Electronic Supplementary Material (ESI) for Chemical Communications

Oxidative 1,2-Difunctionalization of Activated Alkenes with Benzylic C(sp^3)-H Bonds and Aryl C(sp^2)-H Bonds

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Supporting Information

List of Contents

(A) Typical experimental procedure

(B) Analytical data

(C) Reference

(D) Spectra

(A) Typical experimental procedure

(a) Typical Procedures for the Synthesis of Substrates 1:

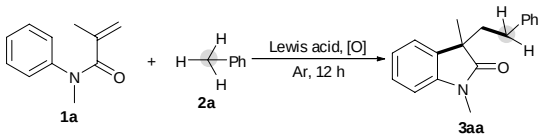
Substrates **1** were synthesized according to the literatures.[1]

(b) Typical Experimental Procedure for the Organomediated Oxidative 1,2-Difunctionalization of Activated Alkenes:

To a Schlenk tube were added *N*-arylacrylamide **1** (0.5 mmol), arylmethane **2** (7.5 mmol), $IrCl_3$ (3 mol%), and DTBP (2 equiv). Then the tube was charged with argon, and was stirred at 120 ^oC for the indicated time until complete consumption of starting material as monitored by TLC and/or GC-MS analysis. After the reaction was finished, the reaction mixture was washed with brine. The aqueous phase was re-extracted with ethyl acetate. The combined organic extracts were dried over Na_2SO_4, concentrated in vacuum, and the resulting residue was purified by silica gel column chromatography (hexane/ethyl acetate = 10 : 1) to afford the desired product.

(c) Table S1: Screening the optimal conditions

Table S1 Screening Optimal Conditions[a]



Entry	Lewis acid (mol%)	[O]	Solvent	Isolated Yield (%)
1	—	DTBP	neat	53
2	—	TBHP	neat	47
3	—	BPO	neat	22
4	—	$PhI(OAc)_2$	neat	42
5	$FeCl_3$ (10)	DTBP	neat	68
6	$Fe(acac)_3$ (10)	DTBP	neat	62
7	$CuCl_2$ (10)	DTBP	neat	63
8	$ZnCl_2$ (10)	DTBP	neat	65
9	$InBr_3$ (10)	DTBP	neat	67
10	$CoCl_2$ (10)	DTBP	neat	64
11	$PdCl_2$ (10)	DTBP	neat	81
12	$RuCl_3$ (10)	DTBP	neat	78
13	$RhCl_3$ (10)	DTBP	neat	79

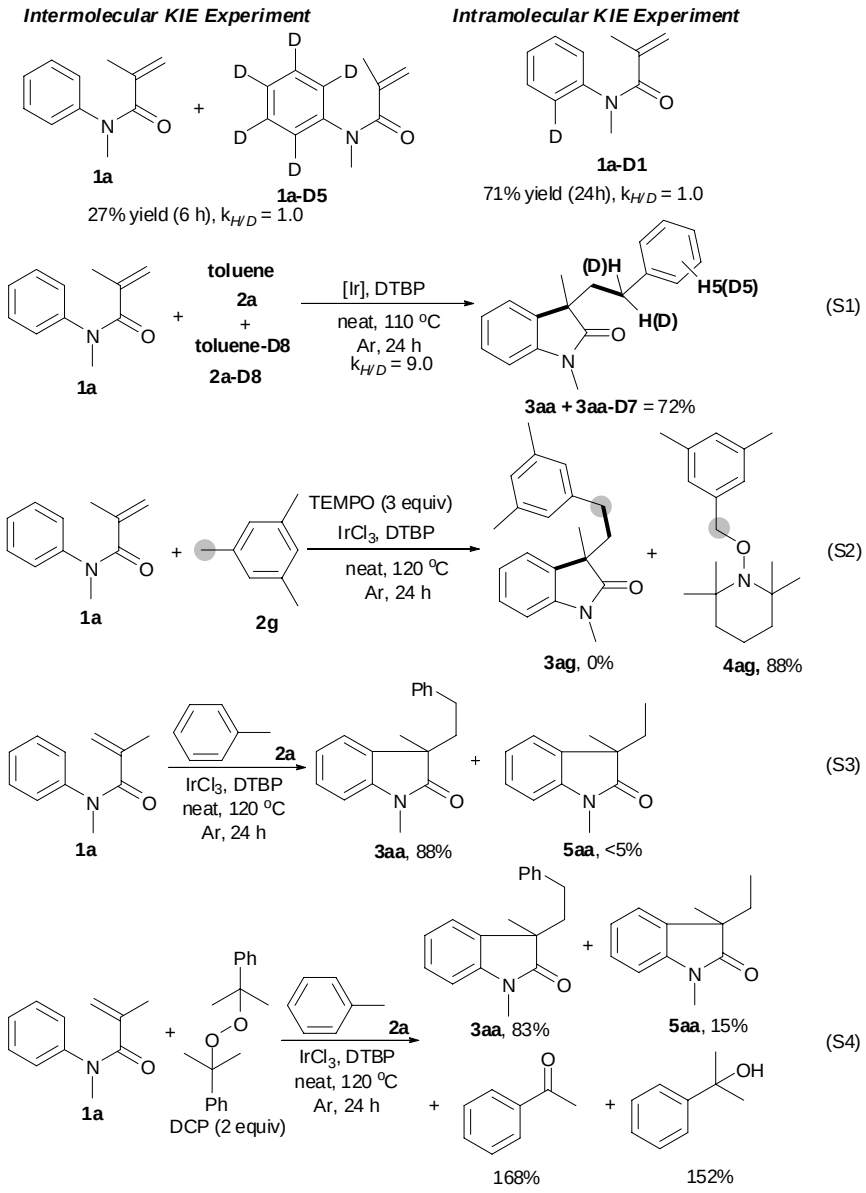
14	$IrCl_3$ (10)	DTBP	neat	85
15[b]	$IrCl_3$ (10)	DTBP	neat	80
16[c]	$IrCl_3$ (10)	DTBP	neat	8
17[d]	$IrCl_3$ (3)	DTBP	neat	83
18[d]	$IrCl_3$ (3)	DCP	neat	81
19[d,e]	$IrCl_3$ (3)	DTBP	DMSO	79
20[d,e]	$IrCl_3$ (3)	DTBP	NMP	trace
21[d,f]	$IrCl_3$ (3)	DTBP	neat	75
22[d,g]	$IrCl_3$ (3)	DTBP	neat	86

[a] Reaction conditions: **1a** (0.5 mmol), **2a** (7.5 mmol), Lewis acid and [O] (1.0 mmol) at 120 °C under argon atmosphere for 12 h. [b] At 130 °C. [c] At 90 °C. [d] For 24 h. [e] **2a** (5 mmol) in solvent (anhydrous, 0.5 mL). [f] DTBP (0.6 mmol). [g] **1a** (10 mmol) and **2a** (15 equiv) for 48 h.

(d) The control experiments

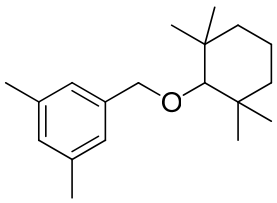
As shown in Scheme S1, some control experiments were carried out to understand the mechanism. The results demonstrated that no kinetic isotope effect (k_H/k_D = 1.0) in either intramolecular or intermolecular experiments was discovered, implying that the iron-catalyzed oxidative difunctionalization proceeds via either the SEAr mechanism or the free radical mechanism (*(a)* W. D. Jones, *Acc. Chem. Res.* 2003, **36**, 140; *(b)* A. Pinto, L. Neuville, P. Retailleau and J. Zhu, *Org. Lett.* 2006, **8**, 4927; *(c)* W. D. Jones and F. J. Feher, *J. Am. Chem. Soc.* 1986, **108**, 4814; *(d)* X. Chen, X.-S. Hao, C. E. Goodhue and J.-Q. Yu, *J. Am. Chem. Soc.* 2006, **128**, 6790.). The deuterated experiment between toluene and toluene-D8 (k_H/k_D = 9.0) supports that benzyl C-H bond cleavage is the rate-limiting step (Eq S1). Notably, two radical inhibitors, TEMPO (Eq 3) and 2,6-di-*tert*-butylphenol, were added to the difunctionalization reaction: a stoichiometric amount of radical inhibitor (2 equiv) results in no conversion of amide **1a**; however, mesitylene (**2g**) was transferred by TEMPO into 1-(3,5-dimethylbenzyloxy)-2,2,6,6-tetramethylpiperidine (**6ag**) in 88% yield (Eq S2). The results suggest that a mesitylene radical is yielded and the current reaction includes a radical process.

The data of the reaction between **1a** and **2a** in-situ determined by GC-MS analysis showed that a DCP could be converted into a methyl group, a ketone and an alcohol (Eqs S3 and S4).



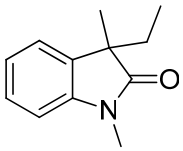
Scheme S1. Control Experiments.

1,3-Dimethyl-5-(((2,2,6,6-tetramethylcyclohexyl)oxy)methyl)benzene (4aa):



^{1}H NMR (400 MHz, $CDCl_3$) δ: 6.98 (s, 2H), 6.88 (s, 1H), 4.75 (s, 2H), 2.32 (s, 6H), 1.61-1.49 (m, 4H), 1.36-1.08 (m, 14H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 131.3, 131.0, 122.5, 118.8, 72.1, 53.3, 33.1, 26.5, 14.9, 13.8, 10.5.

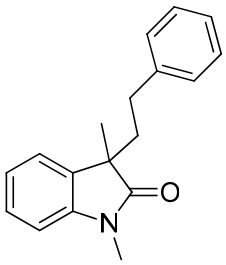
3-Ethyl-1,3-dimethylindolin-2-one (5aa):



Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.26 (t, *J* = 7.5 Hz, 1H), 7.17 (d, *J* = 7.5 Hz, 1H), 7.07 (t, *J* = 7.5 Hz, 1H), 6.84 (d, *J* = 8.0 Hz, 1H), 3.22 (s, 3H), 1.97-1.89 (m, 1H), 1.81-1.74 (m, 1H), 1.35 (s, 3H), 0.59 (t, *J* = 7.5 Hz, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 180.7, 143.4, 133.9, 127.6, 122.5, 122.4, 107.8, 48.9, 31.4, 26.0, 23.3, 8.8; IR (KBr, cm^{-1}): 1722, 1461; LRMS (EI, 70 eV) *m/z* (%): 189 (M^+, 21), 161 (100); HRMS *m/z* (ESI) calcd for $C_{12}H_{16}NO$ ($[M+H]^+$) 190.1308, found 190.1312.

(B) Analytical data

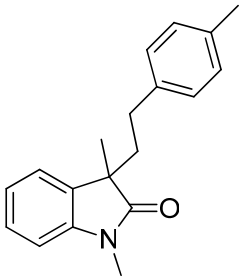
1,3-Dimethyl-3-phenethylindolin-2-one (3aa):



Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.30 (t, *J* = 7.6 Hz, 1H), 7.25-7.19 (m, 3H), 7.15-7.09 (m, 2H), 7.03 (d, *J* = 7.6 Hz, 2H), 6.87 (d, *J* = 7.6 Hz, 1H), 3.21 (s, 3H), 2.33-2.23 (m, 2H), 2.15-1.97 (m, 2H), 1.39 (s, 3H); ^{13}C NMR (100

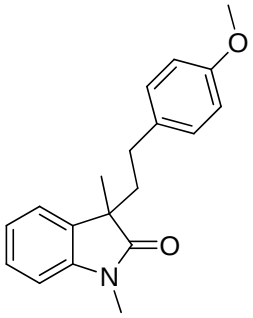
MHz, $CDCl_3$) δ: 180.3, 143.3, 141.3, 133.6, 128.2 (2C), 127.8, 125.8, 122.6, 122.4, 108.0, 48.3, 40.2, 30.9, 26.1, 23.9; IR (KBr, cm^{-1}): 1711, 1668, 1432; LRMS (EI, 70 eV) *m/z* (%): 265 (M^+, 3), 161 (100); HRMS *m/z* (ESI) calcd for $C_{18}H_{20}NO$ ($[M+H]^+$) 266.1539, found 266.1543.

1,3-Dimethyl-3-(4-methylphenethyl)indolin-2-one (3ab):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.29 (t, *J* = 7.6 Hz, 1H), 7.23 (d, *J* = 9.2 Hz, 1H), 7.10 (t, *J* = 7.2 Hz, 1H), 7.01 (d, *J* = 8.0 Hz, 2H), 6.91 (d, *J* = 8.0 Hz, 2H), 6.86 (d, *J* = 7.6 Hz, 1H), 3.20 (s, 3H), 2.29-2.20 (m, 2H), 2.24 (s, 3H), 2.10-1.95 (m, 2H), 1.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.4, 143.3, 138.2, 135.2, 133.7, 128.9, 128.1, 127.7, 122.5, 122.4, 108.0, 48.4, 40.4, 30.4, 26.1, 23.9, 20.9; IR (KBr, cm^{-1}): 1716, 1684, 1481; LRMS (EI, 70 eV) *m/z* (%): 279 (M^+, 1), 161 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{22}NO$ ($[M+H]^+$) 280.1696, found 280.1702.

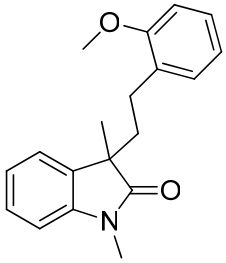
3-(4-Methoxyphenethyl)-1,3-dimethylindolin-2-one (3ac):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.30-7.22 (m, 2H), 7.11 (t, *J* = 6.0 Hz, 1H), 6.94 (d, *J* = 6.8 Hz, 2H), 6.86 (d, *J* = 6.0 Hz, 1H), 6.75 (d, *J* = 6.8 Hz, 2H), 3.75 (s, 3H), 3.21 (s, 3H), 2.26-2.20 (m, 2H), 2.09-1.95 (m, 2H), 1.39 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.3, 157.8, 143.4, 133.8, 133.5, 129.1, 127.8,

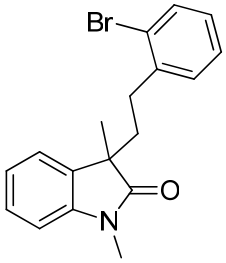
122.5 (2C), 113.7, 107.9, 55.2, 48.3, 40.5, 30.0, 26.1, 23.9; IR (KBr, cm^{-1}): 1723, 1668, 1413; LRMS (EI, 70 eV) *m/z* (%): 295 (M^+, 3), 161 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{22}NO_2$ ($[M+H]^+$) 296.1645, found 296.1654.

3-(2-Methoxyphenethyl)-1,3-dimethylindolin-2-one (3ad):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.29-7.22 (m, 2H), 7.12-7.07 (m, 2H), 6.91 (d, *J* = 7.6 Hz, 1H), 6.84 (d, *J* = 7.6 Hz, 1H), 6.79-6.73 (m, 2H), 3.74 (s, 3H), 3.20 (s, 3H), 2.36-2.16 (m, 3H), 2.07-1.97 (m, 1H), 1.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.5, 157.4, 143.5, 134.0, 129.9, 129.7, 127.6, 127.1, 122.7, 122.3, 120.2, 110.1, 107.8, 55.1, 48.4, 38.1, 26.1, 25.6, 24.0; IR (KBr, cm^{-1}): 1716, 1614, 1471; LRMS (EI, 70 eV) *m/z* (%): 295 (M^+, 1), 161 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{22}NO_2$ ($[M+H]^+$) 296.1645, found 296.1654.

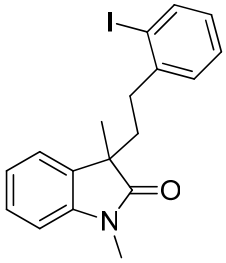
3-(2-Bromophenethyl)-1,3-dimethylindolin-2-one (3ae):



Yellow oil; ^1H NMR (500 MHz, $CDCl_3$) δ: 7.44 (d, *J* = 8.0 Hz, 1H), 7.30 (d, *J* = 8.0 Hz, 2H), 7.17-7.07 (m, 3H), 7.00 (t, *J* = 7.0 Hz, 1H), 6.88 (d, *J* = 7.0 Hz, 1H), 3.25 (s, 3H), 2.41-2.28 (m, 2H), 2.20-2.13 (m, 1H), 2.08-2.02 (m, 1H), 1.40 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 180.2, 143.3, 140.7, 133.4, 132.6, 130.4, 127.8, 127.6, 127.4, 124.1, 122.7, 122.5, 107.9, 48.3, 38.3, 31.5, 26.2, 23.8; IR (KBr,

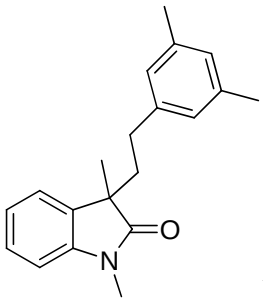
cm^{-1}): 1719, 1623, 1422; LRMS (EI, 70 eV) *m/z* (%): 345 (M^++2, 2), 343 (M^+, 2), 161 (100); HRMS *m/z* (ESI) calcd for $C_{18}H_{19}BrNO$ ($[M+H]^+$) 344.0652, found 344.0658.

3-(2-Iodophenethyl)-1,3-dimethylindolin-2-one (3af):



Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.72 (d, *J* = 8.0 Hz, 1H), 7.34-7.26 (m, 2H), 7.20 (t, *J* = 7.2 Hz, 1H), 7.11-7.08 (m, 2H), 6.88 (d, *J* = 7.6 Hz, 1H), 6.82 (t, *J* = 7.2 Hz, 1H), 3.23 (s, 3H), 2.44-2.36 (m, 1H), 2.30-2.27 (m, 1H), 2.15-1.99 (m, 2H), 1.41 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.2, 144.0, 143.2, 139.3, 133.3, 129.5, 128.3, 127.9, 127.8, 123.0, 122.5, 107.9, 100.0, 48.2, 38.6, 36.0, 26.2, 23.7; IR (KBr, cm^{-1}): 1708, 1633, 1413; LRMS (EI, 70 eV) *m/z* (%): 391 (M^+, 3), 161 (100); HRMS *m/z* (ESI) calcd for $C_{18}H_{19}INO$ ($[M+H]^+$) 392.0513, found 392.0519.

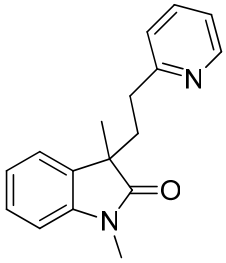
3-(3,5-Dimethylphenethyl)-1,3-dimethylindolin-2-one (3ag):



Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.29 (t, *J* = 7.6 Hz, 1H), 7.23 (d, *J* = 7.2 Hz, 1H), 7.10 (d, *J* = 7.6 Hz, 1H), 6.86 (d, *J* = 7.6 Hz, 1H), 6.77 (s, 1H), 6.66 (s, 2H), 3.22 (s, 3H), 2.29-2.17 (m, 2H), 2.23 (s, 6H), 2.08-1.95 (m, 2H), 1.39 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.4, 143.3, 141.3, 137.6, 133.7, 127.7, 127.4, 126.1, 122.5, 122.4, 107.9, 48.4, 40.4, 30.7, 26.1, 23.9, 21.1; IR (KBr, cm^{-1}):

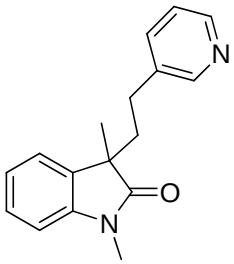
1703, 1621, 1406; LRMS (EI, 70 eV) *m/z* (%): 293 (M^+, 8), 161 (100); HRMS *m/z* (ESI) calcd for $C_{20}H_{24}NO$ ($[M+H]^+$) 294.1832, found 294.1828.

1,3-Dimethyl-3-(2-(pyridin-2-yl)ethyl)indolin-2-one (3ah):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.45 (d, *J* = 4.8 Hz, 1H), 7.51 (t, *J* = 7.6 Hz, 1H), 7.29-7.20 (m, 2H), 7.09-7.04 (m, 2H), 7.00 (d, *J* = 7.6 Hz, 1H), 6.86 (d, *J* = 7.6 Hz, 1H), 3.24 (s, 3H), 2.53-2.19 (m, 4H), 1.42 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.3, 160.9, 148.9, 143.1, 136.3, 133.5, 127.8, 122.7 (2C), 121.1, 107.9, 48.2, 37.8, 33.2, 26.1, 23.8; IR (KBr, cm^{-1}): 1716, 1618, 1431; LRMS (EI, 70 eV) *m/z* (%): 266 (M^+, 12), 161 (100); HRMS *m/z* (ESI) calcd for $C_{17}H_{19}N_2O$ ($[M+H]^+$) 267.1492, found 267.1498.

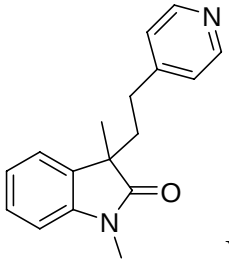
1,3-Dimethyl-3-(2-(pyridin-3-yl)ethyl)indolin-2-one (3ai):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.38 (d, *J* = 4.0 Hz, 1H), 8.21 (s, 1H), 7.38 (t, *J* = 7.6 Hz, 1H), 7.32 (t, *J* = 7.6 Hz, 1H), 7.23 (t, *J* = 7.2 Hz, 1H), 7.16-7.10 (m, 2H), 6.88 (d, *J* = 7.6 Hz, 1H), 3.20 (s, 3H), 2.34-2.26 (m, 2H), 2.25-2.10 (m, 1H), 2.09-1.99 (m, 1H), 1.40 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.1, 149.7, 147.5, 143.3, 136.5, 135.8, 133.3, 128.1, 123.2, 122.8, 122.5, 108.2. 48.3, 39.6, 28.3, 26.2, 24.1; IR (KBr, cm^{-1}): 1721, 1632, 1431; LRMS (EI, 70 eV) *m/z* (%): 266

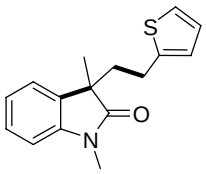
(M^+, 4), 161 (100); HRMS *m/z* (ESI) calcd for $C_{17}H_{19}N_2O$ ($[M+H]^+$) 267.1492, found 267.1496.

1,3-Dimethyl-3-(2-(pyridin-4-yl)ethyl)indolin-2-one (3aj):



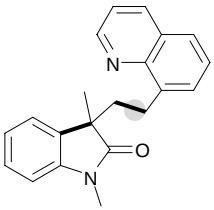
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.41 (d, *J* = 5.6 Hz, 2H), 7.34-7.28 (m, 1H), 7.22 (d, *J* = 6.8 Hz, 1H), 7.12 (t, *J* = 3.6 Hz, 1H), 6.96 (d, *J* = 6.0 Hz, 2H), 6.89 (d, *J* = 7.6 Hz, 1H), 3.22 (s, 3H), 2.33-2.24 (m, 2H), 2.17-1.98 (m, 2H), 1.41 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.0, 150.2, 149.5, 143.2, 133.1, 128.0, 123.7, 122.7, 122.4, 108.1, 48.2, 38.7, 30.3, 26.1, 23.9; IR (KBr, cm^{-1}): 1723, 1646, 1406; LRMS (EI, 70 eV) *m/z* (%): 266 (M^+, 17), 161 (100); HRMS *m/z* (ESI) calcd for $C_{17}H_{19}N_2O$ ($[M+H]^+$) 267.1492, found 267.1480.

1,3-Dimethyl-3-(2-(thiophen-2-yl)ethyl)indolin-2-one (3ak):



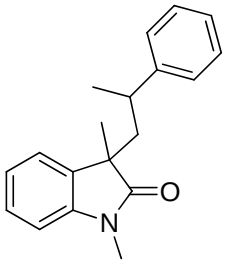
Brown oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.29 (d, *J* = 7.5 Hz, 1H), 7.21 (d, *J* = 7.0 Hz, 1H), 7.09 (t, *J* = 7.5 Hz, 1H), 7.04 (t, *J* = 5.0 Hz, 1H), 6.87-6.82 (m, 2H), 6.64 (d, *J* = 3.5 Hz, 1H), 3.21 (s, 3H), 2.57-2.49 (m, 1H), 2.40-2.30 (m, 2H), 2.14-2.07 (m, 1H), 1.41 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 180.0, 144.1, 143.3, 133.4, 127.9, 126.5, 124.0, 123.0, 122.6, 122.5, 108.0, 48.1, 40.1, 26.1, 25.0, 23.8; IR (KBr, cm^{-1}): 1731, 1651, 1422, 896; LRMS (EI, 70 eV) *m/z* (%): 271 (M^+, 2), 161 (100); HRMS *m/z* (ESI) calcd for $C_{16}H_{18}NOS$ ($[M+H]^+$) 272.1111, found 272.1116.

1,3-Dimethyl-3-(2-(quinolin-8-yl)ethyl)indolin-2-one (3al):



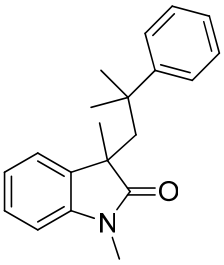
Brown oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 8.86 (d, *J* = 4.0 Hz, 1H), 8.04 (d, *J* = 8.0 Hz, 1H), 7.57 (d, *J* = 4.5 Hz, 1H), 7.35-7.23 (m, 5H), 7.06 (t, *J* = 7.5 Hz, 1H), 6.82 (d, *J* = 7.5 Hz, 1H), 3.21 (s, 3H), 3.00-2.94 (m, 2H), 2.44-2.38 (m, 1H), 2.32-2.26 (m, 1H), 1.41 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 180.6, 149.1, 146.6, 143.3, 140.3, 136.0, 133.9, 128.6, 128.1, 127.6, 126.0 (2C), 122.8, 122.3, 120.7, 107.8, 48.5, 38.7, 26.8, 26.1, 24.1; IR (KBr, cm^{-1}): 1703, 1632, 1418, 982; LRMS (EI, 70 eV) *m/z* (%): 316 (M^+, 1), 156 (100); HRMS *m/z* (ESI) calcd for $C_{21}H_{21}N_2O$ ($[M+H]^+$) 317.1656, found 317.1648.

1,3-Dimethyl-3-(2-phenylpropyl)indolin-2-one (3am):



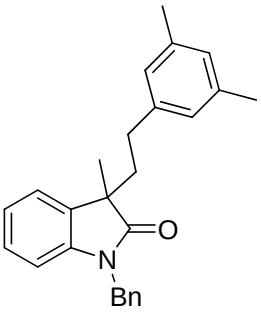
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.14 (t, *J* = 7.6 Hz, 1H), 7.08-7.00 (m, 3H), 6.93-6.85 (m, 4H), 6.72 (d, *J* = 8.0 Hz, 1H), 3.21 (s, 3H), 2.42-2.37 (m, 1H), 2.33-2.28 (m, 1H), 2.20-2.15 (m, 1H), 1.30 (s, 3H), 1.04 (d, *J* = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.7, 147.3, 143.0, 133.4, 128.0, 127.4, 126.6, 125.7, 122.9, 122.3, 107.8, 48.2, 46.1, 37.2, 26.1, 26.0, 22.7; IR (KBr, cm^{-1}): 1709, 1665, 1412; LRMS (EI, 70 eV) *m/z* (%): 279 (M^+, 6), 161 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{22}NO$ ($[M+H]^+$) 280.1696, found 280.1694.

1,3-Dimethyl-3-(2-methyl-2-phenylpropyl)indolin-2-one (3an):



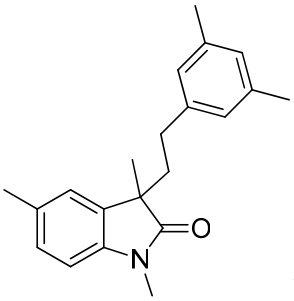
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.13-7.02 (m, 4H), 6.97 (d, *J* = 7.6 Hz, 2H), 6.72-6.63 (m, 3H), 2.99 (s, 3H), 2.54 (d, *J* = 14.4 Hz, 1H), 2.29 (d, *J* = 14.4 Hz, 1H), 1.23 (s, 3H), 1.10 (s, 3H), 1.05 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.4, 148.2, 142.5, 132.7, 127.4, 126.9, 125.9, 125.3, 123.9, 121.7, 107.5, 51.5, 47.4, 37.8, 31.0, 28.3, 28.1, 26.0; IR (KBr, cm^{-1}): 1721, 1653, 1401; LRMS (EI, 70 eV) *m/z* (%): 293 (M^+, 5), 161 (100); HRMS *m/z* (ESI) calcd for $C_{20}H_{24}NO$ ($[M+H]^+$) 294.1781, found 294.1798.

1-Benzyl-3-(3,5-dimethylphenethyl)-3-methylindolin-2-one (3bg):



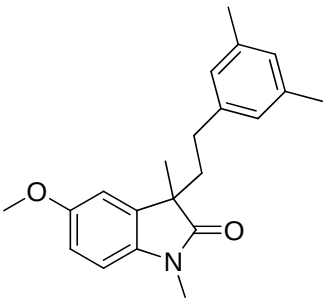
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.30-7.21 (m, 6H), 7.18 (d, *J* = 7.6 Hz, 1H), 7.13 (t, *J* = 7.6 Hz, 1H), 7.07-6.68 (m, 4H), 4.99 (d, *J* = 16.0 Hz, 1H), 4.87 (d, *J* = 16.0 Hz, 1H), 2.34-2.20 (m, 2H), 2.23 (s, 6H), 2.09-2.00 (m, 2H), 1.44 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.4, 142.5, 141.4, 137.7, 133.8, 128.7, 127.6, 127.5 (2C), 127.2, 126.2, 126.1, 122.5 (2C), 109.0, 48.4, 43.6, 40.5, 30.9, 24.2, 21.1; IR (KBr, cm^{-1}): 1703, 1621, 1406; LRMS (EI, 70 eV) *m/z* (%): 369 (M^+, 1), 237 (100); HRMS *m/z* (ESI) calcd for $C_6H_{28}NO$ ($[M+H]^+$) 370.2165, found 370.2166.

