Supporting Information

Visible Light Photoredox Cross-Coupling of Acyl Chlorides with Potassium Alkoxymethyltrifluoroborates: Synthesis of α-Alkoxyketones

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Contents:

EXPERIMENTAL

General Considerations: All reactions were carried out under an inert atmosphere of nitrogen or argon unless otherwise noted. THF was dried over activated alumina. $IrCl_3 \cdot xH_2O$, and $NiCl_2 \cdot$dme were purchased from commercial sources. Cs_2CO_3 was used as received. All other reagents were purchased commercially and used as received. Photoredox reactions were irradiated with two or three standard 26 W compact fluorescent light bulbs. Stereoconvergent cross-couplings were irradiated with blue LED light strips (~425 nm). Melting points (°C) are uncorrected. NMR spectra were recorded on a 400 or 500 MHz spectrometer. Data are presented as follows: chemical shift (ppm), multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet, br = broad), coupling constant *J* (Hz) and integration. Analytical thin-layer chromatography (TLC) was performed on TLC silica gel plates (0.25 mm) precoated with a fluorescent indicator. Visualization of the TLC plates was effected with ultraviolet light. Standard flash chromatography procedures were followed using 100-200 mesh silica gel. HRMS data were obtained by either ESI or CI using a TOF mass spectrometer.

Synthesis of α-alkoxymethyltrifluoroborates:

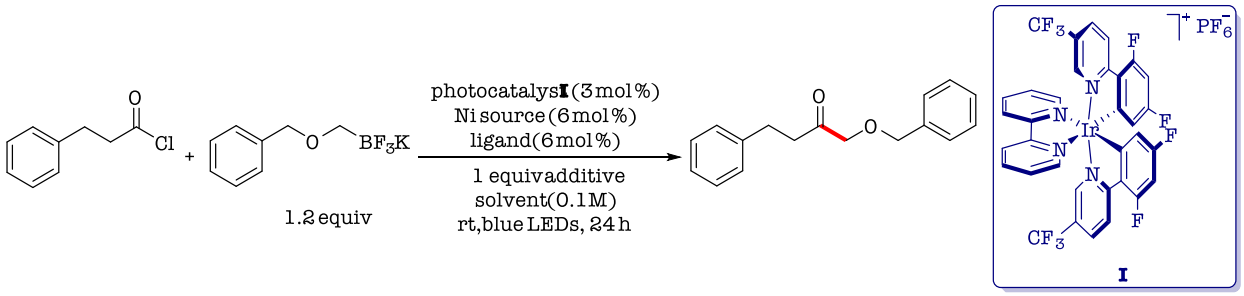
Most potassium α-alkoxymethyltrifluoroborates were purchased commercially. The unavailable potassium α-alkoxymethyltrifluoroborates were synthesized from the corresponding alcohols according to the literature procedure.[1]

Synthesis of $Ir[dF(CF_3)ppy]_2(bpy)PF_6$ as the photocatalyst I:

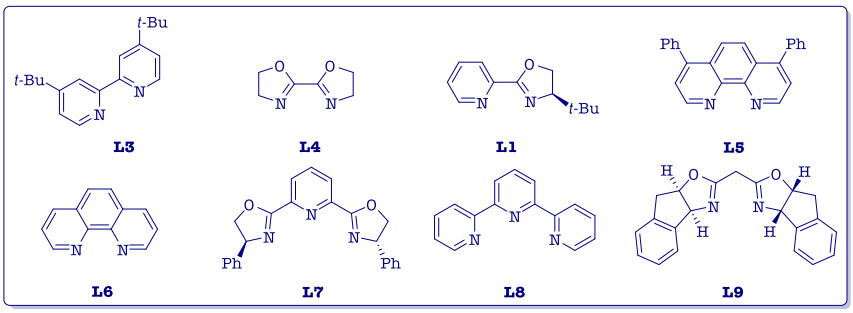
Photocatalyst **I** was synthesized according to the literature procedure.[2]

High-Throughput Experiments in the design and optimization of the photoredox cross-coupling reaction of hydrocinnamoyl chloride with potassium benzyloxymethyltrifluoroborate as model coupling partners:

High Throughput Experimentation (HTE) was performed at the Penn/Merck Center for High Throughput Experimentation at the University of Pennsylvania. The screens were performed on a 10 µmol scale. To reaction vials equipped with a Teflon coated magnetic stir bar in a glovebox was added a solution of Ni source and ligand [1:1] dissolved in THF. The solvent was removed *in vacuo* under an inert atmosphere. Then a solution of a desired additive, potassium benzyloxymethyltrifluoroborate, hydrocinnamoyl chloride, and photocatalyst **I** in a desired solvent, was added to each vial. The vials were sealed and stirred over blue LED lights. After 24 h the reactions were opened to air, 1 µmol of 4,4'-di-*tert*-butylbiphenyl (500 µL of a 0.002 µM solution in MeCN) was added to each vial as an internal standard, and the reaction mixtures were diluted with MeCN. The reaction mixtures were then analyzed by UPLC. The product-to-internal standard (P/IS) ratios from the UPLC are shown in Figures S1-S3.



First Screen Variables:



solvents	ligands	bases	Ni sources
THF	**L3**	no base	$Ni(COD)_2$
	L4	pyridine	$NiCl_2$.dme
	L1	lutidine	
	L5		
	L6		
	L7		
	L8		
	L9		

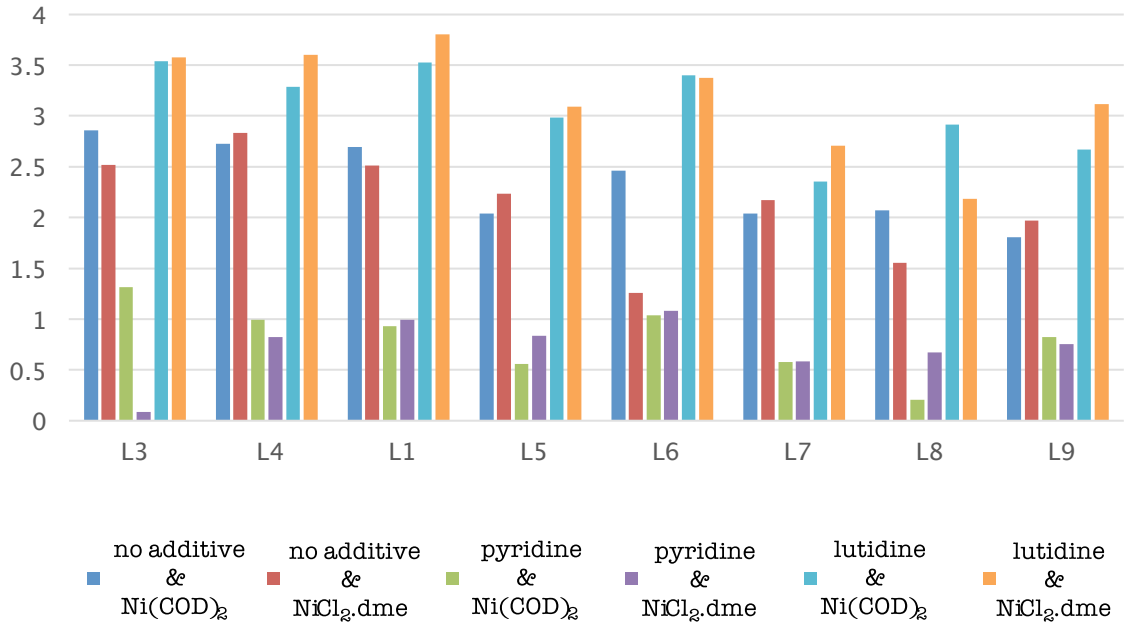
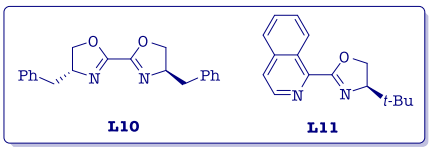


Figure S1. Product to internal standard ratio of the cross coupling reaction of hydrocinnamoyl chloride with potassium benzyloxymethyltrifluoroborate using the first screen variables.

According to this screen the best result was obtained for the reaction in the presence of $NiCl_2$·dme/**L1** and lutidine as a base.

Second Screen Variables:



solvents	ligands	bases	Ni sourcrs
THF	**L3**	lutidine	$NiCl_2$·dme
	L4	2-Me-pyridine	$Ni(PPh_3)_2Cl_2$
	L10		$Ni(NO_3)_2$
	L1		[(TMEDA)Ni(*o*-tolyl)Cl]
	L11		
	L5		

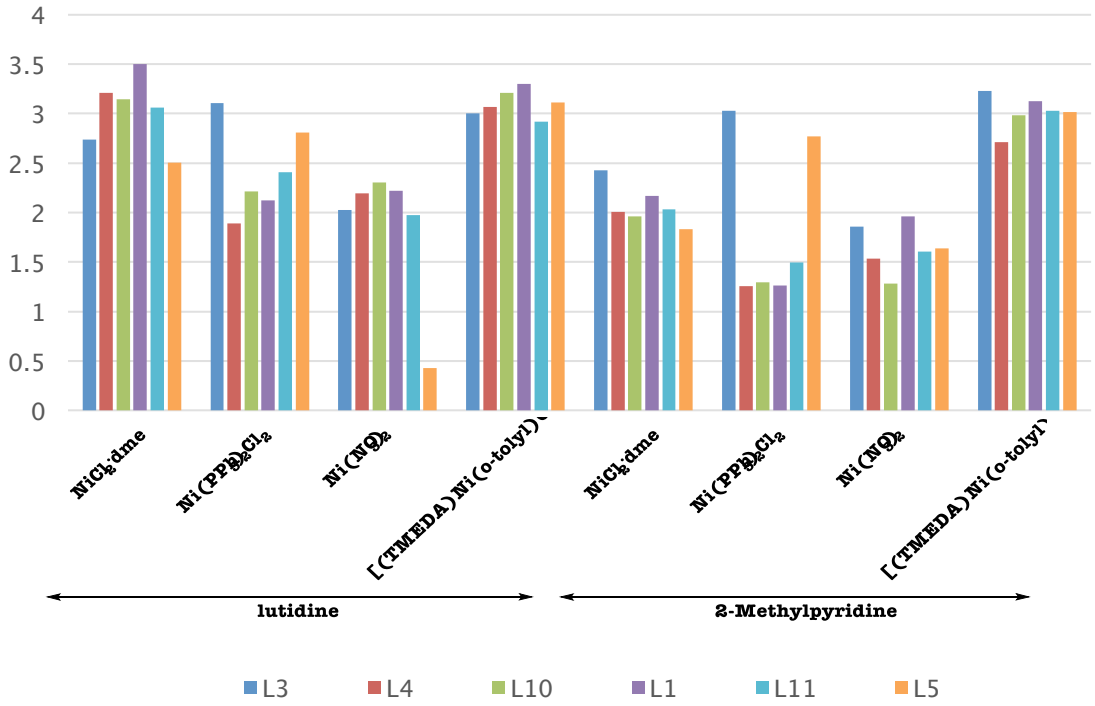


Figure S2. Product to internal standard ratio of the cross coupling reaction of hydrocinnamoyl chloride with potassium benzyloxymethyltrifluoroborate using the second screen variables.

According to the first and second screens, the highest product to internal standard ratio was obtained for the reaction in the presence of $NiCl_2$·dme/**L1** and lutidine as a base. To improve the yield of the reaction further, screens using a variety of inorganic bases as well as solvents were carried out (Figure S3).

Third Screen Variables:

Solvents	ligands	bases	Ni sources
THF	L1	lutidine	$NiCl_2 \cdot dme$
2-MeTHF		Cs_2CO_3	
CH_3CN		$CsHCO_3$	
EtOAc		K_3PO_4	
dioxane		K_2HPO_4	
DME		K_2CO_3	
acetone		$KHCO_3$	
methyl *tert*-butyl ether (MTBE)		NH_4CO_3	
		Na_2CO_3	
		NaH_2PO_4	
		KF	
		CsF	

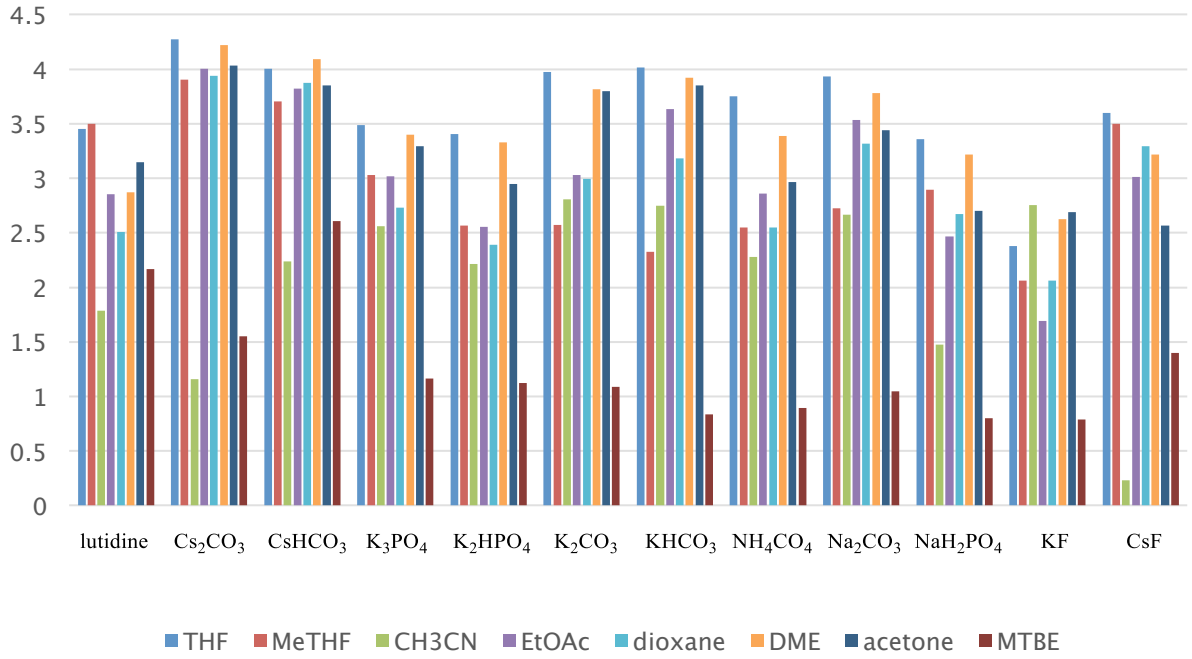
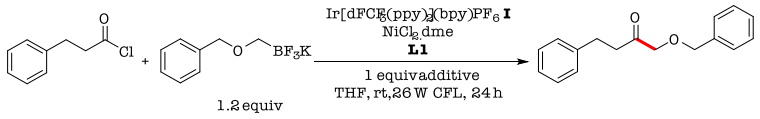


Figure S3. Product to internal standard ratio of the cross coupling reaction of hydrocinnamoyl chloride with potassium benzyloxymethyltrifluoroborate using the third screen variables.

Accordingly, changing the base of the reaction from lutidine to Cs_2CO_3 has a great impact on the product to internal standard ratio.

Control experiments for the cross-coupling of acyl chlorides with potassium alkoxymethyltrifluoroborates

Table S1. Control Experiments.



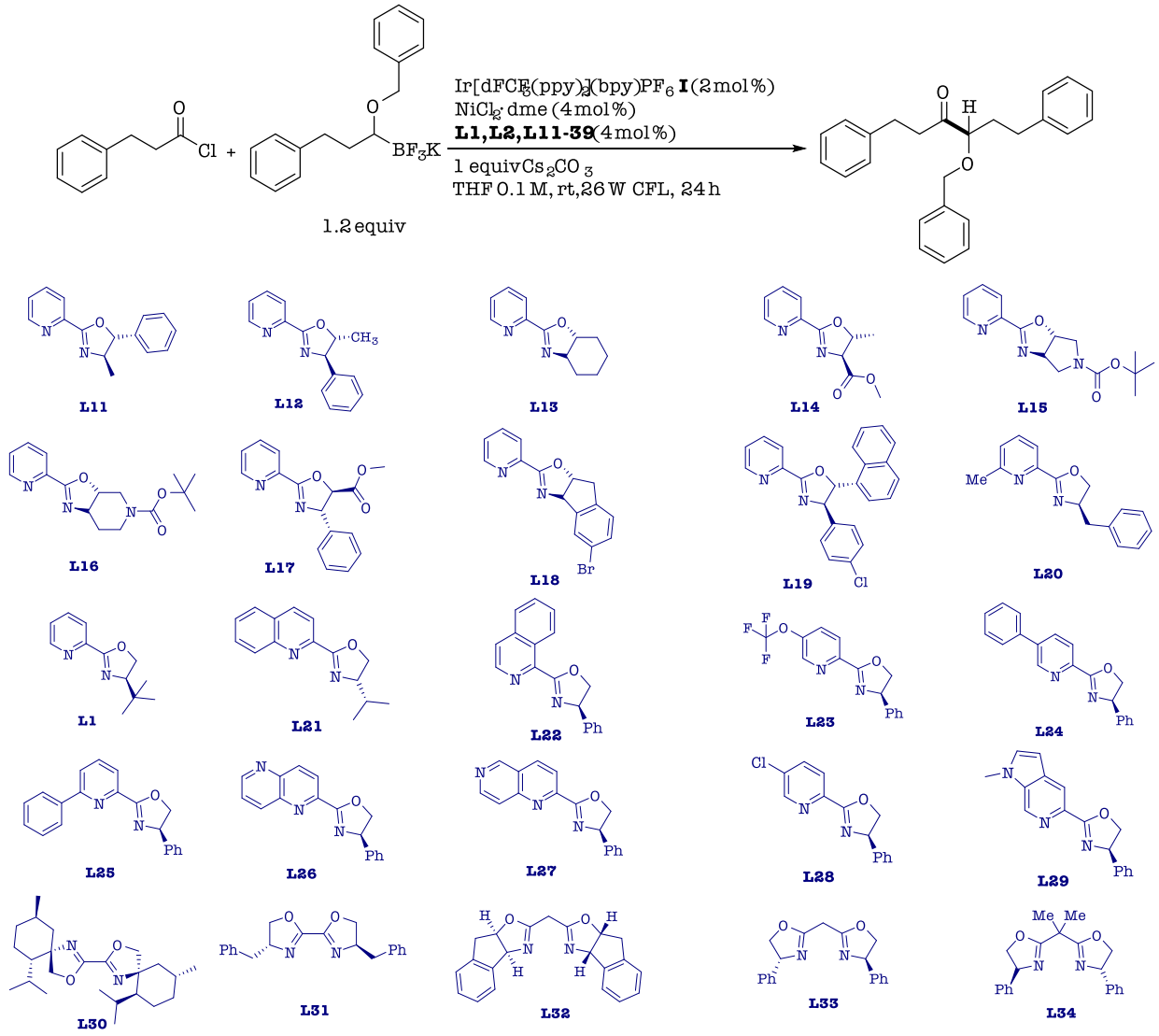
entry	conditions	additive	Yield[e]
1[a]	6 mol % $NiCl_2$·dme/**L1**	lutidine	74 %
2[a]	6 mol % $NiCl_2$·dme/**L1**	Cs_2CO_3	83 %
3[a]	no Ir photocatalyst	Cs_2CO_3	0%
4[a]	no $NiCl_2$·dme, no **L1**	Cs_2CO_3	<10 %
5[a]	no additive	-	58 %
5[b]	4 mol % $NiCl_2$·dme/**L1**	Cs_2CO_3	81 %
6[c]	4 mol % $NiCl_2$·dme/**L1**	Cs_2CO_3	86 %
7[d]	4 mol % $NiCl_2$·dme/**L1**	Cs_2CO_3	68 %

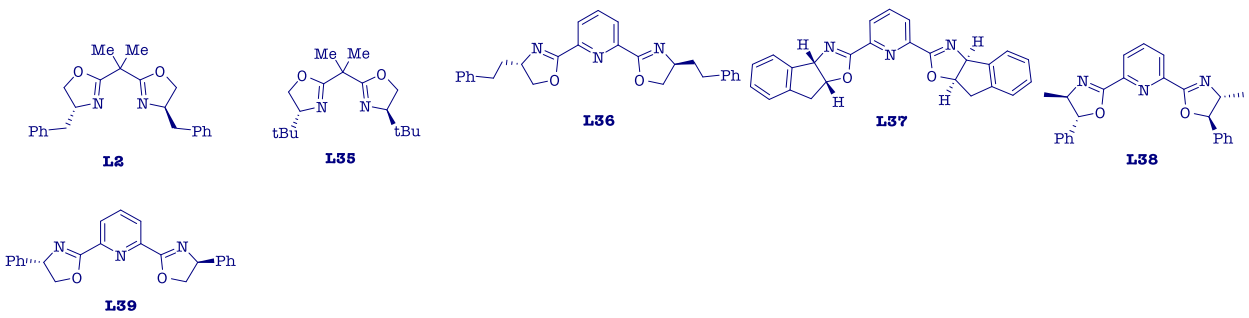
[a] Reactions were carried out using 3 mol % **I** at 0.1 M. [b] Using 2 mol % **I** at 0.1 M. [c] Using 2 mol % **I** at 0.05 M. [d] Using 2 mol % **I** at 0.2 M.[e] Isolated yields.

Screen of various chiral ligands under the optimal conditions for the phtoredox stereoconvergent synthesis of enantioenriched α-alkoxyketones:

Using hydrocinnamoyl chloride and racemic potassium 3-benzyloxy-3-trifluoroboratopropylbenzene as a model reaction, a screen of various chiral ligands **L1, L2, L11-39** under the optimal conditions was conducted. The screen was performed on a 10 μmol scale. To reaction vials equipped with a Teflon coated magnetic stir bar in a glovebox was added a solution of $NiCl_2$·dme and a desired ligand [1:1] dissolved in THF. The solvent was removed

in vacuo under an inert atmosphere. Then Cs_2CO_3 (1.0 equiv) and a solution of potassium 3-benzyloxy-3-trifluoroboratopropylbenzene (1.2 equiv), hydrocinnamoyl chloride, and photocatalyst **I** (2 mol %) in THF, was added to each vial. The vials were sealed and stirred over blue LED lights. After 24 h the reactions were opened to air, and diluted with MeCN. The reaction mixtures were then analyzed by SFC. Accordingly, **L2** was the best chiral ligand and afforded the desired ketone with enantiomeric ratio of 81:19 in an excellent yield. Figure S4 shows the SFC chromatograms of the reaction in the presence of ligands **L1** and **L2** [Figure S4, (a) and (b), respectively].





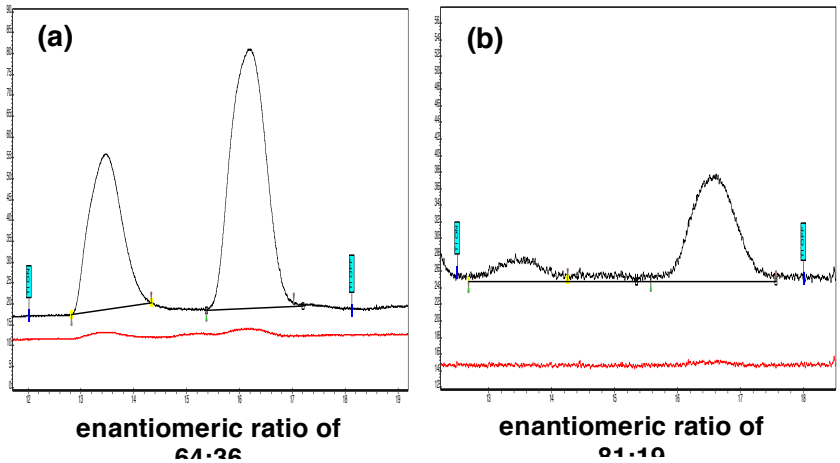
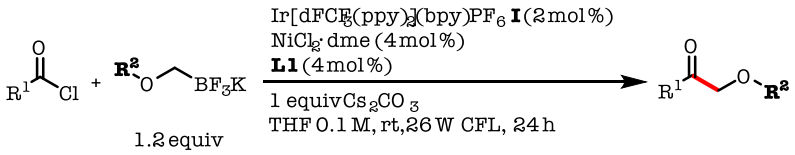


Figure S4. SFC chromatograms of the reaction in the presence of ligands L1 (a) and L2 (b).

General procedure for the photoredox cross-coupling reaction of acyl chlorides with potassium alkoxymethyltrifluoroborates:

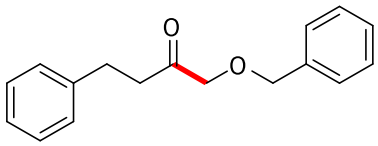


To a two dram (8 mL) borosilicate glass vial equipped with a Teflon-coated magnetic stir bar was added 4-*tert*-Butyl-2-(2-pyridyl)oxazoline **L1** (4.0 mg, 0.02 mmol) and $NiCl_2$·dme (4.4 mg, 0.02 mmol). The vial was sealed and evacuated under vacuum and purged with Ar three times.

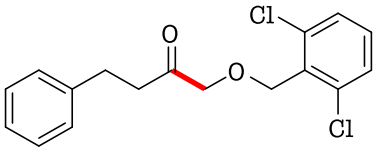
Anhyd and degassed THF (~1 mL) was added by syringe under Ar, and the resulting mixture was stirred until it appeared as a pale green suspension. Then, the solvent was removed under vacuum. Once dry, alkoxymethyltrifluoroborate (0.6 mmol, 1.2 equiv), $Ir[dFCF_3ppy]_2(bpy)PF_6$ **I** (10.1 mg, 0.01 mmol) and Cs_2CO_3 (162.9 mg, 0.5 mmol) were added. Next, the vial was sealed and subsequently purged and evacuated with Ar four times. Anhyd and degassed THF (4 mL) was then added by syringe under Ar followed by the corresponding acyl halide (0.5 mmol). The resulting mixture was stirred for 24 h in the presence of two 26 W fluorescent light bulbs while a fan was blown across the reaction setup to maintain an ambient temperature of 24 ^{o}C. After completion, the crude reaction mixture was filtered through a plug of Celite and rinsed with EtOAc (20 mL). The resulting solution was concentrated, and the residue was purified by column chromatography on silica gel, with EtOAc/hexanes mixtures as the eluent, to obtain products in pure form.

Gram scale reaction: To a ~125 mL long, thin-walled vacuum flask equipped with a Teflon-coated magnetic stir bar was added 4-*tert*-Butyl-2-(2-pyridyl)oxazoline **L1** (24.5 mg, 0.12 mmol), $NiCl_2$·dme (26.4 mg, 0.12 mmol). The vial was sealed and evacuated under vacuum and purged with Ar three times. Anhyd and degassed THF (~5 mL) was added by syringe under Ar, and the resulting mixture was stirred until it appeared as a pale green suspension. Then, the solvent was removed under vacuum. Next, potassium benzyloxymethyltrifluoroborate (1.62 g, 7.11 mmol, 1.2 equiv), $Ir[dFCF_3ppy]_2(bpy)PF_6$ **I** (59.8 mg, 0.059 mmol, 0.01 equiv), and Cs_2CO_3 (1.93 g, 5.93 mmol, 1.0 equiv) were added. The vial was sealed and subsequently purged and evacuated with Ar four times. Anhyd and degassed THF (59.3 mL) was then added by syringe under Ar followed by hydrocinnamoyl chloride (1.000 g, 5.93 mmol). The resulting mixture was

stirred vigorously for 48 h in the presence of three 26 W fluorescent light bulbs while a fan was blown across the reaction setup to maintain an ambient temperature of 24 °C. After completion, the crude reaction mixture was filtered through a plug of Celite and rinsed with EtOAc (50 mL). The resulting solution was concentrated, and the residue was purified by column chromatography on silica gel, with EtOAc/hexanes mixtures as the eluent, to obtain products in pure form.

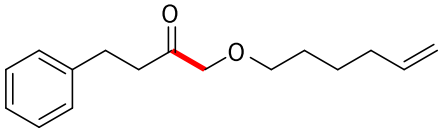


1-(Benzyloxy)-4-phenylbutan-2-one (1a). The title compound was obtained as a liquid in 81% yield (0.5 mmol scale, 101.7 mg). ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.38-7.32 (m, 5H), 7.29 (t, J = 7.5 Hz, 2H), 7.22-7.19 (m, 3H), 4.56 (s, 2H), 4.04 (s, 2H), 2.93 (t, J = 7.5 Hz, 2H), 2.81 (t, J = 7.5 Hz, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.2, 141.1, 137.4, 128.8, 128.6, 128.3, 128.2, 126.4, 75.4, 73.6, 40.8, 29.5; FT-IR (neat): 3331, 1725, 1139, 1095, 733, 696 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{17}H_{18}O_2Na$ $[M+Na]^+$ 277.1204, found 277.1209.

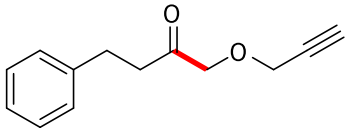


1-(2,6-Dichlorobenzyloxy)-4-phenylbutan-2-one (1b). The title compound was obtained as a solid in 56% yield (0.5 mmol scale, 90.4 mg). mp 62-64 °C; ^{1}H NMR (500 MHz, $CDCl_3$): 7.31 (d, J = 8 Hz, 2H), 7.25-7.23 (m, 3H), 7.18-7.15 (m, 3H), 4.83 (s, 2H), 4.07 (s, 2H), 2.91-2.87 (m, 2H), 2.83-2.79 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.4, 141.2, 137.3, 132.9, 130.6, 128.8, 128.7, 126.4, 75.9, 67.9, 40.8, 29.5; FT-IR (neat): 2923, 2853, 1734, 1565, 1436, 1407,

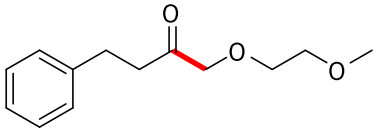
1104, 1090, 1080, 941, 792, 760, 729 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{17}H_{16}O_2NaCl_2$ $[M+Na]^+$ 345.0425, found 345.0419.



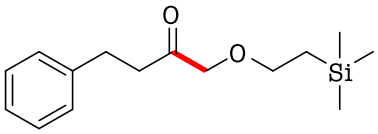
1-(Hex-5-enyloxy)-4-phenylbutan-2-one (1c). The title compound was obtained as a liquid in 82% yield (0.5 mmol scale, 101.0 mg). ^1H NMR (500 MHz, $CDCl_3$): 7.29-7.26 (m, 2H), 7.21-7.18 (m, 3H), 5.82-5.77 (m, 1H), 5.02-4.94 (m, 2H), 3.98 (s, 2H), 3.44 (t, J = 6.5 Hz, 2H), 2.92 (t, J = 7.5 Hz, 2H), 2.79 (t, J = 8.0 Hz, 2H), 2.07 (q, J = 7.0, 2H), 1.64-1.58 (m, 2H), 1.48-1.42 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.9, 141.2, 138.9, 128.8, 128.7, 126.5, 114.9, 76.5, 72.0, 40.8, 33.8, 29.6, 29.3, 25.6; FT-IR (neat): 2934, 1719, 1147, 1113, 1088, 909, 748, 732, 698 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{16}H_{22}O_2$ $[M]^+$ 246.1620, found 246.1622.



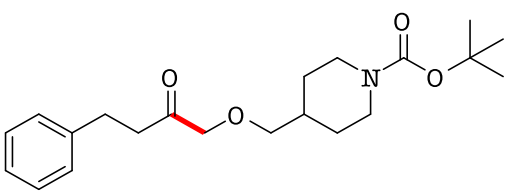
4-Phenyl-1-(prop-2-ynyloxy)butan-2-one (1d). The title compound was obtained as a liquid in 60% yield (0.5 mmol scale, 60.6 mg). ^1H NMR (500 MHz, $CDCl_3$): δ 7.30-7.26 (m, 2H), 7.21-7.18 (m, 3H), 4.24-4.23 (m, 2H), 4.13 (s, 2H), 2.94-2.91 (m, 2H), 2.82-2.79 (m, 2H) 2.45 (t, J = 2.4 Hz, 1H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 207.5, 141.0, 128.9, 128.7, 126.5, 78.8, 75.9, 74.6, 58.7, 40.9, 29.5; FT-IR (neat): 2936, 1724, 1482, 1452, 1427, 1397, 1332, 1197, 1164, 1105, 1007, 700 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{15}O_2$ $[M+H]^+$ 203.1072, found 203.1065.



