Supporting Information
For
Catalytic Intermolecular Carbon Electrophile Induced Semipinacol Rearrangement

Qing-Wei Zhang, Xiao-Bo Zhang, Bao-Sheng Li, Kai Xiang, Fu-Min Zhang, Shao-Hua Wang and Yong-Qiang Tu*

State Key Laboratory of Applied Organic Chemistry and Department of Chemistry

Lanzhou University, Lanzhou 730000, P. R. China

Fax: (+) 86 931-8912582, E-mail: tuyq@lzu.edu.cn

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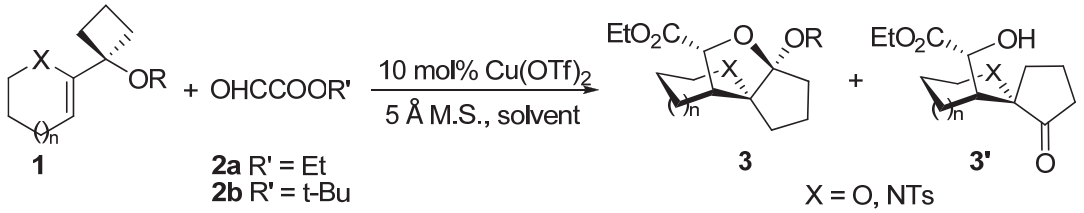
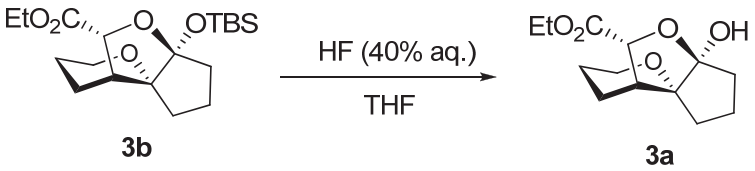
General information

All reactions under standard conditions were monitored by thin-layer chromatography (TLC) on gel F_{254} plates. The silica gel (200-300 meshes) was used for column chromatography, and the distillation range of petroleum was 60-90 ^{o}C. All other solvent were purified according to standard conditions. ^{1}H and ^{13}C NMR spectra were recorded in $CDCl_3$ or CD_3COCD_3 solution on Bruker AX-400 MHz instruments and spectral data were reported in ppm with tetramethylsilane (TMS) as internal standard. High-resolution mass spectral analysis (HRMS) data were measured on the Bruker ApexII by means of the ESI technique. Enantioselectivities were determined by high performance liquid chromatography (HPLC) analysis employing a Darcel Chiracel AD column and optical rotation was detected on RUDOLPH A21202-J APTV/GW.

General procedure of the catalytic intermolecular carbon electrophile induced semipinacol rearrangement (Table 2):

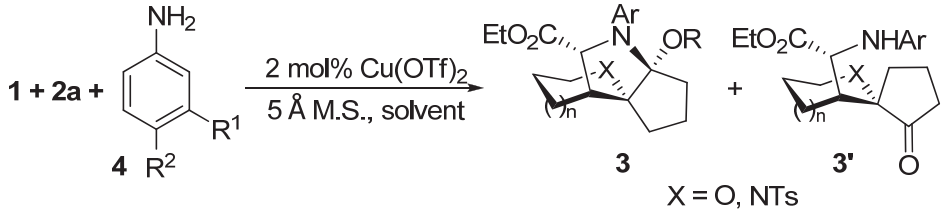


To an oven dried Schlenk tube charged with a magnetic stirring bar was sequentially added substrate (0.2 mmol), ethylglyoxalate (0.4 mmol.), 5Å molecular sieve (200 mg), THF (2 mL, acetone for the preparation of **3d**) and $Cu(OTf)_2$ (10 mol%) at room temperature (-10 ^{o}C for **3d**) (For synthesis of **3b**, the substrate **1b** was dissolved in half of the solvent and was added in 1 h with syringe pump). The reaction was monitored by TLC until all the substrate disappeared and the mixture was directly subjected to column chromatography on silica gel for purification.



The reaction system above containing **3b** was filtered and washed with additional THF (3 mL), HF (40% aq., 0.5 mL) was added and the mixture was stirred for 1h and quenched with K_2CO_3. The mixture was filtered with a short pad of Celite, concentrated and subjected to column chromatography on silica gel to afford **3a** (2 steps, 79% yield).

General procedure of the three component reaction (Table 3):



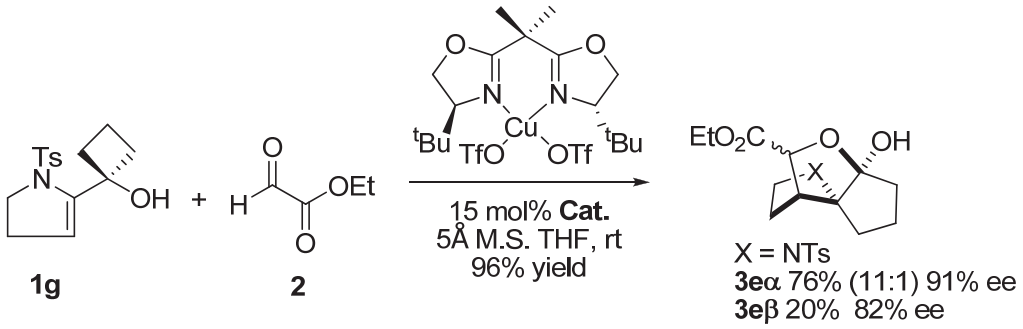
For 3g-3i (entries 1-3):

To an oven dried Schlenk tube charged with a magnetic stirring bar was sequentially added ethyl glyoxalate (2.0 mmol.) 5Å molecular sieve (1 g), aniline derivatives (1.0 mmol), $Cu(OTf)_2$ (2 mol%) and acetone (5 mL). **1b** (1.0 mmol in 5 mL acetone) was then added to the system using syringe pump in 1 h at room temperature. The reaction was monitored by TLC until all the substrate disappeared and the mixture was directly subjected to column chromatography on silica gel for purification. (PE:DCM:EA = 25:75:1)

For 3j (entry 4):

To an oven dried Schlenk tube charged with a magnetic stirring bar was sequentially added substrate **1b** (0.2 mmol), ethyl glyoxalate (0.4 mmol), 5Å molecular sieve (200 mg), aniline derivative **4b** (0.2 mmol), THF (2 mL) and $Cu(OTf)_2$ (15 mol%) at room temperature. The reaction was monitored by TLC until all the substrate disappeared and the mixture was directly subjected to column chromatography on silica gel for purification.

Catalytic asymmetric enantioselective version of the reaction (Scheme 3 in the manuscript):



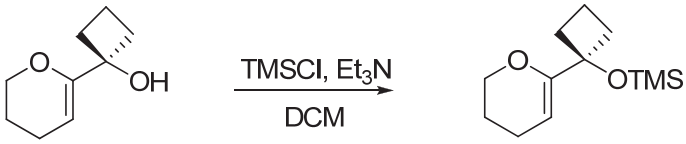
To an oven dried Schlenk tube charged with a magnetic stirring bar was sequentially added **1g** (0.2 mmol), ethyl glyoxalate **2** (0.4 mmol), 5Å molecular sieve (100 mg/mL solvent), THF (2 mL) and (*S*, *S*)-^{t}BuBOX (15 mol%), finally $Cu(OTf)_2$ (15 mol%) was added. The reaction was monitored by TLC until all the substrate disappeared and the mixture was directly subjected to column chromatography on silica gel for purification (PE:DCM:EA = 5:5:1, then PE:EA = 2:1). **3eα**: (60.0 mg, 76%, dr 11:1), **3eß**: (15.8 mg, 20%).

Preparation of substrates and spectroscopic data of key compounds:

Preparation of substrates:

1b m = 1, n = 1
1d m = 0, n = 1
1e m = 2, n = 0

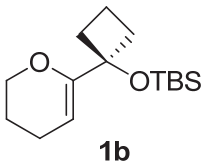
The tertiary alcohol substrates were dissolved in DCM followed by addition of imidazole. After being cooled to 0 °C TBSCl was added in one portion. After fully conversion of the substrates, the reaction was quenched with saturated $NaHCO_3$ (aq.) and extracted with DCM, the combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure and purified by column chromatography on silica gel.



1c

The tertiary alcohol substrate was dissolved in DCM followed by addition of Et_3N. After being cooled to 0 °C TMSCl was added in one portion. After fully conversion of the substrates, the reaction was quenched with saturated $NaHCO_3$ (aq.) and extracted with DCM, the combined organic layer was dried with Na_2SO_4, filtered, concentrated under reduced pressure and purified by column chromatography on silica gel.

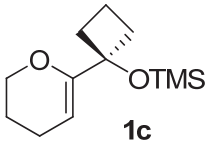
Spectroscopic data of key compounds:



1b

Colorless oil.

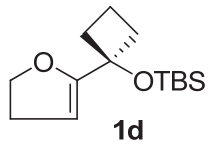
^{1}H NMR (400 MHz, $CDCl_3$, ppm): δ 4.89 (t, J = 4.0 Hz, 1H), 4.02 (t, J = 5.2 Hz, 2H), 2.33 (tt, J_1 = 2.8 Hz , J_2 = 9.2 Hz, 2H), 2.14-2.02 (m, 4H), 1.81 (quint, J = 5.6 Hz, 2H), 1.75-1.60 (m, 1H), 1.51 (sext, J = 9.6 Hz, 1H), 0.89 (s, 9H), 0.05 (s, 6H); **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 155.7, 94.9, 76.4, 66.0, 35.5, 25.9, 22.2, 20.2, 18.0, 13.2, 3.3; **HRMS** (ESI) calcd for $C_{15}H_{29}O_2Si$ $[M+H]^+$: 269.1931, found 269.1934.



1c

Colorless oil.

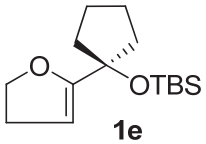
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 4.91 (t, J = 4.0 Hz, 1H), 4.00 (t, J = 5.2 Hz, 2H), 2.38-2.27 (m, 2H), 2.11-2.00 (m, 5H), 1.82-1.74 (m, 2H), 1.73-1.61 (m, 1H), 0.07 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 156.7, 95.8, 77.4, 66.7, 36.3, 23.0, 20.9, 13.9, 1.9; **HRMS** (ESI) calcd for $C_9H_{15}O_2^+$[M-TMS+H]$^+$: 155.1067, found 155.1070.



1d

Colorless oil.

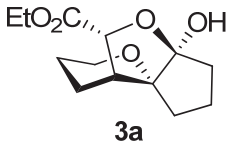
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 4.97 (t, J = 2.0 Hz, 1H), 4.34 (t, J = 9.2 Hz, 2H), 2.64 (dt, J_1 = 2.4 Hz , J_2 = 9.2 Hz, 2H), 2.32 (tt, J_1 = 2.8 Hz , J_2 = 8.8 Hz, 2H), 2.13 (dq, J_1 = 2.8 Hz , J_2 = 9.6 Hz, 2H), 1.69 (tq, J_1 = 2.8 Hz , J_2 = 9.6 Hz, 1H), 1.55 (sext, J = 9.2 Hz, 1H), 0.88 (s, 9H), 0.06 (s, 6H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 161.9, 95.8, 73.7, 70.7, 37.0, 30.6, 26.3, 18.6, 13.8, -3.1; **HRMS** (ESI) calcd for $C_{14}H_{27}O_2Si$ [M+H]$^+$: 255.1775, found 255.1773.



1e

Colorless oil.

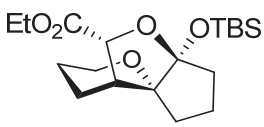
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 4.84 (t, J = 2.4 Hz, 1H), 4.31 (t, J = 9.2 Hz, 2H), 2.61 (dt, J_1 = 2.4 Hz , J_2 = 9.6 Hz, 2H), 1.88-1.72 (m, 6H), 1.70-1.56 (m, 2H), 0.87 (s, 9H), 0.08 (s, 6H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 162.5, 95.1, 81.6, 70.3, 39.9, 30.6, 26.3, 23.9, 18.9, -3.0; **HRMS** (ESI) $C_{15}H_{29}O_2Si$ [M+H]$^+$: 269.1931, found 269.1937.



3a

Colorless crystal, **MP** 65-67 °C.

^{1}H NMR (400 MHz, $CDCl_3$, ppm): δ 4.85 (brs, 1H), 4.44 (d, J = 8.8 Hz, 1H), 4.33-4.20 (m, 1H), 4.20-4.05 (m, 1H), 3.32-3.81 (m, 1H), 3.48 (dt, J_1 = 3.6 Hz , J_2 = 7.2 Hz, 1H), 2.32-2.23 (m, 1H), 2.13-2.02 (m, 2H), 2.02-1.92 (m, 1H), 1.89-1.75 (m, 2H), 1.75-1.65 (m, 1H), 1.63-1.53 (m, 1H), 1.48-1.30 (m, 3H), 2.02-1.92 (t, J = 6.0 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 174.2, 116.3, 84.4, 79.1, 63.1, 61.6, 43.8, 37.2, 34.9, 20.6, 20.3, 19.0, 14.0; **HRMS** (ESI) calcd for $C_{13}H_{24}NO_5$ [M+NH_4]$^+$: 274.1649, found 274.1653.

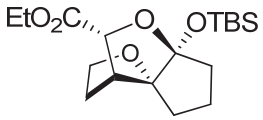


3b

Colorless oil.

^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 4.50 (d, J = 5.6 Hz, 1H), 4.40-4.28 (m, 1H),

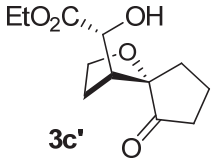
4.20 (q, J = 7.2 Hz, 2H), 3.68-3.55 (m, 1H), 2.25-2.12 (m, 1H), 2.01-1.82 (m, 4H), 1.81-1.70 (m, 1H), 1.68-1.57 (m, 1H), 1.57-1.33 (m, 4H), 1.26 (t, J = 7.2 Hz, 1H), 0.93 (s, 9H), 0.28 (s, 3H), 0.24 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 170.6, 115.4, 85.6, 79.1, 64.3, 61.1, 44.4, 41.3, 39.8, 26.5, 24.5, 22.0, 21.6, 18.6, 14.8, -2.6, -2.8; **HRMS** (ESI) calcd for $C_{19}H_{34}NaO_5Si$ $[M+Na]^+$: 393.2068, found 393.2072.



3c

Colorless oil, inseparable mixture (dr = 5:1), for major isomer:

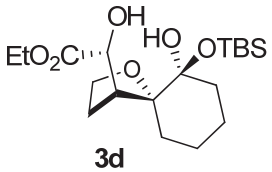
^{1}H NMR (400 MHz, $CDCl_3$, ppm): δ 4.55 (d, J = 6.0 Hz, 1H), 4.21 (q, J = 7.2 Hz, 2H), 4.06 (q, J = 8.0 Hz, 1H), 3.93 (q, J = 8.0 Hz, 1H), 2.78 (dt, J_1 = 6.4 Hz, J_2 = 9.2 Hz, 1H), 2.10-1.94 (m, 5H), 1.80-1.58 (m, 2H), 1.49-1.32 (m, 1H), 1.28 (t, J = 7.2 Hz, 1H), 0.91 (s, 9H), 0.23 (s, 3H), 0.17 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 170.4, 113.4, 96.4, 76.9, 69.2, 60.8, 50.6, 39.3, 35.3, 28.9, 25.7, 21.1, 17.8, 14.2, -3.3; **HRMS** (ESI) calcd for $C_{18}H_{32}NaO_5Si$ $[M+Na]^+$: 379.1911, found 379.1915.



3c'

Colorless oil.

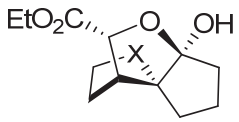
^{1}H NMR (400 MHz, $CDCl_3$, ppm): δ 4.29 (d, J = 7.2 Hz, 1H), 4.28-4.22 (m, 2H), 3.97 (dt, J_1 = 4.0 Hz, J_2 = 8.0 Hz, 1H), 3.70 (q, J = 8.0 Hz, 1H), 2.97 (brs, 1H), 2.80-2.70 (m, 1H), 2.53-2.42 (m, 1H), 2.33-2.25 (m, 1H), 2.21-2.12 (m, 1H), 2.12-1.88 (m, 5H), 1.32 (t, J = 7.2 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 215.8, 174.2, 87.2, 69.9, 66.6, 62.3, 42.6, 34.9, 32.2, 26.5, 18.8, 14.1; **HRMS** (ESI) calcd for $C_{12}H_{18}NaO_5$ $[M+Na]^+$: 265.1046, found 265.1041.



3d

Colorless crystal, **MP** 76-78.

^{1}H NMR (400 MHz, $CDCl_3$) δ 4.65 (s, 1H), 4.35-4.22 (m, 3H), 3.98 (dd, J_1 = 7.2 Hz, J_2 = 15.2 Hz, 1H), 3.83 (dt, J_1 = 5.6 Hz, J_2 = 8.0 Hz, 1H), 3.61 (d, J = 3.2 Hz, 1H), 3.01-2.87 (m, 1H), 2.22-2.18 (m, 1H), 2.06-1.94 (m, 2H), 1.85-1.58 (m, 8H), 1.30 (t, J = 7.1 Hz, 3H), 0.88 (s, 9H), 0.15 (s, 3H), 0.12 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$, ppm): δ 173.2, 108.7, 89.5, 70.2, 66.2, 61.8, 44.3, 36.1, 36.0, 26.0, 24.9, 24.7, 24.7, 18.4, 14.1, -2.7, -2.7; **HRMS** (ESI) calcd for $C_{19}H_{36}NaO_6Si$ $[M+Na]^+$: 411.2173, found 411.2179.

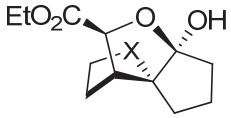


3eα, X = NTs

Colorless viscous oil. Column chromatography (PE:DCM:EA = 5:5:1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (d, J = 8.2 Hz, 2H), 7.37 (d, J = 8.2 Hz, 2H), 5.24 (s, 1H), 4.64 (d, J = 8.4 Hz, 1H), 4.20 (dq, J_1 = 3.8, J_2 = 10.8 Hz, 2H), 3.38-3.30 (m, 2H), 3.21 – 3.03 (m, 1H), 2.91 (dt, J_1 = 8.0 Hz, J_2 = 12.4 Hz, 1H), 2.41 (s, 3H), 2.15 – 2.06 (m, 1H), 1.97 – 1.79 (m, 4H), 1.79 – 1.66 (m, 1H), 1.55 – 1.40 (m, 1H), 1.25 (t, J = 7.2 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 174.1, 143.6, 140.2, 130.3, 128.2, 116.2, 83.6, 78.5, 62.3, 57.9, 50.6, 38.1, 36.9, 25.0, 21.4, 21.4, 14.5; **HRMS** (ESI) calcd for $C_{19}H_{25}NNaO_6S$ $[M+Na]^+$: 418.1295, found 418.1263.

HPLC Enantiomeric excess is 91.5% determined by HPLC (Chiralcel AD, Hexane/Isopropanol 60/40, flow rate=1.0 mL/min, 240 nm): major isomer: t_R = 16.9 min; minor isomer: t_R = 17.8 min, $[a]^{25}_D$ -26° (*c* 1.0, $CHCl_3$).

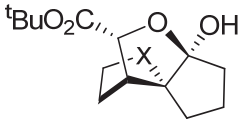


3eβ, X = NTs

Colorless crystal MP 148-149 °C.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, J = 8.4 Hz, 2H), 7.30 (d, J = 8.4 Hz, 2H), 4.38 (d, J = 10.0 Hz, 1H), 4.22 (q, J = 7.2, 2H), 3.71 (brs, 1H), 3.68-3.52 (m, 2H), 2.67 (dd, J_1 = 7.6 Hz, J_2 = 9.6 Hz, 1H), 2.91 (dt, J_1 = 7.2 Hz, J_2 = 12.8 Hz, 1H), 2.43 (s, 3H), 2.21 (dd, J_1 = 6.0 Hz, J_2 = 12.8 Hz, 1H), 1.99 – 1.82 (m, 3H), 1.79 – 1.63 (m, 2H), 1.63 – 1.48 (m, 1H), 1.34 (t, J = 7.2 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) 170.1, 143.3, 138.7, 129.7, 126.7, 113.7, 83.3, 77.7, 61.3, 58.9, 49.1, 37.6, 35.5, 25.0, 21.4, 20.6, 14.1; **HRMS** (ESI) calcd for $C_{19}H_{25}NO_6S$ $[M+NH_4]^+$: 395.1403, found 395.1697.

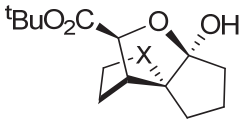
HPLC Enantiomeric excess is 82% determined by HPLC (Chiralcel AD, Hexane/Isopropanol 60/40, flow rate=1.0 mL/min, 246 nm): major isomer: t_R = 15.2 min; minor isomer: t_R = 16.8 min, $[a]^{25}_D$ +53° (*c* 1.0, $CHCl_3$).



3fα, X = NTs

Colorless amorphous solid.

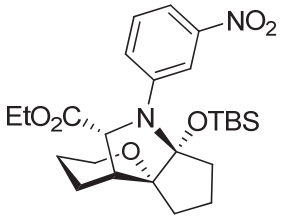
^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 7.75 (d, J = 8.2 Hz, 2H), 7.26 (d, J = 8.2 Hz, 2H), 5.06 (s, 1H), 4.50 (d, J = 9.2 Hz, 1H), 3.40-3.35 (m, 2H), 3.05-2.87 (m, 2H), 2.40 (s, 3H), 2.16 (dt, J_1 = 6.8 Hz, J_2 = 12.8 Hz 1H), 2.09 – 2.03 (m, 1H), 1.95-1.83 (m, 2H), 1.77 (dt, J_1 = 6.8 Hz, J_2 = 13.2 Hz, 2H), 1.44 (s, 9H); **^{13}C NMR** (100 MHz, $CDCl_3$, ppm) δ 173.0, 142.8, 138.1, 129.3, 127.3, 116.0, 83.6, 83.3, 78.9, 57.7, 49.3, 37.2, 36.9, 27.9, 23.9, 21.4, 20.4; **HRMS** (ESI) calcd for $C_{21}H_{33}N_2O_6S$ $[M+NH_4]^+$: 441.2054, found 441.2050.



3fβ, X = NTs

^{1}H NMR (400 MHz, $CDCl_3$, ppm) δ 7.75 (d, J = 8.4 Hz, 2H), 7.31 (d, J = 8.4 Hz, 2H), 4.27 (d, J = 10.4 Hz, 1H), 3.70 -3.52 (m, 2H), 2.67-2.58 (m, 1H), 2.58-2.50 (m, 1H), 2.44

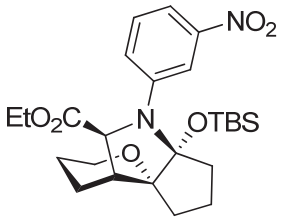
(s, 3H), 2.22 (dd, J_1 = 5.6 Hz, J_1 = 12.4 Hz, 1H), 1.97-1.86 (m, 2H), 1.78-1.63 (m, 2H), 1.63-1.52 (m, 2H), 1.48 (s, 9H). **HRMS** (ESI) calcd for $C_{21}H_{33}N_2O_6S$ $[M+NH_4]^+$: 441.2054, found 441.2050. (together with **3fα**)



3gα

Yellowish oil.

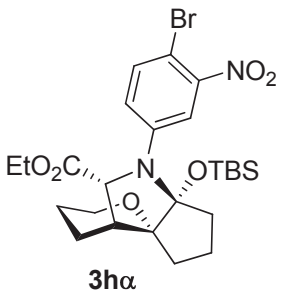
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 7.63 (d, J = 2.4 Hz, 1H), 7.54 (dd, J_1 = 1.2 Hz, J_2 = 8.8 Hz, 1H), 7.41 (t, J = 8.0 Hz, 1H), 7.11 (dd, J_1 = 2.4 Hz, J_2 = 8.4 Hz, 1H), 4.66 (d, J = 10.0 Hz, 1H), 4.13 (q, J = 7.2 Hz, 2H), 3.94 (dd, J_1 = 3.2 Hz, J_2 = 10.0 Hz, 1H), 3.53 (t, J = 4.0 Hz, 1H), 2.52-2.38 (m, 2H), 2.27 (d, J = 9.6 Hz, 1H), 2.23-2.12 (m, 1H), 2.10-1.98 (m, 1H), 1.96-1.92 (m, 3H), 1.92-1.70 (m, 2H), 1.61-1.49 (m, 1H), 1.14 (t, J = 7.2 Hz, 3H), 0.70 (s, 9H), 0.09 (s, 3H), -0.18 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 171.3, 149.6, 146.7, 130.1, 122.4, 113.5, 111.4, 104.4, 88.0, 64.6, 63.1, 61.5, 41.5, 38.5, 36.2, 26.8, 22.8, 21.5, 20.9, 19.8, 14.7, -1.0, -1.8; **HRMS** (ESI) calcd for $C_{25}H_{39}N_2O_6Si$ $[M+H]^+$: 491.2572, found 491.2568.



3gβ

Yellowish crystal, **MP** 110-111 °C.

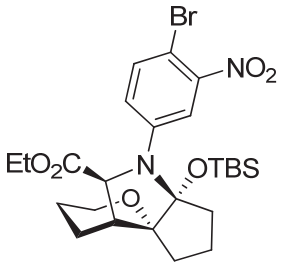
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 7.85 (t, J = 2.4 Hz, 1H), 7.60 (dd, J_1 = 1.6 Hz, J_2 = 8.0 Hz, 1H), 7.43 (t, J = 8.4 Hz, 1H), 7.18 (dd, J_1 = 2.0 Hz, J_2 = 8.0 Hz, 1H), 4.53 (d, J = 8.4 Hz, 1H), 4.16 (q, J = 7.2 Hz, 2H), 4.04-3.96 (m, 1H), 3.68-3.59 (m, 1H), 2.60-2.48 (m, 1H), 2.43-2.33 (m, 1H), 2.25-2.02 (m, 3H), 1.95-1.83 (m, 1H), 1.80-1.67 (m, 2H), 1.67-1.55 (m, 1H), 1.55-1.41 (m, 1H), 1.32-1.23 (m, 1H), 1.20 (t, J = 7.2 Hz, 3H), 0.95 (s, 9H), 0.34 (s, 3H), 0.22 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 173.5, 149.7, 146.2, 130.3, 122.8, 112.8, 111.3, 105.1, 88.9, 65.0, 63.6, 61.8, 43.6, 40.5, 29.8, 27.0, 22.2, 21.3, 20.1, 19.8, 14.6, -1.3, -2.4; **HRMS** (ESI) calcd for $C_{19}H_{23}N_2O_5$ $[M-OTBS]^+$: 359.1601, found 359.1597.



