Electronic Supplementary Material (ESI) for ChemComm.

Electronic Supplementary Information

Indium-catalysed novel route to *β,β*-disubstituted indanones *via* tandem Nakamura addition/hydroarylation/decarboxylation sequence

Nimmakuri Rajesh and Dipak Prajapati*

Medicinal Chemistry Division, CSIR-North-East Institute of Science & Technology, Jorhat, Assam 785006, India

E-mail: dr_dprajapati2003@yahoo.co.uk

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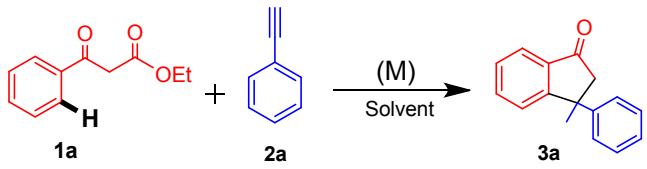
General information

All the commercially available reagents were used as received. IR Spectra were recorded on a SHIMADZU FTIR-8400 instrument. NMR spectra were recorded on Advance DPX 300 or 500 MHz FT-NMR spectrometer using tetramethylsilane (TMS) as an internal standard. Mass spectra were recorded on ESQUIRE 3000 Mass spectrometer. All the experiments were monitored by thin layer chromatography (TLC). TLC was performed on pre-coated silica gel plates (Merck). After elution, plate was visualized under UV illumination at 254 nm for UV active materials. Further visualization was achieved by staining $KMnO_4$ warming in a hot air oven. Column chromatography was performed on silica gel (100-200 mesh, Merck) using ethyl acetate: hexane as eluent.

Experimental Section

General procedure for the tandem sequence: β-keto ester or 1-Benzoylacetone (1 mmol), terminal alkyne (1.2 mmol) and 10 mol% $In(OTf)_3$ were taken in a round bottomed flask containing 6 ml of toluene. Allow the reaction mixture to reflux in toluene for the appropriate time. After completion of reaction as indicated by TLC, the solvent was distilled off under reduced pressure and the crude product was separated through column chromatography by using hexane:ethylacetate as elutent to obtain desired product **3** or **5.**

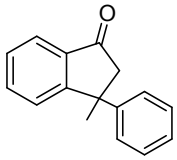
Table S1: Optimisation studies for tandem sequence[a]



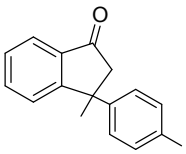
S.No	Catalyst	Solvent	Time (in h)	[b]Yield%
1[c]	$In(OTf)_3$	Toluene	24 h	54
2	$In(OTf)_3$	Toluene	16 h	63
3	$In(OTf)_3$	DCE	24 h	10
4	$In(OTf)_3$	Acetonitrile	24 h	NR
5	InF_3	Toluene	30 h	NR
6[d]	$InCl_3$	Toluene	40 h	5
7[d]	$InBr_3$	Toluene	40 h	13
8	$Sc(OTf)_3$	Toluene	24 h	NR
9	$Yb(OTf)_3$	Toluene	24 h	NR
10	$Zn(OTf)_2$	Toluene	24 h	NR
11	AgOTf	Toluene	30 h	NR
12	$Mg(OTf)_2$	Toluene	30 h	NR

[a]Reaction conditions: Ethyl benzoylacetate (1 mmol), Phenylacetylene(1.2 mmol), catalyst (10 mol%), and solvent (6ml) were refuxed for specified time. [b]Isolated yield.[c]Carried out the reaction at 100 °C. [d]Unconsumed Nakamura addition product was isolated in good yield. NR=No reaction.

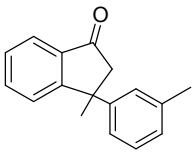
Characterization of the products



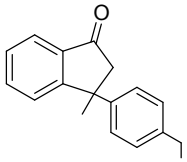
3-methyl-3-phenyl-2,3-dihydro-1*H*-inden-1-one (***3a)***: Light Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.80 (m, 1H), 7.62 (m, 1H), 7.31 (m, 3H), 7.22 (m, 3H), 3.03 (d, *J* = 18 Hz, 1H), 2.90 (d, *J* = 18 Hz, 1H), 1.84 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 205.7, 162.8, 147.3, 135.8, 135.2, 128.5, 127.8, 126.4, 126.2, 125.6, 123.3, 55.7, 46, 28.3; MS (GCMS, m/z) 222 $[M]^+$; Anal. Calcd. for $C_{16}H_{14}O$: C, 86.45; H, 6.35. Found: C, 86.44; H, 6.33.



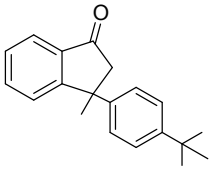
3-methyl-3-(p-tolyl)-2,3-dihydro-1*H*-inden-1-one (***3b)***: Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.72 (m, 1H), 7.54 (t, 1H), 7.36 (m, 1H), 7 (s, 4H), 2.94 (d, *J* = 18 Hz, 1H), 2.81 (d, *J* = 18 Hz, 1H), 2.23 (s, 3H), 1.74 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 206, 163.1, 144.4, 136, 135.7, 135.2, 129.2, 127.7, 126.1, 125.5, 123.3, 55.8, 45.7, 28.4, 20.9; MS (GCMS, m/z) 236 $[M]^+$; Anal. Calcd. for $C_{17}H_{16}O$: C, 86.4; H, 6.82. Found: C, 86.42; H, 6.79.



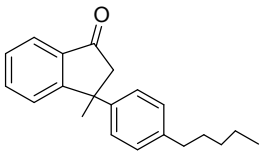
3-methyl-3-(*m*-tolyl)-2,3-dihydro-1*H*-inden-1-one (***3c)***: Light reddish liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.79 (m, 1H), 7.79 (dd, *J* = 8, 6.9 Hz, 1H), 7.42 (t, 1H), 7.30 (m, 1H), 7.19 (t, 1H), 7.03 (m, 3H), 3.01 (d, *J* = 20 Hz, 1H), 2.88 (d, *J* = 20 Hz, 1H), 2.3 (s, 3H), 1.82 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 205.9, 162.9, 147.2, 138.0, 135.6, 135.1, 128.3, 127.6, 127.1, 126.9, 125.5, 123.2, 55.7, 45.8, 28.3, 21.5; MS (GCMS, m/z) 236 $[M]^+$; Anal. Calcd. for $C_{17}H_{16}O$: C, 86.4; H, 6.82. Found: C, 86.42; H, 6.81.



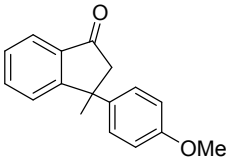
3-(4-ethylphenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (***3d***): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.79 (d, *J* = 7.7 Hz, 1H), 7.61 (t, 1H), 7.41 (t, 1H), 7.11 (s, 4H), 3.02 (d, *J* = 18 Hz, 1H), 2.89 (d, *J* = 18 Hz, 1H), 2.61 (q, 2H), 1.83 (s, 3H), 1.21 (t, 2H); ^{13}C NMR (126 MHz, $CDCl_3$) 206.0, 163.0, 144.4, 142.2, 135.6, 135.1, 127.8, 127.6, 126.1, 125.5, 123.2, 55.7, 45.6, 28.3, 28.2, 15.4; MS (GCMS, m/z) 250 $[M]^+$; Anal. Calcd. for $C_{18}H_{18}O$: C, 86.36; H, 7.25. Found: C, 86.37; H, 7.25.



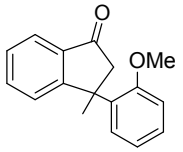
3-(4-(*tert*-butyl)phenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (***3e***): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (d, *J* =7.7 Hz, 1H), 7.59 (t, 1H), 7.41 (t, 1H), 7.35 (m, 4H), 7.15 (m, 2H), 3.04 (d, *J* = 21 Hz, 1H), 2.89 (d, *J* = 21 Hz, 1H), 1.83 (s, 3H), 1.29 (s, 9H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 206, 163, 149.2, 144.2, 135.8, 135.2, 127.7, 125.9, 125.6, 125.3, 123.3, 55.8, 45.7, 34.3, 31.3, 28.4; MS (GCMS, m/z) 278 $[M]^+$; Anal. Calcd. for $C_{20}H_{22}O$: C, 86.29; H, 7.97. Found: C, 86.32; H, 7.96.



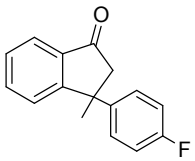
3-methyl-3-(4-pentylphenyl)-2,3-dihydro-1*H*-inden-1-one (***3f***): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.6 Hz, 1H), 7.62 (m, 1H), 7.41 (t, 1H), 7.31 (m, 1H), 7.09 (d, *J* = 2.1 Hz, 4H), 3.03 (d, *J* = 21 Hz, 1H), 2.89 (d, *J* = 21 Hz, 1H), 2.58 (t, 2H), 1.82 (s, 3H), 1.67 (m, 4H), 1.31 (m, 5H), 0.9 (t, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 205.9, 163.1, 144.5, 141.0, 135.8, 135.2, 128.5, 127.7, 126.1, 125.6, 123.3, 55.8, 45.8, 35.4, 31.6, 31.1, 28.4, 22.5, 14.0; MS (GCMS, m/z) 292 $[M]^+$; Anal. Calcd. for $C_{21}H_{24}O$: C, 86.29; H, 7.97. Found: C, 86.25; H, 8.27.



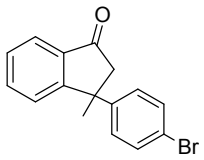
3-(4-methoxyphenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (***3g***): Light Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.7 Hz, 1H), 7.67 (m, 2H), 7.41 (t, 1H), 7.32 (m, 1H), 7.15 (m, 2H), 6.86 (m, 2H), 3.78 (s, 3H), 3.03 (d, *J* = 18 Hz, 1H), 2.89 (d, *J* = 18 Hz, 1H), 1.81 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 206, 163.1, 158, 139.4, 135.7, 135.2, 127.7, 127.3, 125.5, 123.3, 113.8, 77.5, 77, 76.6, 55.8, 55.3, 45.4, 28.6; MS (GCMS, m/z) 252 $[M]^+$; Anal. Calcd. for $C_{17}H_{16}O_2$: C, 80.93; H, 6.39. Found: C, 80.95; H, 6.41.



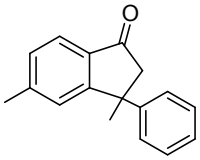
3-(2-methoxyphenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (***3h***): Light Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.76 (d, *J* = 7.7 Hz, 1H), 7.53 (m, 1H), 7.43 (d, *J* = 7.7 Hz, 1H), 7.34 (t, 1H), 7.28 (m, 1H), 7.17 (dd, *J* = 7.6 1H), 6.99 (m, 1H), 6.78 (d, *J* = 8.2 Hz, 1H), 3.41 (s, 3H), 3.21 (d, *J* = 20 Hz, 1H), 2.71 (d, *J* = 20 Hz, 1H), 1.77 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 206.6, 163.0, 157.3, 135.8, 134.3, 134.1, 128.2, 126.9, 126.8, 124.2, 122.8, 120.2, 111.9, 54.8, 52.7, 44.3, 29.1; MS (GCMS, m/z) 252 $[M]^+$; Anal. Calcd. for $C_{17}H_{16}O_2$: C, 80.93; H, 6.39. Found: C, 80.94; H, 6.36.



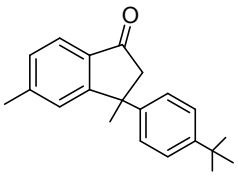
3-(4-fluorophenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (***3i***): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.81 (m, 1H), 7.64 (t, 1H), 7.46 (m, 1H), 7.28 (m, 1H), 7.17 (m, 2H), 6.99 (t, 2H), 2.99 (d, *J* = 18 Hz, 1H), 2.9 (d, *J* = 18 Hz, 1H), 1.82 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 205.4, 162.9, 162.5, 159.7, 143.2, 135.7, 135.3, 127.9, 127.8, 125.4, 123.4, 115.4, 115.1, 55.7, 45.6, 28.5; MS (GCMS, m/z) 240 $[M]^+$; Anal. Calcd. for $C_{16}H_{13}FO$: C, 79.98; H, 5.45. Found: C, 80.01; H, 5.44.



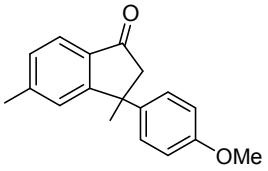
3-(4-bromophenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (***3j***): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.83 (m, 1H), 7.61 (t, 1H), 7.48 (m, 3H), 7.29 (m, 1H), 7.1 (m, 2H), 2.98 (d, *J* = 18 Hz, 1H), 2.89 (d, *J* = 18 Hz, 1H), 1.81 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 205.2, 162.2, 146.4, 135.7, 135.4, 131.6, 128.1, 128.0, 125.4, 123.5, 120.4, 77.5, 77.1, 76.6, 55.5, 45.7, 28.3; MS (GCMS, m/z) 301 $[M]^+$; Anal. Calcd. for $C_{16}H_{13}BrO$: C, 63.81; H, 4.35. Found: C, 63.82; H, 4.35.



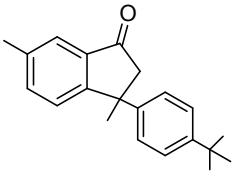
3,5-dimethyl-3-phenyl-2,3-dihydro-1*H*-inden-1-one (***3k***)**:** Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 (d, *J* = 8 Hz, 1H), 7.31 (m, 7H), 7.05 (s, 1H), 2.99 (d, *J* = 20 Hz, 1H), 2.87 (d, *J* = 20 Hz, 1H), 2.39 (s, 3H), 1.82 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 205.3, 163.3, 147.3, 146.4, 133.5, 129.0, 128.4, 128.3, 126.2, 126.1, 125.7, 125.6, 123.1, 55.9, 45.7, 28.1, 22.1; MS (GCMS, m/z) 236 $[M]^+$; Anal. Calcd. for $C_{17}H_{16}O$: C, 86.4; H, 6.82. Found: C, 86.41; H, 6.8.



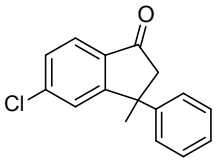
3-(4-*tert*-butyl)phenyl)-3,5-dimethyl-2,3-dihydro-1*H*-inden-1-one (***3l***)**:** Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.68 (d, *J* = 7.7 Hz, 1H), 7.31 (dd, *J* = 8.6, 1.8 Hz, 2H), 7.21 (d, *J* = 8 Hz, 1H), 7.13 (m, 4H), 2.99 (d, *J* = 20 Hz, 1H), 2.81 (d, *J* = 20 Hz, 1H), 2.4 (s, 3H), 1.8 (s, 3H), 1.29 (s, 9H); ^{13}C NMR (126 MHz, $CDCl_3$) 205.4, 163.4, 149.0, 146.3, 144.2, 133.5, 128.9, 125.7, 125.2, 123, 55.9, 45.3, 34.2, 31.2, 28.2, 22.1; MS (GCMS, m/z) 292 $[M]^+$; Anal. Calcd. for $C_{21}H_{24}O$: C, 86.26; H, 8.27. Found: C, 86.29; H, 8.26.



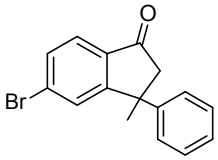
3-(4-methoxyphenyl)-3,5-dimethyl-2,3-dihydro-1*H*-inden-1-one (*3m*): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.66 (d, *J* = 7.78 Hz, 1H), 7.28 (m, 1H), 7.22 (m, 1H), 7.14 (m, 2H), 7.05 (d, *J* = 4.8 Hz, 1H), 6.83 (m, 2H), 3.78 (s, 3H), 2.96 (d, *J* = 20 Hz, 1H), 2.85 (d, *J* = 20 Hz, 1H), 2.39 (s, 3H), 1.79 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 205.5, 163.6, 157.8, 146.4, 139.5, 133.4, 128.9, 127.2, 125.6, 123.0, 113.6, 56.0, 55.1, 45.1, 28.3, 22.1, 14.0; MS (GCMS, m/z) 266 $[M]^+$; Anal. Calcd. for $C_{18}H_{18}O_2$: C, 81.17; H, 6.81. Found: C, 81.16; H, 6.82.



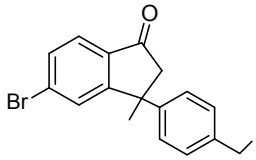
3-(4-*tert*-butyl)phenyl)-3,6-dimethyl-2,3-dihydro-1*H*-inden-1-one (*3n*): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.57 (s, 1H), 7.42 (dd, *J* = 7.9, 1.6 Hz, 1H), 7.31 (m, 2H), 7.2 (d, *J* = 7.9 Hz, 1H), 7.11 (d, *J* = 7.3 Hz, 2H), 3.01 (d, *J* = 15 Hz, 1H), 2.87 (d, *J* = 15 Hz, 1H), 2.42 (s, 3H), 1.80 (s, 3H), 1.29 (s, 9H); ^{13}C NMR (126 MHz, $CDCl_3$) ; MS (GCMS, m/z) 292 $[M]^+$; Anal. Calcd. for $C_{21}H_{24}O$: C, 86.26; H, 8.27. Found: C, 86.29; H, 8.27.



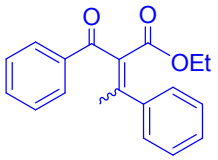
5-chloro-3-methyl-3-phenyl-2,3-dihydro-1*H*-inden-1-one (*3o*): Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.72 (d, *J* = 8.2 Hz, 1H), 7.39 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.31 (m, 2H), 7.28 (m, 2H), 7.2 (m, 2H), 3.03 (d, *J* = 20 Hz, 1H), 2.9 (d, *J* = 20 Hz, 1H), 1.83 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 204.2, 164.3, 146.3, 141.6, 134.0, 128.6, 126.6, 126.0, 125.7, 124.5, 55.7, 45.8, 28.0; MS (GCMS, m/z) 256 $[M]^+$; Anal. Calcd. for $C_{16}H_{13}ClO$: C, 74.85; H, 5.10. Found: C, 74.84; H, 5.12.



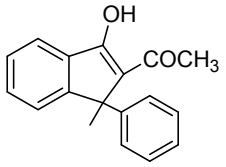
5-bromo-3-methyl-3-phenyl-2,3-dihydro-1*H*-inden-1-one (*3p*): Orangish Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.2 Hz, 1H), 7.56 (dd, *J* = 8.1, 1.7 Hz, 1H), 7.43 (s, 1H), 7.34 (m, 2H), 7.27 (m, 1H), 7.20 (m, 2H), 3.01 (d, *J* = 20 Hz, 1H), 2.88 (d, *J* = 20 Hz, 1H), 1.83 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 204.4, 164.3, 146.3, 134.4, 131.4, 130.4, 128.8, 128.6, 126.6, 126.0, 124.6, 55.6, 45.9, 28.1; MS (GCMS, m/z) 300 $[M]^+$; Anal. Calcd. for $C_{16}H_{13}BrO$: C, 63.81; H, 4.35. Found: C, 63.81; H, 4.33.



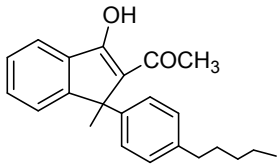
5-bromo-3-(4-ethylphenyl)-3-methyl-2,3-dihydro-1*H*-inden-1-one (*3q*): Orangish Yellow liquid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.66 (m, 1H), 7.56 (m, 1H), 7.43 (s, 1H), 7.14 (d, *J* = 7.5 Hz, 2H), 7.11 (m, 2H), 3.0 (d, *J* = 15 Hz, 1H), 2.87 (d, *J* = 15 Hz, 1H), 2.63 (q, 2H), 1.81 (s, 3H), 1.25 (t, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 204.6, 164.6, 143.5, 142.5, 134.3, 131.3, 130.4, 128.8, 128.0, 126.0, 124.5, 55.6, 45.6, 28.2, 28.1, 15.3; MS (GCMS, m/z) 328 $[M]^+$; Anal. Calcd. for $C_{18}H_{17}BrO$: C, 65.67; H, 5.20. Found: C, 65.7; H, 5.18.



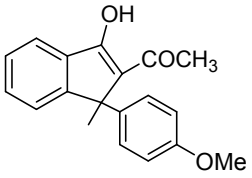
Ethyl-2-benzoyl-3-phenylbut-2-enoate (*3a'*): Light Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.06 (m, 1H), 7.74 (d, *J* = 7.5 Hz, 2H), 7.51 (d, *J* = 7.5 Hz, 1H), 7.44 (m, 2H), 7.32 (d, *J* = 7.2 Hz, 2H), 7.12 (s, 5H), 4.17 (q, 2H), 3.91 (q, 1H), 2.60 (s, 3H), 2.09 (s, 2H), 1.11 (t, 3H), 0.86 (t, 2H); ^{13}C NMR (126 MHz, $CDCl_3$) 194.8, 194.4, 165.3, 165.0, 154.9, 152.9, 141.4, 141.1, 137.4, 136.9, 133.6, 132.8, 131.4, 131.3, 129.1, 129.0, 128.8, 128.4, 128.2, 127.4, 126.7, 60.9, 60.8, 23.7, 22.7, 13.9, 13.5; MS (GCMS, m/z) 292 $[M]^+$; Anal. Calcd. for $C_{19}H_{18}O_3$: C, 77.53; H, 6.16. Found: C, 77.55; H, 6.17.



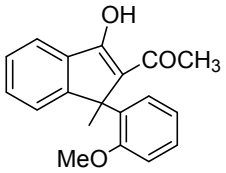
1-(3-hydroxy-1-methyl-1-phenyl-1*H*-inden-2-yl)ethanone (5a): Orangish Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 14.38 (s, 1H), 7.83 (d, *J* = 7.6 Hz, 1H), 7.49 (m, 2H), 7.38 (m, 1H), 7.27 (m, 4H), 7.12 (d, *J* = 7.8 Hz, 1H), 1.87 (s, 3H), 1.74 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 193.9, 176.6, 159.2, 143.9, 135.3, 134.0, 128.4, 127.5, 126.5, 124.1, 123.1, 121.9, 48.9, 24.8, 20.0; MS (GCMS, m/z) 264 $[M]^+$; Anal. Calcd. for $C_{18}H_{16}O_2$: C, 81.79; H, 6.10. Found: C, 81.77; H, 6.10.



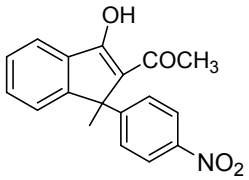
1-(3-hydroxy-1-methyl-1-(4-pentylphenyl)-1*H*-inden-2-yl)ethanone (5b): Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 14.38 (s, 1H), 7.82 (d, *J* = 7.6 Hz, 1H), 7.46 (d, *J* = 7.7 Hz, 1H), 7.36 (t, 2H), 7.14 (d, *J* = 8.1 Hz, 2H), 7.07 (d, *J* = 8.3 Hz, 2H), 2.58 (m, 2H), 1.86 (s, 3H), 1.75 (s, 3H), 1.58 (t, 2H), 1.40 (m, 4H), 0.91 (t, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 194.0, 176.5, 159.4, 141.0, 140.9, 135.3, 134.0, 129.5, 128.4, 127.4, 126.1, 124.1, 123.1, 121.9, 48.6, 35.3, 31.5, 30.9, 24.9, 22.5, 20.0, 14.0; MS (GCMS, m/z) 334 $[M]^+$; Anal. Calcd. for $C_{23}H_{26}O_2$: C, 82.60; H, 7.84. Found: C, 82.63; H, 7.82.



1-(3-hydroxy-1-(4-methoxyphenyl)-1-methyl-1*H*-inden-2-yl)ethanone (5c): Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ Yellow liquid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 14.29 (s, 1H), 7.73 (d, *J* = 7.6 Hz, 1H), 7.42 (m, 1H), 7.28 (t, 1H), 7.12 (m, 3H), 6.75 (m, 2H), 3.69 (s, 3H), 1.77 (s, 3H), 1.68 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 194.0, 176.4, 159.5, 158.0, 135.8, 135.1, 134.0, 127.4, 124.0, 123.1, 121.8, 113.7, 55.1, 48.3, 25.0, 19.9; MS (GCMS, m/z) 294 $[M]^+$; Anal. Calcd. for $C_{19}H_{18}O_3$: C, 77.53; H, 6.16. Found: C, 77.55; H, 6.15.

