Supporting Information

Ligand and Counteranion Enabled Regiodivergent C-H Bond Functionalization of Naphthols with α-Aryl-α-Diazoesters

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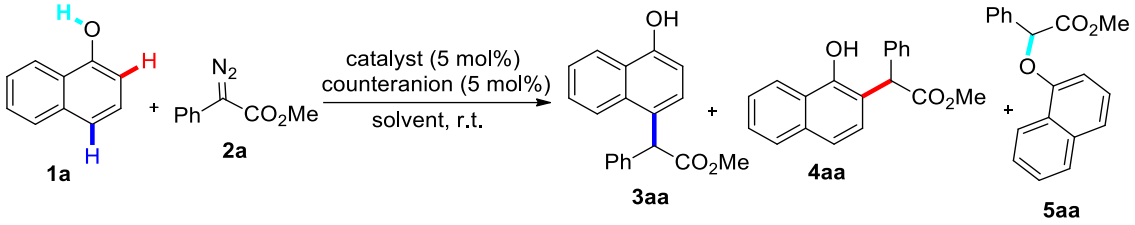
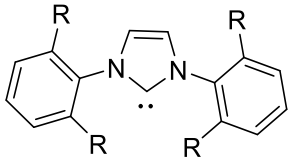
Content:

1. Table S1: Optimization of Reaction Conditions.

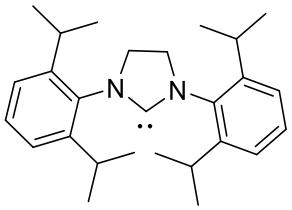


Entry	Catalyst	Counteranion	Solvent	Yield(%)[a] **3aa/4aa/5aa**
1	Ph_3PAuCl	$AgSbF_6$	CH_2Cl_2	57/24/0
2	IPrAuCl	$AgSbF_6$	CH_2Cl_2	32/43/0
3	$(2,4\text{-}^tBu_2C_6H_3O)_3PAuCl$	$AgSbF_6$	CH_2Cl_2	43/15/0
4	$(C_6F_5)_3PAuCl$	$AgSbF_6$	CH_2Cl_2	14/14/0
5	$(4\text{-}CF_3C_6H_4)_3PAuCl$	$AgSbF_6$	CH_2Cl_2	52/18/0
6	JohnphosAuCl	$AgSbF_6$	CH_2Cl_2	53/19/0
7	X-PhosAuCl	$AgSbF_6$	CH_2Cl_2	50/31/0
8	^{t}BuXPhosAuCl	$AgSbF_6$	CH_2Cl_2	49/27/0
9	$PicAuCl_2$	$AgSbF_6$	CH_2Cl_2	NR/NR/NR
10	JohnphosAuCl	$AgBF_4$	CH_2Cl_2	68/8/0
11	JohnphosAuCl	AgOTf	CH_2Cl_2	70/0/0
12	JohnphosAuCl	$AgNTf_2$	CH_2Cl_2	71/25/0
13	JohnphosAuCl	$NaBAr_F$	CH_2Cl_2	26/54/0
14	JohnphosAuCl	AgOTf	DCE	73/7/0
15	JohnphosAuCl	AgOTf	Toluene	67/0/0
16	JohnphosAuCl	AgOTf	THF	90 (87)/0/0
17	JohnphosAuCl	AgOTf	CH_3CN	54/0/0
18	JohnphosAuCl	AgOTf	Ether	80/0/0
19	JohnphosAuCl	AgOTf	1,4-dioxane	47/21/0
20	JohnphosAuCl	-	CH_2Cl_2	NR/NR/NR
21	-	AgOTf	CH_2Cl_2	0/0/0
22	SIPrAuCl	$AgSbF_6$	CH_2Cl_2	32/48/0

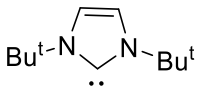
23	IBu^{t}AuCl	$AgSbF_6$	CH_2Cl_2	42/30/0
24	IMesAuCl	$AgSbF_6$	CH_2Cl_2	30/26/0
25	IPrAuCl	AgOTf	CH_2Cl_2	52/18/0
26	IPrAuCl	$AgBF_4$	CH_2Cl_2	45/28/0
27	IPrAuCl	$AgNTf_2$	CH_2Cl_2	25/49/0
28	IPrAuCl	$NaBAr_F$	CH_2Cl_2	13/90(82) /0
29	IPrAuCl	$NaBAr_F$	DCE	28/64/0
30	IPrAuCl	$NaBAr_F$	Toluene	28/65/0
31	IPrAuCl	$NaBAr_F$	CH_3CN	NR/NR/NR
32	IPrAuCl	-	CH_2Cl_2	NR/NR/NR
33	-	$NaBAr_F$	CH_2Cl_2	NR/NR/NR
34	Ph_3PAuCl	AgOTf	CH_2Cl_2	66/16/0
35	(2,4-^{t}Bu$_2$C$_6$H$_3$O)$_3$PAuCl	AgOTf	CH_2Cl_2	60/12/0
36	Ph_3PAuCl	$NaBAr_F$	CH_2Cl_2	42/42/0
37	(2,4-^{t}Bu$_2$C$_6$H$_3$O)$_3$PAuCl	$NaBAr_F$	CH_2Cl_2	19/14/0
38	$Cu(CH_3CN)_4PF_6$	-	CH_2Cl_2	0/12[b]/0
39	$Cu(OTf)_2$	-	CH_2Cl_2	0/48[b]/0
40	$Rh(OAc)_2$	-	CH_2Cl_2	0/54 [b] /9
41	$Pd(OAc)_2$	-	CH_2Cl_2	NR/NR/NR
42	$(C_6F_5)_3B$	-	CH_2Cl_2	0/24/0



IPr, R = ^{i}Pr,
IMes, R = Me



SIPr



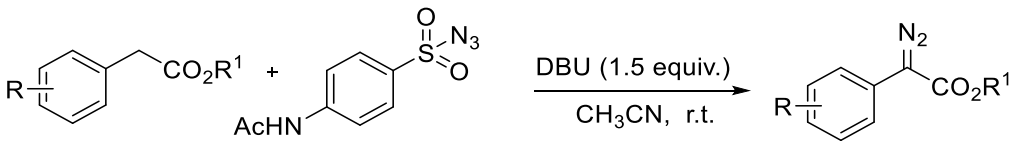
IBu^t

Reaction Conditions: **1a** (0.6 mmol), **2a** (0.4 mmol), catalyst (5 mol%), solvent (5mL), r.t, 15 min. [a]NMR yield, the number in parenthesis is isolated yield. [b]Corresponding lactone was obtained.

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, 1,4-dioxne, Ether were distilled from sodium and benzophenone prior to be used. CH_2Cl_2, CH_3CN were distilled from CaH_2 prior to be used.

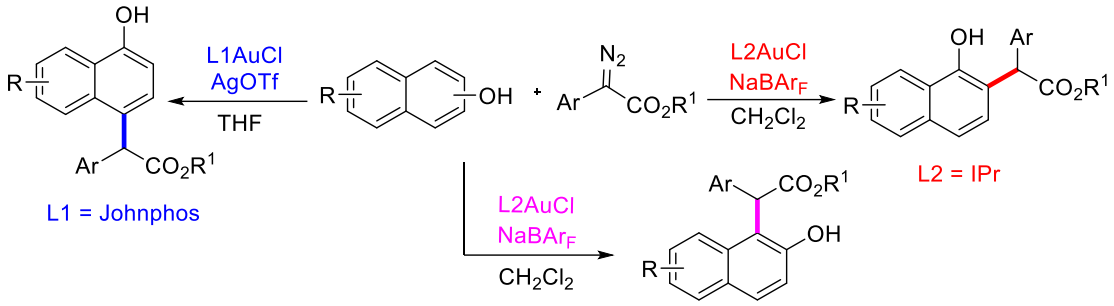
3. General procedure for synthesis of α-aryl-α-diazoesters



S-2 *p*-ABSA **2**

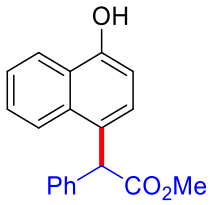
The arylacetate was dissolved in CH_3CN (10 mL/g) and *p*-ABSA (1.5 equiv) and DBU (1.5 equiv.) was added at r.t. The reaction was stirred at r.t. for 12 h. The reaction was diluted with water extracted with ether and dried over Na_2SO_4. The reaction was concentrated and purified by silica chromatography (PE/EA = 200:1) to obtain the desired diazo compound.

4. General procedure for the C-H bond functionalization of naphthalenols.



In a dried glass tube, a mixture of LAuCl (0.02 mmol), AgOTf or $NaBAr_F$ (5 mol%) in solvent (4 mL) was stirred at room temperature for 15 mins. Subsequently, naphthalenol (0.6 mmol) was added to the reaction mixture at room temperature. Then a solution of diazo compounds (0.4 mmol) in solvent (1 mL) was introduced into the reaction mixture by a syringe in 15 mins. The mixture was concentrated under reduced pressure and the residue was purified by column chromatography on silica gel (PE/EA = 10:1 to 5:1 or PE/EA = 20:1) to afford the desired product.

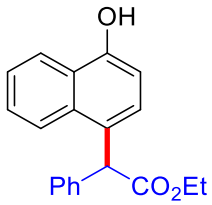
1) The synthesis of 3aa



3aa

3aa，light red oil，(102.1 mg, 87% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.24 (d, *J* = 7.6 Hz, 1H), 7.92 (d, *J* = 8.0 Hz, 1H), 7.45-7.55 (m, 2H), 7.27-7.38 (m, 5H), 7.05 (d, *J* = 8.0 Hz, 1H), 6.57 (d, *J* = 7.6 Hz, 1H), 6.14 (bs, 1H), 5.73 (s, 1H), 3.79 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 52.58, 53.17, 107.93, 122.67, 122.89, 124.91, 124.95, 126.39, 126.56, 126.99, 127.33, 128.64, 128.91, 132.61, 138.02, 151.45, 174.14. MS(EI): m/z (%): 292 (M^+, 17.19), 231 (100); HRMS (EI) calcd. for $C_{19}H_{16}O_3$: 292.1099, found: 292.1096.

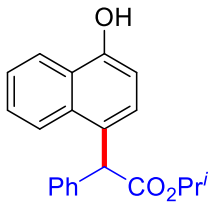
2) The synthesis of 3ab



3ab

3ab, light red oil, (106.2 mg, 87% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.23 (dd, *J* = 8.0 Hz, 1.2 Hz, 1H), 7.94 (d, *J* = 8.0 Hz, 1H), 7.45-7.55 (m, 2H), 7.25-7.35 (m, 5H), 7.05 (d, *J* = 8.0 Hz, 1H), 6.54 (d, *J* = 8.0 Hz, 1H), 6.21 (bs, 1H), 5.71 (s, 1H), 4.25-4.30 (m, 2H), 1.27 (d, *J* = 7.2 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 14.10, 53.29, 61.50, 107.96, 122.66, 122.95, 124.85, 124.96, 126.50, 126.55, 126.87, 127.26, 128.60, 128.93, 132.64, 138.12, 151.41, 173.72. MS(EI): m/z (%): 306 (M^+, 27.00), 233 (100); HRMS (EI) calcd. for $C_{20}H_{18}O_3$: 306.1256, found: 306.1259.

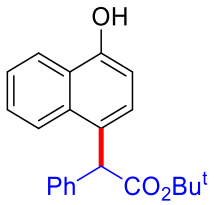
3) The synthesis of 3ac



3ac

3ac，colorless oil, (117.1 mg, 91% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.22 (d, *J* = 8.0 Hz, 1H), 7.95 (d, *J* = 8.0 Hz, 1H), 7.25-7.55 (m, 7H), 7.03 (d, *J* = 7.6 Hz, 1H), 6.53 (d, *J* = 8.0 Hz, 1H), 5.85-5.95 (m, 1H), 5.66 (s, 1H), 5.14 (hept, *J* = 6.4 Hz, 1H), 1.26 (d, *J* = 6.4 Hz, 3H), 1.23 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.64, 53.47, 68.93, 107.98, 122.61, 123.05, 124.84, 126.51, 126.81, 127.20, 128.57, 128.94, 132.71, 138.22, 151.29. MS(EI): m/z (%): 320 (M^+, 22.79), 233 (100); HRMS (EI) calcd. for $C_{21}H_{20}O_3$: 320.1412, found: 320.1407.

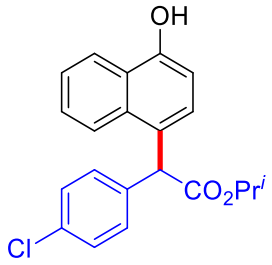
4) The synthesis of 3ad



3ad

3ad，white solid，(99.5 mg, 74% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.21 (d, *J* = 8.0 Hz, 1H), 7.96 (d, *J* = 8.4 Hz, 1H), 7.45-7.55 (m, 2H), 7.25-7.40 (m, 5H), 6.98 (d, *J* = 8.0 Hz, 1H), 6.49 (d, *J* = 8.0 Hz, 1H), 6.02 (s, 1H), 5.60 (s, 1H), 1.47 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.95, 54.23, 81.71, 108.02, 122.60, 123.09, 124.77, 124.93, 126.47, 126.69, 127.09, 127.20, 128.54, 128.96, 132.75, 138.48, 151.18, 172.91. MS(EI): m/z (%): 334 (M^+, 12.89), 233 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_3$: 334.1569, found: 334.1575.

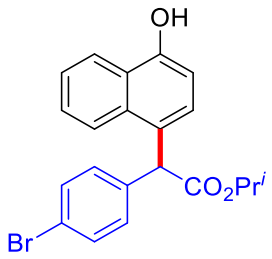
5) The synthesis of 3ae



3ae

3ae，colorless oil，(134.5 mg, 95% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.21 (d, *J* = 7.6 Hz, 1H), 7.86 (d, *J* = 8.0 Hz, 1H), 7.40-7.50 (m, 2H), 7.20-7.30 (m, 4H), 7.00 (d, *J* = 7.6 Hz, 1H), 6.51 (d, *J* = 7.6 Hz, 1H), 6.19 (s, 1H), 5.61 (s, 1H), 5.13 (hept, *J* = 6.4 Hz, 1H), 1.23 (d, *J* = 6.4 Hz, 3H), 1.22 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.60, 21.63, 52.86, 69.21, 107.89, 122.69, 122.91, 124.96, 124.99, 126.16, 126.33, 126.92, 128.73, 130.28, 132.53, 133.12, 136.75, 151.51, 172.89. MS(EI): m/z (%): 354 (M^+, 21.99), 356 ($[M+2]^+$, 6.88), 267 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Cl$: 354.1023, found: 354.1024.

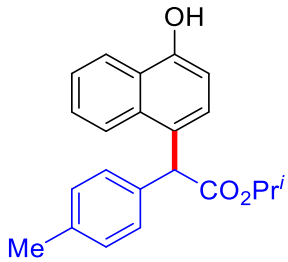
6) The synthesis of 3af



3af

3af，colorless oil, (150.0 mg, 94% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.20-8.25 (m, 1H), 7.87 (d, *J* = 8.0 Hz, 1H), 7.42-7.52 (m, 4H), 7.20 (d, *J* = 8.4 Hz, 2H), 7.02 (d, *J* = 7.6 Hz, 1H), 6.53 (d, *J* = 8.0 Hz, 1H), 6.10 (s, 1H), 5.60 (s, 1H), 5.14 (hept, *J* = 6.4 Hz, 1H), 1.25 (d, *J* = 6.4 Hz, 3H), 1.24 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.61, 21.64, 52.93, 69.23, 107.90, 121.28, 122.69, 122.90, 124.98, 126.11, 126.35, 126.94, 130.64, 131.68, 132.52, 137.27, 151.48, 172.80. MS(EI): m/z (%): 398 (M^+, 21.50), 400 ([M+2]$^+$, 21.42), 231 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Br$: 398.0518, found: 398.0520.

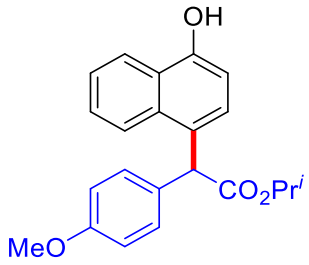
7) The synthesis of 3ag



3ag

3ag，white solid，(112.9 mg, 84% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.21 (d, *J* = 8.4 Hz, 1H), 7.95 (d, *J* = 8.4 Hz, 1H), 7.40-7.55 (m, 2H), 7.23 (d, *J* = 8.0 Hz, 2H), 7.16 (d, *J* = 8.0 Hz, 2H), 7.00 (d, *J* = 8.0 Hz, 1H), 6.47 (d, *J* = 8.0 Hz, 1H), 6.21 (s, 1H), 5.64 (s, 1H), 5.15 (hept, *J* = 6.4 Hz, 1H), 2.35 (s, 3H), 1.27 (d, *J* = 6.4 Hz, 3H), 1.24 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.05, 21.63, 21.65, 53.11, 68.92, 108.02, 122.63, 123.00, 124.75, 124.95, 126.46, 126.73, 126.83, 128.80, 129.30, 132.68, 135.10, 136.83, 151.27, 173.48. MS(EI): m/z (%): 334 (M^+, 20.02), 247 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_3$: 334.1569, found: 334.1573.

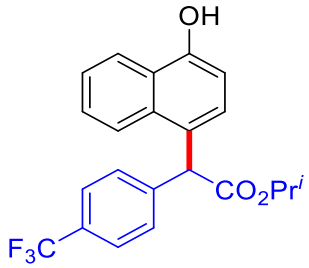
8) The synthesis of 3ao



3ao

3ao，yellow oil，(112.9 mg, 84% yield). ^{1}H-NMR (500 MHz, $CDCl_3$) δ 8.20 (d, *J* = 8.0 Hz, 1H), 7.91 (d, *J* = 8.0 Hz, 1H), 7.40-7.50 (m, 2H), 7.24 (d, *J* = 8.5 Hz, 2H), 7.00 (d, *J* = 7.5 Hz, 1H), 6.86 (d, *J* = 8.5 Hz, 2H), 6.50 (d, *J* = 8.0 Hz, 1H), 5.58 (s, 1H), 5.12 (hept, *J* = 6.0 Hz, 1H), 3.77 (s, 3H), 1.24 (d, *J* = 6.0 Hz, 3H), 1.21 (d, *J* = 6.0 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.64, 52.68, 55.20, 68.88, 107.92, 113.96, 122.64, 123.00, 124.77, 124.94, 126.30, 126.73, 126.88, 129.97, 130.19, 132.61, 151.31, 158.61, 173.52. HRMS (EI) calcd. for $[C_{22}H_{22}O_4+Na]^+$: 373.1410, found: 373.1401.

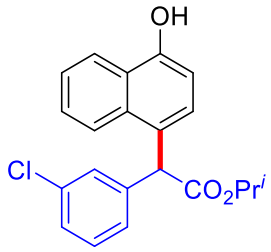
9) The synthesis of 3ap



3ap

3ap，yellow oil，(125.9 mg, 81% yield). ^{1}H-NMR (500 MHz, $CDCl_3$) δ 8.25 (d, *J* = 8.5 Hz, 1H), 7.89 (d, *J* = 8.5 Hz, 1H), 7.40-7.65 (m, 6H), 7.01 (d, *J* = 8.0 Hz, 1H), 6.60-6.70 (m, 1H), 6.50 (d, *J* = 8.0 Hz, 1H), 5.74 (s, 1H), 5.19 (hept, *J* = 6.5 Hz, 1H), 1.28 (d, *J* = 6.5 Hz, 3H), 1.27 (d, *J* = 6.5 Hz, 3H); ^{13}C-NMR (125 MHz, $CDCl_3$) δ 21.54, 21.59, 53.25, 69.58, 107.87, 122.74, 122.80, 124.08 (q, *J* = 268.8 Hz, 1C), 124.99, 125.05, 125.41 (q, *J* = 3.8 Hz, 1C), 125.51 (q, *J* = 3.8 Hz, 1C), 126.48, 126.73, 129.29, 129.47 (q, *J* = 32.5 Hz, 1C), 132.47, 142.20, 151.77, 172.91. HRMS (ESI) calcd. for $[C_{22}H_{19}F_3O_3+Na]^+$: 411.1178, found: 411.1177.

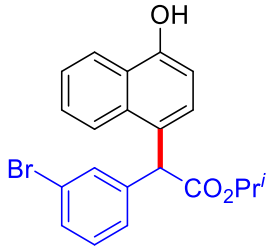
10) The synthesis of 3ah



3ah

3ah, white solid, (120.3 mg, 85% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.20-8.25 (m, 1H), 7.87 (d, *J* = 7.6 Hz, 1H), 7.45-7.55 (m, 2H), 7.15-7.35 (m, 4H), 7.05 (d, *J* = 7.6 Hz, 1H), 6.57 (d, *J* = 7.6 Hz, 1H), 5.83 (s, 1H), 5.61 (s, 1H), 5.13 (hept, *J* = 6.4 Hz, 1H), 1.24 (d, *J* = 6.4 Hz, 6H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.60, 21.66, 53.06, 69.22, 107.95, 122.67, 122.92, 124.95, 125.03, 126.08, 126.38, 127.01, 127.13, 127.50, 129.08, 129.76, 132.56, 134.43, 140.29, 151.43, 172.52. MS(EI): m/z (%): 354 (M^+, 23.69), 356 ($[M+2]^+$, 8.41), 267 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Cl$: 354.1023, found: 354.1028.

11) The synthesis of 3ai

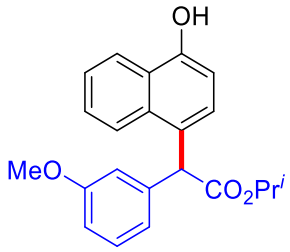


3ai

3ai，white solid, (136.1 mg, 85% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.22-8.26 (m, 1H), 7.87 (d, *J* = 8.0 Hz, 1H), 7.45-7.55 (m, 3H), 7.40 (d, *J* = 8.0 Hz, 1H), 7.16-7.26 (m, 2H), 7.07 (d, *J* = 8.0 Hz, 1H), 6.60 (d, *J* = 8.0 Hz, 1H), 5.87 (bs, 1H), 5.60 (s, 1H), 5.12 (hept, *J* = 6.4 Hz, 1H), 1.23 (d, *J* = 6.4 Hz, 6H). ^{3}C-NMR (100 MHz, $CDCl_3$) δ 21.60, 21.67, 53.03, 69.14, 107.96, 122.66, 122.98, 124.99, 125.06, 126.19, 126.40, 127.03, 127.59, 130.05, 130.41, 131.96, 132.60, 140.67, 151.45, 172.32. MS(EI): m/z (%): 398 (M^+, 17.19), 400 ($[M+2]^+$, 16.89), 231 (100); HRMS (EI) calcd. for

$C_{21}H_{19}O_3Br$: 398.0518, found: 398.0521.

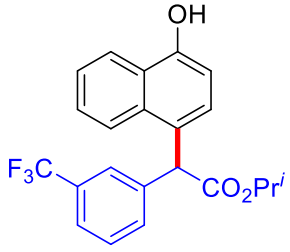
12) The synthesis of 3aj



3aj

3aj，white solid，(122.6 mg, 88% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.19 (d, *J* = 8.0 Hz, 1H), 7.91 (d, *J* = 8.4 Hz, 1H), 7.40-7.50 (m, 2H), 7.21-7.25 (m, 1H), 6.99 (d, *J* = 8.0 Hz, 1H), 6.85-6.95 (m, 2H), 6.81 (dd, *J* = 8.4 Hz, 2.4 Hz, 1H), 6.45 (d, *J* = 8.0 Hz, 1H), 6.22 (s, 1H), 5.61 (s, 1H), 5.12 (hept, *J* = 6.4 Hz, 1H), 3.74 (s, 3H), 1.24 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.63, 21.65, 53.44, 55.16, 69.01, 107.97, 112.59, 114.86, 121.43, 122.66, 122.92, 124.77, 124.93, 126.43, 126.52, 126.77, 129.53, 132.67, 139.67, 151.38, 159.67, 173.13. MS(EI): m/z (%): 350 (M^+, 23.36), 263 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_4$: 350.1518, found: 350.1524.

13) The synthesis of 3ak

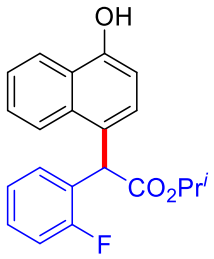


3ak

3ak，colorless oil，(136.5 mg, 88% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.24 (d, *J* = 8.0 Hz, 1H), 7.90 (d, *J* = 8.0 Hz, 1H), 7.64 (s, 1H), 7.40-7.58 (m, 5H), 7.02 (dd, *J* = 8.0 Hz, 5.2 Hz, 1H), 6.52-6.58 (m, 1H), 6.15 (bs, 1H), 5.72 (s, 1H), 5.16 (hept, *J* = 6.0 Hz, 1H), 1.25 (d, *J* = 6.0 Hz, 3H), 1.24 (d, *J* = 6.0 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 172.62, 151.61, 139.25, 132.53, 132.34, 130.88 (q, *J* = 32 Hz, 1C), 129.02, 127.06,

126.47, 125.84, 125.70 (q, J = 4 Hz, 1C), 125.05, 125.01, 124.19 (q, J = 3 Hz, 1C), 124.04 (q, J = 271 Hz, 1C), 122.80, 122.75, 107.93, 69.42, 53.20, 21.59, 21.56. MS(EI): m/z (%): 388 (M^+, 20.94), 301 (100); HRMS (EI) calcd. for $C_{22}H_{19}O_3F_3$: 388.1286, found: 388.1280.

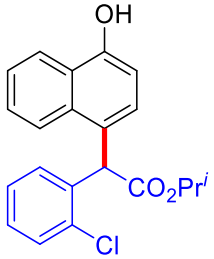
14) The synthesis of 3al



3al

3al，white solid，(122.7 mg, 91% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.20-8.25 (m, 1H), 7.85-7.90 (m, 1H), 7.45-7.52 (m, 2H), 7.20-7.28 (m, 1H), 6.95-7.15 (m, 4H), 6.60-6.68 (m, 1H), 5.90-6.10 (m, 1H), 5.93 (s, 1H), 5.16 (m, 1H), 1.26 (d, J = 6.0 Hz, 3H), 1.24 (d, J = 6.0 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.53, 21.62, 46.30 (d, J = 3.0 Hz, 1C), 69.28, 107.94, 115.16 (d, J = 22 Hz, 1C), 122.81 (d, J = 32 Hz, 1C), 124.06, 124.09, 124.95, 125.00 (d, J = 8 Hz, 1C), 125.75 (d, J = 14 Hz, 1C), 126.16, 126.93, 128.98 (d, J = 8 Hz, 1C), 130.29, 130.32, 132.62, 151.66, 160.54 (d, J = 45 Hz, 1C), 172.76. MS(EI): m/z (%): 338 (M^+, 23.17), 251 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3F$: 338.1318, found:338.1323.

15) The synthesis of 3am

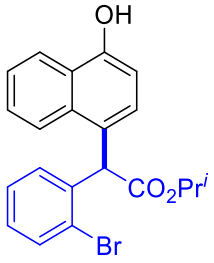


3am

3am，white solid，(105.6 mg, 75% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.20-8.25 (m, 1H), 7.70-7.80 (m, 1H), 7.40-7.50 (m, 3H), 7.19 (dd J = 7.6 Hz, 1.6 Hz, 1H), 7.07-

7.13 (m, 2H), 6.98-7.03 (m, 1H) 6.65-6.75 (m, 1H), 6.03 (s, 1H), 5.60-5.90 (m, 1H), 5.18 (hept, *J* = 6.4 Hz, 1H), 1.28 (d, *J* = 6.4 Hz, 3H), 1.24 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.56, 21.69, 50.80, 69.27, 107.91, 122.61, 123.14, 125.01, 125.13, 125.18, 126.12, 126.87, 126.99, 128.58, 129.42, 130.32, 132.62, 134.20, 136.43, 151.66, 172.75. MS(EI): m/z (%): 354 (M^+, 26.77), 356 ($[M+2]^+$, 8.84), 267 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Cl$: 354.1023, found: 354.1023.

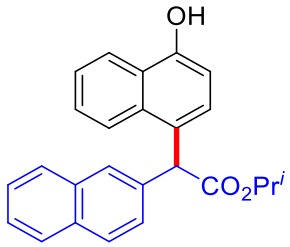
16) The synthesis of 3an



3an

3an, white solid，(115.0 mg, 72% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.17-8.23 (m, 1H), 7.68-7.74 (m, 1H), 7.60 (dd, *J* =7.6 Hz, 1.6 Hz, 1H), 7.40-7.46 (m, 2H), 7.00-7.15 (m, 4H), 6.64 (d, *J* = 8.0 Hz, 1H), 6.24 (s, 1H), 6.02 (s, 1H), 5.20 (hept, *J* = 6.4 Hz, 1H), 1.30 (d, *J* = 6.4 Hz, 3H), 1.25 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.57, 21.73, 53.49, 69.21, 107.88, 122.60, 123.23, 125.01, 125.05, 125.14, 125.45, 126.10, 127.00, 127.49, 128.83, 130.53, 132.62, 132.78, 138.15, 151.67, 172.56. MS(EI): m/z (%): 398 (M^+, 26.76), 400 ($[M+2]^+$, 27.02), 231 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Br$: 398.0518, found: 398.0521.

17) The synthesis of 3ao

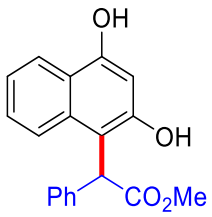


3ao

3ao，white solid，(146.2 mg, 99% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.20-8.25 (m,

1H), 8.00 (d, *J* = 8.4 Hz, 1H), 7.75-7.85 (m, 4H), 7.40-7.50 (m, 5H), 7.00-7.05 (m, 1H), 6.45-6.55 (m, 1H), 6.03 (bs, 1H), 5.83 (s, 1H), 5.19 (hept, *J* = 6.4 Hz, 1H), 1.29 (d, *J* = 6.4 Hz, 3H), 1.25 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.64, 21.65, 53.61, 69.17, 108.03, 122.70, 122.90, 124.78, 124.99, 125.92, 126.10, 126.38, 126.79, 126.82, 127.19, 127.55, 127.58, 127.93, 128.25, 132.55, 132.69, 133.38, 135.60, 151.46, 173.43. MS(EI): m/z (%): 370 (M^+, 23.62), 283 (100); HRMS (EI) calcd. for $C_{25}H_{22}O_3$: 370.1569, found: 370.1571

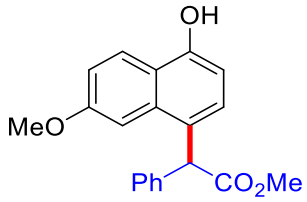
18) The synthesis of 3ba



3ba

3ba，colorless oil, (71.5 mg, 58% yield). ^{1}H-NMR (400 MHz, CD_3OD) δ 8.11 (dd, *J* = 8.4 Hz, 0.8 Hz, 1H), 7.67 (d, *J* = 8.8 Hz, 1H), 7.26-7.33 (m, 3H), 7.11-7.23 (m, 4H), 6.63 (s, 1H), 5.65 (s, 1H), 3.65 (s, 3H), 2.12 (s, 2H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 30.66, 52.54, 101.28, 110.19, 122.23, 122.31, 123.59, 123.74, 127.50, 127.78, 128.90, 130.38, 135.31, 140.27, 154.26, 155.25, 177.27. MS(EI): m/z (%): 308 (M^+, 3.12), 247 (100); HRMS (EI) calcd. for $C_{19}H_{16}O_4$: 308.1049, found: 308.1047.

19) The synthesis of 3ca

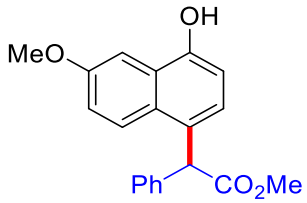


3ca

3ca，colorless oil，(120.3 mg, 93% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.14 (d, *J* = 9.2 Hz, 1H), 7.25-7.38 (m, 5H), 7.17 (d, *J* = 2.4 Hz, 1H), 7.12 (dd, *J* = 9.2 Hz, 2.4 Hz, 1H), 7.03 (d, *J* = 8.0 Hz, 1H), 6.48 (d, *J* = 7.6 Hz, 1H), 5.93 (bs, 1H), 5.60 (s, 1H), 3.83 (s, 3H), 3.79 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 52.49, 53.74, 55.13, 102.35,

106.03, 116.95, 120.03, 124.38, 125.49, 127.21, 127.34, 128.63, 128.94, 134.06, 137.89, 151.55, 158.41, 173.89. MS(EI): m/z (%): 322 (M^+, 6.61), 195 (100); HRMS (EI) calcd. for $C_{20}H_{18}O_4$: 322.1205, found: 322.1207.

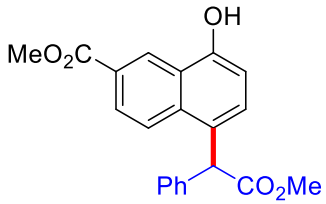
20) The synthesis of 3da



3da

3da，colorless oil，(124.6 mg, 97% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.82 (d, *J* = 9.2 Hz, 1H), 7.50 (d, *J* = 2.8 Hz, 1H), 7.25-7.38 (m, 5H), 7.16 (dd, *J* = 9.2 Hz, 2.4 Hz, 1H), 6.91 (d, *J* = 8.0 Hz, 1H), 6.54 (d, *J* = 8.0 Hz, 1H), 6.32 (s, 1H), 5.70 (s, 1H), 3.90 (s, 3H), 3.80 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 52.61, 53.31, 55.28, 101.06, 108.51, 119.42, 124.07, 124.61, 126.08, 126.33, 127.30, 127.99, 128.61, 128.88, 138.00, 150.52, 156.87, 174.30. MS(EI): m/z (%): 322 (M^+, 39.31), 84 (100); HRMS (EI) calcd. for $C_{20}H_{18}O_4$: 322.1205, found: 322.1210.

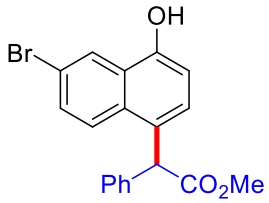
21) The synthesis of 3ea



3ea

3ea，colorless oil，(112.4 mg, 80% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.98 (s, 1H), 8.06 (d, *J* = 8.8 Hz, 1H), 7.92 (d, *J* = 8.8 Hz, 1H), 7.25-7.40 (m, 5H), 7.13 (d, *J* = 8.0 Hz, 1H), 6.97 (s, 1H), 6.66 (d, *J* = 8.0 Hz, 1H), 5.71 (s, 1H), 3.97 (s, 3H), 3.80 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 52.29, 52.72, 53.11, 108.80, 123.13, 124.29, 125.99, 126.10, 126.27, 127.48, 128.75, 128.87, 129.41, 134.66, 137.58, 152.90, 167.48, 174.09. MS(EI): m/z (%): 350 (M^+, 32.26), 43 (100); HRMS (EI) calcd. for $C_{21}H_{18}O_5$: 350.1154, found: 350.1156.

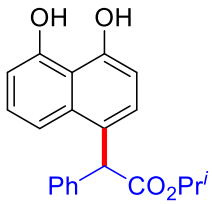
22) The synthesis of 3fa



3fa

3fa，colorless oil, (130.1 mg, 88% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.34 (d, *J* = 2.0 Hz, 1H), 7.74 (d, *J* = 8.8 Hz, 1H), 7.55 (dd, *J* = 8.8 Hz, 2.0 Hz, 1H), 7.28-7.38 (m, 5H), 6.99 (d, *J* = 8.0 Hz, 1H), 6.50 (d, *J* = 8.0 Hz, 1H), 6.14 (s, 1H), 5.65 (s, 1H), 3.80 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 52.78, 53.18, 108.96, 119.22, 124.67, 125.27, 126.14, 126.43, 127.04, 127.52, 128.76, 128.85, 130.24, 131.02, 137.49, 150.57, 174.15. MS(EI): m/z (%): 370 (M^+, 34.87), 372 ($[M+2]^+$, 35.18), 311 (100); HRMS (EI) calcd. for $C_{19}H_{15}O_3Br$: 370.0205, found: 370.0202.

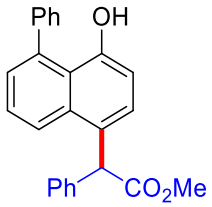
23) The synthesis of 3ga



3ga

3ga，colorless oil，(70.2 mg, 52% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.20-7.40 (m, 8H), 6.81 (d, *J* = 8.0 Hz, 1H), 6.65 (d, *J* = 7.6 Hz, 1H), 6.41 (d, *J* = 8.0 Hz, 1H), 5.56 (s, 1H), 5.17 (hept, *J* = 6.0 Hz, 1H), 1.31 (d, *J* = 6.0 Hz, 3H), 1.24 (d, *J* = 6.0 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.52, 21.67, 54.15, 69.61, 108.21, 109.53, 114.70, 114.94, 125.83, 127.39, 127.42, 127.64, 128.72, 128.96, 134.74, 137.53, 153.16, 154.26, 174.60. MS(EI): m/z (%): 336 (M^+, 1.62), 84 (100); HRMS (EI) calcd. for $C_{21}H_{20}O_4$: 336.1362, found: 336.1369.

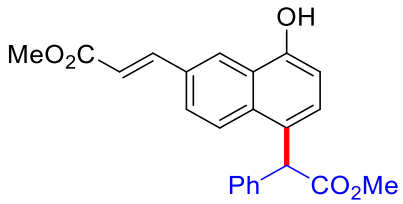
24) The synthesis of 3ha



3ha

3ha, colorless oil, (130.2 mg, 88% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.03 (d, *J* = 8.4 Hz, 1H), 7.45-7.56 (m, 6H), 7.25-7.40 (m, 6H), 7.23 (dd, *J* = 7.2 Hz, 1.2 Hz, 1H), 6.88 (d, *J* = 8.0 Hz, 1H), 5.78 (s, 1H), 5.49 (s, 1H), 3.80 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 52.46, 53.77, 111.19, 121.82, 123.68, 125.47, 126.69, 127.35, 127.72, 128.50, 128.60, 128.65, 128.94, 129.35, 129.40, 133.45, 137.02, 138.12, 141.23, 152.83, 173.56. MS(EI): m/z (%): 368 (M^+, 38.32), 309 (100); HRMS (EI) calcd. for $C_{25}H_{20}O_3$: 368.1412, found: 368.1411.

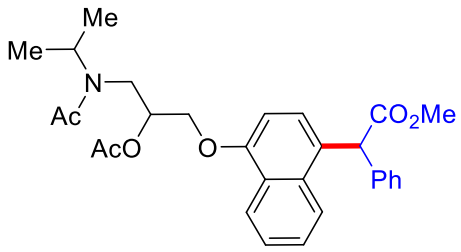
25) The synthesis of 3ia



3ia

3ia，yellow solid，(136.6 mg, 91% yield). ^{1}H-NMR (400 MHz, Acetone-d_6) δ 9.40 (s, 1H), 8.48 (s, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.70-7.80 (m, 2H), 7.25-7.40 (m, 6H), 6.95 (d, *J* = 7.6 Hz, 1H), 6.64 (d, *J* = 16.0 Hz, 1H), 5.79 (s, 1H), 3.77 (s, 3H), 3.72 (s, 3H); ^{13}C-NMR (100 MHz, Acetone-d_6) δ 51.76, 52.52, 53.55, 109.28, 118.73, 125.15, 126.17, 127.02, 127.98, 129.04, 129.30, 129.84, 131.57, 134.33, 139.68, 145.31, 154.37, 167.57, 173.79. HRMS (ESI) calcd. for $C_{23}H_{21}O_5$, $[M+1]^+$: 377.1384, found: 377.1389.

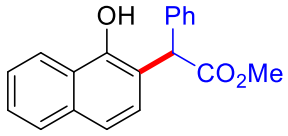
26) The synthesis of 3ja



3ja

3ja, colorless oil, (184.2 mg, 94% yield, d.r. = 3:1). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.25-8.35 (m, 1H), 7.85-8.00 (m,1H), 7.45-7.60 (m, 2H), 7.20-7.40 (m, 6H), 6.70-6.80 (m, 1H), [5.72 (s, 0.27), 5.70 (s, 0.73)], [5.60-5.65 (m, 0.73), 5.45-5.55 (s, 0.27)], [4.45-4.55 (m, 0.27), 4.00-4.10 (s, 0.73)], 4.20-4.35 (m, 2H), [3.80-3.90 (m, 0.73), 3.60-3.70 (s, 0.27)], [3.80-3.90 (m, 0.27), 3.35-3.45 (s, 0.73)], 3.75 (s, 3H), [2.24 (s, 0.81H), 2.16 (s, 2.19)], [2.11 (s, 0.81H), 2.08 (s, 2.19)], 1.20-1.35 (m, 6H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ [20.09, 20.86], [20.51, 21.00], 21.61, [21.95, 22.63], [41.33, 45.42], [47.21, 49.40], 52.27, 53.10, [66.91, 68.33], [70.79, 71.44], 104.17, [122.17, 122.58], [122.90, 123.07], [125.07, 125.36], [125.74, 125.93], [126.20, 126.33], [126.83, 126.93], [127.18, 127.27], [128.49, 128.54], 128.79, [132.38, 132.47], 138.06, [153.33, 153.88], [170.05, 170.38], 171.21, [173.24, 173.34]. MS(EI): m/z (%): 491 (M^+, 0.25), 200 (100); HRMS (EI) calcd. for $C_{29}H_{33}NO_6$: 491.2308, found: 491.2303.

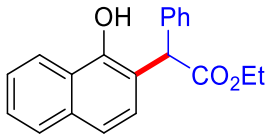
27) The synthesis of 4aa



4aa

4aa，colorless oil，(95.6 mg, 82% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.77 (s, 1H), 8.25-8.35 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.15-7.30 (m, 6H), 5.21 (s, 1H), 3.84 (s, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 53.26, 55.86, 116.04, 120.28, 122.55, 125.39, 126.32, 126.61, 127.23, 127.52, 128.74, 129.03, 134.42, 136.62, 151.35, 176.55. MS(EI): m/z (%): 292 (M^+, 15.46), 231 (100); HRMS (EI) calcd. for $C_{19}H_{16}O_3$: 292.1099, found: 292.1108.

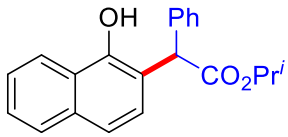
28) The synthesis of 4ab



4ab

4ab，colorless oil，(105.8 mg, 87% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.04 (s, 1H), 8.25-8.35 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.15-7.30 (m, 6H), 5.17 (s, 1H), 4.20-4.40 (m, 2H), 1.33 (t, *J* = 7.2 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 14.04, 56.29, 62.59, 115.96, 120.16, 122.69, 125.33, 126.41, 126.59, 127.18, 127.44, 127.47, 128.71, 129.20, 134.44, 136.75, 151.55, 176.25. MS(EI): m/z (%): 306 (M^+, 14.98), 231 (100); HRMS (EI) calcd. for $C_{20}H_{18}O_3$: 306.1256, found: 306.1262.

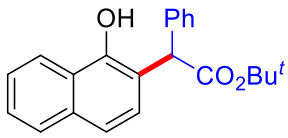
29) The synthesis of 4ac



4ac

4ac, colorless oil，(117.2 mg, 91% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.26 (s, 1H), 8.30-8.40 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.15-7.30 (m, 6H), 5.15 (hept, *J* = 6.4 Hz, 1H), 5.12 (s, 1H), 1.35 (d, *J* = 6.4 Hz, 3H), 1.27 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.59, 21.69, 56.68, 70.60, 115.89, 120.07, 122.78, 125.28, 126.48, 126.57, 127.15, 127.36, 127.42, 128.69, 129.34, 134.45, 136.87, 151.69, 175.88. MS(EI): m/z (%): 320 (M^+, 15.59), 231 (100); HRMS (EI) calcd. for $C_{21}H_{20}O_3$: 320.1412, found: 320.1415.

30) The synthesis of 4ad

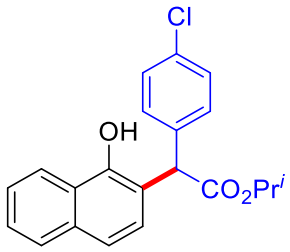


4ad

4ad, colorless oil，(120.7 mg, 90% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.43 (s, 1H), 8.30-8.40 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.15-7.30 (m, 6H), 5.05 (s,

1H), 1.52 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.94, 57.61, 83.94, 116.12, 119.92, 122.84, 125.20, 126.51, 127.11, 127.30, 128.63, 129.48, 134.41, 137.17, 151.78, 175.85. MS(EI): m/z (%): 334 (M^+, 6.23), 231 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_3$: 334.1569, found: 334.1576.

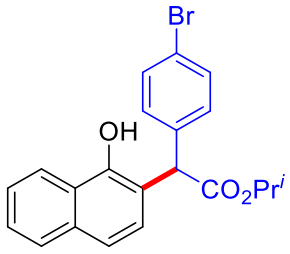
31) The synthesis of 4ae



4ae

4ae, light yellow oil，(125.2 mg, 88% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.18 (s, 1H), 8.30-8.40 (m, 1H), 7.80-7.85 (m, 1H), 7.40-7.55 (m, 3H), 7.15-7.30 (m, 5H), 5.21 (hept, *J* = 6.4 Hz, 1H), 5.13 (s, 1H), 1.39 (d, *J* = 6.4 Hz, 3H), 1.31 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.53, 21.66, 55.89, 70.82, 115.66, 120.30, 122.65, 125.42, 126.41, 126.70, 127.20, 128.80, 128.82, 129.00, 133.33, 134.47, 135.40, 151.53, 175.49. MS(EI): m/z (%): 354 (M^+, 14.58), 356 ($[M+2]^+$, 5.02), 231 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Cl$: 354.1023, found: 354.1018.

32) The synthesis of 4af

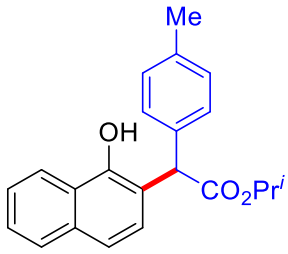


4af

4af, colorless oil，(130.0 mg, 82% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.15 (s, 1H), 8.32-8.38 (m, 1H), 7.78-7.84 (m, 1H), 7.48-7.55 (m, 2H), 7.40-7.46 (m, 3H), 7.23 (d, *J* = 8.4 Hz, 1H), 7.15 (d, *J* = 8.4 Hz, 2H), 5.20 (hept, *J* = 6.4 Hz, 1H), 5.10 (s, 1H), 1.39 (d, *J* = 6.4 Hz, 3H), 1.30 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.54,

21.67, 55.96, 70.85, 115.58, 120.31, 121.48, 122.65, 125.43, 126.41, 126.72, 127.20, 129.00, 129.17, 131.76, 134.48, 135.94, 151.53, 175.42. MS(EI): m/z (%): 398 (M^+, 7.77), 400 ($[M+2]^+$, 7.90), 231 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Br$: 398.0518, found: 398.0532.

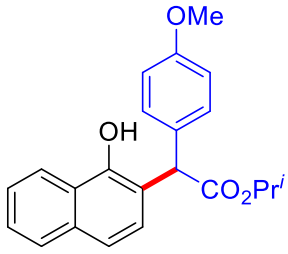
33) The synthesis of 4ag



4ag

4ag, colorless oil，(117.7 mg, 88% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.25 (s, 1H), 8.25-8.35 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.15-7.30 (m, 5H), 5.15 (hept, *J* = 6.4 Hz, 1H), 5.08 (s, 1H), 2.28 (s, 3H), 1.34 (d, *J* = 6.4 Hz, 3H), 1.27 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 20.97, 21.58, 21.68, 56.34, 70.51, 116.07, 120.00, 122.79, 125.22, 126.47, 126.51, 127.12, 127.21, 129.33, 129.38, 133.84, 134.40, 137.09, 151.64, 176.03. MS(EI): m/z (%): 334 (M^+, 16.49), 231 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_3$: 334.1569, found: 334.1563.

34) The synthesis of 4ao

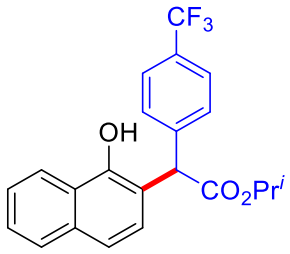


4ao

4ao, yellow oil，(73.8 mg, 53% yield). ^{1}H-NMR (500 MHz, $CDCl_3$) δ 9.31 (s, 1H), 8.32-8.36 (m, 1H), 7.75-7.82 (m, 1H), 7.45-7.52 (m, 2H), 7.40 (d, *J* = 8.5 Hz, 1H), 7.21 (d, *J* = 8.5 Hz, 1H), 7.16 (d, *J* = 8.5 Hz, 2H), 6.82 (d, *J* = 8.5 Hz, 2H), 5.17 (hept, *J* = 6.5 Hz, 1H), 5.06 (s, 1H), 3.76 (s, 3H), 1.36 (d, *J* = 6.5 Hz, 3H), 1.28 (d, *J* = 6.5 Hz,

3H); ^{13}C-NMR (125 MHz, $CDCl_3$) δ 21.61, 21.72, 55.22, 55.99, 70.56, 114.05, 116.06 120.02, 122.79, 125.26, 126.44, 126.55, 127.13, 128.47, 128.80, 129.32, 134.38, 151.62, 158.79, 176.17. HRMS (ESI) calcd. for $[C_{22}H_{22}O_4 + Na]^+$: 373.1410, found: 373.1416.

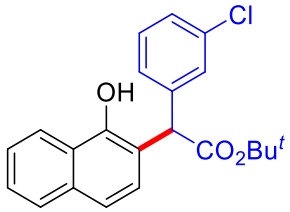
35) The synthesis of 4ap



4ap

4ap, yellow oil，(80.2 mg, 52% yield). ^{1}H-NMR (500 MHz, $CDCl_3$) δ 9.17 (s, 1H), 8.45-8.52 (m, 1H), 7.30-7.35 (m, 1H), 7.58 (d, *J* = 8.5 Hz, 2H), 7.50-7.58 (m, 2H), 7.49 (d, *J* = 8.5 Hz, 1H), 7.40 (d, *J* = 8.5 Hz, 2H), 7.26 (d, *J* = 8.5 Hz, 1H), 5.23 (hept, *J* = 6.0 Hz, 1H), 5.21 (s, 1H), 1.41 (d, *J* = 6.0 Hz, 3H), 1.32 (d, *J* = 6.0 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.52, 21.65, 56.21, 71.06, 115.41, 120.47, 122.60, 123.98 (q, *J* = 270 Hz, 1C), 125.53, 125.61 (q, *J* = 3.8 Hz, 1C), 126.40, 126.82, 127.26, 127.83, 128.95, 129.65 (q, *J* = 32.5 Hz, 1C), 134.53, 140.89, 151.56, 175.30; HRMS (ESI) calcd. for $[C_{22}H_{19}F_3O_3+Na]^+$: 411.1178, found: 411.1189.

36) The synthesis of 4ah

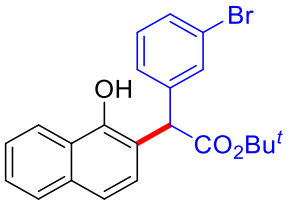


4ah

4ah, colorless oil，(116.9 mg, 79% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.26 (s, 1H), 8.25-8.35 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.10-7.25 (m, 5H), 5.01 (s, 1H), 1.52 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.91, 57.04, 84.33, 115.66, 120.19,

122.77, 125.35, 125.56, 126.50, 126.67, 127.18, 127.55, 127.64, 129.17, 129.83, 134.48, 134.50, 139.25, 151.68, 175.20. MS(EI): m/z (%): 368 (M^+, 0.93), 370 ($[M+2]^+$, 1.29), 231 (100); HRMS (EI) calcd. for $C_{22}H_{21}O_3Cl$: 368.1179, found:368.1182.

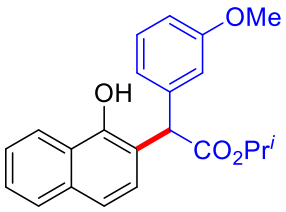
37) The synthesis of 4ai



4ai

4ai, colorless oil，(133.2 mg, 81% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.27 (s, 1H), 8.30-8.40 (m, 1H), 7.75-7.85 (m, 1H), 7.35-7.55 (m, 5H), 7.10-7.25 (m, 3H), 5.03 (s, 1H), 1.55 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.92, 56.99, 84.35, 115.65, 120.20 122.70, 122.77, 125.36, 126.02, 126.50, 126.68, 127.18, 129.15, 130.13, 130.49, 130.53, 134.48, 139.51, 151.66, 175.17. MS(EI): m/z (%): 412 (M^+, 2.00), 414 ($[M+2]^+$, 1.84), 231 (100); HRMS (EI) calcd. for $C_{22}H_{21}O_3Br$: 412.0674, found:412.0668.

38) The synthesis of 4aj



4aj

4aj, colorless oil，(105.6 mg, 75% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.30-8.35 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.15-7.25 (m, 2H), 6.70-6.85 (m, 3H), 5.16 (hept, J = 6.4 Hz, 1H), 5.09 (s, 1H), 3.70 (s, 3H), 1.35 (d, J = 6.4 Hz, 3H), 1.27 (d, J = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.56, 21.67, 55.09, 56.51, 70.58, 112.44, 113.63, 115.88, 119.71, 120.06, 122.74, 125.25, 126.43, 126.54, 127.13, 129.26, 129.64, 134.43, 138.40, 151.63, 159.77, 175.67. MS(EI): m/z (%): 350 (M^+, 29.71), 231 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_4$: 350.1518, found: 350.1526.

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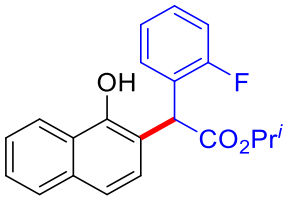
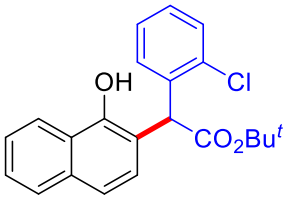
39) The synthesis of 4ak



4ak

4ak, colorless oil, (103.3 mg, 76% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.75 (s, 1H), 8.25-8.35 (m, 1H), 7.70-7.80 (m, 1H), 7.35-7.50 (m, 3H), 7.20-7.30 (m, 2H), 6.95-7.15 (m, 3H), 5.24 (s, 1H), 5.13 (hept, *J* = 6.4 Hz, 1H), 1.33 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.37, 21.47, 50.82, 70.62, 113.79, [115.36, *J* = 22 Hz, 1C], 120.43, 122.63, [123.65, *J* = 15 Hz, 1C], [124.22, *J* = 4 Hz, 1C], 125.40, 126.20, 126.71, 127.25, [129.32, *J* = 25 Hz, 1C], 129.37, 134.53, 151.85, 159.46, 161.91, 174.94.

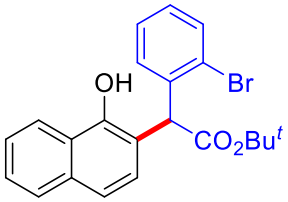
40) The synthesis of 4al



4al

4al, colorless oil, (110.1 mg, 75% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.25-8.35 (m, 1H), 8.26 (s, 1H), 7.75-7.85 (m, 1H), 7.40-7.50 (m, 4H), 7.10-7.30 (m, 4H), 5.34 (s, 1H), 1.46 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.76, 54.98, 83.61, 114.63, 120.44, 122.52, 125.37, 126.03, 126.64, 127.00, 127.29, 128.89, 129.17, 129.81, 130.00, 134.18, 134.31, 134.39, 151.58, 174.03. MS(EI): m/z (%): 368 (M^+, 2.63), 370 ($[M+2]^+$, 0.96), 231 (100); HRMS (EI) calcd. for $C_{22}H_{21}O_3Cl$: 368.1179, found: 368.1187.

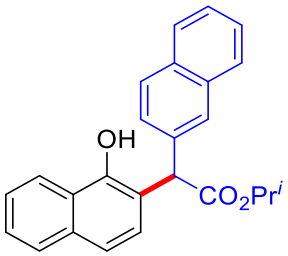
41) The synthesis of 4am



4am

4am, yellow oil，(113.3 mg, 69% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.25-8.35 (m, 1H), 8.07 (s, 1H), 7.75-7.85 (m, 1H), 7.60 (d, *J* = 8.0 Hz, 1H), 7.45-7.55 (m, 2H), 7.41 (d, *J* = 8.4 Hz, 1H), 7.10-7.30 (m, 4H), 5.39 (s, 1H), 1.47 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.80, 56.85, 83.58, 115.26, 120.47, 122.42, 124.78, 125.40, 125.97, 126.62 127.33, 127.66, 128.96, 129.12, 130.32, 133.22, 134.34, 136.22, 151.28, 173.69. MS(EI): m/z (%): 412 (M^+, 1.49), 414 ($[M+2]^+$, 1.50), 231 (100); HRMS (EI) calcd. for $C_{22}H_{21}O_3Br$: 412.0674, found:412.0677.

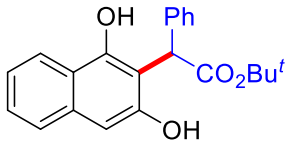
42) The synthesis of 4an



4an

4an, colorless oil，(123.5 mg, 83% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.25 (s, 1H), 7.35-7.45 (m, 1H), 7.70-7.90 (m, 5H), 7.45-7.55 (m, 5H), 7.41 (d, *J* = 8.4 Hz, 1H), 7.34 (d, *J* = 8.4 Hz, 1H), 5.35 (s, 1H), 5.26 (hept, *J* = 6.4 Hz, 1H), 1.43 (d, *J* = 6.4 Hz, 3H), 1.35 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.59, 21.72, 56.66, 70.64, 115.96, 120.14, 122.77, 125.30, 125.56, 126.07, 126.11, 126.21, 126.46, 126.60, 127.18, 127.49, 128.06, 128.48, 129.29, 132.55, 133.26, 134.22, 134.46, 151.71, 175.65. MS(EI): m/z (%): 370 (M^+, 11.25), 281 (100); HRMS (EI) calcd. for $C_{25}H_{22}O_3$: 370.1569, found: 370.1561.

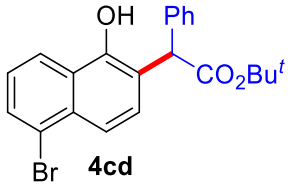
43) The synthesis of 4bd



4bd

4bd, colorless oil，(104.4 mg, 75% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.98 (s, 1H), 8.17 (d, *J* = 8.0 Hz, 1H), 7.92 (d, *J* = 8.8 Hz, 1H), 7.47 (t, *J* = 8.0 Hz, 1H), 7.31 (t, *J* = 7.6 Hz, 1H), 7.15-7.25 (m, 5H), 6.52 (s, 2H), 5.80 (s, 1H), 1.50 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.94, 49.43, 83.77, 103.12, 107.63, 120.96, 121.63, 122.31, 122.71, 127.03, 127.37, 127.60, 128.48, 134.23, 137.51, 153.07, 154.33, 176.32. MS(EI): m/z (%): 350 (M^+, 0.83), 247 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_4$: 350.1518, found: 350.1511.

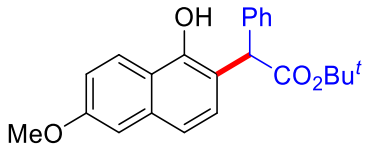
44) The synthesis of 4cd



4cd

4cd, yellow oil, (137.5 mg, 83% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.71(s, 1H), 8.34 (d, *J* = 8.4 Hz, 1H), 7.70-7.80 (m, 2H), 7.20-7.35 (m, 7H), 5.06 (s, 1H), 1.52 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.92, 57.65, 84.28, 117.04, 119.06, 122.08, 122.93, 125.39, 127.19, 127.43, 127.91, 128.71, 130.56, 130.78, 132.95, 136.83, 151.97, 175.89. MS(EI): m/z (%): 412 (M^+, 3.90), 414 ($[M+2]^+$, 4.03), 311 (100); HRMS (EI) calcd. for $C_{22}H_{21}O_3Br$: 412.0674, found: 412.0668.

45) The synthesis of 4dd

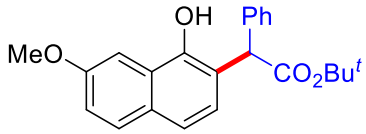


4dd

4dd, colorless oil，(124.9 mg, 86% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.46 (s, 1H), 8.30 (d, *J* = 9.2 Hz, 1H), 7.10-7.40 (m, 9H), 5.07 (s, 1H), 3.94 (s, 3H), 1.57 (s, 9H);

^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.93, 55.24, 57.50, 83.87, 105.26, 114.24, 117.65, 118.81, 121.76, 124.64, 127.26, 128.60, 130.26, 135.86, 137.36, 152.00, 158.31, 176.01. MS(EI): m/z (%): 364 (M^+, 8.73), 261 (100); HRMS (EI) calcd. for $C_{23}H_{24}O_4$: 364.1675, found:364.1680.

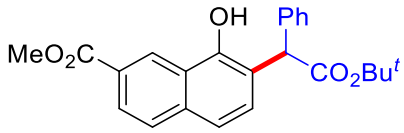
46) The synthesis of 4ed



4ed

4ed, colorless oil，(126.8 mg, 86% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.46 (s, 1H), 7.60-7.70 (m, 2H), 7.05-7.40 (m, 8H), 5.03 (s, 1H), 3.91 (s, 3H), 1.53 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.94, 55.28, 57.71, 83.96, 100.81, 116.77, 119.50, 119.75, 127.11, 127.23, 127.27, 127.52, 128.62, 128.70, 129.90, 137.22, 150.73, 157.45, 176.05. MS(EI): m/z (%): 364 (M^+, 8.02), 261 (100); HRMS (EI) calcd. for $C_{23}H_{24}O_4$: 364.1675, found: 364.1671.

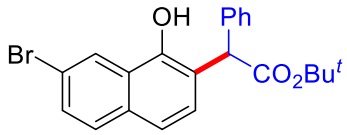
47) The synthesis of 4fd



4fd

4-4fd, light yellow oil, (133.3 mg, 85% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.76 (s, 1H), 9.12 (s, 1H), 8.06 (dd, *J* = 8.4 Hz, 1.6 Hz, 1H), 7.79 (d, *J* = 8.8 Hz, 1H), 7.40 (d, *J* = 8.4 Hz, 1H), 7.20-7.35 (m, 6H), 5.07 (s, 1H), 3.94 (s, 3H), 1.53 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.90, 52.04, 57.52, 84.21, 117.10, 119.61, 125.70, 125.94, 126.34, 126.68, 127.26, 127.37, 127.42, 128.70, 132.05, 136.41, 136.89, 152.99, 167.37, 175.72. MS(EI): m/z (%): 392 (M^+, 3.96), 289 (100); HRMS (EI) calcd. for $C_{24}H_{24}O_5$: 392.1624, found: 392.1628.

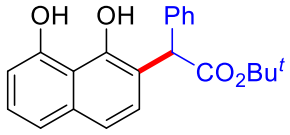
48) The synthesis of 4gd



4gd

4gd, colorless oil, (138.5 mg, 84% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 9.57 (s, 1H), 8.43 (s, 1H), 7.53 (d, *J* = 8.8 Hz, 1H), 7.44 (dd, *J* = 8.8 Hz, 1.6 Hz, 1H), 7.10-7.30 (m, 7H), 4.95 (s, 1H), 1.44 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.92, 57.73, 84.27, 117.16, 119.37, 119.74, 125.48, 127.20, 127.43, 127.71, 128.71, 128.77, 129.86, 129.96, 132.78, 136.86, 151.05, 175.85. MS(EI): m/z (%): 412 (M^+, 4.17), 414 ($[M+2]^+$, 4.08), 311 (100); HRMS (EI) calcd. for $C_{22}H_{21}O_3Br$: 412.0674, found: 412.0666.

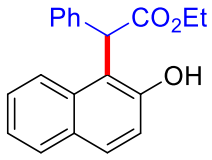
49) The synthesis of 4hd



4hd

4hd, colorless oil, (92.7 mg, 66% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 10.97 (s, 1H), 9.81 (s, 1H), 7.20-7.35 (m, 8H), 7.11 (d, *J* = 8.4 Hz, 1H), 6.77 (dd, *J* = 6.8 Hz, 1.6 Hz, 1H), 5.08 (s, 1H),1.54 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 27.92, 56.74, 84.46, 109.87, 115.96, 116.68, 118.77, 120.72, 127.35, 127.38, 127.50, 128.66, 129.09, 136.57, 136.97, 152.06, 154.84, 176.72. MS(EI): m/z (%): 350 (M^+, 6.39), 247 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_4$: 350.1518, found: 350.1514.

50) The synthesis of 7a

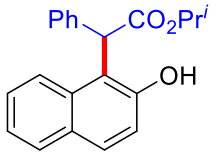


7a

7a, colorless oil, (117.0 mg, 95% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.45 (s, 1H), 8.01 (d, *J* = 8.4 Hz, 1H), 7.80 (d, *J* = 8.0 Hz, 1H), 7.75 (d, *J* = 8.8 Hz, 1H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.34 (t, *J* = 7.6 Hz, 1H), 7.10-7.30 (m, 6H), 5.99 (s, 1H), 4.36 (q, *J* = 7.2

Hz, 1H), 4.23 (q, *J* = 7.2 Hz, 1H), 1.30 (t, *J* = 7.2 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 14.05, 48.51, 62.49, 114.62, 120.53, 121.70, 123.20, 127.12, 127.30, 127.48, 128.58, 128.91, 129.39, 130.34, 133.30, 136.61, 154.08, 176.22. MS(EI): m/z (%): 306 (M^+, 5.40), 231 (100); HRMS (EI) calcd. for $C_{20}H_{18}O_3$: 306.1256, found: 306.1258.

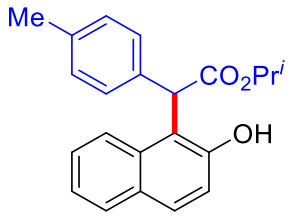
51) The synthesis of 7b



7b

7b, colorless oil, (121.3 mg, 95% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.75 (s, 1H), 8.02 (d, *J* = 8.8 Hz, 1H), 7.81 (d, *J* = 8.0 Hz, 1H), 7.76 (d, *J* = 9.2 Hz, 1H), 7.49 (t, *J* = 8.4 Hz, 1H), 7.35 (t, *J* = 7.2 Hz, 1H), 7.10-7.30 (m, 6H), 5.96 (s, 1H), 5.17 (hept, *J* = 6.4 Hz, 1H), 1.37 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.51, 21.77, 48.81, 70.52, 114.47, 120.69, 121.65, 123.14, 127.07, 127.26, 127.33, 128.58, 128.90, 129.36, 130.31, 133.37, 136.72, 154.29, 175.88. MS(EI): m/z (%): 320 (M^+, 26.30), 233 (100); HRMS (EI) calcd. for $C_{21}H_{20}O_3$: 320.1412, found: 320.1416.

52) The synthesis of 7c

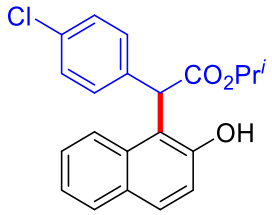


7c

7c, colorless oil, (107.7 mg, 81% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.80 (s, 1H), 8.05 (d, *J* = 8.8 Hz, 1H), 7.84 (d, *J* = 7.6 Hz, 1H), 7.79 (d, *J* = 8.8 Hz, 1H), 7.53 (t, *J* = 8.4 Hz, 1H), 7.38 (t, *J* = 7.2 Hz, 1H), 7.22 (d, *J* = 8.8 Hz, 1H), 7.00-7.10 (m, 4H), 5.96 (s, 1H), 5.20 (hept, *J* = 6.4 Hz, 1H), 2.32 (s, 3H), 1.41 (d, *J* = 6.4 Hz, 3H), 1.24 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 20.98, 21.52, 21.78, 48.52, 70.46, 114.57,

120.76, 121.66, 123.10, 127.04, 127.18, 128.89, 129.32, 129.36, 130.24, 133.39, 133.66, 136.94, 154.33, 176.03. MS(EI): m/z (%): 334 (M^+, 11.86), 231 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_3$: 334.1569, found: 334.1563.

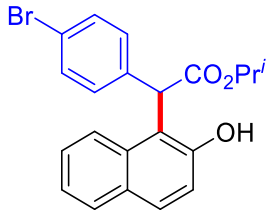
53) The synthesis of 7d



7d

7d, colorless oil, (140.2 mg, 99% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.49 (s, 1H), 7.96 (d, *J* = 8.8 Hz, 1H), 7.81 (d, *J* = 8.0 Hz, 1H), 7.75 (d, *J* = 8.8 Hz, 1H), 7.49 (t, *J* = 8.4 Hz, 1H), 7.35 (t, *J* = 7.6 Hz, 1H), 7.10-7.25 (m, 5H), 5.88 (s, 1H), 5.16 (hept, *J* = 6.4 Hz, 1H), 1.35 (d, *J* = 6.4 Hz, 3H), 1.19 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.47, 21.75, 48.25, 70.65, 114.47, 120.45, 121.60, 123.28, 127.19, 128.68, 128.96, 129.41, 130.47, 133.10, 133.18, 135.37, 153.94, 175.42. MS(EI): m/z (%): 354 (M^+, 6.74), 231 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Cl$: 354.1023, found: 354.1019.

54) The synthesis of 7e

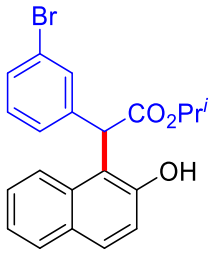


7e

7e, colorless oil, (159.5 mg, 99% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.50 (s, 1H), 7.99 (d, *J* = 8.8 Hz, 1H), 7.84 (d, *J* = 8.0 Hz, 1H), 7.78 (d, *J* = 8.8 Hz, 1H), 7.50-7.55 (m, 1H), 7.35-7.40 (m, 3H), 7.18 (d, *J* = 8.8 Hz, 1H), 7.09 (d, *J* = 8.4 Hz, 2H), 5.89 (s, 1H), 5.19 (hept, *J* = 6.4 Hz, 1H), 1.38 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.46, 21.75, 48.32, 70.65, 114.42, 120.43, 121.23, 121.59, 123.29, 127.19, 128.96, 129.32, 129.41, 130.48, 131.62, 133.17, 135.92, 153.92, 175.31. MS(EI): m/z (%): 398 (M^+, 5.08), 400 ($[M+2]^+$, 5.56), 231 (100); HRMS (EI)

calcd. for $C_{21}H_{19}O_3Br$: 398.0518, found: 398.0517.

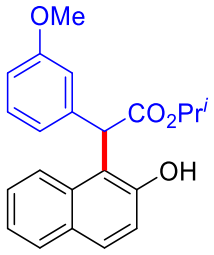
55) The synthesis of 7f



7f

7f, colorless oil, (130.9 mg, 82% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.47 (s, 1H), 7.98 (d, *J* = 8.4 Hz, 1H), 7.84 (d, *J* = 8.0 Hz, 1H), 7.79 (d, *J* = 8.8 Hz, 1H), 7.50-7.55 (m, 1H), 7.30-7.40 (m, 3H), 7.10-7.20 (m, 3H), 5.91 (s, 1H), 5.19 (hept, *J* = 6.4 Hz, 1H), 1.38 (d, *J* = 6.4 Hz, 3H), 1.22 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.46, 21.76, 48.44, 70.70, 114.22, 120.42, 121.58, 122.65, 123.30, 126.28, 127.22, 128.97, 129.42, 130.03, 130.43, 130.55, 130.66, 133.17, 139.19, 153.93, 175.13. MS(EI): m/z (%): 398 (M^+, 7.14), 400 ($[M+2]^+$, 7.35), 231 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Br$: 398.0518, found: 398.0514.

56) The synthesis of 7g

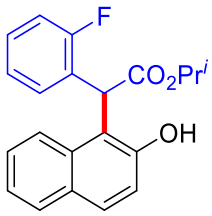


7g

7g, colorless oil, (116.7 mg, 83% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.78 (s, 1H), 8.04 (d, *J* = 8.4 Hz, 1H), 7.83 (d, *J* = 8.0 Hz, 1H), 7.78 (d, *J* = 8.8 Hz, 1H), 7.45-7.55 (m, 1H), 7.37 (t, *J* = 7.2 Hz, 1H), 7.15-7.25 (m, 2H), 6.70-6.85 (m, 3H), 5.96 (s, 1H), 5.19 (hept, *J* = 6.4 Hz, 1H), 3.72 (s, 3H), 1.40 (d, *J* = 6.4 Hz, 3H), 1.24 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.51, 21.77, 48.81, 55.07, 70.53, 112.17, 113.71, 114.33, 119.72, 120.69, 121.62, 123.12, 127.06, 128.89, 129.37, 129.55, 130.34, 133.38,

138.31, 154.36, 159.71, 175.69. MS(EI): m/z (%): 350 (M^+, 10.68), 231 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_4$: 350.1518, found: 350.1515.

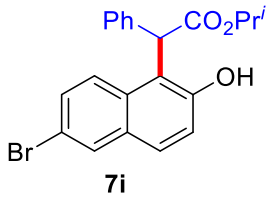
57) The synthesis of 7h



7h

7h, white solid, (127.1 mg, 94% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.15 (s, 1H), 7.96 (d, *J* = 8.8 Hz, 1H), 7.70-7.85 (m, 2H), 7.40-7.50 (m, 1H), 7.30-7.35 (m, 1H), 6.90-7.25 (m, 5H), 6.02 (s, 1H), 5.13 (hept, *J* = 6.4 Hz, 1H), 1.33 (d, *J* = 6.4 Hz, 3H), 1.15 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.40, 21.43, 43.63, 70.46, 112.26, [115.22, *J* = 22 Hz, 1C], 120.07, 121.85, 123.30, [124.14, *J* = 4 Hz, 1C], 127.13, 128.87, [129.31, *J* = 8 Hz, 1C], [129.55, *J* = 9 Hz, 1C], 129.63, 130.53, 133.21, 154.24, 159.93, 162.38, 174.92. MS(EI): m/z (%): 338 (M^+, 9.61), 249 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3F$: 338.1318, found: 338.1320.

58) The synthesis of 7i

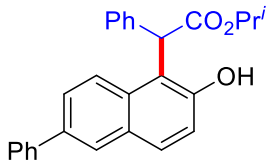


7i

7i, colorless oil, (123.4 mg, 77% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.74 (s, 1H), 7.94 (d, *J* = 2.0 Hz, 1H), 7.87 (d, *J* = 9.2 Hz, 1H), 7.65 (d, *J* = 8.8 Hz, 1H), 7.54 (dd, *J* = 9.2 Hz, 2 Hz, 1H), 7.10-7.30 (m, 6H), 5.88 (s, 1H), 5.17 (hept, *J* = 6.4 Hz, 1H), 1.37 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.50, 21.75, 48.90, 70.69, 114.83, 116.79, 121.82, 123.65, 127.31, 127.40, 128.66, 129.36, 130.17, 130.58, 130.72, 131.97, 136.39, 154.53, 175.56. MS(EI): m/z (%): 398 (M^+, 1.86), 400 ($[M+2]^+$, 1.91), 222 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Br$: 398.0518,

found: 398.0523.

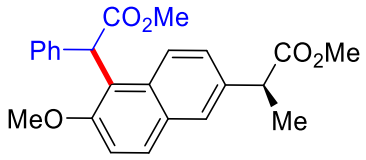
59) The synthesis of 7j



7j

7j, colorless oil, (157.0 mg, 99% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.76 (s, 1H), 8.00-8.10 (m, 1H), 7.81 (s, 1H), 7.60-7.80 (m, 4H), 7.10-7.50 (m, 9H), 5.98 (s, 1H), 5.18 (hept, *J* = 6.4 Hz, 1H), 1.37 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.51, 21.77, 48.96, 70.55, 114.52, 121.11, 122.35, 126.58, 126.69, 127.09, 127.15, 127.29, 127.40, 128.61, 128.82, 129.64, 130.59, 132.58, 135.84, 136.70, 140.63, 154.36, 175.80. MS(EI): m/z (%): 396 (M^+, 9.76), 307 (100); HRMS (EI) calcd. for $C_{27}H_{24}O_3$: 396.1725, found: 396.1713.

60) The synthesis of 7k

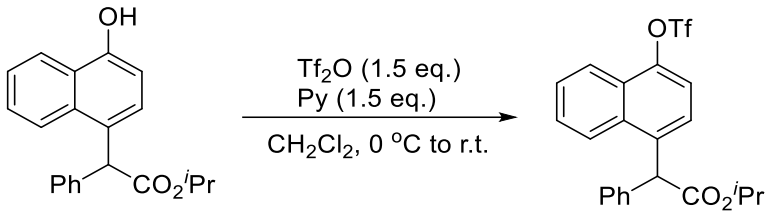


7k

7k, colorless oil, (131.0 mg, 87% yield). ^{1}H-NMR (400 MHz, $CDCl_3$) δ 7.75-7.85 (m, 2H), 7.69 (s, 1H), 7.15-7.40 (m, 7H), 5.73 (s, 1H), 3.92 (s, 3H), 3.82 (q, *J* = 7.2 Hz, 1H), 3.69 (s, 3H), 3.63 (s, 3H), 1.54 (d, *J* = 7.2 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 18.41, 45.06, 48.39, 51.99, 52.10, 56.54, 113.95, 120.53, 123.61, 126.86, 128.18, 129.12, 129.57, 131.84, 135.54, 135.57, 137.77, 154.45, 173.89, 174.90. MS(EI): m/z (%): 392 (M^+, 17.56), 84 (100); HRMS (EI) calcd. for $C_{24}H_{24}O_5$: 392.1624, found: 392.1626.

