A safety problem was discovered for the protocol for preparing (±)-7-azabicyclo[4,2,0]oct-3-en-8-one (**1**). A revised protocol has been published (*Org. Lett.* **2014**, *16*, 3848, DOI: 10.1021/ol5019097).

Supporting Information

Synthesis of β-Lactams Bearing Functionalized Side Chains from a Readily Available Precursor

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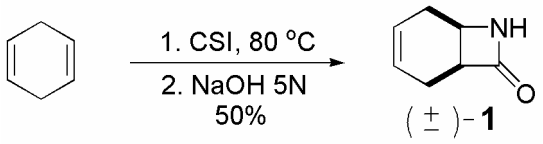
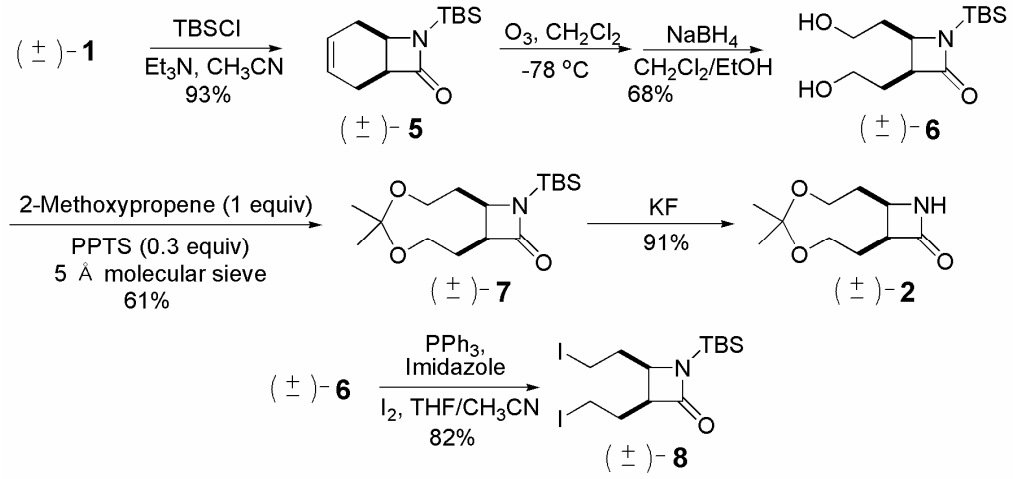
General Methods. All chemicals and lipase bound to polyacrylate resin (Lipolase, L4777) were purchased from Sigma-Aldrich. ^{1}H, ^{13}C and ^{19}F NMR spectra were recorded at 300 MHz for proton, at 75 MHz for carbon and at 282.2 MHz for fluorine. Melting points were determined using a Thomas Hoover Uni-melt capillary melting point apparatus. Optical rotations were determined using a Perkin-Elmer 241 polarimeter.



(±)-7-Azabicyhclo[4,2,0]oct-3-en-8-one (1). To 1,4-cyclohexadiene (25 g, 311.9 mmol) was added chlorosulfonyl isocynate (44.2 g, 311.9 mmol) with stirring. The reaction mixture was stirred at 80 °C for 4 h and then cooled to room temperature. The reaction mixture was diluted with CH_2Cl_2 (30 mL) and poured into ice-water (mixture of water (250 mL) and ice); the pH was adjusted to 7 with 5 N NaOH. The aqueous solution was extracted several times with CH_2Cl_2. The combined organic layers were washed with brine and dried ($MgSO_4$). After filtration, the organic solution was concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 1:1 CH_2Cl_2/EtOAc to EtOAc) to give **1** in 50% yield as a solid: mp 122-125 °C; ^{1}H NMR (300 MH $CDCl_3$) δ 5.93-5.83 (m, 1 H), 5.79-5.68 (m, 1 H), 5.59 (s, 1 H), 4.03-3.97 (m, 1 H), 3.42-3.35 (m, 1 H), 2.54-2.42 (m, 1 H), 2.41-2.28 (m, 1 H), 2.25-2.07 (m, 2 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 170.8, 125.8, 124.2, 47.7, 46.7, 26.8, 21.1; HRMS (m/z, ESI) calcd for C_7H_9NO $(M^{\cdot})^{+}$ 123.0679, found 123.0678.



(±)-7-*tert*-Butyldimethylsilyl-7-azabicyclo[4,2,0]oct-3-en-8-one (5). To a stirred solution of **1** (5.2 g, 42.3 mmol) in acetonitrile (160 mL) was added TBSCl (6.7 g, 44.4 mmol), DMAP (2.0 g, 16.9 mmol), and TEA (8.6 g, 84.7 mmol). The reaction mixture was stirred for 6 h at room temperature. The reaction mixture was concentrated *in vacuo* and diluted with EtOAc (250 mL). The organic solution was washed with 0.5 N HCl, H_2O, sat. $NaHCO_3$ and brine and then dried ($MgSO_4$). After filtration, the solution was concentrated *in vacuo*. The crude product was purified by silica column chromatography (5:1 hexane/EtOAc) to give **5** in 93% yield as a solid: mp 35-38 ^oC; ^1H NMR (300 MHz, $CDCl_3$) δ 5.91-5.82 (m, 1 H), 5.78-5.66 (m, 1 H), 3.91-3.85 (m, 1 H), 3.43-3.34 (m, 1 H), 2.51-2.31 (m, 2 H), 2.22-1.99 (m, 2 H), 0.94 (s, 9 H), 0.22 (s, 3 H), 0.20 (s, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 174.8, 126.6, 124.2, 48.5, 48.1, 27.4, 26.0, 21.5, 18.1, -5.5, -6.1; HRMS (m/z, ESI) calcd for $C_{13}H_{23}NOSi$ $(M+H)^+$ 238.1544, found 238.1550.

(±)-1-*tert*-Butyldimethylsilyl-*cis*-3,4-bis-(2-hydroxyethyl)-azetidin-2-one (6). Compound **5** (7.1 g, 29.9 mmol) was dissolved in CH_2Cl_2 (210 mL), and the solution was cooled to -78 ^oC. O_3 was bubbled through a solution of **5** until the solution became pale blue, and then N_2 was bubbled through until the solution became colorless. EtOH (70 mL) and $NaBH_4$ (3.4 g, 89.7 mmol) were added to the solution at -78 ^oC, and the mixture was warmed to room temperature. The reaction mixture was allowed to stir for 10 h at room temperature. The reaction was quenched by addition of sat. aq. NH_4Cl, and then water (50 mL) was added. The mixture was extracted several times with CH_2Cl_2. The combined organic layers were dried ($MgSO_4$). After filtration, the solution was concentrated *in vacuo*. The crude product was purified by silica column

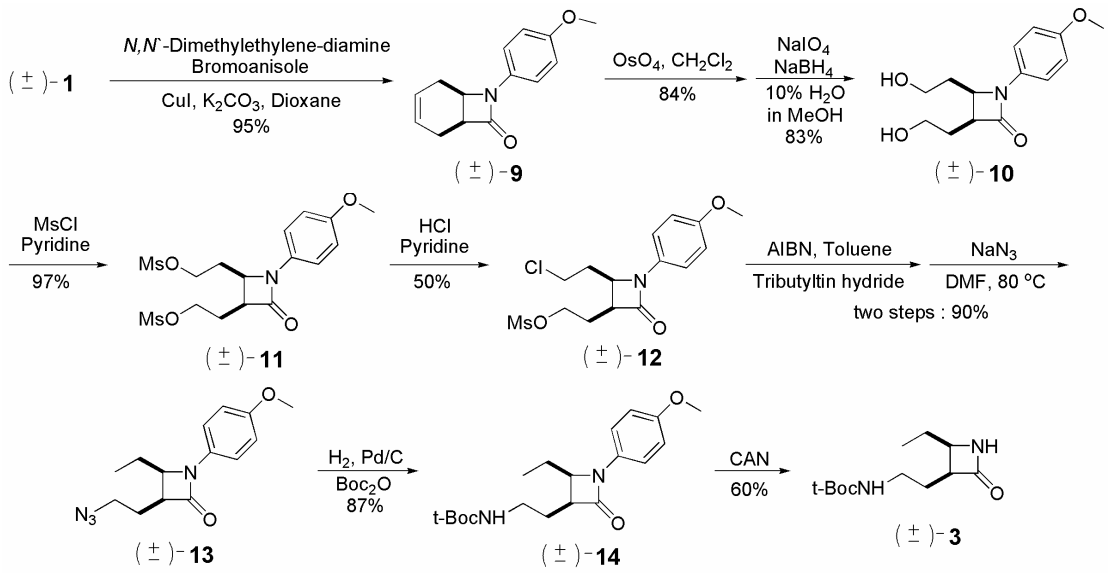
chromatography (eluent varied from EtOAc to 12:1 EtOAc/MeOH) to give **6** in 68% yield as an oil: ^{1}H NMR (300 MHz, CD_3OD) δ 3.87 (ddd, 1 H, *J* = 9.3, 5.4, 3.3 Hz), 3.80-3.49 (m, 4 H), 3.41 (ddd, 1 H, *J* = 8.7, 7.2, 5.7 Hz), 2.05-1.77 (m, 4 H), 0.97 (s, 9 H), 0.25 (s, 6 H); ^{13}C NMR (75 MHz, CD_3OD) δ 178.8, 61.0, 59.7, 51.9, 51.0, 35.6, 29.2, 26.8, 19.1, -5.1, -5.4; HRMS (m/z, ESI) calcd for $C_{13}H_{27}NO_3Si$ $(M+Na)^+$ 296.1653, found 296.1658.

(±)-10-(*tert*-Butyldimethylsilyl)-5,5-dimethyl-4,6-dioxa-10-azabicyclo [7.2.0]undecan-11-one (7). To a stirred solution of **6** (2.2 g, 8.0 mmol) and molecular sieves (10 g, 5□) in anhydrous CH_2Cl_2 (800 mL) was added 2-methoxypropene (0.75 g, 10.4 mmol) and pyridinium *p*-toluenesulfonate (0.61 g, 2.4 mmol) at 0 °C. The mixture was then warmed to room temperature. After sitting overnight, the molecular sieves were filtered off using celite, and the filtrate was washed with sat. $NaHCO_3$ and dried ($MgSO_4$). After filtration, the solution concentrated *in vacuo*. The crude product was purified by silica column chromatography (3:1 hexane/EtOAc) to give **7** in 61% yield as a solid: mp 88-91 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.98 (ddd, 1 H, *J* = 12.6, 3.0, 3.0 Hz), 3.82 (ddd, 1 H, *J* = 9.6, 5.4, 5.1 Hz), 3.77-3.58 (m, 2 H), 3.53-3.34 (m, 2 H), 2.49-2.29 (m, 1 H), 2.08-1.84 (m, 2 H), 1.82-1.70 (m, 1 H), 1.40 (s, 3 H), 1.31 (s, 3 H), 0.94 (s, 9 H), 0.21 (s, 6 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.6, 100.7, 64.5, 59.1, 56.2, 54.3, 33.7, 26.3, 25.9, 25.8, 24.8, 18.3, -5.1, -5.5; HRMS (m/z, ESI) calcd for $C_{16}H_{31}NO_3Si$ $(M+Na)^+$ 336.1966, found 336.1954.

(±)-5,5-Dimethyl-4,6-dioxa-10-azabicyclo[7.2.0]undecan-11-one (2). To a stirred solution of **7** (1.53 g, 4.9 mmol) in MeOH (120 mL) was added potassium fluoride (0.57 g, 9.8 mmol) at 0 °C. The mixture was then warmed to room temperature. After 2 h the reaction mixture was concentrated *in vacuo*. The crude product was purified by silica column chromatography (EtOAc) to give **2** in 91% yield as a solid: mp 145-148 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 5.84 (s, 1 H), 3.98 (ddd, 1 H, *J* = 12.6, 3.0, 2.7 Hz), 3.91 (ddd, 1 H, *J* = 11.1, 4.5, 3.0 Hz), 3.81-3.60 (m, 2 H), 3.58-3.45 (m, 1 H), 3.40-3.30 (m, 1 H), 2.45-2.26 (m, 1 H), 2.20-2.00 (m, 1 H), 1.93-1.74 (m, 2 H), 1.41 (s, 3 H), 1.33 (s, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.0, 100.5, 63.5, 59.2, 53.7, 53.4, 32.6, 25.6, 25.4, 24.5; HRMS (m/z, ESI) calcd for $C_{10}H_{17}NO_3$ $(M+Na)^+$ 222.1101, found 222.1093.

(±)-1-*tert*-Butyldimethylsilyl-*cis*-3,4-bis-(2-iodoethyl)-azetidin-2-one (8). To a stirred solution of triphenylphosphine (1.9 g, 7.3 mmol) and imidazole (0.79 g, 11.7

mmol) in anhydrous THF (10 mL) and acetonitrile (10 mL) was added iodine (1.8 g, 7.3 mmol) at room temperature. After 10 min, a solution of **6** (0.5 g, 1.8 mmol) in THF (10 mL) was added to the reaction mixture. After 4 h at room temperature, the reaction mixture was concentrated *in vacuo*. The residue was dissolved in EtOAc. The organic solution was washed with 5% $Na_2S_2O_5$, H_2O and brine and then dried ($MgSO_4$). After filtration, the solution was concentrated *in vacuo*. The crude product was purified by silica column chromatography (6:1 hexane/EtOAc) to give **8** in 82% yield as an oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.78 (ddd, 1 H, *J* = 9.3, 5.7, 3.3 Hz), 3.54-3.39 (m, 2 H), 3.37-3.26 (m, 1 H), 3.18 (ddd, 1 H, *J* = 10.2, 7.5, 5.4 Hz), 2.99 (ddd, 1 H, *J* = 10.2, 9.0, 6.9 Hz), 2.33-1.95 (m, 4 H), 0.95 (s, 9 H), 0.24 (s, 3 H), 0.23 (s, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 174.0, 53.0, 52.9, 35.2, 29.5, 26.1, 18.0, 2.9, 0.2, -5.3, -5.6; HRMS (m/z, ESI) calcd for $C_{13}H_{25}I_2NOSi$ $(M+Na)^+$ 515.9687, found 515.9679.



(±)-7-(4-Methoxyphenyl)-7-azabicyhclo[4,2,0]oct-3-en-8-one (9). Compound **1** (5.0 g, 40.6 mmol), CuI (0.15 g, 0.8 mmol), K_2CO_3 (16.3 g, 117.7 mmol) were placed in a Schlenk tube, and the tube was evacuated and refilled with N_2. Dioxane (25 mL), 4-bromoanisole (15.2 g, 81.2 mmol), and N, N`-dimethyl-1,2-ethylenediamine (0.79 g, 8.9 mmol) were added to the Schlenk tube under N_2. The Schlenk tube was sealed, and the mixture was allowed to stir for 20 h at 105 °C. After cooling, the reaction mixture was filtered through silica gel, which was then rinsed with EtOAc. The filtrate was concentrated *in vacuo*. The crude product was purified by silica column chromatography (1:1 hexane/EtOAc) to give **9** in 95% yield as a solid: mp 137-139 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.30 (d, 2 H, *J* = 9.0 Hz), 6.86 (d, 2 H, *J* = 9.0 Hz), 5.95-

5.84 (m, 1 H), 5.70-5.59 (m, 1 H), 4.40-4.34 (m, 1 H), 3.78 (s, 3 H), 3.52-3.43 (m, 1 H), 2.75-2.52 (m, 2 H), 2.28-2.14 (m, 2 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 166.4, 155.8, 130.4, 126.5, 124.0, 118.5, 114.3, 55.3, 50.2, 46.6, 23.8, 21.3; HRMS (m/z, ESI) calcd for $C_{14}H_{15}NO_2$ $(M^{\cdot})^+$ 229.1098, found 229.1101.

(±)-*cis*-3,4-bis-(2-Hydroxyethyl)-1-(4-methoxyphenyl)-azetidin-2-one (10). To a stirred solution of **9** (2.0 g, 8.8 mmol) and 4-methylmorpholine N-oxide (3.1 g, 26.5 mmol) in CH_2Cl_2 (100 mL) was added a 4% aqueous OsO_4 solution (2.7 mL, 0.44 mmol) at room temperature. After 24 h, the reaction mixture was diluted with CH_2Cl_2 (120 mL) and washed with 10% $Na_2S_2O_3$, sat. $NaHCO_3$ and brine. The combined aqueous layer was extracted with CH_2Cl_2. The combined organic layers were dried ($MgSO_4$) and, after filtration, concentrated *in vacuo*. The crude product was quickly purified by silica column chromatography (eluent varied from 1:1 $CHCl_3$/EtOAc to 10:1 EtOAc/MeOH) to give 3,4-bis-hydroxy-7-(4-methoxyphenyl)-7-azabicyhclo[4,2,0] octan-8-one in 84% yield as a solid. This material was carried directly on to the next reaction.

To a stirred solution of 3,4-bis-hydroxy-7-(4-methoxyphenyl)-7-azabicyhclo[4,2,0]octan-8-one (2.0 g, 7.4 mmol) in MeOH (220 mL) containing 10 % water was added $NaIO_4$ (2.1 g, 9.7 mmol) at 0 ^{o}C. After 5 h at 0 ^{o}C, $NaBH_4$ (0.84 g, 22.3 mmol) was added to the reaction mixture, which was then warmed to room temperature. After 2 h, the reaction mixture was diluted with EtOAc (1 L) and washed with brine (200 mL). The organic layer was dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 1:1 CH_2Cl_2/EtOAc to 15:1 EtOAc/MeOH) to give **10** in 83% yield as a solid: mp 99-102 ^{o}C; ^{1}H NMR (300 MHz, CD_3OD) δ 7.33 (d, 2 H, J = 8.7 Hz), 6.92 (d, 2 H, J = 9.0 Hz), 4.39 (ddd, 1 H, J = 7.8, 5.4, 5.1 Hz), 3.85-3.72 (m, 5 H), 3.71-3.59 (m, 2 H), 3.49 (ddd, 1 H, J = 8.1, 7.8, 5.7 Hz), 2.15-2.00 (m, 1 H), 1.19-1.82 (m, 3 H); ^{13}C NMR (75 MHz, CD_3OD) δ 169.8, 157.9, 131.6, 120.6, 115.3, 61.0, 59.8, 55.8, 53.4, 49.5, 32.3, 29.1; HRMS (m/z, ESI) calcd for $C_{14}H_{19}NO_4$ $(M+Na)^+$ 288.1209, found 288.1208.

(±)-*cis*-3,4-bis-(2-Methansulfonyloxyethyl)-1-(4-methoxyphenyl)-azetidin-2-one (11). To a stirred solution of **10** (0.68 g, 2.6 mmol) in pyridine (8 mL) was added methansulfonyl chloride (1.2 g, 10.3 mmol) at 0 ^{o}C. The reaction mixture was then warmed to room temperature. After 30 min, the reaction mixture was concentrated under a stream of N_2. The concentrated residue was diluted with EtOAc and washed with 0.5 N HCl, H_2O and brine. The organic layer was dried ($MgSO_4$), filtered and

concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 1:1 CH_2Cl_2/EtOAc to 15:1 EtOAc/MeOH) to give **11** in 97% yield as a oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.26 (d, 2 H, *J* = 8.7 Hz), 6.89 (d, 2 H, *J* = 9.0 Hz), 4.60-4.44 (m, 2 H), 4.42-4.25 (m, 3 H), 3.79 (s, 3 H), 3.57 (ddd, 1 H, *J* = 8.4, 7.8, 6.3 Hz), 3.07 (s, 3 H), 3.04 (s, 3 H), 2.41-2.27 (m, 1 H), 2.25-2.04 (m, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 165.7, 156.3, 129.7, 119.1, 114.3, 67.9, 66.5, 55.2, 51.1, 47.5, 37.0, 36.8, 27.9, 24.7; HRMS (m/z, ESI) calcd for $C_{16}H_{23}NO_8S_2$ $(M^-)^+$ 421.0860, found 421.0851.

(±)-*cis*-4-(2-Chloroethyl)-3-(2-methansulfonyloxyethyl)-1-(4-methoxy phenyl)-azetidin-2-one (12). To a stirred solution of **11** (2.8 g, 6.6 mmol) in pyridine (50 mL) was added 4 N HCl in dioxane (3.3 mL, 13.3 mmol) at 0 °C. The reaction mixture was then warmed to room temperature. After 14 h, the reaction mixture was concentrated under a stream of N_2. The concentrated residue was diluted with EtOAc and washed with 0.5 N HCl, H_2O and brine. The organic layer was dried ($MgSO_4$) and concentrated *in vacuo*. The crude product was purified by silica column chromatography (2:1:2 CH_2Cl_2/hexane/EtOAc) to give **12** in 38% yield as an oil. The recovered starting material (30 to 40%) was recycled by the same procedure to give **12** in total 50% yield as an oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29 (d, 2 H, *J* = 9.3 Hz), 6.89 (d, 2 H, *J* = 9.0 Hz), 4.59-4.41 (m, 3 H), 3.79 (s, 3 H), 3.69-3.51 (m, 3 H), 3.08 (s, 3 H), 2.42-2.28 (m, 1 H), 2.23-2.04 (m, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 165.9, 156.4, 130.0, 119.2, 114.4, 67.8, 55.4, 51.6, 47.5, 41.5, 37.1, 31.5, 25.0; HRMS (m/z, ESI) calcd for $C_{15}H_{20}ClNO_5S$ $(M+Na)^+$ 384.0643, found 384.3652.