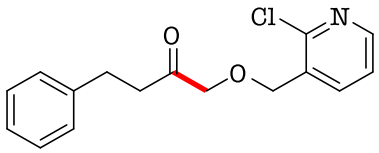
1-(2-Methoxyethoxy)-4-phenylbutan-2-one (1e). The title compound was obtained as a liquid in 86% yield (0.5 mmol scale, 95.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.28-7.26 (m, 2H), 7.20-7.17 (m, 3H), 4.07 (s, 2H), 3.63-3.62 (m, 2H), 3.56-3.55 (m, 2H), 3.36 (s, 3H), 2.91 (t, J = 7.5 Hz, 2H), 2.78 (t, J = 7.5 Hz, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.4, 141.2, 128.8, 128.7, 126.5, 76.9, 72.2, 71.2, 59.3, 40.7, 29.6; FT-IR (neat): 2924, 1720, 1496, 1453, 1199, 1107, 1088, 749, 699 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{18}O_3Na$ $[M+Na]^+$ 245.1154, found 245.1122.



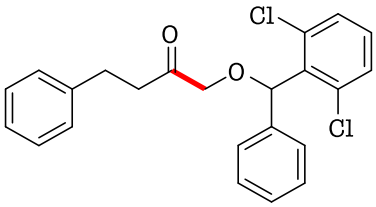
4-Phenyl-1-(2-(trimethylsilyl)ethoxy)butan-2-one (1f). The title compound was obtained as a liquid in 82% yield (0.5 mmol scale, 108.4 mg). ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.29-7.26 (m, 2H), 7.20-7.18 (m, 3H), 3.97 (m, 2H), 3.53 (t, J = 8.3 Hz, 2H), 2.92 (t, J = 7.5, 2H), 2.79 (t, J = 7.5, 2H), 0.99-0.95 (m, 2H), 0.02 (s, 9H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.8, 141.2, 128.7, 128.6, 126.4, 75.9, 69.3, 40.7, 29.6, 18.4, -1.12; FT-IR (neat): 2952, 1720, 1454, 1248, 1098, 858, 835, 848, 697 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{15}H_{24}O_2SiNa$ $[M+Na]^+$ 287.1443, found 287.1445.



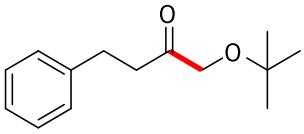
***tert*-Butyl-4-((2-oxo-4-phenylbutoxy)methyl)piperidine-1-carboxylate (1g).** The title compound was obtained as a liquid in 80% yield (0.5 mmol scale, 144.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.25 (t, *J* = 7.5 Hz, 2H), 7.17 (t, *J* = 7.5 Hz, 3H), 4.09 (m, 2H), 3.95 (s, 2H), 3.25 (d, *J* = 6.5 Hz, 2H), 2.89 (t, *J* = 7.5 Hz, 2H), 2.75 (t, *J* = 7.5 Hz, 2H), 2.66 (m, 2H), 1.78-1.66 (m, 3H), 1.43 (s, 9H), 1.16-1.08 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.5, 155.0, 141.0, 128.7, 128.6, 126.4, 79.5, 76.7, 76.6, 44.0, 40.7, 36.6, 29.5, 29.1, 28.7; FT-IR (neat): 2924, 1722, 1686, 1452, 1420, 1365, 1274, 1247, 1233, 1170, 1143, 750 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{21}H_{32}NO_4$ $[M+H]^+$ 362.2331, found 362.2325.



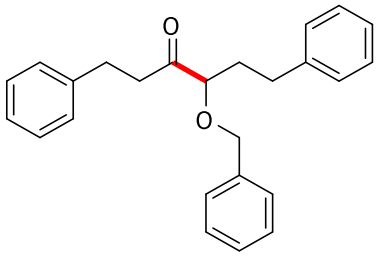
1-((2-Chloropyridin-3-yl)methoxy)-4-phenylbutan-2-one (1h). The title compound was obtained as a liquid in 66% yield (0.5 mmol scale, 66.6 mg). ^{1}H NMR (500 MHz, $CDCl_3$): δ 8.32-8.30 (m, 1H), 7.85-7.83 (m, 1H), 7.29-7.24 (m, 3H), 7.20-7.17 (m, 3H), 4.60 (s, 2H), 4.15 (s, 2H), 2.94 (t, *J* = 7.5 Hz, 2H), 2.81 (t, *J* = 7.5 Hz, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 207.3, 149.6, 148.8, 140.8, 137.5, 132.3, 128.8, 128.6, 126.6, 122.9, 76.2, 69.7, 40.8, 29.6; FT-IR (neat): 3375, 3324, 1687, 1561, 1515, 1434, 1238, 1158, 763 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{16}H_{16}NO_2NaCl$ $[M+Na]^+$ 312.0755, found 312.0767.



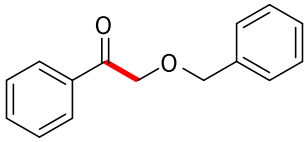
1-((2,6-Dichlorophenyl)(phenyl)methoxy)-4-phenylbutan-2-one (1i) The title compound was obtained as a liquid in 71% yield (0.5 mmol scale, 141.7 mg). ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.37-7.26 (m, 9H), 7.23-7.18 (m, 4H), 6.41 (s, 1H), 4.05 (dd, *J* = 46.8, 16.4 Hz, 2H), 3.01-2.99 (m, 2H), 2.97-2.94 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.5, 141.2, 139.4, 136.6, 135.1, 130.3, 129.8, 128.8, 128.7, 128.4, 127.5, 126.4, 126.1, 79.3, 74.6, 41.1, 29.4; FT-IR (neat): 2933, 2855, 1736, 1565, 1436, 1407, 1104, 1090, 1080, 941, 792, 760, 731cm^{-1}; HRMS (ES+) m/z calcd. for $C_{23}H_{20}O_2NaCl_2$ $[M+Na]^+$ 421.0738, found 421.0734.



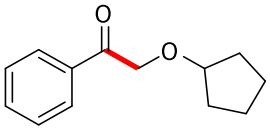
1-(*tert*-Butoxy)-4-phenylbutan-2-one (1j). The title compound was obtained as a liquid in 75% yield (0.5 mmol scale, 82.6 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.30-7.27 (m, 2H), 7.21-7.18 (m, 3H), 3.92 (s, 2H), 2.92-2.89 (m, 2H), 2.86-2.82 (m, 2H),1.19 (s, 9H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 209.9, 141.4, 128.8, 128.7, 126.4, 74.3, 68.8, 41.0, 29.7, 27.6; FT-IR (neat): 2974, 2359, 2341, 1720, 1564, 1490, 1392, 1365, 1197, 1082, 877, 727 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{17}O_2$ $[M-CH_3]^+$ 205.1229, found 205.1222.



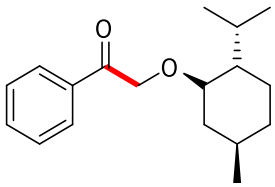
4-(Benzyloxy)-1,6-diphenylhexan-3-one (1k). The title compound was obtained as a solid in 88% yield (0.5 mmol scale, 155.9 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.43-7.32 (m, 9H), 7.25 (t, *J* = 7.5 Hz, 4H), 7.16 (d, *J* = 7.5 Hz, 2H), 4.55 (d, J = 11.5 Hz, 1H), 4.40 (d, *J* = 11.5 Hz, 1H), 3.84 (dd, J = 7.9, 4.5 Hz, 1H), 2.93 (dd, *J* = 14.7, 5.8 Hz, 4H), 2.81-2.75 (m, 1H), 2.71-2.65 (m, 1H), 2.04-2.00 (m, 1H), 1.98-1.93 (m, 1H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 212.3, 141.4, 141.3, 137.7, 128.8, 128.7, 128.7, 128.7, 128.3, 126.4, 126.3, 84.3, 72.7, 39.7, 33.9, 31.6, 29.6.; FT-IR (neat): 3027, 1713, 1496, 1453, 1092, 1028 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{25}H_{26}O_2Na$ $[M+Na]^+$ 381.1831, found 381.1819.



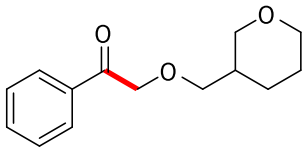
2-(Benzyloxy)-1-phenylethanone (2a). The title compound was obtained as a solid in 87% yield (0.5 mmol scale, 99.5 mg). mp 58-60 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.92 (d, *J* = 8.0 Hz, 2H), 7.57 (t, *J* = 7.5 Hz, 1H), 7.45 (t, *J* = 7.5 Hz, 2H), 7.40-7.34 (m, 4H), 7.31 (t, *J* = 7.5 Hz, 1H), 4.75 (s, 2H), 4.69 (s, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 196.6, 137.6, 135.3, 133.8, 129.0, 128.8, 128.4, 128.3, 128.2, 73.7, 72.9; FT-IR (neat): 2985, 1692, 1226, 1126, 1078, 975, 905, 742 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{15}H_{14}O_2Na$ $[M+Na]^+$ 249.0891, found 249.0890.



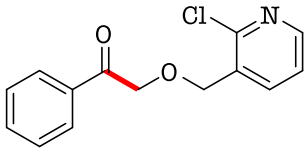
2-(Cyclopentyloxy)-1-phenylethanone (2b). The title compound was obtained as a liquid in 90% yield (0.5 mmol scale, 93.9 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.93 (d, J = 8.5 Hz, 2H), 7.57-7.54 (m, 1H), 7.44 (t, J = 7.5 Hz, 2H), 4.68 (s, 2H), 4.04-4.02 (m, 1H), 1.74-1.71 (m, 6H), 1.53-1.52 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 197.1, 135.4, 133.6, 128.9, 128.3, 82.8, 72.4, 32.4, 23.7; FT-IR (neat): 2936, 2851, 1720, 1699, 1499, 1270, 1227, 1206, 1146, 1117, 969, 755, 714, 689 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{17}O_2$ $[M+H]^+$ 205.1229, found 205.1236.



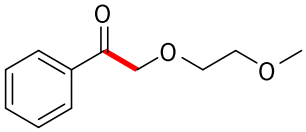
2-(2-Isopropyl-5-methylcyclohexyloxy)-1-phenylethanone (2c) The title compound was obtained as a liquid in 91% yield (0.5 mmol scale, 127.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.96-7.94 (m, 2H), 7.58-7.54 (m, 1H), 7.47-7.43 (m, 2H), 4.82 (d, J = 16.0 Hz, 1H), 4.67 (d, J = 16.0 Hz, 1H), 3.24-3.19 (m, 1H), 2.30-2.24 (m, 1H), 2.14-2.11 (m, 1H), 1.66-1.61 (m, 2H), 1.37-1.31 (m, 2H), 0.98-0.87 (m, 9H), 0.73 (d, J = 6.5 Hz, 3H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 197.1, 135.5, 133.6, 128.9, 128.5, 80.5, 71.8, 48.5, 40.3, 34.7, 31.9, 25.7, 23.5, 22.6, 21.3, 16.4; FT-IR (neat): 2954,2923, 2870, 1721, 1271, 1176, 1151, 1128, 1097, 1146, 1117, 969, 755, 714, 689 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{18}H_{27}O_2$ $[M+H]^+$ 275.2011, found 275.2010.



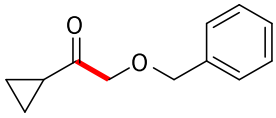
1-Phenyl-2-((tetrahydro-2*H*-pyran-3-yl)methoxy)ethanol (2d). The title compound was obtained as a liquid in 78% yield (0.5 mmol scale, 91.3 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.91-7.89 (m, 2H), 7.57-7.53 (m, 1H), 7.45-7.42 (m, 2H), 4.88-4.84 (m, 1H), 4.78-4.64 (m, 1H), 3.98-3.95 (m, 1H), 3.60-3.51 (m, 3H), 3.44-3.39 (m, 1H), 1.84-1.81 (m, 1H), 1.55-1.46 (m, 4H), 1.35-1.27 (m, 1H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 196.8, 135.2, 133.7, 128.9, 128.2, 77.32, 75.5, 74.6, 68.6, 28.2, 26.1, 23.3; FT-IR (neat): 2918, 2847, 1728, 1564, 1442, 1407, 1288, 1237, 1148, 1111, 1091, 728 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{14}H_{18}O_3$ Na $[M+Na]^+$ 257.1154, found 257.1146.



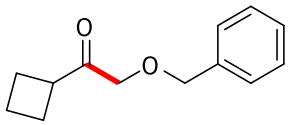
2-((2-Chloropyridin-3-yl)methoxy)-1-phenylethanone (2e). The title compound was obtained as a liquid in 74% yield (0.5 mmol scale, 100.7 mg). mp 41-43 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$): δ 8.32-8.31 (m, 1H), 7.97-7.96 (m, 1H), 7.93 (d, J = 8.3 Hz, 2H), 7.61-7.58 (m, 1H), 7.48 (t, J = 7.7 Hz, 2H), 7.29-7.26 (m, 1H), 4.92 (d, J = 0.4 Hz, 2H), 4.76 (s, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 195.9, 149.6, 148.8, 137.8, 134.9, 134.1, 132.6, 129.1, 128.1, 123.0, 73.8, 69.8; FT-IR (neat): 2923, 1702, 1583, 1566, 1450, 1414, 1229, 1144, 975, 797, 750, 684 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{14}H_{13}NO_2Cl$ $[M+H]^+$ 262.0635, found 262.0639.



2-(2-Methoxyethoxy)-1-phenylethanone (2f). The title compound was obtained as a liquid in 83% yield (0.5 mmol scale, 80.6 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.91 (dd, J = 7.5, 1.0 Hz, 2H), 7.58-7.55 (m, 1H), 7.45 (t, J = 7.5, 2H), 4.83 (s, 2H), 3.77-3.75 (m, 2H), 3.62-3.60 (m, 2H), 3.37 (s, 3H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 196.6, 135.1, 133.8, 129.0, 128.1, 74.4, 72.4, 71.1, 59.3; FT-IR (neat): 2923, 2876, 1720, 1598, 1449, 1270, 1227, 1199, 1174, 1146, 1117, 969, 755, 689 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{11}H_{14}O_3Na$ $[M+Na]^+$ 217.0841, found 217.0842.

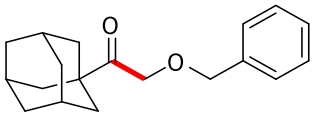


2-(Benzyloxy)-1-cyclopropylethanone (3a). The title compound was obtained as a liquid in 93% yield (0.5 mmol scale, 88.4 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.38-7.34 (m, 4H), 7.32-7.29 (m, 1H), 4.61 (s, 2H), 4.21 (s, 2H), 2.17-2.12 (m, 1H), 1.11-1.08 (m, 2H), 0.94-0.90 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 208.7, 137.5, 128.7, 128.2, 128.1, 75.6, 73.6, 17.2, 11.6; FT-IR (neat): 2987, 1697, 1454, 1385, 1155, 1103, 1061, 1020, 897, 745 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{12}H_{15}O_2$ $[M+H]^+$ 191.1072, found 191.1063.

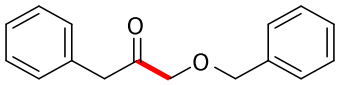


2-(Benzyloxy)-1-cyclobutylethanone (3b). The title compound was obtained as a liquid in 80% yield (0.5 mmol scale, 81.7 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.35-7.34 (m, 4H), 7.31-7.28 (m,

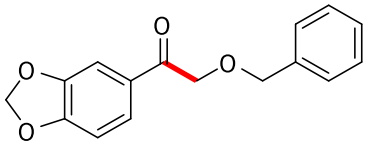
1H), 4.56 (s, 2H), 4.06 (s, 2H), 3.43-3.36 (m, 1H), 2.29-2.21 (m, 2H), 2.15-2.09 (m, 2H), 2.02-1.94 (m, 1H), 1.87-1.82 (m, 1H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 209.4, 137.6, 128.7, 128.1, 128.0, 73.6, 73.5, 42.2, 24.4, 18.3; FT-IR (neat): 2985, 2945, 1721, 1454, 1382, 1160, 1094, 1027, 993 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{15}O_2$ $[M-H]^+$ 203.1072, found 203.1070.



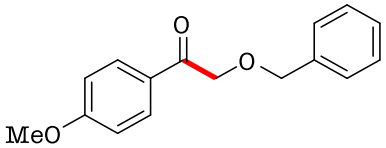
1-(Adamantan-1-yl)-2-(benzyloxy)ethanone (3c). The title compound was obtained as a liquid in 85% yield (0.5 mmol scale, 120.8 mg). mp 56-58 °C; ^{1}H NMR (500 MHz, $CDCl_3$): 7.37-7.33 (m, 4H), 7.31-7.28 (m, 1H), 4.58 (s, 2H), 4.31 (s, 2H), 2.04-2.02 (m, 3H), 1.82-1.81 (m, 6H), 1.75-1.66 (m, 6H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 211.5, 137.8, 128.8, 128.3, 128.2, 73.4, 70.7, 45.6, 38.3, 36.8, 28.1; FT-IR (neat): 2904, 2850, 1703, 1452, 1266, 1118, 1024, 1002, 757, 744, 697 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{19}H_{25}O_2$ $[M+H]^+$ 285.11855, found 285.1850.



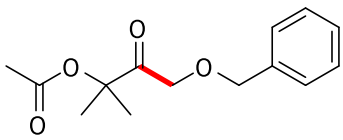
1-(Benzyloxy)-3-phenylpropan-2-one (3d). The title compound was obtained as a liquid in 61% yield (0.5 mmol scale, 73.2 mg). ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.37-7.31 (m, 7H), 7.28-7.20 (m, 3H), 4.56 (s, 2H), 4.12 (s, 2H), 3.78 (s, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 206.3, 137.4, 133.7, 129.8, 129.0, 128.8, 128.4, 128.3, 127.4, 74.7, 73.7, 46.6; FT-IR (neat): 2985, 1720, 1226, 1078, 975, 905, 742 cm^{-1}; HRMS (ES^+) m/z calcd. for $C_{16}H_{17}O_2$ $[M+H]^+$ 241.1229, found 241.1234.



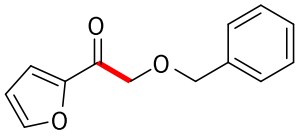
1-(Benzo[*d*][1,3]dioxol-5-yl)-2-(benzyloxy)ethanone (3e). The title compound was obtained as a liquid in 84% yield (0.5 mmol scale, 113.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.50 (dd, J = 8.5, 1.5 Hz, 1H), 7.41 (d, J = 1.5 Hz, 1H), 7.39-7.34 (m, 4H), 7.32-7.28 (m, 1H), 6.82 (d, J = 8.0 Hz, 1H), 6.02 (s, 2H), 4.67-4.66 (m, 4H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 194.5, 152.3, 148.5, 137.6, 129.9, 128.8, 128.3, 128.2, 124.5, 108.3, 108.0, 102.1. 73.6, 72.7; FT-IR (neat): 3925, 1680, 1603, 1486, 1444, 1426, 1248, 1128, 1100, 1082, 1029, 990, 785 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{16}H_{14}O_4Na$ $[M+Na]^+$ 293.0790, found 293.0791.



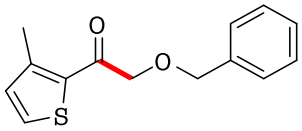
2-(Benzyloxy)-1-(4-methoxyphenyl)ethanone (3f). The title compound was obtained as a liquid in 88% yield (0.5 mmol scale, 112.7 mg). mp 36-38 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.92 (dd, J = 7.0, 1.7 Hz, 2H), 7.40-7.34 (m, 4H), 7.32-7.29 (m, 1H), 6.93-6.91 (m, 2H), 4.70 (s, 2H), 4.68 (s, 2H), 3.86 (s, 3H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 195.1, 164.1, 147.9, 137.7, 130.6, 128.8, 128.4, 128.3, 114.2, 73.7, 72.8, 55.8; FT-IR (neat): 2850, 1685, 1597, 1573, 1509, 1455, 1260, 1235, 1168, 1113, 1021, 832, 749 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{16}H_{17}O_3$ $[M+H]^+$ 257.1178, found 257.1176.



4-(Benzyloxy)-2-methyl-3-oxobutan-2-yl acetate (3g). The title compound was obtained as a liquid in 50% yield (0.5 mmol scale, 62.5 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.37-7.33 (m, 4H), 7.31-7.29 (m, 1H), 4.59 (s, 2H), 4.31 (s, 2H), 2.02 (s, 3H), 1.50 (s, 6H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 205.6, 170.7, 137.7, 128.7, 128.3, 128.2, 82.9, 73.5, 70.9, 24.0, 21.4; FT-IR (neat): 2989, 1730, 1368, 1253, 1146, 1047, 1019, 740, 697 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{14}H_{18}O_4Na$ $[M+Na]^+$ 273.1103, found 273.1106.

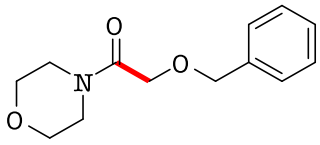


2-(Benzyloxy)-1-(furan-2-yl)ethanone (3h). The title compound was obtained as a liquid in 36% yield (0.5 mmol scale, 38.9 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.58-7.57 (m, 1H), 7.40-7.35 (m, 4H), 7.32-7.31 (m, 2H), 6.54-6.53 (m, 1H), 4.68 (s, 2H), 4.59 (s, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 185.9, 151.3, 146.9, 137.5, 128.8, 128.4, 128.3, 118.5, 112.6, 73.8, 72.5; FT-IR (neat): 2923, 2856, 1689, 1467, 1132, 1018, 764, 738, 698 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{13}O_3$ $[M+H]^+$ 217.0865, found 217.0861.



2-(Benzyloxy)-1-(3-methylthiophen-2-yl)ethanone (3i). The title compound was obtained as a liquid in 46% yield (0.5 mmol scale, 56.6 mg). ^{1}H NMR (500 MHz, $CDCl_3$): 7.43-7.40 (m, 3H), 7.38-7.35 (m, 2H), 7.32-7.29 (m, 1H), 6.95 (d, J = 4.9 Hz, 1H), 4.69 (s, 2H), 4.52 (s, 2H), 2.58 (s, 3H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 190.6, 146.9, 137.6, 137.5, 132.5, 130.9, 128.8, 128.4,

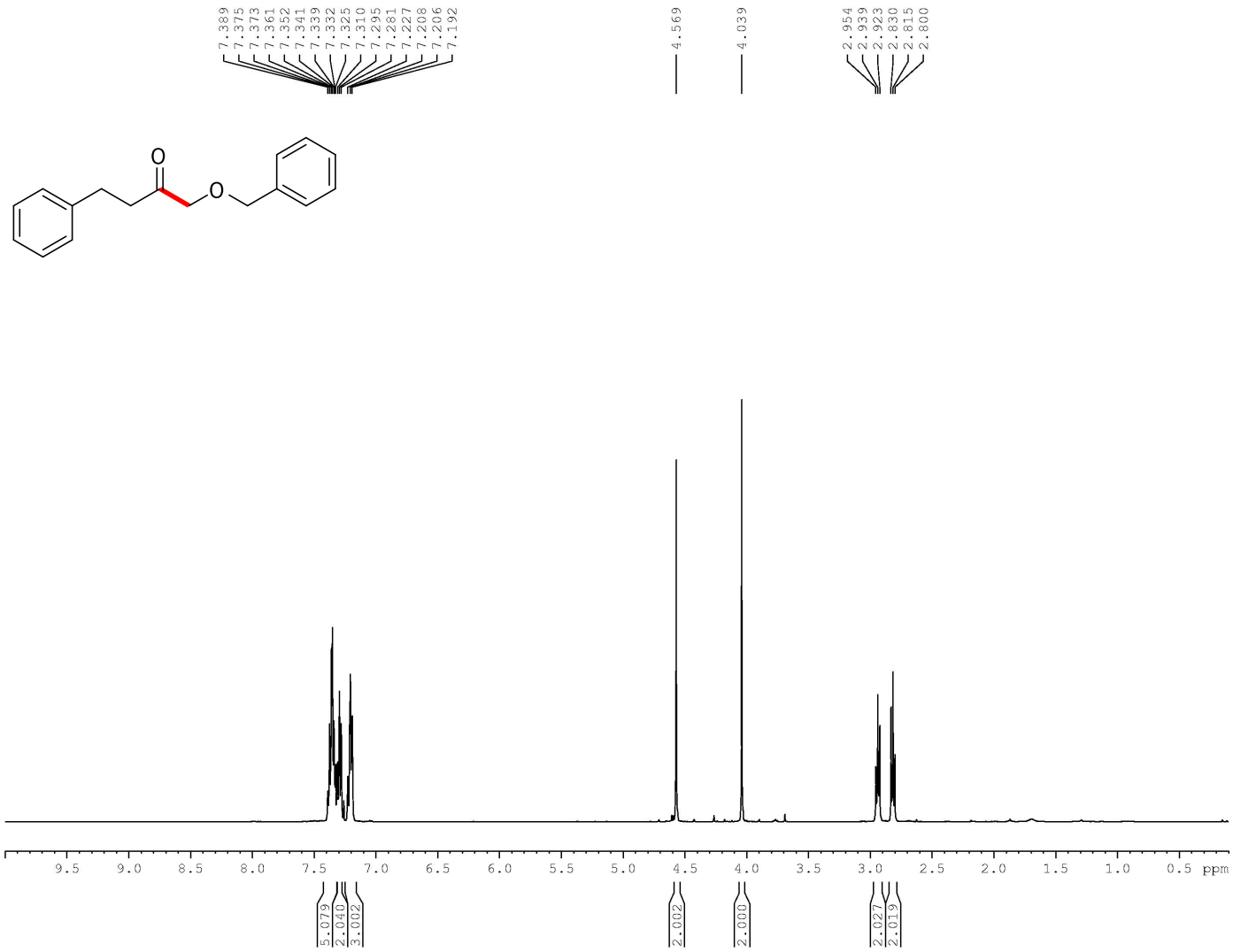
128.3, 74.4, 73.8, 17.3; FT-IR (neat): 2924, 2850, 1656, 1401, 1371, 1210, 1122, 1028, 972, 733, 696 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{14}H_{14}O_2NaS$ $[M+Na]^+$ 269.0612, found 269.0609.



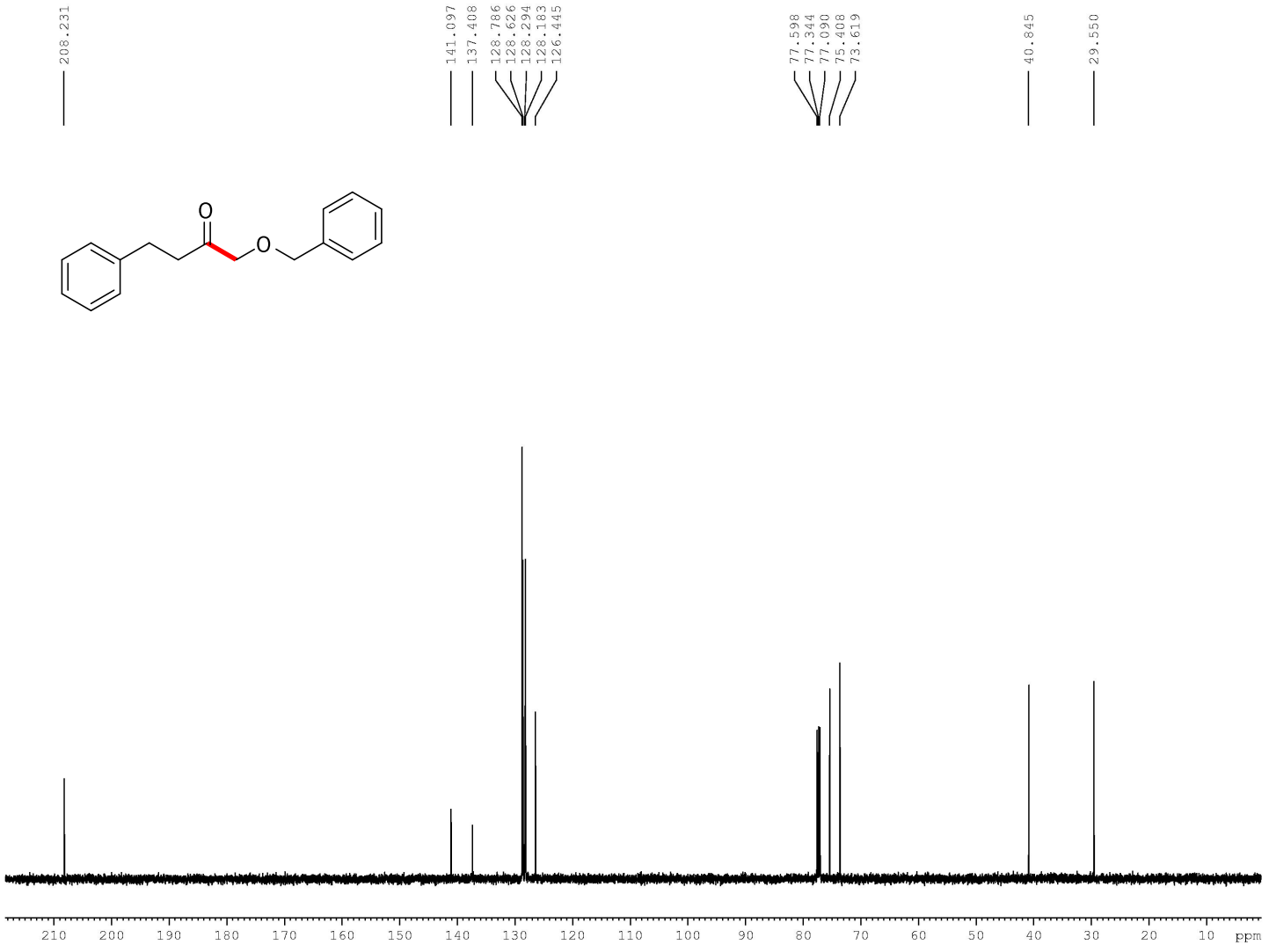
2-(Benzyloxy)-1-morpholinoethanone (3j). The title compound was obtained as a liquid in 77% yield (0.5 mmol scale, 42.3 mg). ^1H NMR (500 MHz, $CDCl_3$): 7.37-7.33 (m, 4H), 7.32-7.29 (m, 1H), 4.59 (s, 2H), 4.17 (s, 2H), 3.68-3.66 (m, 2H), 3.64-3.59 (m, 4H), 3.50-3.48 (m, 2H); ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 168.1, 137.4, 128.8, 128.4, 128.3, 73.6, 69.7, 67.2, 67.0, 45.9, 42.4; FT-IR (neat): 2900, 2857, 1689, 1644, 1453, 1438, 1272, 1111, 1026, 844, 737 cm^{-1}; HRMS (ES+) m/z calcd. for $C_{13}H_{17}NO_3Na$ $[M+Na]^+$ 258.1106, found 258.1115.