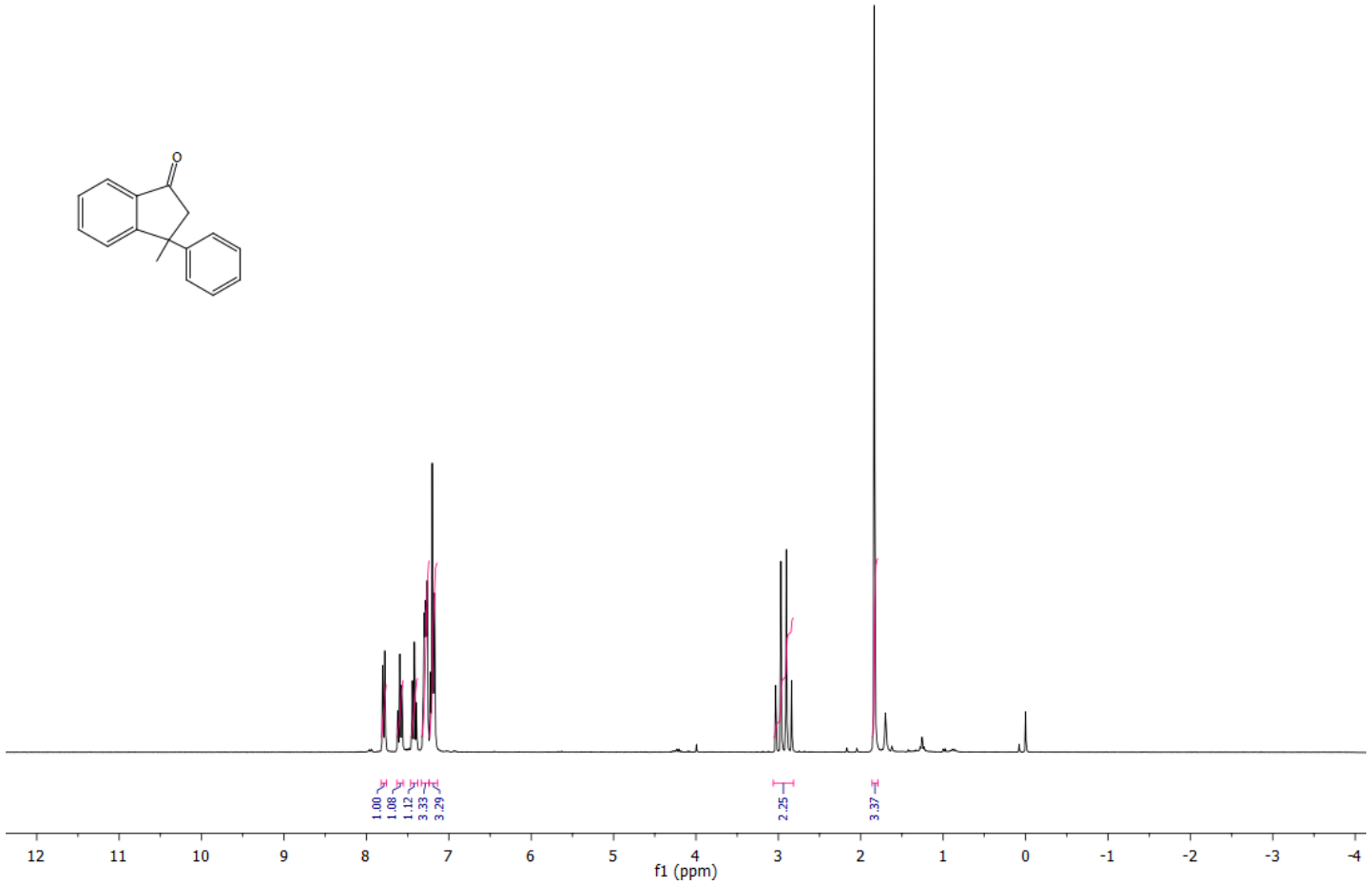


1-(3-hydroxy-1-(2-methoxyphenyl)-1-methyl-1*H*-inden-2-yl)ethanone (5d): Light yellow solid: ^{1}H NMR (500 MHz, $CDCl_3$) δ 14.07 (s, 1H), 7.83 (d, *J* = 7.5 Hz, 1H), 7.65 (dd, *J* = 7.8, 1.7, 1H), 7.43 (t, 1H), 7.35 (t, 1H), 7.27 (m, 1H), 7.09 (m, 2H), 6.71 (dd, *J* = 8.2, 1.3, 1H), 3.22 (s, 3H), 1.79 (s, 3H), 1.69 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 195.4, 171.9, 159.3, 157.5, 136.3, 133.4, 132.1, 128.4, 127.4, 126.8, 122.7, 120.9, 120.3, 112.6, 55.4, 46.9, 26.5, 18.8; MS (GCMS, m/z) 294 $[M]^+$; Anal. Calcd. for $C_{19}H_{18}O_3$: C, 77.53; H, 6.16. Found: C, 77.54; H, 6.15.

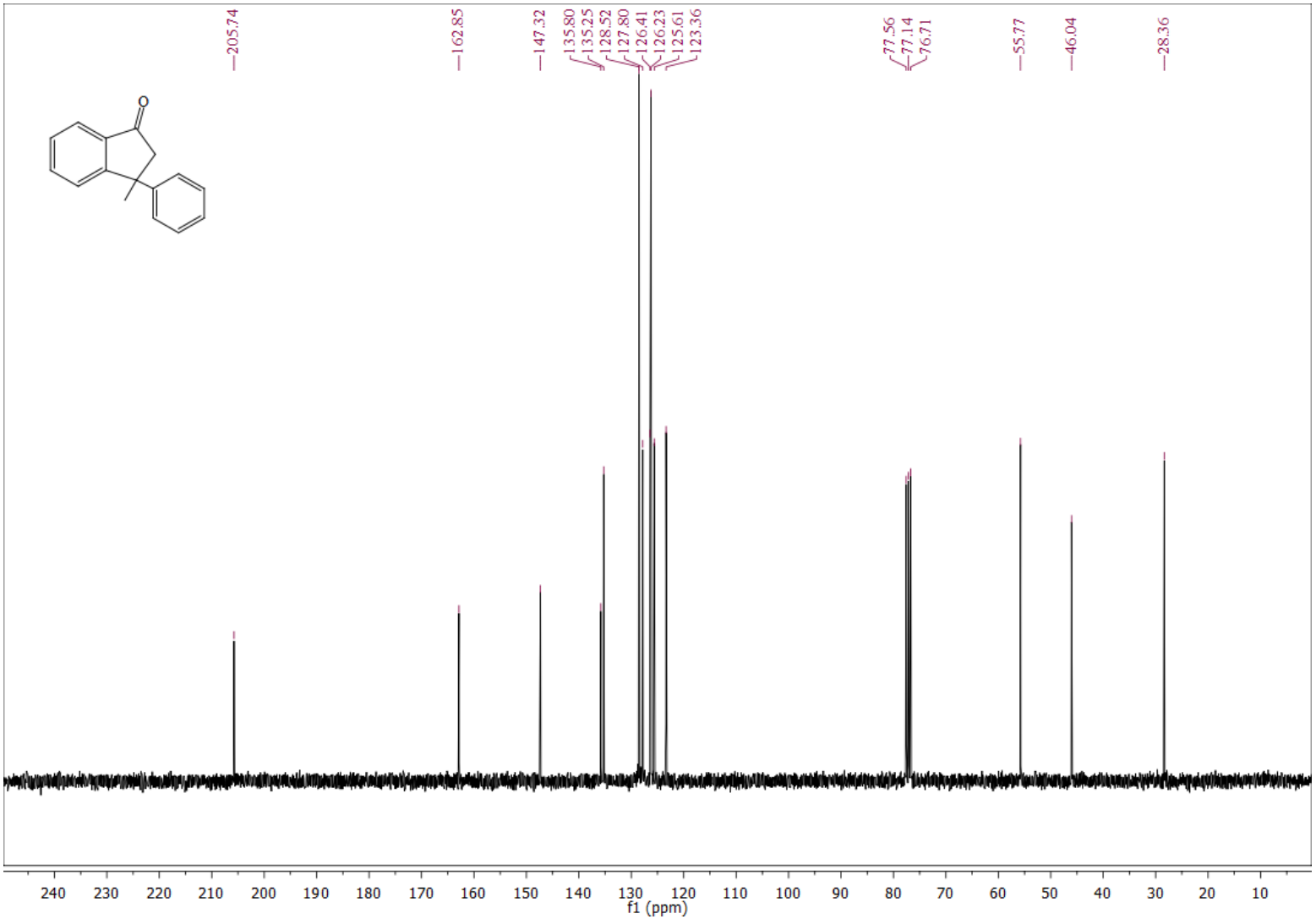


1-(3-hydroxy-1-methyl-1-(4-nitrophenyl)-1*H*-inden-2-yl)ethanone (5e): Yellow gum: ^{1}H NMR (500 MHz, $CDCl_3$) δ 14.38 (s, 1H), 8.14 (d, *J* = 8.9 Hz, 2H), 7.87 (dd, *J* = 7.5, 1.1 Hz, 1H), 7.52 (t, 1H), 7.46 (m, 3H), 7.09 (dd, *J* = 7.7, 1.0 Hz, 1H), 1.94 (s, 3H), 1.75 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) 193.6, 176.6, 157.6, 152.0, 146.5, 135.3, 134.4, 128.2, 127.3, 123.9, 123.7, 123.6, 121.2, 49.0, 24.7, 20.1; MS (GCMS, m/z) 309 $[M]^+$; Anal. Calcd. for $C_{18}H_{15}NO_4$: C, 69.89; H, 4.89, N, 4.53. Found: C, 69.88; H, 4.9 N, 4.51.