5. The transformations of products

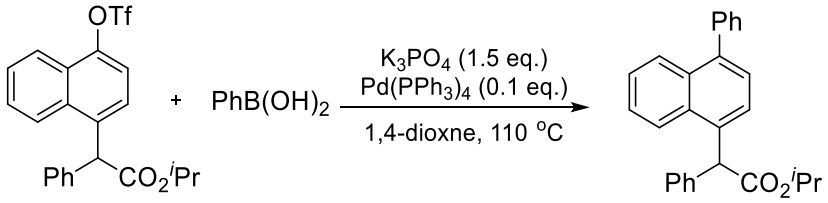
1) the synthesis of 8a



3ac **8a**

To a solution of **3ac** (64 mg, 0.2 mmol), pyridine (24 μL, 0.3 mmol) in CH_2Cl_2 (4 mL) was added Tf_2O (42 μL, 0.3 mmol) at 0 °C. The reaction was warmed to room temperature after 5 mins and stirred for another 10 mins. The reaction was extracted with ethyl acetate and dried with Na_2SO_4 and filtered. The filtrate was concentrated and purified by silica chromatography (PE/EA = 20:1) to obtain the desired product **8a** (90.4 mg, 99%) as a colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.05-8.15 (m, 2H), 7.60-7.70 (m, 2H), 7.20-7.45 (m, 7H), 5.71 (s, 1H), 5.12 (hept, *J* = 6.4 Hz, 1H), 1.25 (d, *J* = 6.4 Hz, 3 H), 1.21 (d, *J* = 6.4 Hz, 3 H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.57, 21.63, 53.71, 69.14, 117.13, 118.71 [q, *J* = 18 Hz, 1C], 121.64, 123.74, 125.77, 126.65, 127.54, 127.67, 127.87, 128.85, 128.89, 133.10, 135.80, 137.22, 145.20, 171.53. MS(EI): m/z (%): 452 (M^+, 22.74), 365 (100); HRMS (EI) calcd. for $C_{22}H_{19}O_5SF_3$: 452.0905, found: 452.0900.

2) the synthesis of 8b

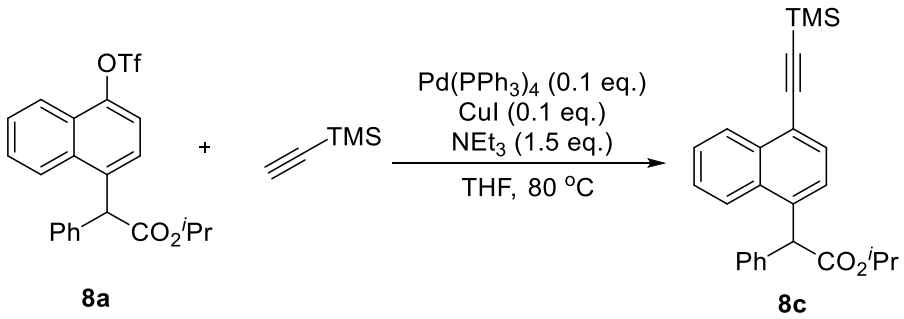


8a **8b**

The mixture of **8a** (90 mg, 0.2 mmol), benzeneboronic (37 mg, 0.3 mmol), K_3PO_4 (64 mg, 0.3 mmol), $Pd(PPh_3)_4$ (23 mg, 0.02 mmol) in 1,4-dioxne (4 mL) was heated to 110 °C for 8 hours. The reaction was cooled to room temperature and extracted with ethyl acetate and dried with Na_2SO_4. The filtrate was concentrated and the residue was

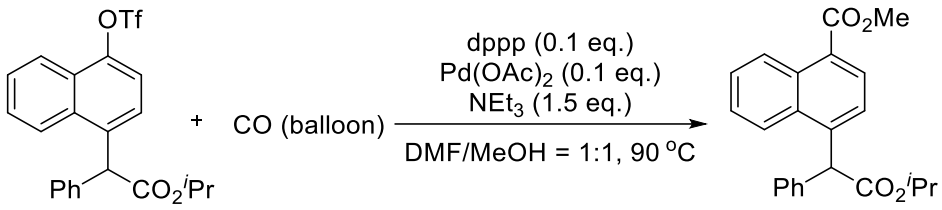
purified by silica chromatography (PE/EA = 20:1) to obtain the desired product **8b** (65.3 mg, 86%) as a colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.12 (d, *J* = 8.4 Hz, 1H), 7.96 (d, *J* = 8.4 Hz, 1H), 7.25-7.60 (m, 14H), 5.83 (s, 1H), 5.19 (hept, *J* = 6.4 Hz, 1H), 1.30 (d, *J* = 6.4 Hz, 3H), 1.28 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.67, 53.90, 68.79, 123.46, 125.65, 125.76, 126.20, 126.42, 127.06, 127.22, 127.31, 128.19, 128.63, 129.01, 130.10, 131.91, 132.15, 134.23, 138.07, 140.09, 140.66, 172.27. MS(EI): m/z (%): 380 (M^+, 39.27), 293 (100); HRMS (EI) calcd. for $C_{27}H_{24}O_2$: 380.1776, found: 380.1774.

3) the synthesis of 8c



The mixture of **8a** (90 mg, 0.2 mmol), trimethylsilylacetylene (29 μL, 0.3 mmol), CuI (3.8 mg, 0.02 mmol), $Pd(PPh_3)_4$ (23 mg, 0.02 mmol), NEt_3 (43 μL, 0.3 mmol) in THF (4 mL) was heated to 80 °C for 12 hours. The reaction was cooled to room temperature and extracted with ethyl acetate and dried with Na_2SO_4. The filtrate was concentrated and the residue was purified by silica chromatography (PE/EA = 20:1) to obtain the desired product **8c** (73.1 mg, 91%) as a colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.26 (d, *J* = 8.4 Hz, 1H), 7.86 (d, *J* = 8.4 Hz, 1H), 7.51 (d, *J* = 7.2 Hz, 1H), 7.30-7.45 (m, 2H), 7.00-7.40 (m, 6H), 5.57 (s, 1H), 4.96 (hept, *J* = 6.4 Hz, 1H), 1.05 (d, *J* = 6.4 Hz, 3H), 1.04 (d, *J* = 6.4 Hz, 3H), 0.18 (s, 9H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 0.06, 21.57, 21.62, 53.92, 68.83, 99.79, 102.98, 120.70, 123.60, 125.54, 126.52, 126.84, 127.17, 127.37, 128.63, 128.91, 130.33, 131.41, 133.77, 135.86, 137.78, 171.89. MS(EI): m/z (%): 400 (M^+, 35.88), 313 (100); HRMS (EI) calcd. for $C_{26}H_{28}O_2Si$: 400.1859, found: 400.1861.

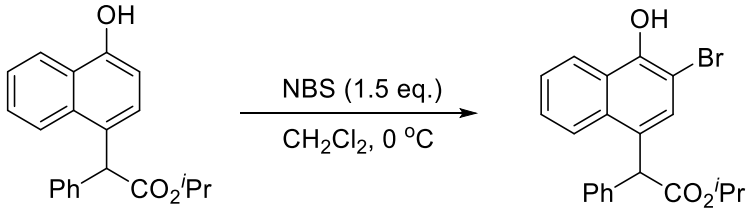
4) the synthesis of 8d



8a **8d**

The mixture of **8a** (90 mg, 0.2 mmol), $Pd(OAc)_2$ (4.5 mg, 0.02 mmol), dppp (8.2 mg, 0.02 mmol), NEt_3 (43 μL, 0.3 mmol) in DMF (2 mL) and MeOH (2 mL) was heated to 90 °C under CO atmosphere (balloon) for 12 hours. The reaction was cooled to room temperature and extracted with ethyl acetate and dried with Na_2SO_4. The filtrate was concentrated and the residue was purified by silica chromatography (PE/EA = 20:1) to obtain the desired product **8d** (54.0 mg, 74%) as a colorless oil. ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.95-9.00 (m, 1H), 8.10-8.20 (m, 2H), 7.55-7.65 (m, 2H), 7.25-7.45 (m, 6H), 5.79 (s, 1H), 5.14 (hept, *J* = 6.4 Hz, 1H), 4.00 (s. 3H), 1.24 (d, *J* = 6.4 Hz, 3H), 1.21 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.57, 52.15, 52.19, 54.13, 68.99, 123.58, 125.04, 126.57, 126.68, 127.01, 127.30, 127.49, 128.70, 128.91, 129.46, 131.68, 131.97, 137.46, 139.95, 167.91, 171.69. MS(EI): m/z (%): 362 (M^+, 37.84), 275 (100); HRMS (EI) calcd. for $C_{23}H_{22}O_4$: 362.1518, found: 362.1514.

5) the synthesis of 8e

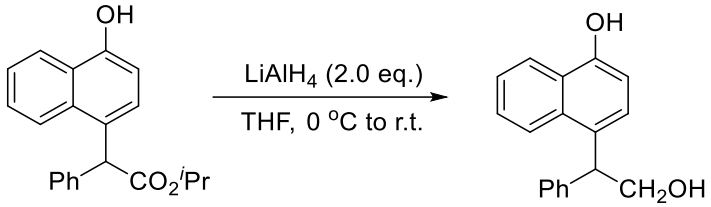


3ac **8e**

To a solution of **7a** (64 mg, 0.2 mmol) in CH_2Cl_2 (4 mL) was added NBS (53 mg, 0.3 mmol) at 0 °C. The reaction was stirred at 0 °C for 15 min and quenched with saturated $Na_2S_2O_3$ solution and extracted with ethyl acetate, dried with Na_2SO_4. The filtrate was concentrated and the residue was purified by silica chromatography (PE/EA = 10:1) to obtain the desired product **8e** (77.2 mg, 97%) as a white solid. ^{1}H-NMR (400

MHz, $CDCl_3$) δ 8.25-8.35 (m, 1H), 7.90-8.00 (m, 1H), 7.50-7.60 (m, 2H), 7.25-7.40 (m, 6H), 6.00 (s, 1H), 5.63 (s, 1H), 5.14 (hept, *J* = 6.4 Hz, 1H), 1.26 (d, *J* = 6.4 Hz, 3H), 1.23 (d, *J* = 6.4 Hz, 3H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.60, 21.62, 53.16, 68.90, 103.55, 123.12, 123.34, 124.80, 125.94, 127.22, 127.46, 128.49, 128.72, 128.83, 131.90, 137.60, 147.88, 171.99. MS(EI): m/z (%): 398 (M^+, 28.52), 400 ($[M+2]^+$, 28.84), 311 (100); HRMS (EI) calcd. for $C_{21}H_{19}O_3Br$: 398.0518, found: 398.0522.

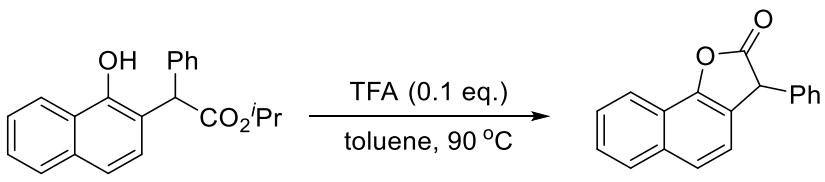
6) the synthesis of 8f



3ac **8f**

To a solution of **8f** (64 mg, 0.2 mmol) in THF (4 mL) was added $LiAlH_4$ (15 mg, 0.4 mmol) at 0 °C. The reaction was warmed to room temperature after 15 min and stirred for another 1 hour. The reaction was quenched with saturated $NaHCO_3$ solution and extracted with ethyl acetate, dried with Na_2SO_4. The filtrate was concentrated and the residue was purified by silica chromatography (PE/EA = 2:1) to obtain the desired product **8f** (51.3 mg, 97%) as a white solid. ^{1}H-NMR (400 MHz, Acetone-d_6) δ 8.94 (s, 1H), 8.25-8.35 (m, 1H), 8.05-8.10 (m, 1H), 7.10-7.45 (m, 8H), 6.93 (d, *J* = 8.0 Hz, 1H), 4.88 (t, *J* = 7.2 Hz, 1H), 4.10-4.30 (m, 2H), 3.75-3.85 (m, 1H); ^{13}C-NMR (100 MHz, Acetone-d_6) δ 49.65, 66.54, 108.30, 123.55, 124.52, 124.96, 126.05, 126.46, 126.90, 129.00, 129.41, 129.69, 134.26, 144.40, 152.84. MS(EI): m/z (%): 264 (M^+, 17.79), 233 (100); HRMS (EI) calcd. for $C_{18}H_{16}O_2$: 264.1150, found: 264.1159.

7) the synthesis of 9



4ac **9**

The solution of **4ac** (64 mg, 0.2 mmol) and TFA (2 μL, 0.02 mmol) in toluene (4 mL)

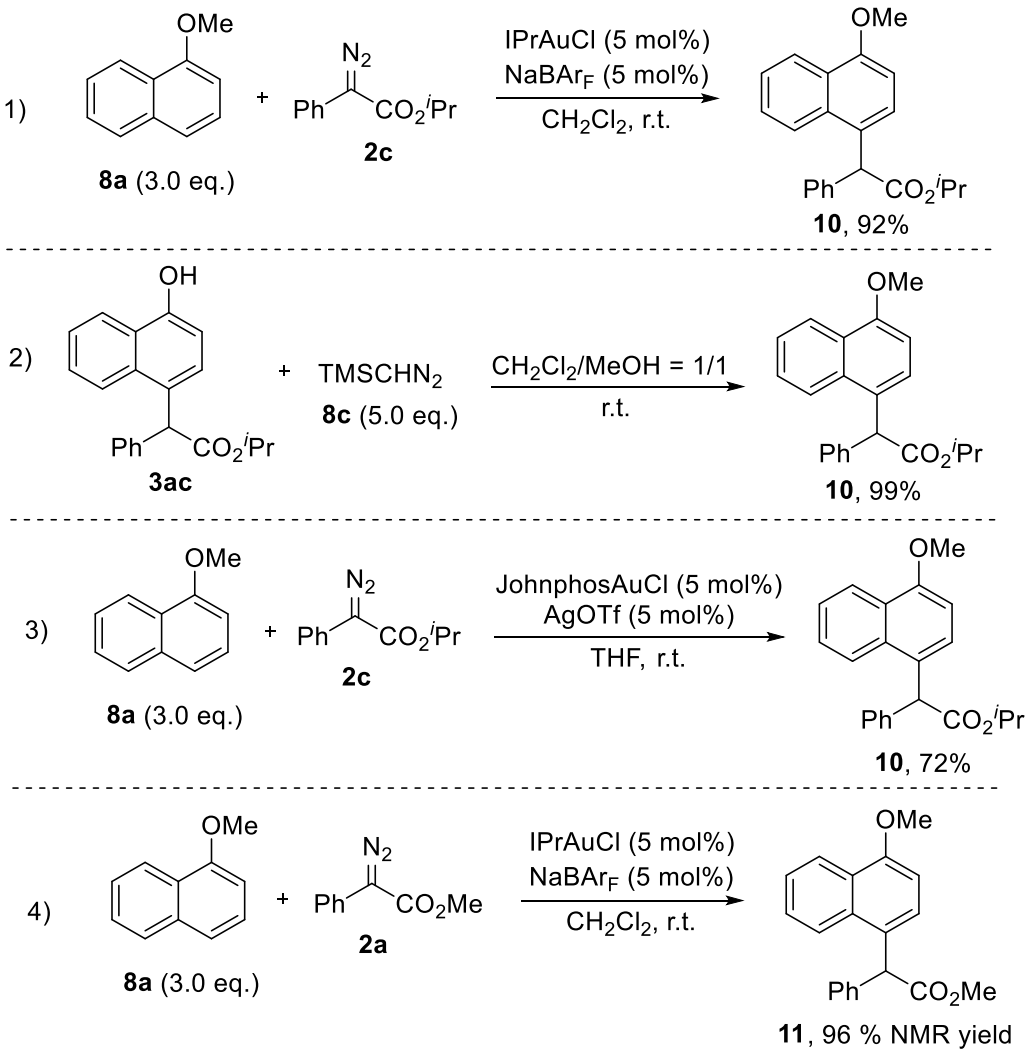
was heated to 90 °C for 12 h. Then the reaction was cooled to room temperature and purified by silica chromatography (PE/EA = 20:1) directly to obtain the desired product **9** (51.5 mg, 99%) as a white solid. ^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.0 Hz, 1H), 7.80 (d, *J* = 8.0 Hz, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.45-7.55 (m, 2H), 7.10-7.30 (m, 6H), 4.96 (s, 1H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 50.73, 119.79, 121.17, 121.54, 124.40, 126.93, 128.21, 128.24, 128.31, 129.13, 134.14, 135.05, 149.58, 175.58. MS(EI): m/z (%): 360 (M^+, 27.90), 231 (100); HRMS (EI) calcd. for $C_{18}H_{12}O_2$: 260.0837, found: 260.0841.

6. **Preliminary mechanism studies**

We performed a series of control experiments to confirm *ortho* selectivity stemed from the coordination between hydroxyl group and gold. First, the reaction between 1-methoxynaphthalene and diazo compound under standard condition was conducted, delivering the *para* C-H bond functionalization product in 92% yield (scheme 1, eq 1). The structure was confirmed by additional experiment (scheme 1, eq 2, eq 3). In order to exclude the *para* selectivity arise from steric hindrance, we switch diazo compound to methyl 2-diazo-2-phenylacetate with less steric hindrance, affording only *para* C-H bond functionalization product (scheme 1, eq 4). These results indicated that the weak interaction between naphthol and gold catalyst played a key role in the *ortho*-selectivity.

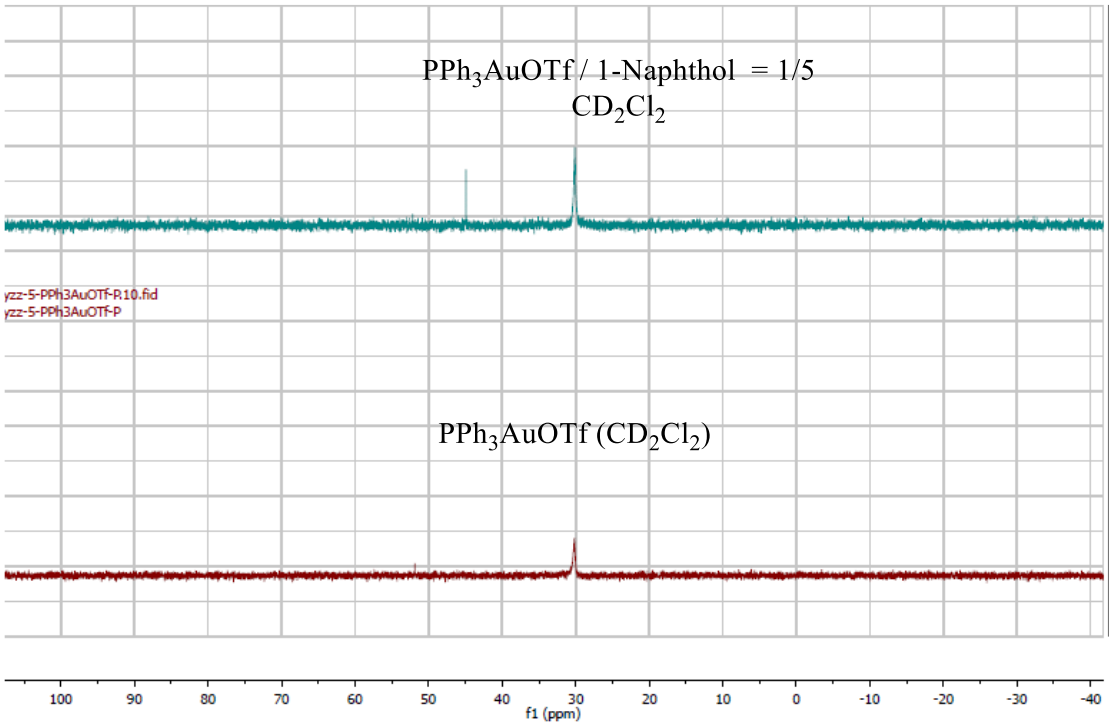
The date of **10** was illustrated as following:

^{1}H-NMR (400 MHz, $CDCl_3$) δ 8.31 (d, *J* = 7.6 Hz, 1H), 7.93 (d, *J* = 7.6 Hz, 1H), 7.40-7.55 (m, 2H), 7.20-7.35 (m, 6H), 6.74 (d, *J* = 8.4 Hz, 1H), 5.64 (s, 1H), 5.11 (hept, *J* = 6.4 Hz, 1H), 3.96 (s, 3H), 1.21 (t, *J* = 6.8 Hz, 6H); ^{13}C-NMR (100 MHz, $CDCl_3$) δ 21.66, 53.43, 55.41, 55.44, 68.56, 103.15, 122.70, 123.08, 124.94, 126.03, 126.31, 126.81, 127.12, 128.50, 128.91, 132.54, 138.49, 154.98, 172.52. MS(EI): m/z (%): 334 (M^+, 24.12), 247 (100); HRMS (EI) calcd. for $C_{22}H_{22}O_3$: 334.1569, found: 334.1566.



Scheme 1 Weak interaction study

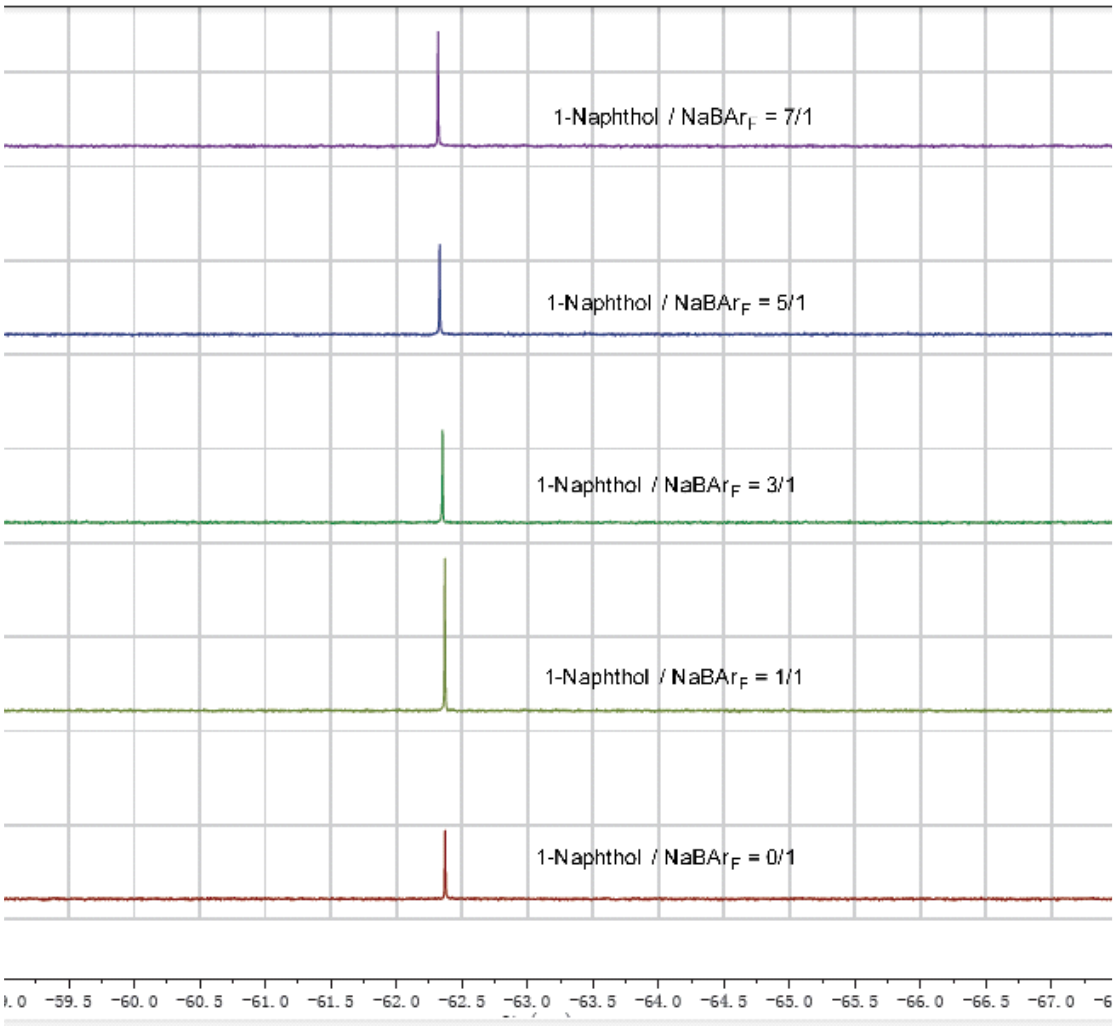
Subsequently, we further conducted a series of related control experiments to identify the type of weak interaction. First, ^{31}P-NMR experiment shown that the coordination between gold catalyst and hydroxyl group was indeed existed (scheme 2).



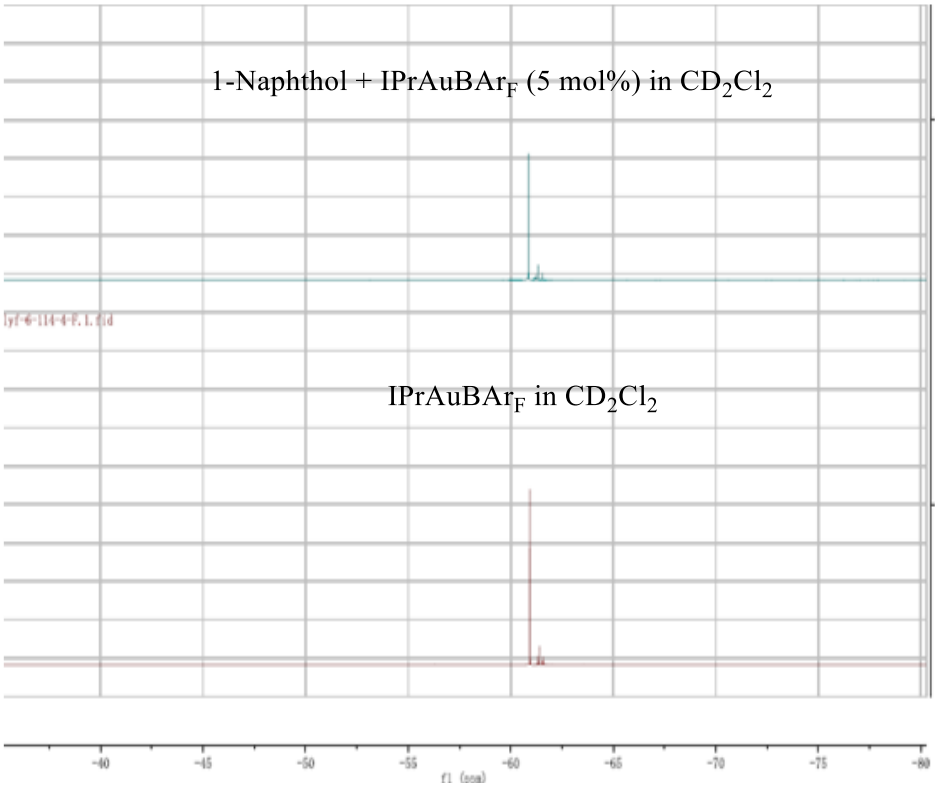
Scheme 2 ^{31}P-NMR experiments

Meanwhile, NMR titration disclosed that no hydrogen bonding interaction was existed between naphthol and gold catalyst (scheme 3).

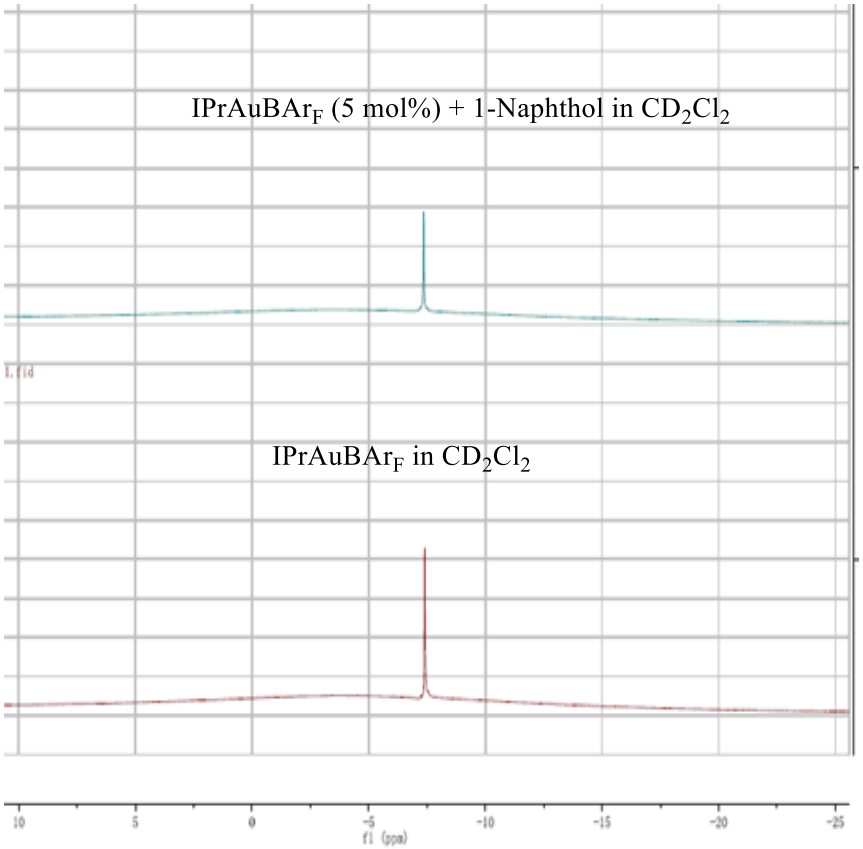
Allowing for the fact the tetrasubstituted boron compounds could undergo SN_2 reaction (*Organometallics* **1998**, *17*, 4155; *J. Fluor. Chem*. **2014**, *168*, 111; *Inorg. Chem.* ***2004***, *43*, *5789*) and has certain lewis acidity (*Chem. Eur. J*. **2017**, *23*, 5219), we wanted to know whether the interaction between hydroxyl group and boron was the key for *ortho*-selectivity. ^{19}F-NMR experiment shown that no new compound was generated when 1-naphthol, IPrAuCl and $NaBAr_F$ were mixed. Meanwhile, the ^{11}B-NMR experiment revealed that no coordination interaction between hydroxyl group and boron atom. Based on these results, the possibility that the *ortho*-selectivity stem from the interaction between hydroxyl group and boron atom could be excluded (scheme 6).



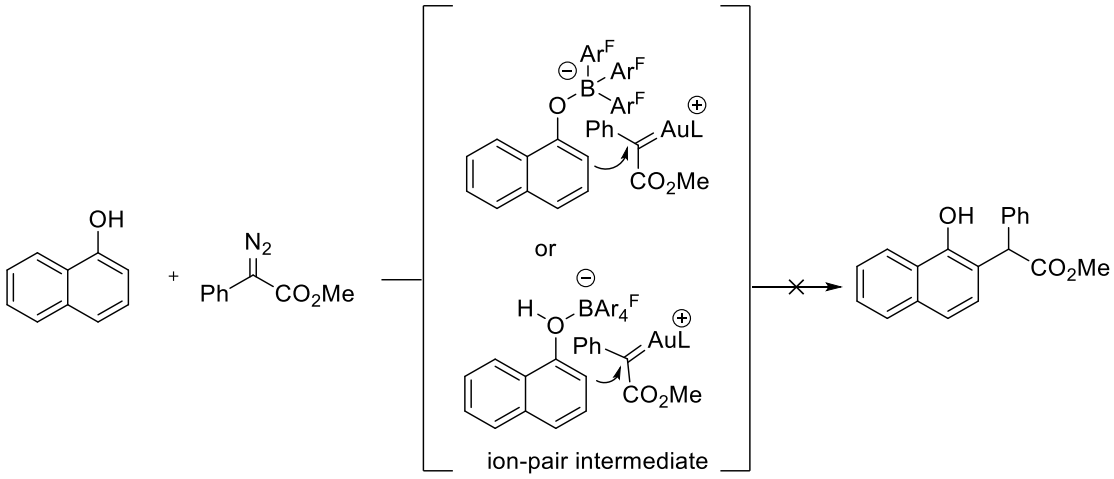
Scheme 3. Titration experiments



Scheme 4. ^{19}F-NMR experiments

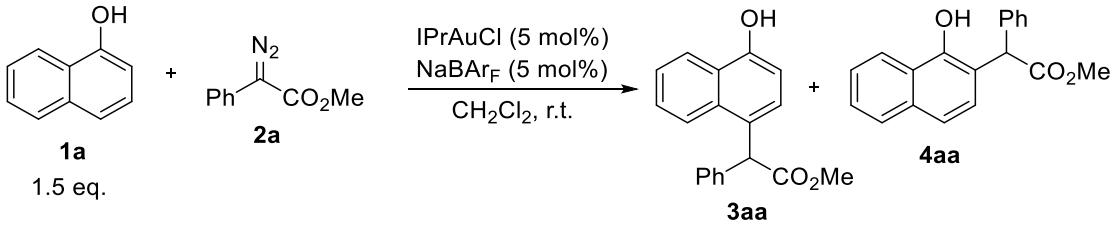


Scheme 5. ^{11}B-NMR experiments



Scheme 6. Impossible mechanism for *ortho*-selectivity

In order to confirm our conclusion that the *ortho* C-H bond functionalization is an intramolecular reaction and *para* C-H bond functionalization is an intermolecular reaction, we performed the reactions under different concentration. As we know that the low concentration is good for the intramolecular reaction while high concentration would facilitate the intermolecular reaction. Thus, the *para* C-H bond functionalization product should become more with increasing of concentration under standard conditions. To my excitement, the reactions were indeed proceeded as our expection (scheme 7).

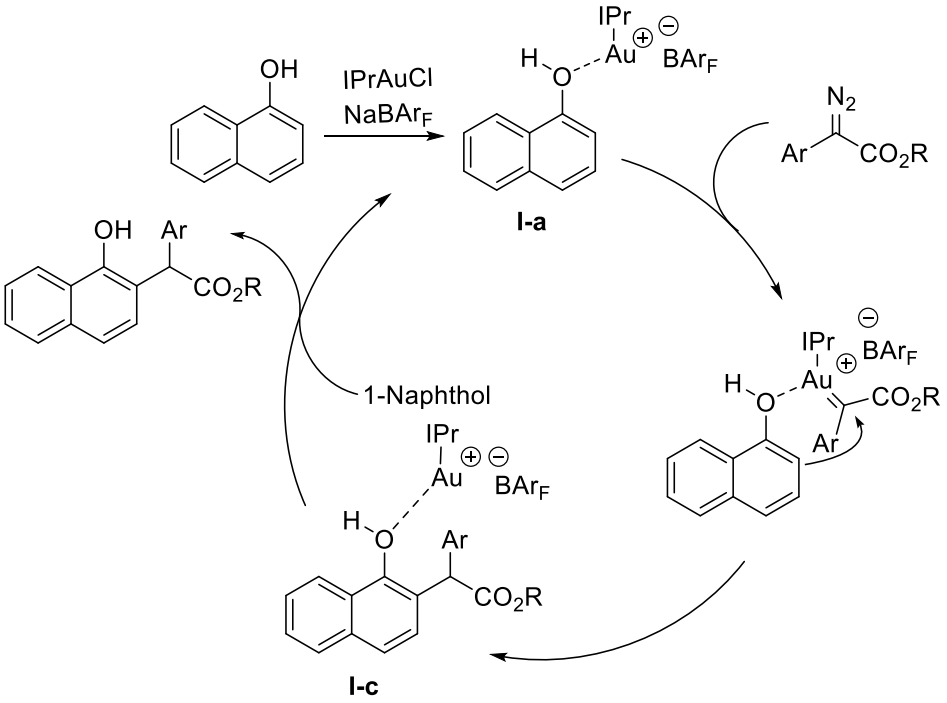


Concentration (mol/L)	**4aa**/**3aa**
0.02	7.9:1
0.04	7.3:1
0.08	6.7:1
0.2	3.2:1
1	1.4:1

Scheme 7. Concentration experiments

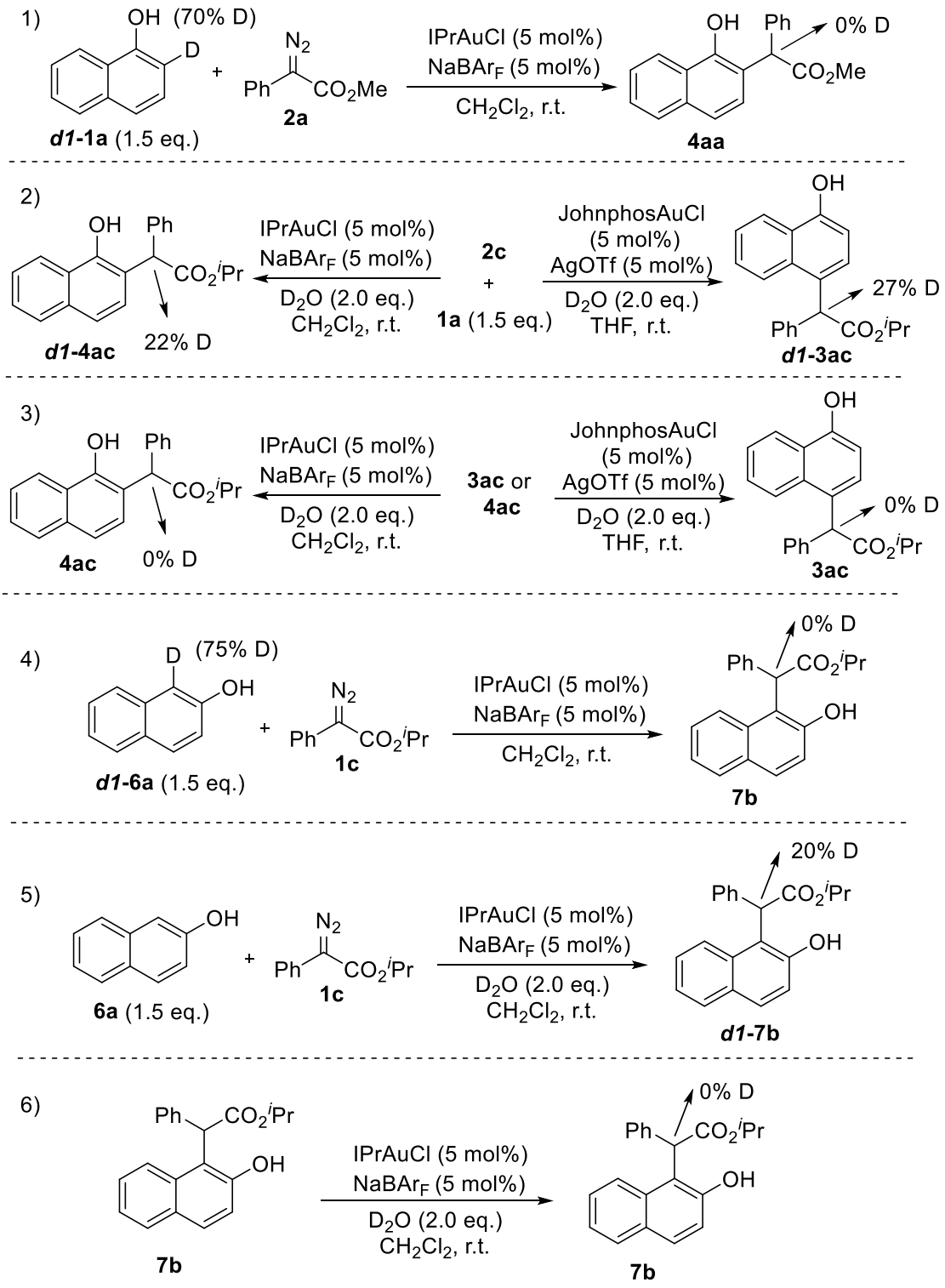
Based on above results, we could conclude that the coordination between hydroxyl

group and gold was the key for the *ortho*-selectivity. The proposed mechanism was illustrated as following (scheme 8).



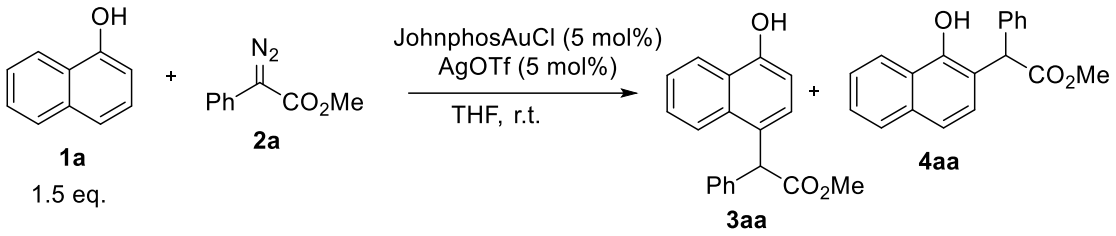
Scheme 8. Proposed mechanism for *ortho*-selectivity

Besides, related deuterium labeling experiments were also conducted to get more insights into mechanism (scheme 9). The results indicated that the reaction did not proceeded via a [1,2]-H shift but a possible water assisted hydrogen. The results of control experiments also demonstrated that no enolization took place in our reaction.



Scheme 9. Deuterium labeling experiments

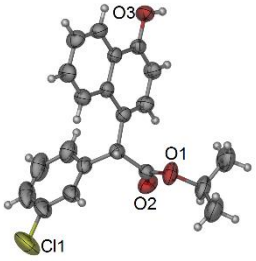
Finally, we studied the silver effect, the results disclosed that no silver effect in para C-H bond functionalization (scheme 10).



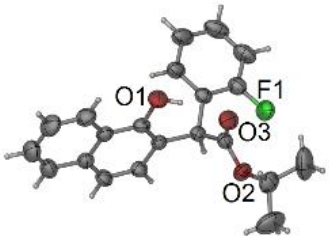
1) with AgCl in reaction system, **3aa** (90% NMR yield) , **4aa** (0% NMR yield)
2) without AgCl in reaction system, **3aa** (86% NMR yield) , **4aa** (0% NMR yield)

Scheme 10. Silver effect studies

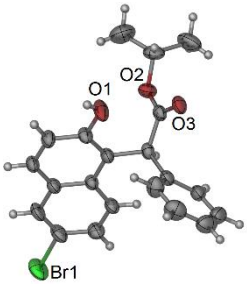
7. **X-ray crystal date for 3ah, 4al, 7i and 9**



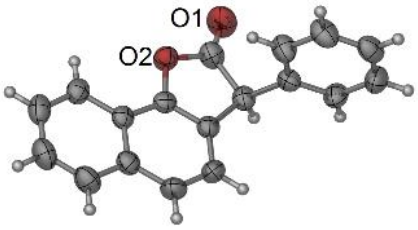
3ah



4al



7i



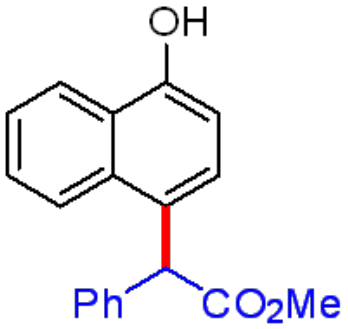
9

8. **NMR Spectra of new compounds**

yzz-14-052-1

8.248
8.229
7.930
7.910
7.511
7.507
7.491
7.486
7.482
7.465
7.352
7.350
7.336
7.324
7.321
7.311
7.307
7.070
7.050
6.582
6.563
6.137
5.734

3.790



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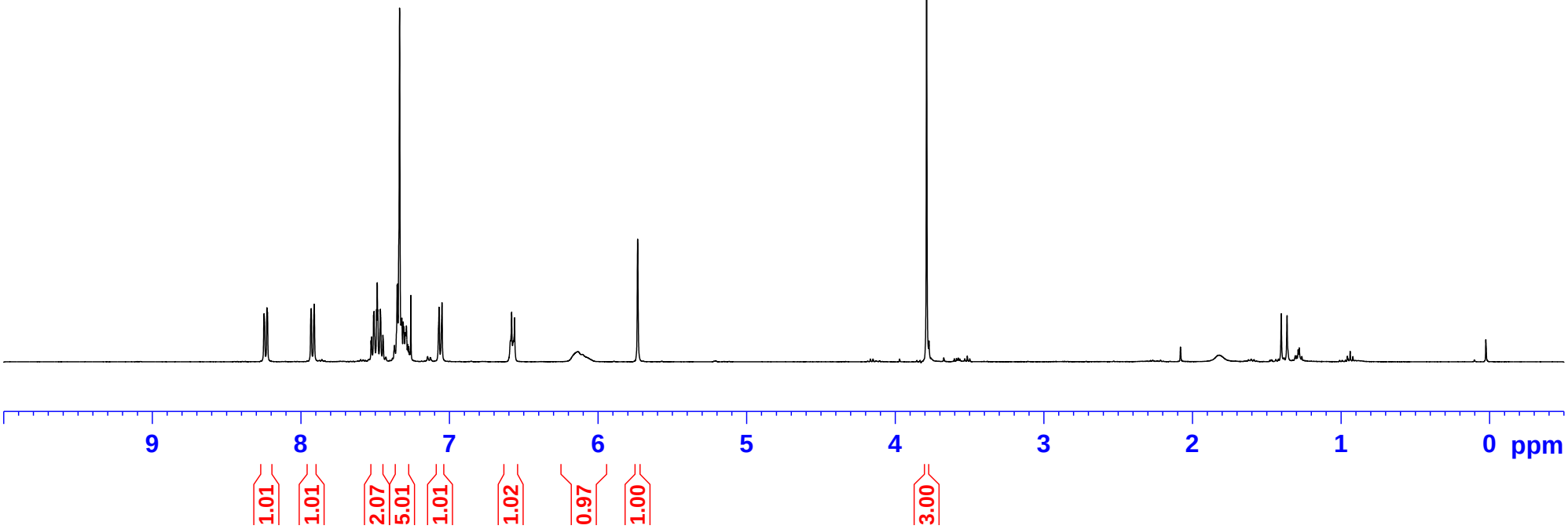
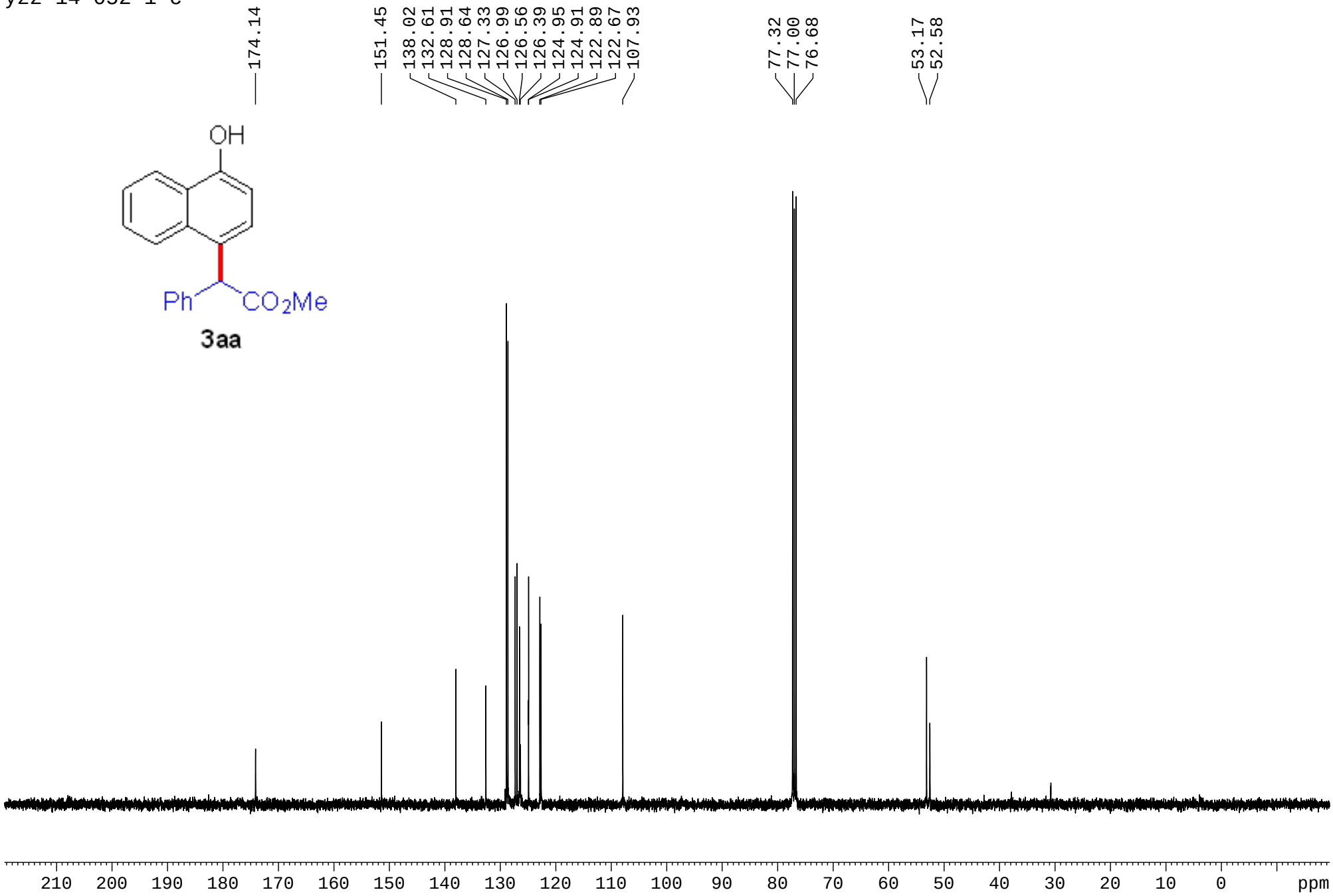


yzz-14-052-1-c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138.02
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126.99
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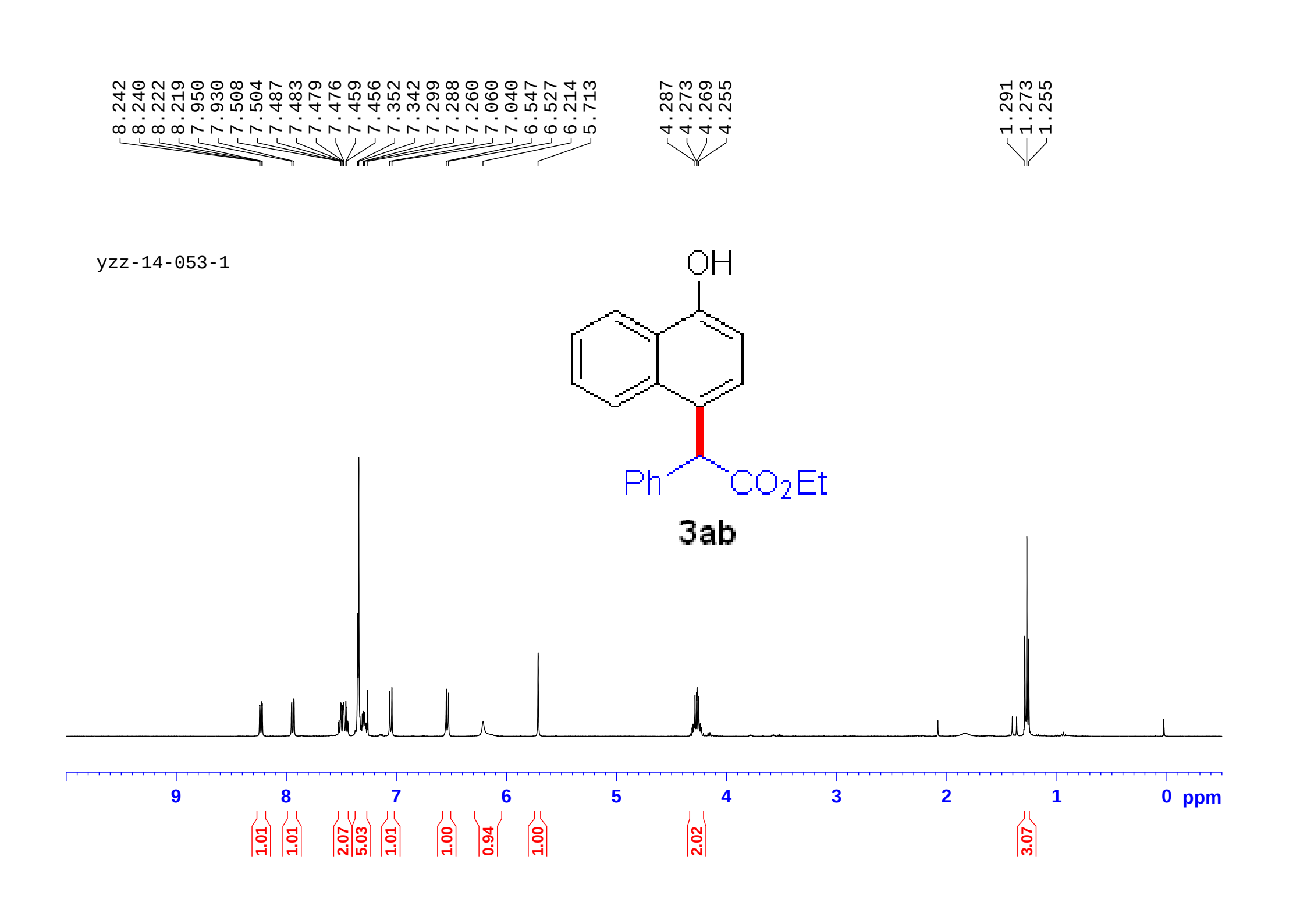
126.39
124.95
124.91
122.89
122.67
107.93
77.32
77.00
76.68
53.17
52.58
OH
Ph
CO2Me
3aa
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm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8.240
8.222
8.219
7.950
7.930
7.508
7.504
7.487
7.483
7.479
7.476
7.459
7.456
7.352
7.342
7.299
7.288
7.260
7.060
7.040
6.547
6.527
6.214
5.713
4.287
4.273
4.269
4.255
1.291
1.273
1.255
yzz-14-053-1
OH
Ph
CO2Et
3ab
9
8
7
6
5
4
3
2
1
0
ppm
1.01
1.01
2.07
5.03
1.01
1.00
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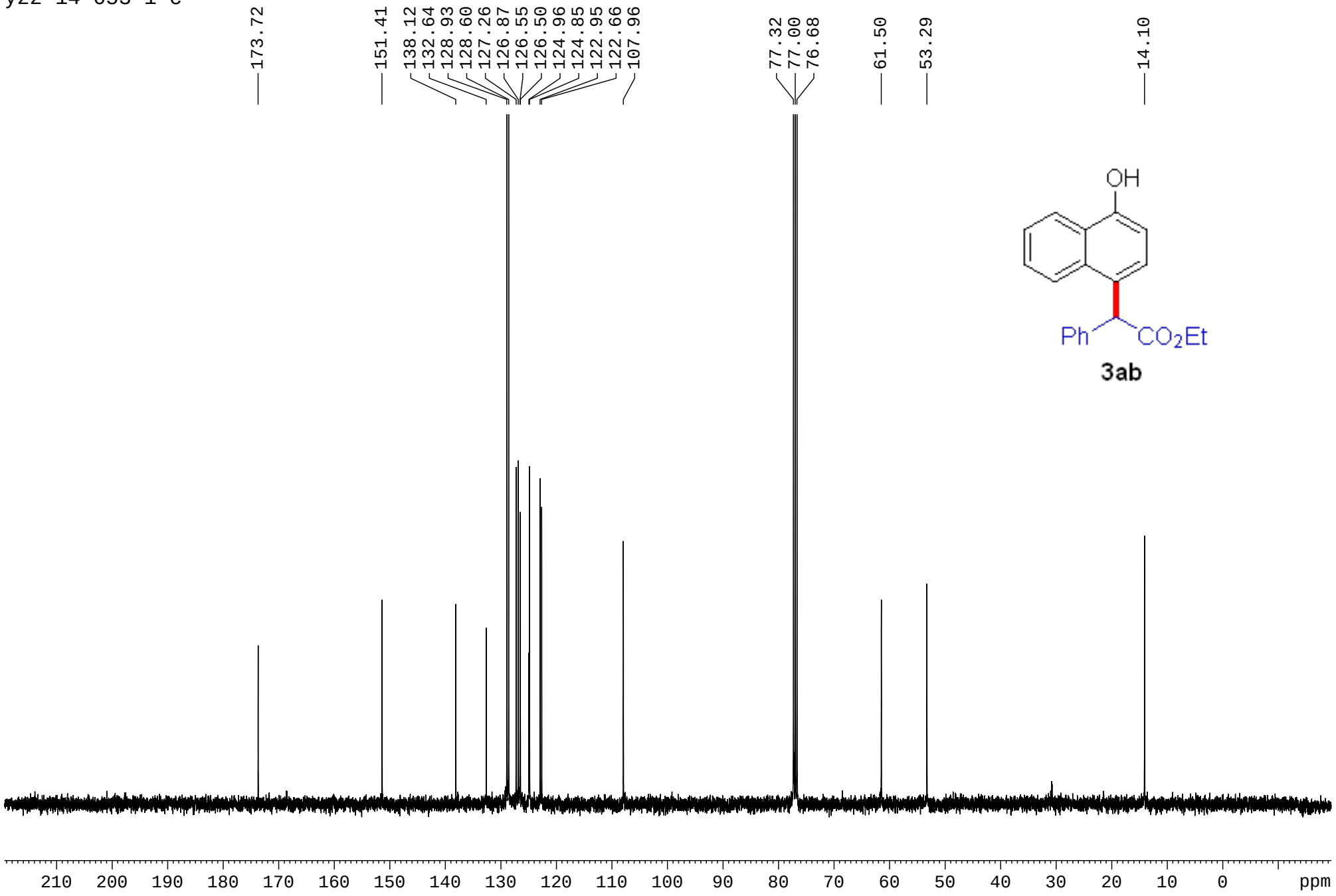
1.00
2.02
3.07

yzz-14-053-1-c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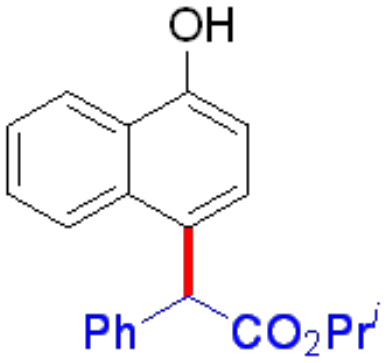
127.26
126.87
126.55
126.50
124.96
124.85
122.95
122.66
107.96
77.32
77.00
76.68
61.50
53.29
14.10
OH
Ph
CO2Et
3ab
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

8.227
8.207
8.204
7.955
7.935
7.520
7.517
7.503
7.500
7.483
7.478
7.457
7.440
7.345
7.336
7.304
7.293
7.282
7.260
7.036
7.017
6.535
6.515
5.930
5.914
5.662
5.176
5.160
5.144
5.129
5.113

1.266
1.250
1.239
1.223

yzz-14-054-2



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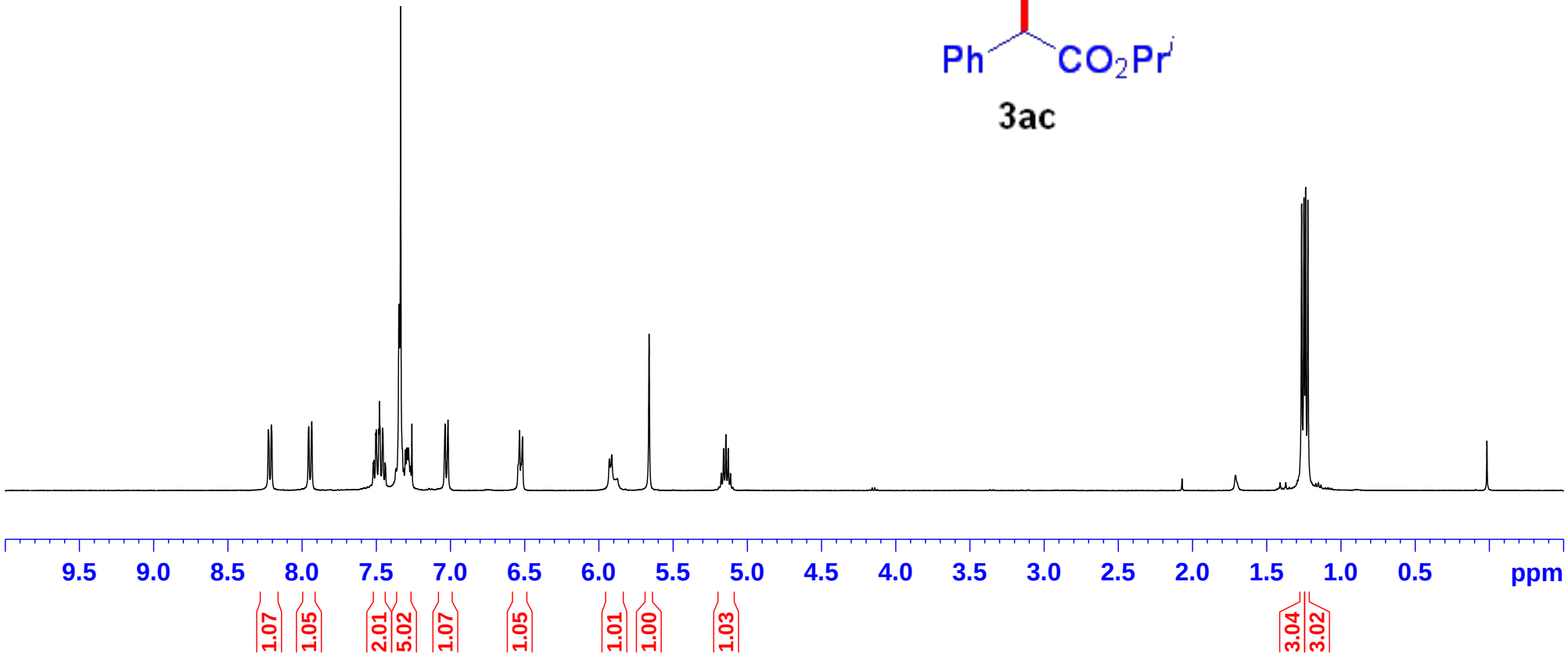

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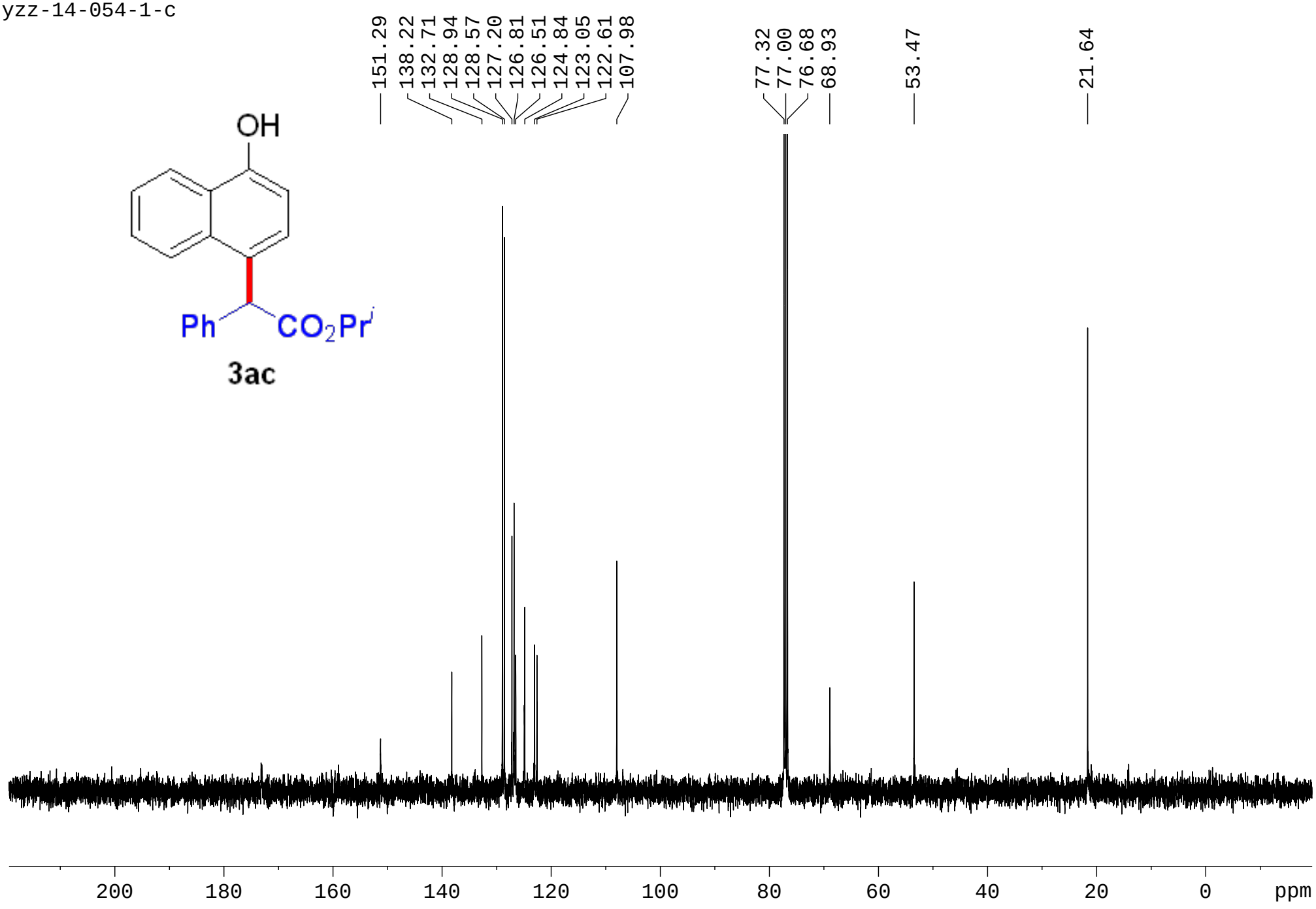
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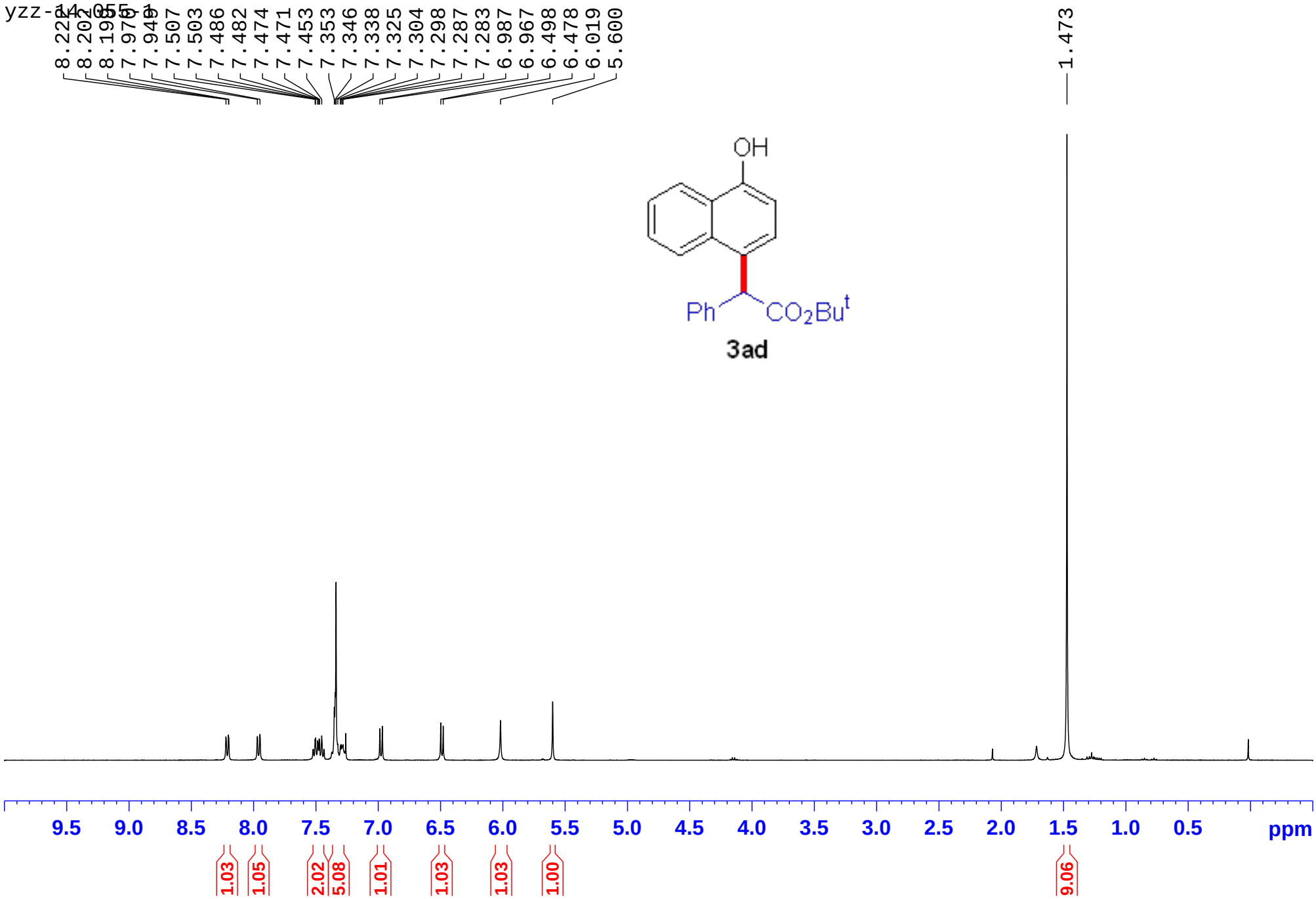
132.71
128.94
128.57
127.20
126.81
126.51
124.84
123.05
122.61
107.98
77.32
77.00
76.68
68.93
53.47
21.64
OH
Ph
CO2Pri
3ac
200
180
160
140
120
100
80
60
40
20
0
ppm


yzz-14-055
8.224
8.202
8.199
7.976
7.949
7.507
7.503
7.486
7.482
7.474
7.471
7.453
7.353
7.346
7.338
7.325
7.304
7.298
7.287
7.283
6.987
6.967
6.498
6.478
6.019
5.600
1.473
OH
Ph
CO2But
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
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1.03
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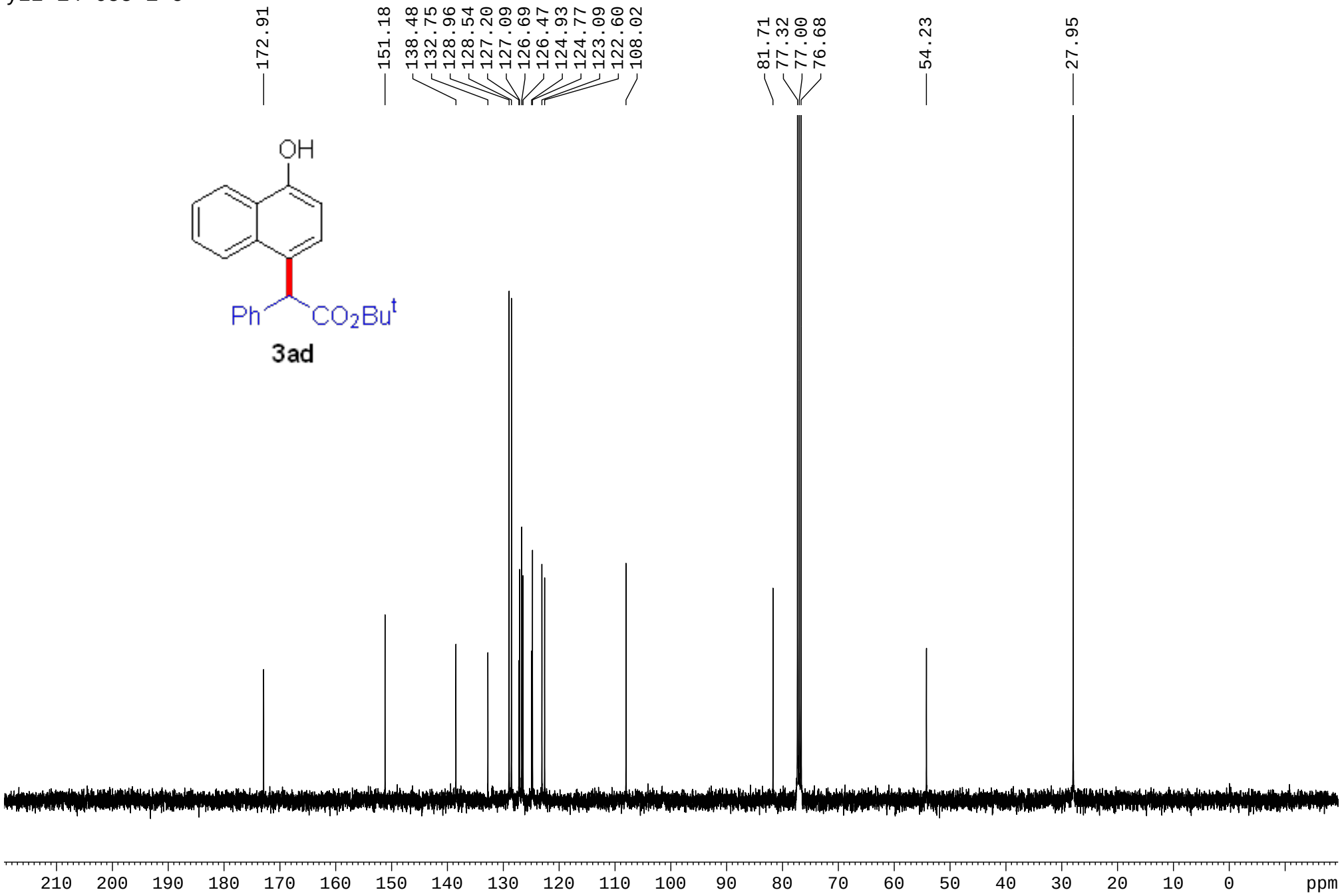
2.02
5.08
1.01
1.03
1.03
1.00
9.06

yzz-14-055-1-c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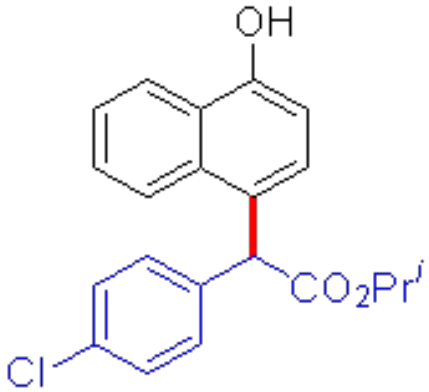
128.54
127.20
127.09
126.69
126.47
124.93
124.77
123.09
122.60
108.02
81.71
77.32
77.00
76.68
54.23
27.95
OH
Ph
CO2But
3ad
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

8.217
8.198
8.194
7.871
7.869
7.849
7.500
7.496
7.483
7.479
7.464
7.459
7.443
7.426
7.299
7.278
7.249
7.242
7.228
7.012
6.993
6.521
6.502
6.193
5.605
5.158
5.143
5.127
5.112
5.096

1.242
1.232
1.227
1.216

yzz-14-058-1



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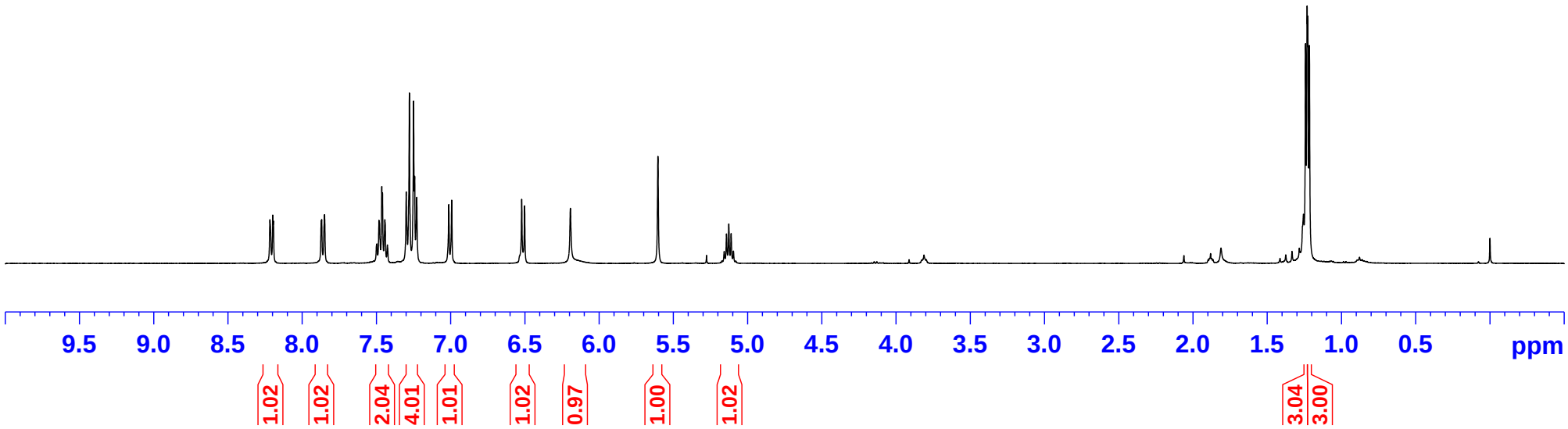
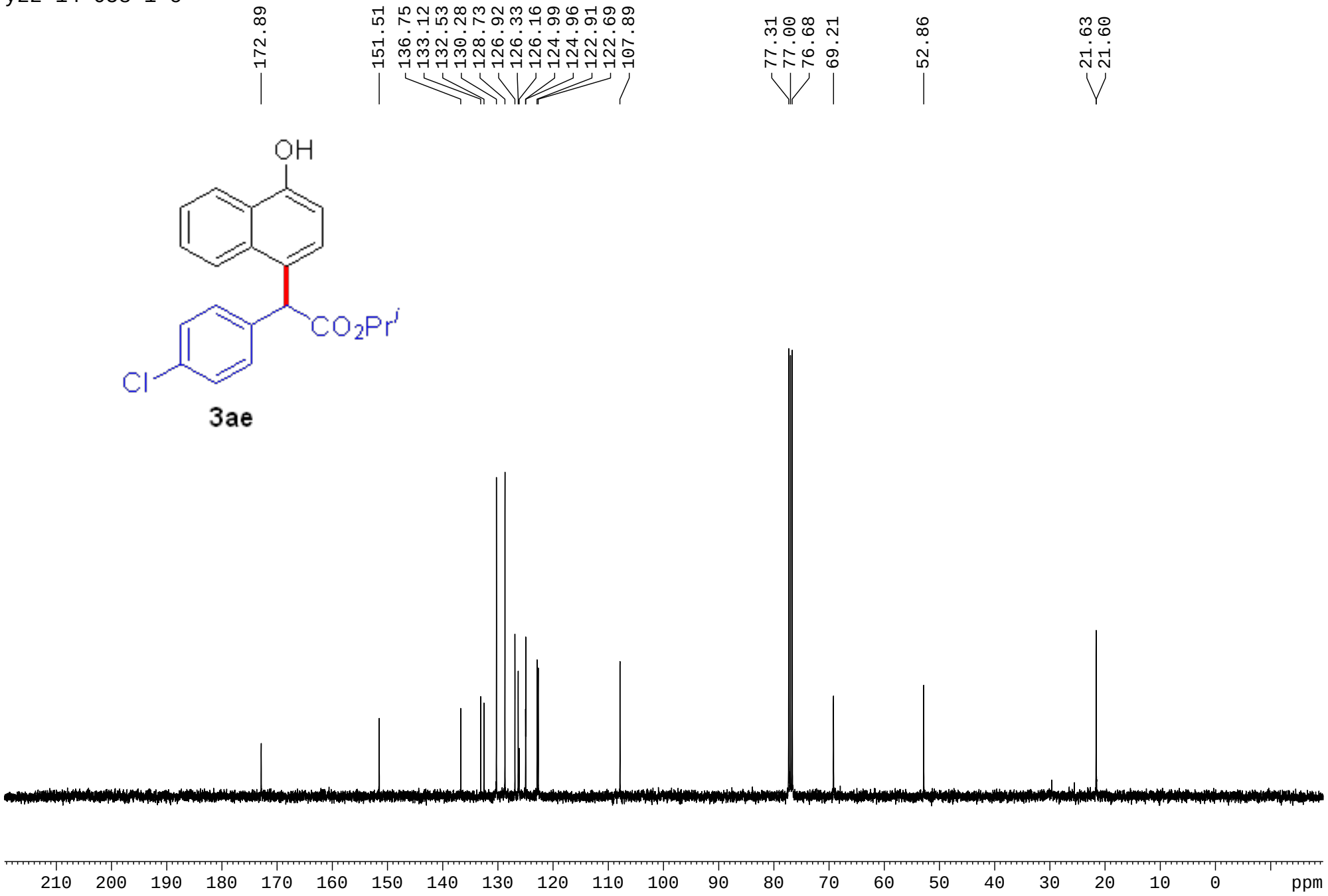


yzz-14-058-1-c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130.28
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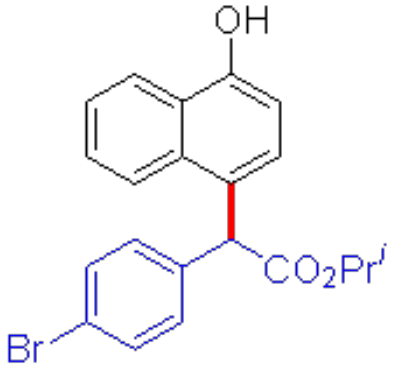
126.92
126.33
126.16
124.99
124.96
122.91
122.69
107.89
77.31
77.00
76.68
69.21
52.86
21.63
21.60
OH
CO2Pri
Cl
3ae
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