3-(3,5-Dimethylphenethyl)-1,3,5-trimethylindolin-2-one (3eg):



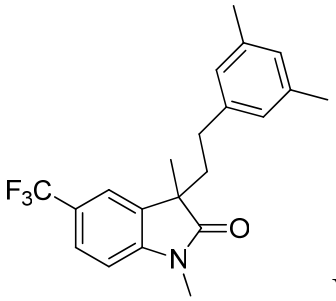
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.08 (d, *J* = 6.0 Hz, 1H), 7.03 (s, 1H), 6.75 (t, *J* = 6.4 Hz, 2H), 6.67 (s, 2H), 3.20 (s, 3H), 2.37 (s, 3H), 2.27-2.19 (m, 2H), 2.20 (s, 6H), 2.08-1.94 (m, 2H), 1.37 (s, 3H); ^{13}C NMR (100MHz, $CDCl_3$) δ: 180.3, 141.4, 140.9, 137.6, 133.7, 132.0, 127.4, 126.1, 123.3, 107.6, 48.4, 40.4, 30.7, 26.9, 23.9, 21.1 (2C); IR (KBr, cm^{-1}): 1711, 1655, 1432; LRMS (EI, 70 eV) *m/z* (%): 307 (M^+, 5), 175 (100); HRMS *m/z* (ESI) calcd for $C_{21}H_{26}NO$ ($[M+H]^+$) 308.2009, found 308.2008.

3-(3,5-Dimethylphenethyl)-5-methoxy-1,3-dimethylindolin-2-one (3fg):



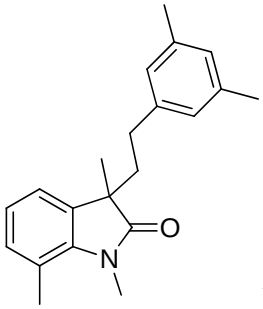
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 6.83-6.79 (m, 2H), 6.75 (d, *J* = 8.4 Hz, 2H), 6.65 (s, 2H), 3.82 (s, 3H), 3.19 (s, 3H), 2.29-2.19 (m, 2H), 2.20 (s, 6H), 2.08-1.92 (m, 2H), 1.37 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.0, 156.2, 141.3, 137.6, 137.0, 135.3, 127.4, 126.1, 111.7, 110.3, 108.1, 55.8, 48.9, 40.5, 30.8, 26.2, 24.0, 21.1; IR (KBr, cm^{-1}): 1708, 1621, 1493; LRMS (EI, 70 eV) *m/z* (%): 323 (M^+, 12), 191 (100); HRMS *m/z* (ESI) calcd for $C_{21}H_{26}NO_2$ ($[M+H]^+$) 324.1965, found 324.1968.

3-(3,5-Dimethylphenethyl)-1,3-dimethyl-5-(trifluoromethyl)indolin-2-one (3gg):



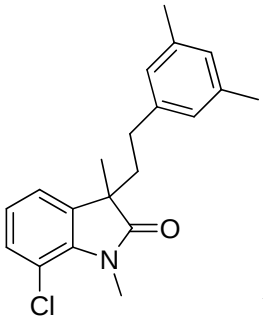
Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.56 (d, *J* = 8.0 Hz, 1H), 7.41 (s, 1H), 6.91 (d, *J* = 8.0 Hz, 1H), 6.77 (s, 1H), 6.62 (s, 2H), 3.24 (s, 3H), 2.32-2.18 (m, 2H), 2.22 (s, 6H), 2.09-2.00 (m, 2H), 1.41 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 180.2, 146.3, 140.6, 137.7, 134.3, 127.6, 126.0, 125.6 (d, *J* = 12.8 Hz, 1C), 124.1 (q, *J* = 186.6 Hz, 1C), 119.5 (d, *J* = 3.5 Hz, 1C), 107.6, 48.4, 40.0, 30.7, 26.3, 23.9, 21.1; IR (KBr, cm^{-1}): 1716, 1624, 1416; LRMS (EI, 70 eV) *m/z* (%): 361 (M^+, 1), 229 (100); HRMS *m/z* (ESI) calcd for $C_{21}H_{23}F_3NO$ ($[M+H]^+$) 362.1730, found 362.1726.

3-(3,5-Dimethylphenethyl)-1,3,7-trimethylindolin-2-one (3hg):



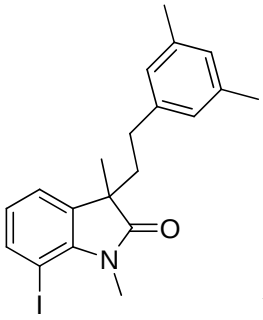
Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.05 (d, *J* = 6.4 Hz, 1H), 7.02-6.96 (m, 2H), 6.77 (s, 1H), 6.66 (s, 2H), 3.50 (s, 3H), 2.60 (s, 3H), 2.27-2.13 (m, 2H), 2.22 (s, 6H), 2.09-1.90 (m, 2H), 1.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 181.1, 141.3, 141.0, 137.6, 134.3, 131.4, 127.4 (2C), 126.1 (2C), 122.4, 120.3, 119.5, 47.7, 40.7, 30.7, 29.4, 24.3, 21.1, 19.0; IR (KBr, cm^{-1}): 1715, 1662, 1413; LRMS (EI, 70 eV) *m/z* (%): 307 (M^+, 4), 175 (100); HRMS *m/z* (ESI) calcd for $C_{20}H_{26}NO$ ($[M+H]^+$) 308.2009, found 308.2008.

7-Chloro-3-(3,5-dimethylphenethyl)-1,3-dimethylindolin-2-one (3ig):



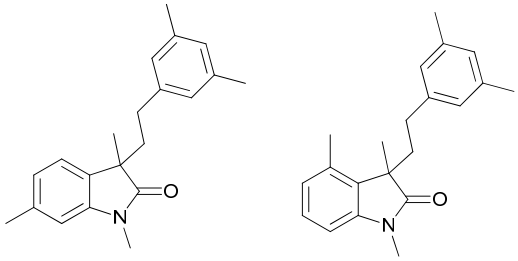
Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.20 (d, *J* = 8.0 Hz, 1H), 7.08 (d, *J* = 7.0 Hz, 1H), 6.99 (d, *J* = 7.5 Hz, 1H), 6.77 (s, 1H), 6.64 (s, 2H), 3.57 (s, 3H), 2.30-2.18 (m, 2H), 2.25 (s, 6H), 2.07-1.92 (m, 2H), 1.37 (s, 3H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 180.5, 140.8, 139.2, 137.7, 136.5, 130.0, 127.5, 126.1, 123.3, 120.9, 115.4, 48.1, 40.5, 30.7, 29.4, 24.3, 21.1; IR (KBr, cm^{-1}): 1716, 1635, 1423; LRMS (EI, 70 eV) *m/z* (%): 327 (M^+, 1), 197 (32), 195 (100); HRMS *m/z* (ESI) calcd for $C_{20}H_{23}ClNO$ ($[M+H]^+$) 328.1463, found 328.1461.

3-(3,5-Dimethylphenethyl)-7-iodo-1,3-dimethylindolin-2-one (3jg):



Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.67 (d, *J* = 7.6 Hz, 1H), 7.14 (d, *J* = 7.2 Hz, 1H), 6.78 (t, *J* = 7.6 Hz, 2H), 6.63 (s, 2H), 3.58 (s, 3H), 2.30-2.14 (m, 2H), 2.23 (s, 6H), 2.07-1.91 (m, 2H), 1.36 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.9, 143.6, 140.8, 140.3, 137.7, 136.8, 127.5, 126.1 (2C), 124.2, 122.2, 71.6, 47.9, 40.4, 30.7, 29.9, 24.3, 21.2; IR (KBr, cm^{-1}): 1716 1489, 1460; LRMS (EI, 70 eV) *m/z* (%): 419 (M^+, 1), 287 (100); HRMS *m/z* (ESI) calcd for $C_{20}H_{23}INO$ ($[M+H]^+$) 420.0826, found 420.0833.

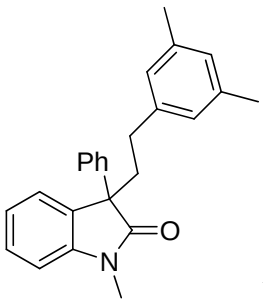
3-(3,5-Dimethylphenethyl)-1,3,6-trimethylindolin-2-one (3kg) and 3-(3,5-Dimethylphenethyl)-1,3,4-trimethylindolin-2-one (3kg')



3kg : 3kg' = 2:1

^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.22-7.16 (m, 1H), 7.09 (d, *J* = 7.6 Hz, 0.5H), 6.90 (d, *J* = 7.2 Hz, 0.5H), 6.86-6.82 (m, 1H), 6.76 (s, 1.5H), 6.70-6.62 (m, 4.5H), 3.19 (s, 1.5H), 3.18 (s, 3H), 2.39 (s, 1.5H), 2.35 (s, 3H), 2.34-2.17 (m, 12H), 2.14-1.91 (m, 3H), 1.45 (s, 1.5H), 1.35 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 180.6, 180.3, 143.5, 143.3(2C), 141.1, 137.6, 137.5, 137.4, 134.0, 130.6, 130.0, 127.5, 127.3, 126.0 (2C), 124.9, 122.9, 122.1, 108.8, 105.6, 49.3, 48.1, 40.4, 38.2, 30.7, 31.2, 26.0, 25.9, 23.9, 22.3, 21.0, 20.9, 18.1, 14.1.

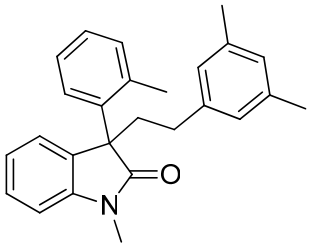
3-(3,5-Dimethylphenethyl)-1-methyl-3-phenylindolin-2-one (3lg):



Yellow oil; ^{1}H NMR (500 MHz, $CDCl_3$) δ: 7.38-7.34 (m, 3H), 7.30-7.26 (m, 3H), 7.23-7.20 (m, 1H), 7.17-7.14 (m, 1H), 6.92 (d, *J* = 8.0 Hz, 1H), 6.79 (s, 1H), 6.70 (s, 2H), 3.22 (s, 3H), 2.71 (d, *J* = 4.0 Hz, 1H), 2.47-2.41 (m, 1H), 2.37-2.31 (m, 1H), 2.24 (s, 6H), 2.15-2.10 (m, 1H); ^{13}C NMR (125 MHz, $CDCl_3$) δ: 178.3, 143.9, 141.1, 140.0, 137.7, 131.9, 128.5, 128.2, 127.5, 127.2, 126.8, 126.1, 124.7, 122.7, 108.3, 56.6, 39.8, 30.8, 26.3, 21.1; IR (KBr, cm^{-1}): 1716, 1681, 1422;

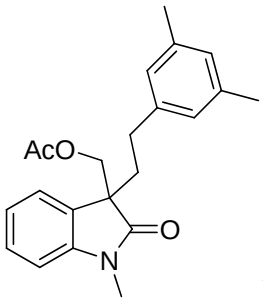
LRMS (EI, 70 eV) *m/z* (%): 355 (M^+, 1), 223 (100); HRMS *m/z* (ESI) calcd for $C_{25}H_{26}NO$ ($[M+H]^+$) 356.2016, found 356.2019.

3-(3,5-Dimethylphenethyl)-1-methyl-3-(o-tolyl)indolin-2-one (3mg):



Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.66 (d, *J* = 8.0 Hz, 1H), 7.31 (t, *J* = 7.2 Hz, 1H), 7.24 (t, *J* = 6.4 Hz, 1H), 7.16 (t, *J* = 7.6 Hz, 1H), 7.06-7.01 (m, 2H), 6.90 (t, *J* = 7.6 Hz, 2H), 6.81 (s, 1H), 6.71 (s, 2H), 3.34 (s, 3H), 2.77-2.66 (m, 1H), 2.49-2.29 (m, 2H), 2.25 (s, 6H), 2.04-1.94 (m, 1H), 1.67 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 178.7, 144.0, 141.3, 138.1, 137.8, 136.9, 132.8, 132.0, 128.0, 127.6, 127.4, 127.3, 126.2, 125.9, 123.2, 123.1, 107.7, 55.9, 40.5, 29.4, 26.2, 21.2, 19.3; IR (KBr, cm^{-1}): 1709, 1665, 1412; LRMS (EI, 70 eV) *m/z* (%): 369 (M^+, 2), 147 (100); HRMS *m/z* (ESI) calcd for $C_{26}H_{28}NO$ ($[M+H]^+$) 370.2165, found 370.2166.

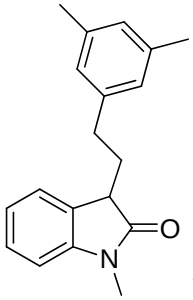
(3-(3,5-Dimethylphenethyl)-1-methyl-2-oxoindolin-3-yl)methyl acetate (3ng):



Yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.32 (t, *J* = 7.6 Hz, 1H), 7.26 (d, *J* = 8.8 Hz, 1H), 7.10 (t, *J* = 7.2 Hz, 1H), 6.86 (d, *J* = 7.6 Hz, 1H), 6.77 (s, 1H), 6.63 (s, 2H), 4.53 (d, *J* = 10.8 Hz, 1H), 4.18 (d, *J* = 10.8 Hz, 1H), 3.22 (s, 3H), 2.28-2.21 (m, 2H), 2.22 (s, 6H), 2.10-2.05 (m, 2H), 1.85 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 177.2, 170.2, 144.2, 140.7, 137.7, 129.3, 128.4, 127.6, 126.1, 123.3, 122.6,

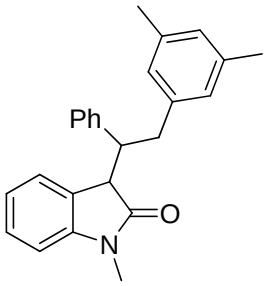
107.9, 67.3, 52.5, 35.4, 29.9, 26.1, 21.1, 20.5; IR (KBr, cm^{-1}): 1712, 1617, 1408; LRMS (EI, 70 eV) *m/z* (%): 351 (M^+, 1), 159 (100); HRMS *m/z* (ESI) calcd for $C_{22}H_{26}NO_3$ ($[M+H]^+$) 352.1907, found 352.1902.

3-(3,5-Dimethylphenethyl)-1-methylindolin-2-one (3og):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.30 (t, *J* = 8.0 Hz, 2H), 7.08 (t, *J* = 8.0 Hz, 1H), 6.85-6.80 (m, 4H), 3.49 (t, *J* = 6.4 Hz, 1H), 3.21 (s, 3H), 2.69-2.52 (m, 2H), 2.29-2.20 (m, 2H), 2.26 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 177.7, 144.4, 141.2, 137.8, 129.0, 127.9, 127.6, 126.3, 123.8, 122.3, 107.9, 45.0, 32.4, 31.8, 26.1, 21.2; IR (KBr, cm^{-1}): 1706, 1681, 1415; LRMS (EI, 70 eV) *m/z* (%): 279 (M^+, 2), 147 (100); HRMS *m/z* (ESI) calcd for $C_{19}H_{22}NO$ ($[M+H]^+$) 280.1696, found 280.1698.

3-(2-(3,5-Dimethylphenyl)-1-phenylethyl)-1-methylindolin-2-one (3pg):



Yellow oil; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.37-7.34 (m, 1H), 7.18 (t, *J* = 6.0 Hz, 2H), 7.14-7.10 (m, 4H), 6.87 (d, *J* = 6.0 Hz, 3H), 6.76 (s, 2H), 3.88 (d, *J* = 2.0 Hz, 1H), 3.39 (s, 3H), 3.22-3.19 (m, 1H), 3.02-2.98 (m, 1H), 2.48-2.43 (m, 1H), 2.30 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 171.2, 141.8, 140.0, 138.3, 138.0, 129.9, 128.6, 128.2, 128.0, 127.3, 127.0, 126.7, 126.3, 123.4, 114.7, 50.5, 44.4,

36.0, 29.6, 21.3; IR (KBr, cm^{-1}): 1719, 1665, 1403; LRMS (EI, 70 eV) *m/z* (%): 355 (M^+, 3), 236 (100); HRMS *m/z* (ESI) calcd for $C_{25}H_{26}NO$ ($[M+H]^+$) 356.2009, found 356.2006.

(C) Reference

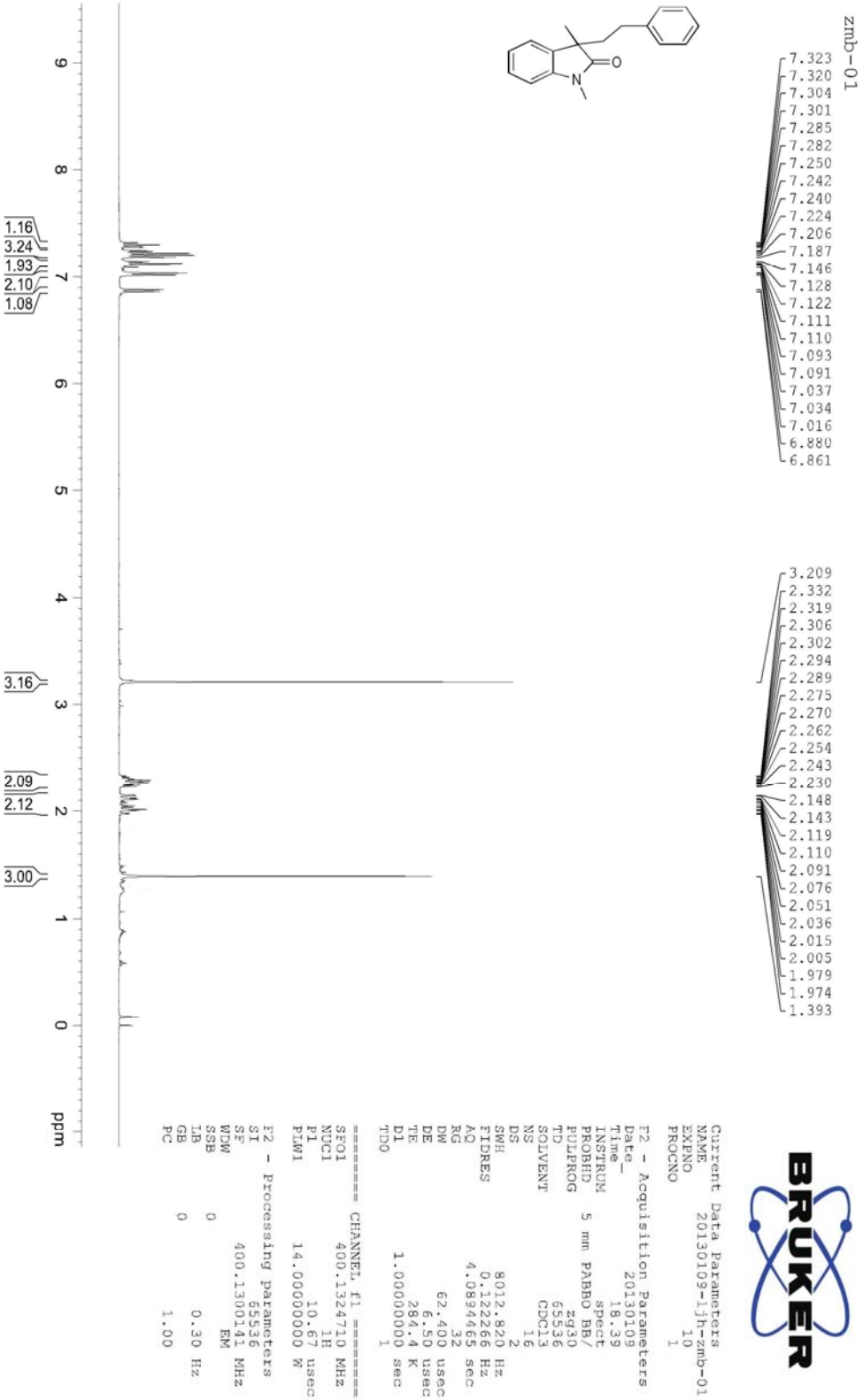
[1] a) T. Wu, X. Mu, Y.-L. Guo, G.-S. Liu, *Angew. Chem. Int. Ed.* **2011**, *50* ,12578; b) H. Wei, T. Piou, J. Dufour, L. Neuville, J. Zhu, *Org. Lett.*, **2011**, *13*, 2244; c) X. Mu, T. Wu, H.-Y. Wang, Y.-L. Guo, G.-S. Liu, *J. Am. Chem. Soc.* **2012**, *134*, 878.

[S2] T. Nishio, K. Iseki, N. Araki, T. Miyazaki, *Helv. Chim. Acta.* **2005**, *88*, 35.

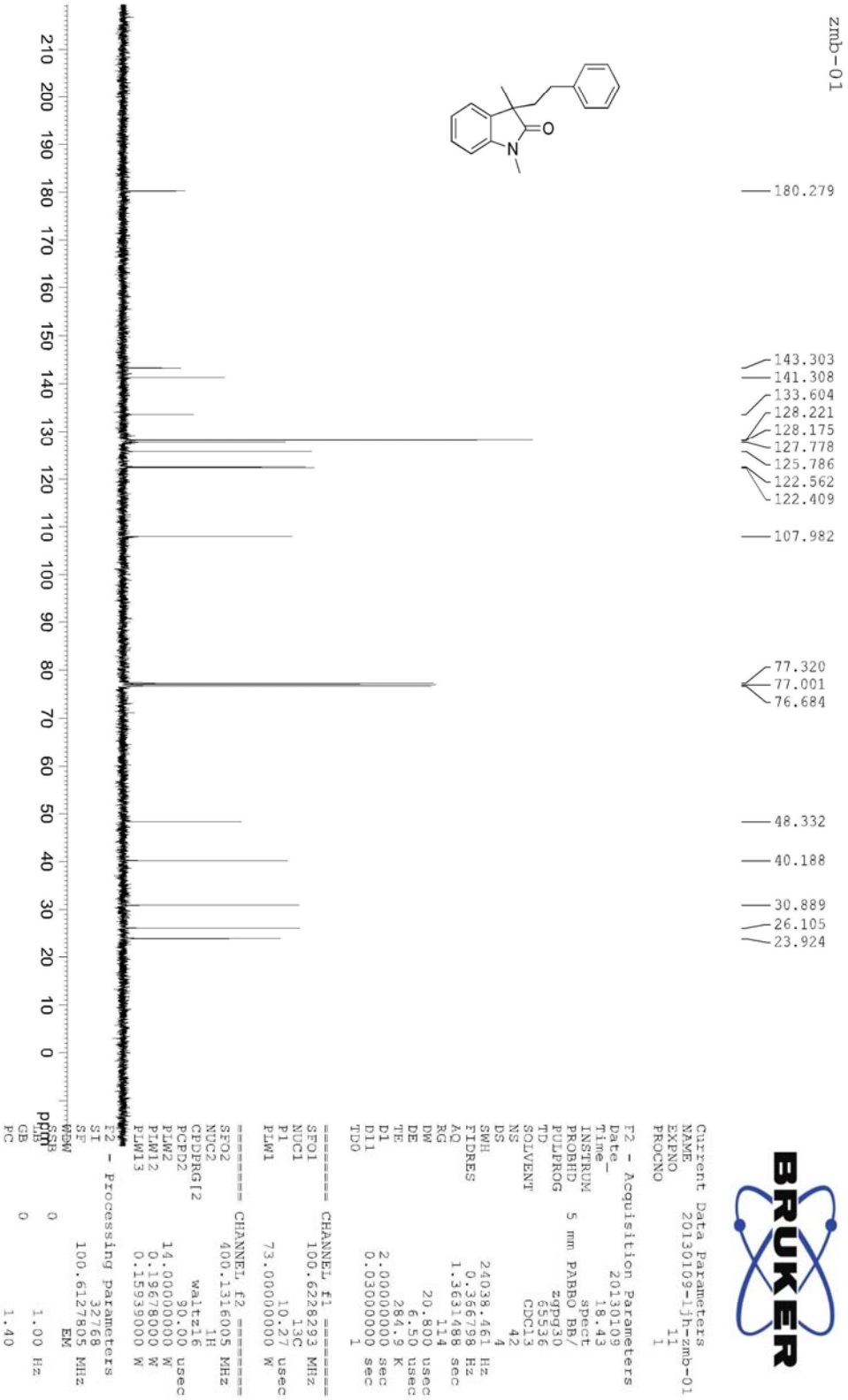
[S3] A. Pinto, Y. Jia, L. Neuville, J. Zhu, *Chem. Eur. J.* **2007**, *13*, 961.

(D) Spectra

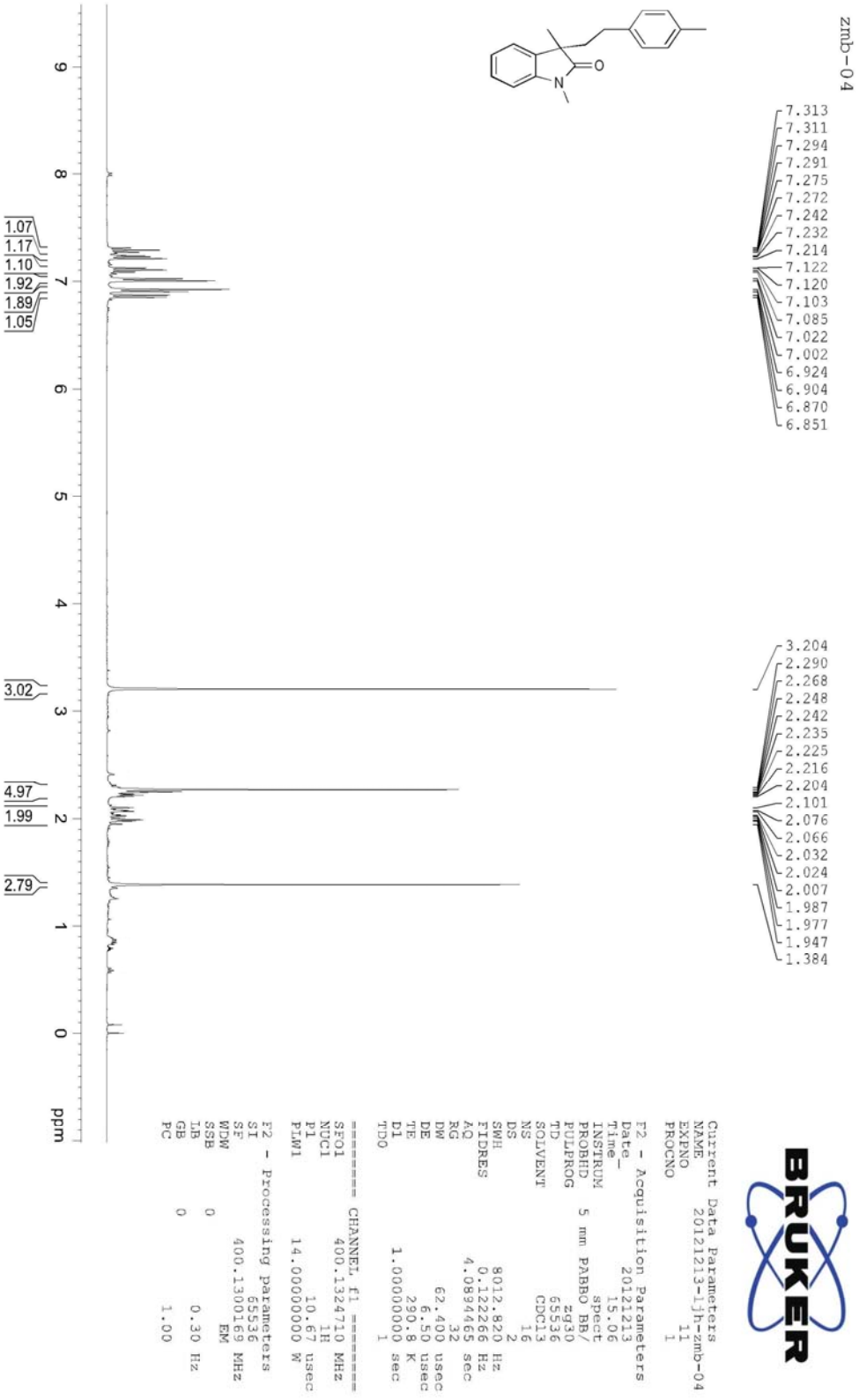
1,3-Dimethyl-3-phenethylindolin-2-one (3aa)



