Supplementary Information

Cp*Rh(III)-catalyzed C(sp^3)–H alkylation of 8-methylquinolines in aqueous media

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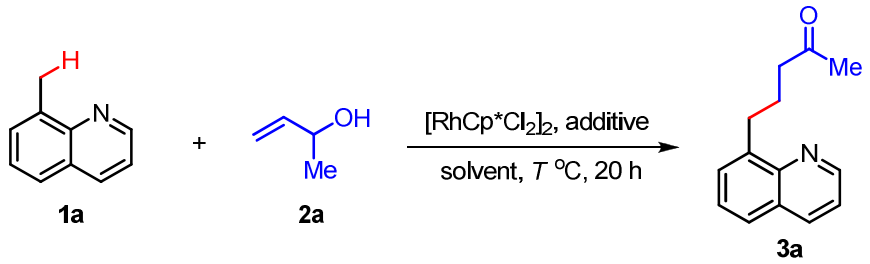
General methods

Commercially available reagents were used without additional purification, unless otherwise stated. Sealed tubes (13 × 100 mm^2) were purchased from Fischer Scientific and dried in oven for overnight and cooled at room temperature prior to use. Thin layer chromatography was carried out using plates coated with Kieselgel $60F_{254}$ (Merck). For flash column chromatography, E. Merck Kieselgel 60 (230–400 mesh) was used. Nuclear magnetic resonance spectra (^1H and ^{13}C NMR) were recorded on a Bruker Unity 400, 500 spectrometers in $CDCl_3$ solution and chemical shifts are reported as parts per million (ppm). Resonance patterns are reported with the notations s (singlet), d (doublet), t (triplet), q (quartet), quint (quintet), sext (sextet), and m (multiplet). In addition, the notation br is used to indicate a broad signal. Coupling constants (*J*) are reported in hertz (Hz). IR spectra were recorded on a Varian 2000 Infrared spectrophotometer and are reported as cm^{-1}. High-resolution mass spectra (HRMS) were recorded on a JEOL JMS-600 spectrometer.

Optimization table



Entry	Additive (mol %)	Solvent	T °C	Yield (%)[a,b]
1	$AgSbF_6$ (10), $Cu(OAc)_2$ (100)	DCE	60	18
2	$AgSbF_6$ (10), AcOH (100)	DCE	60	27
3	$AgSbF_6$ (10), $Cu(OAc)_2$ (100)	AcOH	60	trace
4[c]	$AgSbF_6$ (10), AcOH (100)	DCE	60	N.R.
5[d]	$AgSbF_6$ (10), AcOH (100)	DCE	60	N.R.
6[e]	$AgSbF_6$ (10), AcOH (100)	DCE	60	N.R.
7	$AgSbF_6$ (10), $Cu(OAc)_2$ (100), AcOH (100)	DCE	60	38
8	$AgSbF_6$ (10), $Cu(OAc)_2$ (100), AcOH (100)	*t*-AmOH	60	13
9	$AgSbF_6$ (10), $Cu(OAc)_2$ (100), AcOH (100)	*t*-BuOH	60	13
10	$AgSbF_6$ (10), $Cu(OAc)_2$ (100), AcOH (100)	H_2O	60	59
11	$AgSbF_6$ (10), $Cu(OAc)_2$ (100), AcOH (100)	H_2O	100	71
12	$Cu(OAc)_2$ (100), AcOH (100)	H_2O	100	73
13	$Cu(OAc)_2$ (200), AcOH (100)	H_2O	100	83
14	**$Cu(OAc)_2 \cdot H_2O$ (200), AcOH (100)**	**H_2O**	**100**	**84**

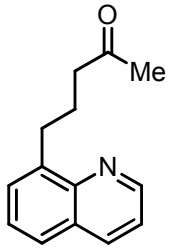
[a] Reaction conditions: **1a** (0.2 mmol), **2a** (0.6 mmol), $[RhCp^*Cl_2]_2$ (2.5 mol %), additive (quantity noted), solvent (1 mL) under air at indicated temperature for 20 h in pressure tubes. [b] Isolated yield by flash column chromatography. [c] $[Ru(p\text{-cymene})Cl_2]_2$ (2.5 mol %) was used as a catalyst. [d] $[CoCp^*(CO)I_2]$ (5 mol %) was used as a catalyst. [e] $Pd(OAc)_2$ (5 mol %) was used as a catalyst.

General procedure for the C(sp^3)–H alkylation of 8-methylquinolines to allylic alcohols (3a–3u and 4b–4i')

To an oven-dried sealed tube charged with 8-methylquinoline (**1a**) (28.6 mg, 0.2 mmol, 100 mol %), $[RhCp^*Cl_2]_2$ (3.1 mg, 0.005 mmol, 2.5 mol %), $Cu(OAc)_2 \cdot H_2O$ (80.0 mg, 0.4 mmol, 200 mol %) and but-3-en-2-ol (**2a**) (43.3 mg, 0.6 mmol, 300 mol %) was added AcOH (12.0 mg, 0.2 mmol, 100 mol %) and H_2O (1 mL) under air at room temperature. The reaction mixture was allowed to stir at 100 ^oC for 20 h, and cooled to room temperature. The reaction mixture was extracted with EtOAc (10 mL). The organic layer was dried over $MgSO_4$, filtered, and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 3:1) to afford 35.8 mg of **3a** in 84% yield.

Characterization data for all products (3a–3u and 4b–4i')

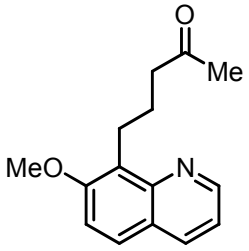
5-(Quinolin-8-yl)pentan-2-one (3a)



3a

35.8 mg (84%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.12 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.67 (dd, *J* = 8.3, 1.1 Hz, 1H), 7.55 (d, *J* = 6.6 Hz, 1H), 7.45 (t, *J* = 7.8 Hz, 1H), 7.38 (dd, *J* = 8.2, 4.2 Hz, 1H), 3.27 (t, *J* = 7.5 Hz, 2H), 2.52 (t, *J* = 7.4 Hz, 2H), 2.12–2.05 (m, 5H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.4, 149.5, 147.0, 140.6, 136.6, 129.1, 128.6, 126.5, 126.4, 121.1, 43.7, 30.8, 30.1, 24.9; IR (KBr) υ 2918, 1707, 1594, 1497, 1362, 1161, 1078, 1026, 949, 828, 793, 753 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{15}NO$ $[M]^+$ 213.1154, found 213.1152.

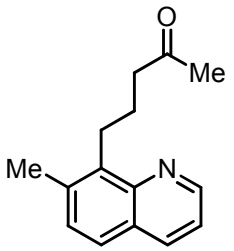
5-(7-Methoxyquinolin-8-yl)pentan-2-one (3b)



3b

40.8 mg (84%); Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.85 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.03 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.65 (t, *J* = 9.0 Hz, 1H), 7.29 (d, *J* = 9.0 Hz, 1H), 7.21 (dd, *J* = 8.2, 4.2 Hz, 1H), 3.94 (s, 3H), 3.28 (t, *J* = 7.3 Hz, 2H), 2.48 (t, *J* = 7.5 Hz, 2H), 2.08 (s, 3H), 1.96 (quint, *J* = 7.5 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.9, 157.4, 150.2, 147.6, 136.3, 126.9, 125.6, 123.6, 118.8, 113.7, 56.4, 43.8, 29.8, 24.2, 23.3; IR (KBr) υ 2934, 1708, 1611, 1503, 1428, 1360, 1317, 1262, 1154, 1094, 954, 828, 801, 741 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO_2$ $[M]^+$ 243.1259, found 243.1260.

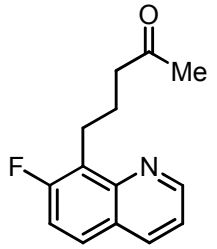
5-(7-Methylquinolin-8-yl)pentan-2-one (3c)



3c

45.0 mg (99%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.87 (d, *J* = 4.0, 2.1 Hz, 1H), 8.05 (d, *J* = 8.2 Hz, 1H), 7.55 (d, *J* = 8.3 Hz, 1H), 7.35–7.29 (m, 2H), 3.31 (t, *J* = 7.6 Hz, 2H), 2.59–2.54 (m, 5H), 2.12 (s, 3H), 1.92 (quint, *J* = 7.5 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.5, 149.3, 147.0, 137.9, 137.2, 136.4, 130.0, 126.9, 125.5, 120.1, 43.8, 30.0, 26.7, 24.2, 20.2; IR (KBr) υ 2931, 1708, 1613, 1501, 1456, 1360, 1317, 1248, 1156, 1074, 958, 834, 801, 720 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO$ $[M]^+$ 227.1310, found 227.1310.

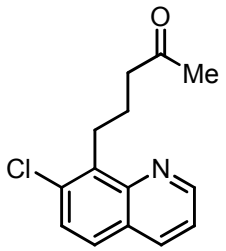
5-(7-Fluoroquinolin-8-yl)pentan-2-one (3d)



3d

41.1 mg (89%); Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.90 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.10 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.65 (dd, *J* = 8.9, 6.1 Hz, 1H), 7.34 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.29 (t, *J* = 9.1 Hz, 1H), 3.27 (dt, *J* = 8.9, 1.9 Hz, 2H), 2.49 (t, *J* = 7.5 Hz, 2H), 2.10 (s, 3H), 2.02 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.2, 160.9 (d, $J_{C\text{-}F}$ = 244.6 Hz), 150.4, 147.9 (d, $J_{C\text{-}F}$ = 9.3 Hz), 136.4, 127.5 (d, $J_{C\text{-}F}$ = 10.6 Hz), 125.6, 124.7 (d, $J_{C\text{-}F}$ = 15.5 Hz), 120.2, 116.9 (d, $J_{C\text{-}F}$ = 27.1 Hz), 43.4, 29.9, 24.2, 22.9; IR (KBr) υ 2926, 1709, 1618, 1584, 1500, 1462, 1431, 1363, 1320, 1213, 1163, 1070, 922, 832, 799 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}FNO$ $[M]^+$ 231.1059, found 231.1062.

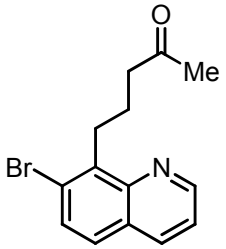
5-(7-Chloroquinolin-8-yl)pentan-2-one (3e)



3e

36.6 mg (74%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.90 (dd, *J* = 4.1, 1.6 Hz, 1H), 8.08 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.58 (d, *J* = 8.8 Hz, 1H), 7.48 (d, *J* = 8.8 Hz, 1H), 7.36 (dd, *J* = 8.2, 4.2 Hz, 1H), 3.43 (t, *J* = 7.6 Hz, 2H), 2.54 (t, *J* = 7.5 Hz, 2H), 2.12 (s, 3H), 2.00 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.3, 150.3, 147.5, 138.2, 136.4, 134.8, 128.3, 127.1, 126.9, 121.1, 43.6, 29.9, 27.6, 23.7; IR (KBr) υ 2930, 1707, 1603, 1588, 1488, 1360, 1267, 1157, 1123, 1043, 952, 866, 831, 797 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}ClNO$ $[M]^+$ 247.0764, found 247.0763.

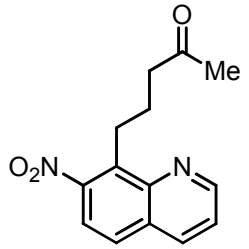
5-(7-Bromoquinolin-8-yl)pentan-2-one (3f)



3f

42.6 mg (76%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.89 (dd, *J* = 4.1, 1.9 Hz, 1H), 8.08 (d, *J* = 8.2 Hz, 1H), 7.64 (d, *J* = 8.7 Hz, 1H), 7.51 (d, *J* = 8.8 Hz, 1H), 7.38 (dd, *J* = 8.1, 4.2 Hz, 1H), 3.45 (t, *J* = 7.6 Hz, 2H), 2.56 (t, *J* = 7.5 Hz, 2H), 2.13 (s, 3H), 1.99 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.3, 150.3, 147.4, 140.3, 136.5, 131.2, 127.5, 127.1, 125.7, 121.3, 43.7, 30.5, 29.9, 23.8; IR (KBr) υ 2927, 1707, 1589, 1486, 1445, 1361, 1252, 1157, 1116, 1037, 952, 832, 797 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}BrNO$ $[M]^+$ 291.0259, found 291.0258.

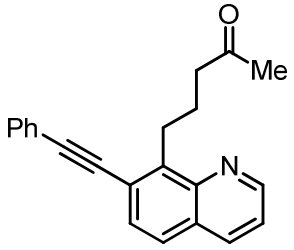
5-(7-Nitroquinolin-8-yl)pentan-2-one (3g)



3g

12.3 mg (24%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.04 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.20 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.87 (d, *J* = 8.9 Hz, 1H), 7.78 (d, *J* = 8.9 Hz, 1H), 7.54 (dd, *J* = 8.3, 4.2 Hz, 1H), 3.49–3.45 (m, 2H), 2.62 (t, *J* = 7.5 Hz, 2H), 2.17 (s, 3H), 2.13–2.05 (m, 2H);^{13}C NMR (100 MHz, $CDCl_3$) δ 208.9, 151.5, 149.6, 146.7, 136.7, 136.5, 130.1, 127.4, 123.3, 121.4, 44.1, 29.9, 26.6, 25.1; IR (KBr) υ 2922, 1707, 1596, 1525, 1457, 1345, 1267, 1162, 949, 838, 806, 741 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}N_2O_3$ $[M]^+$ 258.1004, found 258.1002.

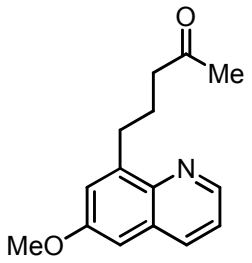
5-(7-(Phenylethynyl)quinolin-8-yl)pentan-2-one (3h)



3h

12.5 mg (20%); Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.94 (dd, *J* = 4.1, 1.7 Hz, 1H), 8.11 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.64–7.59 (m, 4H), 7.40–7.37 (m, 4H), 3.59 (t, *J* = 7.3 Hz, 2H), 2.55 (t, *J* = 7.4 Hz, 2H), 2.18–2.10 (m, 2H), 2.09 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.5, 150.2, 146.9, 143.7, 136.4, 131.8, 129.7, 128.8, 128.6, 128.4, 126.1, 123.6, 123.4, 121.4, 95.0, 88.8, 43.6, 30.0, 29.0, 24.7; IR (KBr) υ 2922, 1708, 1603, 1496, 1443, 1359, 1252, 1157, 1068, 918, 835, 807, 754, 689 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{22}H_{19}NO$ $[M]^+$ 313.1467, found 313.1469.

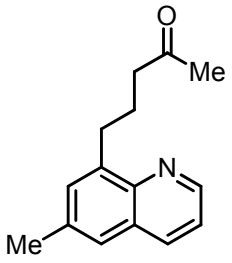
5-(6-Methoxyquinolin-8-yl)pentan-2-one (3i)



3i

43.7 mg (90%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.73 (dd, *J* = 4.2, 1.6 Hz, 1H), 7.99 (dd, *J* = 8.2, 1.5 Hz, 1H), 7.31 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.19 (d, *J* = 2.7 Hz, 1H), 6.90 (d, *J* = 2.8 Hz, 1H), 3.89 (s, 3H), 3.20 (t, *J* = 7.5 Hz, 2H), 2.50 (t, *J* = 7.4 Hz, 2H), 2.10 (s, 3H), 2.04 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.2, 157.5, 147.0, 143.3, 142.3, 135.2, 129.8, 121.7, 121.4, 103.5, 55.5, 43.5, 30.6, 30.0, 24.6; IR (KBr) υ 2934, 1709, 1616, 1595, 1493, 1424, 1373, 1250, 1216, 1159, 1058, 946, 839, 800, 747 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO_2$ $[M]^+$ 243.1259, found 243.1260.

5-(6-Methylquinolin-8-yl)pentan-2-one (3j)

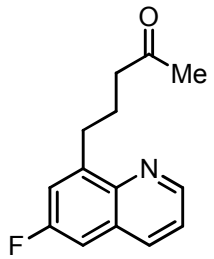


3j

44.0 mg (97%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.82 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.01 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.41 (s, 1H), 7.38 (s, 1H), 7.32 (dd, *J* = 8.2, 4.2 Hz, 1H), 3.22 (t, *J* = 7.5 Hz, 2H), 2.52 (t, *J* = 7.4 Hz, 2H), 2.48 (s, 3H), 2.11 (s, 3H), 2.06 (quint, *J* = 8.1 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.4, 148.6, 145.5, 140.1, 136.2, 135.8, 131.4, 128.7,125.1, 121.0, 43.7, 30.7, 30.0, 24.9, 21.7; IR (KBr) υ 2917, 1708, 1571, 1492, 1444, 1367, 1160, 1037,

949, 861, 786, 737 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO$ $[M]^+$ 227.1310, found 227.1310.

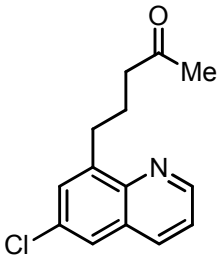
5-(6-Fluoroquinolin-8-yl)pentan-2-one (3k)



3k

32.8 mg (71%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.85 (dd, *J* = 4.1, 1.5 Hz, 1H), 8.05 (dd, *J* = 8.3, 1.6 Hz, 1H), 7.38 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.33 (dd, *J* = 9.4, 2.8 Hz, 1H), 7.27–7.24 (m, 1H), 3.25 (t, *J* = 7.6 Hz, 2H), 2.53 (t, *J* = 7.4 Hz, 2H), 2.13 (s, 3H), 2.06 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.0, 160.2 (d, $J_{C\text{-}F}$ = 246.2 Hz), 148.6 (d, $J_{C\text{-}F}$ = 2.5 Hz), 144.2 (d, $J_{C\text{-}F}$ = 3.5 Hz), 144.1, 135.9 (d, $J_{C\text{-}F}$ = 5.7 Hz), 129.3 (d, $J_{C\text{-}F}$ = 10.2 Hz), 121.9, 119.1 (d, $J_{C\text{-}F}$ = 25.4 Hz), 108.9 (d, $J_{C\text{-}F}$ = 21.1 Hz), 43.4, 30.7 (d, $J_{C\text{-}F}$ = 1.2 Hz), 30.1, 24.6; IR (KBr) υ 2919, 1709, 1590, 1487, 1409, 1364, 1237, 1159, 1033, 904, 863, 785, 735 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}FNO$ $[M]^+$ 231.1059, found 231.1062.

5-(6-Chloroquinolin-8-yl)pentan-2-one (3l)

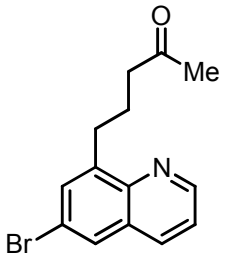


3l

32.6 mg (66%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.87 (dd, *J* = 4.1, 1.5 Hz, 1H), 8.02 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.63 (d, *J* = 2.2 Hz, 1H), 7.48 (d, *J* = 2.0 Hz, 1H), 7.39 (dd, *J* = 8.3, 4.2 Hz, 1H), 3.22 (t, *J* = 7.6 Hz, 2H), 2.52 (t, *J* = 7.4 Hz, 2H), 2.13 (s, 3H), 2.05 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.0, 149.6, 145.4, 143.0, 135.6, 132.1, 129.8,

129.2, 124.8, 122.0, 43.5, 30.6, 30.1, 24.6; IR (KBr) υ 2920, 1709, 1590, 1487, 1409, 1364, 1320, 1235, 1158, 1033, 904, 863, 785, 720 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}ClNO$ $[M]^+$ 247.0764, found 247.0762.

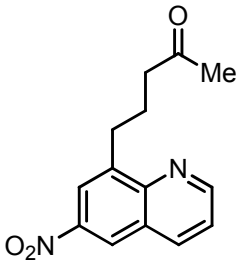
5-(6-Bromoquinolin-8-yl)pentan-2-one (3m)



3m

37.9 mg (65%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.88 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.01 (dd, *J* = 8.3, 1.6 Hz, 1H), 7.81 (d, *J* = 2.1 Hz, 1H), 7.61 (d, *J* = 1.9 Hz, 1H), 7.38 (dd, *J* = 8.3, 4.2 Hz, 1H), 3.21 (t, *J* = 7.6 Hz, 2H), 2.52 (t, *J* = 7.4 Hz, 2H), 2.13 (s, 3H), 2.05 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.0, 149.8, 145.6, 143.1, 135.5, 132.3, 129.7, 128.2, 121.9, 120.4, 43.5, 30.5, 30.1, 24.7; IR (KBr) υ 2919, 1708, 1589, 1486, 1407, 1360, 1319, 1234, 1156, 1031, 948, 862, 841, 783 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}BrNO$ $[M]^+$ 291.0259, found 291.0260.

5-(6-Nitroquinolin-8-yl)pentan-2-one (3n)

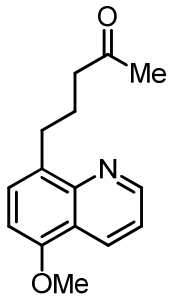


3n

23.7 mg (46%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 9.07 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.63 (d, *J* = 2.6 Hz, 1H), 8.33 (dd, *J* = 8.2, 1.8 Hz, 2H), 7.55 (dd, *J* = 8.3, 4.2 Hz, 1H), 3.33 (t, *J* = 7.6 Hz, 2H), 2.57 (t, *J* = 7.4 Hz, 2H), 2.15 (s, 3H), 2.14–2.06 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.7, 152.8, 149.0, 145.4, 143.8, 138.6, 127.4, 122.9, 122.8, 122.1, 43.4, 31.0, 30.2,

24.6; IR (KBr) υ 2923, 1708, 1616, 1527, 1490, 1411, 1346, 1319, 1229, 1159, 1092, 943, 899, 794, 741 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}N_2O_3$ $[M]^+$ 258.1004, found 258.1006.

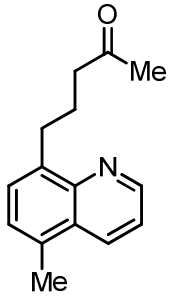
5-(5-Methoxyquinolin-8-yl)pentan-2-one (3o)



3o

46.2 mg (95%); Brown oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.89 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.55 (dd, *J* = 8.4, 1.8 Hz, 1H), 7.41 (d, *J* = 7.9 Hz, 1H), 7.35 (dd, *J* = 8.4, 4.2 Hz, 1H), 6.76 (d, *J* = 7.9 Hz, 1H), 3.96 (s, 3H), 3.15 (t, *J* = 7.5 Hz, 2H), 2.49 (t, *J* = 7.4 Hz, 2H), 2.10 (s, 3H), 2.04 (quint, *J* = 7.7 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.6, 153.8, 149.7, 147.4, 132.1, 131.1, 128.7, 121.1, 120.1, 104.0, 55.8, 43.7, 30.4, 30.0, 25.0; IR (KBr) υ 2920, 1709, 1614, 1590, 1472, 1400, 1385, 1267, 1157, 1087, 972, 817, 791 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO_2$ $[M]^+$ 243.1259, found 243.1260.

5-(5-Methylquinolin-8-yl)pentan-2-one (3p)

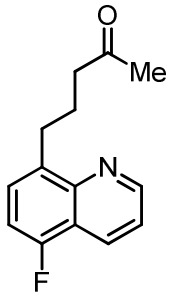


3p

41.3 mg (91%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.93 (dd, *J* = 4.1, 1.5 Hz, 1H), 8.31 (dd, *J* = 8.4, 1.5 Hz, 1H), 7.45–7.40 (m, 2H), 7.29 (d, *J* = 7.2 Hz, 1H), 3.25 (t, *J* = 7.5 Hz, 2H), 2.65 (s, 3H), 2.53 (t, *J* = 7.4 Hz, 2H), 2.13 (s, 3H), 2.08 (quint, *J* = 7.5 Hz, 2H); ^{13}C NMR

(100 MHz, $CDCl_3$) δ 209.5, 148.9, 147.2, 138.5, 132.8, 132.7, 128.7, 127.9, 126.9, 120.6, 43.7, 30.8, 30.0, 25.0, 18.7; IR (KBr) υ 2921, 1709, 1599, 1502, 1354, 1241, 1153, 1069, 945, 836, 787, 748 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO$ $[M]^+$ 227.1310, found 227.1310.

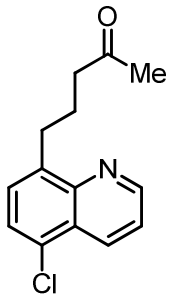
5-(5-Fluoroquinolin-8-yl)pentan-2-one (3q)



3q

32.3 mg (70%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.94 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.40 (dd, *J* = 8.4, 1.8 Hz, 1H), 7.47–7.42 (m, 2H), 7.12 (dd, *J* = 9.6, 8.0 Hz, 1H), 3.20 (t, *J* = 7.6 Hz, 2H), 2.50 (t, *J* = 7.4 Hz, 2H), 2.12 (s, 3H), 2.08–2.00 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.3, 156.6 (d, $J_{C\text{-}F}$ = 251.5 Hz), 150.2, 147.2, 136.5 (d, $J_{C\text{-}F}$ = 4.7 Hz), 129.6 (d, $J_{C\text{-}F}$ = 5.0 Hz), 128.2 (d, $J_{C\text{-}F}$ = 8.3 Hz), 121.7 (d, $J_{C\text{-}F}$ = 2.8 Hz), 119.3 (d, $J_{C\text{-}F}$ = 16.0 Hz), 109.7 (d, $J_{C\text{-}F}$ = 18.8 Hz), 43.5, 30.5, 30.1, 25.0; IR (KBr) υ 2920, 1709, 1626, 1596, 1577, 1473, 1402, 1364, 1254, 1139, 1051, 999, 831, 789 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}FNO$ $[M]^+$ 231.1059, found 231.1062.

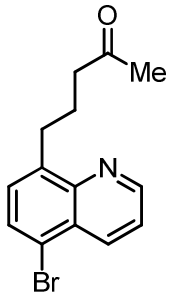
5-(5-Chloroquinolin-8-yl)pentan-2-one (3r)



3r

29.7 mg (60%); Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.93 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.55 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.52 (d, *J* = 7.7 Hz, 1H), 7.50–7.44 (m, 2H), 3.22 (t, *J* = 7.4 Hz, 2H), 2.51 (t, *J* = 7.4 Hz, 2H), 2.12 (s, 3H), 2.04 (quint, *J* = 7.7 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.2, 150.0, 147.5, 140.1, 133.3, 129.4, 128.8, 126.5, 126.4, 121.8, 43.5, 30.7, 30.1, 24.8; IR (KBr) υ 2922, 1711, 1567, 1494, 1463, 1385, 1353, 1265, 1154, 1115, 1037, 933, 833, 789 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}ClNO$ $[M]^+$ 247.0764, found 247.0763.

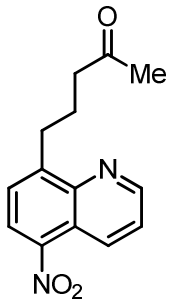
5-(5-Bromoquinolin-8-yl)pentan-2-one (3s)



3s

26.8 mg (46%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (dd, *J* = 4.1, 1.7 Hz, 1H), 8.51 (dd, *J* = 8.5, 1.7 Hz, 1H), 7.73 (d, *J* = 7.7 Hz, 1H), 7.48 (dd, *J* = 8.5, 4.2 Hz, 1H), 7.40 (d, *J* = 7.7 Hz, 1H), 3.22 (t, *J* = 7.4 Hz, 2H), 2.51 (t, *J* = 7.4 Hz, 2H), 2.12 (s, 3H), 2.04 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.2, 150.0, 147.7, 140.9, 135.9, 130.2, 129.4, 127.8, 122.2, 119.9, 43.5, 30.7, 30.1, 24.8; IR (KBr) υ 2920, 1709, 1564, 1492, 1348, 1267, 1152, 1036, 913, 832, 788 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}BrNO$ $[M]^+$ 291.0259, found 291.0260.

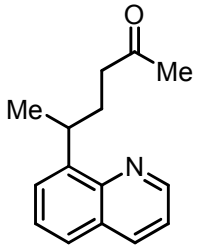
5-(5-Nitroquinolin-8-yl)pentan-2-one (3t)



3t

14.4 mg (28%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.04–9.00 (m, 2H), 8.31 (d, *J* = 7.9 Hz, 1H), 7.66–7.61 (m, 2H), 3.34 (t, *J* = 7.6 Hz, 2H), 2.55 (t, *J* = 7.3 Hz, 2H), 2.15 (s, 3H), 2.07 (quint, *J* = 7.5 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.8, 150.5, 149.5, 146.6, 144.2, 132.4, 127.2, 124.8, 123.9, 121.5, 43.4, 31.6, 30.2, 24.7; IR (KBr) υ 2923, 1710, 1592, 1515, 1499, 1401, 1329, 1267, 1157, 1078, 954, 829, 793, 741 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{14}N_2O_3$ $[M]^+$ 258.1004, found 258.1006.

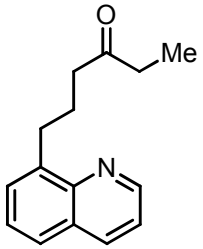
5-(Quinolin-8-yl)hexan-2-one (3u)



3u

25.0 mg (55%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.93 (dd, *J* = 4.0, 1.6 Hz, 1H), 8.16 (dd, *J* = 8.1, 0.9 Hz, 1H), 7.67 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.59 (dd, *J* = 7.1, 1.2 Hz, 1H), 7.52 (t, *J* = 7.7 Hz, 1H), 7.41 (dd, *J* = 8.2, 4.2 Hz, 1H), 4.28 (sext, *J* = 7.1 Hz, 1H), 2.50–2.42 (m, 1H), 2.34–2.26 (m, 1H), 2.09–2.03 (m, 5H), 1.65 (br s, 1H), 1.38 (d, *J* = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 209.5, 149.3, 145.5, 143.1, 136.9, 128.7, 126.8, 126.3, 126.1, 121.1, 42.4, 32.0, 31.8, 30.0, 22.0; IR (KBr) υ 2921, 1709, 1596, 1496, 1457, 1362, 1261, 1160, 1006, 985, 830, 795, 760 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO$ $[M]^+$ 227.1310, found 227.1311.

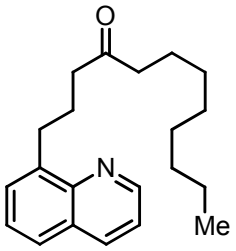
6-(Quinolin-8-yl)hexan-3-one (4b)



4b

40.9 mg (90%); Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.92 (dd, *J* = 4.1, 1.6 Hz, 1H), 8.13 (dd, *J* = 8.3, 1.8 Hz, 1H), 7.67 (dd, *J* = 8.1, 1.2 Hz, 1H), 7.55 (d, *J* = 6.5 Hz, 1H), 7.46 (dd, *J* = 8.0, 7.3 Hz, 1H), 7.38 (dd, *J* = 8.3, 4.2 Hz, 1H), 3.28 (t, *J* = 7.6 Hz, 2H), 2.51 (t, *J* = 7.5 Hz, 2H), 2.40 (q, *J* = 7.4 Hz, 2H), 2.09 (quint, *J* = 7.7 Hz, 2H), 1.03 (t, *J* = 7.4 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 212.0, 149.4, 146.9, 140.7, 136.7, 129.2, 128.6, 126.5, 126.4, 121.1, 42.3, 36.0, 30.9, 25.0, 8.0; IR (KBr) υ 2934, 1708, 1595 ,1497, 1457, 1411, 1365, 1166, 1112, 1077, 979, 827, 793, 759 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{15}H_{17}NO$ $[M]^+$ 227.1310, found 227.1312.