3hα

Yellowish oil.

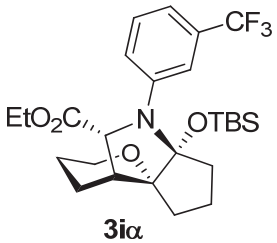
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 7.57 (d, J = 8.8 Hz, 1H), 7.27 (d, J = 2.8 Hz, 1H), 6.90 (dd, J_1 = 2.8 Hz, J_2 = 9.2 Hz, 1H), 4.63 (d, J = 10.0 Hz, 1H), 4.15 (q, J = 7.2 Hz, 2H), 3.97-3.90 (m, 1H), 3.38-3.50 (m, 1H), 2.46-2.32 (m, 2H), 2.26 (dt, J_1 = 4.0 Hz, J_2 = 10.0 Hz, 1H), 2.18-2.10 (m, 1H), 2.04-1.97 (m, 1H), 1.97-1.87 (m, 3H), 1.87-1.78 (m, 1H), 1.78-1.69 (m, 1H), 1.58-1.49 (m, 1H), 1.17 (t, J = 7.2 Hz, 3H), 0.74 (s, 9H), 0.10 (s, 3H), -0.14 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 173.2, 151.0, 145.4, 135.2, 121.6, 113.4, 105.1, 100.1, 88.8, 64.8, 63.6, 62.0, 43.5, 40.1, 29.7, 27.1, 22.1, 21.2, 20.1, 19.9, 14.6, -1.3, -2.4; **HRMS** (ESI) calcd for $C_{25}H_{38}BrN_2O_6Si$ $[M+H]^+$: 569.1677, found 569.1670.



3hβ

Yellowish crystal, **MP** 145-147 °C.

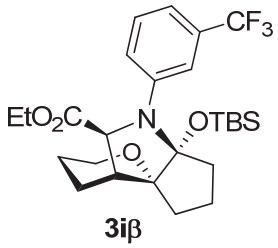
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 7.59 (d, J = 8.8 Hz, 1H), 7.49 (d, J = 3.2 Hz, 1H), 6.95 (dd, J_1 = 3.2 Hz, J_2 = 8.8 Hz, 1H), 4.50 (d, J = 8.8 Hz, 1H), 4.23-4.10 (m, 2H), 4.00-3.90 (m, 1H), 3.65-3.55 (m, 1H), 2.60-2.50 (m, 1H), 2.42-2.32 (m, 1H), 2.21-2.00 (m, 3H), 1.92-1.70 (m, 3H), 1.63-1.44 (m, 2H), 1.40-1.25 (m, 1H), 1.21 (t, J = 7.2 Hz, 3H), 0.92 (s, 9H), 0.27 (s, 3H), 0.20 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 171.1, 151.0, 145.9, 135.1, 121.0, 113.1, 104.5, 100.6, 88.2, 64.5, 62.9, 61.6, 41.3, 38.2, 35.5, 26.8, 22.6, 21.6, 20.6, 19.7, 14.6, -1.1, -1.9; **HRMS** (ESI) calcd for $C_{25}H_{38}BrN_2O_6Si$ $[M+H]^+$: 569.1677, found 569.1664.



3iα

Yellowish oil.

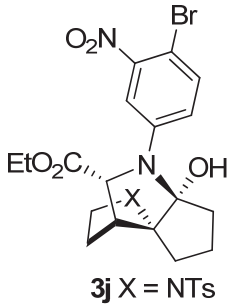
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 7.48 (t, J = 8.0 Hz, 1H), 7.19 (s, 1H), 7.13 (dd, J_1 = 3.2 Hz, J_2 = 8.0 Hz, 2H), 4.77 (d, J = 10.0 Hz, 1H), 4.24 (q, J = 7.2 Hz, 2H), 4.08 (dd, J_1 = 3.6 Hz, J_2 = 6.4 Hz, 1H), 3.69 (dd, J_1 = 9.6 Hz, J_2 = 11.6 Hz, 1H), 2.68-2.56 (m, 1H), 2.56-2.47 (m, 1H), 2.43-2.35 (m, 1H), 2.33-2.22 (m, 1H), 2.22-2.10 (m, 1H), 2.10-1.93 (m, 4H), 1.93-1.82 (m, 1H), 1.73-1.60 (m, 1H), 1.26 (t, J = 7.2 Hz, 3H), 0.84 (s, 9H), 0.21 (s, 3H), 0.03 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 173.6, 145.6, 131.5 (q, J_F = 31.0 Hz), 130.1, 125.7 (d, J_F = 270 Hz), 120.6, 114.9 (J_F = 3.8 Hz), 113.5 (J_F = 4.0 Hz), 105.0, 88.8, 65.1, 63.5, 61.6, 43.6, 40.8, 30.0, 27.1, 22.3, 21.4, 20.2, 19.8, 14.5, -1.4, -2.3; **HRMS** (ESI) calcd for $C_{20}H_{25}F_3NO_4$ $[M-TBS+H]^+$: 400.1730, found 400.1758.



3iβ

Yellowish crystal, **MP** 48-52 °C.

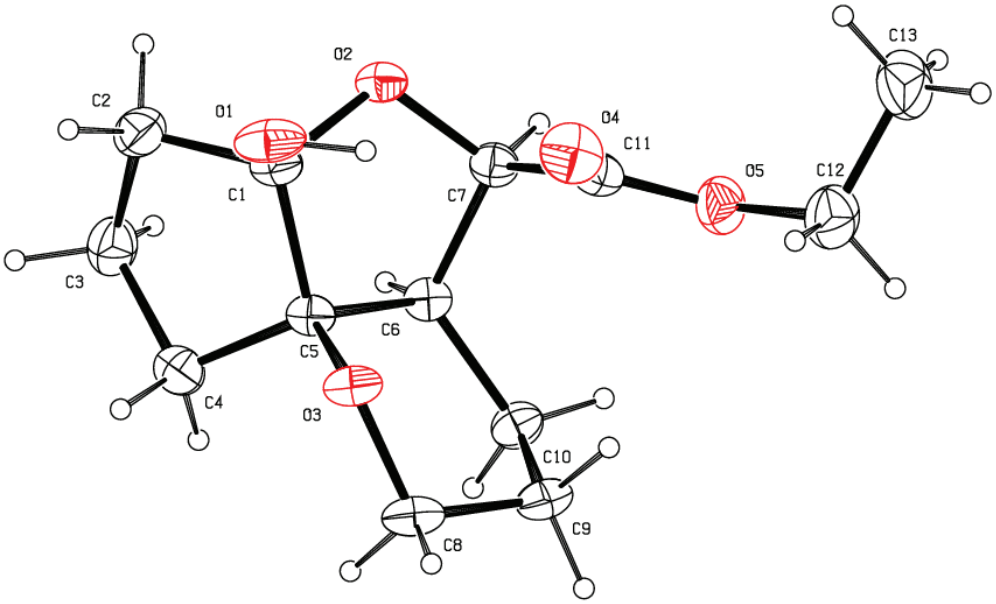
^{1}H NMR (400 MHz, CD_3COCD_3, ppm): δ 7.37 (t, *J* = 8.0 Hz, 1H), 7.32 (s, 1H), 7.10-7.02 (m, 2H), 4.50 (d, *J* = 8.4 Hz, 1H), 4.14 (q, *J* = 7.2 Hz, 2H), 4.07-3.97 (m, 1H), 3.68-3.58 (m, 1H), 2.55-2.45 (m, 1H), 2.41-2.30 (m, 1H), 2.18-2.00 (m, 3H), 1.95-1.84 (m, 1H), 1.75-1.57 (m, 3H), 1.57-1.43 (m, 1H), 1.28-1.15 (m, 1H), 1.18 (t, *J* = 7.2 Hz, 3H), 0.96 (s, 9H), 0.30 (s, 3H), 0.22 (s, 3H); **^{13}C NMR** (100 MHz, CD_3COCD_3, ppm): δ 171.4, 146.2, 131.0 (q, J_F = 31.0 Hz), 130.0, 125.8 (d, J_F = 270 Hz), 120.1, 115.5 (J_F = 2.9 Hz), 113.8 (J_F = 3.6 Hz), 104.2, 87.9, 64.5, 63.1, 61.3, 41.6, 38.0, 36.6, 26.8, 23.0, 21.5, 21.0, 19.7, 14.6, -1.0, -1.8; **HRMS** (ESI) calcd for $C_{20}H_{23}F_3NO_3$ $[M\text{-}OTBS]^+$: 382.1625, found 382.1626.



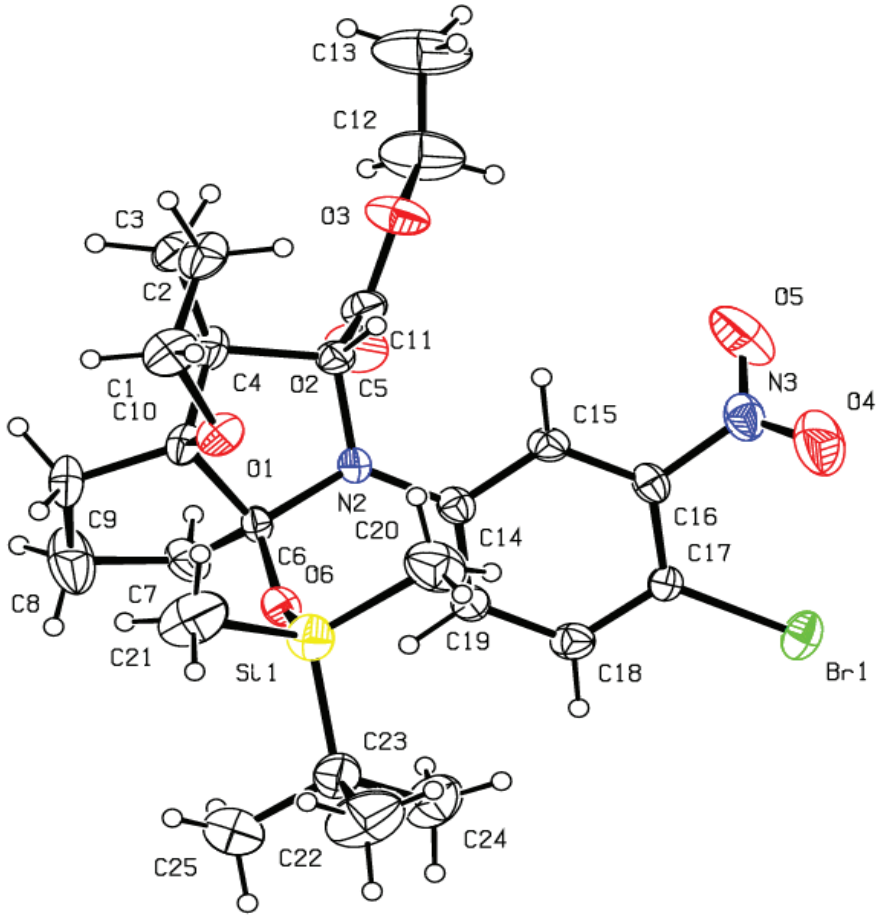
3j X = NTs

Yellowish viscous oil.

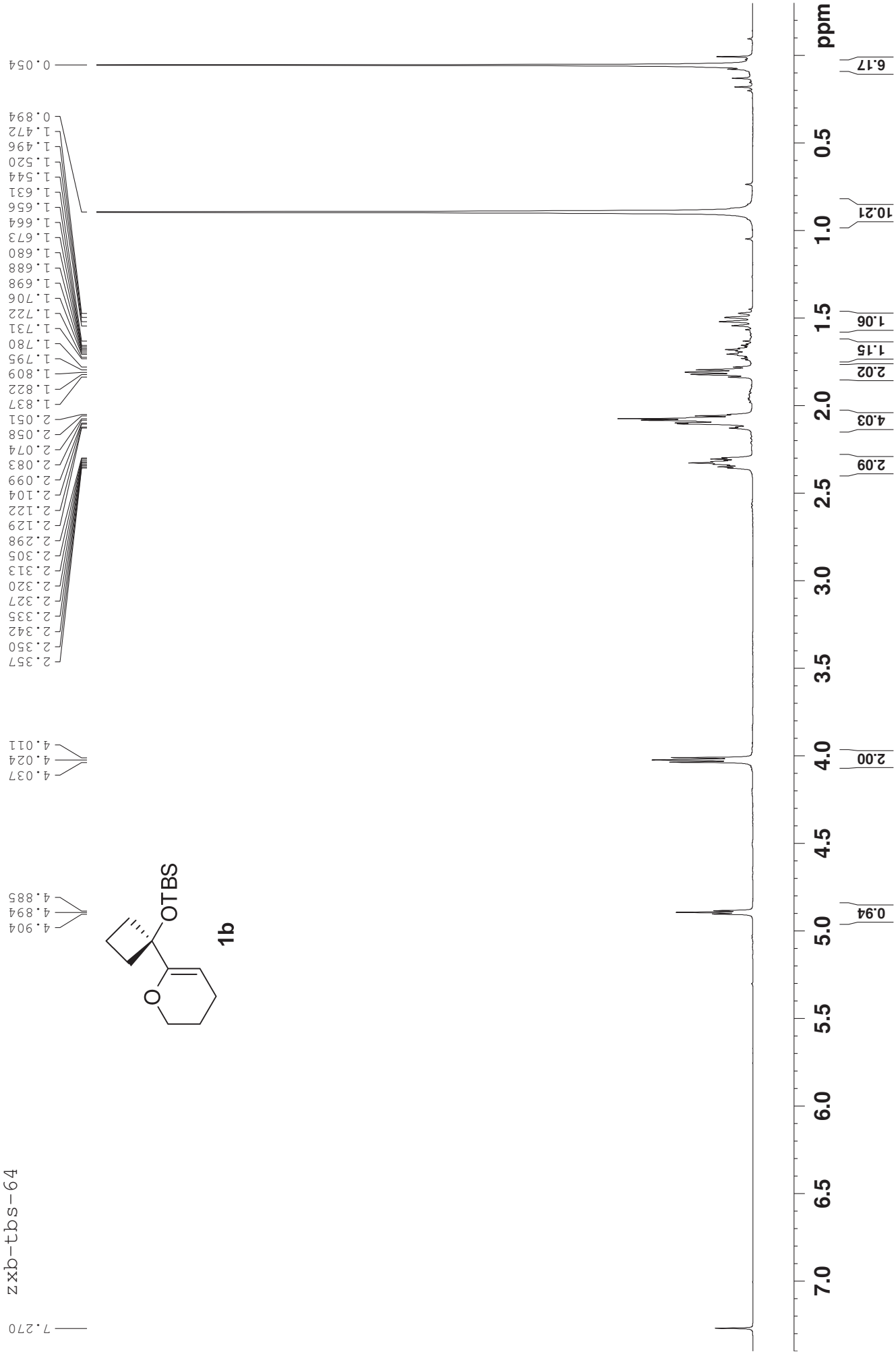
^{1}H NMR (400 MHz, CD_3COCD_3, ppm) δ 7.81 (d, *J* = 8.4 Hz, 2H), 7.64 (d, *J* = 6.4 Hz, 1H), 7.62 (s, 1H), 7.41 (d, *J* = 8.0 Hz, 2H), 7.27 (dd, J_1 = 2.8 Hz, J_2 = 8.8 Hz, 1H), 4.69 (d, *J* = 8.4 Hz, 1H), 4.16 (q, *J* = 7.2 Hz, 2H), 3.63 (dt, J_1 = 4.0 Hz, J_2 = 8.8 Hz, 1H), 3.39 (td, J_1 = 6.8 Hz, J_2 = 8.8 Hz, 1H), 3.11 (dd, J_1 = 3.6 Hz, J_2 = 12.8 Hz, 1H), 2.97 (dt, J_1 = 8.0 Hz, J_2 = 12.8 Hz, 1H), 2.82 (s, 1H), 2.43 (s, 3H), 2.36 (dd, J_1 = 6.0 Hz, J_2 = 12.8 Hz,, 1H), 2.29-2.10 (m, 2H), 1.93-1.79 (m, 2H), 1.69-1.57 (m, 1H), 1.20 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR** (101 MHz, CD_3COCD_3, ppm) δ 171.3, 151.2, 146.2, 144.0, 140.0, 135.2, 130.5, 128.1, 123.0, 114.6, 102.3, 101.9, 83.6, 62.6, 62.2, 53.2, 50.6, 35.8, 35.2, 26.0, 21.5, 21.4, 21.4, 14.6; **HRMS** (ESI) calcd for $C_{25}H_{27}BrN_3O_6S$ $[M\text{-}OH]^+$: 576.0798, found 576.0780.