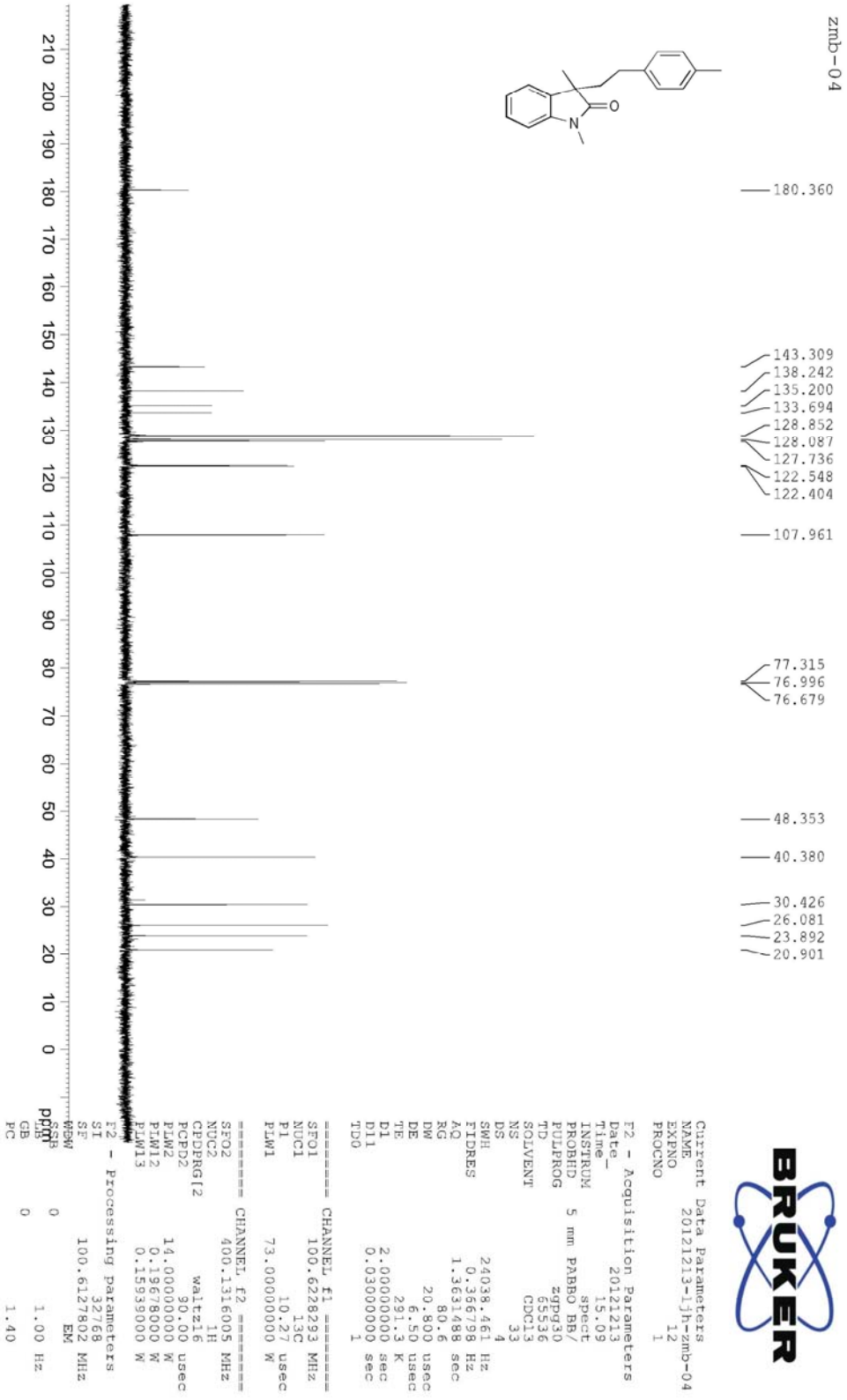
1,3-Dimethyl-3-phenethylindolin-2-one (3aa)



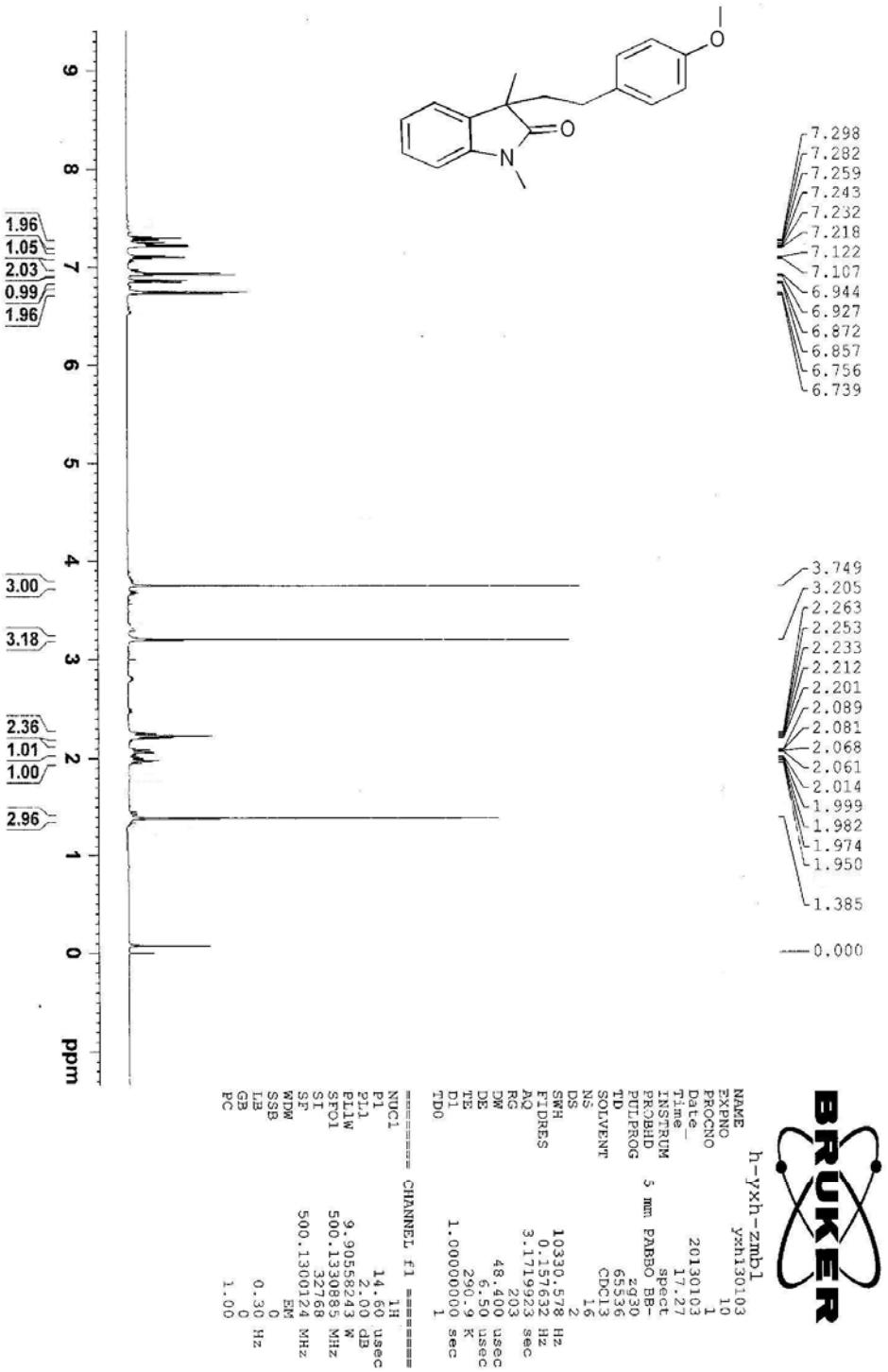
1,3-Dimethyl-3-(4-methylphenethyl)indolin-2-one (3ab)



1,3-Dimethyl-3-(4-methylphenethyl)indolin-2-one (3ab)



3-(4-Methoxyphenethyl)-1,3-dimethylindolin-2-one (3ac)



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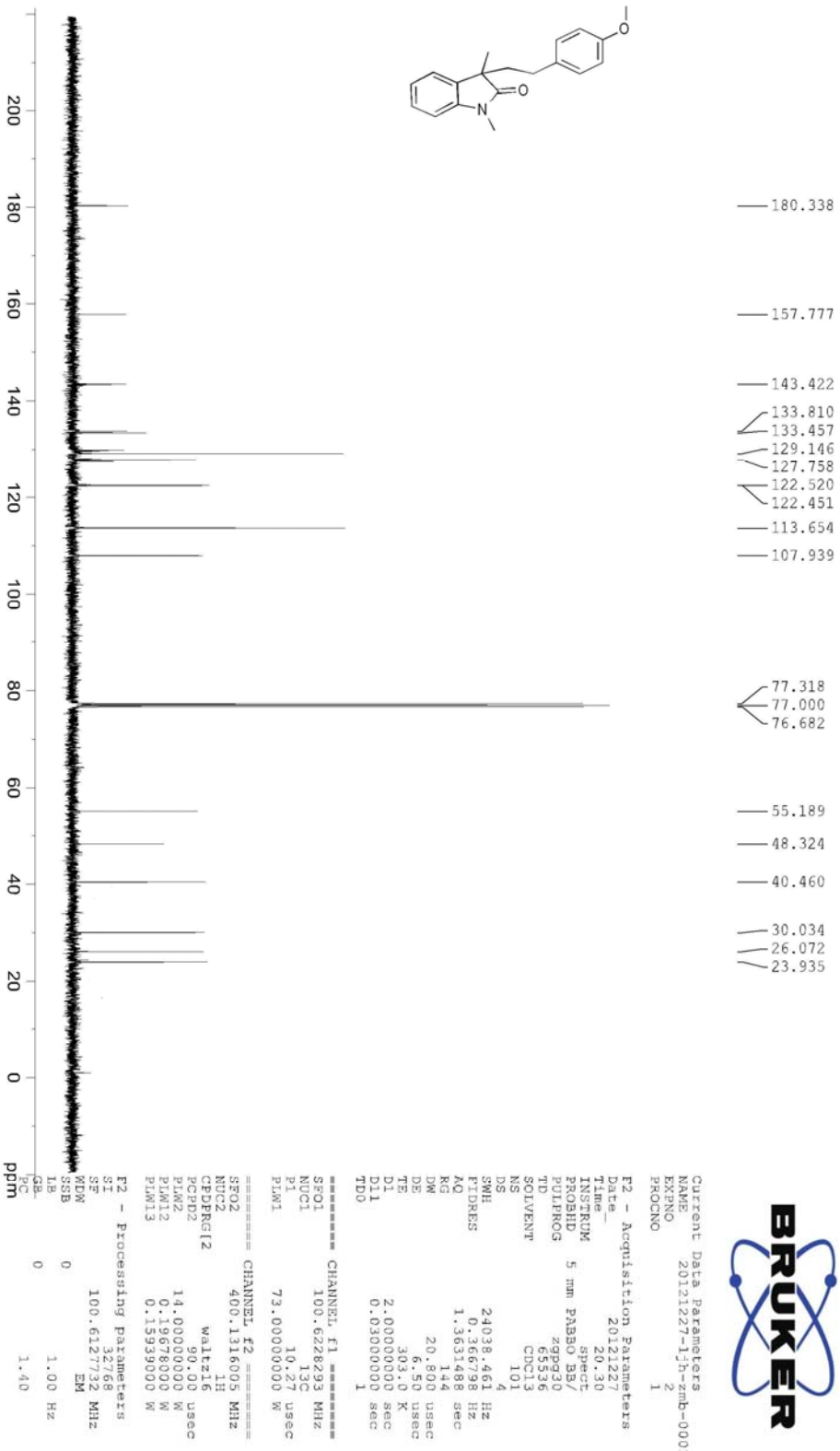
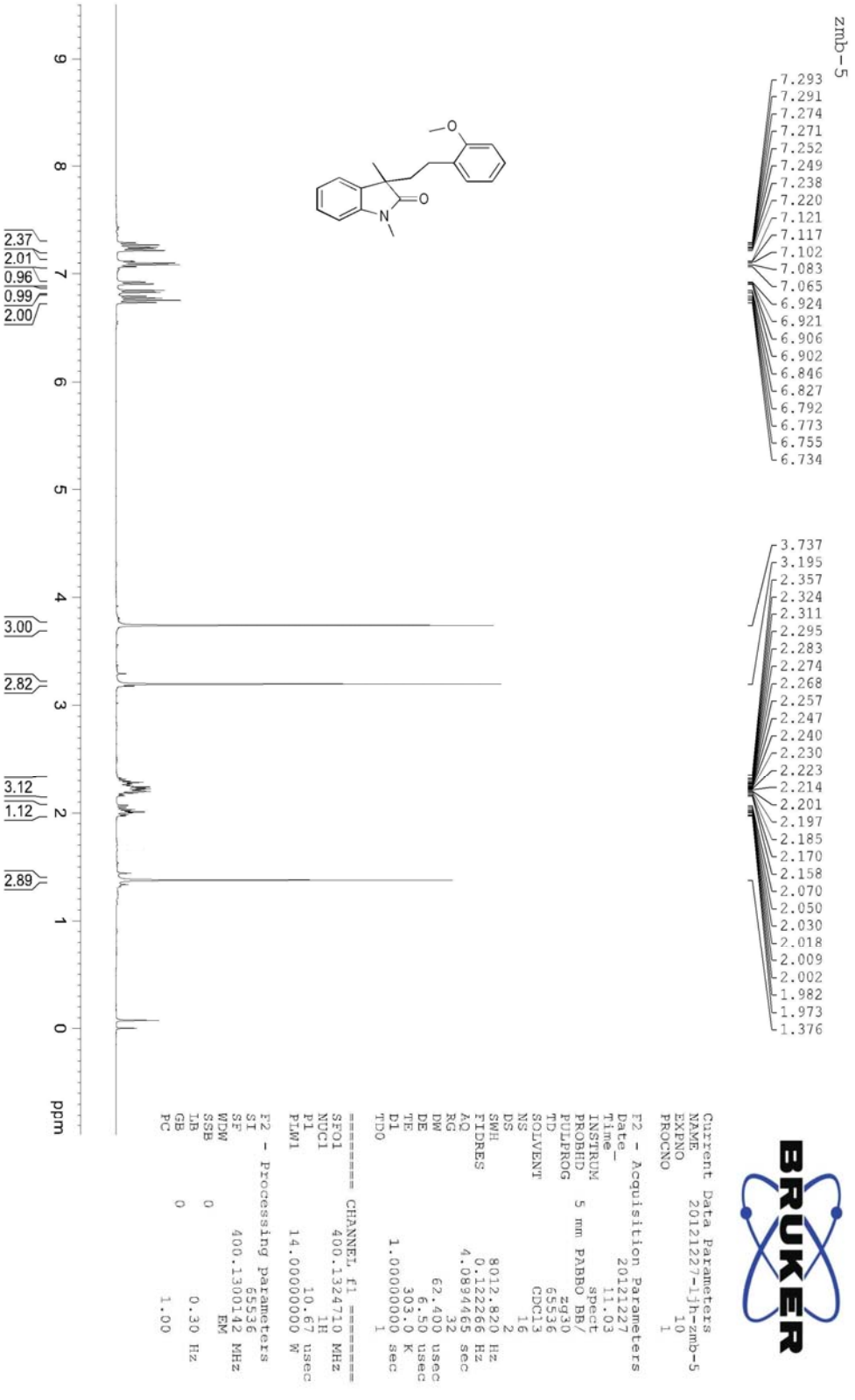
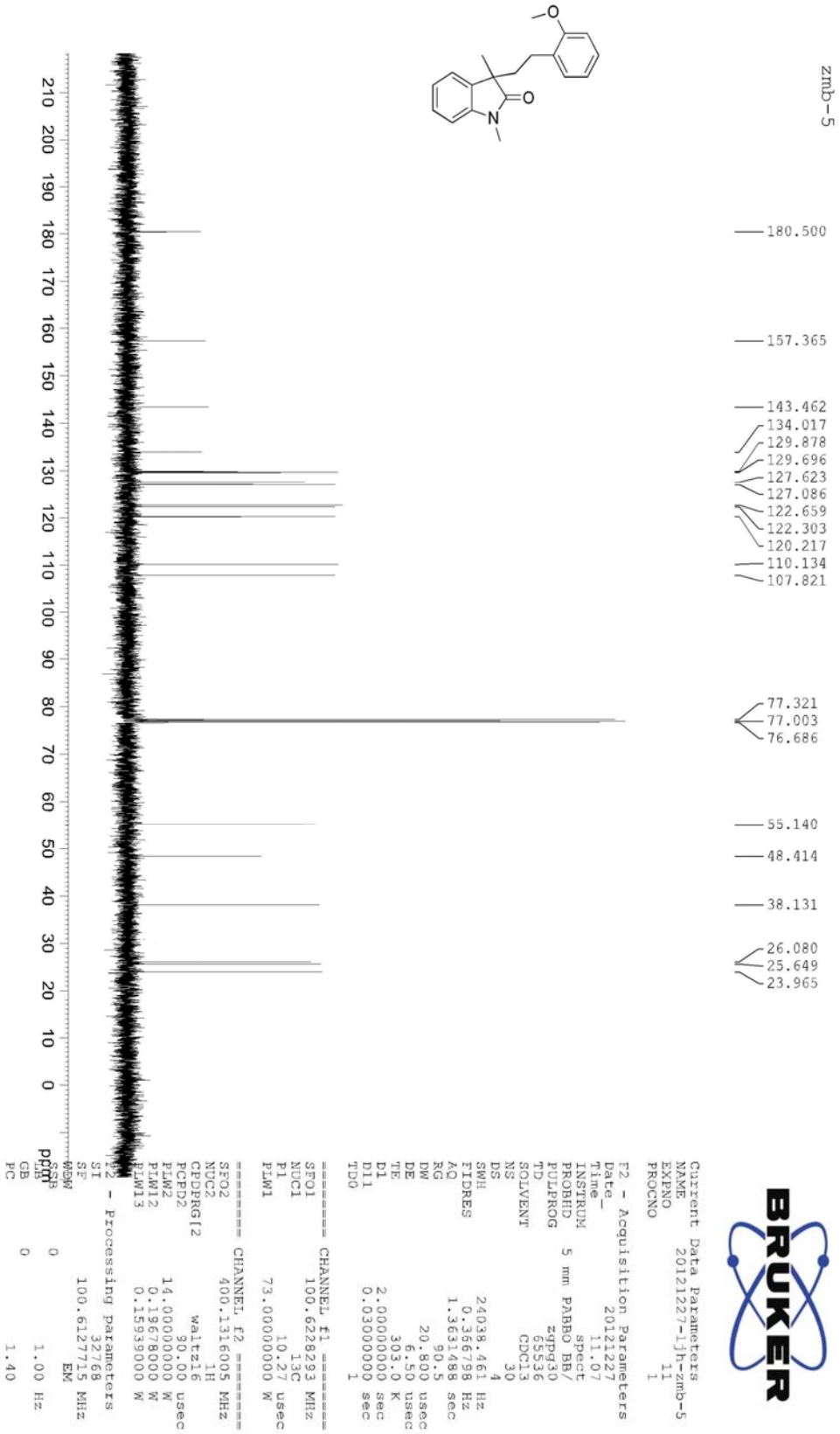


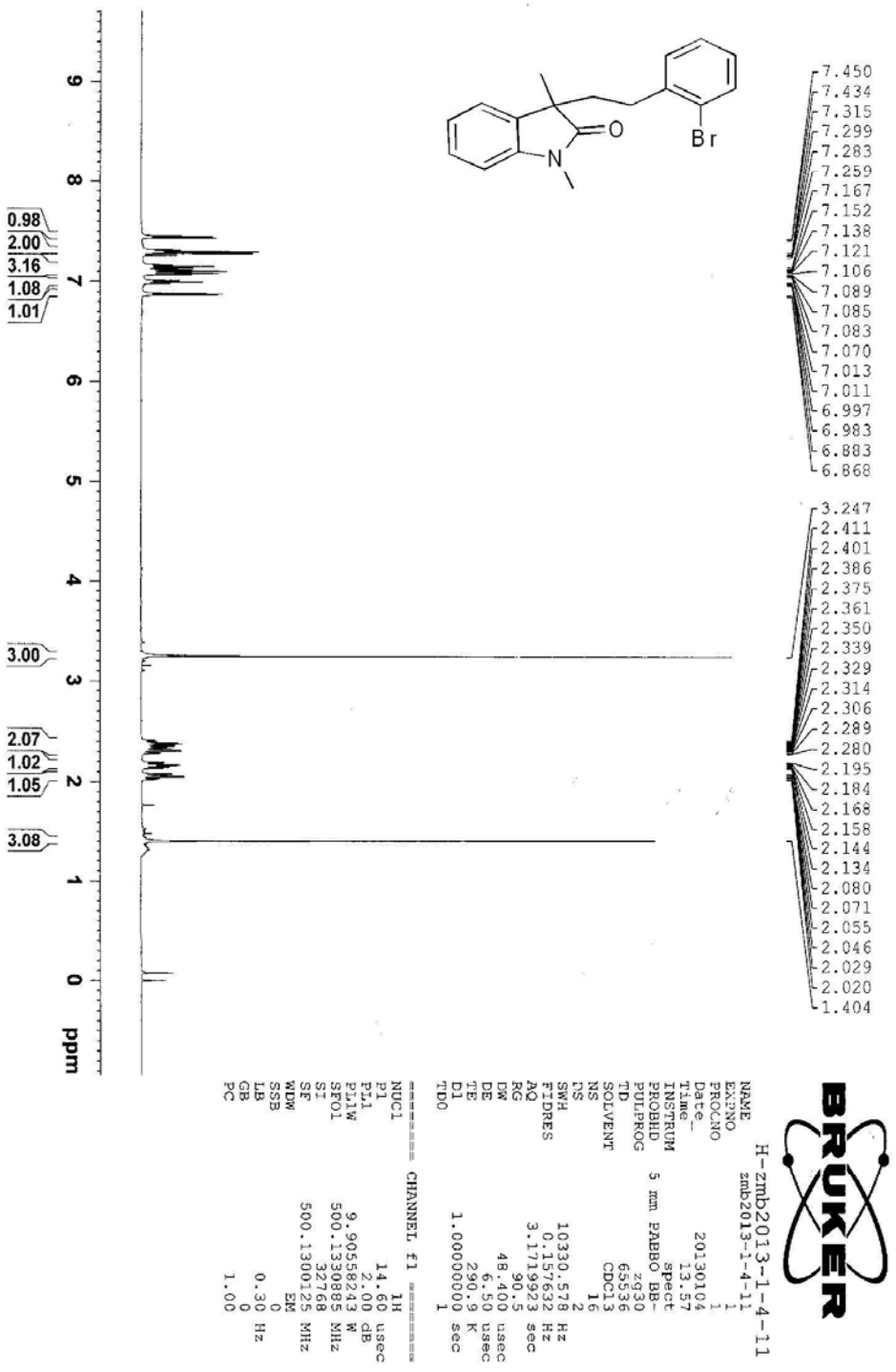
3-(2-Methoxyphenethyl)-1,3-dimethylindolin-2-one (3ad)



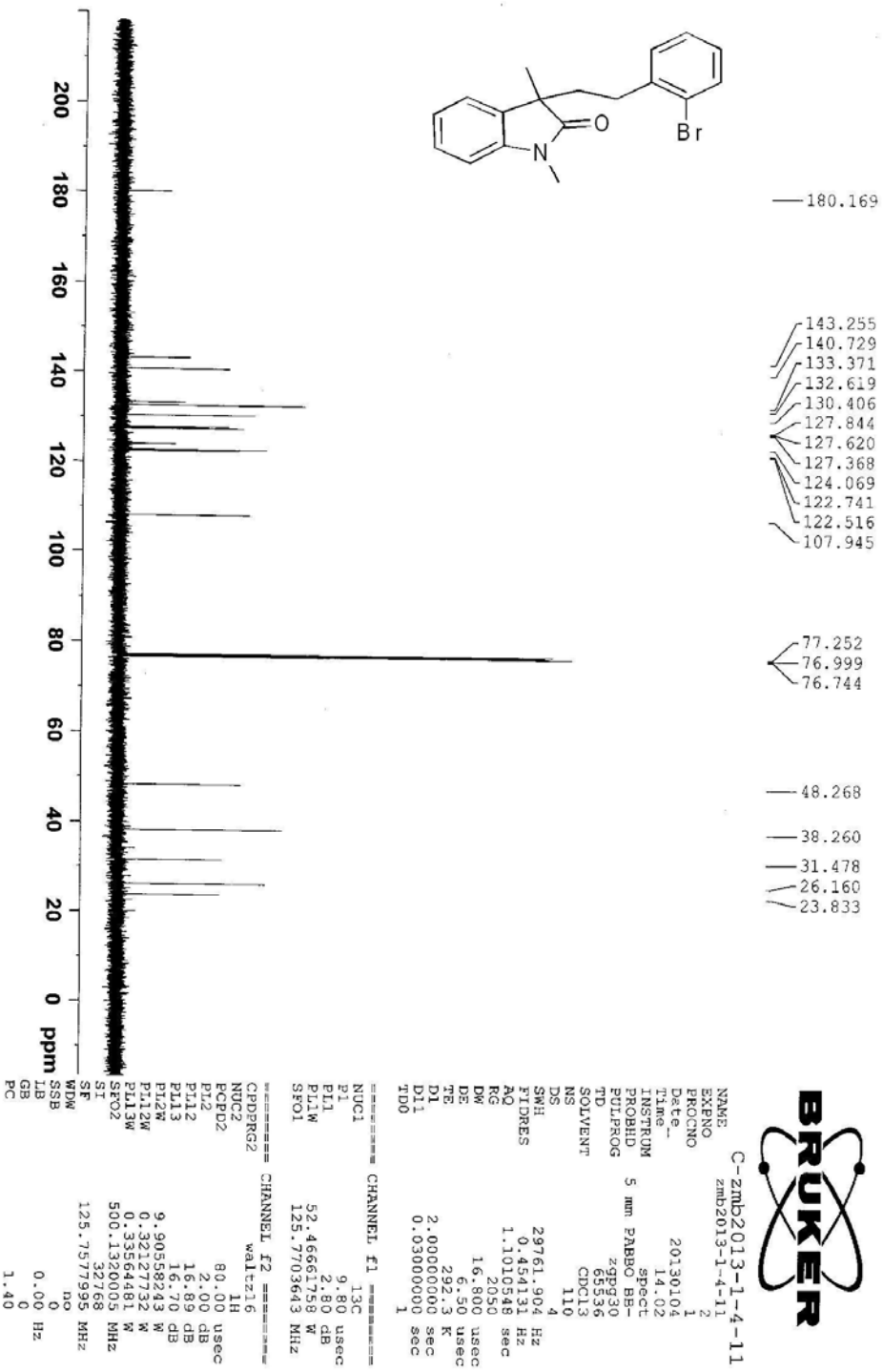
3-(2-Methoxyphenethyl)-1,3-dimethylindolin-2-one (3ad)



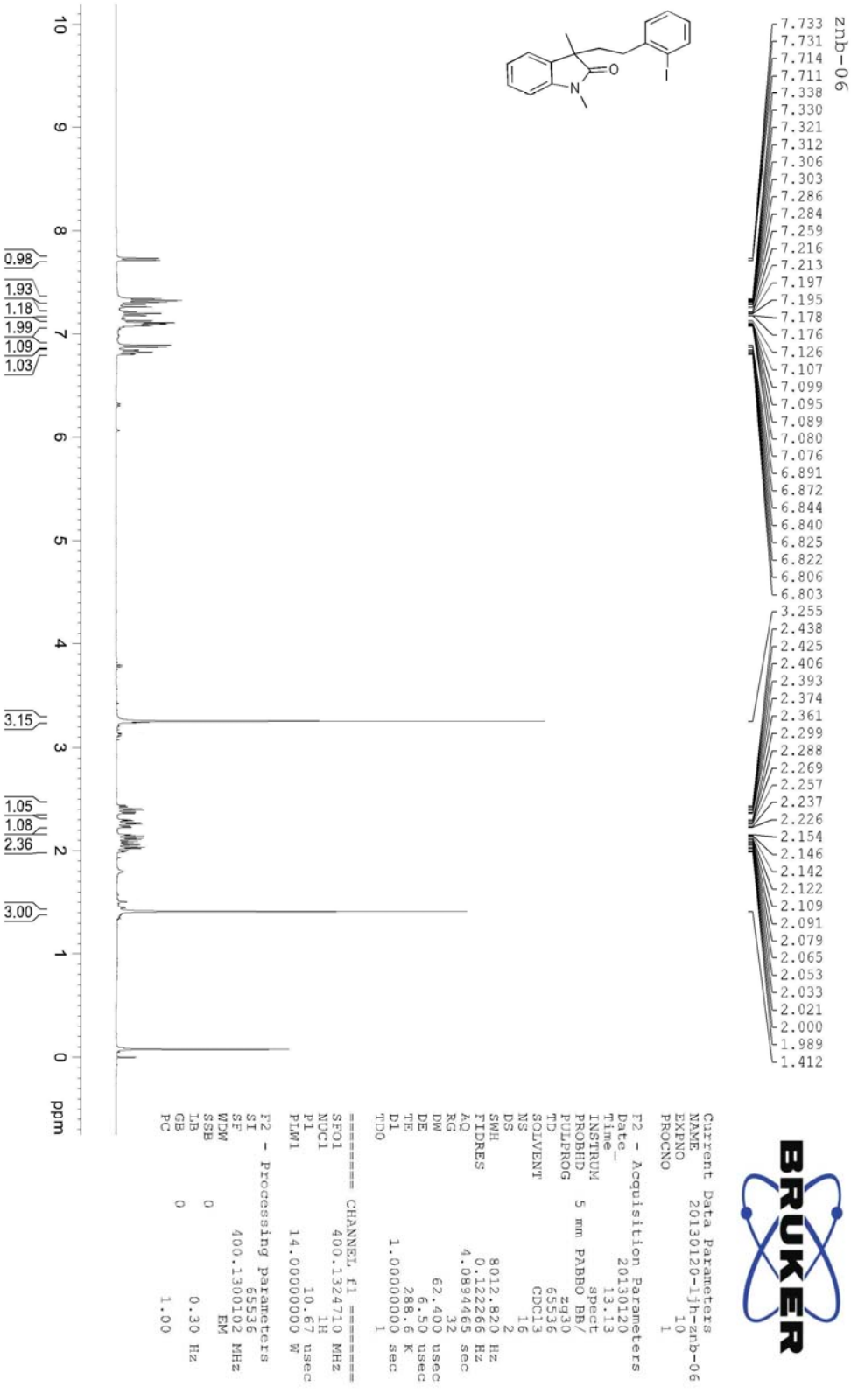
3-(2-Bromophenethyl)-1,3-dimethylindolin-2-one (3ae)



