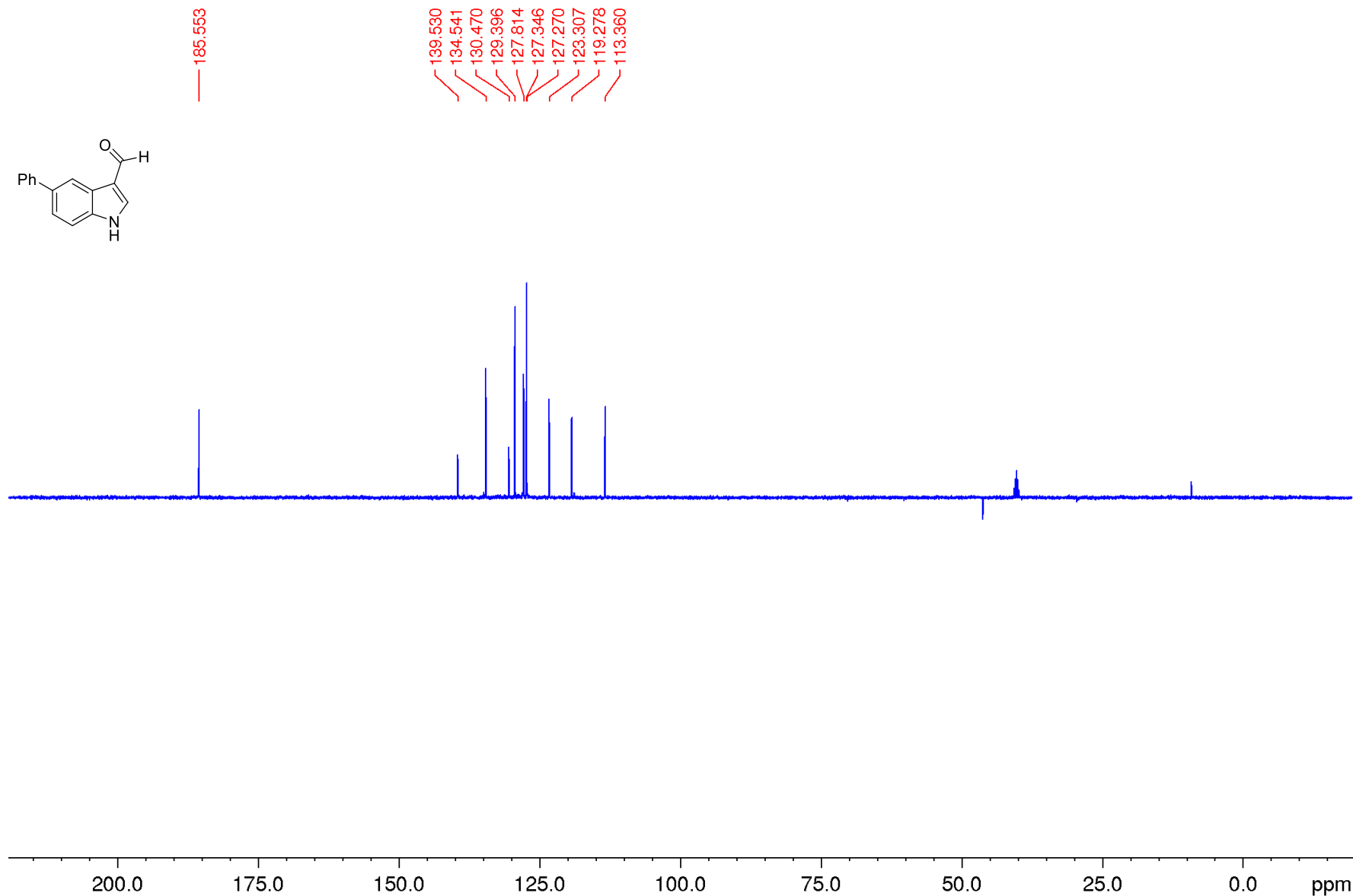




5-phenyl-1H-indole-3-carbaldehyde

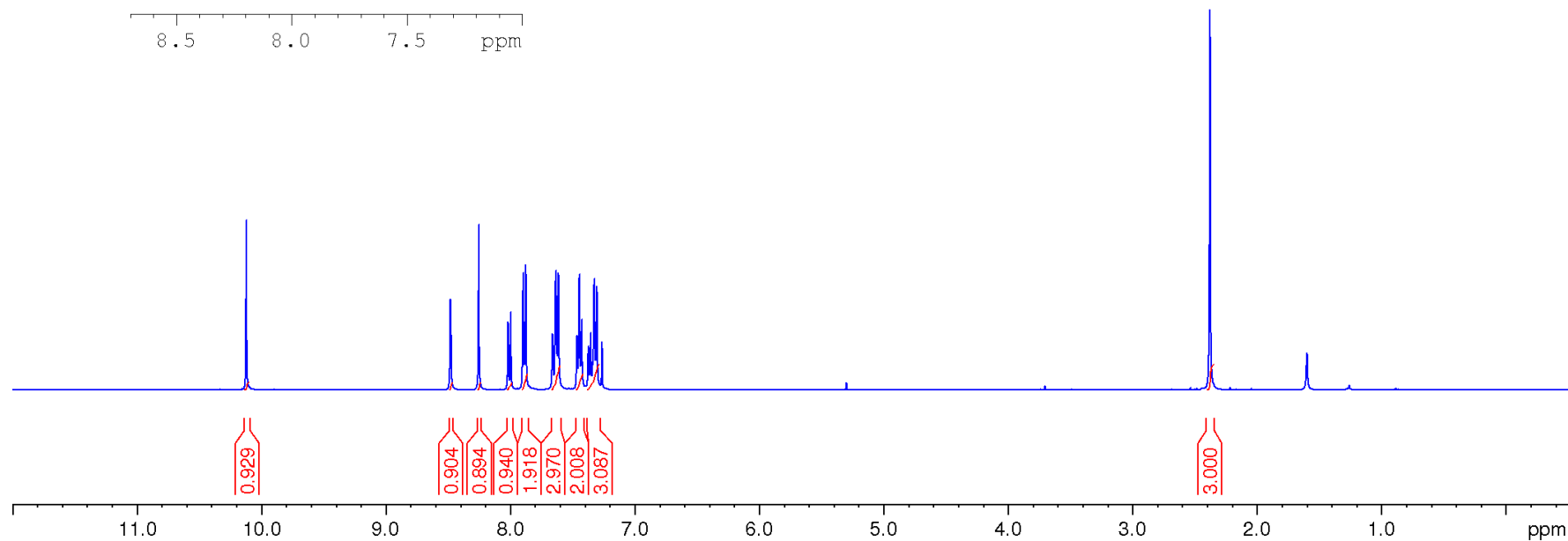
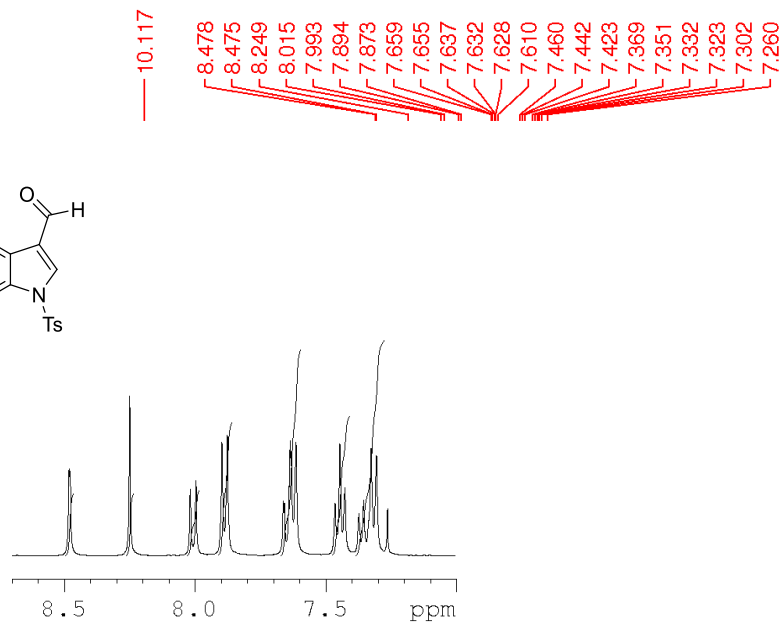
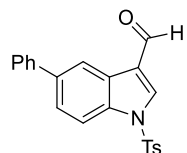
<sup>13</sup>C NMR-spectrum (100.6 MHz) (DMSO-*d*<sub>6</sub>)





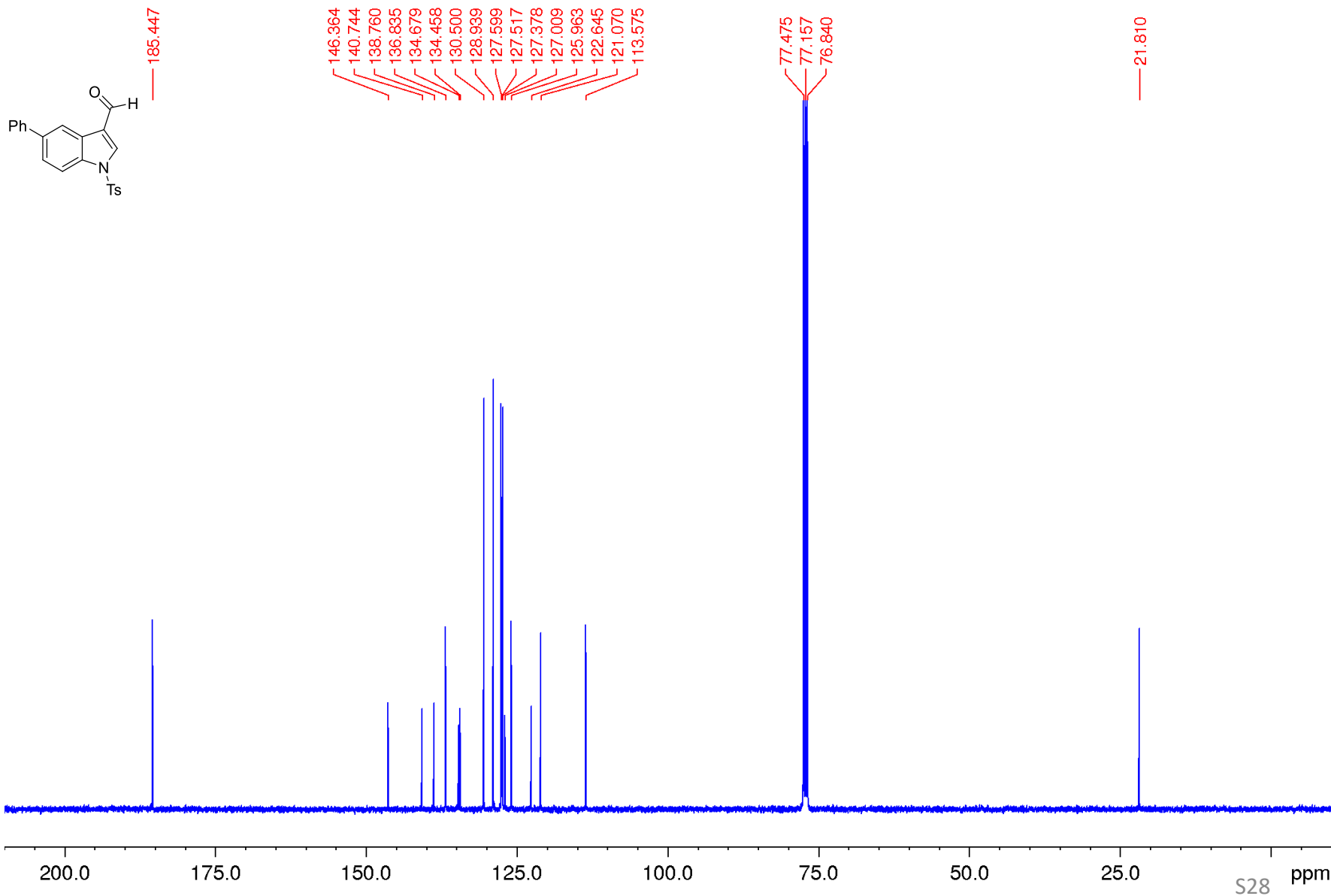
5-phenyl-1-tosyl-1H-indole-3-carbaldehyde

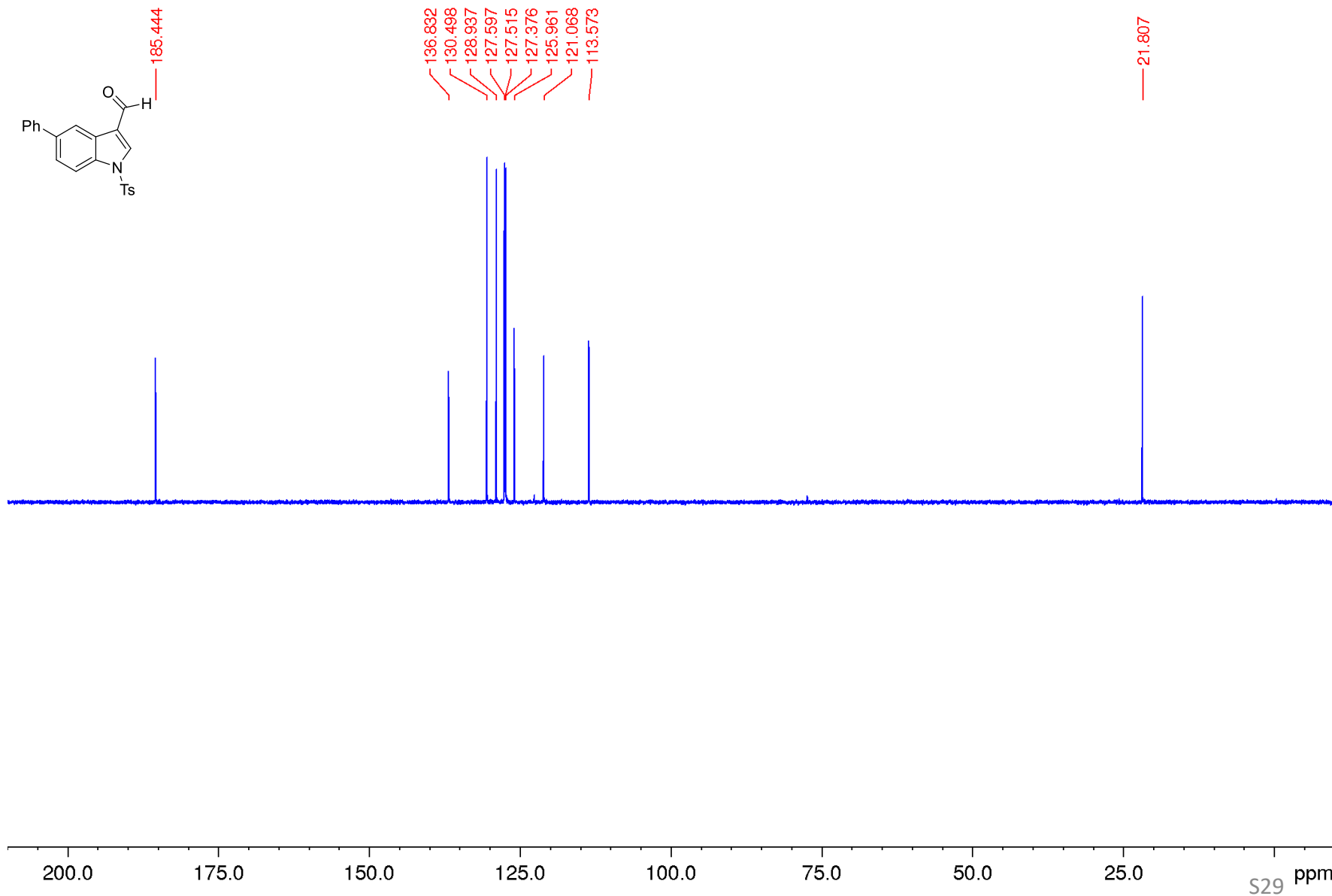
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



5-phenyl-1-tosyl-1H-indole-3-carbaldehyde

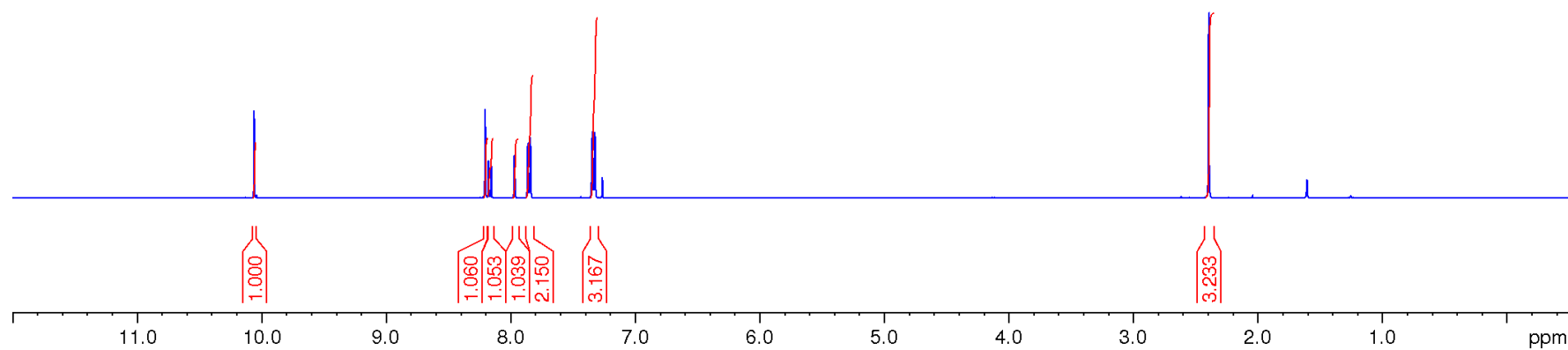
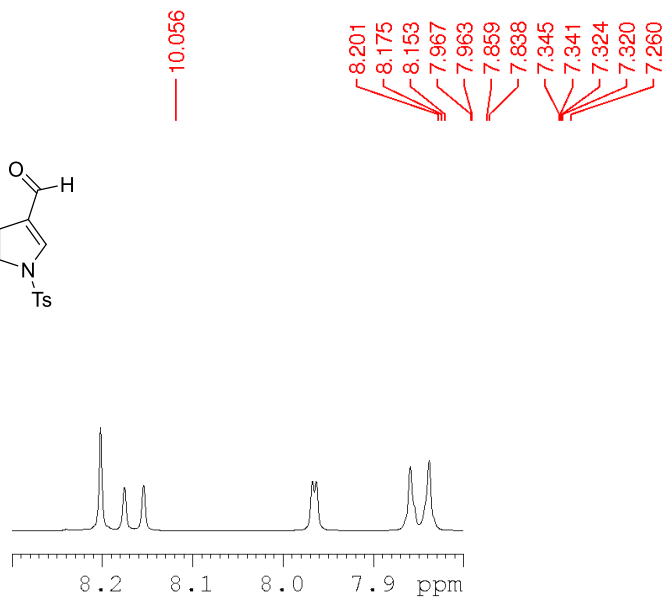
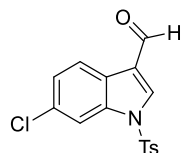
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )

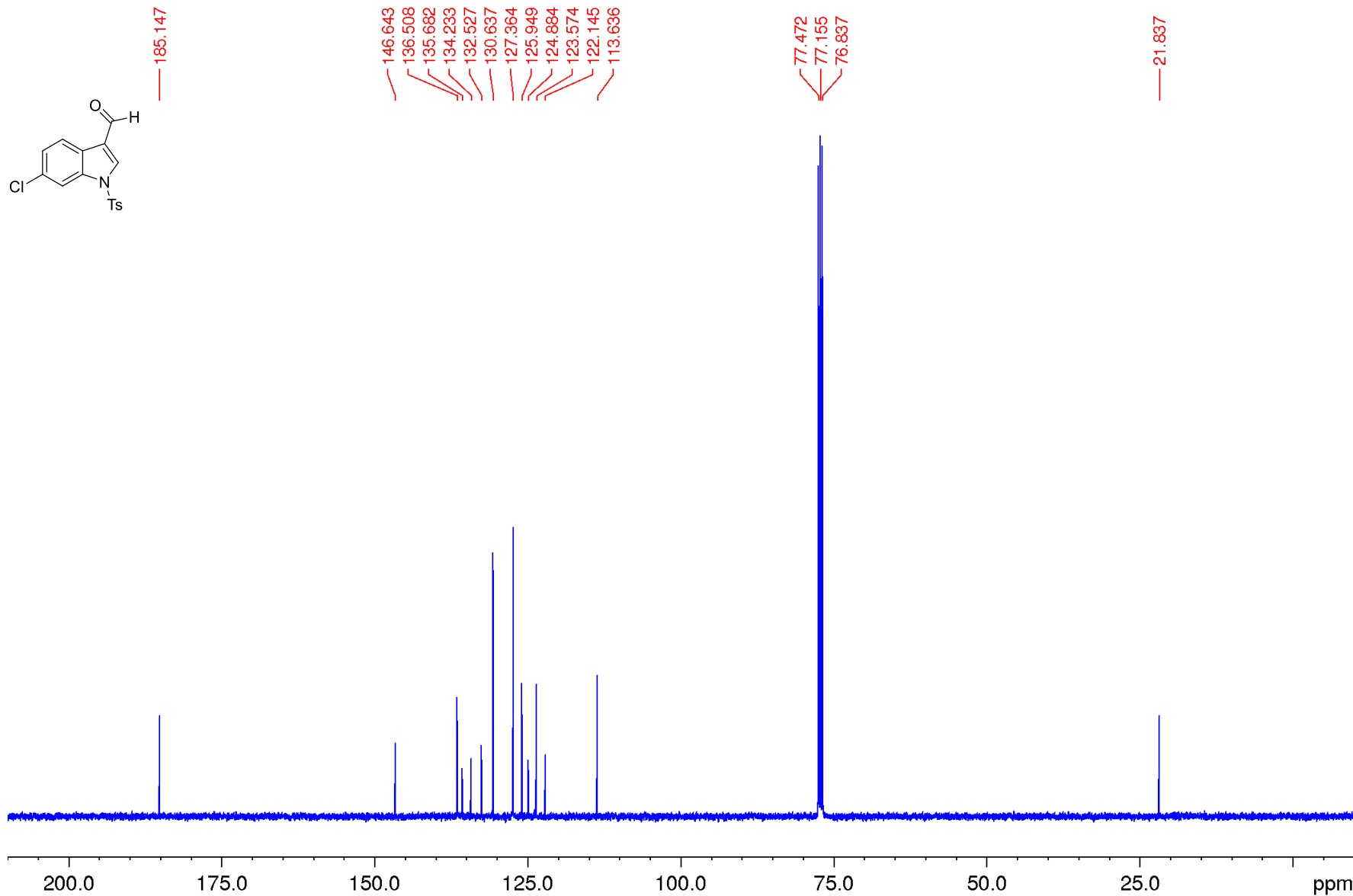


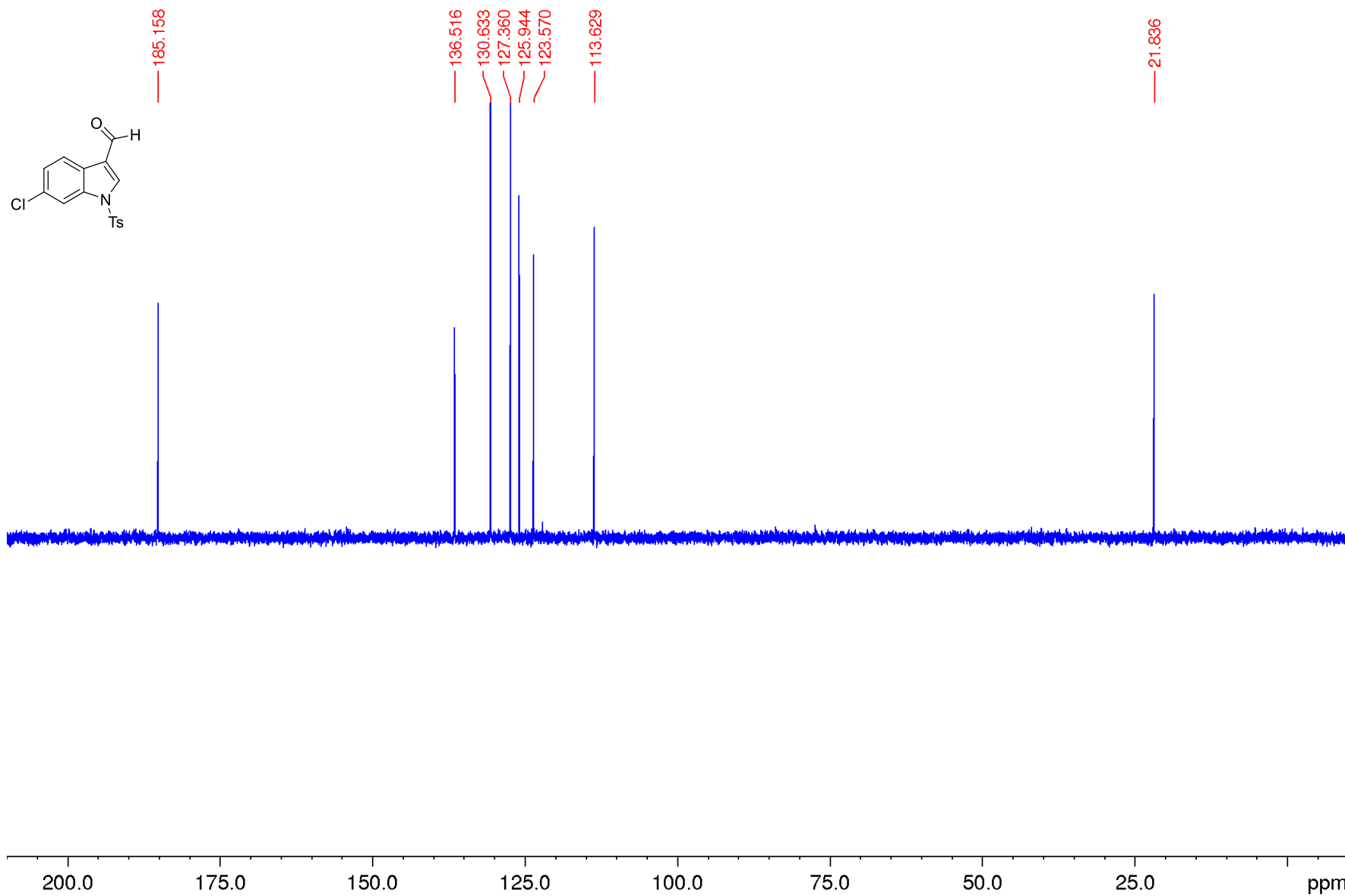


6-chloro-1-tosyl-1H-indole-3-carbaldehyde

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



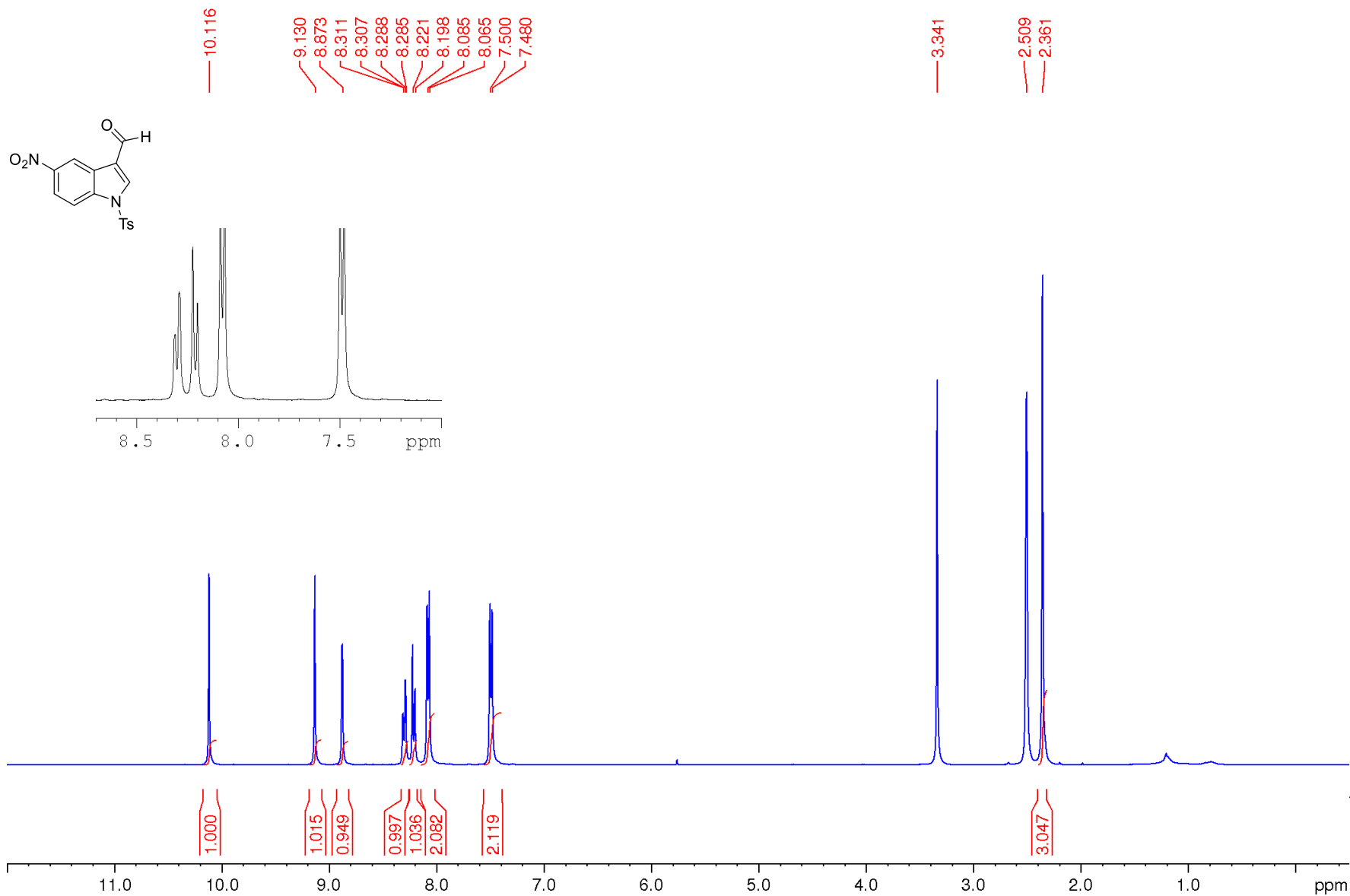


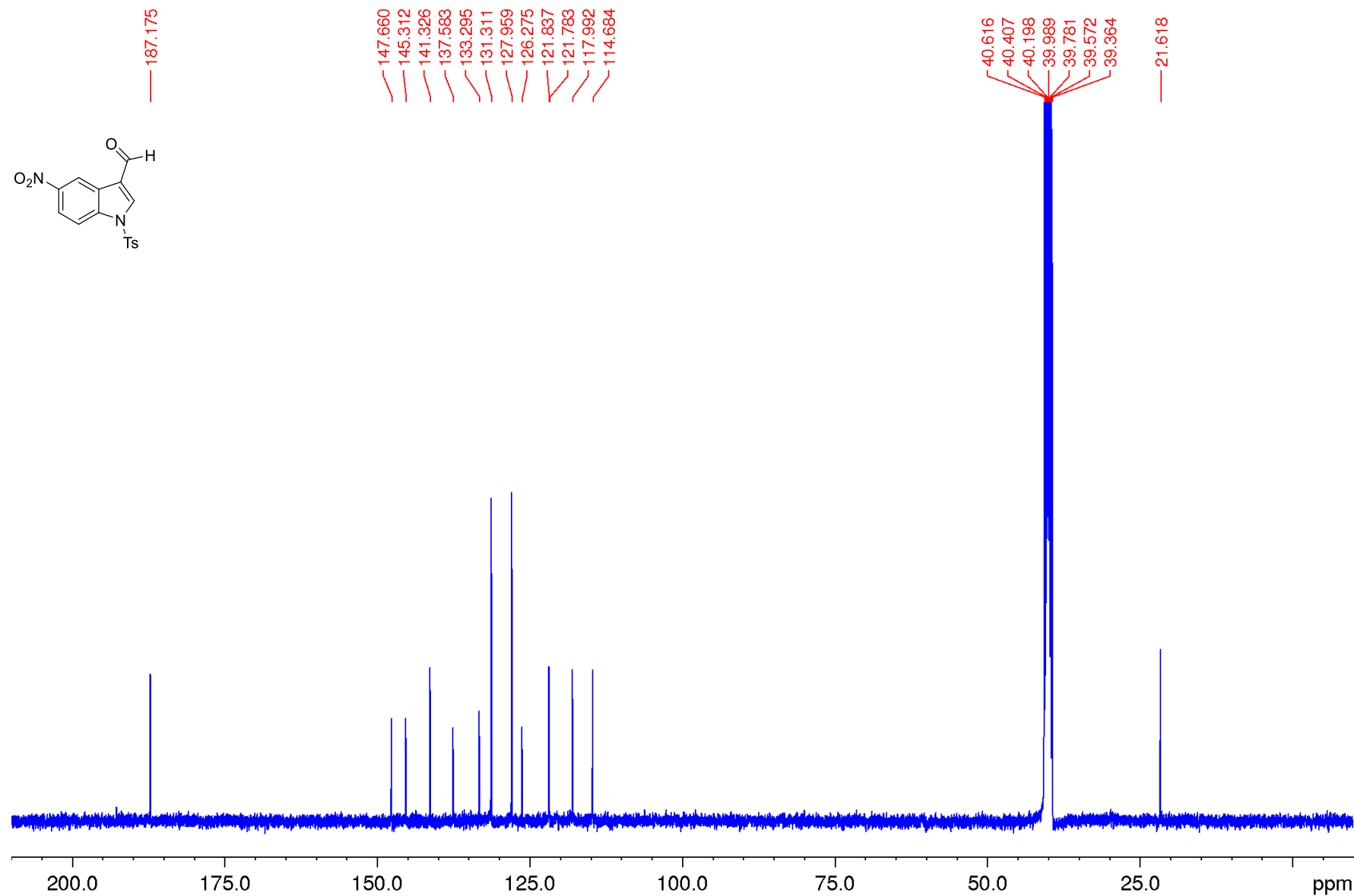
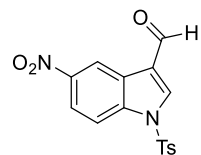


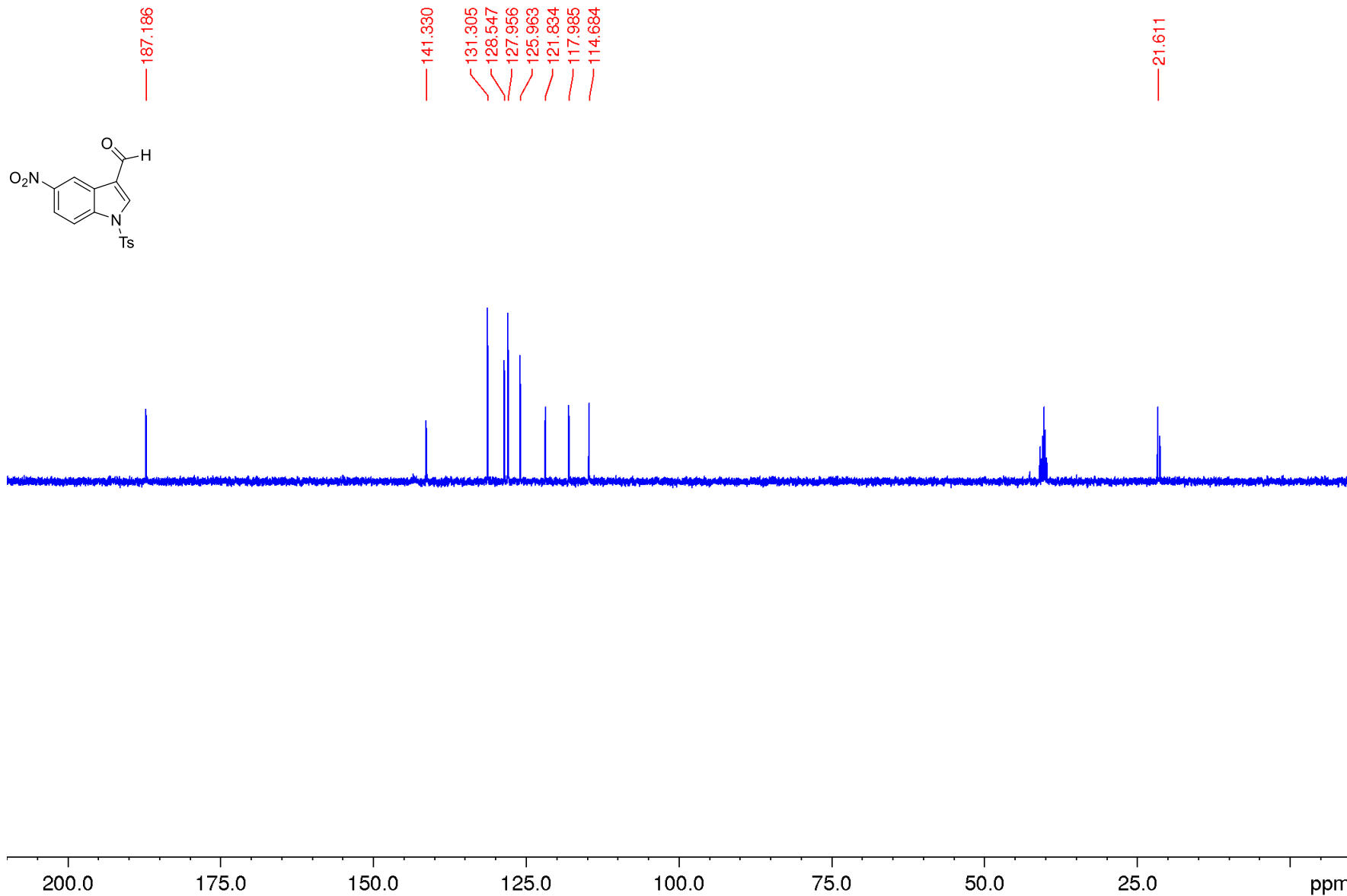


5-nitro-1-tosyl-1H-indole-3-carbaldehyde

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO}-d_6$ )

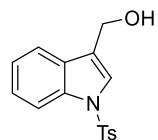






(1-tosyl-1H-indol-3-yl)methanol

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )

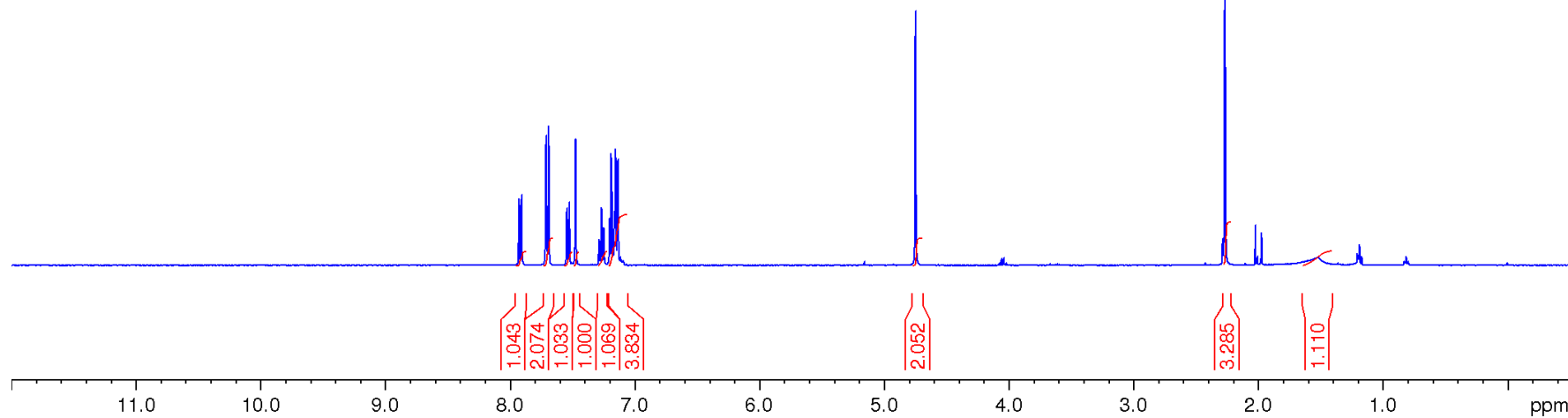
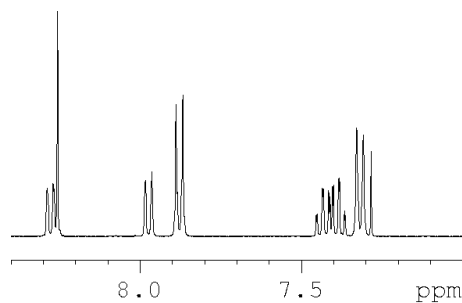


7.927  
7.906  
7.710  
7.689  
7.543  
7.524  
7.473  
7.286  
7.283  
7.265  
7.247  
7.244  
7.200  
7.199  
7.188  
7.181  
7.160  
7.154  
7.133

4.747

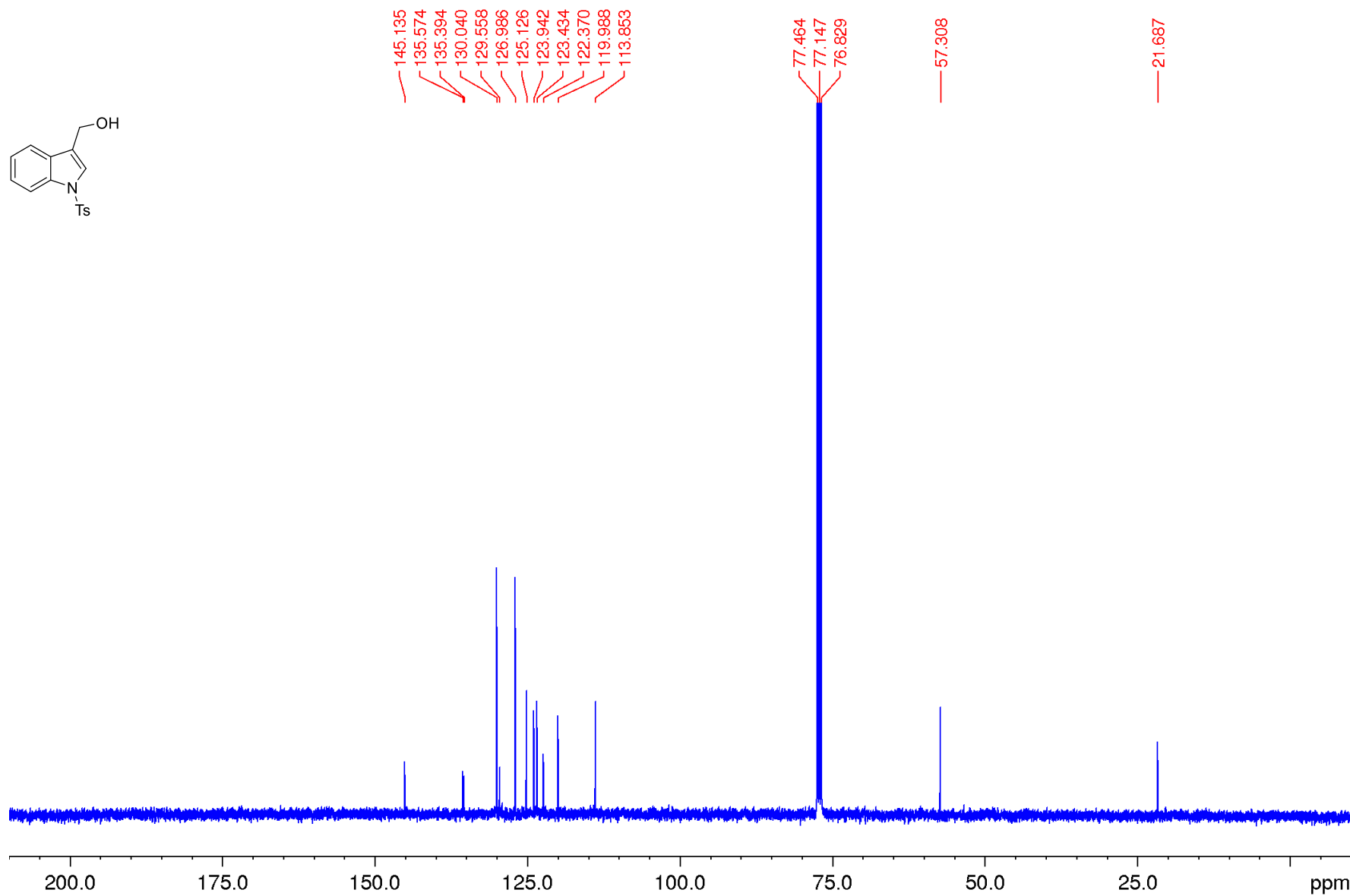
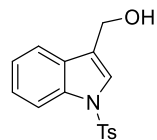
2.264

1.545



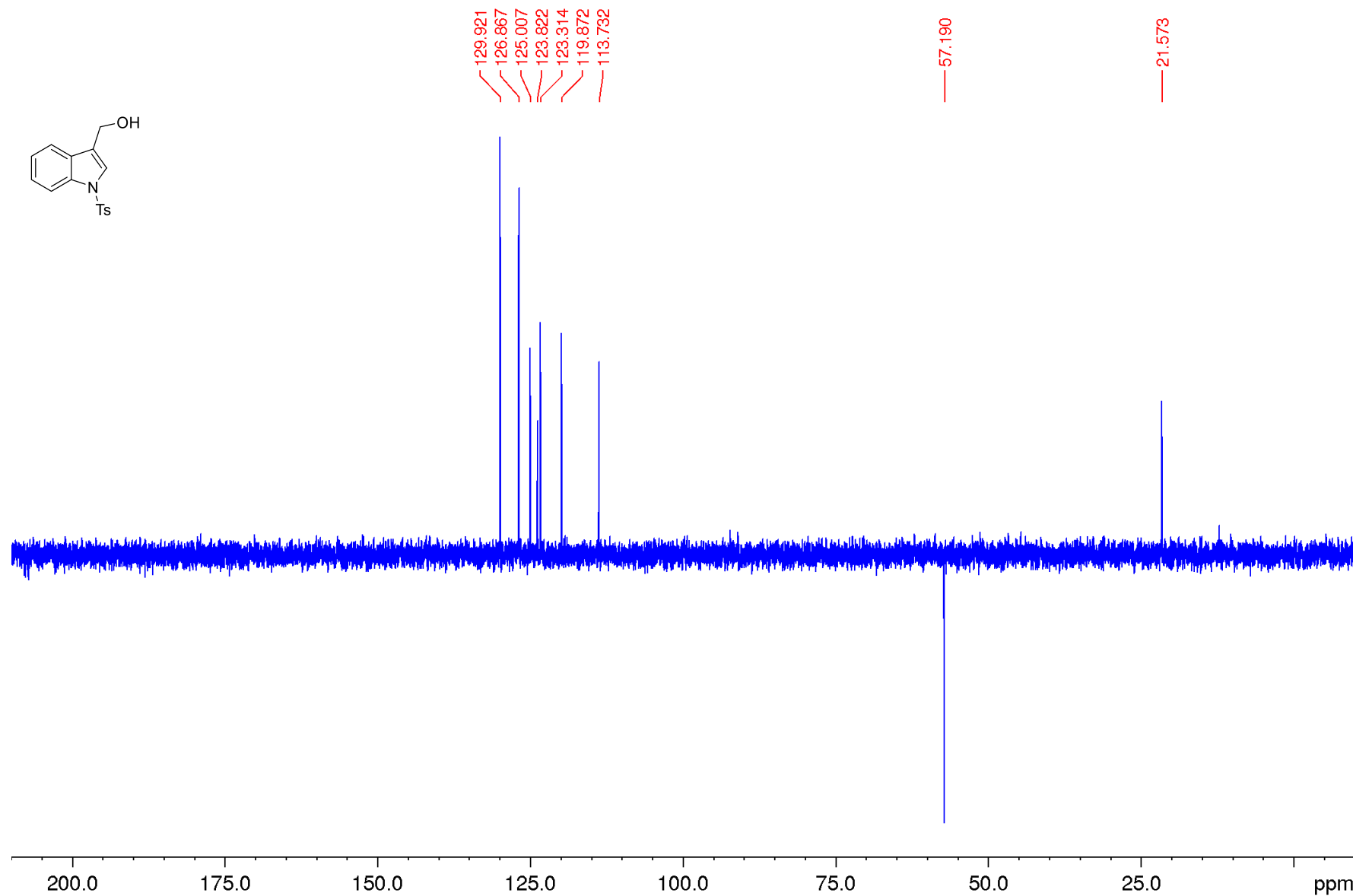
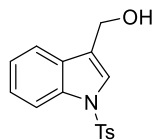
(1-tosyl-1H-indol-3-yl)methanol

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



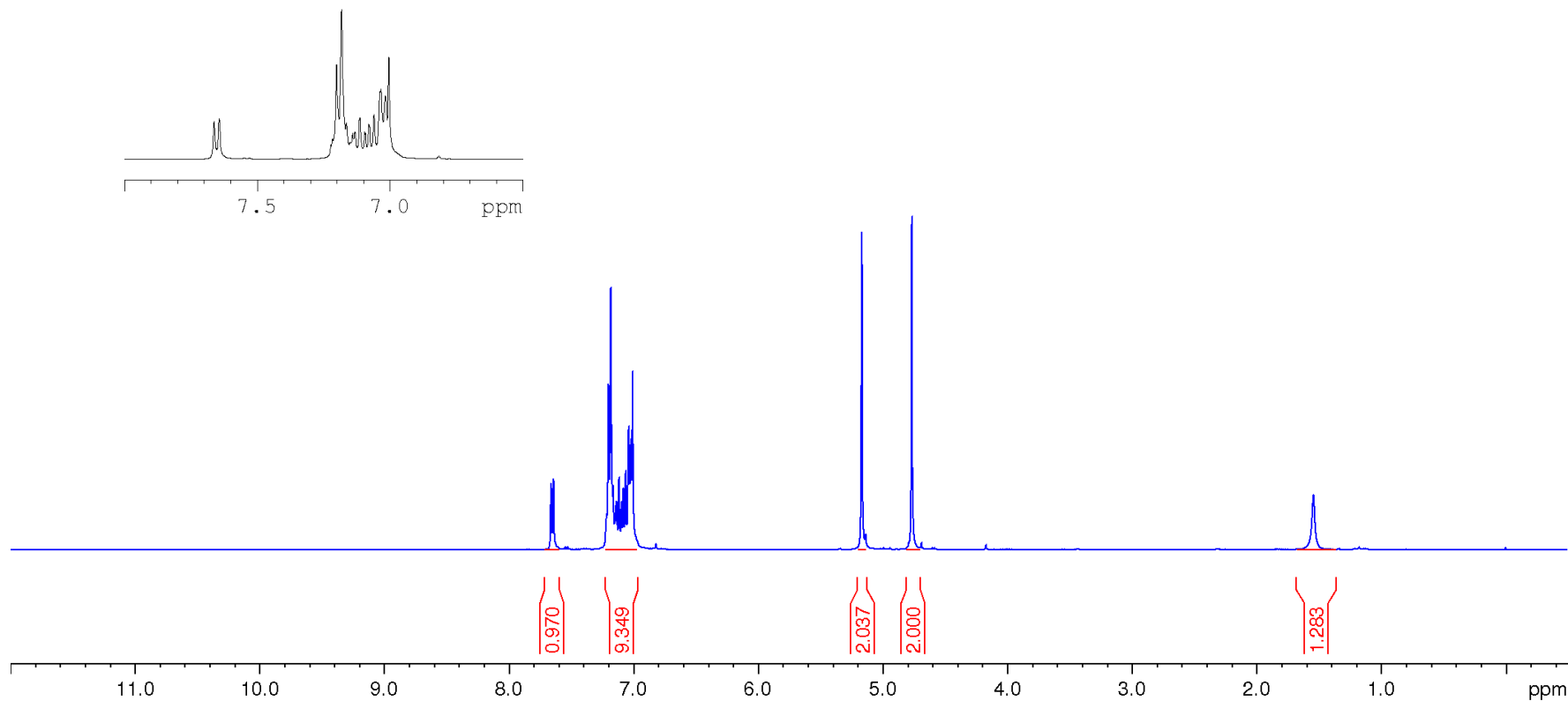
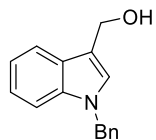
(1-tosyl-1H-indol-3-yl)methanol

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)

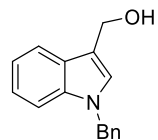


(1-tosyl-1H-indol-3-yl)methanol

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



(1-tosyl-1H-indol-3-yl)methanol



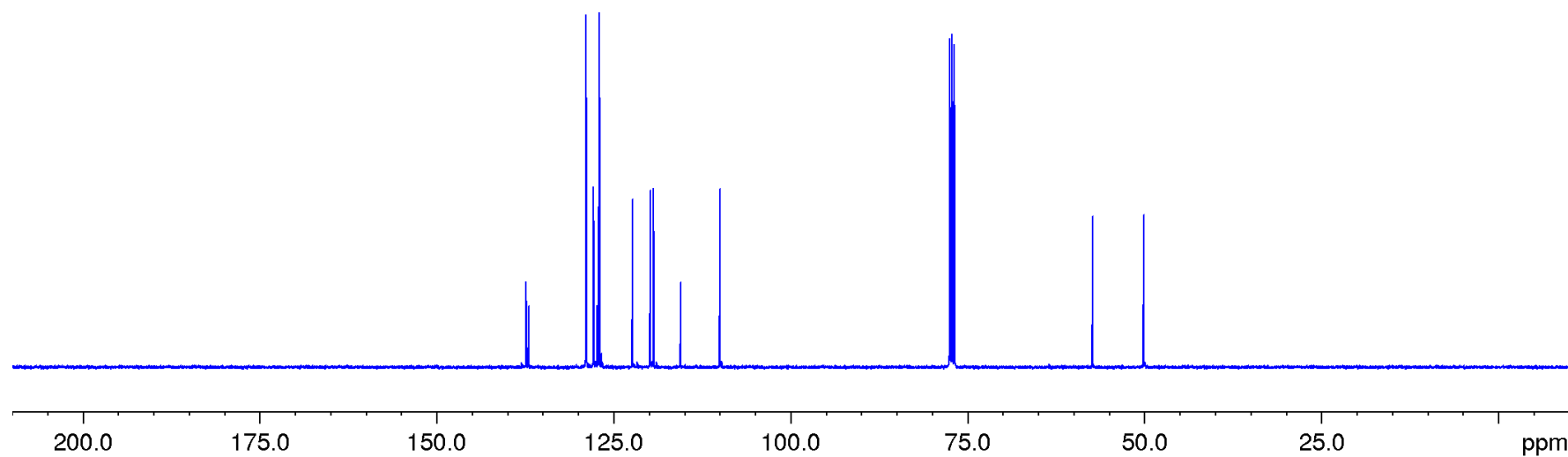
<sup>13</sup>C NMR-spectrum (100.6 MHz) (CDCl<sub>3</sub>)

137.354  
136.996  
128.896  
127.817  
127.337  
127.103  
127.015  
122.325  
119.825  
119.366  
115.517  
109.975

77.477  
77.158  
76.841

57.307

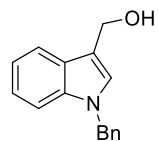
50.101





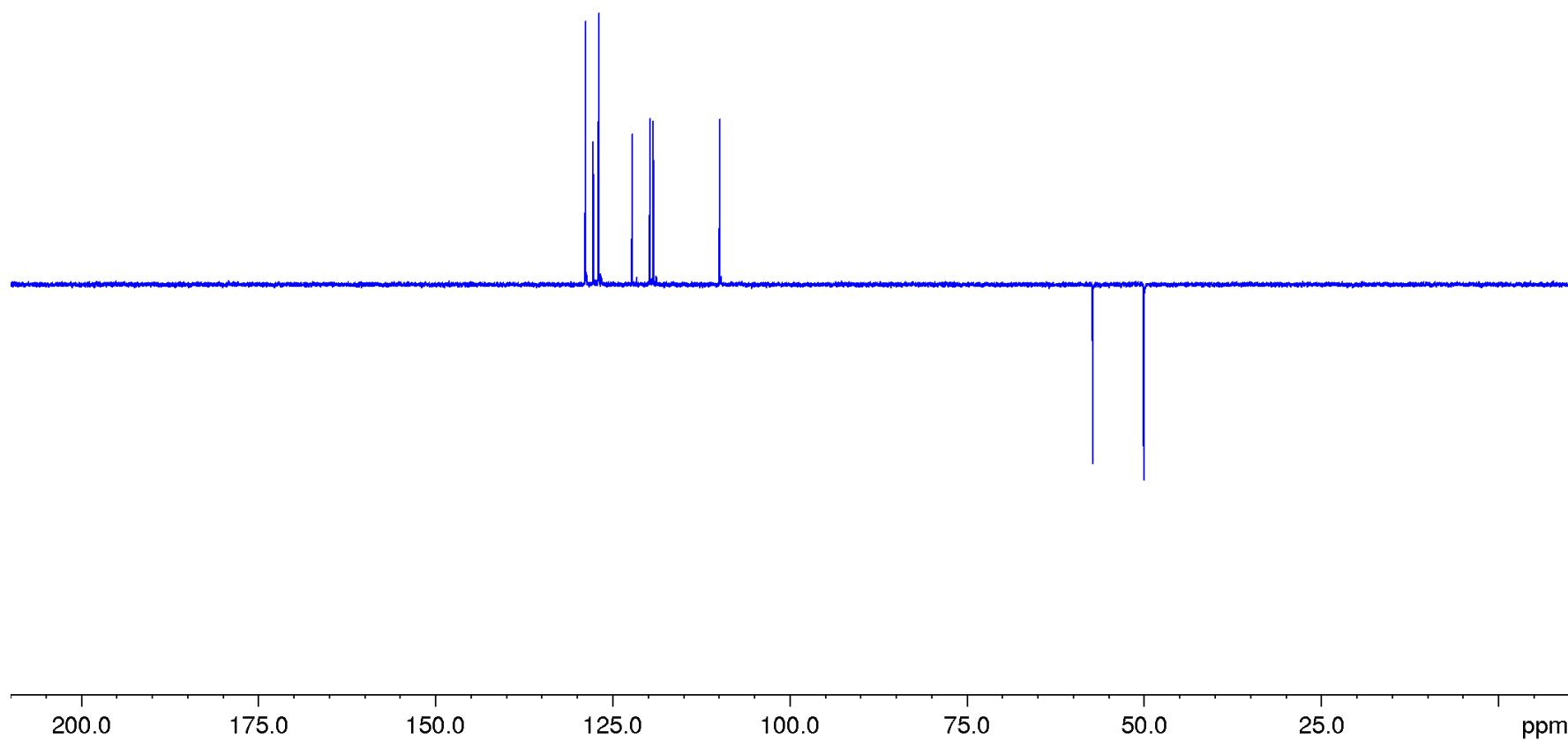
(1-tosyl-1H-indol-3-yl)methanol

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



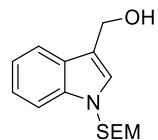
128.802  
127.723  
127.009  
126.921  
122.231  
119.732  
119.272  
109.881

57.212  
50.007



(1-tosyl-1H-indol-3-yl)methanol

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO}-d_6$ )



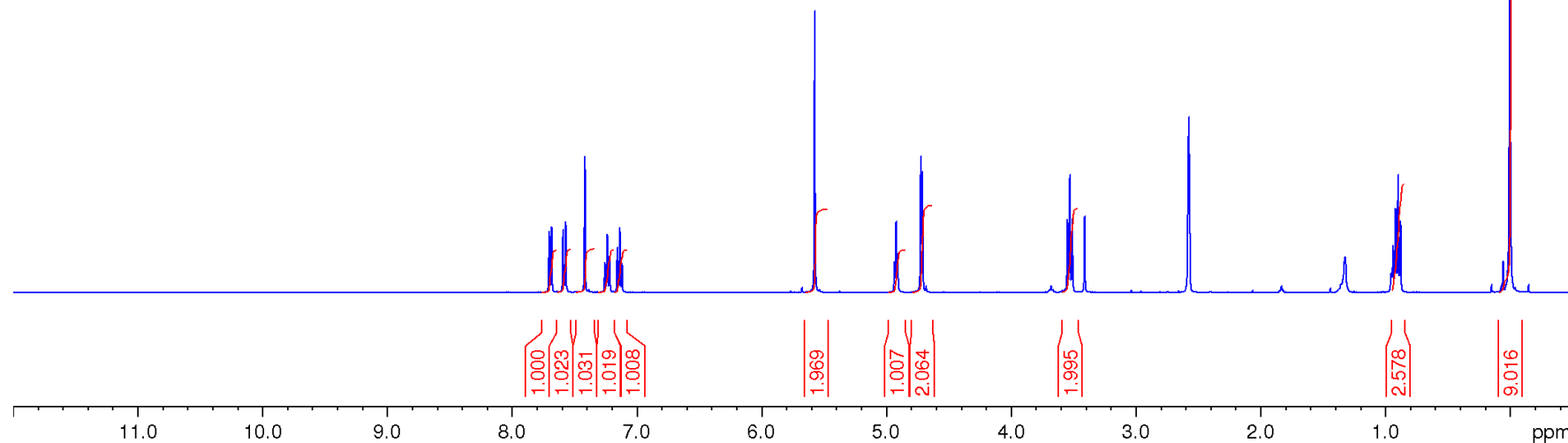
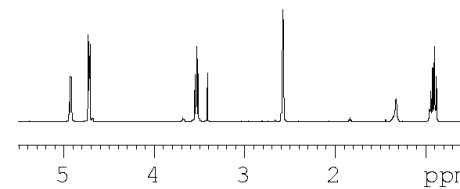
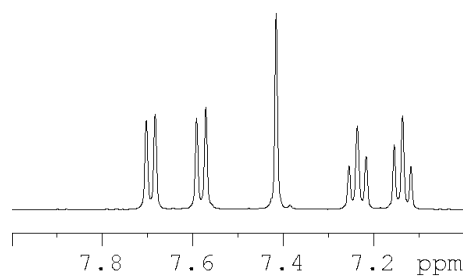
7.701  
7.682  
7.590  
7.570  
7.416  
7.254  
7.236  
7.216  
7.154  
7.136  
7.117

