Supporting Information

Gold-Catalyzed Construction of Two Adjacent Quaternary Stereocenters via Sequential C-H Functionalization and Aldol Annulation

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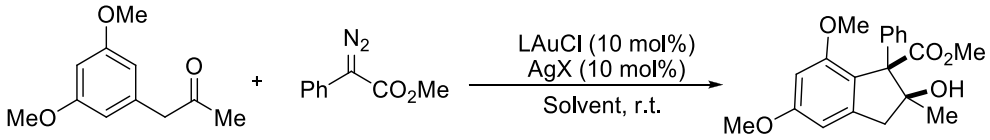
Content:

Table S1: Optimization of Reaction Conditions.[a]



1aa **2aa** **3aa**

Entry	Catalyst	AgX	Solvents	Time	d.r.	Yield[d] (%)
1	PPh_3AuCl	$AgNTf_2$	CH_2Cl_2	45 min	9:1	76
2	IPrAuCl	$AgNTf_2$	CH_2Cl_2	45 min	> 20:1	48
3	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	CH_2Cl_2	45 min	12:1	81
4	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	AgOTf	CH_2Cl_2	45 min	4:1	48
5	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgSbF_6$	CH_2Cl_2	45 min	8:1	48
6	$CuOTf_2$ (10 mol%)	-	CH_2Cl_2	12 h	-.	N.D.
7	CuOTf (10 mol%)	-	CH_2Cl_2	12 h	-	N.D.
8	$Rh_2(OAc)_4$ (10 mol%)	-	CH_2Cl_2	12 h	-	N.D.
9	$Pd(OAc)_2$ (10 mol%)	-	CH_2Cl_2	12 h	-	N.D.
10	$Pd(PPh_3)_4$ (10 mol%)	-	CH_2Cl_2	12 h	-	N.D.
11	$AgNTf_2$ (10 mol%)	-	CH_2Cl_2	45 min	5:1	38
12[b]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	CH_2Cl_2	45 min	11:1	68
13[c]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	CH_2Cl_2	45 min	18:1	82 (77)
14[c]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	CH_3CN	45 min	> 20:1	44
15[c]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	THF	45 min	1.5:1	30
16[c]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	Toluene	45 min	14:1	34
17[c]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgNTf_2$	$ClCH_2CH_2Cl$	45 min	8:1	63
18[c]	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	-	CH_2Cl_2	45 min	-	N.R.

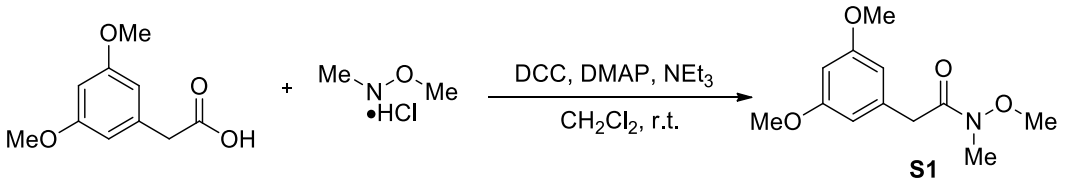
[a] Unless noted, the reaction was carried out with **1aa** (0.3 mmol), **2aa** (0.2 mmol), catalyst (10 mol%) in solvent (4 mL) at room temperature. [b] Gold catalyst (5 mol%) was used. [c] 3 equiv of **1aa** and 5 mol% of catalyst were used. [d] NMR yield and the numbers in parenthesis is isolated yield.

2. General Information:

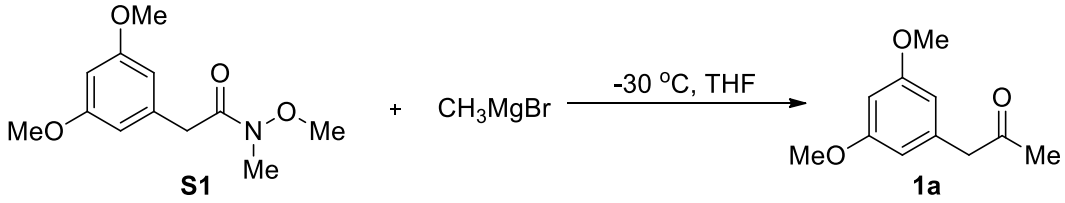
All air- and moisture-sensitive manipulations were carried out with standard Schlenk techniques under nitrogen or in a glove box under nitrogen. ^{1}H NMR, ^{13}C NMR spectra were measured at 400 MHz and 100 MHz in $CDCl_3$. Data for ^{1}H NMR spectra are reported as follows: chemical shift (ppm, referenced to TMS; s = singlet, d = doublet, t = triplet, dd = doublet of doublets, dt = doublet of triplets, m = multiplet), coupling constant (Hz), and integration. Data for ^{13}C NMR are reported in terms of chemical shift (ppm) relative to residual solvent peak ($CDCl_3$: 77.0 ppm). THF， toluene and ether were distilled from sodium and benzophenone prior to be used. CH_2Cl_2, DMF was distilled from CaH_2 prior to be used.

3. Synthesis of 1.

1) Synthesis of 1-(3, 5-dimethoxyphenyl)propan-2-one (1a).



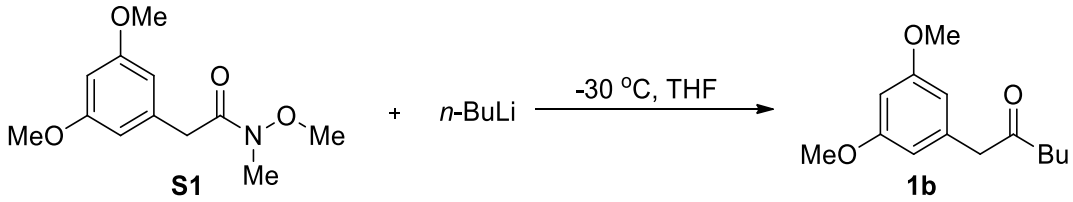
To a mixture of 2-(3,5-dimethoxyphenyl)acetic acid (1.0 g, 5.1 mmol), N,O-dimethylhydroxylamine (597 mg, 6.1 mmol) and DMAP (62 mg, 0.51 mmol) in CH_2Cl_2 (10 mL), NEt_3 (880 μL, 6.1 mmol) was added dropwise at 0 ^oC and then DCC (1.26 g, 6.1 mmol) was added. The reaction was stirred at 0 ^oC for 15 min, and then was allowed to warm to room temperature and stir for another 1 hour. The reaction was quenched with water. The solid was filtered off and washed with ethyl acetate. The filtrate was extracted with ethyl acetate for two times, and the combined organic layer was washed with brine and dried with anhydrous Na_2SO_4. After removal of the solvent, the residue was purified by silica chromatography (PE/EtOAc = 10:1 to 5:1) to afford **S1** (830.0 mg, 68%) as a colorless oil. ^1H NMR (400 MHz, $CDCl_3$) δ 6.45 (d, *J* = 2.0 Hz, 2H), 6.35 (t, *J* = 2.0 Hz, 1H), 3.77 (s, 6H), 3.70 (s, 2H), 3.61 (s, 3H), 3.19 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.08, 160.74, 137.02, 107.27, 98.91, 61.23, 55.21, 39.57, 32.17. MS (EI): m/z (%): 239 (M^+, 25.69), 151 (100); HRMS (EI) calcd. for $C_{12}H_{17}NO_4$: 239.1158, found: 239.1159.



To a solution of amide **S1** (1.0 g, 4.2 mmol) in THF (10 mL) methyl Grignard reagent (6.3 mmol, 6.3 mL, 1.0 M in THF) was added at -30 ^oC. After being stirred for overnight, the reaction was quenched with NH_4Cl solution. Then the resulting solution was extracted with ethyl acetate, washed with saturated bine solution and dried with anhydrous Na_2SO_4. After being filtrated and concentrated, the residue was

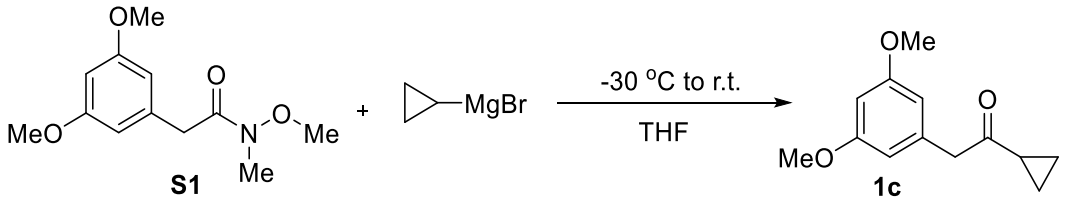
purified by silica chromatography (PE/EtOAc = 10:1) to give **1a** (0.65 g, 80%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.37 (t, *J* = 2.0 Hz, 1H), 6.35 (d, *J* = 2.0 Hz, 2H), 3.77 (s, 6H), 3.60 (s, 2H), 2.14 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 206.18, 160.99, 136.34, 107.40, 99.01, 55.26, 51.27, 29.03. MS (EI): m/z (%): 194 (M^+, 90.16), 151 (100); HRMS (EI) calcd. for $C_{11}H_{14}O_3$ 194.0943, found: 194.0945.

2) Synthesis of 1-(3, 5-dimethoxyphenyl)hexan-2-one (1b).



The general procedure was followed as **1a**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1b** (269.5 mg, 54%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.32-6.38 (m, 3H), 3.77 (s, 6H), 3.59 (s, 2H), 2.44 (t, *J* = 7.6 Hz, 2H) 1.45-1.58 (m, 2H), 1.20-1.30 (m, 2H), 0.86 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.47, 160.88, 136.48, 107.35, 98.99, 55.25, 50.39, 41.46, 25.75, 22.16, 13.79. MS (EI): m/z (%): 236 (M^+, 6.05), 85 (100); HRMS (ESI) calcd. for $C_{14}H_{20}O_3$: 236.1412, found: 236.1415.

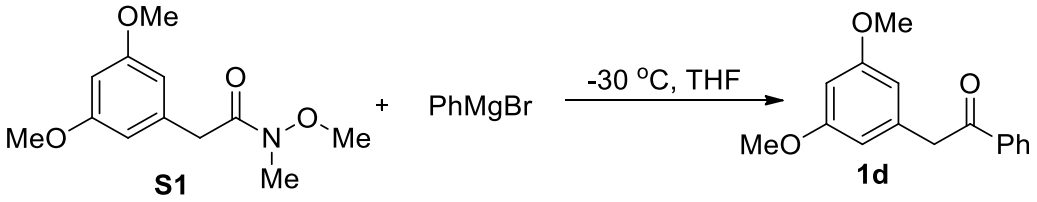
3) Synthesis of 1-cyclopropyl-2-(3, 5-dimethoxyphenyl)ethanone (1c).



The general procedure was followed as **1a**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1c** (220.1 mg, 30%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.36-6.42 (m, 3H), 3.78 (s, 6H), 3.74 (s, 2H), 1.92-2.02 (m, 1H) 1.00-1.05 (m, 2H), 0.80-0.85 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.28, 160.90, 136.52, 107.51, 98.90, 55.27, 50.96, 19.89, 11.44. MS (ESI): m/z (%): 243.02 ($[M+Na]^+$, 22.00), 221.05 (100); HRMS (ESI) calcd. for $C_{13}H_{16}NaO_3$ [M+Na]:

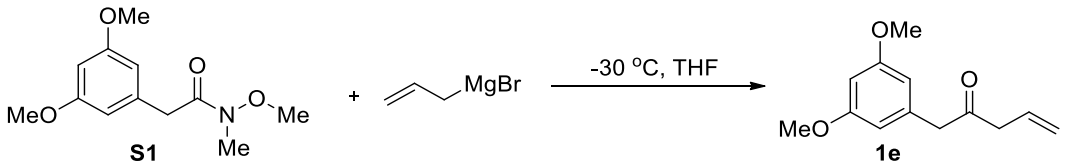
243.0092, found: 243.0984.

4) Synthesis of 2-(3, 5-dimethoxyphenyl)-1-phenylethanone (1d).[1]



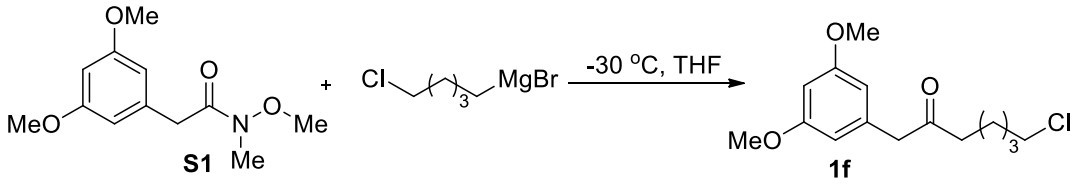
The general procedure was followed as **1a**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1d** (287.5 mg, 53%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96-8.02 (m, 2H), 7.50-7.60 (m, 1H), 7.42-7.48 (m, 2H), 6.43 (d, *J* = 2.0 Hz, 2H) , 6.35 (t, *J* = 2.0 Hz, 1H), 4.21 (s, 2H), 3.76 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.40, 160.92, 136.66, 136.54, 133.12, 128.59, 128.58, 107.49, 98.92, 55.23, 45.76. MS(EI): m/z (%): 256 (M^+, 25.35), 105 (100), HRMS (EI) calcd. for $C_{16}H_{16}O_3$: 256.1099, found: 256.1100.

5) Synthesis of 1-(3, 5-dimethoxyphenyl)pent-4-en-2-one (1e).



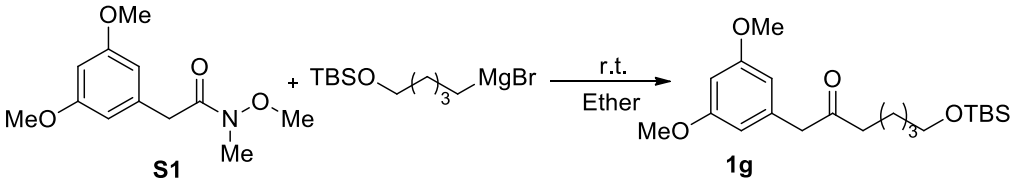
The general procedure was followed as **1a**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1e** (356.3 mg, 77%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.35-6.41 (m, 3H), 5.84-5.94 (m, 1H), 5.08-5.20 (m, 2H), 3.78 (s, 6H) , 3.64 (s, 2H), 3.2 (dt, *J* = 6.8 Hz, 1.2 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 205.99, 160.99, 136.04, 130.38, 119.01, 107.48, 99.06, 53.30, 49.84, 46.51. MS (EI): m/z (%): 220 (M^+, 44.82), 69 (100); HRMS (EI) calcd. for $C_{13}H_{16}O_3$: 220.1099, found: 220.1098.

6) Synthesis of 7-chloro-1-(3, 5-dimethoxyphenyl)heptan-2-one (1f).



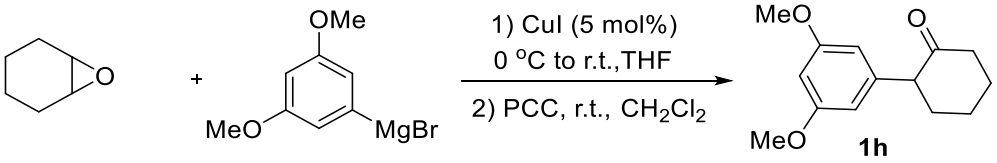
The general procedure was followed as **1a**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1f** (298.0 mg, 25%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.37 (t, *J* = 2.0 Hz, 1H), 6.34 (d, *J* = 2.0 Hz, 2H), 3.78 (s, 6H), 3.59 (s, 2H), 3.49 (t, *J* = 6.8 Hz, 2H), 2.46 (t, *J* = 7.2 Hz, 2H), 1.68-1.78 (m, 2H), 1.50-1.60 (m, 2H), 1.32-1.40 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 207.95, 161.01, 136.36, 107.43, 99.00, 55.31, 50.54, 44.76, 41.35, 32.30, 26.28, 22.84. MS (EI): m/z (%): 284 (M^+, 41.64), 286 ($[M+2]^+$, 14.02), 69 (100); HRMS (EI) calcd. for $C_{15}H_{21}O_3$: 284.1179, found 284.1180.

7) Synthesis of 7-(tert-butyldimethylsilyloxy)-1-(3,5-dimethoxyphenyl)heptan -2-one (1g).



The general procedure was followed as **1a** at room temperature. The residue was purified by silica chromatography (PE/EtOAc = 20:1) to give **1g** (200.0 mg, 35%) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.32-6.38 (m, 3H), 3.77 (s, 6H), 3.59 (s, 2H), 3.56 (t, *J* = 6.8 Hz, 2H), 2.45 (*J* = 7.6 Hz, 2H), 1.40-1.60 (m, 4H), 1.24-1.35 (m, 2H), 0.88 (s, 9H), 0.03 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.27, 160.98, 136.49, 107.43, 99.00, 62.95, 55.29, 50.46, 41.75, 32.56, 25.95, 25.36, 23.51, 18.33, -5.31. MS (ESI): m/z (%): 403.12 ($[M+Na]^+$, 84), 147.11 (100); HRMS (ESI) calcd. for $C_{21}H_{36}NaO_4Si$ [M+Na]: 403.2275, found: 403.2275.

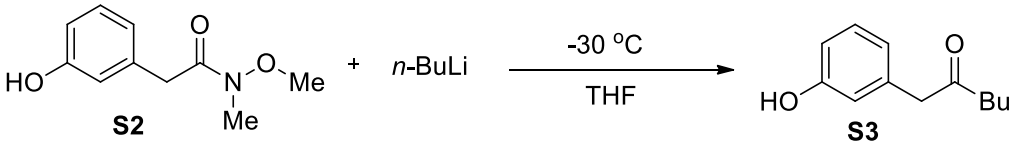
8) Synthesis of 2-(3,5-dimethoxyphenyl)cyclohexan-1-one (1h).



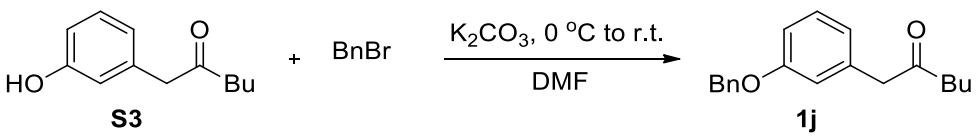
To the solution of the Grignard reagent, CuI (95 mg, 0.5 mmol) in THF at 0 °C, cyclohexene oxide was added (980 mg, 10 mmol). After being stirred for 3 h at room

temperature, the reaction was quenched with aqueous NH_4Cl solution. Then the resulting solution was extracted with ethyl acetate and dried with anhydrous Na_2SO_4. After being filtrated and concentrated, the residue was dissolved in CH_2Cl_2 (20 mL) and silica (8.6 g) was added. Then, PCC (4.3 g, 20 mmol) was added and the resulting mixture was stirred at room temperature for another 11h. The solid was filtered off and the filtrate was concentrated. The residue was purified by silica column chromatography (PE/EtOAc = 6:1 to 3:1) to give **1h** (1.51 g, 64%) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.37 (t, *J* = 2.4 Hz, 1H), 6.30 (d, *J* = 2.4 Hz, 2H), 3.77 (s, 6H), 3.50-3.60 (m, 1H), 2.36-2.58 (m, 2H), 2.20-2.28 (m, 1H), 1.94-2.18 (m, 3H), 1.74-1.88 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.06, 160.64, 140.97, 106.69, 98.80, 57.49, 55.22, 42.10, 34.69, 27.69, 25.14. MS(EI): m/z (%): 234 (M^+, 100), HRMS (EI) calcd. for $C_{14}H_{18}O_3$:234.1256, found: 234.1254.

9) Synthesis of 1-(3-(benzyloxy)phenyl)hexan-2-one (1j).



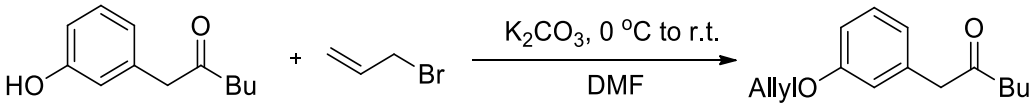
The general procedure was followed as **1a**. The residue was purified by silica chromatography (PE/EtOAc = 5:1) to give **S3** (5.81 g, 83% yield) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18 (t, *J* = 8.0 Hz, 1H), 6.75 (dd, *J* = 8.0 Hz, 2.0 Hz, 2H), 6.70 (d, *J* = 2.0 Hz, 1H), 6.39 (br, 1H) , 3.64 (s, 2H), 2.47 (t, *J* =7.6 Hz, 2H), 1.46-1.58 (m, 2H), 1.18-1.32 (m, 2H), 0.86 (t, *J* =7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.36, 156.21, 135.52, 129.91, 121.48, 116.19, 114.27, 49.96, 41.71, 25.75, 22.14, 13.76; MS(EI): m/z (%): 192 (M^+, 24.69), 101 (100), HRMS (EI) calcd. for $C_{12}H_{16}O_2$: 192.1150, found: 192.1151.



To a mixture of ketone **S3** (1.0 g, 5.2 mmol), K_2CO_3 (857 mg, 6.2 mmol) in DMF

(10 mL) Benzyl bromide (736 μL, 6.2 mmol) was added at 0 °C. The reaction was stirred for 12 h at room temperature. After being extracted with ethyl acetate and concentrated under vacuum, the residue was purified by silica column chromatography (PE/EtOAc = 50:1 to 10:1) to give **1j** (1.27 g, 87% yield) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.50 (m, 5H), 7.20-7.28 (m, 1H), 6.80-6.92 (m, 3H), 5.06 (s, 2H), 3.65 (s, 2H), 2.44 (t, *J* = 7.6 Hz, 2H), 1.48-1.56 (m, 2H), 1.20-1.30 (m, 2H), 0.88 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.48, 158.95, 136.84, 135.84, 129.67, 128.53, 127.93, 127.46, 121.99, 115.90, 113.29, 69.87, 50.13, 41.59, 25.76, 22.17, 13.80. MS(EI): m/z (%): 282 (M^+, 7.54), 91 (100), HRMS (EI) calcd. for $C_{19}H_{22}O_2$: 282.1620, found: 282.1618.

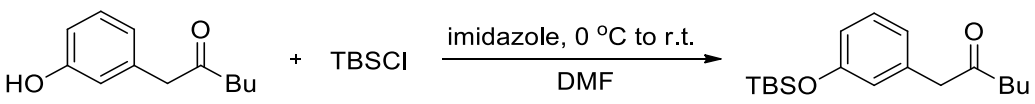
10) Synthesis of 1-(3-(allyloxy)phenyl)hexan-2-one.



S3 **1k**

The general procedure was followed as **1j**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1k** (810 mg, 67% yield) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.23 (t, *J* = 8.0Hz, 1H), 6.74-6.84 (m, 3H), 6.00-6.10 (m, 1H), 5.41 (d, *J* = 17.2 Hz, 1H), 5.28 (d, *J* = 10.4 Hz, 1H), 4.53 (d, *J* = 4.8 Hz, 2H), 3.64 (s, 2H), 2.44 (t, *J* = 7.6 Hz, 2H), 1.45-1.58 (m, 2H), 1.20-1.30 (m, 2H), 0.86 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.53, 158.76, 135.80, 133.14, 129.63, 121.88, 117.67, 115.78, 113.16, 68.69, 50.15, 41.59, 25.77, 22.18, 13.80. MS(EI): m/z (%): 232 (M^+, 17.75), 85 (100), HRMS (EI) calcd. for $C_{15}H_{20}O_2$: 232.1463, found: 232.1461.

11) Synthesis of 1-(3-(tert-butyldimethylsilyloxy)phenyl)hexan-2-one (1l).

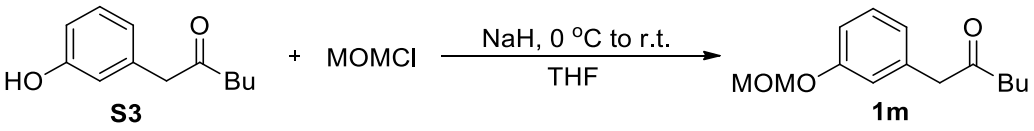


S3 **1l**

To a mixture of ketone **S3** (1.0 g, 5.2 mmol), imidazole (422 mg, 6.2 mmol) in

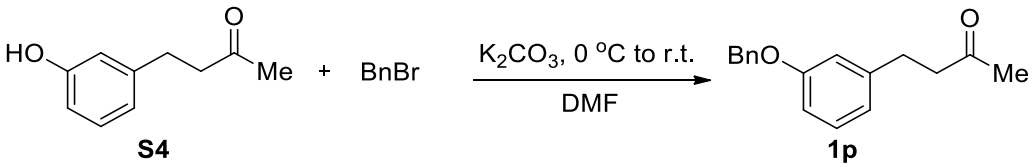
DMF (10 mL) tert-butylchlorodimethylsilane (934 mg, 6.2 mmol) was added at 0 ^{o}C. After being stirred for 12 h at room temperature, the reaction was extracted with ethyl acetate and concentrated under vacuum. The residue was purified by silica column chromatography (PE/EtOAc =50:1 to 10:1) to give **1l** (1.17 g, 73% yield) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.17 (t, *J* = 8.0 Hz, 1H), 6.79 (d, *J* = 8.0 Hz, 1H), 6.74 (dd, *J* = 8.0 Hz, 1.6 Hz, 1H), 6.70 (t, *J* = 1.6 Hz, 1H), 3.60 (s, 2H), 2.42 (t, *J* = 7.6 Hz, 2H), 1.45-1.55 (m, 2H), 1.20-1.30 (m, 2H), 0.98 (s, 9H), 0.85 (t, *J* = 7.6 Hz, 3H), 0.19 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.59, 155.86, 135.78, 129.58, 122.37, 121.19, 118.64, 50.14, 41.49, 25.79, 25.65, 22.20, 18.17, 13.79, -4.44. MS(EI): m/z (%): 306 (M^+, 25.46), 249 (100), HRMS (EI) calcd. for $C_{18}H_{30}O_2Si$: 306.2015, found: 306.2012.

12) Synthesis of 1-(3-(methoxymethoxy)phenyl)hexan-2-one (1m).



To a solution of ketone **S3** (600 mg, 3.1 mmol) in THF (6 mL) NaH (148 mg, 3.7 mmol) was added at 0 ^{o}C. After the solution was stirred for 15 min, chloro(methoxy)methane (281 μL, 3.7 mmol) was added and the reaction was allowed to warm to room temperature and stirred for another 12 h. After the resulting solution was extracted with ethyl acetate and concentrated under vacuum, the residue was purified by silica column chromatography (PE/EtOAc =50:1 to 20:1) to give **1m** (432.5 mg, 59% yield) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.24 (t, *J* = 8.0 Hz, 1H), 6.94 (dd, *J* = 8.0 Hz, 2.0 Hz, 1H), 6.88 (d, *J* =2.0 Hz, 1H), 6.84 (d, *J* =8.0 Hz, 1H), 5.17 (s, 2H), 3.65 (s, 2H), 3.47 (s, 3H), 2.45 (t, *J* = 7.6 Hz, 2H), 1.48-1.60 (m, 2H), 1.20-1.30 (m, 2H), 0.86 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.38, 157.44, 135.85, 129.64, 122.92, 117.33, 114.66, 94.37, 55.98, 50.02, 41.67, 25.77, 22.18, 13.79. MS(EI): m/z (%): 236 (M^+, 15.88), 45 (100), HRMS (EI) calcd. for $C_{14}H_{20}O_3$: 236.1412, found: 236.1413.

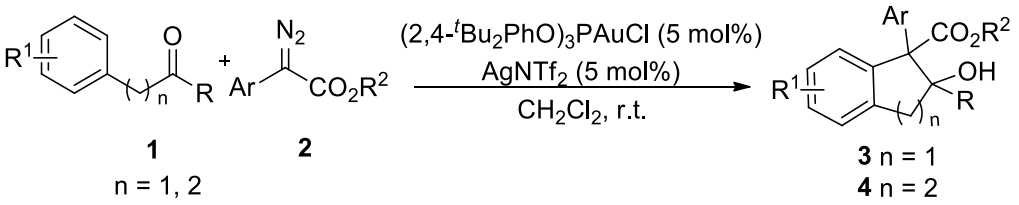
13) Synthesis of 4-(3-(benzyloxy)phenyl)butan-2-one (1p).[2]



S4 **1p**

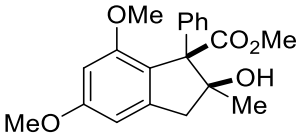
The general procedure was followed as **1j**. The residue was purified by silica chromatography (PE/EtOAc = 10:1) to give **1p** (1.05 g, 88% yield) as a colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.50 (m, 5H), 7.15-7.20 (m, 1H), 6.76-6.84 (m, 3H), 5.05 (s, 2H), 2.88 (t, *J* =7.6 Hz, 2H), 2.76 (t, *J* =7.6 Hz, 2H), 2.14 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 207.88, 158.89, 142.63, 136.98, 129.47, 128.53, 127.90, 127.46, 120.89, 115.00, 112.23, 69.85, 44.98, 30.05, 29.68.

4. General procedure for the cascade reaction:



In a dried glass tube, a solution of (2,4-^{t}Bu$_2$PhO)$_3$PAuCl (8.8 mg, 0.01 mmol), $AgNTf_2$ (3.9 mg, 0.01 mmol) in CH_2Cl_2 (3 mL) was stirred at room temperature for 15 min. Aryl ketone **1** (0.6 mmol) was added to the reaction mixture at room temperature. Then a solution of diazo compound **2** (0.2 mmol) in 1 mL of CH_2Cl_2 was introduced into the solution by a syringe in 30 min. The resulting mixture was continually stirred at room temperature for another 15-30 min and diazo compound was consumed completely determined by TLC analysis. After being filtrated through a short silica gel column and concentrated, the residue was purified by column chromatography on silica gel to afford the desired product.

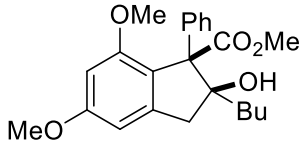
1) Synthesis of methyl 2-hydroxy-5,7-dimethoxy-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3aa).



3aa

The general procedure was followed using **1a** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3aa** (52.4 mg, 77%, d.r. = 14:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20-7.30 (m, 3H), 7.10-7.18 (m, 2H), 6.44(d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 4.58 (s, 1H), 3.83 (s, 3H), 3.68 (s, 3H), 3.67 (s, 3H), 3.31 (d, *J* = 15.6 Hz, 1H), 2.96 (d, *J* = 15.6 Hz, 1H), 0.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.16, 161.64, 158.37, 144.80, 136.73, 128.33, 127.24, 126.77, 120.33, 101.51, 98.23, 84.62, 68.24, 55.41, 55.30, 52.31, 47.52, 25.23; MS(EI): m/z (%): 342 (M^+, 3.83); 310 (100); HRMS (EI) calcd. for $C_{20}H_{22}O_5$: 342.1467, found: 342.1465.

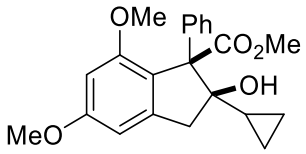
2) Synthesis of methyl 2-butyl-2-hydroxy-5,7-dimethoxy-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ba).



3ba

The general procedure was followed using **1b** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ba** (48.8 mg, 64%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.16-7.28 (m, 5H), 6.46 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 3.92 (s, 1H), 3.84 (s, 3H), 3.71 (s, 3H), 3.64 (s, 3H), 3.07 (d, *J* = 16.0 Hz, 1H), 3.00 (d, *J* = 16.0 Hz, 1H), 1.40-1.50 (m, 1H), 1.05-1.30 (m, 5H), 0.79 (t, *J* = 7.2 Hz, 3H) ; ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.25, 161.57, 158.16, 144.32, 137.00, 128.55, 127.35, 126.77, 122.17, 101.33, 98.21, 87.13, 69.30, 55.42, 55.37, 52.15, 44.13, 36.14, 26.17, 23.15, 14.03; MS(EI): m/z (%): 384 (M^+, 2.57), 352 (100), HRMS (ESI) calcd. for $C_{23}H_{28}O_5$: 384.1937, found: 384.1935.

3) Synthesis of methyl 2-cyclopropyl-2-hydroxy-5,7-dimethoxy-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ca).

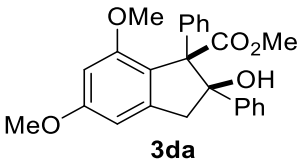


3ca

The general procedure was followed using **1c** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ca** (52.3 mg, 71%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18-7.30 (m, 5H), 6.46 (d, *J* = 2.0 Hz, 1H), 6.40 (d, *J* = 2.0 Hz, 1H), 4.53 (s, 1H), 3.84 (s, 3H), 3.70 (s, 3H), 3.67 (s, 3H), 3.05 (d, *J* = 15.6 Hz, 1H), 2.91 (d, *J* = 15.6 Hz, 1H), 0.58-0.66 (m, 1H), 0.30-0.36 (m, 1H), 0.20-0.28 (m, 1H), 0.08-0.16 (m, 1H), -0.05-0.02 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.41, 161.58, 158.06, 144.98,

136.87, 129.17, 126.94, 126.75, 121.52, 101.54, 97.98, 85.64, 68.27, 55.43, 55.40, 52.39, 45.93, 17.41, 1.36, 1.03. MS(EI): m/z (%): 368 (M^+, 2.00); 293 (100); HRMS (EI) calcd. for $C_{22}H_{24}O_5$: 368.1624, found:368.1626.

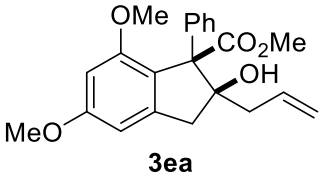
4) Synthesis of methyl 2-hydroxy-5,7-dimethoxy-1,2-diphenyl-2,3-dihydro-1H-indene-1-carboxylate (3da).



3da

The general procedure was followed using **1d** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1), **3da** (52.6 mg, 65%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, CDCl3) δ 6.96-7.15 (m, 4H), 6.85-6.95 (m, 4H), 6.59 (d, *J* = 1.2 Hz, 1H), 6.53 (d, *J* = 7.6 Hz, 2H) 6.43(d, *J* = 1.2 Hz, 1H), 5.52 (s, 1H), 3.90 (s, 3H), 3.75 (s, 3H), 3.64 (s, 3H), 3.57(d, *J* = 16.0 Hz, 1H), 3.35 (d, *J* = 16.0 Hz, 1H); ^{13}C NMR (100 MHz, CDCl3) δ 175.24, 161.95, 158.25, 145.36, 141.97, 136.27, 128.92, 127.07, 126.98, 126.87, 126.50, 126.45, 121.27, 101.32, 98.17, 89.09, 69.85, 55.53, 55.39, 52.55, 46.11; MS(EI): m/z (%): 404 (M^+, 0.60); 328 (100); HRMS (ESI) calcd. for $C_{25}H_{24}O_5$: 404.1624, found: 404.1626.

5) Synthesis of methyl 2-allyl-2-hydroxy-5,7-dimethoxy-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ea).

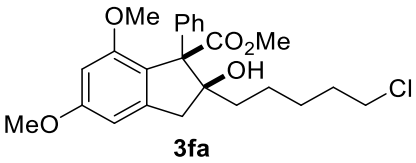


3ea

The general procedure was followed using **1e** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ea** (49.1 mg, 67%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25-7.32 (m, 3H), 7.16-7.24 (m, 2H), 6.43 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 5.75-5.90 (m, 1H), 5.05 (d, *J* = 10.0 Hz, 1H), 4.92 (d, *J* = 17.2 Hz, 1H), 4.30 (d,

J = 0.9 Hz, 1H), 3.83 (s, 3H), 3.69 (s, 3H), 3.66 (s, 3H), 3.14 (d, *J* = 16.0 Hz, 1H), 3.09 (d, *J* = 16.0 Hz, 1H), 1.72-1.86 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.73, 161.64, 158.24, 144.35, 136.42, 134.41, 128.47, 127.43, 126.92, 120.77, 118.11, 101.40, 98.29, 85.91, 68.76, 55.43, 55.33, 52.31, 43.67, 41.34. MS(EI): m/z (%): 368 (M^+, 3.52); 267 (100); HRMS (EI) calcd. for $C_{22}H_{24}O_5$: 368.1624, found: 368.1622.

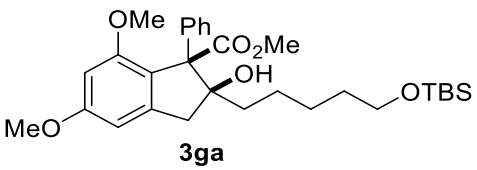
6) Synthesis of methyl 2-(5-chloropentyl)-2-hydroxy-5,7-dimethoxy-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3fa).



3fa

The general procedure was followed using **1f** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3fa** (51.8 mg, 60%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.15-7.28 (m, 5H), 6.45 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 4.04 (d, *J* = 1.2 Hz, 1H), 3.84 (s, 3H), 3.70 (s, 3H), 3.65 (s, 3H), 3.42-3.48 (m, 2H), 3.08 (d, *J* = 16.0 Hz, 1H), 3.00 (d, *J* = 16.0 Hz, 1H), 1.60-1.70 (m, 2H), 1.42-1.50 (m, 1H), 1.18-1.32 (m, 4H), 1.05-1.12 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.36, 161.59, 158.17, 144.19, 136.76, 128.49, 127.42, 126.87, 121.76, 101.31, 98.24, 86.90, 69.13, 55.43, 55.37, 52.23, 45.05, 44.03, 36.22, 32.59, 27.31, 23.34; MS(EI): m/z (%): 432 (M^+, 1.29), 434 ($[M+2]^+$, 0.43), 183 (100); HRMS (EI) calcd. for $C_{24}H_{29}O_5Cl$: 432.1704, found: 432.1708.

7) Synthesis of methyl 2-(5-(tert-butyldimethylsilyloxy)pentyl)-2-hydroxy-5,7-dimethoxy-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ga).

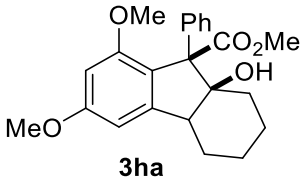


3ga

The general procedure was followed using **1g** (0.6 mmol) and **2a** (0.2 mmol). After

purification by column chromatography (PE/EtOAc = 20:1 to 10:1), **3ga** (63.6 mg, 58%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18-7.32 (m, 5H), 6.45 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 3.91 (d, *J* = 1.2 Hz, 1H), 3.84 (s, 3H), 3.70 (s, 3H), 3.64 (s, 3H), 3.51 (t, *J* = 6.8 Hz, 2H), 3.07 (d, *J* = 16.0 Hz, 1H), 2.99 (d, *J* = 16.0 Hz, 1H), 1.35-1.50 (m, 3H), 1.05-1.30 (m, 5H), 0.86 (s, 9H), 0.01 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.28, 161.64, 158.22, 144.33, 137.02, 128.57, 127.39, 126.81, 122.21, 101.41, 98.30, 87.12, 69.35, 63.27, 55.40, 52.15, 44.19, 36.47, 32.89, 26.30, 25.98, 23.86, 18.35, -5.27; MS(ESI): m/z (%): 551.17 ([M+Na]$^{+}$, 100); HRMS (ESI) calcd. for $C_{30}H_{44}NaO_6Si$[M+Na]: 551.2799, found: 551.2776.

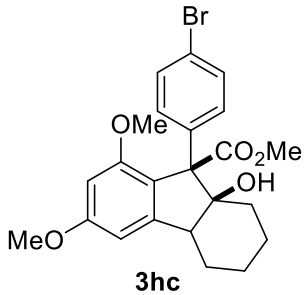
8) Synthesis of 1,3-dimethoxy-9-((methylperoxy)-l2-methyl)-9-phenyl-4b,5,6,7,8,9-hexahydro-8aH-fluoren-8a-ol (3ha).



3ha

The general procedure was followed using **1h** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ha** (37.8 mg, 49%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.22-7.32 (m, 3H), 7.05-7.15 (m, 2H), 6.43 (d, *J* = 1.6 Hz, 2H), 5.15 (d, *J* = 1.6 Hz, 1H), 3.86 (s, 3H), 3.72 (s, 3H), 3.62 (s, 3H), 3.54 (d, *J* = 4.0 Hz, 1H), 2.06-2.15 (m, 1H), 1.92-2.05 (m, 1H), 1.35-1.50 (m, 2H), 0.90-1.30 (m, 3H), 0.35-0.45 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.02, 161.58, 158.81, 147.99, 135.20, 128.40, 126.97, 126.62, 118.01, 100.06, 97.95, 84.56, 66.81, 55.43, 55.21, 52.42, 48.26, 31.80, 22.52, 21.44, 21.21. MS(EI): m/z (%): 382 (M^{+}, 2.90); 306 (100); HRMS (ESI) calcd. for $C_{23}H_{26}O_5$: 382.1780, found: 382.1782.

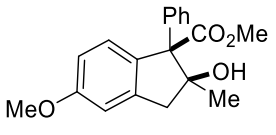
9) Synthesis of 9-(4-bromophenyl)-1,3-dimethoxy-9-((methylperoxy)-l2-methyl)-4b,5,6,7,8,9-hexahydro-8aH-fluoren-8a-ol (3hc).



3hc

The general procedure was followed using **1h** (0.6 mmol) and **2c** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3hc** (48.6 mg, 53%, d.r. = 11:1) was obtained as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40 (d, *J* = 8.4 Hz, 2H), 7.01 (d, *J* = 8.4 Hz, 2H), 6.41 (s, 2H), 4.99 (d, *J* = 2.4 Hz, 1H), 3.85 (s, 3H), 3.71 (s, 3H), 3.61 (s, 3H), 3.54 (s, 1H), 2.05-2.15 (m, 1H), 1.90-2.02 (m, 1H), 1.40-1.55 (m, 2H), 1.05-1.30 (m, 2H), 0.85-1.00 (m, 1H), 0.35-0.50 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.49, 161.76, 158.61, 147.98, 134.52, 130.24, 130.10, 120.74, 117.52, 100.17, 97.94, 84.51, 66.52, 55.47, 55.18, 52.51, 48.25, 31.90, 22.51, 21.42, 21.16. MS(ESI): m/z (%): 483.89 ($[M+Na]^+$, 26), 485.93 (($[M+2+Na]^+$, 24), 483.89 (100); HRMS (EI) calcd. for $C_{23}H_{25}O_5Br$: 460.0885, found: 460.0889.

10) Synthesis of methyl 2-hydroxy-5-methoxy-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ia).

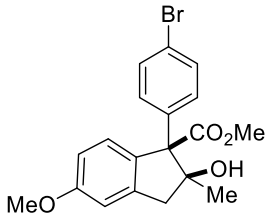


3ia

The general procedure was followed using **1i** (1.0 mmol), **2a** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 20:1 to 10:1), **3ia** (33.9 mg, 54%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 8.8 Hz, 1H), 7.27-7.36 (m, 3H), 7.12-7.18 (m, 2 H), 6.78-6.84 (m, 2 H), 5.00 (s, 1H), 3.83 (s, 3H), 3.67 (s, 3H), 3.29 (d, *J* = 15.6 Hz, 1 H), 2.95 (d, *J* = 15.6 Hz, 1 H), 0.87 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.75, 159.88, 144.00, 138.47, 132.08, 128.68, 128.17, 127.52, 127.28, 113.10, 109.96, 84.16, 68.43, 55.34, 52.48, 46.28, 25.41; MS(EI): m/z (%): 312 (M^+, 7.42); 236 (100);

HRMS (EI) calcd. for $C_{19}H_{20}O_4$: 312.1362, found: 312.13585.

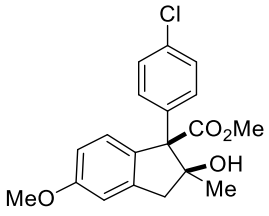
11) Synthesis of methyl 1-(4-bromophenyl)-2-hydroxy-5-methoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ic).



3ic

The general procedure was followed using **1i** (1.0 mmol), **2c** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ic** (42.7 mg, 55%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.4 Hz, 1H), 7.04 (d, *J* = 8.4 Hz, 2H), 6.80-6.88 (m, 2H), 4.91 (s, 1H), 3.83 (s, 3H), 3.66 (s, 3H), 3.31 (d, *J* = 15.6 Hz, 1H), 2.94 (d, *J* = 15.6 Hz, 1H), 0.86 (s, 3H); 13C NMR (100 MHz, CDCl3) δ 175.26, 160.02, 143.94, 137.57, 131.51, 131.28, 129.30, 128.49, 121.36, 113.26, 110.07, 84.02, 68.01, 55.35, 52.59, 46.31, 25.44. MS (EI): m/z (%): 390 (M^+, 5.57), 392 ($[M+2]^+$, 5.25); 390 (100); HRMS (EI) calcd. for $C_{19}H_{19}O_4Br$: 390.0467, found: 390.0469.

12） Synthesis of methyl 1-(4-chlorophenyl)-2-hydroxy-5-methoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ie).

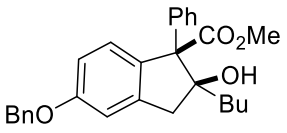


3ie

The general procedure was followed using **1i** (1.0 mmol) and **2e** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ie** (41.4 mg, 60%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 (d, *J* = 8.0 Hz, 1H), 7.30 (d, *J* = 8.8 Hz, 2H), 7.09 (d, *J* = 8.8 Hz, 2H), 6.78-6.85 (m, 2H),

4.91 (s, 1H), 3.83 (s, 3H), 3.66 (s, 3H), 3.31 (d, *J* = 15.6 Hz, 1H), 2.94 (d, *J* = 15.6 Hz, 1H), 0.86 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.34, 160.02, 143.95, 137.04, 133.20, 131.60, 128.95, 128.51, 128.34, 113.26, 110.08, 84.08, 67.95, 55.36, 52.59, 46.31, 25.43. MS(EI): m/z (%): 346 (M^+, 5.41), 348 ($[M+2]^+$, 1.85); 84 (100); HRMS (EI) calcd. for $C_{19}H_{19}O_4Cl$: 346.0972, found: 346.0970.

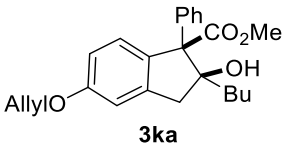
13） Synthesis of methyl 5-(benzyloxy)-2-hydroxy-2-methyl-1-phenyl-2,3-dihydro -1H-indene-1-carboxylate (3ja).



3ja

The general procedure was followed using **1j** (1.0 mmol), **2a** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ja** (47.1 mg, 55%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25-7.55 (m, 9H), 6.98-7.08 (m, 2H), 6.86-6.94 (m, 2H), 5.10 (s, 2H), 4.49 (s, 1H), 3.75 (s, 3H), 3.09 (d, *J* = 16.0 Hz, 1H), 2.98 (d, *J* = 16.0 Hz, 1H), 1.40-1.60 (m, 1H), 1.26-1.35 (m, 1H), 1.06-1.25 (m, 3H), 0.96-1.05 (m, 1H), 0.80 (t, *J* =7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.46, 159.08, 144.17, 138.94, 136.95, 133.23, 128.57, 128.33, 128.17, 127.97, 127.54, 127.49, 127.21, 113.77, 110.99, 86.49, 70.09, 70.03, 52.39, 42.28, 36.69, 26.01, 23.16, 14.05. MS(EI): m/z (%): 430 (M^+, 0.81); 91 (100); HRMS (EI) calcd. for $C_{28}H_{30}O_4$: 430.2144, found: 430.2140.

14） Synthesis of methyl 5-(allyloxy)-2-hydroxy-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ka).

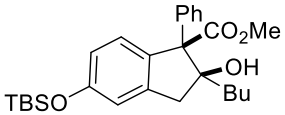


3ka

The general procedure was followed using **1k** (1.0 mmol), **2a** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ka** (50.5 mg, 66%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400

MHz, $CDCl_3$) δ 7.44 (d, *J* = 8.0 Hz, 1H), 7.22-7.30 (m, 3H), 6.95-7.05 (m, 2H), 6.80-6.85 (m, 2H), 6.02-6.15 (m, 1H), 5.44 (dd, *J* = 17.2 Hz, 1.6 Hz, 1H), 5.31 (dd, *J* = 10.4 Hz, 1.6 Hz, 1H), 4.56 (d, *J* = 5.2 Hz, 2H), 4.47 (s, 1H), 3.73 (s, 3H), 3.07 (d, *J* = 16.0 Hz, 1H), 2.95 (d, *J* = 16.0 Hz, 1H), 1.42-1.52 (m, 1H), 1.05-1.35 (m, 4H), 0.92-1.00 (m, 1H), 0.77 (t, *J* =7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.50, 158.87, 144.14, 138.98, 133.28, 133.13, 128.30, 128.19, 127.56, 127.23, 117.70, 113.71, 110.90, 86.50, 70.05, 68.93, 52.42, 42.30, 36.71, 26.03, 23.18, 14.06. MS(EI): m/z (%): 380 (M^+, 5.44); 249 (100); HRMS (EI) calcd. for $C_{24}H_{28}O_4$: 380.1988, found: 380.1990.

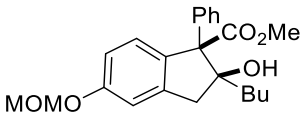
15） Synthesis of methyl 5-(tert-butyldimethylsilyloxy)-2-hydroxy-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3la).



3la

The general procedure was followed using **1l** (1.0 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3la** (40.3 mg, 44%, d.r. > 20:1) was obtained as a colorless oil. ^1H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 8.4 Hz, 1H), 7.25-7.32 (m, 3H), 6.95-7.02 (m, 2H), 6.72-6.80 (m, 2H), 4.48 (s, 1H), 3.76 (s, 3H), 3.07 (d, *J* = 16.0 Hz, 1H), 2.94 (d, *J* = 16.0 Hz, 1H), 1.40-1.52 (m, 1H), 1.24-1.34 (m, 1H), 1.06-1.23 (m, 3H), 1.02 (s, 9H), 0.92-1.02 (m, 1H), 0.80 (t, *J* = 7.2 Hz, 3H), 0.26 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.53, 155.74, 144.08, 139.07, 133.56, 128.24, 128.16, 127.56, 127.20, 118.71, 116.37, 86.47, 70.09, 52.39, 42.17, 36.76, 26.04, 25.64, 23.18, 18.14, 14.05, -4.39. MS(EI): m/z (%): 454 (M^+, 3.79); 378 (100); HRMS (EI) calcd. for $C_{27}H_{38}O_4Si$: 454.2539, found: 454.2536.

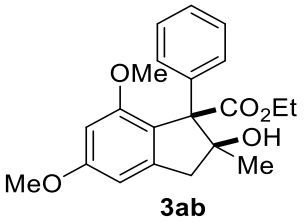
16） Synthesis of methyl 2-hydroxy-5-(methoxymethoxy)-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ma).



3ma

The general procedure was followed using **1m** (1.0 mmol), **2a** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ma** (35.5 mg, 46%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45 (d, *J* = 8.5 Hz, 1H), 7.22-7.30 (m, 3H), 6.96-7.04 (m, 3H), 6.90-6.95 (m, 1H), 5.20 (dd, *J* = 10.0 Hz, 7.0 Hz, 2H), 4.47 (s, 1H), 3.73 (s, 3H), 3.51 (s, 3H), 3.07 (d, *J* = 16.0 Hz, 1H), 2.96 (d, *J* = 16.0 Hz, 1H), 1.44-1.52 (m, 1H), 1.23-1.32 (m, 1H), 1.05-1.22 (m, 3H), 0.92-1.01 (m, 1H), 0.77 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 175.45, 157.48, 144.19, 138.85, 134.20, 128.38, 128.20, 127.58, 127.25, 115.12, 112.51, 94.51, 86.52, 70.09, 56.08, 52.44, 42.25, 36.69, 26.00, 23.18, 14.07. MS(EI): m/z (%): 384 (M^+, 3.93); 45 (100); HRMS (EI) calcd. for $C_{23}H_{28}O_5$: 384.1937, found: 384.1939.

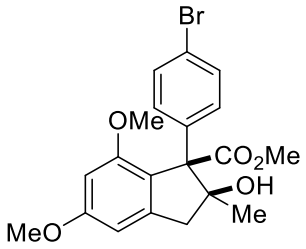
17）Synthesis of ethyl 2-hydroxy-5,7-dimethoxy-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (3ab).



3ab

The general procedure was followed using **1a** (0.6 mmol) and **2b** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ab** (43.2 mg, 61%, d.r. = 6:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.22-7.32 (m, 3H), 7.14-7.21 (m, 2H), 6.42 (s, 1H), 6.38 (s, 1H), 4.60 (s, 1H), 4.12-4.22 (m, 2H), 3.83 (s, 3H), 3.65 (s, 3H), 3.31 (d, *J* = 15.6 Hz, 1H), 2.95 (d, *J* = 15.6 Hz, 1H), 1.13 (t, *J* =7.2 Hz, 3H), 0.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.60, 161.56, 158.38, 144.81, 136.91, 128.38, 127.14, 126.61, 120.38, 101.27, 97.98, 84.49, 68.30, 61.00, 55.41, 55.00, 47.60, 25.33, 13.86; MS(EI): m/z (%): 356 (M^+, 4.98), 310 (100), HRMS (EI) calcd. for $C_{21}H_{24}O_5$: 356.1624, found:356.1627.

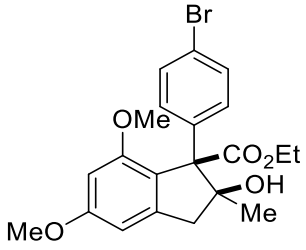
18） Synthesis of methyl 1-(4-bromophenyl)-2-hydroxy-5,7-dimethoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ac).



3ac

The general procedure was followed using **1a** (0.6 mmol) and **2c** (0.2 mmol). After purification by column chromatography (PE/EtOAc =10:1 to 5:1), **3ac** (60.0 mg, 71%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.8 Hz, 2H), 7.06 (d, *J* = 8.8 Hz, 2H), 6.44 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 4.36 (s, 1H), 3.83 (s, 3H), 3.67 (s, 6H), 3.30 (d, *J* = 15.6 Hz, 1H), 2.95 (d, *J* = 15.6 Hz, 1H), 0.87 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.55, 161.80, 158.15, 144.70, 135.99, 130.33, 130.17, 120.88, 119.86, 101.58, 98.20, 84.49, 67.92, 55.41, 55.24, 52.35, 47.48, 25.24; MS(EI): m/z (%): 420 (M^+, 2.81), 422 ($[M+2]^+$, 2.80), 388 (100); HRMS (EI) calcd. for $C_{20}H_{21}O_5Br$: 420.0572, found: 420.0574.

19） Synthesis of ethyl -(4-bromophenyl)-2-hydroxy-5,7-dimethoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ad).

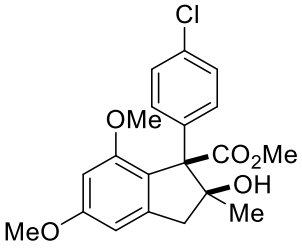


3ad

The general procedure was followed using **1a** (0.6 mmol) and **2d** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ad** (56.5 mg, 65%, d.r. = 7:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 (d, *J* = 8.8 Hz, 2H), 7.06 (d, *J* = 8.8 Hz, 2H), 6.42 (d, *J* = 2.0 Hz, 1H), 6.37 (d, *J* = 2.0 Hz, 1H), 4.43 (s, 1H), 4.05-4.20 (m, 2H), 3.83 (s, 3H), 3.65 (s, 3H), 3.30 (d, *J* = 15.6 Hz, 1H), 2.94 (d, *J* = 15.6 Hz, 1H), 1.13 (t, *J* = 7.2 Hz, 3H), 0.85 (s, 3H); ^{13}C NMR (100

MHz, $CDCl_3$) δ 174.08, 161.79, 158.21, 144.78, 136.20, 130.26 (2C), 120.75, 119.96, 101.44, 98.03, 84.40, 68.03, 61.14, 55.44, 54.98, 47.61, 25.38, 13.85; MS(EI): m/z (%): 434 (M^+, 2.69), 436 ($[M+2]^+$, 2.29), 185 (100); HRMS (EI) calcd. for $C_{21}H_{23}O_5Br$ 434.0729, found: 434.0728.

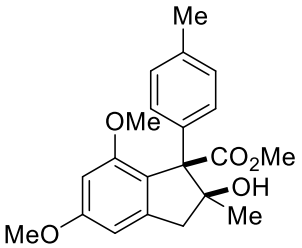
20）Synthesis of methyl 1-(4-chlorophenyl)-2-hydroxy-5,7-dimethoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ae).



3ae

The general procedure was followed using **1a** (0.6 mmol) and **2e** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ae** (60.2 mg, 80%, d.r. = 10:1) was obtained as a colorless oil. ^1H NMR (400 MHz, $CDCl_3$) δ 7.24 (d, *J* = 8.8 Hz, 2H), 7.12 (d, *J* = 8.8 Hz, 2H), 6.43 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H), 4.34 (s, 1H), 3.83 (s, 3H), 3.670 (s, 3H), 3.667 (s, 3H), 3.30 (d, *J* = 15.6 Hz, 1H), 2.95 (d, *J* = 15.6 Hz, 1H), 0.87 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.65, 161.84, 158.20, 144.73, 135.48, 132.70, 129.82, 127.42, 120.02, 101.61, 98.25, 84.59, 67.90, 55.46, 55.27, 52.36, 47.52, 25.24; MS(EI): m/z (%): 376 (M^+, 3.17), 378 ($[M+2]^+$, 1.12), 344 (100); HRMS (EI) calcd. for $C_{20}H_{21}O_5Cl$, 376.1078, found: 376.1080.

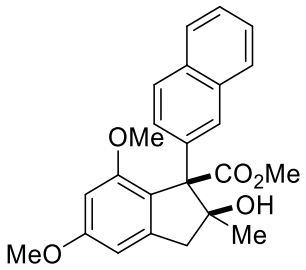
21）Synthesis of methyl 2-hydroxy-5,7-dimethoxy-2-methyl-1-p-tolyl-2,3-dihydro-1H-indene-1-carboxylate (3af).



3af

The general procedure was followed using **1a** (0.6 mmol) and **2f** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3af** (60.3 mg, 85%, d.r. = 6:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.02-7.12 (m, 4H), 6.44 (d, *J* = 2.0 Hz, 1H), 6.40 (d, *J* = 2.0 Hz, 1H), 4.54 (s, 1H), 3.83 (s, 3H), 3.677 (s, 3H), 3.676 (s, 3H), 3.29 (d, *J* = 15.6 Hz, 1H), 2.95 (d, *J* = 15.6 Hz, 1H), 2.33 (s, 3H), 0.88 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.27, 161.53, 158.33, 144.77, 136.29, 133.61, 128.17, 128.03, 120.43, 101.43, 98.17, 84.59, 67.87, 55.39, 55.29, 52.29, 47.42, 25.15, 21.00; MS(EI): m/z (%): 356 (M^+, 5.44), 324 (100); HRMS (EI) calcd. for $C_{21}H_{24}O_5$: 356.1624, found: 356.1627.

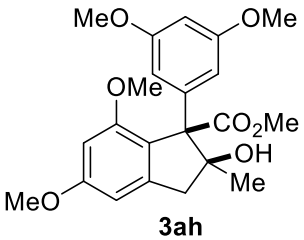
22）Synthesis of methyl 2-hydroxy-5,7-dimethoxy-2-methyl-1-(naphthalen-2-yl)-2,3-dihydro-1H-indene-1-carboxylate (3ag).



3ag

The general procedure was followed using **1a** (0.6 mmol) and **2g** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ag** (70.0 mg, 89%, d.r. = 7:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80-7.85 (m, 1H), 7.72-7.79 (m, 2H), 7.59 (d, *J* = 1.2 Hz, 1H), 7.40-7.48 (m, 2H), 7.35 (dd, *J* = 8.4 Hz, 2.0 Hz, 1H), 6.48 (d, *J* = 2.0 Hz, 1H), 6.44 (d, *J* = 2.0 Hz, 1H), 4.61 (s, 1H), 3.86 (s, 3H), 3.70 (s, 3H), 3.66 (s, 3H), 3.36 (d, *J* = 15.6 Hz, 1H), 3.01 (d, *J* = 15.6 Hz, 1H), 0.89 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.22, 161.76, 158.45, 144.92, 134.46, 132.84, 132.45, 128.28, 127.30, 127.10, 127.02, 126.40, 125.66, 125.60, 120.43, 101.62, 98.33, 84.81, 68.39, 55.47, 55.31, 52.37, 47.69, 25.44; MS(EI): m/z (%): 392 (M^+, 2.33), 165 (100), HRMS (EI) calcd. for $C_{24}H_{24}O_5$:392.1624, found: 392.1623.

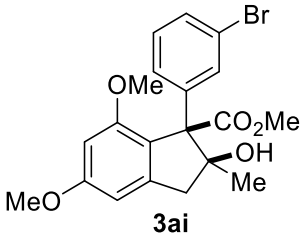
23）Synthesis of methyl 1-(3,5-dimethoxyphenyl)-2-hydroxy-5,7-dimethoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ah).



3ah

The general procedure was followed using **1a** (0.6 mmol) and **2h** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ah** (59.4 mg, 74%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.35-6.45 (m, 5H), 4.46 (s, 1H), 3.82 (s, 3H), 3.73 (s, 6H), 3.71 (s, 3H), 3.68 (s, 3H), 3.27 (d, *J* = 15.6 Hz, 1H), 3.27 (d, *J* = 15.6 Hz, 1H), 2.97 (d, *J* = 15.6 Hz, 1H), 0.91 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.81, 161.63, 159.73, 158.33, 144.76, 139.01, 120.25, 107.11, 101.44, 98.71, 98.27, 84.57, 68.34, 55.41, 55.35, 55.17, 52.32, 47.49, 25.09. MS(EI): m/z (%): 402 (M^+, 9.75), 213 (100); HRMS (EI) calcd. for $C_{22}H_{26}O_7$: 402.1679, found: 402.1681.

24）Synthesis of methyl 1-(3-bromophenyl)-2-hydroxy-5,7-dimethoxy-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ai).

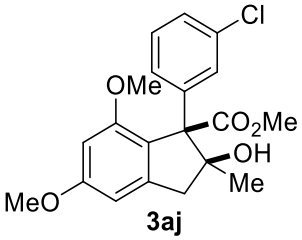


3ai

The general procedure was followed using **1a** (0.6 mmol) and **2i** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ai** (46.1 mg, 55%, d.r. = 7:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.0 Hz, 1H), 7.34 (s, 1H), 7.05-7.18 (m, 2H), 6.43 (d, *J* = 2.0 Hz, 1H), 6.40 (d, *J* = 2.0 Hz, 1H), 4.45 (s, 1H), 3.83 (s, 3H), 3.69 (s, 3H), 3.67 (s, 3H), 3.33 (d, *J* = 15.6 Hz, 1H), 2.96 (d, *J* = 15.6 Hz, 1H), 0.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.59, 161.83, 158.17, 144.78, 139.09, 131.57, 129.90, 128.81, 126.92, 121.50, 119.40, 101.67, 98.32, 84.55, 67.96, 55.44, 55.32, 52.47, 47.51, 25.35; MS(EI): m/z (%): 420

(M^+, 2.83), 422 ($[M+2]^+$, 2.60), 388 (100); HRMS (EI) calcd. for $C_{20}H_{21}O_5Br$: 420.0572, found: 420.0569.

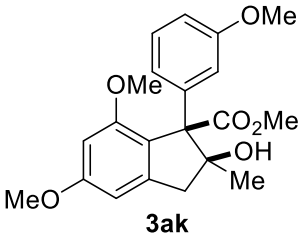
25）Synthesis of methyl 1-(3-chlorophenyl)-2-hydroxy-5,7-dimethoxy-2-methyl-3-dihydro-1H-indene-1-carboxylate (3aj).



3aj

The general procedure was followed using **1a** (0.6 mmol) and **2j** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3aj** (43.3 mg, 58% d.r. = 7:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.15-7.30 (m, 3H), 7.05 (d, *J* = 7.2 Hz, 1H), 6.43 (d, *J* = 2.0 Hz, 1H), 6.40 (d, *J* = 2.0 Hz, 1H), 4.43 (s, 1H), 3.83 (s, 3H), 3.69 (s, 3H), 3.68 (s, 3H), 3.33 (d, *J* = 15.6 Hz, 1H), 2.96 (d, *J* = 15.6 Hz, 1H), 0.86 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.58, 161.83, 158.18, 144.77, 138.86, 133.25, 128.69, 128.49, 126.99, 126.50, 119.50, 101.64, 98.31, 84.56, 68.01, 55.45, 55.31, 52.47, 47.51, 25.31; MS(EI): m/z (%): 376 (M^+, 3.07), 378 ($[M+2]^+$, 1.04); 344 (100); HRMS (EI) calcd. for $C_{20}H_{21}O_5Cl$: 376.1078, found: 376.1075.

26）Synthesis of methyl 2-hydroxy-5,7-dimethoxy-1-(3-methoxyphenyl)-2-methyl-2,3-dihydro-1H-indene-1-carboxylate (3ak).

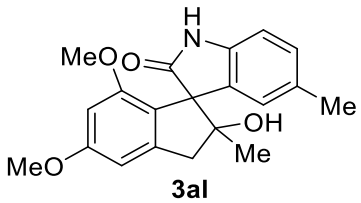


3ak

The general procedure was followed using **1a** (0.6 mmol) and **2k** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **3ak** (46.1 mg, 62%, d.r. = 5:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.19 (t, *J* = 8.4 Hz, 1H), 7.75-7.85 (m, 3H), 6.43 (d, *J* = 2.0 Hz, 1H), 6.39 (d, *J* = 2.0 Hz, 1H),

4.49 (s, 1H), 3.83 (s, 3H), 3.75 (s, 3H), 3.69 (s, 3H), 3.68 (s, 3H), 3.29 (d, *J* = 15.6 Hz, 1H), 2.96 (d, *J* = 15.6 Hz, 1H), 0.88 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.97, 161.62, 158.70, 158.33, 144.76, 138.29, 128.13, 120.87, 120.26, 114.87, 111.83, 101.46, 98.25, 84.59, 68.21, 55.41, 55.33, 55.09, 52.32, 47.48, 25.15; MS(EI): m/z (%): 372 (M^+, 7.94), 340 (100); HRMS (EI) calcd. for $C_{21}H_{24}O_6$: 372.1573, found:372.1575.

27) Synthesis of 2-hydroxy-5,7-dimethoxy-2,5'-dimethyl-2,3-dihydrospiro[indene-1,3'-indolin]-2'-one (3al).

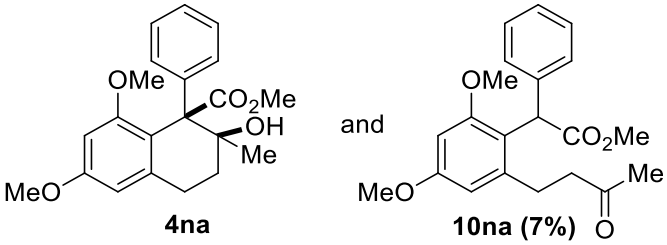


3al

The general procedure was followed using **1a** (0.6 mmol) and **2l** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 5:1 to 2:1), **3al** (54.4 mg, 80%, d.r. = 3:1) was obtained as a yellow solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ [8.51 (s, 0.75 H), 7.99 (s, 0.25H)], [7.04 (d, *J* = 7.6 Hz, 0.25H), 6,53 (d, *J* = 7.6 Hz, 0.75H)], [6.98 (d, *J* = 8.4 Hz, 1H)], [6.82 (d, *J* = 8.0 Hz, 0.75H), 6.80 (d, *J* = 8.0 Hz, 0.25H)], [6.62 (d, *J* = 1.6 Hz, 0.75 H), 6.52 (d, *J* = 1.6 Hz, 0.25H)], [6.24 (d, *J* = 1.6 Hz, 1H)], [5.18 (s, 1H)], [3.810 (s, 2.25H), 3.805 (s, 0.75H)], [3.54 (s, 2.25H), 3.41 (s, 0.75H)], [3.51 (d, *J* = 16.0 Hz, 0.25H), 3.35 (d, *J* = 16.0 Hz, 0.75H)], [3.15 (d, *J* = 16.0 Hz, 0.75H), 3.08 (d, *J* = 16.0 Hz, 0.25H)], [2.28 (s, 0.25H), 2.22 (s, 2.25H)], [1.37 (s, 0.25H), 1.15 (s, 2.25H)]; ^{13}C NMR (100 MHz, $CDCl_3$) δ [180.60, 179.26], [161.63, 162.59], [156.37, 157.05], [145.63, 146.01], [138.06, 139.33], [132.05, 131.30], [131.49, 129.14], [128.39, 128.47], [124.44, 126.51], [123.17, 121.38], [109.87, 109.41], [102.23, 101.83], [97.57, 97.72], [85.07, 84.52], [64.00, 67.10], [55.51, 55.49], [55.45, 55.23], [48.05, 46.54], [23.18, 22.81], [21.12]; MS(EI): m/z (%): 339 (M^+, 7.40); 49 (100); HRMS (EI) calcd. for $C_{20}H_{21}NO_4$: 339.1471, found: 339.1468.

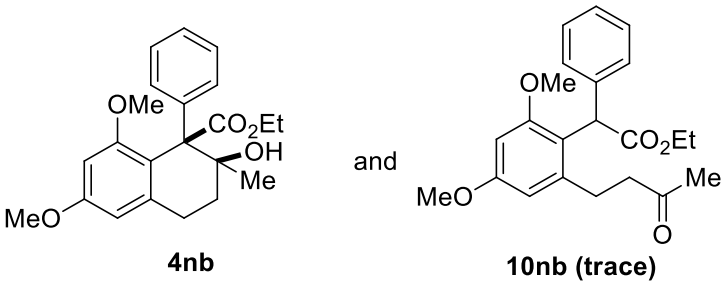
27） Synthesis of methyl 2-hydroxy-6,8-dimethoxy-2-methyl-1-phenyl-1,2,3,4-

tetrahydronaphthalene-1-carboxylate (4na).



The general procedure was followed using **1n** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4na** (42.5 mg, 60%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.40-7.50 (m, 2H), 7.12-7.20 (m, 3H), 6.40 (d, *J* = 2.4 Hz, 1H), 6.30 (d, *J* = 2.4 Hz, 1H), 3.84 (s, 3H), 3.73 (s, 3H), 3.44 (s, 3H), 3.27 (s, 1H), 3.12-3.25 (m, 1H), 2.65-2.76 (m, 1H), 1.52-1.64 (m, 2H), 1.28 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.49, 159.45, 158.95, 141.22, 138.41, 129.99, 126.72, 126.41, 120.04, 104.25, 97.98, 73.58, 60.49, 55.63, 55.21, 52.04, 31.48, 26.65, 26.08; MS(EI): m/z (%): 356 (M^+, 5.65); 324 (100); HRMS (EI) calcd. for $C_{21}H_{24}O_5$: 356.1624, found: 356.1627.

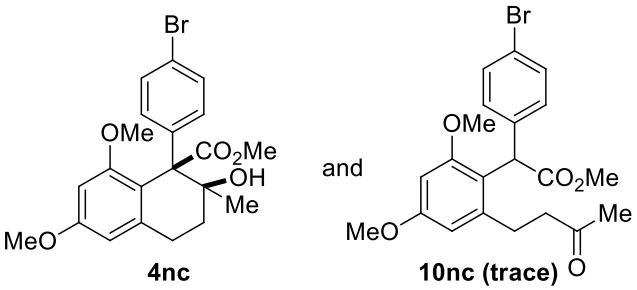
28） Synthesis of ethyl 2-hydroxy-6,8-dimethoxy-2-methyl-1-phenyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4nb).[3]



The general procedure was followed using **1n** (0.6 mmol) and **2n** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4nb** (56.5 mg, 76%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38-7.50 (m, 2H), 7.10-7.25 (m, 3H), 6.39 (d, *J* = 2.0 Hz, 1H), 6.28 (d, *J* = 2.0 Hz, 1H), 4.25-4.35 (m, 1H), 4.15-4.24 (m, 1H), 3.84 (s, 3H), 3.46 (s, 1H), 3.44 (s, 3H), 3.11-3.25 (m, 1H), 2.65-2.75 (m, 1H), 1.52-1.70 (m, 2H), 1.28 (s, 3H), 1.26 (t, *J* = 10.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.89, 159.40, 158.88, 141.16, 138.55, 130.14, 126.64, 126.34, 119.98, 104.11, 97.68, 73.49, 61.04, 60.50, 55.33, 55.19,

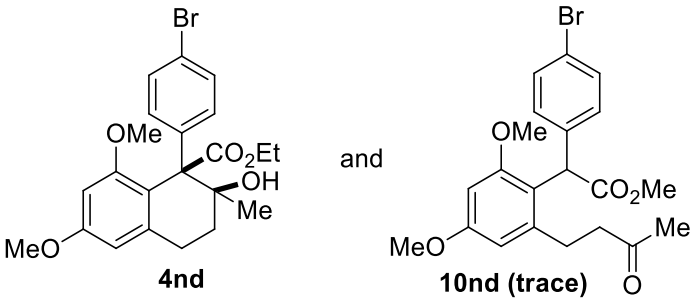
31.50, 26.62, 26.18, 14.16; MS(EI): m/z (%): 370 (M^+, 7.25); 324 (100); HRMS (EI) calcd. for $C_{22}H_{26}O_5$: 370.1780, found: 370.1783.