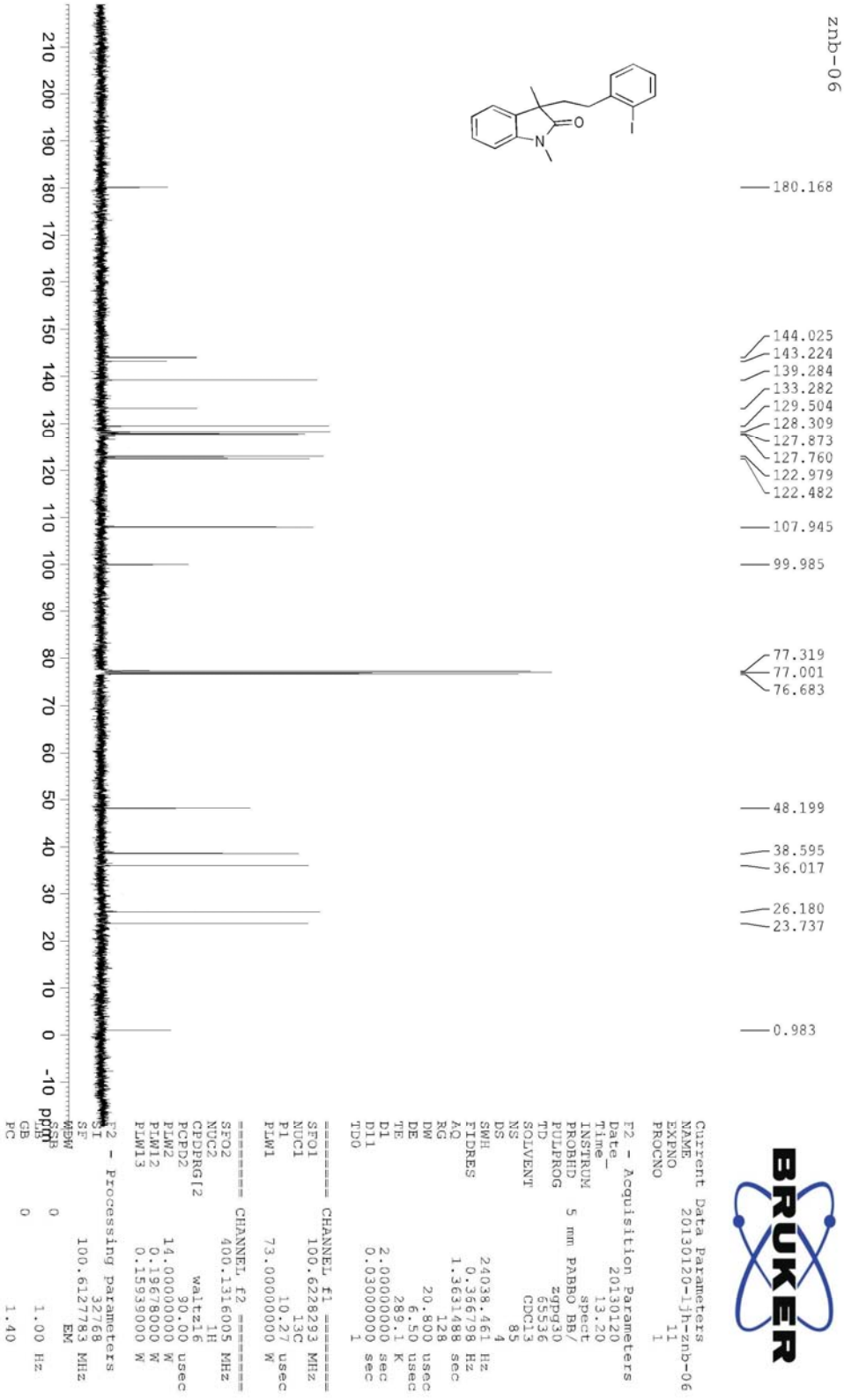
3-(2-Bromophenethyl)-1,3-dimethylindolin-2-one (3ae)



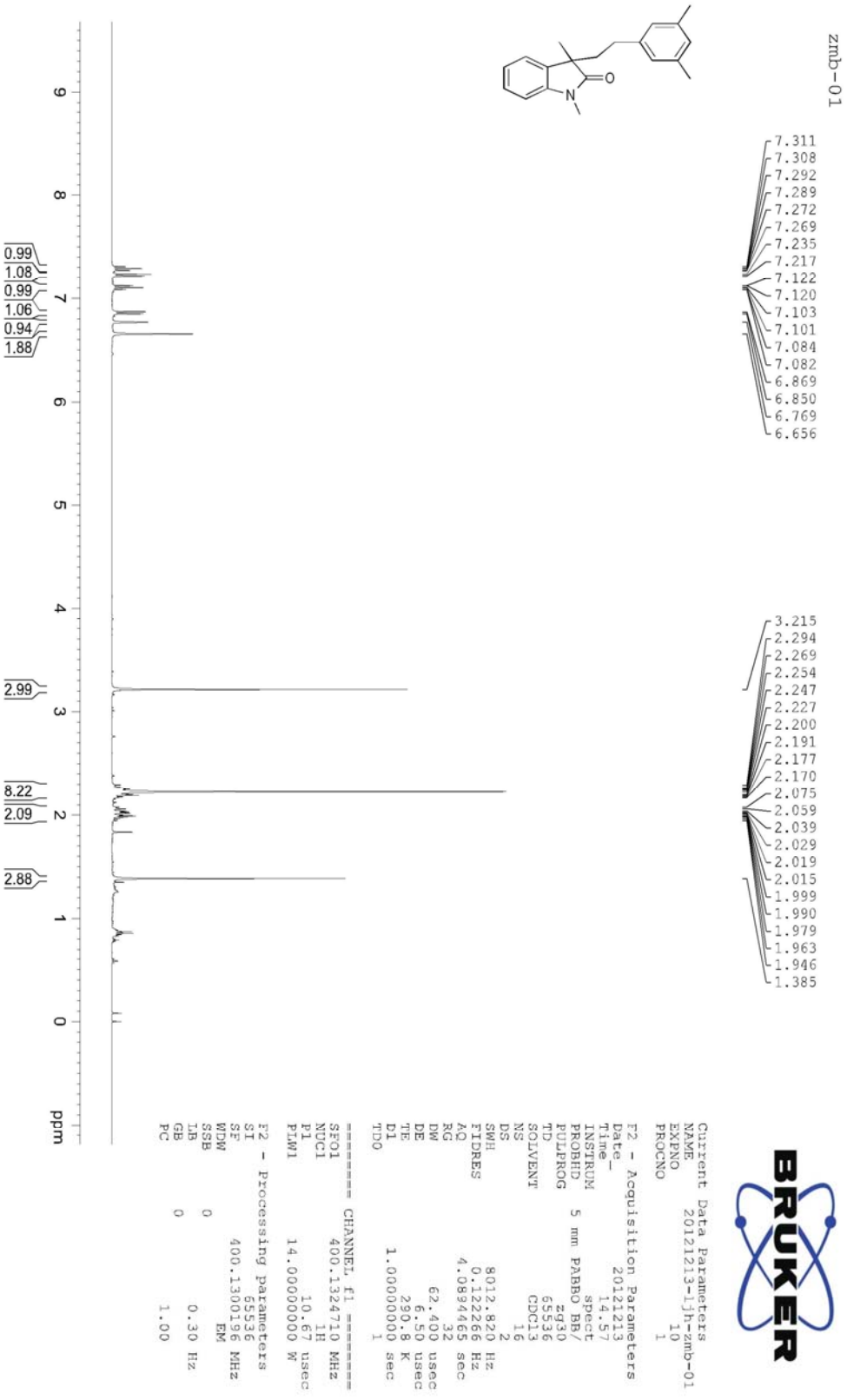
3-(2-Iodophenethyl)-1,3-dimethylindolin-2-one (3af)



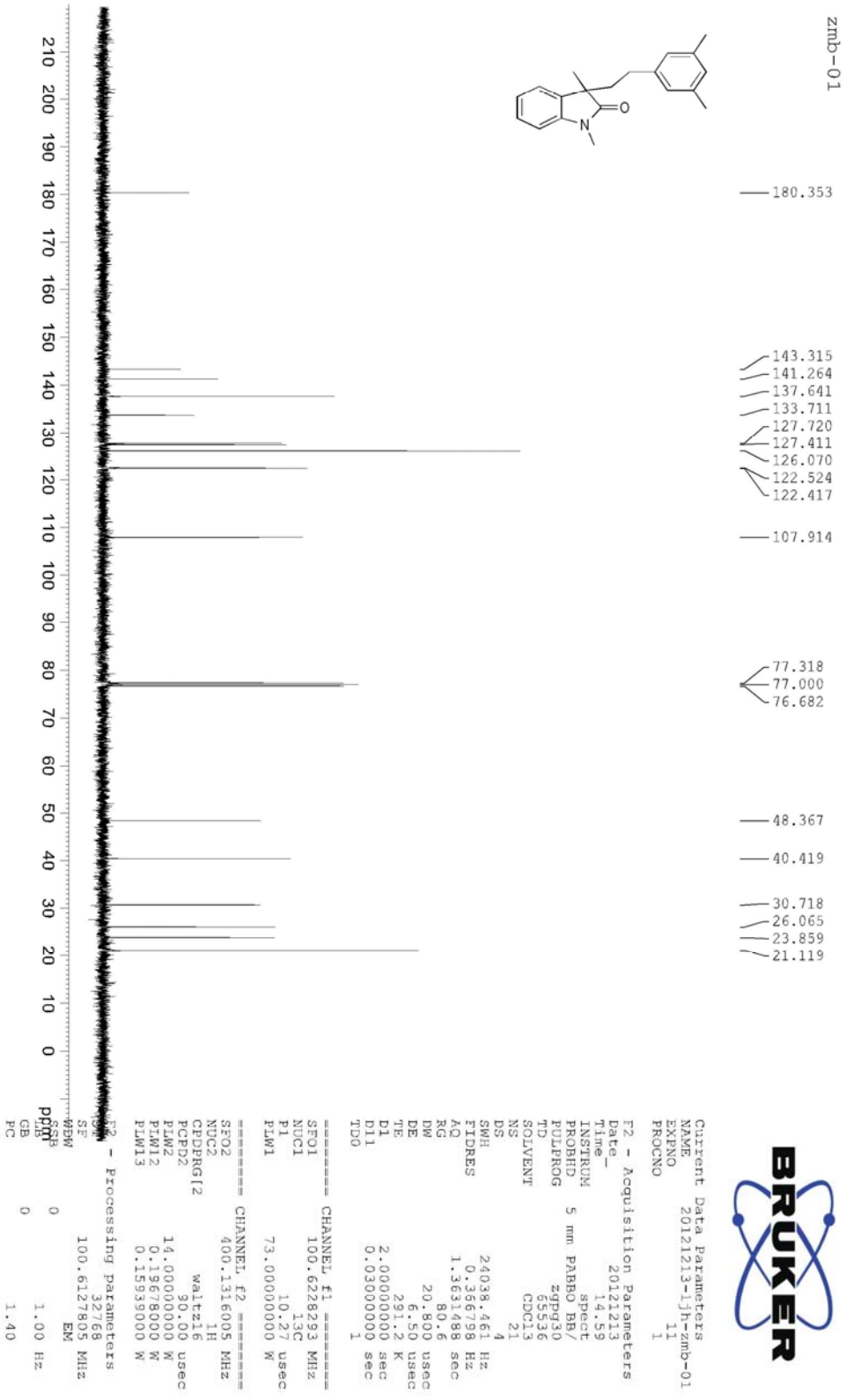
3-(2-Iodophenethyl)-1,3-dimethylindolin-2-one (3af)



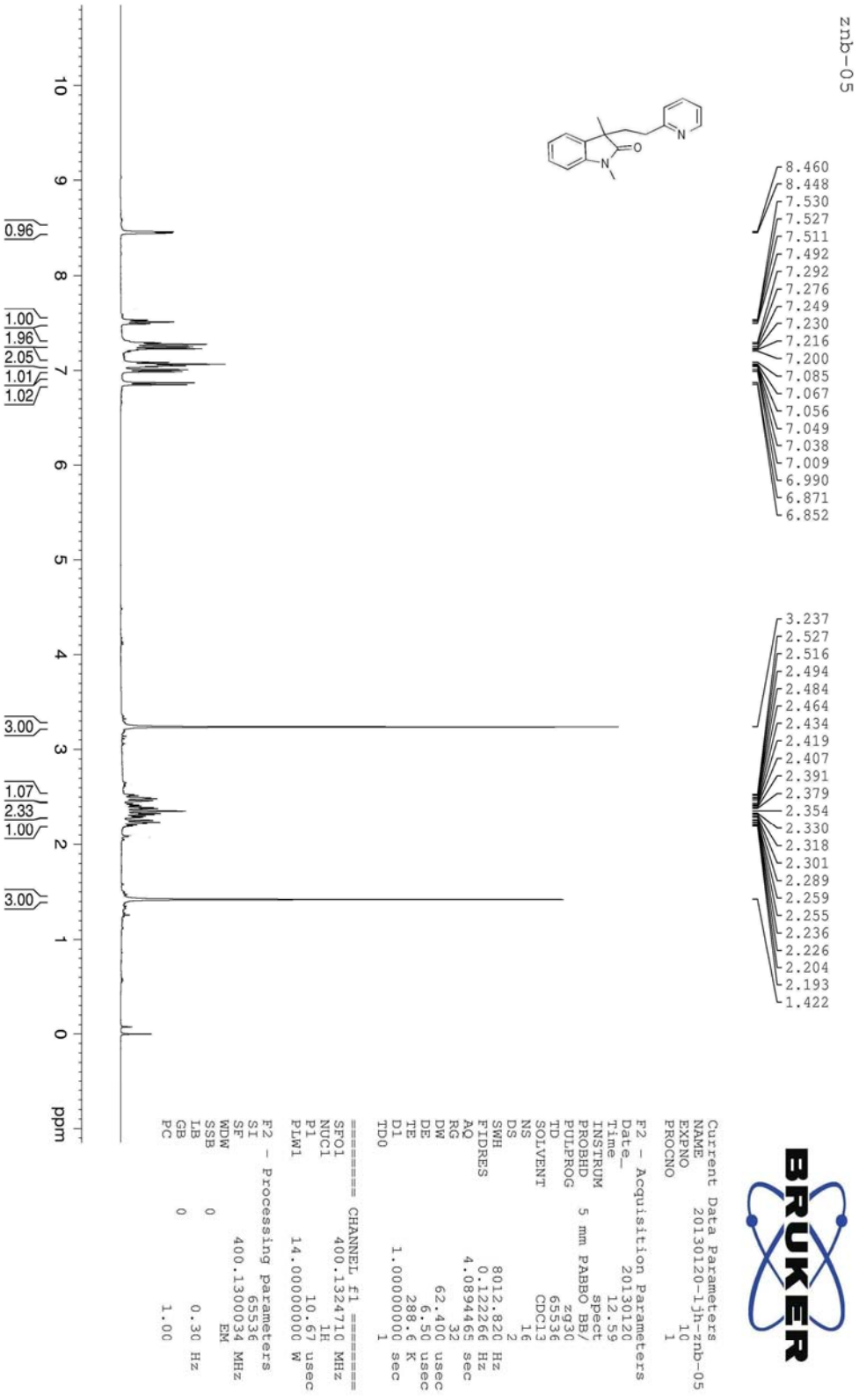
3-(3,5-Dimethylphenethyl)-1,3-dimethylindolin-2-one (3ag)



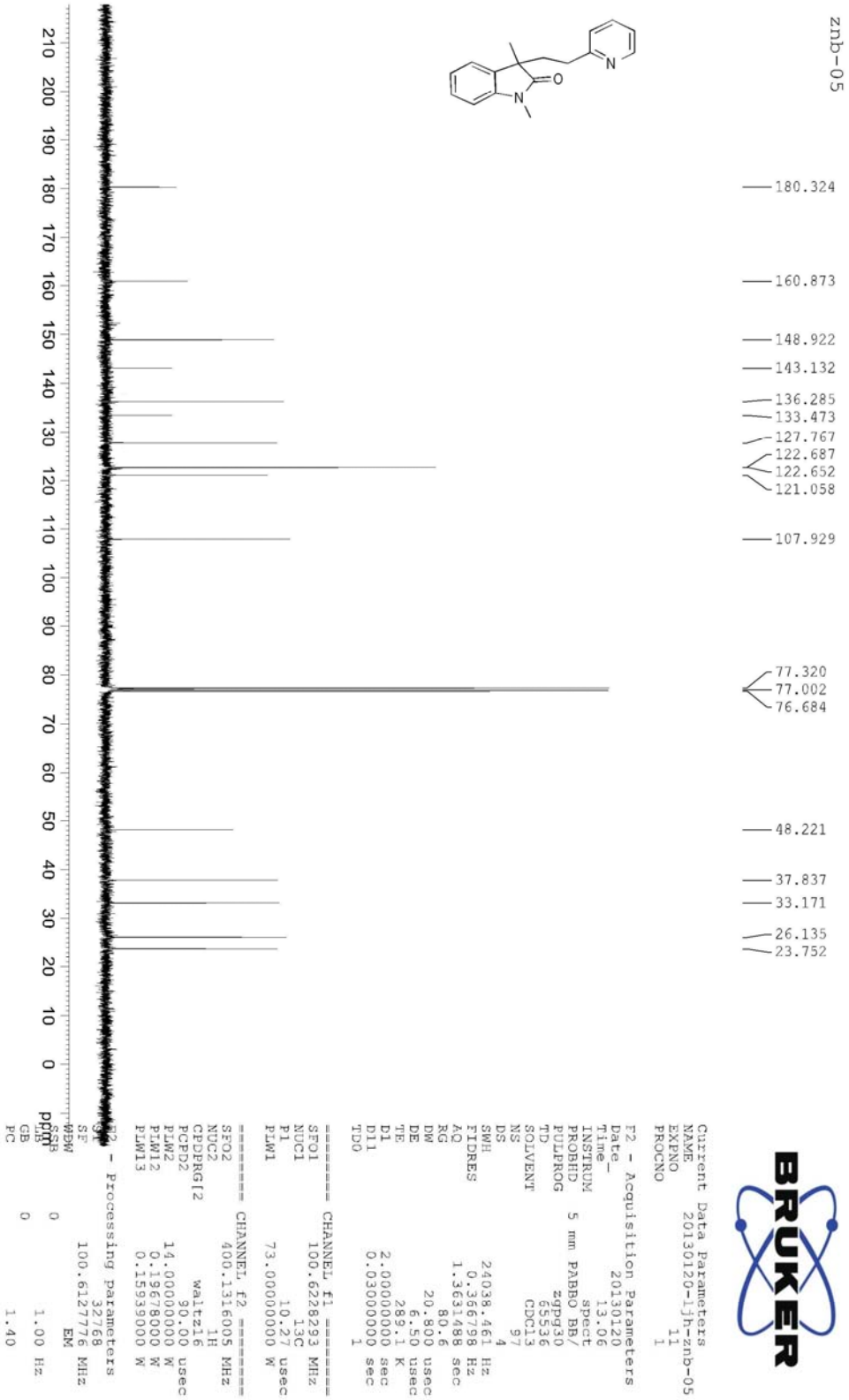
3-(3,5-Dimethylphenethyl)-1,3-dimethylindolin-2-one (3ag)



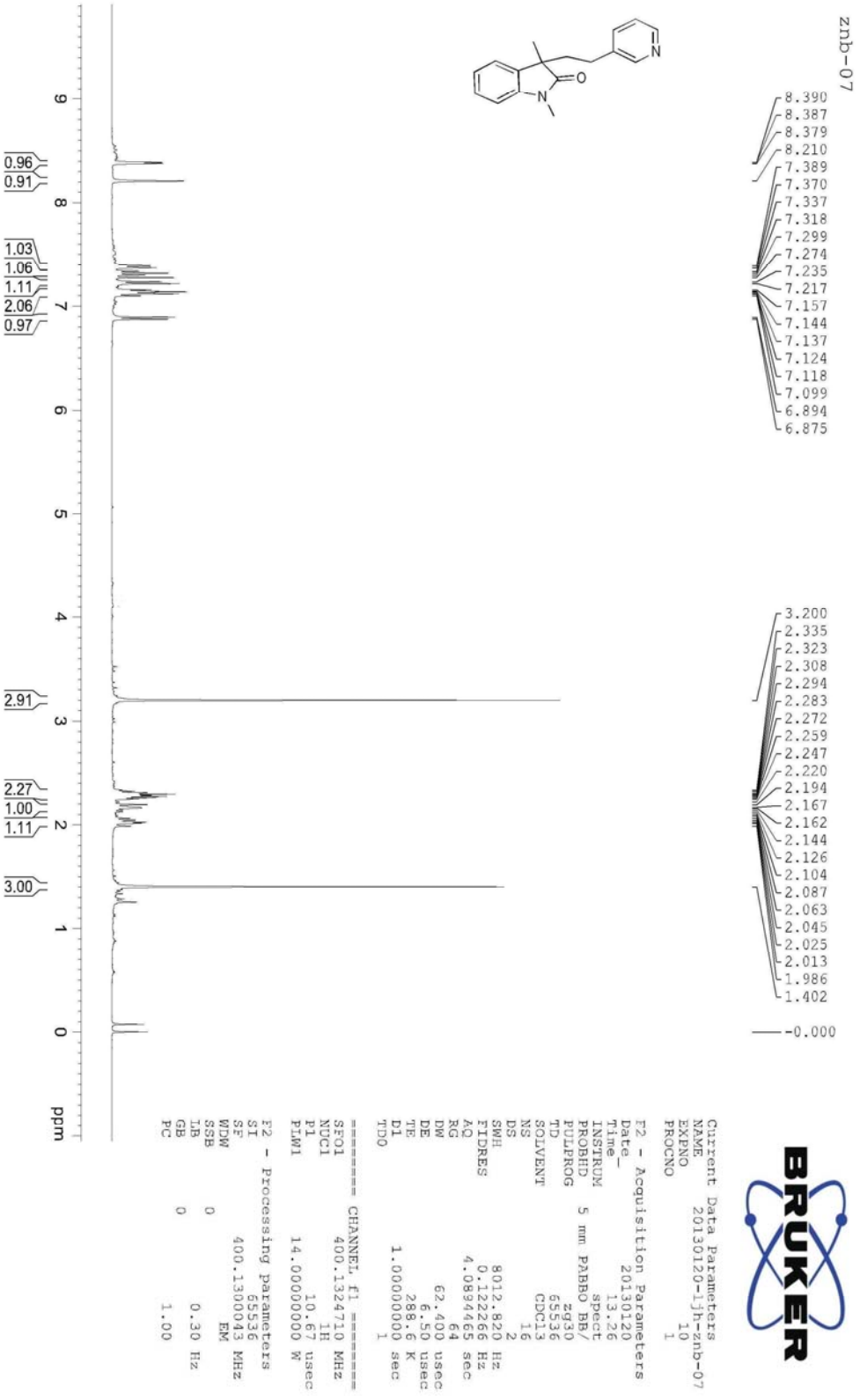
1,3-Dimethyl-3-(2-(pyridin-2-yl)ethyl)indolin-2-one (3ah)



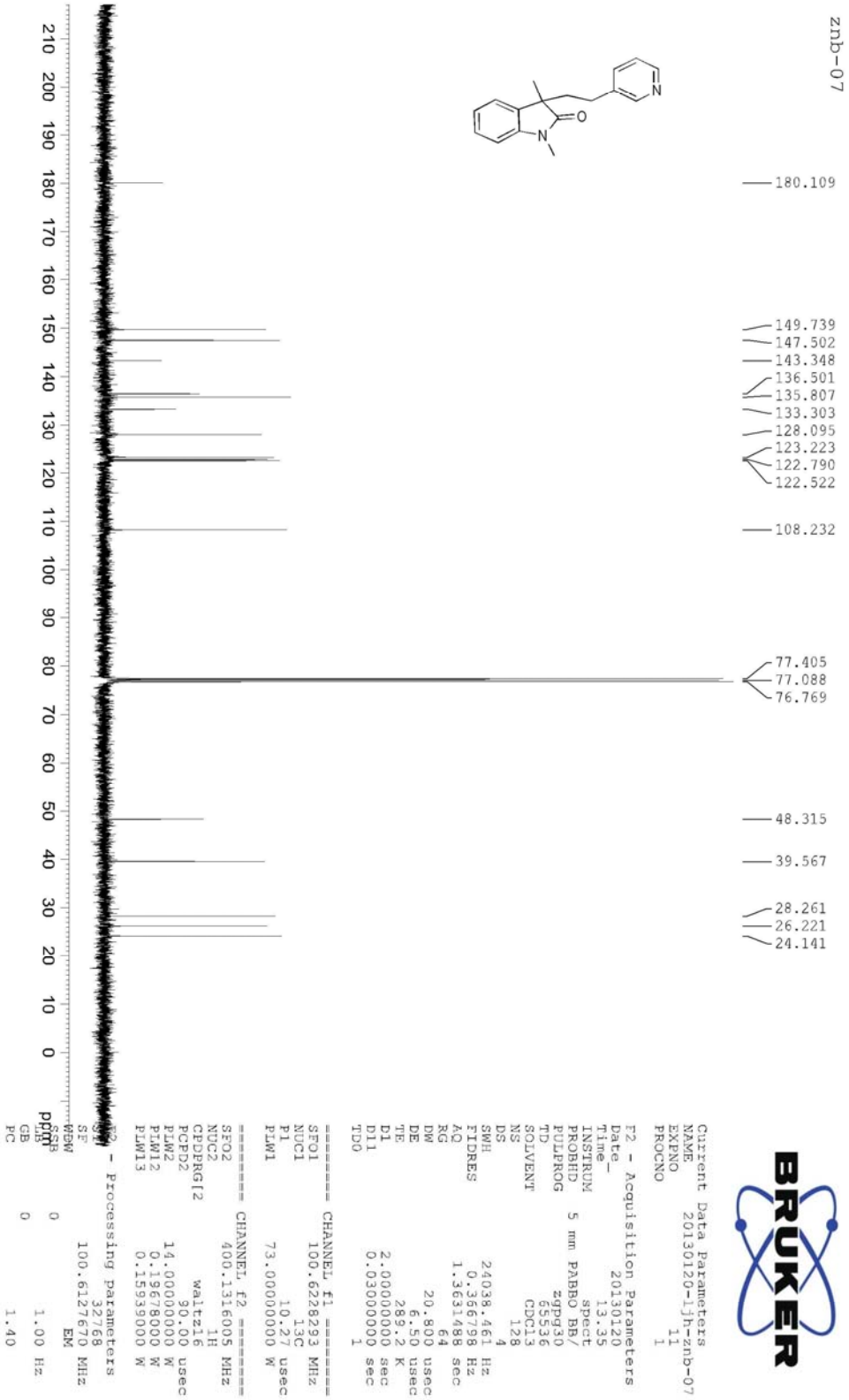
1,3-Dimethyl-3-(2-(pyridin-2-yl)ethyl)indolin-2-one (3ah)



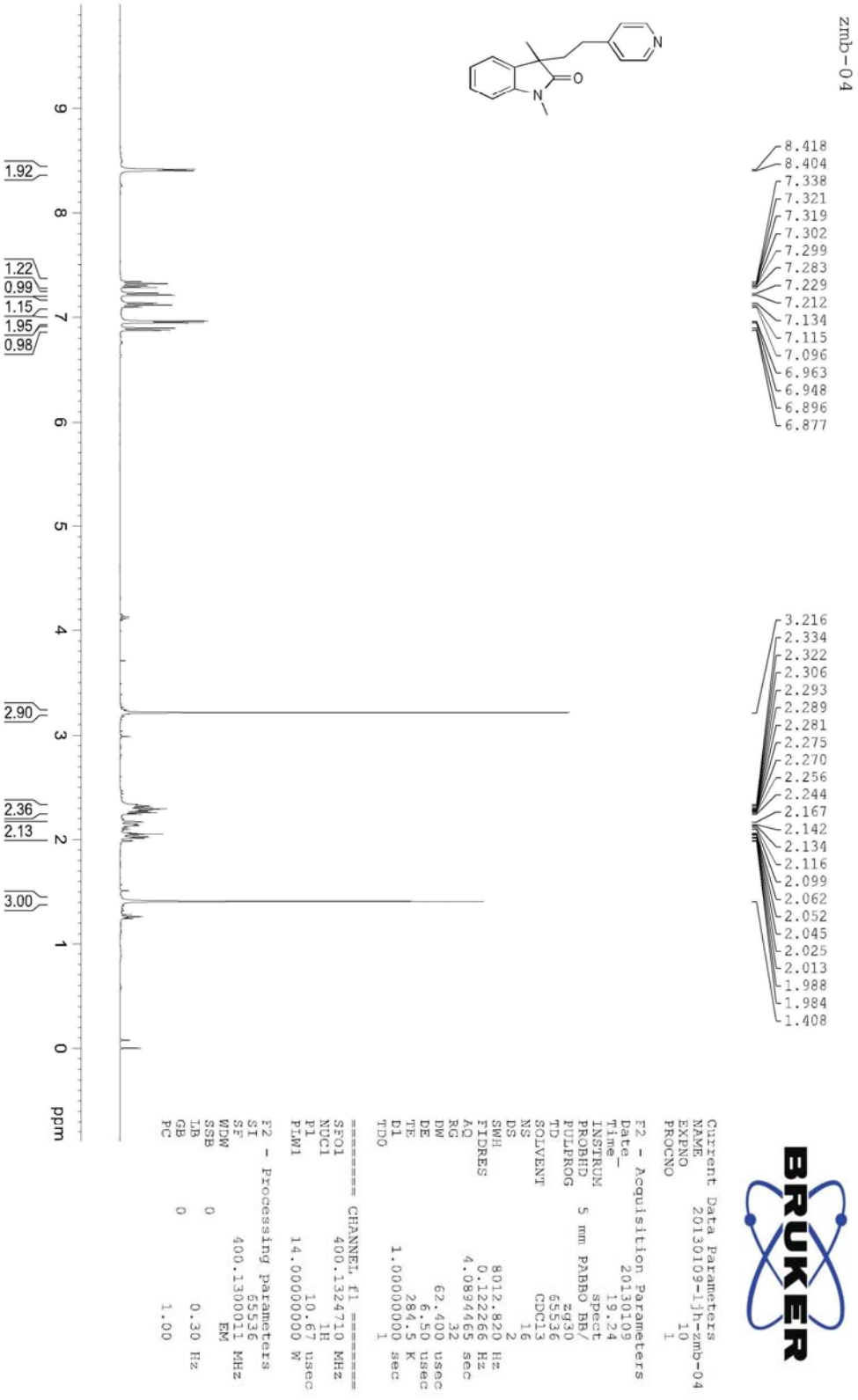
1,3-Dimethyl-3-(2-(pyridin-3-yl)ethyl)indolin-2-one (3ai)