5.573  
4.933  
4.920  
4.906  
4.722  
4.709

3.547  
3.527  
3.507

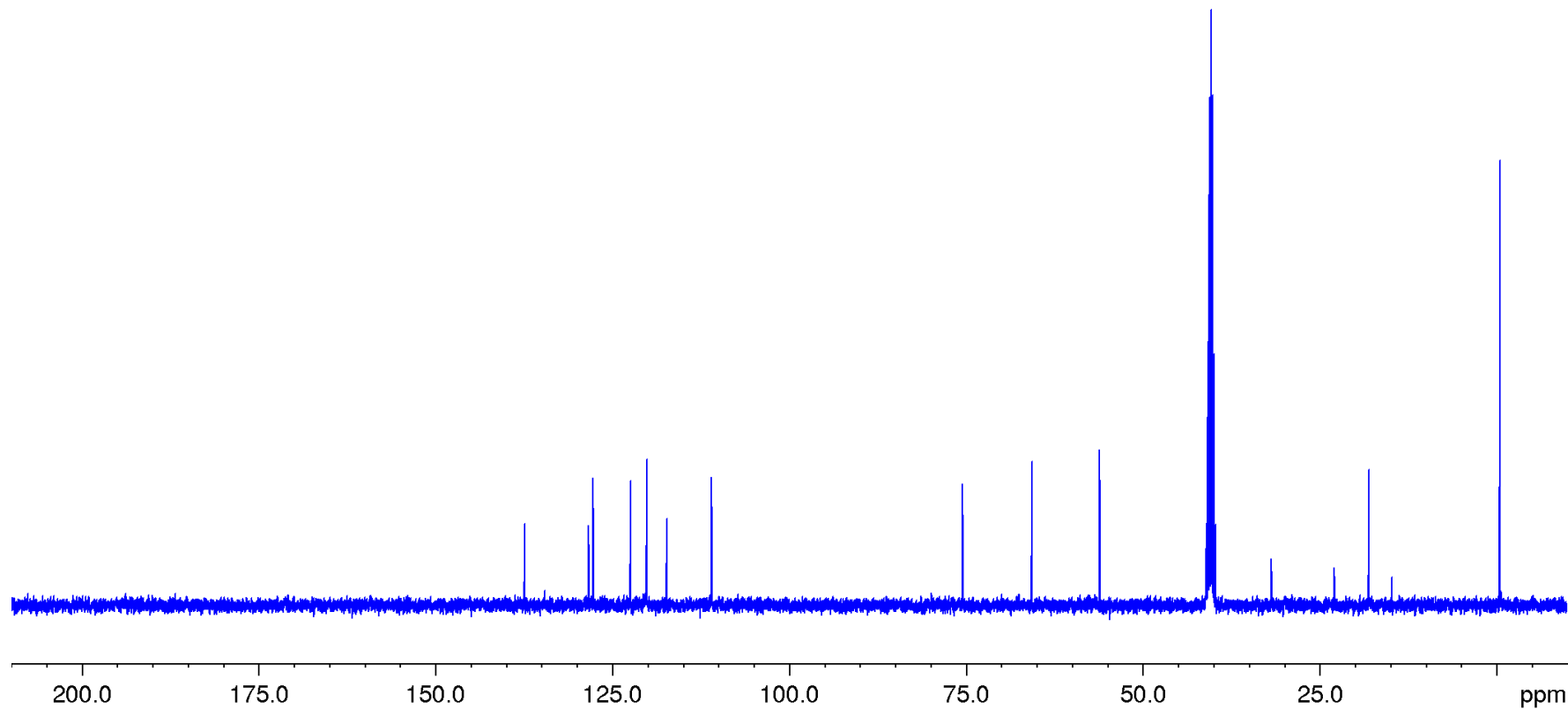
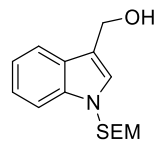
0.916  
0.896  
0.876

-0.000



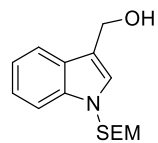
(1-tosyl-1H-indol-3-yl)methanol

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



(1-tosyl-1H-indol-3-yl)methanol

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



127.735  
122.438  
120.142  
120.108  
110.979

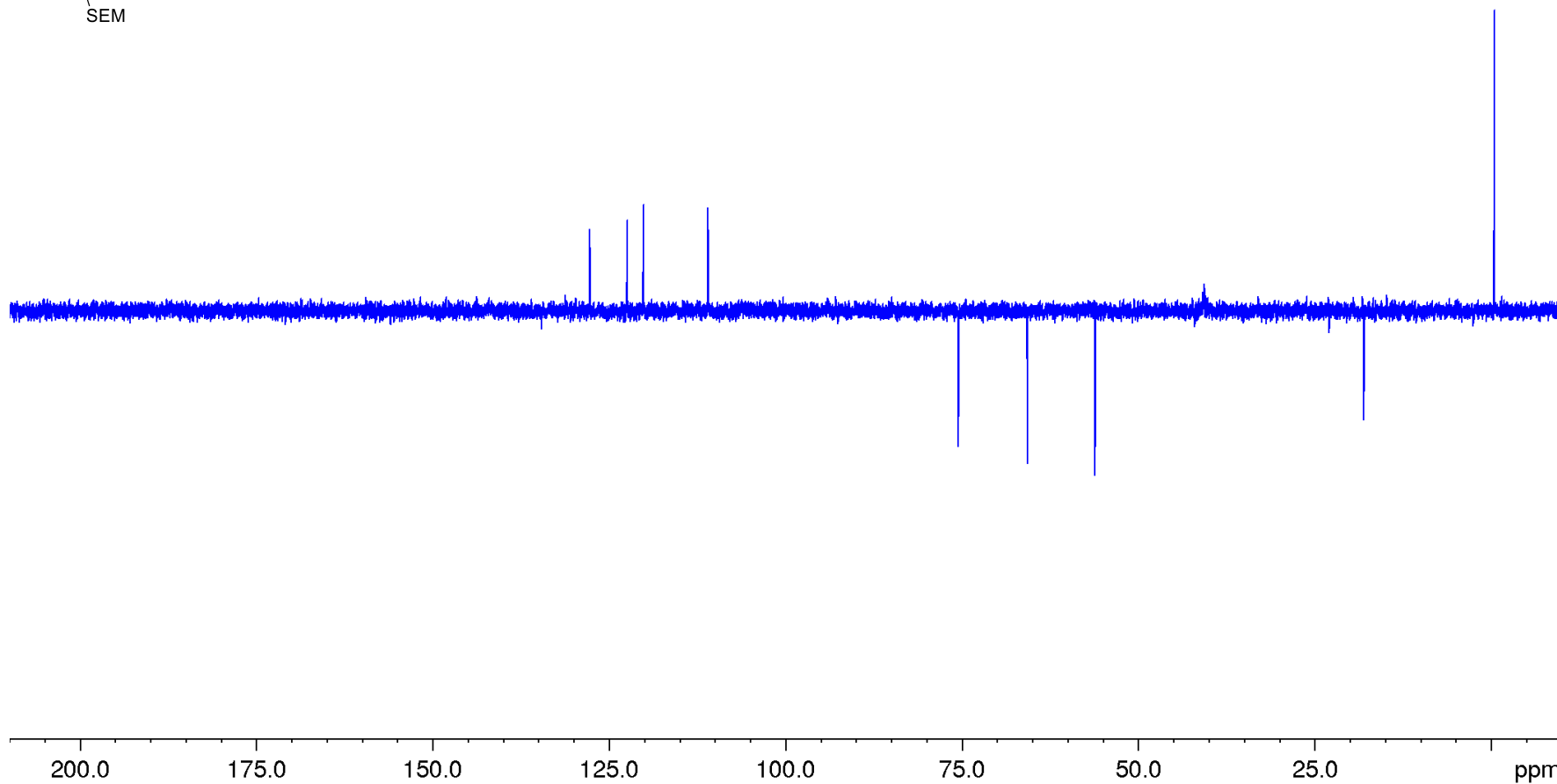
75.485

65.699

56.097

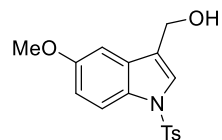
18.028

-0.504



(5-methoxy-1-tosyl-1H-indol-3-yl)methanol

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



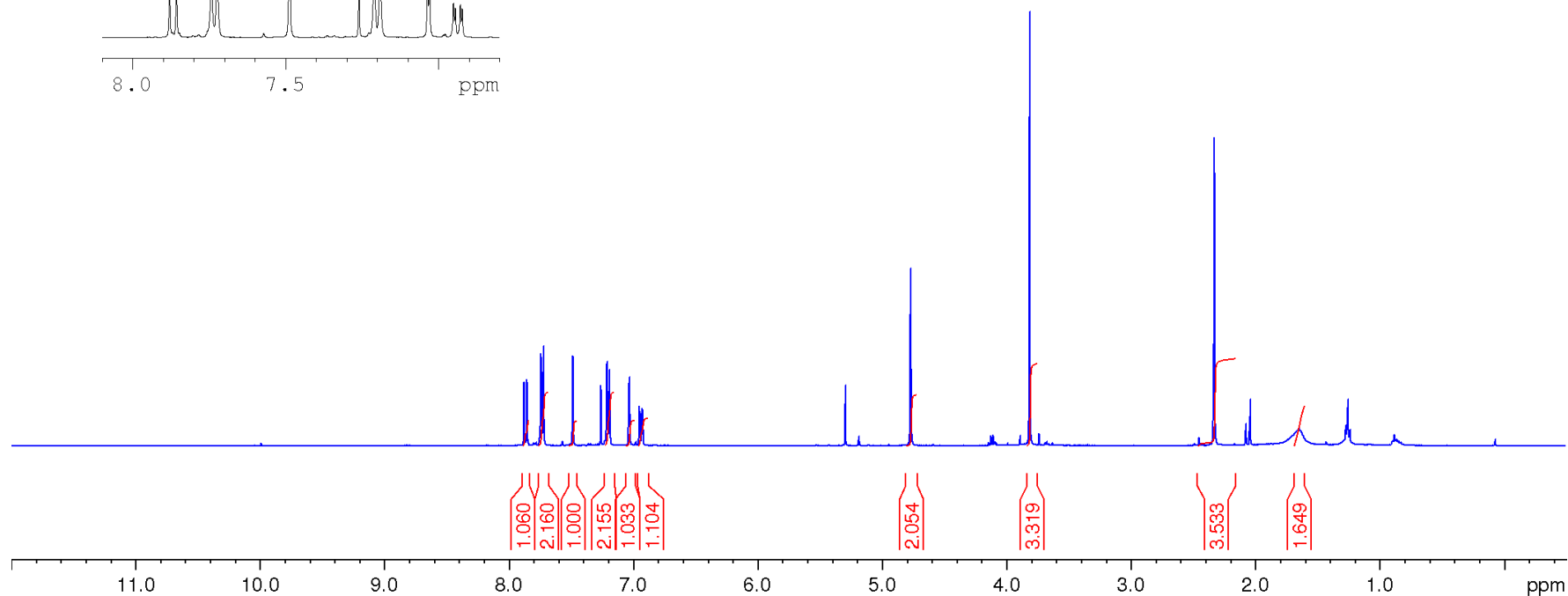
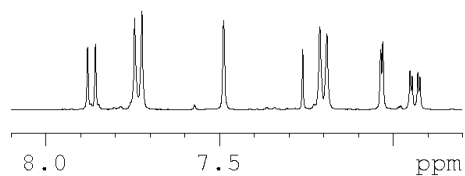
7.877  
7.855  
7.741  
7.721  
7.485  
7.260  
7.210  
7.190  
7.035  
7.029  
6.950  
6.944  
6.928  
6.922

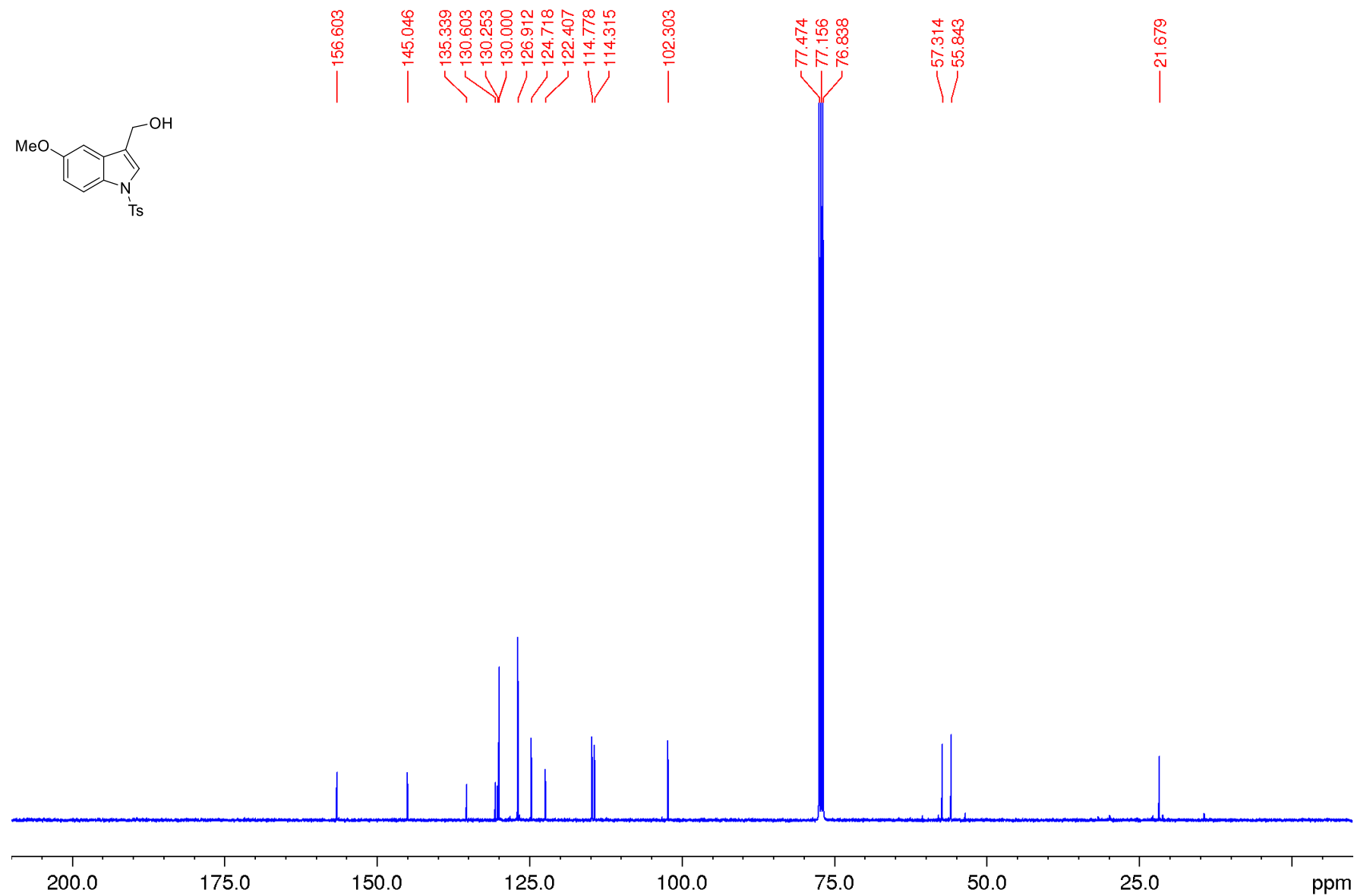
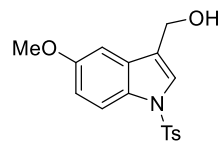
4.770

3.813

2.329

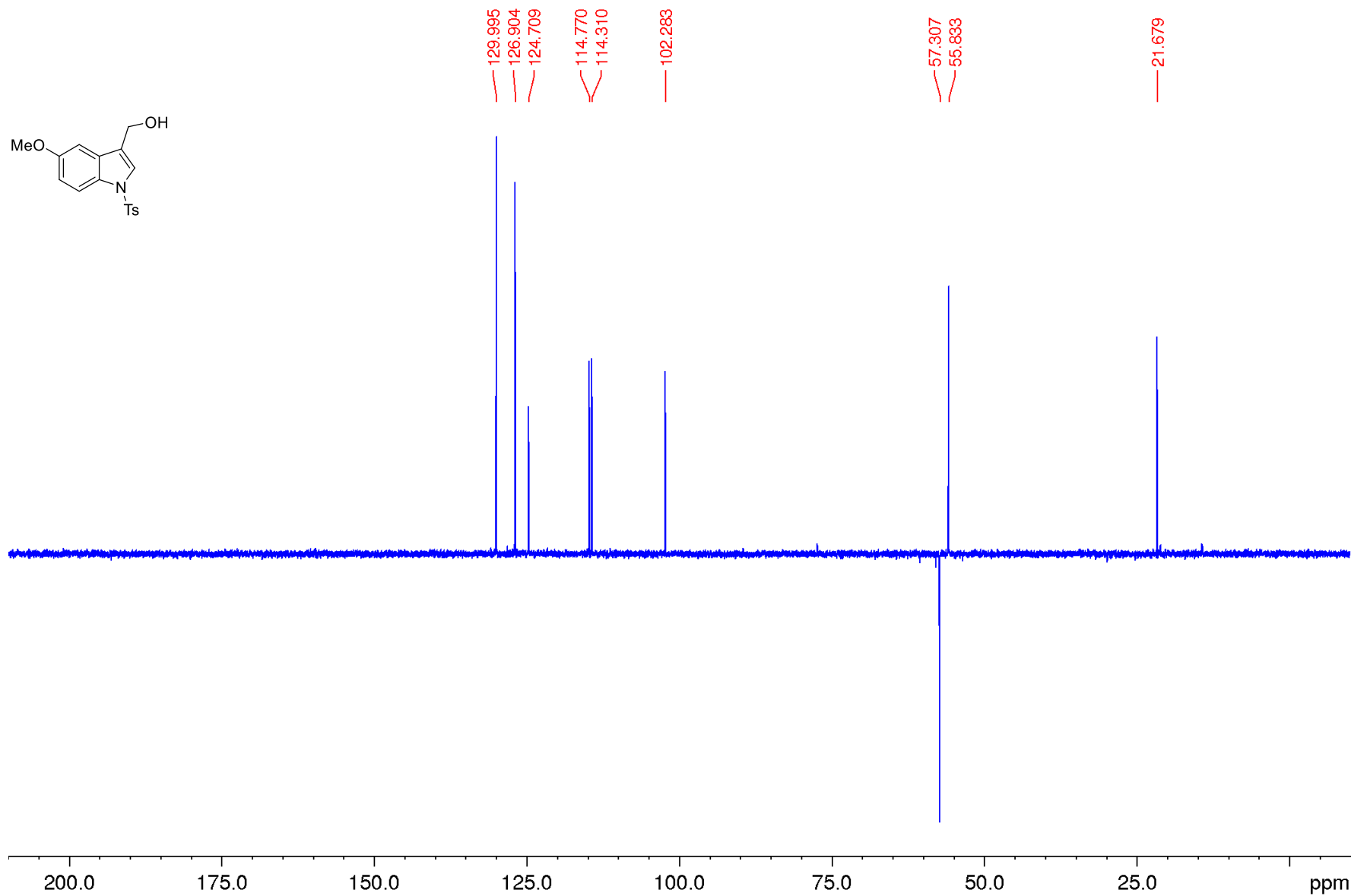
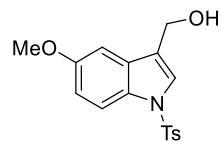
1.658





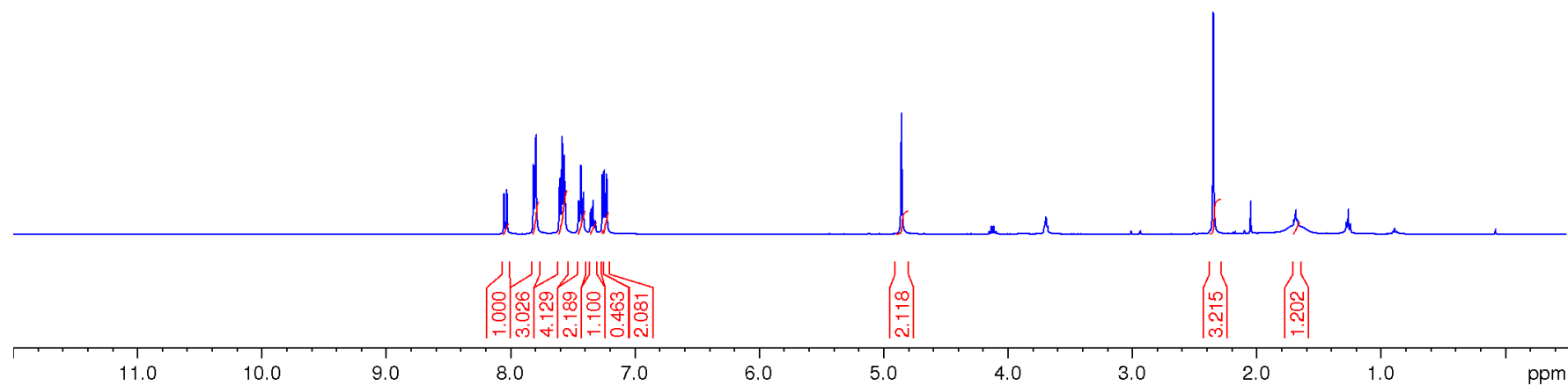
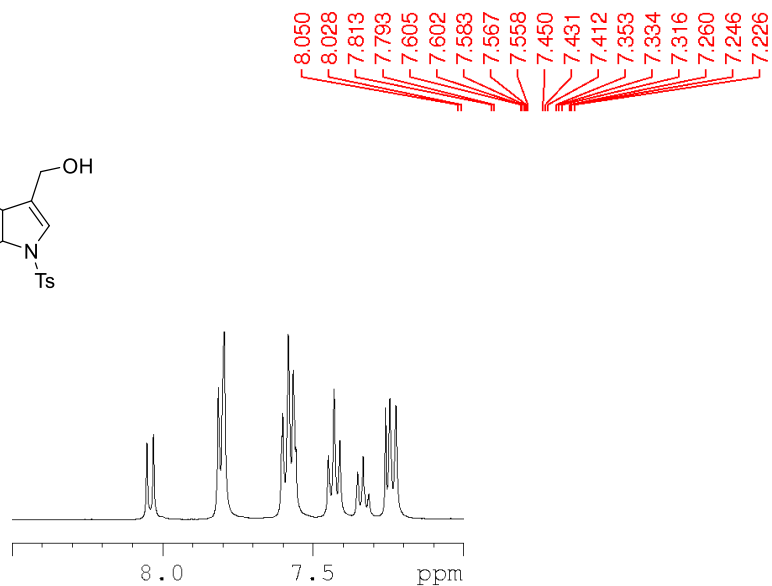
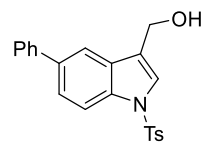
(5-methoxy-1-tosyl-1H-indol-3-yl)methanol

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



(5-phenyl-1-tosyl-1H-indol-3-yl)methanol

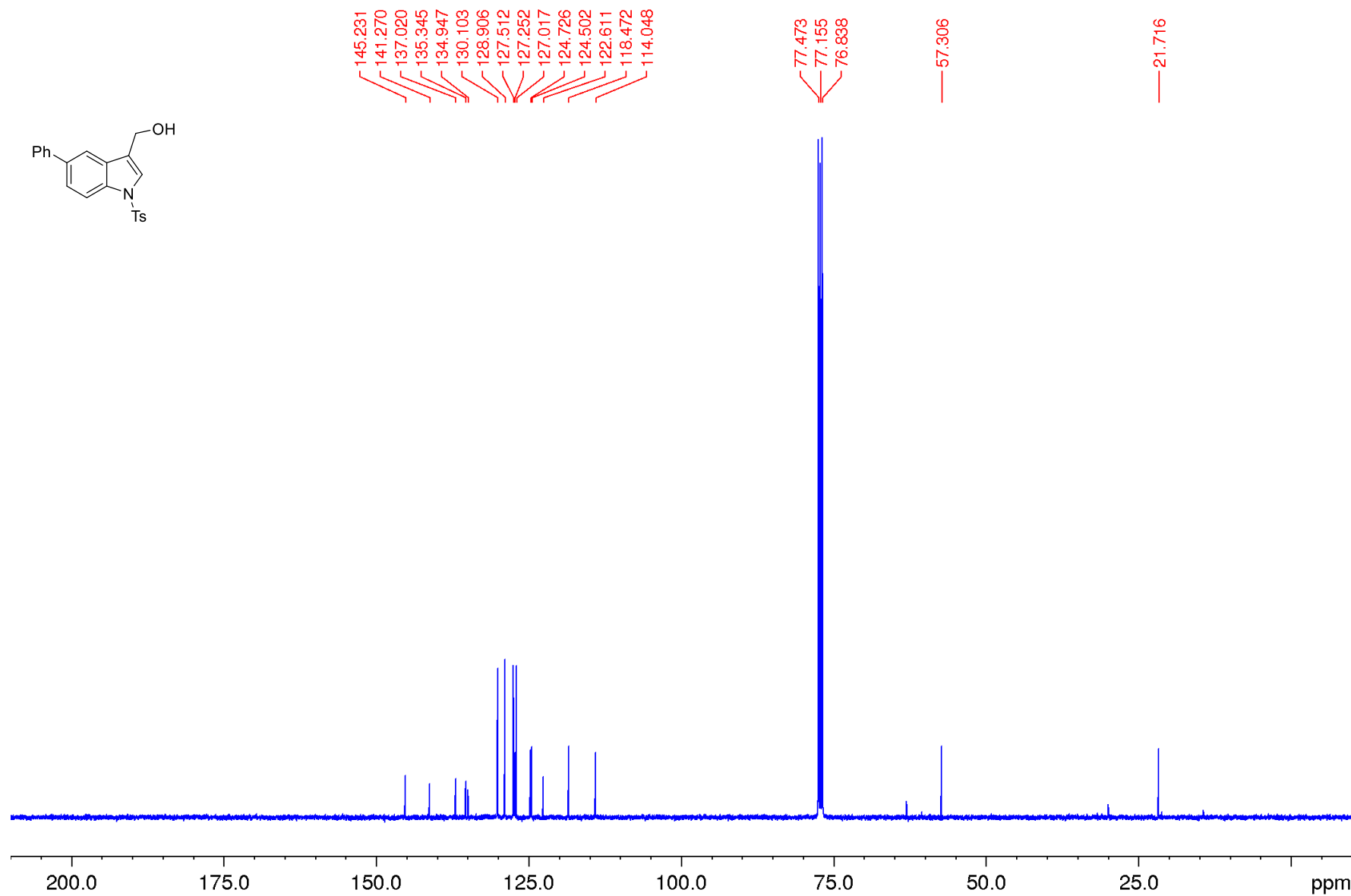
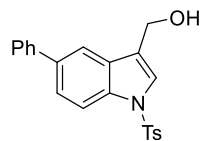
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )





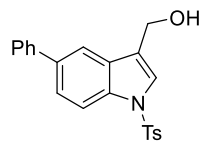
*((5-phenyl-1-tosyl-1H-indol-3-yl)methanol)*

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



(5-phenyl-1-tosyl-1H-indol-3-yl)methanol

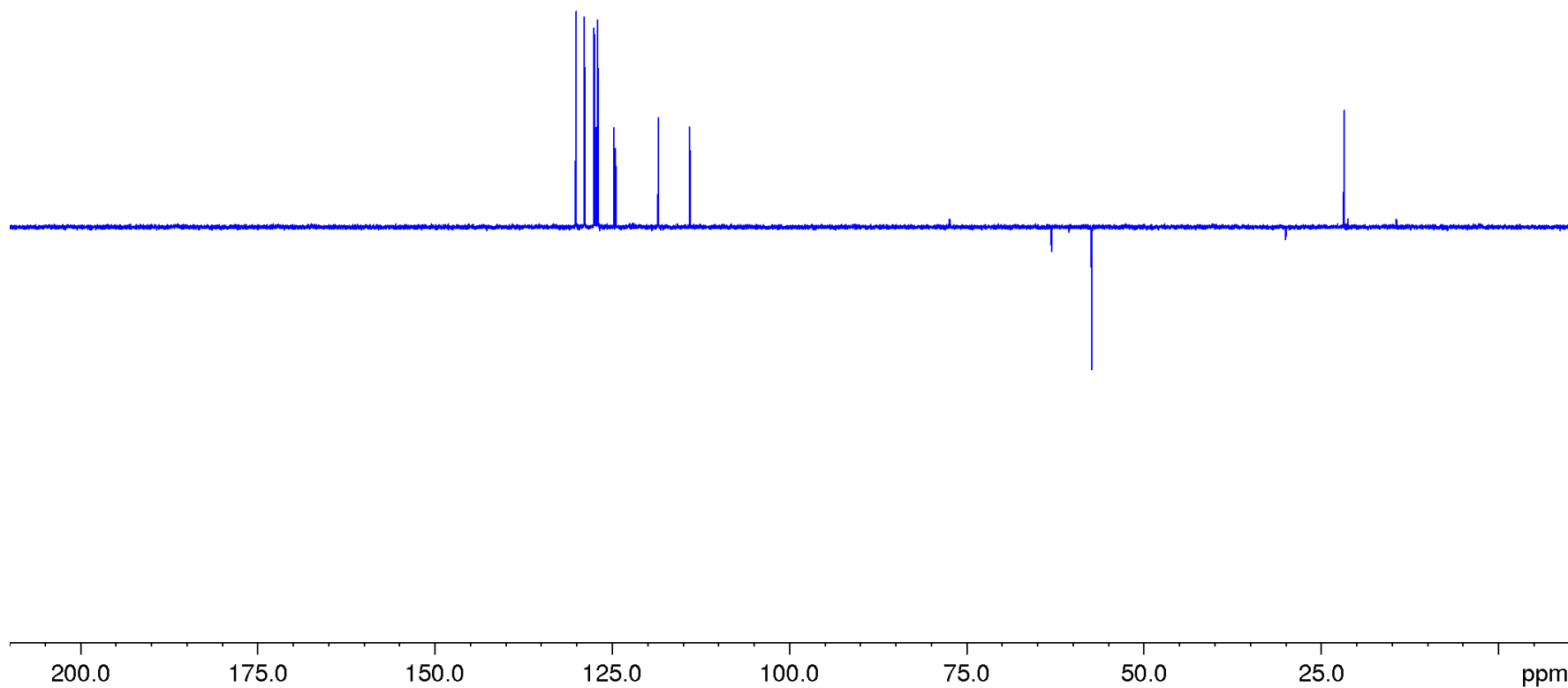
DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



130.091  
128.894  
127.500  
127.240  
127.006  
124.714  
124.491  
118.461  
114.037

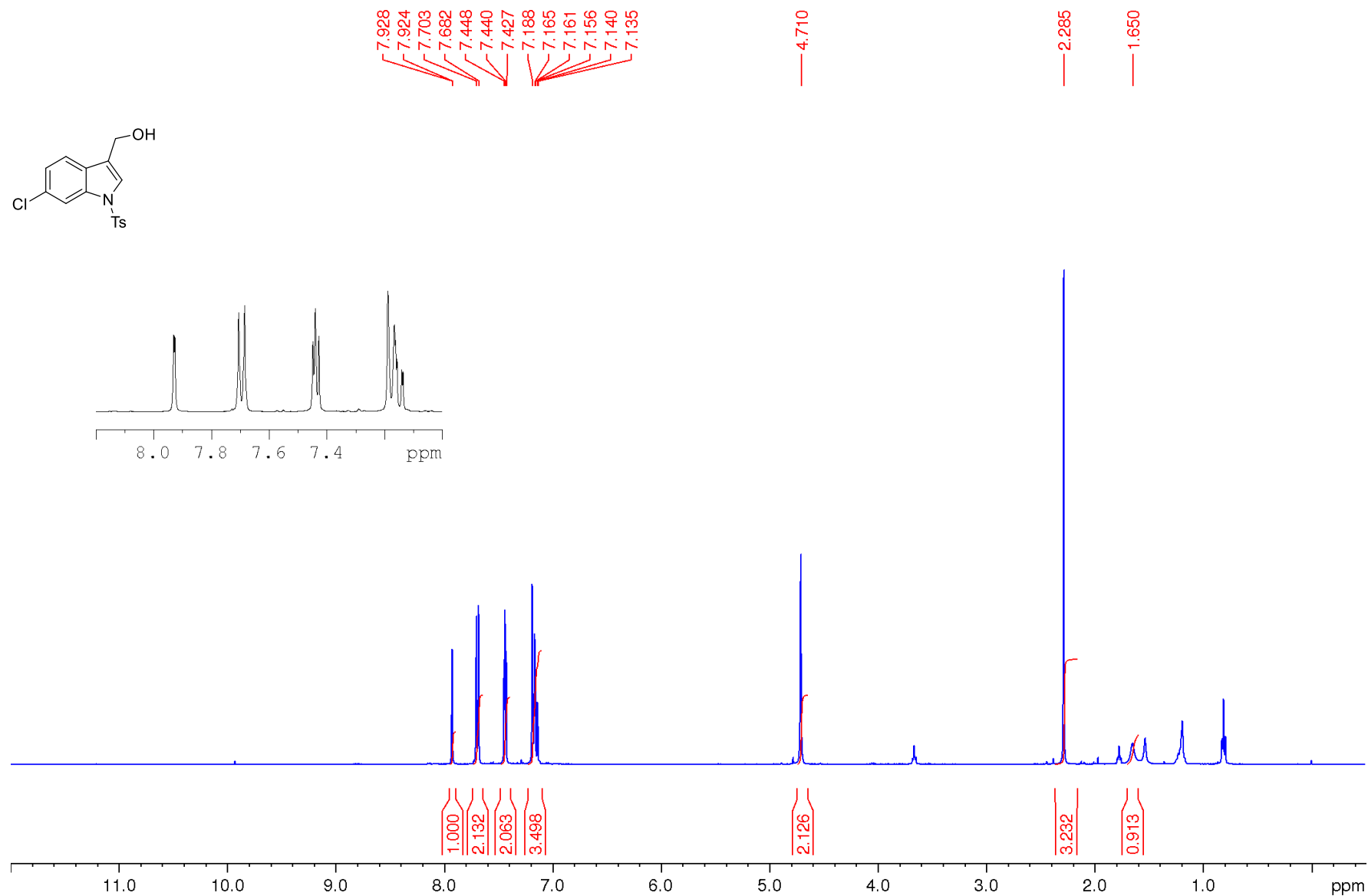
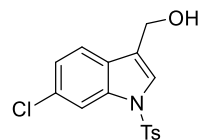
57.295

21.706



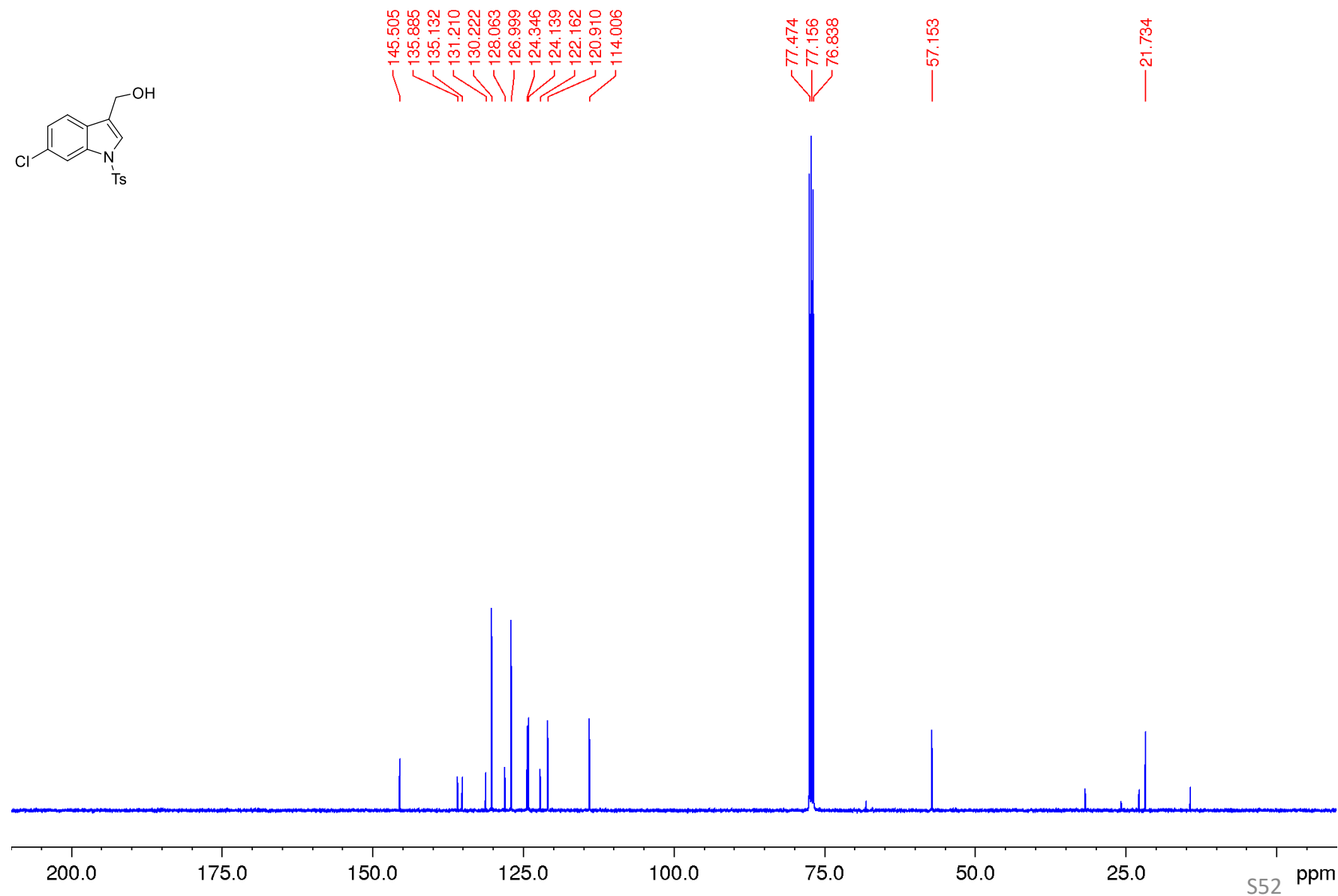
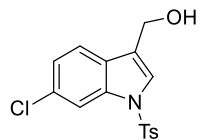
(6-chloro-1-tosyl-1H-indol-3-yl)methanol

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



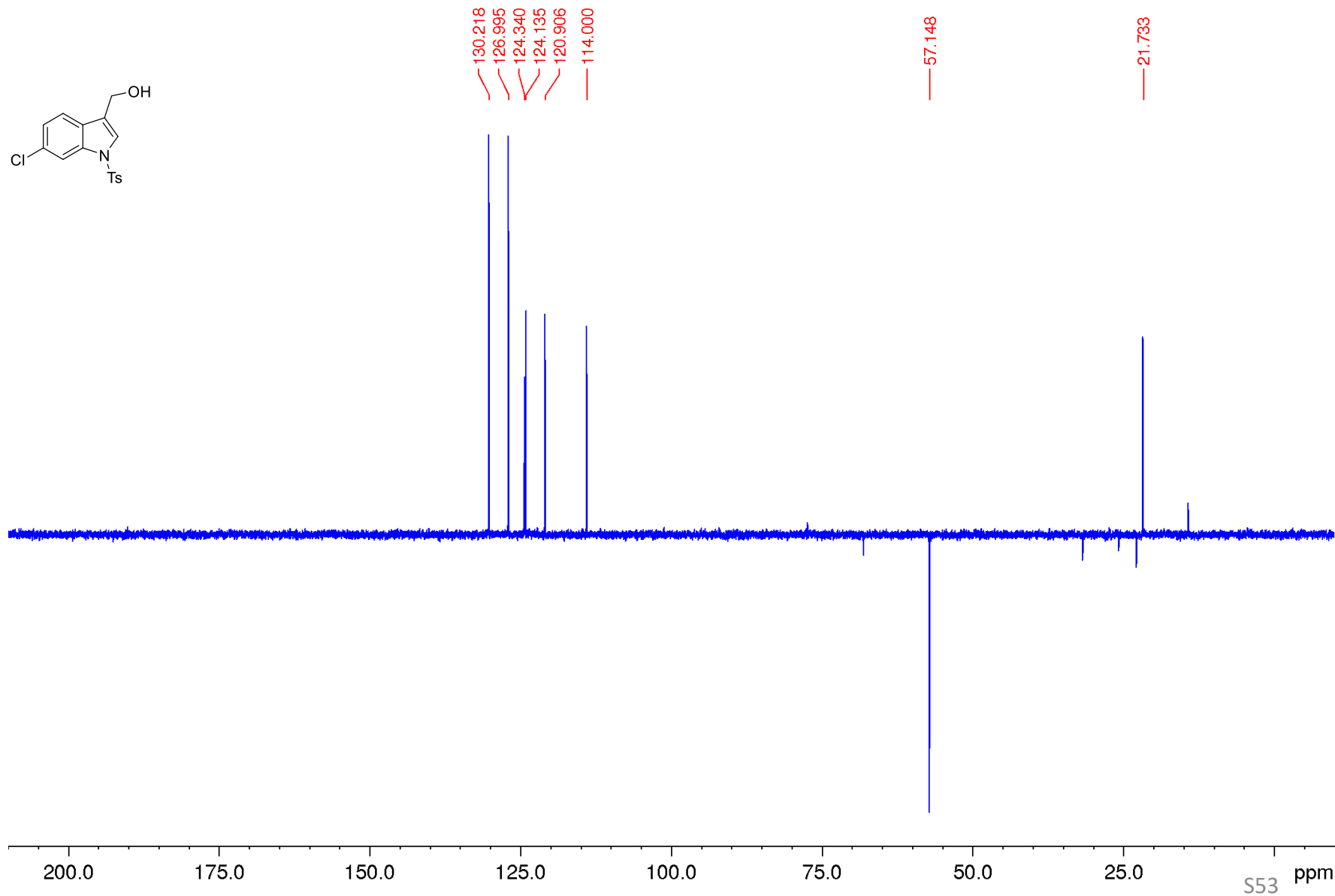
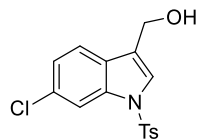
(6-chloro-1-tosyl-1H-indol-3-yl)methanol

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



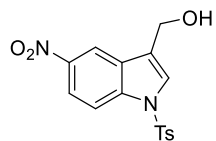
(6-chloro-1-tosyl-1H-indol-3-yl)methanol

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



(5-nitro-1-tosyl-1H-indol-3-yl)methanol

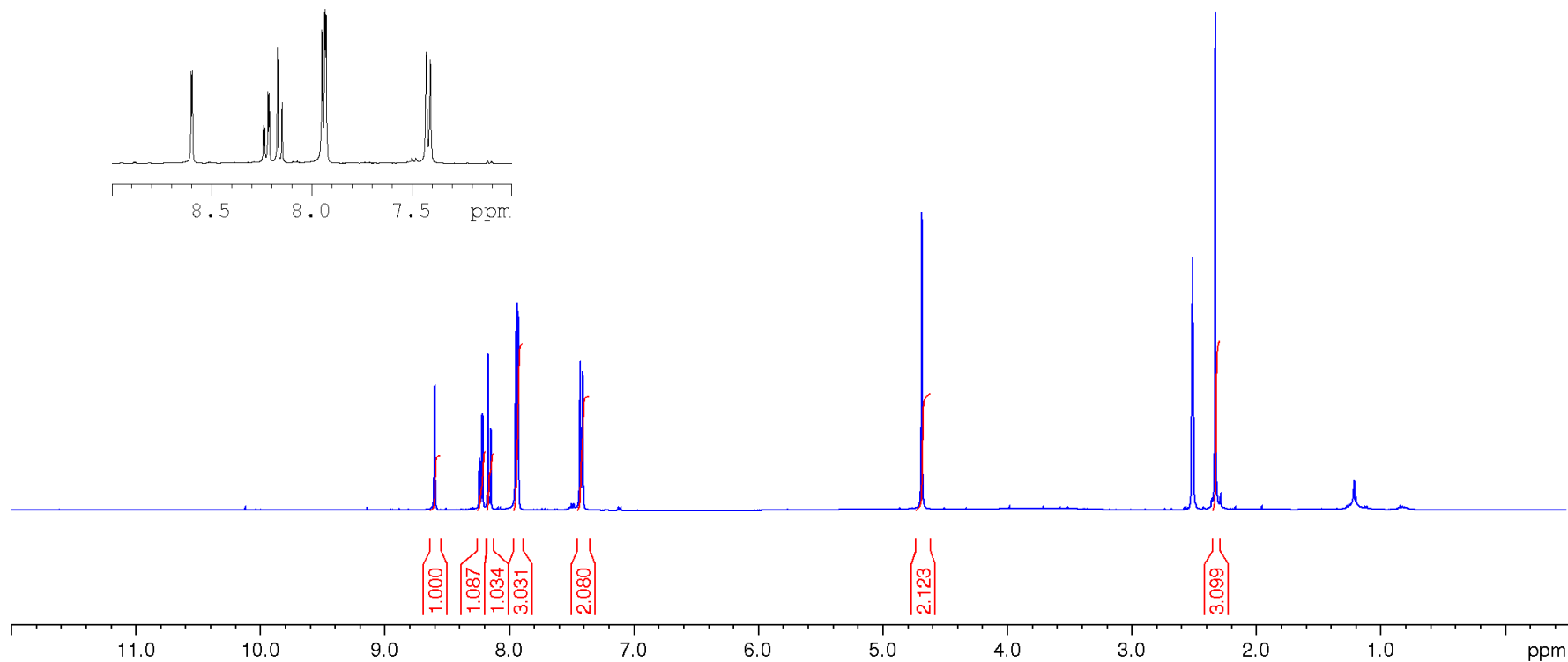
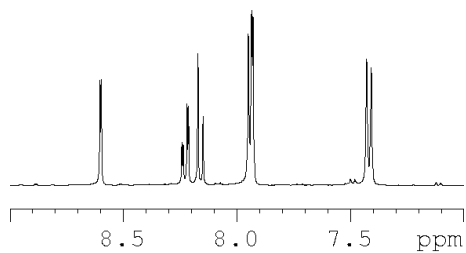
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO-}d_6$ )



8.600  
8.595  
8.239  
8.234  
8.216  
8.211  
8.169  
8.146  
7.947  
7.932  
7.926  
7.429  
7.408

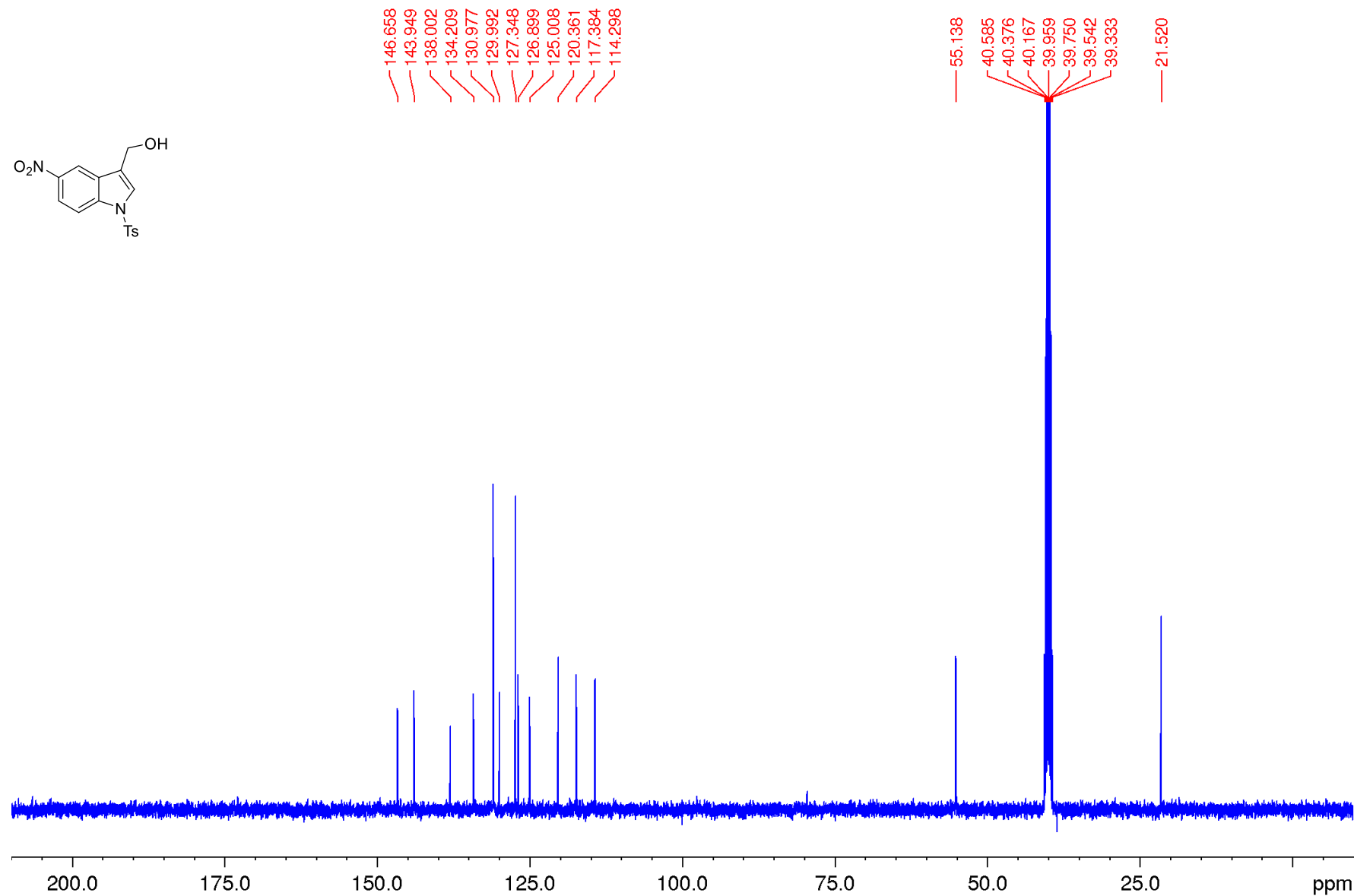
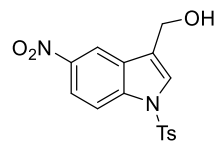
4.685  
4.683

2.517  
2.513  
2.508  
2.504  
2.500  
2.326



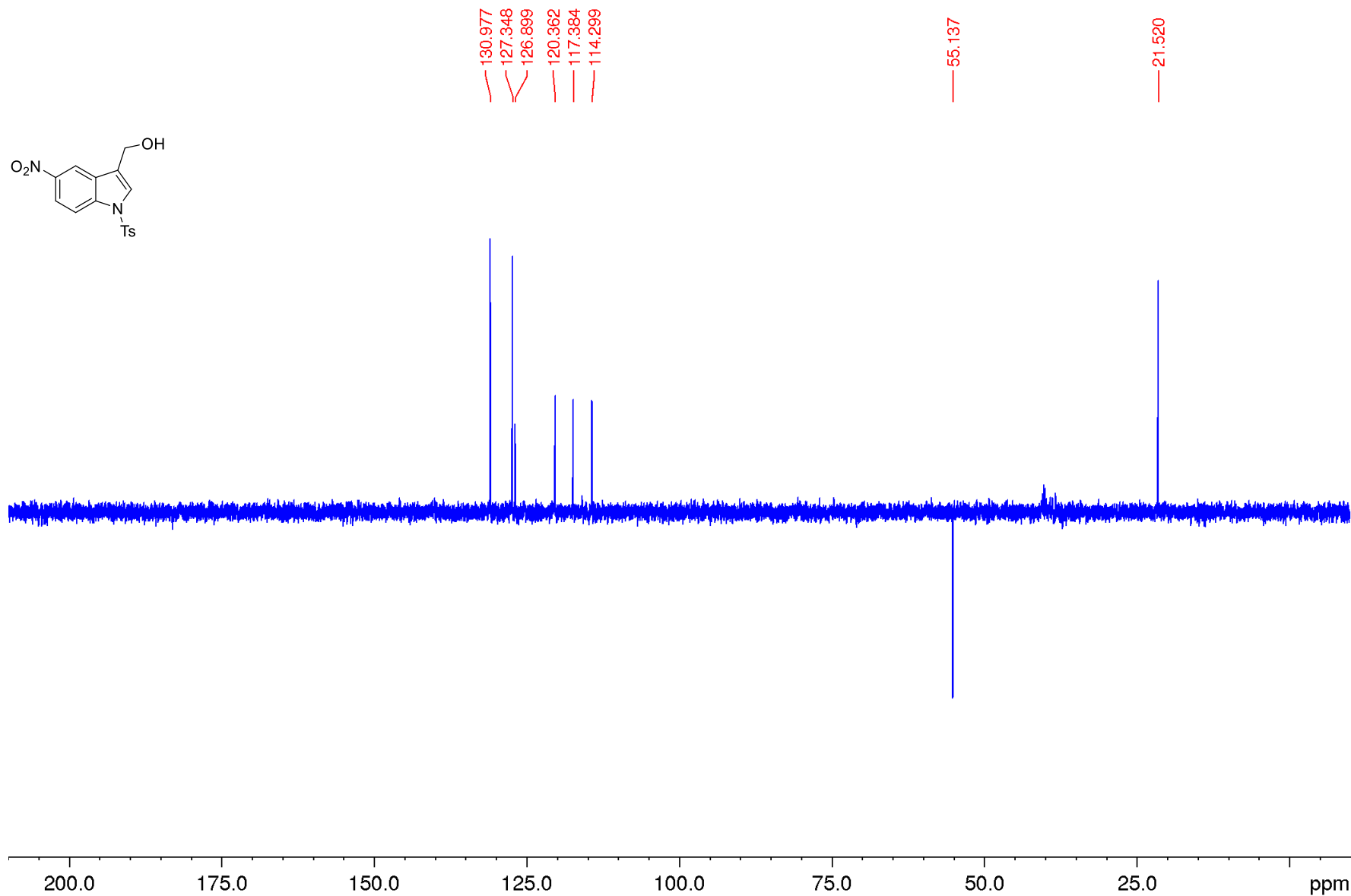
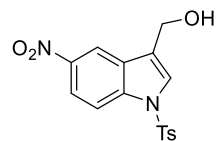
(5-nitro-1-tosyl-1H-indol-3-yl)methanol

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) (DMSO- $d_6$ )



(5-nitro-1-tosyl-1H-indol-3-yl)methanol

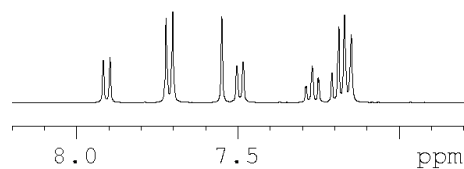
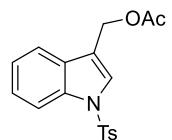
DEPT 135 NMR-spectrum (DMSO- $d_6$ )





(1-tosyl-1H-indol-3-yl)methyl acetate **3a**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )

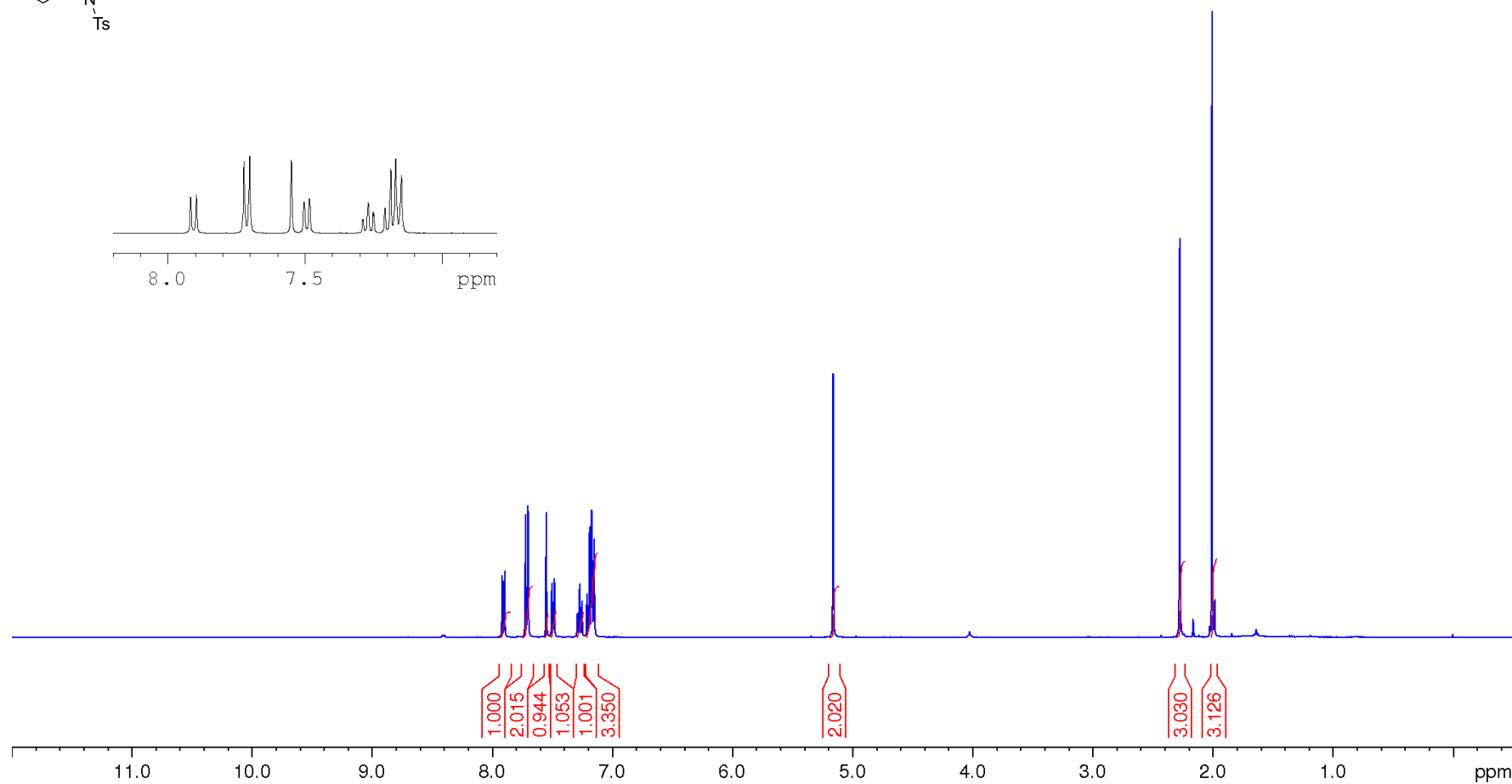


7.915  
7.894  
7.721  
7.700  
7.548  
7.501  
7.482  
7.291  
7.288  
7.270  
7.252  
7.249  
7.210  
7.208  
7.187  
7.170  
7.149

5.159

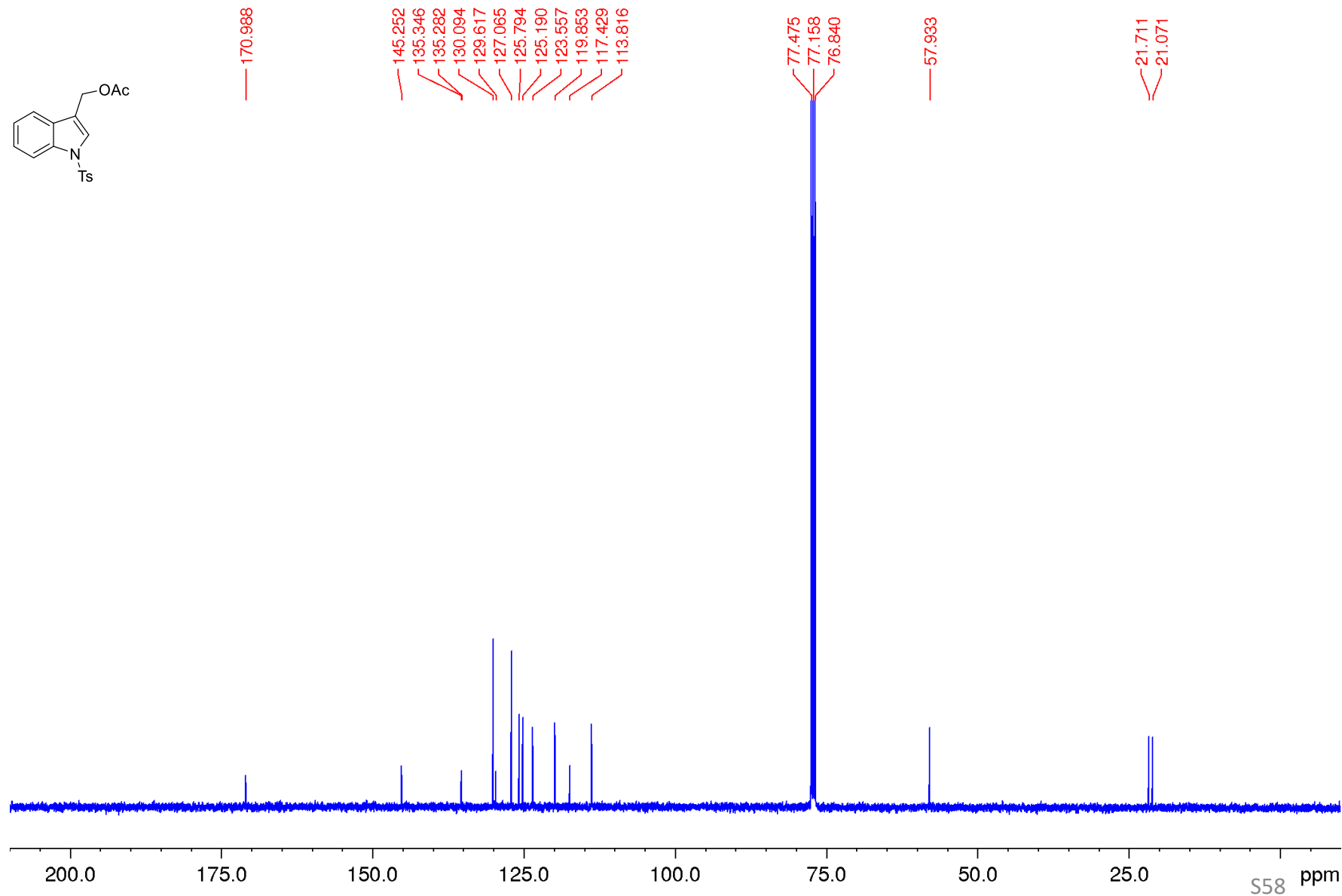
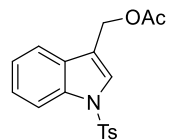
2.273