(±)-*cis*-3-(2-Azidoethyl)-4-ethyl-1-(4-methoxyphenyl)-azetidin-2-one (13). A reaction flask was charged with **12** (1.2 g, 3.2 mmol) and AIBN (0.1 g, 0.64 mmol) and then evacuated. Toluene (30 mL) was added, and the flask was filled with N_2. To the stirred reaction mixture was added tributyltinhydride (4.7 g, 16.1 mmol). A reflux condenser was then installed, and the mixture was warmed to 80 °C. After 12 h, the reaction mixture was concentrated *in vacuo*. The concentrated residue was purified by silica column chromatography (eluent varied from $CHCl_3$ to 1:1 Hexane/EtOAc) to give tributyltinhydride-contaminated *cis*-4-ethyl-3-(2-methansulfonyloxyethyl)-1-(4-methoxyphenyl)-azetidin-2-one, which was used for the next reaction without further purification.

To a stirred solution of the tributyltinhydride-contaminated *cis*-4-ethyl-3-(2-methansulfonyloxyethyl)-1-(4-methoxyphenyl)-azetidin-2-one described above in DMF

(15 mL) at 60-80 °C was added NaN_3 (2.1 g, 32.2 mmol). After 12 h, the reaction mixture was diluted with H_2O and extracted several times with EtOAc. The combined organic layers were washed with H_2O and brine, dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (2:1 hexane/EtOAc) to give **13** in 90% overall yield from **12** as a solid: mp 49-50 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.28 (d, 2 H, *J* = 9.0 Hz), 6.87 (d, 2 H, *J* = 9.0 Hz), 4.05 (ddd, 1 H, *J* = 9.3, 5.7, 3.9 Hz), 3.78 (s, 3 H), 3.74-3.64 (m, 1 H), 3.62-3.51 (m, 1 H), 3.40 (ddd, 1 H, *J* = 10.5, 5.7, 5.4 Hz), 2.16-1.84 (m, 3 H), 1.74-1.57 (m, 1 H), 1.00 (t, 3 H, *J* = 7.5 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 166.1, 155.7, 130.5, 118.5, 113.9, 55.5, 54.9, 49.1, 48.1, 24.0, 20.9, 10.3; HRMS (m/z, ESI) calcd for $C_{14}H_{18}N_4O_2$ $(M+Na)^+$ 297.1322, found 297.1319.

In order to confirm the regiochemistry of compound **13**, COSY 2D-NMR spectroscopy was was performed; the data are shown below.

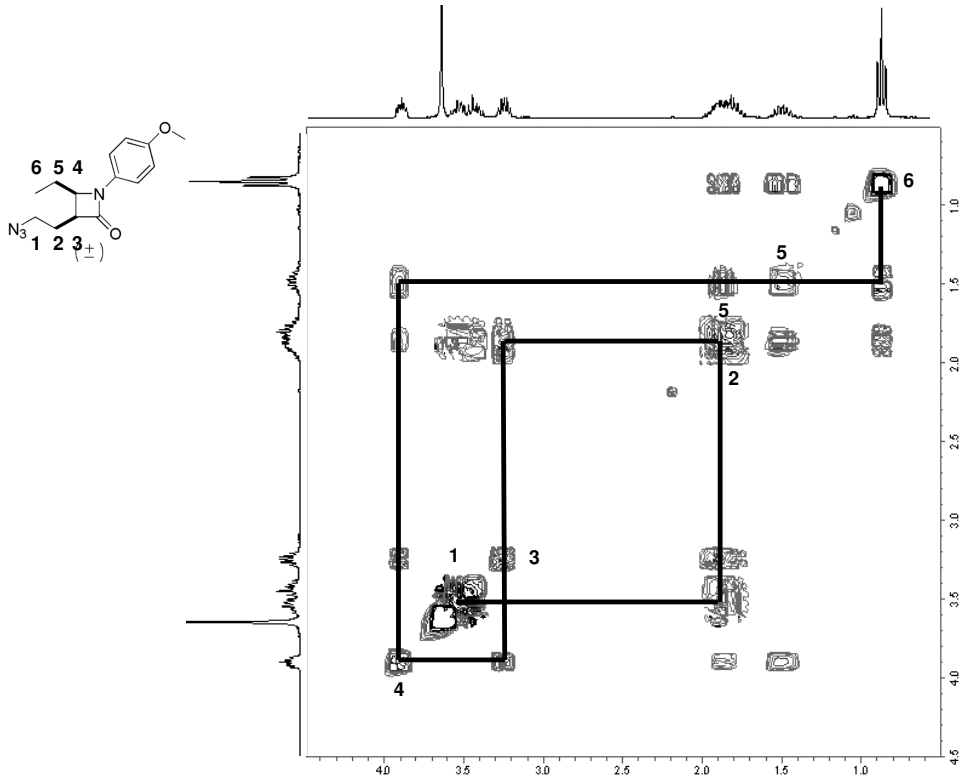
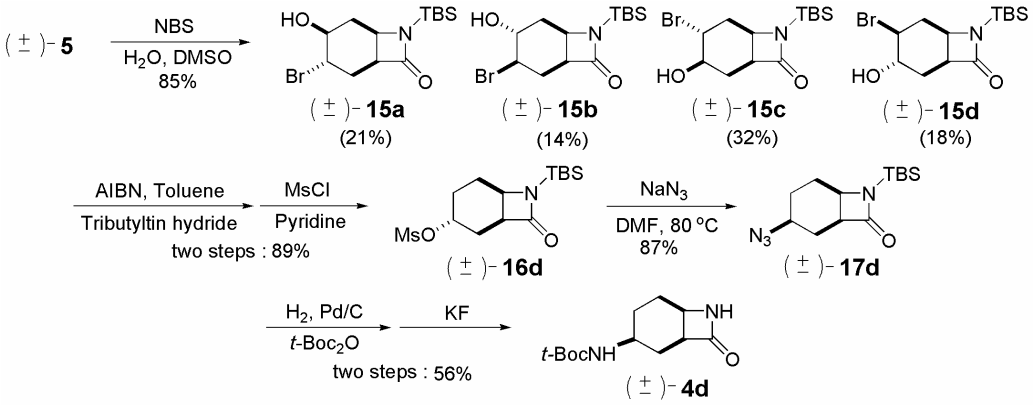


Figure S1. COSY data of **13**.

(±)-*cis*-3-(2-*tert*-Butoxycarbonylaminoethyl)-4-ethyl-1-(4-methoxyphenyl)-azetidin-2-one (14). A suspension of **13** (0.8 g, 2.9 mmol), Boc_2O (1.9 g, 8.7 mmol) and 10% Pd/C (wet, 0.64 g) in MeOH (10 mL) was shaken on a Parr hydrogenation apparatus under 50 psi H_2 at room temperature. After 12 h, the reaction mixture was

filtered through celite, and the pad was rinsed with MeOH. The combined filtrate was concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 3:3:1 CH_2Cl_2/hexane/EtOAc to 2:1 hexane/EtOAc) to give **14** in 87% yield as a solid.: mp 100-103 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29 (d, 2 H, *J* = 9.0 Hz), 6.87 (d, 2 H, *J* = 9.3 Hz), 5.61 (s, 1 H), 4.03 (ddd, 1 H, *J* = 9.3, 5.7, 3.9 Hz), 3.78 (s, 3 H), 3.58-3.43 (m, 1 H), 3.38-3.15 (m, 2 H), 2.07-1.78 (m, 3 H), 1.75-1.56 (m, 1 H), 1.45 (s, 9 H), 0.99 (t, 3 H, *J* = 7.5 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 167.2, 156.0, 155.9, 130.6, 118.7, 114.1, 78.5, 55.7, 55.1, 49.8, 39.0, 28.2, 24.7, 21.1, 10.5; HRMS (m/z, ESI) calcd for $C_{19}H_{28}N_2O_4$ $(M^{\cdot})^+$ 348.2044, found 348.2039.

(±)-*cis*-3-(2-*tert*-Butoxycarbonylaminoethyl)-4-ethyl-azetidin-2-one (3). To a stirred solution of **14** (0.87 g, 2.5 mmol) in THF (4 mL) and acetonitrile (16 mL) was added a solution of ceric ammonium nitrate (CAN; 4.1 g, 7.5 mmol) in H_2O (20 mL) at 0 °C. After 30 min at 0 °C, the reaction was quenched by addition of 10% Na_2SO_3 and then water (20 mL) was added. The reaction mixture was extracted several times with EtOAc. The combined organic layers were washed with brine, dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 1:1 hexane/EtOAc to 1:4 hexane/EtOAc) to give **3** in 60% yield as a solid: mp 88-90 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.16 (s, 1 H), 5.46 (s, 1 H), 3.61 (ddd, 1 H, *J* = 9.3, 4.8, 4.5 Hz), 3.48-3.32 (m, 1 H), 3.26-3.07 (m, 2 H), 1.92-1.56 (m, 3 H), 1.55-1.46 (m, 1 H), 1.44 (s, 9 H), 0.96 (t, 3 H, *J* = 7.5 Hz); ^{13}C NMR (75 MHz, $CDCl_3$) δ 172.0, 156.1, 78.7, 53.2, 51.0, 39.1, 28.3, 24.9, 24.0, 10.7; HRMS (m/z, ESI) calcd for $C_{12}H_{22}N_2O_3$ $(M+Na)^+$ 265.1523, found 265.1527.



(±)-4-Bromo-7-*tert*-butyldimethylsilyl-3-hydroxy-7-azabicyhclo[4,2,0] octan-8-one (15). To a stirred solution of **5** (1.2 g, 5.0 mmol) and H_2O (0.72 g, 40.1

mmol) in DMSO (23 mL) was added N-bromosuccinimide (0.98 g, 5.5 mmol) at 0 °C. The mixture was then warmed to room temperature. After 2 h, the reaction mixture was diluted with H_2O and extracted several times with EtOAc. The combined organic layers were washed with H_2O and brine, dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 5:1 to 1:1 hexane/EtOAc) to give **15a** (21%), a mixture of **15b** (14%) and **15c** (32%), and **15d** (18%). In order to determine the stereochemistries of **15a**, **15b**, **15c** and **15d**, these compounds were resynthesized using (*1S,6R*)-**5** and then crystallized (crystals of **15b** could not be obtained). Crystal structures were determined for enantiopure **15a**, **15c** and **15d** (shown below).

15a: ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.20-4.07 (m, 1 H), 3.92-3.77 (m, 2 H), 3.49-3.39 (m, 1 H), 2.78-2.65 (m, 1 H), 2.61-2.40 (m, 2 H), 2.20-2.03 (m, 1 H), 1.85-1.70 (m, 1 H), 0.96 (s, 9 H), 0.27 (s, 3 H), 0.20 (s, 3 H).

15b and 15c: ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.22 (ddd, 1 H (**15c**), *J* = 10.2, 8.1, 3.9 Hz), 4.08-3.85 (m, 2.2 H (**15b**=1.2 H, **15c**=1 H)), 3.81 (ddd, 1 H (**15c**), *J* = 5.7, 5.7, 2.7 Hz), 3.44-3.27 (m, 1.4 H (**15b**=0.4 H, **15c**=1 H)), 2.68-2.19 (m, 5.6 H (**15b**=1.6 H, **15c**=4 H)), 2.00 (ddd, 1 H (**15c**), *J* = 12.3, 7.8, 4.5 Hz), 1.76 (ddd, 0.4 H (**15b**), *J* = 15.0, 9.6, 6.0 Hz), 0.96 (s, 12.6 H (**15b**=3.6 H, **15c**=9 H)), 0.25 (s, 4.2 H (**15b**=1.2 H, **15c**=3 H)), 0.24 (s, 1.2 H (**15b**)), 0.20 (s, 3 H(**15c**)).

15d: mp 107-110 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.06-3.88 (m, 2 H), 3.81-3.71 (m, 1 H), 3.56 (ddd, 1 H, *J* = 8.7, 6.0, 3.3 Hz), 2.82 (ddd, 1 H, *J* = 15.0, 7.2, 5.7 Hz), 2.54-2.42 (m, 2 H), 2.23 (ddd, 1 H, *J* = 15.3, 10.2, 5.4 Hz), 1.64 (ddd, 1 H, *J* = 14.4, 8.7, 8.4 Hz), 0.96 (s, 9 H), 0.29 (s, 3 H), 0.20 (s, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.0, 71.7, 55.3, 48.2, 39.5, 29.0, 26.3, 18.6, -5.3, -5.4; HRMS (m/z, ESI) calcd for $C_{13}H_{24}BrNO_2Si$ $(M+Na)^+$ 356.0651, found 356.0657.

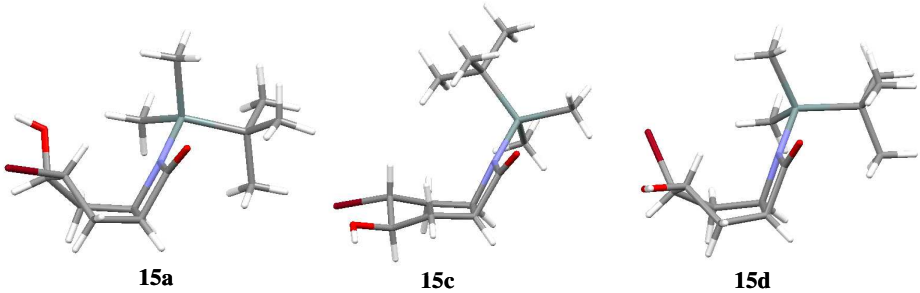


Figure S2. Crystal structure of **15a**, **15c** and **15d**.

(±)-7-*tert*-Butyldimethylsilyl-3-methansulfonyloxy-7-azabicyhclo[4,2,0] octan-8-one (16d). A reaction flask was charged with **15d** (0.27 g, 0.8 mmol) and

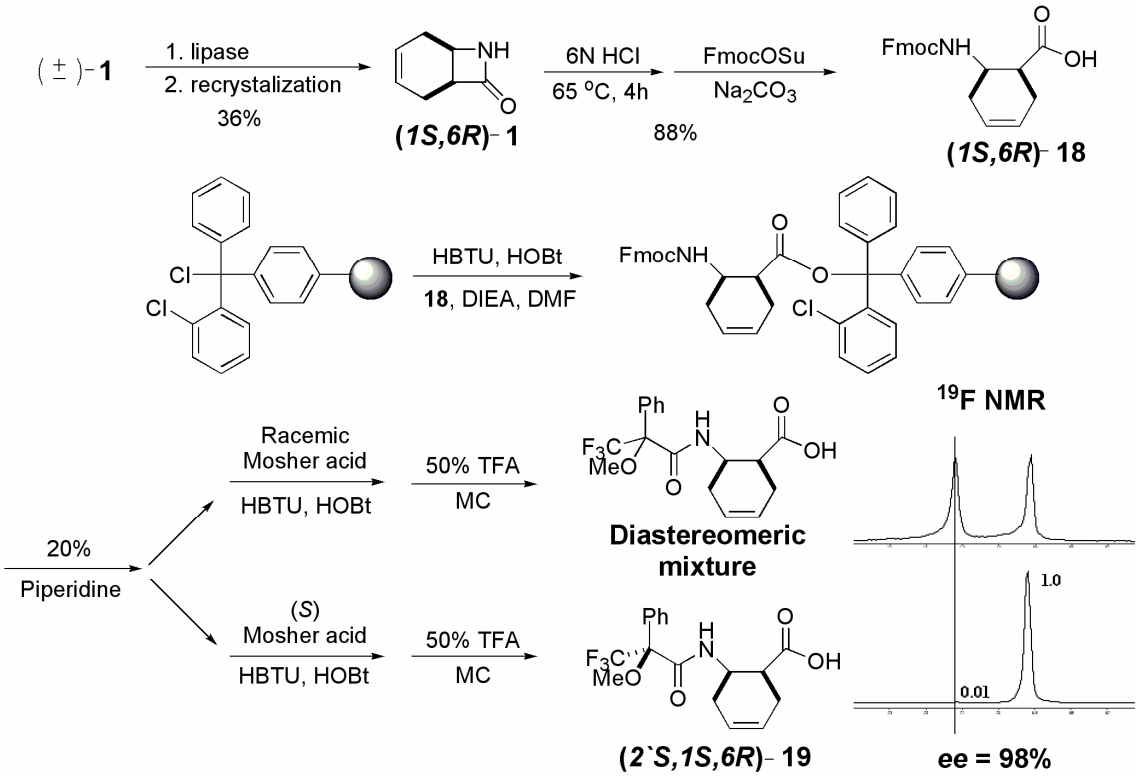
AIBN (26.8 mg, 0.16 mmol) and evacuated. Toluene (15 mL) was added, and the flask was filled with N_2. To the stirring mixture was added tributyltinhydride (1.2 g, 4.1 mmol). A reflux condenser was then installed, and the mixture was warmed to 80 ^oC. After 12 h, the reaction mixture was concentrated *in vacuo*. The residue was purified by silica column chromatography (eluent varied from $CHCl_3$ to 1:4 hexane/EtOAc) to give tributyltinhydride-contaminated 7-*tert*-butyldimethylsilyl-3-hydroxy-7-azabicyhclo [4,2,0]octan-8-one, which was used for the next reaction without further purification.

To a stirred solution of the tributyltinhydride-contaminated 7-*tert*-butyldimethylsilyl-3-hydroxy-7-azabicyhclo[4,2,0]octan-8-one described above in pyridine (2 mL) was added methansulfonyl chloride (0.18 g, 1.6 mmol) at 0 ^oC. The mixture was then warmed to room temperature. After 30 min, the reaction mixture was concentrated under a stream of N_2. The residue was diluted with EtOAc, and the solution was washed with 0.5 N HCl, H_2O and brine. The organic layer was dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (1:1 hexane/EtOAc) to give **16d** in 89% overall yield from **15d** as an oil: ^1H NMR (300 MHz, $CDCl_3$) δ 5.07-4.95 (m, 1 H), 3.84-3.75 (m, 1 H), 3.46-3.36 (m, 1 H), 3.00 (s, 3 H), 2.38-2.25 (m, 1 H), 2.20-1.93 (m, 3 H), 1.91-1.67 (m, 2 H), 0.96 (s, 9 H), 0.26 (s, 3 H), 0.19 (s, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 174.9, 76.2, 47.2, 45.6, 38.4, 26.6, 26.1, 24.9, 23.5, 18.3, -5.5, -5.7; HRMS (m/z, ESI) calcd for $C_{14}H_{27}NO_4SSi$ $(M+Na)^+$ 356.1322, found 356.1311.

(±)-3-Azido-7-*tert*-butyldimethylsilyl-7-azabicyhclo[4,2,0]octan-8-one (17d). To a stirred solution of **16d** (0.24 g, 0.72 mmol) in DMF (3 mL) at 60-65 ^oC was added NaN_3 (0.23 g, 3.6 mmol). After 2 h, the reaction mixture was diluted with H_2O and extracted several times with EtOAc. The combined organic layers were washed with H_2O and brine, dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (3:1 hexane/EtOAc) to give **17d** in 87% yield as an oil: ^1H NMR (300 MHz, $CDCl_3$) δ 3.75-3.66 (m, 1 H), 3.62-3.48 (m, 1 H), 3.28 (ddd, 1 H, J = 9.3, 6.0, 5.7 Hz), 2.14-2.08 (m, 1 H), 1.98-1.68 (m, 5 H), 0.96 (s, 9 H), 0.24 (s, 3 H), 0.21 (s, 3 H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.5, 56.2, 47.1, 45.9, 26.3, 26.1, 25.8, 24.6, 18.3, -5.5, -5.8; HRMS (m/z, ESI) calcd for $C_{13}H_{24}N_4OSi$ $(M+H)^+$ 281.1793, found 281.1786.

(±)-3-*tert*-Butoxycarbonylamino-7-azabicyhclo[4,2,0]octan-8-one (4d). A suspension of **17d** (0.18 g, 0.62 mmol), Boc_2O (0.54 g, 2.49 mmol) and 10% Pd/C (wet, 0.14 g) in MeOH (6 mL) was shaken on a Parr hydrogenation apparatus under 50 psi H_2

at room temperature. After 12 h, the reaction mixture was filtered through celite, and the bed was rinsed with MeOH. The filtrate was concentrated *in vacuo*. To a stirred solution of the concentrated residue in MeOH (10 mL) at 0 ^{o}C was added potassium fluoride (73 mg, 1.2 mmol). The mixture was then warmed to room temperature. After 2 h, the reaction mixture was concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from 1:5 hexane/EtOAc to EtOAc) to give **4d** in 56% yield as a solid: mp 173-175 ^{o}C; ^{1}H NMR (300 MHz, CD_3OD) δ 3.79 (ddd, 1 H, *J* = 5.1, 4.8, 0.9 Hz), 3.50-3.36 (m, 1 H), 3.21 (ddd, 1 H, *J* = 10.2, 5.7, 5.1 Hz), 2.15-2.00 (m, 1 H), 1.97-1.86 (m, 1 H), 1.85-1.48 (m, 4 H), 1.42 (s, 9 H); ^{13}C NMR (75 MHz, CD_3OD) δ 175.1, 157.6, 79.9, 47.4, 46.7, 46.4, 28.7, 27.7, 27.6, 26.4; HRMS (m/z, ESI) calcd for $C_{12}H_{20}N_2O_3$ $(M+Na)^+$ 263.1367, found 263.1376.