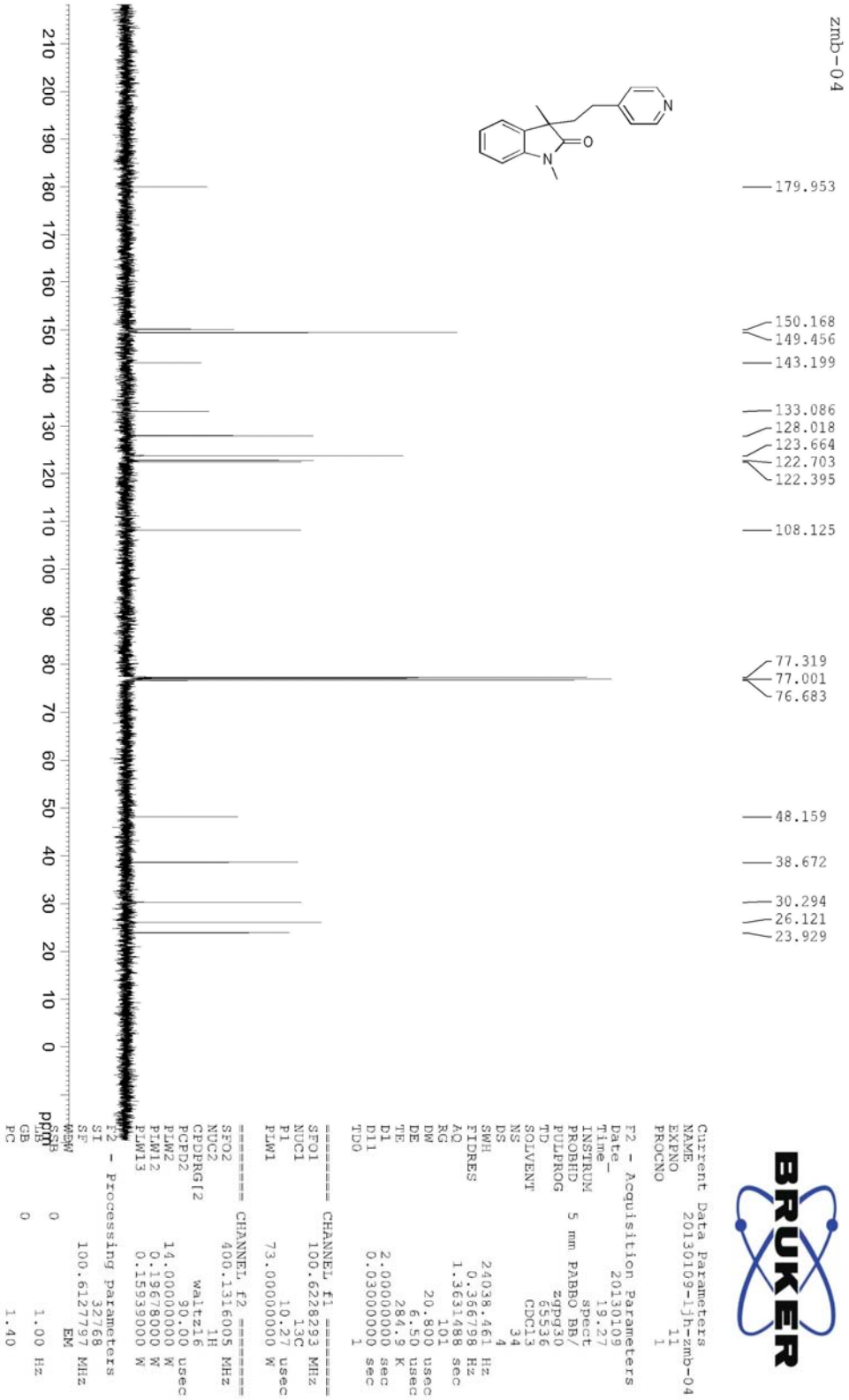
1,3-Dimethyl-3-(2-(pyridin-3-yl)ethyl)indolin-2-one (3ai)



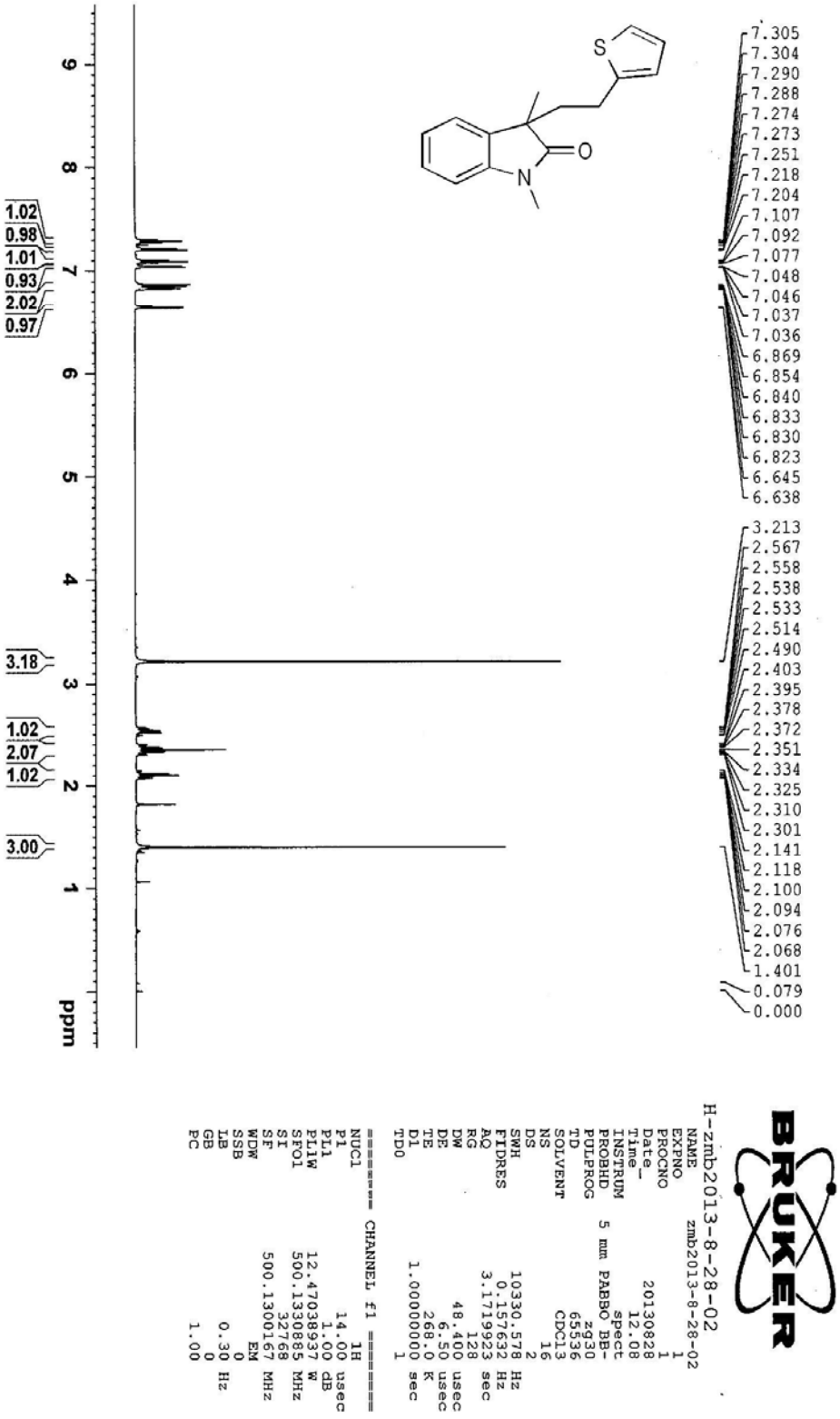
1,3-Dimethyl-3-(2-(pyridin-4-yl)ethyl)indolin-2-one (3aj)



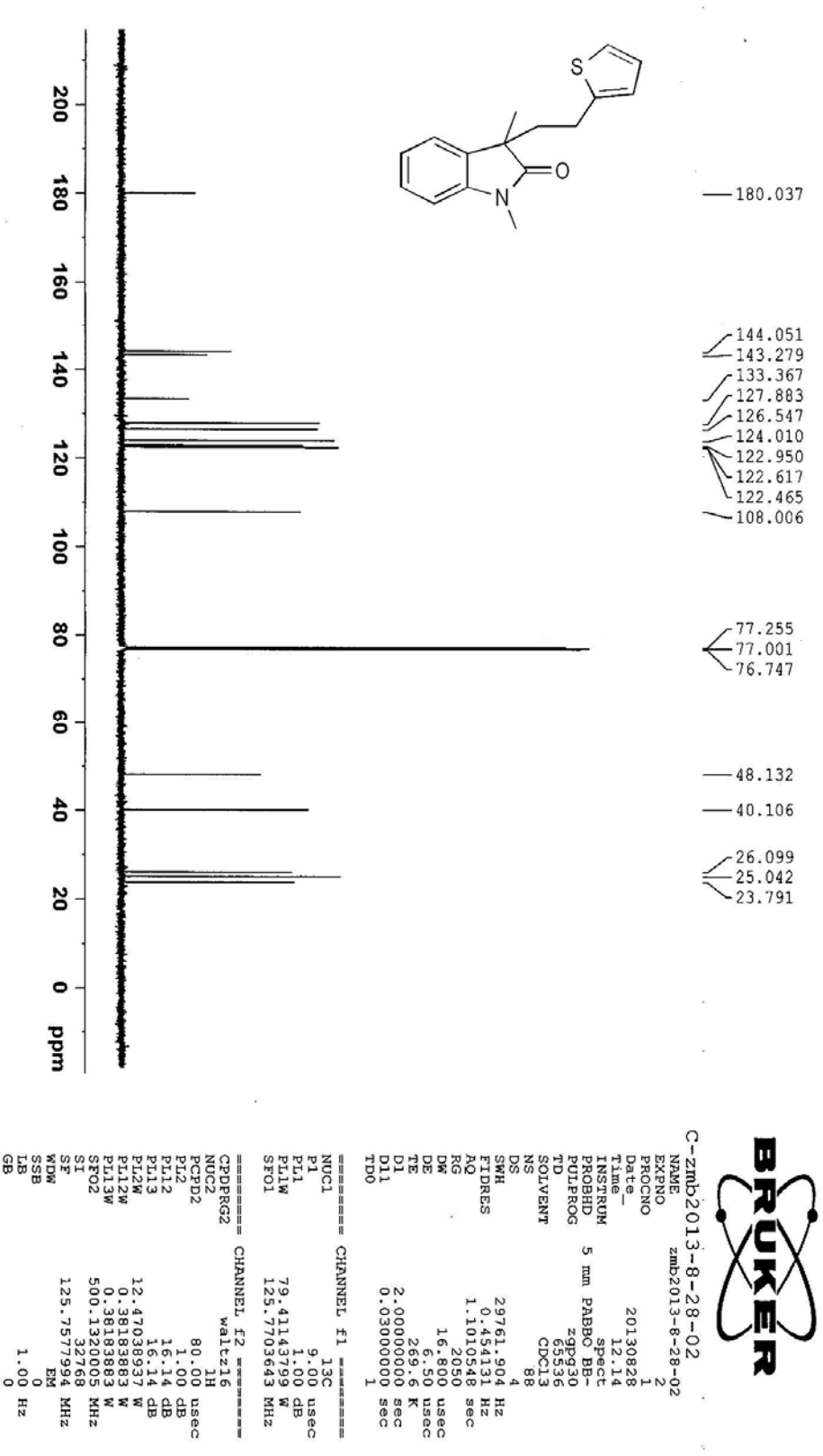
1,3-Dimethyl-3-(2-(pyridin-4-yl)ethyl)indolin-2-one (3aj)



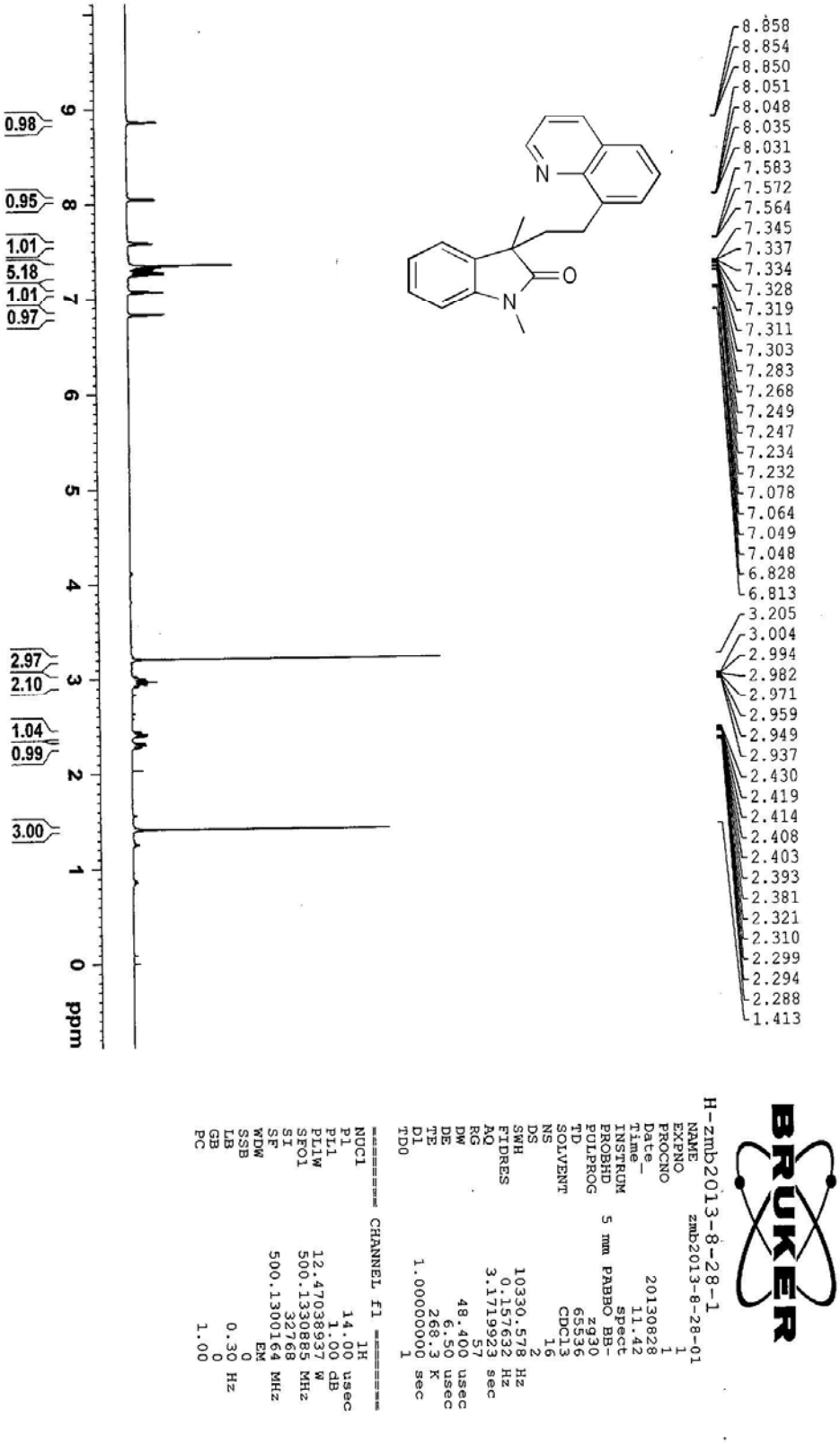
1,3-Dimethyl-3-(2-(thiophen-2-yl)ethyl)indolin-2-one (3ak):



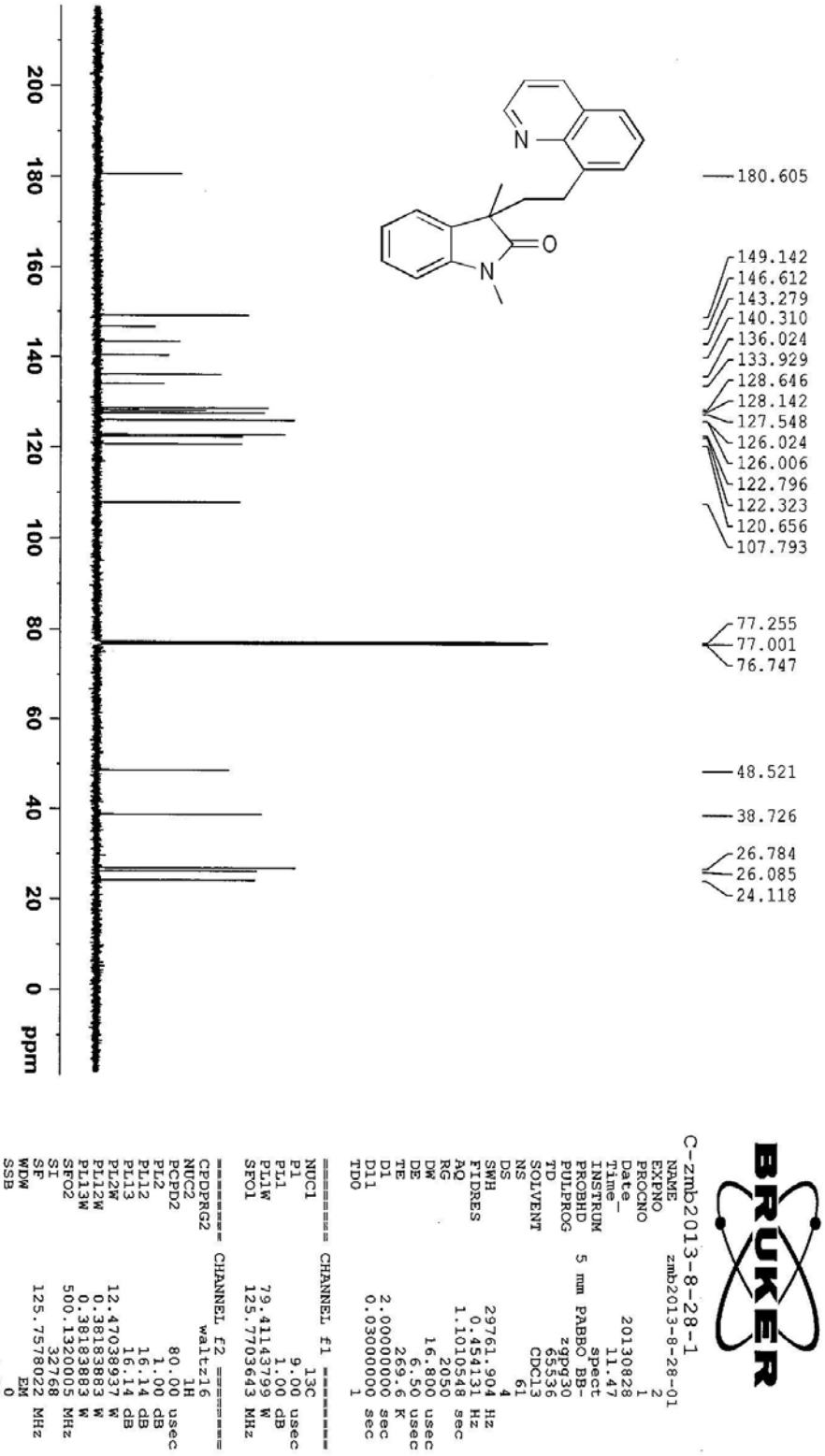
1,3-Dimethyl-3-(2-(thiophen-2-yl)ethyl)indolin-2-one (3ak):



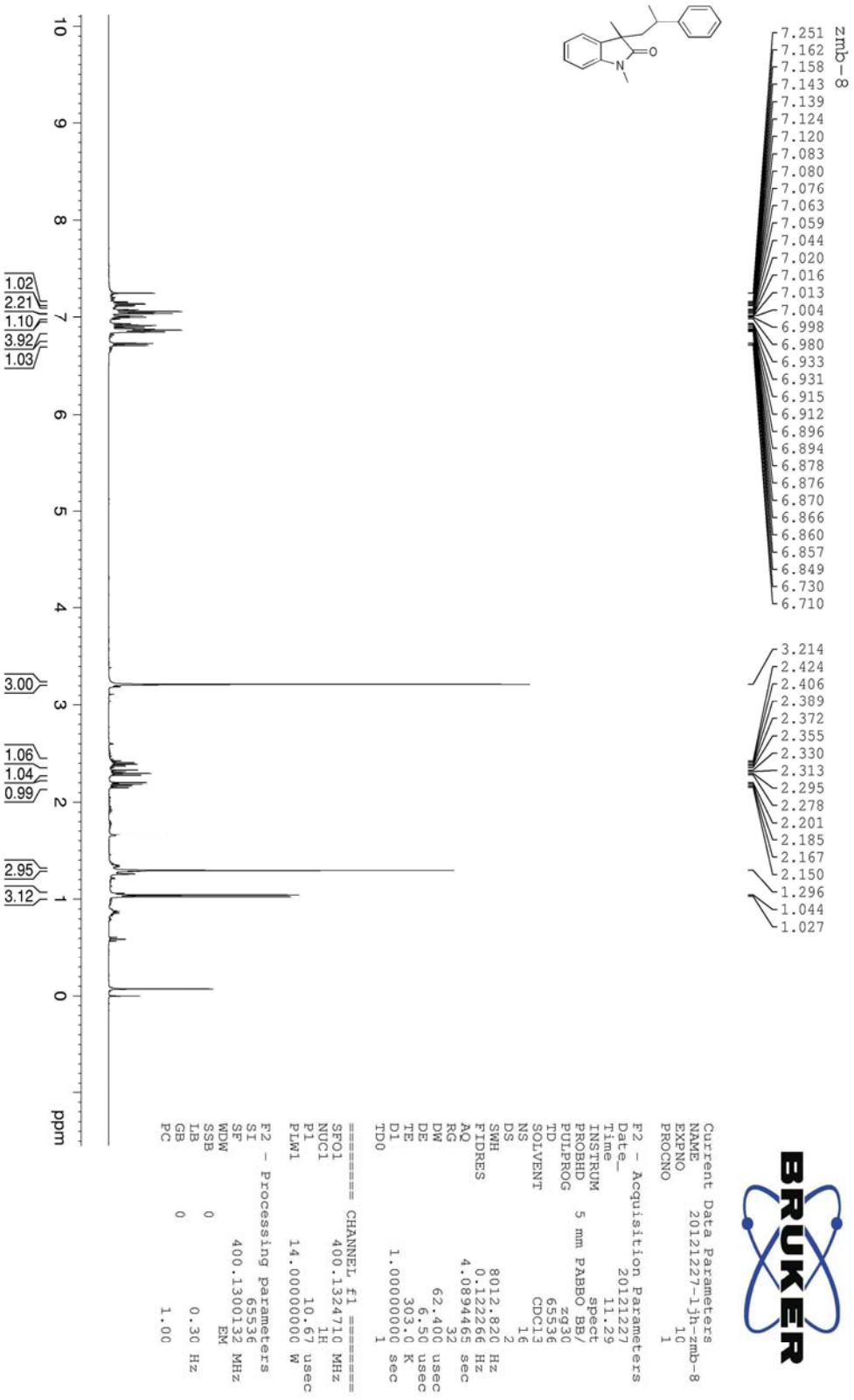
1,3-Dimethyl-3-(2-(quinolin-8-yl)ethyl)indolin-2-one (3al):



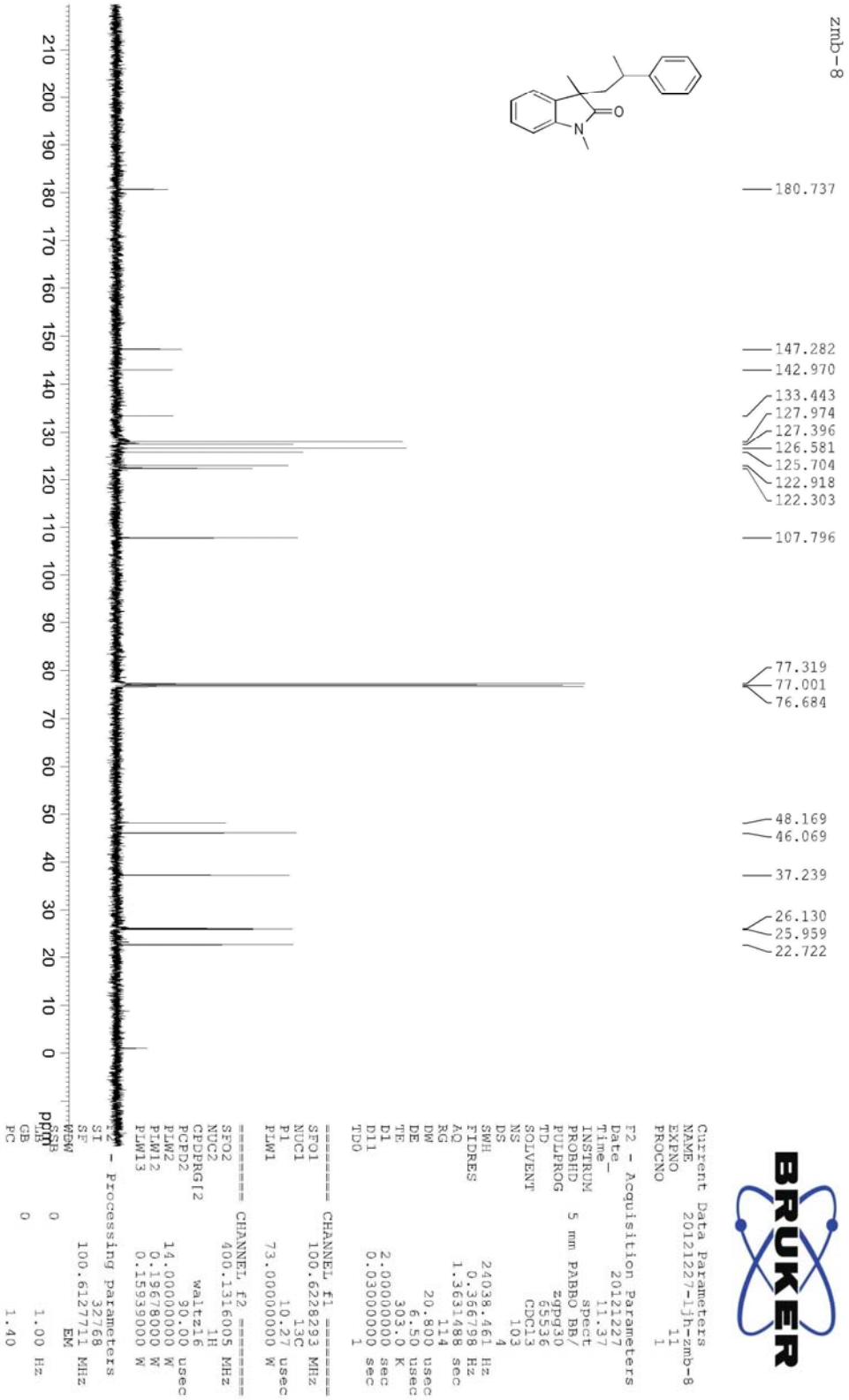
1,3-Dimethyl-3-(2-(quinolin-8-yl)ethyl)indolin-2-one (3al):