References:

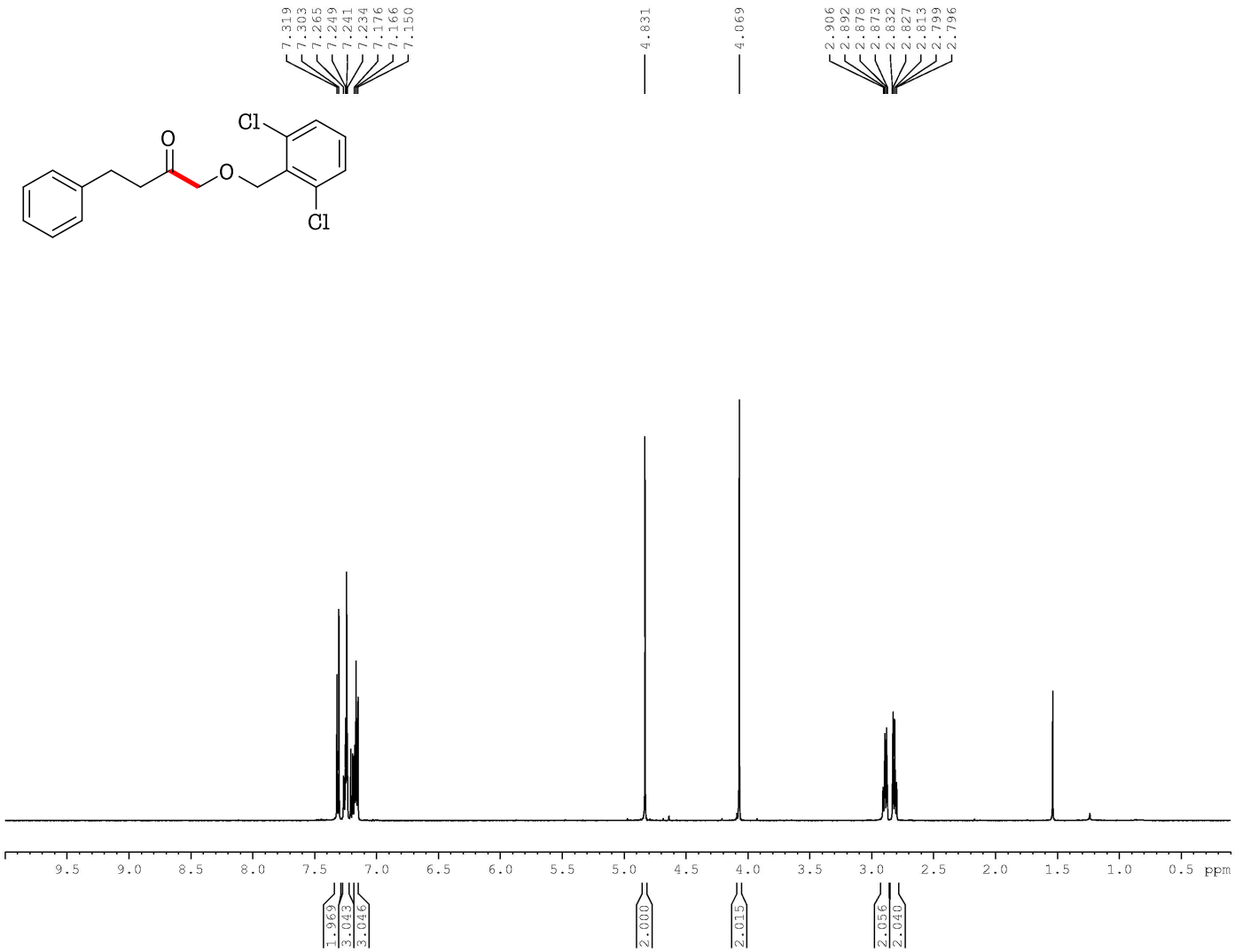
1) Molander, G. A.; Canturk, B. J. *Org. Lett.* **2008**, *10*, 2135.
2) Tellis, J. C.; Primer, D. N.; Molander, G. A. *Science* **2014**, *345*, 433



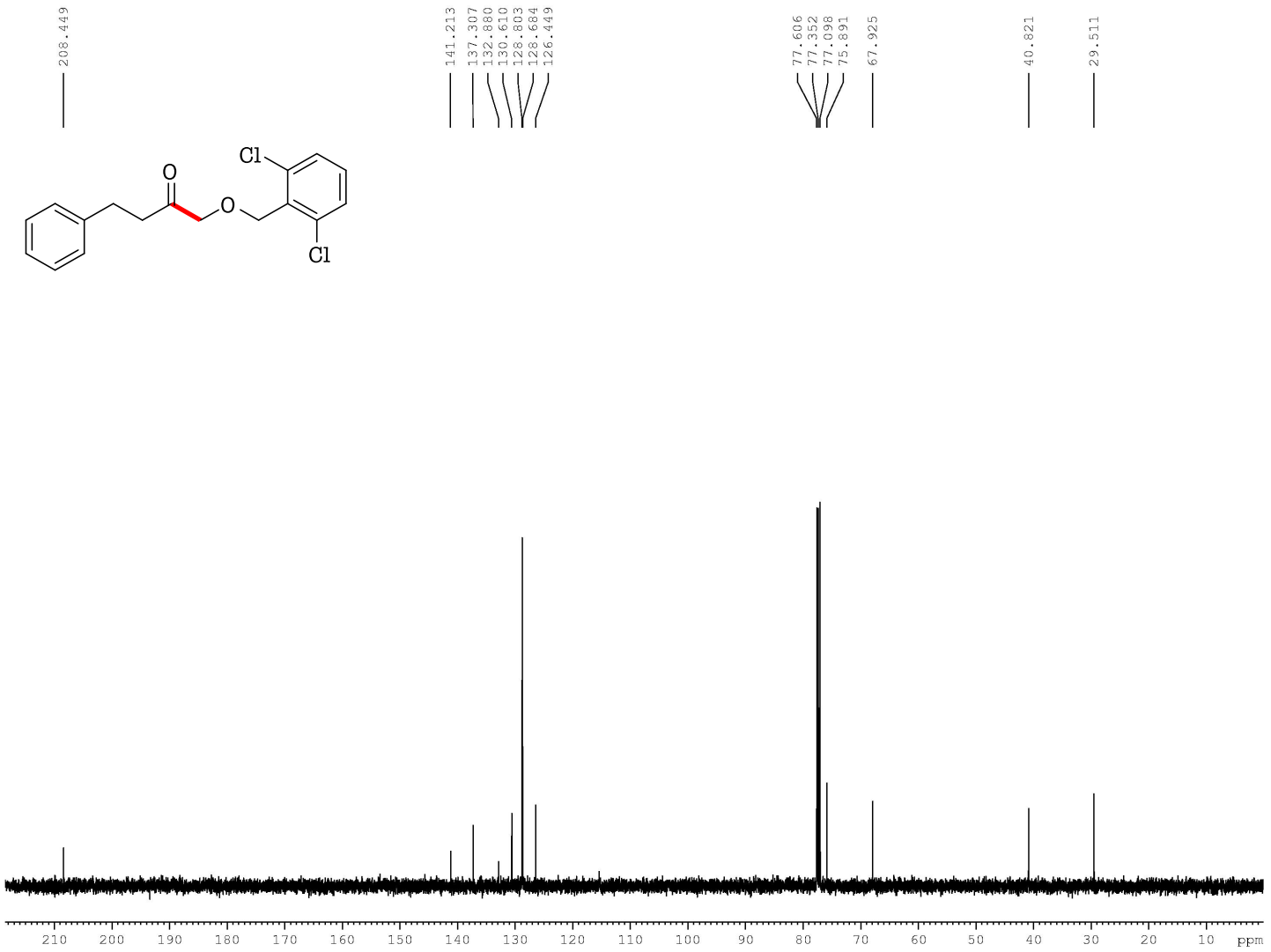
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(Benzyloxy)-4-phenylbutan-2-one (1a)



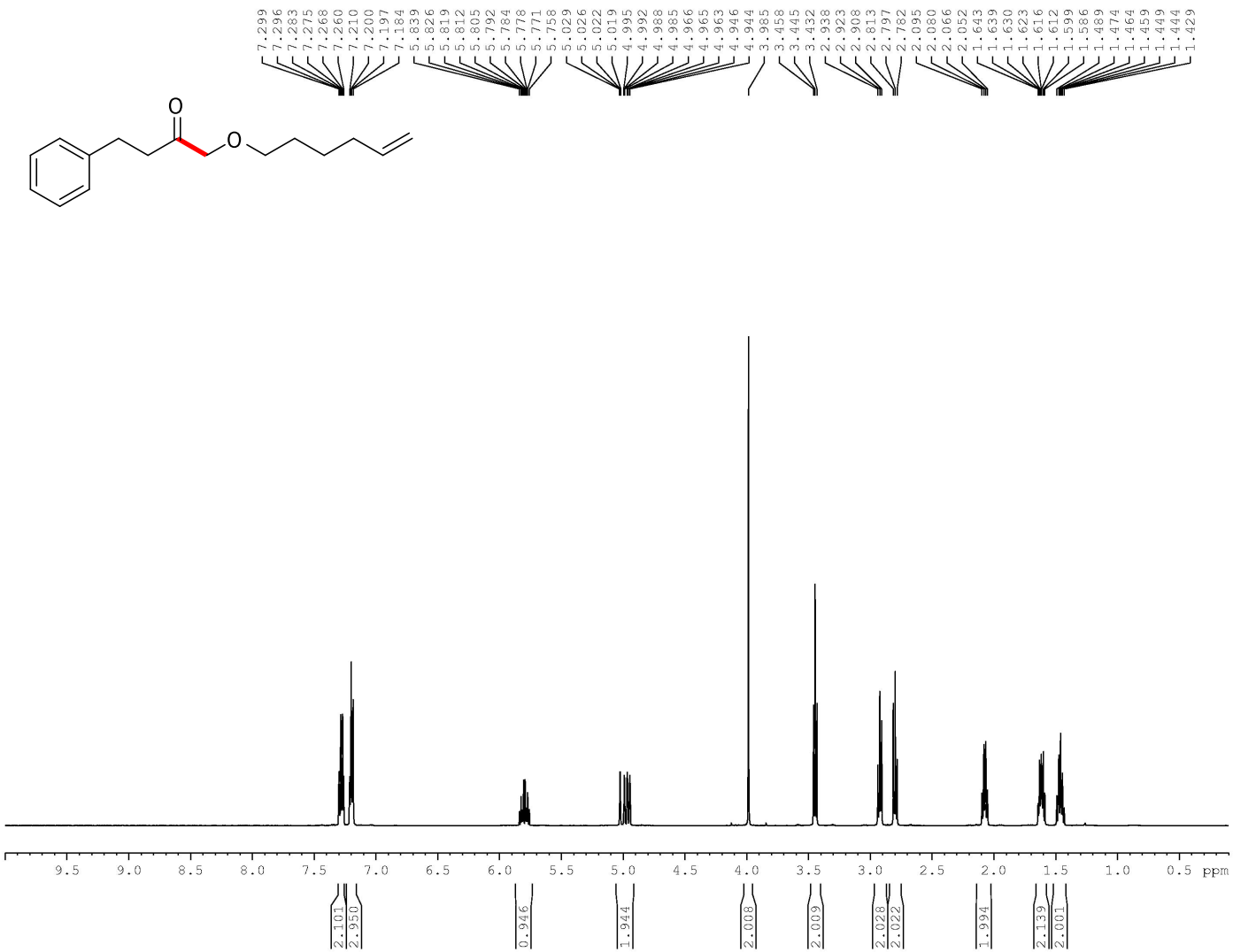
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(Benzyloxy)-4-phenylbutan-2-one (1a)



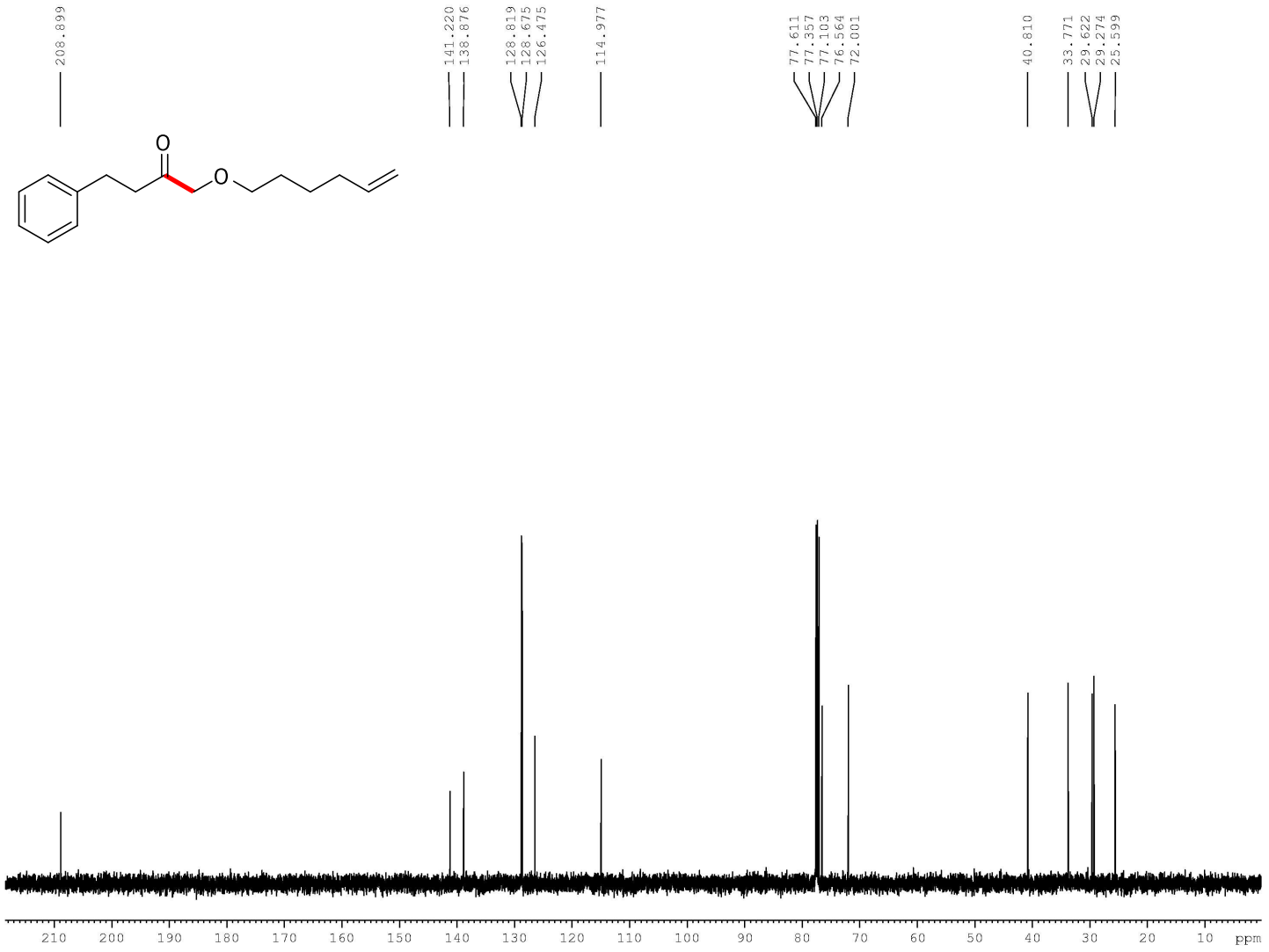
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(2,6-Dichlorobenzyloxy)-4-phenylbutan-2-one (1b)



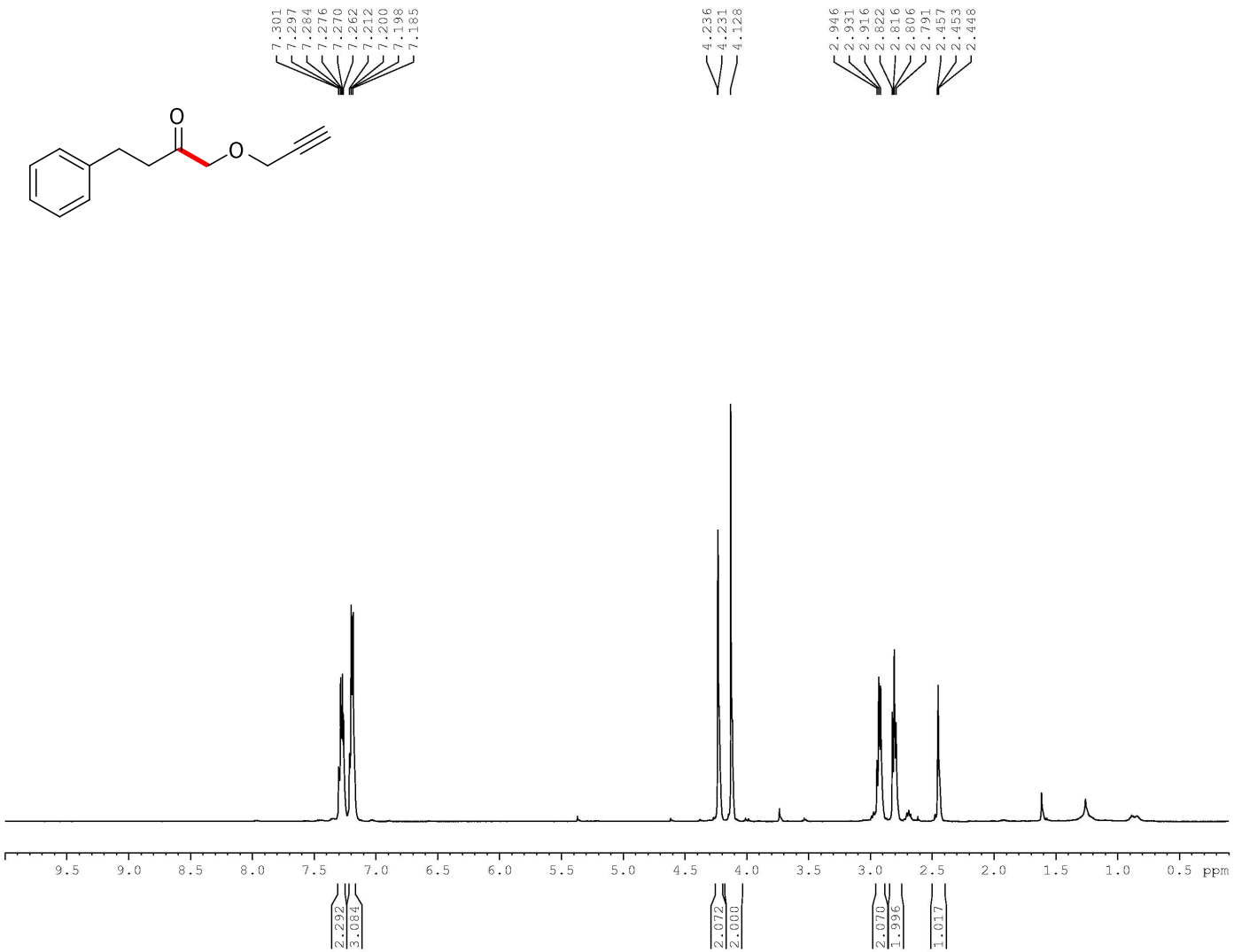
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(2,6-Dichlorobenzyloxy)-4-phenylbutan-2-one (1b)



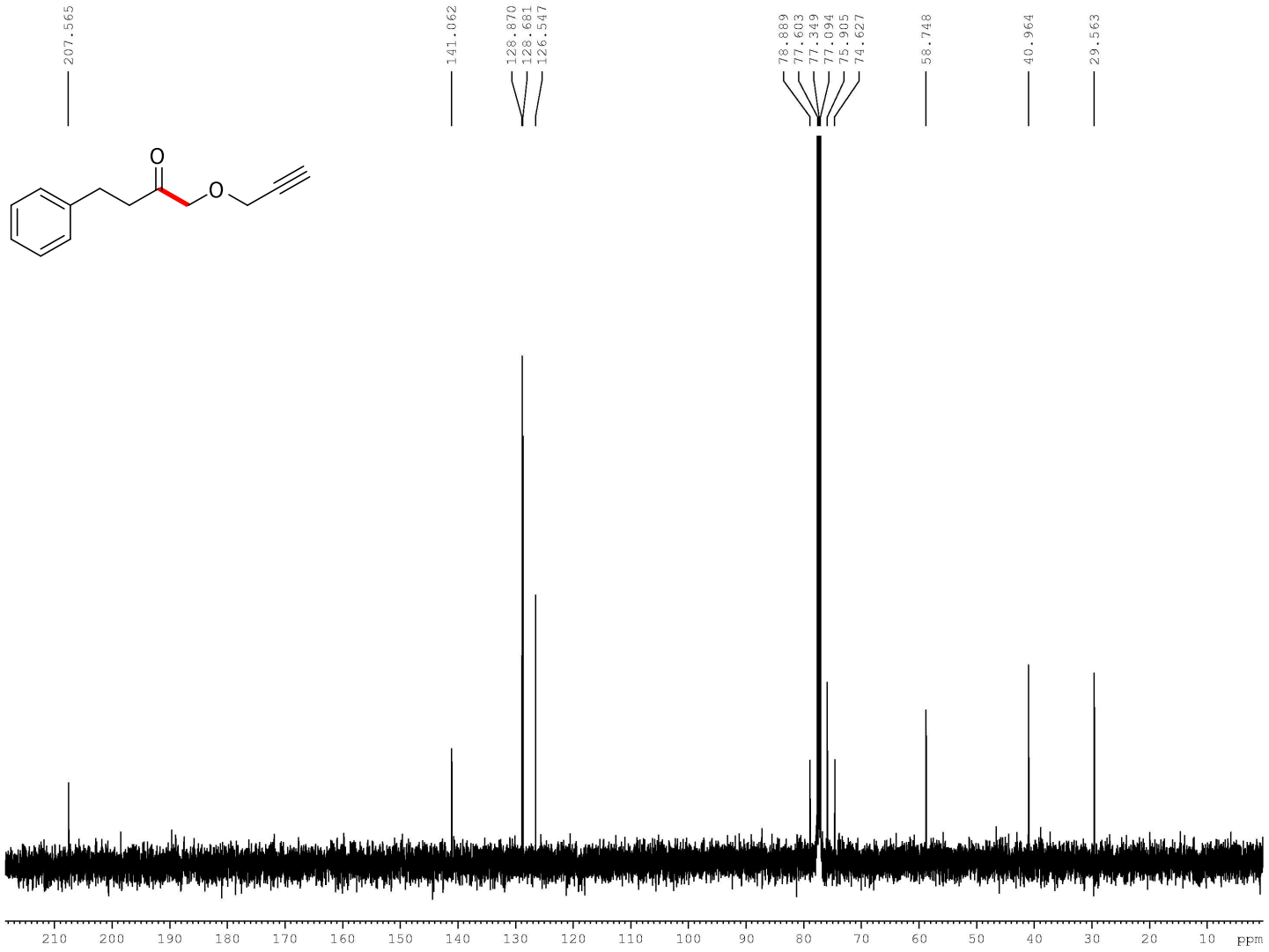
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(Hex-5-enyloxy)-4-phenylbutan-2-one (1c)



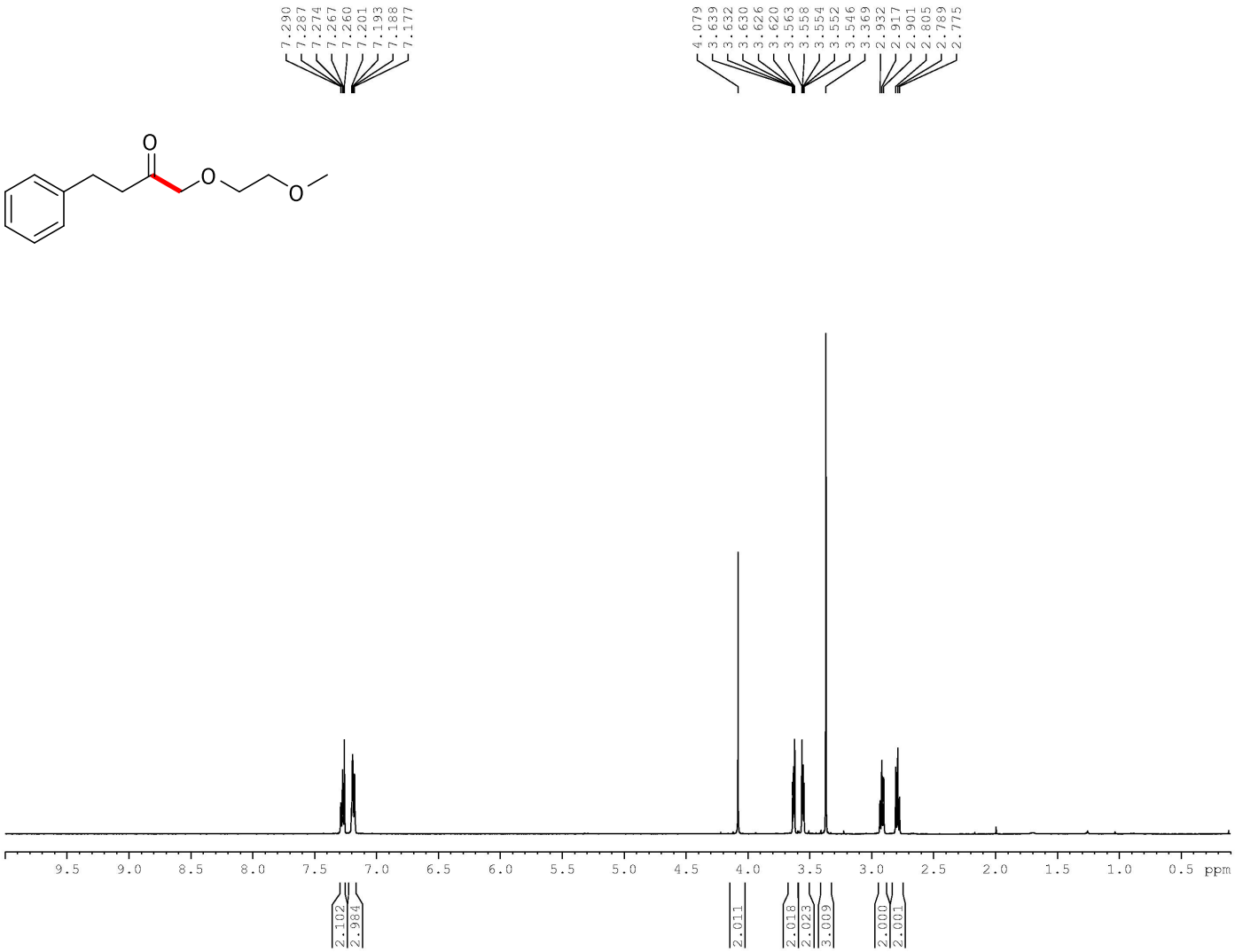
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(Hex-5-enyloxy)-4-phenylbutan-2-one (1c)



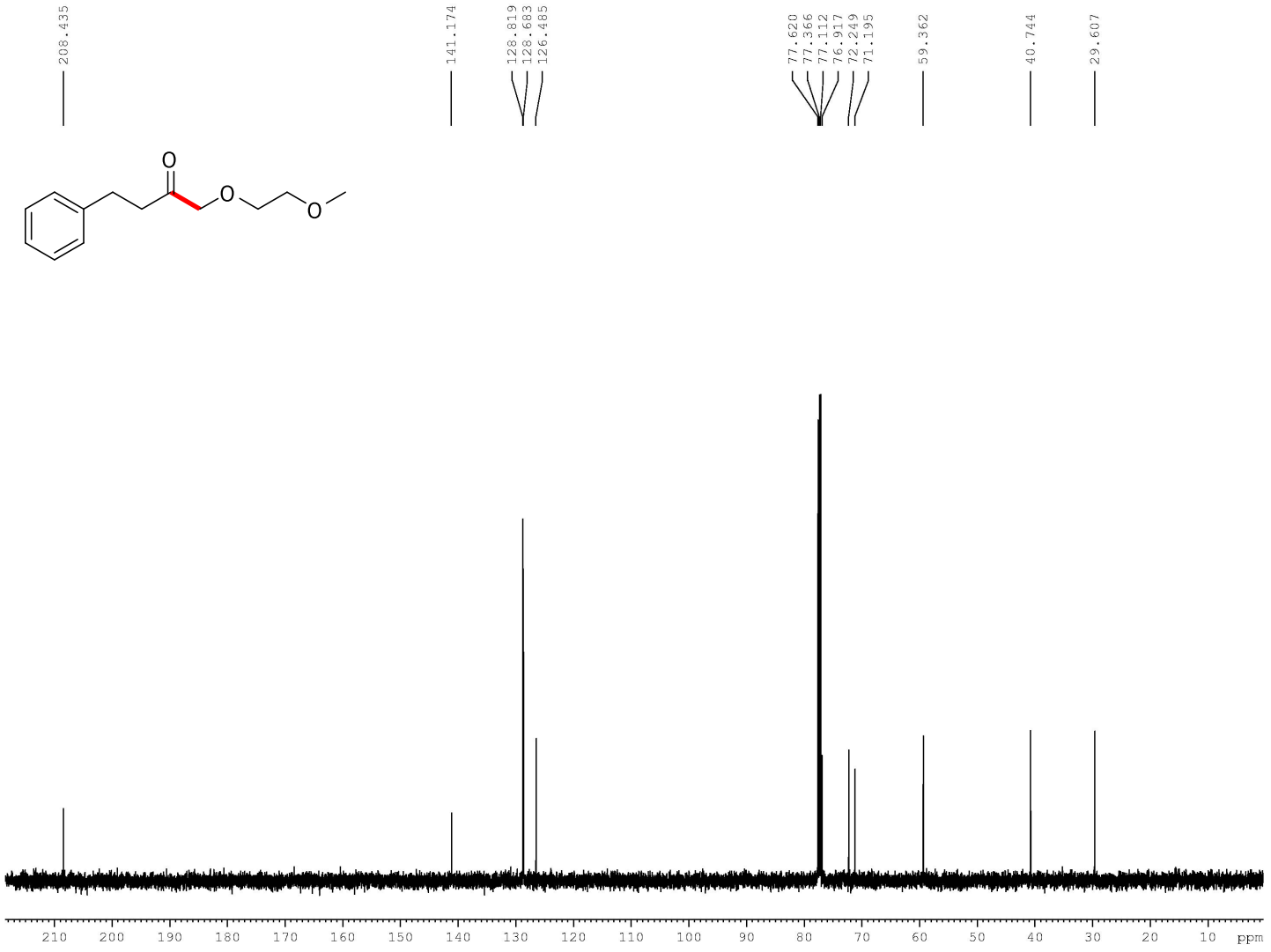
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 4-Phenyl-1-(prop-2-ynyloxy)butan-2-one (1d)



^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 4-Phenyl-1-(prop-2-ynyloxy)butan-2-one (1d)

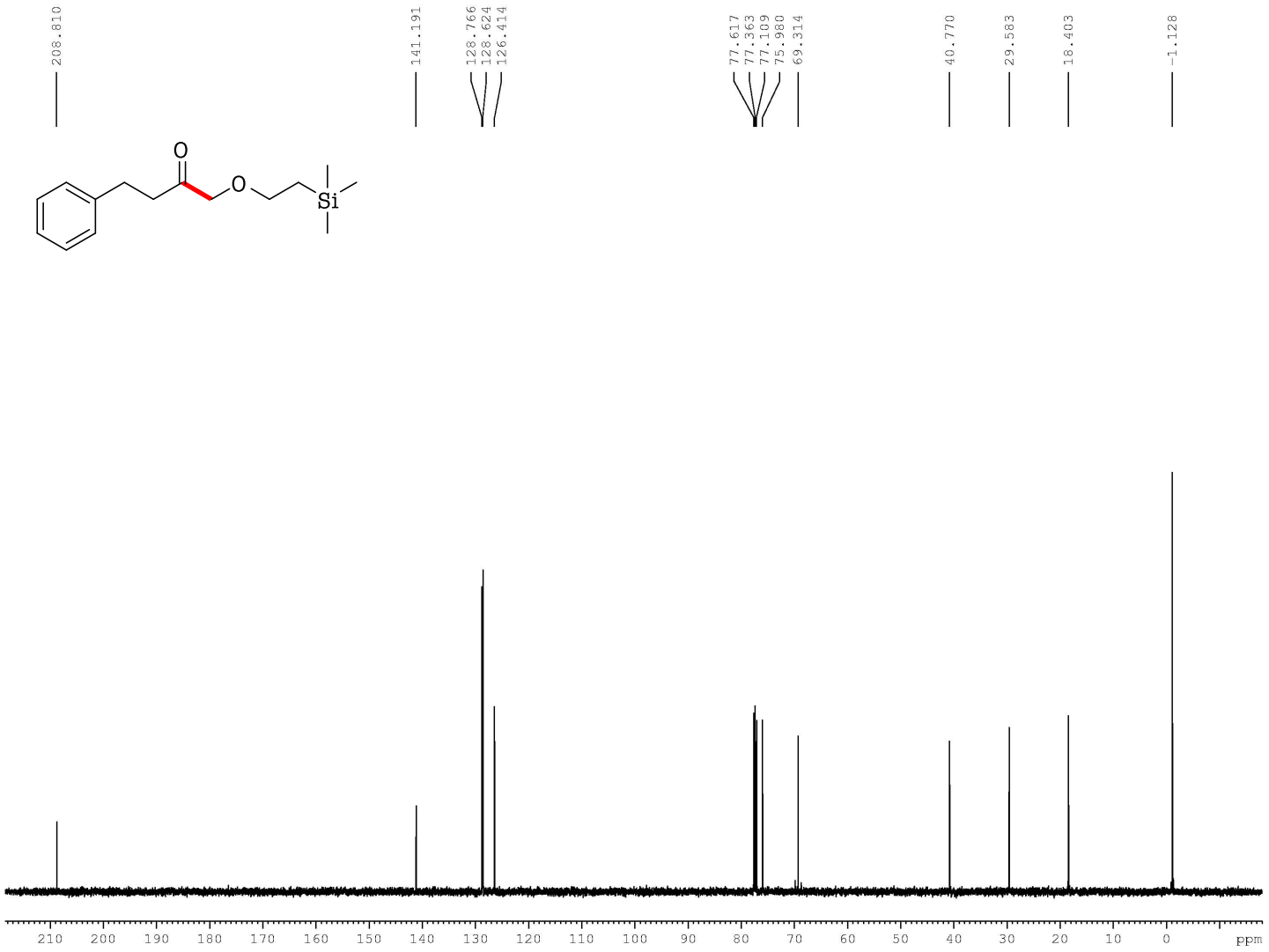


^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(2-Methoxyethoxy)-4-phenylbutan-2-one (1e)