(*1S,6R*)-7-Azabicyhclo[4,2,0]oct-3-en-8-one (1). An Erlenmeyer flask (500 mL) was charged with **1** (5 g, 40.6 mmol), lipase on polyacrylate resin (10 g), H_2O (0.73 g, 40.6 mmol) and diisopropyl ether (200 mL). The reaction flask was sealed and agitated at 60 ^{0}C, for 12 h in a shaking incubator. The reaction mixture was filtered, and the isolated solids were rinsed with diisopropyl ether. The combined filtrate was concentrated *in vacuo*. The crude product was purified by silica column

chromatography (eluent varied from 1:1 hexane/EtOAc to EtOAc) and then recrystallized from $CHCl_3$ and diisopropyl ether to give (*1S,6R*)-**1** in 36% yield as a solid: mp 158-161 ^oC; $[\alpha]_D$ -28.2 (c 0.4, $CHCl_3$).

(*1S,6R*)-6-(9*H*-Fluoren-9-ylmethoxycarbonylamino)-cyclohex-3-en-1-carboxylic acid (18). Compound (*1S,6R*)-**1** (0.15 g, 1.2 mmol) was dissolved in 6 N HCl (8 mL). The flask was fitted with a reflux condenser, and the reaction mixture was warmed to 65 ^oC. After 4 h, the reaction mixture was cooled in an ice bath and neutralized to pH 7 by addition of 10 N NaOH. The neutralized reaction mixture was stirred, and $NaCO_3$ (0.52 g, 4.9 mmol) and dioxane (6 mL) were added. A solution of FmocOSu (0.82 g, 2.4 mmol) in dioxane (6 mL) was then slowly added to the stirred reaction mixture at 0 ^oC. After the mixture had stirred overnight at room temperature, the pH was adjusted to 2 with 1 N HCl, and the acidified solution was then extracted several times with EtOAc. The combined organic layers were washed with H_2O and brine, dried ($MgSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by silica column chromatography (eluent varied from $CHCl_3$ to EtOAc) to give **18** in 88 % yield as a solid: mp 74-80 ^oC; $[\alpha]_D$ +11.5 (c 3.0, $CHCl_3$); ^1H NMR (300 MH CD_3OD) δ 7.78 (d, 2 H, *J* = 7.5 Hz), 7.67-7.53 (m, 2 H), 7.42-7.25 (m, 4 H), 5.75-5.55 (m, 2 H), 4.42-4.32 (m, 1 H), 4.31-4.15 (m, 3 H), 2.89-2.78 (m, 1 H), 2.62-1.96 (m, 4 H); ^{13}C NMR (75 MHz, CD_3OD) δ 176.5, 157.8, 145.0, 144.9, 142.2, 128.5, 128.0, 127.9, 126.0, 125.9, 125.2, 120.7, 67.6, 48.1, 47.9, 42.5, 31.2, 26.1; HRMS (m/z, ESI) calcd for $C_{22}H_{21}NO_4$ $(M+Na)^+$ 386.1363, found 386.1359.

Preparation of Mosher amide derivatives from 18. After swelling of 2-chlorotritylchloride resin (1.2 mmol/g, 25 μmol) in CH_2Cl_2, a solution of **18** (1.2 equiv), DIEA (3.3 equiv) in CH_2Cl_2 (1 mL) was added to the resin. After 2 h stirring, the resin was filtered and washed 3 times with CH_2Cl_2 and 3 times with DMF. The Fmoc group was removed by treating the resin with 20% piperidine in DMF twice, for 7 min each time. The resin was isolated by filtration and washed 3 times with CH_2Cl_2 and 3 times with DMF. A solution of racemic or (*S*)-Mosher acid (3 equiv), HBTU (3 equiv), HOBt (3 equiv) and DIEA (6 equiv) in DMF (1 mL) was added to the resin. After 4 h stirring, the resin was isolated by filtration and washed 3 times with CH_2Cl_2, 3 times with DMF and 3 times with CH_2Cl_2. The product was cleaved from the resin using 50% TFA in CH_2Cl_2 for 2 h. The deprotection solution was filtered, and the filtrate was concentrated under a stream of N_2. The crude product was directly used to determine the *ee* value of **19** using ^{19}F NMR; TFA (5 μL) was used as an internal standard.

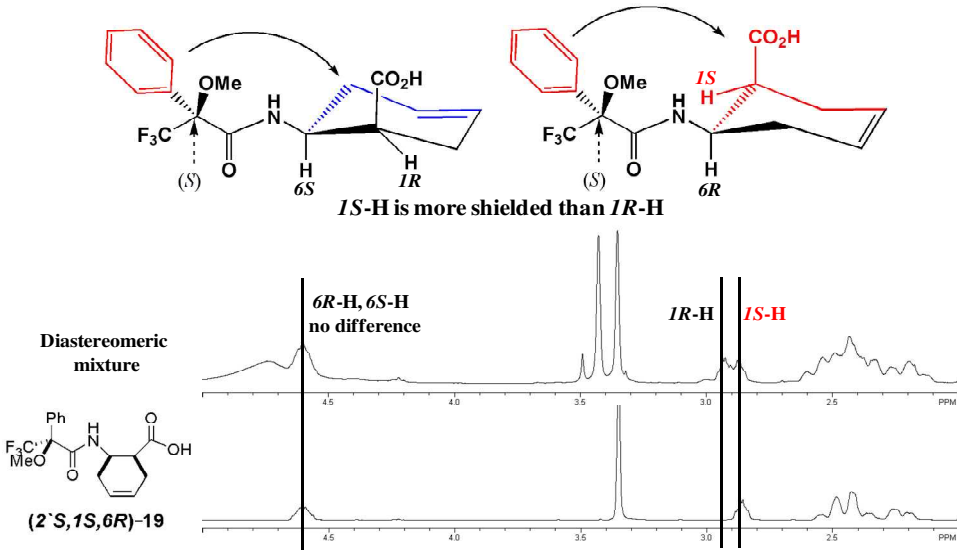
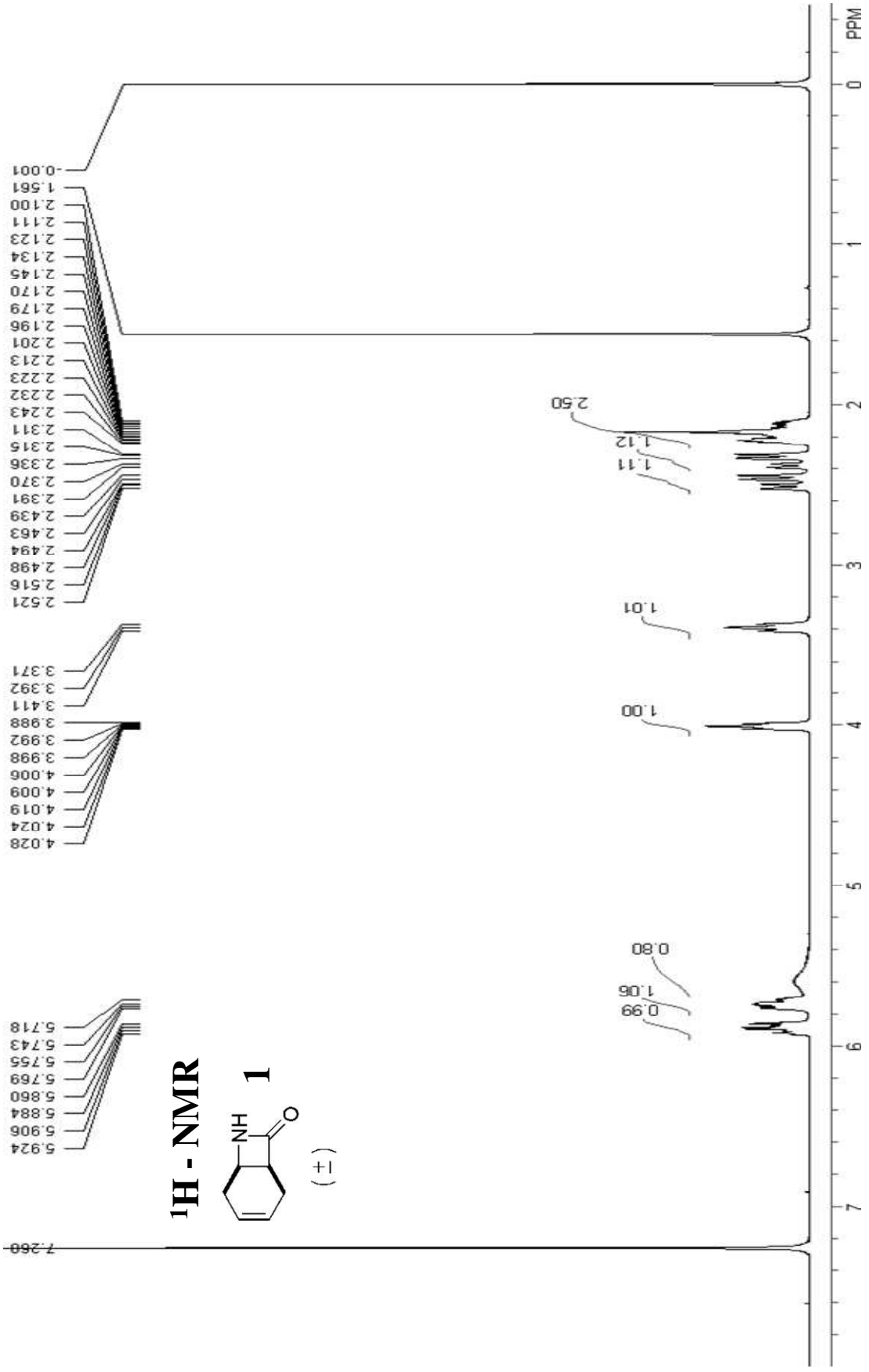


Figure S3. Determination of absolute configuration of (*2`S,1S,6R*)-**19**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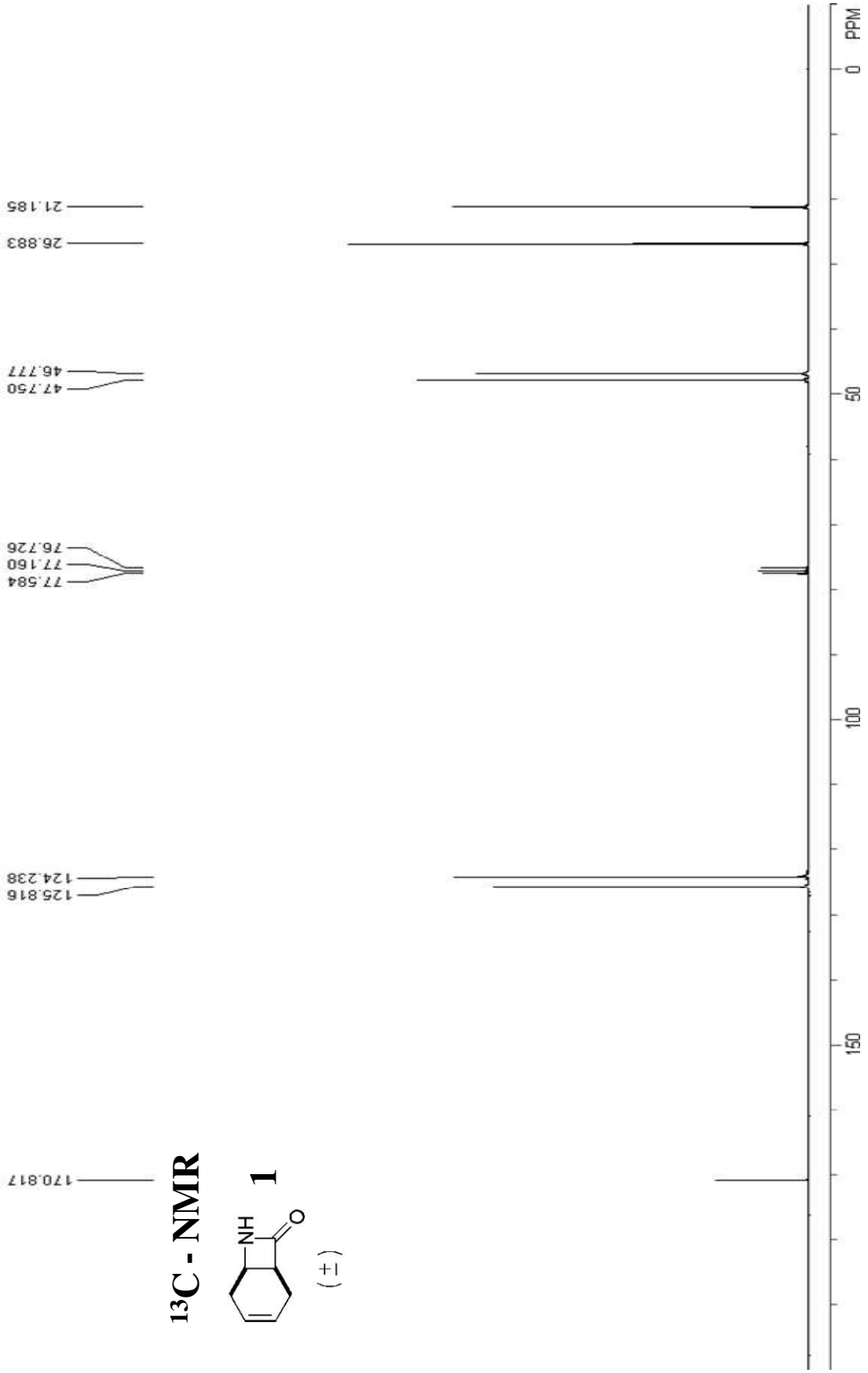
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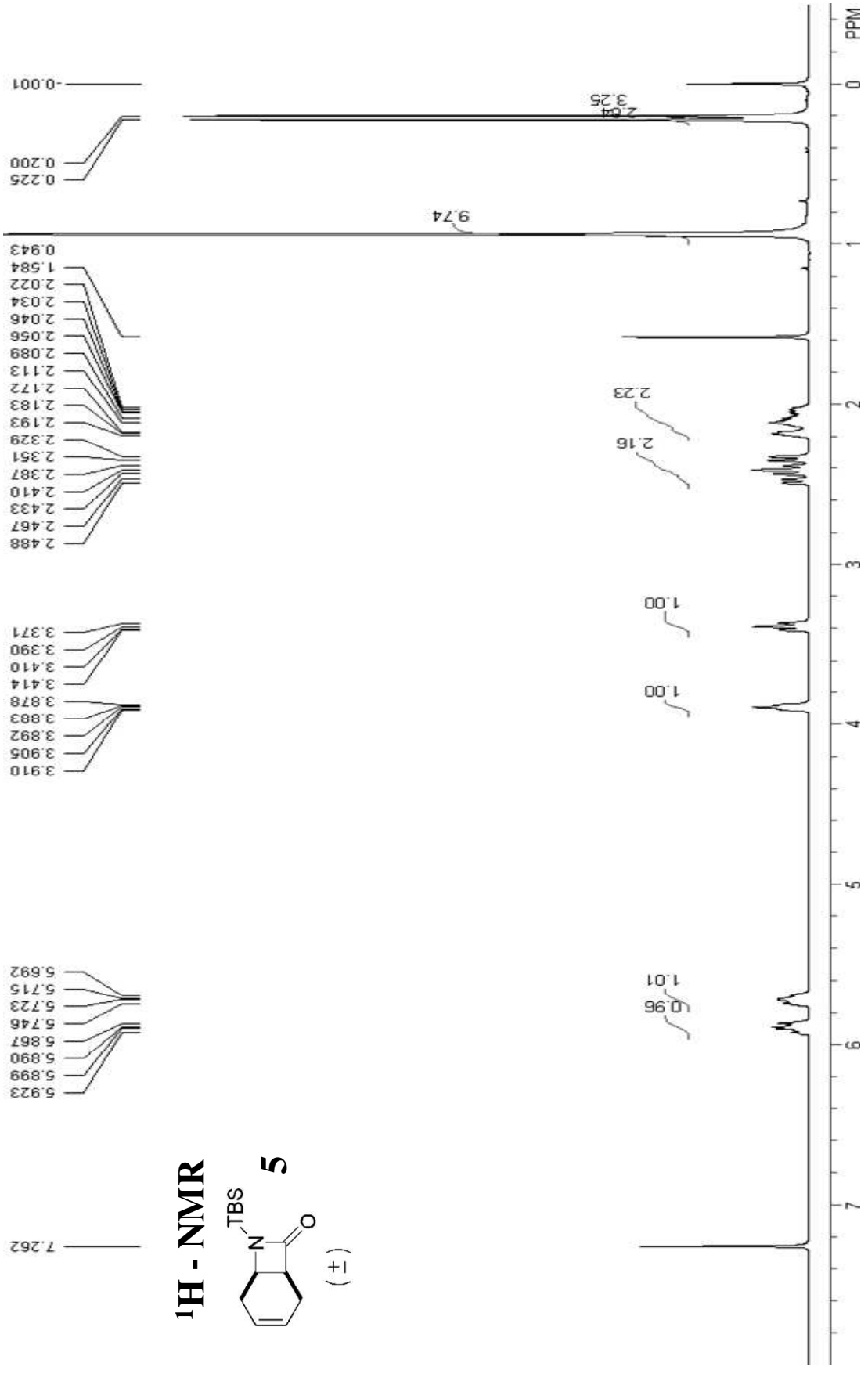
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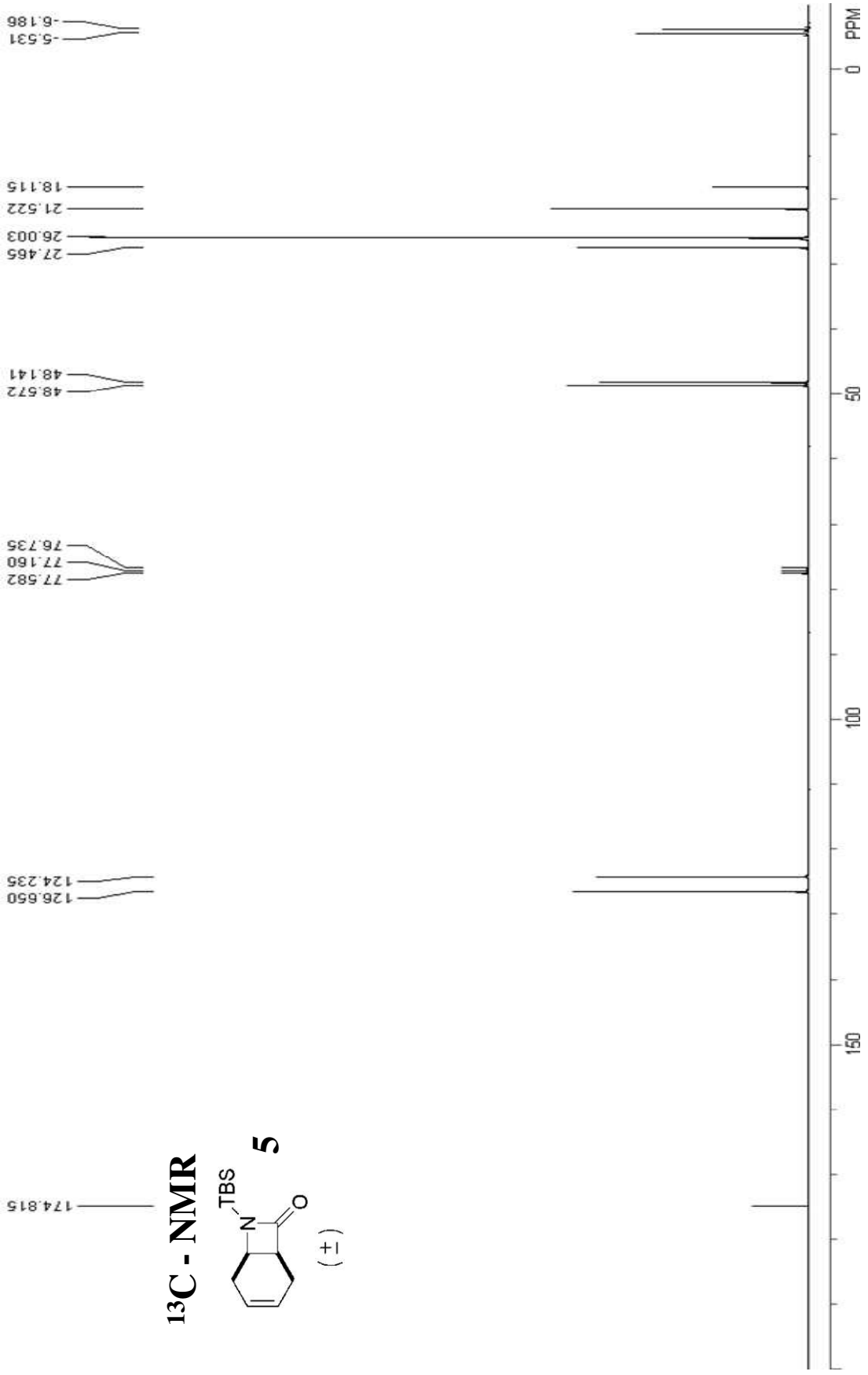
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TBS
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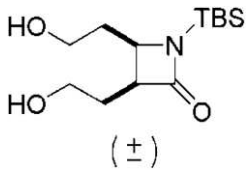
(±)