29) Synthesis of methyl 1-(4-bromophenyl)-2-hydroxy-6,8-dimethoxy-2-methyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4nc).



The general procedure was followed using **1n** (0.2 mmol) and **2c** (0.6 mmol). After purification by column chromatography (PE/EtOAc = 6:1), **4nc** (51.5 mg, 59%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 (d, *J* = 9.2 Hz, 2H), 7.28 (d, *J* = 9.2 Hz, 2H), 6.39 (d, *J* = 2.4 Hz, 1H), 6.29 (d, *J* = 2.4 Hz, 1H), 3.83 (s, 3H), 3.71 (s, 3H), 3.46 (s, 3H), 3.11-3.25 (m, 1H), 3.10 (s, 1H), 2.65-2.78 (m, 1H), 1.55-1.70 (m, 2H), 1.24 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.03, 159.61, 158.79, 140.47, 138.19, 131.75, 129.80, 120.77, 119.45, 104.23, 97.93, 73.39, 60.08, 55.55, 55.24, 52.14, 31.53, 26.50, 25.95; MS (ESI): m/z (%): 456.97 ($[M+Na]^+$, 53.00), ($[M+2+Na]^+$, 51.00), 166.10 (100); HRMS (ESI) calcd. for $C_{21}H_{23}BrNaO_5$ [M+Na]: 457.0621, found 457.0607.

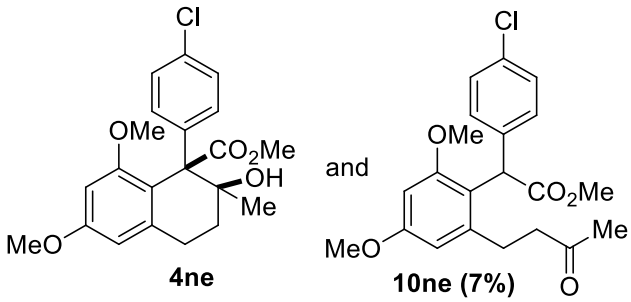
30) Synthesis of ethyl 1-(4-bromophenyl)-2-hydroxy-6,8-dimethoxy-2-methyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4nd).



The general procedure was followed using **1n** (0.6 mmol) and **2d** (0.2 mmol). After

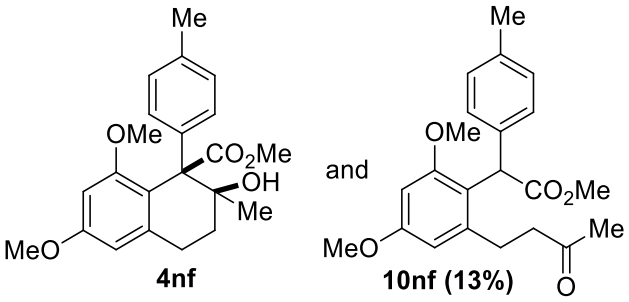
purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4nd** (59.2 mg, 66%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.34 (d, *J* = 9.2 Hz, 2H), 7.28 (d, *J* = 9.2 Hz, 2H), 6.38 (d, *J* = 2.4 Hz, 1H), 6.27 (d, *J* = 2.4 Hz, 1H), 4.11-4.22 (m, 1H), 4.23-4.34 (m, 1H), 3.83 (s, 3H), 3.44 (s, 3H), 3.30 (s, 1H), 3.10-3.22 (m, 1H), 2.65-2.75 (m, 1H), 1.52-1.68 (m, 2H), 1.14-1.28 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.43, 159.56, 158.73, 140.42, 138.34, 131.89, 129.72, 120.71, 119.43, 104.12, 97.64, 73.31, 61.16, 60.12, 55.24, 55.21, 31.57, 26.48, 26.07, 14.12; MS(EI): m/z (%): 448 (M^+, 2.28), 450 ($[M+2]^+$, 2.31), 84 (100); HRMS (ESI) calcd. for $C_{22}H_{25}O_5$: 448.0885, found: 448.0888.

31) **Synthesis of methyl 1-(4-chlorophenyl)-2-hydroxy-6,8-dimethoxy-2-methyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4ne).**



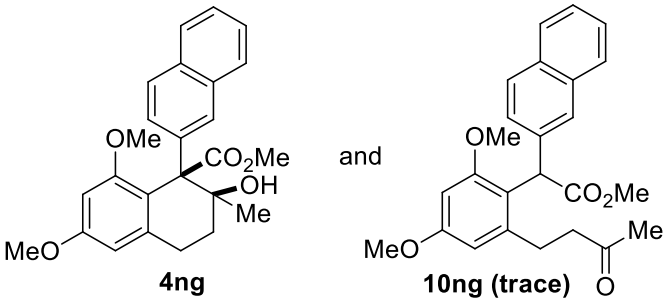
The general procedure was followed using **1n** (0.6 mmol) and **2e** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4ne** (64.8 mg, 83%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 9.2 Hz, 2H), 7.13 (d, *J* = 9.2 Hz, 2H), 6.39 (d, *J* = 2.4 Hz, 1H), 6.29 (d, *J* = 2.4 Hz, 1H), 3.83 (s, 3H), 3.71 (s, 3H), 3.45 (s, 3H), 3.10-3.22 (m, 1H), 3.11 (s, 1H), 2.65-2.75 (m, 1H), 1.52-1.68 (m, 2H), 1.25 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.11, 159.62, 158.82, 139.92, 138.20, 132.42, 131.37, 126.84, 119.57, 104.26, 97.96, 73.46, 60.04, 55.56, 55.25, 52.13, 31.54, 26.51, 25.97; MS(EI): m/z (%): 390 (M^+, 12.30); 392($[M+2]^+$, 4.52), 358 (100); HRMS (EI) calcd. for $C_{21}H_{23}O_5Cl$: 390.1234, found: 390.1238.

32) **Synthesis of methyl 2-hydroxy-6,8-dimethoxy-2-methyl-1-p-tolyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4nf).**



The general procedure was followed using **1n** (0.6 mmol) and **2f** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4nf** (52.3 mg, 71%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30 (d, *J* = 8.4, 2H), 6.98 (d, *J* = 8.4 Hz, 2H), 6.40 (d, *J* = 2.4 Hz, 1H), 6.30 (d, *J* = 2.4 Hz, 1H), 3.84 (s, 3H), 3.74 (s, 3H), 3.47 (s, 3H), 3.38 (s, 1H), 3.11-3.24 (m, 1H), 2.64-2.74 (m, 1H), 2.28 (s, 3H), 1.54-1.66 (m, 2H), 1.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.75, 159.37, 158.90, 138.51, 138.08, 135.95, 129.96, 127.48, 120.07, 104.27, 97.92, 73.57, 60.22, 55.70, 55.19, 52.02, 31.35, 26.67, 26.09, 20.78; MS(EI): m/z (%): 370 (M^+, 6.14); 338 (100); HRMS (EI) calcd. for $C_{22}H_{26}O_5$: 370.1780, found: 370.1783.

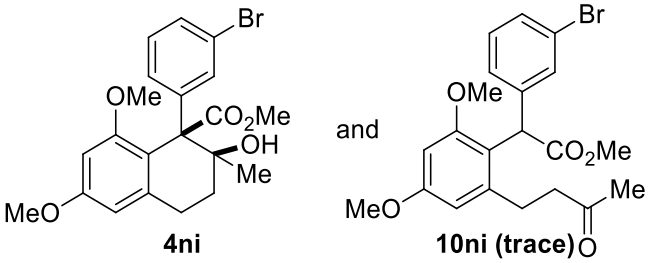
33) **Synthesis of methyl 2-hydroxy-6,8-dimethoxy-2-methyl-1,2,3,4-tetrahydro-1,2'-binaphthyl-1-carboxylate (4ng).**



The general procedure was followed using **1n** (0.6 mmol) and **2g** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4ng** (50.8 mg, 63%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65-8.00 (m, 5H), 7.35-7.48 (m, 2H), 6.45 (d, *J* = 2.4 Hz, 1H), 6.32 (d, *J* = 2.4 Hz, 1H), 3.87 (s, 3H), 3.77 (s, 3H), 3.41 (s, 3H), 3.32 (s, 1H), 3.15-3.30 (m, 1H), 2.72-2.84 (m, 1H), 1.58-1.72 (m, 2H), 1.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ

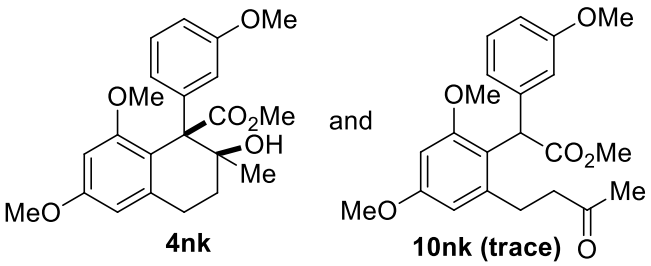
174.58, 159.51, 158.98, 138.86, 138.41, 132.44, 131.96, 129.16, 128.66, 128.32, 126.94, 125.77, 125.64, 125.35, 119.96, 104.29, 97.92, 73.81, 60.57, 55.59, 55.24, 52.10, 31.59, 26.79, 26.12; MS(ESI): m/z (%): 406 (M^+, 18.67), 374 (100); HRMS (ESI) calcd. for $C_{25}H_{26}O_5$: 406.1780, found: 406.1783.

34) **Synthesis of methyl -1-(3-bromophenyl)-2-hydroxy-6,8-dimethoxy-2-methyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4ni).**



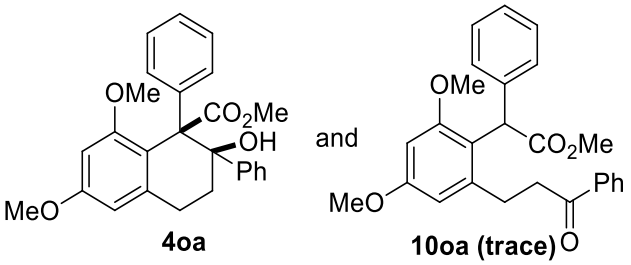
The general procedure was followed using **1n** (0.6 mmol) and **2i** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4ni** (51.1 mg, 59%, d.r.> 20:1) and **4ah'** (14.0 mg, 16%) were obtained as colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 (s, 1H), 7.26-7.34 (m, 2H), 7.02 (t, *J* = 8.0 Hz, 1H), 6.38 (d, *J* = 2.4 Hz, 1H), 6.29 (d, *J* = 2.4 Hz, 1H), 3.84 (s, 3H), 3.71 (s, 3H), 3.45 (s, 3H), 3.10-3.22 (m, 1H), 3.06 (s, 1H), 2.66-2.78 (m, 1H), 1.55-1.70 (m, 2H), 1.24 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.85, 159.65, 158.82, 143.80, 138.14, 132.95, 129.54, 128.44, 128.17, 121.18, 119.33, 104.30, 98.02, 73.53, 60.23, 55.55, 55.23, 52.16, 31.65, 26.52, 25.95; MS(ESI): m/z (%): 457.09 ($[M+Na]^+$, 96.00); 459.09 ($[M+Na+2]^+$, 100); HRMS (EI) calcd. for $C_{21}H_{23}O_5Br$: 434.0729, found: 434.0731.

35) **Synthesis of methyl 2-hydroxy-6,8-dimethoxy-1-(3-methoxyphenyl)-2-phenyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4nk).**



The general procedure was followed using **1n** (0.6 mmol) and **2k** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4nk** (44.4 mg, 57%, d.r > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.15 (s, 1H), 7.08 (t, *J* = 8.0 Hz, 1H), 6.97 (d, *J* = 8.0 Hz, 1H), 6.70-6.74 (m, 1H), 6.38 (d, *J* = 2.4 Hz, 1H), 6.29 (d, *J* = 2.4 Hz, 1H), 3.83 (s, 3H), 3.74 (s, 3H), 3.72 (s, 3H), 3.46 (s, 3H), 3.22 (s, 1H), 3.12-3.20 (m, 1H), 2.65-2.75 (m, 1H), 1.58-1.70 (m, 2H), 1.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.39, 159.45, 158.96, 158.19, 142.94, 138.26, 127.36, 122.72, 120.04, 116.96, 111.16, 104.24, 97.99, 73.62, 60.42, 55.68, 55.20, 55.06, 52.05, 31.50, 26.70, 26.03; MS(EI): m/z (%): 386 (M^+, 9.99); 354 (100); HRMS (ESI) calcd. for $C_{22}H_{26}O_6$: 386.1729, found: 386.1731.

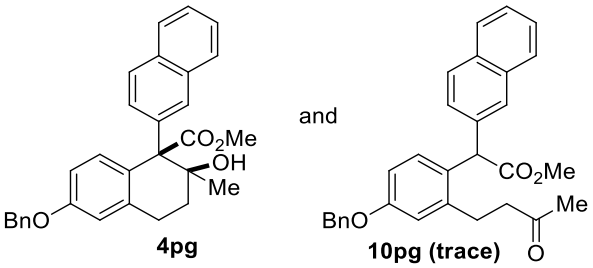
36) **Synthesis of methyl 2-hydroxy-6,8-dimethoxy-1,2-diphenyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4oa).[4]**



The general procedure was followed using **1o** (0.6 mmol) and **2a** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4oa** (50.0 mg, 60%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20-7.32 (m, 3H), 7.05-7.15 (m, 1H), 6.90-7.02 (m, 4H), 6.46-6.58 (m, 3H), 6.34 (d, *J* = 2.8 Hz, 1H), 5.17 (s, 1H), 3.87 (s, 3H), 3.78 (s, 3H), 3.49 (s, 3H), 3.38-3.45 (m, 1H), 2.80-2.92 (m, 1H), 2.14-2.24 (m, 1H), 1.80-1.90 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.47, 159.57, 158.73, 144.12, 139.34, 138.77, 131.44, 127.78, 127.41,

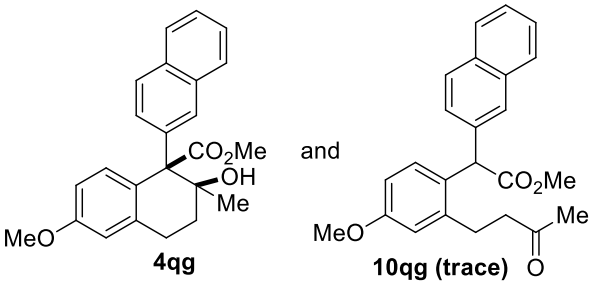
126.95, 126.64, 125.78, 120.02, 104.52, 97.77, 76.62, 62.26, 55.69, 55.25, 52.22, 29.76, 26.57; MS(EI): m/z (%):418 (M^+, 1.79); 105 (100); HRMS (ESI) calcd. for $C_{26}H_{26}O_5$: 418.1780, found: 418.1777.

37) **Synthesis of methyl 6-(benzyloxy)-2-hydroxy-2-methyl-1,2,3,4-tetrahydro-1,2'-binaphthyl-1-carboxylate (4pg).**



The general procedure was followed using **1p** (1.0 mmol), **2g** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4pg** (42.9 mg, 47%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78-7.84 (m, 1H), 7.70-7.77 (m, 2H), 7.25-7.55 (m, 10H), 6.78-6.84 (m, 2H), 5.08 (s, 2H), 4.63 (s, 1H), 3.71 (s, 3H), 2.95-3.05 (m, 2H), 2.44-2.56 (m, 1H), 1.84-1.94 (m, 1H), 0.88 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.58, 157.85, 138.82, 138.21, 136.85, 134.25, 132.25, 132.17, 129.05, 128.60, 128.27, 128.25, 128.04, 127.58, 127.27, 126.21, 126.02, 125.85, 113.44, 112.93, 73.76, 69.88, 64.19, 52.65, 34.53, 28.51, 24.74. MS(EI): m/z (%): 452 (M^+, 1.01); 91 (100); HRMS (ESI) calcd. for $C_{30}H_{28}O_4$: 452.1988, found: 452.1989.

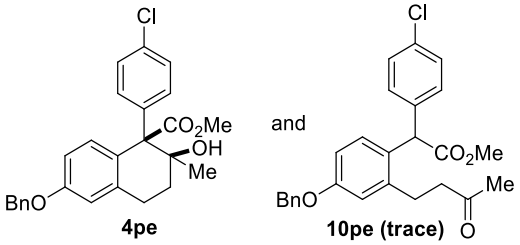
38) **Synthesis of methyl 2-hydroxy-6-methoxy-2-methyl-1,2,3,4-tetrahydro-1,2'-binaphthyl-1-carboxylate (4qg).[5]**



The general procedure was followed using **1q** (1.0 mmol), **2g** (0.2 mmol) and gold

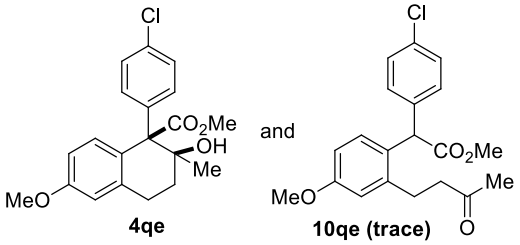
catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4qg** (31.7 mg, 42%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80-7.85 (m, 1H), 7.72-7.79 (m, 2H), 7.42-7.52 (m, 3H), 7.26-7.36 (m, 2H), 6.70-6.75 (m, 2H), 4.63 (s, 1H), 3.84 (s, 3H), 3.71 (s, 3H), 2.96-3.04 (m, 2H), 2.44-2.54 (m, 1H), 2.85-2.93 (m, 1H), 0.92 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.61, 158.53, 138.77, 138.22, 134.21, 132.35, 132.17, 129.04, 128.27, 128.25, 127.75, 127.27, 126.20, 126.02, 125.84, 112.49, 112.29, 73.76, 64.17, 55.17, 52.64, 34.54, 28.51, 24.72; MS(EI): m/z (%): 376 (M^+, 5.67); 299 (100); HRMS (ESI) calcd. for $C_{24}H_{24}O_4$: 376.1675, found: 376.1679.

39) **Synthesis of methyl 6-(benzyloxy)-1-(4-chlorophenyl)-2-hydroxy-2-methyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4pe).**



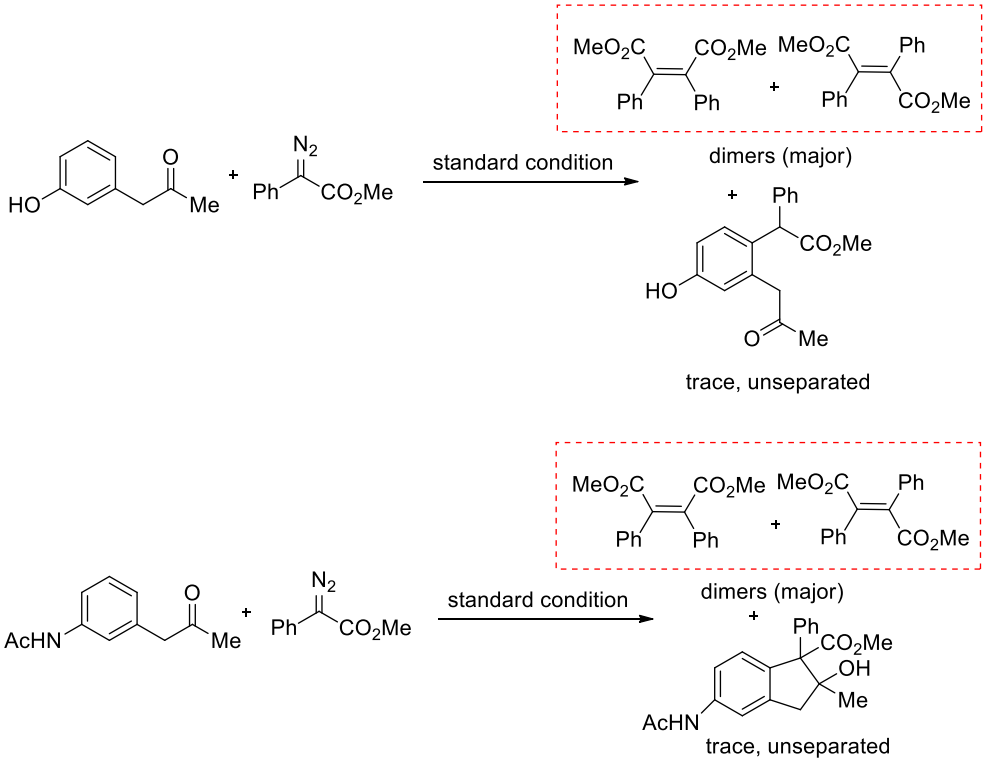
The general procedure was followed using **1p** (1.0 mmol), **2e** (0.2 mmol) and gold catalyst (10 mol%). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4pe** (36.1 mg, 41%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.46 (m, 5H), 7.20-7.29 (m, 3H), 7.03 (d, *J* = 8.8 Hz, 2H), 7.72-7.82 (m, 2H), 5.05 (s, 2H), 4.42 (s, 1H), 3.67 (s, 3H), 2.90-2.98 (m, 2H), 2.42-2.54 (m, 1H), 1.80-1.88 (m, 1H), 0.84 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.12, 157.92, 139.20, 138.75, 136.80, 134.01, 132.81, 131.35, 128.60, 128.04, 127.58, 127.53, 127.21, 113.50, 113.04, 73.43, 69.88, 63.69, 52.66, 34.40, 28.44, 24.52. MS(EI): m/z (%): 436 (M^+, 0.28); 438 ($[M+2]^+$, 0.09), 91 (100); HRMS (ESI) calcd. for $C_{26}H_{25}O_4Cl$: 436.1441, found: 436.1445.

40) **Synthesis of methyl 1-(4-chlorophenyl)-2-hydroxy-6-methoxy-2-methyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (4qe).**



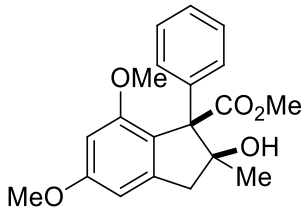
The general procedure was followed using **1q** (1.0 mmol) and **2e** (0.2 mmol). After purification by column chromatography (PE/EtOAc = 10:1 to 5:1), **4qe** (34.5 mg, 48%, d.r. > 20:1) was obtained as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20-7.32 (m, 3H), 7.04 (d, *J* = 8.4 Hz, 2H), 6.64-6.76 (m, 2H), 4.42 (s, 1H), 3.81 (s, 3H), 3.68 (s, 3H), 2.89-3.02 (m, 2H), 2.42-2.55 (m, 1H), 1.80-1.88 (m, 1H), 0.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.13, 158.62, 139.23, 138.69, 133.95, 132.80, 131.36, 127.30, 127.20, 112.56, 112.39, 73.43, 63.68, 55.15, 52.63, 34.42, 28.43, 24.52. MS(EI): m/z (%): 360 (M^+, 5.22); 362 ($[M+2]^+$, 1.75), 284 (100); HRMS (ESI) calcd. for $C_{20}H_{21}O_4Cl$: 360.1128, found: 360.1129.

5. Reactions of phenol and aniline derivatives:



6. Preliminary investigation on asymmetric catalysis.

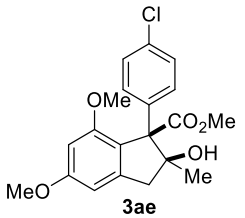
1) Procedure for 3aa



3aa

In a dried glass tube, a solution of (R)-MeO-DTBM-PIPHEP (11.5 mg, 0.01 mmol) and AuCl·Me_2S (5.9 mg, 0.02 mmol) in CH_2Cl_2 (2 mL) was stirred at room temperature for 2 h. Then, the solvent was removed in reduced pressure. $AgNTf_2$ (7.8 mg, 0.02 mmol) and CH_2Cl_2 (3 mL) was added in the residue and the resulting solution was stirred at room temperature for 15 min. Aryl ketone (39mg, 0.2 mmol) was added to the reaction mixture at room temperature. Then a solution of diazo compound (106 mg, 0.6 mmol) in CH_2Cl_2 (1 mL) was introduced into the reaction mixture by a syringe in 30 min at -40 ^oC. The resulting mixture was continually stirred at -40 ^oC for 24 h and aryl ketone compound was consumed completely determined by TLC analysis. After being filtrated through a short silica gel column and concentrated under reduced pressure, the residue was purified by column chromatography on silica gel (PE / EtOAc = 5:1 to 2:1) to afford the desired product (57.4 mg, 84%, d.r. = 8:1, 58% ee) as a colorless oil. HPLC analysis Daicel chiralpak AD-H, hexane/*i*-PrOH = 80/20, 0.8 mL/min, 210 nm. t_R (minor) = 12.7 min, t_R (major) = 24.8 min; $[\alpha]_D^{25}$ = 37.7 (*c* = 0.2, $CHCl_3$).

2) For 3ae

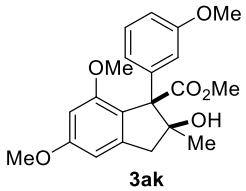


3ae

The procedure was followed as **3aa.** The desired product **3ae** was obtained (64.3 mg, 86%, d.r. = 9:1, 67% ee) as a colorless oil. HPLC analysis Daicel chiralpak AD-H, hexane/*i*-PrOH = 80/20, 0.8 mL/min, 210 nm. t_R (minor) = 17.5 min, t_R (major) = 31.8

min; $[\alpha]_D^{25}$ = 45.8 (*c* = 0.2, $CHCl_3$).

3) For 3ak

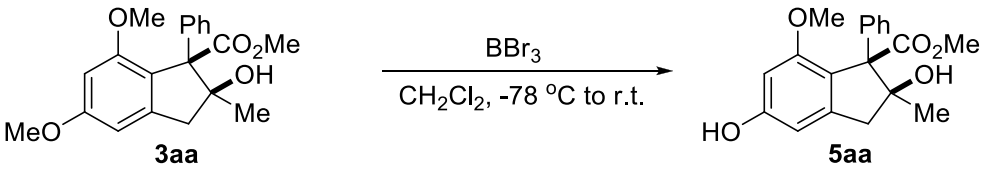


3ak

The procedure was followed as **3aa.** The desired product **3ak** was obtained (54.5 mg, 72%, d.r. = 5:1, 59% ee) as a colorless oil. HPLC analysis Daicel chiralpak AD-H, hexane/*i*-PrOH = 80/20, 0.8 mL/min, 210 nm. t_R (minor) = 9.2 min, t_R (major) = 13.9 min; $[\alpha]_D^{25}$ = 31.0 (*c* = 0.2, $CHCl_3$).

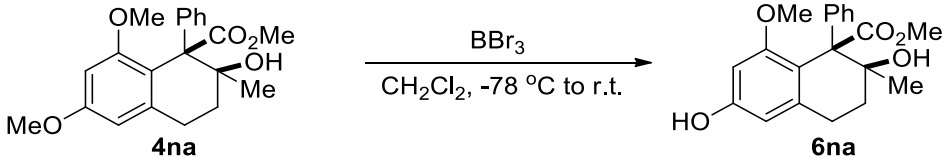
7. Transformations of products.

1) Synthesis of methyl 2,5-dihydroxy-7-methoxy-2-methyl-1-phenyl-2,3-dihydro-1H-indene-1-carboxylate (5aa)



To a solution of compound **3aa** (51 mg, 0.15 mmol) in CH_2Cl_2 (5 mL), the solution of BBr_3 (56 μL, 0.6 mmol) in CH_2Cl_2 (1 mL) was added at -78 ^oC. After being stirred for 15 min at room temperature, the reaction was quenched with saturated $NaHCO_3$ solution. After being extracted with ethyl acetate, washed with brine solution and dried with Na_2SO_4, the solid was filtered off and the filtrate was concentrated under reduced pressure. The residue was purified by silica chromatography (PE/EtOAc = 2:1 to 1:1) to give **5aa** (25.2 mg, 51%) as a white solid. ^1H NMR (400 MHz, $CDCl_3$) δ 7.25-7.31 (m, 3H), 7.12-7.24 (m, 2H), 6.33 (d, *J* = 4.0 Hz, 2H), 5.77 (s, 1H), 4.81 (s, 1H), 3.69 (s, 3H), 3.64 (s, 3H), 3.27 (d, *J* = 15.6 Hz, 1H), 2.91 (d, *J* = 15.6 Hz, 1H), 0.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.46, 158.47, 157.78, 144.88, 136.51, 128.33, 127.28, 126.87, 119.73, 104.27, 98.56, 84.77, 68.04, 55.31, 52.46, 47.12, 25.18; MS(EI): m/z (%): 328 (M^+, 4.48); 296 (100); HRMS (EI) calcd. for $C_{19}H_{20}O_5$: 328.1311, found: 328.1309

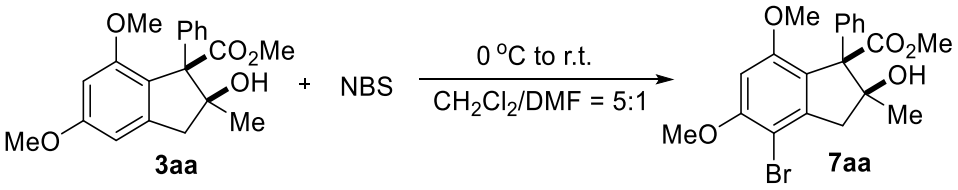
2) Synthesis of methyl 2,6-dihydroxy-8-methoxy-2-methyl-1-phenyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (6na).



The procedure was followed as **5aa**. The corresponding residue was purified by silica chromatography (PE/EtOAc = 2:1 to 1:1) to get desired product **6na** (32.3 mg, 63%) as a white solid. ^1H NMR (400 MHz, $CDCl_3$) δ 7.38-7.46 (m, 2H), 7.12-7.20 (m, 3H), 6.29 (d, *J* = 2.4 Hz, 1H), 6.24 (d, *J* = 2.4 Hz, 1H), 5.81 (s, 1H), 3.75 (s, 3H), 3.62 (s, 1H), 3.42 (s, 3H), 3.04-3.15 (m, 1H), 2.58-2.66 (m, 1H), 1.52-1.64 (m, 2H),

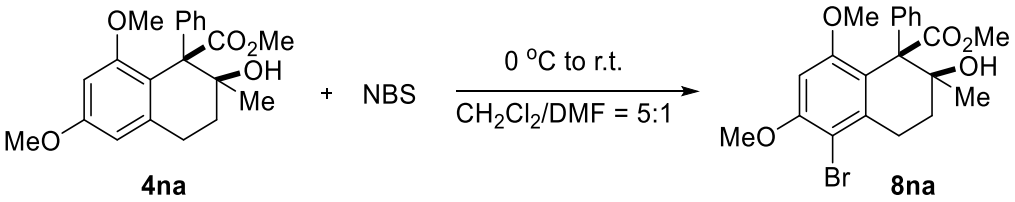
1.25 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 175.04, 158.96, 155.74, 140.93, 138.73, 130.06, 126.77, 126.51, 119.43, 107.19, 98.28, 73.91, 60.52, 55.64, 52.19, 31.26, 26.69, 25.70; MS(EI): m/z (%): 342 (M^+, 6.00), 310 (100); HRMS (EI) calcd. for $C_{20}H_{22}O_5$: 342.1467, found: 342.1470.

3) Synthesis of methyl 4-bromo-2-hydroxy-5,7-dimethoxy-2-methyl-1-phenyl -2,3-dihydro-1H-indene-1-carboxylate (7aa).



To a solution of compound **3aa** (110 mg, 0.32 mmol) in CH_2Cl_2 (5.0 mL), the solution of NBS (113 mg, 0.96 mmol) in DMF (1 mL) was added at 0 °C. After was stirred for 1 hour at r.t., the solution was quenched with saturated Na_2SO_3 solution. After the mixture was extracted with ethyl acetate, washed with brine solution, dried with Na_2SO_4 and concentrated, the residue was purified by silica chromatography (PE/EtOAc = 5:1) to get desired product **7aa** (131.8 mg, 98%) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.24-7.32 (m, 3H), 7.12-7.20 (m, 2H), 6.44 (s, 1H), 4.31 (s, 1H), 3.94 (s, 3H), 3.70 (s, 3H), 3.69 (s, 3H), 3.31 (d, *J* = 16.4 Hz, 1H), 3.09 (d, *J* = 16.4 Hz, 1H), 0.90 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.44, 157.34, 157.18, 144.83, 136.52, 128.13, 127.32, 126.90, 121.58, 100.14, 96.17, 83.78, 69.65, 56.45, 55.65, 52.34, 48.71, 25.31; MS(EI): m/z (%): 420 (M^+, 5.56), 422 ($[M+2]^+$, 5.36); 346 (100); HRMS (EI) calcd. for $C_{20}H_{21}O_5Br$: 420.0572, found: 420.0570.

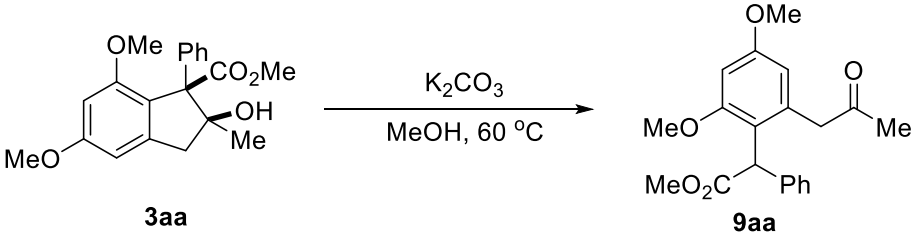
4) Synthesis of methyl 5-bromo-2-hydroxy-6,8-dimethoxy-2-methyl-1-phenyl-1,2,3,4-tetrahydronaphthalene-1-carboxylate (8na).



The procedure was followed as **7aa**. The corresponding residue was purified by silica chromatography (PE/EtOAc = 5:1 to 2:1) to get desired produc **8na** (50.5 mg,

97%) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38-7.50 (m, 2H), 7.15-7.22 (m, 3H), 6.40 (s, 1H), 3.93 (s, 3H), 3.74 (s, 3H), 3.48 (s, 3H), 3.19 (s, 1H), 2.95-3.08 (m, 1H), 2.82-2.94 (m, 1H), 1.55-1.75 (m, 2H), 1.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 174.22, 157.74, 155.64, 140.88, 138.05, 129.88, 126.84, 126.59, 121.76, 105.27, 95.63, 73.24, 60.86, 56.31, 55.97, 52.14, 31.46, 27.64, 26.45; MS(EI): m/z (%): 434 (M^+, 0.76), 436 ($[M+2]^+$, 0.77), 151 (100); HRMS (EI) calcd. for $C_{21}H_{23}O_5Br$: 434.0729, found: 434.0728.

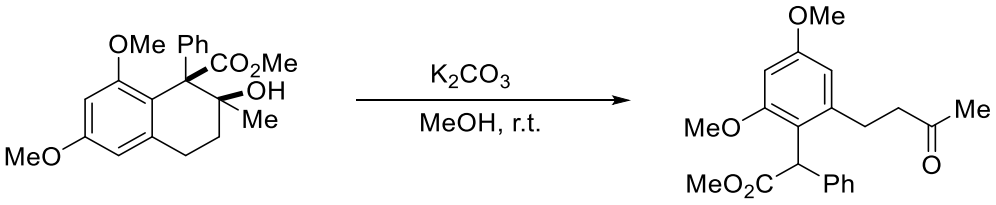
5) Synthesis of methyl 2-(2,4-dimethoxy-6-(2-oxopropyl)phenyl)-2-phenylacetate (9aa).



3aa **9aa**

The mixture of compound **3aa** (34 mg, 0.1 mmol), K_2CO_3 (14 mg, 0.1 mmol) in MeOH (5 mL) was heated to 60 ^{o}C and for 45 mins. The resulting solution was quenched with H_2O and extracted with CH_2Cl_2. After the combined organic layer was dried with Na_2SO_4 and concentrated, the residue was purified by silica chromatography (PE/EtOAc = 1:1) to give **9aa** (33.9 mg, 99%) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.12-7.35 (m, 5H), 6.51 (d, *J* = 2.4 Hz, 1H), 6.35 ((d, *J* = 2.4 Hz, 1H), 5.13 (s, 1H), 3.81 (s, 3H), 3.80 (s, 3H), 3.68 (s, 3H), 3.59 (s, 2H), 1.94 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 206.17, 173.54, 159.70, 158.50, 137.51, 135.58, 128.85, 128.17, 126.84, 119.42, 107.96, 98.02, 55.66, 55.23, 52.09, 49.09, 48.52, 28.98; MS(EI): m/z (%): 342 (M^+, 2.51), 310 (100); HRMS (EI) calcd. for $C_{20}H_{22}O_5$: 342.1467, found: 342.1464.

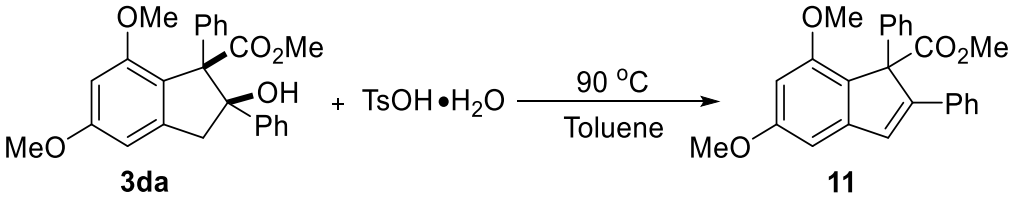
6) Synthesis of methyl 2-(2,4-dimethoxy-6-(3-oxobutyl)phenyl)-2-phenylacetate (10na).



4na **10na**

The procedure was followed as **9aa** at room temperature. The crude product was purified by silica chromatography (PE/EtOAc = 1:1) to get desired product **10na** (33.9 mg, 99%) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.12-7.28 (m, 5H), 6.41 (d, *J* = 2.4 H, 1H), 6.33 (d, *J* = 2.4 H, 1H), 5.03 (s, 1H), 3.78 (s, 3H), 3.75 (s, 3H), 3.67 (s, 3H), 2.72-2.88 (m, 2H), 2.30-2.52 (m, 2H), 1.96 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 207.45, 173.72, 159.67, 158.33, 141.76, 138.14, 129.02, 128.11, 126.77, 118.86, 106.45, 97.12, 55.54, 55.17, 52.01, 48.81, 44.27, 29.77, 27.49; MS(EI): m/z (%): 356 (M^+, 5.61); 91 (100); HRMS (ESI) calcd. for $C_{21}H_{24}O_5$: 356.1624, found: 356.1621.

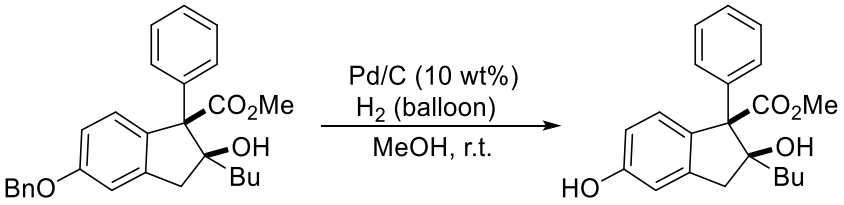
7) Synthesis of 5,7-dimethoxy-1-(methylperoxymethyl)-1,2-diphenyl-1H-indene (11).



3da **11**

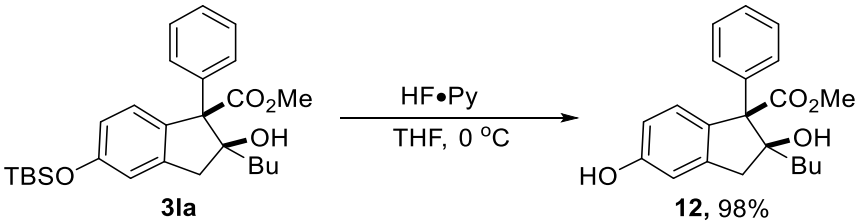
The solution of compound **3da** (410 mg, 1 mmol), TsOH ·H_2O (19 mg, 0.1 mmol) in toluene (10 mL) was heated to 90 °C for 2 hours. After the resulting solution was extracted with ether, dried with Na_2SO_4 and concentrated, the residue was purified by silica chromatography (PE/EtOAc = 20:1 to 10:1) to give **11** (241.0 mg, 62%) as a white solid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49-7.54 (m, 2H), 7.41-7.48 (m, 2H), 7.35 (s, 1H), 7.14-7.28 (m, 6H), 6.62 (d, *J* = 2.0 Hz, 1H), 6.27 (d, *J* = 2.0 Hz, 1H), 3.83 (s, 3H), 3.70 (s, 3H), 3.57 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.12, 161.51, 154.89, 150.82, 144.53, 137.04, 133.55, 129.89, 129.55, 128.21, 128.19, 127.75, 127.62, 127.25, 126.73, 99.15, 97.42, 67.01, 55.50, 55.40, 52.42; MS(EI): m/z (%): 386 (M^+, 44.65); 327 (100); HRMS (EI) calcd. for $C_{25}H_{24}O_4$: 386.1518, found: 386.1517.

8) Synthesis of methyl 2-butyl-2,5-dihydroxy-1-phenyl-2,3-dihydro-1H-indene -1-carboxylate (12).



3ja **12**, 99%

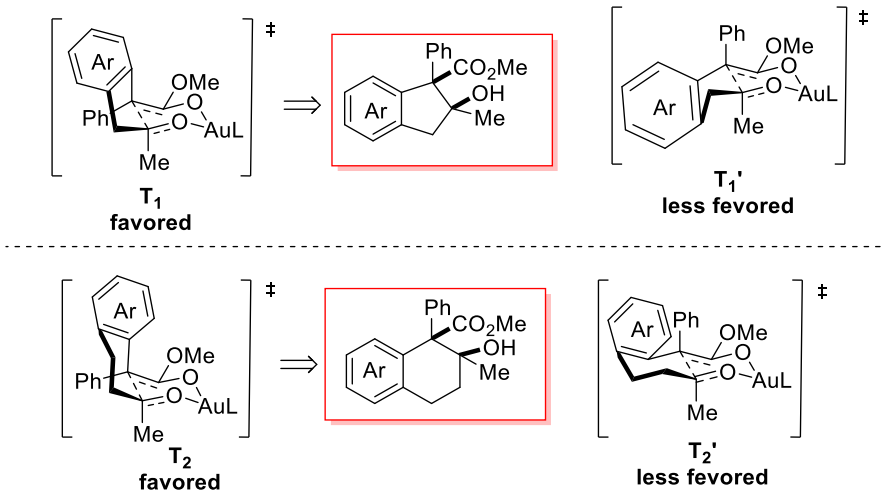
Pd/C (10 mg) was added to the solution of **3ja** (43 mg, 0.1 mmol) in MeOH (5 mL). The mixture was stirred at room temperature for 12 h under H_2 balloon. After the solution was filtered and concentrated, **12** was obtained (34.0 mg, 99%) as a colorless oil.



3la **12**, 98%

To a solution of **3la** (43 mg, 0.1 mmol) in THF (2 mL) HF·Py (0.5 mL) was added at 0 ^{o}C. After being stirred for 12 h under N_2 atmosphere, the reaction was quenched with saturated $NaHCO_3$ solution. The resulting mixture was extracted with ethyl acetate and the combined organic layer was concentrated. The residue was purified by silica chromatography directly (PE/EtOAc = 5:1 to 2:1) to afford **12** (33.2 mg, 98%) as a colorless oil. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.42 (d, *J* = 8.4 Hz, 1H), 7.22-7.35 (m, 3H), 6.88-7.02 (m, 2H), 6.74 (d, *J* = 8.4 Hz, 1H), 6.65 (s, 1H), 6.33 (s, 1H), 4.78 (s, 1H), 3.82 (s, 3H), 3.01 (d, *J* = 16.2 Hz, 1H), 2.86 (d, *J* = 16.2 Hz, 1H), 1.40-1.65 (m, 2H), 0.95-1.34 (m, 4H), 0.83 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 175.67, 156.13, 144.14, 139.19, 132.90, 128.20, 128.14, 127.56, 127.28, 114.52, 112.24, 87.11, 70.24, 52.43, 42.01, 36.81, 26.05, 23.14, 13.98. MS(EI): m/z (%): 340(M^+, 7.00), 44 (100), HRMS (EI) calcd. for $C_{21}H_{24}O_4$: 340.1675, found: 340.1673.

8. Another proposed Mechanism.



The excellent diastereoselectivity of this reaction may be attributed to the stereocontrol of the intramolecuar aldol reaction step. The cis-fused transition state T1, T2 is favored over the trans-fused one T1', T2', leading to the formation of the product with hydroxyl group and ester group having cis-configuration.

9. References:

(1) Preparation of **S1**, see: Kumbe, T.; Maruyama, T.; Nakai, Y.; Oida, H.; Maruyama, T.; Abe, N. Nishiura, A.; Naki, H.; Toda, M. *Bioorg. Med. Chem*. **2012**, *20*, 3502.

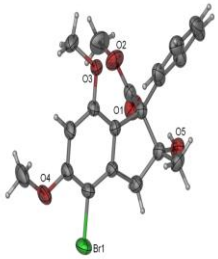
(2) Preparation of **S4,** see: Acton, III, J. F.; Black, R. M.; Jones, B.; Moller, D. E.; Colwell, L.; Doebber, T. W.; Macnaul, K. L.; Bergerb, J.; Wood, H. B. *Bioorg. Med. Chem. Lett.* **2005**, *15*, 357.

(3) Preparation of **1n,** see: Pharma, S. A. C.; Daria, Z.; Joanna, L.; Maciej, W.; Karolina, D.; Abdellah, Y.; Krzysztof, D.; Monika, L.-P.; Paulina, G.; Aleksandra, S. *WO2014/141015 A1*, **2014.**

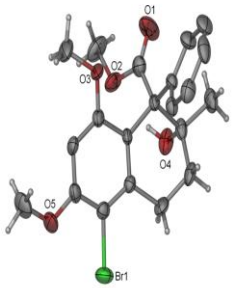
(4) Preparation of **1n,** see: Corrie, J. E. T. *Tetrahedron* **1998**, *54*, 5407.

(5) Preparation of **1q,** see: Conrad, J. C.; Kong, J.; Laforteza, B. N.; Macmillan, D. W. C. *J. Am. Chem. Soc*. **2009**, *131*, 11640.

10. Crystal structures of 7aa and 8na.



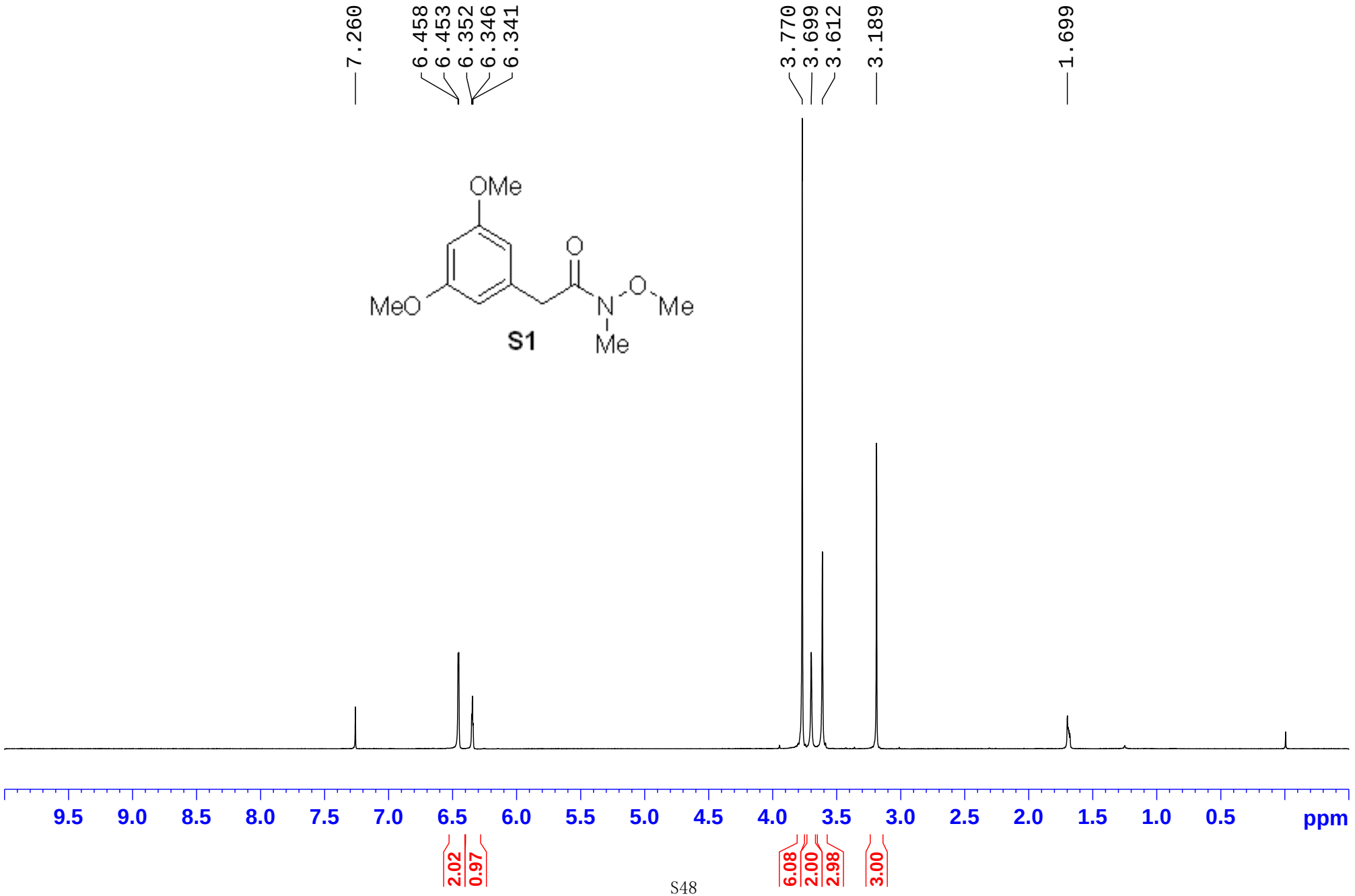
7aa



8na

11. NMR Spectra of new compounds

yzz-7-126-1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6.453
6.352
6.346
6.341
3.770
3.699
3.612
3.189
1.699
OMe
MeO
O
N
O
Me
Me
S1
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
2.02
0.97
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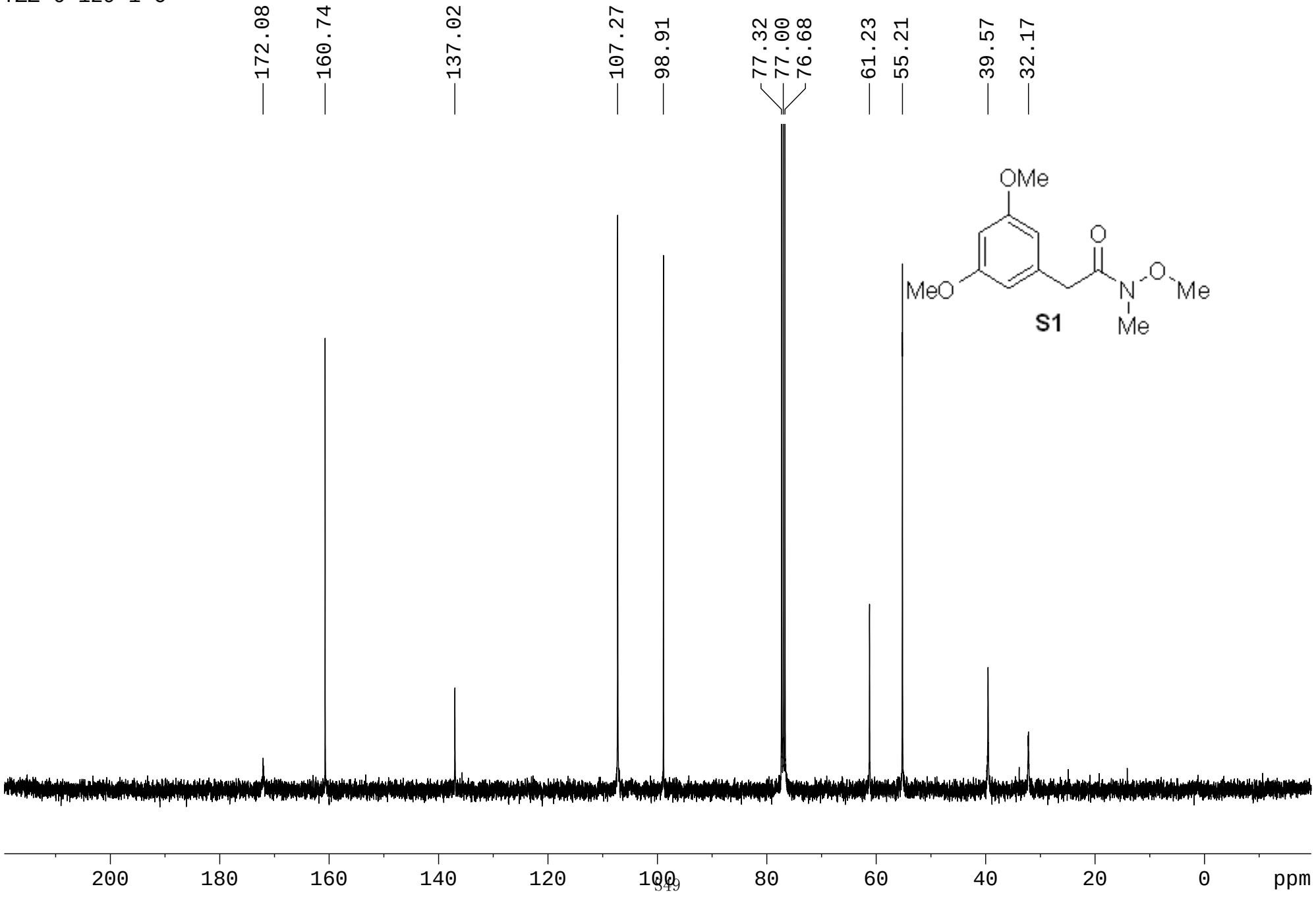
2.00
2.98
3.00

YZZ-6-129-1-C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98.91
77.32
77.00
76.68
61.23
55.21
39.57
32.17
OMe
MeO
O
N
O
Me
Me
S1
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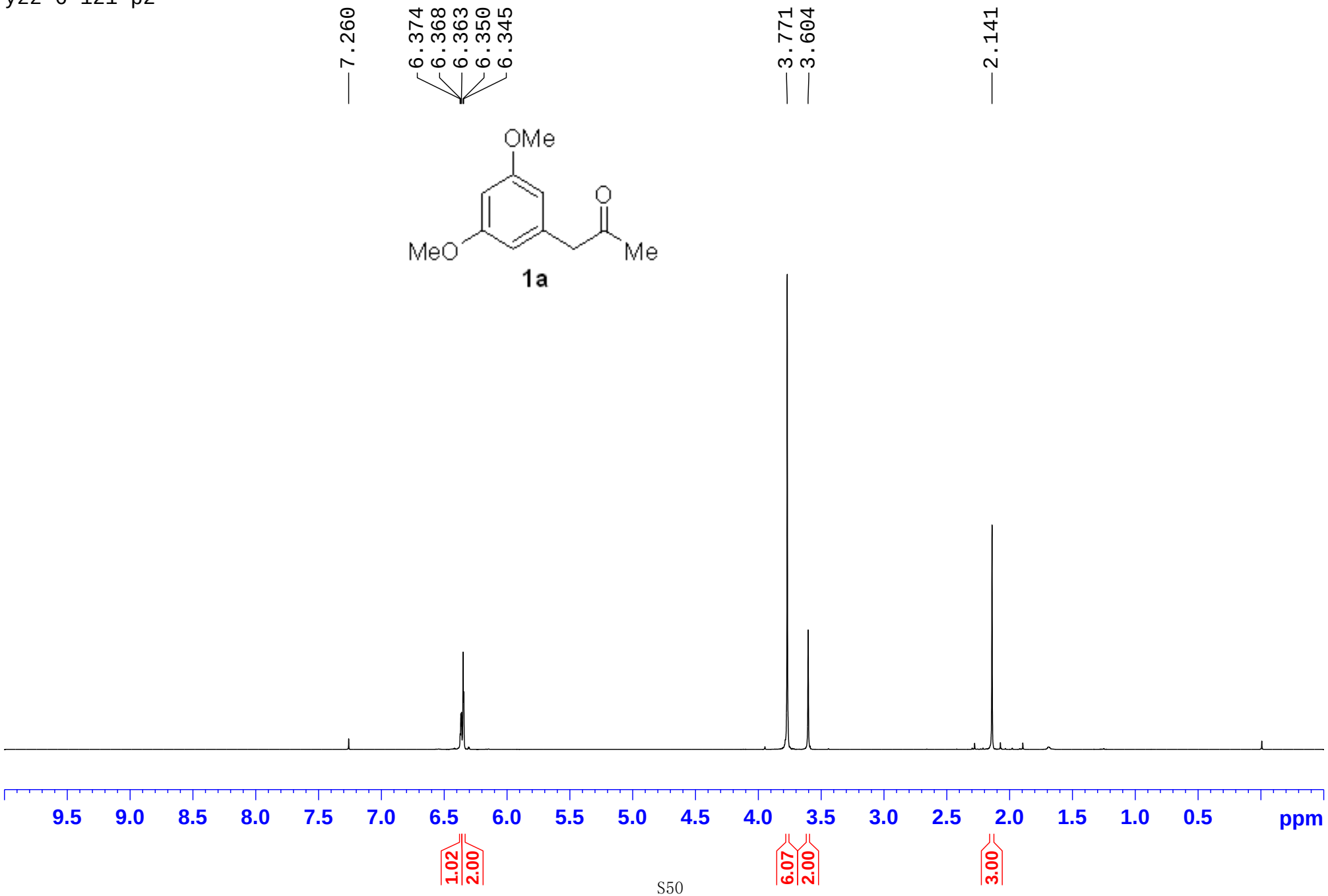
180
160
140
120
100
80
60
40
20
0
ppm

yzz-6-121-p2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6.363
6.350
6.345
3.771
3.604
2.141
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O
MeO
Me
1a
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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
1.02
2.00
6.07
2.00
3.00

yzz-6-121-p2-c

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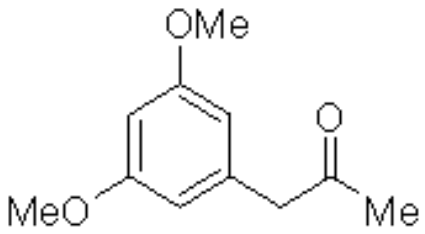
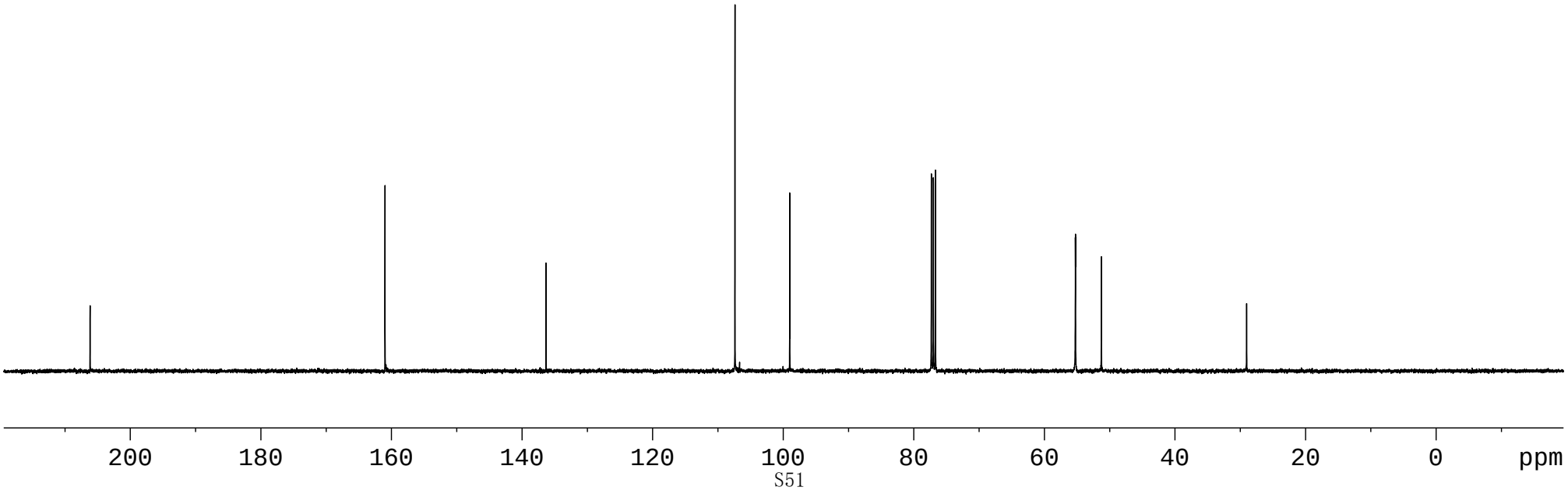
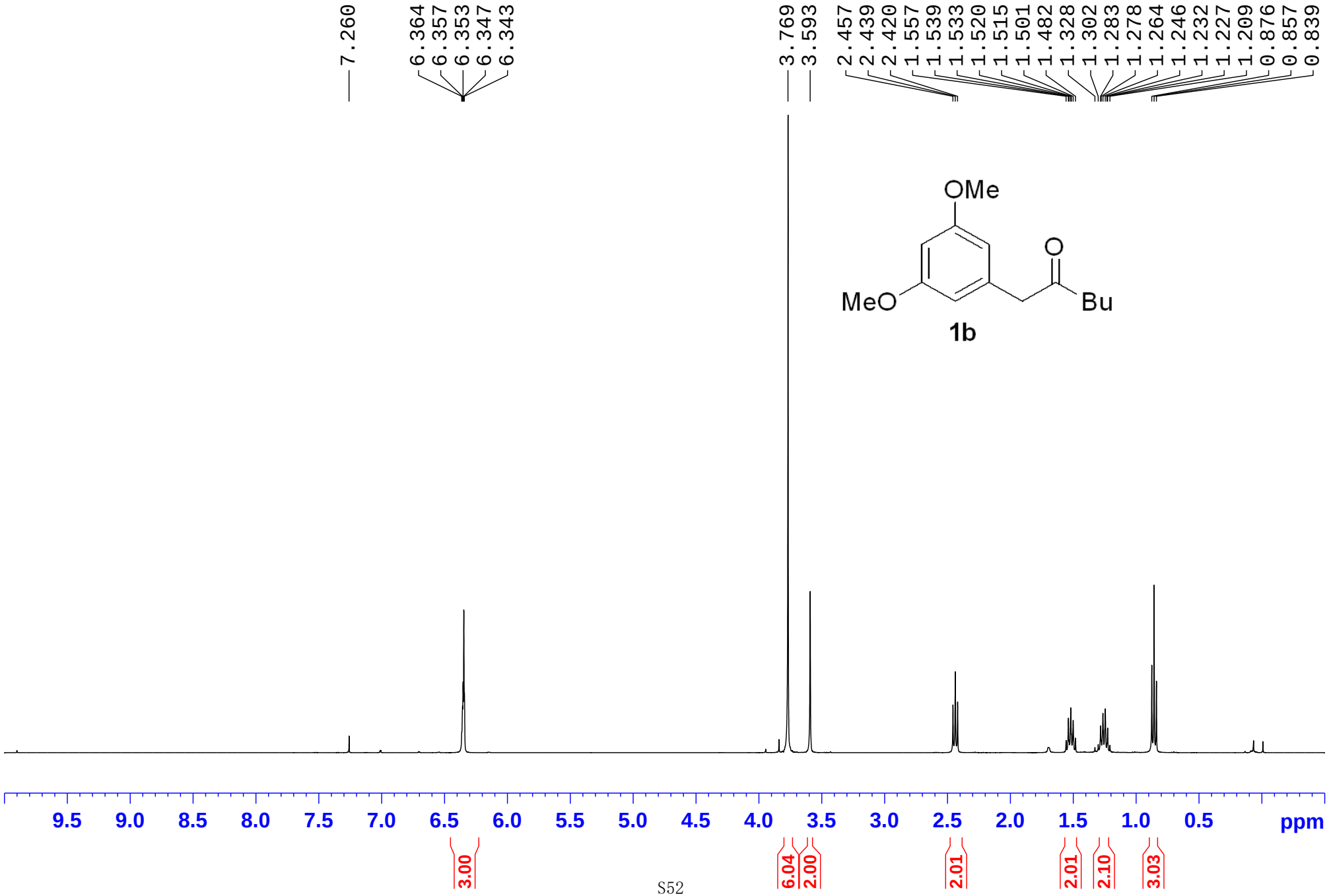
136.34
107.40
99.01
77.32
77.00
76.68
55.26
51.27
29.03



1a

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1.533
1.520
1.515
1.501
1.482
1.328
1.302
1.283
1.278
1.264
1.246
1.232
1.227
1.209
0.876
0.857
0.839
OMe
MeO
O
Bu
1b
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
3.00
6.04
2.00
2.01
2.01
2.10
3.03

208.47
160.88
136.48
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55.25
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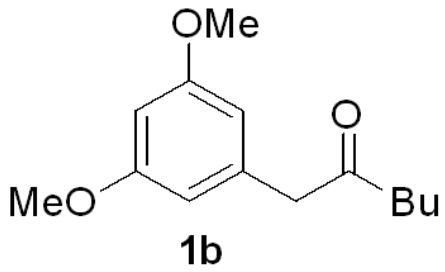
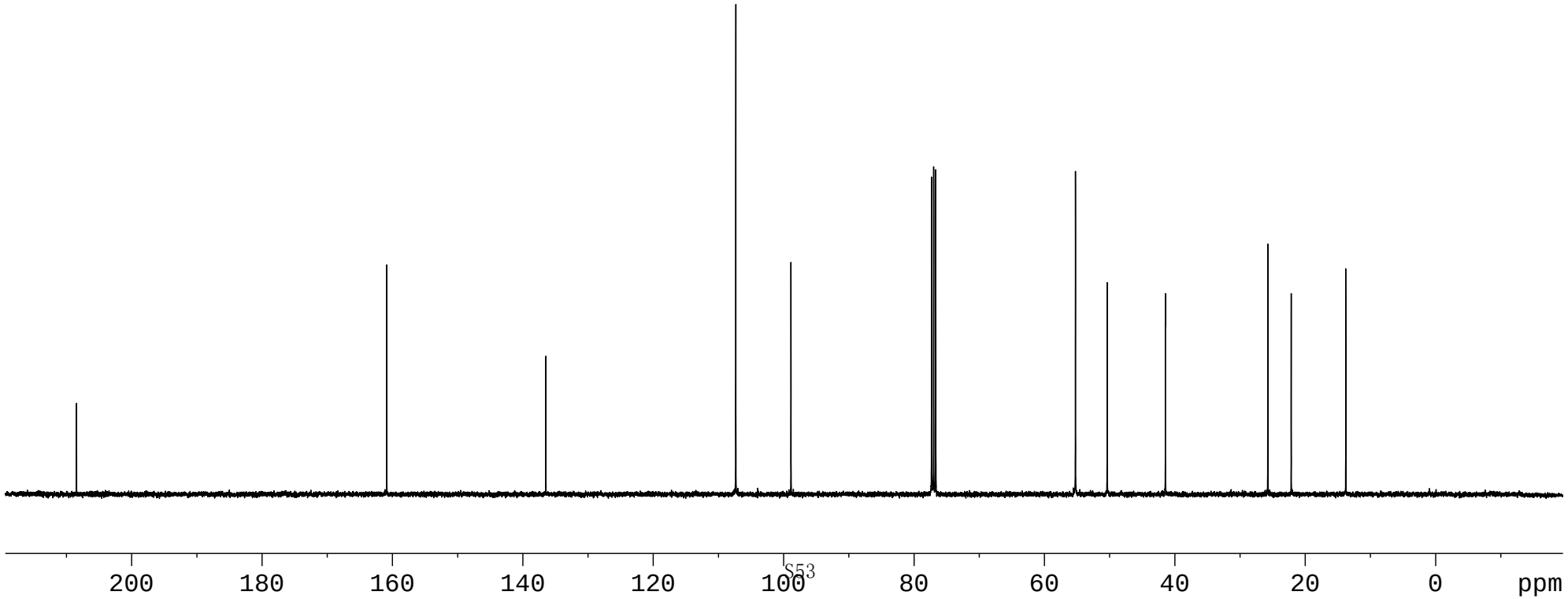
41.46
25.75
22.16
13.79