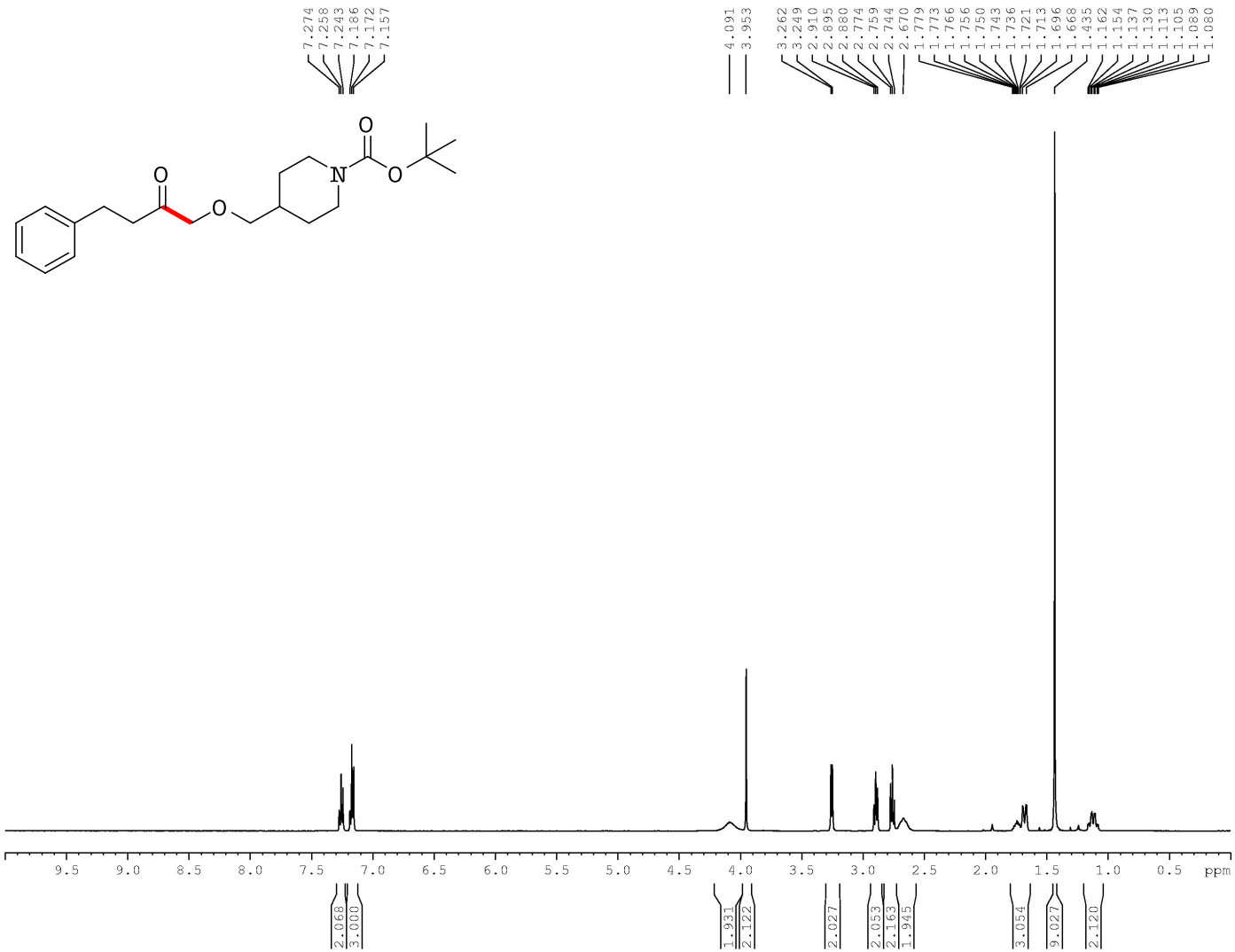


^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(2-Methoxyethoxy)-4-phenylbutan-2-one (1e)

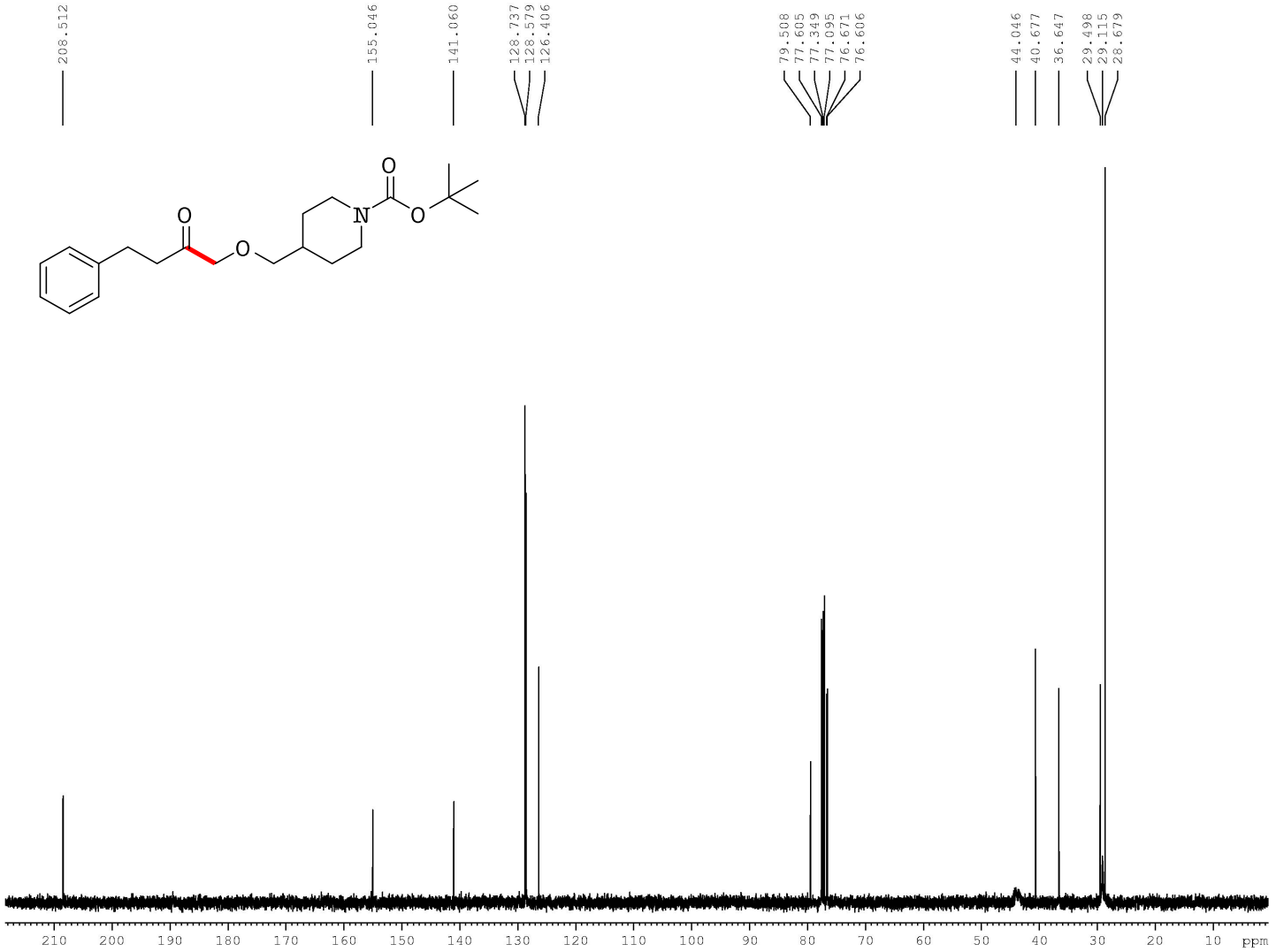
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 4-Phenyl-1-(2-(trimethylsilyl)ethoxy)butan-2-one (1f)



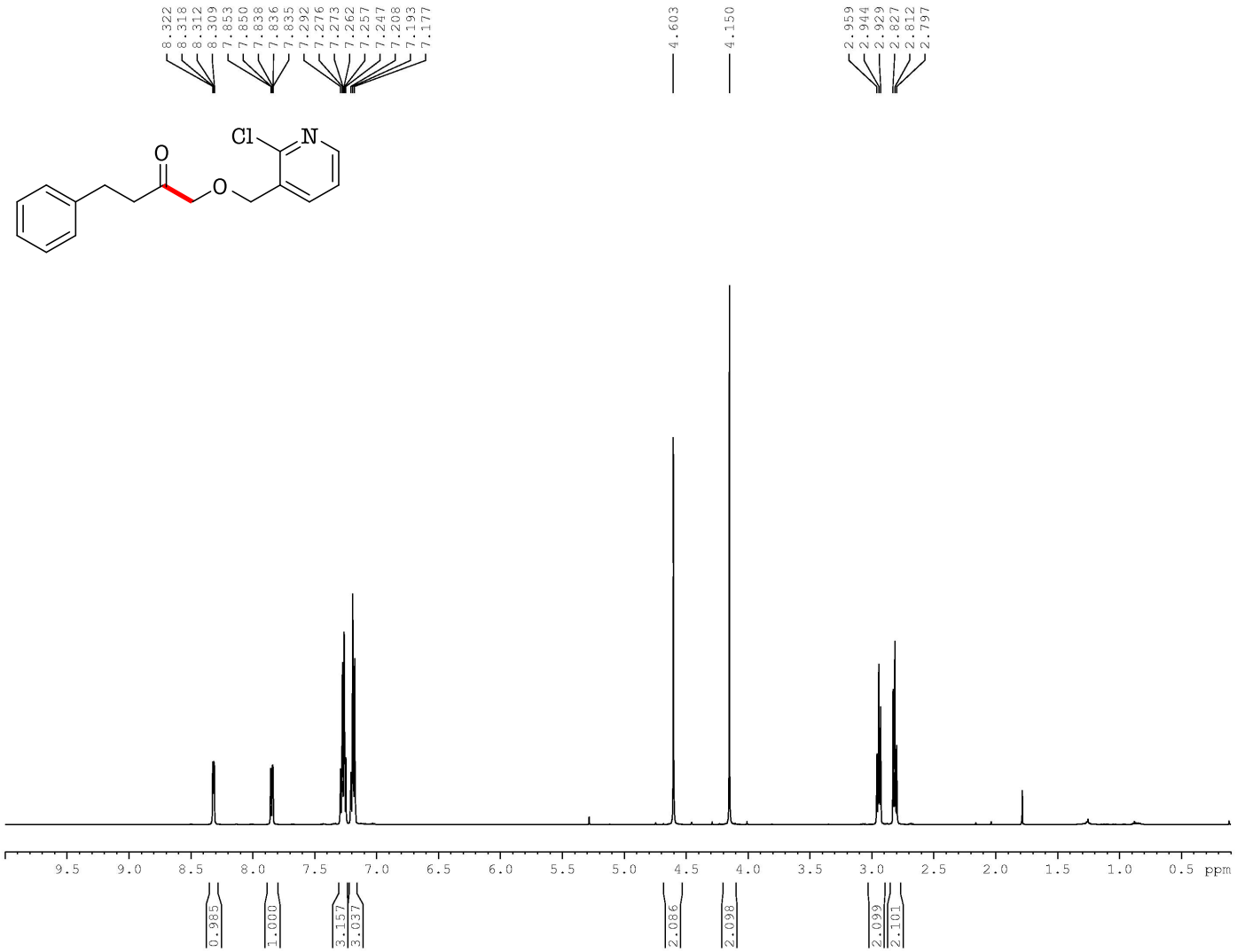
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 4-Phenyl-1-(2-(trimethylsilyl)ethoxy)butan-2-one (1f)



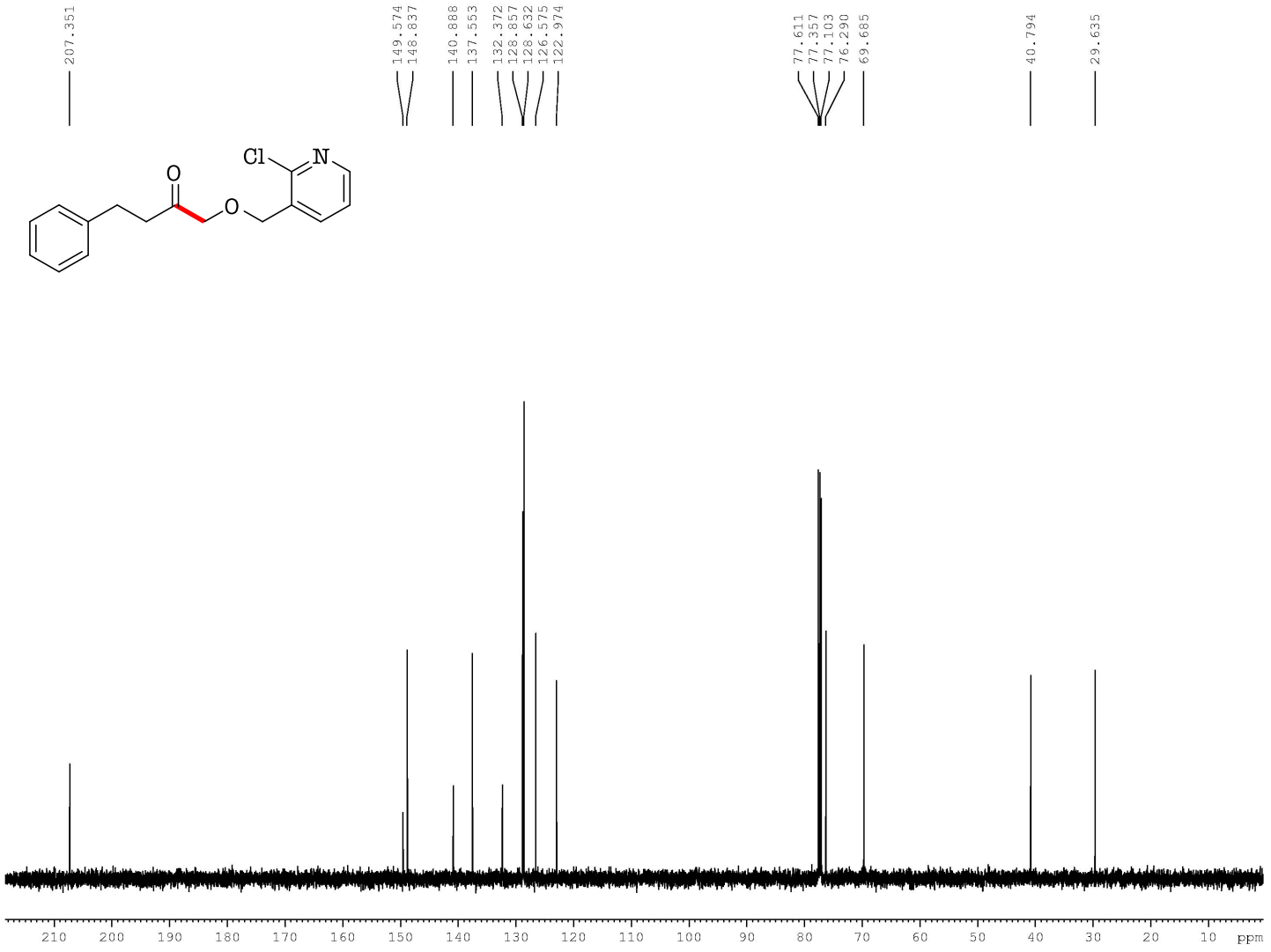
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of *tert*-Butyl 4-((2-oxo-4-phenylbutoxy)methyl)piperidine-1-carboxylate (1g)



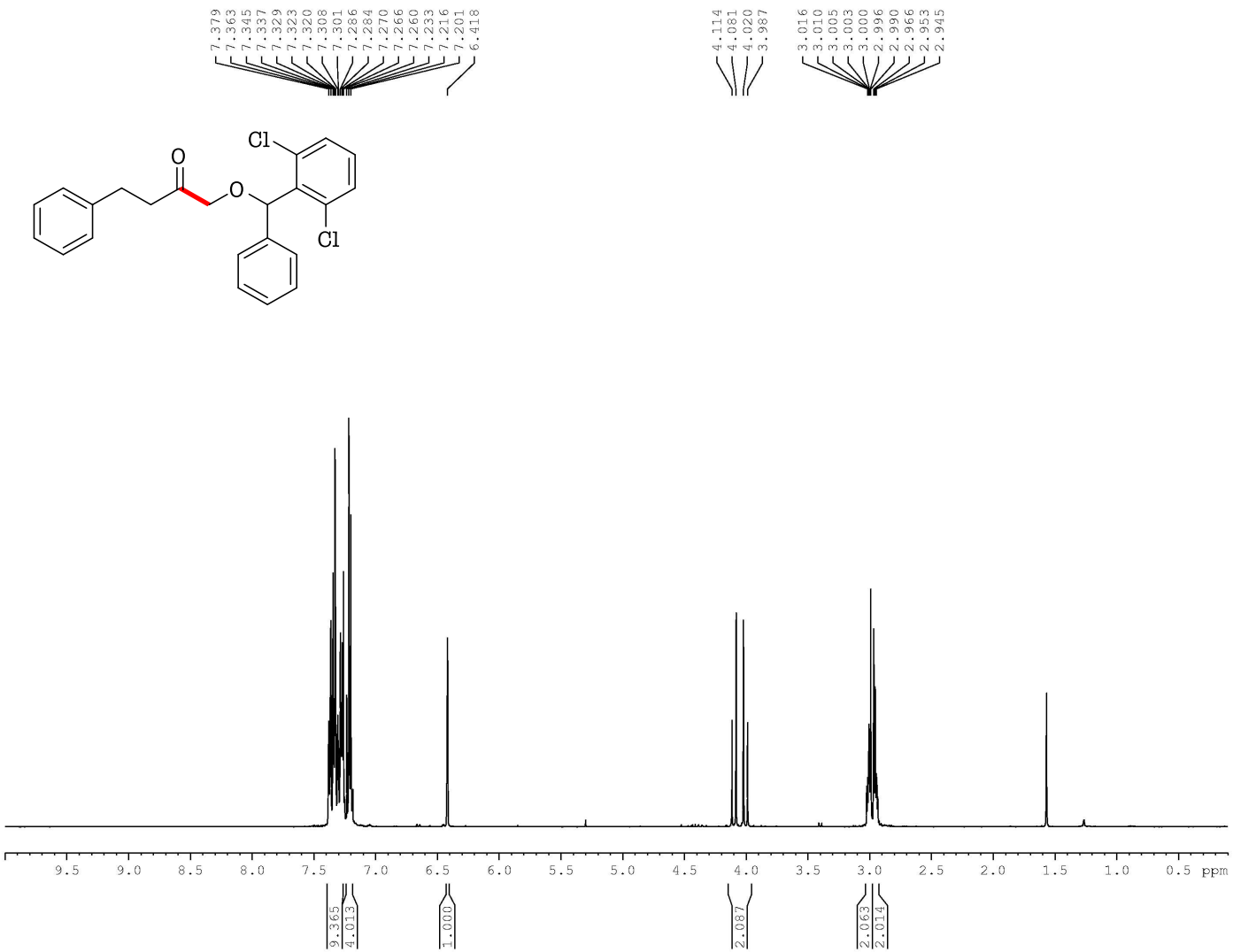
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of *tert*-Butyl 4-((2-oxo-4-phenylbutoxy)methyl)piperidine-1-carboxylate (1g)



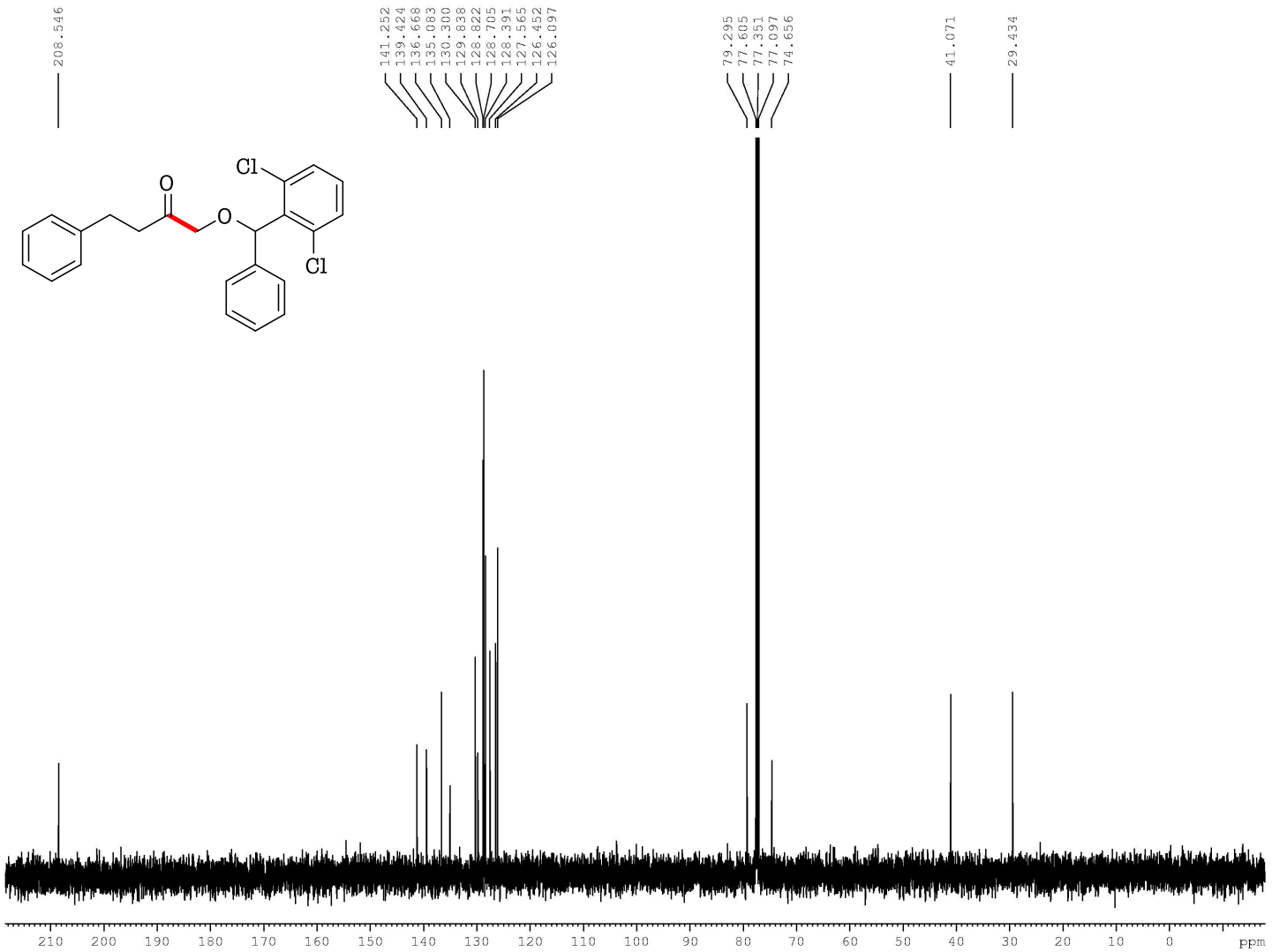
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-((2-Chloropyridin-3-yl)methoxy)-4-phenylbutan-2-one (1h)



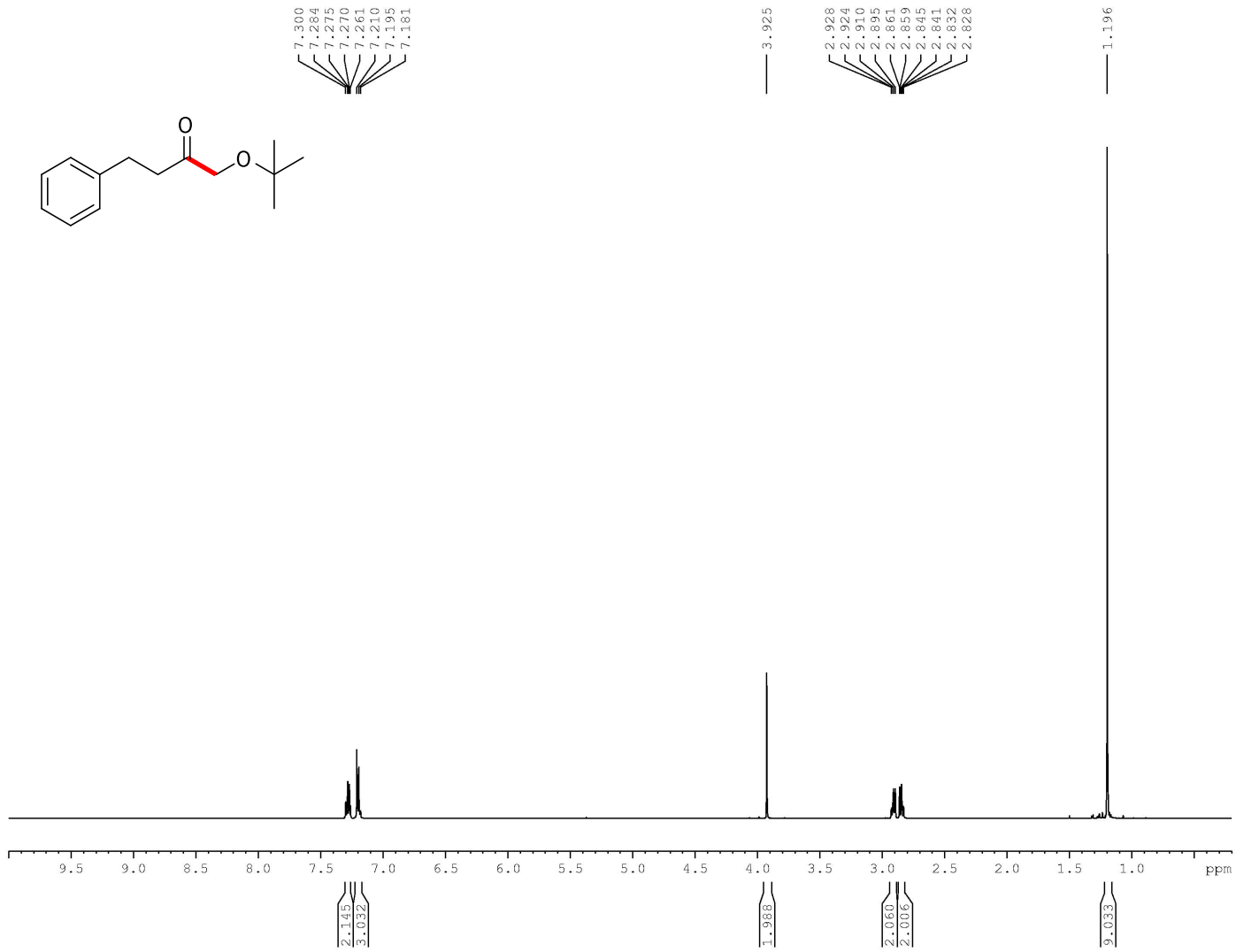
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-((2-Chloropyridin-3-yl)methoxy)-4-phenylbutan-2-one (1h)



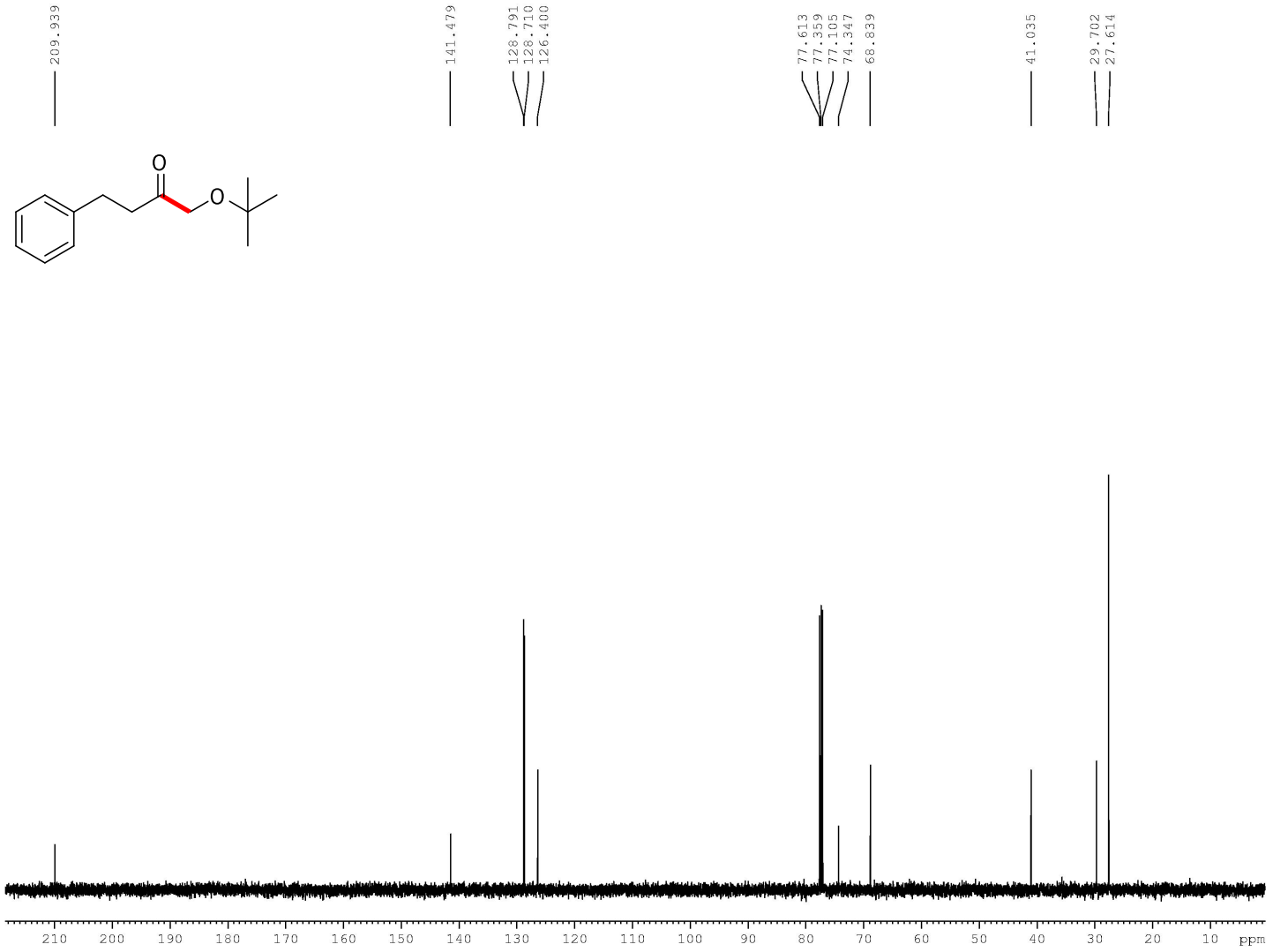
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-((2,6-Dichlorophenyl)(phenyl)methoxy)-4-phenylbutan-2-one (1i)