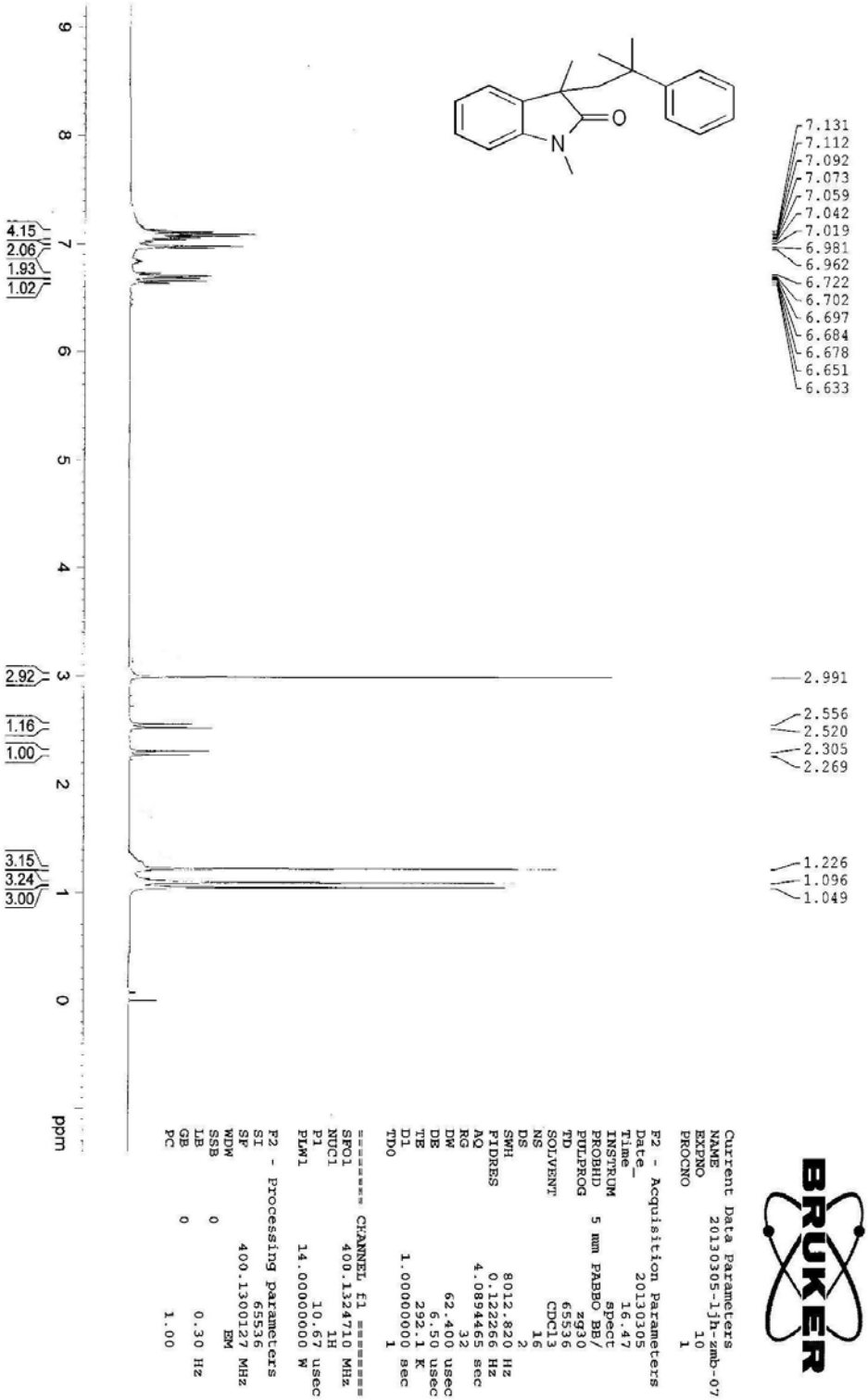
1,3-Dimethyl-3-(2-phenylpropyl)indolin-2-one (3am)



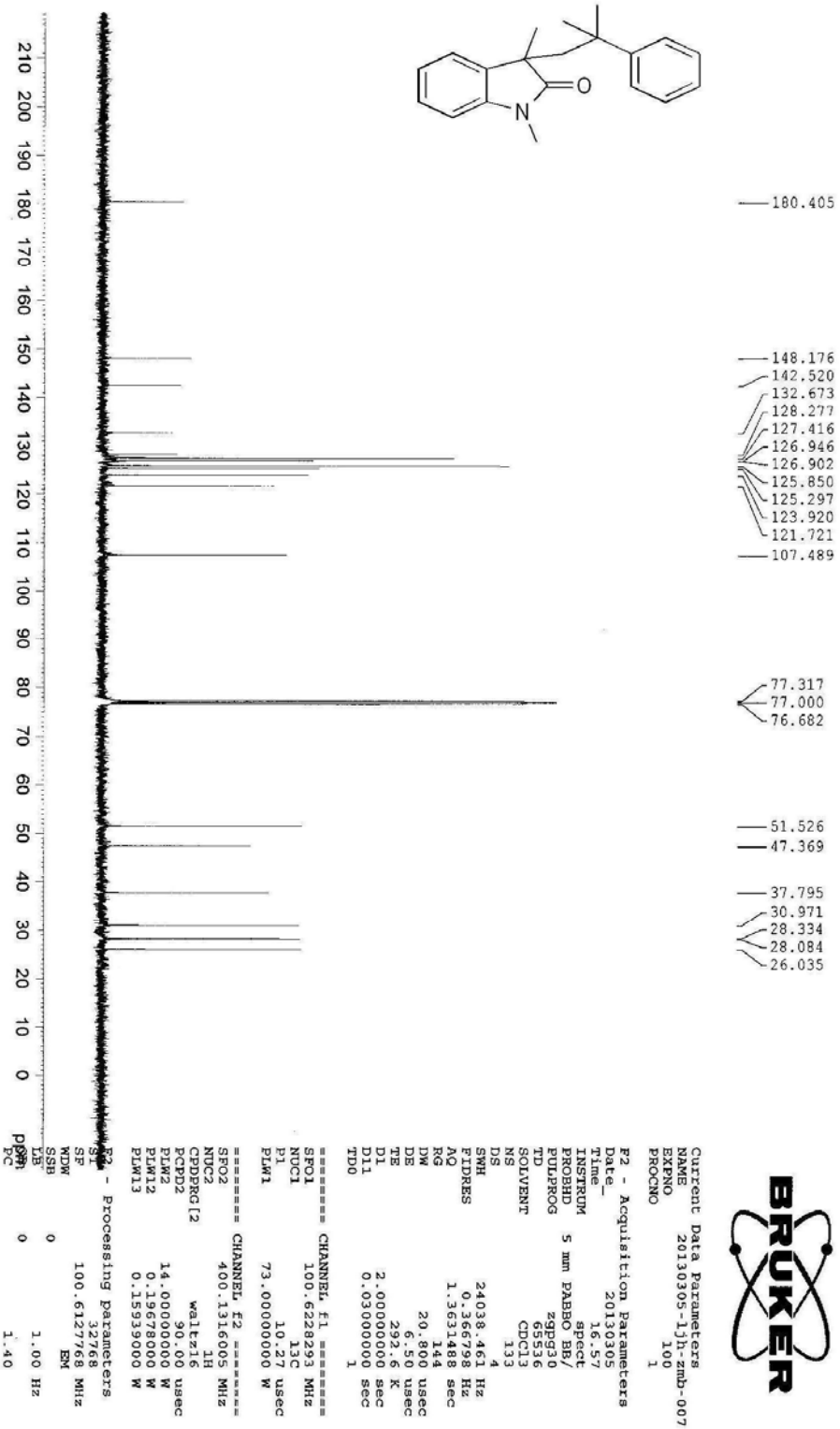
1,3-Dimethyl-3-(2-phenylpropyl)indolin-2-one (3am)



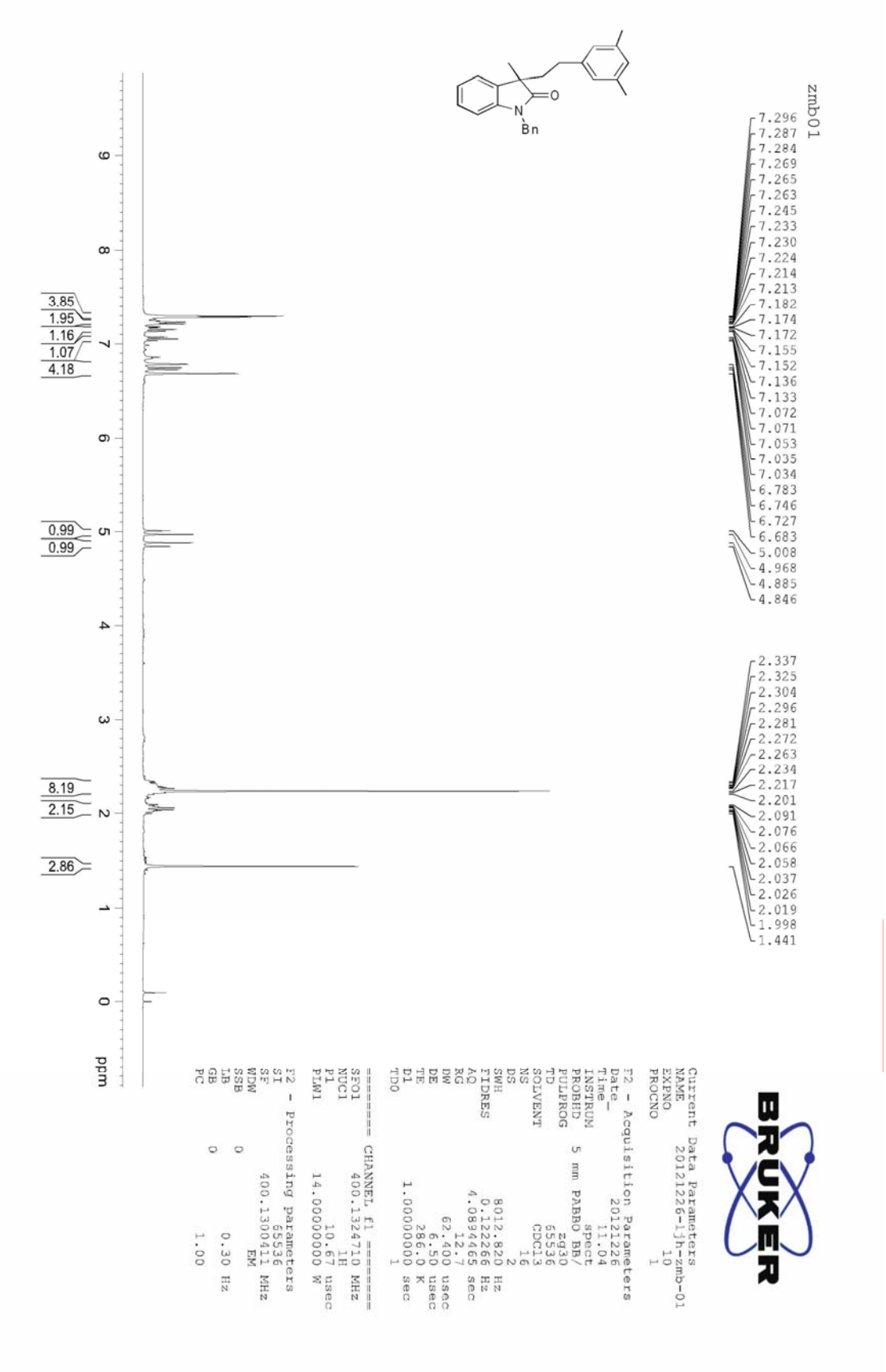
1,3-Dimethyl-3-(2-methyl-2-phenylpropyl)indolin-2-one (3an)



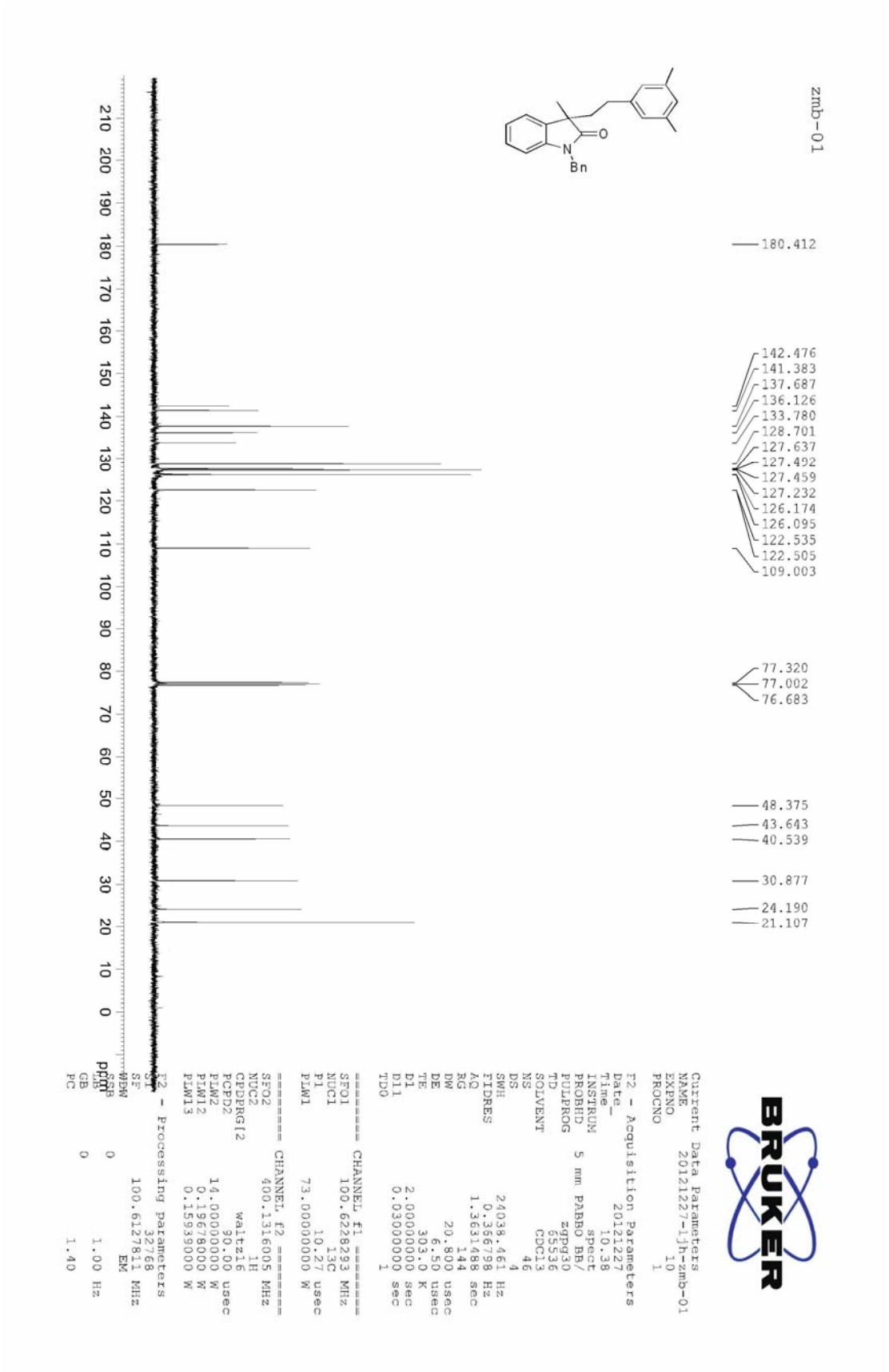
1,3-Dimethyl-3-(2-methyl-2-phenylpropyl)indolin-2-one (3an)



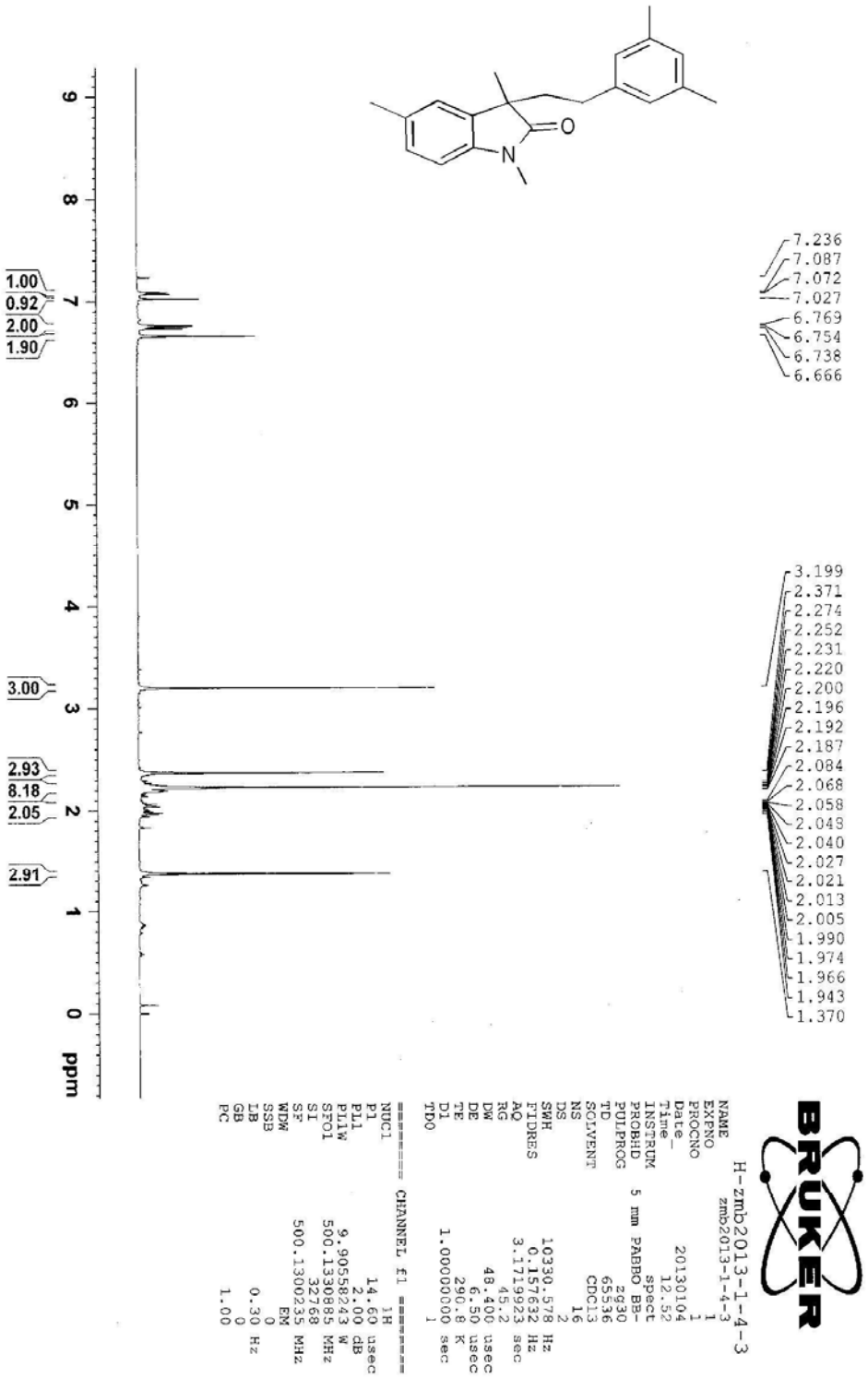
1-Benzyl-3-(3,5-dimethylphenethyl)-3-methylindolin-2-one (3bg)



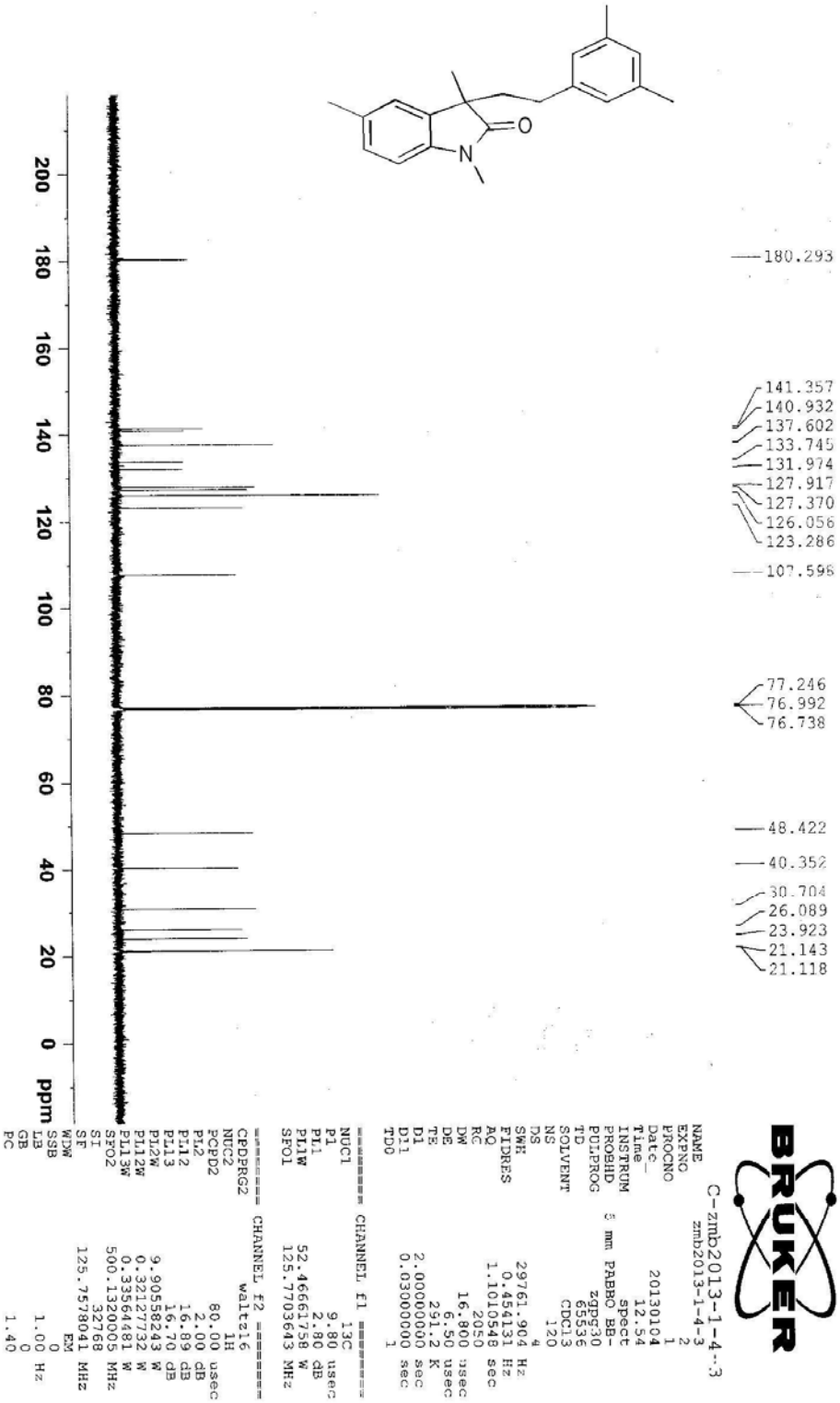
1-Benzyl-3-(3,5-dimethylphenethyl)-3-methylindolin-2-one (3bg)



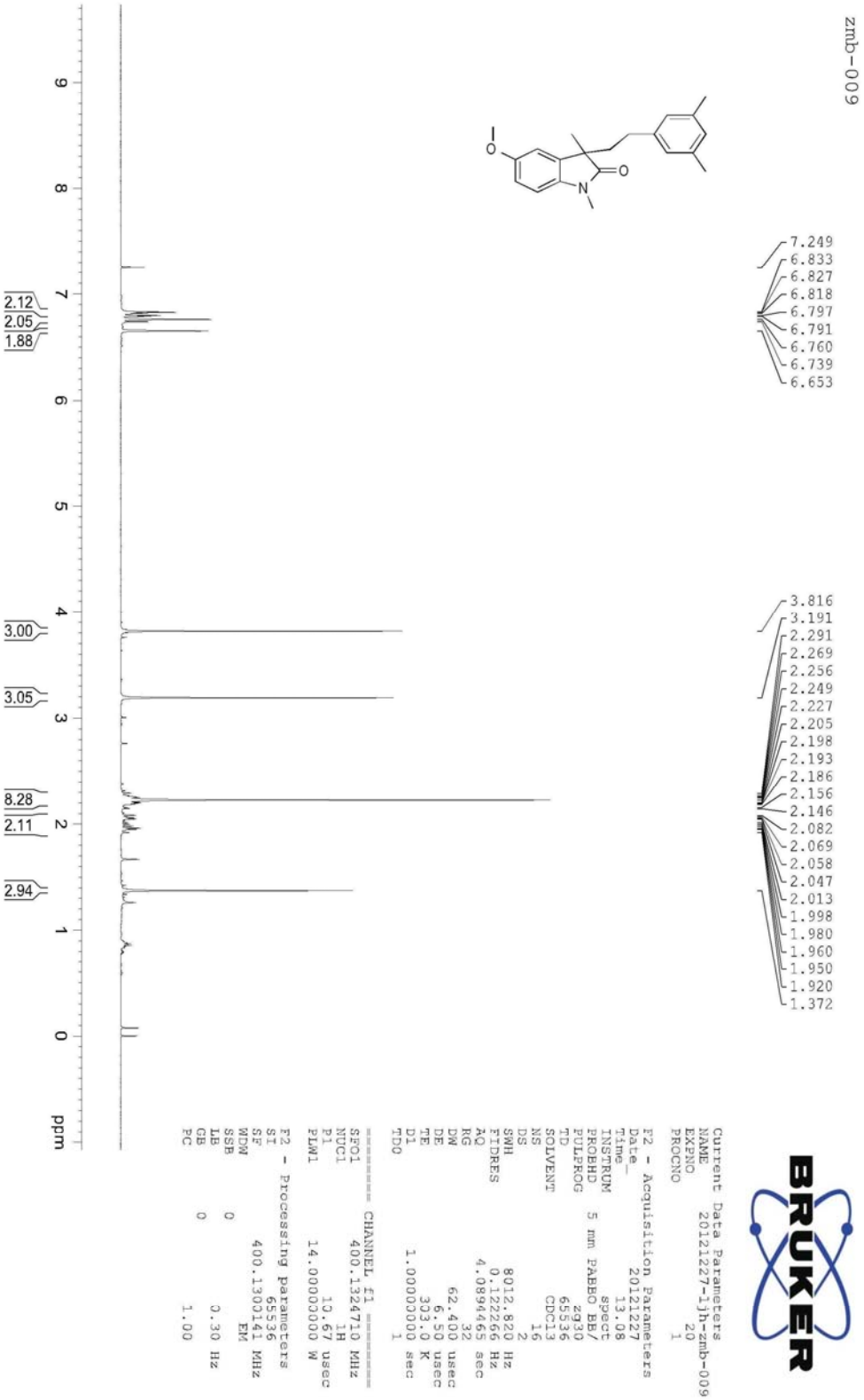
3-(3,5-Dimethylphenethyl)-1,3,5-trimethylindolin-2-one (3eg)



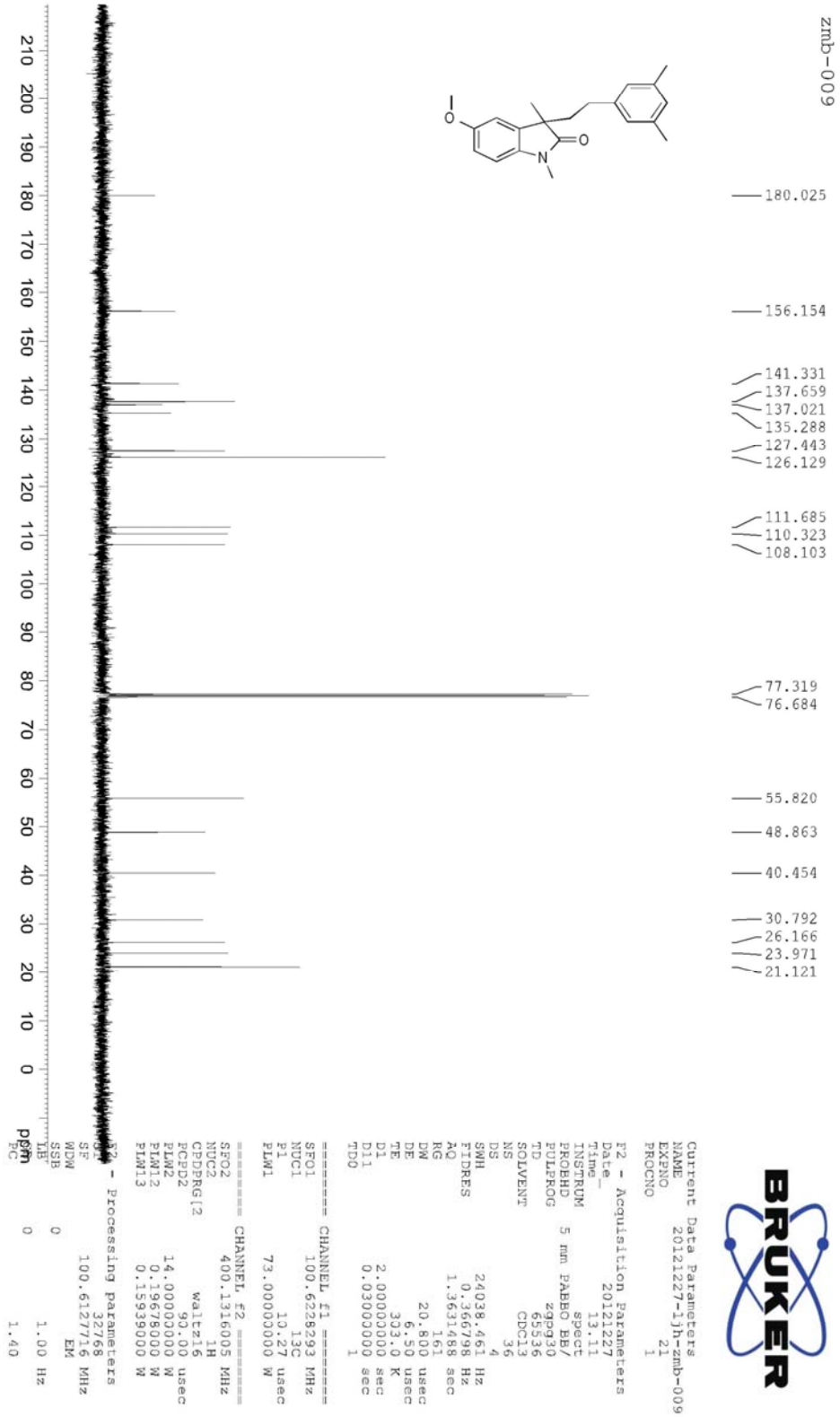
3-(3,5-Dimethylphenethyl)-1,3,5-trimethylindolin-2-one (3eg)