1b



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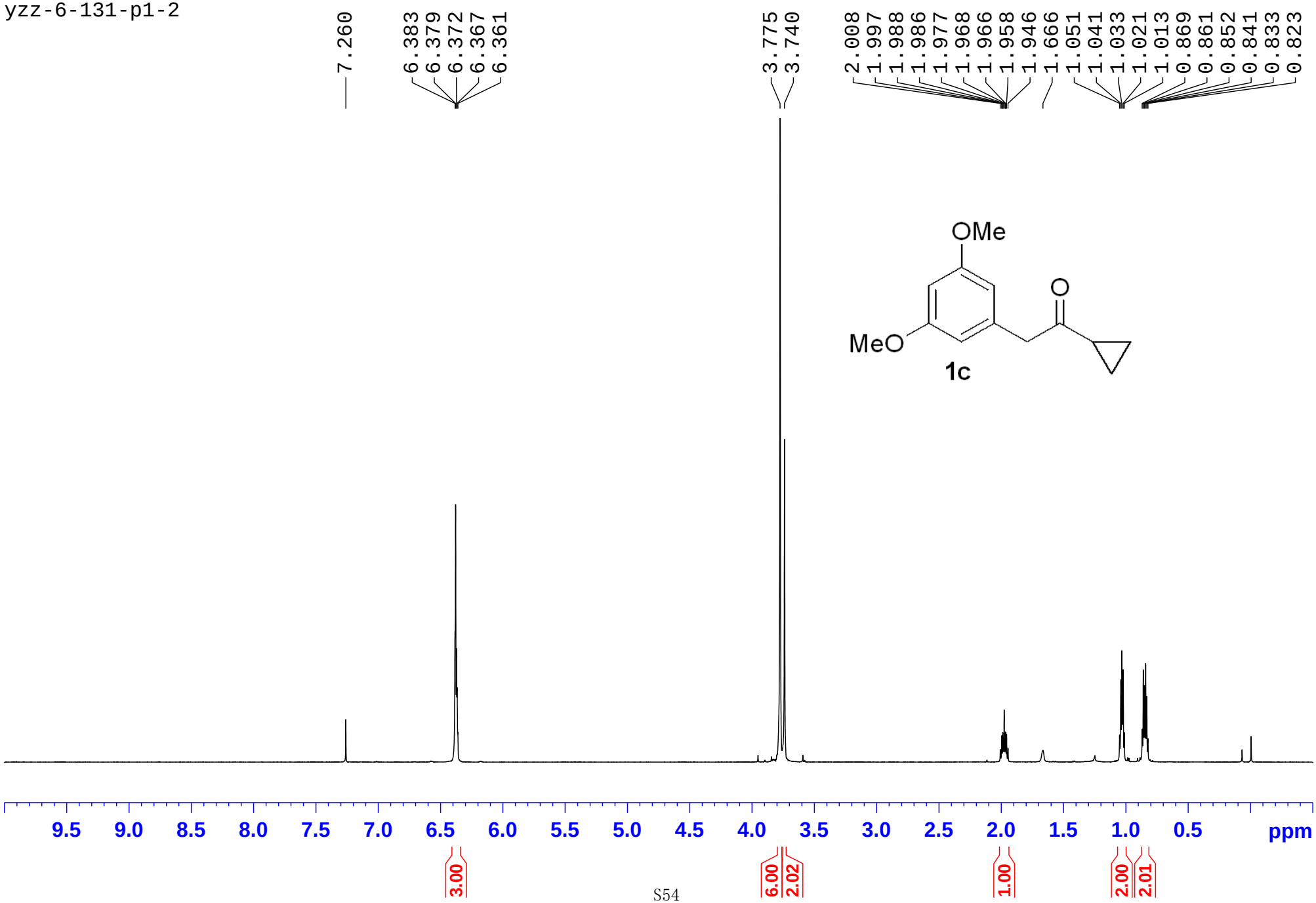
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1.988
1.986
1.977
1.968
1.966
1.958
1.946
1.666
1.051
1.041
1.033
1.021
1.013
0.869
0.861
0.852
0.841
0.833
0.823
OMe
MeO
O
1c
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
3.00
6.00
2.02
1.00
2.00
2.01

yzz-6-131-p1-2-c

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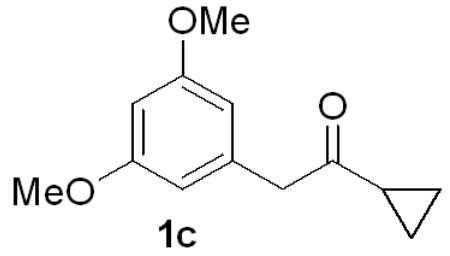
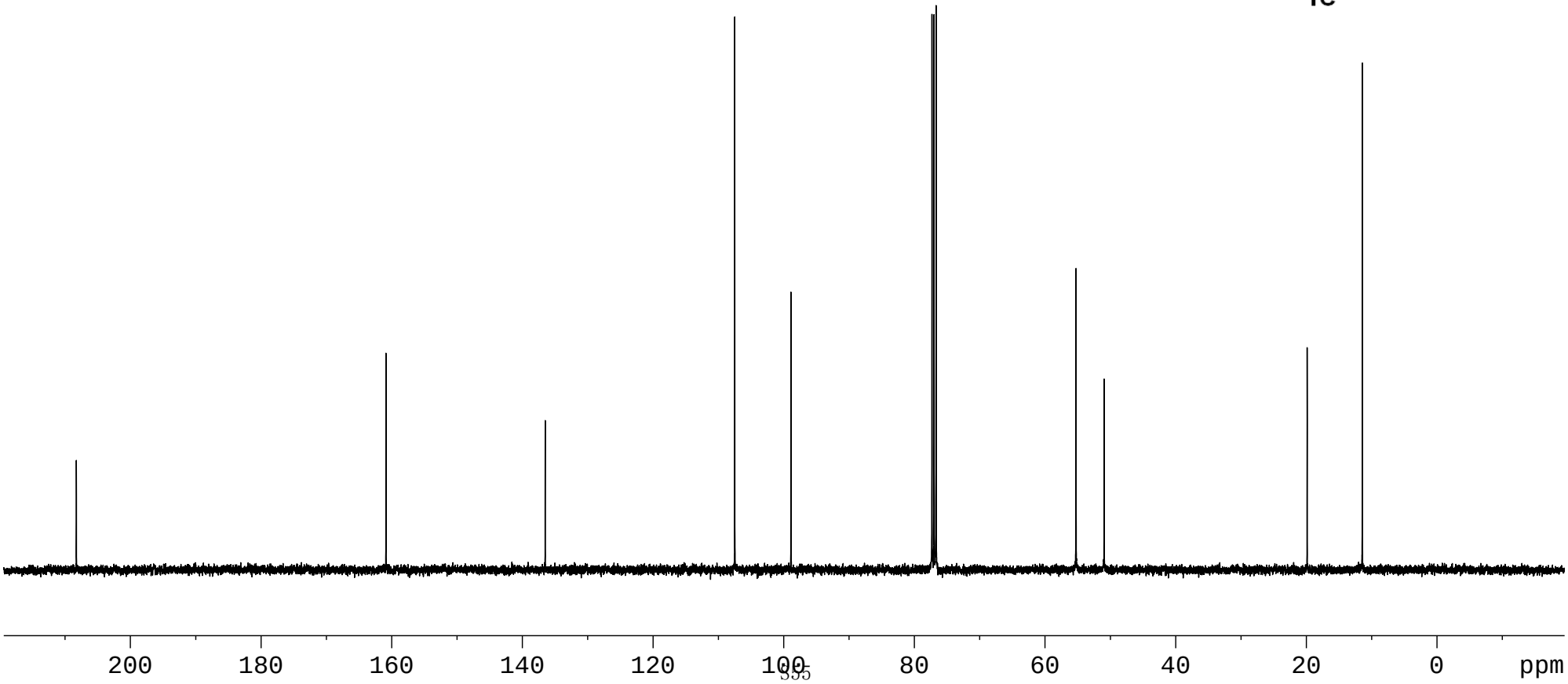
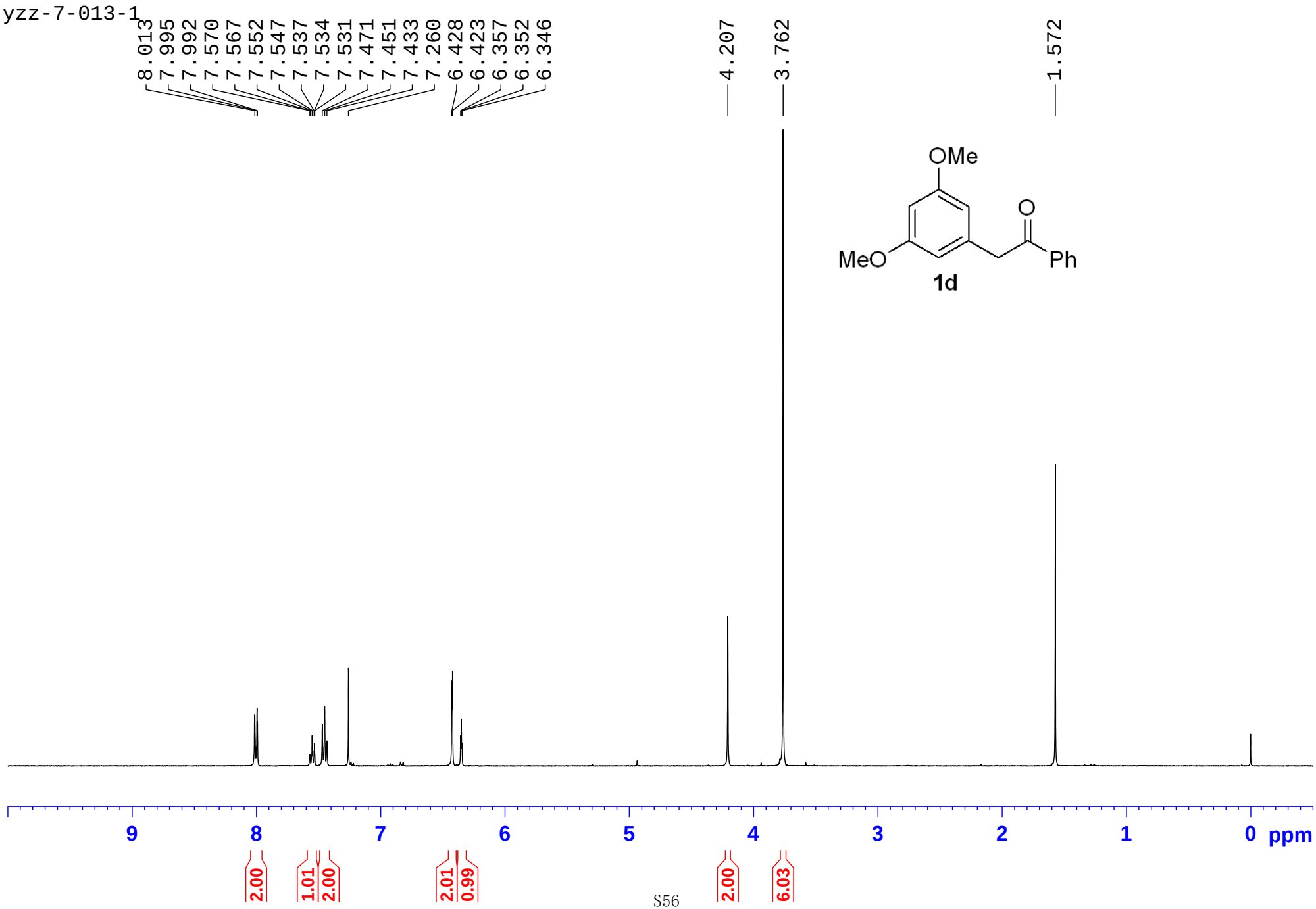
11.44



1c

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7.552
7.547
7.537
7.534
7.531
7.471
7.451
7.433
7.260
6.428
6.423
6.357
6.352
6.346
4.207
3.762
1.572
OMe
MeO
O
Ph
1d
9
8
7
6
5
4
3
2
1
0
ppm
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1.01
2.00
2.01
0.99
2.00
6.03

yzz-7-012-p2-2-c

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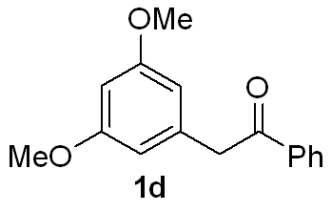
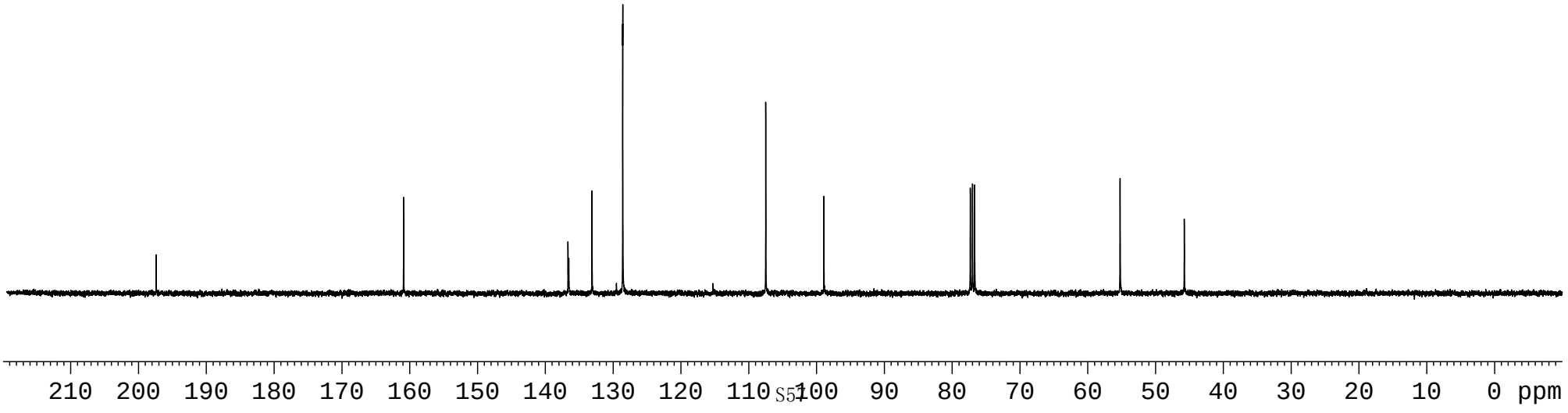
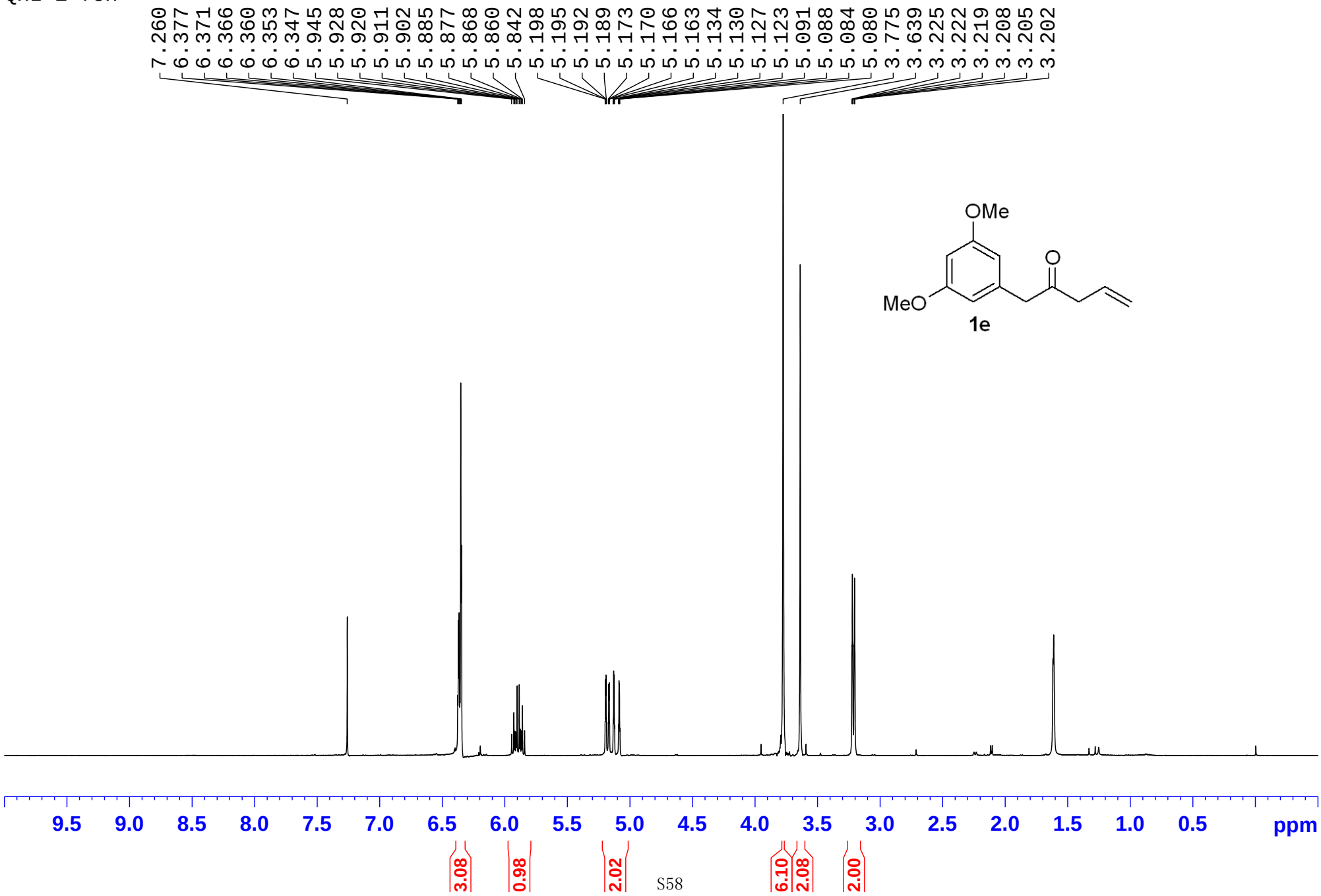
76.68
55.23
45.76



1d



QHL-1-75H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6.347
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5.877
5.868
5.860
5.842
5.198
5.195
5.192
5.189
5.173
5.170
5.166
5.163
5.134
5.130
5.127
5.123
5.091
5.088
5.084
5.080
3.775
3.639
3.225
3.222
3.219
3.208
3.205
3.202
OMe
O
MeO
1e
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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
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ppm
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0.98
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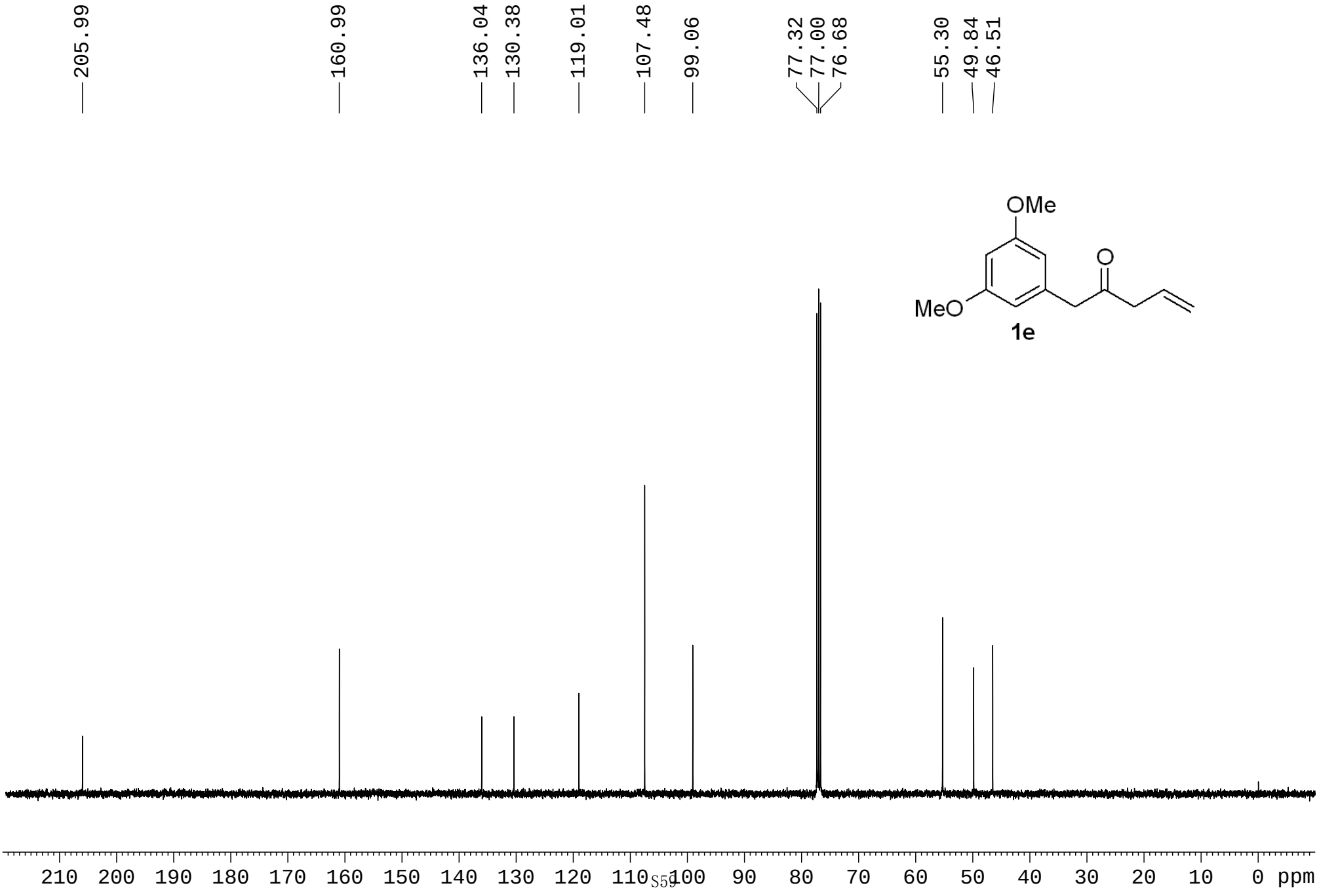
6.10
2.08
2.00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119.01
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77.00
76.68
55.30
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OMe
O
MeO
1e
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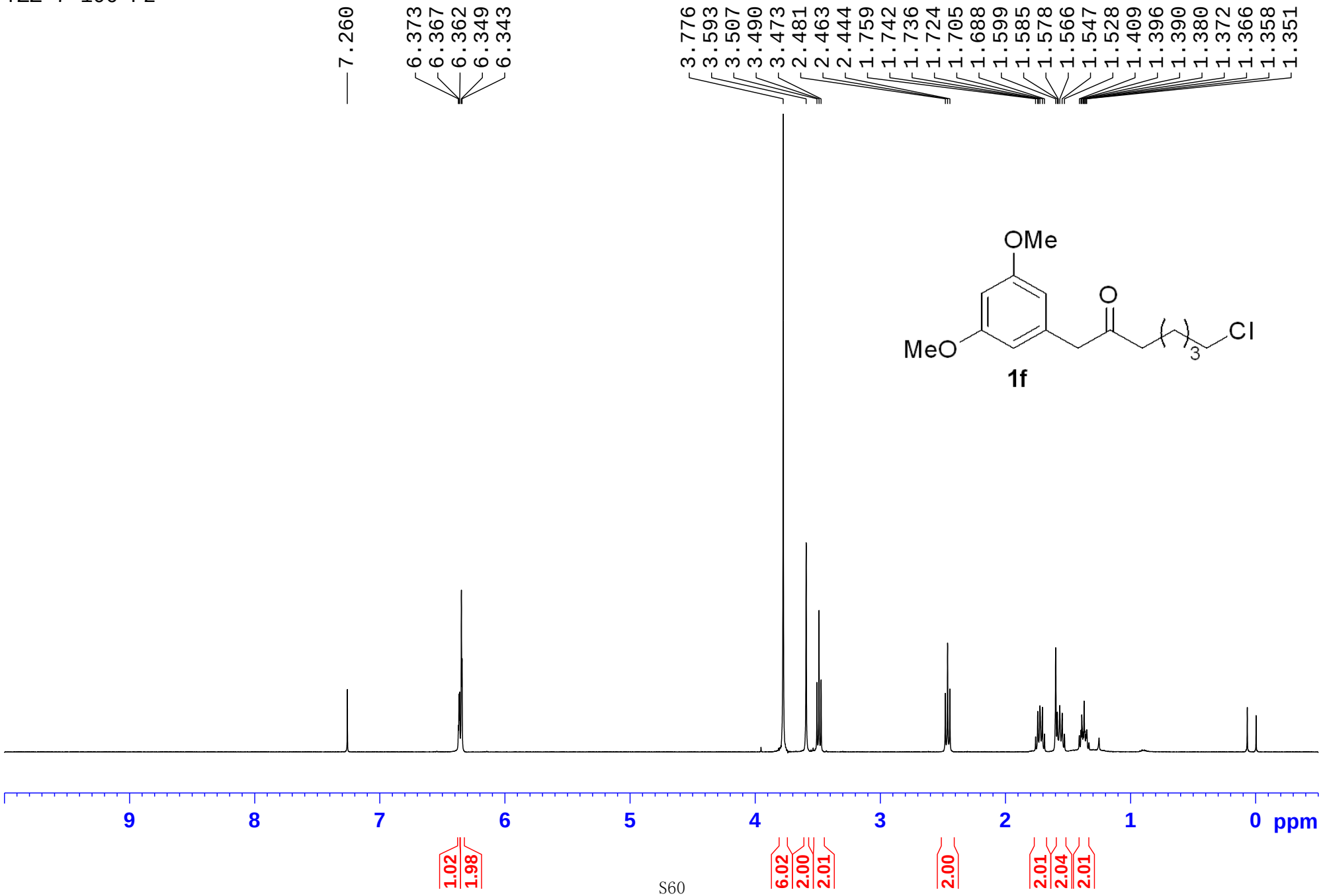
YZZ-7-106-P2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2.444
1.759
1.742
1.736
1.724
1.705
1.688
1.599
1.585
1.578
1.566
1.547
1.528
1.409
1.396
1.390
1.380
1.372
1.366
1.358
1.351
OMe
O
MeO
Cl
3
1f
9
8
7
6
5
4
3
2
1
0 ppm
1.02
1.98
6.02
2.00
2.01
2.00
2.01
2.04
2.01

YZZ-7-106-P2-C

207.95
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136.36
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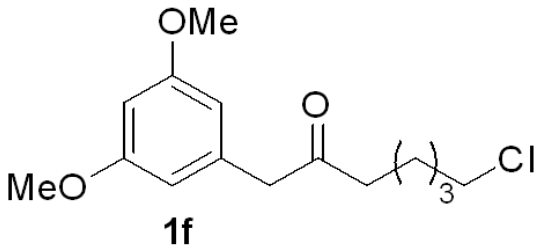
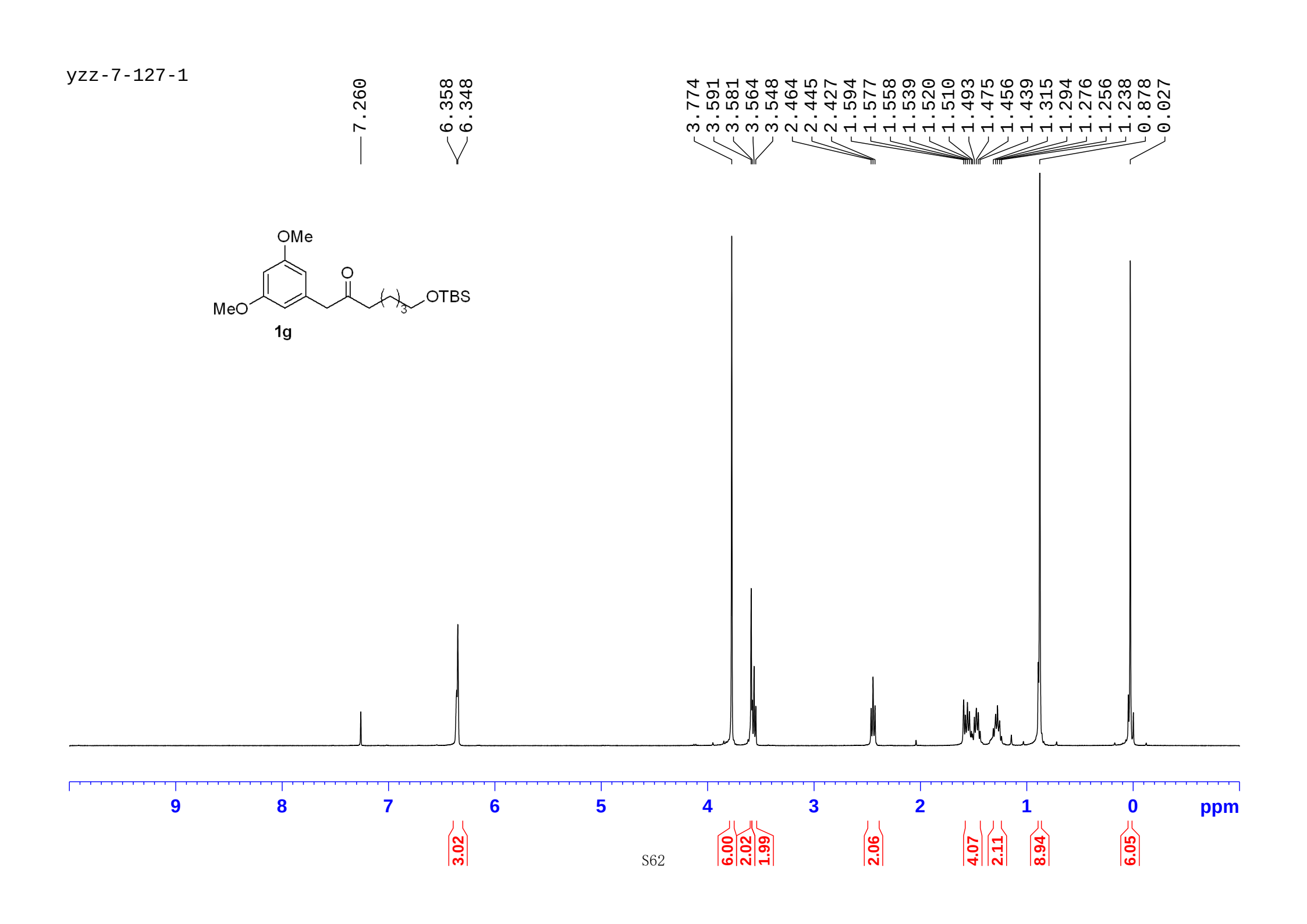
32.30
26.28
22.84



1f

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

yzz-7-127-1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1.520
1.510
1.493
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1.315
1.294
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0.027
OMe
MeO
O
OTBS
3
1g
9
8
7
6
5
4
3
2
1
0
ppm
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6.00
2.02
1.99
2.06
4.07
2.11
8.94
6.05

yzz-7-127-1-c

208.27
160.98
136.49
107.43
99.00
77.32
77.00
76.68
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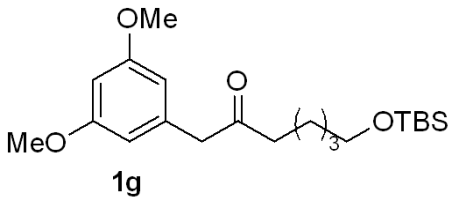
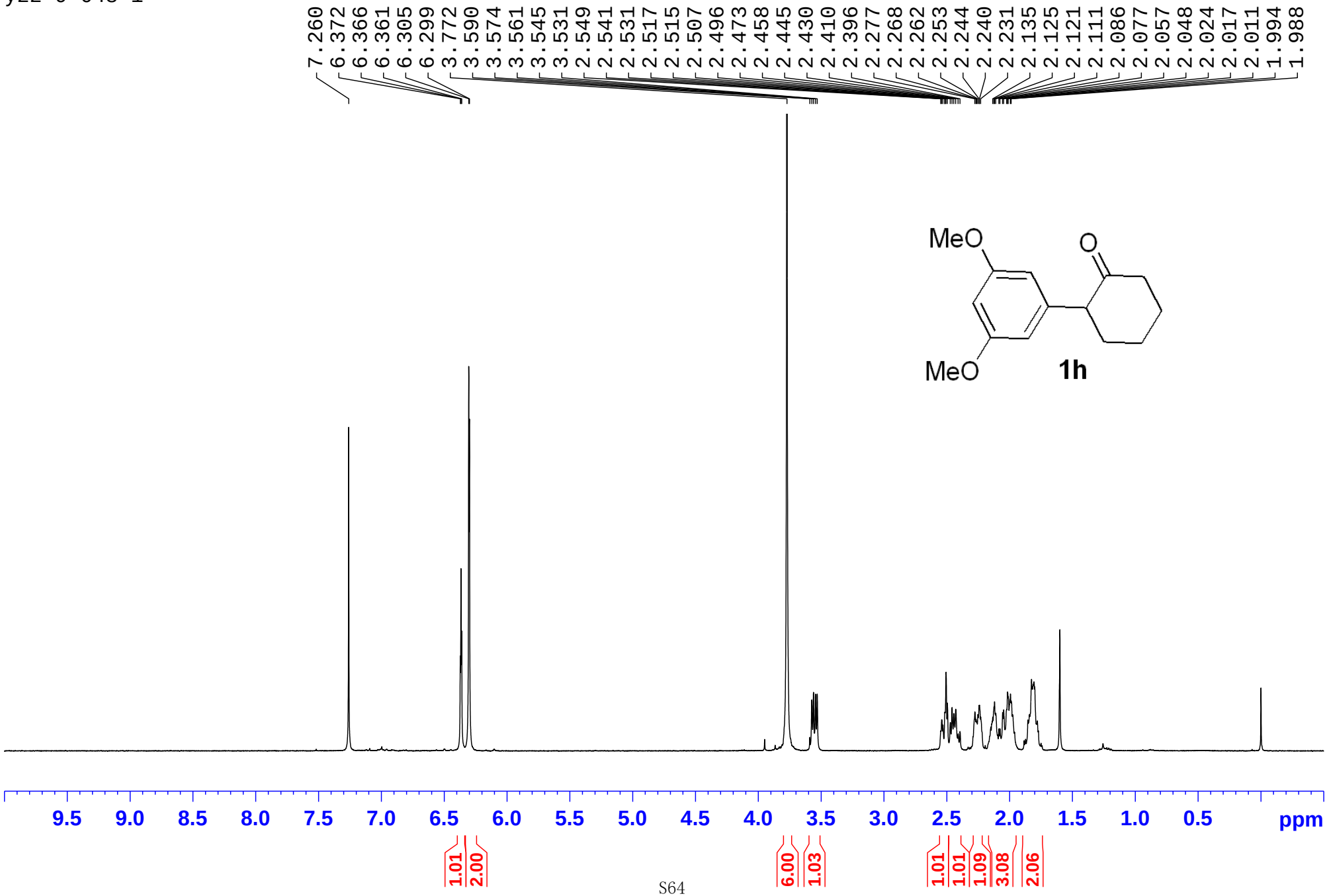
32.56
25.95
25.36
23.51
18.33
-5.31

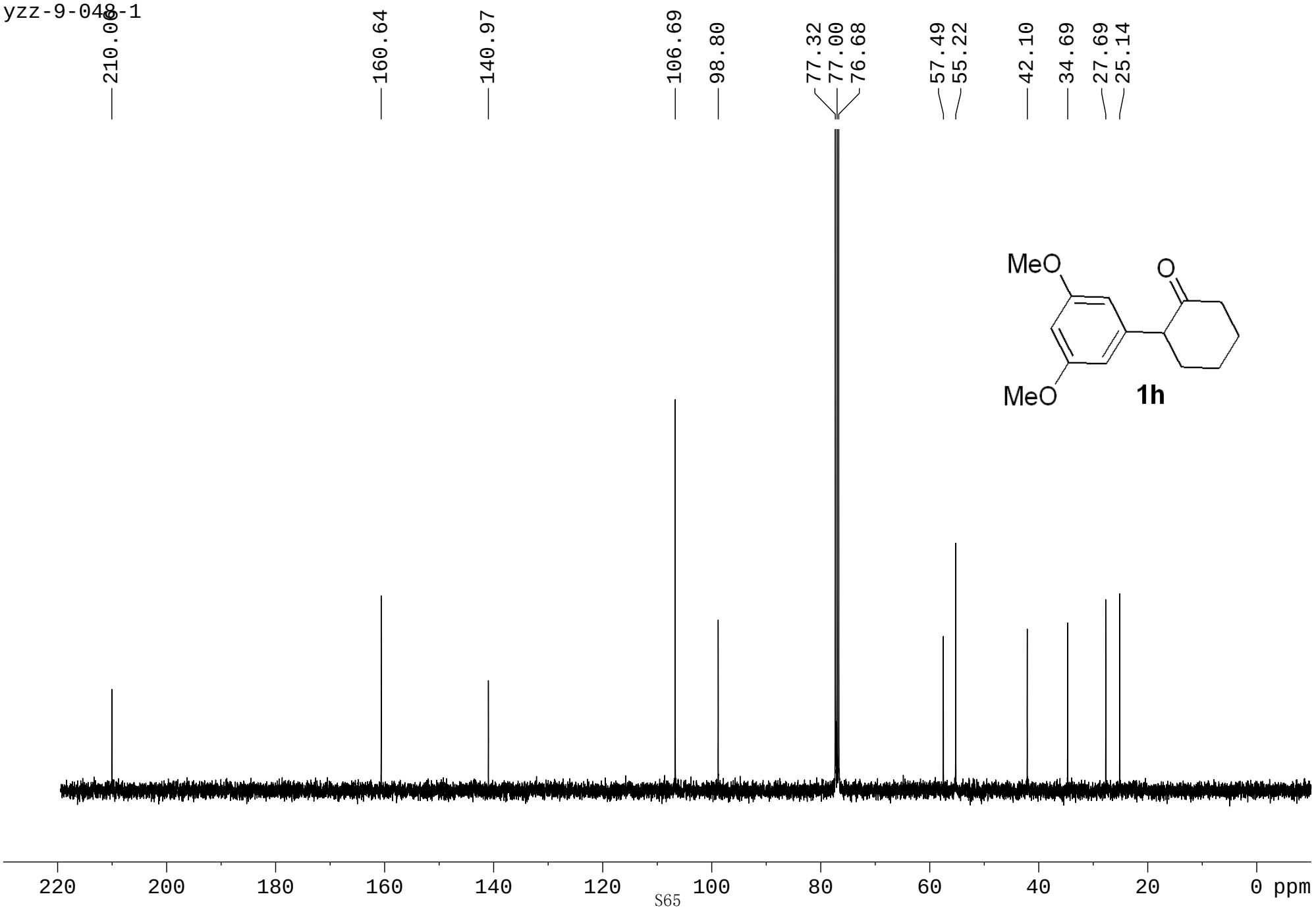


1g

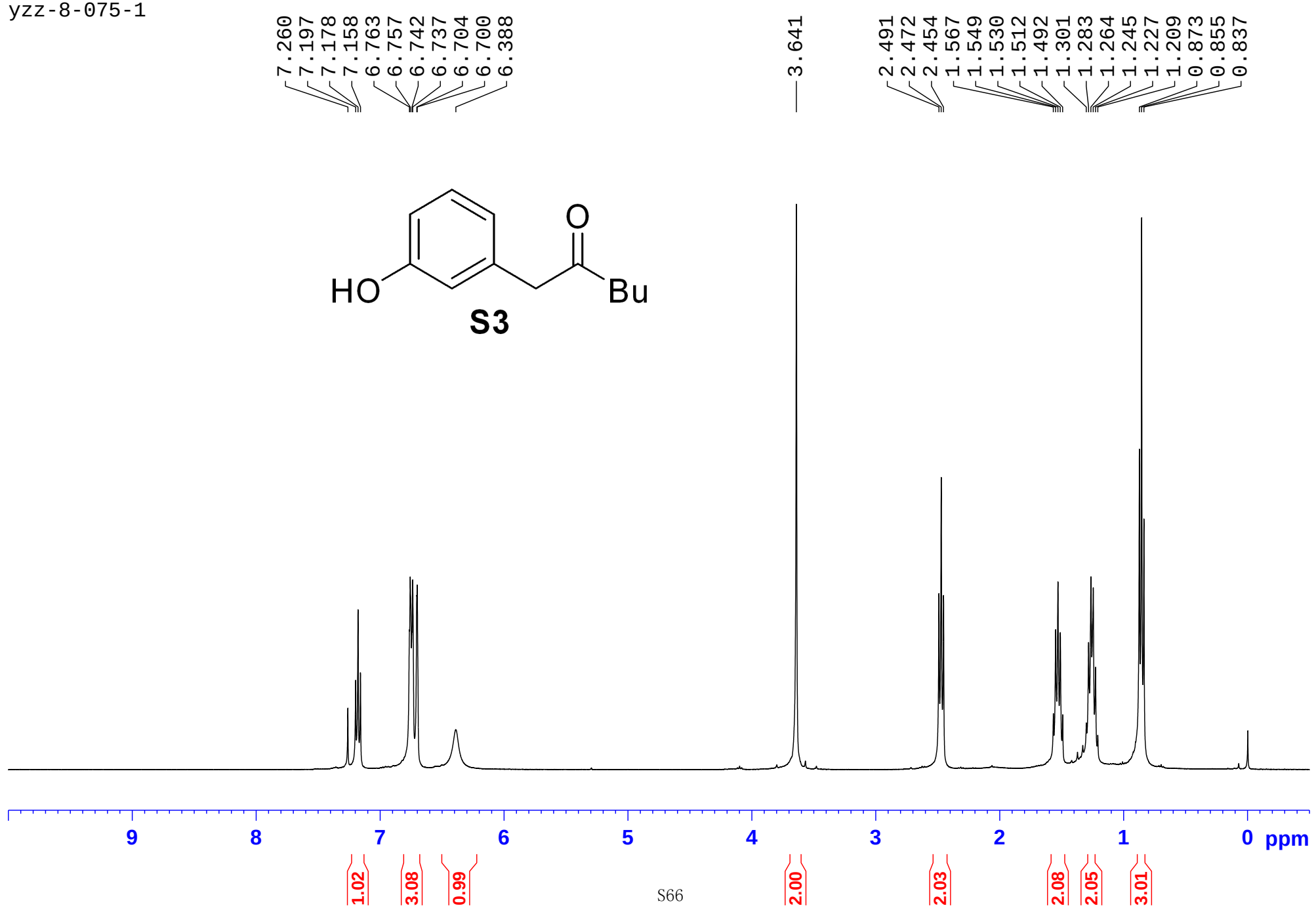
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-9-048-1

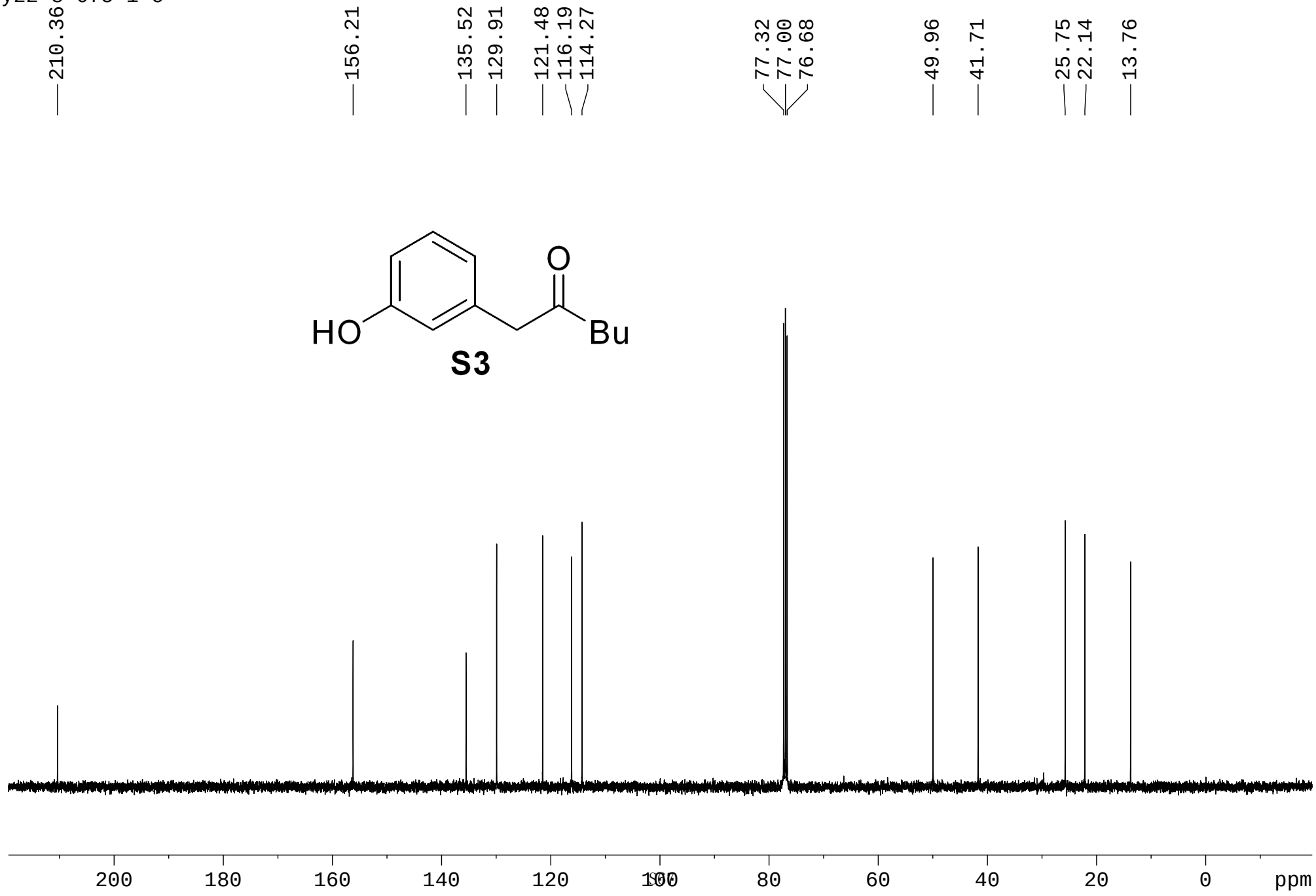

7.260
6.372
6.366
6.361
6.305
6.299
3.772
3.590
3.574
3.561
3.545
3.531
2.549
2.541
2.531
2.517
2.515
2.507
2.496
2.473
2.458
2.445
2.430
2.410
2.396
2.277
2.268
2.262
2.253
2.244
2.240
2.231
2.135
2.125
2.121
2.111
2.086
2.077
2.057
2.048
2.024
2.017
2.011
1.994
1.988
MeO
O
MeO
1h
9.5
9.0
8.5
8.0
7.5
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
1.01
2.00
6.00
1.03
1.01
1.01
1.09
3.08
2.06

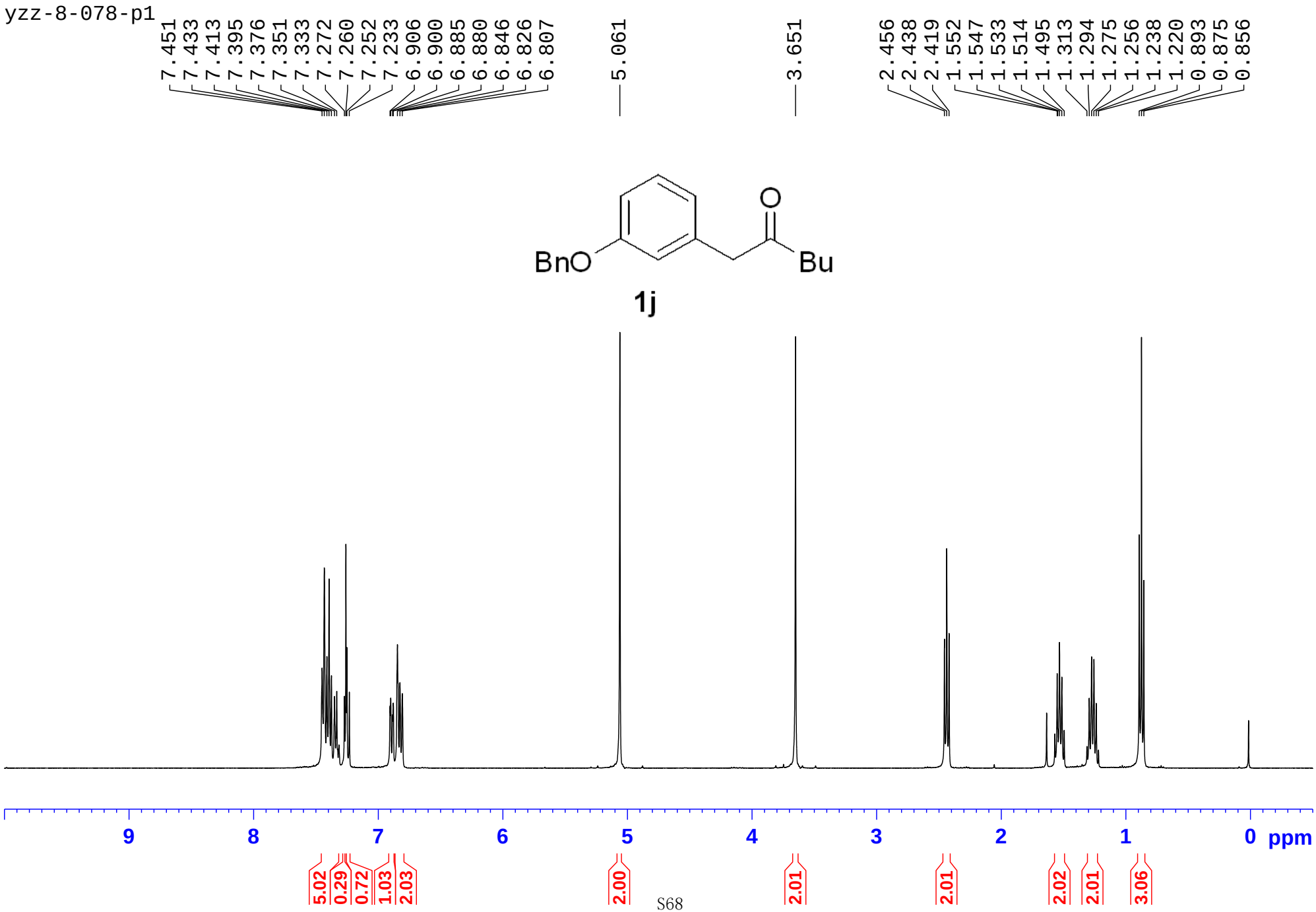

yzz-9-048-1
210.06
160.64
140.97
106.69
98.80
77.32
77.00
76.68
57.49
55.22
42.10
34.69
27.69
25.14
MeO
O
MeO
1h
220
200
180
160
140
120
100
80
60
40
20
0 ppm

yzz-8-075-1


7.260
7.197
7.178
7.158
6.763
6.757
6.742
6.737
6.704
6.700
6.388
3.641
2.491
2.472
2.454
1.567
1.549
1.530
1.512
1.492
1.301
1.283
1.264
1.245
1.227
1.209
0.873
0.855
0.837
HO
O
Bu
S3
9
8
7
6
5
4
3
2
1
0 ppm
1.02
3.08
0.99
2.00
2.03
2.08
2.05
3.01

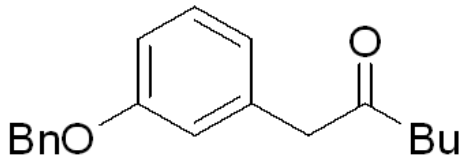
yzz-8-075-1-c


210.36
156.21
135.52
129.91
121.48
116.19
114.27
77.32
77.00
76.68
49.96
41.71
25.75
22.14
13.76
HO
O
Bu
S3
200
180
160
140
120
100
80
60
40
20
0
ppm

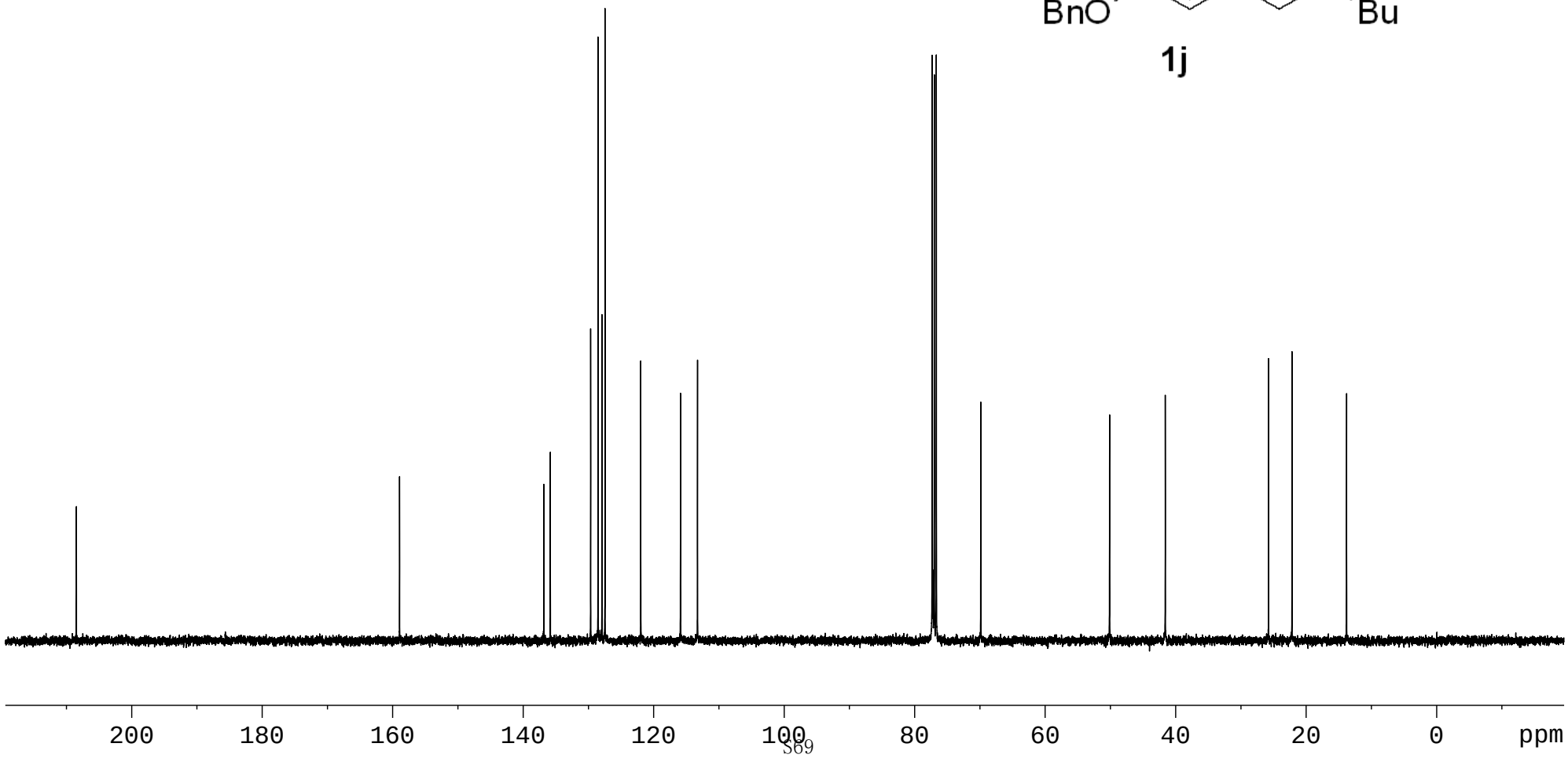

yzz-8-078-p1
7.451
7.433
7.413
7.395
7.376
7.351
7.333
7.272
7.260
7.252
7.233
6.906
6.900
6.885
6.880
6.846
6.826
6.807
5.061
3.651
2.456
2.438
2.419
1.552
1.547
1.533
1.514
1.495
1.313
1.294
1.275
1.256
1.238
1.220
0.893
0.875
0.856
BnO
O
Bu
1j
9
8
7
6
5
4
3
2
1
0
ppm
5.02
0.29
0.72
1.03
2.03
2.00
2.01
2.01
2.02
2.01
3.06

yzz-8-078-p1-c

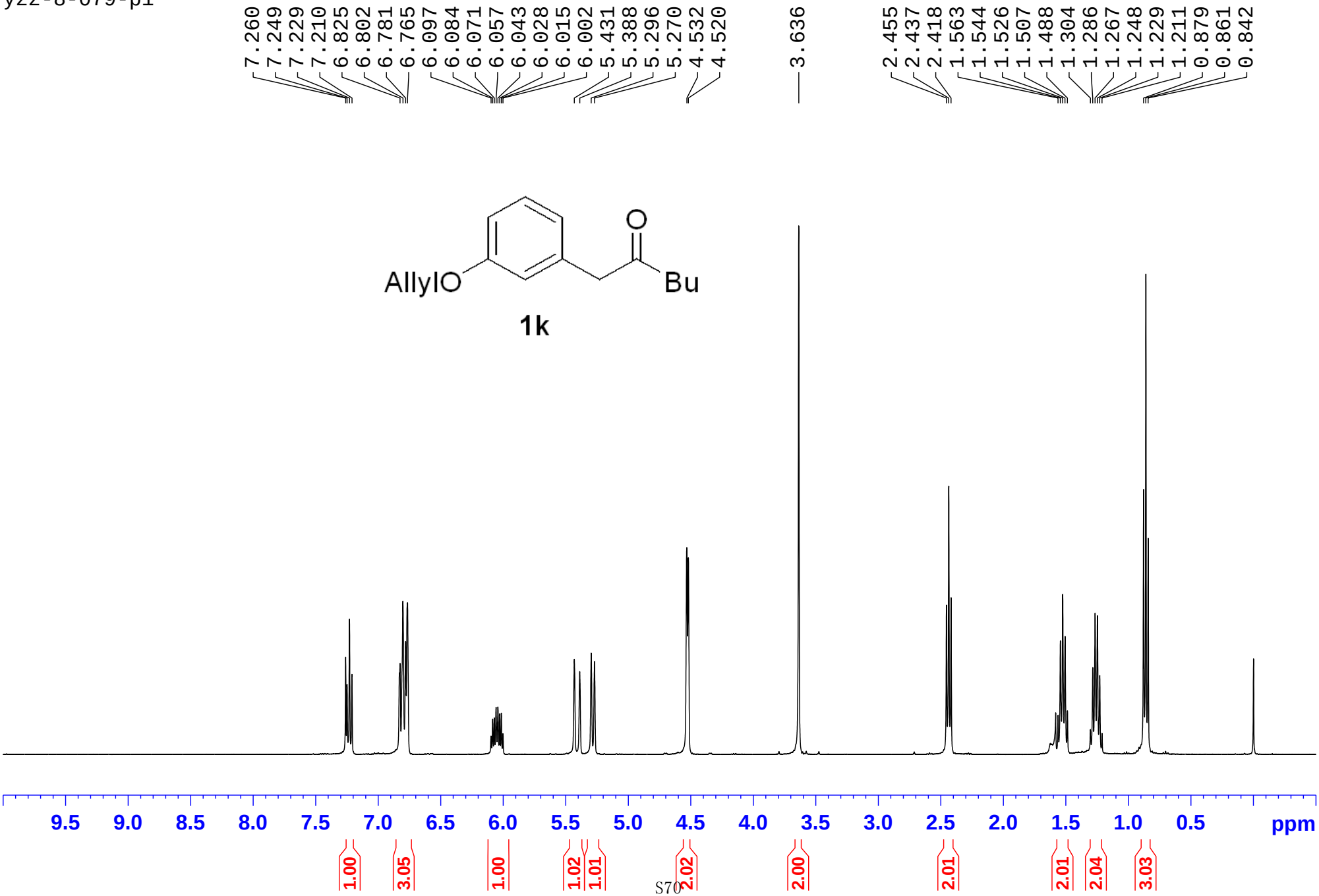
208.48
158.95
136.84
135.84
129.67
128.53
127.93
127.46
121.99
115.90
113.29
77.32
77.00
76.68
69.87
50.13
41.59
25.76
22.17
13.80



1j

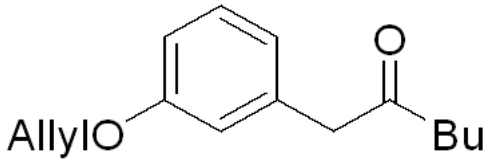


yzz-8-079-p1

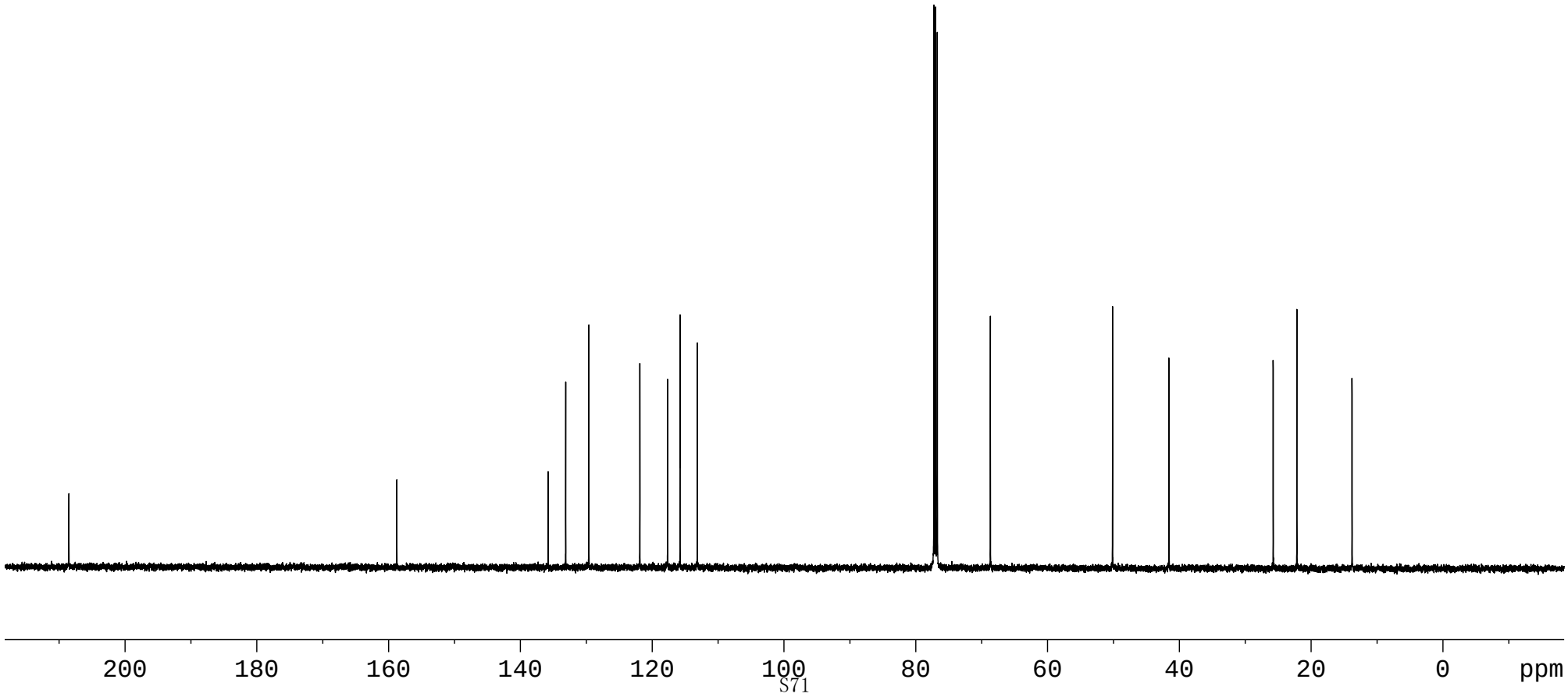

7.260
7.249
7.229
7.210
6.825
6.802
6.781
6.765
6.097
6.084
6.071
6.057
6.043
6.028
6.015
6.002
5.431
5.388
5.296
5.270
4.532
4.520
3.636
2.455
2.437
2.418
1.563
1.544
1.526
1.507
1.488
1.304
1.286
1.267
1.248
1.229
1.211
0.879
0.861
0.842
AllylO
O
Bu
1k
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.00
3.05
1.00
1.02
1.01
2.02
2.00
2.01
2.01
2.04
3.03

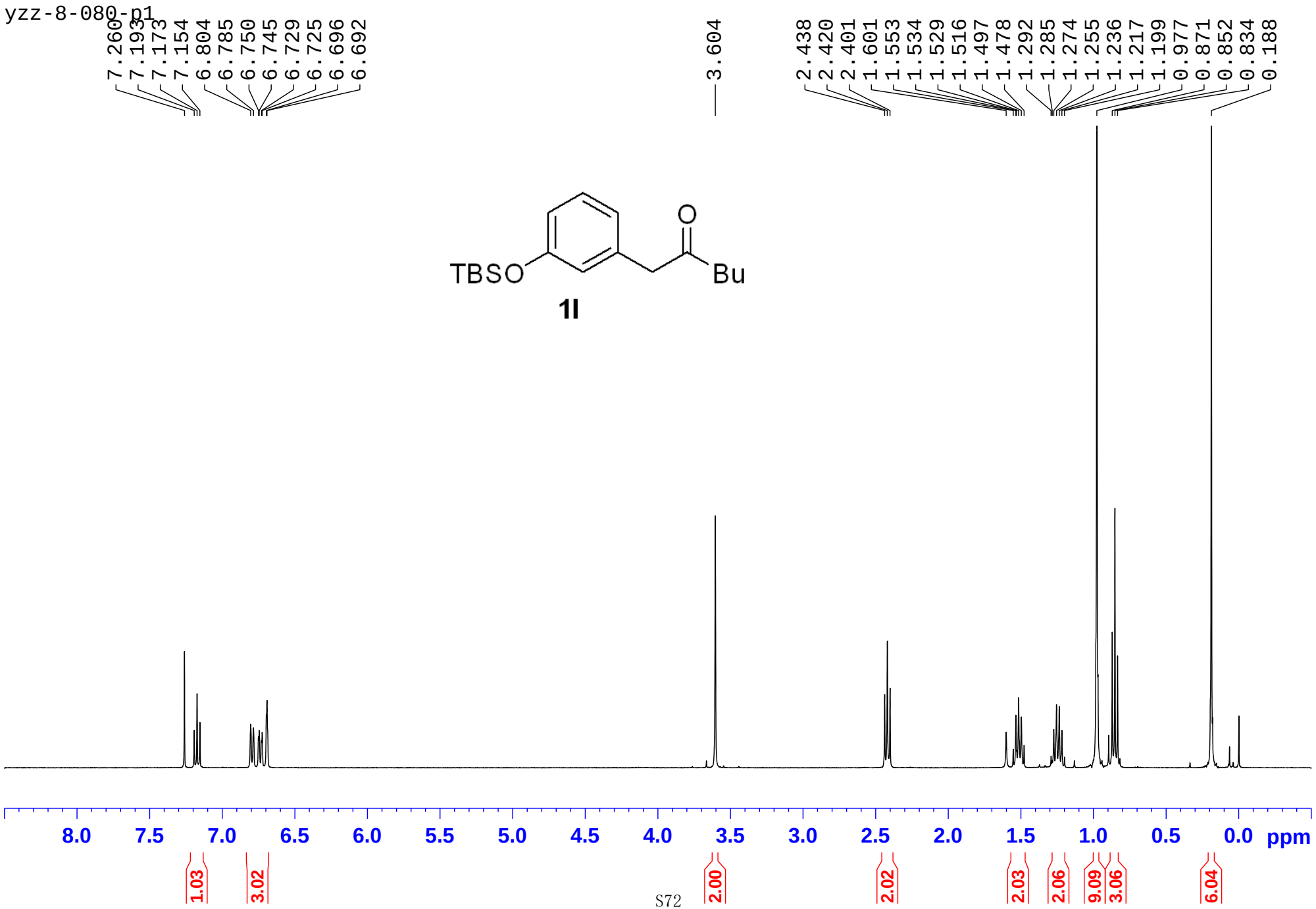
yzz-8-078-1-c

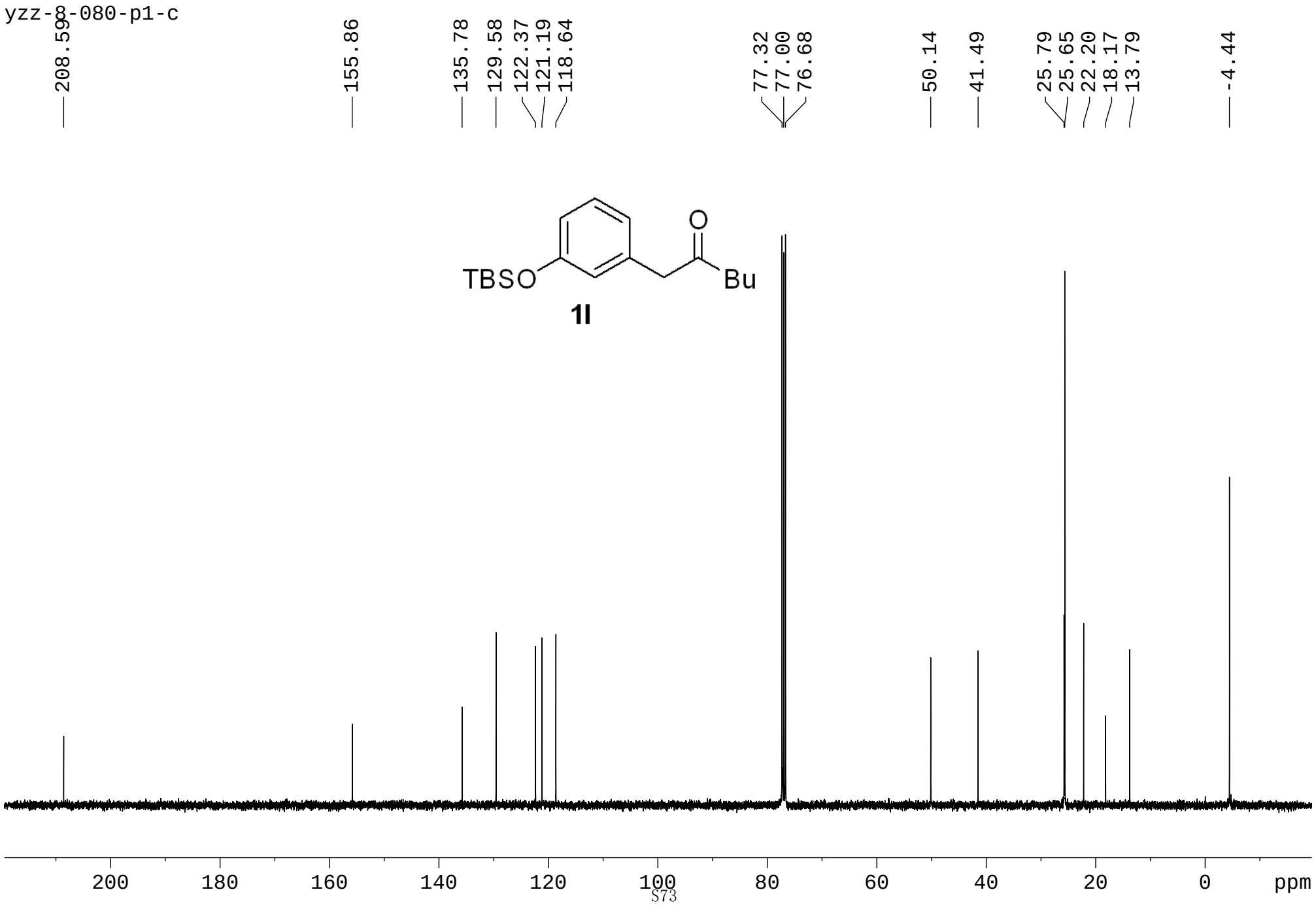
208.53
158.76
135.80
133.14
129.63
121.88
117.67
115.78
113.16
77.25
77.00
76.75
68.69
50.15
41.59
25.77
22.18
13.80



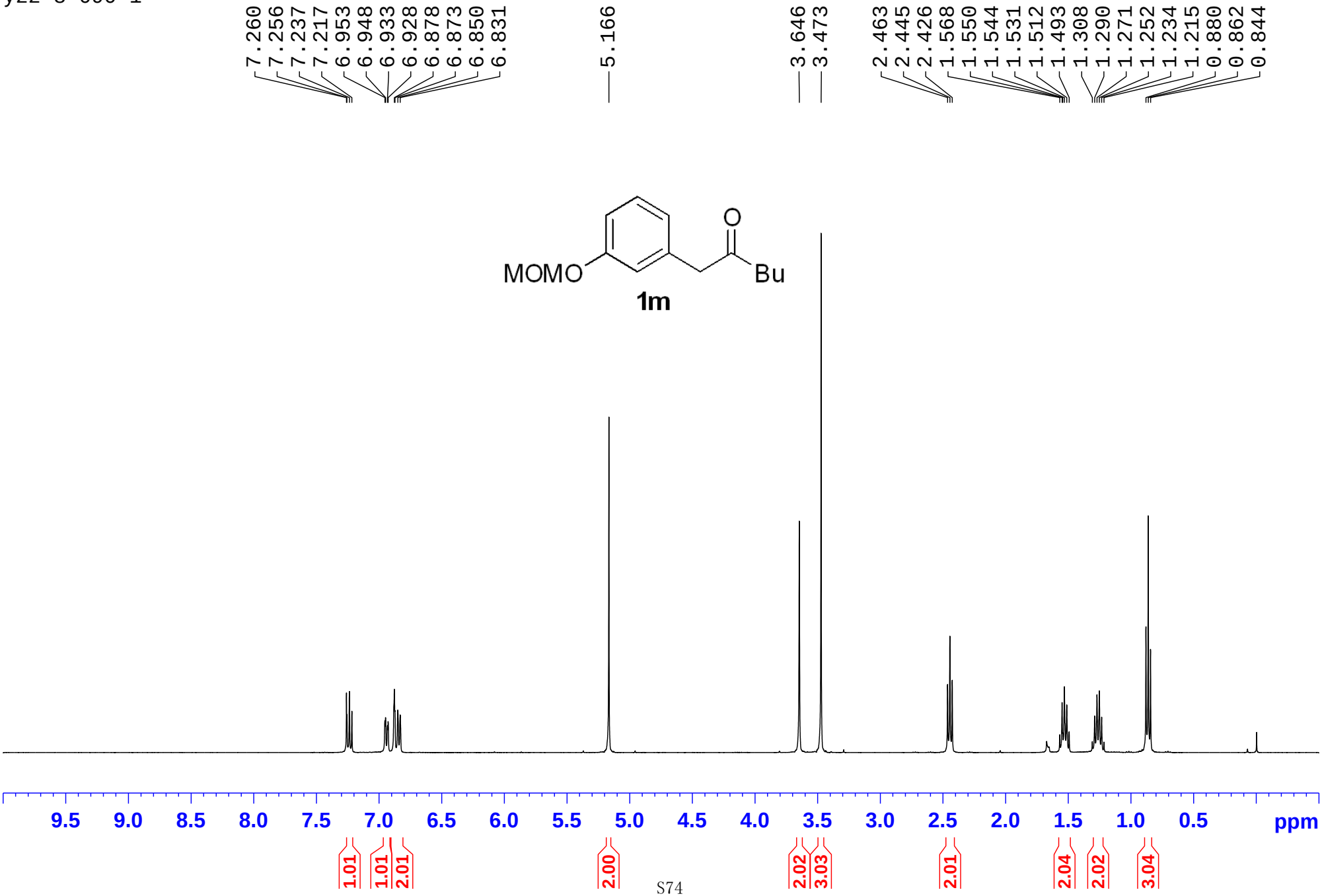
1k




yzz-8-080-p1
7.260
7.193
7.173
7.154
6.804
6.785
6.750
6.745
6.729
6.725
6.696
6.692
3.604
2.438
2.420
2.401
1.601
1.553
1.534
1.529
1.516
1.497
1.478
1.292
1.285
1.274
1.255
1.236
1.217
1.199
0.977
0.871
0.852
0.834
0.188
TBSO
O
Bu
1l
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
1.03
3.02
2.00
2.02
2.03
2.06
9.09
3.06
6.04

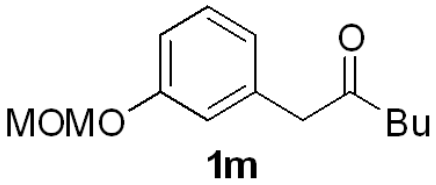

yzz-8-080-p1-c
208.59
155.86
135.78
129.58
122.37
121.19
118.64
77.32
77.00
76.68
50.14
41.49
25.79
25.65
22.20
18.17
13.79
-4.44
TBSO
O
Bu
1l
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-8-090-1