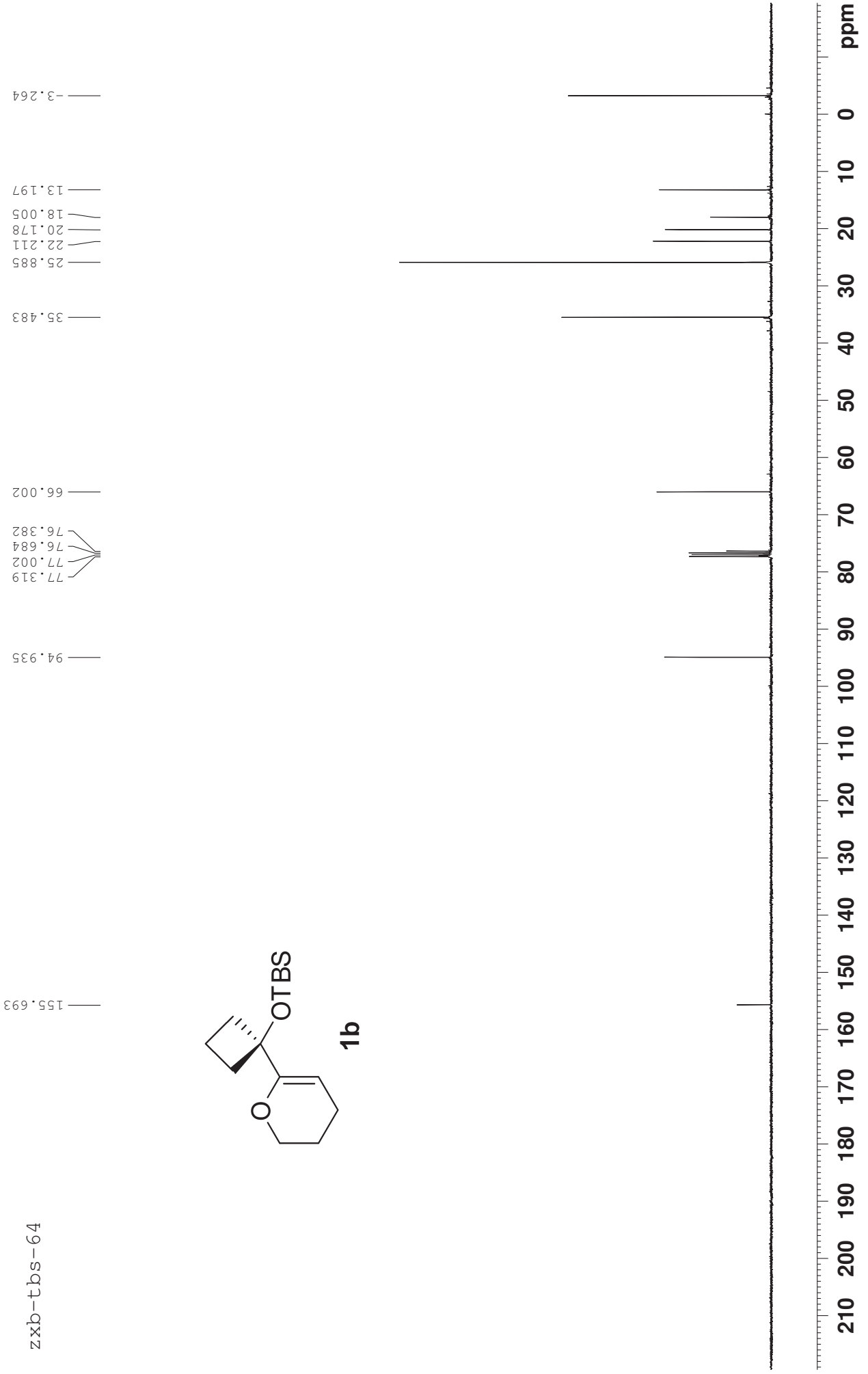


ORTEM drawing of 3a



ORTEM drawing of 3hß

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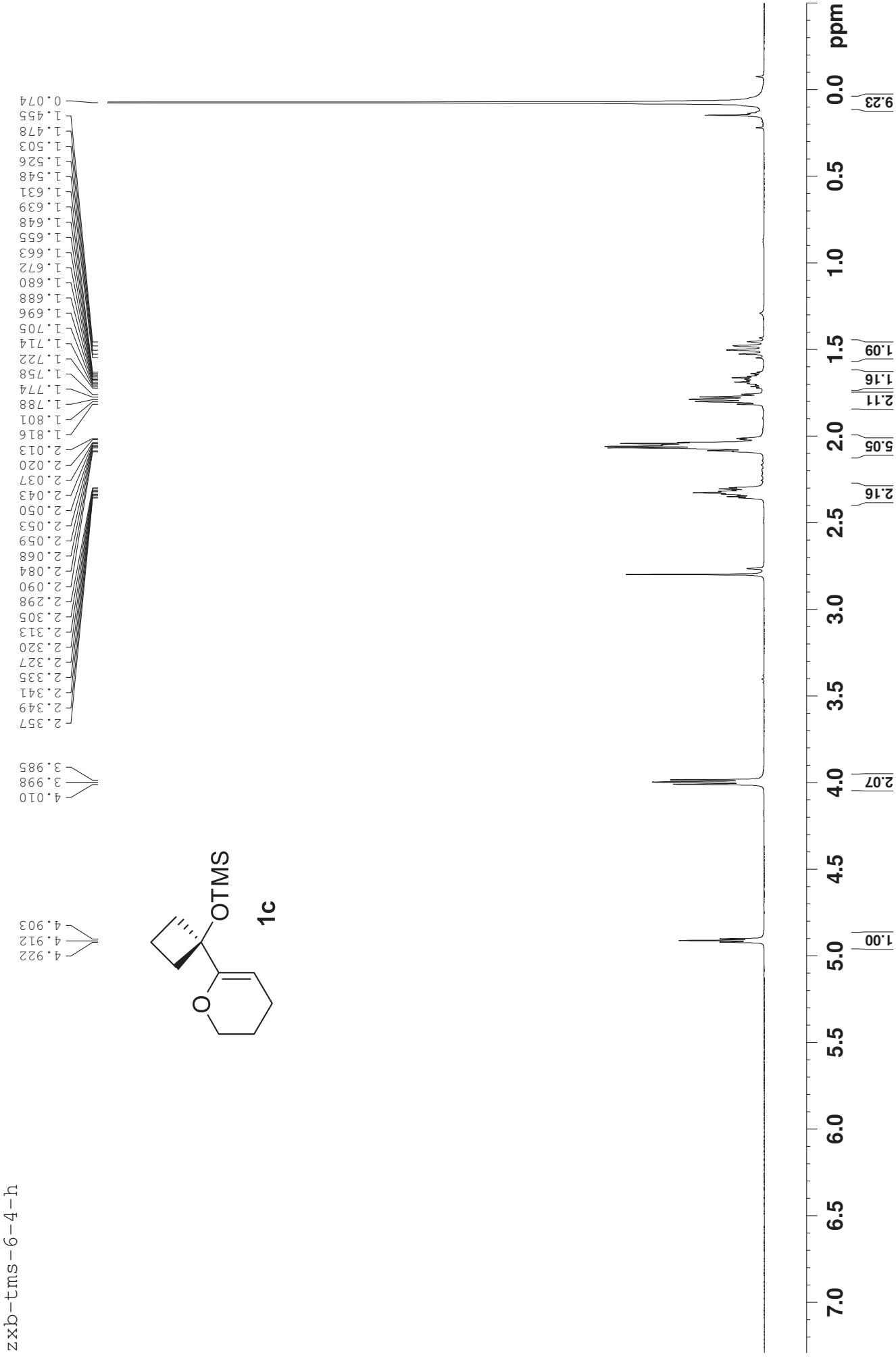
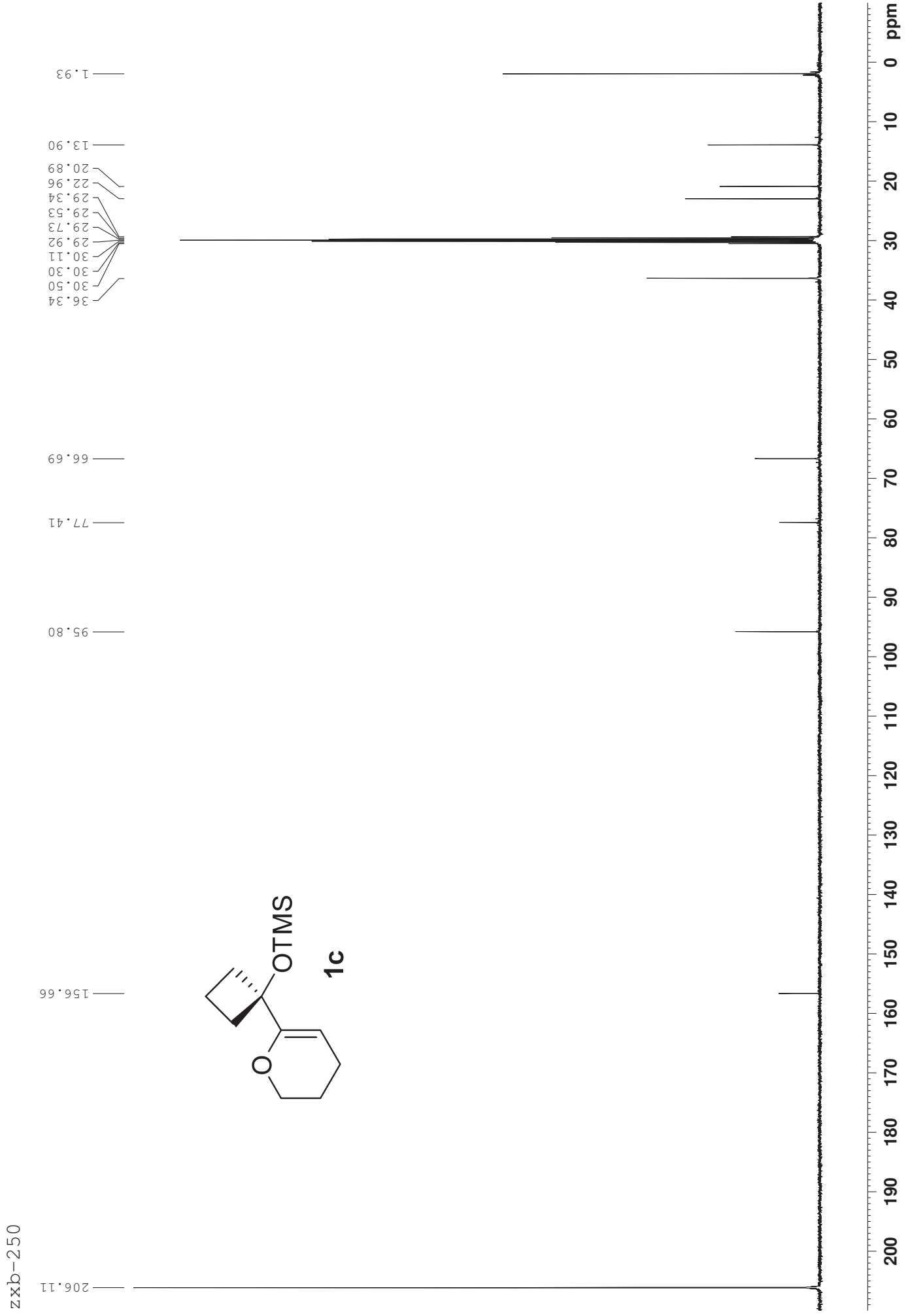
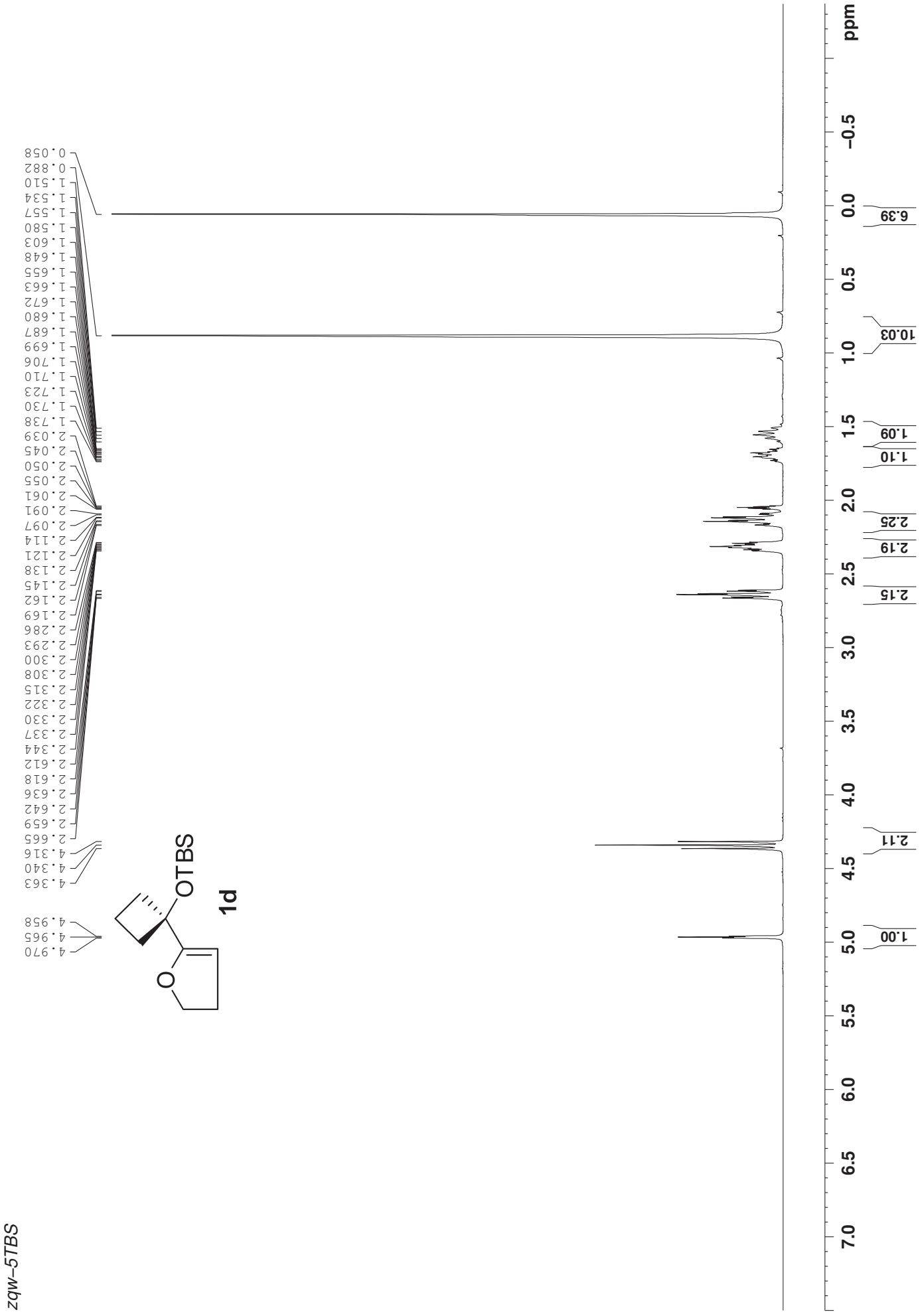
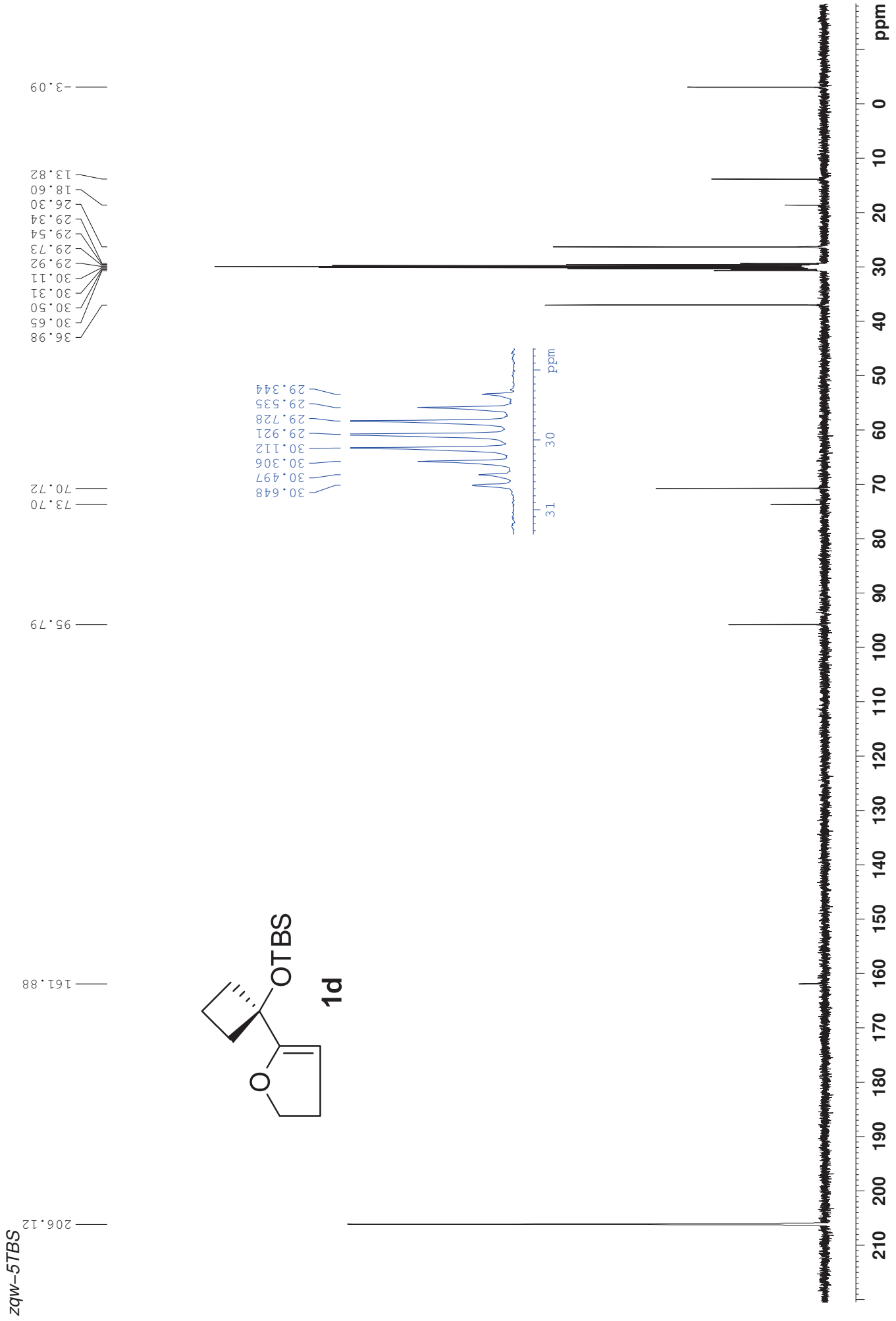
18.005
20.178
22.211
25.885
35.483
66.002
76.382
76.684
77.002
77.319
94.935
155.693
OTBS
O
1b
zxb-tbs-64
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210





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161.88
95.79
73.70
70.72
36.98
30.65
30.50
30.31
30.11
29.92
29.73
29.54
29.34
26.30
18.60
13.82
-3.09
29.344
29.535
29.728
29.921
30.112
30.306
30.497
30.648
ppm
30
31
OTBS
O
1d
ppm
0
10
20
30
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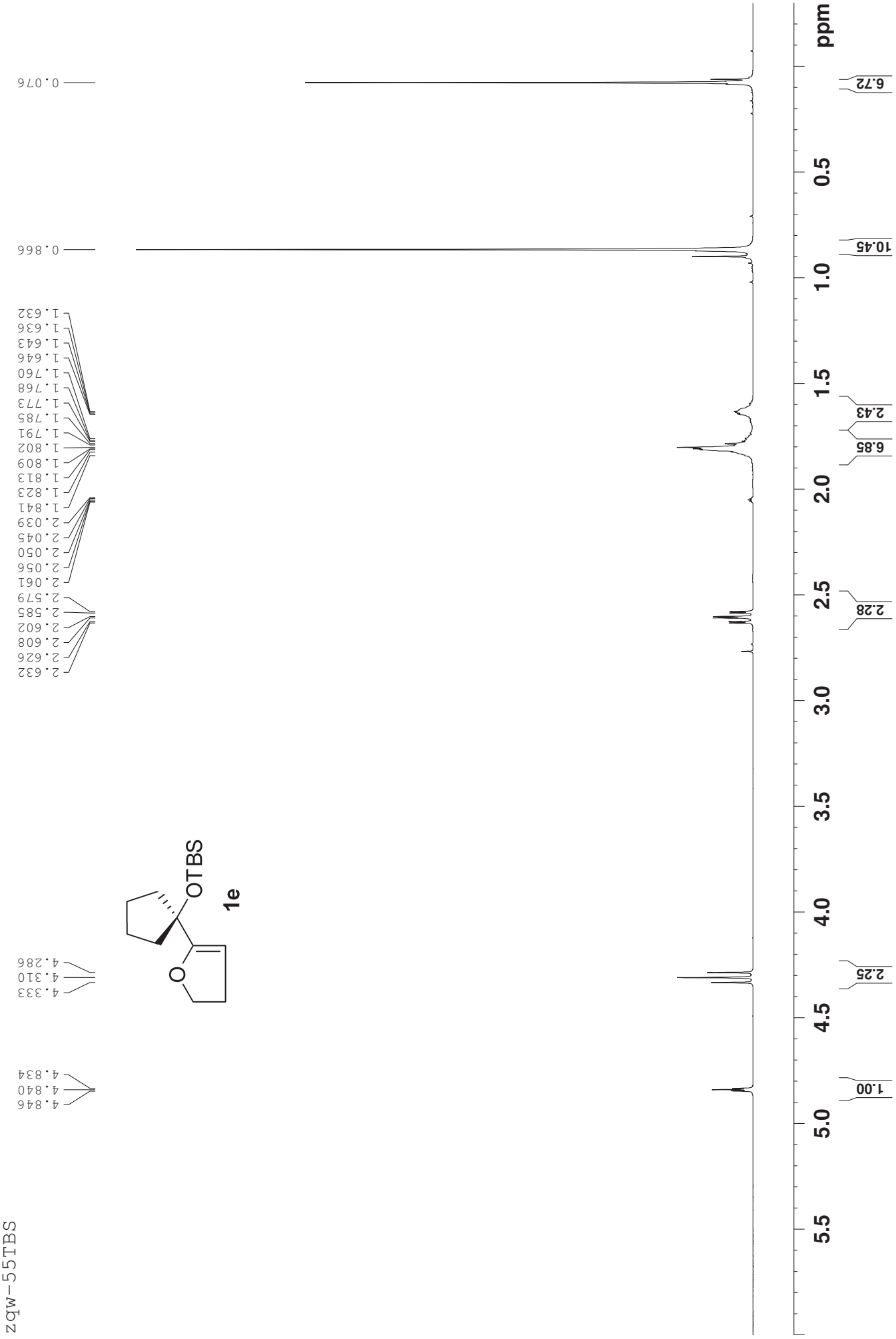
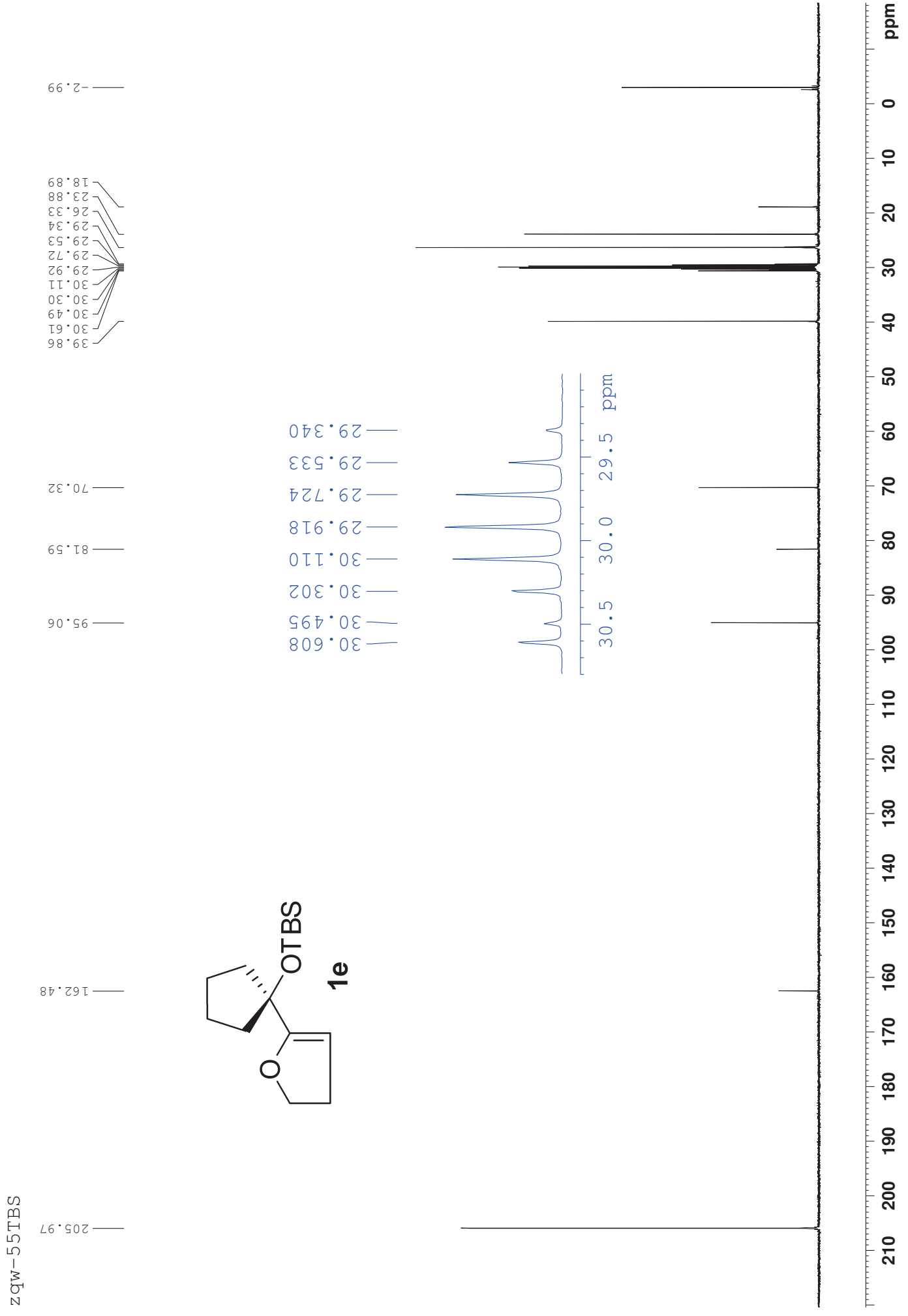
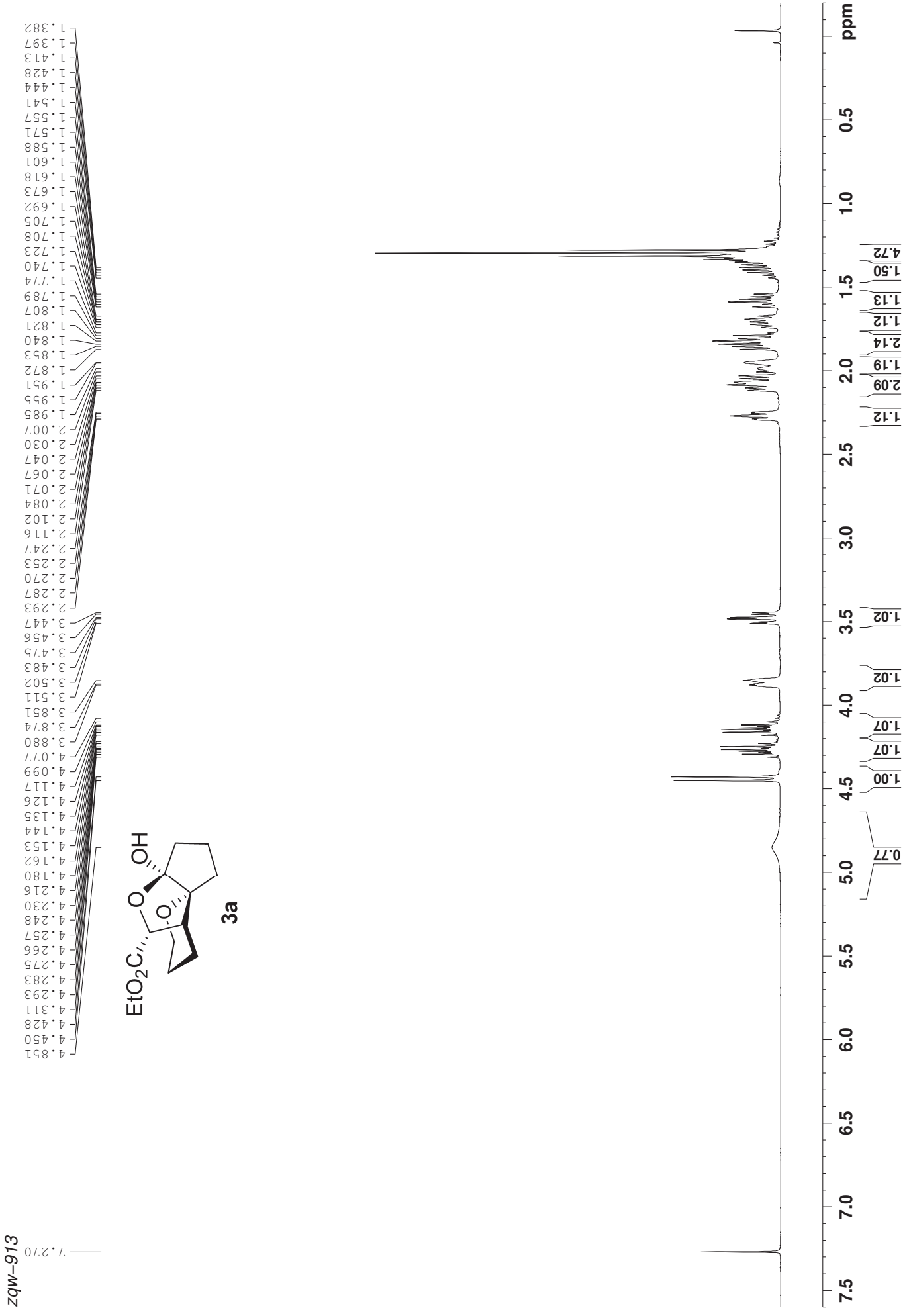
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210



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4.428
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4.275
4.266
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4.153
4.144
4.135
4.126
4.117
4.099
4.077
3.880
3.874
3.851
3.511
3.502
3.483
3.475
3.456
3.447
2.293
2.287
2.270
2.253
2.247
2.116
2.102
2.084
2.071
2.067
2.047
2.030
2.007
1.985
1.955
1.951
1.872
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1.557
1.541
1.444
1.428
1.413
1.397
1.382
OH
O
O
EtO2C
3a
ppm
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1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
4.72
1.50
1.13
1.12
2.14
1.19
2.09
1.12
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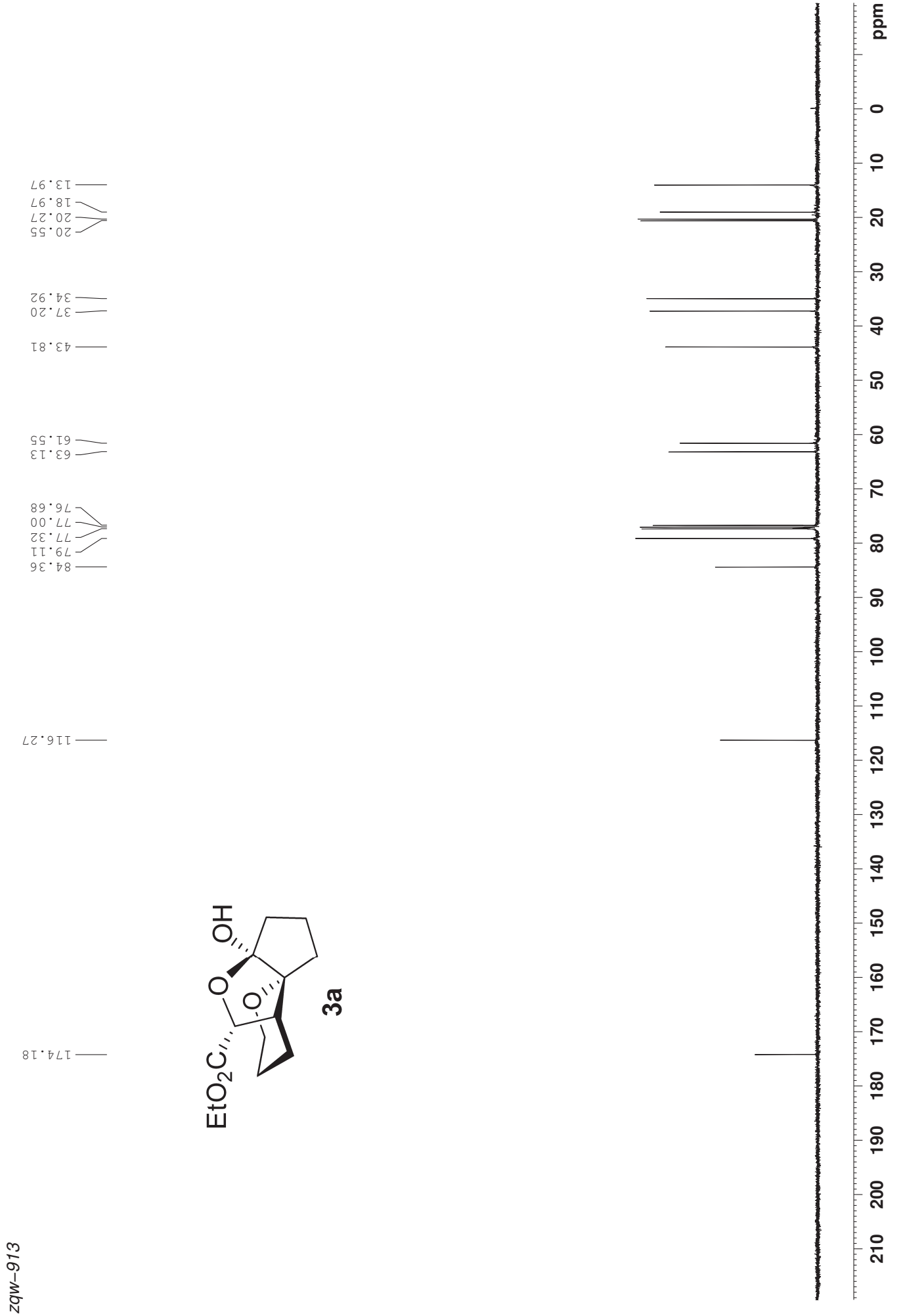
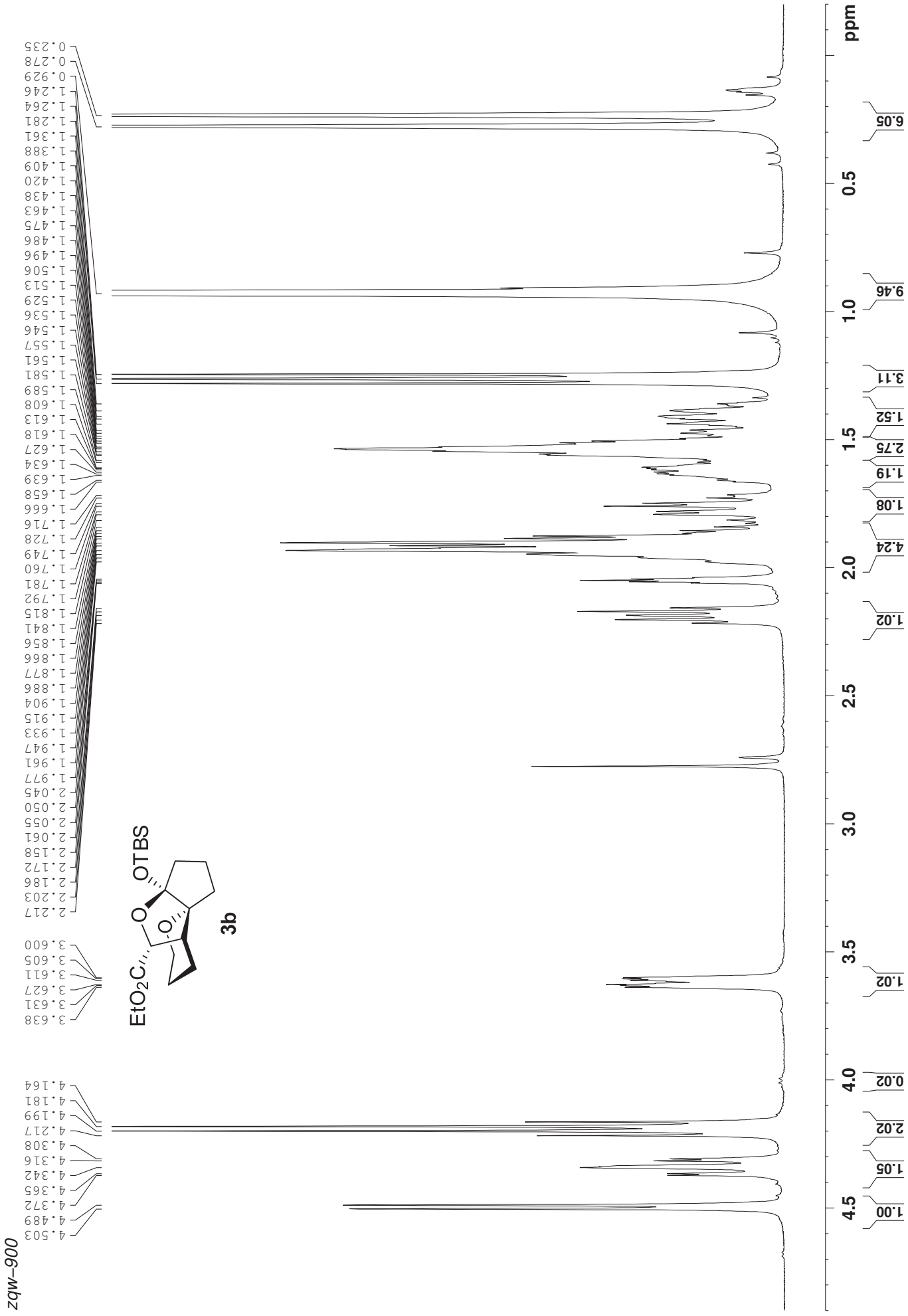
1.02
1.07
1.07
1.00
0.77

