Supporting information

Enantioselective [3+2] Cycloaddition of Azomethine Ylides and Aldehydes via Ni/Bis(oxazoline)-Catalyzed Ring Opening of *N*-Tosylaziridines through Chirality Transfer Approach

Xingxing Wu,Wei Zhou, Hai-Hong Wu, and Junliang Zhang**

e-mail : jlzhang@chem.ecnu.edu.cn

Contents

General information.....S2

Figure 1.....S2

Table S1.....S3

Table S2.....S4

Table S3.....S4

Synthesis of aziridines 1f-1o.....S5

Typical procedure for preparation of racemic 1,3-oxazolidines.....S8

Typical procedure for $Ni(ClO_4)_2 \cdot 6H_2O$/Bn-Box catalyzed cycloaddition of aziridine 1 with aldehyde 2……S8

Copies of HPLC spectra of racemic / chiral products……..S31

Copies of NMR spectra of products…… S55

General information.

Infrared (IR) spectra were obtained using a Bruker tensor 27 infrared spectrometer. ^{1}H NMR spectra, ^{13}C NMR spectra were recorded on a Bruker 400 MHz spectrometer in chloroform-d_3. All signals are reported in ppm with the internal TMS signal at 0 ppm as a standard. The data is being reported as (s = singlet, d = doublet, t = triplet, hep = heptet, m = multiplet or unresolved, br = broad signal, coupling constant(s) in Hz, integration). Enantiomer ratios were determined using chiral HPLC analysis by comparison with authentic racemic materials. All reactions were carried out under an atmosphere of nitrogen in flame-dried glassware with magnetic stirrer bar. $ClCH_2CH_2Cl$ (DCE), CH_2Cl_2 (DCM) were freshly distilled from CaH_2; THF and toluene were freshly distilled from sodium metal prior to use. Solid aldehydes were used directly. All other liquid aldehydes were freshly distilled prior to use. Aziridine were prepared according to the literature (X. Wu, L. Li and J. Zhang, *Adv. Synth. Catal.*, 2012, **354**, 3485.).

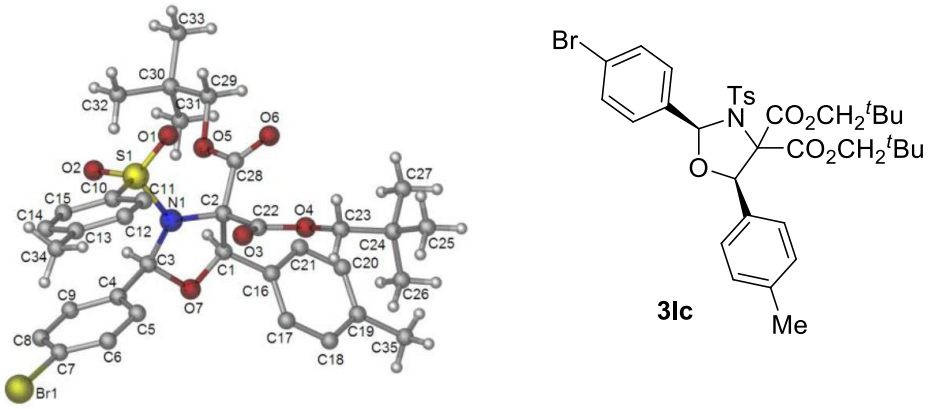
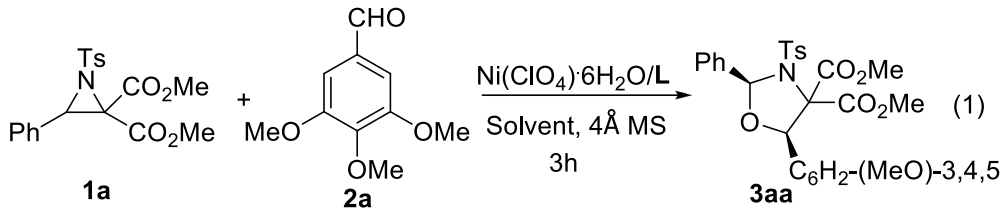


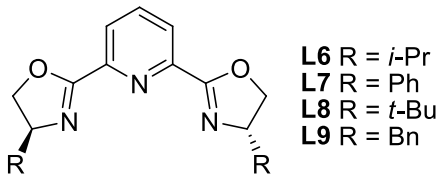
Figure 1. ORTEP representation of **3lc** (CCDC 895347).

Table S1. Screening conditions of reaction between 1a and 2a using Pybox or Box as the chiral ligand.[a]



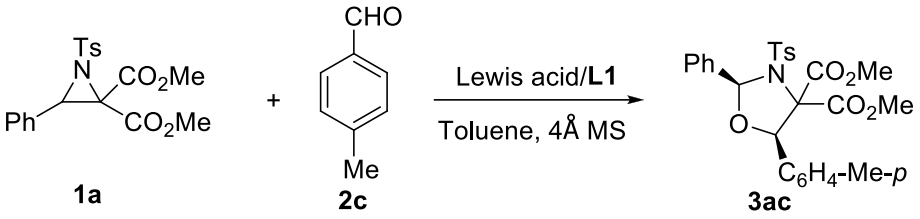
Entry	Lewis acid	**L***	Solvent	Time (h)	Yield (%)[b]	Ee (%)[c]
1	$Ni(ClO_4)_2{\cdot}6H_2O$	**L6**	Toluene	3	83	11
2	$Ni(ClO_4)_2{\cdot}6H_2O$	**L7**	Toluene	3	71	3
3	$Ni(ClO_4)_2{\cdot}6H_2O$	**L8**	Toluene	3	81	racemic
4	$Ni(ClO_4)_2{\cdot}6H_2O$	**L9**	Toluene	3	83	42
5	$Ni(ClO_4)_2{\cdot}6H_2O$	**L1**	Toluene	3	81	88
6	$Ni(ClO_4)_2{\cdot}6H_2O$	**L4**	Toluene	3	79	70

[a] Reaction conditions: **1a** (0.2 mmol), **2a** (1.5 equiv), $Ni(ClO_4)_2$/**L** (1/1.2, 5 mol%), and 100 mg of activated 4 Å MS in 2 ml of toluene at room temperature. [b] NMR yield of the crude product (using CH_2Br_2 as internal standard). [c] Determined by chiral-phase HPLC analysis.



L6 R = *i*-Pr
L7 R = Ph
L8 R = *t*-Bu
L9 R = Bn

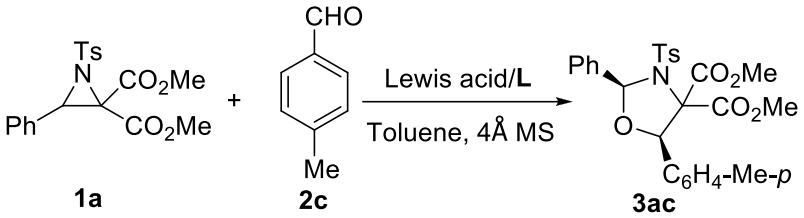
Table S2. **Screening reaction conditions using L1 as the chiral ligand.**[a]



Entry	Lewis acid	Temp/Additive (equiv)	Solvent	Time (h)	Yield (%)	Ee (%)[c]
1	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/-	DCM	3	68	49
2	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/-	DCE	3	67	57
3	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/-	DME	24	trace	n.d.
4	$Ni(ClO_4)_2{\cdot}6H_2O$	-15 °C/-	toluene	12	73	53
5	NiI_2	rt/-	toluene	24	n.r.	n.d.
6	$Ni(OTf)_2$	rt/-	toluene	24	trace	n.d.
7	$Ni(BF_4)_2$	rt/-	toluene	4	71	36
8	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/LiI (0.05)	toluene	4	Trace	42
9	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/$P(O)Ph_3$ (0.20)	toluene	3	55	68
10	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/$Ca(ClO)_2$ (0.05)	toluene	3	68	55
11	$Ni(ClO_4)_2{\cdot}6H_2O$	rt/PhCOOH (0.20)	toluene	3	71	67

[a] Reaction conditions: **1a** (0.2 mmol), **2c** (1.5 equiv), Lewis acid/**L1** (1/1.2, 5 mol%), and 100 mg of activated 4 Å MS in 2 ml of toluene at room temperature. [b] Yield of isolated product. [c] Determined by chiral-phase HPLC analysis. n.d. = not determined.

Table S3. **Screening reaction conditions using Pybox as the chiral ligand.**[a]



Entry	Lewis acid	**L***	Solvent	Time (h)	Yield (%)[b]	Ee (%)[c]
1	$Ni(ClO_4)_2{\cdot}6H_2O$	**L6**	Toluene	48	12	39
2	$Ni(ClO_4)_2{\cdot}6H_2O$	**L7**	Toluene	48	trace	n.d.
3	$Ni(ClO_4)_2{\cdot}6H_2O$	**L8**	Toluene	48	trace	n.d.
4	$Ni(ClO_4)_2{\cdot}6H_2O$	**L9**	Toluene	48	19	23

[a] Reaction conditions: **1a** (0.2 mmol), **2c** (1.5 equiv), $Ni(ClO_4)_2$/**L** (1/1.2, 5 mol%), and 100 mg of activated 4 Å MS in 2 ml of toluene at room temperature. [b] NMR yield of the crude product (using CH_2Br_2 as internal standard). [c] Determined by chiral-phase HPLC analysis. n.d. = not determined.

Synthesis of aziridines 1f-1o.

Aziridines were prepared according to the literature (X. Wu, L. Li and J. Zhang, *Adv. Synth. Catal.*, 2012, **354**, 3485).

1. Dineopentyl 3-phenyl-1-tosylaziridine-2,2-dicarboxylate (1f).

White solid, mp = 96 – 98 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.97 (d, *J* = 8.4 Hz, 2 H); 7.34 (d, *J* = 8.4 Hz, 2 H); 7.18 – 7.26 (m, 5 H); 4.92 (s, 1 H); 4.05 (d, *J* = 10.4 Hz, 1 H); 4.00 (d, *J* = 10.4 Hz, 1 H); 3.64 (d, *J* = 10.4 Hz, 1 H); 3.44 (d, *J* = 10.4 Hz, 1 H); 2.45 (s, 3 H); 0.99 (s, 9 H); 0.66 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.2, 162.6, 144.6, 136.7, 131.2, 129.7, 128.9, 128.5, 127.7, 126.9, 76.5, 75.3, 57.8, 49.7, 31.4, 30.9, 26.4, 25.9, 21.6 ppm. IR (neat) *v*/cm^{-1} 2959, 2917, 2869, 1739, 1724, 1598, 1476, 1462, 1402, 1375, 1343, 1311, 1298, 1279, 1266, 1166, 1126, 1092, 1045, 981, 968, 935. HRMS (ESI): $C_{27}H_{35}NNaO_6S$ $[M+Na]^+$ calcd: 524.2077, found: 524.2139.

2. Dineopentyl 3-(4-isopropylphenyl)-1-tosylaziridine-2,2-dicarboxylate (1g).

White solid, mp = 80 – 83 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.96 (d, *J* = 8.4 Hz, 2 H); 7.34 (d, *J* = 8.4 Hz, 2 H); 7.15 (d, *J* = 8.0 Hz, 2 H); 7.10 (d, *J* = 8.0 Hz, 2 H); 4.90 (s, 1 H); 4.05 (d, *J* = 10.4 Hz, 1 H); 3.99 (d, *J* = 10.4 Hz, 1 H); 3.70 (d, *J* = 10.4 Hz, 1 H); 3.43 (d, *J* = 10.4 Hz, 1 H); 2.83 (hep, *J* = 6.8 Hz, 1 H); 2.44 (s, 3 H); 1.17 (d, *J* = 6.8 Hz, 6 H); 0.99 (s, 9 H); 0.62 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.3, 162.8, 149.7, 144.5, 136.8, 129.6, 128.6, 127.7, 126.8, 126.6, 76.4, 75.3, 57.8, 49.9, 33.9, 31.4, 30.9, 26.3, 25.9, 23.8, 21.7 ppm. IR (neat) v/cm^{-1} 2599, 2905, 2871, 1756, 1703, 1608, 1594, 1479, 1466, 1429, 1401, 1369, 1341, 1293, 1272, 1247, 1224, 1194, 1183, 1164, 1116, 1091, 1030, 1018, 998, 936, 918. HRMS (ESI): $C_{30}H_{41}NNaO_6S$ $[M+Na]^+$ calcd: 566.2547, found: 566.2573.

3. Dineopentyl 3-(*p*-tolyl)-1-tosylaziridine-2,2-dicarboxylate (1h).

White solid, mp = 89 – 92 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.95 (d, *J* = 8.4 Hz, 2 H), 7.33 (d, *J* = 8.4 Hz, 2 H), 7.12 (d, *J* = 8.0 Hz, 2 H), 7.05 (d, *J* = 8.0 Hz, 2 H), 4.87 (s, 1 H), 4.03 (d, *J* = 10.4 Hz, 1 H), 3.99 (d, *J* = 10.4 Hz, 1 H), 3.65 (d, *J* = 10.4 Hz, 1 H), 3.46 (d, *J* = 10.4 Hz, 1 H), 2.44 (s, 3 H), 2.27 (s, 3 H), 0.99 (s, 9 H), 0.68 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.3, 162.7, 144.5, 138.7, 136.8, 129.6, 129.1, 128.2, 127.7, 126.8, 76.5, 75.3, 57.8, 49.7, 31.4, 31.0, 26.4, 25.9, 21.6, 21.1 ppm. IR (neat) v/cm^{-1} 2977, 2954, 2868, 1738, 1724, 1686, 1597, 1519, 1478, 1402, 1377, 1365, 1342, 1311, 1297, 1279, 1266, 1168, 1121, 1092, 1043, 1022, 981, 967, 931. HRMS (ESI): $C_{28}H_{37}NNaO_6S$ $[M+Na]^+$ calcd: 538.2234, found: 538.2262.

4. Dineopentyl 3-(*m*-tolyl)-1-tosylaziridine-2,2-dicarboxylate (1i).

White solid, mp = 101 – 102 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.97 (d, *J* = 8.4Hz, 2H); 7.34 (d, *J* = 8.0 Hz, 2 H); 6.96 – 7.18 (m, 4 H); 4.87 (s, 1H); 4.04 (d, *J* = 10.4 Hz, 1 H); 3.99 (d, *J* = 10.8 Hz, 1 H); 3.65 (d, *J* = 10.4 Hz, 1 H); 3.45 (d, *J* = 10.4 Hz, 1 H); 2.45 (s, 3 H), 2.26 (s, 3 H); 0.99 (s, 9 H); 0.67 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.3, 162.7, 144.6, 138.2, 136.6, 131.1, 129.6, 128.4, 127.8, 127.6, 123.8, 76.5, 75.3, 57.7, 49.6, 31.4, 31.0, 26.4, 25.9, 21.7, 21.2 ppm. IR(neat) v/cm^{-1} 2955, 2349, 1759, 1742, 1560, 1520, 1367, 1342, 1312, 1293, 1255, 1234, 1190, 1162, 1125, 1068, 1010, 974, 931, 920. HRMS (ESI): $C_{28}H_{37}NNaO_6S$ $[M+Na]^+$ calcd: 538.2234, found: 538.2262.

5. Dineopentyl 3-(4-nitrophenyl)-1-tosylaziridine-2,2-dicarboxylate (1j).

White solid, mp = 109 – 111 ºC, ^{1}H NMR (400 MHz,$CDCl_3$): δ = 8.14 (d, *J* = 8.4 Hz, 2 H); 7.96 (d, *J* = 8.4 Hz, 2 H); 7.44 (d, *J* = 8.4 Hz, 2 H); 7.37 (d, *J* = 8.4 Hz, 2 H); 4.94 (s, 1 H); 4.06 (d, *J* = 10.4 Hz,1 H); 4.01 (d, *J* = 10.4 Hz, 1 H); 3.64 (d, *J* = 10.4 Hz, 1 H); 3.48 (d, *J* = 10.4 Hz,1 H); 2.47 (s, 3 H); 1.00 (s, 9 H); 0.69 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 162.6, 162.1, 148.3, 145.2, 138.4, 136.0, 129.9, 128.1, 127.8, 123.7, 76.9, 75.7, 57.9, 48.3, 31.4, 31.0, 26.3, 25.9, 21.7 ppm. IR (neat) v/cm^{-1} 2960, 2886, 2871, 2823, 2361, 2341, 1745, 1608, 1535, 1477, 1451, 1402, 1369, 1357, 1313, 1271, 1252, 1234, 1192, 1171, 1119, 1073, 1034, 1013, 991, 962, 941, 930. HRMS (ESI): $C_{27}H_{34}N_2NaO_8S$ $[M+Na]^+$ calcd: 569.1907, found: 569.1928.

6. Dineopentyl 3-(4-chlorophenyl)-1-tosylaziridine-2,2-dicarboxylate (1k).

White solid, mp = 121 – 124 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.95 (d, *J* = 8.4 Hz, 2 H); 7.35 (d, *J* = 8.4 Hz, 2 H); 7.24 (d, *J* = 8.4 Hz, 2 H); 7.18 (d, *J* = 8.4 Hz, 2 H); 4.86 (s, 1 H); 4.04 (d, *J* = 10.4 Hz, 1 H); 3.99 (d, *J* = 10.4 Hz, 1 H); 3.66 (d, *J* = 10.4 Hz, 1 H); 3.47 (d, *J* = 10.4 Hz, 1 H); 2.45 (s, 3 H); 0.99 (s, 9 H); 0.69 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.0, 162.4, 144.9, 136.3, 134.9, 129.7, 128.7, 128.3, 127.7, 76.6, 75.5, 57.7, 48.8, 31.4, 31.0, 26.3, 25.9, 21.7 ppm. IR (neat) v/cm^{-1} 2954, 2908, 2870, 1740, 1726, 1658, 1597, 1494, 1478, 1402, 1377, 1365, 1323, 1307, 1288, 1168, 1120, 1091, 1042, 1017, 981, 966, 951. HRMS (ESI): $C_{27}H_{34}ClNNaO_6S$ $[M+Na]^+$ calcd: 558.1688, found: 558.1725.

7. Dineopentyl 3-(4-bromophenyl)-1-tosylaziridine-2,2-dicarboxylate (1l).

White solid, mp = 120 – 123 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.94 (d, *J* = 8.4 Hz, 2 H); 7.39 (d, *J* = 8.4 Hz, 2 H); 7.35 (d, *J* = 8.0 Hz, 2 H); 7.12 (d, *J* = 8.0 Hz, 2 H);

4.84 (s, 1 H); 4.04 (d, *J* = 10.4 Hz, 1 H); 3.99 (d, *J* = 10.4 Hz, 1 H); 3.67 (d, *J* = 10.4 Hz, 1 H); 3.47 (d, *J* = 10.4 Hz, 1 H); 2.45 (s, 3 H); 0.99 (s, 9 H); 0.69 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.0, 162.4, 144.9, 136.4, 131.7, 130.3, 129.7, 128.6, 127.7, 123.1, 76.6, 75.5, 57.7, 48.9, 31.4, 31.0, 26.3, 25.9, 21.7 ppm. IR (neat) v/cm^{-1} 2955, 2869, 1740, 1725, 1591, 1574, 1489, 1479, 1467, 1377, 1366, 1341, 1323, 1306, 1288, 1264, 1167, 1121, 1091, 1071, 1043, 1013, 980, 931. HRMS (ESI): $C_{27}H_{34}BrNNaO_6S$ $[M+Na]^+$ calcd: 602.1182, found: 602.1184.

8. Dineopentyl 3-(3-bromophenyl)-1-tosylaziridine-2,2-dicarboxylate (1m)

White solid, mp = 85 – 88 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.96 (d, *J* = 8.0 Hz, 2 H); 7.32 – 7.44 (m, 4 H); 7.08 – 7.22 (m, 2 H); 4.84 (s, 1 H); 4.05 (d, *J* = 10.4 Hz, 1 H); 3.99 (d, *J* = 10.4 Hz, 1 H); 3.68 (d, *J* = 10.4 Hz, 1 H); 3.47 (d, *J* = 10.4 Hz, 1 H); 2.46 (s, 3 H); 0.99 (s, 9 H); 0.70(s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 162.9, 162.4, 144.9, 136.3, 133.6, 132.1, 130.1, 129.9, 129.8, 127.8, 125.7, 122.6, 75.5, 57.8, 48.5, 31.4, 31.0, 26.4, 26.0, 21.7 ppm. IR(neat) v/cm^{-1} 2961, 2872, 2363, 2332, 1744, 1598, 1570, 1477, 1370, 1345, 1323, 1275, 1253, 1228, 1194, 1166, 1123, 1091, 1040, 994, 927. HRMS (ESI): $C_{27}H_{34}BrNNaO_6S$ $[M+Na]^+$ calcd: 602.1182, found: 602.1184.

9. Dineopentyl 3-(naphthalen-2-yl)-1-tosylaziridine-2,2-dicarboxylate (1n).

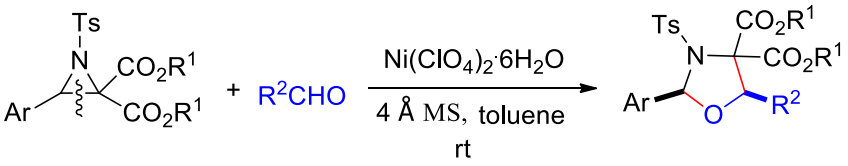
White solid, mp = 135 – 137 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.00 (d, *J* = 8.4 Hz, 2 H); 7.68 – 7.84 (m, 4 H); 7.42 – 7.54 (m, 2 H); 7.29 – 7.42 (m, 3 H); 5.06 (s, 1 H); 4.07 (d, *J* = 10.4 Hz, 1 H); 4.02 (d, *J* = 10.4 Hz, 1 H); 3.57 (d, *J* = 10.4 Hz, 1 H); 3.41 (d, *J* = 10.4 Hz, 1 H); 2.45 (s, 3 H); 1.01 (s, 9 H); 0.60 (s, 9 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 163.2, 162.7, 144.7, 136.6, 133.4, 132.9, 129.7, 128.7, 128.4, 128.0, 127.8, 127.7, 126.53, 126.49, 126.4, 124.0, 76.6, 75.4, 57.9, 49.8, 31.4, 30.9, 26.4, 25.9, 21.7 ppm. IR(neat) v/cm^{-1} 2973, 2887, 1756, 1733, 1697, 1597, 1478, 1405, 1369, 1332, 1314, 1292, 1276, 1227, 1168, 1119, 1089, 1051, 1035, 989, 937, 928, 907. HRMS (ESI): $C_{31}H_{37}NNaO_6S$ $[M+Na]^+$ calcd: 574.2213, found: 574.2234.

10. dineopentyl 1-((4-nitrophenyl)sulfonyl)-3-phenylaziridine-2,2-dicarboxylate (1o).

White solid, mp = 93 – 94 ºC, ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.41 (d, *J* = 8.8 Hz, 2 H); 8.30 (d, *J* = 8.4 Hz, 2 H); 7.18 – 7.34 (m, 5 H); 5.02 (s, 1 H); 4.05 (s, 2 H); 3.65 (d, *J* = 10.4 Hz, 1 H); 3.49 (d, *J* = 10.4 Hz, 1 H); 1.00 (s, 9 H); 0.64 (s, 9 H); ^{13}C NMR(100 MHz, $CDCl_3$): δ = 163.0, 162.2, 150.6, 145.5, 130.5, 129.3, 128.9, 128.7, 126.7, 124.4, 76.9, 75.7, 58.3, 50.7, 31.4, 30.9, 26.3, 25.9 ppm. IR(neat) v/cm^{-1} 2961,

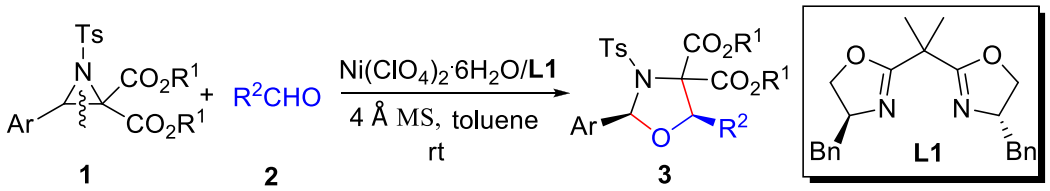
2887, 2871, 2361, 2341, 1745, 1608, 1535, 1477, 1451, 1402, 1369, 1357, 1313, 1271, 1252, 1234, 1192, 1171, 1119, 1089, 1034, 1013, 991, 962, 930. HRMS (ESI): $C_{26}H_{32}N_2NaO_8S$ $[M+Na]^+$ calcd: 555.1778, found: 555.1772.

Typical procedure for preparation of racemic 1, 3-oxazolidines.



In an inert atmosphere, a flame-dried vial was charged with a maganetic stirrer bar, 100 mg of activated 4Å molecular sieves (M.S.), $Ni(ClO_4)_2{\cdot}6H_2O$ (2.74 mg, 5 mol %), aldehyde (0.225 mmol, 1.5 equiv), and 2 mL of toluene. The mixture was allowed to be stirred at room temperature for 15 minutes, then aziridine (0.15 mmol, 1.0 equiv) was added. The reaction mixture was continued to be stirred until the reaction was completed (monitored by TLC). The mixture was then passed over a small plug of silica gel eluted with CH_2Cl_2. After evaporation under reduced pressure, the residue was purified by flash chromatography to afford the desired product.

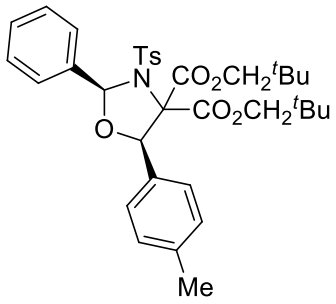
Typical procedure for $Ni(ClO_4)_2{\cdot}6H_2O$/Bn-Box catalyzed cycloaddition of aziridine 1 with aldehyde 2.



In an inert atmosphere, a flame-dried vial was charged with a maganetic stirrer bar, 150 mg of activated 4Å molecular sieves (M.S.), $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 5 mol%), Bn-Box (6.52 mg, 6 mol%) and 3 mL of toluene. The mixture was allowed to be stirred for 3 h at room temperature. Then, aldehyde **2** (0.45 mmol, 1.5 equiv) was added, followed by aziridine **1** (0.25 mmol, 1.0 equiv). The mixture was continued to be stirred at room temperature until the complete consumption of the aziridine

(determined by TLC analysis). The reaction mixture was then passed over a small plug of silica gel eluted with CH_2Cl_2. After evaporation under reduced pressure, the residue was purified by flash chromatography (eluent, PE : EA = 10:1) to afford the product **3** and enantiomeric excess was determined by chiral HPLC. (Note: For some cases, it was not possible to separate the desired products and the starting aromatic aldehydes using flash chromatography, as they appeared as single spots when isolated by thin layer chromatography. Thus, the aldehydes can be transformed into the corresponding oximes by mixing the crude products with $NH_2OH{\cdot}HCl$ (2 equiv, respected to the excess amount of the aldehyde), NaOAc (2 equiv), EtOH (2 mL), which was stirred at room temperature for 1-2 h before flash chromatography.)

1. (2*S*,5*R*)-dineopentyl 2-phenyl-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3fc).



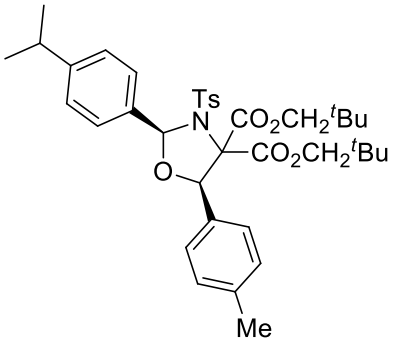
The reaction of **1f** (150.5 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fc** (174.0 mg) in 90% yield, white solid. m.p. 133 – 136 °C; $[\alpha]_{20}^{D}$ = -57.4 (*c* = 1.0, $CHCl_3$); ee = 93% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 7.47 min, t_{major} = 9.95 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.49 (d, *J* = 7.2 Hz, 2 H); 7.18 – 7.32 (m, 3 H); 7.06 – 7.18 (m, 6 H); 6.89 (d, *J* = 8.4 Hz, 2 H); 6.17 (s, 1 H); 5.76 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.91 (d, *J* = 10.4 Hz, 1 H); 2.91 (d, *J* = 10.4 Hz, 1 H); 2.31 (s, 3 H); 2.29 (s, 3 H); 1.16 (s, 9 H); 0.73 (s, 9 H). ^{13}C NMR (100

MHz, $CDCl_3$): δ = 166.9, 166.6, 142.7, 138.9, 137.6, 133.7, 131.3, 129.9, 129.0, 128.3, 128.2, 127.9, 126.5, 92.7, 87.3, 77.4, 76.2, 75.8, 31.6, 30.9, 26.8, 26.2, 21.4, 21.2 ppm. IR (neat) ν/cm^{-1} 2988, 2955, 1763, 1731, 1600, 1527, 1476, 1462, 1398, 1368, 1346, 1289, 1249, 1232, 1181, 1157, 1078, 1036, 1008, 964, 925. HRMS (ESI): $C_{35}H_{43}NNaO_7S$ $[M+Na]^+$ calcd: 644.2652, found: 644.2647.

Procedure for synthesis of 3fa in a gram level scale.

In a flame-dried nitrogen-flushed flask, a solution of $Ni(ClO_4)_2{\cdot}6H_2O$ (58.5 mg, 2 mol%), Bn-Box ligand (63.8 mg, 2.2 mol%), and 1g 4Å M.S. in dry toluene (60 mL) was stirred for 4 h, then **2c** (1.44 g, 12 mmol) was added to this mixture, followed by aziridine **1f** (4.01g, 8 mmol). The mixture was continued to be stirred for 18 h at room temperature. After filtration to remove the 4Å M.S., the solution was concentrated under reduced pressure. Then, the residue was purified by flash chromatography (PE:EA = 10:1) to afford **3fc** (4.3 g) in 85% yield, white solid, ee = 93% (chiral HPLC analysis), and the ^{1}H NMR and ^{13}C NMR spectra were in accordance with the previous data.

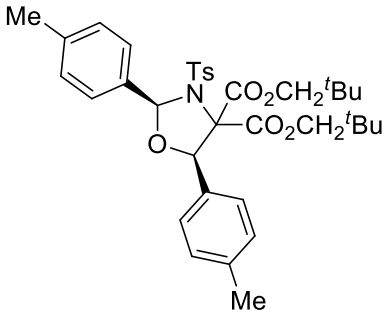
2. (2*S*,5*R*)-dineopentyl 2-(4-isopropylphenyl)-5-(*p*-tolyl)-3-tosyloxazolidine -4,4-dicarboxylate (3gc).



The reaction of **1g** (163.1 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was

carried out at r.t. for 12 hours to afford **3gc** (176.5 mg) in 89% yield, white solid. m.p. 147 – 151 °C; $[\alpha]_{20}^{D}$ = -36.8 (*c* = 1.0, $CHCl_3$); ee = 89% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 7.55 min, t_{major} = 11.05 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.38 (d, *J* = 8.0 Hz, 2 H); 7.22 (d, *J* = 8.0 Hz, 2 H); 7.16 (d, *J* = 8.4 Hz, 2 H); 7.11 (d, *J* = 8.0 Hz, 2 H); 6.96 (d, *J* = 8.0 Hz, 2 H); 6.87 (d, *J* = 8.4 Hz, 2 H); 6.15 (s, 1 H); 5.74 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.92 (d, *J* = 10.4 Hz, 1 H); 2.92 (d, *J* = 10.4 Hz, 1 H); 2.78 – 2.90 (m, 1 H); 2.31 (s, 3 H); 2.28 (s, 3 H); 1.23 (s, 3 H); 1.21 (s, 3 H); 1.16 (s, 9 H); 0.73 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.0, 166.7, 150.8, 142.3, 138.8, 137.8, 131.5, 131.0, 129.8, 129.0, 128.3, 128.2, 126.5, 125.9, 92.5, 87.2, 77.5, 76.2, 75.8, 34.0, 31.6, 30.9, 26.8, 26.2, 24.1, 23.9, 21.4, 21.2 ppm. IR (neat) *v*/cm^{-1} 2960, 2870, 1758, 1739, 1614, 1598, 1516, 1497, 1467, 1434, 1393, 1368, 1341, 1298, 1236, 1217, 1203, 1154, 1089, 1078, 1059, 1041, 1020, 1007, 975, 938, 927. HRMS (ESI): $C_{38}H_{49}NNaO_7S$ $[M+Na]^+$ calcd: 686.3122, found: 686.3127.

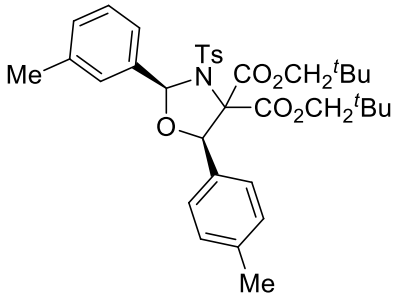
3. (2*S*,5*R*)-dineopentyl 2,5-di-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3hc).



The reaction of **1h** (154.6 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 18 hours to afford **3hc** (179.0 mg) in 94% yield, white solid. m.p. 146 – 149 °C; $[\alpha]_{20}^{D}$ = -46.4 (*c* = 1.0, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 8.34 min, t_{major} = 11.69 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.35 (d, *J* = 8.0 Hz, 2 H); 7.22 (d, *J* = 8.0 Hz,

2 H); 7.16 (d, *J* = 8.4 Hz, 2 H); 7.11 (d, *J* = 8.0 Hz, 2 H); 6.90 (t, *J* = 7.8 Hz, 4 H); 6.12 (s, 1 H); 5.73 (s, 1 H); 4.20 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.90 (d, *J* = 10.4 Hz, 1 H); 2.93 (d, *J* = 10.4 Hz, 1 H); 2.31 (s, 6 H); 1.16 (s, 9 H); 0.73 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.0, 166.6, 142.5, 139.9, 138.8, 137.8, 131.4, 130.8, 129.7, 128.9, 128.4, 128.3, 128.1, 126.5, 92.5, 87.2, 77.4, 76.2, 75.8, 31.5, 30.9, 26.7, 26.2, 21.4, 21.2, 21.1 ppm. IR (neat) *v*/cm^{-1} 2956, 2869, 1761, 1736, 1617, 1598, 1516, 1476, 1464, 1368, 1345, 1309, 1289, 1247, 1227, 1212, 1154, 1089, 1036, 1006, 970, 940, 926. HRMS (ESI): $C_{36}H_{45}NNaO_7S$ $[M+Na]^+$ calcd: 658.2809, found: 658.2810.

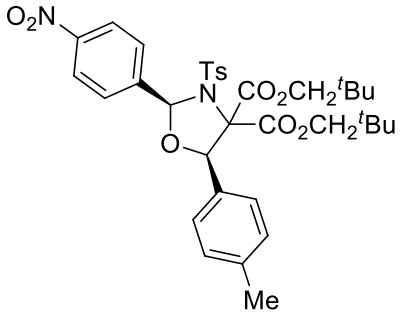
4. (2*S*,5*R*)-dineopentyl 2-(*m*-tolyl)-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3ic).



The reaction of **1i** (154.6 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3ic** (169.3 mg) in 89% yield, white solid. m.p. 158 – 161 °C; $[\alpha]_{20}^{D}$ = -63.1 (*c* = 1.0, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 8.25 min, t_{major} = 13.34 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.18 – 7.30 (m, 4 H); 7.17 (d, *J* = 8.0 Hz, 2 H); 7.12 (d, *J* = 7.6 Hz, 2 H); 7.05 (d, *J* = 4.4 Hz, 2 H); 6.90 (d, *J* = 8.0 Hz, 2 H); 6.11 (s, 1 H); 5.72 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.09 (d, *J* = 10.4 Hz, 1 H); 3.91 (d, *J* = 10.4 Hz, 1 H); 2.95 (d, *J* = 10.4 Hz, 1 H); 2.31 (s, 3 H); 2.30 (s, 3 H); 2.14 (s, 3 H); 1.16 (s, 9 H); 0.73 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.1, 166.6, 142.5,

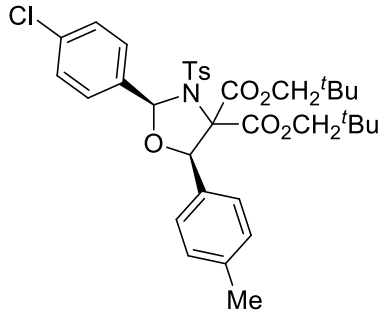
138.9, 137.7, 137.6, 133.3, 131.4, 130.7, 130.3, 129.0, 128.3, 128.1, 127.7, 127.2, 126.6, 92.7, 87.2, 77.5, 76.2, 75.8, 31.6, 30.9, 26.8, 26.2, 21.3, 21.2, 21.0 ppm. IR (neat) ν/cm^{-1} 2958, 2904, 2870, 1764, 1735, 1599, 1518, 1475, 1399, 1367, 1347, 1310, 1288, 1251, 1231, 1213, 1173, 1154, 1092, 1075, 1039, 1011, 971, 939, 908. HRMS (ESI): $C_{36}H_{45}NNaO_7S$ $[M+Na]^+$ calcd: 658.2809, found: 658.2807.

5. (2*S*,5*R*)-dineopentyl 2-(4-nitrophenyl)-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3jc).



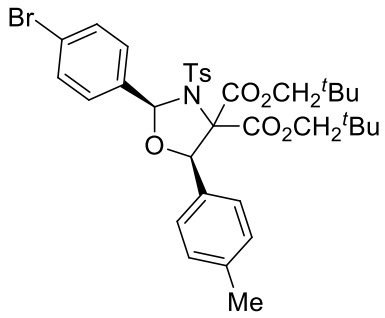
The reaction of **1j** (163.9 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 72 hours to afford **3jc** (154.5 mg) in 77% yield, white solid. m.p. 182 – 185 °C; $[\alpha]_{20}^{D}$ = -33.1(*c* = 1.0, $CHCl_3$); ee = 96% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 7.80 min, t_{major} = 11.43 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.95 (d, *J* = 8.8 Hz, 2 H); 7.70 (d, *J* = 8.4 Hz, 2 H); 7.11 – 7.24 (m, 6 H); 6.92 (d, *J* = 8.0 Hz, 2 H); 6.23 (s, 1 H); 5.80 (s, 1 H); 4.23 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.91 (d, *J* = 10.0 Hz, 1 H); 2.92 (d, *J* = 10.0 Hz, 1 H); 2.33 (s, 3 H); 2.30 (s, 3 H); 1.16 (s, 9 H); 0.72 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.6, 166.3, 148.8, 143.8, 140.8, 139.3, 137.3, 130.9, 130.7, 129.2, 128.5, 128.2, 126.4, 122.8, 91.1, 87.9, 77.4, 76.4, 76.1, 31.6, 30.9, 26.8, 26.1, 21.3, 21.2 ppm. IR (neat) ν/cm^{-1} 2957, 2869, 1763, 1739, 1525, 1477, 1370, 1346, 1288, 1228, 1202, 1156, 1089, 1034, 1007, 920. HRMS (ESI): $C_{35}H_{42}N_2NaO_9S$ $[M+Na]^+$ calcd: 689.2503, found: 689.2506.

6. (2*S*,5*R*)-dineopentyl 2-(4-chlorophenyl)-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3kc).



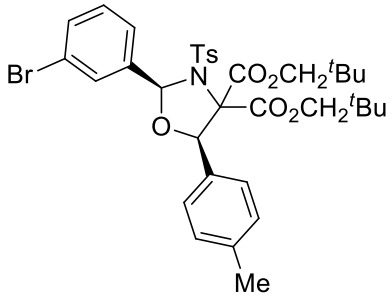
The reaction of **1k** (160.8 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3kc** (194.3 mg) in 99% yield, white solid. m.p. 168 – 171 °C; $[\alpha]_{20}^{D}$ = -27.1(*c* = 0.5, $CHCl_3$); ee = 94% (chiral HPLC analysis: Chiralcel OZ3, *n*-hexane/^{i}PrOH = 95/5, 0.8 mL/min, t_{minor} = 5.77 min, t_{major} = 11.67 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.41 (d, *J* = 8.4 Hz, 2 H); 7.16 – 7.24 (m, 4 H); 7.13 (d, *J* = 8.0 Hz, 2 H); 7.07 (d, *J* = 8.4 Hz, 2 H); 6.96 (d, *J* = 8.4 Hz, 2 H); 6.12 (s, 1 H); 5.74 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.07 (d, *J* = 10.4 Hz, 1 H); 3.91 (d, *J* = 10.4 Hz, 1 H); 2.91 (d, *J* = 10.4 Hz, 1 H); 2.34 (s, 3 H); 2.32 (s, 3 H); 1.16 (s, 9 H); 0.72 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.69, 166.65, 143.1, 139.1, 137.5, 136.1, 132.4, 131.14, 131.06, 129.1, 128.4, 128.2, 128.0, 126.5, 91.7, 87.4, 77.4, 76.3, 75.9, 31.6, 30.9, 26.8, 26.2, 21.4, 21.2 ppm. IR (neat) *v*/cm^{-1} 2965, 2864, 1904, 1760, 1736, 1599, 1547, 1520, 1493, 1478, 1424, 1367, 1349, 1262, 1234, 1214, 1158, 1090, 1034, 1018, 963, 943. HRMS (ESI): $C_{35}H_{42}ClNNaO_7S$ $[M+Na]^+$ calcd: 678.2263, found: 678.2248.

7. (2*S*,5*R*)-dineopentyl 2-(4-bromophenyl)-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3lc).



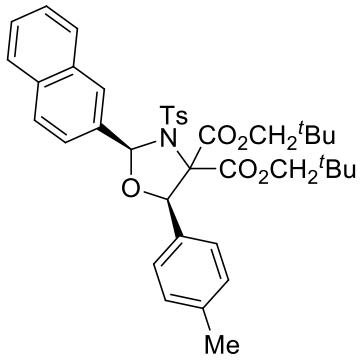
The reaction of **1l** (174.2 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3lc** (178.0 mg) in 85% yield, white solid. m.p. 167 – 170 °C; $[\alpha]_{20}^{D}$ = -24.7 (*c* = 0.5, $CHCl_3$); ee = 95% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 6.28 min, t_{major} = 7.61 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.34 (d, *J* = 8.4 Hz, 2 H); 7.16 – 7.28 (m, 6 H); 7.12 (d, *J* = 8.0 Hz, 2 H); 6.96 (d, *J* = 8.0 Hz, 2 H); 6.10 (s, 1 H); 5.74 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.07 (d, *J* = 10.4 Hz, 1 H); 3.91 (d, *J* = 10.4 Hz, 1 H); 2.92 (d, *J* = 10.4 Hz, 1 H); 2.35 (s, 3 H); 2.32 (s, 3 H); 1.16 (s, 9 H); 0.72 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.7, 166.6, 143.2, 139.1, 137.5, 132.8, 131.4, 131.04, 130.96, 129.1, 128.4, 128.2, 126.4, 124.4, 91.8, 87.4, 77.4, 76.3, 75.9, 31.6, 30.9, 26.8, 26.1, 21.4, 21.1 ppm. IR (neat) *v*/cm^{-1} 2979, 2949, 2870, 1760, 1736, 1597, 1518, 1478, 1422, 1368, 1343, 1235, 1208, 1158, 1088, 1045, 1037, 1010, 972, 939, 928. HRMS (ESI): $C_{35}H_{42}BrNNaO_7S$ $[M+Na]^+$ calcd: 722.1758, found: 722.1703.

8. (2*S*,5*R*)-dineopentyl 2-(3-bromophenyl)-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-dicarboxylate (3mc).



The reaction of **1m** (174.2 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 38 hours to afford **3mc** (176.7 mg) in 84% yield, white solid. m.p. 167 – 171 °C; $[\alpha]_{20}^{D}$ = -64.2 (*c* = 1.0, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 6.91 min, t_{major} = 9.13 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.53 (s, 1 H); 7.43 (d, *J* = 7.6 Hz, 1 H); 7.36 (d, *J* = 8.0 Hz, 1 H); 7.18 – 7.30 (m, 4 H); 7.13 (d, *J* = 8.0 Hz, 2 H); 7.05 (t, *J* = 8.0 Hz, 1 H); 6.96 (d, *J* = 8.0 Hz, 2 H); 6.08 (s, 1 H); 5.73 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.92 (d, *J* = 10.4 Hz, 1 H); 2.95 (d, *J* = 10.4 Hz, 1 H); 2.34 (s, 3 H); 2.32 (s, 3 H); 1.16 (s, 9 H); 0.73 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.8, 166.5, 143.3, 139.1, 137.3, 135.8, 133.0, 132.8, 131.1, 129.3, 129.1, 128.6, 128.5, 128.1, 126.5, 122.2, 91.7, 87.4, 77.2, 76.3, 75.9, 31.6, 30.9, 26.8, 26.2, 21.5, 21.2 ppm. IR (neat) *v*/cm^{-1} 2959, 2884, 2869, 1756, 1735, 1598, 1578, 1518, 1476, 1437, 1367, 1346, 1292, 1263, 1230, 1213, 1157, 1081, 1037, 968, 939, 921, 906. HRMS (ESI): $C_{35}H_{42}BrNNaO_7S$ $[M+Na]^+$ calcd: 722.1758, found: 722.1766.

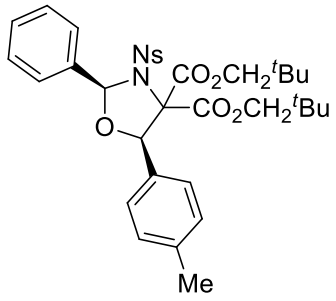
9. (2*S*,5*R*)-dineopentyl 2-(naphthalen-2-yl)-5-(*p*-tolyl)-3-tosyloxazolidine-4,4-di-carboxylate (3nc).



The reaction of **1n** (165.5 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018

mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3nc** (188.0 mg) in 93% yield, white solid. m.p. 202 – 205 °C; $[\alpha]_{20}^{D}$ = -9.4 (*c* = 0.5, $CHCl_3$); ee = 89% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 90/10, 0.8 mL/min, t_{minor} = 9.82 min, t_{major} = 18.09 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.96 (s, 1 H); 7.75 (t, *J* = 7.0 Hz, 2 H); 7.44 – 7.53 (m, 4 H); 7.27 (d, *J* = 8.0 Hz, 2 H); 7.14 (d, *J* = 8.0 Hz, 2 H); 7.07 (d, *J* = 8.0 Hz, 2 H); 6.53 (d, *J* = 8.4 Hz, 2 H); 6.31 (s, 1 H); 5.80 (s, 1 H); 4.24 (d, *J* = 10.4 Hz, 1 H); 4.11 (d, *J* = 10.4 Hz, 1 H); 3.95 (d, *J* = 10.4 Hz, 1 H); 2.98 (d, *J* = 10.4 Hz, 1 H); 2.33 (s, 3 H); 2.07 (s, 3 H); 1.19 (s, 9 H); 0.75 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.0, 166.8, 142.6, 139.0, 137.4, 134.3, 132.4, 131.4, 130.9, 130.2, 129.1, 128.4, 128.2, 128.0, 127.7, 127.4, 126.8, 126.6, 126.0, 125.9, 92.7, 87.4, 77.5, 76.2, 75.9, 31.6, 30.9, 26.8, 26.2, 21.18, 21.15 ppm. IR (neat) *v*/cm^{-1} 2987, 2971, 2901, 1752, 1738, 1601, 1477, 1452, 1406, 1379, 1347, 1246, 1179, 1158, 1075, 1067, 1047, 1006, 977, 963. HRMS (ESI): $C_{39}H_{45}NNaO_7S$ $[M+Na]^+$ calcd: 694.2809, found: 694.2786.

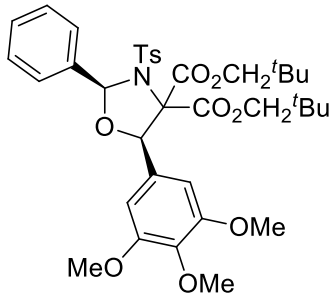
10. (2*S*,5*R*)-dineopentyl 3-((4-nitrophenyl)sulfonyl)-2-phenyl-5-(*p*-tolyl)oxazolidine-4,4-dicarboxylate (3oc).



The reaction of **1o** (159.8 mg, 0.3 mmol), **2c** (54.1 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 60 hours to afford **3oc** (153.5 mg) in 78% yield, white solid. m.p. 188 – 190 °C; $[\alpha]_{20}^{D}$ = -83.5 (*c* = 1.0, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 12.06 min, t_{major} = 15.12

min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.91 (d, *J* = 8.4 Hz, 2 H); 7.47 (d, *J* = 7.6 Hz, 2 H); 7.40 (d, *J* = 8.8 Hz, 2 H); 7.31 (t, *J* = 7.4 Hz, 1 H); 7.04 – 7.25 (m, 6 H); 6.20 (s, 1 H); 5.77 (s, 1 H); 4.22 (d, *J* = 10.4 Hz, 1 H); 4.10 (d, *J* = 10.4 Hz, 1 H); 3.93 (d, *J* = 10.0 Hz, 1 H); 2.89 (d, *J* = 10.0 Hz, 1 H); 2.33 (s, 3 H); 1.18 (s, 9 H); 0.72 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.6, 166.4, 149.2, 145.9, 139.3, 133.2, 130.9, 130.5, 130.1, 129.5, 129.2, 128.1, 126.5, 122.7, 92.7, 87.5, 77.7, 76.6, 76.2, 31.6, 30.9, 26.8, 26.1, 21.2 ppm. IR (neat) *v*/cm^{-1} 2957, 2901, 2867, 1757, 1735, 1607, 1526, 1478, 1464, 1399, 1359, 1314, 1270, 1236, 1217, 1161, 1089, 1075, 1051, 1013, 1001, 963, 927. HRMS (ESI): $C_{34}H_{40}N_2NaO_9S$ $[M+Na]^+$ calcd: 675.2347, found: 675.2336.

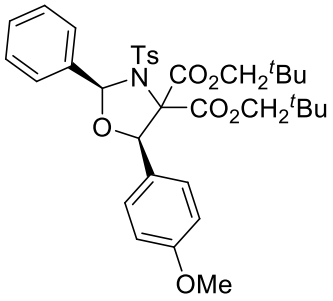
11. (2*S*,5*R*)-dineopentyl 2-phenyl-3-tosyl-5-(3,4,5-trimethoxyphenyl)oxazolidine-4,4-dicarboxylate (3fa).



The reaction of **1f** (150.5 mg, 0.3 mmol), **2a** (88.3 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fa** (190.2 mg) in 91% yield, white solid. m.p. 135 – 138 °C; $[\alpha]_{20}^{D}$ = -35.6 (*c* = 1.0, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel ADH, *n*-hexane/^{i}PrOH = 80/20, 0.8 mL/min, t_{minor} = 6.55 min, t_{major} = 5.80 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.50 (d, *J* = 7.2 Hz, 2 H); 7.28 – 7.37 (m, 1 H); 7.02 – 7.23 (m, 4 H); 6.90 (d, *J* = 8.4 Hz, 2 H); 6.56 (s, 2 H); 6.20 (s, 1 H); 5.75 (s, 1 H); 4.25 (d, *J* = 10.4 Hz, 1 H); 4.07 (d, *J* = 10.4 Hz, 1 H); 3.97 (d, *J* = 10.4 Hz, 1 H); 3.81 (s, 3 H); 3.80 (s, 6 H); 2.98 (d, *J* = 10.0 Hz, 1 H); 2.29 (s, 3 H); 1.17 (s, 9 H); 0.76 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.8, 166.5, 153.2, 142.8, 138.3,

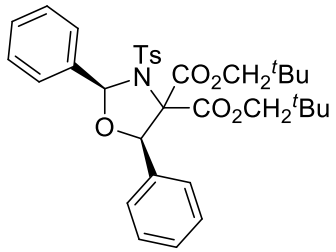
137.5, 133.8, 129.9, 129.8, 128.3, 128.1, 127.9, 103.4, 92.8, 87.1, 77.2, 76.3, 76.0, 60.7, 56.0, 31.6, 31.0, 26.7, 26.2, 21.4 ppm. IR (neat) ν/cm^{-1} 2958, 2869, 2841, 1760, 1736, 1587, 1499, 1462, 1421, 1398, 1367, 1347, 1325, 1236, 1158, 1104, 1093, 1046, 998, 985, 957, 939, 909. HRMS (ESI): $C_{37}H_{47}NNaO_{10}S$ $[M+Na]^+$ calcd: 720.2813, found: 720.2836.

12. (2*S*,5*R*)-dineopentyl 5-(4-methoxyphenyl)-2-phenyl-3-tosyloxazolidine- 4,4-dicarboxylate (3fb).



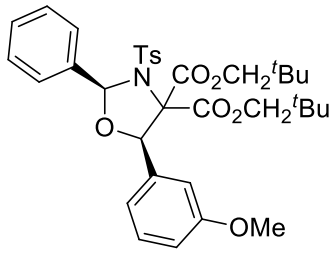
The reaction of **1f** (150.5 mg, 0.3 mmol), **2b** (61.3 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fb** (168.4 mg) in 88% yield, white solid. m.p. 136 – 139 °C; $[\alpha]_{20}^{D}$ = -61.5 (*c* = 0.5, $CHCl_3$); ee = 90% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 8.33 min, t_{major} = 11.32 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.48 (d, *J* = 7.6 Hz, 2 H); 7.24 – 7.30 (m, 3 H); 7.08 – 7.20 (m, 4 H); 6.89 (d, *J* = 8.4 Hz, 2 H); 6.84 (d, *J* = 8.8 Hz, 2 H); 6.17 (s, 1 H); 5.73 (s, 1 H); 4.21 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.93 (d, *J* = 10.4 Hz, 1 H); 3.78 (s, 3 H); 2.96 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 1.16 (s, 9 H); 0.75 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.6, 160.2, 142.7, 137.6, 133.7, 129.9, 129.8, 128.3, 128.1, 128.0, 127.9, 126.3, 113.8, 92.6, 87.2, 77.4, 76.2, 75.9, 55.3, 31.6, 31.0, 26.8, 26.2, 21.4 ppm. IR (neat) ν/cm^{-1} 2958, 2902, 2885, 1763, 1733, 1614, 1599, 1516, 1461, 1397, 1368, 1342, 1306, 1291, 1248, 1224, 1210, 1173, 1157, 1116, 1090, 1077, 1053, 1033, 1009, 972, 926. HRMS (ESI): $C_{35}H_{43}NNaO_8S$ $[M+Na]^+$ calcd: 660.2602, found: 660.2634.

13. (2*S*,5*R*)-dineopentyl 2,5-diphenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fd).



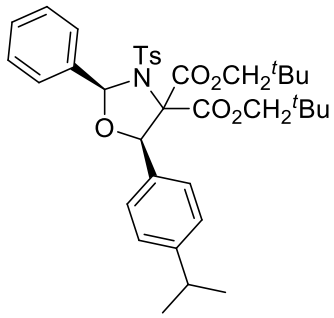
The reaction of **1f** (150.5 mg, 0.3 mmol), **2d** (95.4 mg, 0.9 mmol) in the presence of 10 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (10.97 mg, 0.03 mmol), Bn-Box ligand (13.05 mg, 0.036 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fd** (162.2 mg) in 89% yield, white solid. m.p. 138 – 141 °C; $[\alpha]_{20}^{D}$ = -52.2 (*c* = 1.0, $CHCl_3$); ee = 90% (chiral HPLC analysis: Chiralcel OZ3, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 5.04 min, t_{major} = 8.63 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.49 (d, *J* = 7.2 Hz, 2 H); 7.22 – 7.40 (m, 6 H); 7.05 – 7.20 (m, 4 H); 6.89 (d, *J* = 8.0 Hz, 2 H); 6.19 (s, 1 H); 5.79 (s, 1 H); 4.22 (d, *J* = 10.4 Hz, 1 H); 4.09 (d, *J* = 10.4 Hz, 1 H); 3.92 (d, *J* = 10.4 Hz, 1 H); 2.83 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 1.17 (s, 9 H); 0.73 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.5, 142.7, 137.6, 134.4, 133.7, 129.9, 129.8, 129.1, 128.4, 128.3, 128.2, 127.9, 126.6, 92.8, 87.2, 77.4, 76.3, 75.8, 31.6, 31.0, 26.8, 26.2, 21.4 ppm. IR (neat) *v*/cm^{-1} 2973, 2902, 1741, 1598, 1496, 1463, 1400, 1370, 1349, 1333, 1293, 1241, 1214, 1159, 1094, 1081, 1067, 1051, 1039, 1007, 976, 961, 940, 926. HRMS (ESI): $C_{34}H_{41}NNaO_7S$ $[M+Na]^+$ calcd: 630.2496, found: 630.2495.

14. (2*S*,5*R*)-dineopentyl 5-(3-methoxyphenyl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fe).



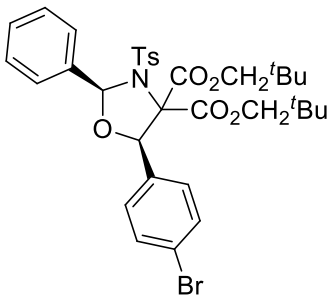
The reaction of **1f** (150.5 mg, 0.3 mmol), **2e** (61.3 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 24 hours to afford **3fe** (130.2 mg) in 68% yield, white solid. m.p. 118 – 121 °C; $[\alpha]_{20}^{D}$ = -39.2 (*c* = 0.5, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 8.43 min, t_{major} = 9.83 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.49 (d, *J* = 7.2 Hz, 2 H); 7.20 – 7.38 (m, 2 H); 7.07 – 7.20 (m, 4 H); 6.73 – 7.07 (m, 5 H); 6.18 (s, 1 H); 5.77 (s, 1 H); 4.22 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.94 (d, *J* = 10.4 Hz, 1 H); 3.75 (s, 3 H); 2.92 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 1.16 (s, 9 H); 0.74 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.8, 166.5, 159.6, 142.7, 137.6, 135.9, 133.7, 129.9, 129.4, 128.3, 128.2, 127.9, 118.8, 114.6, 112.2, 92.8, 87.0, 77.4, 76.3, 75.9, 55.2, 31.6, 31.0, 26.8, 26.2, 21.4 ppm. IR (neat) *v*/cm^{-1} 2956, 2938, 1759, 1739, 1599, 1494, 1467, 1370, 1357, 1281, 1260, 1238, 1214, 1163, 1155, 1096, 1086, 1072, 1035, 1003, 976, 963, 931, 921, 911. HRMS (ESI): $C_{35}H_{43}NNaO_8S$ $[M+Na]^+$ calcd: 660.2602, found: 660.2634.

15. (2*S*,5*R*)-dineopentyl 5-(4-isopropylphenyl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3ff).