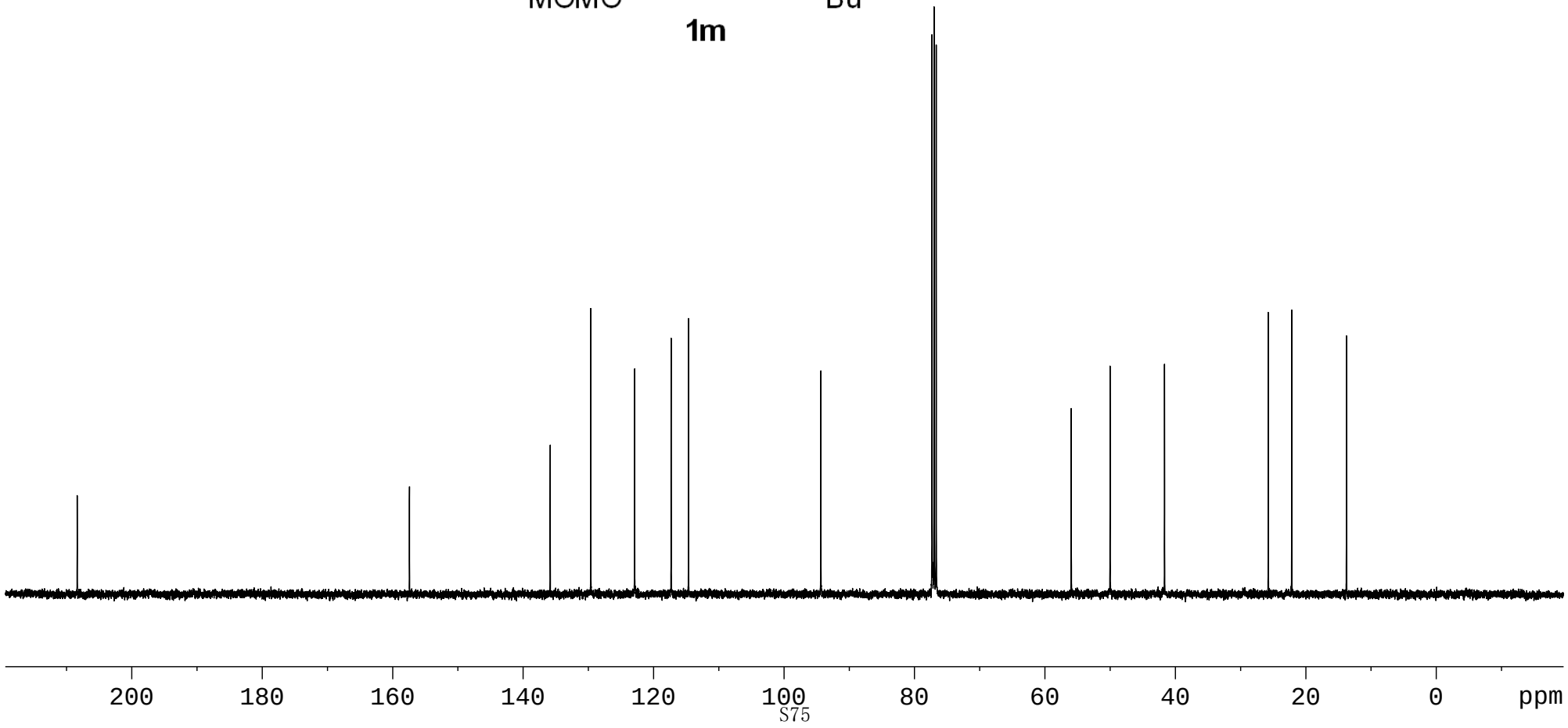

7.260
7.256
7.237
7.217
6.953
6.948
6.933
6.928
6.878
6.873
6.850
6.831
5.166
3.646
3.473
2.463
2.445
2.426
1.568
1.550
1.544
1.531
1.512
1.493
1.308
1.290
1.271
1.252
1.234
1.215
0.880
0.862
0.844
MOMO
O
Bu
1m
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.01
1.01
2.01
2.00
2.02
3.03
2.01
2.04
2.02
3.04

yzz-8-090-1-c

208.38
157.44
135.85
129.64
122.92
117.33
114.66
94.37
77.32
77.00
76.68
55.98
50.02
41.67
25.77
22.18
13.79



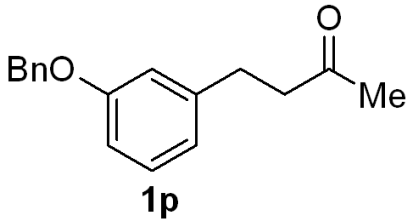
1m



yzz-8-093-1

7.451 7.433 7.412 7.407 7.394 7.390 7.375 7.353 7.350 7.346 7.338 7.332 7.314 7.260 7.227 7.221 7.209 7.205 7.194 7.186 6.831 6.814 6.807 6.787 5.053

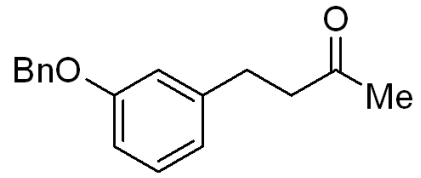
2.897 2.879 2.860 2.775 2.756 2.738 2.142



1p

yzz-8-093-1-c

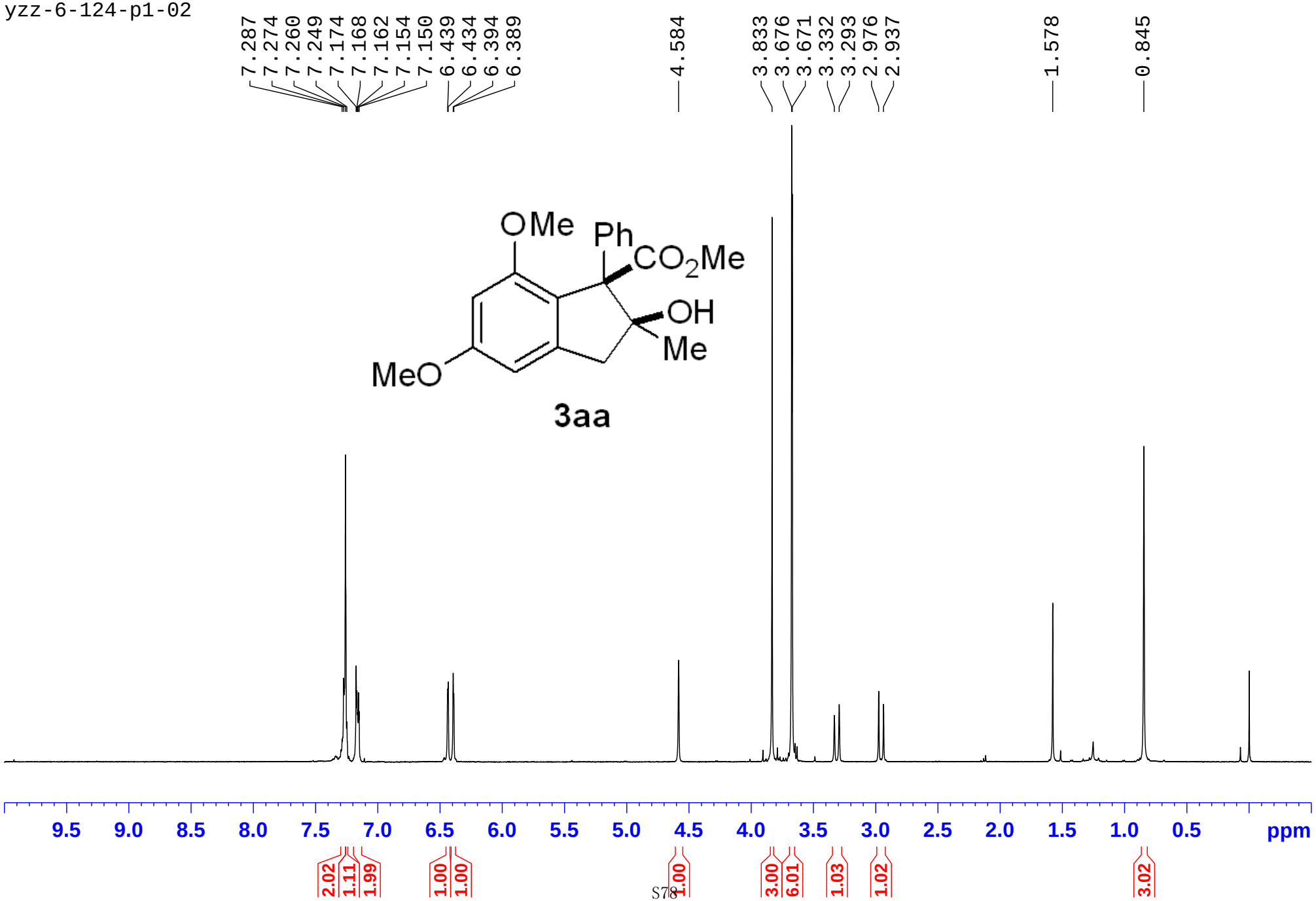
207.88
158.89
142.63
136.98
129.47
128.53
127.90
127.46
120.89
115.00
112.23
77.32
77.00
76.68
69.85
44.98
30.05
29.68



1p

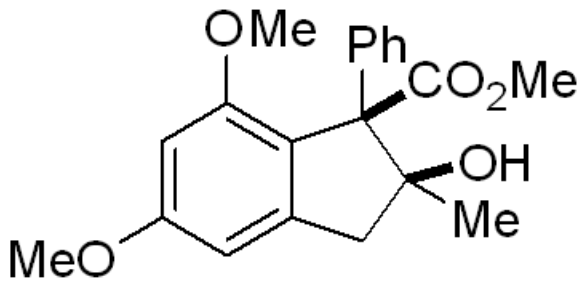
200 180 160 140 120 100 80 60 40 20 0 ppm

yzz-6-124-p1-02



yzz-6-124-1-c

175.16
161.64
158.37
144.80
136.73
128.33
127.24
126.77
120.33
101.51
98.23
84.62
77.32
77.00
76.68
68.24
55.41
55.30
52.31
47.52
25.23



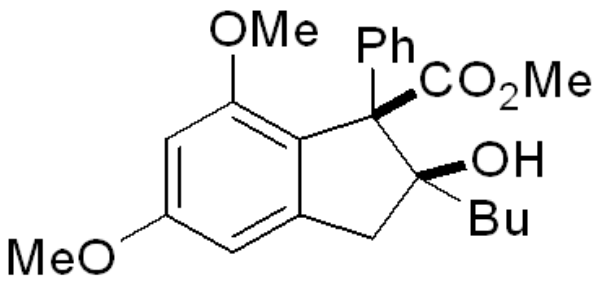
3aa

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

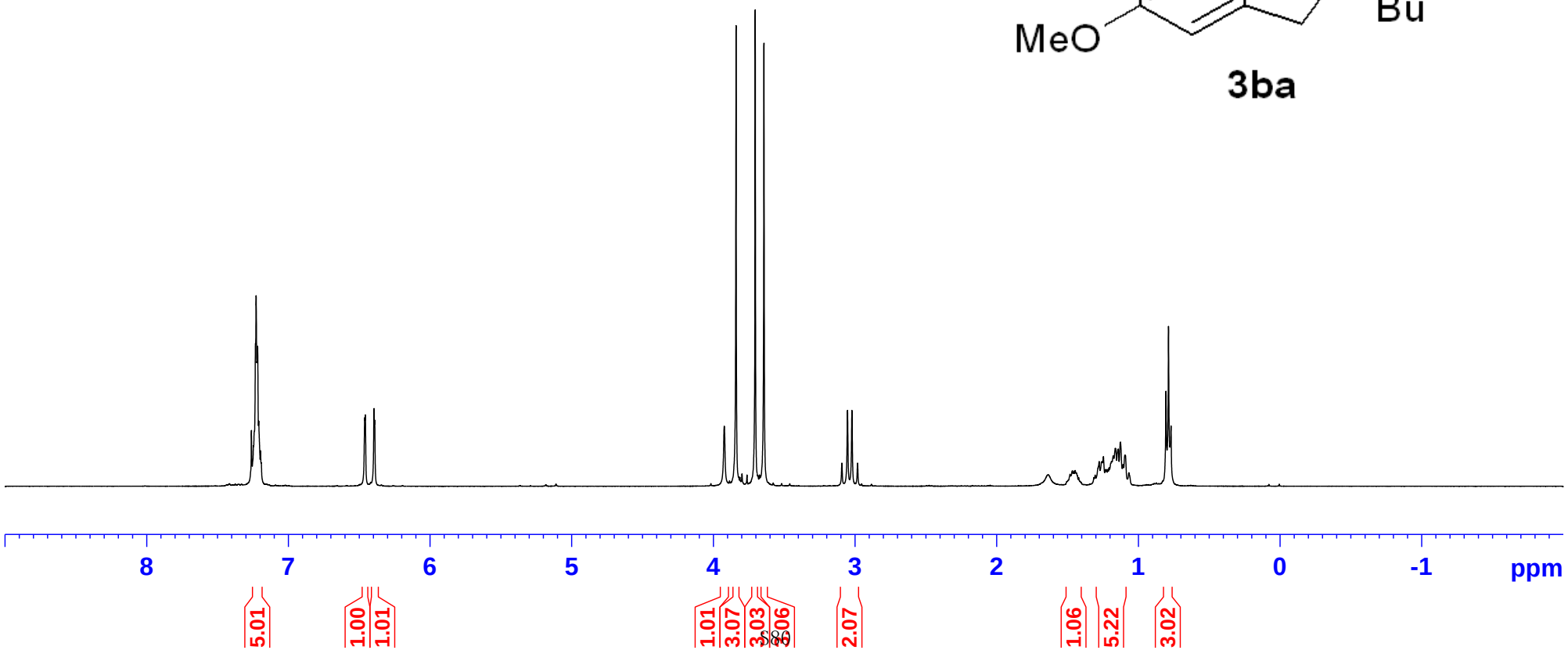
yzz-7-064-1

7.260 7.246 7.232 7.227 7.221 7.216 7.209 7.196 7.191 6.461 6.456 6.395 6.390

3.923 3.840 3.705 3.643 3.093 3.053 3.022 2.982 1.482 1.466 1.460 1.454 1.446 1.440 1.437 1.431 1.421 1.277 1.260 1.256 1.247 1.234 1.230 1.222 1.216 1.207 1.190 1.178 1.163 1.161 1.142 1.128 1.108 1.096 1.091 1.067 0.805 0.787 0.770

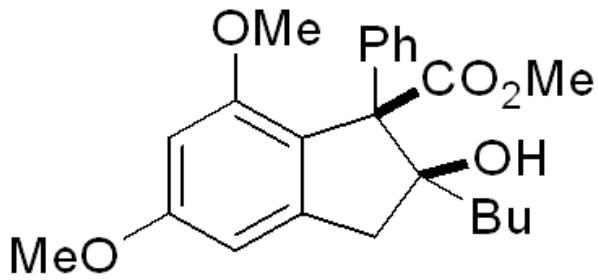


3ba



yzz-7-064-1-c

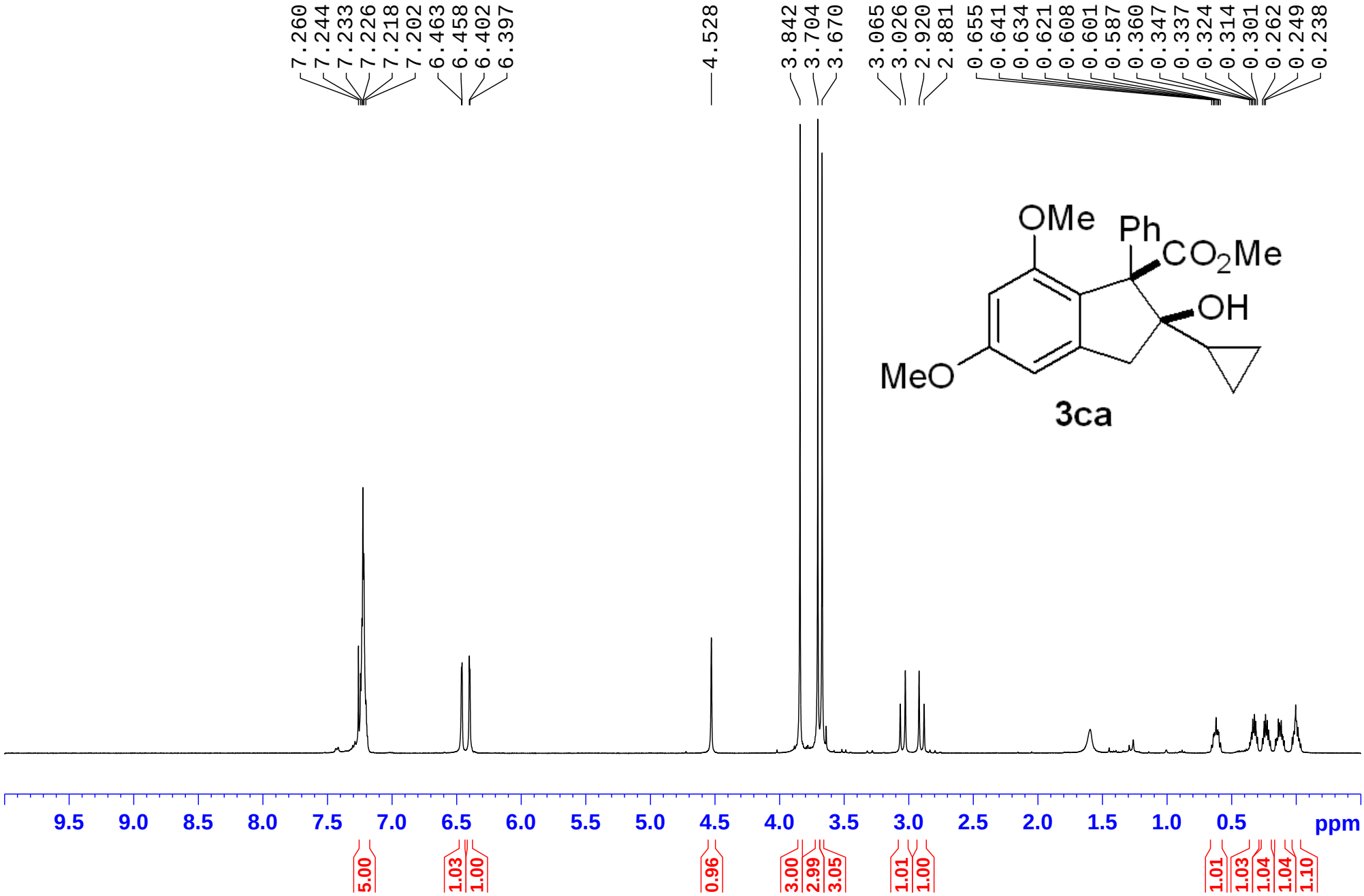
174.25
161.57
158.16
144.32
137.00
128.55
127.35
126.77
122.17
101.33
98.21
87.13
77.32
77.00
76.68
69.30
55.42
55.37
52.15
44.13
36.14
26.17
23.15
14.03

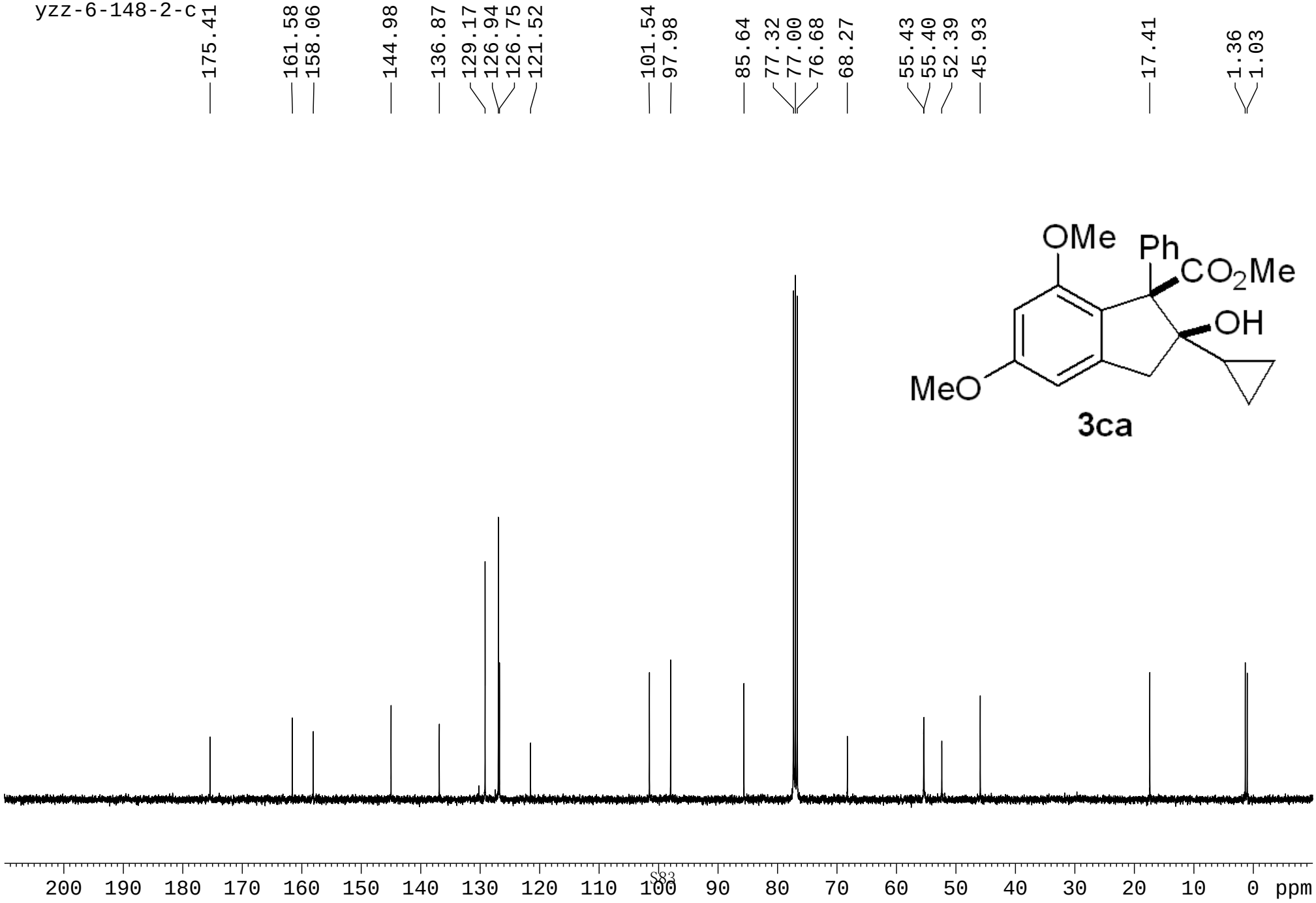


3ba

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

YZZ-6-148-1


7.260
7.244
7.233
7.226
7.218
7.202
6.463
6.458
6.402
6.397
4.528
3.842
3.704
3.670
3.065
3.026
2.920
2.881
0.655
0.641
0.634
0.621
0.608
0.601
0.587
0.360
0.347
0.337
0.324
0.314
0.301
0.262
0.249
0.238
OMe
Ph
CO2Me
OH
MeO
3ca
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
5.00
1.03
1.00
0.96
3.00
2.99
3.05
1.01
1.00
1.01
1.03
1.04
1.04
1.10

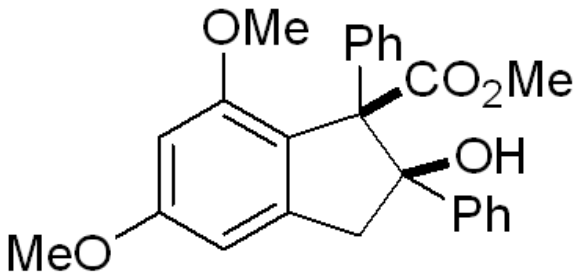

yzz-6-148-2-c
175.41
161.58
158.06
144.98
136.87
129.17
126.94
126.75
121.52
101.54
97.98
85.64
77.32
77.00
76.68
68.27
55.43
55.40
52.39
45.93
17.41
1.36
1.03
OMe
Ph
CO2Me
OH
MeO
3ca
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-7-017-p1-1

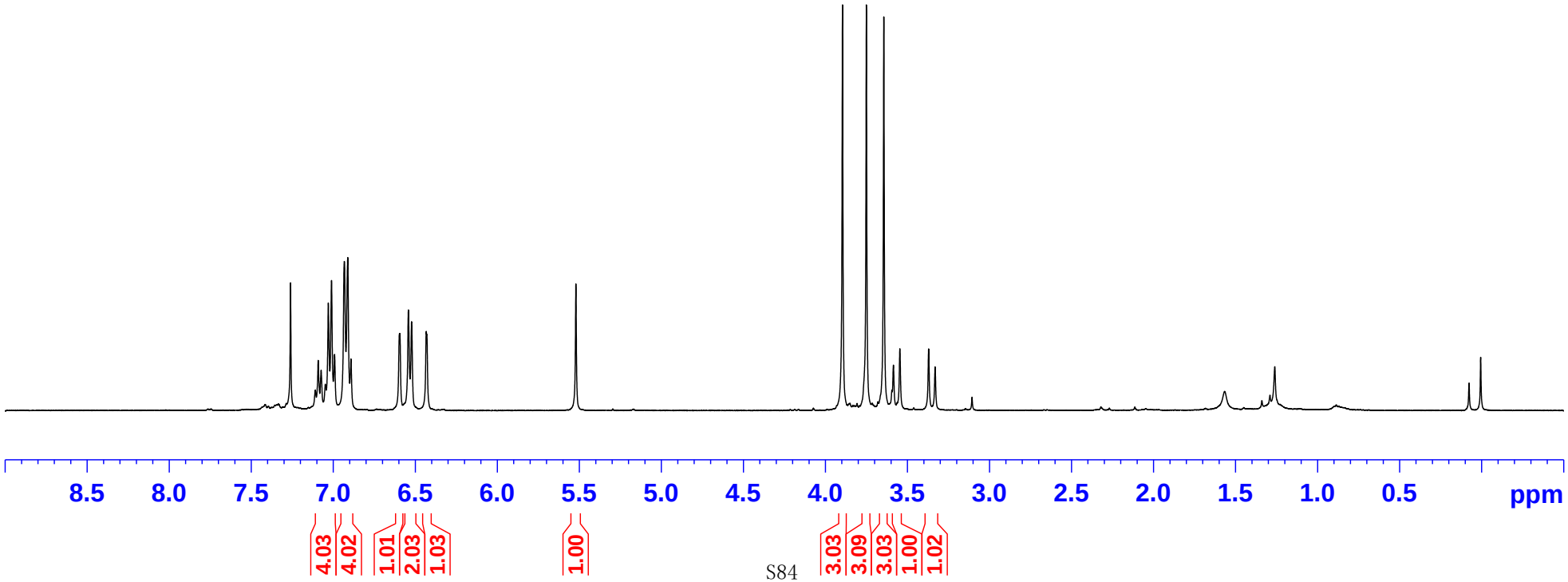
7.260
7.109
7.092
7.074
7.048
7.030
7.010
6.992
6.932
6.911
6.892
6.594
6.542
6.523
6.433
6.430
5.521

3.896
3.751
3.644
3.586
3.546
3.371
3.332

1.567

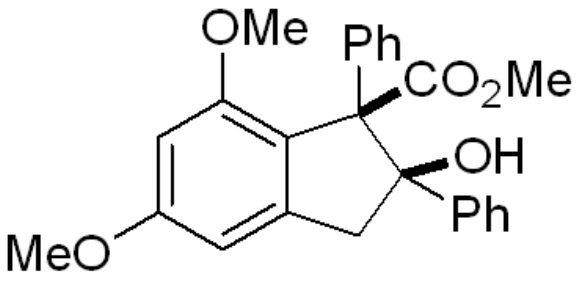


3da



yzz-7-017-p1-c

175.24
161.95
158.25
145.36
141.97
136.27
128.92
127.07
126.98
126.87
126.50
126.45
121.27
101.32
98.17
89.09
77.32
77.00
76.68
69.85
55.53
55.39
52.55
46.11

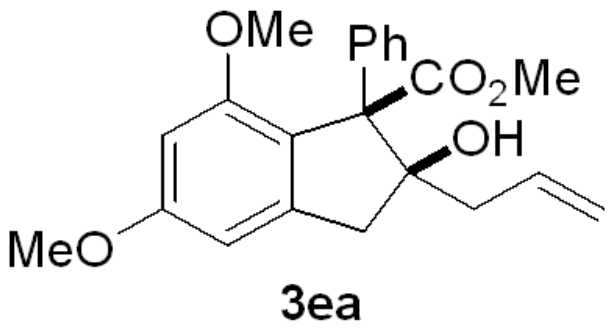


3da

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-7-068-3

7.287
7.275
7.260
7.249
7.211
7.205
7.199
7.191
7.187
6.433
6.429
6.396
6.391
5.886
5.871
5.865
5.860
5.849
5.844
5.824
5.817
5.807
5.803
5.797
5.782
5.059
5.034
4.937
4.894
4.305
4.302
3.833
3.685
3.659
3.156
3.116
3.105
3.065
1.853
1.838
1.818
1.803
1.783
1.762
1.749
1.727
1.602



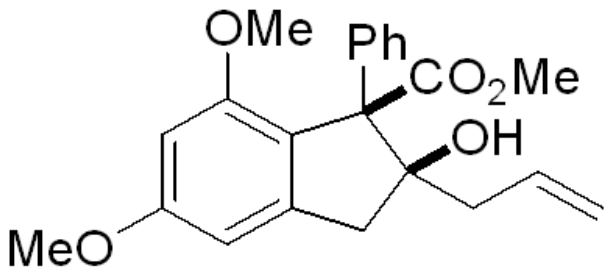
3ea

9 8 7 6 5 4 3 2 1 0 ppm

3.05 2.05 1.01 1.00 1.00 1.01 1.00 0.99 3.09 3.02 3.01 2.03 2.06

yzz-7-068-3-c

174.73
161.64
158.24
144.35
136.42
134.41
128.47
127.43
126.92
120.77
118.11
101.40
98.29
85.91
77.32
77.00
76.68
68.76
55.43
55.33
52.31
43.67
41.34



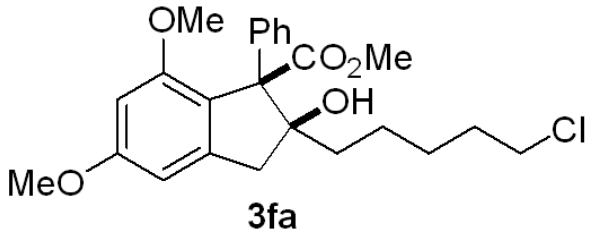
3ea

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

yzz-7-118-p1-01

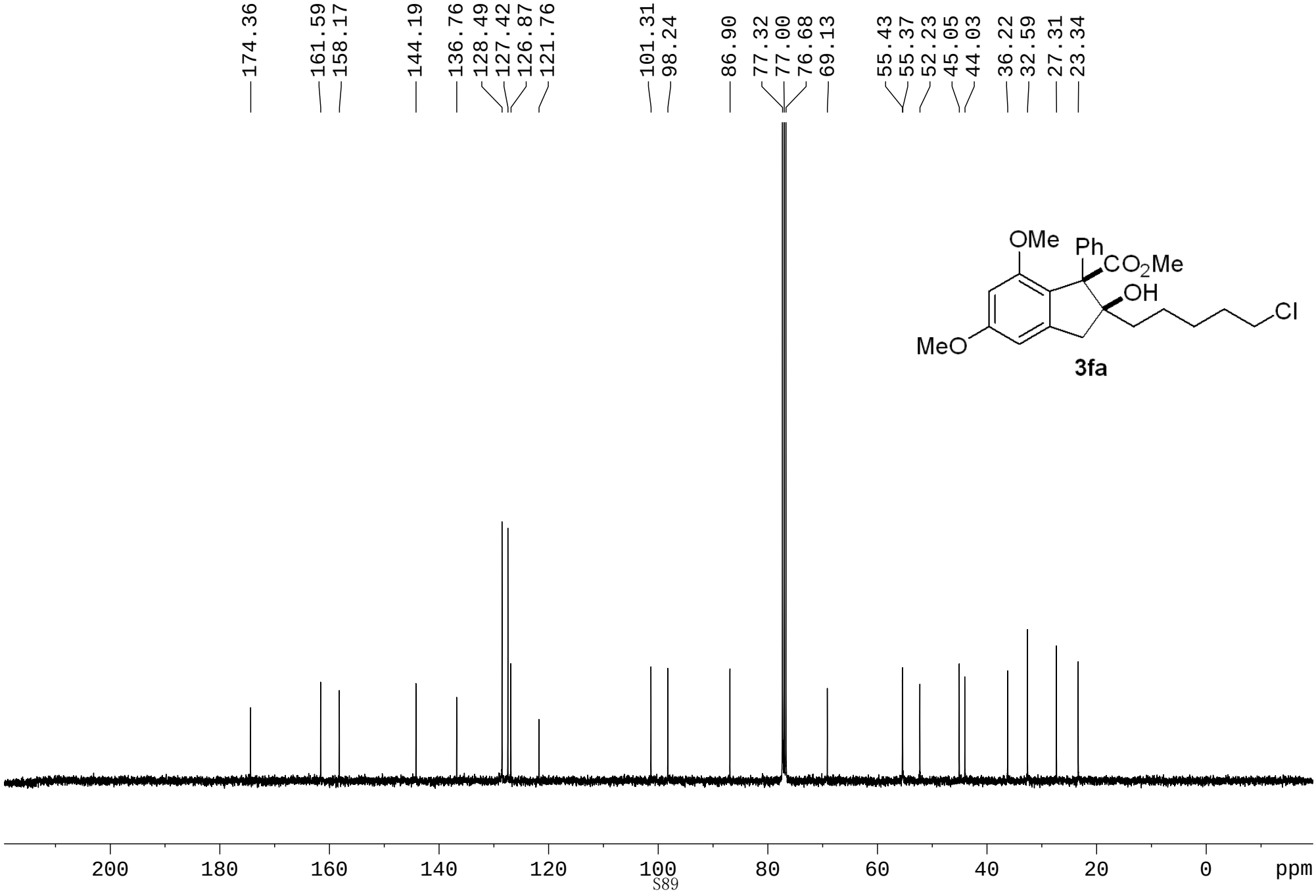
7.260 7.253 7.249 7.240 7.235 7.202 7.194 7.183 7.177 6.457 6.452 6.395 6.390

4.046 4.042 3.841 3.701 3.647 3.467 3.462 3.450 3.445 3.433 3.428 3.103 3.063 3.019 2.980 1.679 1.662 1.644 1.589 1.509 1.495 1.483 1.473 1.466 1.462 1.254 1.250 1.240 1.233 1.125 1.121

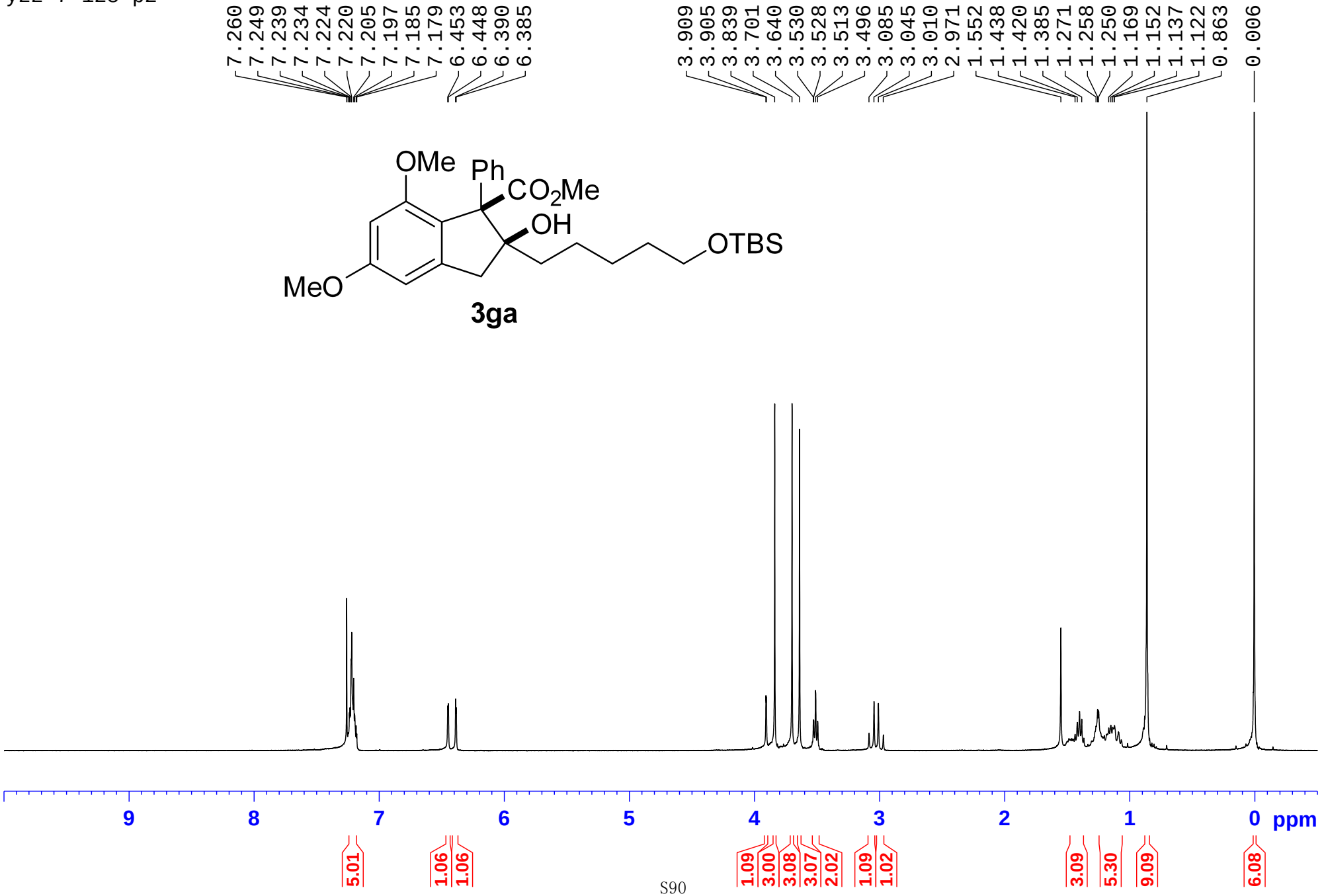


3fa

yzz-7-118-p1-01

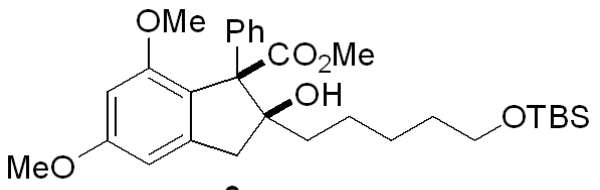


yzz-7-128-p2


7.260
7.249
7.239
7.234
7.224
7.220
7.205
7.197
7.185
7.179
6.453
6.448
6.390
6.385
3.909
3.905
3.839
3.701
3.640
3.530
3.528
3.513
3.496
3.085
3.045
3.010
2.971
1.552
1.438
1.420
1.385
1.271
1.258
1.250
1.169
1.152
1.137
1.122
0.863
0.006
OMe
Ph
CO2Me
OH
OTBS
MeO
3ga
9
8
7
6
5
4
3
2
1
0
ppm
5.01
1.06
1.06
1.09
3.00
3.08
3.07
2.02
1.09
1.02
3.09
5.30
9.09
6.08

yzz-7-128-p2-c

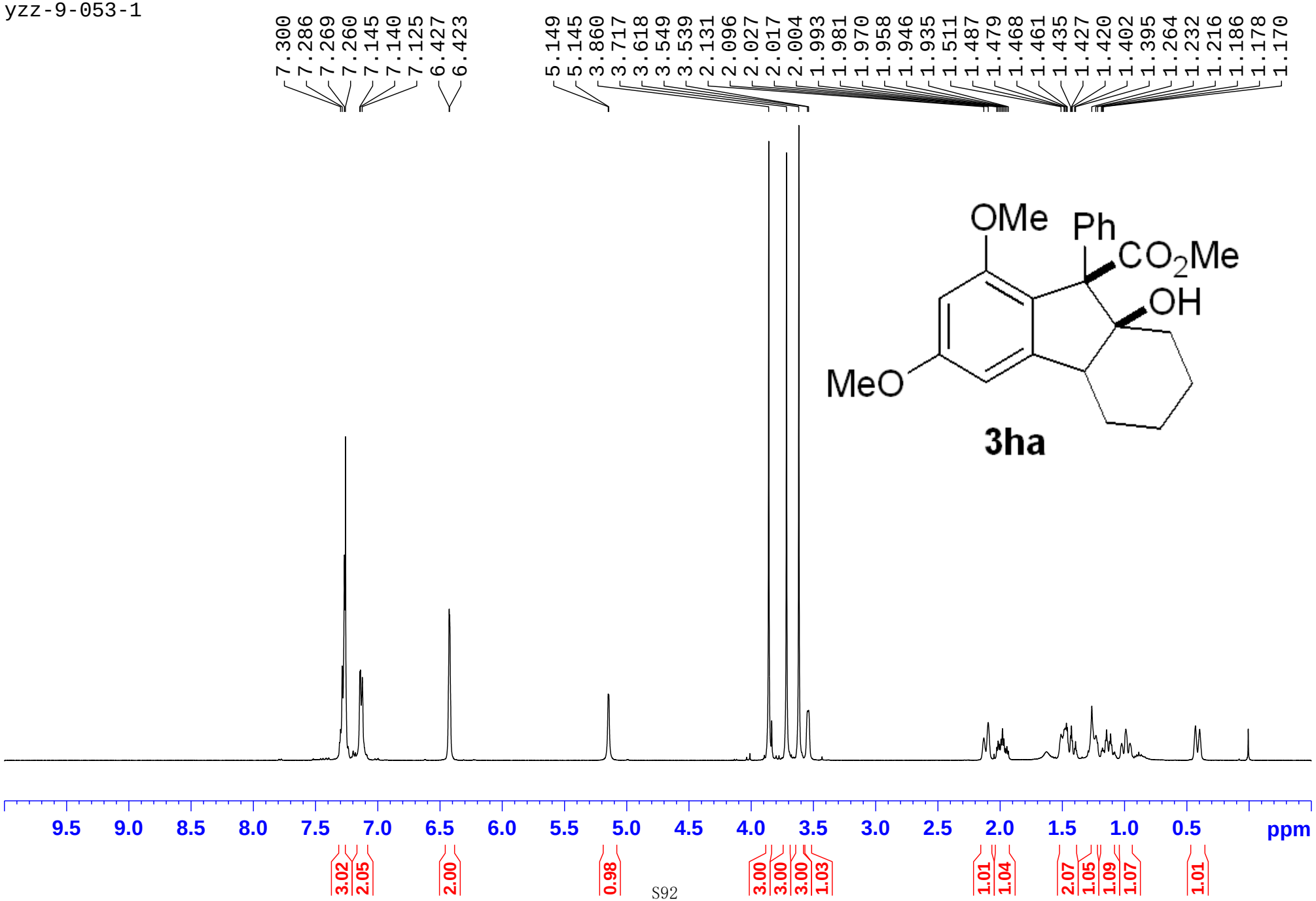
174.28
161.64
158.22
144.33
137.02
128.57
127.39
126.81
122.21
101.41
98.30
87.12
77.32
77.00
76.68
69.35
63.27
55.40
52.15
44.19
36.47
32.89
26.30
25.98
23.86
18.35
-5.27



3ga

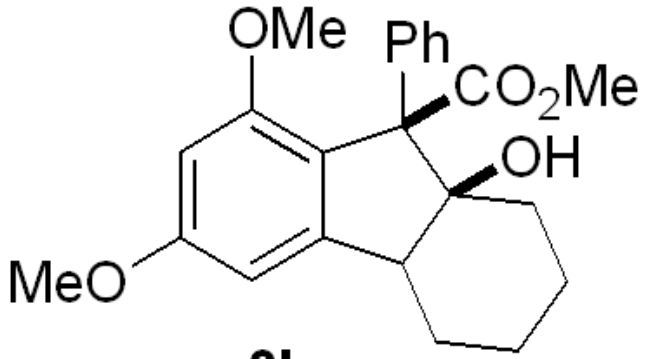
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-9-053-1


7.300
7.286
7.269
7.260
7.145
7.140
7.125
6.427
6.423
5.149
5.145
3.860
3.717
3.618
3.549
3.539
2.131
2.096
2.027
2.017
2.004
1.993
1.981
1.970
1.958
1.946
1.935
1.511
1.487
1.479
1.468
1.461
1.435
1.427
1.420
1.402
1.395
1.264
1.232
1.216
1.186
1.178
1.170
OMe
Ph
CO2Me
OH
MeO
3ha
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
3.02
2.05
2.00
0.98
3.00
3.00
3.00
1.03
1.01
1.04
2.07
1.05
1.09
1.07
1.01

yzz-9-053-1-c

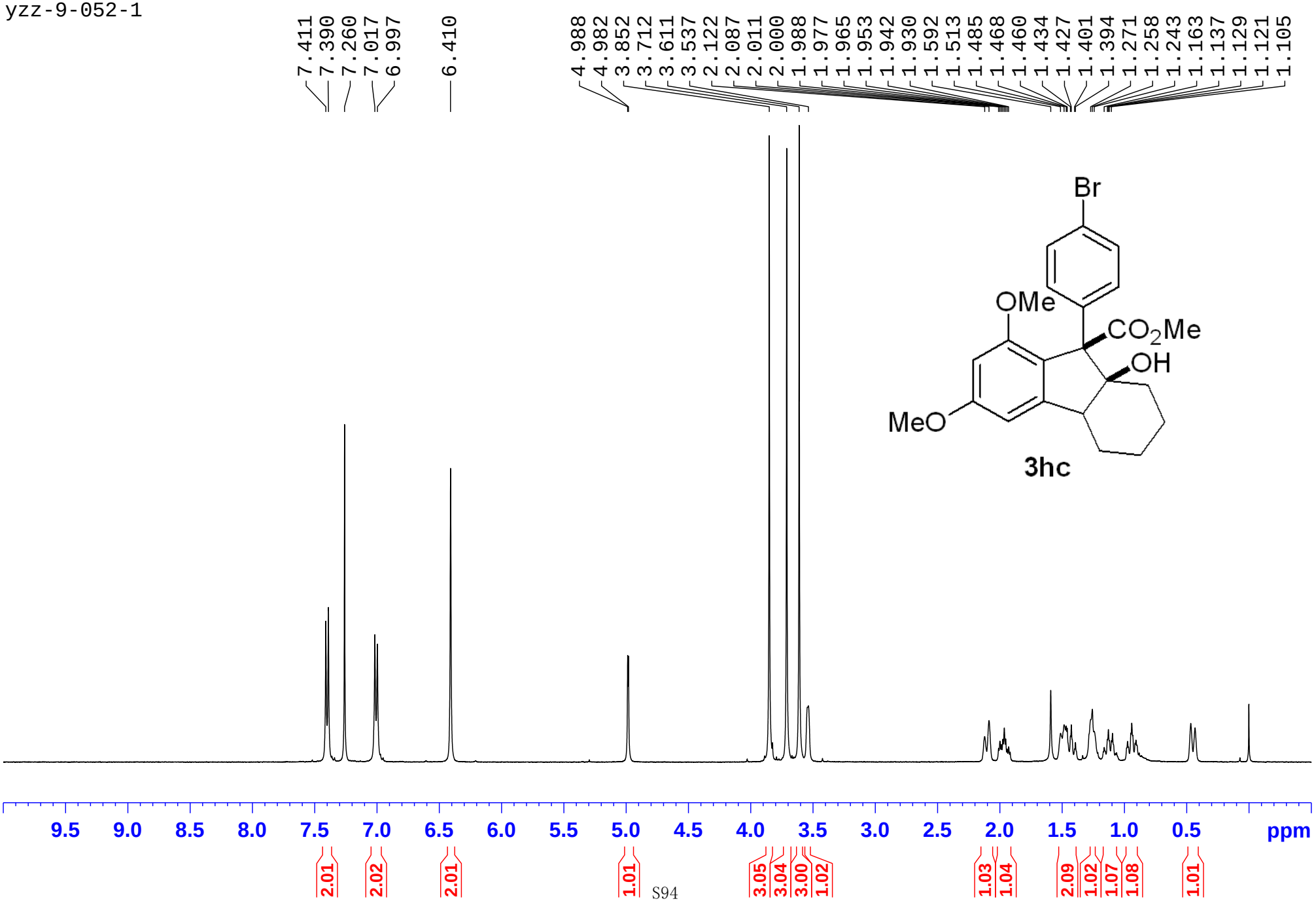
176.02
161.58
158.81
147.99
135.20
128.40
126.97
126.62
118.01
100.06
97.95
84.56
77.32
77.00
76.68
66.81
55.43
55.21
52.42
48.26
31.80
22.52
21.44
21.21



3ha

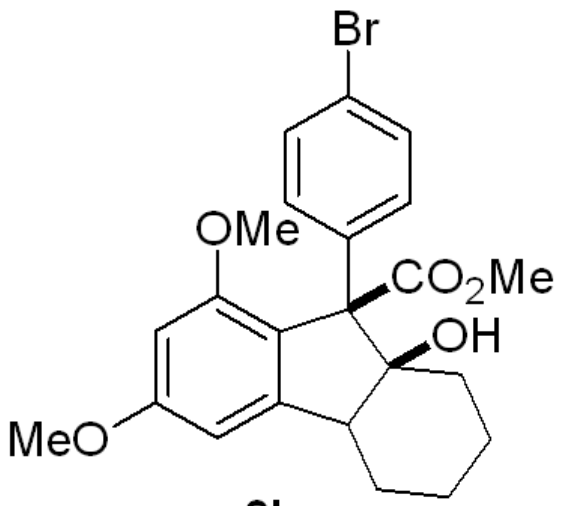
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-9-052-1


7.411
7.390
7.260
7.017
6.997
6.410
4.988
4.982
3.852
3.712
3.611
3.537
2.122
2.087
2.011
2.000
1.988
1.977
1.965
1.953
1.942
1.930
1.592
1.513
1.485
1.468
1.460
1.434
1.427
1.401
1.394
1.271
1.258
1.243
1.163
1.137
1.129
1.121
1.105
Br
OMe
CO2Me
OH
MeO
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
2.01
2.02
2.01
1.01
3.05
3.04
3.00
1.02
1.03
1.04
2.09
1.02
1.07
1.08
1.01

yzz-9-052-1-c

175.49
161.76
158.61
147.98
134.52
130.24
130.10
120.74
117.52
100.17
97.94
84.51
77.32
77.00
76.68
66.52
55.47
55.18
52.51
48.25
31.90
22.51
21.42
21.16

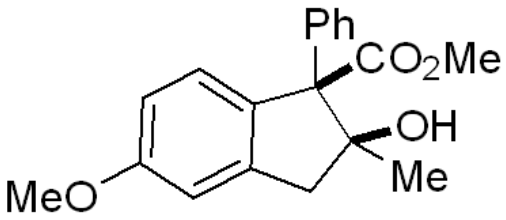


3hc

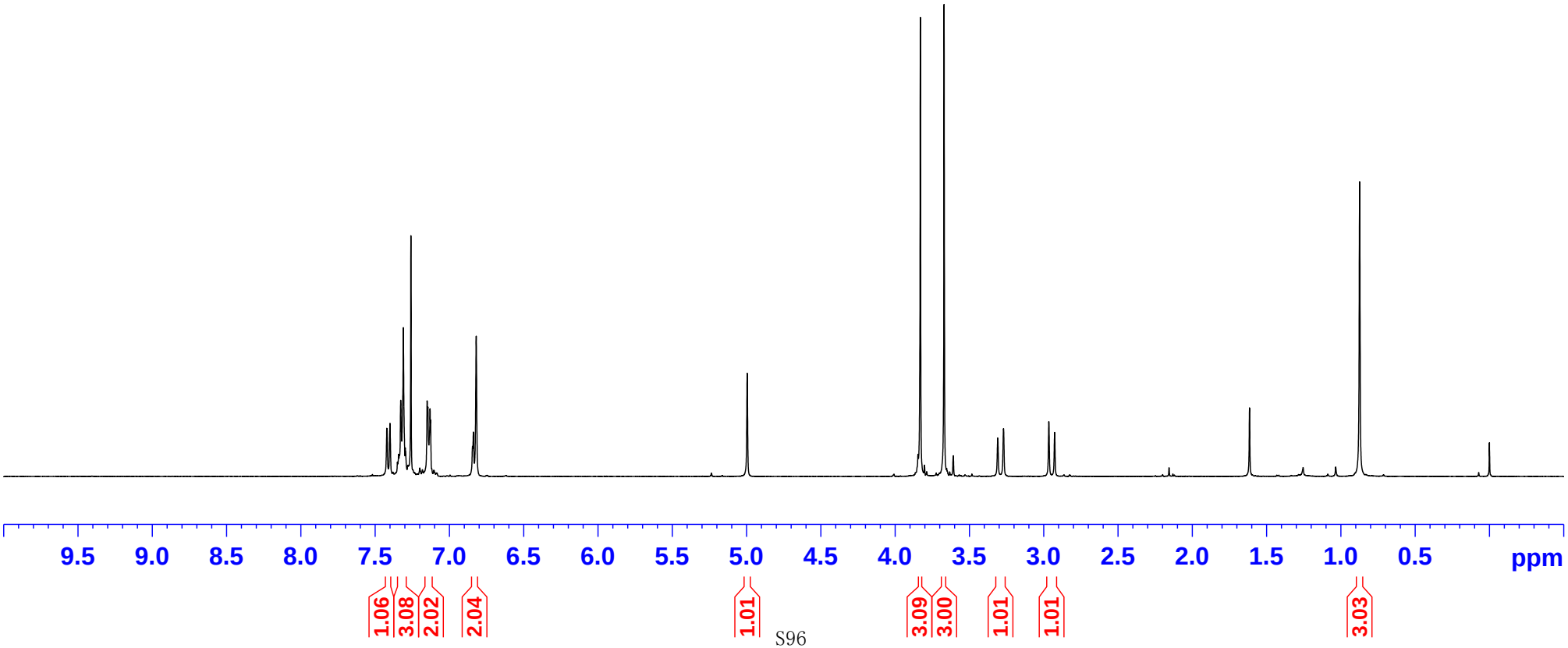
200 180 160 140 120 100 80 60 40 20 0 ppm

yzz-8-044-p1-1

7.422
7.400
7.328
7.311
7.298
7.260
7.151
7.146
7.131
7.127
6.845
6.839
6.820
4.996
3.831
3.671
3.310
3.271
2.966
2.927
1.615
0.874

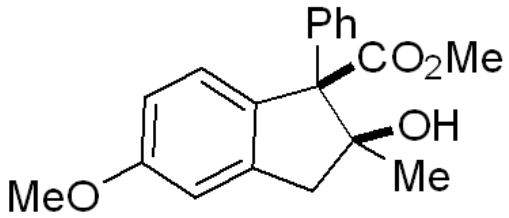


3ia



YZZ-8-044-P1-1-C

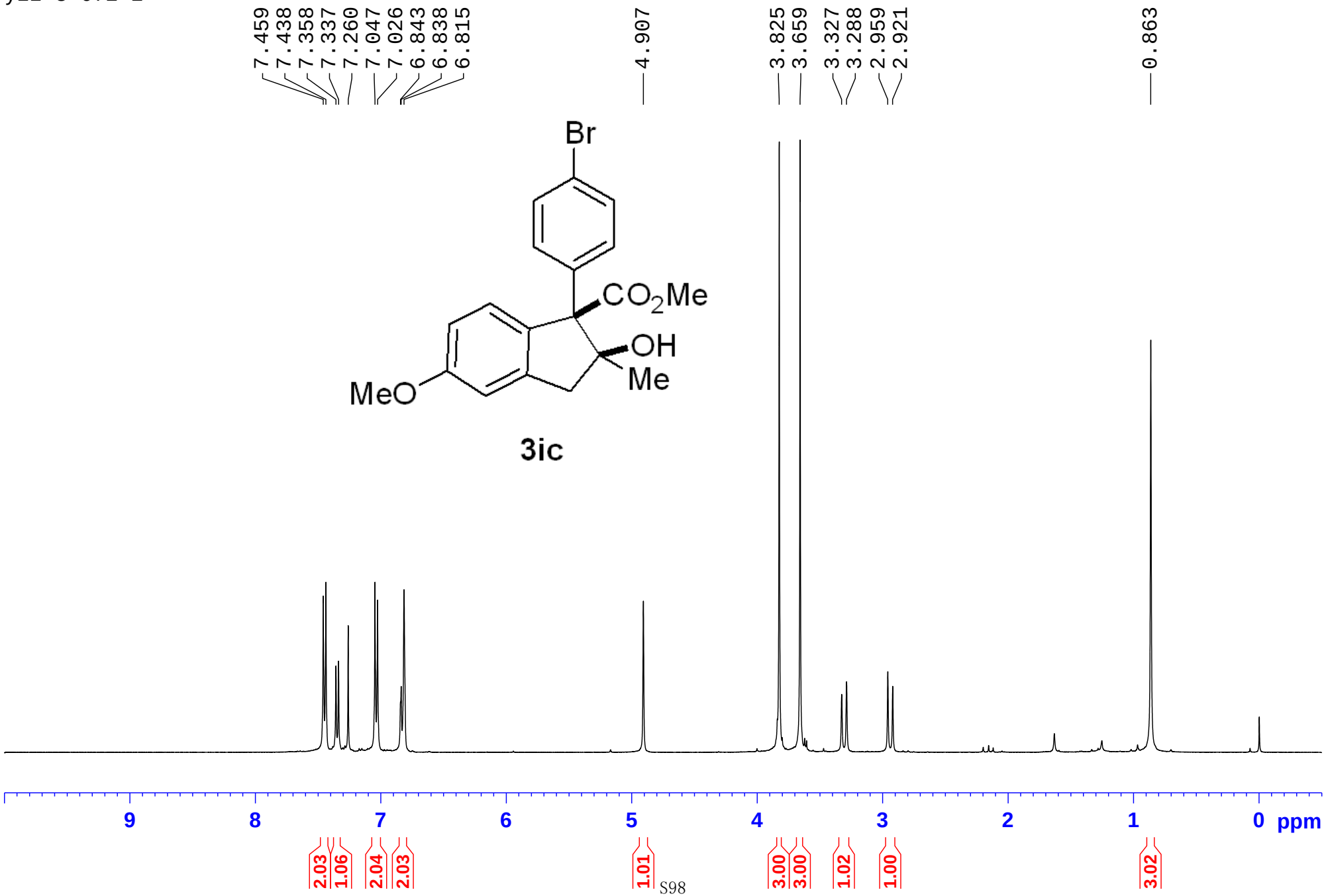
175.75
159.88
144.00
138.47
132.08
128.68
128.17
127.52
127.28
113.10
109.96
84.16
77.32
77.00
76.68
68.43
55.34
52.48
46.28
25.41



3ia

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

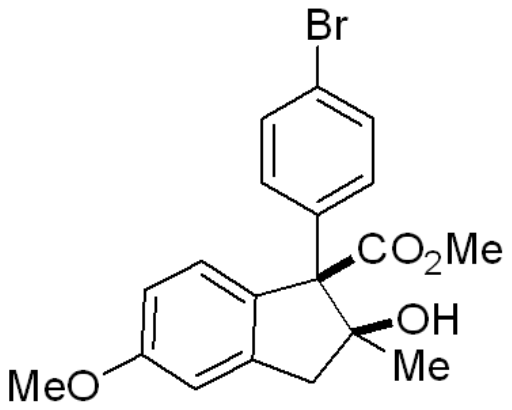
yzz-8-072-2



3ic

yzz-8-072-2-c

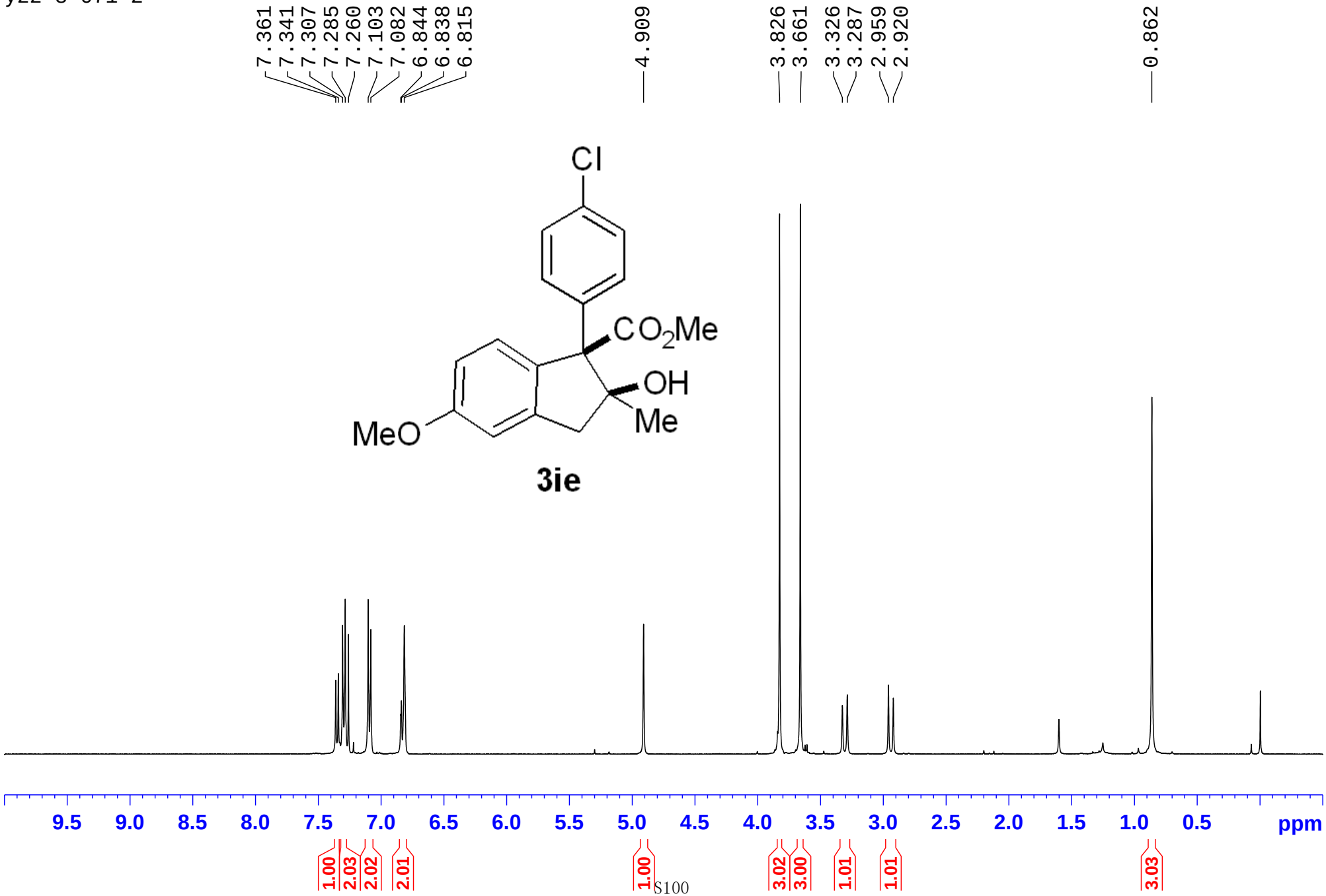
175.26
160.02
143.94
137.57
131.51
131.28
129.30
128.49
121.36
113.26
110.07
84.02
77.32
77.00
76.68
68.01
55.35
52.59
46.31
25.44



3ic

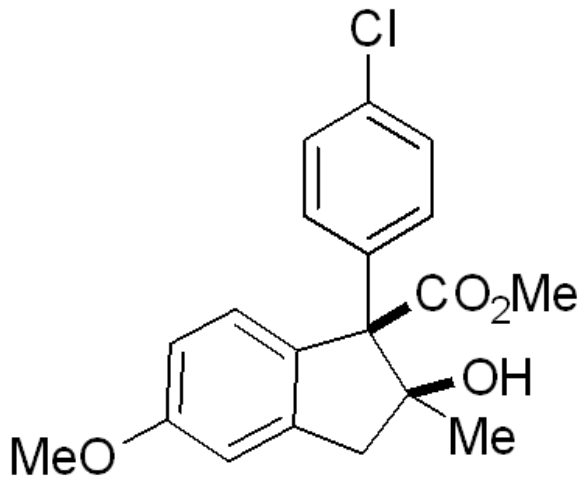
200 180 160 140 120 100 80 60 40 20 0 ppm

yzz-8-071-2


7.361
7.341
7.307
7.285
7.260
7.103
7.082
6.844
6.838
6.815
4.909
3.826
3.661
3.326
3.287
2.959
2.920
0.862
Cl
CO2Me
OH
Me
MeO
3ie
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
1.00
2.03
2.02
2.01
1.00
3.02
3.00
1.01
1.01
3.03

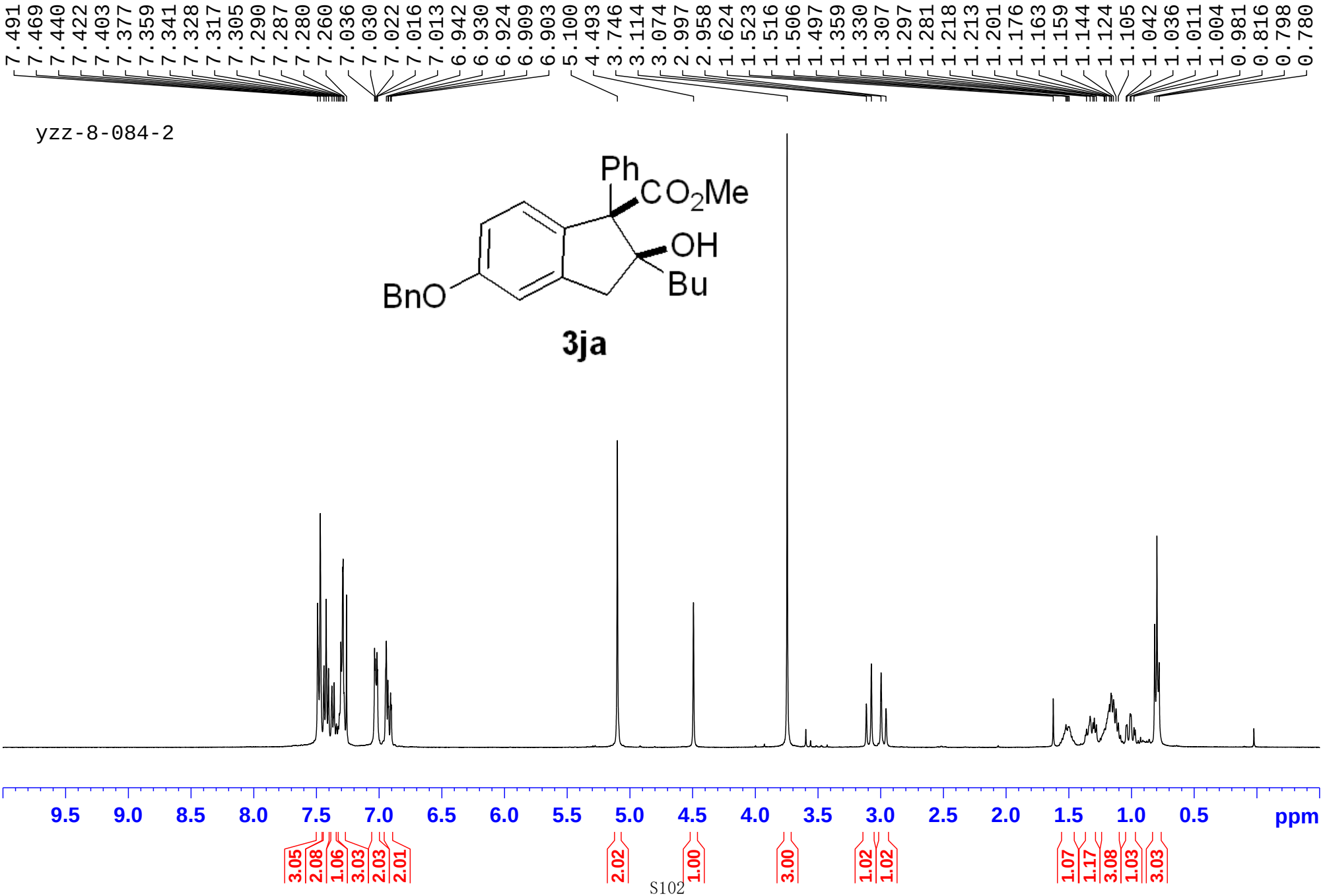
yzz-8-071-2-c

175.34
160.02
143.95
137.04
133.20
131.60
128.95
128.51
128.34
113.26
110.08
84.08
77.32
77.00
76.68
67.95
55.36
52.59
46.31
25.43



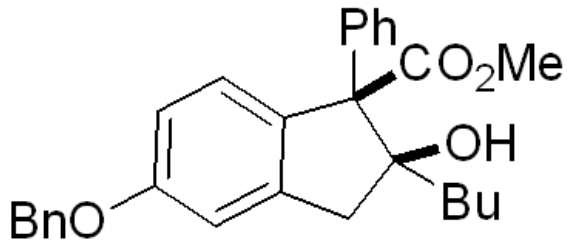
3ie

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


7.491
7.469
7.440
7.422
7.403
7.377
7.359
7.341
7.328
7.317
7.305
7.290
7.287
7.280
7.260
7.036
7.030
7.022
7.016
7.013
6.942
6.930
6.924
6.909
6.903
5.100
4.493
3.746
3.114
3.074
2.997
2.958
1.624
1.523
1.516
1.506
1.497
1.359
1.330
1.307
1.297
1.281
1.218
1.213
1.201
1.176
1.163
1.159
1.144
1.124
1.105
1.042
1.036
1.011
1.004
0.981
0.816
0.798
0.780
yzz-8-084-2
Ph
CO2Me
OH
Bu
BnO
3ja
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
3.05
2.08
1.06
3.03
2.03
2.01
2.02
1.00
3.00
1.02
1.02
1.07
1.17
3.08
1.03
3.03

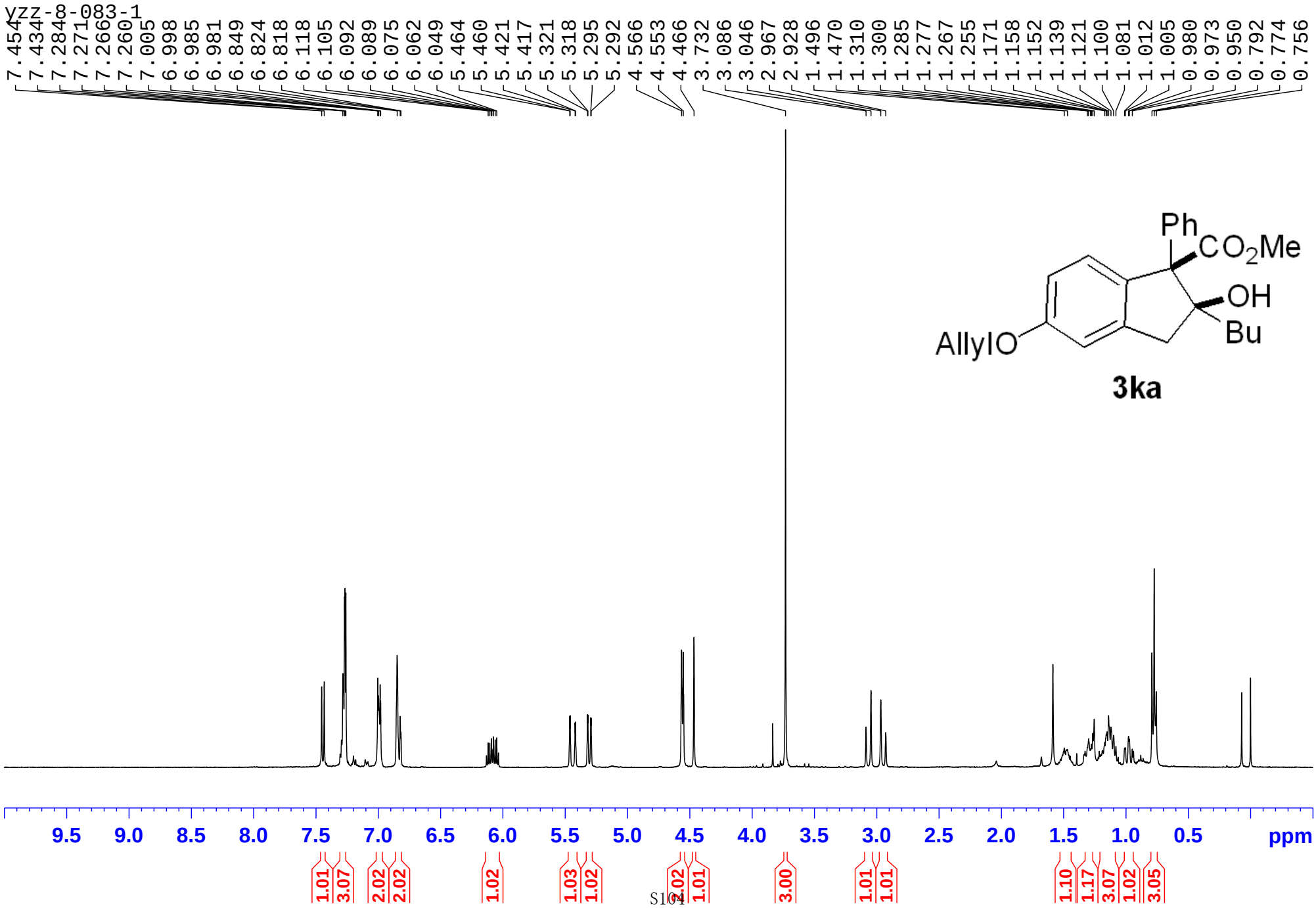
yzz-8-084-2-c

175.46
159.08
144.17
138.94
136.95
133.23
128.57
128.33
128.17
127.97
127.54
127.49
127.21
113.77
110.99
86.49
77.32
77.00
76.68
70.09
70.03
52.39
42.28
36.69
26.01
23.16
14.05