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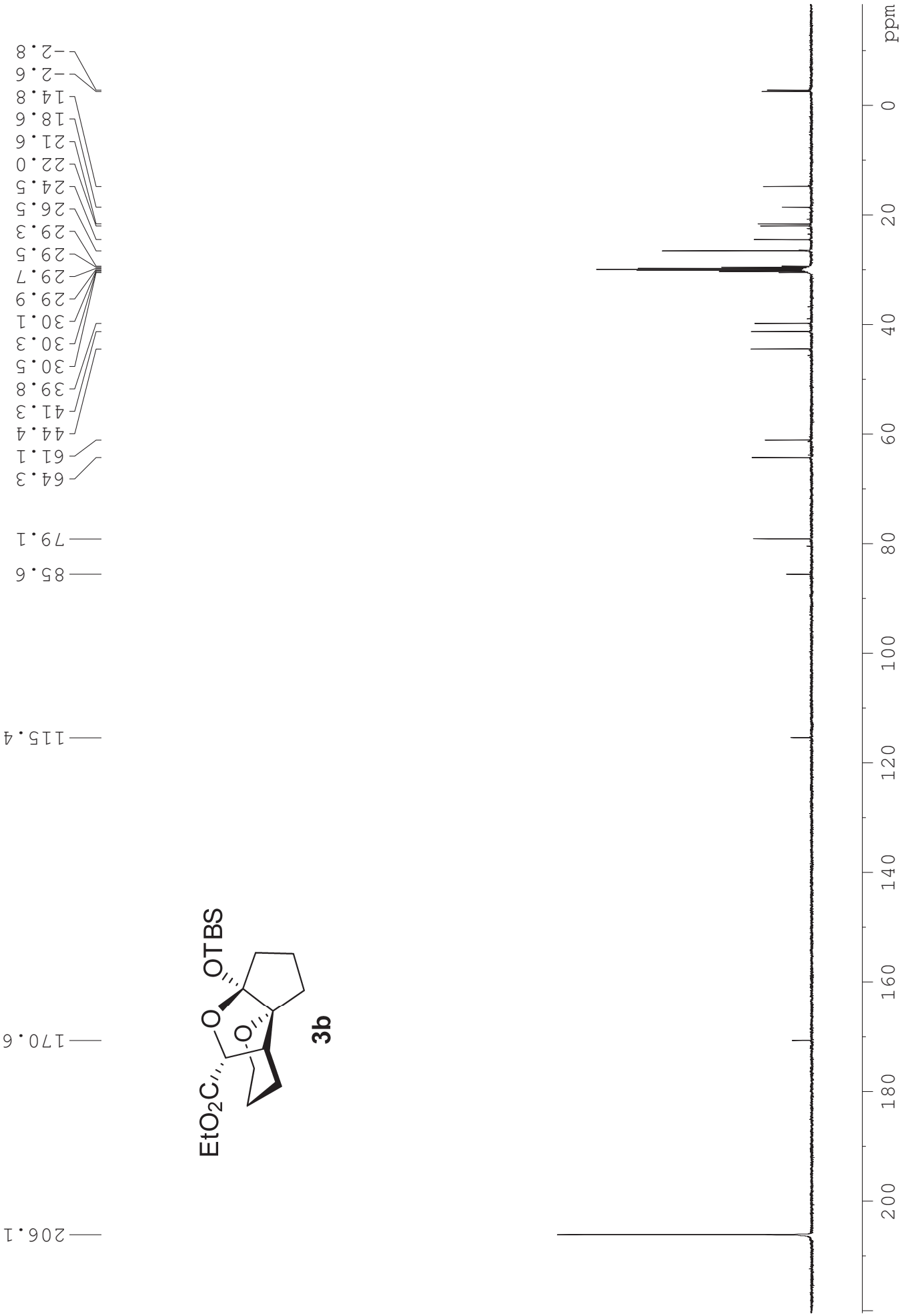
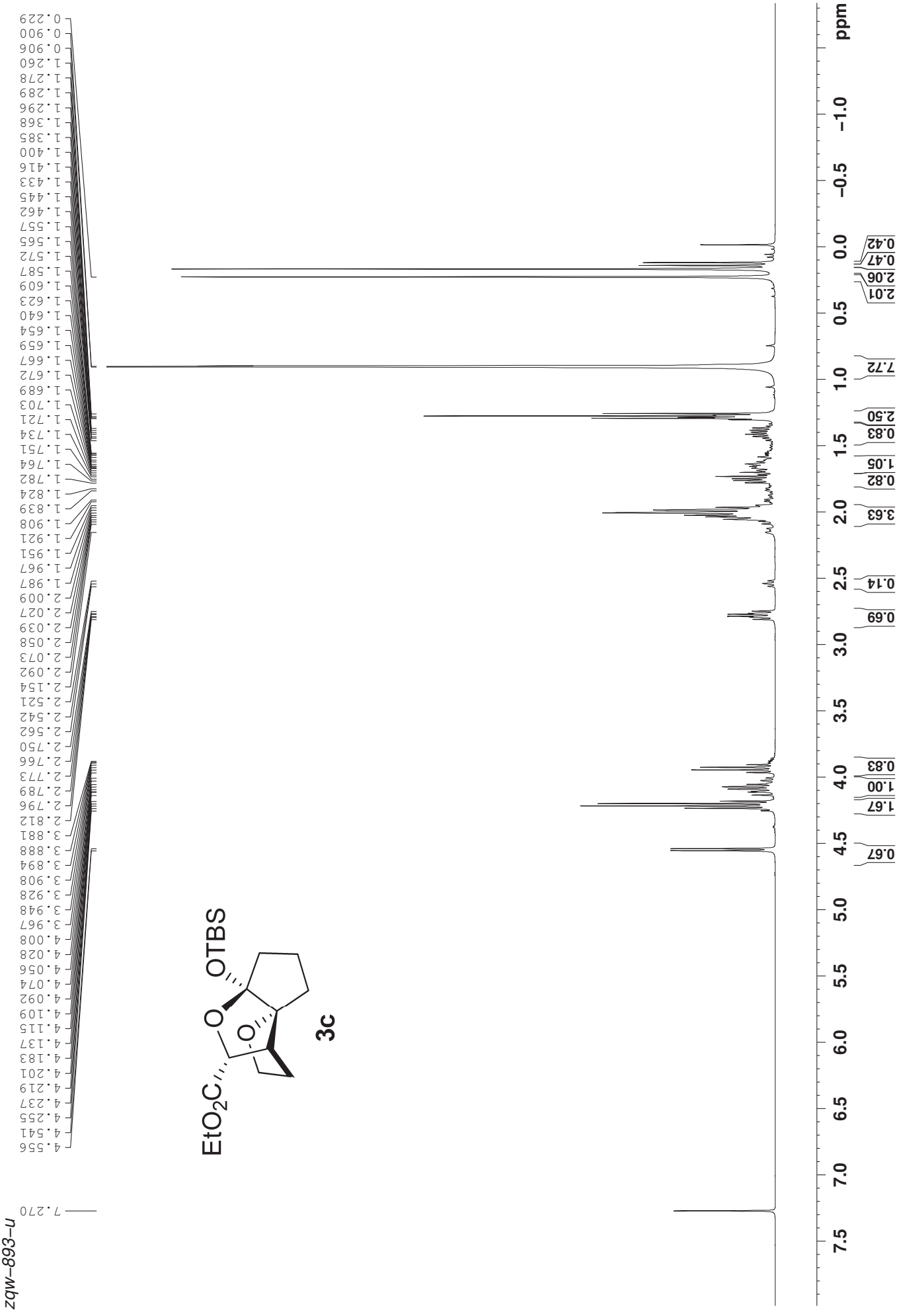
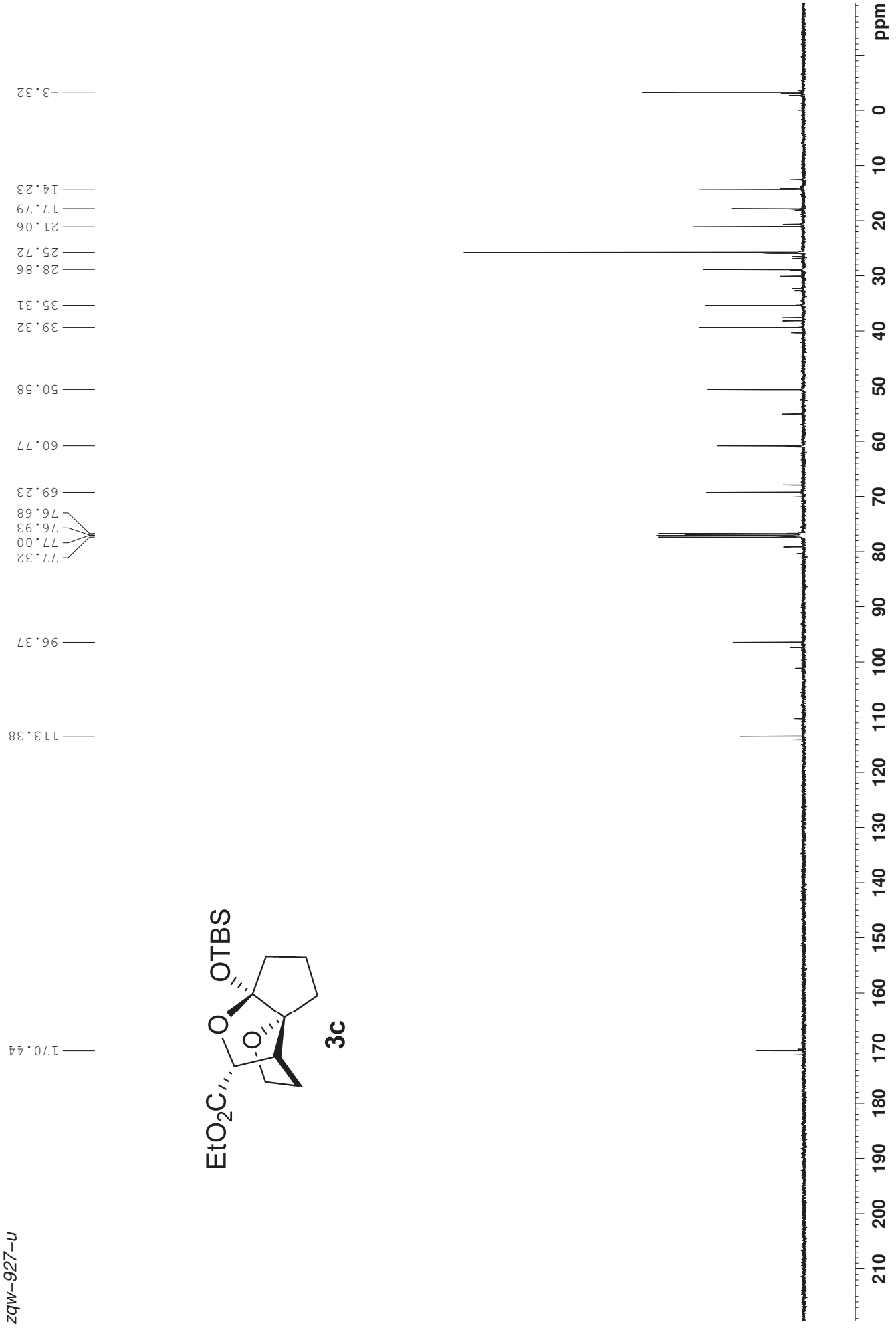
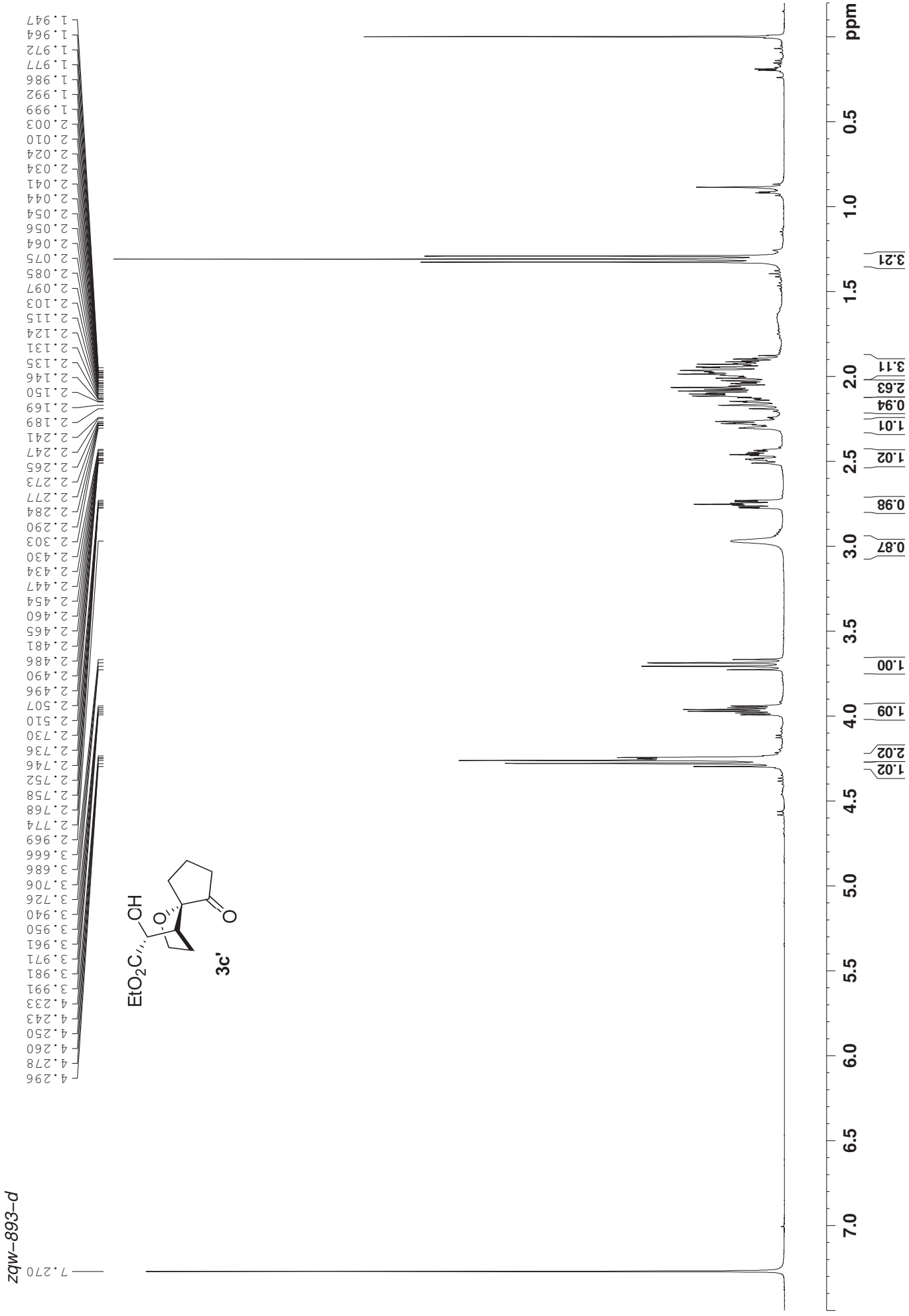
1.5
2.0
2.5
3.0
3.5
4.0
4.5
6.05
9.46
3.11
1.52
2.75
1.19
1.08
4.24
1.02
1.02
0.02
2.02
1.05
1.00
OTBS
O
O
EtO2C
3b




zqw–893–u
ppm
EtO2C
OTBS
O
O
3c
0.42
0.47
2.06
2.01
7.72
2.50
0.83
1.05
0.82
3.63
0.14
0.69
0.83
1.00
1.67
0.67




zqw-893-d
ppm
EtO2C
OH
O
O
3c'
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3.11
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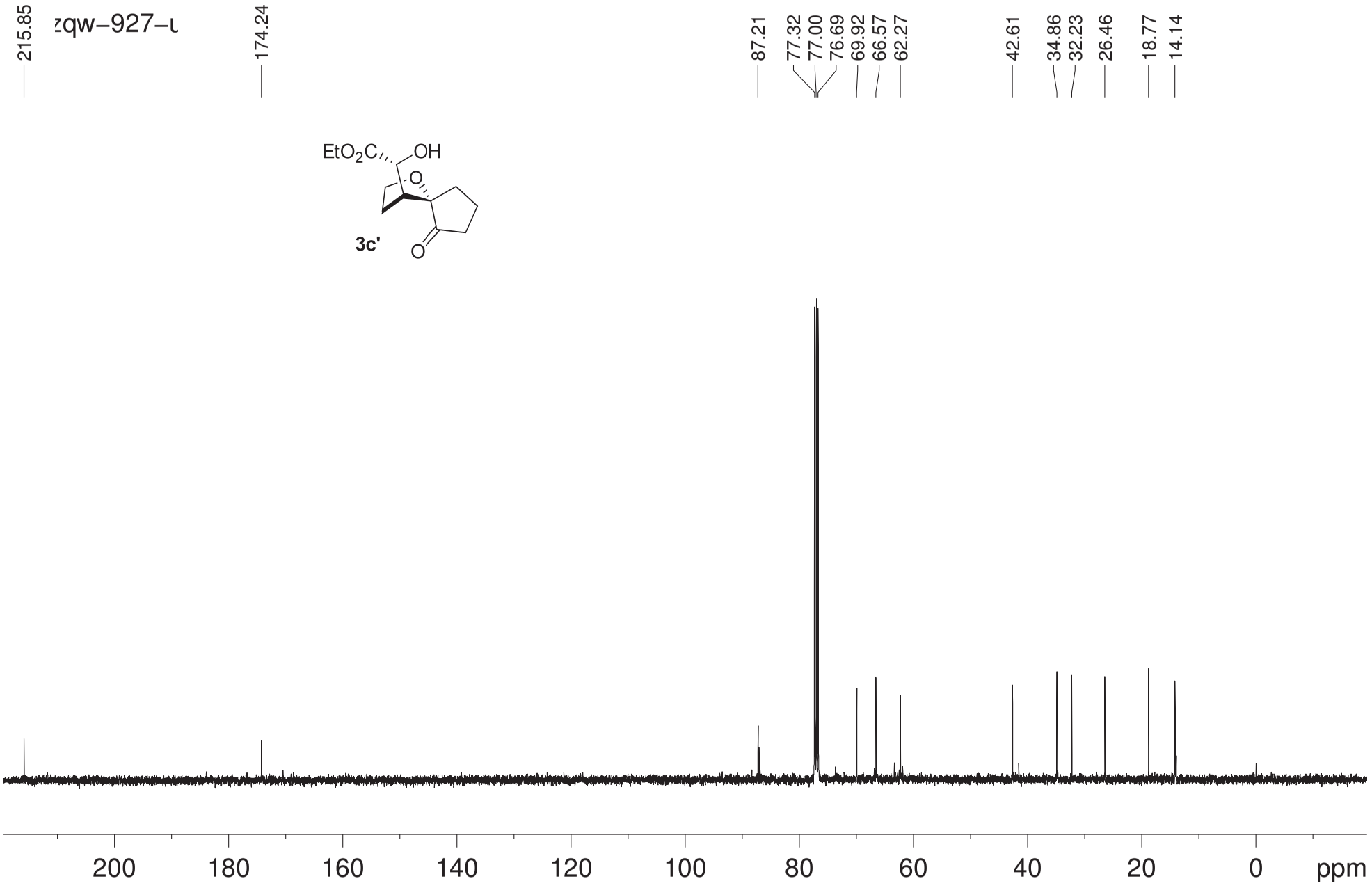
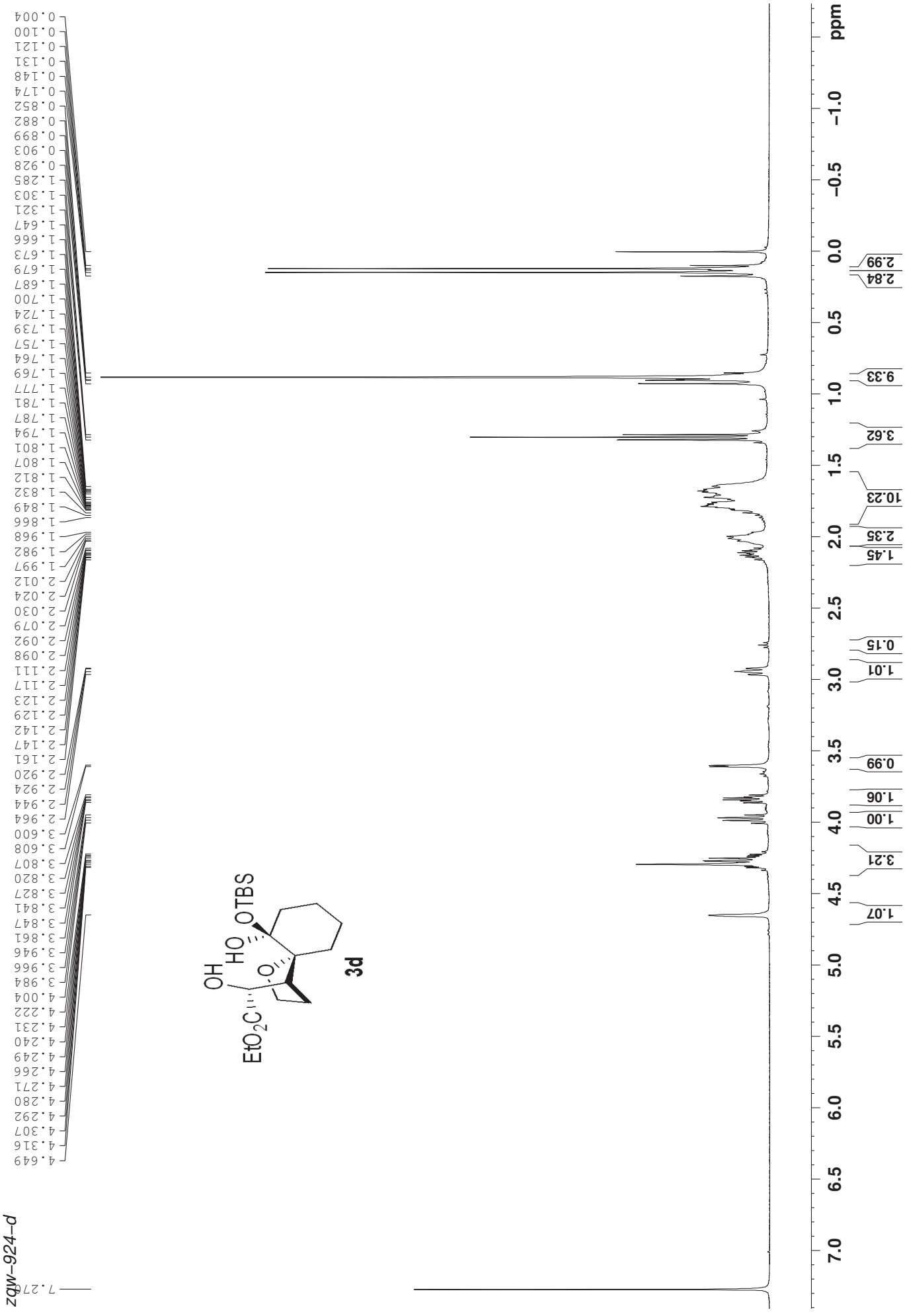
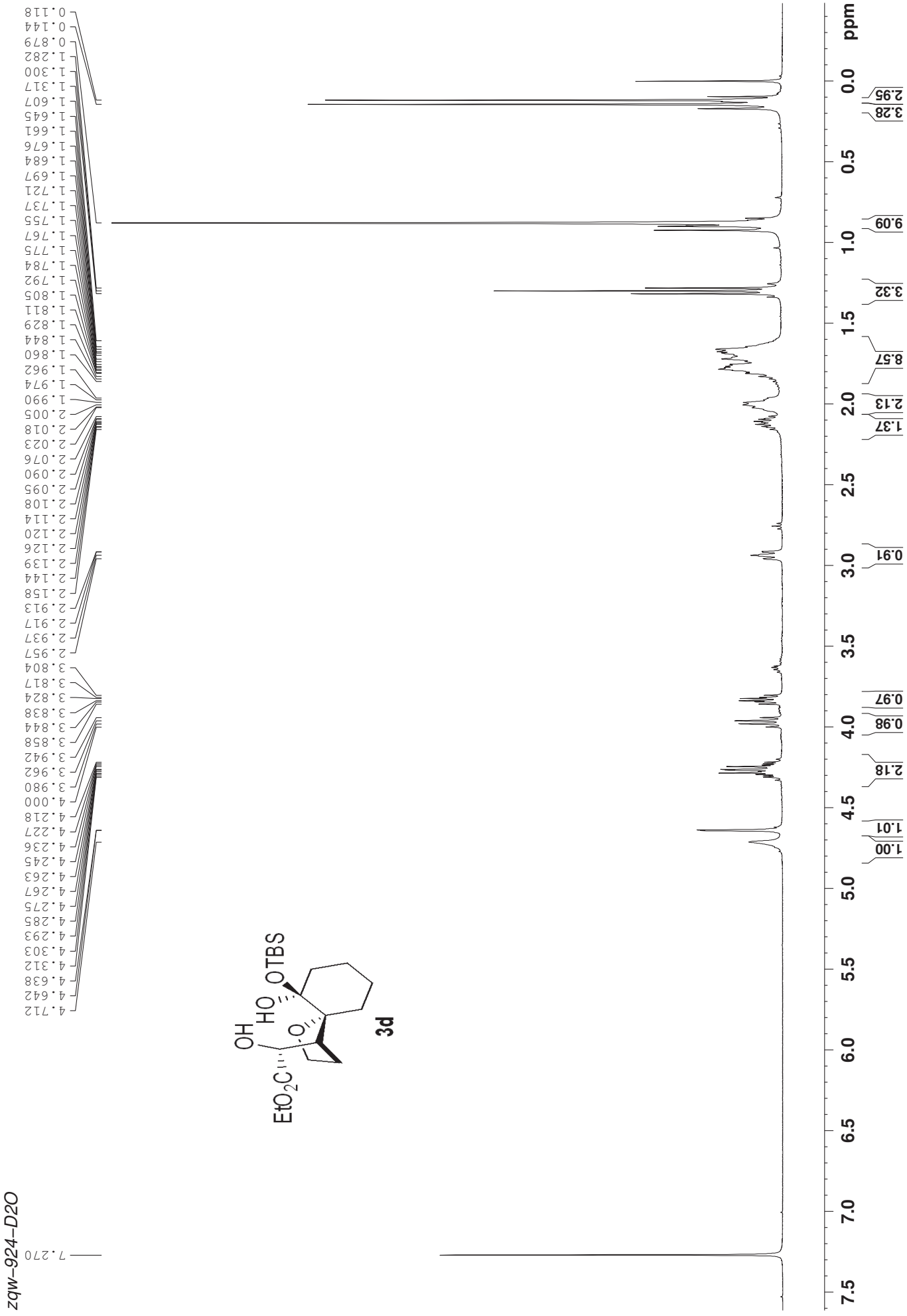
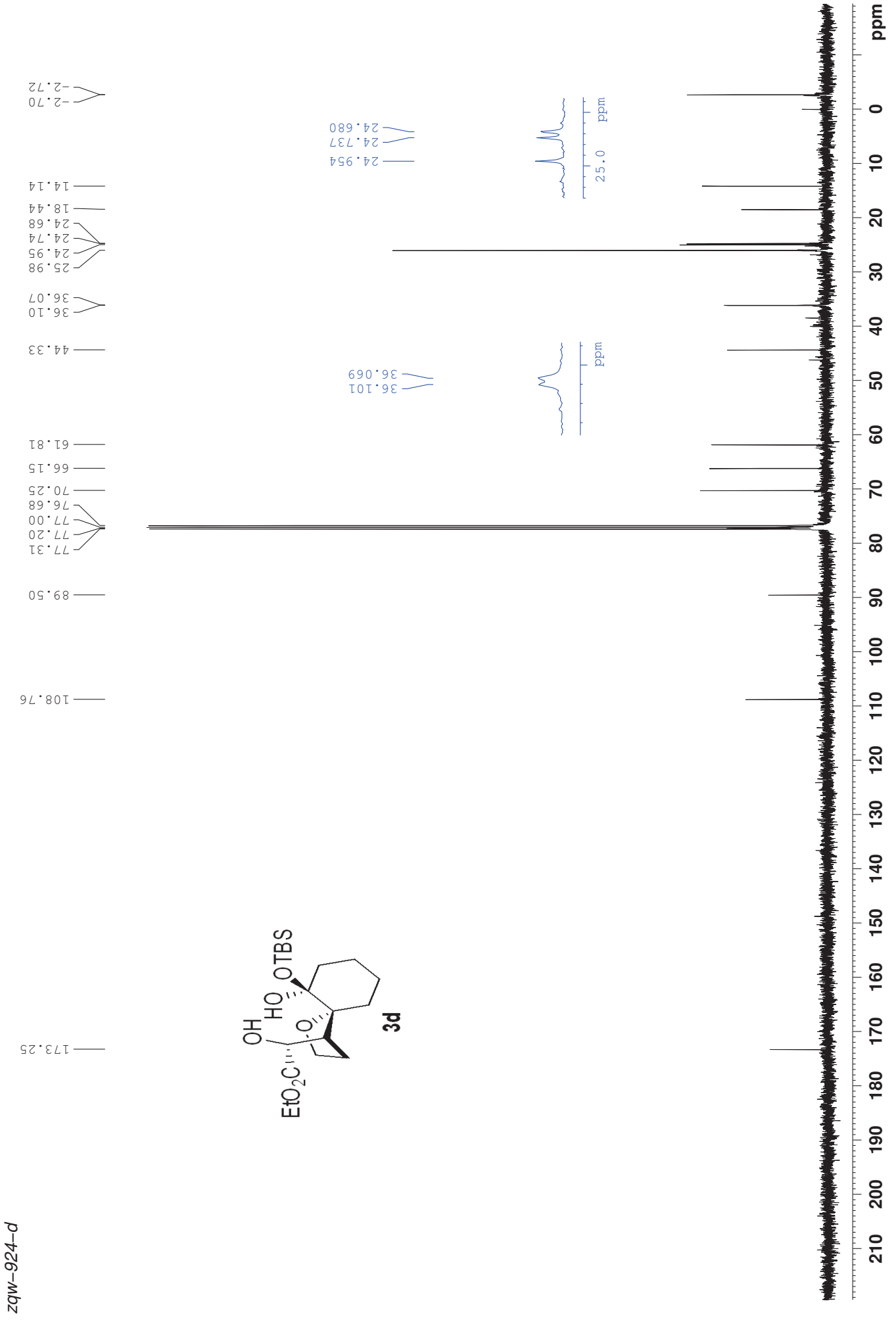
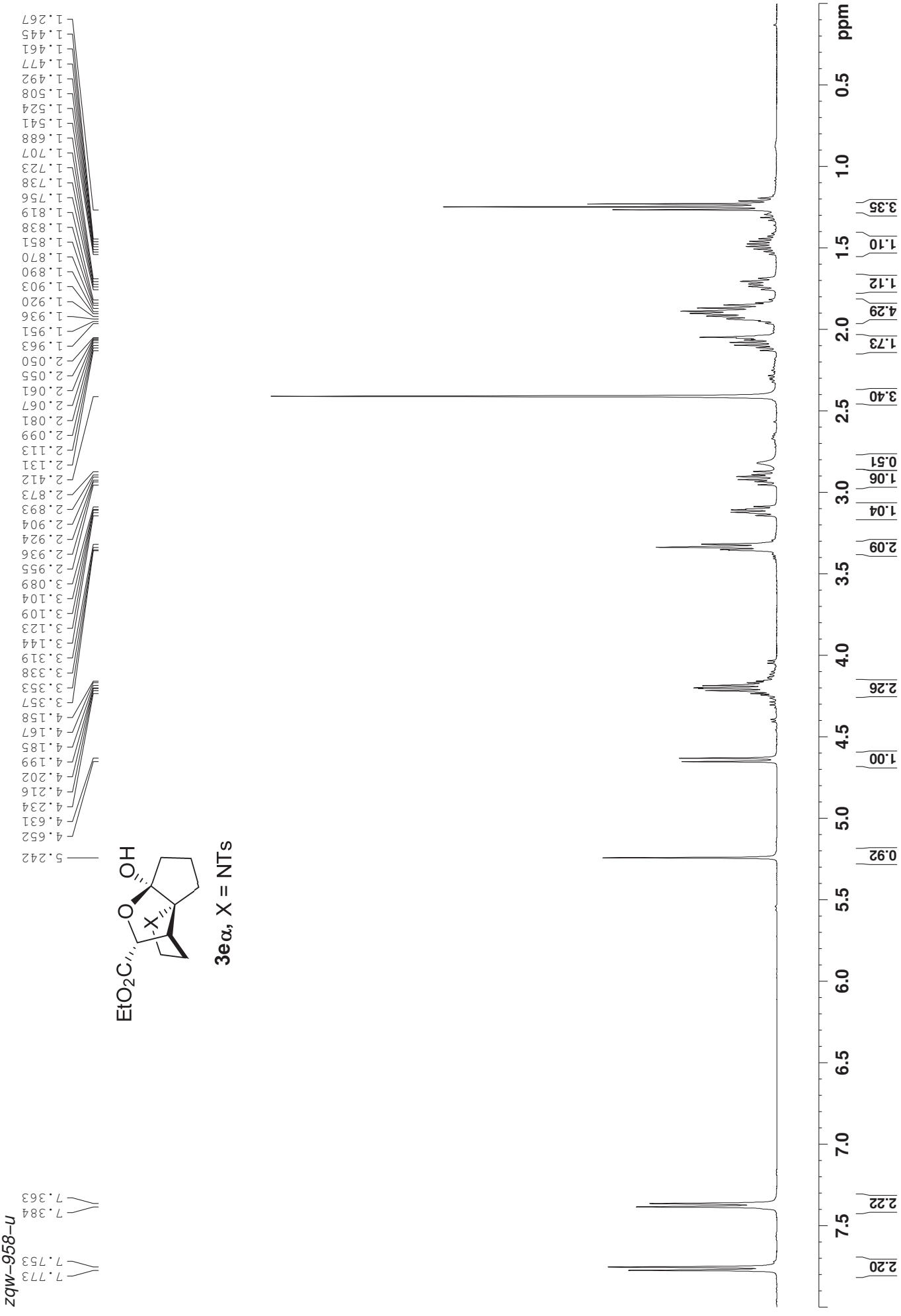
1.02
0.98
0.87
1.00
1.09
2.02
1.02