^{1}H - NMR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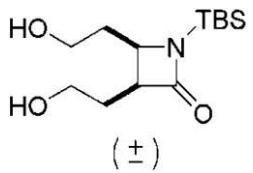
^{13}C - NMR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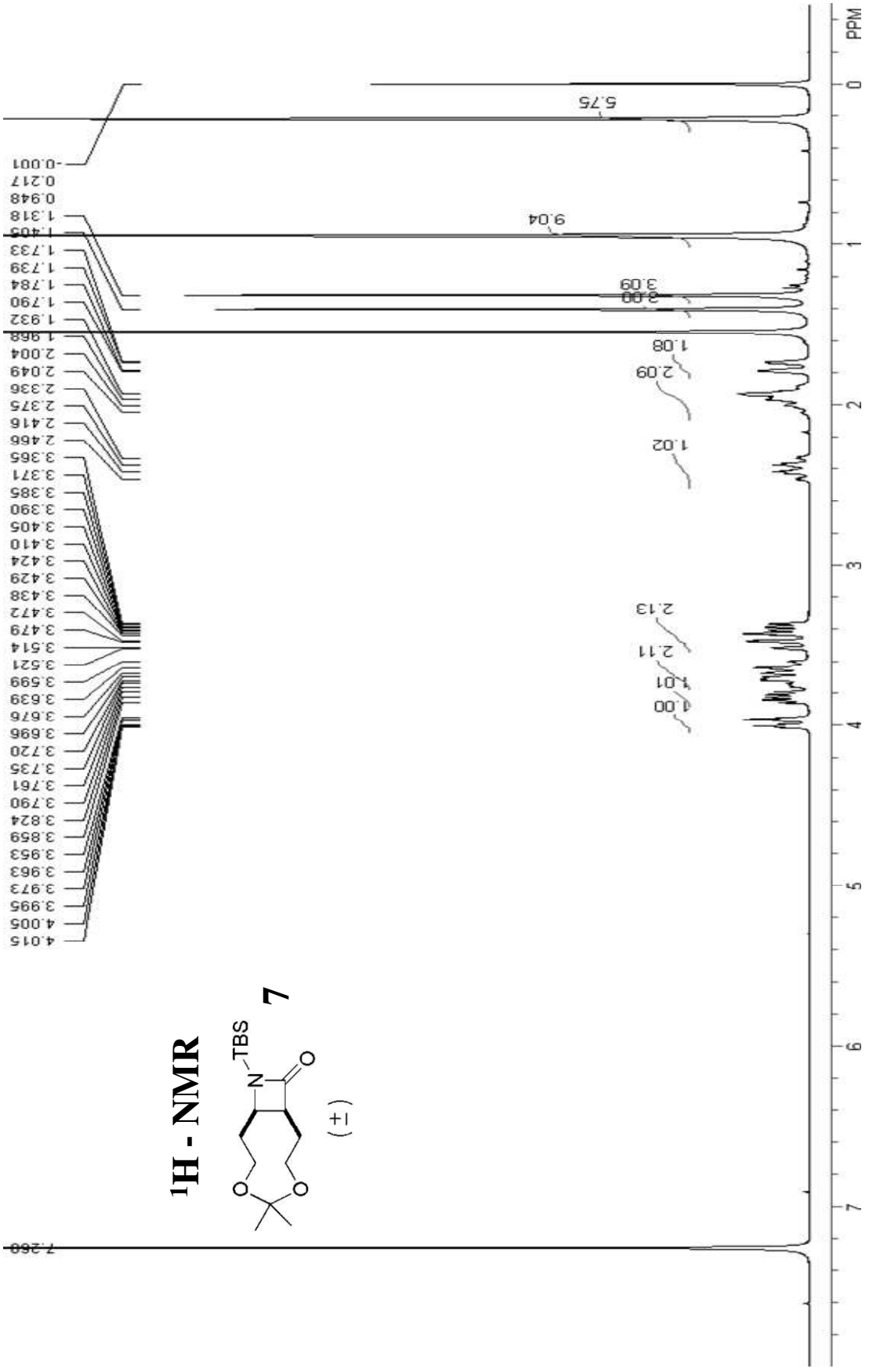
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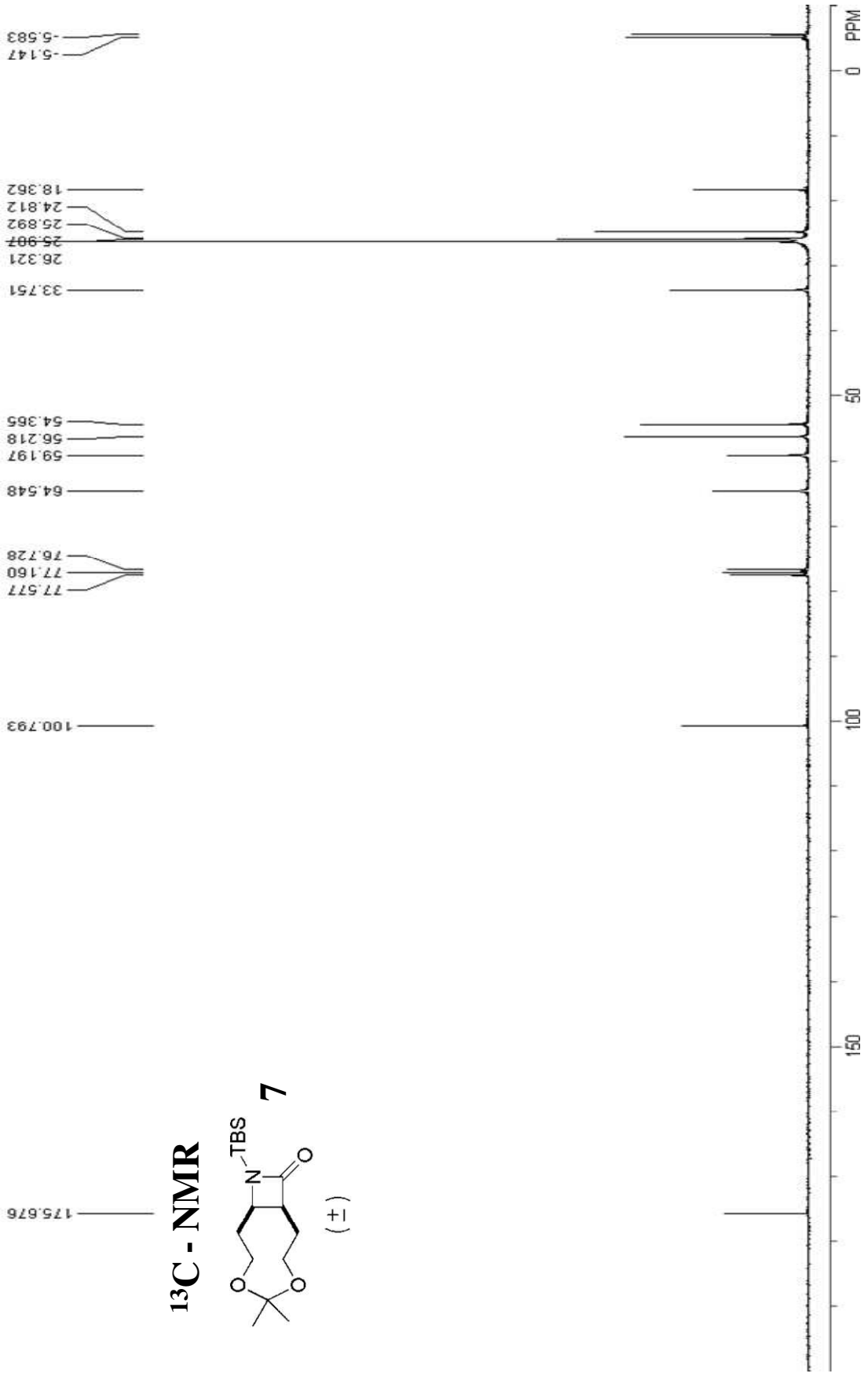
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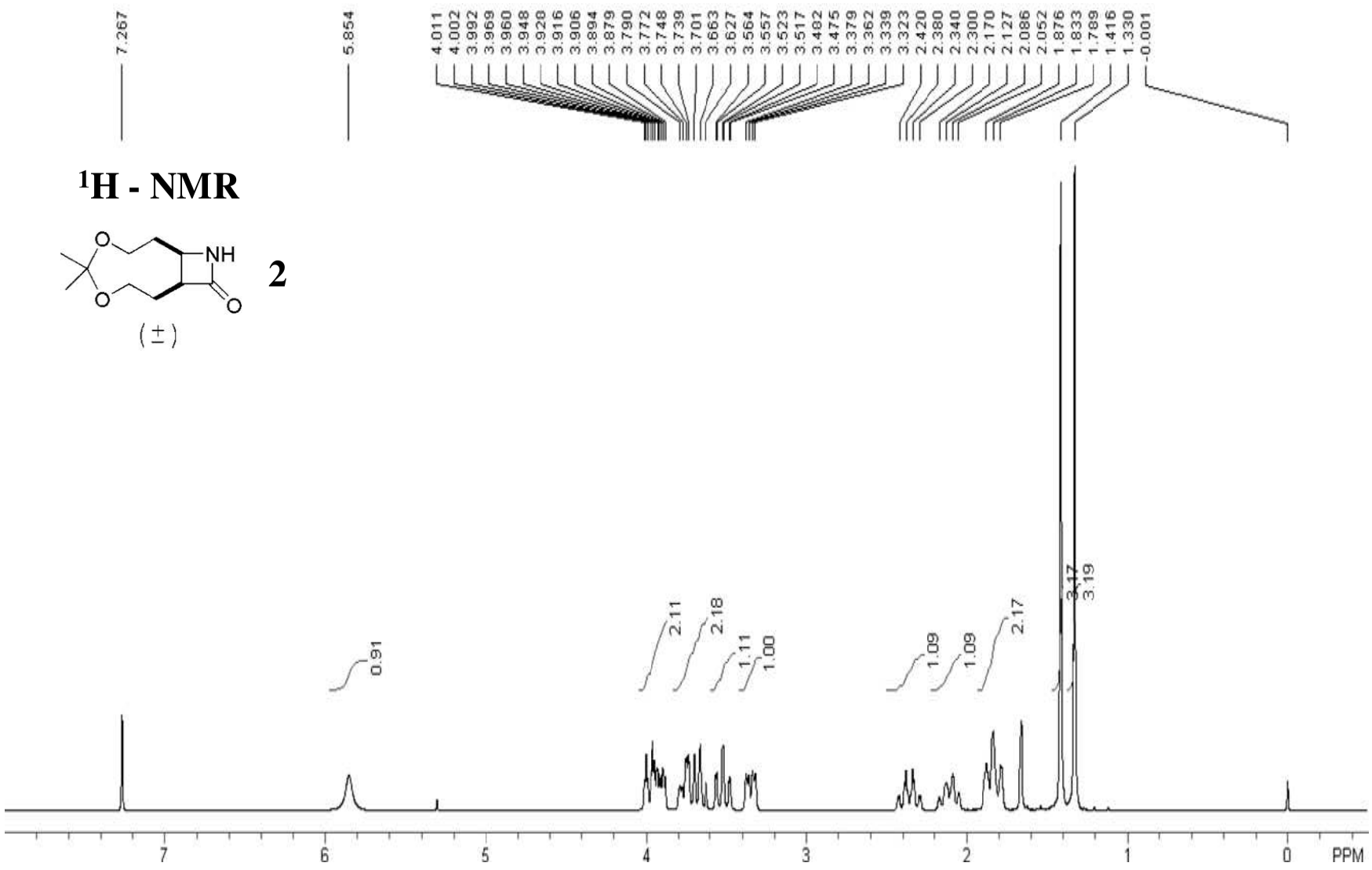
(±)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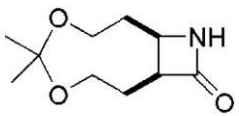
NH
O

2

(±)

^{13}C - NMR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(±)

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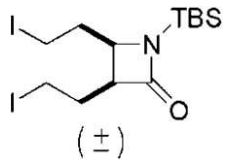
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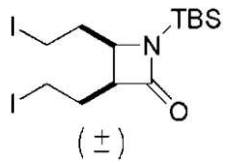
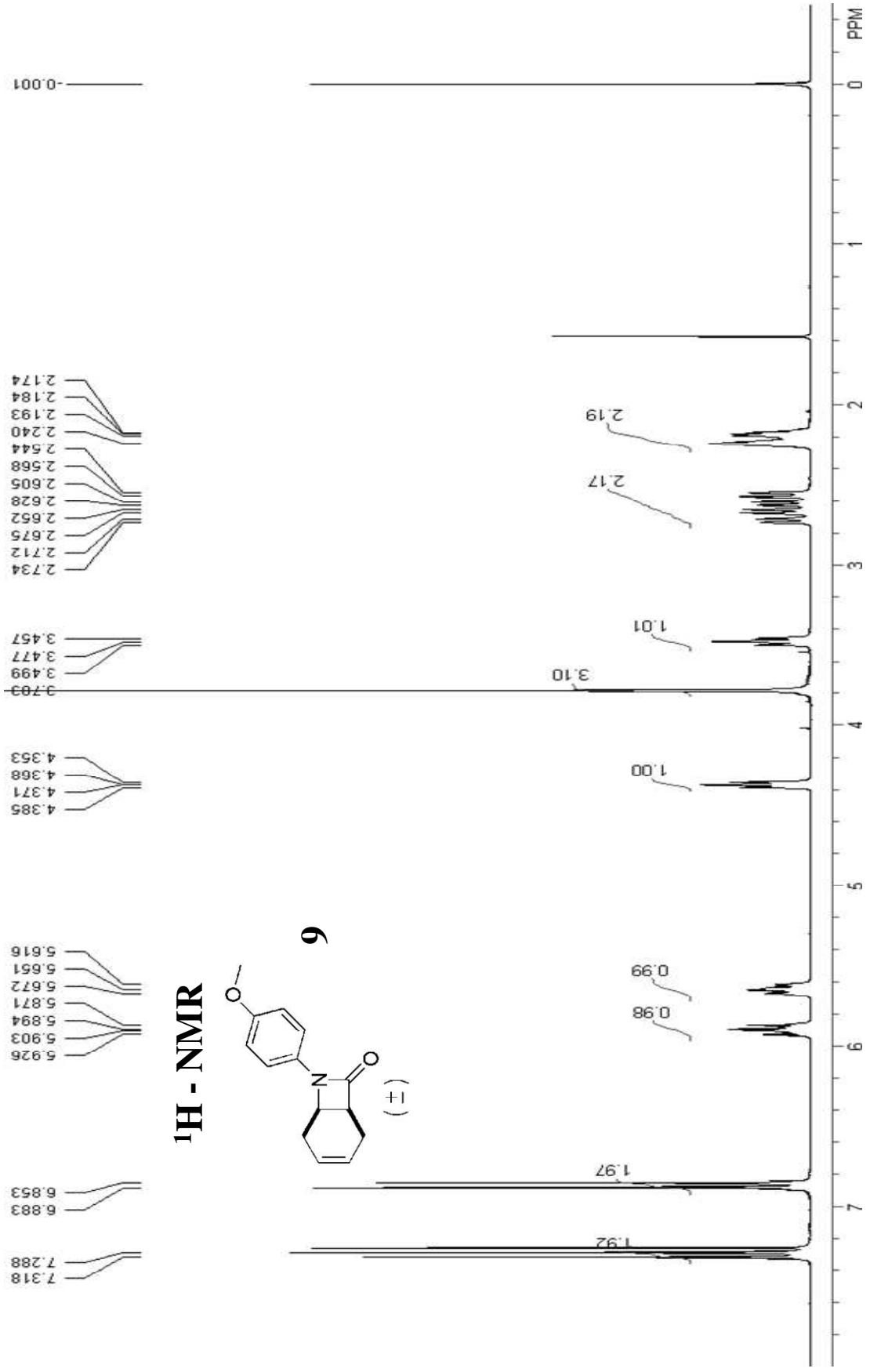
PPM

^{13}C - NMR


I
I
N
TBS
O
(±)

8

174.030
53.047
52.980
35.237
29.587
26.120
18.068
2.992
0.212
-5.394
-5.632
150
100
50
0
PPM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2.184
2.193
2.240
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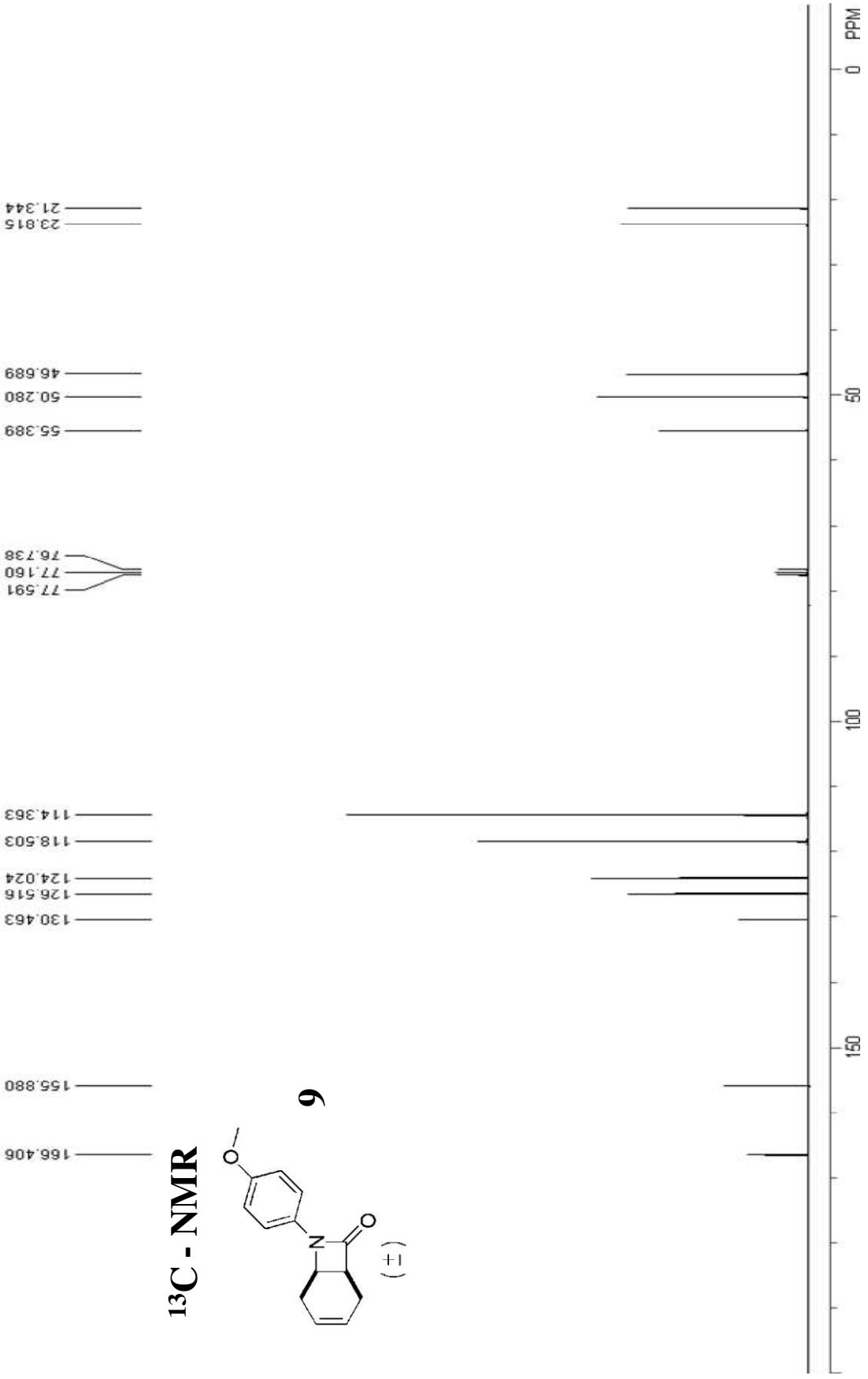
2.568
2.605
2.628
2.652
2.675
2.712
2.734
3.457
3.477
3.499
3.703
4.353
4.368
4.371
4.385
5.616
5.651
5.672
5.871
5.894
5.903
5.926
6.853
6.883
7.288
7.318
2.19
2.17
1.01
3.10
1.00
0.99
0.98
1.97
1.92