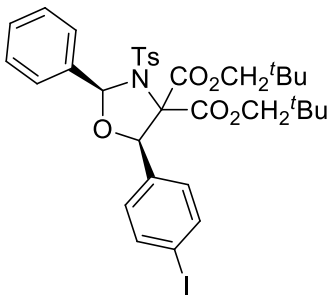
The reaction of **1f** (150.5 mg, 0.3 mmol), **2f** (66.7 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3ff** (169.8 mg) in 87% yield, white solid. m.p. 102 – 105 °C; $[\alpha]_{20}^{D}$ = -48.0 (*c* = 1.0, $CHCl_3$); ee = 94% (chiral HPLC analysis: Chiralcel ADH, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 4.59 min, t_{major} = 7.57 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.58 (d, *J* = 6.8 Hz, 2 H); 7.30 – 7.42 (m, 3 H); 7.12 – 7.31 (m, 6 H); 6.97 (d, *J* = 8.0 Hz, 2 H); 6.28 (s, 1 H); 5.85 (s, 1 H); 4.32 (d, *J* = 10.4 Hz, 1 H); 4.17 (d, *J* = 10.4 Hz, 1 H); 4.00 (d, *J* = 10.4 Hz, 1 H); 2.92 – 3.08 (m, 1 H); 2.90 (d, *J* = 10.4 Hz, 1 H); 2.37 (s, 3 H); 1.30 (d, *J* = 6.8 Hz, 6 H); 1.26 (s, 9 H); 0.80 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.6, 149.8, 142.6, 137.6, 133.8, 131.8, 129.9, 129.8, 128.21, 128.16, 127.8, 126.7, 126.4, 92.7, 87.3, 77.4, 76.2, 75.8, 33.9, 31.6, 30.9, 26.8, 26.2, 23.9, 23.8, 21.4 ppm. IR (neat) *v*/cm^{-1} 2960, 2886, 2870, 1749, 1732, 1598, 1515, 1462, 1396, 1368, 1349, 1279, 1259, 1236, 1212, 1156, 1079, 1053, 1032, 965, 940, 923, 876, 832. HRMS (ESI): $C_{37}H_{47}NNaO_7S$ $[M+Na]^+$ calcd: 672.2965, found: 672.2973.

16. (2*S*,5*R*)-dineopentyl 5-(4-bromophenyl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fg).



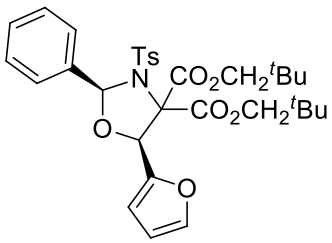
The reaction of **1f** (150.5 mg, 0.3 mmol), **2g** (166.5 mg, 0.9 mmol) in the presence of 10 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (10.97 mg, 0.03 mmol), Bn-Box ligand (13.05 mg, 0.036 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 24 hours to afford **3fg** (139.2 mg) in 68% yield, white solid. m.p. 152 – 155 °C; $[\alpha]_{20}^{D}$ = -42.9 (*c* = 0.5, $CHCl_3$); ee = 90% (chiral HPLC analysis: Chiralcel OZ3, *n*-hexane/^{i}PrOH = 85/15, 0.4 mL/min, t_{minor} = 9.89 min, t_{major} = 15.37 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.41 – 7.50 (m, 4 H); 7.19 – 7.37 (m, 3 H); 7.04 – 7.18 (m, 4 H); 6.90 (d, *J* = 8.0 Hz, 2 H); 6.15 (s, 1 H); 5.73 (s, 1 H); 4.20 (d, *J* = 10.4 Hz, 1 H); 4.10 (d, *J* = 10.4 Hz, 1 H); 3.92 (d, *J* = 10.4 Hz, 1 H); 3.00 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 1.15 (s, 9 H); 0.76 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.4, 142.9, 137.5, 133.51, 133.47, 131.5, 130.0, 129.8, 128.4, 128.3, 128.2, 128.0, 123.2, 92.8, 86.5, 77.3, 76.5, 76.0, 31.6, 31.0, 26.8, 26.2, 21.4 ppm. IR (neat) *v*/cm^{-1} 2960, 2883, 2871, 1742, 1599, 1578, 1491, 1463, 1396, 1370, 1348, 1331, 1291, 1255, 1217, 1156, 1095, 1072, 1048, 1005, 979, 963, 927. HRMS (ESI): $C_{34}H_{40}BrNNaO_7S$ $[M+Na]^+$ calcd: 708.1601, found: 708.1625.

17. (2*S*,5*R*)-dineopentyl 5-(4-iodophenyl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fh).



The reaction of **1f** (150.5 mg, 0.3 mmol), **2h** (208.8 mg, 0.9 mmol) in the presence of 10 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (10.97 mg, 0.03 mmol), Bn-Box ligand (13.05 mg, 0.036 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fh** (171.9 mg) in 78% yield, white solid. m.p. 129 – 131 °C; $[\alpha]_{20}^{D}$ = -61.3 (*c* = 1.0, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 90/10, 0.8 mL/min, t_{minor} = 7.94 min, t_{major} = 10.01 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.66 (d, *J* = 8.4 Hz, 2 H); 7.45 (d, *J* = 7.2 Hz, 2 H); 7.26 – 7.34 (m, 1 H); 7.08 – 7.22 (m, 6 H); 6.90 (d, *J* = 8.0 Hz, 2 H); 6.15 (s, 1 H); 5.71 (s, 1 H); 4.20 (d, *J* = 10.4 Hz, 1 H); 4.09 (d, *J* = 10.4 Hz, 1 H); 3.92 (d, *J* = 10.4 Hz, 1 H); 3.00 (d, *J* = 10.4 Hz, 1 H); 2.30 (s, 3 H); 1.15 (s, 9 H); 0.76 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.4, 142.8, 137.5, 134.2, 133.5, 130.0, 129.8, 129.0, 128.40, 128.35, 128.2, 127.9, 125.3, 95.0, 92.8, 86.5, 76.5, 76.1, 31.6, 31.0, 26.8, 26.2, 21.4 ppm. IR (neat) *v*/cm^{-1} 2961, 2907, 2889, 1743, 1599, 1486, 1461, 1394, 1369, 1348, 1294, 1256, 1240, 1217, 1155, 1100, 1059, 1039, 1004, 979, 958, 941, 927. HRMS (ESI): $C_{34}H_{40}INNaO_7S$ $[M+Na]^+$ calcd: 756.1462, found: 756.1438.

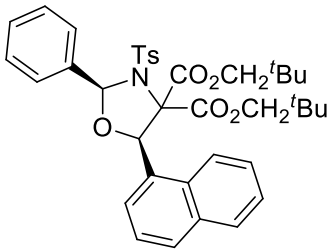
18. (2*S*,5*S*)-dineopentyl 5-(furan-2-yl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fi).



The reaction of **1f** (150.5 mg, 0.3 mmol), **2i** (45.2 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fi** (167.7 mg) in 94% yield, white solid. m.p. 108 – 111 °C; $[\alpha]_{20}^{D}$ = -42.7 (*c* = 1.0, $CHCl_3$); ee = 88% (chiral HPLC analysis:

Chiralcel OZ3, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 6.88 min, t_{major} = 8.34 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.36 – 7.62 (m, 3 H); 7.22 – 7.36 (m, 1 H); 7.19 (d, *J* = 8.0 Hz, 2 H); 7.13 (t, *J* = 7.6 Hz, 2 H); 6.91 (d, *J* = 8.0 Hz, 2 H); 6.38 – 6.48 (m, 1 H); 6.27 – 6.38 (m, 1 H); 6.15 (s, 1 H); 5.83 (s, 1 H); 4.19 (d, *J* = 10.4 Hz, 1 H); 4.14 (d, *J* = 10.4 Hz, 1 H); 4.08 (d, *J* = 10.4 Hz, 1 H); 3.25 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 1.13 (s, 9 H); 0.87 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.7, 166.2, 147.7, 143.4, 142.8, 137.5, 133.8, 129.9, 129.8, 128.3, 127.9, 110.6, 109.9, 92.9, 81.3, 77.2, 76.3, 76.2, 31.6, 31.3, 26.7, 26.3, 21.4 ppm. IR (neat) *v*/cm^{-1} 2885, 1742, 1703, 1598, 1505, 1478, 1414, 1401, 1368, 1353, 1332, 1238, 1215, 1160, 1095, 1083, 1052, 1037, 1012, 984, 962, 954, 917. HRMS (ESI): $C_{32}H_{39}NNaO_8S$ $[M+Na]^+$ calcd: 620.2289, found: 620.2298.

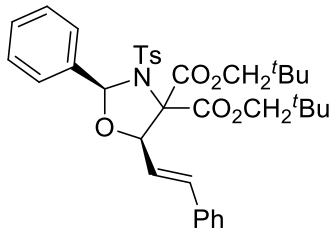
19. (2*S*,5*R*)-dineopentyl 5-(naphthalen-1-yl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fj).



The reaction of **1f** (150.5 mg, 0.3 mmol), **2j** (140.6 mg, 0.9 mmol) in the presence of 10 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (10.97 mg, 0.03 mmol), Bn-Box ligand (13.05 mg, 0.036 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 18 hours to afford **3fj** (150.2 mg) in 76% yield, white solid. m.p. 168 – 171 °C; $[\alpha]_{20}^{D}$ = -80.4 (*c* = 1.0, $CHCl_3$); ee = 86% (chiral HPLC analysis: Chiralcel ADH, *n*-hexane/^{i}PrOH = 90/10, 0.5 mL/min, t_{minor} = 10.10 min, t_{major} = 8.85 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.76 – 7.90 (m, 3 H); 7.65 (d, *J* = 7.2 Hz, 1 H); 7.36 – 7.62 (m, 5 H); 7.30 (t, *J* = 7.4 Hz, 1 H); 7.08 – 7.22 (m, 4 H); 6.89 (d, *J* = 8.4 Hz, 2 H); 6.64 (s, 1 H); 6.33 (s, 1 H); 4.34 (d, *J* = 10.4 Hz, 1 H); 4.11 (d, *J* = 10.4 Hz, 1 H); 3.85 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 2.24 (d, *J* = 10.4 Hz, 1 H); 1.25 (s, 9 H);

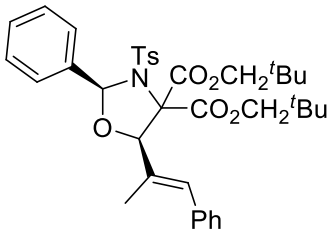
0.35 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.6, 142.8, 137.5, 133.9, 133.7, 131.10, 131.05, 130.0, 129.9, 129.5, 128.9, 128.3, 128.2, 128.0, 126.7, 125.8, 125.1, 124.4, 122.4, 92.8, 84.1, 77.6, 76.8, 75.6, 31.5, 30.5, 26.9, 25.7, 21.4 ppm. IR (neat) *v*/cm^{-1} 2958, 2926, 2869, 1963, 1733, 1598, 1513, 1477, 1462, 1400, 1366, 1346, 1324, 1293, 1262, 1227, 1156, 1090, 1080, 1051, 1037, 1008, 962, 921. HRMS (ESI): $C_{38}H_{43}NNaO_7S$ $[M+Na]^+$ calcd: 680.2652, found: 680.2639.

20. (2*S*,5*R*)-dineopentyl 2-phenyl-5-((*E*)-styryl)-3-tosyloxazolidine-4,4-dicarboxylate (3fk).



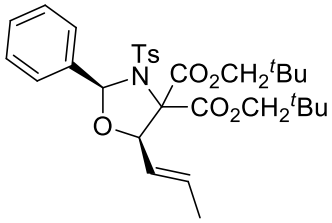
The reaction of **1f** (150.5 mg, 0.3 mmol), **2k** (59.5 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fk** (176.8 mg) in 93% yield, white solid. m.p. 114 – 116 °C; $[\alpha]_{20}^{D}$ = -34.9 (*c* = 1.0, $CHCl_3$); ee = 85% (chiral HPLC analysis: Chiralcel OZ3, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 6.60 min, t_{major} = 14.35 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.22 – 7.48 (m, 10 H); 7.13 (t, *J* = 7.6 Hz, 2 H); 6.94 (d, *J* = 8.0 Hz, 2 H); 6.71 (d, *J* = 16.0 Hz, 2 H); 6.30 (dd, J_1 = 16.0 Hz, J_2 = 7.2 Hz, 1 H); 6.04 (s, 1 H); 5.29 (d, *J* = 7.6 Hz, 1 H); 4.11 (s, 2 H); 4.07 (d, *J* = 10.4 Hz, 1 H); 3.82 (d, *J* = 10.4 Hz, 1 H); 2.31 (s, 3 H); 1.10 (s, 9 H); 0.90 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.0, 166.7, 142.9, 137.5, 135.6, 134.9, 133.9, 129.8, 129.6, 128.5, 128.42, 128.39, 128.3, 127.9, 126.9, 122.0, 92.9, 86.6, 76.8, 76.3, 76.2, 31.5, 31.4, 26.6, 26.4, 21.4 ppm. IR (neat) *v*/cm^{-1} 3065, 3030, 2957, 2887, 2869, 1748, 1728, 1684, 1600, 1478, 1460, 1398, 1369, 1342, 1274, 1249, 1233, 1156, 1093, 1065, 1034, 1004, 962, 939, 911. HRMS (ESI): $C_{36}H_{43}NNaO_7S$ $[M+Na]^+$ calcd: 656.2652, found: 656.2655.

21. (2*S*,5*R*)-dineopentyl 2-phenyl-5-((*E*)-1-phenylprop-1-en-2-yl)-3- tosyloxazolidine-4,4-dicarboxylate (3fl).



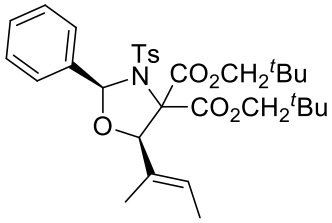
The reaction of **1f** (150.5 mg, 0.3 mmol), **2l** (65.8 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 18 hours to afford **3fl** (158.4 mg) in 82% yield, white solid. m.p. 137 – 140 °C; $[\alpha]_{20}^{D}$ = -70.2 (*c* = 0.5, $CHCl_3$); ee = 92% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 95/5, 0.8 mL/min, t_{minor} = 10.41 min, t_{major} = 11.49 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.43 (d, *J* = 7.2 Hz, 2 H); 7.28 – 7.36 (m, 3 H); 7.18 – 7.26 (m, 3 H); 7.12 – 7.18 (m, 4 H); 6.92 (d, *J* = 8.0 Hz, 2 H); 6.65 (s, 1 H); 6.08 (s, 1 H); 5.30 (s, 1 H); 4.28 (d, *J* = 10.4 Hz, 1 H); 4.15 (d, *J* = 10.4 Hz, 1 H); 4.03 (d, *J* = 10.4 Hz, 1 H); 3.55 (d, *J* = 10.4 Hz, 1 H); 2.30 (s, 3 H); 1.92 (s, 3 H); 1.13 (s, 9 H); 0.93 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.2, 166.8, 142.8, 137.4, 136.5, 134.0, 130.9, 129.9, 129.8, 129.0, 128.3, 128.2, 128.1, 127.9, 127.8, 126.9, 92.6, 89.4, 76.4, 76.1, 31.5, 31.4, 26.7, 26.5, 21.4, 15.8 ppm. IR (neat) *v*/cm^{-1} 2959, 2916, 2884, 1758, 1740, 1600, 1495, 1473, 1447, 1411, 1398, 1376, 1366, 1344, 1326, 1306, 1292, 1230, 1156, 1087, 1058, 1037, 1026, 1010, 986, 971, 921, 902. HRMS (ESI): $C_{37}H_{45}NNaO_7S$ $[M+Na]^+$ calcd: 670.2809, found: 670.2820.

22. (2*S*,5*R*)-dineopentyl 2-phenyl-5-((*E*)-prop-1-en-1-yl)-3-tosyloxazolidine-4,4-dicarboxylate (3fm).



The reaction of **1f** (150.5 mg, 0.3 mmol), **2m** (31.5 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 12 hours to afford **3fm** (168.8 mg) in 99% yield, white solid. m.p. 80 – 83 °C; $[\alpha]_{20}^{D}$ = -26.6 (*c* = 0.5, $CHCl_3$); ee = 69% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 85/15, 0.8 mL/min, t_{minor} = 12.63 min, t_{major} = 11.35 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.30 (d, *J* = 7.2 Hz, 2 H); 7.15 – 7.26 (m, 3 H); 7.08 (t, *J* = 7.6 Hz, 2 H); 6.90 (d, *J* = 8.0 Hz, 2 H); 5.99 (s, 1 H); 5.82 – 5.96 (m, 1 H); 5.54 – 5.76 (m, 1 H); 5.08 (d, *J* = 8.0 Hz, 1 H); 4.00 – 4.13 (m, 3 H); 3.92 (d, *J* = 10.4 Hz, 1 H); 2.28 (s, 3 H); 1.68 – 1.88 (m, 3 H); 1.08 (s, 9 H); 1.02 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 166.9, 166.8, 142.7, 137.6, 134.0, 132.9, 129.7, 129.5, 128.3, 128.2, 127.8, 124.4, 92.7, 86.9, 76.6, 76.2, 31.5, 31.4, 26.6, 26.5, 21.4, 17.9 ppm. IR (neat) *v*/cm^{-1} 2960, 2870, 1743, 1677, 1598, 1477, 1463, 1403, 1369, 1345, 1306, 1261, 1237, 1217, 1156, 1093, 1051, 1032, 1015, 994, 968, 929, 902. HRMS (ESI): $C_{31}H_{41}NNaO_7S$ $[M+Na]^+$ calcd: 594.2496, found: 594.2528.

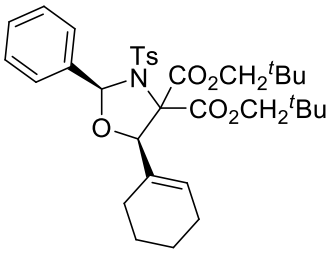
23. (2*S*,5*R*)-dineopentyl 5-((*E*)-but-2-en-2-yl)-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fn).



The reaction of **1f** (150.5 mg, 0.3 mmol), **2n** (37.9 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018

mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 20 hours to afford **3fn** (160.2 mg) in 91% yield, white solid. m.p. 108 – 111 °C; $[\alpha]_{20}^{D}$ = -30.6 (*c* = 1.0, $CHCl_3$); ee = 87% (chiral HPLC analysis: Chiralcel IC, *n*-hexane/^{i}PrOH = 95/5, 0.8 mL/min, t_{minor} = 12.01 min, t_{major} = 12.88 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.38 (d, *J* = 7.6 Hz, 2 H); 7.23 – 7.40 (m, 1 H); 7.02 – 7.20 (m, 4 H); 6.88 (d, *J* = 8.4 Hz, 2 H); 6.04 (s, 1 H); 5.69 (q, *J* = 6.4 Hz, 1 H); 5.13 (s, 1 H); 4.22 (d, *J* = 10.4 Hz, 1 H); 4.13 (d, *J* = 10.4 Hz, 1 H); 3.98 (d, *J* = 10.4 Hz, 1 H); 3.61 (d, *J* = 10.4 Hz, 1 H); 2.28 (s, 3 H); 1.64 (s, 3 H); 1.61 (d, *J* = 7.2 Hz, 3 H); 1.11 (s, 9 H); 1.02 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.1, 142.7, 137.6, 134.1, 129.79, 129.76, 129.1, 128.3, 128.2, 127.8, 123.7, 92.4, 89.6, 76.5, 76.3, 76.2, 31.4, 26.7, 26.5, 21.4, 13.5, 13.2 ppm. IR (neat) *v*/cm^{-1} 2961, 2869, 1752, 1738, 1599, 1477, 1461, 1403, 1368, 1344, 1262, 1237, 1210, 1156, 1094, 1052, 1028, 1008, 984, 959, 940. HRMS (ESI): $C_{32}H_{43}NNaO_7S$ $[M+Na]^+$ calcd: 608.2652, found: 608.2672.

24. (2*S*,5*R*)-dineopentyl 5-cyclohexenyl-2-phenyl-3-tosyloxazolidine-4,4-dicarboxylate (3fo).



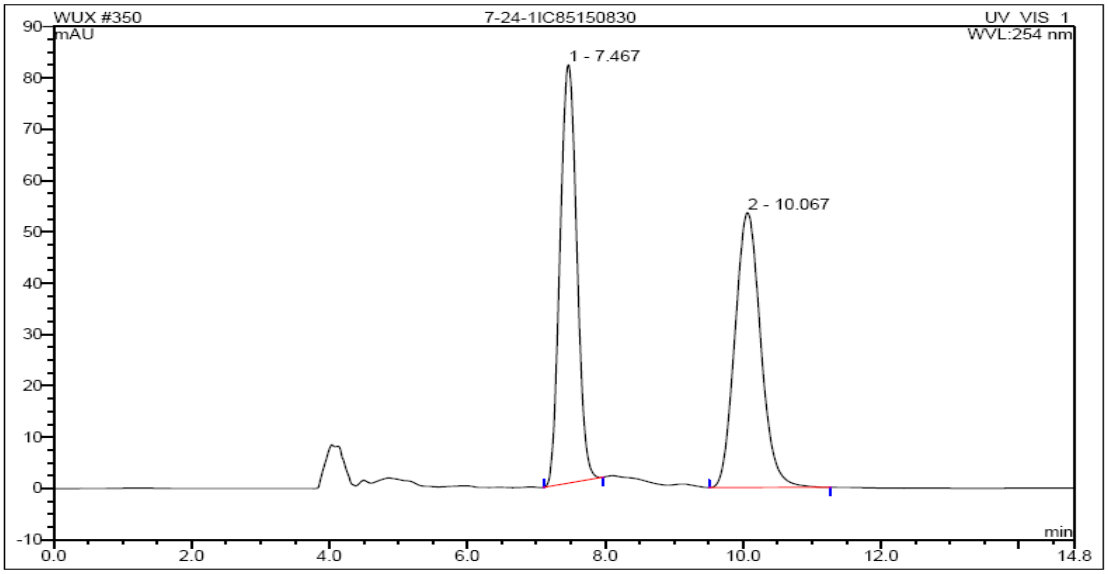
The reaction of **1f** (150.5 mg, 0.3 mmol), **2o** (49.6 mg, 0.45 mmol) in the presence of 5 mol % $Ni(ClO_4)_2{\cdot}6H_2O$ (5.48 mg, 0.015 mmol), Bn-Box ligand (6.52 mg, 0.018 mmol), 120 mg of activated 4Å M.S. and using toluene (3 mL) as the solvent was carried out at r.t. for 18 hours to afford **3fo** (145.0 mg) in 79% yield, white solid. m.p. 130 – 133 °C; $[\alpha]_{20}^{D}$ = -41.2 (*c* = 0.5, $CHCl_3$); ee = 85% (chiral HPLC analysis: Chiralcel OZ3, *n*-hexane/^{i}PrOH = 95/5, 0.8 mL/min, t_{minor} = 6.82 min, t_{major} = 11.89 min); ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.39 (d, *J* = 7.2 Hz, 2 H); 7.25 – 7.33 (m, 1 H); 7.04 – 7.20 (m, 4 H); 6.90 (d, *J* = 8.4 Hz, 2 H); 6.01 (s, 1 H); 5.83 – 5.90 (m, 1 H); 5.06 (s, 1 H); 4.40 (d, *J* = 10.4 Hz, 1 H); 4.11 (d, *J* =10.4 Hz, 1 H); 4.00 (d, *J* = 10.4

Hz, 1 H); 3.57 (d, *J* = 10.4 Hz, 1 H); 2.29 (s, 3 H); 1.84 – 2.16 (m, 4 H); 1.50 – 1.70 (m, 4 H); 1.11 (s, 9 H); 1.04 (s, 9 H). ^{13}C NMR (100 MHz, $CDCl_3$): δ = 167.2, 166.7, 142.7, 137.5, 134.0, 131.4, 129.8, 128.3, 128.1, 127.8, 125.9, 92.3, 88.4, 76.4, 76.1, 75.6, 31.8, 31.4, 26.7, 26.5, 25.6, 24.8, 22.2, 22.0, 21.4 ppm. IR (neat) $\tilde{\nu}$/cm^{-1} 2948, 2900, 1757, 1737, 1598, 1462, 1401, 1369, 1351, 1327, 1308, 1291, 1235, 1214, 1156, 1095, 1040, 1004, 980, 959, 916. HRMS (ESI): $C_{34}H_{45}NNaO_7S$ $[M+Na]^+$ calcd: 634.2809, found: 634.2882.

HPLC results

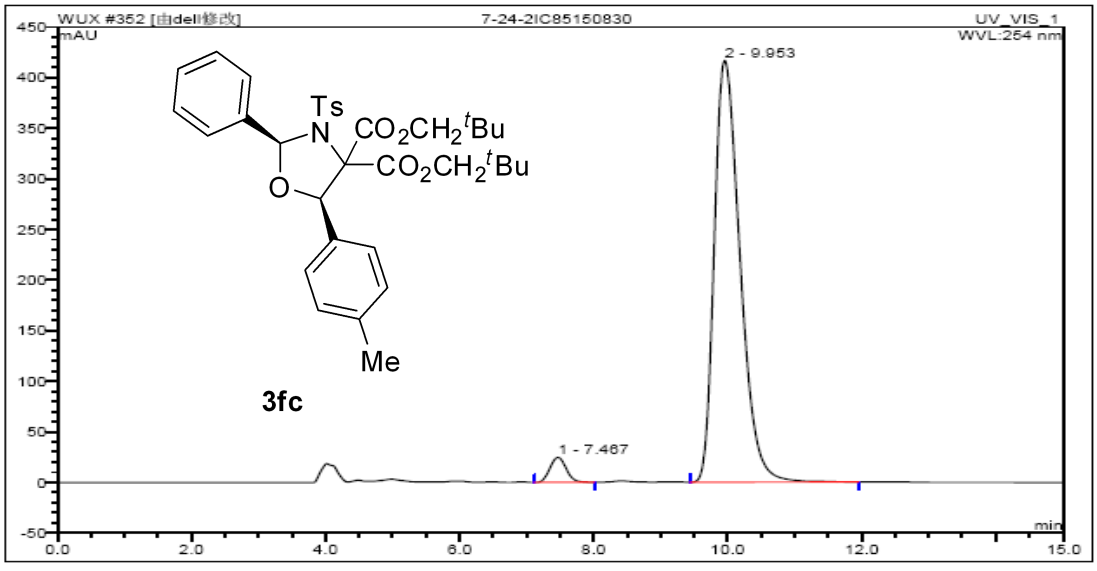
3fc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.47	n.a.		81.519	22.987	49.74	n.a.	BMB
2	10.07	n.a.		53.559	23.223	50.26	n.a.	BMB
总和:				135.078	46.210	100.00	0.000	

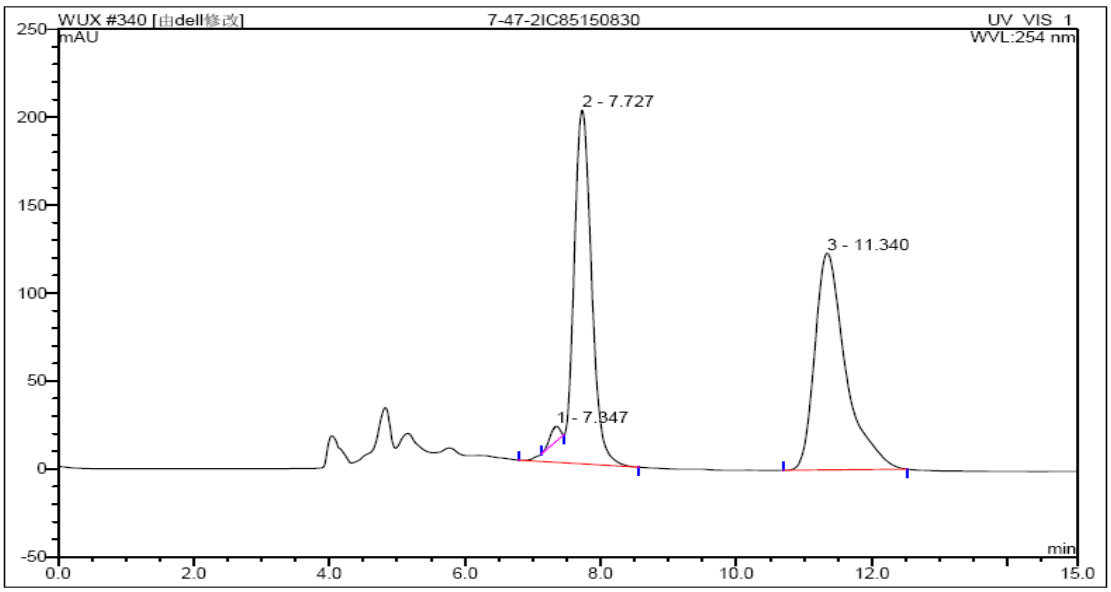
Enantioenriched **3fc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.47	n.a.		24.529	6.871	3.56	n.a.	BMB
2	9.95	n.a.		416.867	185.866	96.44	n.a.	BMB
总和:				441.397	192.737	100.00	0.000	

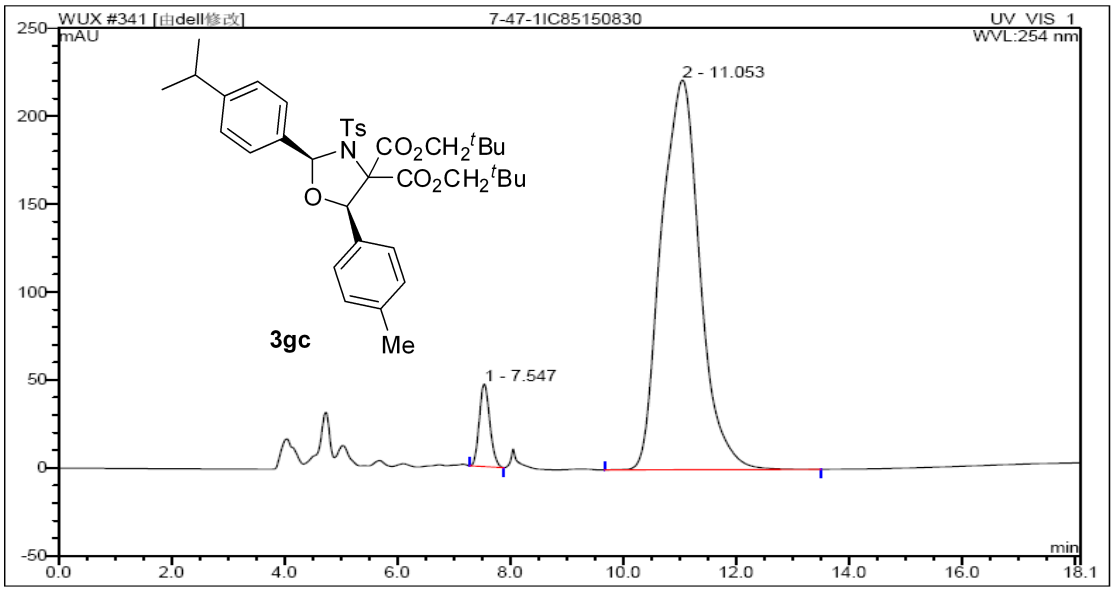
3gc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3gc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.35	n.a.		8.500	1.447	1.11	n.a.	Ru
2	7.73	n.a.		201.191	63.976	48.97	n.a.	BMB
3	11.34	n.a.		123.264	65.211	49.92	n.a.	BMB*
总和:				332.955	130.635	100.00	0.000	

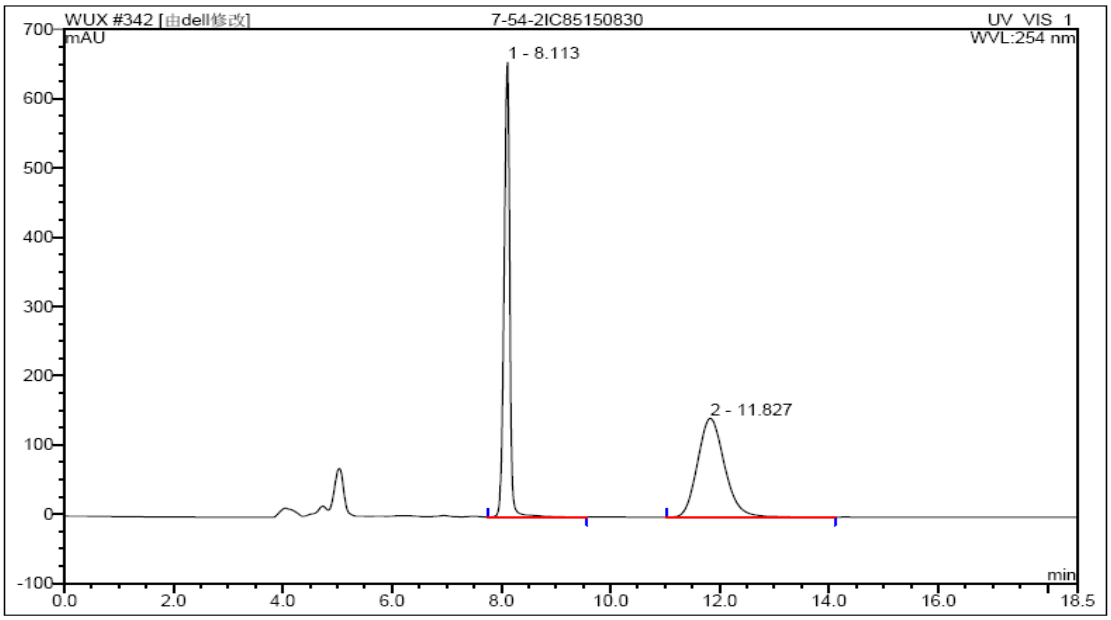
Enantioenriched **3gc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.55	n.a.		46.936	10.205	5.49	n.a.	BMB
2	11.05	n.a.		221.574	175.690	94.51	n.a.	BMB
总和:				268.510	185.895	100.00	0.000	

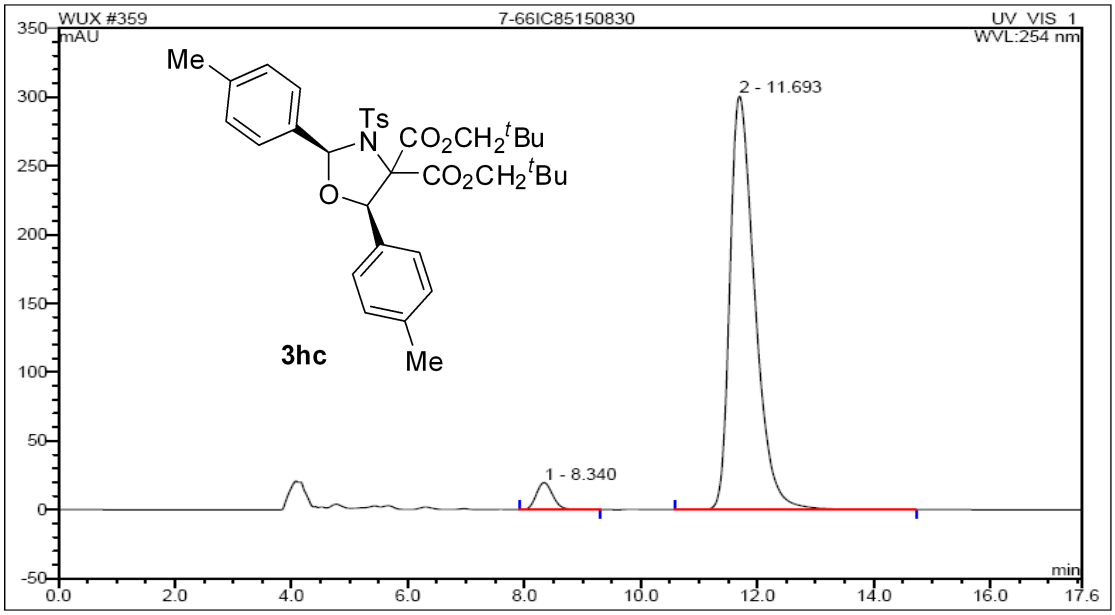
3hc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3hc**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.11	n.a.	656.421	79.440	49.30	n.a.	BMB
2	11.83	n.a.	142.592	81.684	50.70	n.a.	BMB
总和:			799.013	161.124	100.00	0.000	

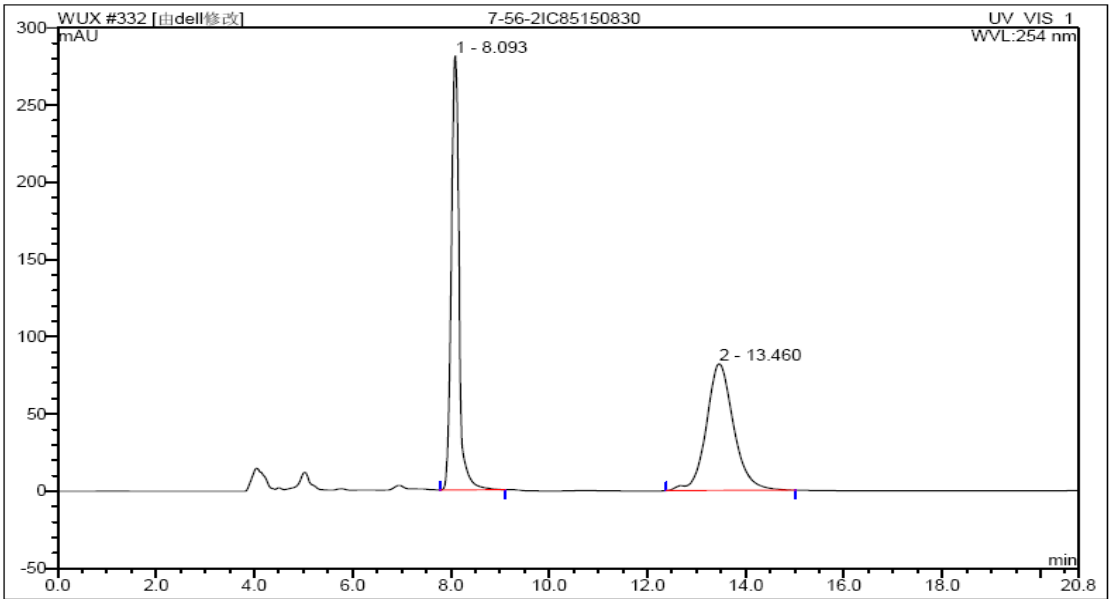
Enantioenriched **3hc**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.34	n.a.	19.649	6.478	4.17	n.a.	BMB
2	11.69	n.a.	300.696	149.058	95.83	n.a.	BMB
总和:			320.345	155.536	100.00	0.000	

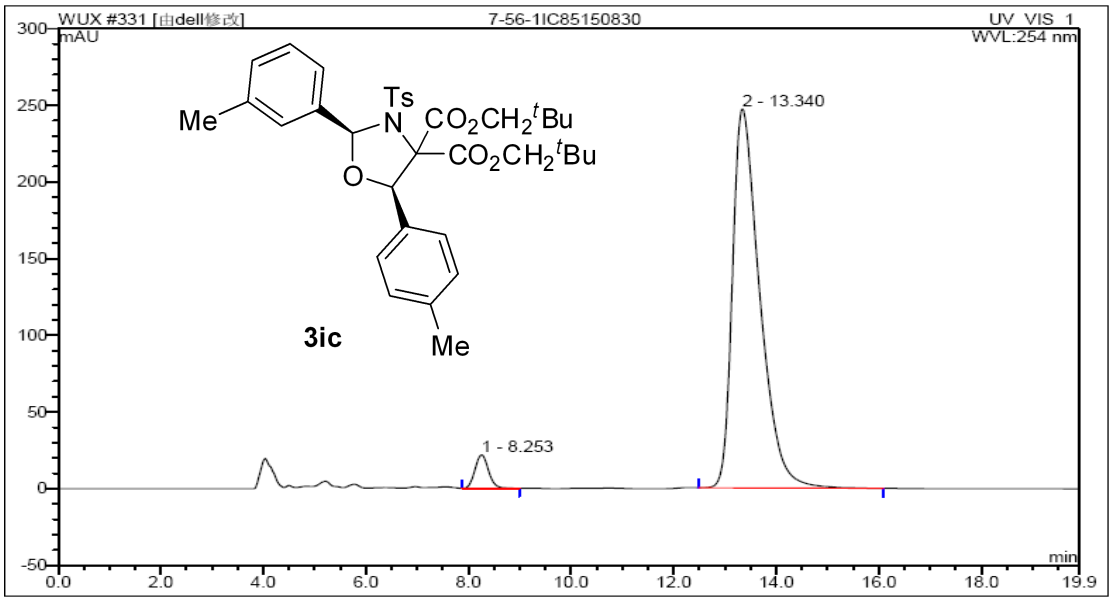
3ic HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3ic**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.09	n.a.		280.973	51.860	49.53	n.a.	BMB
2	13.46	n.a.		82.024	52.849	50.47	n.a.	BMB*
总和:				362.998	104.709	100.00	0.000	

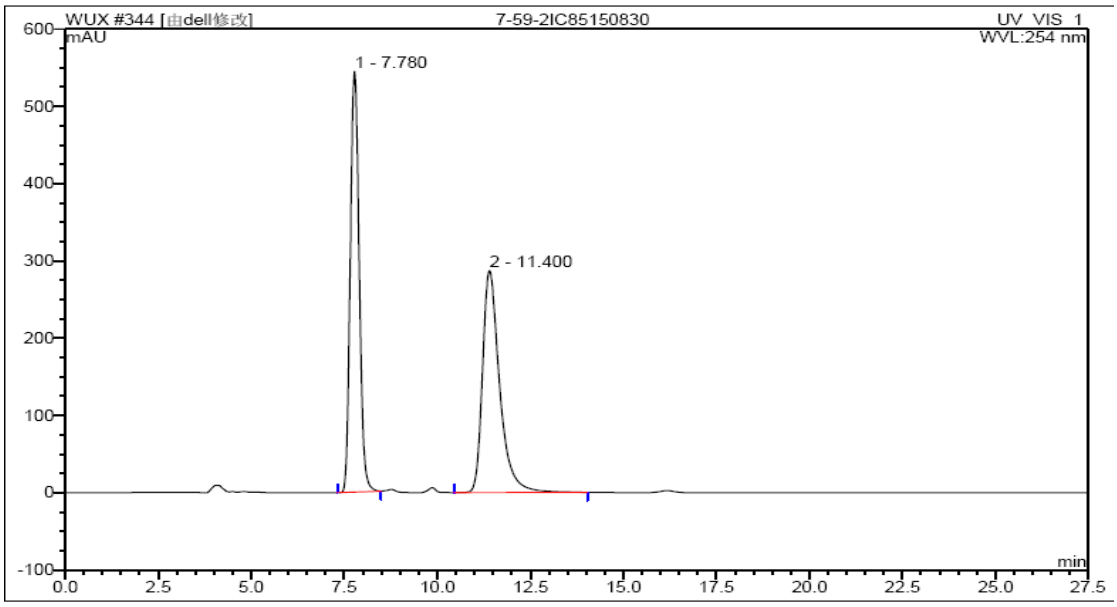
Enantioenriched **3ic**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.25	n.a.		21.815	6.602	4.15	n.a.	BMB
2	13.34	n.a.		247.066	152.448	95.85	n.a.	BMB
总和:				268.881	159.049	100.00	0.000	

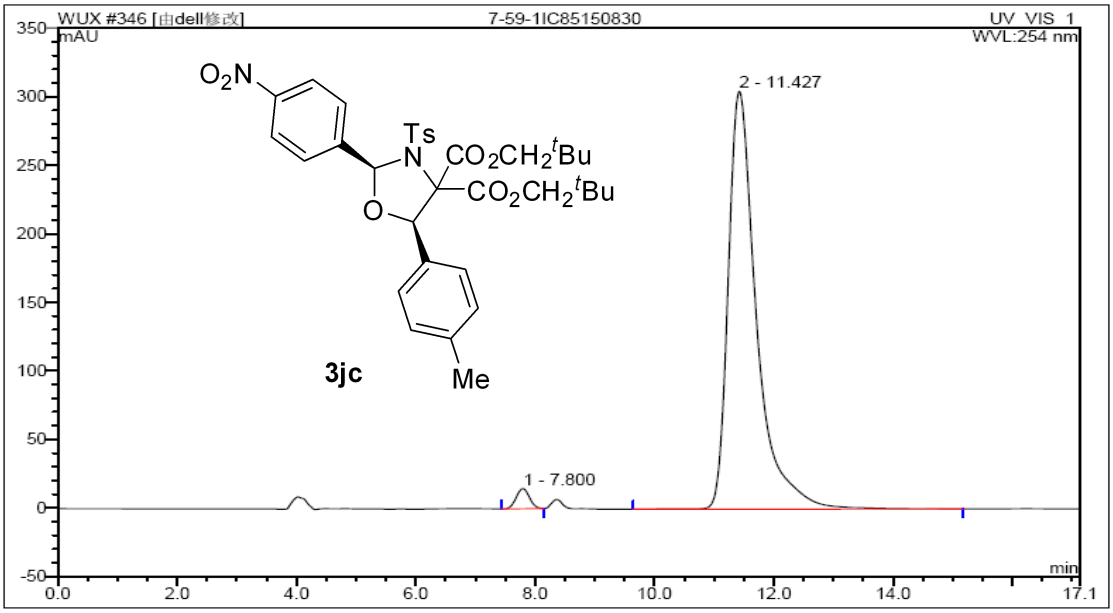
3jc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3jc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.78	n.a.		544.070	151.262	49.73	n.a.	BMB*
2	11.40	n.a.		287.044	152.892	50.27	n.a.	BMB
总和:				831.115	304.154	100.00	0.000	

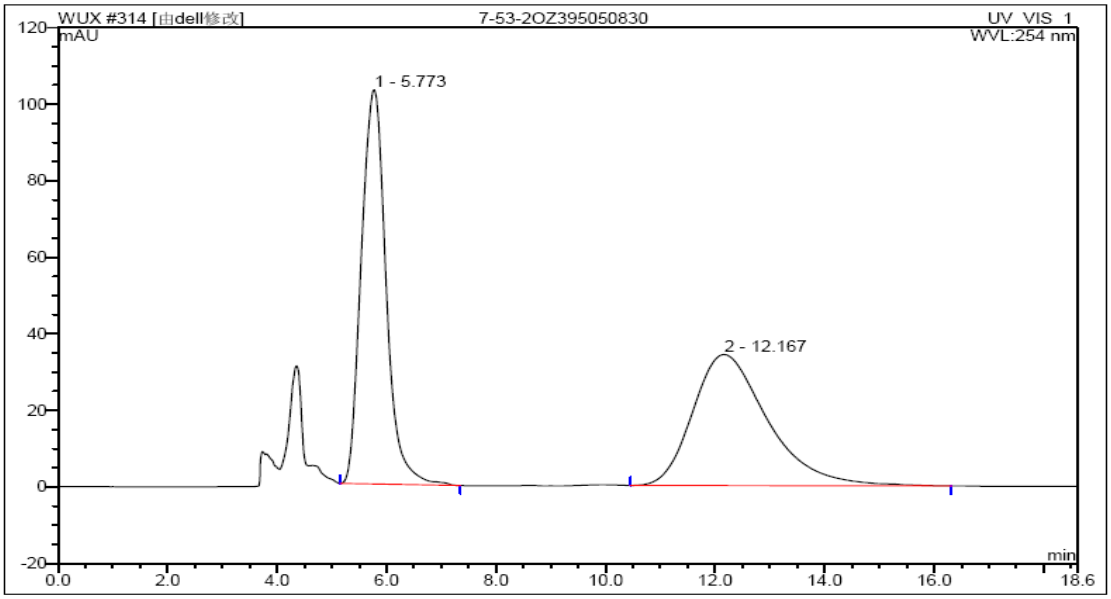
Enantioenriched **3jc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.80	n.a.		14.611	3.760	2.19	n.a.	BMB*
2	11.43	n.a.		304.864	167.643	97.81	n.a.	BMB
总和:				319.475	171.404	100.00	0.000	

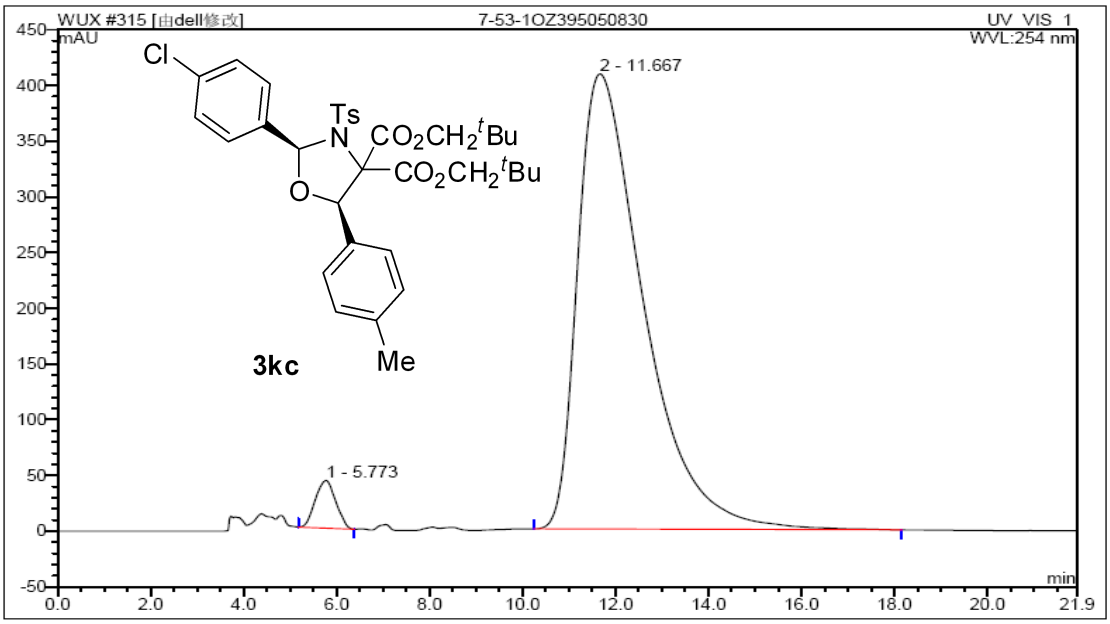
3kc HPLC using an OZ3 (*n*-Hexane/*i*PrOH=95/05, flow rate 0.8 ml/min)

Racemic **3kc**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	5.77	n.a.	102.977	53.923	49.91	n.a.	BMB
2	12.17	n.a.	34.213	54.110	50.09	n.a.	BMB
总和:			137.190	108.033	100.00	0.000	

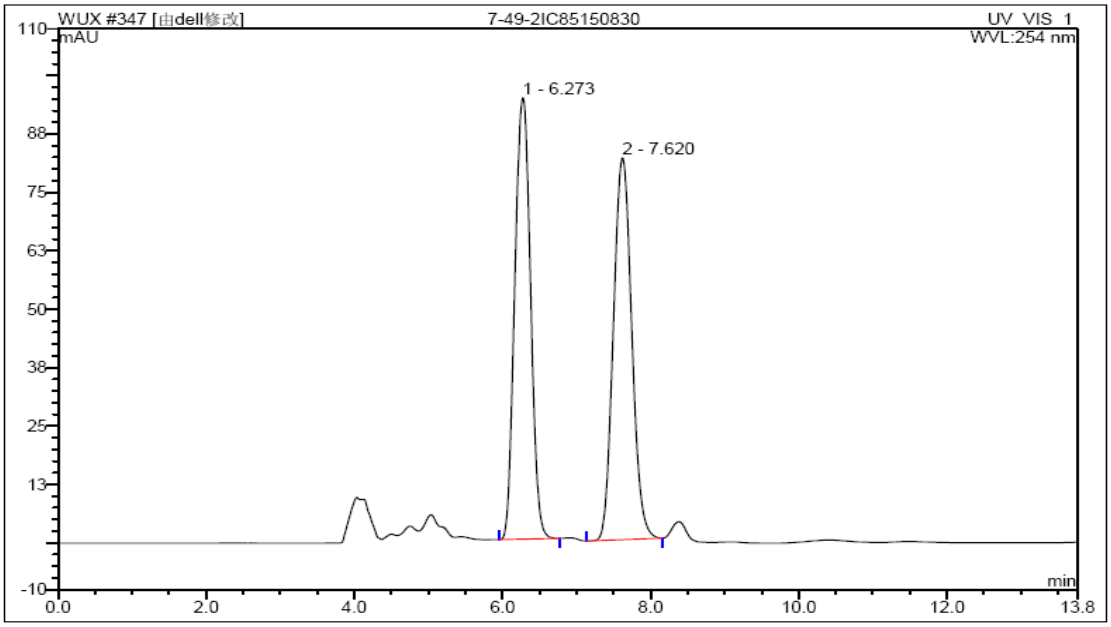
Enantioenriched **3kc**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	5.77	n.a.	42.707	21.732	3.14	n.a.	BMB
2	11.67	n.a.	408.331	670.202	96.86	n.a.	BMB*
总和:			451.037	691.934	100.00	0.000	

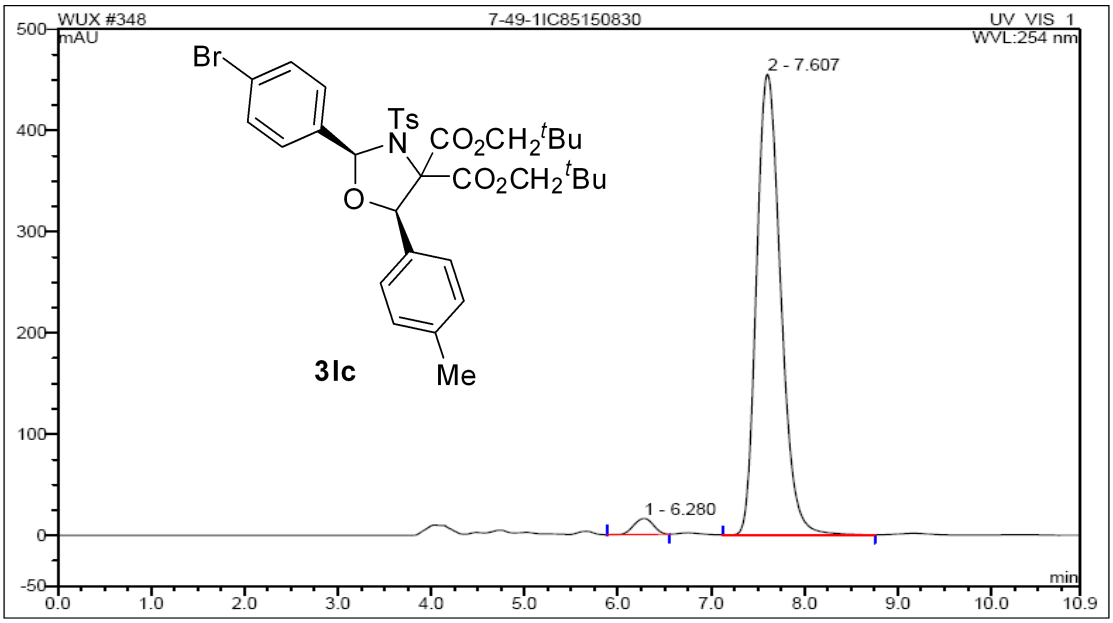
3lc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3lc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.27	n.a.		94.458	23.275	49.83	n.a.	BMB
2	7.62	n.a.		81.725	23.435	50.17	n.a.	BMB*
总和:				176.183	46.710	100.00	0.000	

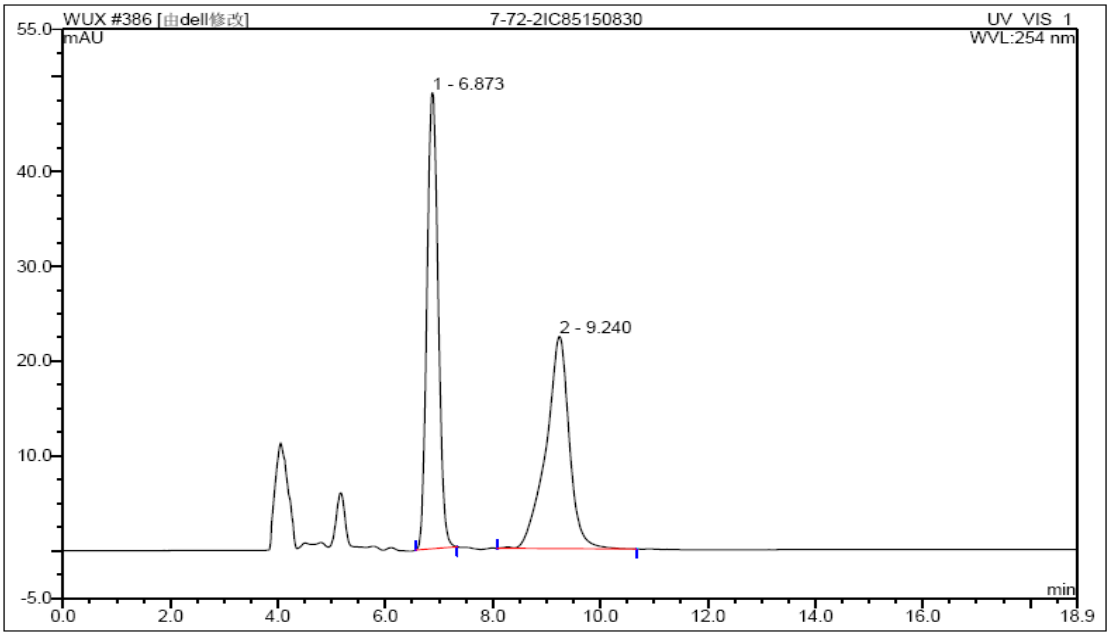
Enantioenriched **3lc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.28	n.a.		15.647	3.766	2.68	n.a.	BMB
2	7.61	n.a.		454.907	136.778	97.32	n.a.	BMB
总和:				470.554	140.544	100.00	0.000	

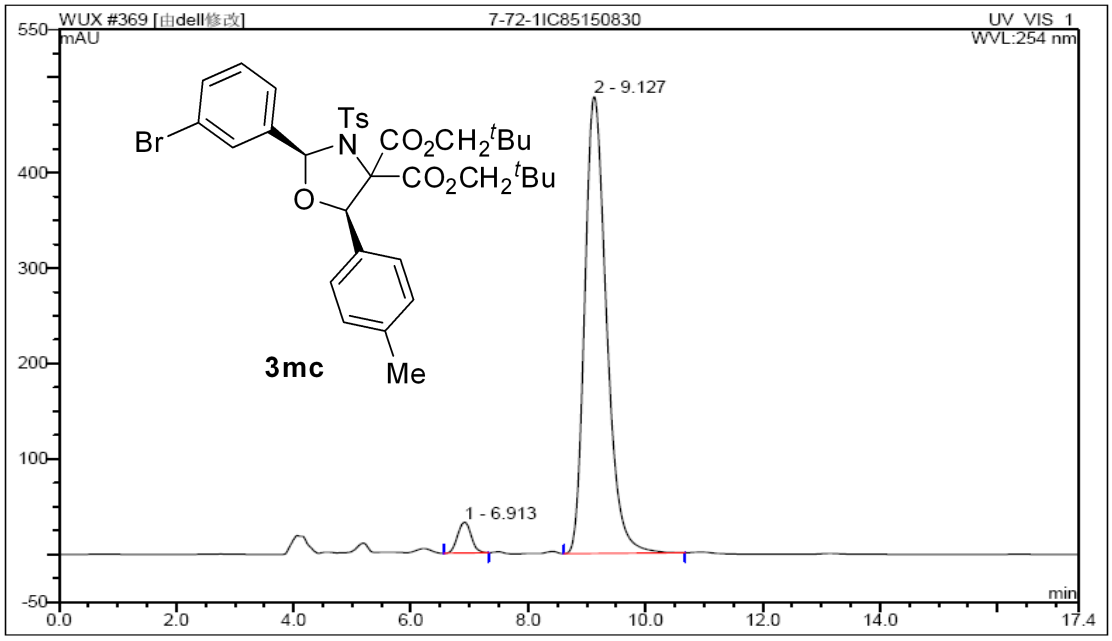
3mc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3mc**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.87	n.a.	48.081	11.612	50.77	n.a.	BMB*
2	9.24	n.a.	22.375	11.260	49.23	n.a.	BMB*
总和:			70.456	22.873	100.00	0.000	