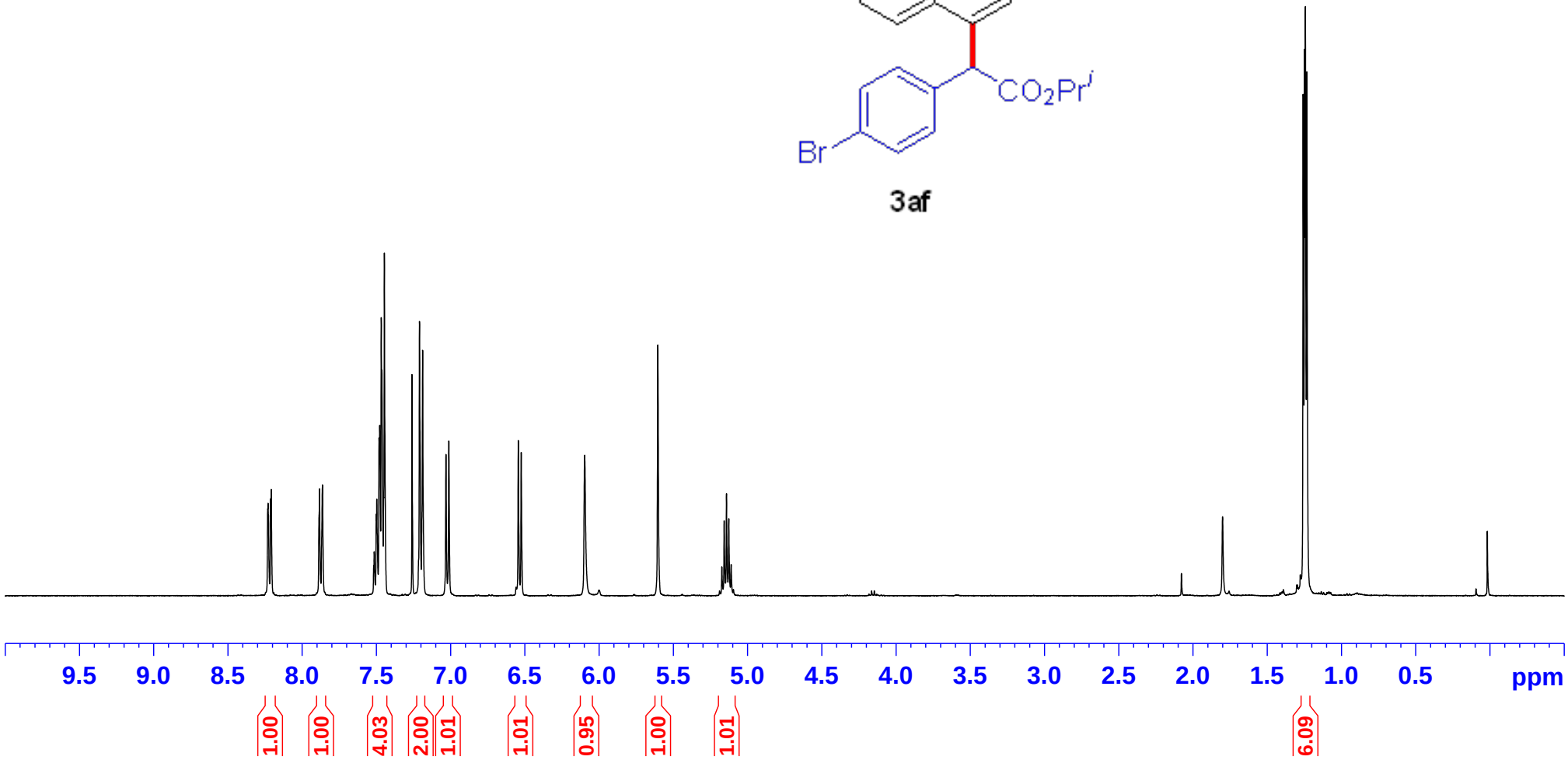
yzz-14-067-1

8.232
8.230
8.227
8.213
8.208
7.883
7.863
7.518
7.514
7.501
7.497
7.482
7.478
7.467
7.463
7.450
7.446
7.260
7.210
7.189
7.031
7.012
6.544
6.524
6.097
5.604
5.173
5.158
5.142
5.126
5.111

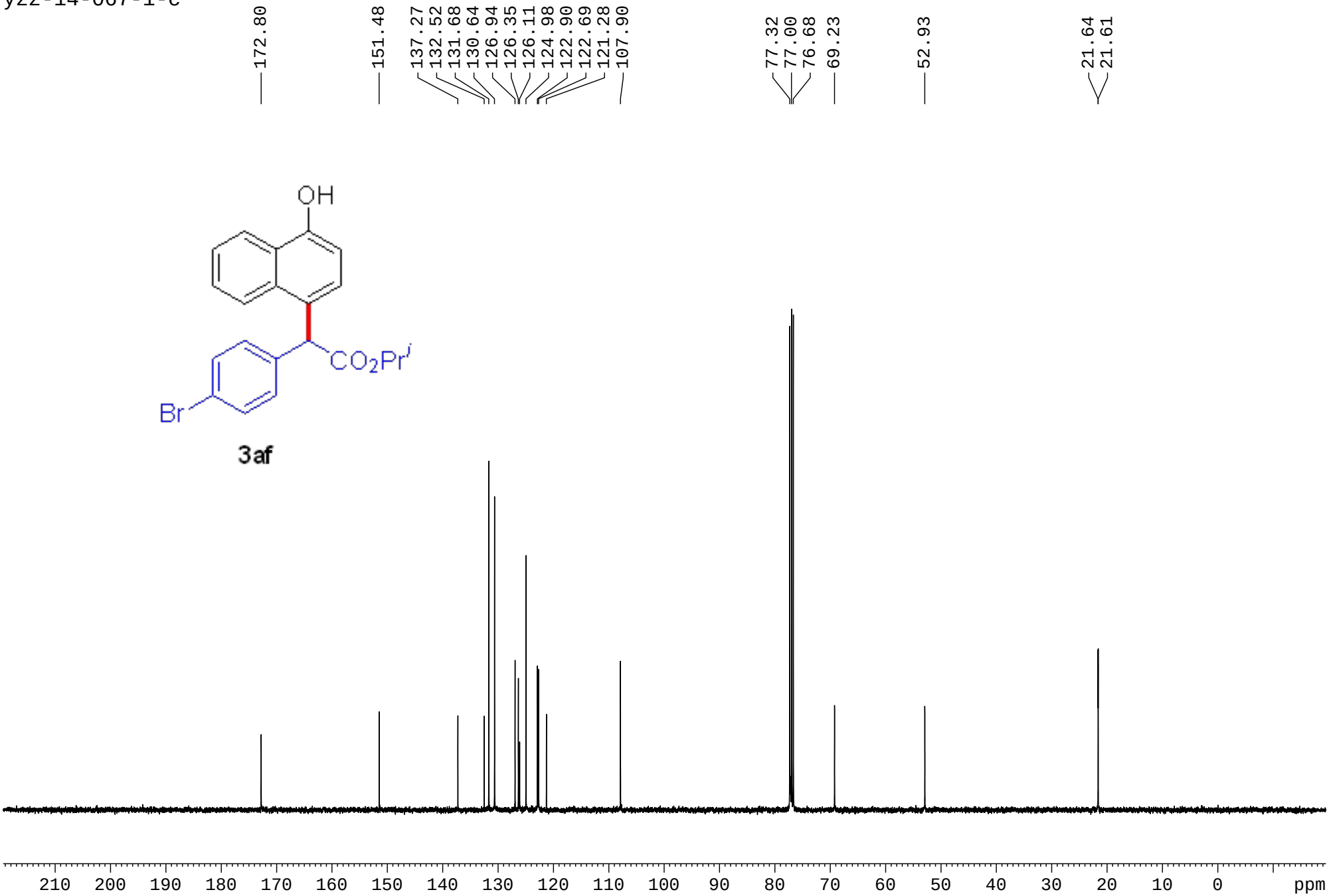
1.258
1.249
1.243
1.233



3af



yzz-14-067-1-c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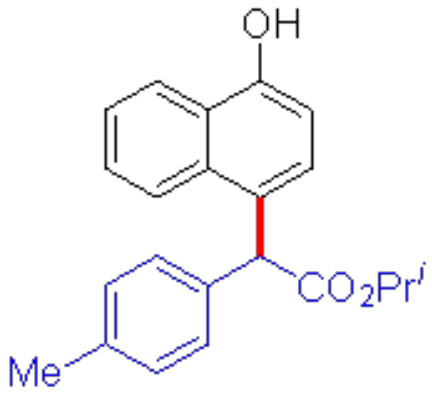
130.64
126.94
126.35
126.11
124.98
122.90
122.69
121.28
107.90
77.32
77.00
76.68
69.23
52.93
21.64
21.61
OH
CO2Pri
Br
3af
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

yzz-14-068-1

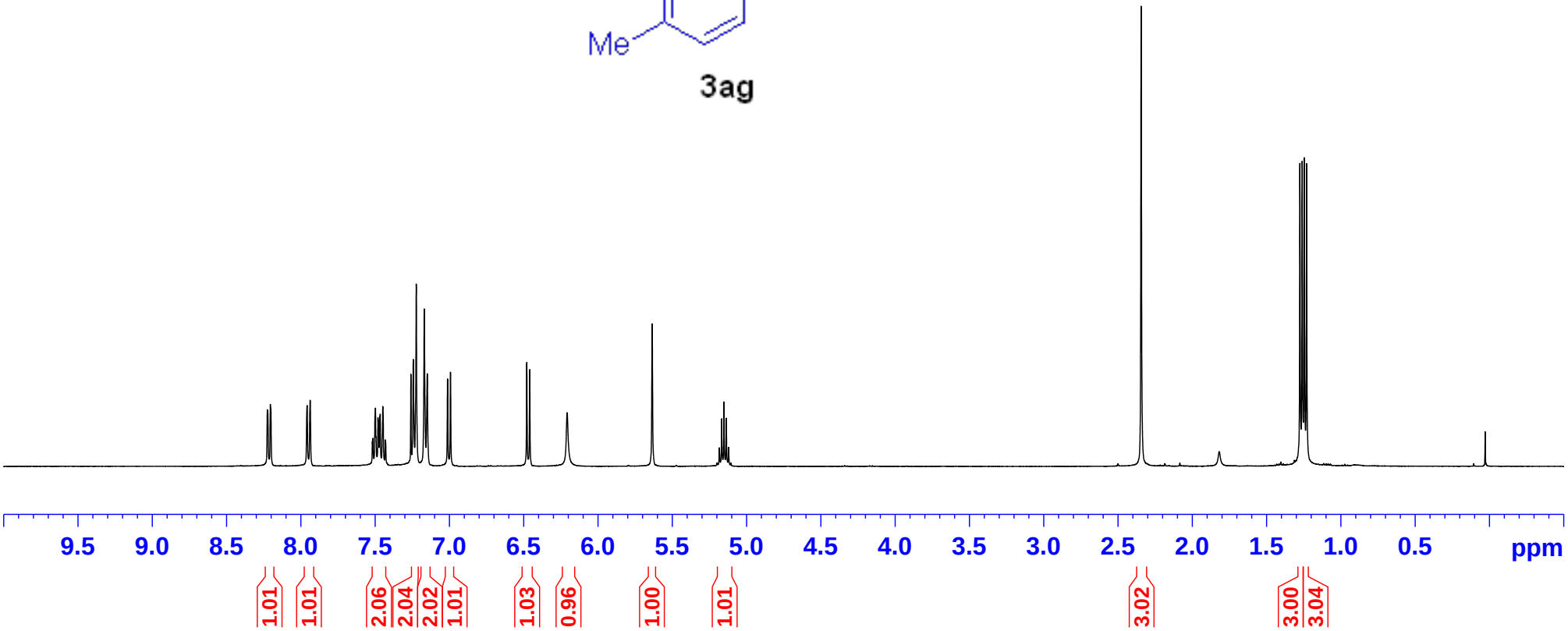
8.223 8.205 8.202 7.958 7.937 7.519 7.515 7.502 7.498 7.495 7.481 7.477 7.470 7.466 7.449 7.432 7.430 7.260 7.244 7.224 7.170 7.150 7.013 6.993 6.480 6.460 6.208 5.636 5.184 5.168 5.152 5.137 5.121

2.345

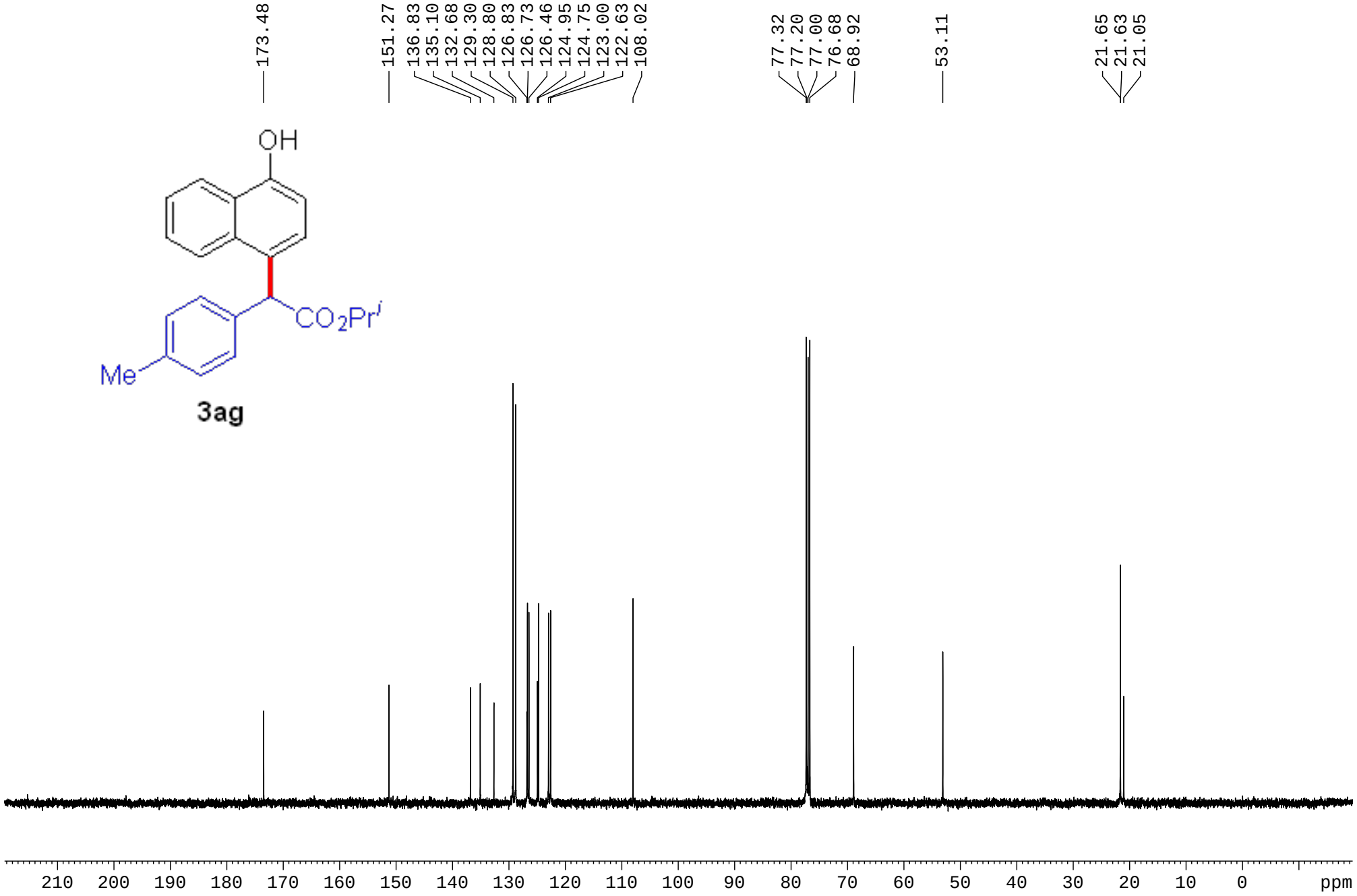
1.276 1.261 1.247 1.231



3ag



YZZ-14-068-1-C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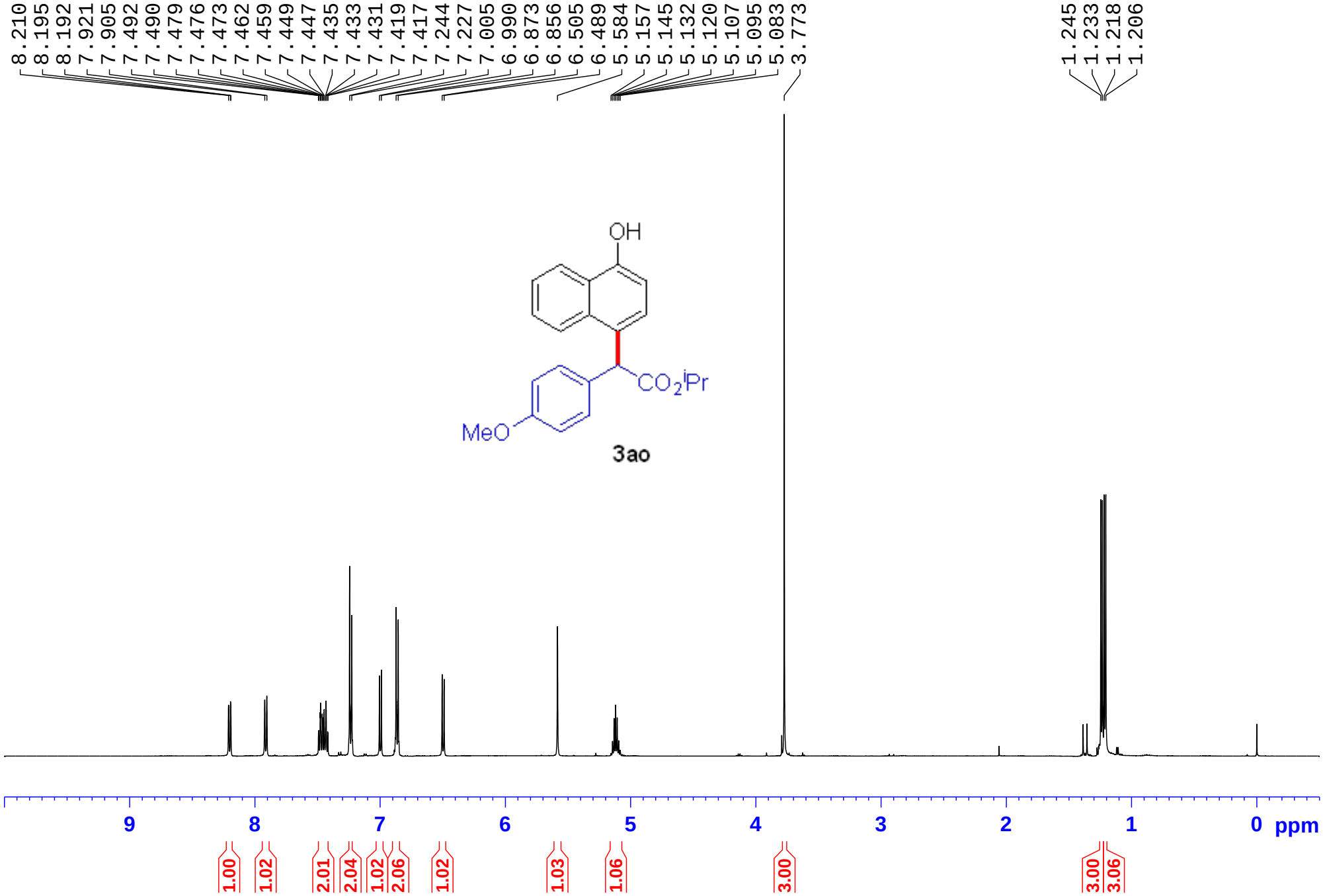
128.80
126.83
126.73
126.46
124.95
124.75
123.00
122.63
108.02
77.32
77.20
77.00
76.68
68.92
53.11
21.65
21.63
21.05
OH
CO2Pri
Me
3ag
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm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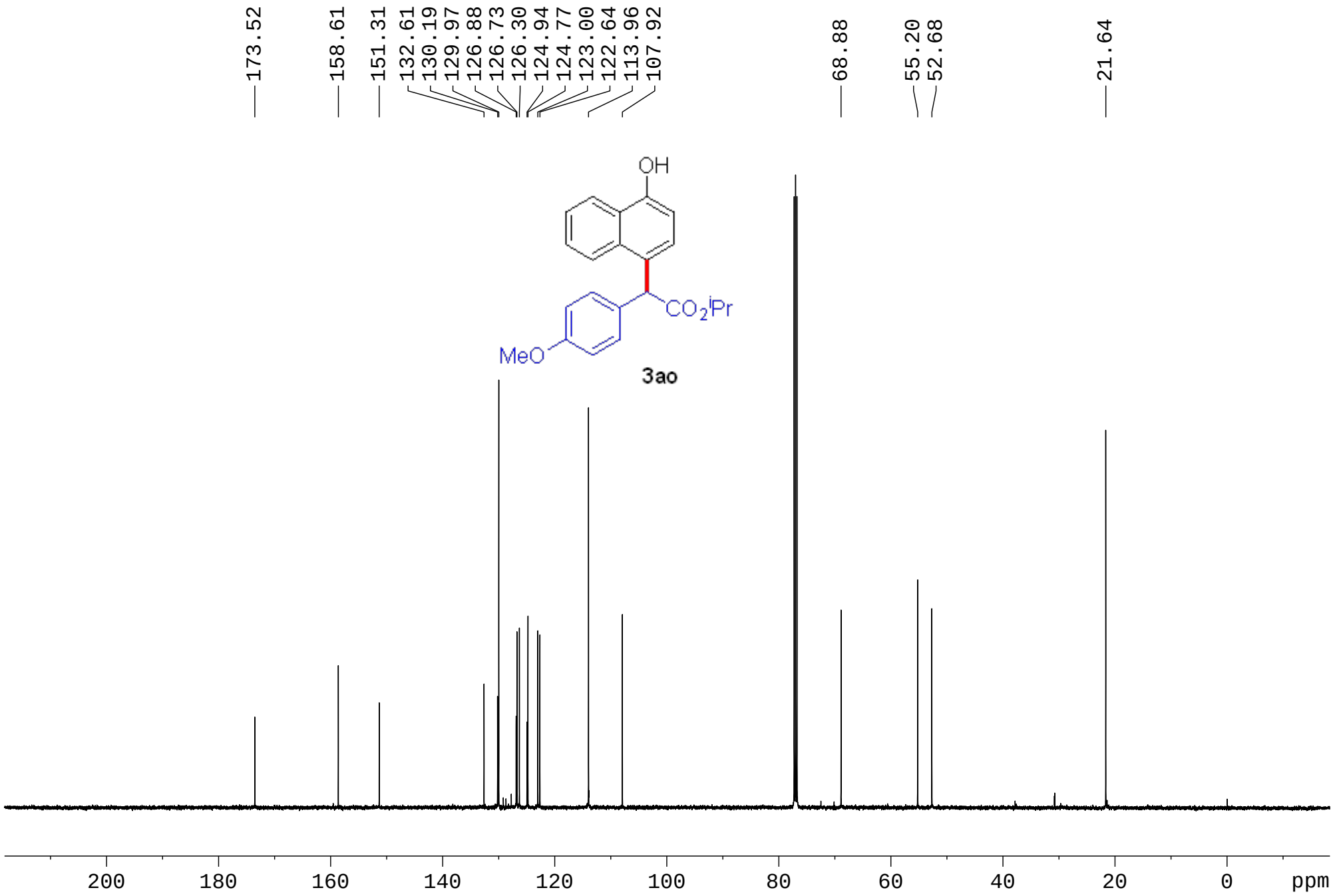
8.195
8.192
7.921
7.905
7.492
7.490
7.479
7.476
7.473
7.462
7.459
7.449
7.447
7.435
7.433
7.431
7.419
7.417
7.244
7.227
7.005
6.990
6.873
6.856
6.505
6.489
5.584
5.157
5.145
5.132
5.120
5.107
5.095
5.083
3.773
1.245
1.233
1.218
1.206
OH
CO2iPr
MeO
3ao
9
8
7
6
5
4
3
2
1
0
ppm
1.00
1.02
2.01
2.04
1.02
2.06
1.02
1.03
1.06
3.00
3.00
3.06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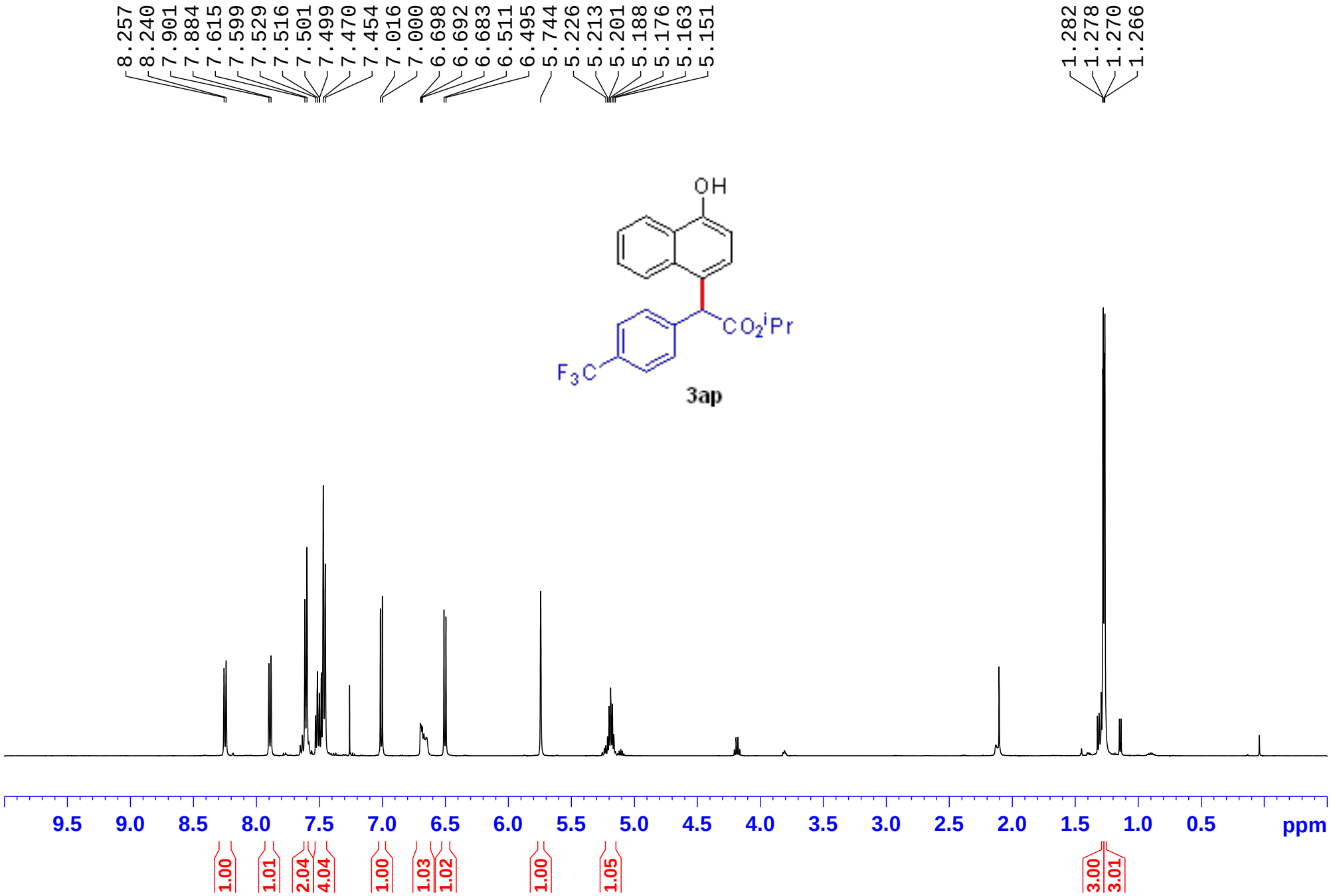
158.61
151.31
132.61
130.19
129.97
126.88
126.73
126.30
124.94
124.77
123.00
122.64
113.96
107.92
68.88
55.20
52.68
21.64
OH
CO2iPr
MeO
3ao
200
180
160
140
120
100
80
60
40
20
0
ppm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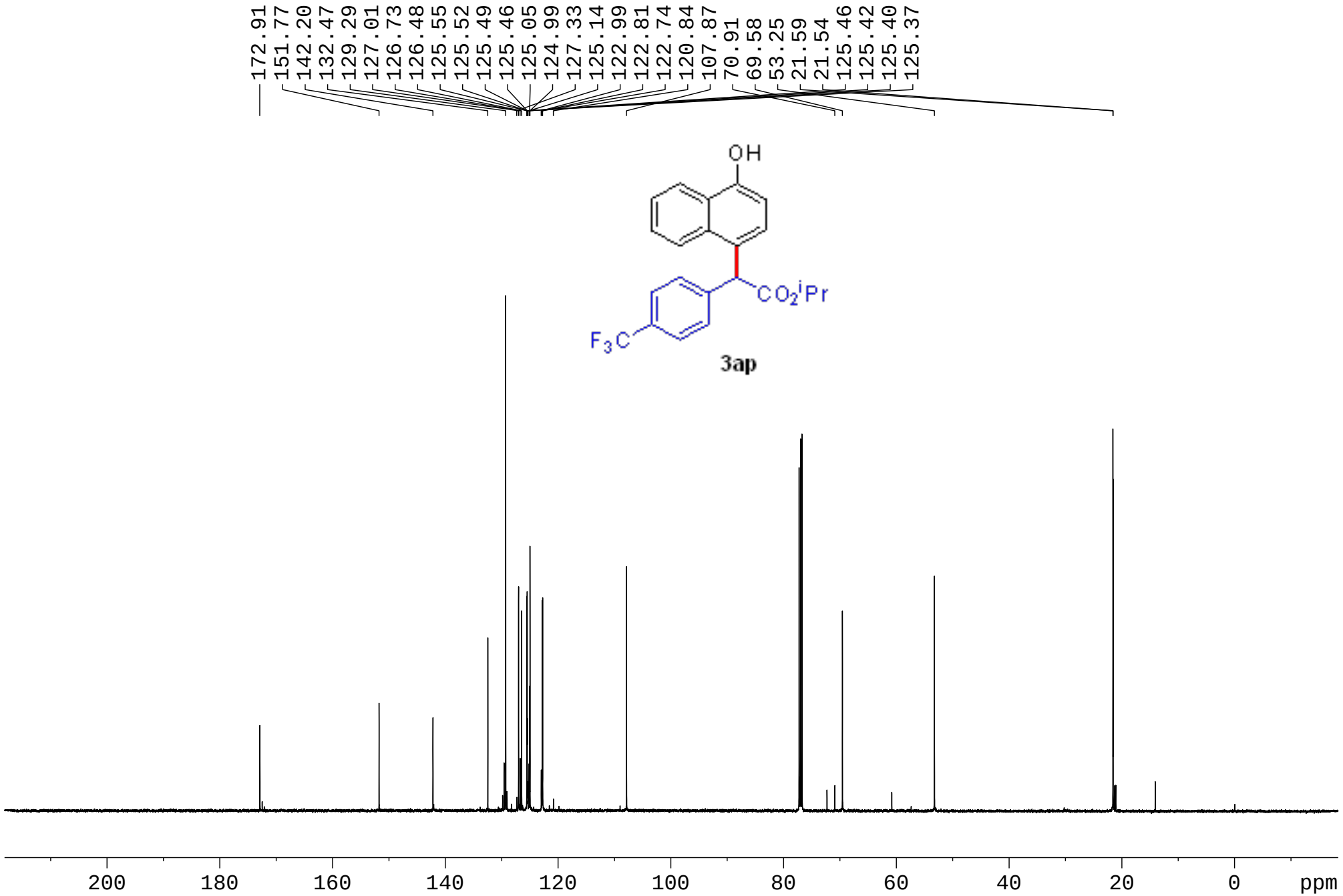
8.240
7.901
7.884
7.615
7.599
7.529
7.516
7.501
7.499
7.470
7.454
7.016
7.000
6.698
6.692
6.683
6.511
6.495
5.744
5.226
5.213
5.201
5.188
5.176
5.163
5.151
1.282
1.278
1.270
1.266
OH
CO2iPr
F3C
3ap
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.00
1.01
2.04
4.04
1.00
1.03
1.02
1.00
1.05
3.00
3.01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142.20
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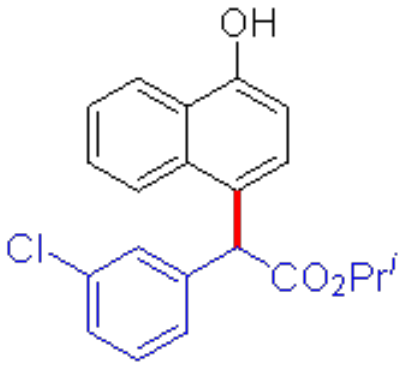
127.01
126.73
126.48
125.55
125.52
125.49
125.46
125.05
124.99
127.33
125.14
122.99
122.81
122.74
120.84
107.87
70.91
69.58
53.25
21.59
21.54
125.46
125.42
125.40
125.37
OH
CO2iPr
F3C
3ap
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-14-059-2

7.882 7.863 7.518 7.514 7.501 7.497 7.493 7.482 7.478 7.462 7.459 7.446 7.442 7.314 7.252 7.248 7.241 7.238 7.232 7.228 7.220 7.210 7.206 7.199 7.187 7.183 7.061 7.042 6.577 6.558 5.834 5.609 5.160 5.145 5.129 5.114 5.098

1.241 1.225

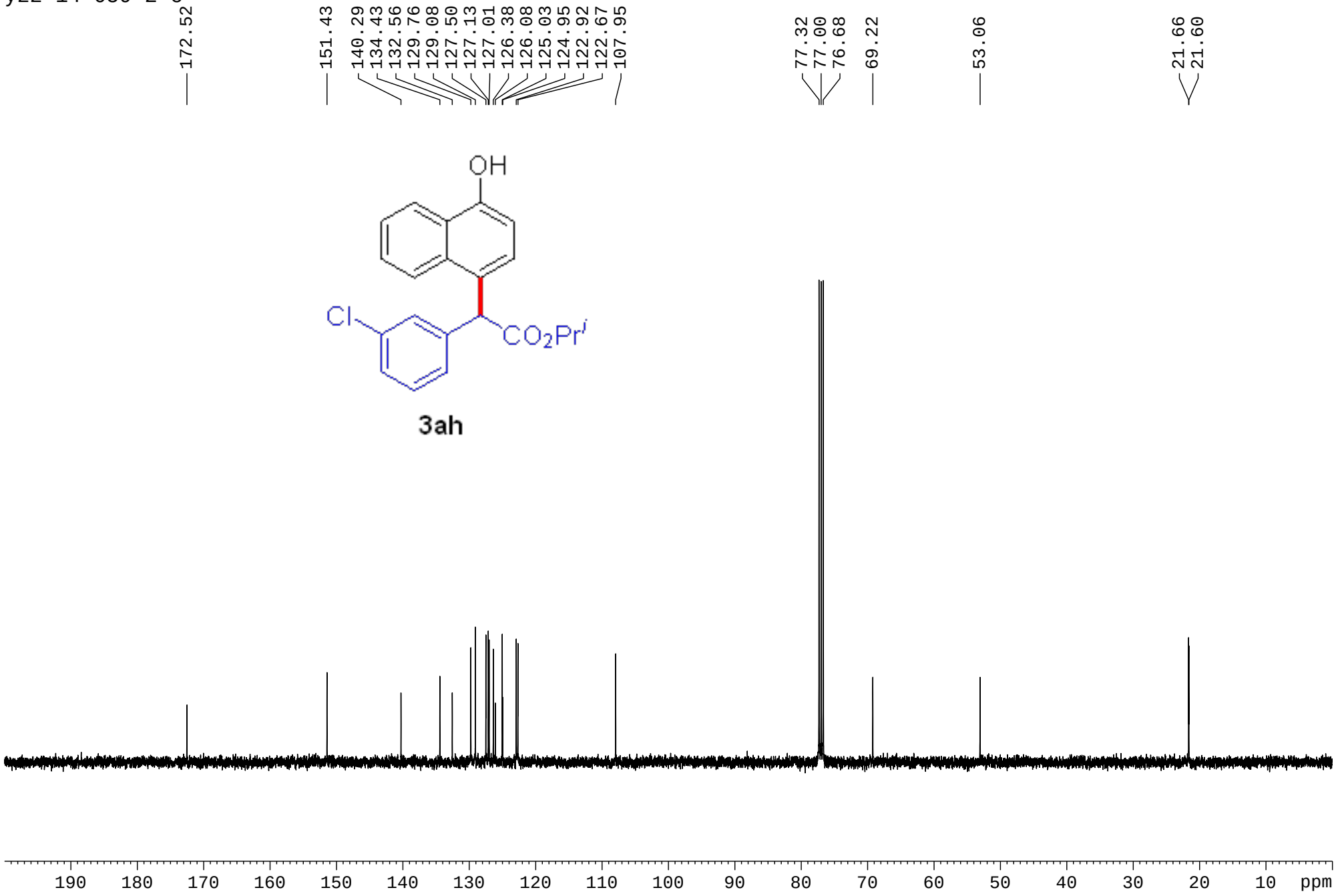


3ah

9 8 7 6 5 4 3 2 1 0 ppm

0.99 1.00 2.03 1.00 3.00 1.02 1.00 1.00 1.00 0.99 6.02

yzz-14-059-2-c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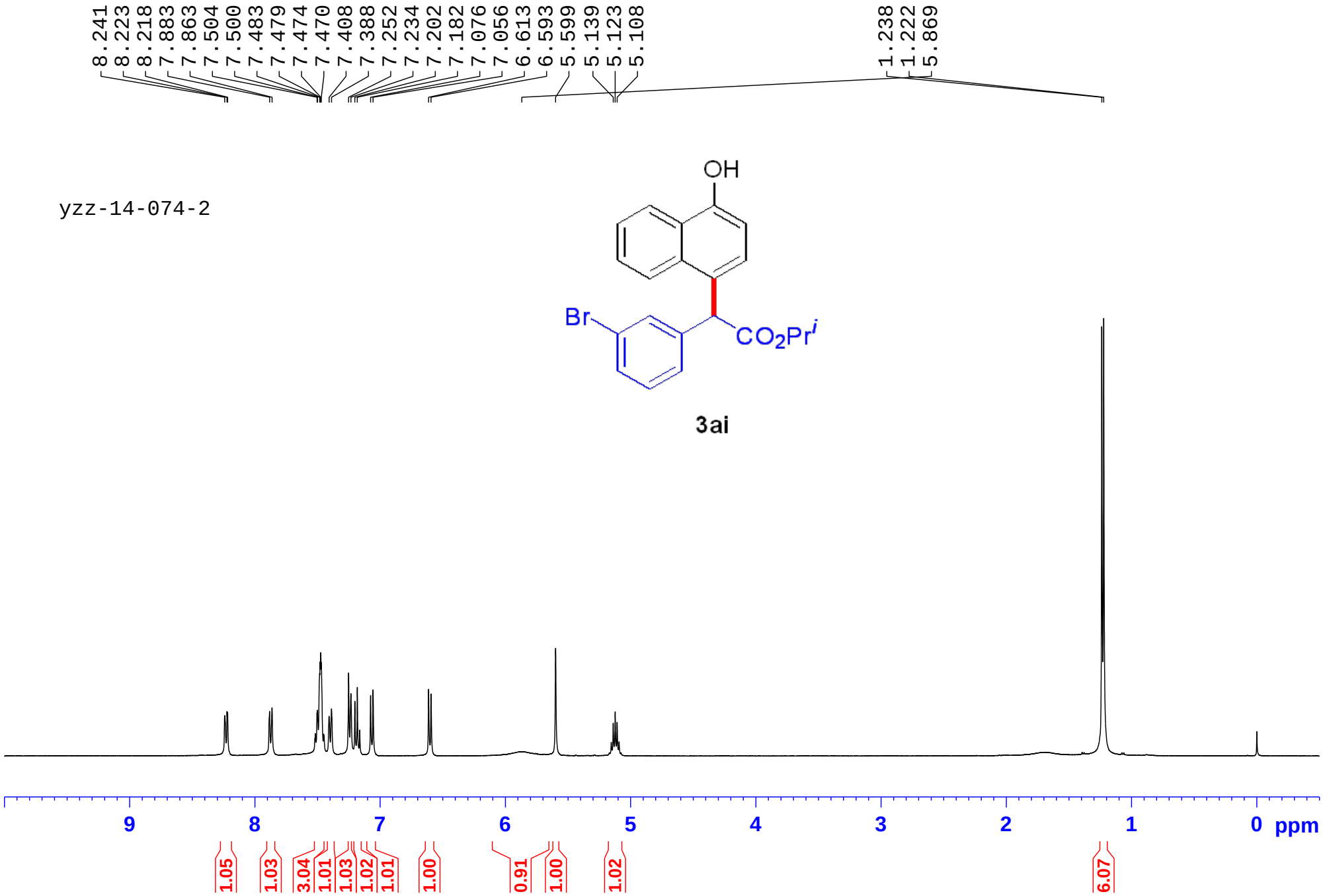
127.50
127.13
127.01
126.38
126.08
125.03
124.95
122.92
122.67
107.95
77.32
77.00
76.68
69.22
53.06
21.66
21.60
OH
Cl
CO2Pri
3ah
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm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7.883
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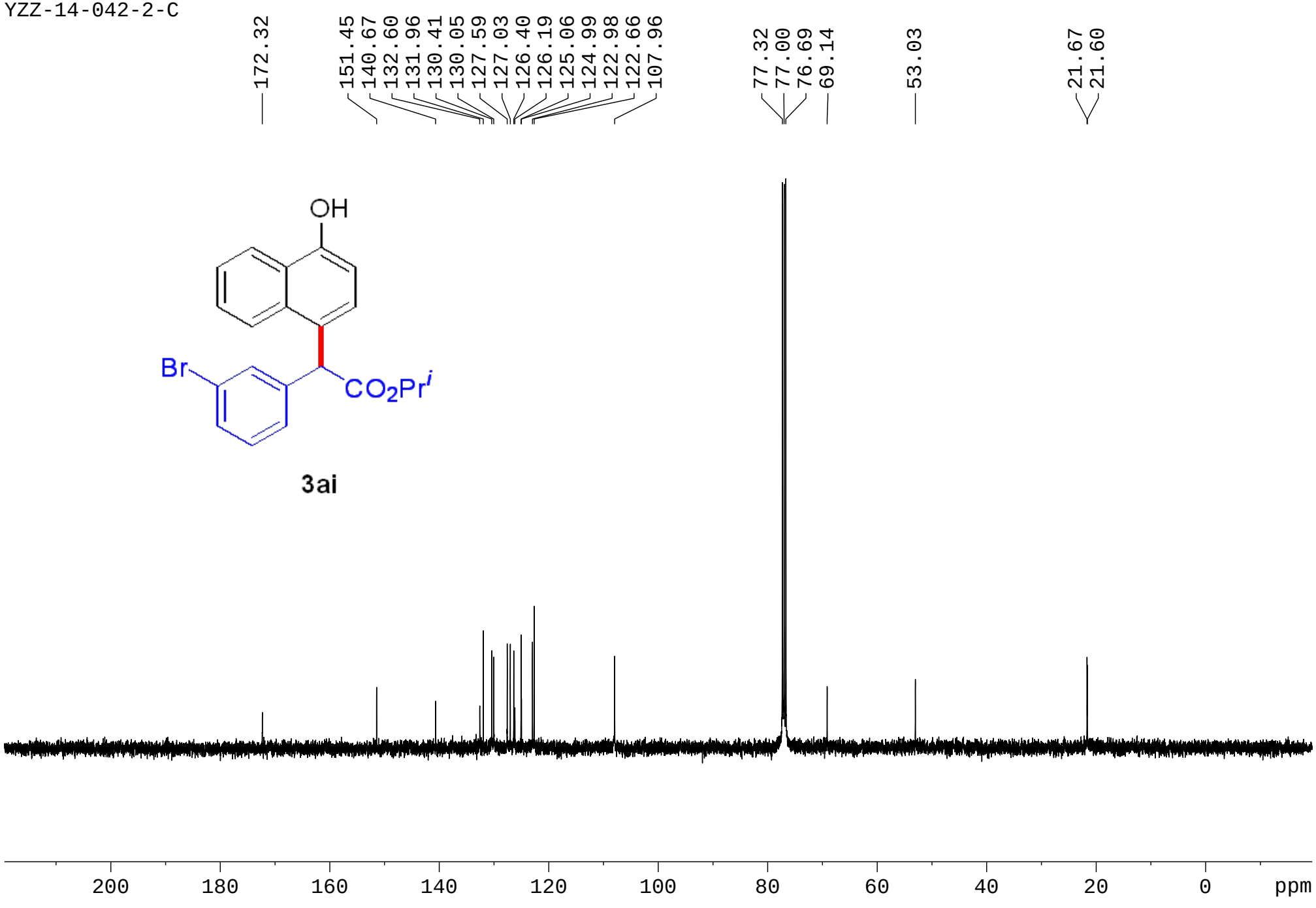
7.504
7.500
7.483
7.479
7.474
7.470
7.408
7.388
7.252
7.234
7.202
7.182
7.076
7.056
6.613
6.593
5.599
5.139
5.123
5.108
1.238
1.222
5.869
yzz-14-074-2
OH
Br
CO2Pri
3ai
9
8
7
6
5
4
3
2
1
0
ppm
1.05
1.03
3.04
1.01
1.03
1.02
1.01
1.00
0.91
1.00
1.02
6.07

YZZ-14-042-2-C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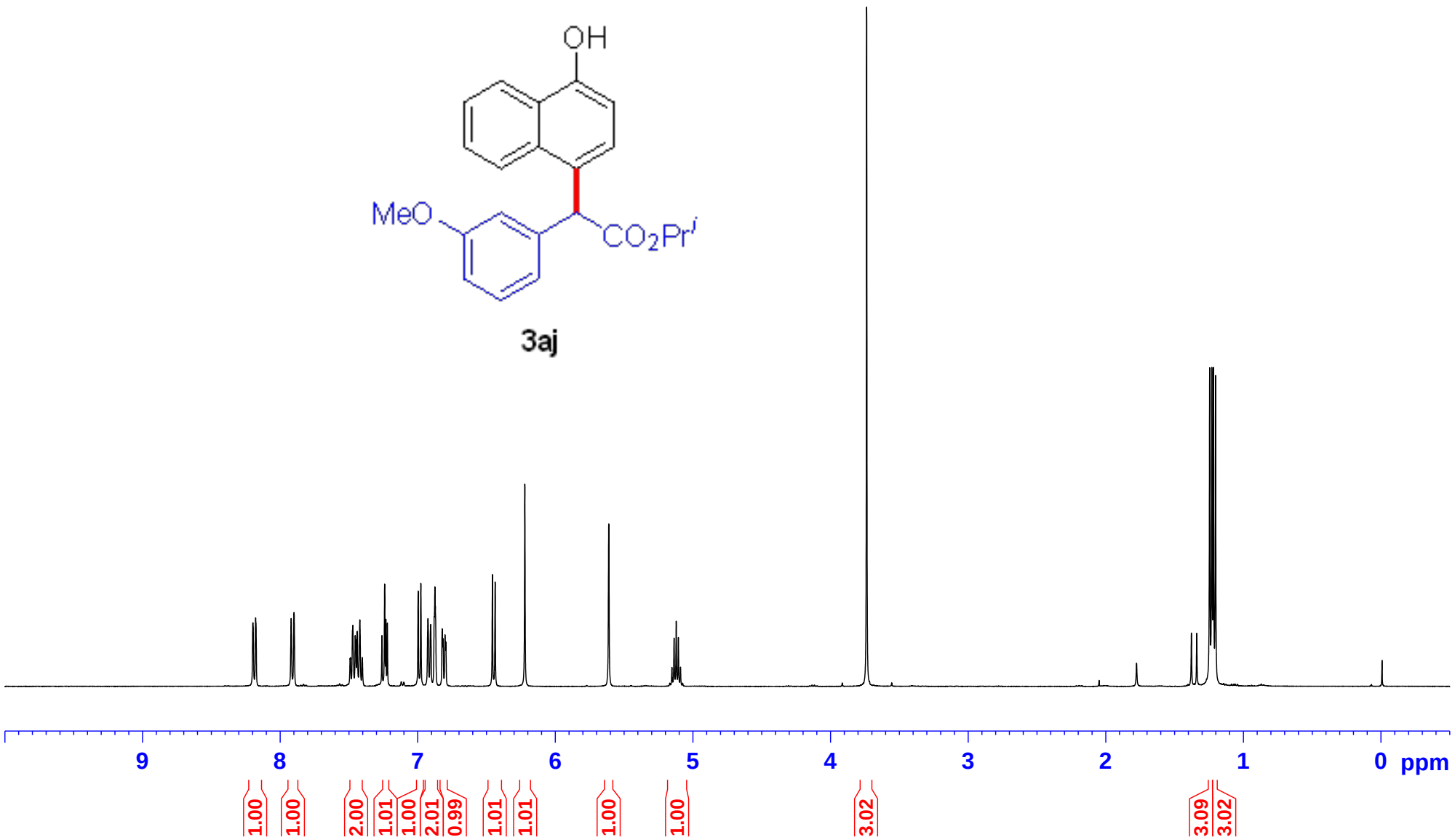
127.59
127.03
126.40
126.19
125.06
124.99
122.98
122.66
107.96
77.32
77.00
76.69
69.14
53.03
21.67
21.60
OH
Br
CO2Pri
3ai
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-14-075-1

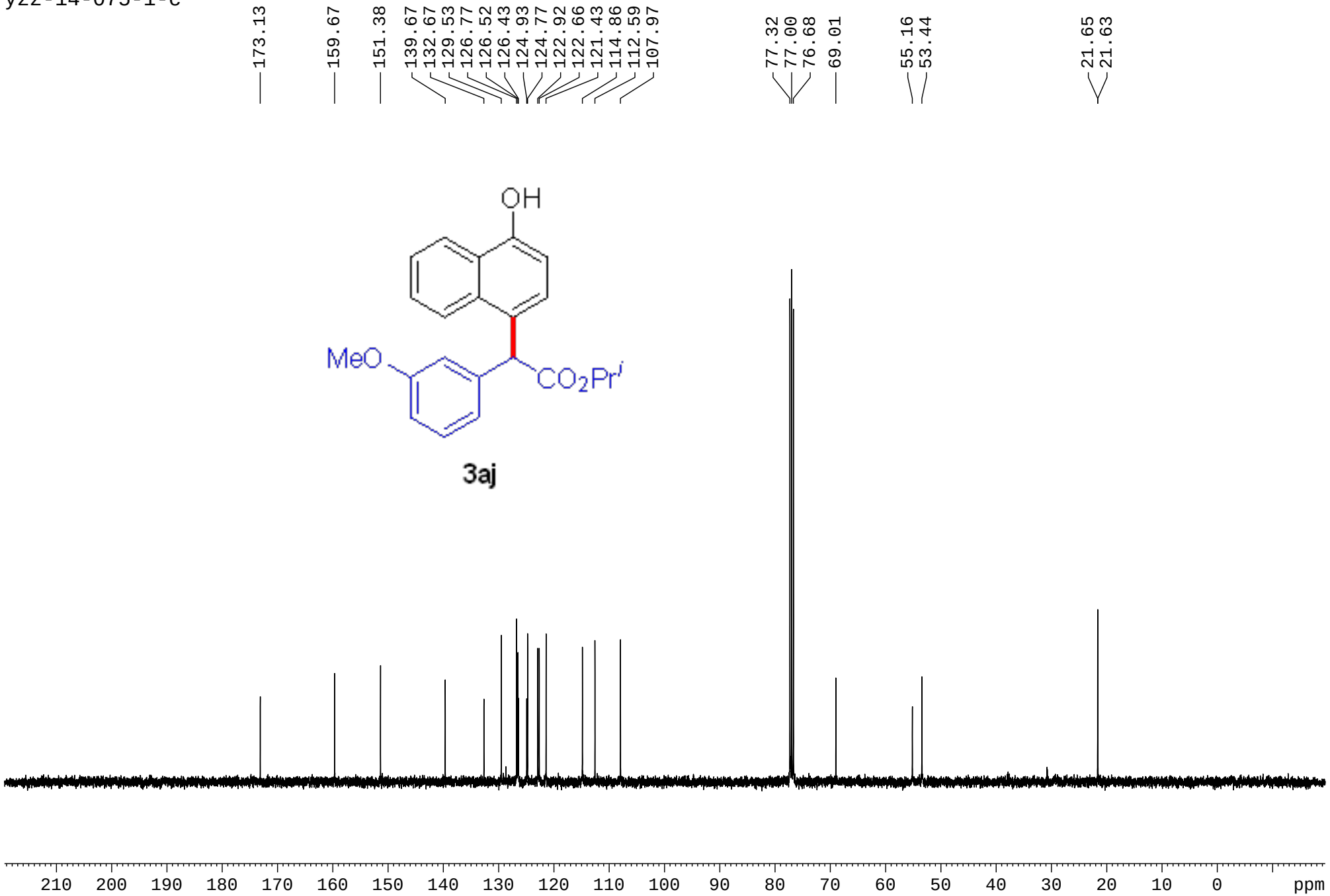
7.919 7.898 7.491 7.488 7.474 7.471 7.454 7.450 7.441 7.439 7.421 7.403 7.260 7.240 7.231 7.220 6.997 6.977 6.925 6.906 6.880 6.875 6.823 6.817 6.802 6.796 6.458 6.438 6.222 5.612 5.169 5.153 5.138 5.122 5.106 5.091 5.075 3.738

1.245 1.230 1.218 1.202

3aj



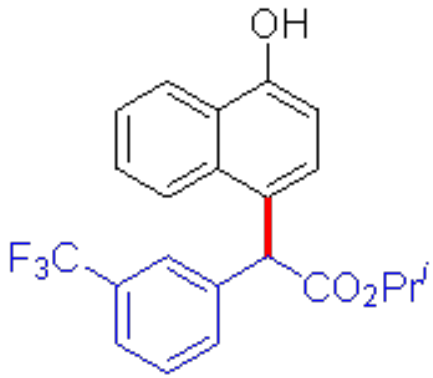
yzz-14-075-1-c


173.13
159.67
151.38
139.67
132.67
129.53
126.77
126.52
126.43
124.93
124.77
122.92
122.66
121.43
114.86
112.59
107.97
77.32
77.00
76.68
69.01
55.16
53.44
21.65
21.63
OH
MeO
CO2Pri
3aj
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

yzz-14-073-1

8.251 8.231 8.227 7.907 7.887 7.637 7.557 7.538 7.521 7.518 7.513 7.501 7.496 7.492 7.475 7.457 7.438 7.418 7.260 7.035 7.023 7.016 7.003 6.559 6.551 6.531 6.153 5.717 5.192 5.177 5.161 5.146 5.130

1.260 1.252 1.245 1.237

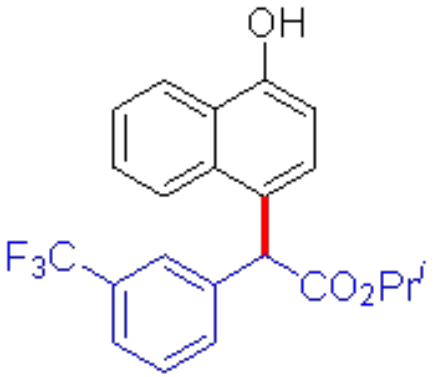


3ak

9 8 7 6 5 4 3 2 1 0 ppm

1.02 1.02 1.05 5.07 1.03 1.03 1.02 1.00 1.04 3.02 3.06

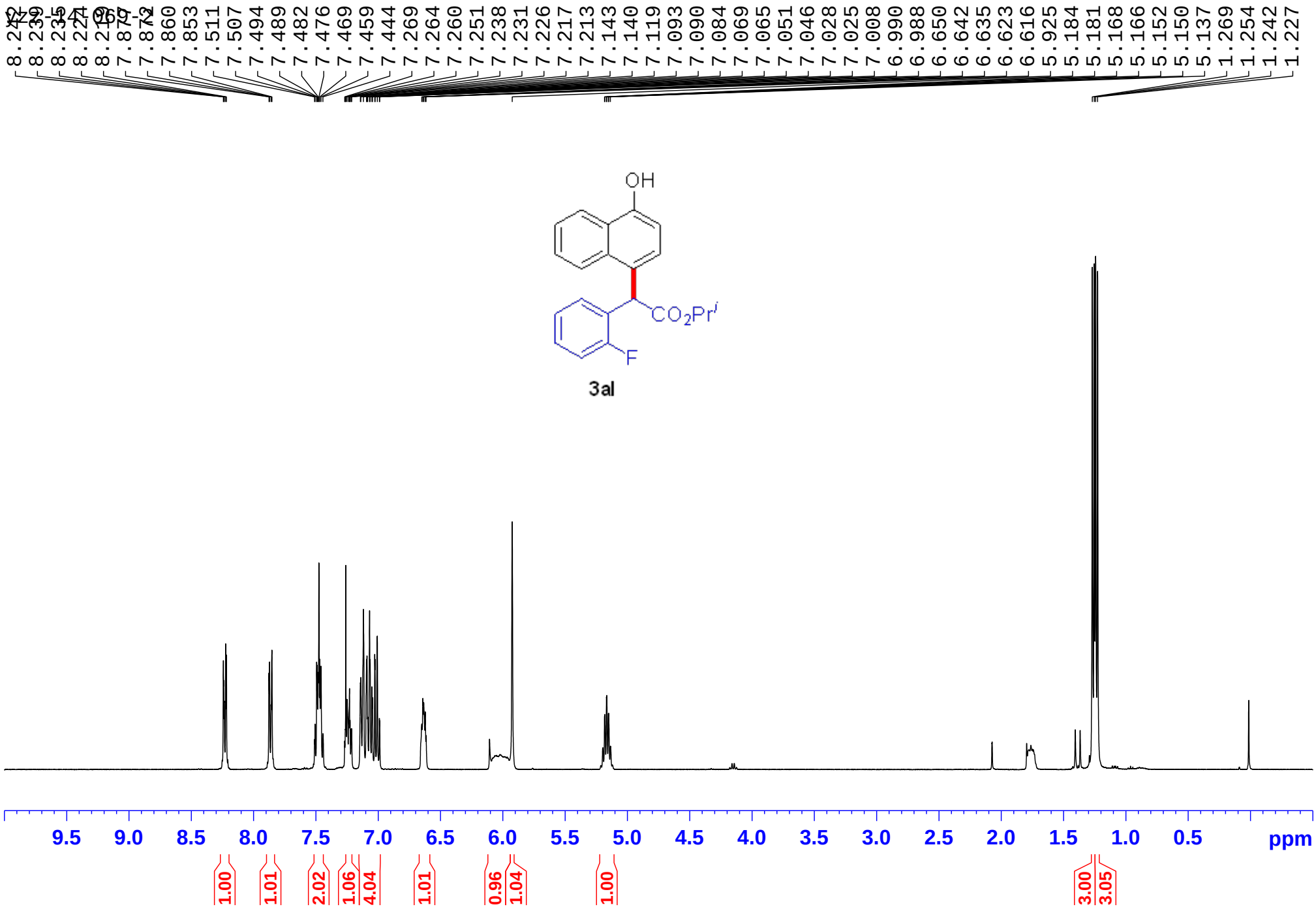
yzz-14-073-1-c



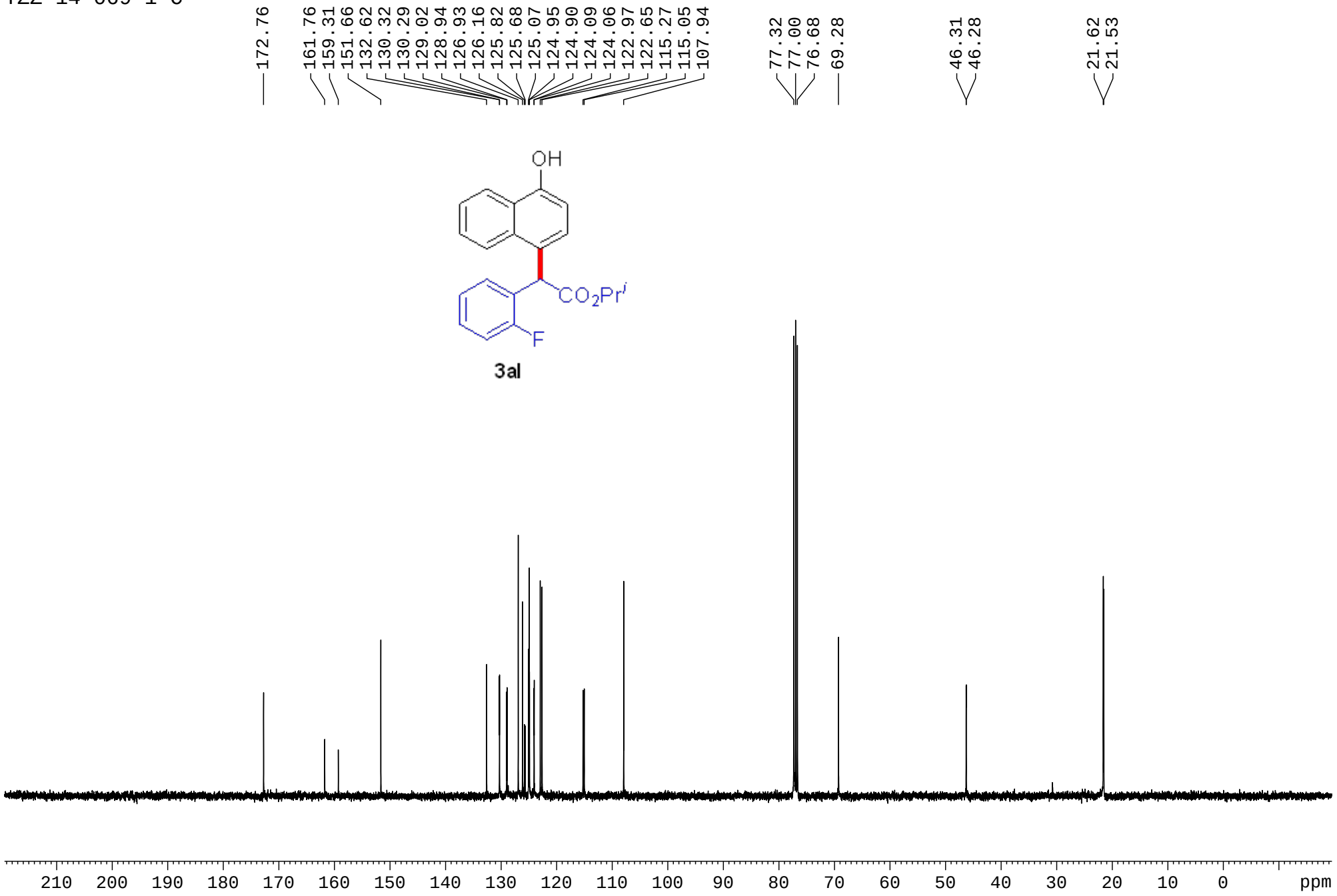
3ak

172.62
151.61
139.25
132.53
132.34
131.36
131.04
130.72
130.40
129.02
128.10
127.06
126.47
125.84
125.76
125.72
125.68
125.64
125.39
125.05
125.01
124.20
124.17
122.80
122.75
122.68
119.97
107.93
77.32
77.00
76.68
69.42
53.20
21.59
21.56

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


8.242
8.239
8.234
8.224
8.217
7.872
7.860
7.853
7.511
7.507
7.494
7.489
7.482
7.476
7.469
7.459
7.444
7.269
7.264
7.260
7.251
7.238
7.231
7.226
7.217
7.213
7.143
7.140
7.119
7.093
7.090
7.084
7.069
7.065
7.051
7.046
7.028
7.025
7.008
6.990
6.988
6.650
6.642
6.635
6.623
6.616
5.925
5.184
5.181
5.168
5.166
5.152
5.150
5.137
1.269
1.254
1.242
1.227
OH
CO2Pri
F
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
1.00
1.01
2.02
1.06
4.04
1.01
0.96
1.04
1.00
3.00
3.05

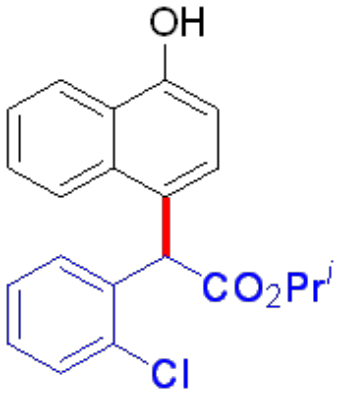
YZZ-14-069-1-C


172.76
161.76
159.31
151.66
132.62
130.32
130.29
129.02
128.94
126.93
126.16
125.82
125.68
125.07
124.95
124.90
124.09
124.06
122.97
122.65
115.27
115.05
107.94
77.32
77.00
76.68
69.28
46.31
46.28
21.62
21.53
OH
CO2Pri
F
3al
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

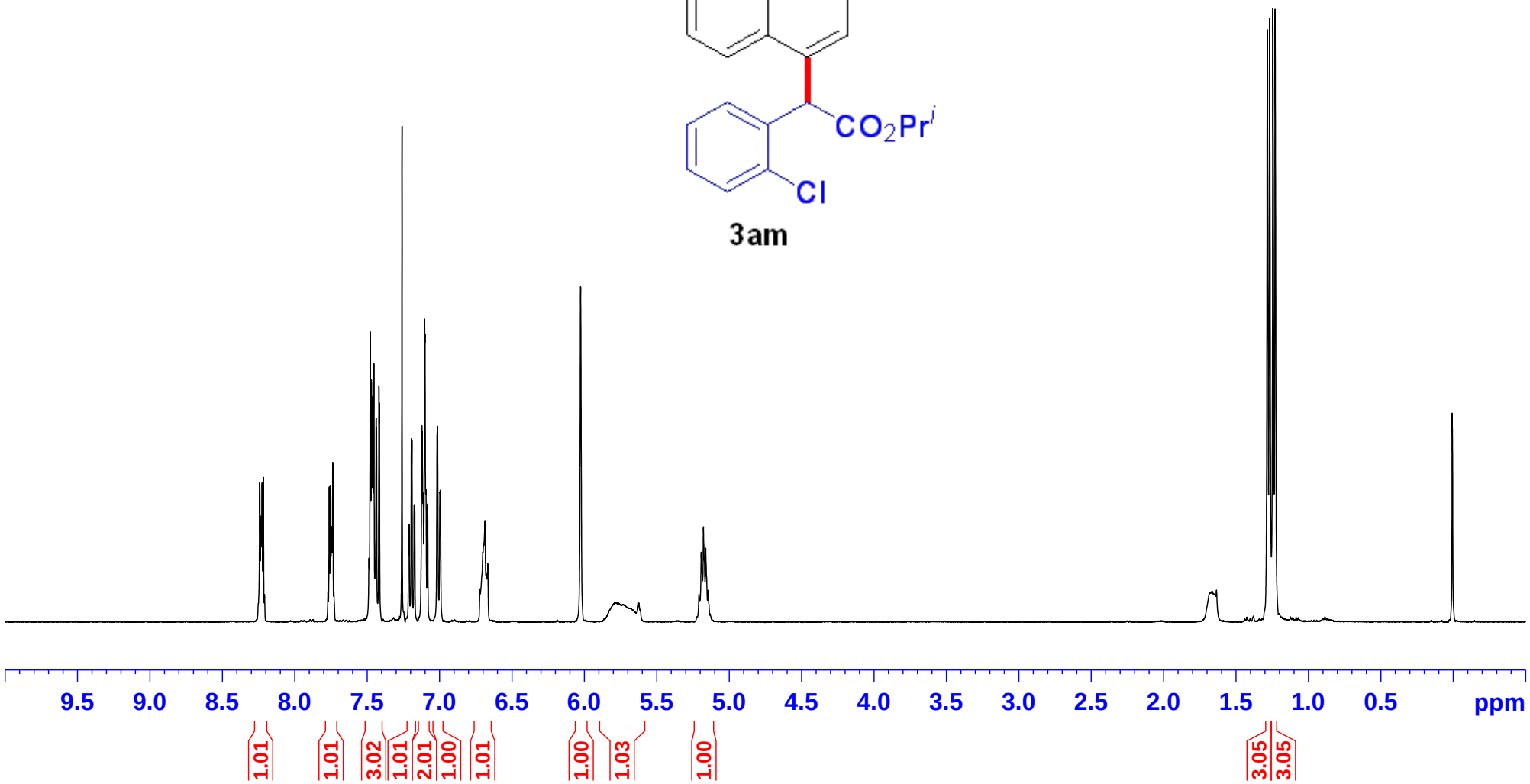
yzz-14-060-3

7.753 7.747 7.743 7.737 7.471 7.463 7.454 7.439 7.436 7.419 7.416 7.260 7.195 7.191 7.176 7.172 7.123 7.120 7.114 7.104 7.101 7.095 7.085 7.082 6.722 6.697 6.687 6.678 6.668 6.027 5.783 5.766 5.737 5.194 5.178 5.163 5.147

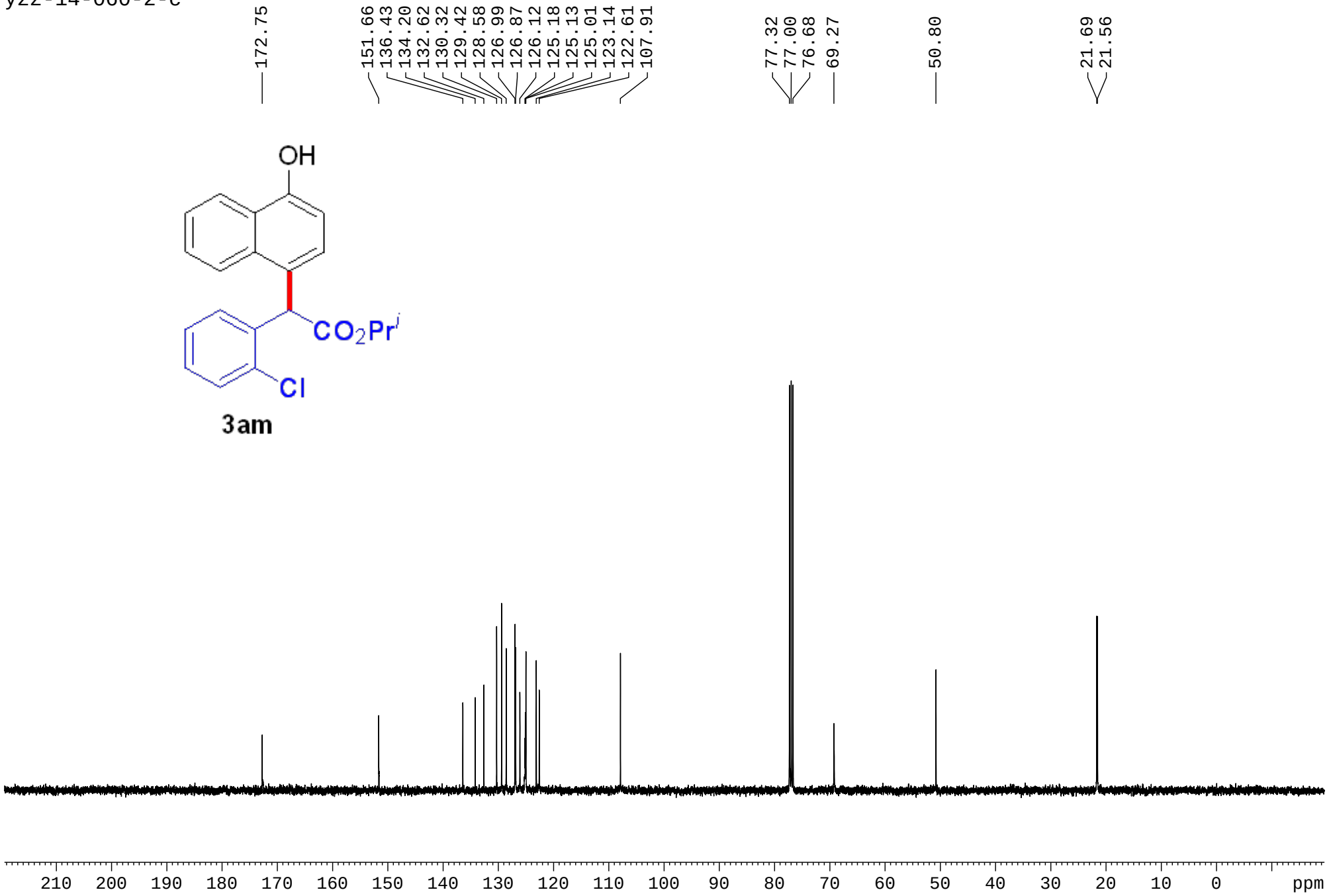
1.285 1.269 1.246 1.231



3am



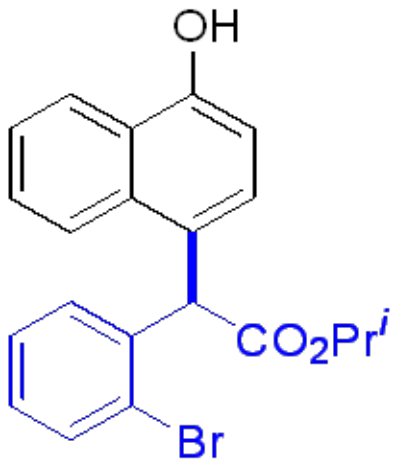
yzz-14-060-2-c


172.75
151.66
136.43
134.20
132.62
130.32
129.42
128.58
126.99
126.87
126.12
125.18
125.13
125.01
123.14
122.61
107.91
77.32
77.00
76.68
69.27
50.80
21.69
21.56
OH
CO2Pri
Cl
3am
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

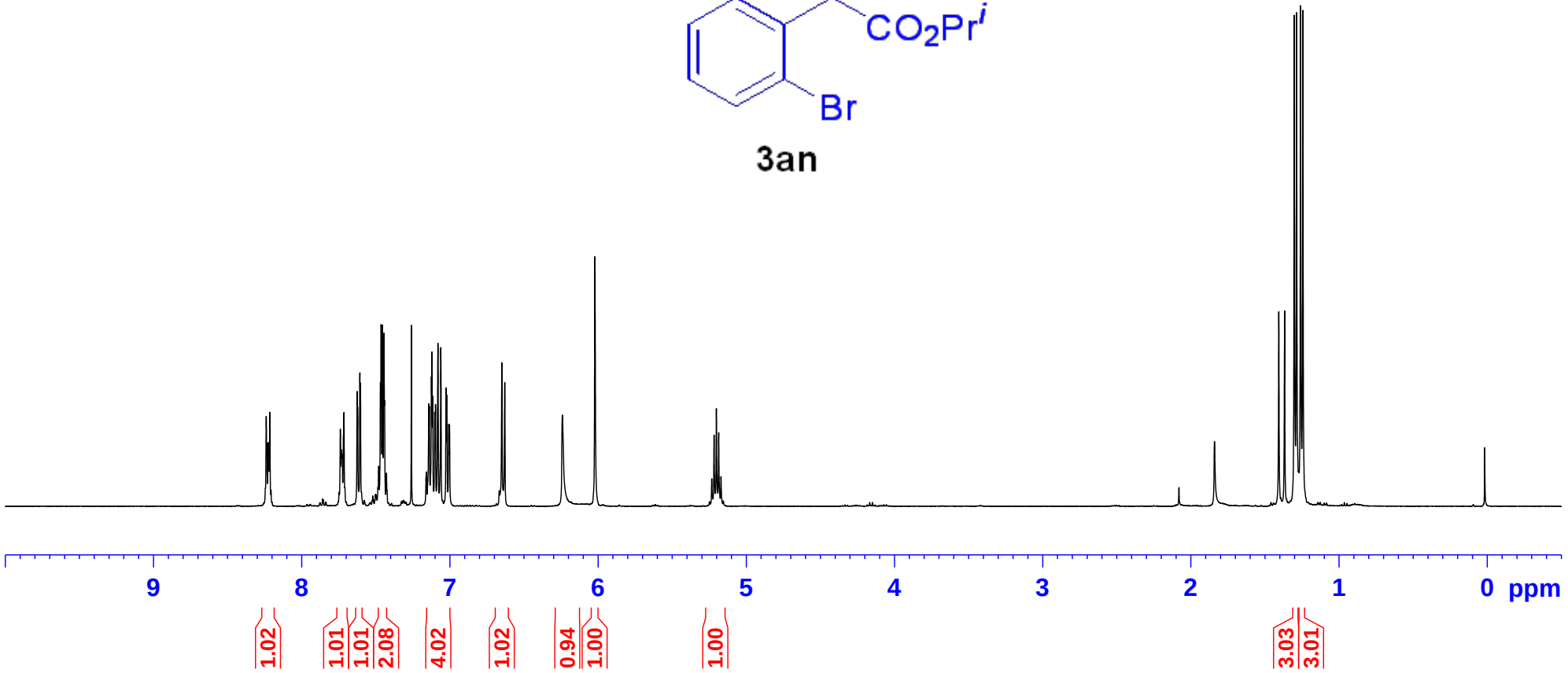
YZZ-14-070-1

7.734 7.730 7.727 7.719 7.716 7.627 7.623 7.608 7.604 7.469 7.465 7.455 7.445 7.441 7.260 7.143 7.140 7.125 7.122 7.116 7.103 7.098 7.081 7.062 7.027 7.021 7.008 7.003 6.650 6.630 6.241 6.022 5.234 5.218 5.202 5.187 5.171