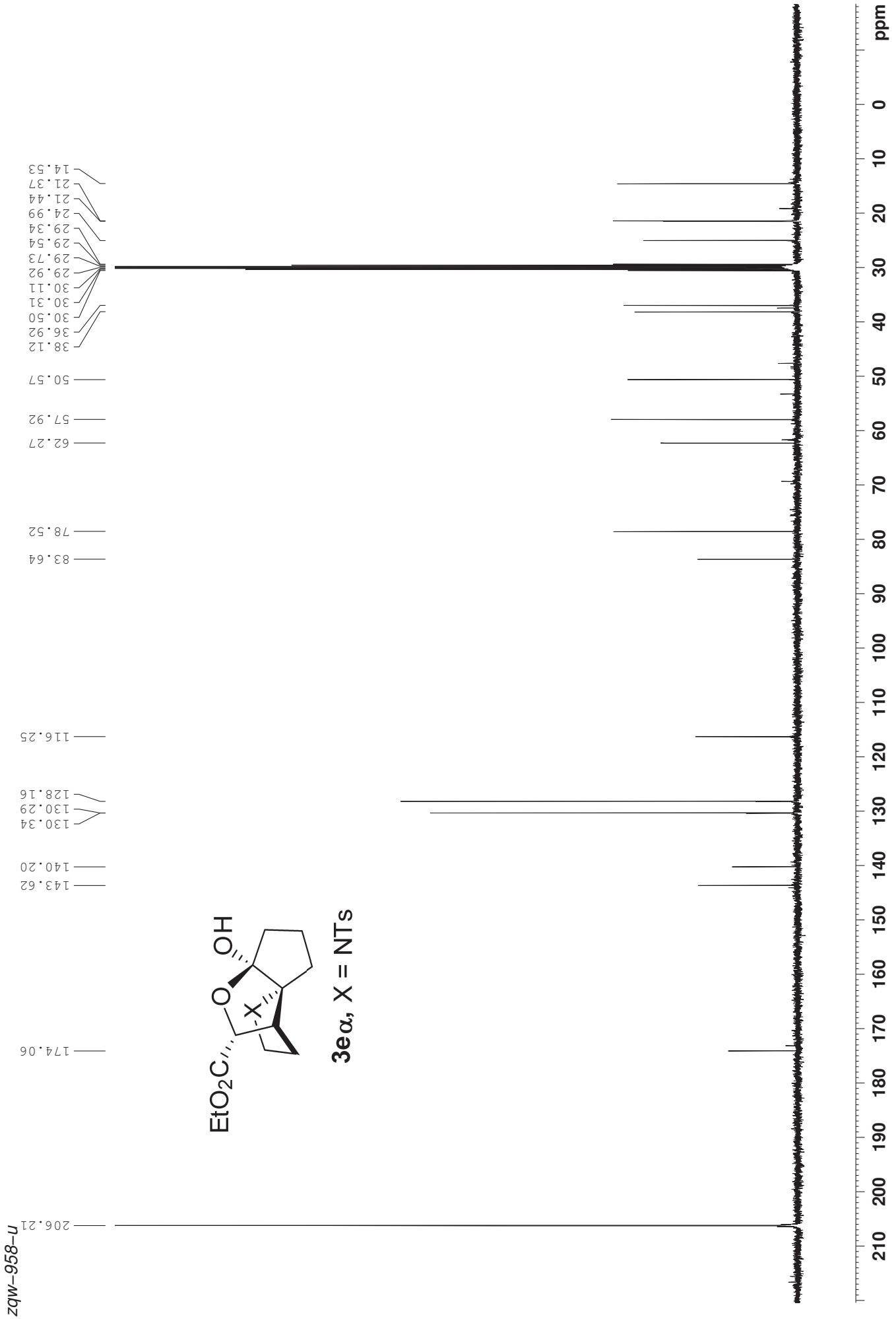


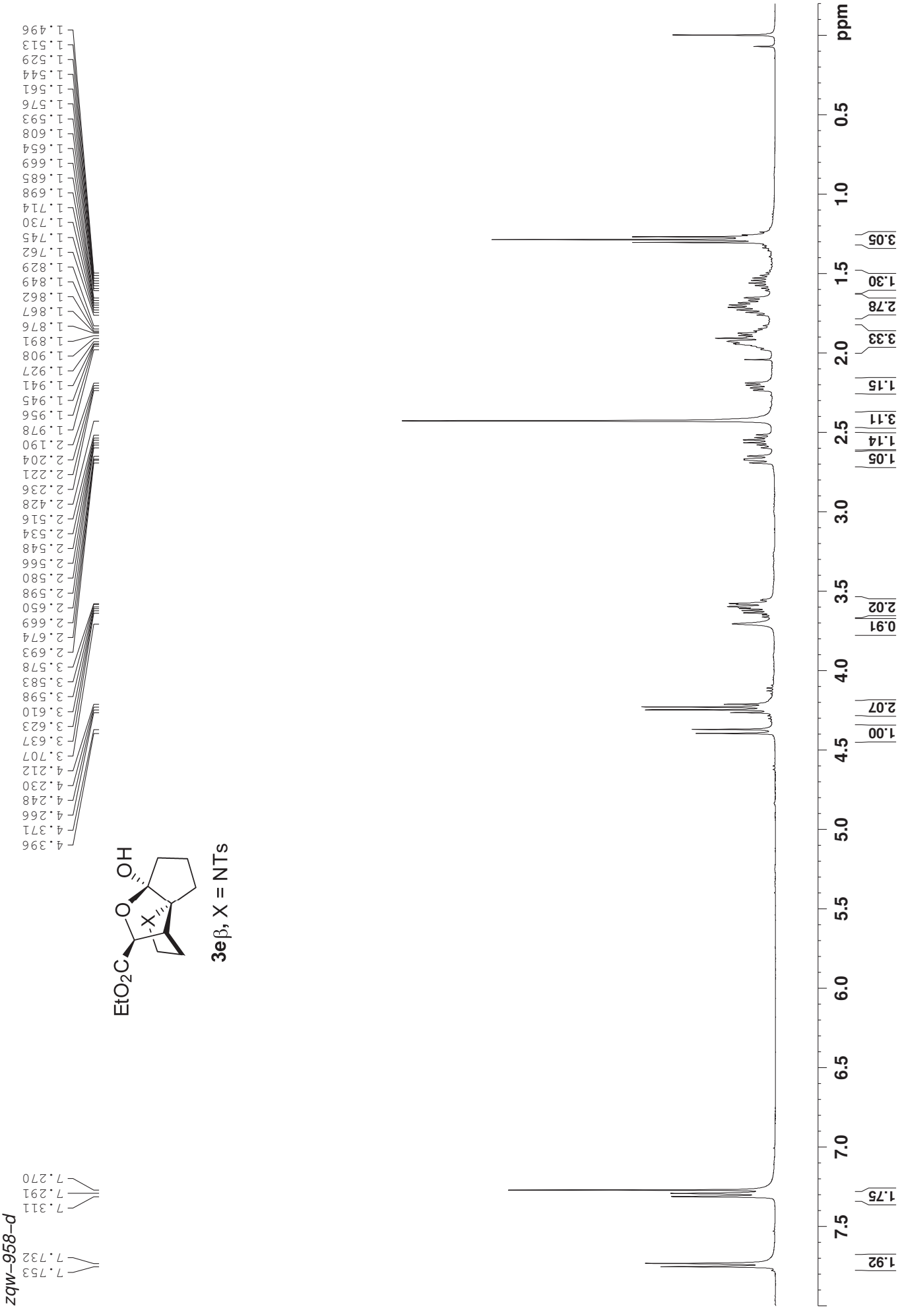


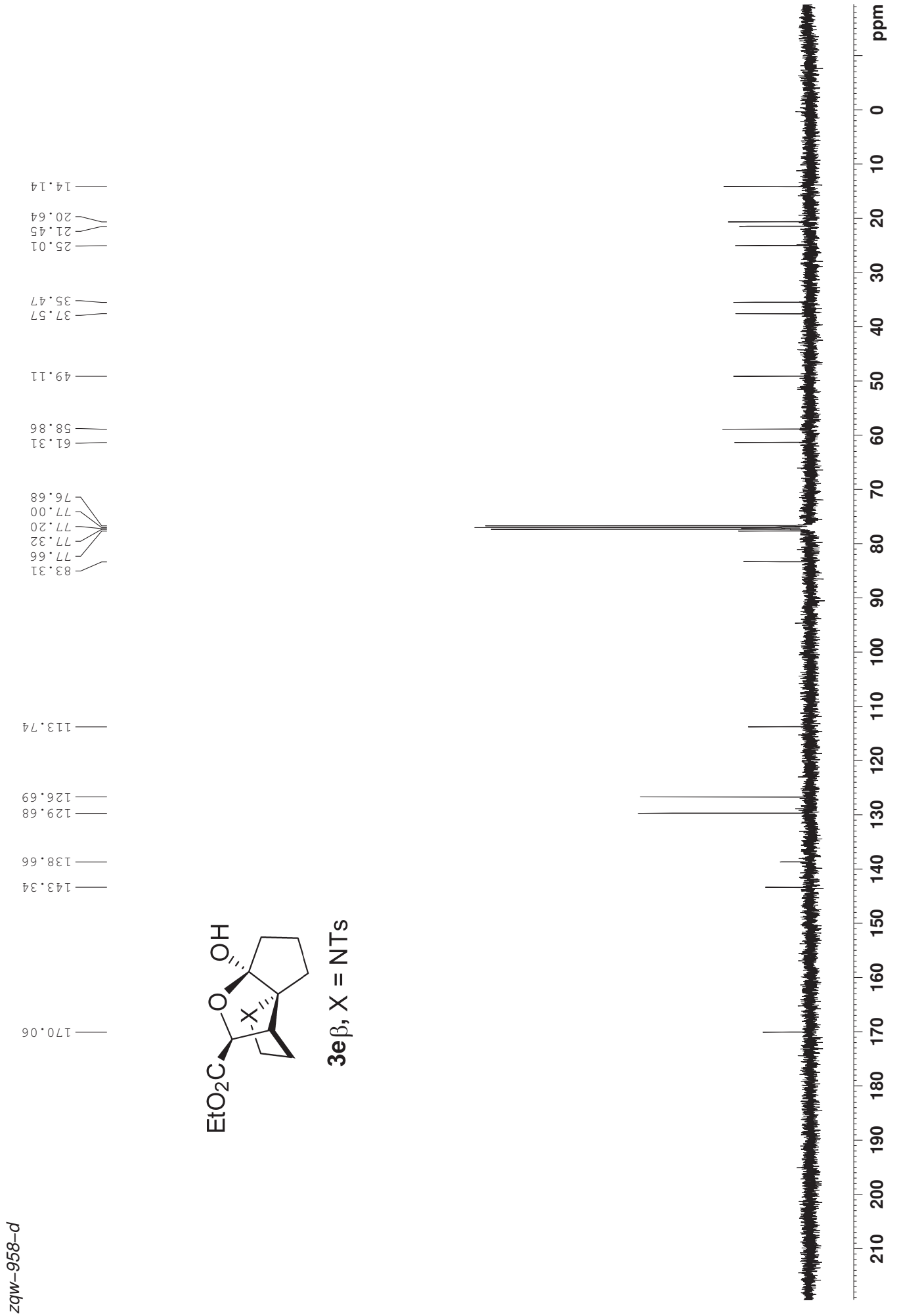


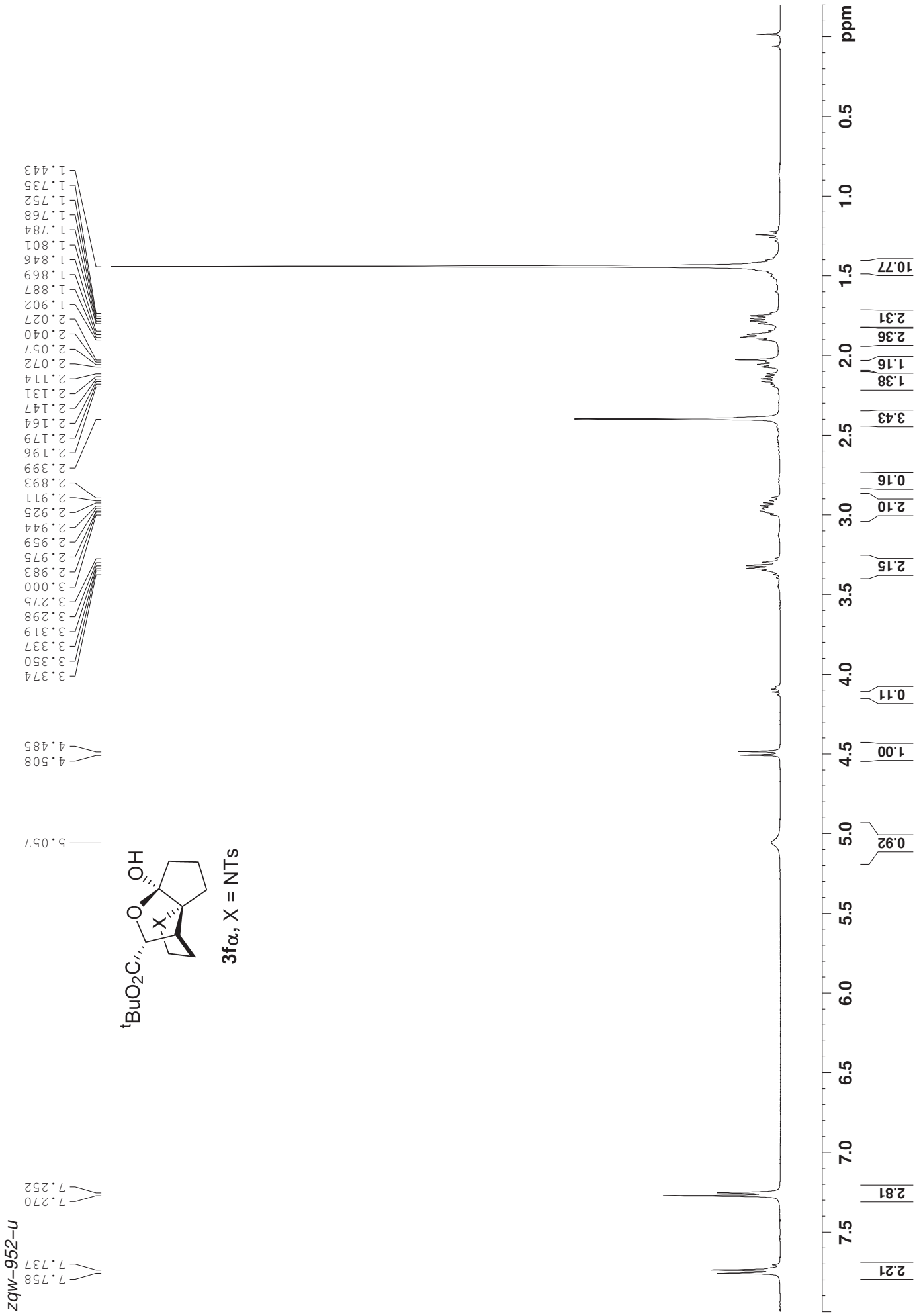

-2.72
-2.70
14.14
18.44
24.68
24.74
24.95
25.98
36.07
36.10
44.33
61.81
66.15
70.25
76.68
77.00
77.20
77.31
89.50
108.76
173.25
24.680
24.737
24.954
25.0 ppm
36.069
36.101
ppm
OH
HO
OTBS
O
EtO2C
3d
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
zqw-924-d


zqw-958-u
7.773
7.753
7.384
7.363
5.242
4.652
4.631
4.234
4.216
4.202
4.199
4.185
4.167
4.158
3.357
3.353
3.338
3.319
3.144
3.123
3.109
3.104
3.089
2.955
2.936
2.924
2.904
2.893
2.873
2.412
2.131
2.113
2.099
2.081
2.067
2.061
2.055
2.050
1.963
1.951
1.936
1.920
1.903
1.890
1.870
1.851
1.838
1.819
1.756
1.738
1.723
1.707
1.688
1.541
1.524
1.508
1.492
1.477
1.461
1.445
1.267
EtO2C
OH
O
X
3eα, X = NTs
ppm
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
2.20
2.22
0.92
1.00
2.26
4.00
2.09
1.04
1.06
0.51
3.40
1.73
4.29
1.12
1.10
3.35