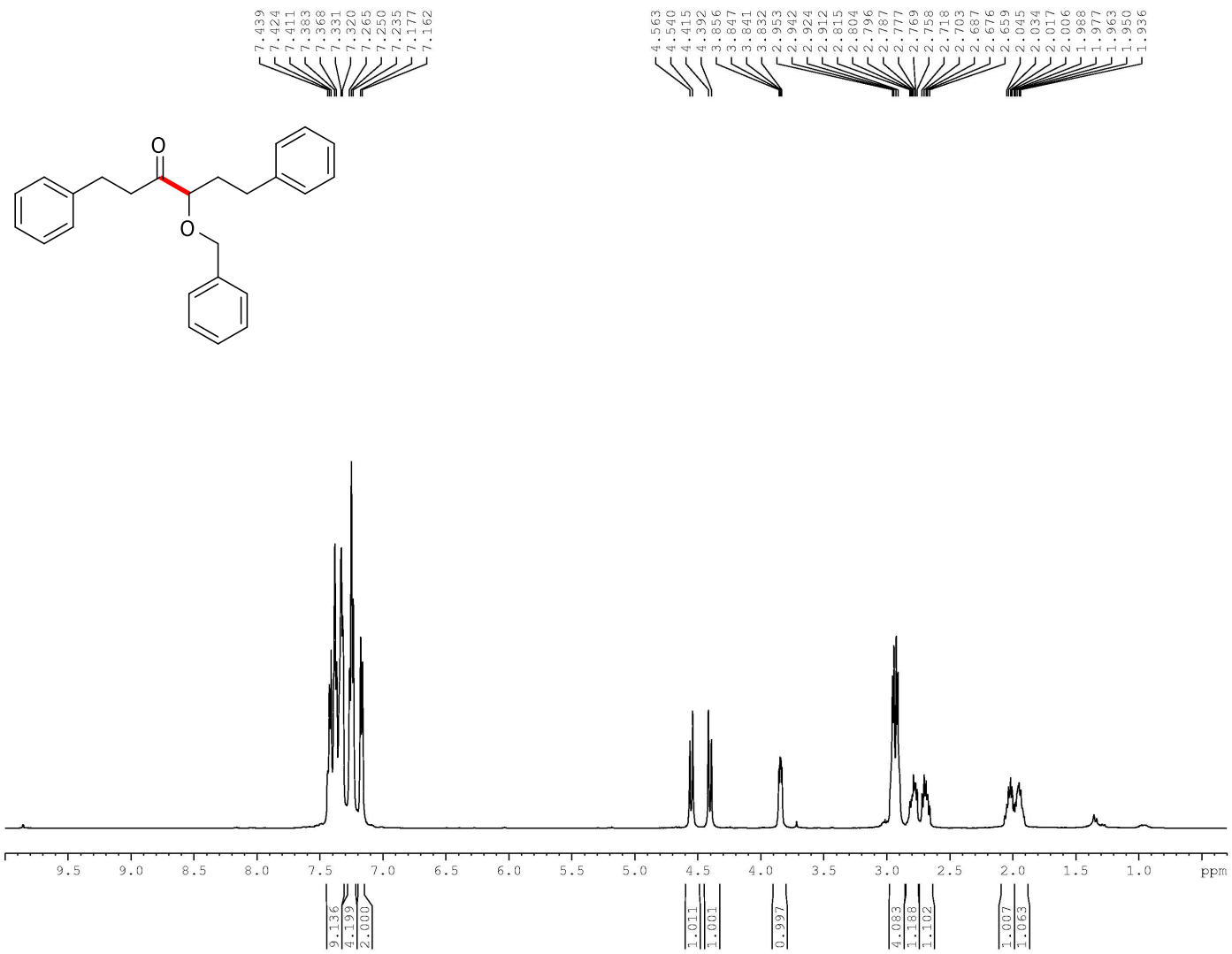
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-((2,6-Dichlorophenyl)(phenyl)methoxy)-4-phenylbutan-2-one (1i)



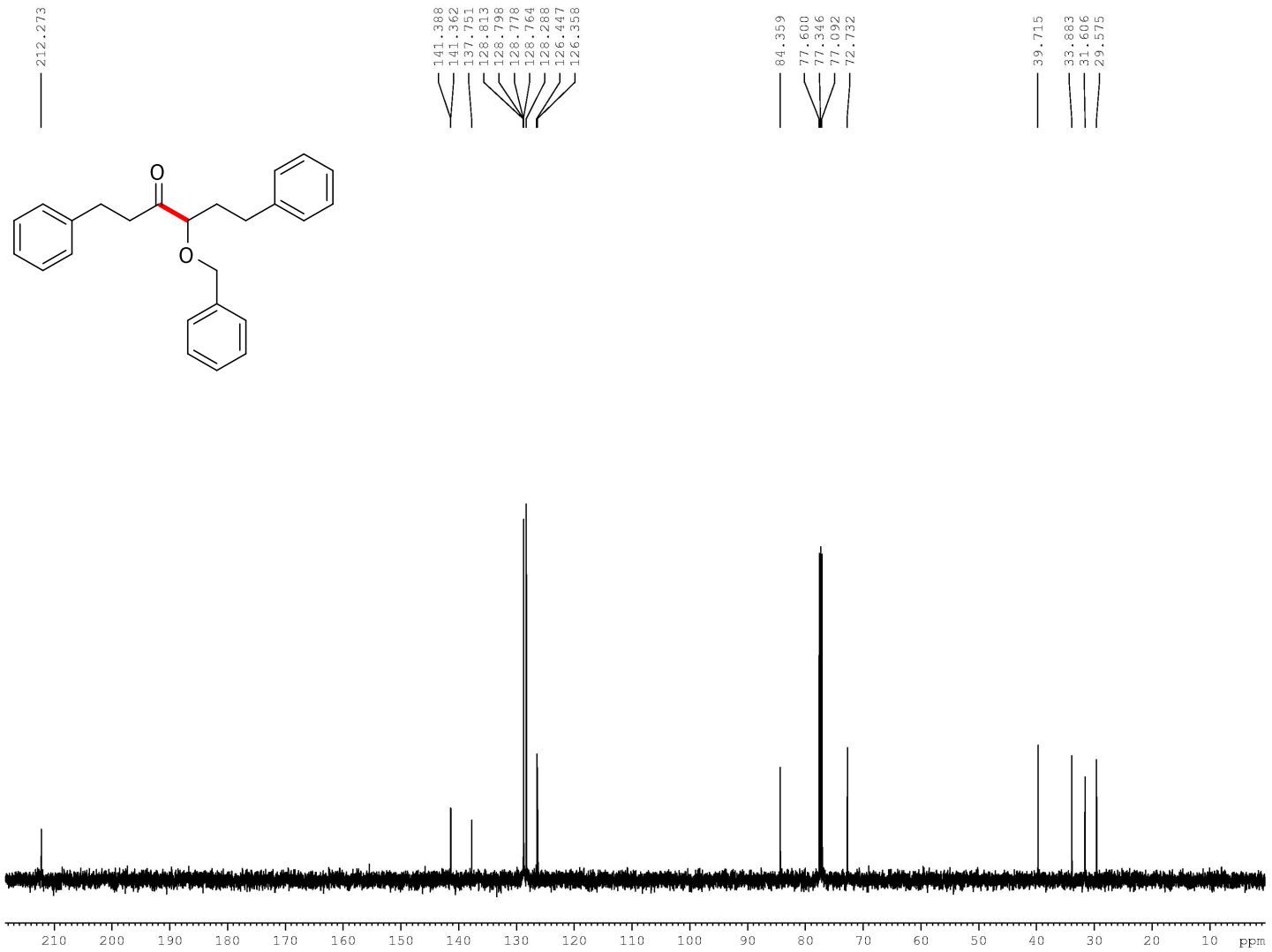
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(*tert*-Butoxy)-4-phenylbutan-2-one (1j)



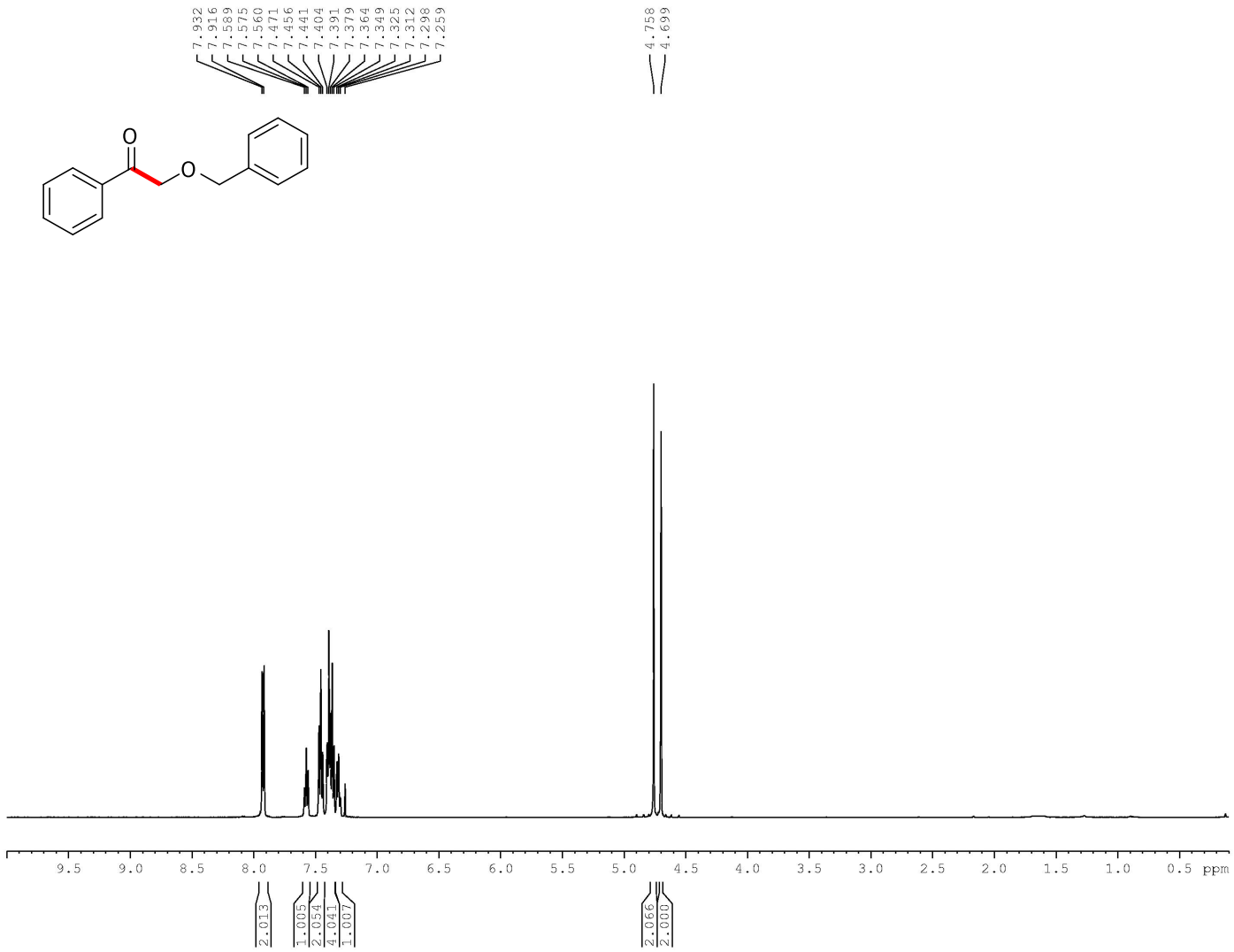
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(*tert*-Butoxy)-4-phenylbutan-2-one (1j)



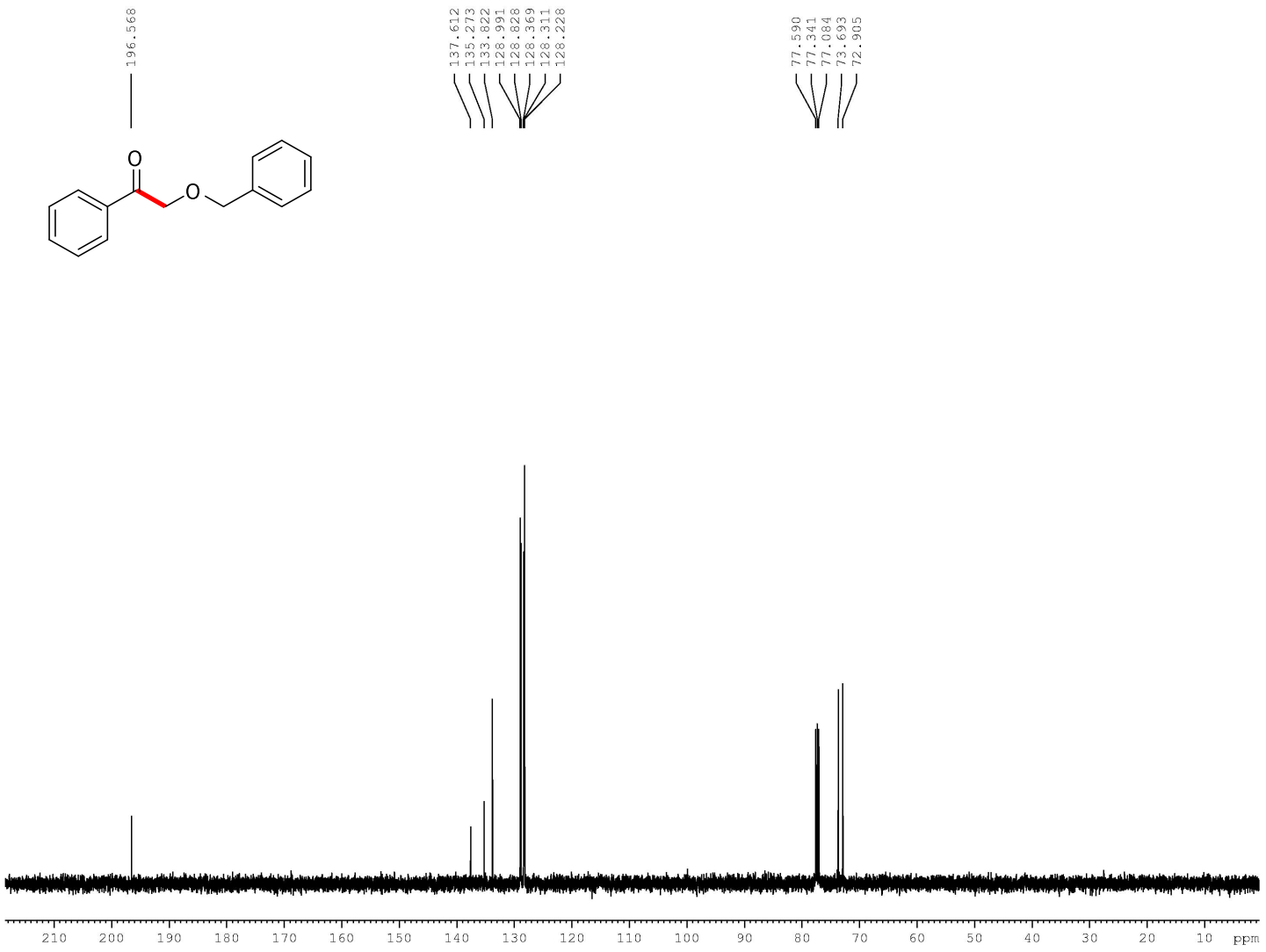
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 4-(Benzyloxy)-1,6-diphenylhexan-3-one (1k)



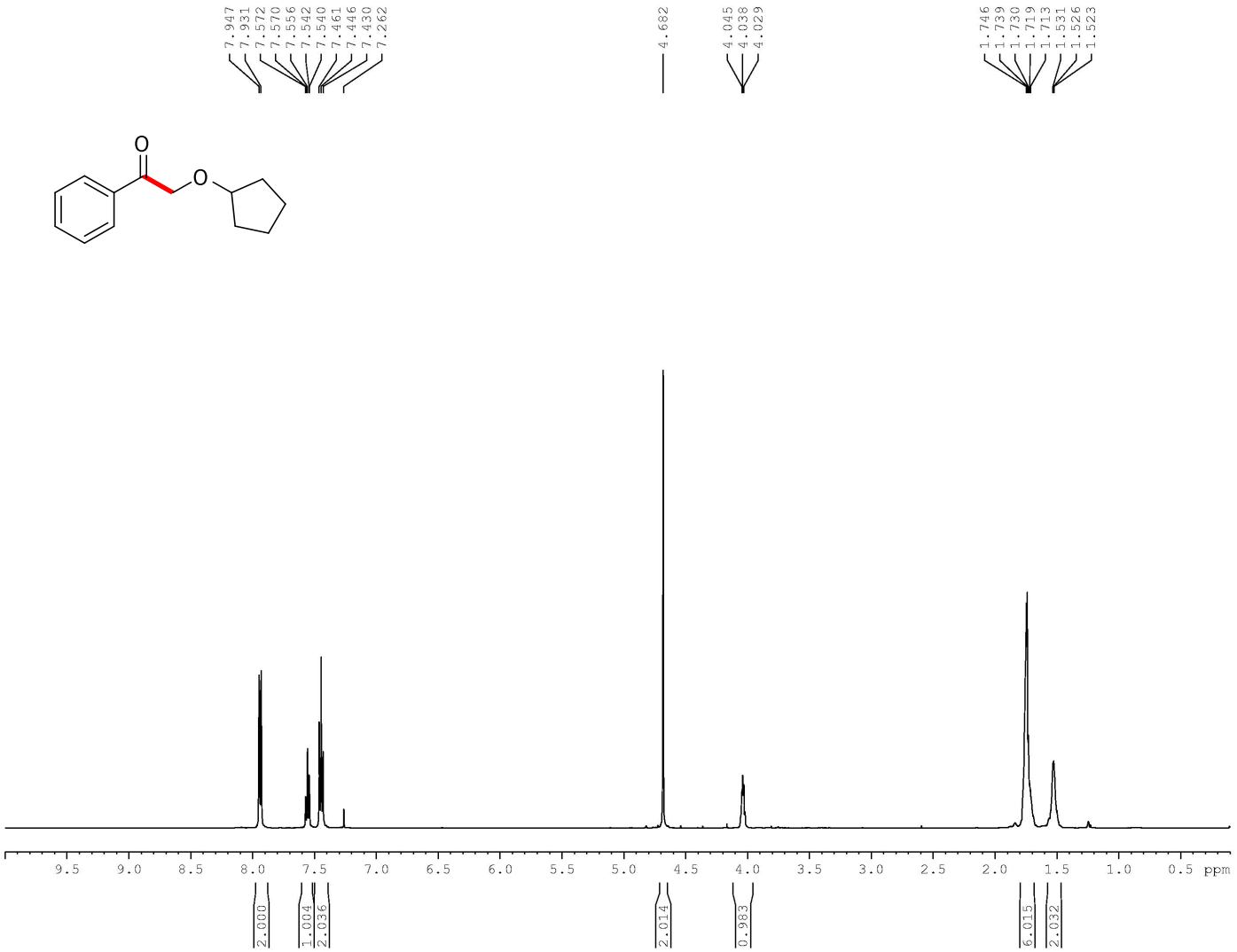
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 4-(Benzyloxy)-1,6-diphenylhexan-3-one (1k)



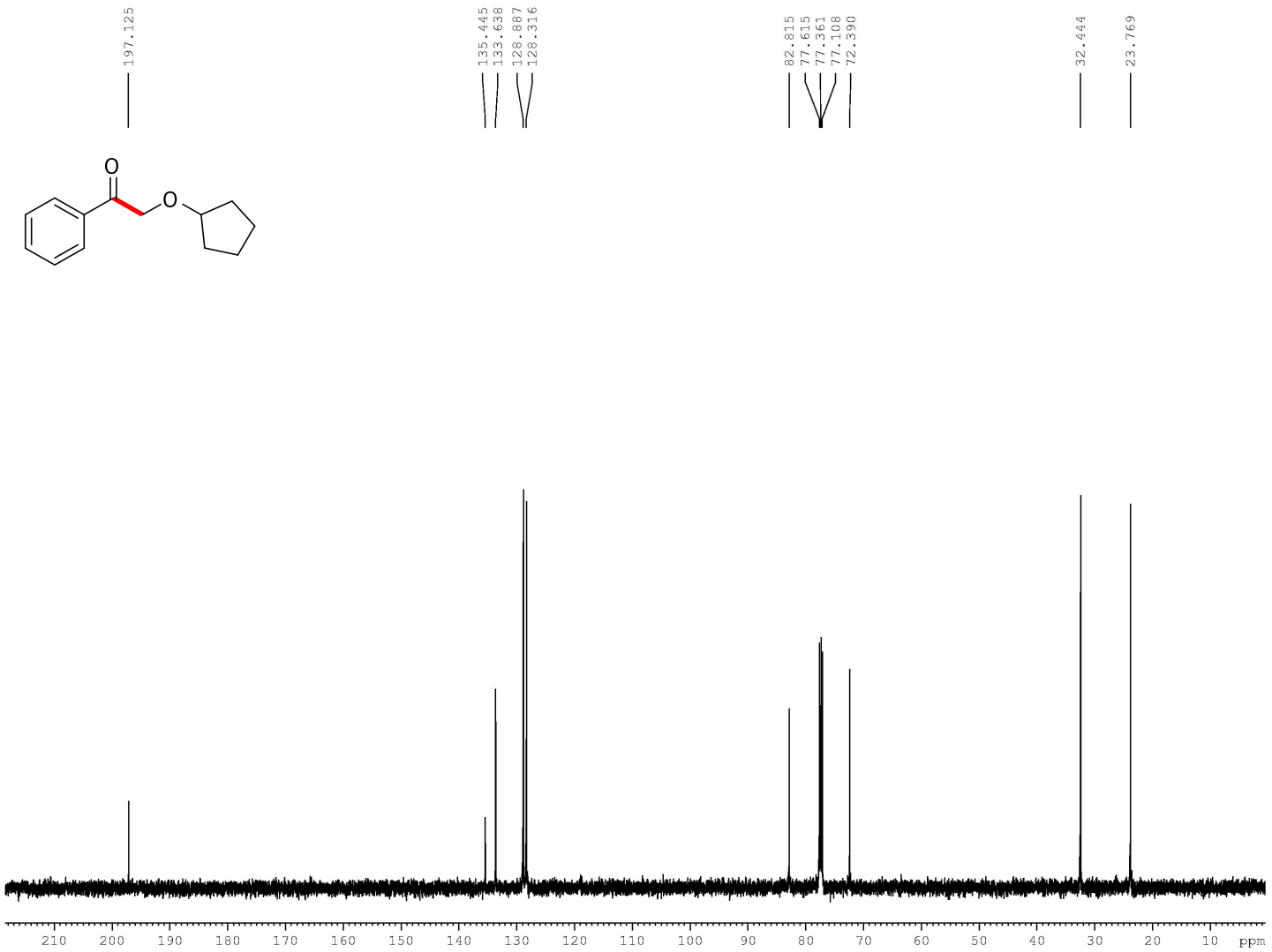
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-phenylethanone (2a)



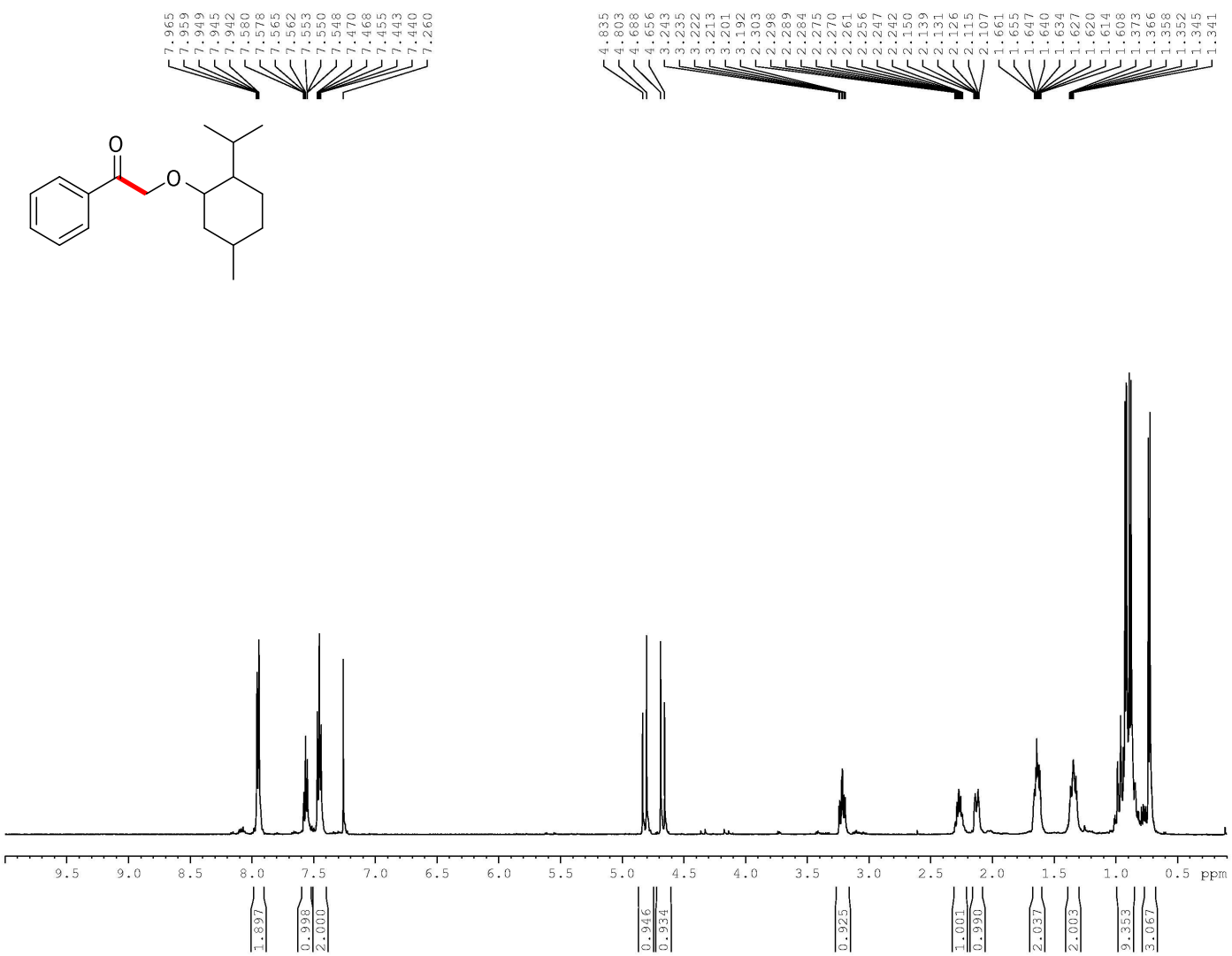
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-phenylethanone (2a)



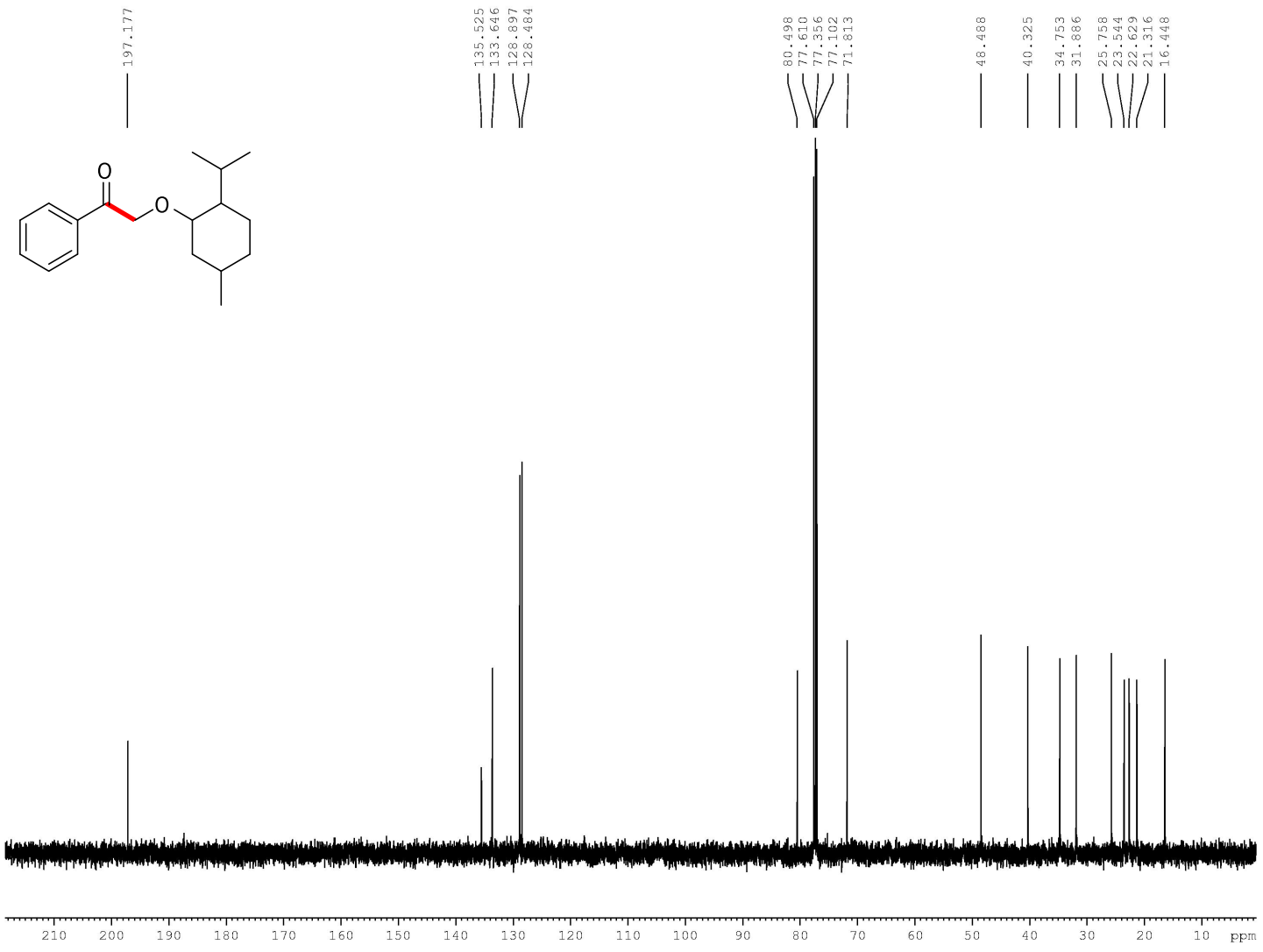
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Cyclopentyloxy)-1-phenylethanone (2b)



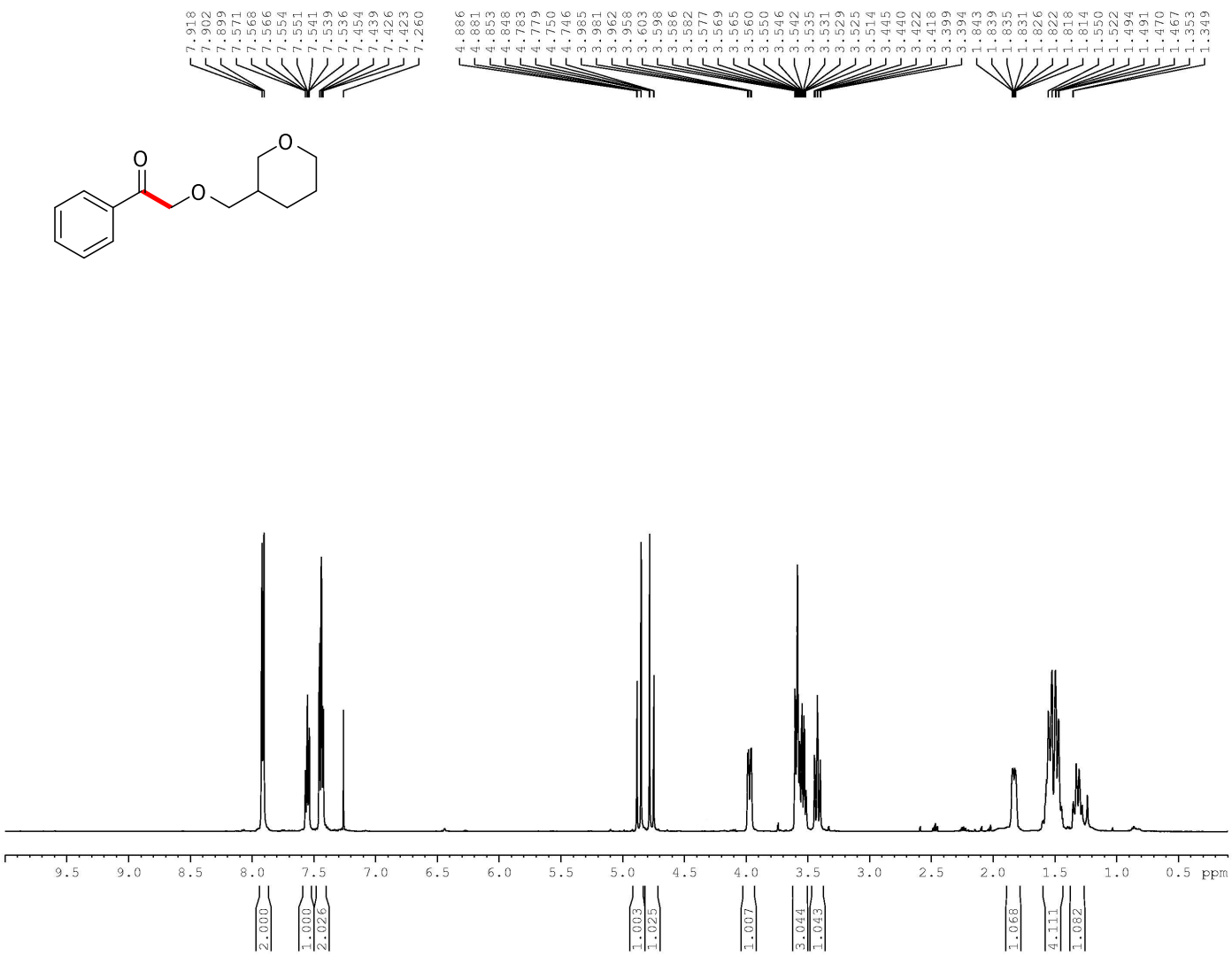
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Cyclopentyloxy)-1-phenylethanone (2b)