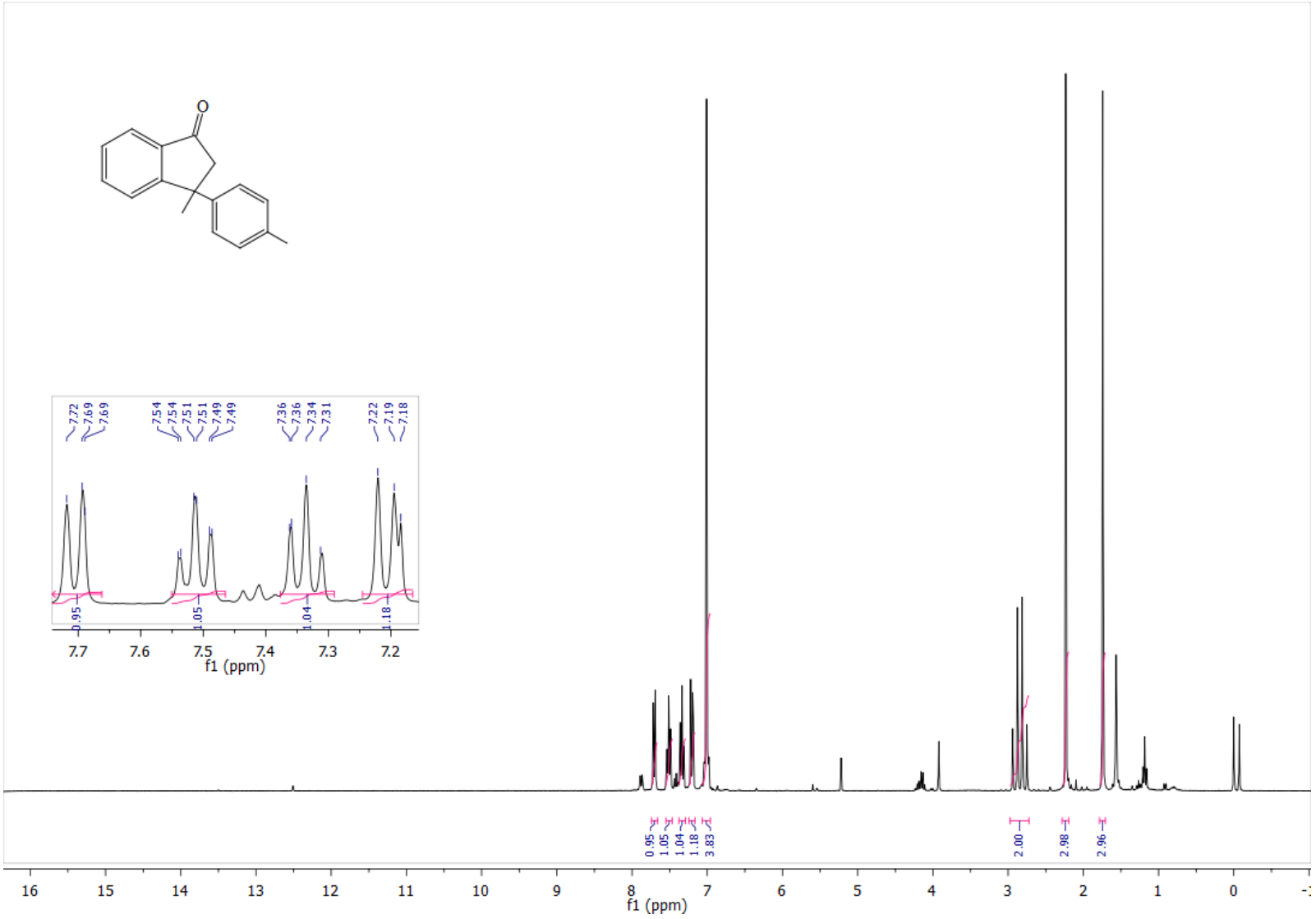
Spectral Copies



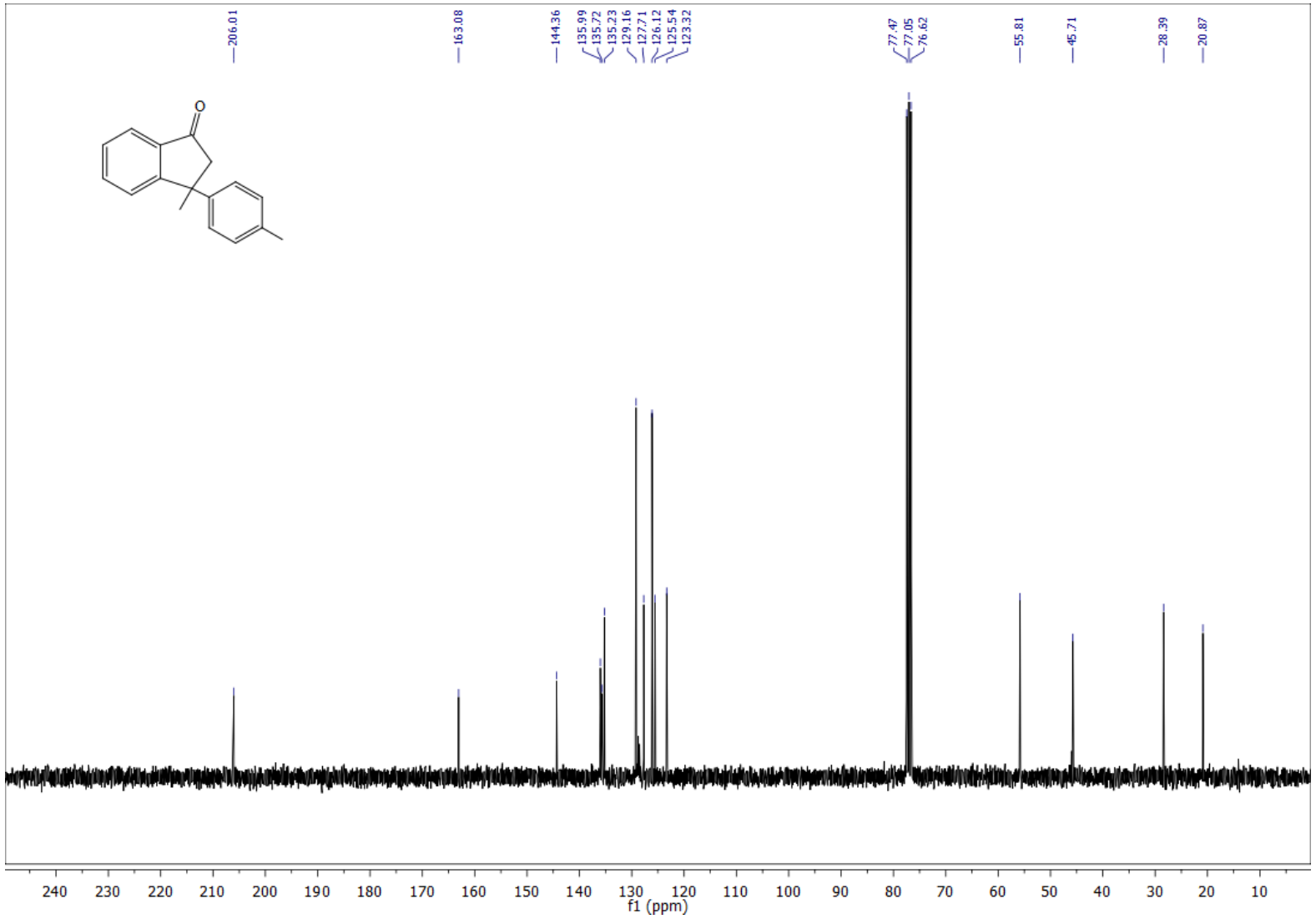
^{1}H NMR Spectrum of compound **3a**



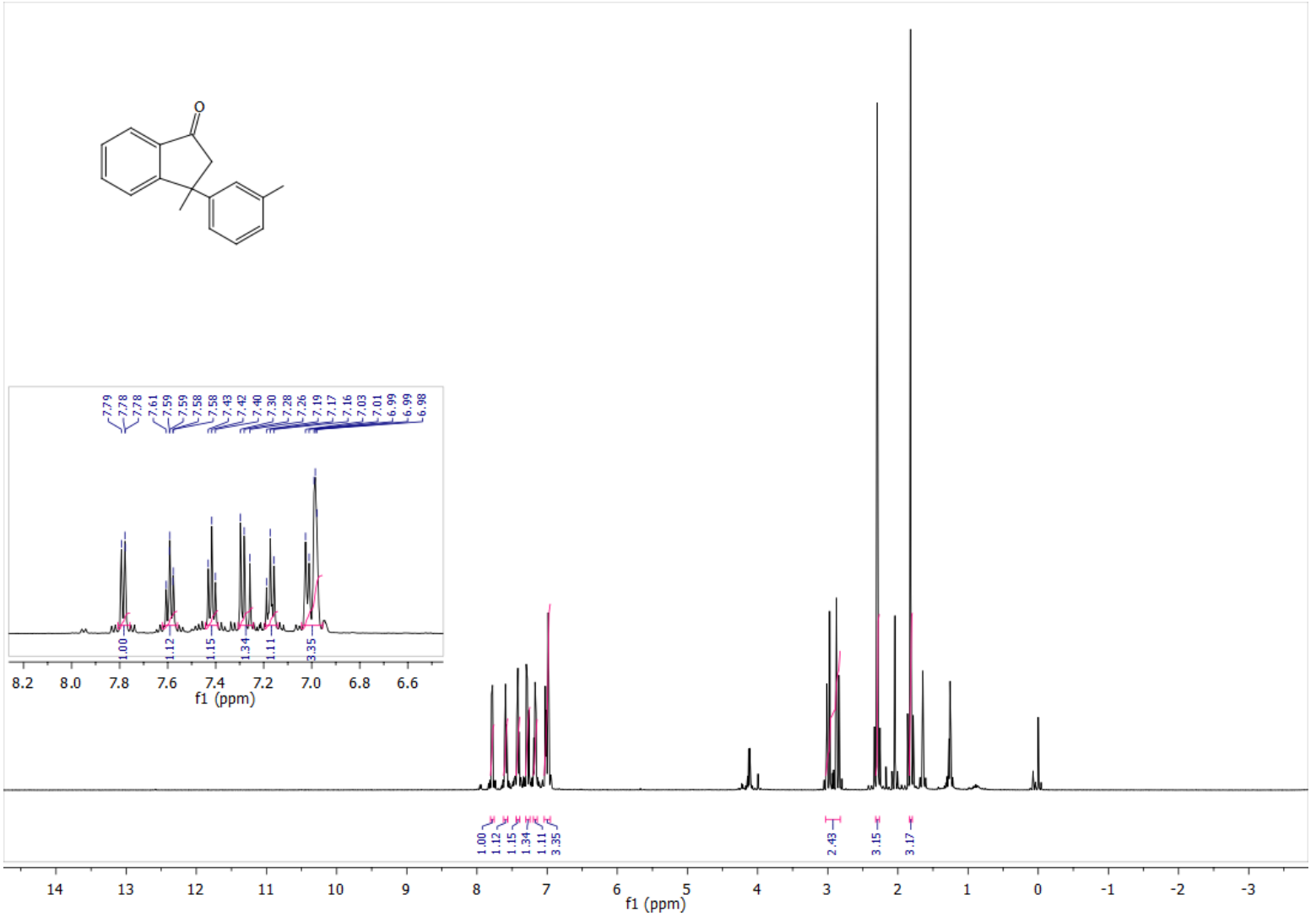
^{13}C NMR Spectrum of compound **3a**



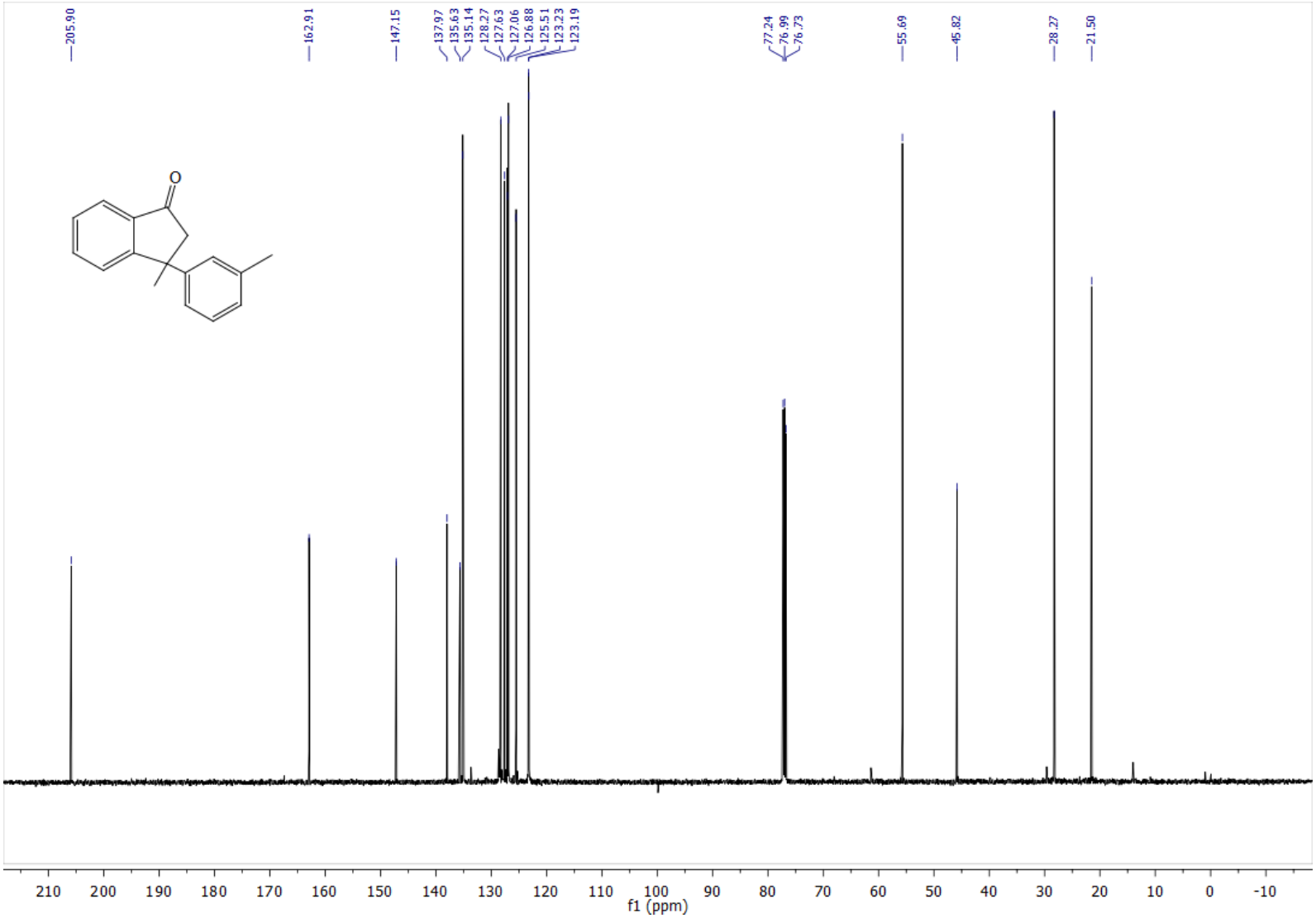
^{1}H NMR Spectrum of compound **3b**



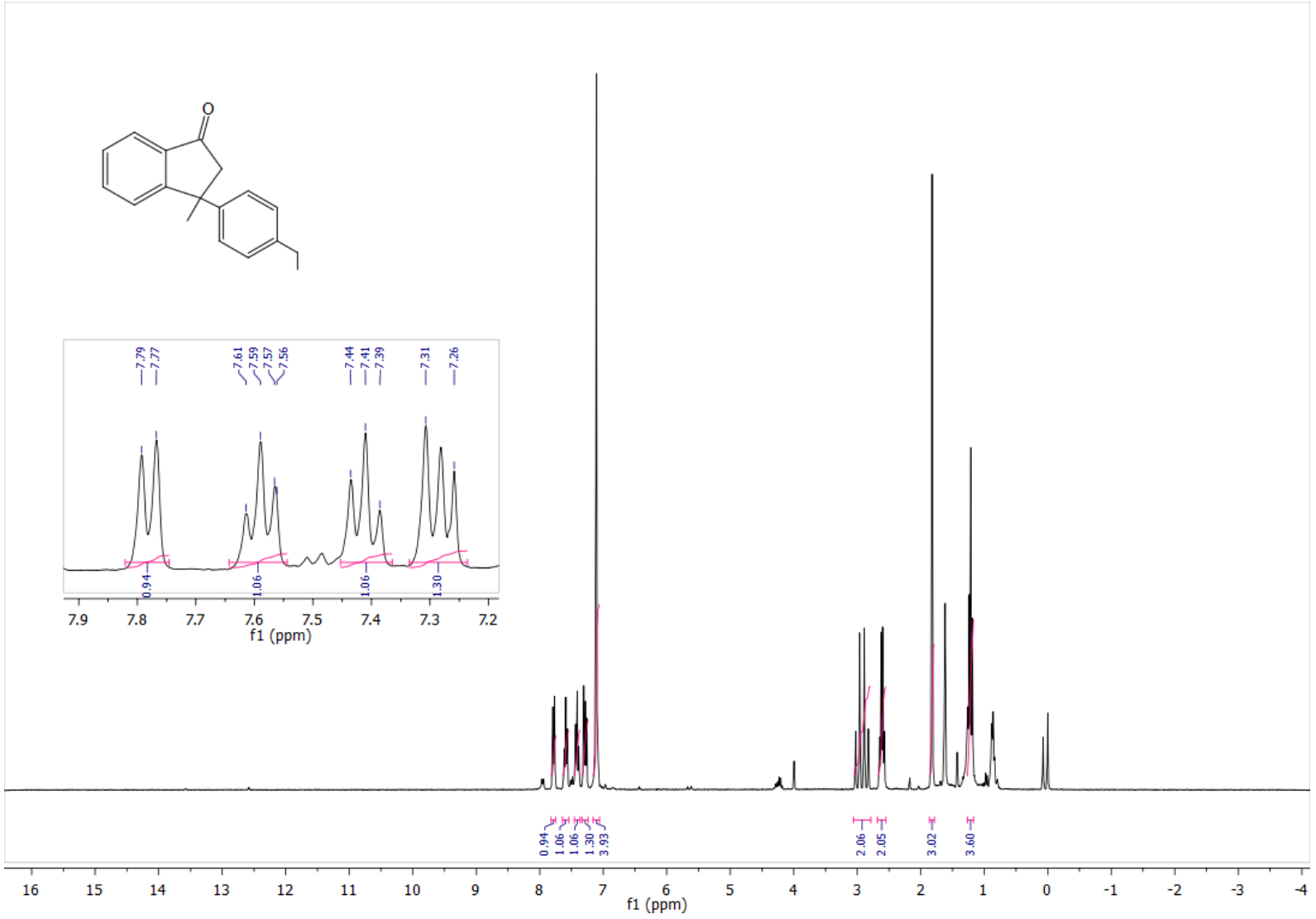
^{13}C NMR Spectrum of compound **3b**



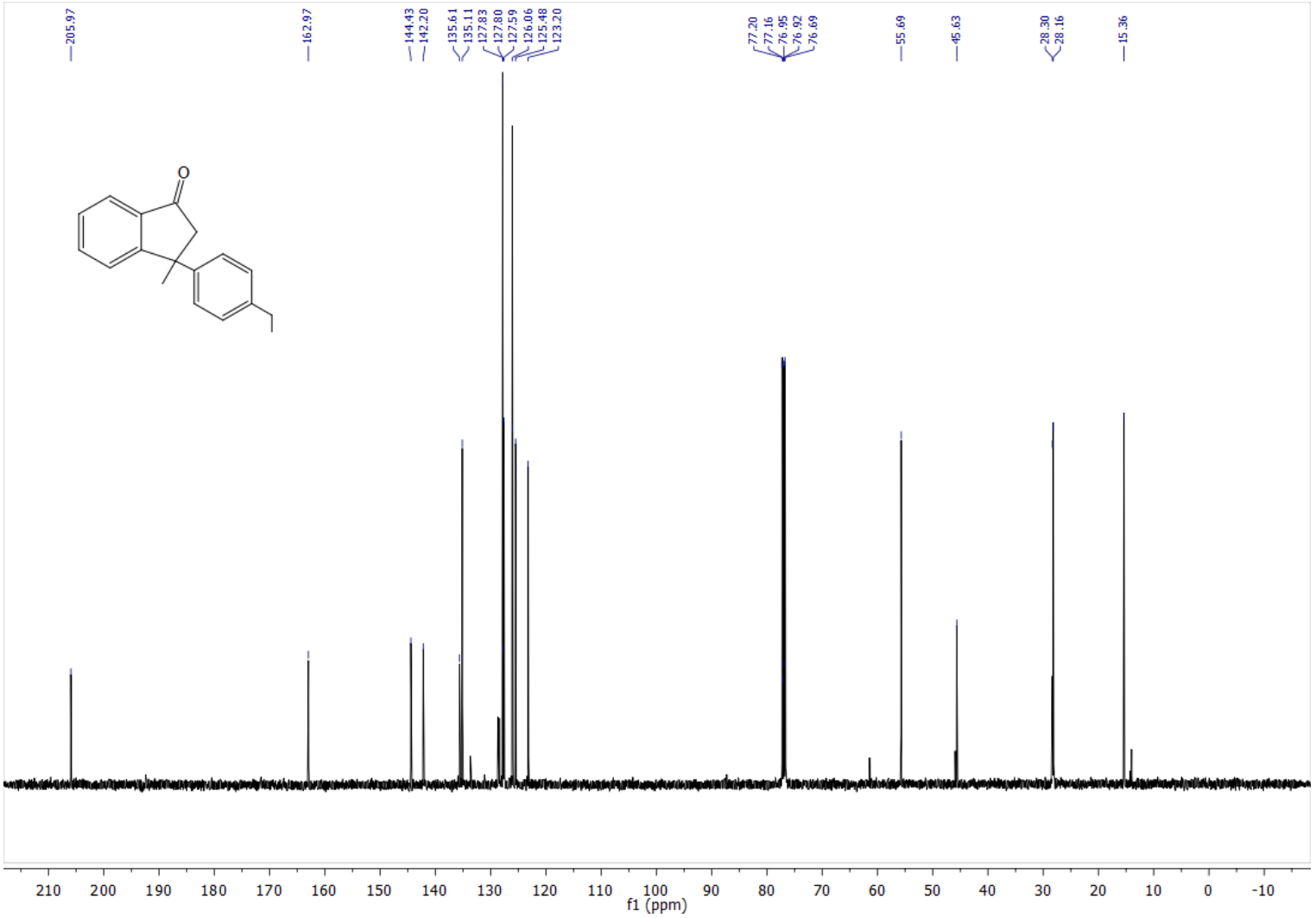
^{1}H NMR Spectrum of compound **3c**



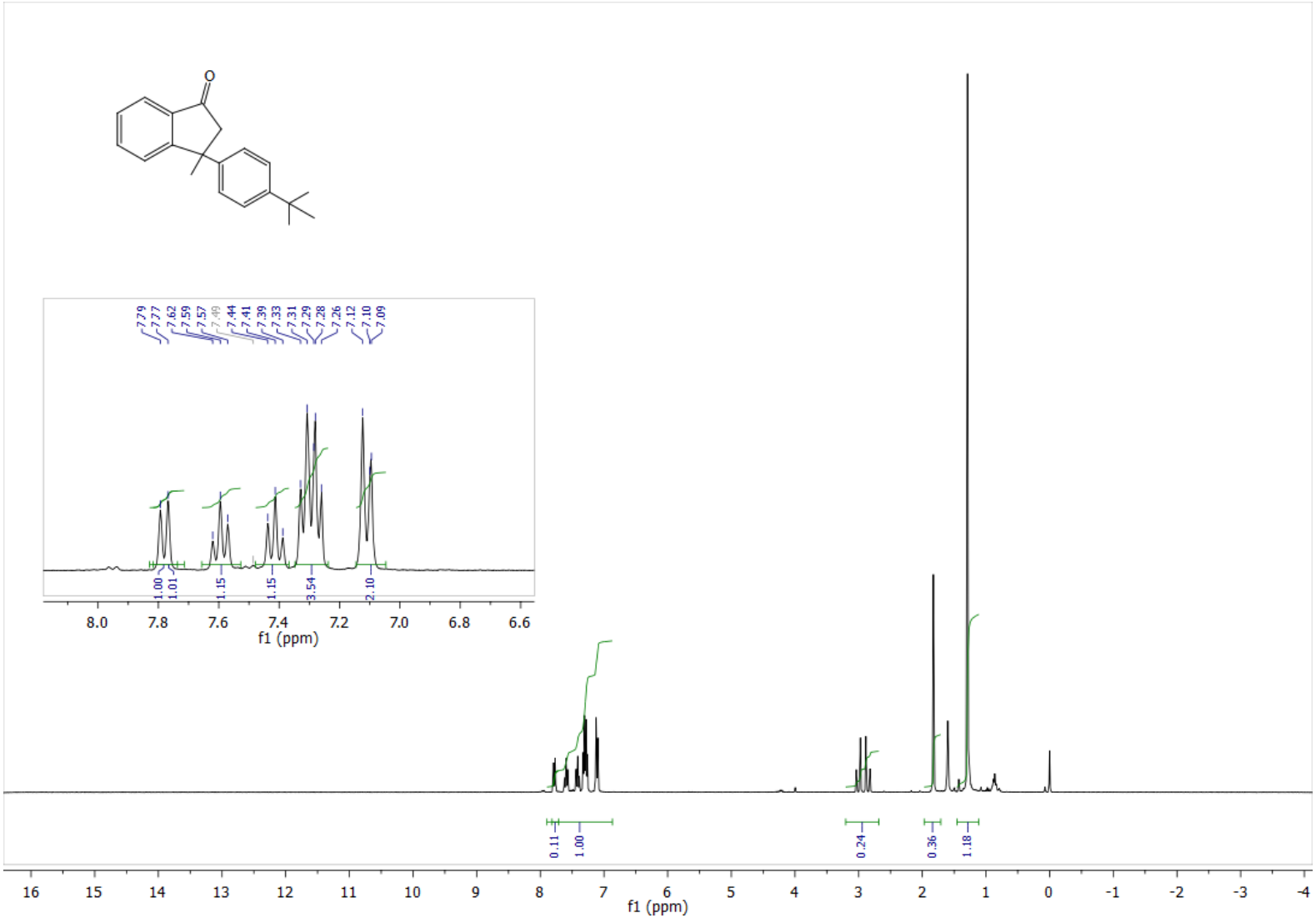
^{13}C NMR Spectrum of compound **3c**



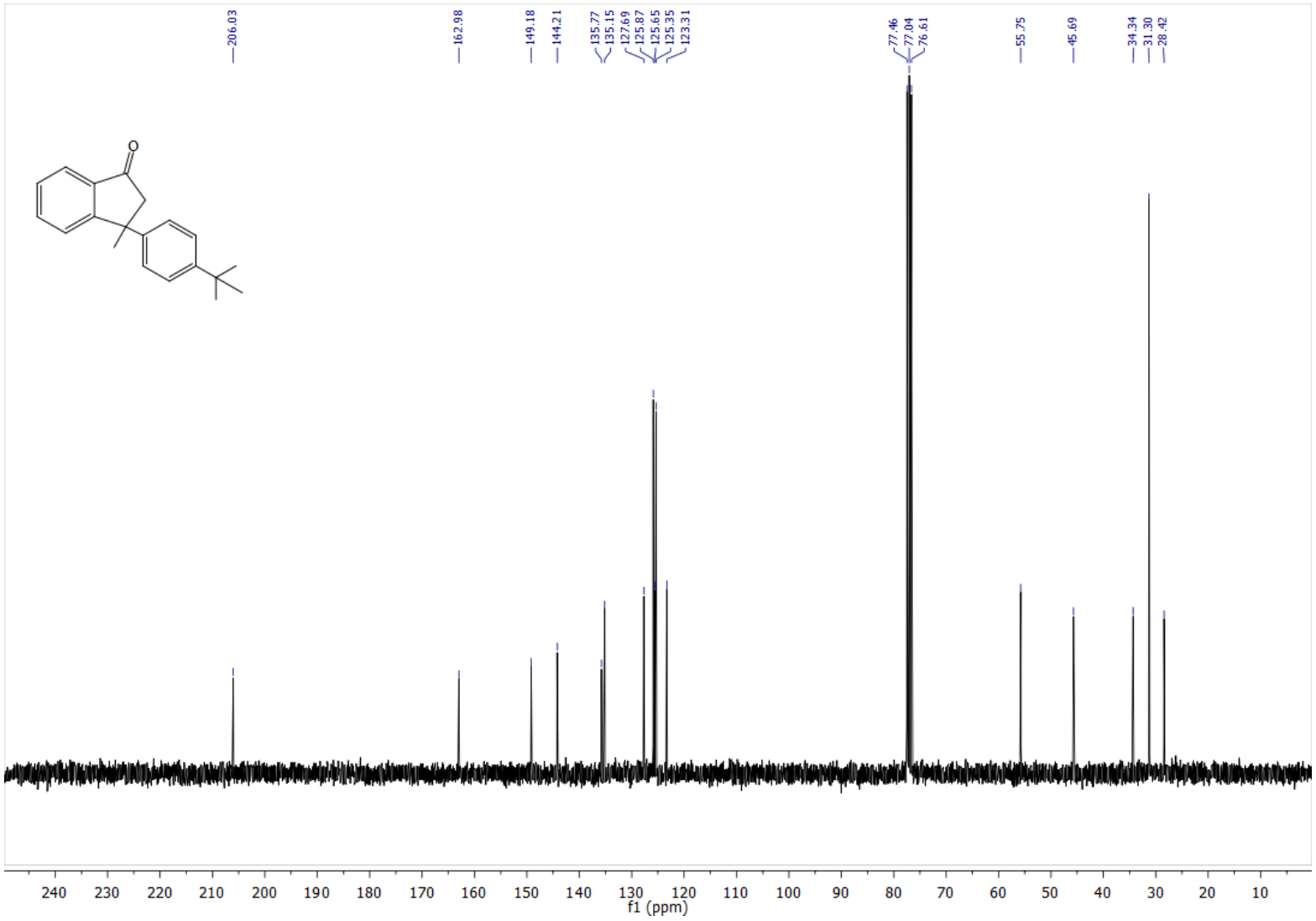