^{1}H - NMR

9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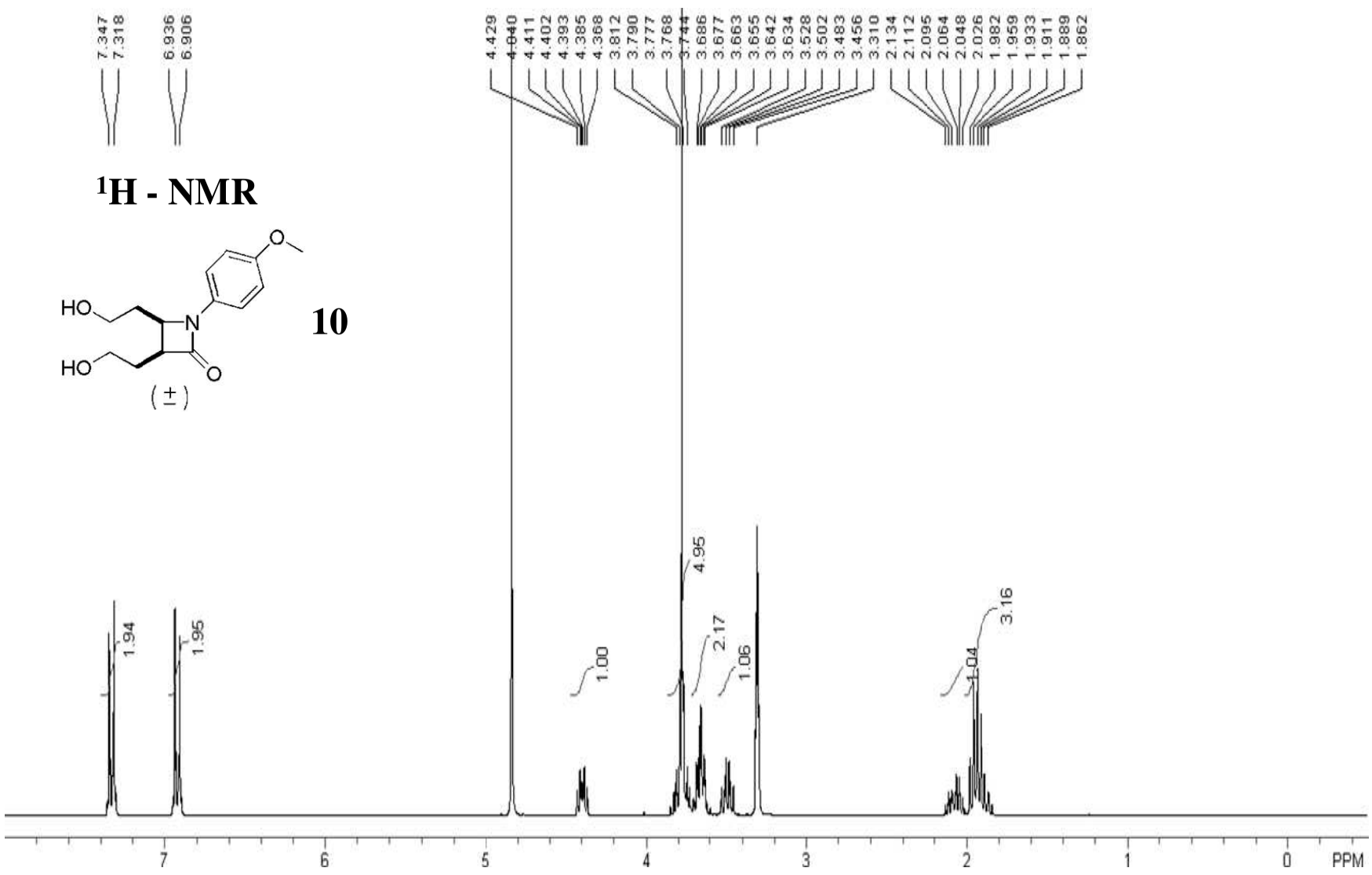
23.815
46.689
50.280
55.389
76.738
77.160
77.591
114.363
118.503
124.024
126.516
130.463
155.880
166.406
PPM
0
50
100
150

^{13}C - NMR

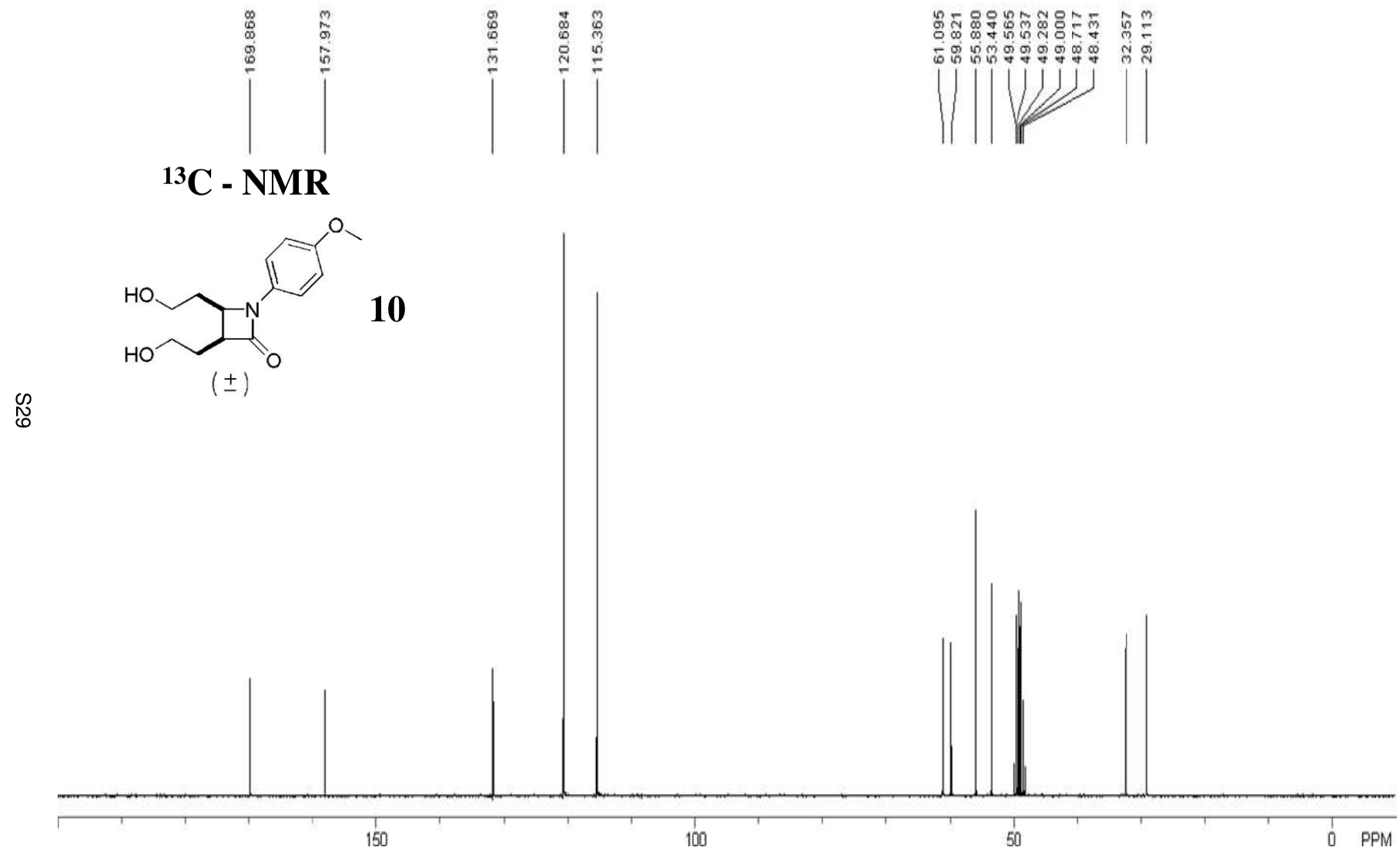
9


7.347
7.318
6.936
6.906
4.429
4.040
4.411
4.402
4.393
4.385
4.368
3.812
3.790
3.777
3.768
3.744
3.686
3.677
3.663
3.655
3.642
3.634
3.528
3.502
3.483
3.456
3.310
2.134
2.112
2.095
2.064
2.048
2.026
1.982
1.959
1.933
1.911
1.889
1.862
1.94
1.95
1.00
4.95
2.17
1.06
1.04
3.16
7
6
5
4
3
2
1
0
PPM

^{1}H - NMR

HO
HO
N
O
O
(±)

10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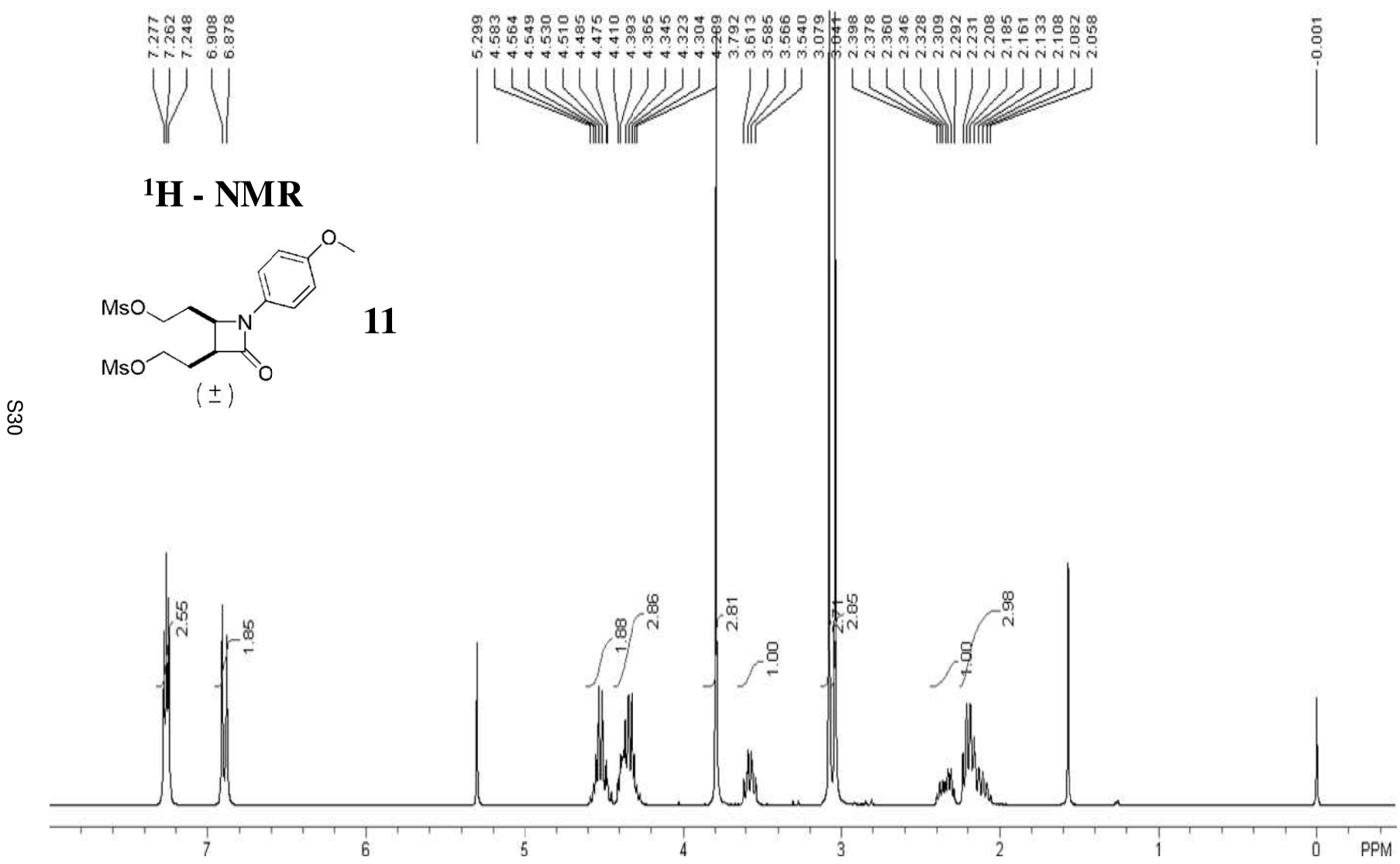
157.973
131.669
120.684
115.363
61.095
59.821
55.880
53.440
49.565
49.537
49.282
49.000
48.717
48.431
32.357
29.113
150
100
50
0
PPM

^{13}C - NMR

HO
HO
N
O
O
(±)

10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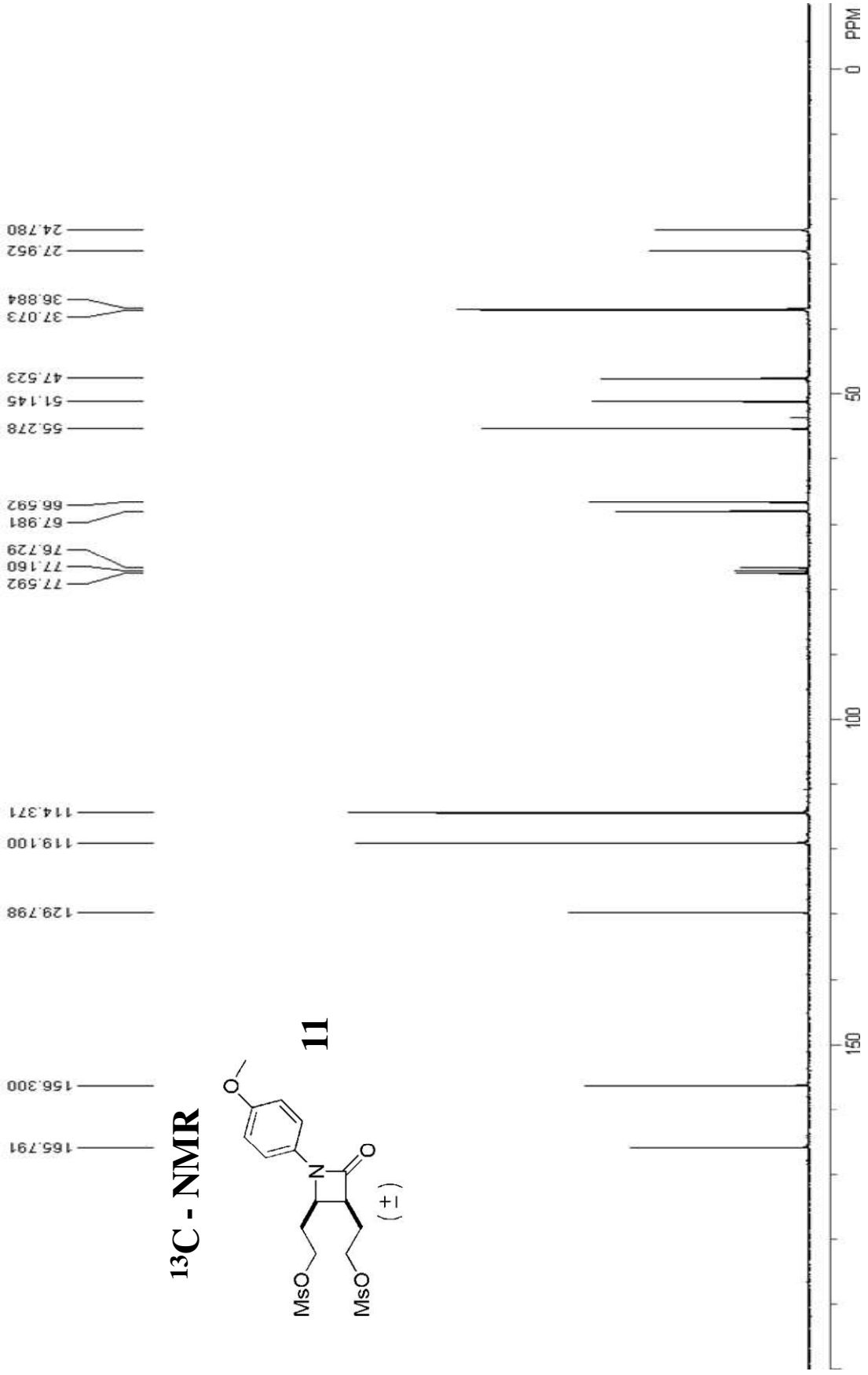
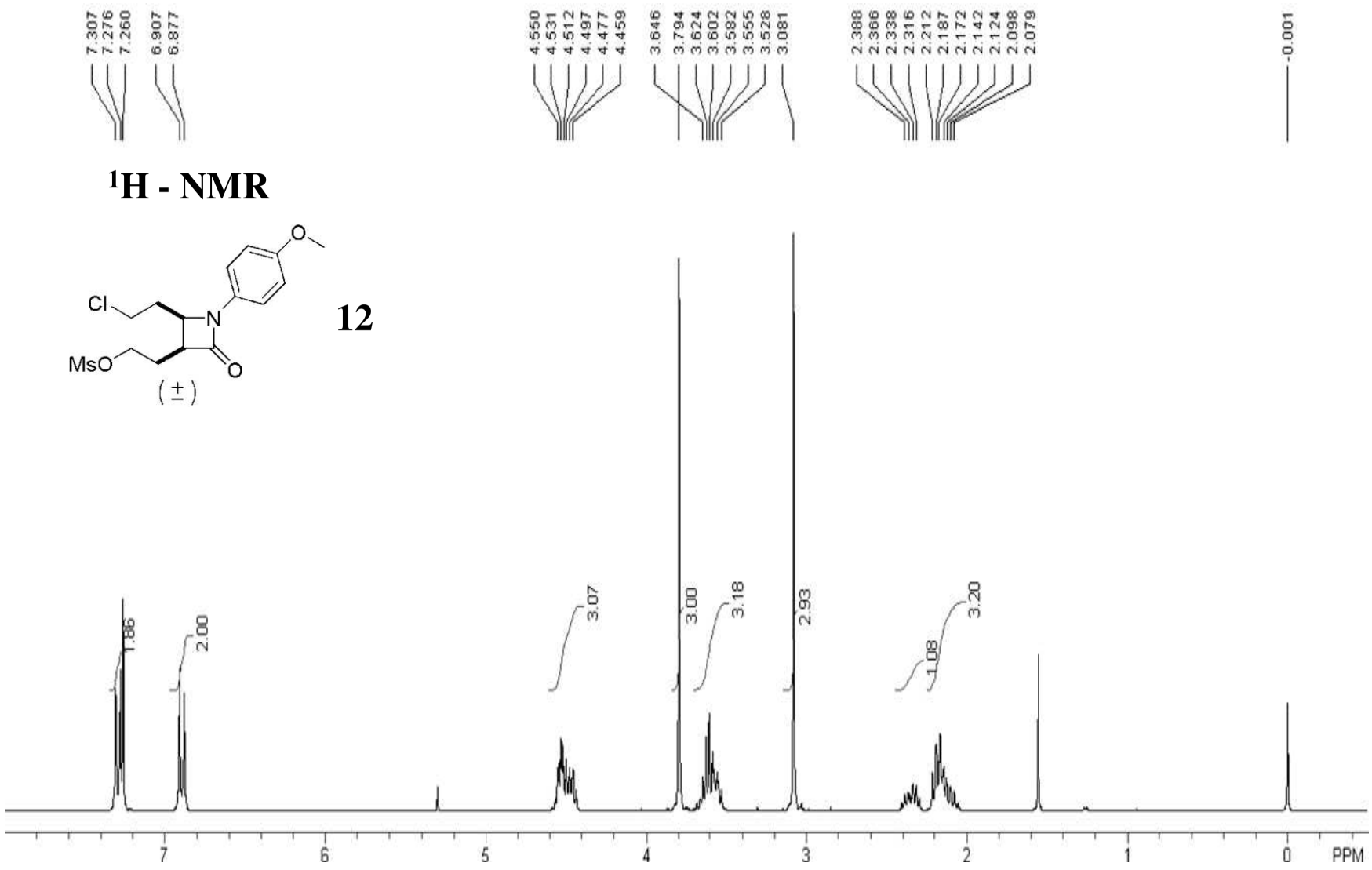
7.262
7.248
6.908
6.878
5.299
4.583
4.564
4.549
4.530
4.510
4.485
4.475
4.410
4.393
4.365
4.345
4.323
4.304
4.289
3.792
3.613
3.585
3.566
3.540
3.079
3.041
2.398
2.378
2.360
2.346
2.328
2.309
2.292
2.231
2.208
2.185
2.161
2.133
2.108
2.082
2.058
-0.001
2.55
1.85
1.88
2.86
2.81
1.00
2.71
2.85
1.00
2.98
7
6
5
4
3
2
1
0
PPM

^{1}H - NMR

MsO
MsO
N
O
O
(±)