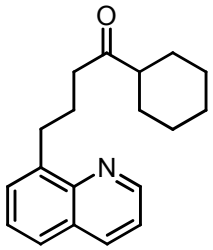
1-(Quinolin-8-yl)dodecan-4-one (4c)



4c

24.9 mg (40%); Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.93 (d, *J* = 2.0 Hz, 1H), 8.16 (d, *J* = 5.1 Hz, 1H), 7.68 (d, *J* = 8.0 Hz, 1H), 7.57 (d, *J* = 6.7 Hz, 1H), 7.48 (t, *J* = 7.6 Hz, 1H), 7.40 (d, *J* = 3.4 Hz, 1H), 3.29 (t, *J* = 7.6 Hz, 2H), 2.52 (t, *J* = 7.3 Hz, 2H), 2.38 (q, *J* = 7.4 Hz, 2H), 2.09 (quint, *J* = 7.7 Hz, 2H) 1.54 (q, *J* = 7.3 Hz, 2H), 1.30–1.25 (m, 10H), 0.87 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 211.7, 149.4, 142.7, 140.6, 136.8, 129.3, 128.7, 126.6, 126.4, 121.1, 43.0, 42.7, 32.0, 30.9, 29.6, 29.5, 29.4, 25.0, 24.1, 22.9, 14.3; IR (KBr) υ 2922, 1709, 1595, 1497, 1456, 1366, 1235, 1128, 1089, 996, 827, 793, 722 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{21}H_{29}NO$ $[M]^+$ 311.2249, found 311.2250.

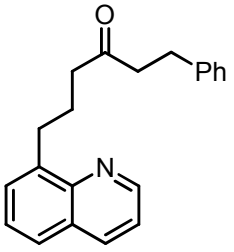
1-Cyclohexyl-4-(quinolin-8-yl)butan-1-one (4d)



4d

43.9 mg (78%); Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.91 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.12 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.66 (dd, *J* = 8.1, 1.4 Hz, 1H), 7.56 (dd, *J* = 1.2, 0.6 Hz, 1H), 7.45 (dd, *J* = 8.0, 7.2 Hz, 1H), 7.37 (dd, *J* = 8.2, 4.2 Hz, 1H), 3.26 (t, *J* = 7.5 Hz, 2H), 2.54 (t, *J* = 7.3 Hz, 2H), 2.35–2.28 (m, 1H), 2.10–2.03 (m, 2H), 1.81–1.73 (m, 4H), 1.65–1.62 (m, 1H), 1.35–1.14 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 214.5, 149.5, 147.0, 140.8, 136.5, 129.1, 128.6, 126.5, 126.3, 121.0, 50.9, 40.6, 30.9, 28.7, 26.1, 25.9, 24.8; IR (KBr) υ 2926, 1701, 1595, 1497, 1448, 1367, 1317, 1142, 1078, 994, 890, 826, 792, 756 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{19}H_{23}NO$ $[M]^+$ 281.1780, found 281.1777.

1-Phenyl-6-(quinolin-8-yl)hexan-3-one (4e)

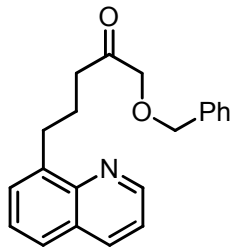


4e

40.6 mg (67%); Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.90 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.12 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.66 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.53–7.51 (m, 1H), 7.45 (t, *J* = 7.9 Hz, 1H), 7.38 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.28–7.24 (m, 2H), 7.19–7.15 (m, 3H), 3.26 (t, *J* = 7.5 Hz, 2H), 2.87 (t, *J* = 7.3 Hz, 2H), 2.71 (t, *J* = 7.9 Hz, 2H), 2.49 (t, *J* = 7.4 Hz, 2H), 2.08 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 210.4, 149.5, 147.0, 141.4, 140.6, 136.6, 129.2, 128.7, 128.6, 128.5, 126.5, 126.4, 126.2, 121.1, 44.4, 42.9, 30.9, 29.9, 24.9; IR (KBr) υ 2923,

1718, 1595, 1497, 1454, 1365, 1317, 1267, 1095, 1326, 910, 828, 794, 740, 698 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{21}H_{21}NO$ $[M]^+$ 303.1623, found 303.1625.

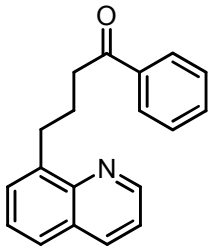
1-(Benzyloxy)-5-(quinolin-8-yl)pentan-2-one (4f)



4f

16.0 mg (25%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.89 (dd, *J* = 4.1, 1.6 Hz, 1H), 8.13 (dd, *J* = 8.3, 1.6 Hz, 1H), 7.68 (dd, *J* = 8.0, 0.7 Hz, 1H), 7.55 (d, *J* = 6.9 Hz, 1H), 7.45 (t, *J* = 7.6 Hz, 1H), 7.38 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.35–7.30 (m, 5H), 4.57 (s, 2H), 4.07 (s, 2H), 3.29 (t, *J* = 7.5 Hz, 2H), 2.56 (t, *J* = 7.4 Hz, 2H), 2.11 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 208.9, 149.5, 147.0, 140.5, 137.5, 136.6, 129.2, 128.7, 128.6, 128.2, 128.1, 126.5, 126.4, 121.1, 75.1, 73.5, 39.0, 30.9, 24.4; IR (KBr) υ 2924, 1715, 1595, 1497, 1454, 1366, 1240, 1095, 1027, 910, 828, 795, 735, 698 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{21}H_{21}NO_2$ $[M]^+$ 319.1572, found 319.1571.

1-Phenyl-4-(quinolin-8-yl)butan-1-one (4g)

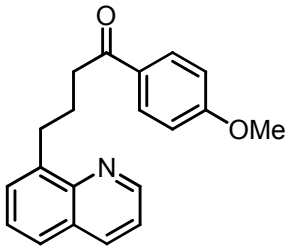


4g

26.4 mg (48%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.89 (dd, *J* = 4.1, 1.6 Hz, 1H), 8.13 (dd, *J* = 8.2, 1.5 Hz, 1H), 7.92 (d, *J* = 7.6 Hz, 2H), 7.68 (d, *J* = 8.10 Hz, 1H), 7.60 (d, *J* = 6.9 Hz, 1H), 7.52 (t, *J* = 7.3 Hz, 1H), 7.49–7.36 (m, 4H), 3.39 (t, *J* = 7.5 Hz, 2H), 3.08 (t, *J* = 7.4 Hz, 2H), 2.27 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 200.6, 149.5, 147.0, 140.7,

137.3, 136.6, 133.0, 129.2, 128.7, 128.6, 128.2, 126.5, 126.4, 121.1, 38.5, 31.0, 25.3; IR (KBr) υ 2923, 1680, 1595, 1497, 1447, 1364, 1318, 1225, 1199, 1179, 1076, 976, 827, 792, 752, 689 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{19}H_{17}NO$ $[M]^+$ 275.1310, found 275.1311.

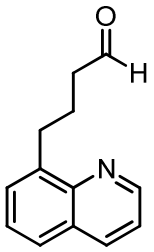
1-(4-Methoxyphenyl)-4-(quinolin-8-yl)butan-1-one (4h)



4h

20.1 mg (33%); Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.91 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.15 (dd, *J* = 8.2, 1.5 Hz, 1H), 7.93–7.89 (m, 2H), 7.68 (dd, *J* = 8.1, 0.9 Hz, 1H), 7.61 (d, *J* = 6.9 Hz, 1H), 7.47 (t, *J* = 7.4 Hz, 1H), 7.39 (dd, *J* = 8.2, 4.2 Hz, 1H), 6.92–6.88 (m, 2H), 3.86 (s, 3H), 3.39 (t, *J* = 7.5 Hz, 2H), 3.04 (t, *J* = 7.3 Hz, 2H), 2.25 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 199.2, 163.4, 149.4, 140.7, 136.7, 130.5, 130.4, 129.3, 129.2, 128.6, 126.6, 126.4, 121.0, 113.8, 55.6, 38.2, 31.0, 25.5; IR (KBr) υ 2928, 1671, 1597, 1574, 1509, 1498, 1364, 1307, 1252, 1168, 1029, 982, 826, 795 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{20}H_{19}NO_2$ $[M]^+$ 305.1416, found 305.1413.

4-(Quinolin-8-yl)butanal (4i)

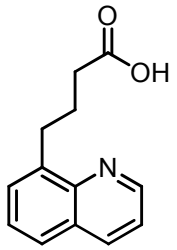


4i

10.0 mg (25%); Brown oil; ^1H NMR (400 MHz, $CDCl_3$) δ 9.77 (dd, *J* = 3.5, 1.7 Hz, 1H), 8.92 (dd, *J* = 4.1, 1.7 Hz, 1H), 8.14 (dd, *J* = 8.3, 1.8 Hz, 1H), 7.69 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.56 (d, *J* = 6.4 Hz, 1H), 7.47 (t, *J* = 7.9 Hz, 1H), 7.40 (dd, *J* = 8.3, 4.2 Hz, 1H), 3.33 (t, *J* = 7.4 Hz,

2H), 2.52 (dt, *J* = 9.0, 1.7 Hz, 2H), 2.16 (quint, *J* = 7.6 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 203.0, 149.6, 147.1, 140.4, 136.6, 129.3, 128.7, 126.6, 126.5, 121.2, 43.8, 31.0, 23.4; IR (KBr) υ 2924, 1718, 1594, 1497, 1392, 1316, 1250, 1132, 1077, 975, 827, 792, 759 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{13}H_{13}NO$ $[M]^+$ 199.0997, found 199.0998.

4-(Quinolin-8-yl)butanoic acid (4i')



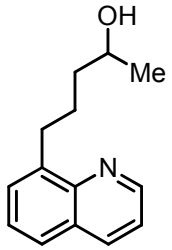
4i'

11.6 mg (27%); Brown solid; mp = 114.8–116.5 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.93 (dd, *J* = 4.2, 1.6 Hz, 1H), 8.20 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.71 (d, *J* = 7.4 Hz, 1H), 7.60 (d, *J* = 6.8 Hz, 1H), 7.50 (t, *J* = 7.7 Hz, 1H), 7.44 (dd, *J* = 8.3, 4.3 Hz, 1H), 3.34 (t, *J* = 7.2 Hz, 2H), 2.43 (t, *J* = 7.1 Hz, 2H), 2.15 (quint, *J* = 7.1 Hz, 2H); ^{13}C NMR (125 MHz, $CDCl_3$) δ 177.7, 149.2, 146.2, 139.9, 137.7, 130.3, 128.8, 127.0, 126.7, 121.2, 34.2, 30.7, 27.8; IR (KBr) υ 3041, 2921, 2490, 1705, 1595, 1503, 1403, 1375, 1335, 1267, 1237, 1196, 1085, 912, 867, 813, 782, 732 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{13}H_{13}NO_2$ $[M]^+$ 215.0946, found 215.0943.

Experimental procedure and characterization for reduction of quinoline 3a

1-Methyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (**3a**) (85.3 mg, 0.4 mmol) were dissolved in MeOH (4 mL) and CH_2Cl_2 (2 mL). $NaBH_4$ (121 mg, 3.2 mmol) was added in portions with stirring under cooling for 30 min. Then the reaction mixture was stirred for another 20 h at 30 ^oC. After the removal of the solvents, the residue was absorbed to small amounts of silica. The purification was performed by flash column chromatography on silica gel (*n*-hexanes/EtOAc = 2:1) to afford **5a** (84.4 mg) in 98% yield.

5-(Quinolin-8-yl)pentan-2-ol (5a)



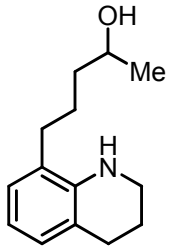
5a

84.4 mg (98%); Brown oil; ^1H NMR (400 MHz, $CDCl_3$) δ 8.89 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.13 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.67–7.55 (m, 1H), 7.54 (dd, *J* = 6.4, 0.6 Hz, 1H), 7.44 (dd, *J* = 8.0, 7.1 Hz, 1H), 7.37 (dd, *J* = 8.3, 4.2 Hz, 1H), 4.08–4.00 (m, 1H), 3.67 (br s, 1H), 3.45–3.37 (m, 1H), 3.15–3.08 (m, 1H), 1.97–1.80 (m, 2H), 1.65–1.51 (m, 2H), 1.22 (d, *J* = 6.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.3, 146.7, 141.4, 136.9, 129.1, 128.7, 126.6, 126.2, 121.0, 67.4, 38.5, 31.0, 27.4, 23.5; IR (KBr) υ 3387, 2927, 1596, 1494, 1463, 1359, 1316, 1266, 1189, 1110, 1004, 942, 826, 778, 740 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{17}NO$ $[M]^+$ 215.1310, found 215.1307.

1-Methyl-3-(quinolin-8-ylmethyl)pyrrolidine-2,5-dione (**3a**) (85.3 mg, 0.4 mmol) and $NiCl_2 \cdot 6H_2O$ (9.5 mg, 0.04 mmol, 10 mol %) were dissolved in MeOH (4 mL) and CH_2Cl_2 (2 mL). $NaBH_4$ (226.9 mg, 6 mmol, 15 equiv) was added in portions with stirring under cooling for 1 h. Then the reaction mixture was stirred for another 40 h at 30 ^oC. After the removal of the solvents, the residue was absorbed to small amounts of silica. The purification was performed by

flash column chromatography on silica gel (*n*-hexanes/EtOAc = 1:1) to afford **5b** (57.1 mg) in 65% yield.

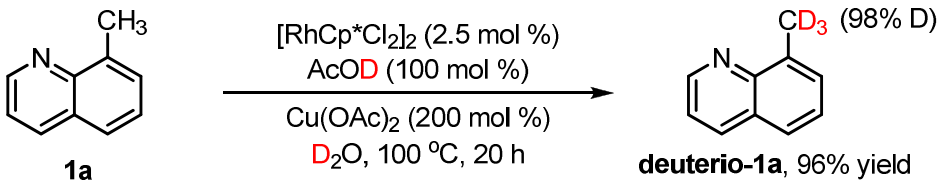
5-(1,2,3,4-Tetrahydroquinolin-8-yl)pentan-2-ol (5b)



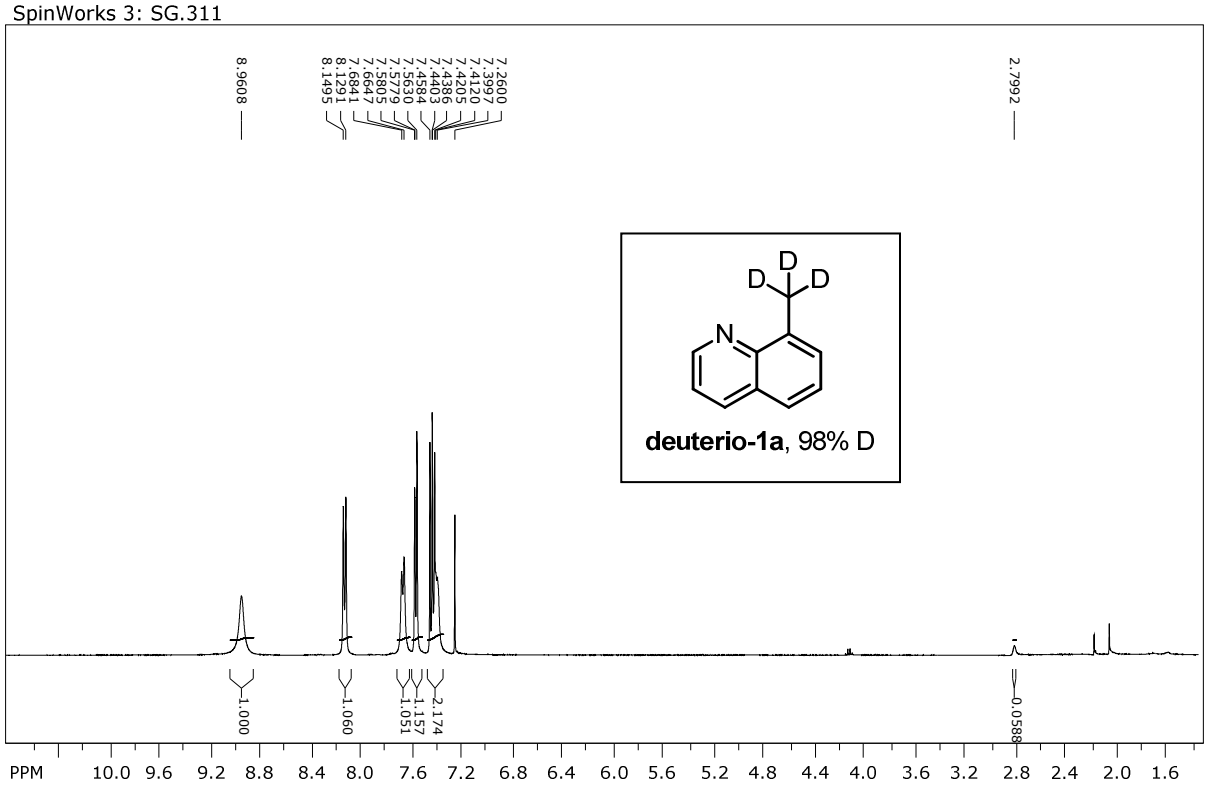
5b

57.1 mg (65%); Brown oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.86 (t, *J* = 7.2 Hz, 2H), 6.58 (t, *J* = 7.4 Hz, 1H), 3.86 (sext, *J* = 6.2 Hz, 1H), 3.36 (t, *J* = 5.5 Hz, 2H), 2.79 (t, *J* = 6.4 Hz, 2H), 2.49–2.37 (m, 2H), 1.97–1.91 (m, 2H), 1.79–1.60 (m, 2H), 1.57–1.51 (m, 2H), 1.21 (d, *J* = 6.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 142.4, 127.7, 126.9, 125.5, 121.5, 116.6, 68.2, 42.5, 39.2, 31.0, 27.6, 24.8, 23.9, 22.3; IR (KBr) υ 3363, 2925, 1595, 1498, 1458, 1368, 1316, 1267, 1130, 1087, 983, 941, 828, 792 cm^{-1}; HRMS (quadrupole, EI) calcd for $C_{14}H_{21}NO$ $[M]^+$ 219.1623, found 219.1624.

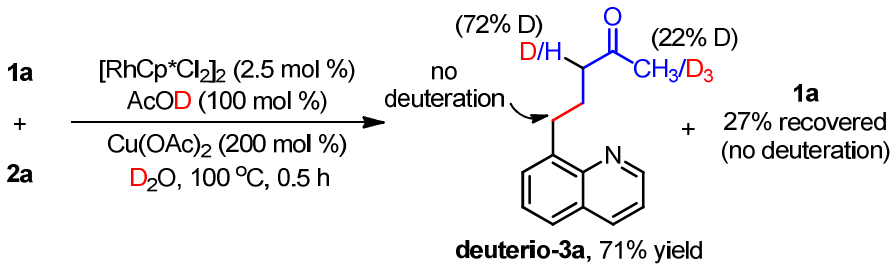
Mechanistic investigation (H/D exchange reactions)



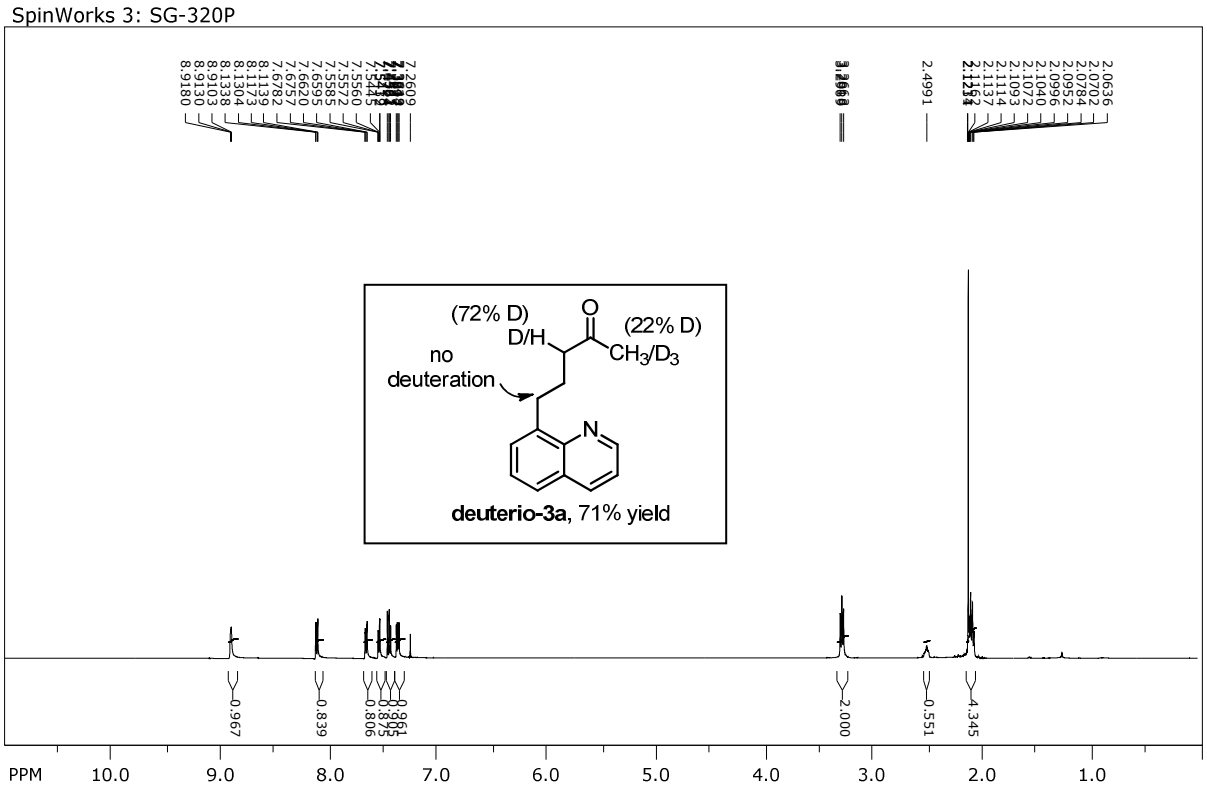
To an oven-dried sealed tube charged with 8-methylquinoline (**1a**) (43.0 mg, 0.3 mmol, 100 mol %), $[RhCp^*Cl_2]_2$ (4.6 mg, 0.0075 mmol, 2.5 mol %) and AcOD (54.1 mg, 0.9 mmol, 300 mol %) was added $Cu(OAc)_2$ (109.0 mg, 0.6 mmol, 200 mol %) and D_2O (1 mL) under air at room temperature. The reaction mixture was allowed to stir at 100 °C for 20 h, and cooled to room temperature. The reaction mixture was extracted with EtOAc (10 mL). The organic layer was dried over $MgSO_4$, filtered, and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 10:1) to afford 42.1 mg of **deuterio-1a** in 96% yield.



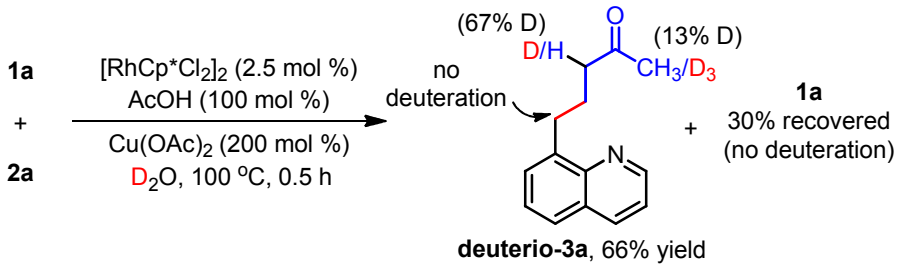
Mechanistic investigation (deuterium incorporation)



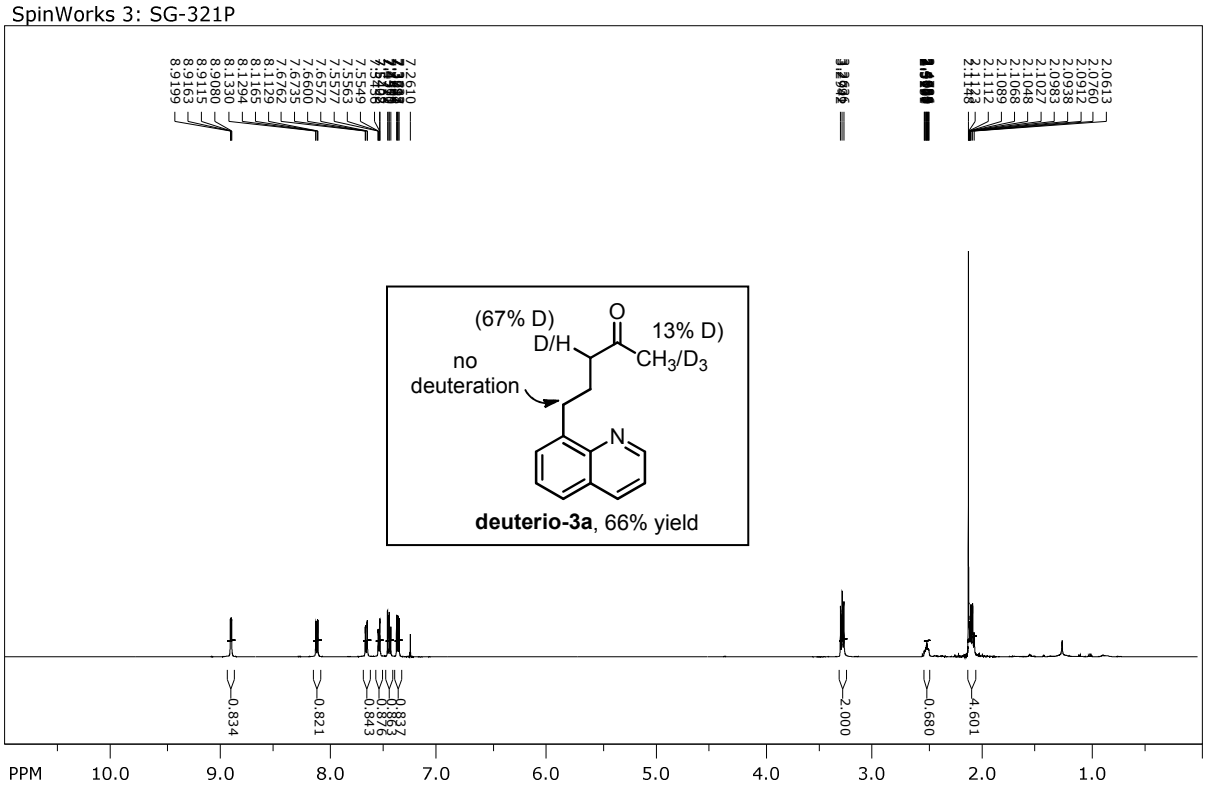
To an oven-dried sealed tube charged with 8-methylquinoline (**1a**) (43.0 mg, 0.3 mmol, 100 mol %), $[RhCp^*Cl_2]_2$ (4.6 mg, 0.0075 mmol, 2.5 mol %) and AcOD (54.1 mg, 0.9 mmol, 300 mol %) was added $Cu(OAc)_2$ (109.0 mg, 0.6 mmol, 200 mol %) and D_2O (1 mL) under air at room temperature. The reaction mixture was allowed to stir at 100 °C for 0.5 h, and cooled to room temperature. The reaction mixture was extracted with EtOAc (10 mL). The organic layer was dried over $MgSO_4$, filtered, and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 3:1 to 2:1) to afford **3a** (45.5 mg, 71% yield) and **1a** (11.6 mg, 27% recovered yield), respectively.



Mechanistic investigation (deuterium incorporation)

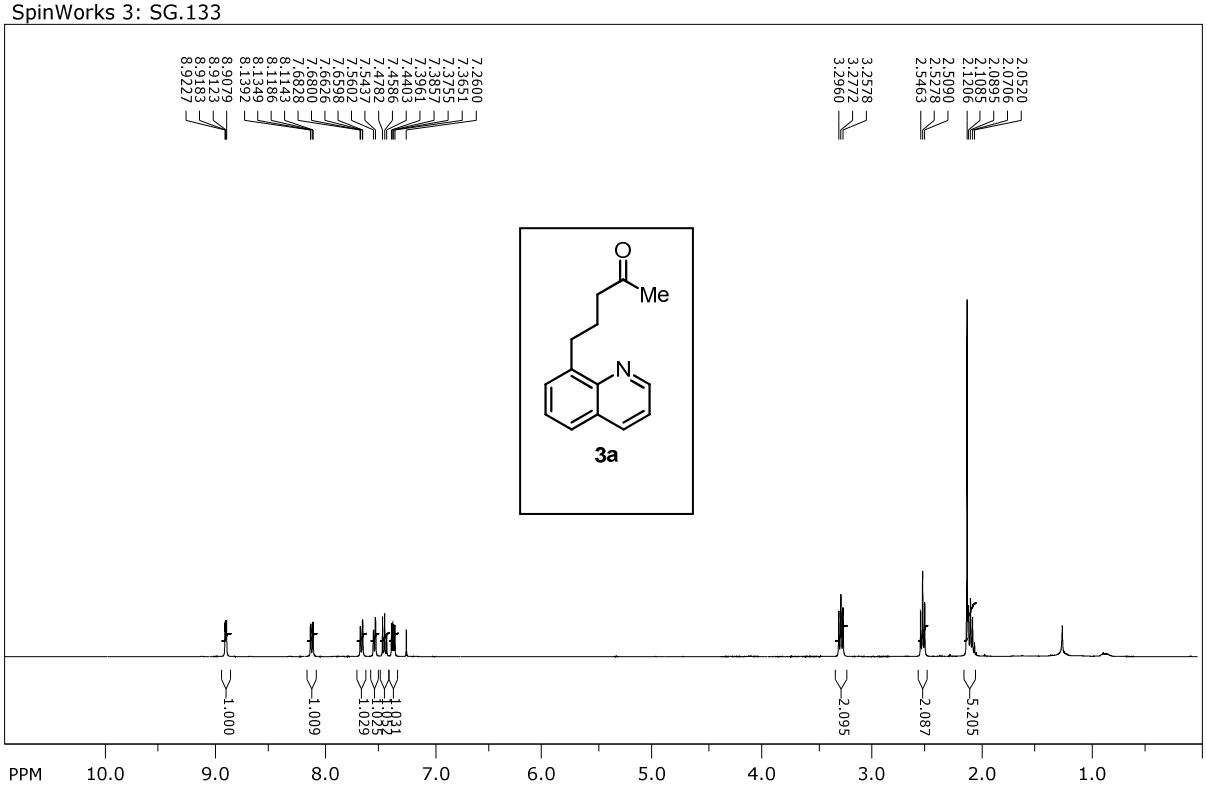


To an oven-dried sealed tube charged with 8-methylquinoline (**1a**) (43.0 mg, 0.3 mmol, 100 mol %), $[RhCp^*Cl_2]_2$ (4.6 mg, 0.0075 mmol, 2.5 mol %) and AcOH (54.1 mg, 0.9 mmol, 300 mol %) was added $Cu(OAc)_2$ (109.0 mg, 0.6 mmol, 200 mol %) and D_2O (1 mL) under air at room temperature. The reaction mixture was allowed to stir at 100 °C for 0.5 h, and cooled to room temperature. The reaction mixture was extracted with EtOAc (10 mL). The organic layer was dried over $MgSO_4$, filtered, and concentrated in vacuo. The residue was purified by flash column chromatography (*n*-hexanes/EtOAc = 3:1 to 2:1) to afford **3a** (42.3 mg, 66% yield) and **1a** (12.9 mg, 30% recovered yield), respectively.