^{1}H NMR Spectrum of compound **3d**



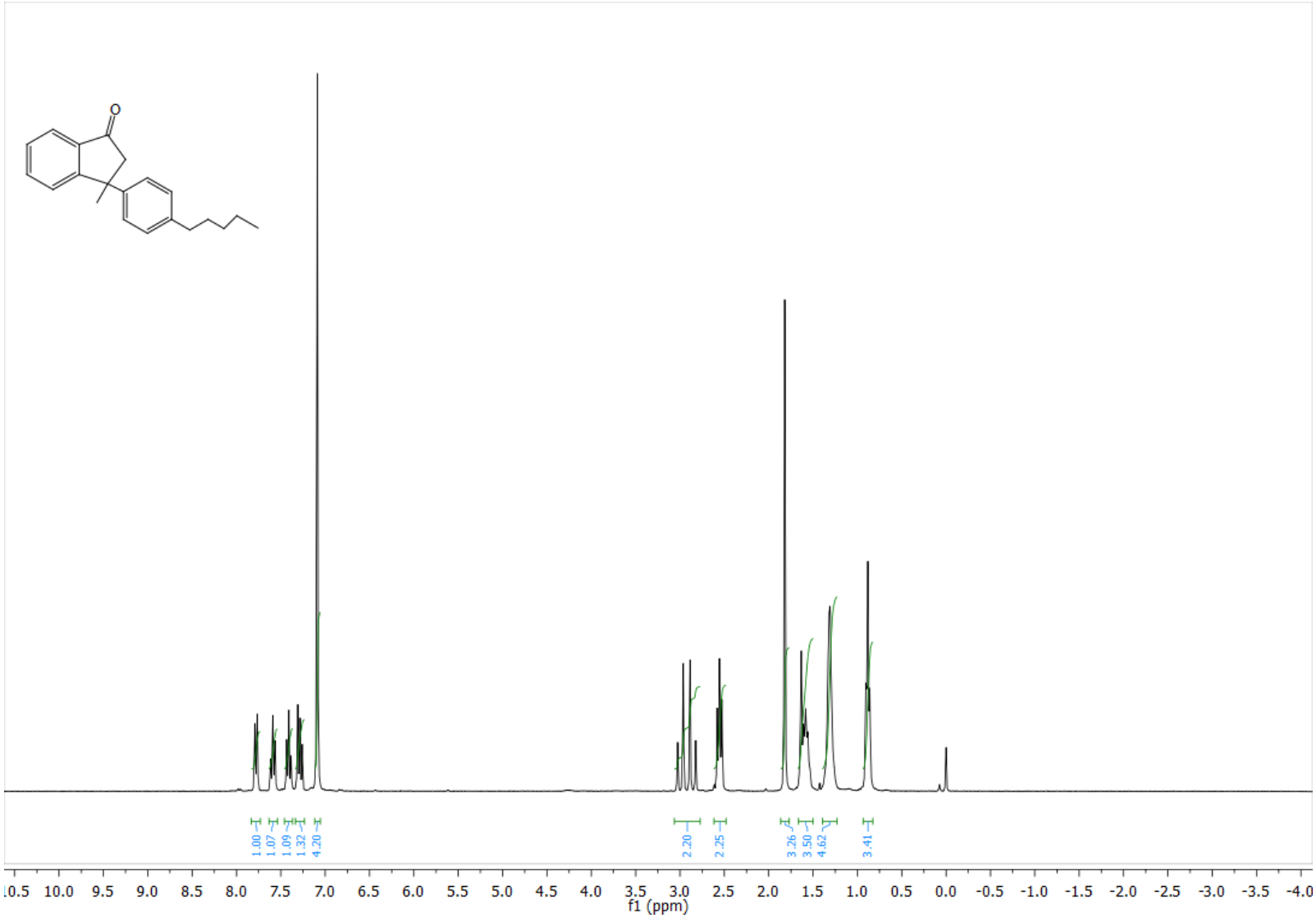
^{13}C NMR Spectrum of compound **3d**



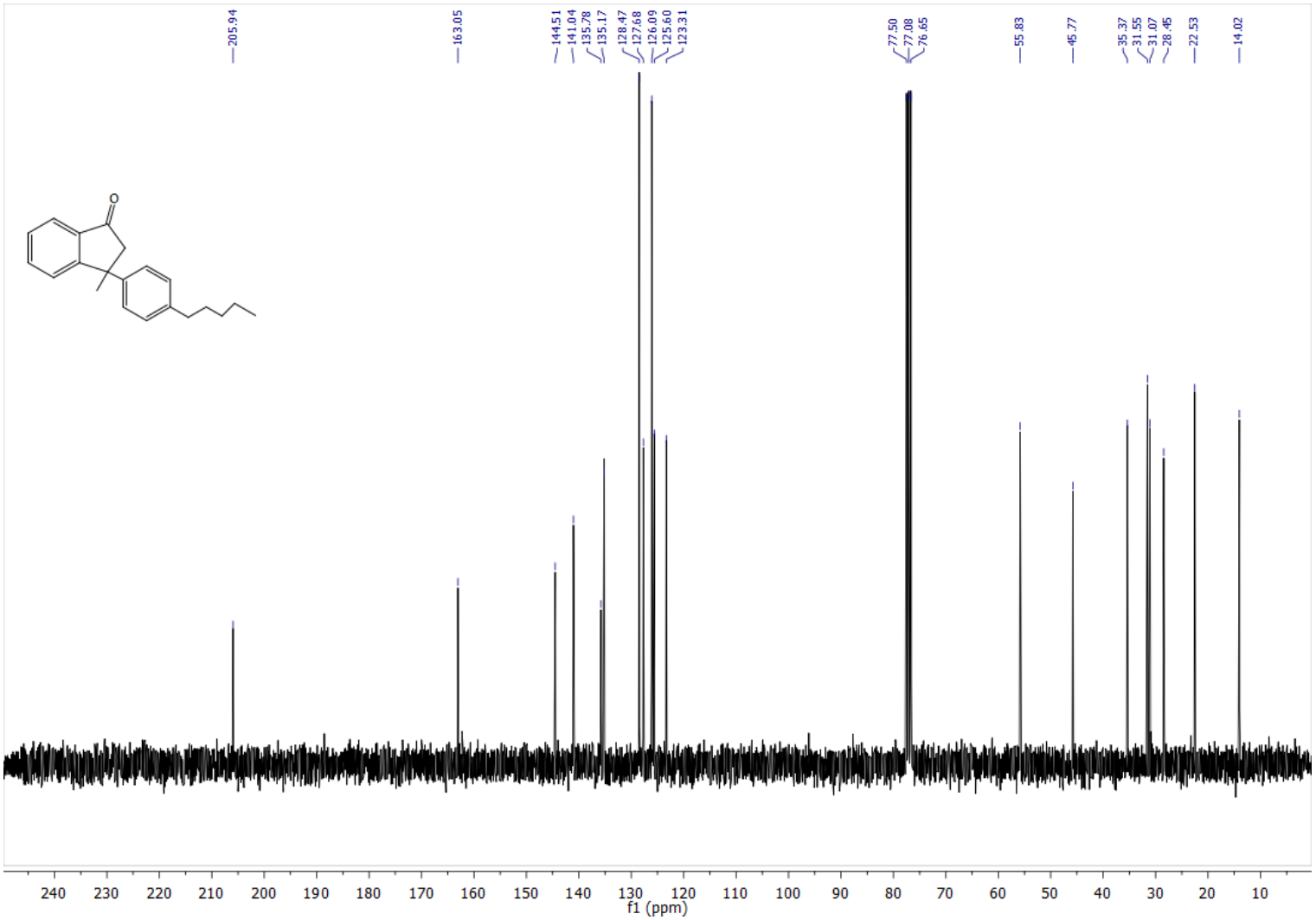
^{1}H NMR Spectrum of compound **3e**



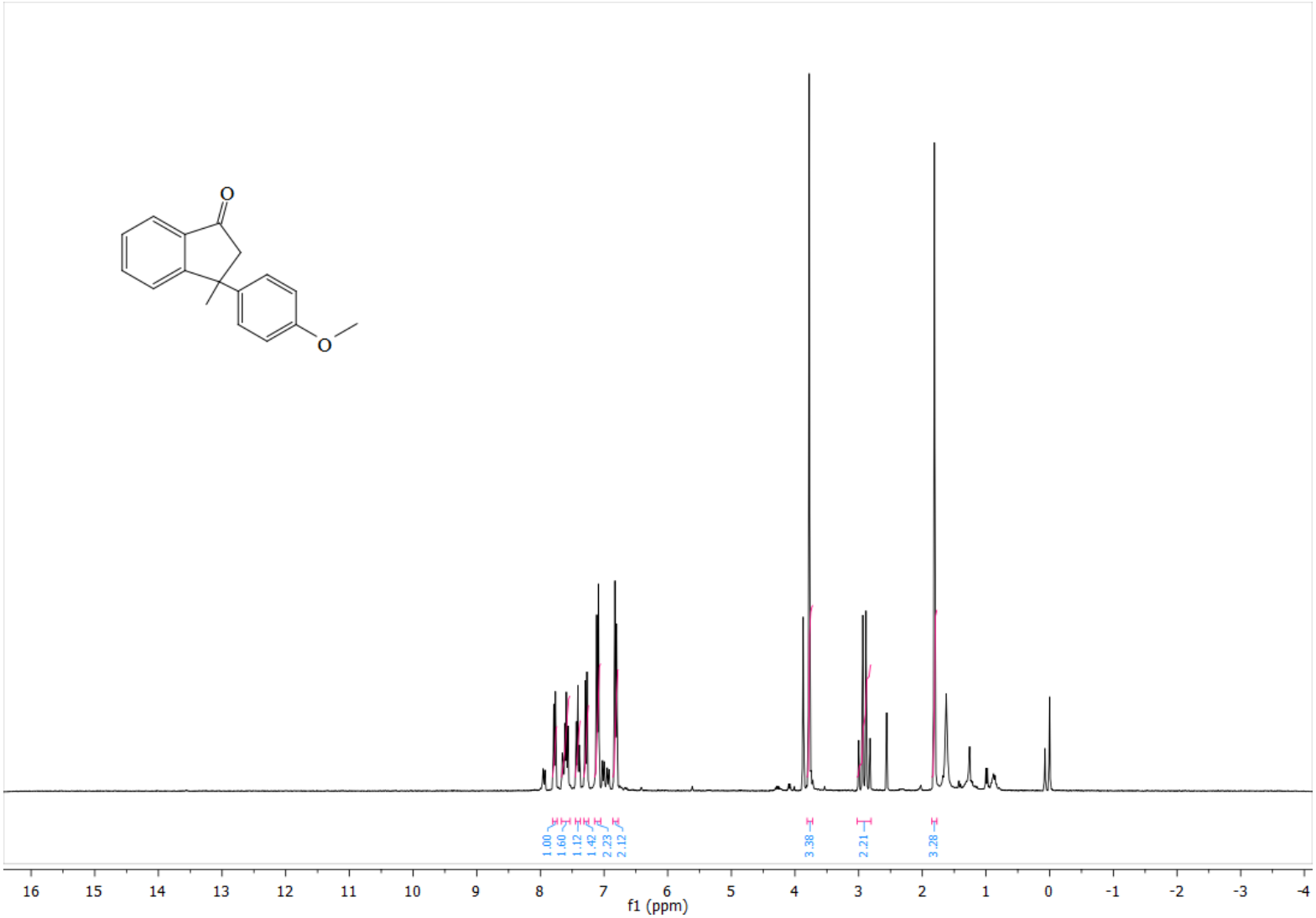
^{13}C NMR Spectrum of compound **3e**



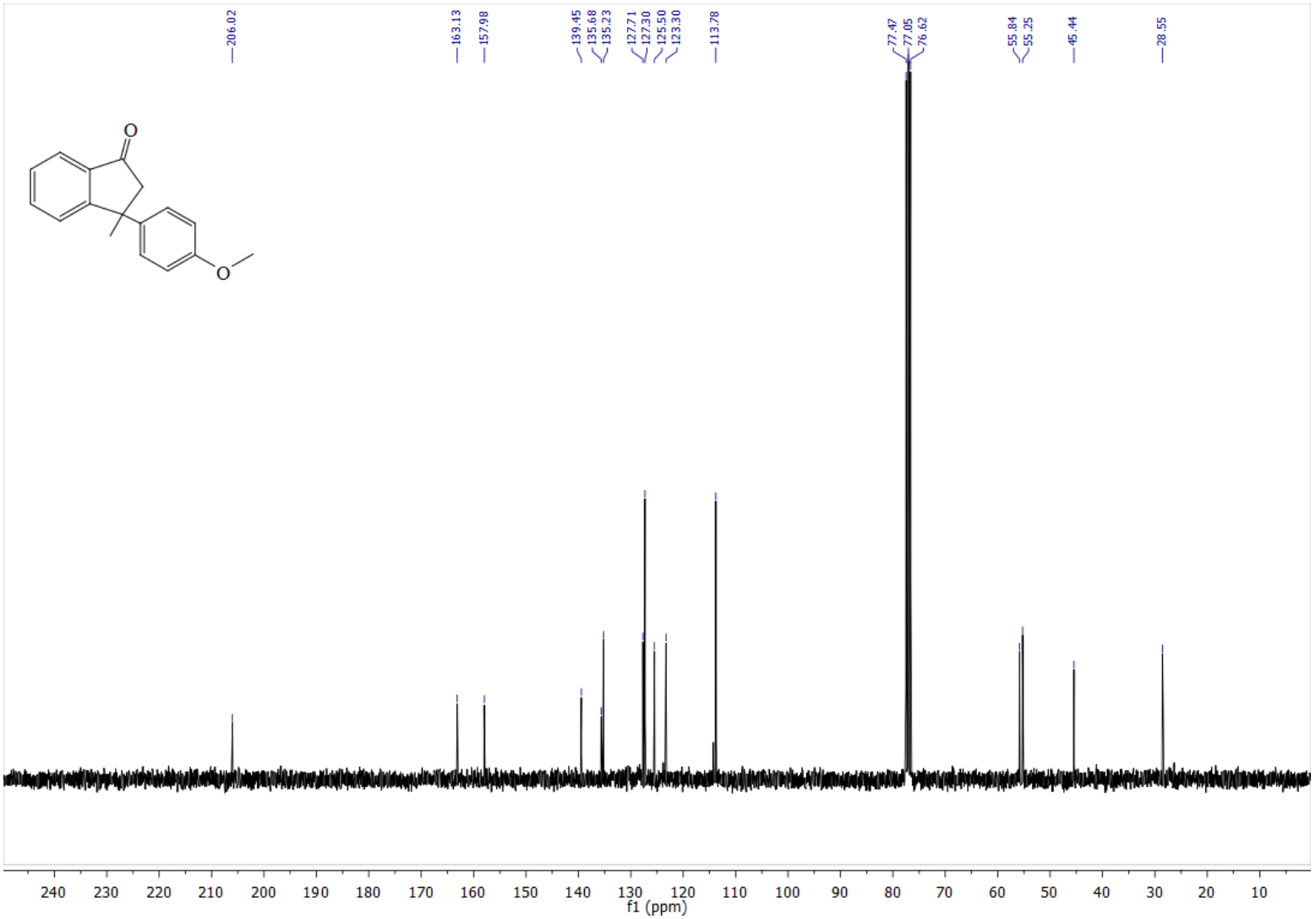
^{1}H NMR Spectrum of compound **3f**



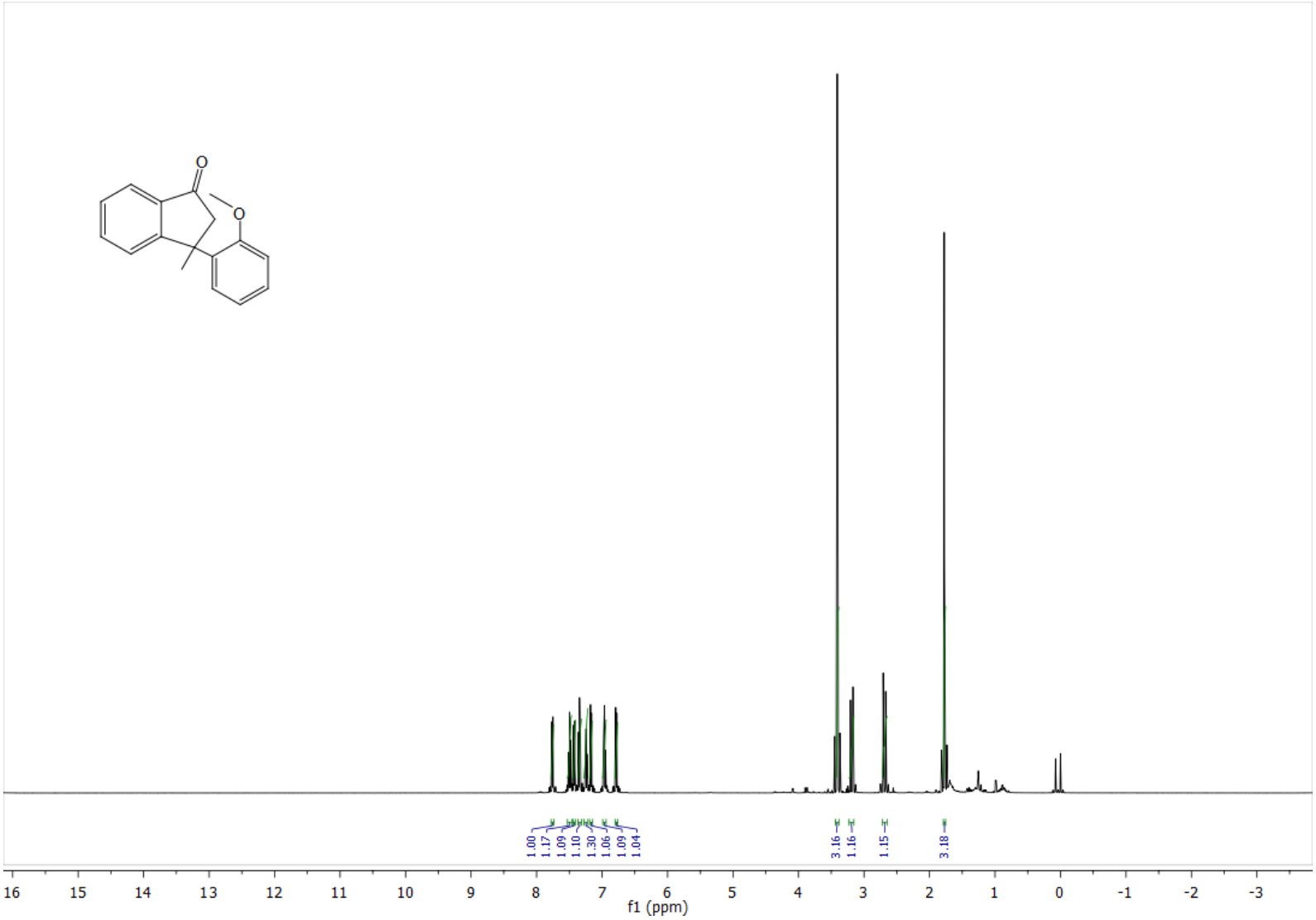
^{13}C NMR Spectrum of compound **3f**



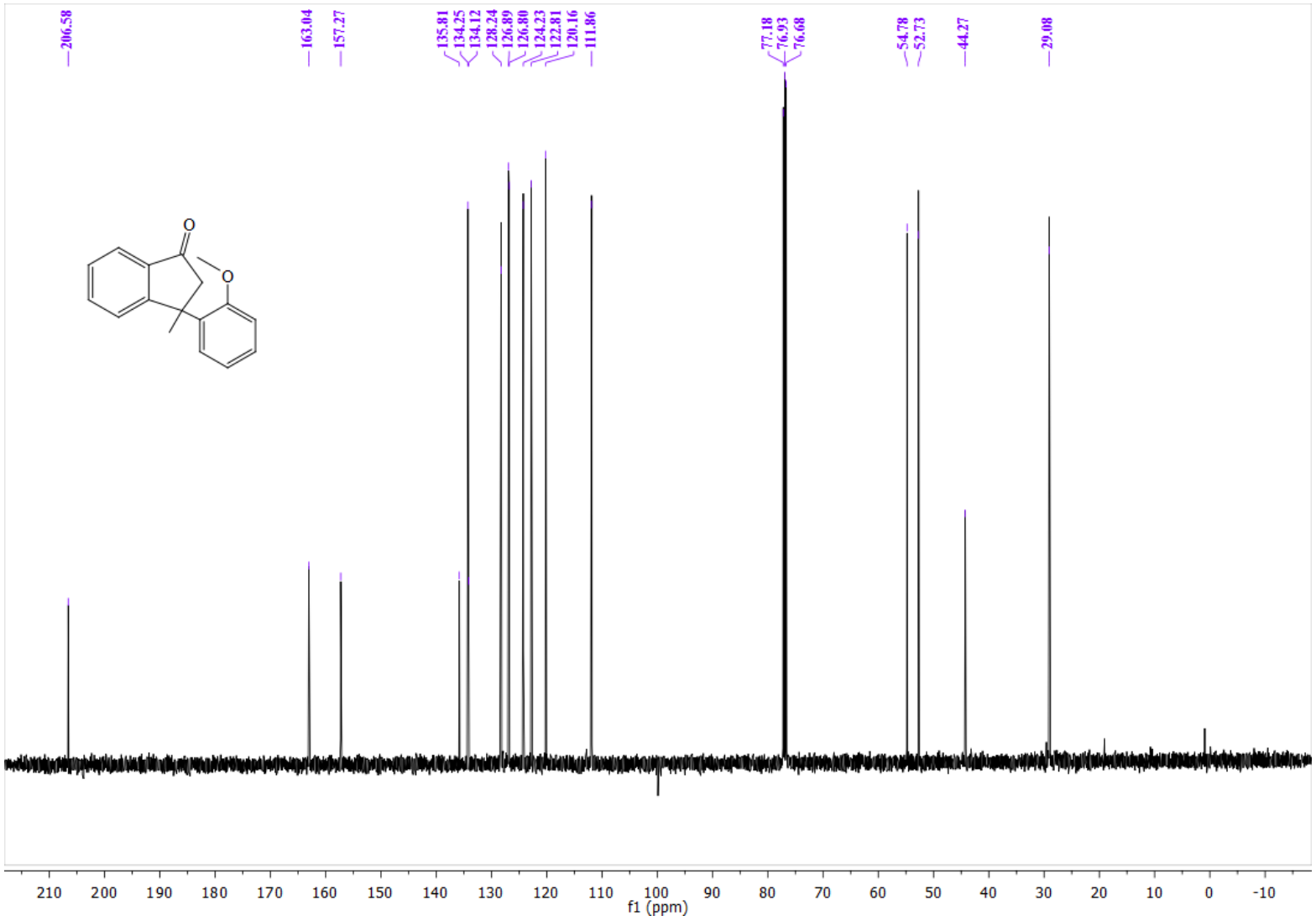
^{1}H NMR Spectrum of compound **3g**



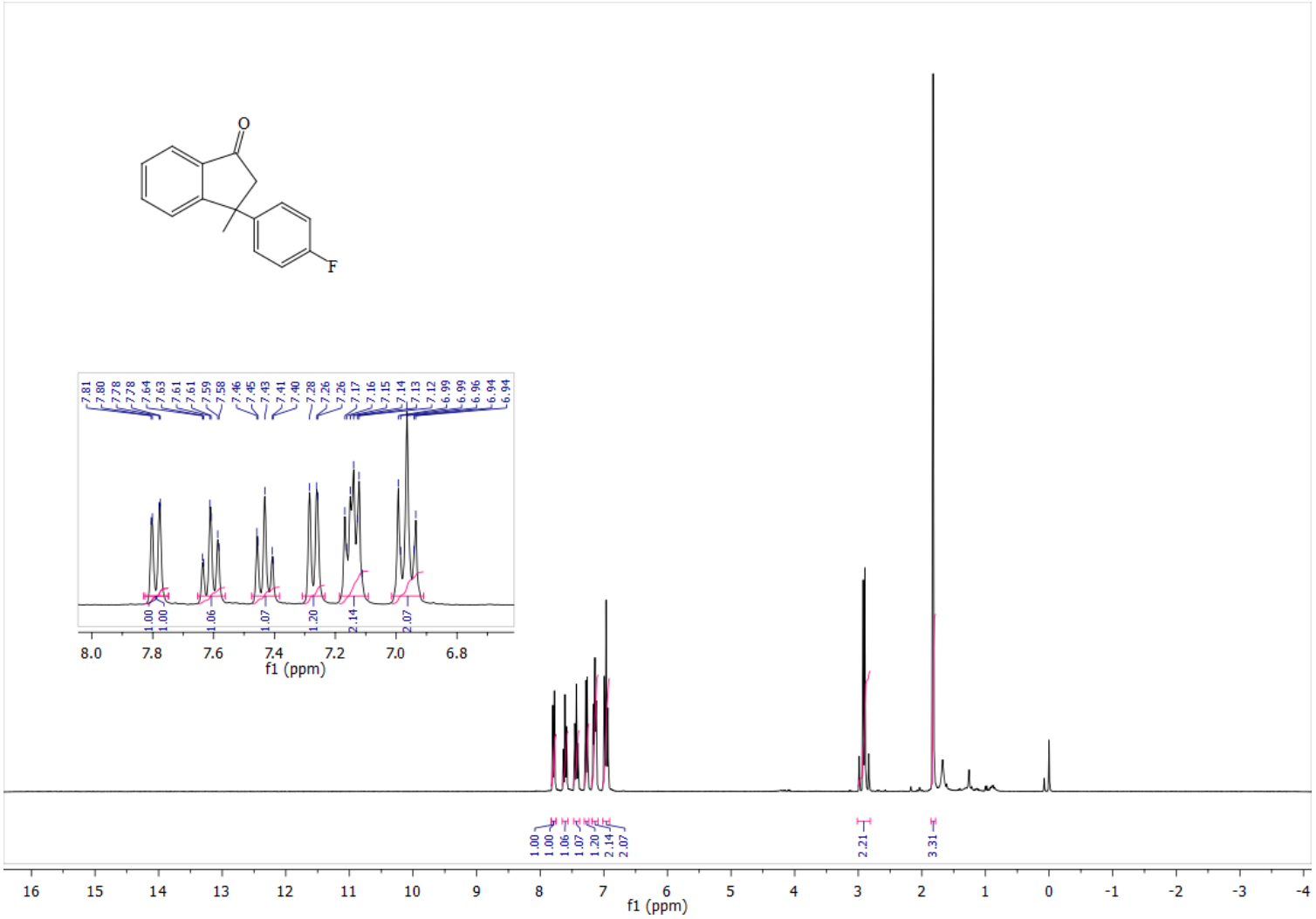
^{13}C NMR Spectrum of compound **3g**