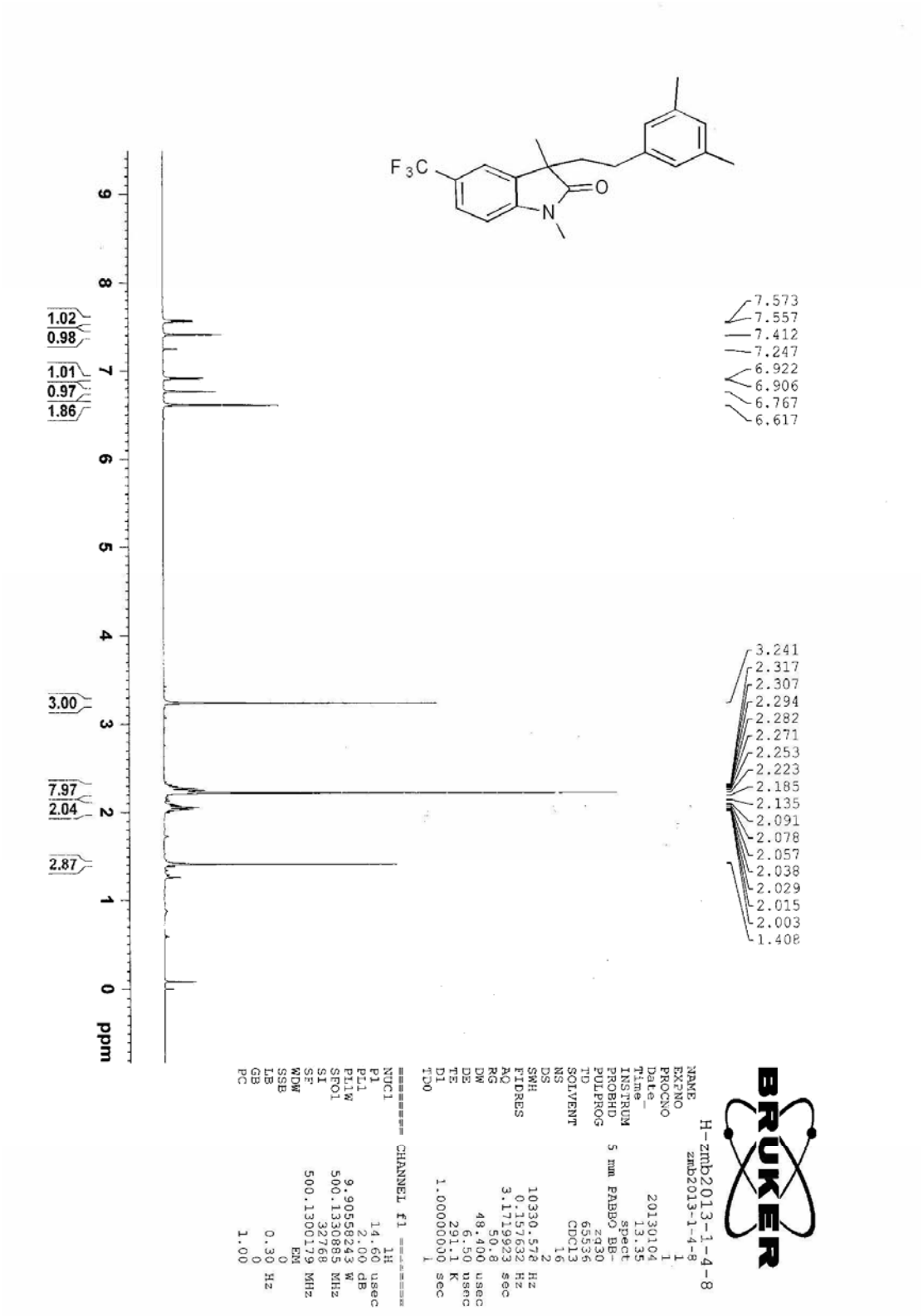
3-(3,5-Dimethylphenethyl)-5-methoxy-1,3-dimethylindolin-2-one (3fg)



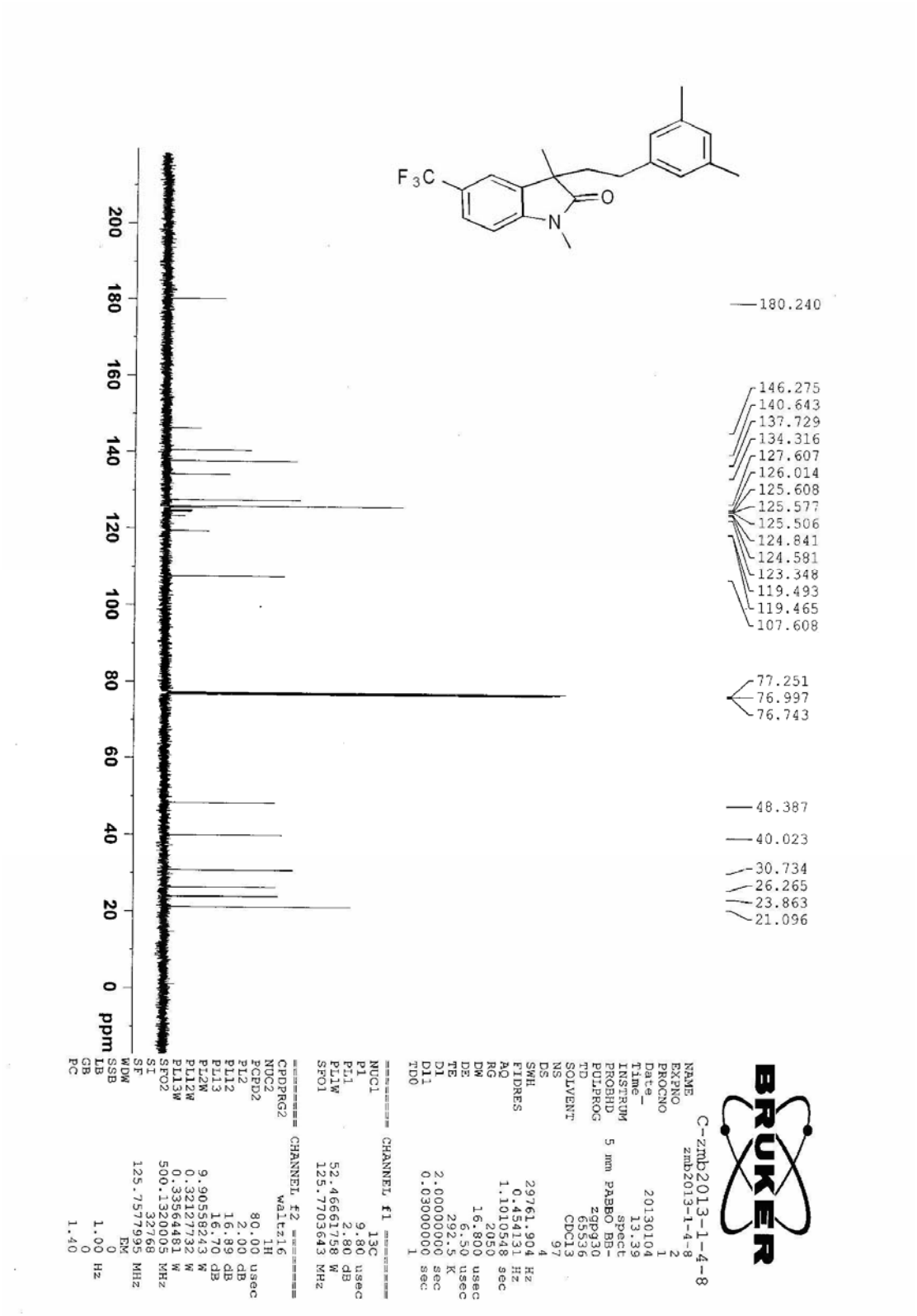
3-(3,5-Dimethylphenethyl)-5-methoxy-1,3-dimethylindolin-2-one (3fg)



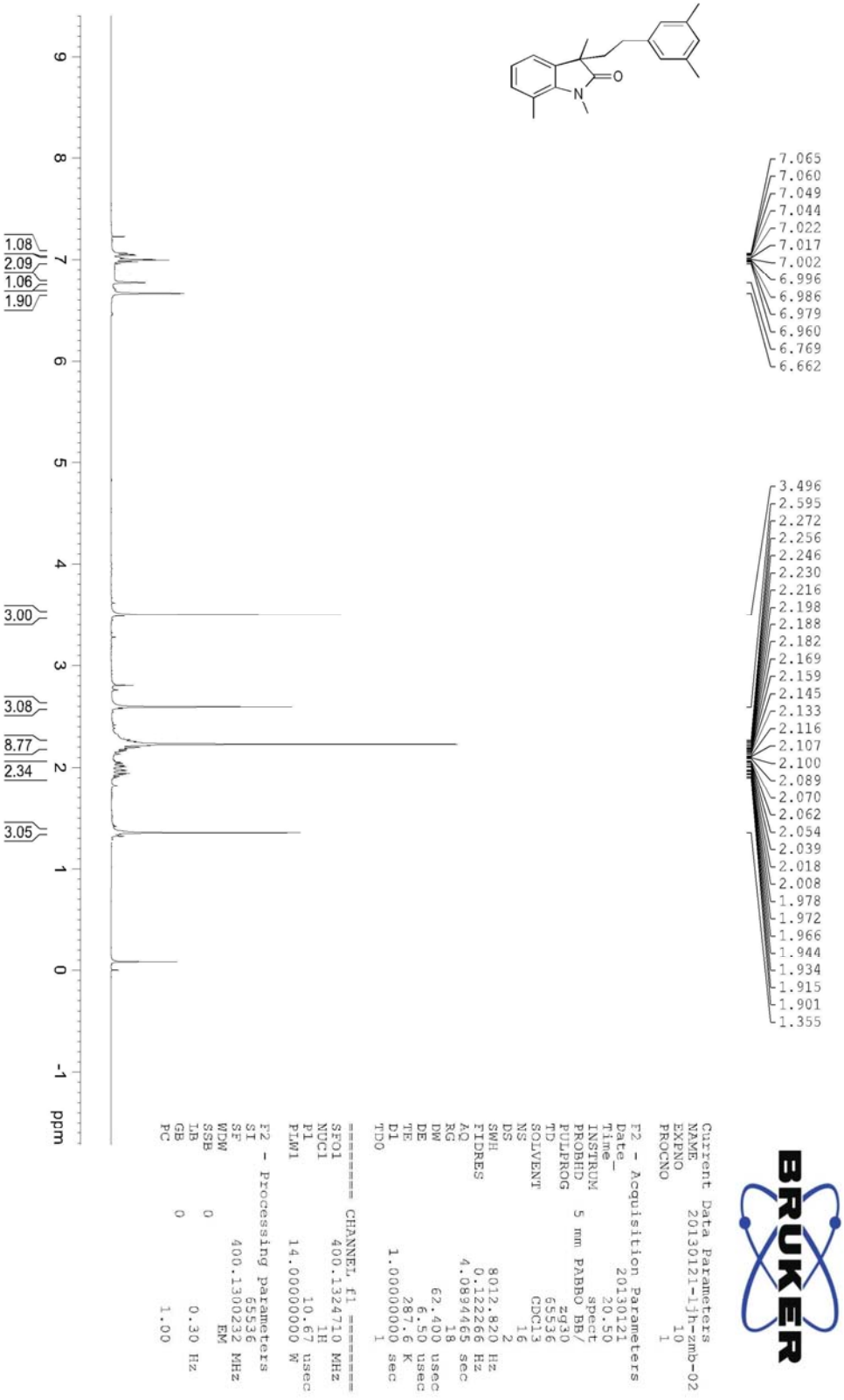
3-(3,5-Dimethylphenethyl)-1,3-dimethyl-5-(trifluoromethyl)indolin-2-one (3gg)



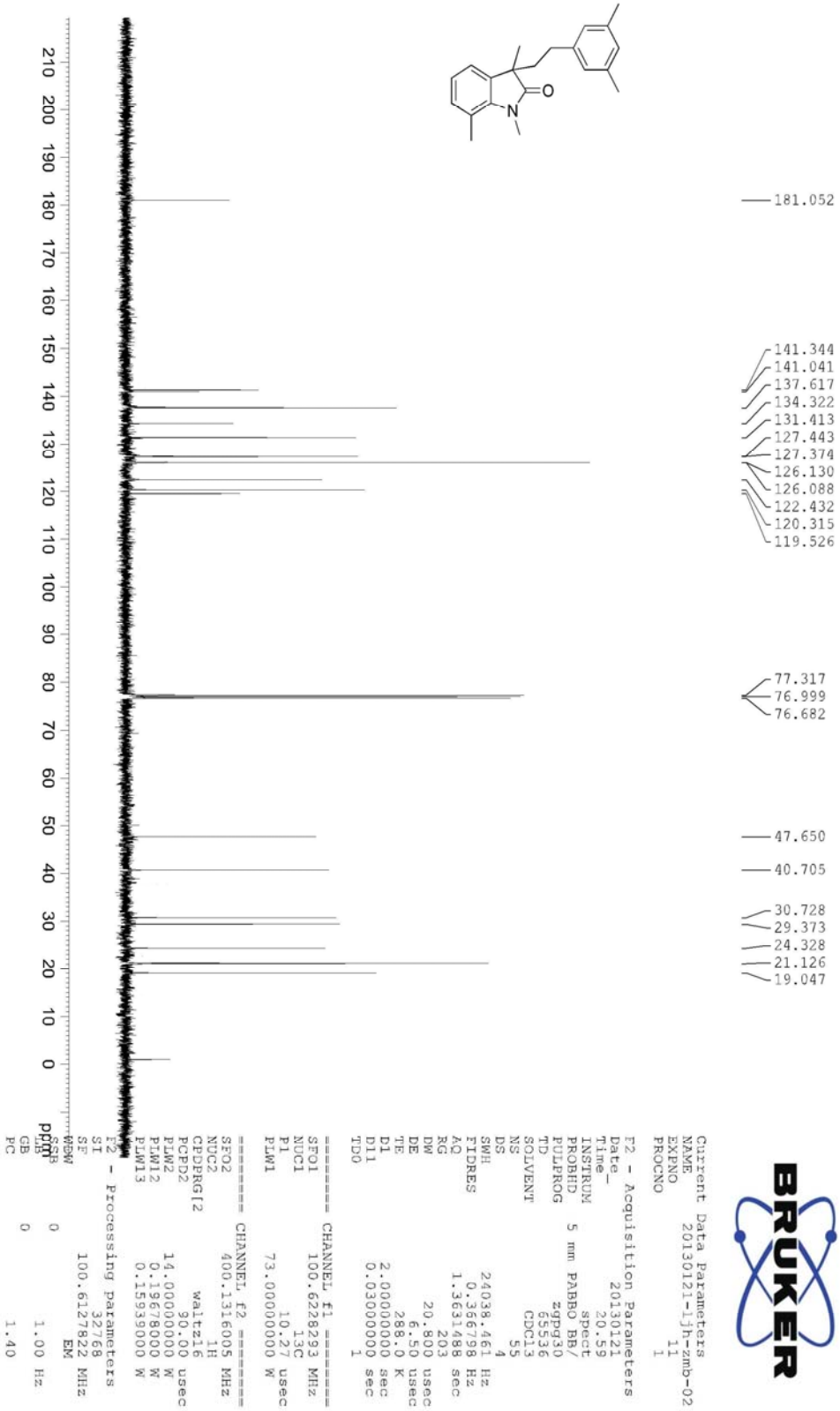
3-(3,5-Dimethylphenethyl)-1,3-dimethyl-5-(trifluoromethyl)indolin-2-one (3gg)



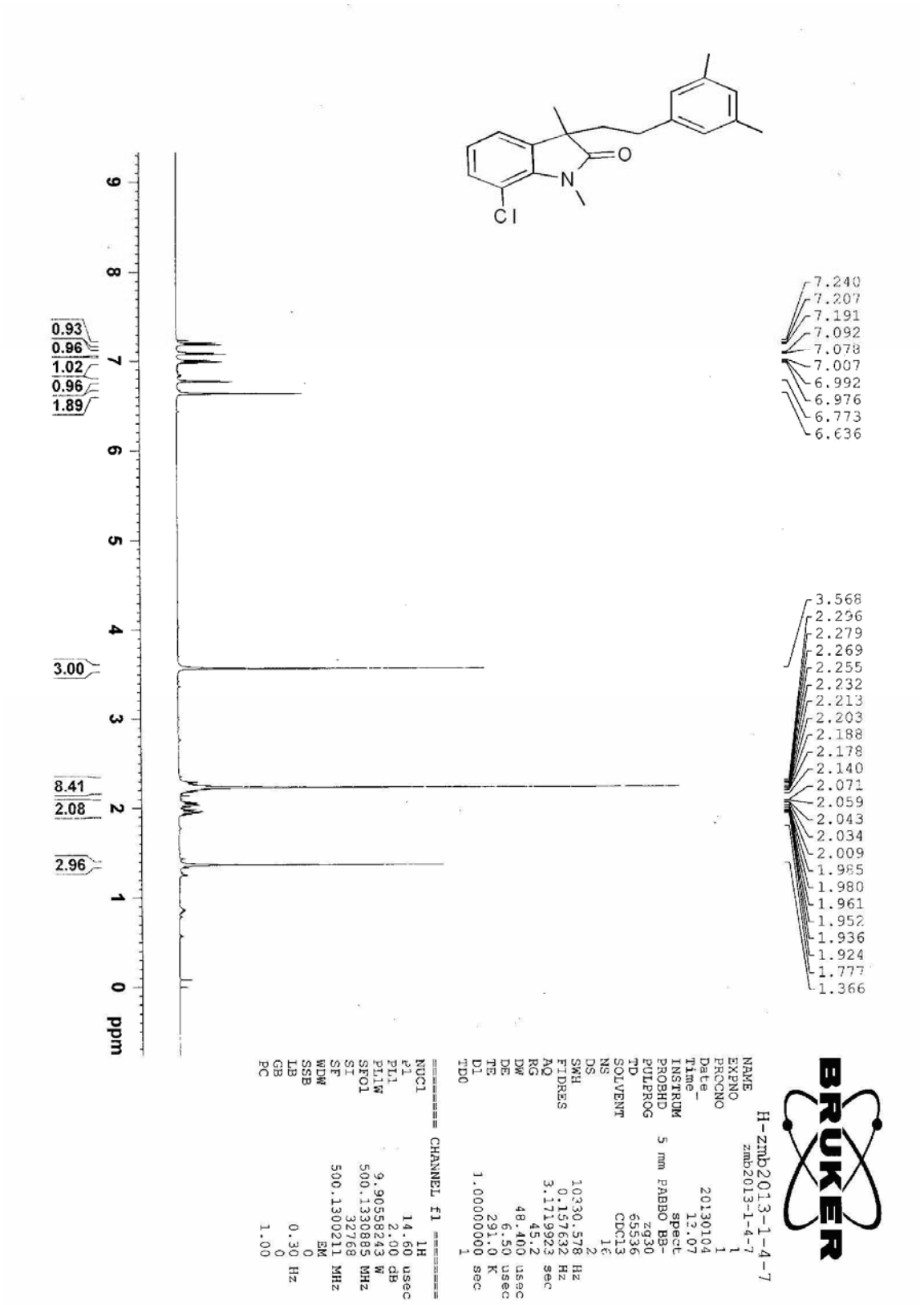
3-(3,5-Dimethylphenethyl)-1,3,7-trimethylindolin-2-one (3hg)



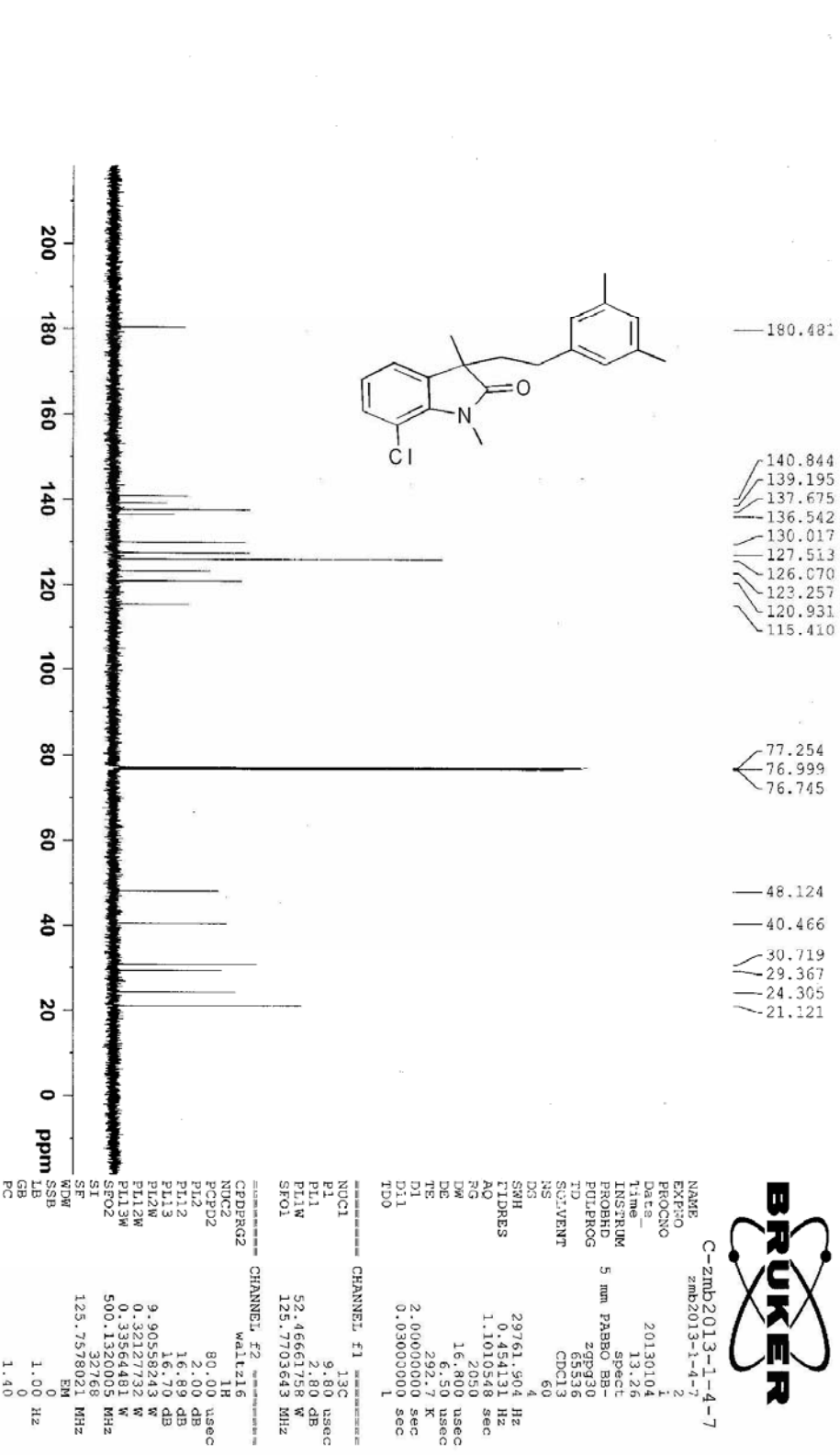
3-(3,5-Dimethylphenethyl)-1,3,7-trimethylindolin-2-one (3hg)



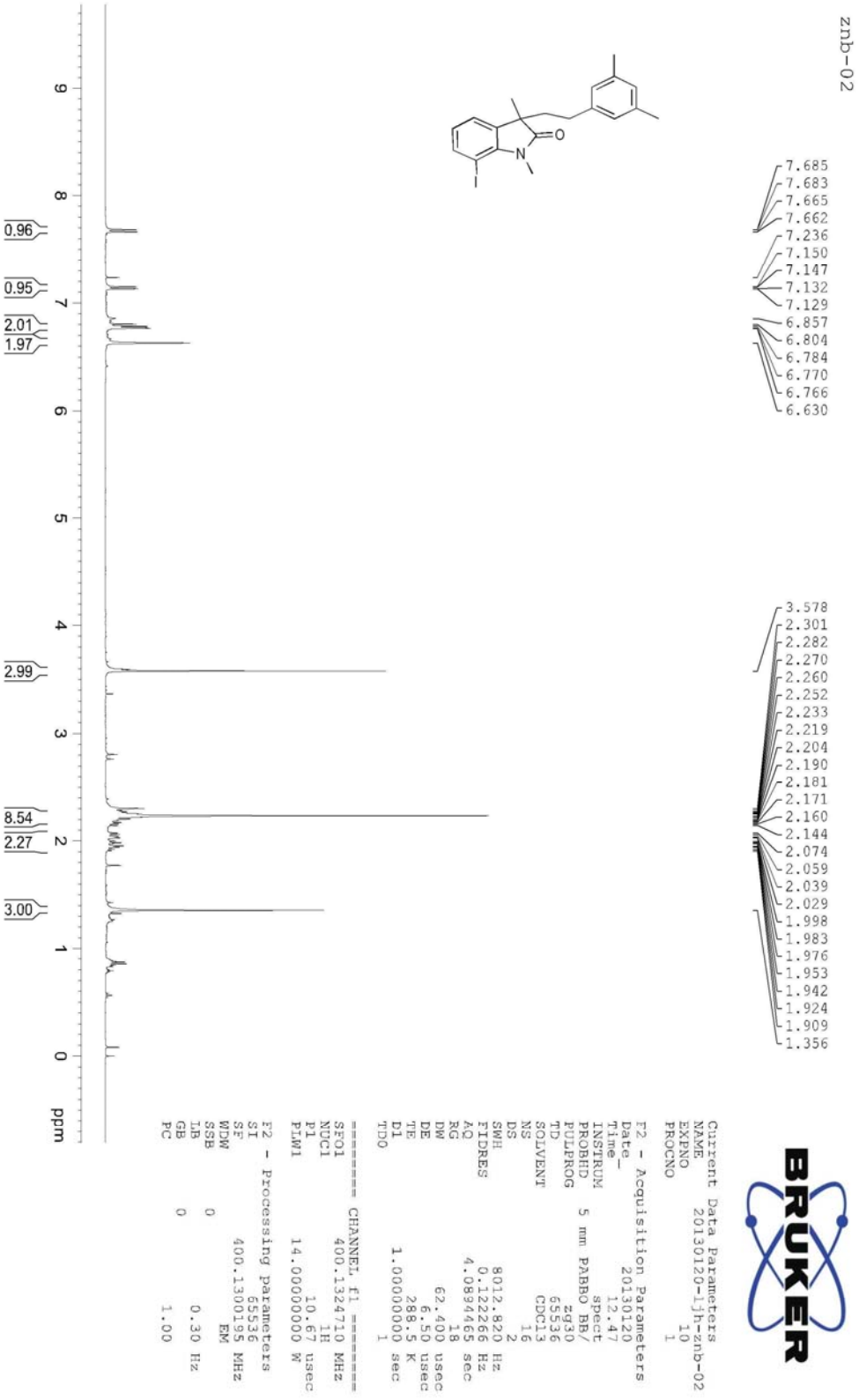
7-Chloro-3-(3,5-dimethylphenethyl)-1,3-dimethylindolin-2-one (3ig)