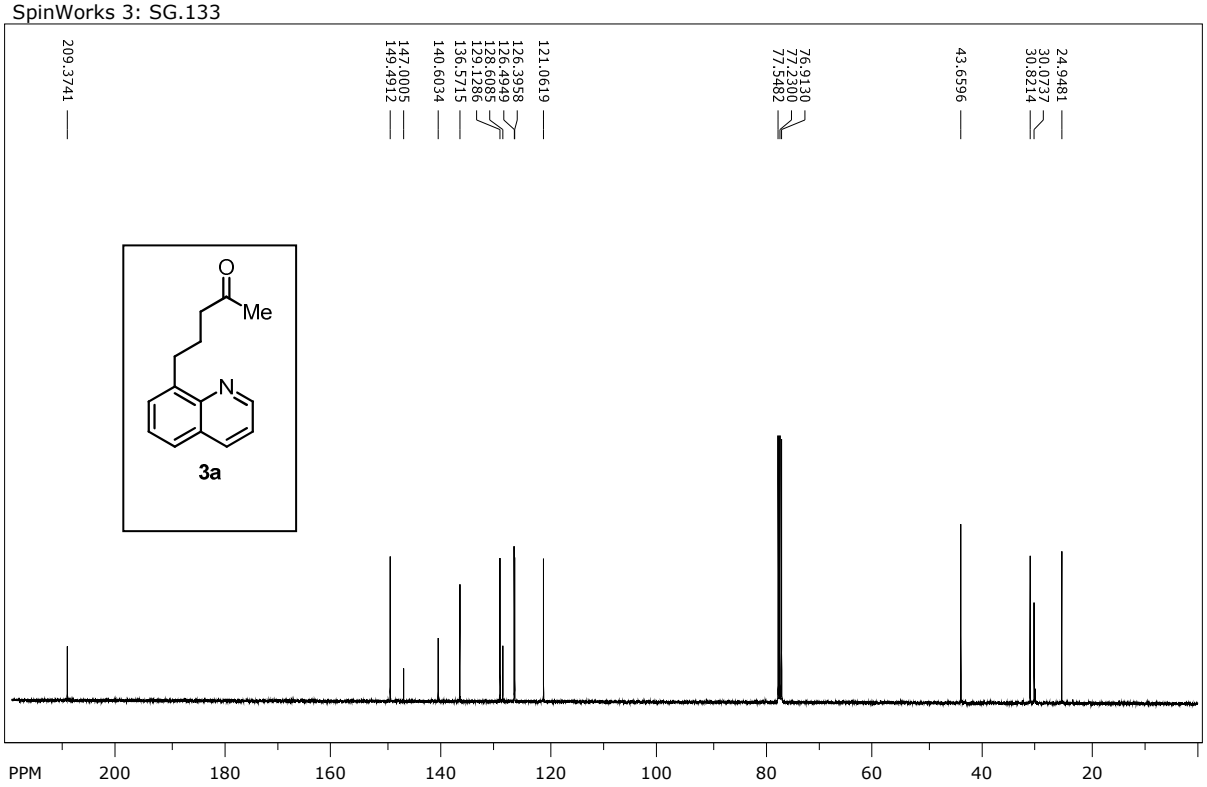


^{1}H and ^{13}C NMR spectra of all compounds

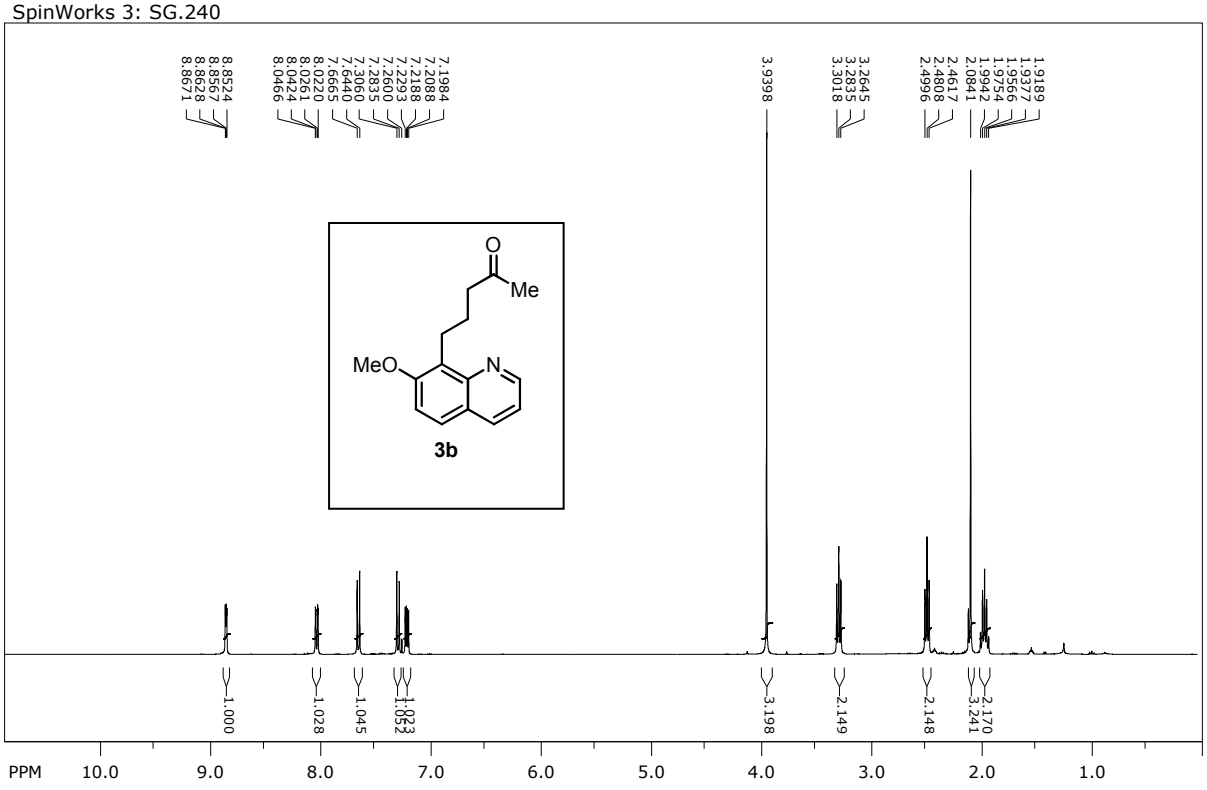
SpinWorks 3: SG.133



SpinWorks 3: SG.133



SpinWorks 3: SG.240



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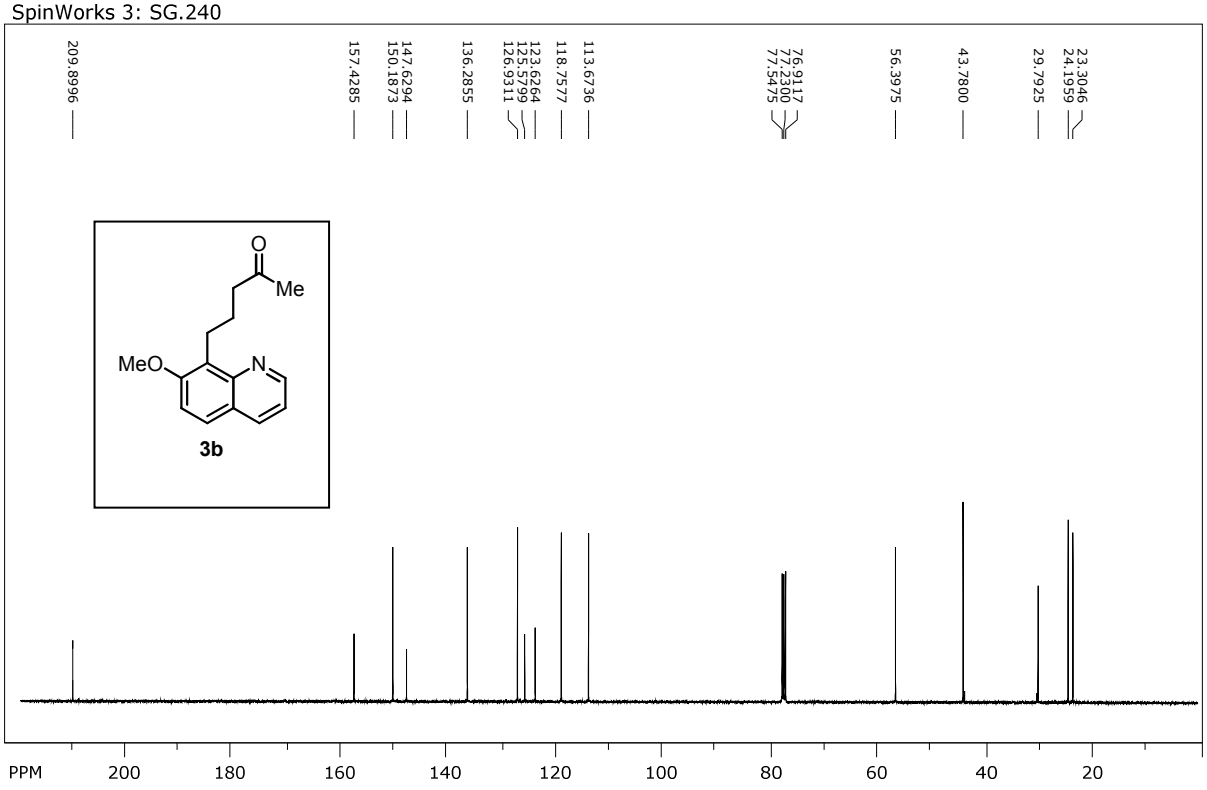

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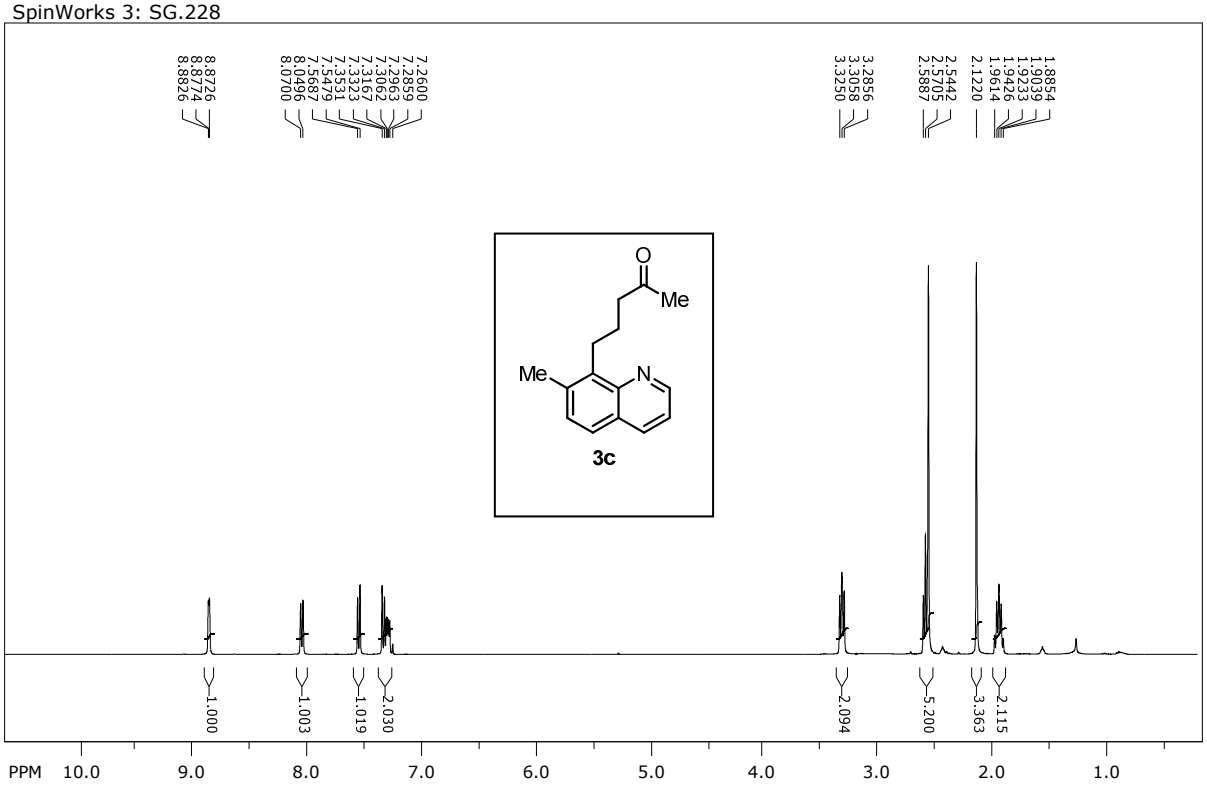

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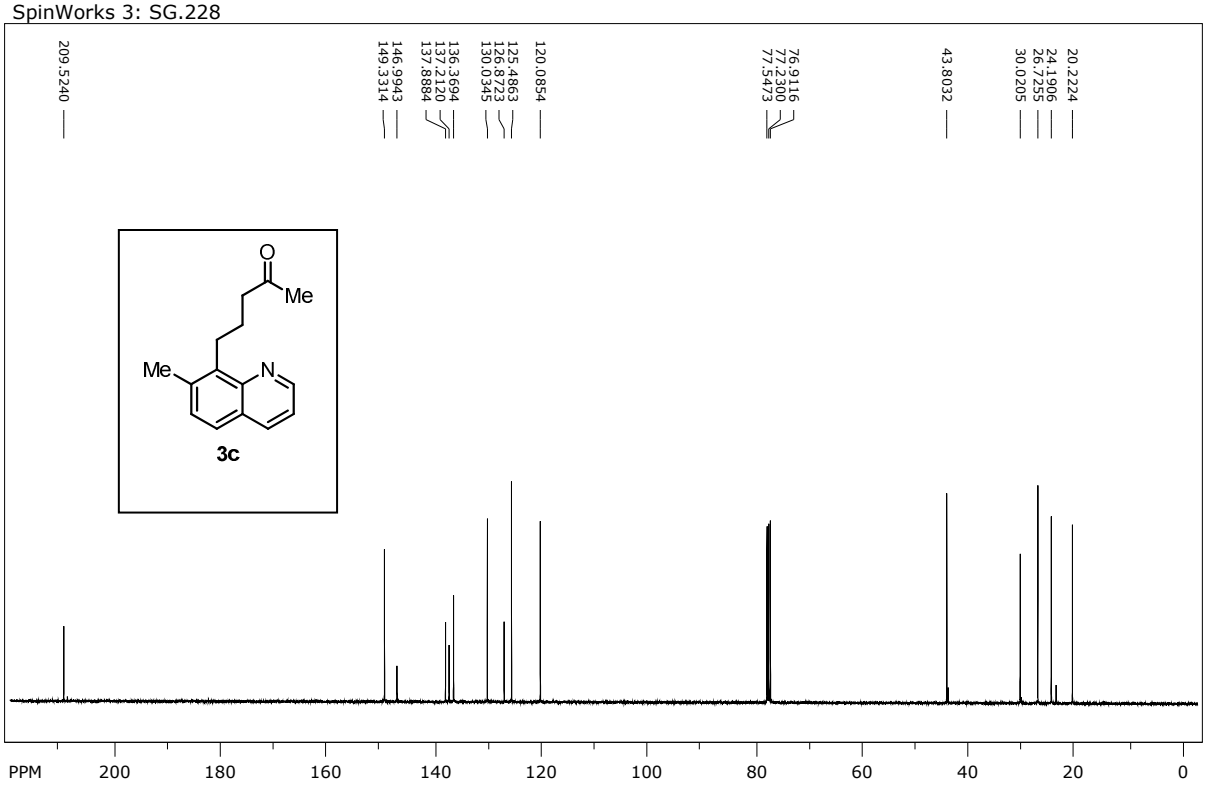
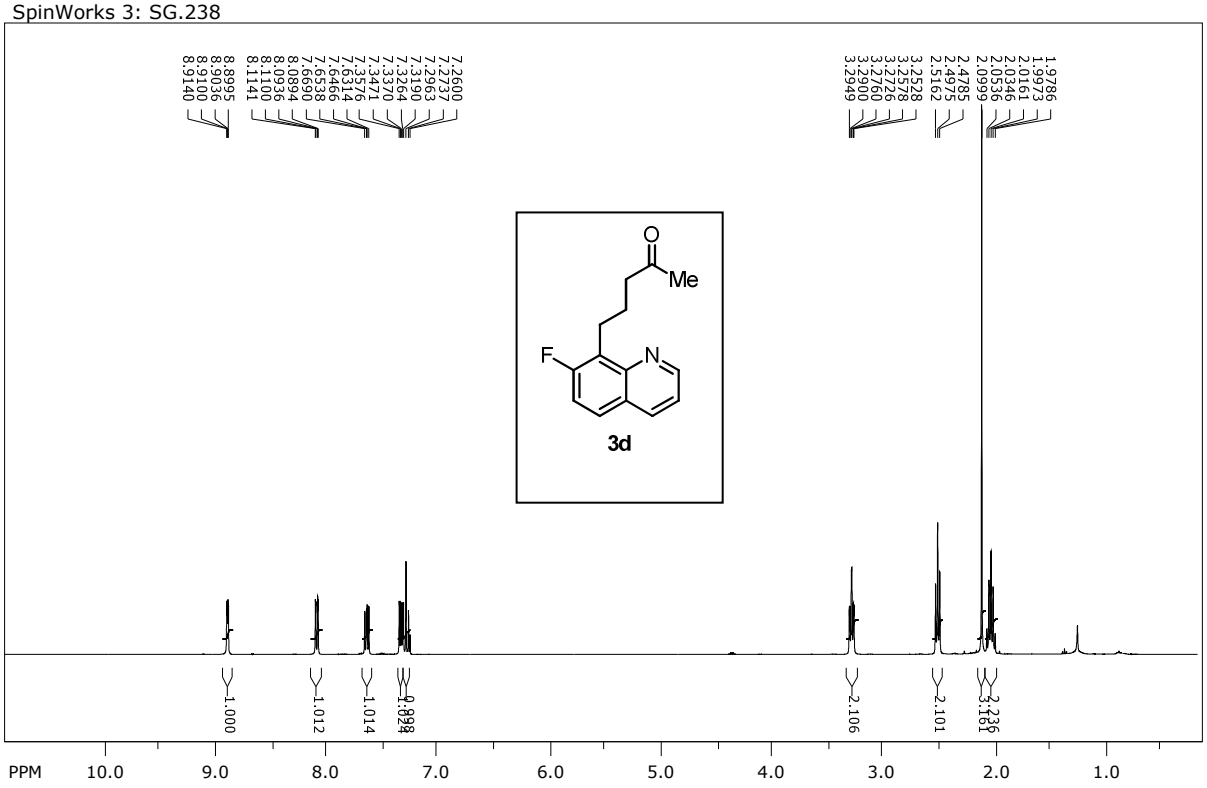


SpinWorks 3: SG.238



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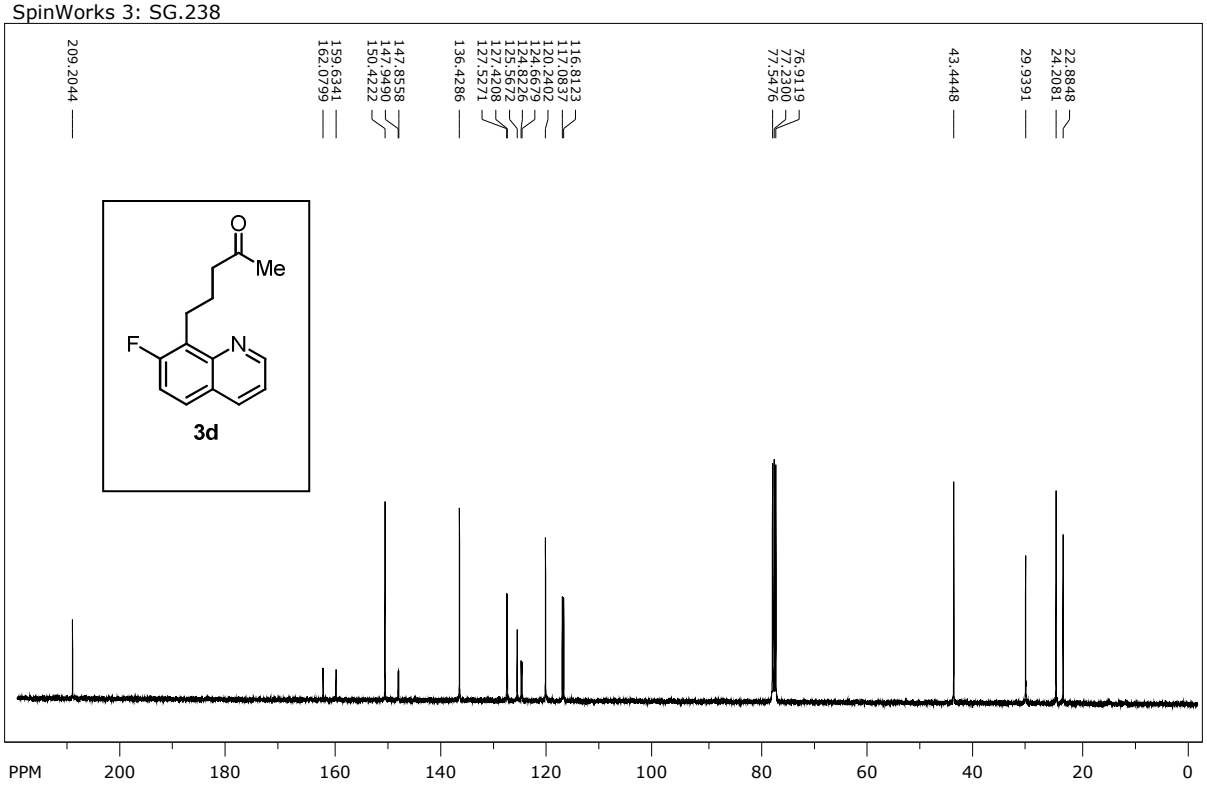
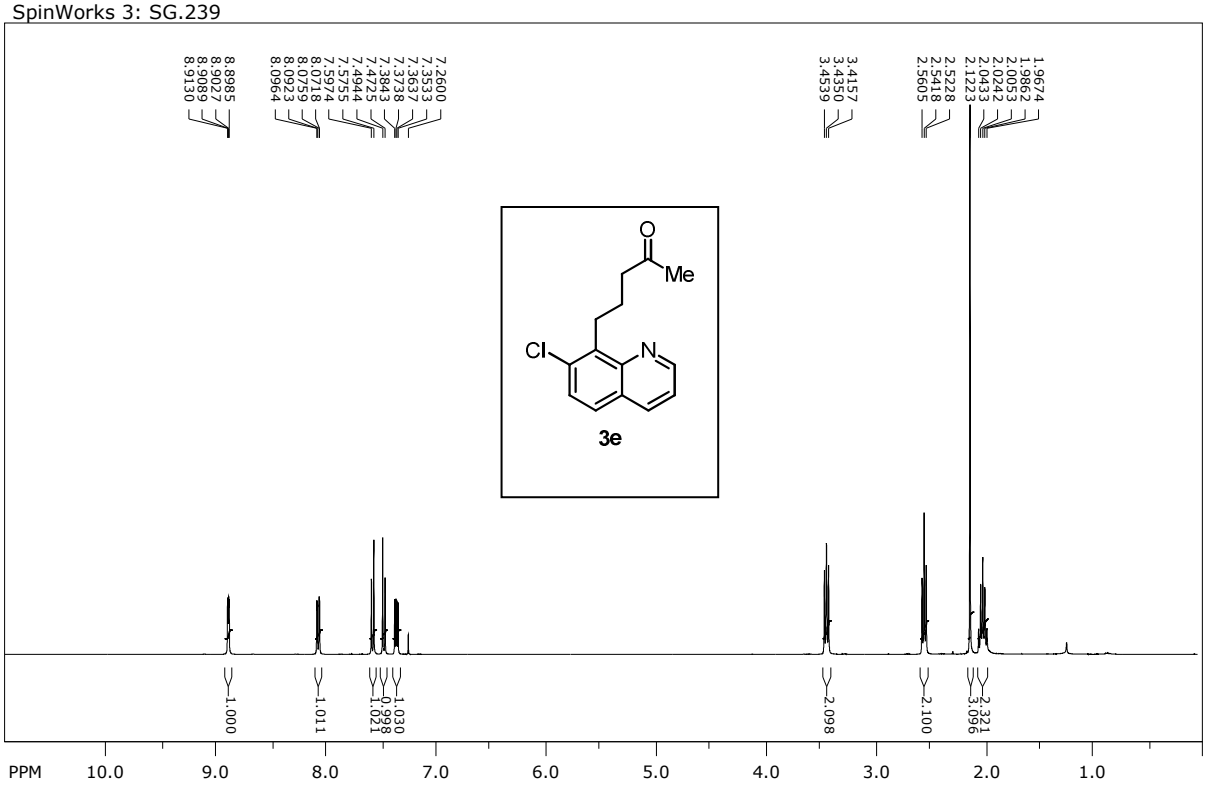
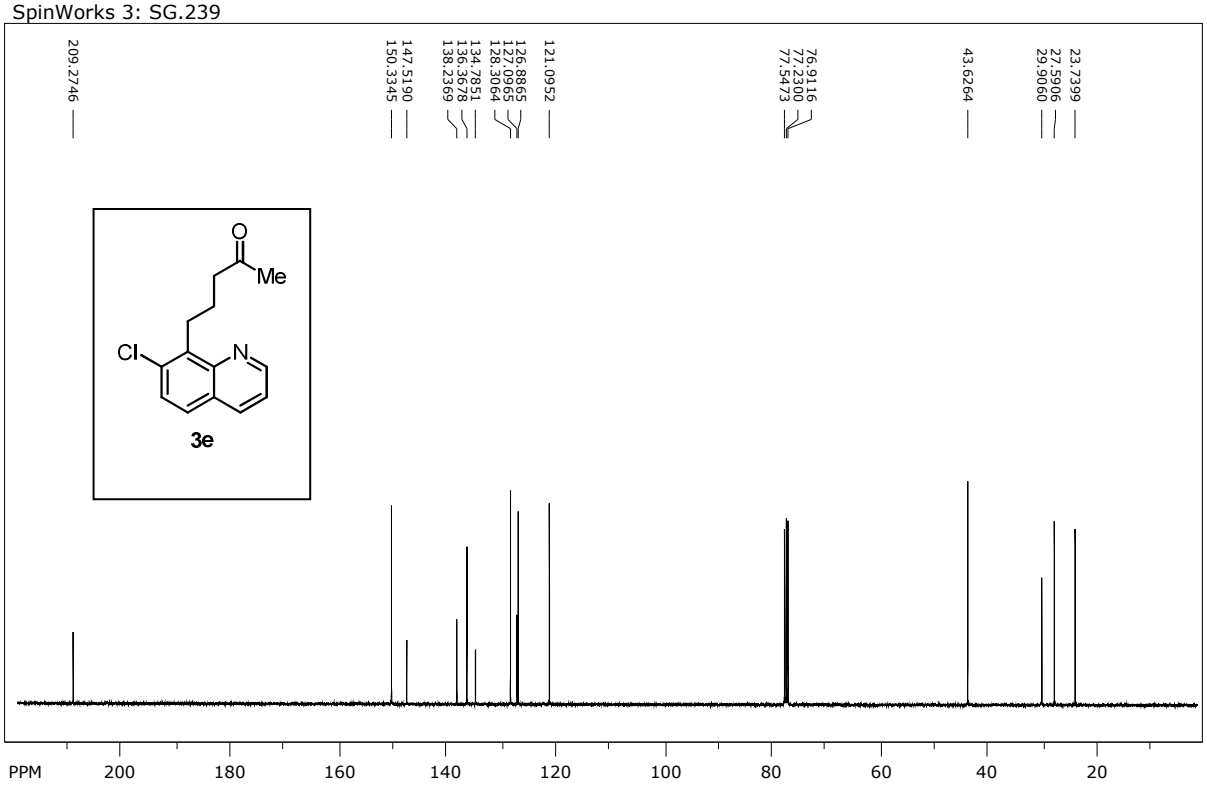


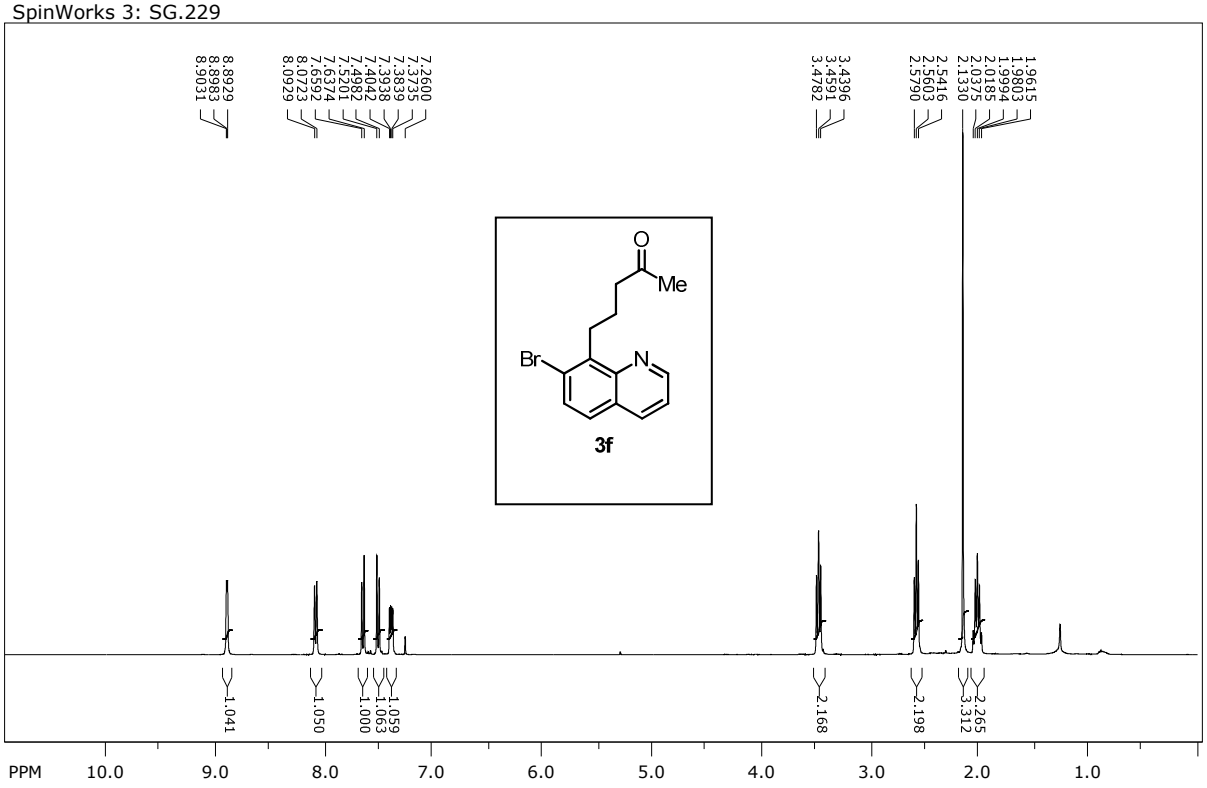
SpinWorks 3: SG.239



SpinWorks 3: SG.239



SpinWorks 3: SG.229



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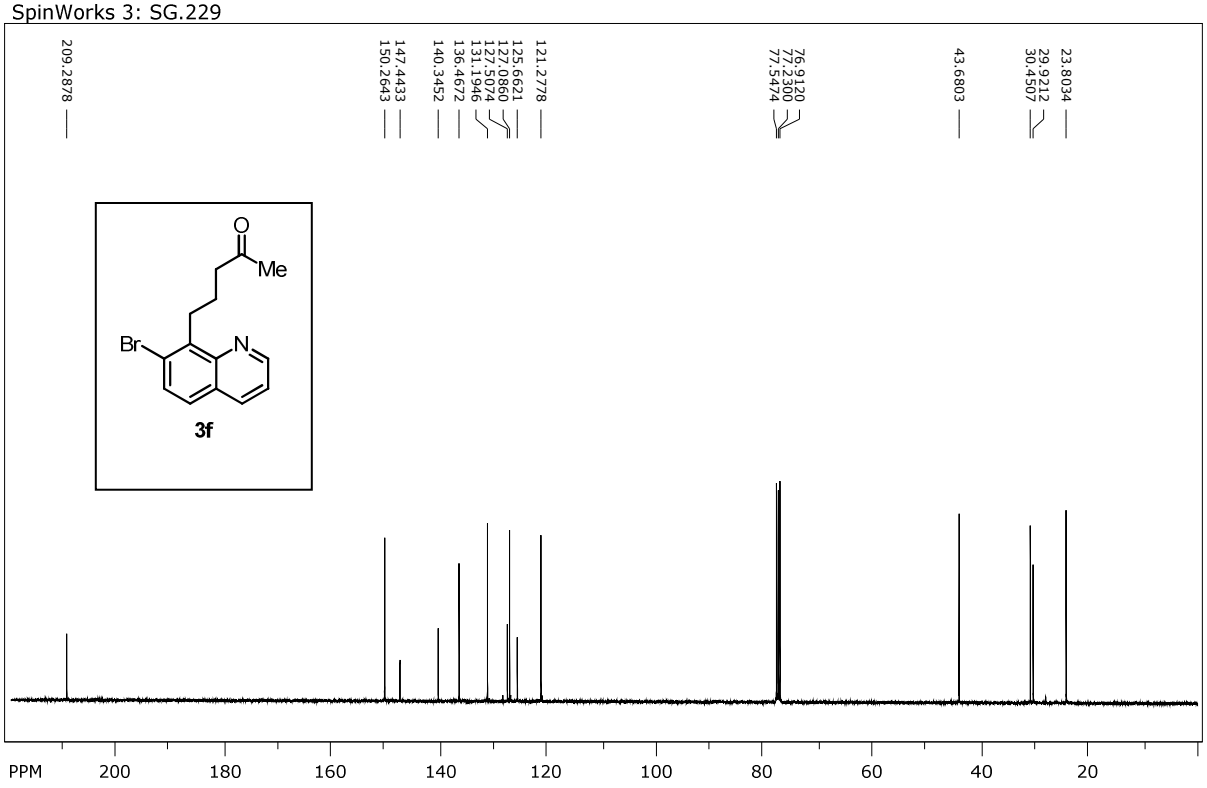