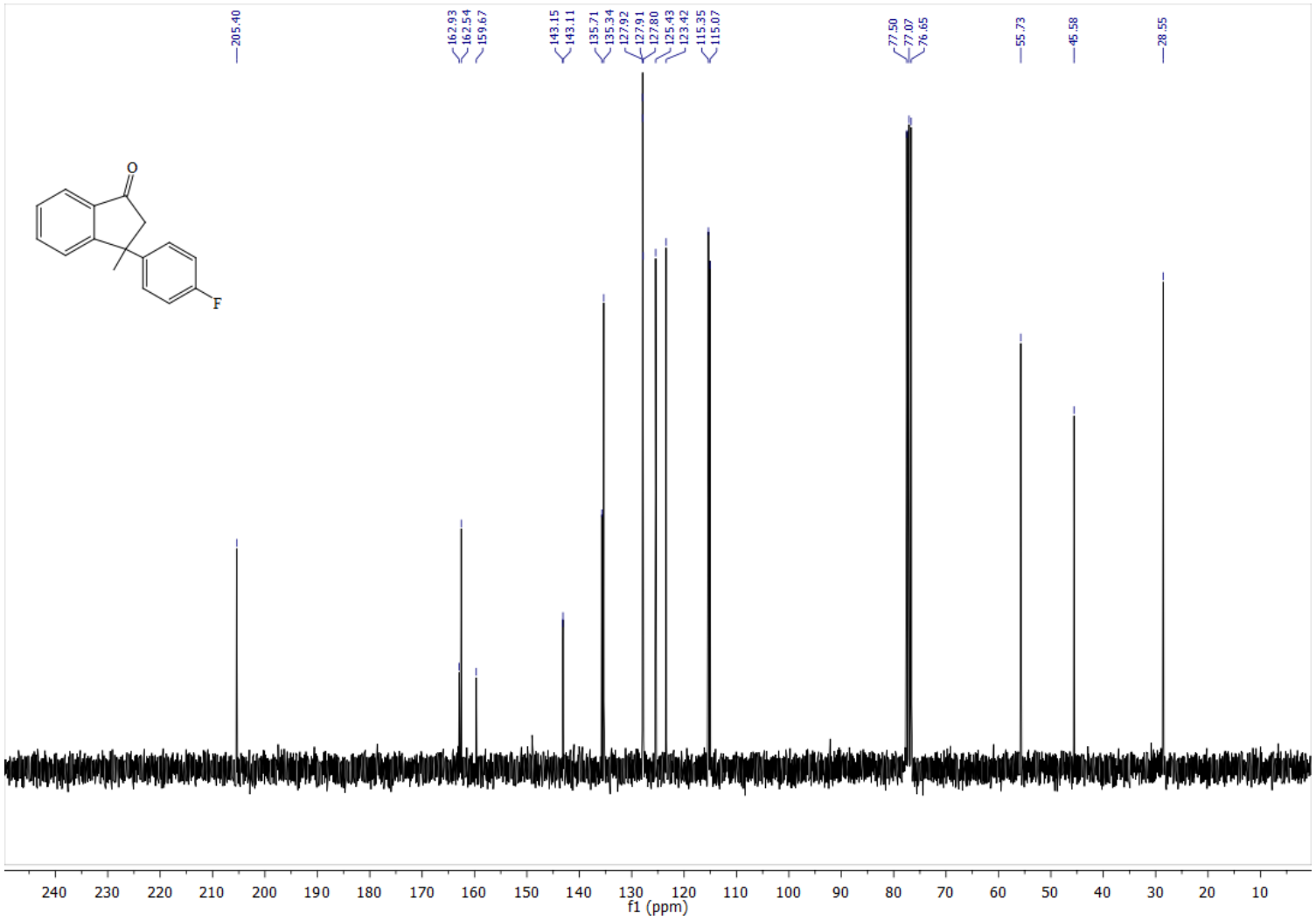
^{1}H NMR Spectrum of compound **3h**



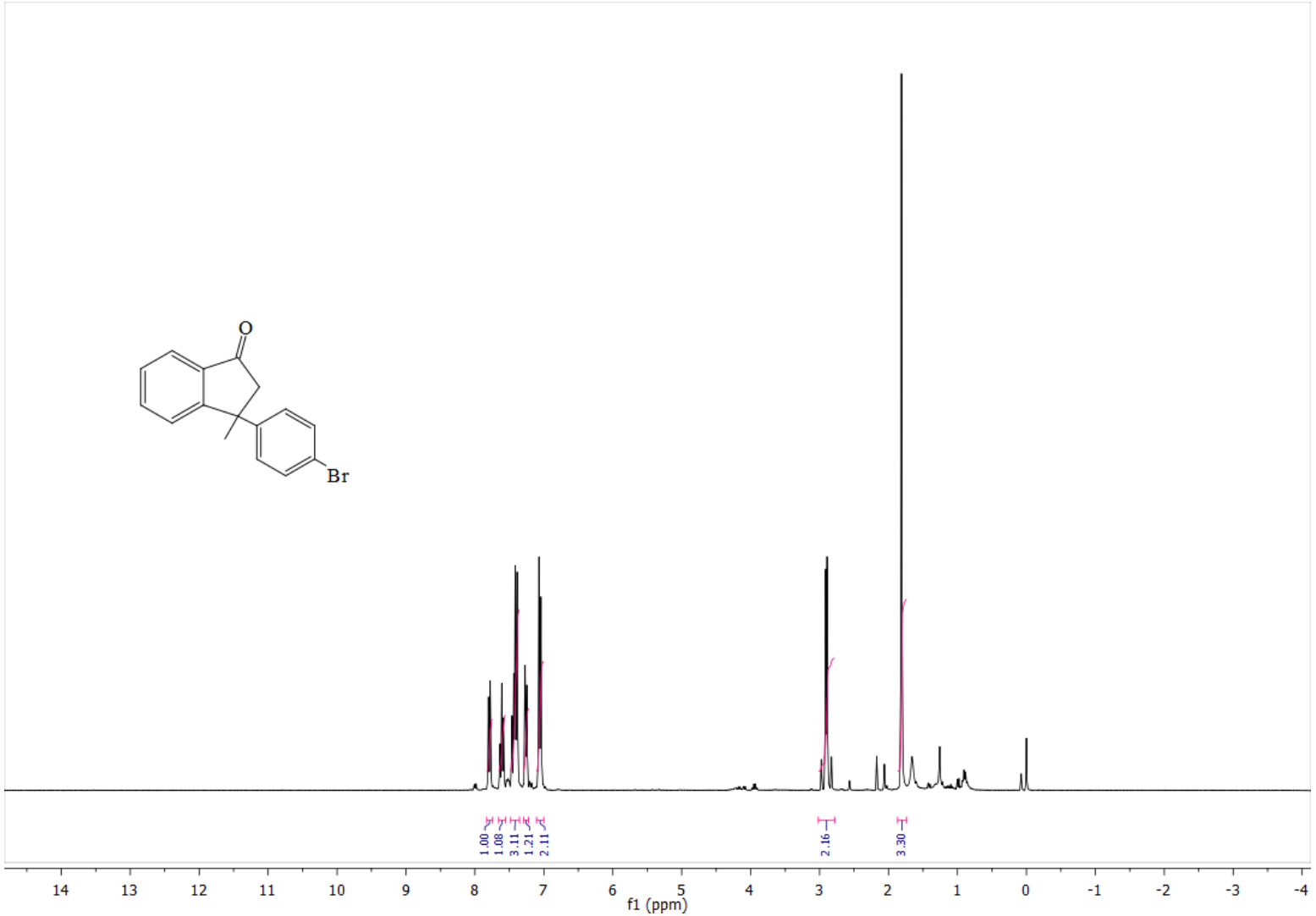
^{13}C NMR Spectrum of compound **3h**



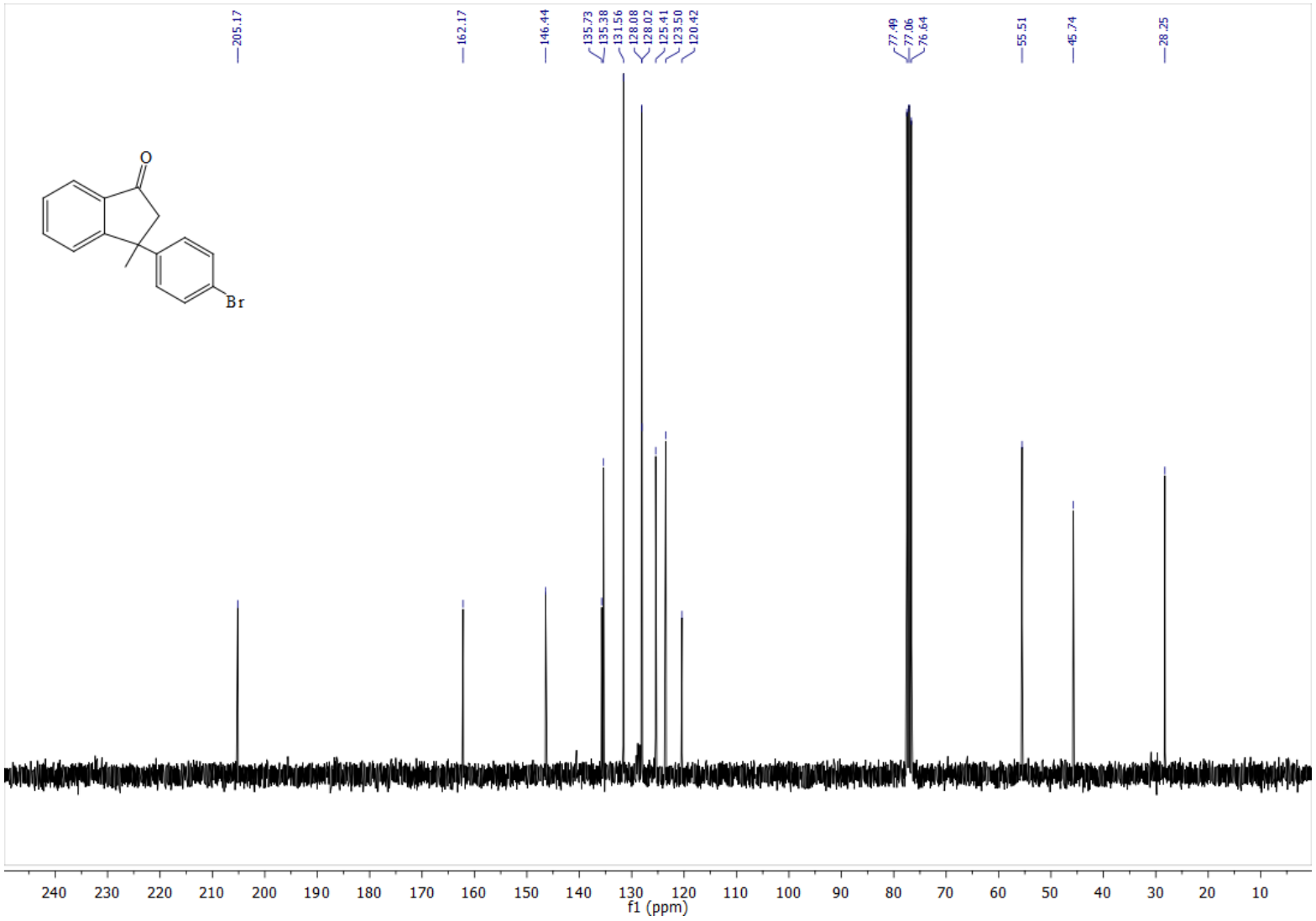
^{1}H NMR Spectrum of compound **3i**



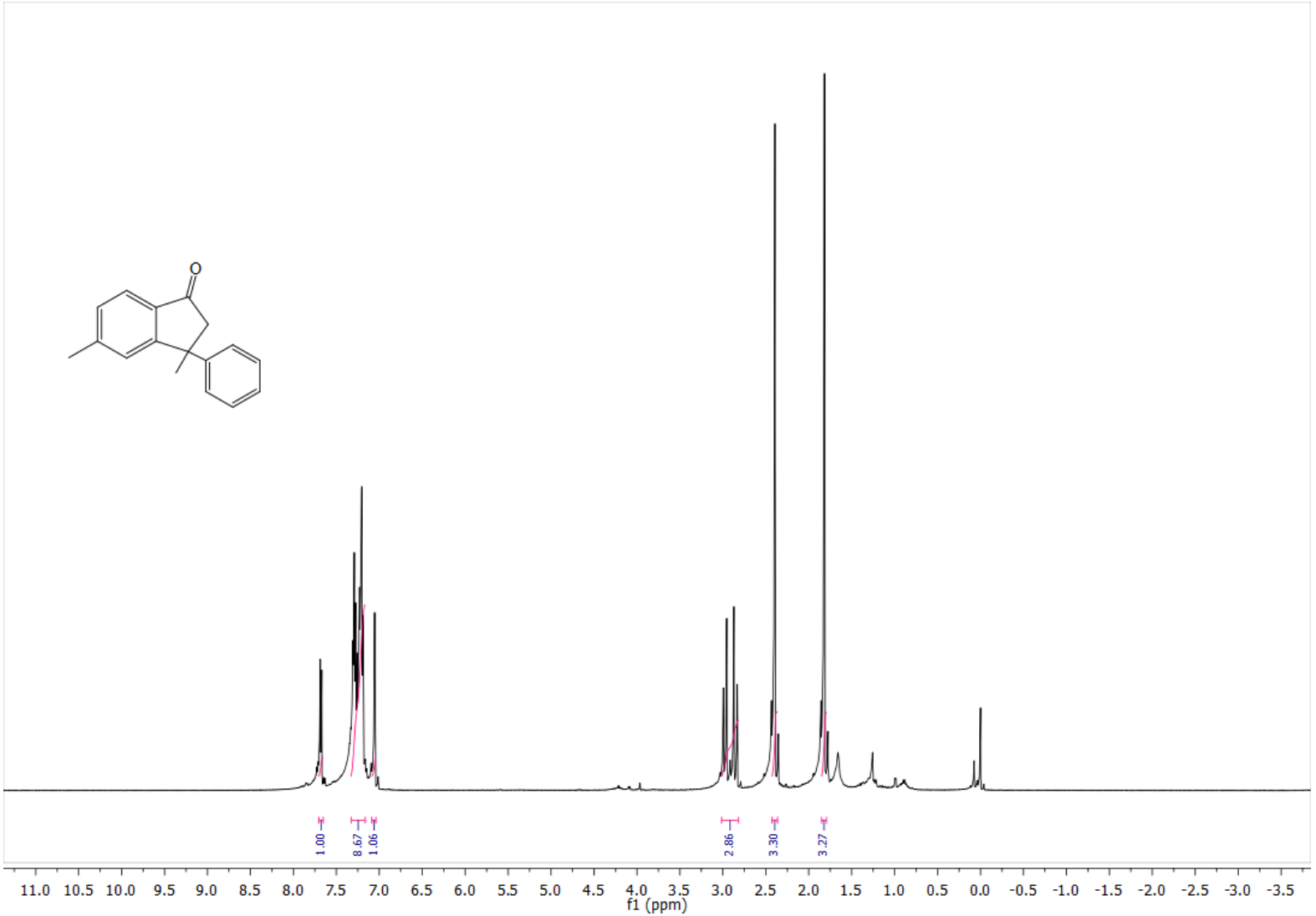
^{13}C NMR Spectrum of compound **3i**



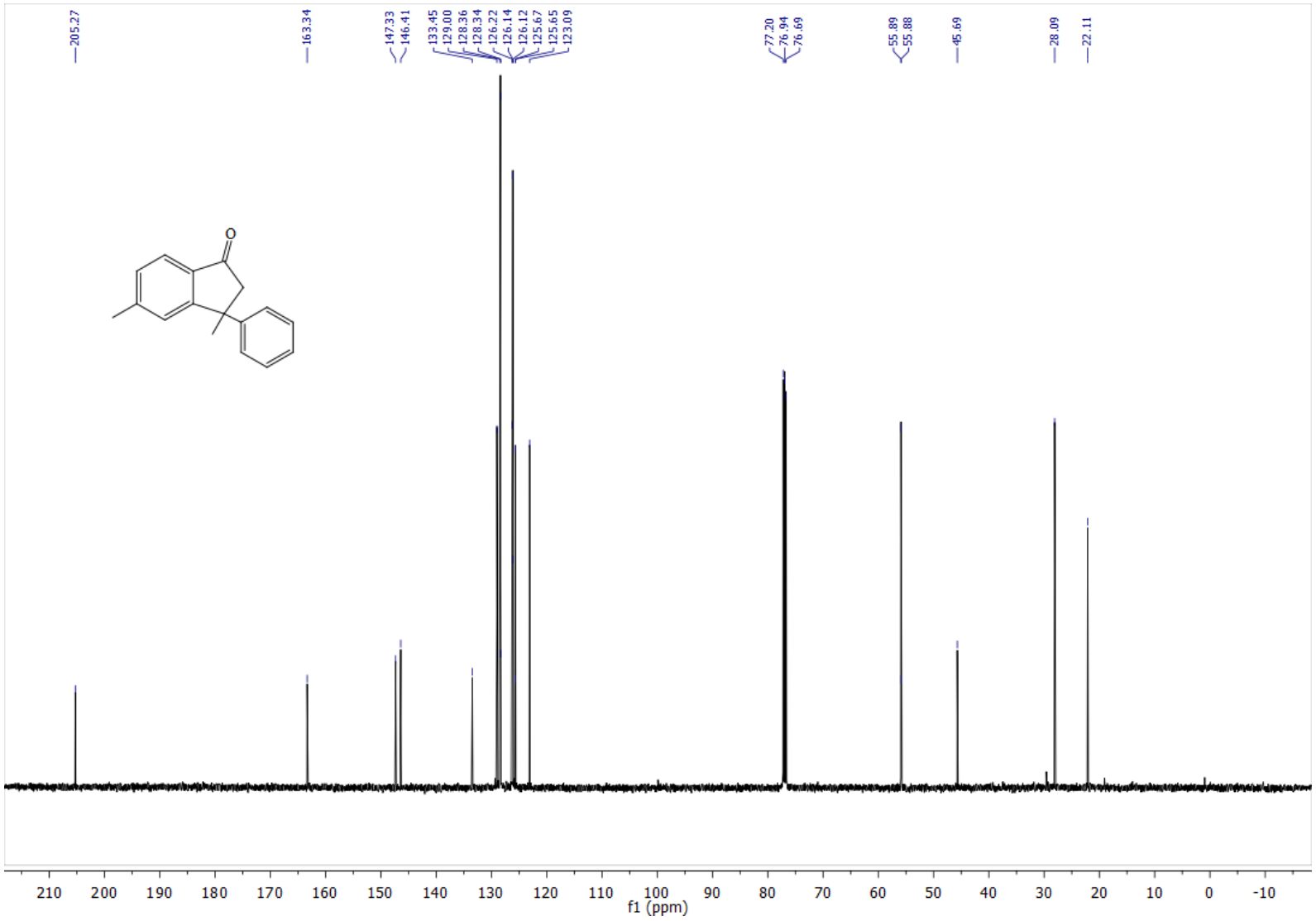
^{1}H NMR Spectrum of compound **3j**



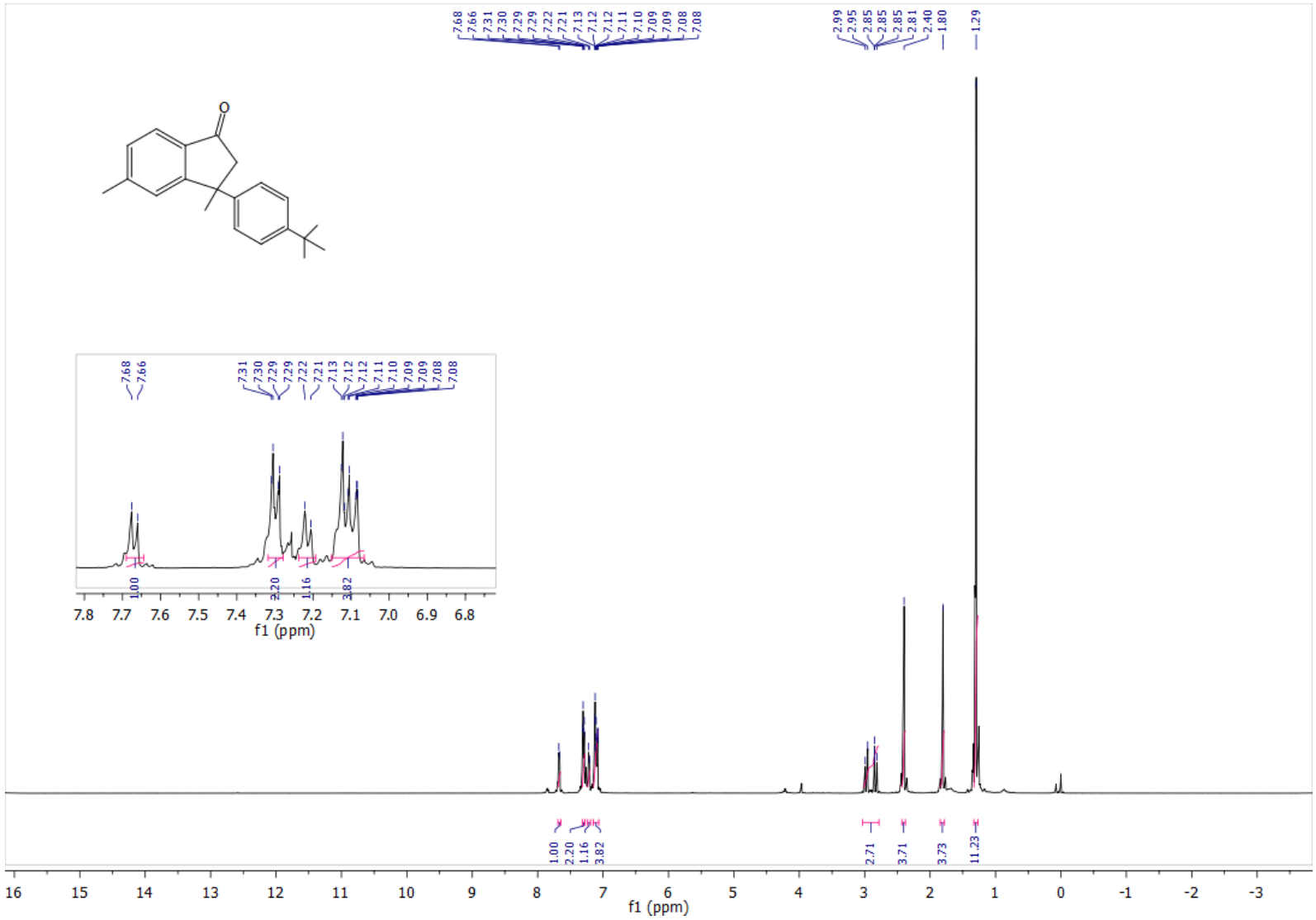
^{13}C NMR Spectrum of compound **3j**



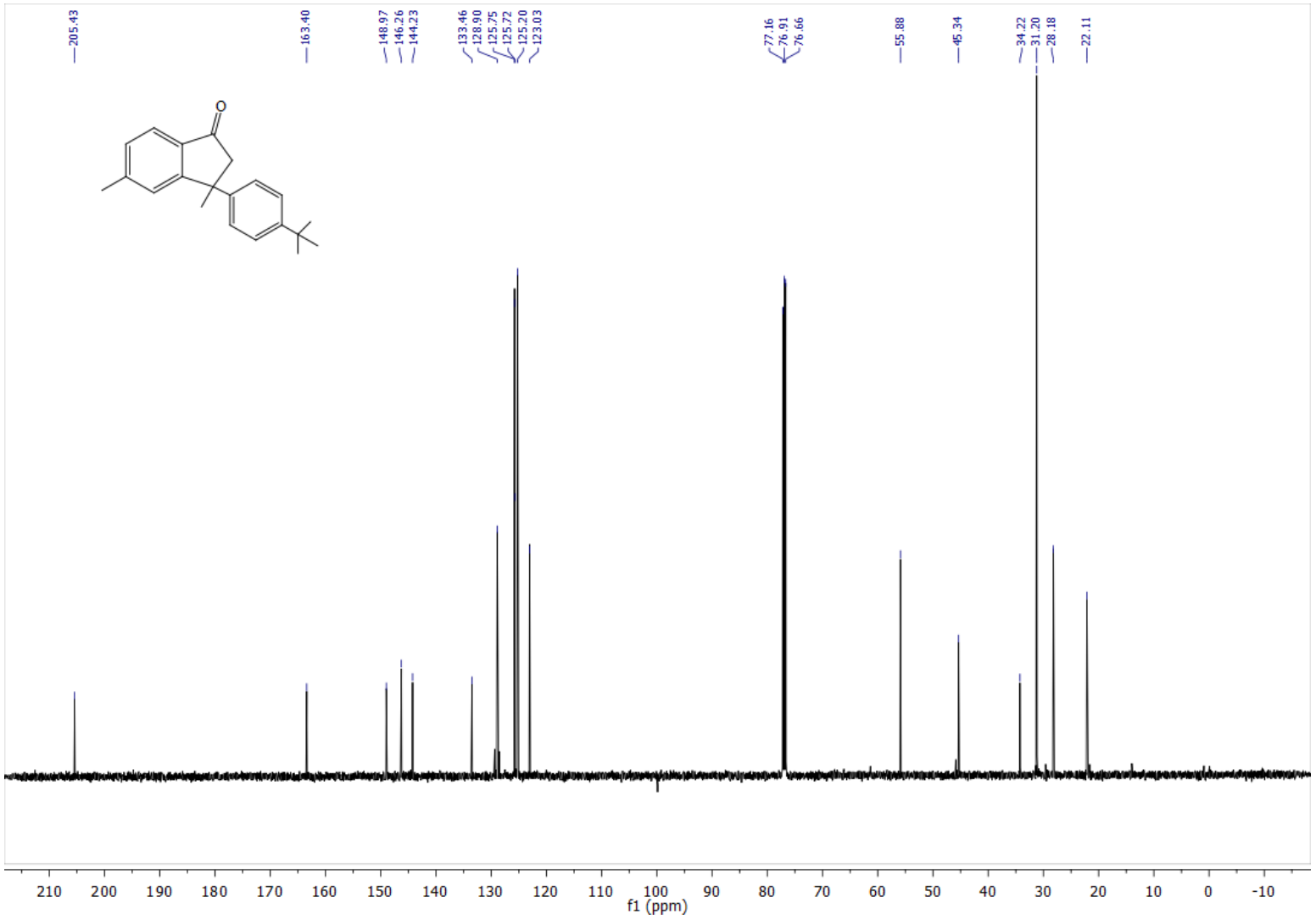
^{1}H NMR Spectrum of compound **3k**



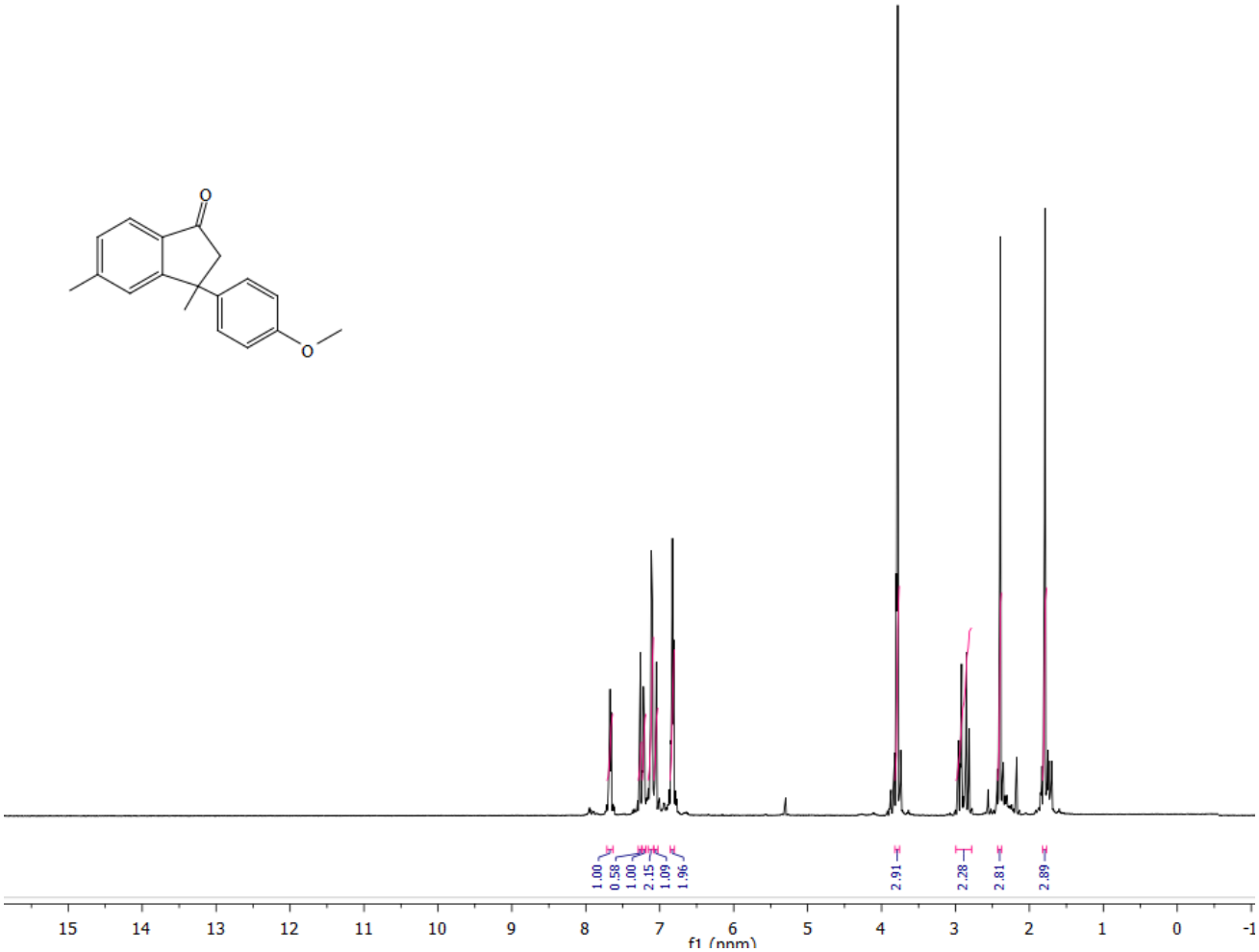