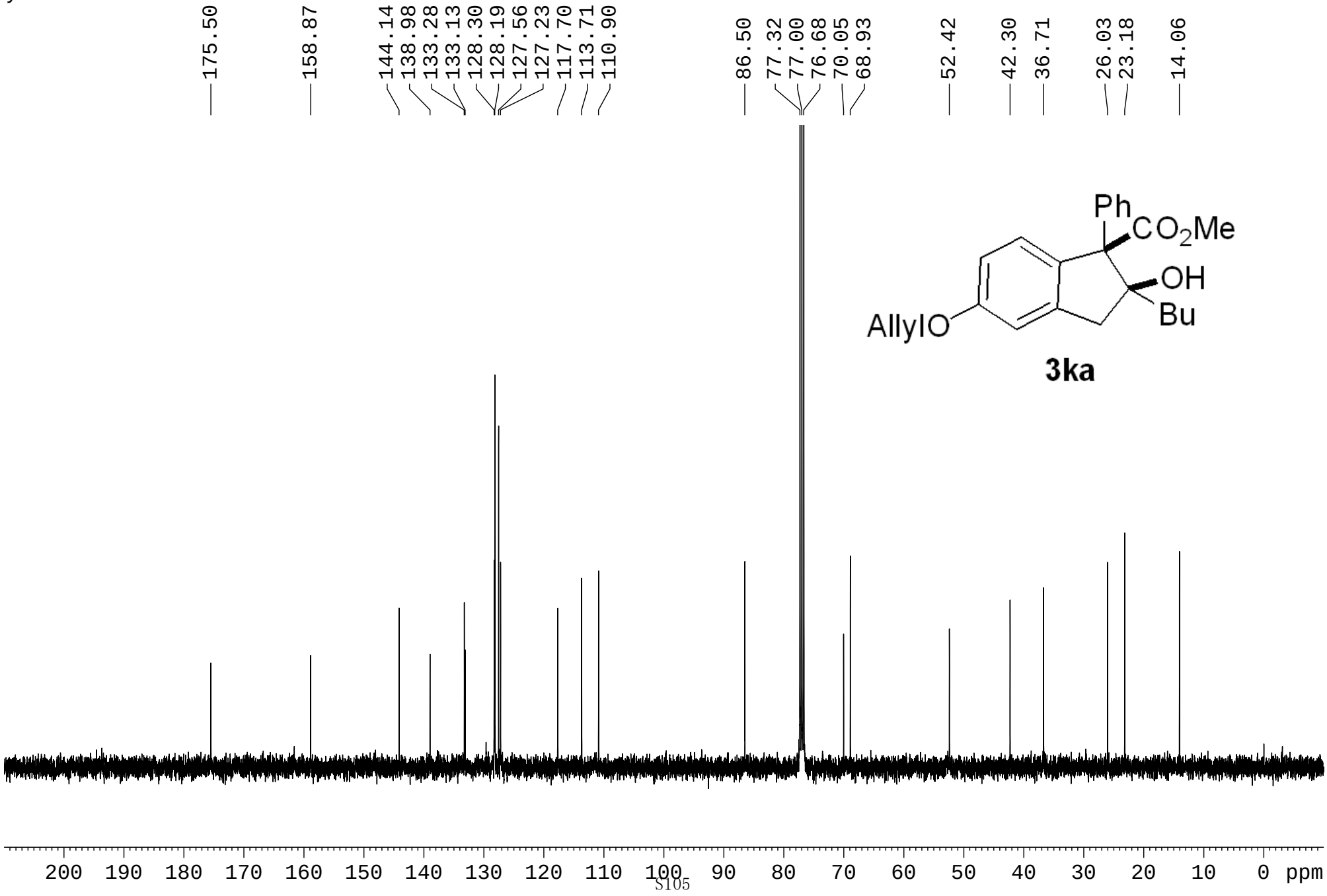


3ja

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

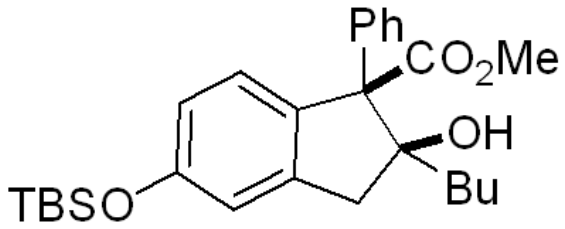

yzz-8-083-1
7.454 7.434 7.284 7.271 7.266 7.260 7.005 6.998 6.985 6.981 6.849 6.824 6.818 6.118 6.105 6.092 6.089 6.075 6.062 6.049 5.464 5.460 5.421 5.417 5.321 5.318 5.295 5.292 4.566 4.553 4.466 3.732 3.086 3.046 2.967 2.928 1.496 1.470 1.310 1.300 1.285 1.277 1.267 1.255 1.171 1.158 1.152 1.139 1.121 1.100 1.081 1.012 1.005 0.980 0.973 0.950 0.792 0.774 0.756
Ph
CO2Me
OH
Bu
AllylO
3ka
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
1.01 3.07 2.02 2.02 1.02 1.03 1.02 2.02 1.01 3.00 1.01 1.01 1.10 1.17 3.07 1.02 3.05

yzz-8-083-1-c


175.50
158.87
144.14
138.98
133.28
133.13
128.30
128.19
127.56
127.23
117.70
113.71
110.90
86.50
77.32
77.00
76.68
70.05
68.93
52.42
42.30
36.71
26.03
23.18
14.06
Ph
CO2Me
OH
Bu
AllylO
3ka
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-8-085-1-h

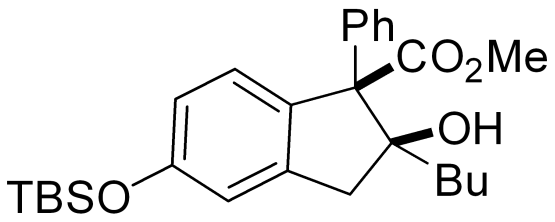
7.425 7.404 7.311 7.300 7.295 7.287 7.283 7.017 7.010 7.006 6.997 6.993 6.797 6.792 6.777 6.771 6.756 6.750 4.477 3.759 3.087 3.047 2.959 2.919 1.617 1.517 1.509 1.499 1.486 1.361 1.344 1.333 1.329 1.319 1.311 1.300 1.282 1.210 1.205 1.195 1.182 1.178 1.163 1.146 1.125 1.105 1.053 1.028 1.021 0.994 0.987 0.963 0.953 0.816 0.798 0.780 0.255 0.027



3la

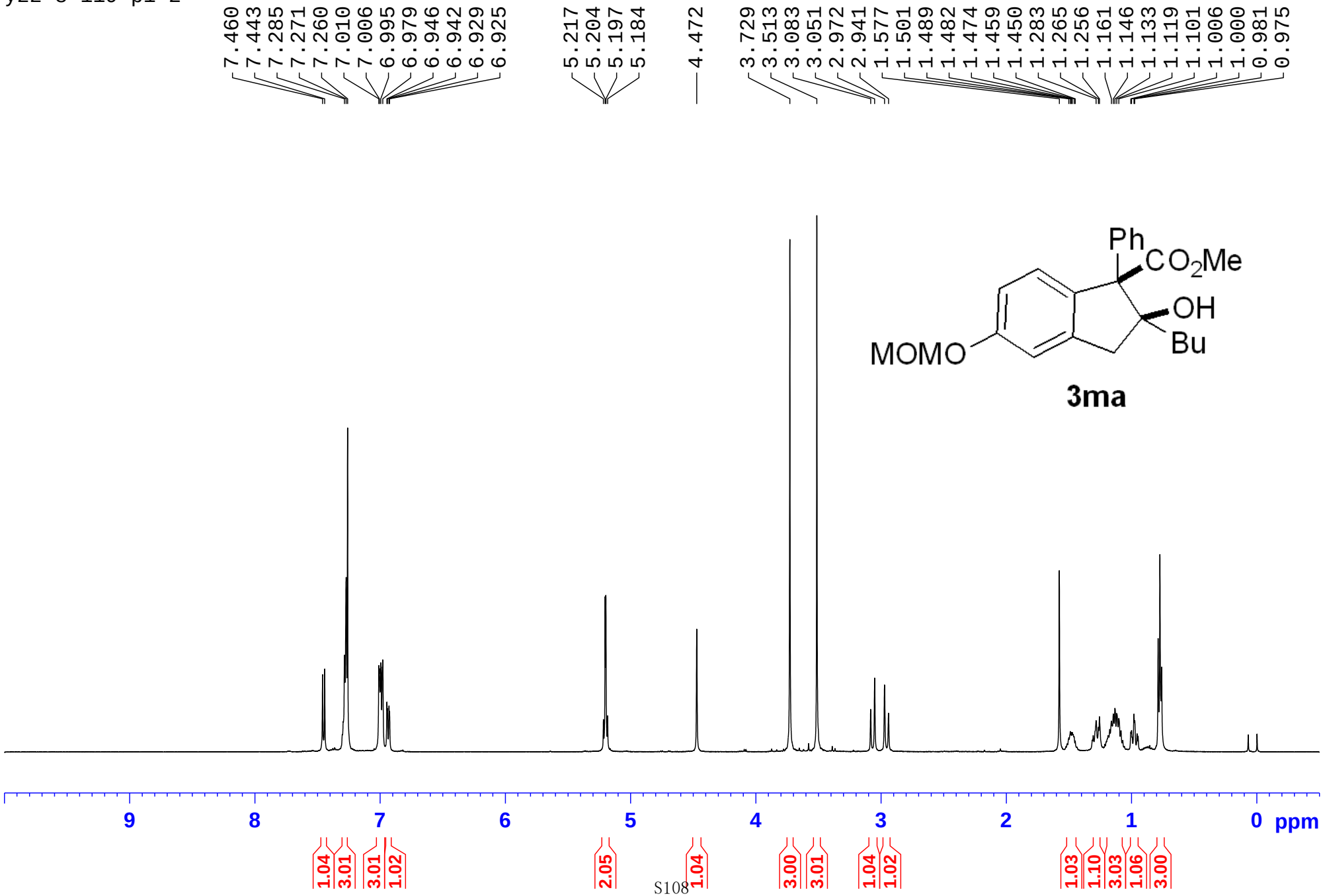
yzz-8-085-1-c

175.53
155.74
144.08
139.07
133.56
128.24
128.16
127.56
127.20
118.71
116.37
86.47
77.32
77.00
76.68
70.09
52.39
42.17
36.76
26.04
25.64
23.18
18.14
14.05
-4.39



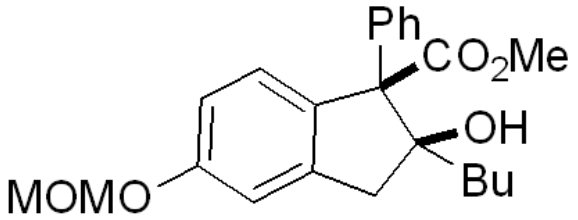
3la

yzz-8-119-p1-2


7.460
7.443
7.285
7.271
7.260
7.010
7.006
6.995
6.979
6.946
6.942
6.929
6.925
5.217
5.204
5.197
5.184
4.472
3.729
3.513
3.083
3.051
2.972
2.941
1.577
1.501
1.489
1.482
1.474
1.459
1.450
1.283
1.265
1.256
1.161
1.146
1.133
1.119
1.101
1.006
1.000
0.981
0.975
Ph
CO2Me
OH
Bu
MOMO
3ma
9
8
7
6
5
4
3
2
1
0
ppm
1.04
3.01
3.01
1.02
2.05
1.04
3.00
3.01
1.04
1.02
1.03
1.10
3.03
1.06
3.00

yzz-8-119-p1-2-c

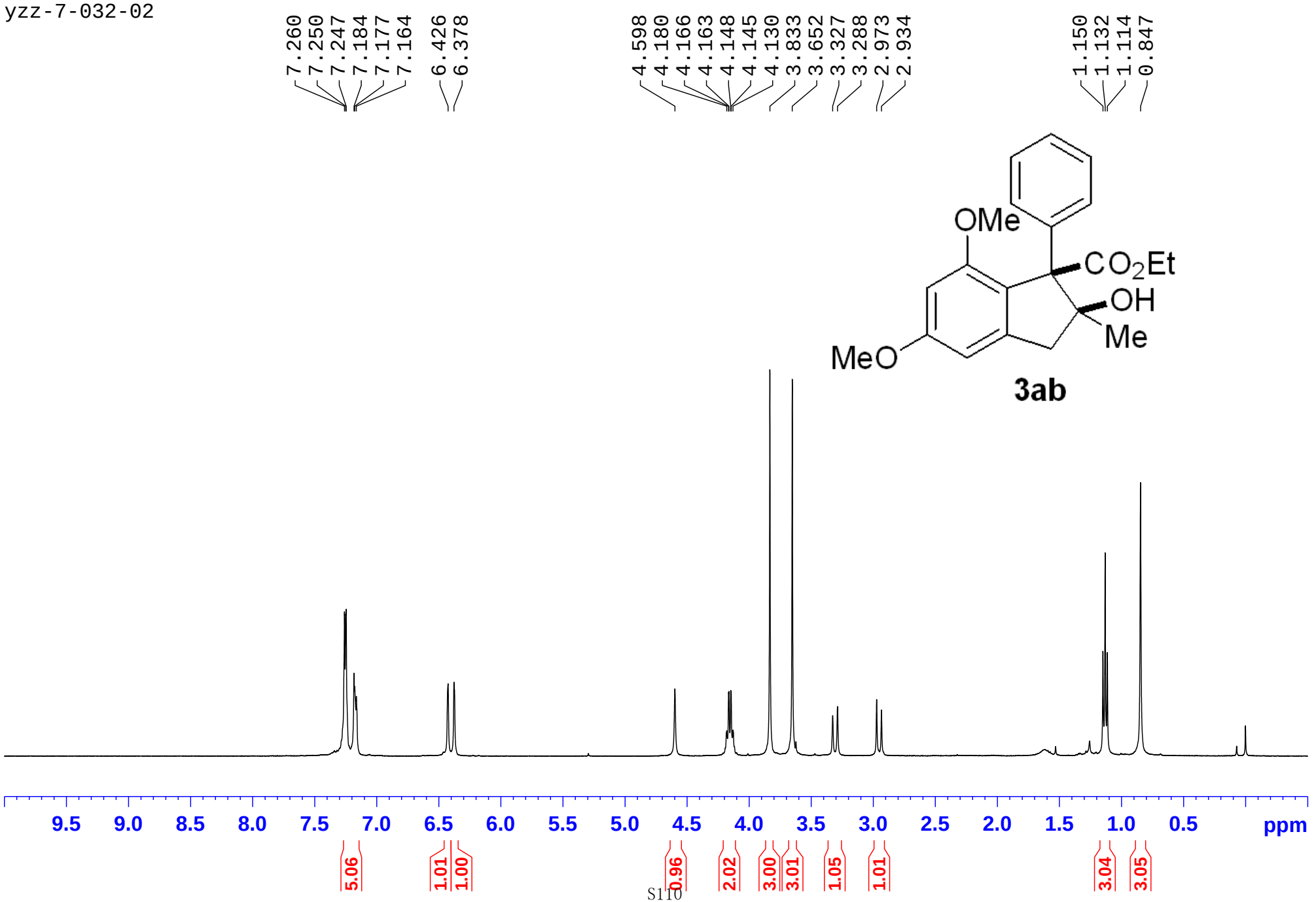
175.45
157.48
144.19
138.85
134.20
128.38
128.20
127.58
127.25
115.12
112.51
94.51
86.52
77.25
77.00
76.75
70.09
56.08
52.44
42.25
36.69
26.00
23.18
14.07



3ma

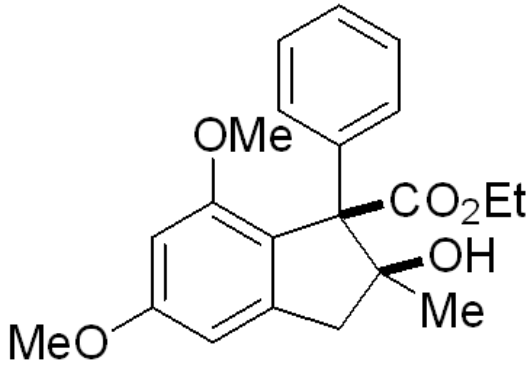
220 200 180 160 140 120 100 80 60 40 20 0 ppm

yzz-7-032-02


7.260
7.250
7.247
7.184
7.177
7.164
6.426
6.378
4.598
4.180
4.166
4.163
4.148
4.145
4.130
3.833
3.652
3.327
3.288
2.973
2.934
1.150
1.132
1.114
0.847
OMe
CO2Et
OH
Me
MeO
3ab
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
5.06
1.01
1.00
0.96
2.02
3.00
3.01
1.05
1.01
3.04
3.05

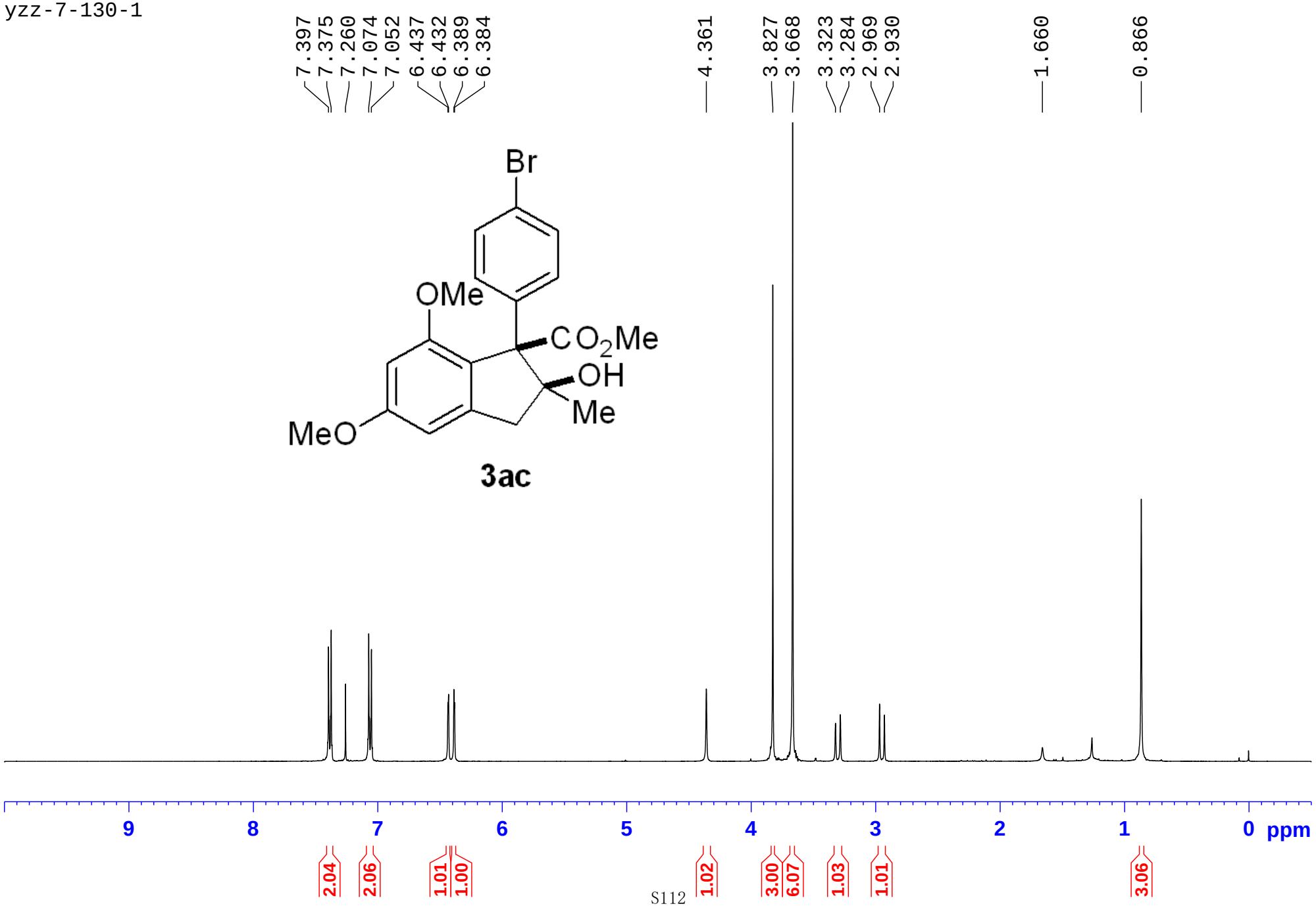
yzz-7-032-02-c

174.60
161.56
158.38
144.81
136.91
128.38
127.14
126.61
120.38
101.27
97.98
84.49
77.32
77.00
76.68
68.30
61.00
55.41
55.00
47.60
25.33
13.86



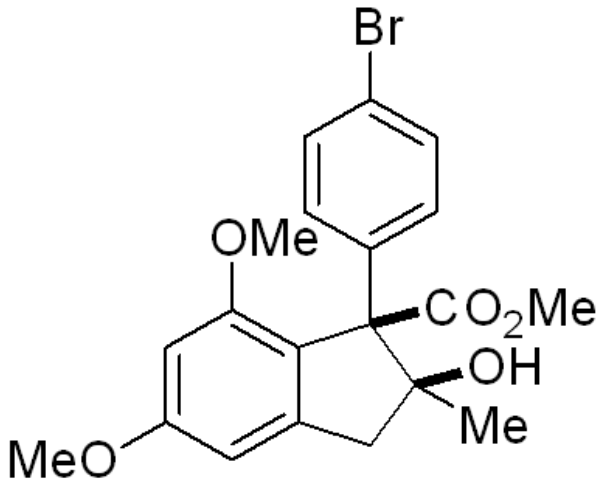
3ab

yzz-7-130-1


7.397
7.375
7.260
7.074
7.052
6.437
6.432
6.389
6.384
4.361
3.827
3.668
3.323
3.284
2.969
2.930
1.660
0.866
Br
OMe
CO2Me
OH
Me
MeO
3ac
9
8
7
6
5
4
3
2
1
0 ppm
2.04
2.06
1.01
1.00
1.02
3.00
6.07
1.03
1.01
3.06

YZZ-7-130-1-C

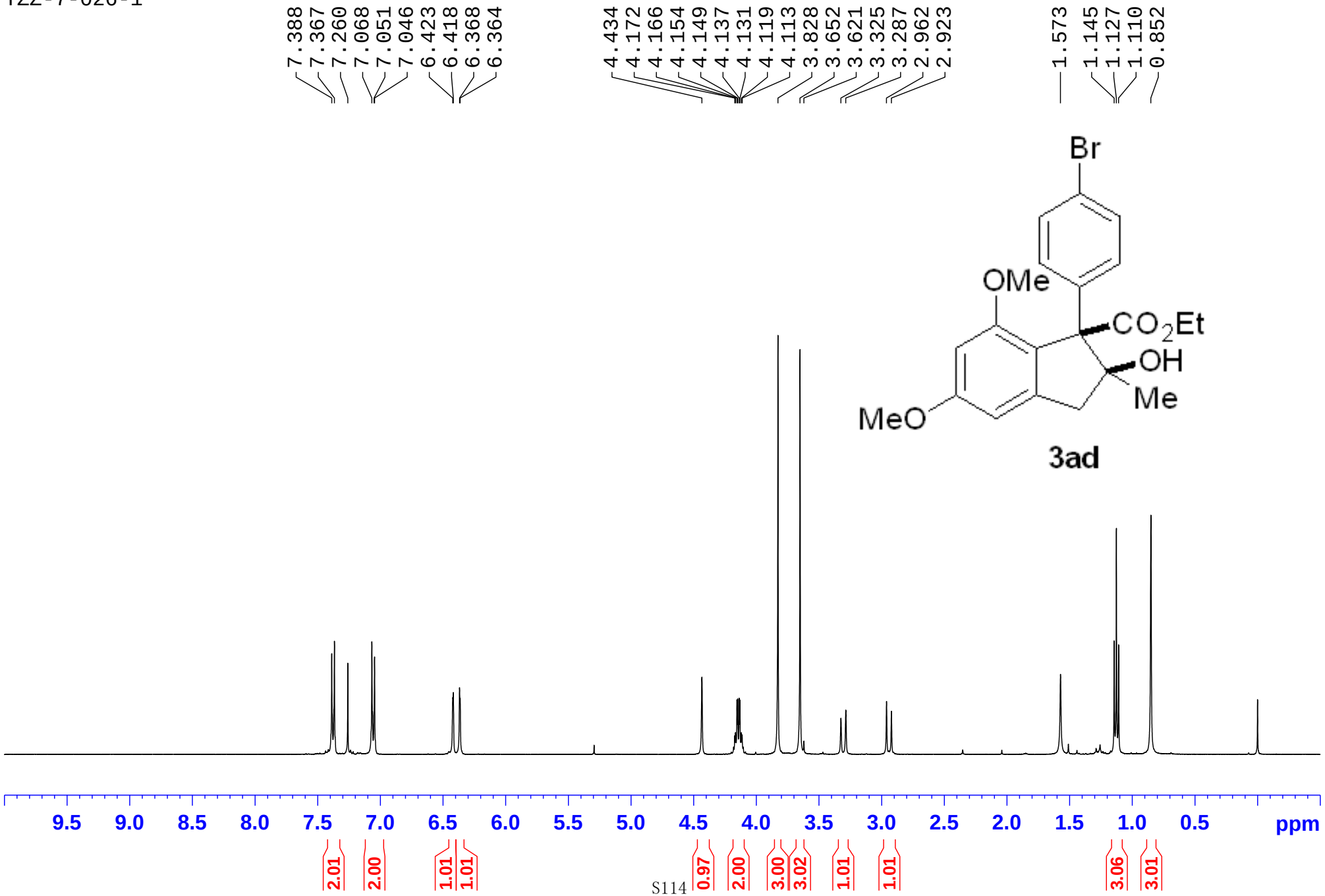
174.55
161.80
158.15
144.70
135.99
130.33
130.17
120.88
119.86
101.58
98.20
84.49
77.32
77.00
76.68
67.92
55.41
55.24
52.35
47.48
25.24



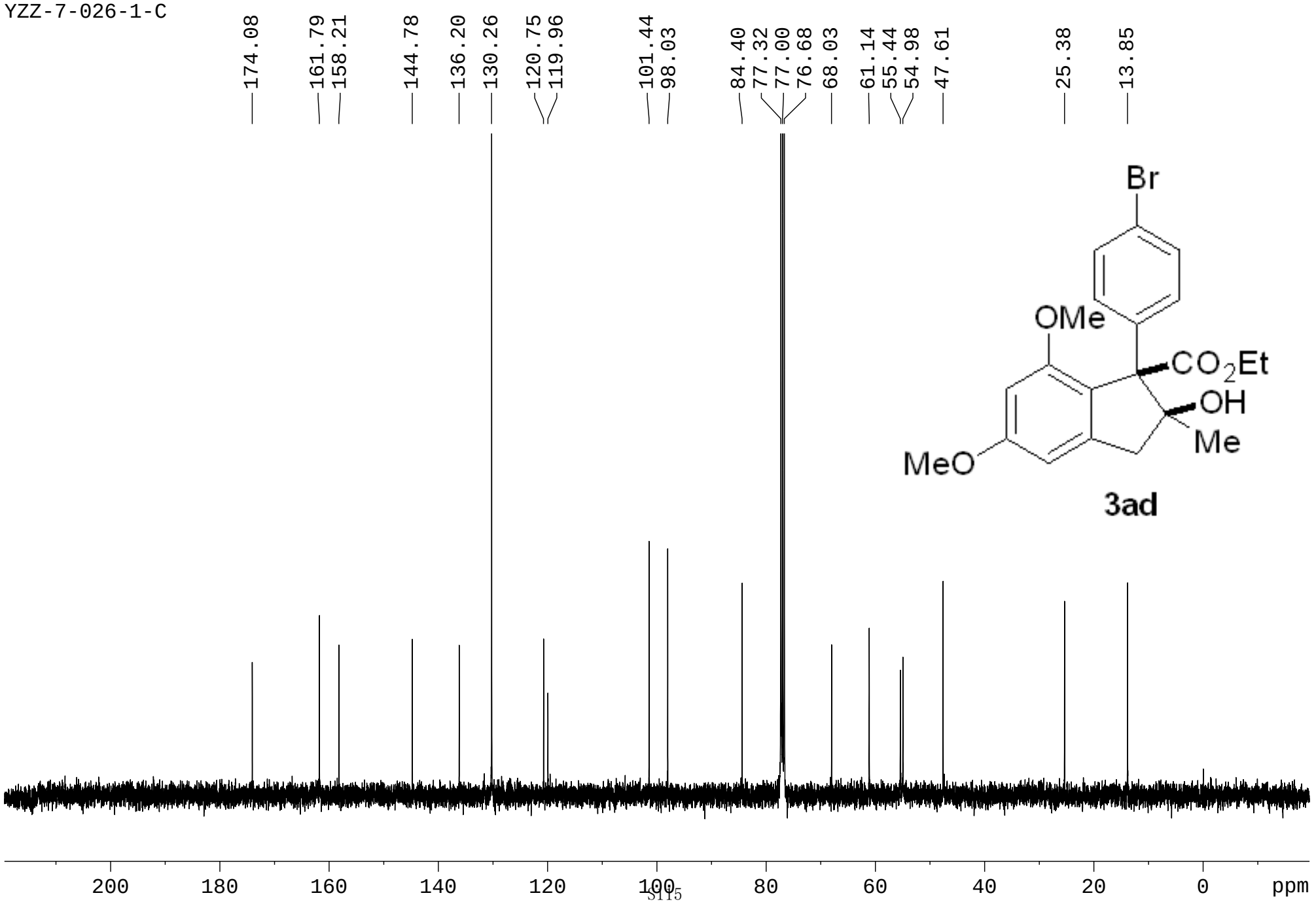
3ac

190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

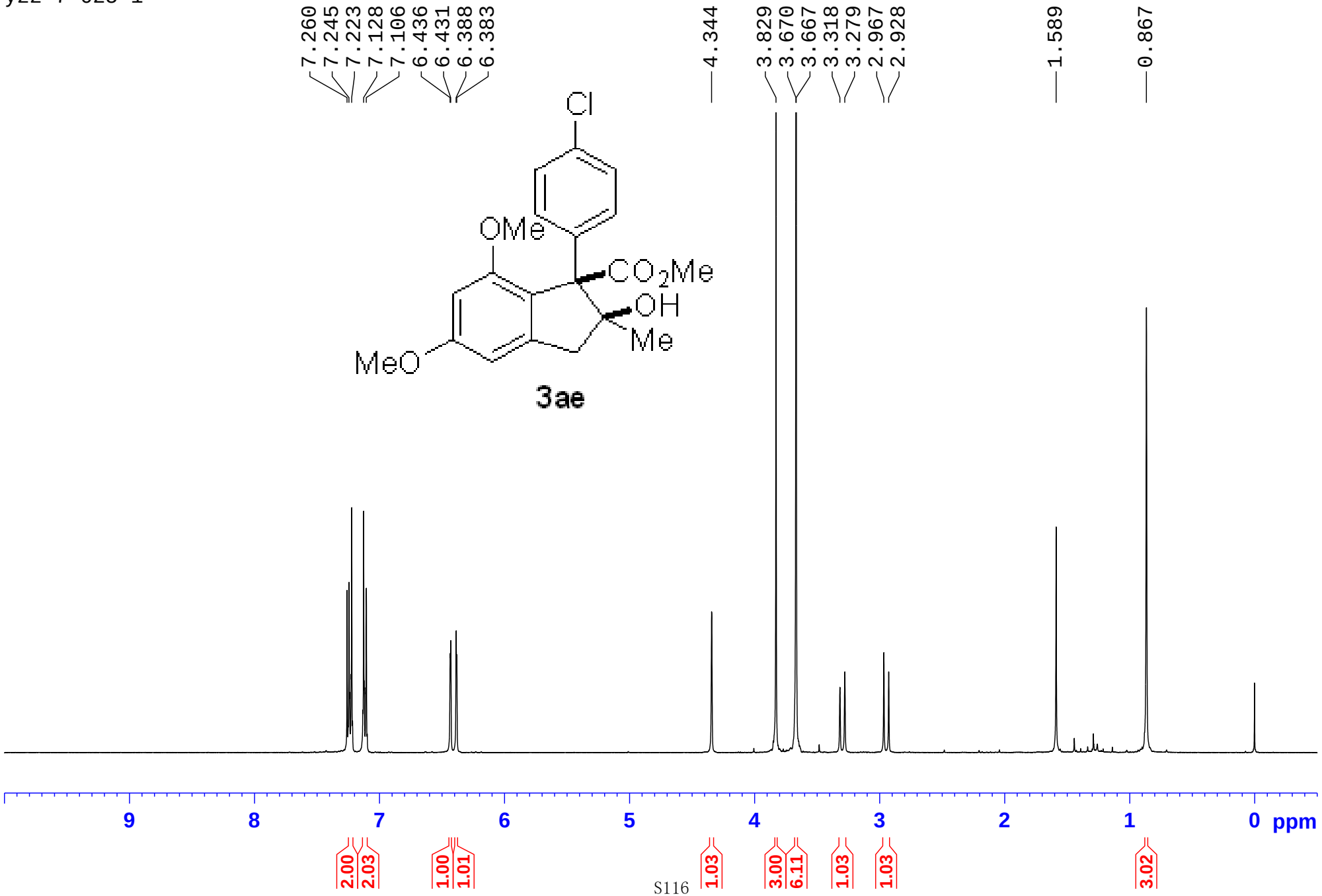
YZZ-7-026-1

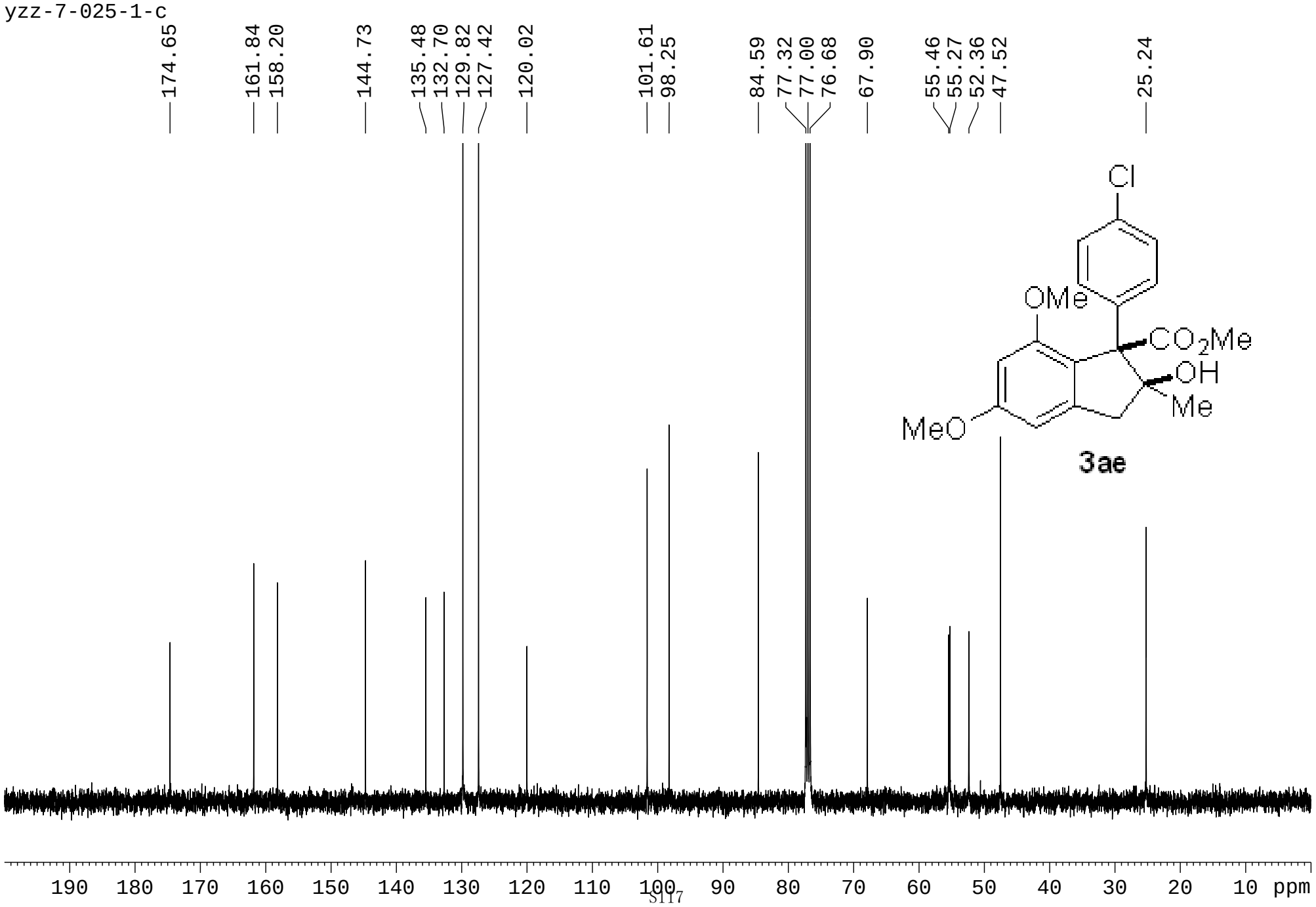

7.388
7.367
7.260
7.068
7.051
7.046
6.423
6.418
6.368
6.364
4.434
4.172
4.166
4.154
4.149
4.137
4.131
4.119
4.113
3.828
3.652
3.621
3.325
3.287
2.962
2.923
1.573
1.145
1.127
1.110
0.852
Br
OMe
CO2Et
OH
Me
MeO
3ad
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.01
2.00
1.01
1.01
0.97
2.00
3.00
3.02
1.01
1.01
3.06
3.01

YZZ-7-026-1-C

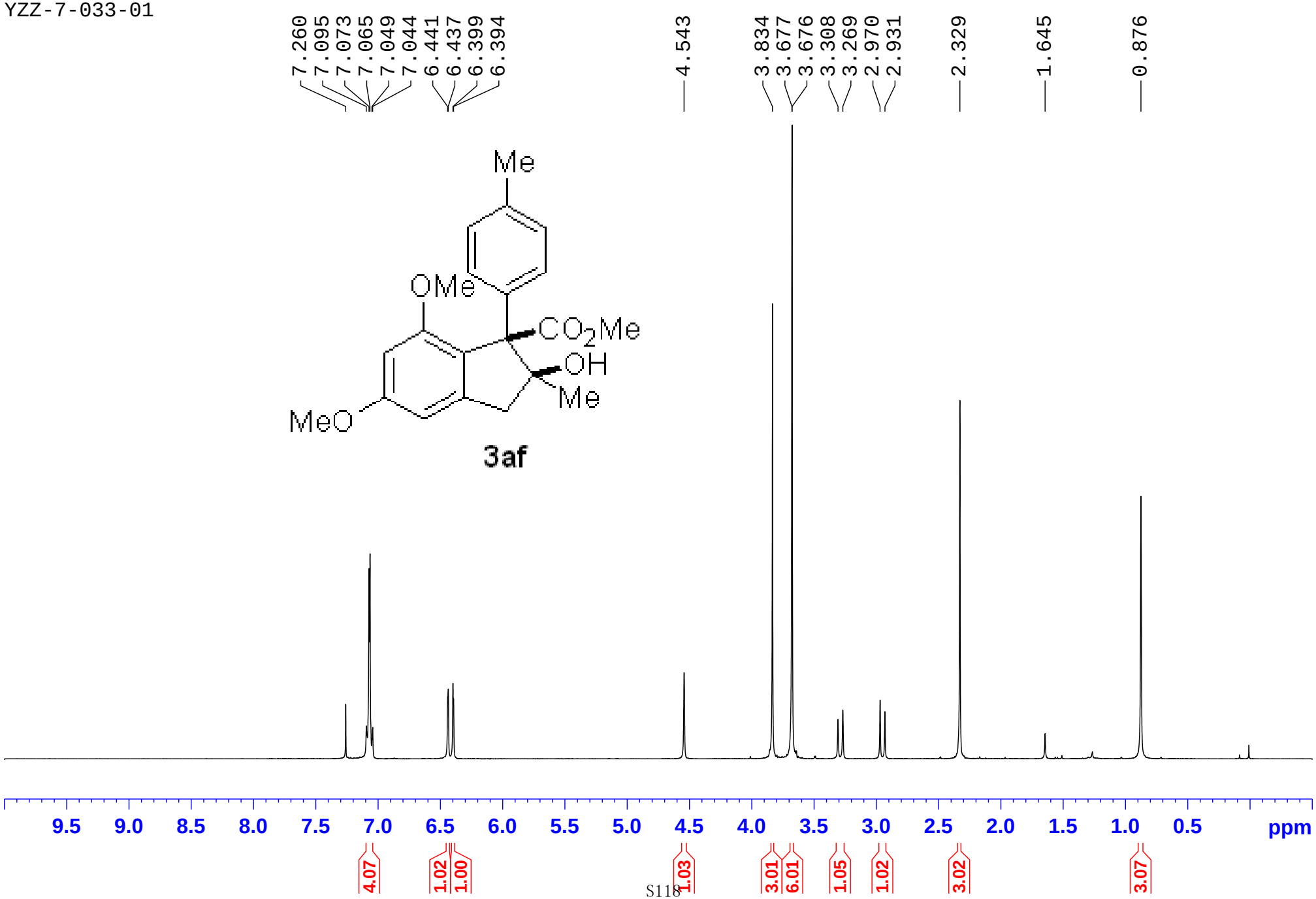

174.08
161.79
158.21
144.78
136.20
130.26
120.75
119.96
101.44
98.03
84.40
77.32
77.00
76.68
68.03
61.14
55.44
54.98
47.61
25.38
13.85
Br
OMe
CO2Et
OH
Me
MeO
3ad
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-7-025-1

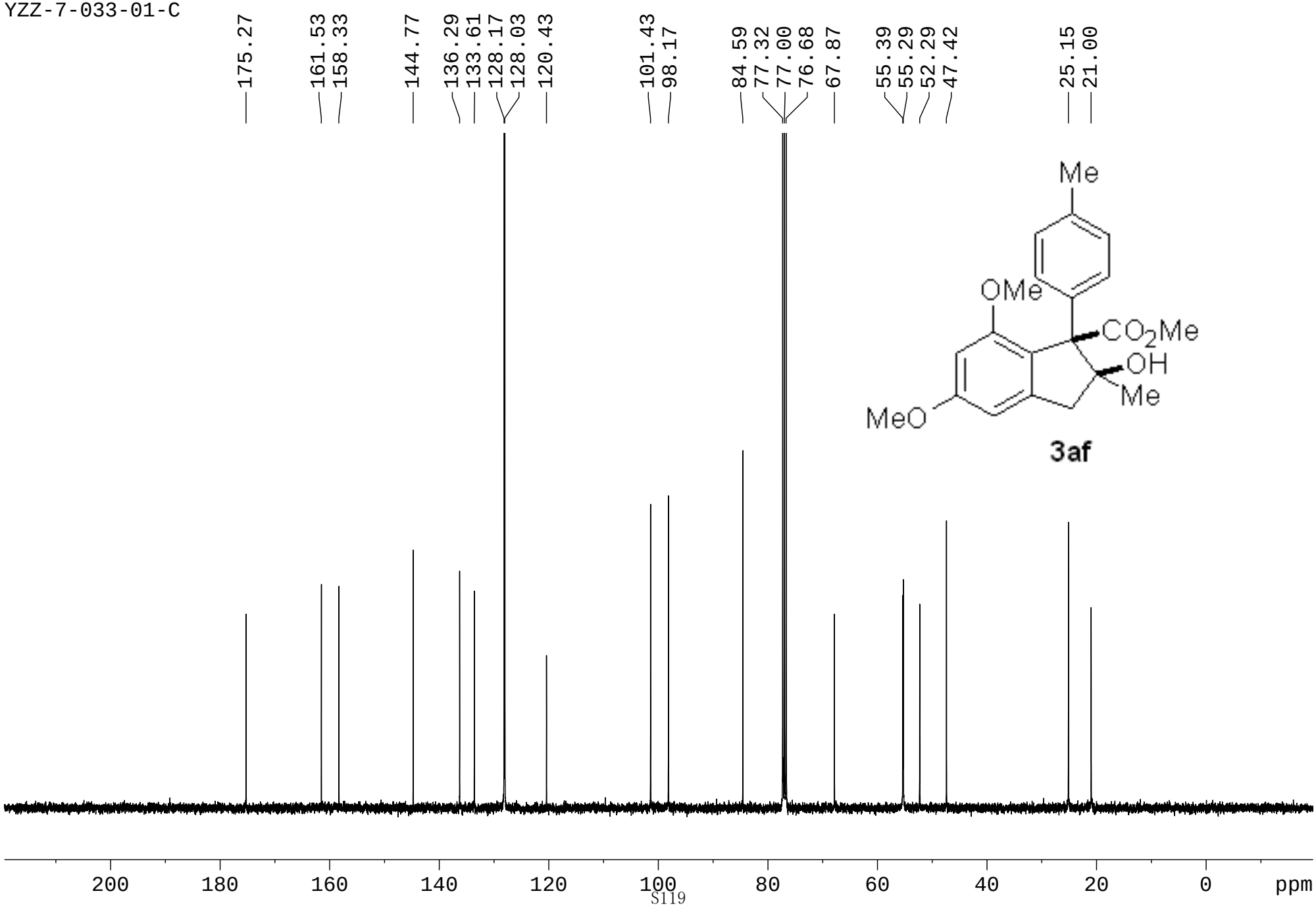

7.260
7.245
7.223
7.128
7.106
6.436
6.431
6.388
6.383
4.344
3.829
3.670
3.667
3.318
3.279
2.967
2.928
1.589
0.867
Cl
OMe
CO2Me
OH
Me
MeO
3ae
9
8
7
6
5
4
3
2
1
0 ppm
2.00
2.03
1.00
1.01
1.03
3.00
6.11
1.03
1.03
3.02

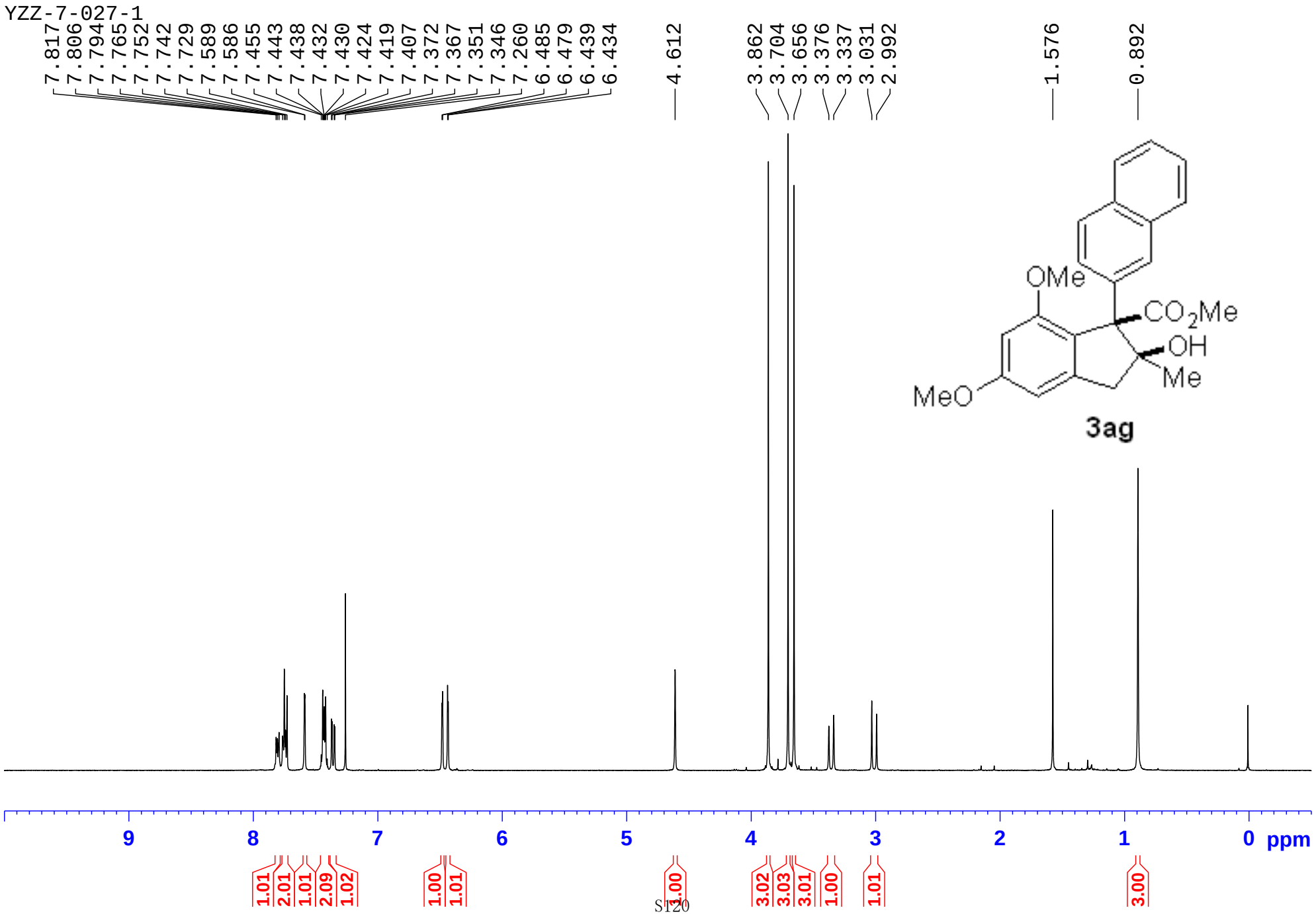

yzz-7-025-1-c
174.65
161.84
158.20
144.73
135.48
132.70
129.82
127.42
120.02
101.61
98.25
84.59
77.32
77.00
76.68
67.90
55.46
55.27
52.36
47.52
25.24
Cl
OMe
CO2Me
OH
Me
MeO
3ae
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

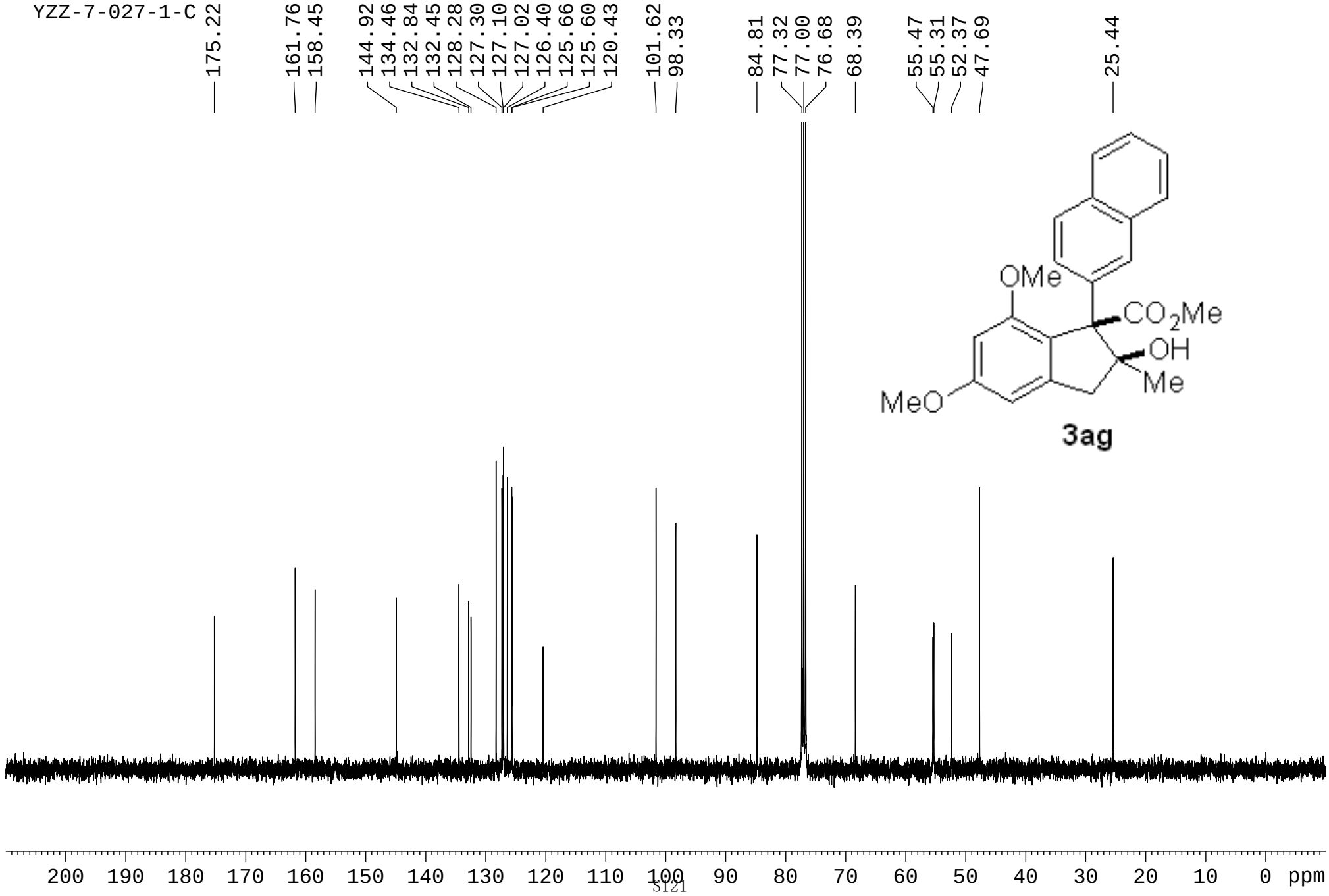
YZZ-7-033-01


7.260
7.095
7.073
7.065
7.049
7.044
6.441
6.437
6.399
6.394
4.543
3.834
3.677
3.676
3.308
3.269
2.970
2.931
2.329
1.645
0.876
Me
OMe
CO2Me
OH
Me
MeO
3af
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
4.07
1.02
1.00
1.03
3.01
6.01
1.05
1.02
3.02
3.07

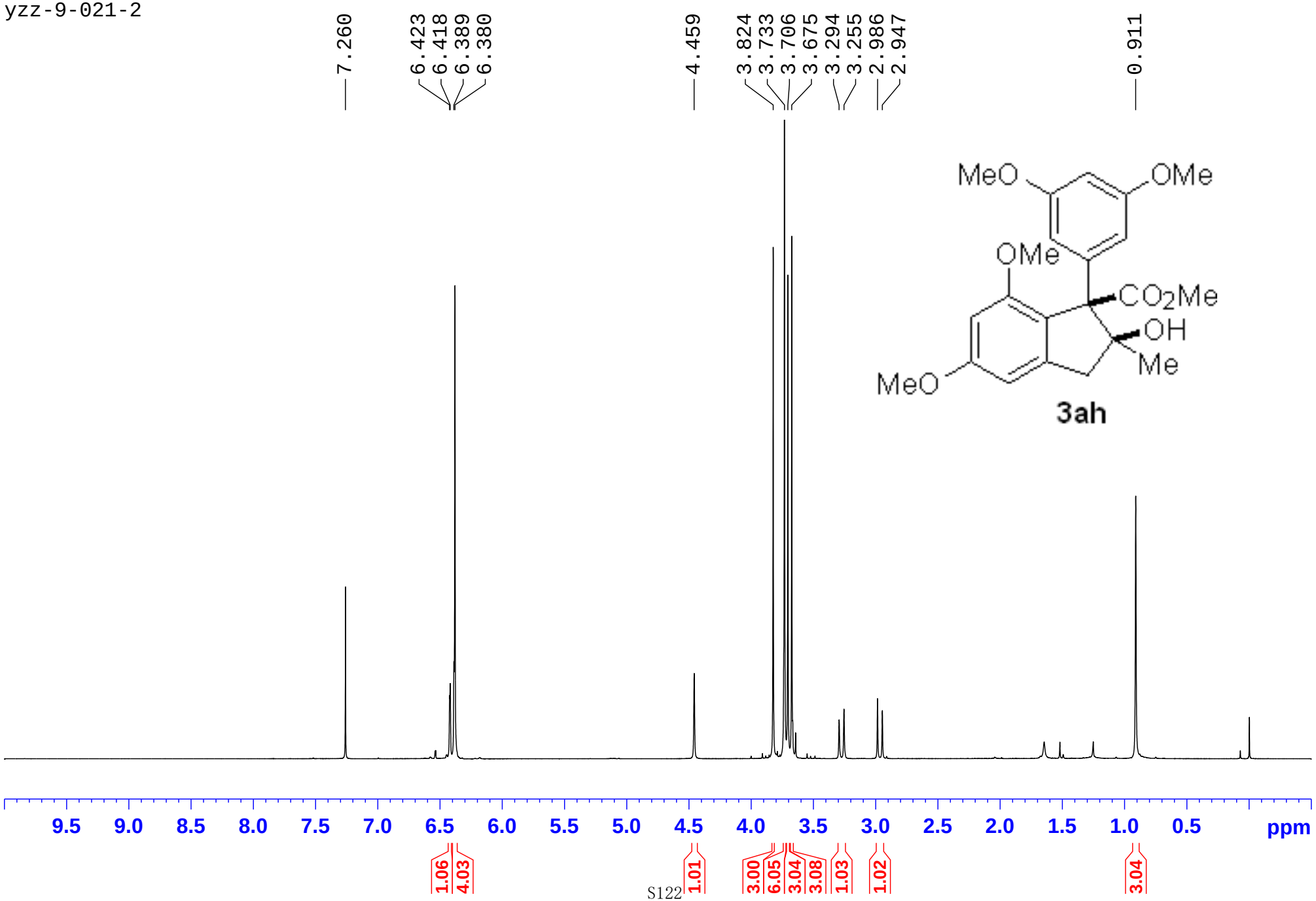
YZZ-7-033-01-C


175.27
161.53
158.33
144.77
136.29
133.61
128.17
128.03
120.43
101.43
98.17
84.59
77.32
77.00
76.68
67.87
55.39
55.29
52.29
47.42
25.15
21.00
Me
OMe
CO2Me
OH
Me
MeO
3af
200
180
160
140
120
100
80
60
40
20
0
ppm


YZZ-7-027-1
7.817
7.806
7.794
7.765
7.752
7.742
7.729
7.589
7.586
7.455
7.443
7.438
7.432
7.430
7.424
7.419
7.407
7.372
7.367
7.351
7.346
7.260
6.485
6.479
6.439
6.434
4.612
3.862
3.704
3.656
3.376
3.337
3.031
2.992
1.576
0.892
OMe
CO2Me
OH
Me
MeO
3ag
9
8
7
6
5
4
3
2
1
0
ppm
1.01
2.01
1.01
2.09
1.02
1.00
1.01
1.00
3.02
3.03
3.01
1.00
1.01
3.00

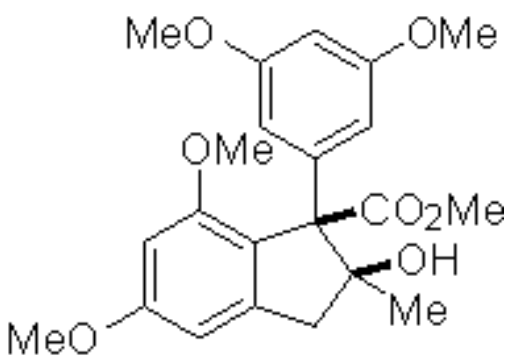

YZZ-7-027-1-C
175.22
161.76
158.45
144.92
134.46
132.84
132.45
128.28
127.30
127.10
127.02
126.40
125.66
125.60
120.43
101.62
98.33
84.81
77.32
77.00
76.68
68.39
55.47
55.31
52.37
47.69
25.44
OMe
CO2Me
OH
Me
MeO
3ag
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-9-021-2


7.260
6.423
6.418
6.389
6.380
4.459
3.824
3.733
3.706
3.675
3.294
3.255
2.986
2.947
0.911
MeO
OMe
OMe
CO2Me
OH
Me
MeO
3ah
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
1.06
4.03
1.01
3.00
6.05
3.04
3.08
1.03
1.02
3.04

yzz-9-021-1-c

174.81
161.63
159.73
158.33
144.76
139.01
120.25
107.11
101.44
98.71
98.27
84.57
77.25
77.00
76.75
68.34
55.41
55.35
55.17
52.32
47.49
25.09

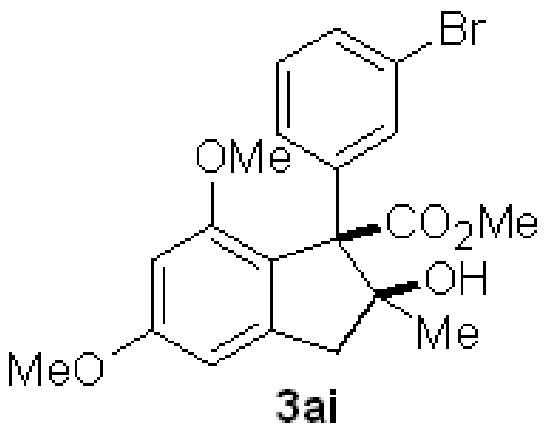


3ah

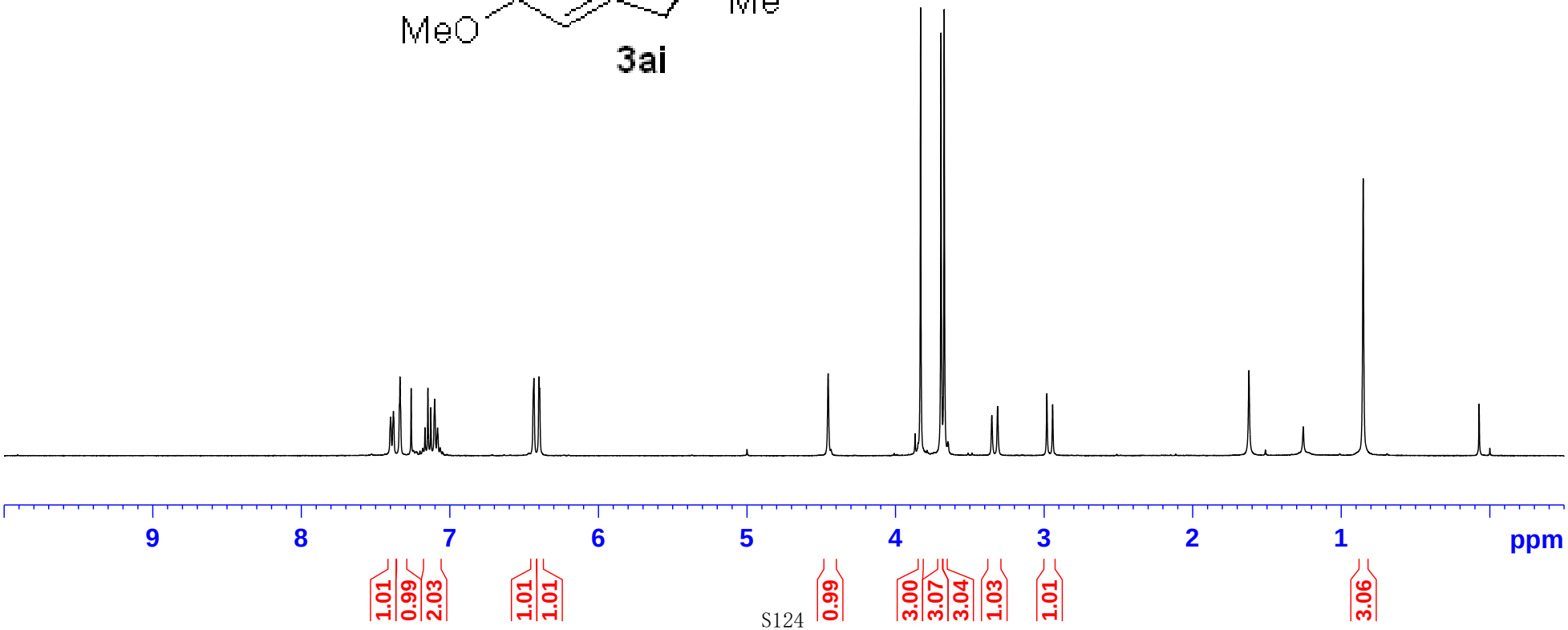
200 180 160 140 120 100 80 60 40 20 0 ppm

yzz-7-060-p1-1

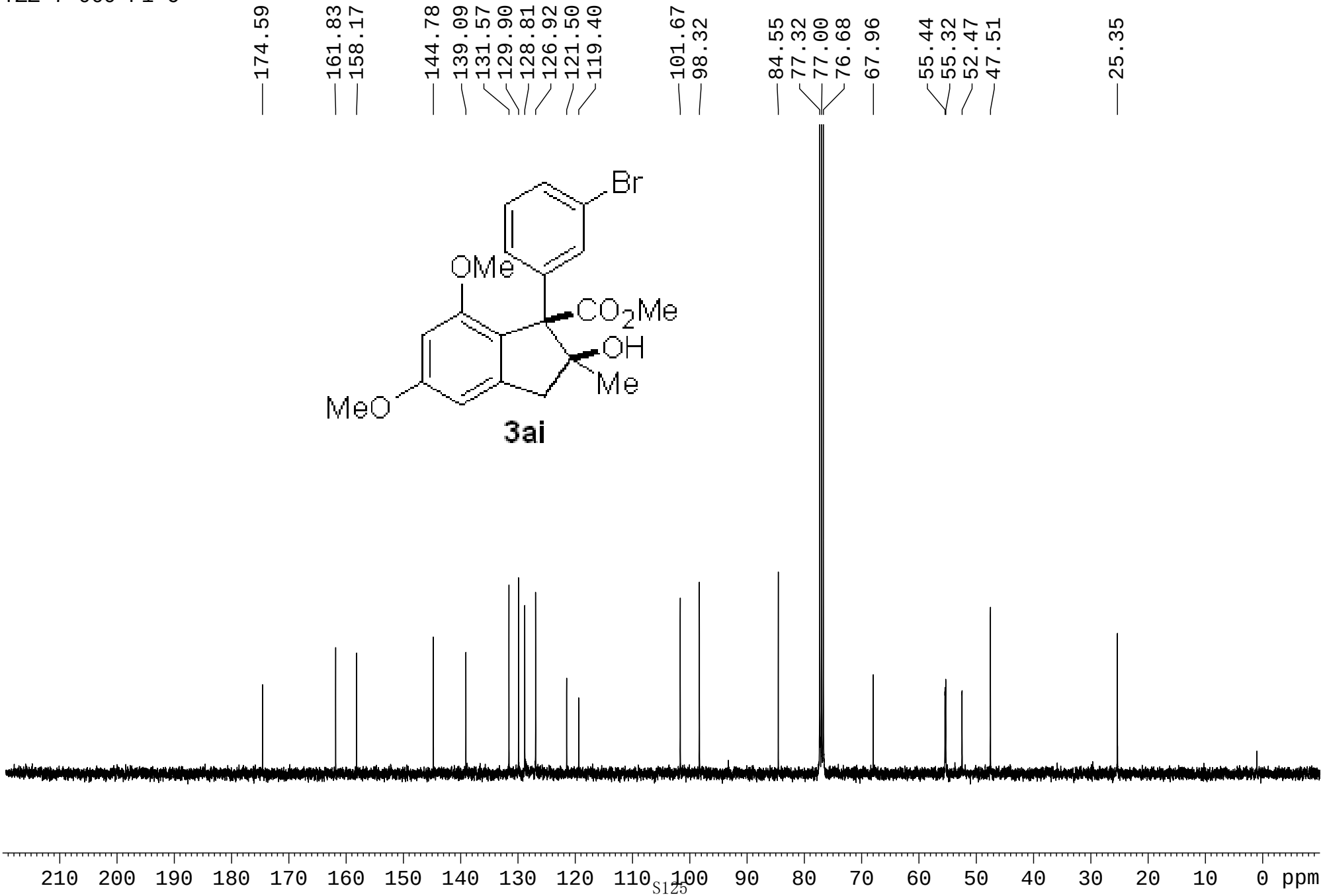
7.399
7.379
7.335
7.260
7.167
7.147
7.128
7.102
7.082
7.065
6.434
6.400
6.395
4.454
3.832
3.694
3.673
3.352
3.313
2.982
2.943
1.621
0.852



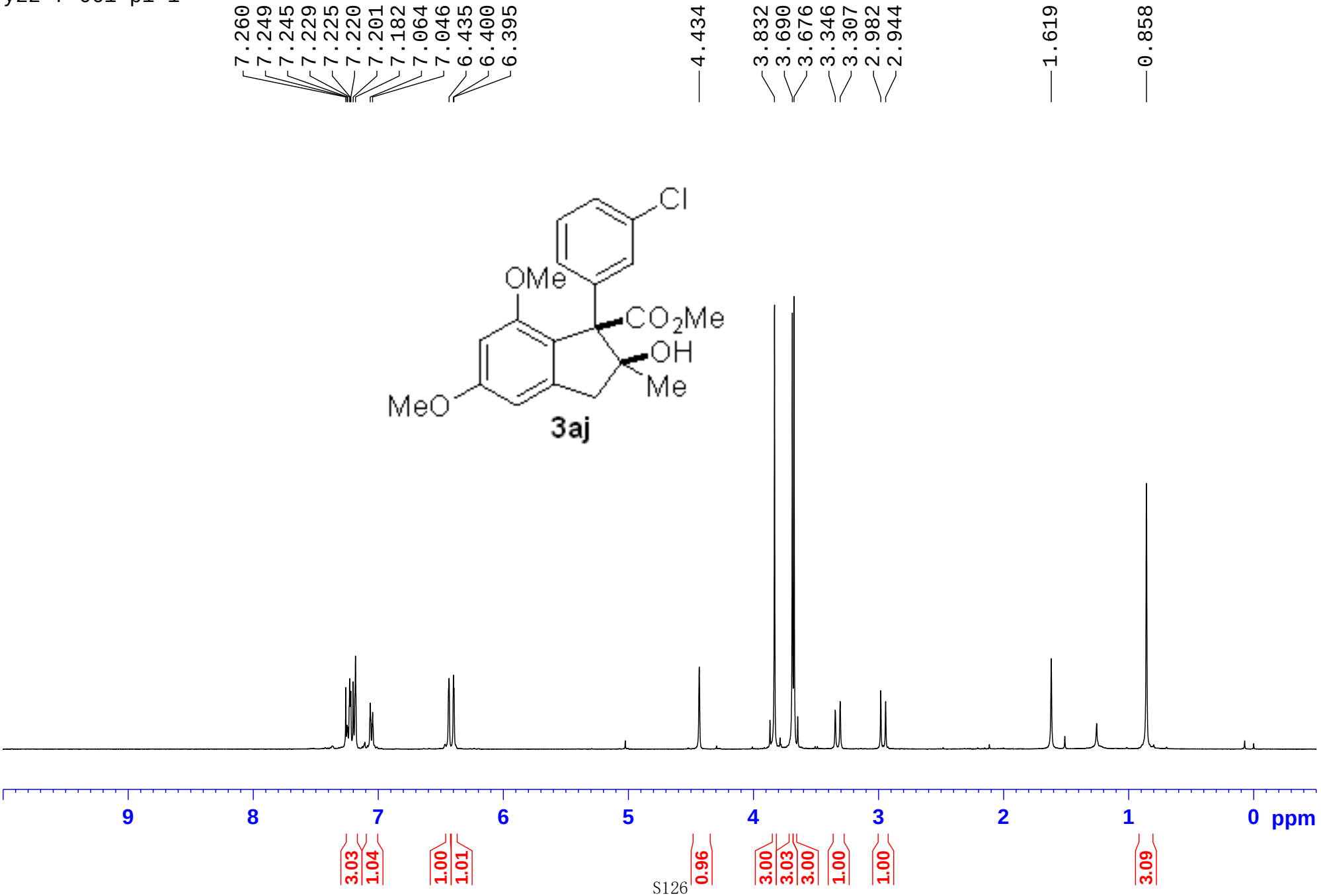
3ai



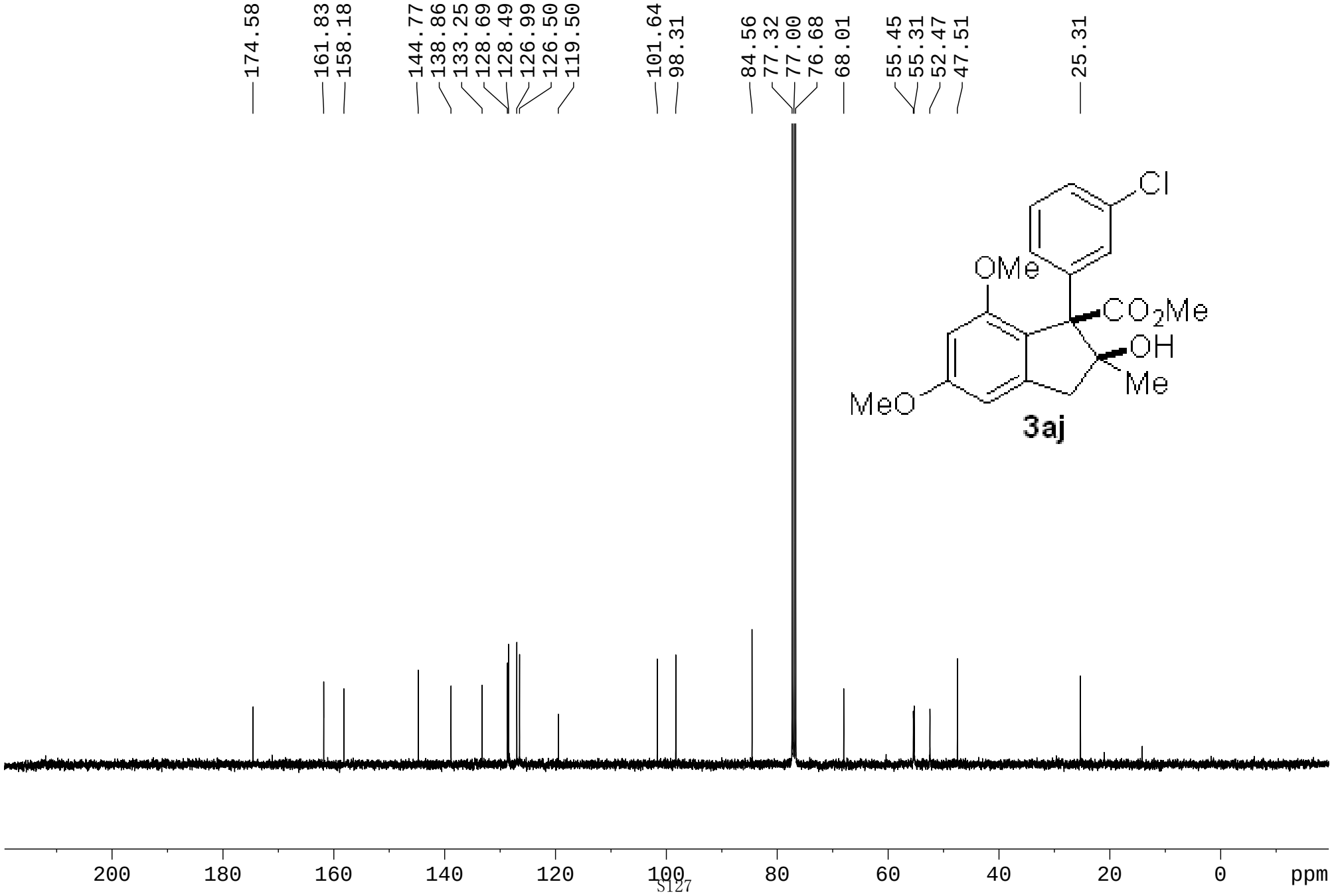
YZZ-7-060-P1-C


174.59
161.83
158.17
144.78
139.09
131.57
129.90
128.81
126.92
121.50
119.40
101.67
98.32
84.55
77.32
77.00
76.68
67.96
55.44
55.32
52.47
47.51
25.35
Br
OMe
CO2Me
OH
Me
MeO
3ai
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