11


^{13}C - NMR
11
MsO
MsO
(±)
PPM
0
50
100
150
24.780
27.952
36.884
37.073
47.523
51.145
55.278
66.592
67.981
76.729
77.160
77.592
114.371
119.100
129.798
156.300
165.791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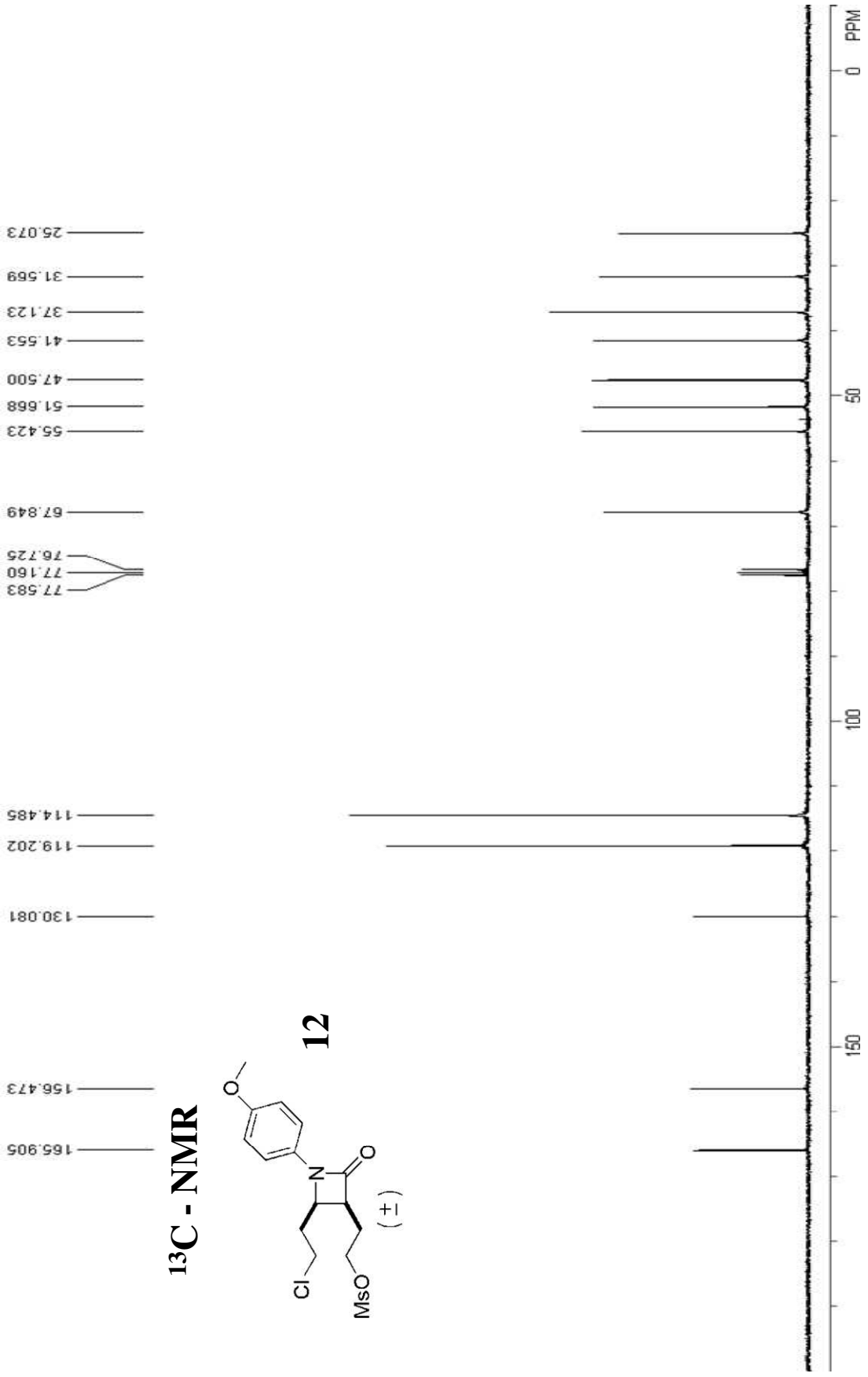
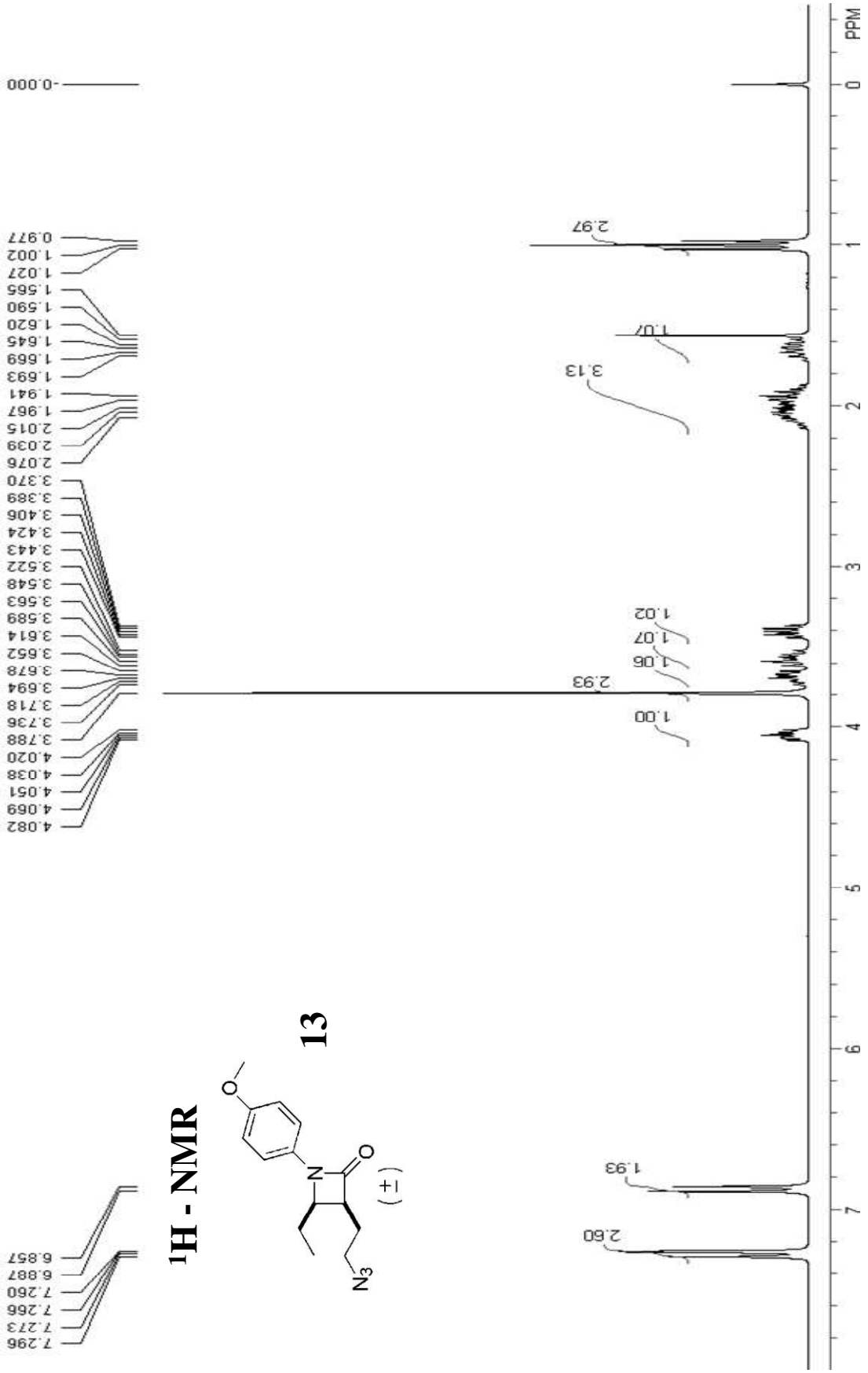
7.276
7.260
6.907
6.877
4.550
4.531
4.512
4.497
4.477
4.459
3.646
3.794
3.624
3.602
3.582
3.555
3.528
3.081
2.388
2.366
2.338
2.316
2.212
2.187
2.172
2.142
2.124
2.098
2.079
-0.001
1.86
2.00
3.07
3.00
3.18
2.93
1.08
3.20
7
6
5
4
3
2
1
0
PPM

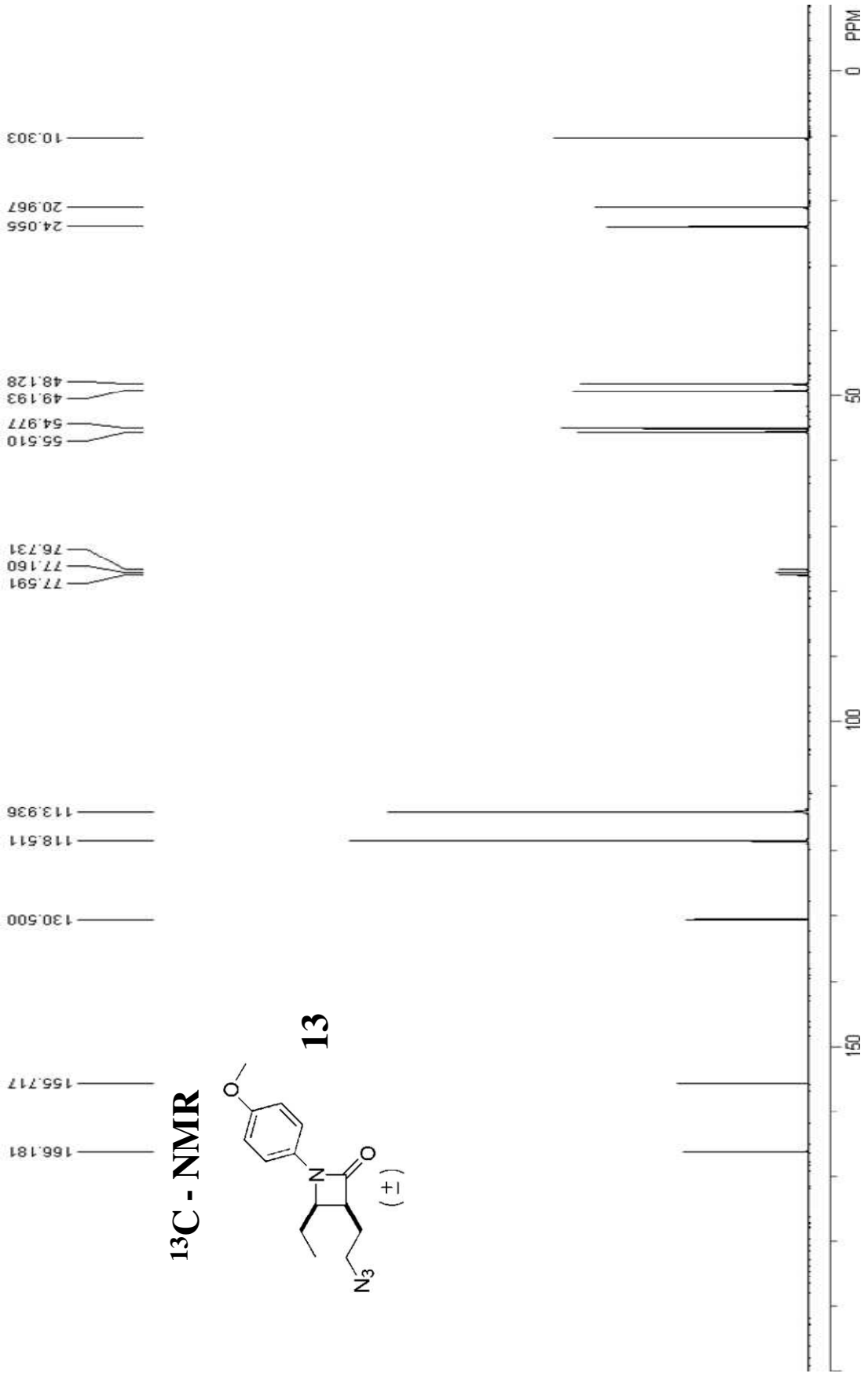
^{1}H - NMR

O
Cl
N
MsO
O
(±)

12


^{13}C - NMR
12
(±)
Cl
MsO
N
O
O
PPM
0
50
100
150
25.073
31.569
37.123
41.553
47.500
51.668
55.423
67.849
76.725
77.160
77.583
114.485
119.202
130.081
156.473
165.905


1H - NMR
13
(±)
O
N
O
N3
PPM
0
1
2
3
4
5
6
7
2.97
1.07
3.13
2.93
1.06
1.07
1.02
1.00
1.93
2.60
-0.000
0.977
1.002
1.027
1.565
1.590
1.620
1.645
1.669
1.693
1.941
1.967
2.015
2.039
2.076
3.370
3.389
3.406
3.424
3.443
3.522
3.548
3.563
3.589
3.614
3.652
3.678
3.694
3.718
3.736
3.788
4.020
4.038
4.051
4.069
4.082
6.857
6.887
7.260
7.266
7.273
7.296


13C - NMR
13
(±)
N3
PPM
0
50
100
150
10.303
20.967
24.055
48.128
49.193
54.977
55.510
76.731
77.160
77.591
113.936
118.511
130.500
155.717
166.181

1H - NMR
14
t-BocNH
(±)
PPM
0.001
0.967
0.992
1.017
1.459
1.600
1.654
1.678
1.702
1.727
1.847
1.883
1.909
1.928
1.951
1.965
1.987
2.013
3.244
3.261
3.293
3.312
3.330
3.347
3.366
3.476
3.496
3.518
3.787
4.005
4.025
4.037
4.055
4.068
5.617
6.855
6.886
7.263
7.278
7.308
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0.78
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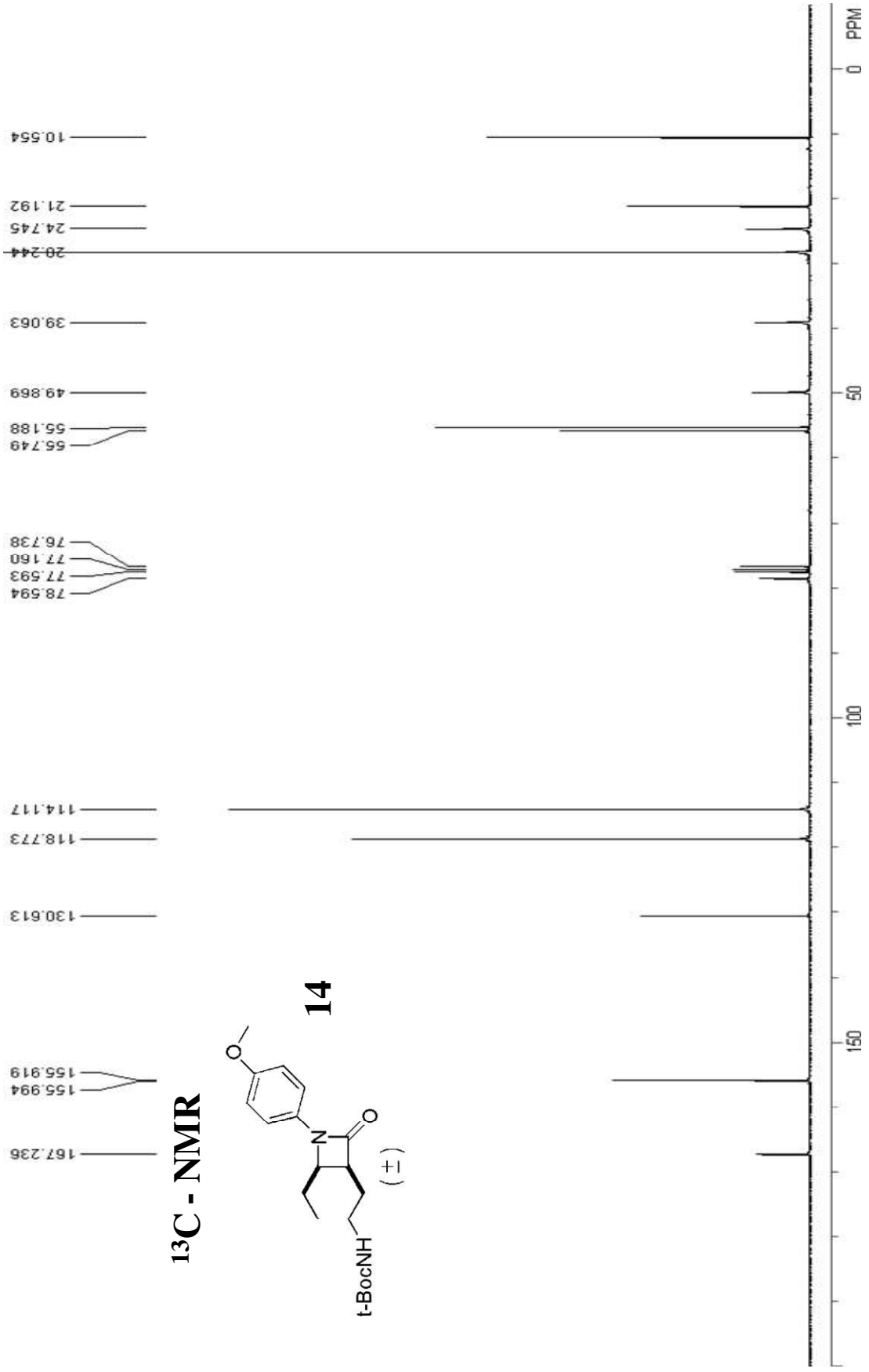
2.97
1.00
2.11
3.12
1.46
9.05
3.00


10.554
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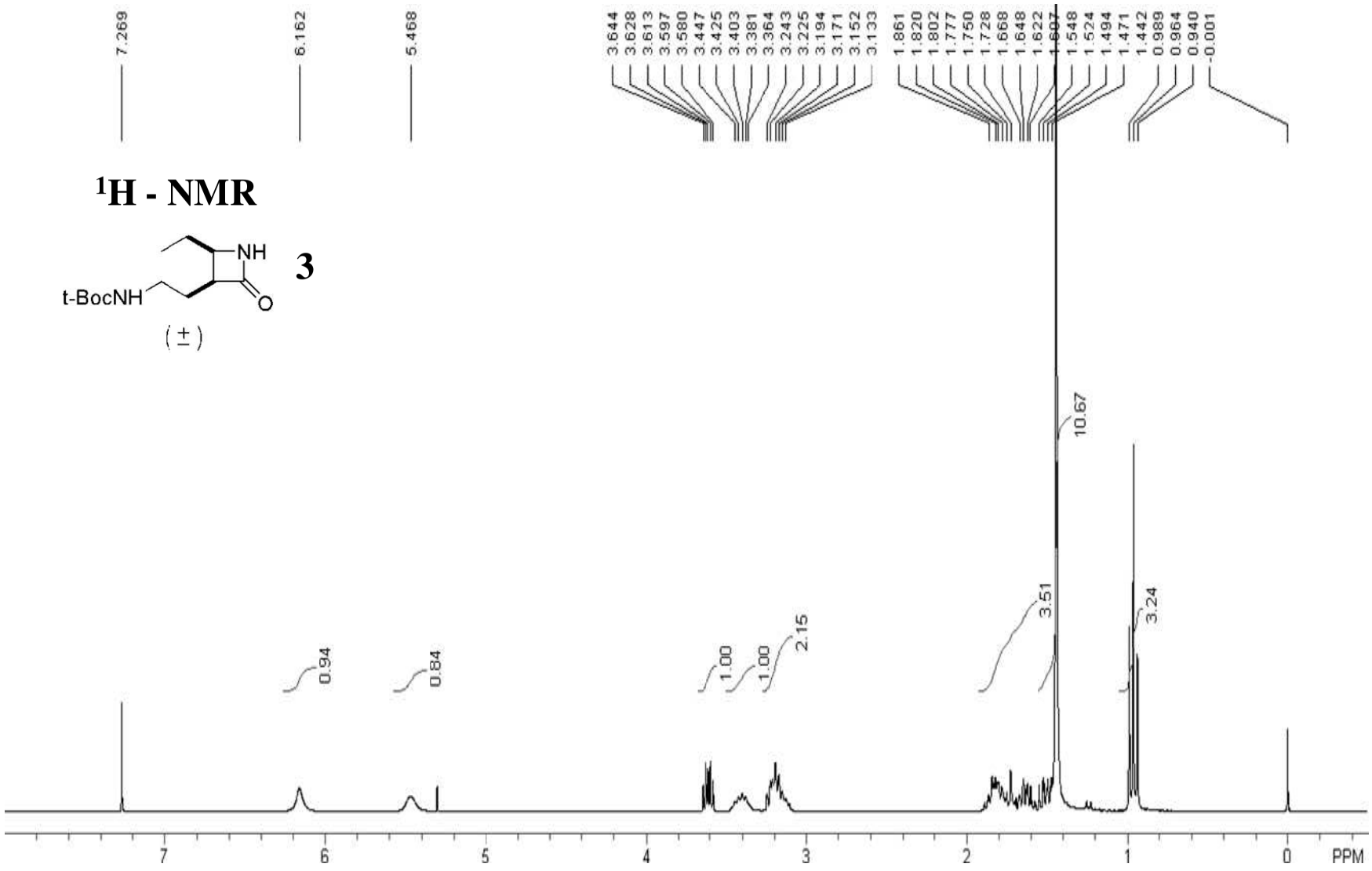
24.745
28.244
39.063
49.869
55.188
55.749
76.738
77.160
77.593
78.594
114.117
118.773
130.613
155.919
155.994
167.236
PPM
0
50
100
150
^{13}C - NMR
14
(±)
t-BocNH