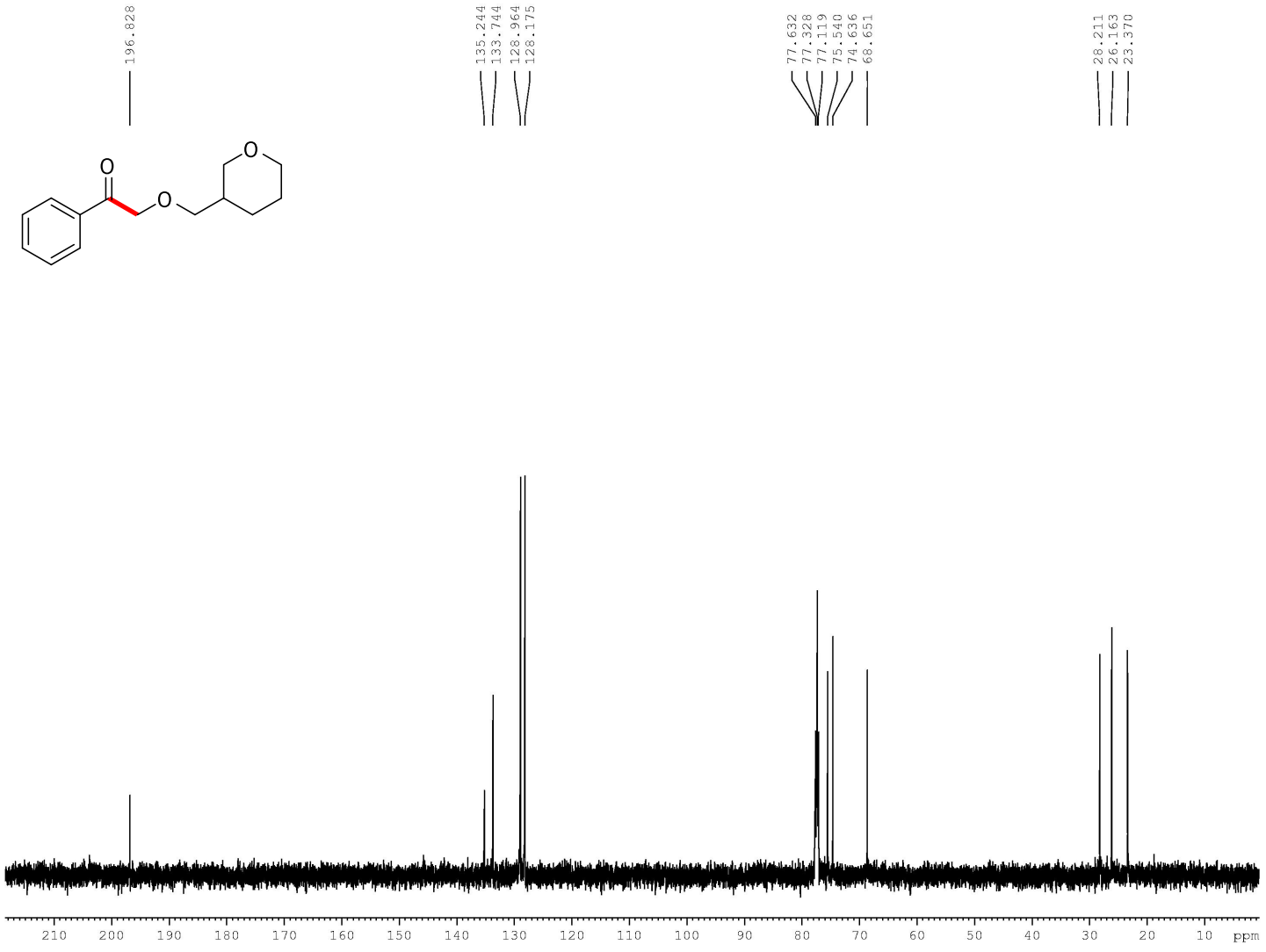
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(2-Isopropyl-5-methylcyclohexyloxy)-1-phenylethanone (2c)



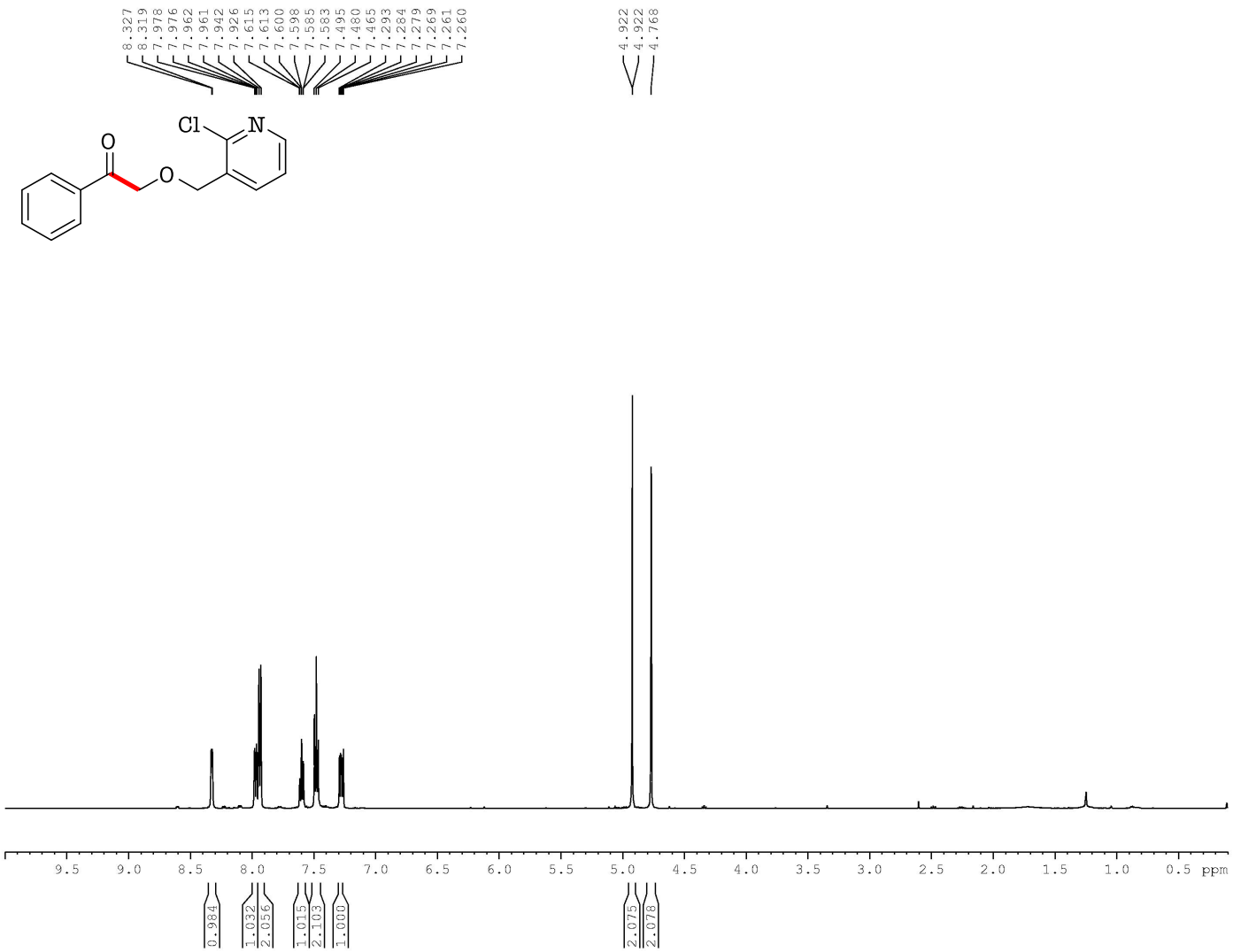
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(2-Isopropyl-5-methylcyclohexyloxy)-1-phenylethanone (2c)



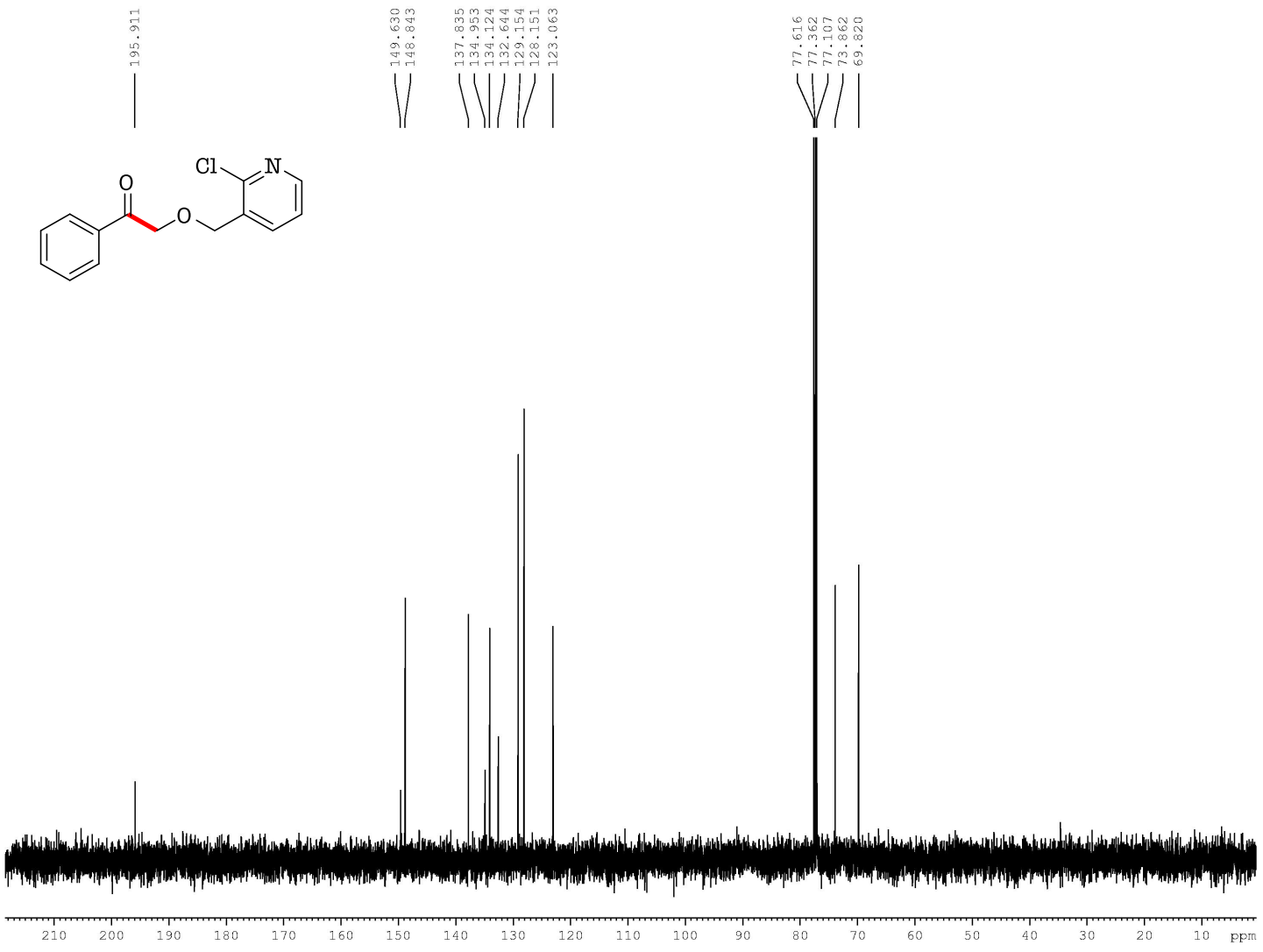
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-Phenyl-2-((tetrahydro-2*H*-pyran-3-yl)methoxy)ethanol (2d)



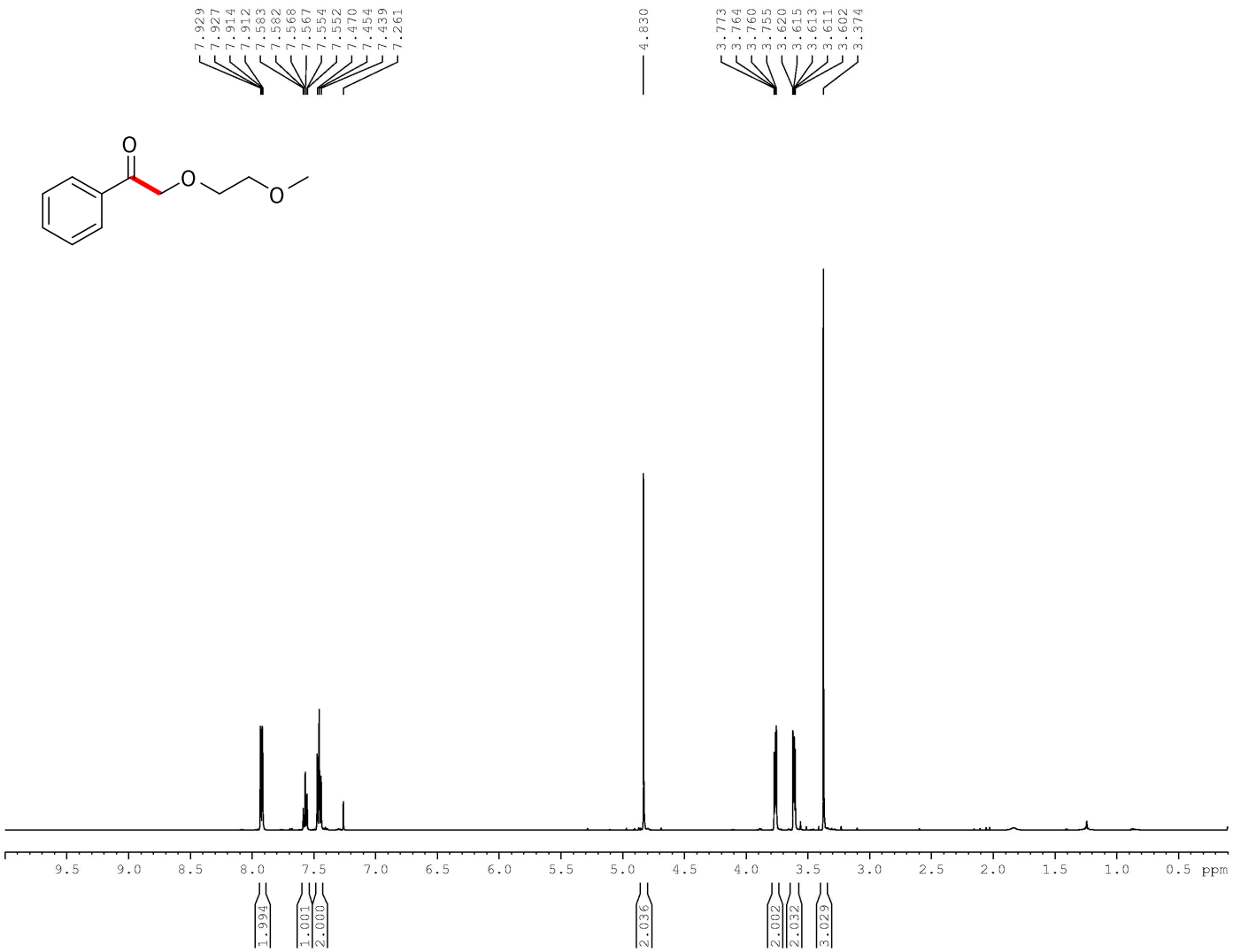
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-Phenyl-2-((tetrahydro-2*H*-pyran-3-yl)methoxy)ethanol (2d)



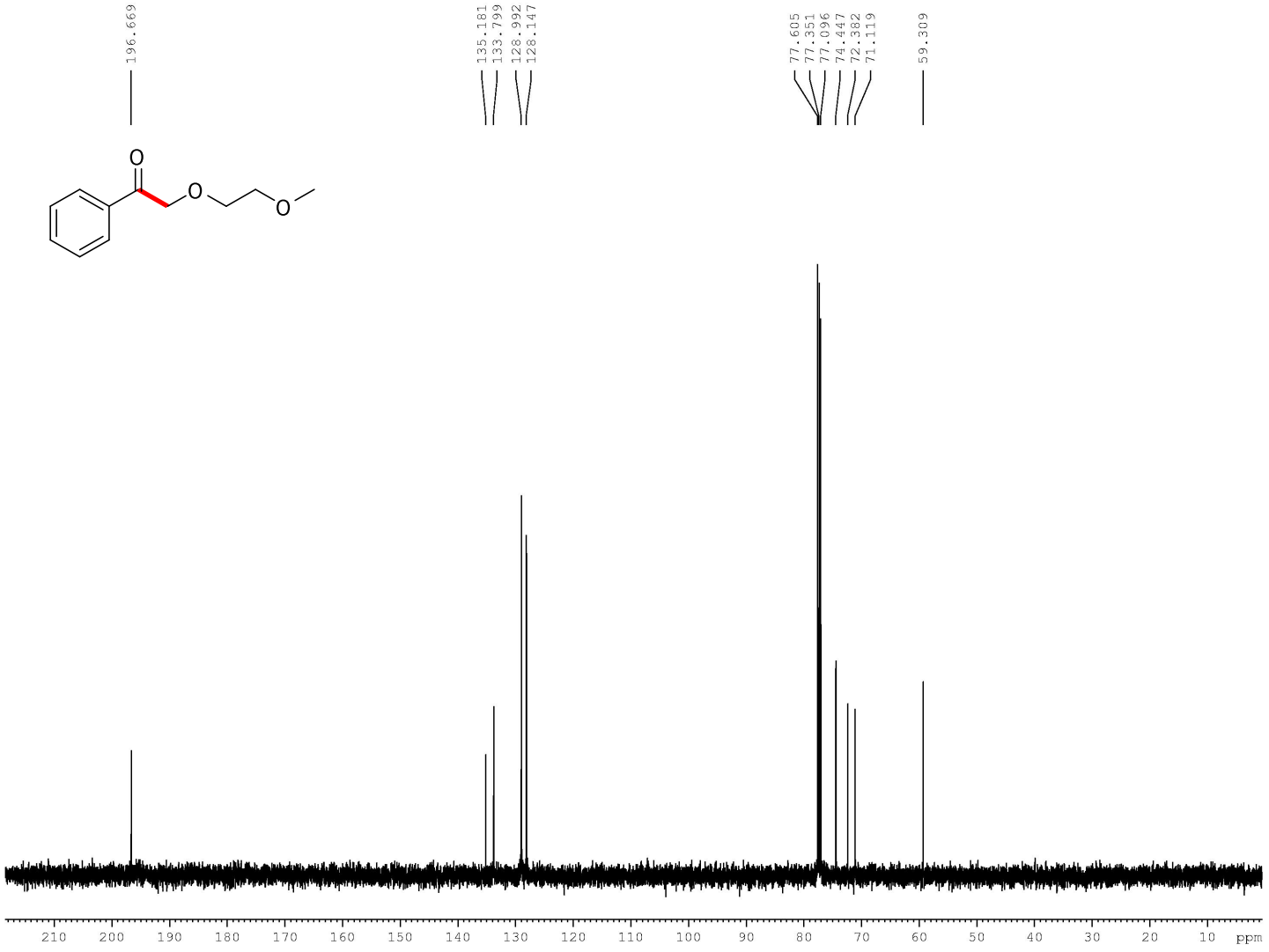
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-((2-Chloropyridin-3-yl)methoxy)-1-phenylethanone (2e)



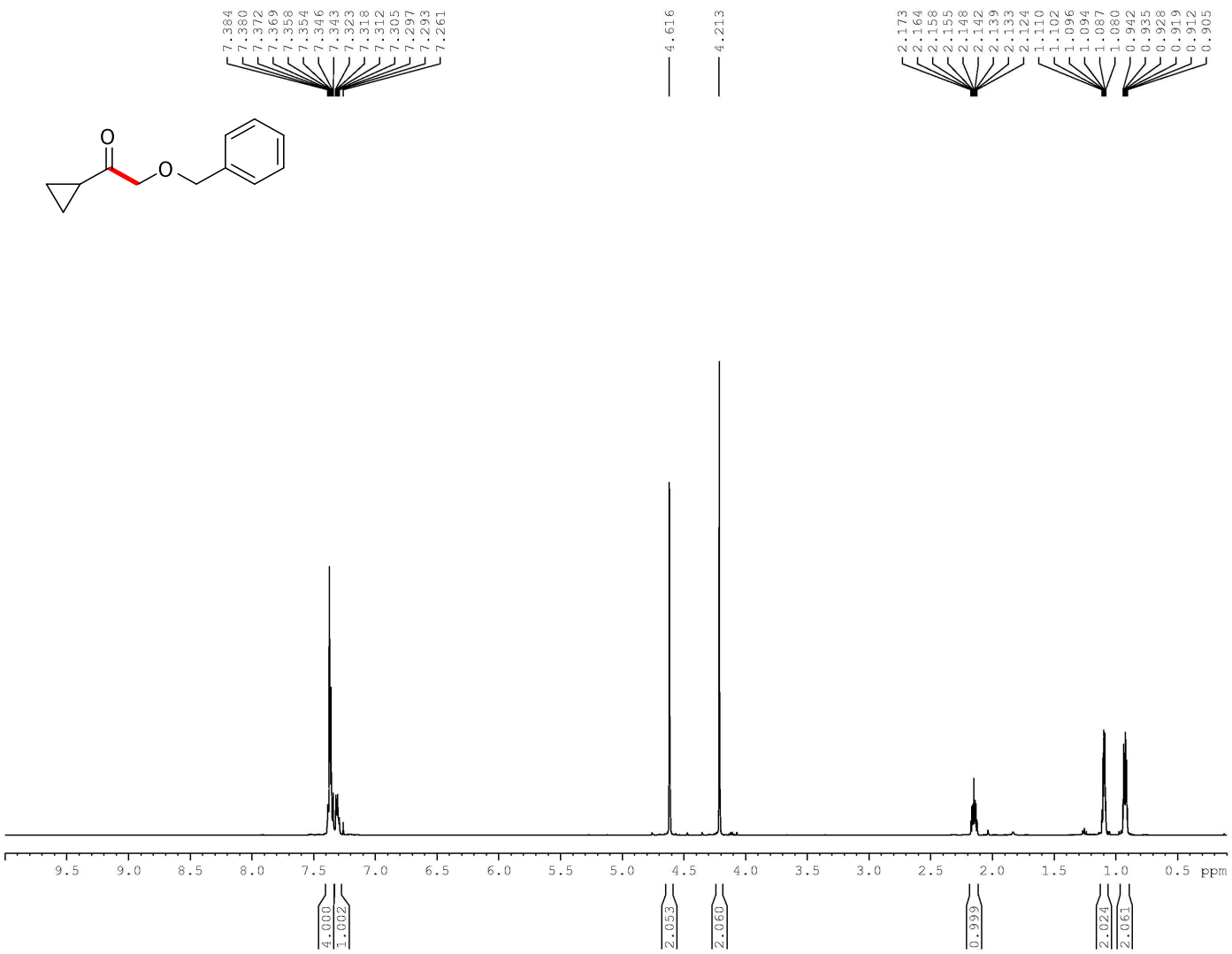
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-((2-Chloropyridin-3-yl)methoxy)-1-phenylethanone (2e)



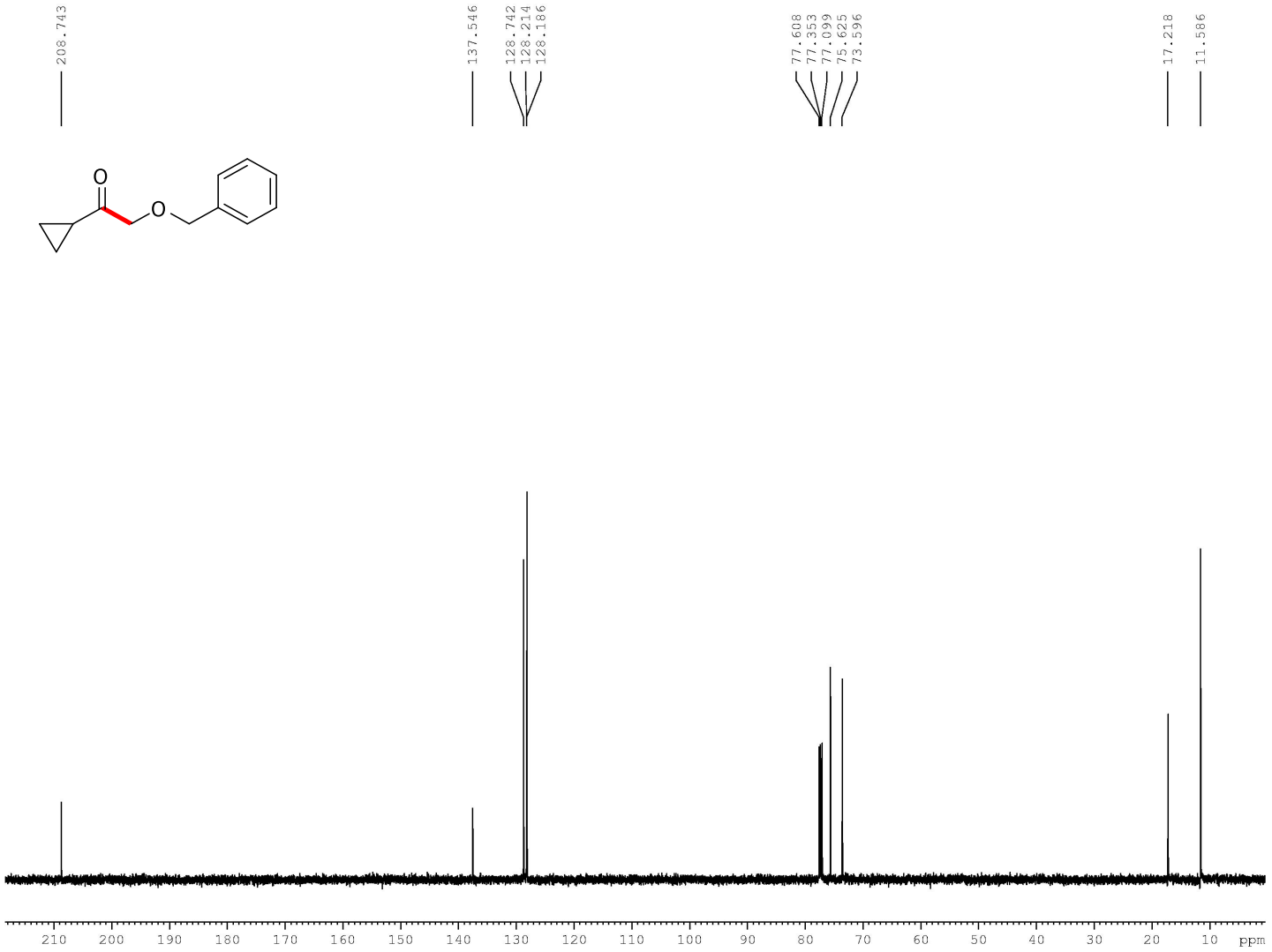
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(2-Methoxyethoxy)-1-phenylethanone (2f)



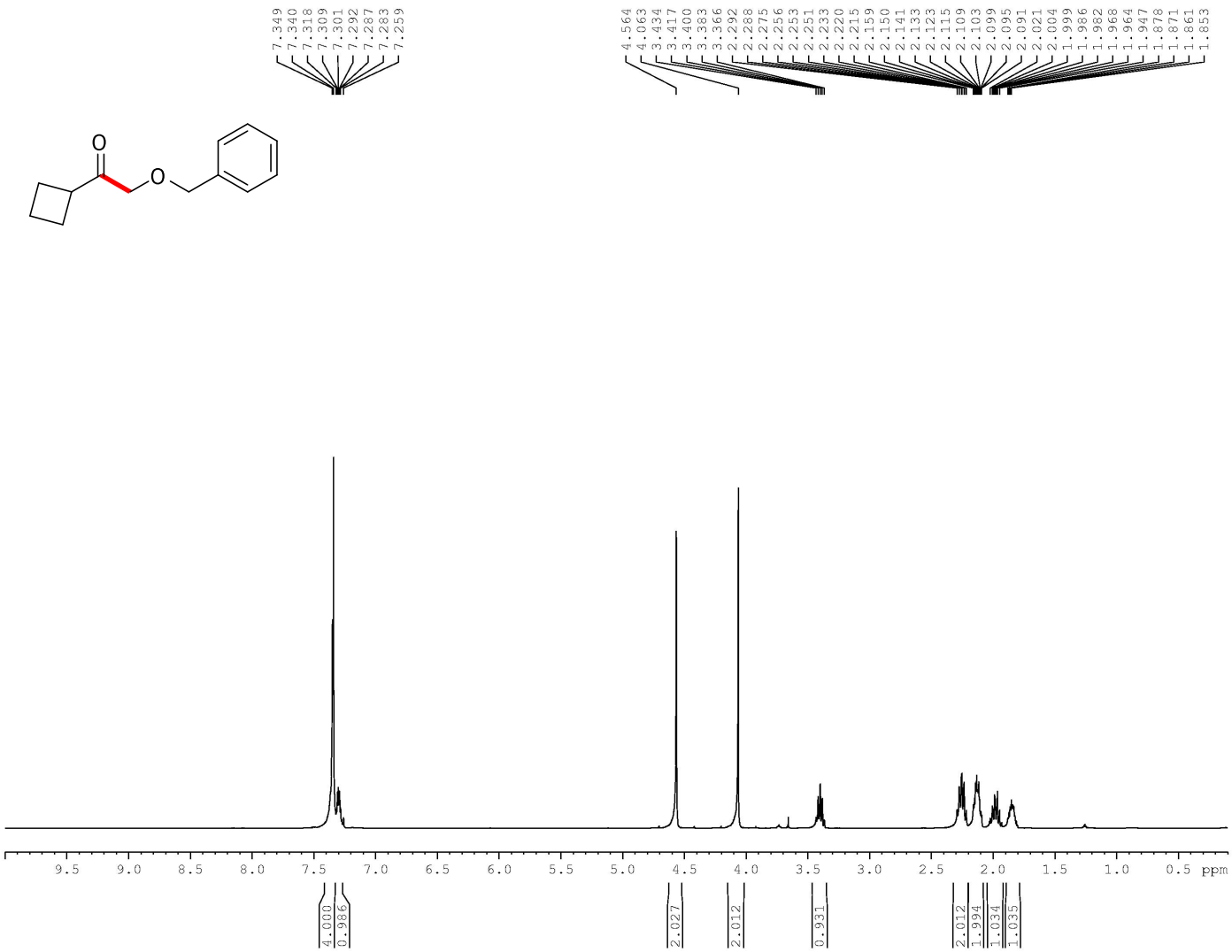
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(2-Methoxyethoxy)-1-phenylethanone (2f)