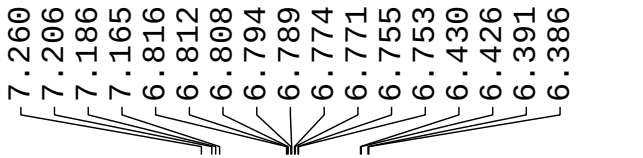
yzz-7-061-p1-1

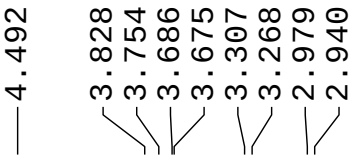

7.260
7.249
7.245
7.229
7.225
7.220
7.201
7.182
7.064
7.046
6.435
6.400
6.395
4.434
3.832
3.690
3.676
3.346
3.307
2.982
2.944
1.619
0.858
Cl
OMe
CO2Me
OH
Me
MeO
3aj
9
8
7
6
5
4
3
2
1
0 ppm
3.03
1.04
1.00
1.01
0.96
3.00
3.03
3.00
1.00
1.00
3.09

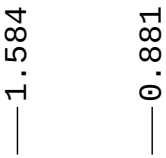
YZZ-7-061-P1-C

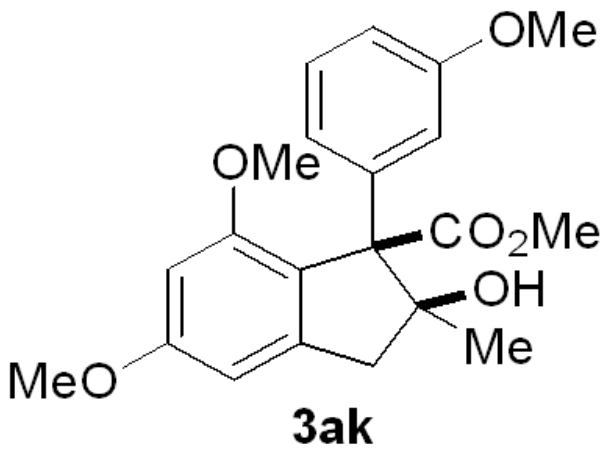

174.58
161.83
158.18
144.77
138.86
133.25
128.69
128.49
126.99
126.50
119.50
101.64
98.31
84.56
77.32
77.00
76.68
68.01
55.45
55.31
52.47
47.51
25.31
Cl
OMe
CO2Me
OH
Me
MeO
3aj
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-7-062-1

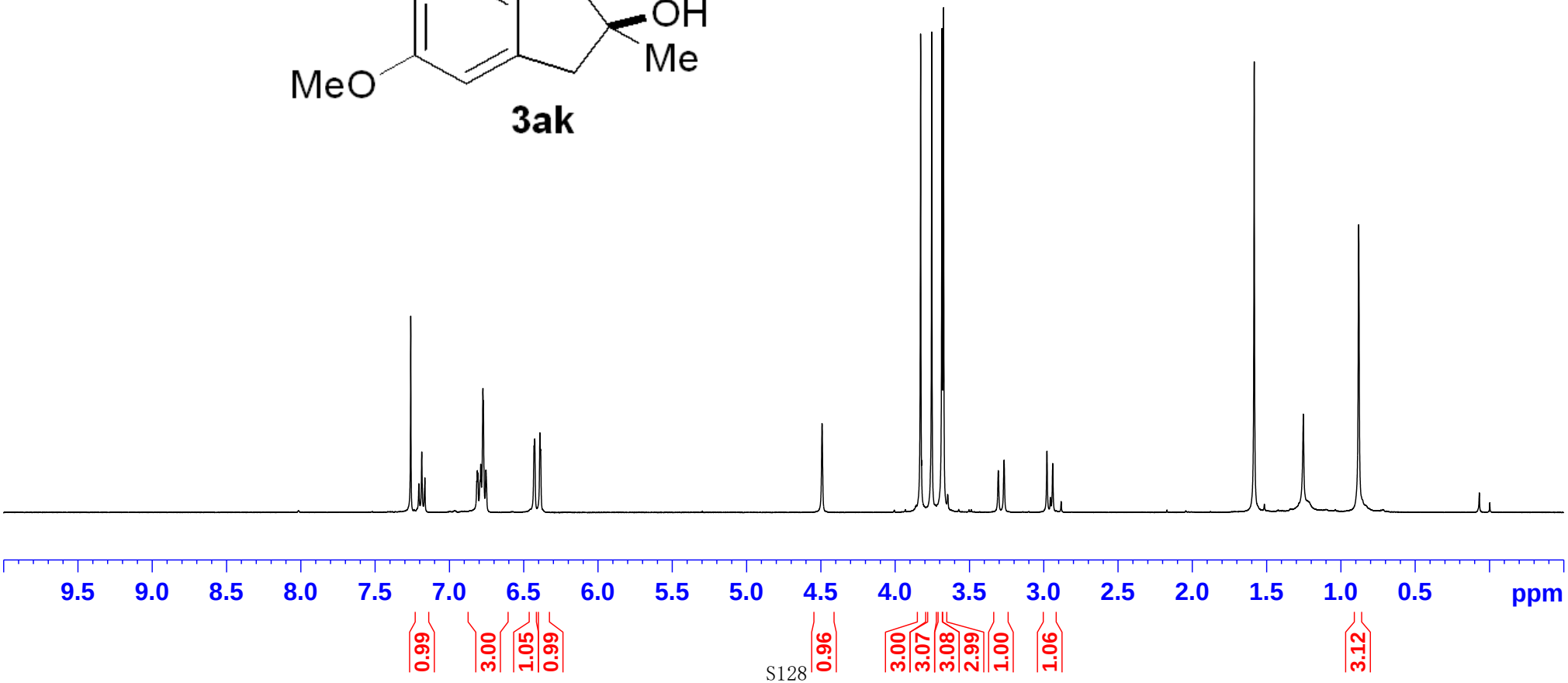






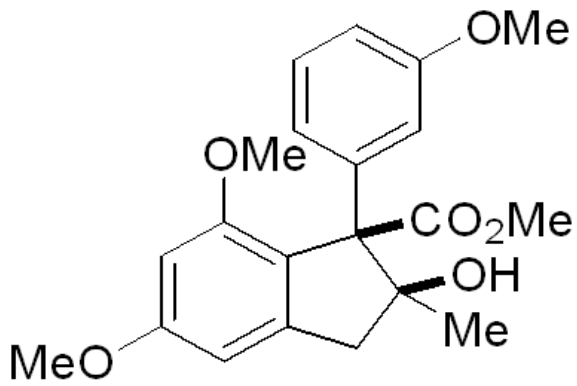


3ak

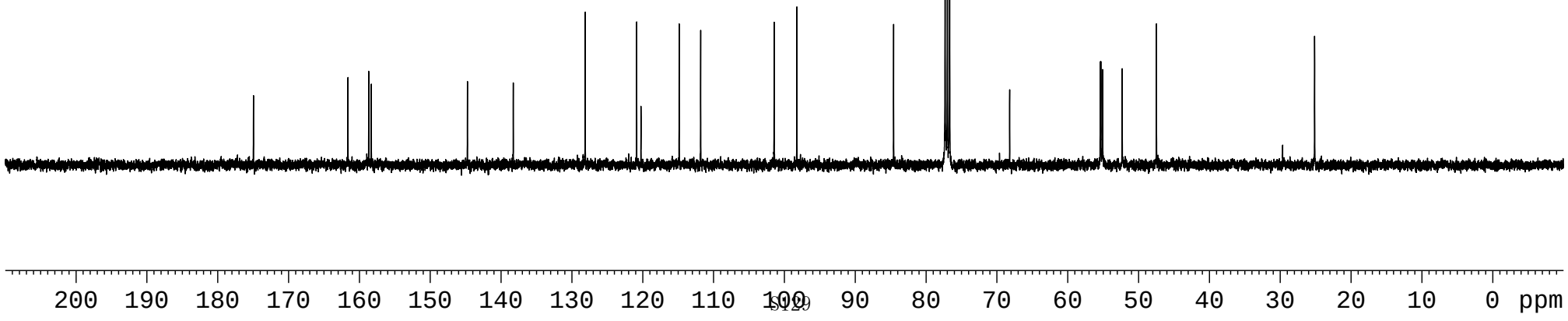


yzz-7-062-p1-2-c

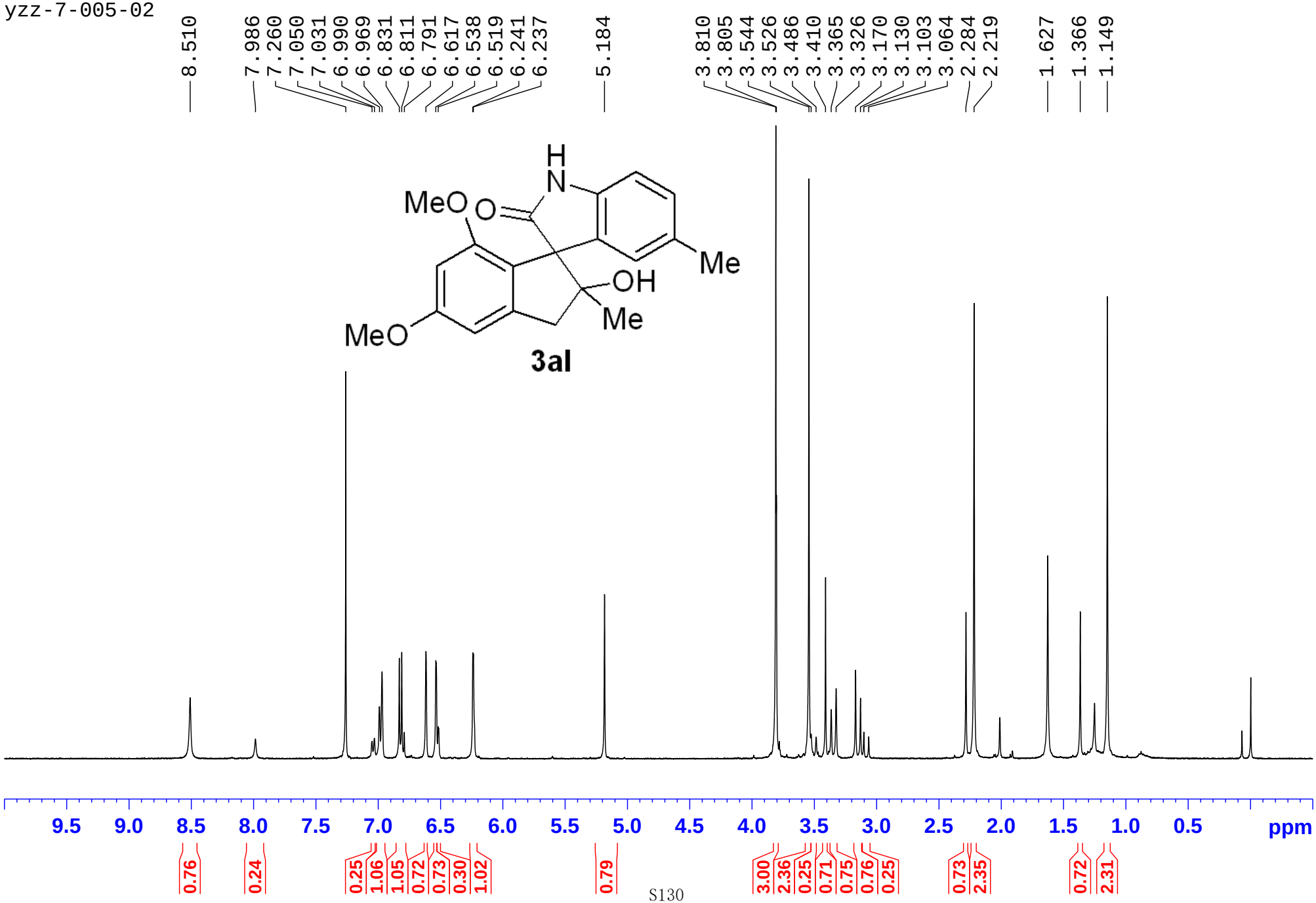
174.97
161.62
158.70
158.33
144.76
138.29
128.13
120.87
120.26
114.87
111.83
101.46
98.25
84.59
77.32
77.00
76.68
68.21
55.41
55.33
55.09
52.32
47.48
25.15



3ak

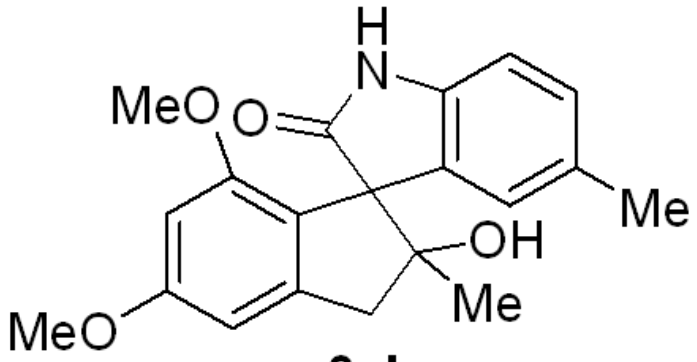


yzz-7-005-02


8.510
7.986
7.260
7.050
7.031
6.990
6.969
6.831
6.811
6.791
6.617
6.538
6.519
6.241
6.237
5.184
3.810
3.805
3.544
3.526
3.486
3.410
3.365
3.326
3.170
3.130
3.103
3.064
2.284
2.219
1.627
1.366
1.149
H
N
MeO
O
Me
OH
Me
MeO
3al
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
0.76
0.24
0.25
1.06
1.05
0.72
0.73
0.30
1.02
0.79
3.00
2.36
0.25
0.71
0.75
0.76
0.25
0.73
2.35
0.72
2.31

YZZ-7-005-1-C

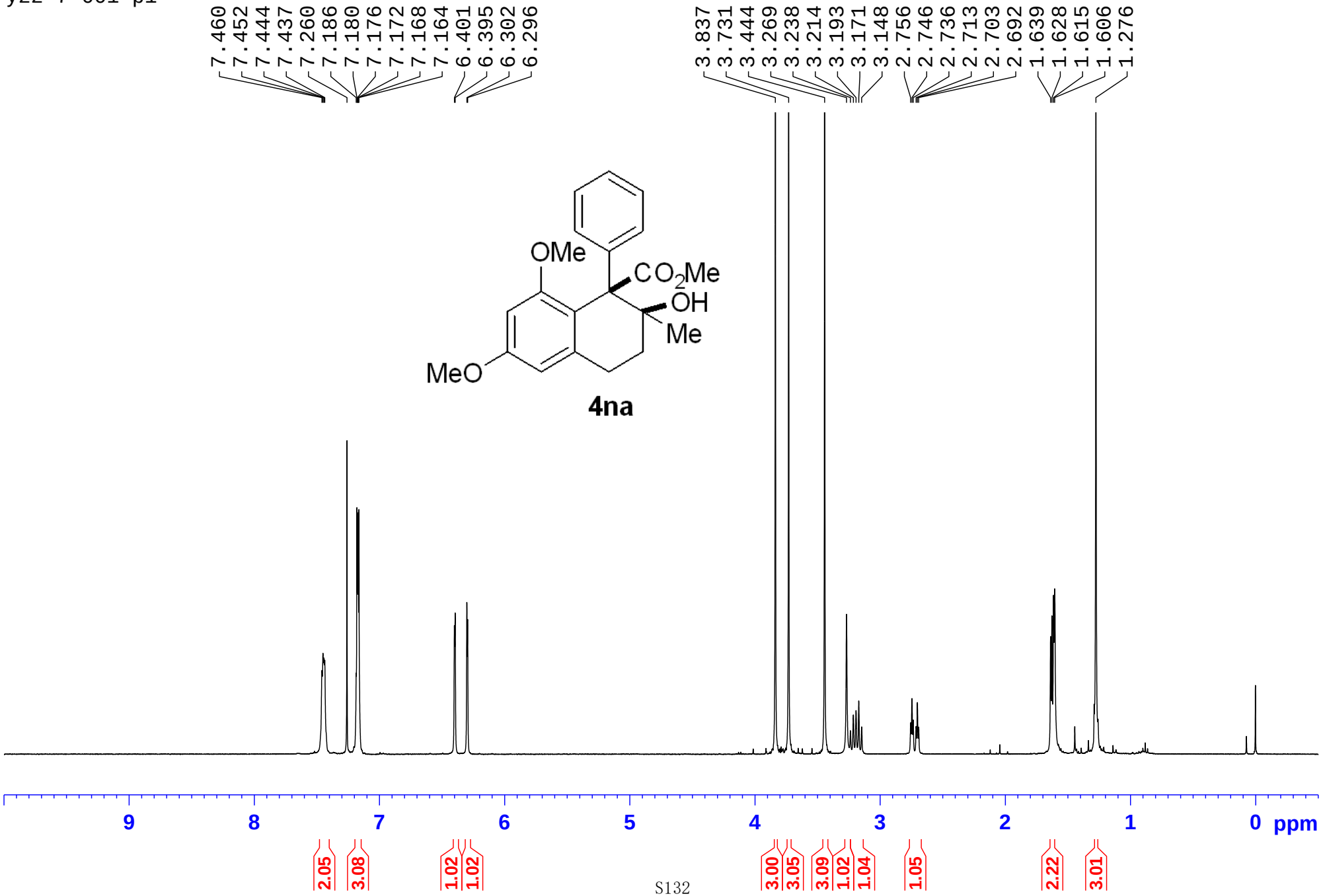
180.60
179.26
161.63
161.59
157.05
156.37
146.01
145.63
139.33
138.06
132.05
131.49
131.30
129.14
128.47
128.39
126.51
124.44
123.17
121.38
109.87
109.41
102.23
101.83
97.72
97.57
85.07
84.52
77.32
77.00
76.68
67.10
64.00
55.51
55.45
55.23
48.05
46.54
23.18
22.81
21.12
55.49



3al

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

yzz-7-001-p1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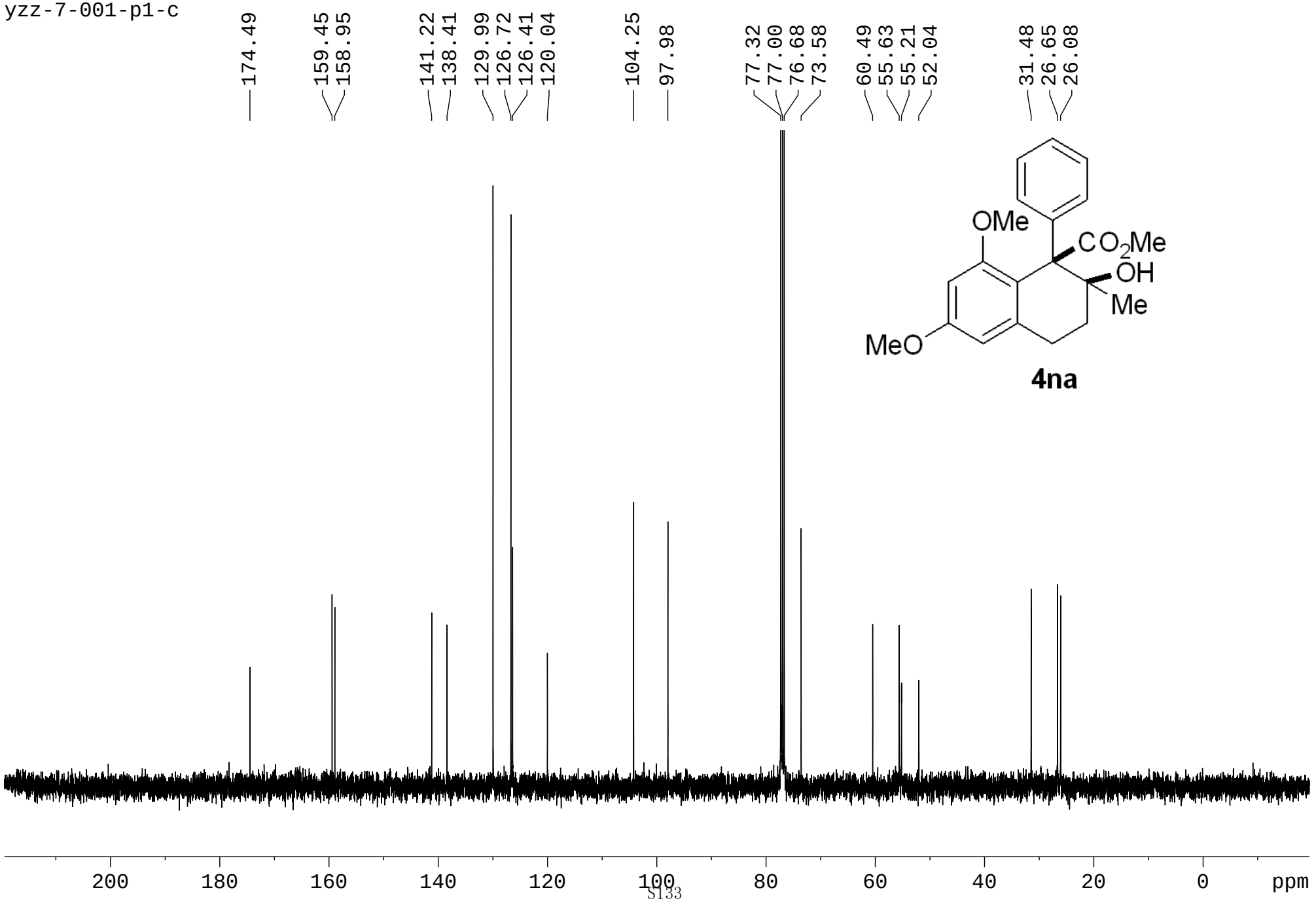
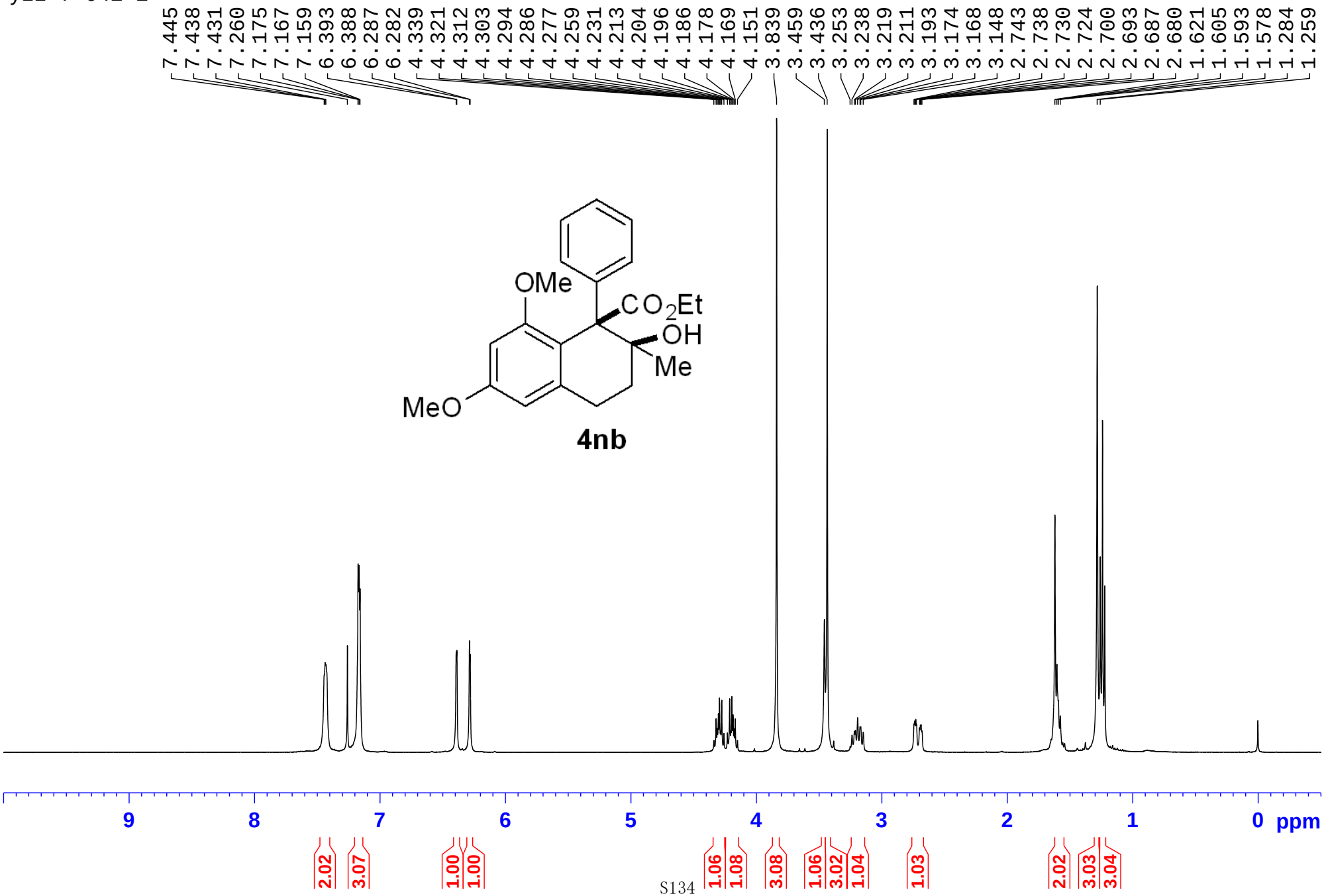
7.452
7.444
7.437
7.260
7.186
7.180
7.176
7.172
7.168
7.164
6.401
6.395
6.302
6.296
3.837
3.731
3.444
3.269
3.238
3.214
3.193
3.171
3.148
2.756
2.746
2.736
2.713
2.703
2.692
1.639
1.628
1.615
1.606
1.276
OMe
CO2Me
OH
Me
MeO
4na
9
8
7
6
5
4
3
2
1
0
ppm
2.05
3.08
1.02
1.02
3.00
3.05
3.09
1.02
1.04
1.05
2.22
3.01

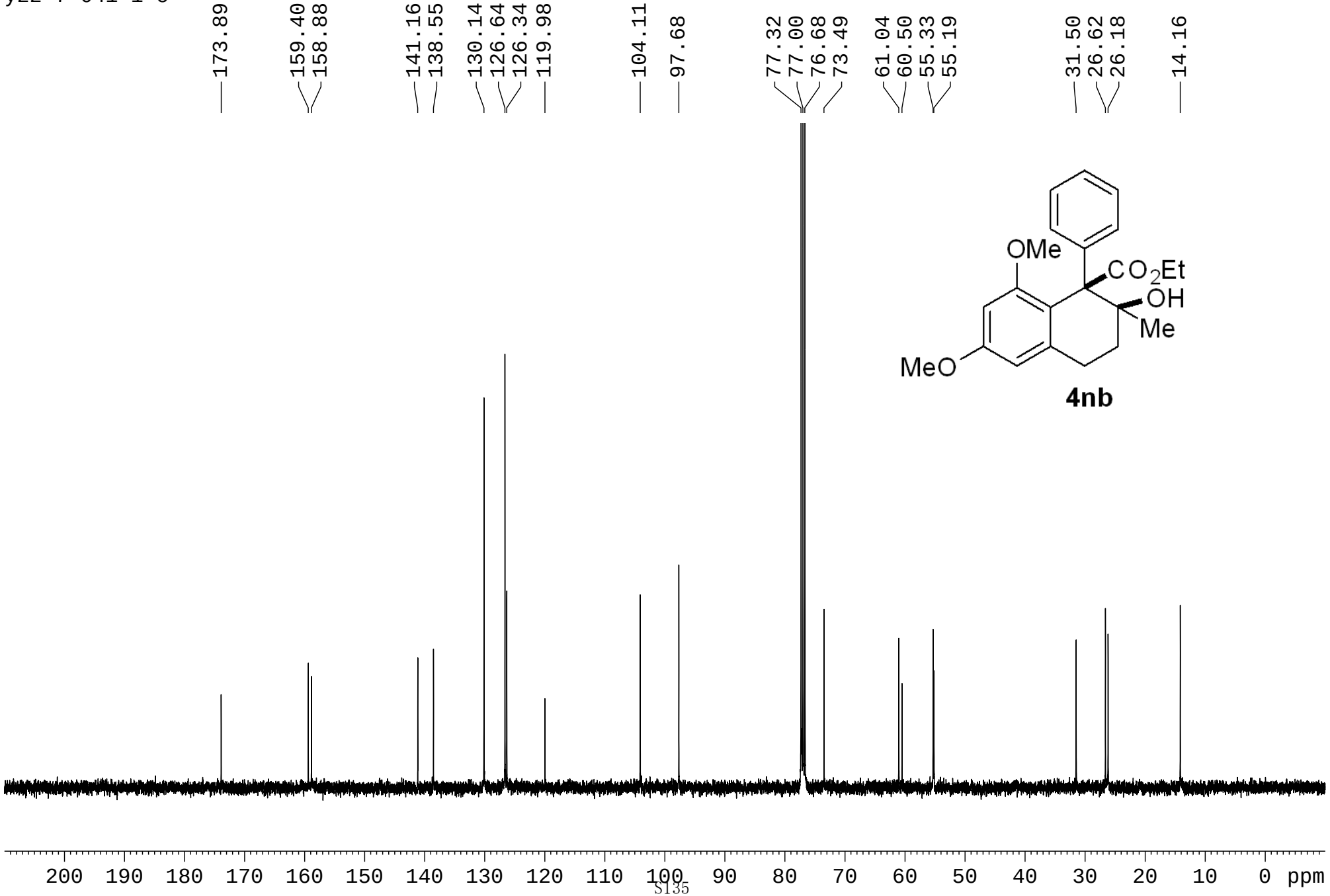
yzz-7-001-p1-c


174.49
159.45
158.95
141.22
138.41
129.99
126.72
126.41
120.04
104.25
97.98
77.32
77.00
76.68
73.58
60.49
55.63
55.21
52.04
31.48
26.65
26.08
OMe
CO2Me
OH
Me
MeO
4na
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-7-041-1


7.445
7.438
7.431
7.260
7.175
7.167
7.159
6.393
6.388
6.287
6.282
4.339
4.321
4.312
4.303
4.294
4.286
4.277
4.259
4.231
4.213
4.204
4.196
4.186
4.178
4.169
4.151
3.839
3.459
3.436
3.253
3.238
3.219
3.211
3.193
3.174
3.168
3.148
2.743
2.738
2.730
2.724
2.700
2.693
2.687
2.680
1.621
1.605
1.593
1.578
1.284
1.259
OMe
CO2Et
OH
Me
MeO
4nb
9
8
7
6
5
4
3
2
1
0
ppm
2.02
3.07
1.00
1.00
1.06
1.08
3.08
1.06
3.02
1.04
1.03
2.02
3.03
3.04

yzz-7-041-1-c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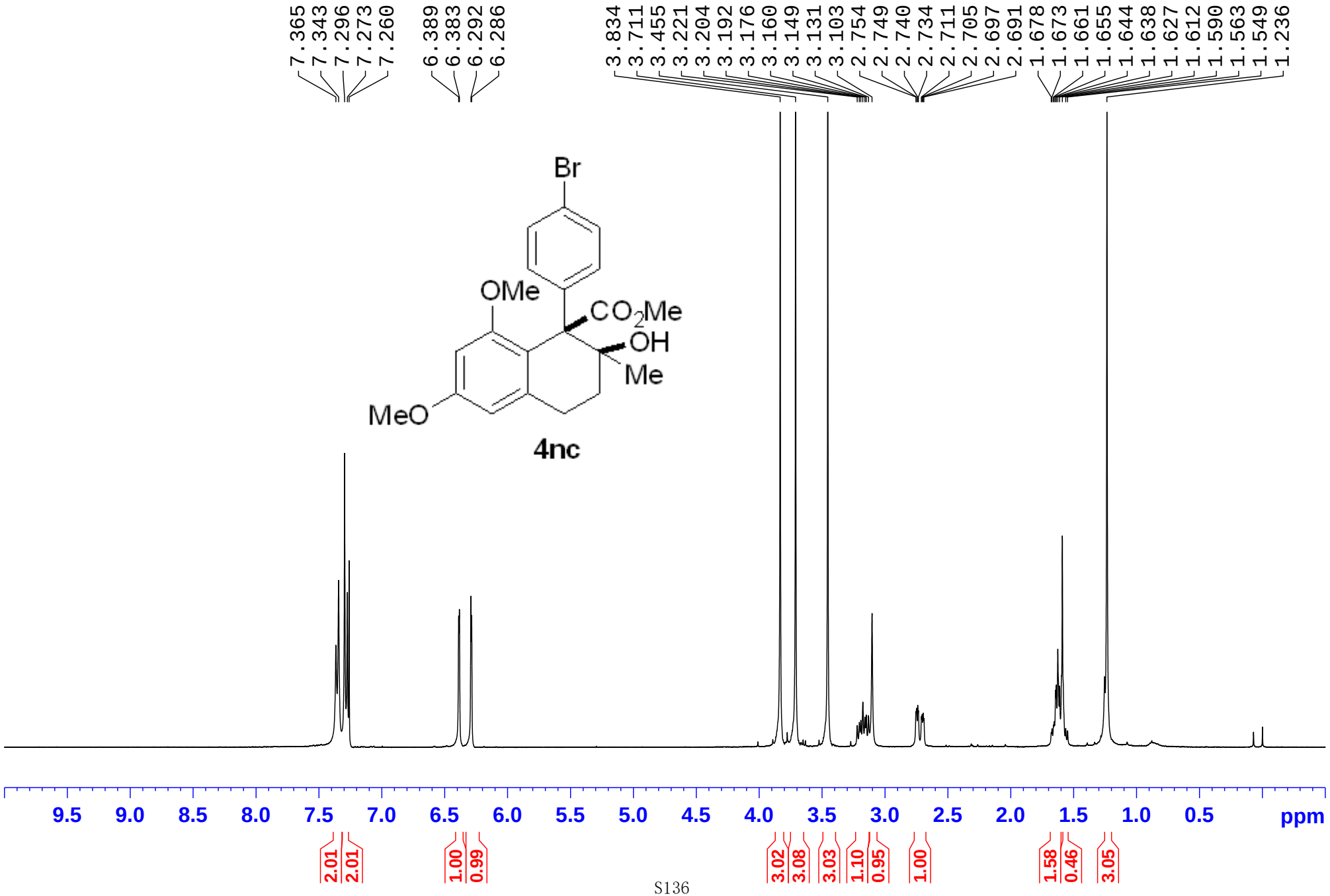
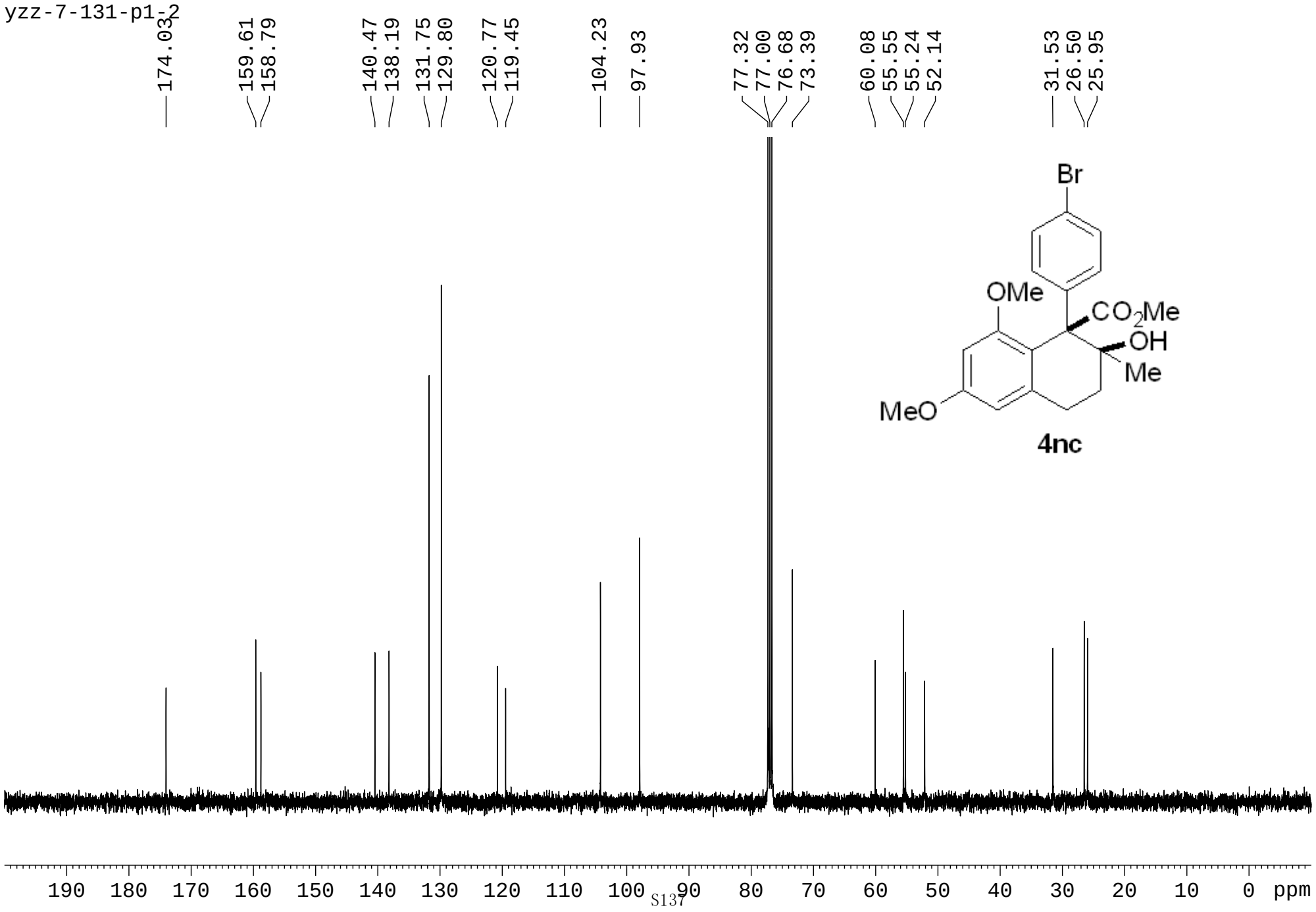
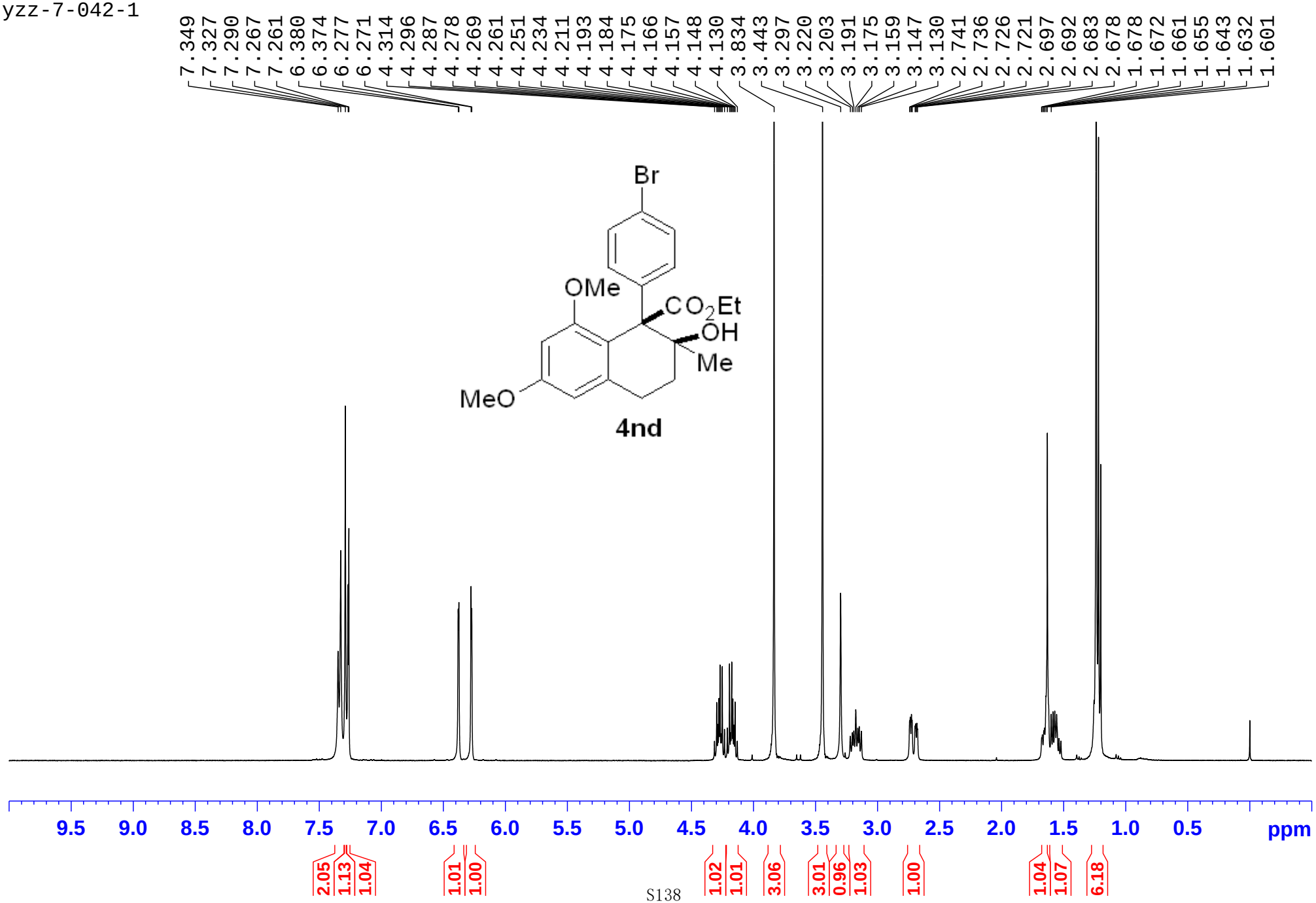
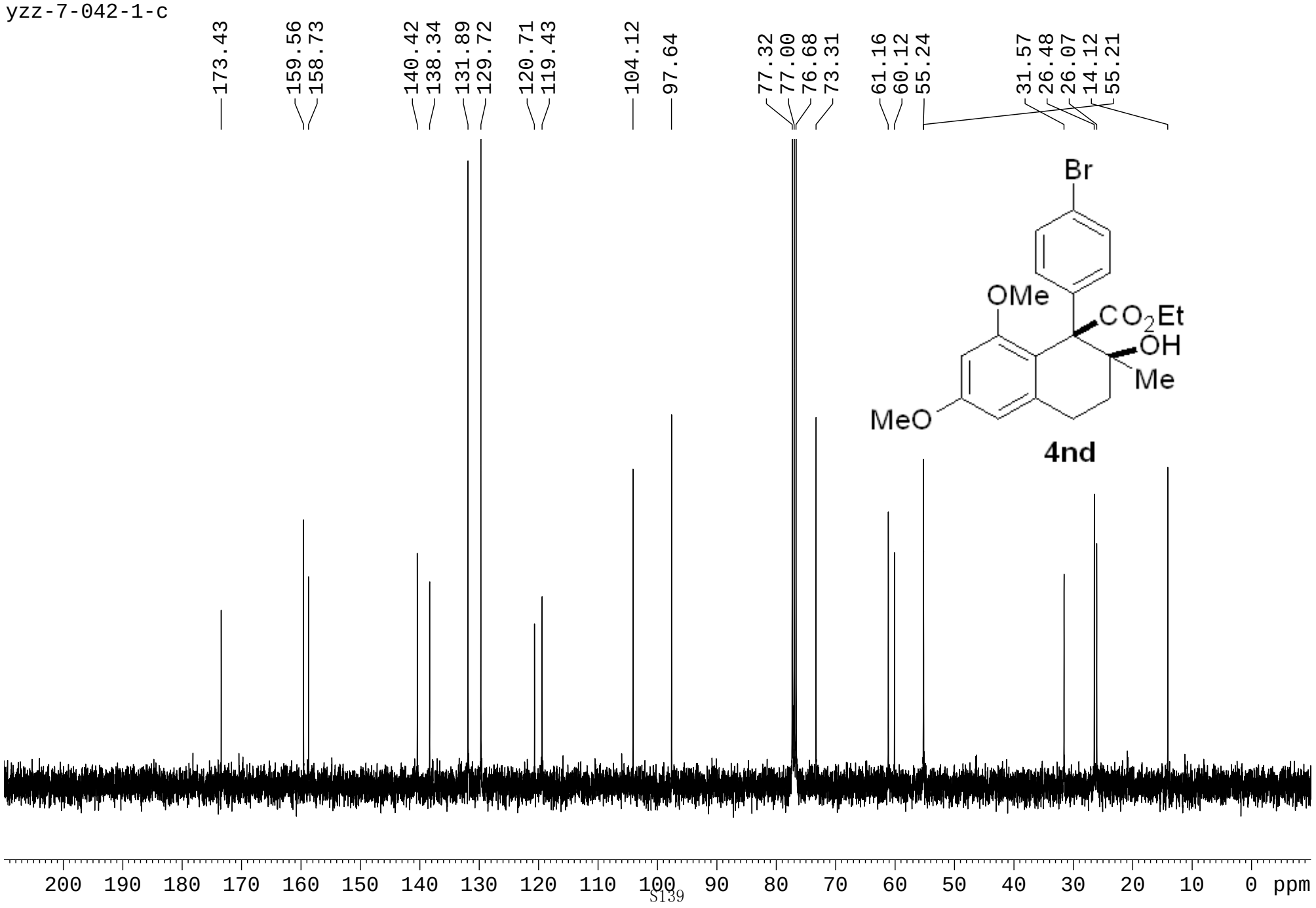
159.40
158.88
141.16
138.55
130.14
126.64
126.34
119.98
104.11
97.68
77.32
77.00
76.68
73.49
61.04
60.50
55.33
55.19
31.50
26.62
26.18
14.16
OMe
CO2Et
OH
Me
MeO
4nb
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm


7.365
7.343
7.296
7.273
7.260
6.389
6.383
6.292
6.286
3.834
3.711
3.455
3.221
3.204
3.192
3.176
3.160
3.149
3.131
3.103
2.754
2.749
2.740
2.734
2.711
2.705
2.697
2.691
1.678
1.673
1.661
1.655
1.644
1.638
1.627
1.612
1.590
1.563
1.549
1.236
Br
OMe
CO2Me
OH
Me
MeO
4nc
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
2.01
1.00
0.99
3.02
3.08
3.03
1.10
0.95
1.00
1.58
0.46
3.05

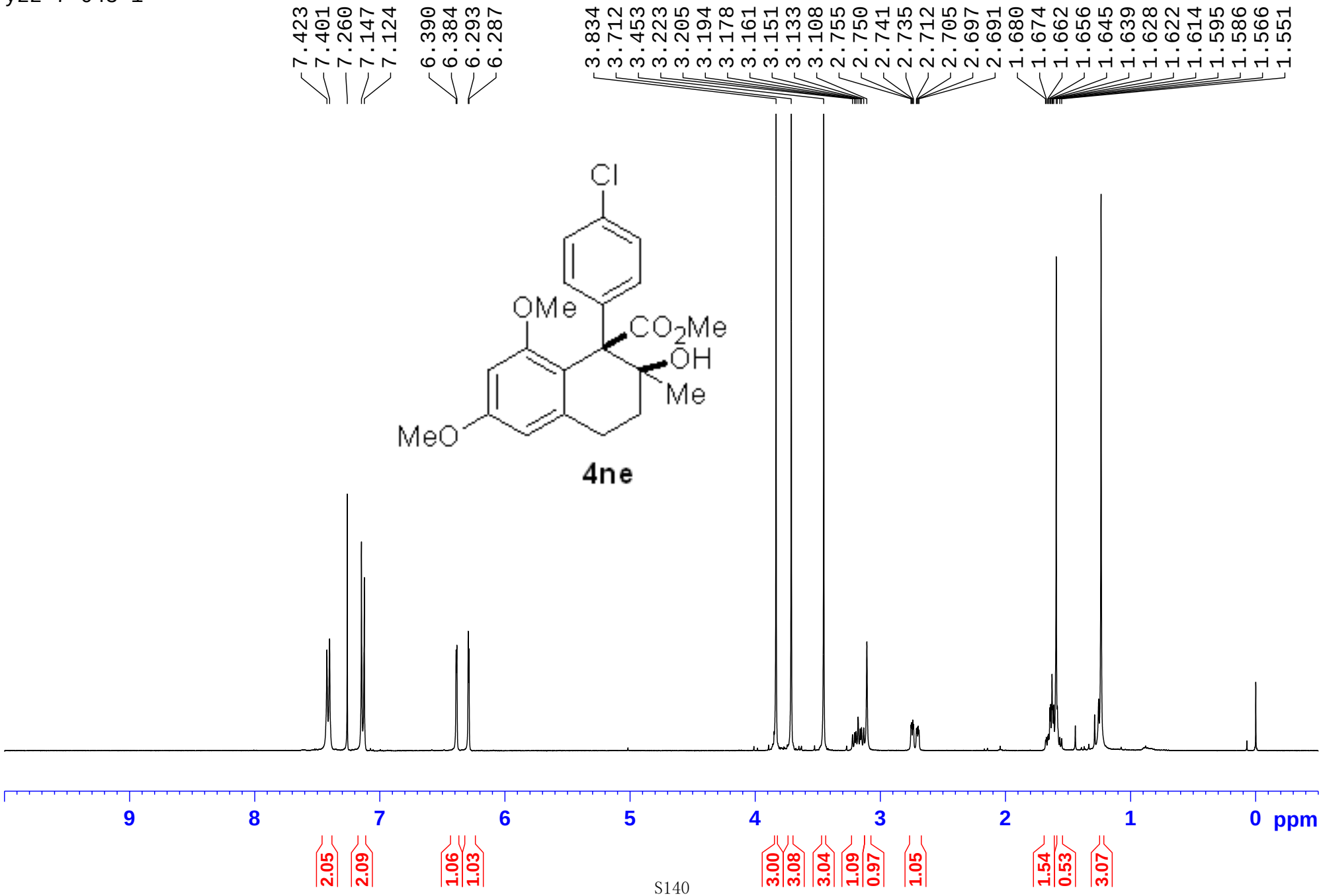

yzz-7-131-p1-2
174.03
159.61
158.79
140.47
138.19
131.75
129.80
120.77
119.45
104.23
97.93
77.32
77.00
76.68
73.39
60.08
55.55
55.24
52.14
31.53
26.50
25.95
Br
OMe
CO2Me
OH
Me
MeO
4nc
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

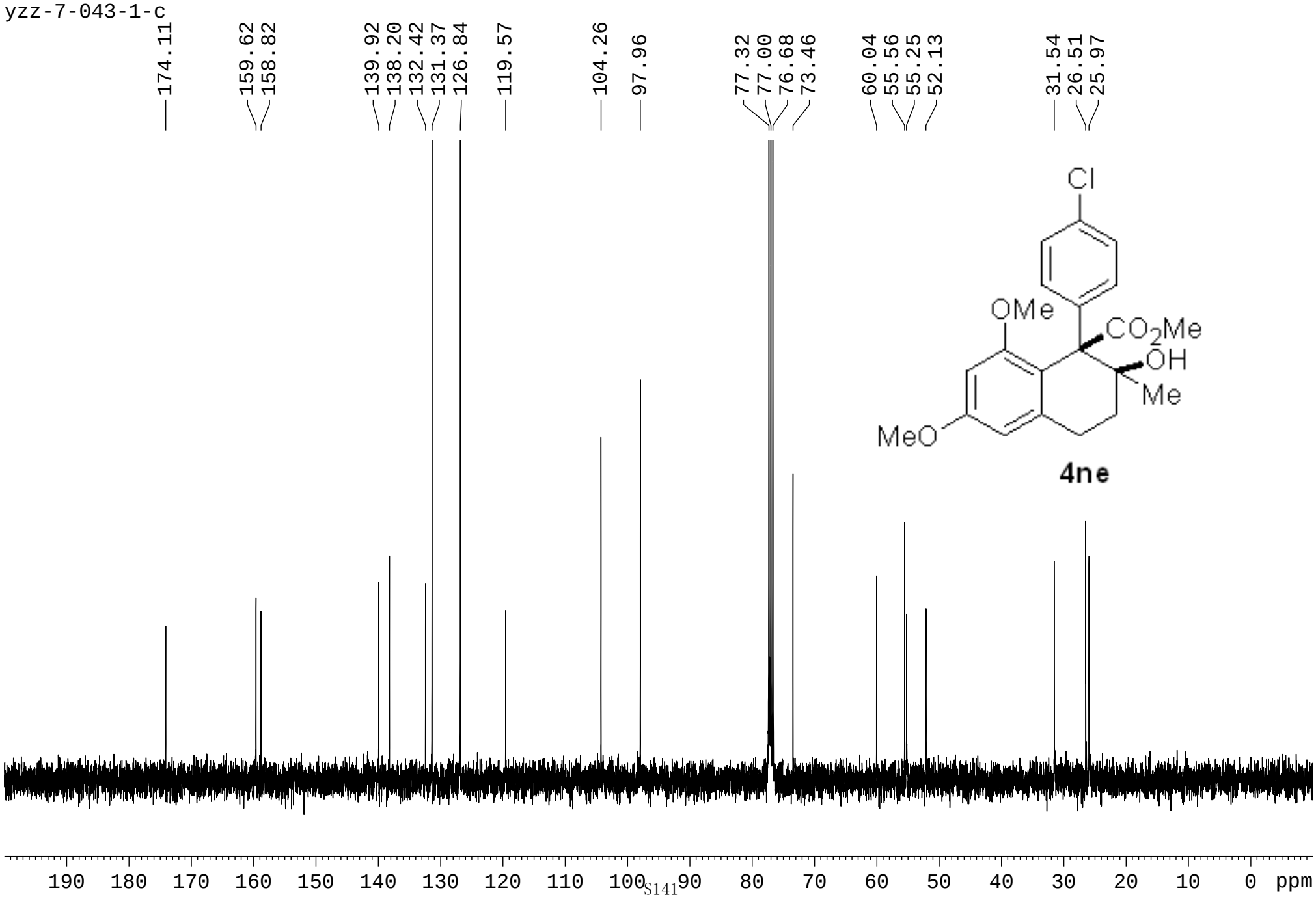
yzz-7-042-1


7.349
7.327
7.290
7.267
7.261
6.380
6.374
6.277
6.271
4.314
4.296
4.287
4.278
4.269
4.261
4.251
4.234
4.211
4.193
4.184
4.175
4.166
4.157
4.148
4.130
3.834
3.443
3.297
3.220
3.203
3.191
3.175
3.159
3.147
3.130
2.741
2.736
2.726
2.721
2.697
2.692
2.683
2.678
1.678
1.672
1.661
1.655
1.643
1.632
1.601
Br
OMe
CO2Et
OH
Me
MeO
4nd
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
1.13
1.04
1.01
1.00
1.02
1.01
3.06
3.01
0.96
1.03
1.00
1.04
1.07
6.18

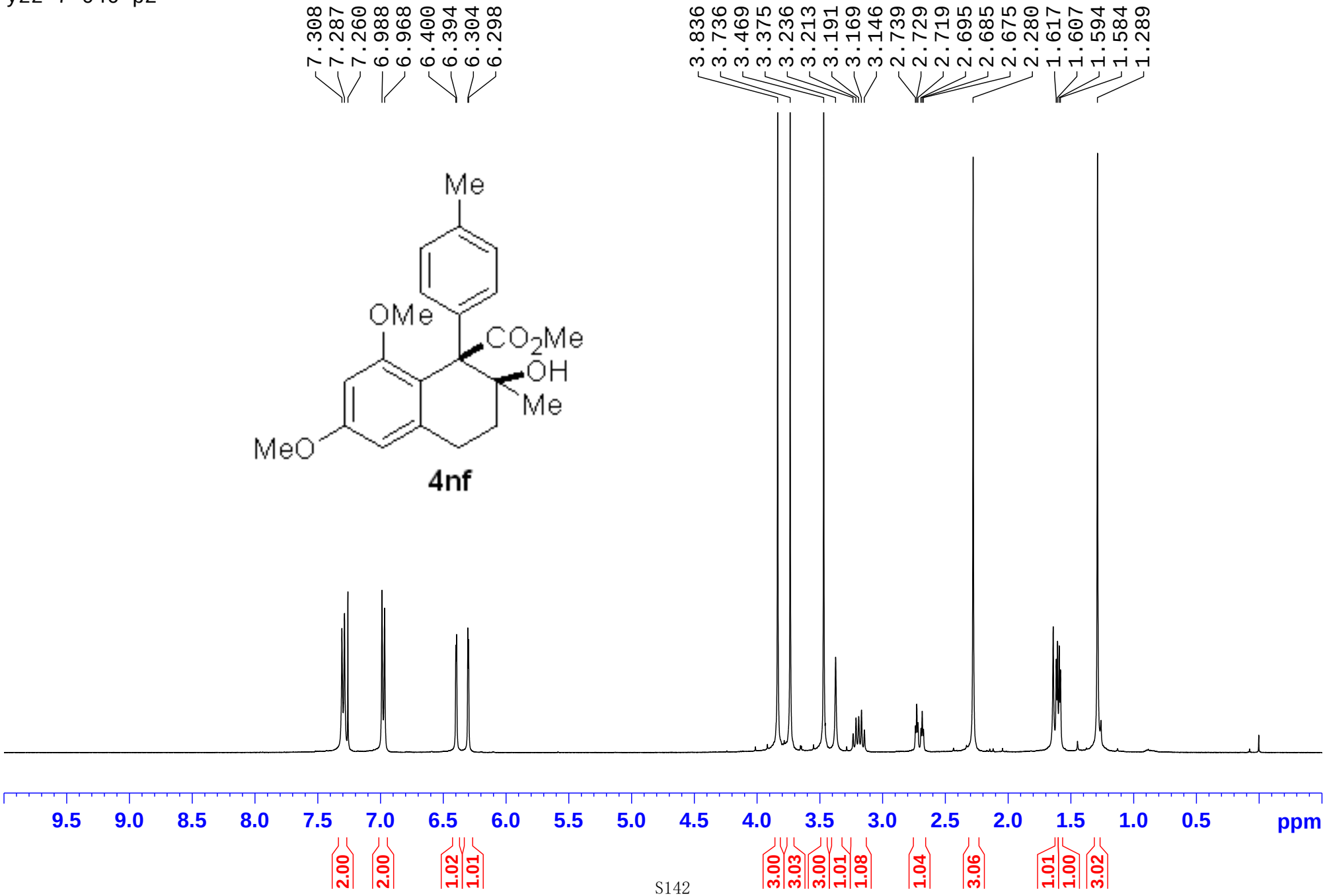

yzz-7-042-1-c
173.43
159.56
158.73
140.42
138.34
131.89
129.72
120.71
119.43
104.12
97.64
77.32
77.00
76.68
73.31
61.16
60.12
55.24
31.57
26.48
26.07
14.12
55.21
Br
OMe
CO2Et
OH
Me
MeO
4nd
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

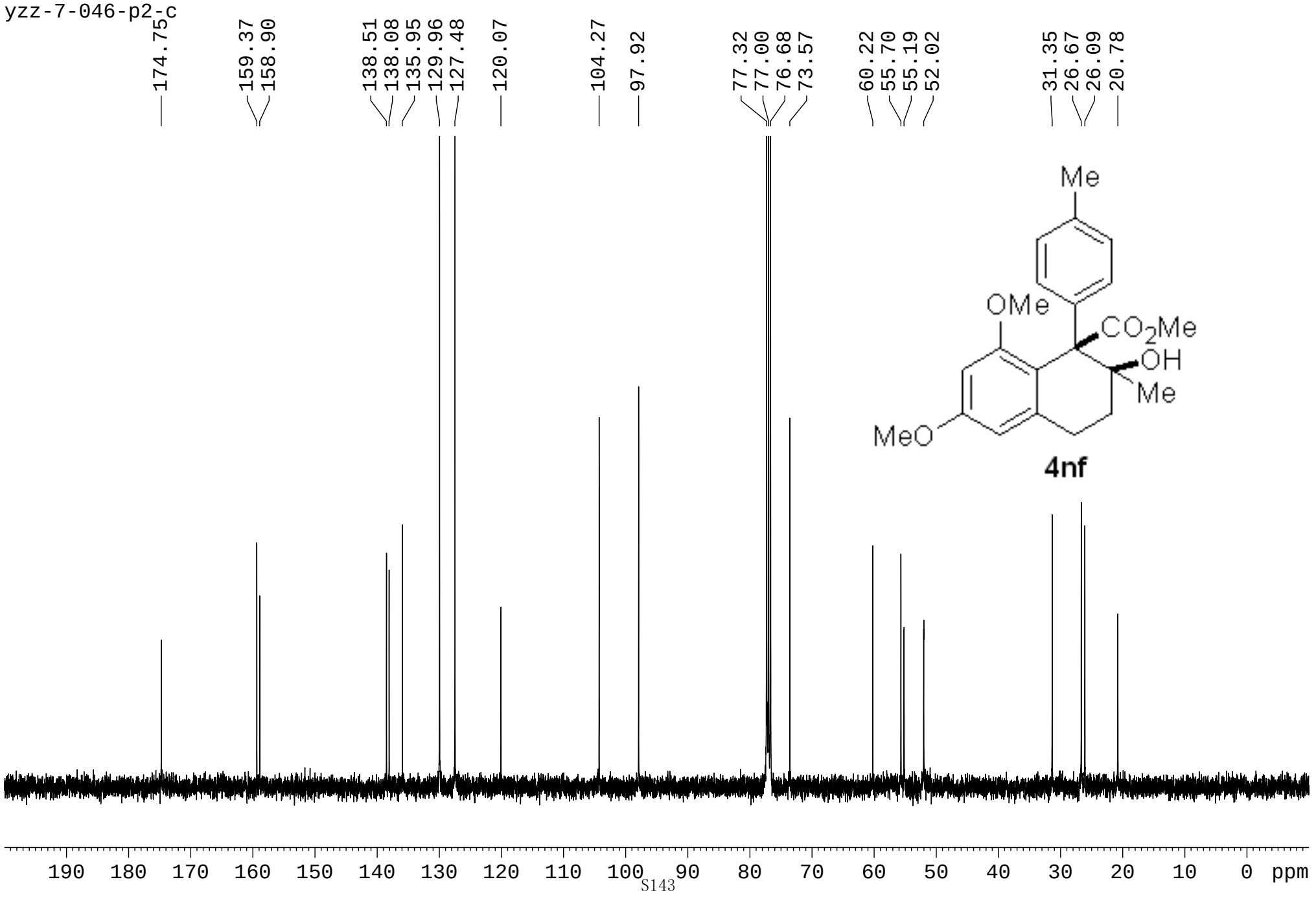
yzz-7-043-1


7.423
7.401
7.260
7.147
7.124
6.390
6.384
6.293
6.287
3.834
3.712
3.453
3.223
3.205
3.194
3.178
3.161
3.151
3.133
3.108
2.755
2.750
2.741
2.735
2.712
2.705
2.697
2.691
1.680
1.674
1.662
1.656
1.645
1.639
1.628
1.622
1.614
1.595
1.586
1.566
1.551
Cl
OMe
CO2Me
OH
Me
MeO
4ne
9
8
7
6
5
4
3
2
1
0 ppm
2.05
2.09
1.06
1.03
3.00
3.08
3.04
1.09
0.97
1.05
1.54
0.53
3.07


yzz-7-043-1-c
174.11
159.62
158.82
139.92
138.20
132.42
131.37
126.84
119.57
104.26
97.96
77.32
77.00
76.68
73.46
60.04
55.56
55.25
52.13
31.54
26.51
25.97
Cl
OMe
CO2Me
OH
Me
MeO
4ne
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

yzz-7-046-p2


7.308
7.287
7.260
6.988
6.968
6.400
6.394
6.304
6.298
3.836
3.736
3.469
3.375
3.236
3.213
3.191
3.169
3.146
2.739
2.729
2.719
2.695
2.685
2.675
2.280
1.617
1.607
1.594
1.584
1.289
Me
OMe
CO2Me
OH
Me
MeO
4nf
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
2.00
1.02
1.01
3.00
3.03
3.00
1.01
1.08
1.04
3.06
1.01
1.00
3.02


yzz-7-046-p2-c
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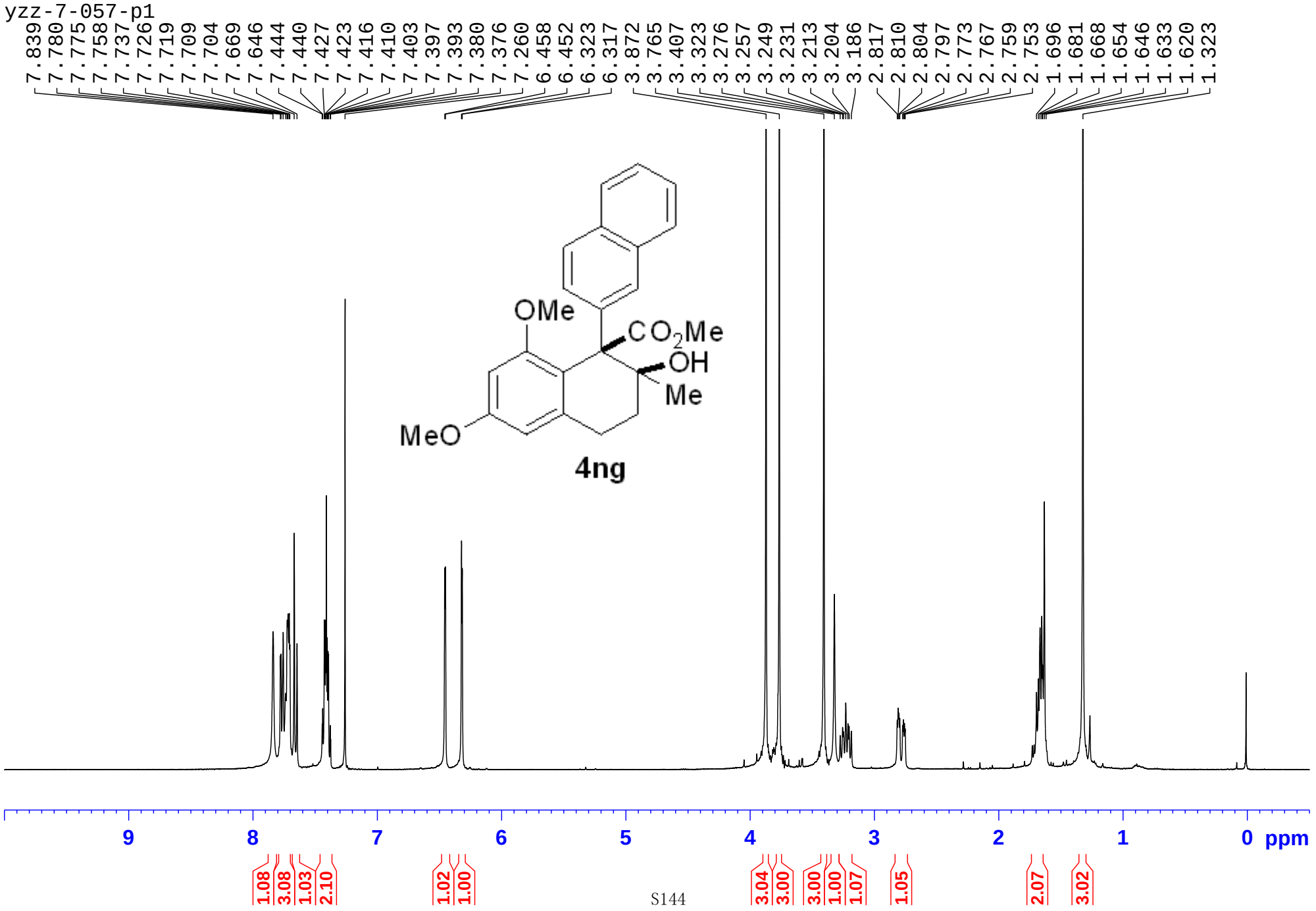
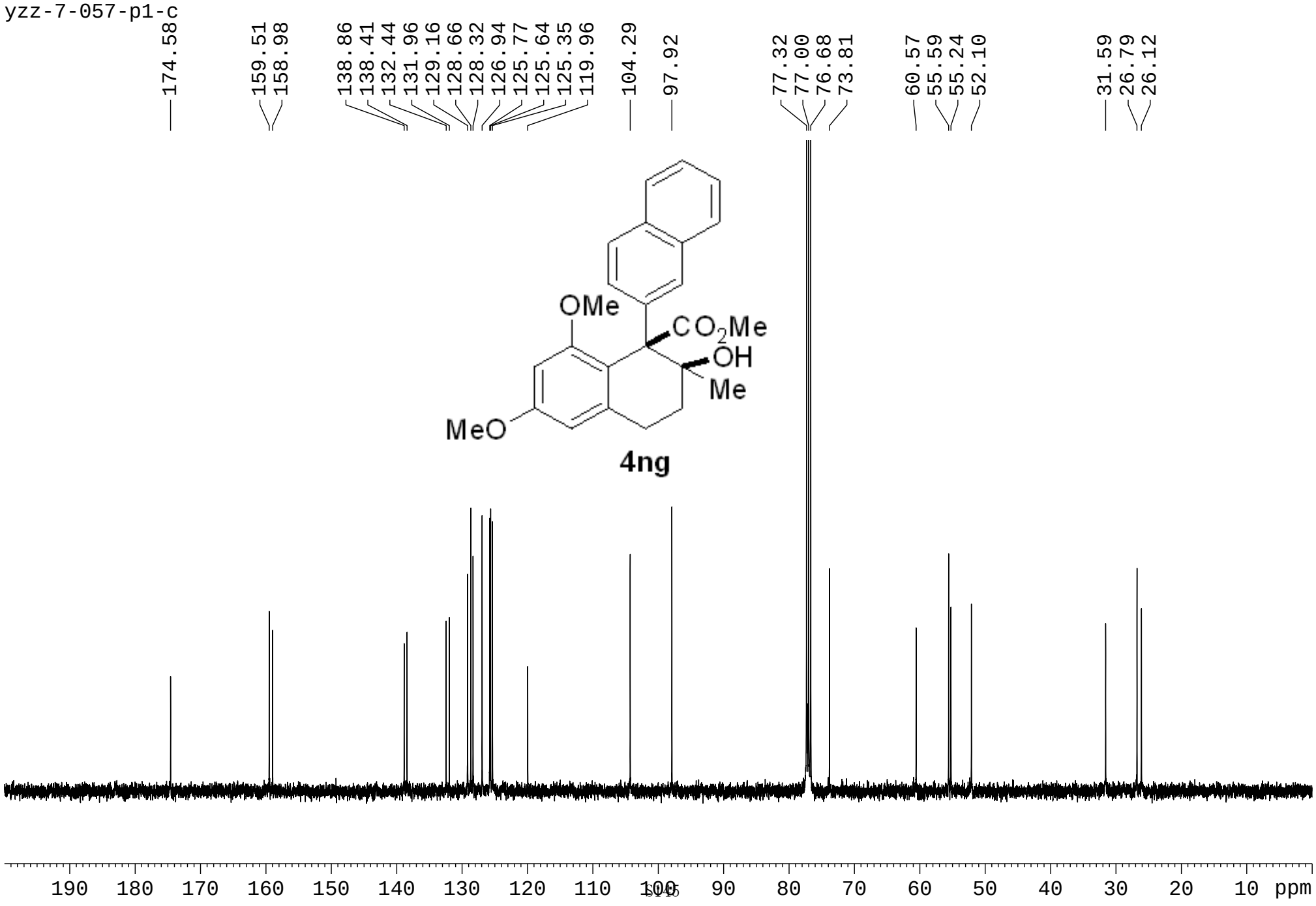
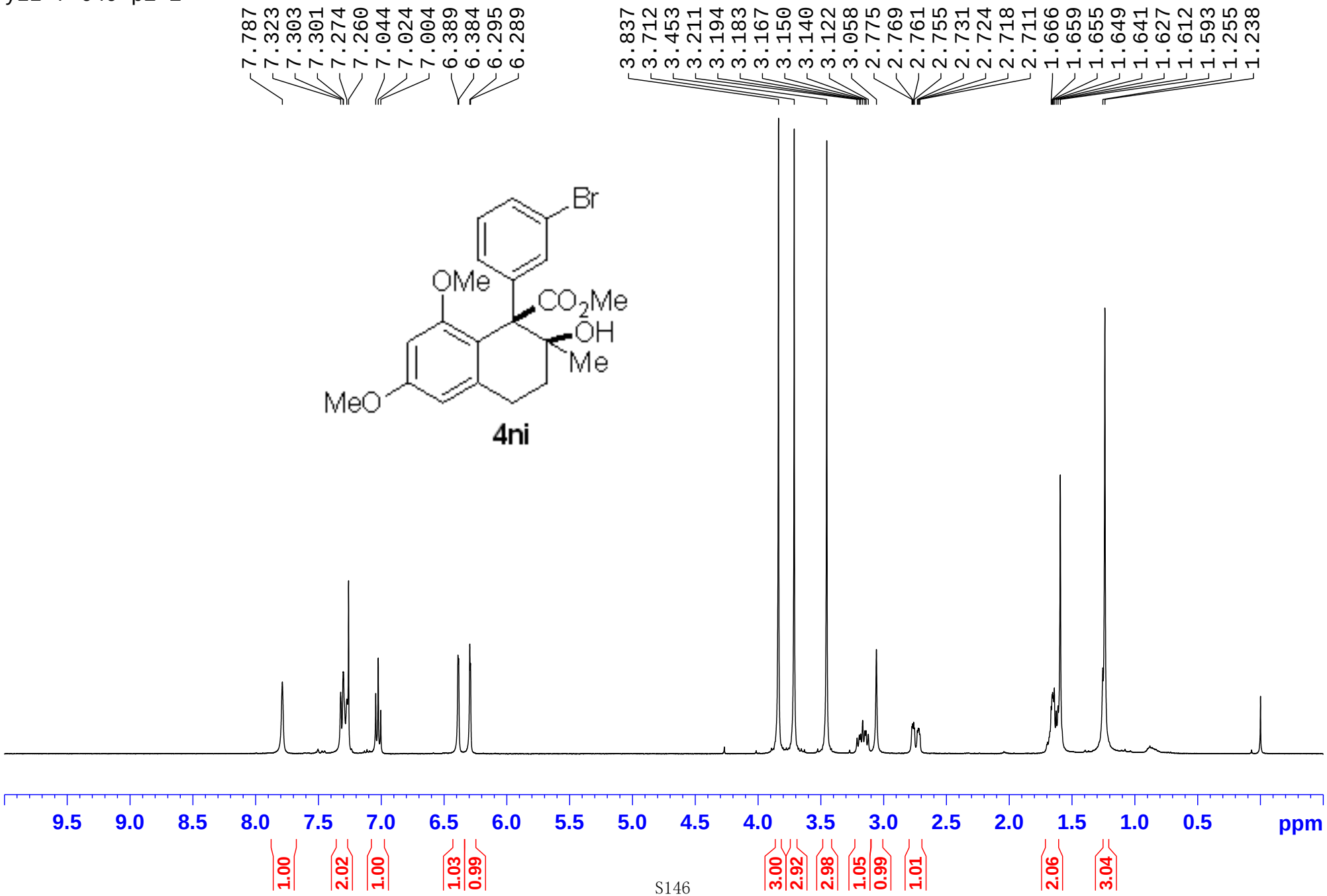
159.37
158.90
138.51
138.08
135.95
129.96
127.48
120.07
104.27
97.92
77.32
77.00
76.68
73.57
60.22
55.70
55.19
52.02
31.35
26.67
26.09
20.78
Me
OMe
CO2Me
OH
Me
MeO
4nf
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm


yzz-7-057-p1
7.839
7.780
7.775
7.758
7.737
7.726
7.719
7.709
7.704
7.669
7.646
7.444
7.440
7.427
7.423
7.416
7.410
7.403
7.397
7.393
7.380
7.376
7.260
6.458
6.452
6.323
6.317
3.872
3.765
3.407
3.323
3.276
3.257
3.249
3.231
3.213
3.204
3.186
2.817
2.810
2.804
2.797
2.773
2.767
2.759
2.753
1.696
1.681
1.668
1.654
1.646
1.633
1.620
1.323
OMe
CO2Me
OH
Me
MeO
4ng
9
8
7
6
5
4
3
2
1
0 ppm
1.08
3.08
1.03
2.10
1.02
1.00
3.04
3.00
3.00
1.00
1.07
1.05
2.07
3.02