^{13}C NMR Spectrum of compound **3k**



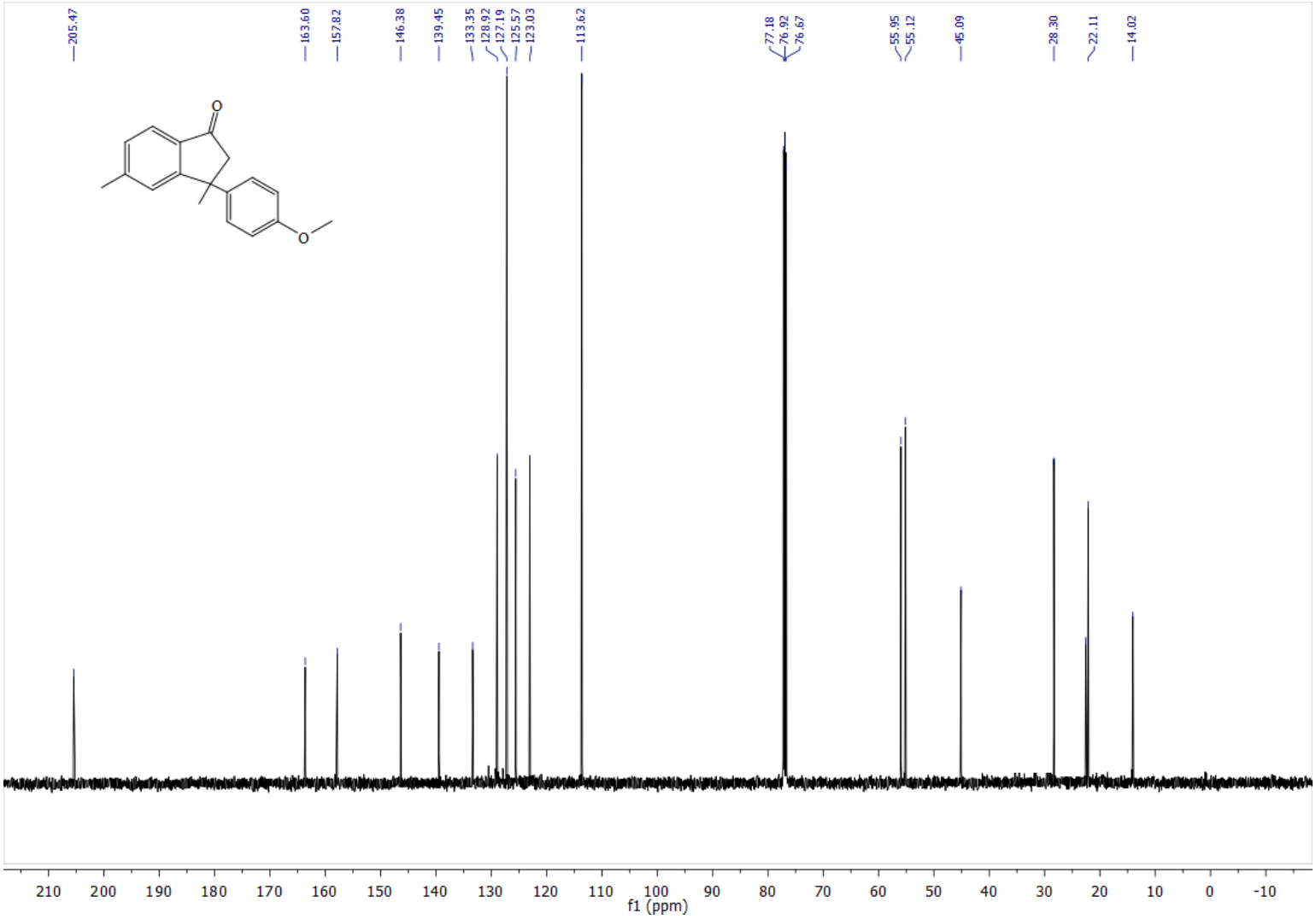
^{1}H NMR Spectrum of compound **3l**



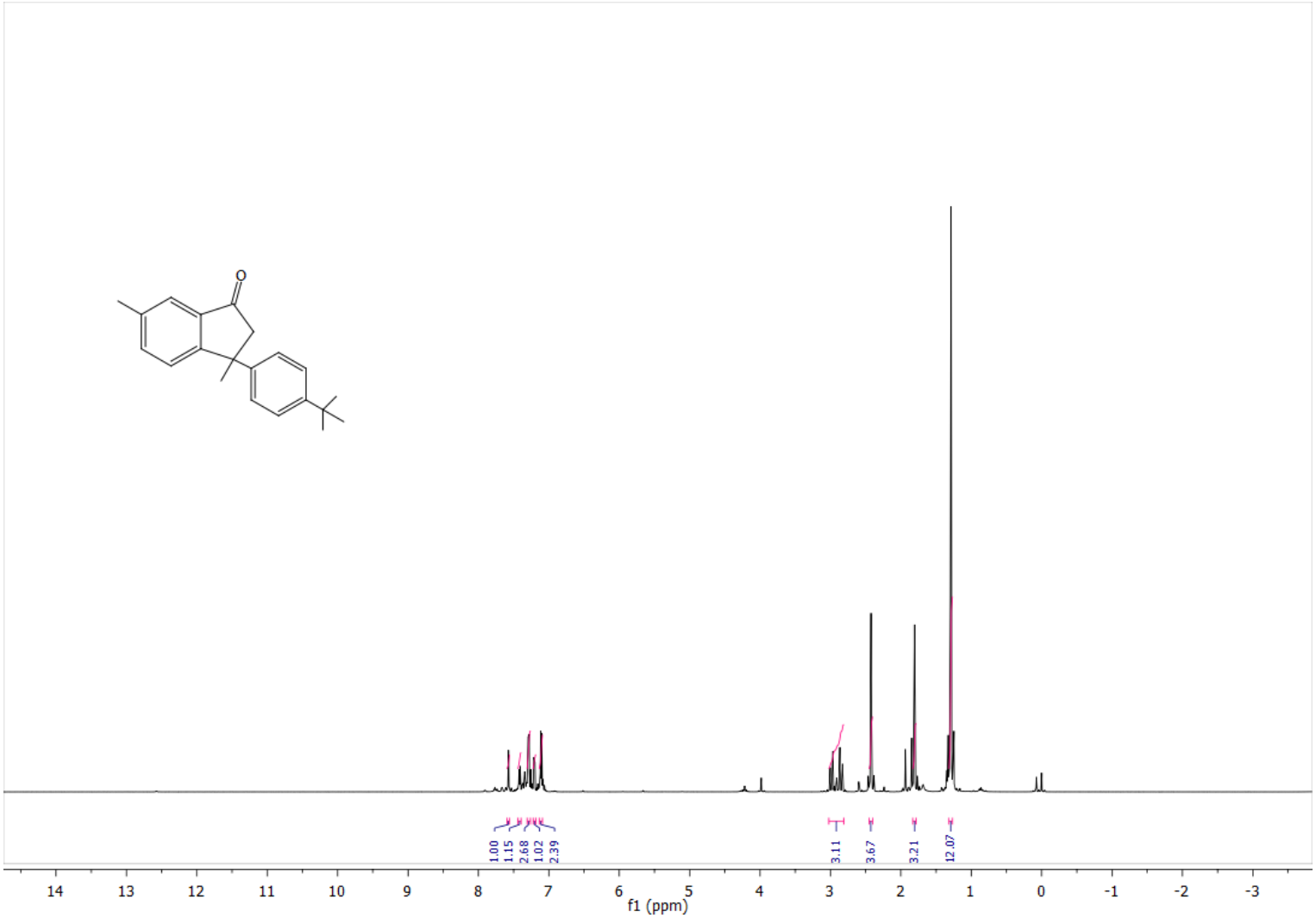
^{13}C NMR Spectrum of compound **3l**



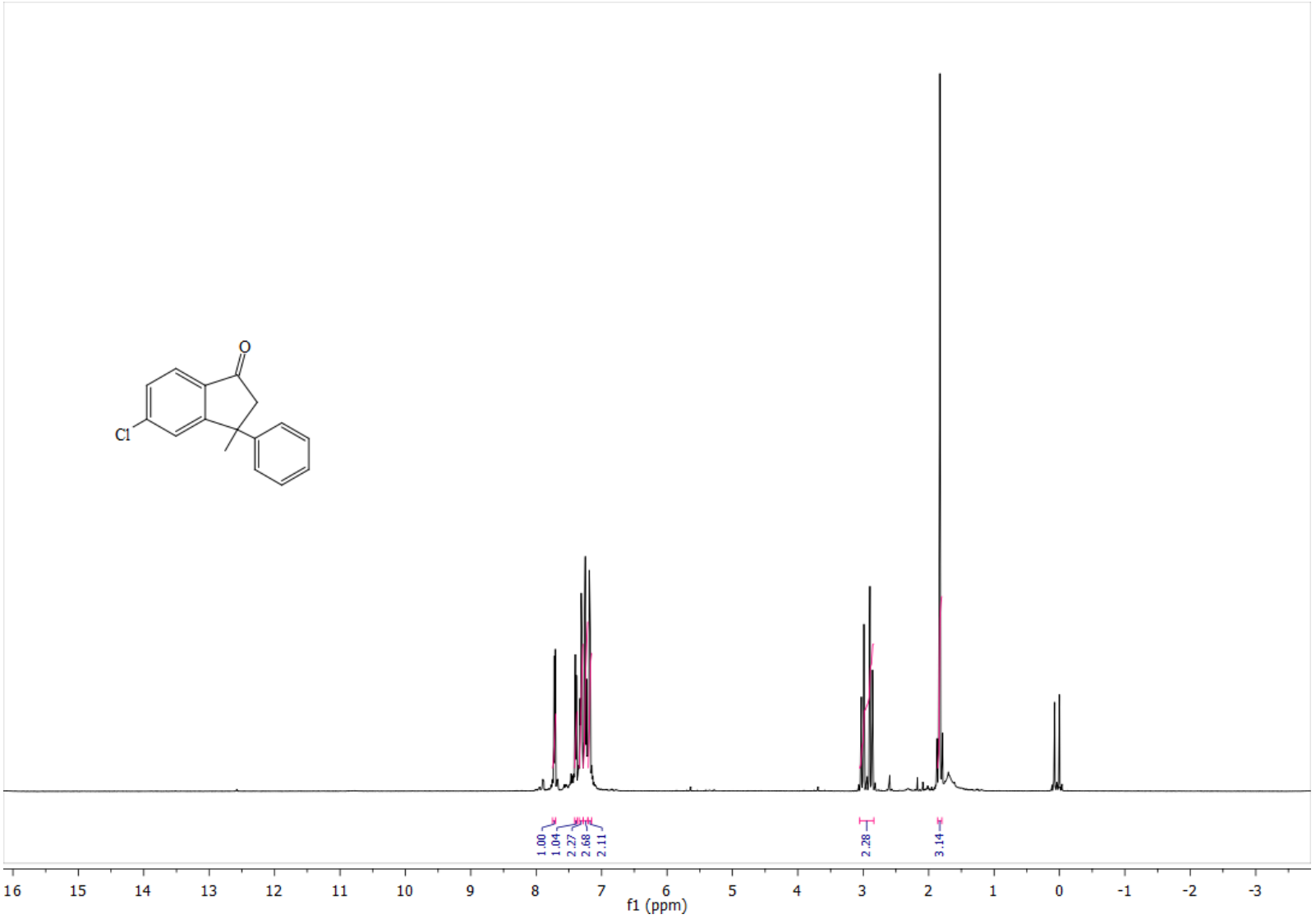
^{1}H NMR Spectrum of compound **3m**



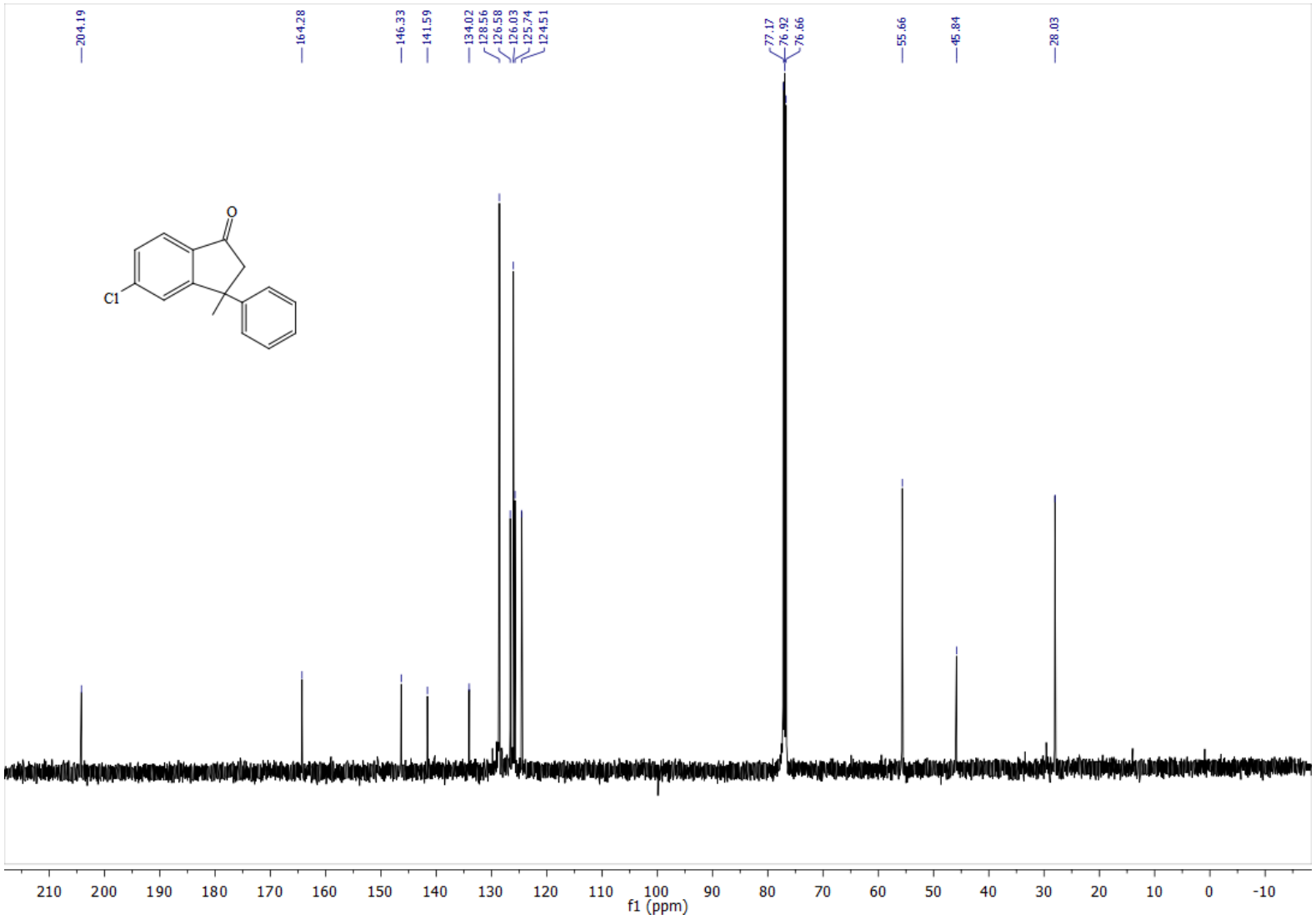
^{13}C NMR Spectrum of compound **3m**



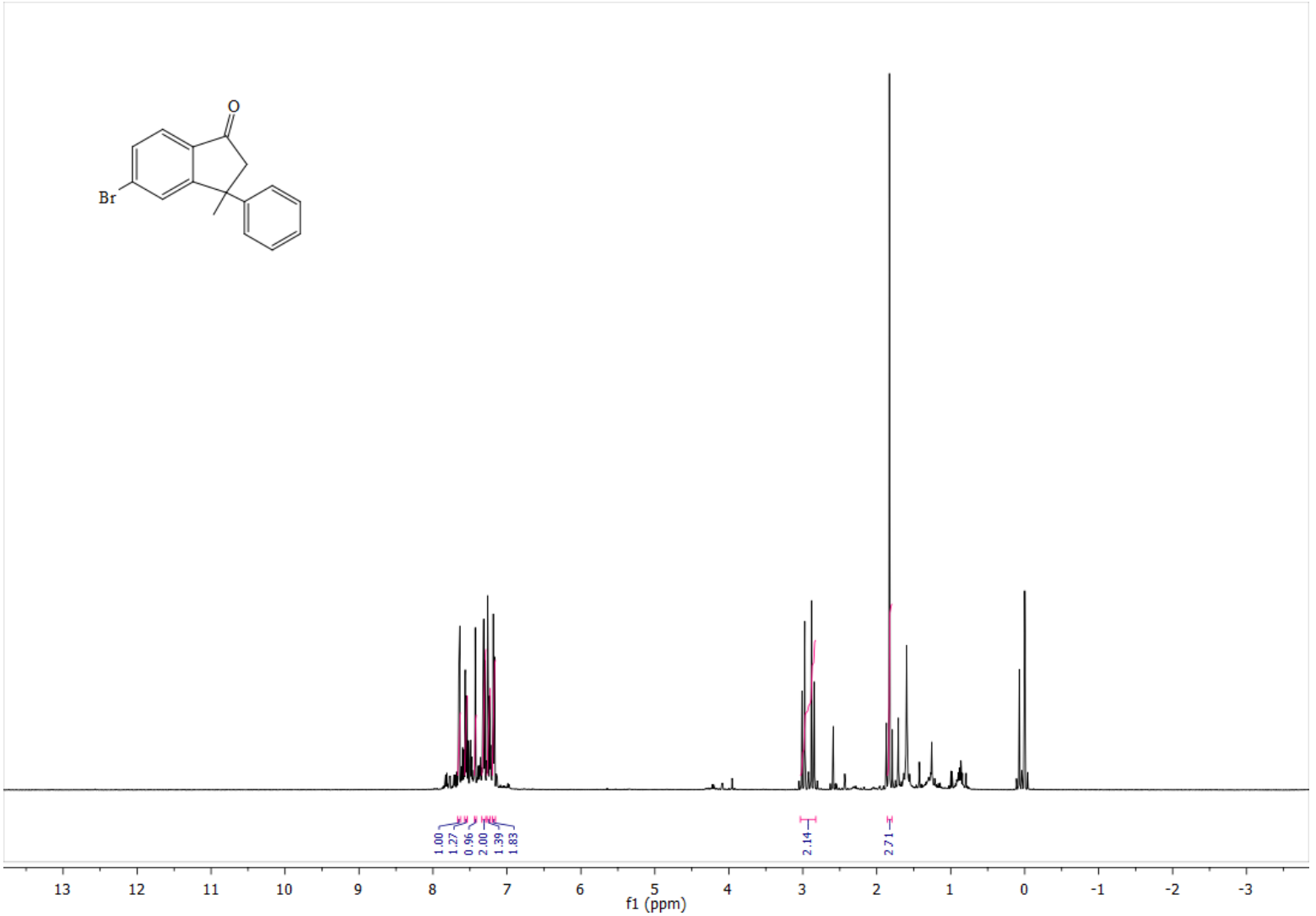
^{1}H NMR Spectrum of compound **3n**



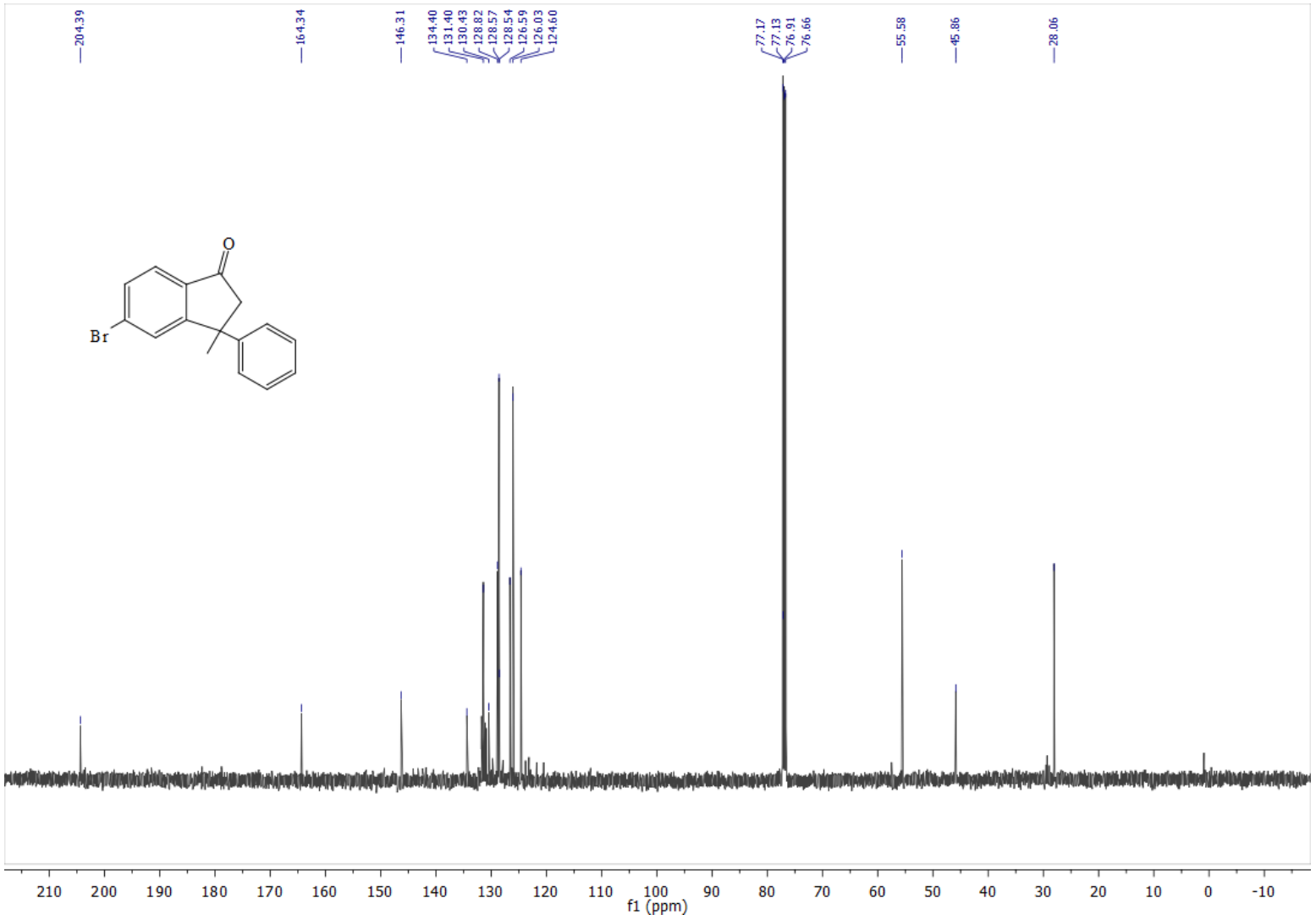
^{1}H NMR Spectrum of compound **3o**



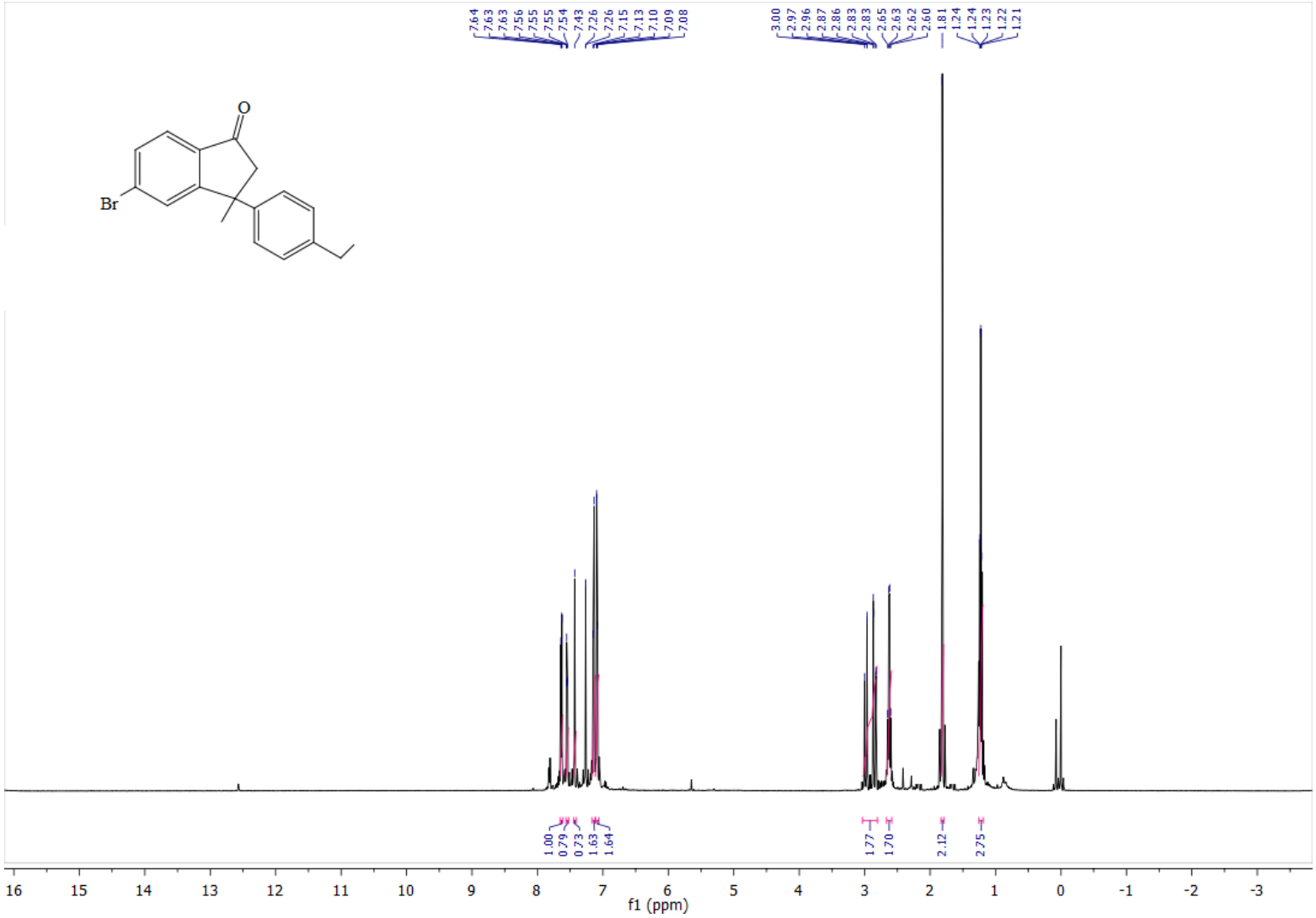
^{13}C NMR Spectrum of compound **3o**