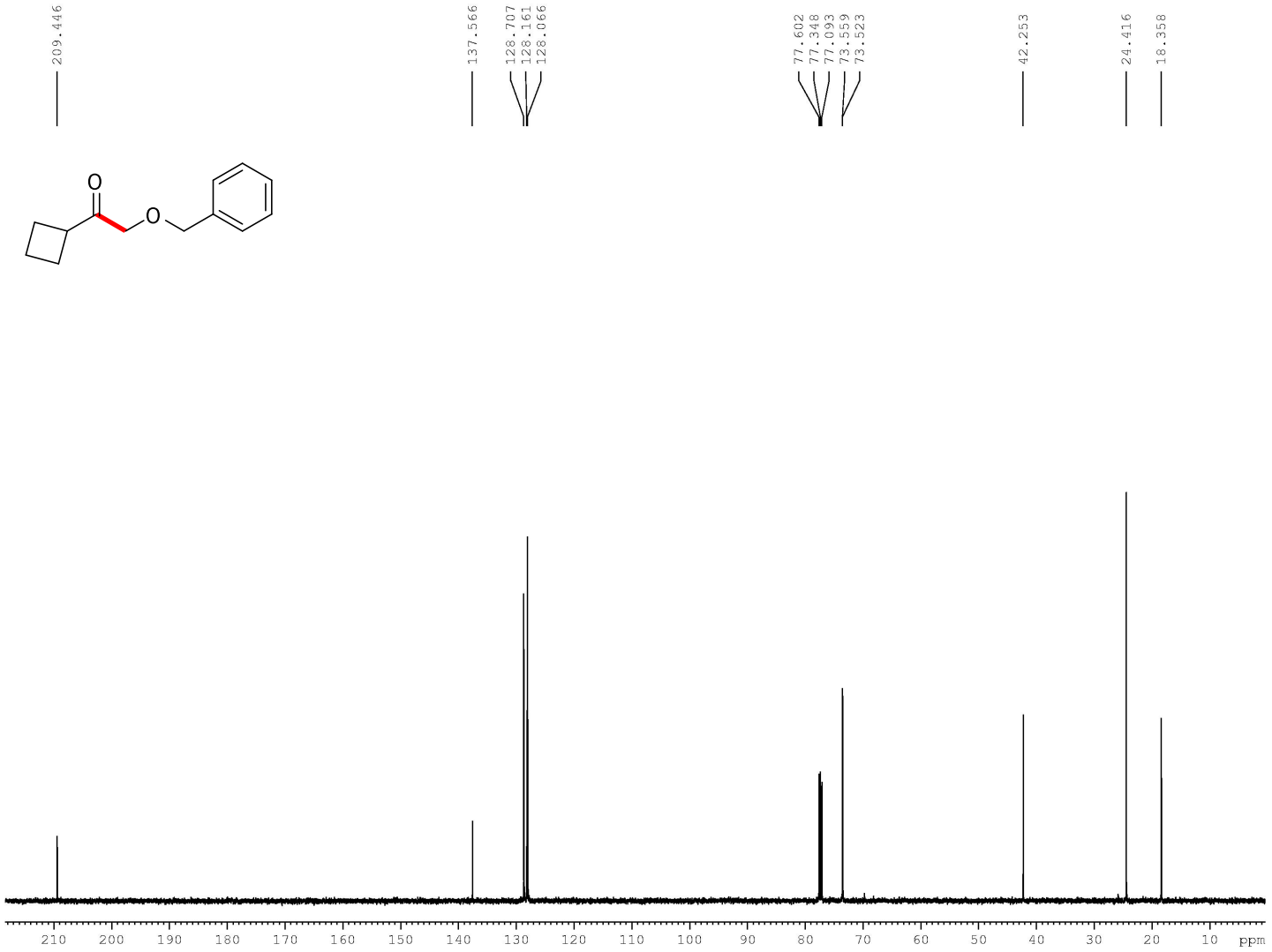
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-cyclopropylethanone (3a)



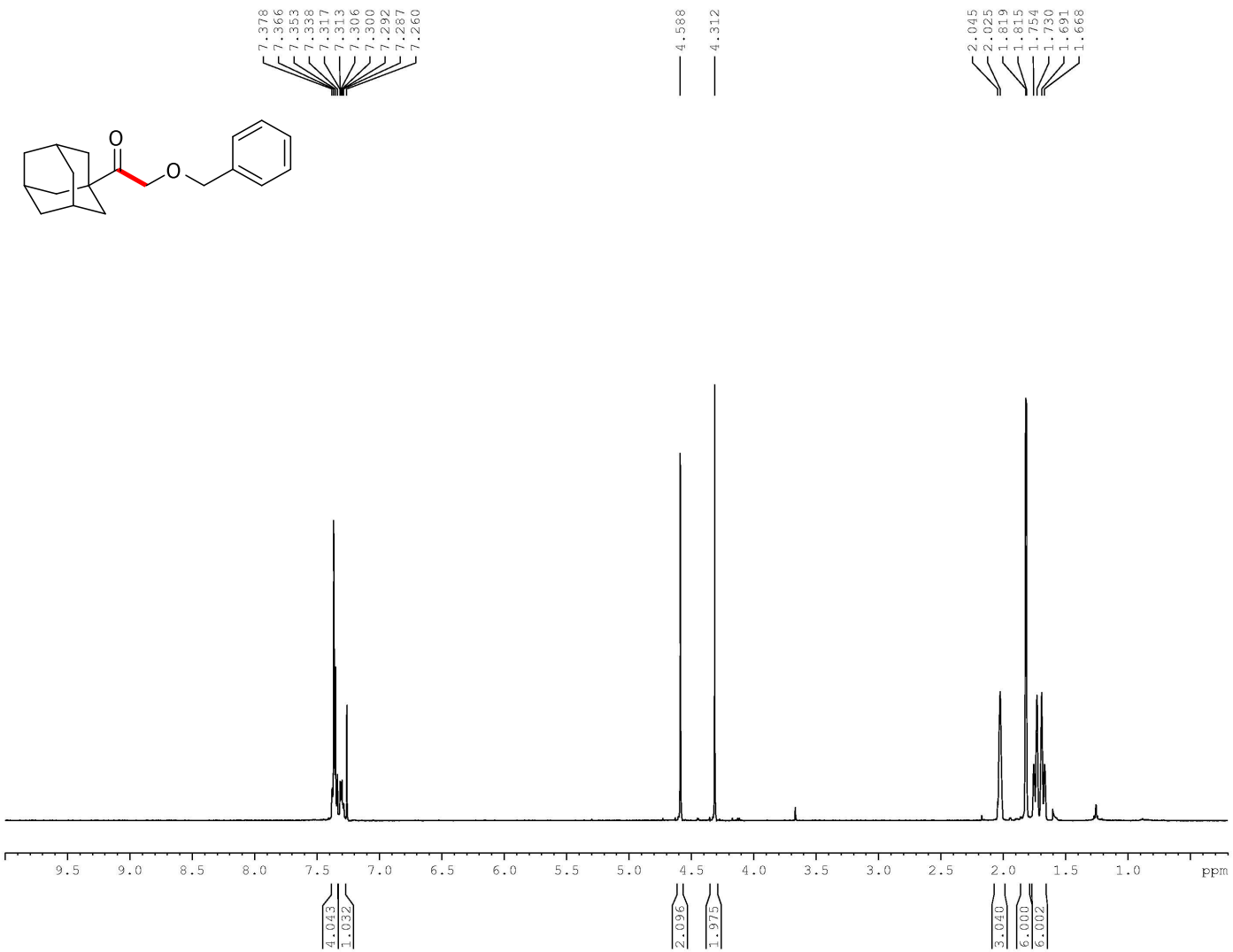
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-cyclopropylethanone (3a)



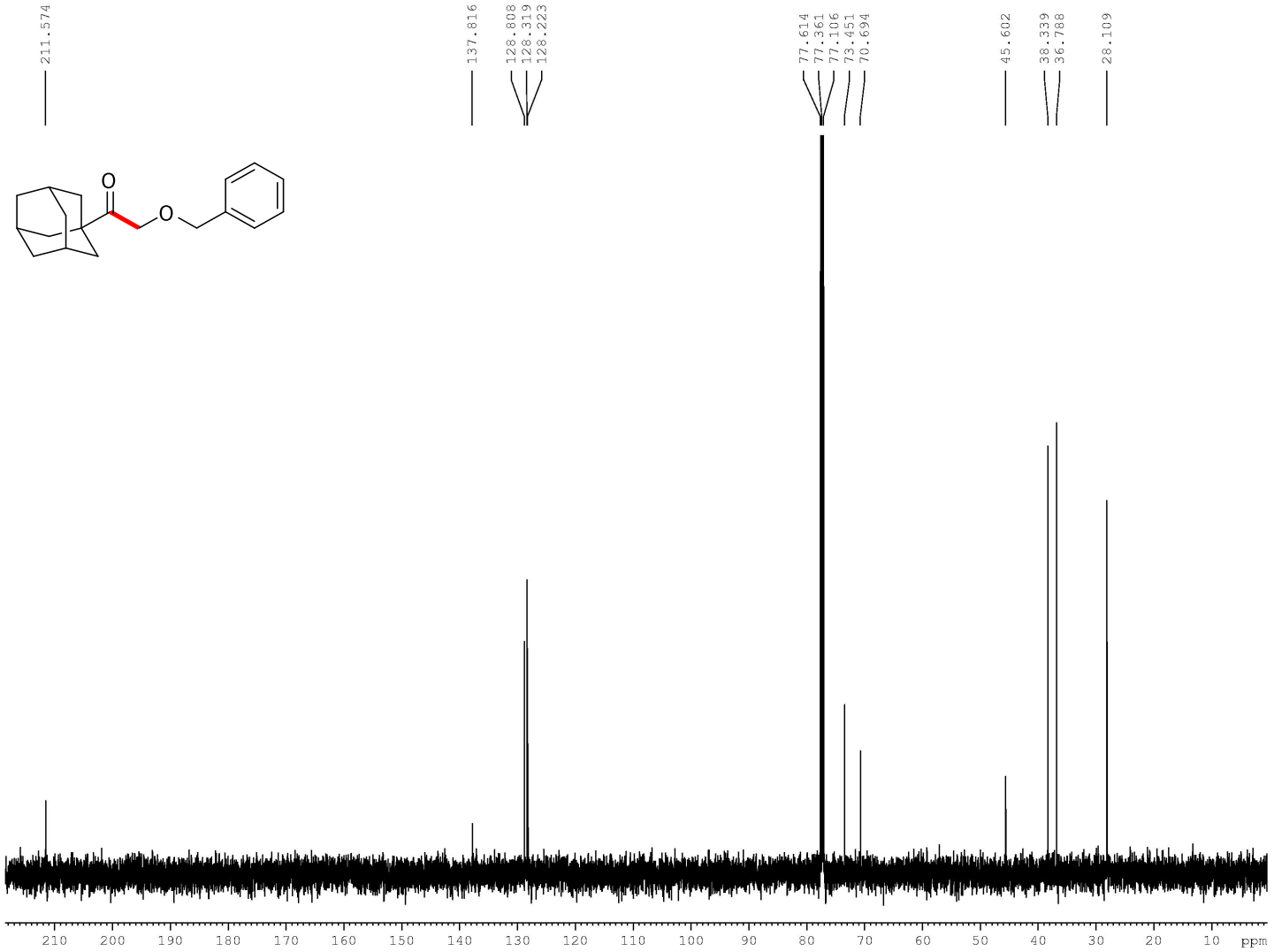
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-cyclobutylethanone (3b)



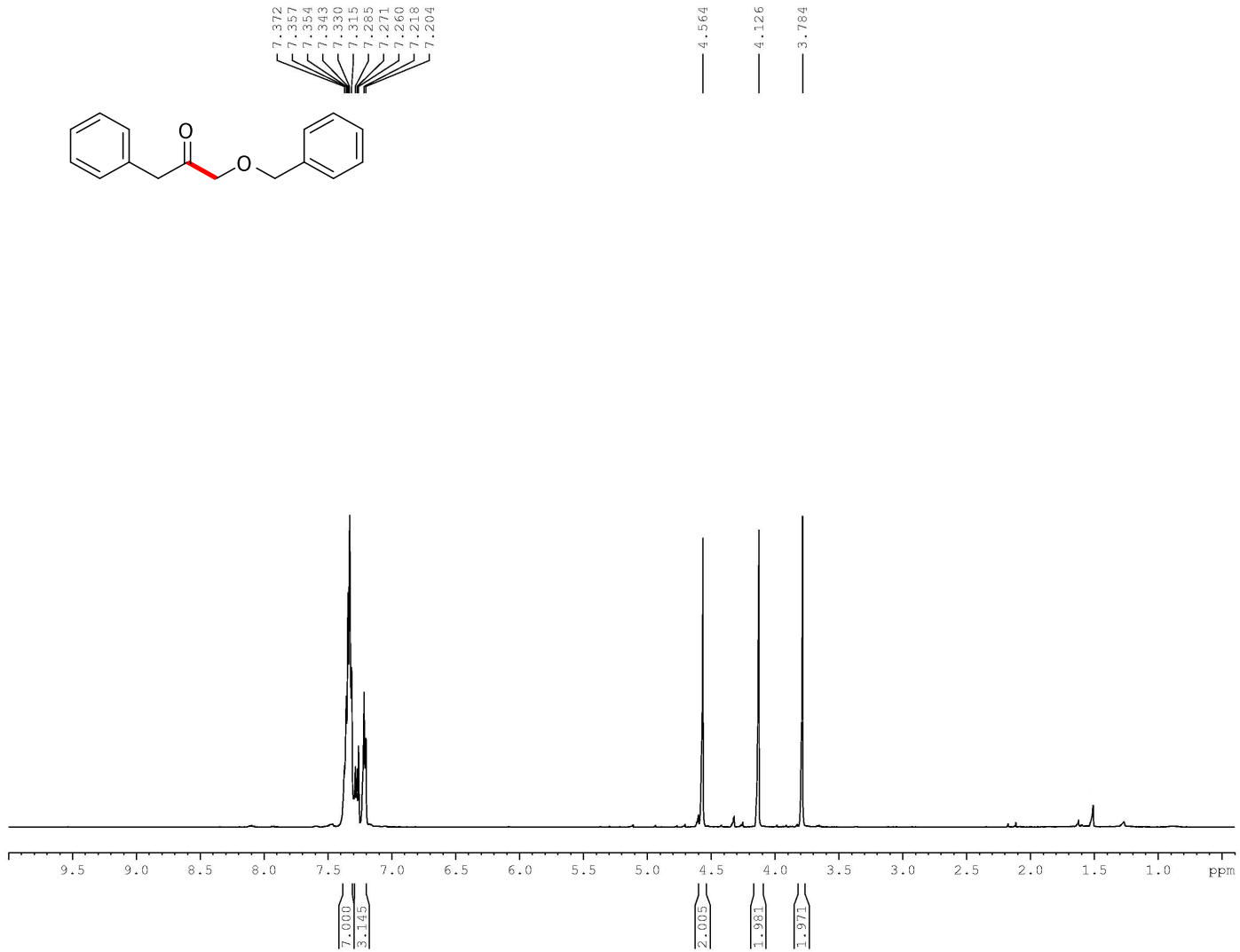
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-cyclobutylethanone (3b)



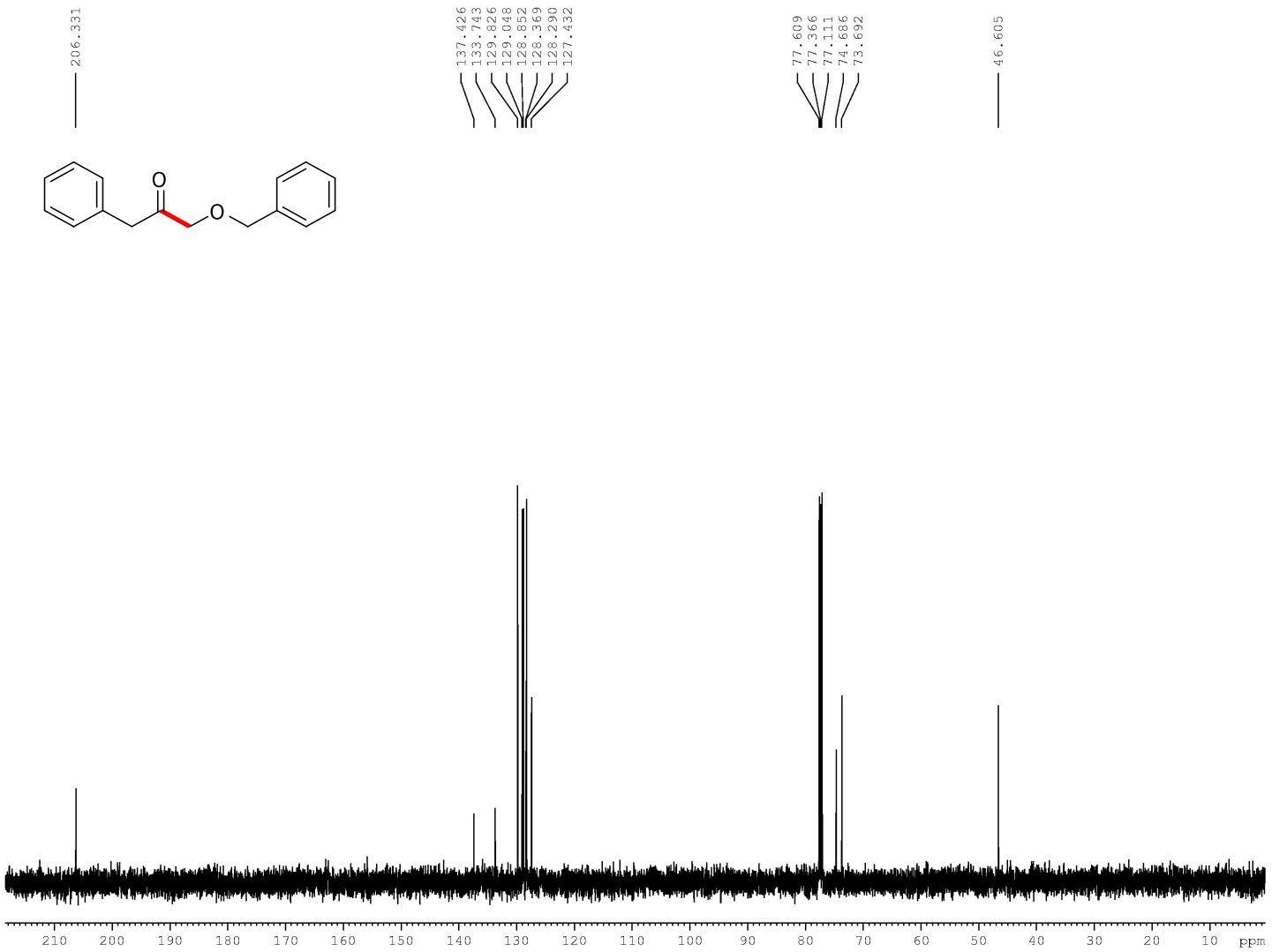
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(Adamantan-1-yl)-2-(benzyloxy)ethanone (3c)



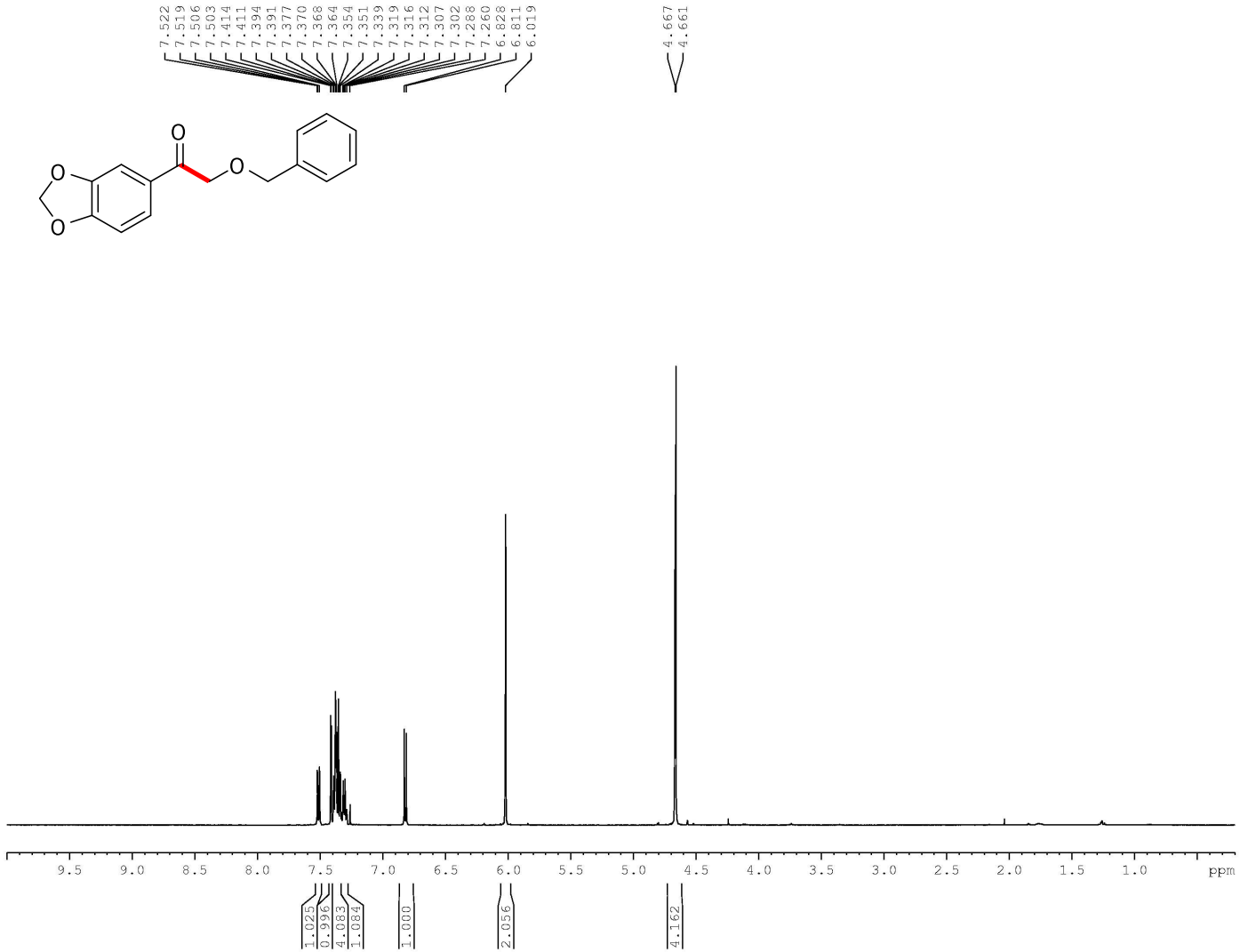
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(Adamantan-1-yl)-2-(benzyloxy)ethanone (3c)



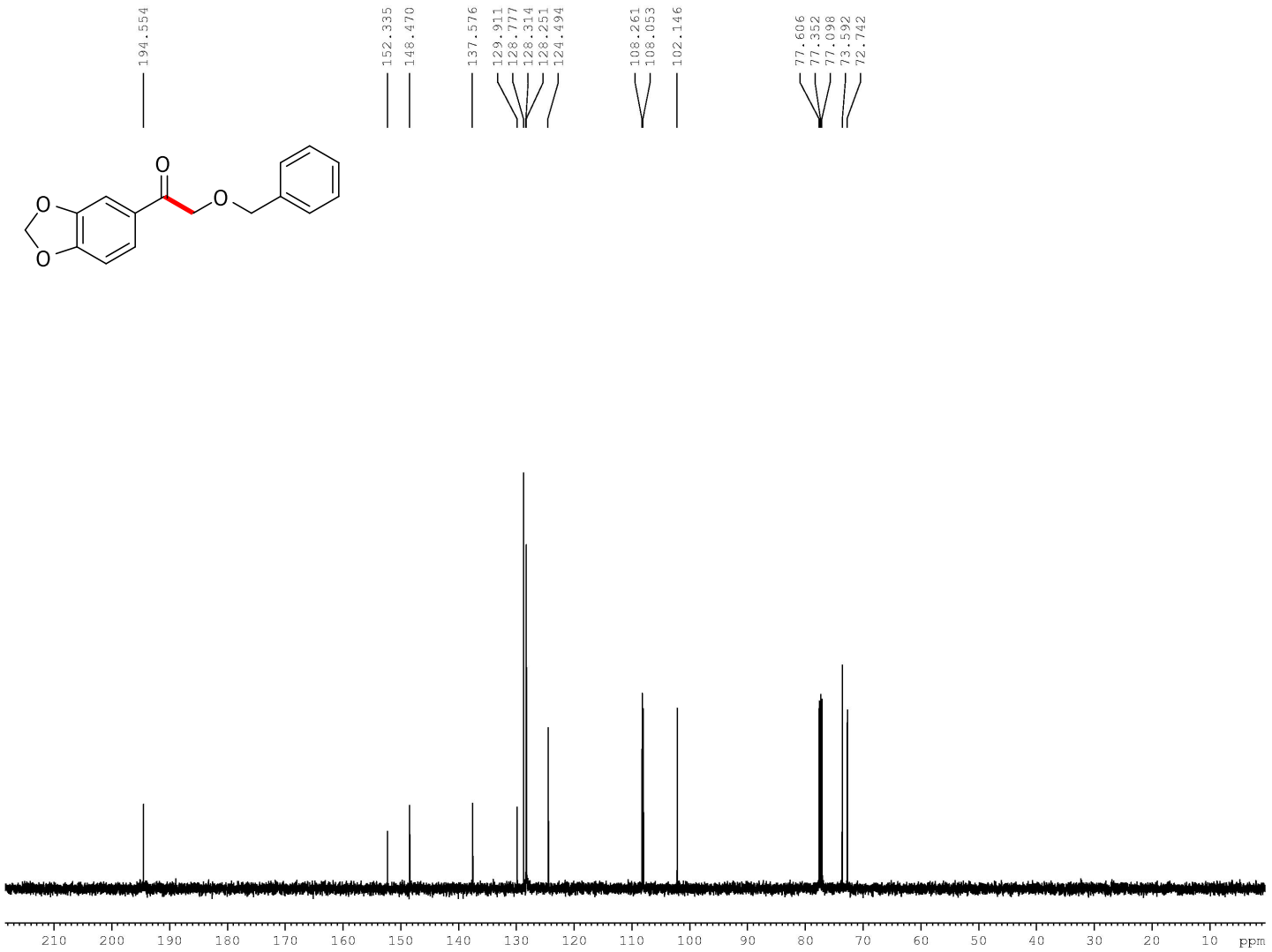
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(Benzyloxy)-3-phenylpropan-2-one (3d)



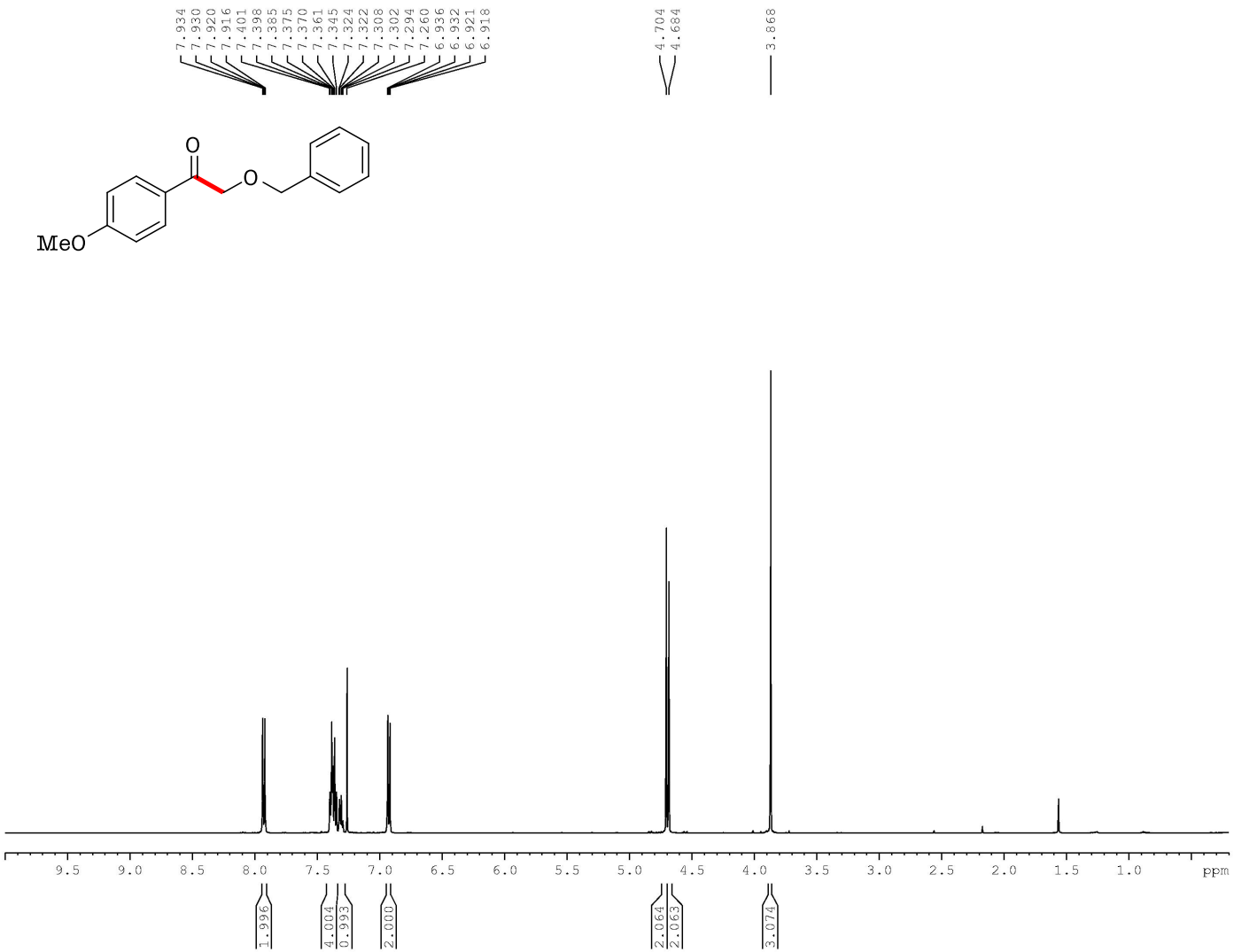
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(Benzyloxy)-3-phenylpropan-2-one (3d)



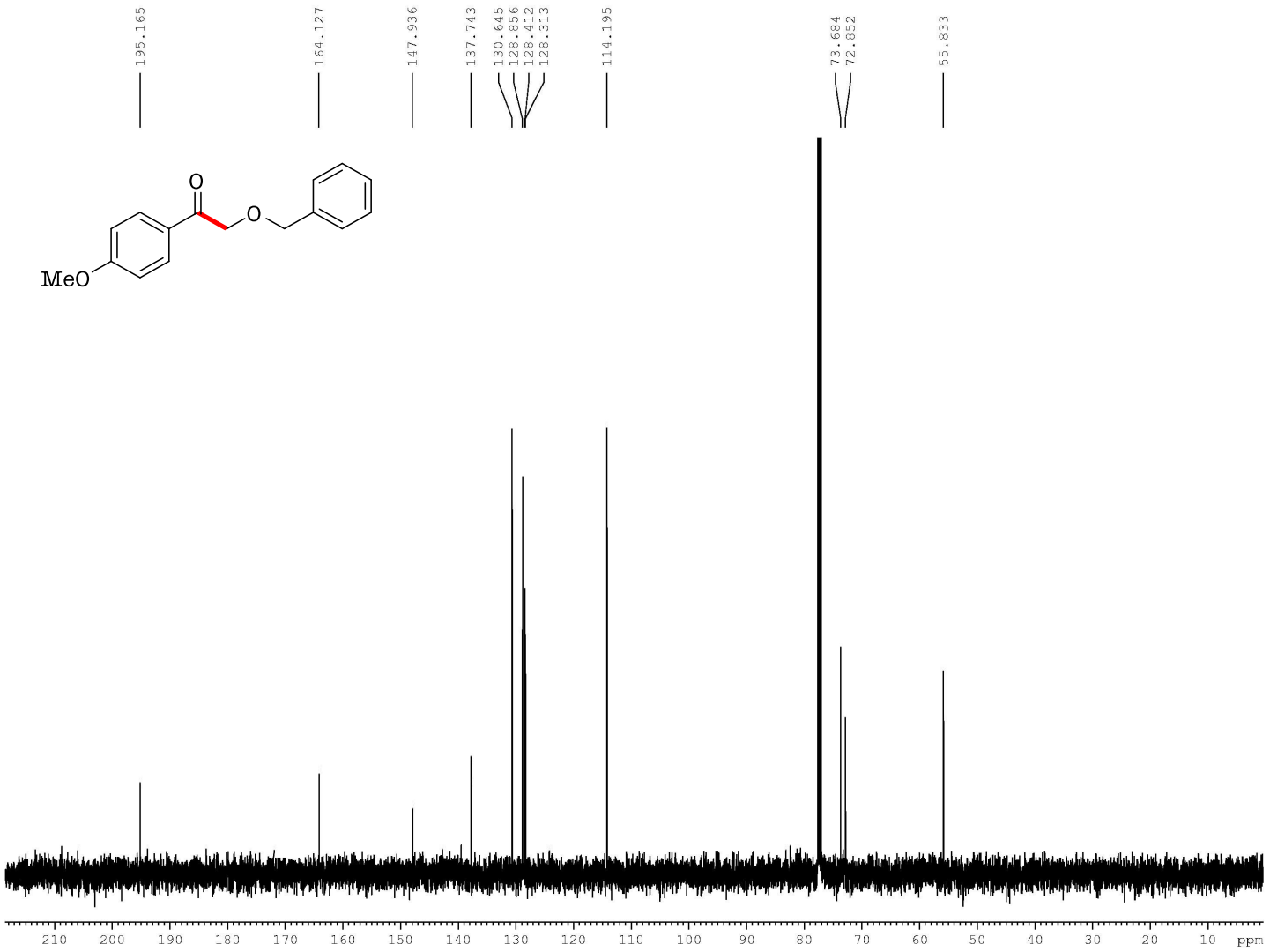
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 1-(Benzo[*d*][1,3]dioxol-5-yl)-2-(benzyloxy)ethanone (3e)