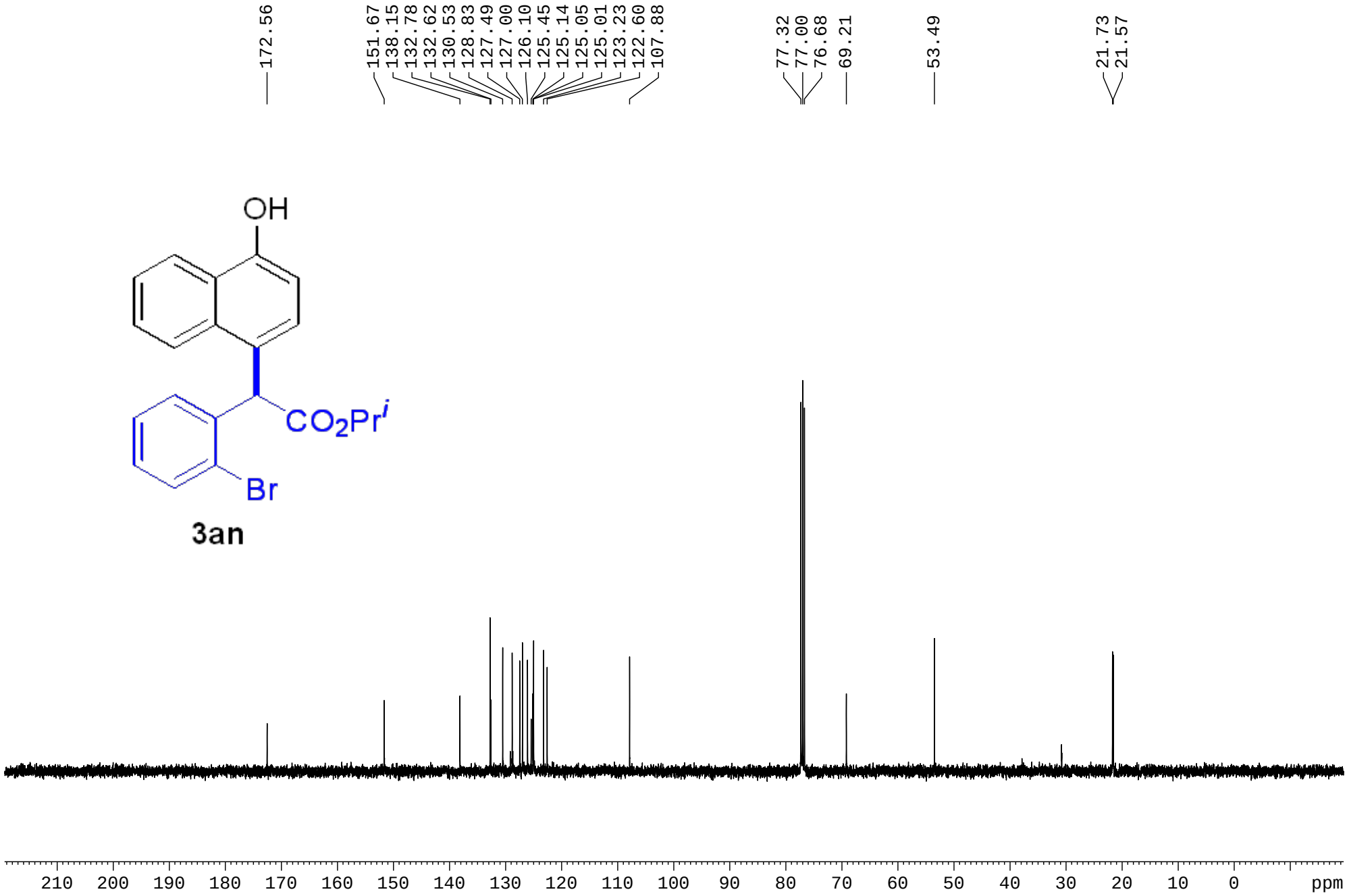
1.303 1.288 1.261 1.245



3an



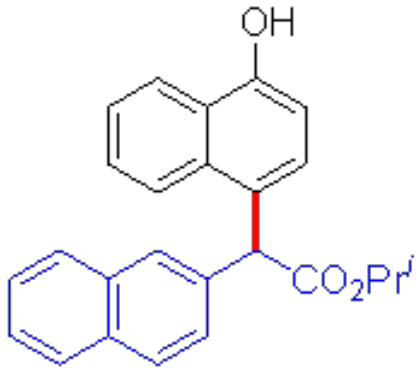
YZZ-14-070-1-C


172.56
151.67
138.15
132.78
132.62
130.53
128.83
127.49
127.00
126.10
125.45
125.14
125.05
125.01
123.23
122.60
107.88
77.32
77.00
76.68
69.21
53.49
21.73
21.57
OH
CO2Pri
Br
3an
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

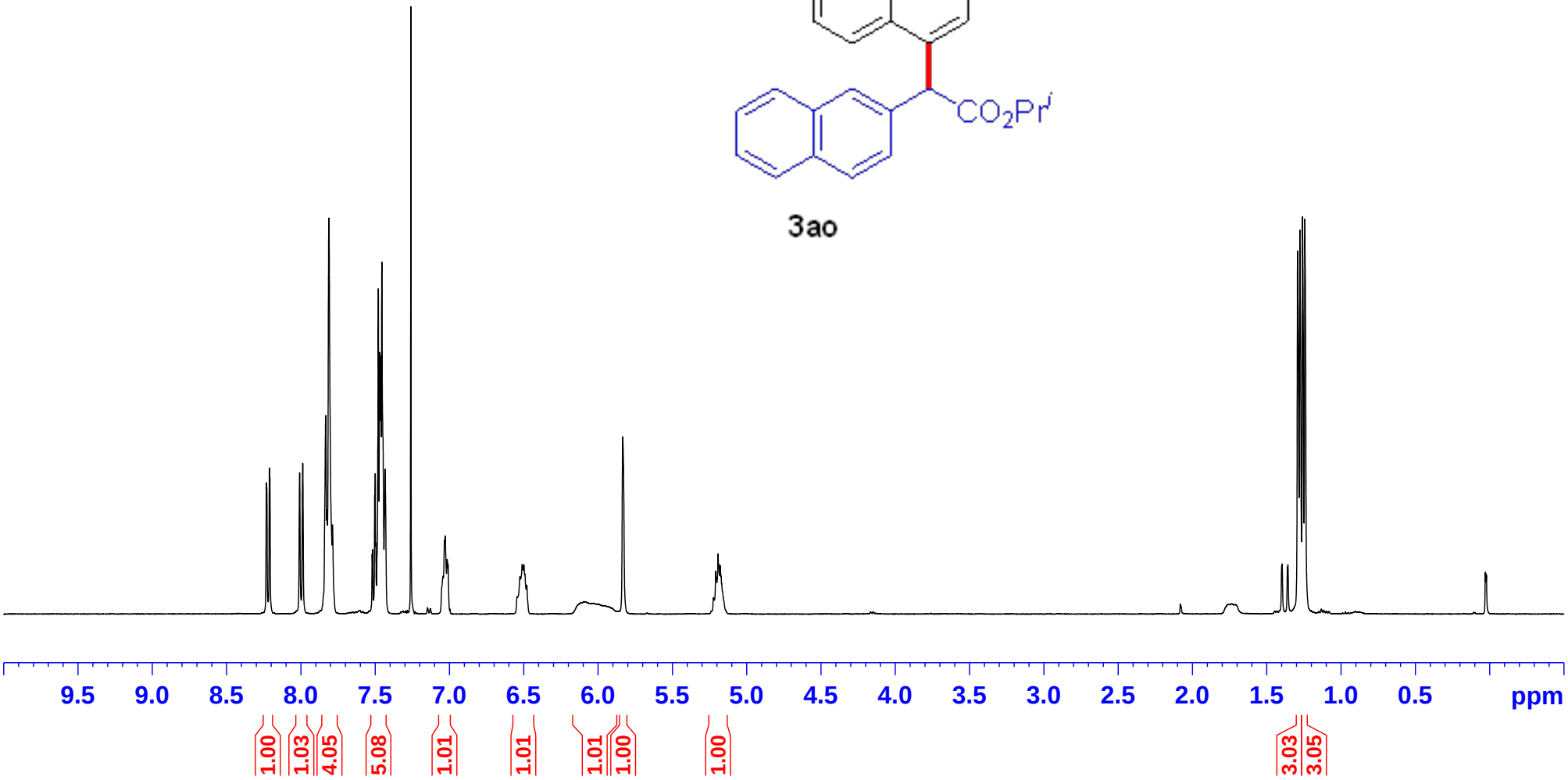
yzz-14-072-2

8.212 8.209 8.008 7.987 7.833 7.824 7.812 7.787 7.503 7.500 7.479 7.470 7.464 7.455 7.434 7.044 7.034 7.029 7.015 7.010 6.545 6.526 6.511 6.499 6.492 6.480 6.030 5.994 5.834 5.224 5.220 5.209 5.204 5.193 5.188 5.184 5.178 5.173

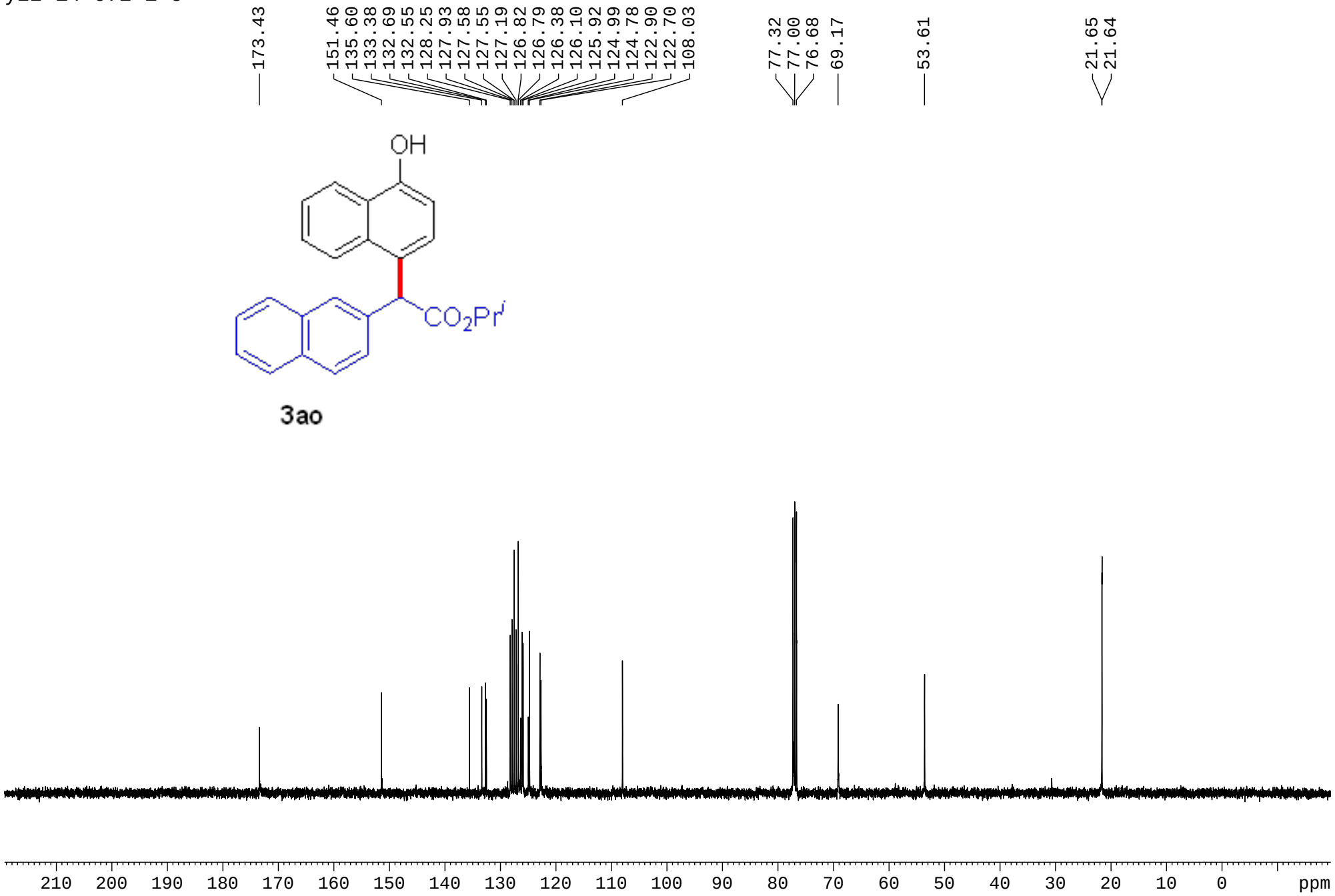
1.293 1.278 1.260 1.244



3ao



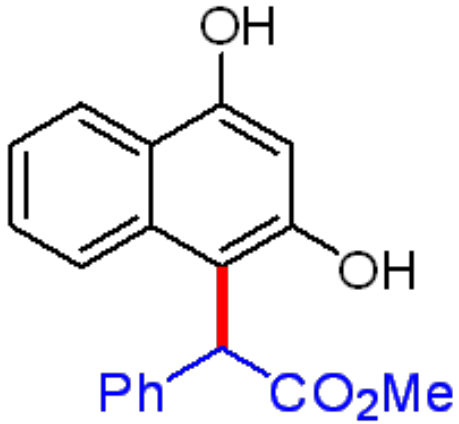
yzz-14-072-1-c



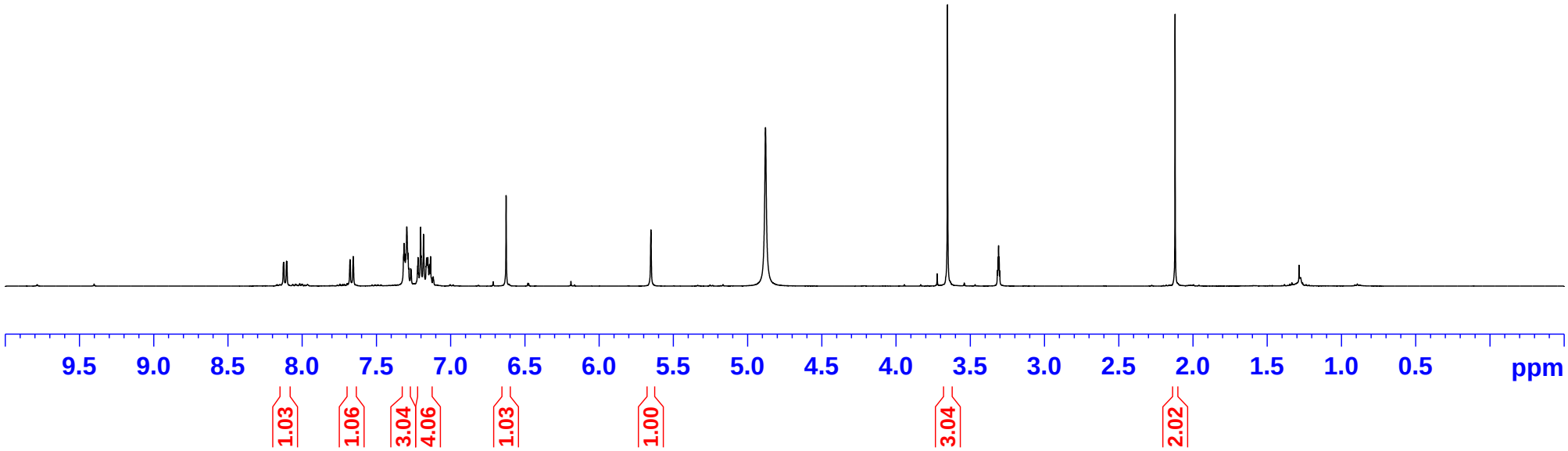
3ao

8.126
8.124
8.105
8.103
7.678
7.656
7.316
7.313
7.307
7.303
7.295
7.287
7.282
7.269
7.265
7.222
7.220
7.202
7.198
7.183
7.165
7.162
7.159
7.153
7.150
7.145
7.142
7.135
6.626
5.652
4.880
3.654
3.318
3.314
3.310
3.306
3.302
2.121

yzz-14-138-2

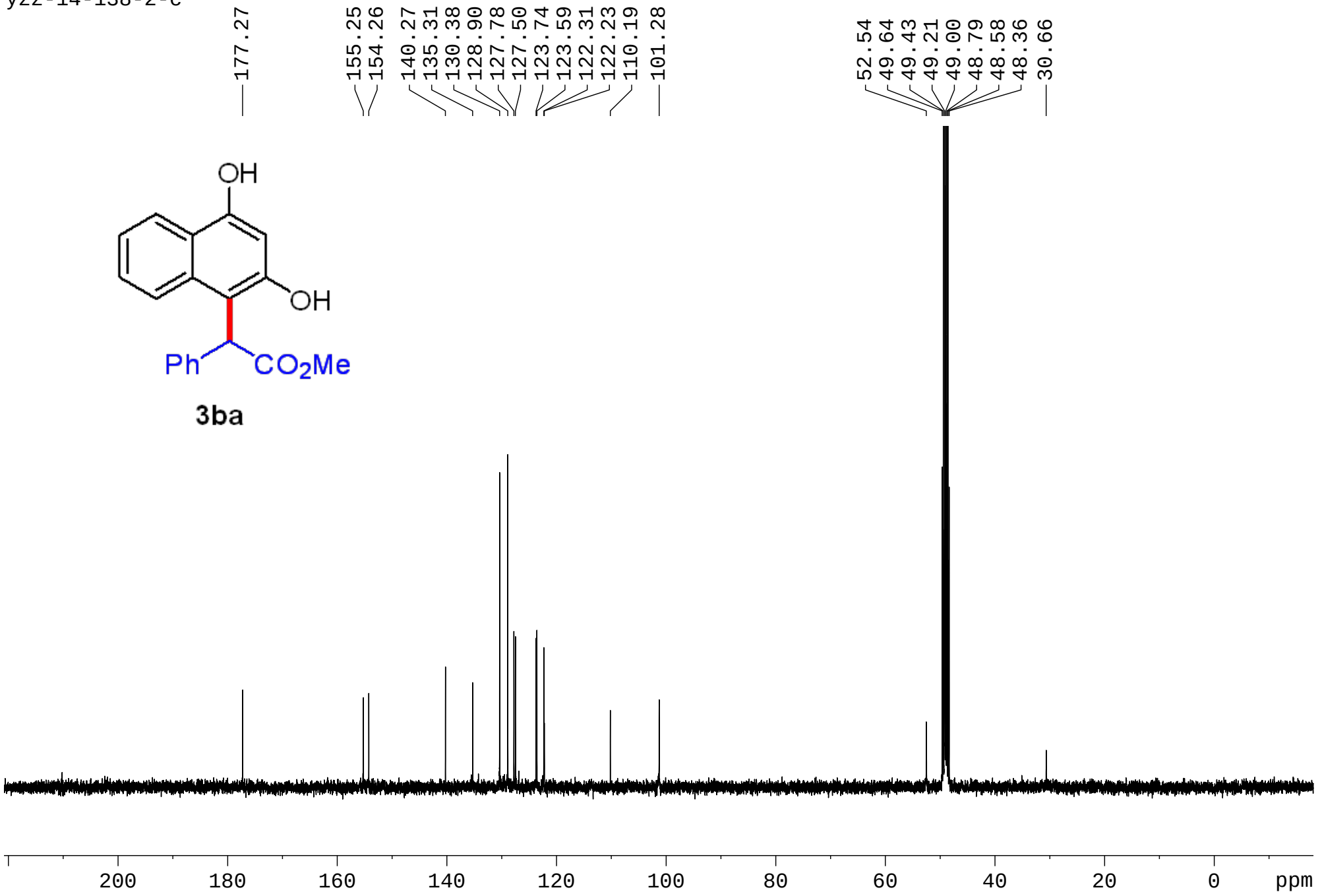


3ba



yzz-14-138-2-c

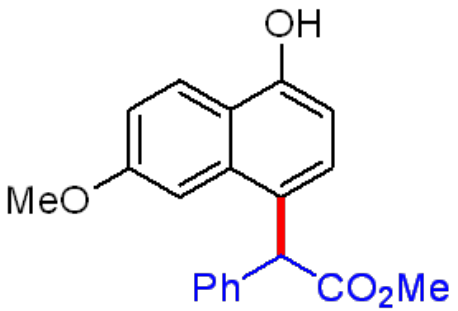
3ba



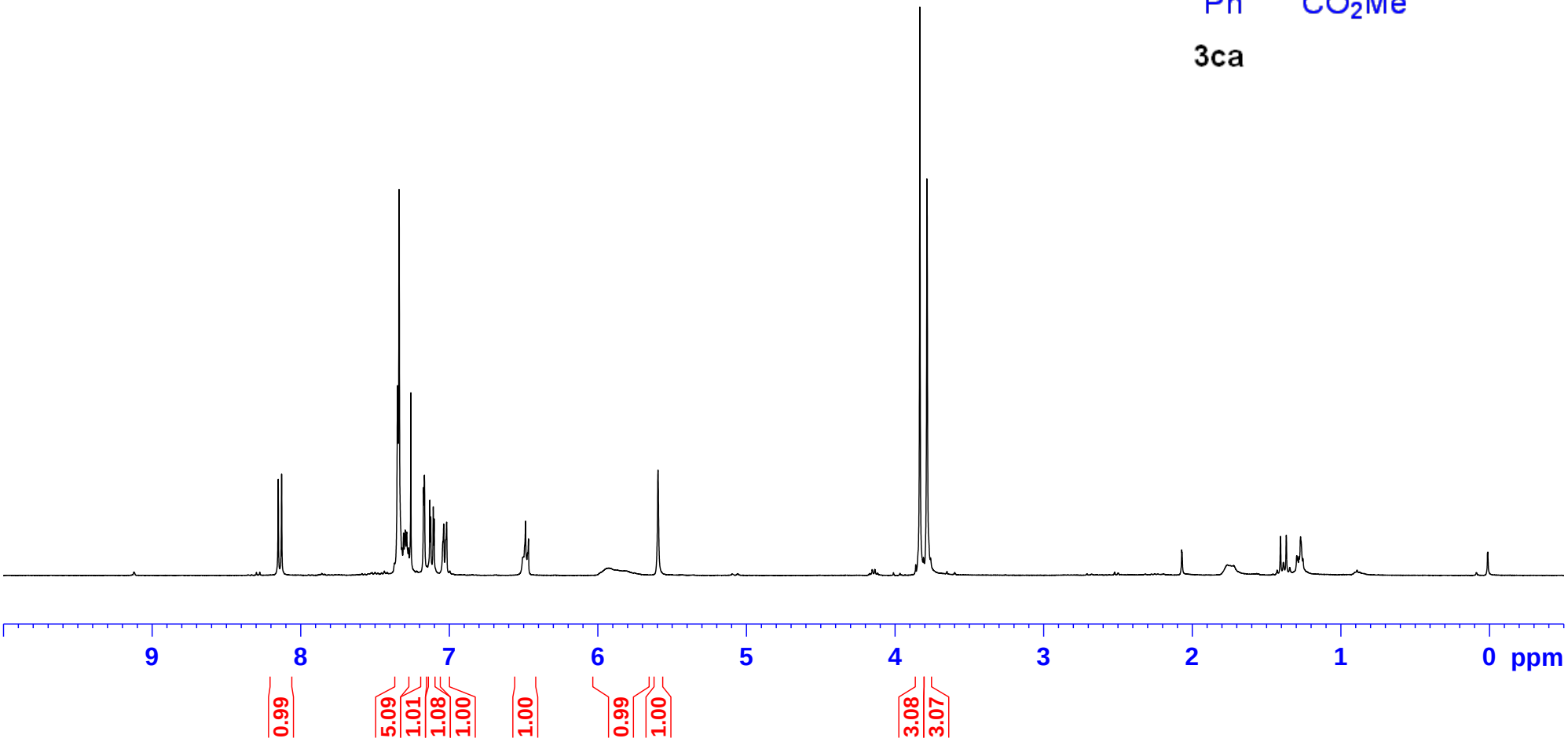
yzz-15-027-1

8.152
8.129
7.349
7.338
7.297
7.259
7.173
7.168
7.131
7.125
7.108
7.102
7.038
7.018
6.487
6.468
5.927
5.596

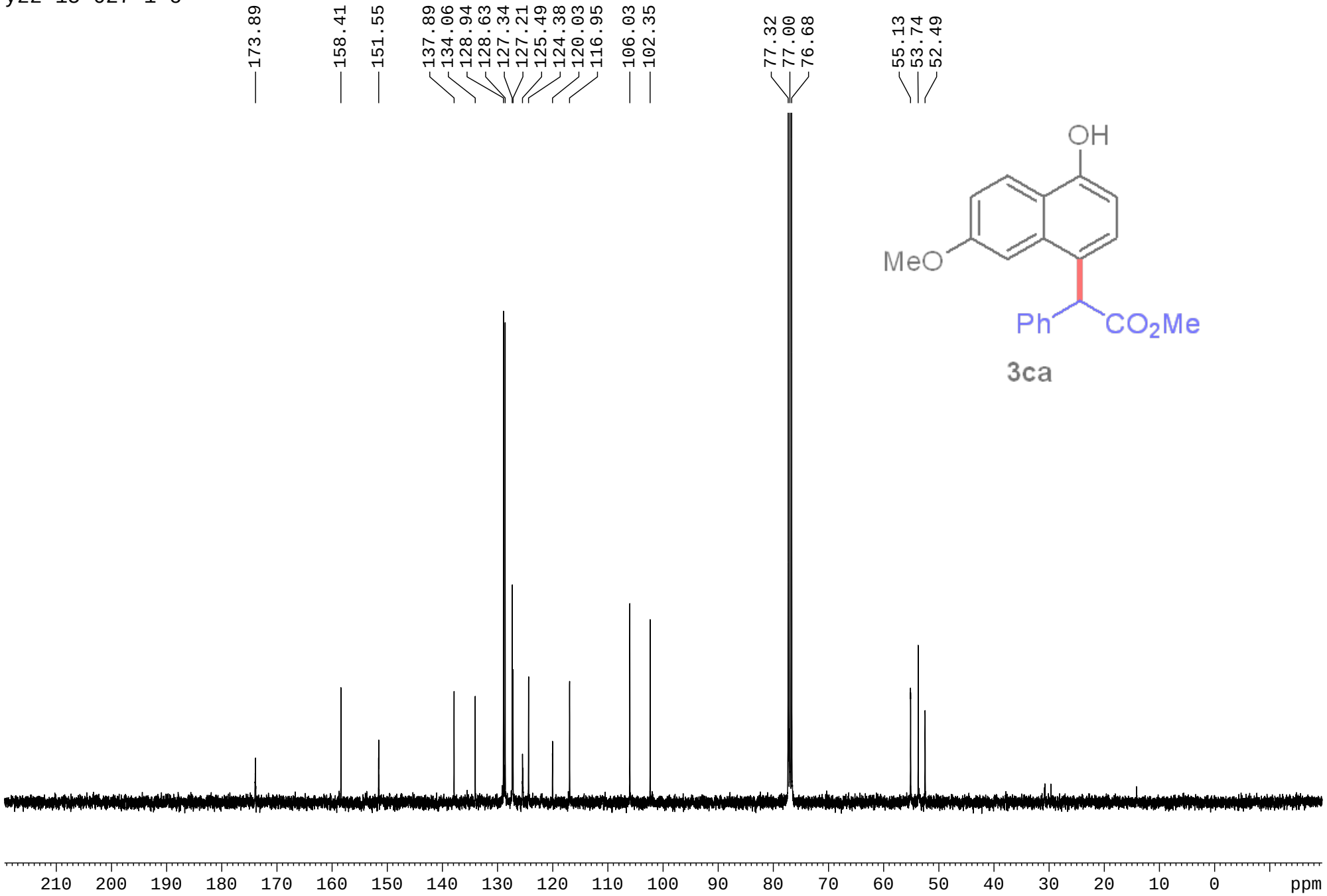
3.833
3.786



3ca



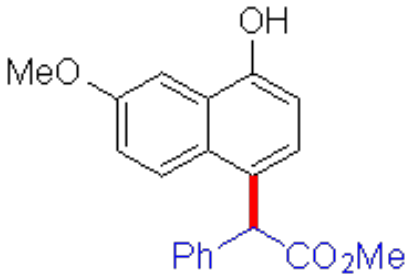
yzz-15-027-1-c


173.89
158.41
151.55
137.89
134.06
128.94
128.63
127.34
127.21
125.49
124.38
120.03
116.95
106.03
102.35
77.32
77.00
76.68
55.13
53.74
52.49
OH
MeO
Ph
CO2Me
3ca
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

yzz-15-029-1

7.829 7.806 7.504 7.497 7.366 7.363 7.359 7.345 7.342 7.328 7.324 7.312 7.308 7.305 7.301 7.291 7.283 7.274 7.267 7.260 7.179 7.172 7.155 7.149 6.920 6.900 6.547 6.527 6.321 5.696

3.895 3.795

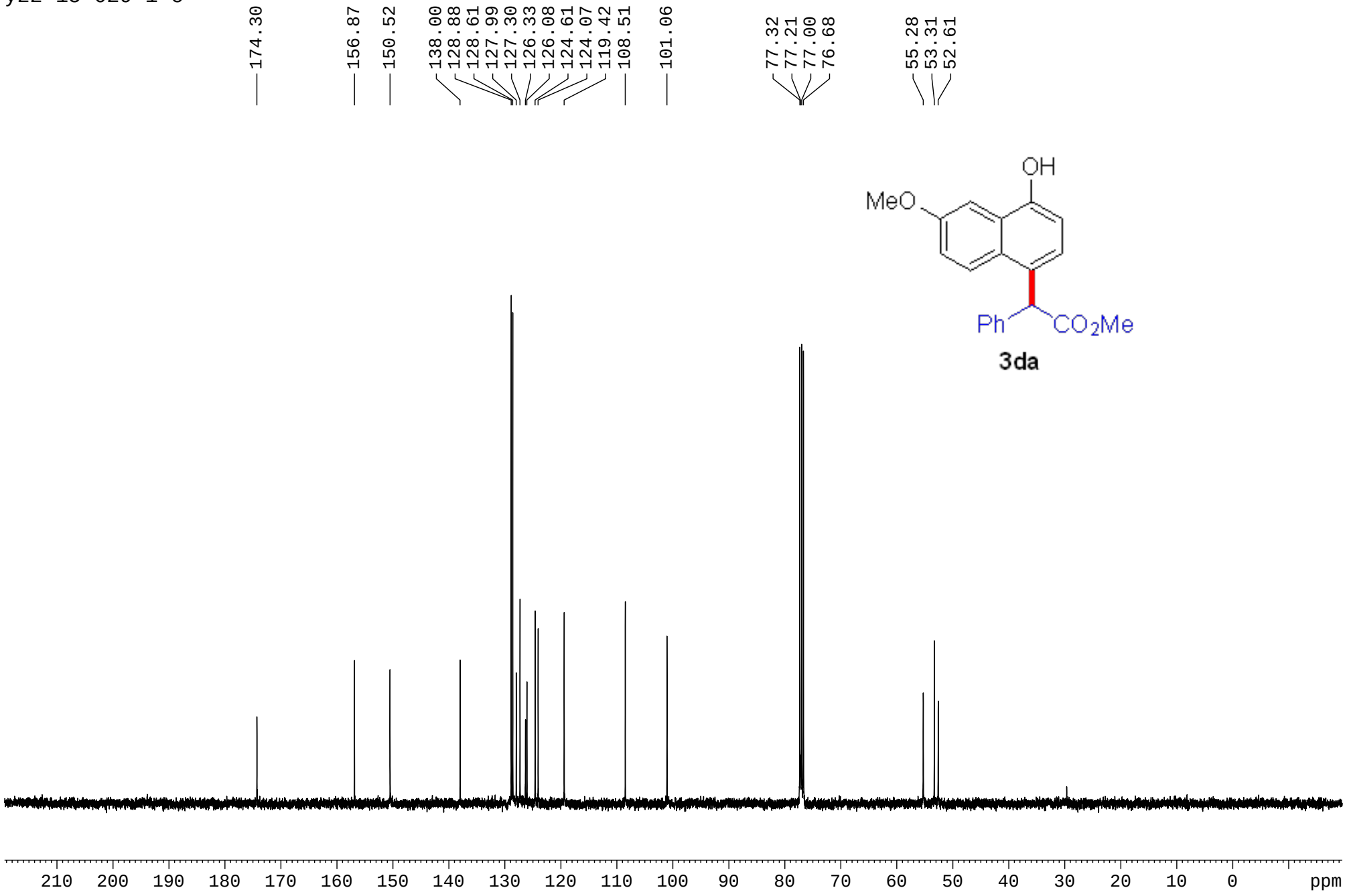


3da

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

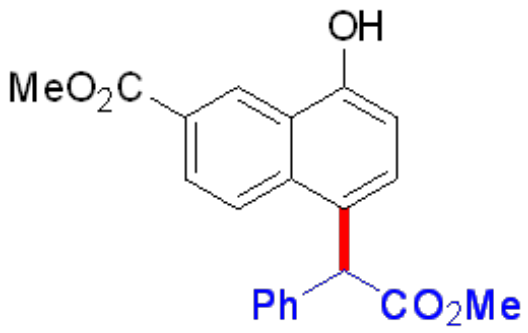
1.04 1.07 5.08 1.04 1.02 1.01 0.99 1.00 3.04 3.03

yzz-15-029-1-c

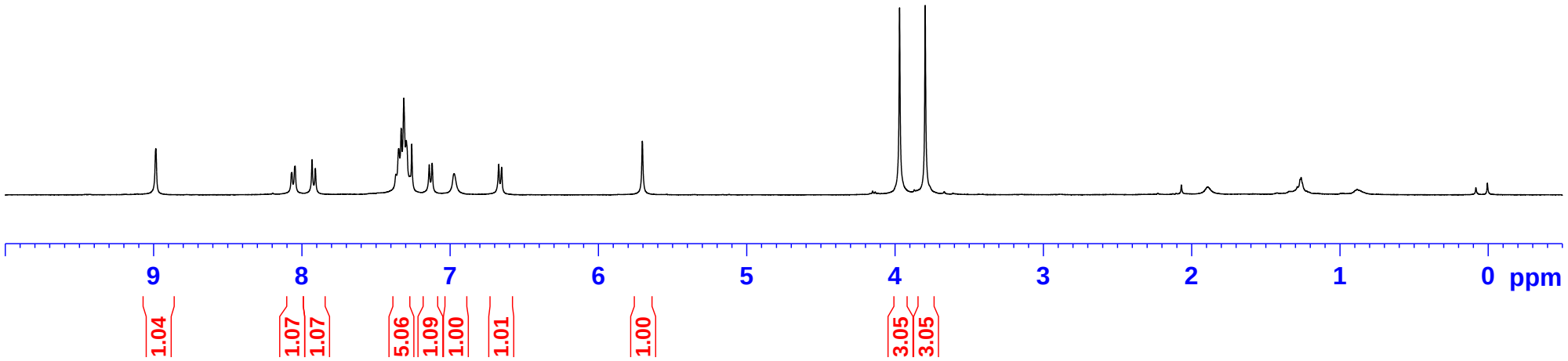

174.30
156.87
150.52
138.00
128.88
128.61
127.99
127.30
126.33
126.08
124.61
124.07
119.42
108.51
101.06
77.32
77.21
77.00
76.68
55.28
53.31
52.61
OH
MeO
Ph
CO2Me
3da
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

yzz-15-043-1

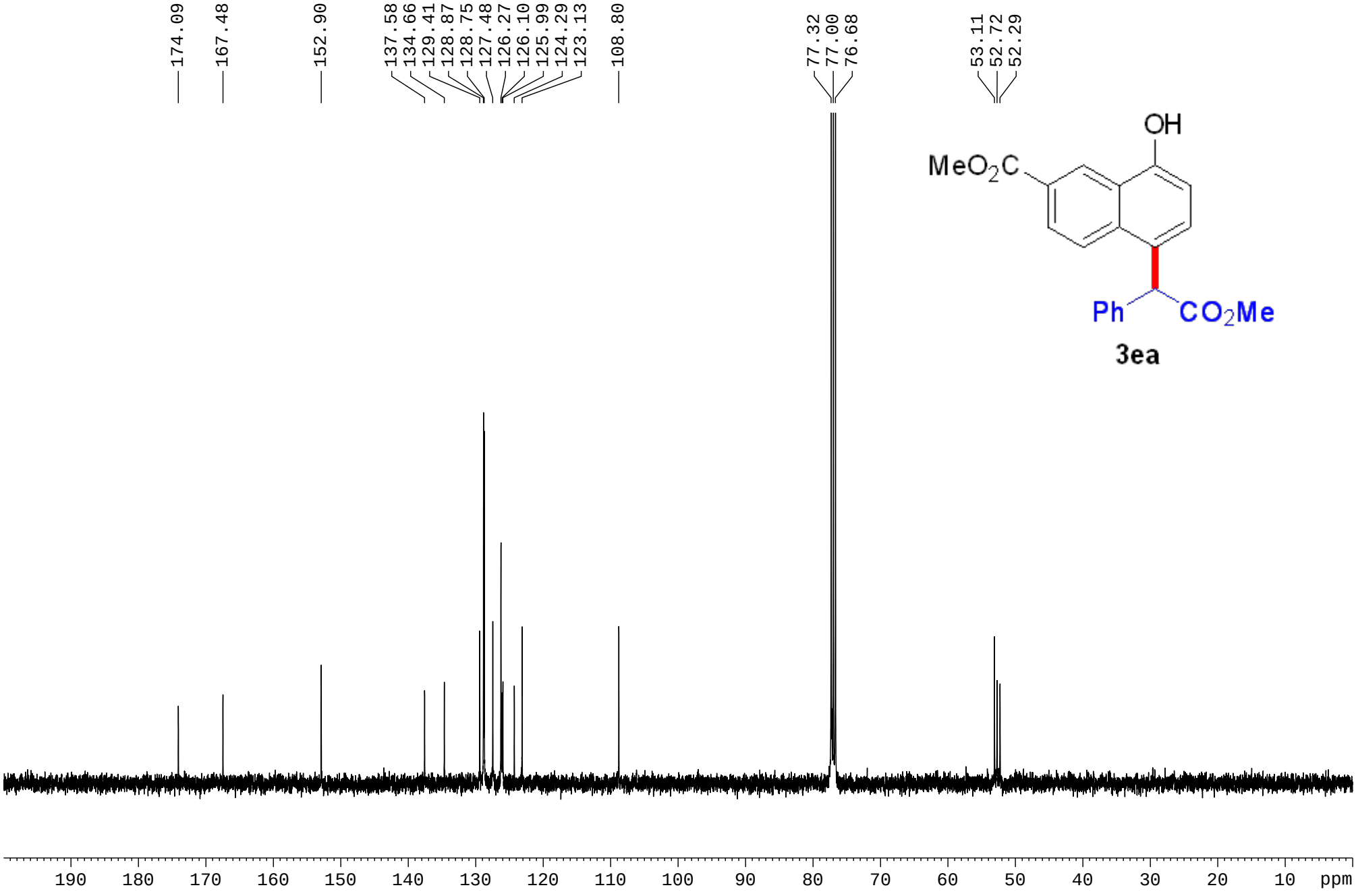
8.984
8.068
8.049
8.046
7.932
7.910
7.367
7.348
7.331
7.313
7.296
7.273
7.260
7.142
7.122
6.975
6.673
6.653
5.705
3.970
3.797



3ea

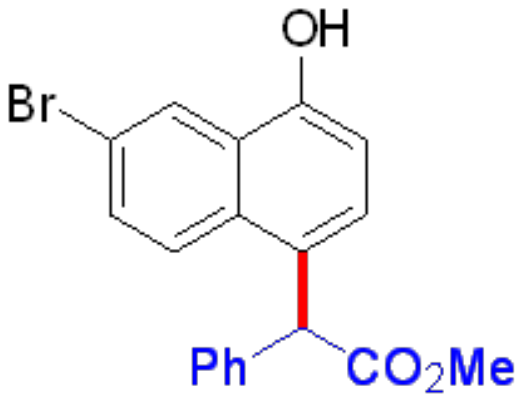


yzz-15-043-1-c


174.09
167.48
152.90
137.58
134.66
129.41
128.87
128.75
127.48
126.27
126.10
125.99
124.29
123.13
108.80
77.32
77.00
76.68
53.11
52.72
52.29
OH
MeO2C
Ph
CO2Me
3ea
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

yzz-14-137-1

8.343
8.338
7.755
7.733
7.561
7.556
7.539
7.534
7.362
7.358
7.341
7.317
7.305
7.285
7.260
7.000
6.980
6.509
6.489
6.140
5.653
3.804



3fa

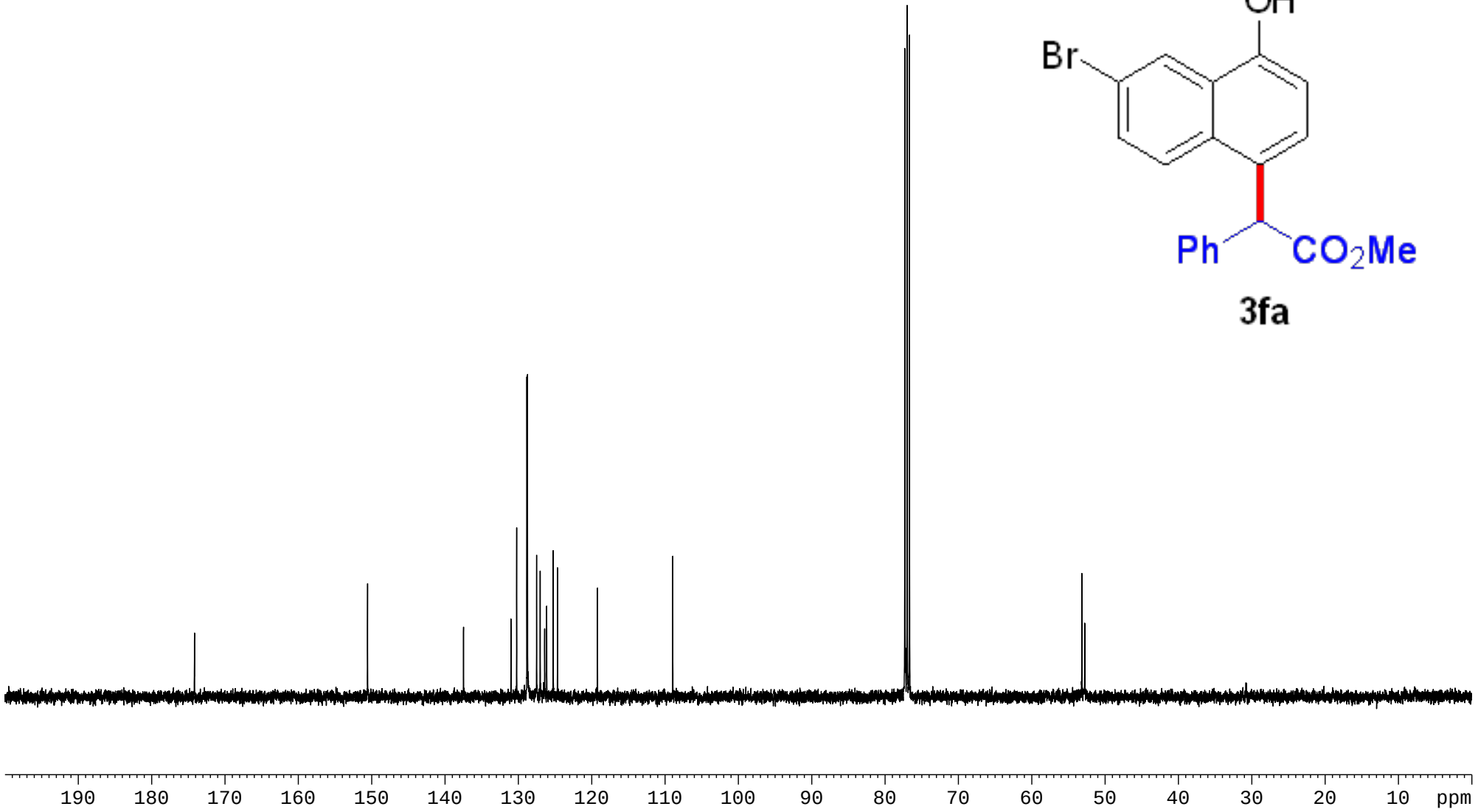
9 8 7 6 5 4 3 2 1 0 ppm

1.00 1.04 1.09 5.09 1.02 1.01 0.97 1.00 3.03

yzz-14-137-1-c

174.15
150.57
137.49
131.02
130.24
128.85
128.76
127.52
127.04
126.43
126.14
125.27
124.67
119.22
108.96
77.32
77.00
76.68
53.18
52.78

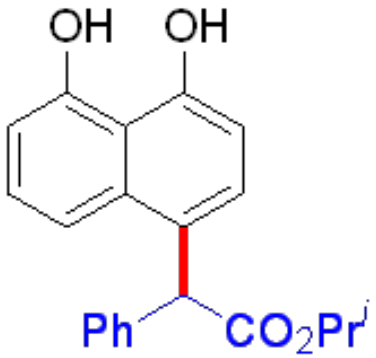
3fa



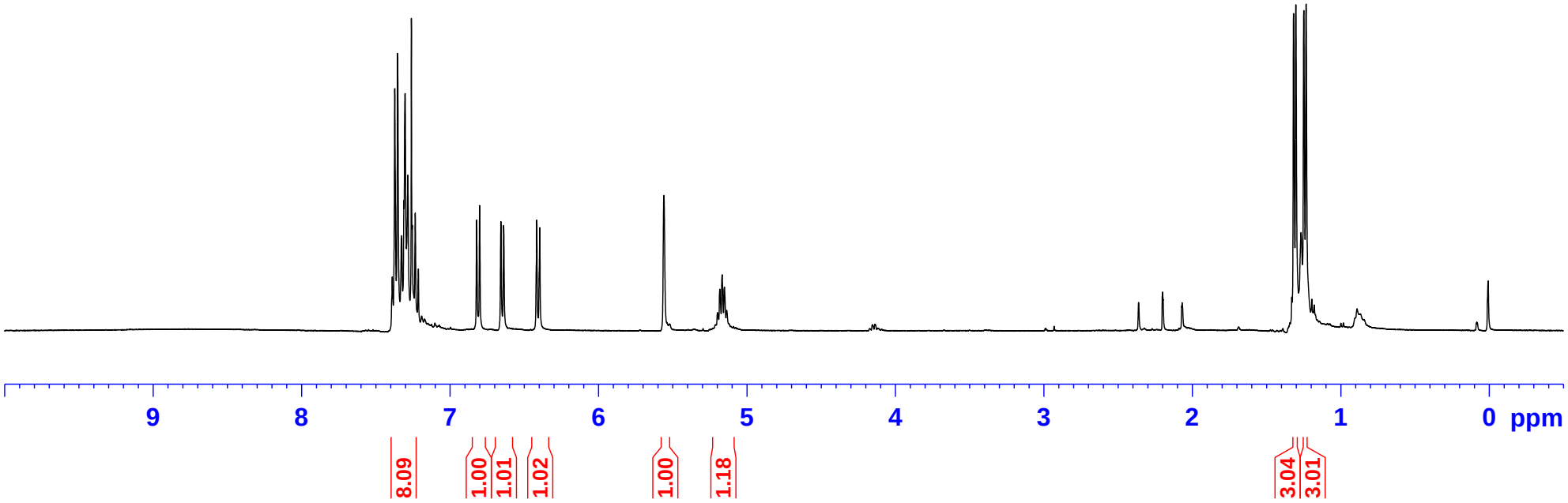
yzz-14-056-2

7.389
7.372
7.352
7.328
7.325
7.311
7.303
7.284
7.260
7.254
7.234
7.213
6.820
6.800
6.657
6.638
6.415
6.395
5.559
5.198
5.183
5.167
5.151
5.136

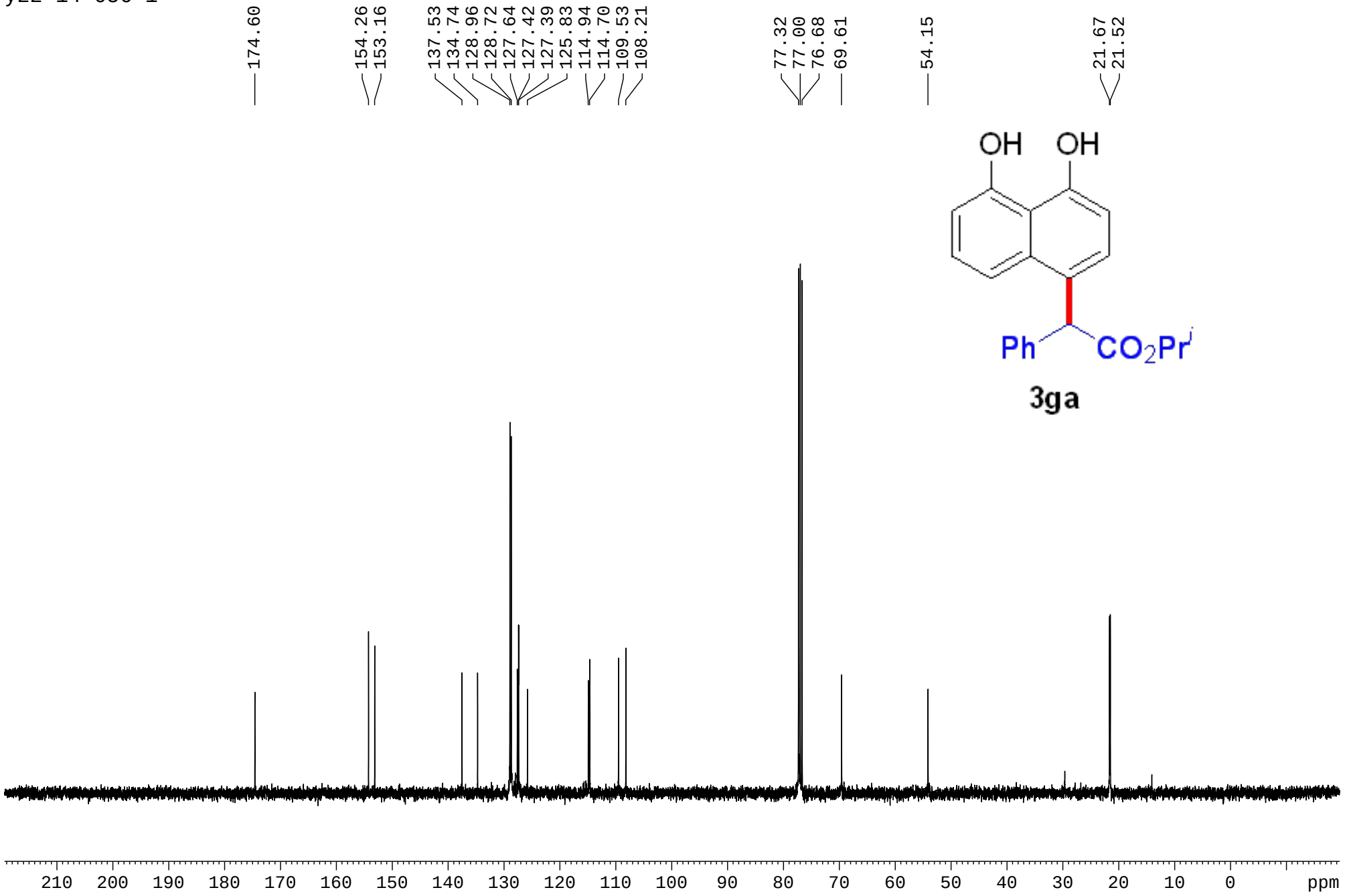
1.318
1.303
1.249
1.234



3ga



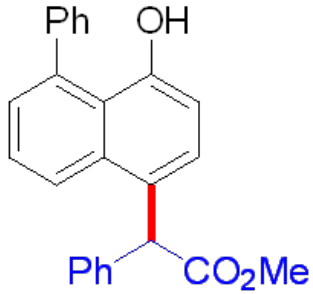
yzz-14-056-1


174.60
154.26
153.16
137.53
134.74
128.96
128.72
127.64
127.42
127.39
125.83
114.94
114.70
109.53
108.21
77.32
77.00
76.68
69.61
54.15
21.67
21.52
OH
OH
Ph
CO2Pri
3ga
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

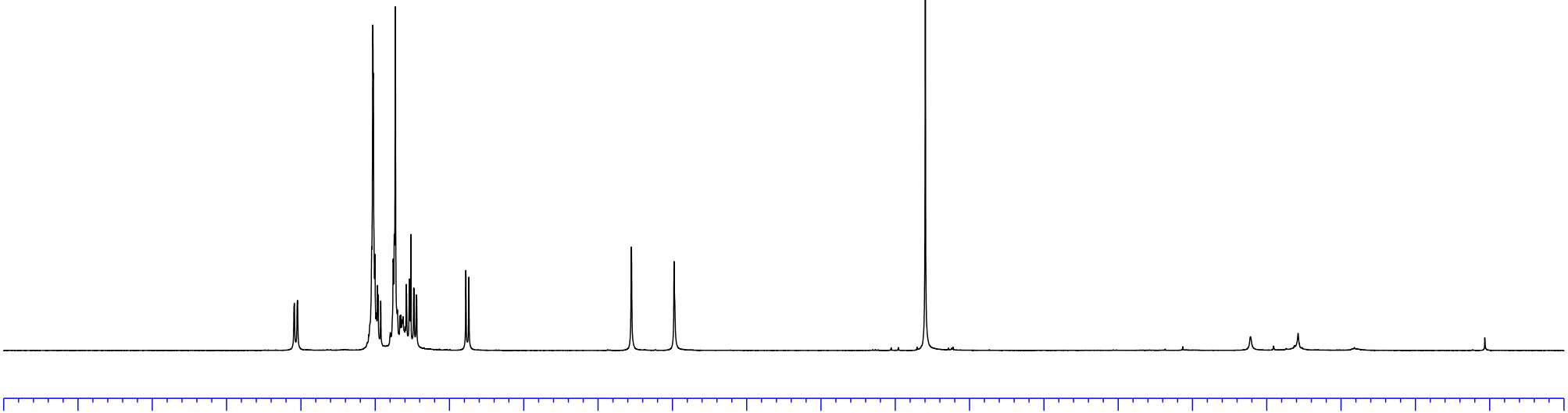
yzz-15-024-1

8.044
8.023
7.523
7.515
7.512
7.502
7.484
7.480
7.379
7.377
7.371
7.364
7.290
7.270
7.260
7.241
7.238
7.223
7.221
6.890
6.870
5.776
5.489

3.798



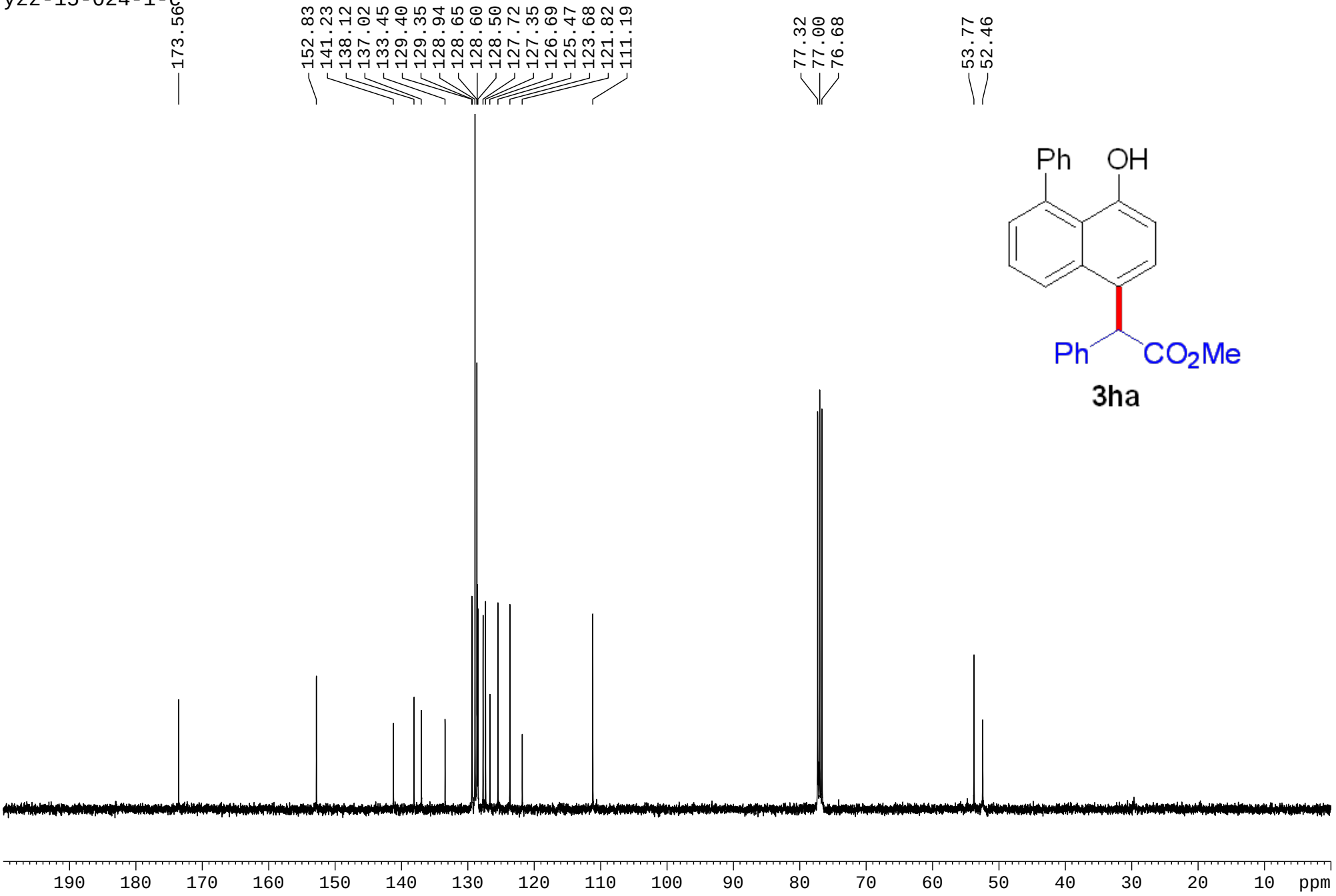
3ha



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

1.01 6.04 6.06 1.03 1.02 1.00 1.00 3.03

yzz-15-024-1-c


173.56
152.83
141.23
138.12
137.02
133.45
129.40
129.35
128.94
128.65
128.60
128.50
127.72
127.35
126.69
125.47
123.68
121.82
111.19
77.32
77.00
76.68
53.77
52.46
Ph
OH
Ph
CO2Me
3ha
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

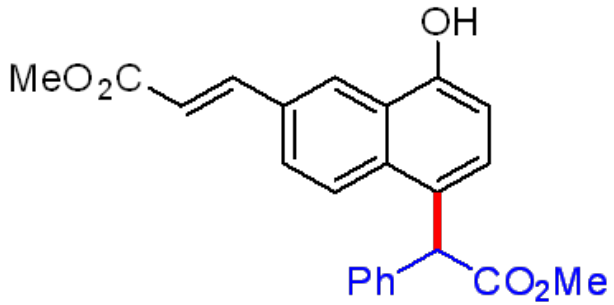
8.482
8.037
8.015
7.875
7.849
7.845
7.835
7.827
7.823
7.378
7.373
7.356
7.354
7.348
7.330
7.310
7.284
7.280
7.275
7.269
7.263
7.256
7.245
7.225
6.960
6.941
6.658
6.618
5.791

3.765
3.716

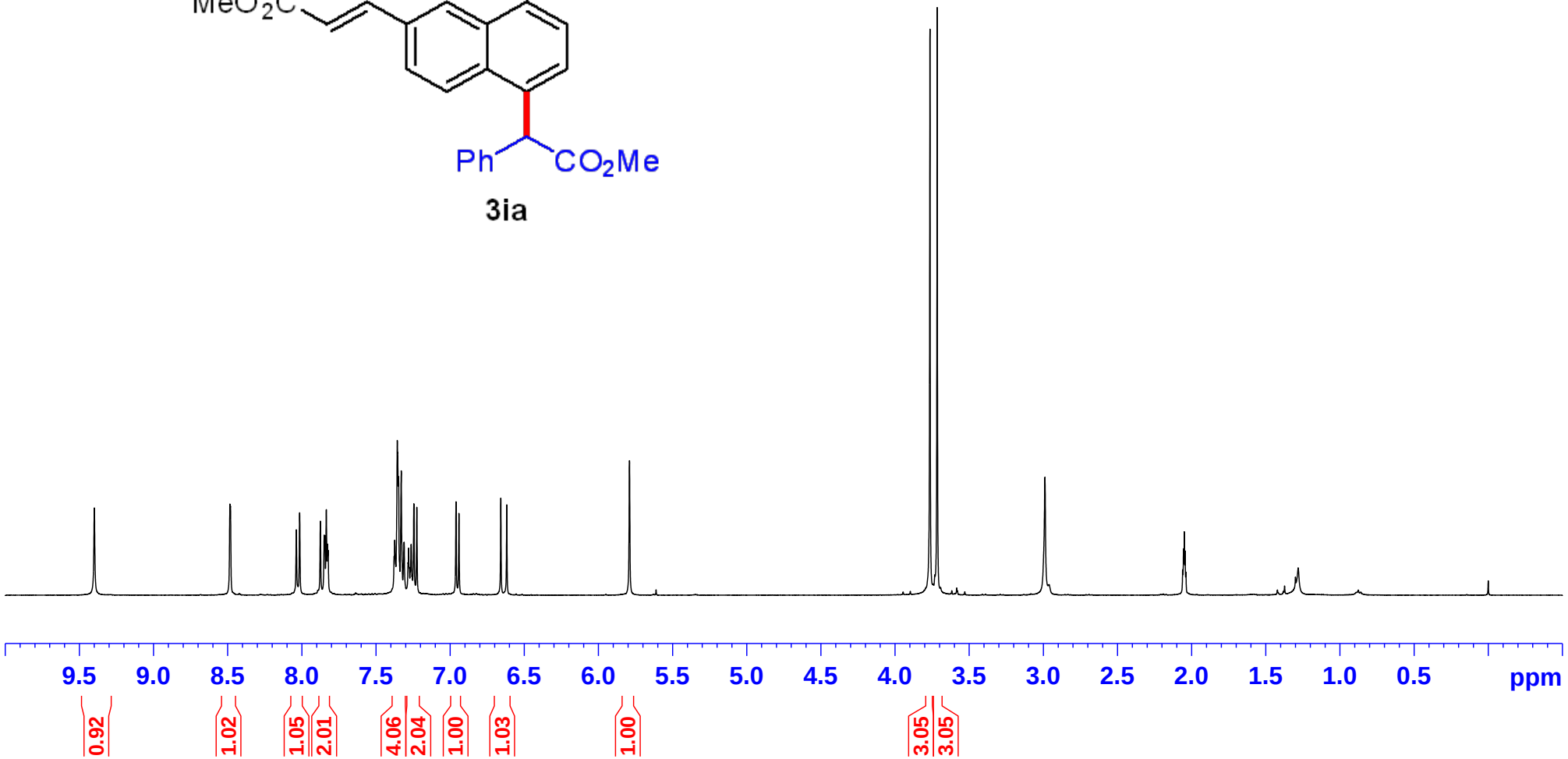
2.990

2.061
2.055
2.050
2.045

yzz-16-021-2

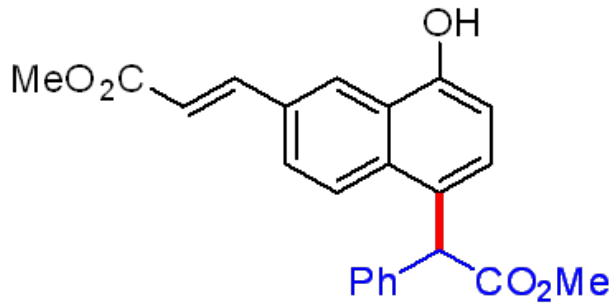


3ia



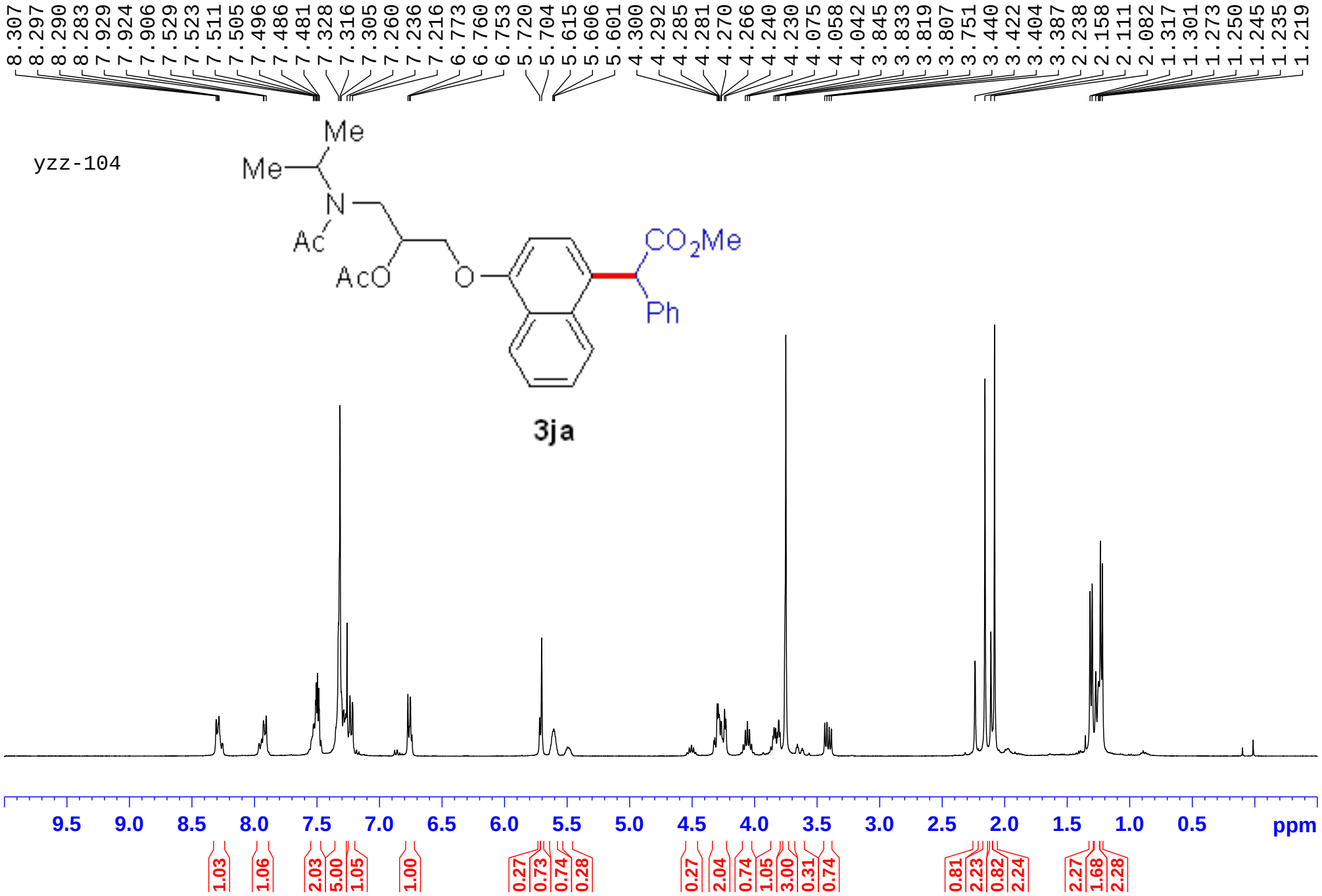
yzz-16-021-2-c

206.23
173.79
167.57
154.37
145.31
139.68
134.33
131.57
129.84
129.30
129.04
127.98
127.02
126.17
125.89
125.15
118.73
109.28
53.55
52.52
51.76
30.42
30.22
30.03
29.84
29.65
29.45
29.26



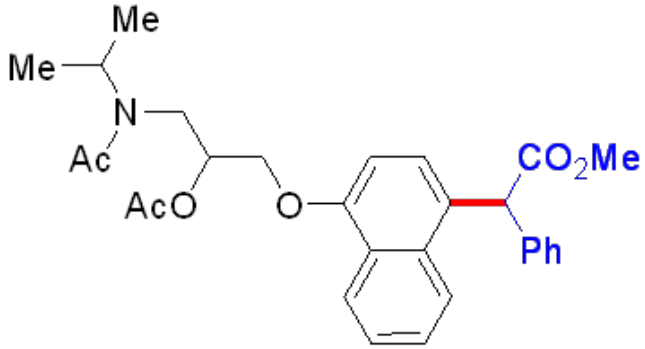
3ia

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

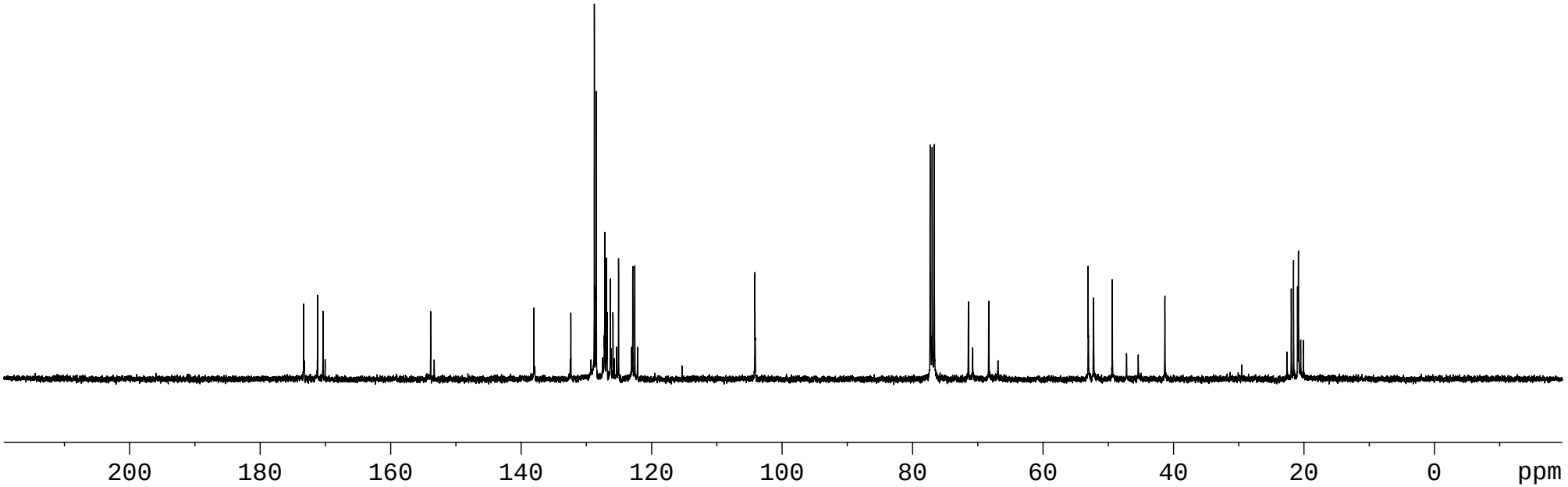

8.307
8.297
8.290
8.283
7.929
7.924
7.906
7.529
7.523
7.511
7.505
7.496
7.486
7.481
7.328
7.316
7.305
7.260
7.236
7.216
6.773
6.760
6.753
5.720
5.704
5.615
5.606
5.601
4.300
4.292
4.285
4.281
4.270
4.266
4.240
4.230
4.075
4.058
4.042
3.845
3.833
3.819
3.807
3.751
3.440
3.422
3.404
3.387
2.238
2.158
2.111
2.082
1.317
1.301
1.273
1.250
1.245
1.235
1.219
yzz-104
Me
Me
N
Ac
AcO
O
CO2Me
Ph
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
1.03
1.06
2.03
5.00
1.05
1.00
0.27
0.73
0.74
0.28
0.27
2.04
0.74
1.05
3.00
0.31
0.74
0.81
2.23
0.82
2.24
2.27
1.68
2.28

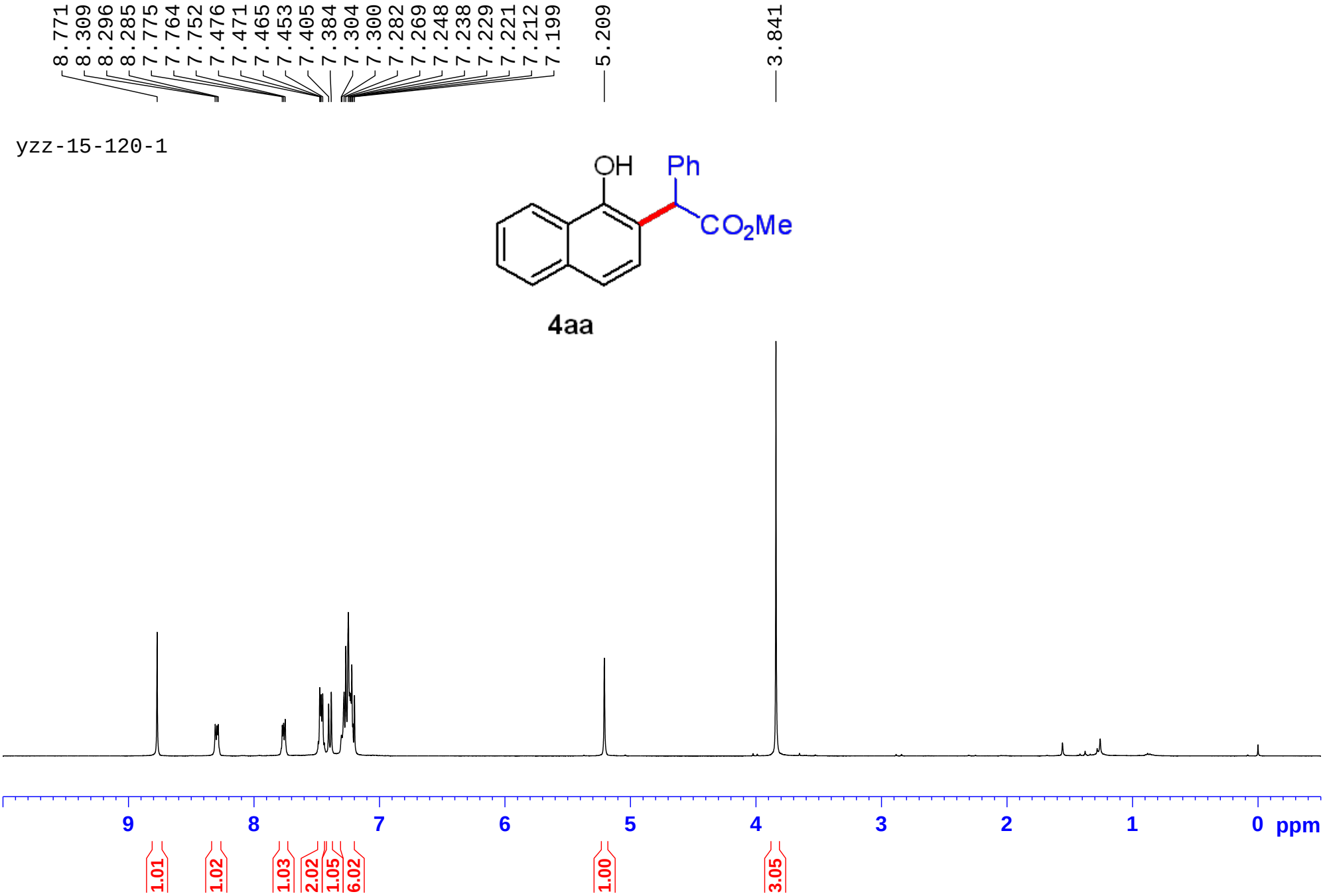
yzz-15-054-2-c

173.34 173.24 171.21 170.38 170.05 153.88 153.33 138.06 132.47 132.38 128.79 128.54 128.49 127.27 127.18 126.93 126.83 126.33 126.20 125.93 125.74 125.36 125.07 123.07 122.90 122.58 122.17 104.17 77.32 77.00 76.68 71.44 70.79 68.33 66.91 53.10 52.27 49.40 47.21 45.42 41.33 22.63 21.95 21.61 21.00 20.86 20.51 20.09