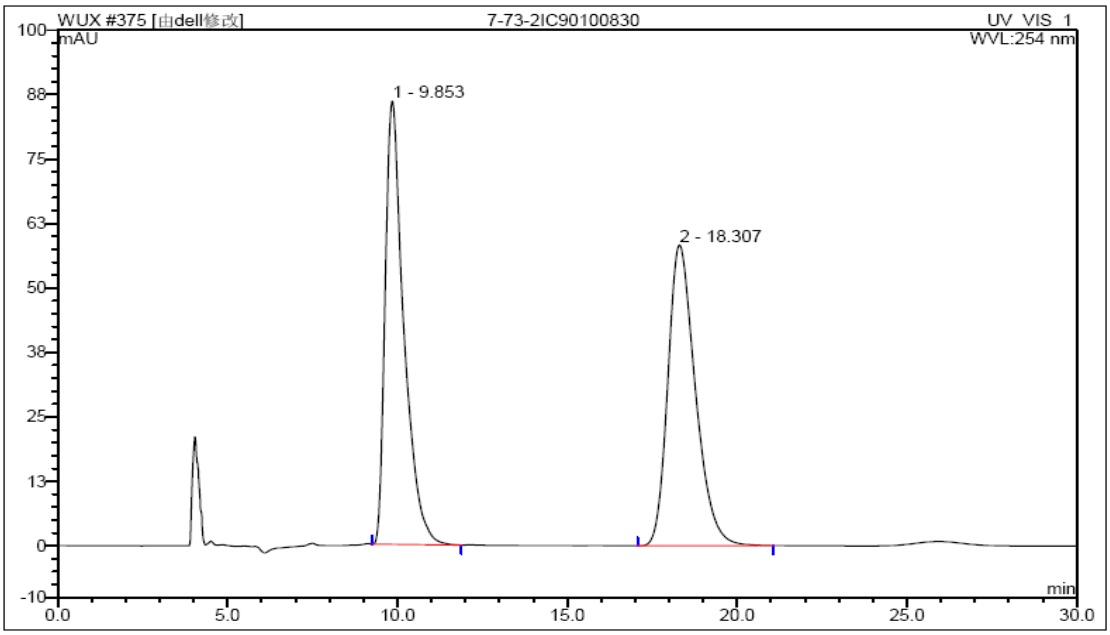
Enantioenriched **3mc**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.91	n.a.	32.321	8.709	4.07	n.a.	BMB
2	9.13	n.a.	478.816	205.228	95.93	n.a.	BMB
总和:			511.137	213.937	100.00	0.000	

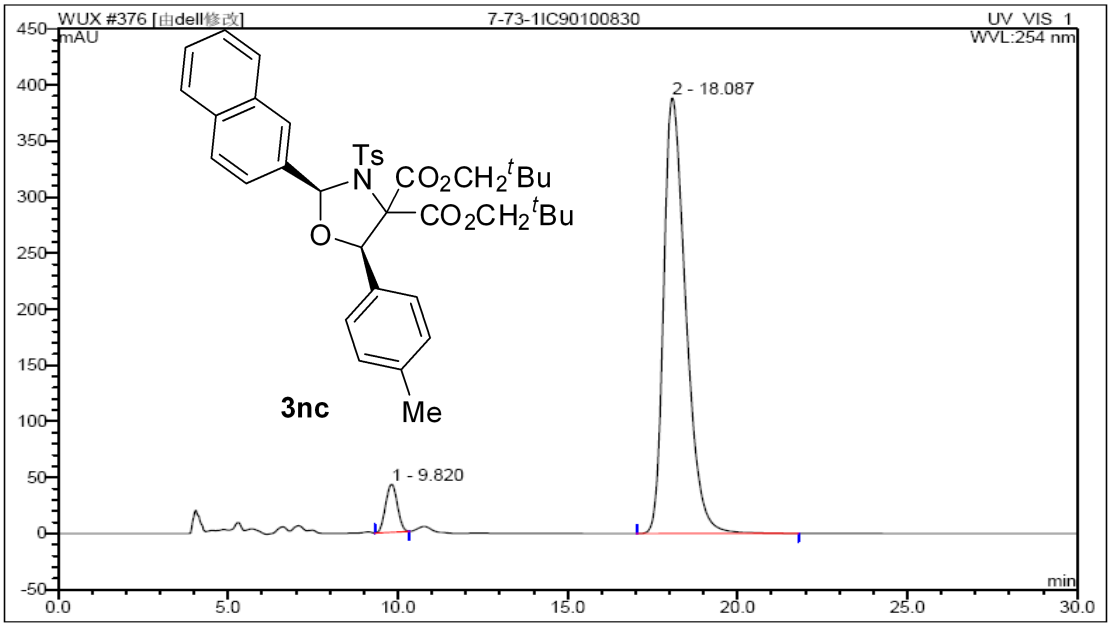
3nc HPLC using an IC (*n*-Hexane/*i*PrOH=90/10, flow rate 0.8 ml/min)

Racemic **3nc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	9.85	n.a.		85.946	54.658	49.97	n.a.	BMB
2	18.31	n.a.		58.317	54.717	50.03	n.a.	BMB
总和:				144.263	109.375	100.00	0.000	

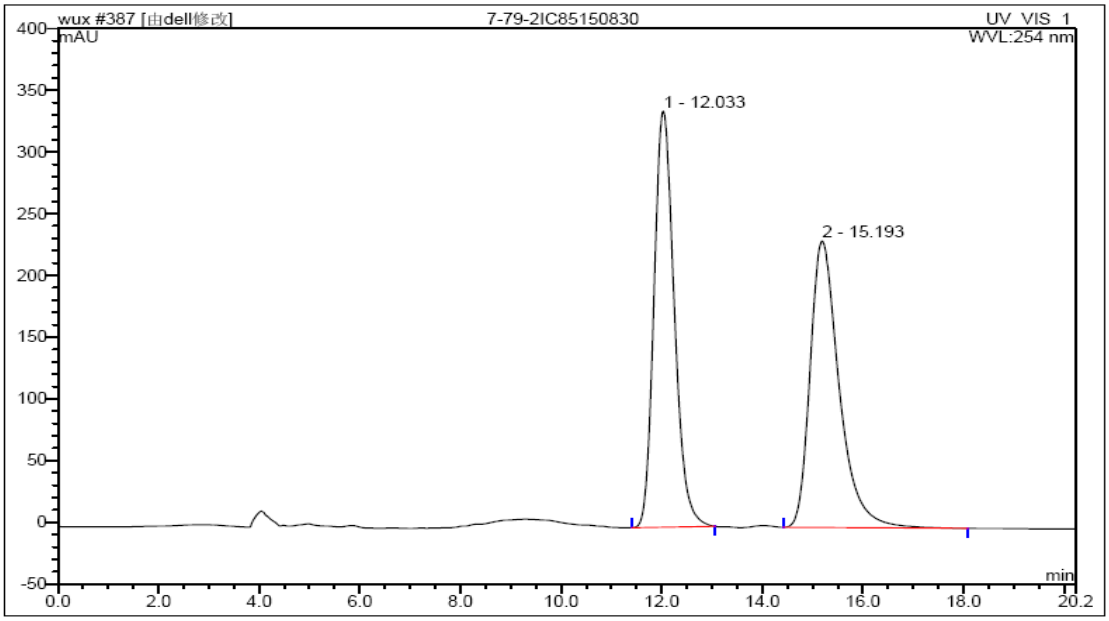
Enantioenriched **3nc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	9.82	n.a.		42.732	17.184	5.55	n.a.	BMB*
2	18.09	n.a.		388.248	292.681	94.45	n.a.	BMB
总和:				430.981	309.865	100.00	0.000	

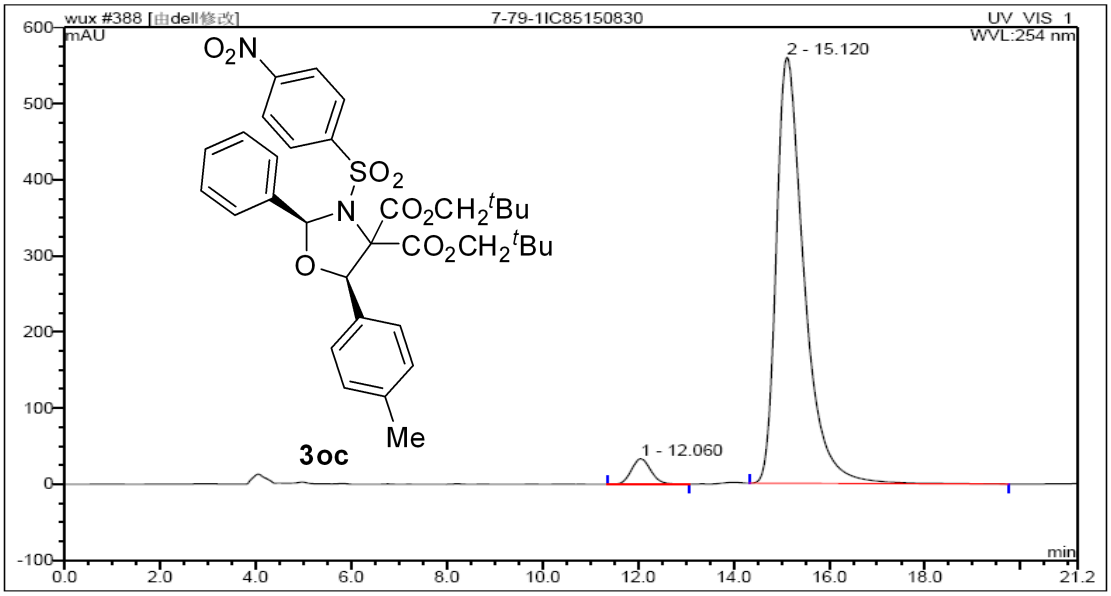
3oc HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3oc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	12.03	n.a.		337.149	157.316	50.30	n.a.	BMB*
2	15.19	n.a.		232.032	155.428	49.70	n.a.	BMB
总和:				569.181	312.744	100.00	0.000	

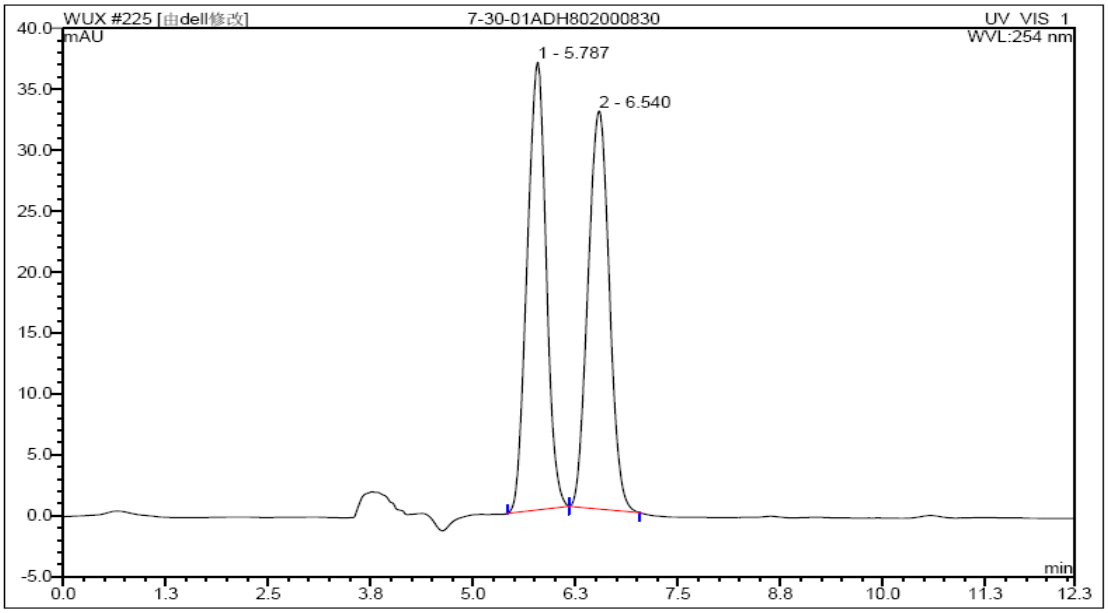
Enantioenriched **3oc**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	12.06	n.a.		33.453	15.803	4.03	n.a.	BMB
2	15.12	n.a.		559.387	376.788	95.97	n.a.	BMB
总和:				592.839	392.592	100.00	0.000	

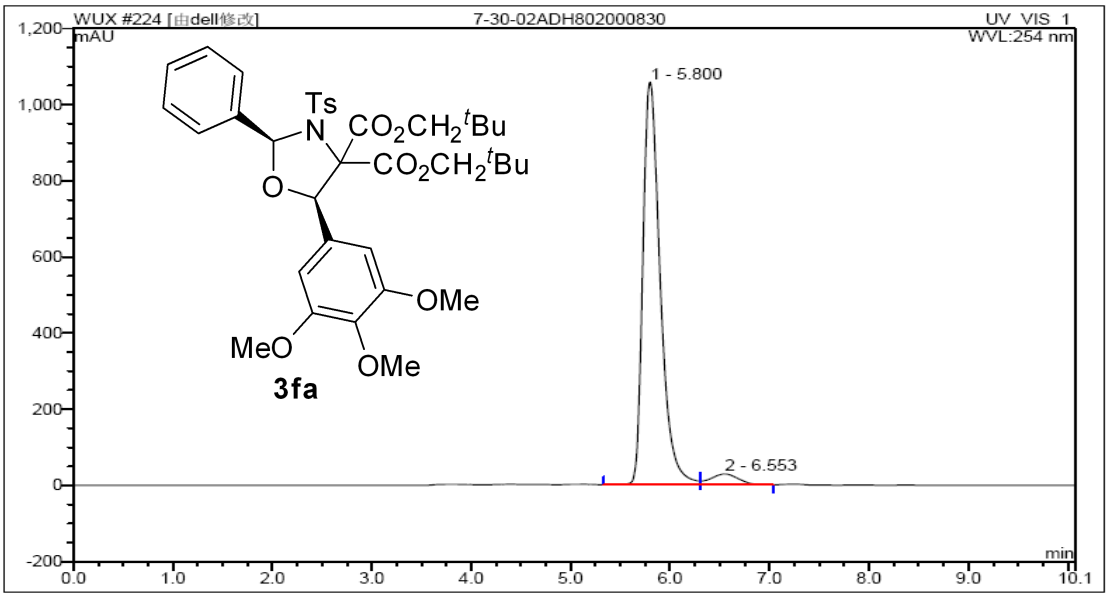
3fa HPLC using an ADH (*n*-Hexane/*i*PrOH=80/20, flow rate 0.8 ml/min)

Racemic **3fa**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	5.79	n.a.		36.746	9.879	50.06	n.a.	BMb*
2	6.54	n.a.		32.667	9.854	49.94	n.a.	bMB*
总和:				69.412	19.733	100.00	0.000	

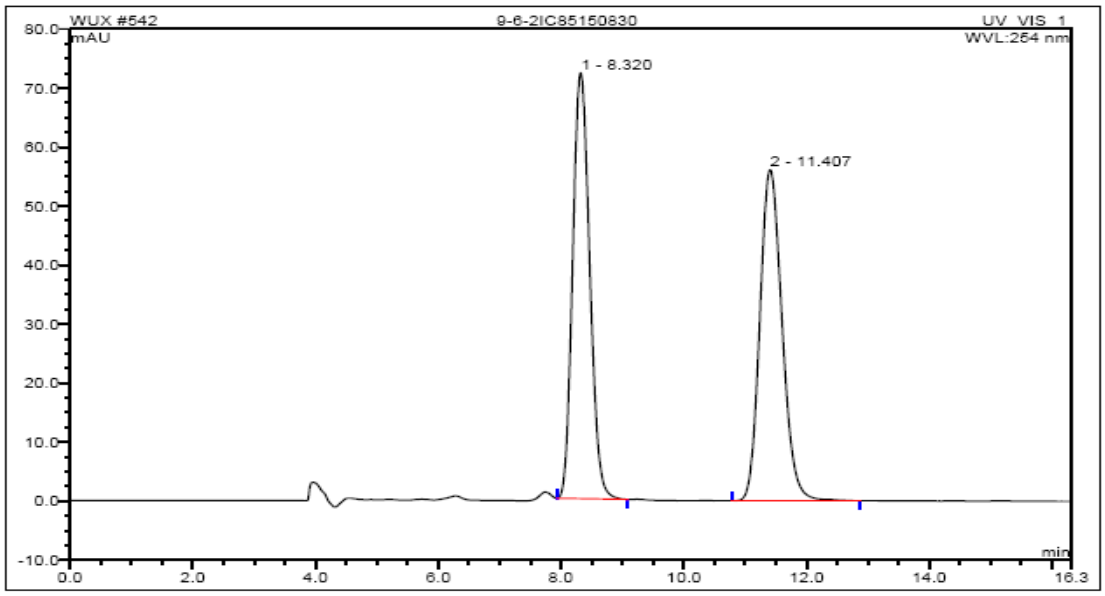
Enantioenriched **3fa**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	5.80	n.a.		1057.830	214.525	95.90	n.a.	BM *
2	6.55	n.a.		28.348	9.166	4.10	n.a.	MB*
总和:				1086.178	223.691	100.00	0.000	

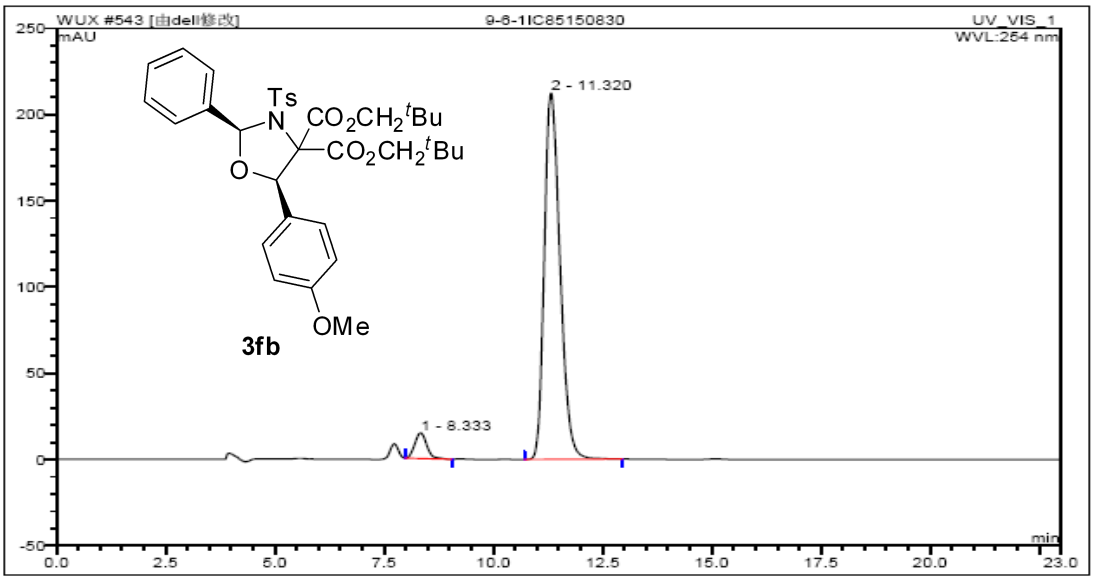
3fb HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fb**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.32	n.a.		72.186	23.156	49.65	n.a.	BMB
2	11.41	n.a.		56.092	23.478	50.35	n.a.	BMB
总和:				128.277	46.634	100.00	0.000	

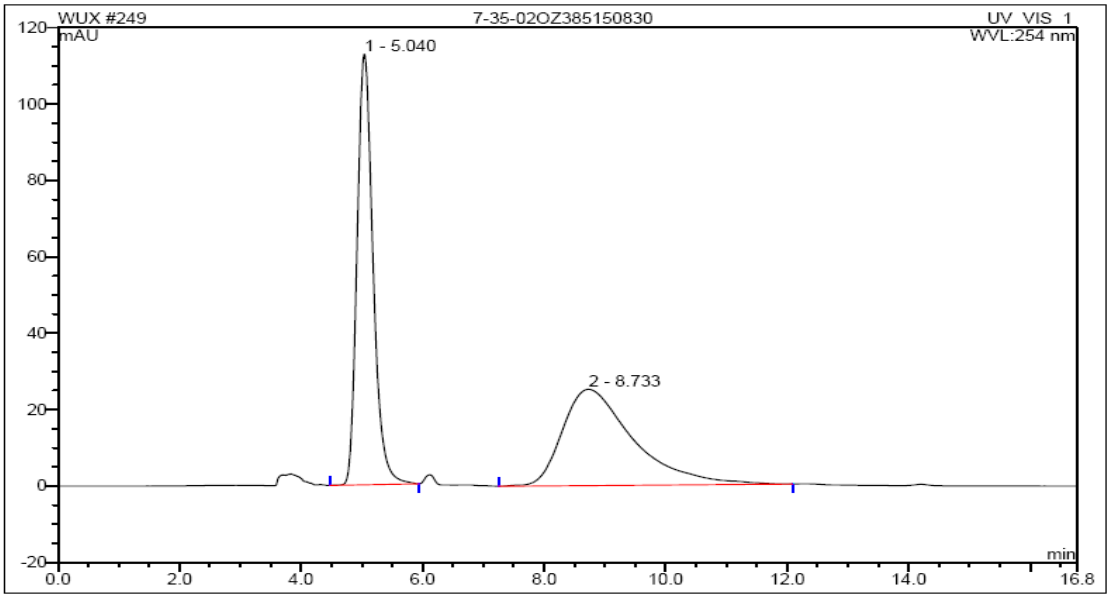
Enantioenriched **3fb**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.33	n.a.		14.930	4.780	5.12	n.a.	BMB*
2	11.32	n.a.		212.385	88.634	94.88	n.a.	BMB
总和:				227.315	93.413	100.00	0.000	

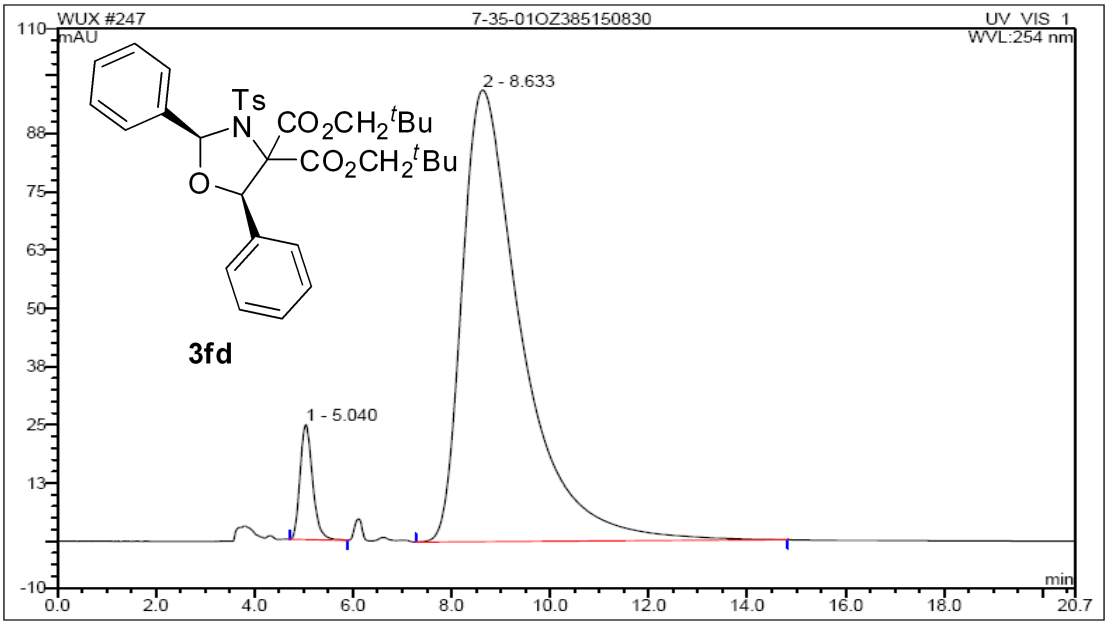
3fd HPLC using an OZ3 (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fd**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	5.04	n.a.		112.708	34.352	50.17	n.a.	BMB
2	8.73	n.a.		25.214	34.121	49.83	n.a.	BMB
总和:				137.922	68.473	100.00	0.000	

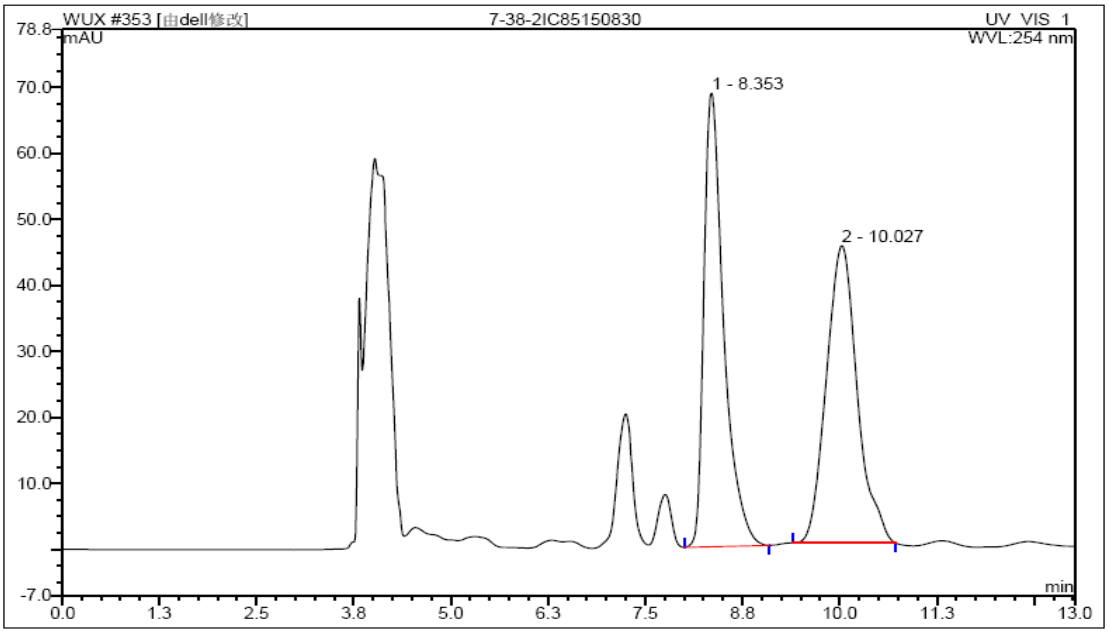
Enantioenriched **3fd**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	5.04	n.a.		24.650	7.295	5.12	n.a.	BMB
2	8.63	n.a.		96.911	135.255	94.88	n.a.	BMB
总和:				121.561	142.549	100.00	0.000	

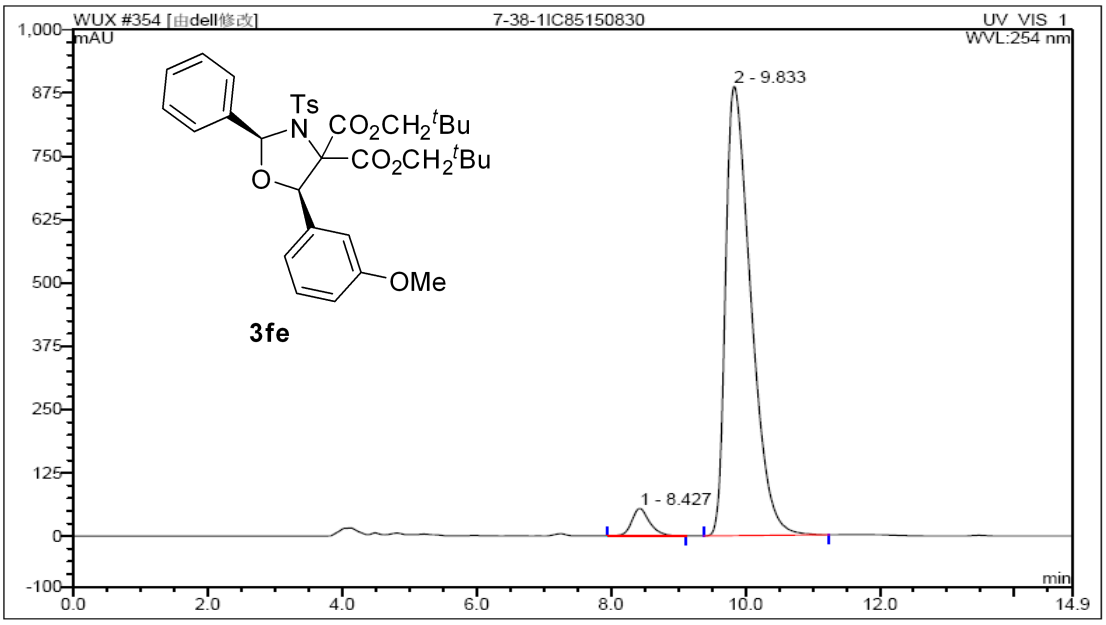
3fe HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fe**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.35	n.a.	68.742	20.325	49.51	n.a.	BMB*
2	10.03	n.a.	45.002	20.731	50.49	n.a.	BMB*
总和:			113.744	41.056	100.00	0.000	

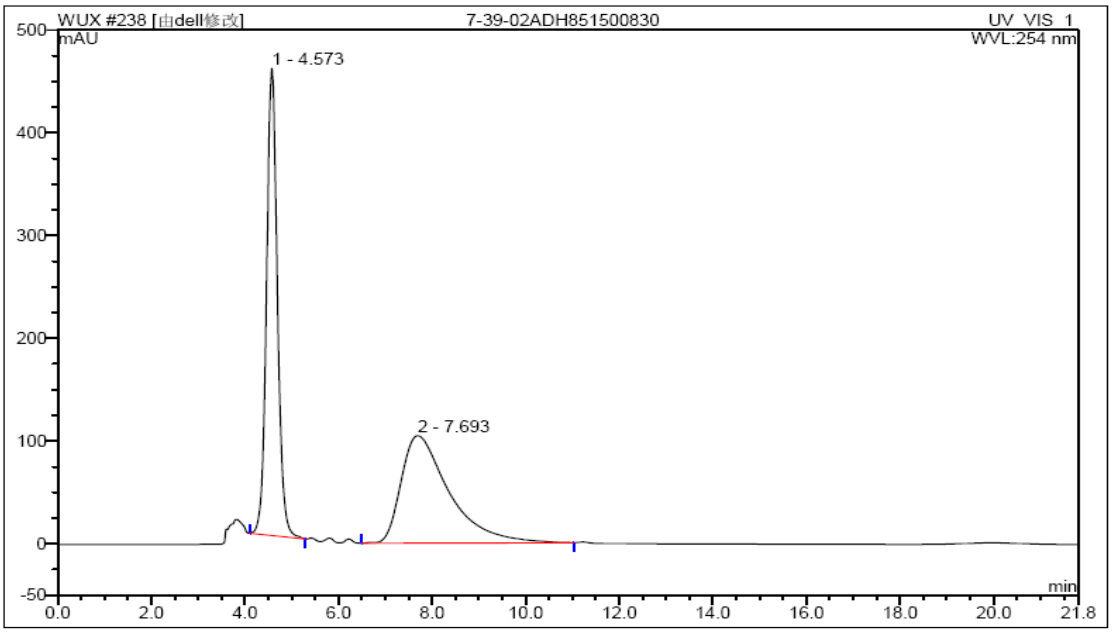
Enantioenriched **3fe**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.43	n.a.	53.799	16.475	4.10	n.a.	BMB
2	9.83	n.a.	886.489	385.665	95.90	n.a.	BMB*
总和:			940.288	402.140	100.00	0.000	

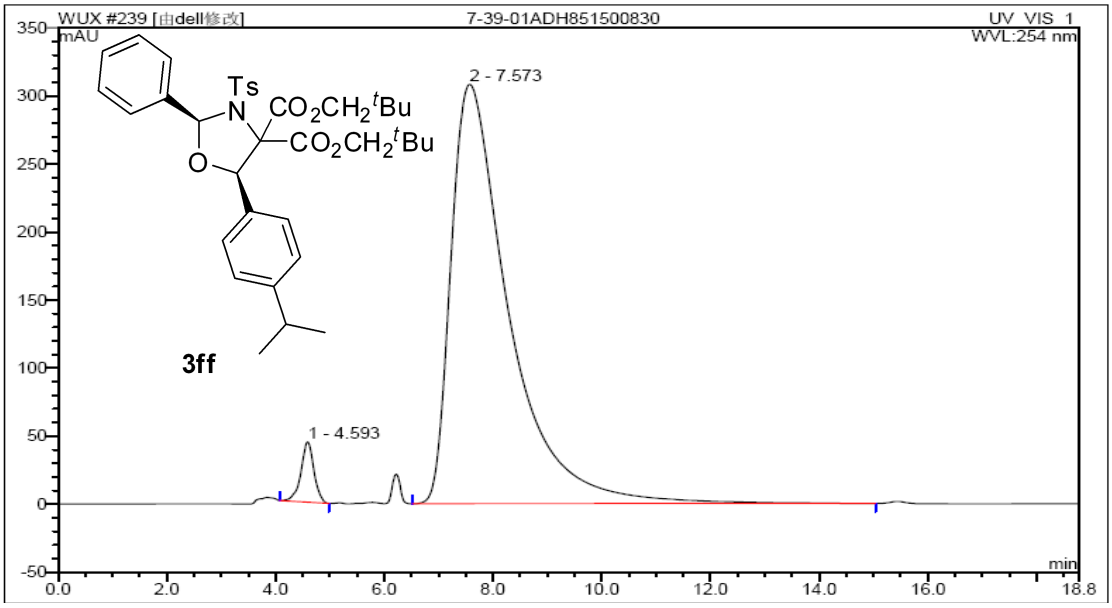
3ff HPLC using an ADH (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3ff**



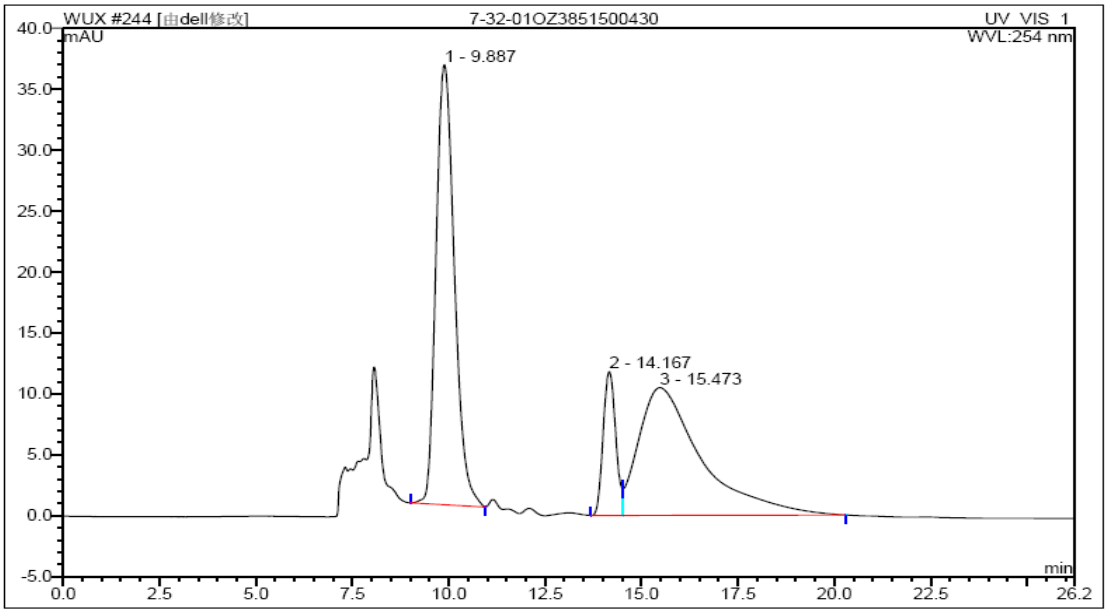
序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	4.57	n.a.		454.835	121.881	49.57	n.a.	BMB*
2	7.69	n.a.		104.599	124.005	50.43	n.a.	BMB
总和:				559.435	245.886	100.00	0.000	

Enantioenriched **3ff**



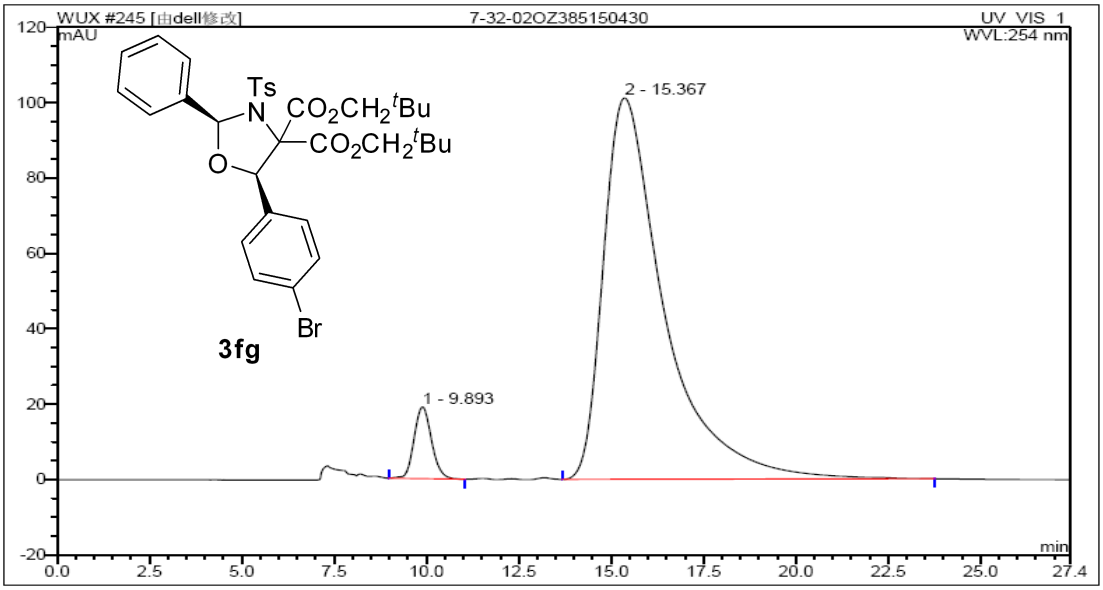
序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	4.59	n.a.		44.396	12.320	3.14	n.a.	BMB
2	7.57	n.a.		308.252	379.579	96.86	n.a.	BMB
总和:				352.647	391.899	100.00	0.000	

Racemic **3fg**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	9.89	n.a.		36.121	19.964	45.18	n.a.	BMB
2	14.17	n.a.		11.816	4.474	10.13	n.a.	BM
3	15.47	n.a.		10.488	19.747	44.69	n.a.	MB
总和:				58.425	44.186	100.00	0.000	

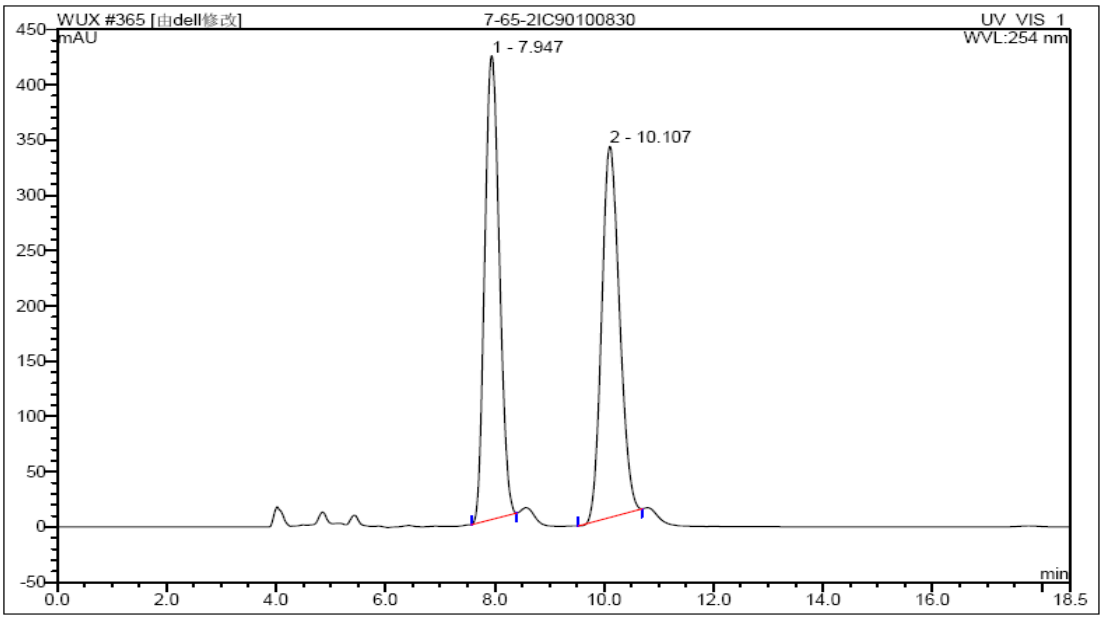
Enantioenriched **3fg**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	9.89	n.a.		19.027	10.459	5.14	n.a.	BMB
2	15.37	n.a.		101.182	193.140	94.86	n.a.	BMB
总和:				120.208	203.599	100.00	0.000	

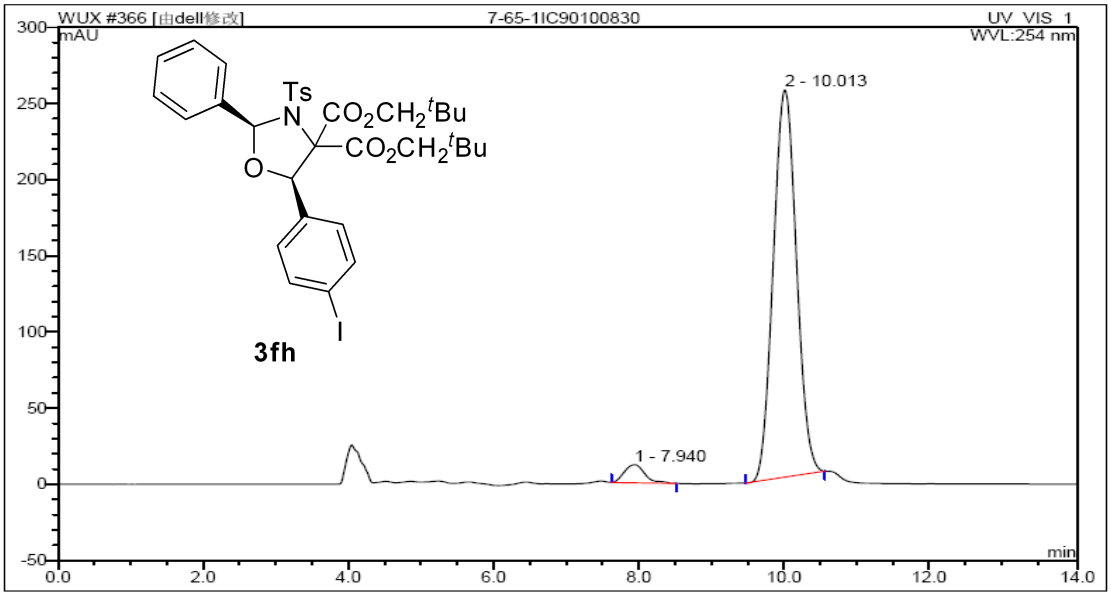
3fh HPLC using an IC (*n*-Hexane/*i*PrOH=90/10, flow rate 0.8 ml/min)

Racemic **3fh**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.95	n.a.		419.300	130.090	50.64	n.a.	BMB*
2	10.11	n.a.		335.580	126.823	49.36	n.a.	BMB*
总和:				754.880	256.913	100.00	0.000	

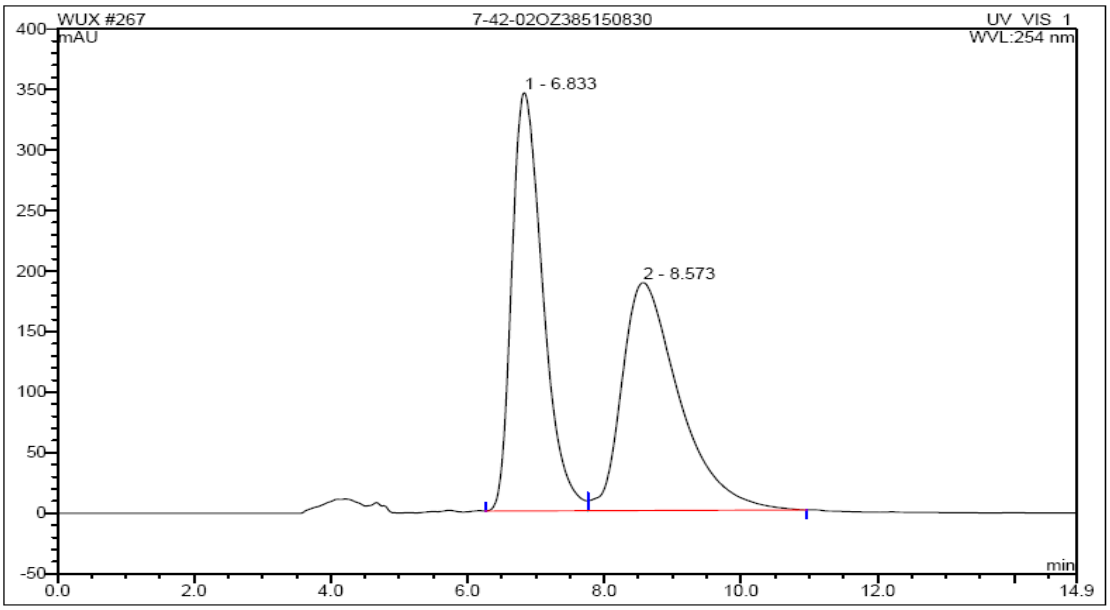
Enantioenriched **3fh**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	7.94	n.a.		11.910	3.887	3.97	n.a.	BMB
2	10.01	n.a.		254.307	93.926	96.03	n.a.	BMB*
总和:				266.217	97.813	100.00	0.000	

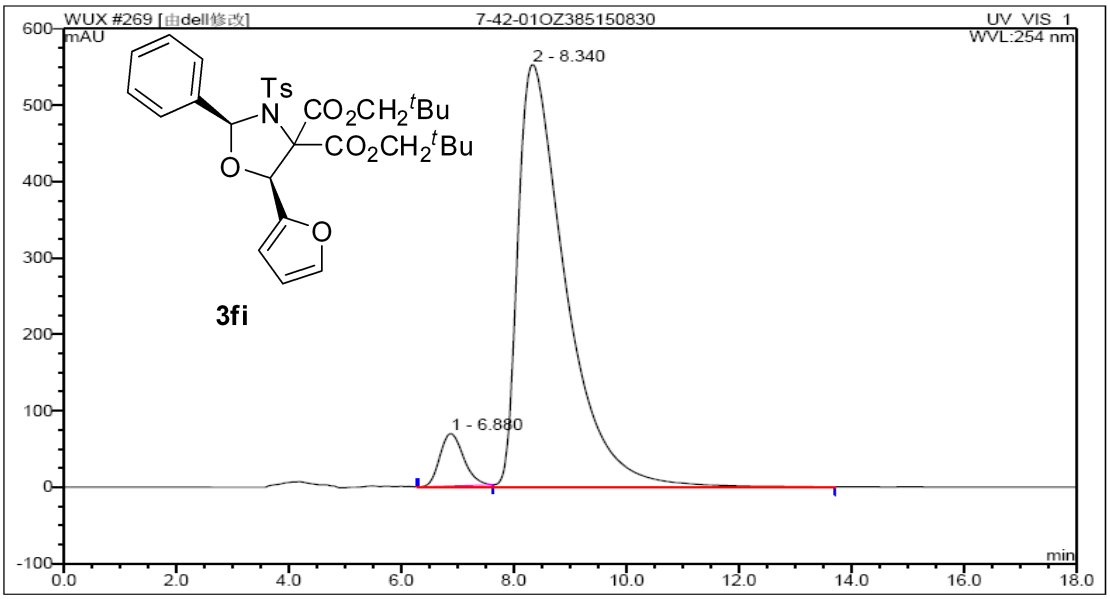
3fi HPLC using an OZ3 (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fi**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.83	n.a.		345.397	182.877	49.96	n.a.	BM
2	8.57	n.a.		188.268	183.184	50.04	n.a.	MB
总和:				533.665	366.061	100.00	0.000	

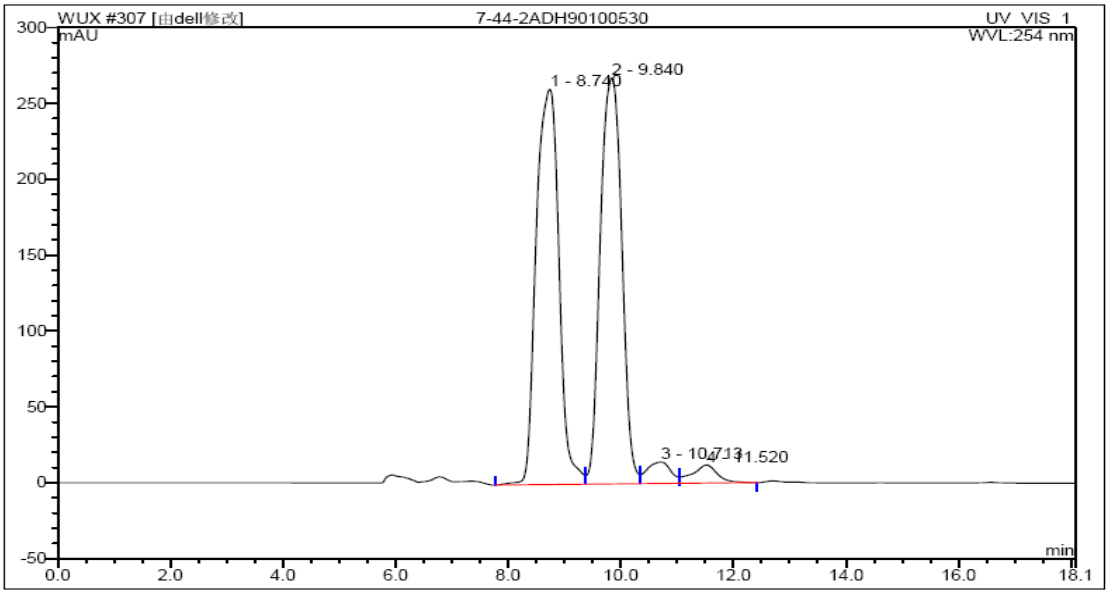
Enantioenriched **3fi**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.88	n.a.		68.424	33.384	5.80	n.a.	Ru
2	8.34	n.a.		552.554	542.298	94.20	n.a.	BMB
总和:				620.978	575.682	100.00	0.000	

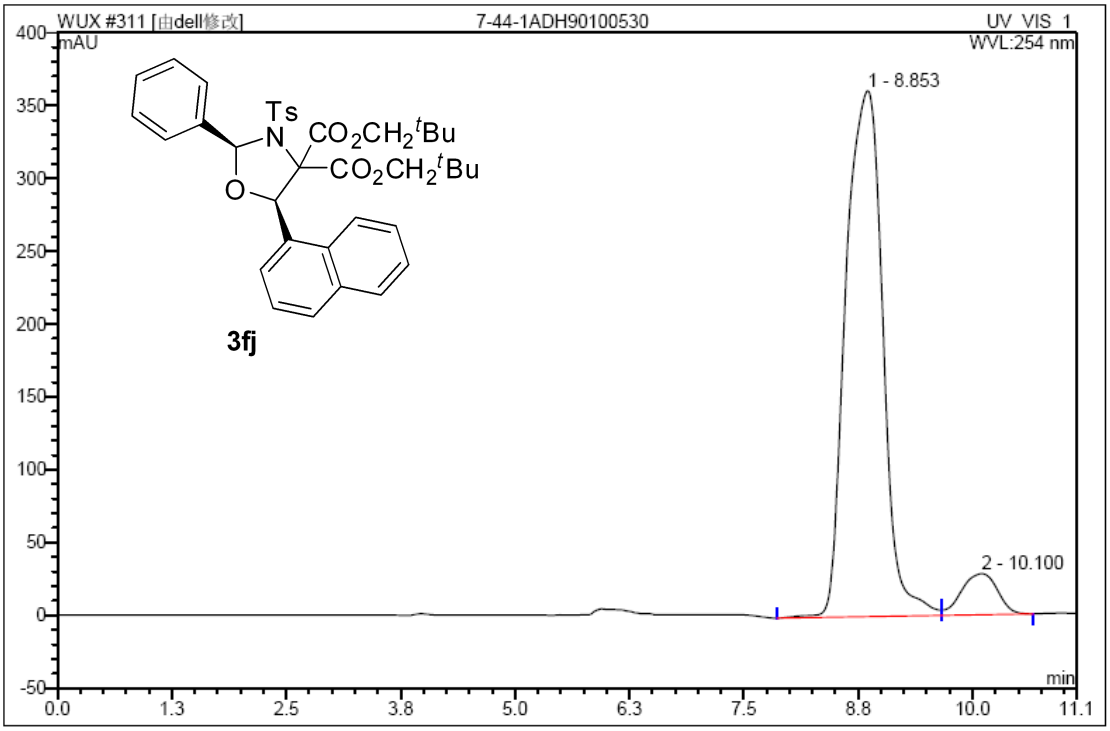
3fj HPLC using an ADH (*n*-Hexane/*i*PrOH=90/10, flow rate 0.5 ml/min)

Racemic **3fj**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.74	n.a.		260.552	122.251	48.14	n.a.	BM
2	9.84	n.a.		267.552	118.524	46.68	n.a.	M
3	10.71	n.a.		14.155	6.932	2.73	n.a.	M
4	11.52	n.a.		11.922	6.226	2.45	n.a.	MB
总和:				554.181	253.933	100.00	0.000	

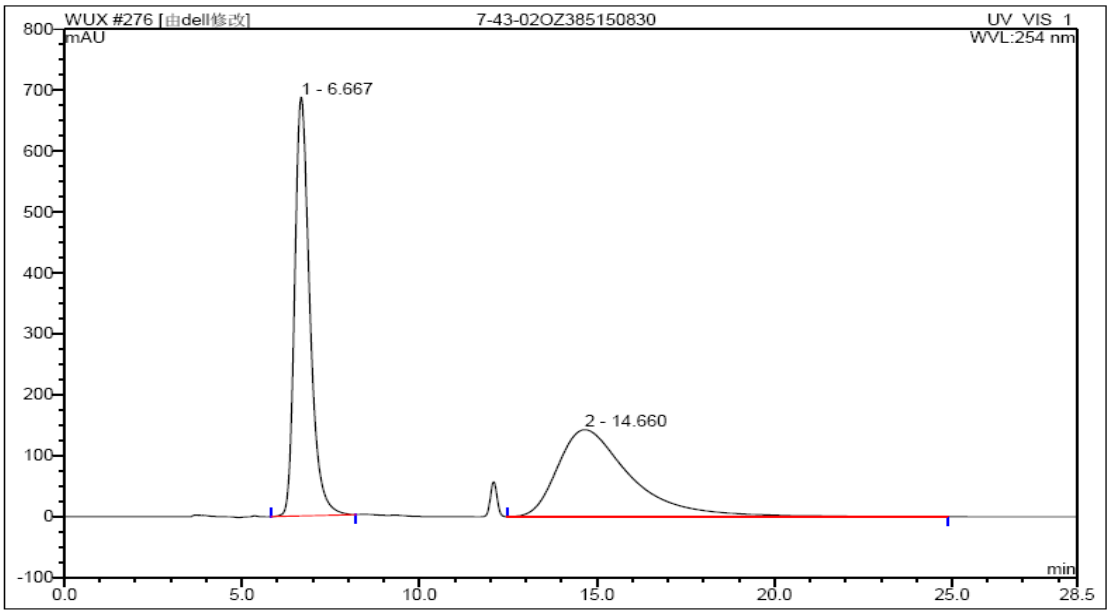
Enantioenriched **3fj**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	8.85	n.a.		360.990	168.852	92.95	n.a.	BM
2	10.10	n.a.		28.056	12.797	7.05	n.a.	MB
总和:				389.046	181.650	100.00	0.000	

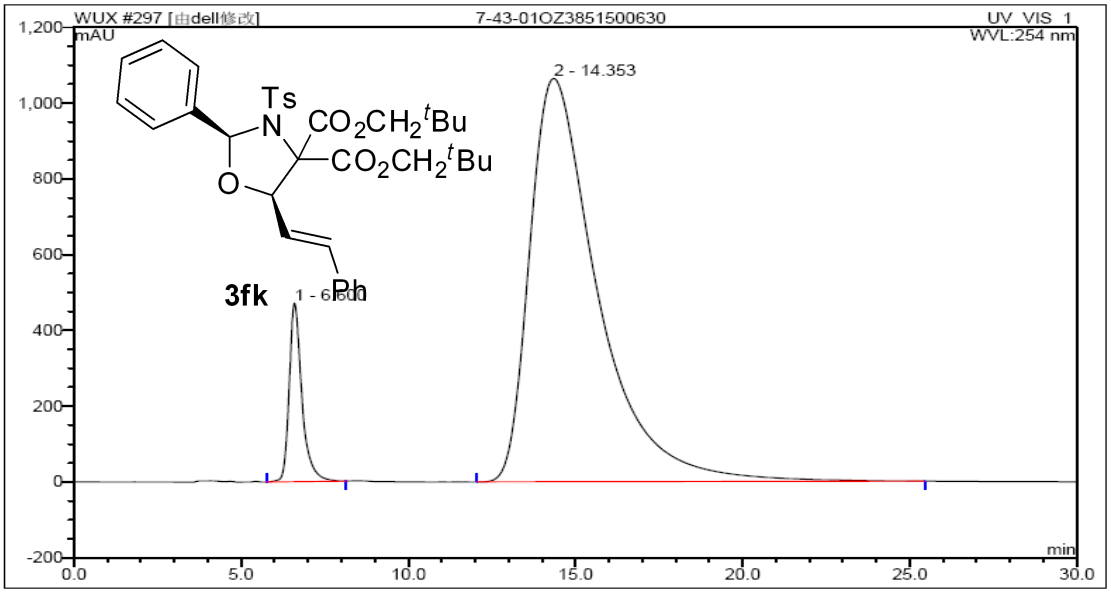
3fk HPLC using an OZ3 (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fk**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.67	n.a.		687.213	339.847	50.05	n.a.	BMB
2	14.66	n.a.		142.715	339.218	49.95	n.a.	BMB*
总和:				829.928	679.065	100.00	0.000	