2.005



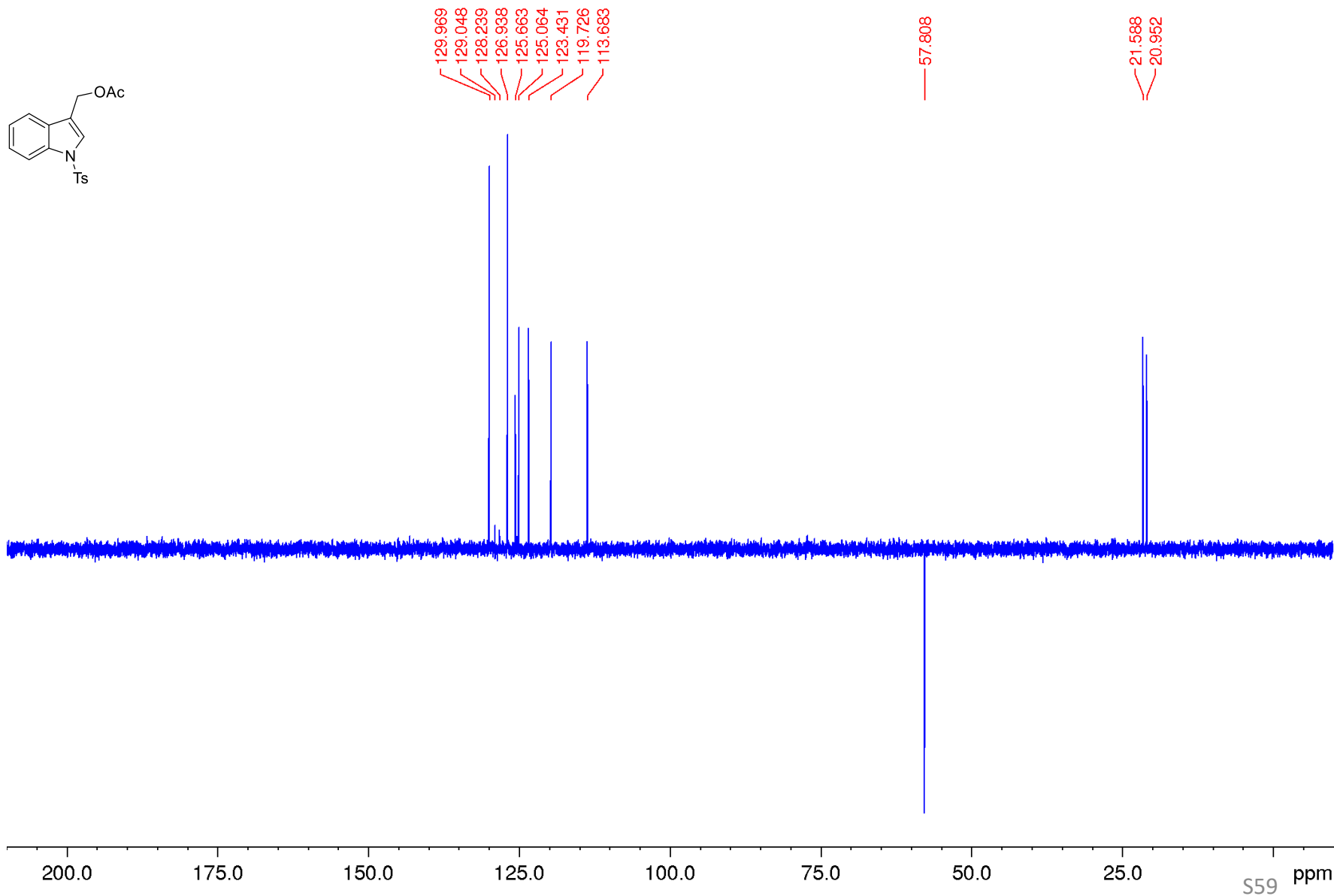
(1-tosyl-1H-indol-3-yl)methyl acetate **3a**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



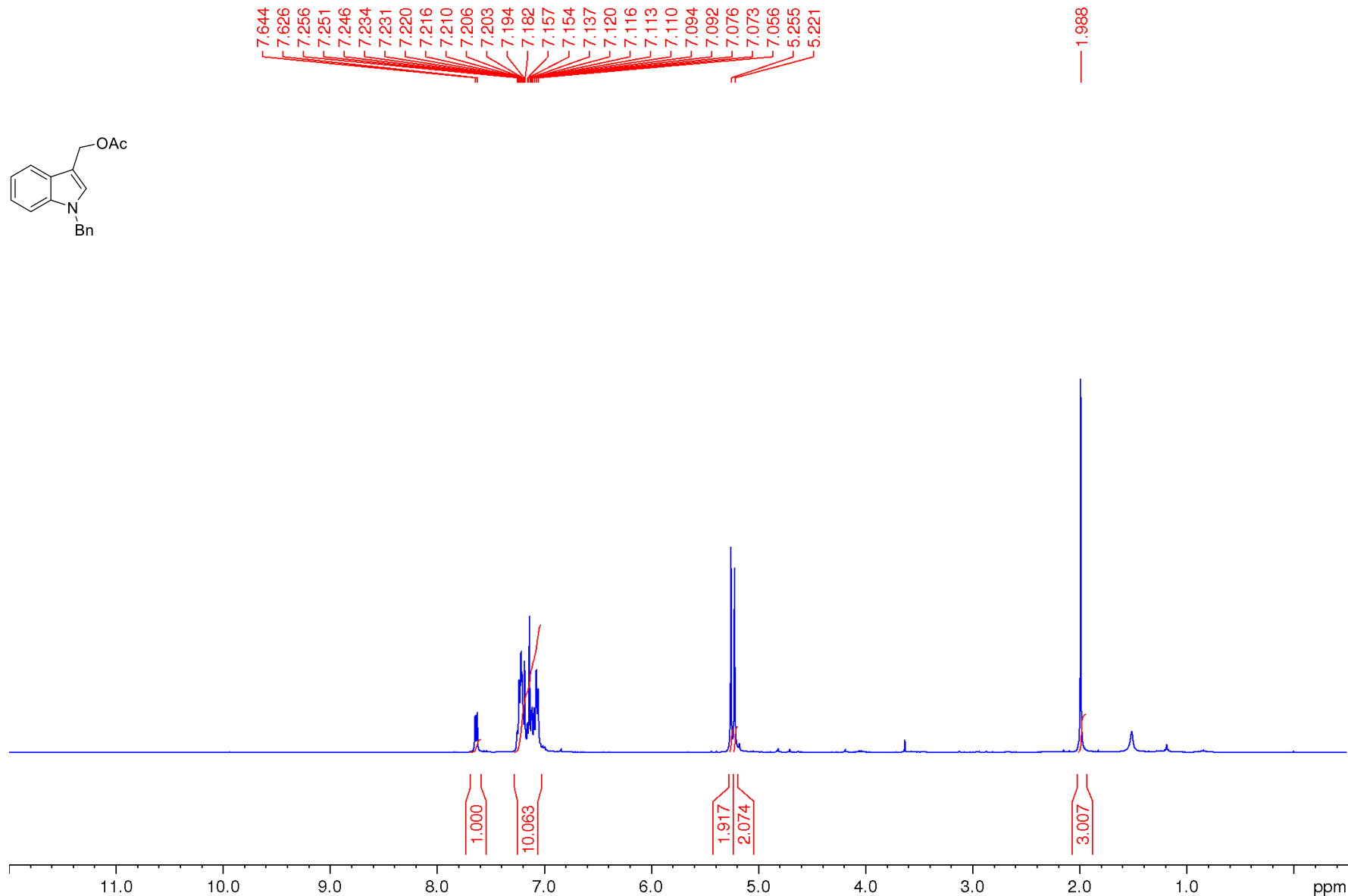
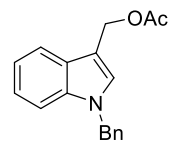
(1-tosyl-1H-indol-3-yl)methyl acetate **3a**

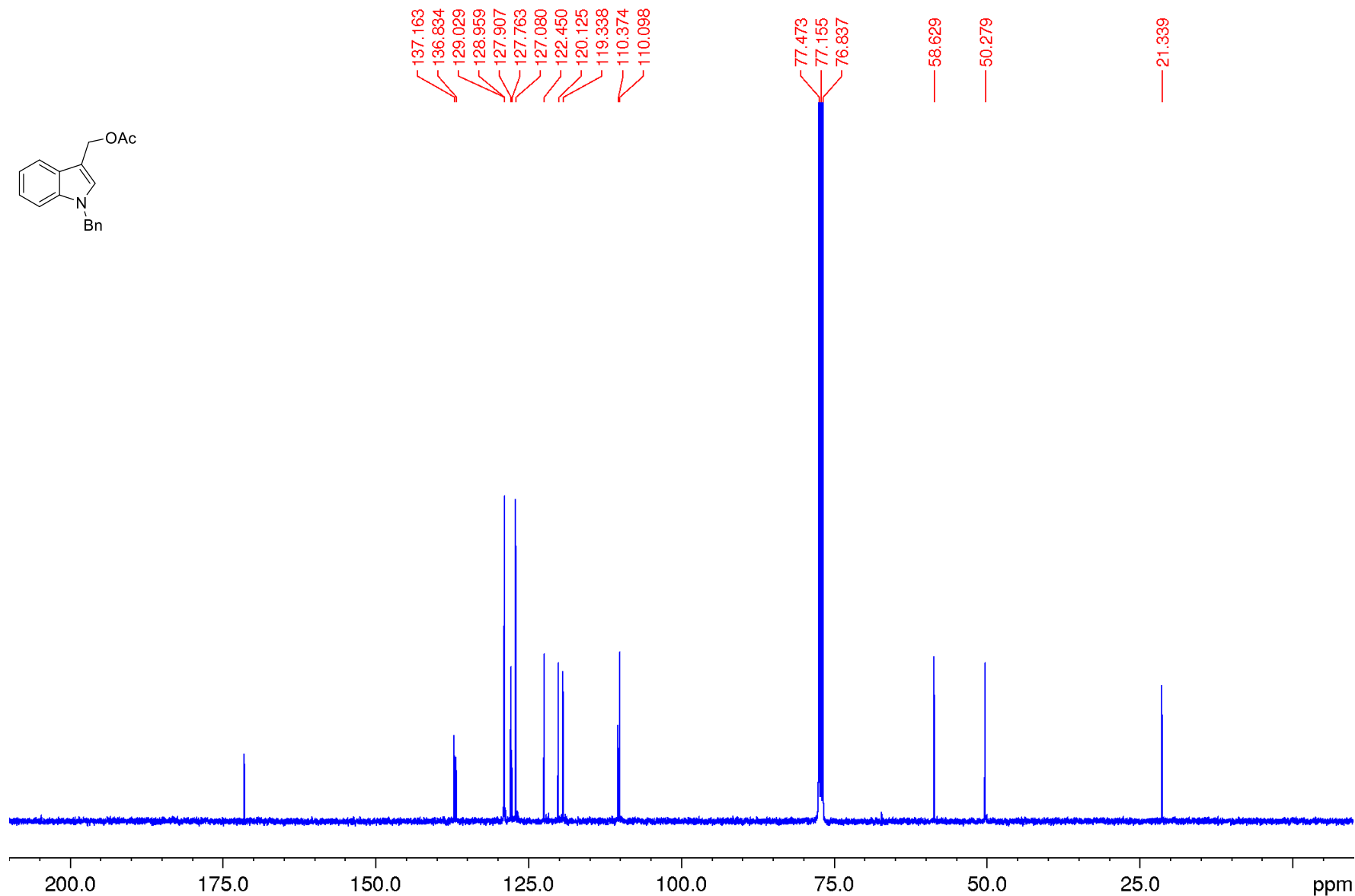
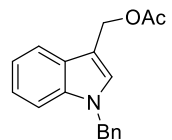
DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)

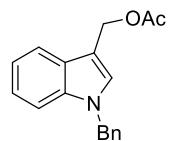


(1-benzyl-1H-indol-3-yl)methyl acetate **3b**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )





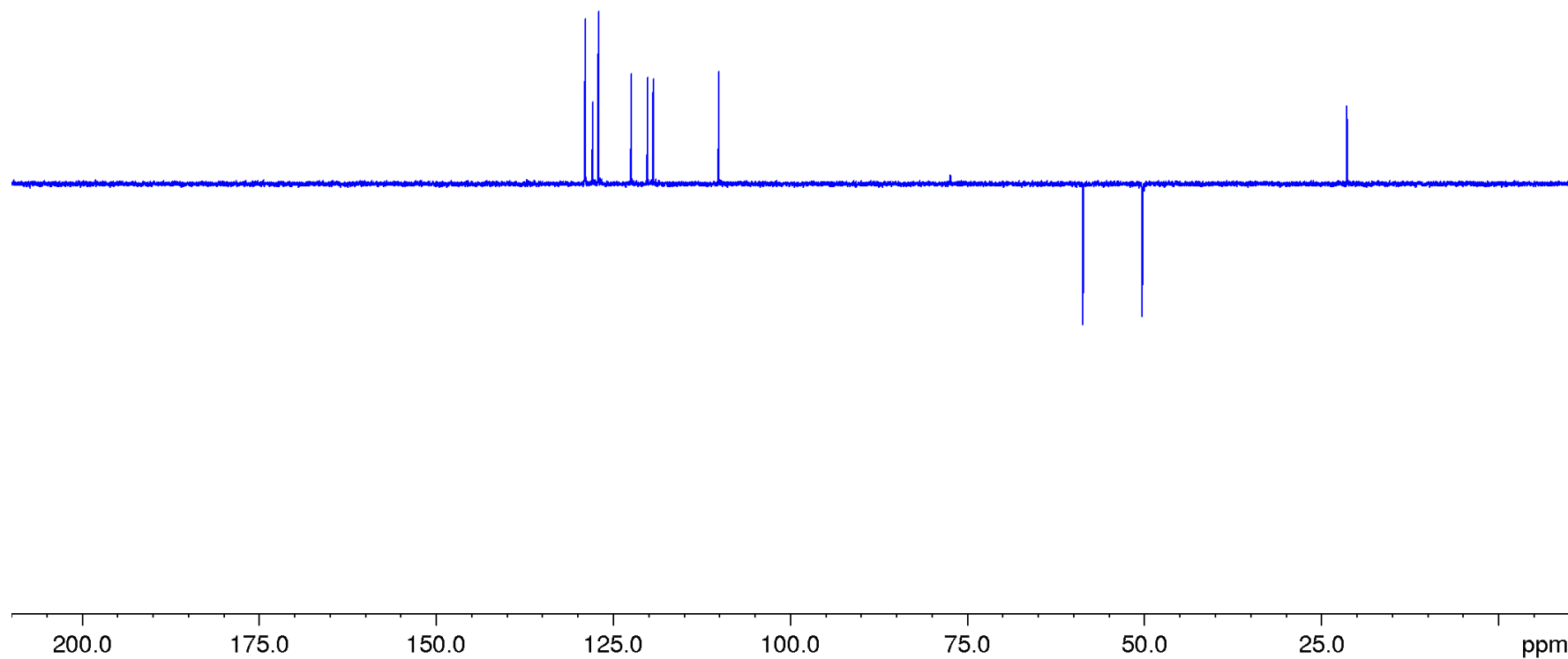


129.016  
128.946  
127.893  
127.067  
122.437  
120.112  
119.325  
110.085

58.616

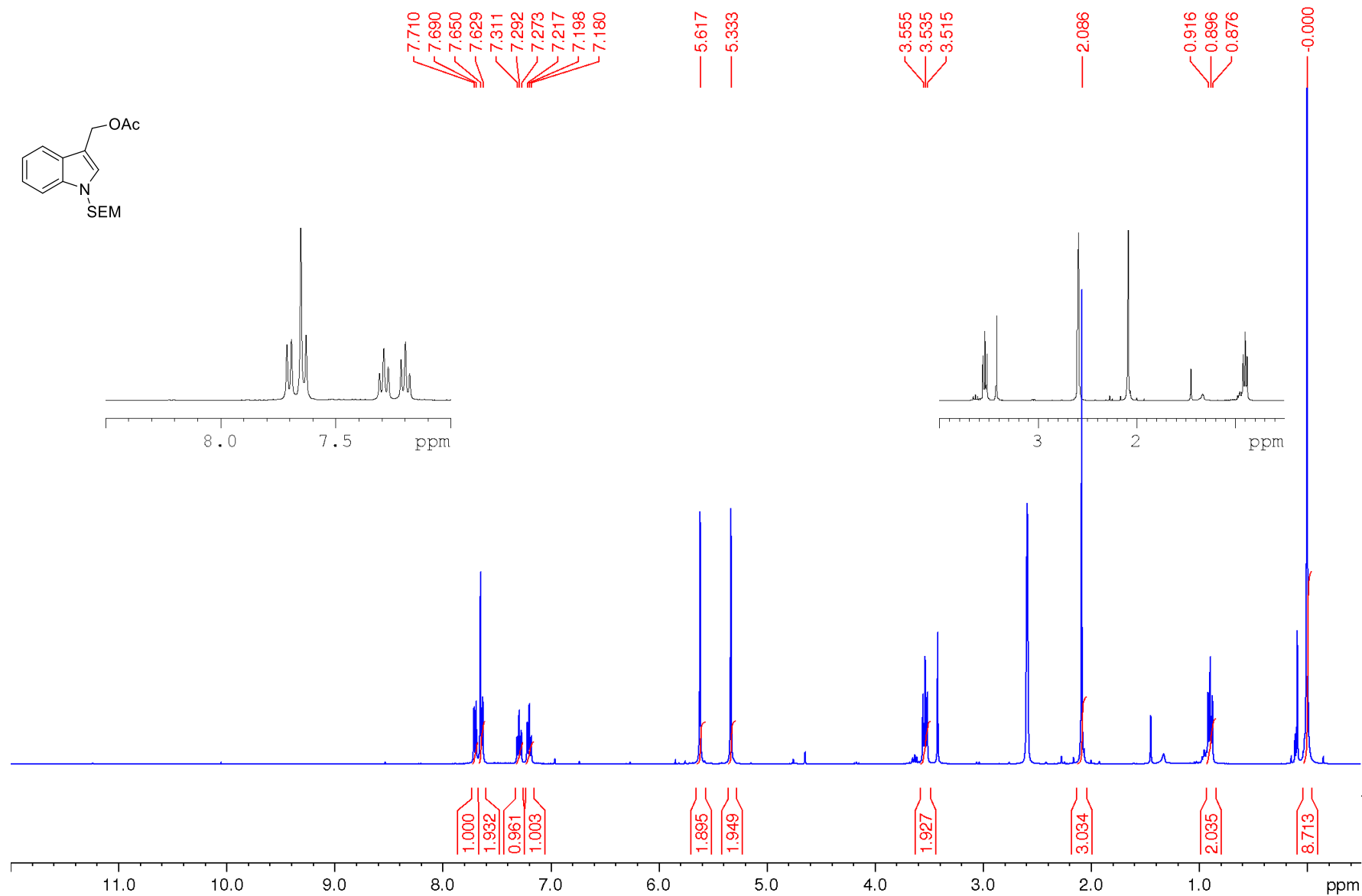
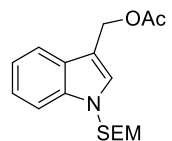
50.266

21.327

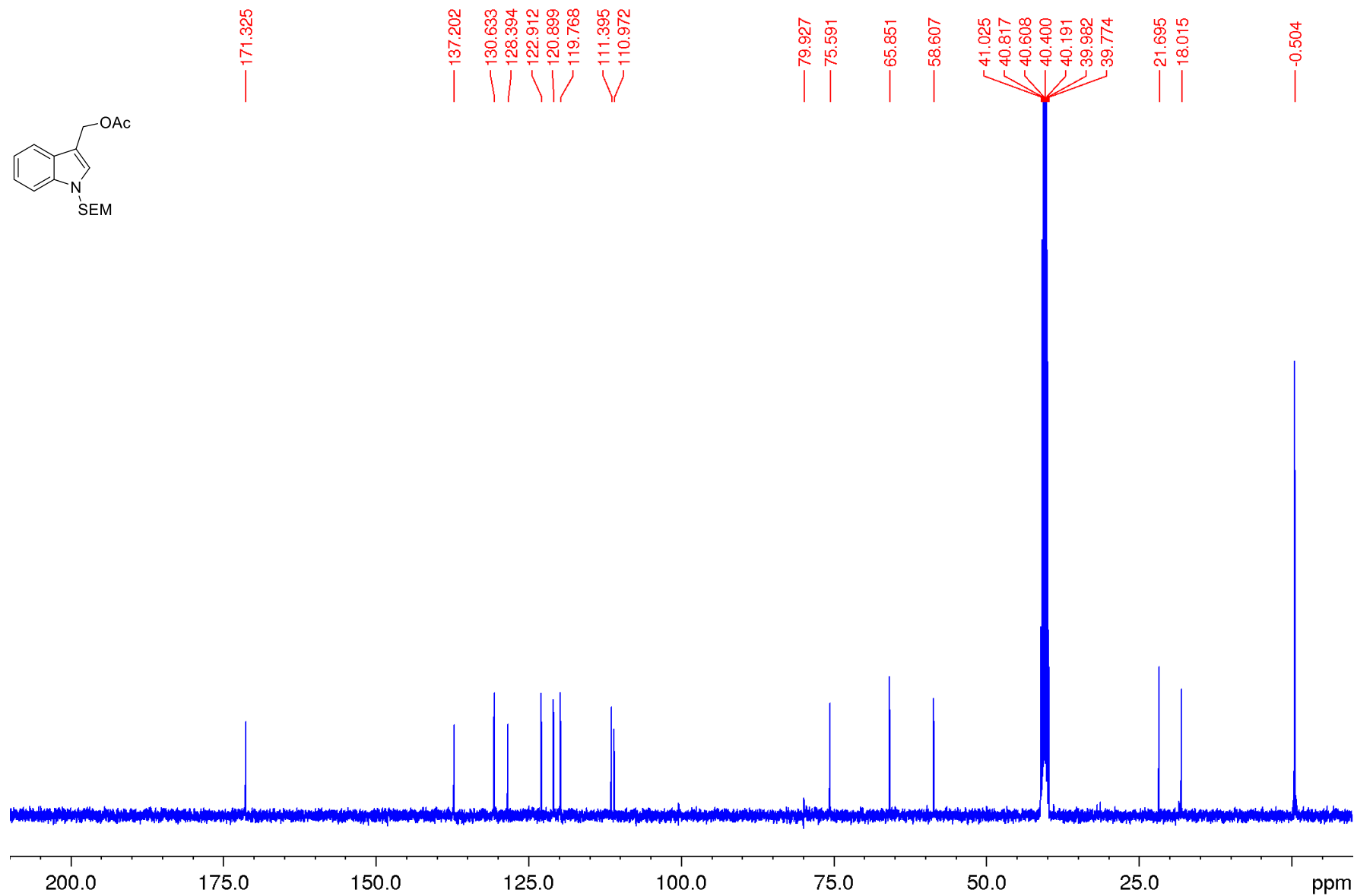
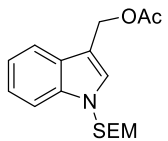


(1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl  
acetate **3c**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



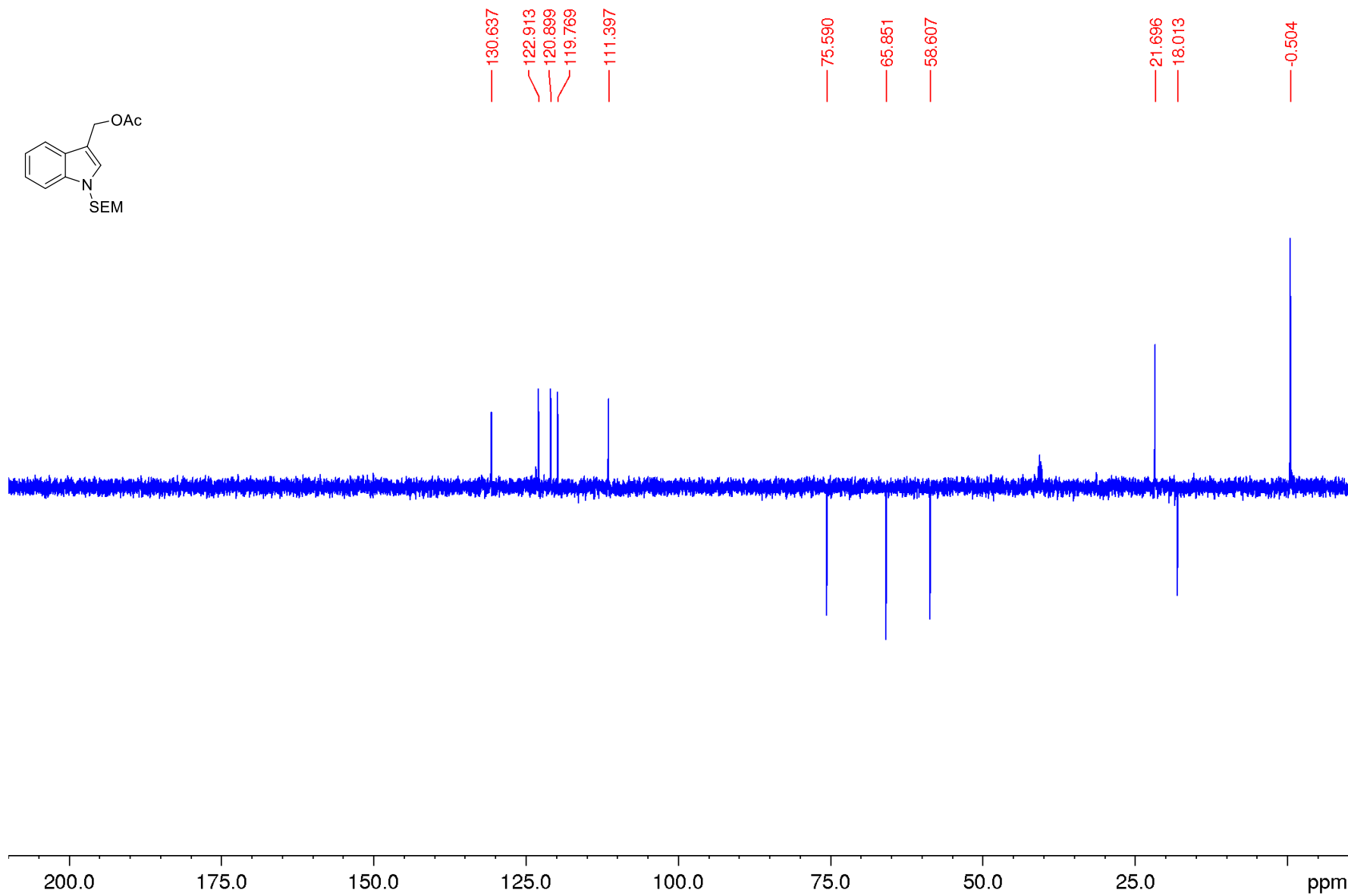
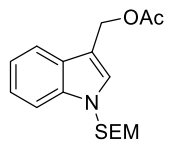
(1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl acetate **3c**

 $^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{DMSO-}d_6$ )



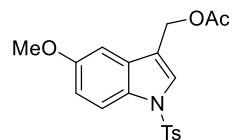
(1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl  
acetate **3c**

DEPT 135 NMR-spectrum (DMSO- $d_6$ )



(5-methoxy-1-tosyl-1H-indol-3-yl)methyl acetate **3d**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO}-d_6$ )



7.842  
7.837  
7.821  
7.814  
7.390  
7.370  
7.135  
7.129  
6.997  
6.991  
6.974  
6.968

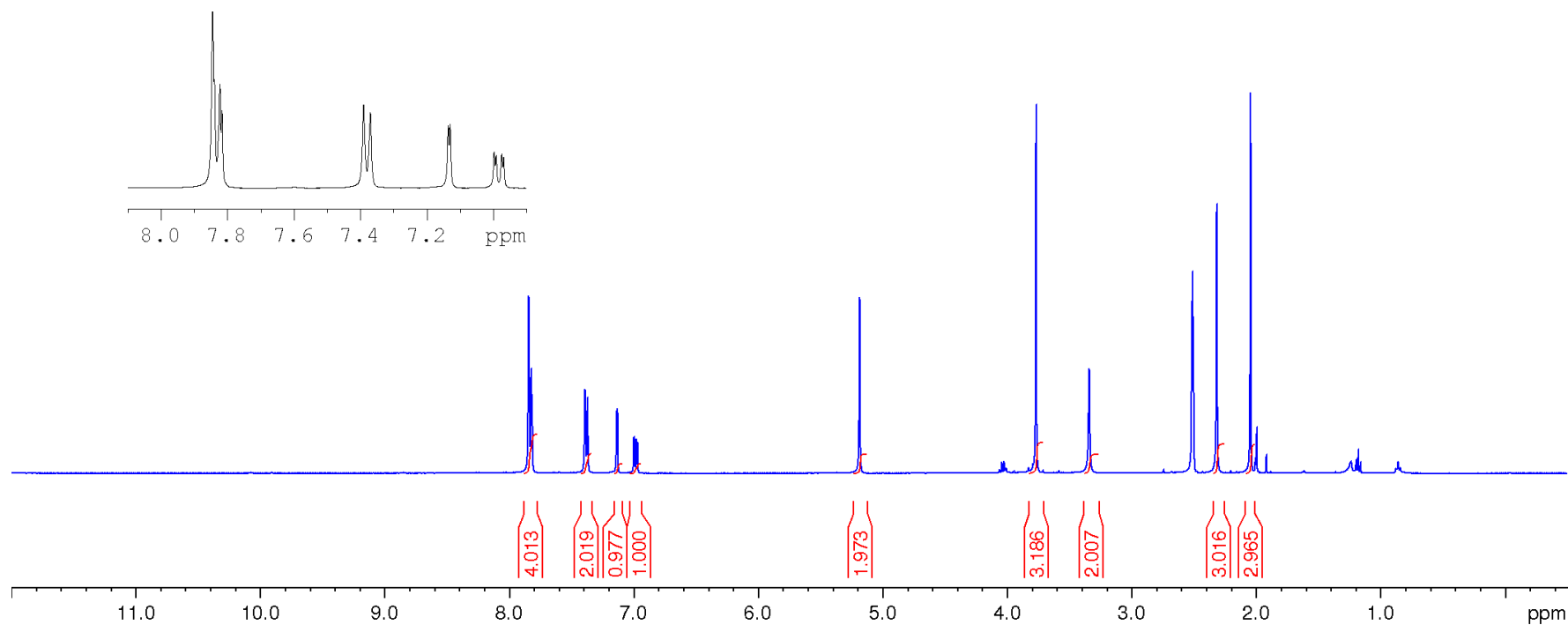
5.183

3.766

3.339

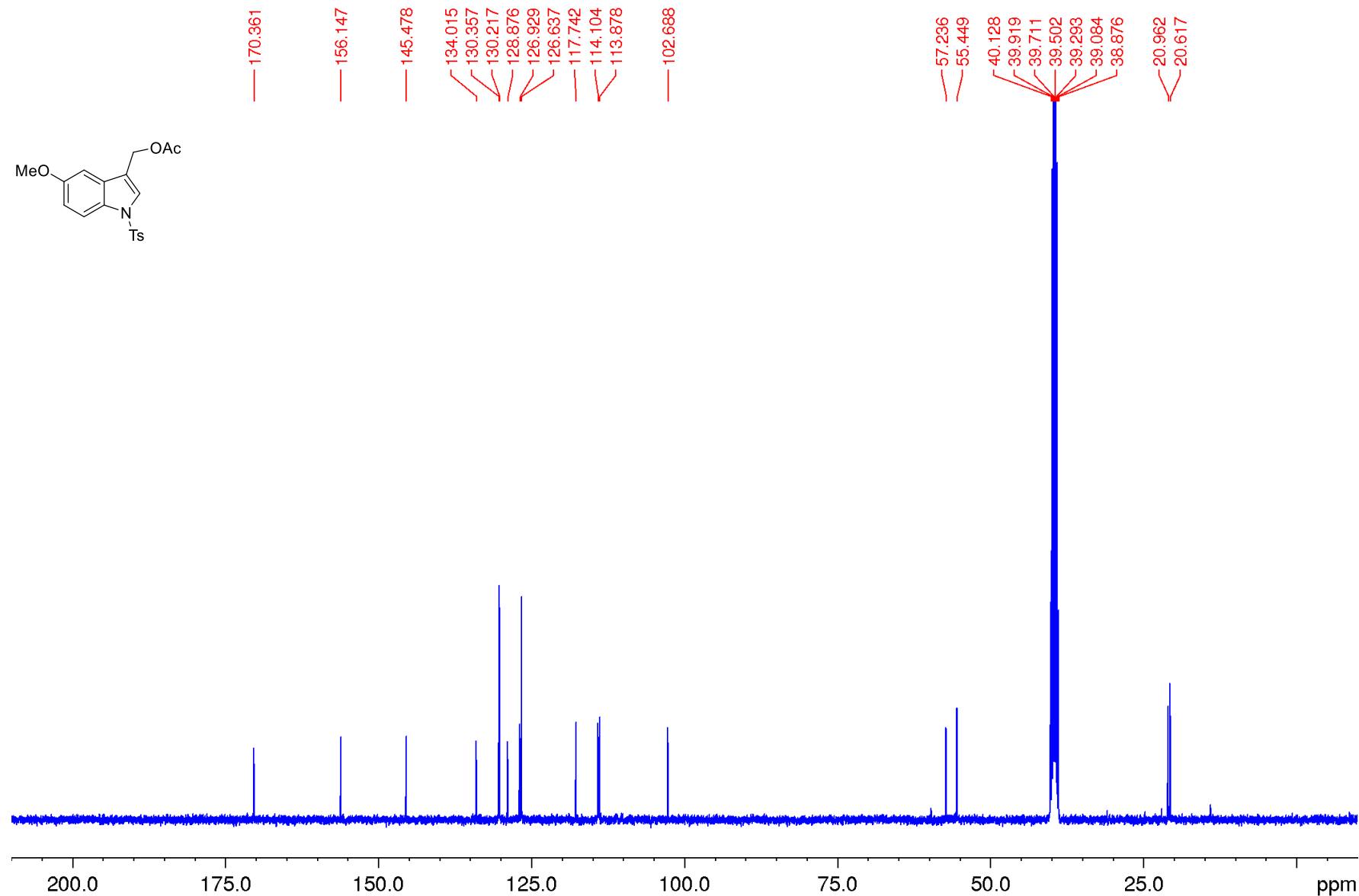
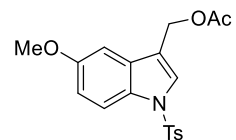
2.314

2.043



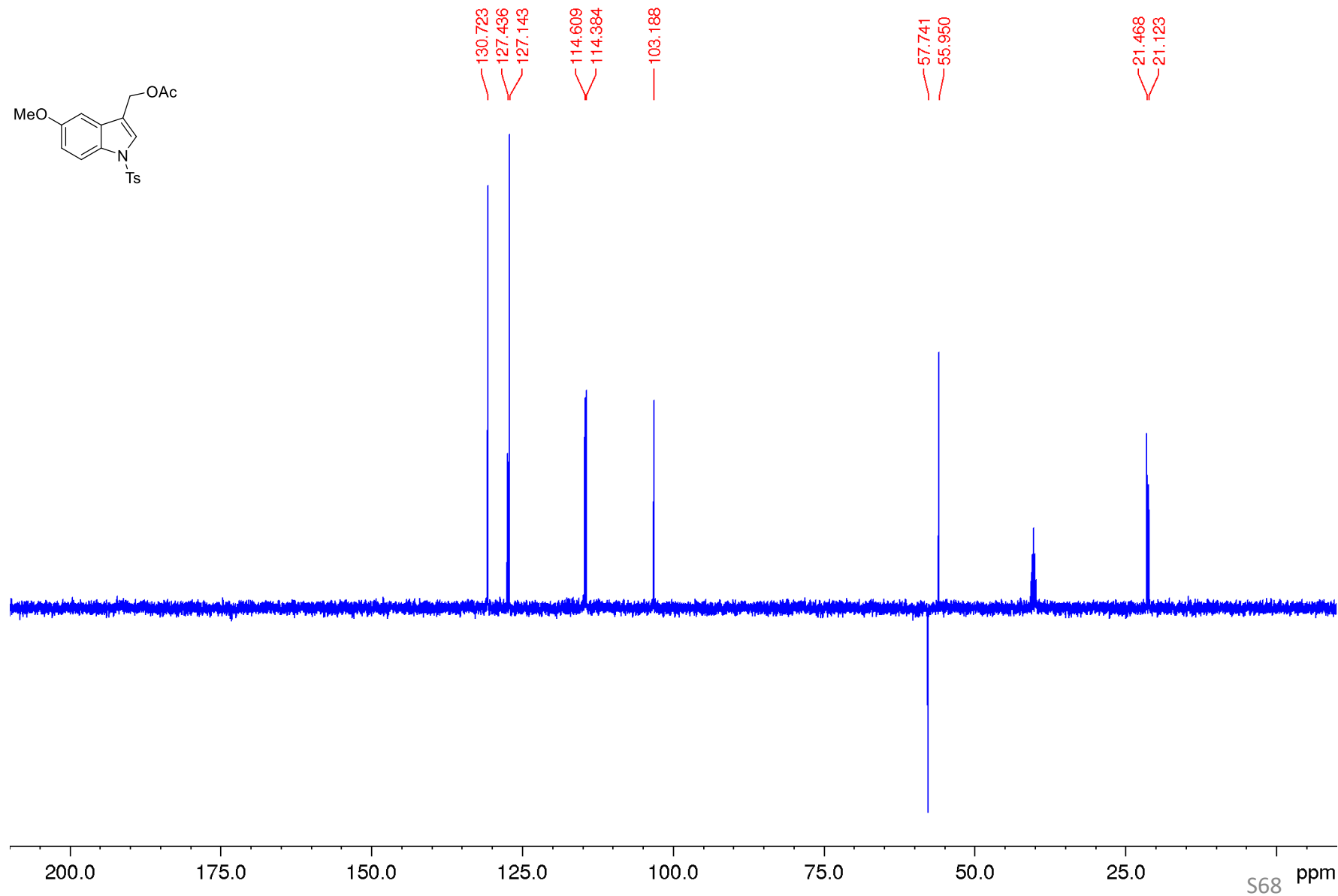
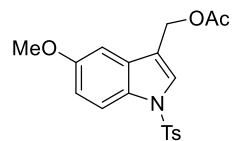
(5-methoxy-1-tosyl-1H-indol-3-yl)methyl acetate **3d**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{DMSO}-d_6$ )



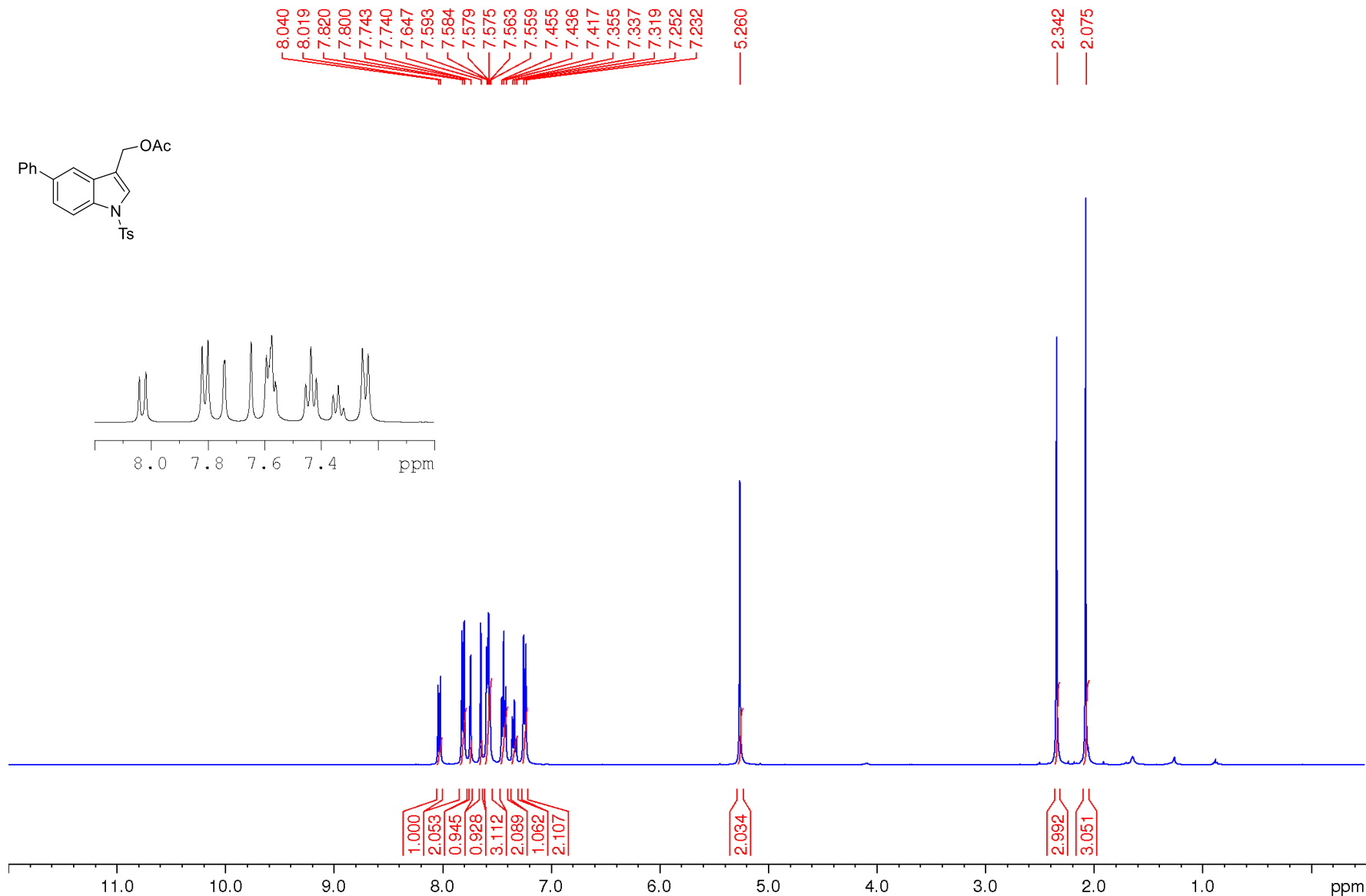
(5-methoxy-1-tosyl-1H-indol-3-yl)methyl acetate **3d**

DEPT 135 NMR-spectrum (DMSO- $d_6$ )



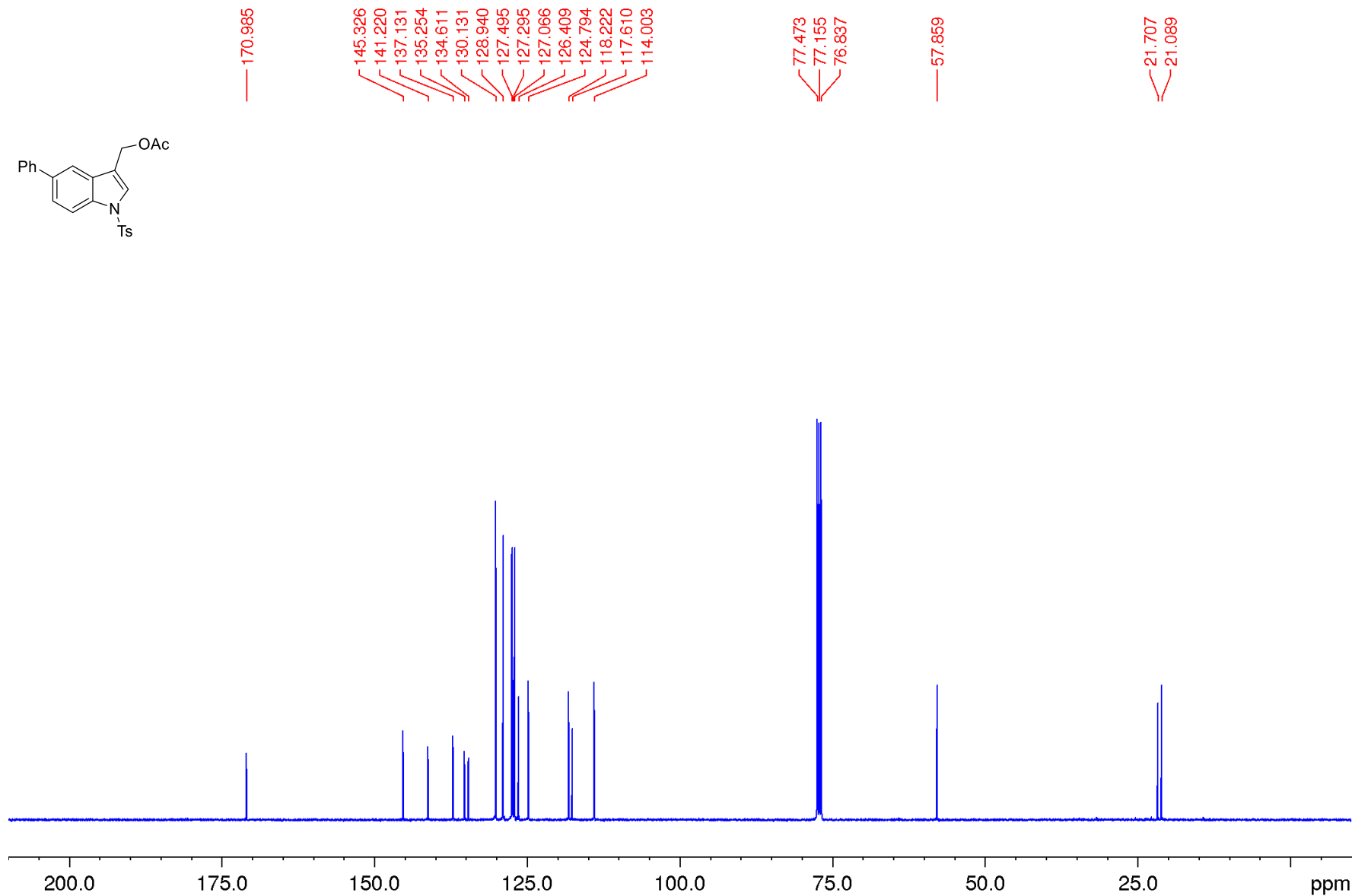
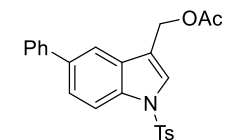
(5-phenyl-1-tosyl-1H-indol-3-yl)methyl acetate **3e**

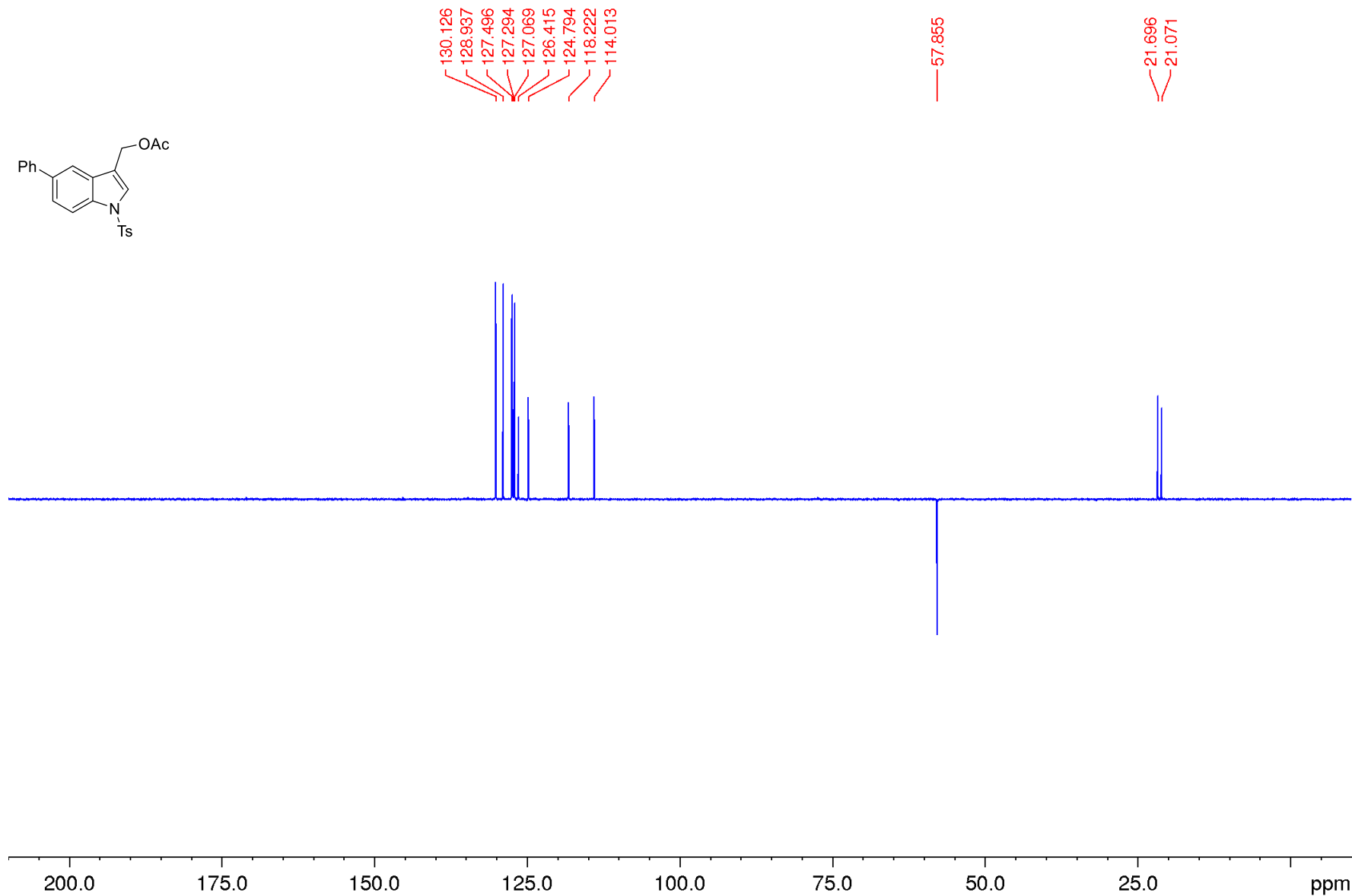
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



(5-phenyl-1-tosyl-1H-indol-3-yl)methyl acetate **3e**

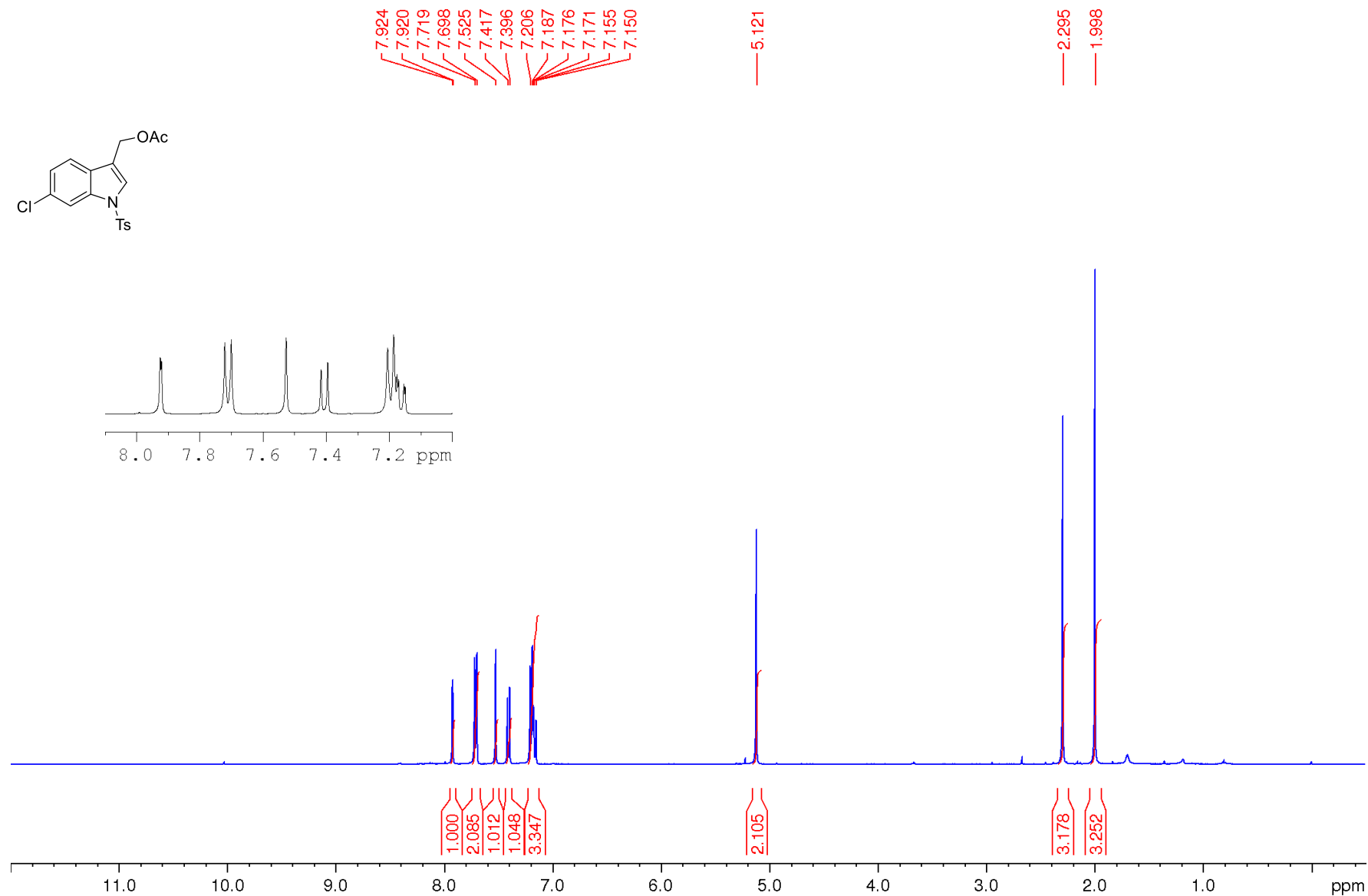
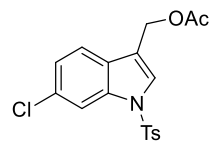
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )





(6-chloro-1-tosyl-1H-indol-3-yl)methyl acetate **3f**

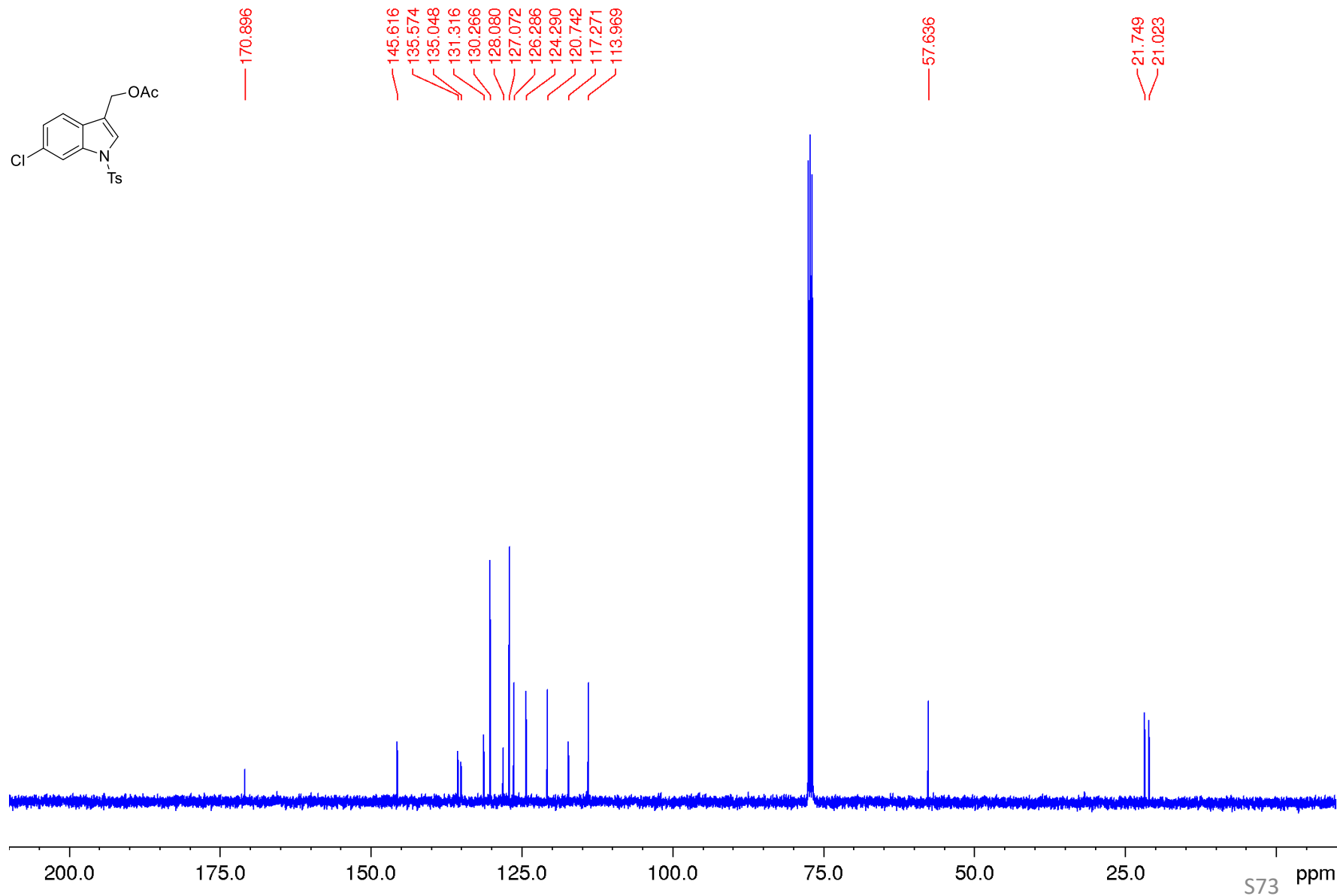
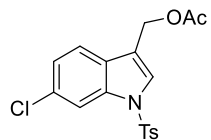
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )

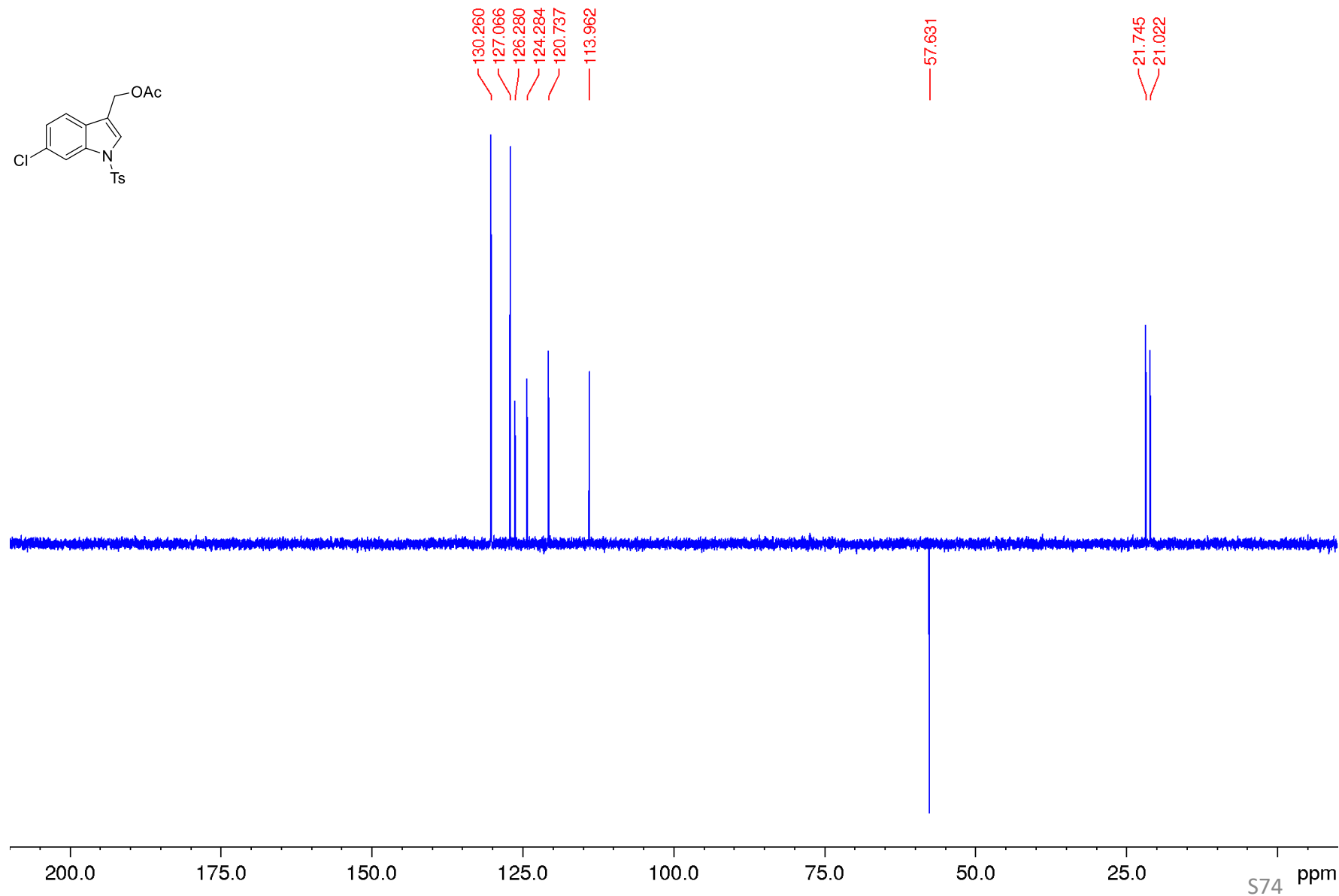
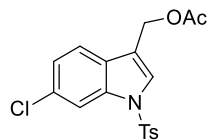