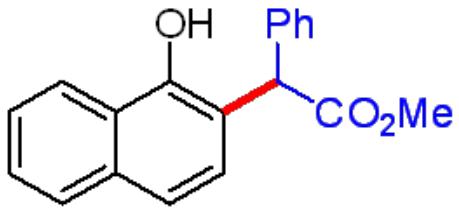
3ja



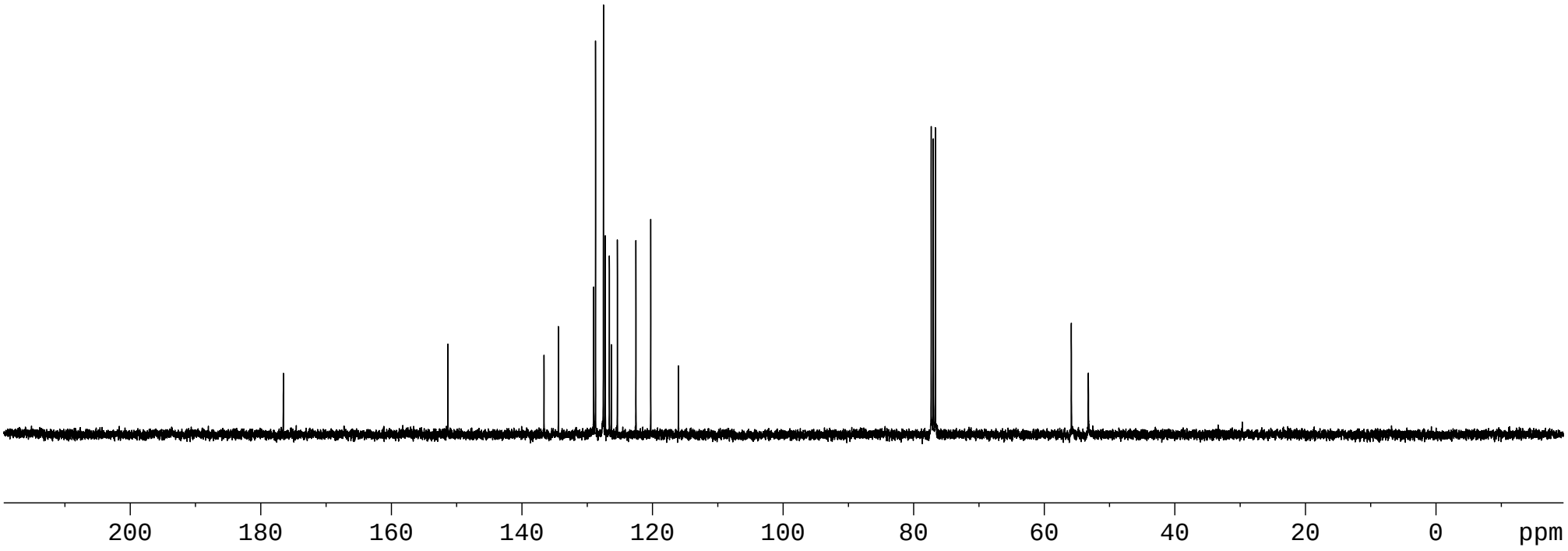

8.771
8.309
8.296
8.285
7.775
7.764
7.752
7.476
7.471
7.465
7.453
7.405
7.384
7.304
7.300
7.282
7.269
7.248
7.238
7.229
7.221
7.212
7.199
5.209
3.841
yzz-15-120-1
OH
Ph
CO2Me
4aa
9
8
7
6
5
4
3
2
1
0
ppm
1.01
1.02
1.03
2.02
1.05
6.02
1.00
3.05

yzz-15-120-1-c

176.55
151.35
136.62
134.42
129.03
128.74
127.52
127.23
126.61
126.32
125.39
122.55
120.28
116.04
77.32
77.00
76.68
55.86
53.26

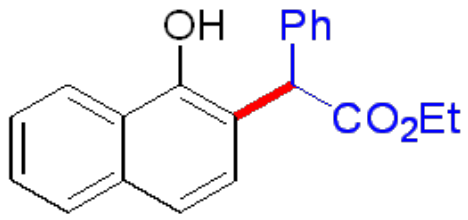


4aa

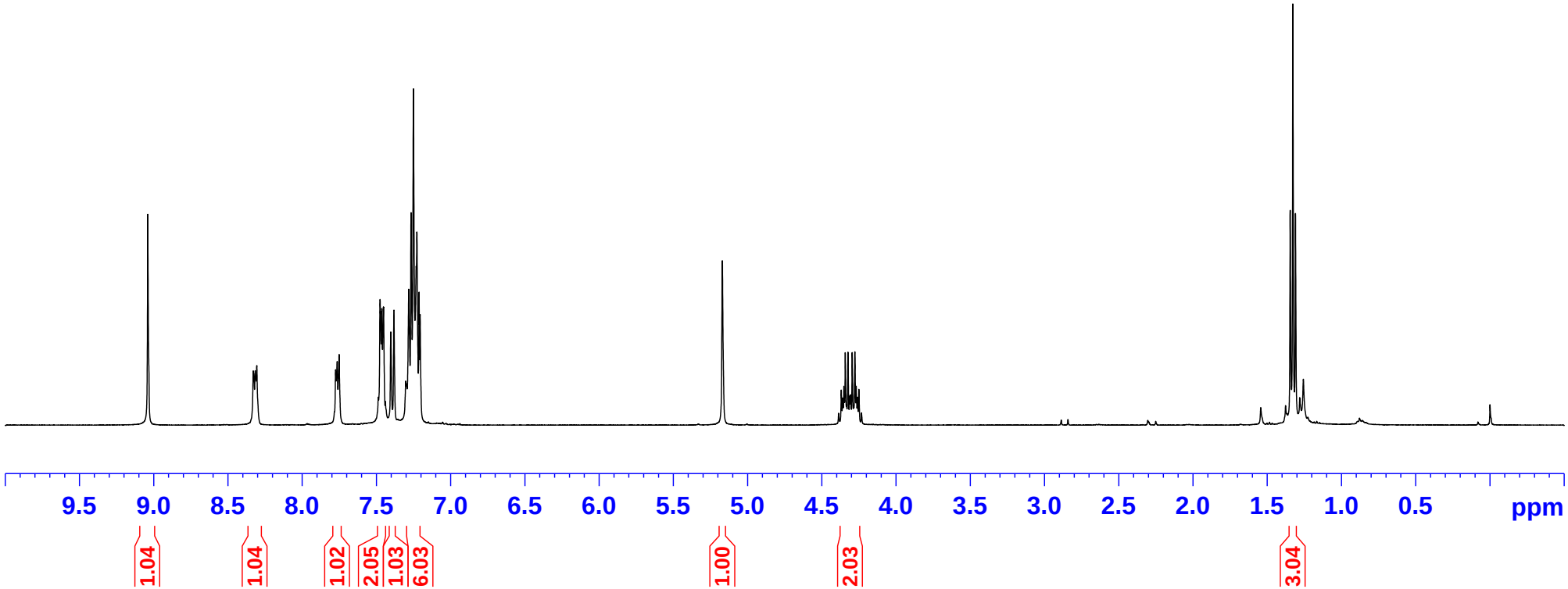


9.040
8.330
8.316
8.306
7.774
7.768
7.764
7.475
7.471
7.463
7.456
7.452
7.451
7.403
7.382
7.282
7.266
7.251
7.232
7.227
7.213
7.206
5.170
4.369
4.351
4.342
4.324
4.295
4.277
4.268
4.250
1.346
1.328
1.310

yzz-15-121-1

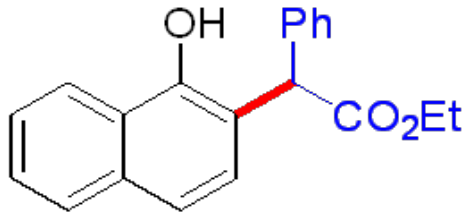


4ab

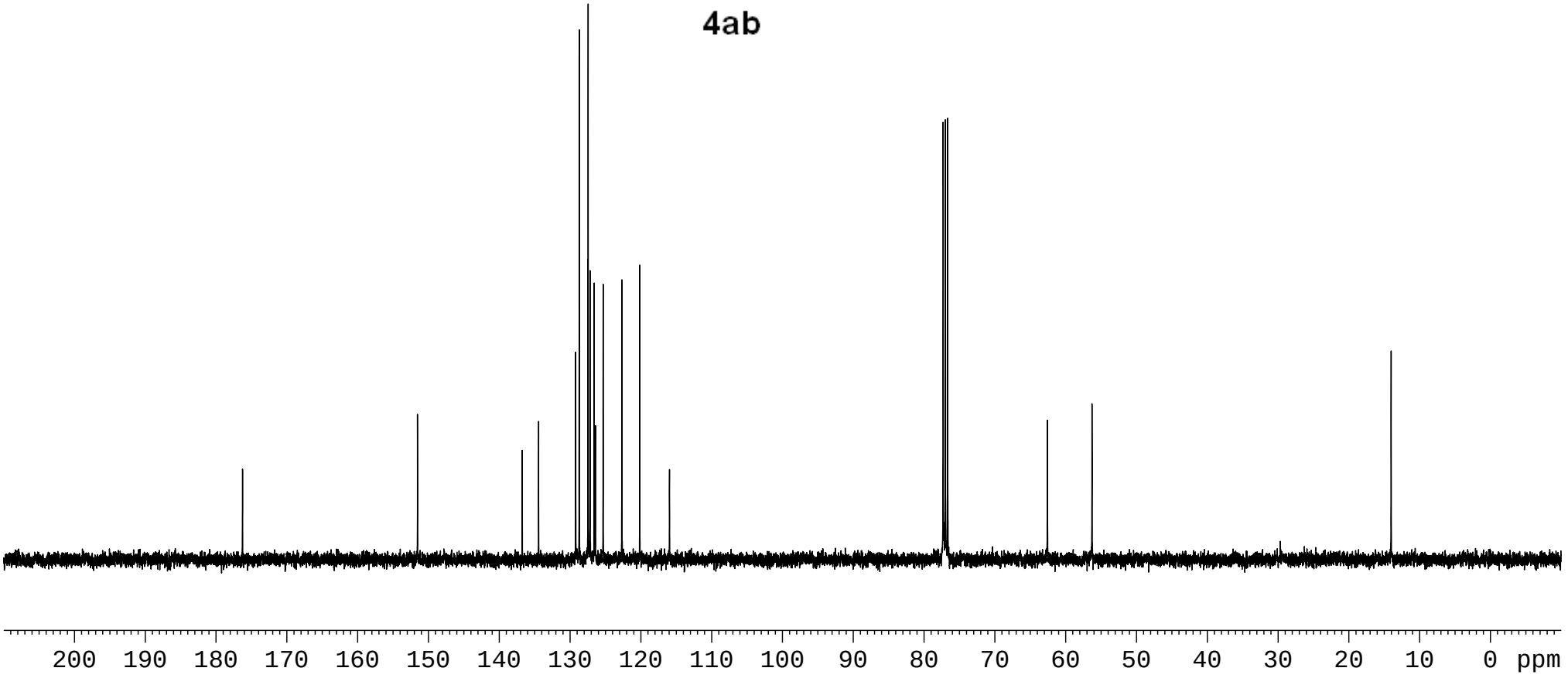


yzz-15-121-1-c

176.25
151.55
136.75
134.44
129.20
128.71
127.47
127.44
127.18
126.59
126.41
125.33
122.69
120.16
115.96
77.32
77.00
76.68
62.59
56.29
14.04

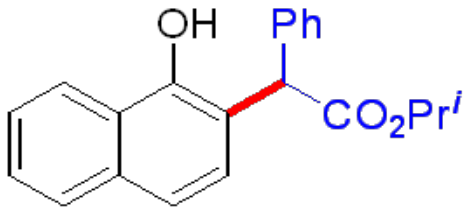


4ab

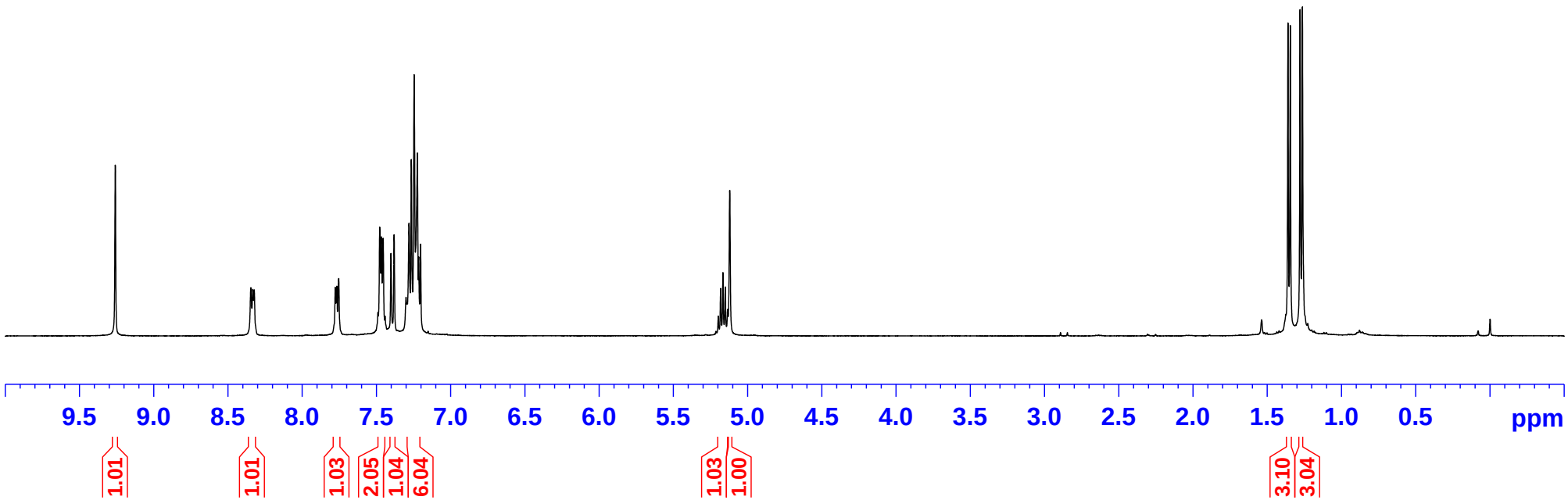


9.259
8.345
8.333
8.323
7.777
7.766
7.754
7.478
7.466
7.454
7.402
7.381
7.300
7.293
7.280
7.265
7.245
7.224
7.215
7.202
5.181
5.166
5.150
5.134
5.120
1.361
1.345
1.279
1.263

yzz-15-119-1

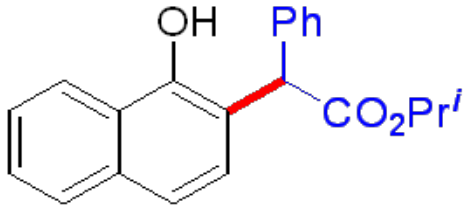


4ac

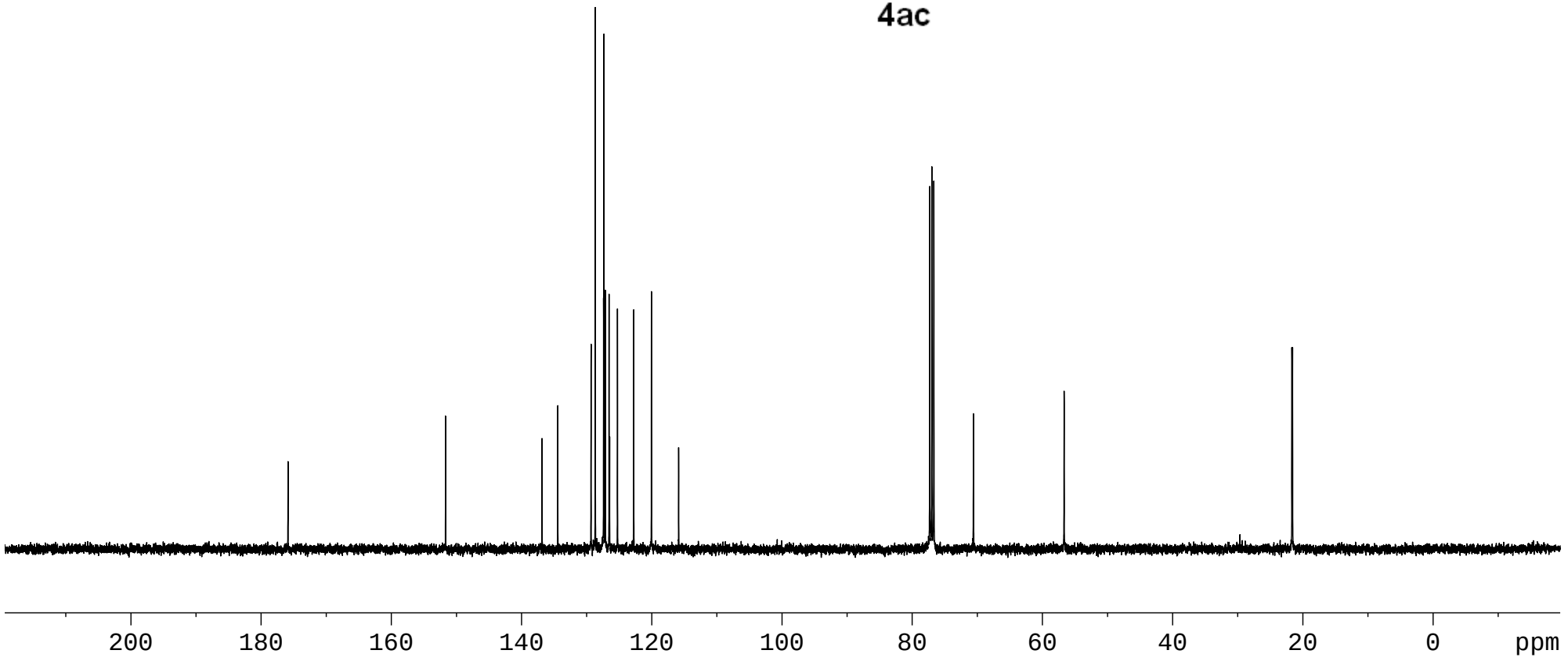


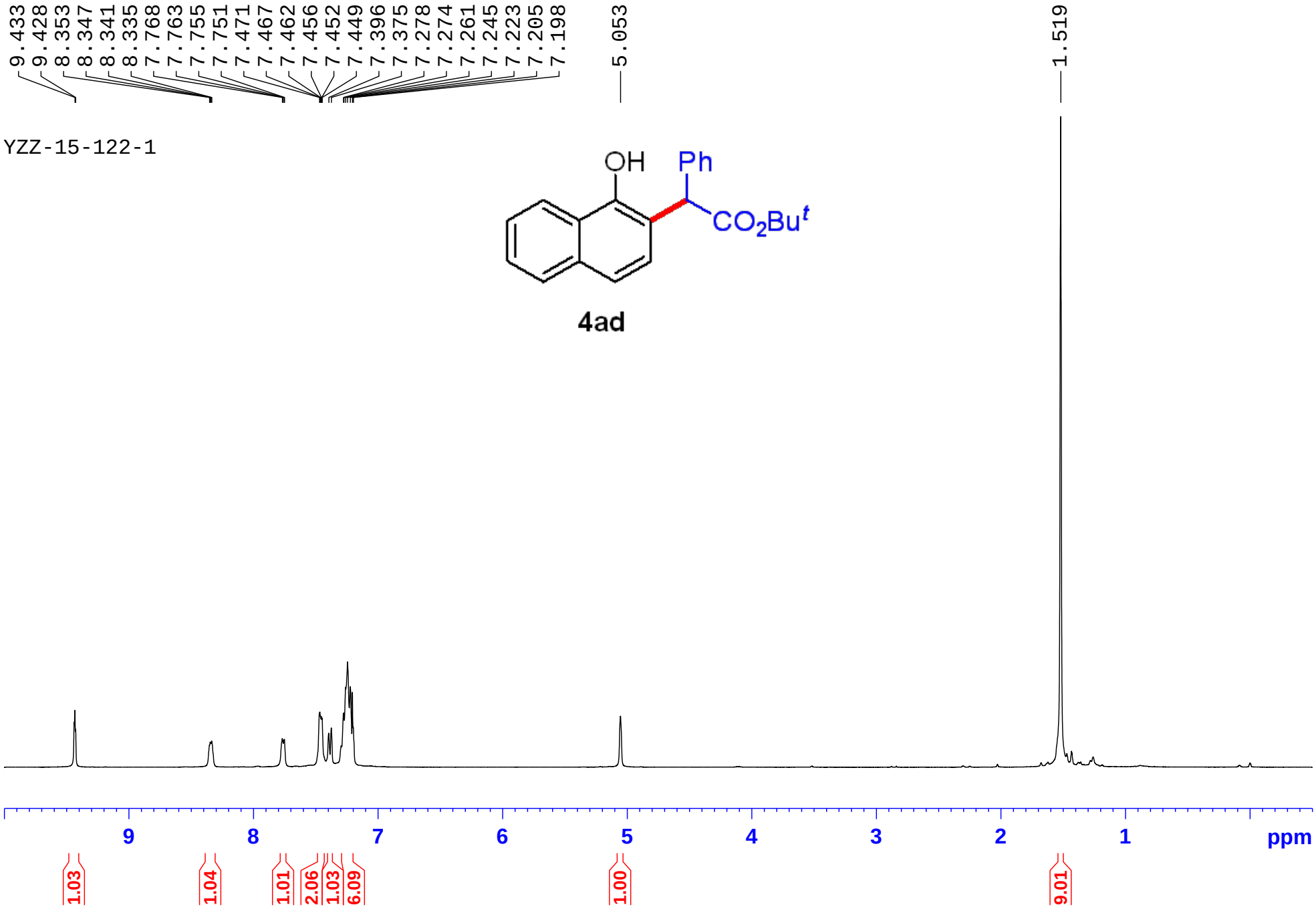
yzz-15-119-1-c

175.88
151.69
136.87
134.45
129.34
128.69
127.42
127.36
127.15
126.57
126.48
125.28
122.78
120.07
115.89
77.32
77.00
76.68
70.60
56.68
21.69
21.59



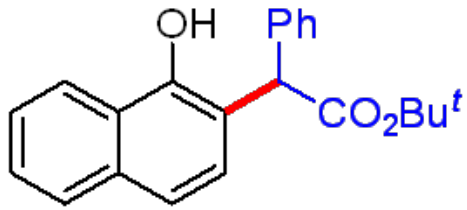
4ac



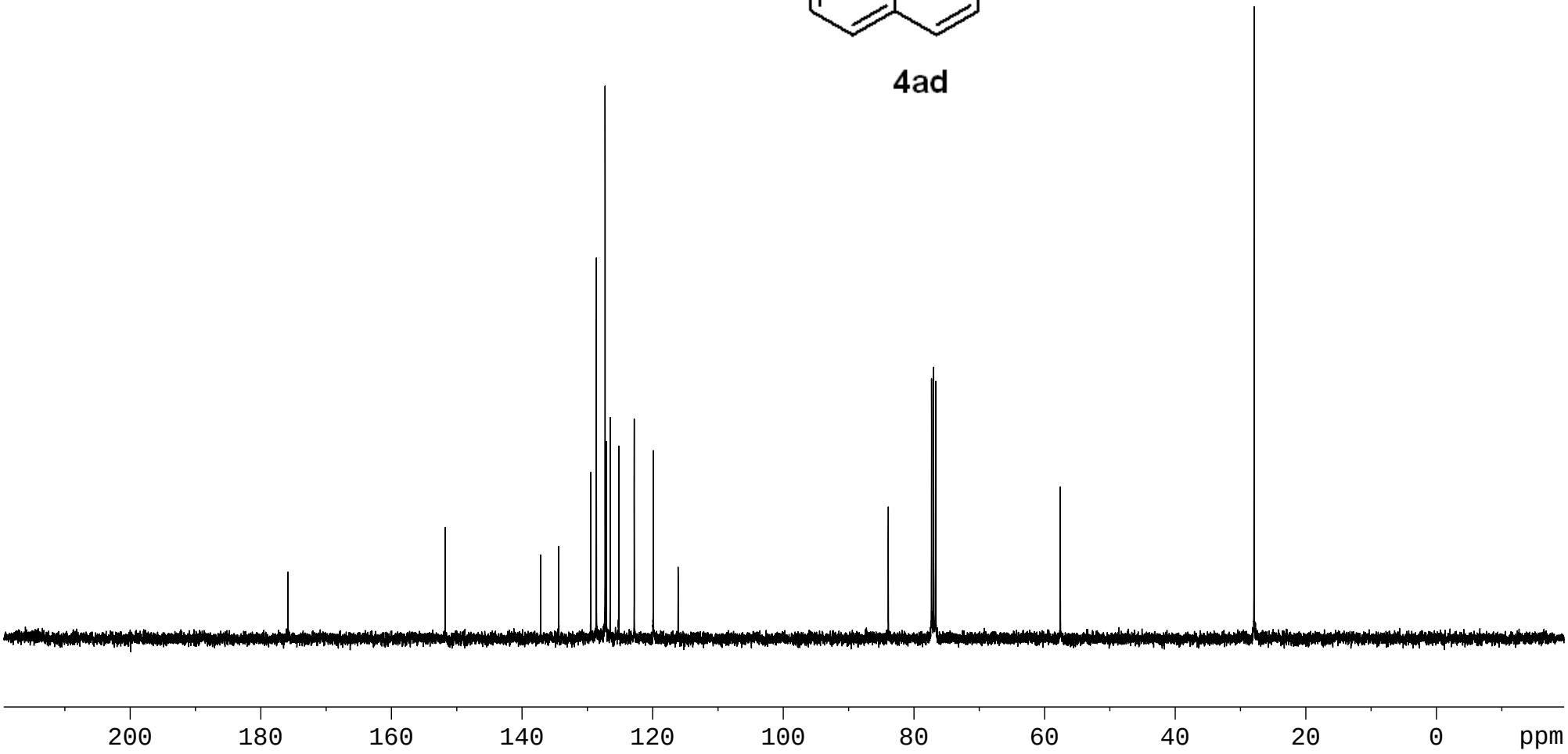

9.433
9.428
8.353
8.347
8.341
8.335
7.768
7.763
7.755
7.751
7.471
7.467
7.462
7.456
7.452
7.449
7.396
7.375
7.278
7.274
7.261
7.245
7.223
7.205
7.198
5.053
1.519
YZZ-15-122-1
OH
Ph
CO2But
4ad
9
8
7
6
5
4
3
2
1
ppm
1.03
1.04
1.01
2.06
1.03
6.09
1.00
9.01

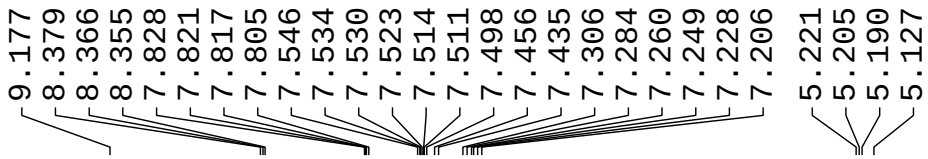
YZZ-15-122-1-C

175.85
151.78
137.17
134.41
129.48
128.63
127.30
127.11
126.51
125.20
122.84
119.92
116.12
83.94
77.32
77.00
76.68
57.61
27.94

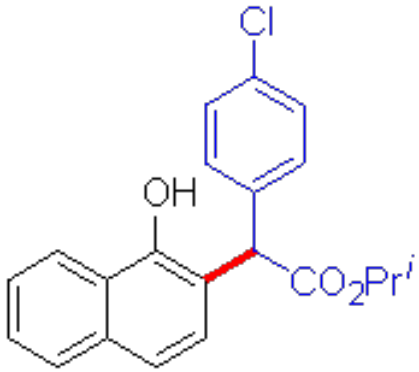


4ad

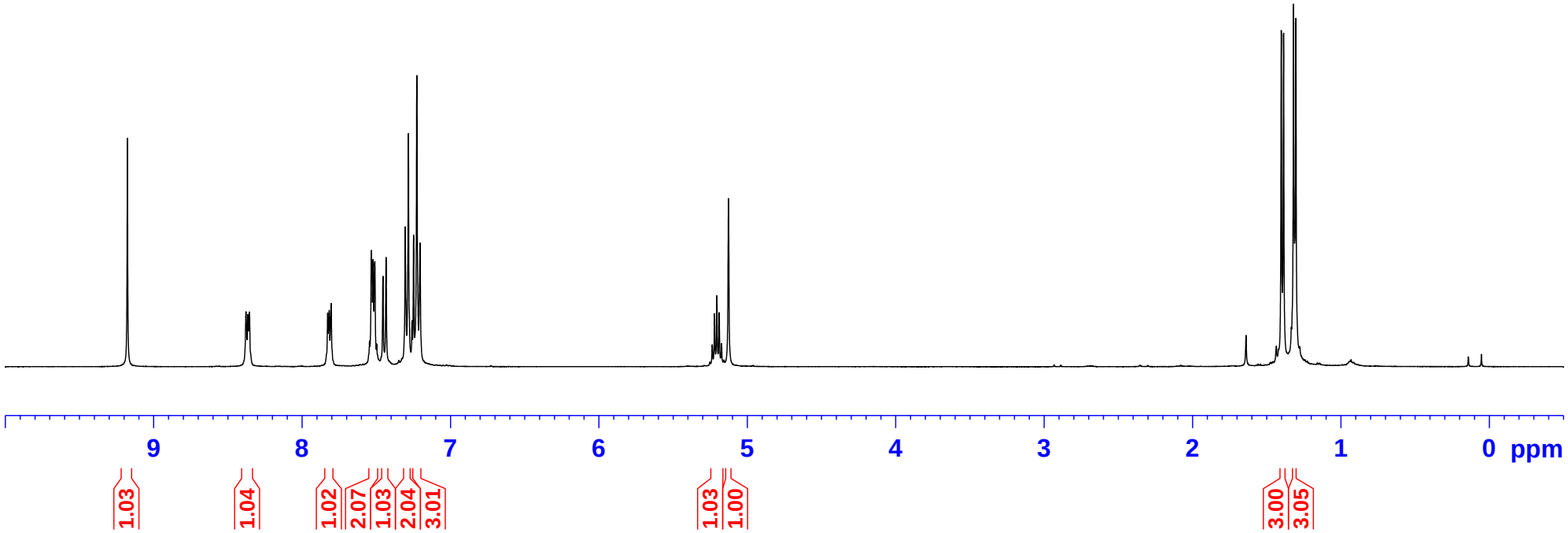




yzz-15-125-1

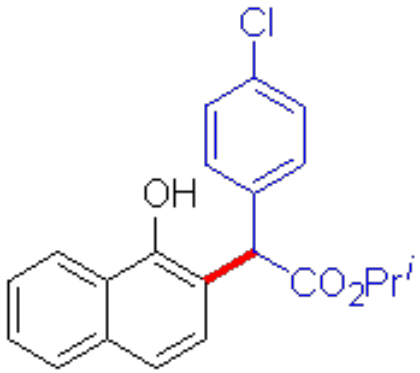


4ae

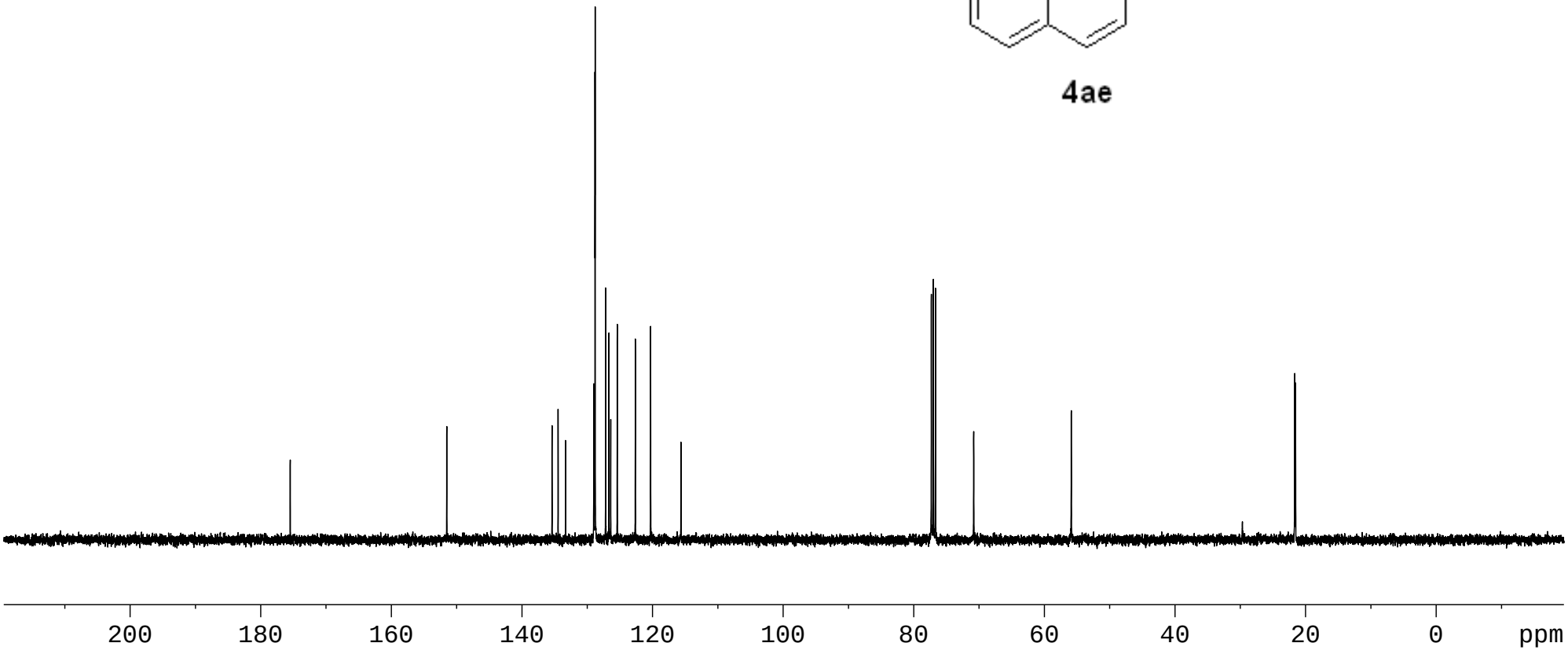


yzz-15-125-1-c

175.49
151.53
135.40
134.47
133.33
129.00
128.82
128.80
127.20
126.70
126.41
125.42
122.65
120.30
115.66
77.32
77.00
76.68
70.82
55.89
21.66
21.53



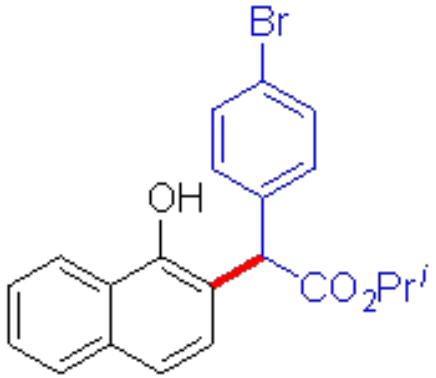
4ae



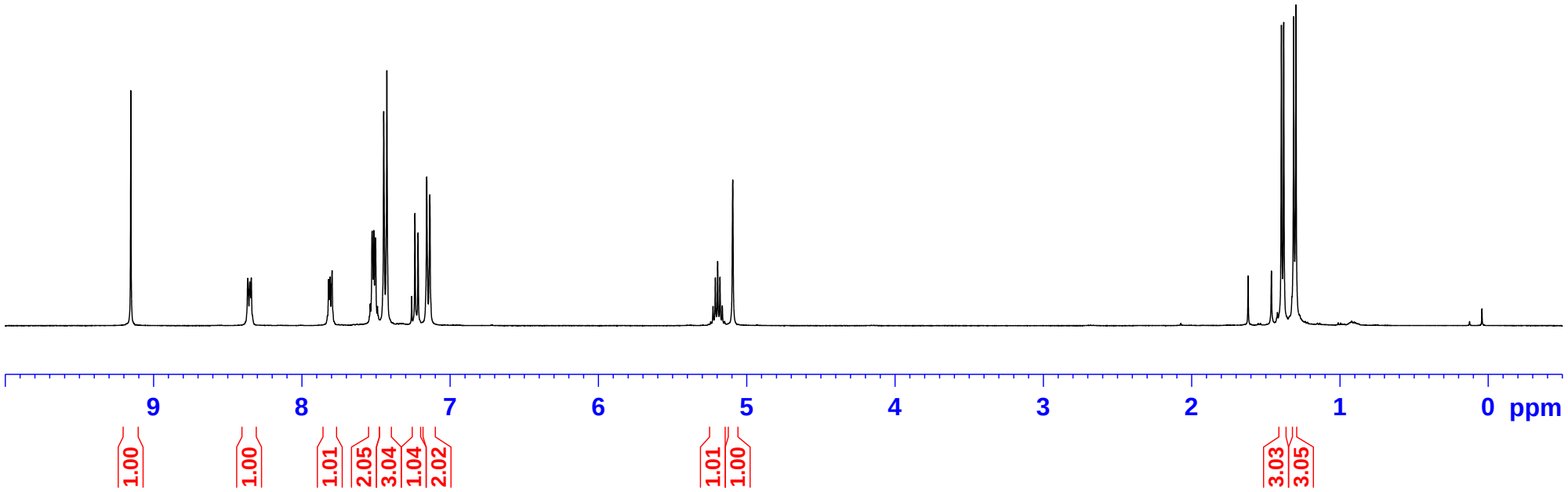
9.153
8.366
8.352
8.342
7.828
7.820
7.814
7.810
7.797
7.545
7.540
7.527
7.523
7.516
7.507
7.504
7.491
7.485
7.449
7.427
7.260
7.238
7.217
7.159
7.138
5.228
5.212
5.197
5.181
5.165
5.095

1.395
1.379
1.312
1.297

yzz-15-124-1

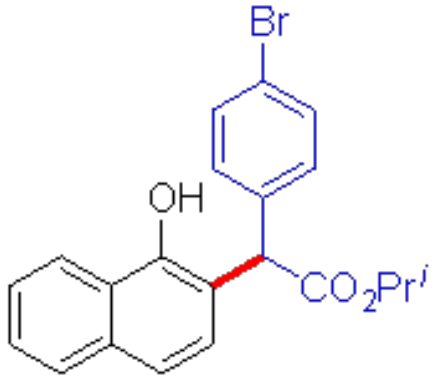


4af

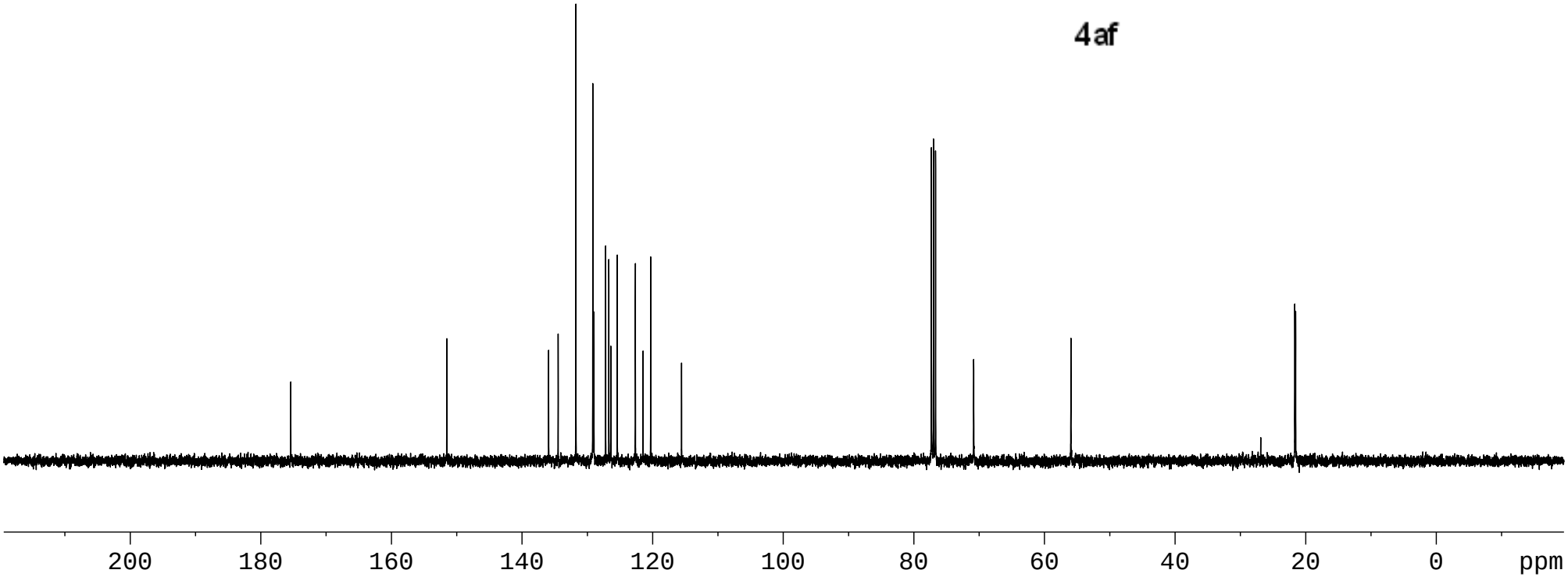


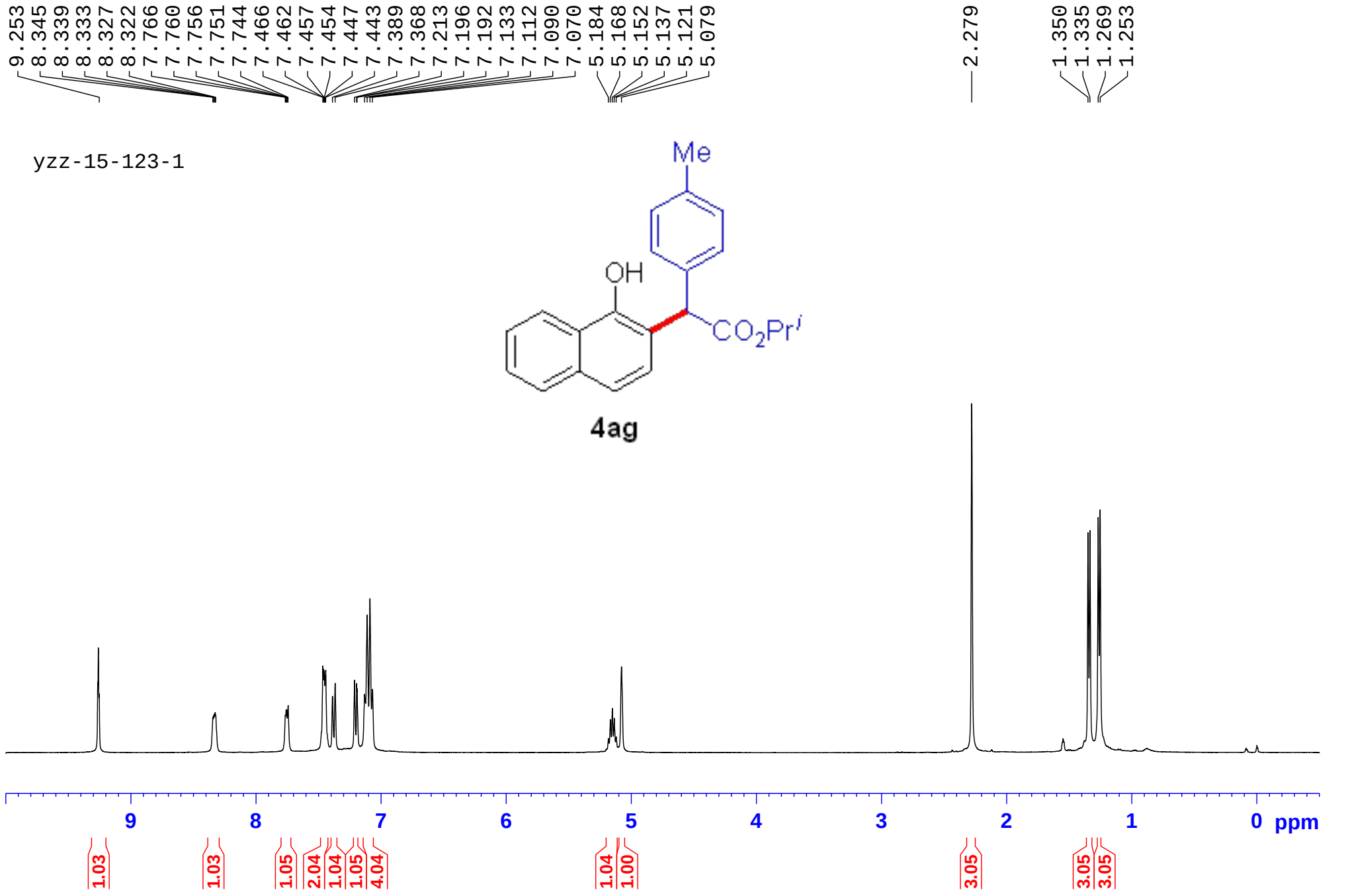
yzz-15-124-1-c

175.42
151.53
135.94
134.48
131.76
129.17
129.00
127.20
126.72
126.41
125.43
122.65
121.48
120.31
115.58
77.32
77.00
76.68
70.85
55.96
21.67
21.54



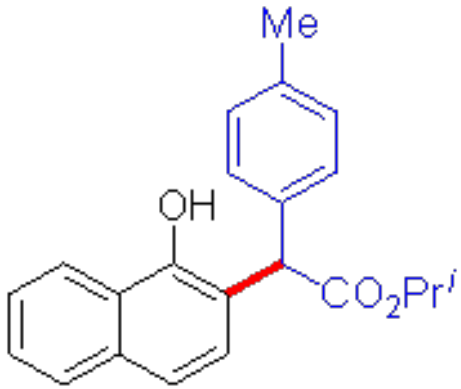
4af




9.253
8.345
8.339
8.333
8.327
8.322
7.766
7.760
7.756
7.751
7.744
7.466
7.462
7.457
7.454
7.447
7.443
7.389
7.368
7.213
7.196
7.192
7.133
7.112
7.090
7.070
5.184
5.168
5.152
5.137
5.121
5.079
2.279
1.350
1.335
1.269
1.253
yzz-15-123-1
Me
OH
CO2Pri
4ag
9
8
7
6
5
4
3
2
1
0 ppm
1.03
1.03
1.05
2.04
1.04
1.05
4.04
1.04
1.00
3.05
3.05
3.05

yzz-15-123-1-c

176.03
151.64
137.09
134.40
133.84
129.38
129.33
127.21
127.12
126.51
126.47
125.22
122.79
120.00
116.07
77.32
77.00
76.68
70.51
56.34
21.68
21.58
20.97



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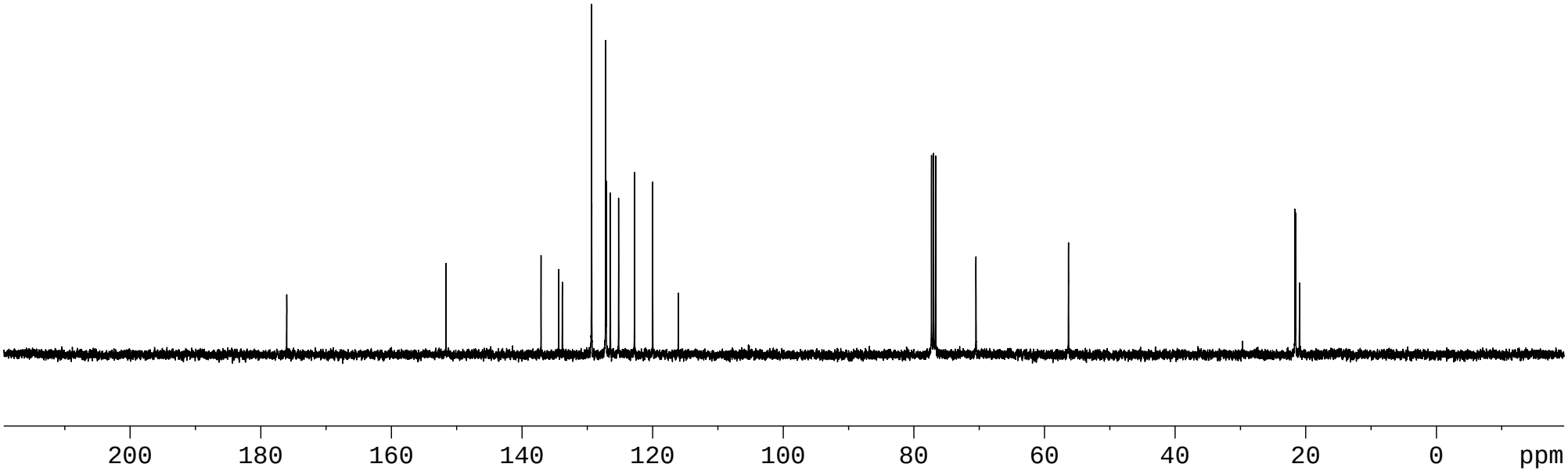

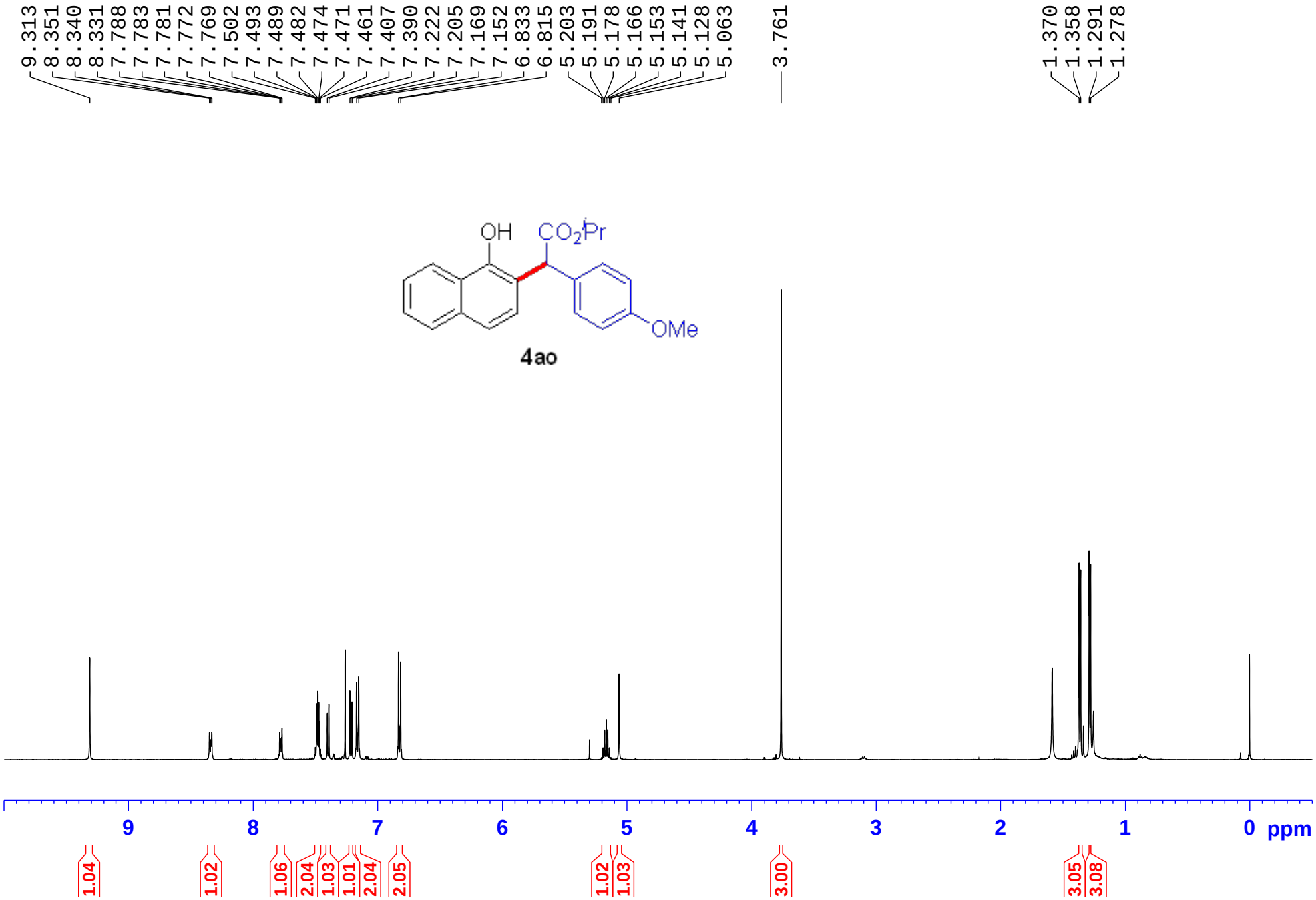
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7.772
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7.502
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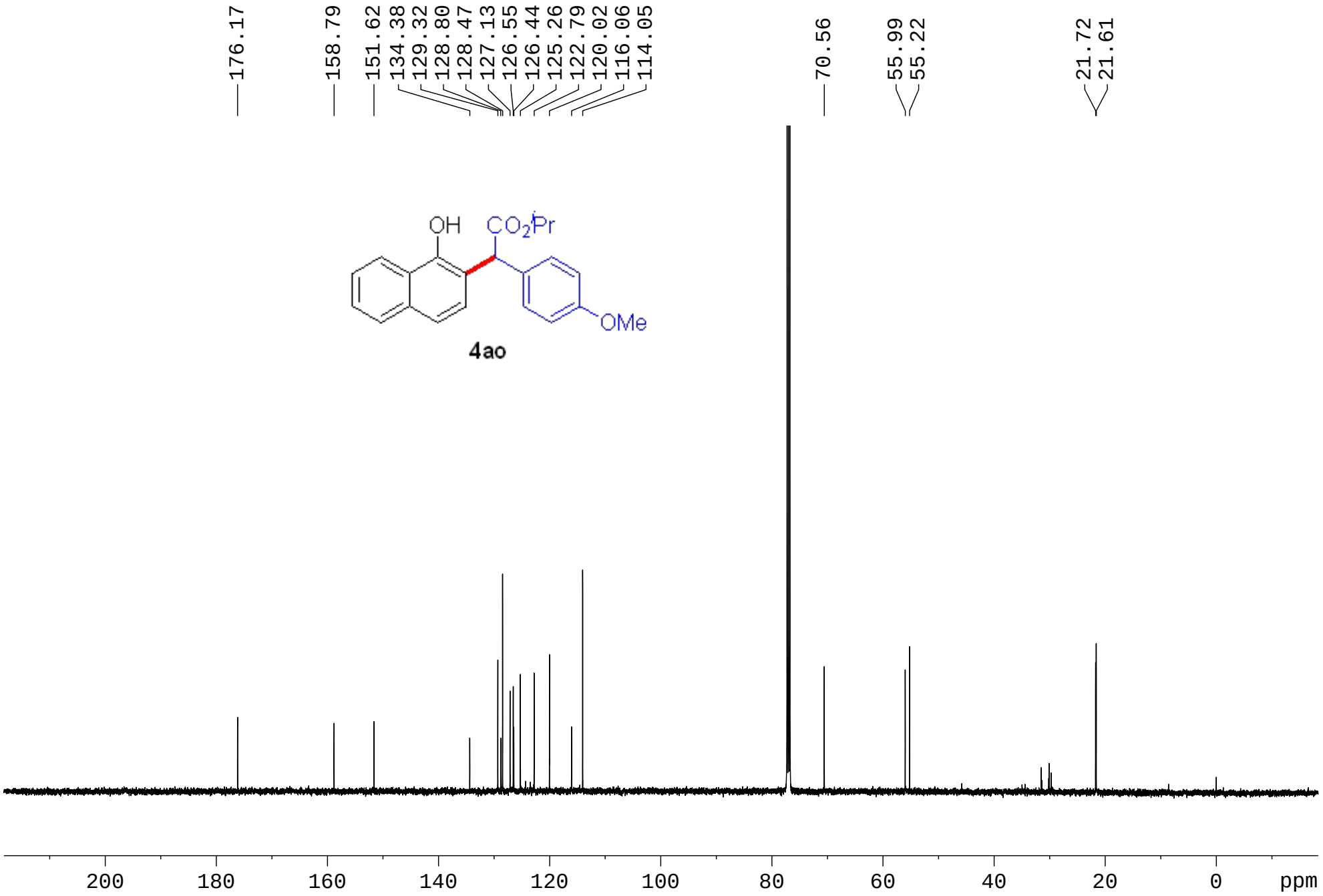
7.489
7.482
7.474
7.471
7.461
7.407
7.390
7.222
7.205
7.169
7.152
6.833
6.815
5.203
5.191
5.178
5.166
5.153
5.141
5.128
5.063
3.761
1.370
1.358
1.291
1.278
OH
CO2iPr
OMe
4ao
9
8
7
6
5
4
3
2
1
0
ppm
1.04
1.02
1.06
2.04
1.03
1.01
2.04
2.05
1.02
1.03
3.00
3.05
3.08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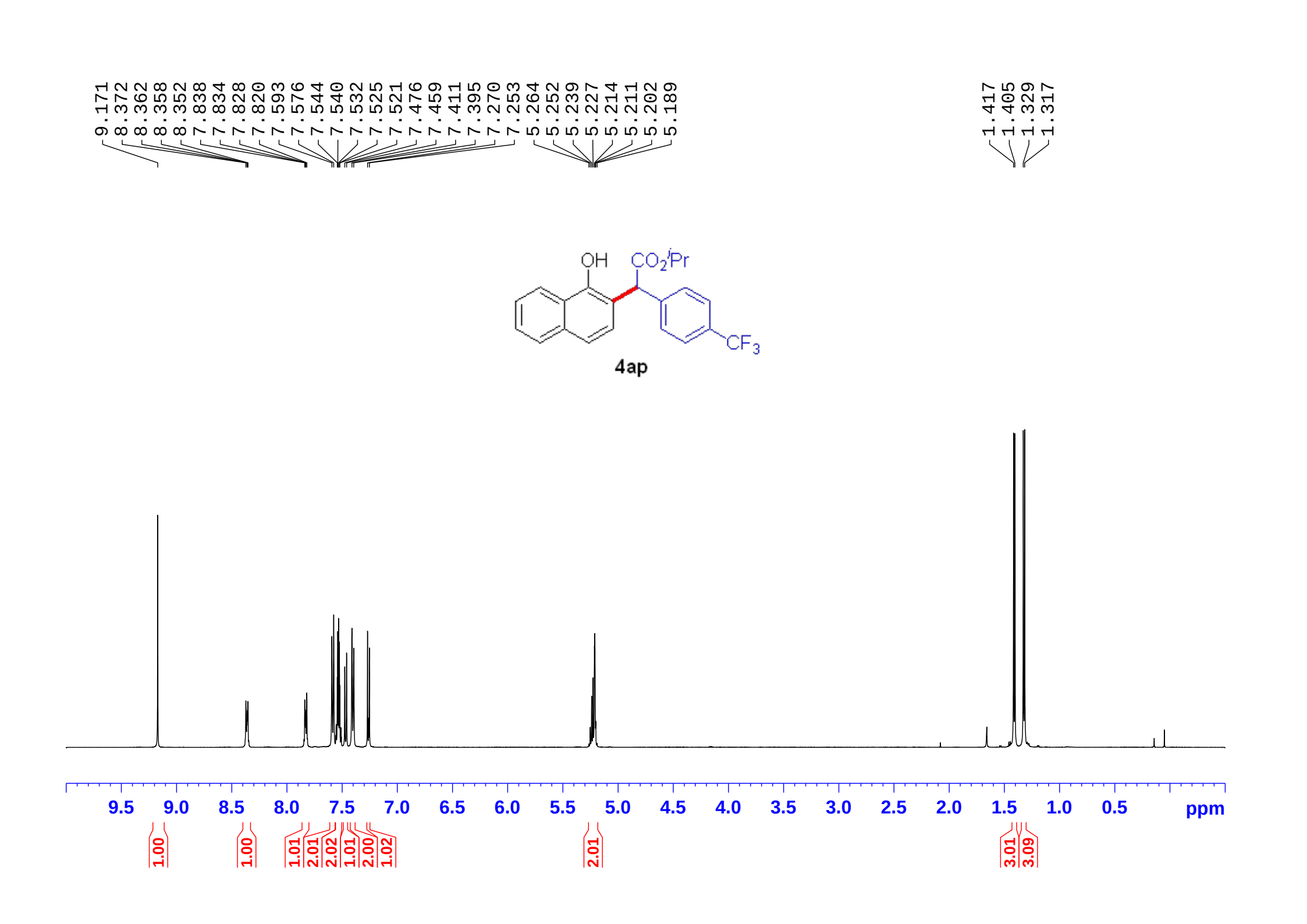
158.79
151.62
134.38
129.32
128.80
128.47
127.13
126.55
126.44
125.26
122.79
120.02
116.06
114.05
70.56
55.99
55.22
21.72
21.61
OH
CO2iPr
OMe
4ao
200
180
160
140
120
100
80
60
40
20
0
ppm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7.828
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7.593
7.576
7.544
7.540
7.532
7.525
7.521
7.476
7.459
7.411
7.395
7.270
7.253
5.264
5.252
5.239
5.227
5.214
5.211
5.202
5.189
1.417
1.405
1.329
1.317
OH
CO2iPr
CF3
4ap
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
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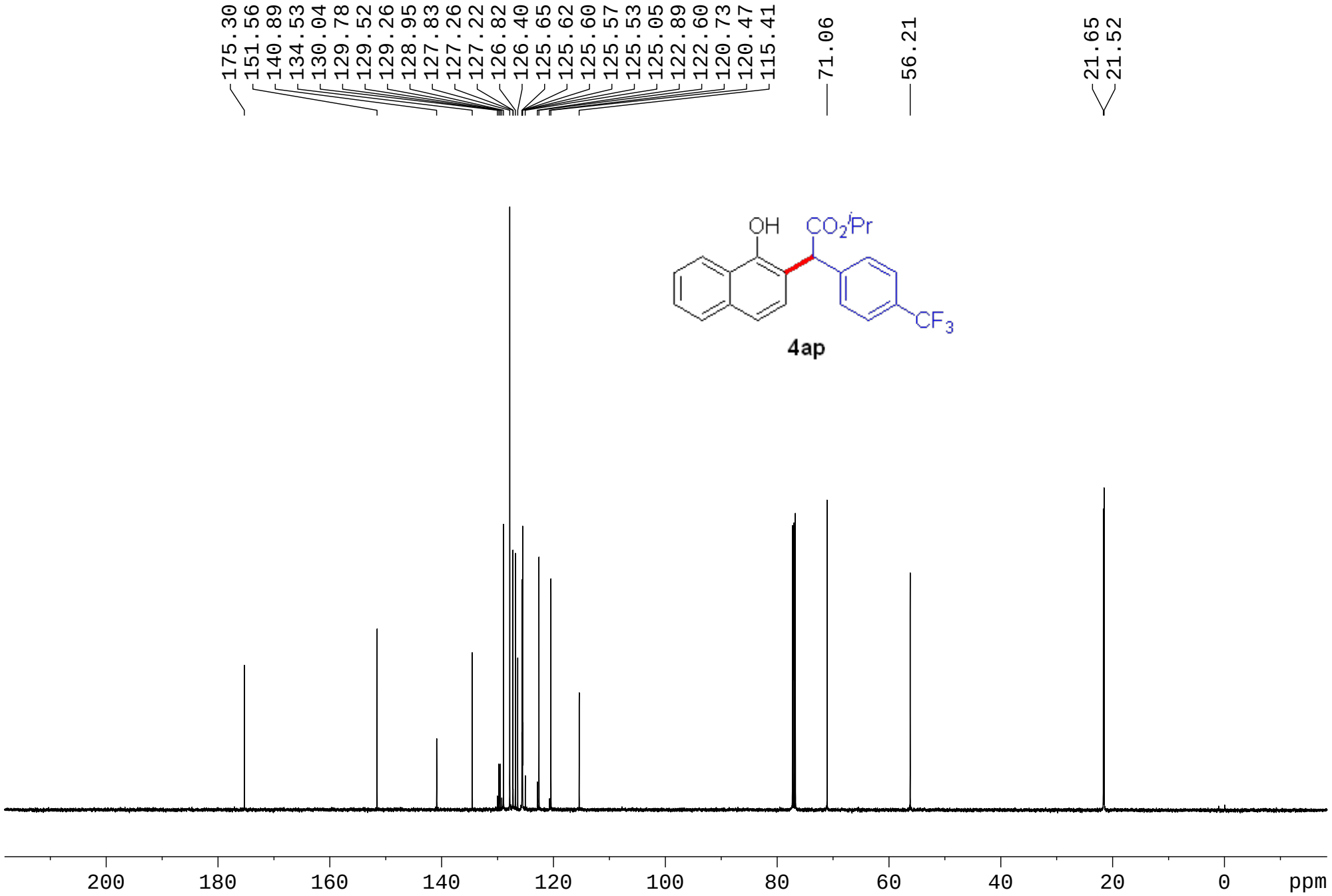
1.01
2.01
2.02
1.01
2.00
1.02
2.01
3.01
3.09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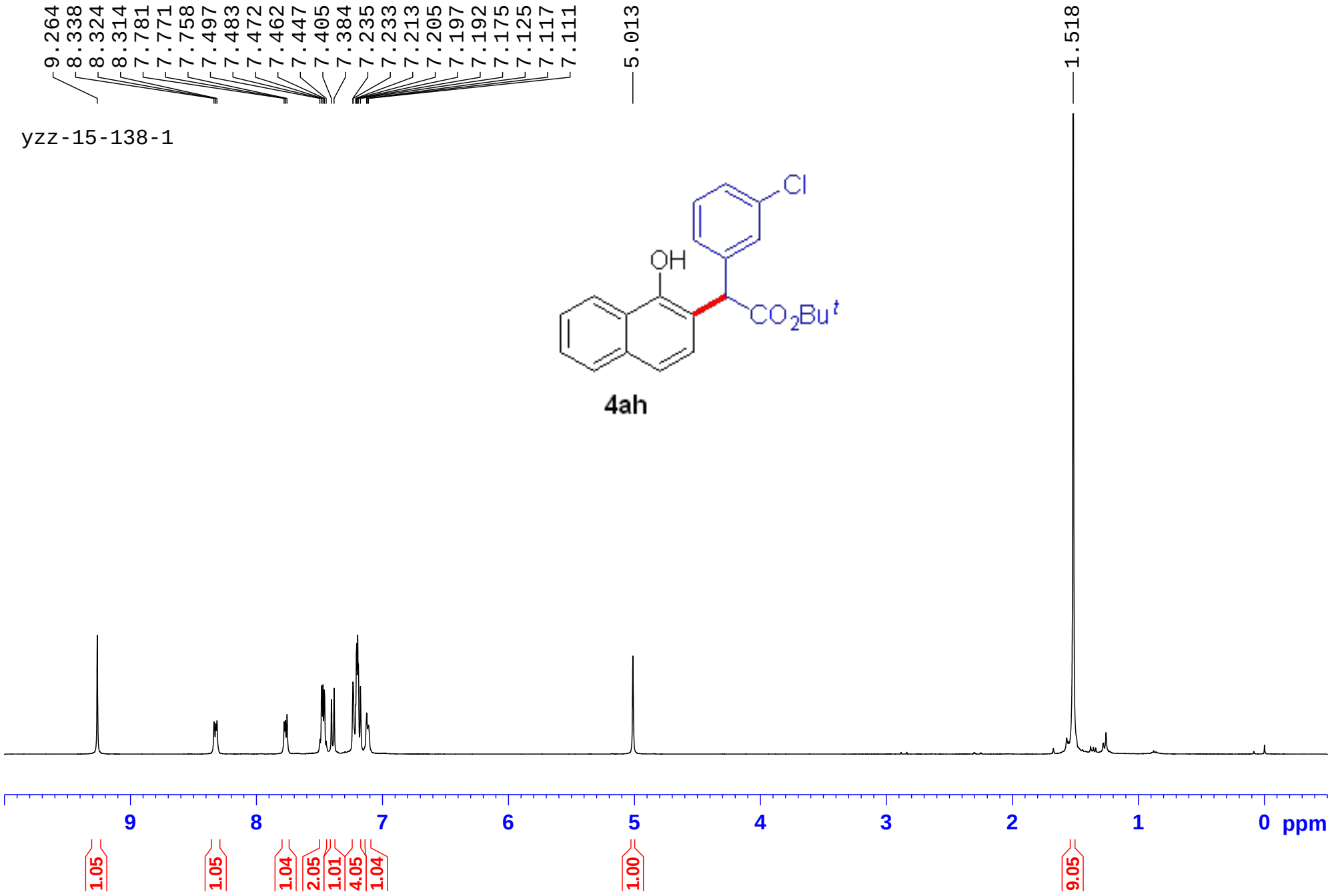
151.56
140.89
134.53
130.04
129.78
129.52
129.26
128.95
127.83
127.26
127.22
126.82
126.40
125.65
125.62
125.60
125.57
125.53
125.05
122.89
122.60
120.73
120.47
115.41
71.06
56.21
21.65
21.52
OH
CO2iPr
CF3
4ap
200
180
160
140
120
100
80
60
40
20
0
ppm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8.314
7.781
7.771
7.758
7.497
7.483
7.472
7.462
7.447
7.405
7.384
7.235
7.233
7.213
7.205
7.197
7.192
7.175
7.125
7.117
7.111
5.013
1.518
yzz-15-138-1
Cl
OH
CO2But
4ah
9
8
7
6
5
4
3
2
1
0 ppm
1.05
1.05
1.04
2.05
1.01
4.05
1.04
1.00
9.05

yzz-15-138-1-c

175.20
151.68
139.25
134.50
134.48
129.83
129.17
127.64
127.55
127.18
126.67
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122.77
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77.32
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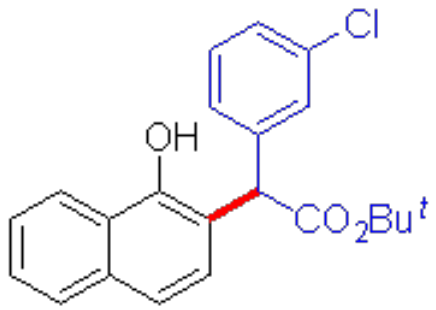
76.68
57.04
27.91



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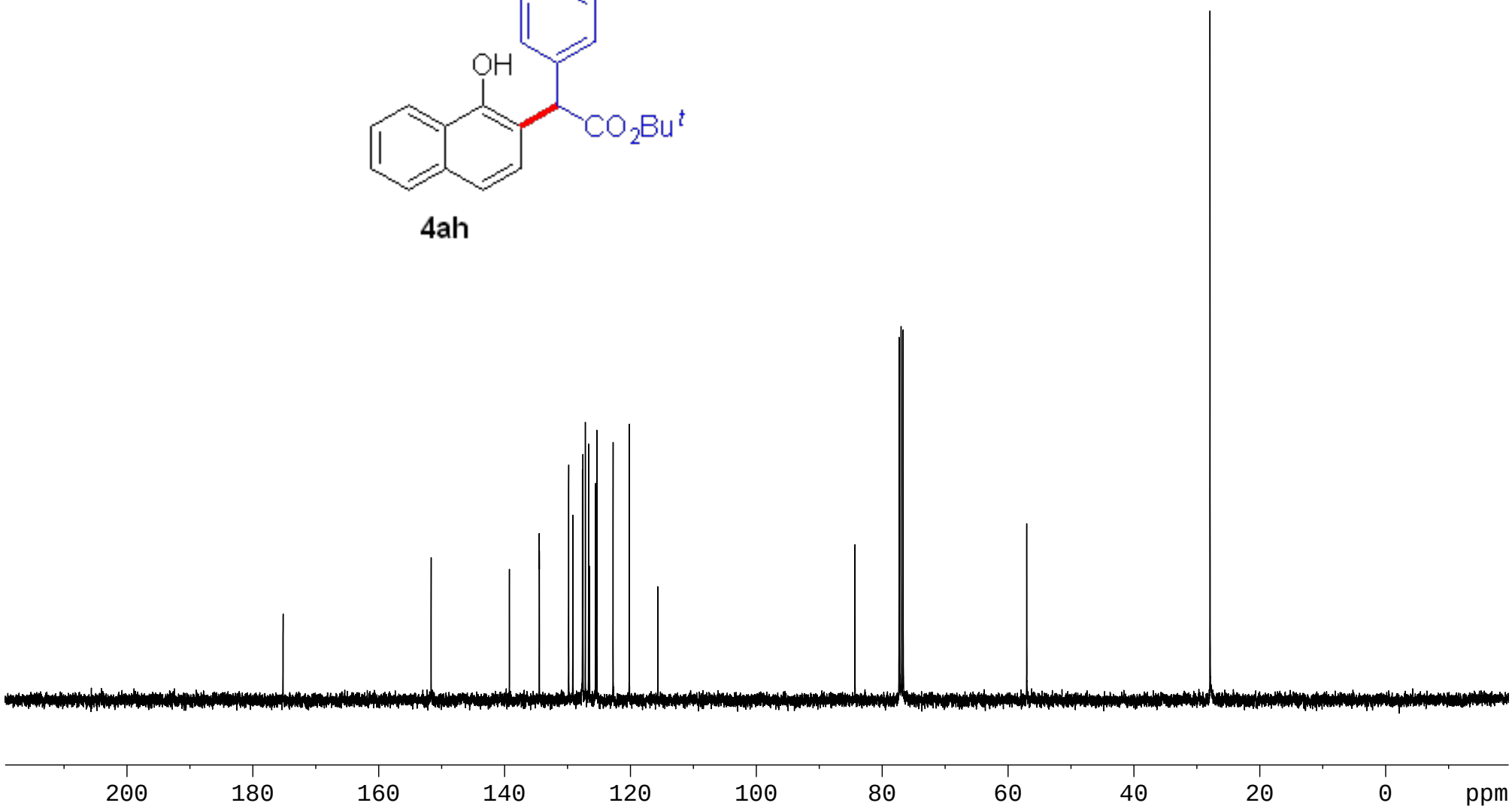

yzz-15-137-1

9.272
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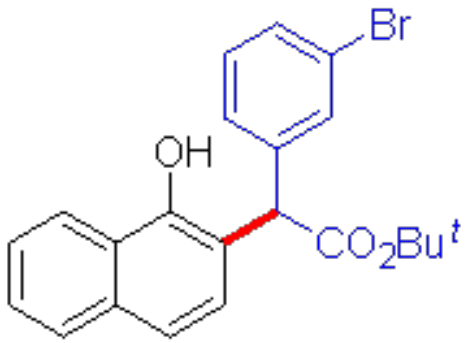
8.338
7.809
7.802
7.789
7.526
7.514
7.503
7.492
7.480
7.433
7.413
7.385
7.260
7.220
7.199
7.181
7.162
7.143
5.033
1.548