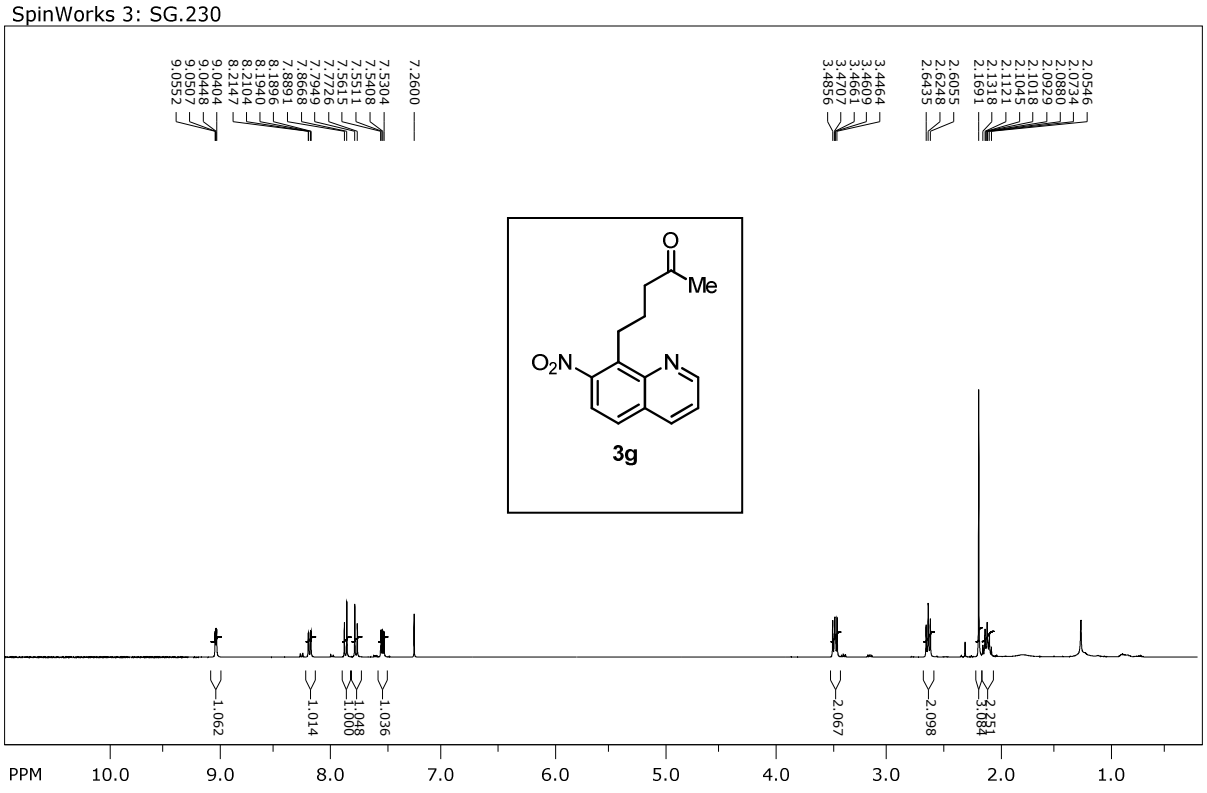
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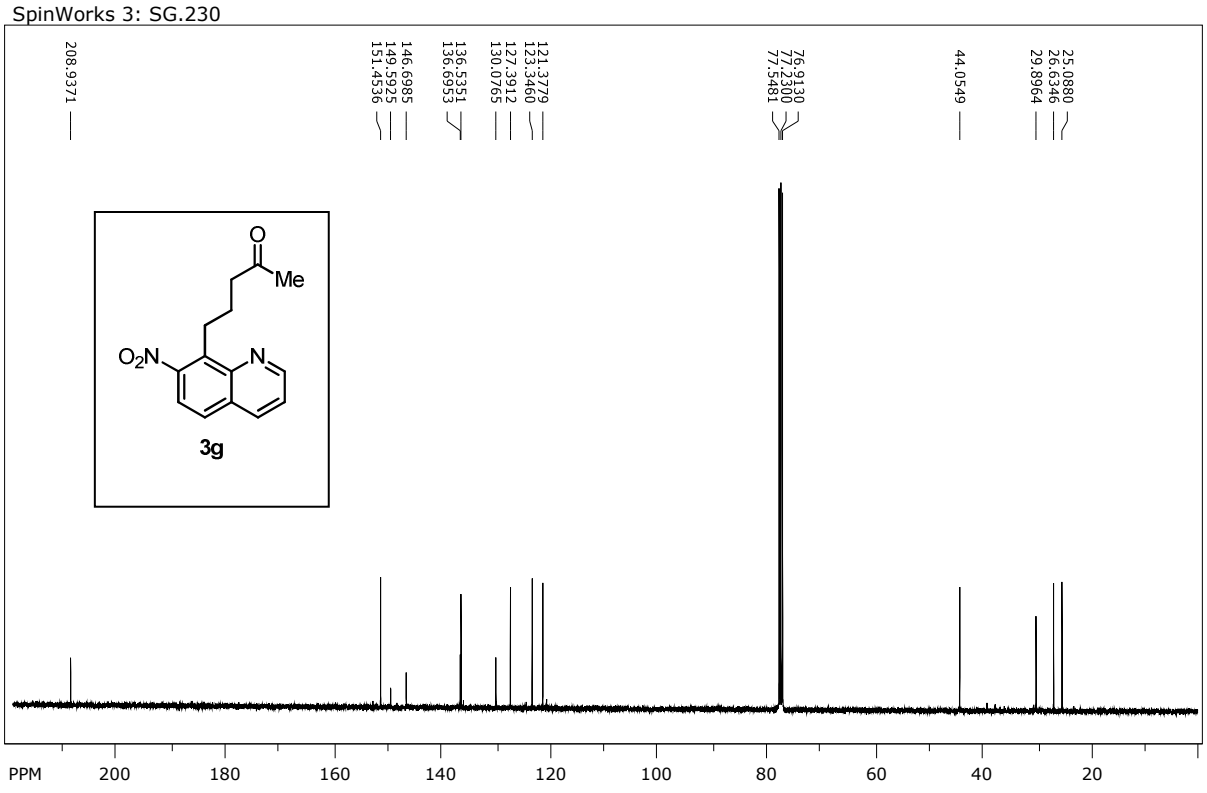
1.0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76.9130
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26.6346
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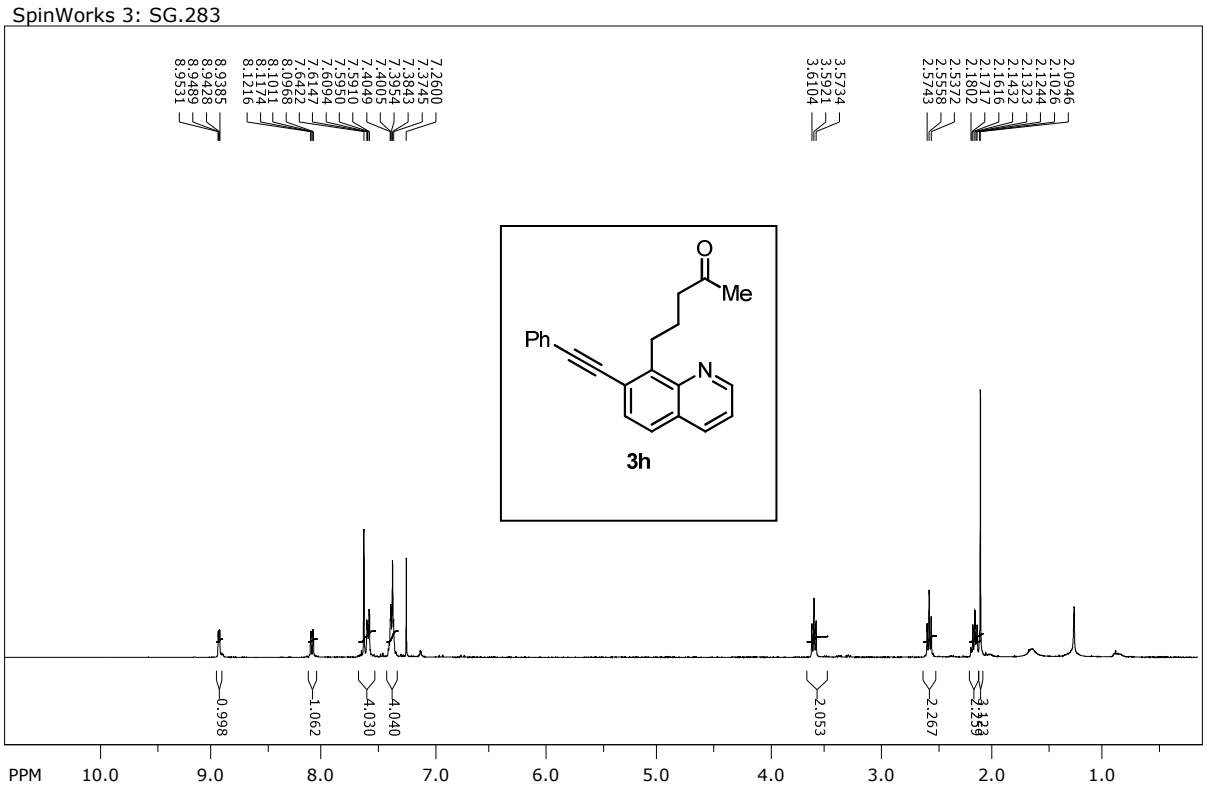
180
160
140
120
100
80
60
40
20


SpinWorks 3: SG.283
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7.4049
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7.3854
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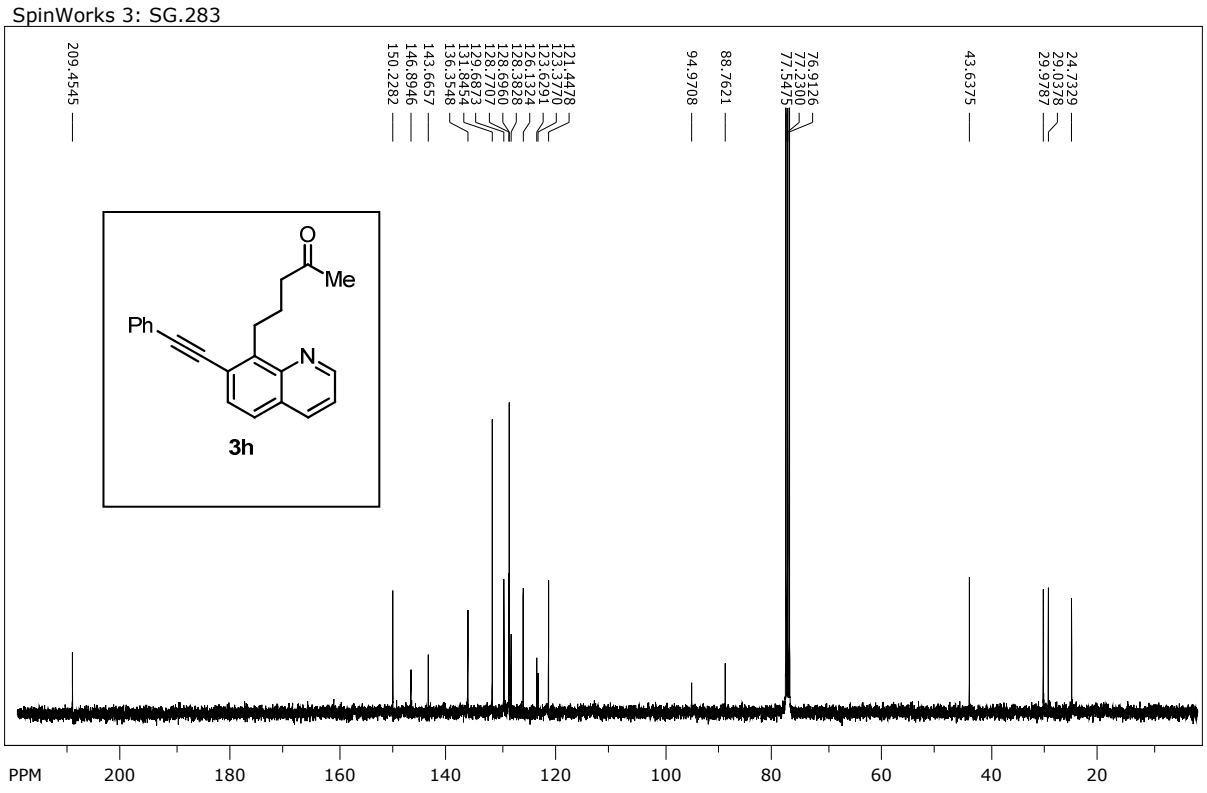
2.1717
2.1616
2.1432
2.1323
2.1244
2.1026
2.0946
O
Me
Ph
N
3h
0.998
1.062
4.030
4.040
2.053
2.267
3.123
3.159
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0


SpinWorks 3: SG.283
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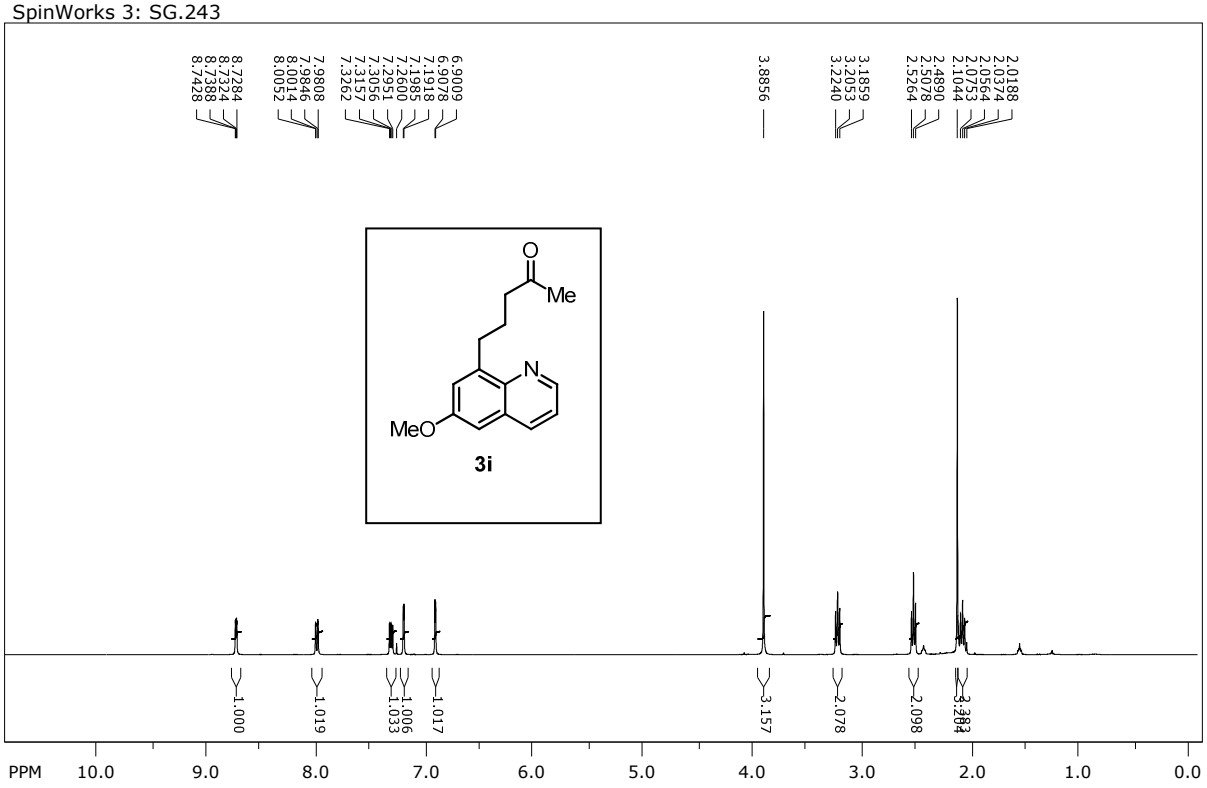
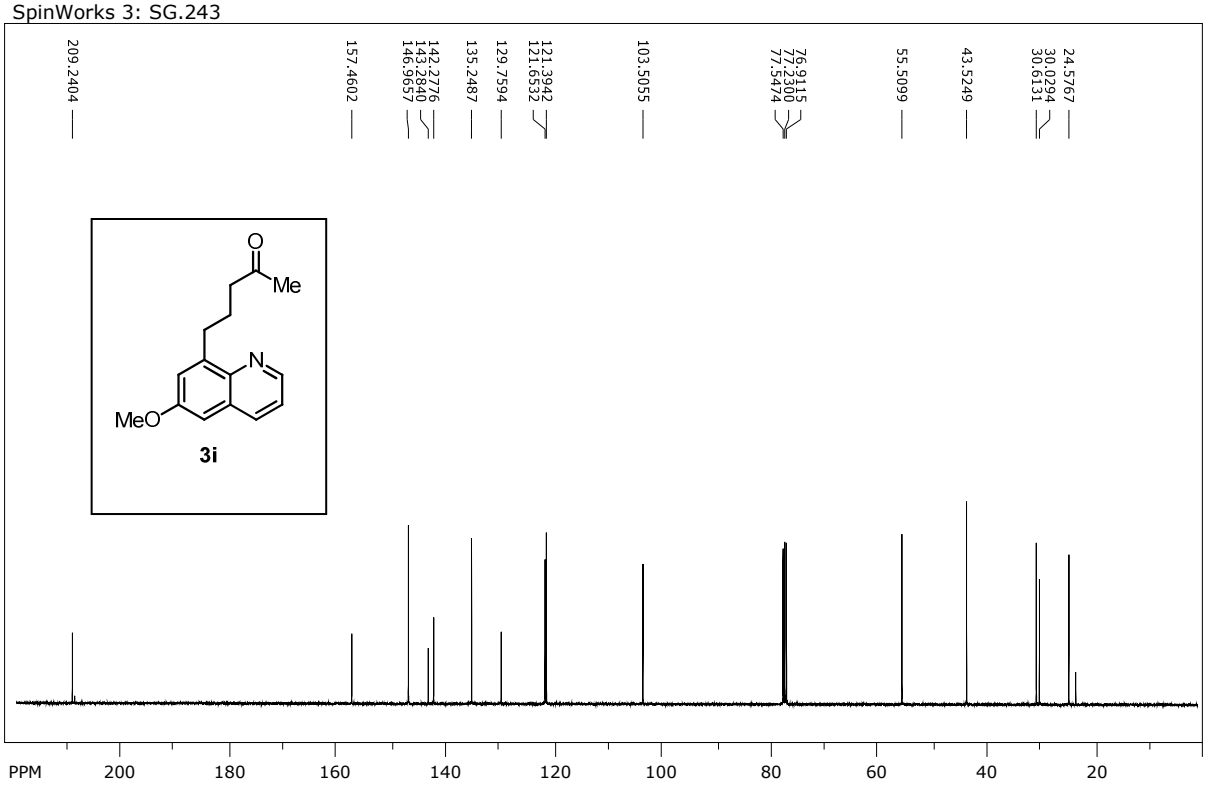
123.3770
121.4478
94.9708
88.7621
77.3473
77.2500
76.9126
43.6375
29.9787
29.0378
24.7329
O
Me
Ph
N
3h
PPM
200
180
160
140
120
100
80
60
40
20