(6-chloro-1-tosyl-1H-indol-3-yl)methyl acetate **3f**

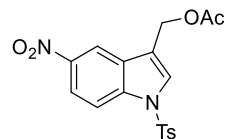
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )





(5-nitro-1-tosyl-1H-indol-3-yl)methyl acetate **3g**

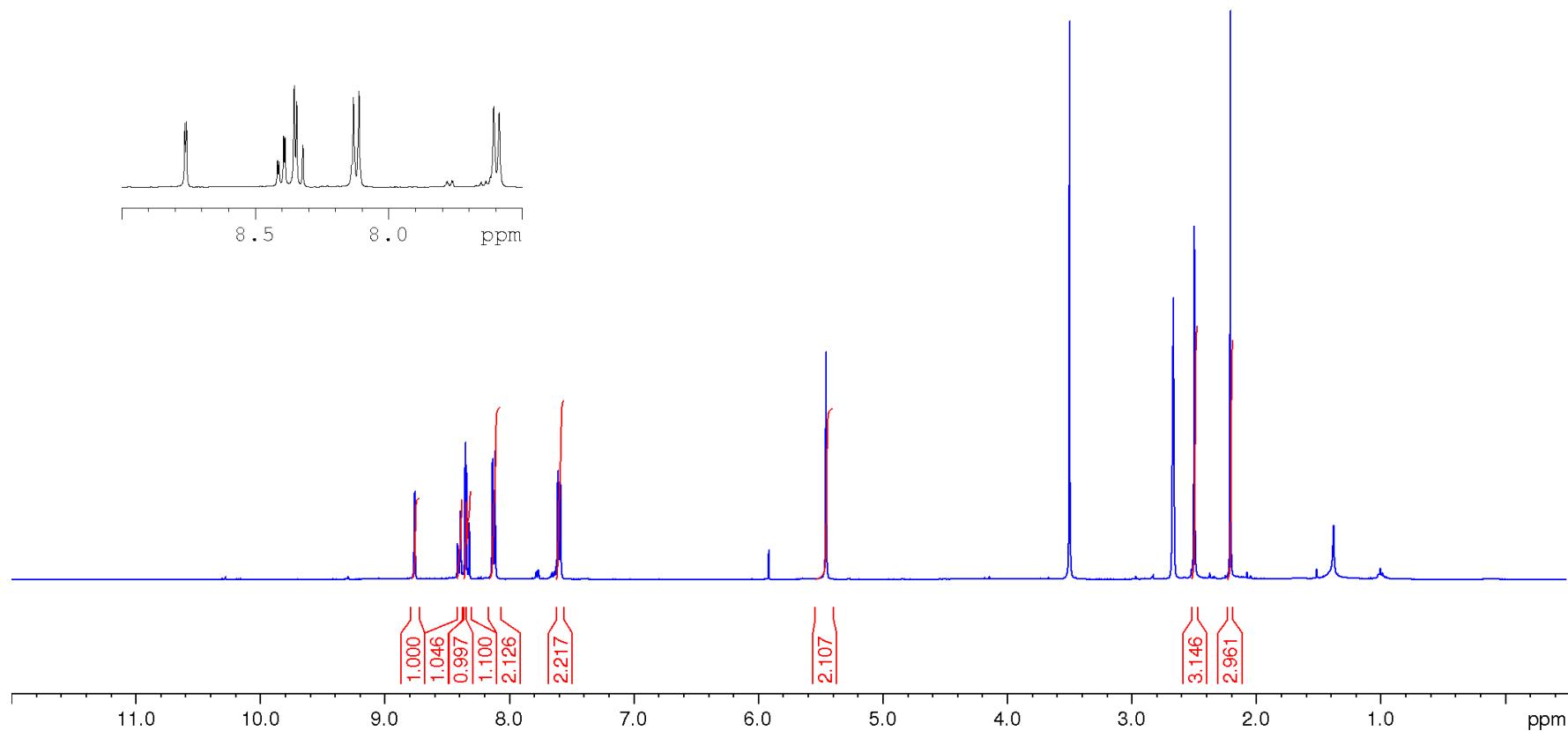
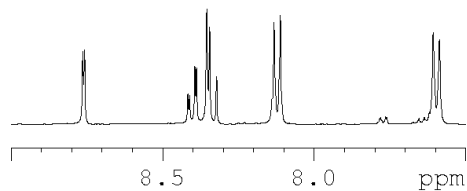
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO}-d_6$ )

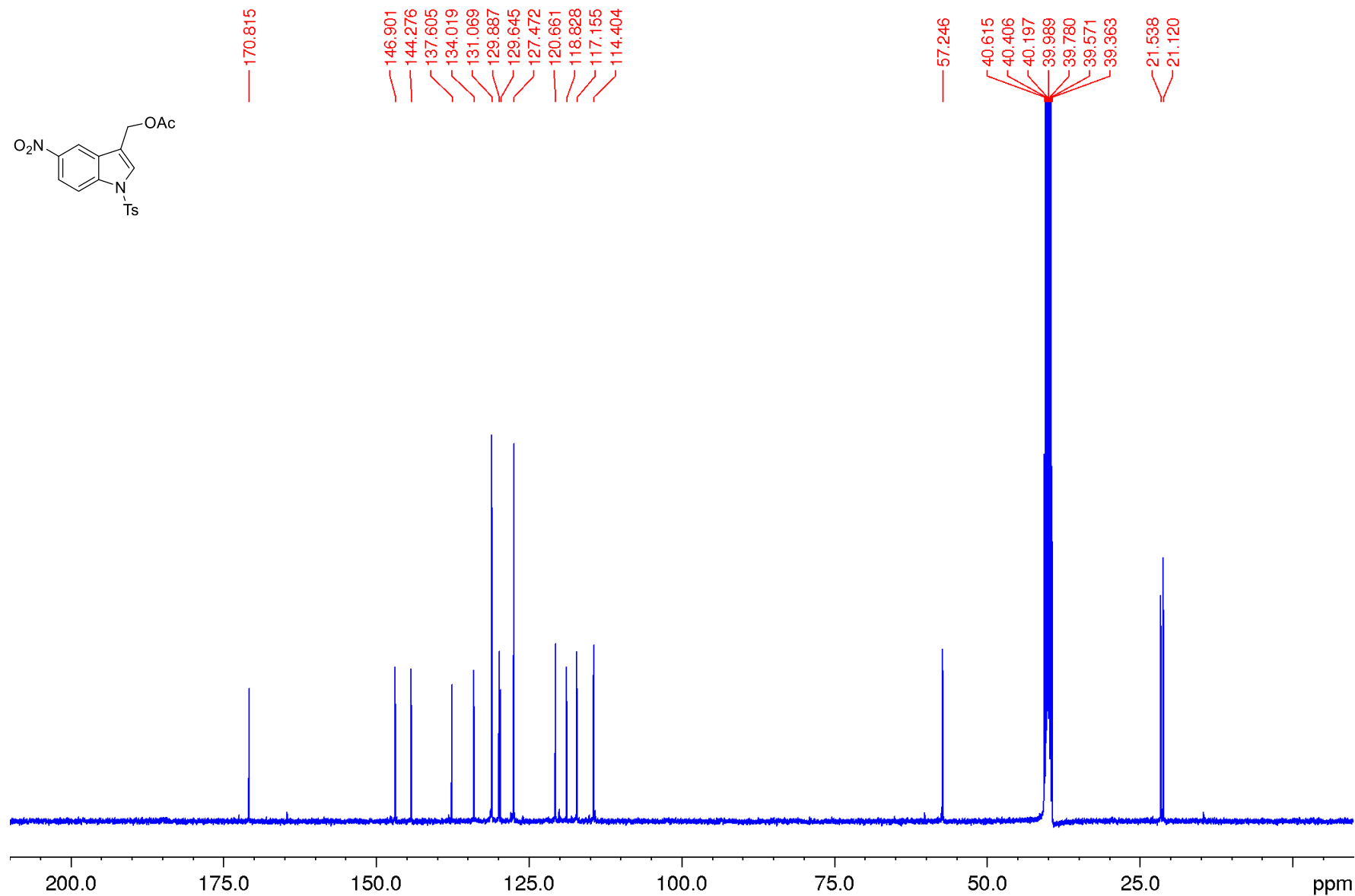
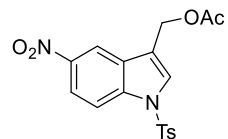


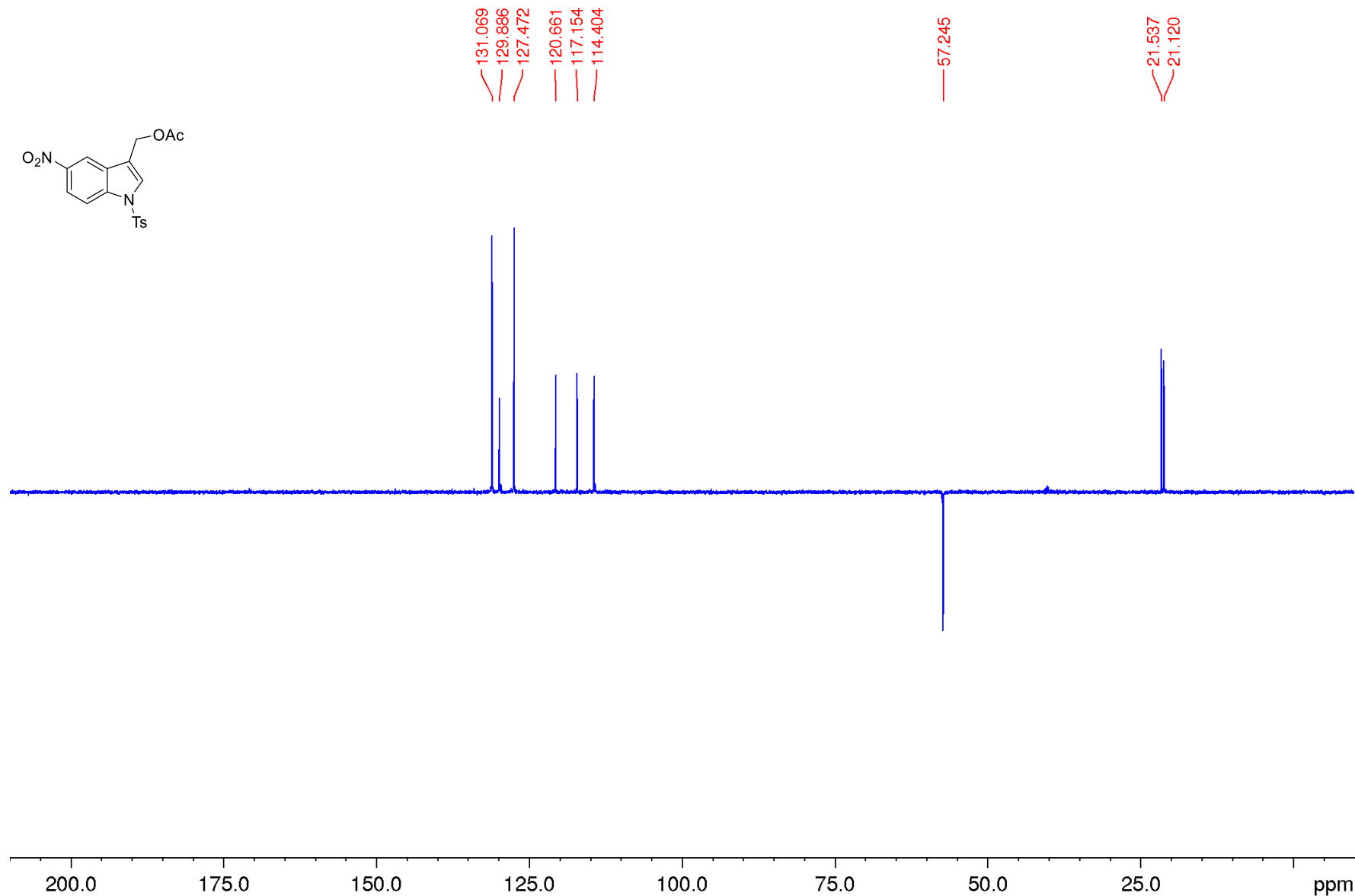
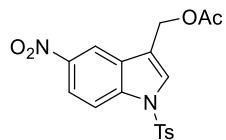
8.761  
8.755  
8.414  
8.409  
8.391  
8.386  
8.352  
8.343  
8.320  
8.133  
8.112  
7.608  
7.588

5.453

3.497  
2.673  
2.669  
2.664  
2.660  
2.656  
2.495  
2.205

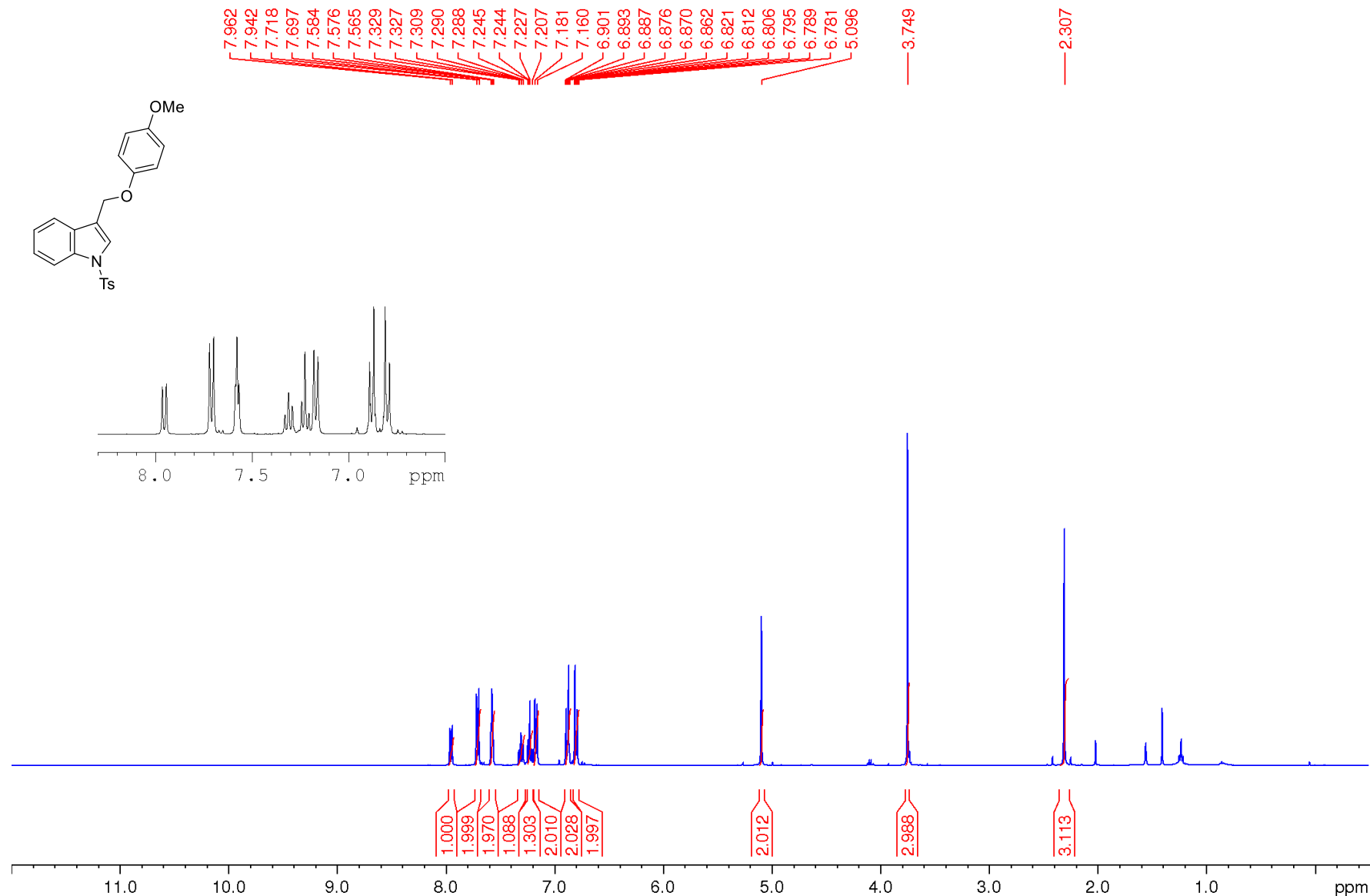






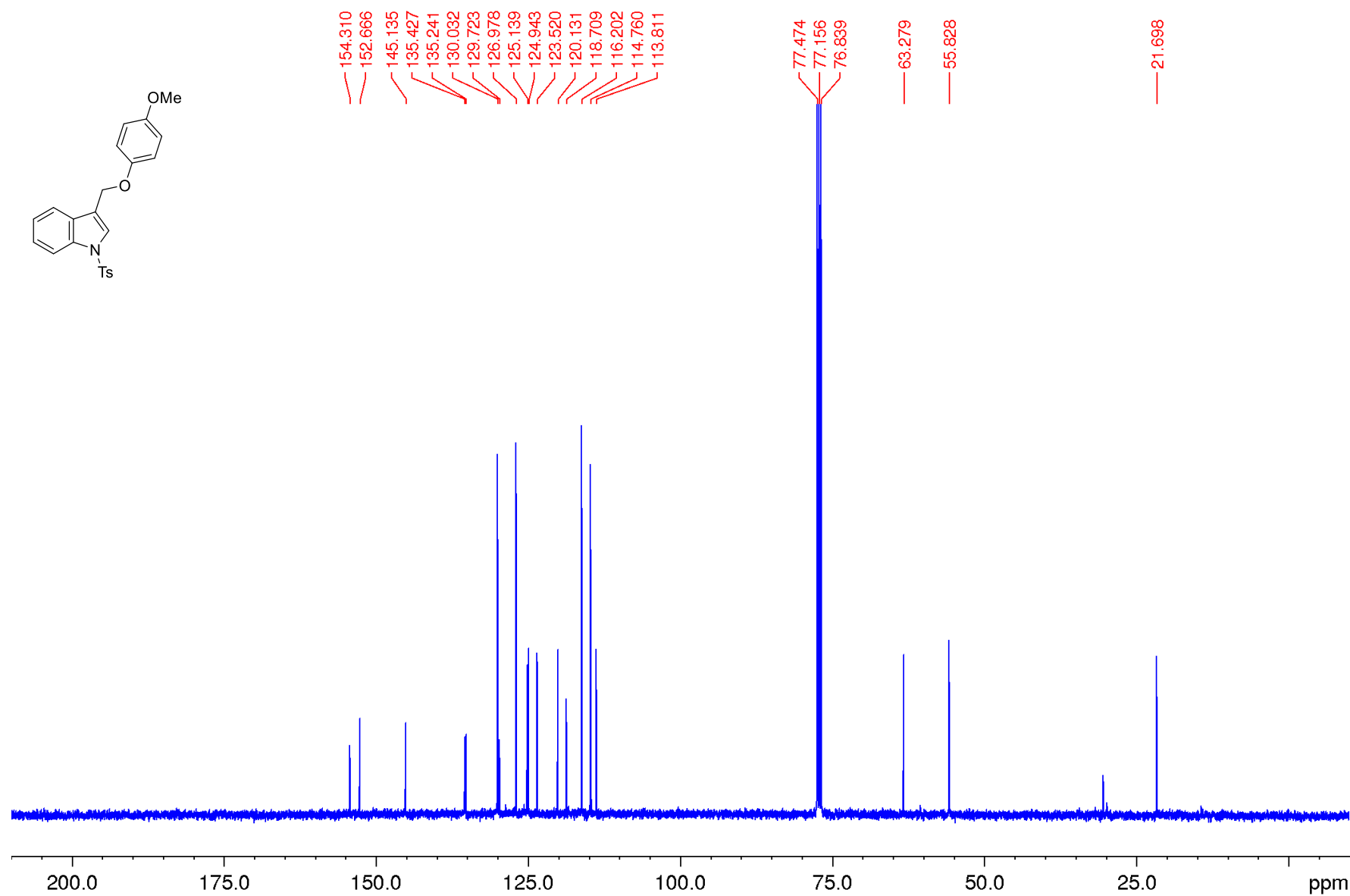
3-((4-methoxyphenoxy)methyl)-1-tosyl-1H-indole **4aa**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



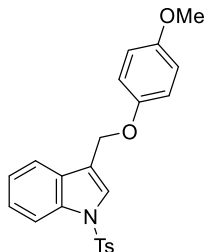
3-((4-methoxyphenoxy)methyl)-1-tosyl-1H-indole **4aa**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



3-((4-methoxyphenoxy)methyl)-1-tosyl-1H-indole **4aa**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)

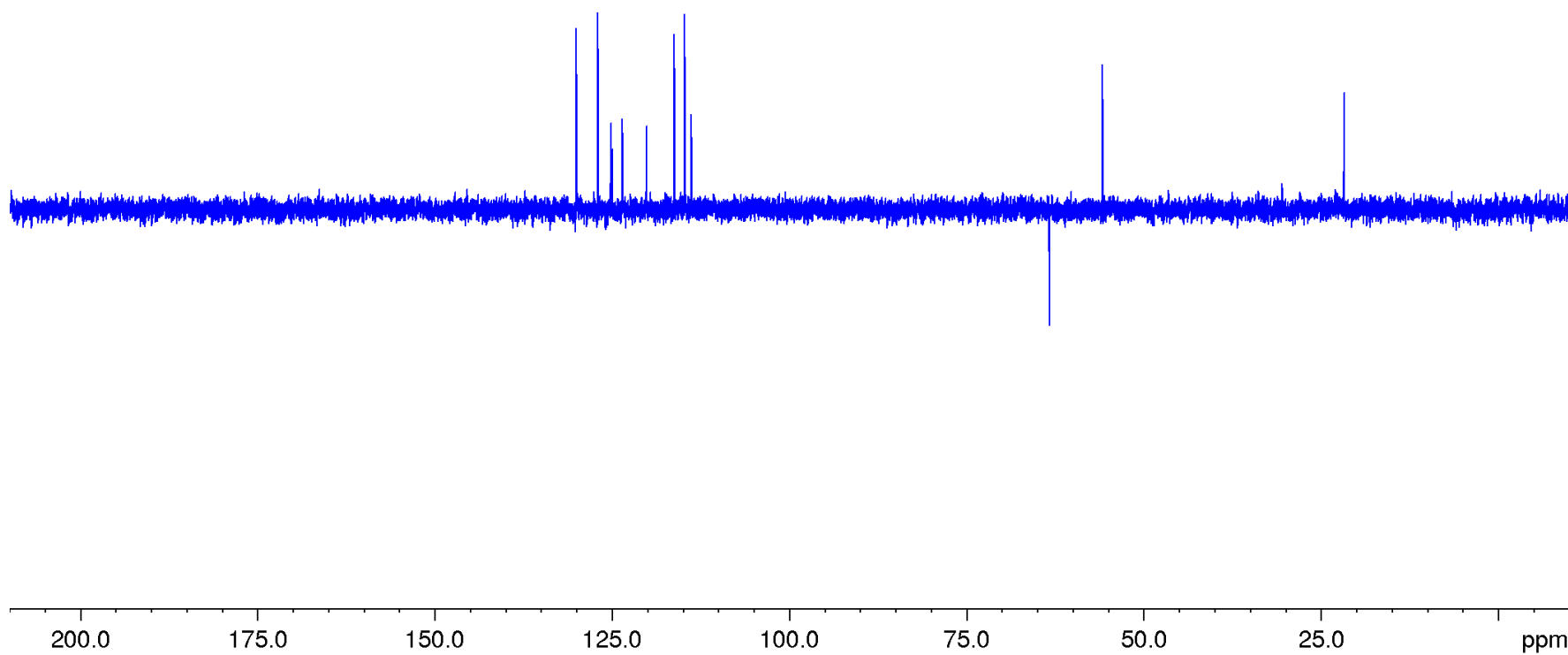


130.035  
126.980  
125.141  
124.944  
123.523  
120.133  
116.202  
114.760  
113.813

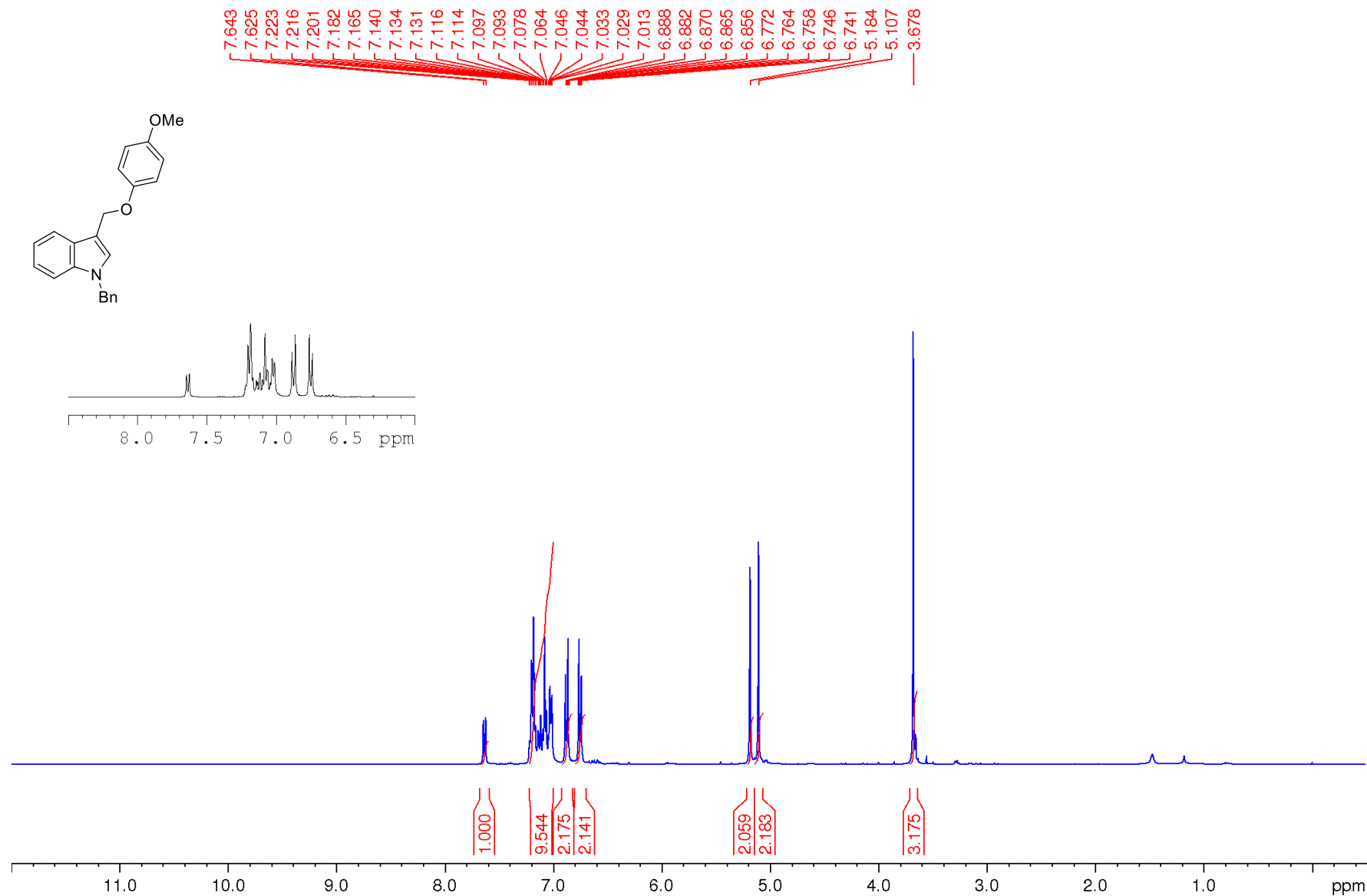
63.278

55.890

21.701

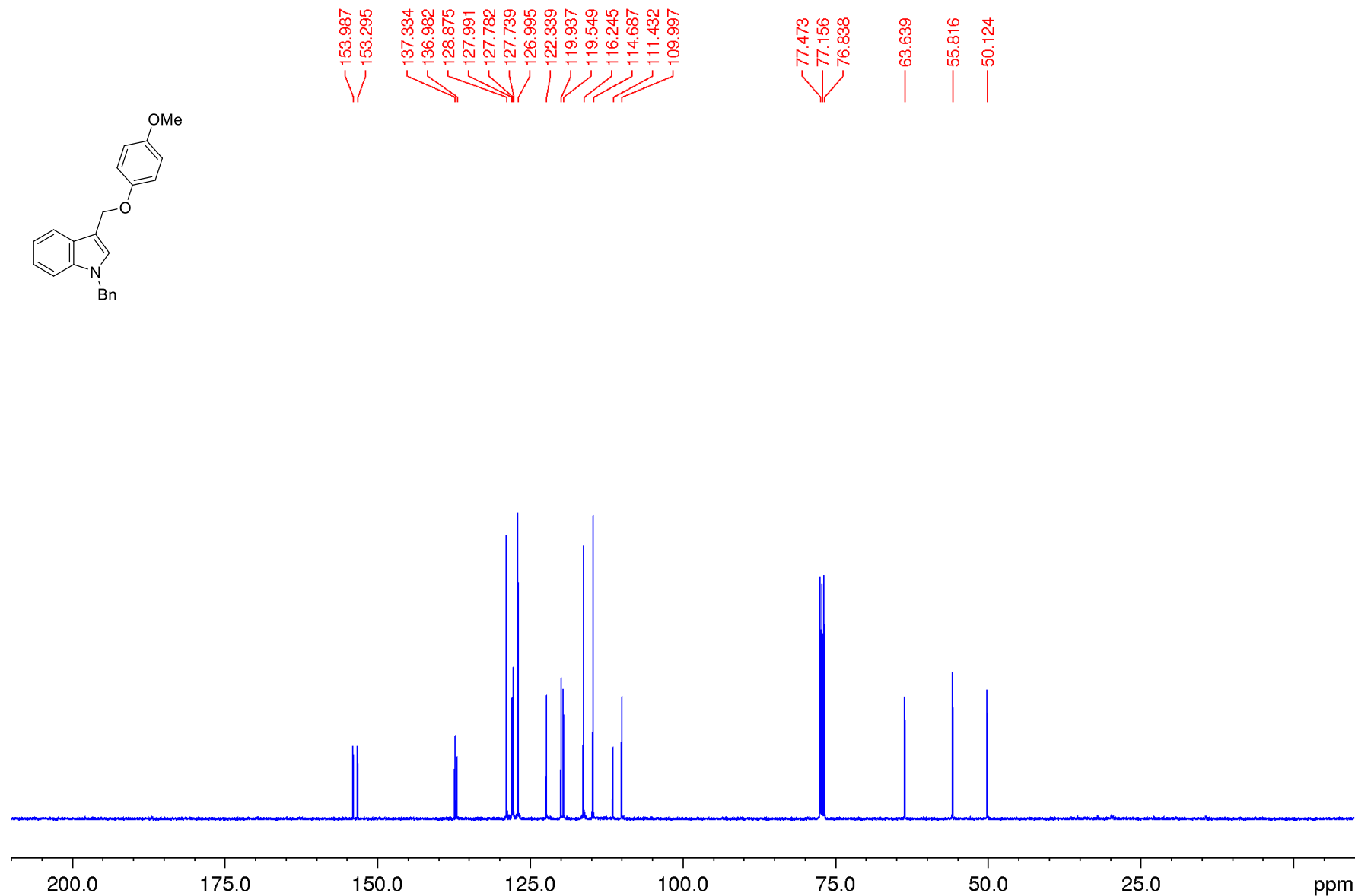
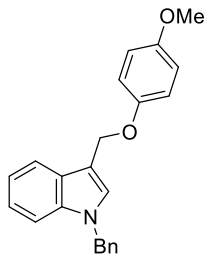


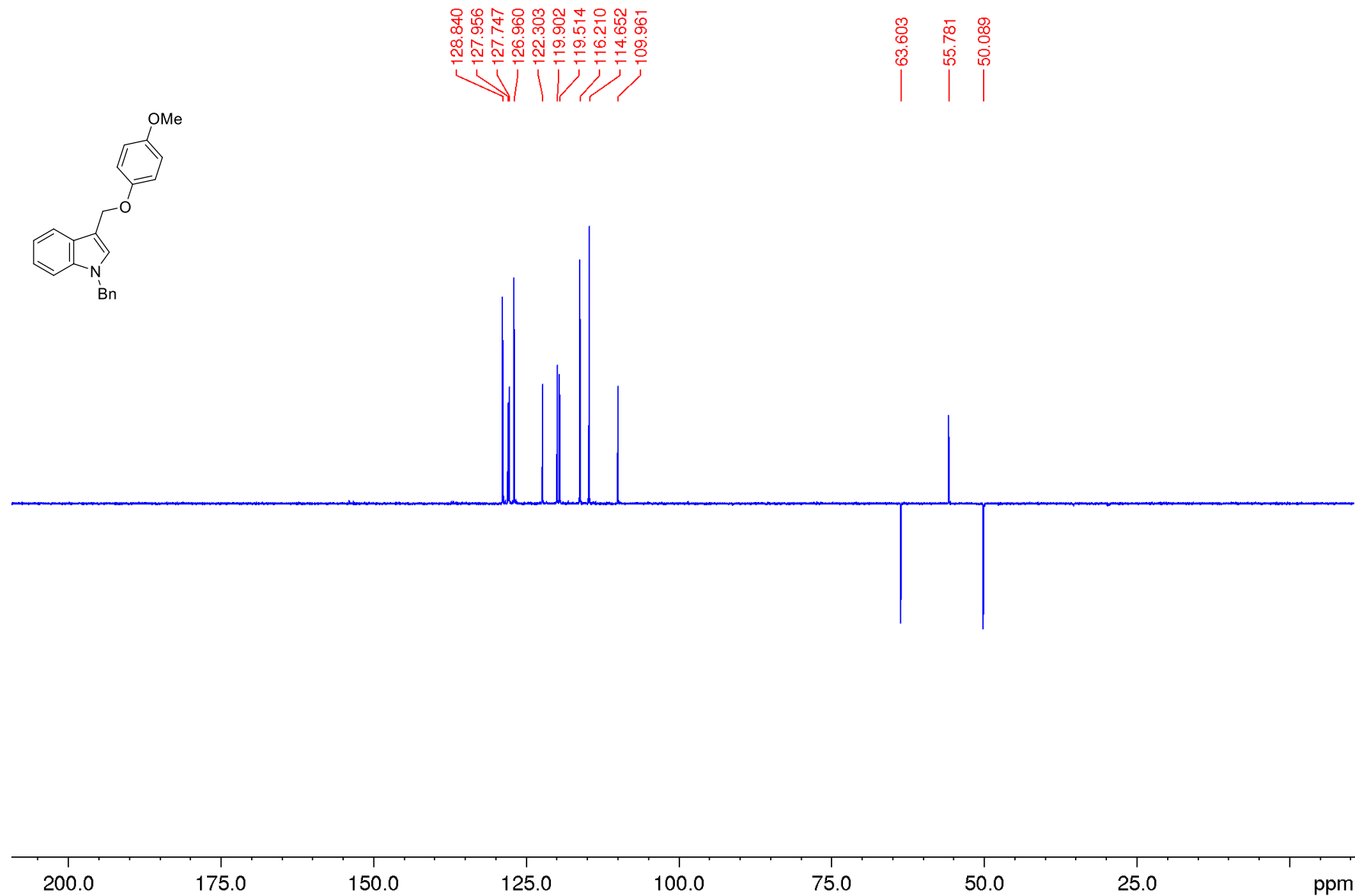




1-benzyl-3-((4-methoxyphenoxy)methyl)-1H-indole **4ba**

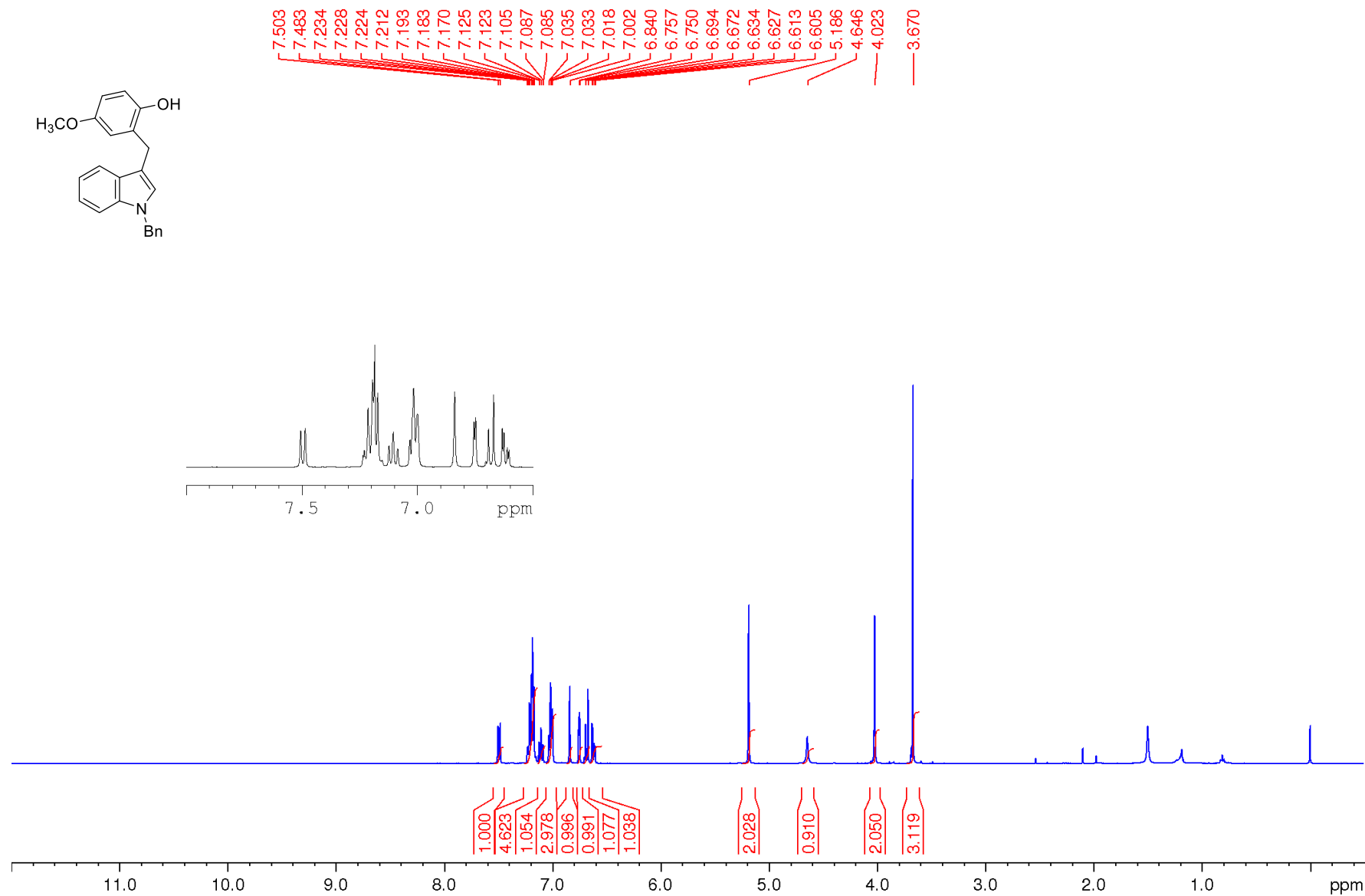
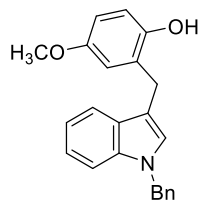
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )





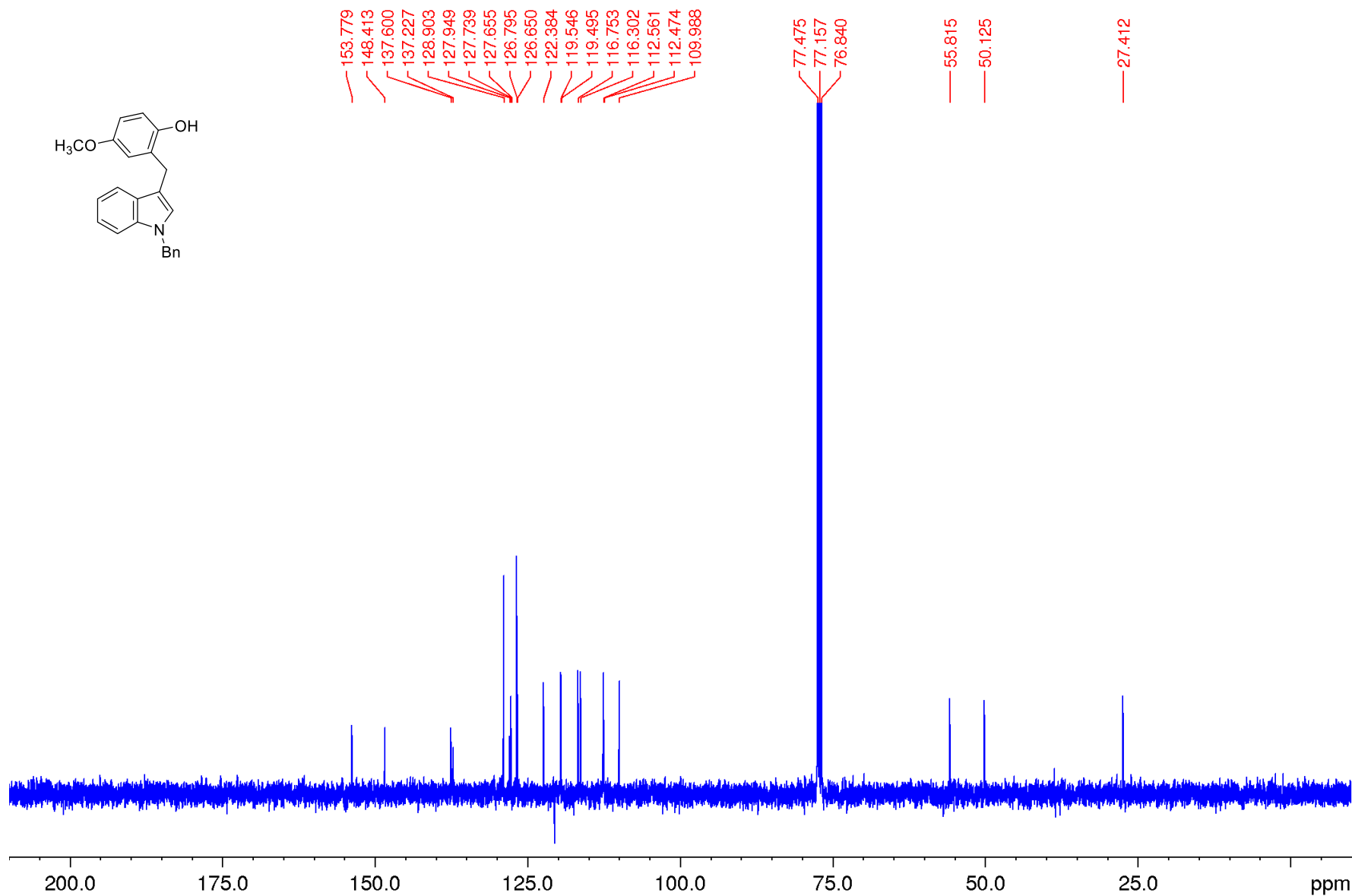
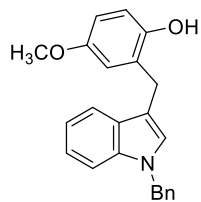
2-((1-benzyl-1H-indol-3-yl)methyl)-4-methoxyphenol **7ba**

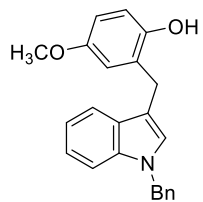
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



2-((1-benzyl-1H-indol-3-yl)methyl)-4-methoxyphenol **7ba**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



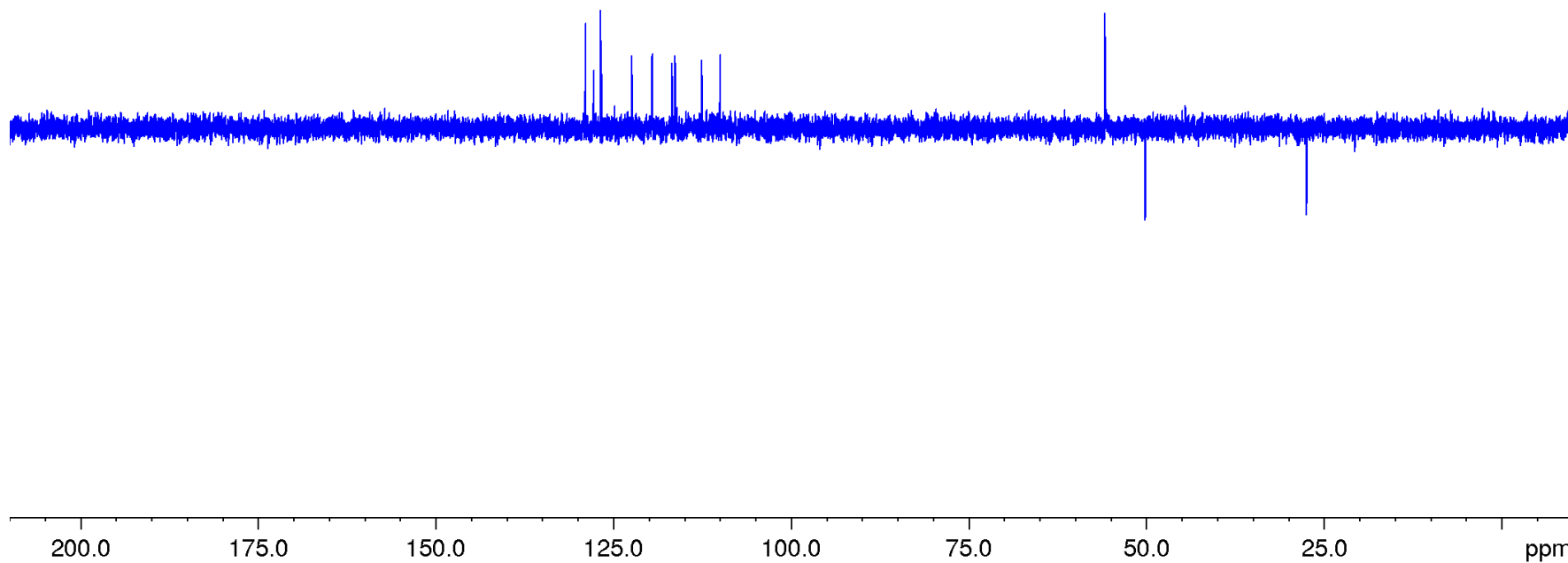


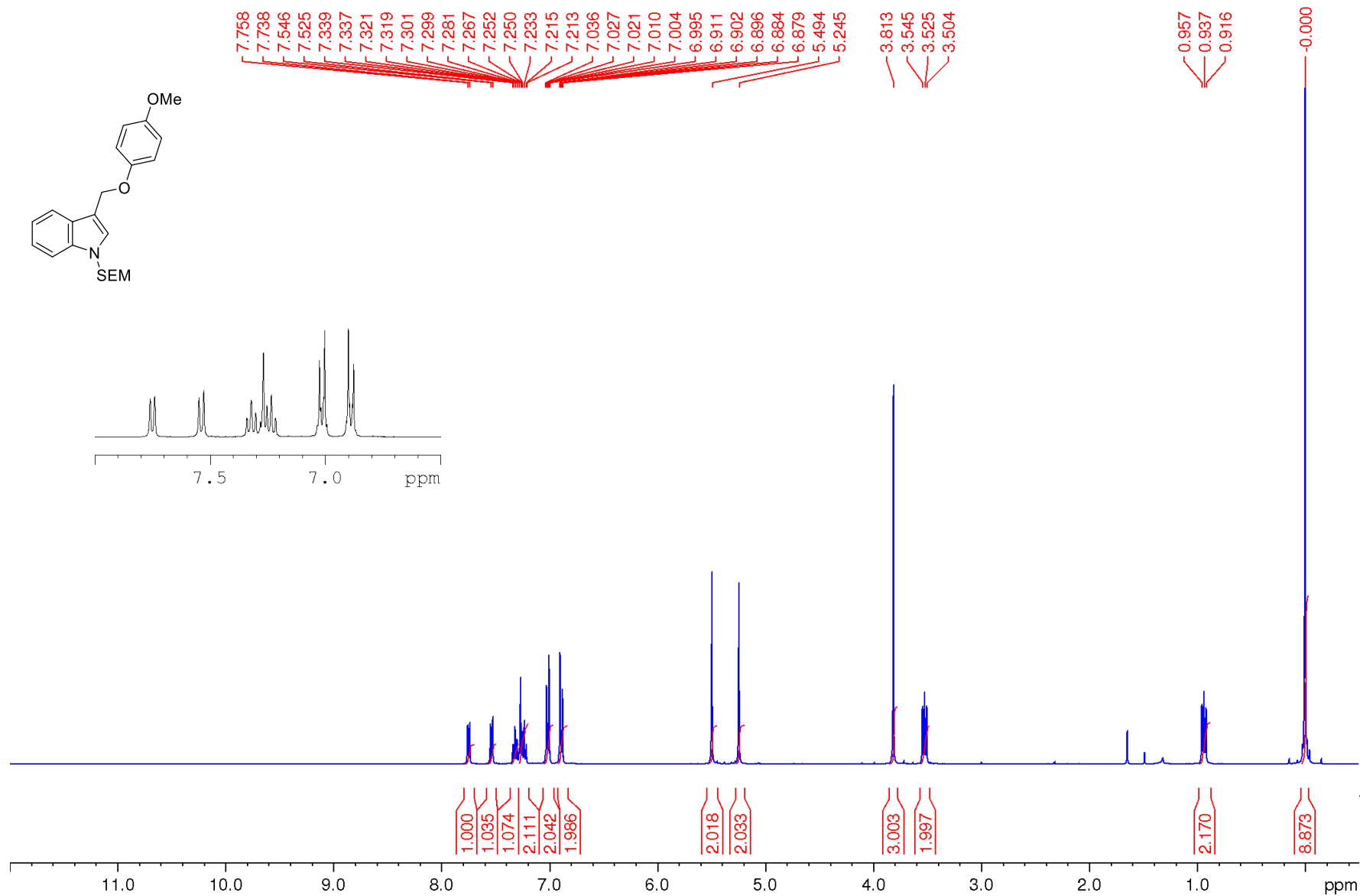
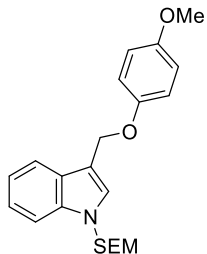
128.894  
127.728  
126.787  
126.642  
122.376  
119.537  
119.488  
116.744  
116.294  
112.553  
109.980

55.807

50.116

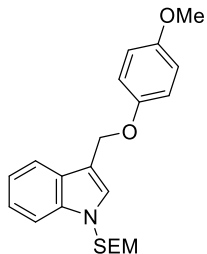
27.403



<sup>1</sup>H NMR-spectrum (400.13 MHz) (CDCl<sub>3</sub>)

3-((4-methoxyphenoxy)methyl)-1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indole **4ca**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )

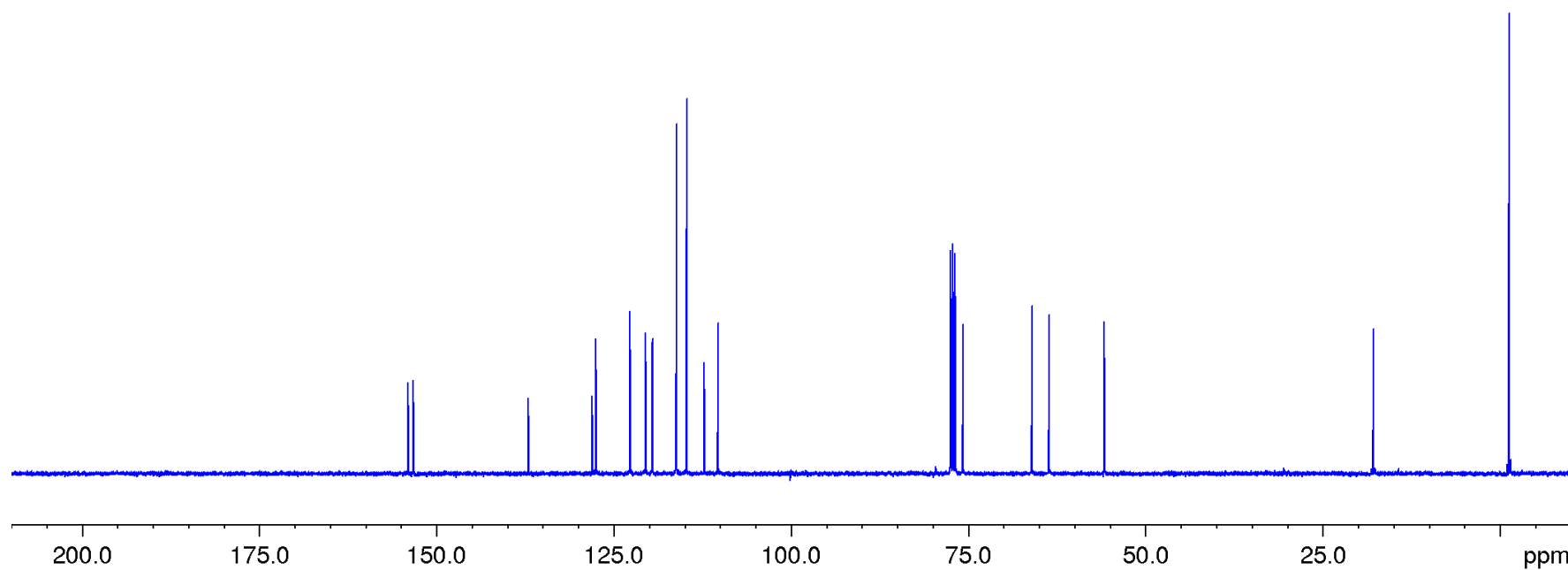


154.027  
153.277  
137.062  
128.064  
127.528  
122.704  
120.497  
119.536  
116.155  
114.720  
112.241  
110.273

77.475  
77.157  
76.839  
75.740  
66.000  
63.572  
55.816

17.843

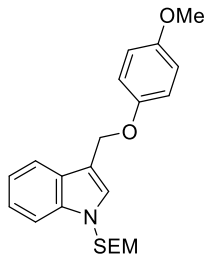
-1.299





3-((4-methoxyphenoxy)methyl)-1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indole **4ca**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



127.494  
122.670  
120.463  
119.502  
116.121  
114.686  
110.238

75.706

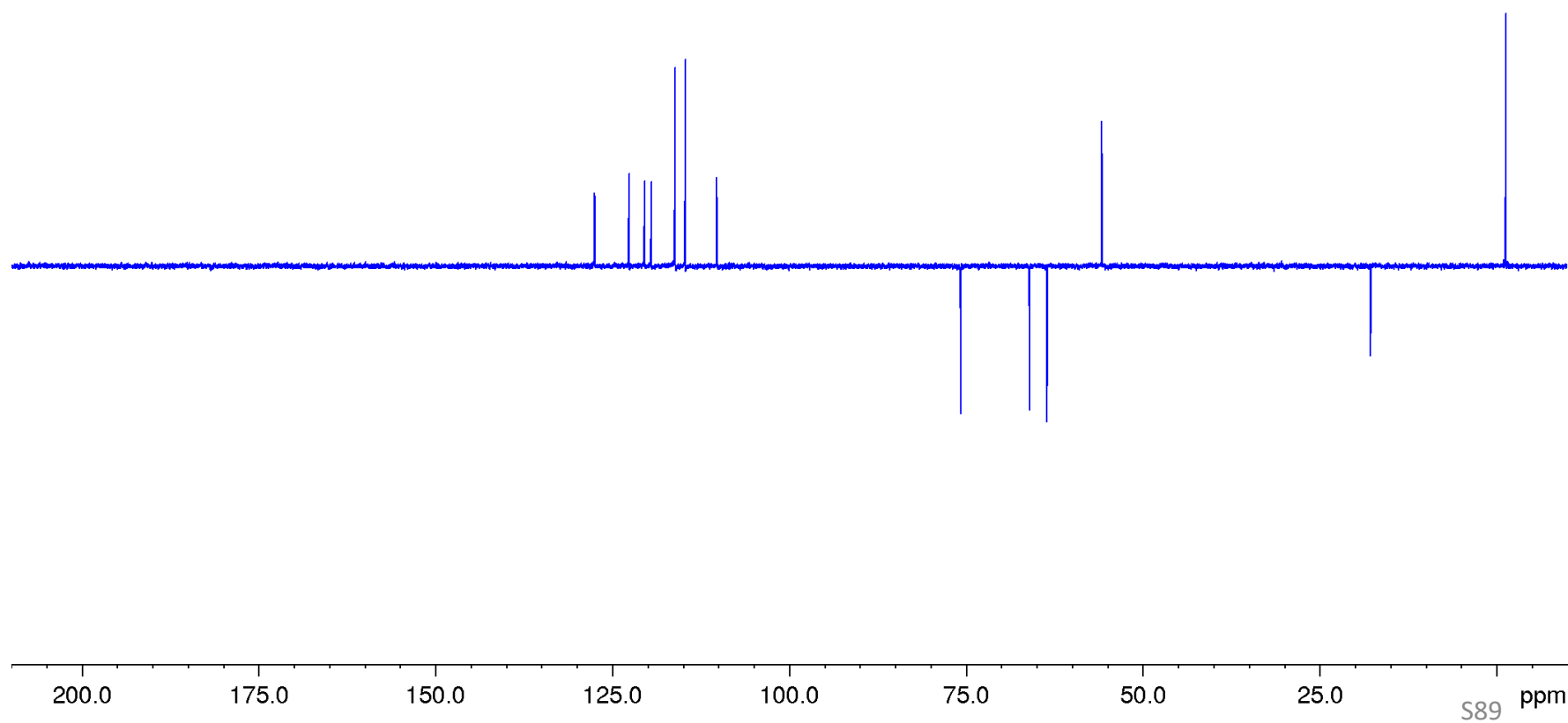
65.966

63.537

55.782

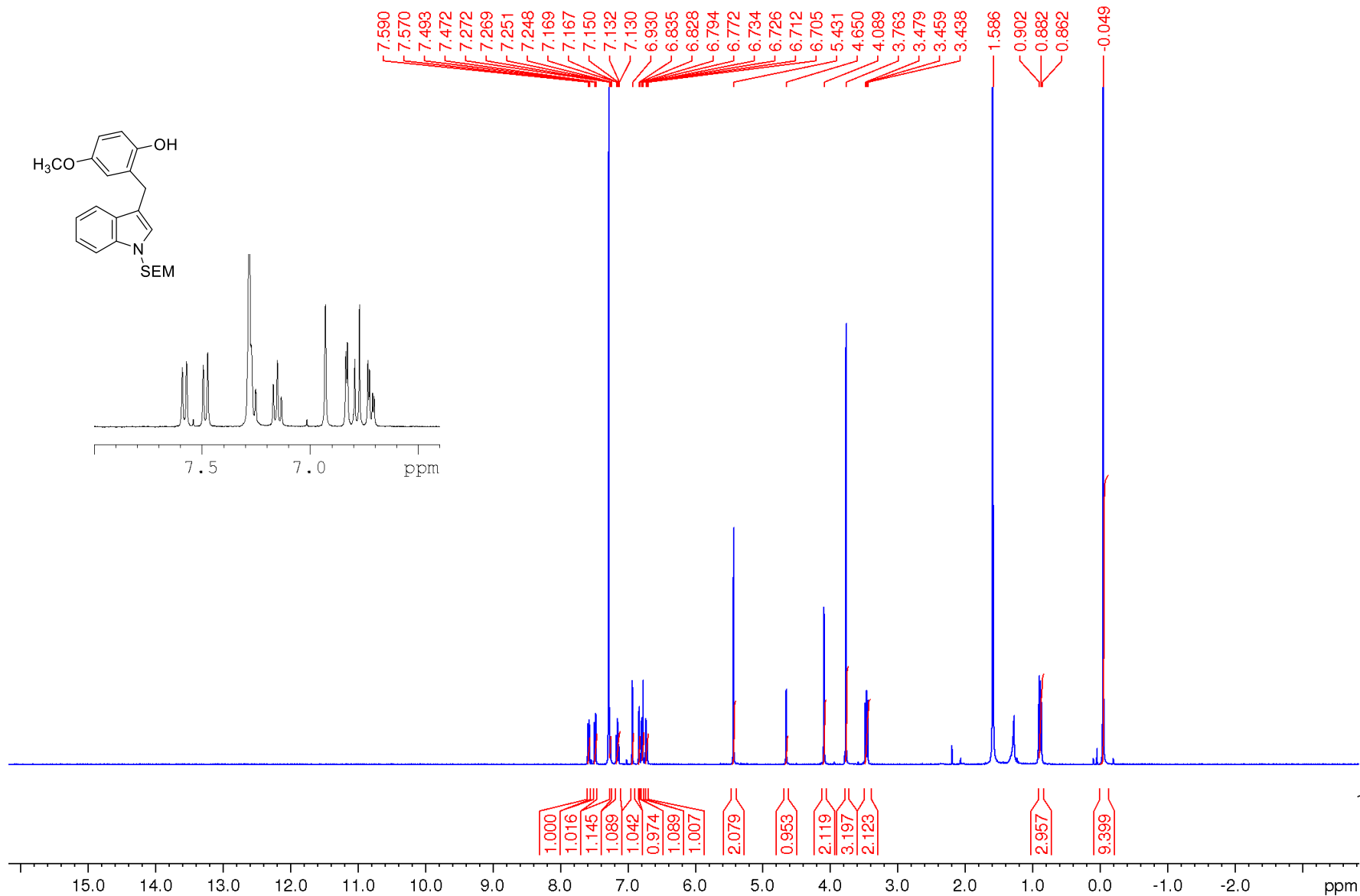
17.808

-1.334



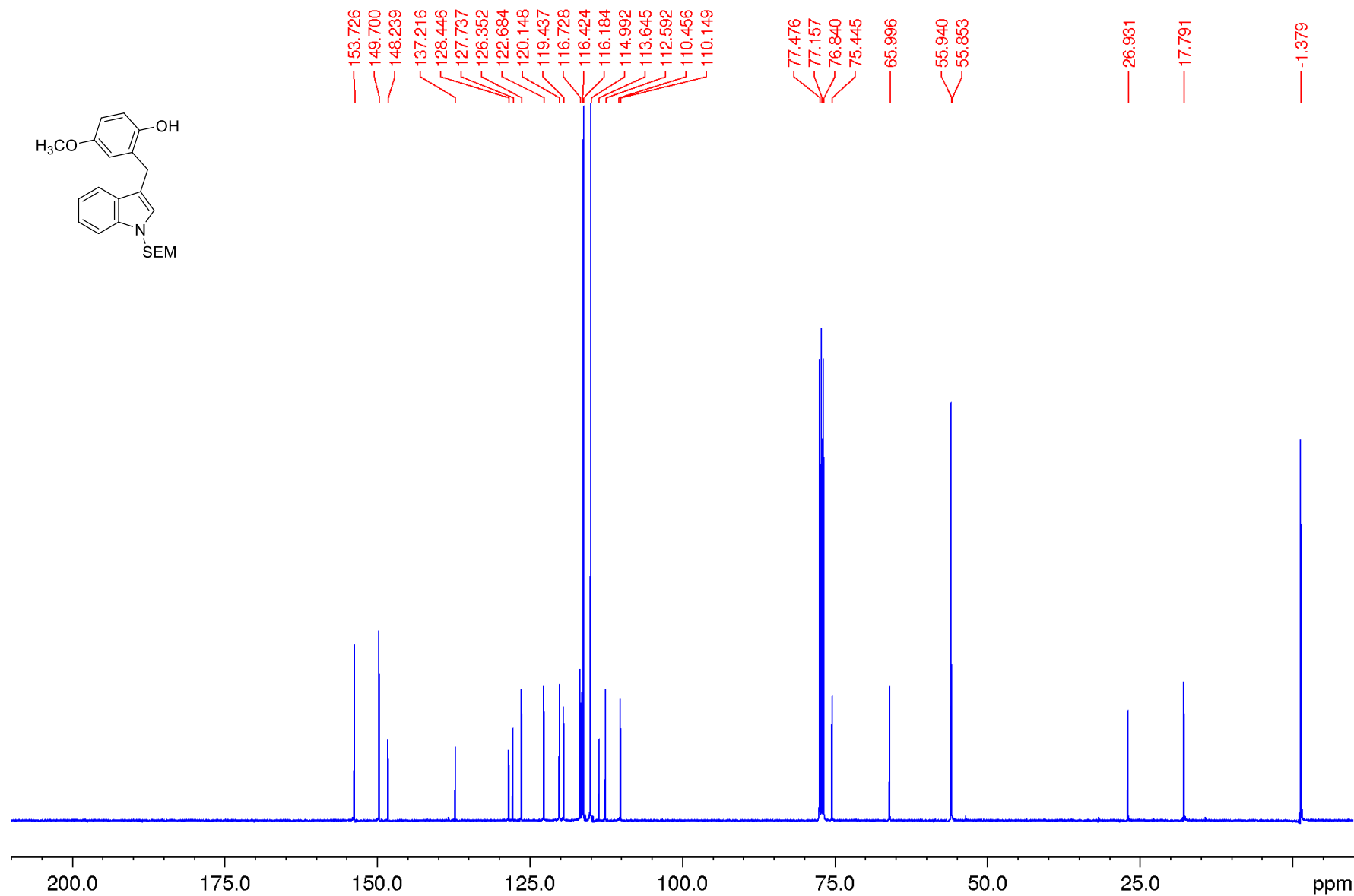
4-methoxy-2-((1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl)phenol **7ca**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