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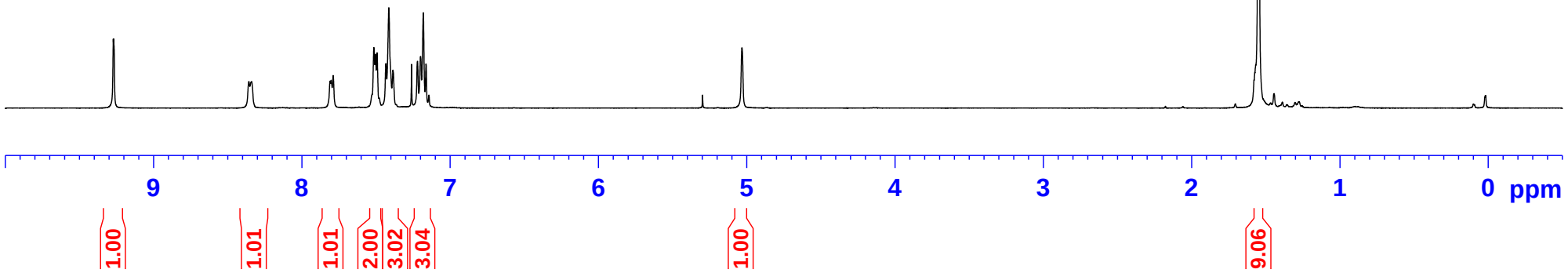
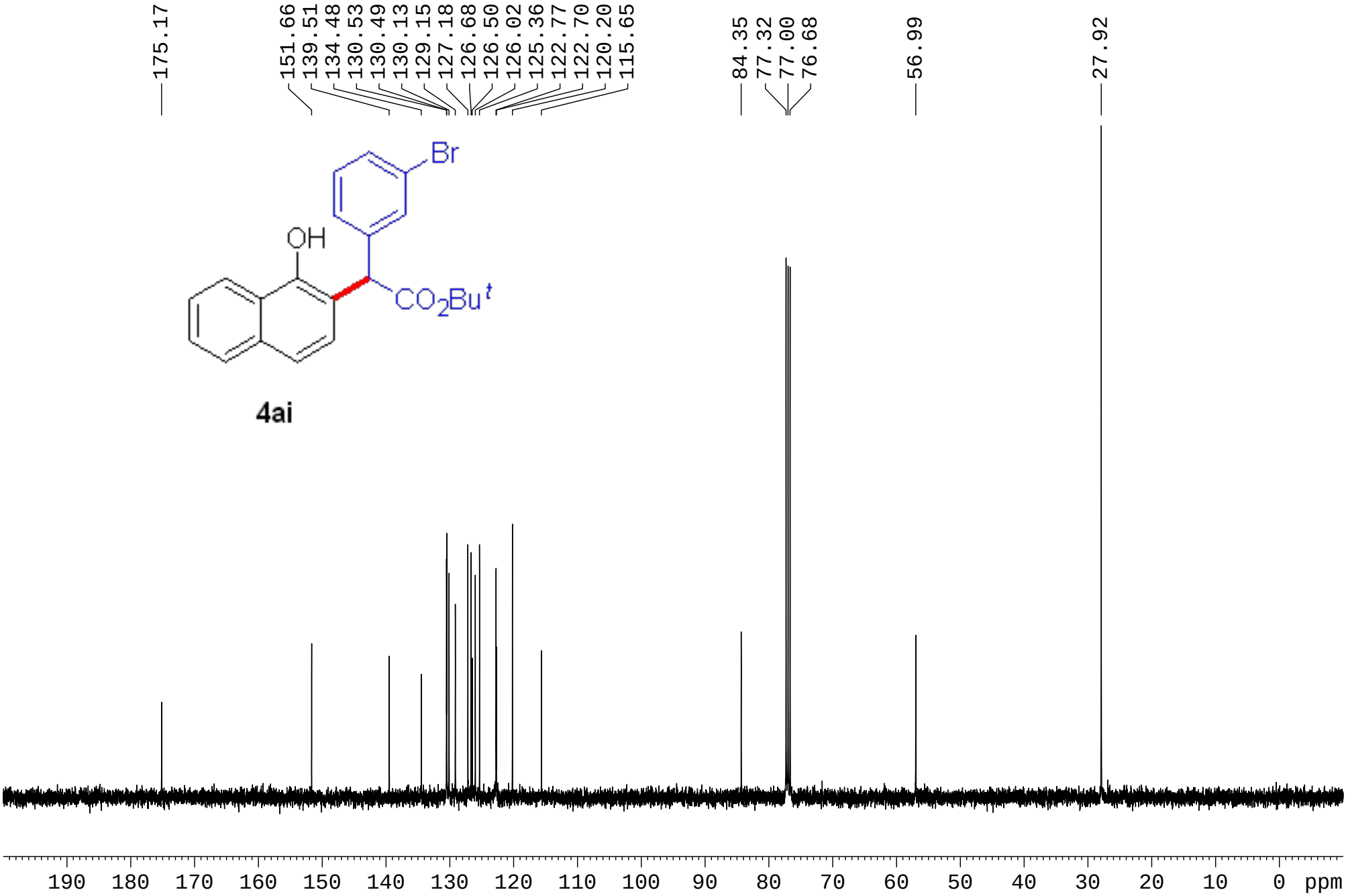


yzz-15-137-1-c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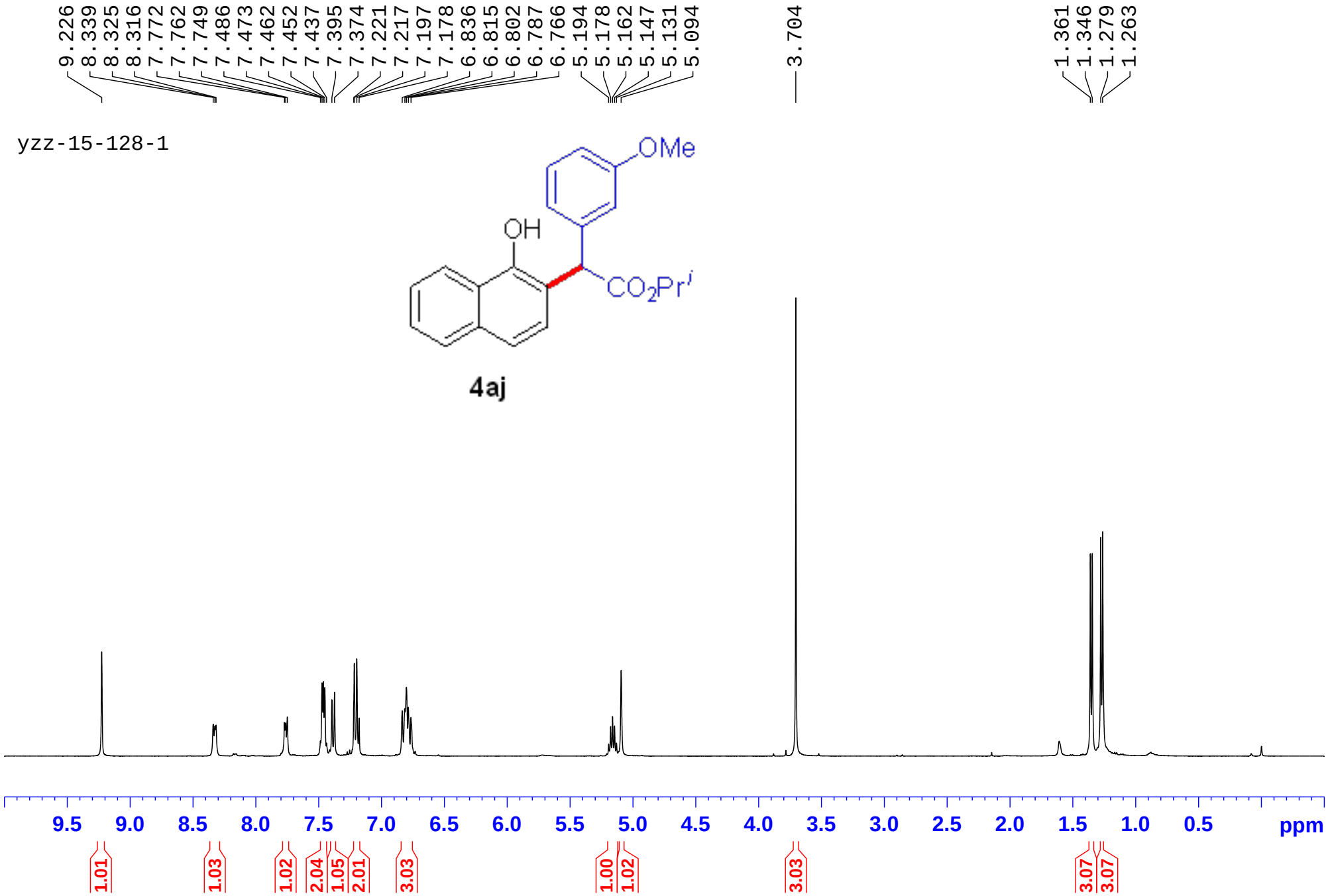
139.51
134.48
130.53
130.49
130.13
129.15
127.18
126.68
126.50
126.02
125.36
122.77
122.70
120.20
115.65
84.35
77.32
77.00
76.68
56.99
27.92
Br
OH
CO2Bu^t
4ai
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm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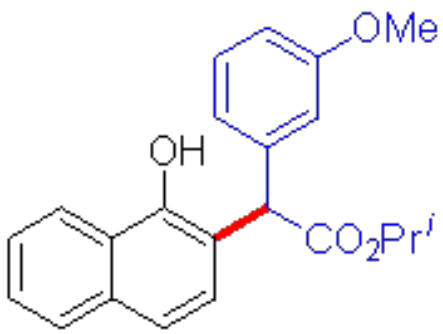
7.762
7.749
7.486
7.473
7.462
7.452
7.437
7.395
7.374
7.221
7.217
7.197
7.178
6.836
6.815
6.802
6.787
6.766
5.194
5.178
5.162
5.147
5.131
5.094
3.704
1.361
1.346
1.279
1.263
yzz-15-128-1
OMe
OH
CO2Pri
4aj
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.01
1.03
1.02
2.04
1.05
2.01
3.03
1.00
1.02
3.03
3.07
3.07

yzz-15-128-1-c

175.67
159.77
151.63
138.40
134.43
129.64
129.26
127.13
126.54
126.43
125.25
122.74
120.06
119.71
115.88
113.63
112.44
77.32
77.00
76.68
70.58
56.51
55.09
21.67
21.56



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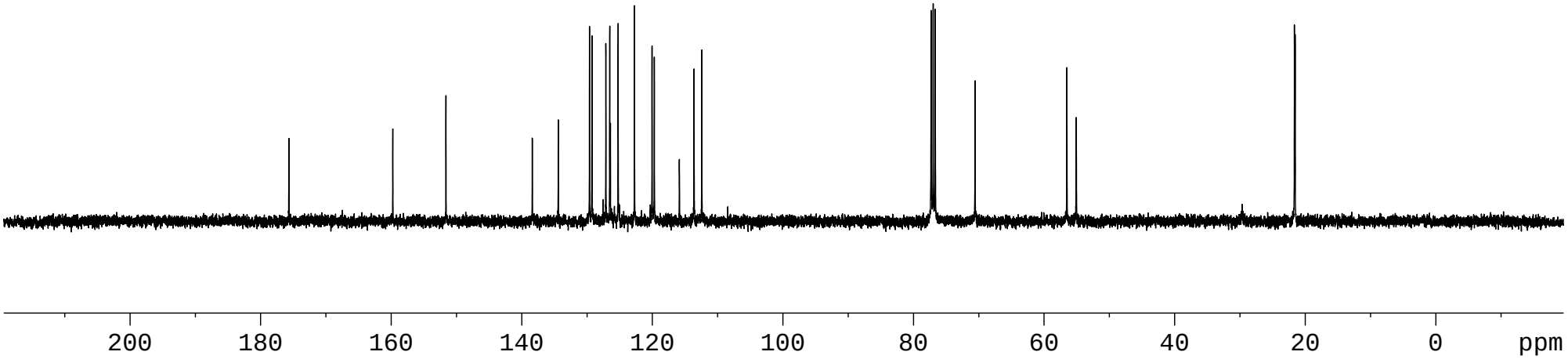

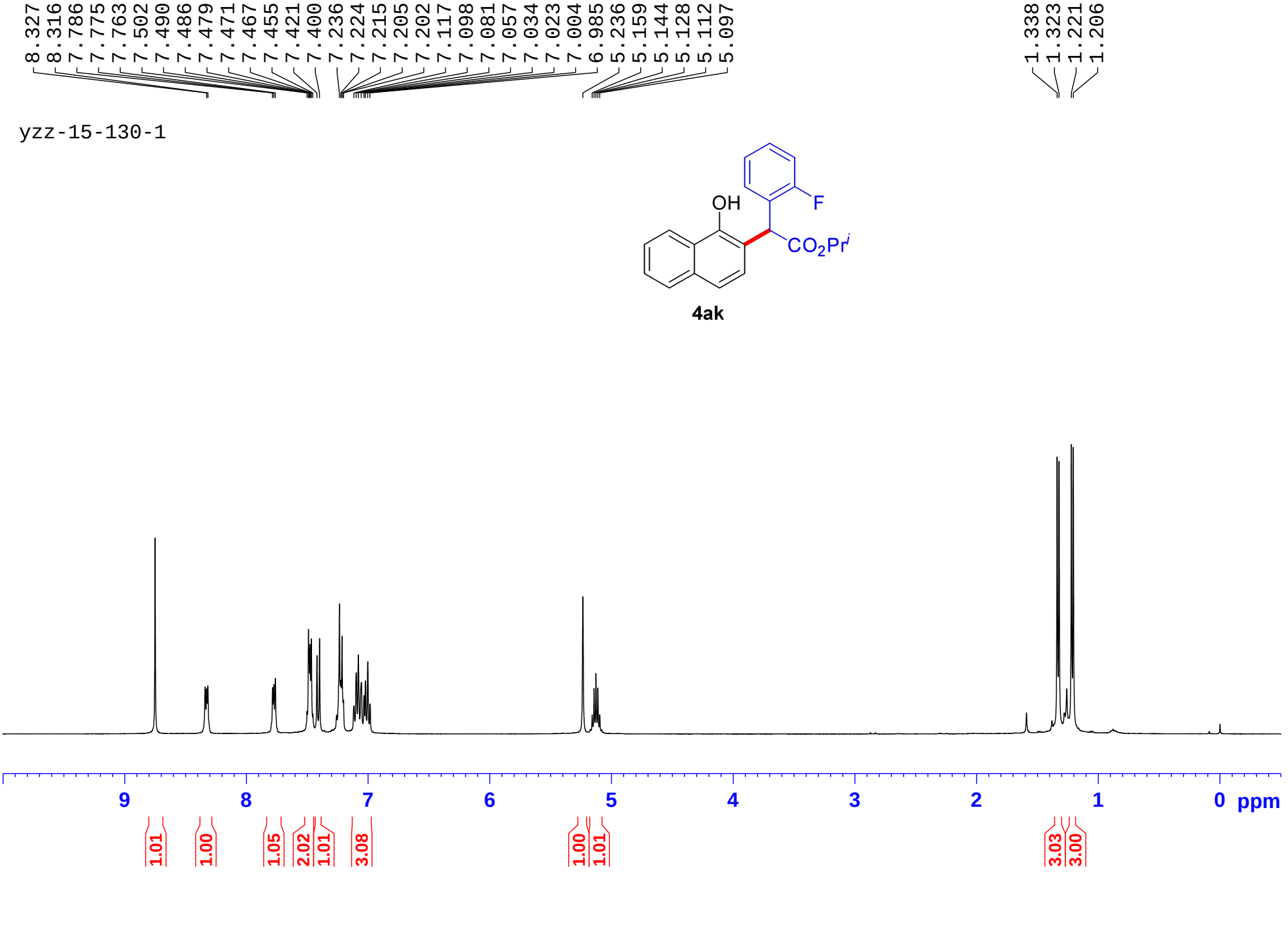
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7.486
7.479
7.471
7.467
7.455
7.421
7.400
7.236
7.224
7.215
7.205
7.202
7.117
7.098
7.081
7.057
7.034
7.023
7.004
6.985
5.236
5.159
5.144
5.128
5.112
5.097
1.338
1.323
1.221
1.206
yzz-15-130-1
OH
F
CO2Pri
4ak
9
8
7
6
5
4
3
2
1
0
ppm
1.01
1.00
1.05
2.02
1.01
3.08
1.00
1.01
3.03
3.00

yzz-15-130-1-c

174.94
161.91
159.46
151.85
134.53
129.44
129.37
129.19
127.25
126.71
126.20
125.40
124.24
124.20
123.72
123.57
122.63
120.43
115.47
115.25
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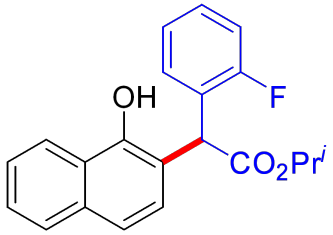
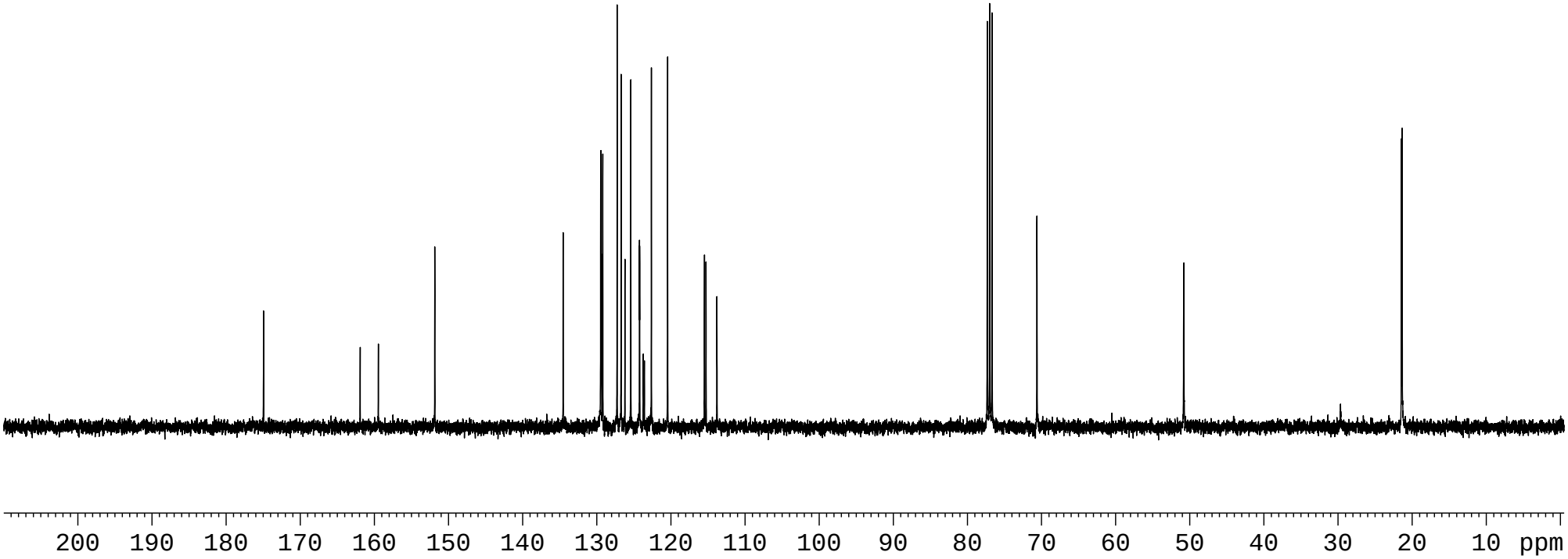
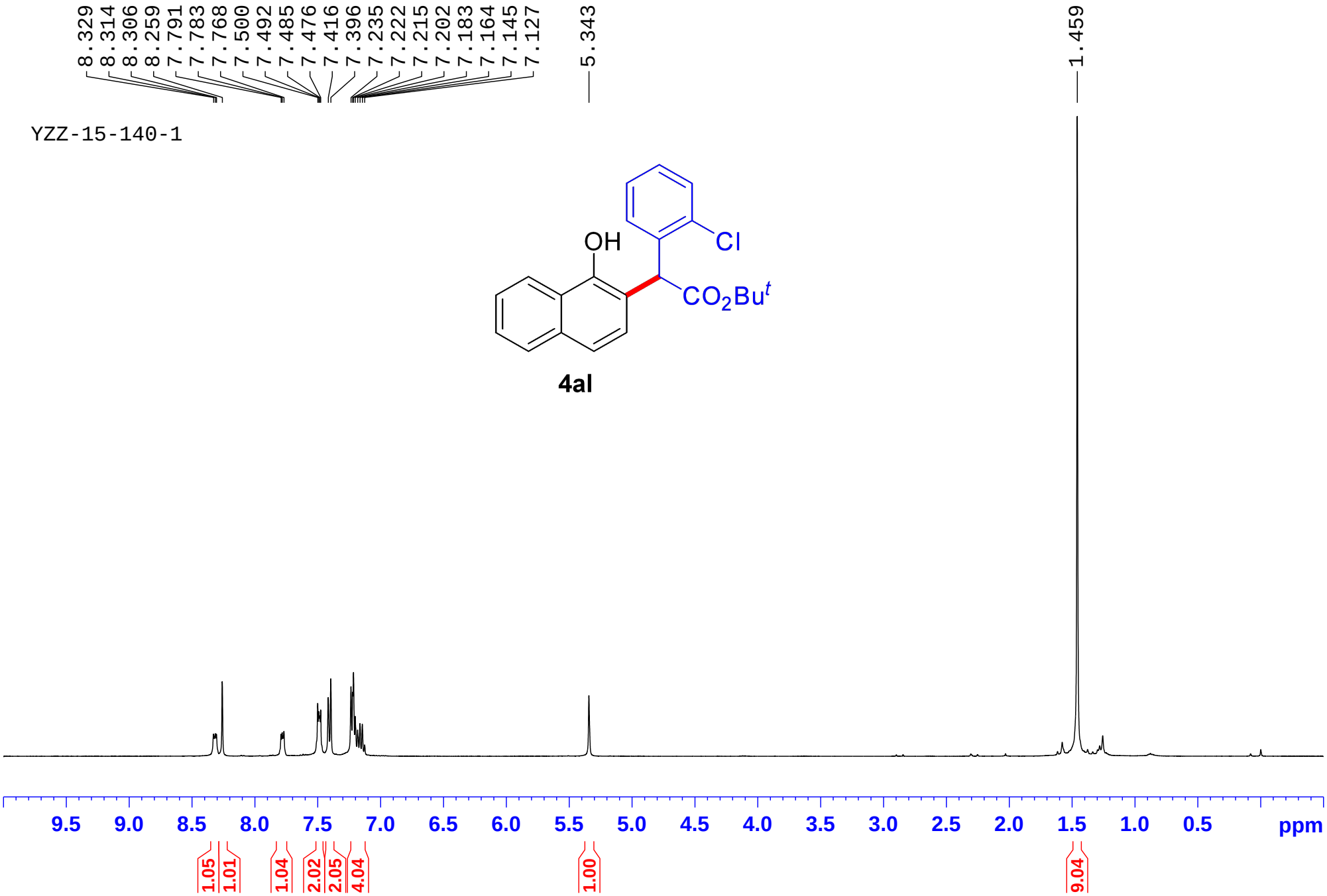
77.00
76.68
70.62
50.82
21.47
21.37



4ak

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8.259
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7.783
7.768
7.500
7.492
7.485
7.476
7.416
7.396
7.235
7.222
7.215
7.202
7.183
7.164
7.145
7.127
5.343
1.459
YZZ-15-140-1
OH
Cl
CO2But
4al
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
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ppm
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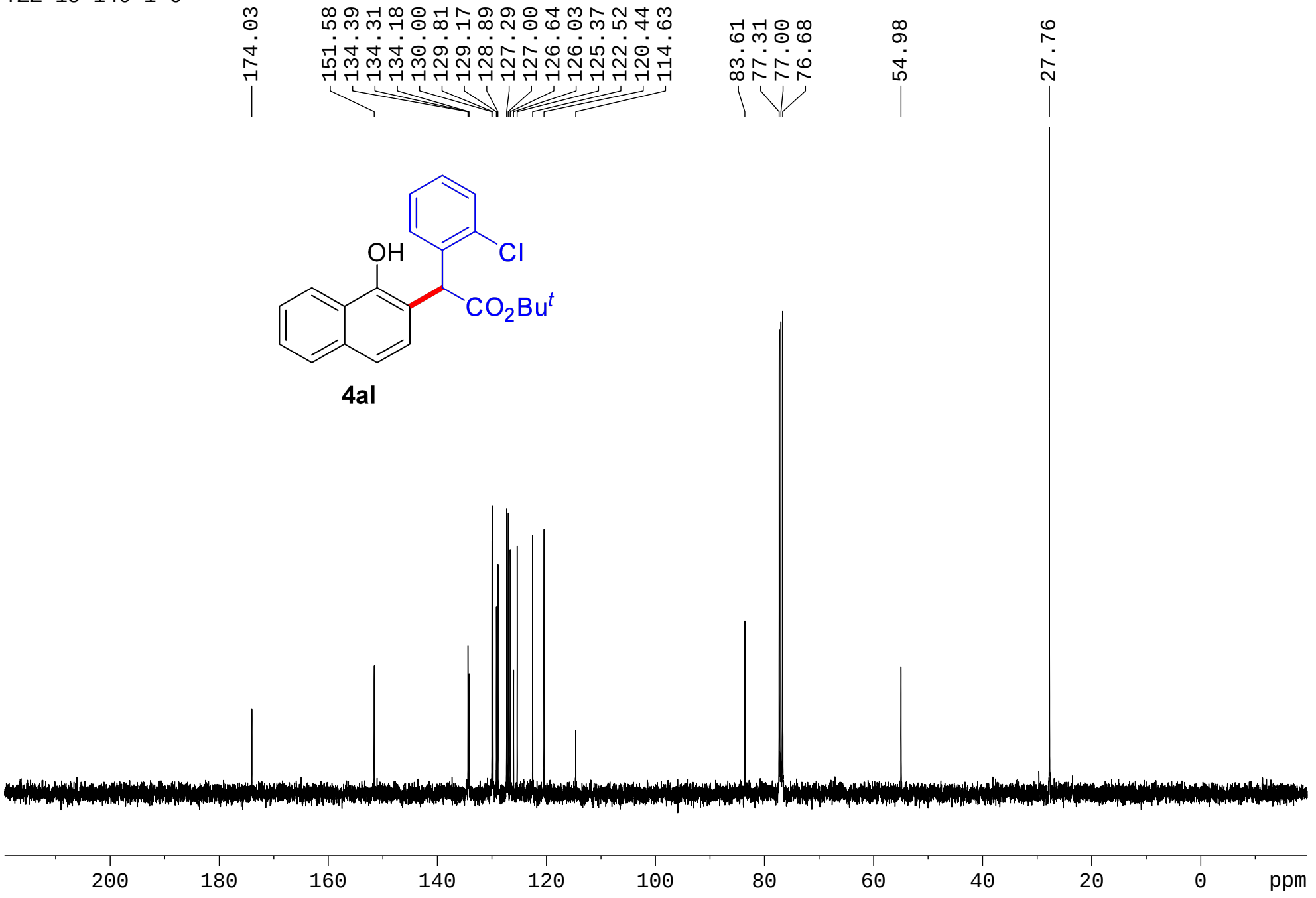
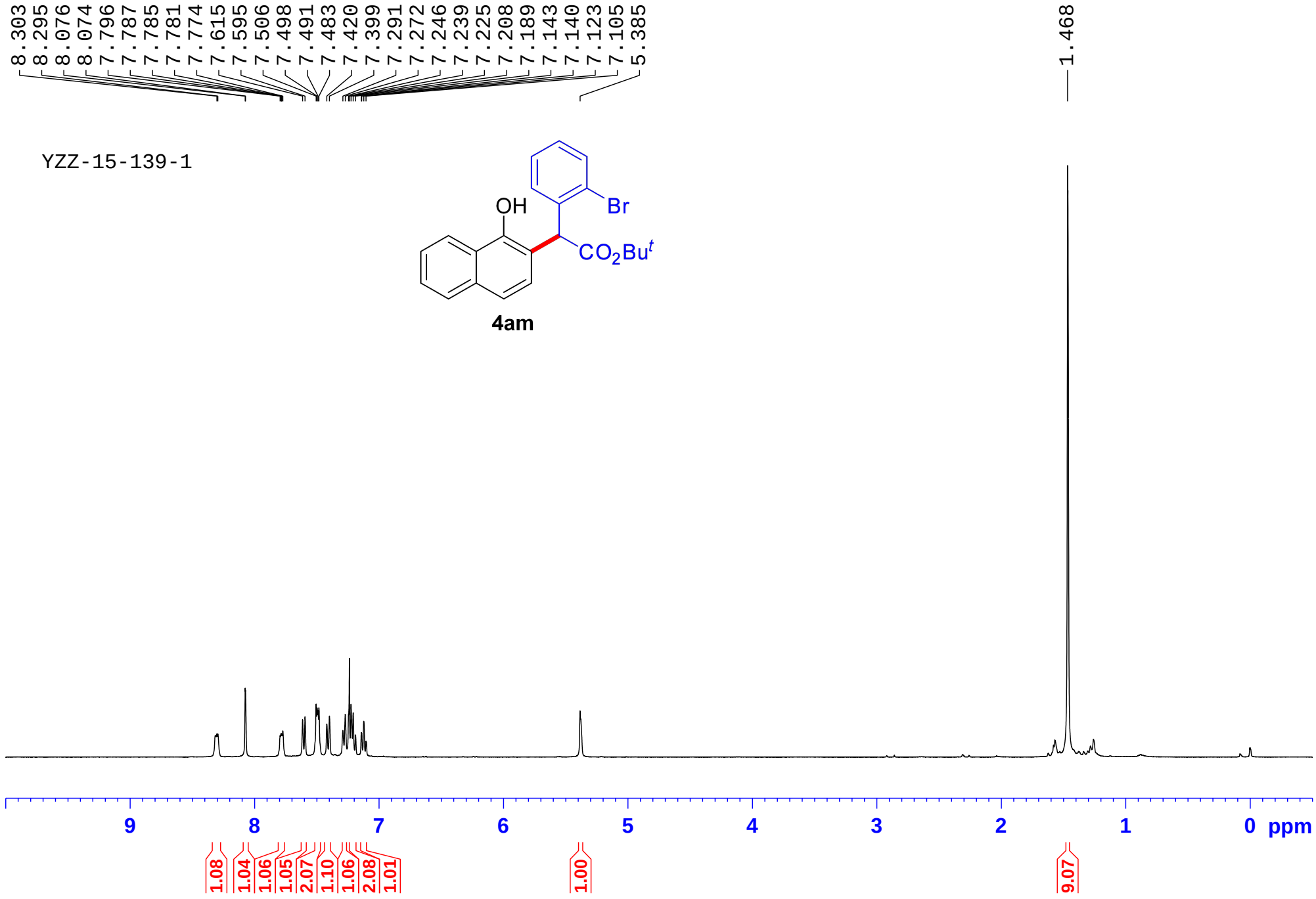
1.01
1.04
2.02
2.05
4.04
1.00
9.04

YZZ-15-140-1-C


174.03
151.58
134.39
134.31
134.18
130.00
129.81
129.17
128.89
127.29
127.00
126.64
126.03
125.37
122.52
120.44
114.63
83.61
77.31
77.00
76.68
54.98
27.76
OH
Cl
CO2Bu^t
4al
200
180
160
140
120
100
80
60
40
20
0
ppm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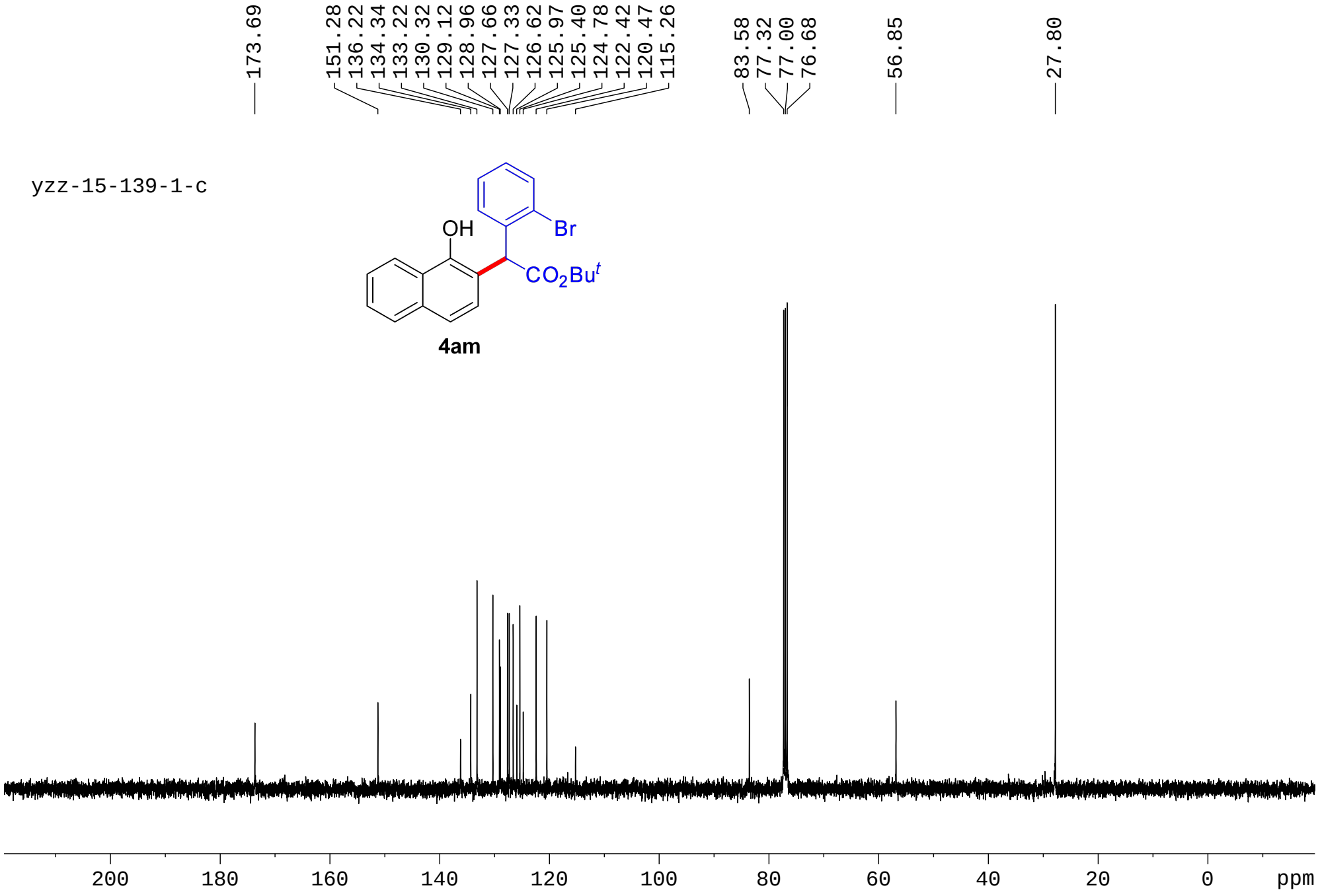
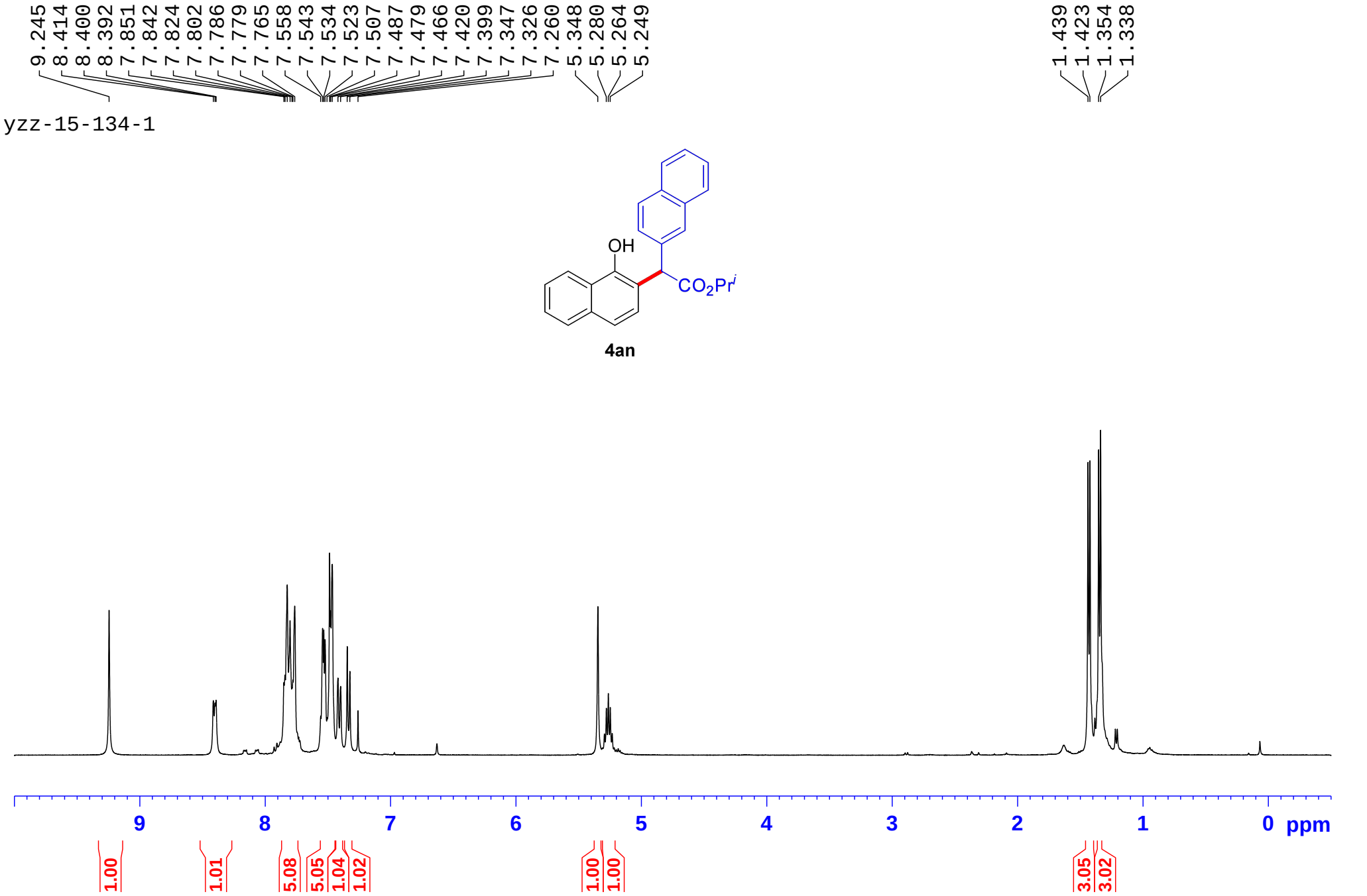
7.787
7.785
7.781
7.774
7.615
7.595
7.506
7.498
7.491
7.483
7.420
7.399
7.291
7.272
7.246
7.239
7.225
7.208
7.189
7.143
7.140
7.123
7.105
5.385
1.468
YZZ-15-139-1
OH
Br
CO2But
4am
9
8
7
6
5
4
3
2
1
0 ppm
1.08
1.04
1.06
1.05
2.07
1.10
1.06
2.08
1.01
1.00
9.07

yzz-15-139-1-c

4am

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7.824
7.802
7.786
7.779
7.765
7.558
7.543
7.534
7.523
7.507
7.487
7.479
7.466
7.420
7.399
7.347
7.326
7.260
5.348
5.280
5.264
5.249
1.439
1.423
1.354
1.338
yzz-15-134-1
OH
CO2Pri
4an
9
8
7
6
5
4
3
2
1
0
ppm
1.00
1.01
5.08
5.05
1.04
1.02
1.00
1.00
3.05
3.02

yzz-15-134-1-c

175.65
151.71
134.46
134.22
133.26
132.55
129.29
128.48
128.06
127.49
127.18
126.60
126.46
126.21
126.11
126.07
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120.14
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77.00
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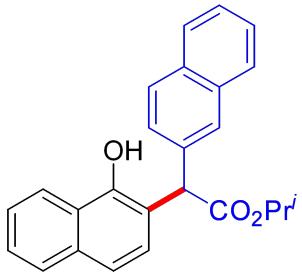
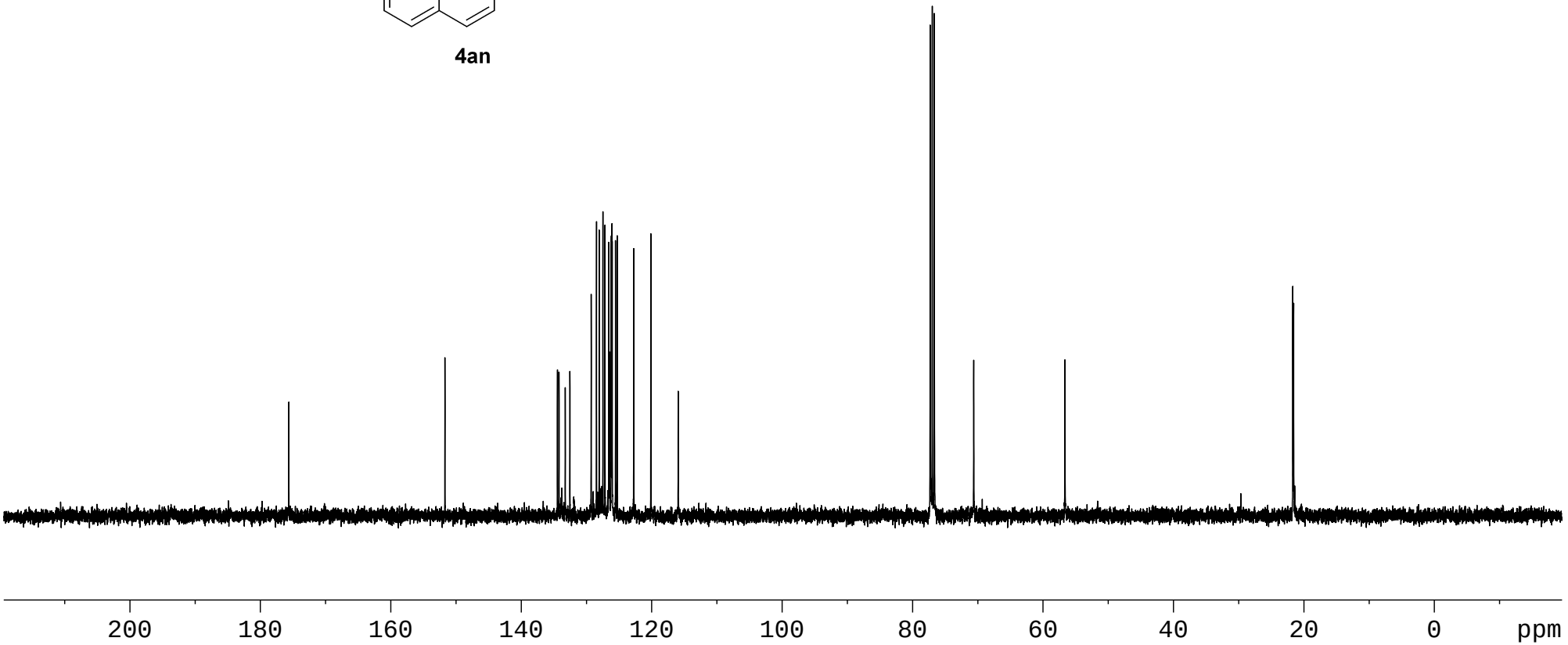
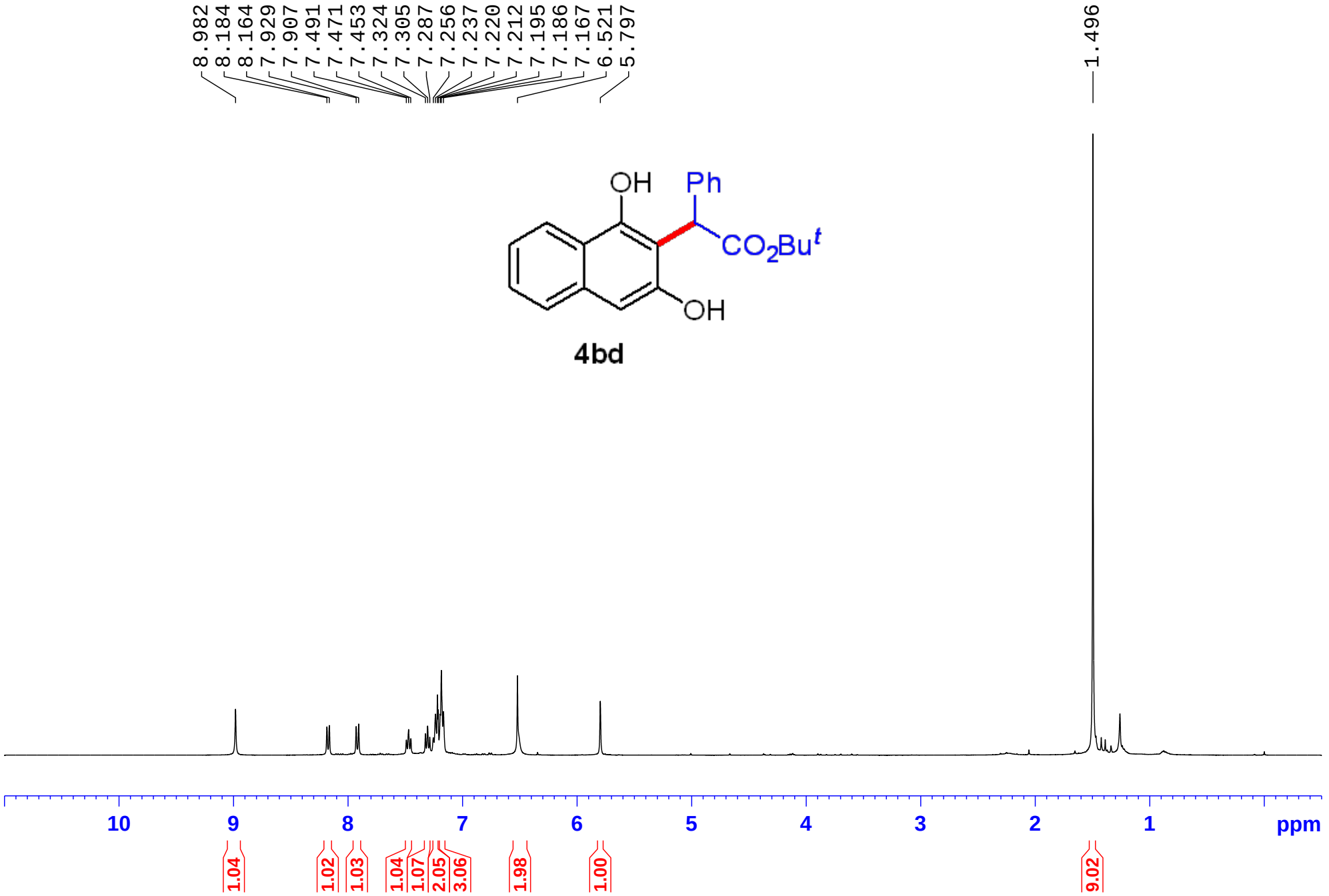
70.64
56.66
21.72
21.59



4an



YZZ-16-001-3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7.453
7.324
7.305
7.287
7.256
7.237
7.220
7.212
7.195
7.186
7.167
6.521
5.797
1.496
OH
Ph
CO2But
OH
4bd
10
9
8
7
6
5
4
3
2
1
ppm
1.04
1.02
1.03
1.04
1.07
2.05
3.06
1.98
1.00
9.02

yzz-16-001-3-c

176.32
154.33
153.07
137.51
134.23
128.48
127.60
127.37
127.03
122.71
122.31
121.63
120.96
107.63
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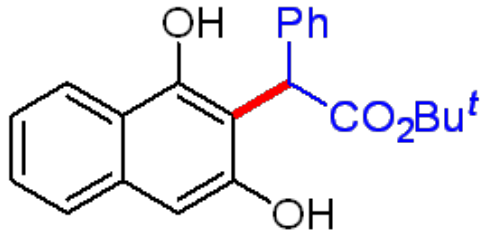
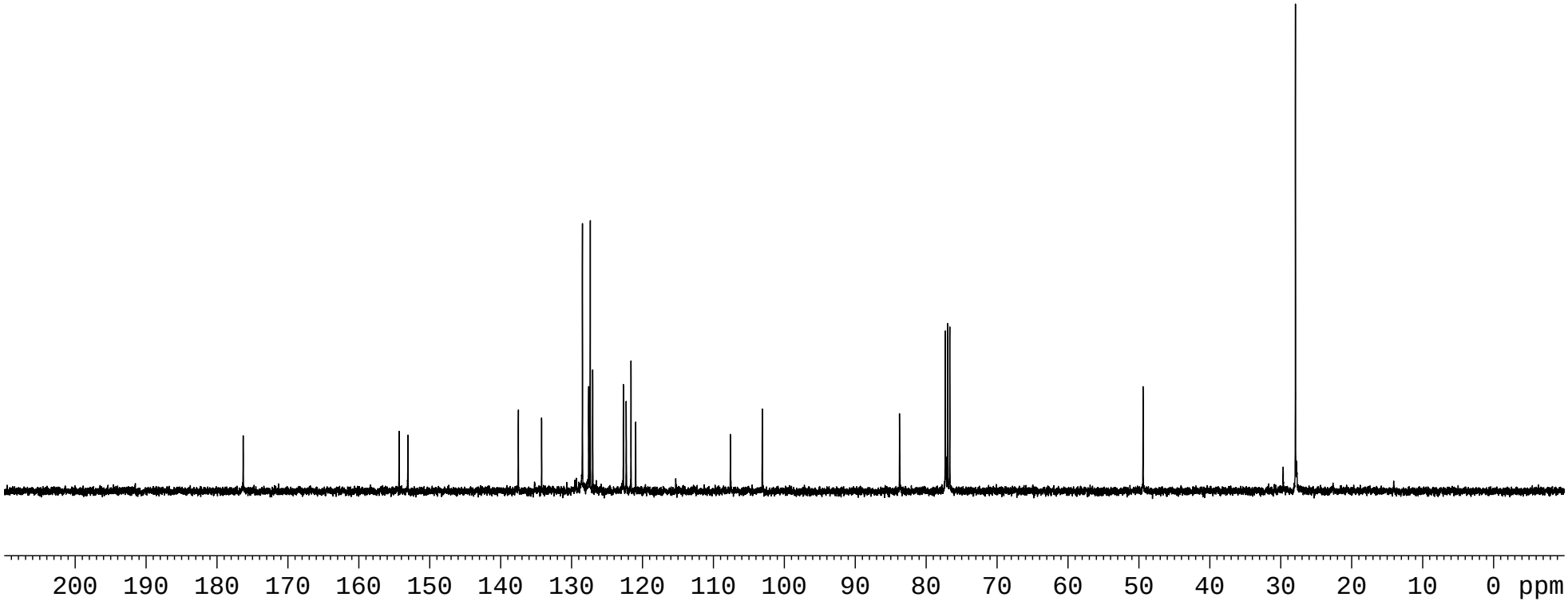
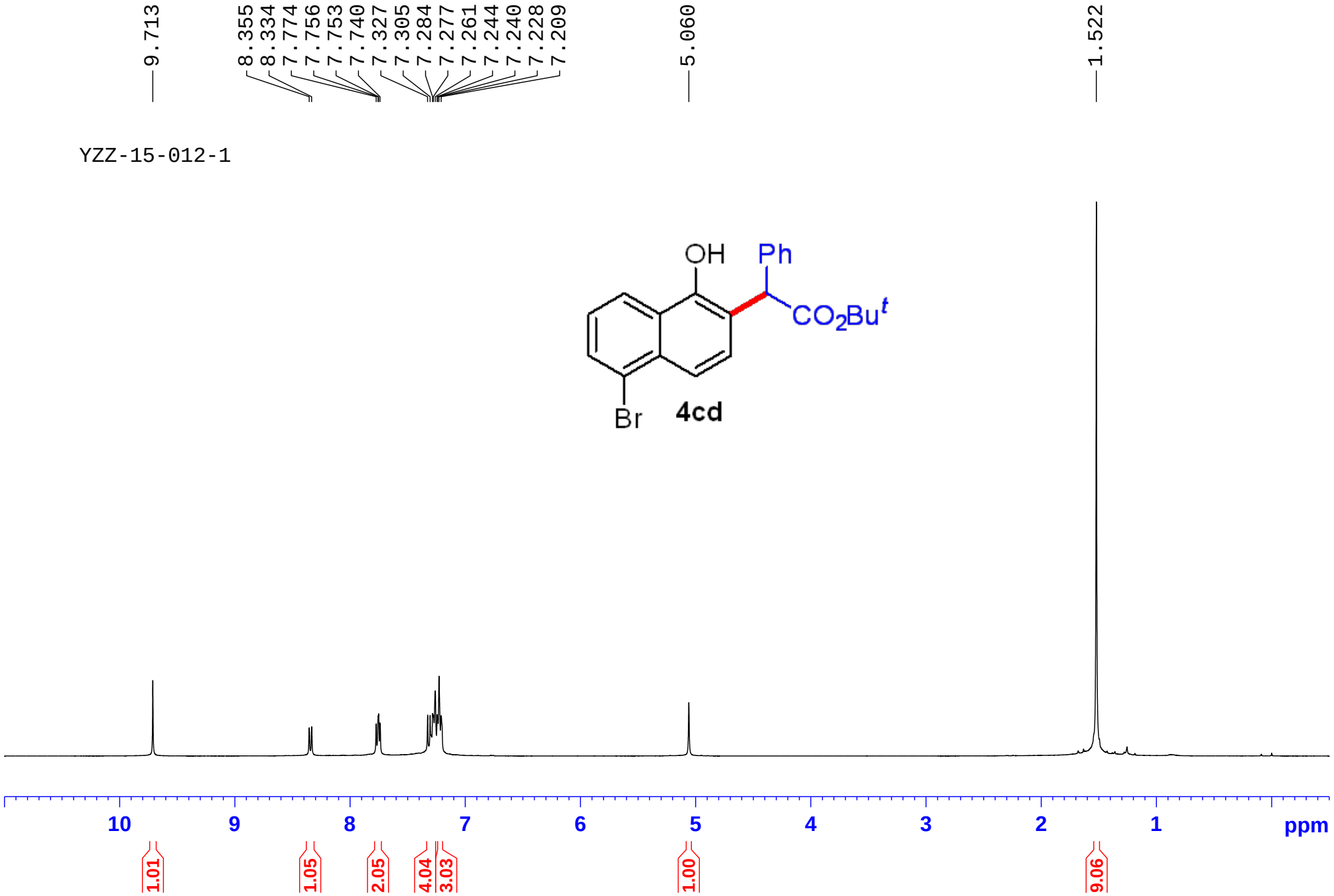
77.32
77.20
77.00
76.68
49.43
27.94



4bd

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7.327
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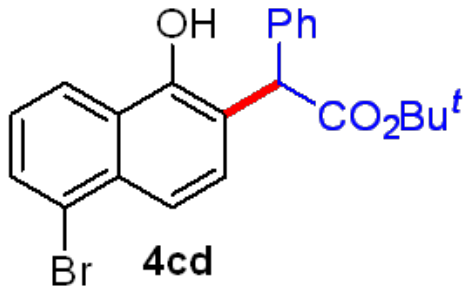
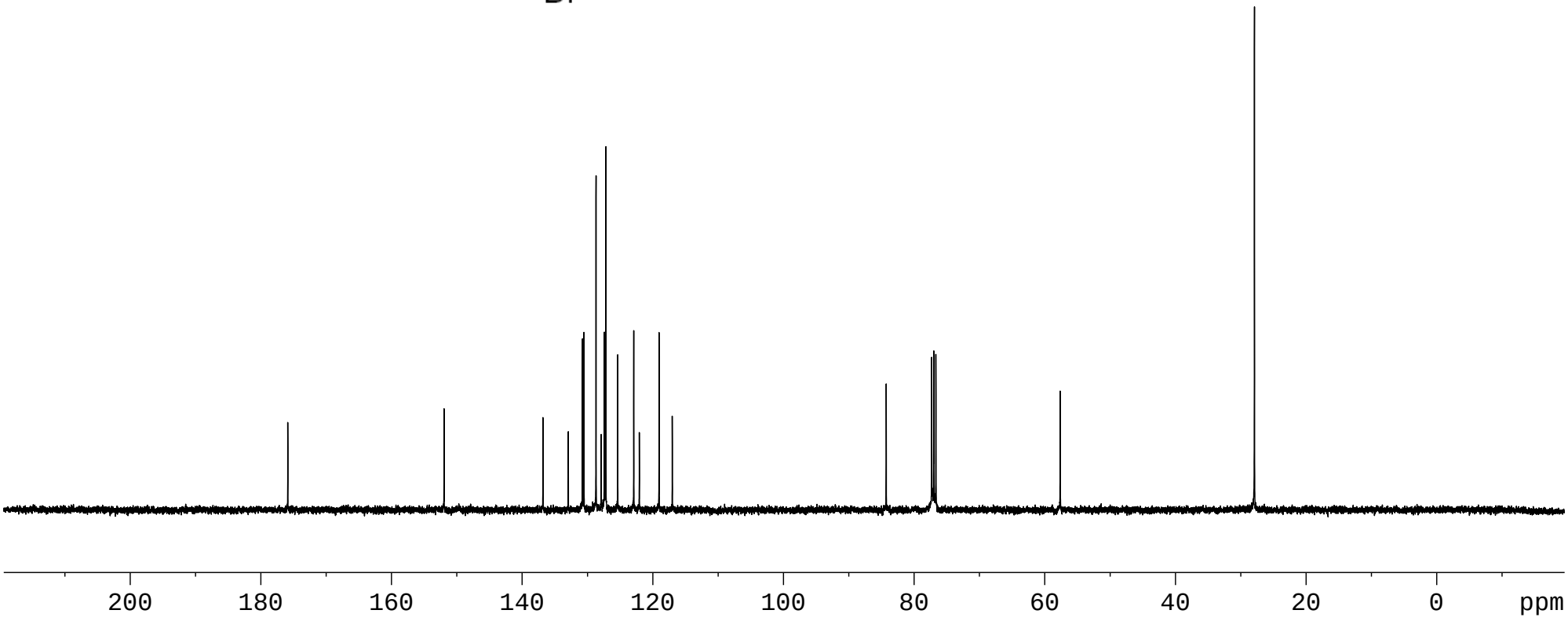
7.284
7.277
7.261
7.244
7.240
7.228
7.209
5.060
1.522
YZZ-15-012-1
OH
Ph
CO2Bu^t
Br
4cd
10
9
8
7
6
5
4
3
2
1
ppm
1.01
1.05
2.05
4.04
3.03
1.00
9.06

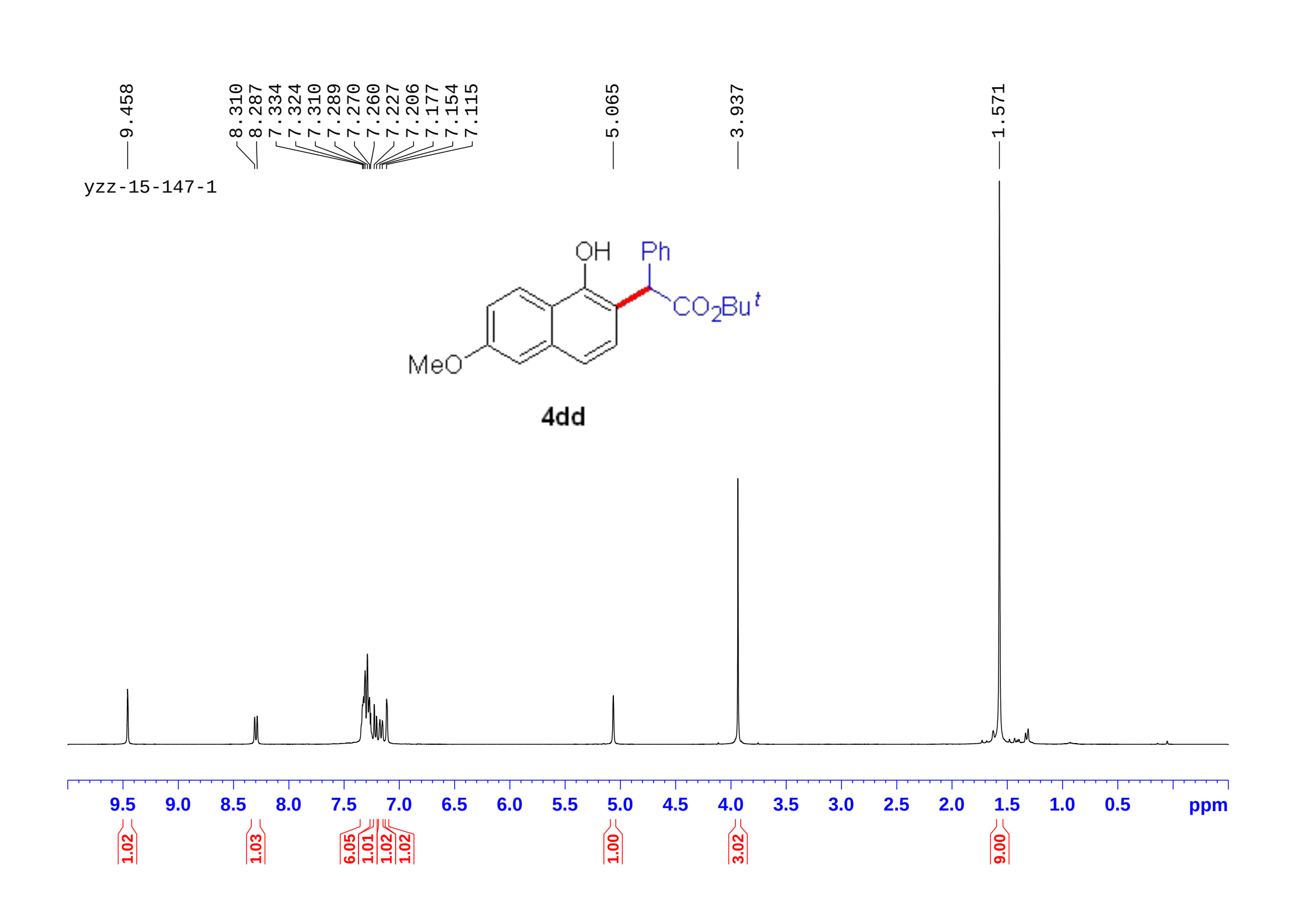
YZZ-15-012-1-C

175.89
151.97
136.83
132.95
130.78
130.56
128.71
127.91
127.43
127.19
125.39
122.93
122.08
119.06
117.04
84.28
77.32
77.00
76.68
57.65
27.92



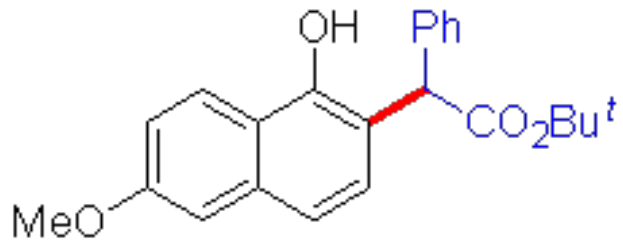
4cd



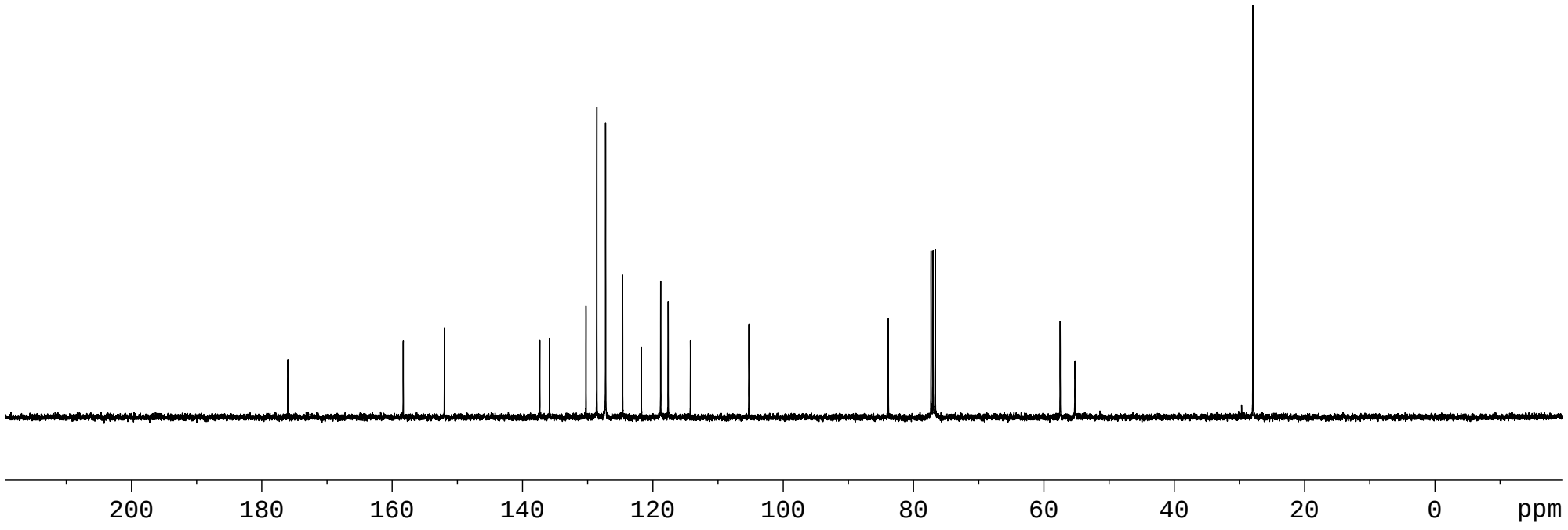

9.458
8.310
8.287
7.334
7.324
7.310
7.289
7.270
7.260
7.227
7.206
7.177
7.154
7.115
5.065
3.937
1.571
yzz-15-147-1
OH
Ph
CO2But
MeO
4dd
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.02
1.03
6.05
1.01
1.02
1.02
1.00
3.02
9.00

yzz-15-147-1-c

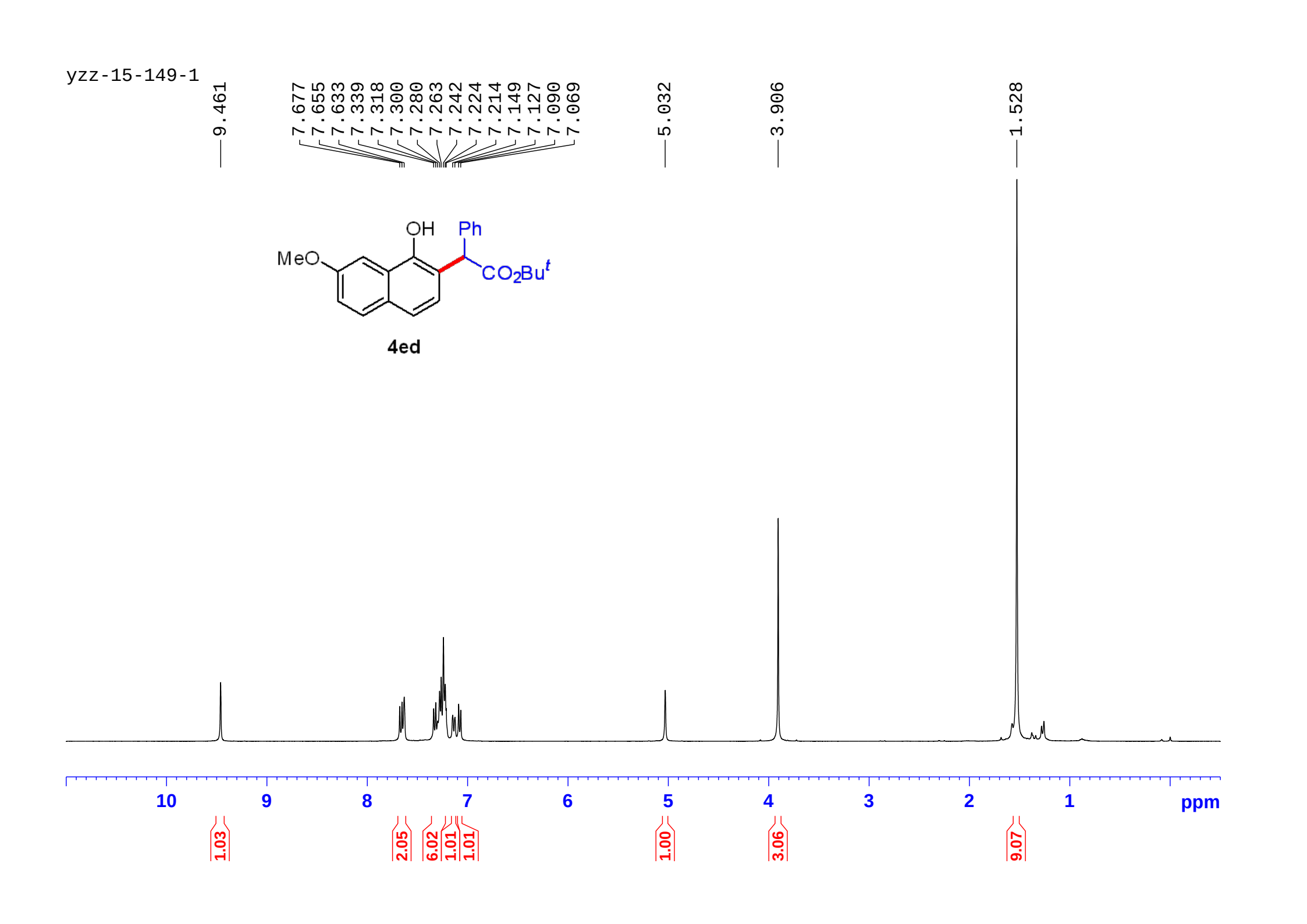
176.01
158.31
152.00
137.36
135.86
130.26
128.60
127.26
124.64
121.76
118.81
117.65
114.24
105.26
83.87
77.32
77.00
76.68
57.50
55.24
27.93



4dd



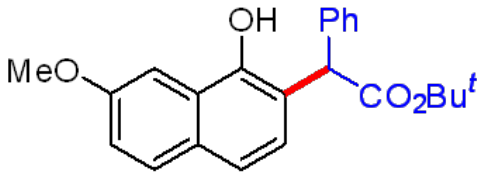
yzz-15-149-1



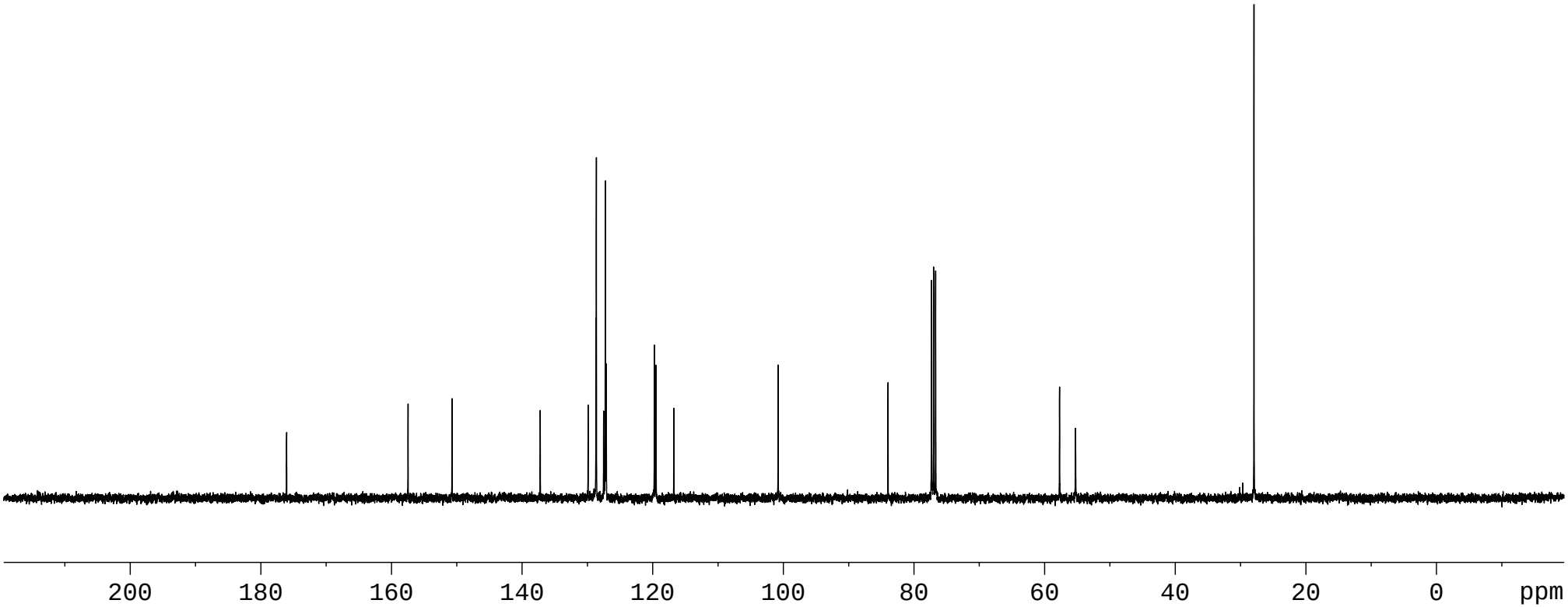
4ed

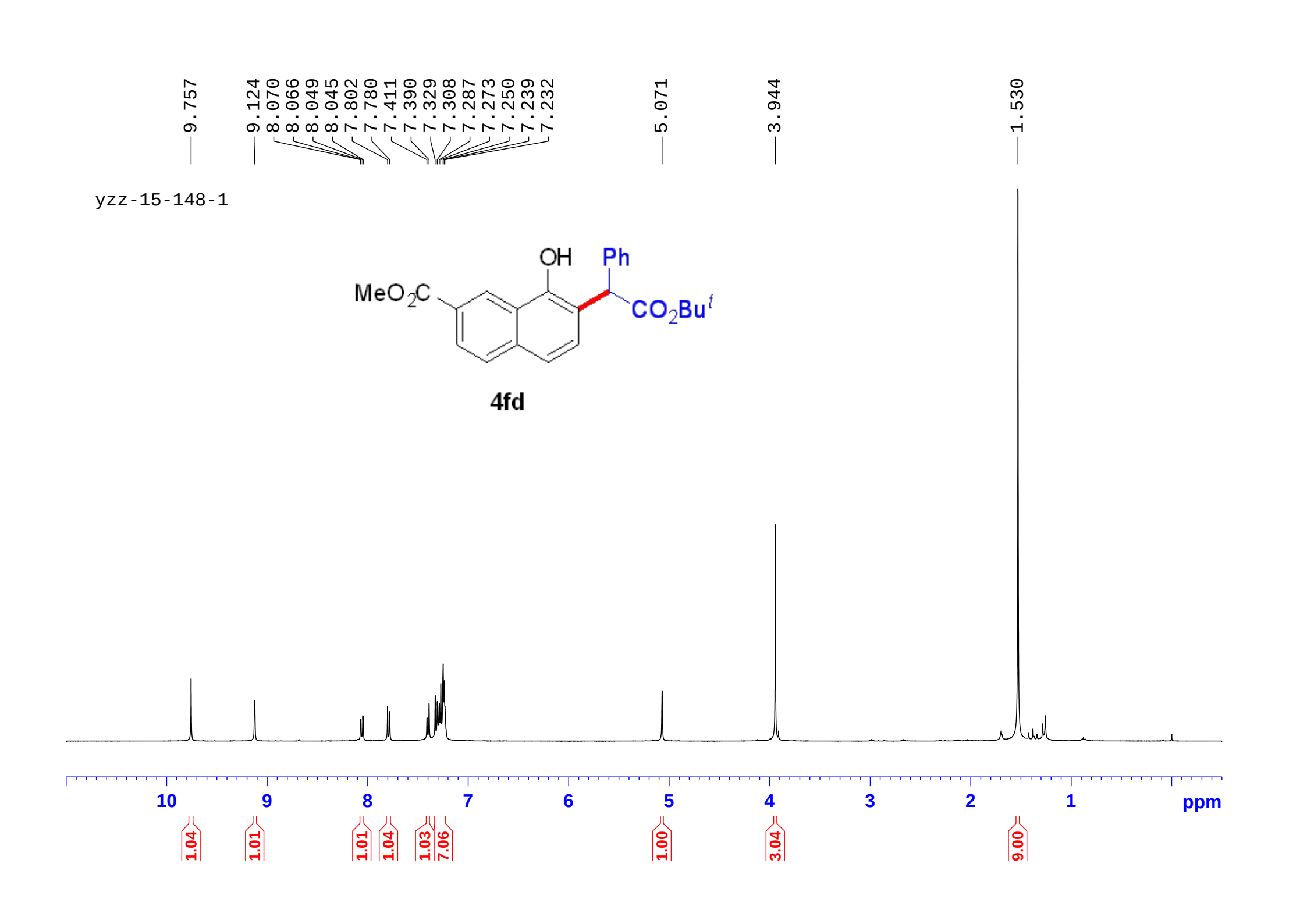
yzz-15-149-1-c

176.05
157.45
150.73
137.22
129.90
128.70
128.62
127.52
127.27
127.23
127.11
119.75
119.50
116.77
100.81
83.96
77.32
77.00
76.68
57.71
55.28
27.94



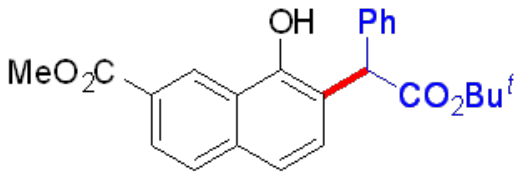
4ed



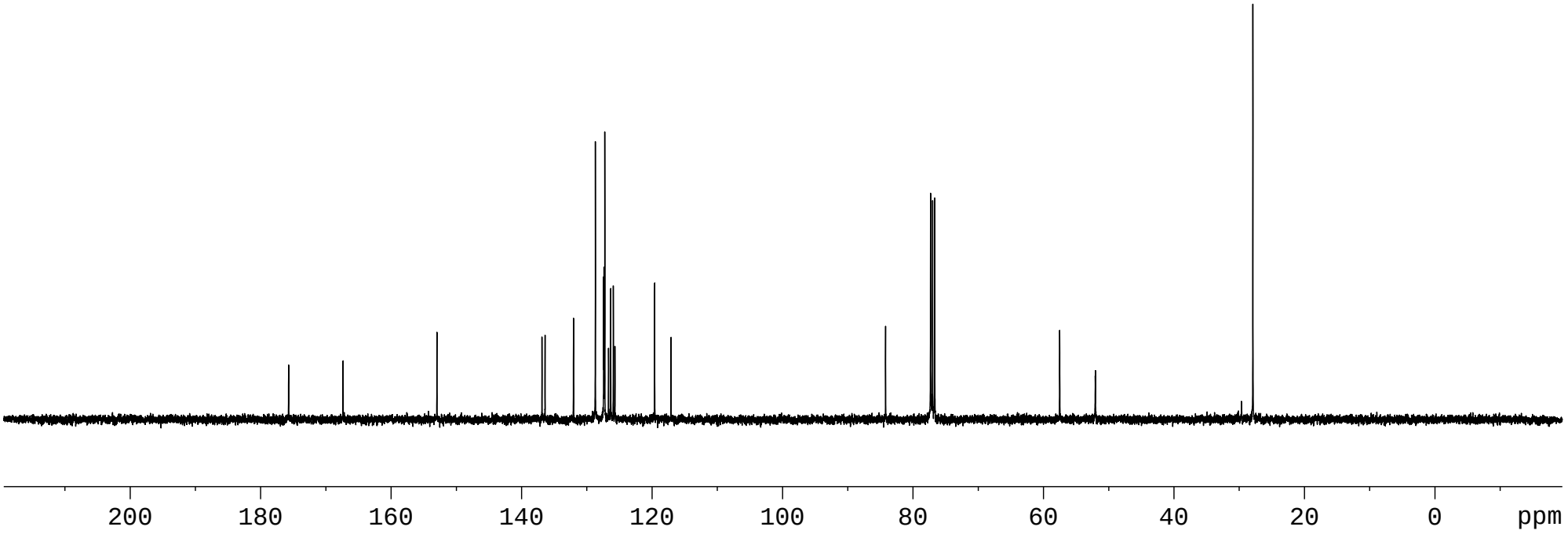

9.757
9.124
8.070
8.066
8.049
8.045
7.802
7.780
7.411
7.390
7.329
7.308
7.287
7.273
7.250
7.239
7.232
5.071
3.944
1.530
yzz-15-148-1
OH
Ph
MeO2C
CO2Bu^t
4fd
10
9
8
7
6
5
4
3
2
1
ppm
1.04
1.01
1.01
1.04
1.03
7.06
1.00
3.04
9.00

yzz-15-148-1-c

175.72
167.37
152.99
136.89
136.41
132.05
128.70
127.42
127.37
127.26
126.68
126.34
125.94
125.70
119.61
117.10
84.21
77.32
77.20
77.00
76.68
57.52
52.04
27.90

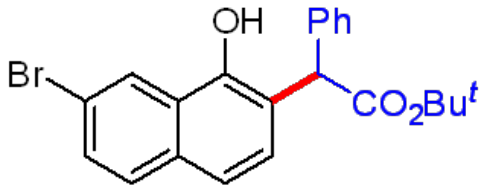


4fd

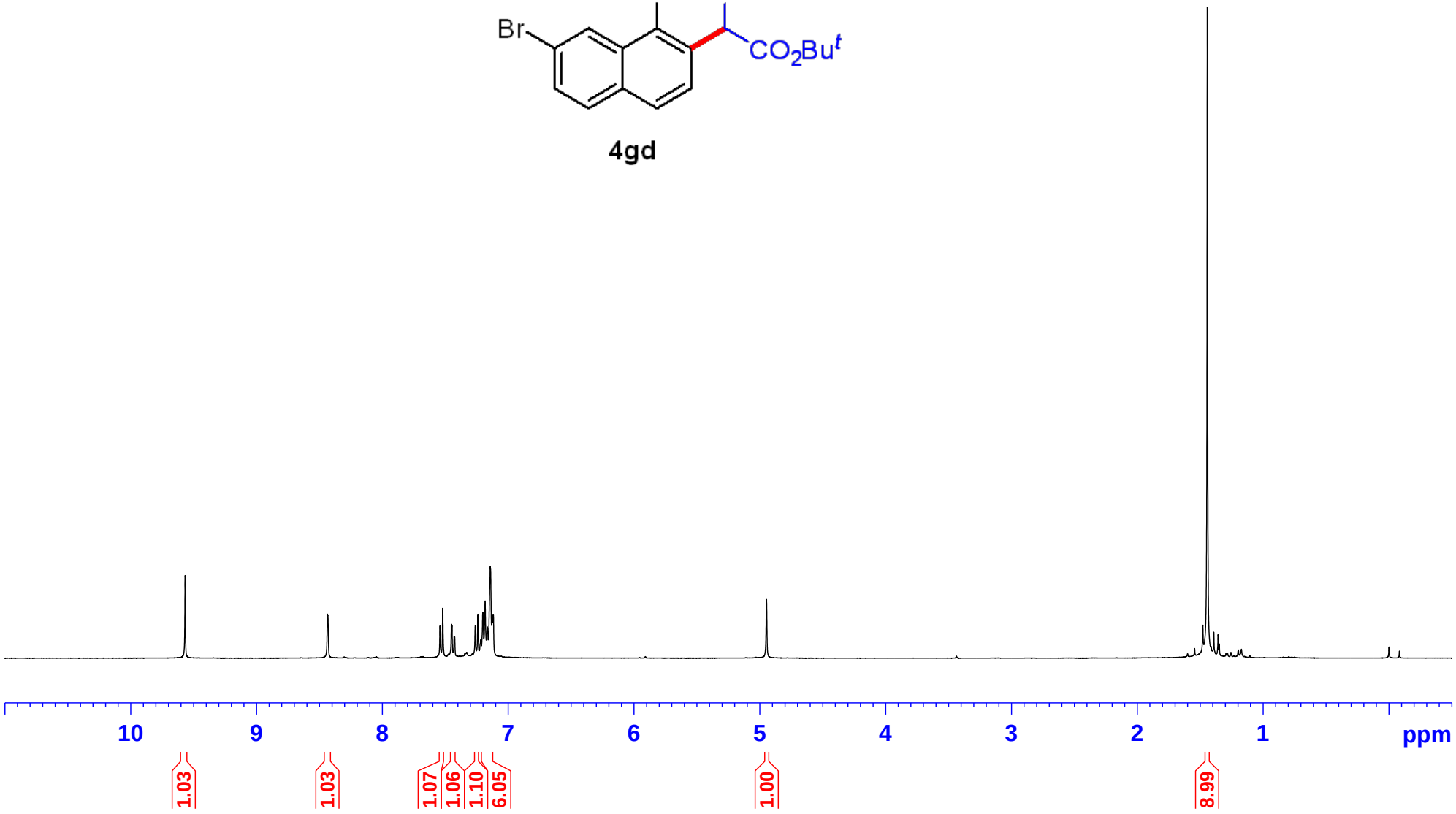


yzz-15-150-1

9.568
8.434
7.543
7.521
7.452
7.448
7.431
7.426
7.263
7.242
7.220
7.203
7.184
7.167
7.165
7.142
7.126
7.118
4.948
1.444