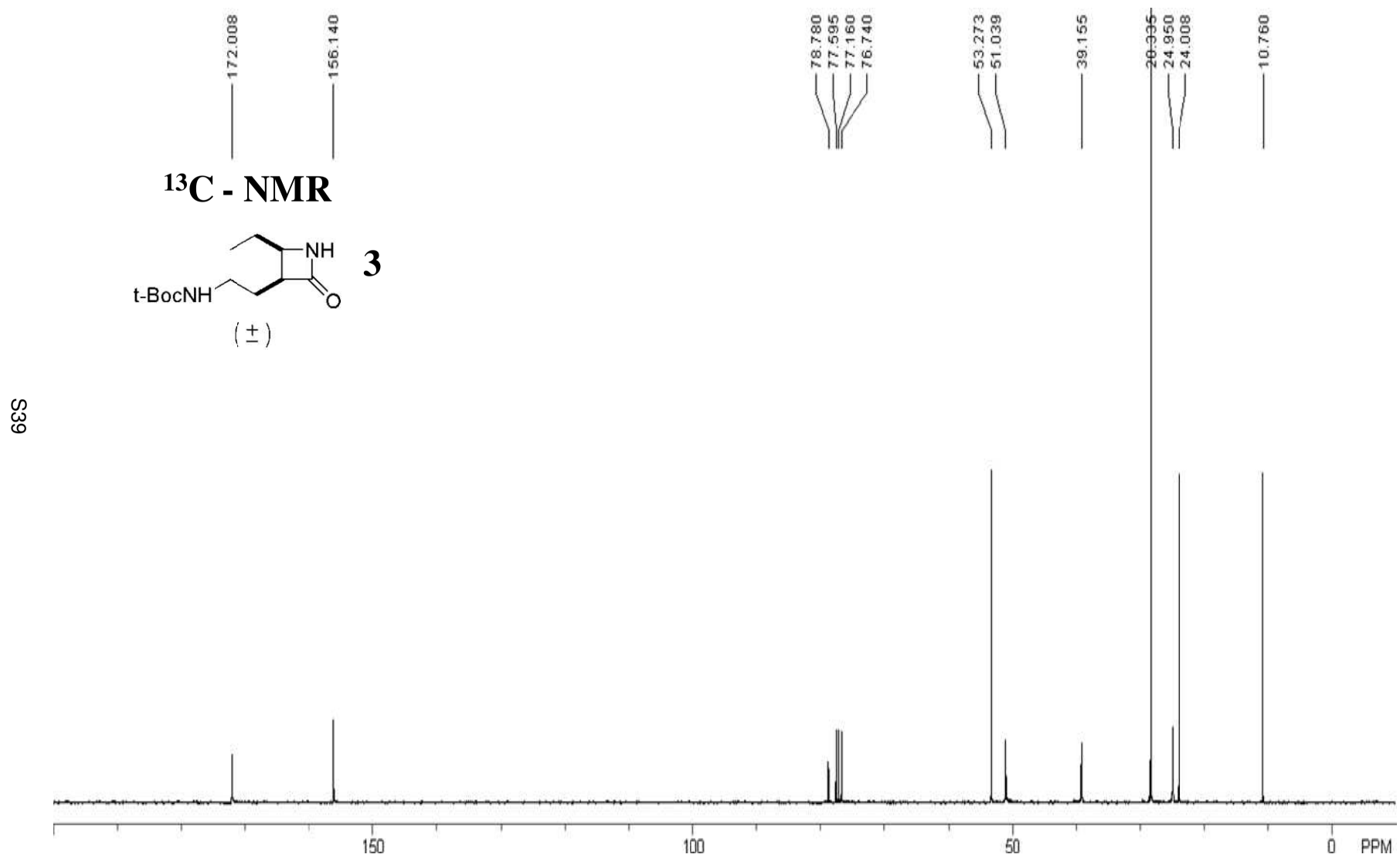

7.269
6.162
5.468
3.644
3.628
3.613
3.597
3.580
3.447
3.425
3.403
3.381
3.364
3.243
3.225
3.194
3.171
3.152
3.133
1.861
1.820
1.802
1.777
1.750
1.728
1.668
1.648
1.622
1.607
1.548
1.524
1.494
1.471
1.442
0.989
0.964
0.940
-0.001
0.94
0.84
1.00
1.00
2.15
3.51
10.67
3.24
7
6
5
4
3
2
1
0
PPM

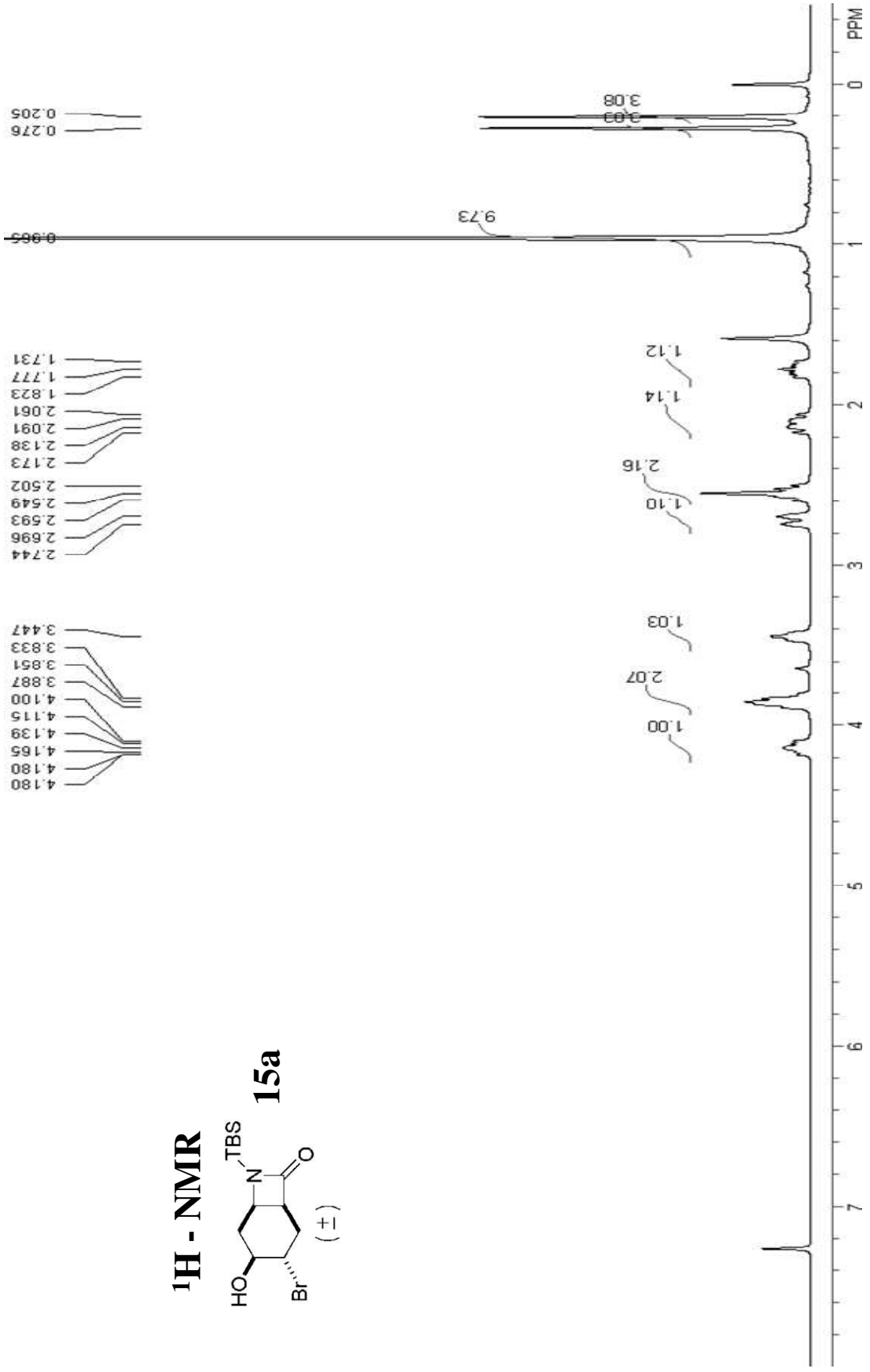
^{1}H - NMR

NH
t-BocNH
O

3

(±)

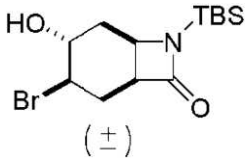

172.008
156.140
78.780
77.595
77.160
76.740
53.273
51.039
39.155
20.335
24.950
24.008
10.760
^{13}C - NMR
NH
t-BocNH
O
3
(±)
150
100
50
0
PPM


0.205
0.276
3.08
3.03
9.73
0.985
1.731
1.777
1.823
2.061
2.091
2.138
2.173
2.502
2.549
2.593
2.696
2.744
3.447
3.833
3.851
3.887
4.100
4.115
4.139
4.165
4.180
4.180
1.12
1.14
2.16
1.10
1.03
2.07
1.00
PPM
0
1
2
3
4
5
6
7

^{1}H - NMR **15a**

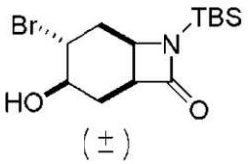
TBS
N
O
HO
Br
(±)

^{1}H - NMR



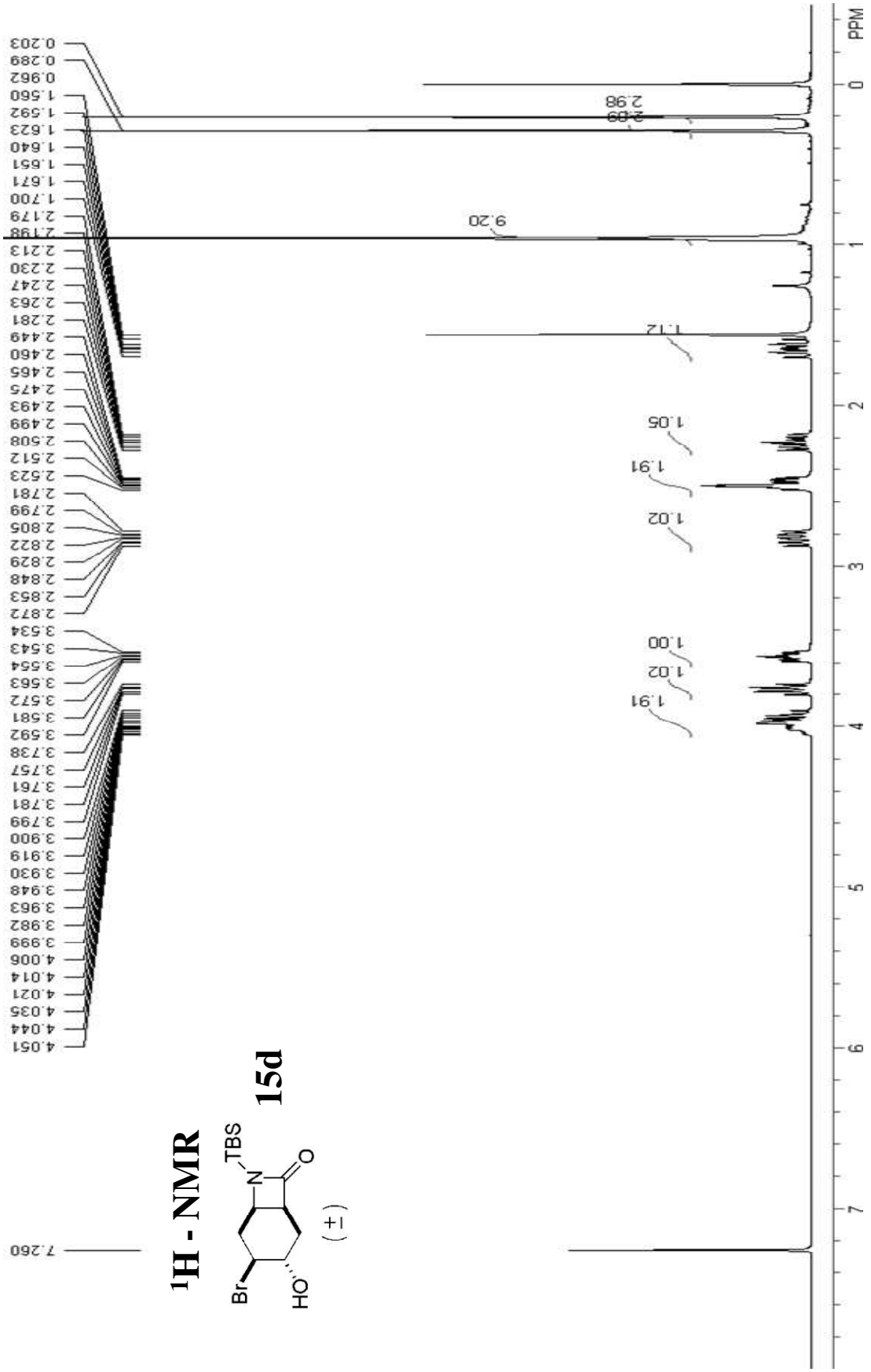
(±)

15b



(±)

15c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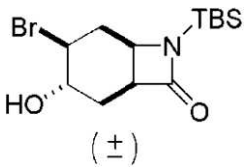
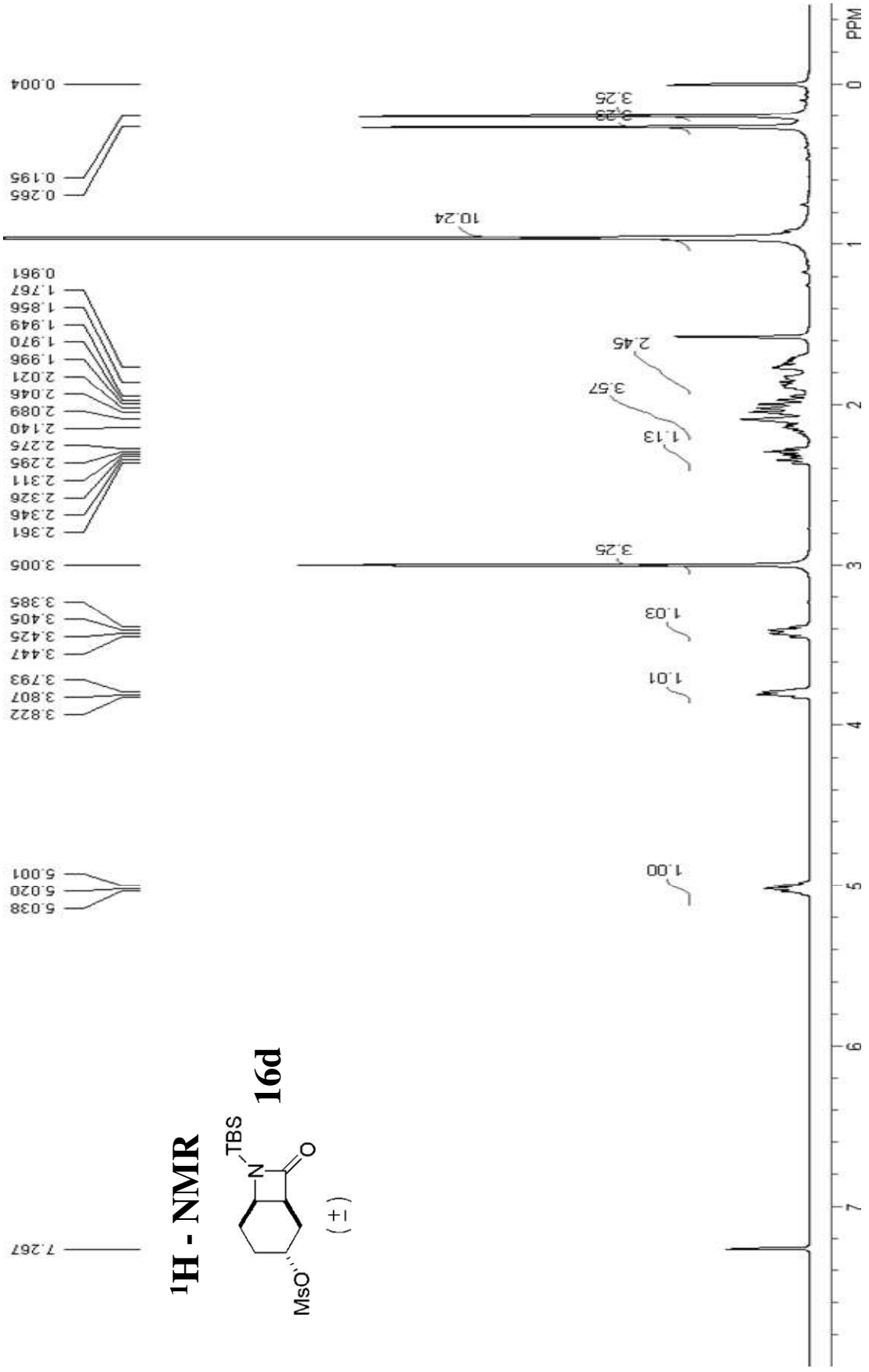
0.289
0.962
1.560
1.592
1.623
1.640
1.651
1.671
1.700
2.179
2.198
2.213
2.230
2.247
2.263
2.281
2.449
2.460
2.465
2.475
2.493
2.499
2.508
2.512
2.523
2.781
2.799
2.805
2.822
2.829
2.848
2.853
2.872
3.534
3.543
3.554
3.563
3.572
3.581
3.592
3.738
3.757
3.761
3.781
3.799
3.900
3.919
3.930
3.948
3.963
3.982
3.999
4.006
4.014
4.021
4.035
4.044
4.051
7.260
9.20
2.09
2.98
1.12
1.05
1.91
1.02
1.00
1.02
1.91
PPM
0
1
2
3
4
5
6
7
1H - NMR
15d
TBS
N
O
Br
HO
(±)

^{13}C - NMR

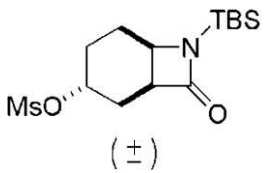

Br
TBS
N
HO
O
(±)

15d

175.042
77.575
77.162
76.734
71.775
55.318
48.266
39.547
29.069
26.375
18.690
-5.347
-5.437
150
100
50
0
PPM

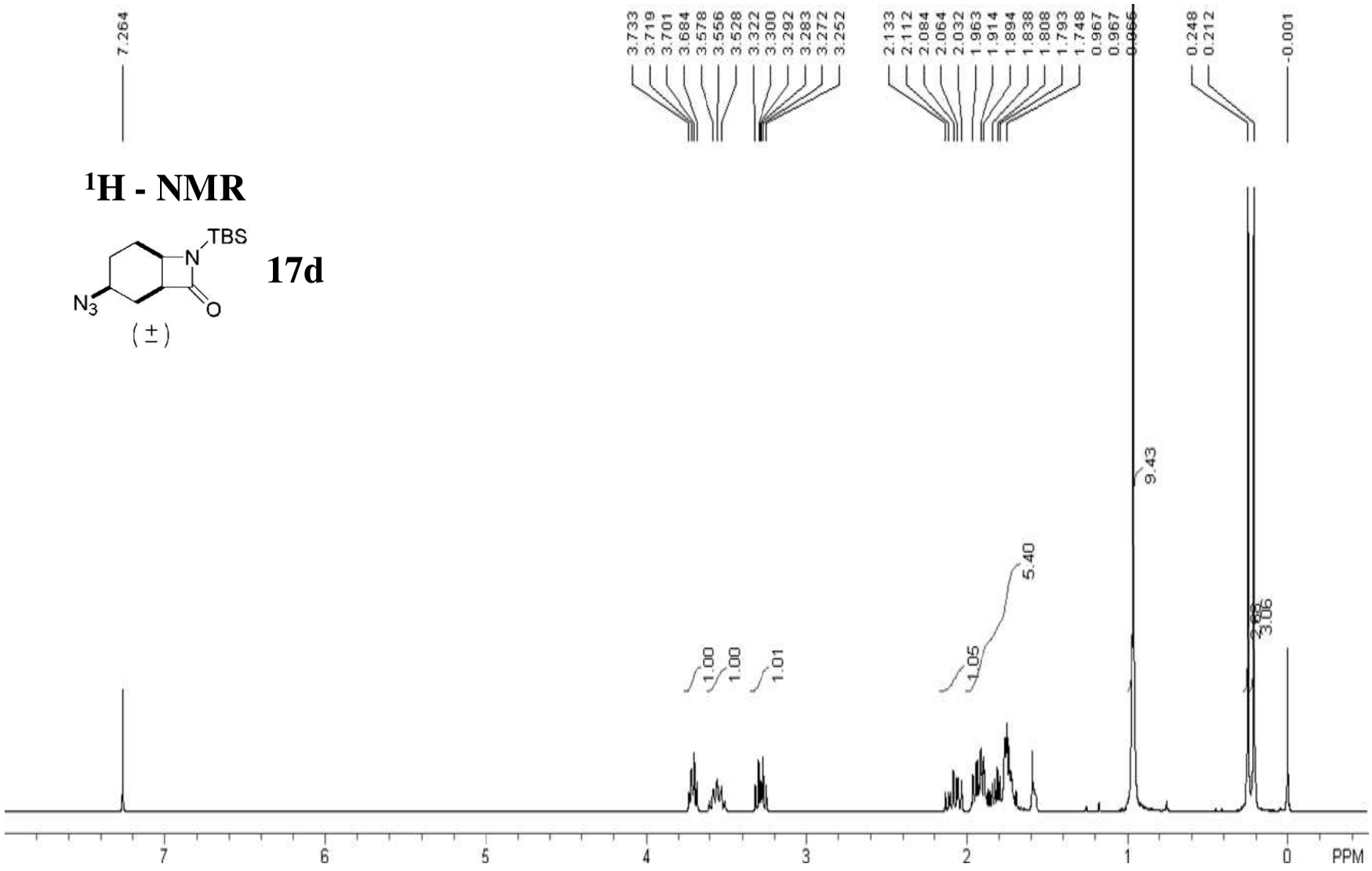

1H - NMR
16d
TBS
N
O
MsO
(±)
PPM
0
1
2
3
4
5
6
7
7.267
5.038
5.020
5.001
3.822
3.807
3.793
3.447
3.425
3.405
3.385
3.005
2.361
2.346
2.326
2.311
2.295
2.276
2.140
2.089
2.046
2.021
1.996
1.970
1.949
1.856
1.767
0.961
0.265
0.195
0.004
10.24
3.25
3.23
3.25
2.45
3.57
1.13
3.25
1.03
1.01
1.00