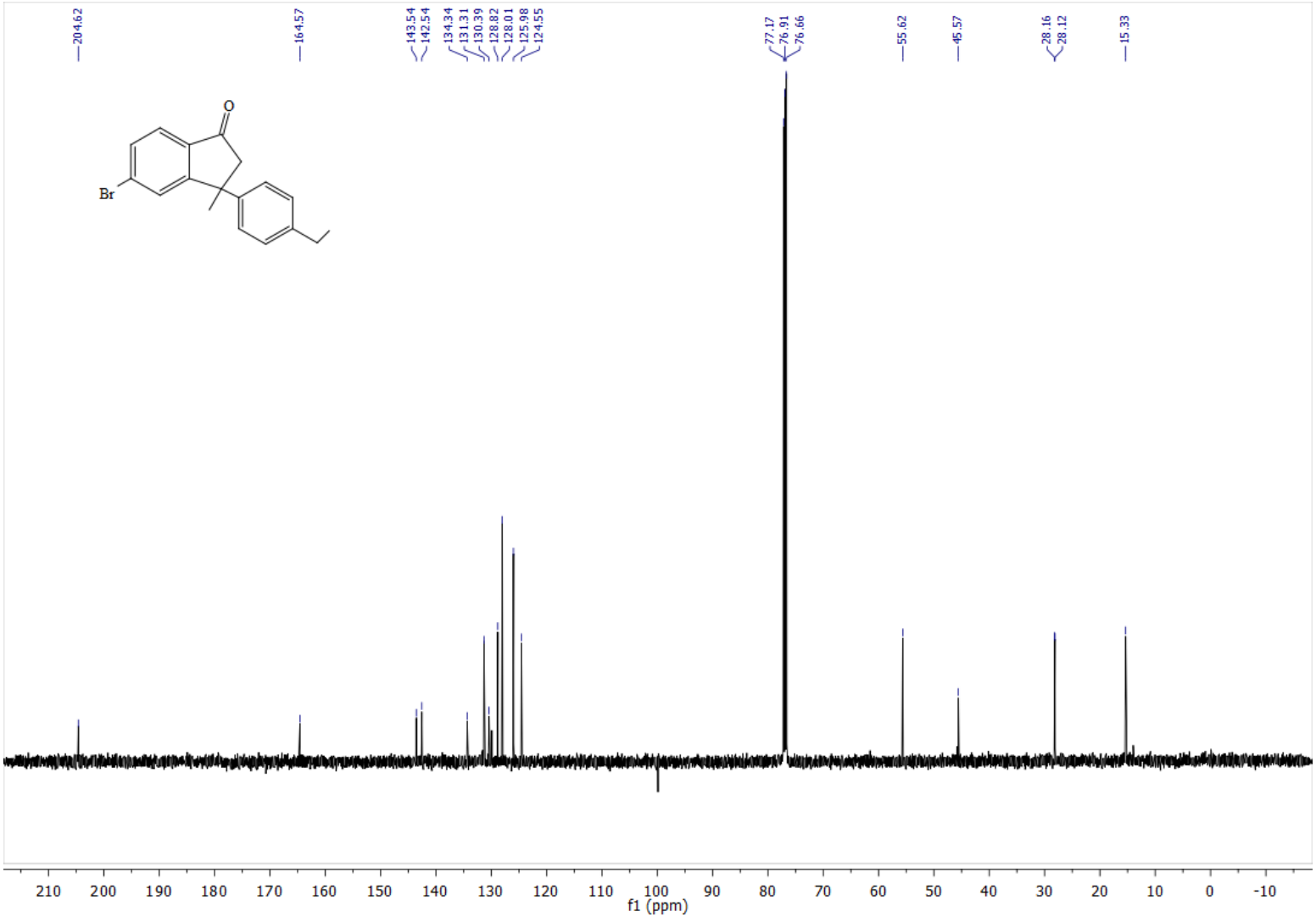
^{1}H NMR Spectrum of compound **3p**



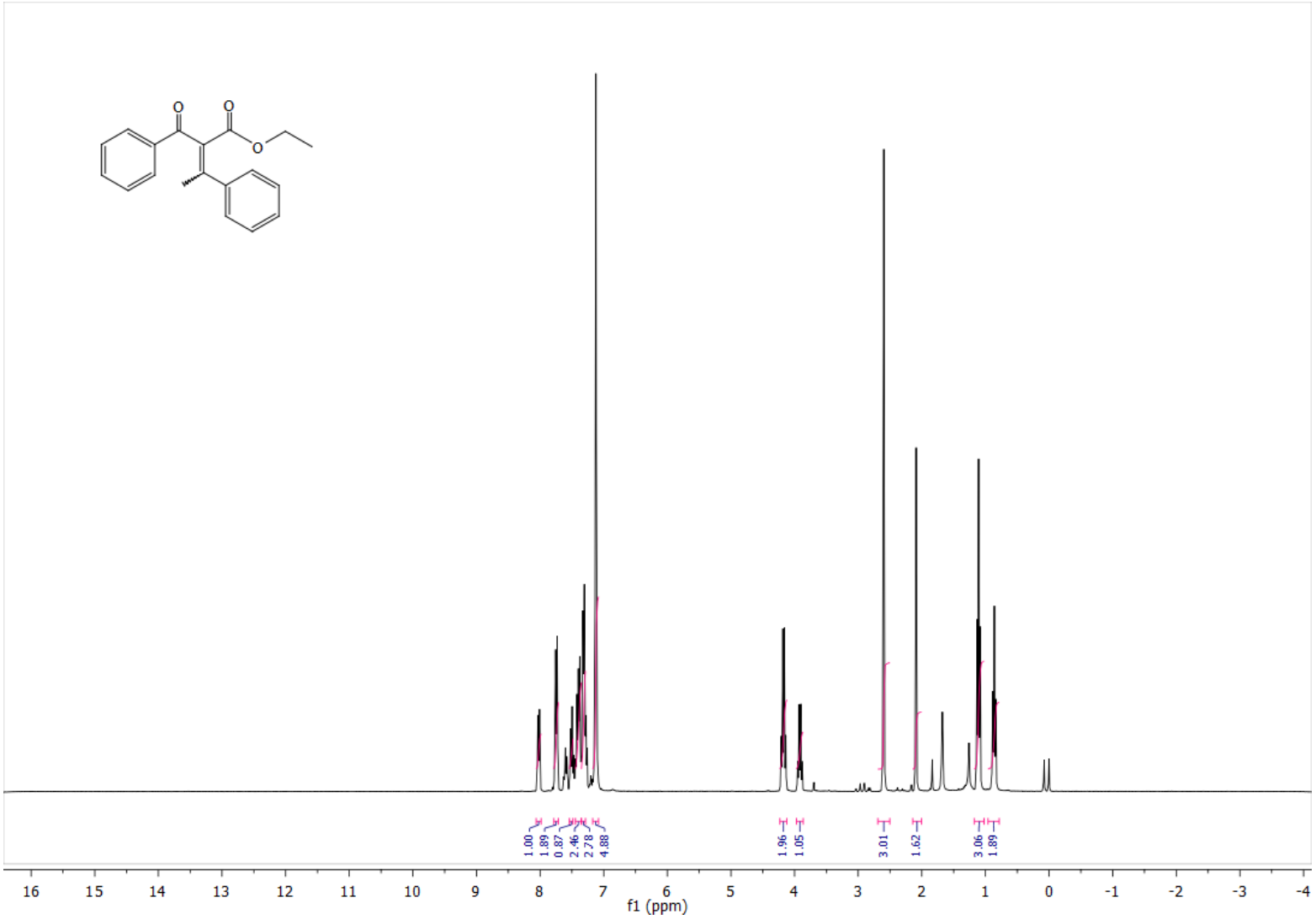
^{13}C NMR Spectrum of compound **3p**



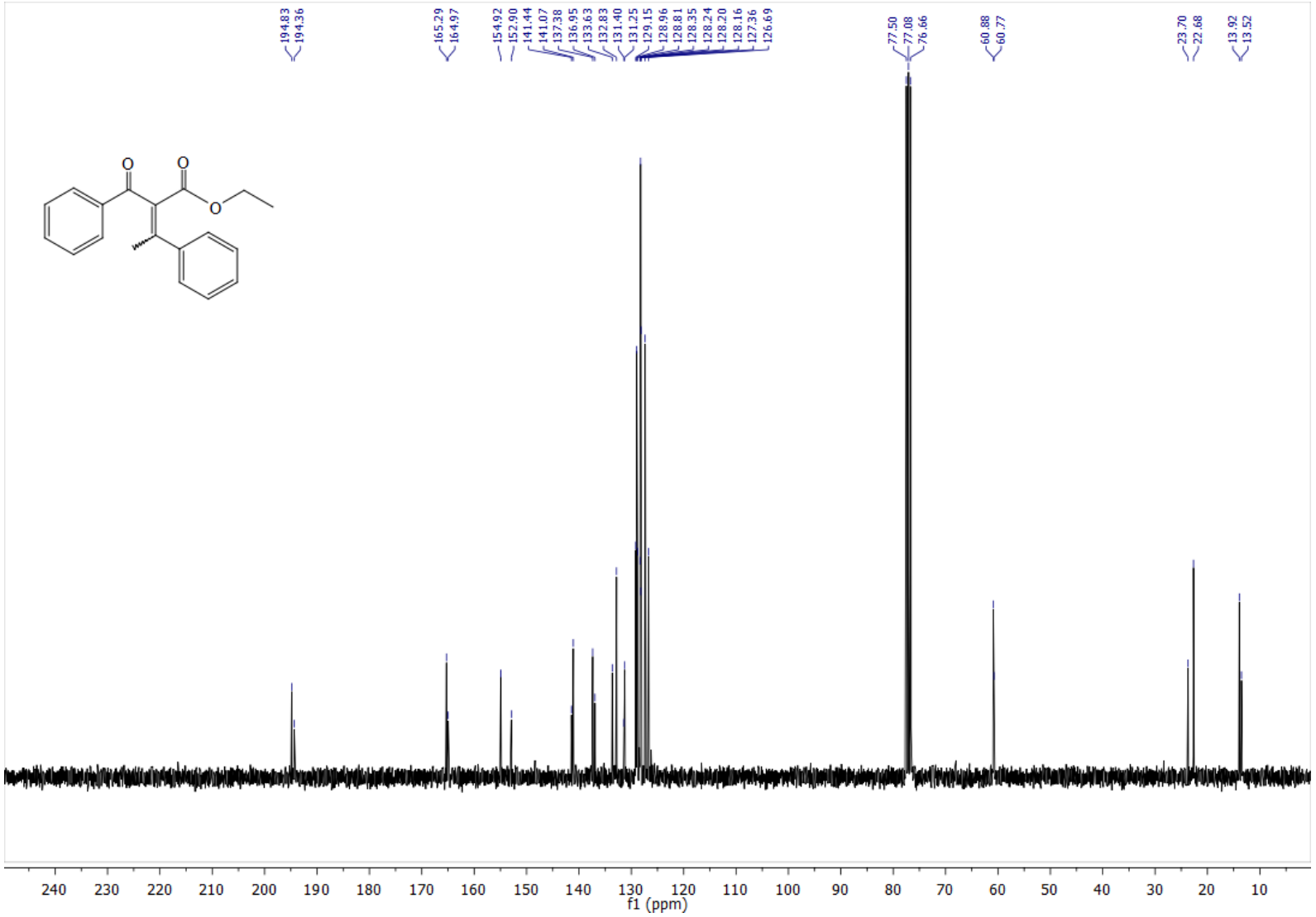
^{1}H NMR Spectrum of compound **3q**



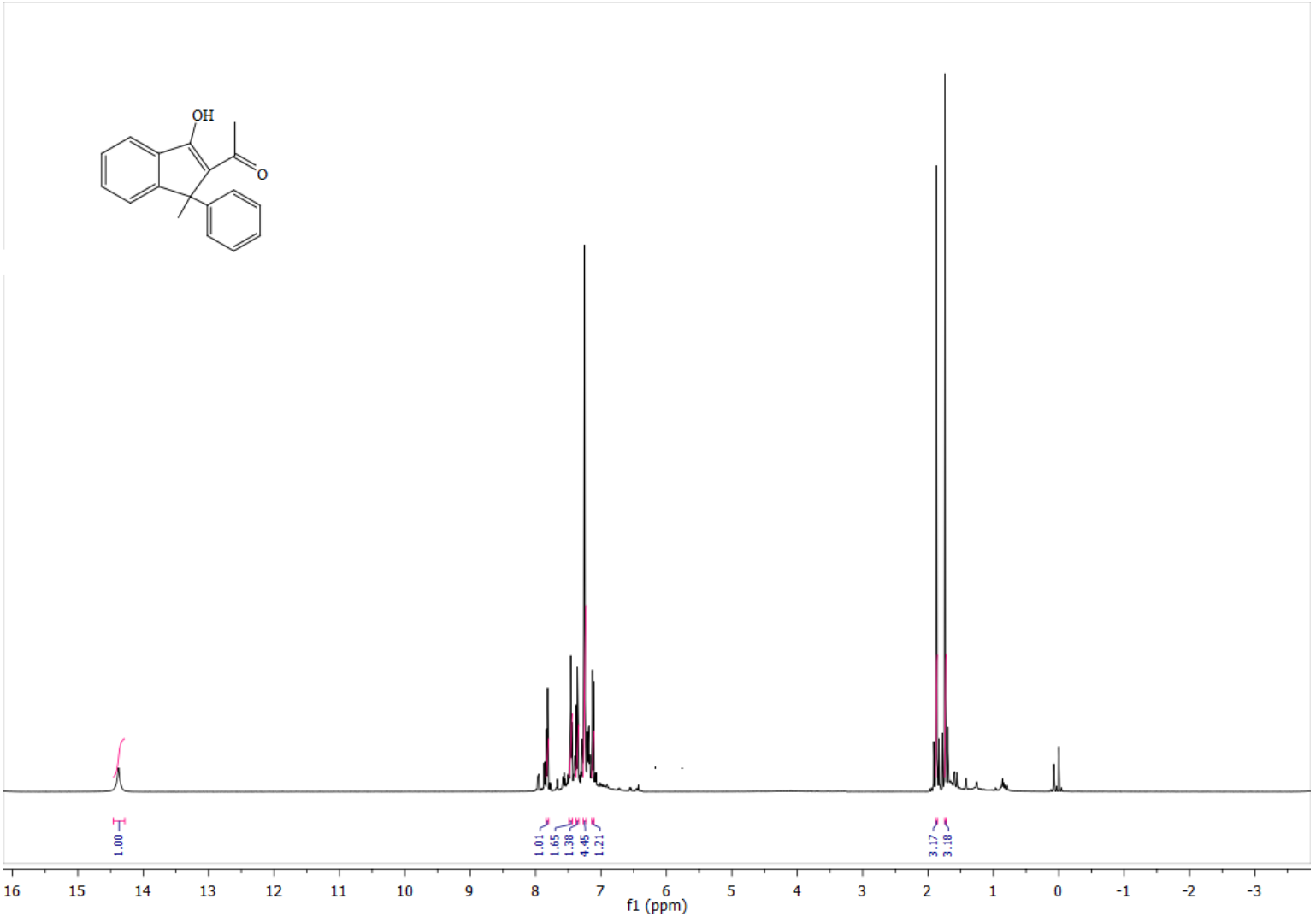
^{13}C NMR Spectrum of compound **3q**



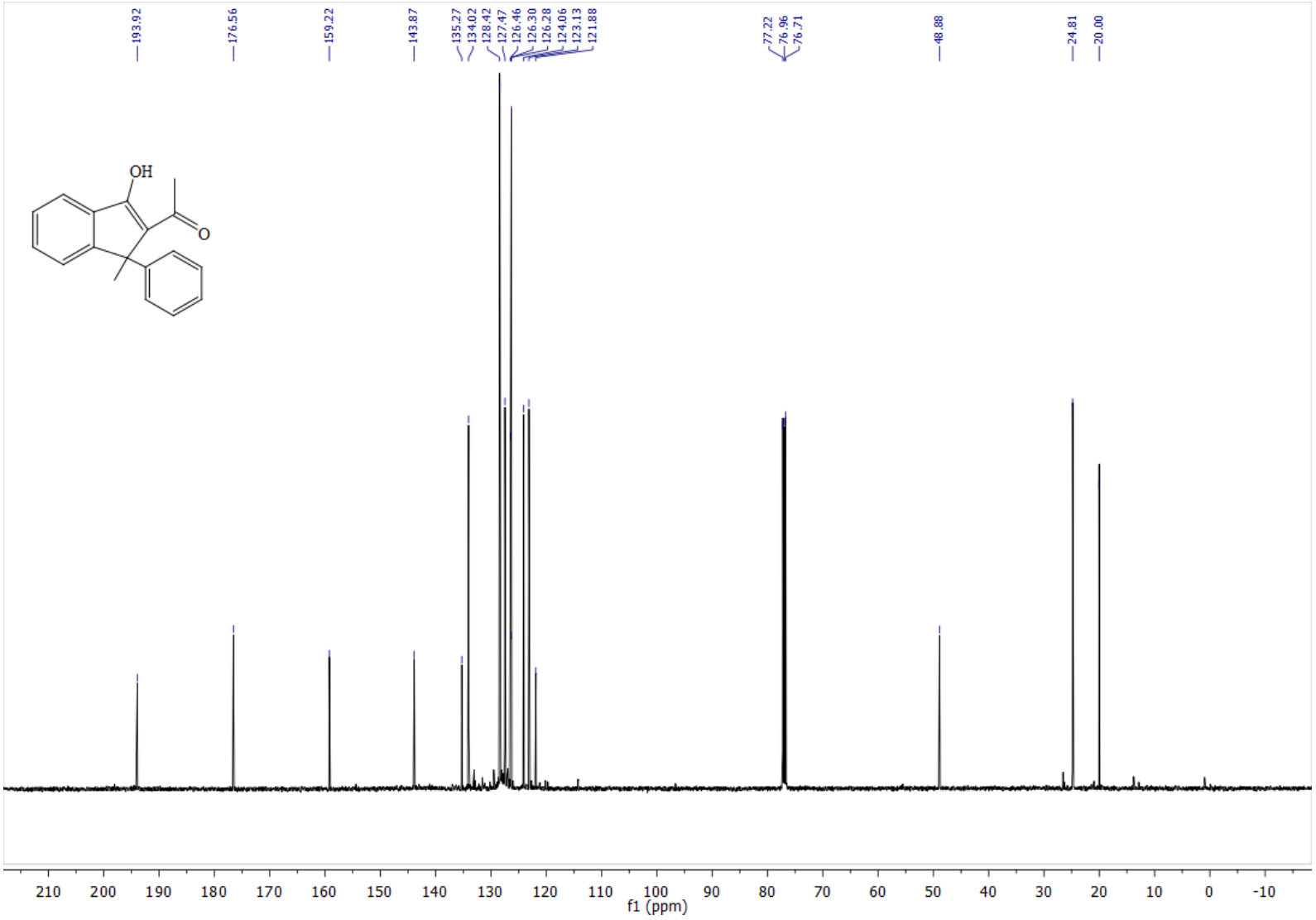
^{1}H NMR Spectrum of compound **3a'**



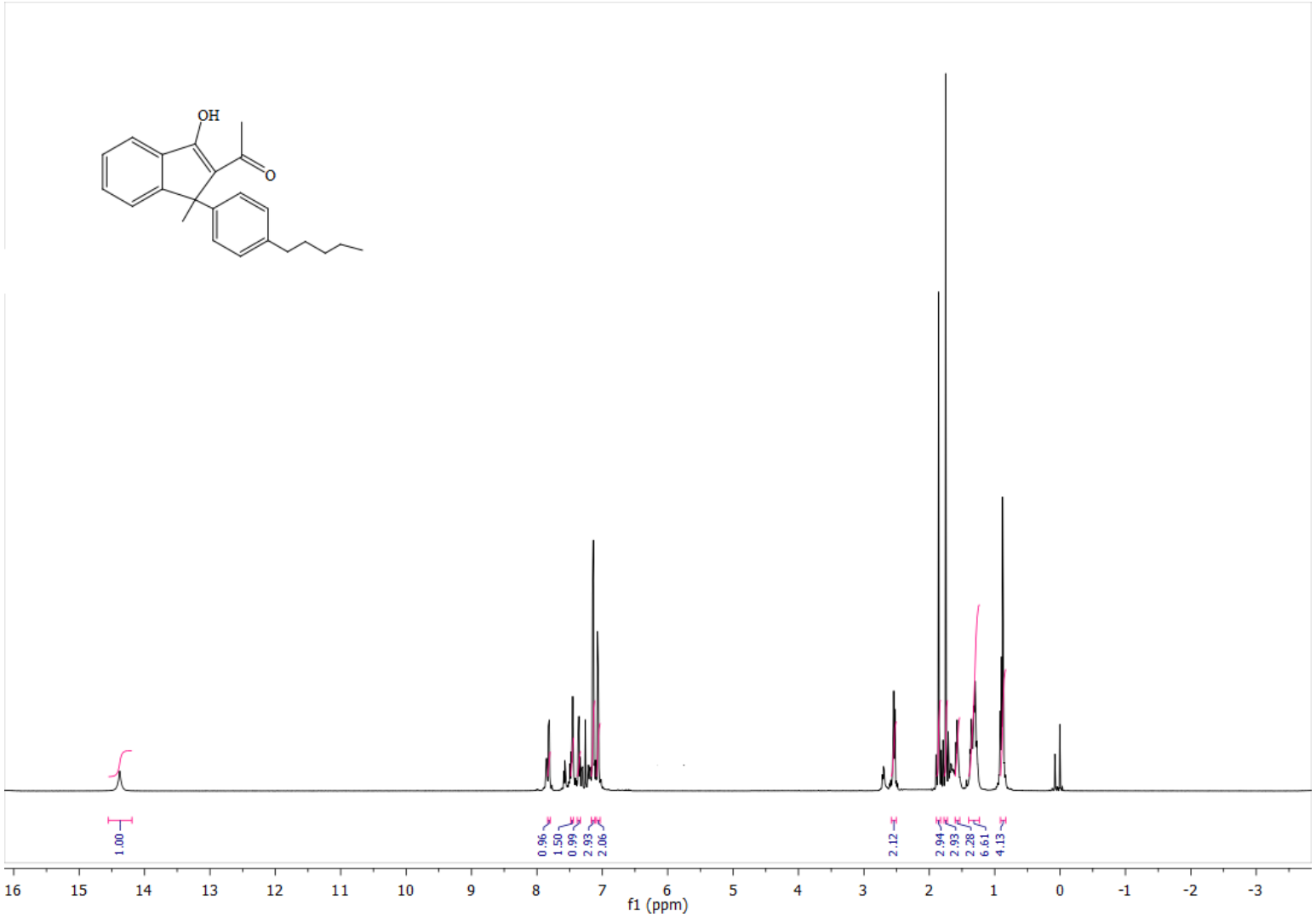
^{13}C NMR Spectrum of compound **3a'**



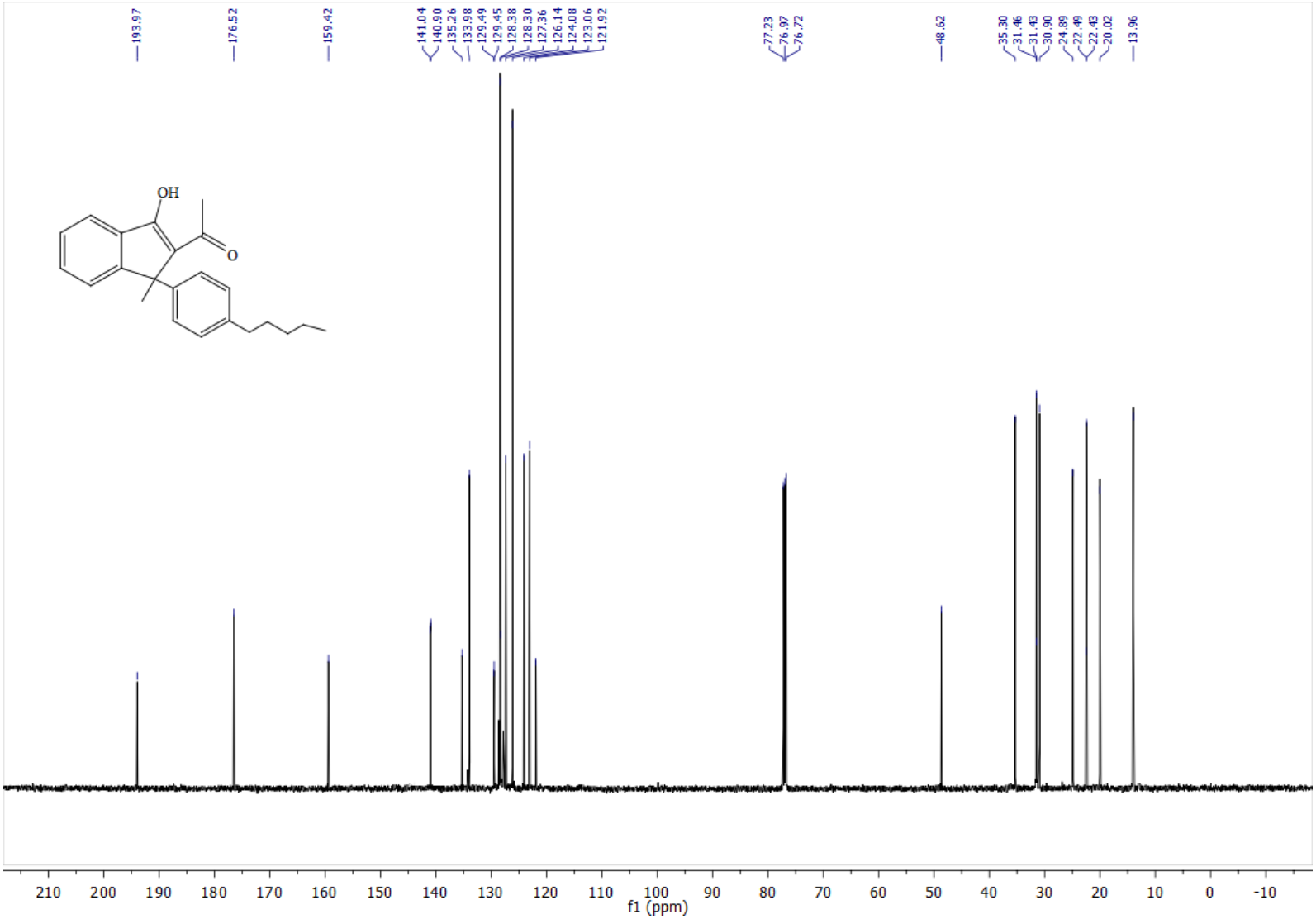
^{1}H NMR Spectrum of compound **5a**