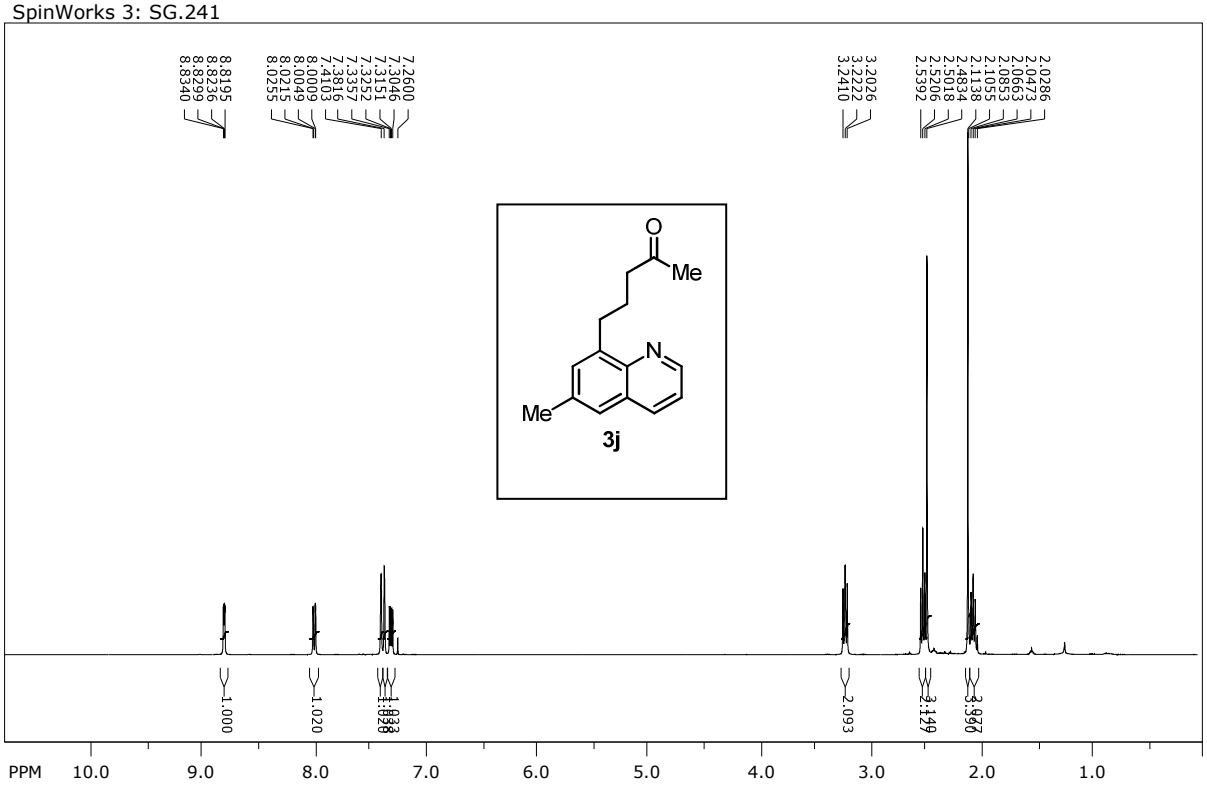
SpinWorks 3: SG.243



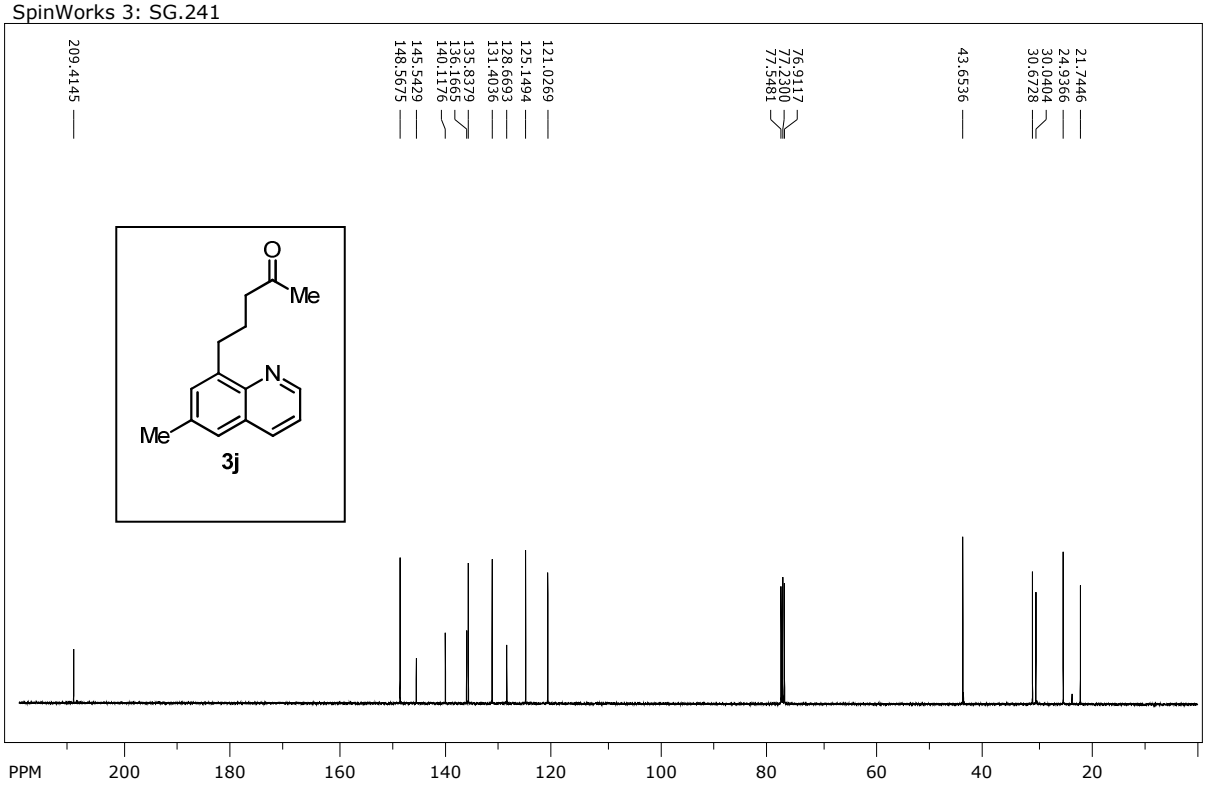
SpinWorks 3: SG.243



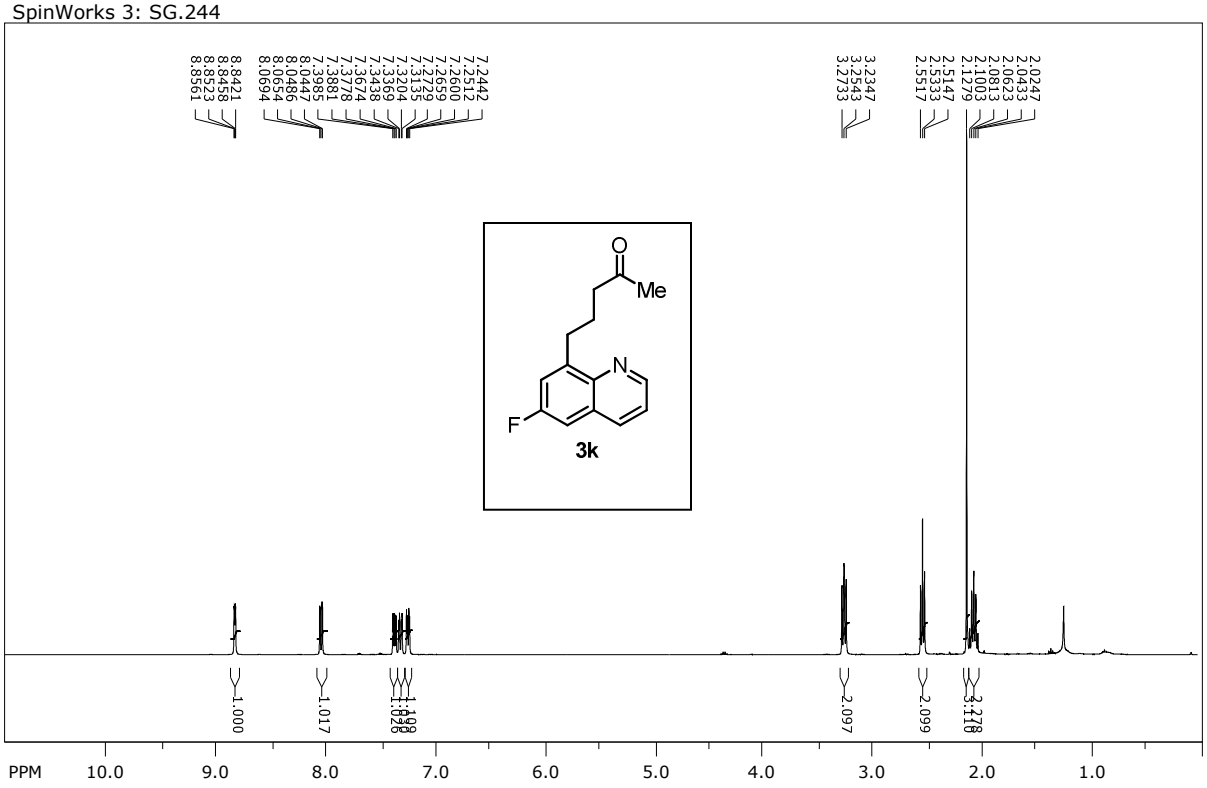
SpinWorks 3: SG.241



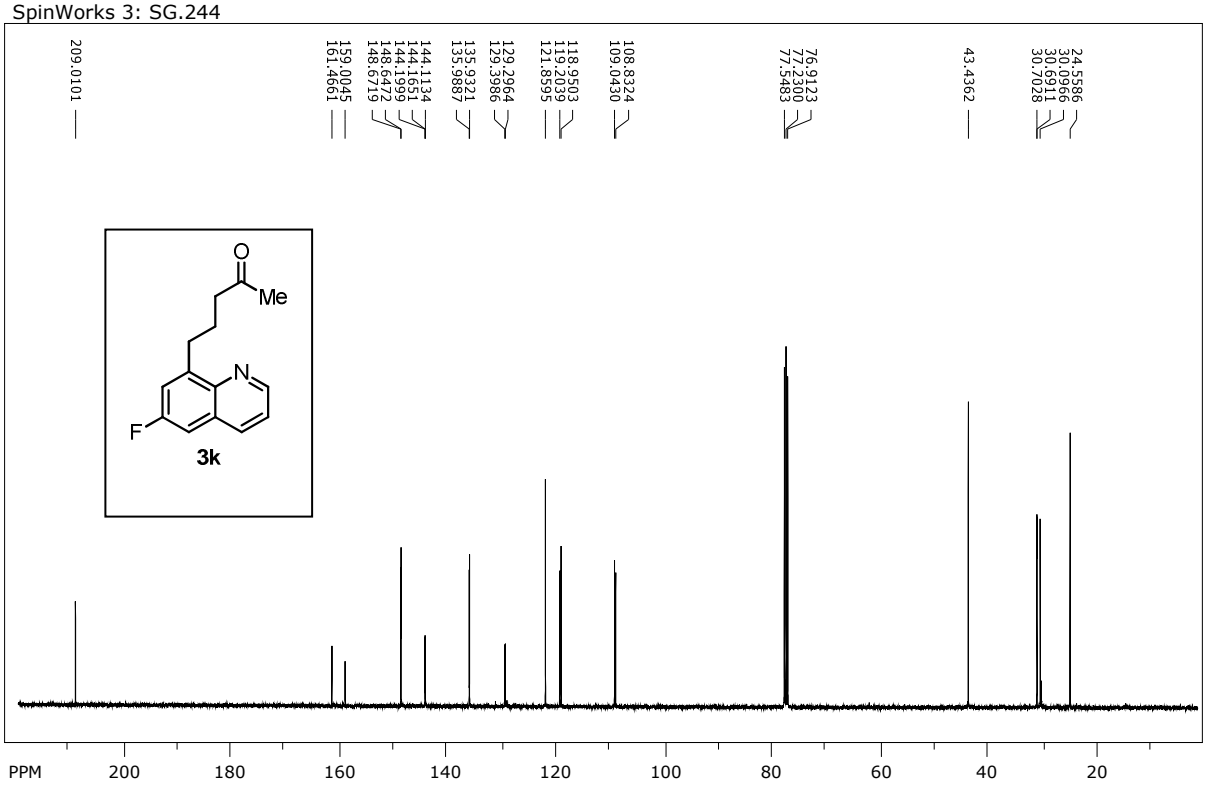
SpinWorks 3: SG.241



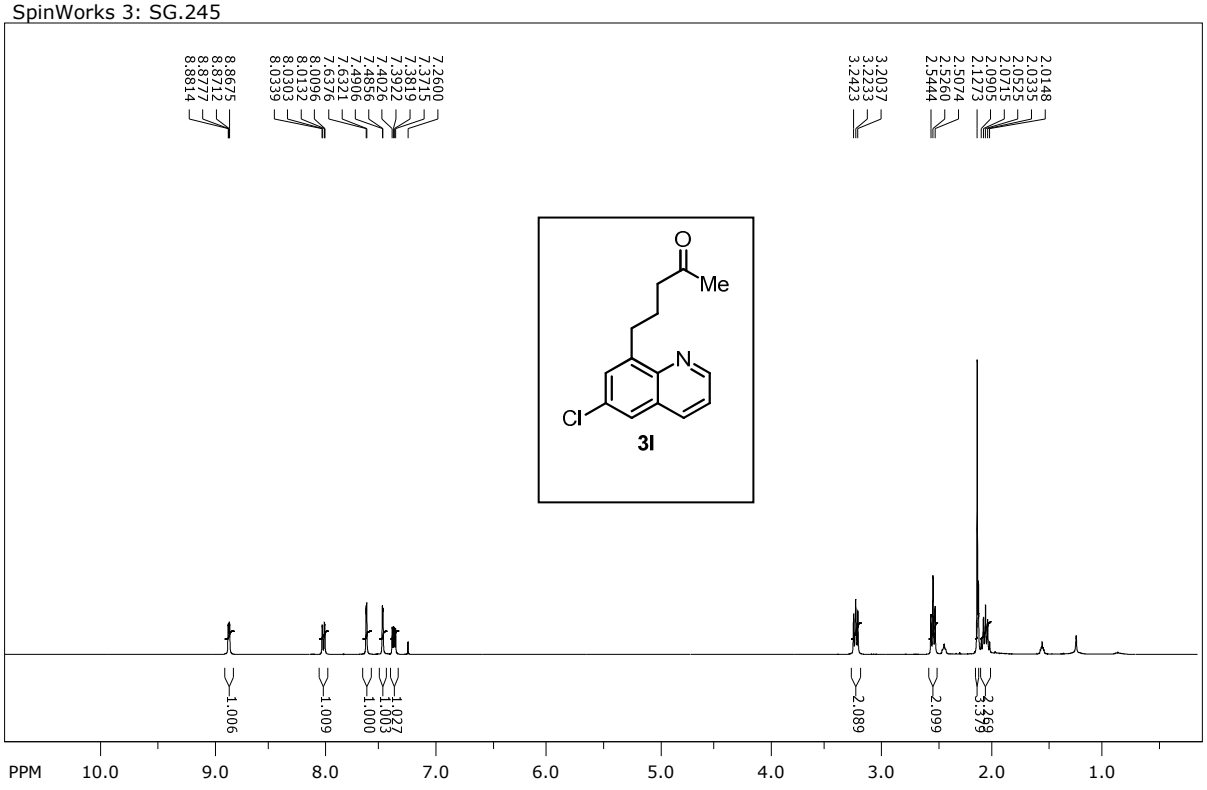
SpinWorks 3: SG.244



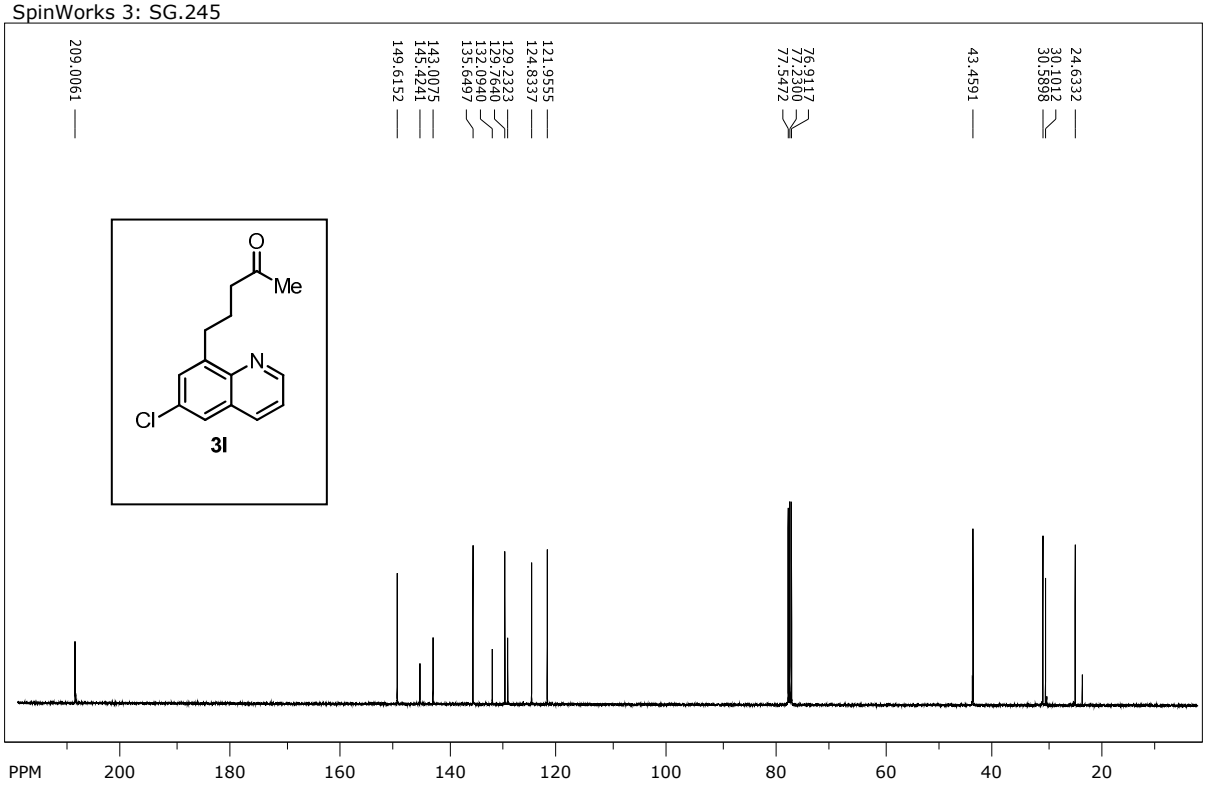
SpinWorks 3: SG.244



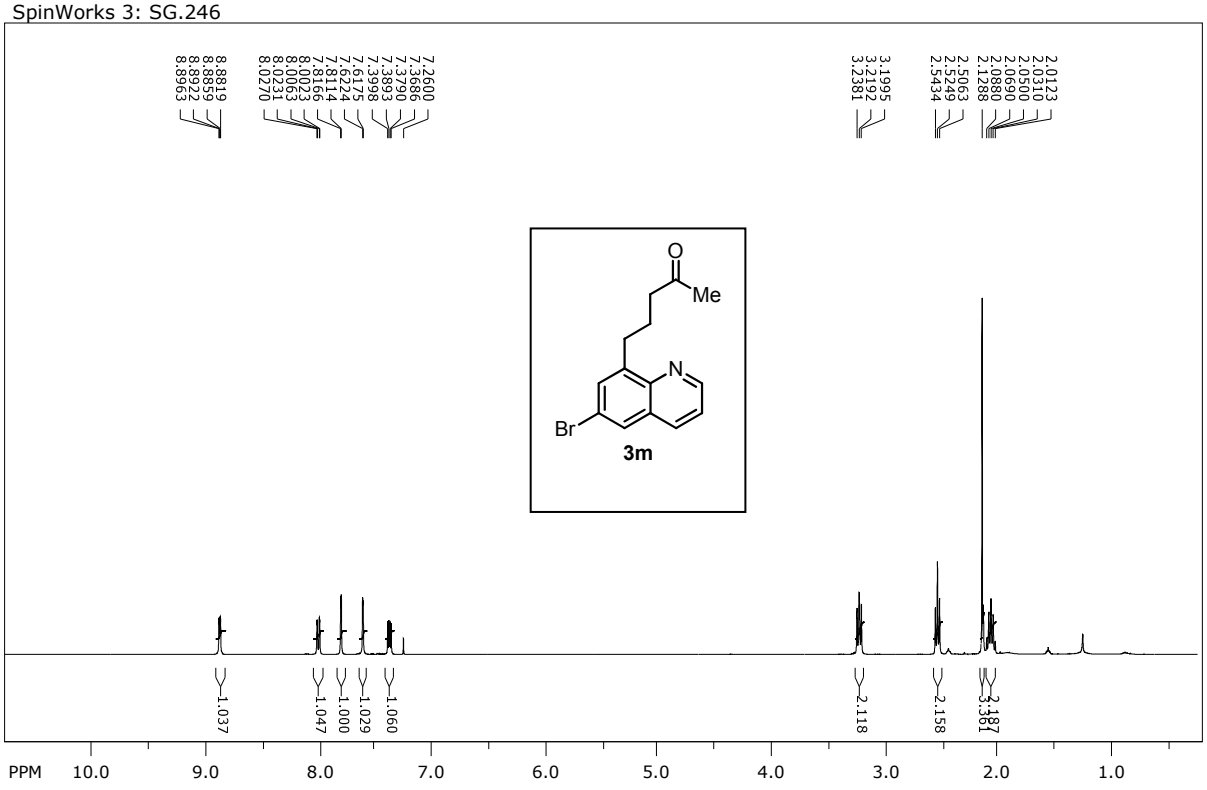
SpinWorks 3: SG.245



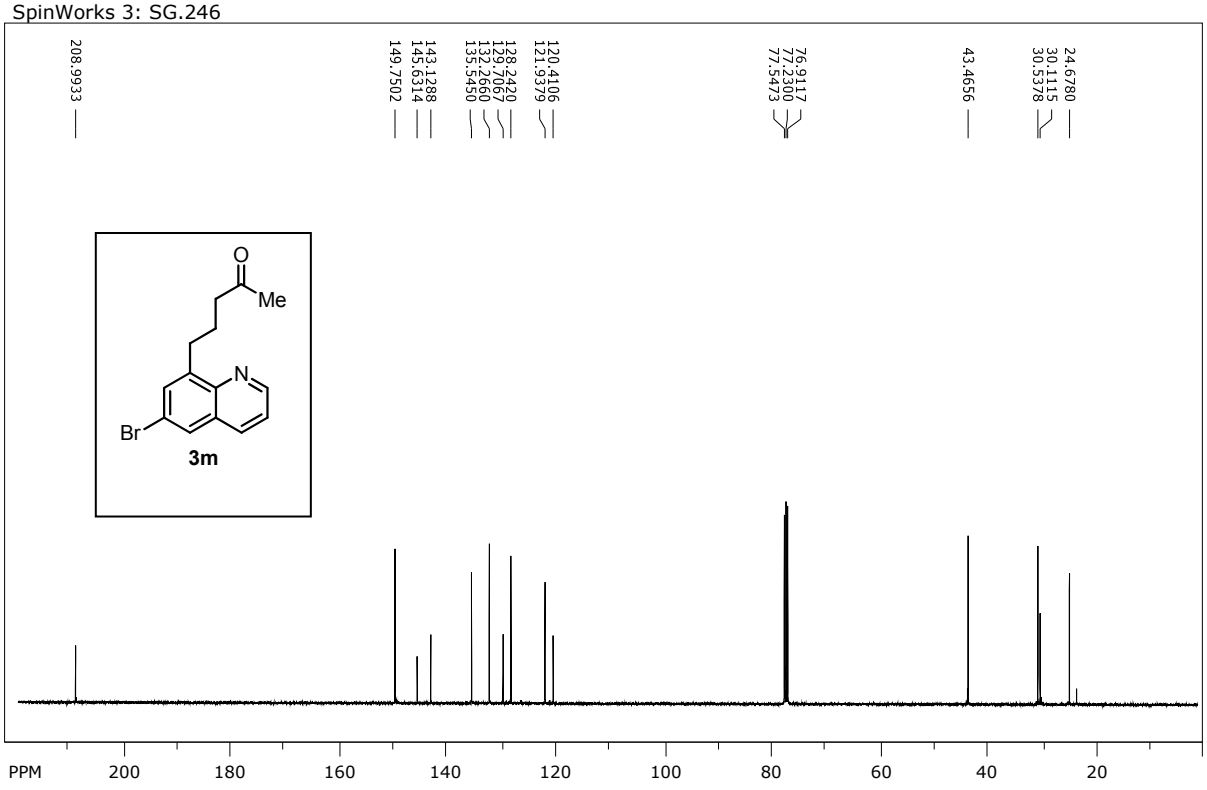
SpinWorks 3: SG.245



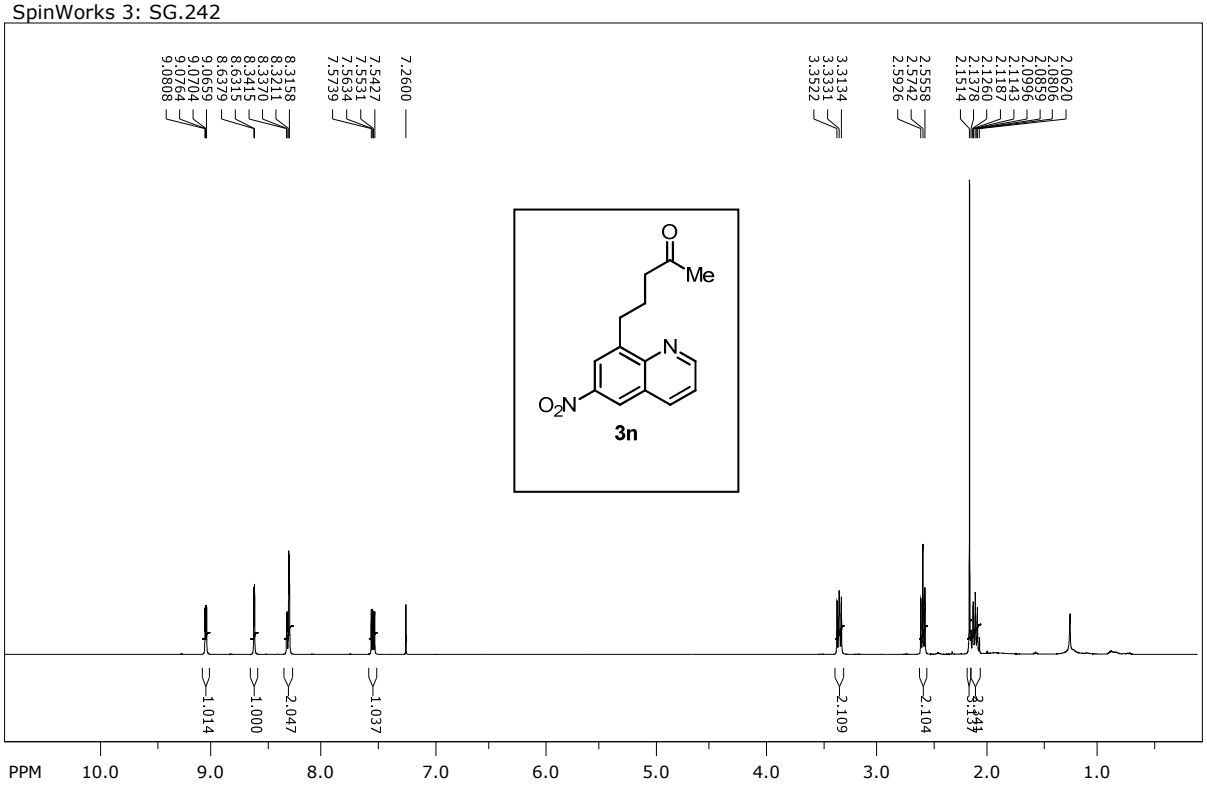
SpinWorks 3: SG.246



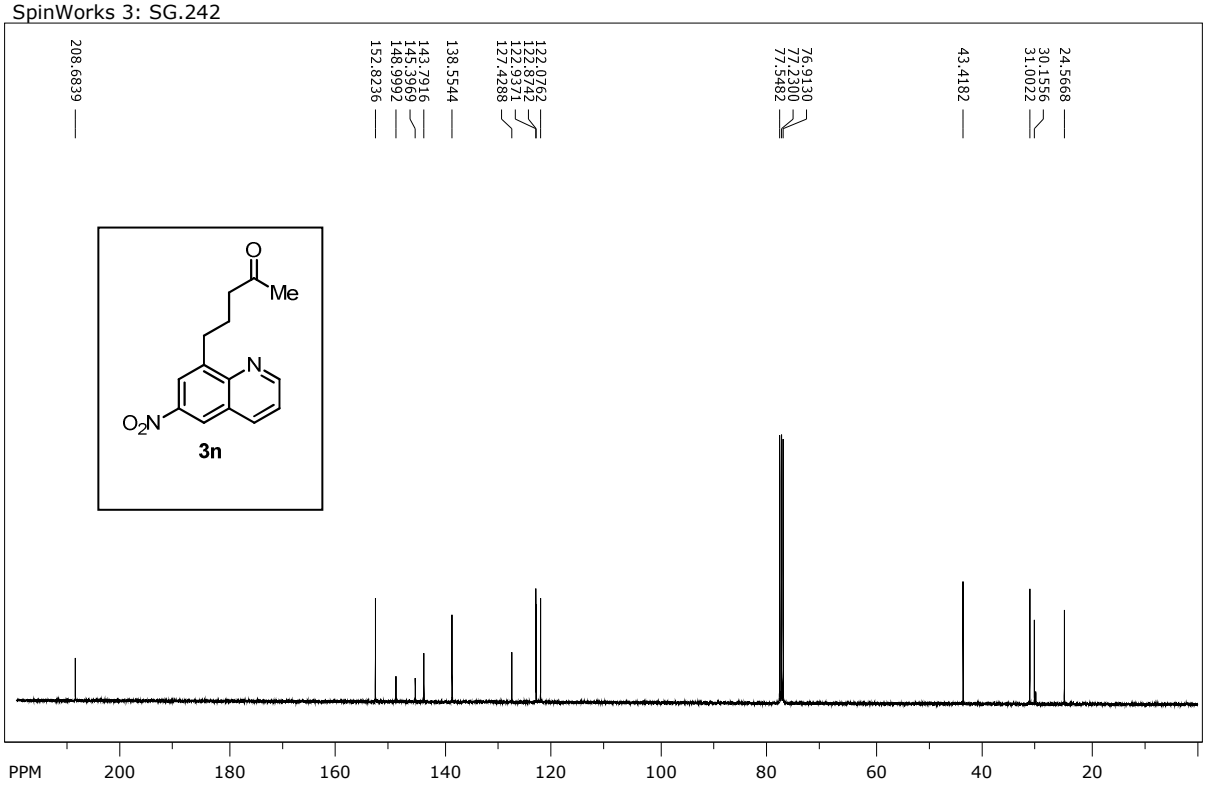
SpinWorks 3: SG.246



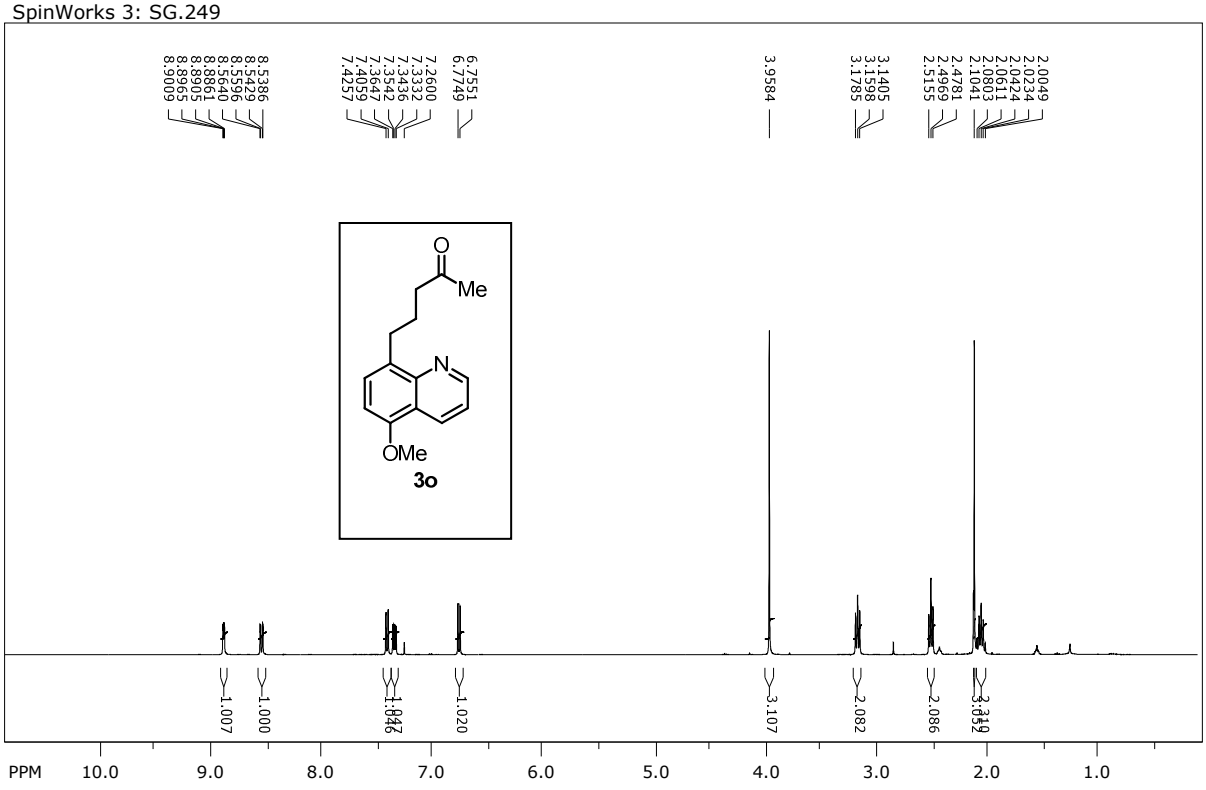
SpinWorks 3: SG.242



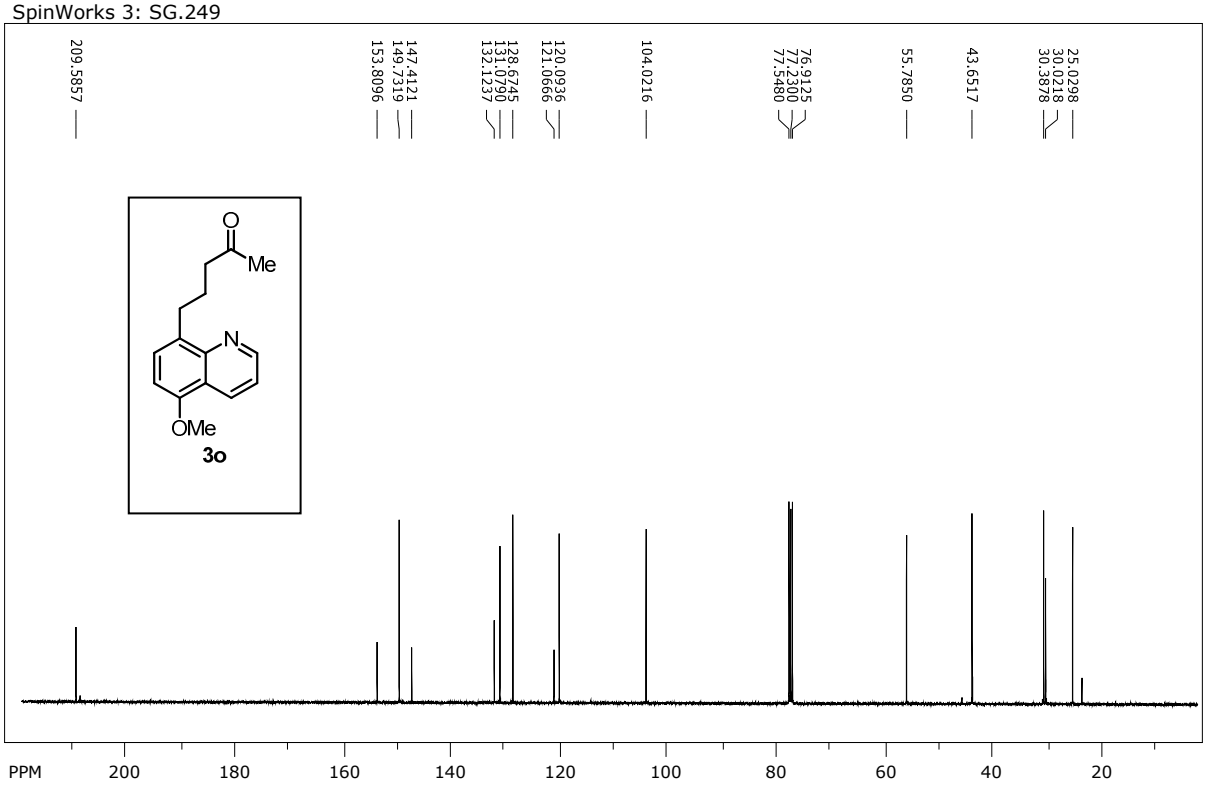