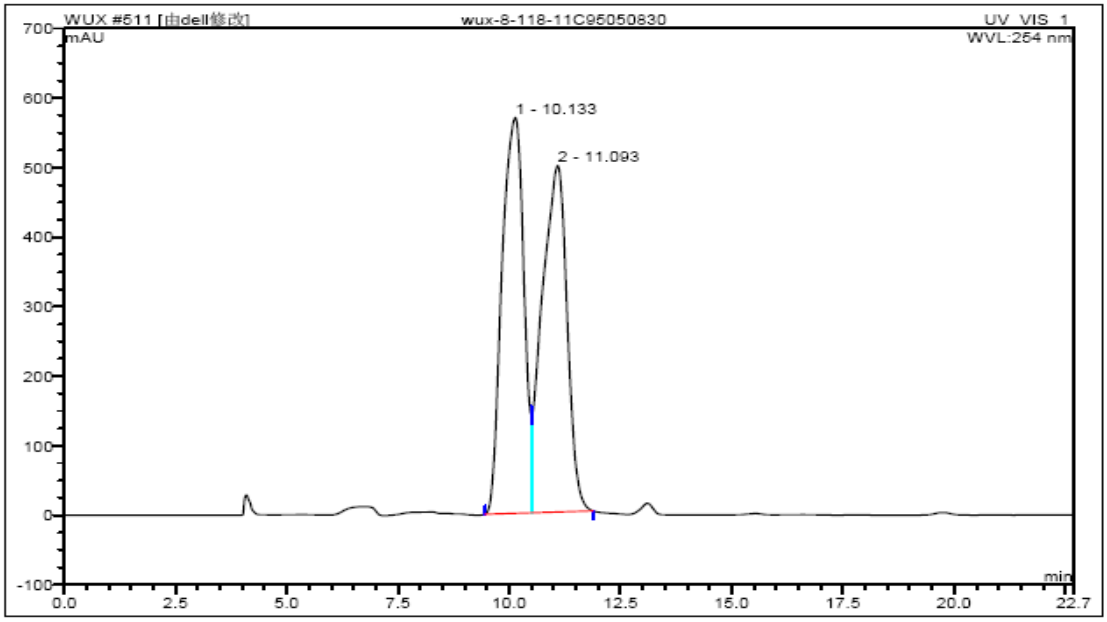
Enantioenriched **3fk**



序号	保留时间 min		峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.60	n.a.		471.128	208.184	7.65	n.a.	BMB
2	14.35	n.a.		1064.687	2511.500	92.35	n.a.	BMB*
总和:				1535.815	2719.684	100.00	0.000	

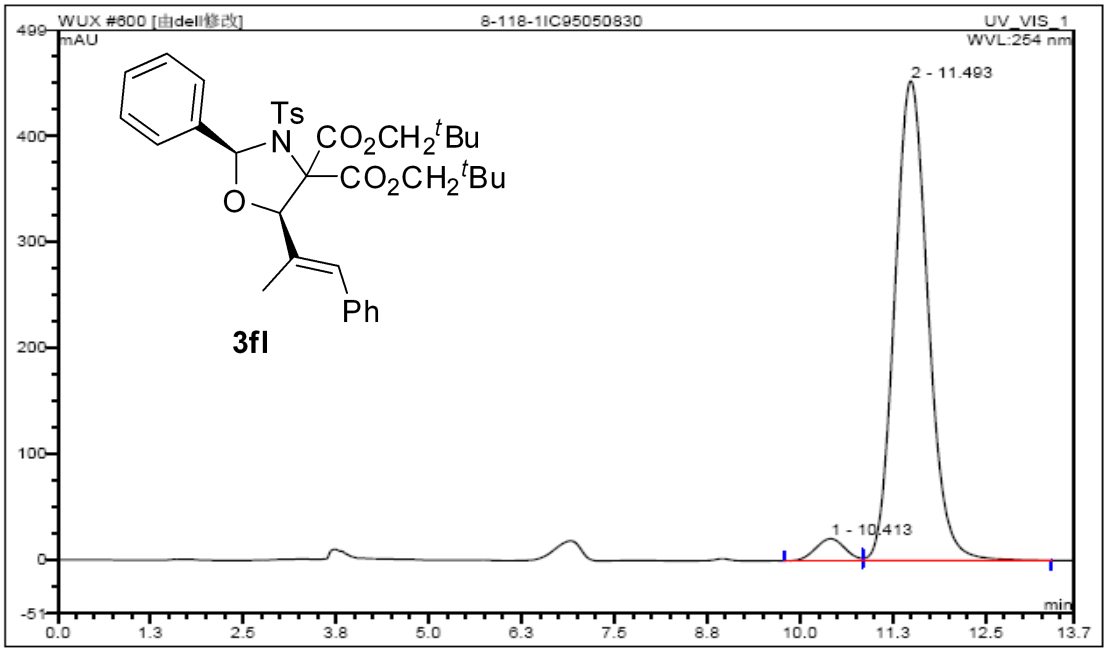
3fl HPLC using an IC (*n*-Hexane/*i*PrOH=95/05, flow rate 0.8 ml/min)

Racemic **3fl**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	10.13	n.a.	569.122	322.020	49.83	n.a.	BM *
2	11.09	n.a.	497.983	324.268	50.17	n.a.	MB*
总和:			1067.105	646.289	100.00	0.000	

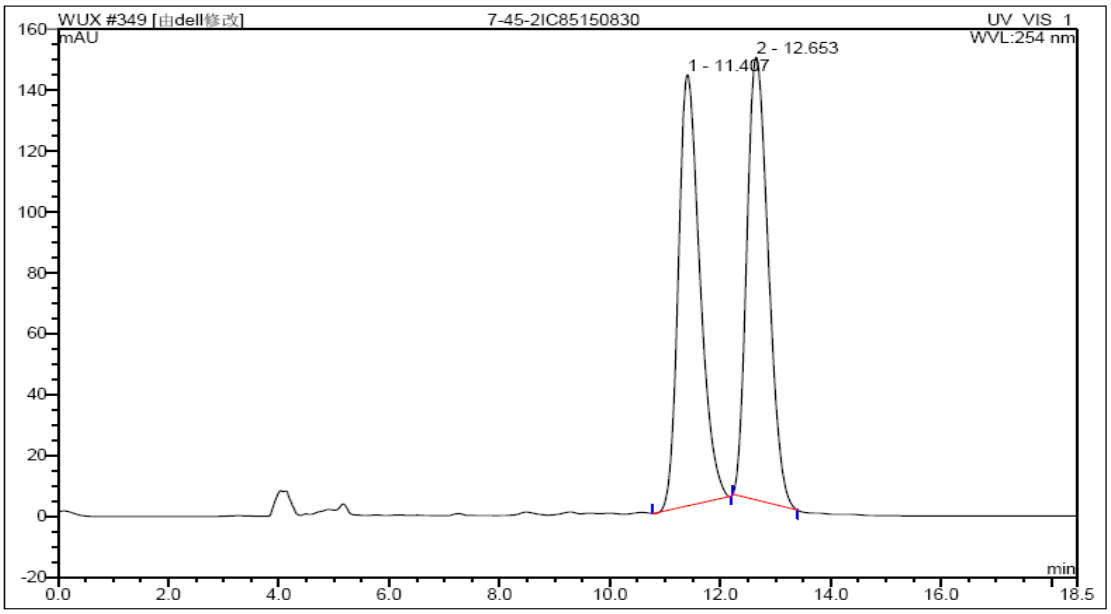
Enantioenriched **3fl**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	10.41	n.a.	20.858	9.570	3.92	n.a.	BM
2	11.49	n.a.	452.406	234.846	96.08	n.a.	MB
总和:			473.263	244.416	100.00	0.000	

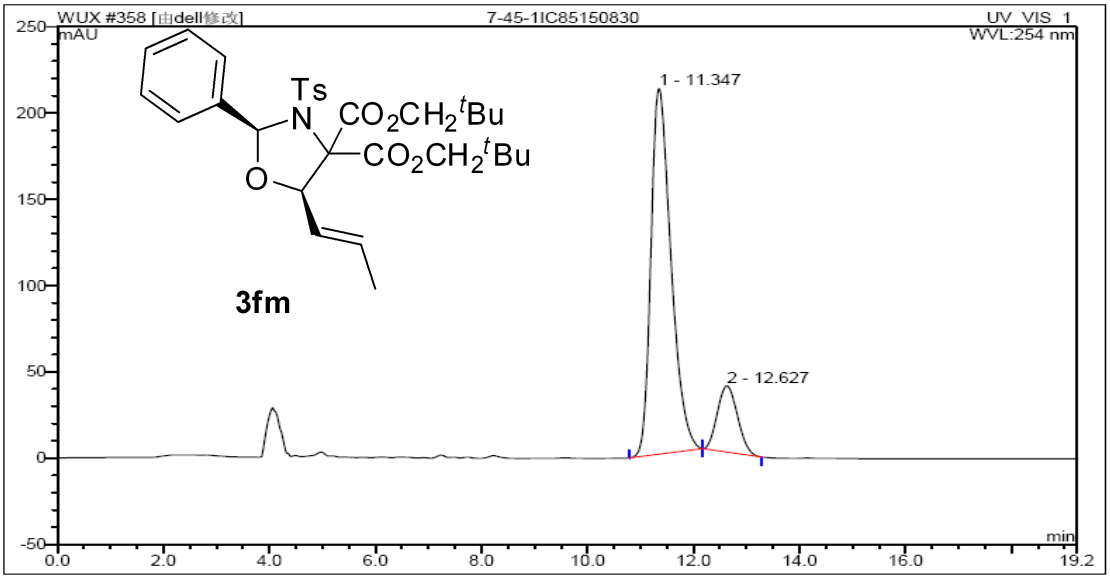
3fm HPLC using an IC (*n*-Hexane/*i*PrOH=85/15, flow rate 0.8 ml/min)

Racemic **3fm**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	11.41	n.a.	141.639	64.024	49.36	n.a.	BMB*
2	12.65	n.a.	145.431	65.673	50.64	n.a.	BMB*
总和:			287.070	129.698	100.00	0.000	

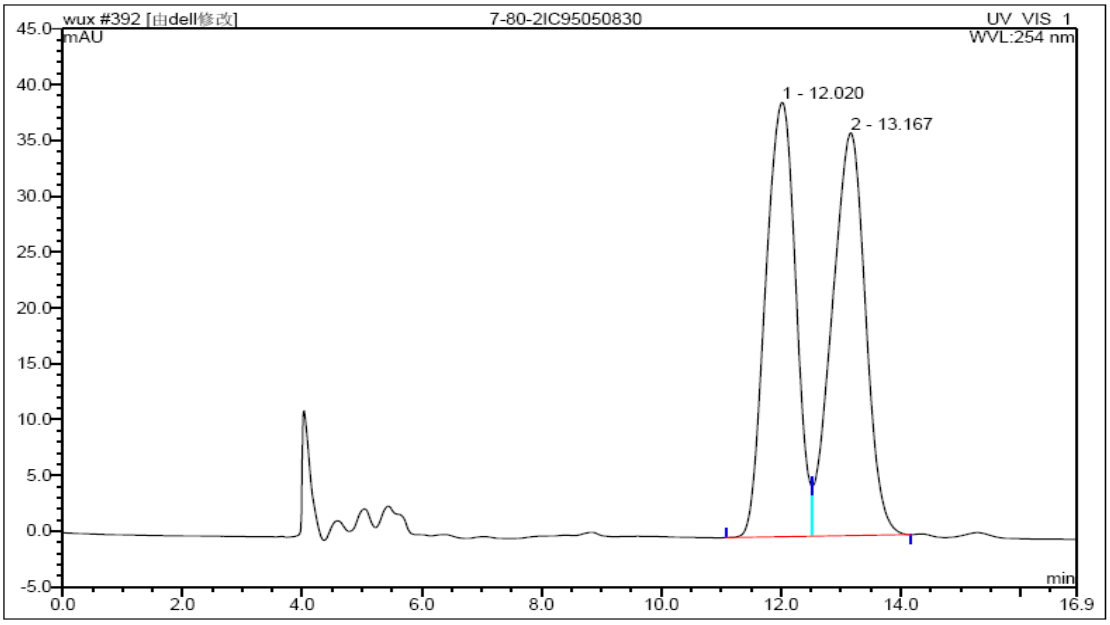
Enantioenriched **3fm**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	11.35	n.a.	211.933	93.221	84.60	n.a.	BMb
2	12.63	n.a.	38.393	16.964	15.40	n.a.	bMB
总和:			250.326	110.186	100.00	0.000	

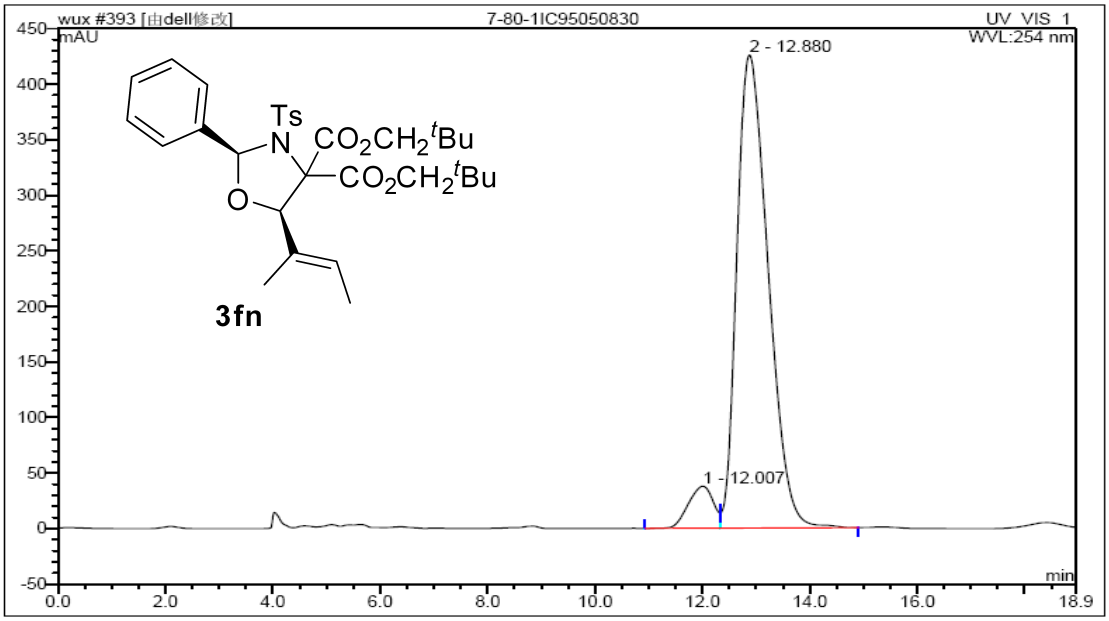
3fn HPLC using an IC (*n*-Hexane/*i*PrOH=95/05, flow rate 0.8 ml/min)

Racemic **3fn**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	12.02	n.a.	38.899	22.693	49.30	n.a.	BM
2	13.17	n.a.	36.066	23.338	50.70	n.a.	MB
总和:			74.965	46.031	100.00	0.000	

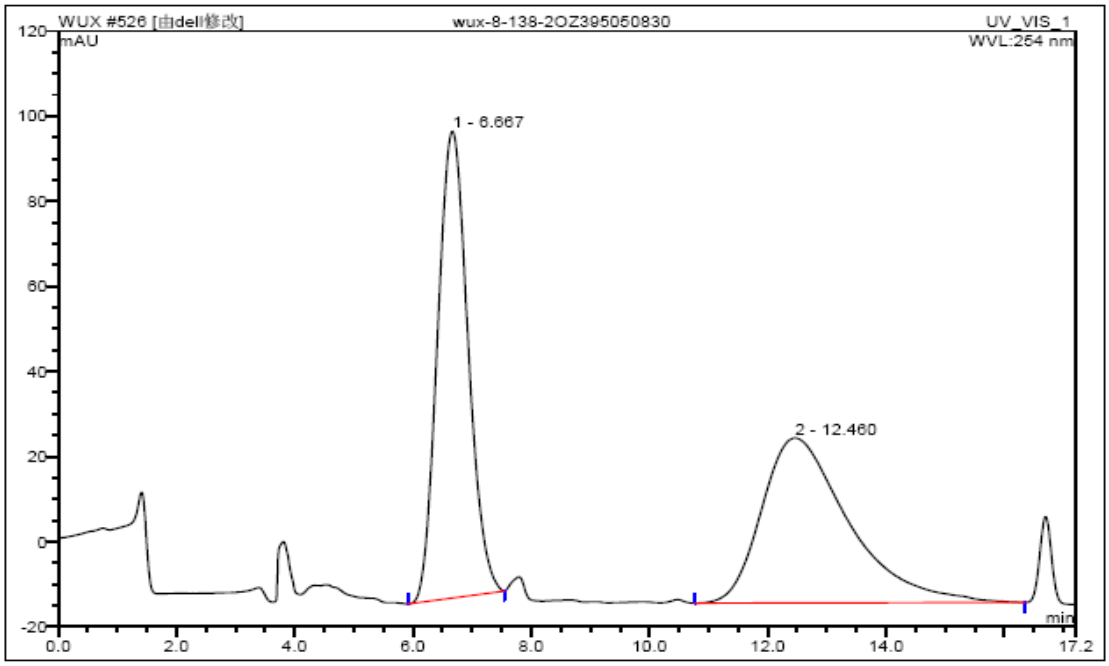
Enantioenriched **3fn**



序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	12.01	n.a.	37.674	20.125	6.55	n.a.	BM
2	12.88	n.a.	425.630	287.355	93.45	n.a.	MB
总和:			463.304	307.480	100.00	0.000	

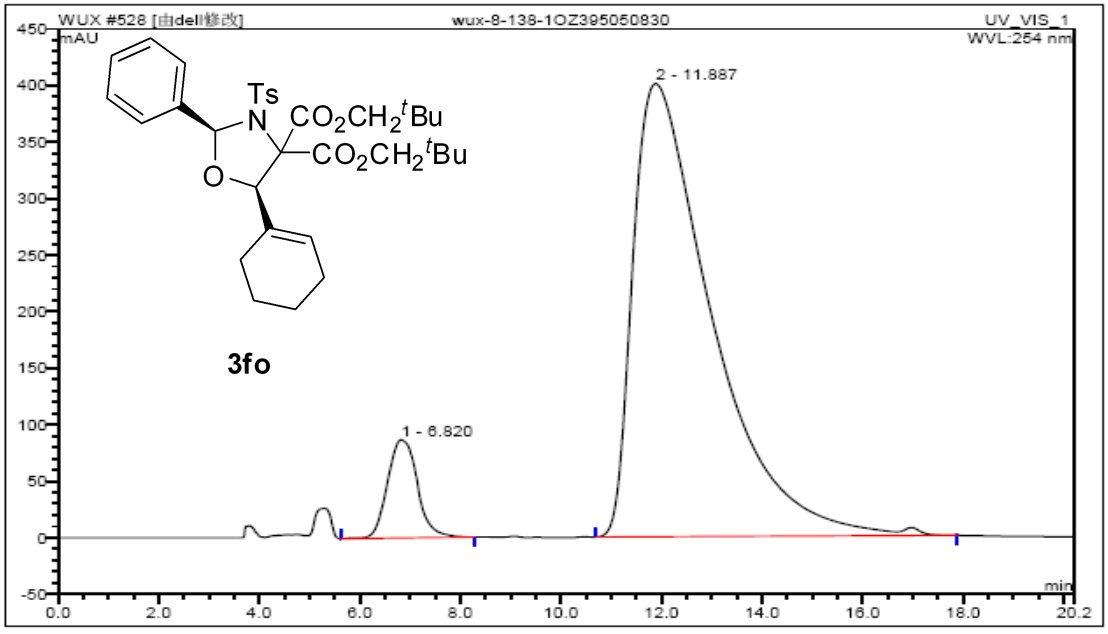
3fo HPLC using an OZ3 (*n*-Hexane/*i*PrOH=95/05, flow rate 0.8 ml/min)

Racemic **3fo**

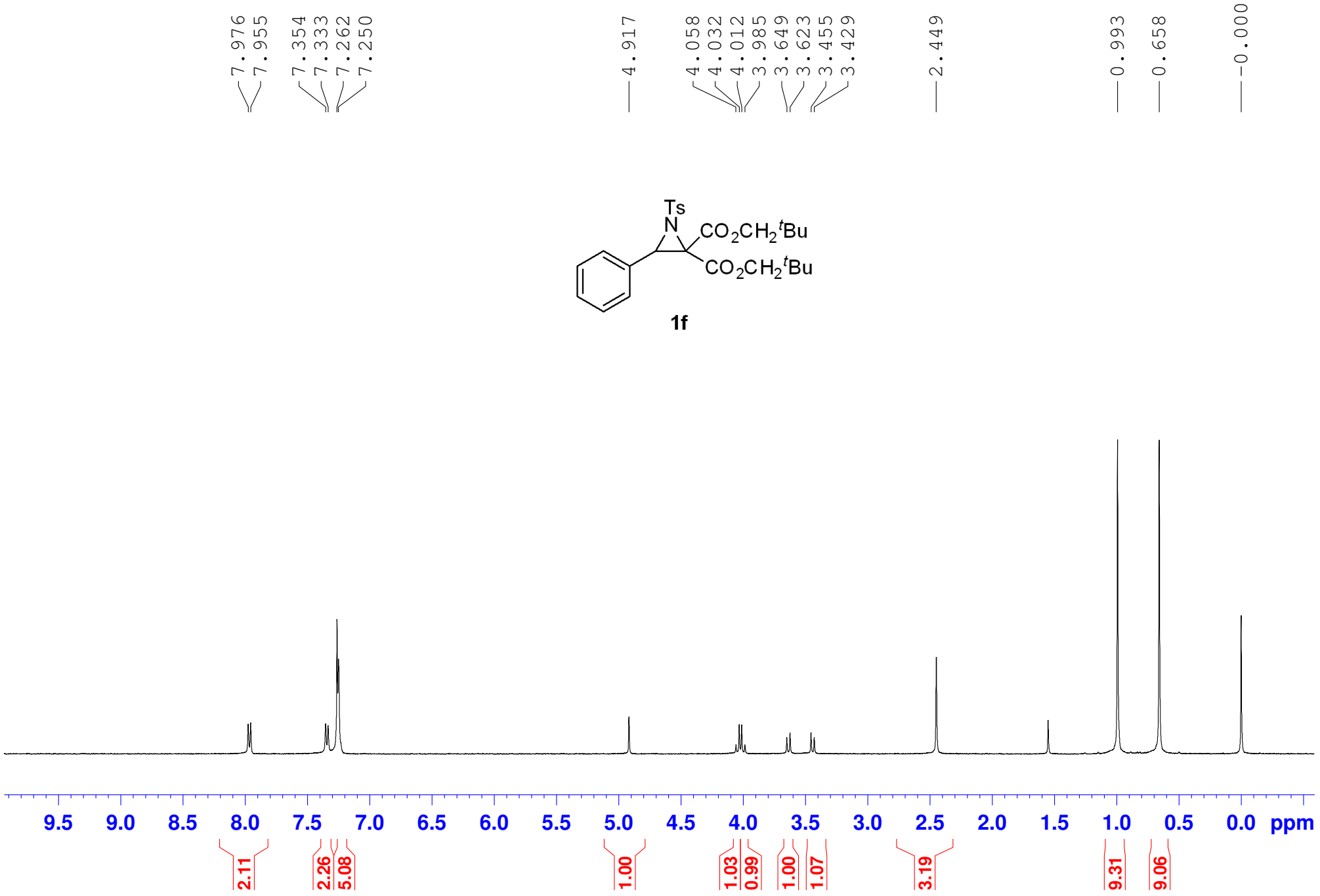


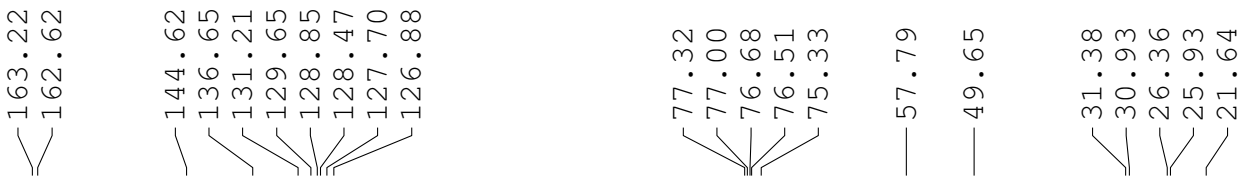
序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.67	n.a.	109.677	65.391	49.78	n.a.	BMB*
2	12.46	n.a.	38.762	65.967	50.22	n.a.	BMB*
总和:			148.440	131.359	100.00	0.000	

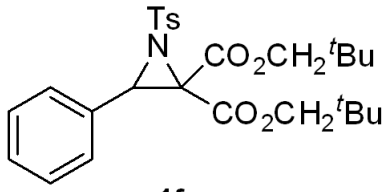
Enantioenriched **3fn**



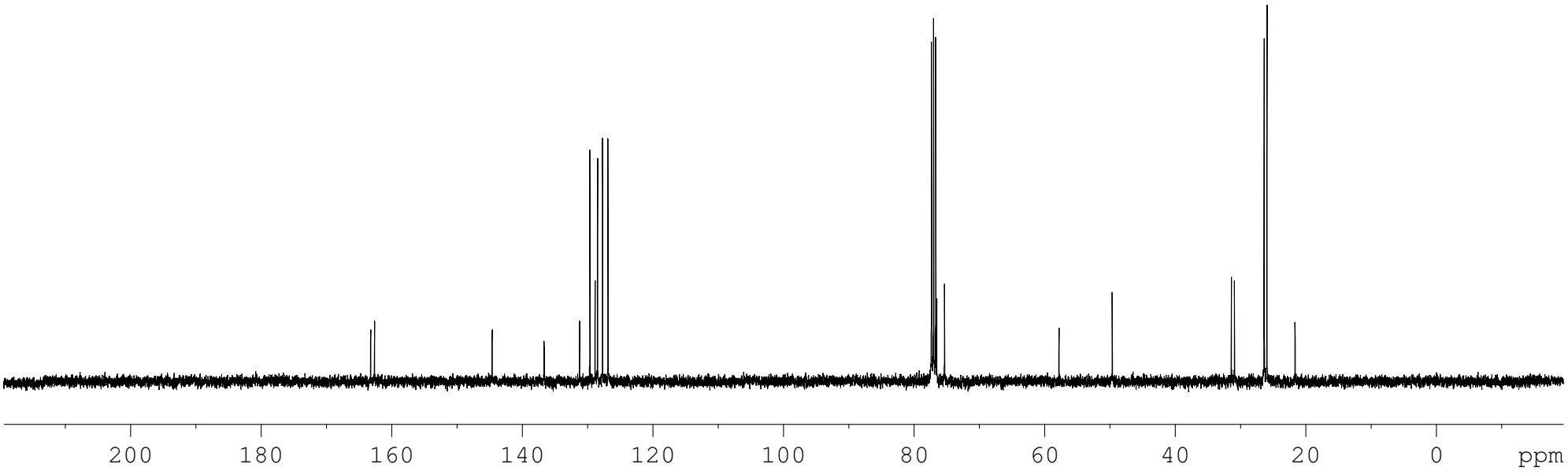
序号	保留时间 min	峰名称	峰高 mAU	峰面积 mAU*min	相对峰面积 %	样品量	类型
1	6.82	n.a.	86.883	59.752	7.59	n.a.	BMB
2	11.89	n.a.	400.798	727.456	92.41	n.a.	BMB*
总和:			487.682	787.208	100.00	0.000	

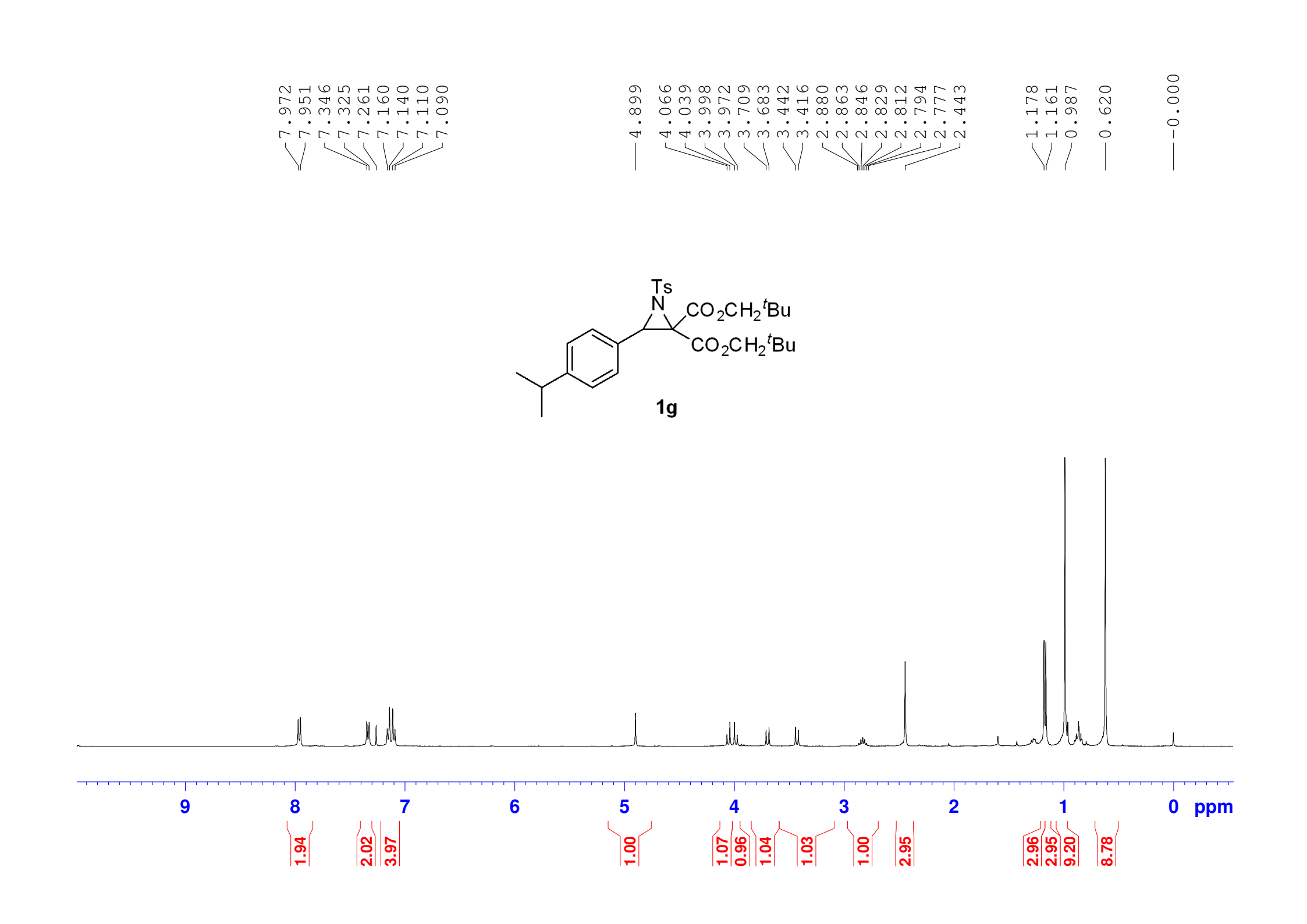

7.976
7.955
7.354
7.333
7.262
7.250
4.917
4.058
4.032
4.012
3.985
3.649
3.623
3.455
3.429
2.449
0.993
0.658
-0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
1f
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm
2.11
2.26
5.08
1.00
1.03
0.99
1.00
1.07
3.19
9.31
9.06

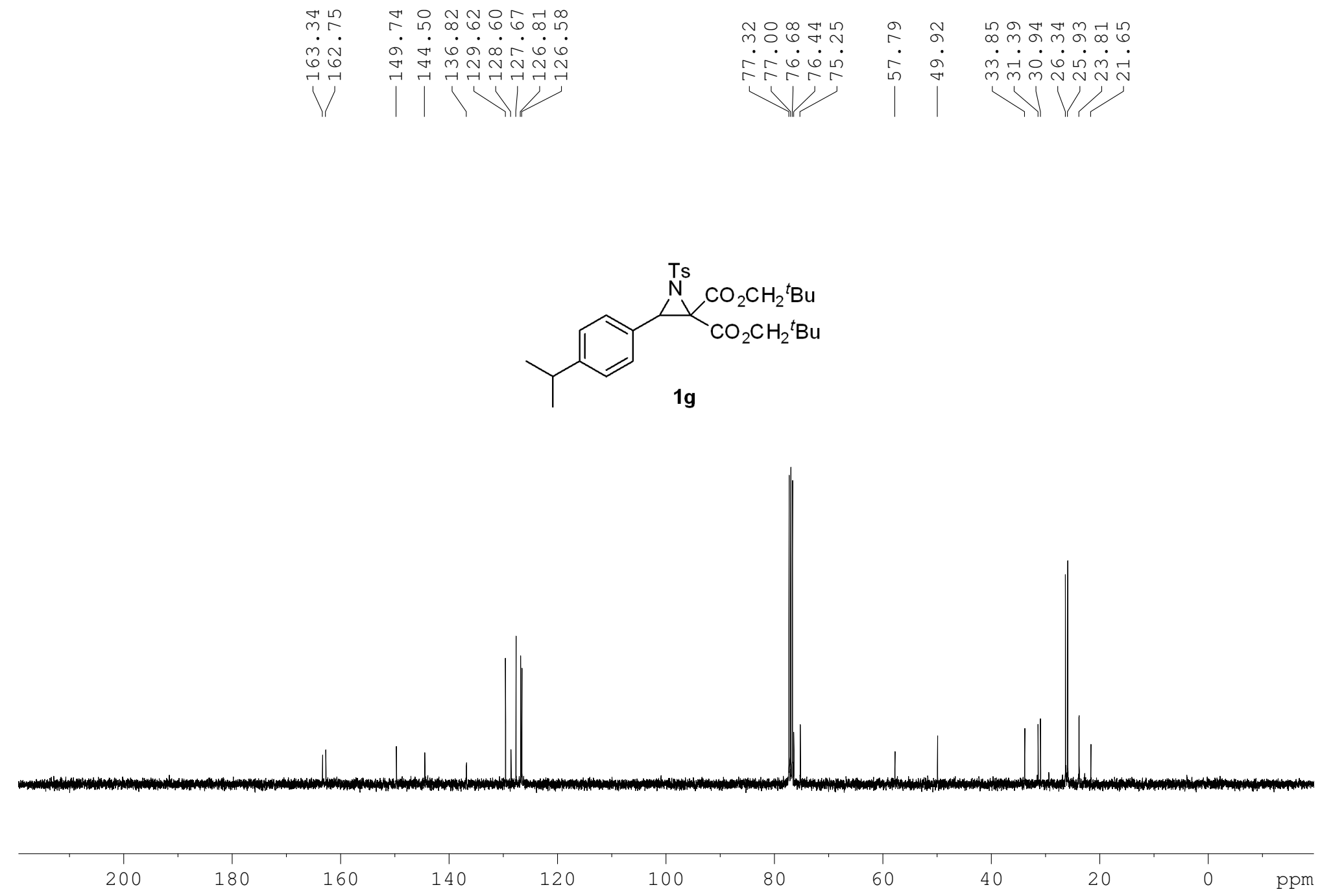

163.22
162.62
144.62
136.65
131.21
129.65
128.85
128.47
127.70
126.88
77.32
77.00
76.68
76.51
75.33
57.79
49.65
31.38
30.93
26.36
25.93
21.64

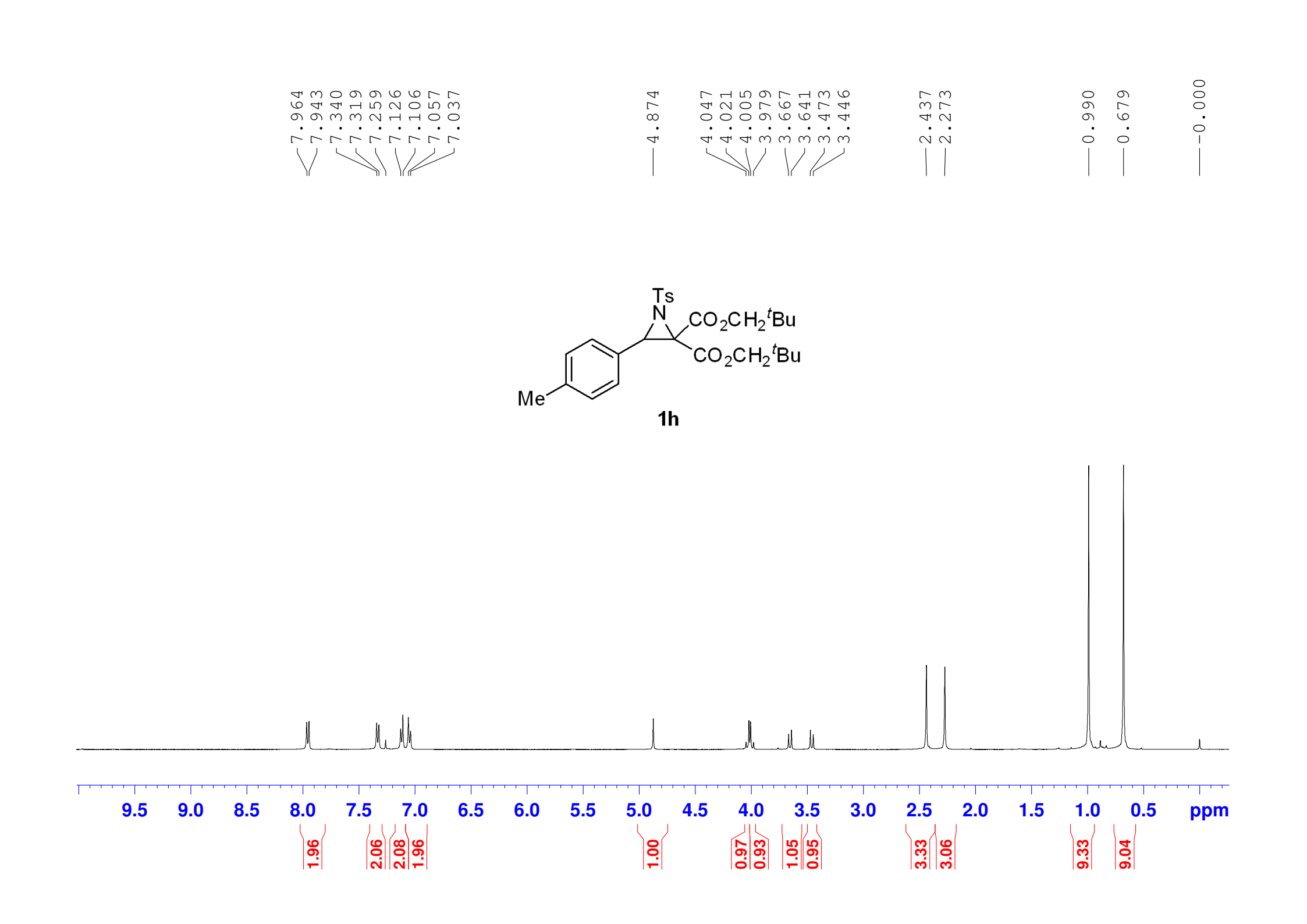

Ts
N
CO2CH2tBu
CO2CH2tBu

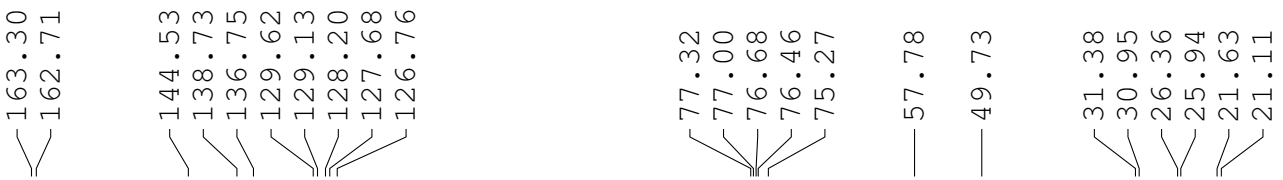
1f

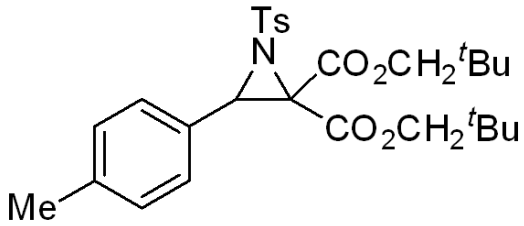

200
180
160
140
120
100
80
60
40
20
0
ppm


7.972
7.951
7.346
7.325
7.261
7.160
7.140
7.110
7.090
4.899
4.066
4.039
3.998
3.972
3.709
3.683
3.442
3.416
2.880
2.863
2.846
2.829
2.812
2.794
2.777
2.443
1.178
1.161
0.987
0.620
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
1g
9
8
7
6
5
4
3
2
1
0
ppm
1.94
2.02
3.97
1.00
1.07
0.96
1.04
1.03
1.00
2.95
2.96
2.95
9.20
8.78

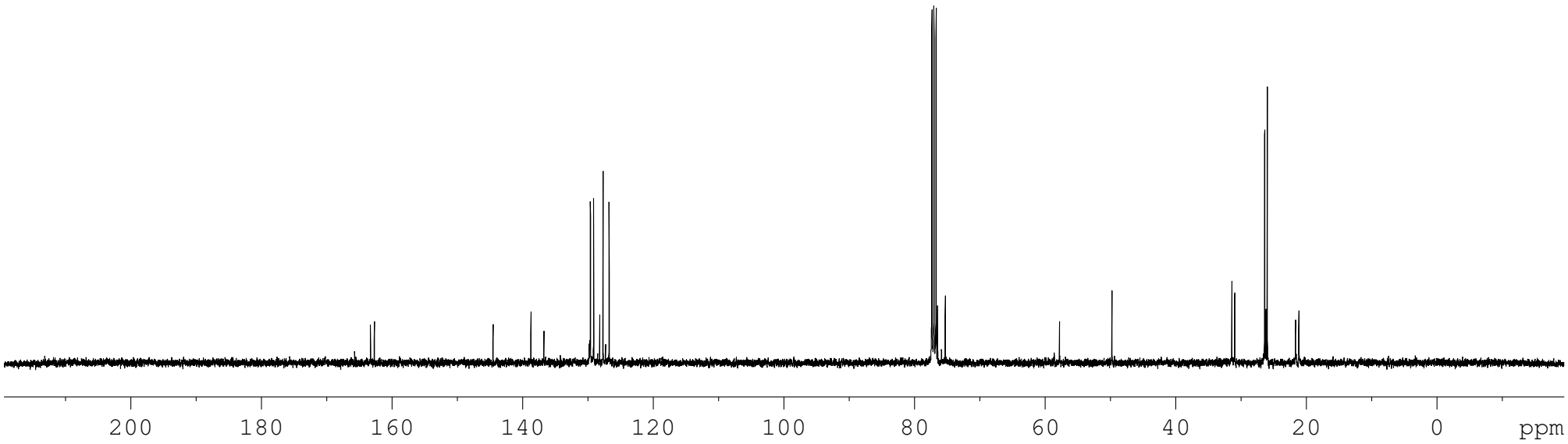

163.34
162.75
149.74
144.50
136.82
129.62
128.60
127.67
126.81
126.58
77.32
77.00
76.68
76.44
75.25
57.79
49.92
33.85
31.39
30.94
26.34
25.93
23.81
21.65
Ts
N
CO2CH2tBu
CO2CH2tBu
1g
200
180
160
140
120
100
80
60
40
20
0
ppm

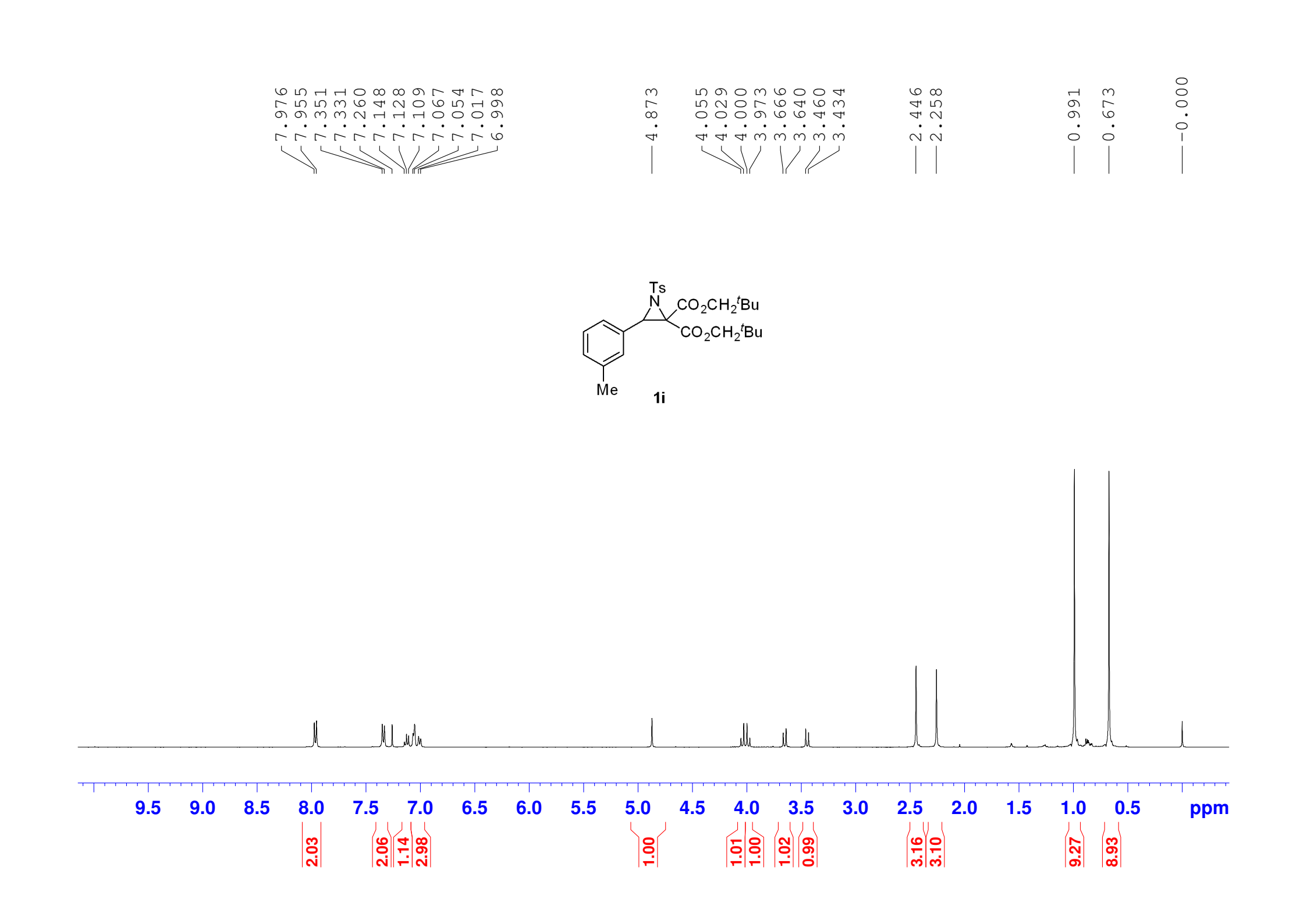

7.964
7.943
7.340
7.319
7.259
7.126
7.106
7.057
7.037
4.874
4.047
4.021
4.005
3.979
3.667
3.641
3.473
3.446
2.437
2.273
0.990
0.679
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
Me
1h
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.96
2.06
2.08
1.96
1.00
0.97
0.93
1.05
0.95
3.33
3.06
9.33
9.04

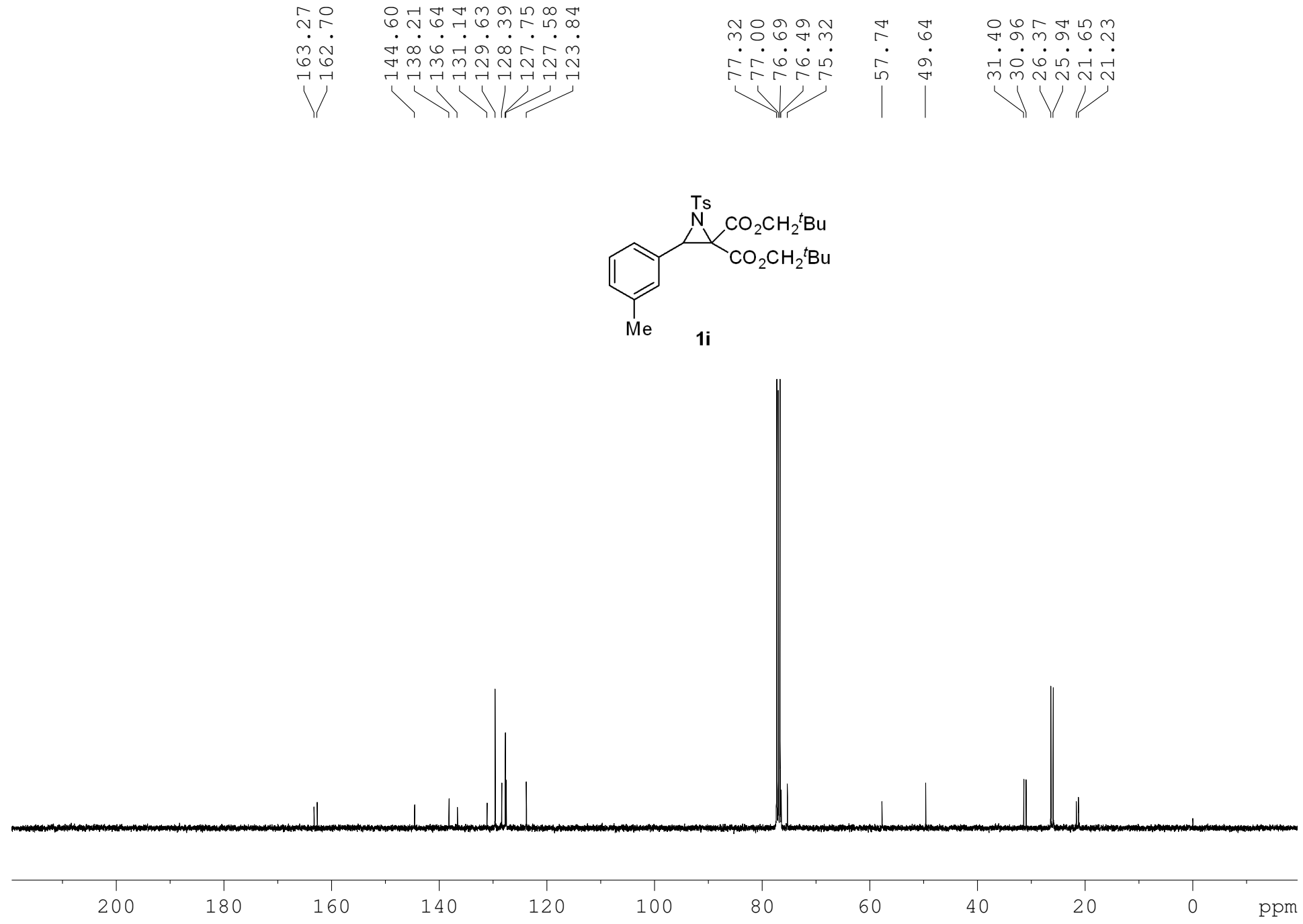

163.30
162.71
144.53
138.73
136.75
129.62
129.13
128.20
127.68
126.76
77.32
77.00
76.68
76.46
75.27
57.78
49.73
31.38
30.95
26.36
25.94
21.63
21.11

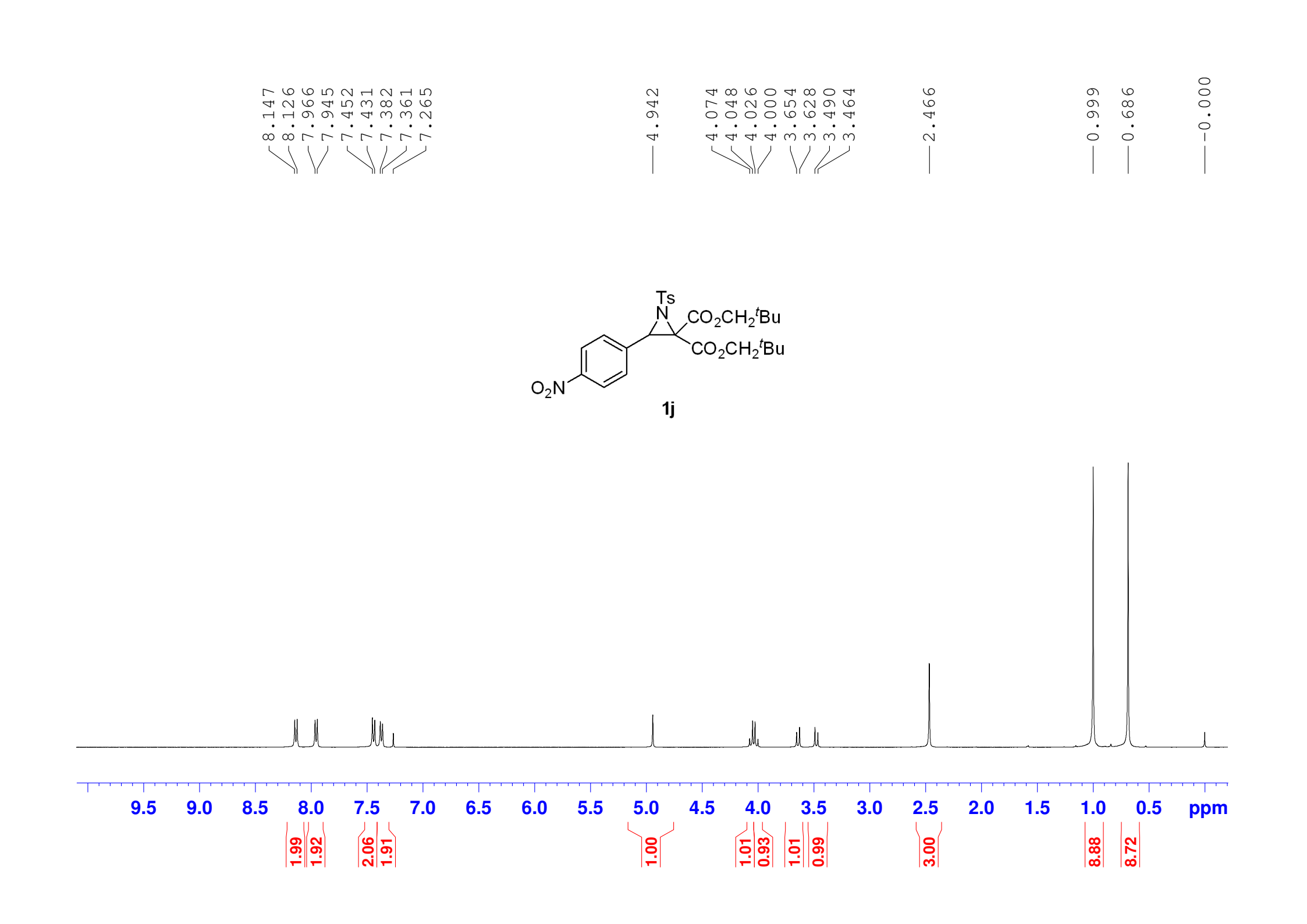

Ts
N
CO2CH2tBu
CO2CH2tBu
Me

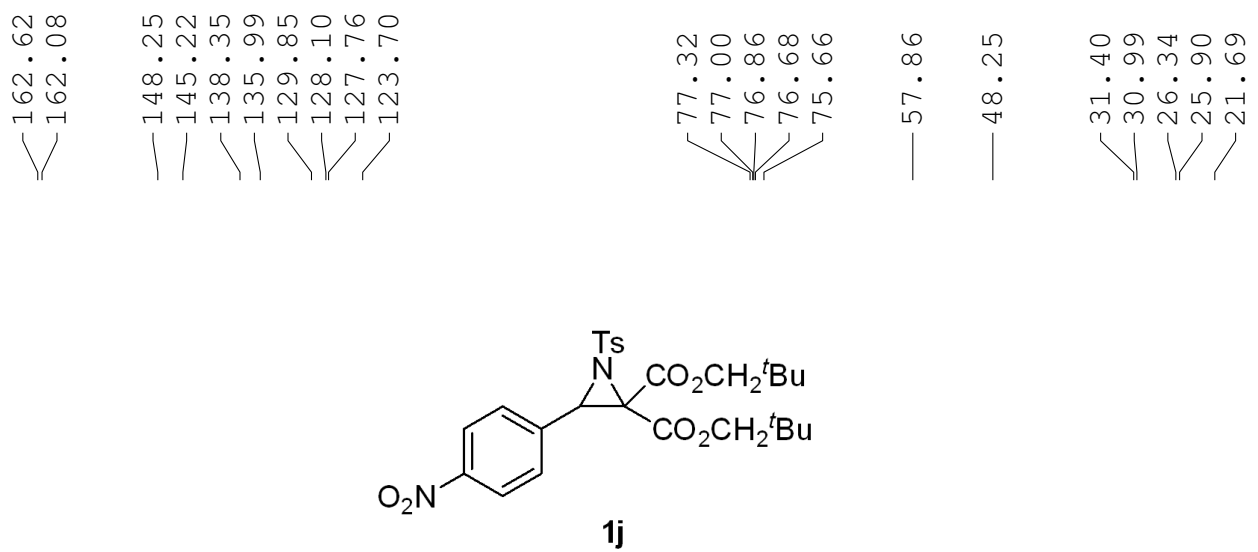
1h

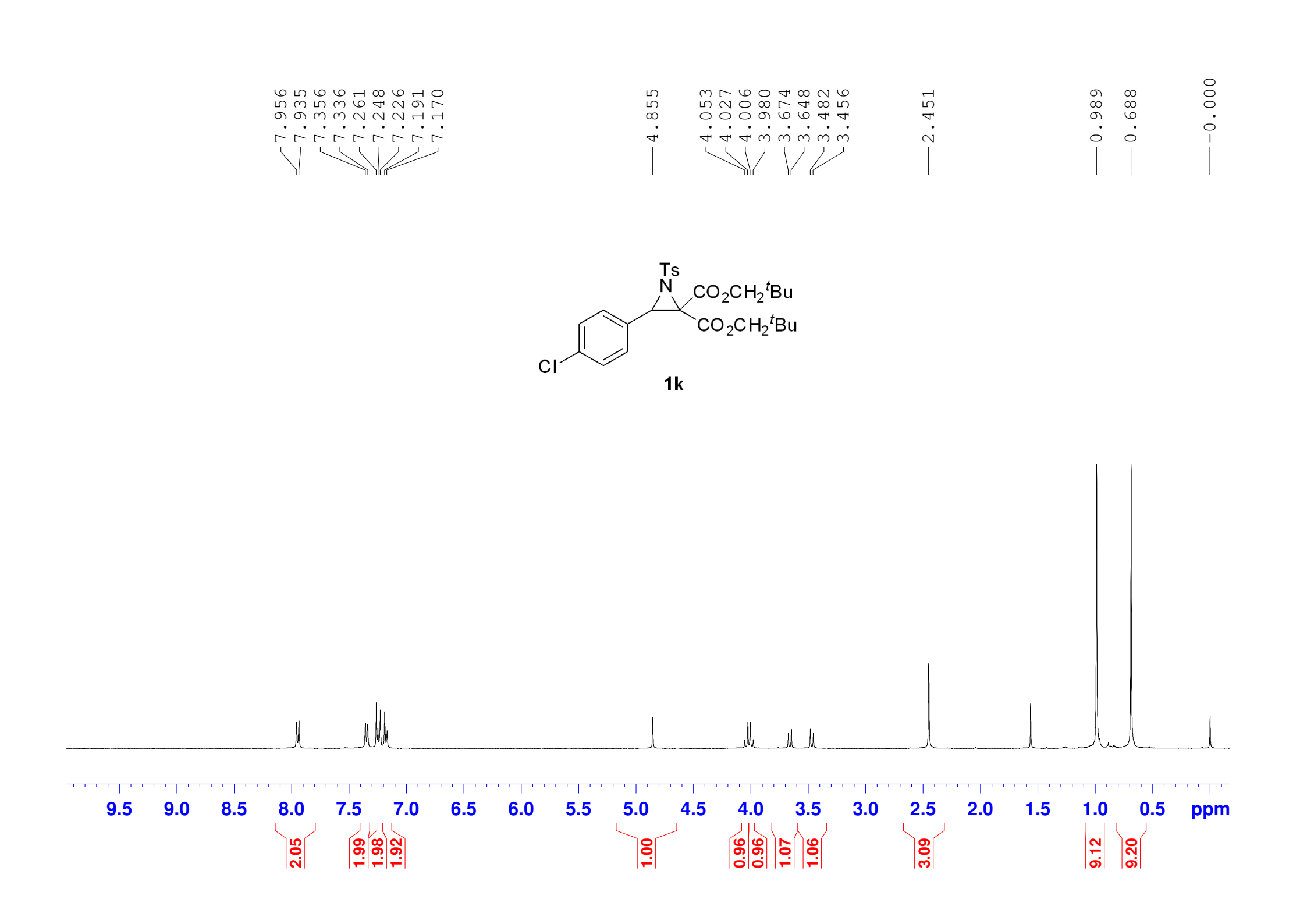

200
180
160
140
120
100
80
60
40
20
0
ppm

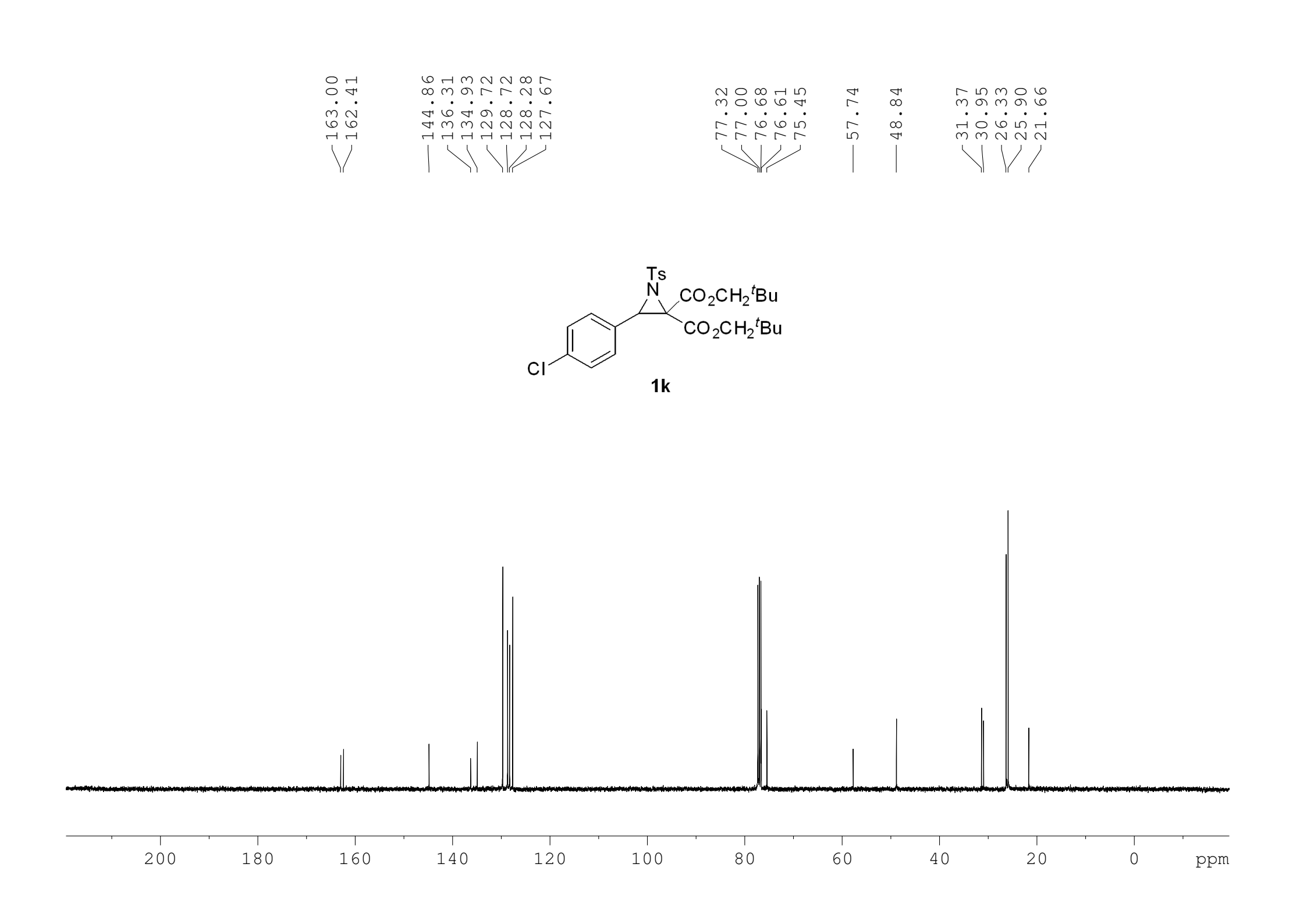

7.976
7.955
7.351
7.331
7.260
7.148
7.128
7.109
7.067
7.054
7.017
6.998
4.873
4.055
4.029
4.000
3.973
3.666
3.640
3.460
3.434
2.446
2.258
0.991
0.673
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
Me
1i
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.03
2.06
1.14
2.98
1.00
1.01
1.00
1.02
0.99
3.16
3.10
9.27
8.93