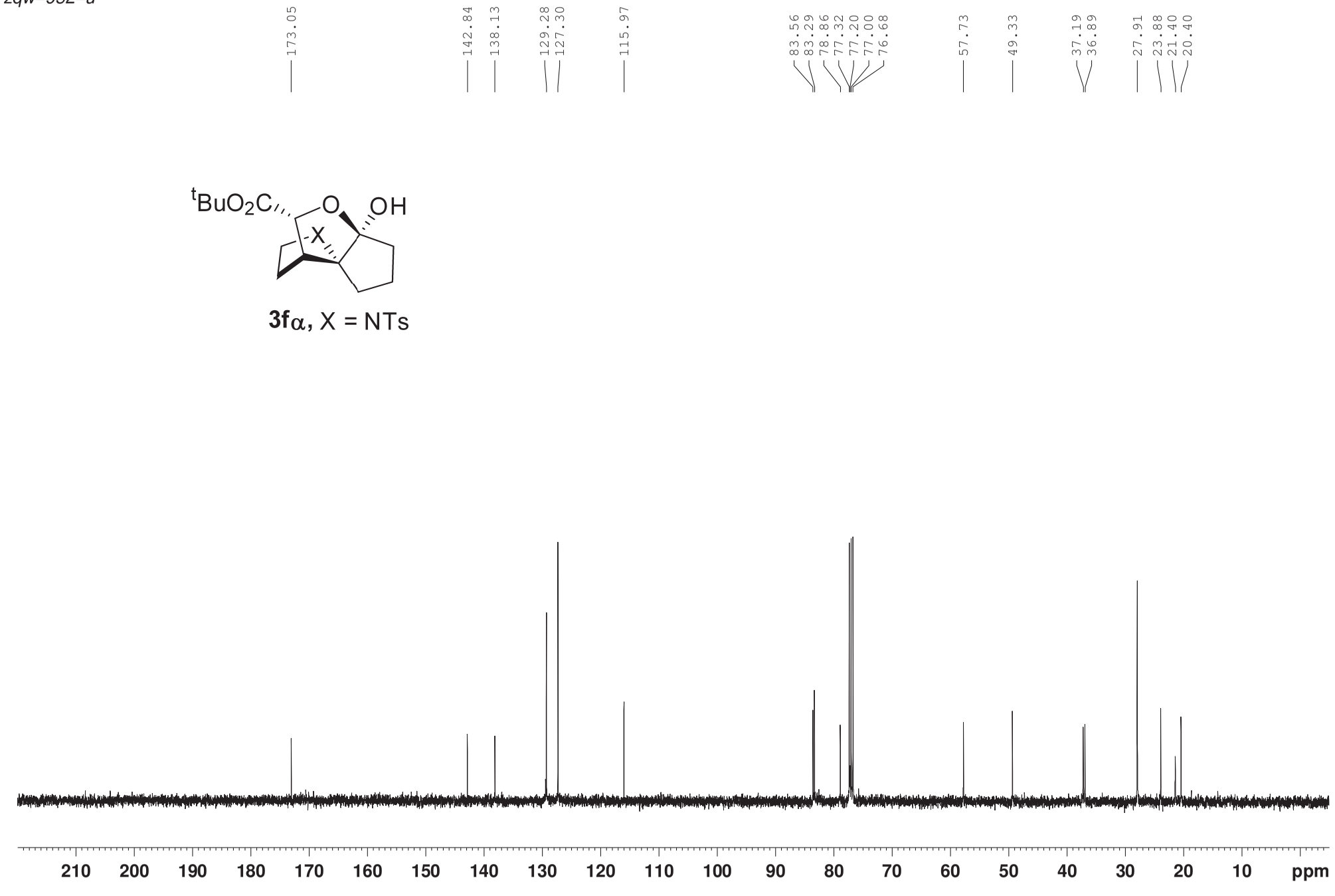

zqw–958–u
206.21
174.06
143.62
140.20
130.34
130.29
128.16
116.25
83.64
78.52
62.27
57.92
50.57
38.12
36.92
30.50
30.31
30.11
29.92
29.73
29.54
29.34
24.99
21.44
21.37
14.53
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
OH
O
X
EtO2C
3eα, X = NTs

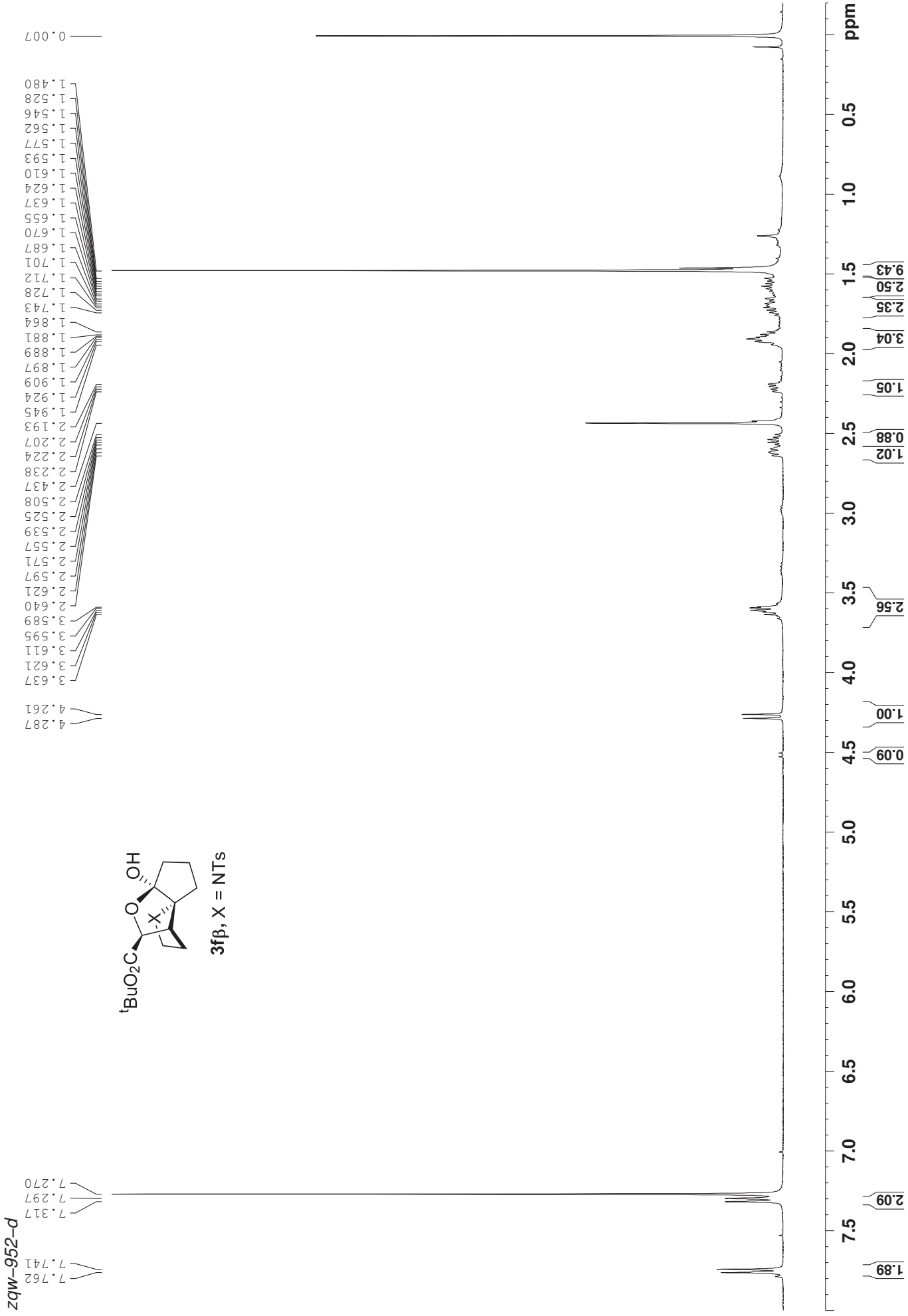

zqw-958-d
7.753
7.732
7.311
7.291
7.270
4.396
4.371
4.266
4.248
4.230
4.212
3.707
3.637
3.623
3.610
3.598
3.583
3.578
2.693
2.674
2.669
2.650
2.598
2.580
2.566
2.548
2.534
2.516
2.428
2.236
2.221
2.204
2.190
1.978
1.956
1.945
1.941
1.927
1.908
1.891
1.876
1.867
1.862
1.849
1.829
1.762
1.745
1.730
1.714
1.698
1.685
1.669
1.654
1.608
1.593
1.576
1.561
1.544
1.529
1.513
1.496
EtO2C
O
OH
X
3eβ, X = NTs
ppm
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
1.92
1.75
2.07
1.00
2.02
0.91
1.05
1.14
3.11
1.15
3.33
2.78
1.30
3.05

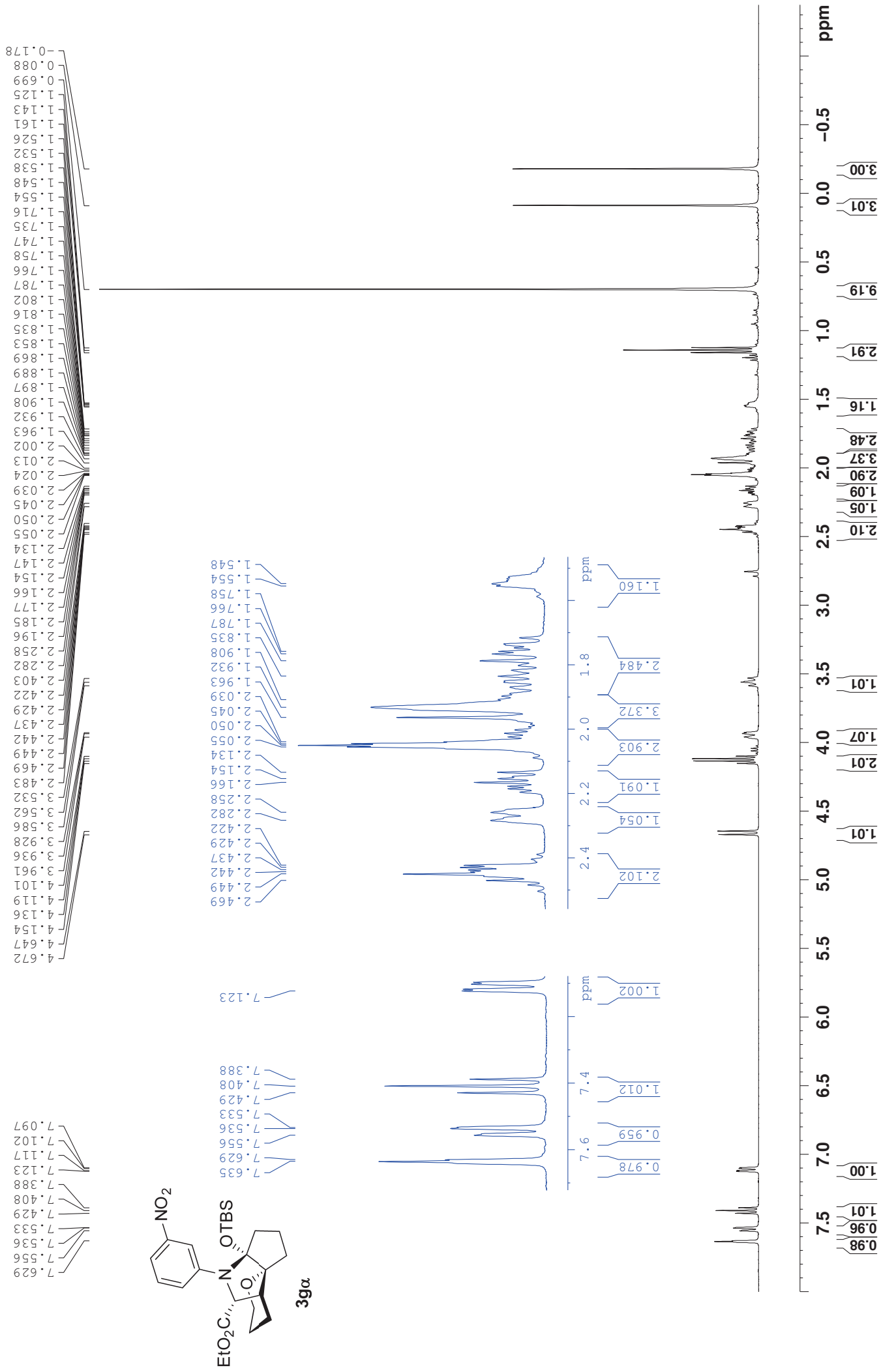


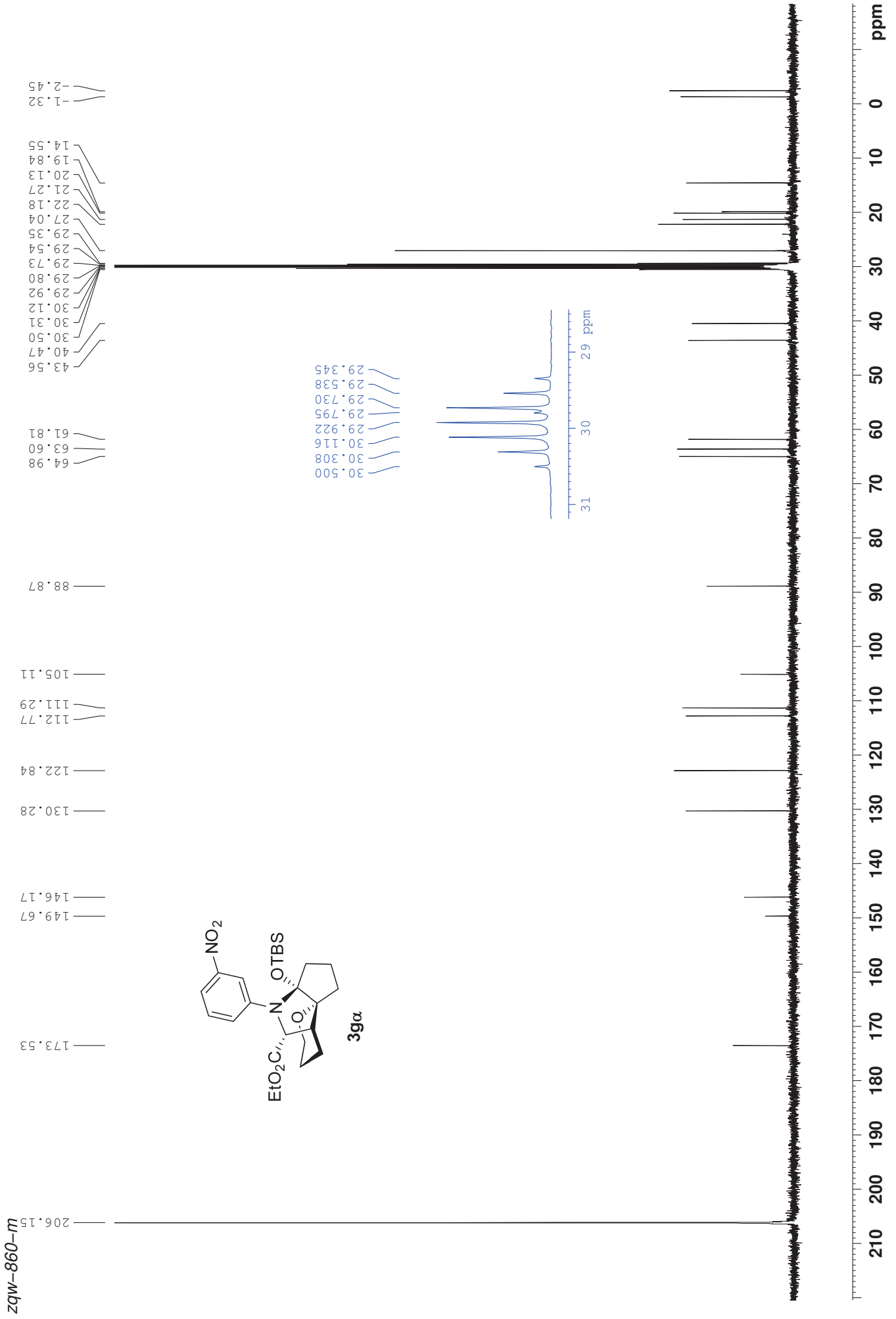

zqw-952-u
7.758
7.737
7.270
7.252
5.057
4.508
4.485
3.374
3.350
3.337
3.319
3.298
3.275
3.000
2.983
2.975
2.959
2.944
2.925
2.911
2.893
2.399
2.196
2.179
2.164
2.147
2.131
2.114
2.072
2.057
2.040
2.027
1.902
1.887
1.869
1.846
1.801
1.784
1.768
1.752
1.735
1.443
tBuO2C
OH
O
X
3fα, X = NTs
ppm
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
10.77
2.31
2.36
1.16
1.38
3.43
0.16
2.10
2.15
0.11
1.00
0.92
2.81
2.21

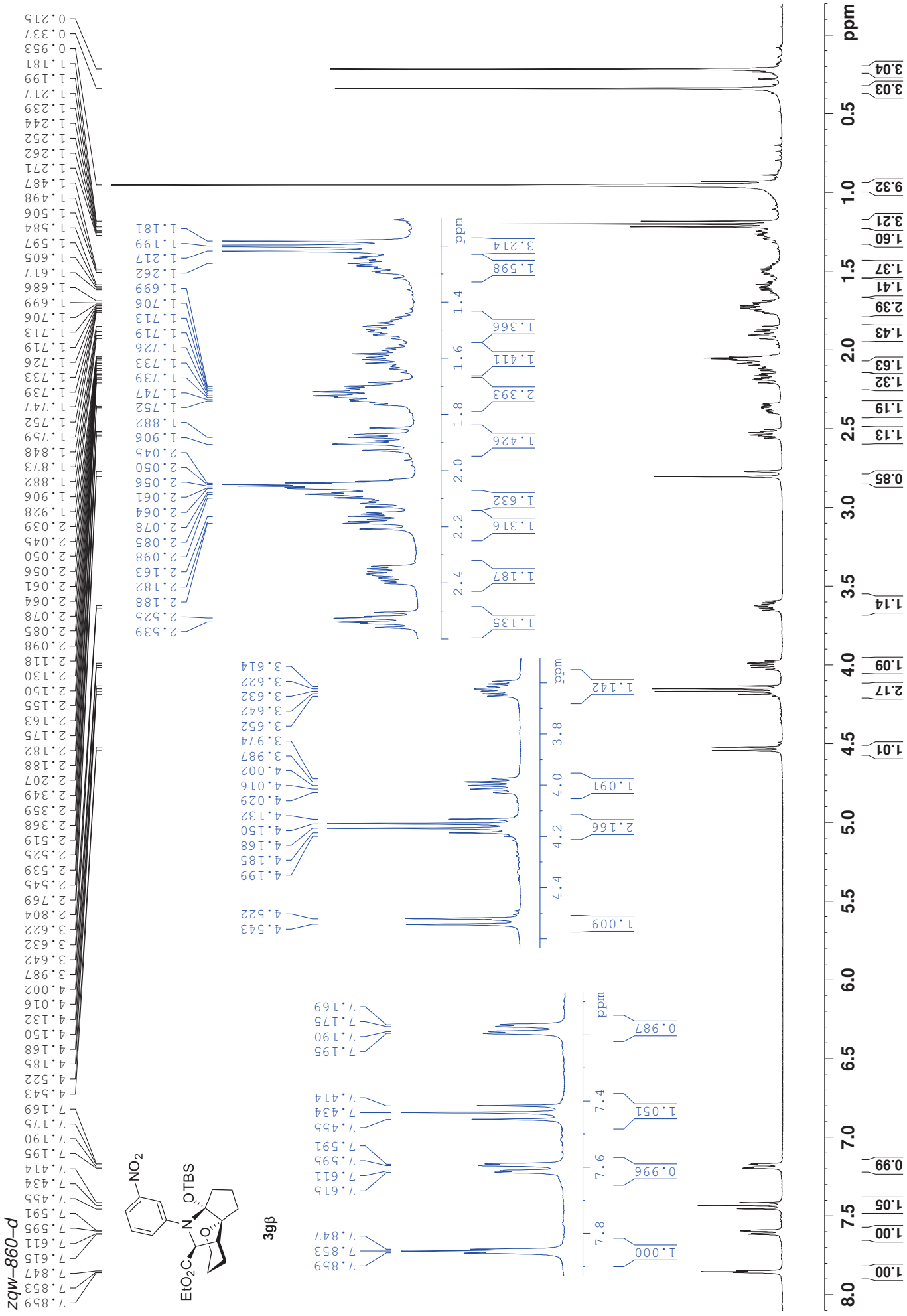
zqw–952–u

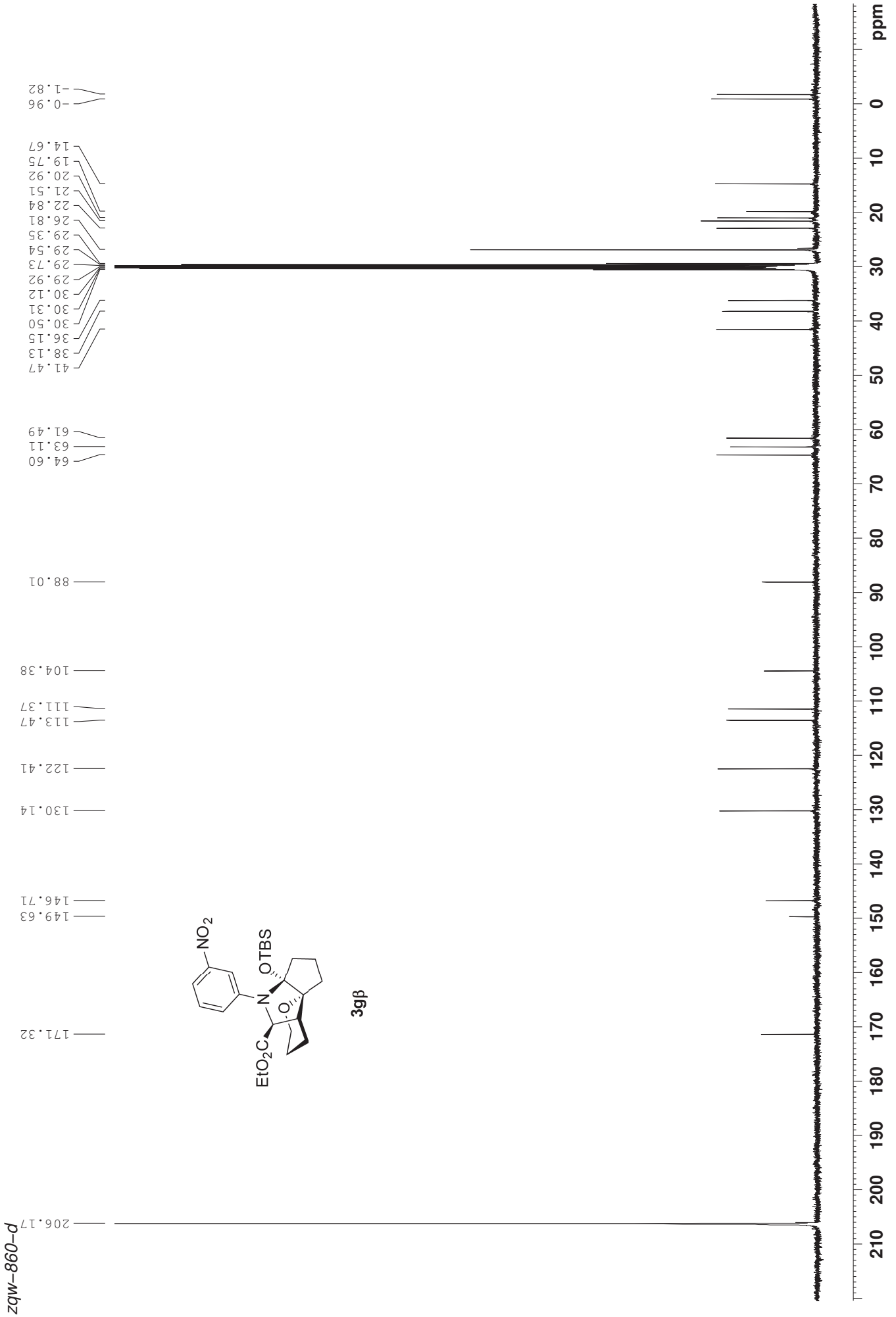


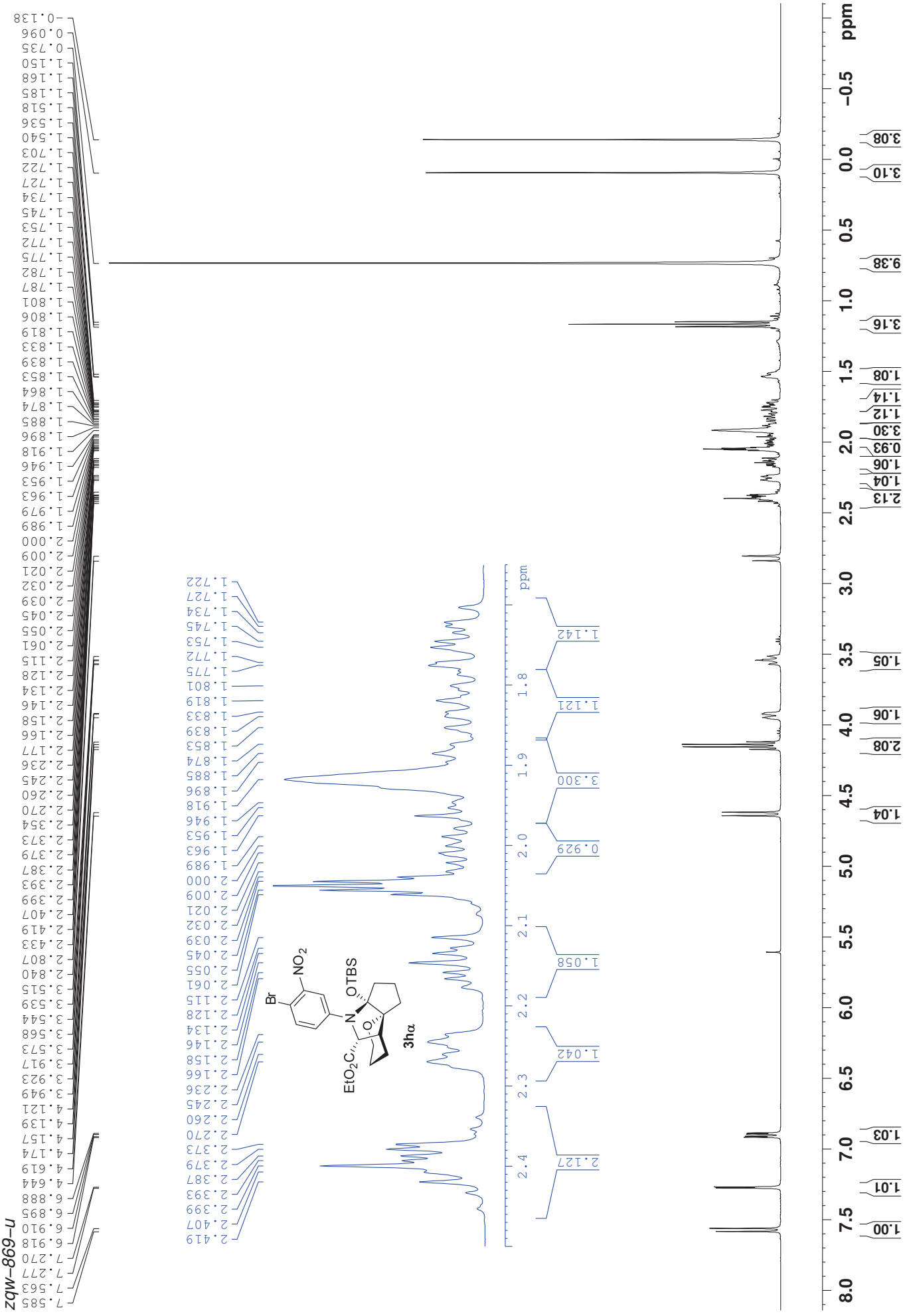

zqw-952-d
0.007
1.480
1.528
1.546
1.562
1.577
1.593
1.610
1.624
1.637
1.655
1.670
1.687
1.701
1.712
1.728
1.743
1.864
1.881
1.889
1.897
1.909
1.924
1.945
2.193
2.207
2.224
2.238
2.437
2.508
2.525
2.539
2.557
2.571
2.597
2.621
2.640
3.589
3.595
3.611
3.621
3.637
4.261
4.287
7.270
7.297
7.317
7.741
7.762
ppm
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
9.43
2.50
2.35
3.04
1.05
0.88
1.02
2.56
1.00
0.09
2.09
1.89
OH
O
X
tBuO2C
3fβ, X = NTs