SpinWorks 3: SG.242



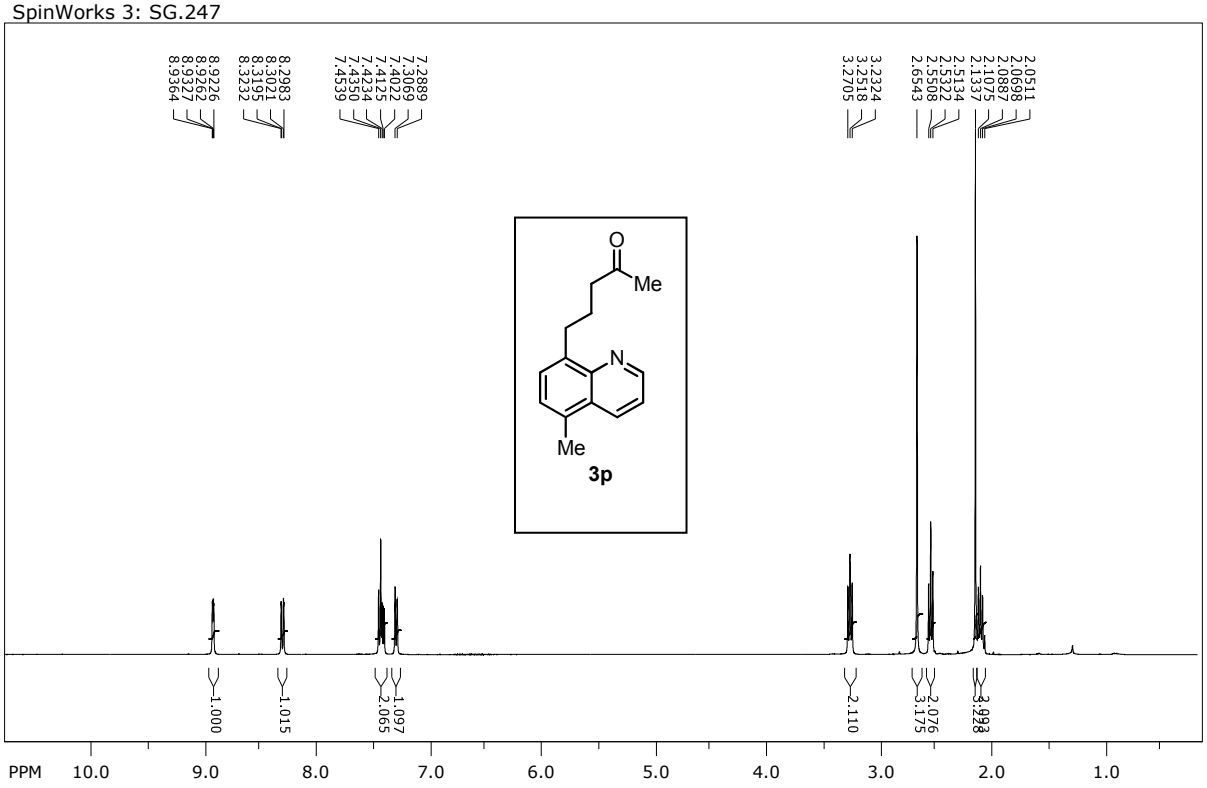
SpinWorks 3: SG.249



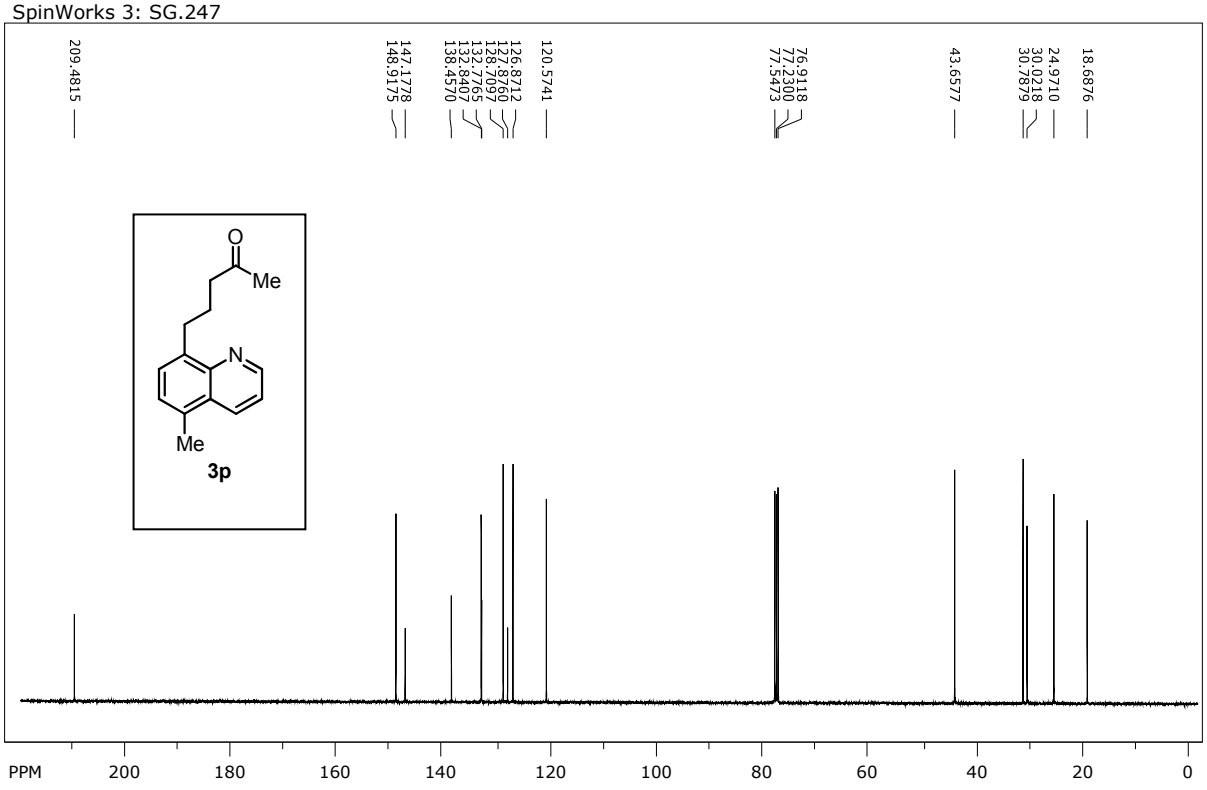
SpinWorks 3: SG.249



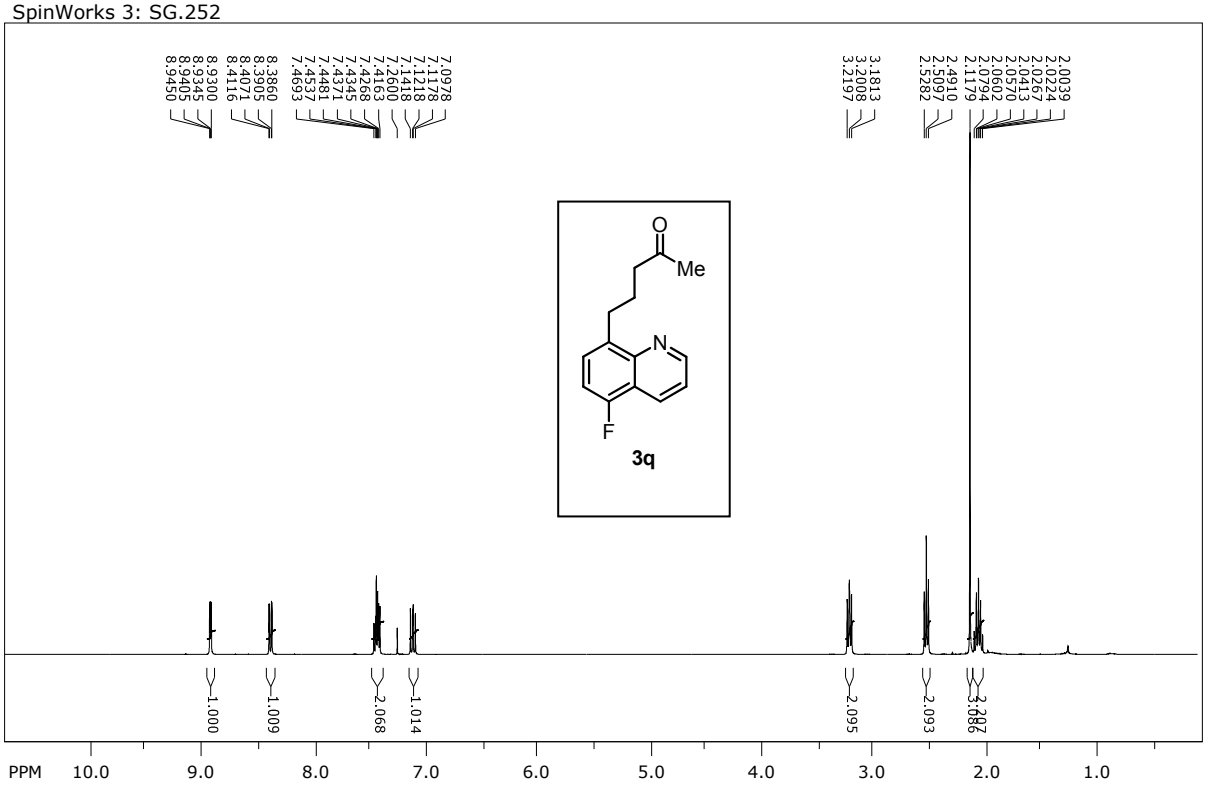
SpinWorks 3: SG.247



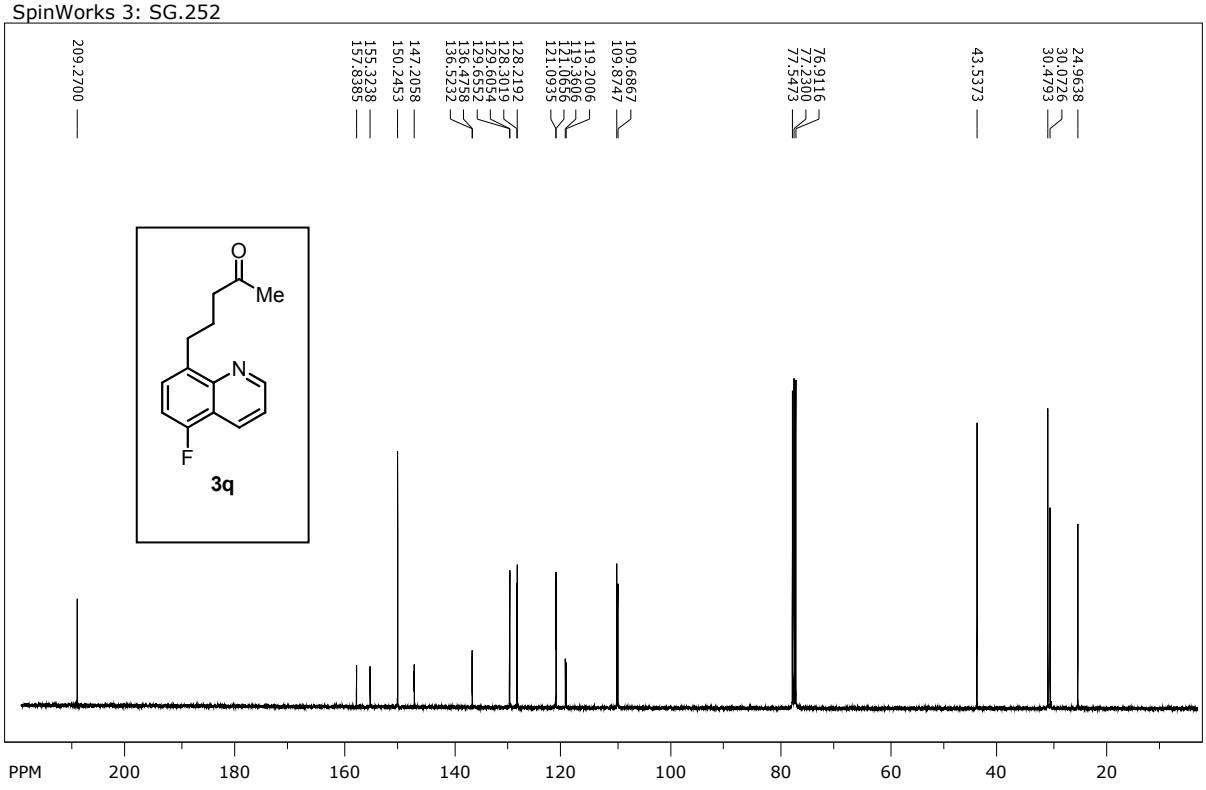
SpinWorks 3: SG.247



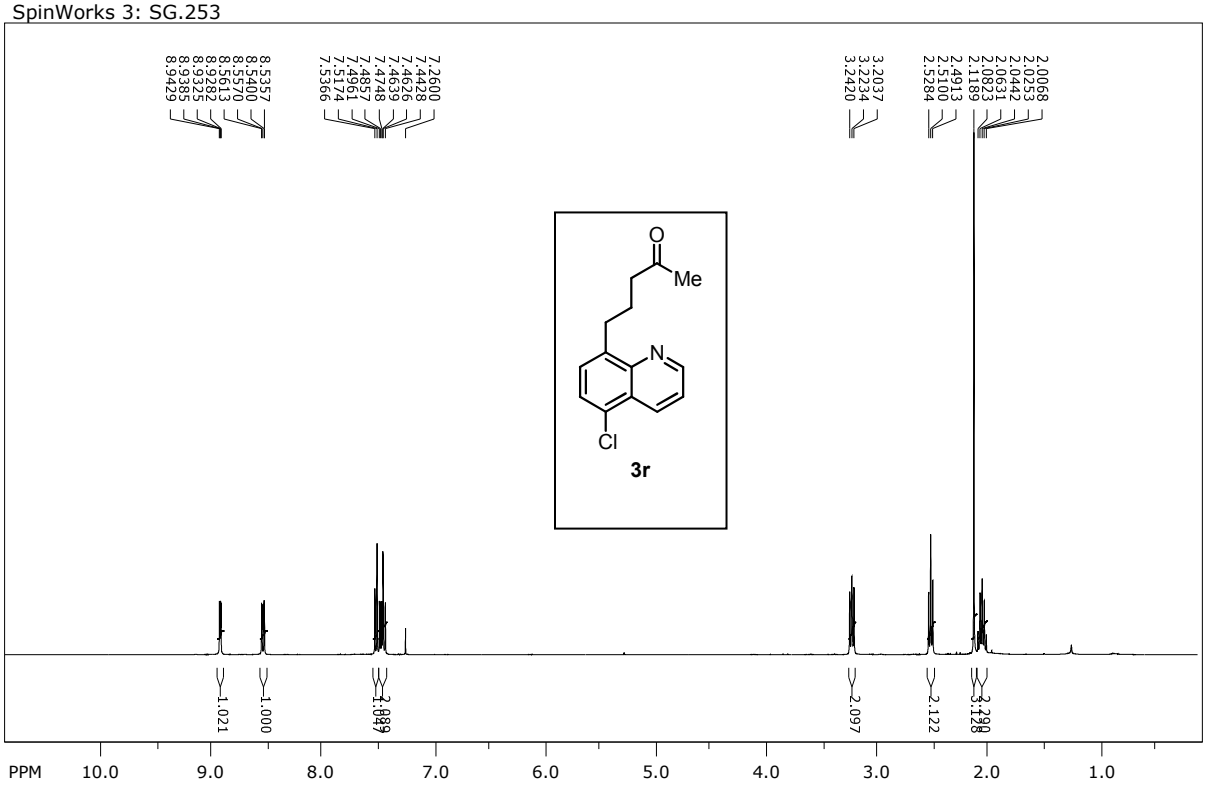
SpinWorks 3: SG.252



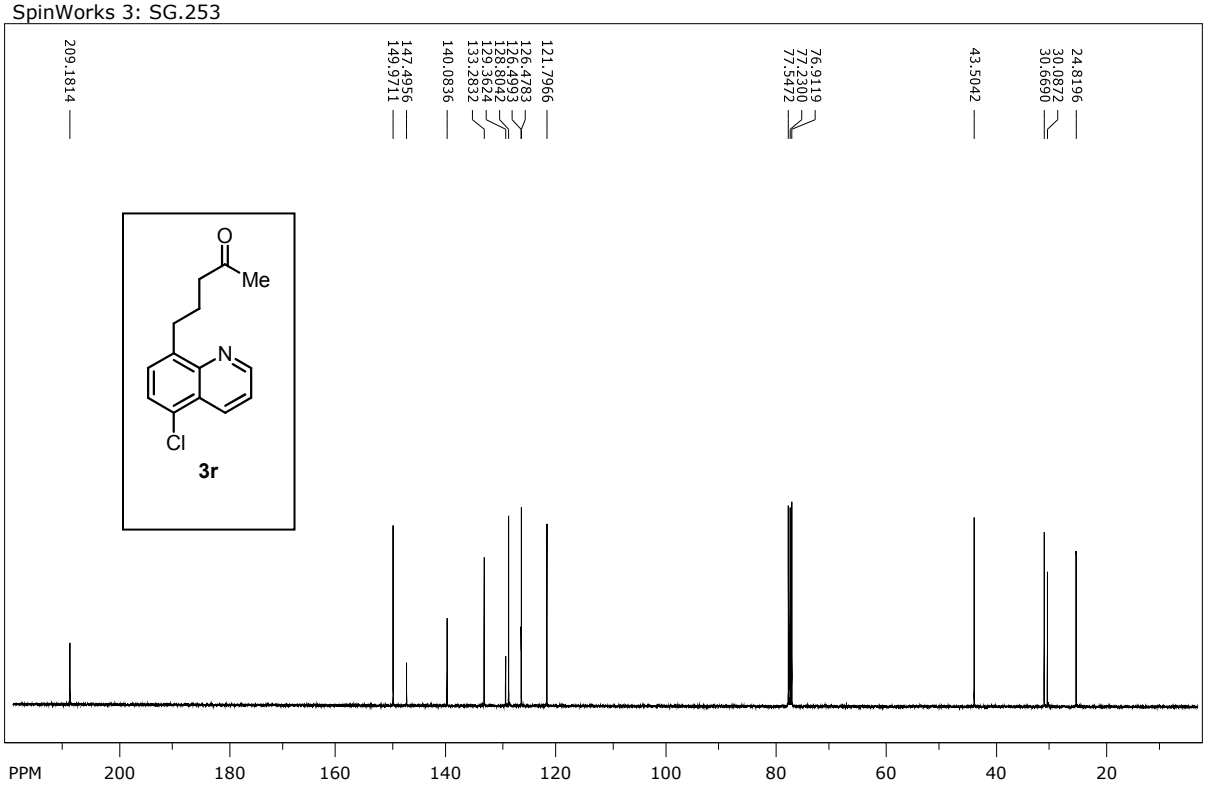
SpinWorks 3: SG.252



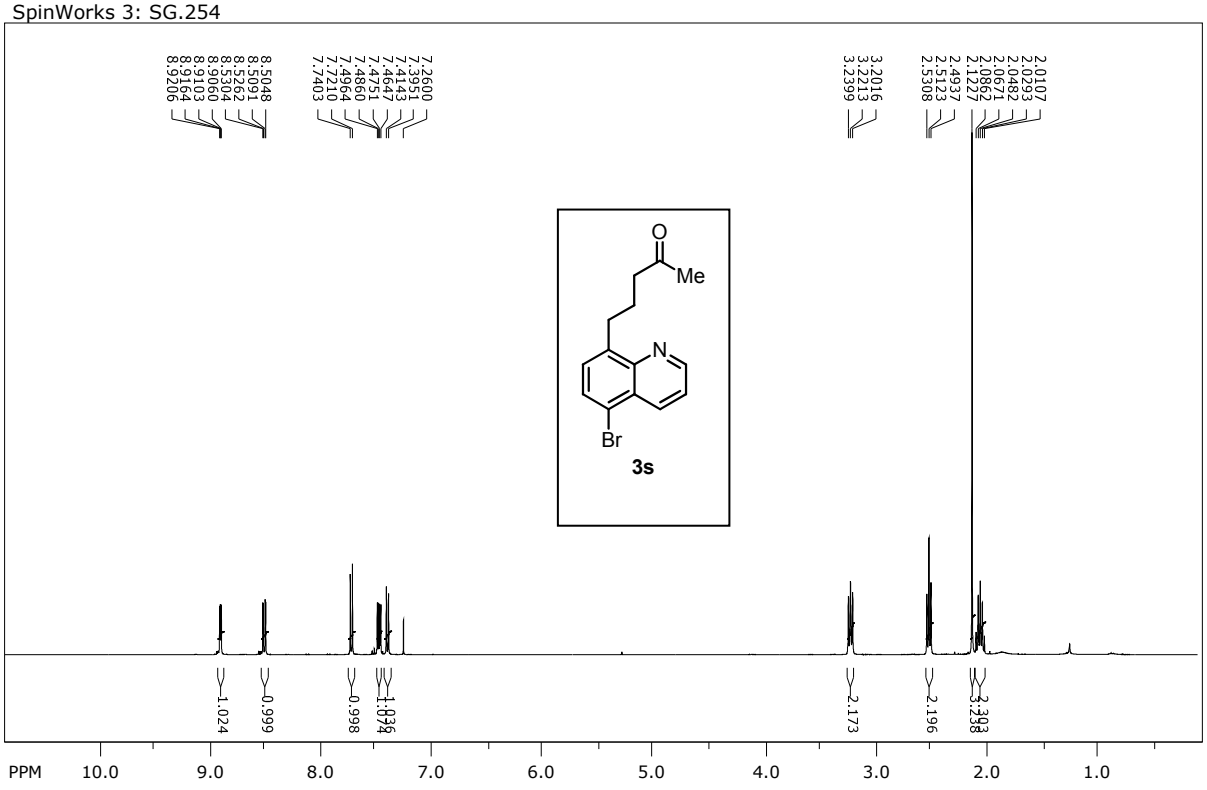
SpinWorks 3: SG.253



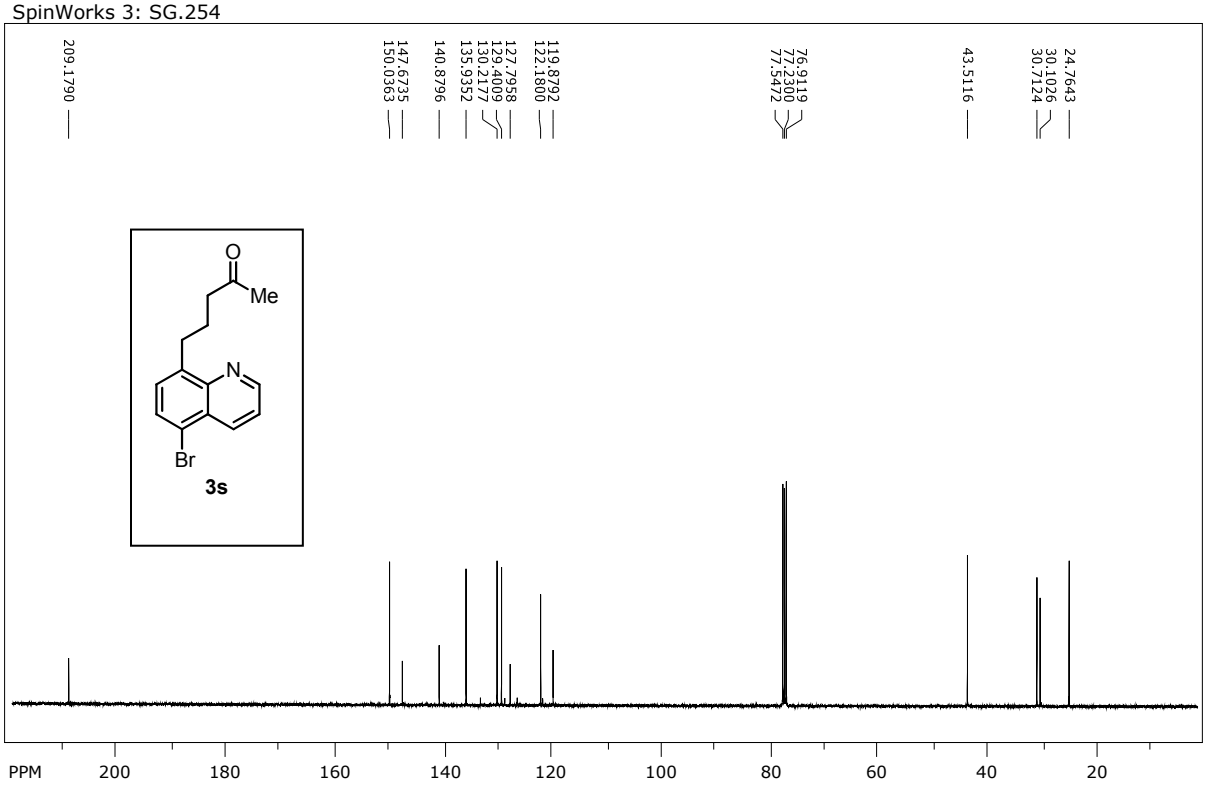
SpinWorks 3: SG.253



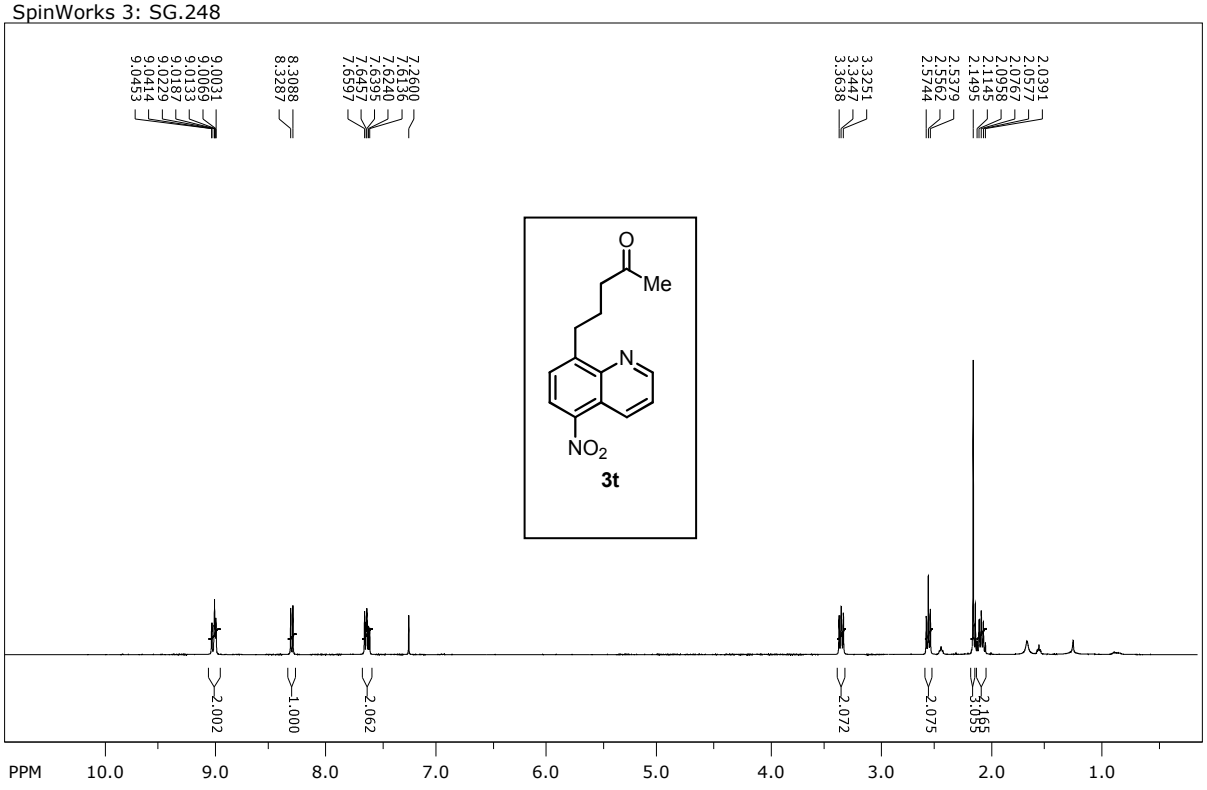
SpinWorks 3: SG.254



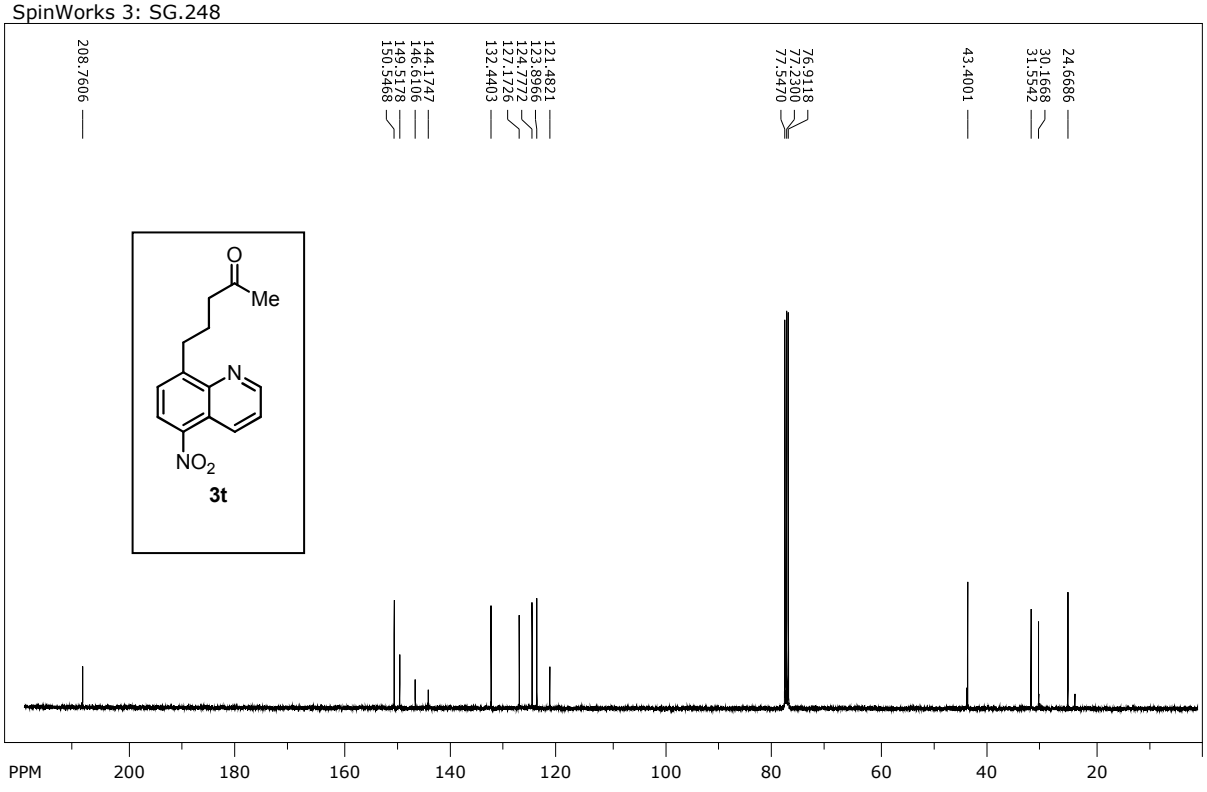
SpinWorks 3: SG.254



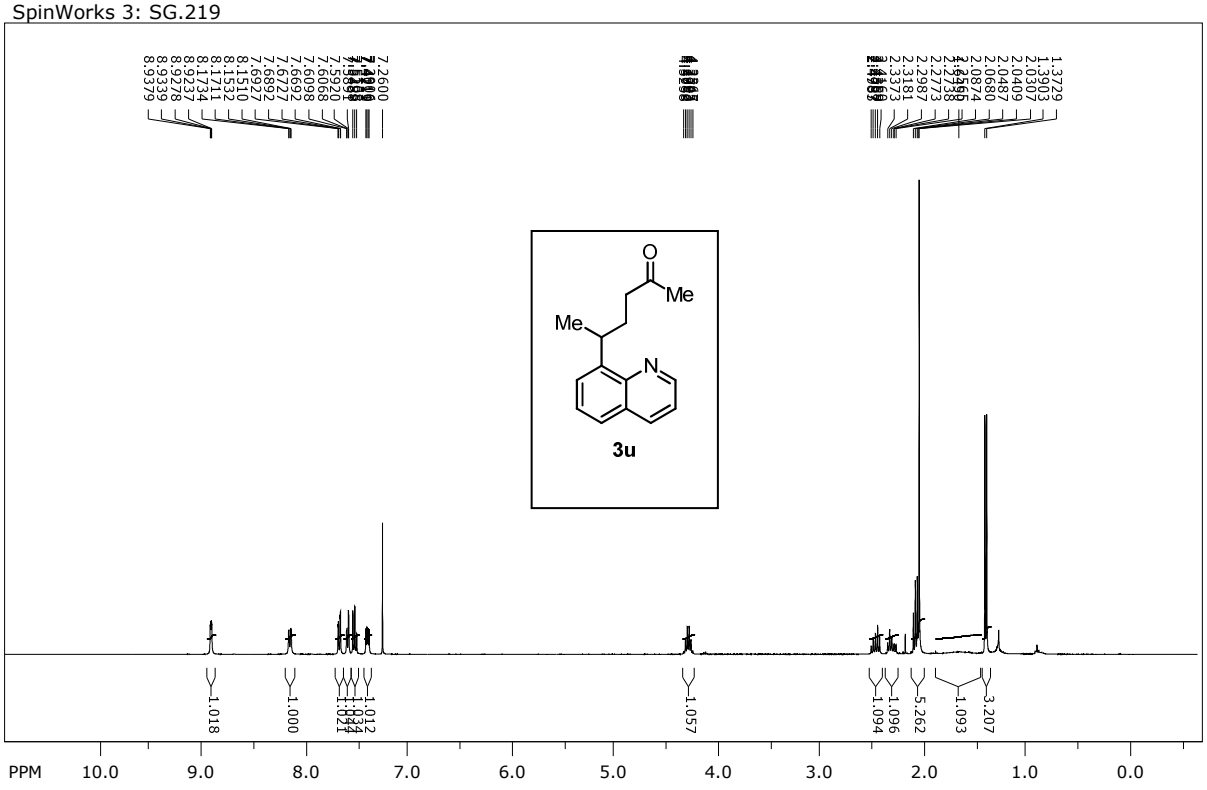
SpinWorks 3: SG.248