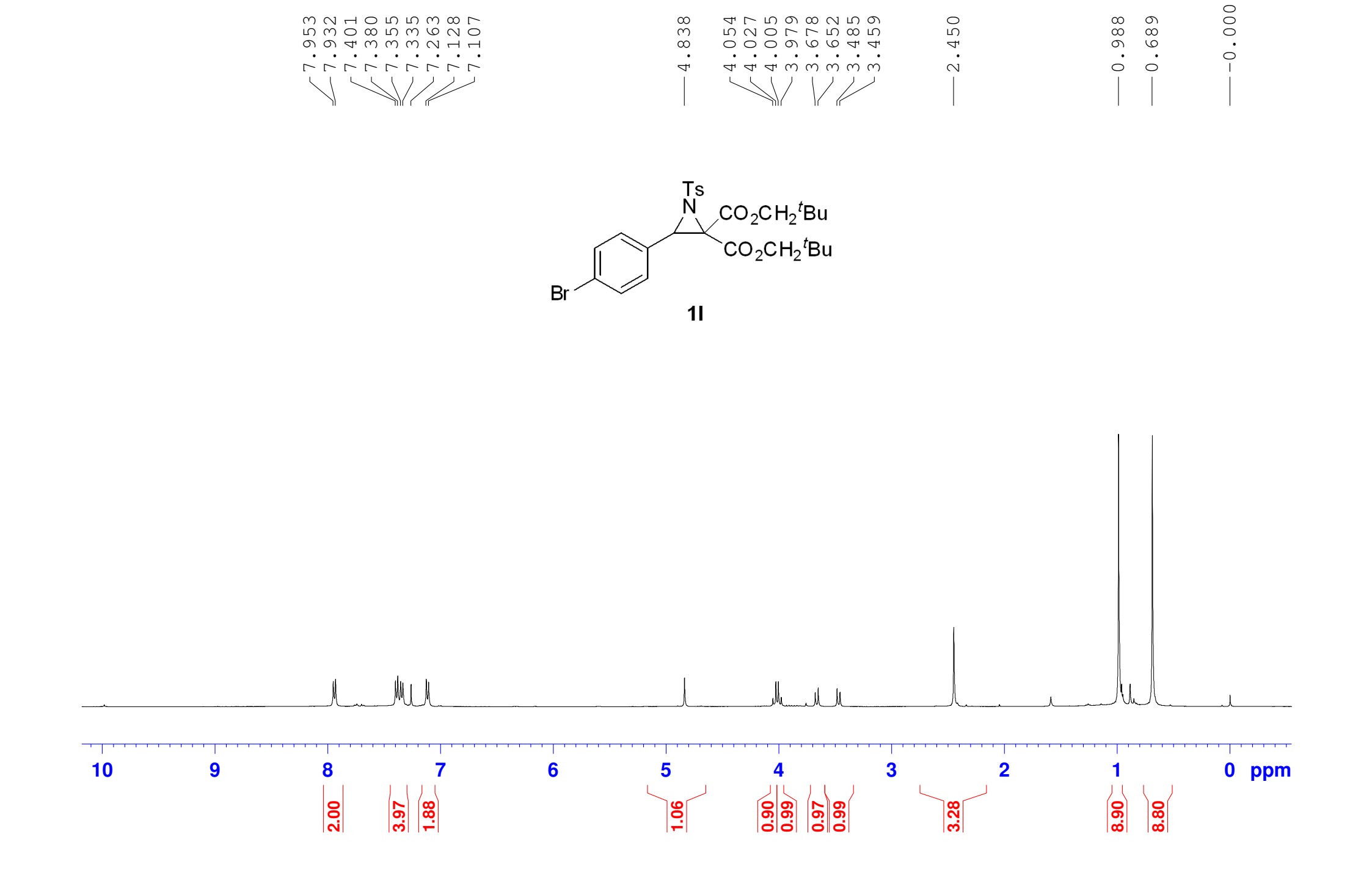

163.27
162.70
144.60
138.21
136.64
131.14
129.63
128.39
127.75
127.58
123.84
77.32
77.00
76.69
76.49
75.32
57.74
49.64
31.40
30.96
26.37
25.94
21.65
21.23
Ts
N
CO2CH2tBu
CO2CH2tBu
Me
1i
200
180
160
140
120
100
80
60
40
20
0
ppm

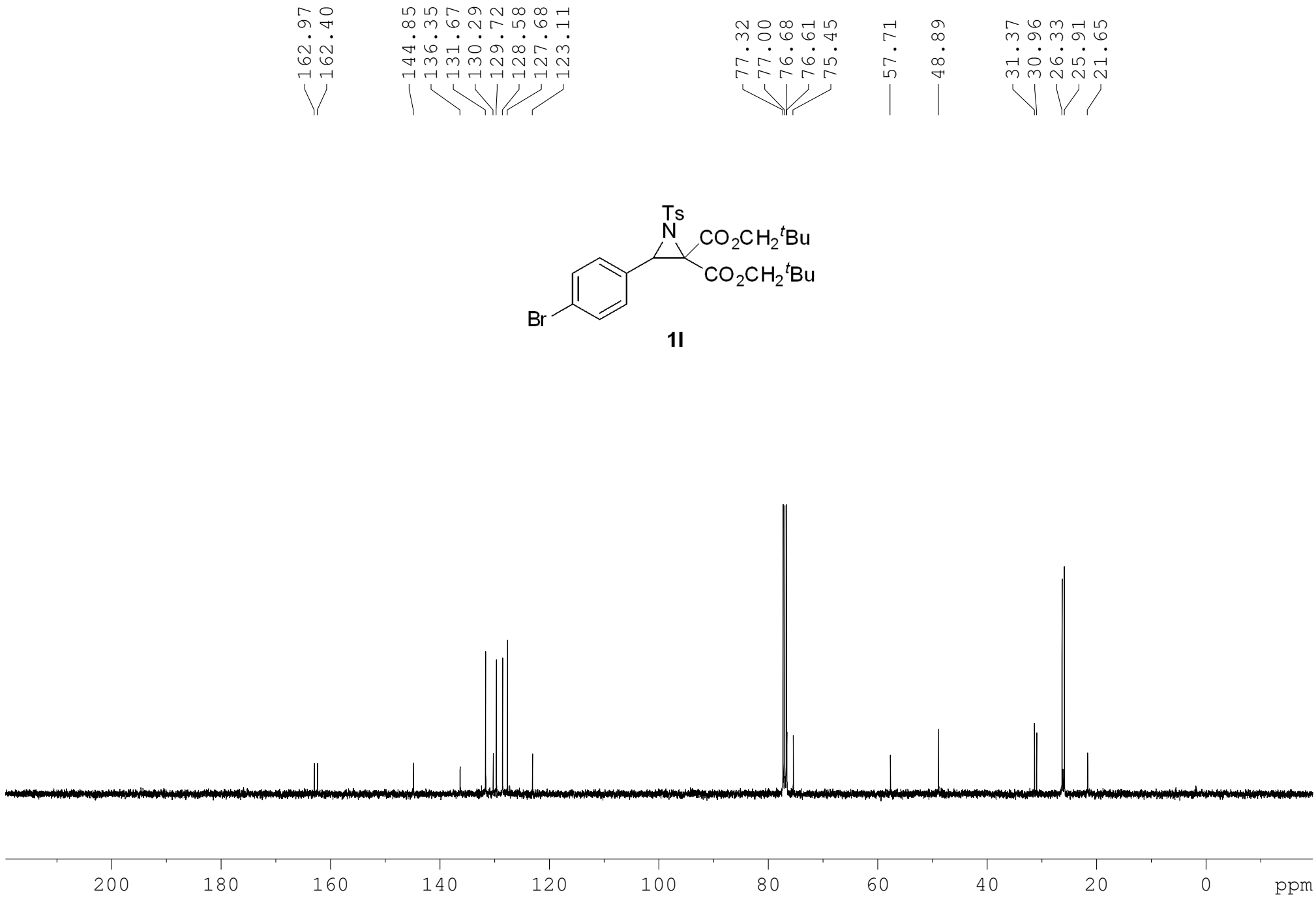

8.147
8.126
7.966
7.945
7.452
7.431
7.382
7.361
7.265
4.942
4.074
4.048
4.026
4.000
3.654
3.628
3.490
3.464
2.466
0.999
0.686
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O2N
1j
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.99
1.92
2.06
1.91
1.00
1.01
0.93
1.01
0.99
3.00
8.88
8.72


162.62
162.08
148.25
145.22
138.35
135.99
129.85
128.10
127.76
123.70
77.32
77.00
76.86
76.68
75.66
57.86
48.25
31.40
30.99
26.34
25.90
21.69
Ts
N
CO2CH2tBu
CO2CH2tBu
O2N
1j
200
180
160
140
120
100
80
60
40
20
0
ppm

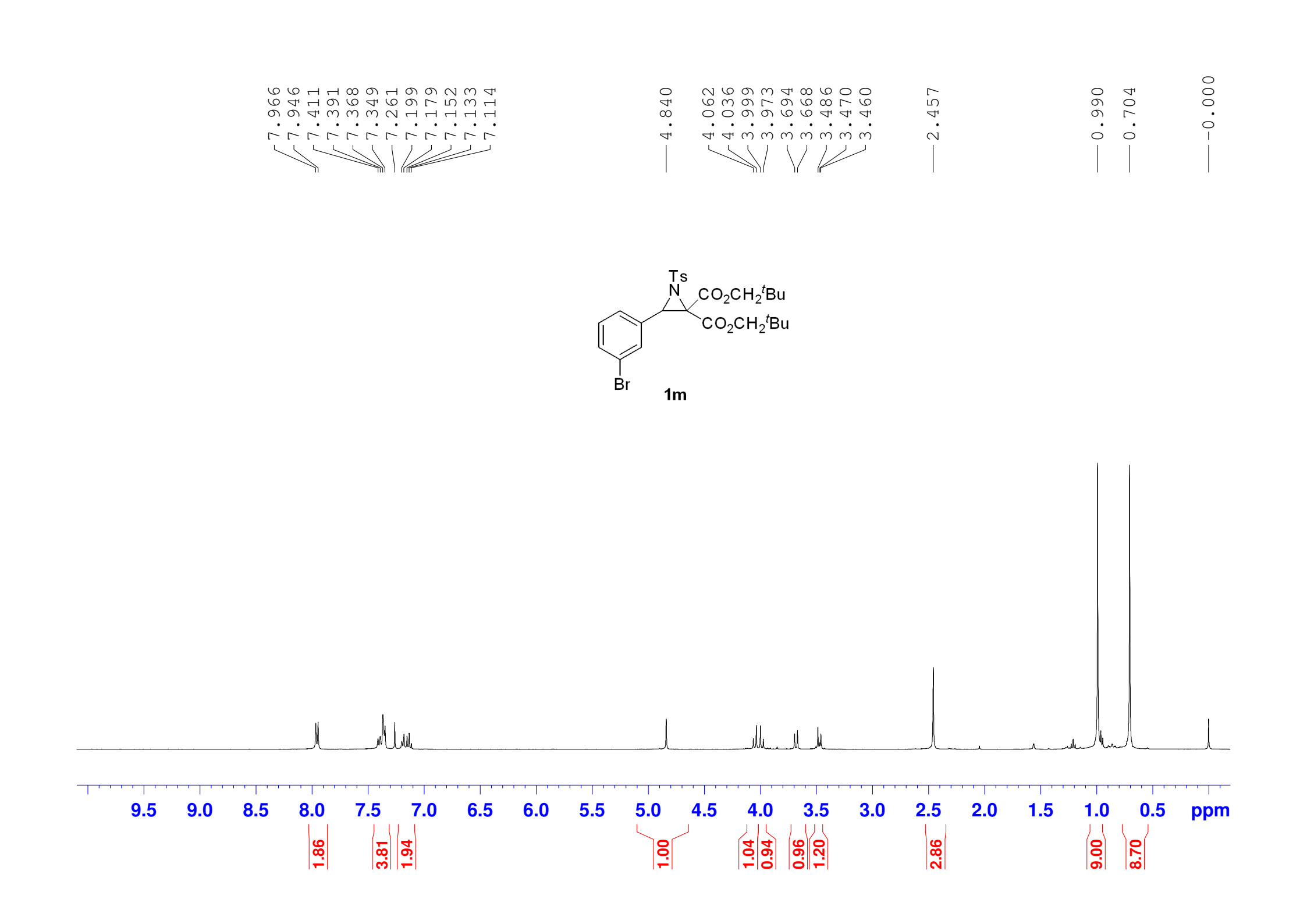

7.956
7.935
7.356
7.336
7.261
7.248
7.226
7.191
7.170
4.855
4.053
4.027
4.006
3.980
3.674
3.648
3.482
3.456
2.451
0.989
0.688
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
Cl
1k
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.05
1.99
1.98
1.92
1.00
0.96
0.96
1.07
1.06
3.09
9.12
9.20

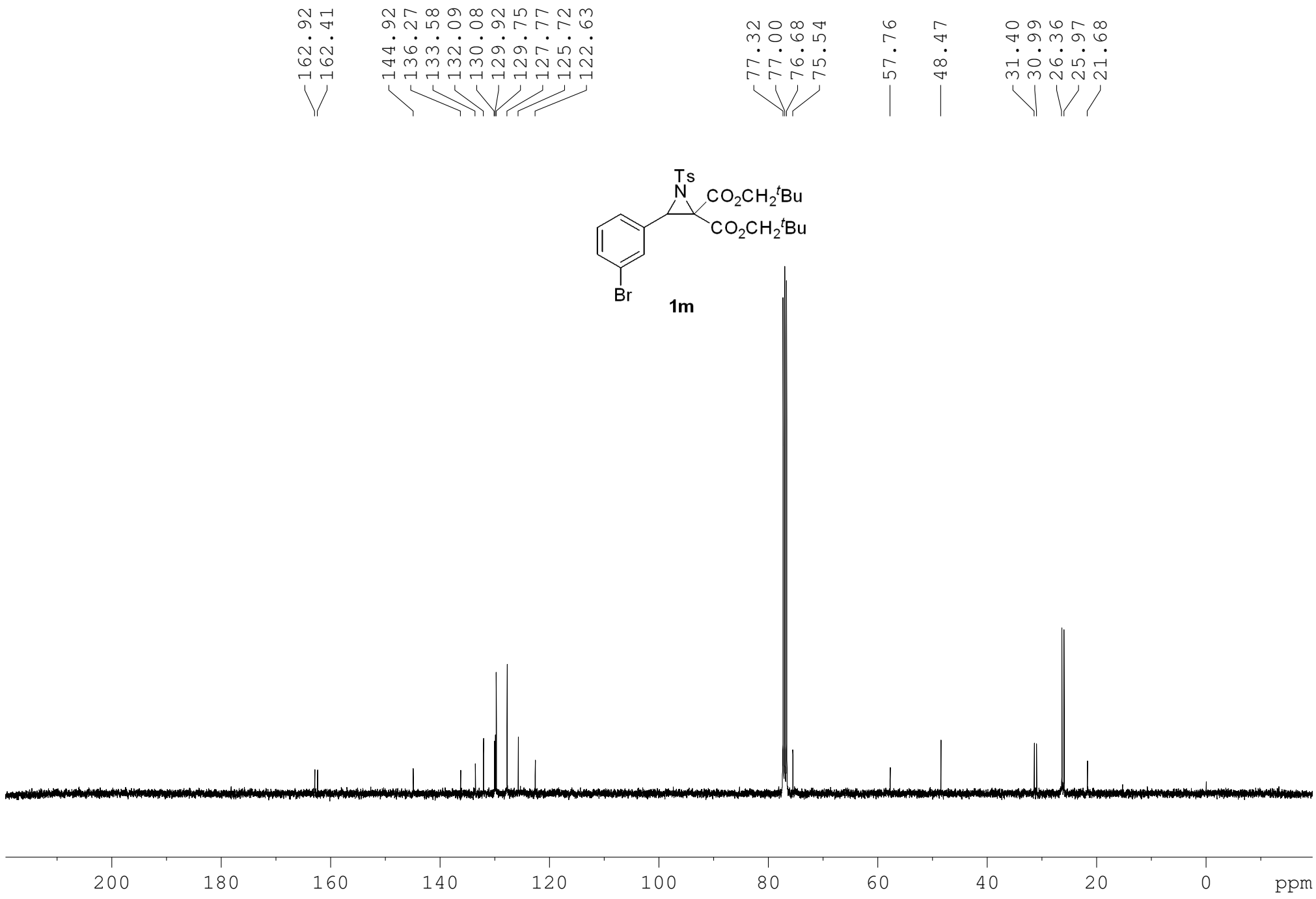

163.00
162.41
144.86
136.31
134.93
129.72
128.72
128.28
127.67
77.32
77.00
76.68
76.61
75.45
57.74
48.84
31.37
30.95
26.33
25.90
21.66
Ts
N
CO2CH2tBu
CO2CH2tBu
Cl
1k
200
180
160
140
120
100
80
60
40
20
0
ppm


7.953
7.932
7.401
7.380
7.355
7.335
7.263
7.128
7.107
4.838
4.054
4.027
4.005
3.979
3.678
3.652
3.485
3.459
2.450
0.988
0.689
-0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
Br
1l
10
9
8
7
6
5
4
3
2
1
0
ppm
2.00
3.97
1.88
1.06
0.90
0.99
0.97
0.99
3.28
8.90
8.80

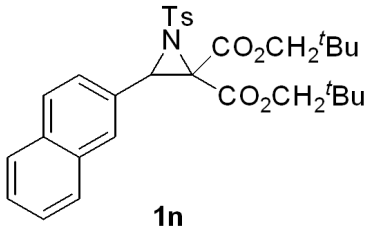

162.97
162.40
144.85
136.35
131.67
130.29
129.72
128.58
127.68
123.11
77.32
77.00
76.68
76.61
75.45
57.71
48.89
31.37
30.96
26.33
25.91
21.65
Ts
N
CO2CH2tBu
CO2CH2tBu
Br
200
180
160
140
120
100
80
60
40
20
0
ppm

1l

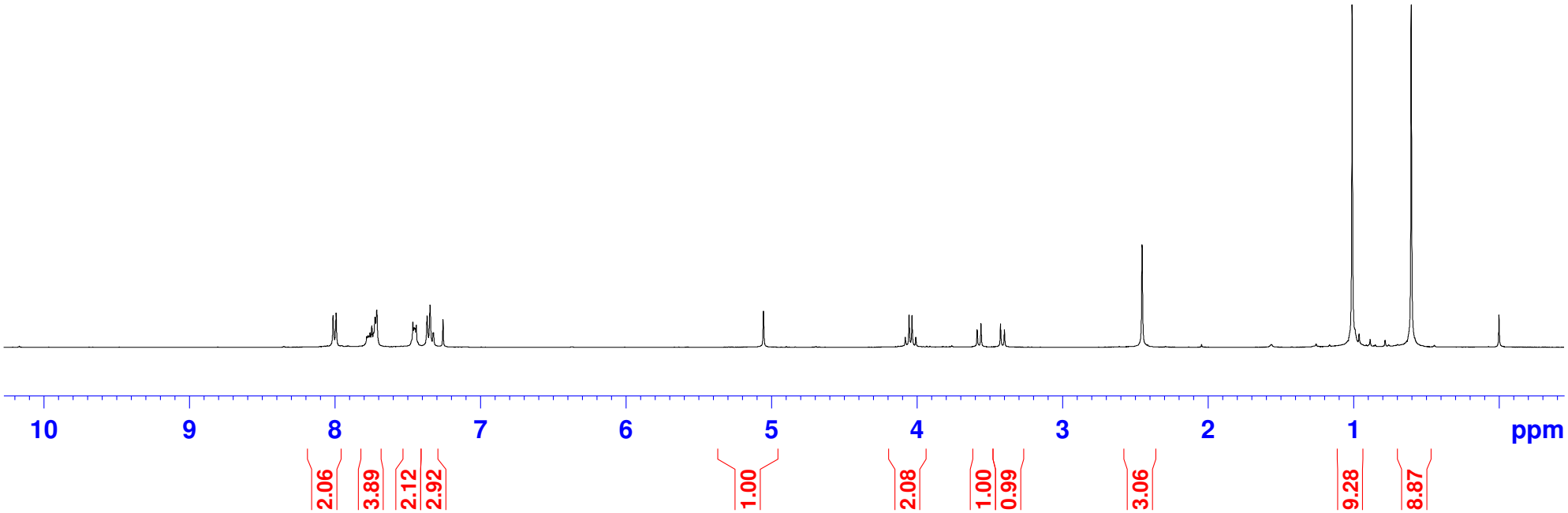

7.966
7.946
7.411
7.391
7.368
7.349
7.261
7.199
7.179
7.152
7.133
7.114
4.840
4.062
4.036
3.999
3.973
3.694
3.668
3.486
3.470
3.460
2.457
0.990
0.704
-0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
Br
1m
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.86
3.81
1.94
1.00
1.04
0.94
0.96
1.20
2.86
9.00
8.70

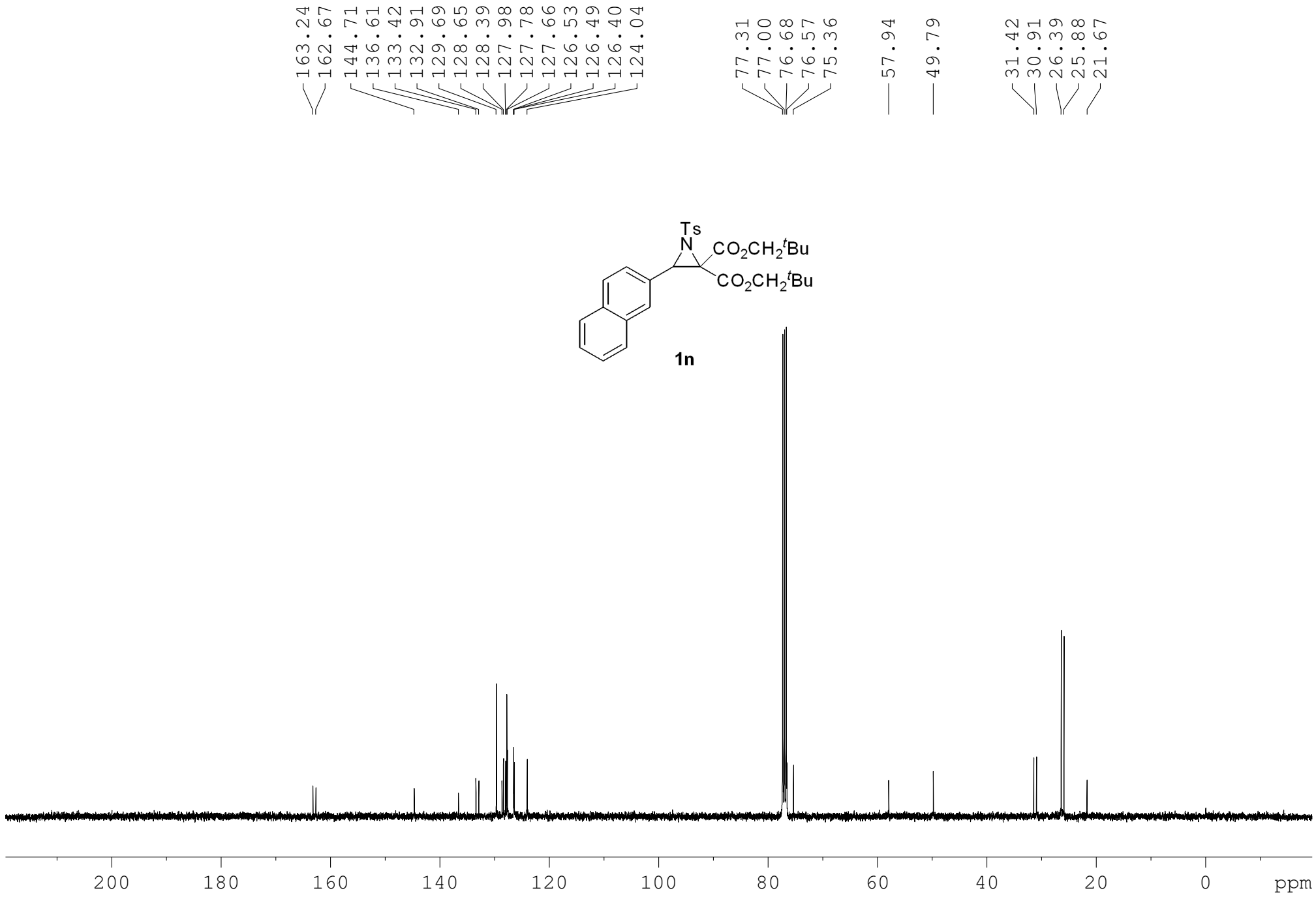

162.92
162.41
144.92
136.27
133.58
132.09
130.08
129.92
129.75
127.77
125.72
122.63
77.32
77.00
76.68
75.54
57.76
48.47
31.40
30.99
26.36
25.97
21.68
Ts
N
CO2CH2tBu
CO2CH2tBu
Br
1m
200
180
160
140
120
100
80
60
40
20
0
ppm

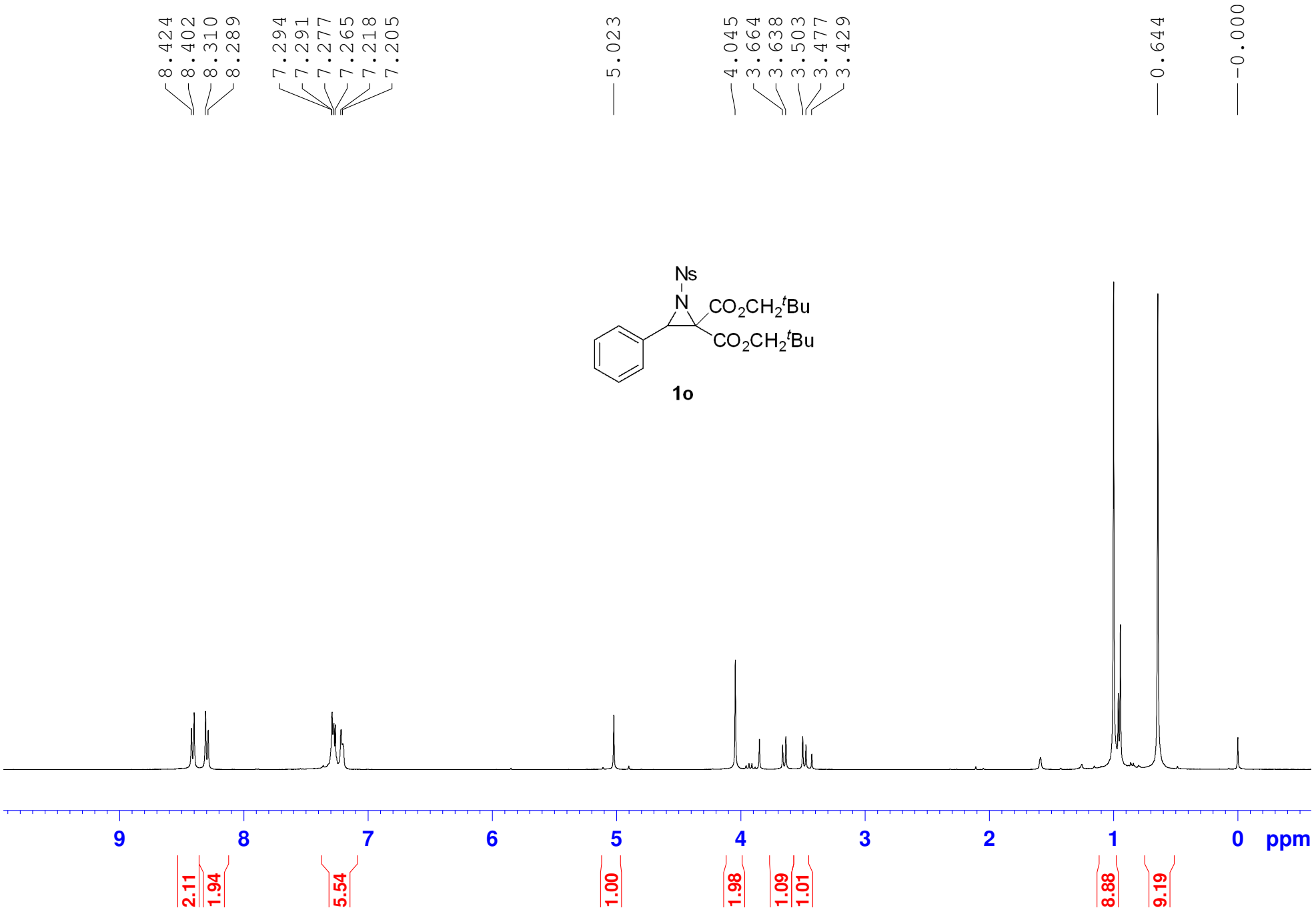
8.013
7.992
7.758
7.747
7.735
7.725
7.712
7.465
7.458
7.455
7.451
7.448
7.441
7.367
7.347
7.326
7.323
7.258
5.055
4.080
4.054
4.034
4.008
3.586
3.560
3.425
3.399
2.452
1.009
0.603
-0.000

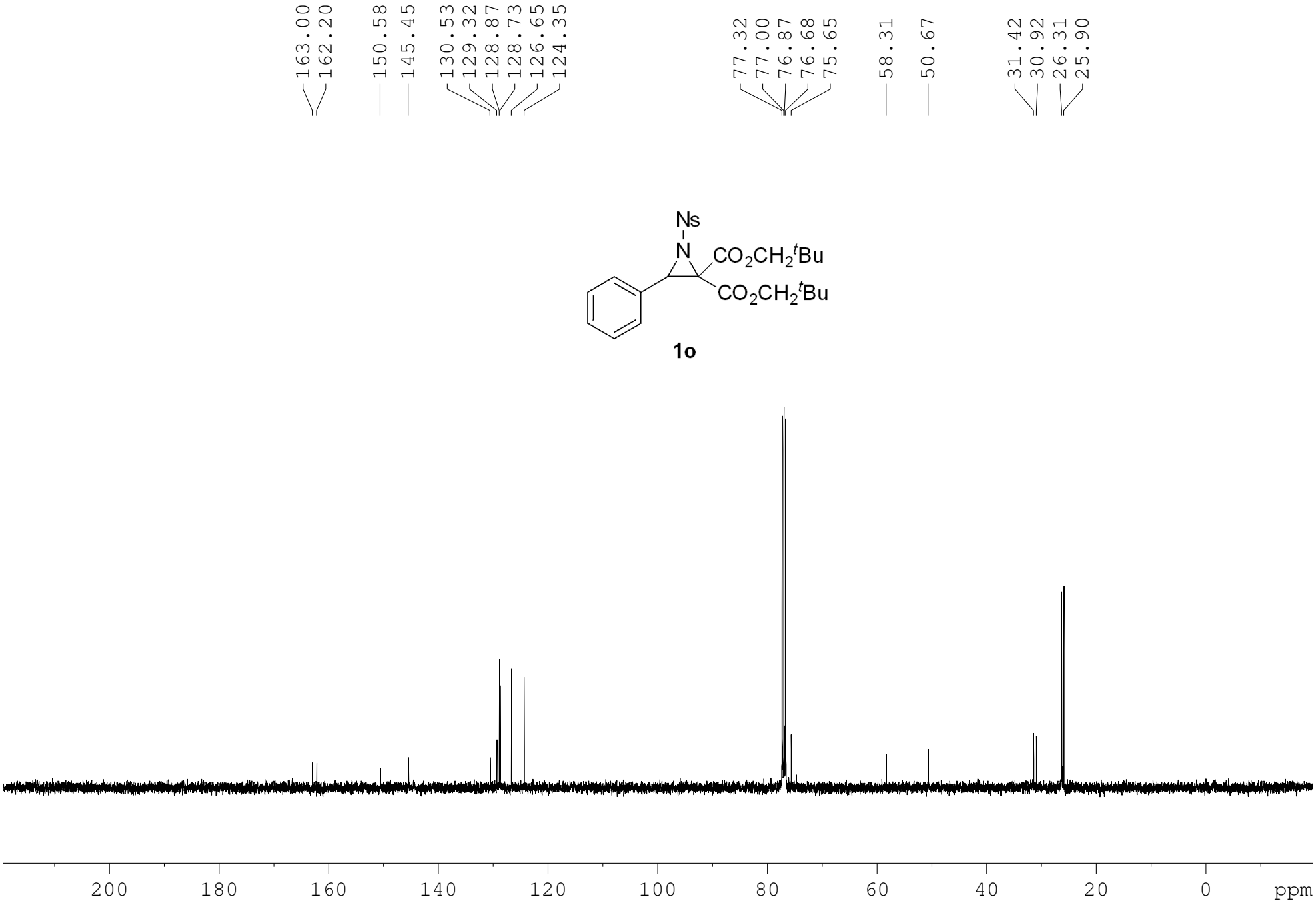


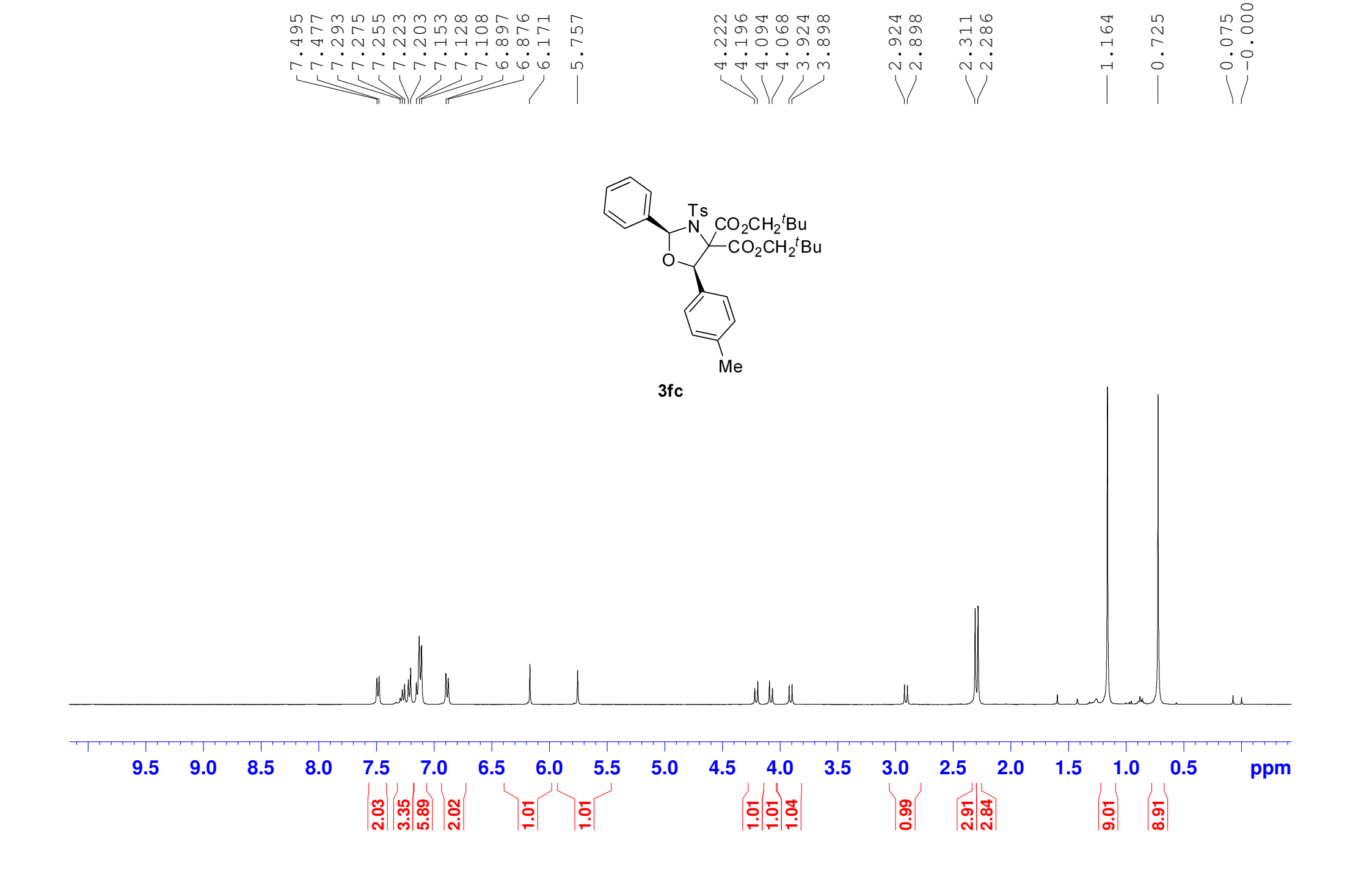
1n

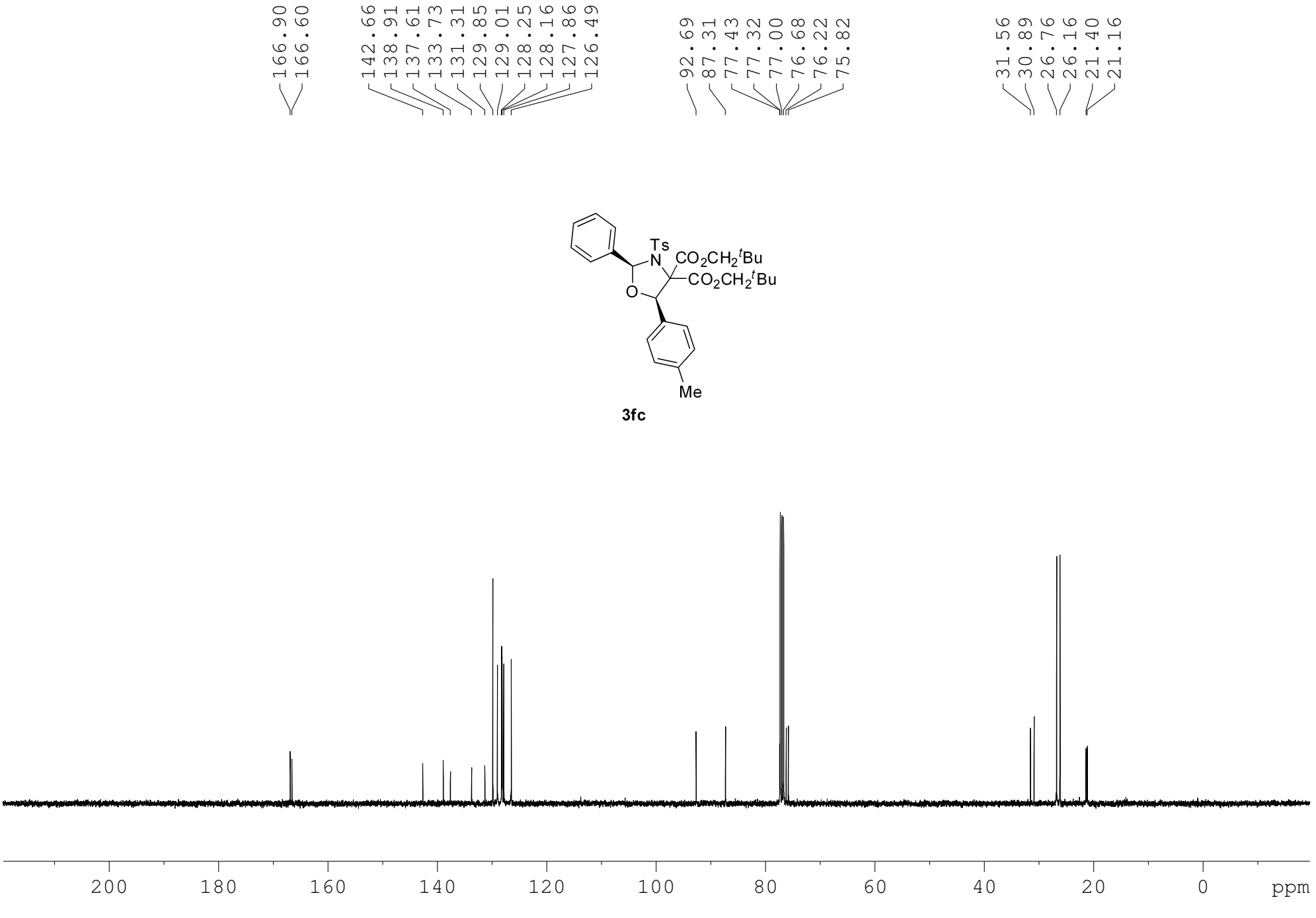



163.24
162.67
144.71
136.61
133.42
132.91
129.69
128.65
128.39
127.98
127.78
127.66
126.53
126.49
126.40
124.04
77.31
77.00
76.68
76.57
75.36
57.94
49.79
31.42
30.91
26.39
25.88
21.67
Ts
N
CO2CH2tBu
CO2CH2tBu
1n
200
180
160
140
120
100
80
60
40
20
0
ppm

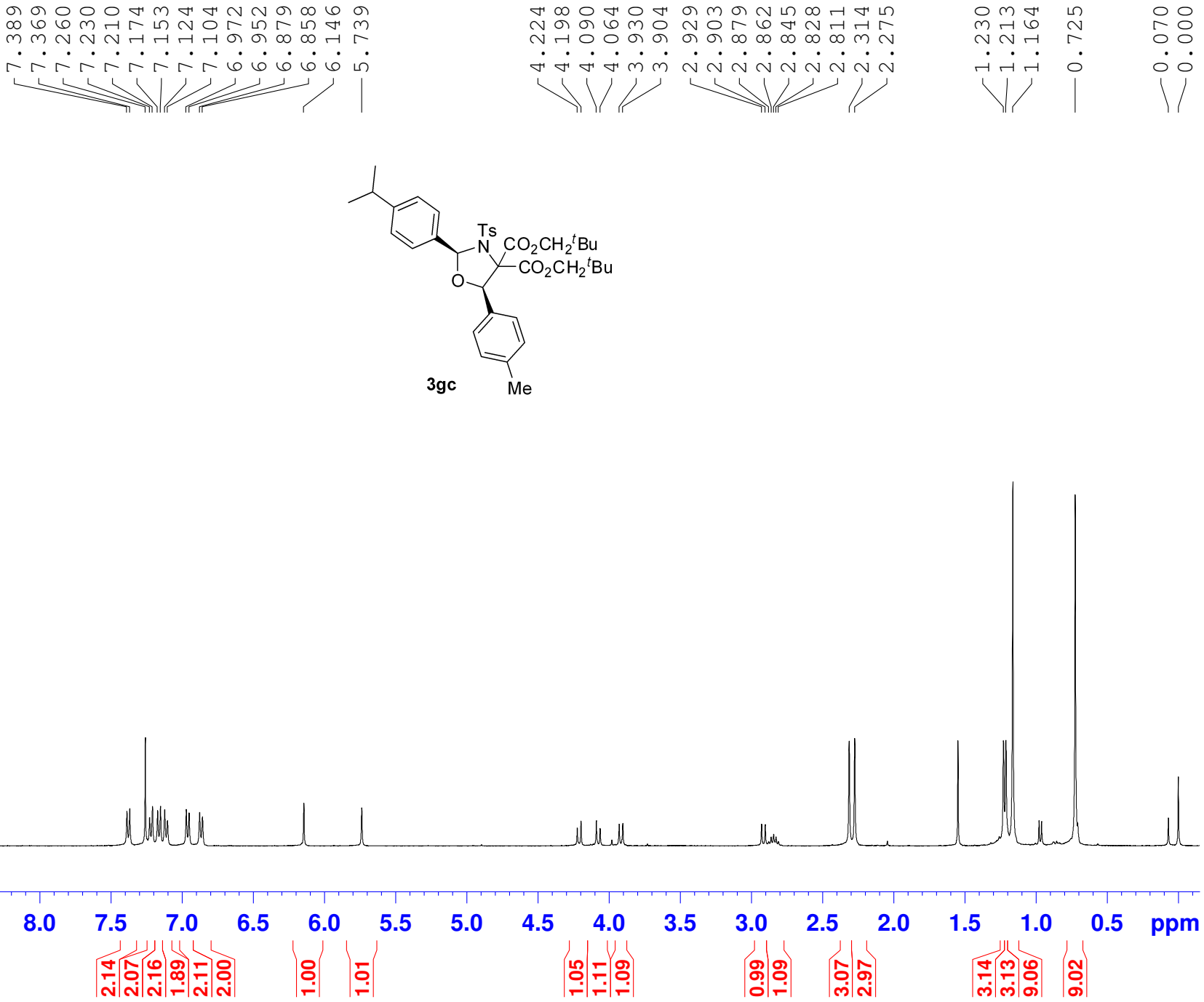

8.424
8.402
8.310
8.289
7.294
7.291
7.277
7.265
7.218
7.205
5.023
4.045
3.664
3.638
3.503
3.477
3.429
0.644
-0.000
Ns
N
CO2CH2tBu
CO2CH2tBu
1o
9
8
7
6
5
4
3
2
1
0
ppm
2.11
1.94
5.54
1.00
1.98
1.09
1.01
8.88
9.19

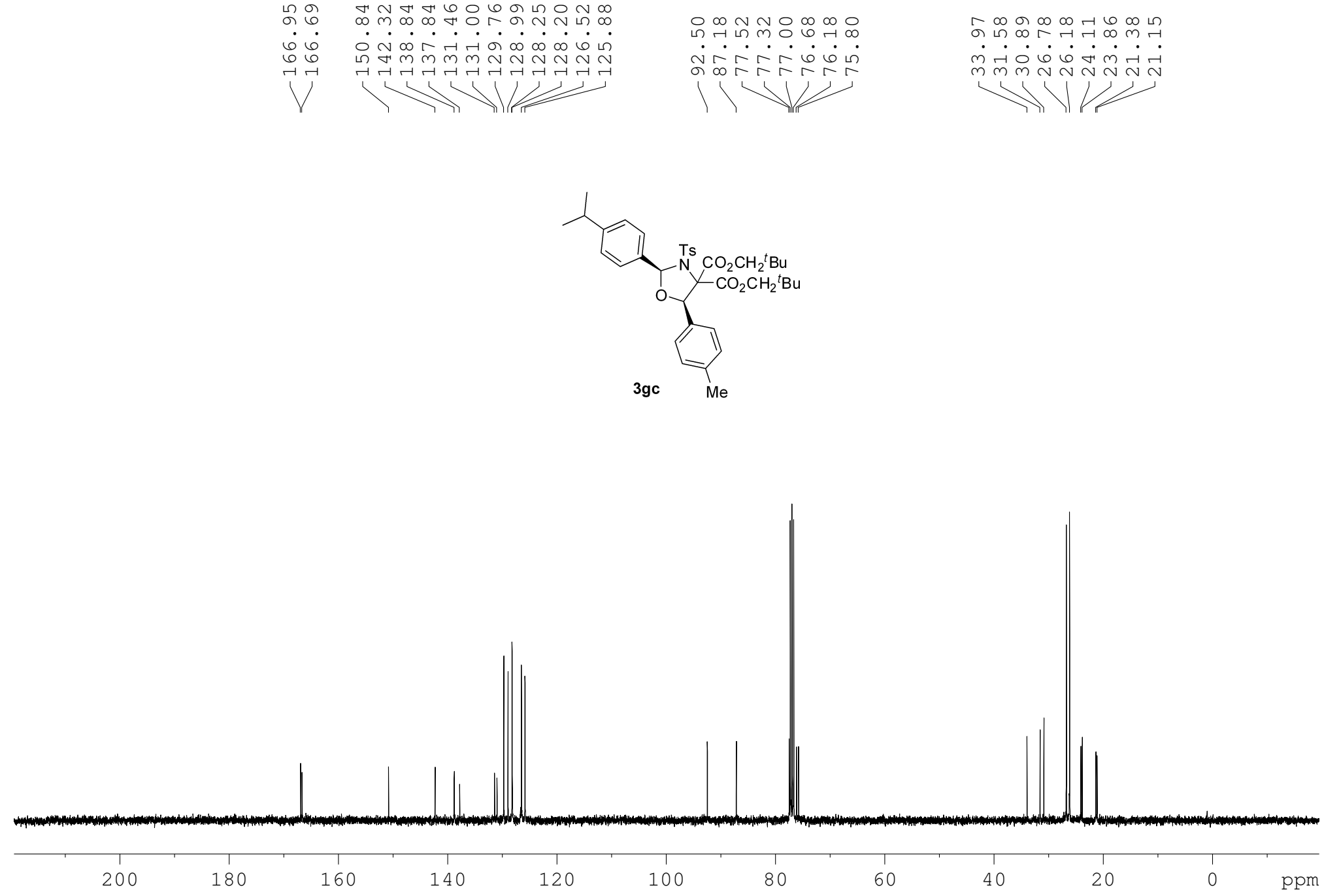

163.00
162.20
150.58
145.45
130.53
129.32
128.87
128.73
126.65
124.35
77.32
77.00
76.87
76.68
75.65
58.31
50.67
31.42
30.92
26.31
25.90
Ns
N
CO2CH2tBu
CO2CH2tBu
1o
200
180
160
140
120
100
80
60
40
20
0
ppm

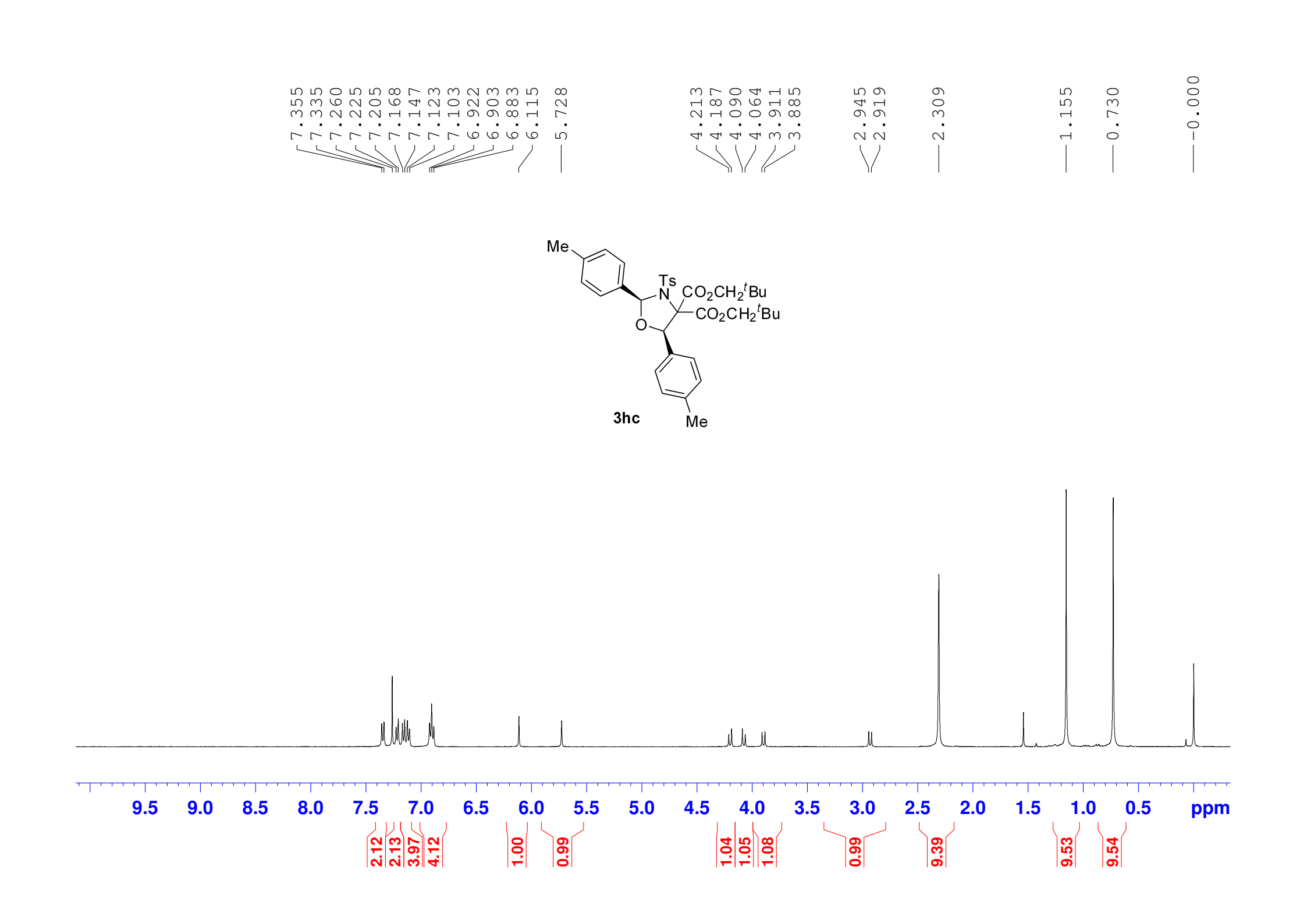

7.495
7.477
7.293
7.275
7.255
7.223
7.203
7.153
7.128
7.108
6.897
6.876
6.171
5.757
4.222
4.196
4.094
4.068
3.924
3.898
2.924
2.898
2.311
2.286
1.164
0.725
0.075
-0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3fc
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.03
3.35
5.89
2.02
1.01
1.01
1.01
1.01
1.04
0.99
2.91
2.84
9.01
8.91