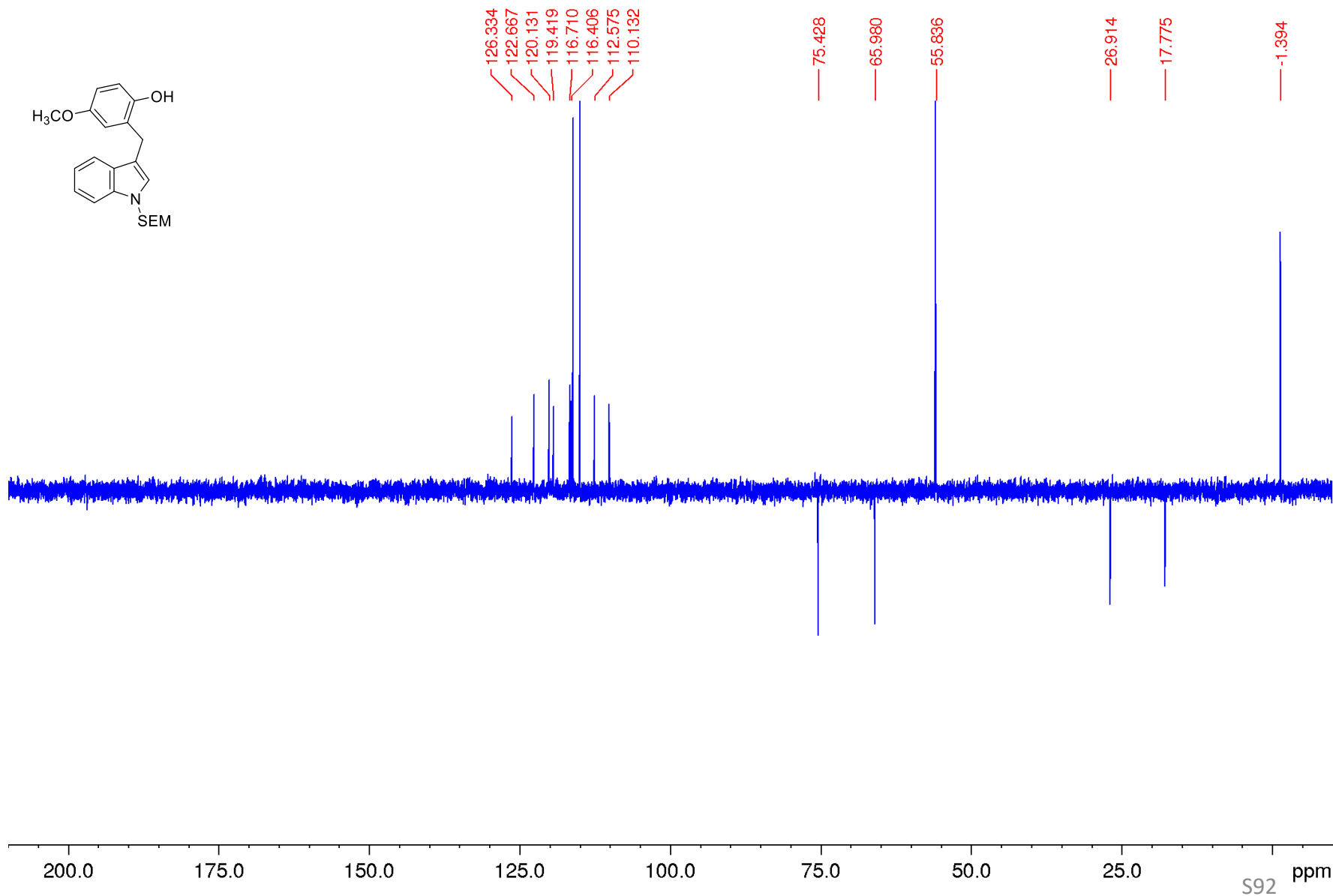
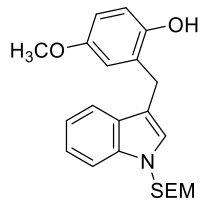
4-methoxy-2-((1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl)phenol **7ca**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



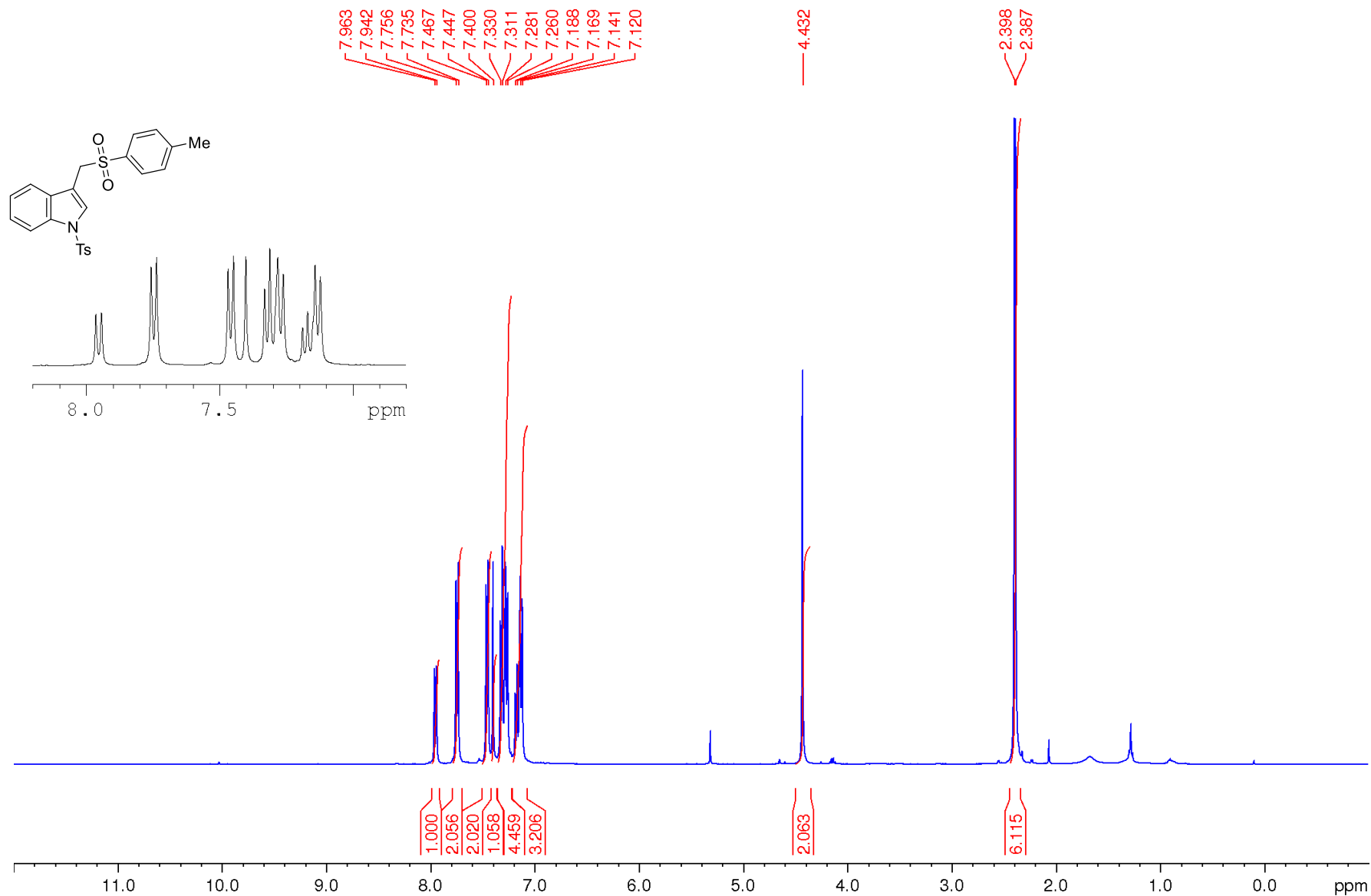
4-methoxy-2-((1-((2-(trimethylsilyl)ethoxy)methyl)-1H-indol-3-yl)methyl)phenol **7ca**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



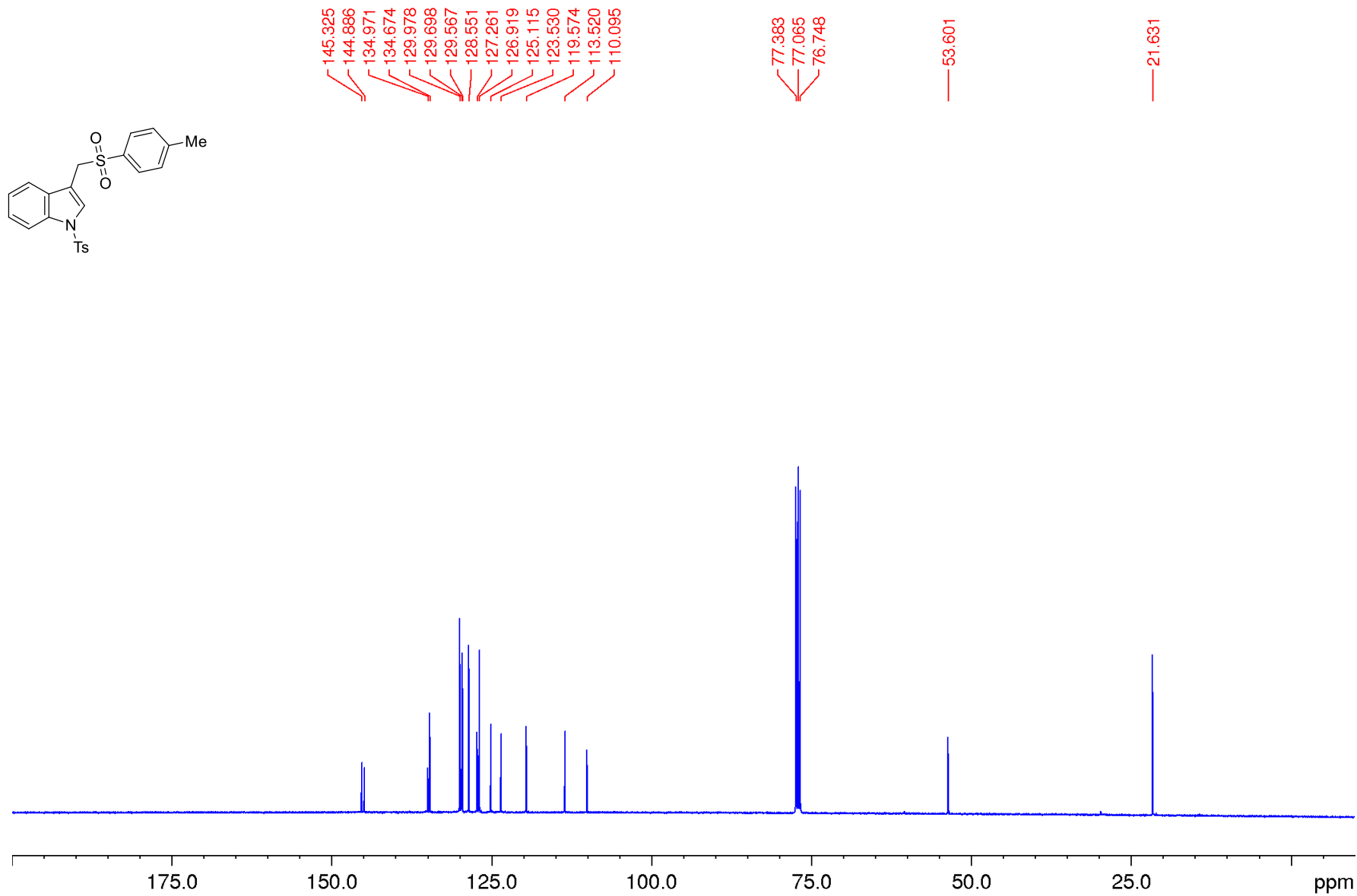
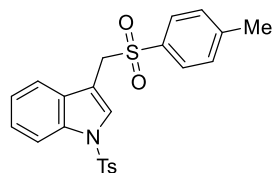
1-tosyl-3-(tosylmethyl)-1*H*-indole **9aa**

<sup>1</sup>H NMR-spectrum (400.13 MHz) (CDCl<sub>3</sub>)



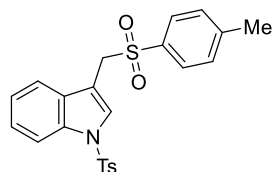
1-tosyl-3-(tosylmethyl)-1*H*-indole **9aa**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



1-tosyl-3-(tosylmethyl)-1*H*-indole **9aa**

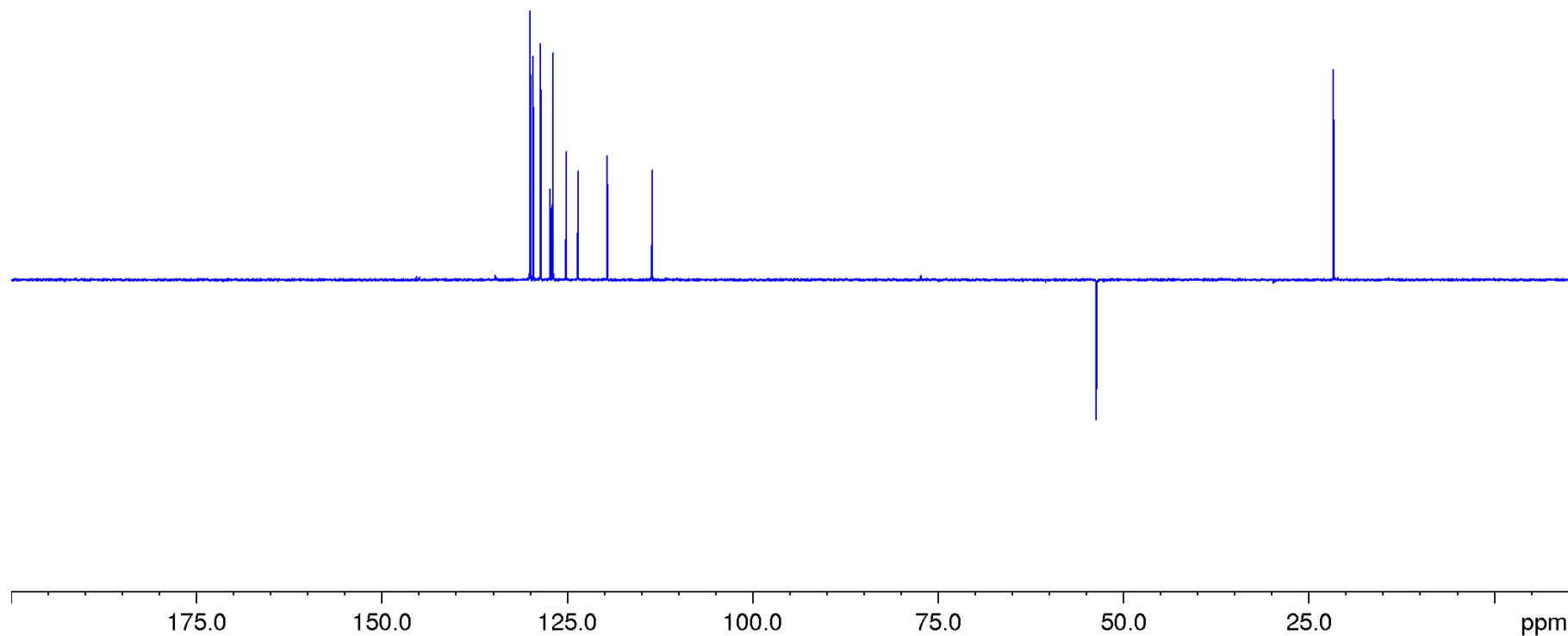
DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



145.324  
144.884  
129.978  
129.566  
128.551  
127.260  
126.919  
125.115  
123.530  
119.574  
113.519

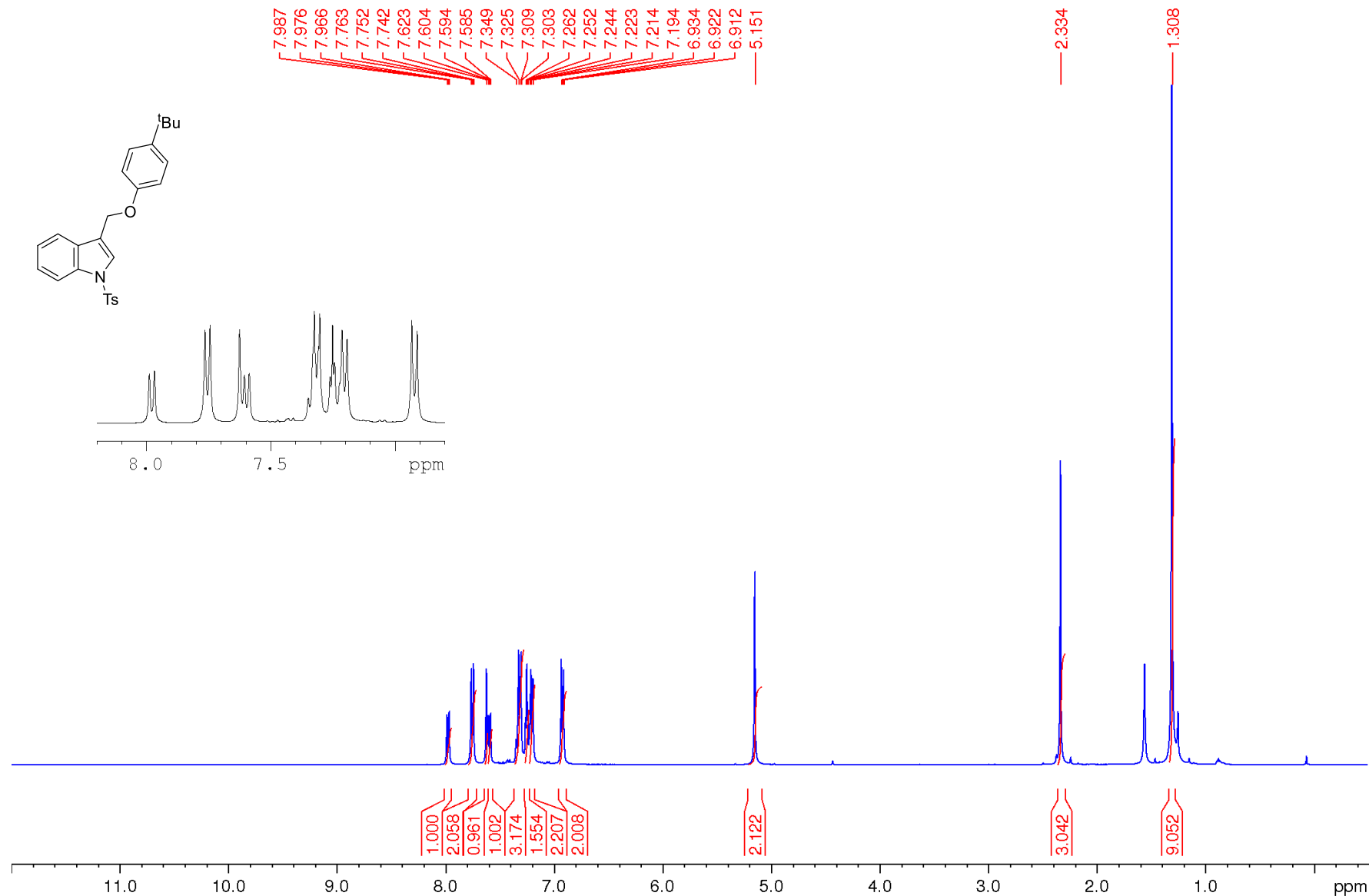
53.601

21.631



3-((4-(*tert*-butyl)phenoxy)methyl)-1-tosyl-1*H*-indole **4ab**

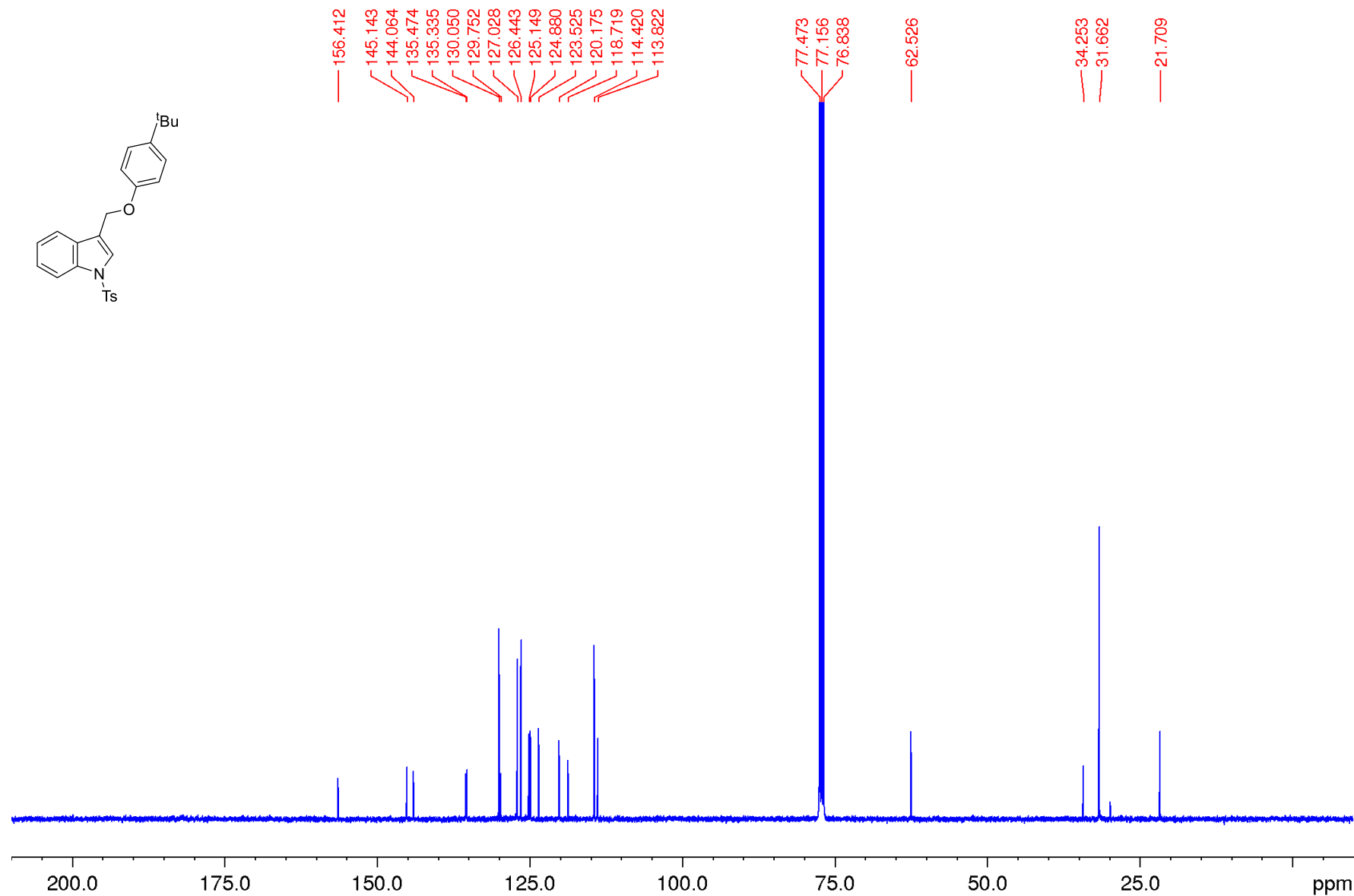
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )





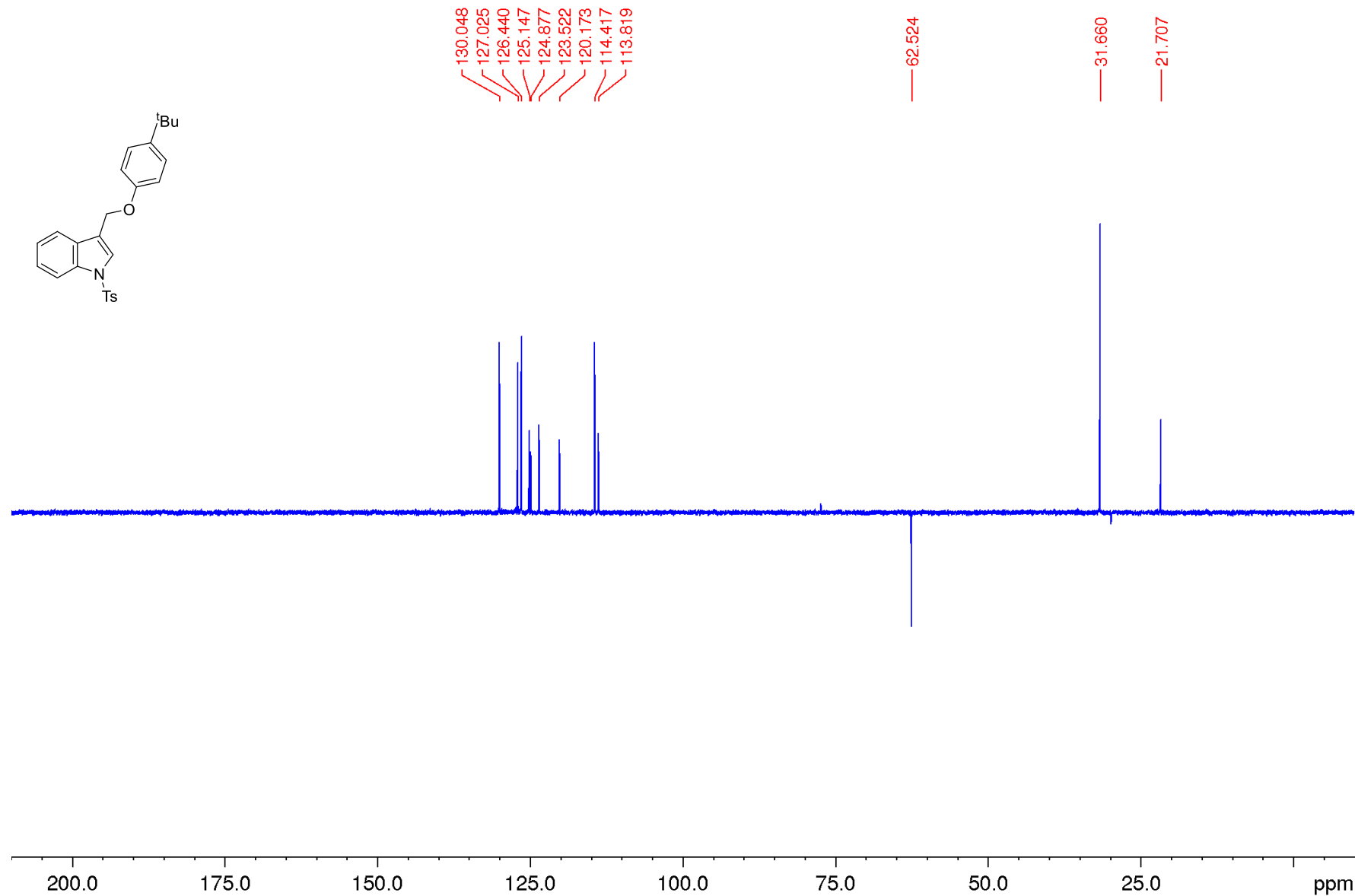
3-((4-(*tert*-butyl)phenoxy)methyl)-1-tosyl-1*H*-indole **4ab**

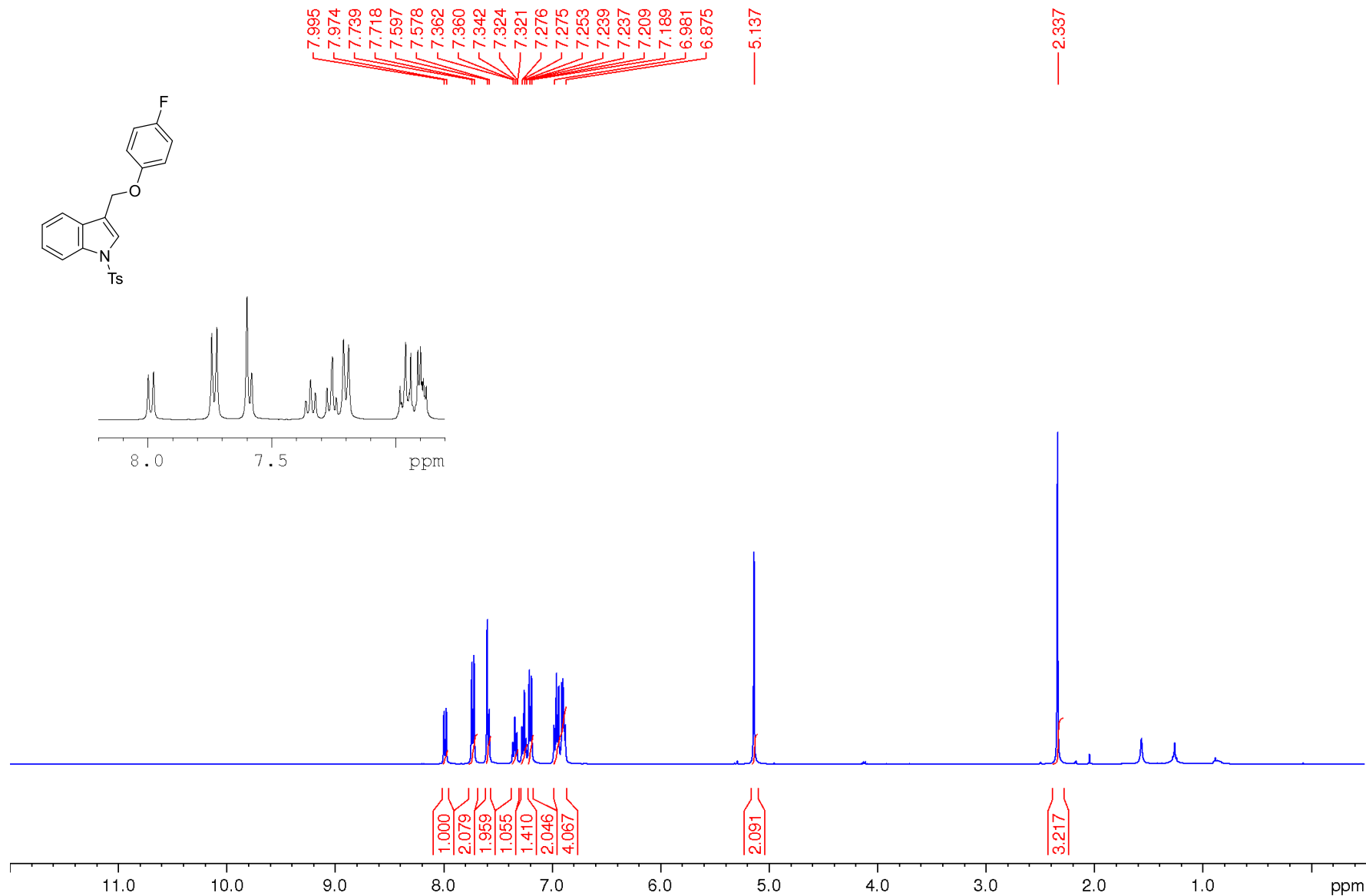
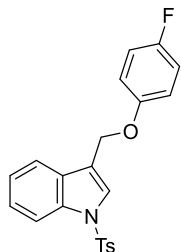
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



3-((4-(*tert*-butyl)phenoxy)methyl)-1-tosyl-1*H*-indole **4ab**

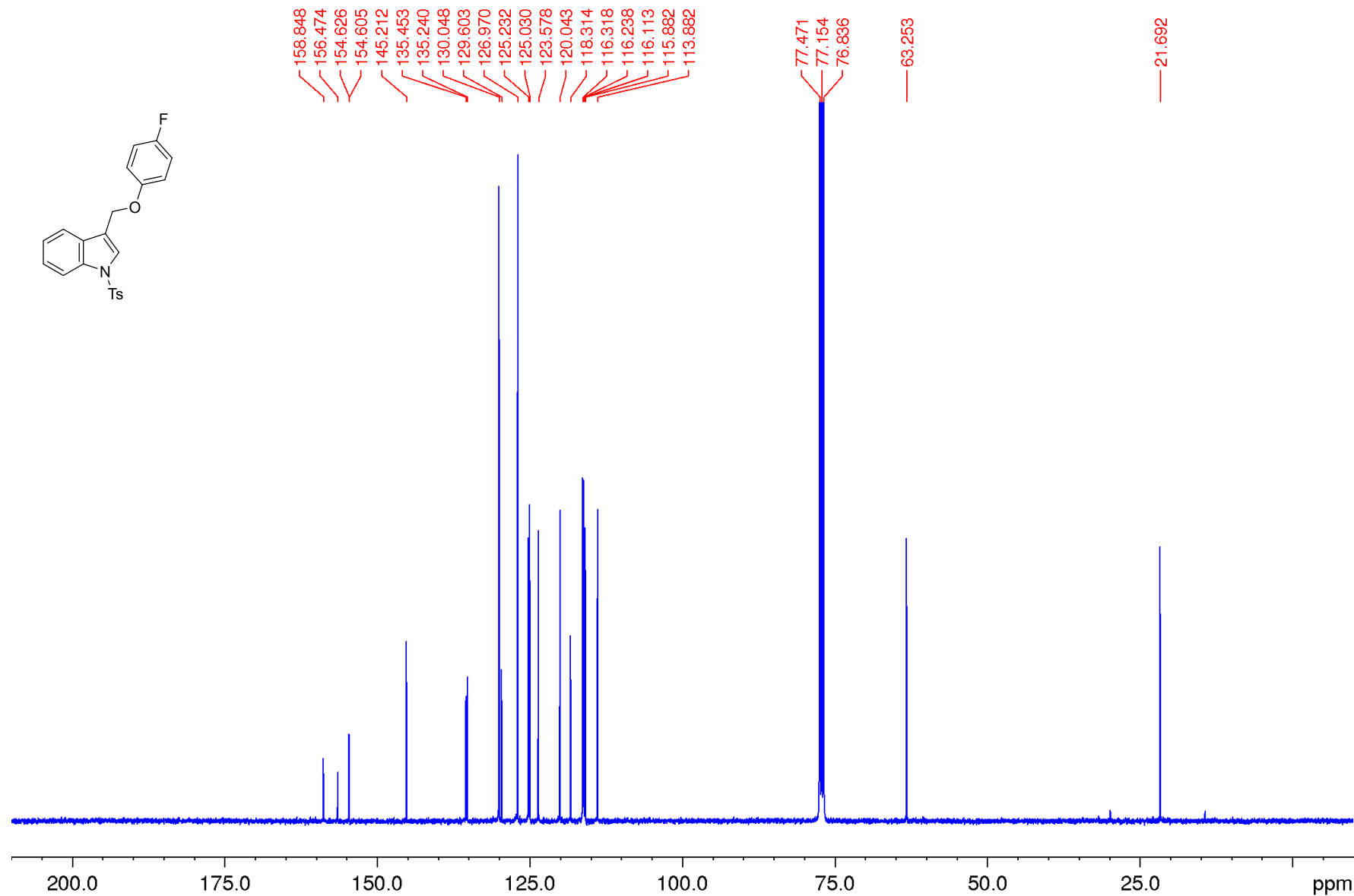
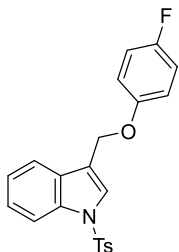
DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)





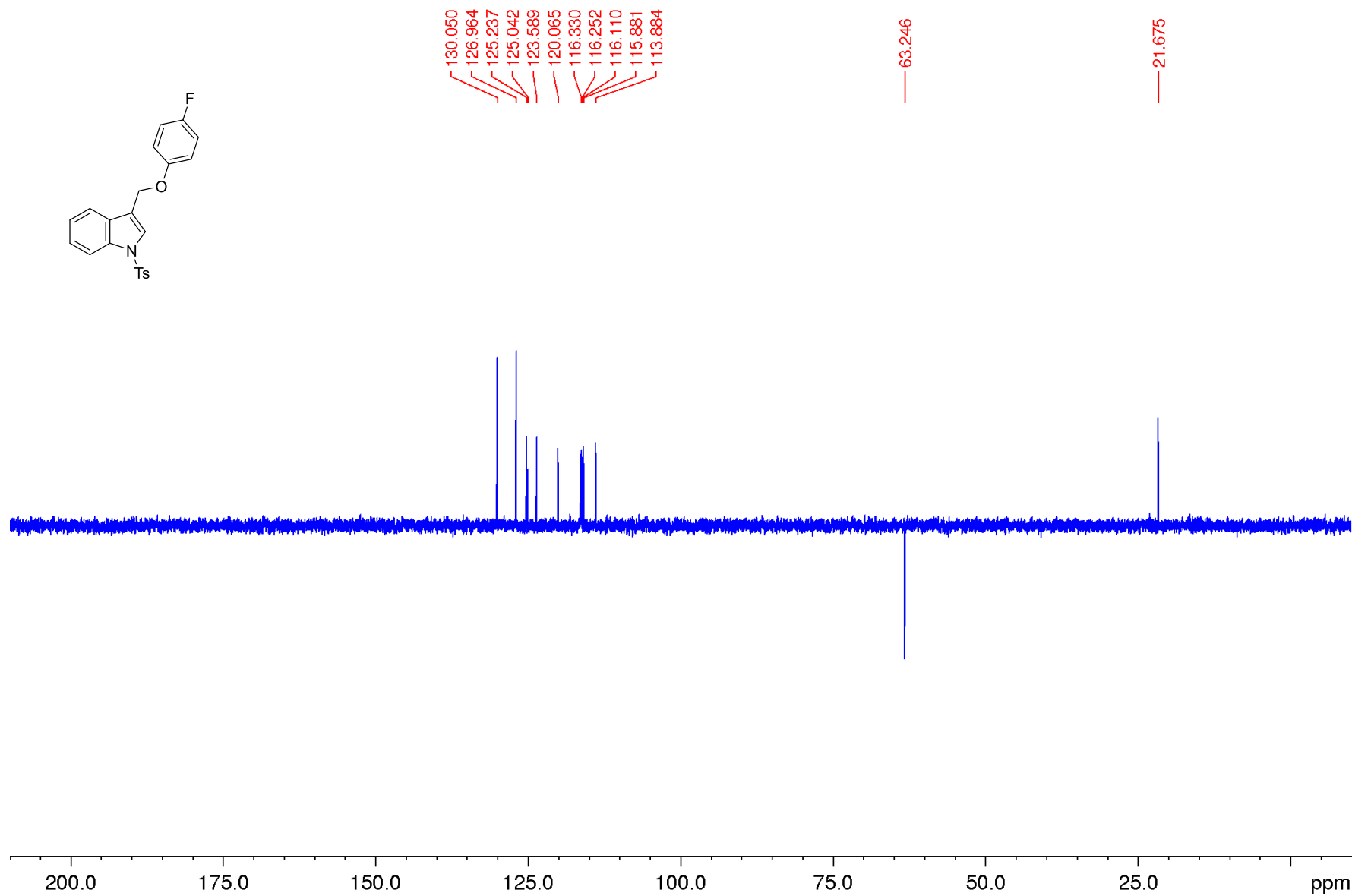
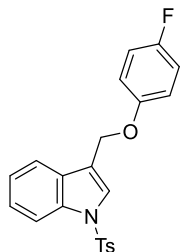
3-((4-fluorophenoxy)methyl)-1-tosyl-1H-indole **4ac**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



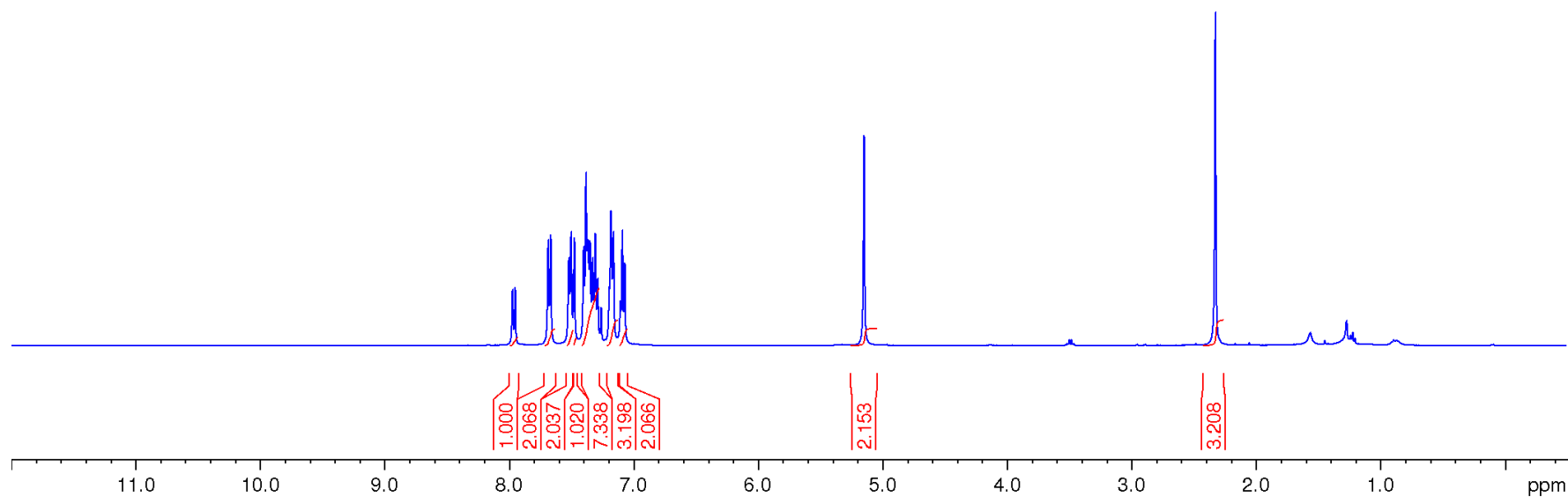
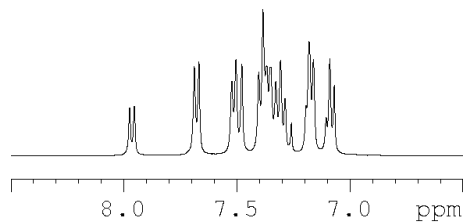
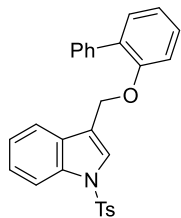
3-((4-fluorophenoxy)methyl)-1-tosyl-1H-indole **4ac**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



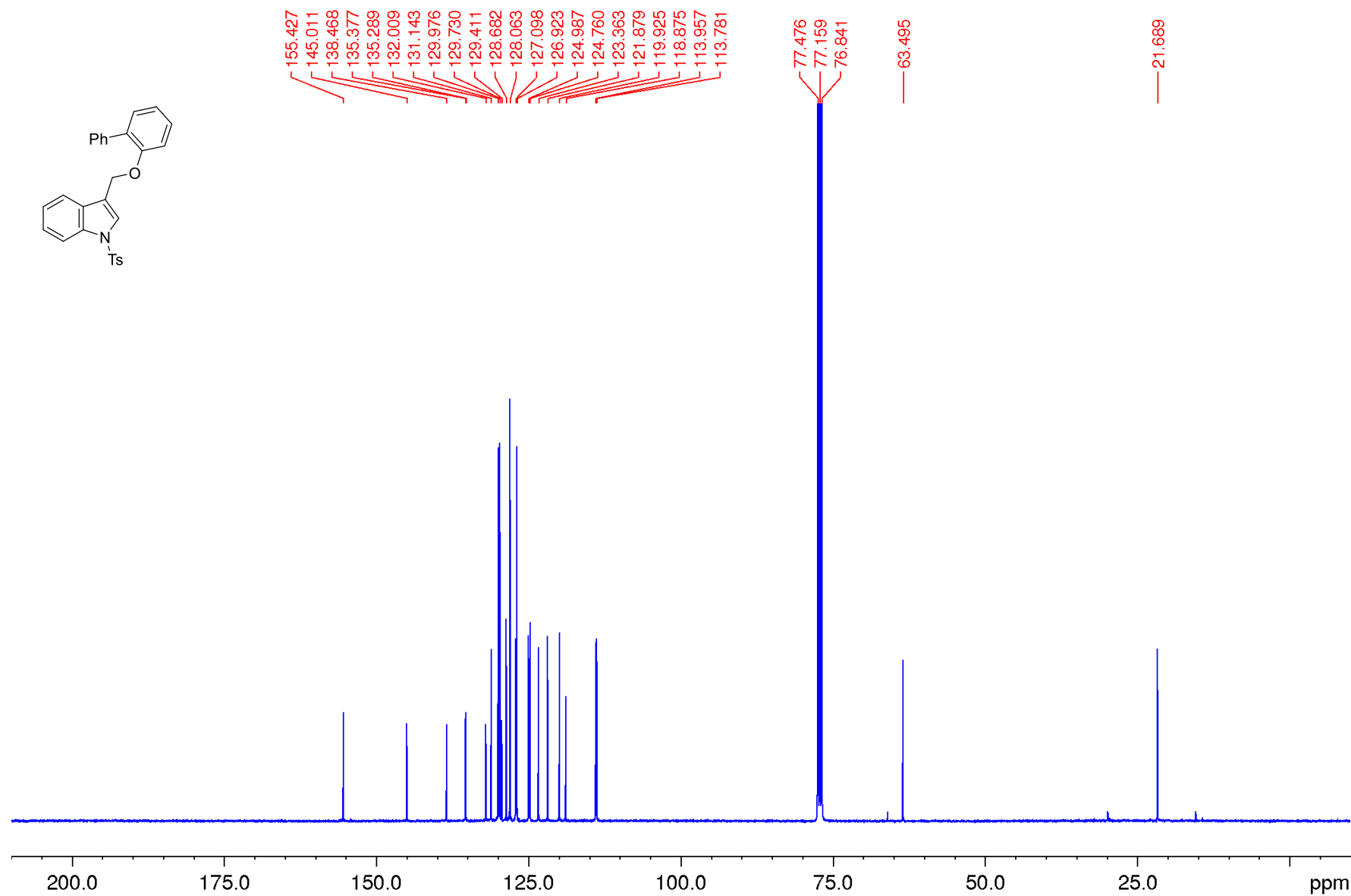
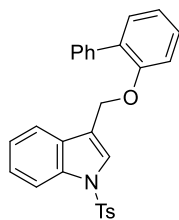
3-([1,1'-biphenyl]-2-yloxy)methyl)-1-tosyl-1H-indole **4ad**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



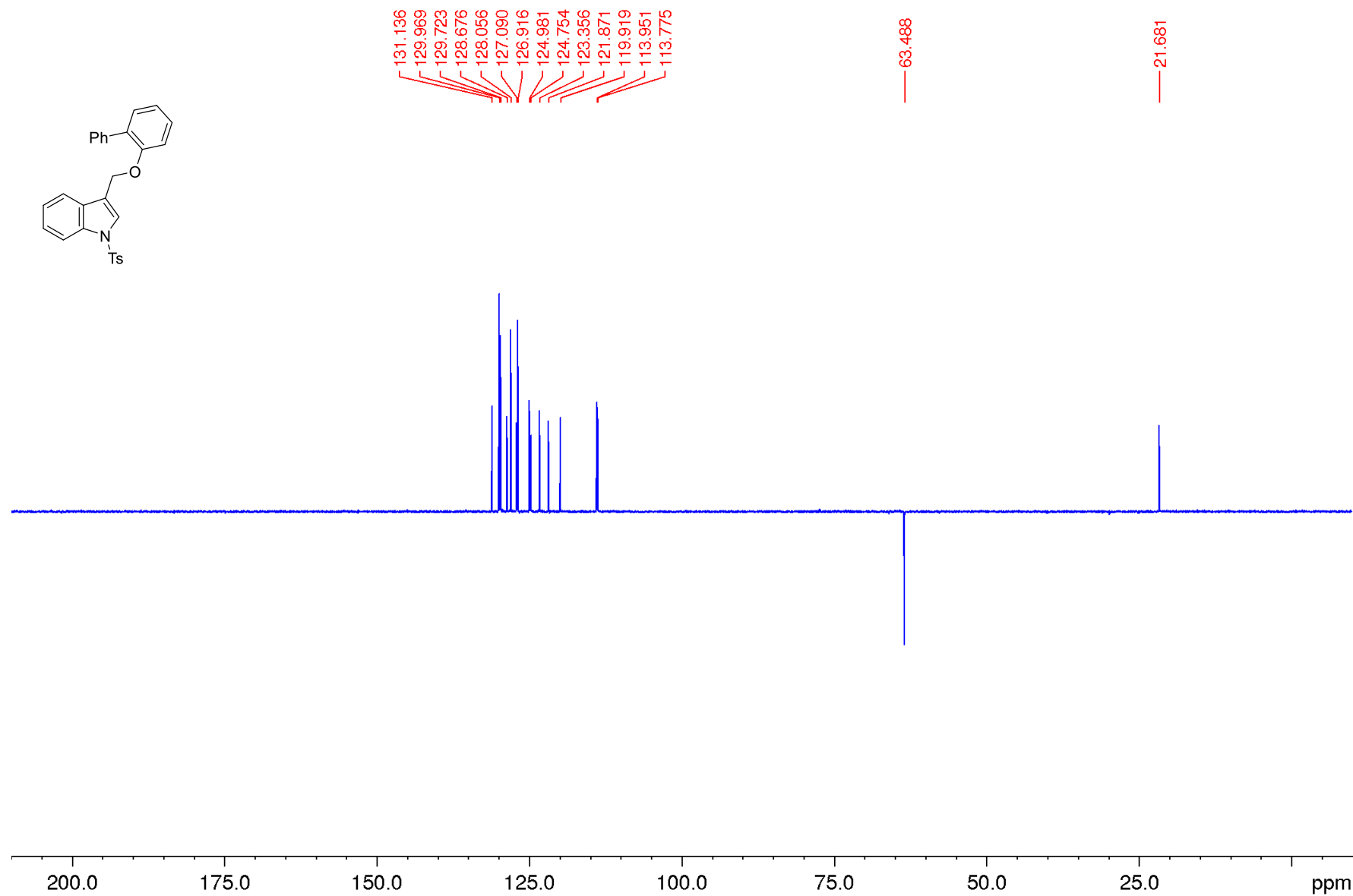
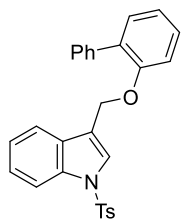
3-([1,1'-biphenyl]-2-yloxy)methyl-1-tosyl-1H-indole **4ad**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



3-([1,1'-biphenyl]-2-yloxy)methyl-1-tosyl-1H-indole **4ad**

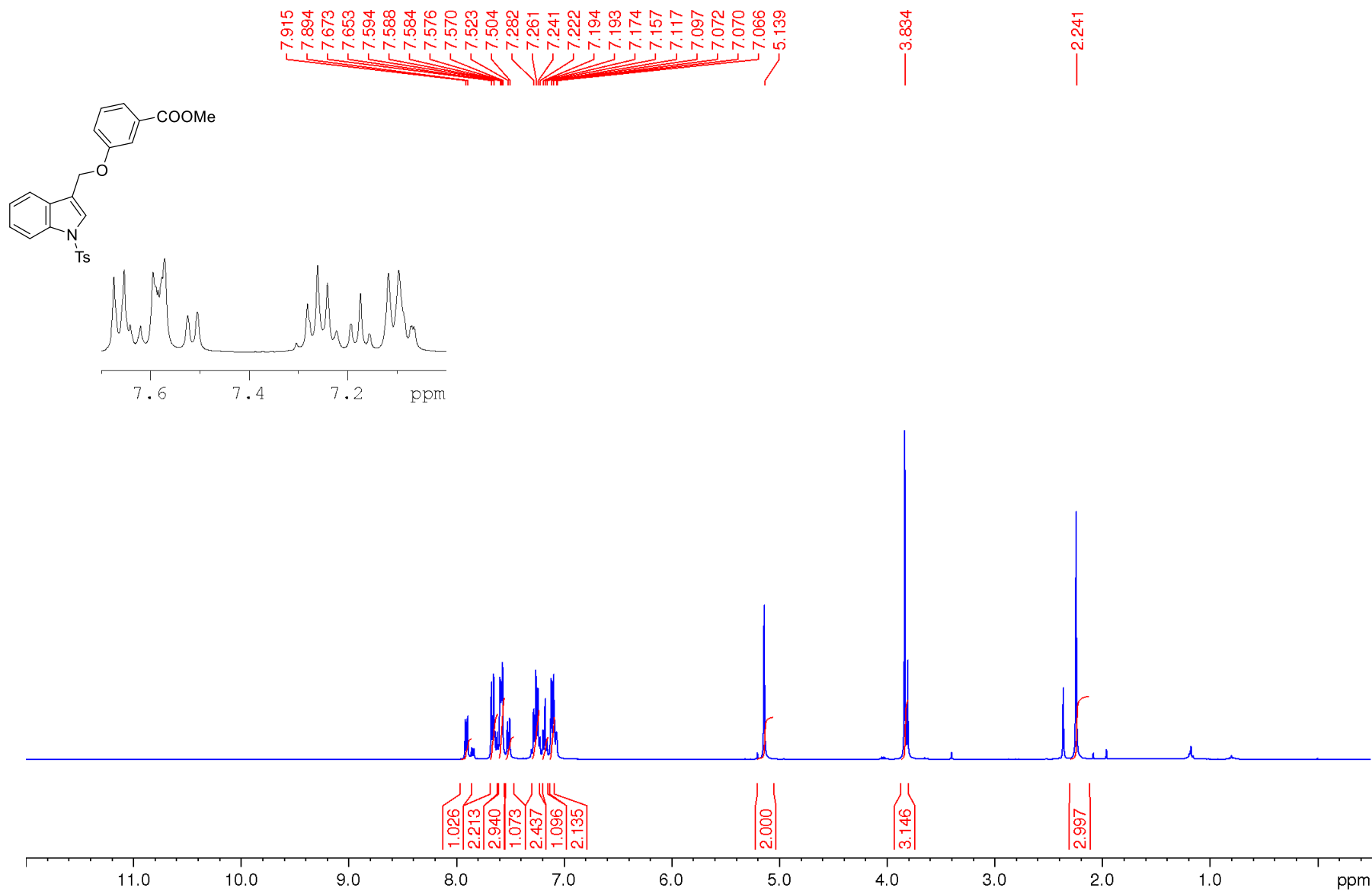
DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)





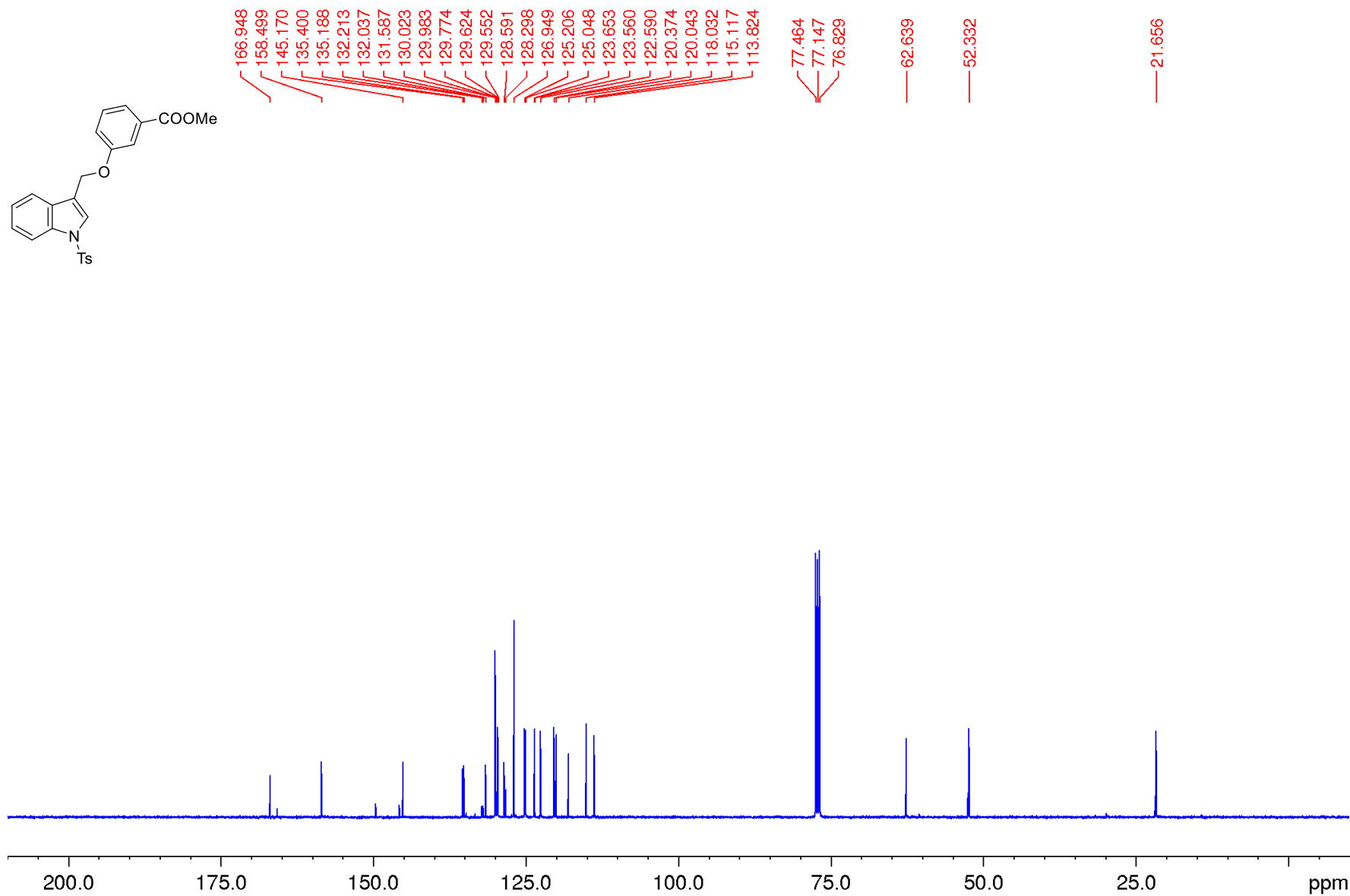
methyl 3-((1-tosyl-1H-indol-3-yl)methoxy)benzoate **4ae**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