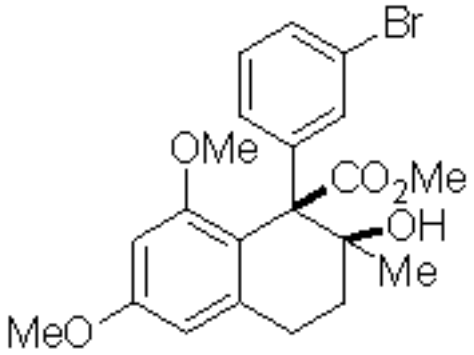

yzz-7-057-p1-c
174.58
159.51
158.98
138.86
138.41
132.44
131.96
129.16
128.66
128.32
126.94
125.77
125.64
125.35
119.96
104.29
97.92
77.32
77.00
76.68
73.81
60.57
55.59
55.24
52.10
31.59
26.79
26.12
OMe
CO2Me
OH
Me
MeO
4ng
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

yzz-7-049-p1-1


7.787
7.323
7.303
7.301
7.274
7.260
7.044
7.024
7.004
6.389
6.384
6.295
6.289
3.837
3.712
3.453
3.211
3.194
3.183
3.167
3.150
3.140
3.122
3.058
2.775
2.769
2.761
2.755
2.731
2.724
2.718
2.711
1.666
1.659
1.655
1.649
1.641
1.627
1.612
1.593
1.255
1.238
Br
OMe
CO2Me
OH
Me
MeO
4ni
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
1.00
2.02
1.00
1.03
0.99
3.00
2.92
2.98
1.05
0.99
1.01
2.06
3.04

YZZ-7-049-P1-1-C

173.85
159.65
158.82
143.80
138.14
132.95
129.54
128.44
128.17
121.18
119.33
104.30
98.02
77.32
77.00
76.68
73.53
60.23
55.55
55.23
52.16
31.65
26.52
25.95



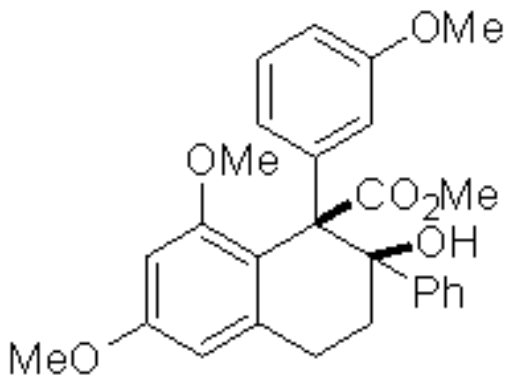
4ni

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-7-047-1

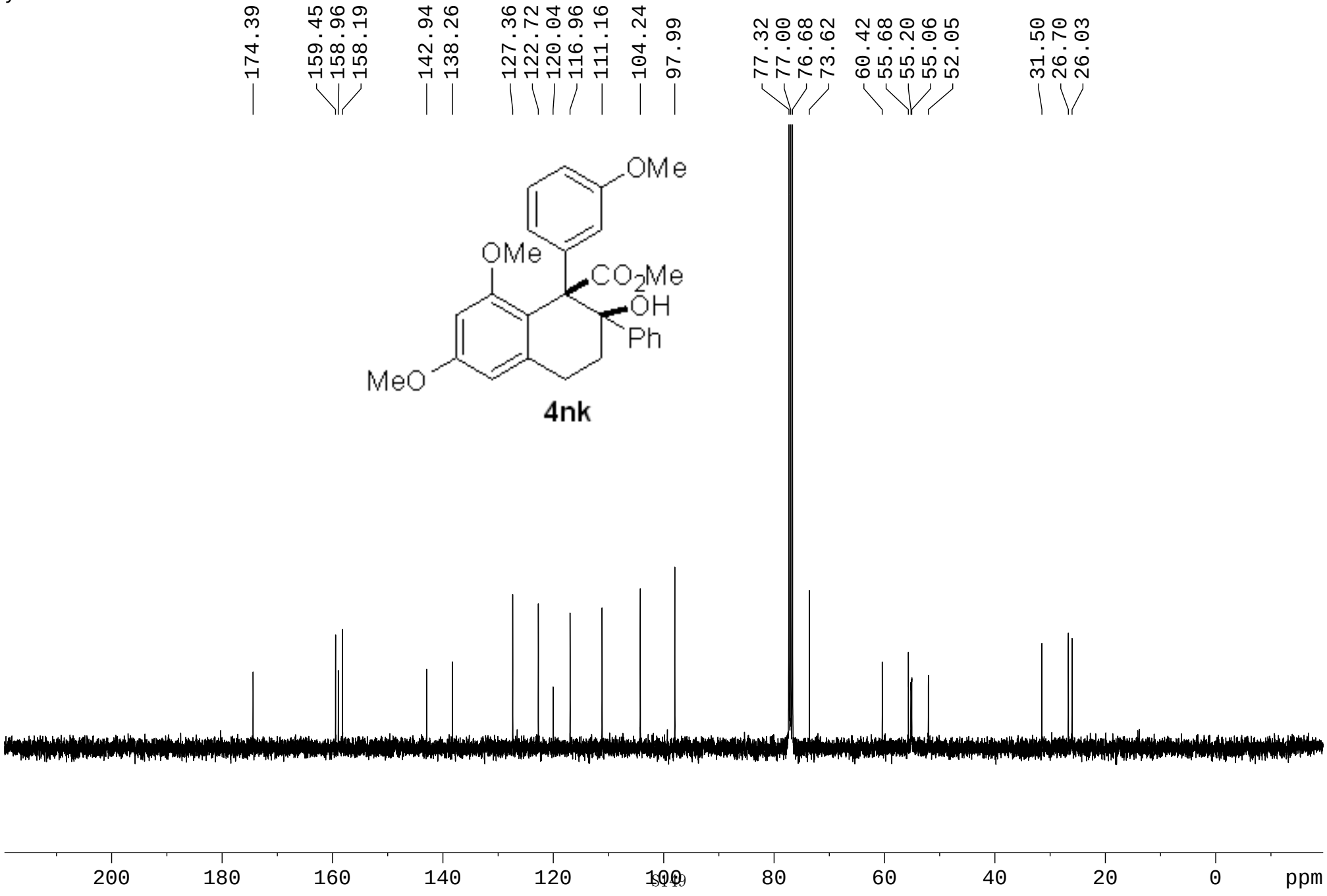
7.260 7.149 7.099 7.079 7.059 6.982 6.962 6.742 6.738 6.724 6.722 6.718 6.382 6.376 6.291 6.285

3.827 3.736 3.724 3.459 3.218 3.201 3.192 3.175 3.158 3.148 3.130 2.752 2.746 2.738 2.732 2.709 2.703 2.694 2.689 1.682 1.667 1.653 1.646 1.640 1.629 1.623 1.612 1.606 1.593 1.285

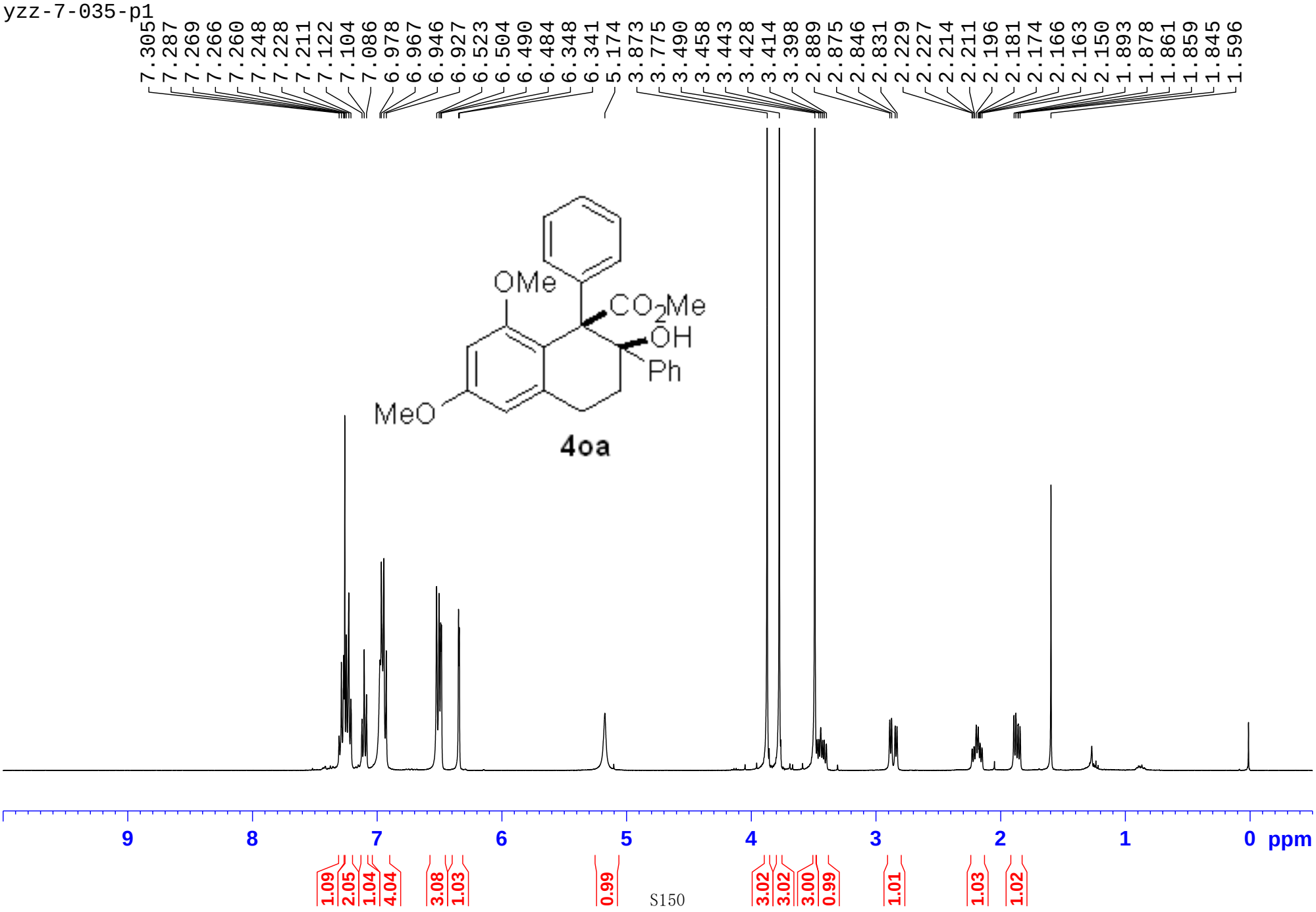


4nk

yzz-7-047-1-c

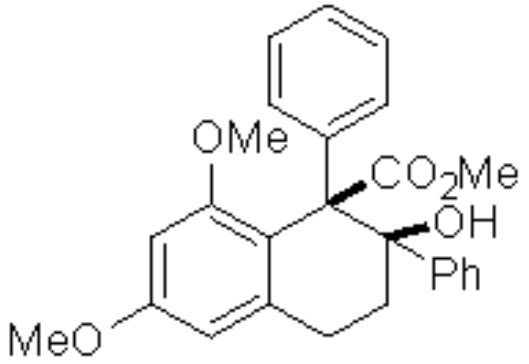

174.39
159.45
158.96
158.19
142.94
138.26
127.36
122.72
120.04
116.96
111.16
104.24
97.99
77.32
77.00
76.68
73.62
60.42
55.68
55.20
55.06
52.05
31.50
26.70
26.03
OMe
OMe
CO2Me
OH
Ph
MeO
4nk
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-7-035-p1


7.305
7.287
7.269
7.266
7.260
7.248
7.228
7.211
7.122
7.104
7.086
6.978
6.967
6.946
6.927
6.523
6.504
6.490
6.484
6.348
6.341
5.174
3.873
3.775
3.490
3.458
3.443
3.428
3.414
3.398
2.889
2.875
2.846
2.831
2.229
2.227
2.214
2.211
2.196
2.181
2.174
2.166
2.163
2.150
1.893
1.878
1.861
1.859
1.845
1.596
OMe
CO2Me
OH
Ph
MeO
4oa
9
8
7
6
5
4
3
2
1
0 ppm
1.09
2.05
1.04
4.04
3.08
1.03
0.99
3.02
3.02
3.00
0.99
1.01
1.03
1.02

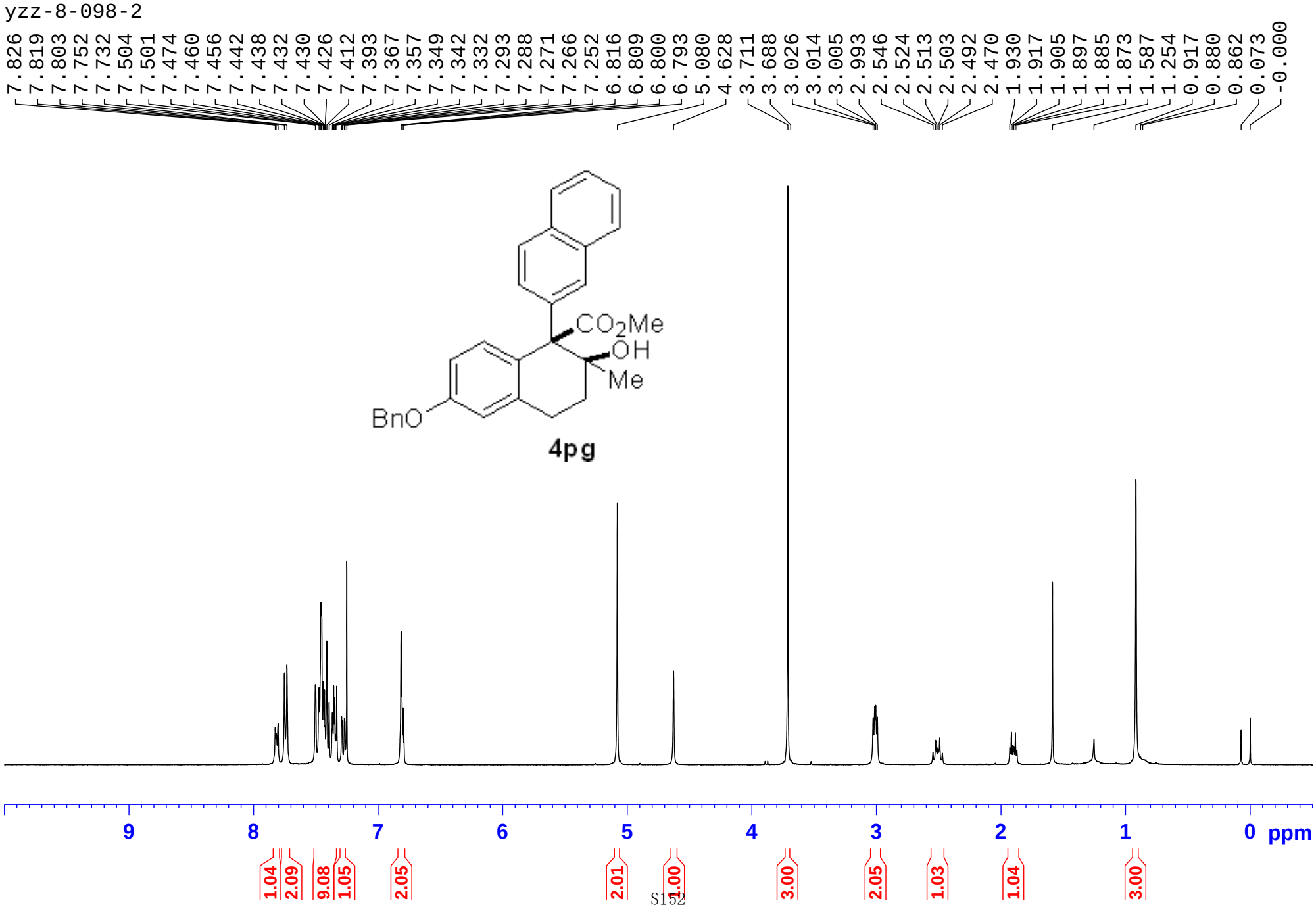
yzz-7-035-p1-c

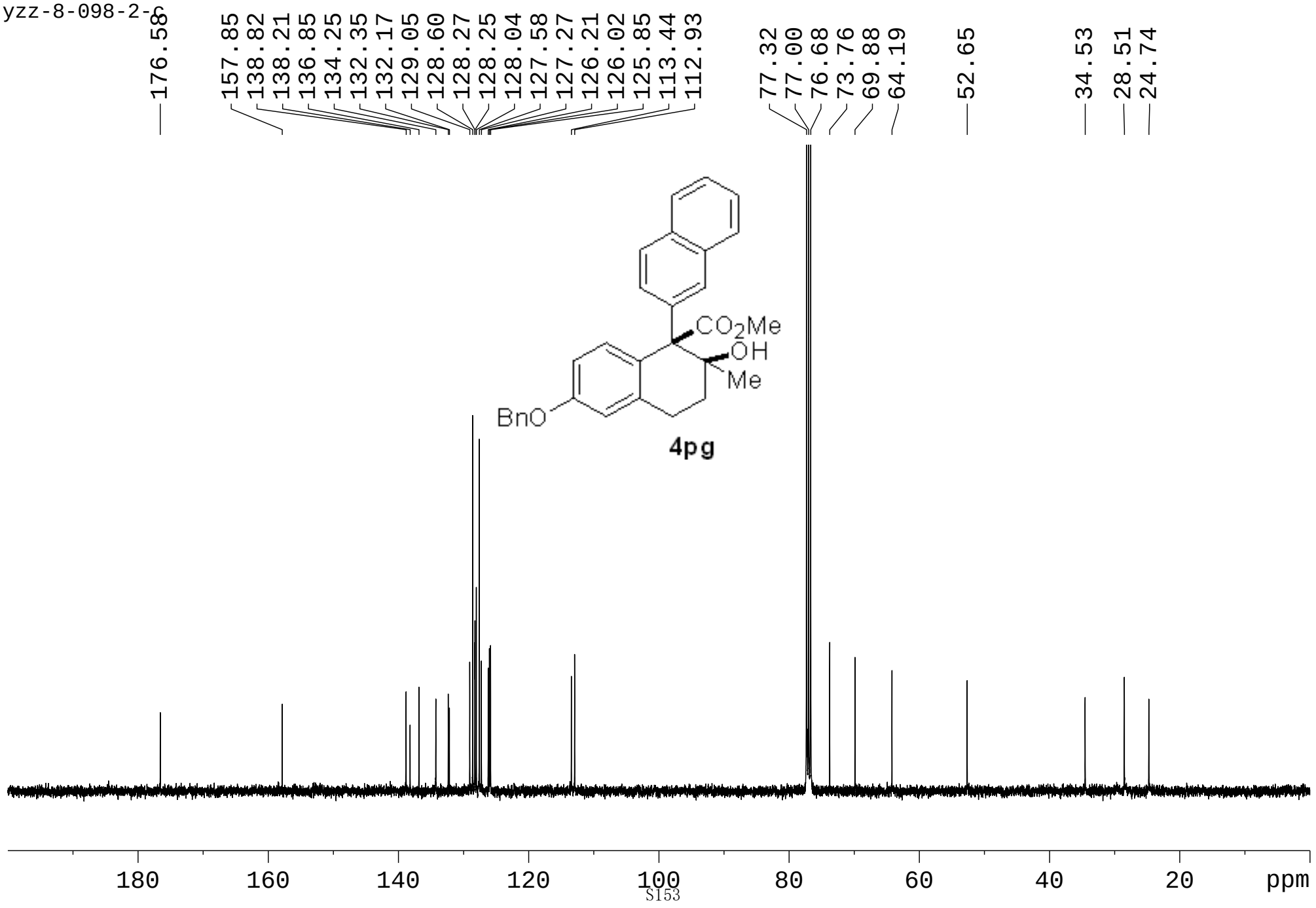
175.47
159.57
158.73
144.12
139.34
138.77
131.44
127.78
127.41
126.95
126.64
125.78
120.02
104.52
97.77
77.32
77.00
76.68
76.62
62.26
55.69
55.25
52.22
29.76
26.57



4oa

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


yzz-8-098-2
7.826
7.819
7.803
7.752
7.732
7.504
7.501
7.474
7.460
7.456
7.442
7.438
7.432
7.430
7.426
7.412
7.393
7.367
7.357
7.349
7.342
7.332
7.293
7.288
7.271
7.266
7.252
6.816
6.809
6.800
6.793
5.080
4.628
3.711
3.688
3.026
3.014
3.005
2.993
2.546
2.524
2.513
2.503
2.492
2.470
1.930
1.917
1.905
1.897
1.885
1.873
1.587
1.254
0.917
0.880
0.862
0.073
-0.000
CO2Me
OH
Me
BnO
4pg
9
8
7
6
5
4
3
2
1
0
ppm
1.04
2.09
9.08
1.05
2.05
2.01
1.00
3.00
2.05
1.03
1.04
3.00

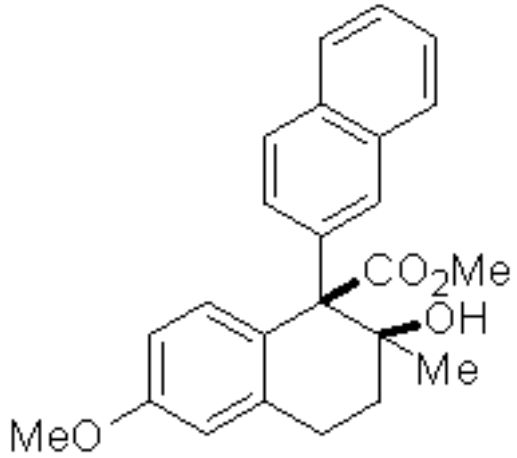

yzz-8-098-2-c
176.58
157.85
138.82
138.21
136.85
134.25
132.35
132.17
129.05
128.60
128.27
128.25
128.04
127.58
127.27
126.21
126.02
125.85
113.44
112.93
77.32
77.00
76.68
73.76
69.88
64.19
52.65
34.53
28.51
24.74
CO2Me
OH
Me
BnO
4pg
180
160
140
120
100
80
60
40
20
ppm

yzz-8-102-2

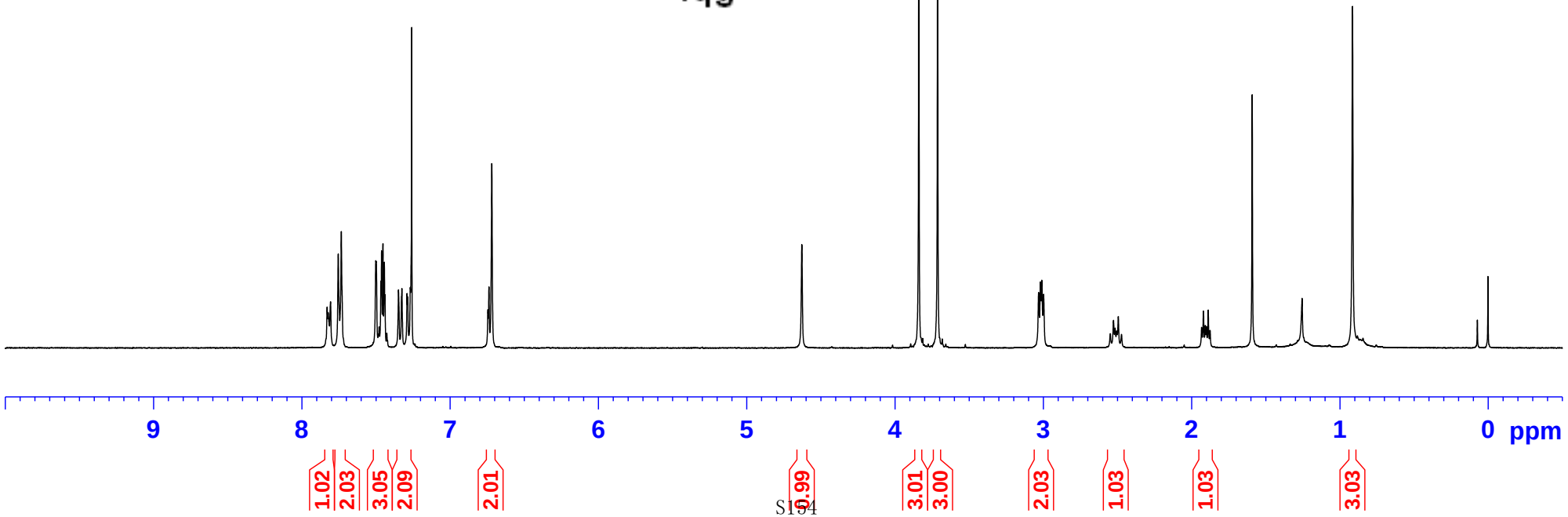
7.829 7.826 7.806 7.754 7.734 7.502 7.499 7.485 7.480 7.468 7.463 7.454 7.444 7.440 7.428 7.349 7.326 7.291 7.287 7.269 7.260 6.746 6.739 6.720

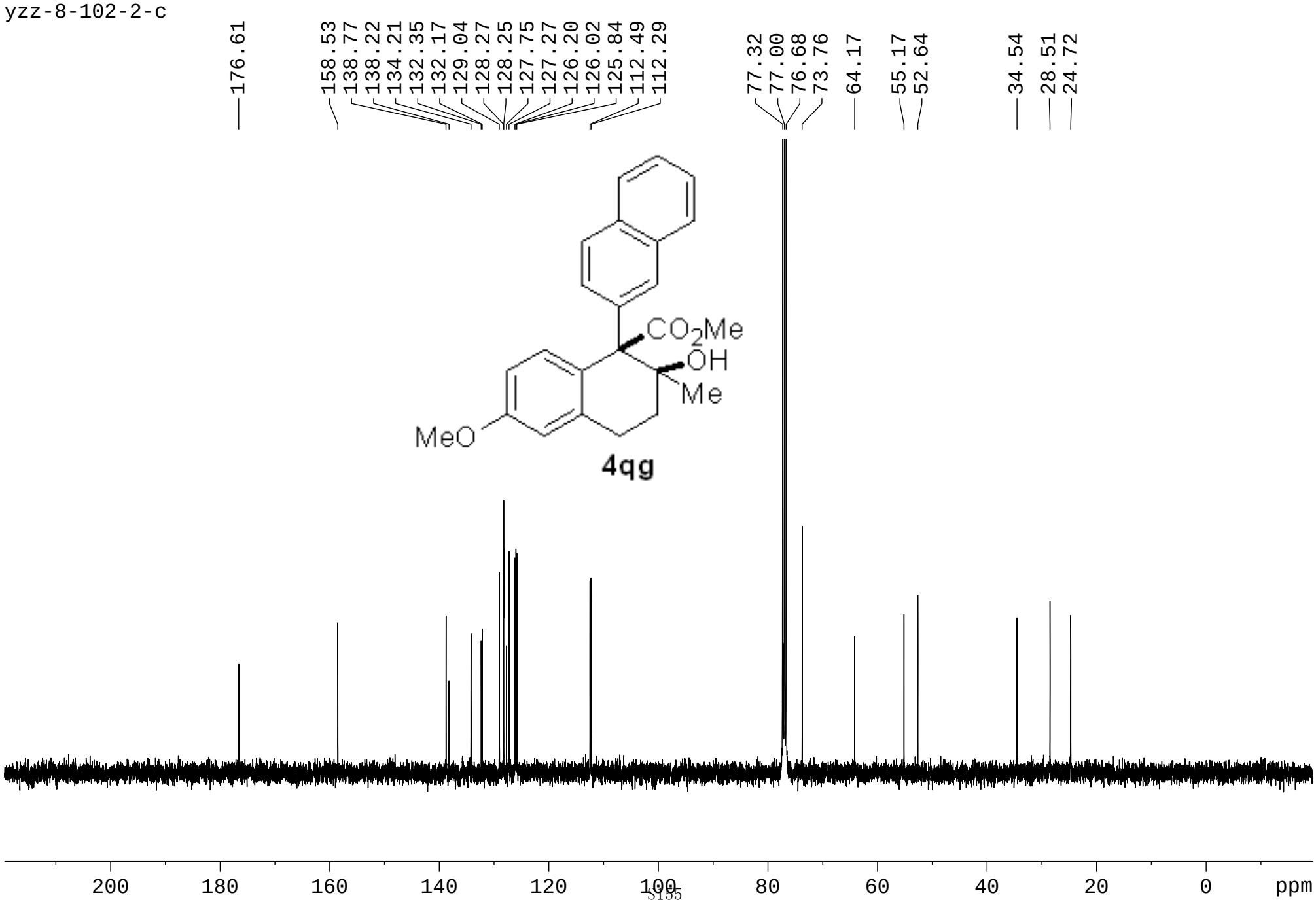
4.629

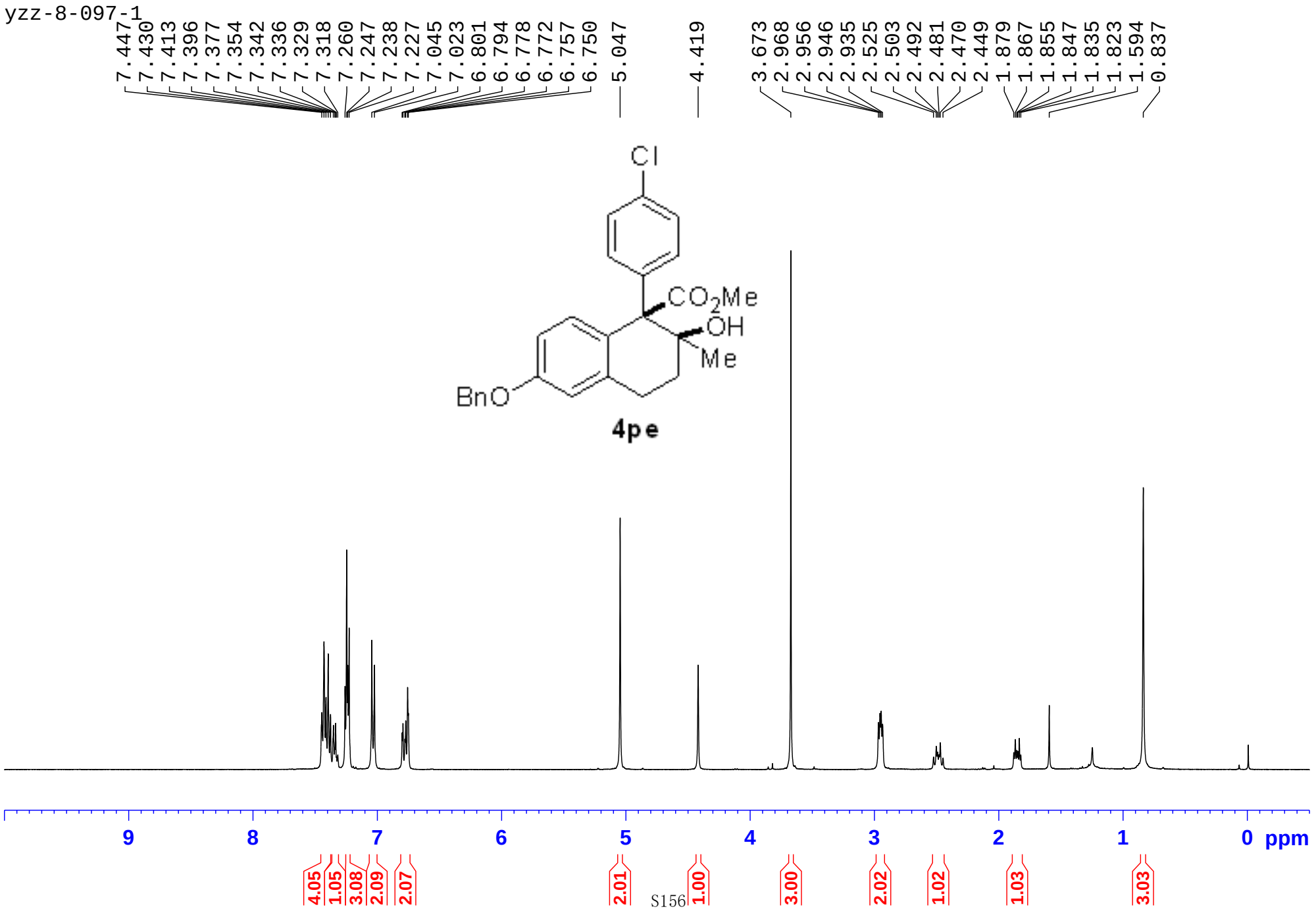
3.840 3.713 3.032 3.020 3.011 2.999 2.549 2.527 2.516 2.506 2.495 2.473 1.933 1.921 1.908 1.901 1.888 1.876 1.592 0.915



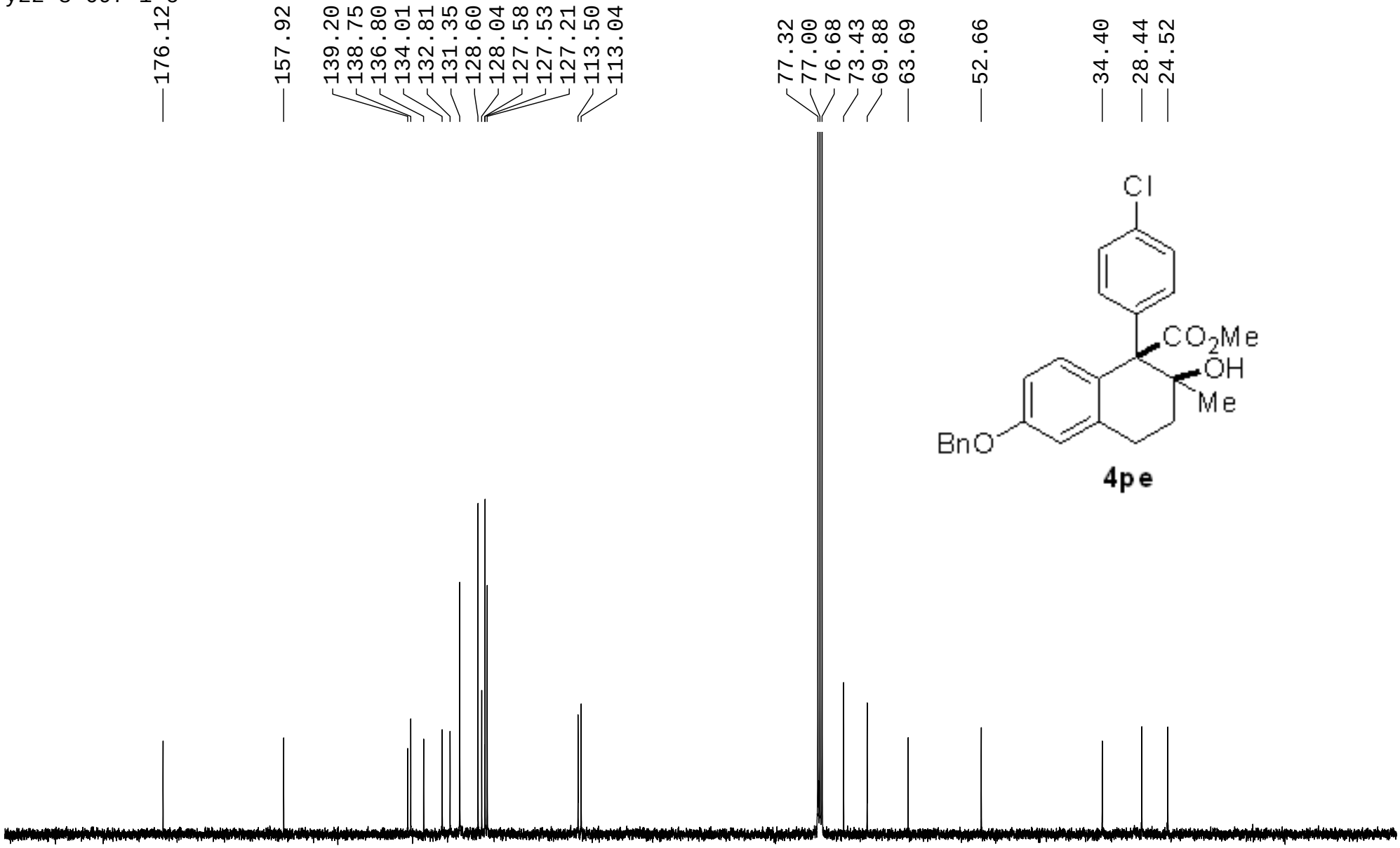
4qg



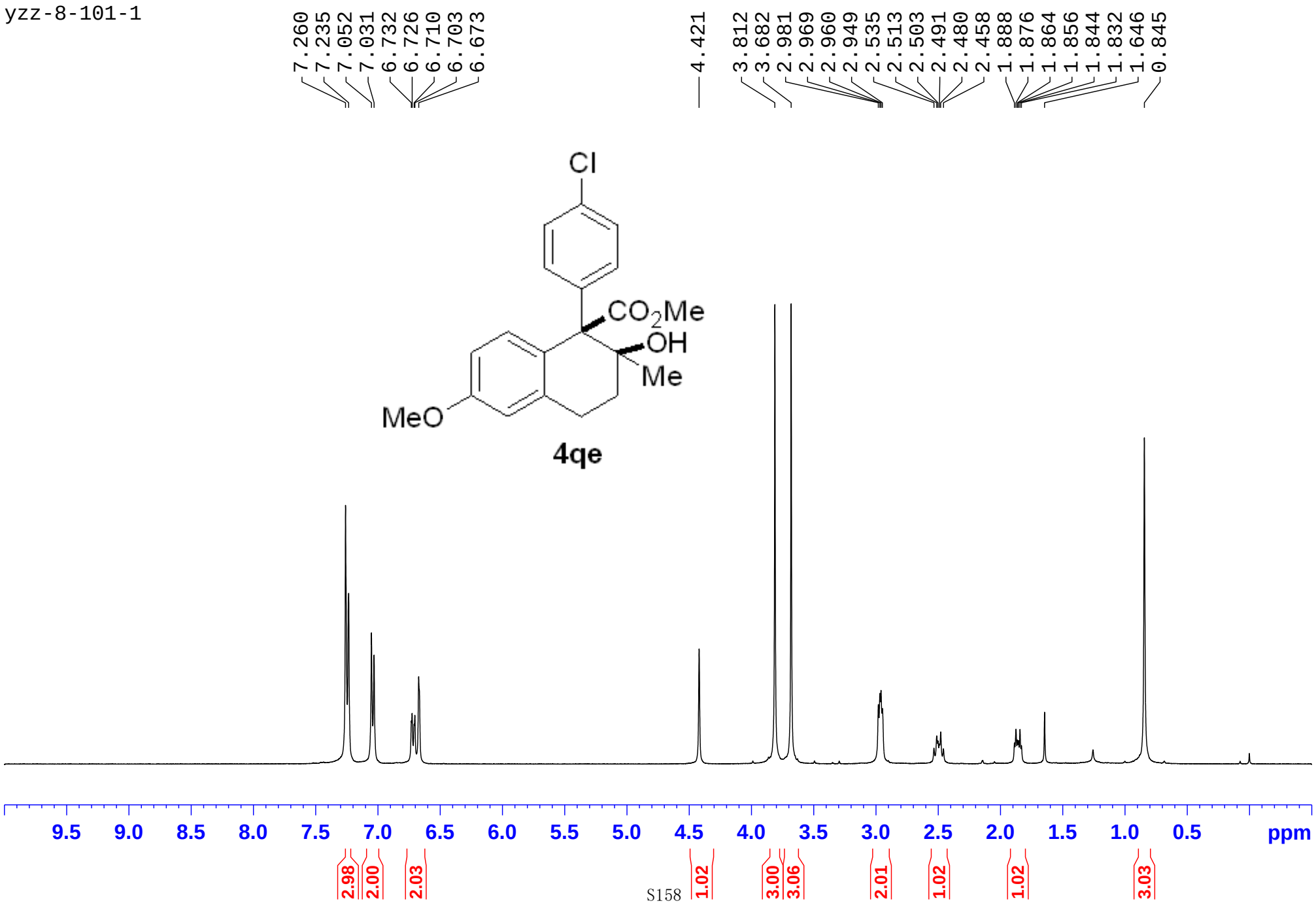

yzz-8-102-2-c
176.61
158.53
138.77
138.22
134.21
132.35
132.17
129.04
128.27
128.25
127.75
127.27
126.20
126.02
125.84
112.49
112.29
77.32
77.00
76.68
73.76
64.17
55.17
52.64
34.54
28.51
24.72
CO2Me
OH
Me
MeO
4qg
200
180
160
140
120
100
80
60
40
20
0
ppm

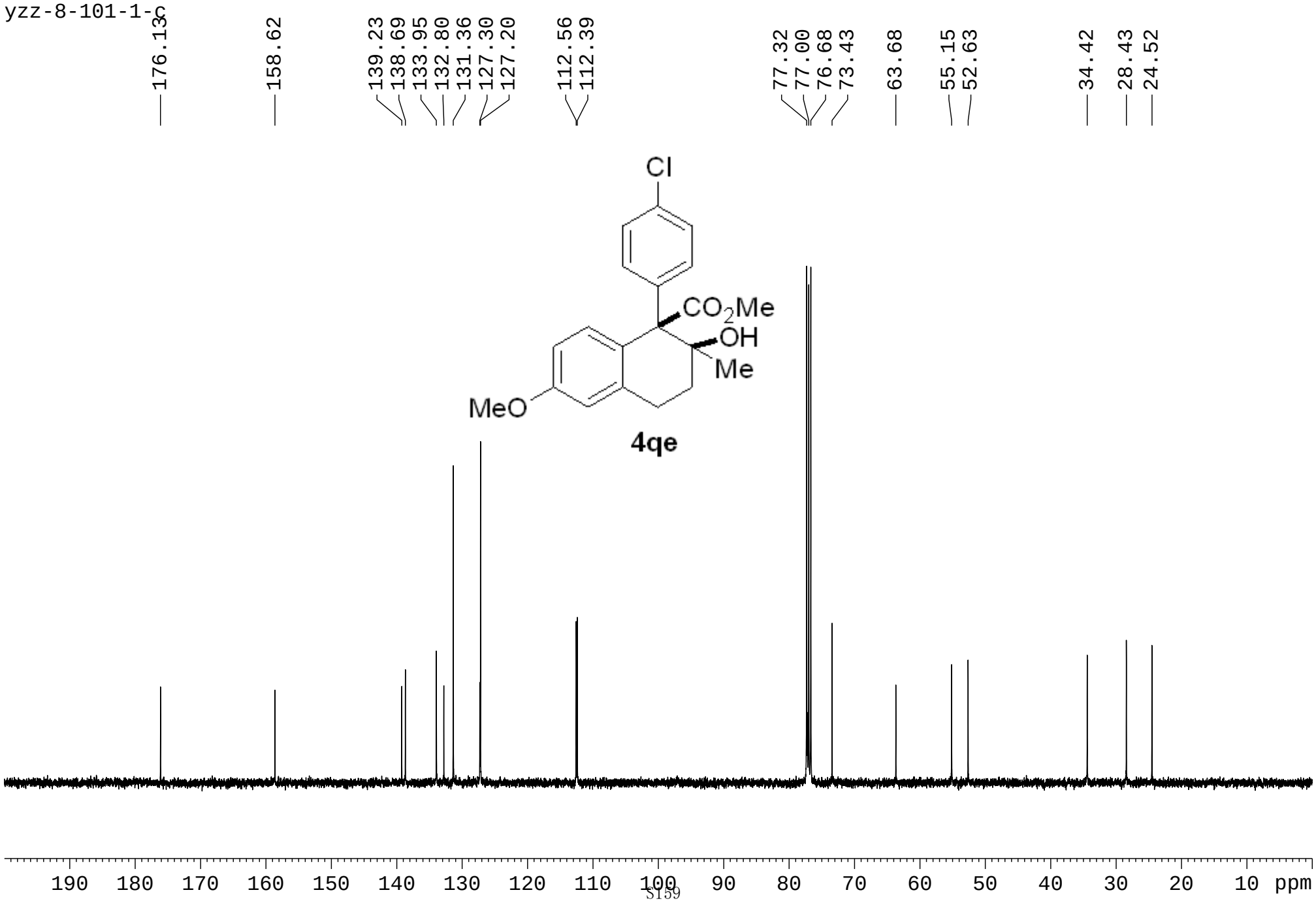

yzz-8-097-1
7.447
7.430
7.413
7.396
7.377
7.354
7.342
7.336
7.329
7.318
7.260
7.247
7.238
7.227
7.045
7.023
6.801
6.794
6.778
6.772
6.757
6.750
5.047
4.419
3.673
2.968
2.956
2.946
2.935
2.525
2.503
2.492
2.481
2.470
2.449
1.879
1.867
1.855
1.847
1.835
1.823
1.594
0.837
Cl
CO2Me
OH
Me
BnO
4pe
9
8
7
6
5
4
3
2
1
0 ppm
4.05
1.05
3.08
2.09
2.07
2.01
1.00
3.00
2.02
1.02
1.03
3.03

yzz-8-097-1-c

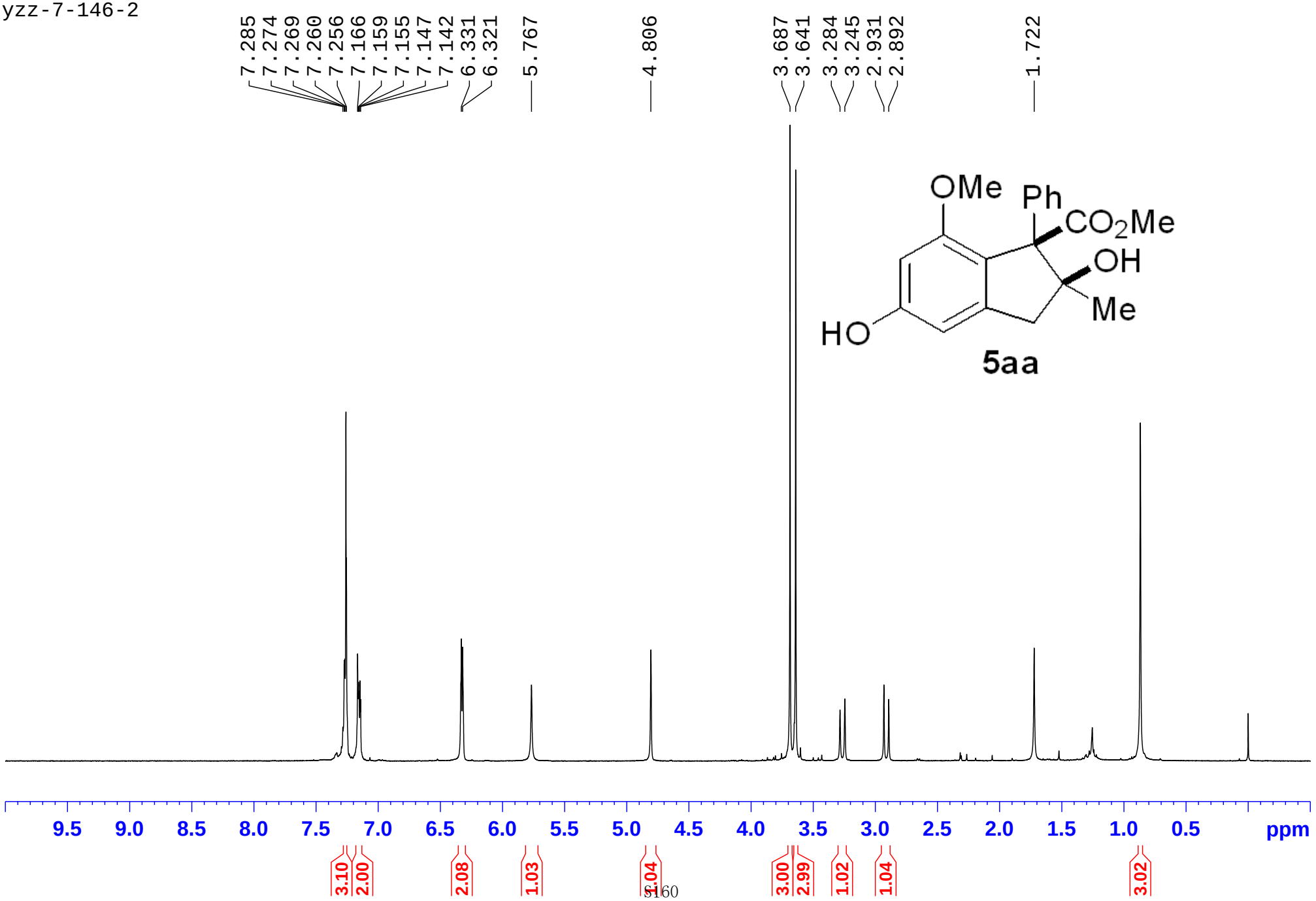

176.12
157.92
139.20
138.75
136.80
134.01
132.81
131.35
128.60
128.04
127.58
127.53
127.21
113.50
113.04
77.32
77.00
76.68
73.43
69.88
63.69
52.66
34.40
28.44
24.52
Cl
CO2Me
OH
Me
BnO
4pe
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

yzz-8-101-1

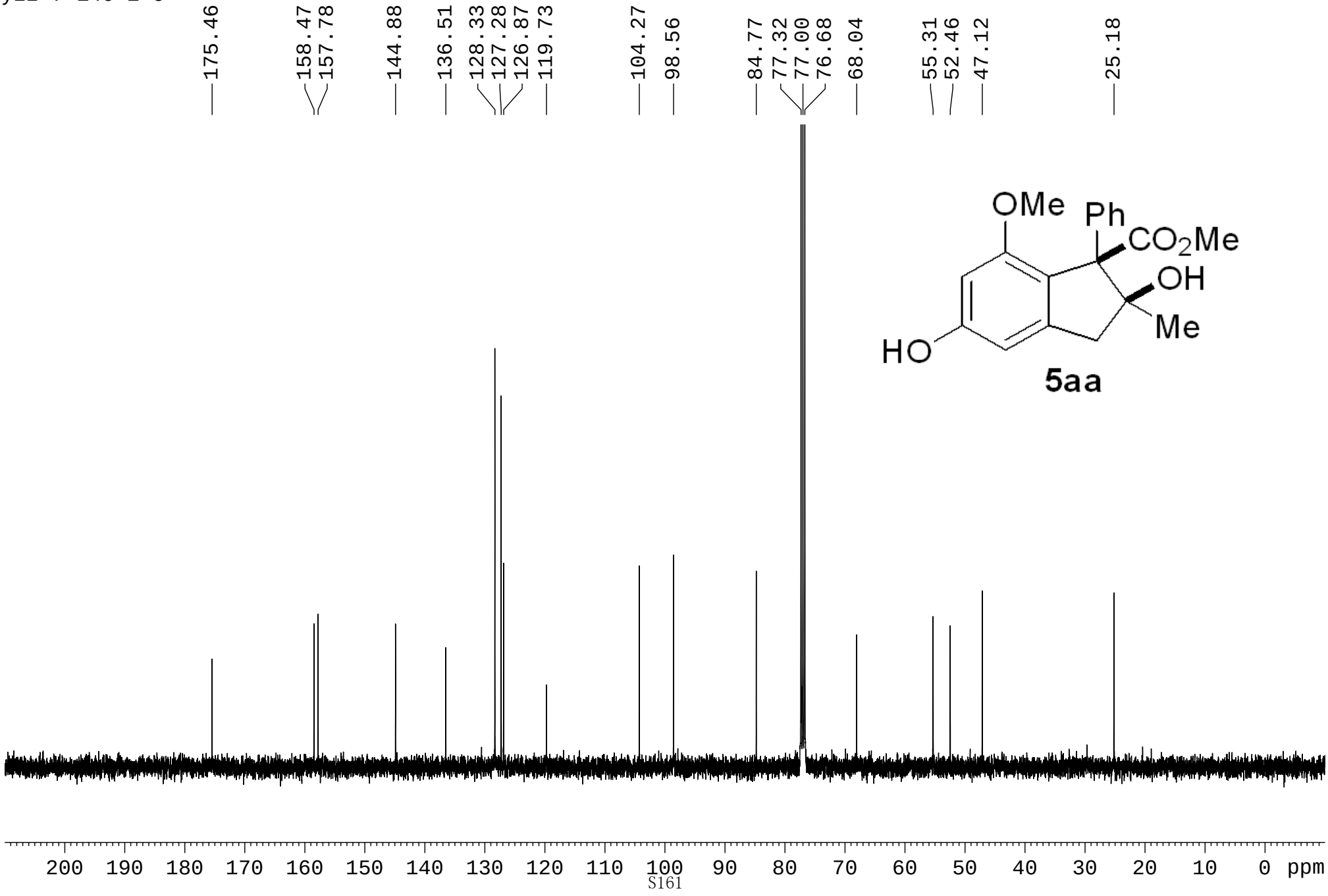

7.260
7.235
7.052
7.031
6.732
6.726
6.710
6.703
6.673
4.421
3.812
3.682
2.981
2.969
2.960
2.949
2.535
2.513
2.503
2.491
2.480
2.458
1.888
1.876
1.864
1.856
1.844
1.832
1.646
0.845
Cl
CO2Me
OH
Me
MeO
4qe
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.98
2.00
2.03
1.02
3.00
3.06
2.01
1.02
1.02
3.03

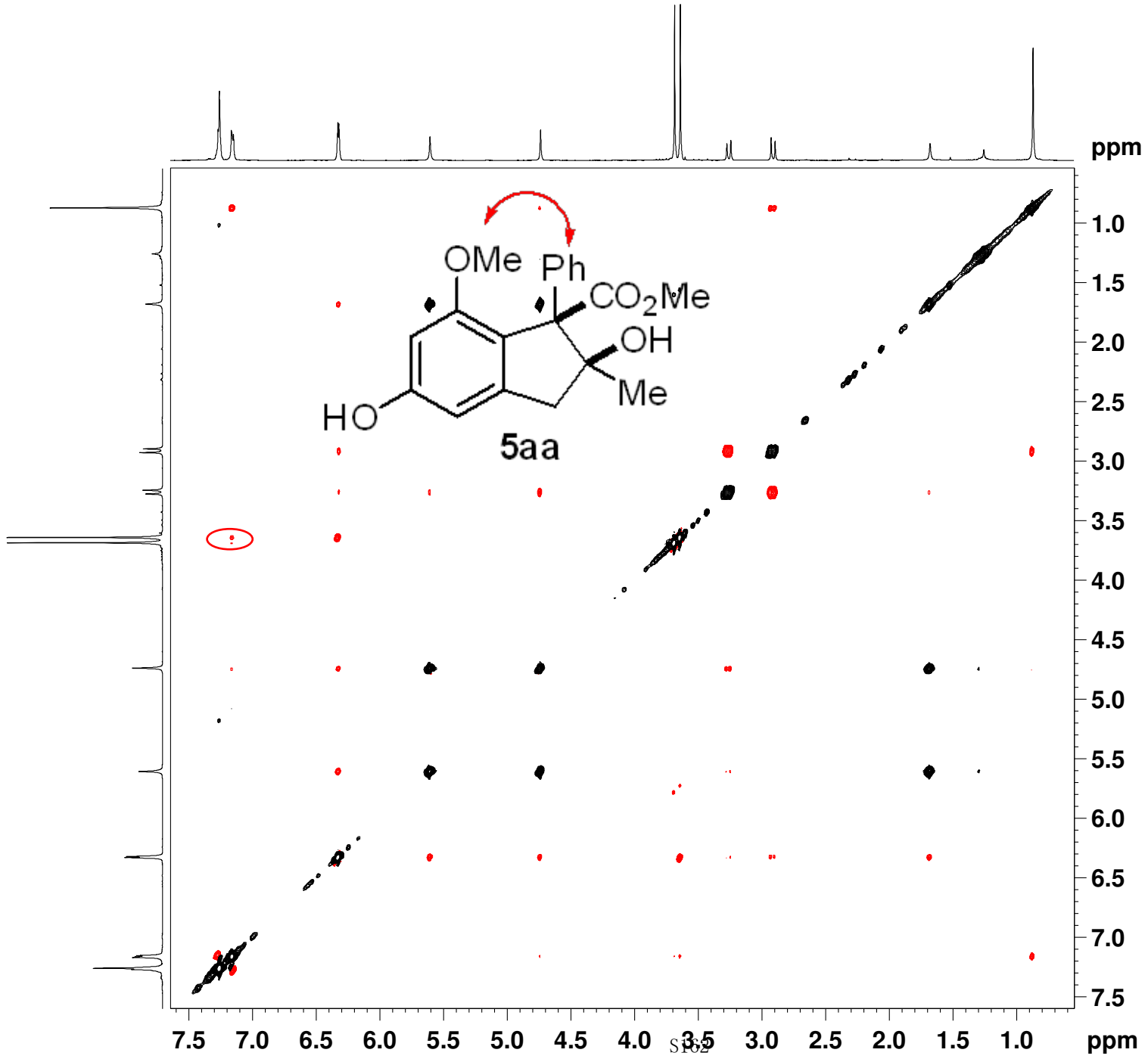

yzz-8-101-1-c
176.13
158.62
139.23
138.69
133.95
132.80
131.36
127.30
127.20
112.56
112.39
77.32
77.00
76.68
73.43
63.68
55.15
52.63
34.42
28.43
24.52
Cl
CO2Me
OH
Me
MeO
4qe
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

yzz-7-146-2

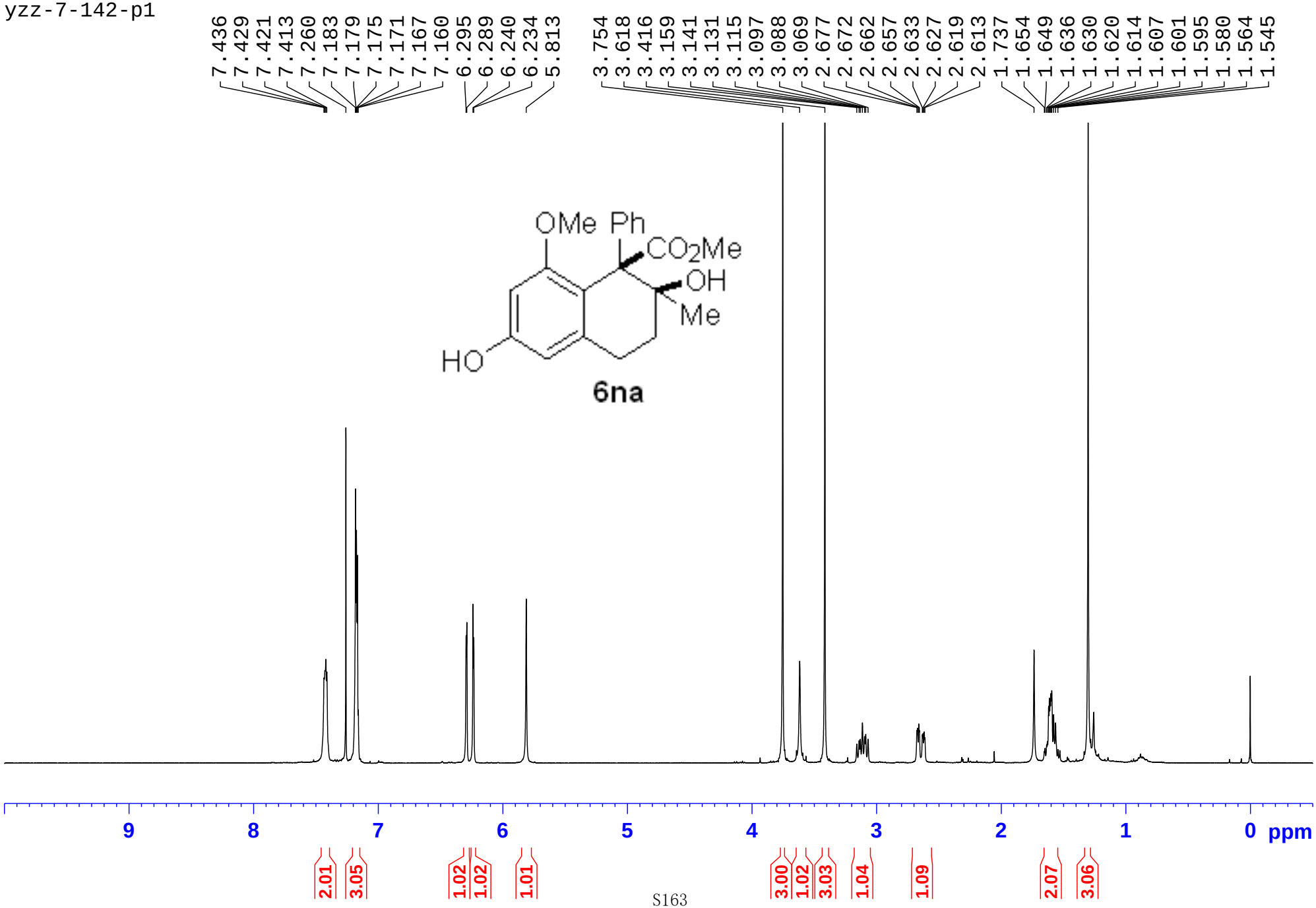

7.285
7.274
7.269
7.260
7.256
7.166
7.159
7.155
7.147
7.142
6.331
6.321
5.767
4.806
3.687
3.641
3.284
3.245
2.931
2.892
1.722
OMe
Ph
CO2Me
OH
Me
HO
5aa
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
3.10
2.00
2.08
1.03
4.04
3.00
2.99
1.02
1.04
3.02

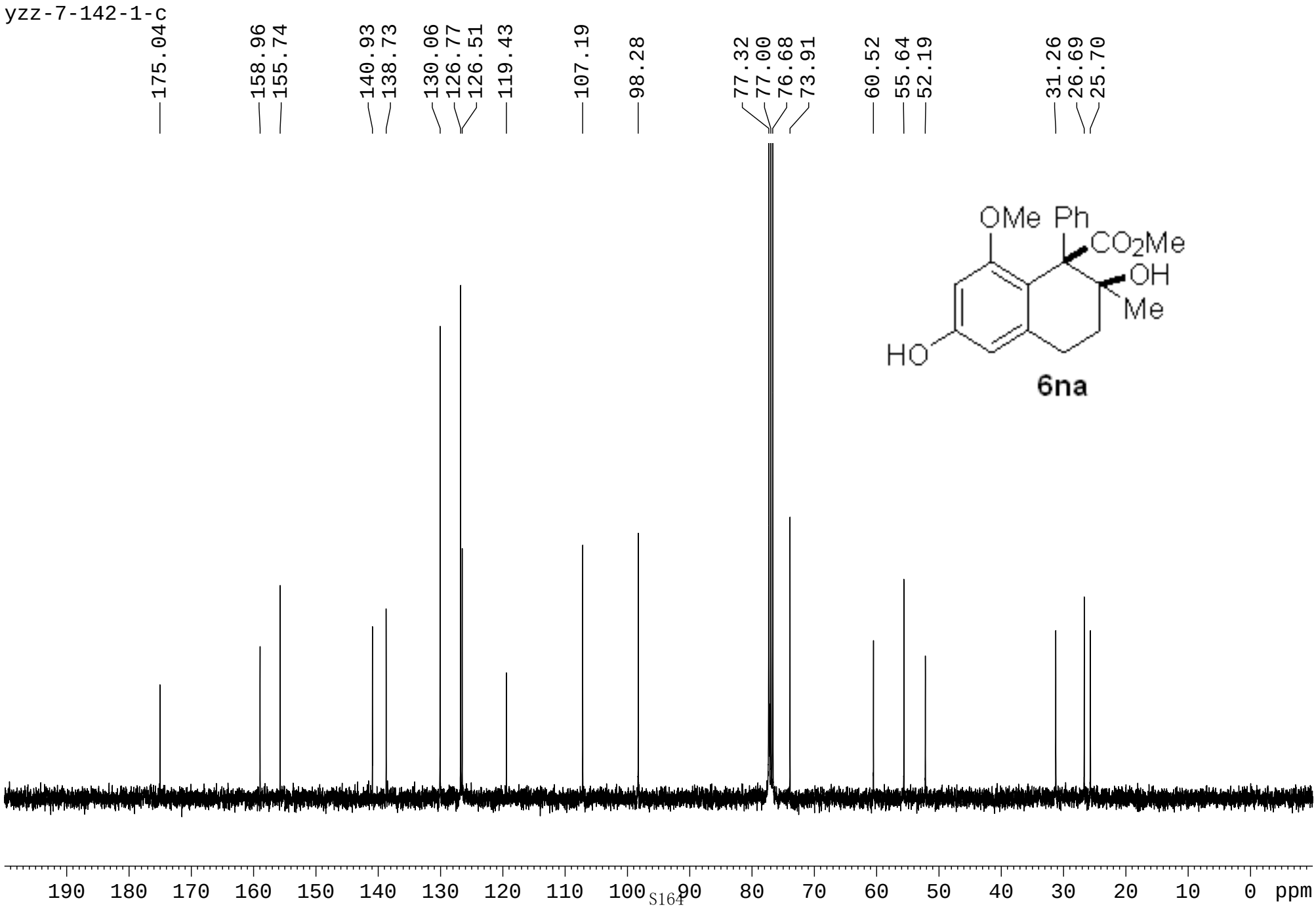
yzz-7-146-1-c

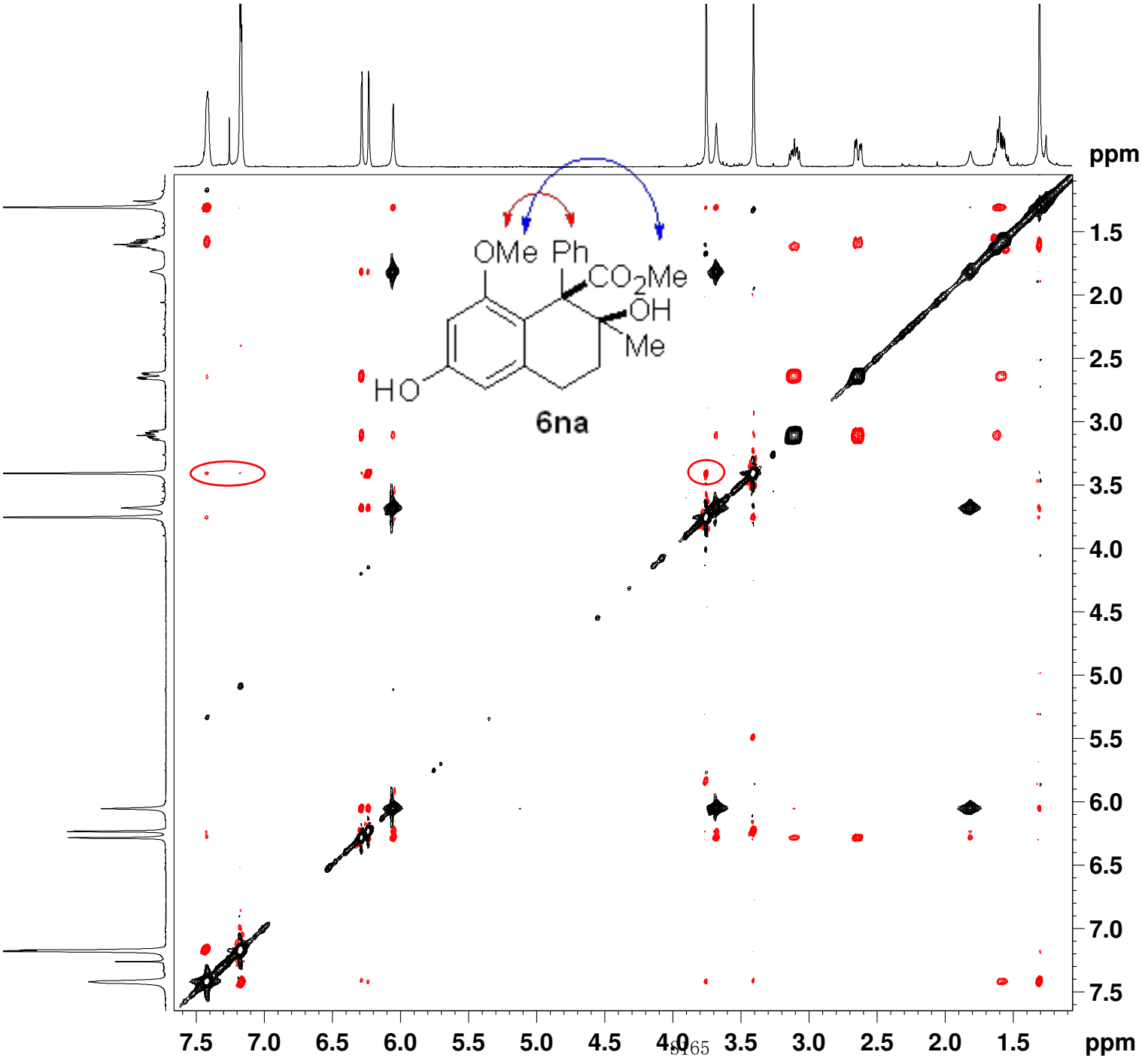

175.46
158.47
157.78
144.88
136.51
128.33
127.28
126.87
119.73
104.27
98.56
84.77
77.32
77.00
76.68
68.04
55.31
52.46
47.12
25.18
OMe
Ph
CO2Me
OH
Me
HO
5aa
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm


OMe
Ph
CO2Me
OH
Me
HO
5aa
ppm
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
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
ppm

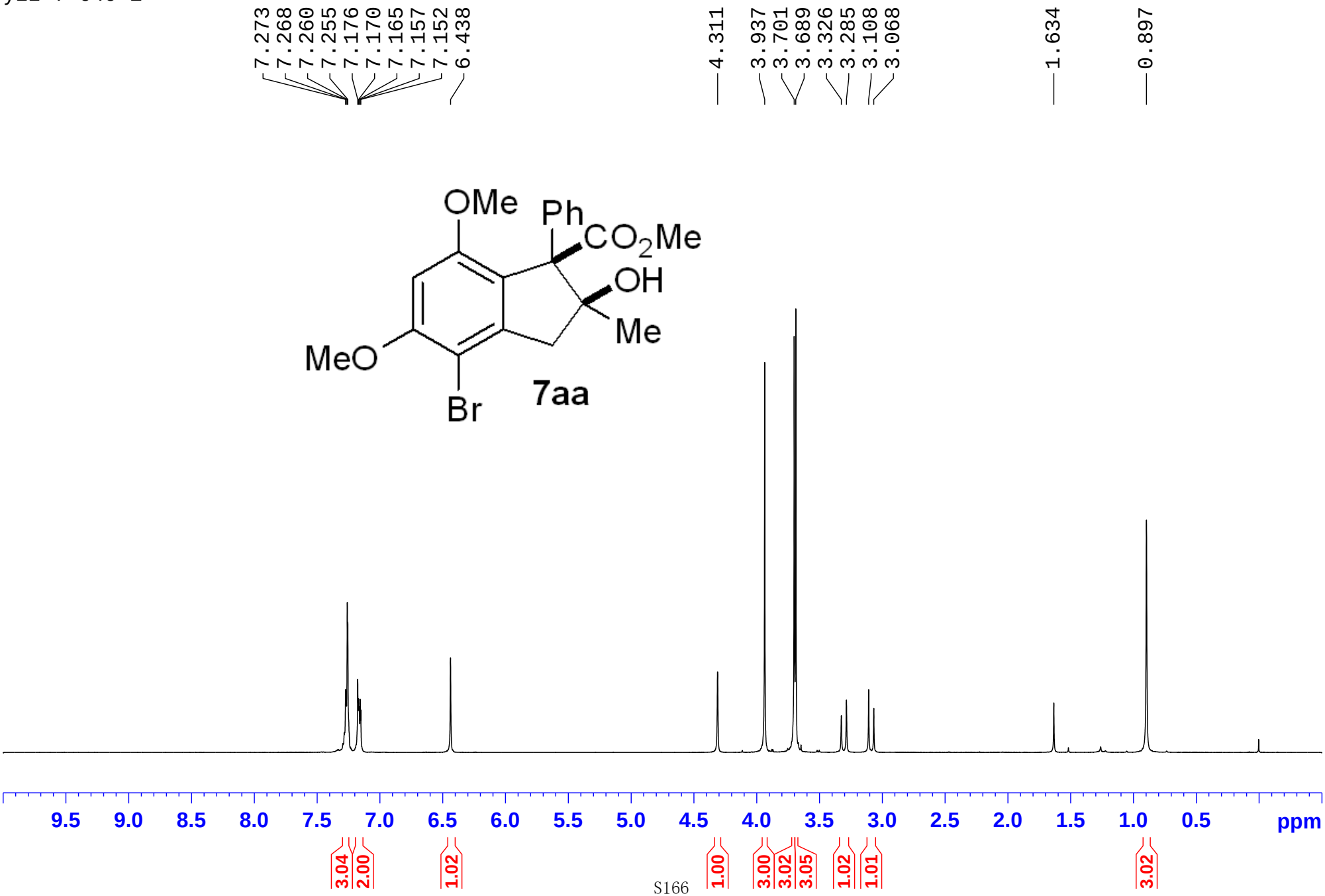
yzz-7-142-p1


7.436
7.429
7.421
7.413
7.260
7.183
7.179
7.175
7.171
7.167
7.160
6.295
6.289
6.240
6.234
5.813
3.754
3.618
3.416
3.159
3.141
3.131
3.115
3.097
3.088
3.069
2.677
2.672
2.662
2.657
2.633
2.627
2.619
2.613
1.737
1.654
1.649
1.636
1.630
1.620
1.614
1.607
1.601
1.595
1.580
1.564
1.545
OMe
Ph
CO2Me
OH
Me
HO
6na
9
8
7
6
5
4
3
2
1
0
ppm
2.01
3.05
1.02
1.02
1.01
3.00
1.02
3.03
1.04
1.09
2.07
3.06


yzz-7-142-1-c
175.04
158.96
155.74
140.93
138.73
130.06
126.77
126.51
119.43
107.19
98.28
77.32
77.00
76.68
73.91
60.52
55.64
52.19
31.26
26.69
25.70
OMe
Ph
CO2Me
OH
Me
HO
6na
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

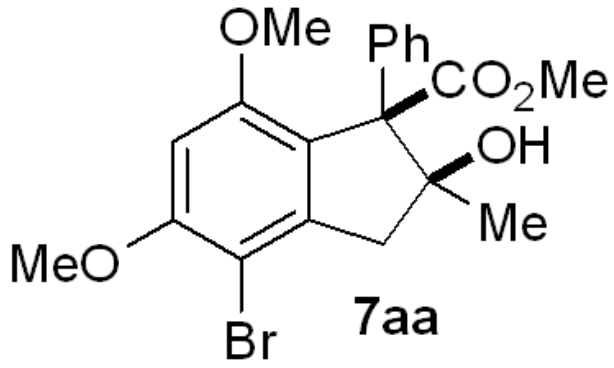

ppm
OMe
Ph
CO2Me
OH
Me
HO
6na
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
ppm

yzz-7-040-1


7.273
7.268
7.260
7.255
7.176
7.170
7.165
7.157
7.152
6.438
4.311
3.937
3.701
3.689
3.326
3.285
3.108
3.068
1.634
0.897
OMe
Ph
CO2Me
OH
Me
MeO
Br
7aa
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
3.04
2.00
1.02
1.00
3.00
3.02
3.05
1.02
1.01
3.02

YZZ-7-040-1-C

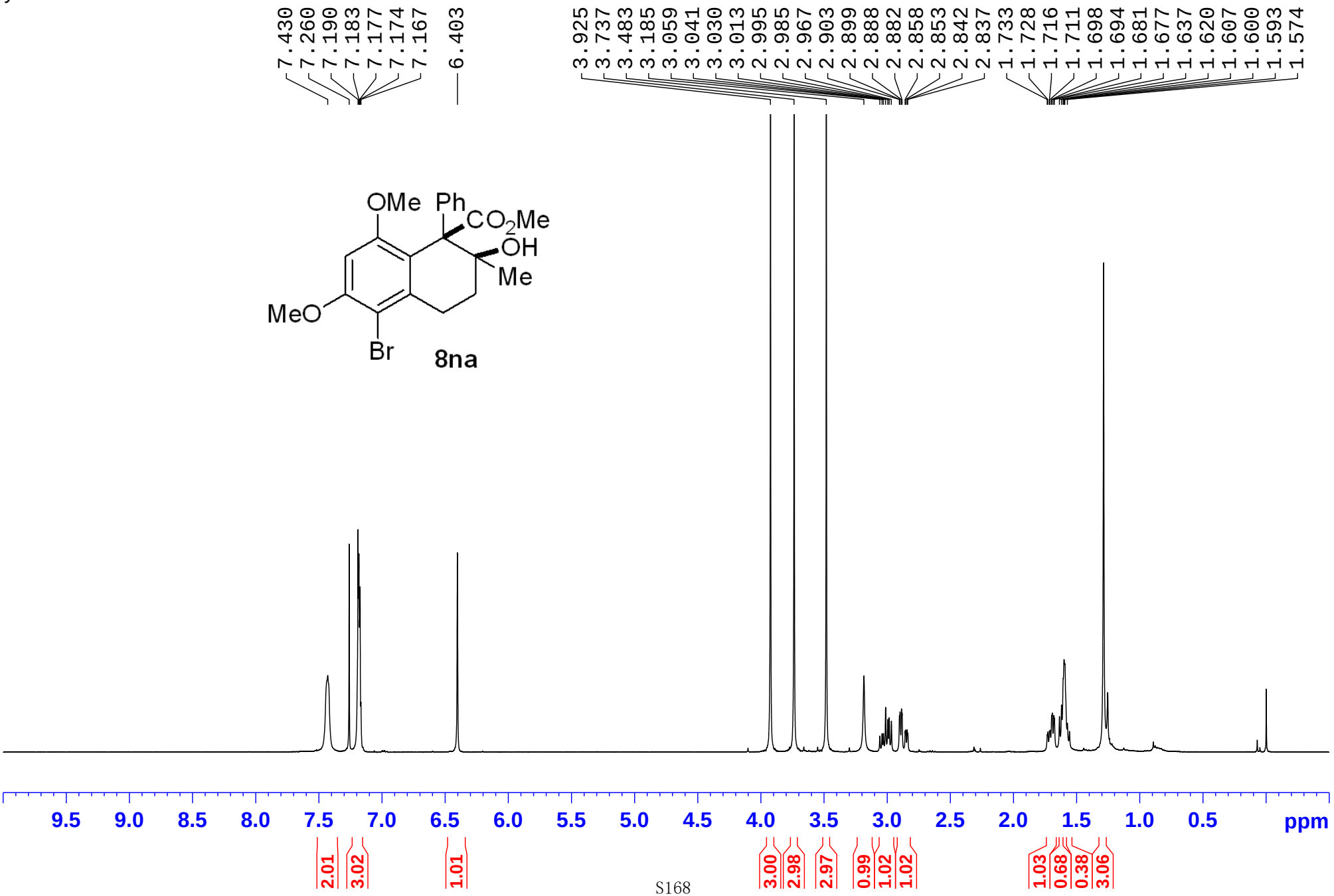
174.44
157.34
157.18
144.83
136.52
128.13
127.32
126.90
121.58
100.14
96.17
83.78
77.32
77.00
76.68
69.65
56.45
55.65
52.34
48.71
25.31



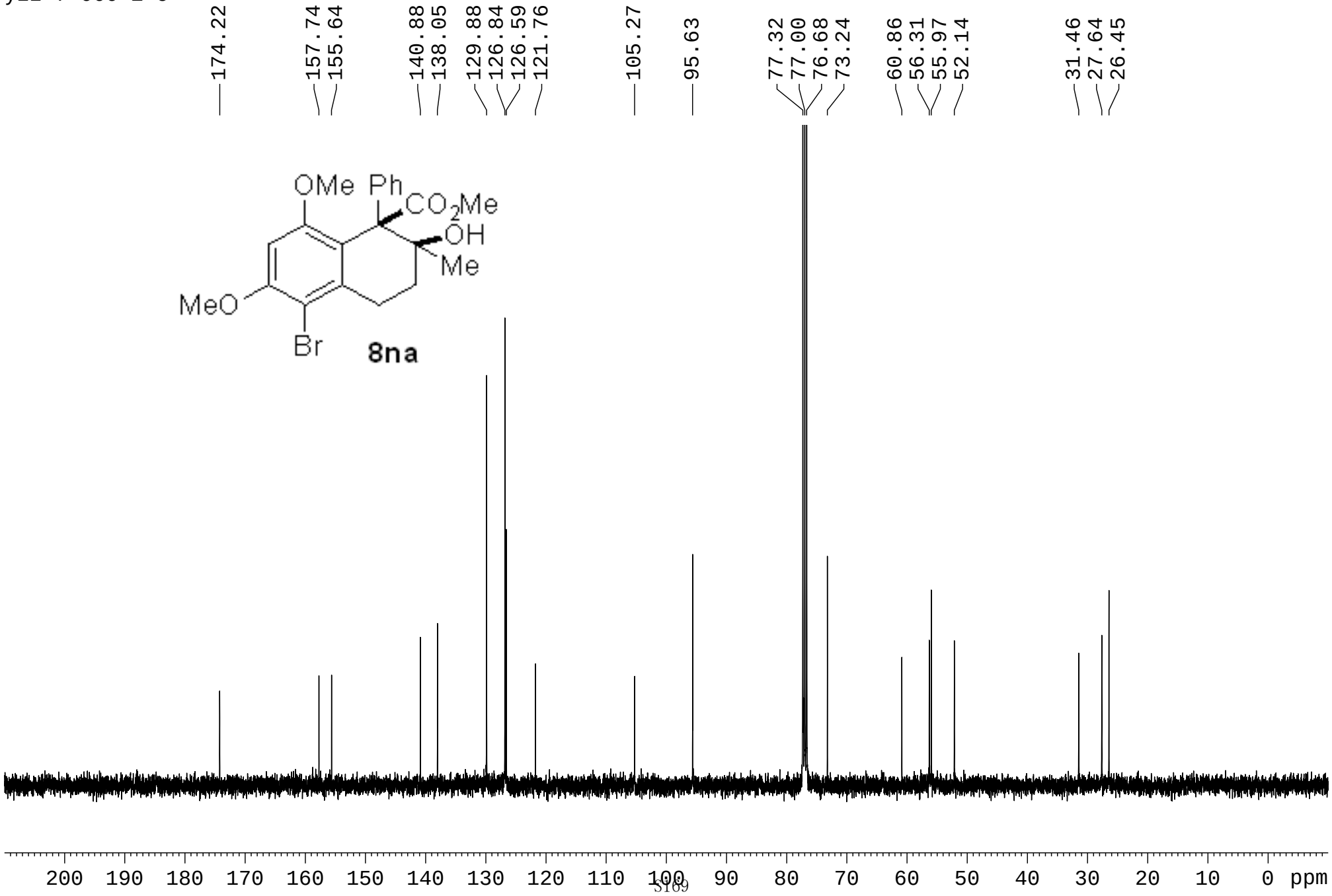
7aa

190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

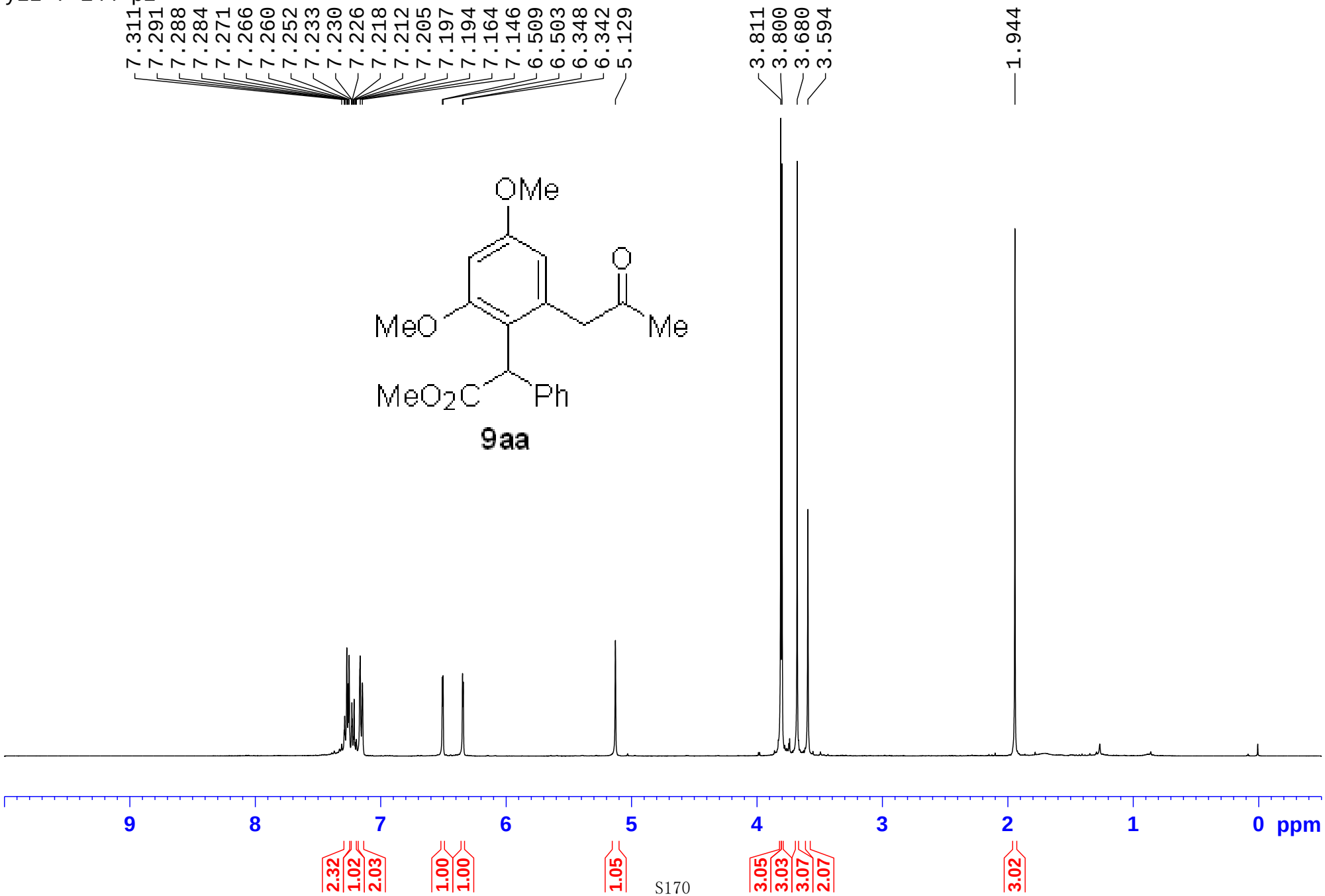
yzz-7-066-1

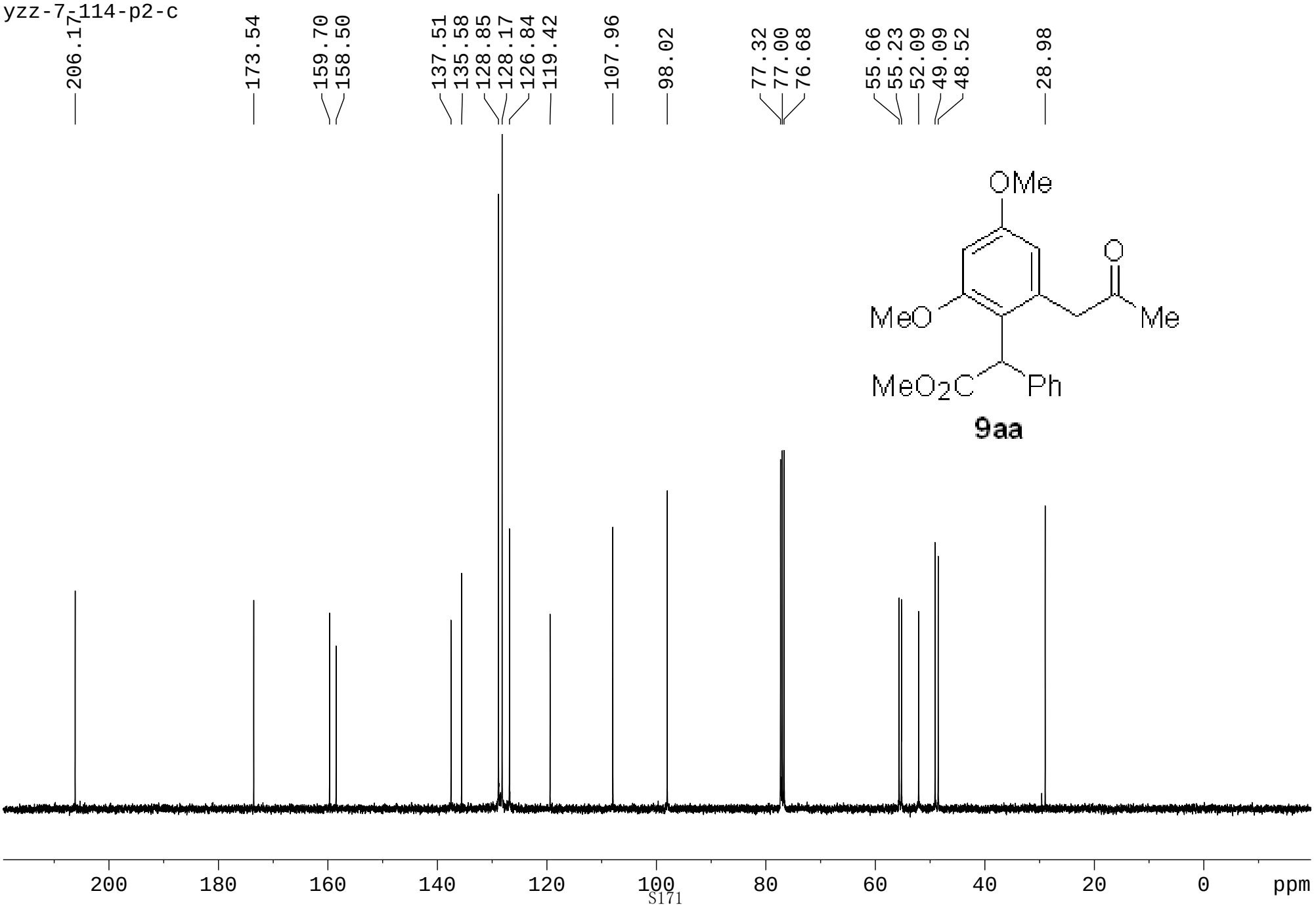

7.430
7.260
7.190
7.183
7.177
7.174
7.167
6.403
3.925
3.737
3.483
3.185
3.059
3.041
3.030
3.013
2.995
2.985
2.967
2.903
2.899
2.888
2.882
2.858
2.853
2.842
2.837
1.733
1.728
1.716
1.711
1.698
1.694
1.681
1.677
1.637
1.620
1.607
1.600
1.593
1.574
OMe
Ph
CO2Me
OH
Me
MeO
Br
8na
9.5
9.0
8.5
8.0
7.5
7.0
6.5
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
3.02
1.01
3.00
2.98
2.97
0.99
1.02
1.02
1.03
0.68
0.38
3.06

yzz-7-066-1-c

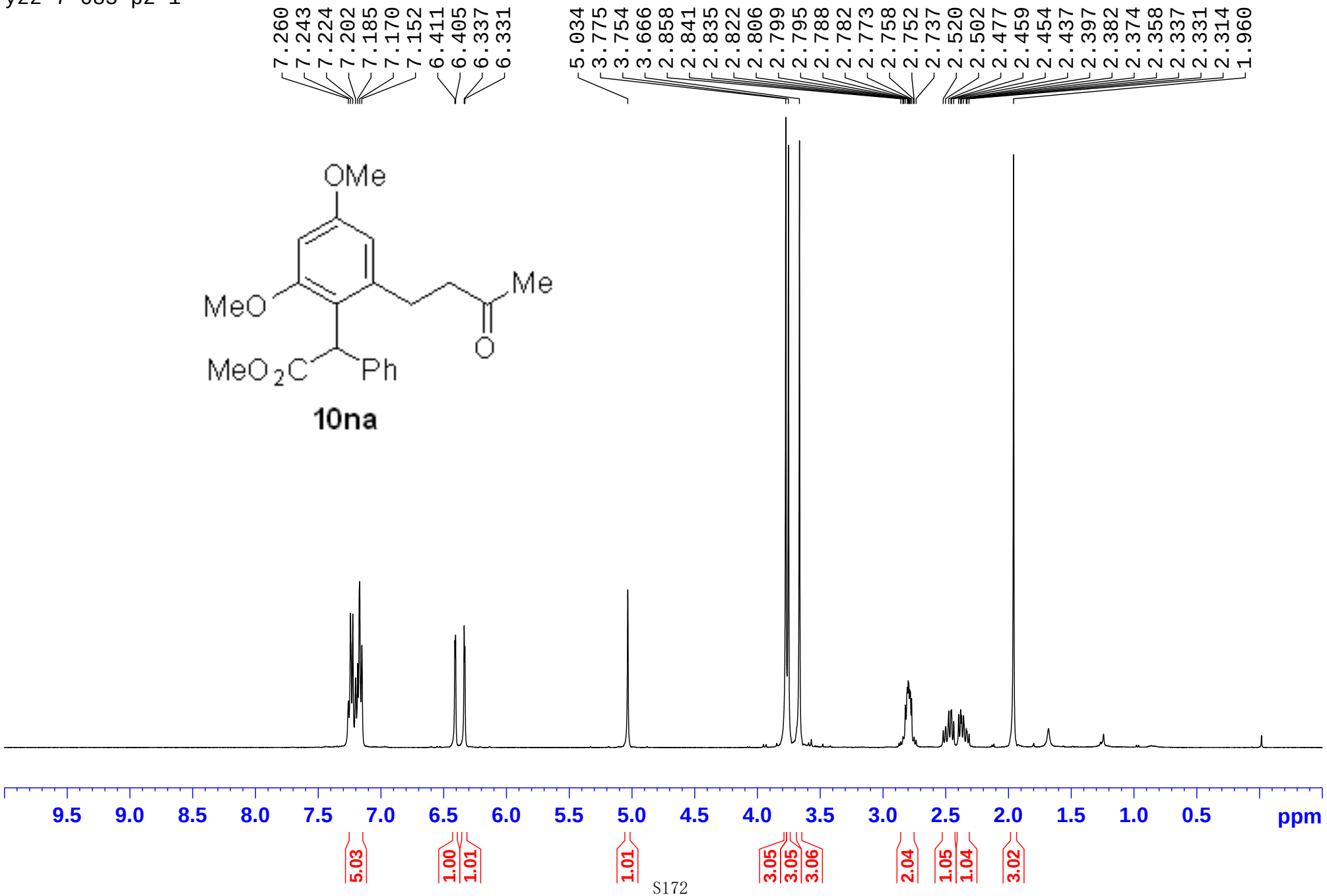

174.22
157.74
155.64
140.88
138.05
129.88
126.84
126.59
121.76
105.27
95.63
77.32
77.00
76.68
73.24
60.86
56.31
55.97
52.14
31.46
27.64
26.45
OMe
Ph
CO2Me
OH
Me
MeO
Br
8na
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

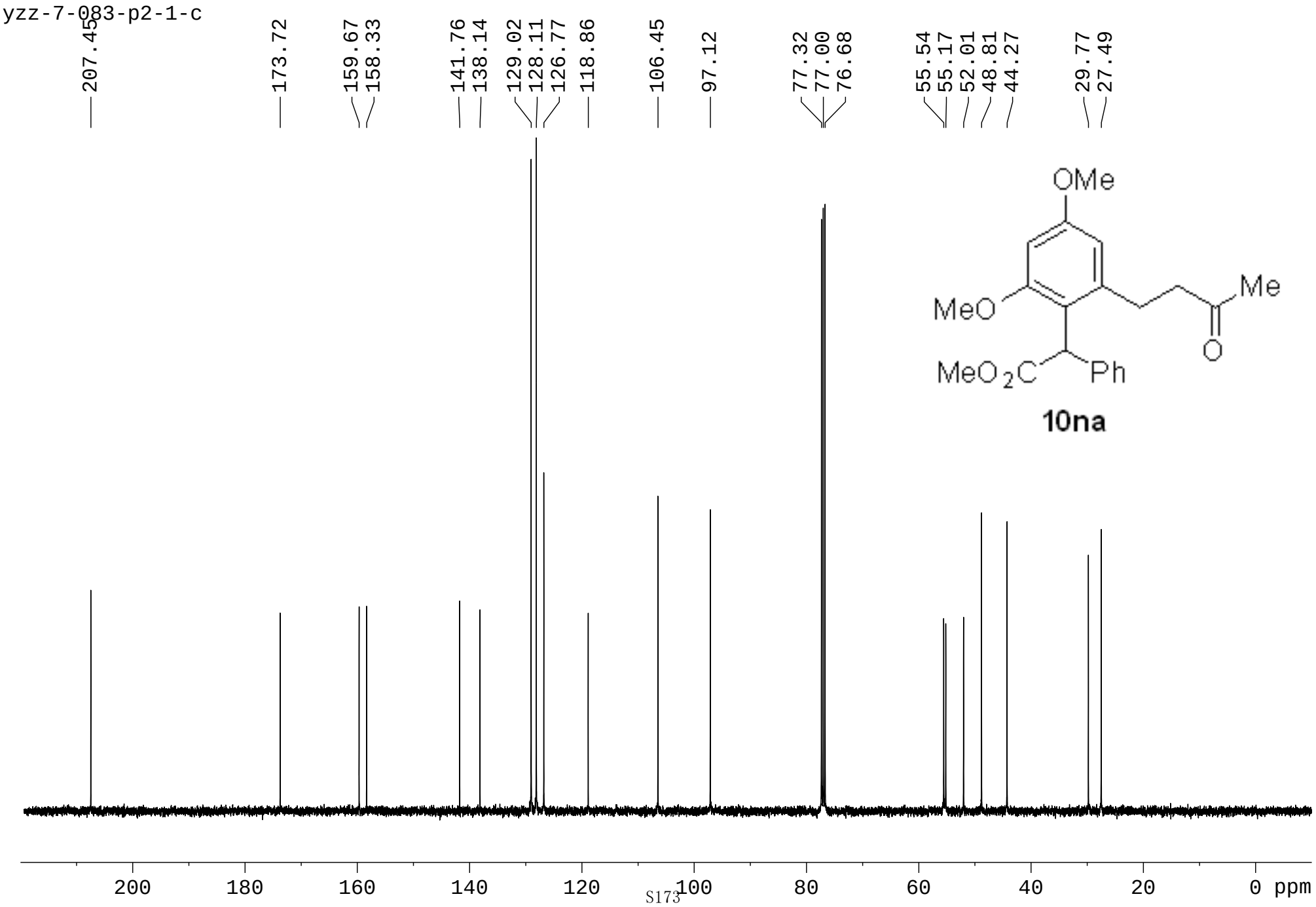
yzz-7-144-p2


7.311
7.291
7.288
7.284
7.271
7.266
7.260
7.252
7.233
7.230
7.226
7.218
7.212
7.205
7.197
7.194
7.164
7.146
6.509
6.503
6.348
6.342
5.129
3.811
3.800
3.680
3.594
1.944
OMe
O
MeO
Me
MeO2C
Ph
9aa
9
8
7
6
5
4
3
2
1
0 ppm
2.32
1.02
2.03
1.00
1.00
1.05
3.05
3.03
3.07
2.07
3.02


yzz-7-114-p2-c
206.17
173.54
159.70
158.50
137.51
135.58
128.85
128.17
126.84
119.42
107.96
98.02
77.32
77.00
76.68
55.66
55.23
52.09
49.09
48.52
28.98
OMe
O
MeO
Me
MeO2C
Ph
9aa
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-7-083-p2-1

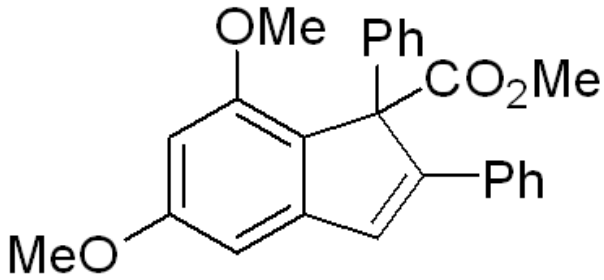

7.260
7.243
7.224
7.202
7.185
7.170
7.152
6.411
6.405
6.337
6.331
5.034
3.775
3.754
3.666
2.858
2.841
2.835
2.822
2.806
2.799
2.795
2.788
2.782
2.773
2.758
2.752
2.737
2.520
2.502
2.477
2.459
2.454
2.437
2.397
2.382
2.374
2.358
2.337
2.331
2.314
1.960
OMe
MeO
Me
O
MeO2C
Ph
10na
9.5
9.0
8.5
8.0
7.5
7.0
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
5.03
1.00
1.01
1.01
3.05
3.05
3.06
2.04
1.05
1.04
3.02


yzz-7-083-p2-1-c
207.45
173.72
159.67
158.33
141.76
138.14
129.02
128.11
126.77
118.86
106.45
97.12
77.32
77.00
76.68
55.54
55.17
52.01
48.81
44.27
29.77
27.49
OMe
MeO
Me
O
MeO2C
Ph
10na
200
180
160
140
120
100
80
60
40
20
0 ppm

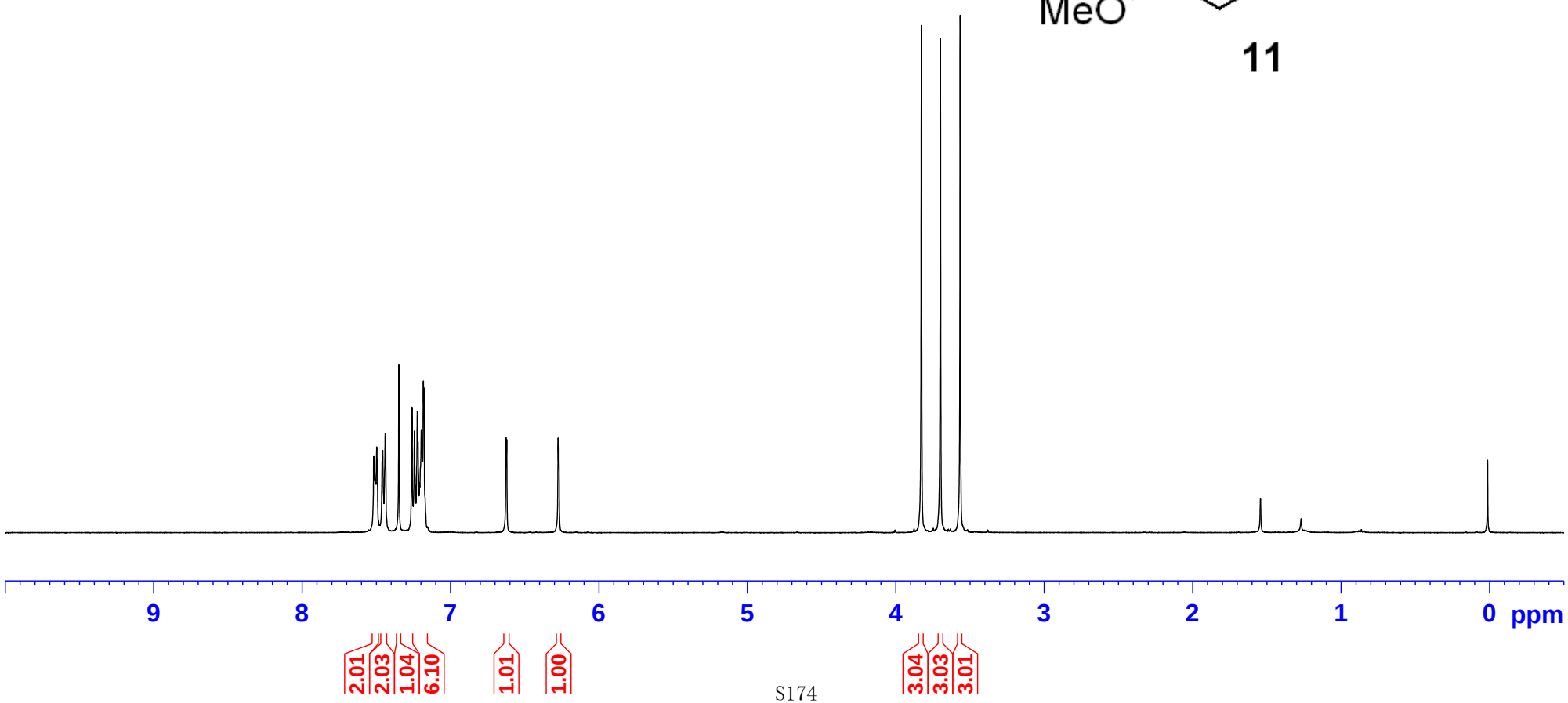
yzz-7-113-3

7.518
7.511
7.503
7.498
7.493
7.461
7.457
7.440
7.437
7.348
7.260
7.243
7.224
7.219
7.209
7.197
7.193
7.190
7.183
7.179
6.627
6.622
6.275
6.270

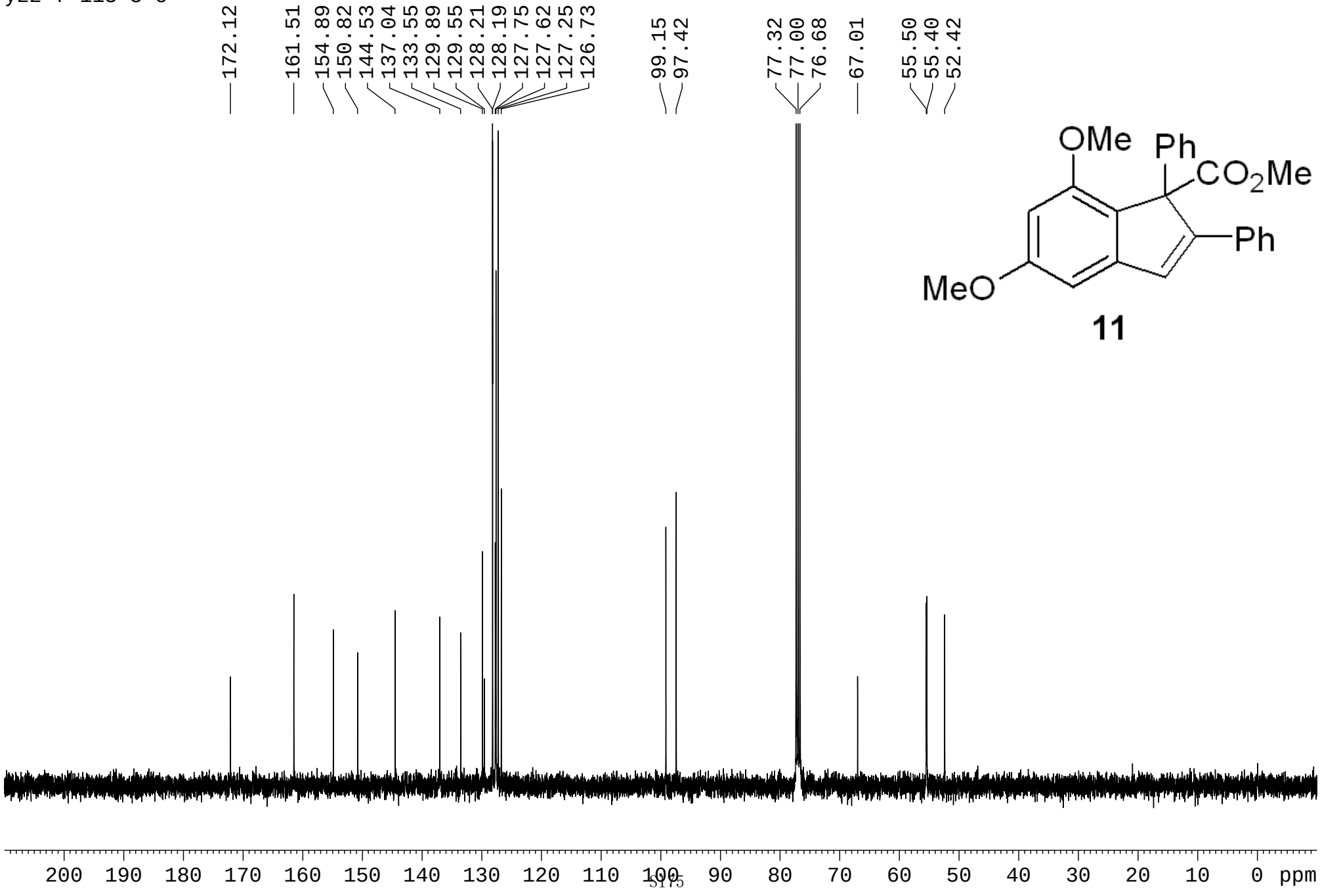
3.828
3.700
3.566



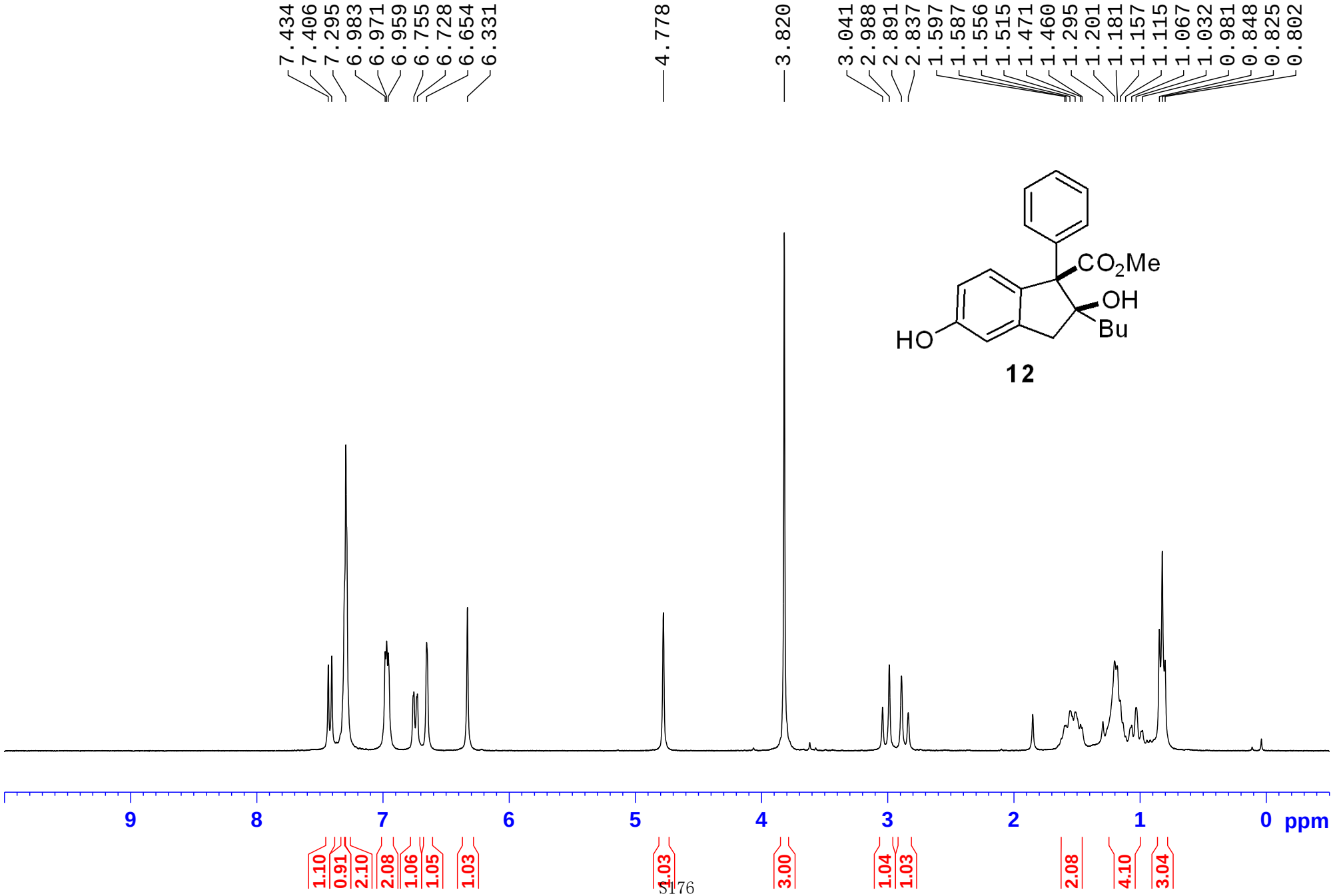
11



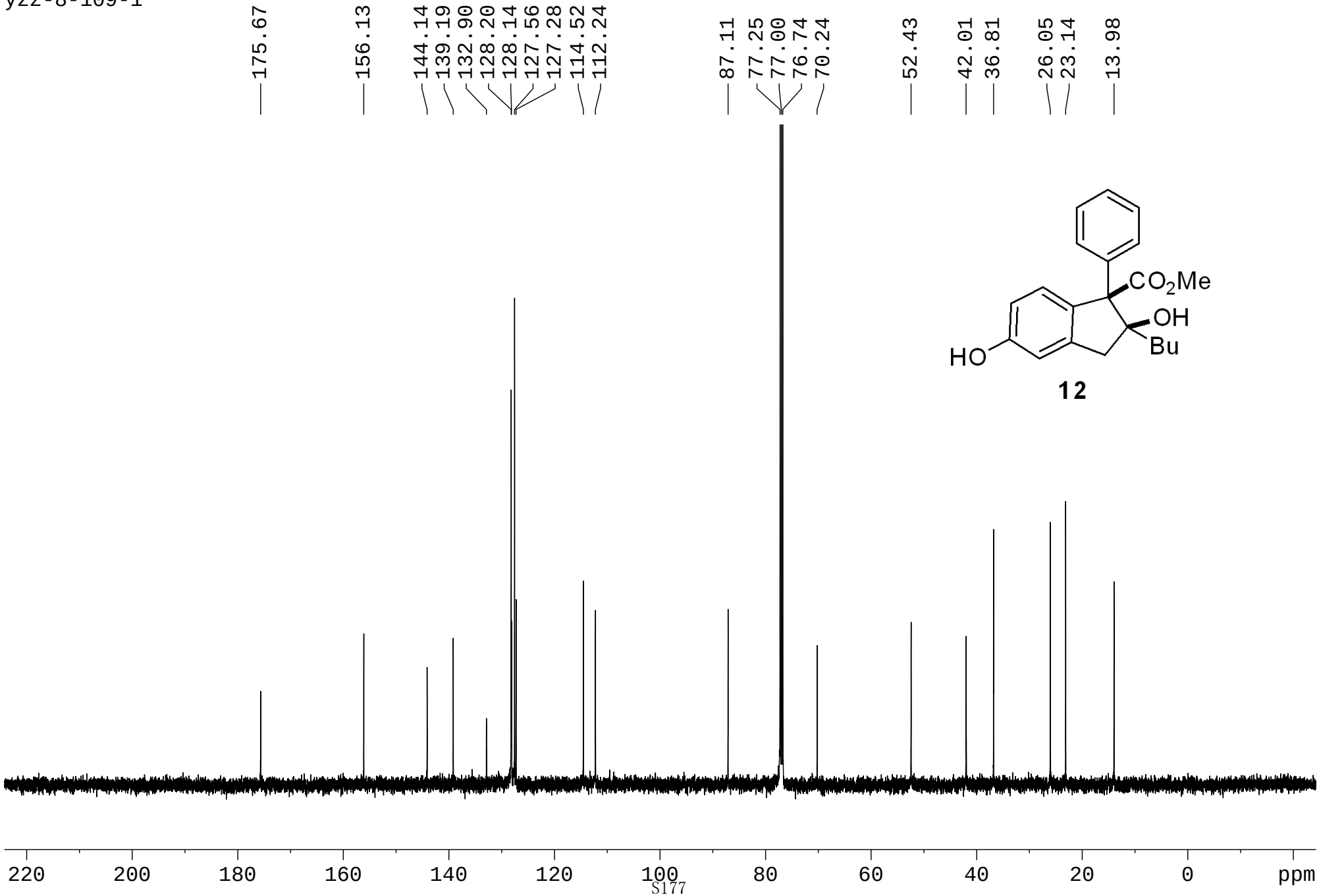
yzz-7-113-3-c


172.12
161.51
154.89
150.82
144.53
137.04
133.55
129.89
129.55
128.21
128.19
127.75
127.62
127.25
126.73
99.15
97.42
77.32
77.00
76.68
67.01
55.50
55.40
52.42
OMe
Ph
CO2Me
Ph
MeO
11
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

yzz-8-109-1

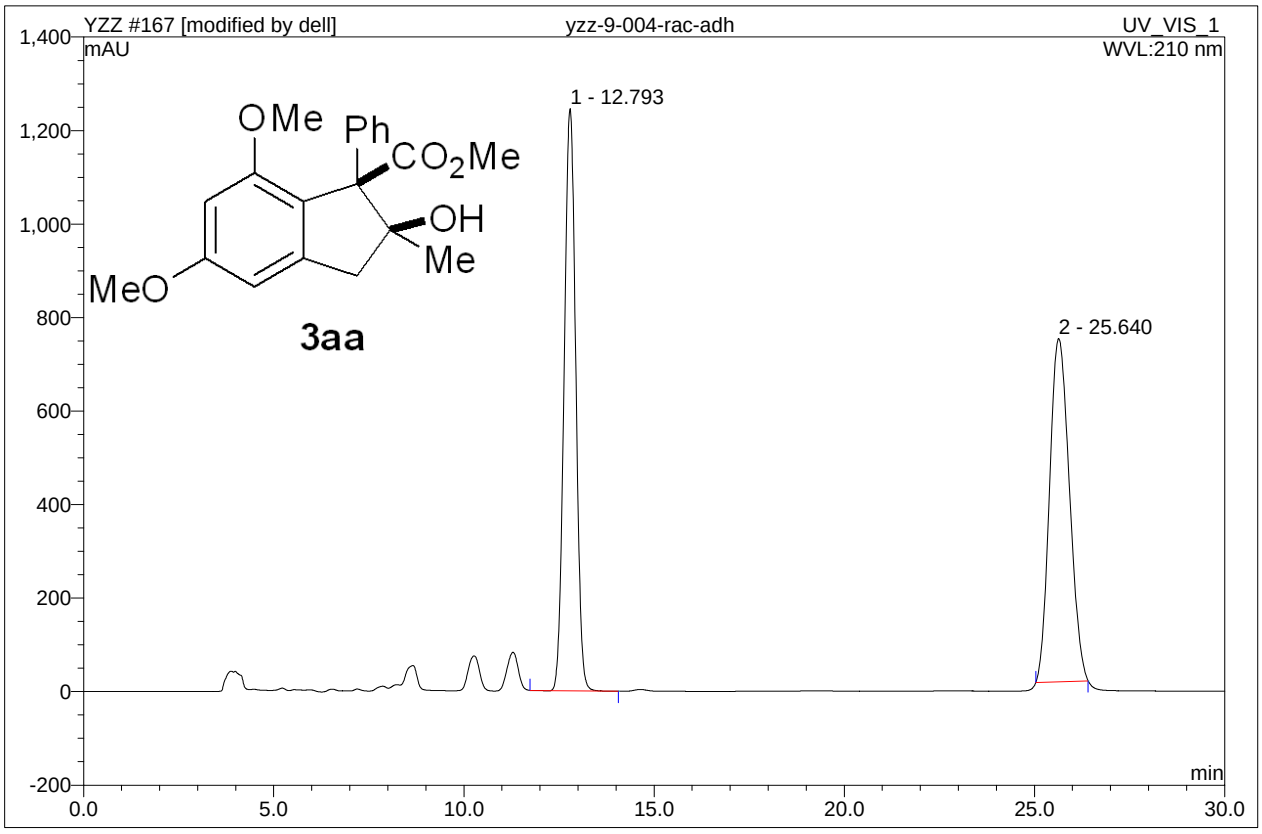

7.434
7.406
7.295
6.983
6.971
6.959
6.755
6.728
6.654
6.331
4.778
3.820
3.041
2.988
2.891
2.837
1.597
1.587
1.556
1.515
1.471
1.460
1.295
1.201
1.181
1.157
1.115
1.067
1.032
0.981
0.848
0.825
0.802
CO2Me
OH
Bu
HO
12
9
8
7
6
5
4
3
2
1
0
ppm
1.10
0.91
2.10
2.08
1.06
1.05
1.03
3.03
3.00
1.04
1.03
2.08
4.10
3.04

yzz-8-109-1


175.67
156.13
144.14
139.19
132.90
128.20
128.14
127.56
127.28
114.52
112.24
87.11
77.25
77.00
76.74
70.24
52.43
42.01
36.81
26.05
23.14
13.98
CO2Me
OH
Bu
HO
12
220
200
180
160
140
120
100
80
60
40
20
0
ppm

167 yzz-9-004-rac-adh

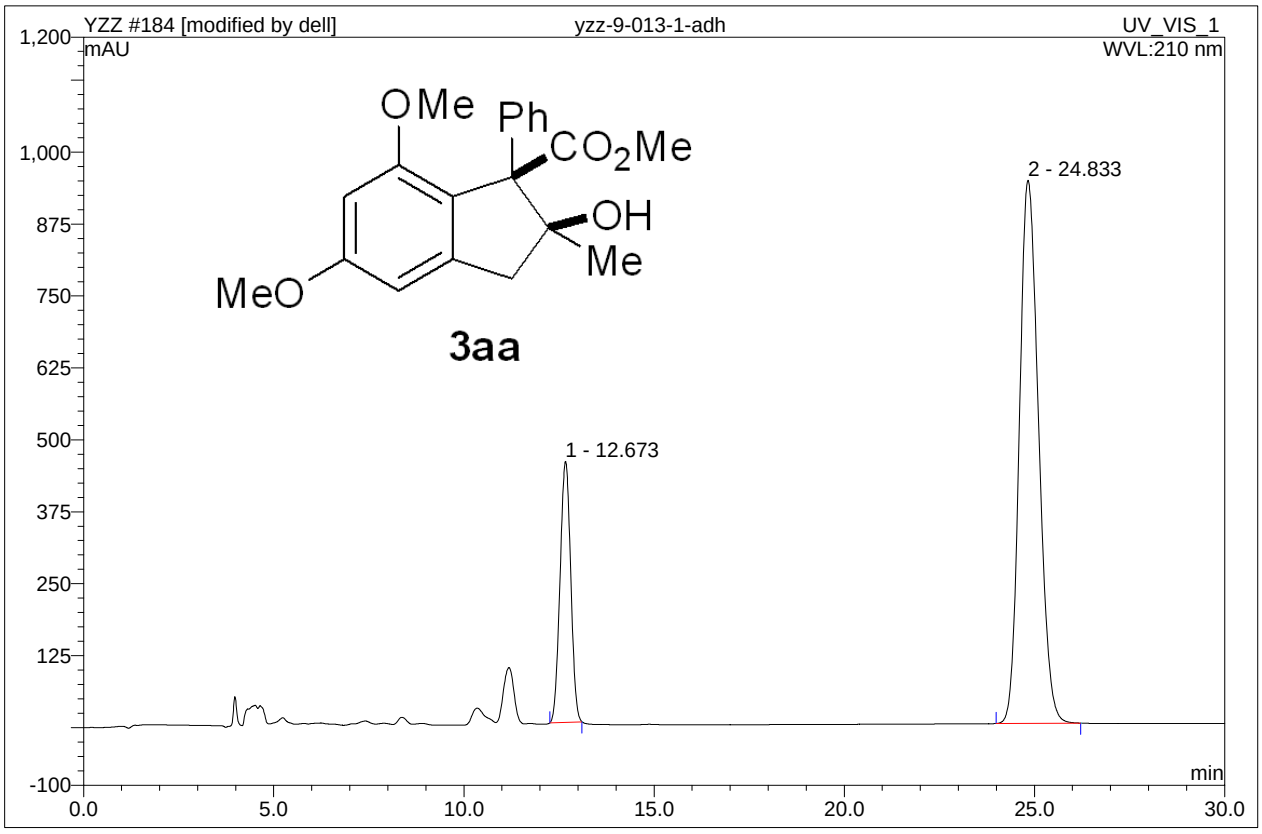
样品名:	**yzz-9-004-rac-adh**	*进样量:*	**20.0**
瓶序号:	**169**	*通道:*	**UV_VIS_1**
样品类型:	**unknown**	*波长:*	**210**
控制程序:	**程序文件-公用-08**	*带宽:*	**n.a.**
定量方法:	**方法-公用**	*稀释因子:*	**1.0000**
记录时间:	**2015-3-26 16:17**	*样品重量:*	**1.0000**
运行时间 (min):	**30.00**	*样品量:*	**1.0000**



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	12.79	n.a.	1245.367	438.580	49.73	n.a.	BMB*
2	25.64	n.a.	734.540	443.298	50.27	n.a.	BMB*
总和:			1979.907	881.878	100.00	0.000	

184 yzz-9-013-1-adh

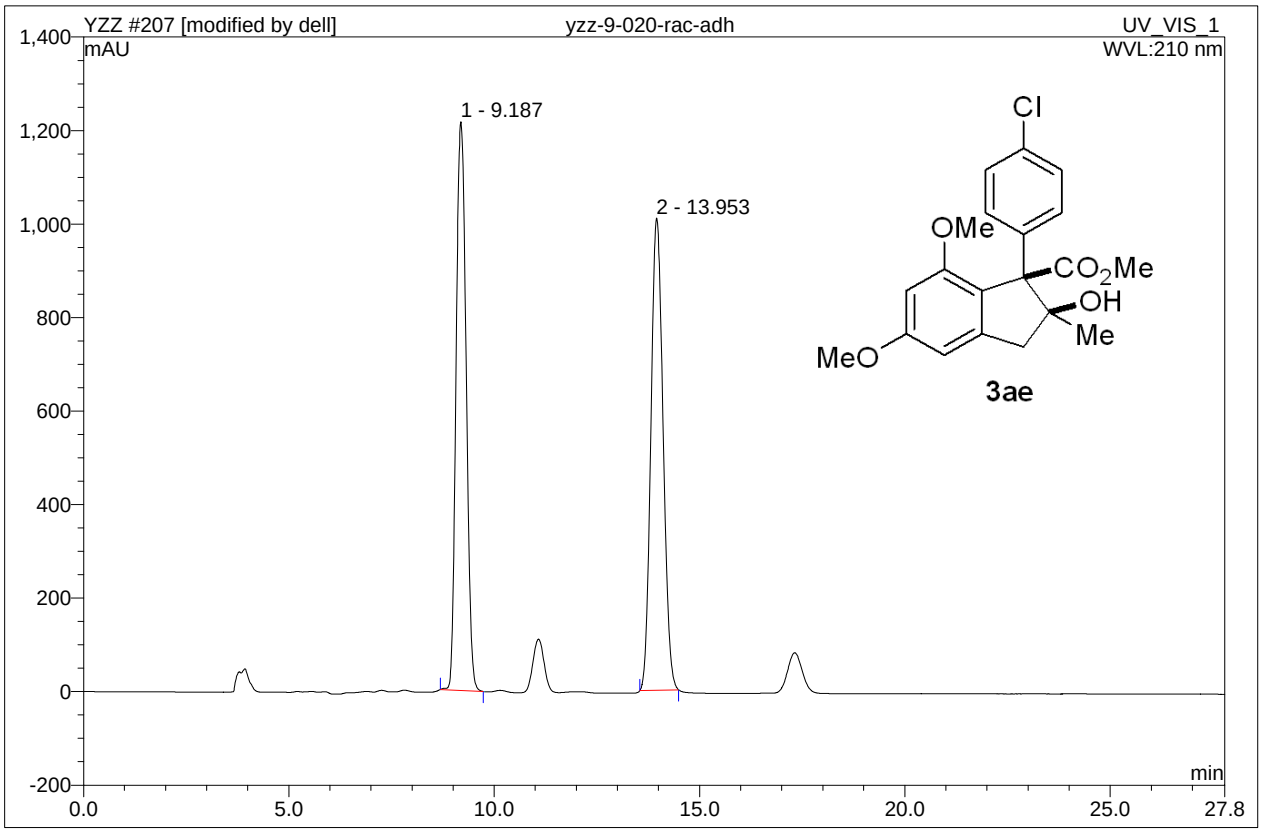
样品名:	**yzz-9-013-1-adh**	*进样量:*	**20.0**
瓶序号:	**186**	*通道:*	**UV_VIS_1**
样品类型:	**unknown**	*波长:*	**210**
控制程序:	**程序文件-公用-08**	*带宽:*	**n.a.**
定量方法:	**方法-公用**	*稀释因子:*	**1.0000**
记录时间:	**2015-4-1 22:46**	*样品重量:*	**1.0000**
运行时间 (min):	**30.00**	*样品量:*	**1.0000**



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	12.67	n.a.	453.667	147.163	21.06	n.a.	BMB*
2	24.83	n.a.	944.082	551.673	78.94	n.a.	BMB*
总和:			1397.749	698.837	100.00	0.000	

207 yzz-9-020-rac-adh

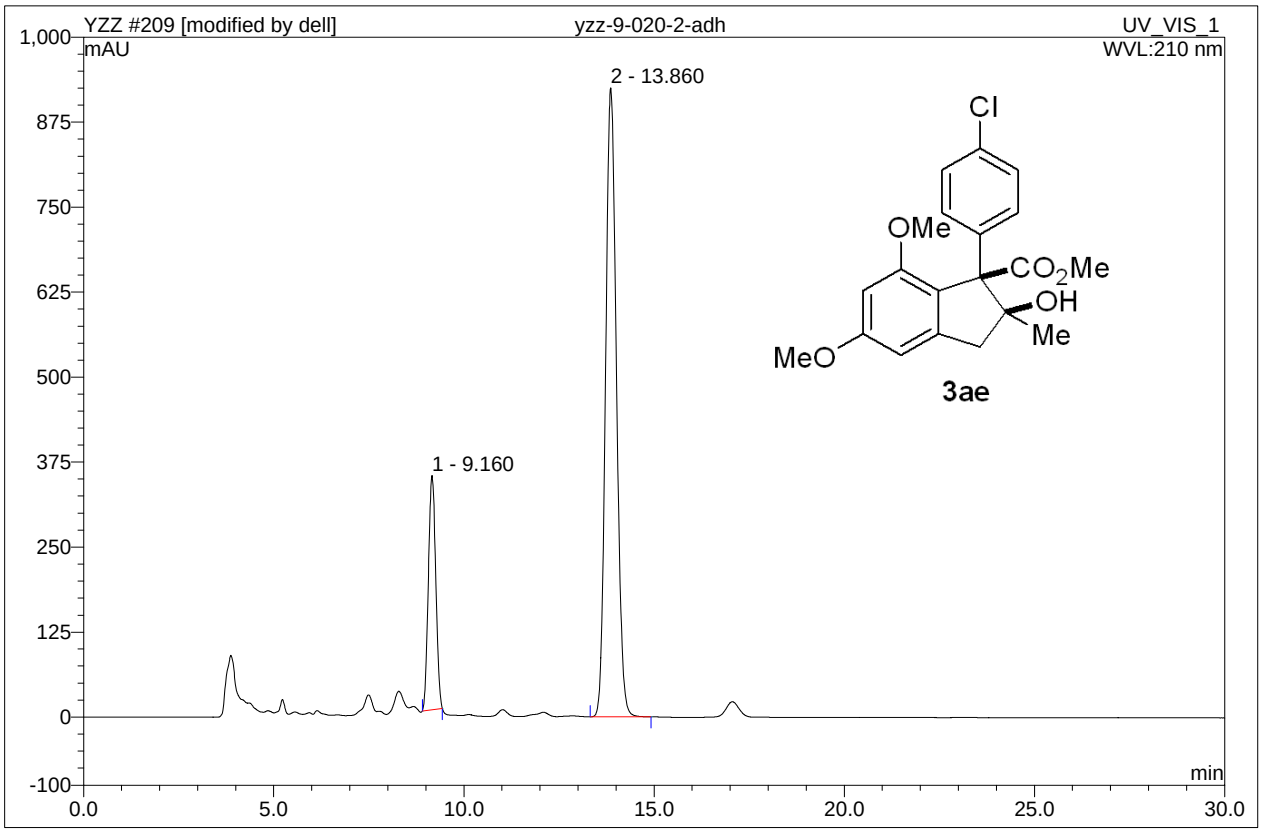
样品名:	**yzz-9-020-rac-adh**	*进样量:*	**20.0**
瓶序号:	**209**	*通道:*	**UV_VIS_1**
样品类型:	**unknown**	*波长:*	**210**
控制程序:	**程序文件-公用-1**	*带宽:*	**n.a.**
定量方法:	**方法-公用**	*稀释因子:*	**1.0000**
记录时间:	**2015-5-13 13:08**	*样品重量:*	**1.0000**
运行时间 (min):	**27.79**	*样品量:*	**1.0000**



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	9.19	n.a.	1216.822	345.627	49.97	n.a.	BMB*
2	13.95	n.a.	1010.679	346.059	50.03	n.a.	BMB*
总和:			2227.502	691.686	100.00	0.000	

209 yzz-9-020-2-adh

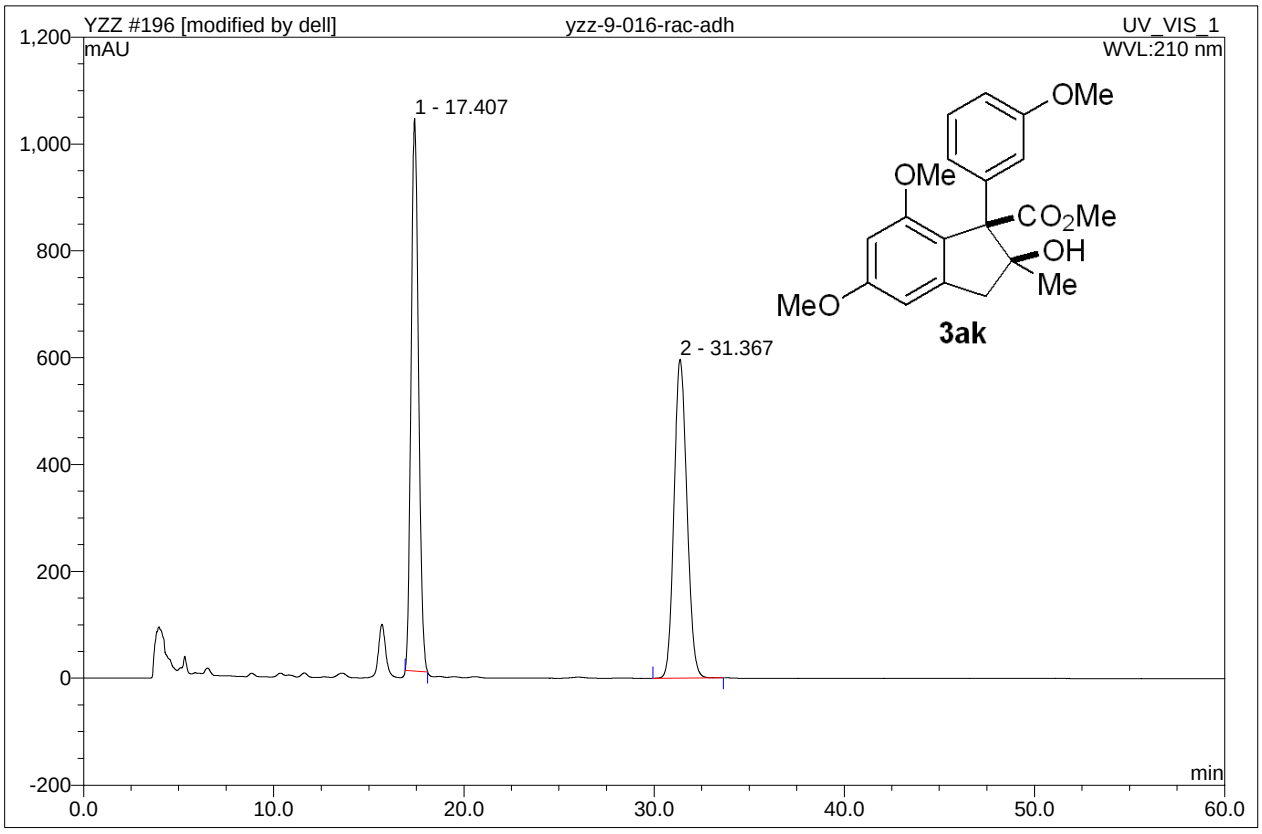
样品名:	**yzz-9-020-2-adh**	*进样量:*	**20.0**
瓶序号:	**211**	*通道:*	**UV_VIS_1**
样品类型:	**unknown**	*波长:*	**210**
控制程序:	**程序文件-公用-1**	*带宽:*	**n.a.**
定量方法:	**方法-公用**	*稀释因子:*	**1.0000**
记录时间:	**2015-5-13 14:16**	*样品重量:*	**1.0000**
运行时间 (min):	**30.00**	*样品量:*	**1.0000**



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	9.16	n.a.	344.345	77.563	20.35	n.a.	BMB*
2	13.86	n.a.	925.204	303.587	79.65	n.a.	BMB*
总和:			1269.549	381.150	100.00	0.000	

196 yzz-9-016-rac-adh

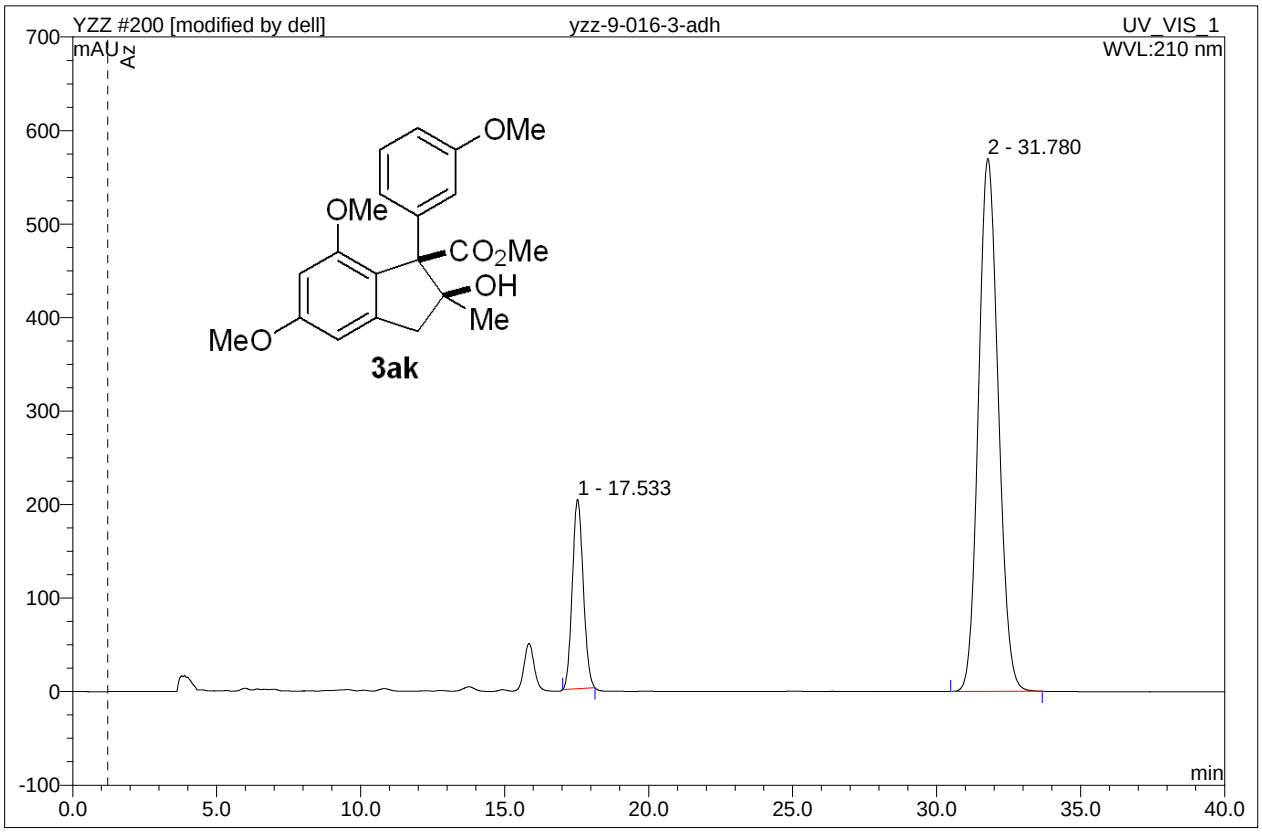
样品名:	**yzz-9-016-rac-adh**	*进样量:*	**20.0**
瓶序号:	**198**	*通道:*	**UV_VIS_1**
样品类型:	**unknown**	*波长:*	**210**
控制程序:	**程序文件-公用-08**	*带宽:*	**n.a.**
定量方法:	**方法-公用**	*稀释因子:*	**1.0000**
记录时间:	**2015-4-6 16:38**	*样品重量:*	**1.0000**
运行时间 (min):	**60.00**	*样品量:*	**1.0000**



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	17.41	n.a.	1033.940	468.884	50.02	n.a.	BMB*
2	31.37	n.a.	596.860	468.436	49.98	n.a.	BMB*
总和:			1630.800	937.320	100.00	0.000	

200 yzz-9-016-3-adh

样品名:	**yzz-9-016-3-adh**	*进样量:*	**20.0**
瓶序号:	**202**	*通道:*	**UV_VIS_1**
样品类型:	**unknown**	*波长:*	**210**
控制程序:	**程序文件-公用-08**	*带宽:*	**n.a.**
定量方法:	**方法-公用**	*稀释因子:*	**1.0000**
记录时间:	**2015-4-7 15:17**	*样品重量:*	**1.0000**
运行时间 (min):	**40.00**	*样品量:*	**1.0000**



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	17.53	n.a.	202.594	88.792	16.32	n.a.	BMB*
2	31.78	n.a.	570.067	455.419	83.68	n.a.	BMB*
总和:			772.661	544.211	100.00	0.000	