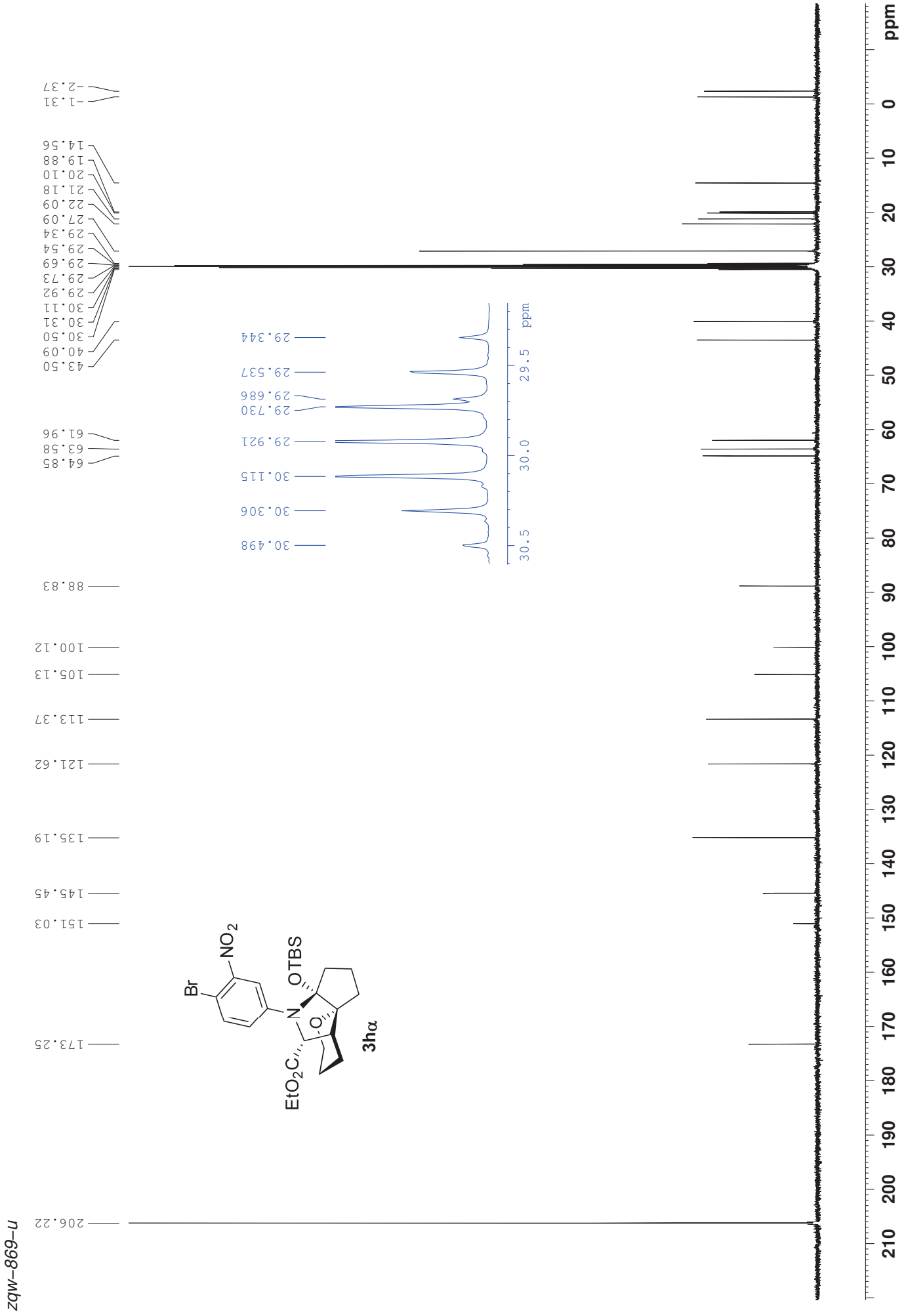


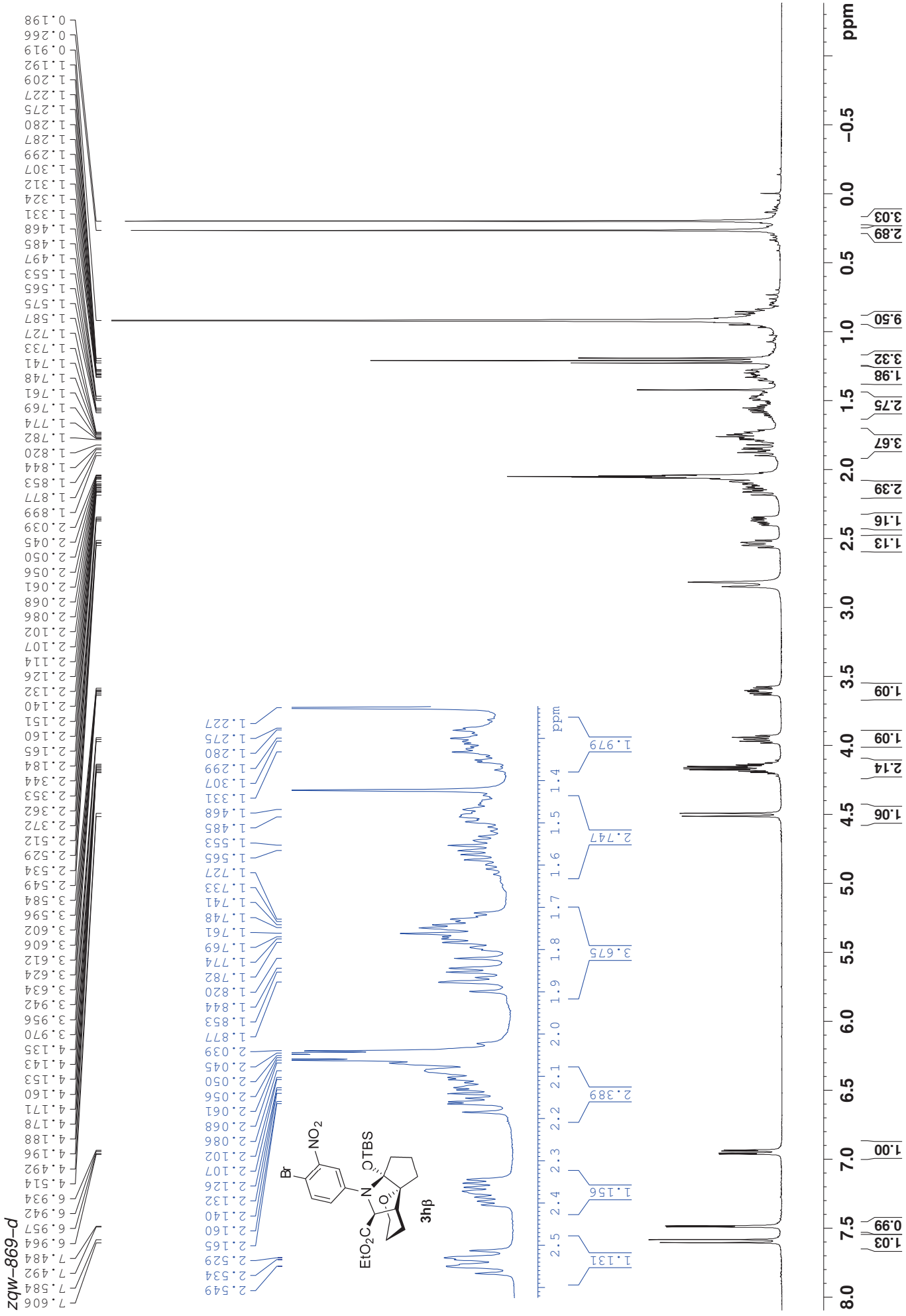

zqw-860-m
206.15
173.53
149.67
146.17
130.28
122.84
112.77
111.29
105.11
88.87
64.98
63.60
61.81
43.56
40.47
30.50
30.31
30.12
29.92
29.80
29.73
29.54
29.35
27.04
22.18
21.27
20.13
19.84
14.55
-1.32
-2.45
30.500
30.308
30.116
29.922
29.795
29.730
29.538
29.345
31
30
29 ppm
NO2
OTBS
N
O
EtO2C
3gα
ppm

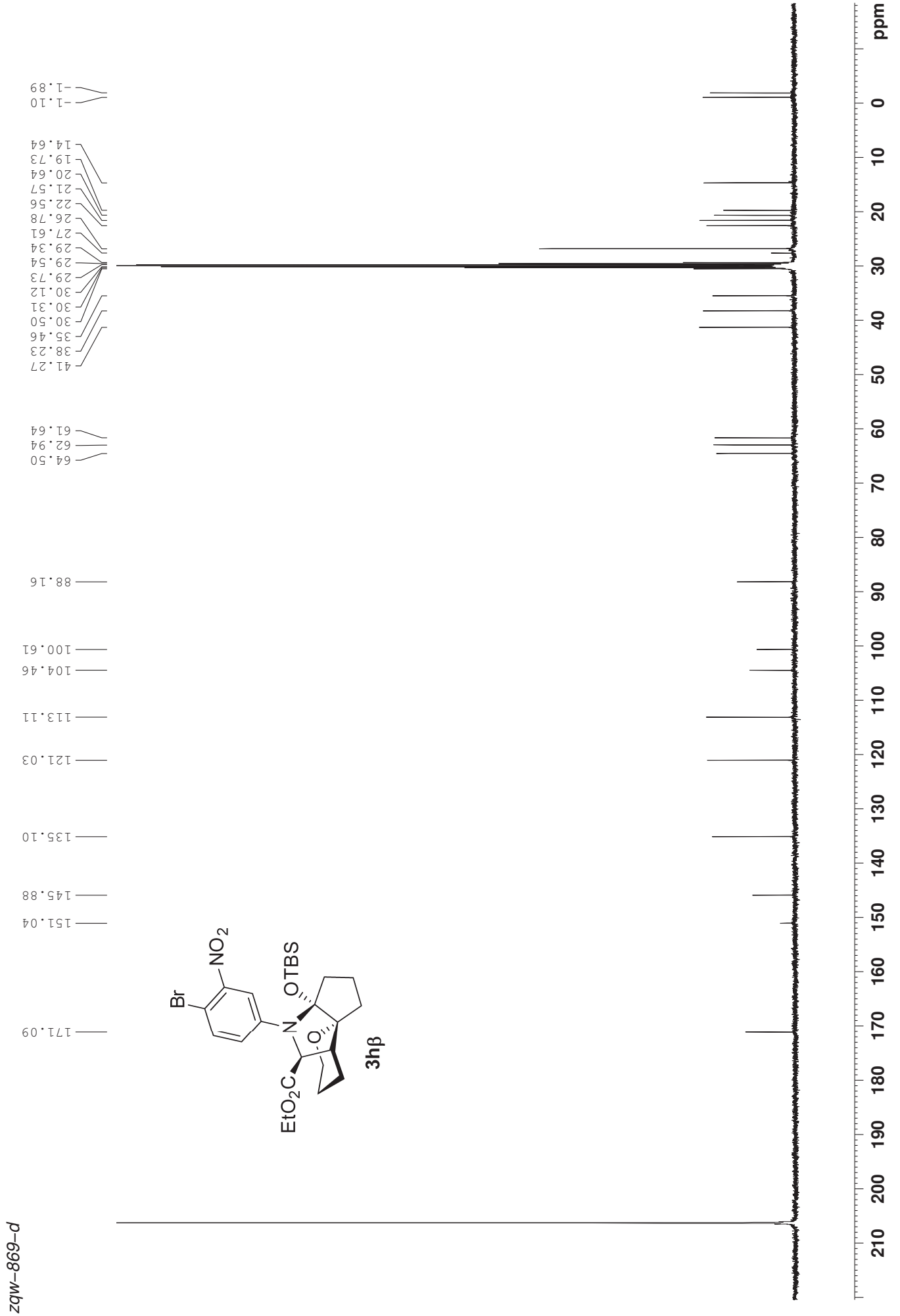

zqw-860-d
3gβ
NO2
OTBS
N
O
EtO2C
ppm

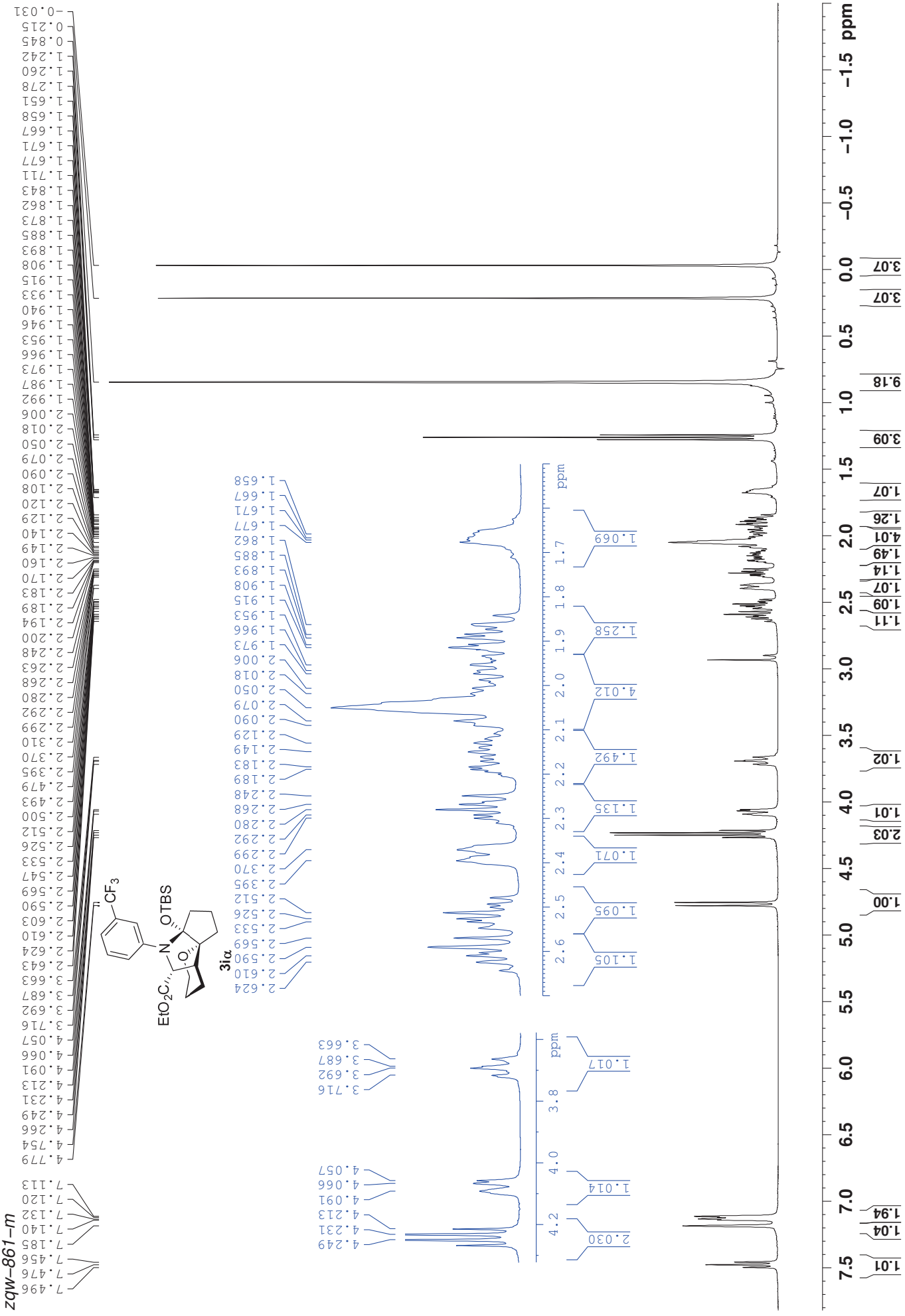

zqw–860–d
206.17
171.32
149.63
146.71
130.14
122.41
113.47
111.37
104.38
88.01
64.60
63.11
61.49
41.47
38.13
36.15
30.50
30.31
30.12
29.92
29.73
29.54
29.35
26.81
22.84
21.51
20.92
19.75
14.67
-0.96
-1.82
NO2
OTBS
N
O
EtO2C
3gβ
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210

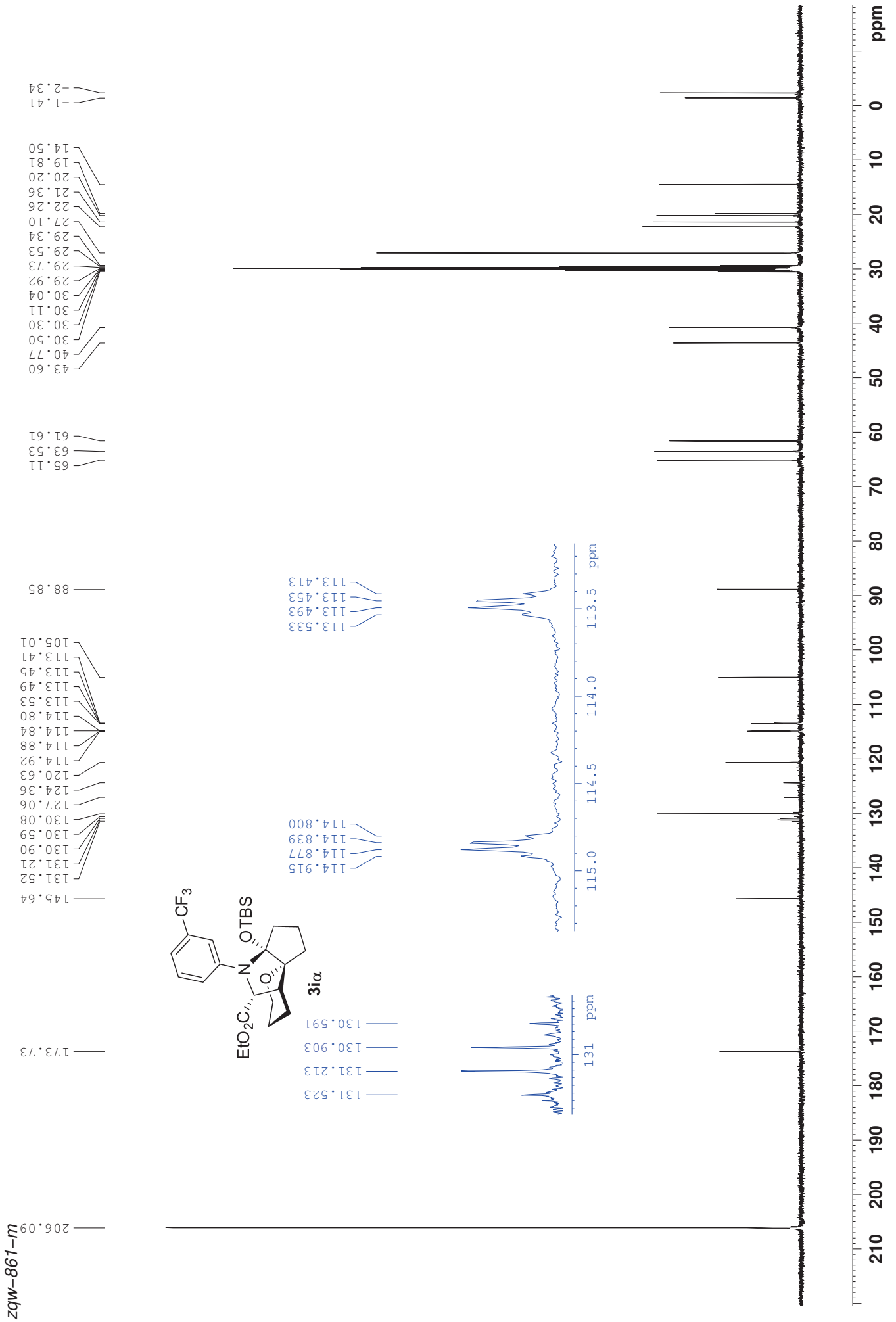

zqw-869-u
ppm
Br
NO2
OTBS
N
O
EtO2C
3hα

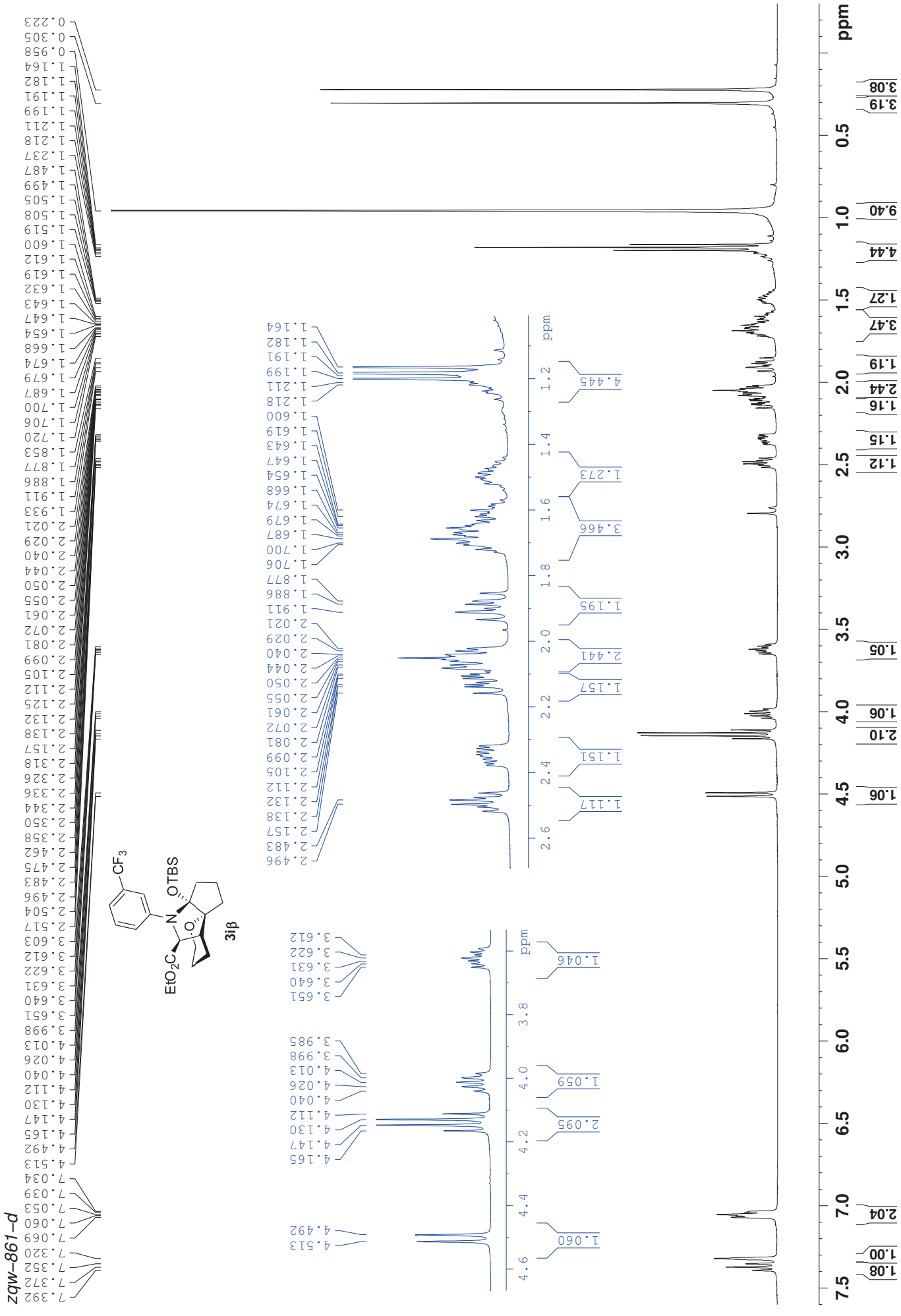

zqw–869–u
206.22
173.25
151.03
145.45
135.19
121.62
113.37
105.13
100.12
88.83
64.85
63.58
61.96
43.50
40.09
30.50
30.31
30.11
29.92
29.73
29.69
29.54
29.34
27.09
22.09
21.18
20.10
19.88
14.56
-1.31
-2.37
29.344
29.537
29.686
29.730
29.921
30.115
30.306
30.498
30.5
30.0
29.5
ppm
Br
NO2
OTBS
N
O
EtO2C
3hα
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210