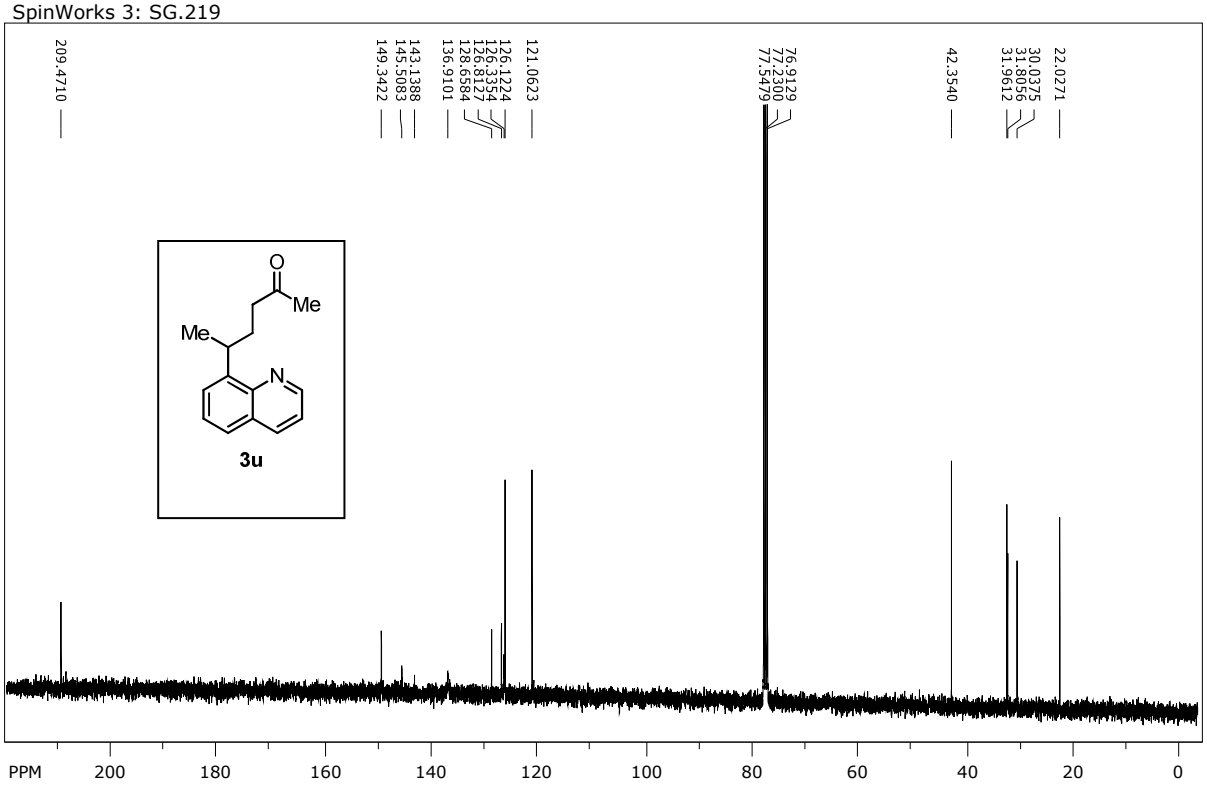
SpinWorks 3: SG.248



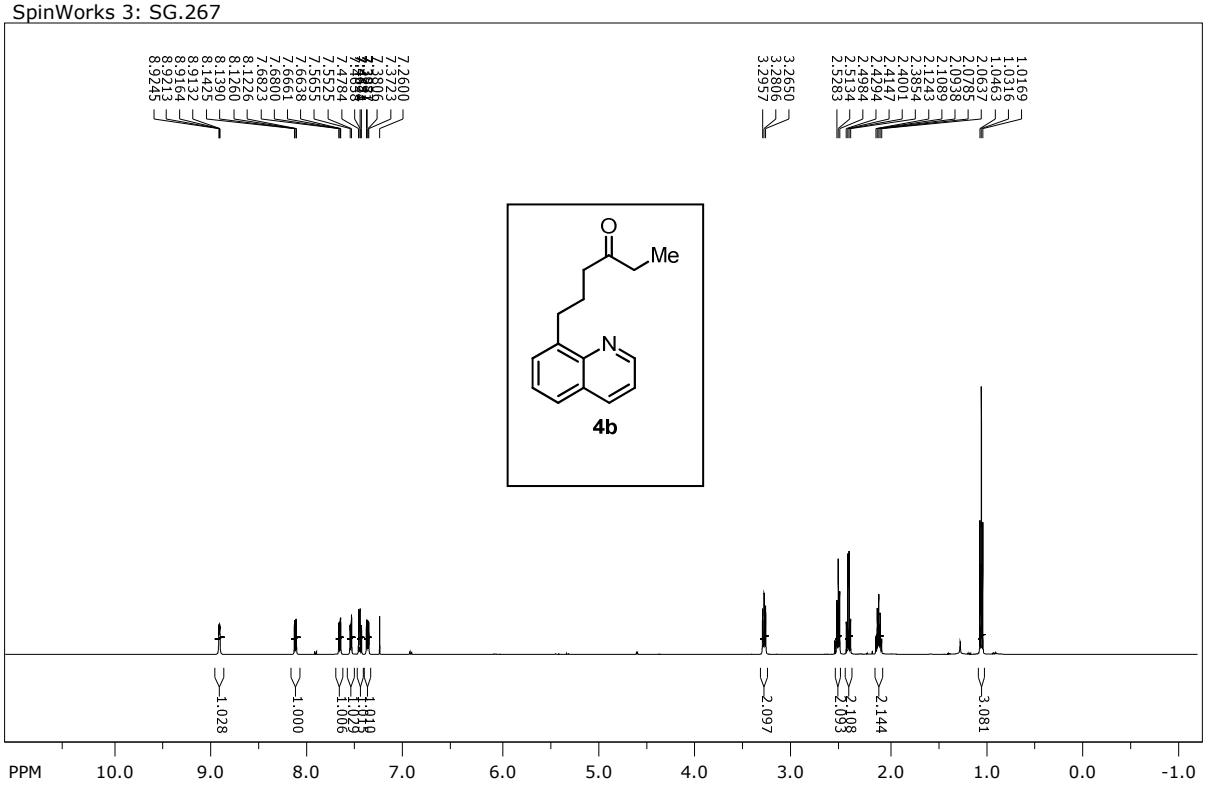
SpinWorks 3: SG.219



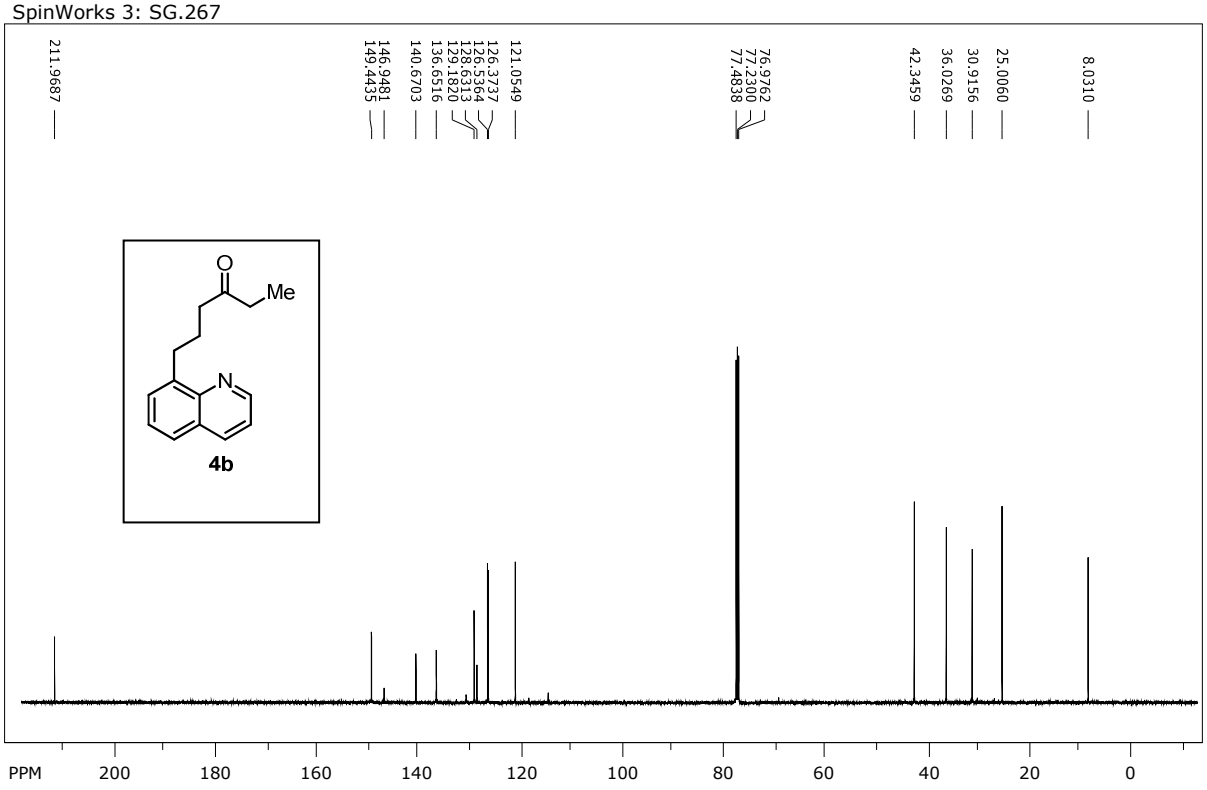
SpinWorks 3: SG.219



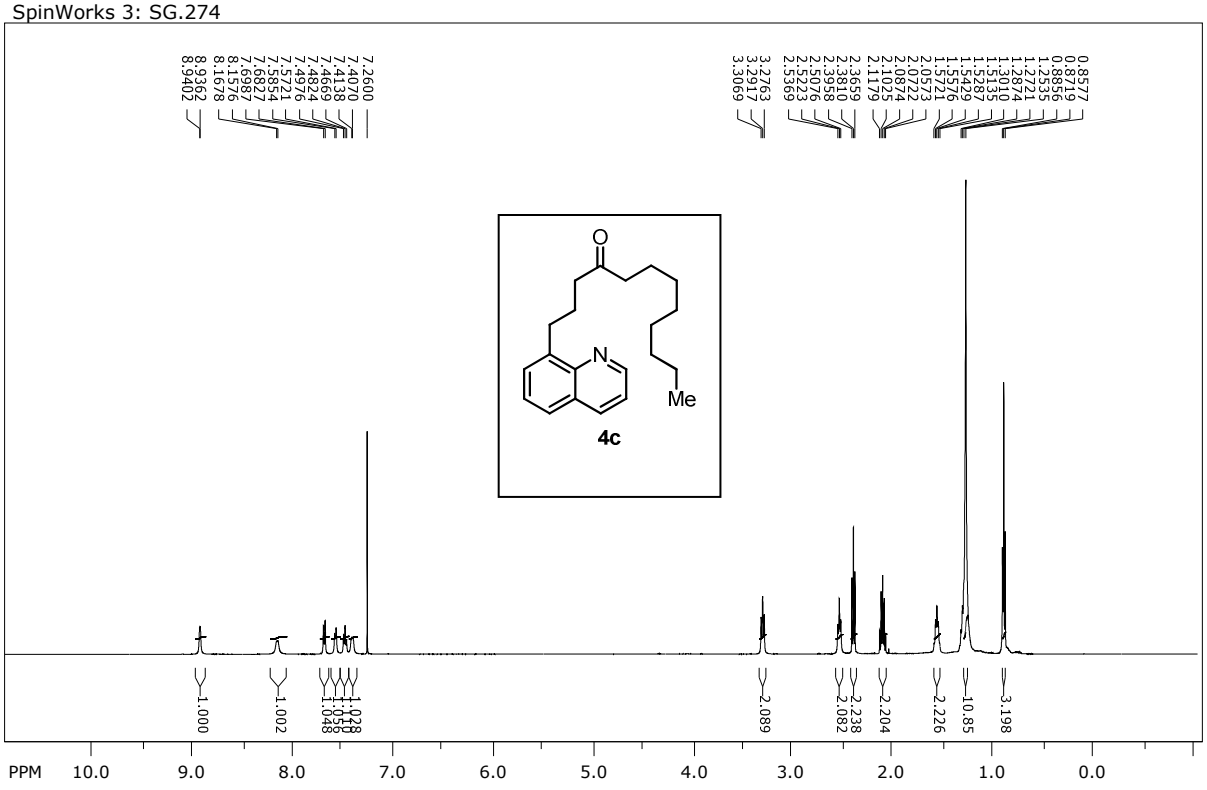
SpinWorks 3: SG.267



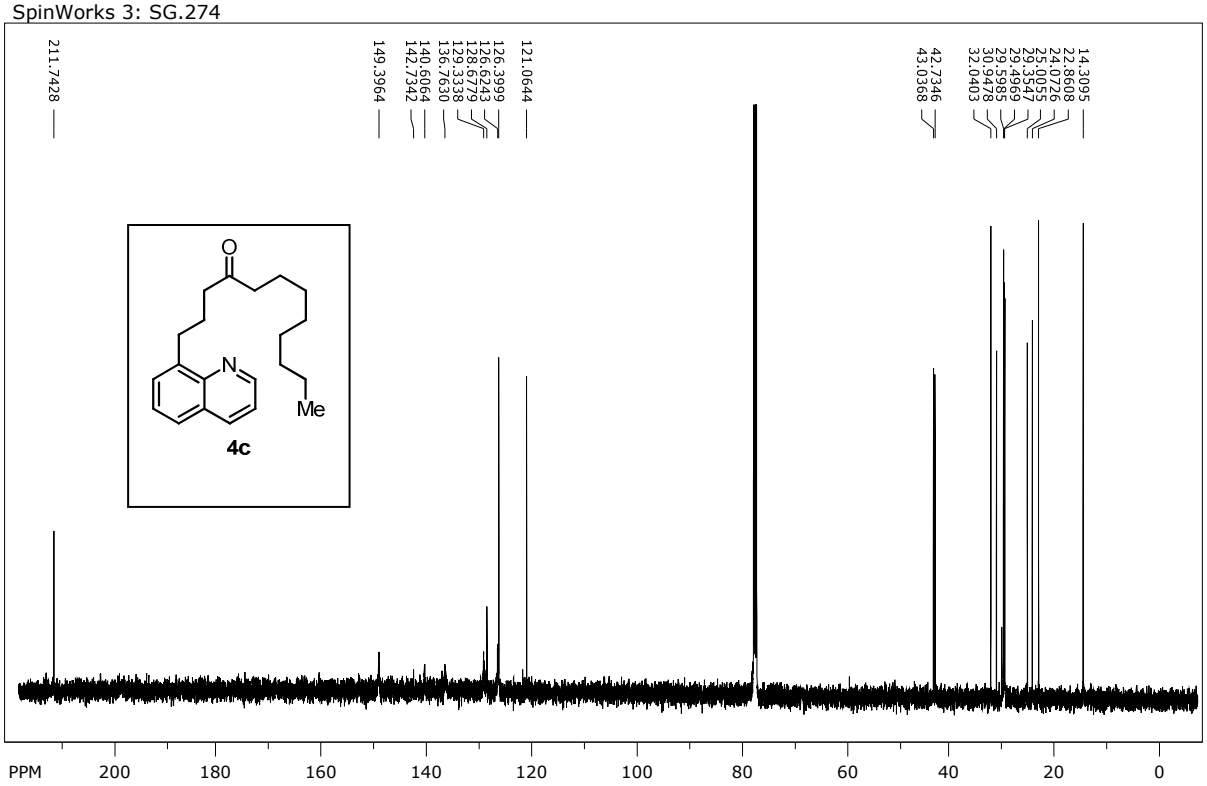
SpinWorks 3: SG.267



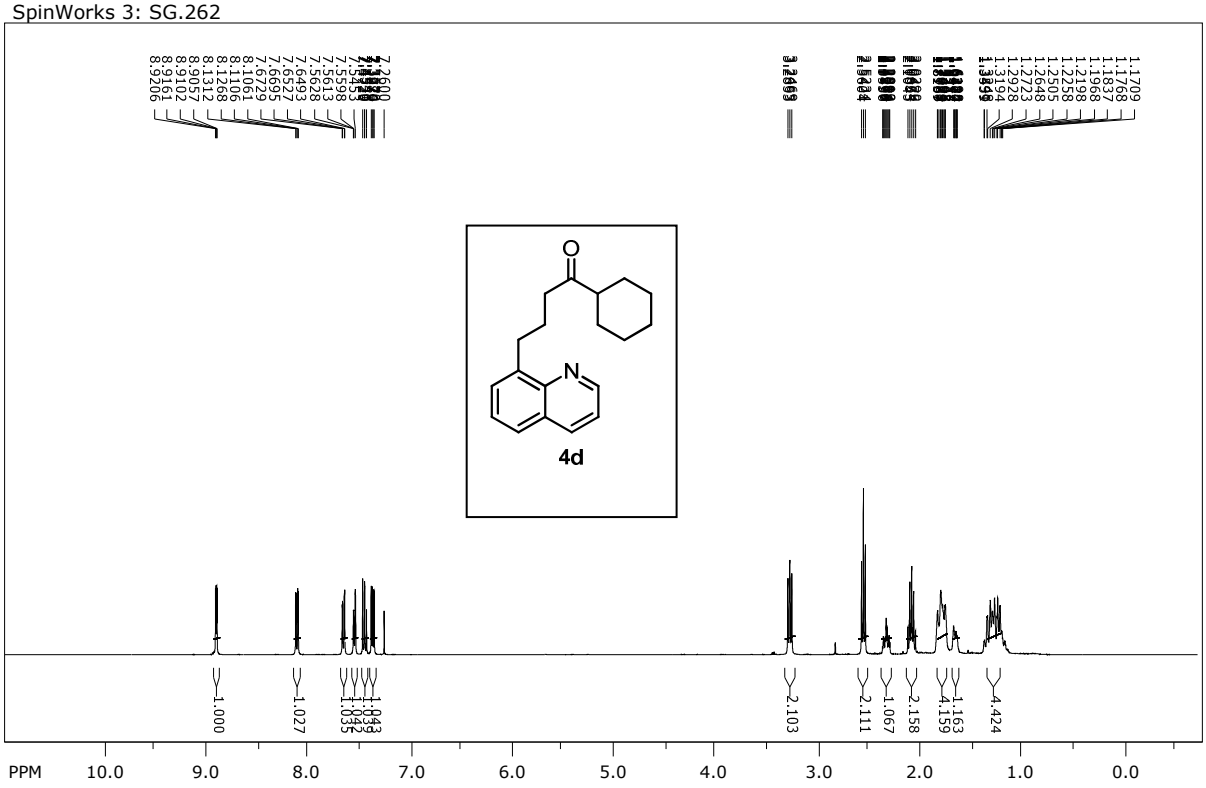
SpinWorks 3: SG.274



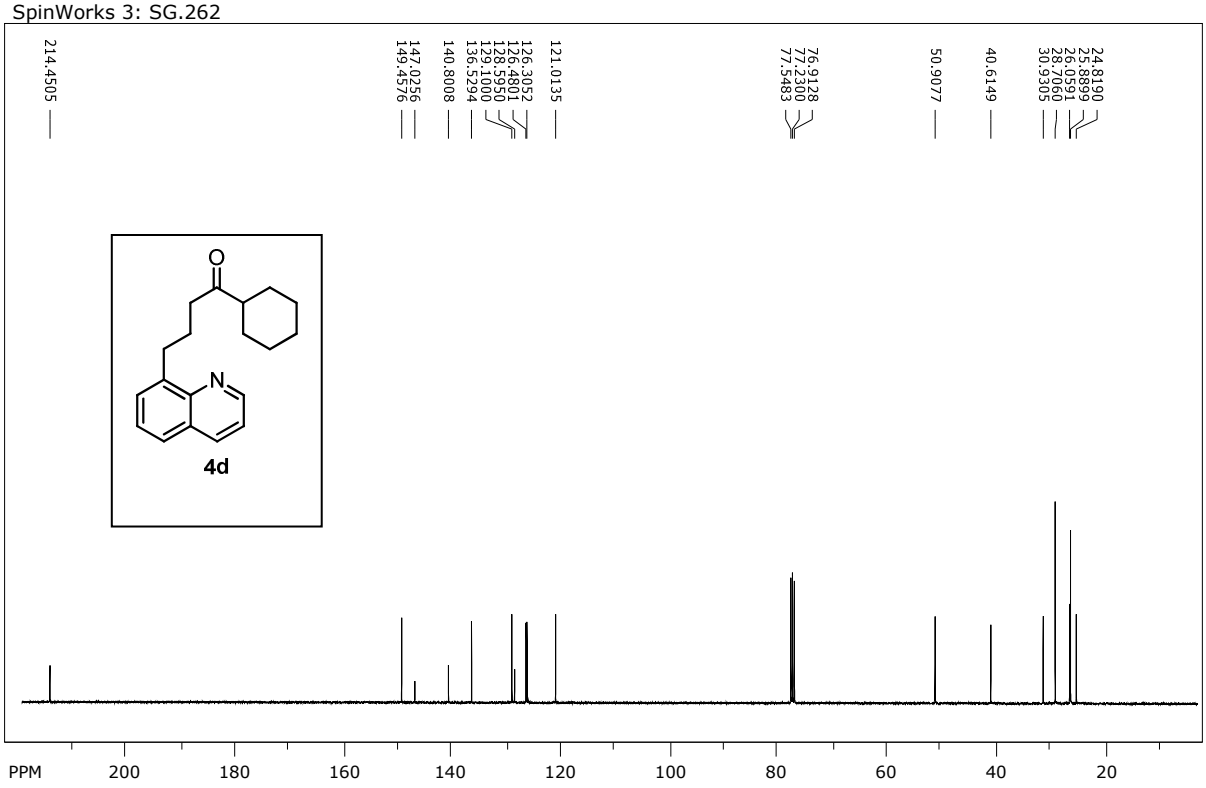
SpinWorks 3: SG.274



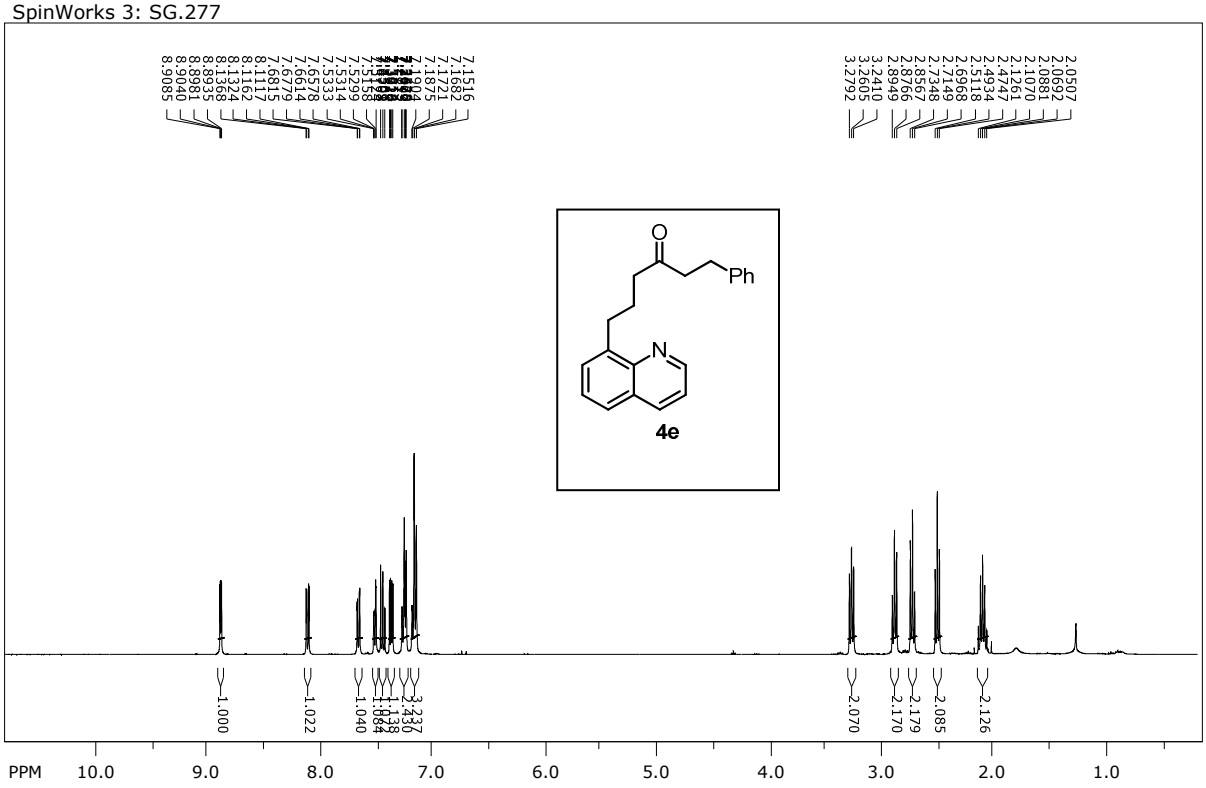
SpinWorks 3: SG.262



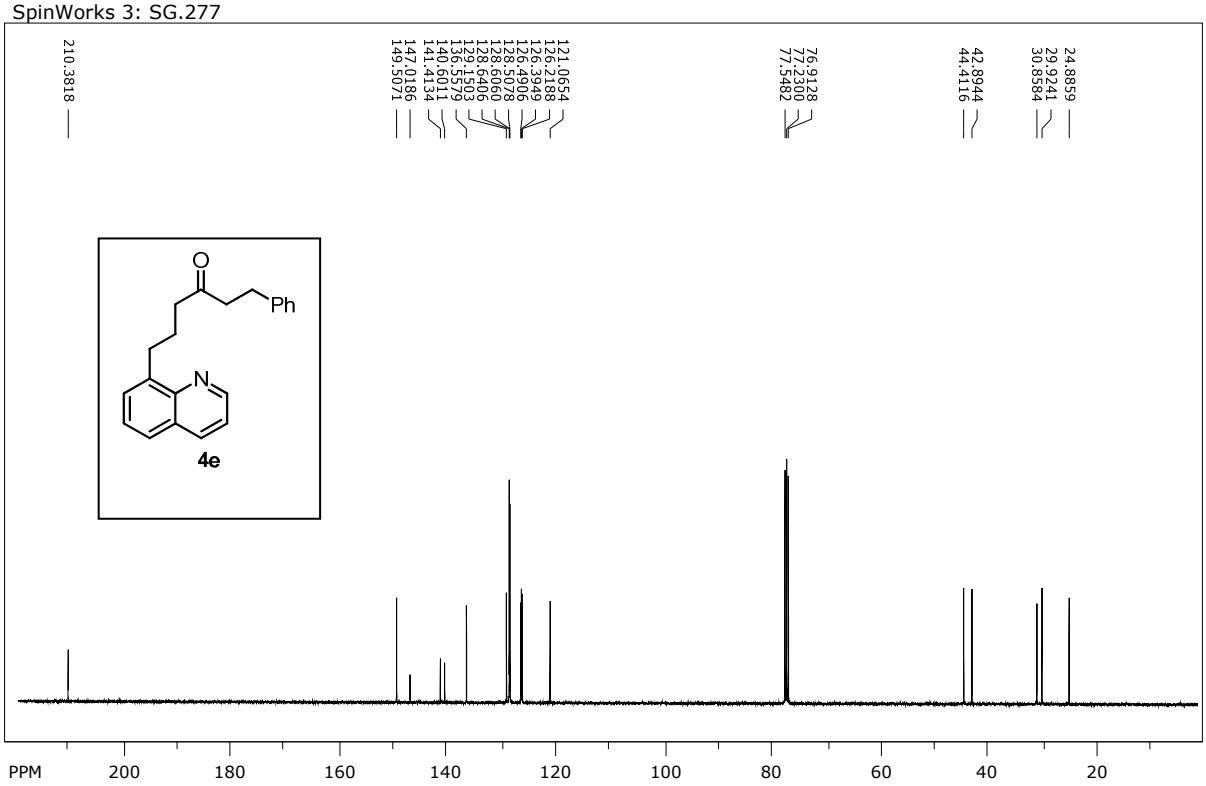
SpinWorks 3: SG.262



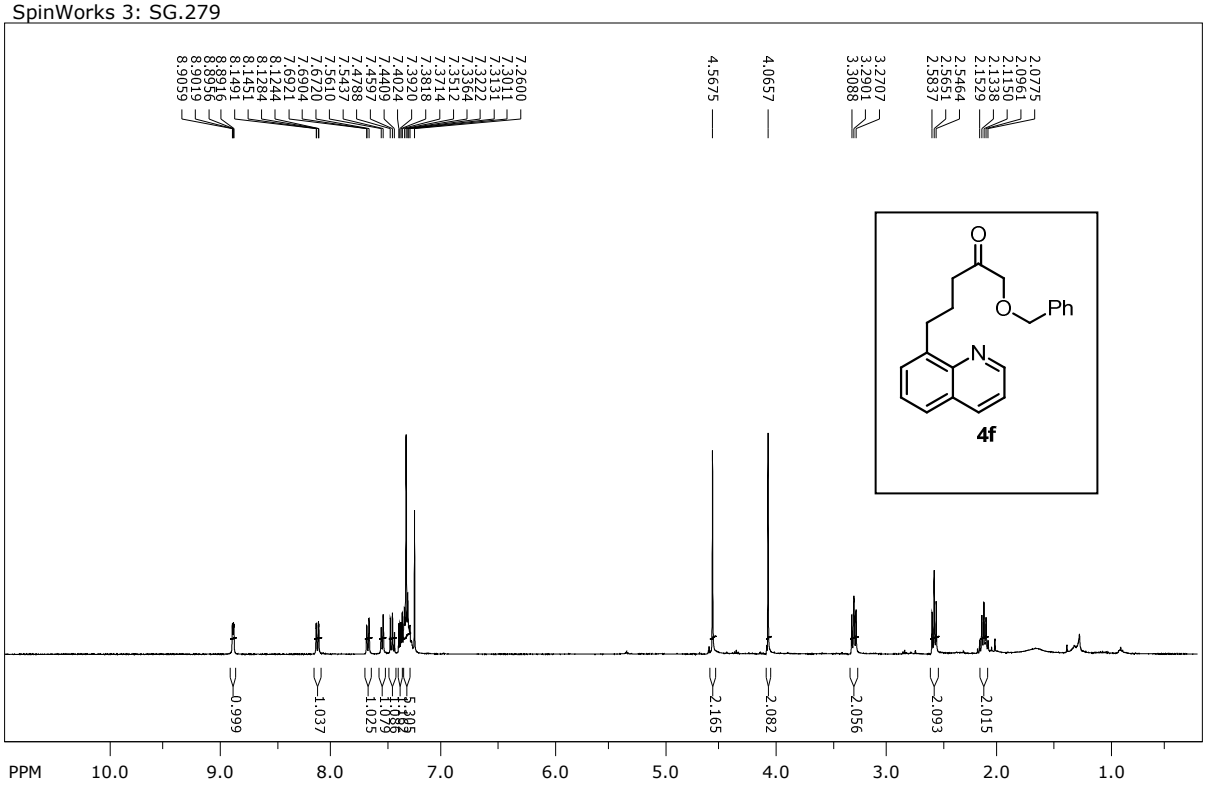
SpinWorks 3: SG.277



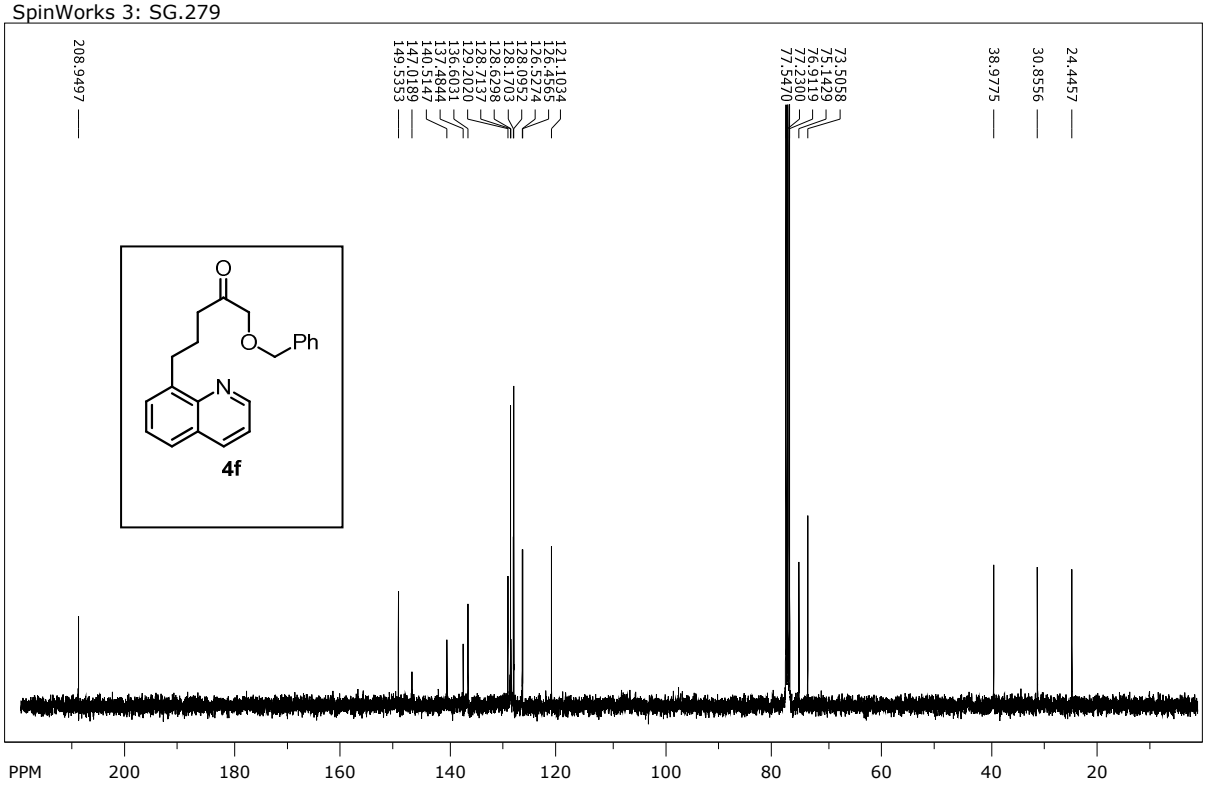
SpinWorks 3: SG.277



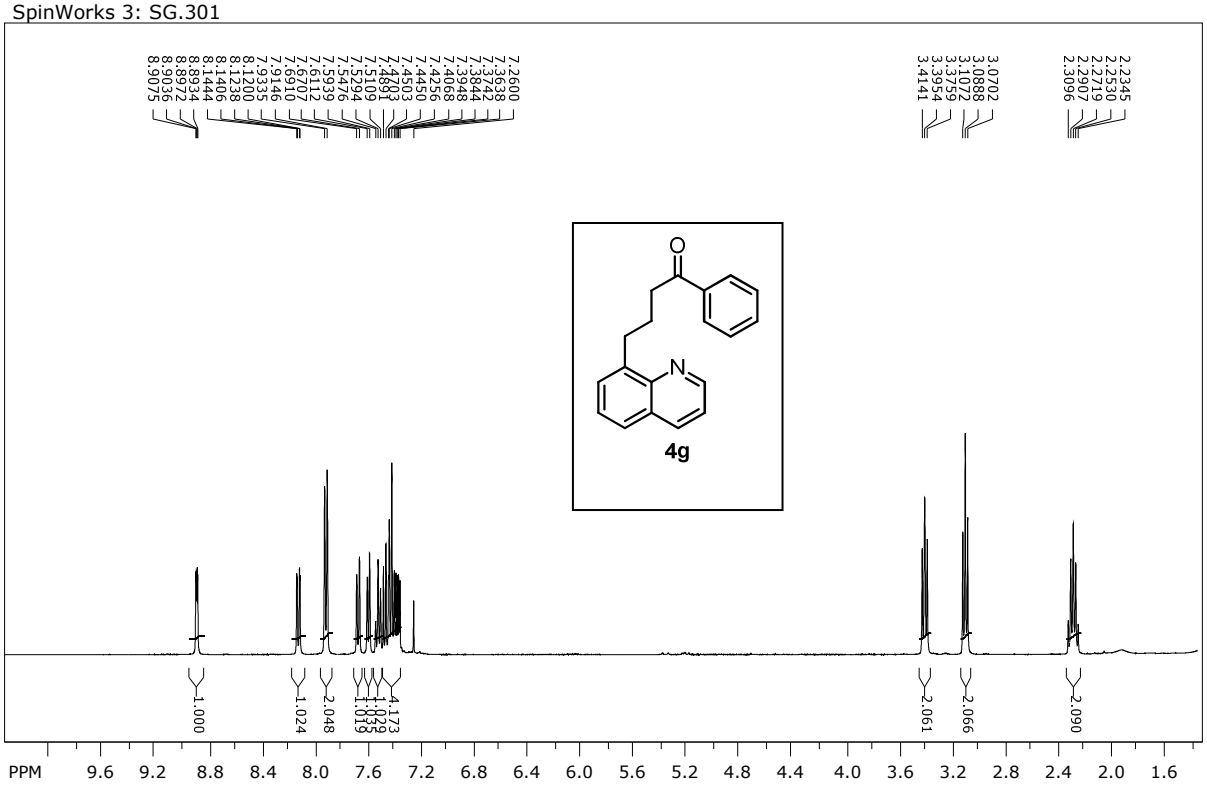