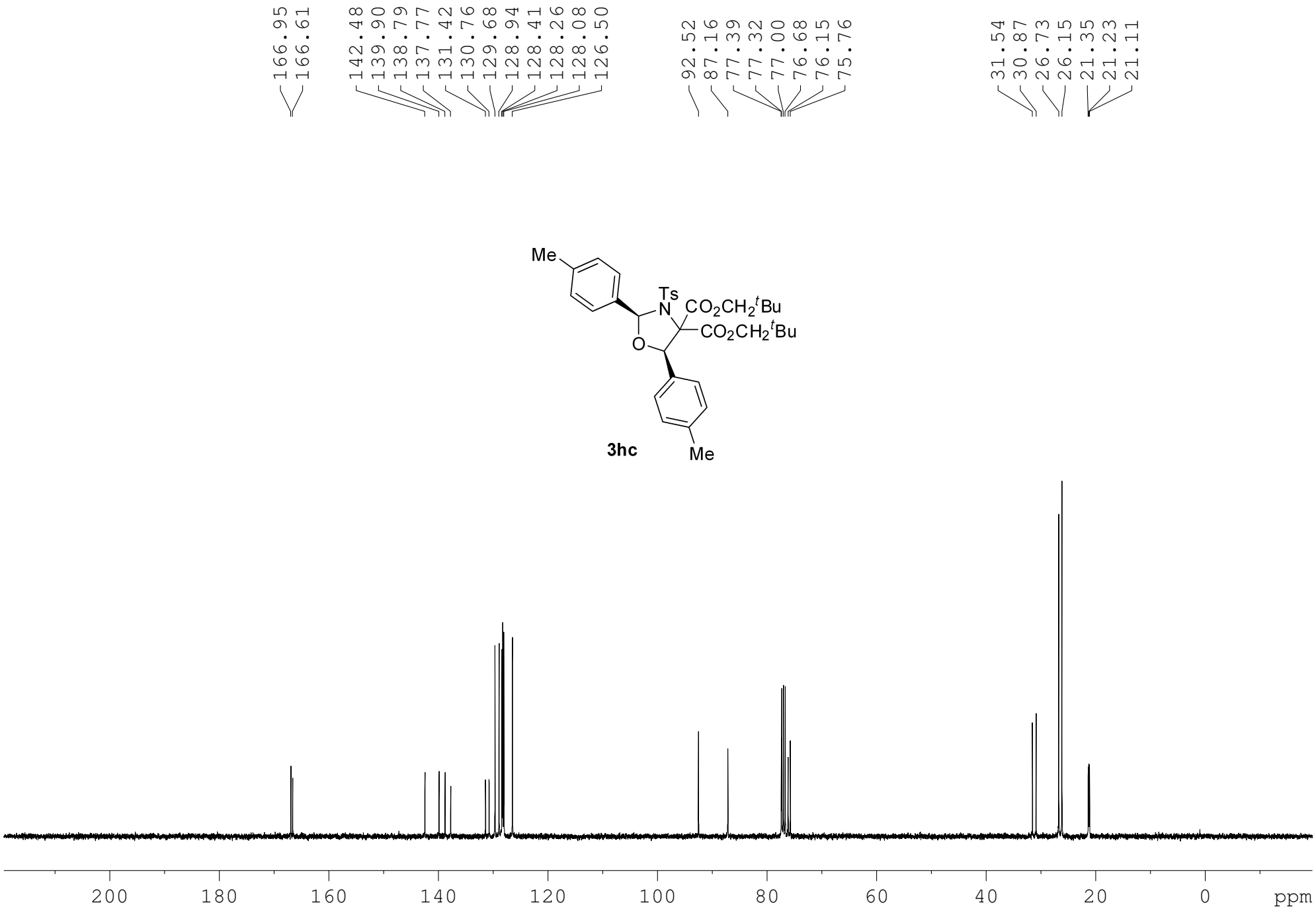

166.90
166.60
142.66
138.91
137.61
133.73
131.31
129.85
129.01
128.25
128.16
127.86
126.49
92.69
87.31
77.43
77.32
77.00
76.68
76.22
75.82
31.56
30.89
26.76
26.16
21.40
21.16
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
200
180
160
140
120
100
80
60
40
20
0
ppm

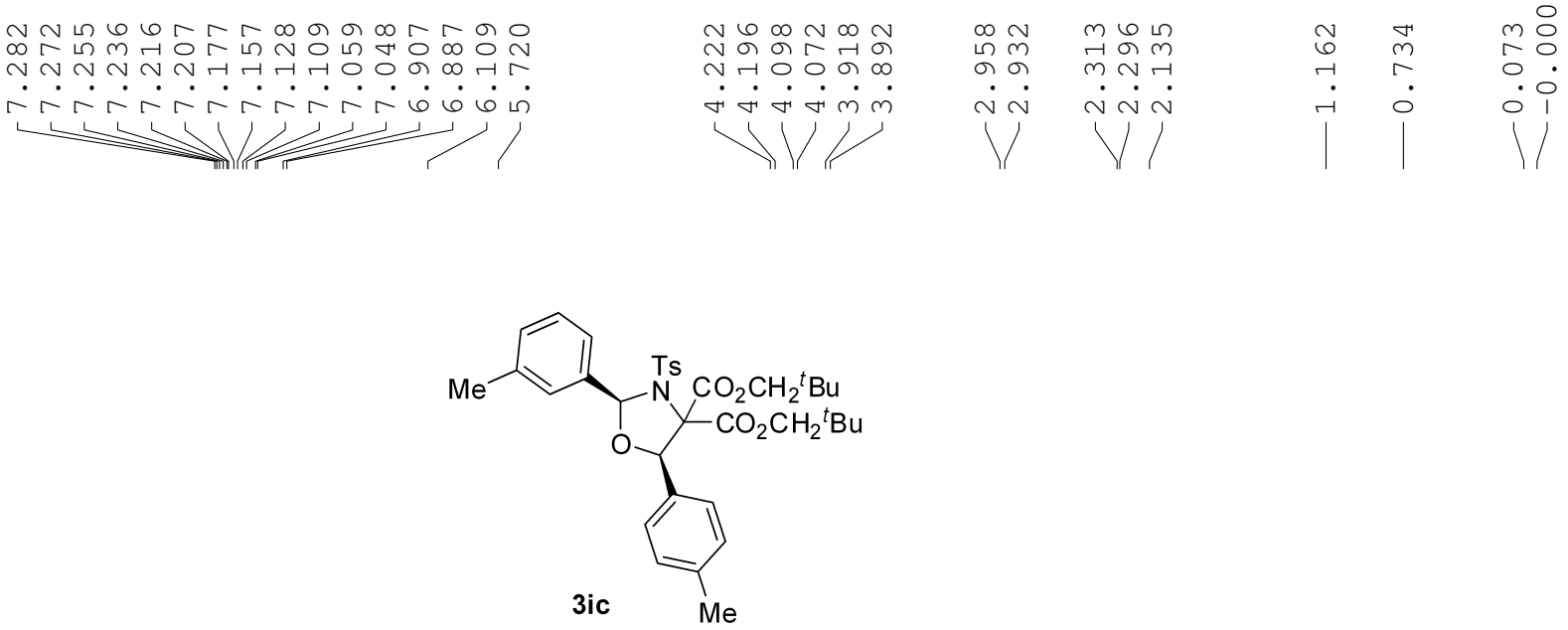
3fc

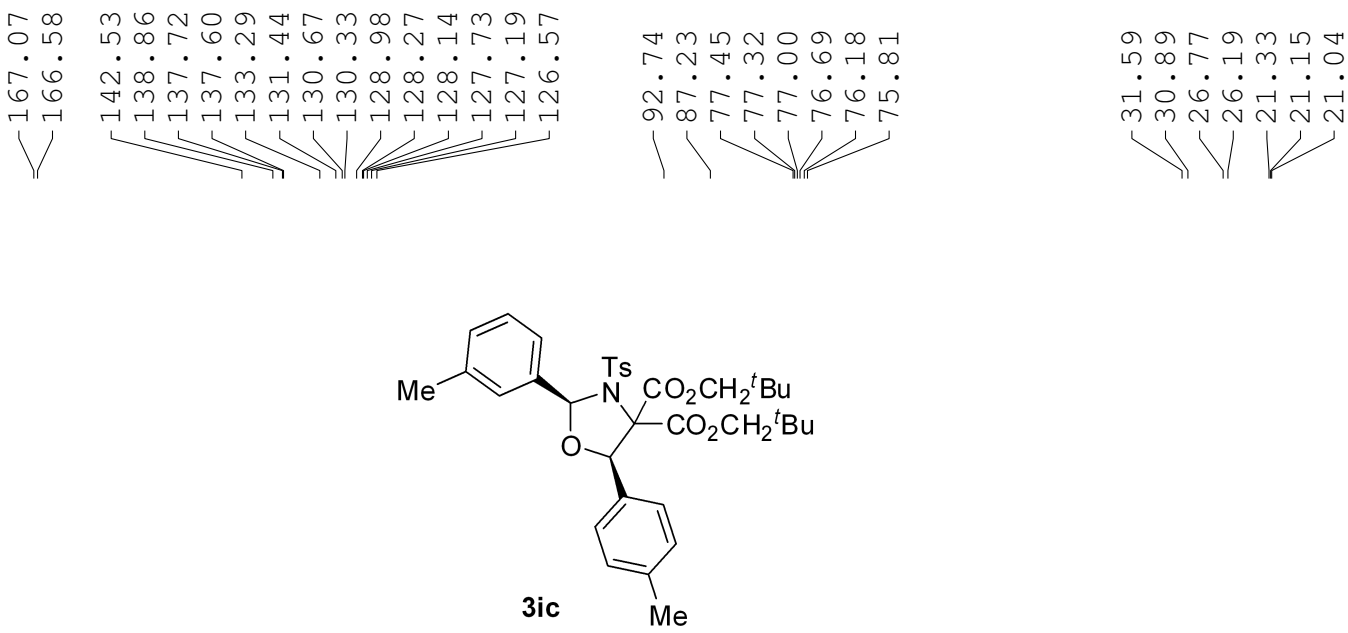

7.389
7.369
7.260
7.230
7.210
7.174
7.153
7.124
7.104
6.972
6.952
6.879
6.858
6.146
5.739
4.224
4.198
4.090
4.064
3.930
3.904
2.929
2.903
2.879
2.862
2.845
2.828
2.811
2.314
2.275
1.230
1.213
1.164
0.725
0.070
0.000
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3gc
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.14
2.07
2.16
1.89
2.11
2.00
1.00
1.01
1.05
1.11
1.09
0.99
1.09
3.07
2.97
3.14
3.13
9.06
9.02

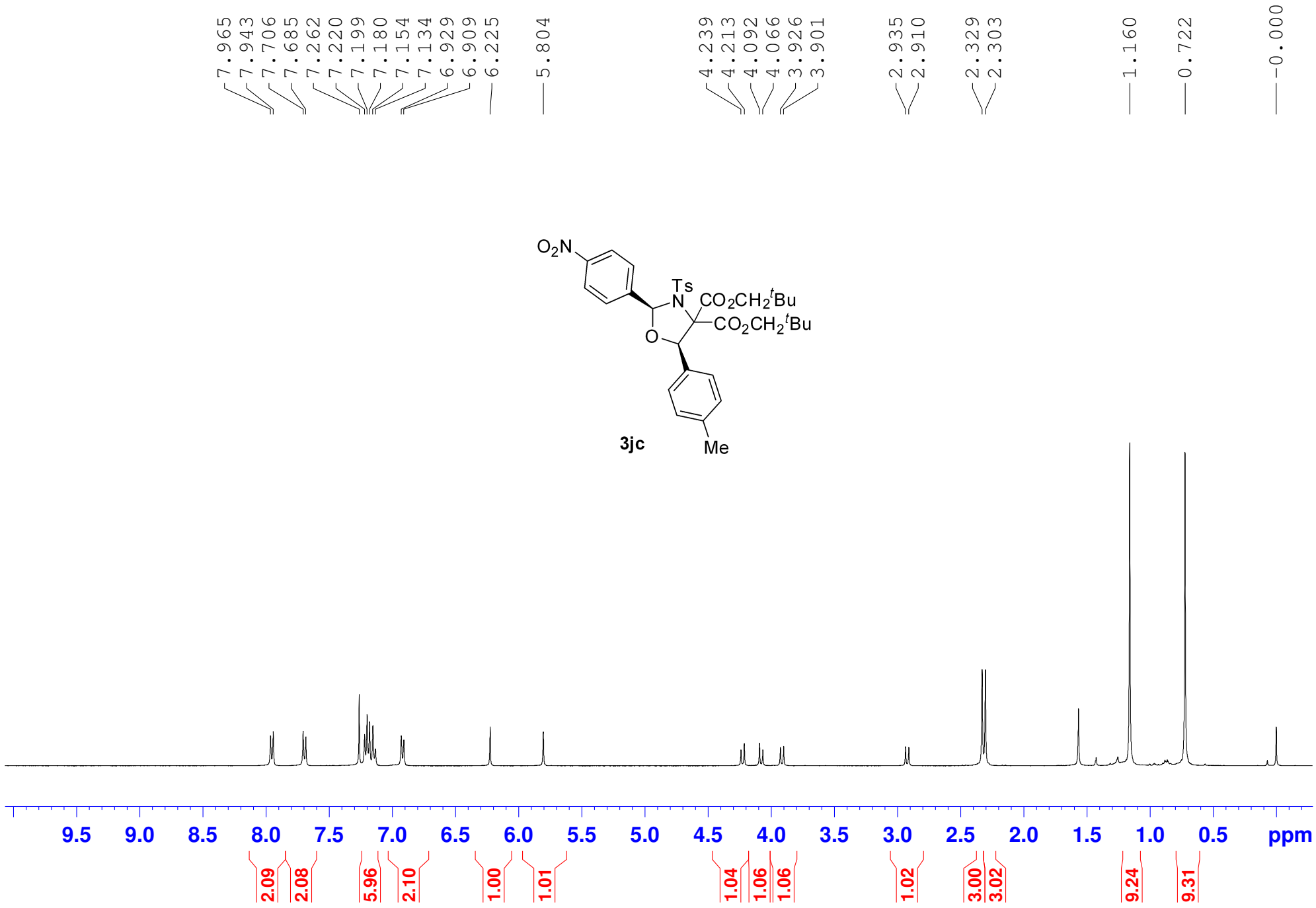

166.95
166.69
150.84
142.32
138.84
137.84
131.46
131.00
129.76
128.99
128.25
128.20
126.52
125.88
92.50
87.18
77.52
77.32
77.00
76.68
76.18
75.80
33.97
31.58
30.89
26.78
26.18
24.11
23.86
21.38
21.15
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3gc
200
180
160
140
120
100
80
60
40
20
0
ppm

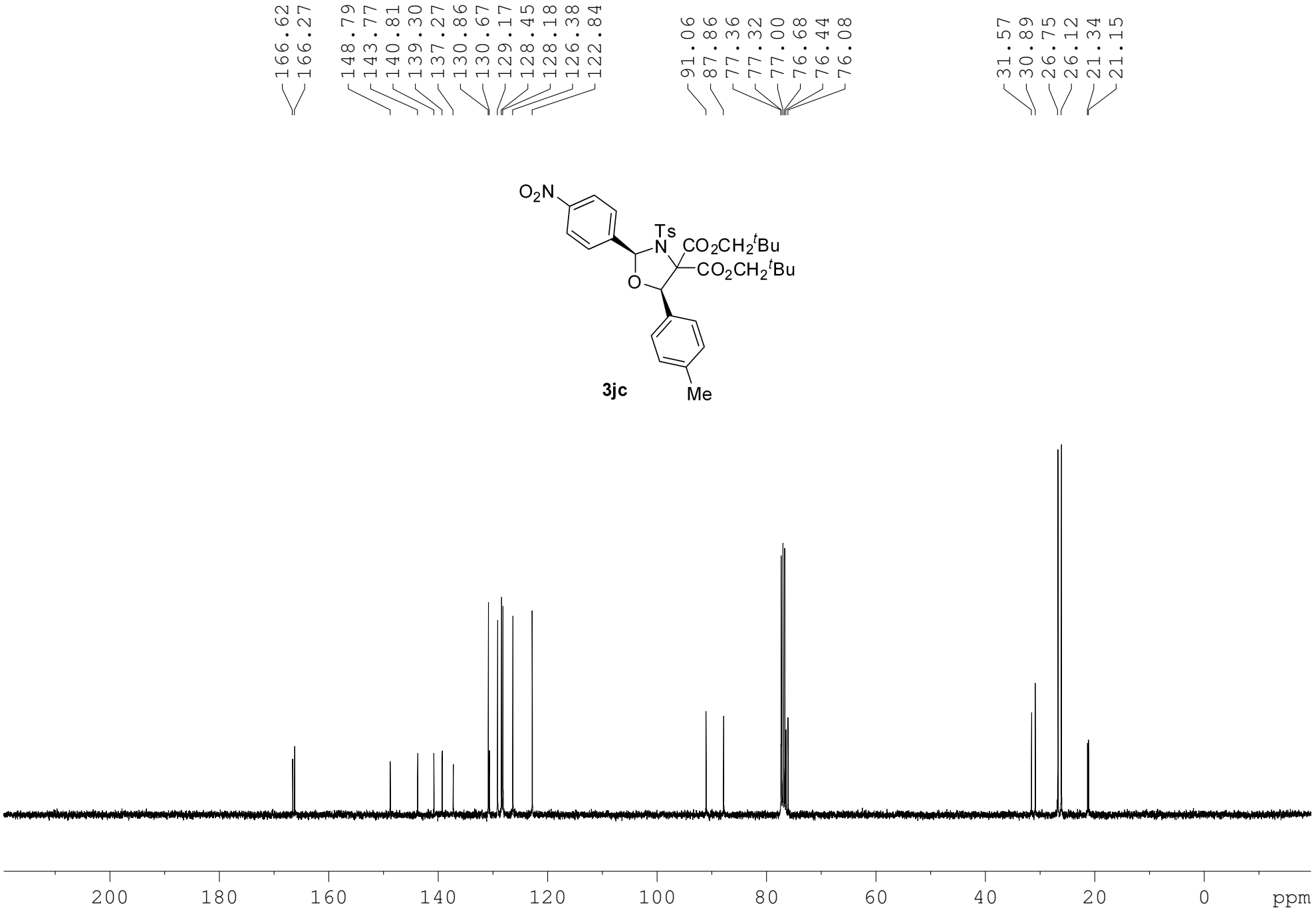

7.355
7.335
7.260
7.225
7.205
7.168
7.147
7.123
7.103
6.922
6.903
6.883
6.115
5.728
4.213
4.187
4.090
4.064
3.911
3.885
2.945
2.919
2.309
1.155
0.730
-0.000
Me
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3hc
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.12
2.13
3.97
4.12
1.00
0.99
1.04
1.05
1.08
0.99
9.39
9.53
9.54

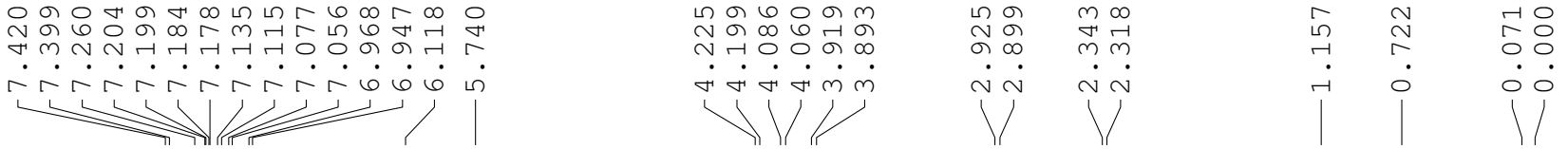

166.95
166.61
142.48
139.90
138.79
137.77
131.42
130.76
129.68
128.94
128.41
128.26
128.08
126.50
92.52
87.16
77.39
77.32
77.00
76.68
76.15
75.76
31.54
30.87
26.73
26.15
21.35
21.23
21.11
Me
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3hc
200
180
160
140
120
100
80
60
40
20
0
ppm

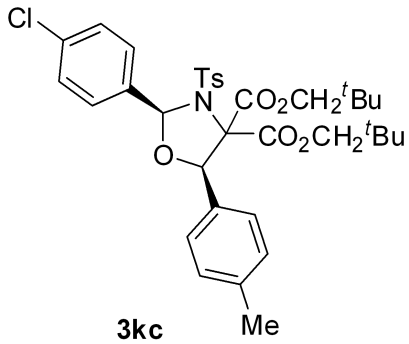

7.282
7.272
7.255
7.236
7.216
7.207
7.177
7.157
7.128
7.109
7.059
7.048
6.907
6.887
6.109
5.720
4.222
4.196
4.098
4.072
3.918
3.892
2.958
2.932
2.313
2.296
2.135
1.162
0.734
0.073
-0.000
Me
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3ic
10
9
8
7
6
5
4
3
2
1
ppm
4.39
2.01
2.01
1.92
1.91
1.00
1.01
1.03
1.00
1.05
0.98
2.79
2.81
2.82
8.81
9.28


167.07
166.58
142.53
138.86
137.72
137.60
133.29
131.44
130.67
130.33
128.98
128.27
128.14
127.73
127.19
126.57
92.74
87.23
77.45
77.32
77.00
76.69
76.18
75.81
31.59
30.89
26.77
26.19
21.33
21.15
21.04
Me
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3ic
200
180
160
140
120
100
80
60
40
20
0
ppm

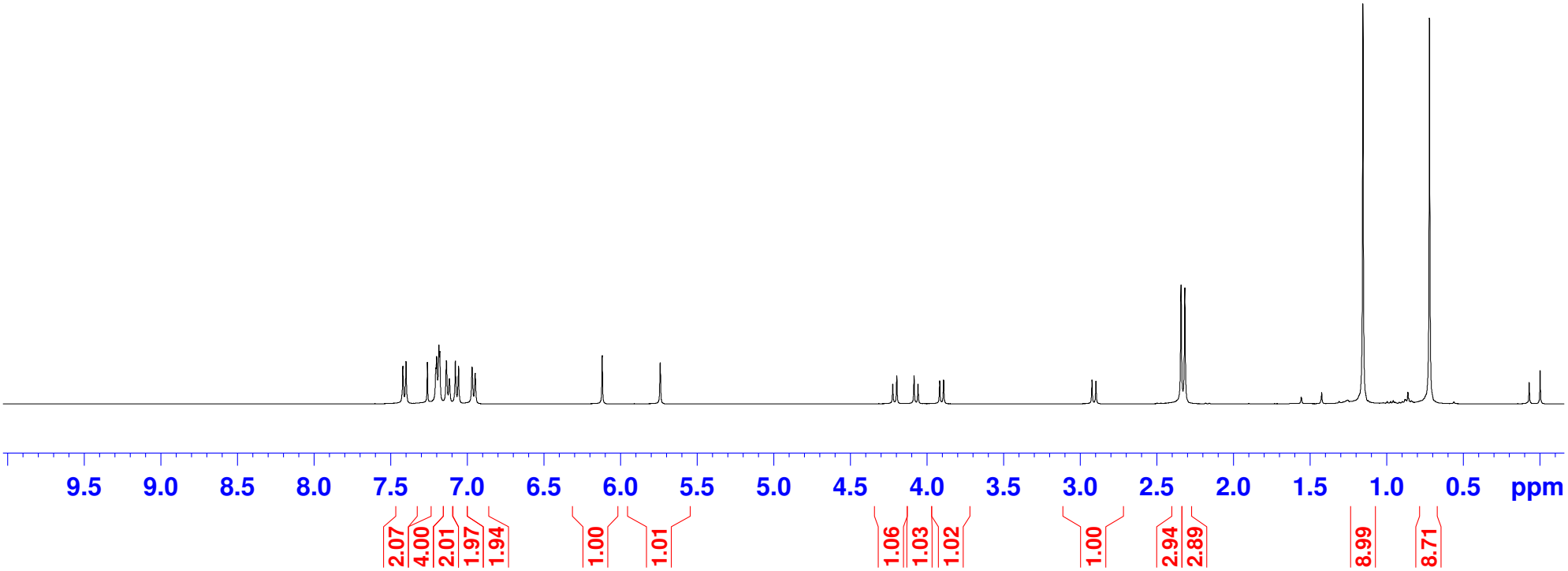

7.965
7.943
7.706
7.685
7.262
7.220
7.199
7.180
7.154
7.134
6.929
6.909
6.225
5.804
4.239
4.213
4.092
4.066
3.926
3.901
2.935
2.910
2.329
2.303
1.160
0.722
0.000
O2N
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3jc
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.09
2.08
5.96
2.10
1.00
1.01
1.04
1.06
1.06
1.02
3.00
3.02
9.24
9.31

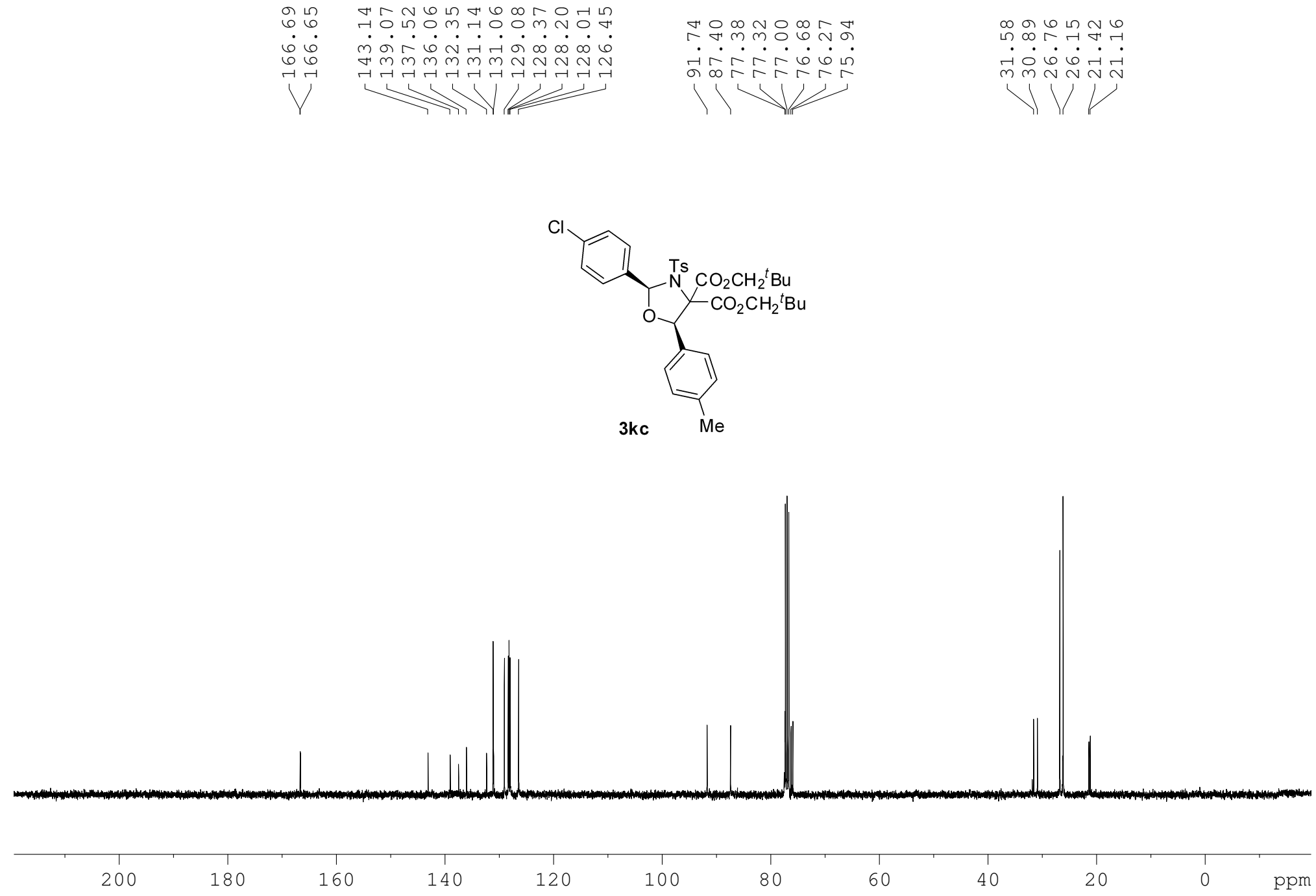

166.62
166.27
148.79
143.77
140.81
139.30
137.27
130.86
130.67
129.17
128.45
128.18
126.38
122.84
91.06
87.86
77.36
77.32
77.00
76.68
76.44
76.08
31.57
30.89
26.75
26.12
21.34
21.15
O2N
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3jc
200
180
160
140
120
100
80
60
40
20
0
ppm

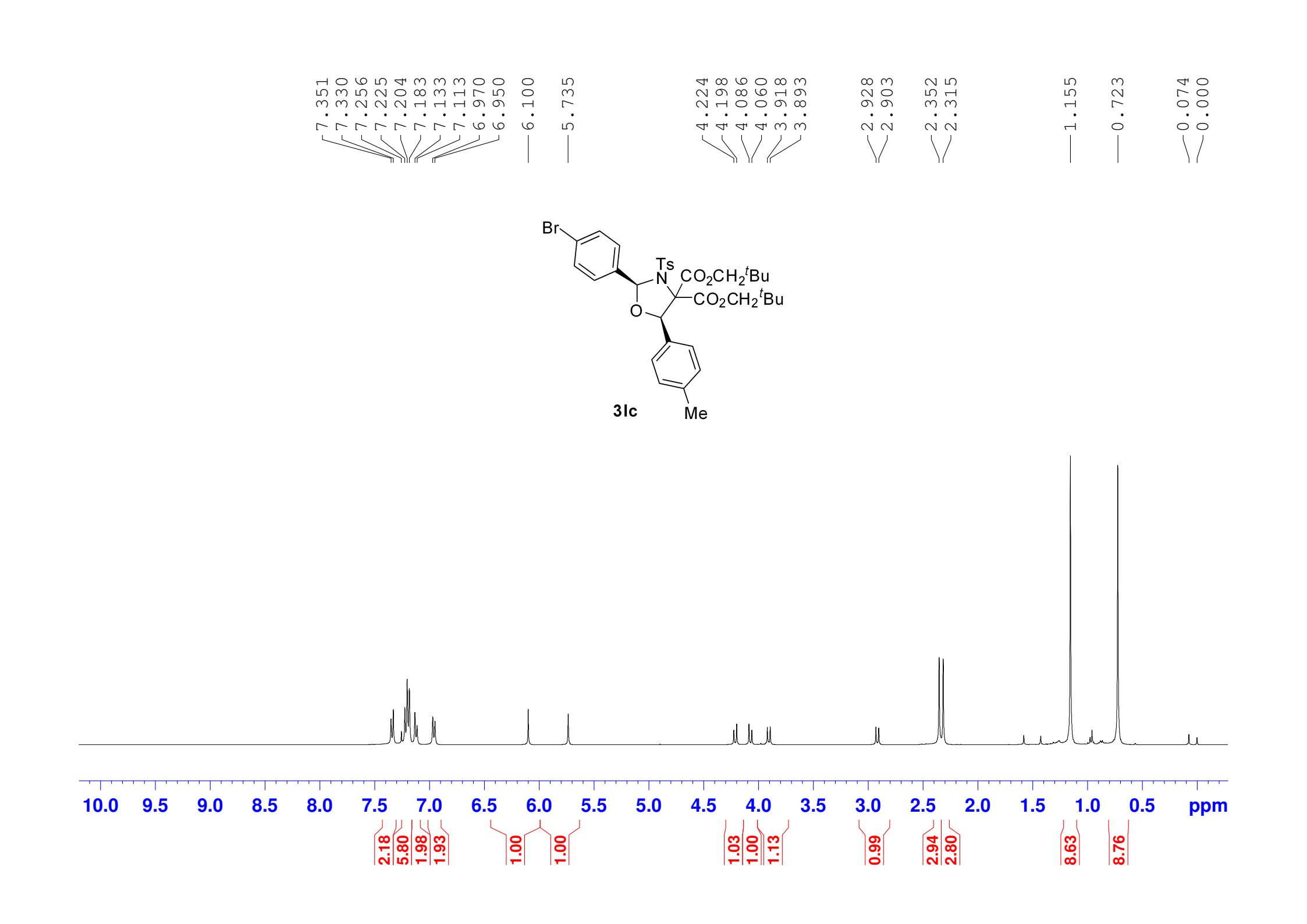

7.420
7.399
7.260
7.204
7.199
7.184
7.178
7.135
7.115
7.077
7.056
6.968
6.947
6.118
5.740
4.225
4.199
4.086
4.060
3.919
3.893
2.925
2.899
2.343
2.318
1.157
0.722
0.071
0.000

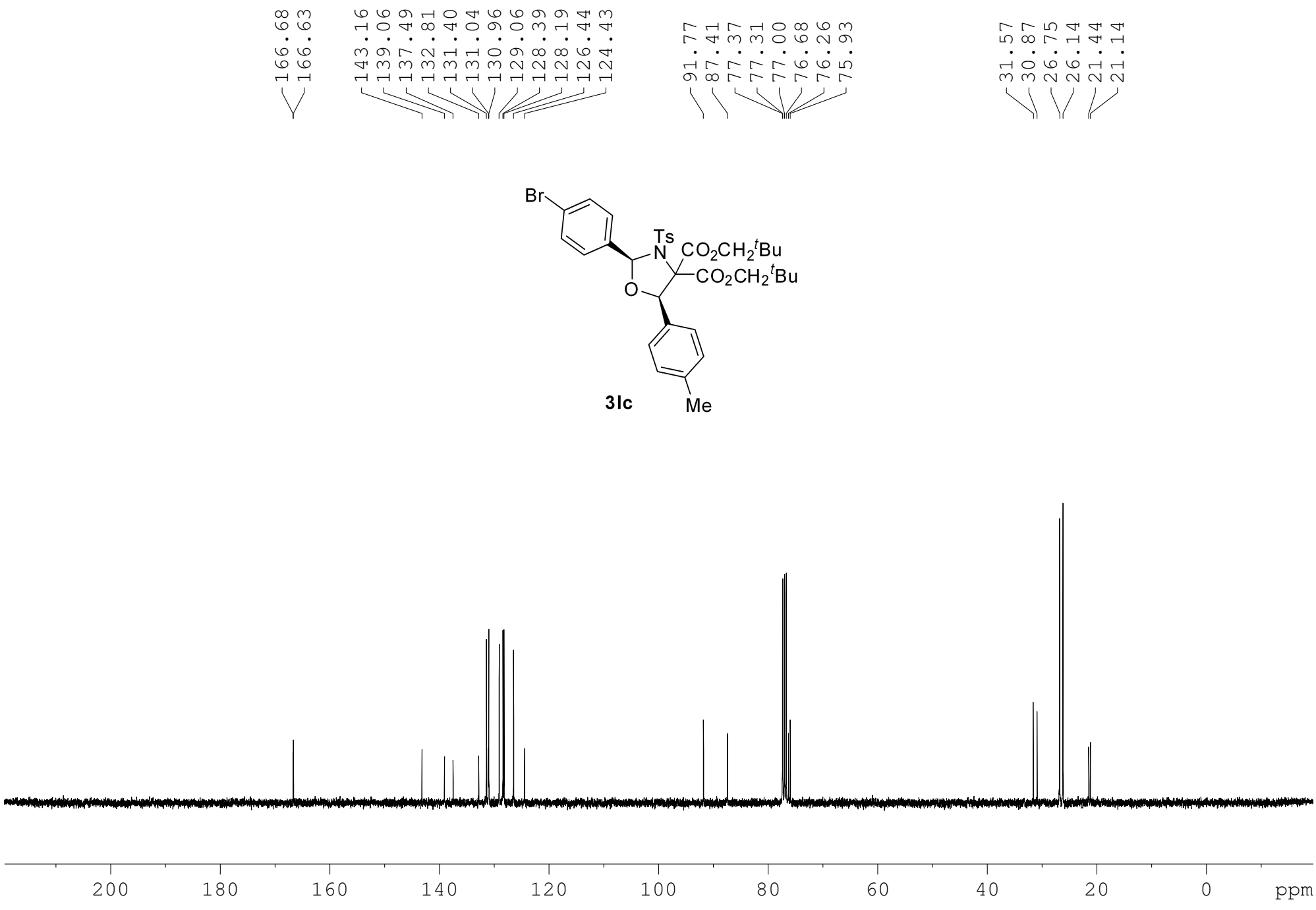

Cl
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me

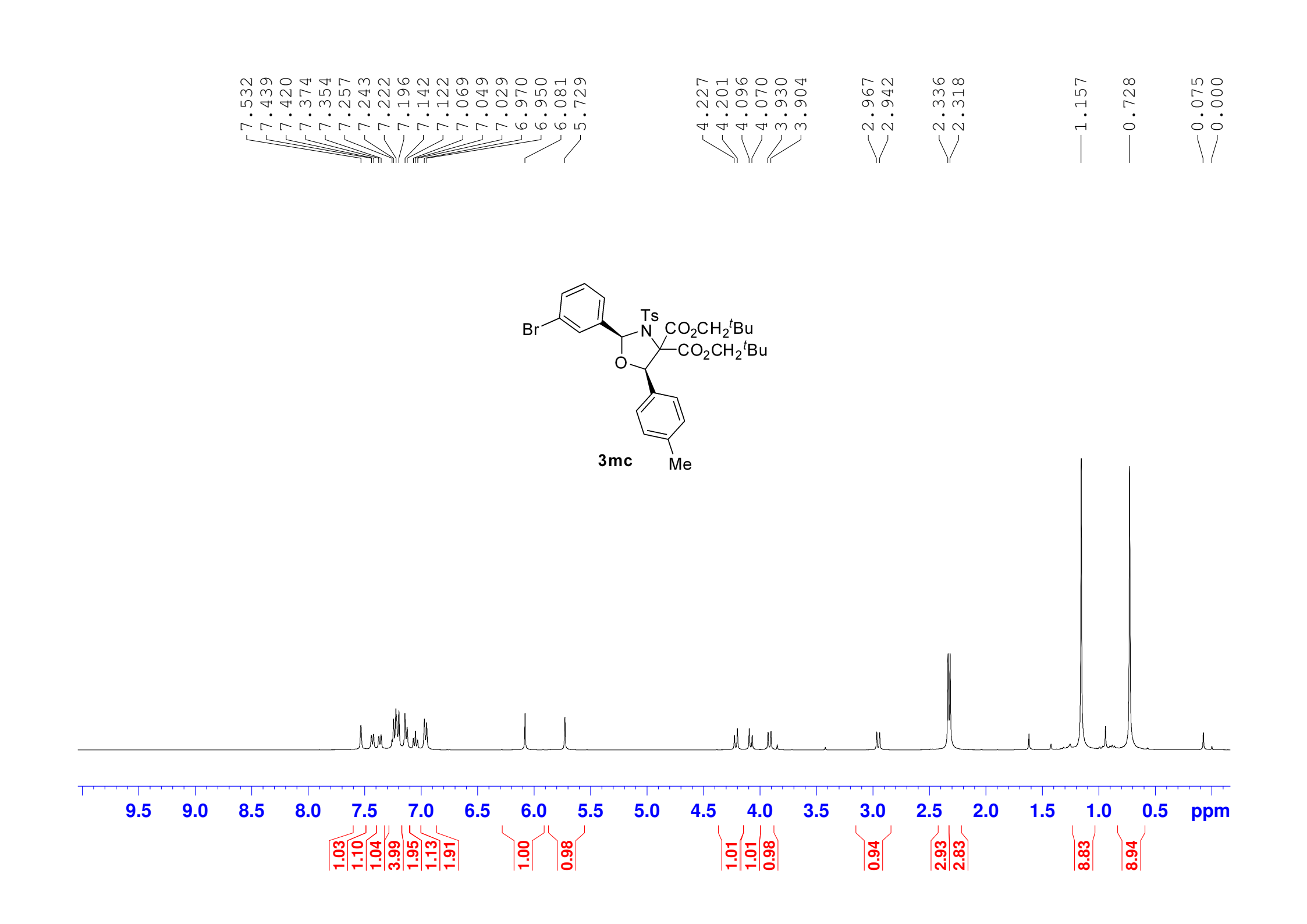
3kc

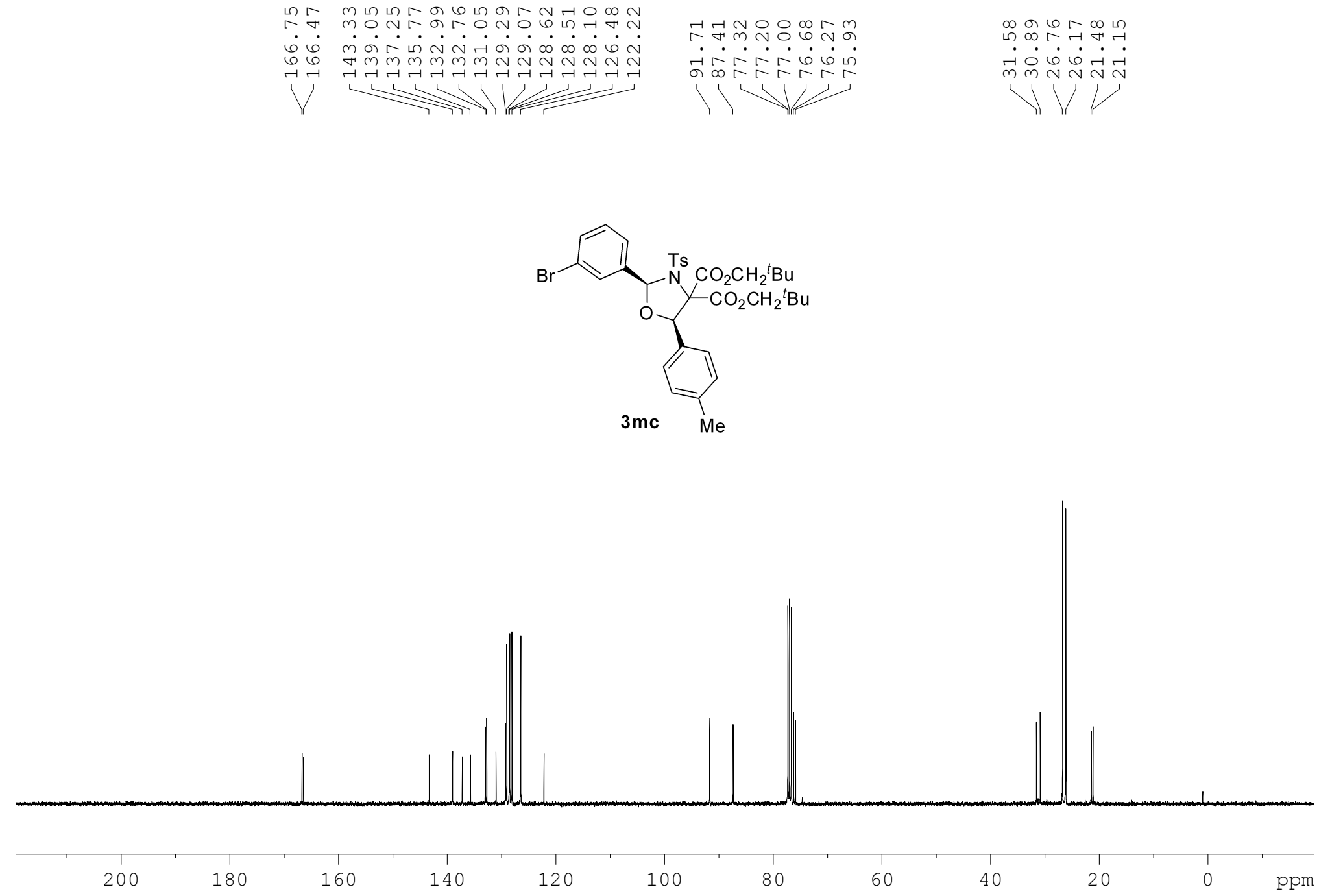

9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.07
4.00
2.01
1.97
1.94
1.00
1.01
1.06
1.03
1.02
1.00
2.94
2.89
8.99
8.71

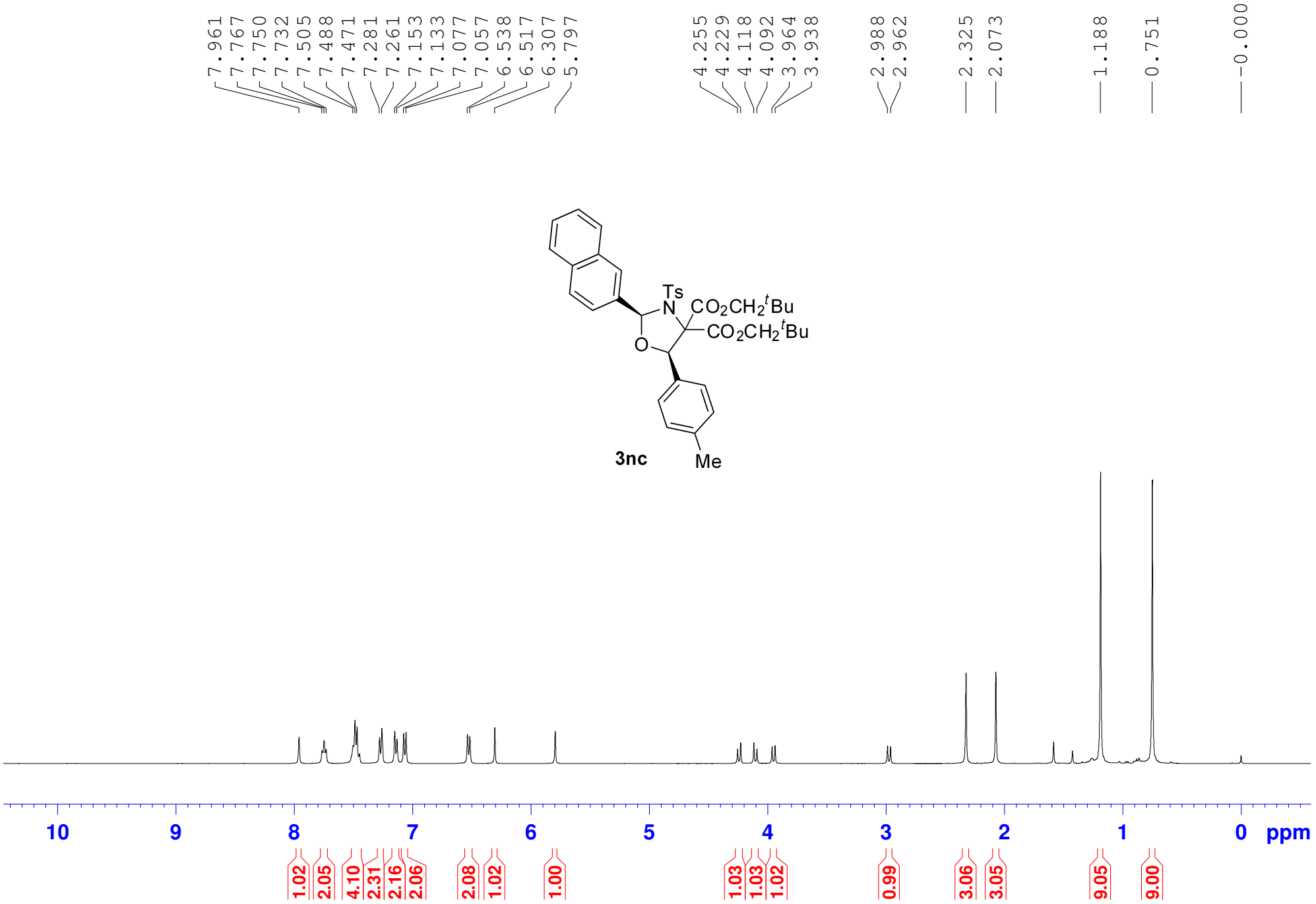

166.69
166.65
143.14
139.07
137.52
136.06
132.35
131.14
131.06
129.08
128.37
128.20
128.01
126.45
91.74
87.40
77.38
77.32
77.00
76.68
76.27
75.94
31.58
30.89
26.76
26.15
21.42
21.16
Cl
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3kc
200
180
160
140
120
100
80
60
40
20
0
ppm

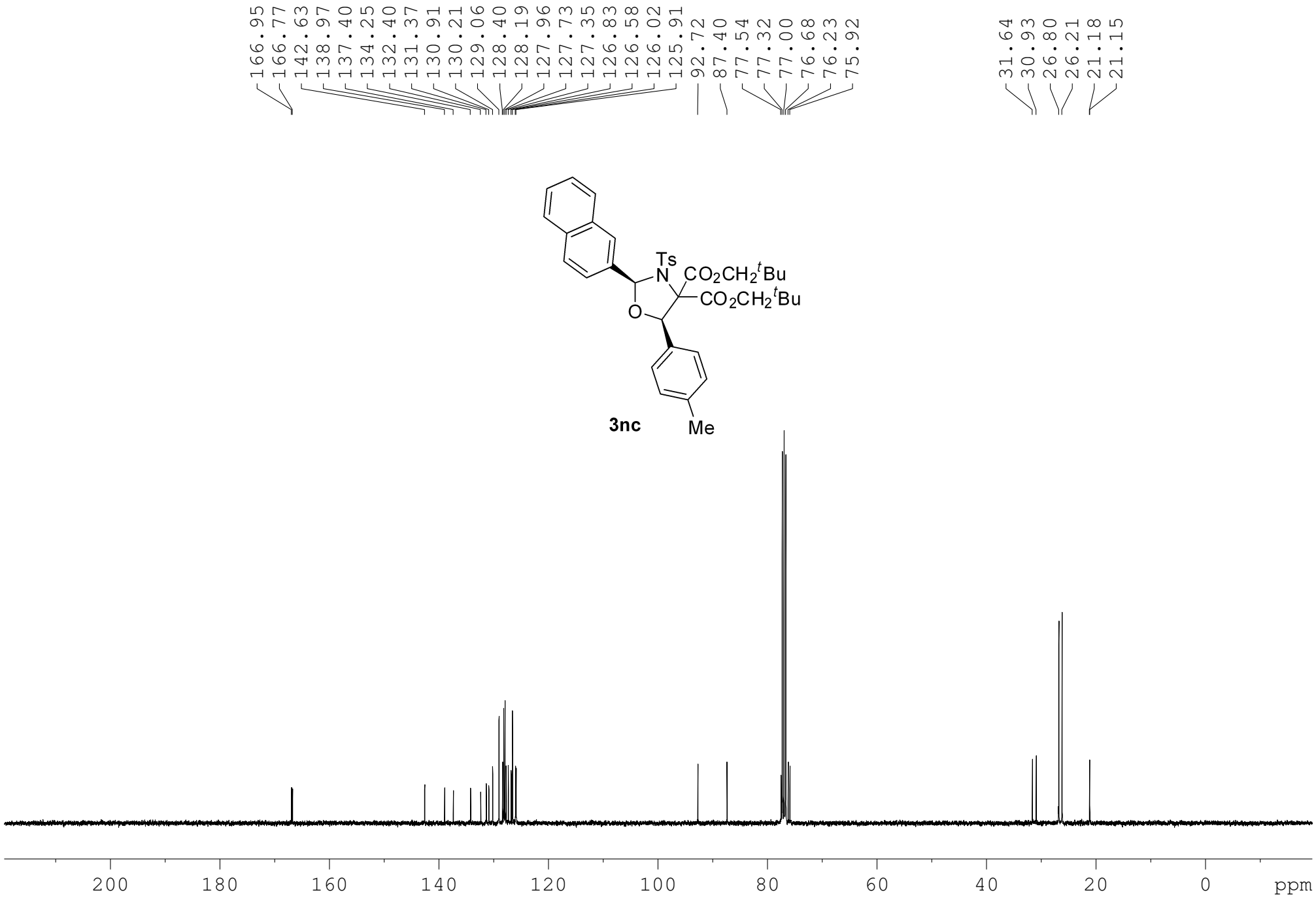

7.351
7.330
7.256
7.225
7.204
7.183
7.133
7.113
6.970
6.950
6.100
5.735
4.224
4.198
4.086
4.060
3.918
3.893
2.928
2.903
2.352
2.315
1.155
0.723
0.074
0.000
Br
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3Ic
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.18
5.80
1.98
1.93
1.00
1.00
1.03
1.00
1.13
0.99
2.94
2.80
8.63
8.76

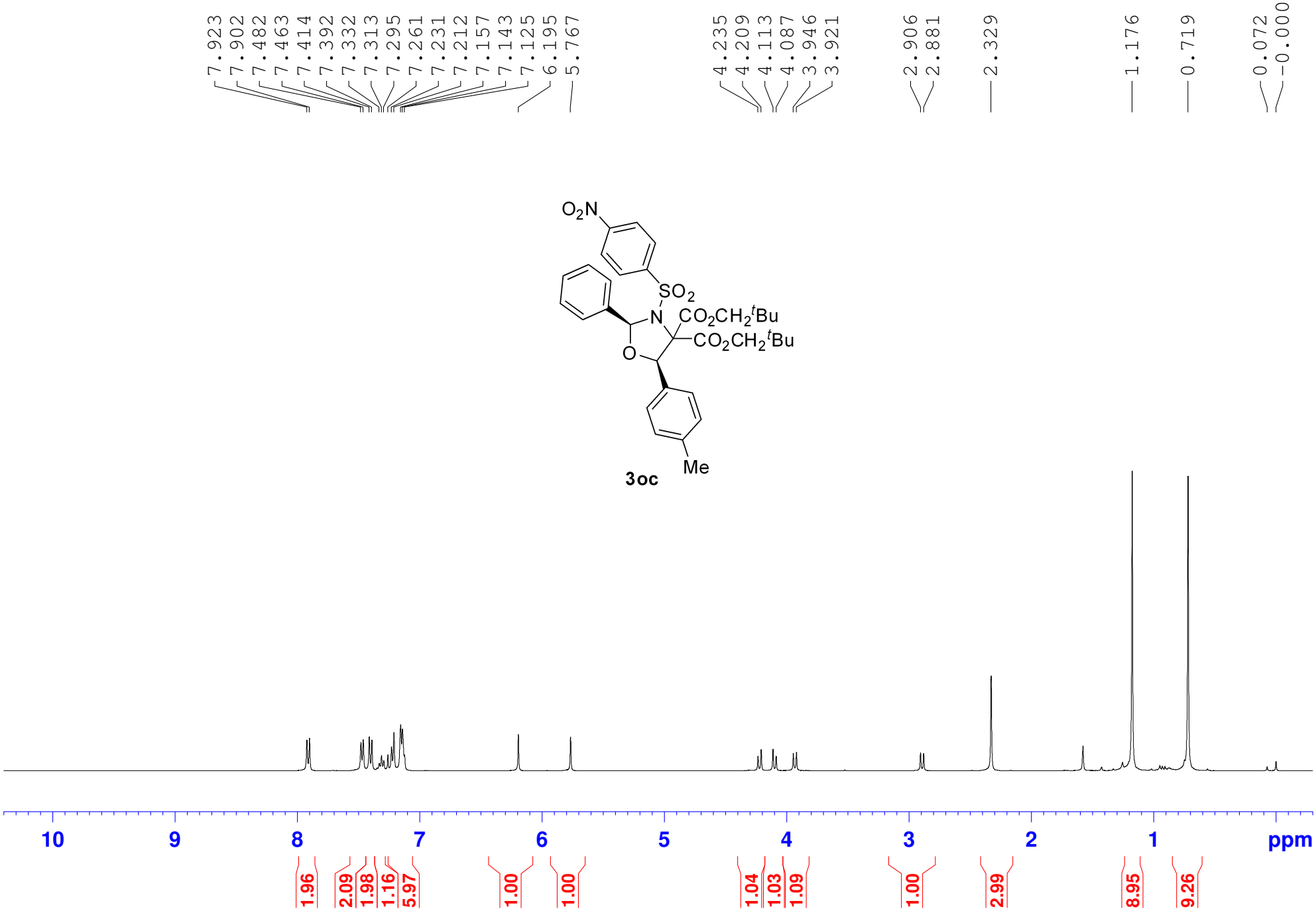

166.68
166.63
143.16
139.06
137.49
132.81
131.40
131.04
130.96
129.06
128.39
128.19
126.44
124.43
91.77
87.41
77.37
77.31
77.00
76.68
76.26
75.93
31.57
30.87
26.75
26.14
21.44
21.14
Br
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3Ic
200
180
160
140
120
100
80
60
40
20
0
ppm

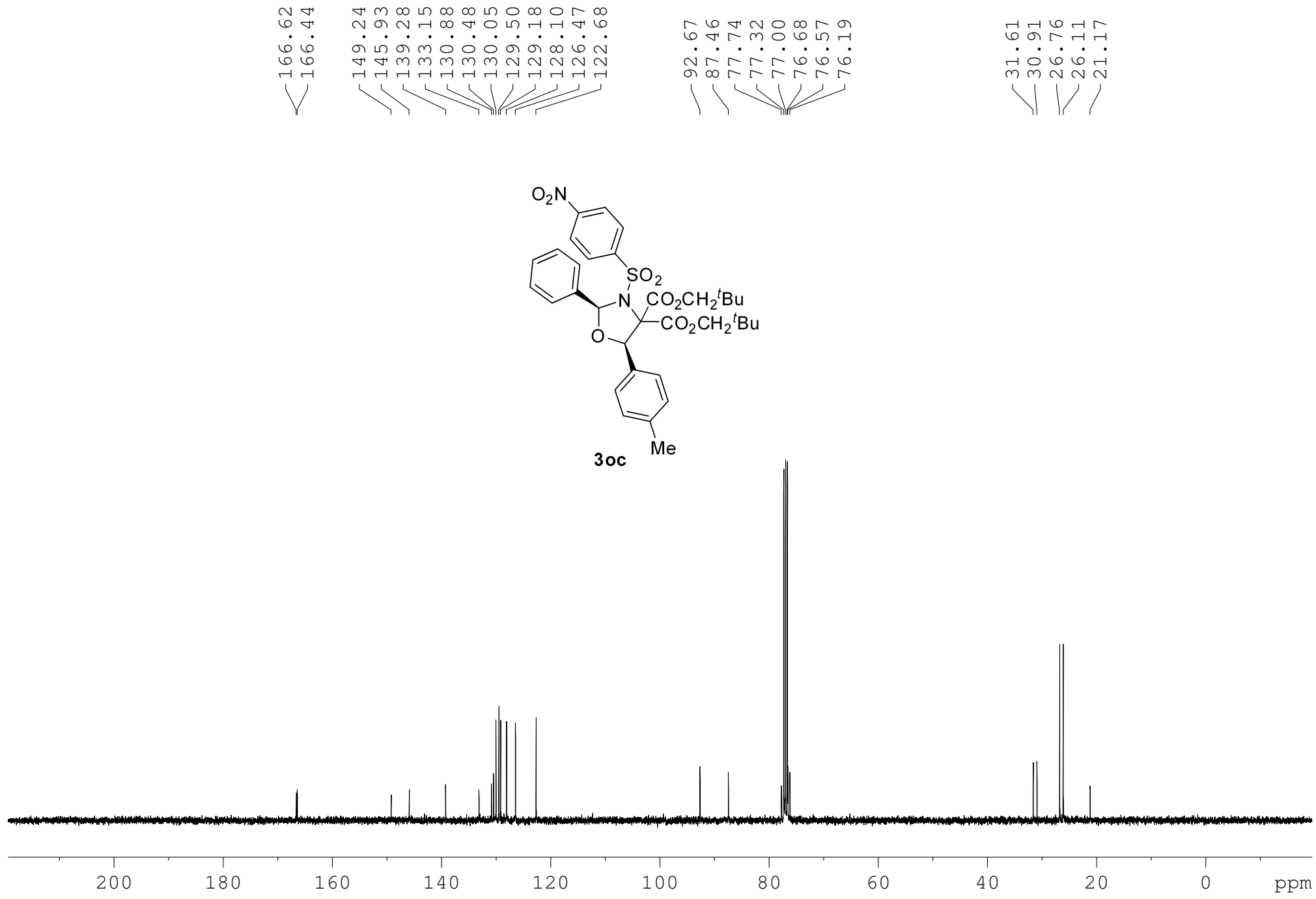

7.532
7.439
7.420
7.374
7.354
7.257
7.243
7.222
7.196
7.142
7.122
7.069
7.049
7.029
6.970
6.950
6.081
5.729
4.227
4.201
4.096
4.070
3.930
3.904
2.967
2.942
2.336
2.318
1.157
0.728
0.075
0.000
Br
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Me
3mc
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.03
1.10
1.04
3.99
1.95
1.13
1.91
1.00
0.98
1.01
1.01
0.98
0.94
2.93
2.83
8.83
8.94