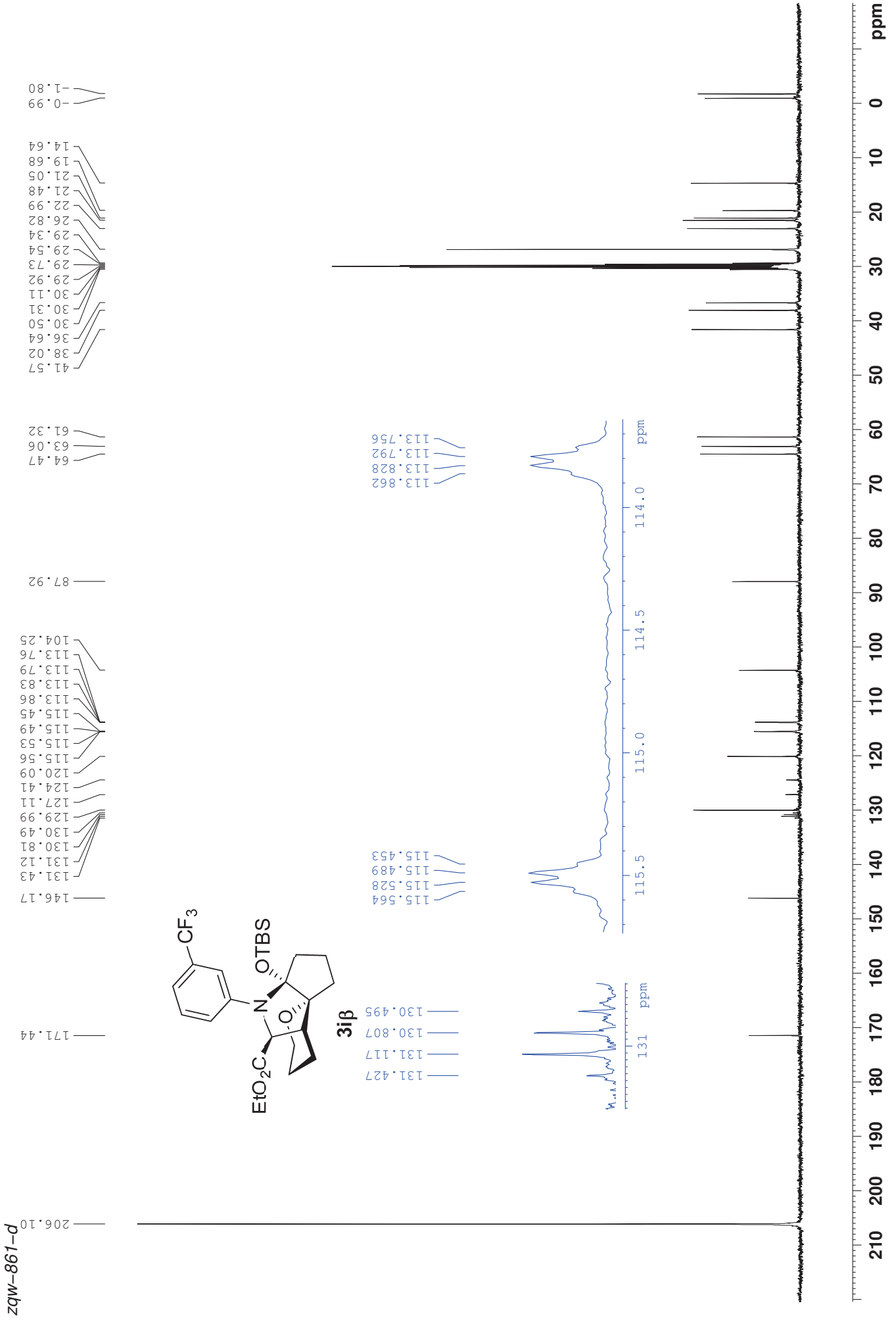

zqw-869-d
ppm
Br
NO2
OTBS
N
O
EtO2C
3hβ

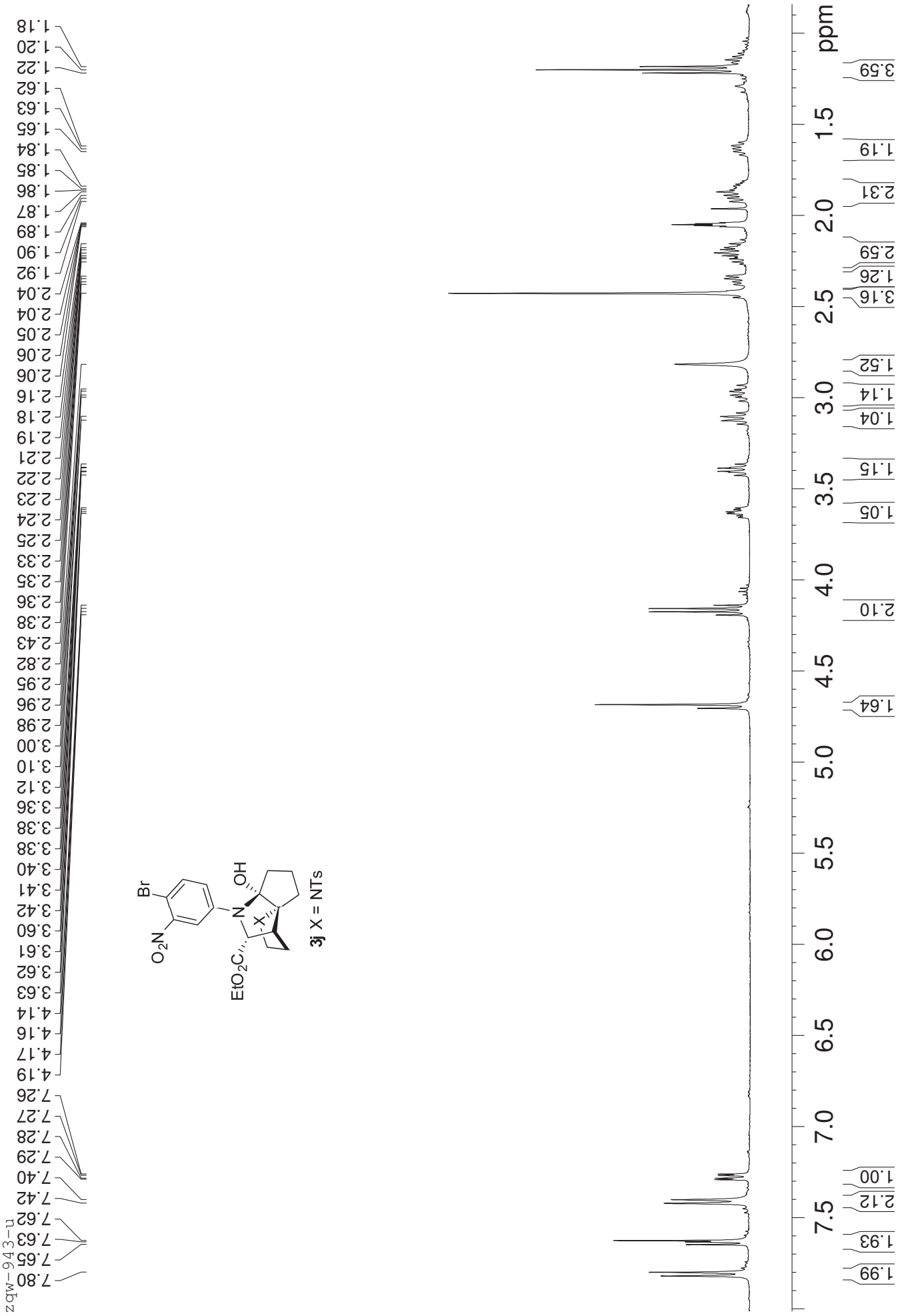


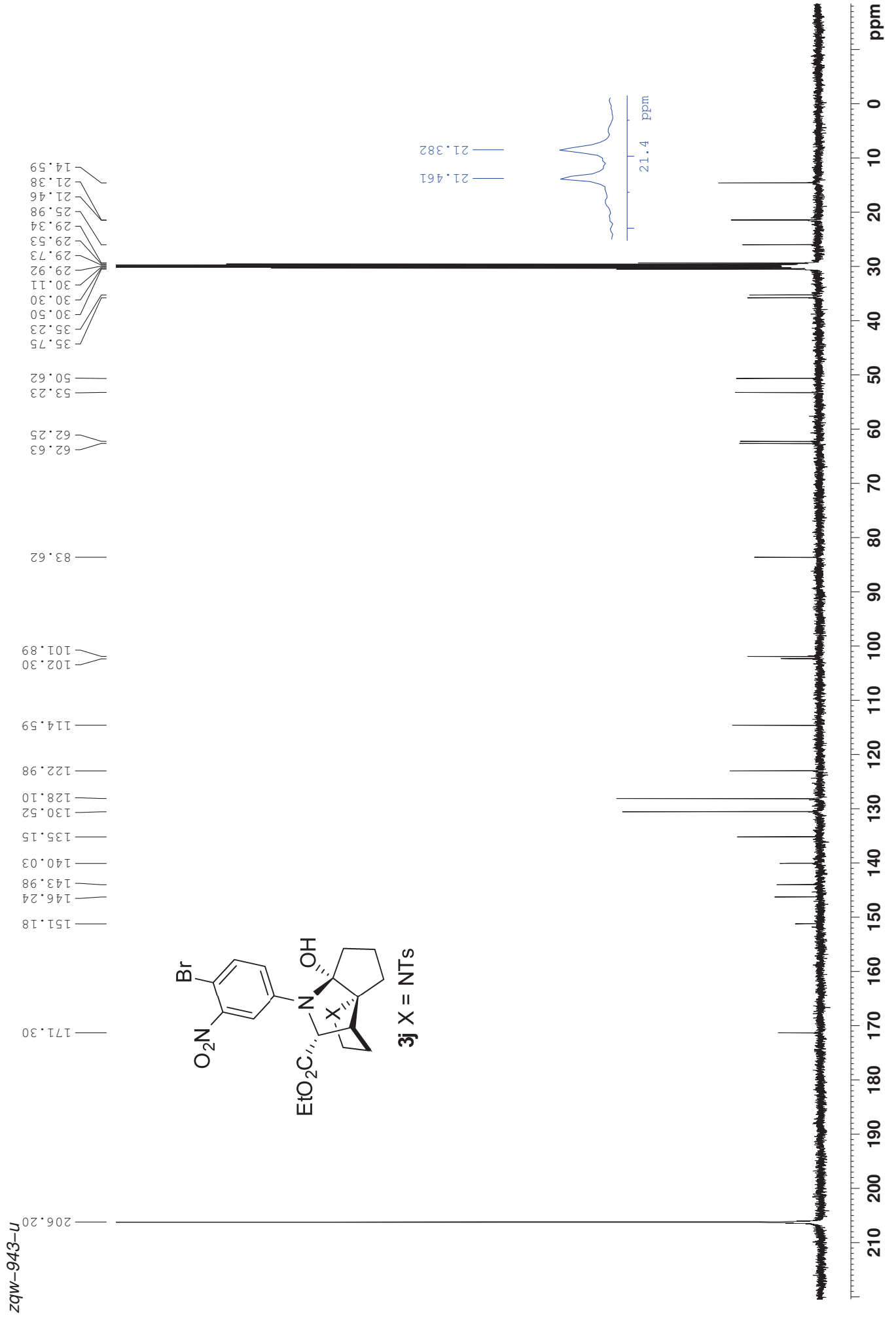

zqw-861-m
3ia
OTBS
CF3
EtO2C
ppm


zqw–861–m
206.09
173.73
145.64
131.52
131.21
130.90
130.59
130.08
127.06
124.36
120.63
114.92
114.88
114.84
114.80
113.53
113.49
113.45
113.41
105.01
88.85
65.11
63.53
61.61
43.60
40.77
30.50
30.30
30.11
30.04
29.92
29.73
29.53
29.34
27.10
22.26
21.36
20.20
19.81
14.50
-1.41
-2.34
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
131.523
131.213
130.903
130.591
114.915
114.877
114.839
114.800
113.533
113.493
113.453
113.413
131
ppm
115.0
114.5
114.0
113.5
ppm
3iα
OTBS
N
O
CF3
EtO2C



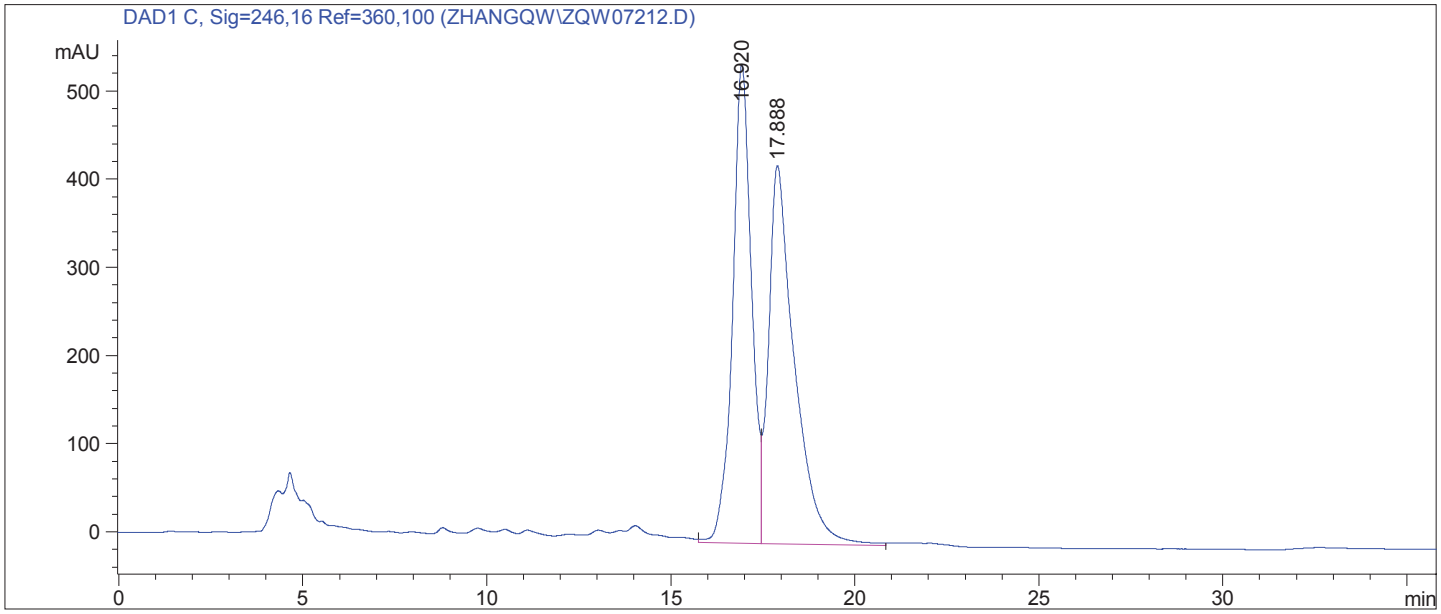

zqw-861-d
206.10
171.44
146.17
131.43
131.12
130.81
130.49
129.99
127.11
124.41
120.09
115.56
115.53
115.49
115.45
113.86
113.83
113.79
113.76
104.25
87.92
64.47
63.06
61.32
41.57
38.02
36.64
30.50
30.31
30.11
29.92
29.73
29.54
29.34
26.82
22.99
21.48
21.05
19.68
14.64
-0.99
-1.80
CF3
OTBS
N
O
O
EtO2C
3iβ
130.495
130.807
131.117
131.427
115.564
115.528
115.489
115.453
113.862
113.828
113.792
113.756
ppm
131
115.5
115.0
114.5
114.0
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0




zqw–943–u
206.20
171.30
151.18
146.24
143.98
140.03
135.15
130.52
128.10
122.98
114.59
102.30
101.89
83.62
62.63
62.25
53.23
50.62
35.75
35.23
30.50
30.30
30.11
29.92
29.73
29.53
29.34
25.98
21.46
21.38
14.59
21.461
21.382
21.4 ppm
ppm
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
Br
O2N
N
OH
EtO2C
X
3j X = NTs

Data File C:\HPCHEM\1\DATA\ZHANGQW\ZQW07212.D Sample Name: zqw-N
AD hex:ipr=60:40 1ml/min

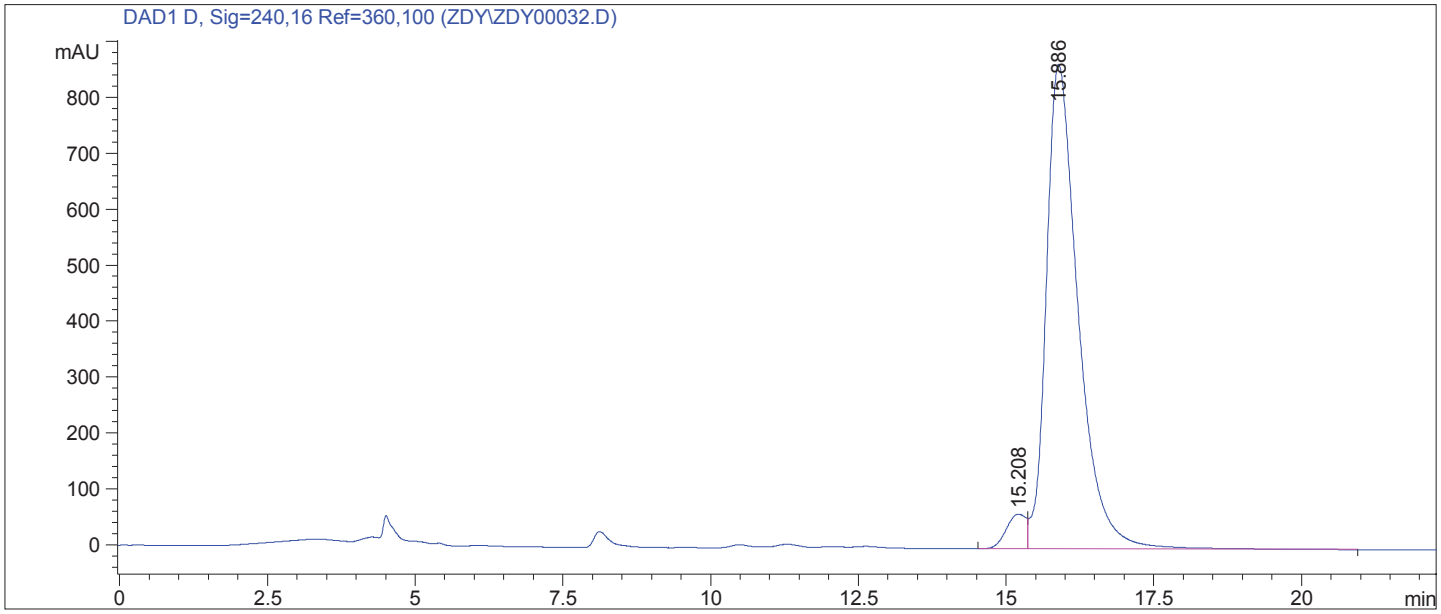
```
==========================================================================
Injection Date  : 7/25/2002 1:00:54 AM
Sample Name     : zqw-N                          Location : Vial 1
Acq. Operator   : zhangqw
Acq. Method     : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 12:59:11 AM by zhangqw
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 2:05:55 AM by ZDY
==========================================================================
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000


Signal 1: DAD1 C, Sig=246,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.920 VV    0.5288 1.93985e4   542.99091  48.0985
   2  17.888 VB    0.6812 2.09323e4   429.04163  51.9015

Totals :                  4.03309e4   972.03253

 Results obtained with enhanced integrator!
==========================================================================
                          Summed Peaks Report
==========================================================================

Signal 1: DAD1 C, Sig=246,16 Ref=360,100
==========================================================================
                       Final Summed Peaks Report
==========================================================================

Signal 1: DAD1 C, Sig=246,16 Ref=360,100
```

Data File C:\HPCHEM\1\DATA\ZDY\ZDY00032.D Sample Name: zqw-Box-tBu-u
AD hex:ipr=90:10 1ml/min

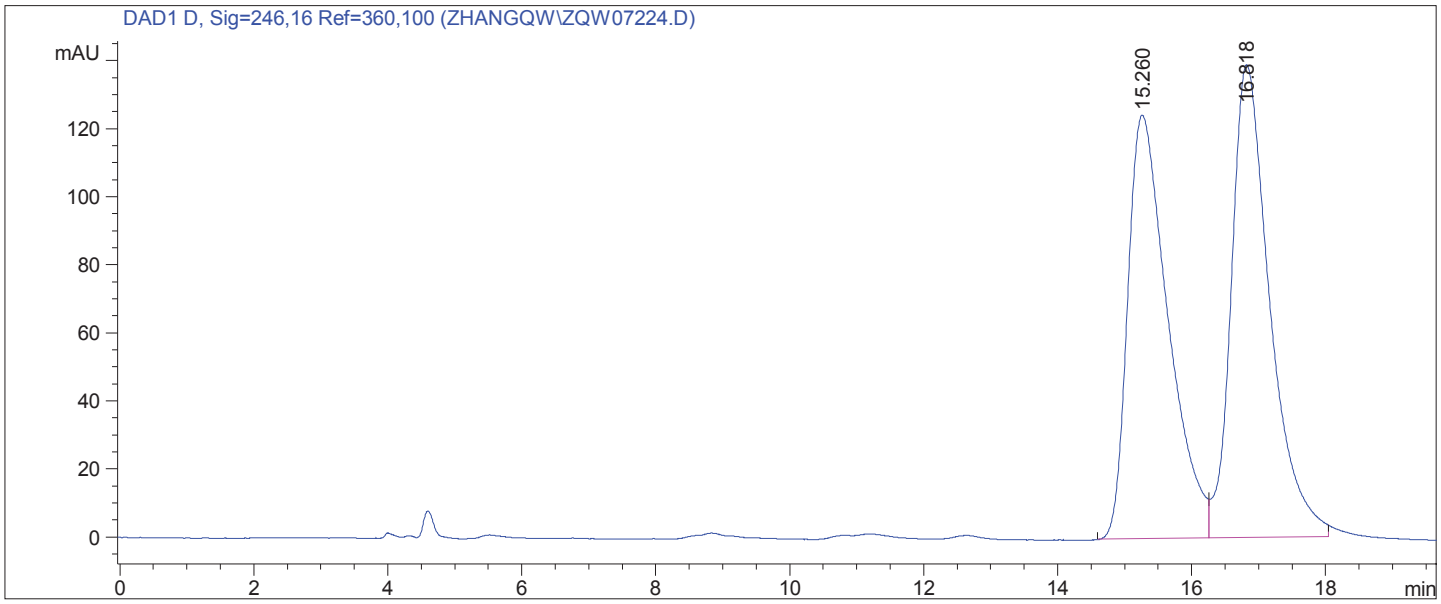
```
==========================================================================
Injection Date  : 7/25/2002 12:40:41 AM
Sample Name     : zqw-Box-tBu-u                  Location : Vial 1
Acq. Operator   : ZDY
Acq. Method     : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 12:41:15 AM by ZDY
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 2:05:55 AM by ZDY
==========================================================================
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000


Signal 1: DAD1 D, Sig=240,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  15.208 VV    0.3608 1452.43188   62.11741   4.2630
   2  15.886 VP    0.5634 3.26179e4   866.06079  95.7370

Totals :                  3.40703e4   928.17820

 Results obtained with enhanced integrator!
==========================================================================
                          Summed Peaks Report
==========================================================================

Signal 1: DAD1 D, Sig=240,16 Ref=360,100
==========================================================================
                       Final Summed Peaks Report
==========================================================================

Signal 1: DAD1 D, Sig=240,16 Ref=360,100
```

Data File C:\HPCHEM\1\DATA\ZHANGQW\ZQW07224.D Sample Name: zqw-N-d-race
AD hex:ipr=60:40 1ml/min

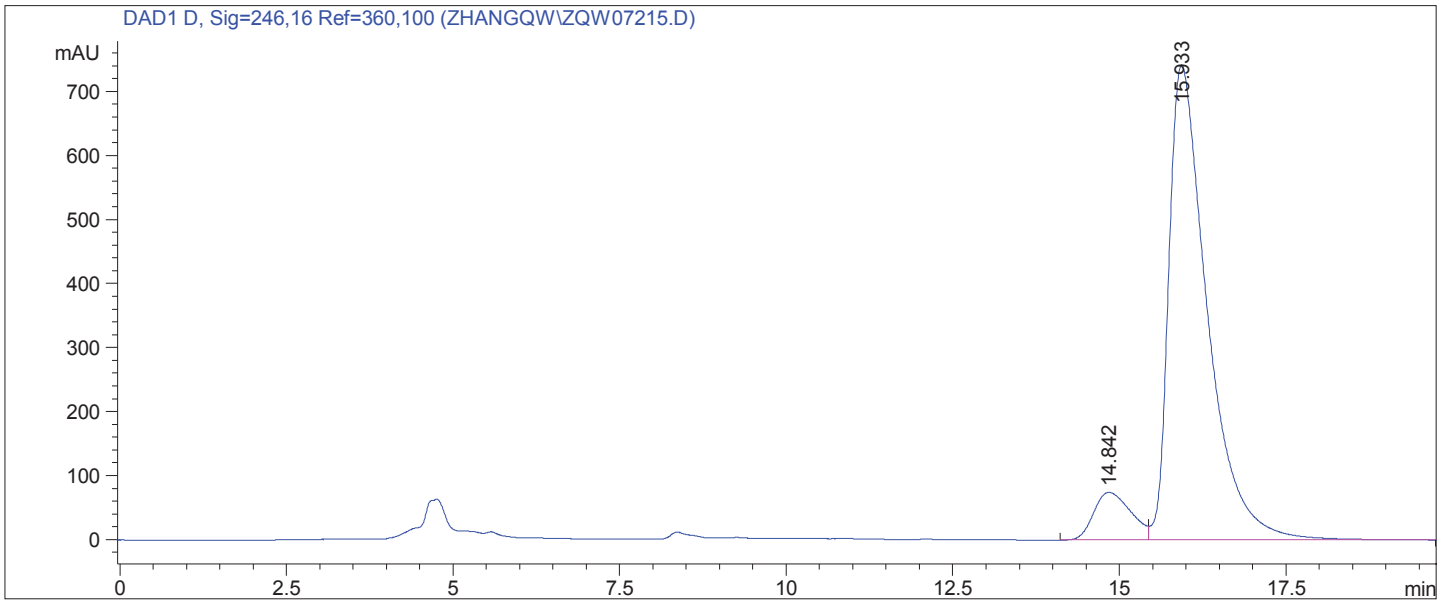
```
==========================================================================
Injection Date  : 7/25/2002 4:03:09 AM
Sample Name     : zqw-N-d-race                    Location : Vial 1
Acq. Operator   : zhangqw
Acq. Method     : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 3:45:21 AM by zhangqw
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 4:24:59 AM by zhangqw
                  (modified after loading)
==========================================================================
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000


Signal 1: DAD1 D, Sig=246,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  15.260 BV    0.6259 5231.52295  124.59288  48.5024
   2  16.818 VB    0.5982 5554.58740  139.00560  51.4976

Totals :                  1.07861e4   263.59848

 Results obtained with enhanced integrator!
==========================================================================
                          Summed Peaks Report
==========================================================================

Signal 1: DAD1 D, Sig=246,16 Ref=360,100
==========================================================================
                       Final Summed Peaks Report
==========================================================================

Signal 1: DAD1 D, Sig=246,16 Ref=360,100
```

Data File C:\HPCHEM\1\DATA\ZHANGQW\ZQW07215.D Sample Name: zqw-N-chiral-d
AD hex:ipr=60:40 1ml/min

```
==========================================================================
Injection Date  : 7/25/2002 1:45:47 AM
Sample Name     : zqw-N-chiral-d                  Location : Vial 1
Acq. Operator   : zhangqw
Acq. Method     : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 12:41:15 AM by ZDY
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\ZHANGQW.M
Last changed    : 7/25/2002 1:48:54 AM by ZDY
                  (modified after loading)
==========================================================================
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000


Signal 1: DAD1 D, Sig=246,16 Ref=360,100

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  14.842 VV    0.6101 2905.15674   74.64555   8.8810
   2  15.933 VBA   0.6005 2.98069e4   742.27356  91.1190

Totals :                  3.27121e4   816.91911

 Results obtained with enhanced integrator!
==========================================================================
                          Summed Peaks Report
==========================================================================

Signal 1: DAD1 D, Sig=246,16 Ref=360,100
==========================================================================
                       Final Summed Peaks Report
==========================================================================

Signal 1: DAD1 D, Sig=246,16 Ref=360,100
```