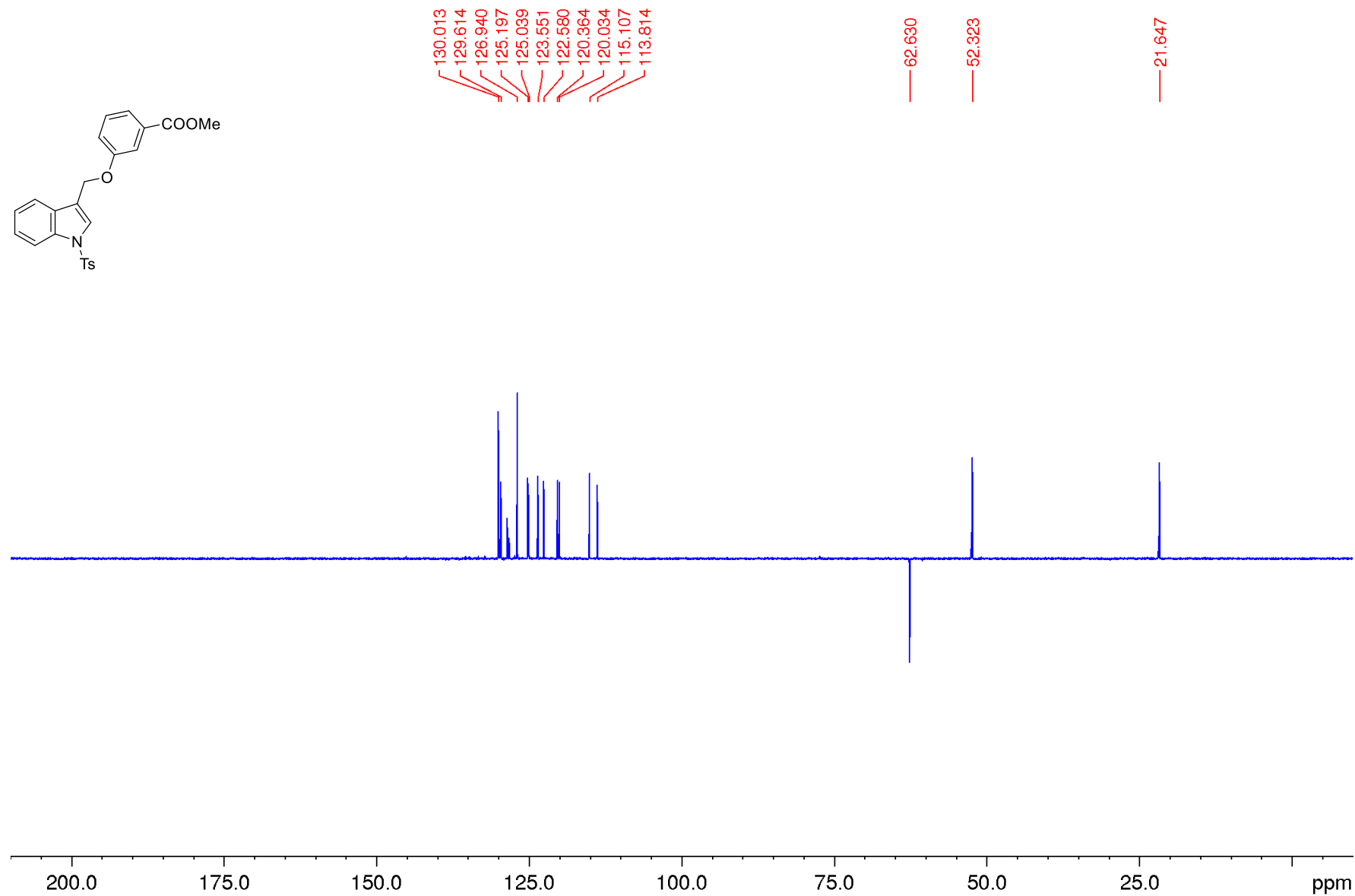
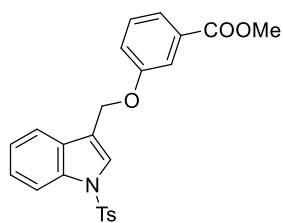
methyl 3-((1-tosyl-1H-indol-3-yl)methoxy)benzoate **4ae**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



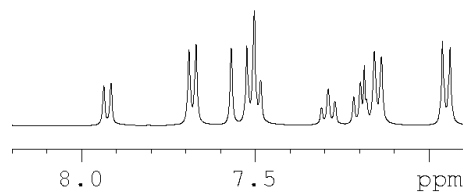
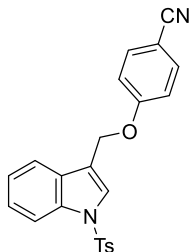
methyl 3-((1-tosyl-1H-indol-3-yl)methoxy)benzoate **4ae**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



4-((1-tosyl-1H-indol-3-yl)methoxy)benzonitrile **4af**

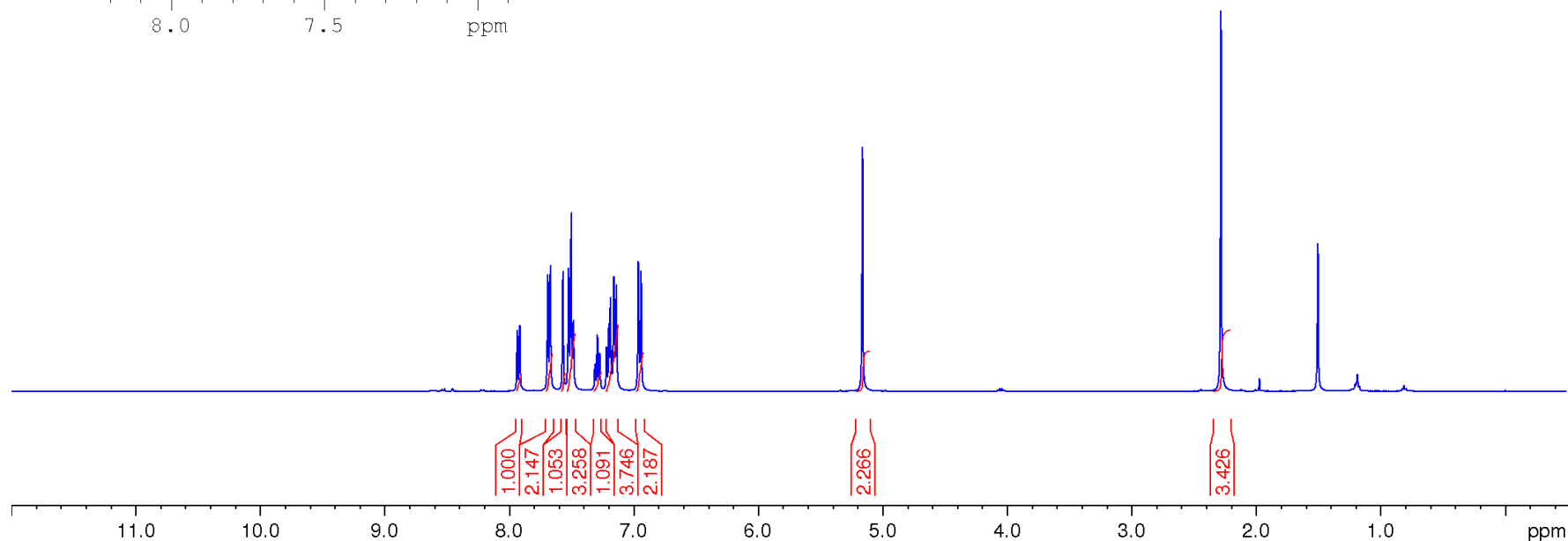
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



7.934  
7.913  
7.689  
7.668  
7.567  
7.522  
7.501  
7.483  
7.310  
7.290  
7.272  
7.217  
7.198  
7.186  
7.158  
7.137  
6.962  
6.940

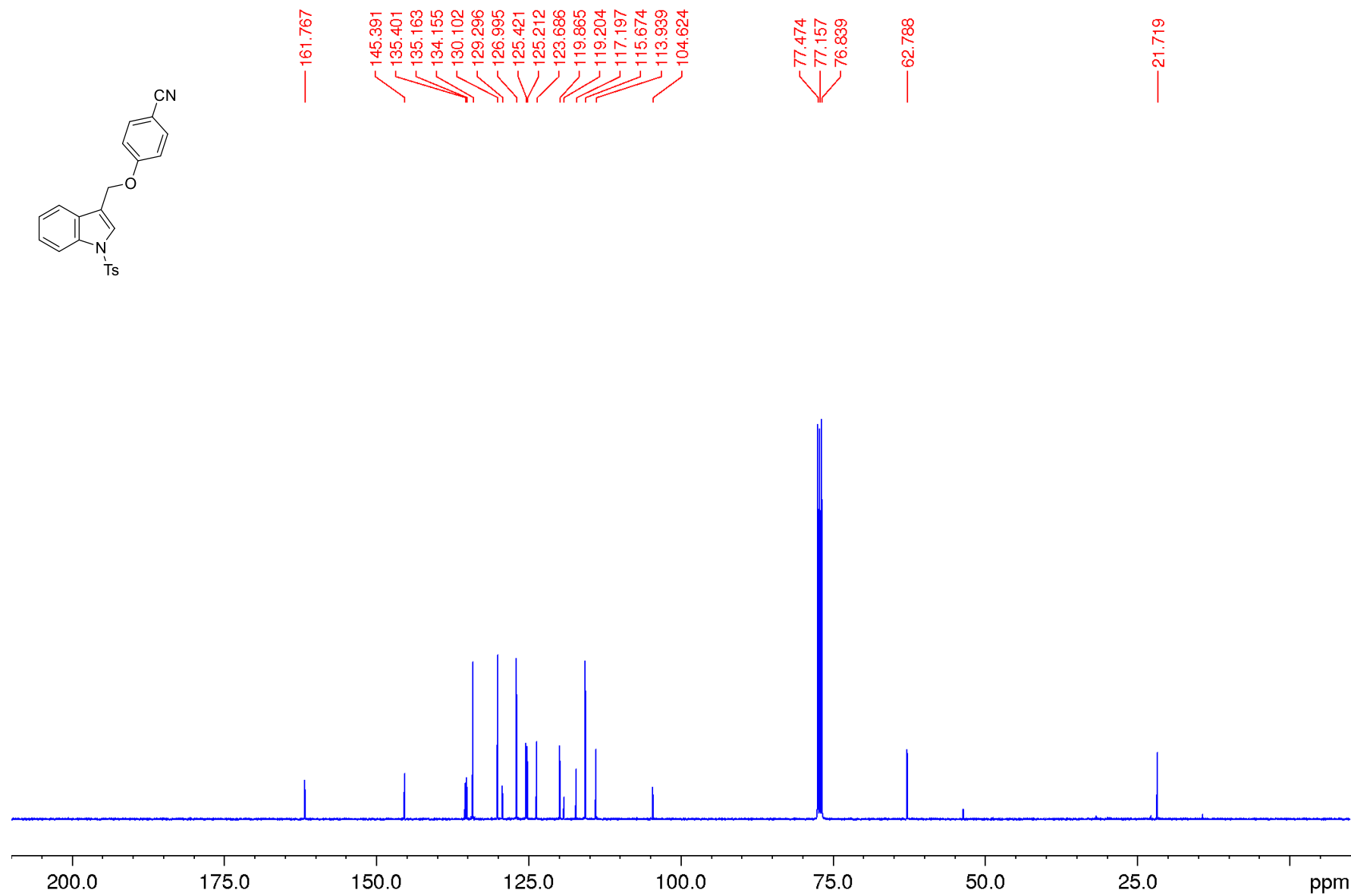
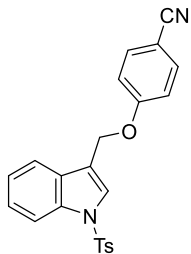
5.161

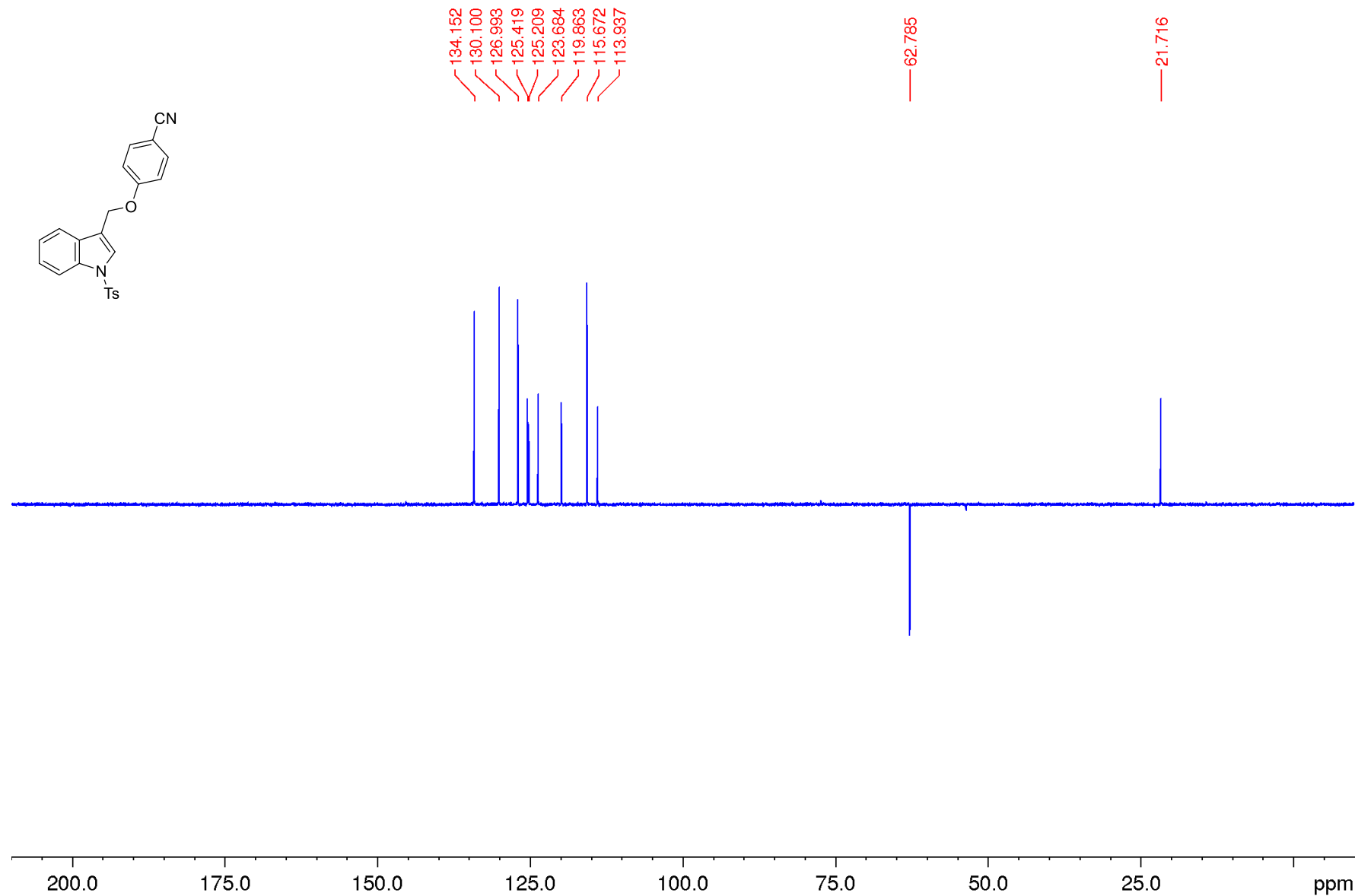
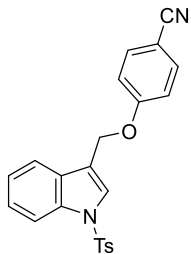
2.281



4-((1-tosyl-1H-indol-3-yl)methoxy)benzonitrile **4af**

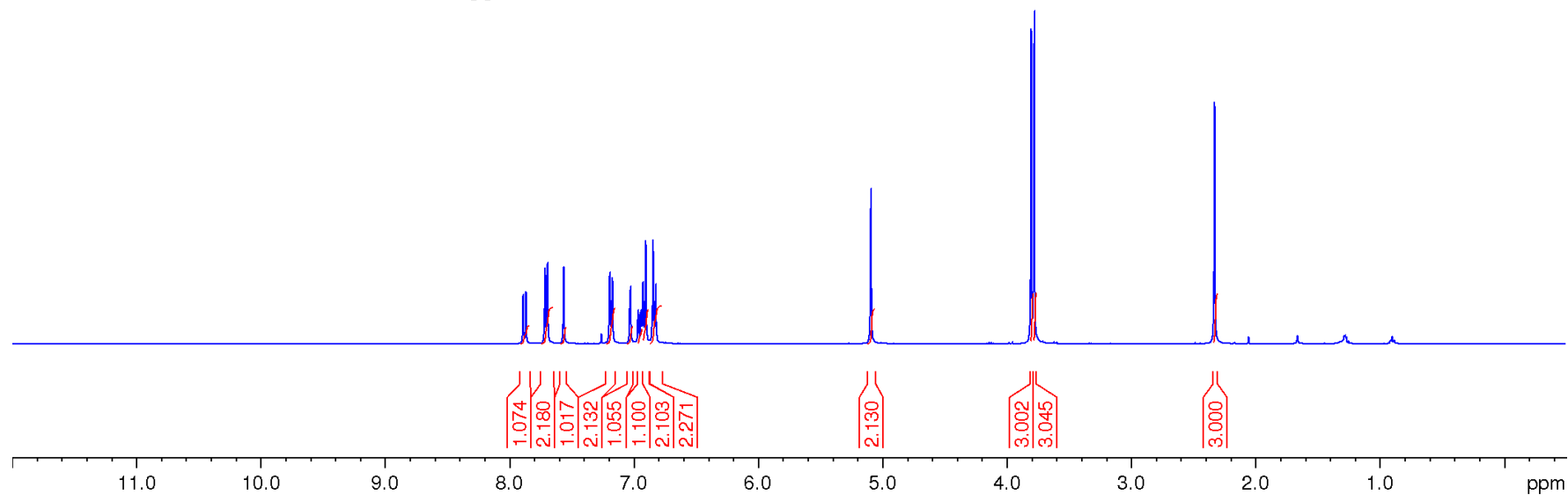
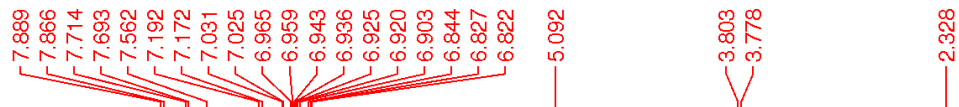
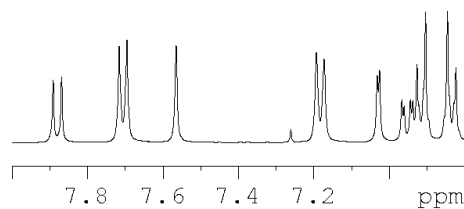
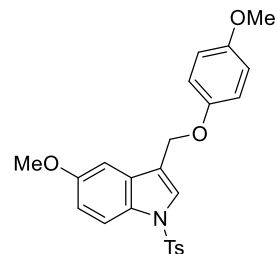
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )





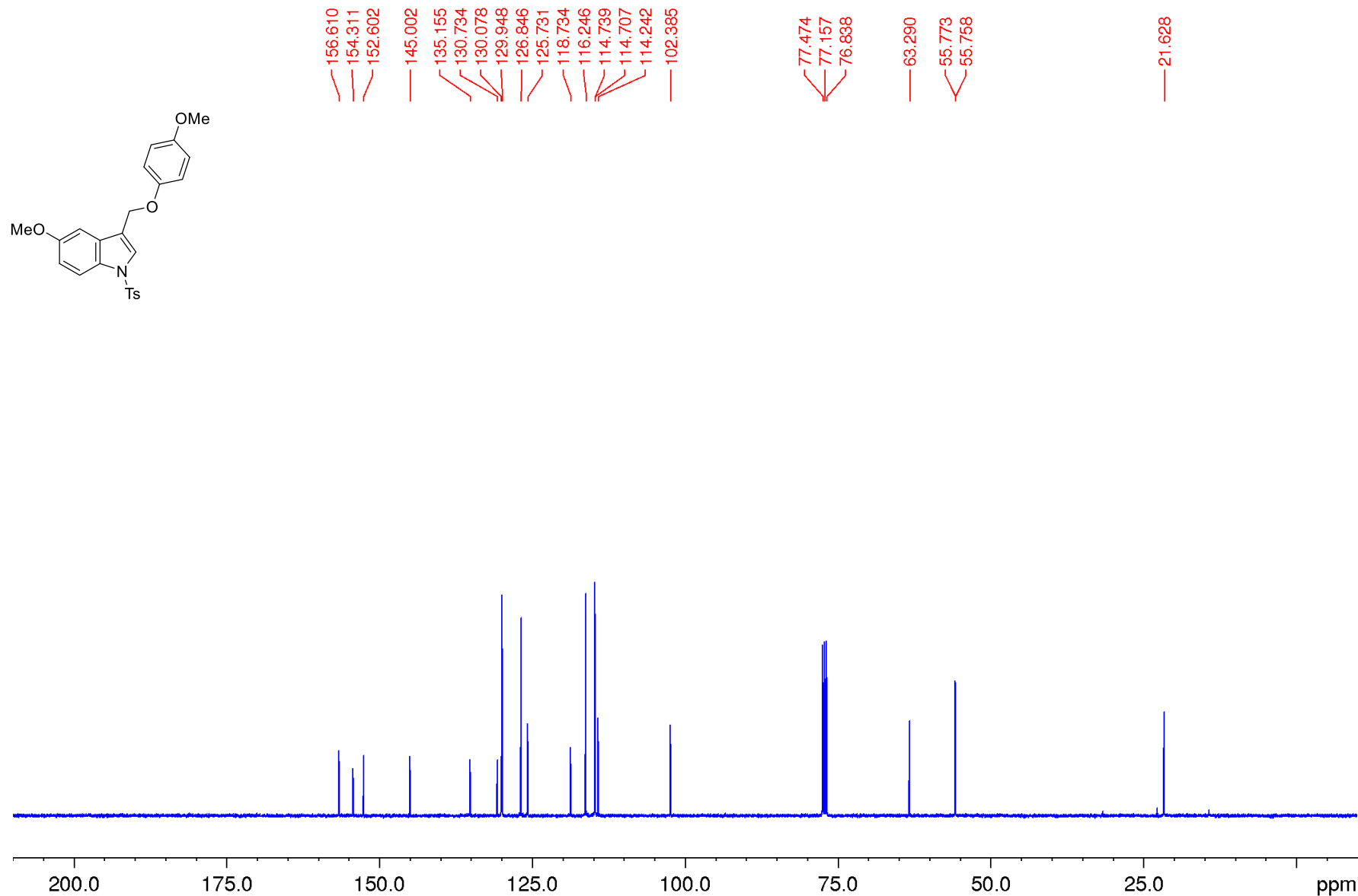
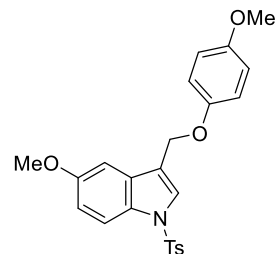
5-methoxy-3-((4-methoxyphenoxy)methyl)-1-tosyl-1H-indole **4da**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )

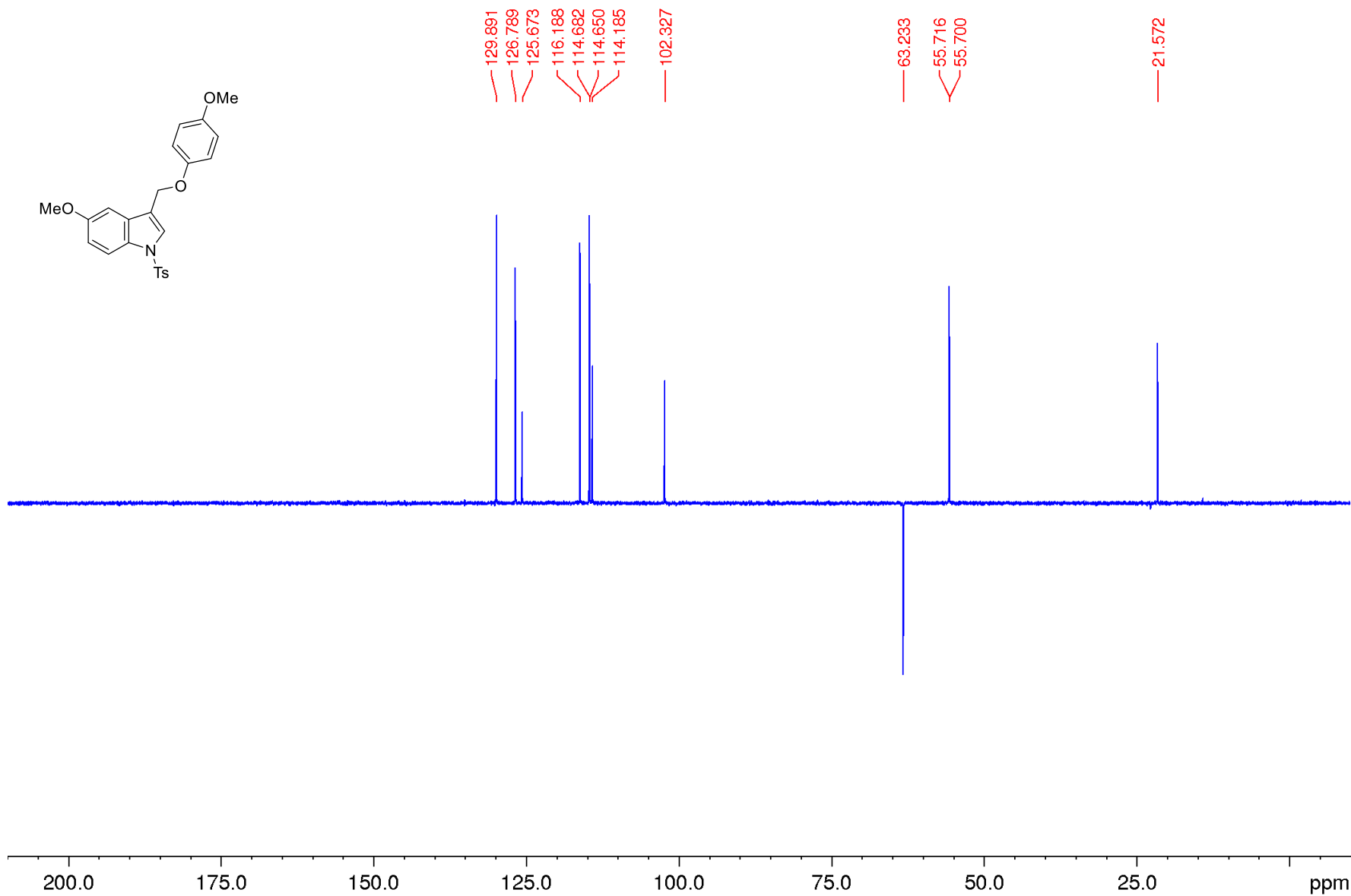
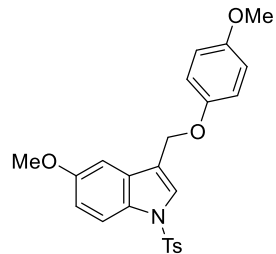


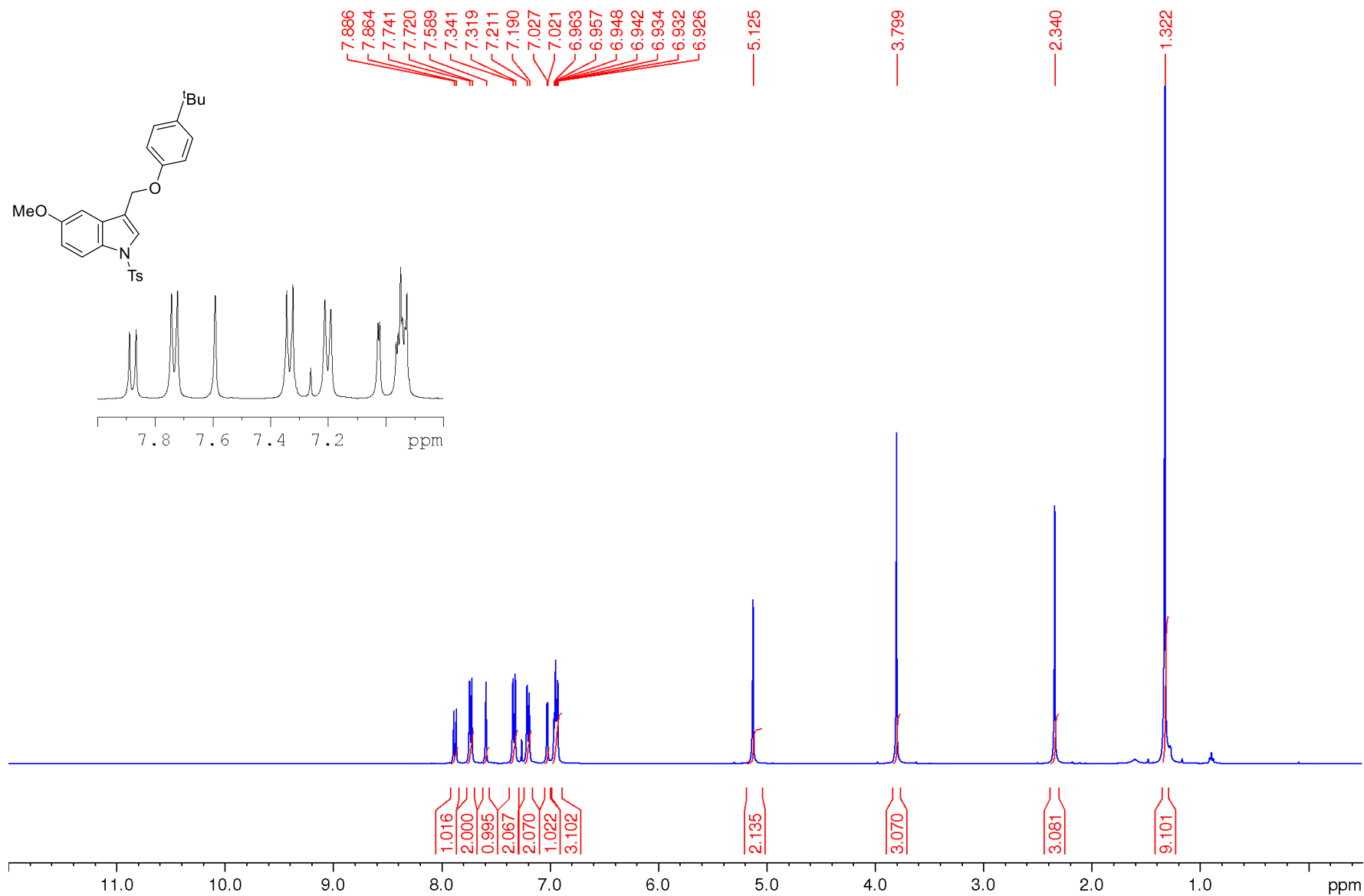
5-methoxy-3-((4-methoxyphenoxy)methyl)-1-tosyl-1H-indole **4da**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



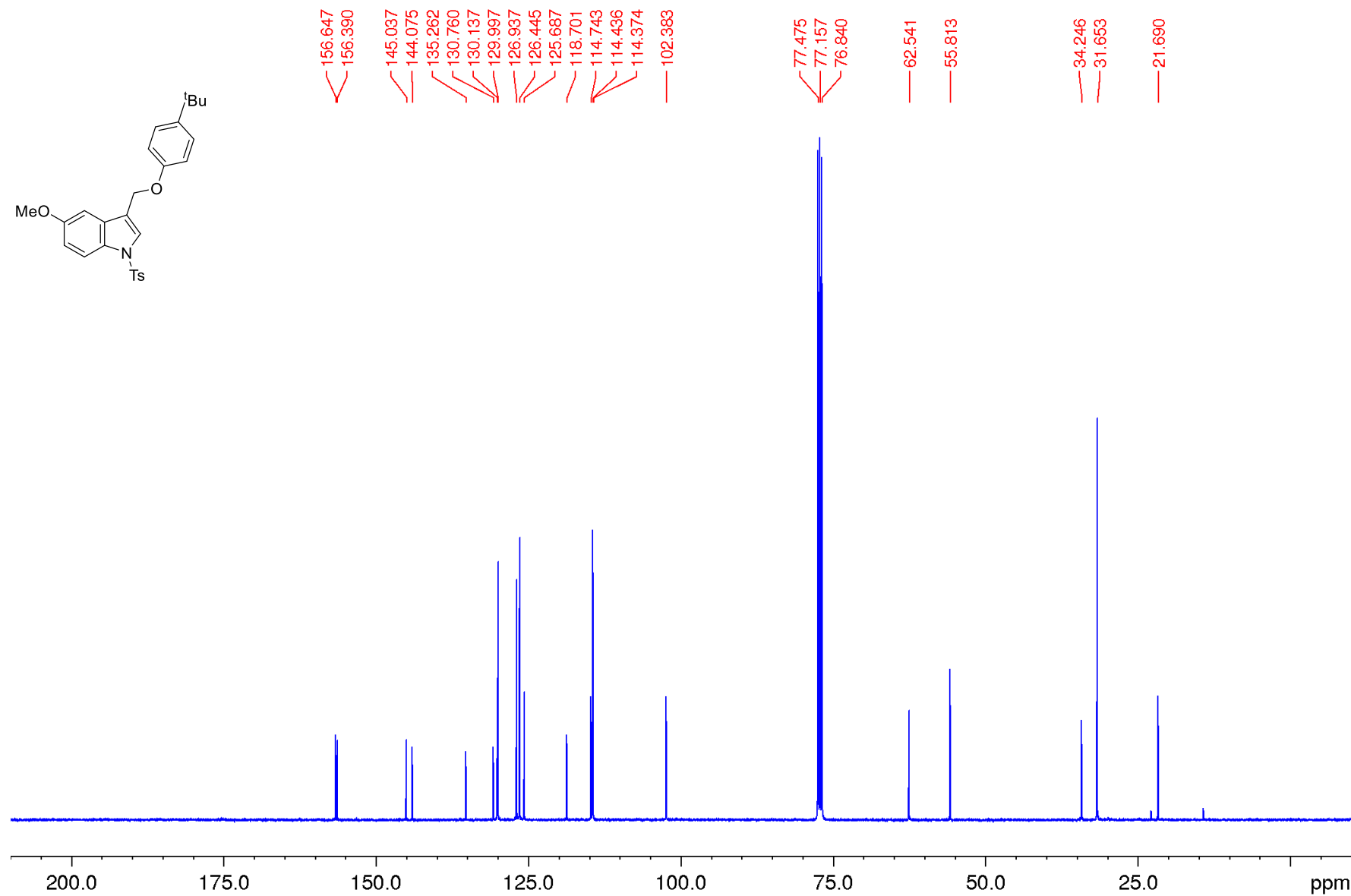
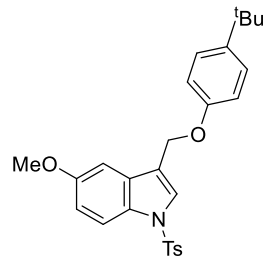


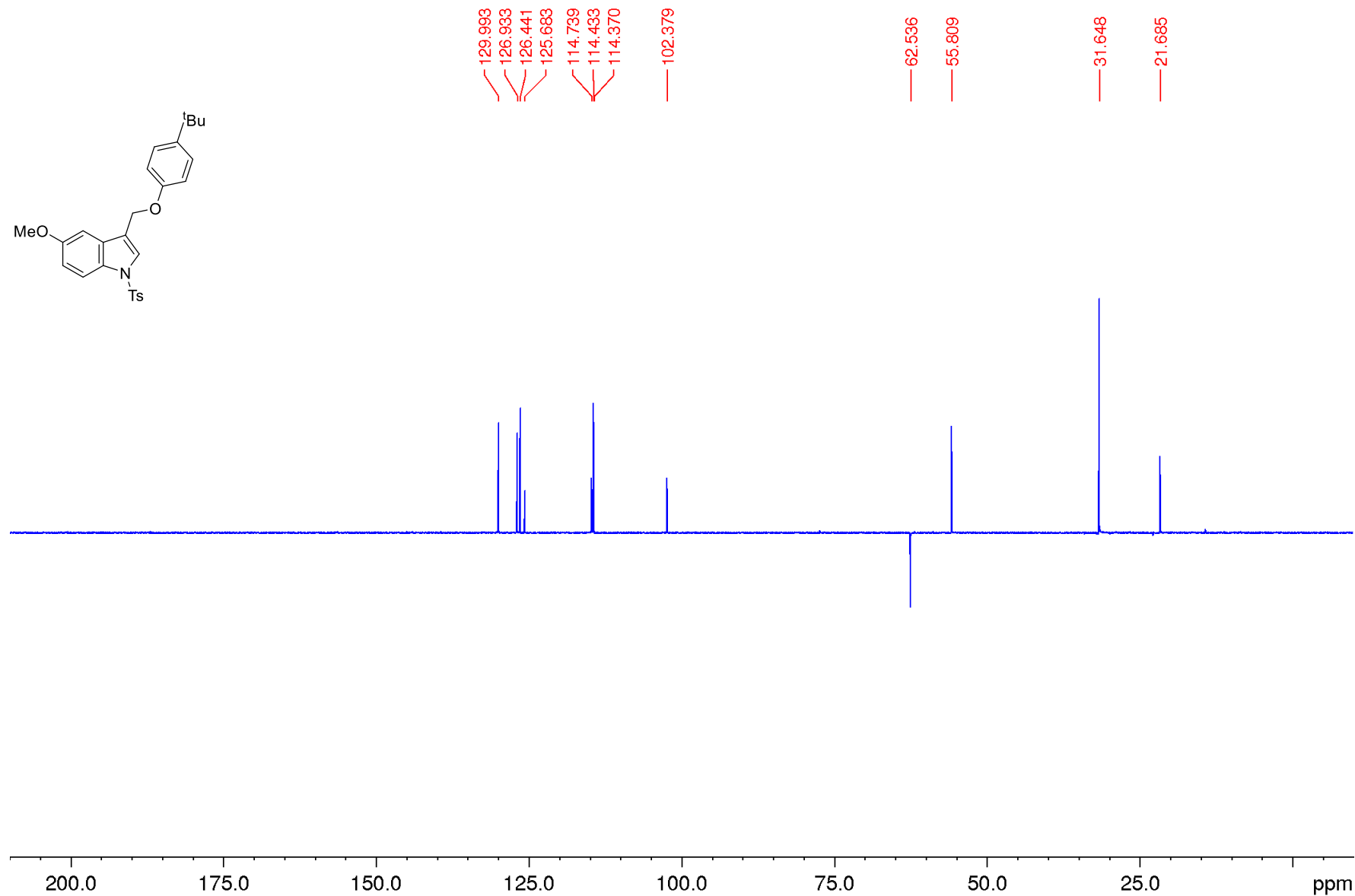
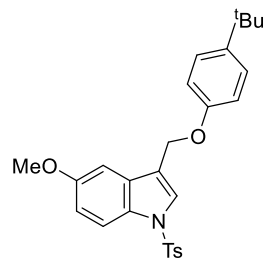




3-((4-(*tert*-butyl)phenoxy)methyl)-5-methoxy-1-tosyl-1*H*-indole **4db**

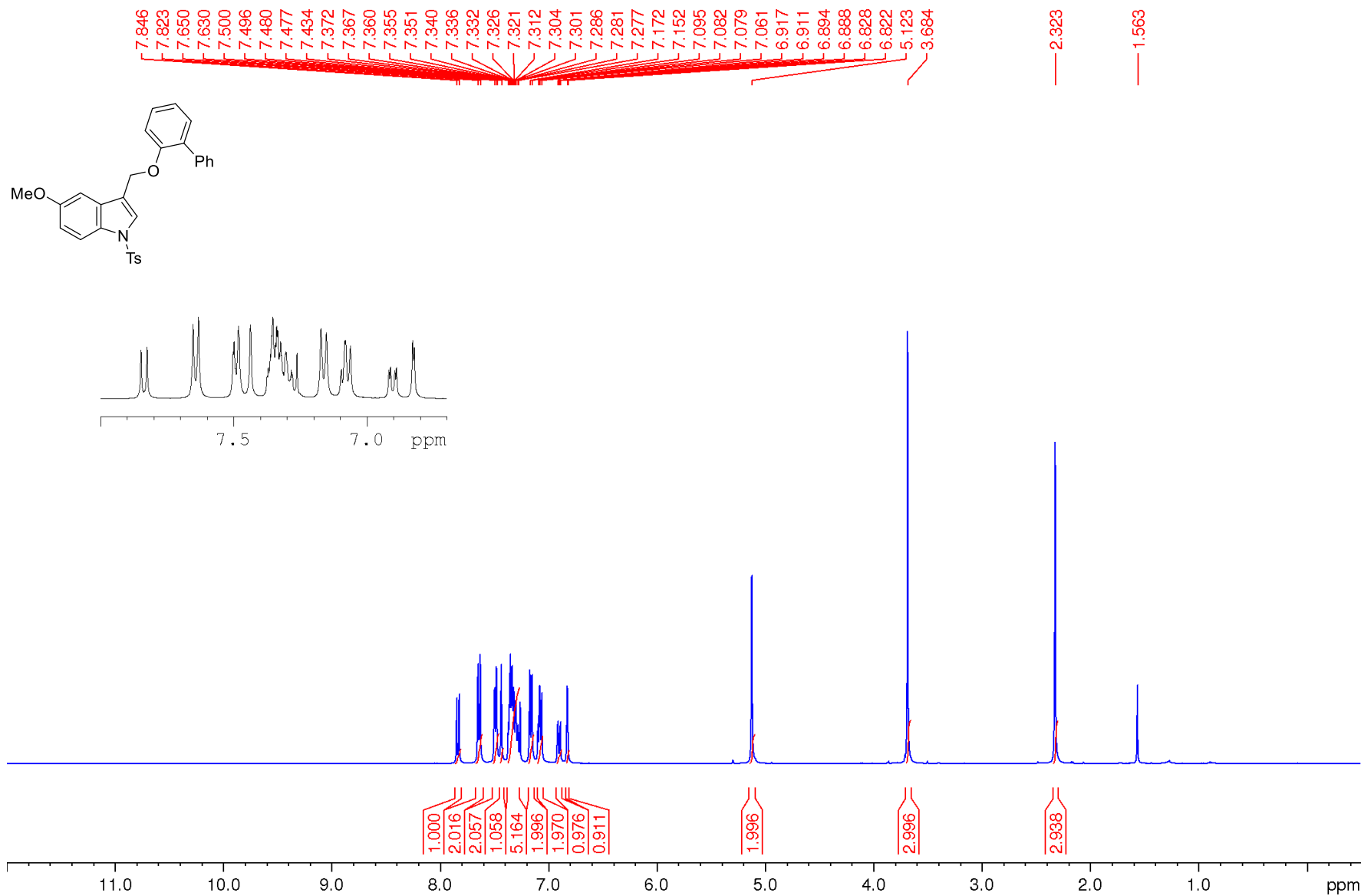
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )





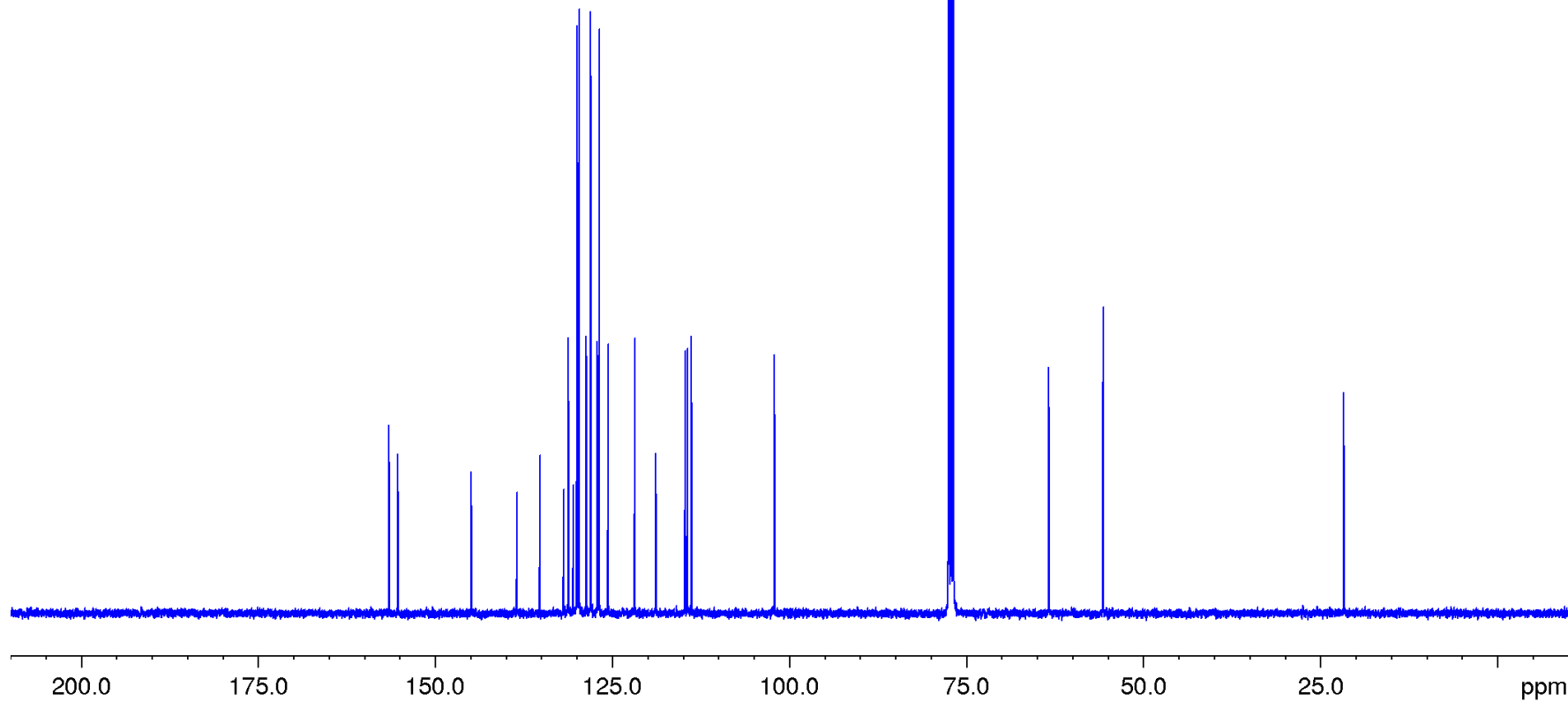
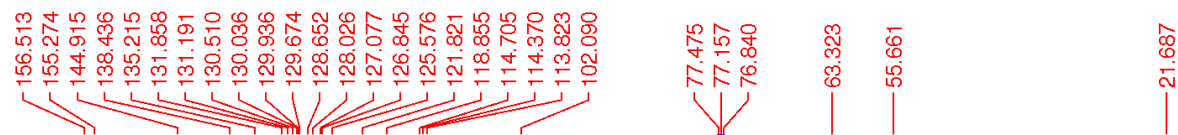
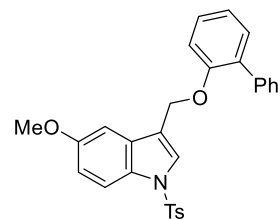
3-([1,1'-biphenyl]-2-yloxy)methyl)-5-methoxy-1-tosyl-1H-indole **4dc**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



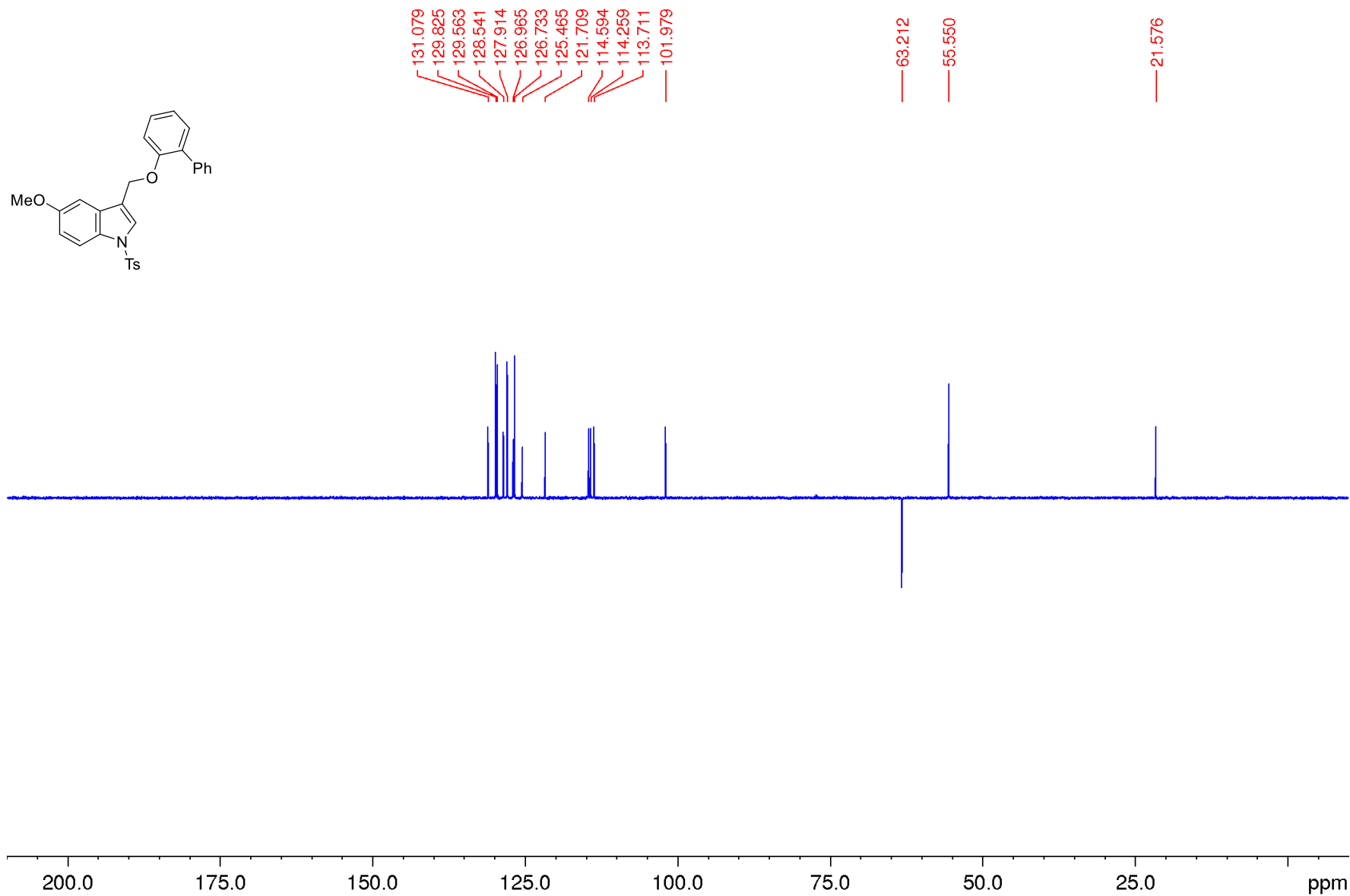
3-([1,1'-biphenyl]-2-yloxy)methyl)-5-methoxy-1H-indole **4dc**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



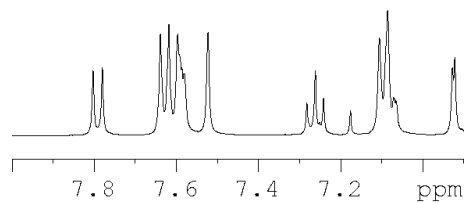
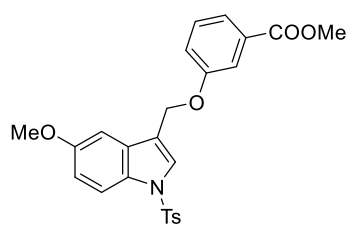
3-([1,1'-biphenyl]-2-yloxy)methyl)-5-methoxy-1-tosyl-1H-indole **4dc**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



methyl 3-((5-methoxy-1-tosyl-1H-indol-3-yl)methoxy)benzoate **4de**

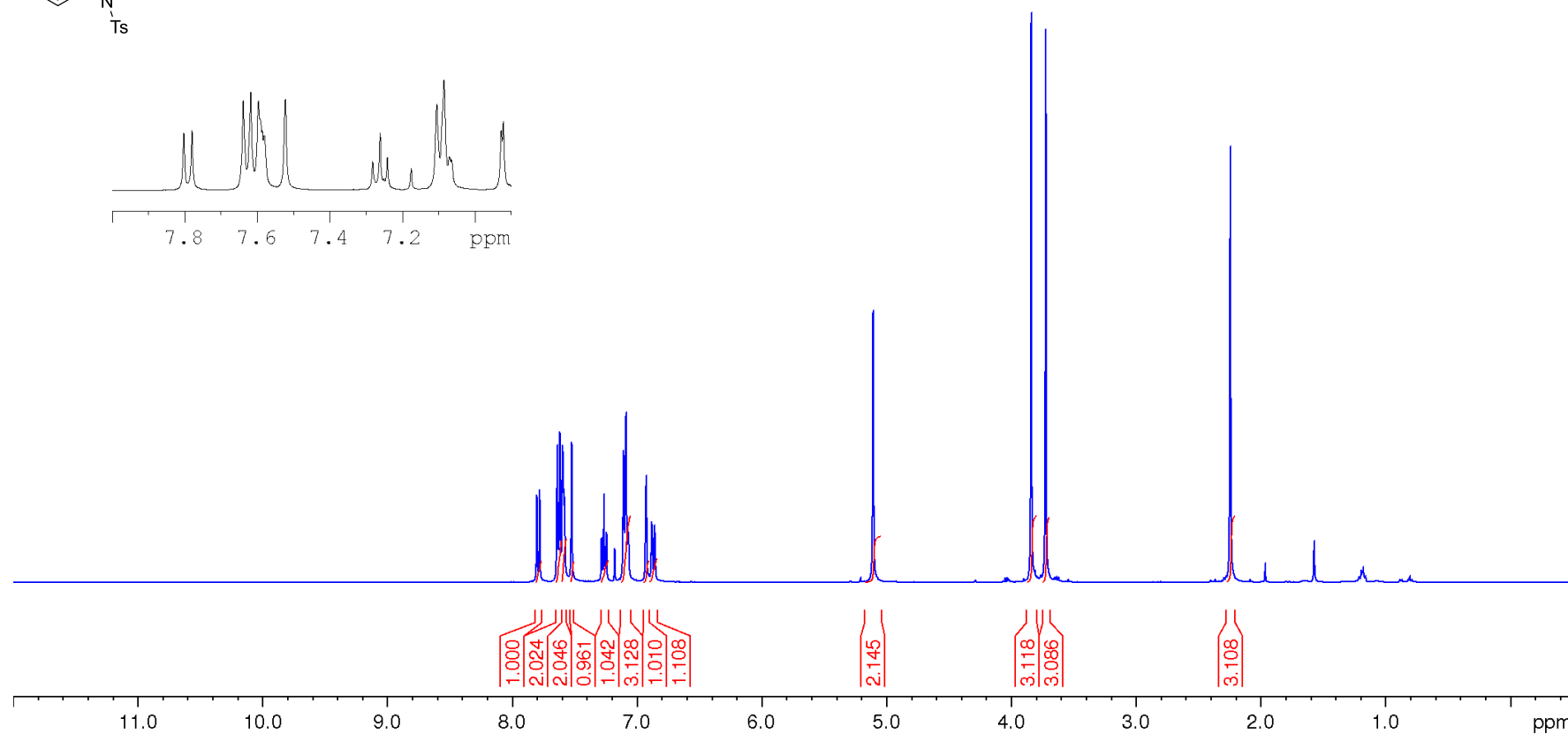
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



7.801  
7.778  
7.637  
7.616  
7.595  
7.591  
7.585  
7.580  
7.578  
7.521  
7.282  
7.262  
7.252  
7.242  
7.176  
7.106  
7.086  
7.071  
7.065  
6.928  
6.922  
6.881  
6.875  
6.858  
6.852  
5.105

3.837  
3.722

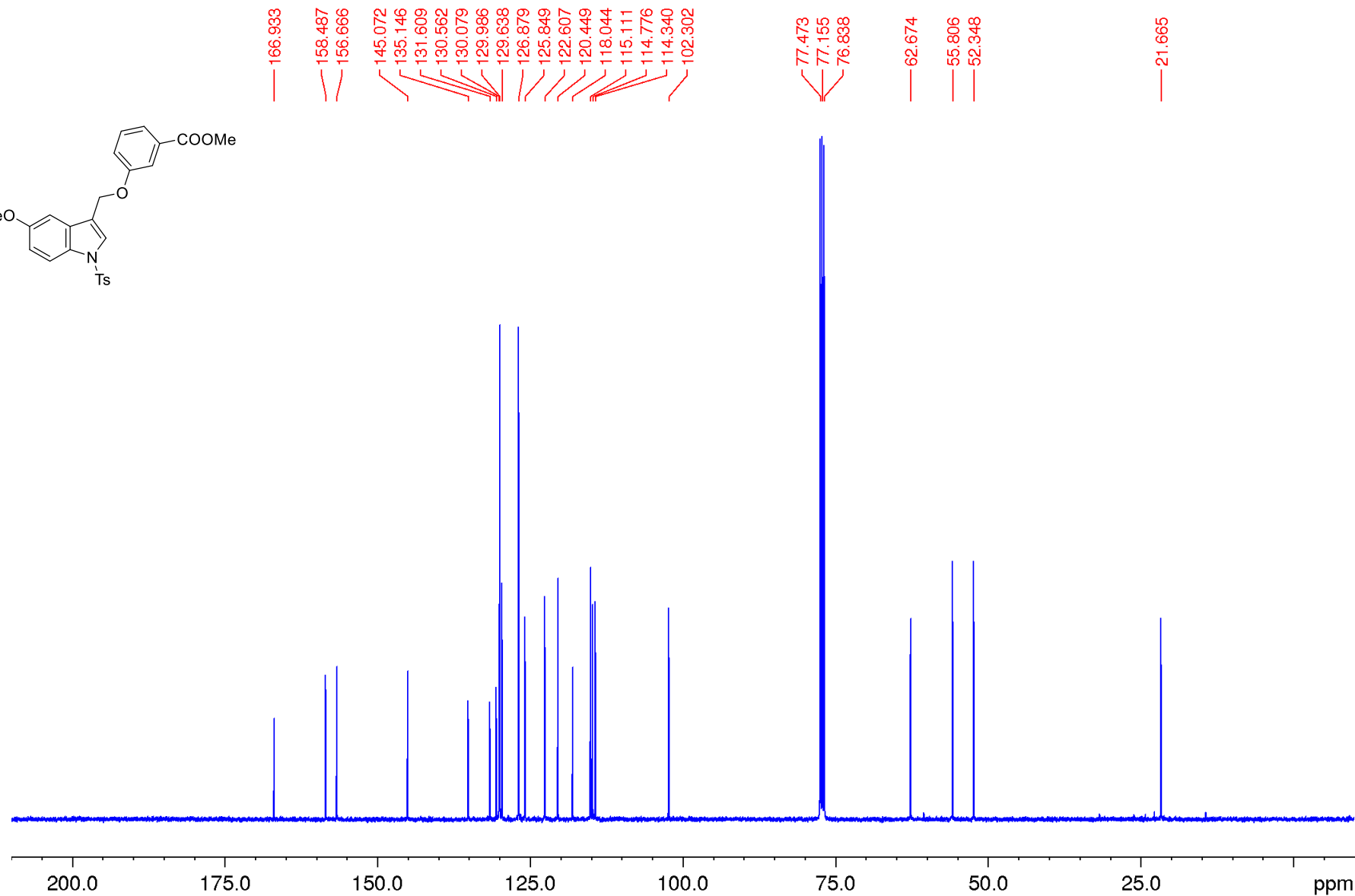
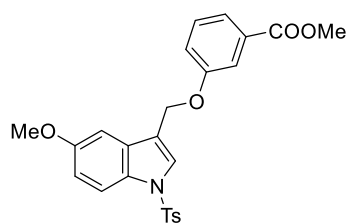
2.241