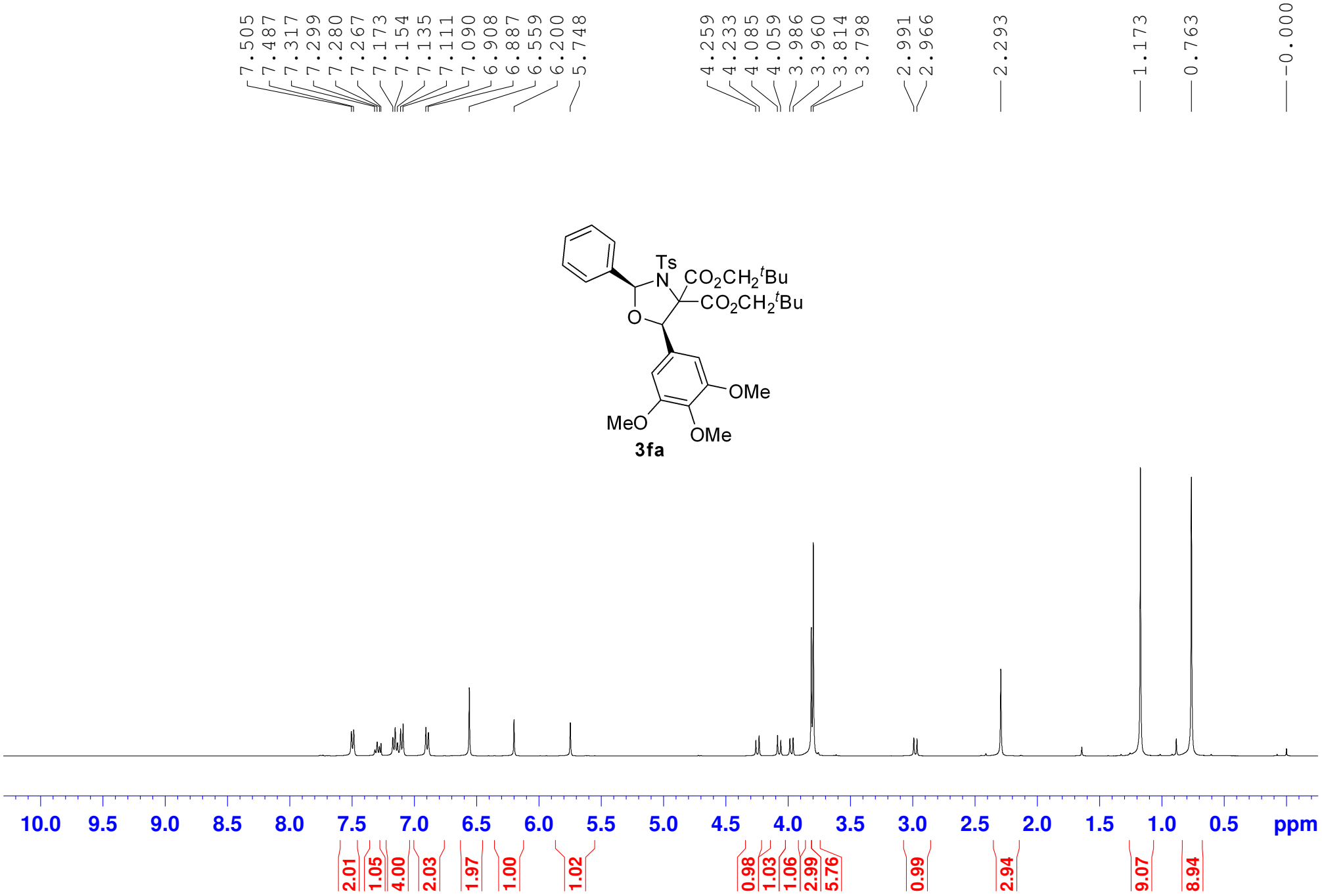

166.75
166.47
143.33
139.05
137.25
135.77
132.99
132.76
131.05
129.29
129.07
128.62
128.51
128.10
126.48
122.22
91.71
87.41
77.32
77.20
77.00
76.68
76.27
75.93
31.58
30.89
26.76
26.17
21.48
21.15
Br
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3mc
200
180
160
140
120
100
80
60
40
20
0
ppm

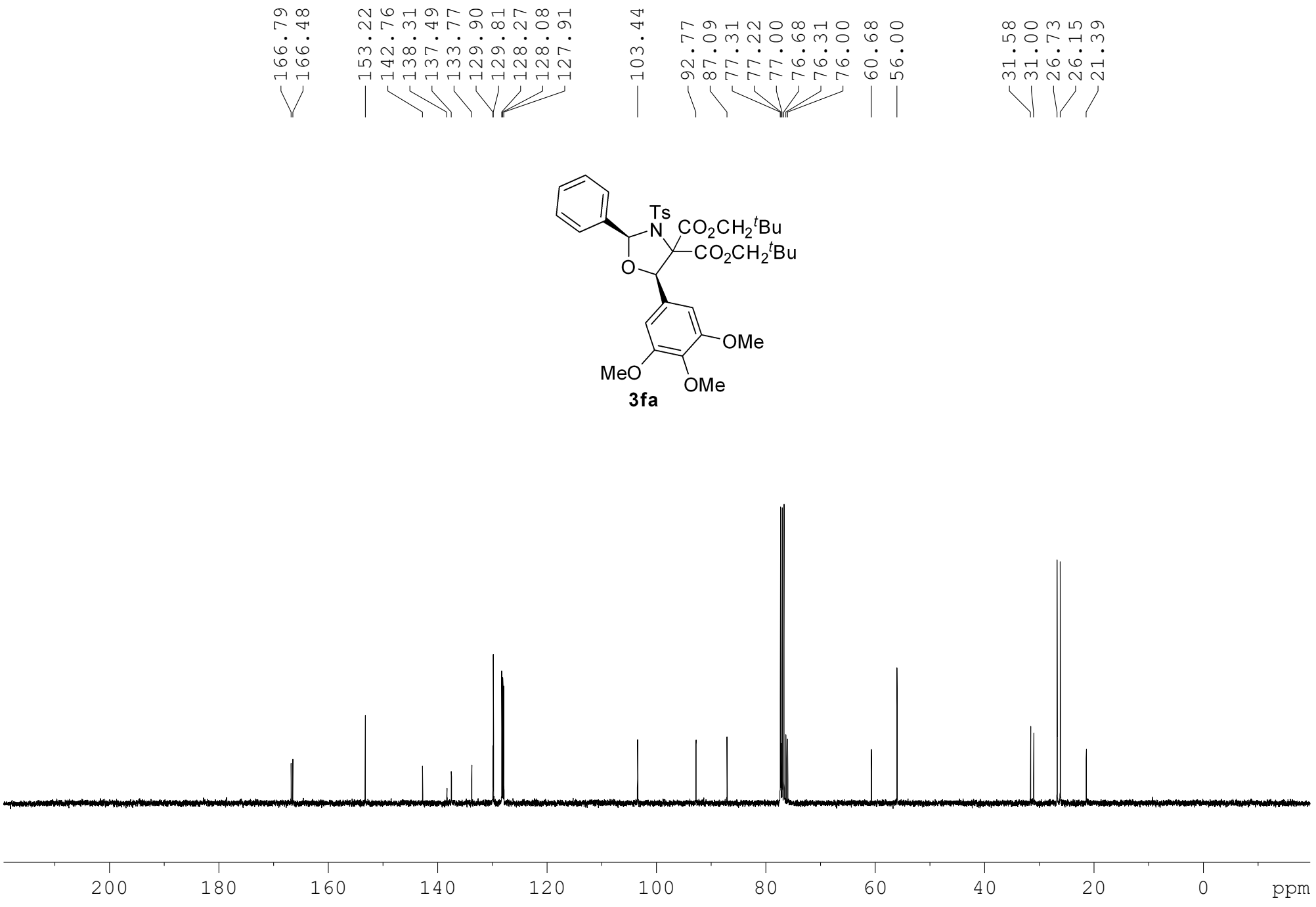

7.961
7.767
7.750
7.732
7.505
7.488
7.471
7.281
7.261
7.153
7.133
7.077
7.057
6.538
6.517
6.307
5.797
4.255
4.229
4.118
4.092
3.964
3.938
2.988
2.962
2.325
2.073
1.188
0.751
-0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3nc
10
9
8
7
6
5
4
3
2
1
0
ppm
1.02
2.05
4.10
2.31
2.16
2.06
2.08
1.02
1.00
1.03
1.03
1.02
0.99
3.06
3.05
9.05
9.00

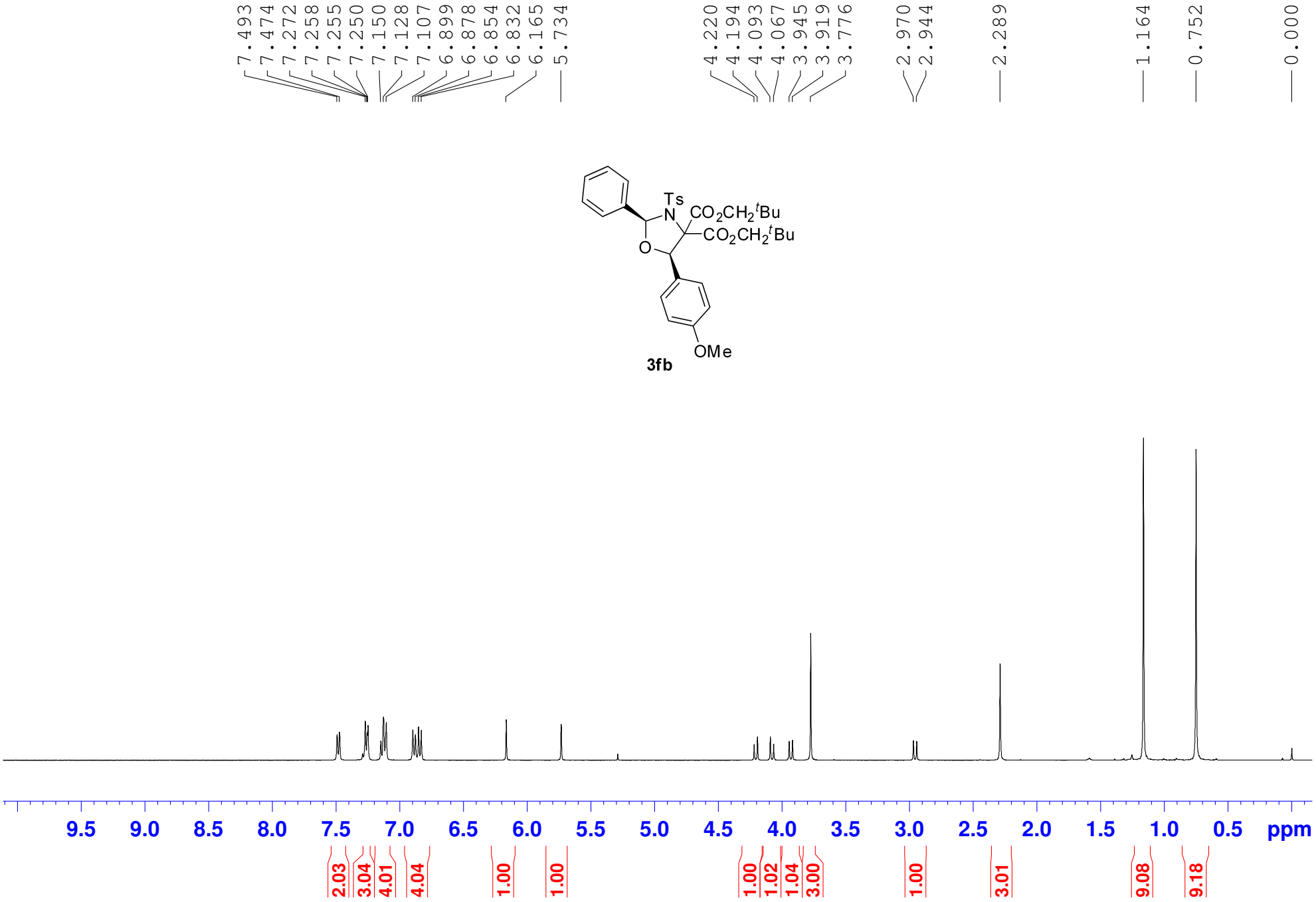

166.95
166.77
142.63
138.97
137.40
134.25
132.40
131.37
130.91
130.21
129.06
128.40
128.19
127.96
127.73
127.35
126.83
126.58
126.02
125.91
92.72
87.40
77.54
77.32
77.00
76.68
76.23
75.92
31.64
30.93
26.80
26.21
21.18
21.15
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Me
3nc
200
180
160
140
120
100
80
60
40
20
0
ppm

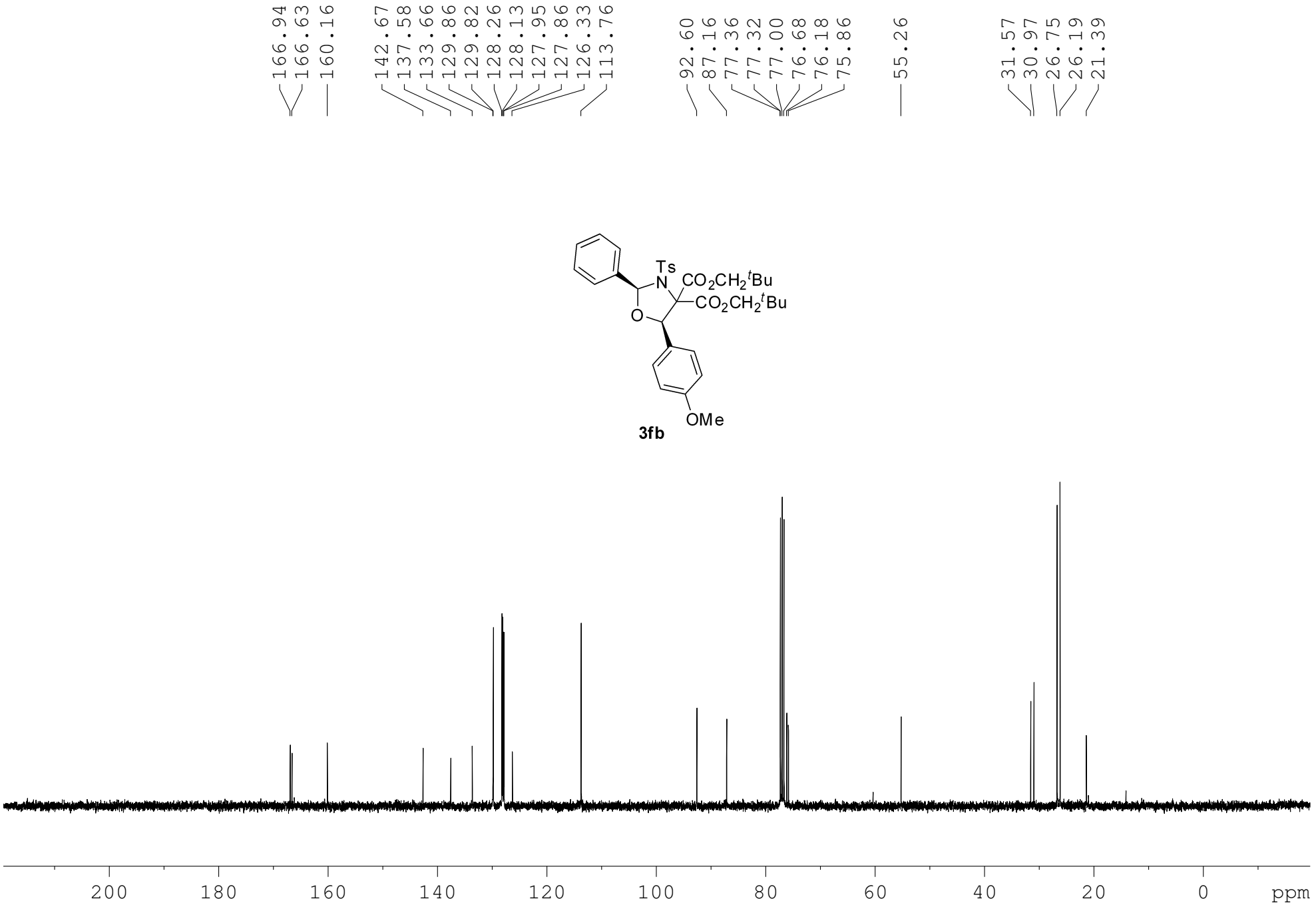

7.923
7.902
7.482
7.463
7.414
7.392
7.332
7.313
7.295
7.261
7.231
7.212
7.157
7.143
7.125
6.195
5.767
4.235
4.209
4.113
4.087
3.946
3.921
2.906
2.881
2.329
1.176
0.719
0.072
-0.000
O2N
SO2
N
CO2CH2tBu
CO2CH2tBu
O
Me
3oc
10
9
8
7
6
5
4
3
2
1
ppm
1.96
2.09
1.98
1.16
5.97
1.00
1.00
1.04
1.03
1.09
1.00
2.99
8.95
9.26

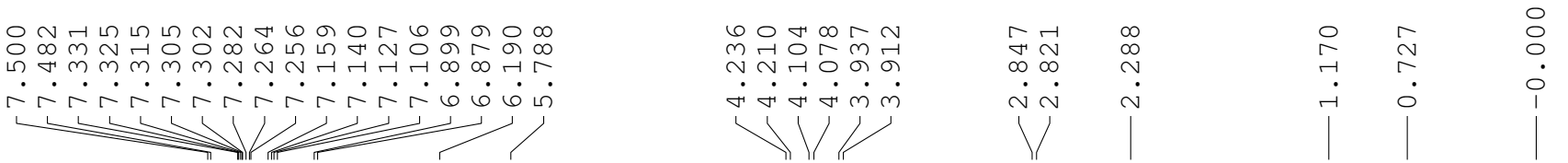

166.62
166.44
149.24
145.93
139.28
133.15
130.88
130.48
130.05
129.50
129.18
128.10
126.47
122.68
92.67
87.46
77.74
77.32
77.00
76.68
76.57
76.19
31.61
30.91
26.76
26.11
21.17
O2N
SO2
N
CO2CH2tBu
CO2CH2tBu
O
Me
3oc
200
180
160
140
120
100
80
60
40
20
0
ppm

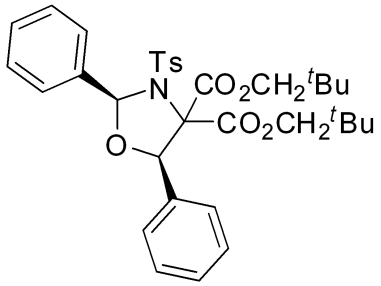

7.505
7.487
7.317
7.299
7.280
7.267
7.173
7.154
7.135
7.111
7.090
6.908
6.887
6.559
6.200
5.748
4.259
4.233
4.085
4.059
3.986
3.960
3.814
3.798
2.991
2.966
2.293
1.173
0.763
0.000
Ts
N
O
CO2CH2tBu
CO2CH2tBu
OMe
MeO
OMe
3fa
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.01
1.05
4.00
2.03
1.97
1.00
1.02
0.98
1.03
1.06
2.99
5.76
0.99
2.94
9.07
8.94


166.79
166.48
153.22
142.76
138.31
137.49
133.77
129.90
129.81
128.27
128.08
127.91
103.44
92.77
87.09
77.31
77.22
77.00
76.68
76.31
76.00
60.68
56.00
31.58
31.00
26.73
26.15
21.39
Ts
N
O
CO2CH2tBu
CO2CH2tBu
OMe
MeO
OMe
3fa
200
180
160
140
120
100
80
60
40
20
0
ppm

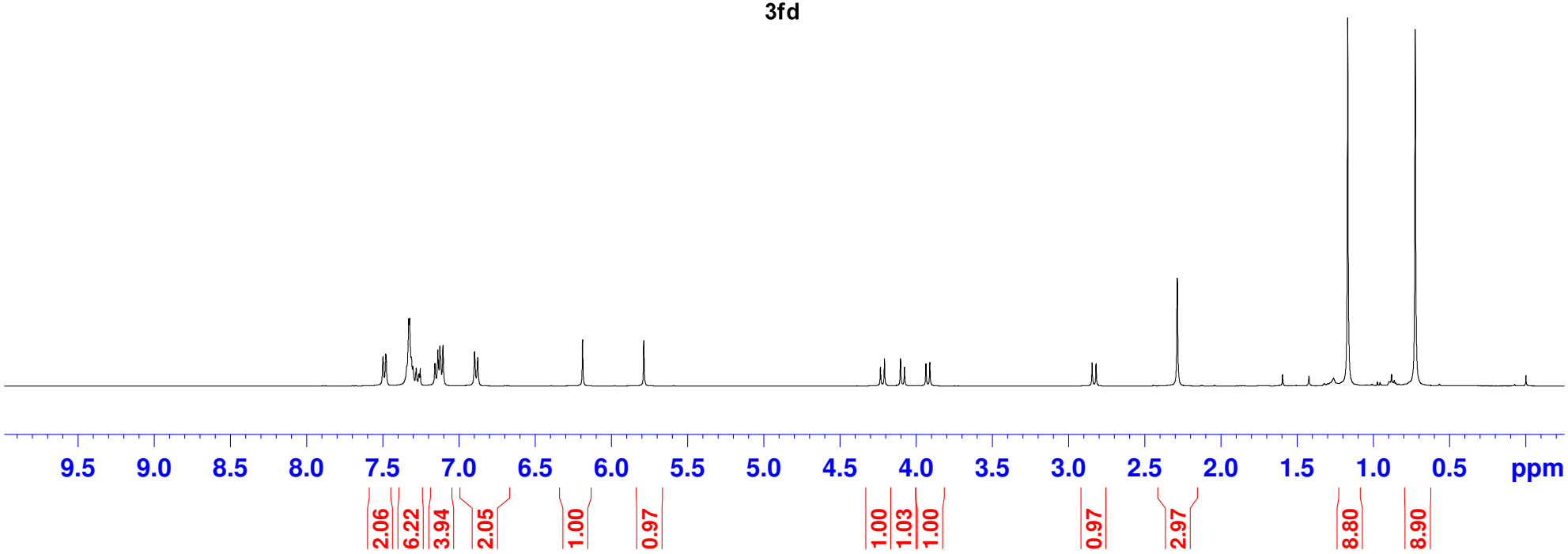

7.493
7.474
7.272
7.258
7.255
7.250
7.150
7.128
7.107
6.899
6.878
6.854
6.832
6.165
5.734
4.220
4.194
4.093
4.067
3.945
3.919
3.776
2.970
2.944
2.289
1.164
0.752
0.000
Ts
N
O
CO2CH2tBu
CO2CH2tBu
OMe
3fb
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.03
3.04
4.01
4.04
1.00
1.00
1.00
1.02
1.04
3.00
1.00
3.01
9.08
9.18

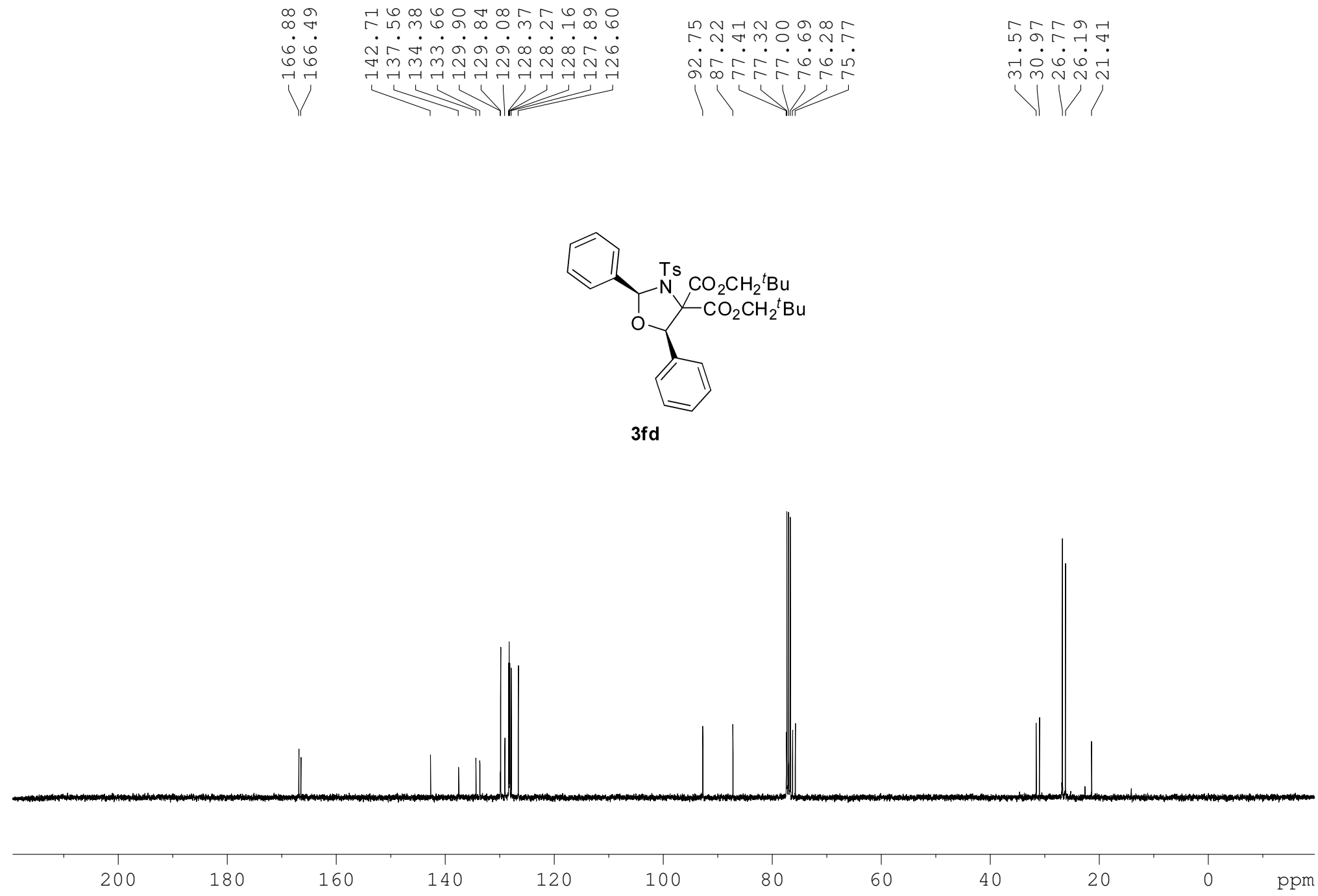

166.94
166.63
160.16
142.67
137.58
133.66
129.86
129.82
128.26
128.13
127.95
127.86
126.33
113.76
92.60
87.16
77.36
77.32
77.00
76.68
76.18
75.86
55.26
31.57
30.97
26.75
26.19
21.39
Ts
N
O
CO2CH2tBu
CO2CH2tBu
OMe
3fb
200
180
160
140
120
100
80
60
40
20
0
ppm


7.500
7.482
7.331
7.325
7.315
7.305
7.302
7.282
7.264
7.256
7.159
7.140
7.127
7.106
6.899
6.879
6.190
5.788
4.236
4.210
4.104
4.078
3.937
3.912
2.847
2.821
2.288
1.170
0.727
0.000

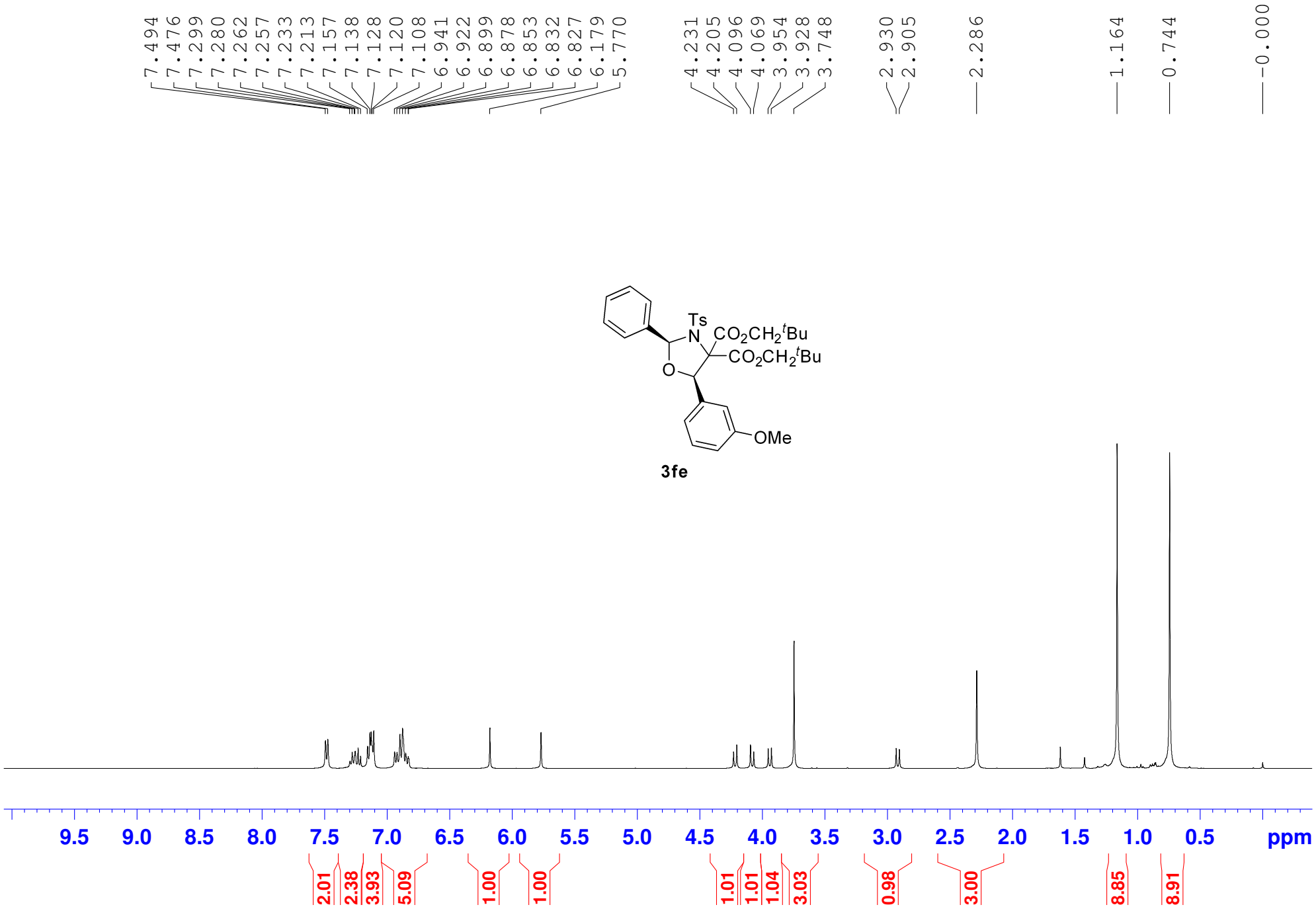

Ts
N
O
CO2CH2tBu
CO2CH2tBu

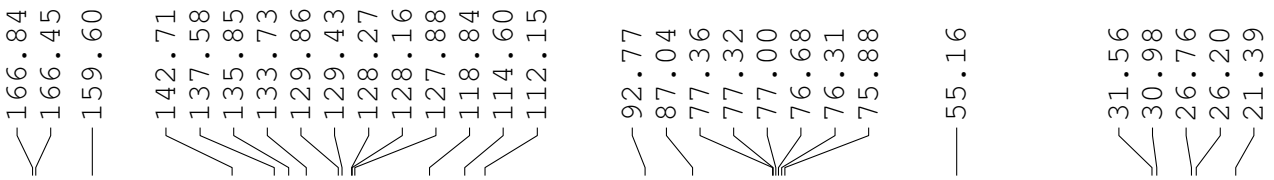
3fd

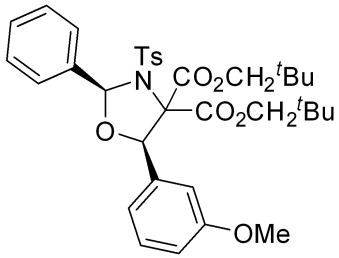

9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.06
6.22
3.94
2.05
1.00
0.97
1.00
1.03
1.00
0.97
2.97
8.80
8.90


166.88
166.49
142.71
137.56
134.38
133.66
129.90
129.84
129.08
128.37
128.27
128.16
127.89
126.60
92.75
87.22
77.41
77.32
77.00
76.69
76.28
75.77
31.57
30.97
26.77
26.19
21.41
Ts
N
O
CO2CH2tBu
CO2CH2tBu
200
180
160
140
120
100
80
60
40
20
0
ppm

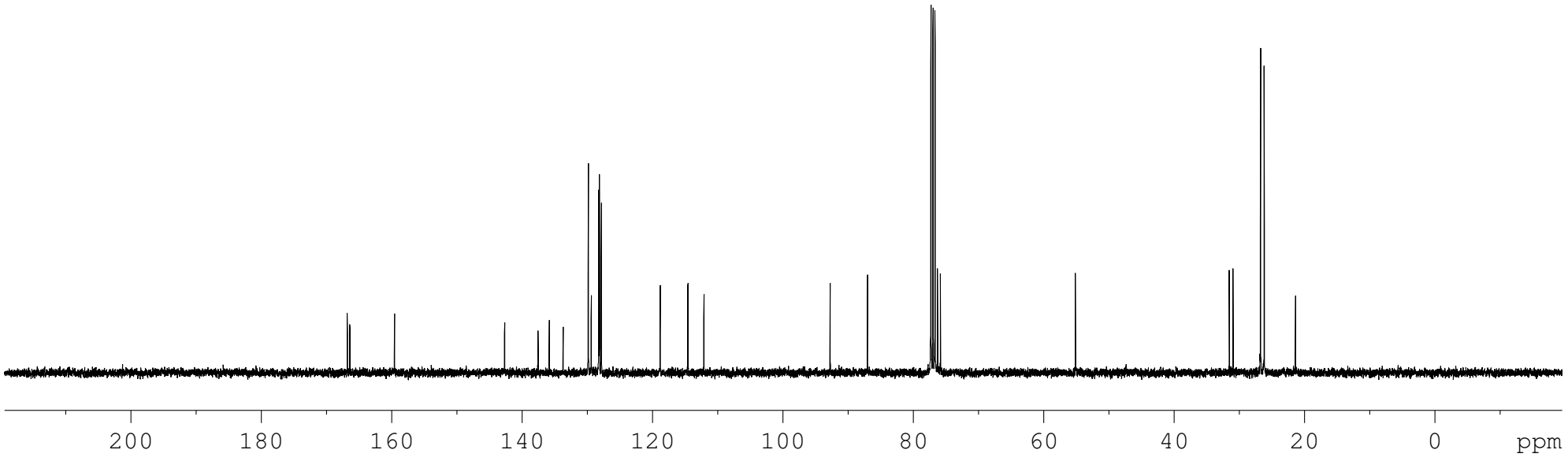
3fd

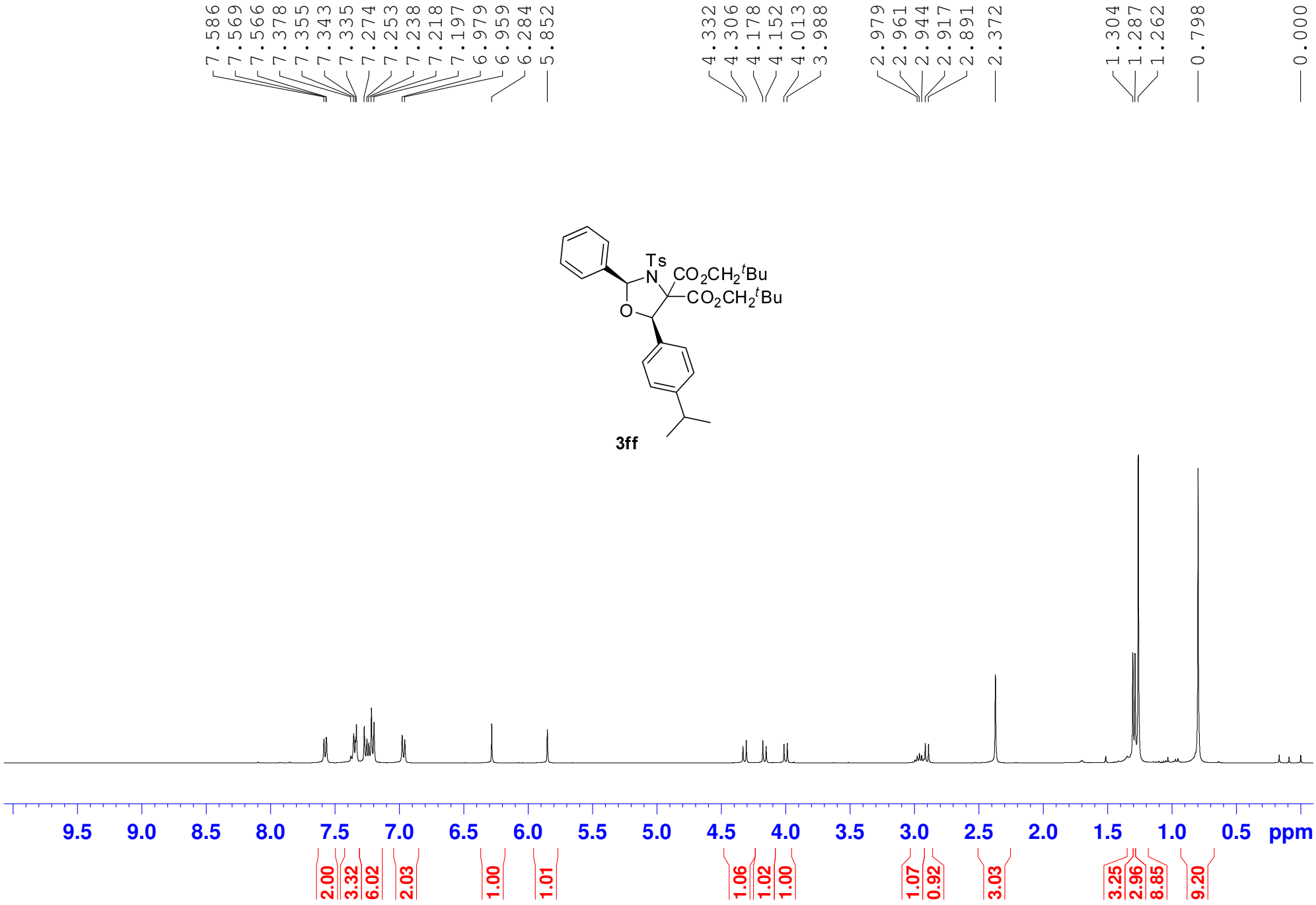

7.494
7.476
7.299
7.280
7.262
7.257
7.233
7.213
7.157
7.138
7.128
7.120
7.108
6.941
6.922
6.899
6.878
6.853
6.832
6.827
6.179
5.770
4.231
4.205
4.096
4.069
3.954
3.928
3.748
2.930
2.905
2.286
1.164
0.744
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O
OMe
3fe
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.01
2.38
3.93
5.09
1.00
1.00
1.01
1.01
1.04
3.03
0.98
3.00
8.85
8.91

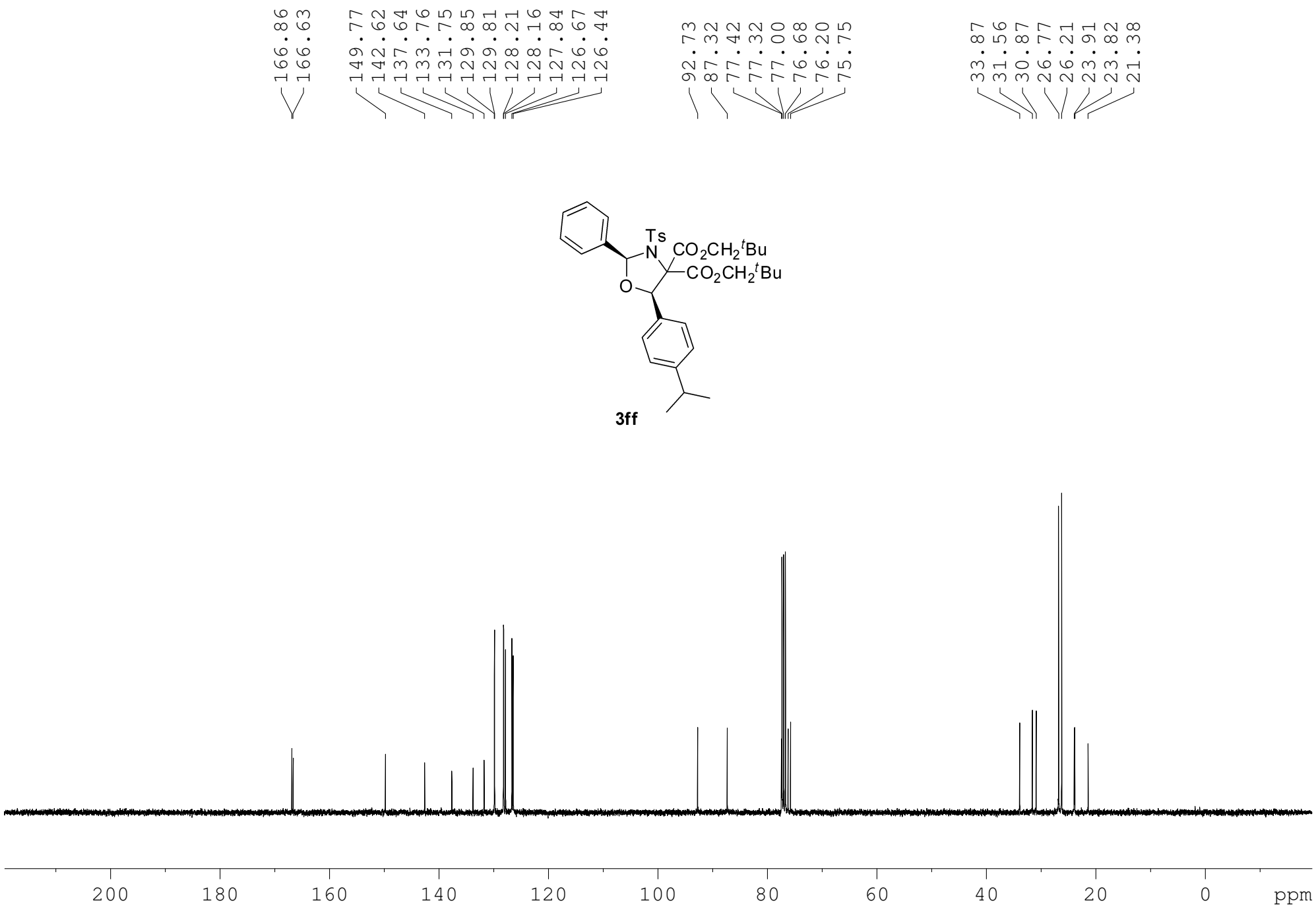

166.84
166.45
159.60
142.71
137.58
135.85
133.73
129.86
129.43
128.27
128.16
127.88
118.84
114.60
112.15
92.77
87.04
77.36
77.32
77.00
76.68
76.31
75.88
55.16
31.56
30.98
26.76
26.20
21.39

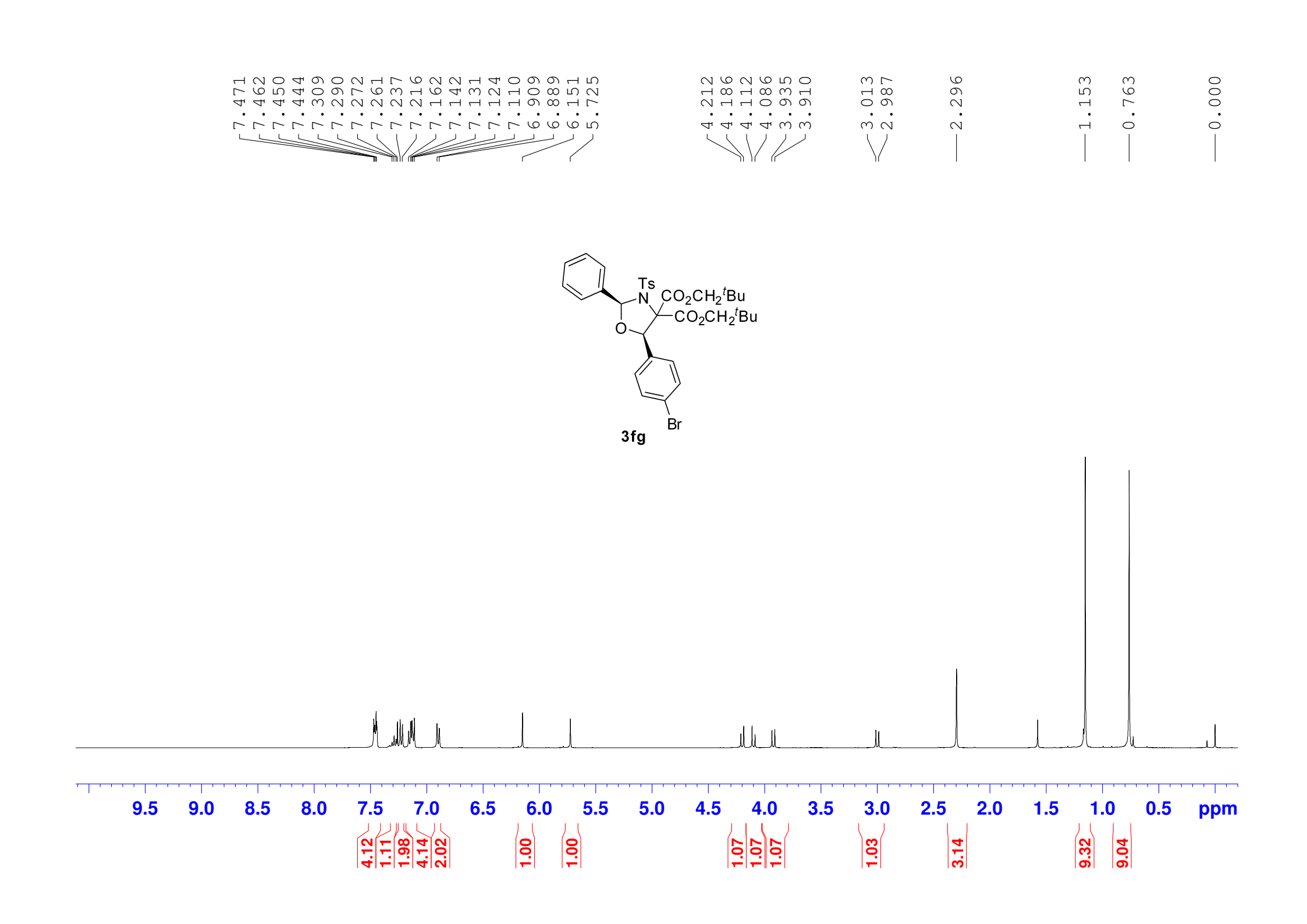

Ts
N
O
CO2CH2tBu
CO2CH2tBu
OMe

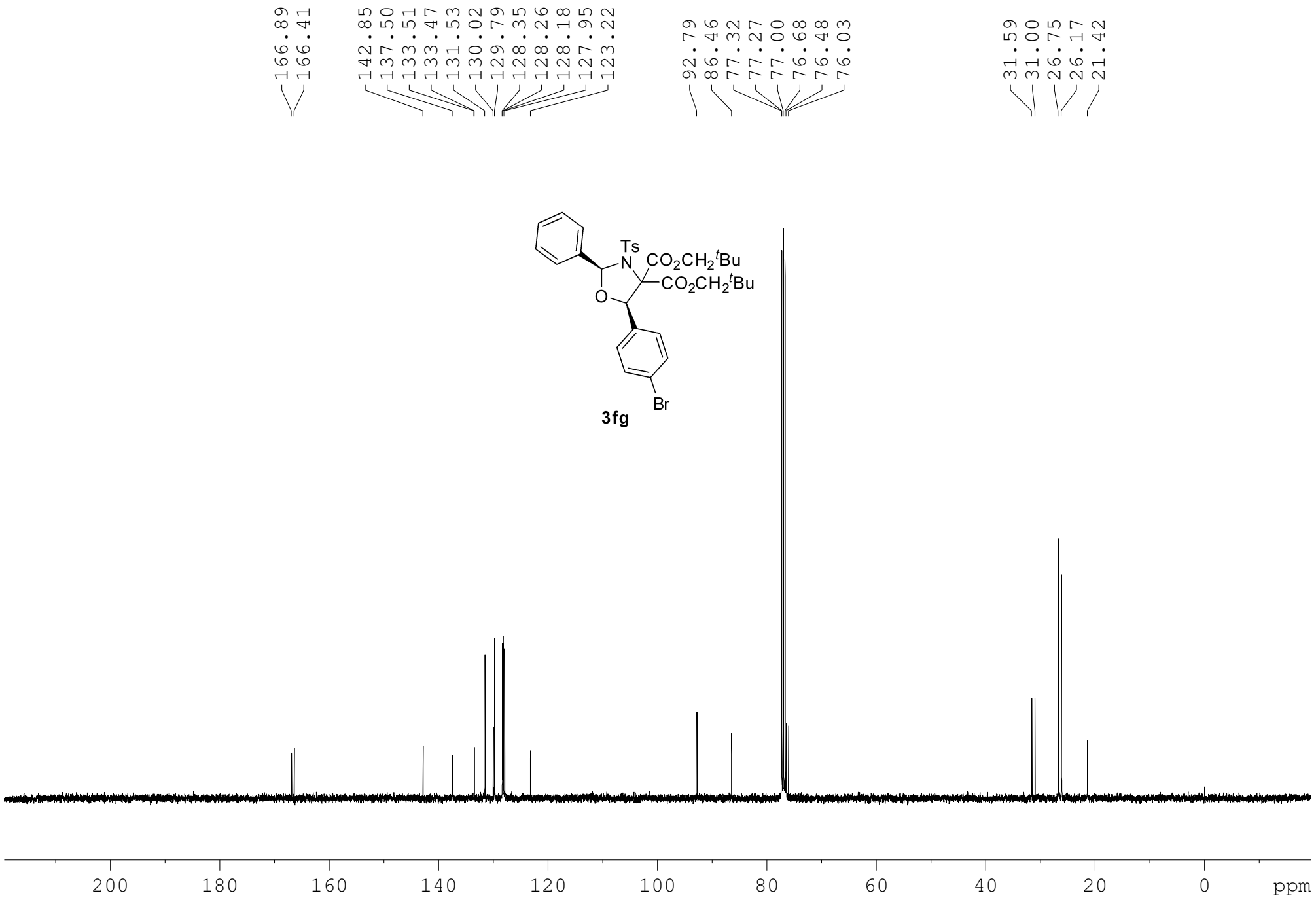
3fe

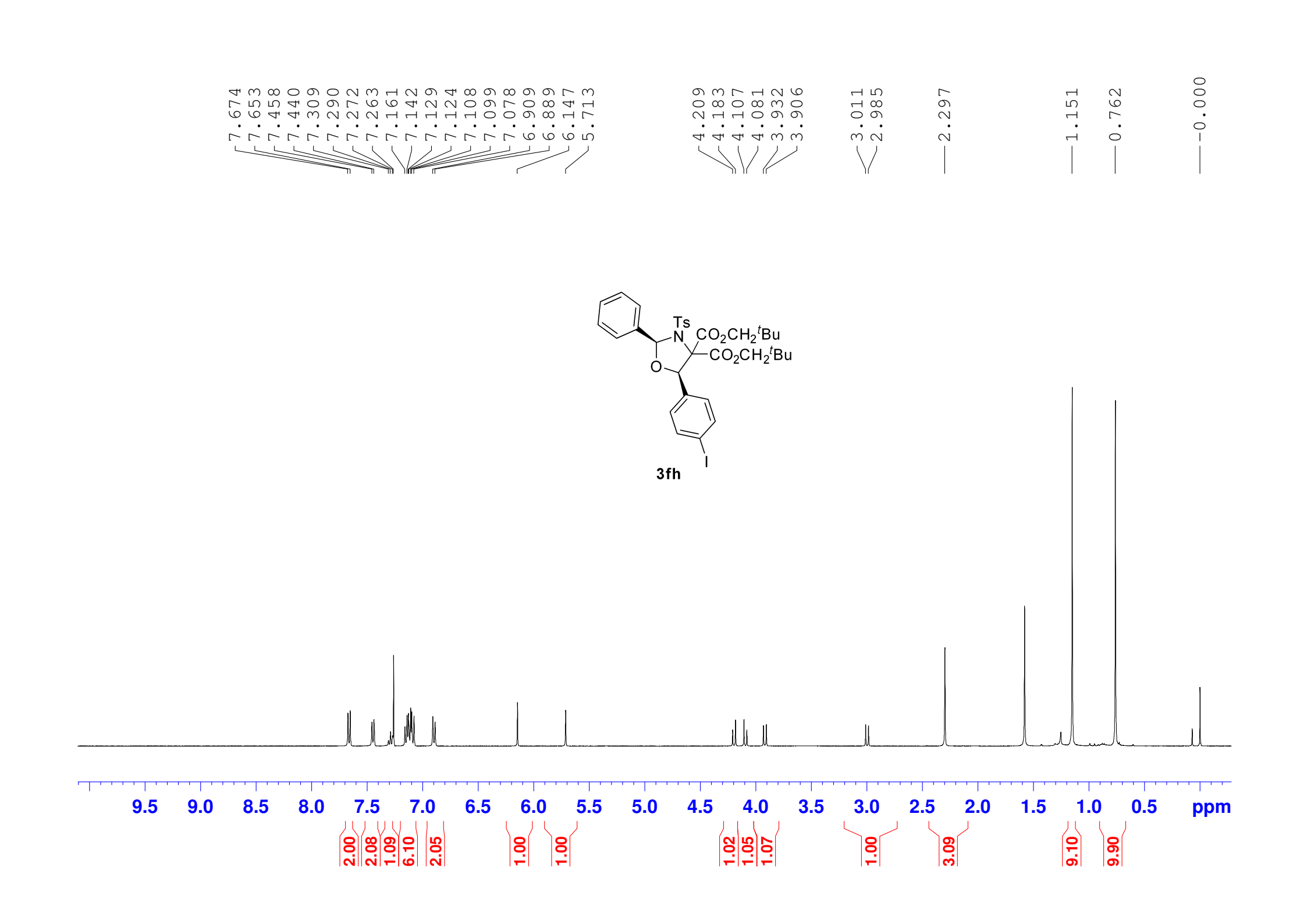

200
180
160
140
120
100
80
60
40
20
0
ppm

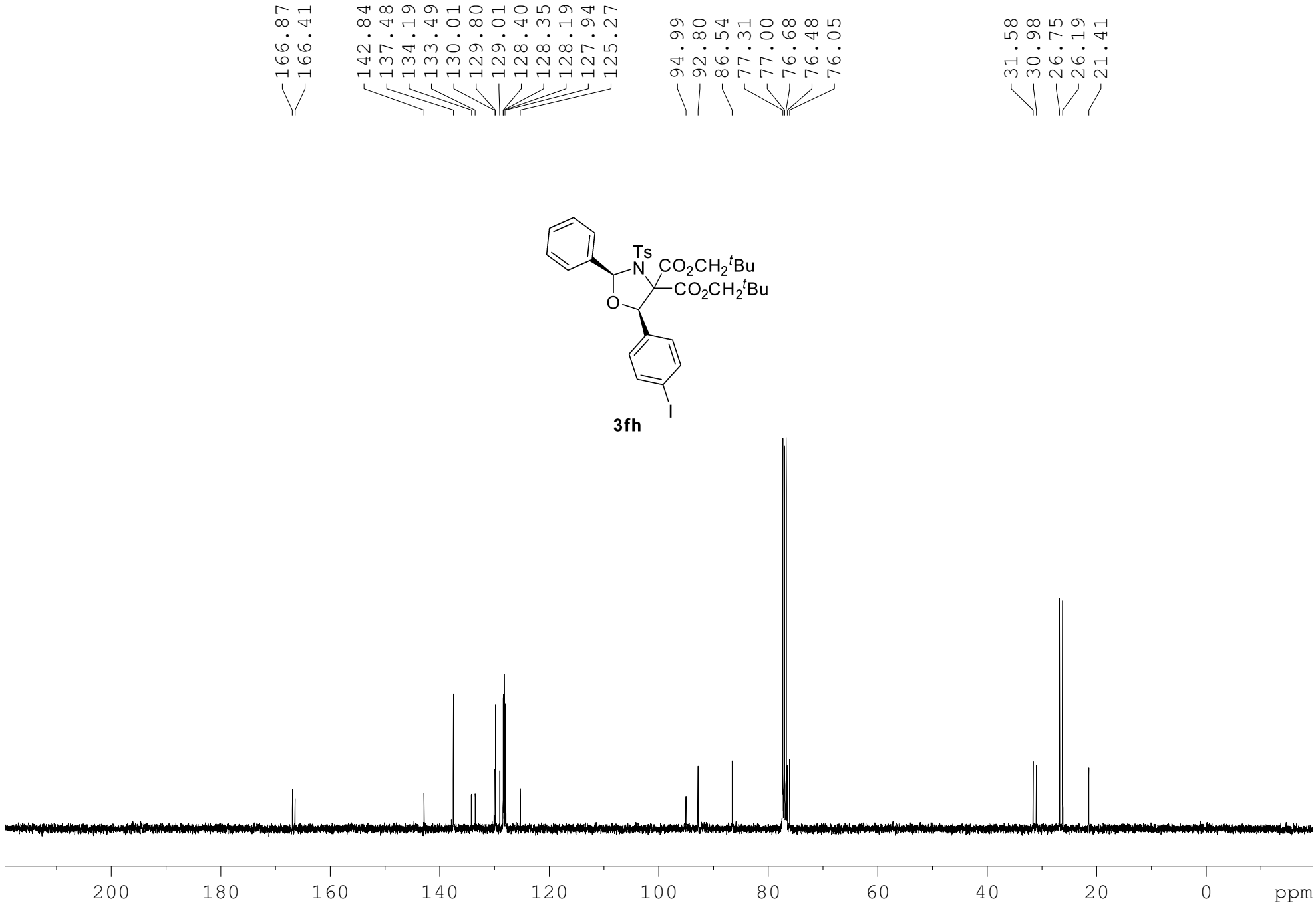

7.586
7.569
7.566
7.378
7.355
7.343
7.335
7.274
7.253
7.238
7.218
7.197
6.979
6.959
6.284
5.852
4.332
4.306
4.178
4.152
4.013
3.988
2.979
2.961
2.944
2.917
2.891
2.372
1.304
1.287
1.262
0.798
0.000
Ts
N
O
CO2CH2tBu
CO2CH2tBu
3ff
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.00
3.32
6.02
2.03
1.00
1.01
1.06
1.02
1.00
1.07
0.92
3.03
3.25
2.96
8.85
9.20