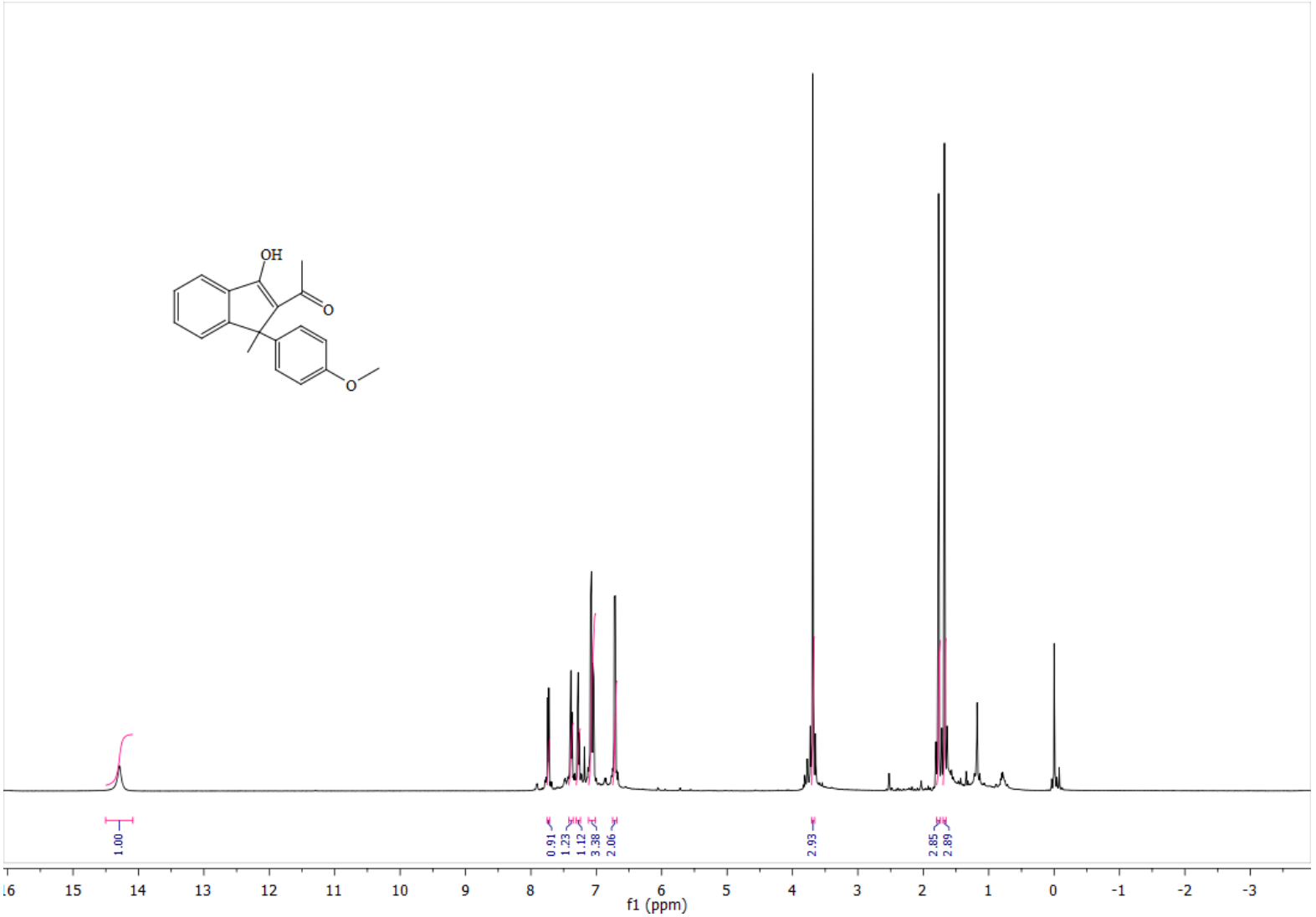
^{13}C NMR Spectrum of compound **5a**



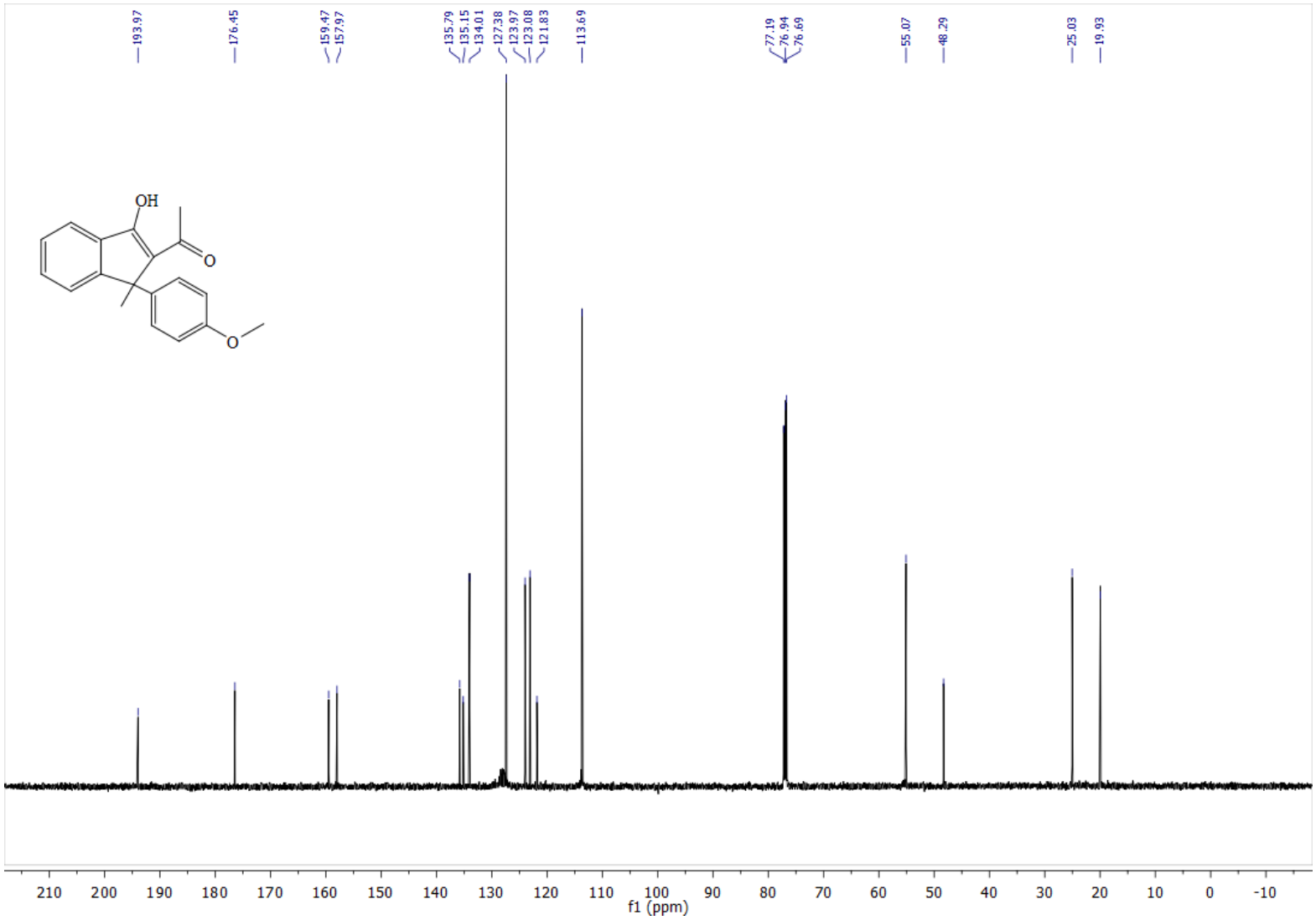
^{1}H NMR Spectrum of compound **5b**



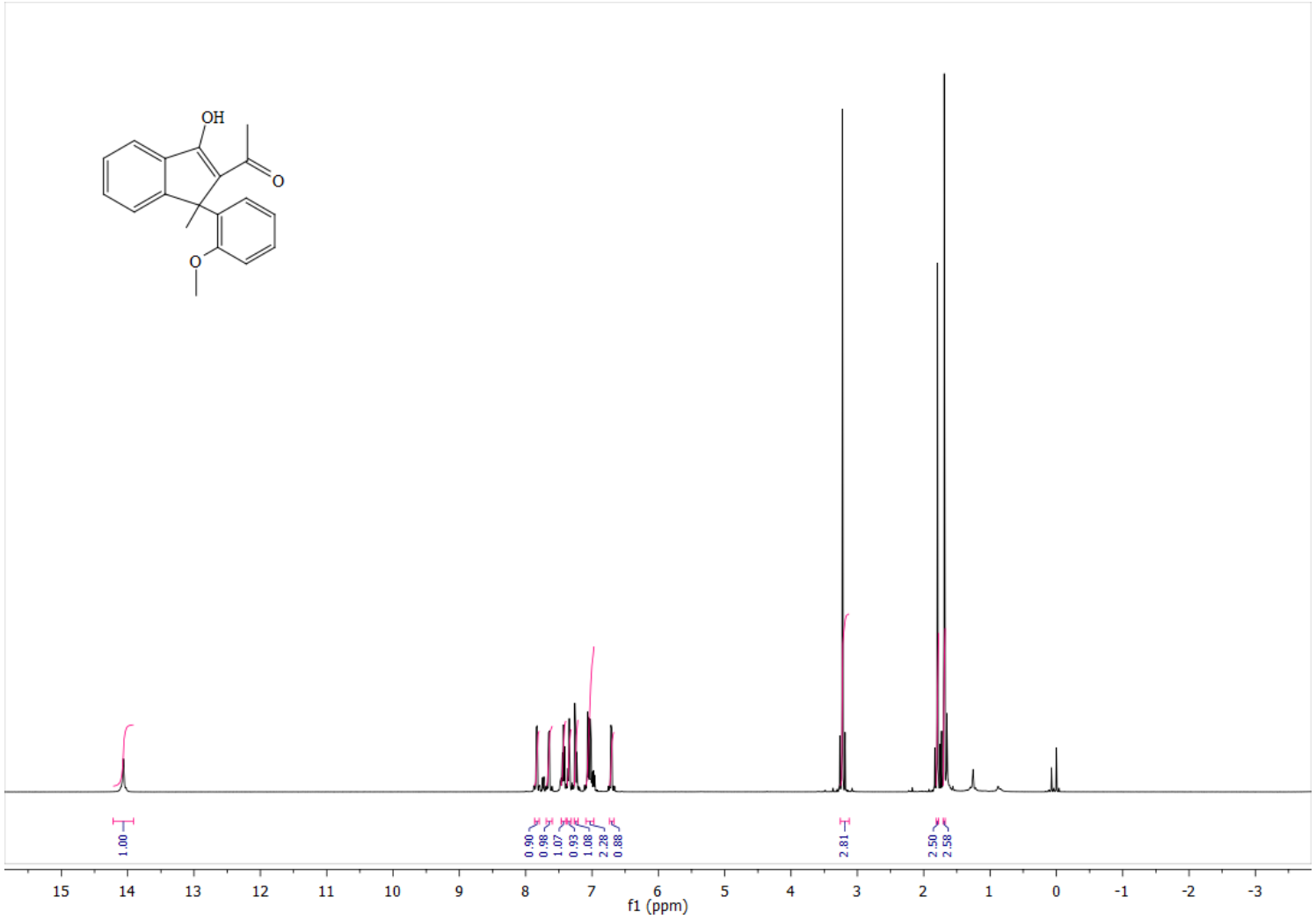
^{13}C NMR Spectrum of compound **5b**



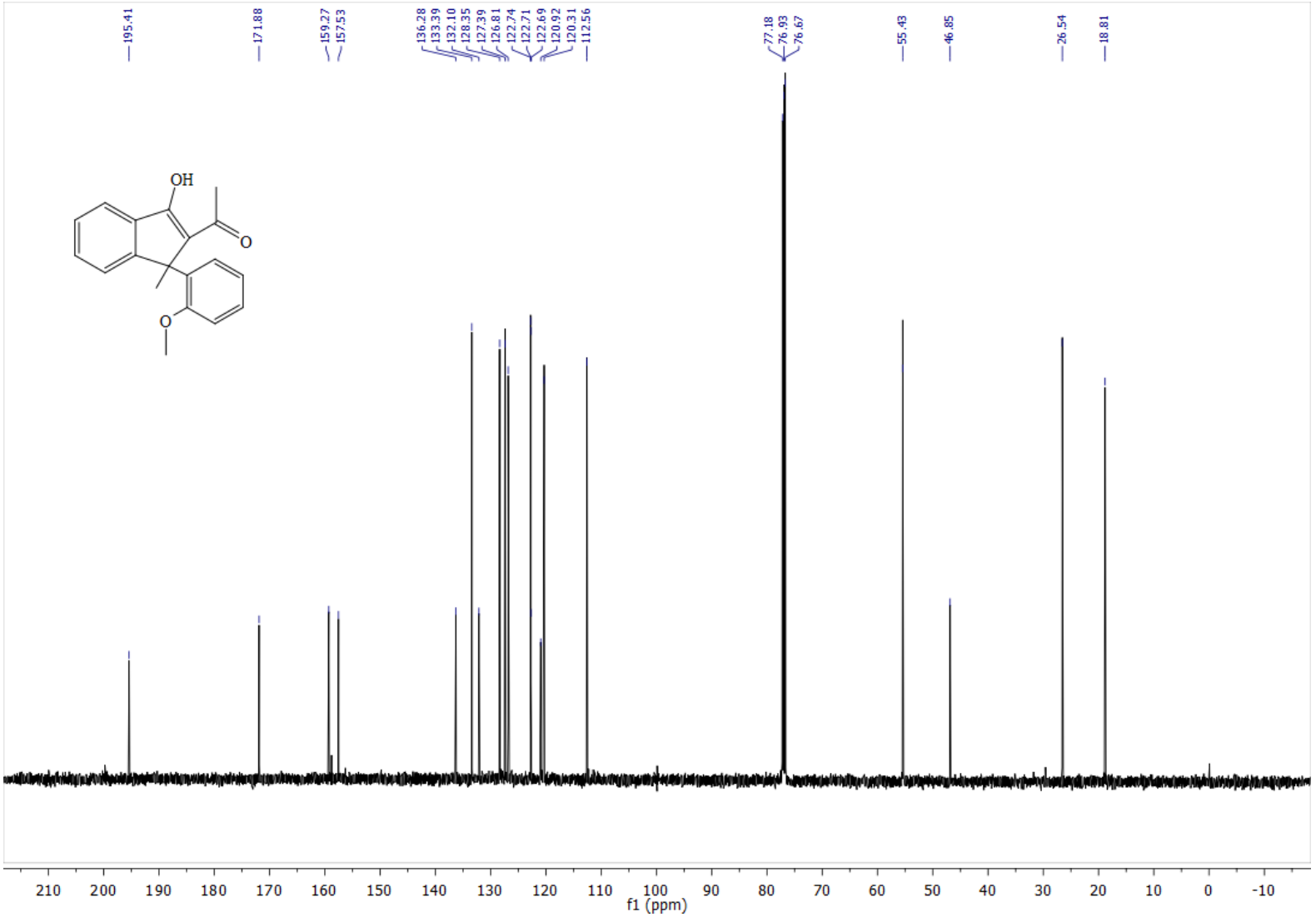
^{1}H NMR Spectrum of compound **5c**



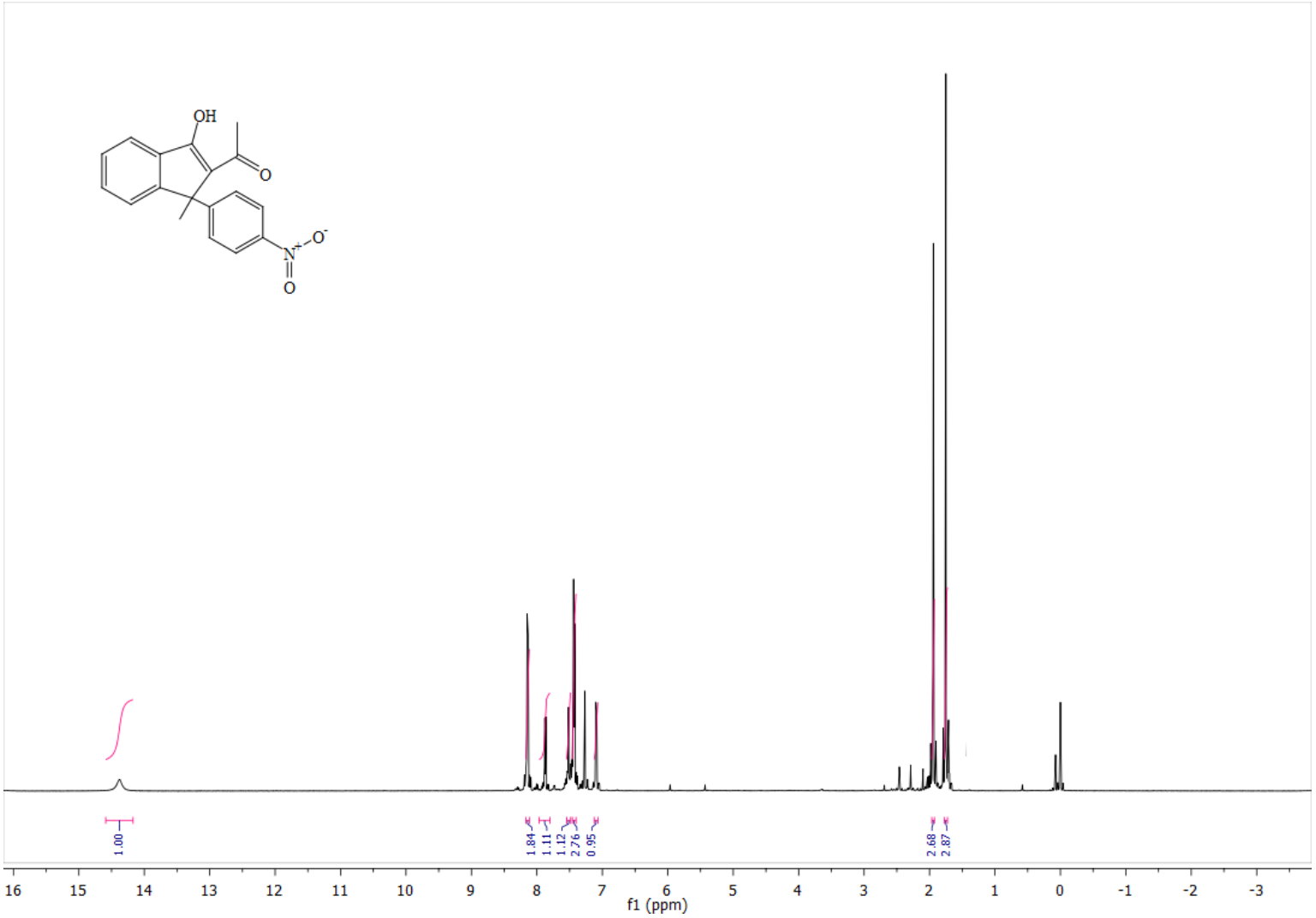
^{13}C NMR Spectrum of compound **5c**



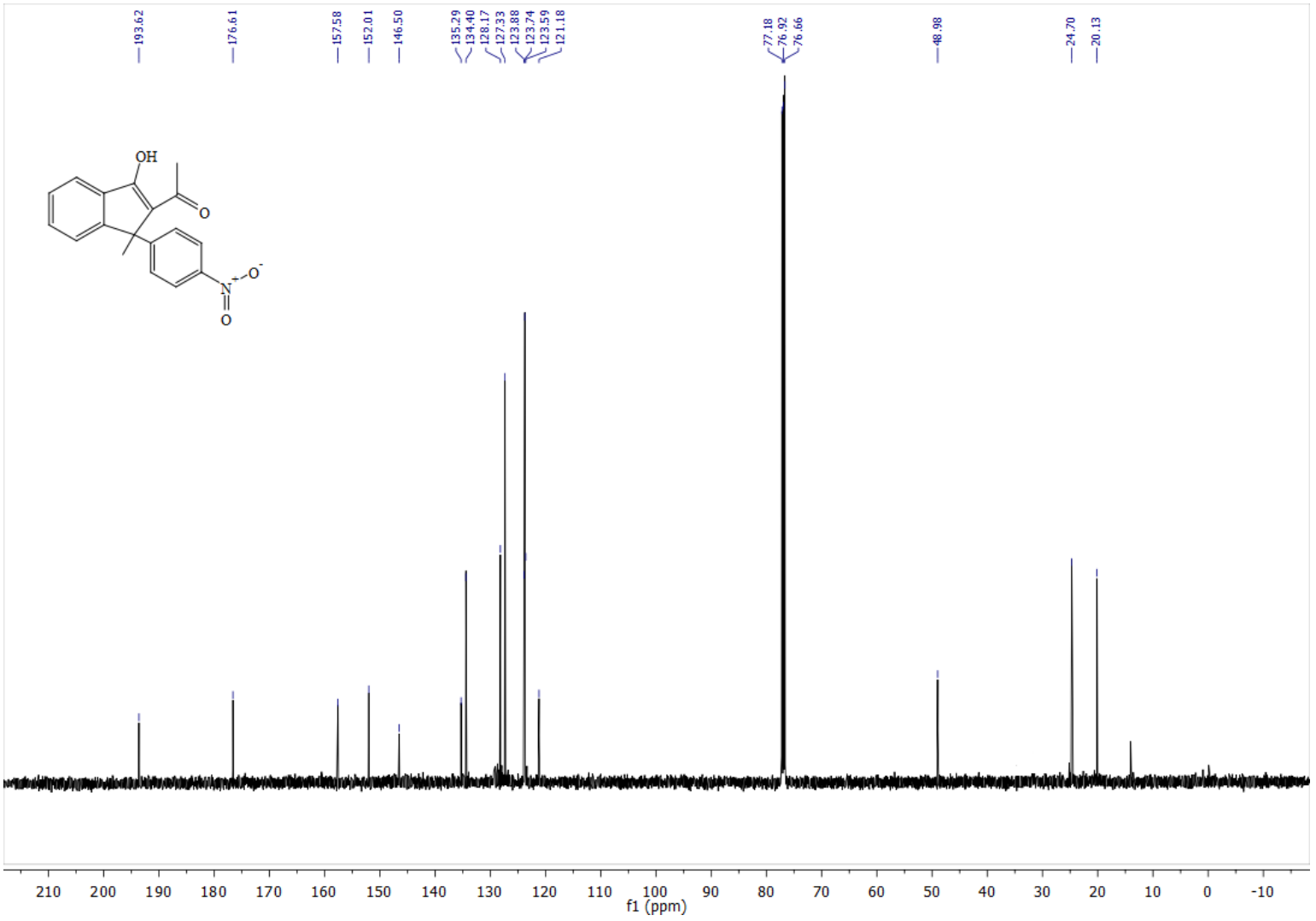
^{1}H NMR Spectrum of compound **5d**



^{13}C NMR Spectrum of compound **5d**



^{1}H NMR Spectrum of compound **5e**



^{13}C NMR Spectrum of compound **5e**