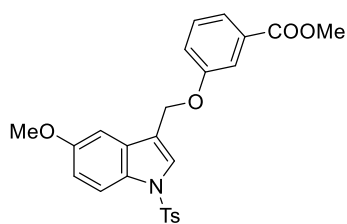
methyl 3-((5-methoxy-1-tosyl-1H-indol-3-yl)methoxy)benzoate **4de**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



methyl 3-((5-methoxy-1-tosyl-1H-indol-3-yl)methoxy)benzoate **4de**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



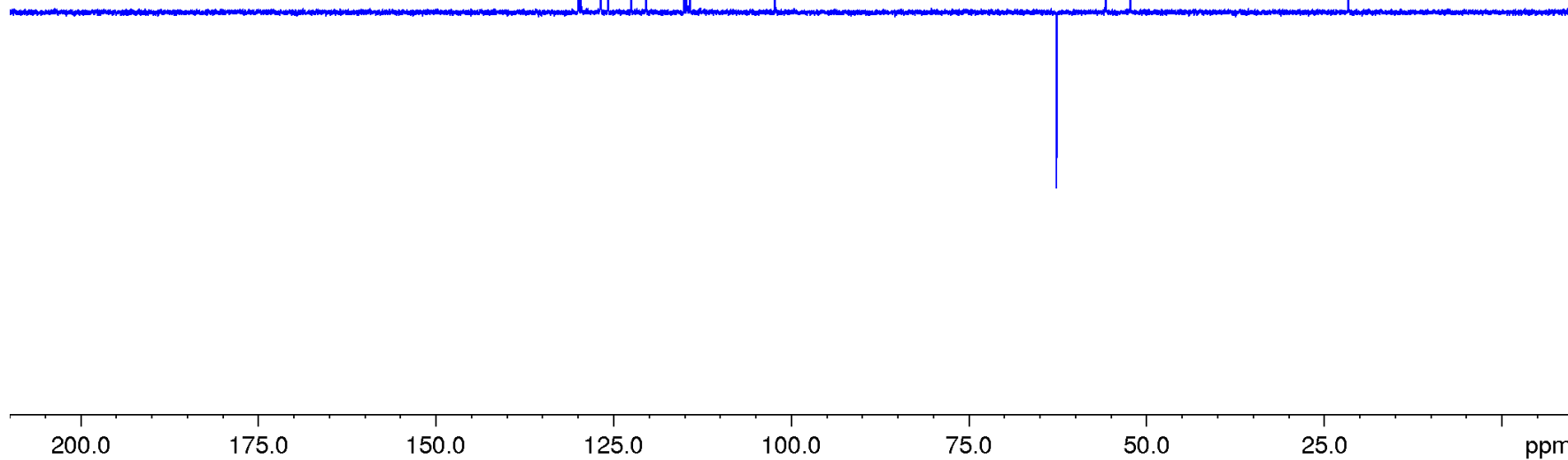
129.898  
129.549  
126.791  
125.760  
122.519  
120.361  
115.023  
114.688  
114.251  
102.214

62.586

55.717

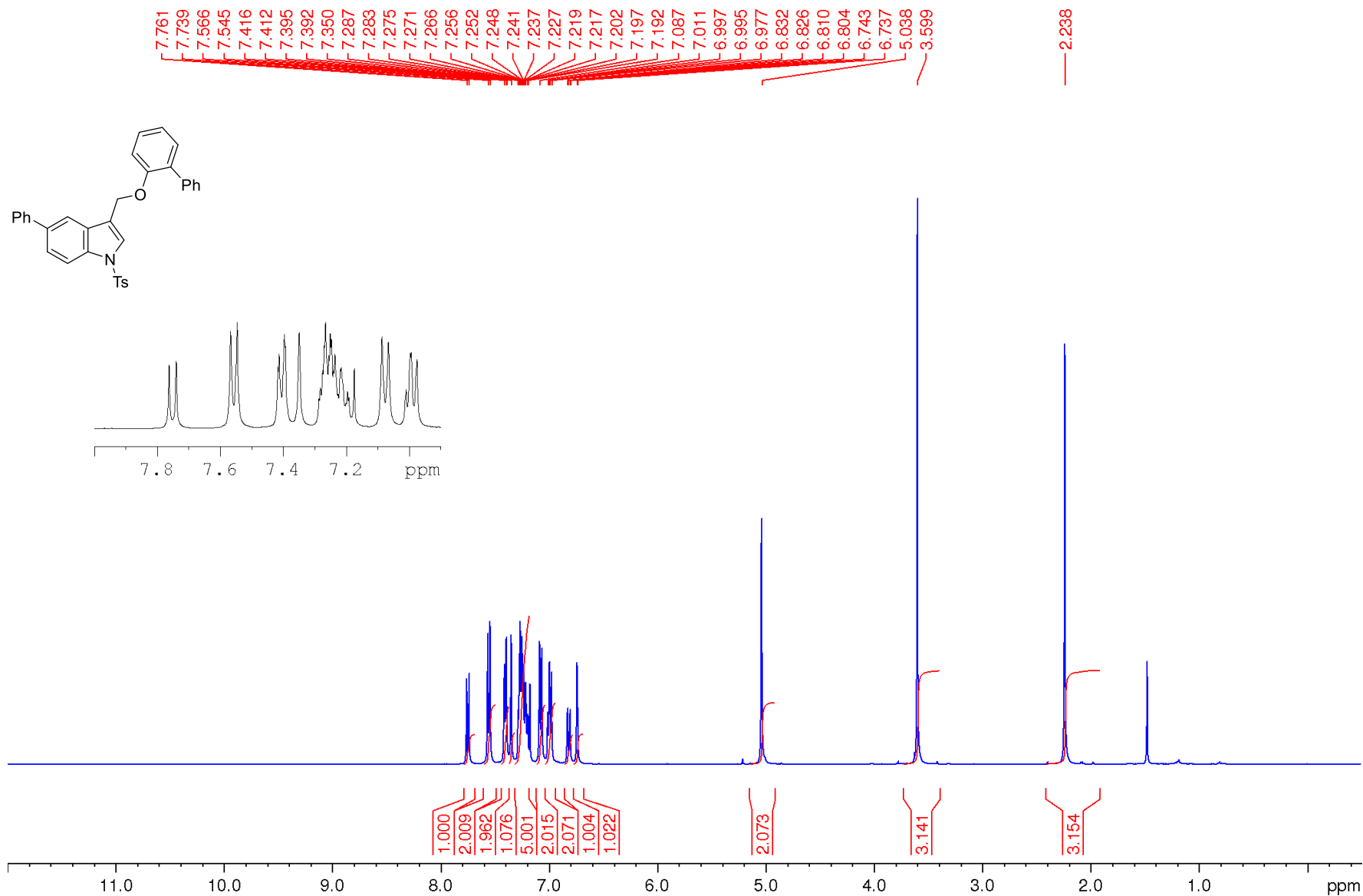
52.260

21.576



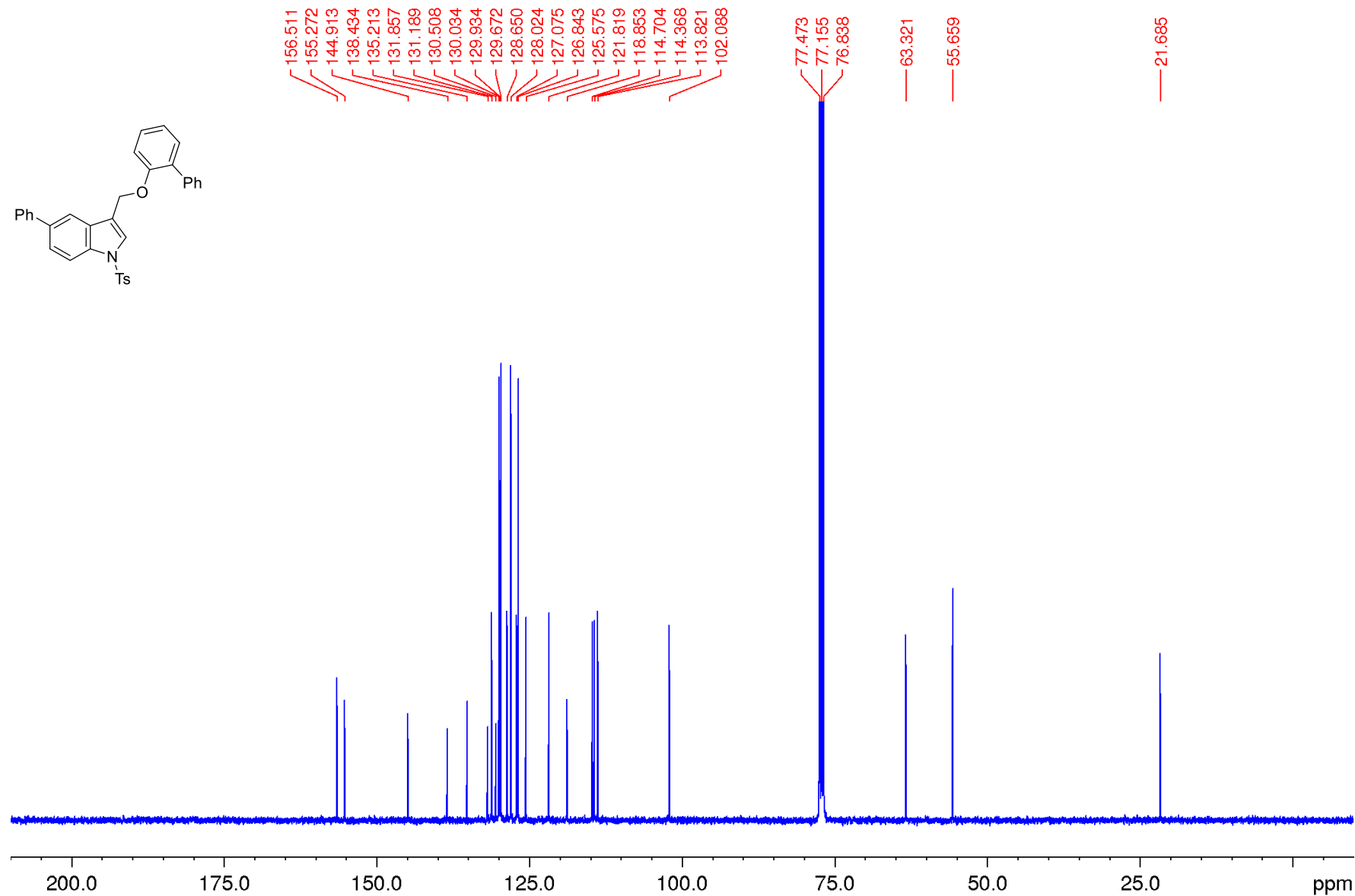
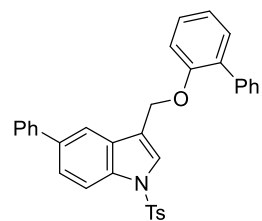
3-([1,1'-biphenyl]-2-yloxy)methyl)-5-phenyl-1-tosyl-1H-indole **4ed**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



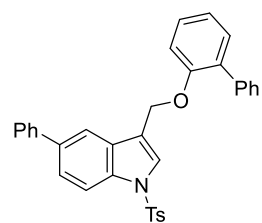
3-([1,1'-biphenyl]-2-yloxy)methyl)-5-phenyl-1-tosyl-1H-indole **4ed**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



3-((1,1'-biphenyl)-2-yloxy)methyl)-5-phenyl-1-tosyl-1H-indole **4ed**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)

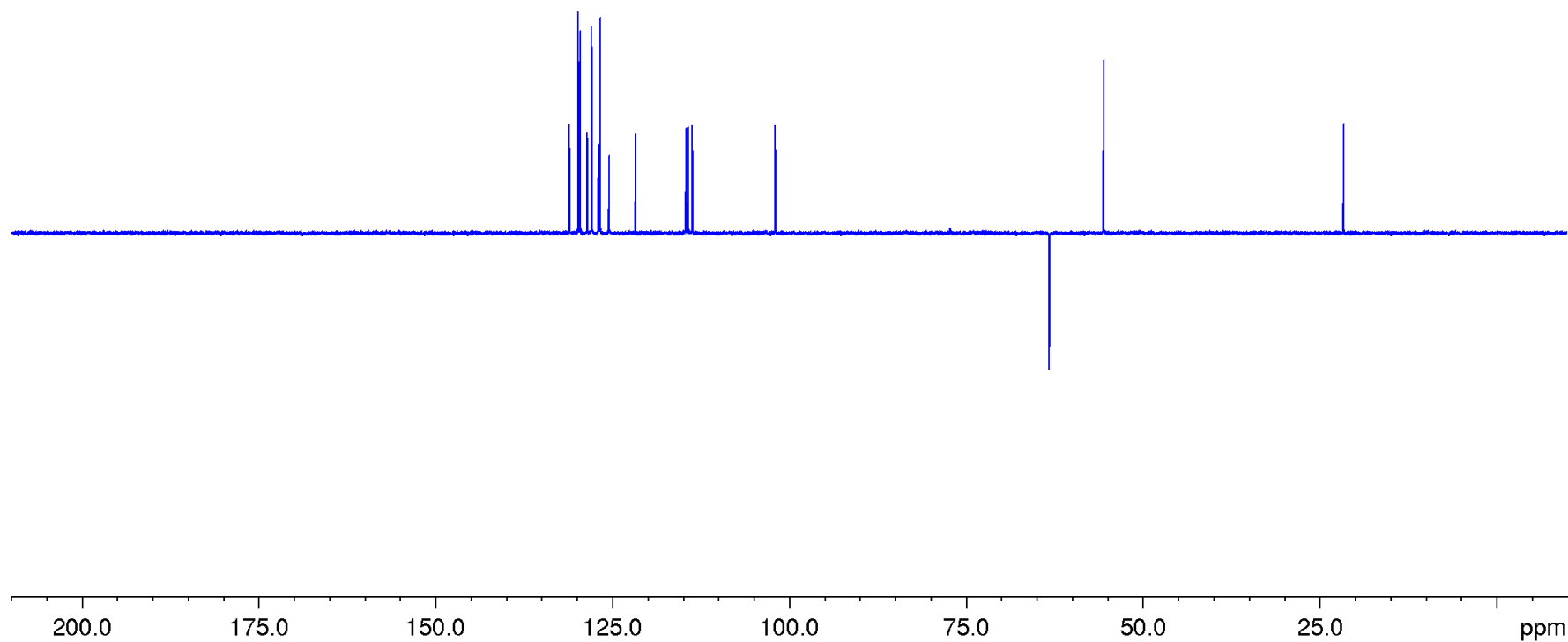


131.079  
129.825  
129.563  
128.541  
127.914  
126.965  
126.733  
125.465  
121.709  
114.594  
114.259  
113.711  
101.979

63.212

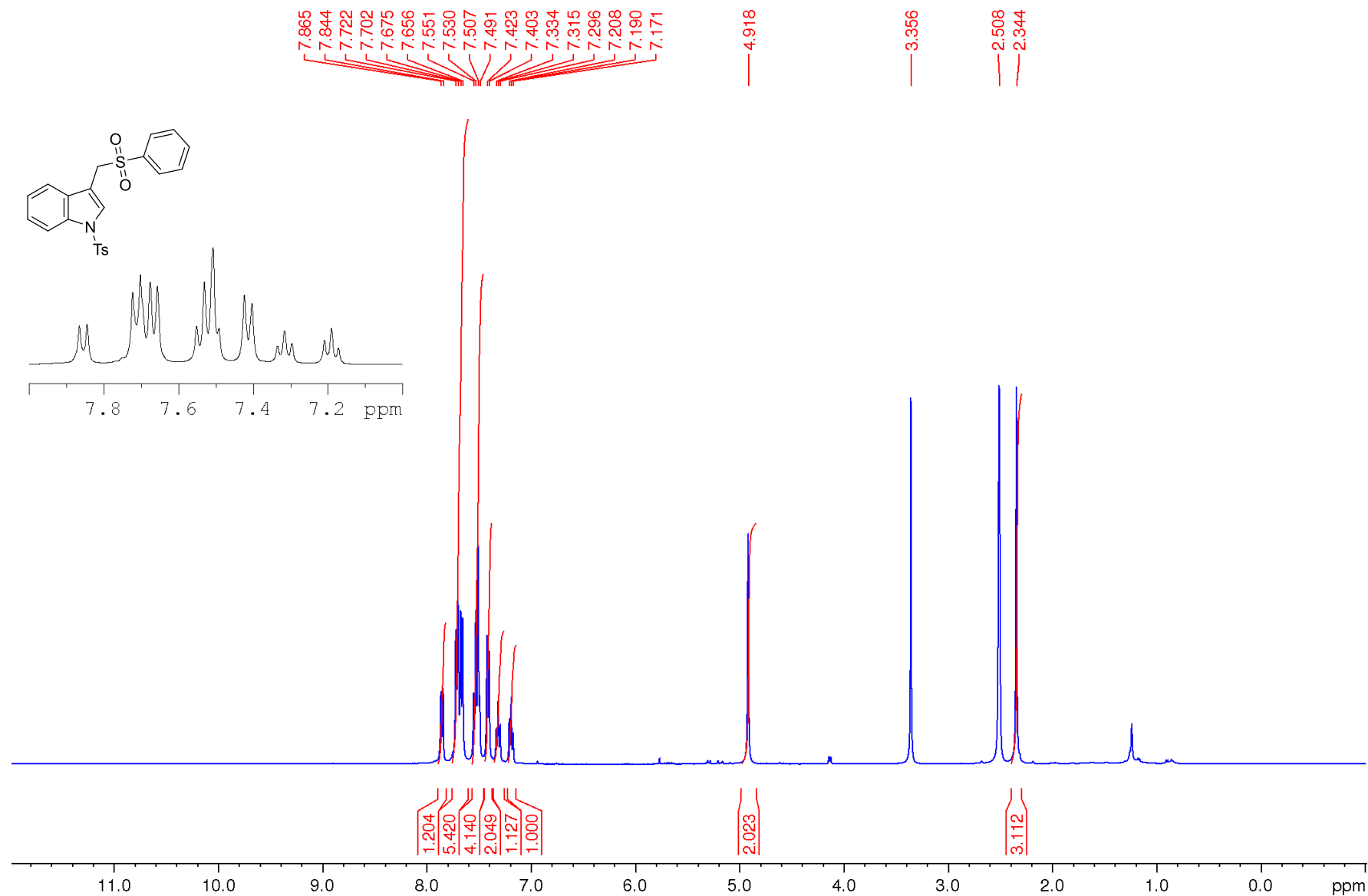
55.550

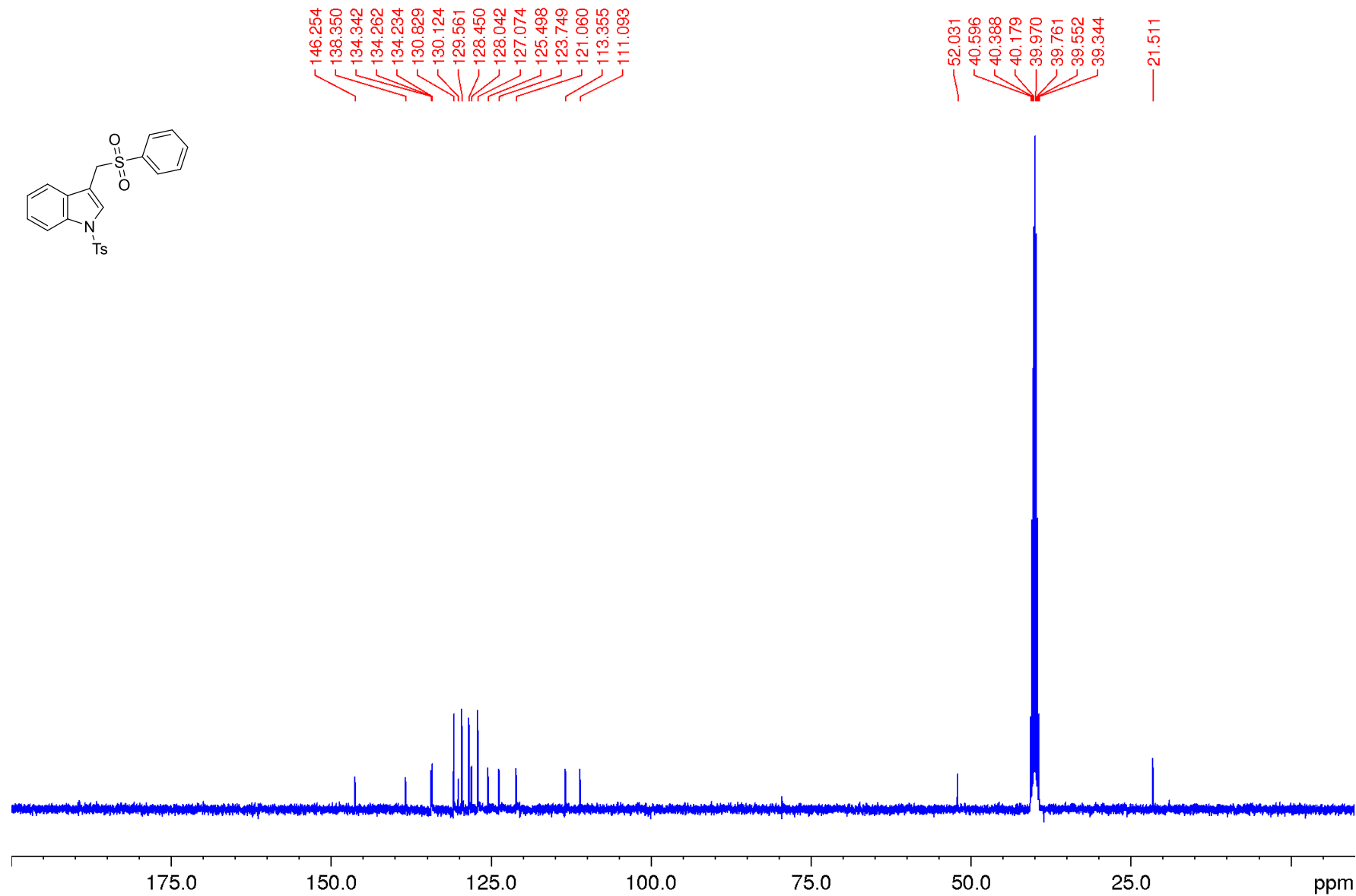
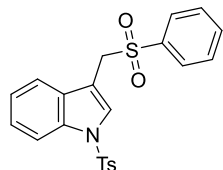
21.576

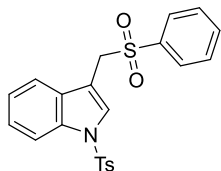


3-((phenylsulfonyl)methyl)-1-tosyl-1*H*-indole **9ab**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{DMSO}-d_6$ )



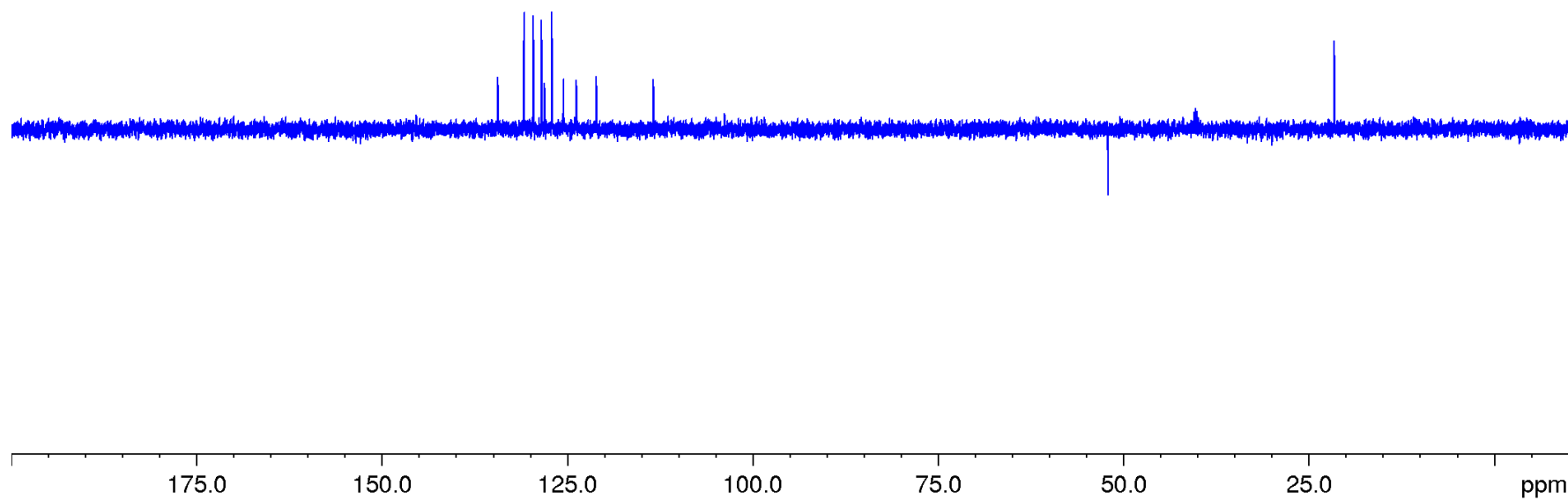




134.345  
130.831  
129.564  
128.453  
128.045  
127.077  
125.500  
123.752  
121.062  
113.358

52.029

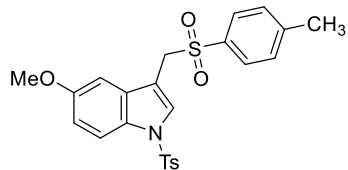
21.509





5-methoxy-1-tosyl-3-(tosylmethyl)-1*H*-indole **9da**

<sup>1</sup>H NMR-spectrum (400.13 MHz) (CDCl<sub>3</sub>)

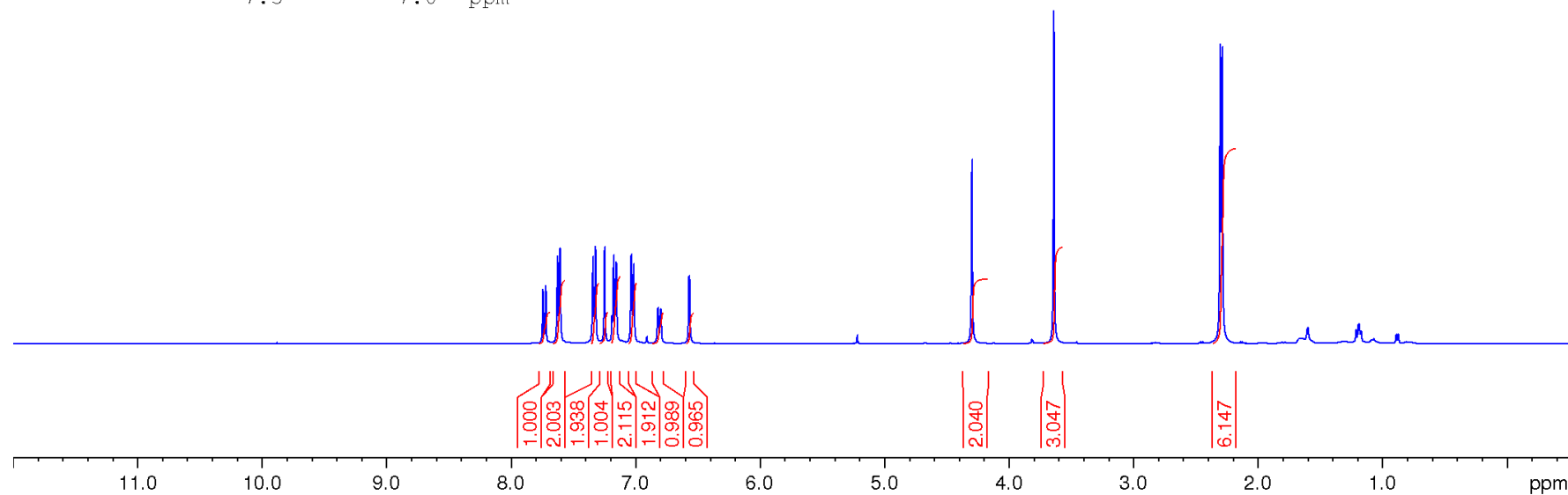
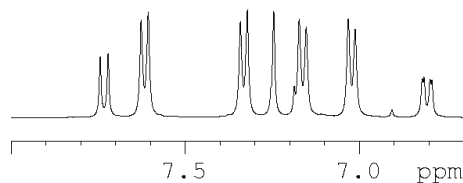


7.742  
7.719  
7.624  
7.604  
7.340  
7.319  
7.246  
7.187  
7.173  
7.153  
7.032  
7.012  
6.820  
6.814  
6.797  
6.792  
6.568  
6.563

4.295

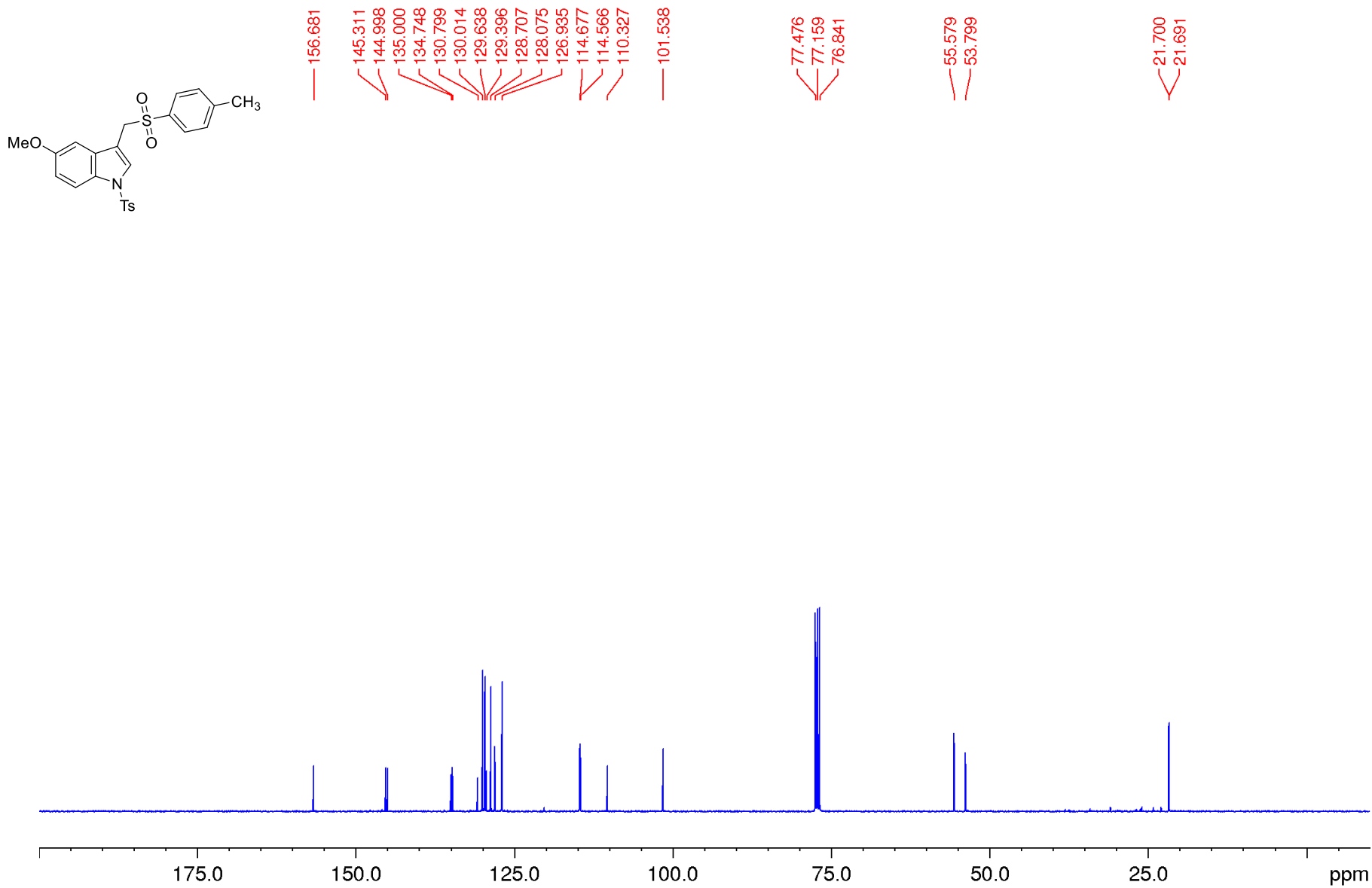
3.637

2.300  
2.284



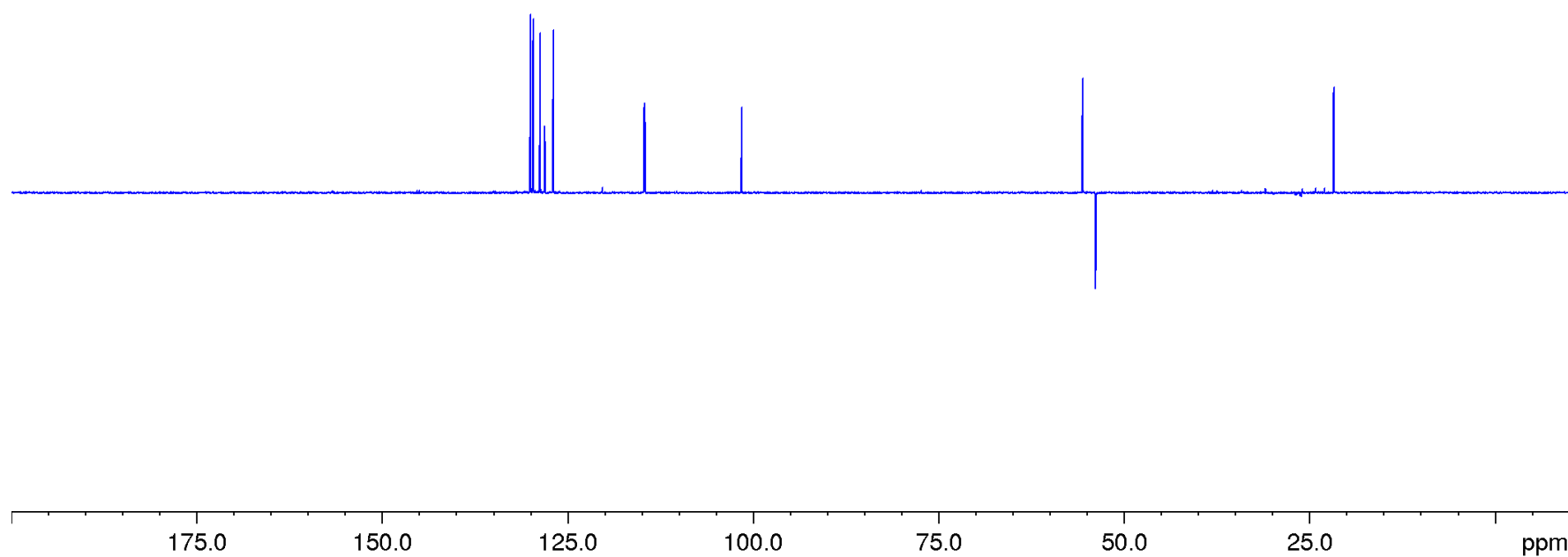
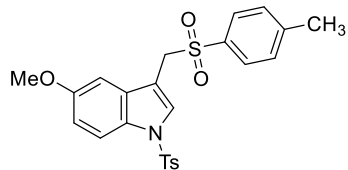
5-methoxy-1-tosyl-3-(tosylmethyl)-1*H*-indole **9da**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



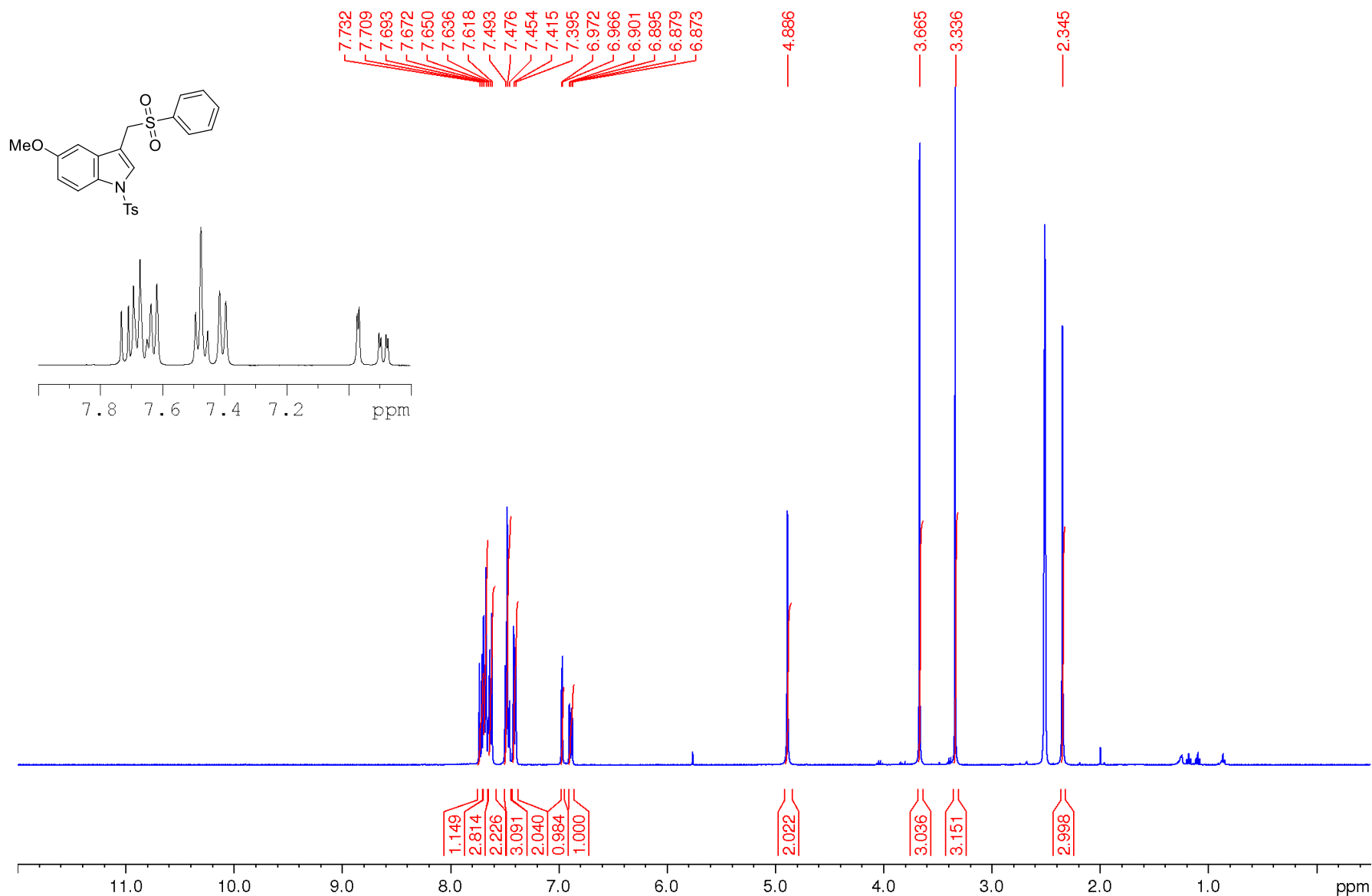
5-methoxy-1-tosyl-3-(tosylmethyl)-1*H*-indole **9da**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)



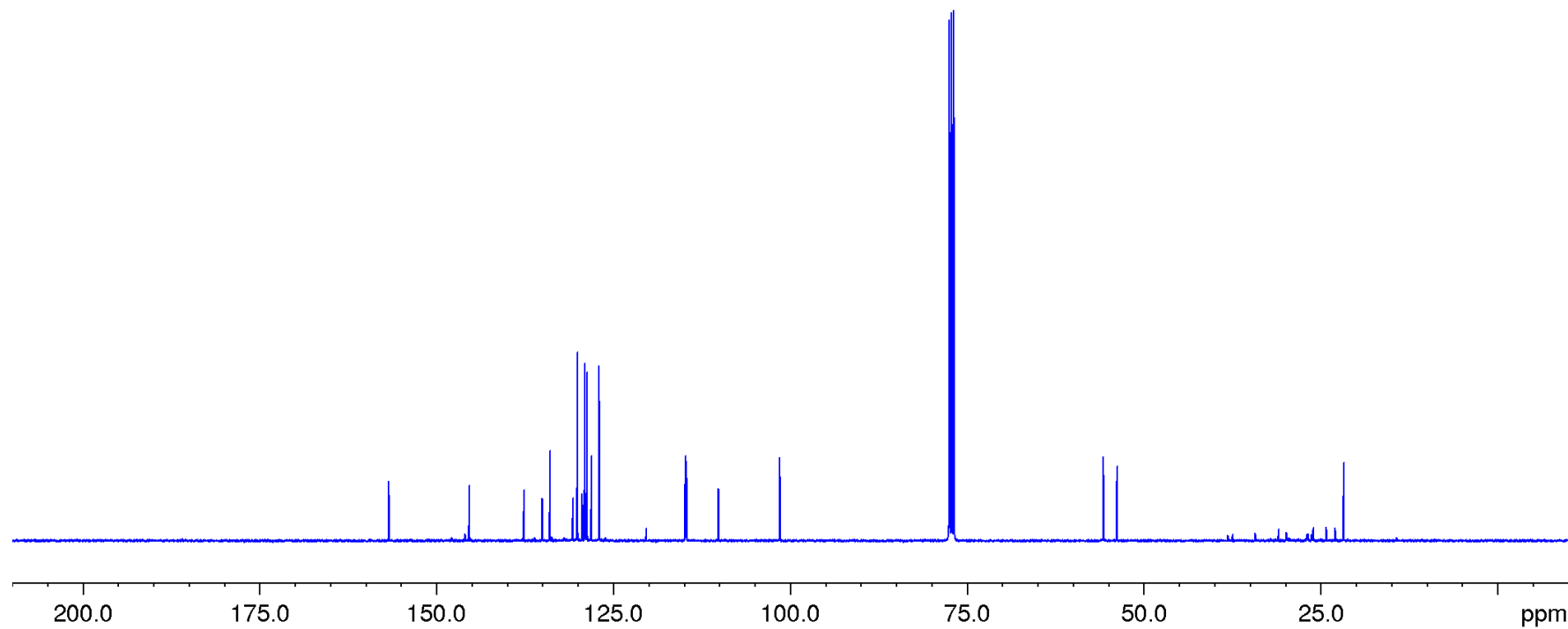
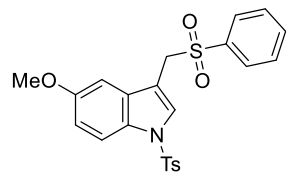
5-methoxy-3-((phenylsulfonyl)methyl)-1-tosyl-1H-indole **9db**

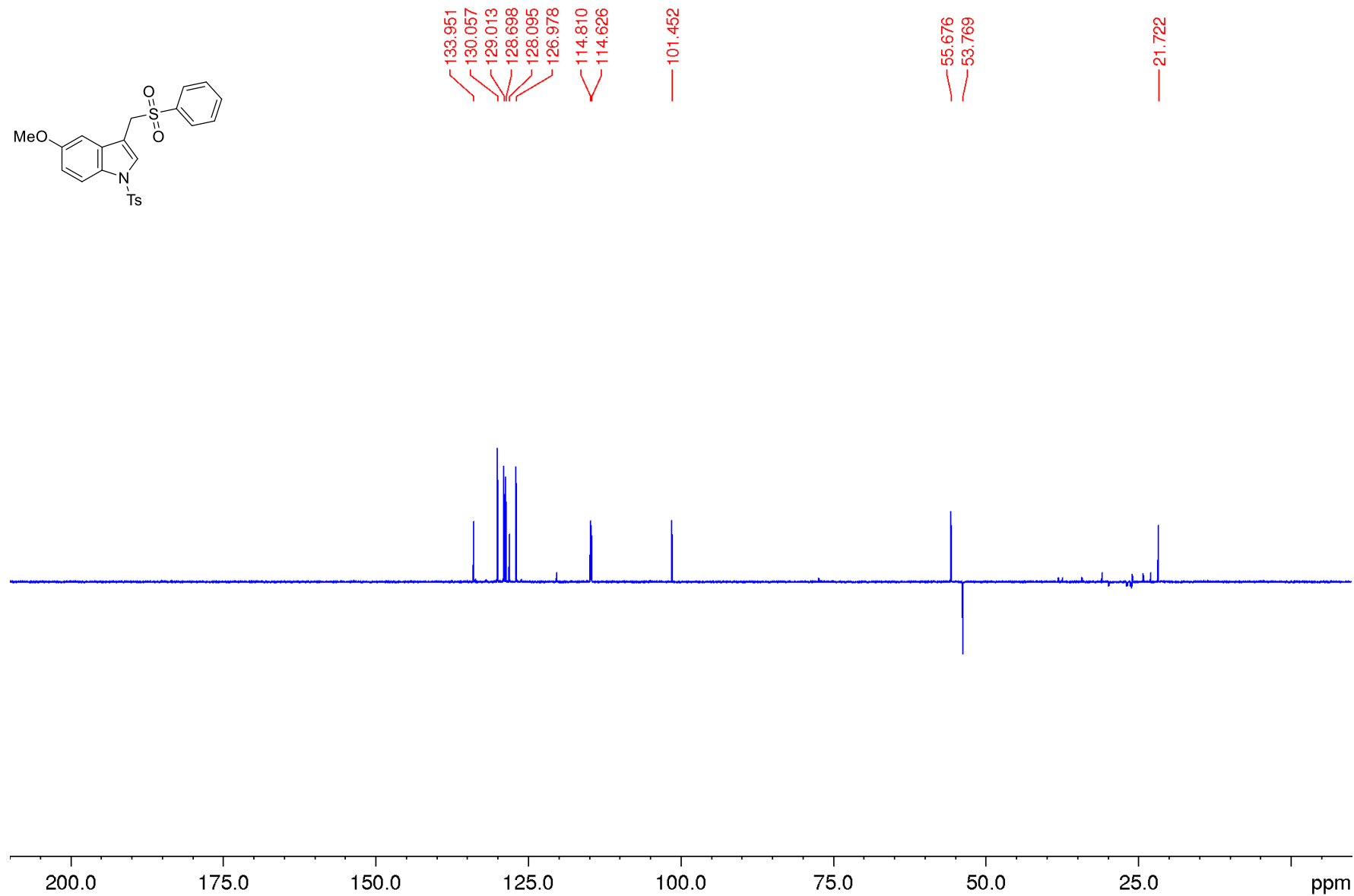
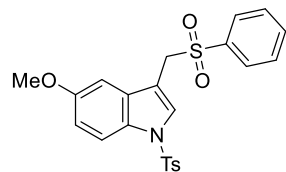
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



5-methoxy-3-((phenylsulfonyl)methyl)-1-tosyl-1H-indole **9db**

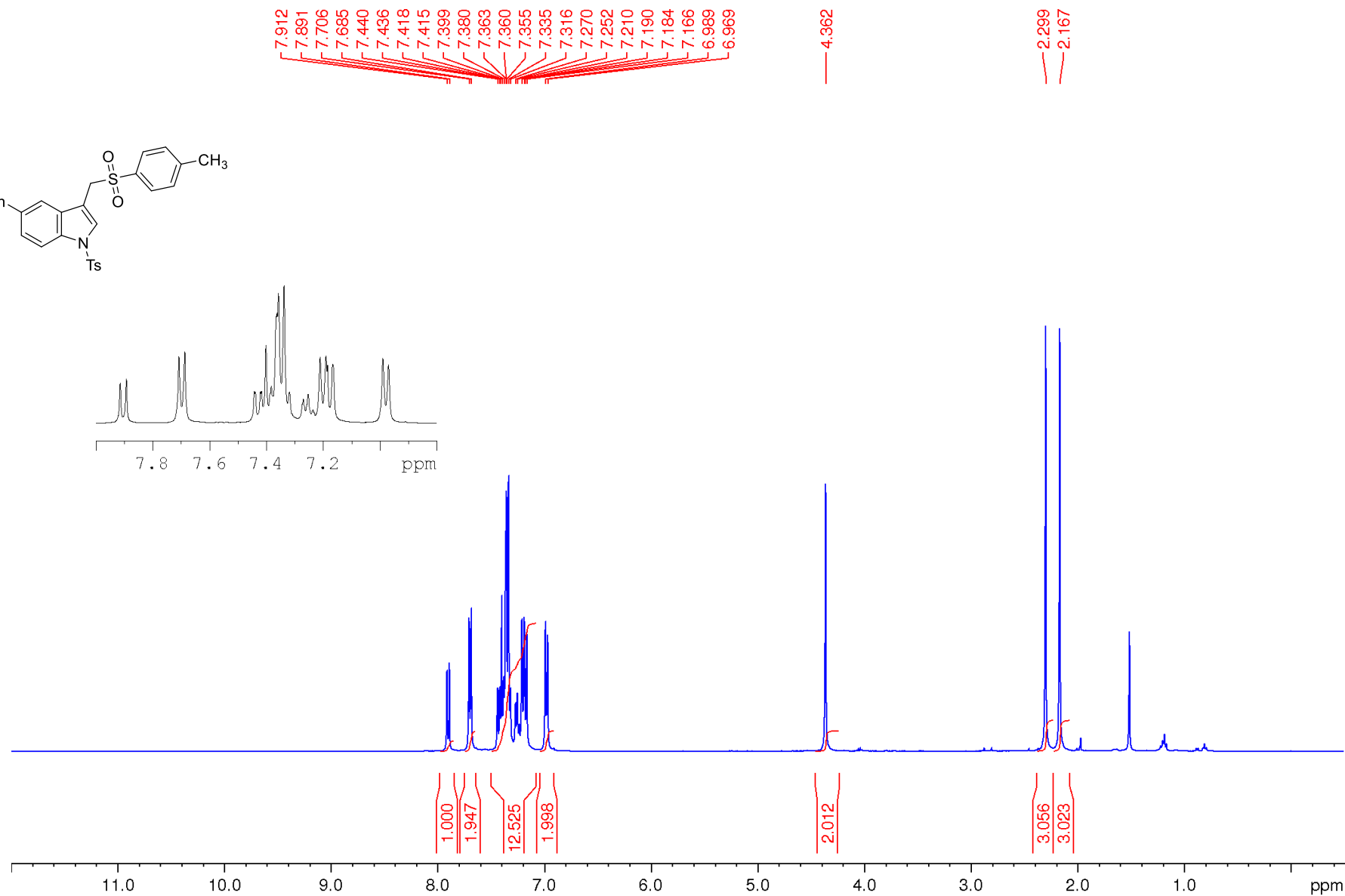
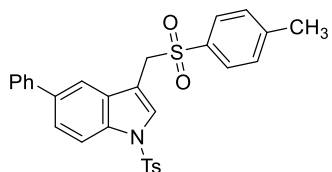
$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )

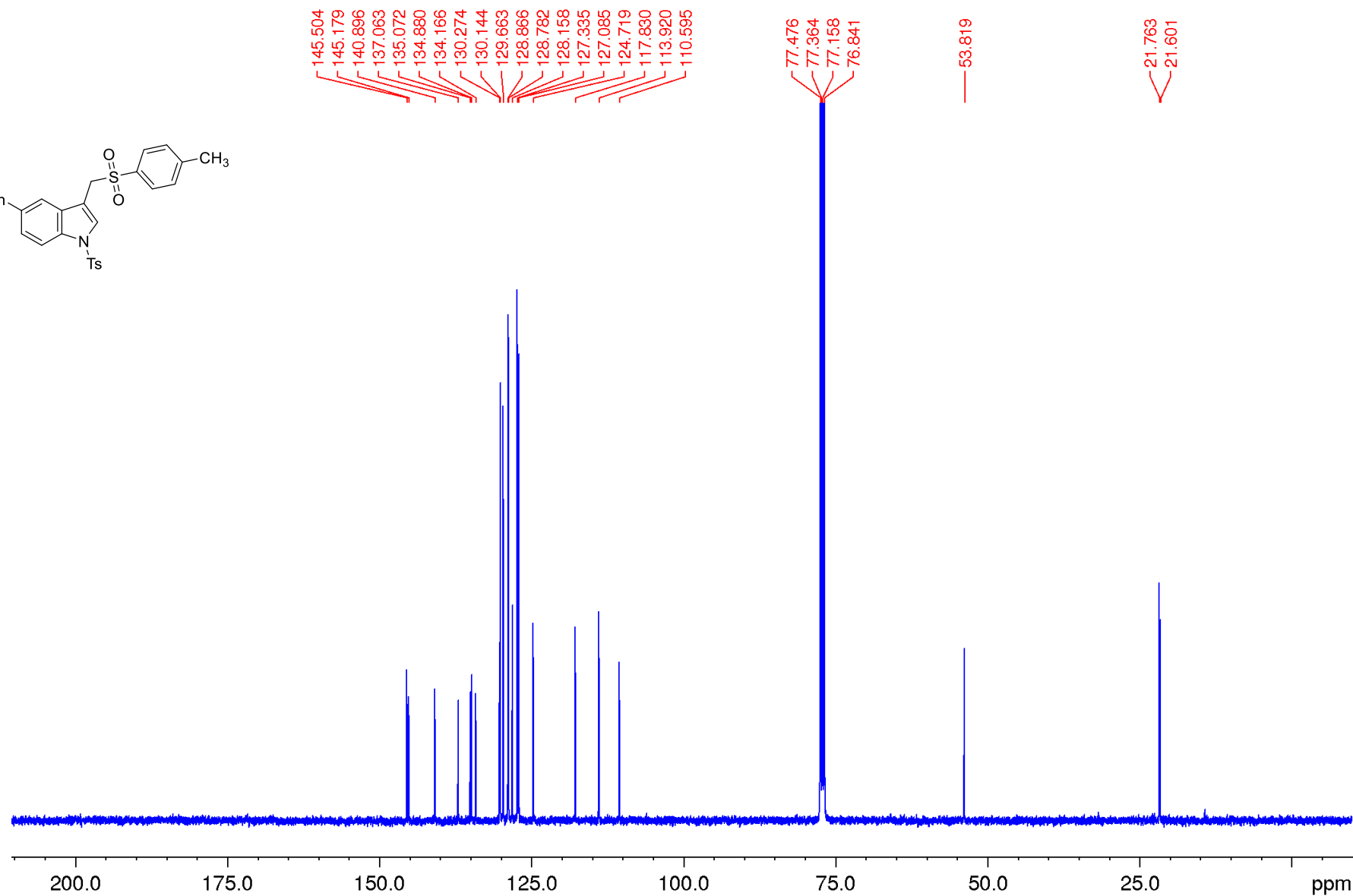
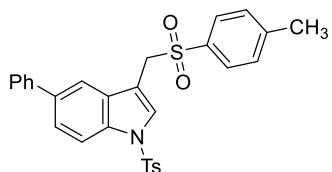




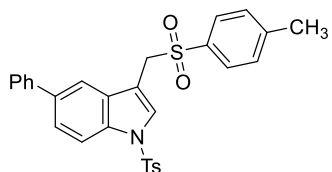
5-phenyl-1-tosyl-3-(tosylmethyl)-1H-indole **9ea**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )





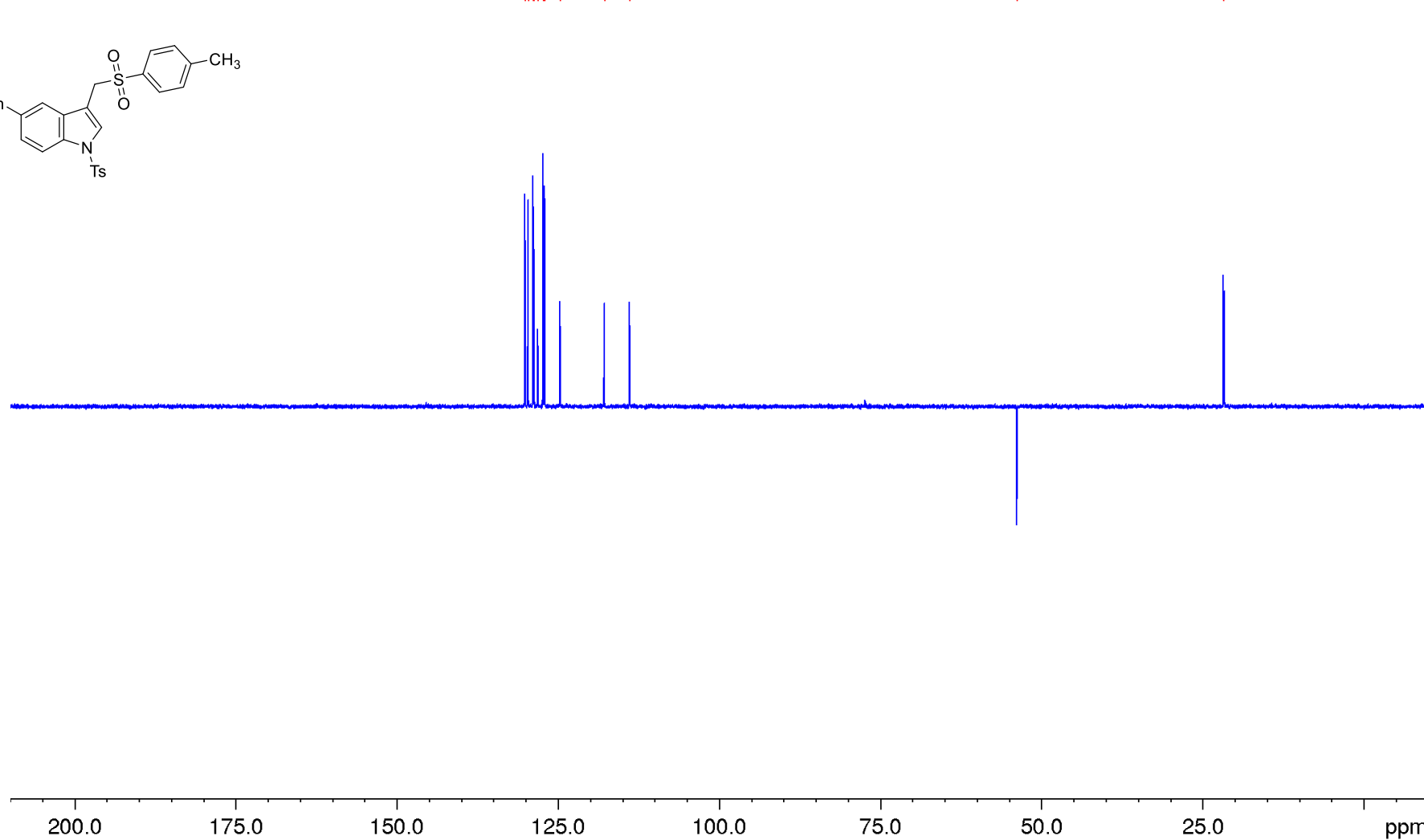


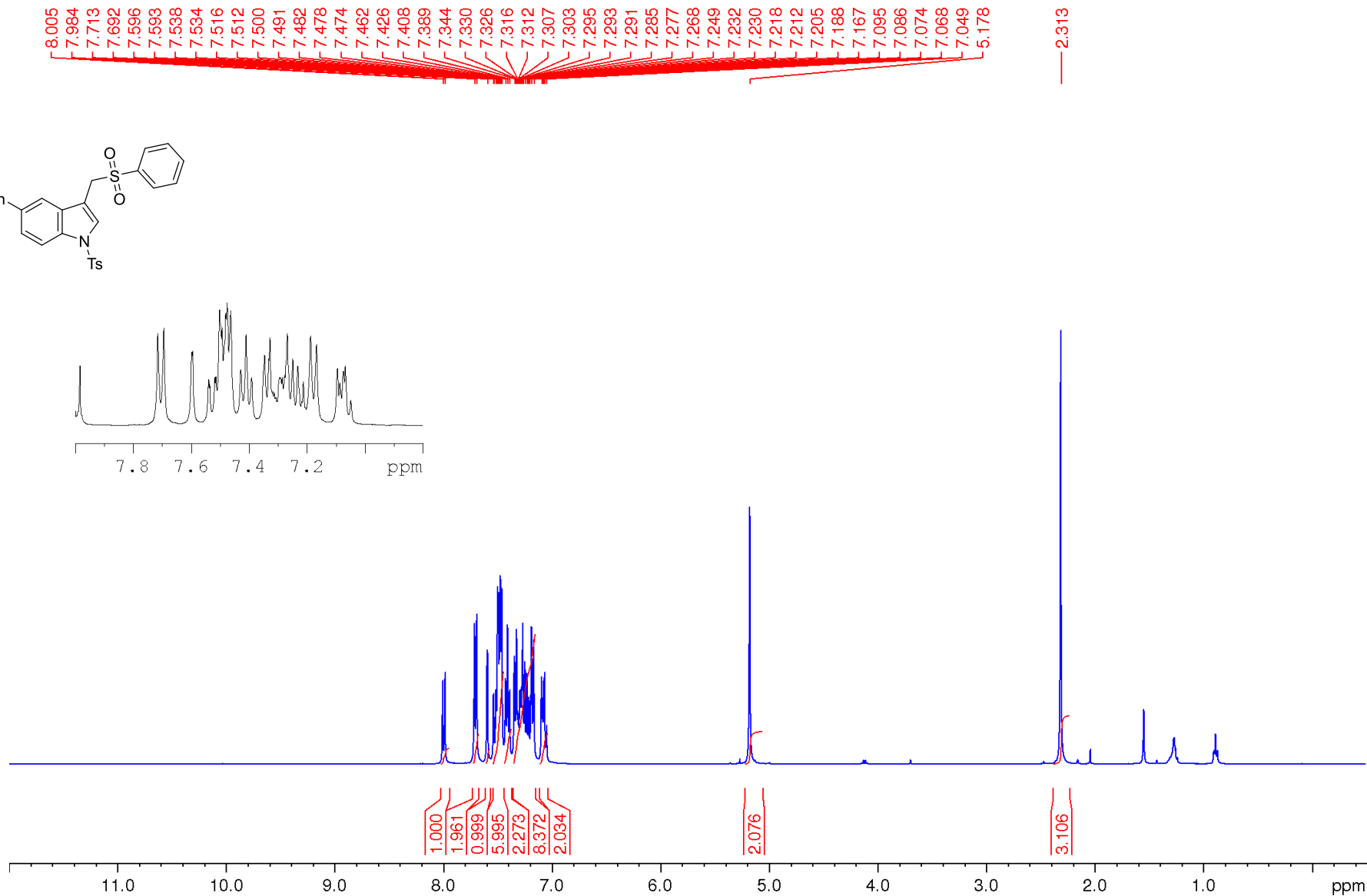
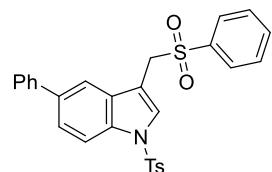