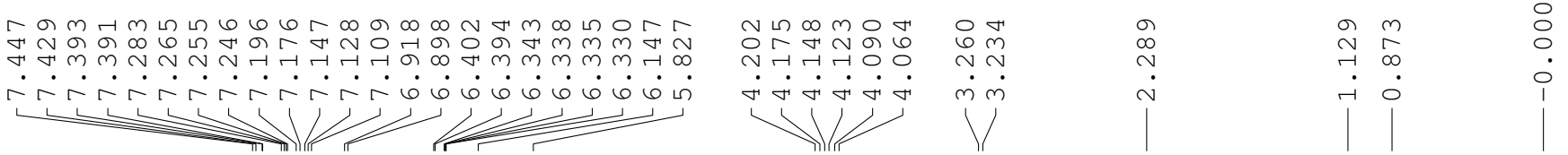

166.86
166.63
149.77
142.62
137.64
133.76
131.75
129.85
129.81
128.21
128.16
127.84
126.67
126.44
92.73
87.32
77.42
77.32
77.00
76.68
76.20
75.75
33.87
31.56
30.87
26.77
26.21
23.91
23.82
21.38
Ts
N
O
CO2CH2tBu
CO2CH2tBu
3ff
200
180
160
140
120
100
80
60
40
20
0
ppm

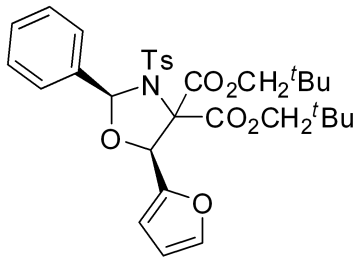

7.471
7.462
7.450
7.444
7.309
7.290
7.272
7.261
7.237
7.216
7.162
7.142
7.131
7.124
7.110
6.909
6.889
6.151
5.725
4.212
4.186
4.112
4.086
3.935
3.910
3.013
2.987
2.296
1.153
0.763
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Br
3fg
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
4.12
1.11
1.98
4.14
2.02
1.00
1.00
1.07
1.07
1.07
1.03
3.14
9.32
9.04


166.89
166.41
142.85
137.50
133.51
133.47
131.53
130.02
129.79
128.35
128.26
128.18
127.95
123.22
92.79
86.46
77.32
77.27
77.00
76.68
76.48
76.03
31.59
31.00
26.75
26.17
21.42
Ts
N
O
CO2CH2tBu
CO2CH2tBu
Br
3fg
200
180
160
140
120
100
80
60
40
20
0
ppm

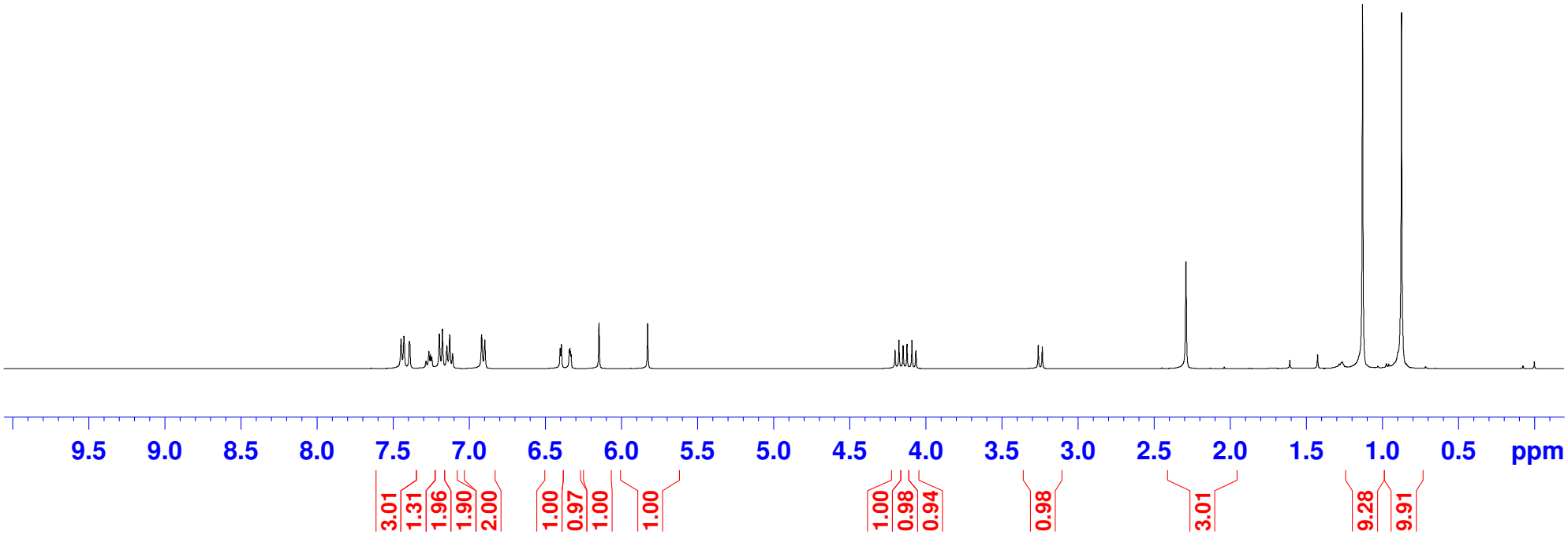

7.674
7.653
7.458
7.440
7.309
7.290
7.272
7.263
7.161
7.142
7.129
7.124
7.108
7.099
7.078
6.909
6.889
6.147
5.713
4.209
4.183
4.107
4.081
3.932
3.906
3.011
2.985
2.297
1.151
0.762
0.000
Ts
N
O
CO2CH2tBu
CO2CH2tBu
I
3fh
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.00
2.08
1.09
6.10
2.05
1.00
1.00
1.02
1.05
1.07
1.00
3.09
9.10
9.90

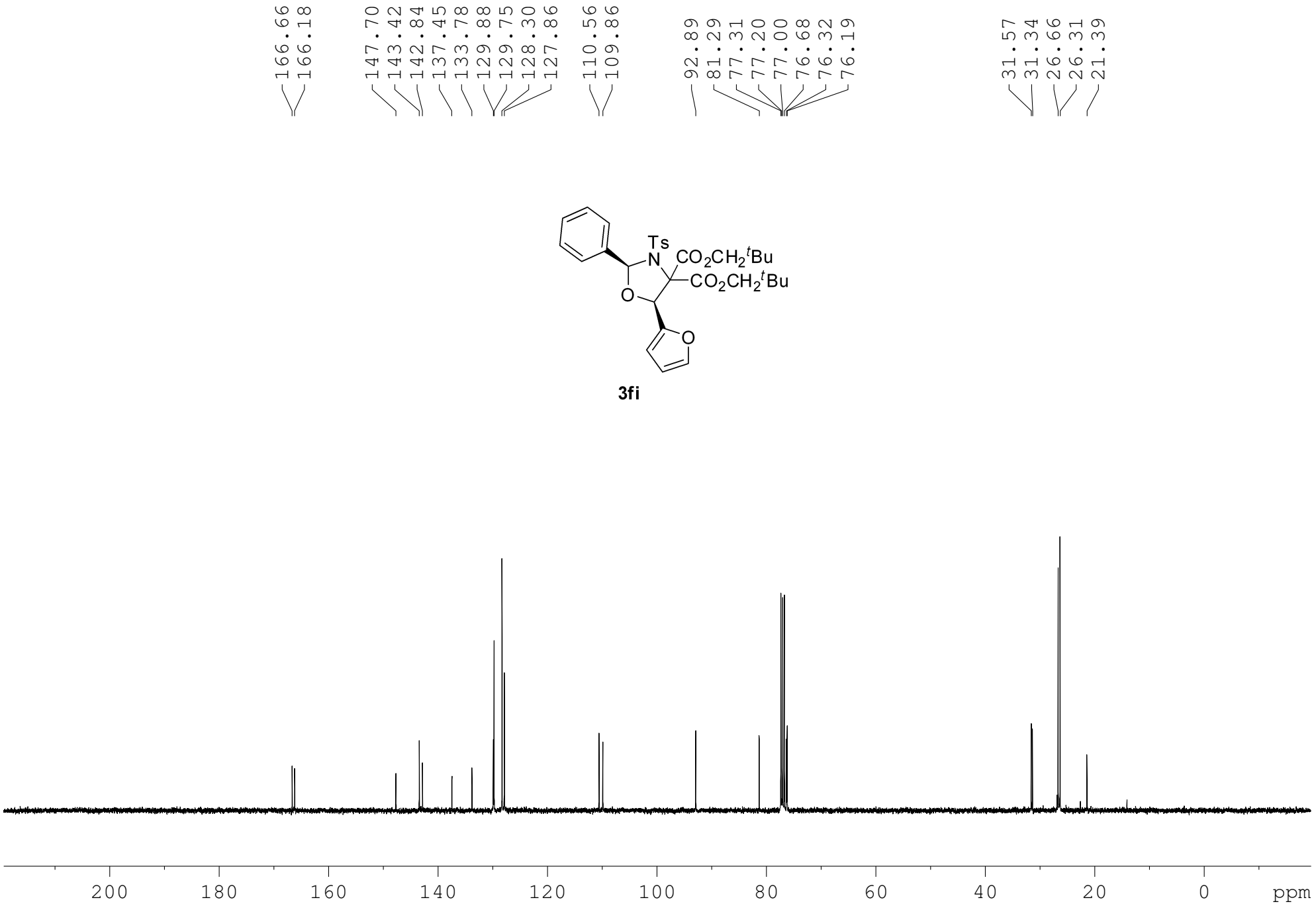

166.87
166.41
142.84
137.48
134.19
133.49
130.01
129.80
129.01
128.40
128.35
128.19
127.94
125.27
94.99
92.80
86.54
77.31
77.00
76.68
76.48
76.05
31.58
30.98
26.75
26.19
21.41
Ts
N
O
CO2CH2tBu
CO2CH2tBu
I
3fh
200
180
160
140
120
100
80
60
40
20
0
ppm


7.447
7.429
7.393
7.391
7.283
7.265
7.255
7.246
7.196
7.176
7.147
7.128
7.109
6.918
6.898
6.402
6.394
6.343
6.338
6.335
6.330
6.147
5.827
4.202
4.175
4.148
4.123
4.090
4.064
3.260
3.234
2.289
1.129
0.873
0.000

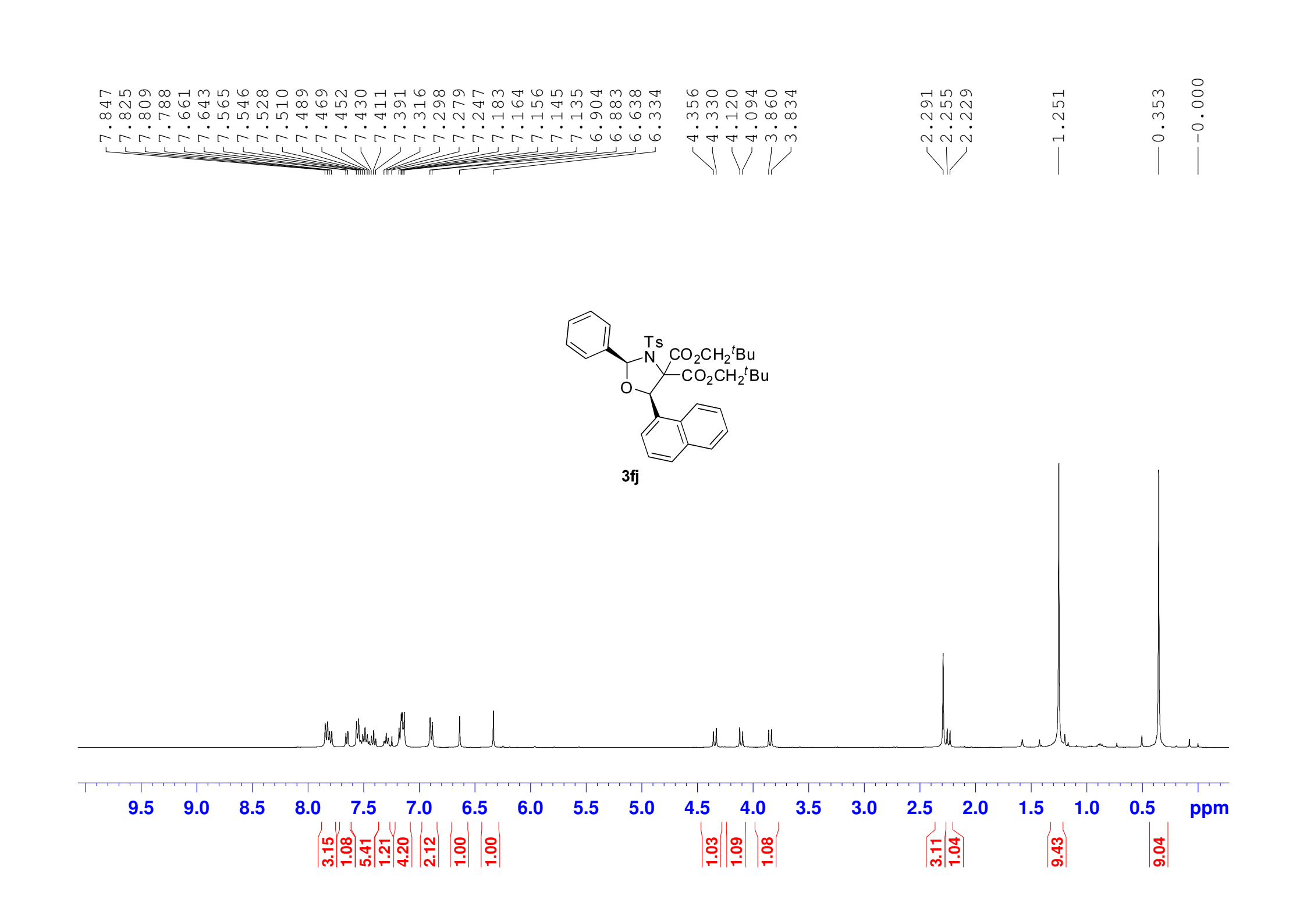

Ts
N
CO2CH2tBu
CO2CH2tBu
O
O

3fi


9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
3.01
1.31
1.96
1.90
2.00
1.00
0.97
1.00
1.00
1.00
0.98
0.94
0.98
3.01
9.28
9.91

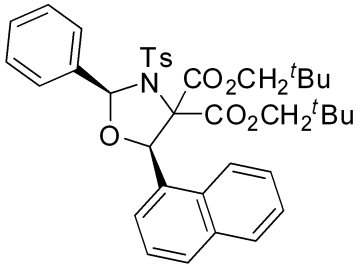

166.66
166.18
147.70
143.42
142.84
137.45
133.78
129.88
129.75
128.30
127.86
110.56
109.86
92.89
81.29
77.31
77.20
77.00
76.68
76.32
76.19
31.57
31.34
26.66
26.31
21.39
Ts
N
CO2CH2tBu
CO2CH2tBu
O
O
200
180
160
140
120
100
80
60
40
20
0
ppm

3fi

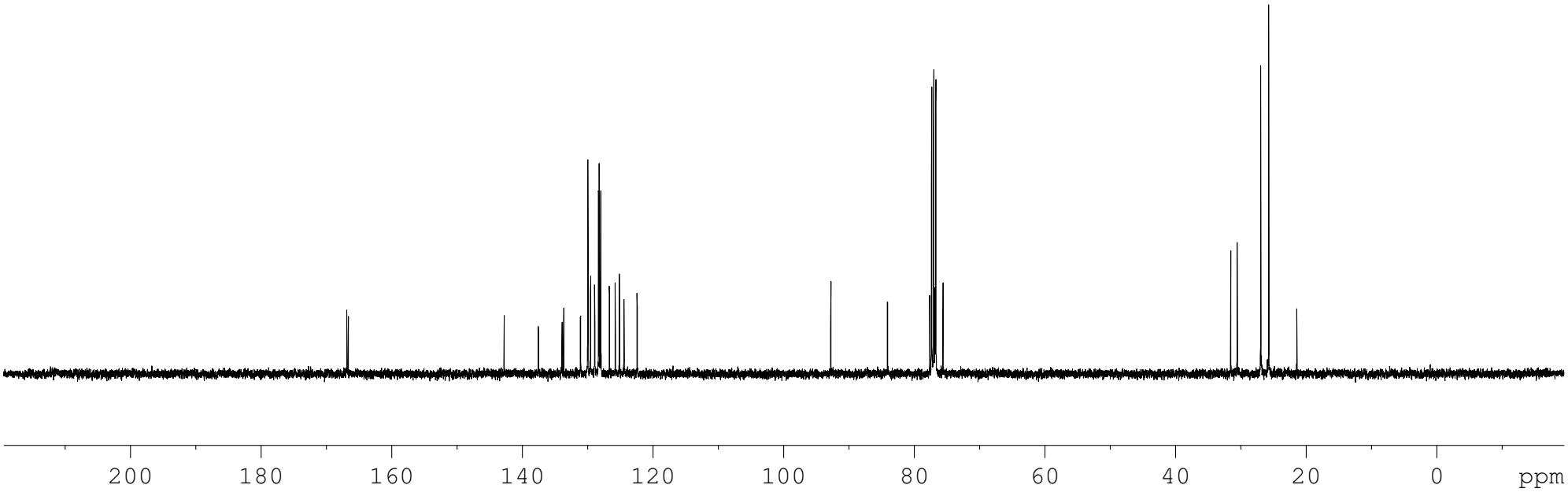

7.847
7.825
7.809
7.788
7.661
7.643
7.565
7.546
7.528
7.510
7.489
7.469
7.452
7.430
7.411
7.391
7.316
7.298
7.279
7.247
7.183
7.164
7.156
7.145
7.135
6.904
6.883
6.638
6.334
4.356
4.330
4.120
4.094
3.860
3.834
2.291
2.255
2.229
1.251
0.353
0.000
Ts
N
O
CO2CH2tBu
CO2CH2tBu
3fj
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
3.15
1.08
5.41
1.21
4.20
2.12
1.00
1.00
1.03
1.09
1.08
3.11
1.04
9.43
9.04

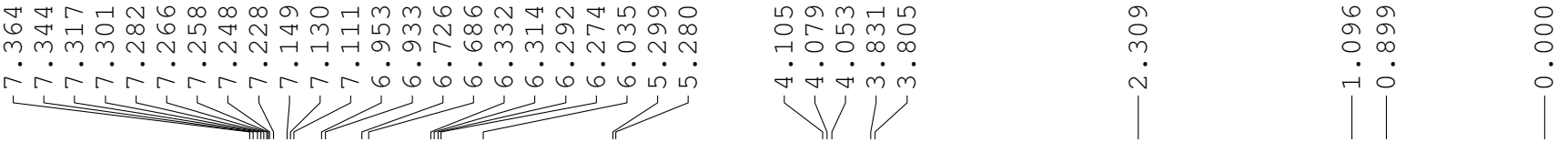
166.87
166.63
142.77
137.53
133.90
133.66
131.10
131.05
129.96
129.91
129.54
128.91
128.32
128.21
127.98
126.66
125.76
125.13
124.43
122.41
92.75
84.08
77.61
77.32
77.00
76.82
76.68
75.57

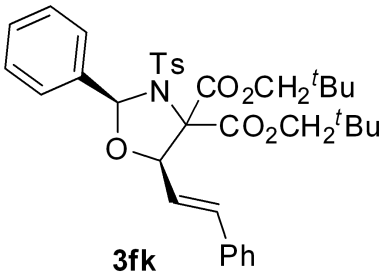
31.50
30.54
26.93
25.70
21.40



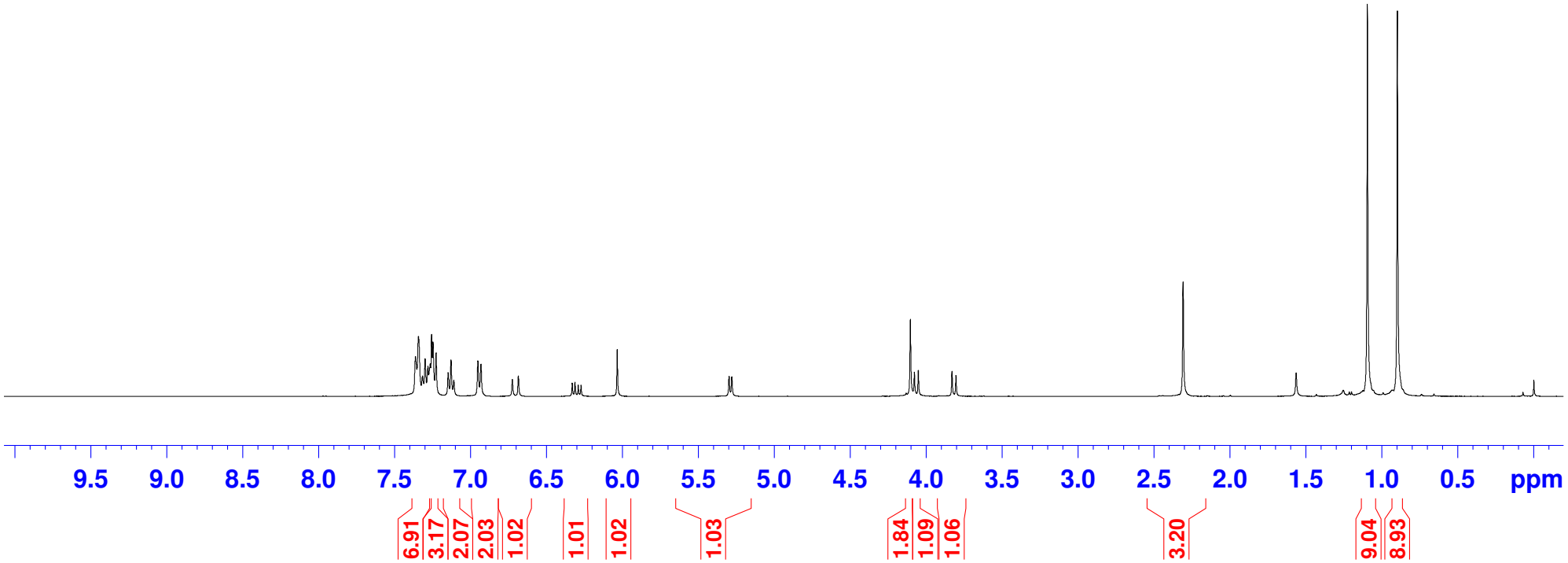
3fj

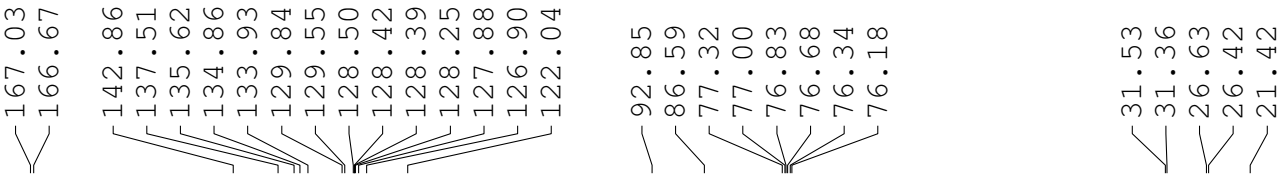


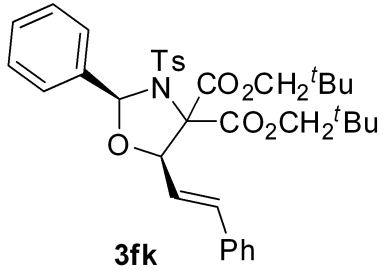

7.364
7.344
7.317
7.301
7.282
7.266
7.258
7.248
7.228
7.149
7.130
7.111
6.953
6.933
6.726
6.686
6.332
6.314
6.292
6.274
6.035
5.299
5.280
4.105
4.079
4.053
3.831
3.805
2.309
1.096
0.899
0.000


Ts
N
CO2CH2tBu
CO2CH2tBu
O
Ph

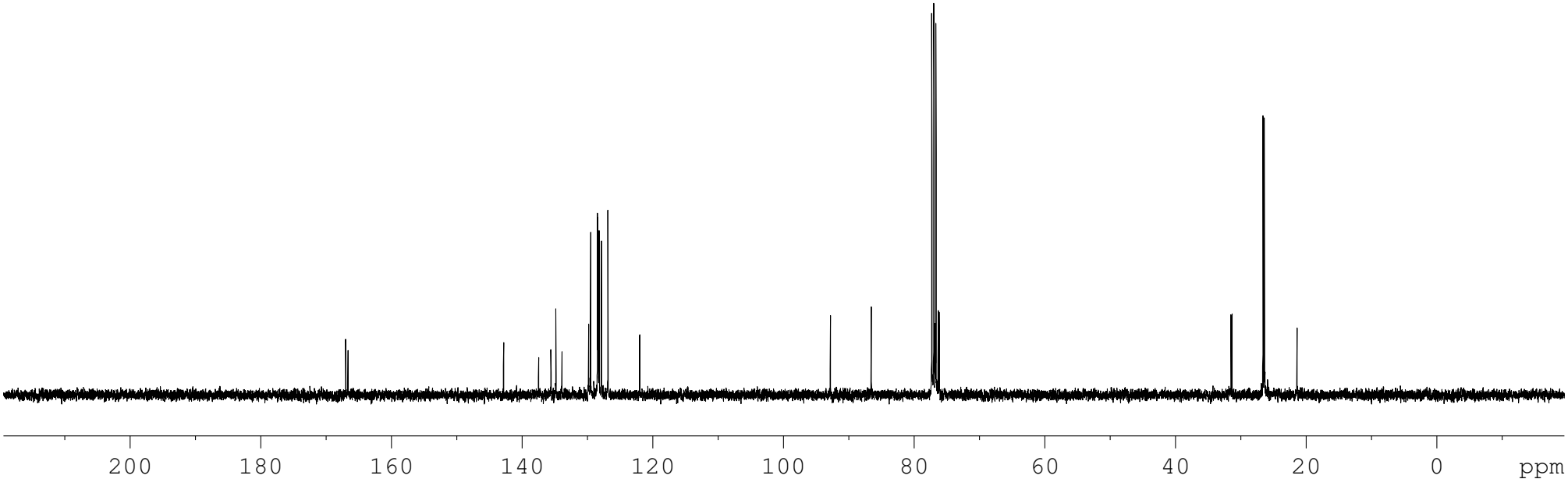
3fk

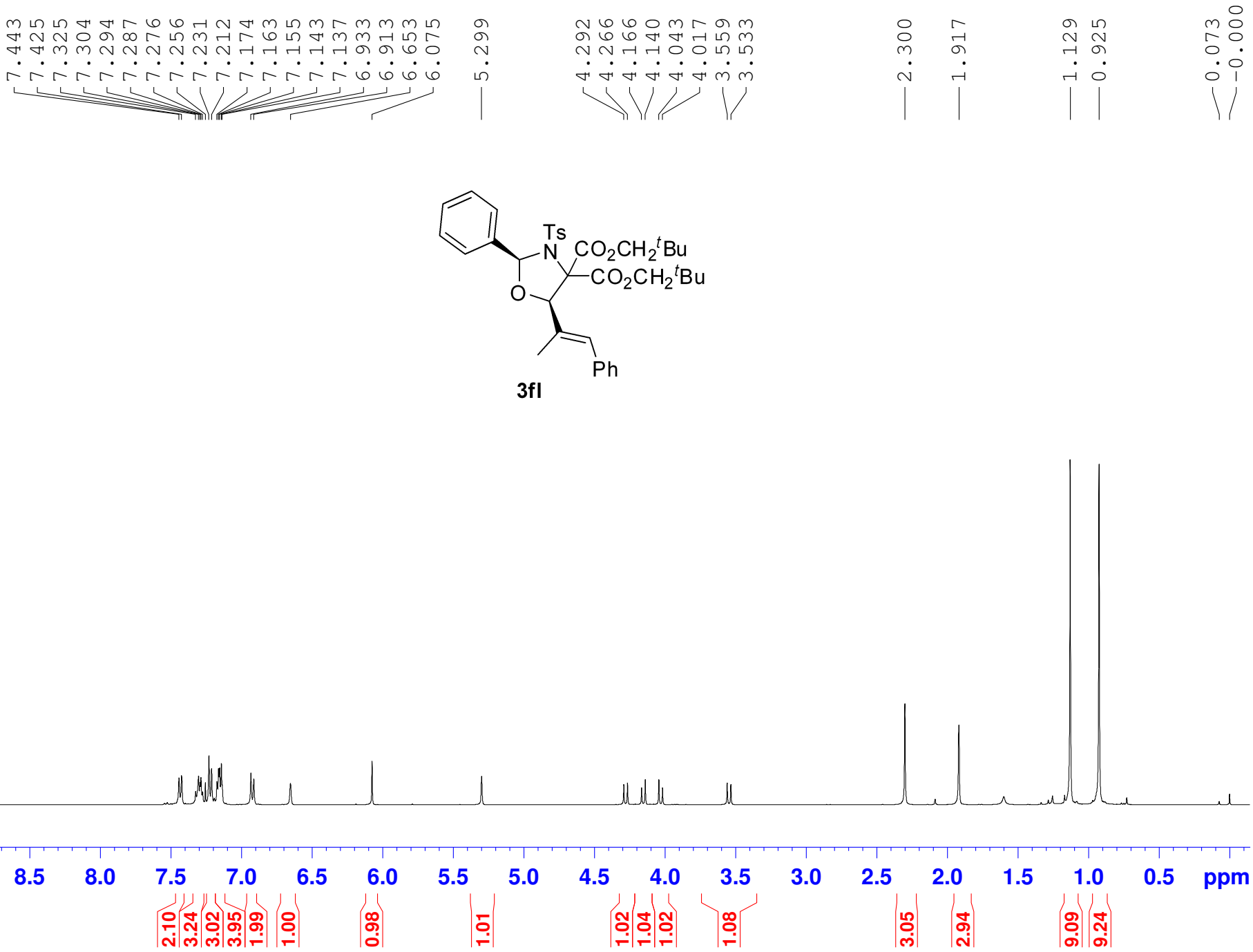

9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
6.91
3.17
2.07
2.03
1.02
1.01
1.02
1.03
1.84
1.09
1.06
3.20
9.04
8.93

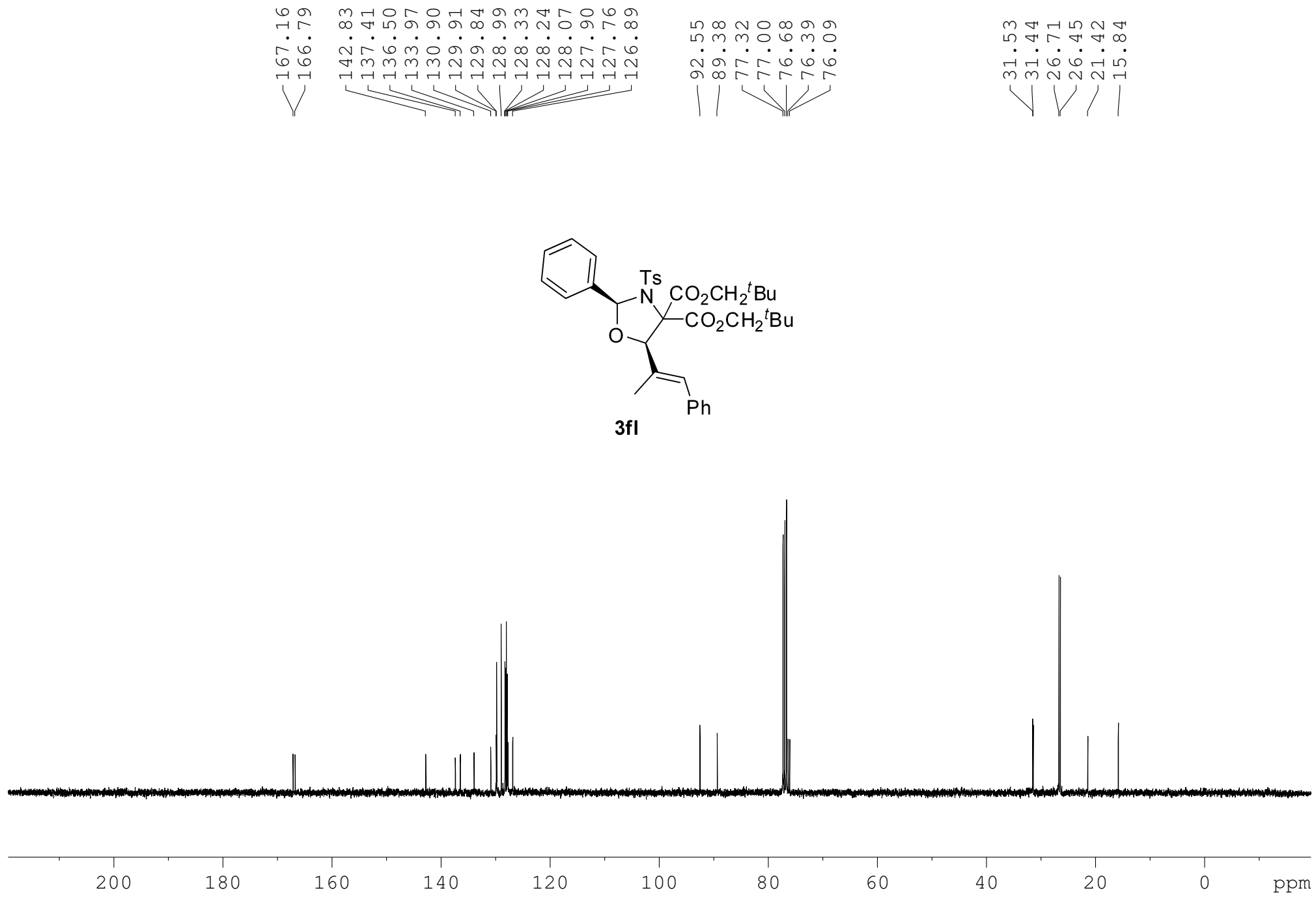

167.03
166.67
142.86
137.51
135.62
134.86
133.93
129.84
129.55
128.50
128.42
128.39
128.25
127.88
126.90
122.04
92.85
86.59
77.32
77.00
76.83
76.68
76.34
76.18
31.53
31.36
26.63
26.42
21.42


Ts
N
CO2CH2tBu
CO2CH2tBu
O
Ph

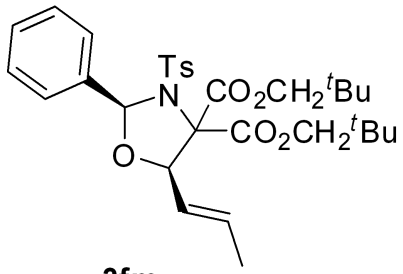
3fk


200
180
160
140
120
100
80
60
40
20
0
ppm

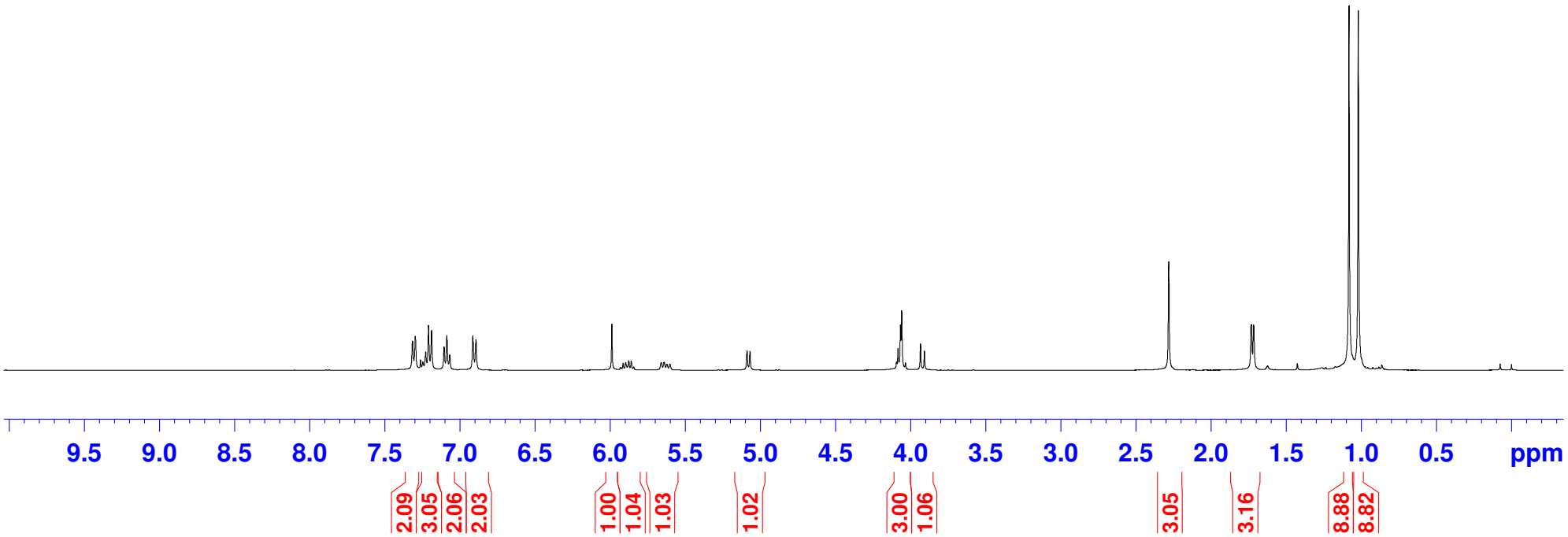

7.443
7.425
7.325
7.304
7.294
7.287
7.276
7.256
7.231
7.212
7.174
7.163
7.155
7.143
7.137
6.933
6.913
6.653
6.075
5.299
4.292
4.266
4.166
4.140
4.043
4.017
3.559
3.533
2.300
1.917
1.129
0.925
0.073
-0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Ph
3fl
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.10
3.24
3.02
3.95
1.99
1.00
0.98
1.01
1.02
1.04
1.02
1.08
3.05
2.94
9.09
9.24


167.16
166.79
142.83
137.41
136.50
133.97
130.90
129.91
129.84
128.99
128.33
128.24
128.07
127.90
127.76
126.89
92.55
89.38
77.32
77.00
76.68
76.39
76.09
31.53
31.44
26.71
26.45
21.42
15.84
Ts
N
CO2CH2tBu
CO2CH2tBu
O
Ph
3fl
200
180
160
140
120
100
80
60
40
20
0
ppm

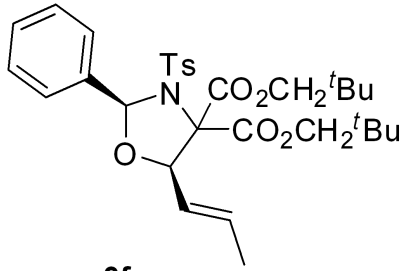
7.313
7.295
7.259
7.244
7.226
7.207
7.186
7.103
7.084
7.065
6.911
6.891
5.986
5.928
5.912
5.895
5.873
5.857
5.840
5.660
5.656
5.640
5.636
5.621
5.618
5.601
5.598
5.087
5.067
4.094
4.084
4.068
4.060
4.034
3.934
3.908
2.282
1.733
1.732
1.717
1.082
1.020
0.075
0.000



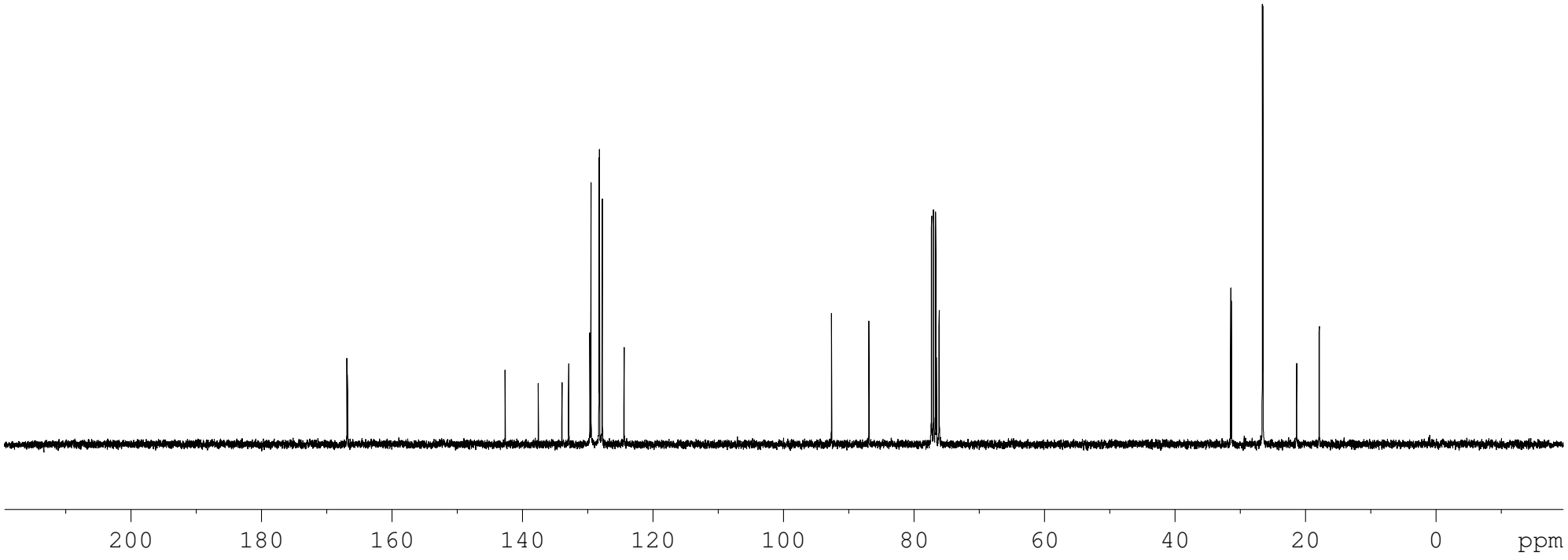
3fm

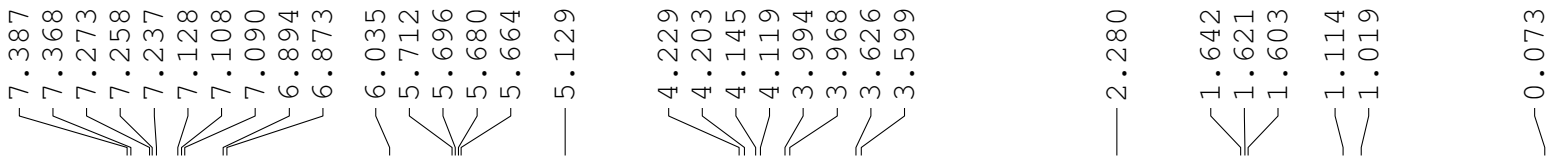


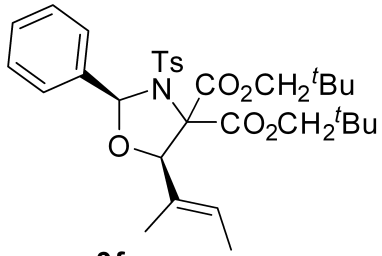
166.93
166.84
142.68
137.61
133.96
132.92
129.68
129.52
128.28
128.21
127.78
124.44
92.65
86.91
77.32
77.00
76.68
76.56
76.15
31.46
31.35
26.60
26.53
21.35
17.90



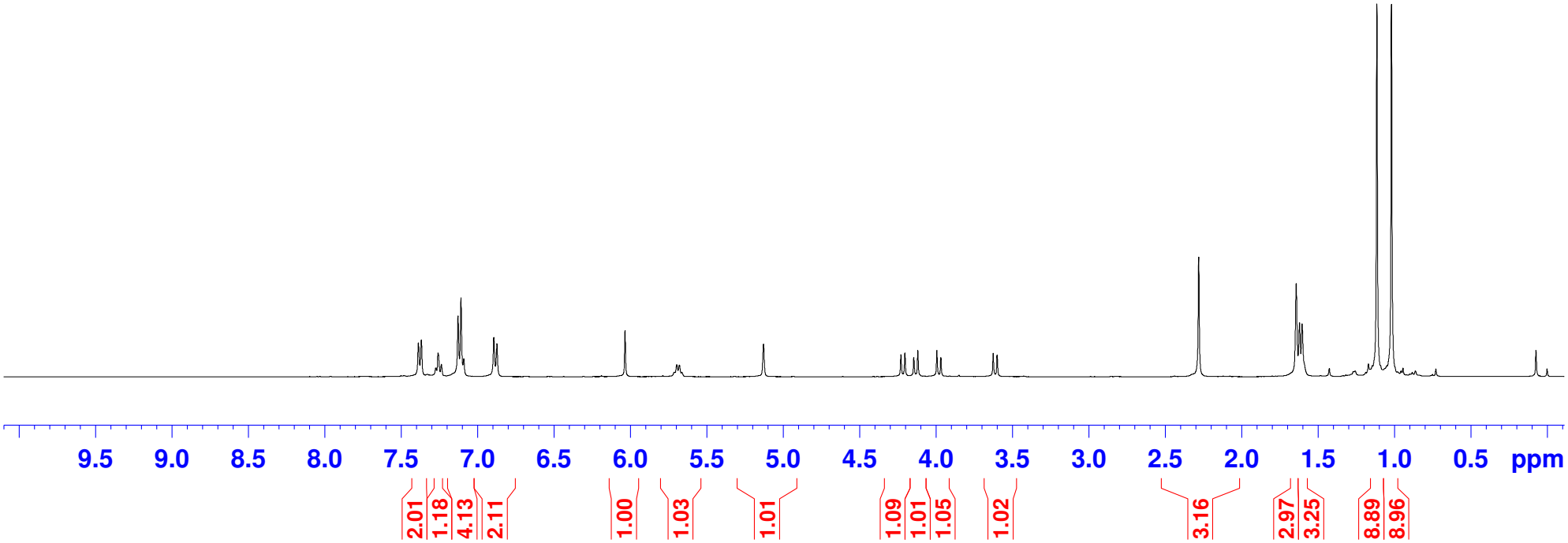
3fm

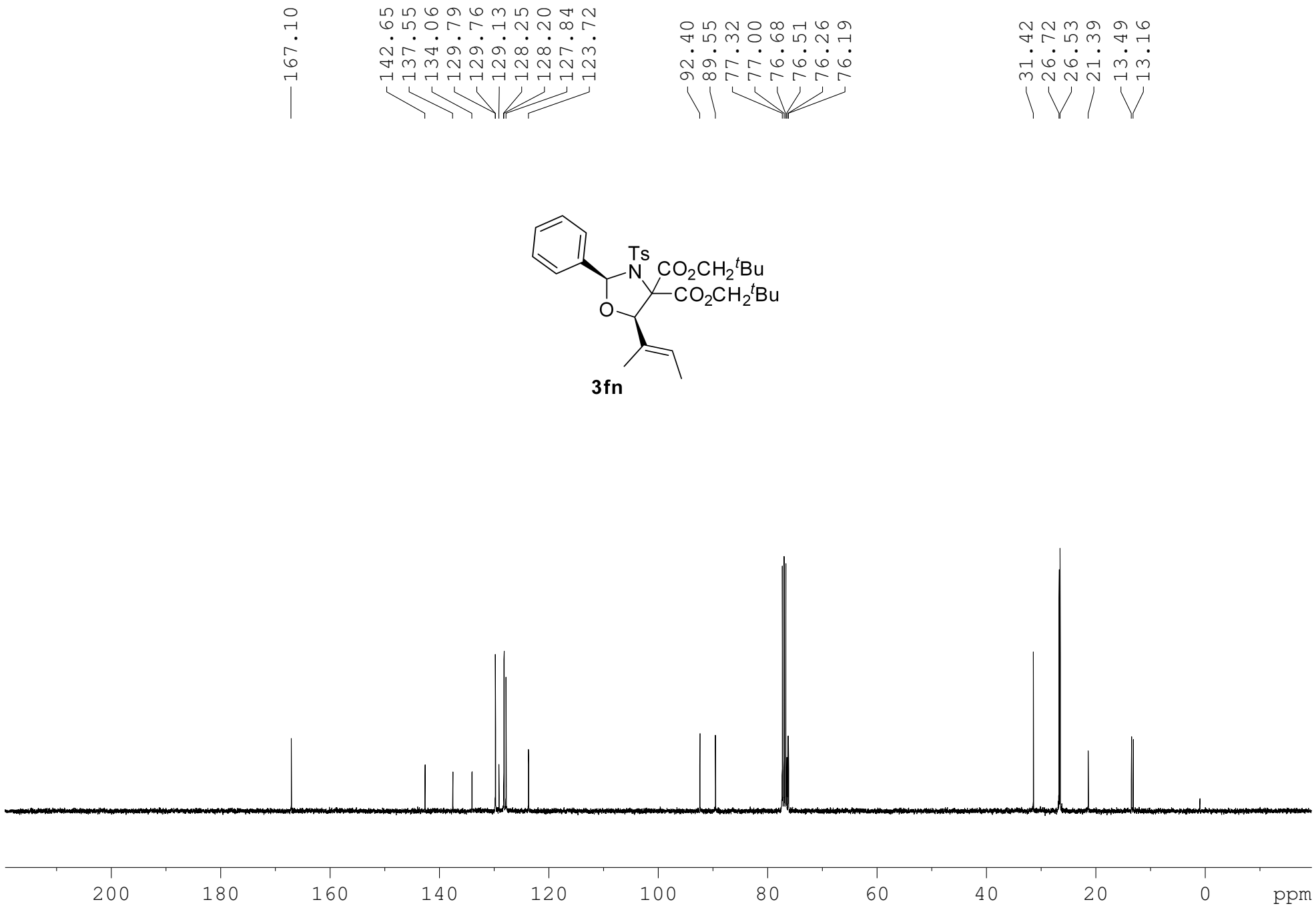


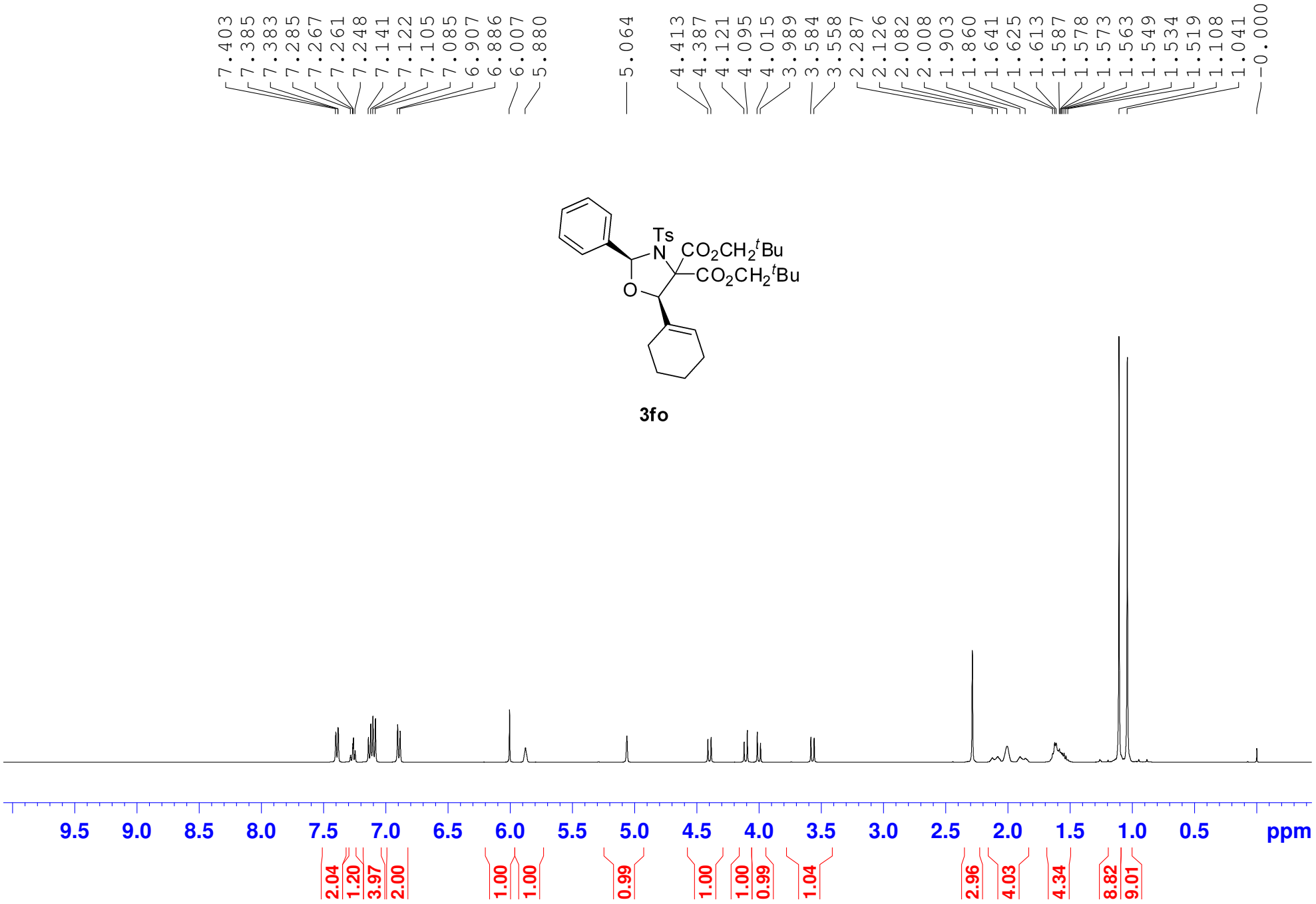

7.387
7.368
7.273
7.258
7.237
7.128
7.108
7.090
6.894
6.873
6.035
5.712
5.696
5.680
5.664
5.129
4.229
4.203
4.145
4.119
3.994
3.968
3.626
3.599
2.280
1.642
1.621
1.603
1.114
1.019
0.073

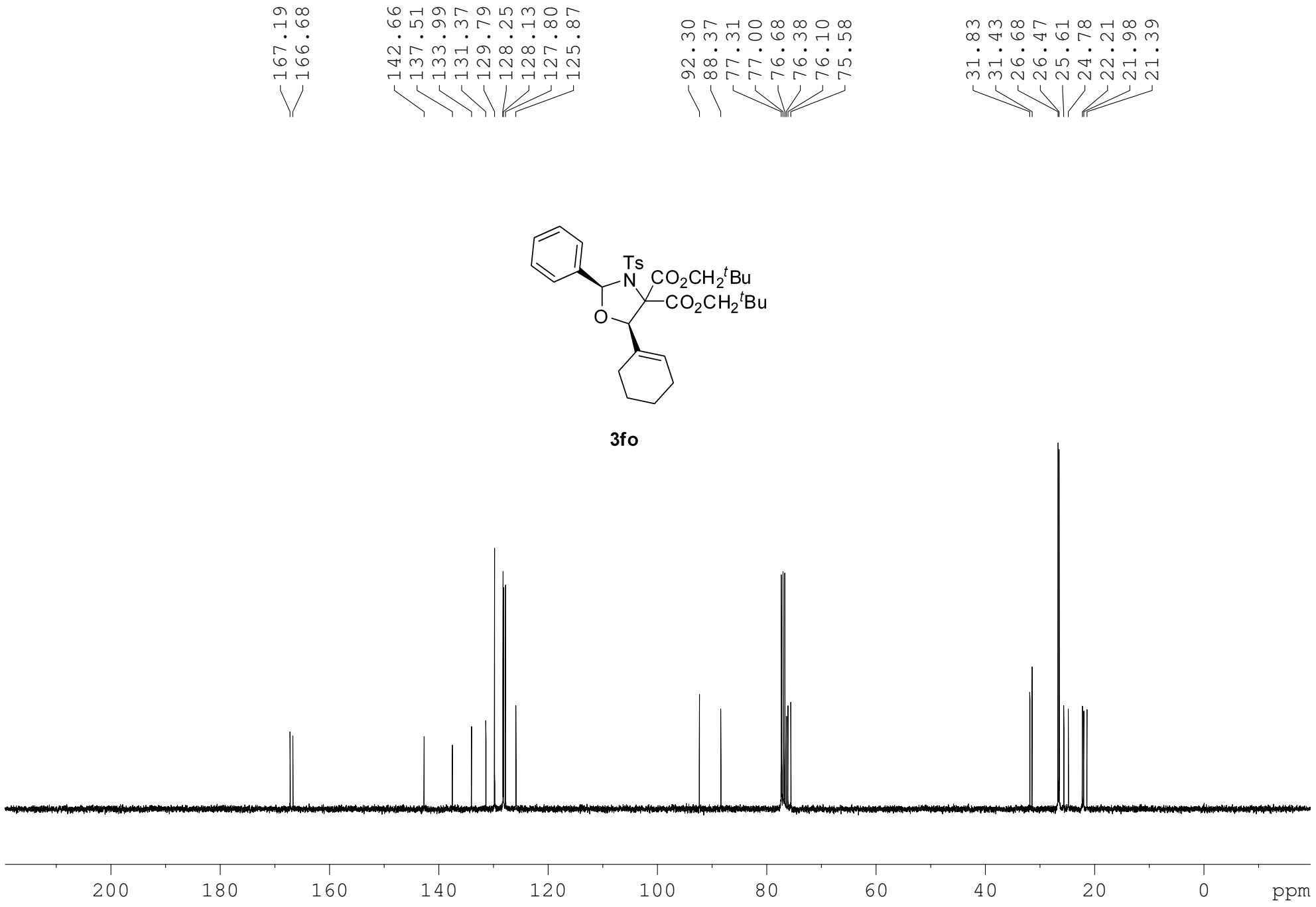

Ts
N
CO2CH2tBu
CO2CH2tBu
O

3fn


9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.01
1.18
4.13
2.11
1.00
1.03
1.01
1.09
1.01
1.05
1.02
3.16
2.97
3.25
8.89
8.96


167.10
142.65
137.55
134.06
129.79
129.76
129.13
128.25
128.20
127.84
123.72
92.40
89.55
77.32
77.00
76.68
76.51
76.26
76.19
31.42
26.72
26.53
21.39
13.49
13.16
Ts
N
O
CO2CH2tBu
CO2CH2tBu
3fn
200
180
160
140
120
100
80
60
40
20
0
ppm


7.403
7.385
7.383
7.285
7.267
7.261
7.248
7.141
7.122
7.105
7.085
6.907
6.886
6.007
5.880
5.064
4.413
4.387
4.121
4.095
4.015
3.989
3.584
3.558
2.287
2.126
2.082
2.008
1.903
1.860
1.641
1.625
1.613
1.587
1.578
1.573
1.563
1.549
1.534
1.519
1.108
1.041
0.000
Ts
N
CO2CH2tBu
CO2CH2tBu
O
3fo
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.04
1.20
3.97
2.00
1.00
1.00
0.99
1.00
1.00
0.99
1.04
2.96
4.03
4.34
8.82
9.01


167.19
166.68
142.66
137.51
133.99
131.37
129.79
128.25
128.13
127.80
125.87
92.30
88.37
77.31
77.00
76.68
76.38
76.10
75.58
31.83
31.43
26.68
26.47
25.61
24.78
22.21
21.98
21.39
Ts
N
O
CO2CH2tBu
CO2CH2tBu
200
180
160
140
120
100
80
60
40
20
0
ppm

3fo