SpinWorks 3: SG.279



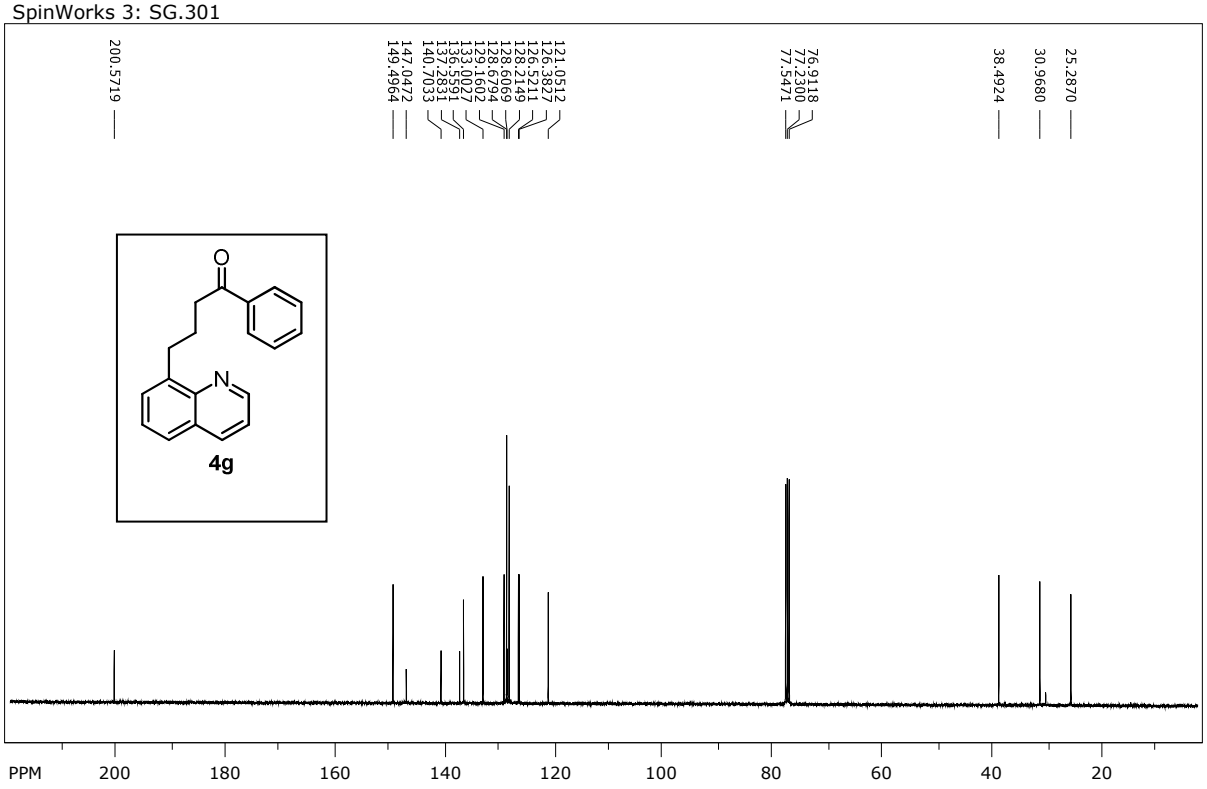
SpinWorks 3: SG.279



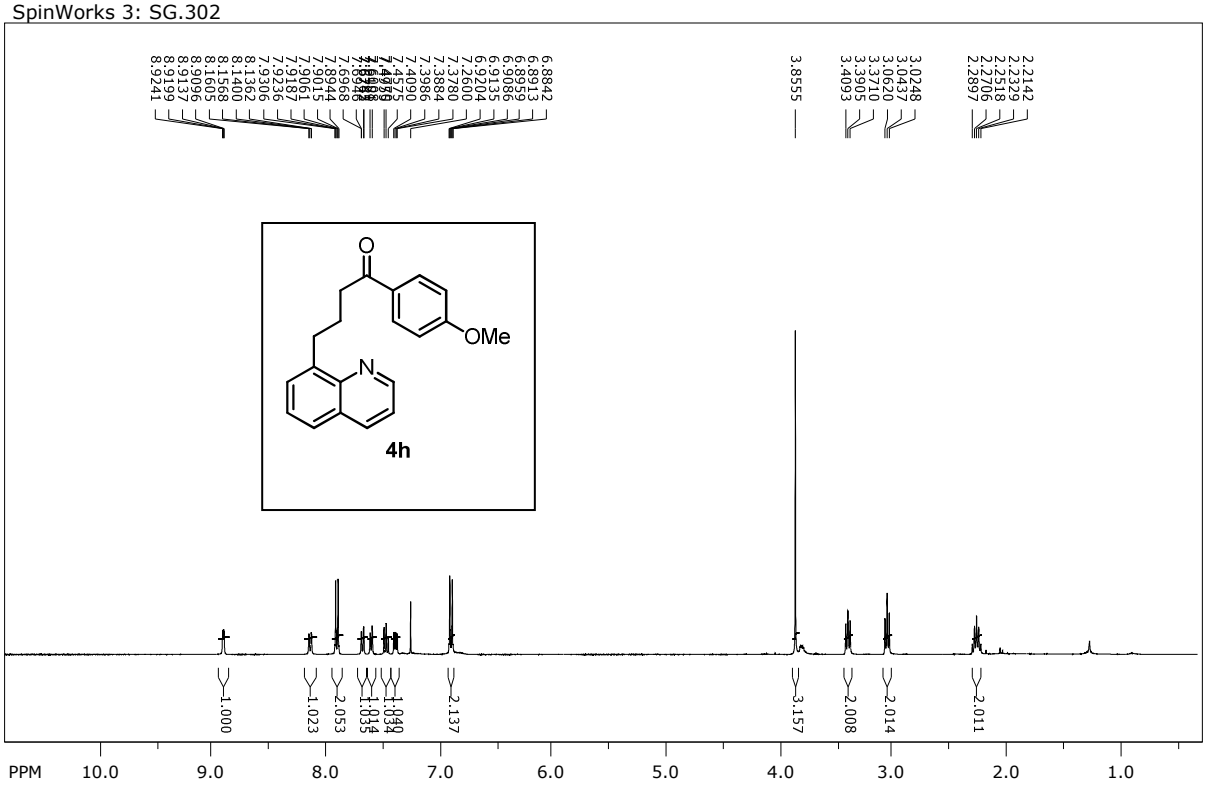
SpinWorks 3: SG.301



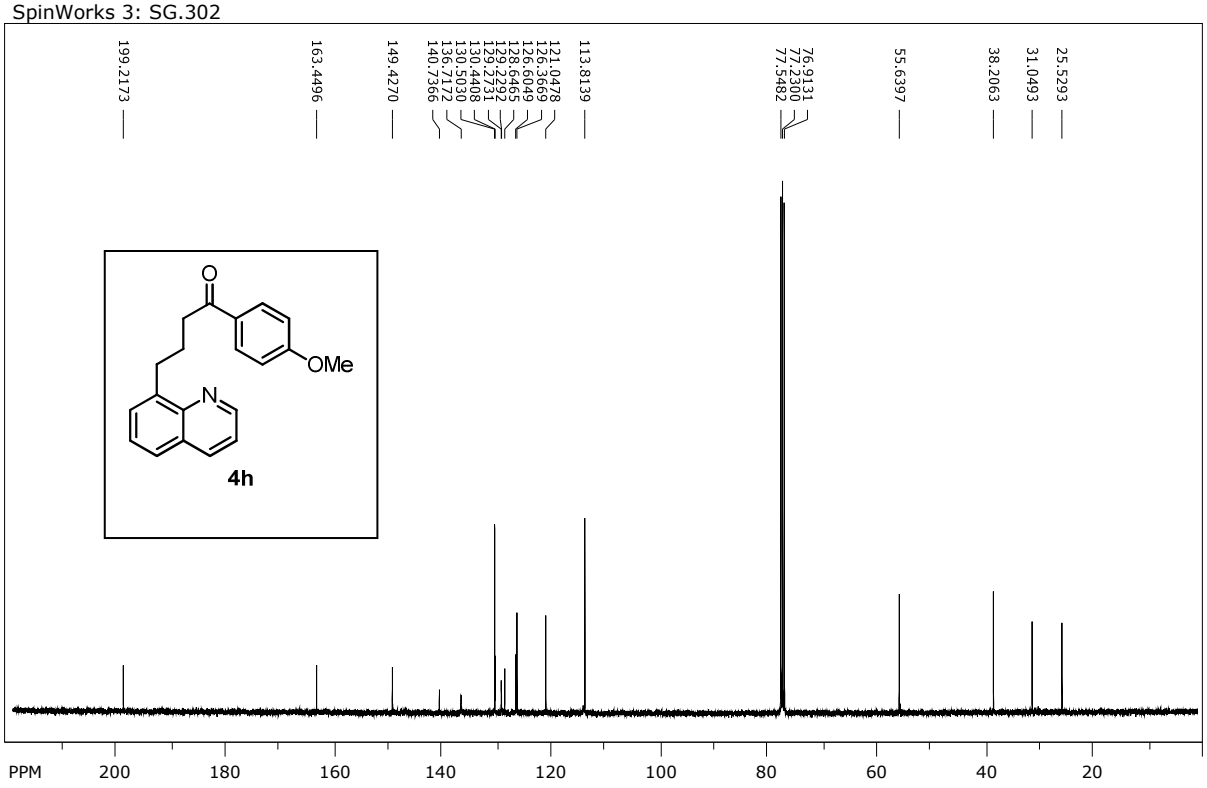
SpinWorks 3: SG.301



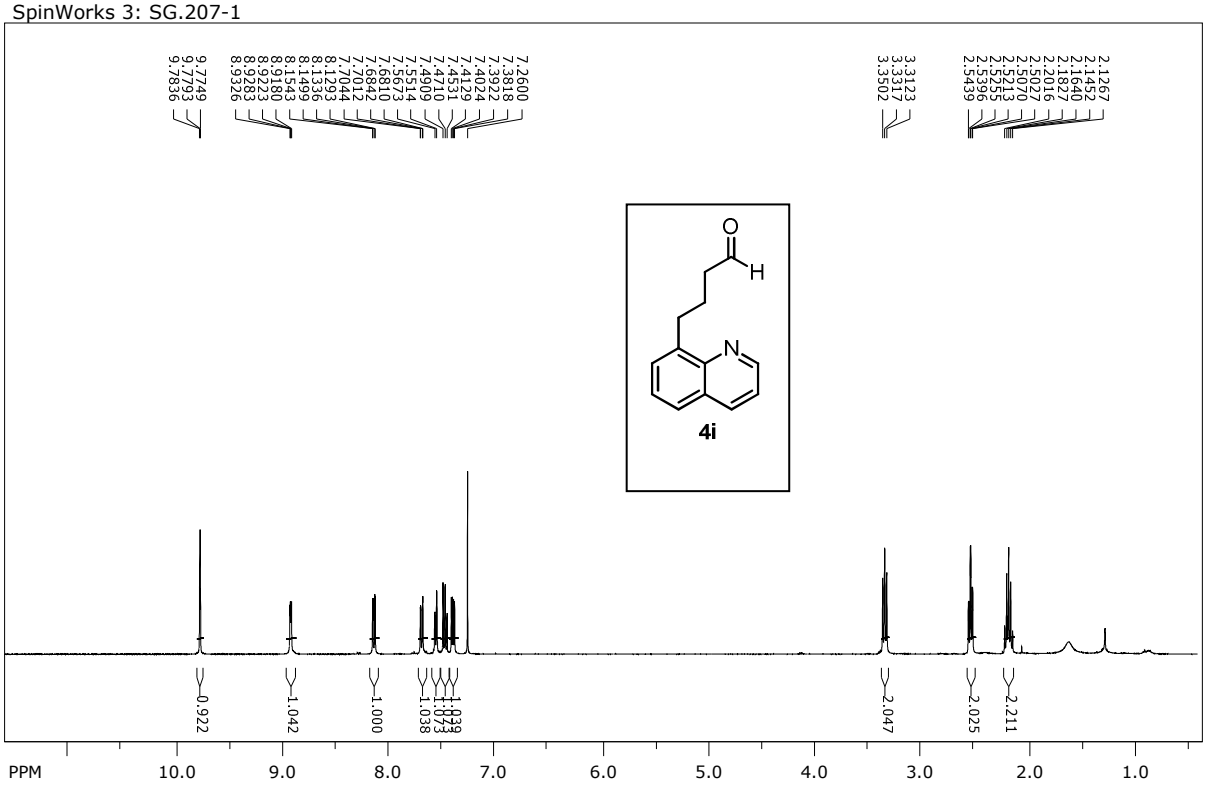
SpinWorks 3: SG.302



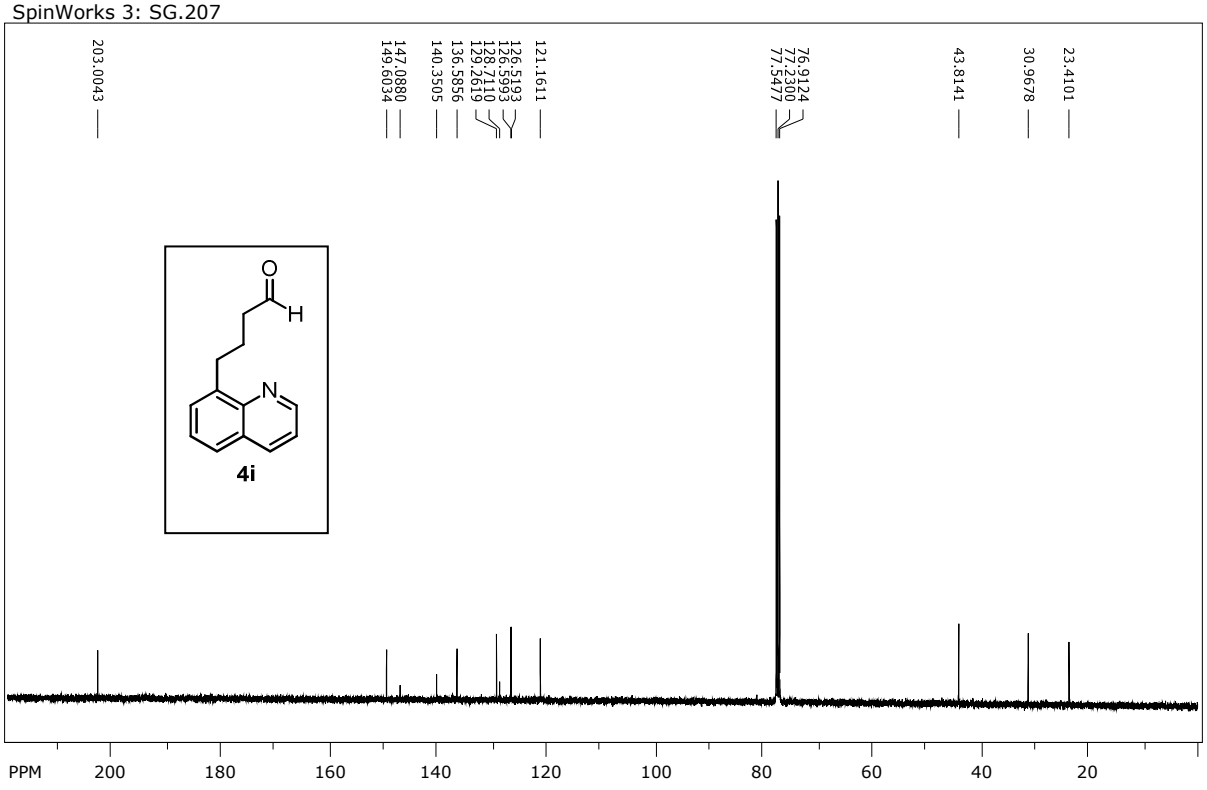
SpinWorks 3: SG.302



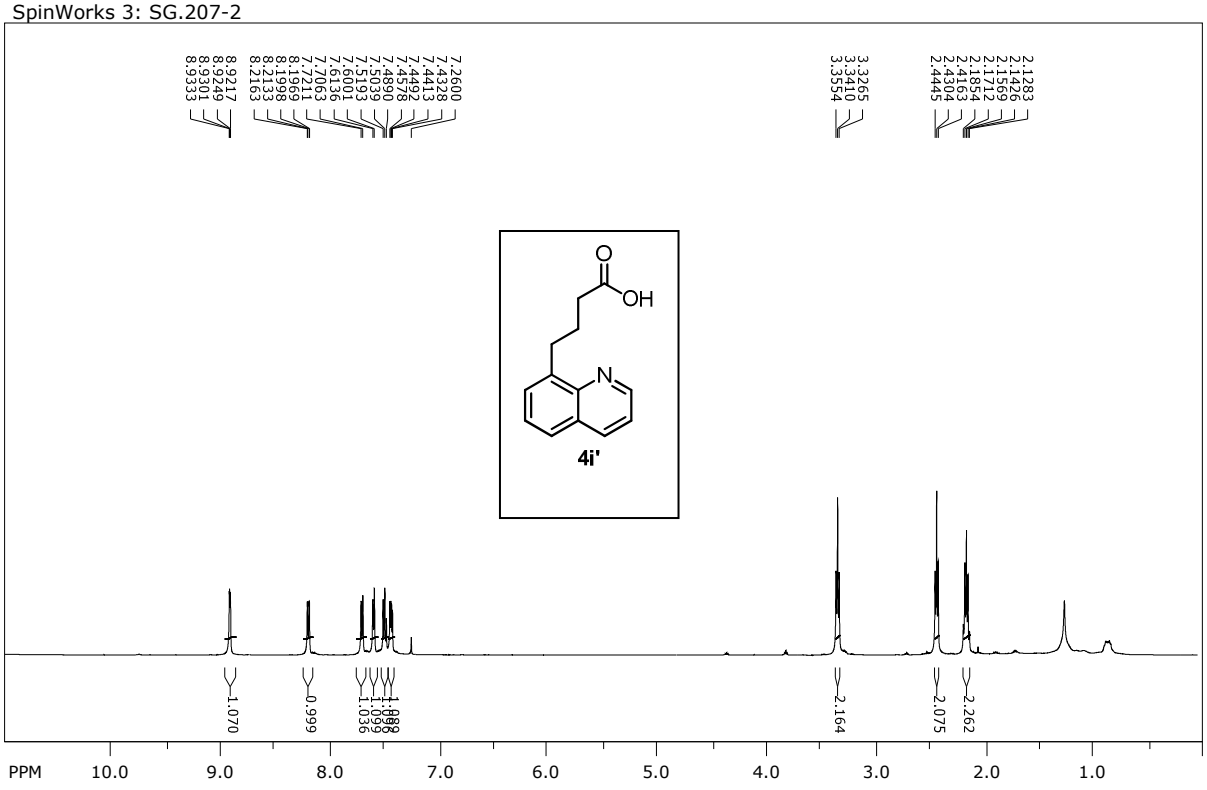
SpinWorks 3: SG.207-1



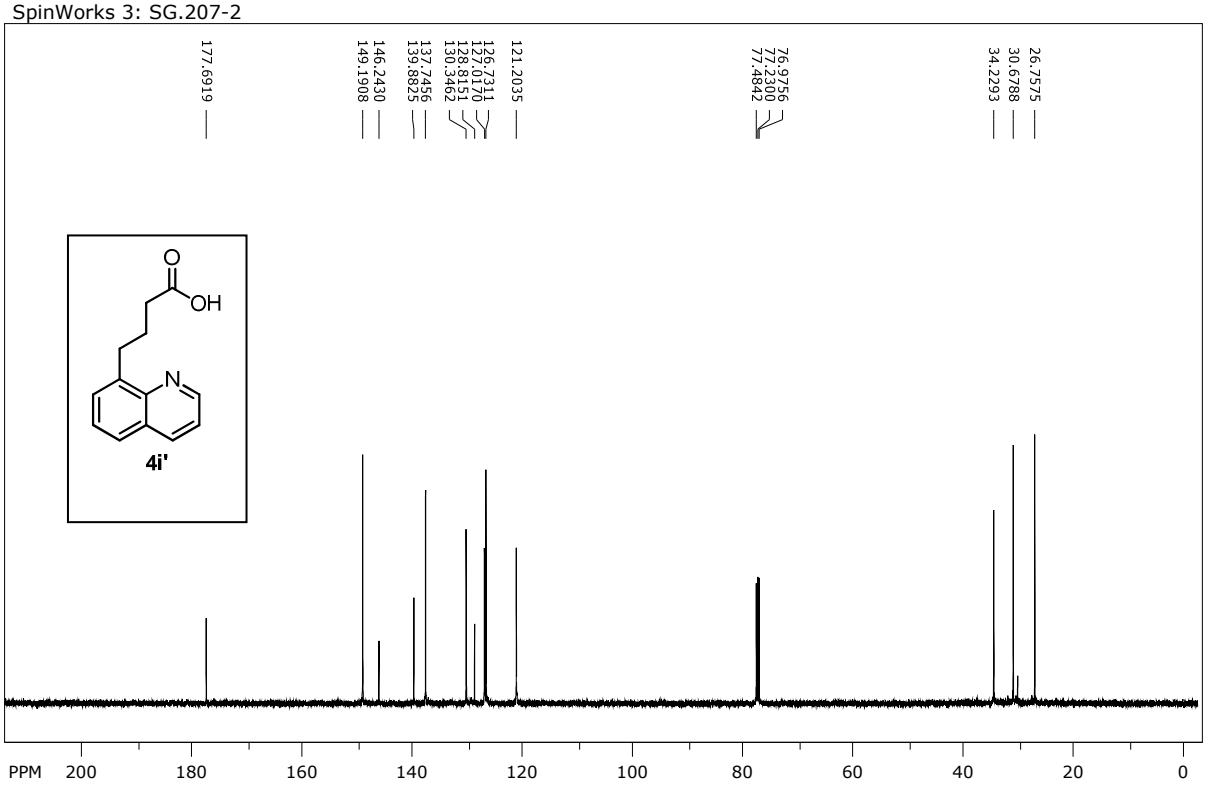
SpinWorks 3: SG.207



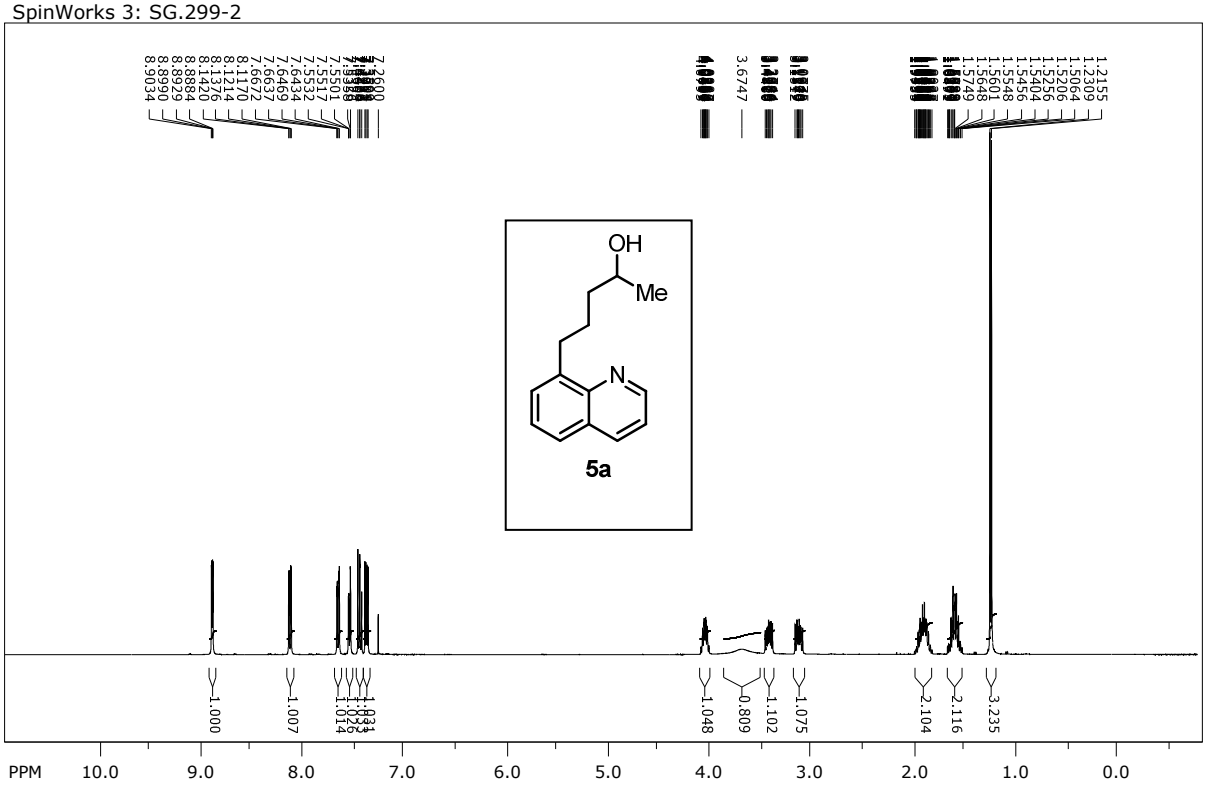
SpinWorks 3: SG.207-2



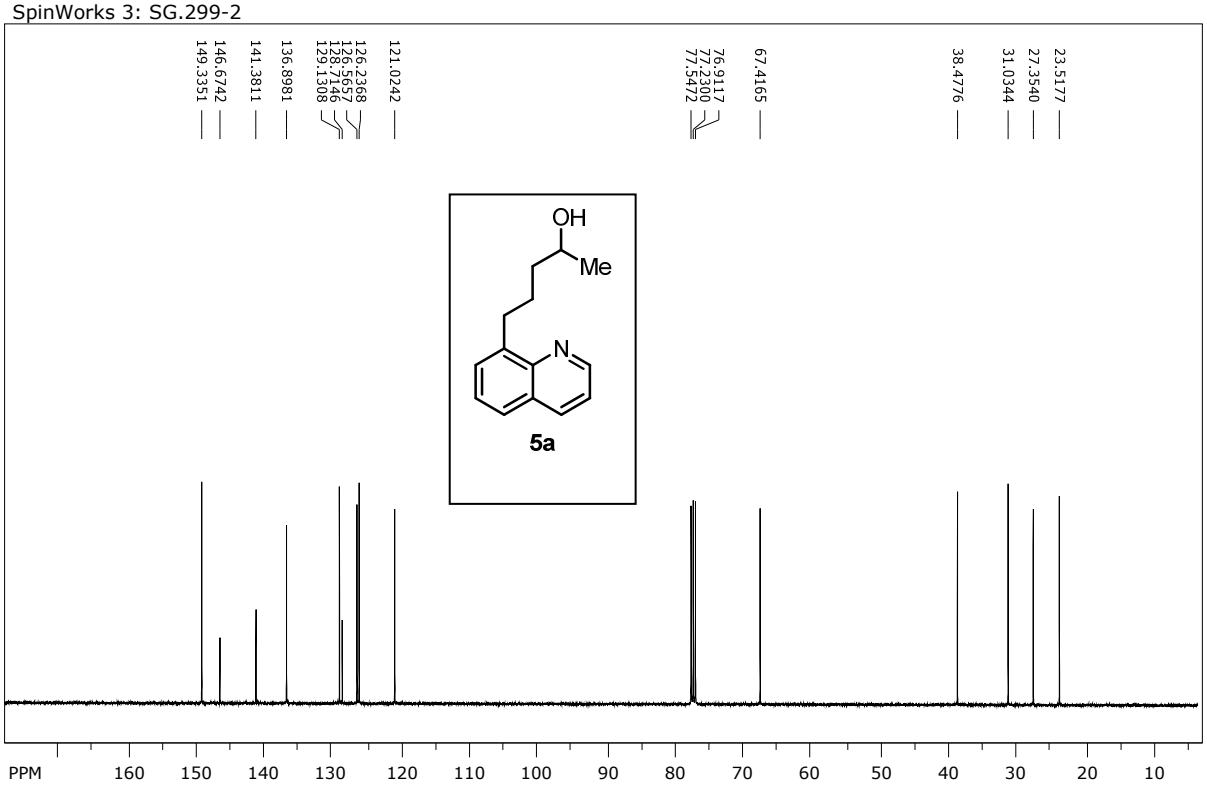
SpinWorks 3: SG.207-2



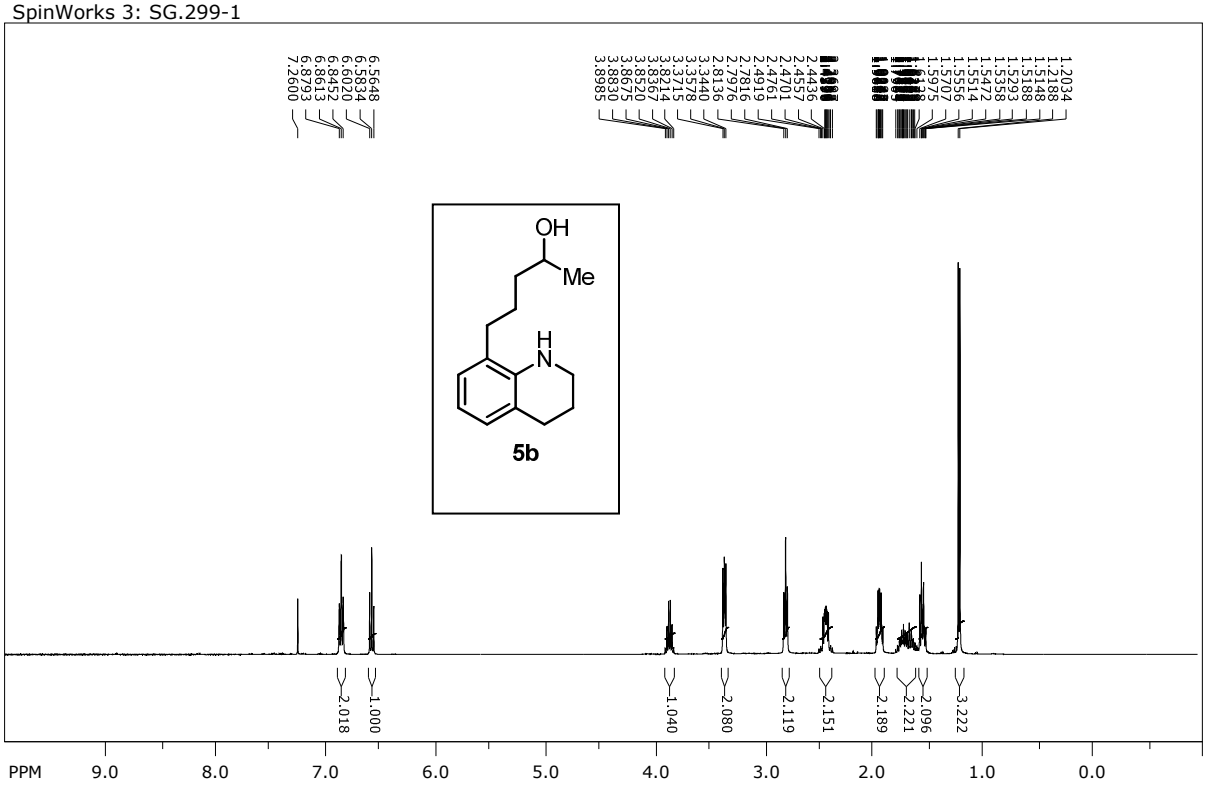
SpinWorks 3: SG.299-2



SpinWorks 3: SG.299-2



SpinWorks 3: SG.299-1



SpinWorks 3: SG.299-1