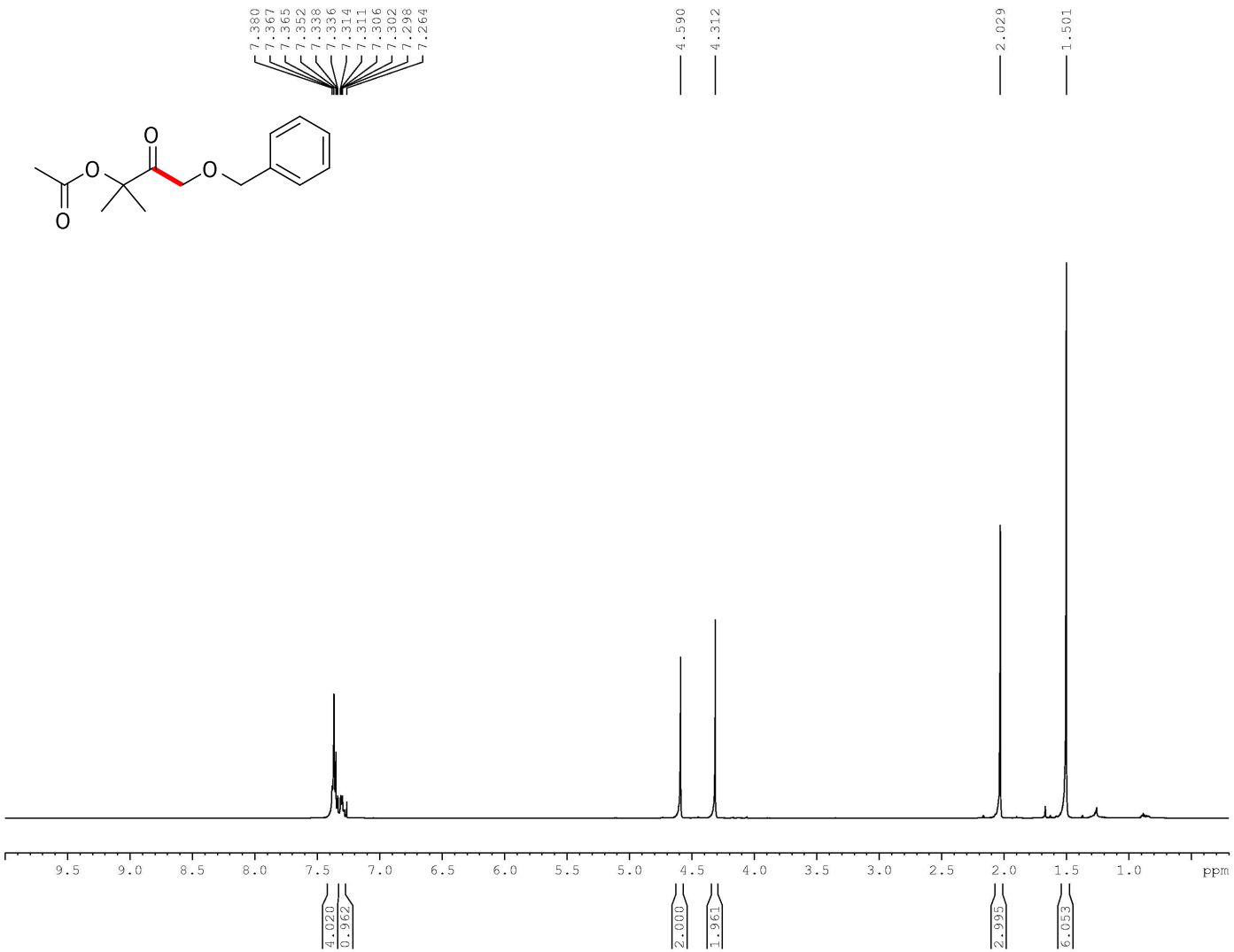
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 1-(Benzo[*d*][1,3]dioxol-5-yl)-2-(benzyloxy)ethanone (3e)



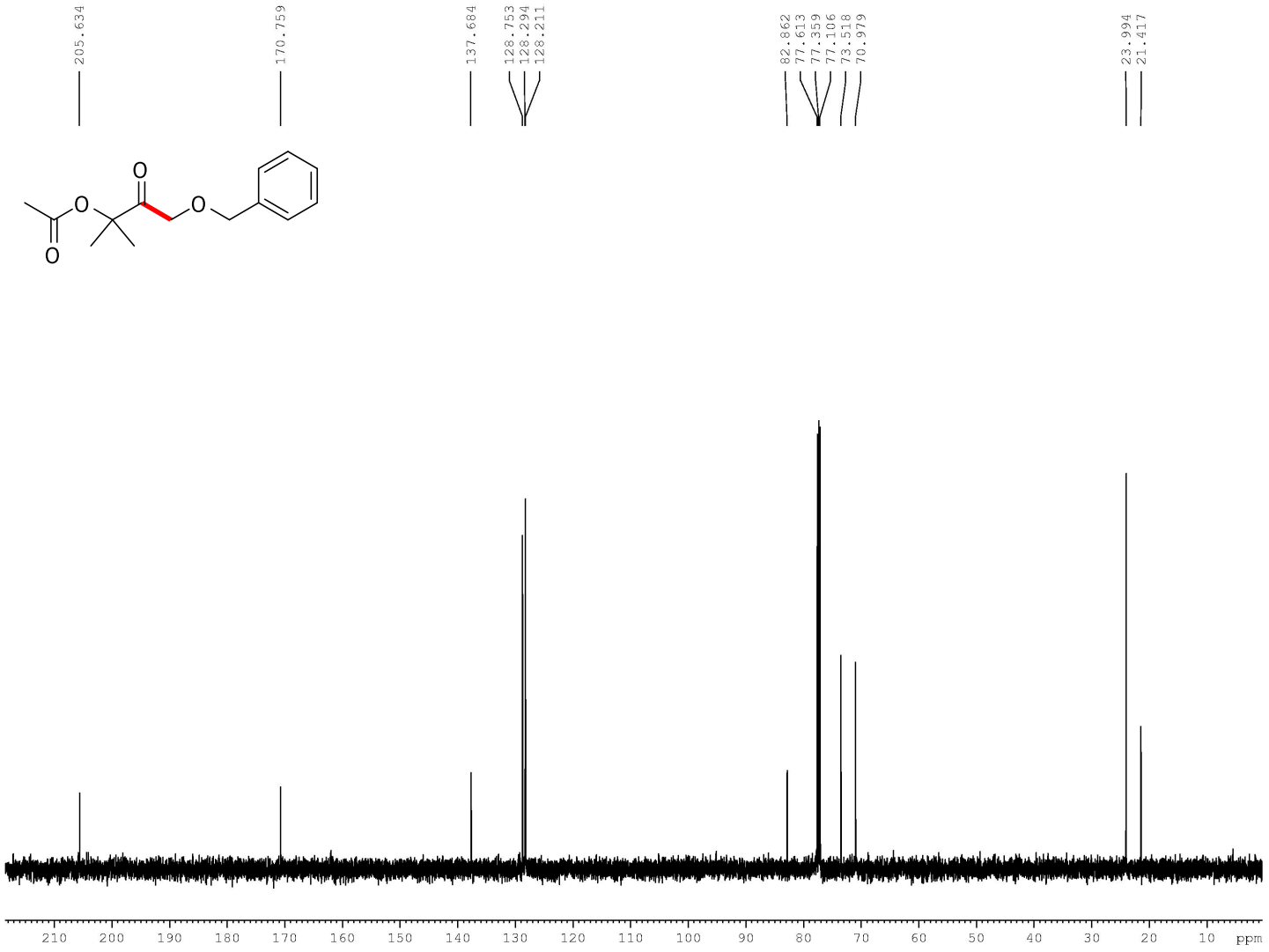
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-(4-methoxyphenyl)ethanone (3f)



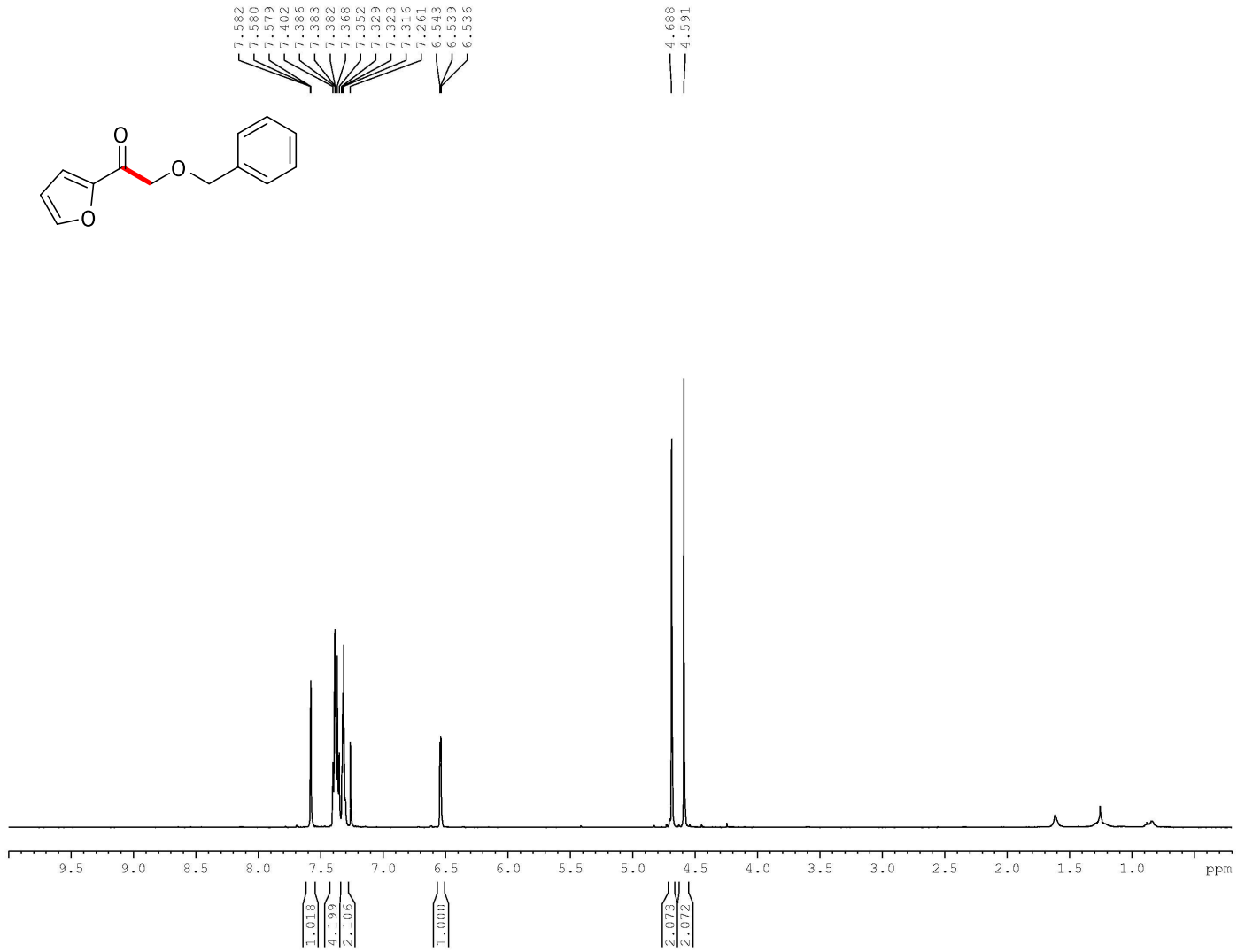
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-(4-methoxyphenyl)ethanone (3f)



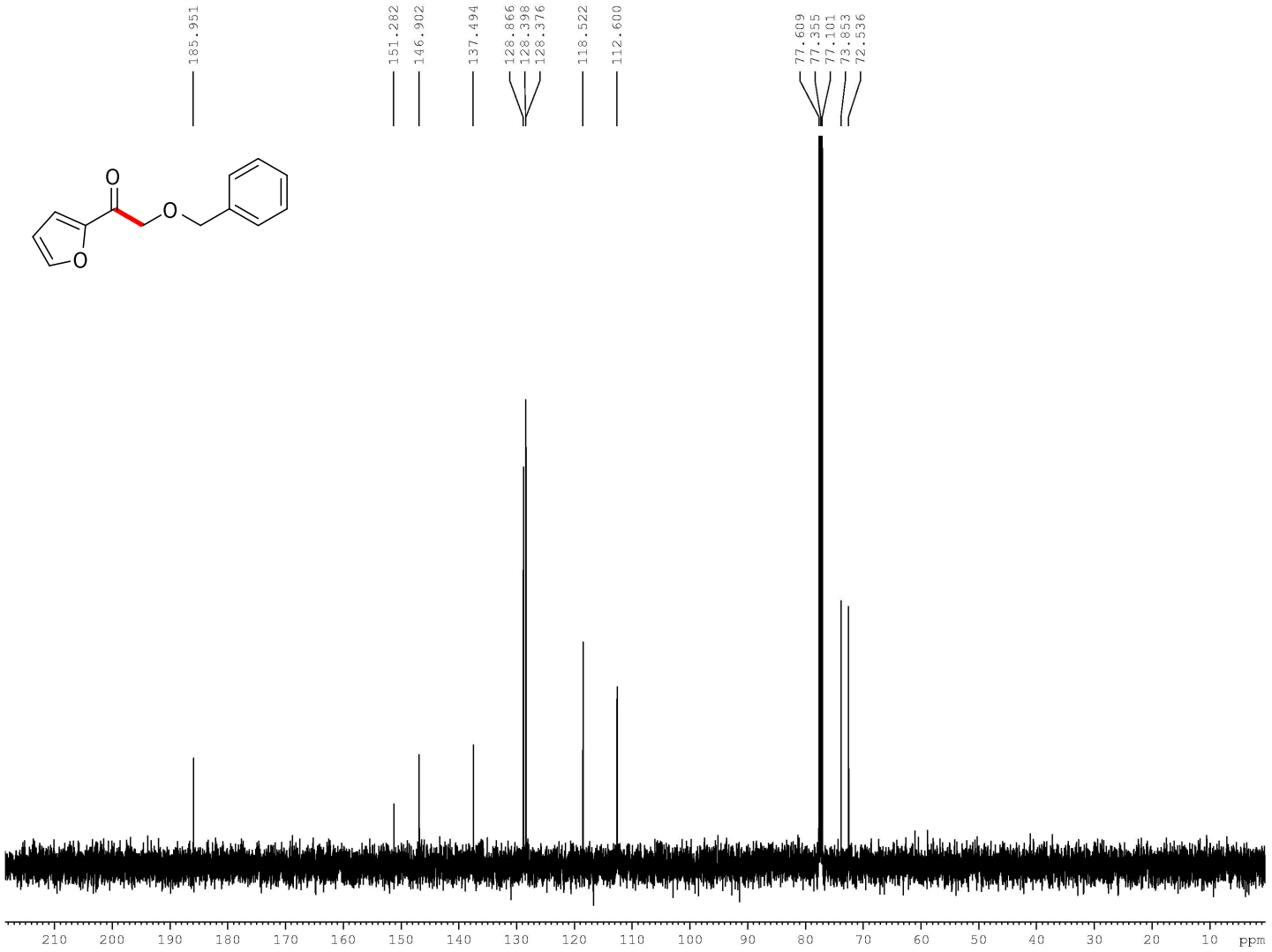
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 4-(Benzyloxy)-2-methyl-3-oxobutan-2-yl acetate (3g)



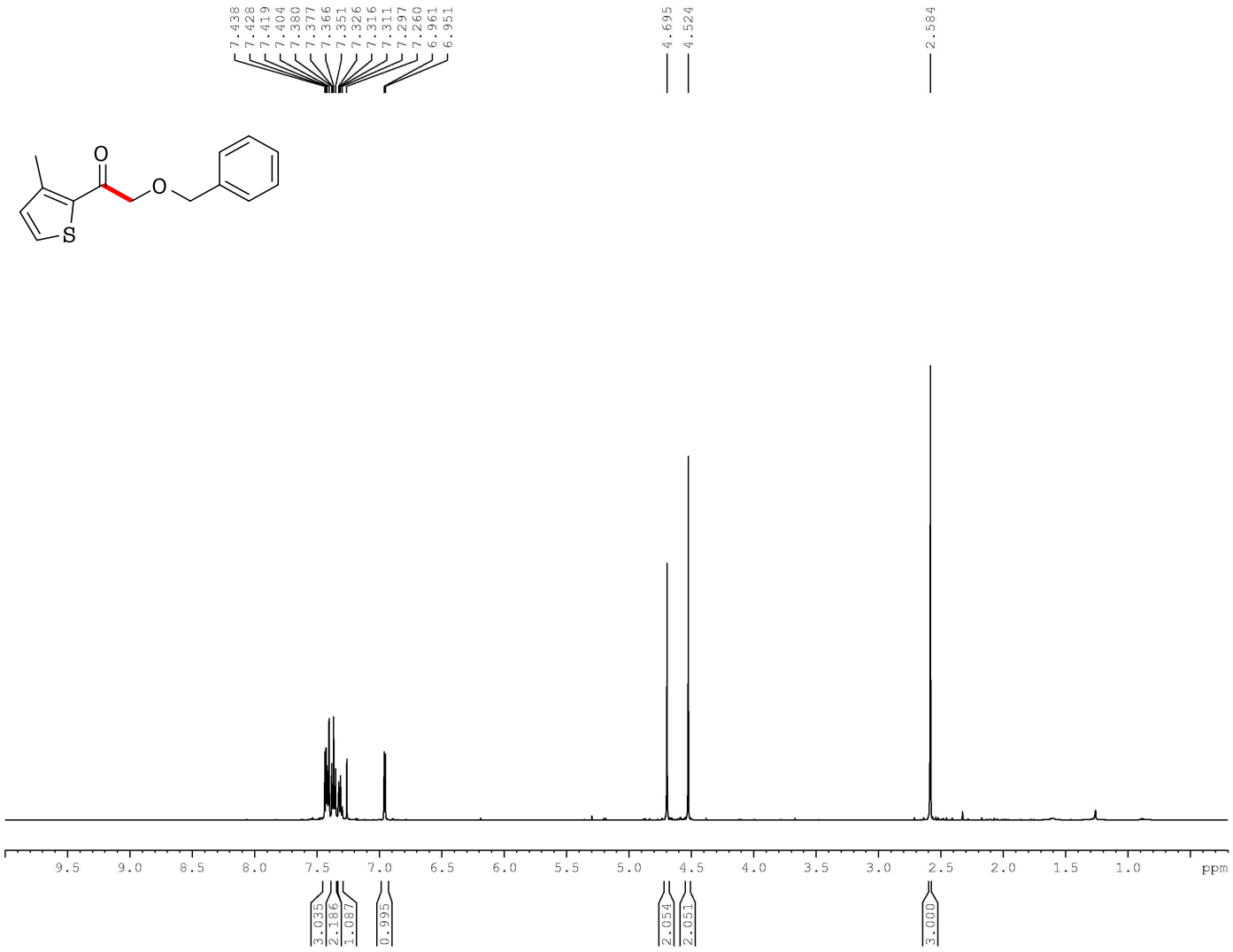
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 4-(Benzyloxy)-2-methyl-3-oxobutan-2-yl acetate (3g)



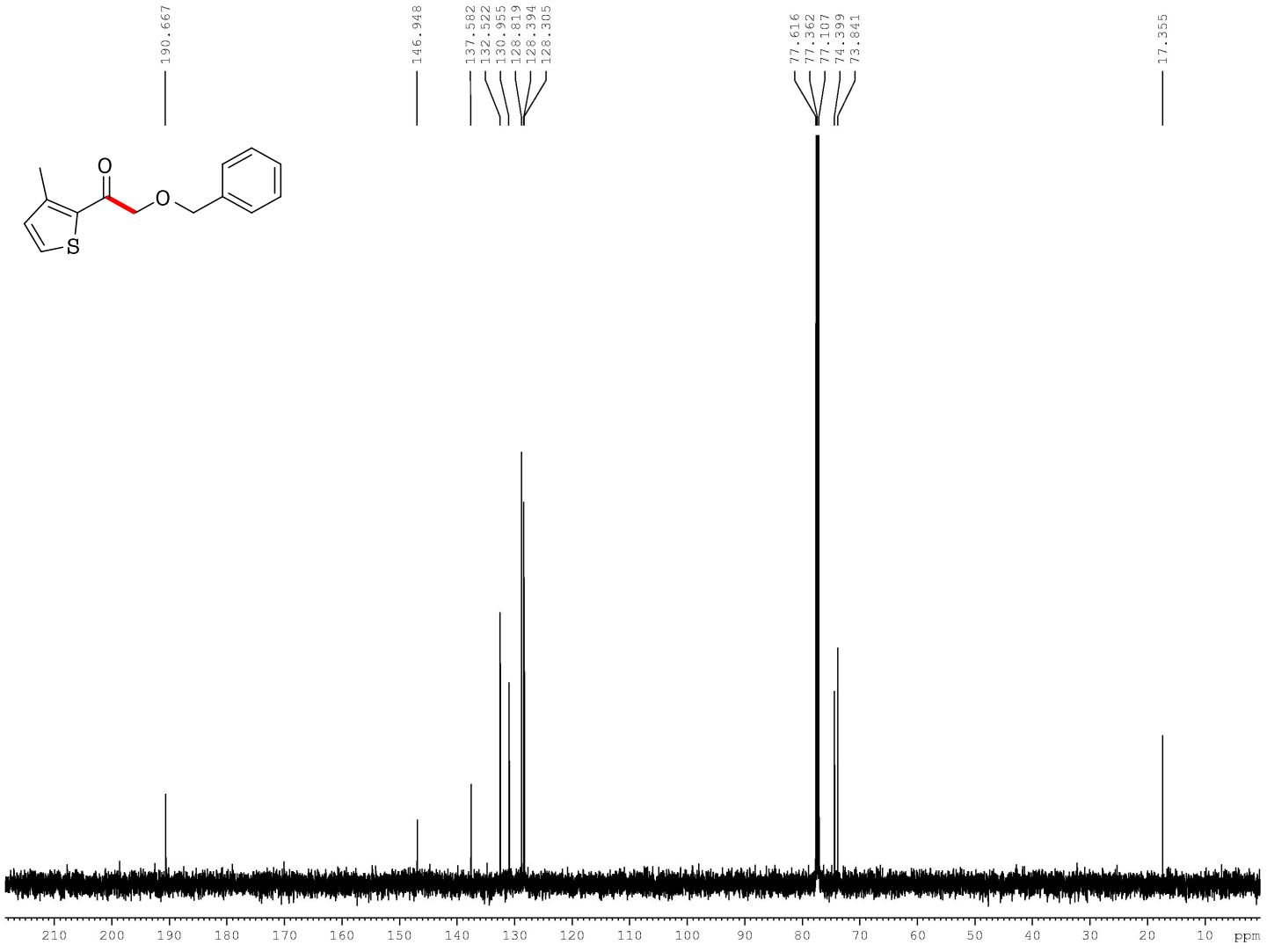
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-(furan-2-yl)ethanone (3h)



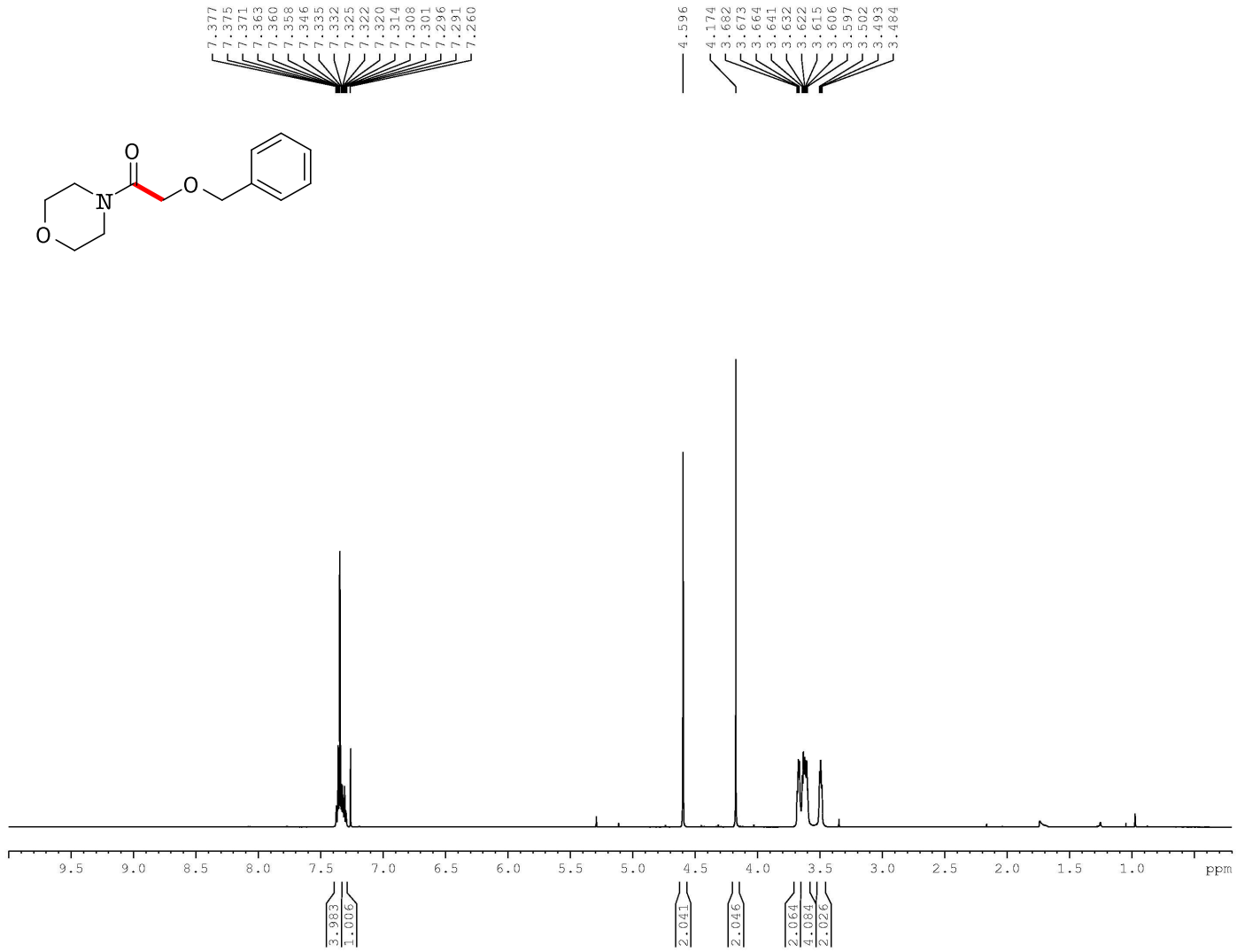
^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-(furan-2-yl)ethanone (3h)



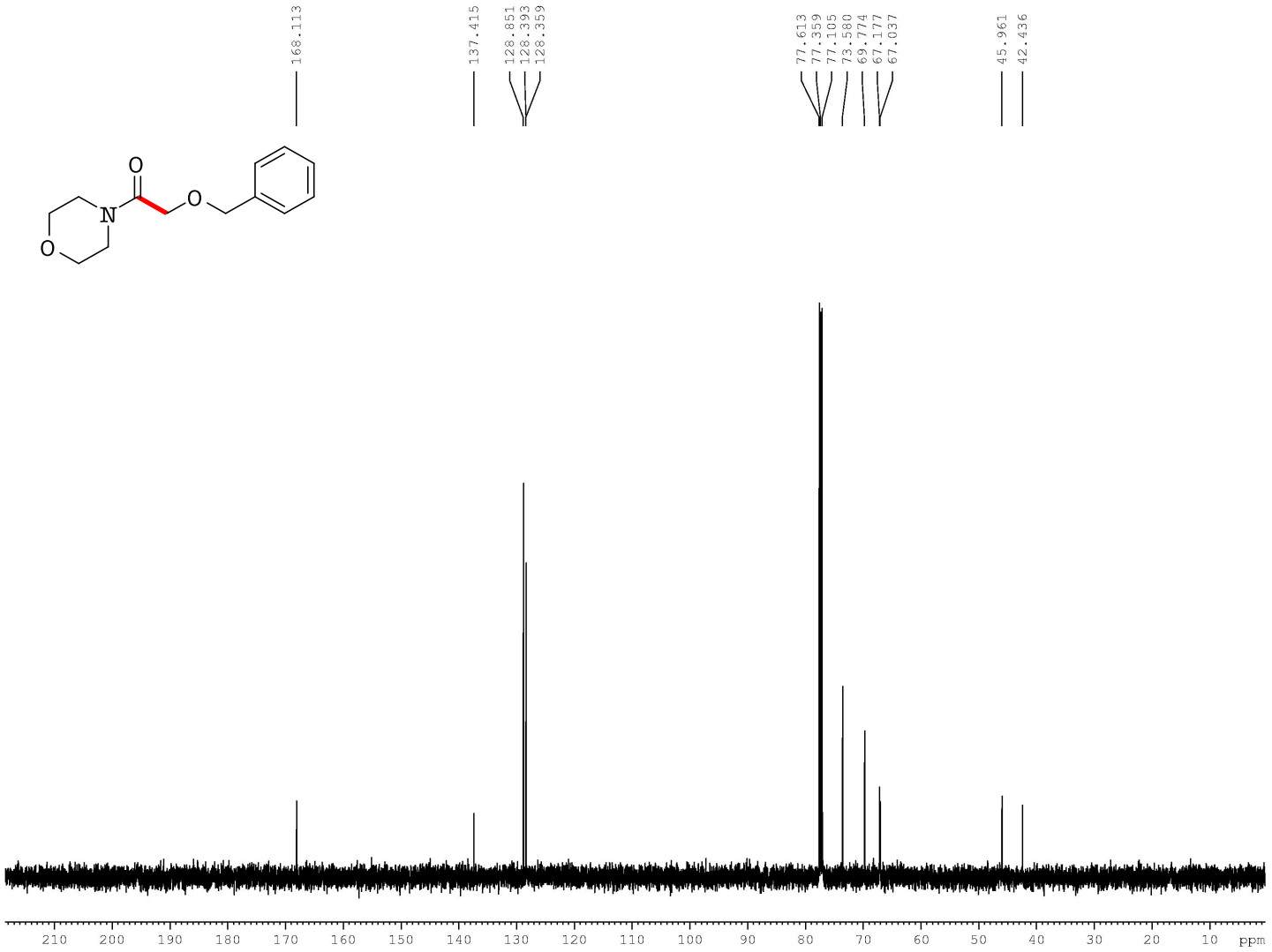
^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-(3-methylthiophen-2-yl)ethanone (3i)



^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-(3-methylthiophen-2-yl)ethanone (3i)



^{1}H NMR (500 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-morpholinoethanone (3j)



^{13}C NMR (125.8 MHz, $CDCl_3$) Spectrum of 2-(Benzyloxy)-1-morpholinoethanone (3j)