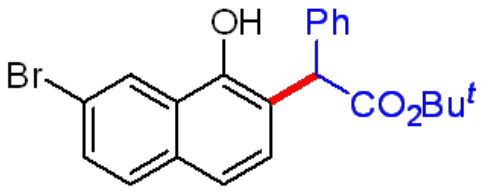


4gd

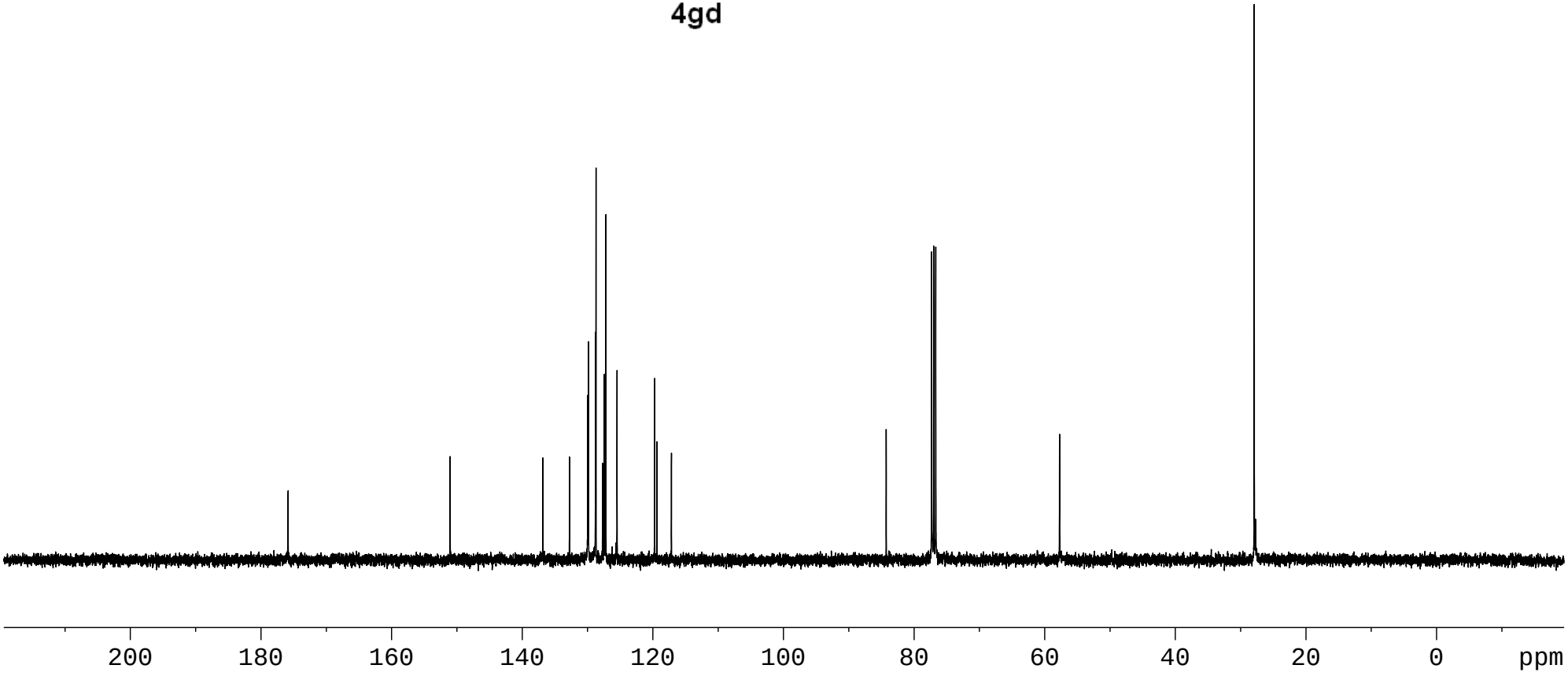


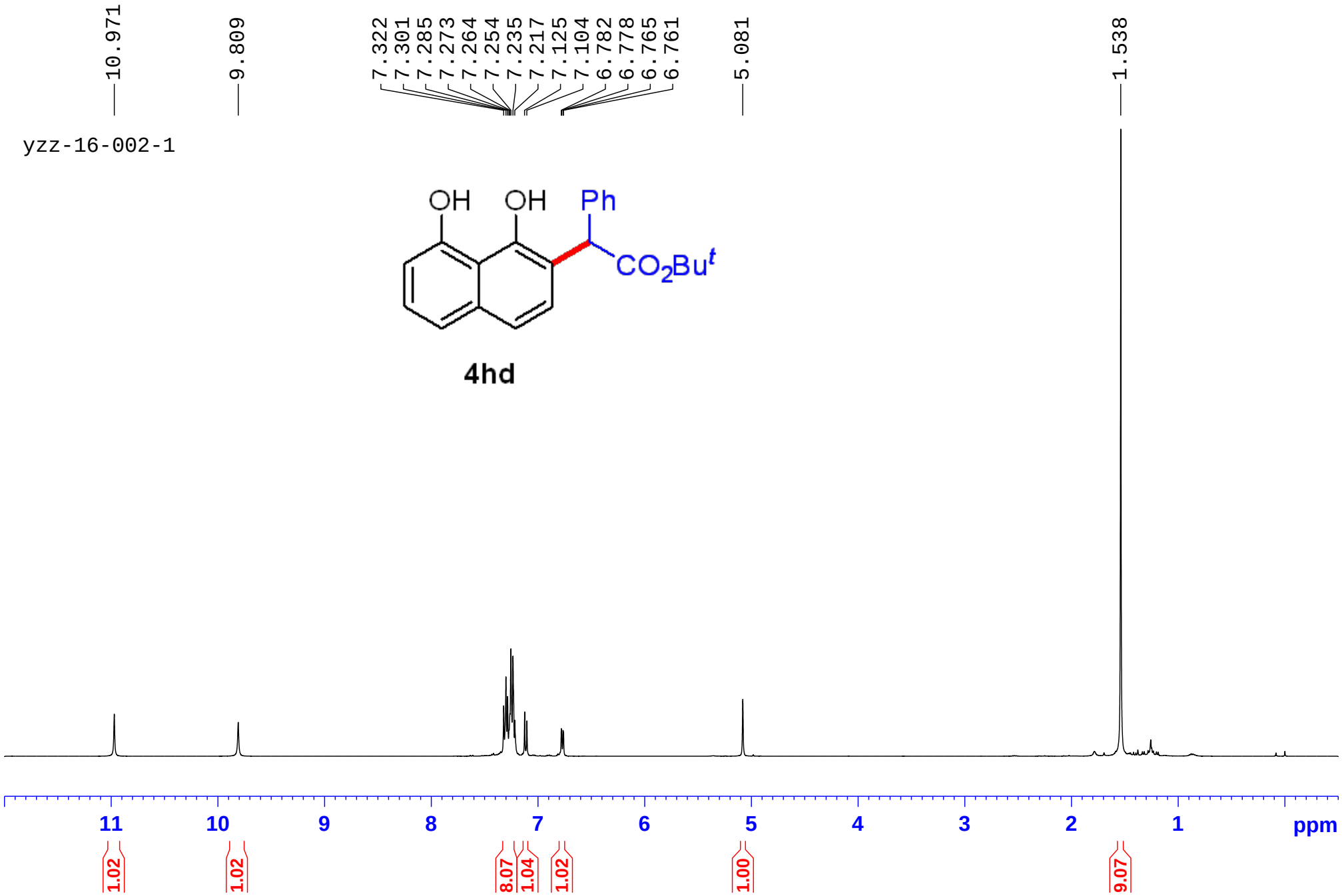
yzz-15-150-1-c

175.85
151.05
136.86
132.78
129.96
129.86
128.77
128.71
127.71
127.43
127.20
125.48
119.74
119.37
117.16
84.27
77.32
77.00
76.68
57.73
27.92



4gd




10.971
9.809
7.322
7.301
7.285
7.273
7.264
7.254
7.235
7.217
7.125
7.104
6.782
6.778
6.765
6.761
5.081
1.538
yzz-16-002-1
OH
OH
Ph
CO2But
4hd
11
10
9
8
7
6
5
4
3
2
1
ppm
1.02
1.02
8.07
1.04
1.02
1.00
9.07

yzz-16-002-1-c

176.72
154.84
152.06
136.97
136.57
129.09
128.66
127.50
127.38
127.35
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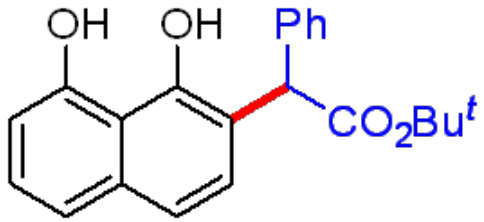
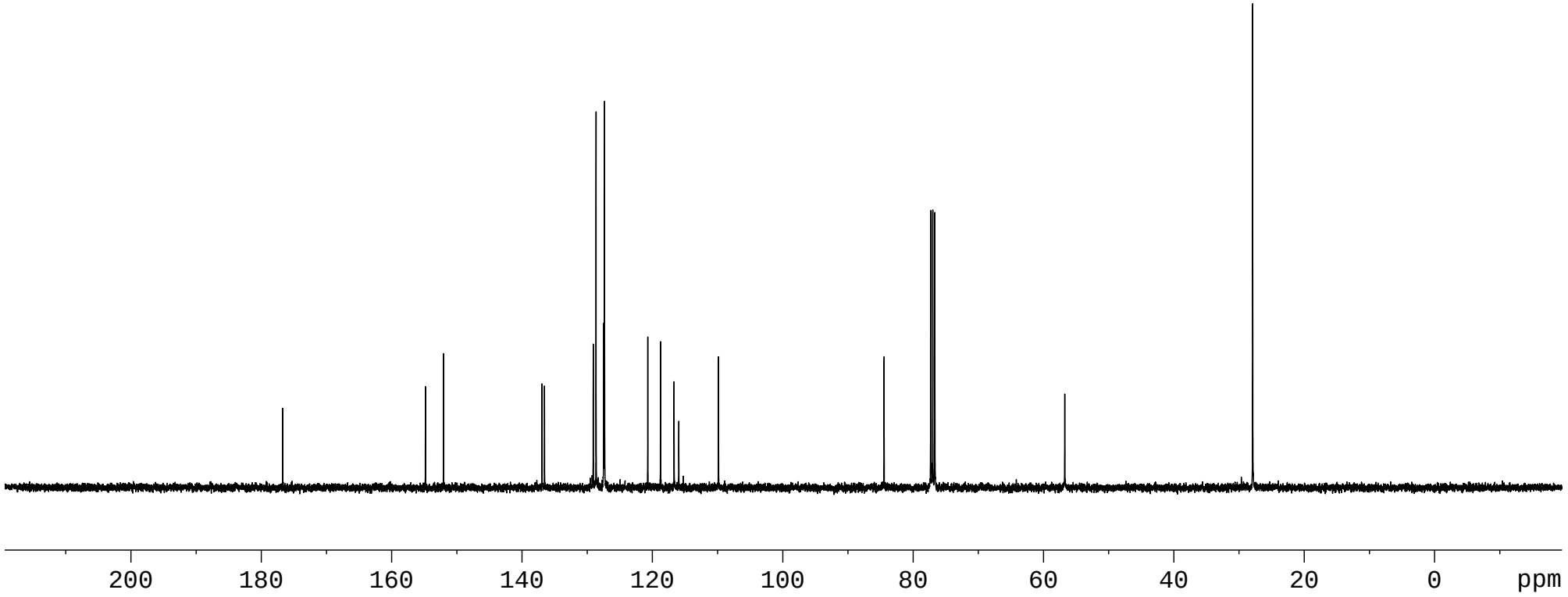
118.77
116.68
115.96
109.87
84.46
77.32
77.00
76.68
56.74
27.92



4hd

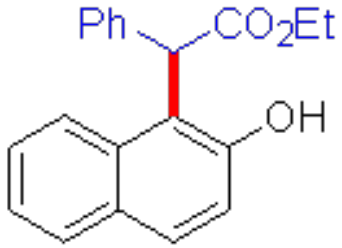


yzz-15-060-2

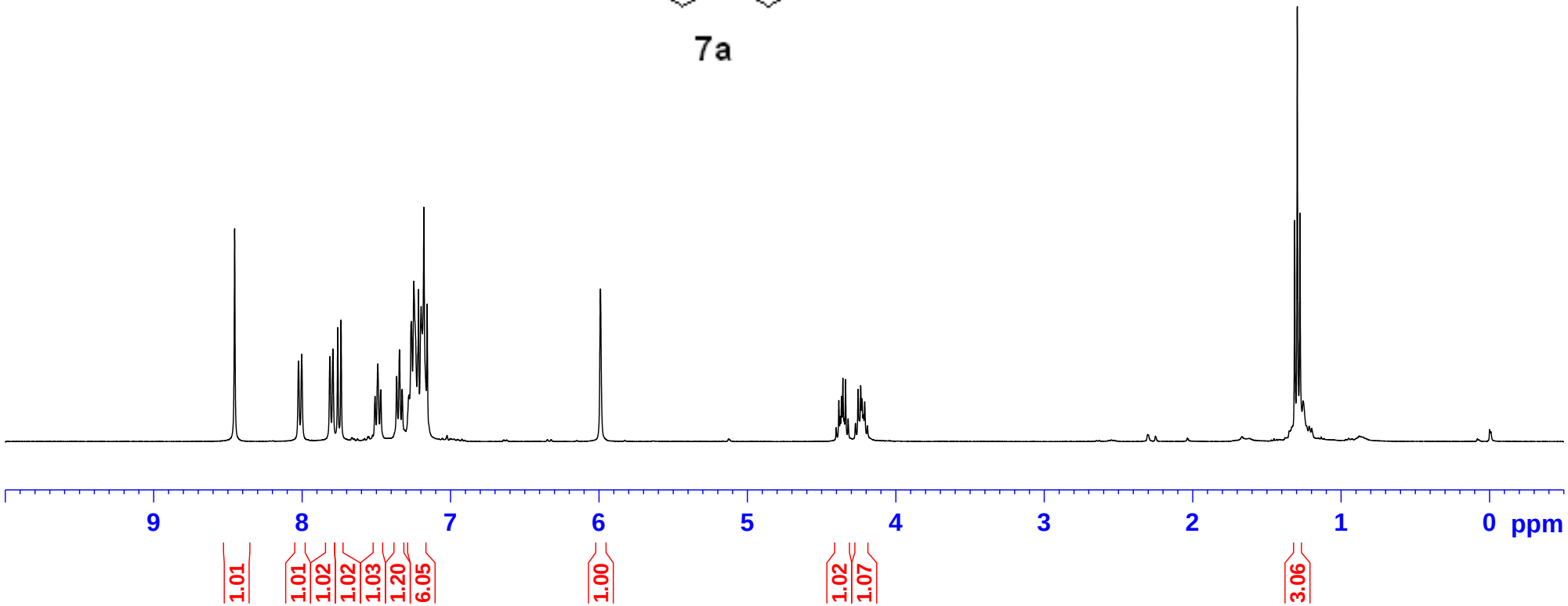
8.454 8.024 8.003 7.813 7.793 7.760 7.738 7.508 7.490 7.470 7.363 7.344 7.326 7.264 7.247 7.215 7.198 7.180 7.157 5.990

4.384 4.366 4.357 4.339 4.254 4.237 4.228 4.219 4.210

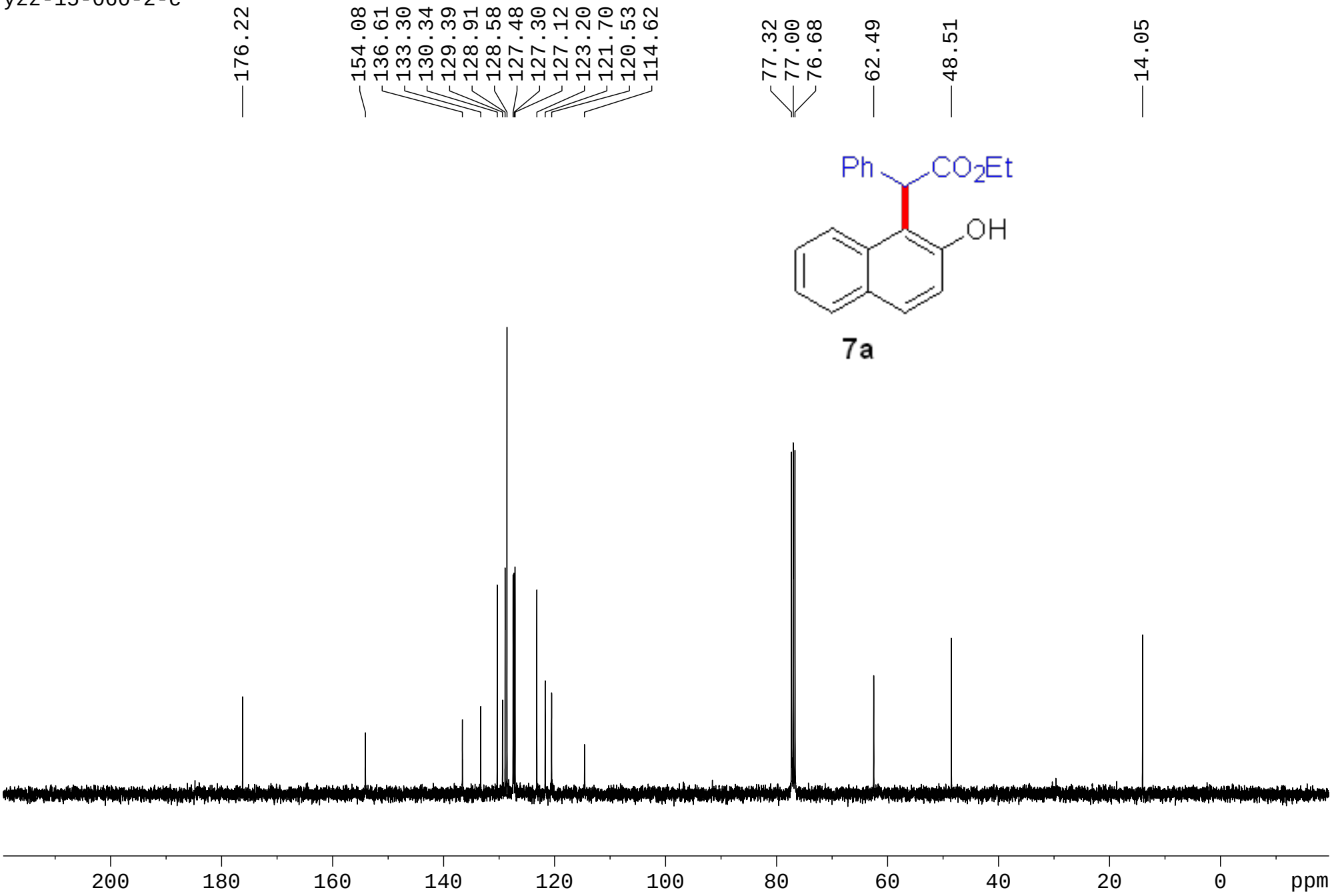
1.313 1.295 1.277



7a



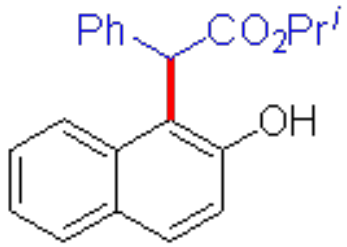
yzz-15-060-2-c


176.22
154.08
136.61
133.30
130.34
129.39
128.91
128.58
127.48
127.30
127.12
123.20
121.70
120.53
114.62
77.32
77.00
76.68
62.49
48.51
14.05
Ph
CO2Et
OH
7a
200
180
160
140
120
100
80
60
40
20
0
ppm

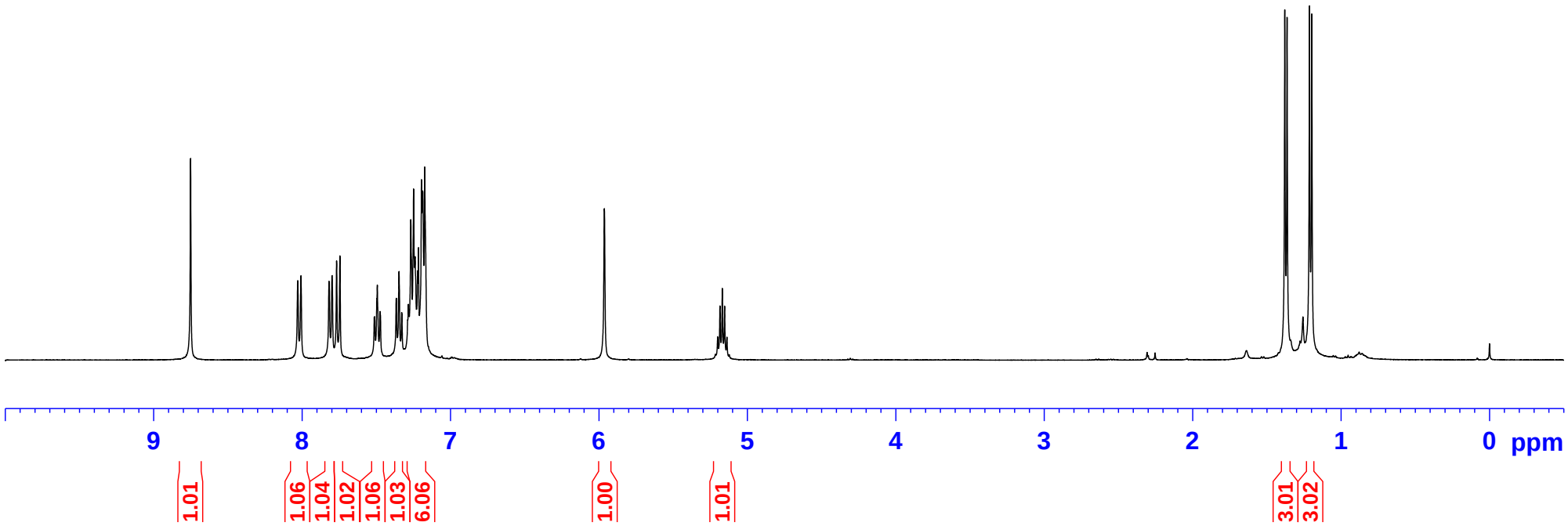
yzz-15-061-2

8.030
8.008
7.818
7.798
7.768
7.745
7.514
7.511
7.497
7.493
7.475
7.473
7.365
7.347
7.329
7.289
7.284
7.280
7.268
7.249
7.239
7.222
7.216
7.196
7.188
7.174
5.963
5.200
5.185
5.169
5.154
5.138

1.379
1.364
1.213
1.197

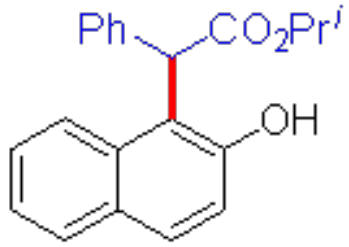


7b

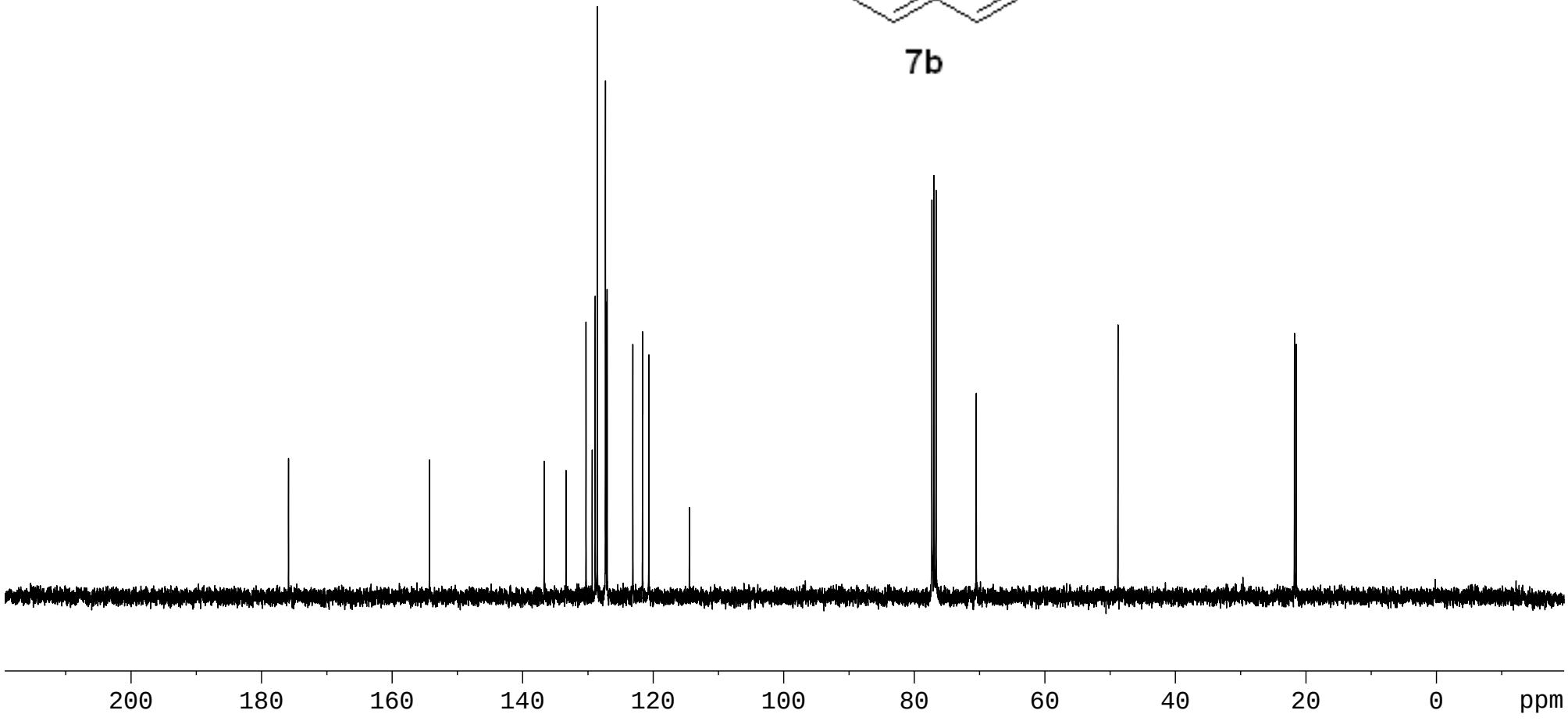


yzz-15-061-2-c

175.88
154.29
136.72
133.37
130.31
129.36
128.90
128.58
127.33
127.26
127.07
123.14
121.65
120.69
114.47
77.32
77.00
76.68
70.52
48.81
21.77
21.51

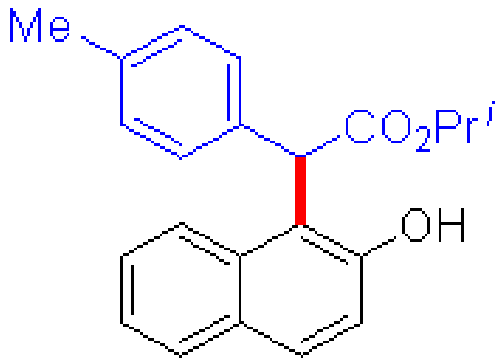


7b



yzz-15-063-2

8.795
8.065
8.043
7.849
7.830
7.799
7.777
7.546
7.544
7.526
7.508
7.505
7.397
7.379
7.361
7.260
7.232
7.210
7.103
5.960
5.228
5.212
5.197
5.181
5.165
2.315
1.411
1.395
1.248
1.233



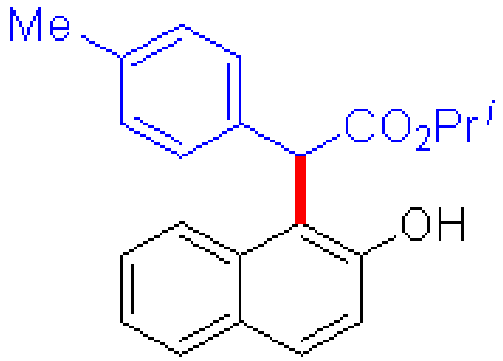
7c

9 8 7 6 5 4 3 2 1 0 ppm

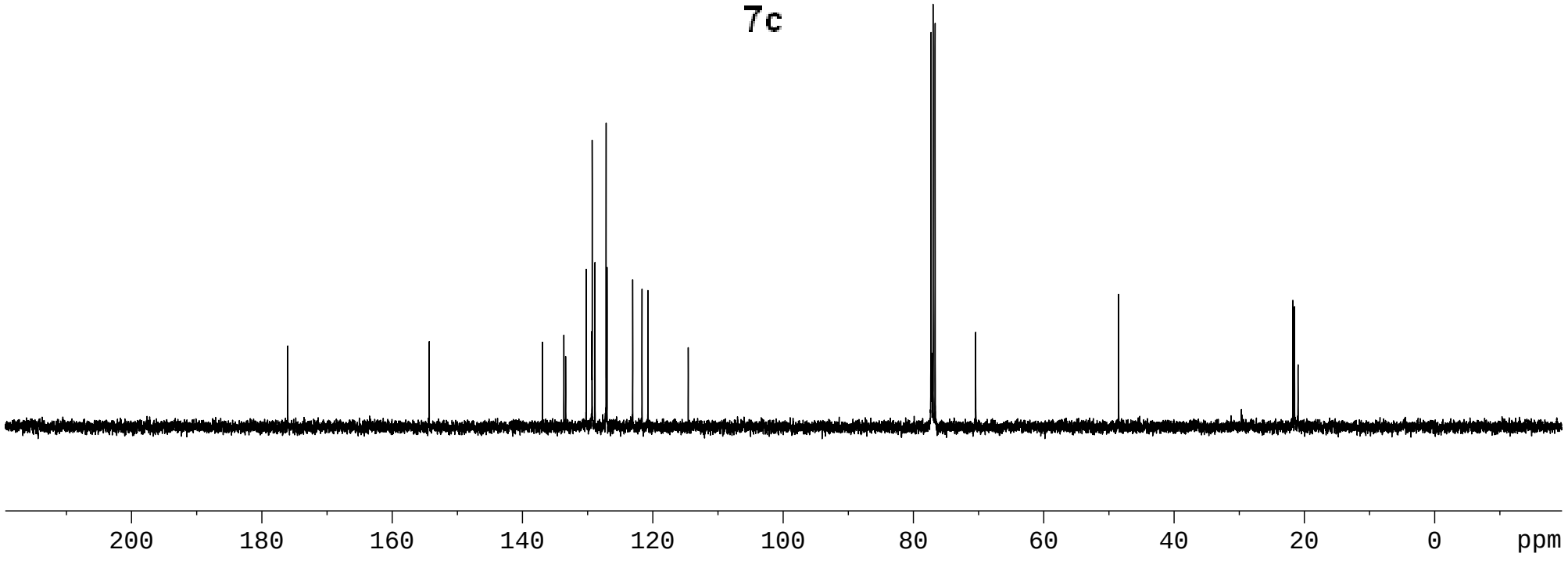
0.86 1.04 1.02 1.03 1.02 1.04 1.03 4.03 1.00 1.03 3.02 3.05 3.03

yzz-15-063-2-c

176.03
154.33
136.94
133.66
133.39
130.24
129.36
129.32
128.89
127.18
127.04
123.10
121.66
120.76
114.57
77.32
77.00
76.68
70.46
48.52
21.78
21.52
20.98



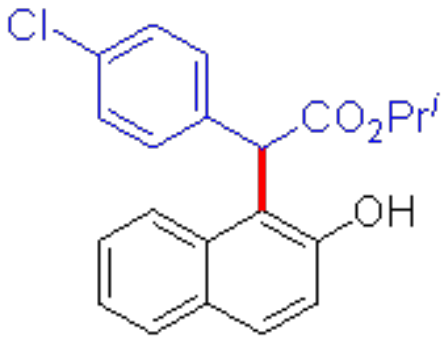
7c



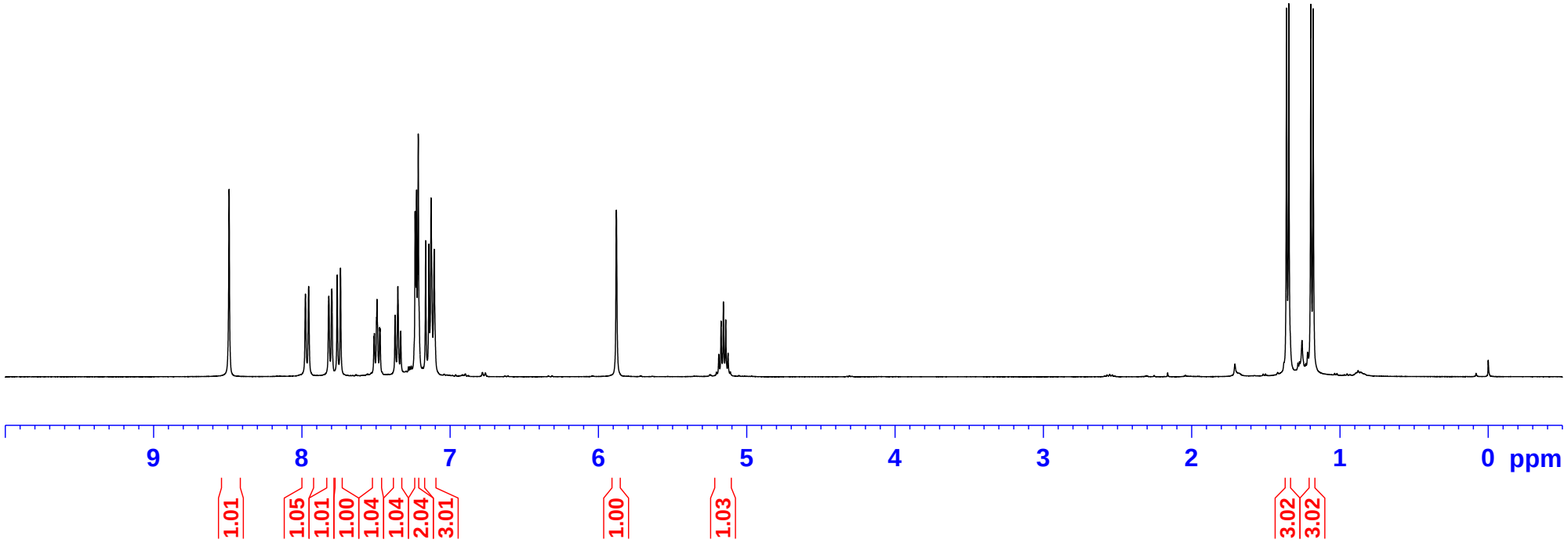
yzz-15-064-2

8.490 7.976 7.954 7.818 7.798 7.761 7.739 7.514 7.512 7.494 7.476 7.473 7.371 7.353 7.334 7.237 7.232 7.227 7.216 7.166 7.144 7.129 7.108 5.880 5.189 5.174 5.158 5.142 5.127

1.361 1.345 1.196 1.181



7d



yzz-15-064-2-c

175.42
153.94
135.37
133.18
133.10
130.47
129.41
128.96
128.68
127.19
123.28
121.60
120.45
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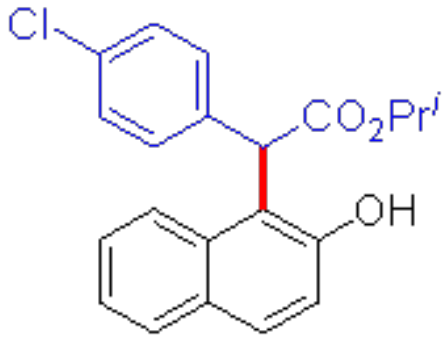
77.32
77.00
76.69
70.65
48.25
21.75
21.47



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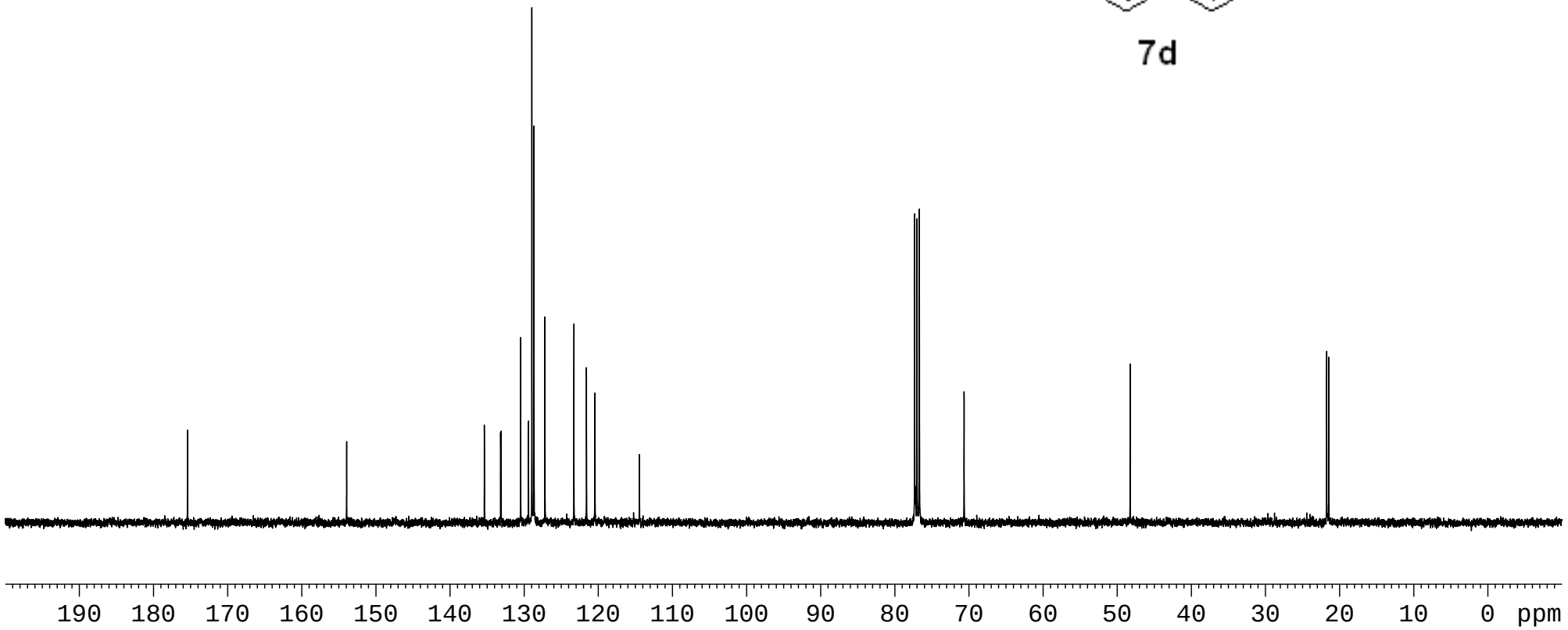
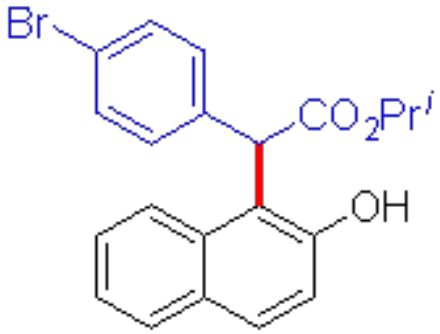


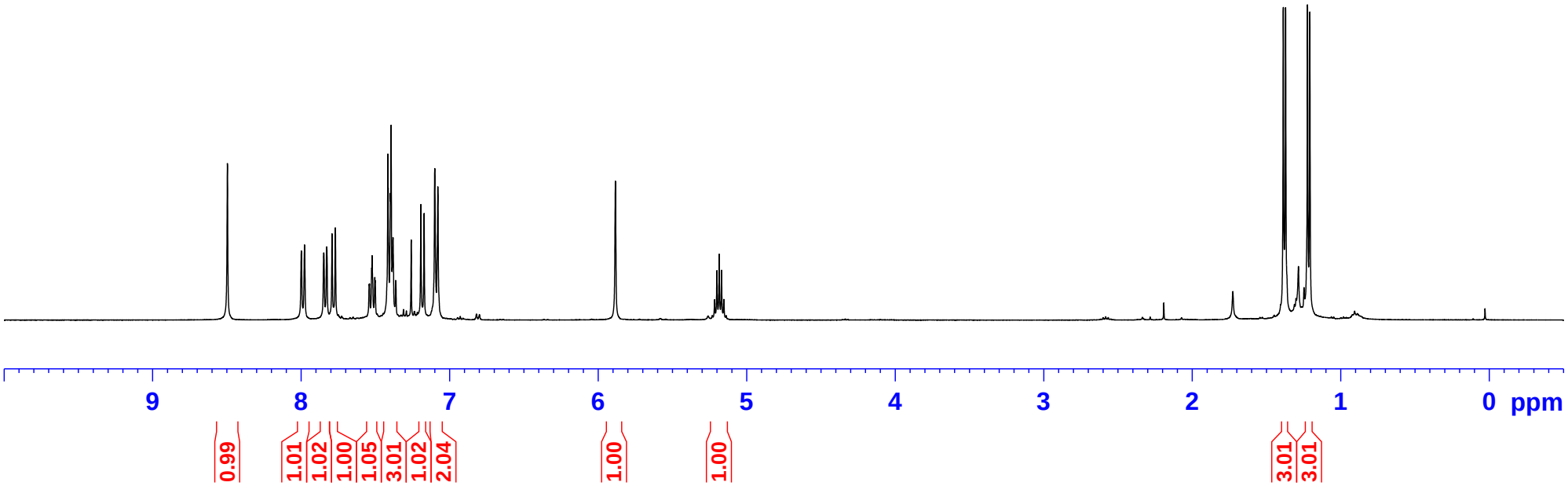
8.497
7.999
7.977
7.848
7.828
7.792
7.770
7.543
7.540
7.525
7.522
7.504
7.501
7.416
7.400
7.395
7.382
7.364
7.260
7.195
7.173
7.101
7.080
5.885
5.217
5.201
5.186
5.170
5.154

1.388
1.372
1.224
1.209

yzz-15-075-2

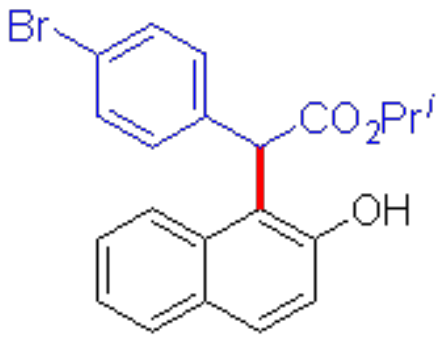


7e

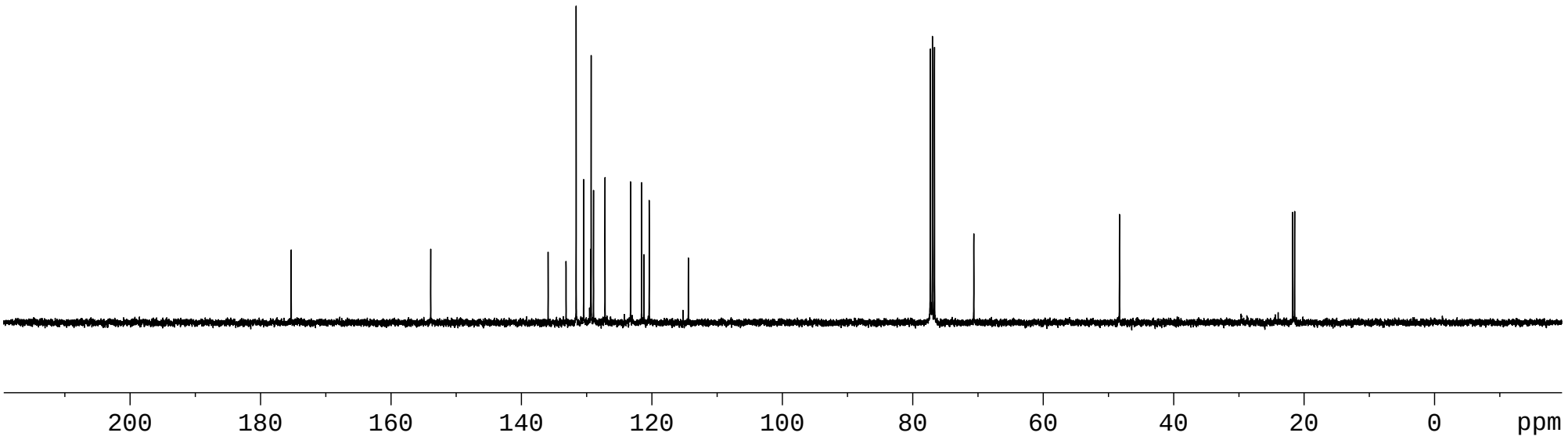


yzz-15-075-2-c

175.31
153.92
135.92
133.17
131.62
130.48
129.41
129.32
128.96
127.19
123.29
121.59
121.23
120.43
114.42
77.32
77.00
76.68
70.65
48.32
21.75
21.46



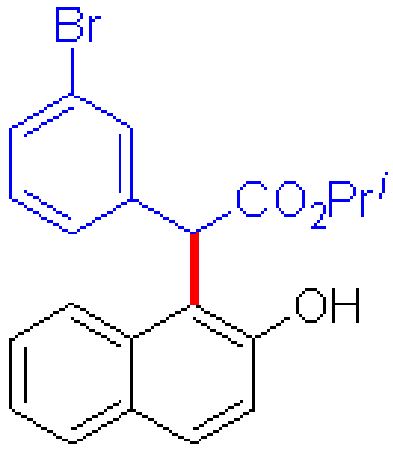
7e



yzz-15-065-1

8.470 7.995 7.974 7.852 7.832 7.798 7.776 7.550 7.548 7.530 7.512 7.509 7.406 7.386 7.381 7.375 7.260 7.200 7.178 7.149 7.139 5.908 5.224 5.208 5.192 5.177 5.161

1.394 1.379 1.223 1.207



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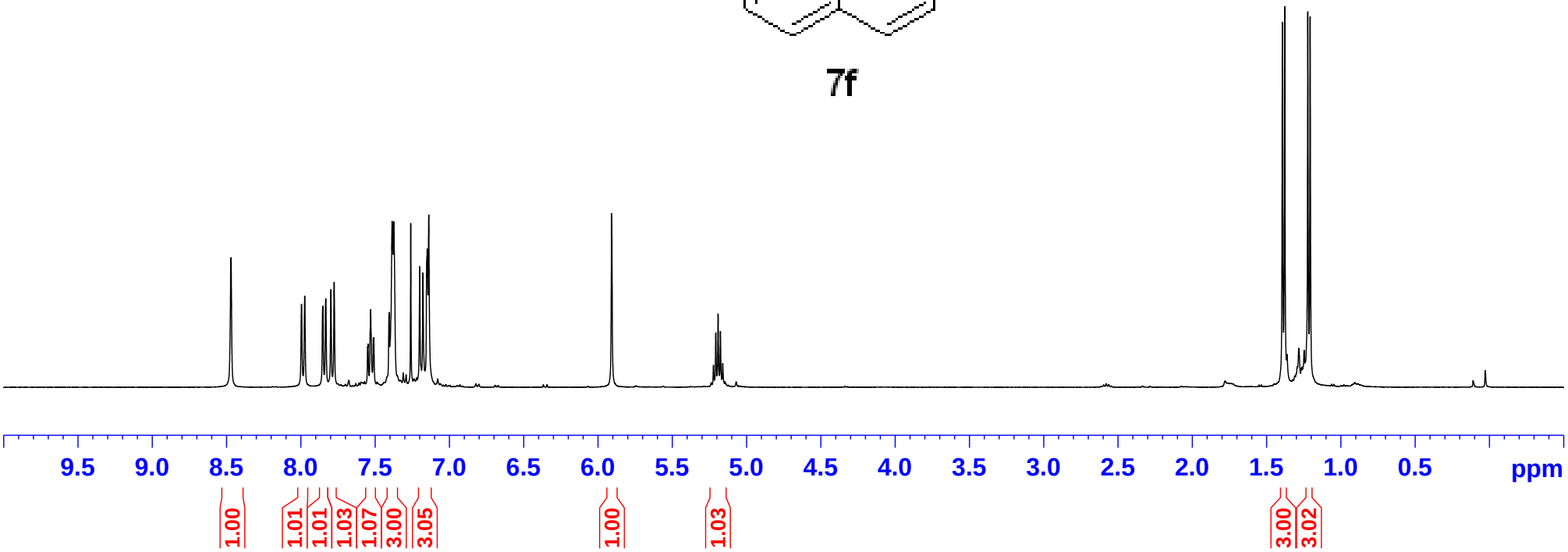
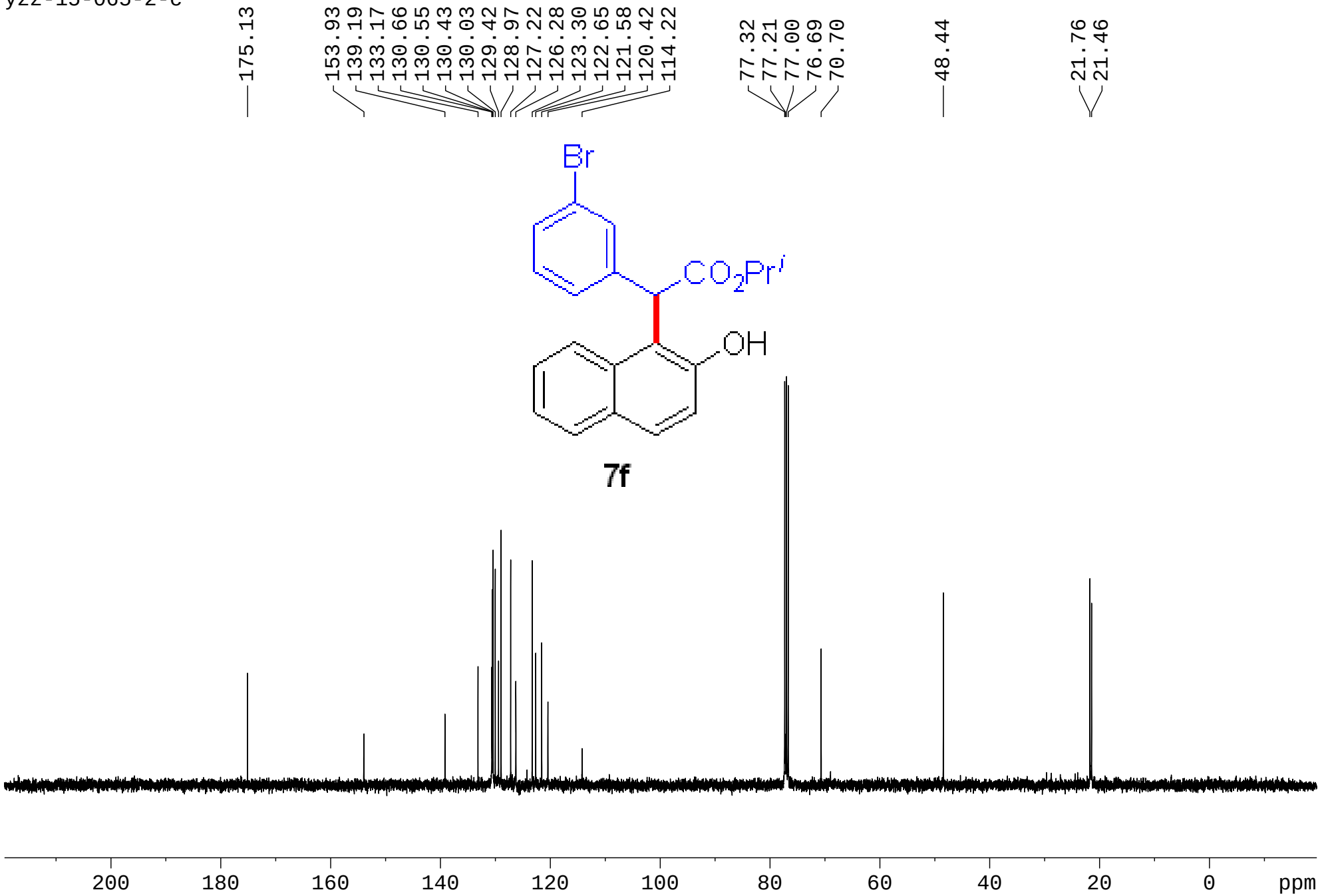


yzz-15-065-2-c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153.93
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130.55
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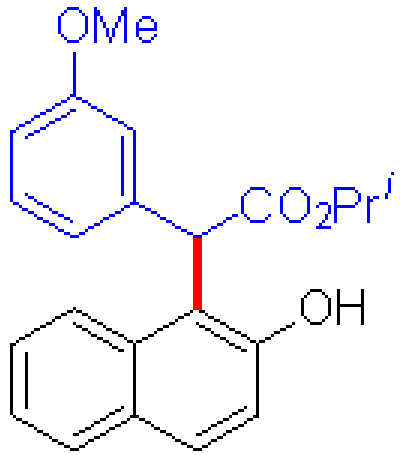
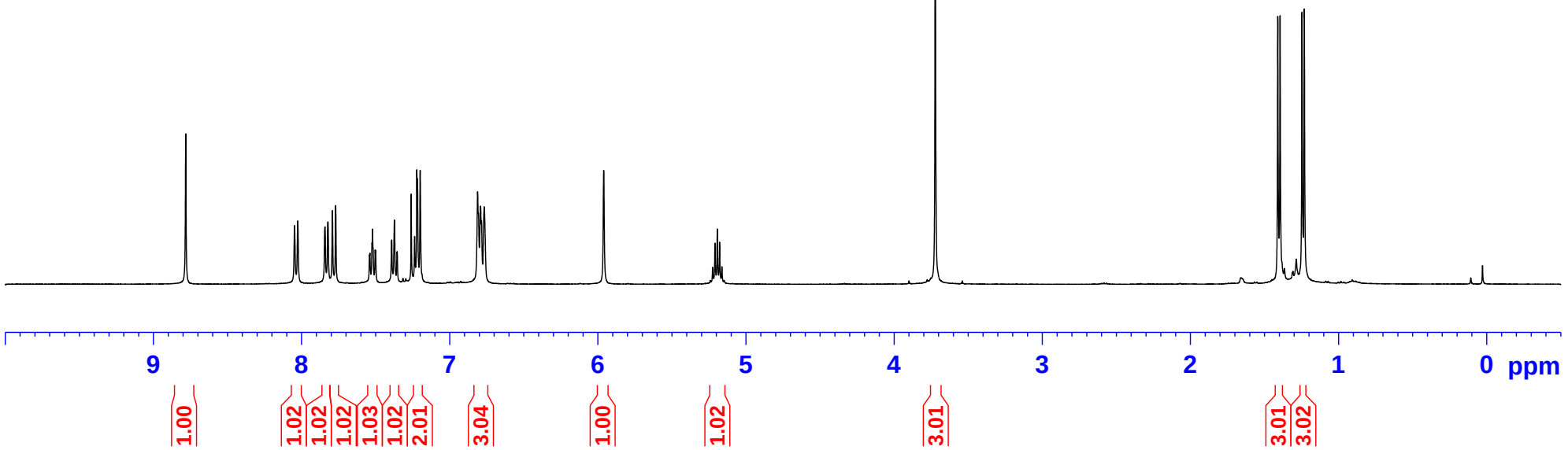
130.03
129.42
128.97
127.22
126.28
123.30
122.65
121.58
120.42
114.22
77.32
77.21
77.00
76.69
70.70
48.44
21.76
21.46
Br
CO2Pri
OH
7f
200
180
160
140
120
100
80
60
40
20
0
ppm

yzz-15-066-1

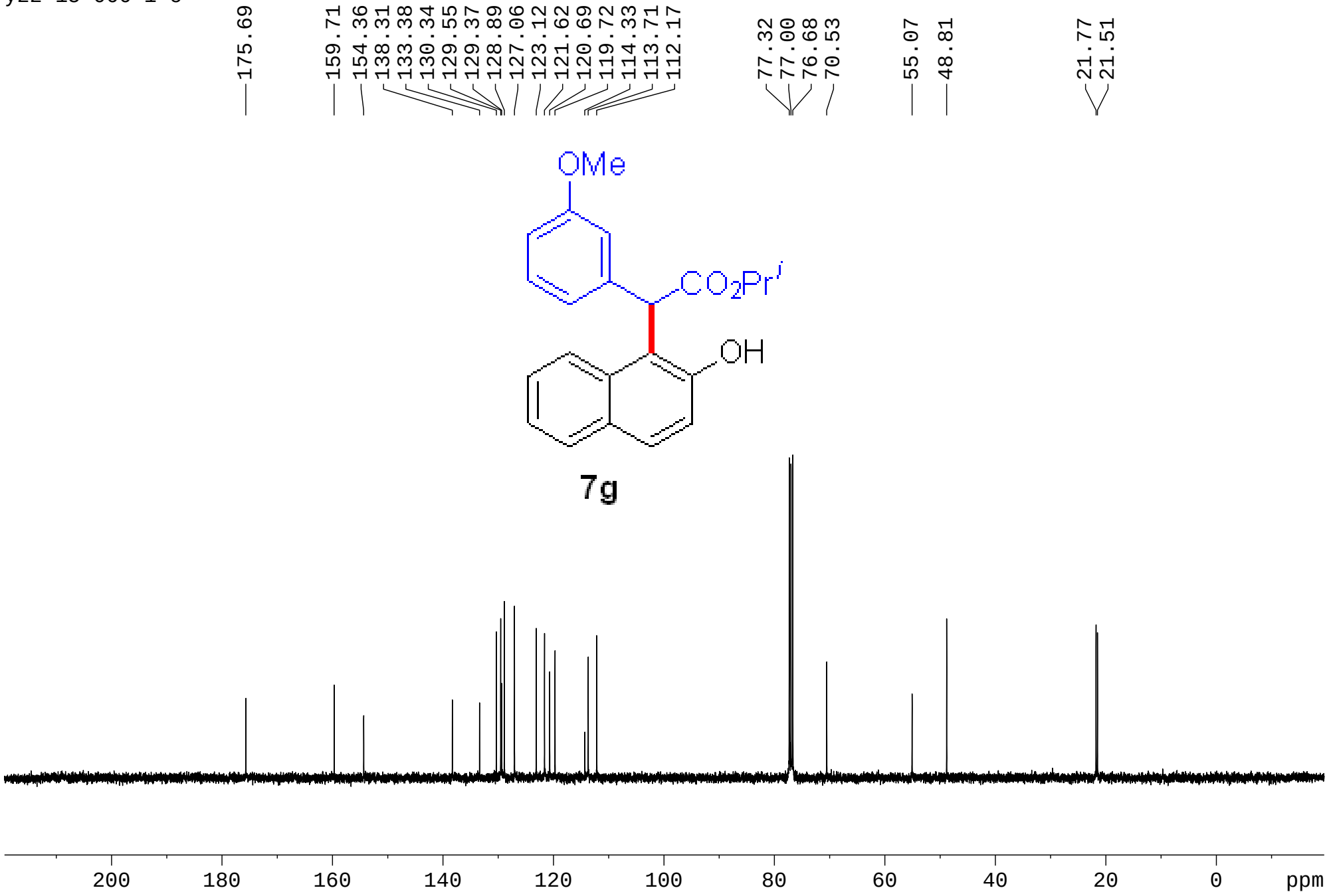
8.782 8.047 8.026 7.842 7.822 7.792 7.770 7.542 7.539 7.525 7.521 7.503 7.500 7.391 7.374 7.356 7.260 7.237 7.222 7.217 7.199 6.812 6.806 6.792 6.785 6.767 5.960 5.225 5.210 5.194 5.178 5.163 3.722 1.410 1.395 1.247 1.231



7g



yzz-15-066-1-c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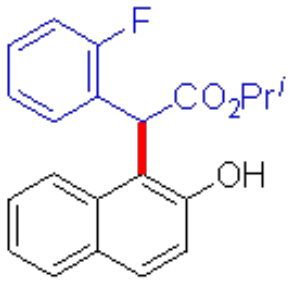
133.38
130.34
129.55
129.37
128.89
127.06
123.12
121.62
120.69
119.72
114.33
113.71
112.17
77.32
77.00
76.68
70.53
55.07
48.81
21.77
21.51
OMe
CO2Pri
OH
7g
200
180
160
140
120
100
80
60
40
20
0
ppm

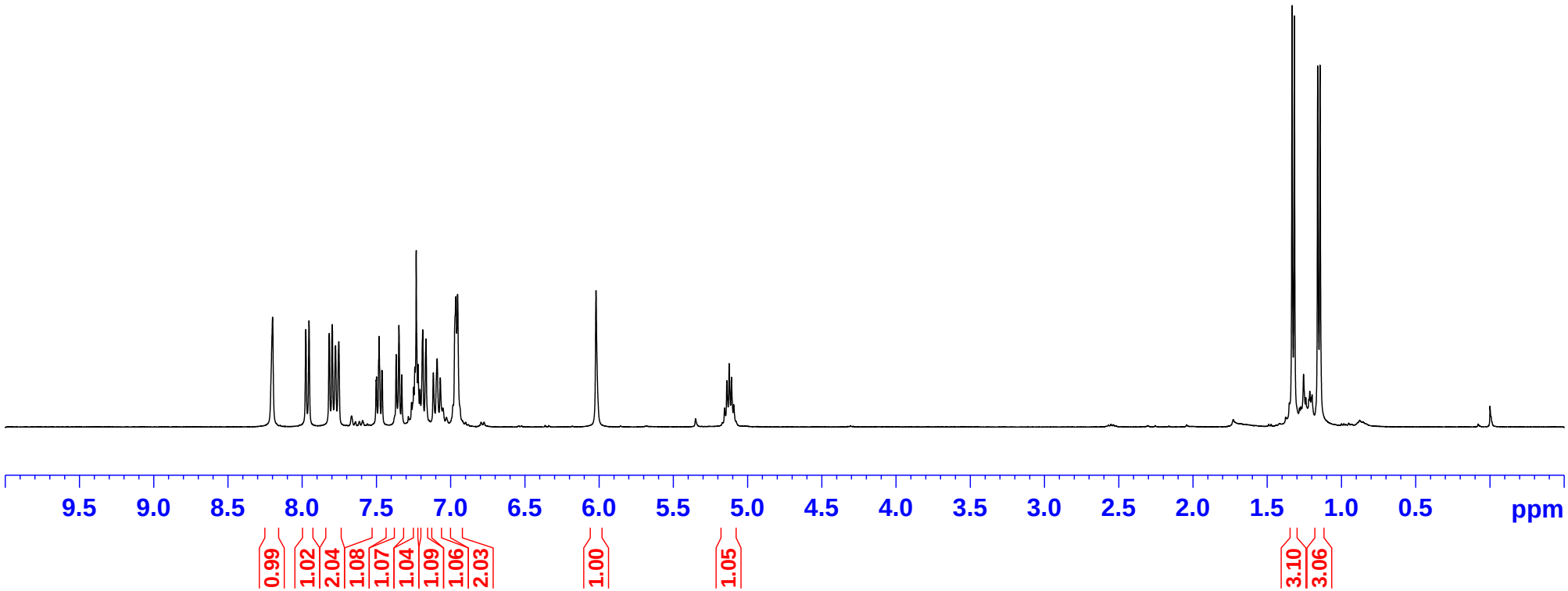
yzz-15-067-1

7.976 7.954 7.817 7.797 7.775 7.753 7.502 7.499 7.482 7.463 7.461 7.366 7.348 7.329 7.249 7.241 7.232 7.220 7.207 7.188 7.166 7.116 7.091 7.070 6.966 6.964 6.953 6.021 5.156 5.141 5.125 5.109 5.094

1.333 1.317 1.161 1.145

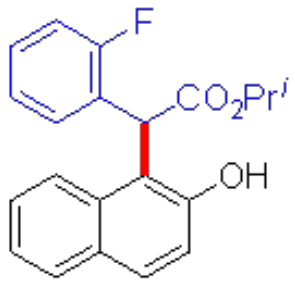


7h

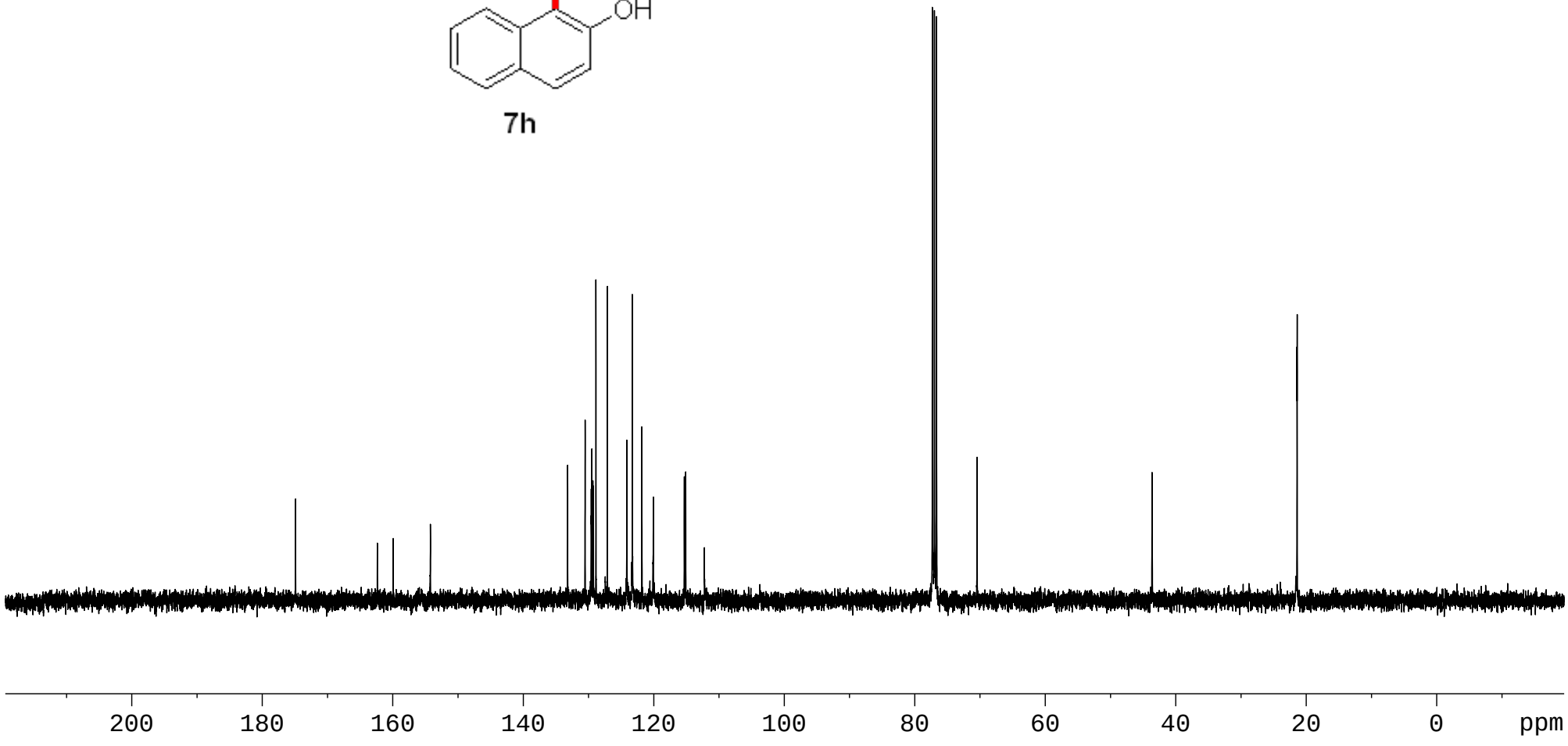


yzz-15-067-1-c

174.92
162.38
159.93
154.24
133.21
130.53
129.59
129.50
129.35
129.27
128.87
127.13
124.16
124.12
123.30
121.85
120.07
115.33
115.11
112.26
77.32
77.00
76.68
70.46
43.63
21.43
21.40
129.63



7h



yzz-15-070-1

8.742
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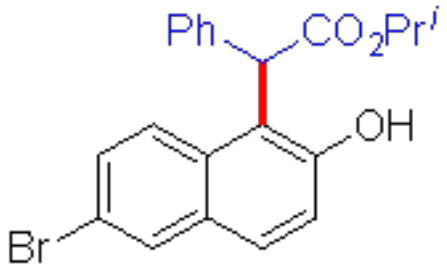
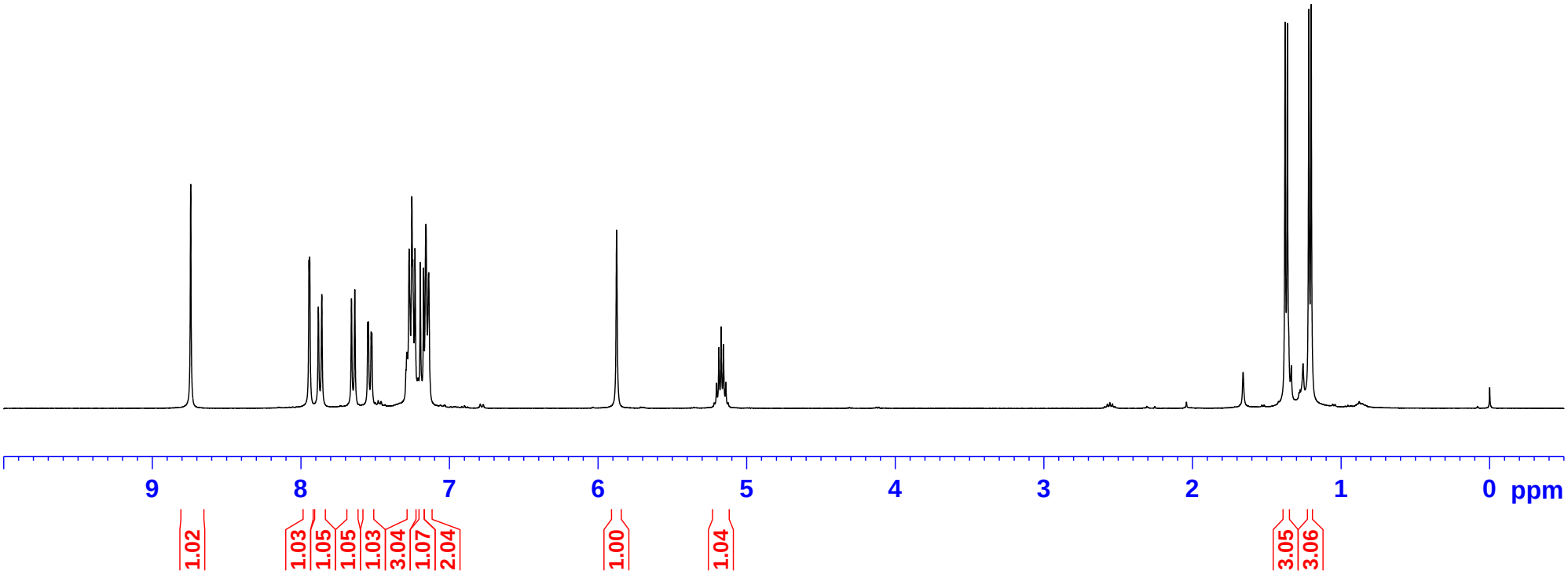
7.941
7.883
7.860
7.660
7.638
7.551
7.546
7.528
7.523
7.294
7.288
7.284
7.272
7.254
7.248
7.232
7.212
7.197
7.175
7.159
7.141
5.876
5.203
5.188
5.172
5.156
5.141

1.377
1.361
1.217
1.201



7i



yzz-15-070-1-c

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127.40
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114.83
77.32
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76.68
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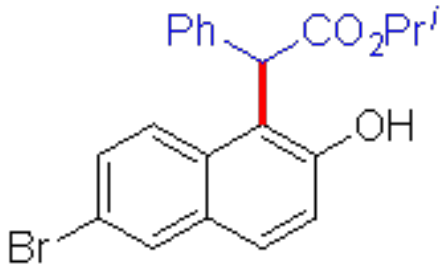
48.90
21.75
21.50



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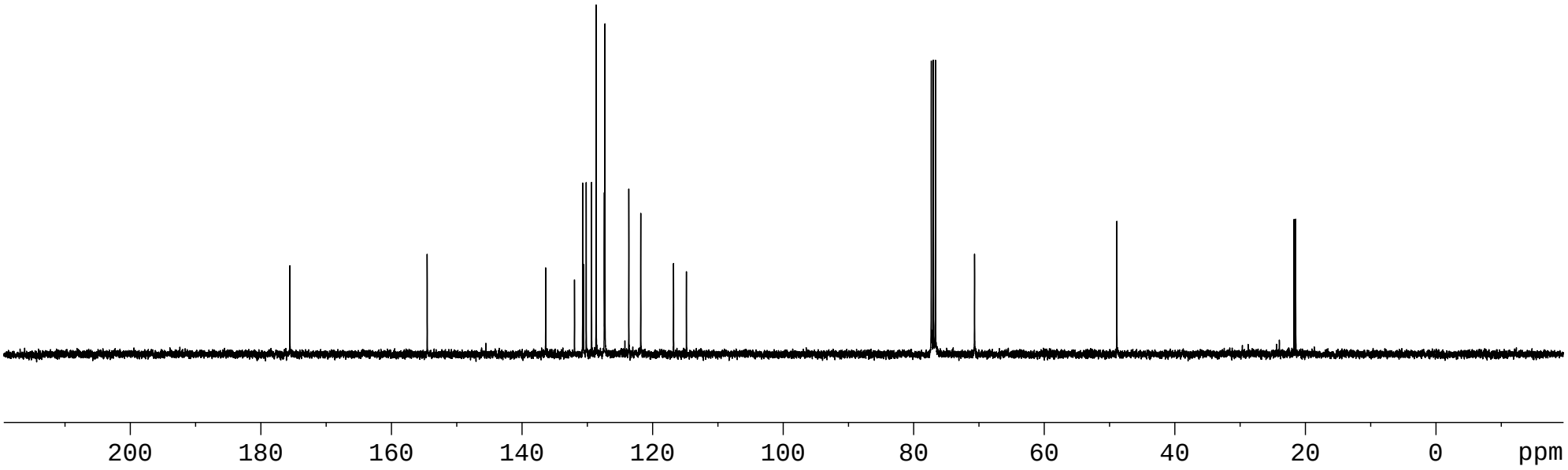
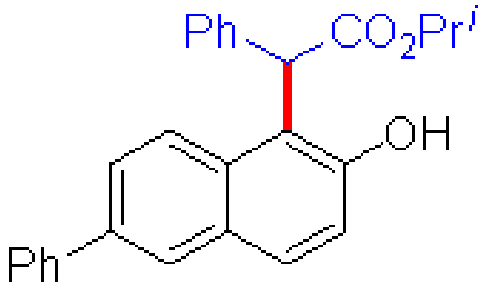


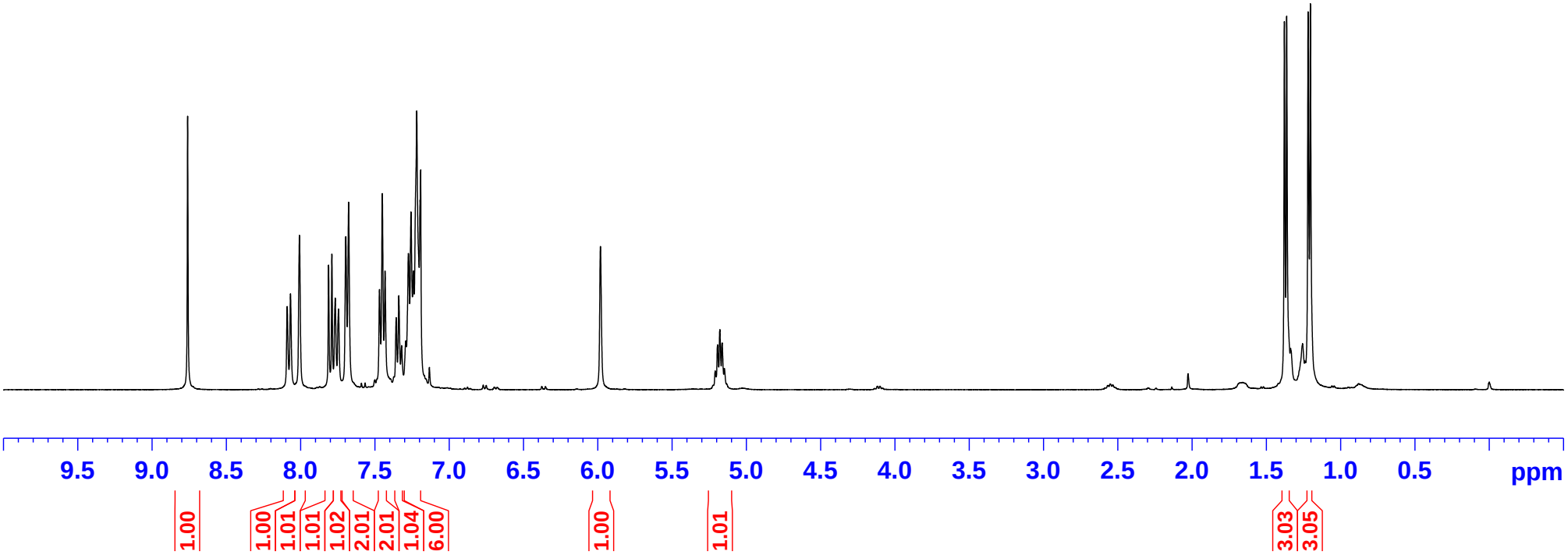
8.760
8.090
8.068
8.008
7.812
7.789
7.767
7.745
7.695
7.677
7.469
7.450
7.432
7.357
7.339
7.320
7.292
7.274
7.257
7.241
7.218
7.196
7.192
5.983
5.210
5.194
5.178
5.163
5.149