^{13}C - NMR


TBS
N
MsO
O
(±)

16d

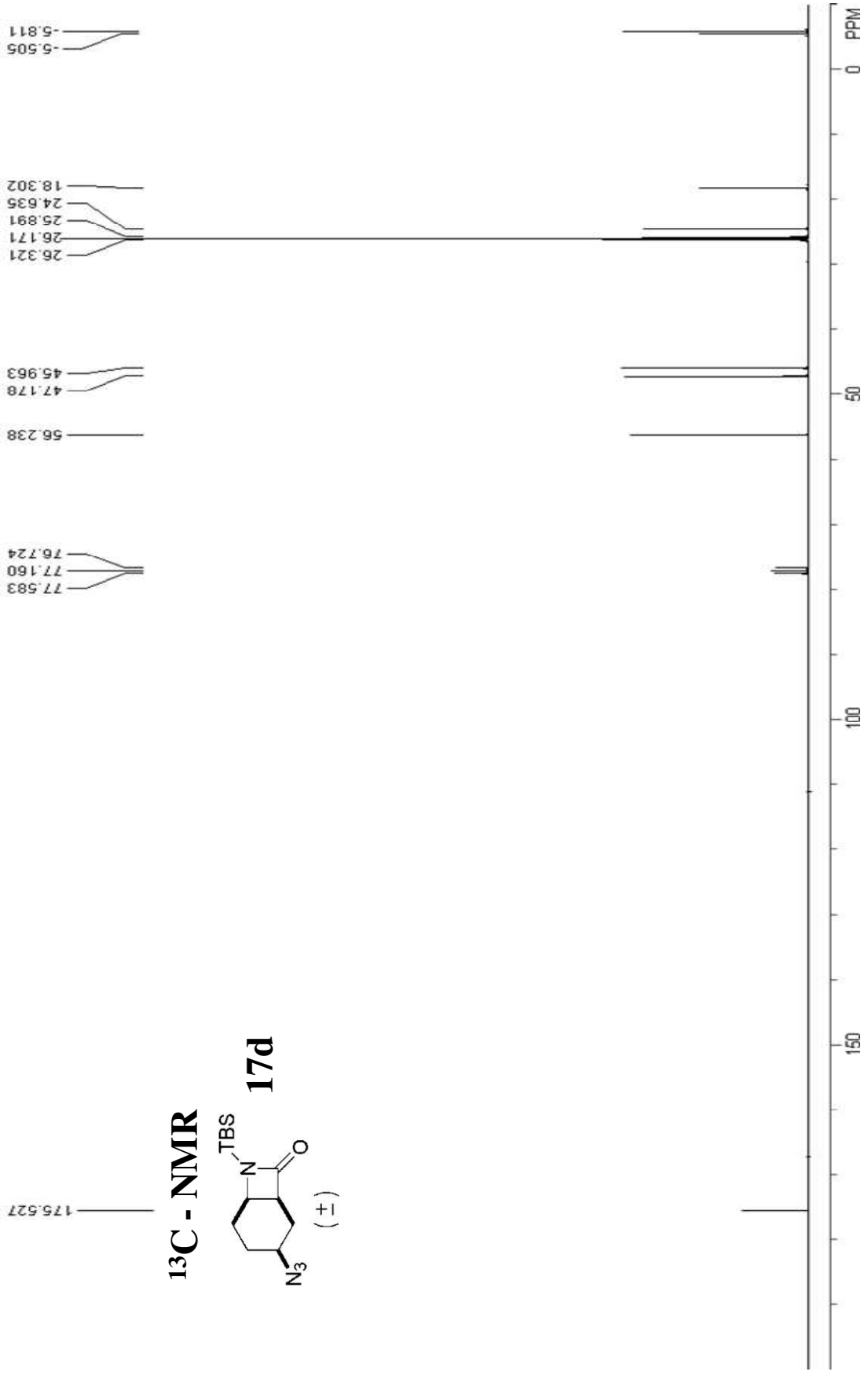
174.987
77.588
77.160
76.736
76.214
47.204
45.624
38.427
26.617
26.148
24.902
23.584
18.352
-5.555
-5.706
150
100
50
0
PPM


7.264
3.733
3.719
3.701
3.684
3.578
3.556
3.528
3.322
3.300
3.292
3.283
3.272
3.252
2.133
2.112
2.084
2.064
2.032
1.963
1.914
1.894
1.838
1.808
1.793
1.748
0.967
0.967
0.966
0.248
0.212
-0.001
1.00
1.00
1.01
1.05
5.40
9.43
3.06
7
6
5
4
3
2
1
0
PPM

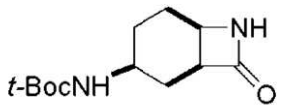
^{1}H - NMR

TBS
N
N3
O
(±)

17d


13C - NMR
17d
TBS
N
O
N3
(±)
-5.811
-5.505
18.302
24.635
25.891
26.171
26.321
45.963
47.178
56.238
76.724
77.160
77.583
175.527
PPM
0
50
100
150

^{1}H - NMR


NH
t-BocNH
O

4d

(±)

4.842
3.819
3.802
3.793
3.777
3.498
3.463
3.446
3.428
3.393
3.310
3.253
3.234
3.217
3.200
3.183
2.139
2.105
2.090
2.071
2.037
1.954
1.921
1.905
1.897
1.882
1.850
1.836
1.797
1.781
1.737
1.693
1.677
1.657
1.639
1.622
1.603
1.591
1.575
1.556
1.506
1.434
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10.16
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6
5
4
3
2
1
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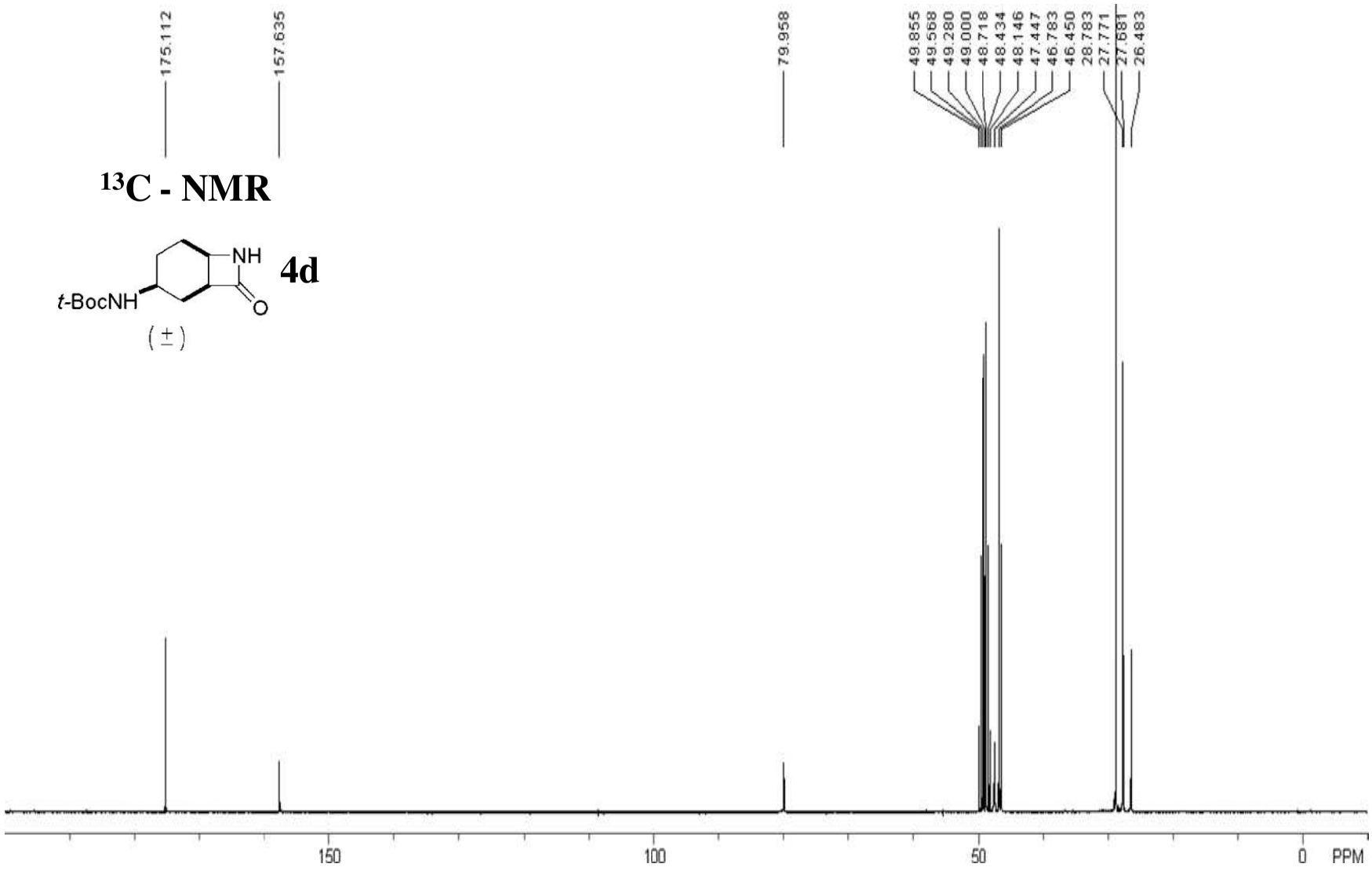
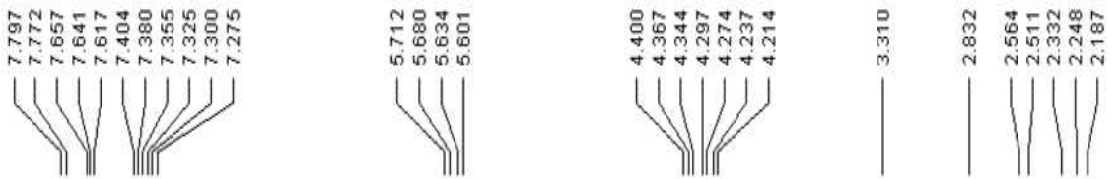
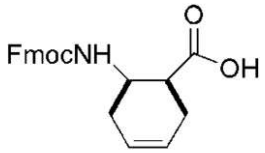
PPM


175.112
157.635
79.958
49.855
49.568
49.280
49.000
48.718
48.434
48.146
47.447
46.783
46.450
28.783
27.771
27.681
26.483
^{13}C - NMR
NH
t-BocNH
O
4d
(±)
150
100
50
0
PPM

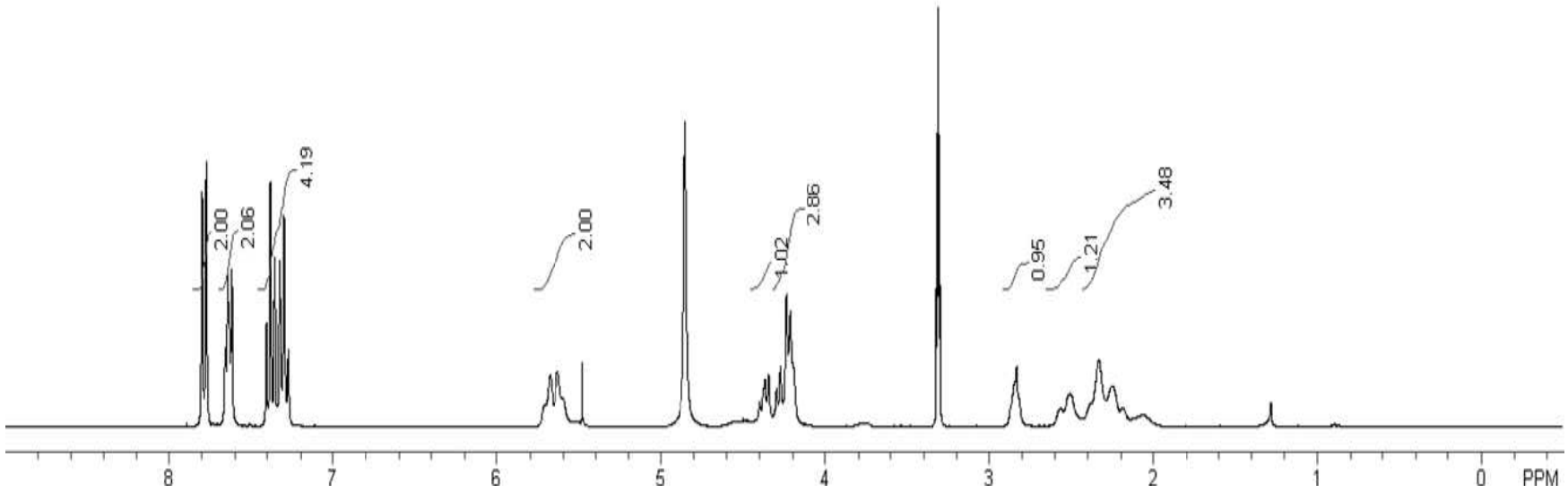


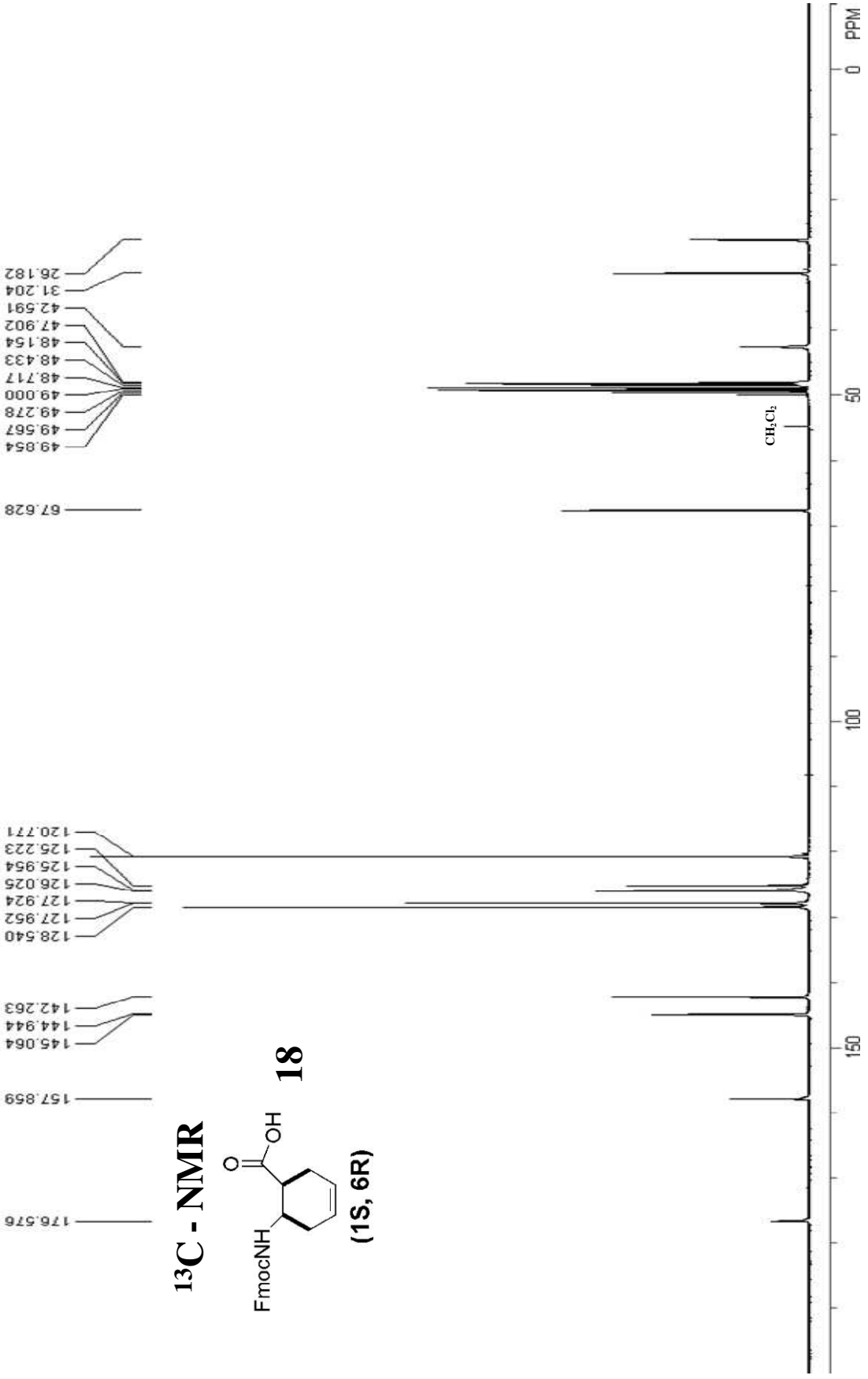
^{1}H - NMR

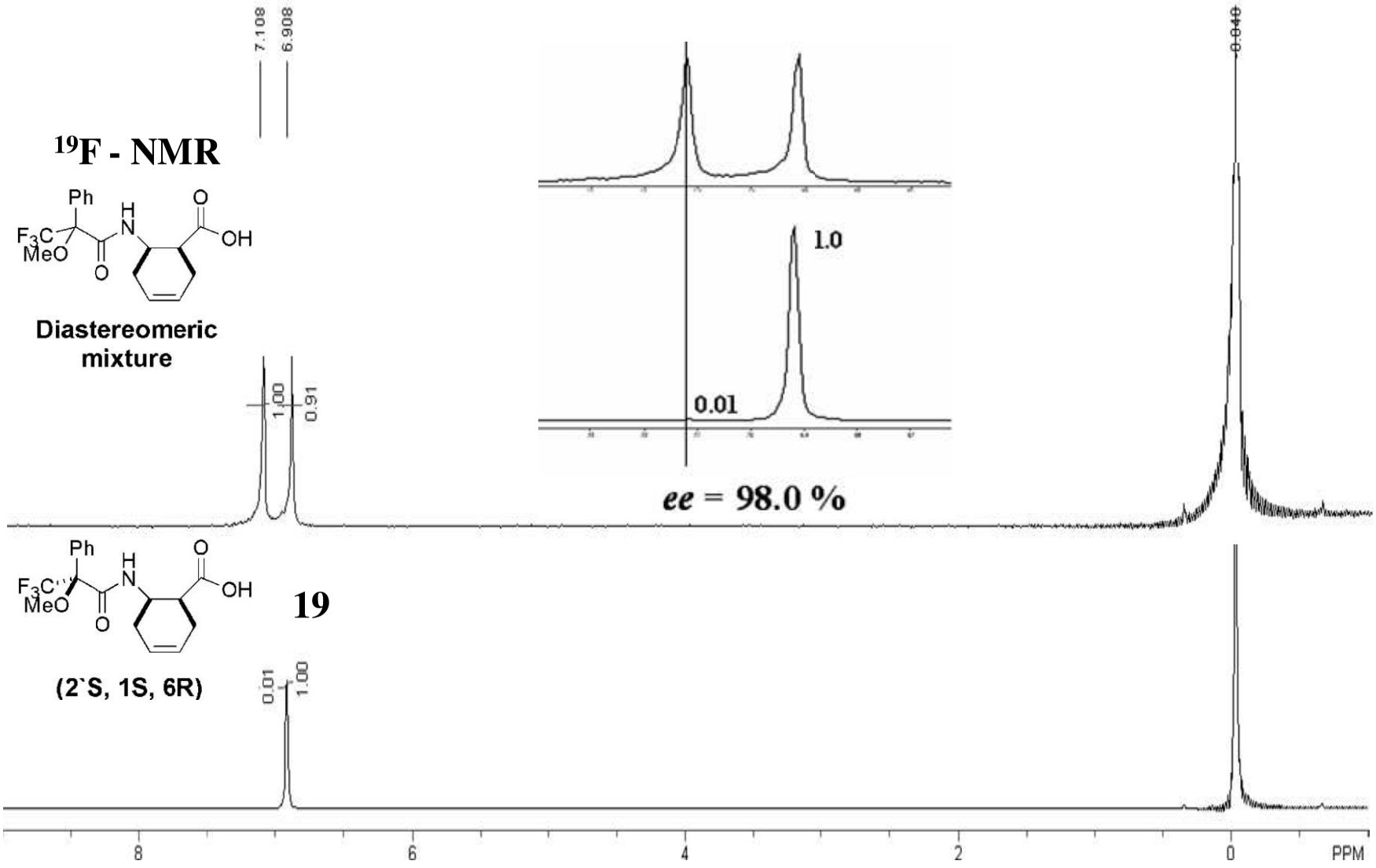


18

(1S, 6R)




26.182
31.204
42.591
47.902
48.154
48.433
48.717
49.000
49.278
49.567
49.854
67.628
120.771
125.223
125.954
126.025
127.924
127.952
128.540
142.263
144.944
145.064
157.859
176.576
^{13}C - NMR
18
FmocNH
O
OH
(1S, 6R)
CH_2Cl_2
PPM
0
50
100
150


19F - NMR
Ph
F3C
MeO
H
N
O
O
OH
Diastereomeric mixture
7.108
6.908
1.00
0.91
1.0
0.01
ee = 98.0 %
(2`S, 1S, 6R)
19
0.01
1.00
8
6
4
2
0
PPM