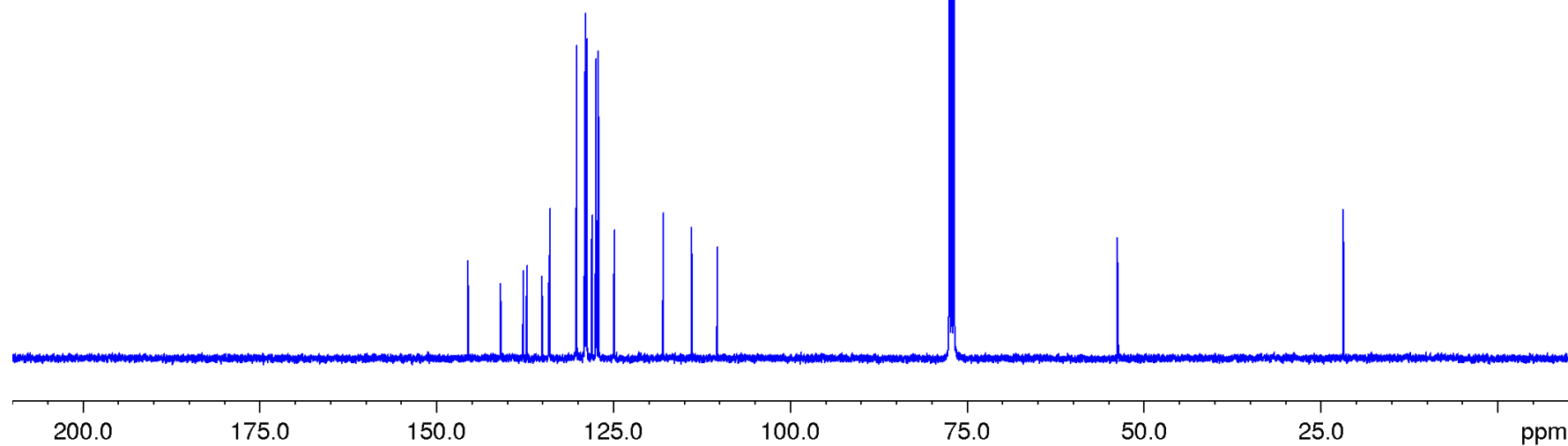
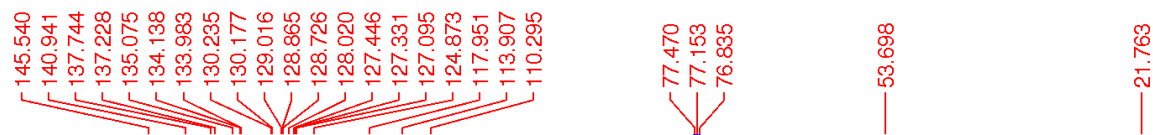
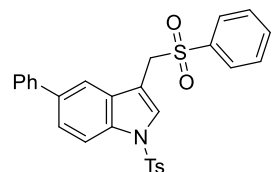
130.132  
129.651  
128.854  
128.770  
128.146  
127.323  
127.073  
124.707  
117.817  
113.908

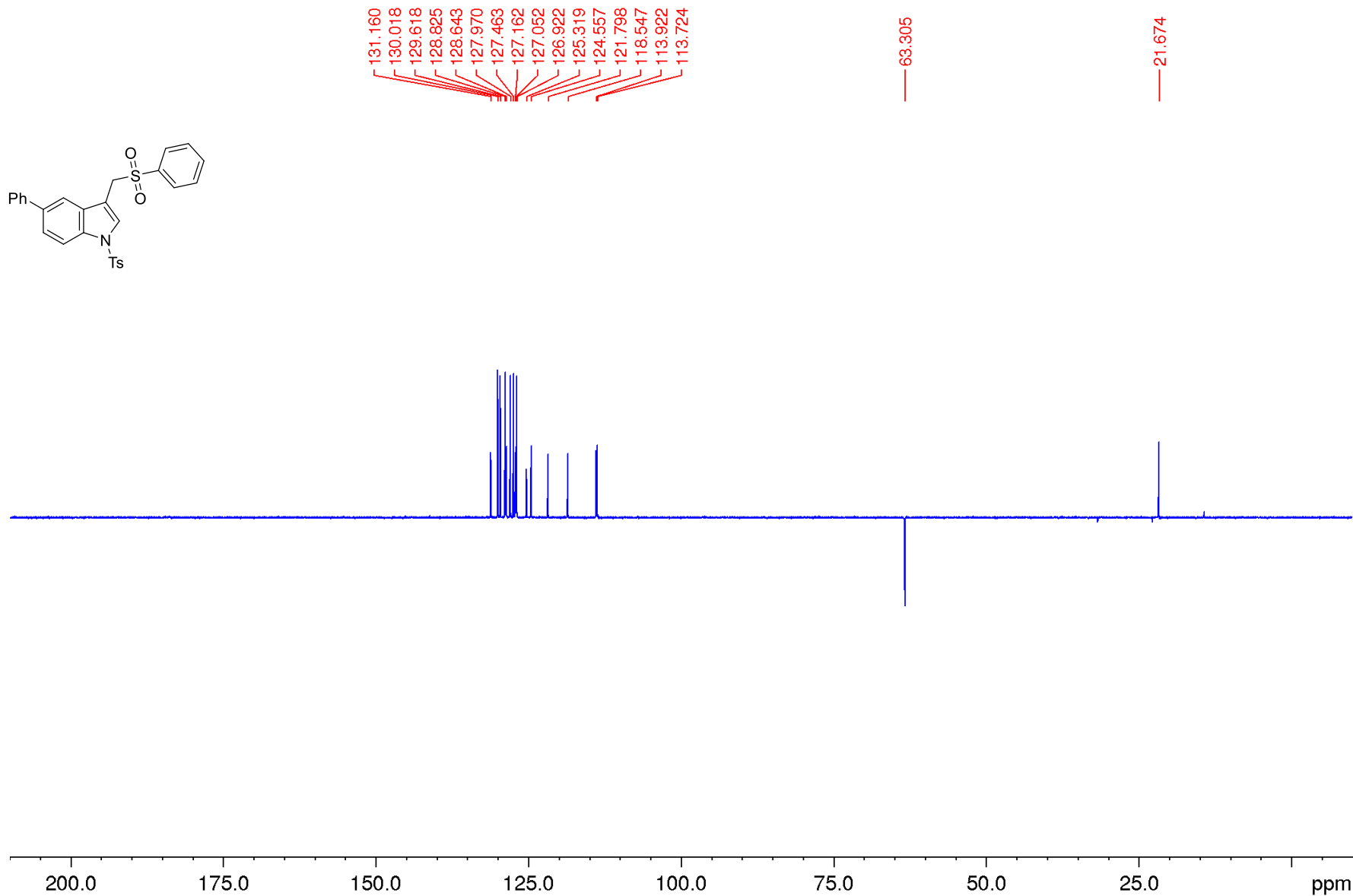
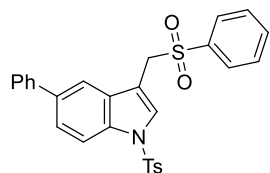
53.807

21.752



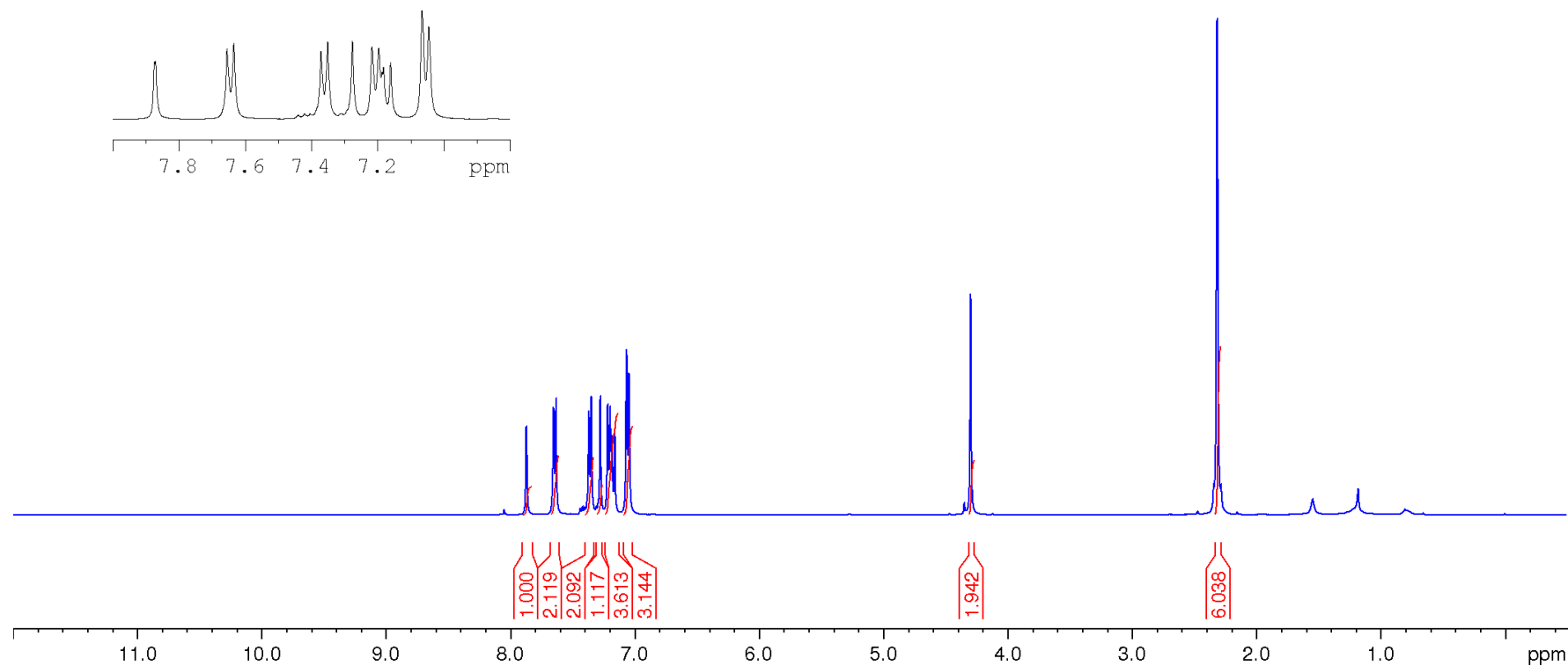
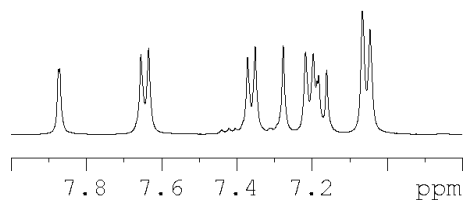
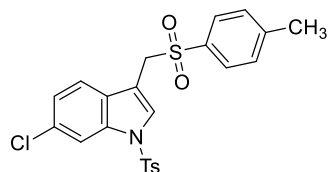






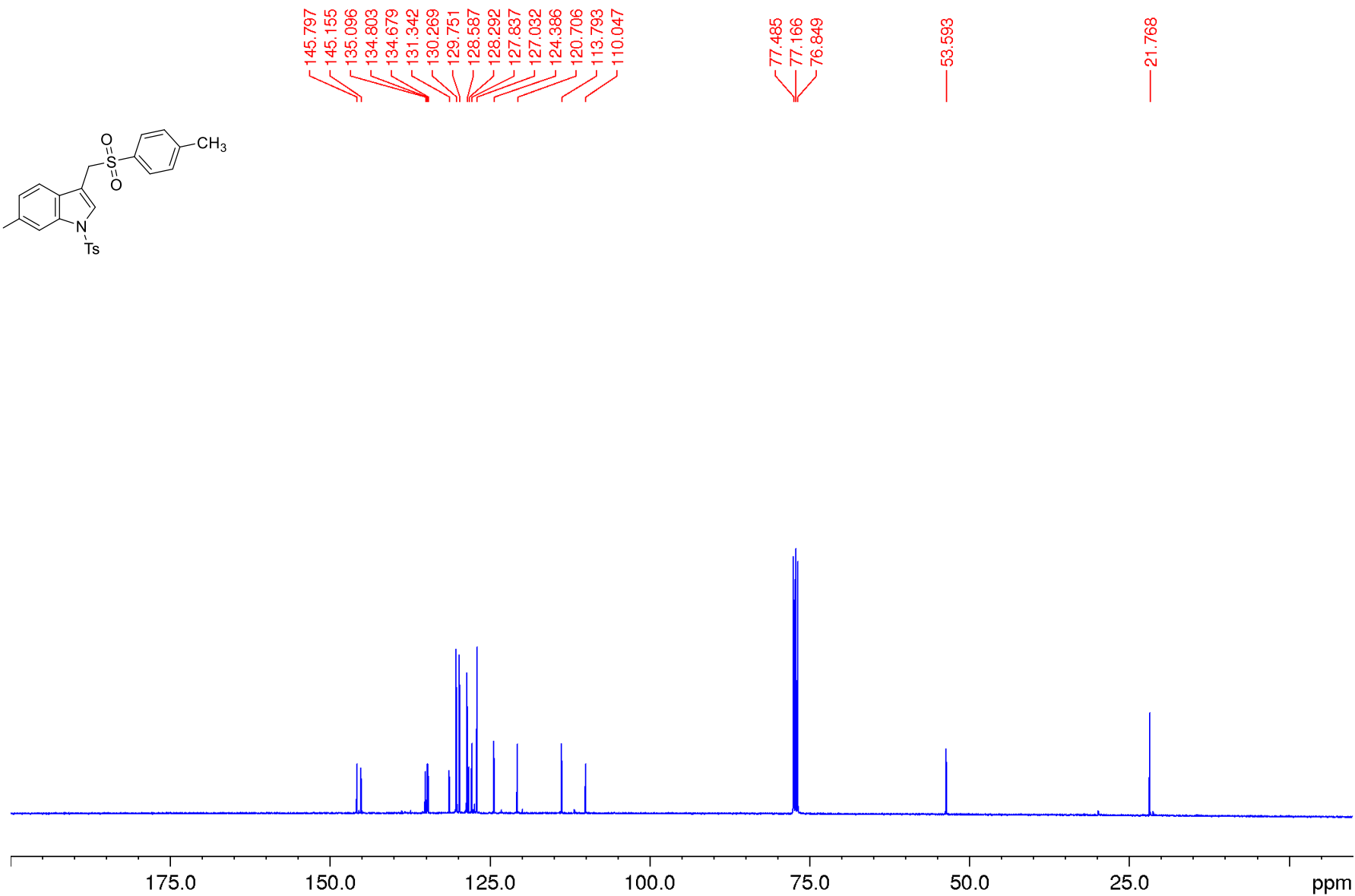
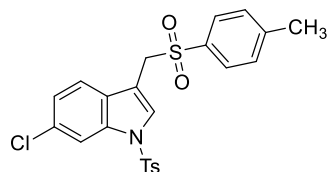
6-chloro-1-tosyl-3-(tosylmethyl)-1H-indole **9fa**

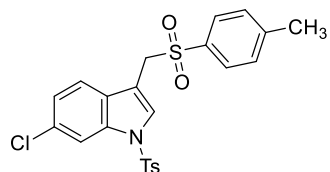
$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



6-chloro-1-tosyl-3-(tosylmethyl)-1H-indole **9fa**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )

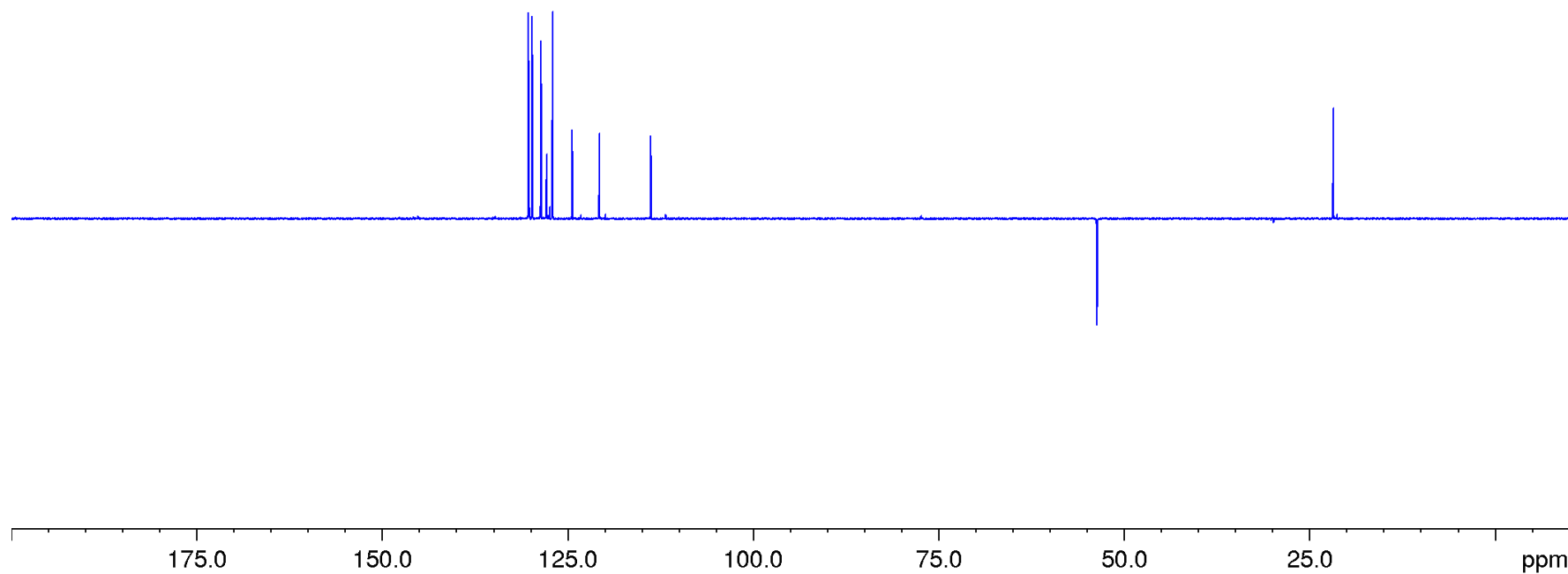




130.265  
129.747  
128.582  
127.833  
127.028  
124.382  
120.702  
113.788

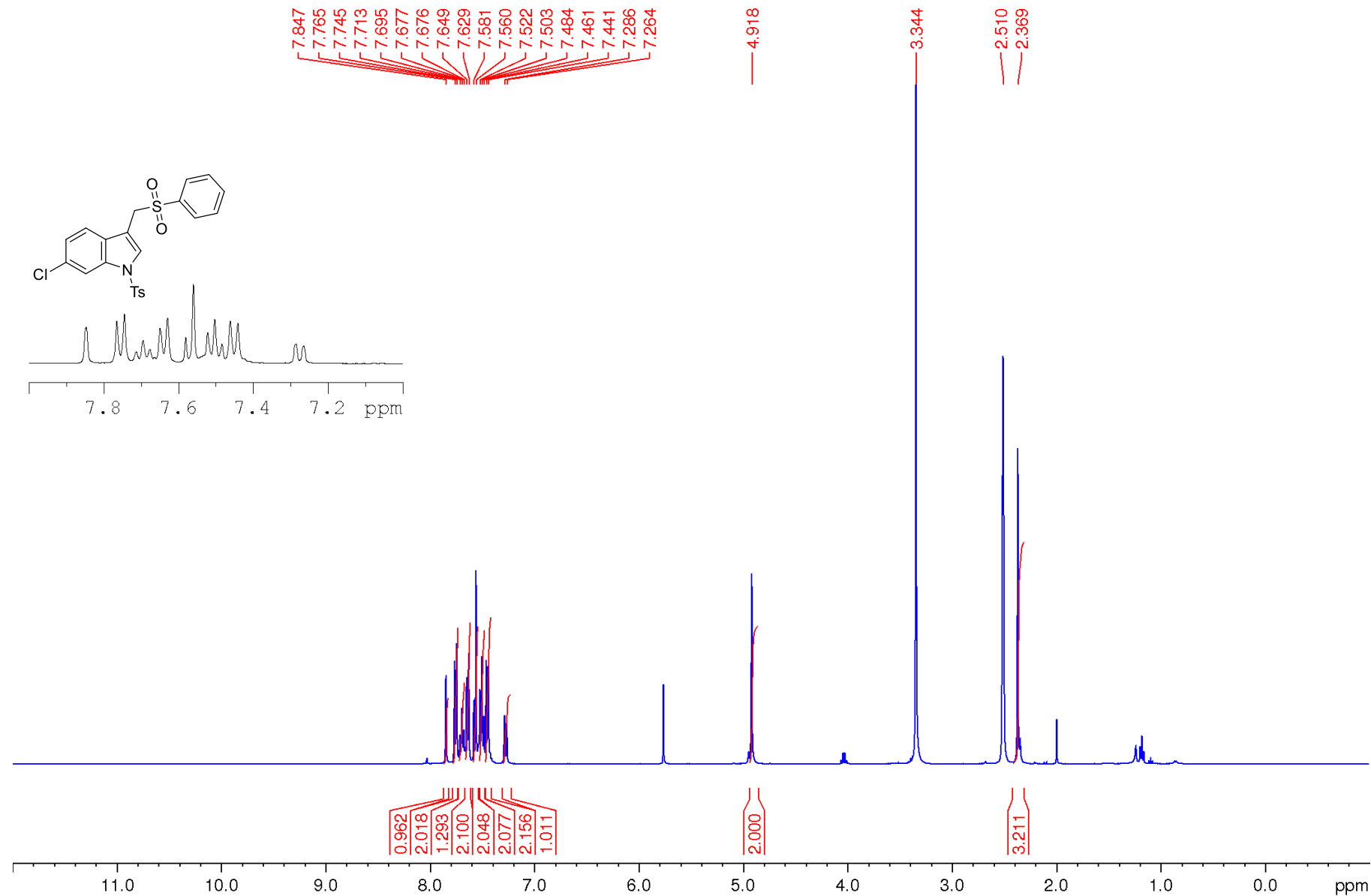
53.589

21.765

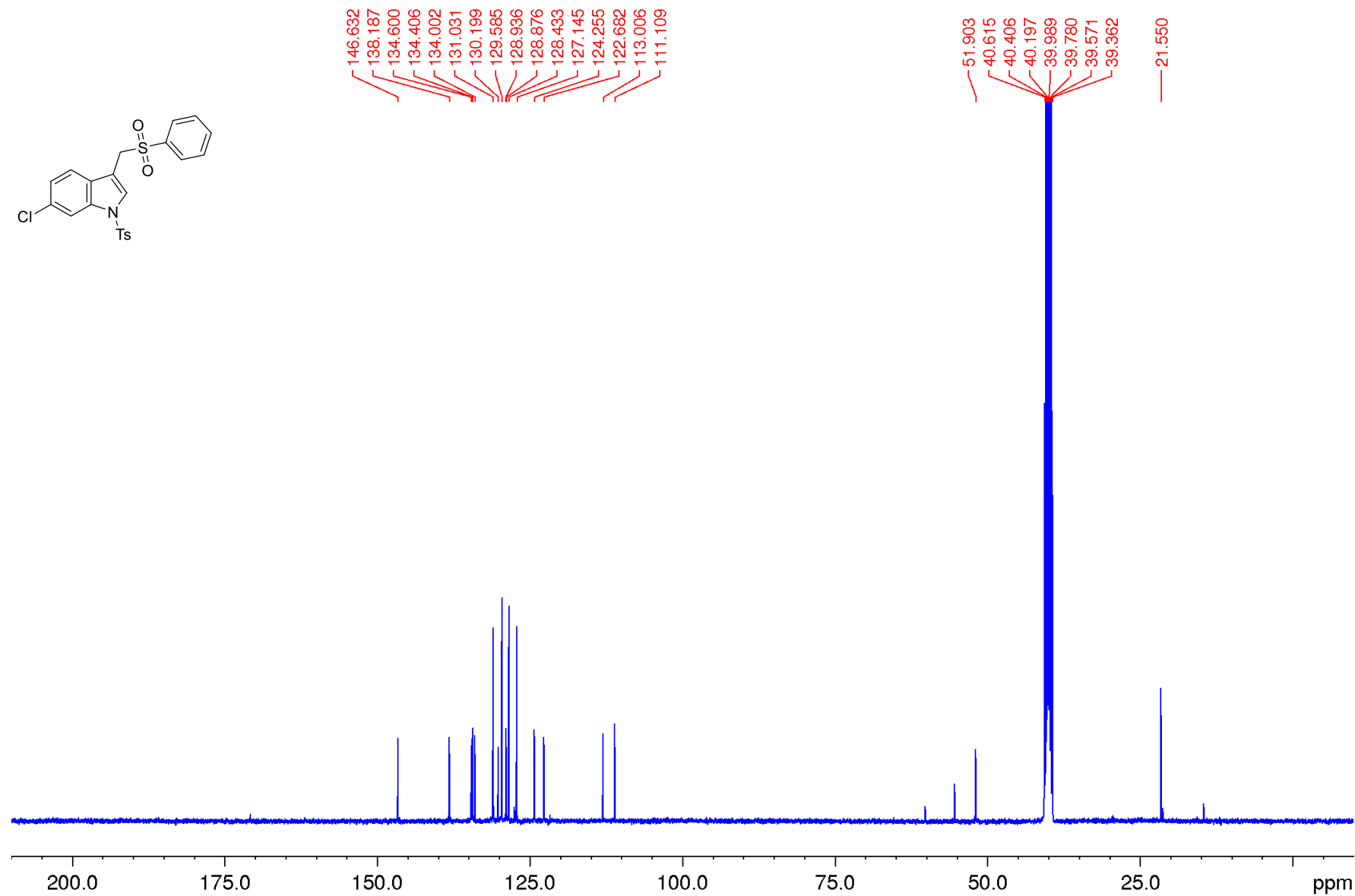
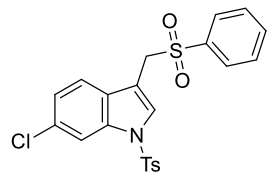


6-chloro-3-((phenylsulfonyl)methyl)-1-tosyl-1H-indole **9fb**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )

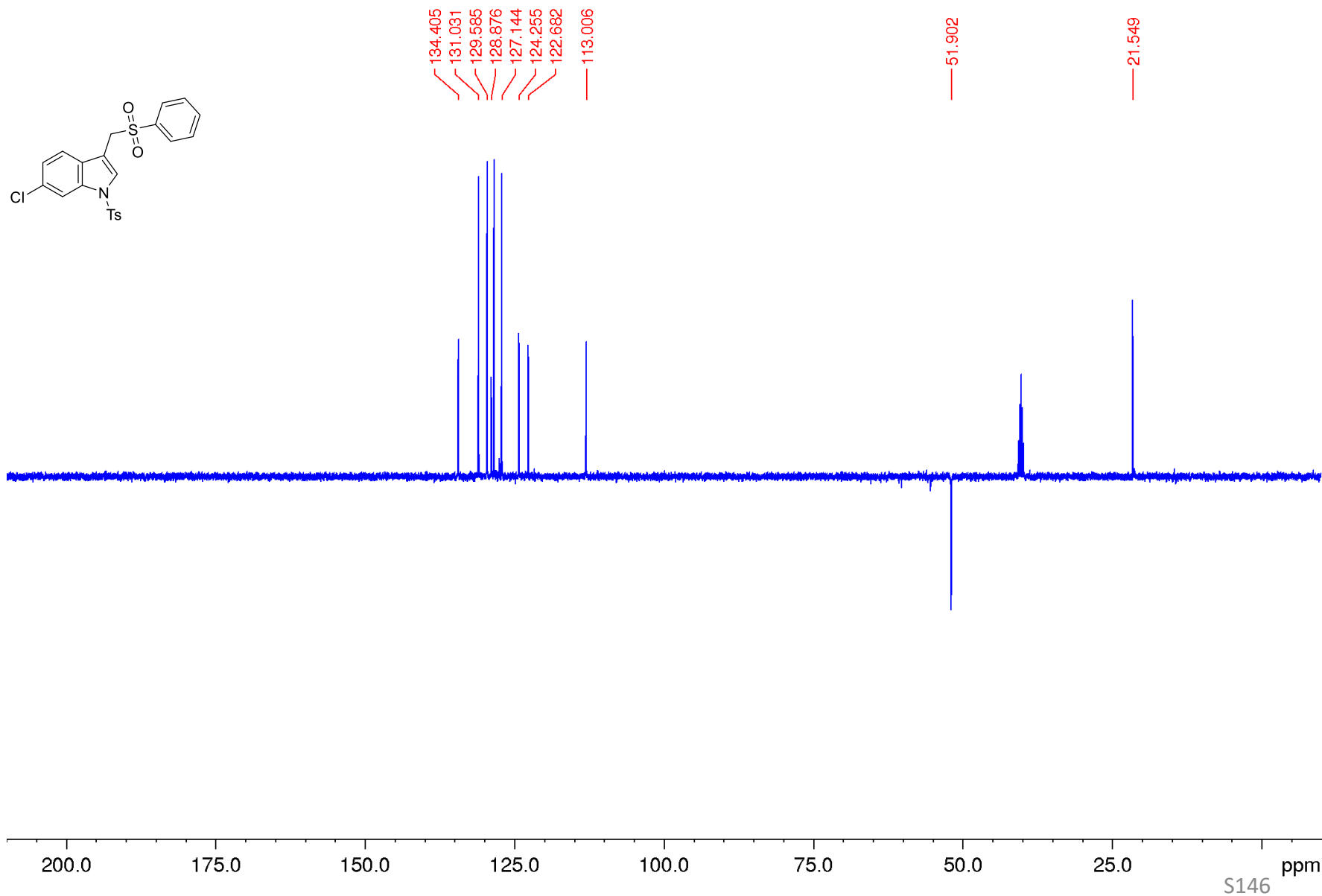






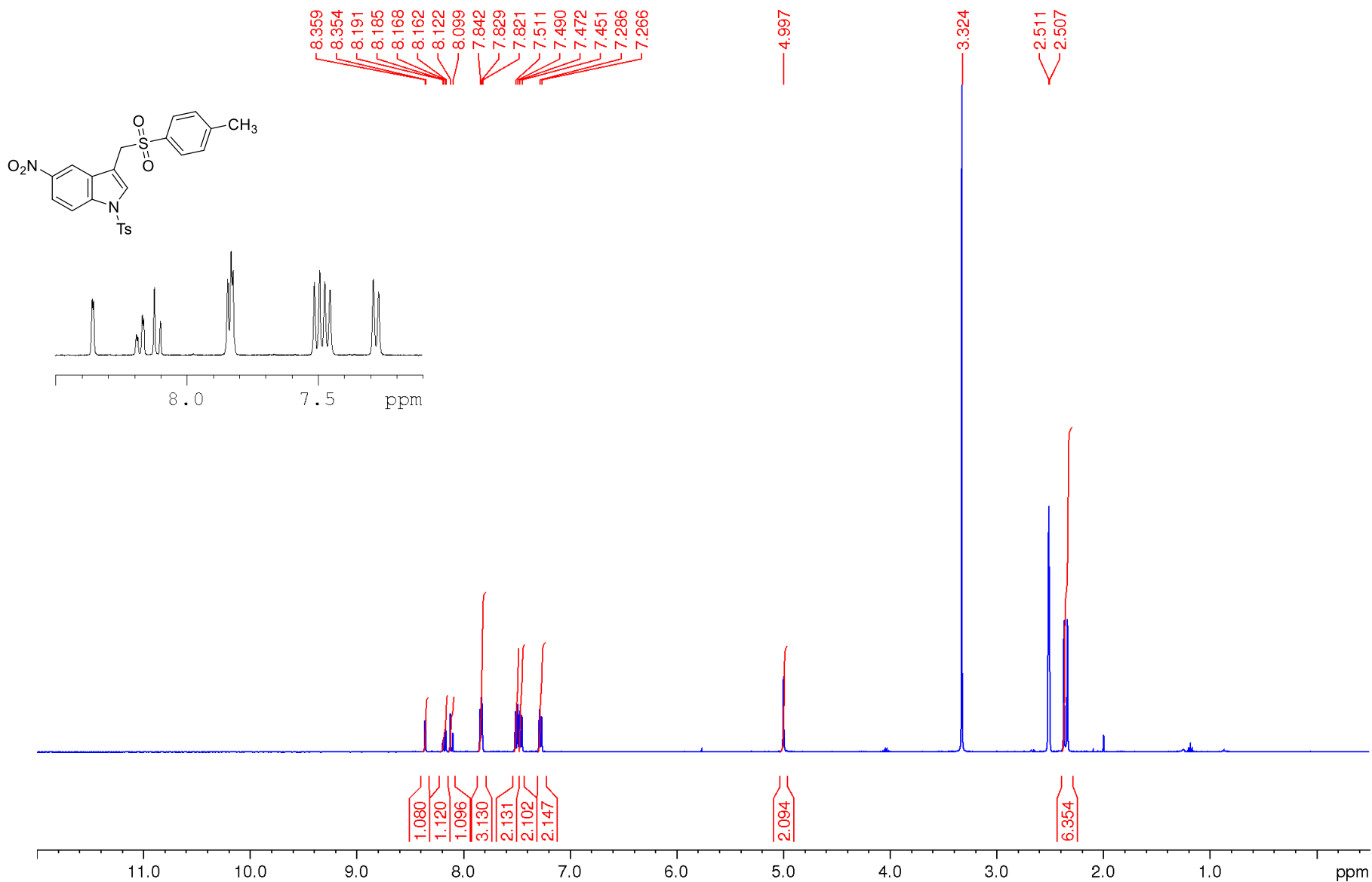
6-chloro-3-((phenylsulfonyl)methyl)-1-tosyl-1H-indole **9fb**

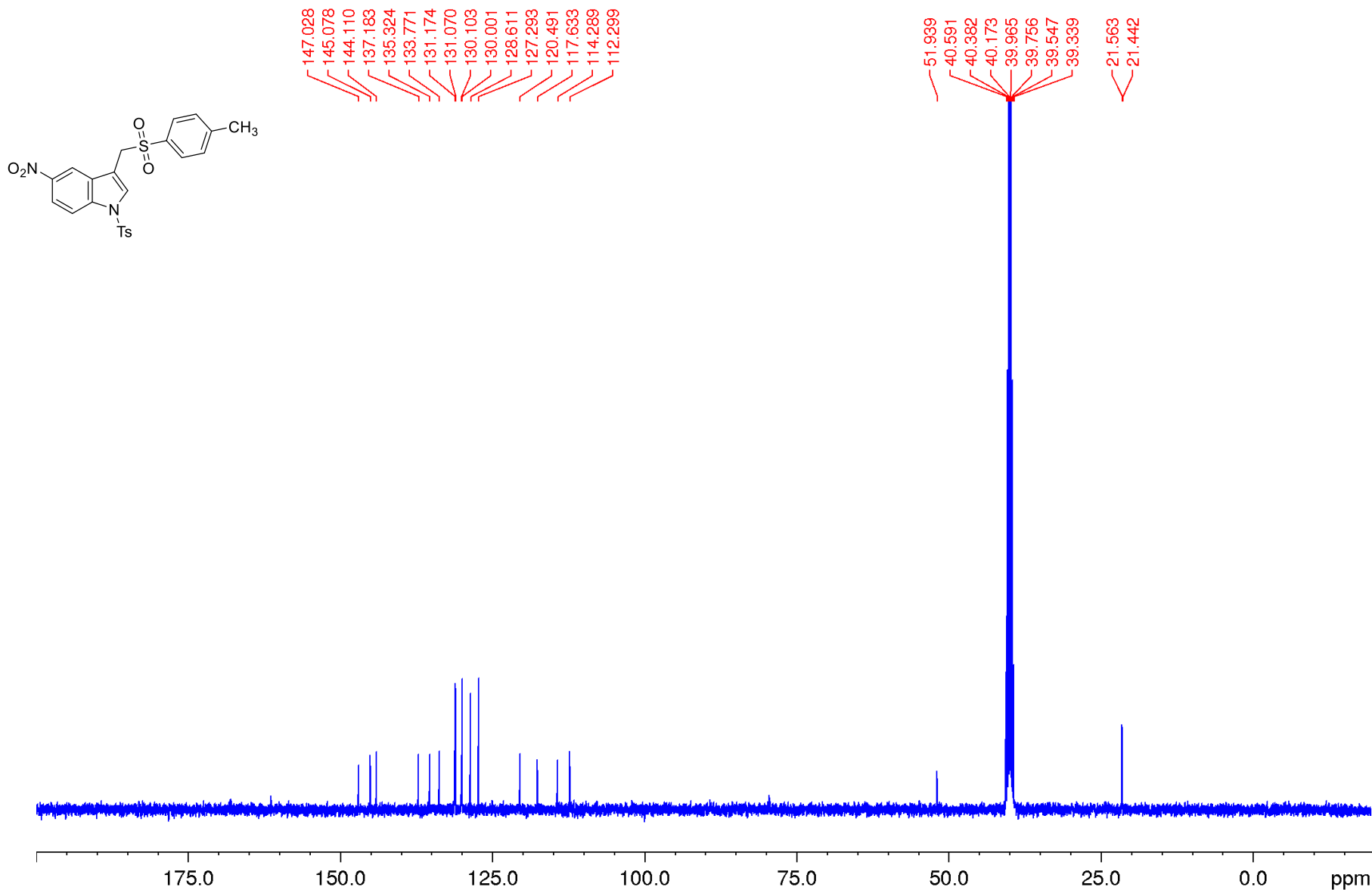
DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)

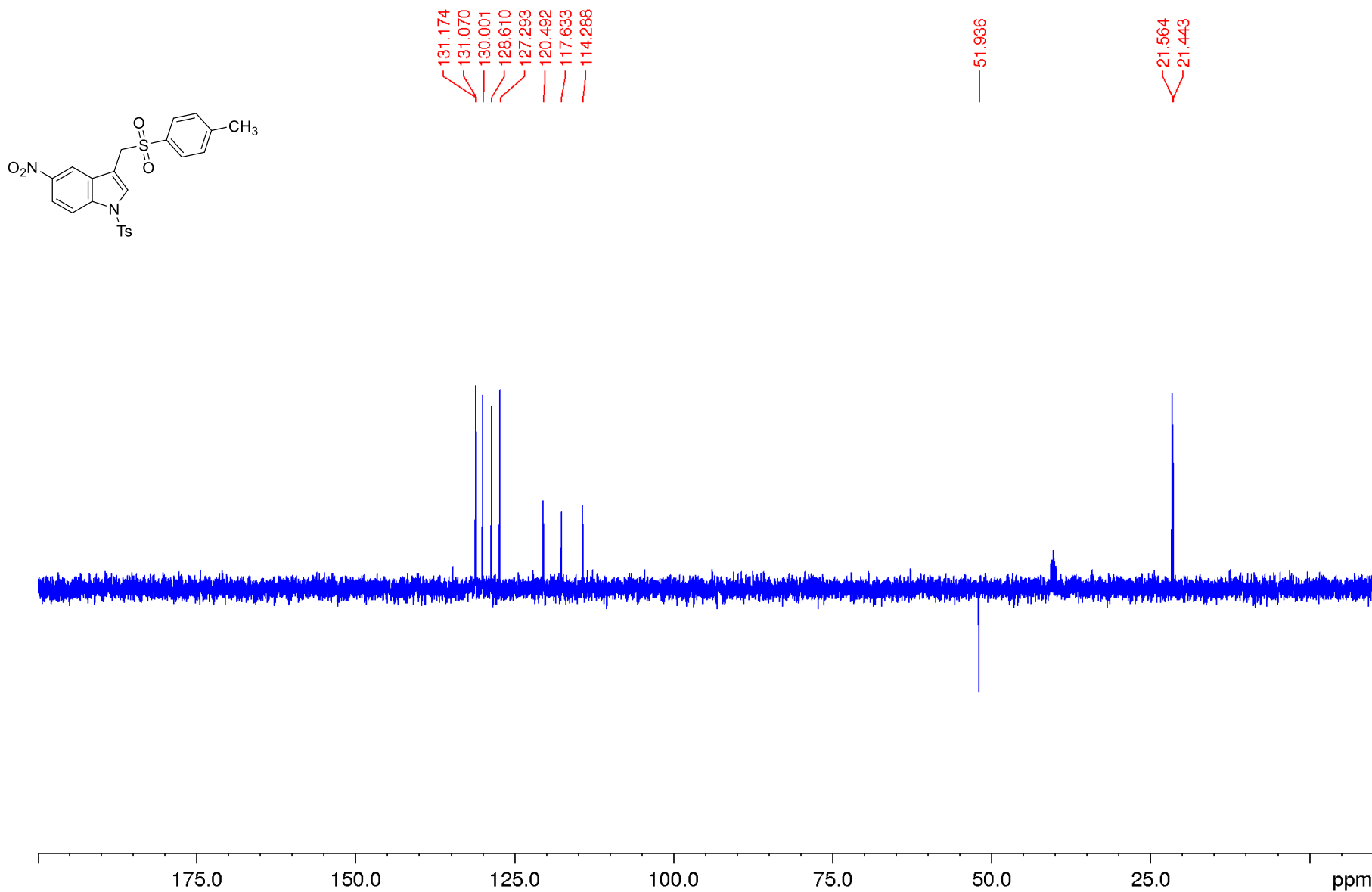


5-nitro-1-tosyl-3-(tosylmethyl)-1H-indole **9ga**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )

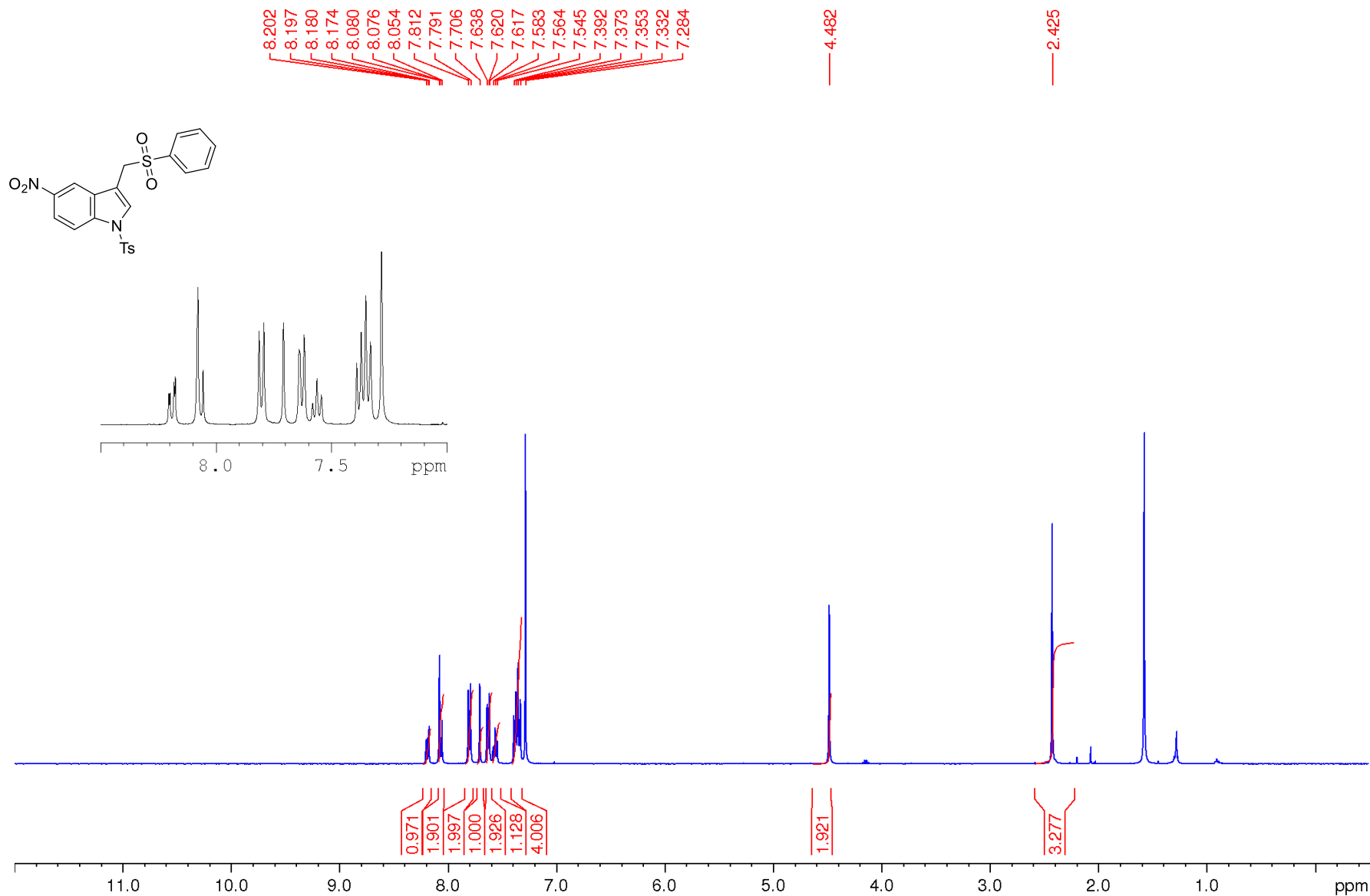


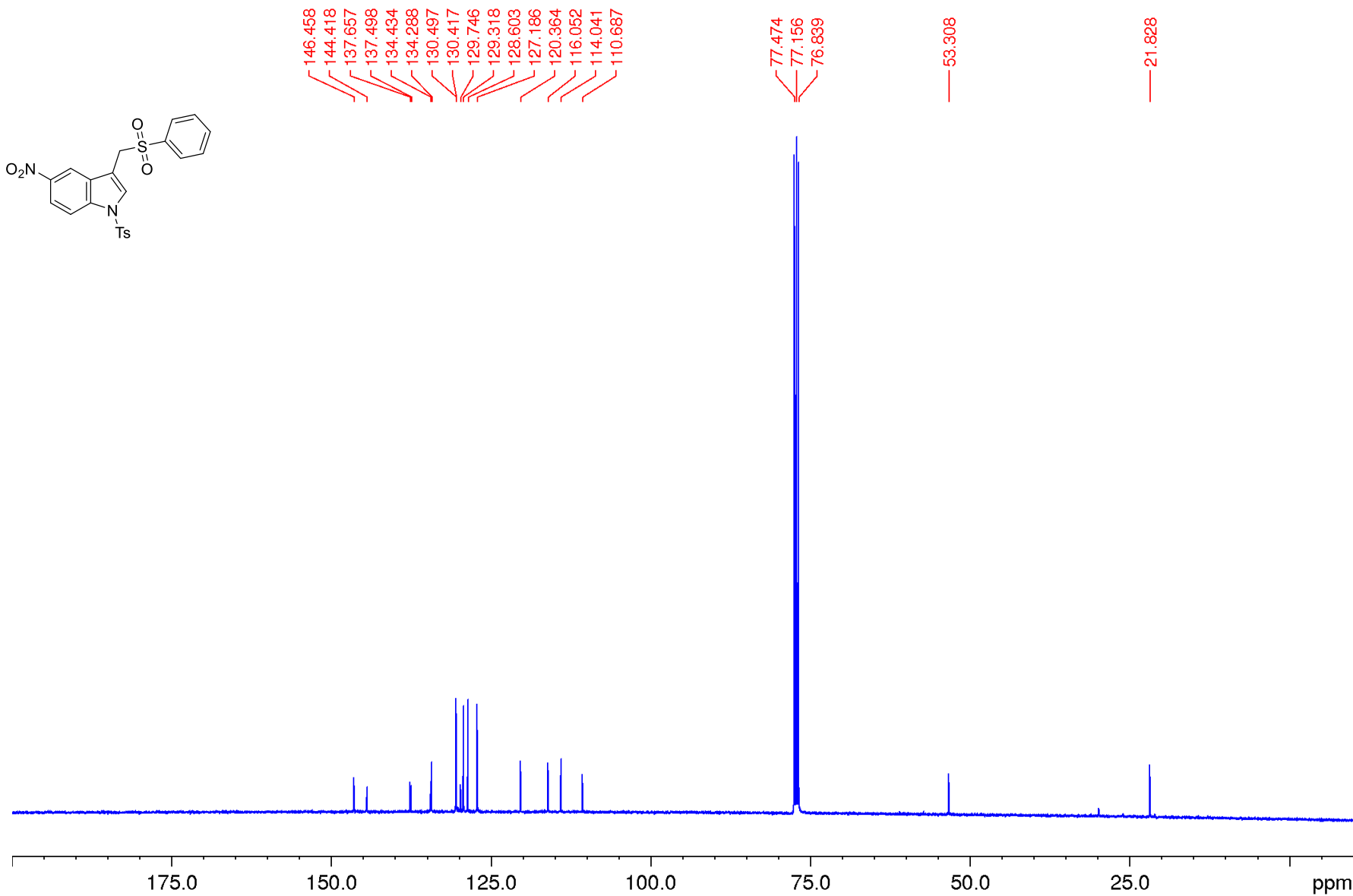
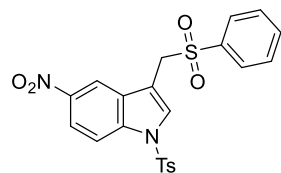


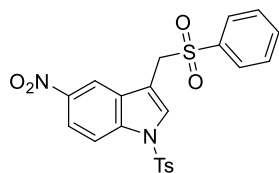


5-nitro-3-((phenylsulfonyl)methyl)-1H-indole **9gb**

$^1\text{H}$  NMR-spectrum (400.13 MHz) ( $\text{CDCl}_3$ )



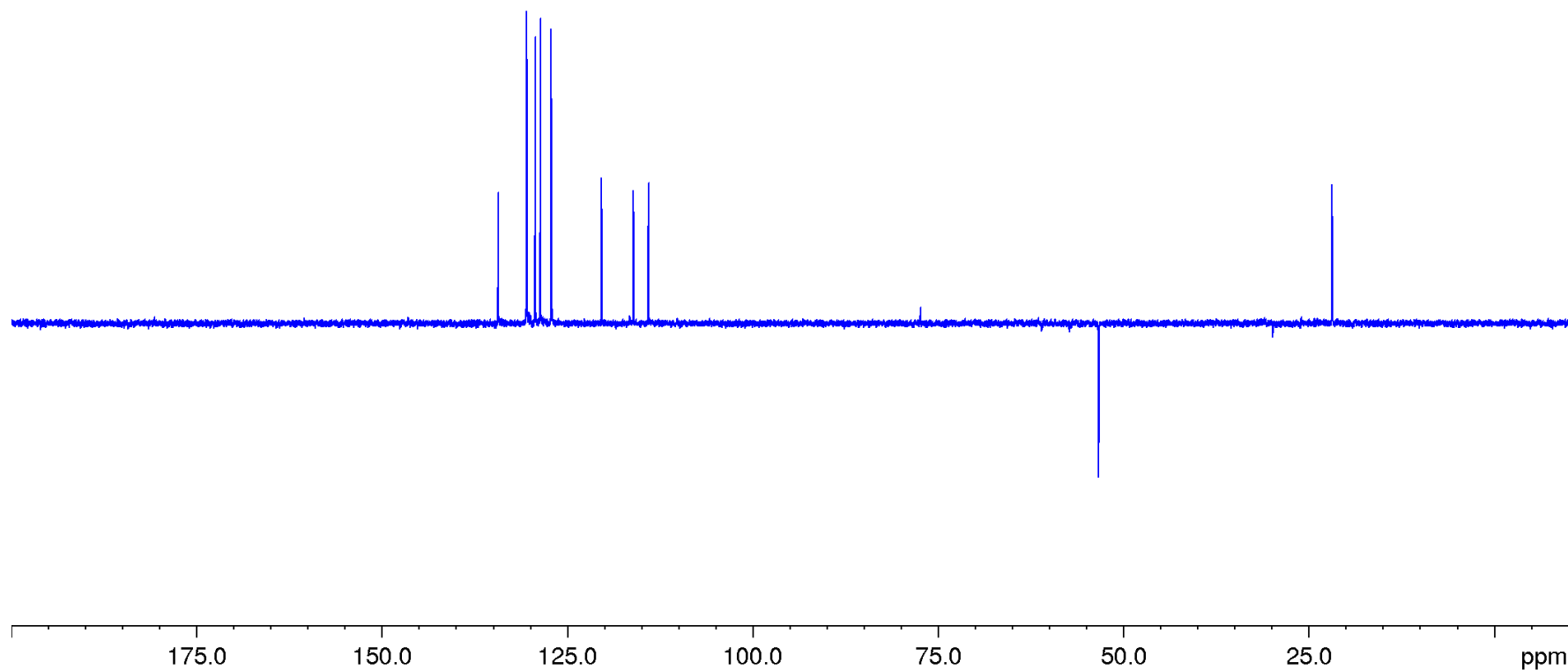




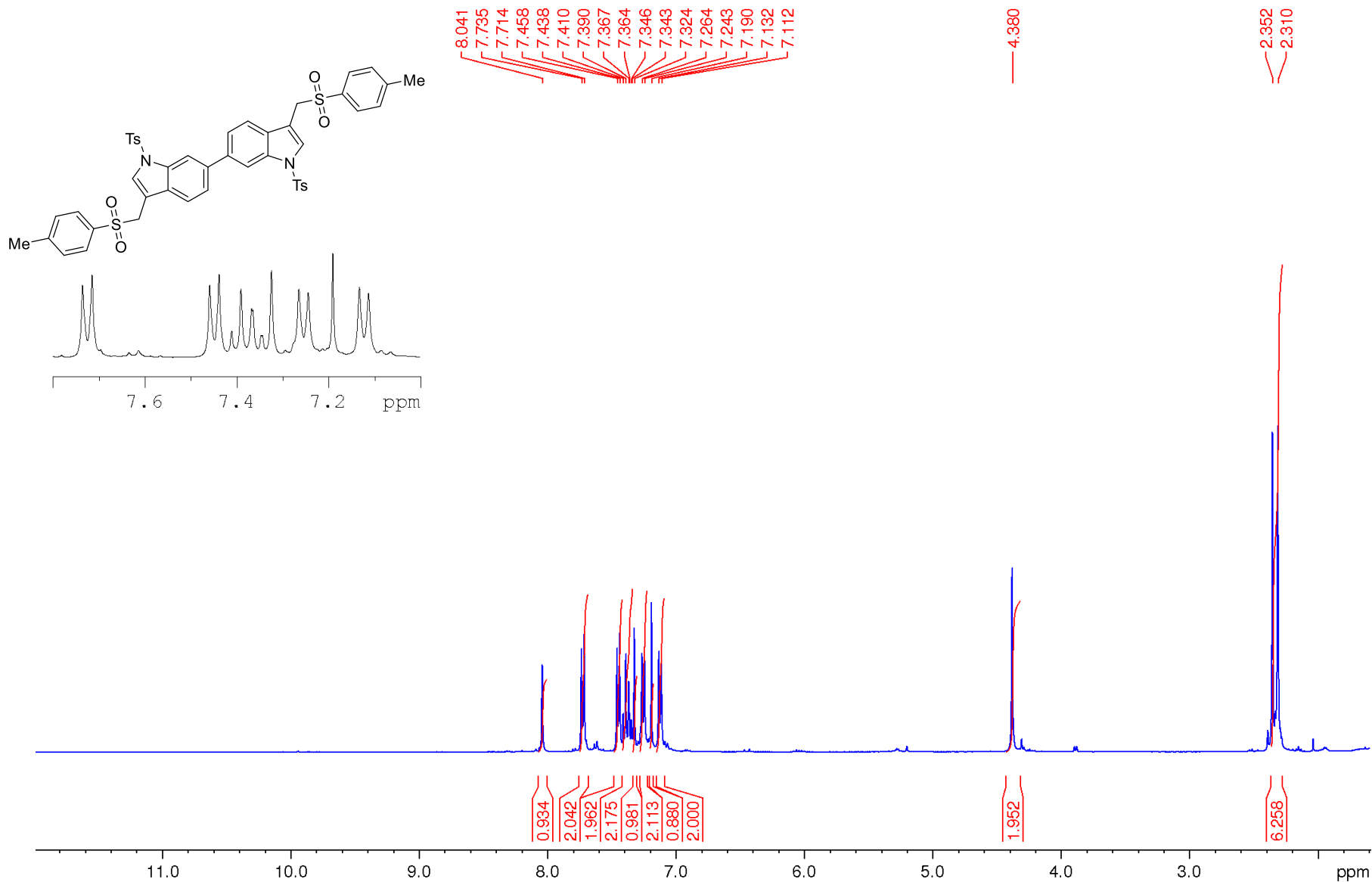
134.286  
130.495  
130.415  
129.316  
128.601  
127.184  
120.362  
116.051  
114.039

53.306

21.827

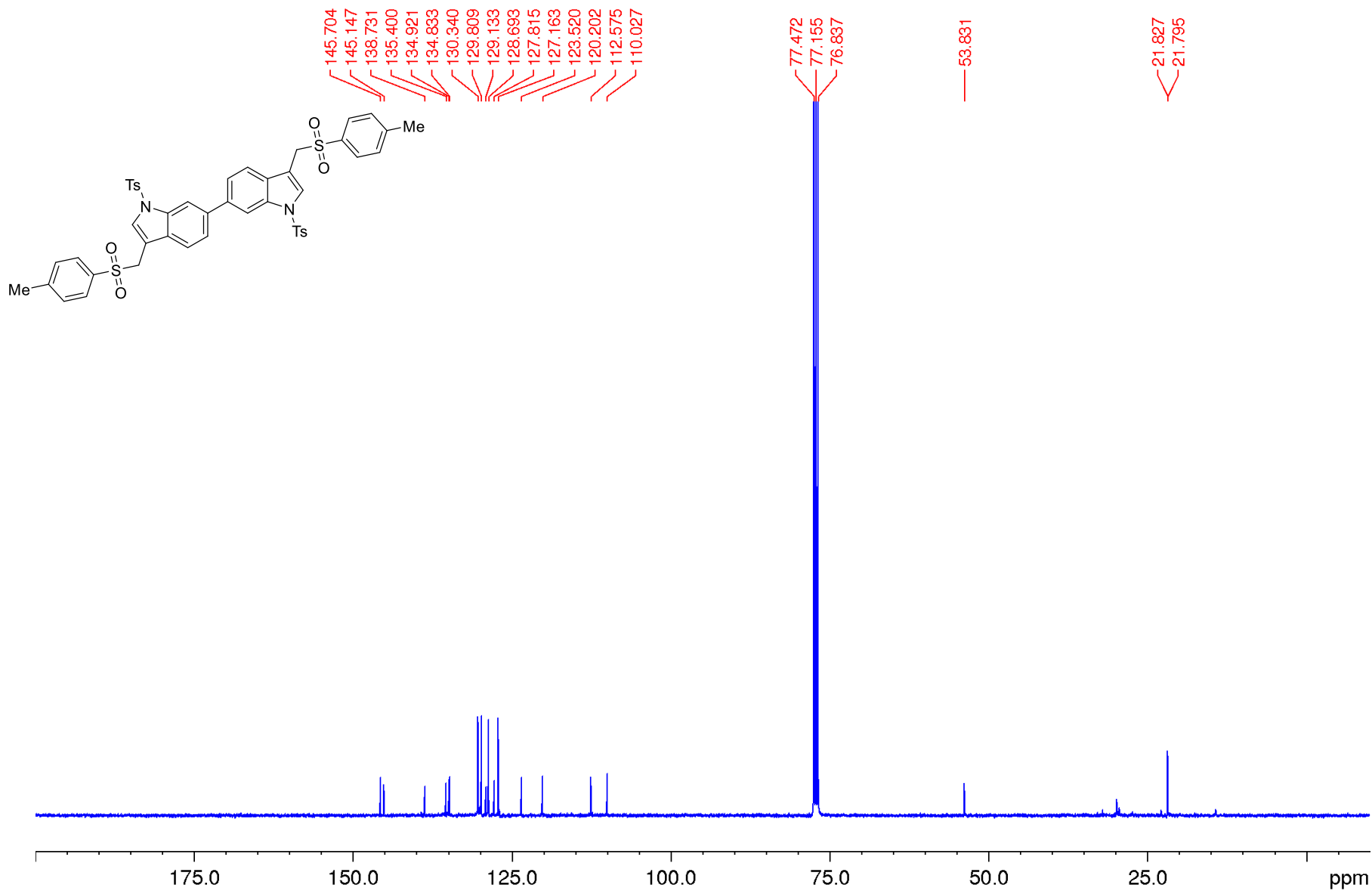






1,1'-ditosyl-3,3'-bis(tosylmethyl)-1*H*,1'*H*-6,6'-biindole **13a**

$^{13}\text{C}$  NMR-spectrum (100.6 MHz) ( $\text{CDCl}_3$ )



1,1'-ditosyl-3,3'-bis(tosylmethyl)-1*H*,1'*H*-6,6'-biindole **13a**

DEPT 135 NMR-spectrum (CDCl<sub>3</sub>)