1.379
1.364
1.220
1.204

yzz-15-071-2



7j



yzz-15-071-2-c

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140.63
136.70
135.84
132.58
130.59
129.64
128.82
128.61
127.40
127.29
127.15
127.09
126.69
126.58
122.35
121.11
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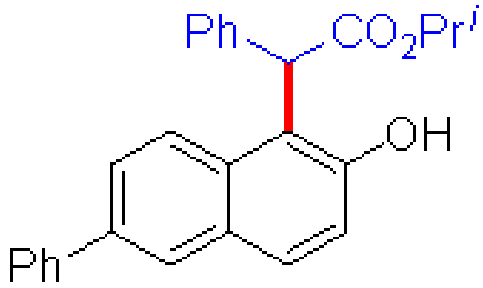
21.77
21.51



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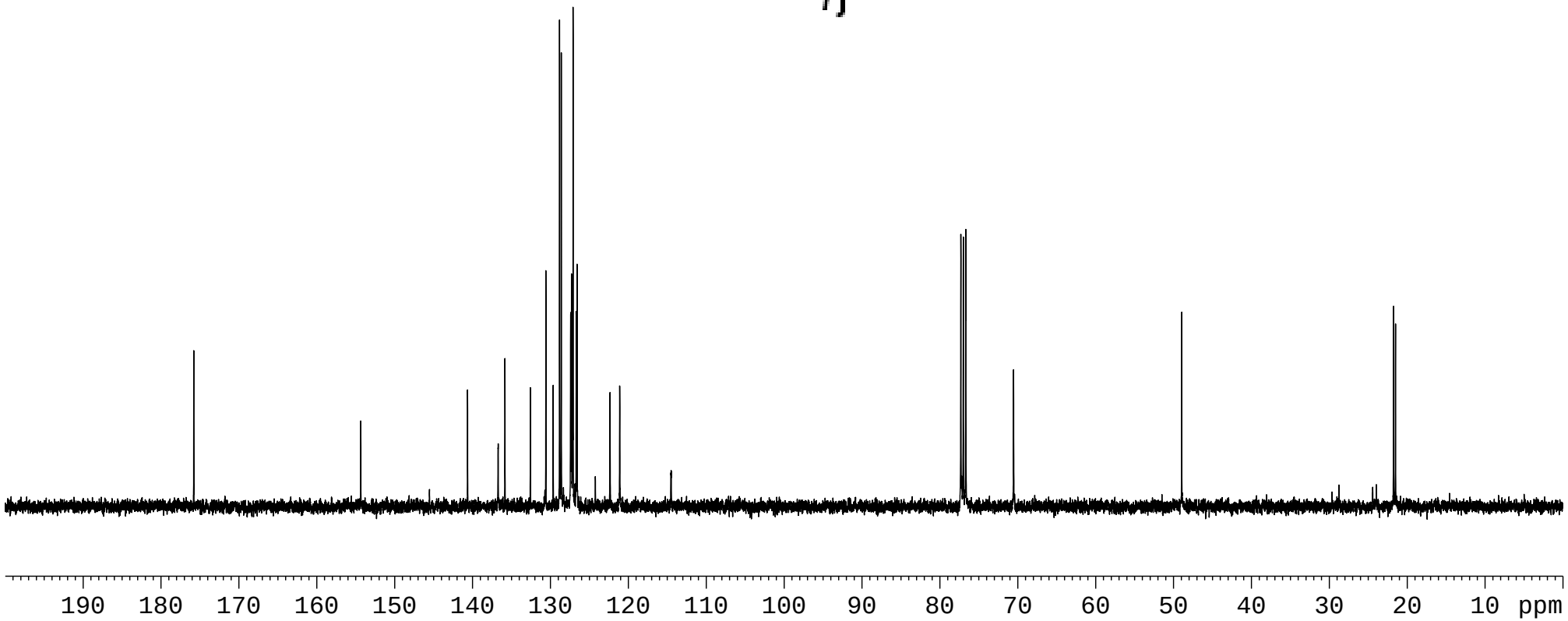

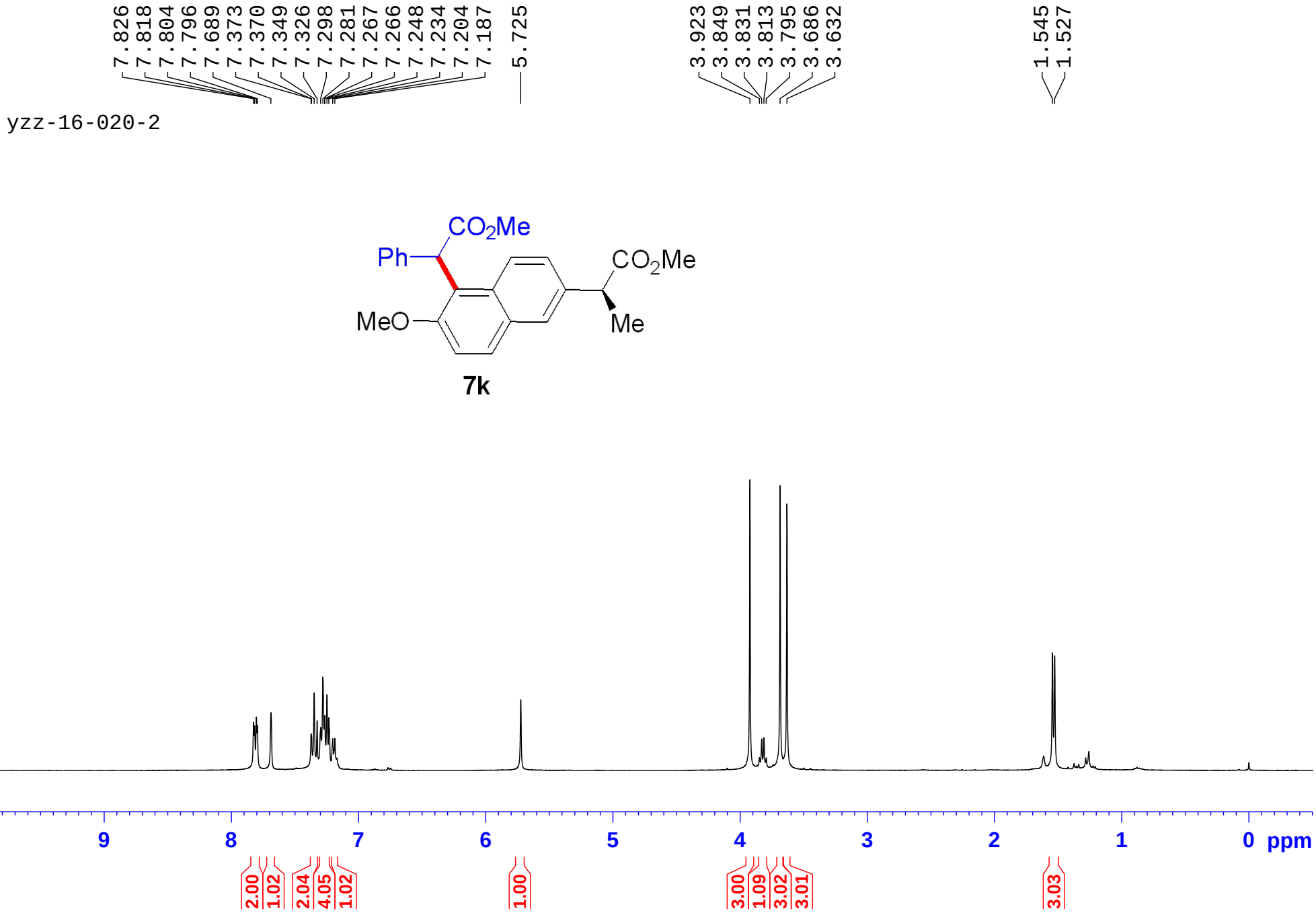
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7.349
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7.298
7.281
7.267
7.266
7.248
7.234
7.204
7.187
5.725
3.923
3.849
3.831
3.813
3.795
3.686
3.632
1.545
1.527
yzz-16-020-2
CO2Me
Ph
CO2Me
MeO
Me
7k
9
8
7
6
5
4
3
2
1
0 ppm
2.00
1.02
2.04
4.05
1.02
1.00
3.00
1.09
3.02
3.01
3.03

yzz-16-020-1-c

174.90
173.89
154.45
137.77
135.57
135.54
131.84
129.57
129.12
128.18
126.86
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120.53
113.95
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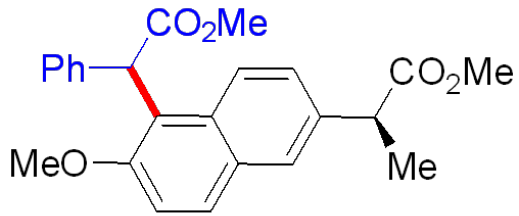
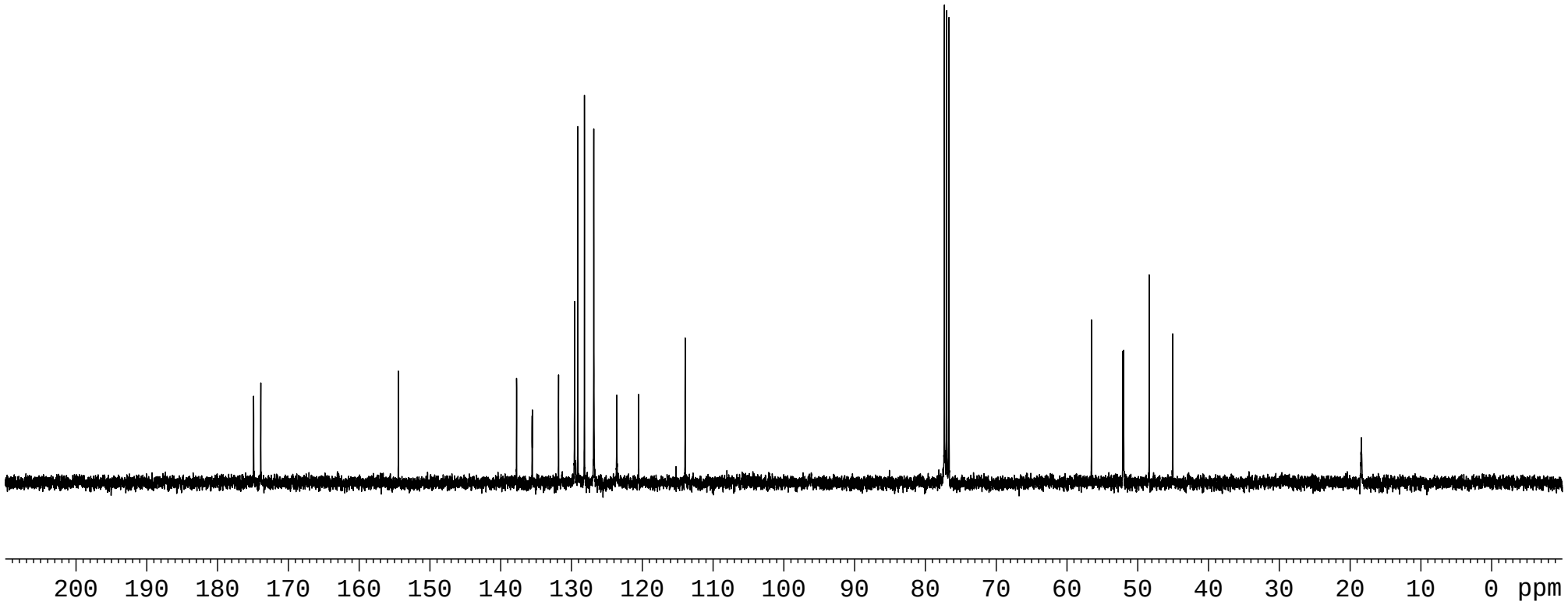
76.68
56.54
52.10
51.99
48.39
45.06
18.41

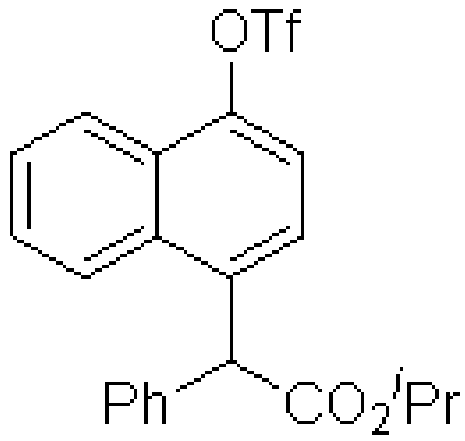


7k

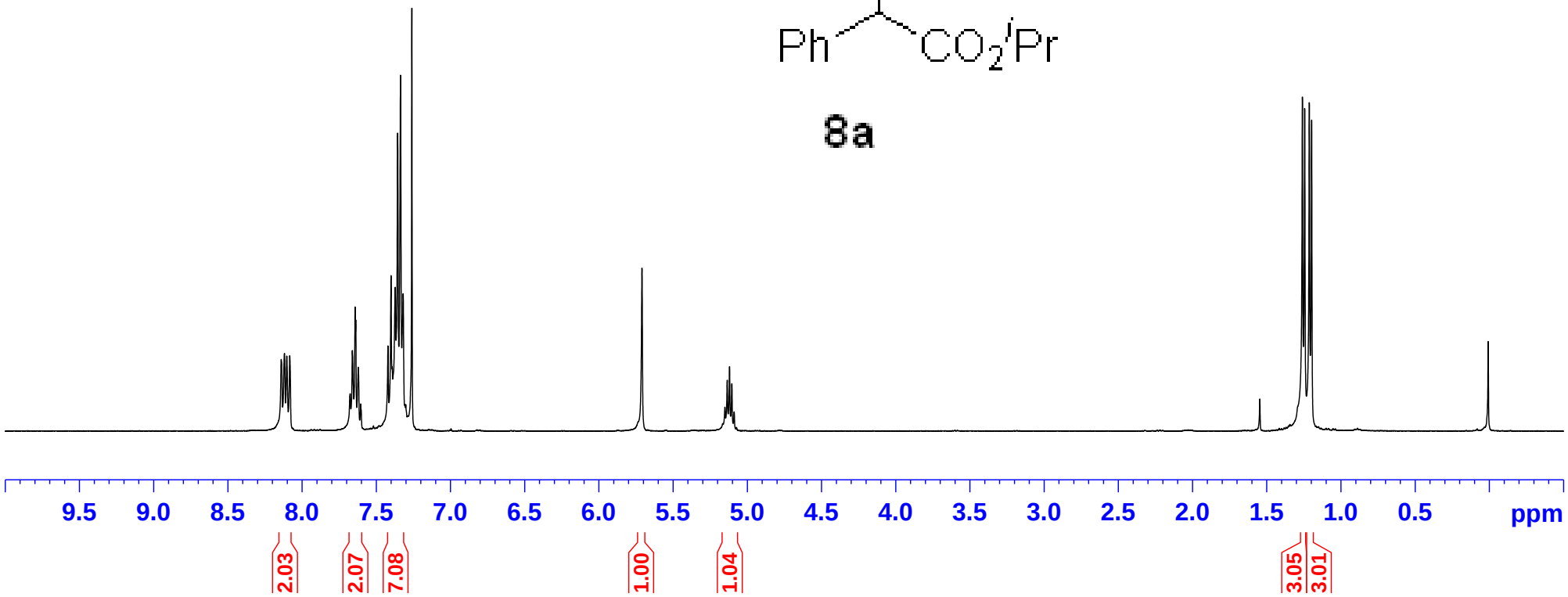


yzz-15-090-2

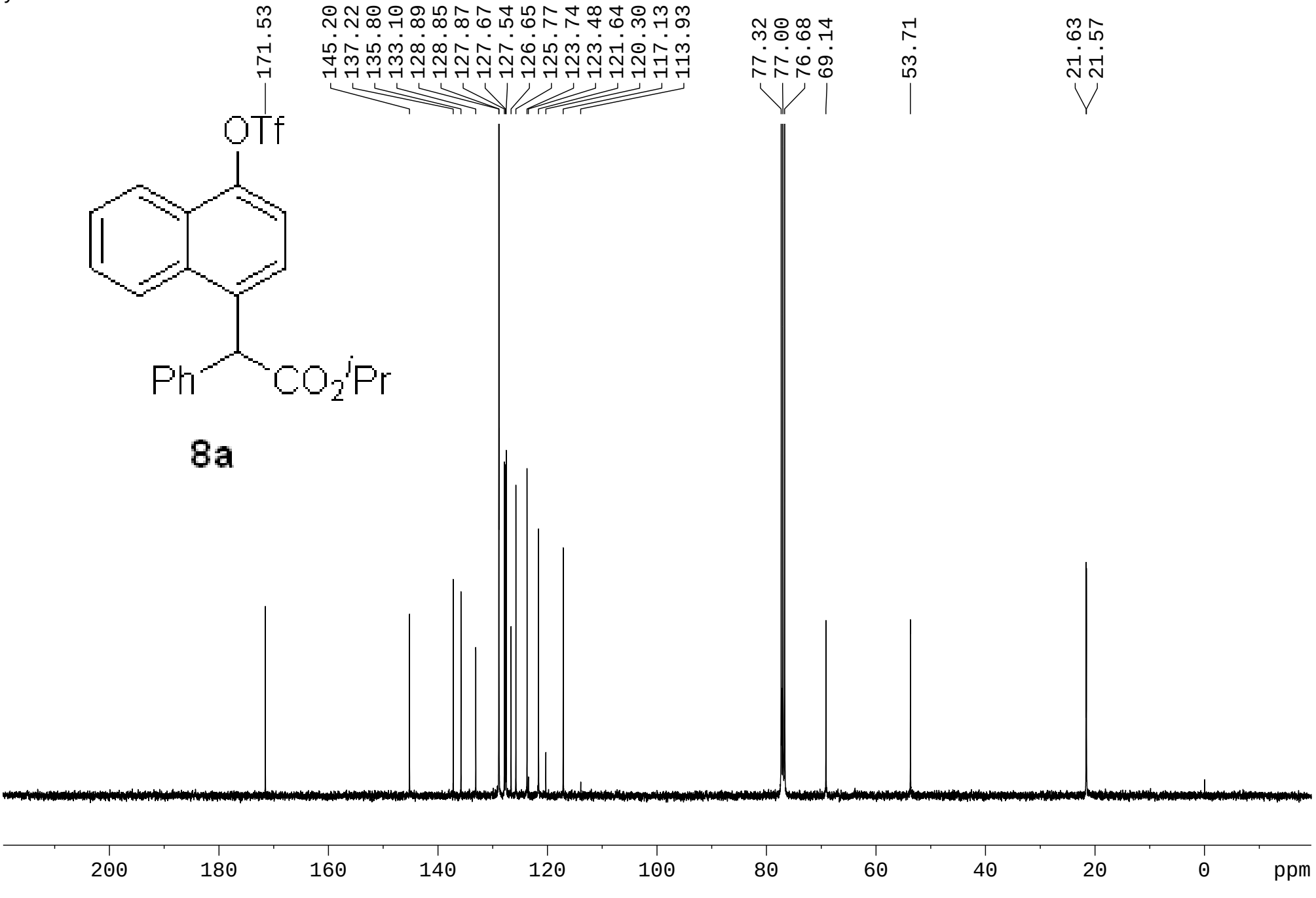
8.1410
8.1190
8.1030
8.0830
7.6760
7.6610
7.6430
7.6380
7.6220
7.6050
7.4210
7.4010
7.3720
7.3560
7.3370
7.3190
7.2600
5.7100
5.1510
5.1350
5.1200
5.1040
5.0880
1.2600
1.2440
1.2130
1.1970



8a



yzz-15-090-3-c


171.53
145.20
137.22
135.80
133.10
128.89
128.85
127.87
127.67
127.54
126.65
125.77
123.74
123.48
121.64
120.30
117.13
113.93
77.32
77.00
76.68
69.14
53.71
21.63
21.57
OTf
Ph
CO2iPr
8a
200
180
160
140
120
100
80
60
40
20
0
ppm

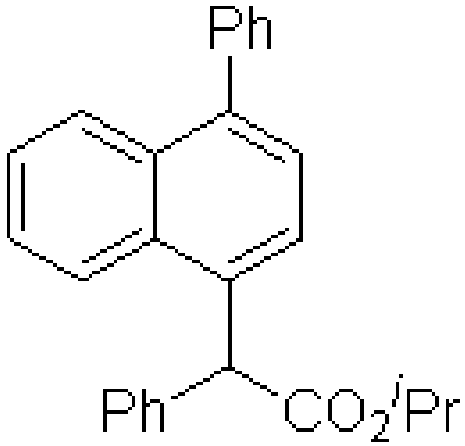
yzz-15-085-1

8.135
8.114
7.974
7.954
7.529
7.513
7.502
7.468
7.459
7.437
7.417
7.393
7.375

5.830

5.219
5.203
5.188
5.172
5.157

1.310
1.294
1.283
1.268



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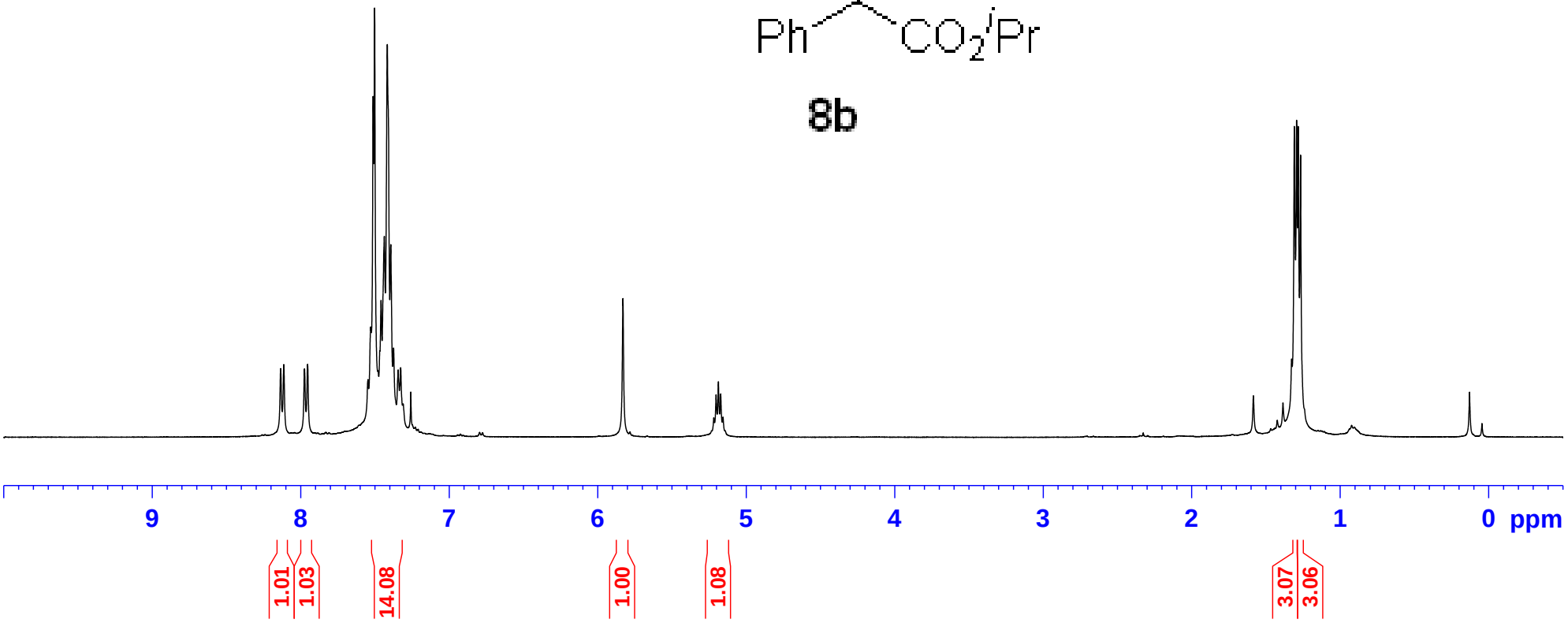

yzz-15-085-1

172.27
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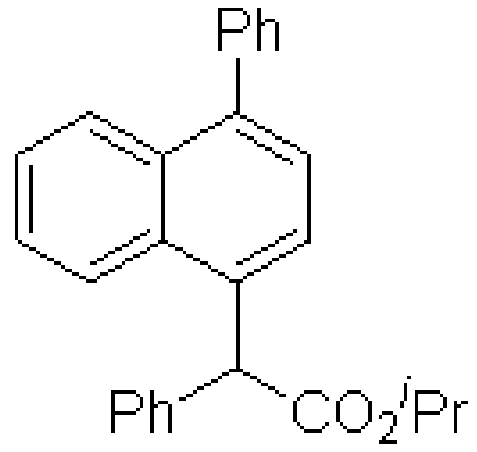
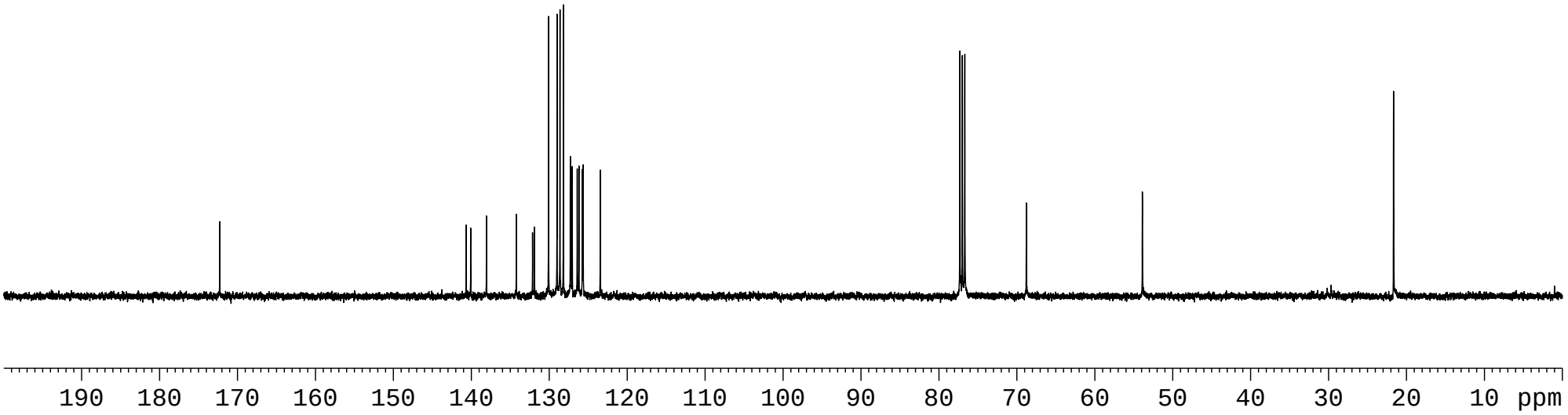
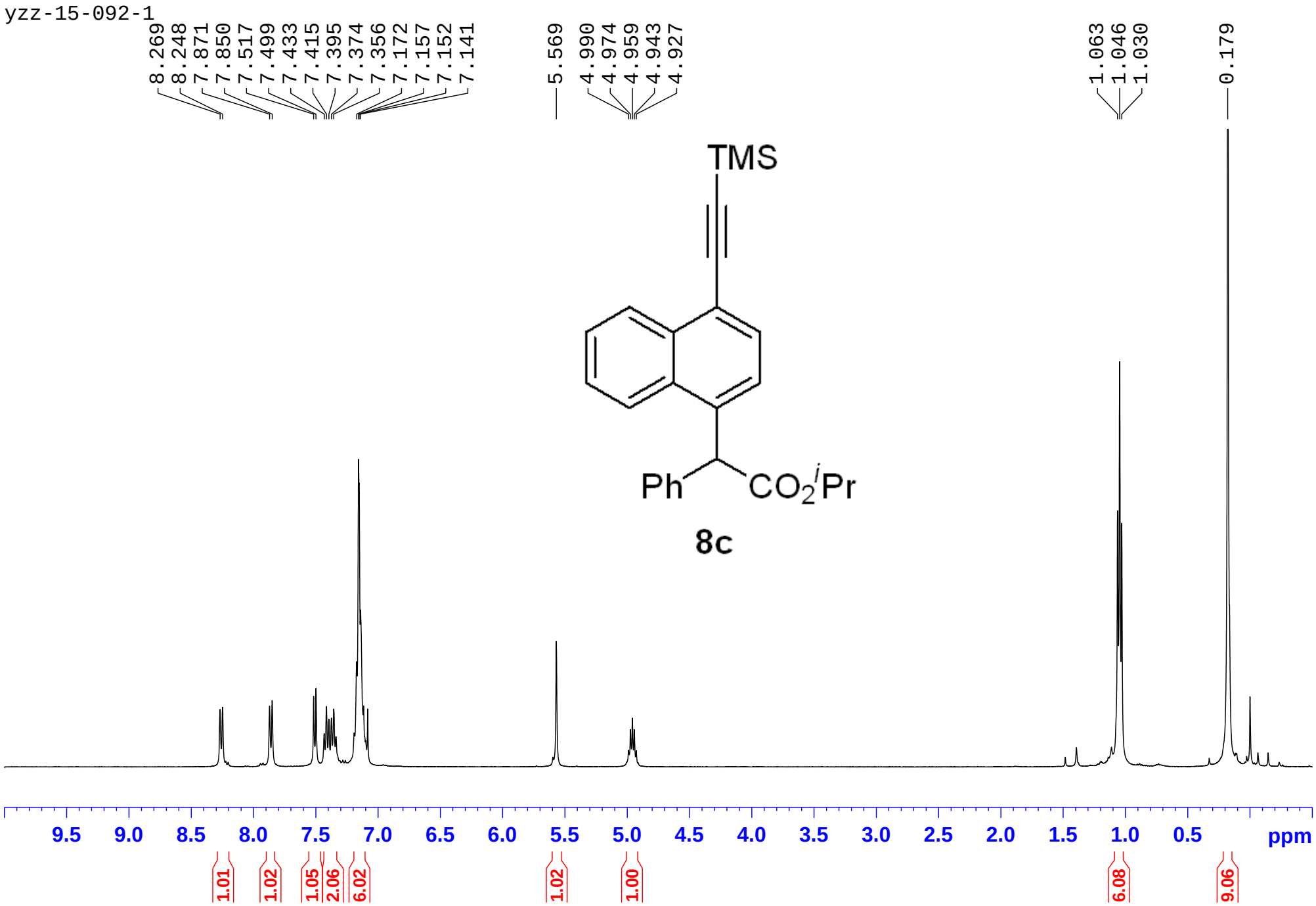
140.09
138.07
134.23
132.15
131.91
130.10
129.01
128.63
128.19
127.31
127.22
127.06
126.42
126.20
125.76
125.65
123.46
77.32
77.00
76.68
68.79
53.90
21.67



8b




yzz-15-092-1
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8.248
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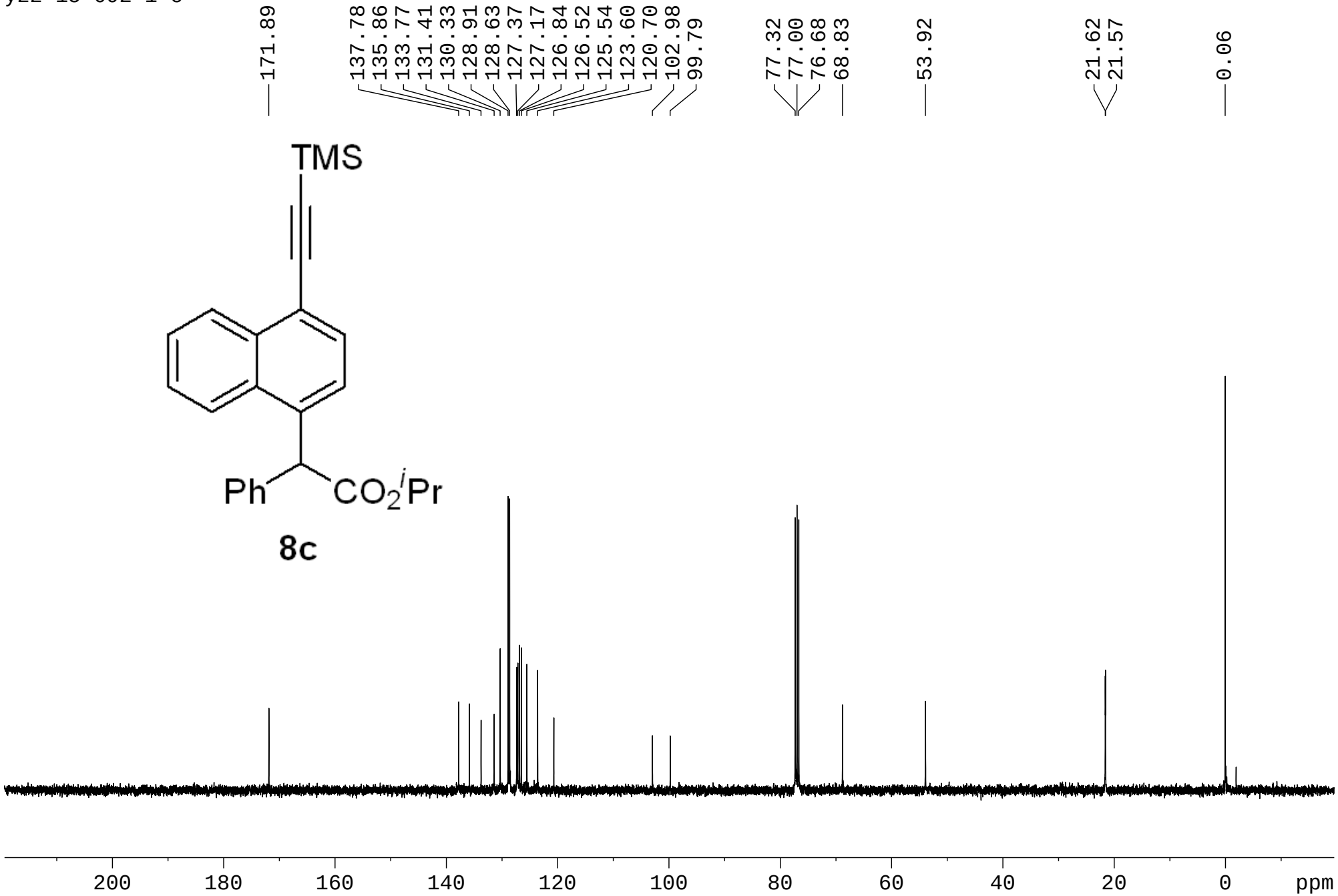
7.850
7.517
7.499
7.433
7.415
7.395
7.374
7.356
7.172
7.157
7.152
7.141
5.569
4.990
4.974
4.959
4.943
4.927
1.063
1.046
1.030
0.179
TMS
Ph
CO2iPr
8c
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.01
1.02
1.05
2.06
6.02
1.02
1.00
6.08
9.06

yzz-15-092-1-c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133.77
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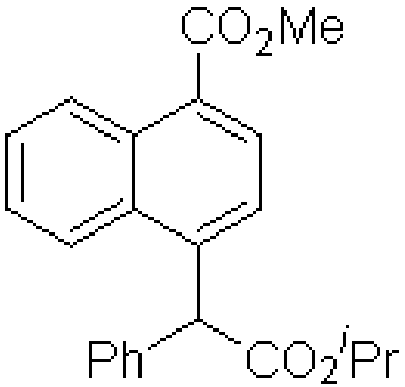
130.33
128.91
128.63
127.37
127.17
126.84
126.52
125.54
123.60
120.70
102.98
99.79
77.32
77.00
76.68
68.83
53.92
21.62
21.57
0.06
TMS
Ph
CO2iPr
8c
200
180
160
140
120
100
80
60
40
20
0
ppm

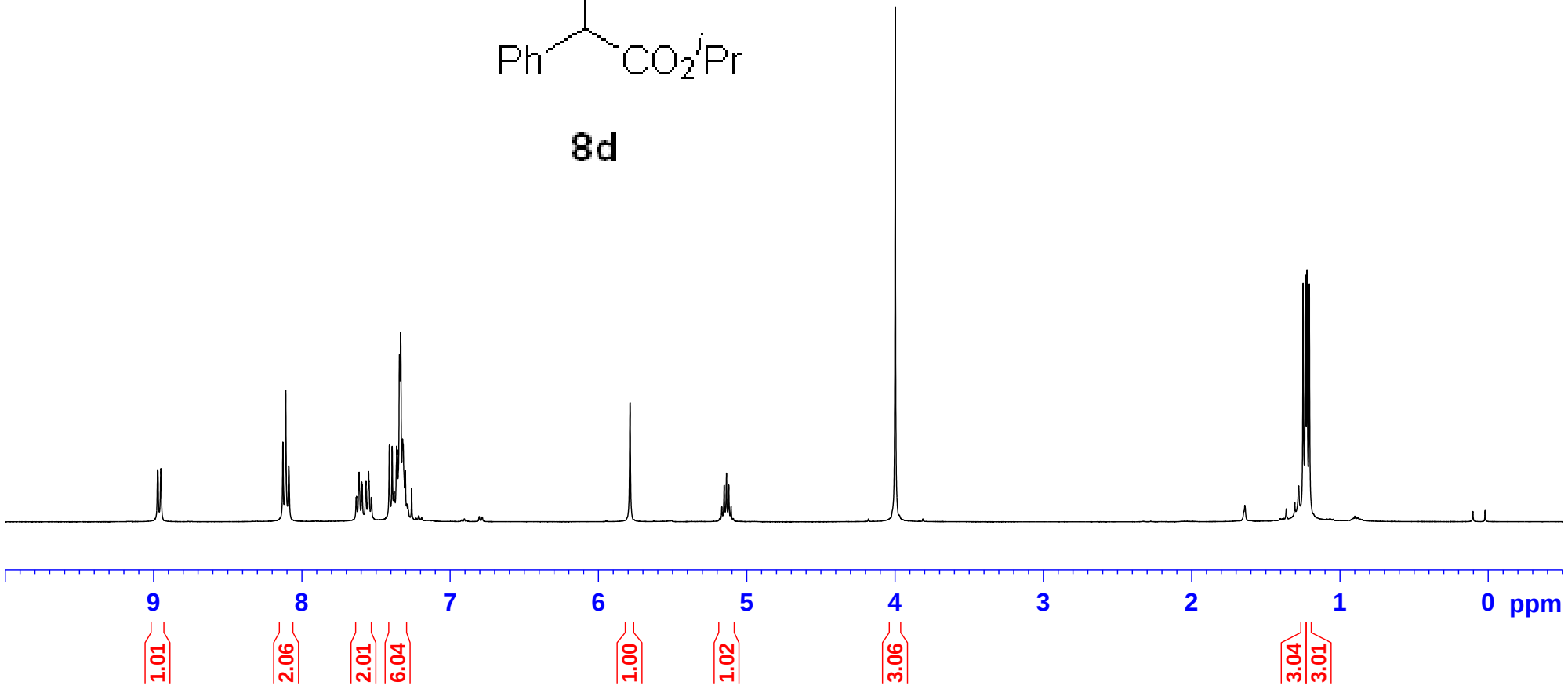
yzz-15-094-1

8.088 7.634 7.631 7.617 7.614 7.596 7.593 7.570 7.567 7.550 7.547 7.532 7.529 7.410 7.391 7.380 7.378 7.360 7.356 7.342 7.333 7.321 7.317 7.302 7.293 7.285 7.259 5.787 5.169 5.153 5.137 5.122 5.106 3.999

1.248 1.233 1.222 1.206



8d



yzz-15-094-1-c

171.69
167.91
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137.46
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129.46
128.91
128.70
127.49
127.30
127.01
126.68
126.57
125.04
123.58
77.32
77.00
76.68
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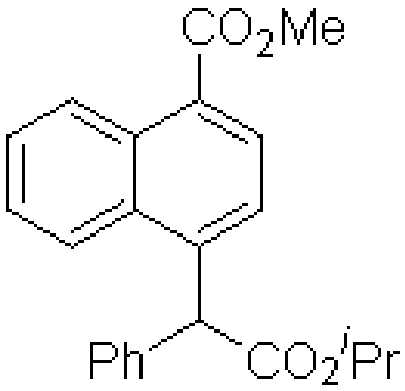
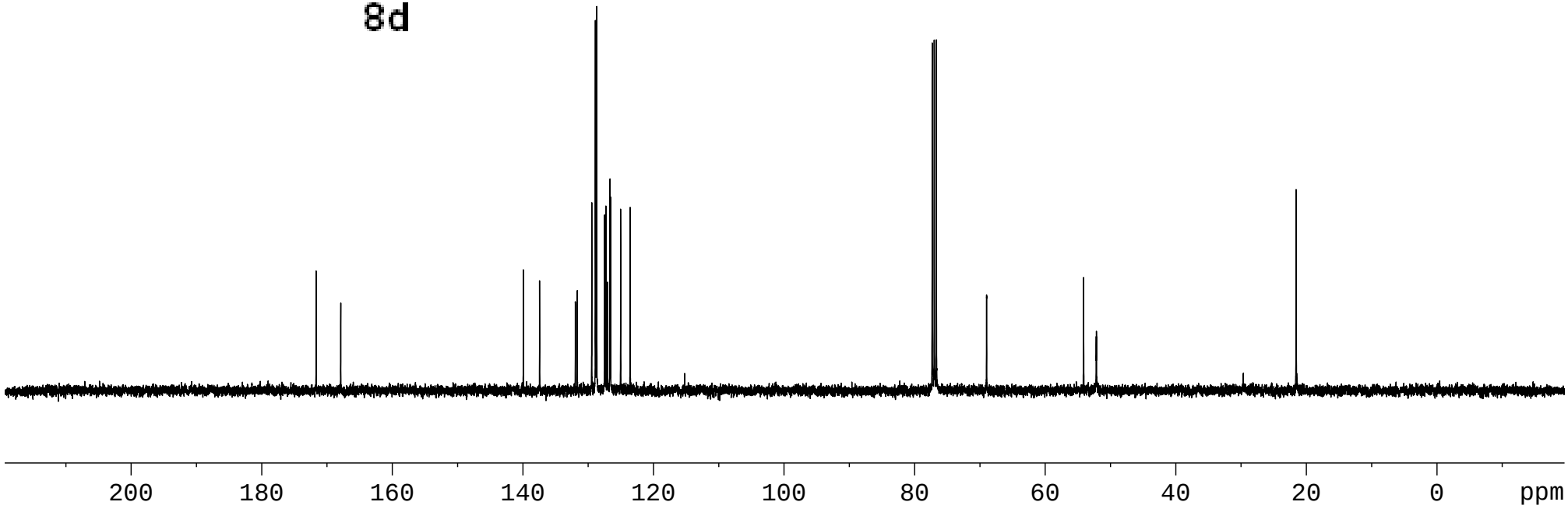
52.19
52.15
21.57



8d



yzz-15-093-1

8.310
8.306
8.299
8.295
8.292
8.286
7.948
7.943
7.935
7.925
7.538
7.533
7.524
7.513
7.510
7.368
7.366
7.352
7.346
7.328
7.306
6.001
5.628
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5.138
5.122
5.107
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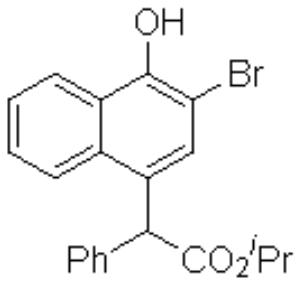
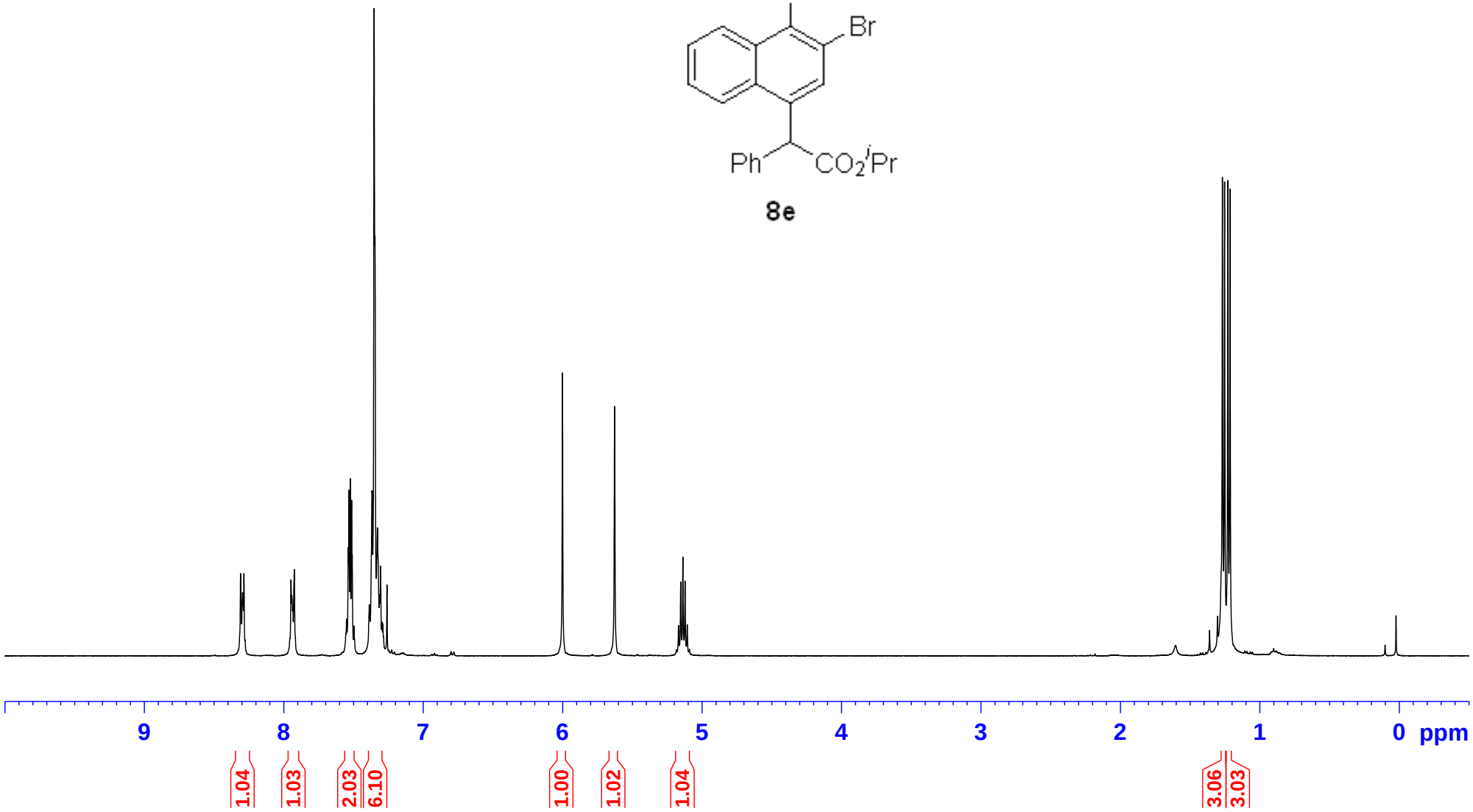
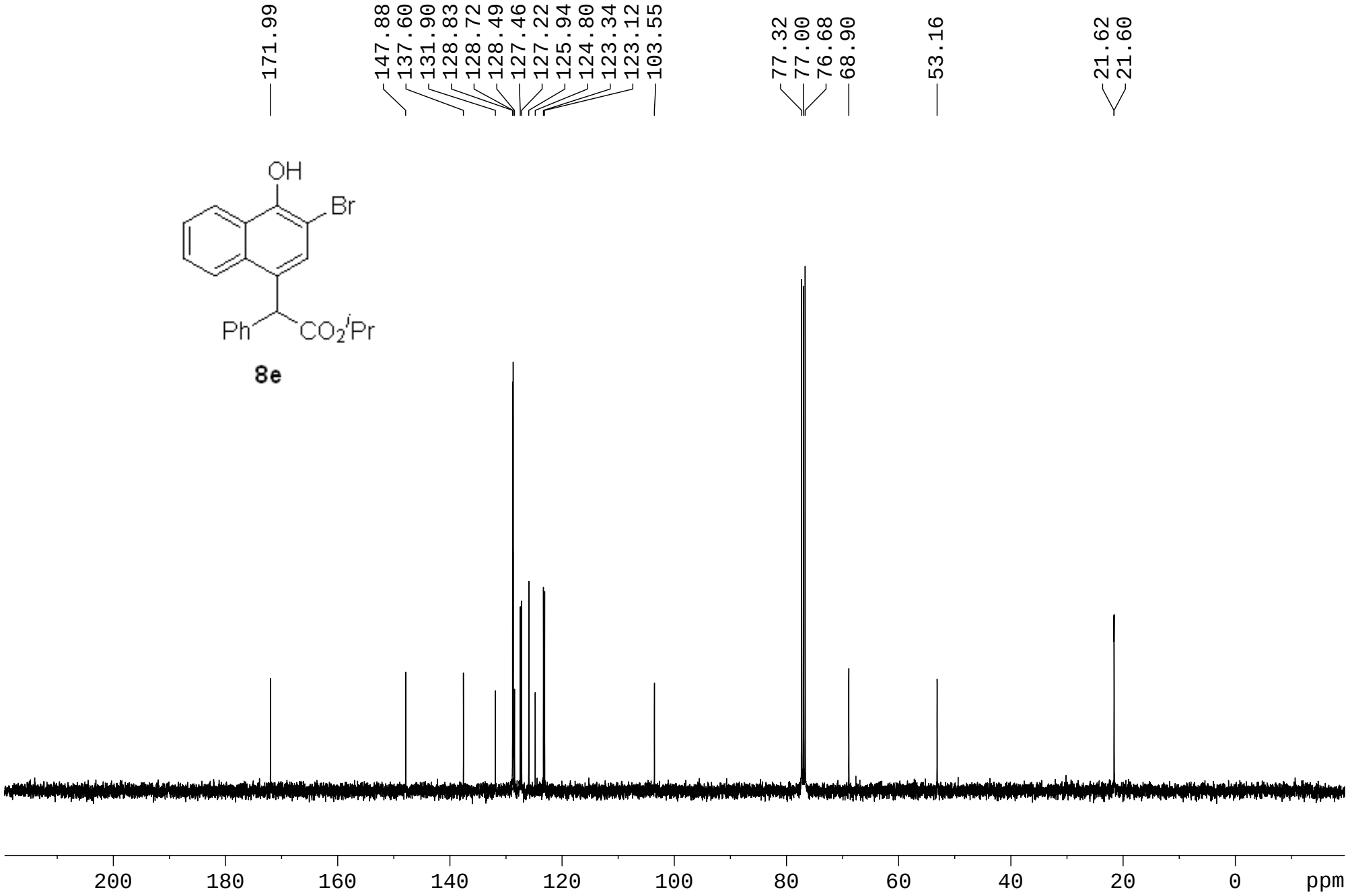
1.254
1.230
1.215



8e



yzz-15-093-1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128.72
128.49
127.46
127.22
125.94
124.80
123.34
123.12
103.55
77.32
77.00
76.68
68.90
53.16
21.62
21.60
OH
Br
Ph
CO2iPr
8e
200
180
160
140
120
100
80
60
40
20
0
ppm

8.941
8.291
8.282
8.273
8.267
8.086
8.081
8.070
8.064
7.417
7.409
7.392
7.373
7.348
7.330
7.259
7.241
7.221
7.156
7.138
7.119
6.937
6.917
4.902
4.884
4.867
4.256
4.243
4.229
4.212
4.198
4.183
4.170
4.165
4.156
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3.822
3.808
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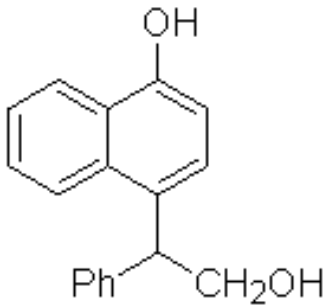
2.055
2.050
2.045

yzz-15-105-2



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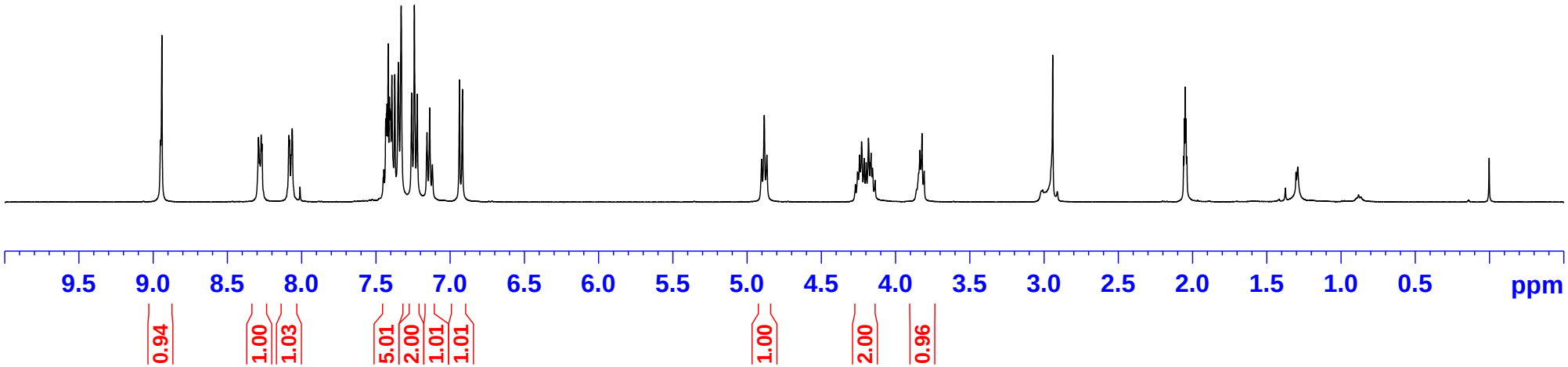

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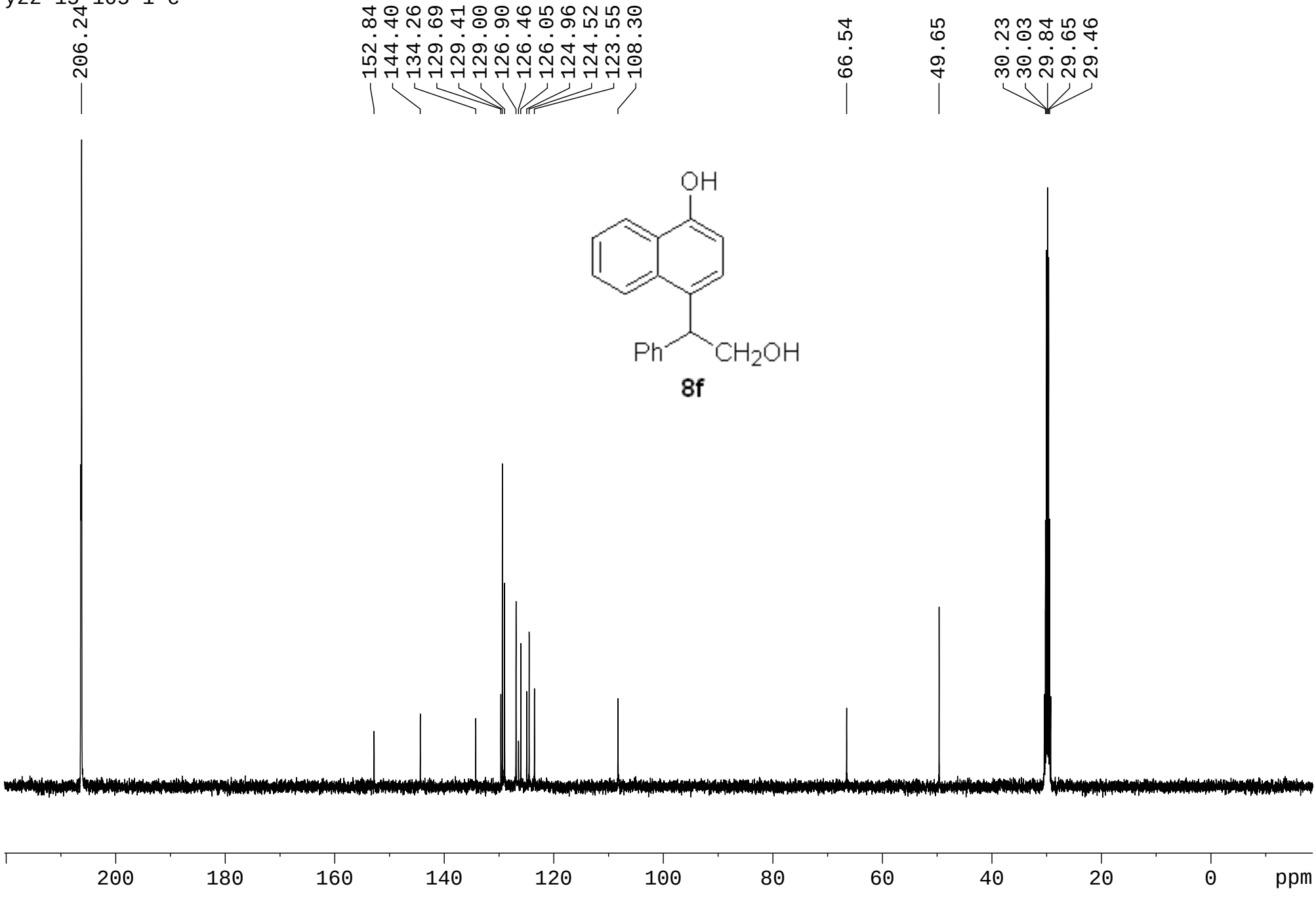
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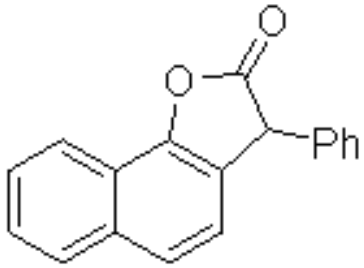
129.41
129.00
126.90
126.46
126.05
124.96
124.52
123.55
108.30
66.54
49.65
30.23
30.03
29.84
29.65
29.46
OH
Ph
CH2OH
8f
200
180
160
140
120
100
80
60
40
20
0
ppm

8.006
7.986
7.814
7.794
7.594
7.573
7.525
7.510
7.490
7.468
7.452
7.295
7.289
7.274
7.255
7.239
7.200
7.179
7.169
7.165
7.150

4.962

YZZ-15-010-1



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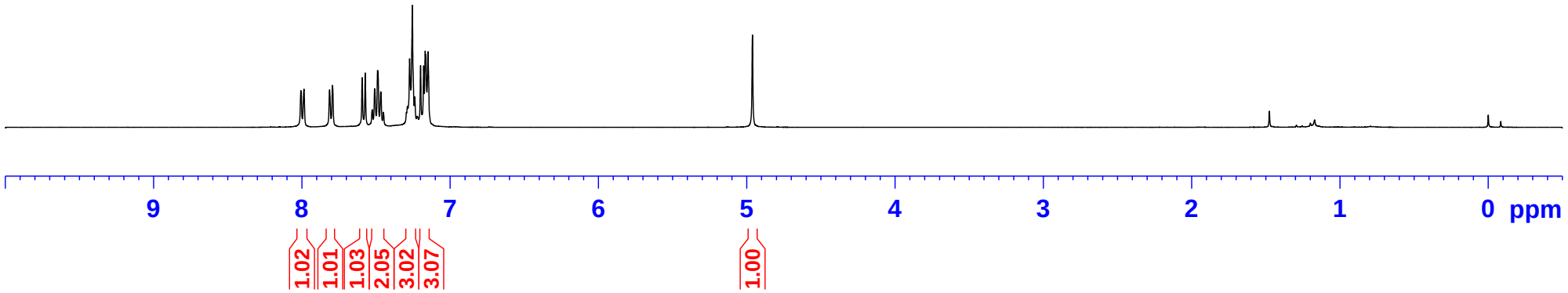
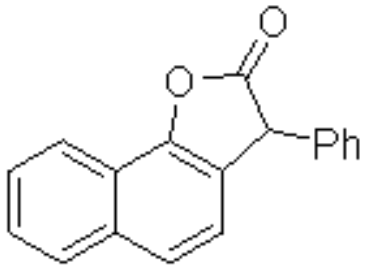


YZZ-15-010-1-C

175.58
149.58
135.05
134.14
129.13
128.31
128.24
128.21
126.93
124.40
121.54
121.17
119.79
77.32
77.00
76.68
50.73



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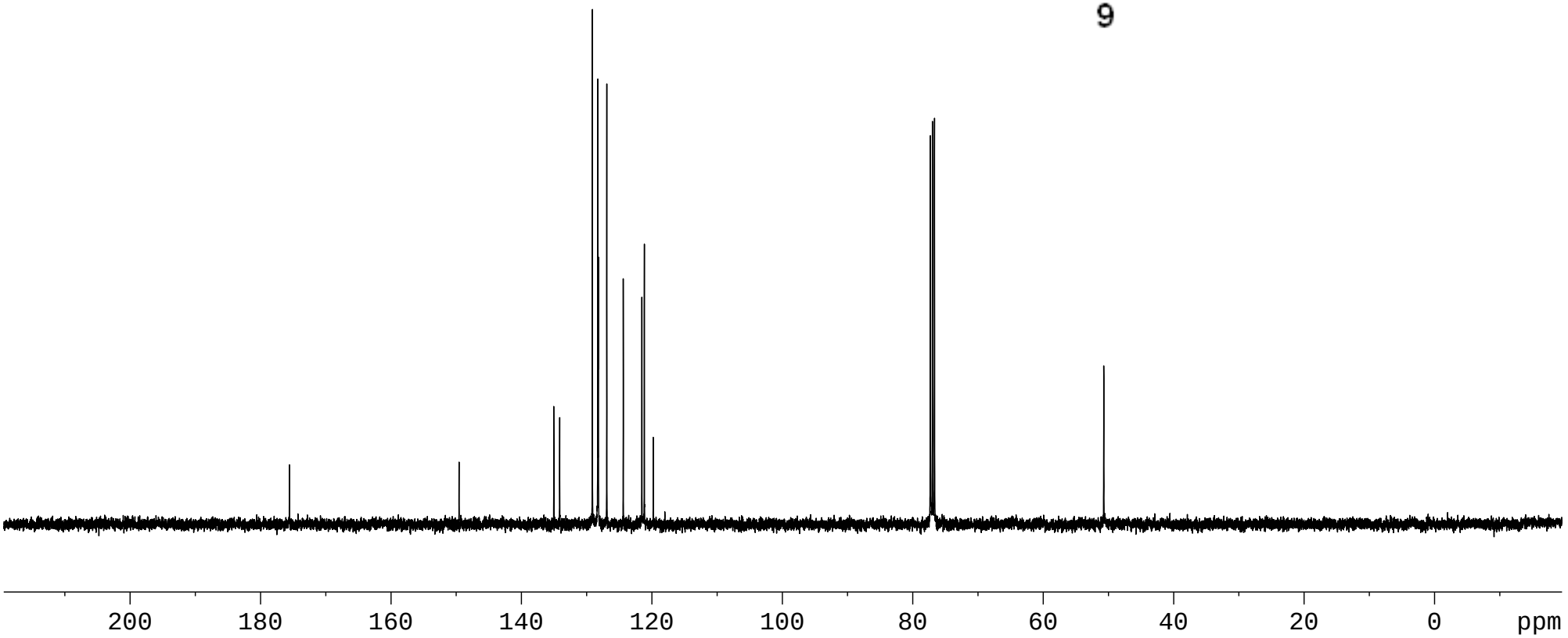

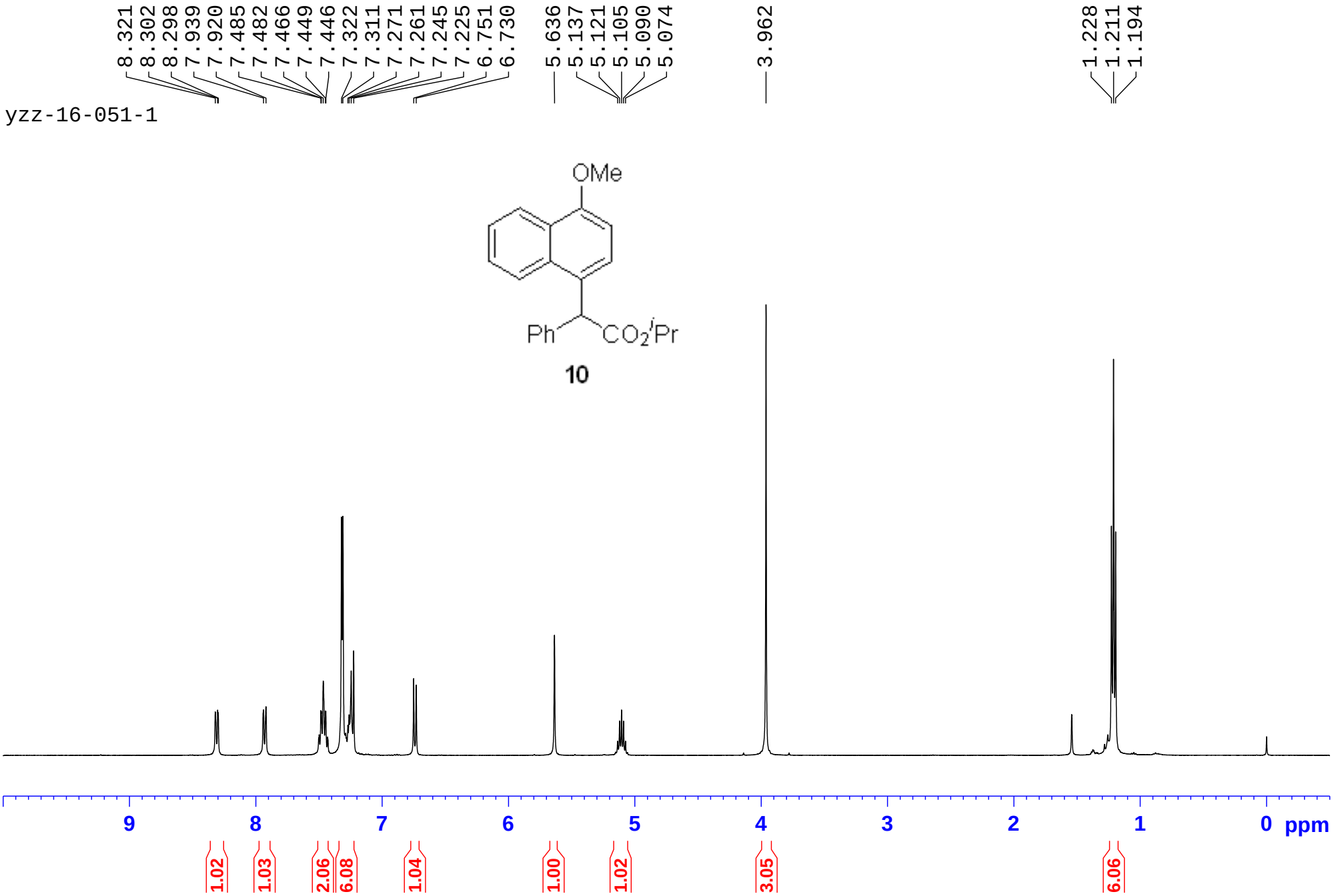
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7.485
7.482
7.466
7.449
7.446
7.322
7.311
7.271
7.261
7.245
7.225
6.751
6.730
5.636
5.137
5.121
5.105
5.090
5.074
3.962
1.228
1.211
1.194
yzz-16-051-1
OMe
Ph
CO2iPr
10
9
8
7
6
5
4
3
2
1
0
ppm
1.02
1.03
2.06
6.08
1.04
1.00
1.02
3.05
6.06

yzz-16-051-1-c

172.52
154.98
138.49
132.54
128.91
128.50
127.12
126.81
126.31
126.03
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122.70
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68.56
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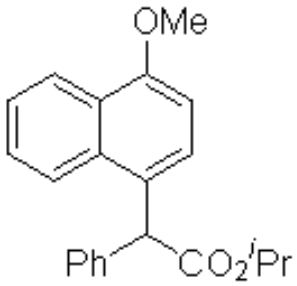
55.41
53.43
21.66



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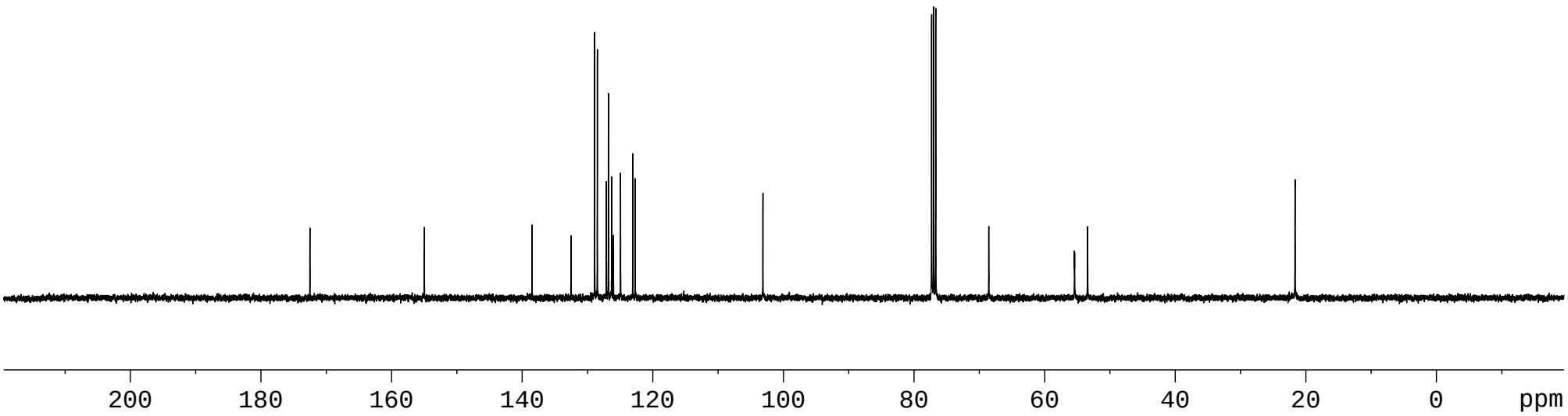

8.235
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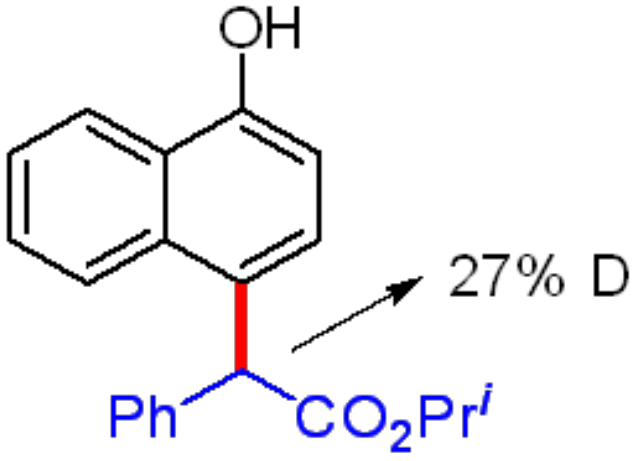
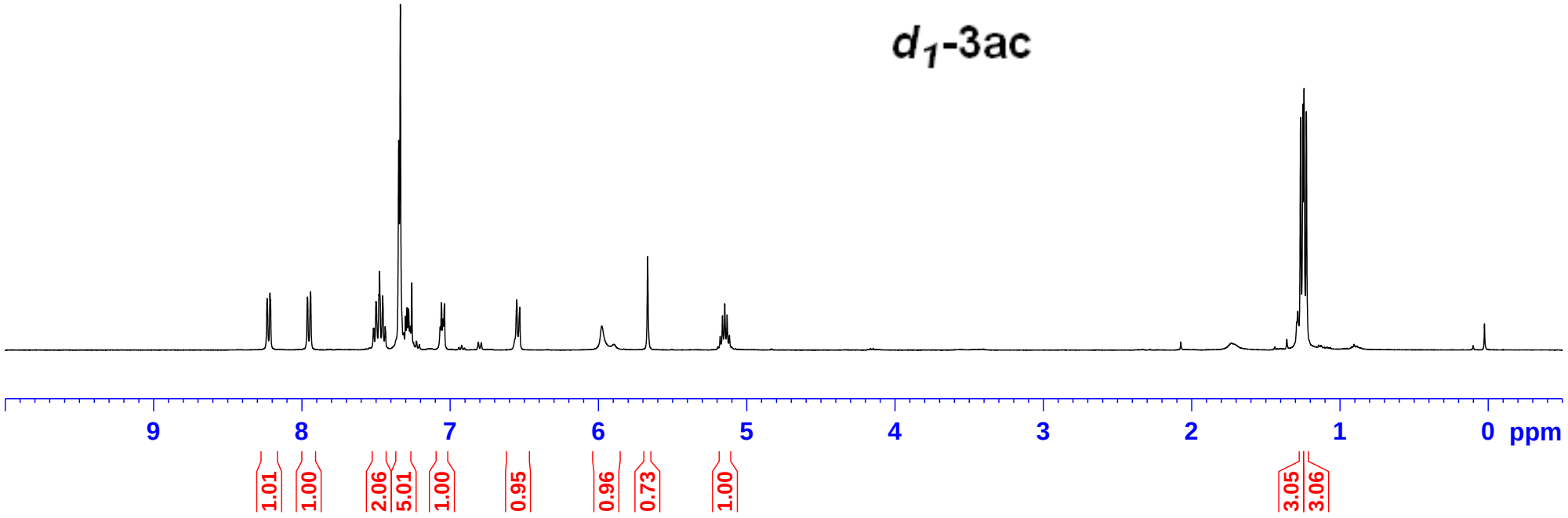
8.212
7.962
7.941
7.501
7.498
7.481
7.476
7.456
7.439
7.348
7.337
7.292
7.281
7.259
7.068
7.059
7.048
7.040
6.551
6.531
5.978
5.669
5.180
5.164
5.149
5.133
5.117

1.266
1.250
1.242
1.226

yzz-16-033-1



***d*$_1$-3ac**



9.216
9.191
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7.778
7.767
7.755
7.479
7.475
7.468
7.456
7.402
7.381
7.303
7.282
7.268
7.250
7.232
7.224
7.203
5.202
5.186
5.170
5.155
5.139
5.121
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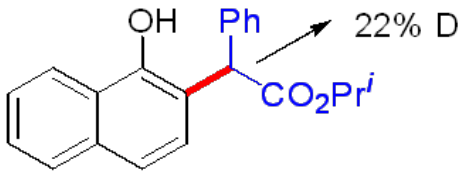
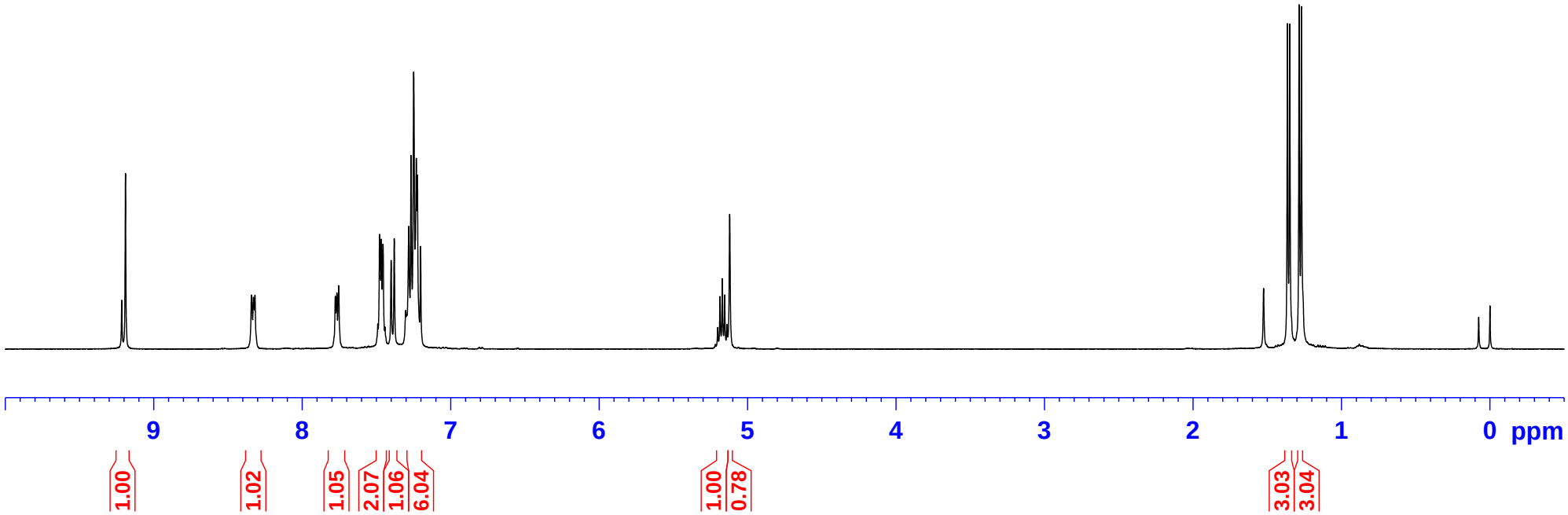
1.285
1.270

yzz-16-034-1



***d*$_1$-4ac**



8.729
8.036
8.015
7.829
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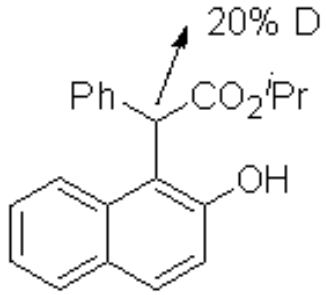
7.784
7.762
7.523
7.505
7.485
7.376
7.358
7.339
7.292
7.275
7.256
7.246
7.231
7.210
7.188
7.169
5.969
5.211
5.195
5.180
5.164
5.148

1.393
1.377
1.229
1.213

yzz-16-045-1



***d1*-7b**