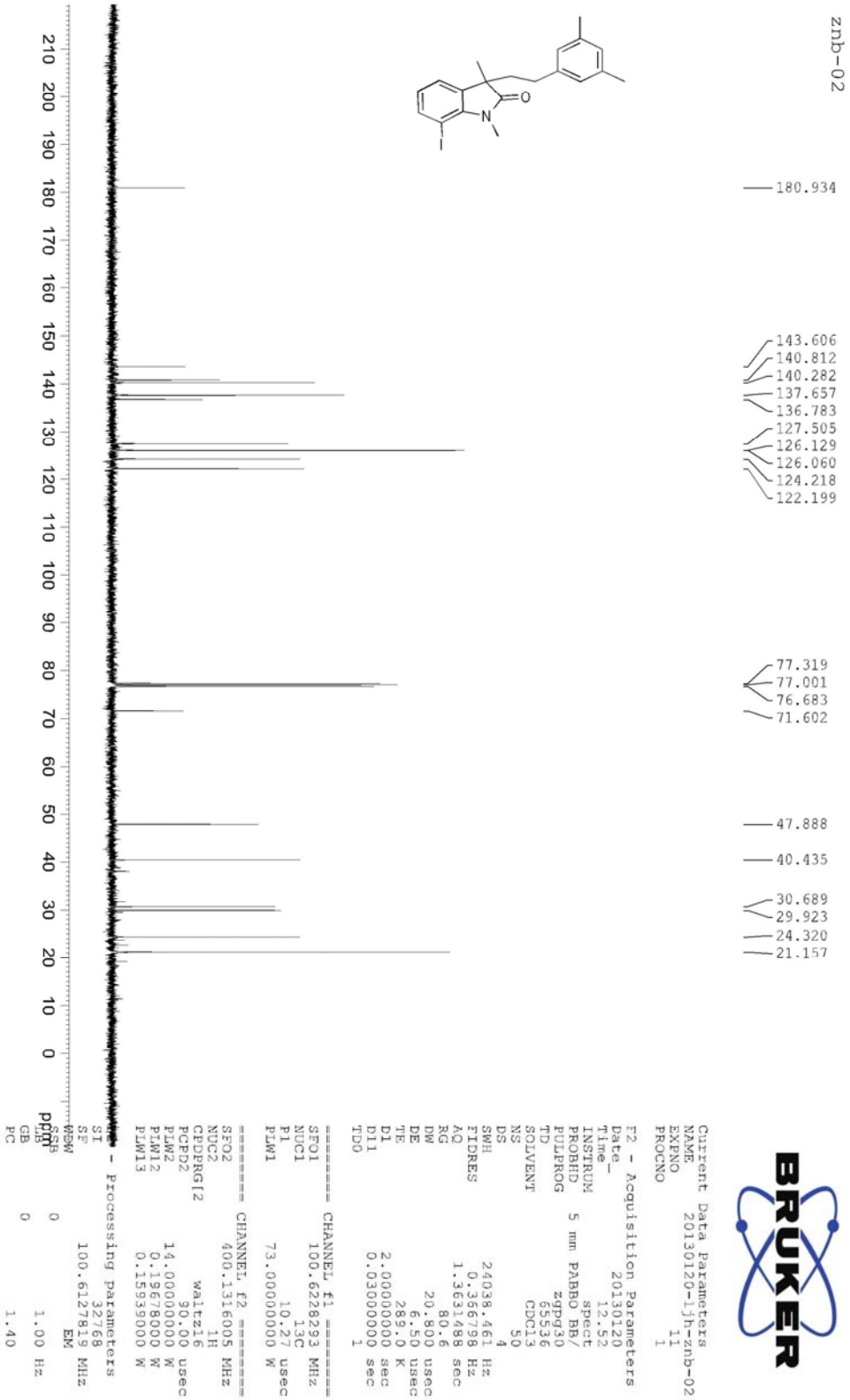
7-Chloro-3-(3,5-dimethylphenethyl)-1,3-dimethylindolin-2-one (3ig)



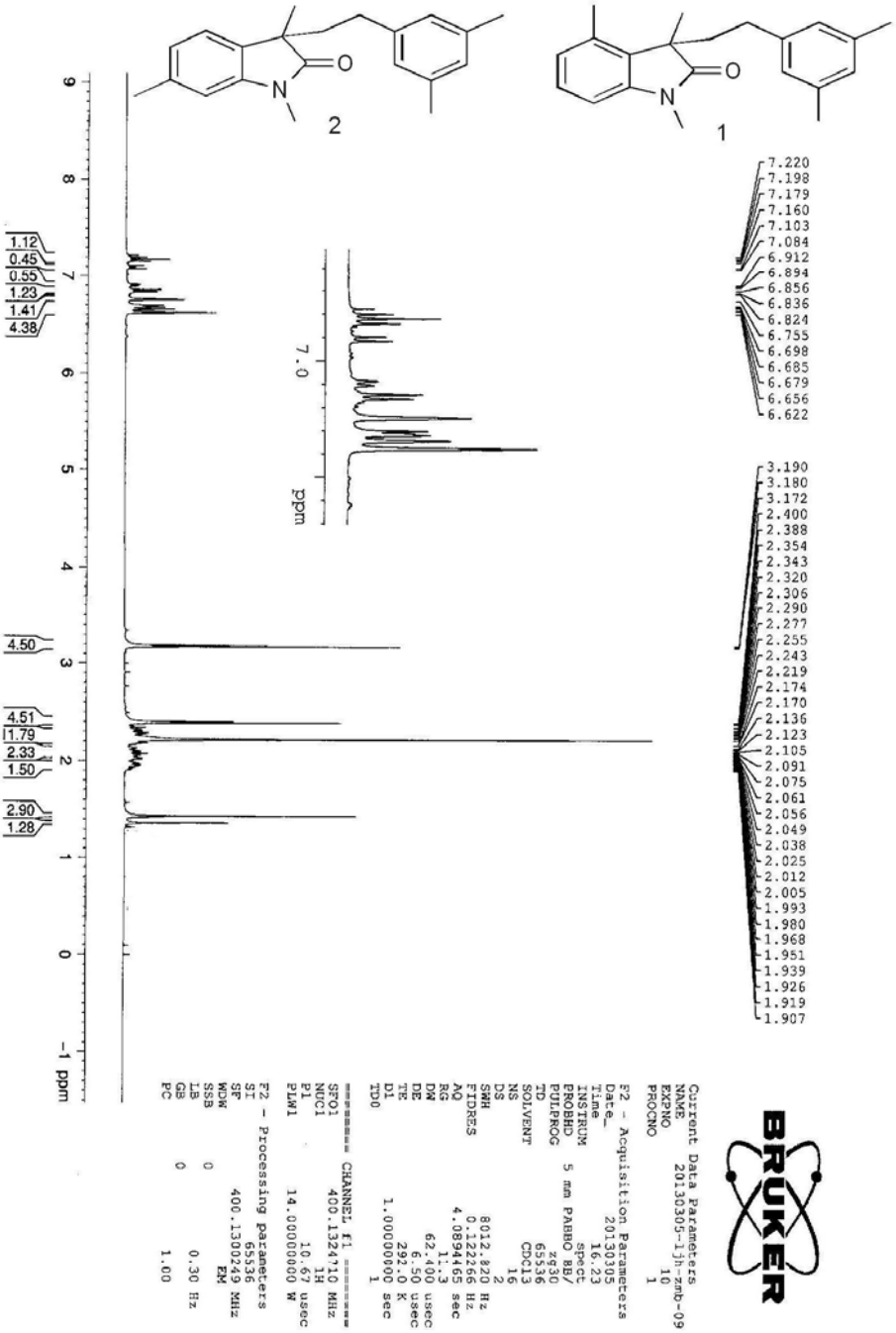
3-(3,5-Dimethylphenethyl)-7-iodo-1,3-dimethylindolin-2-one (3jg)



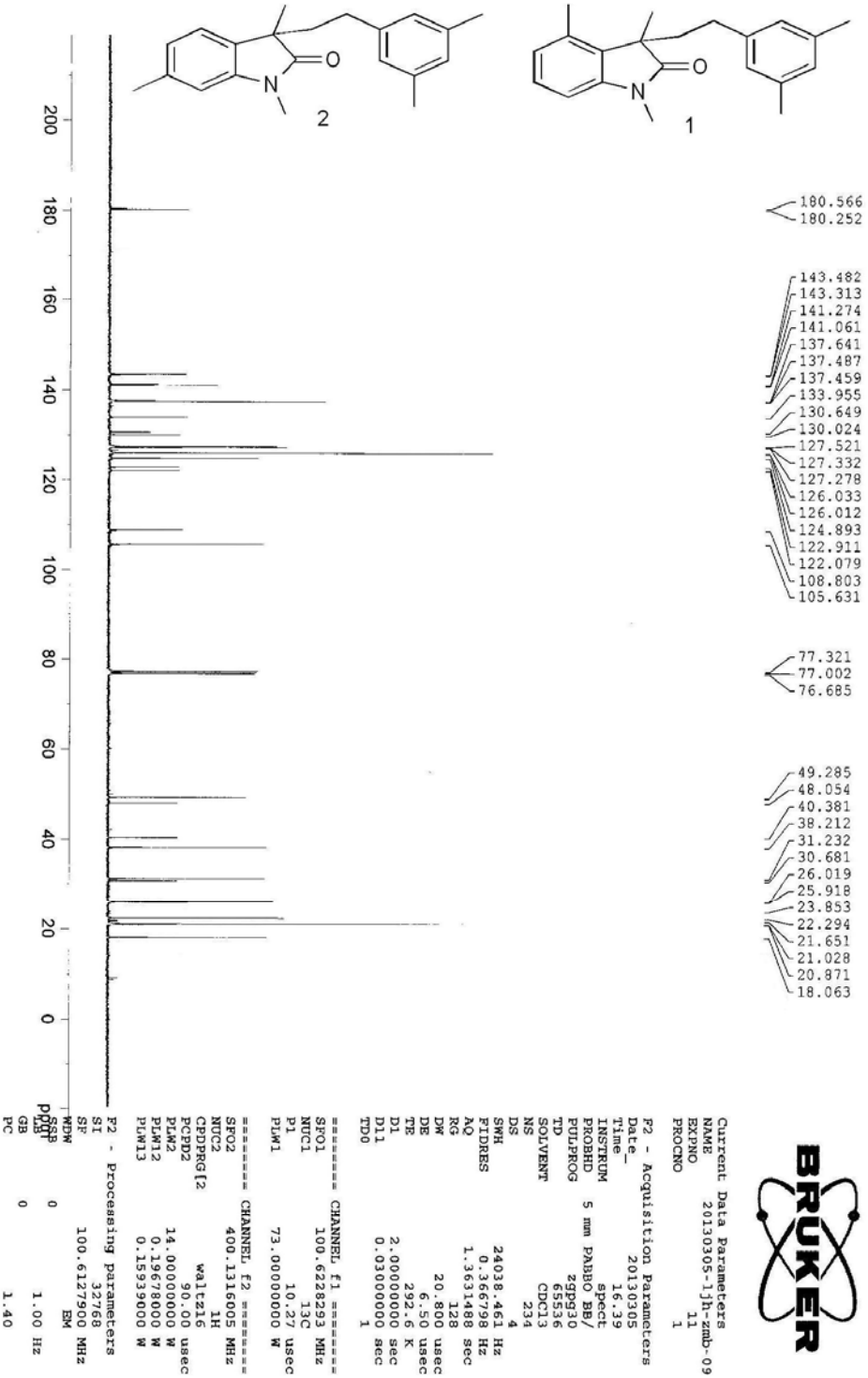
3-(3,5-Dimethylphenethyl)-7-iodo-1,3-dimethylindolin-2-one (3jg)



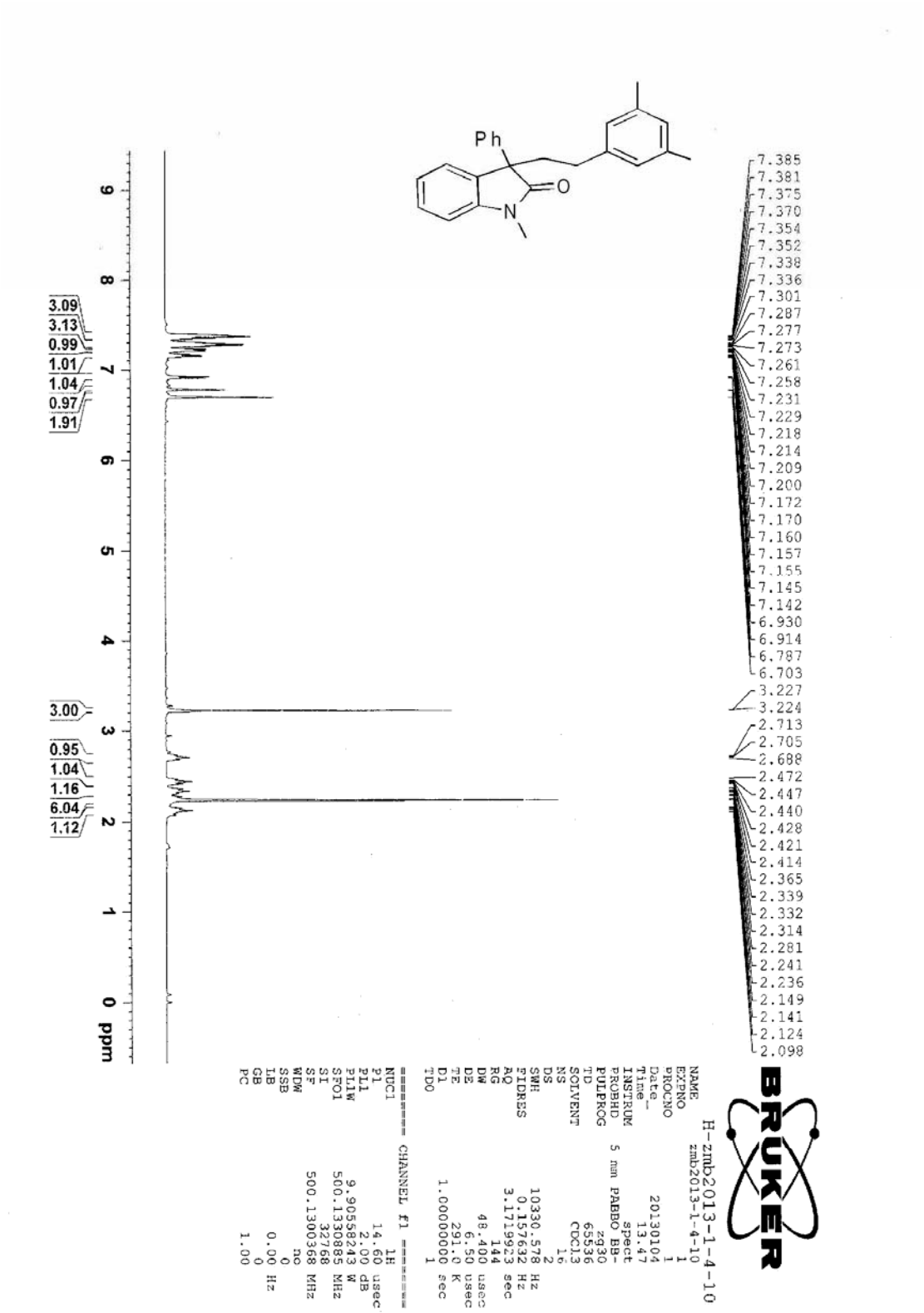
3-(3,5-Dimethylphenethyl)-1,3,6-trimethylindolin-2-one (3kg) and 3-(3,5-Dimethylphenethyl)-1,3,4-trimethylindolin-2-one (3kg')



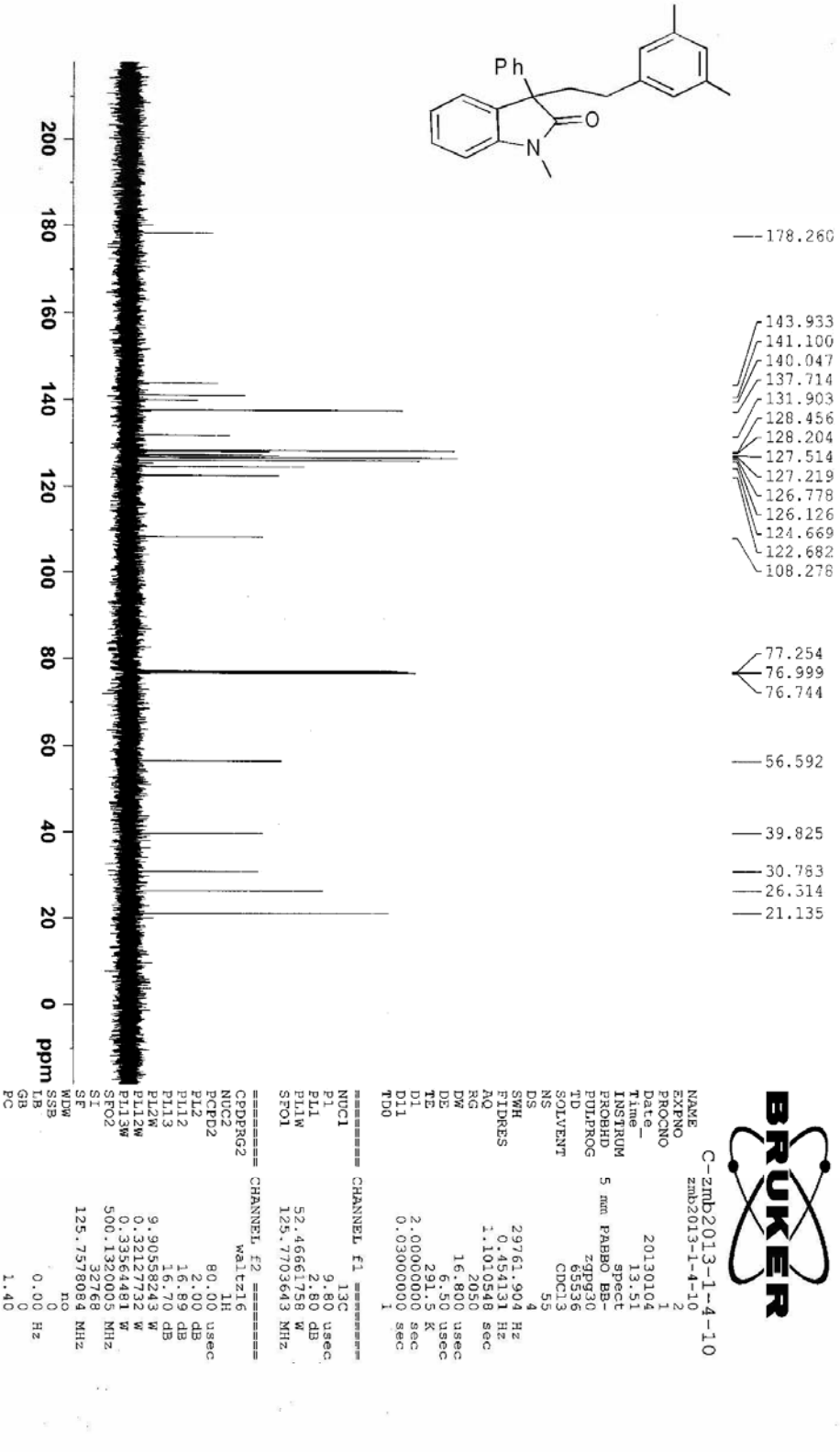
3-(3,5-Dimethylphenethyl)-1,3,6-trimethylindolin-2-one (3kg) and 3-(3,5-Dimethylphenethyl)-1,3,4-trimethylindolin-2-one (3kg')



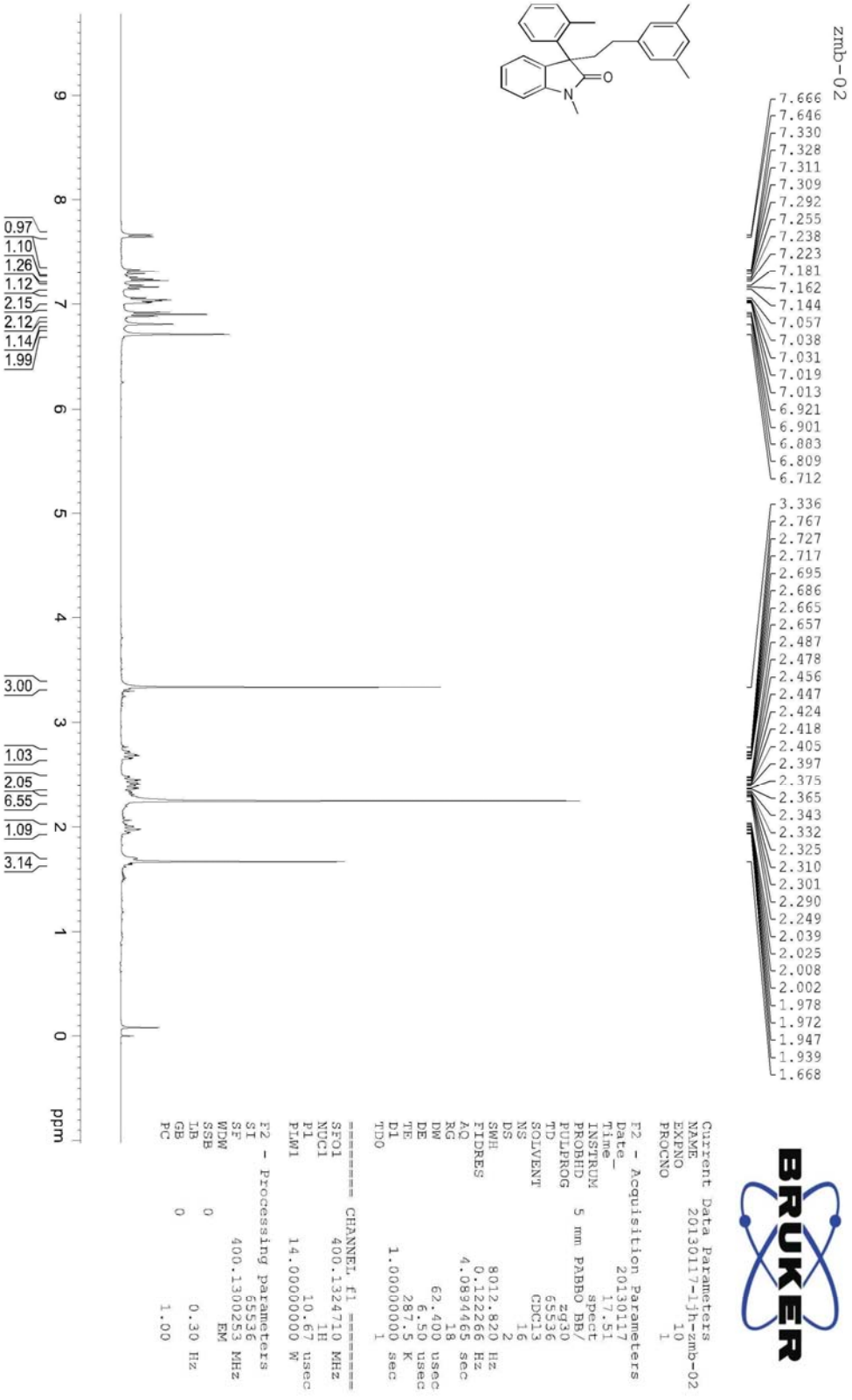
3-(3,5-Dimethylphenethyl)-1-methyl-3-phenylindolin-2-one (3lg)



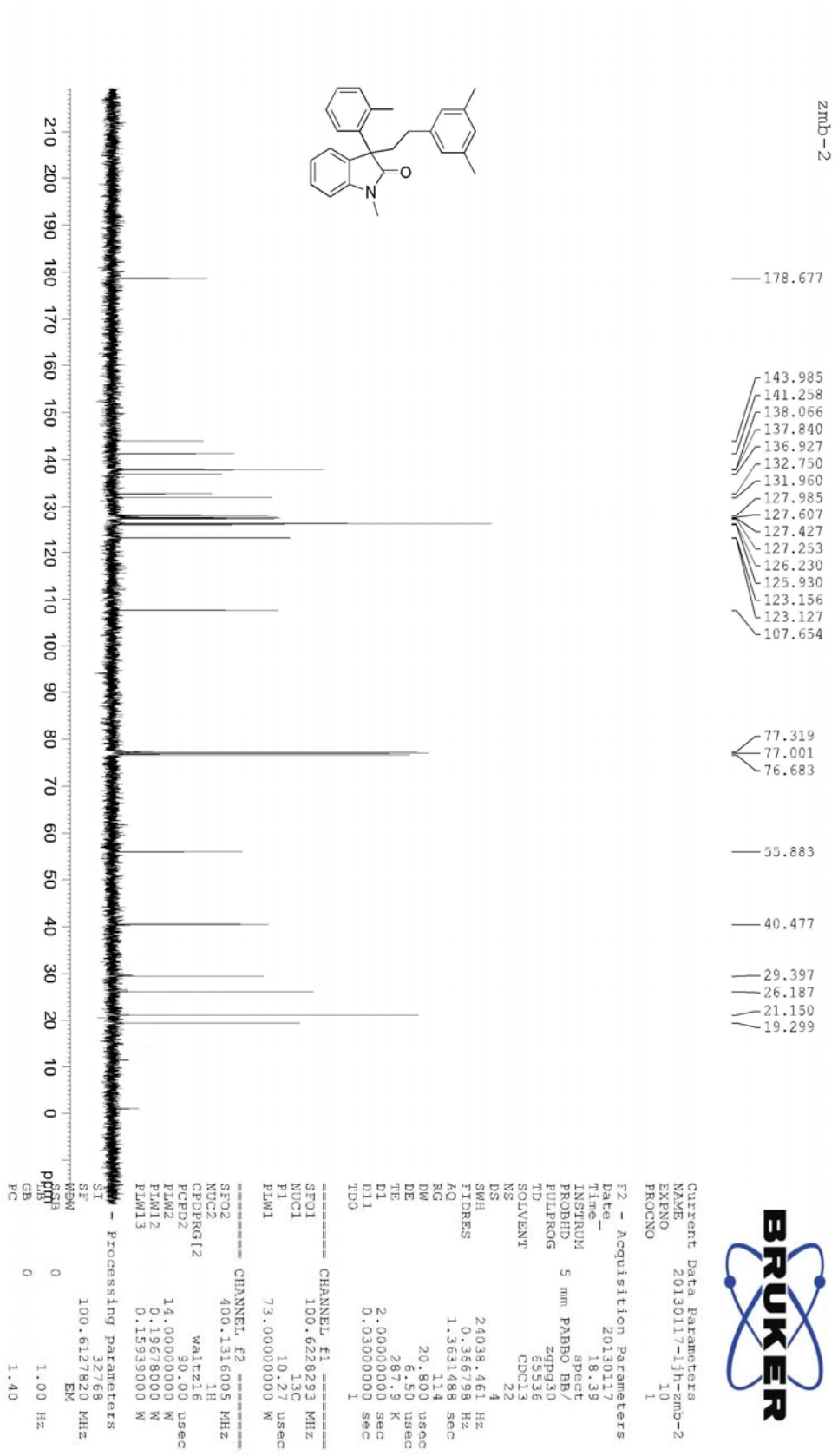
3-(3,5-Dimethylphenethyl)-1-methyl-3-phenylindolin-2-one (3lg)



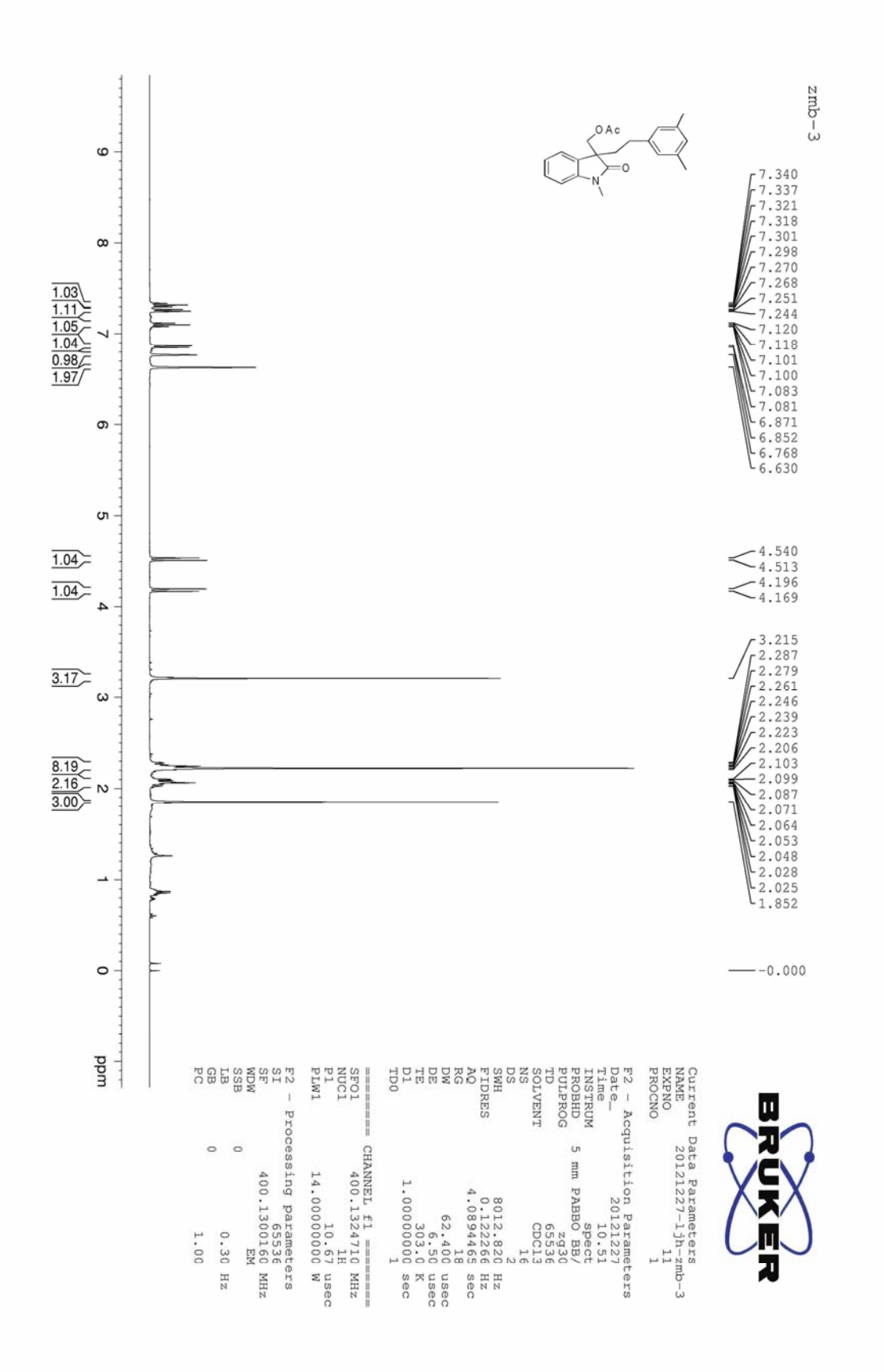
3-(3,5-Dimethylphenethyl)-1-methyl-3-(o-tolyl)indolin-2-one (3mg)



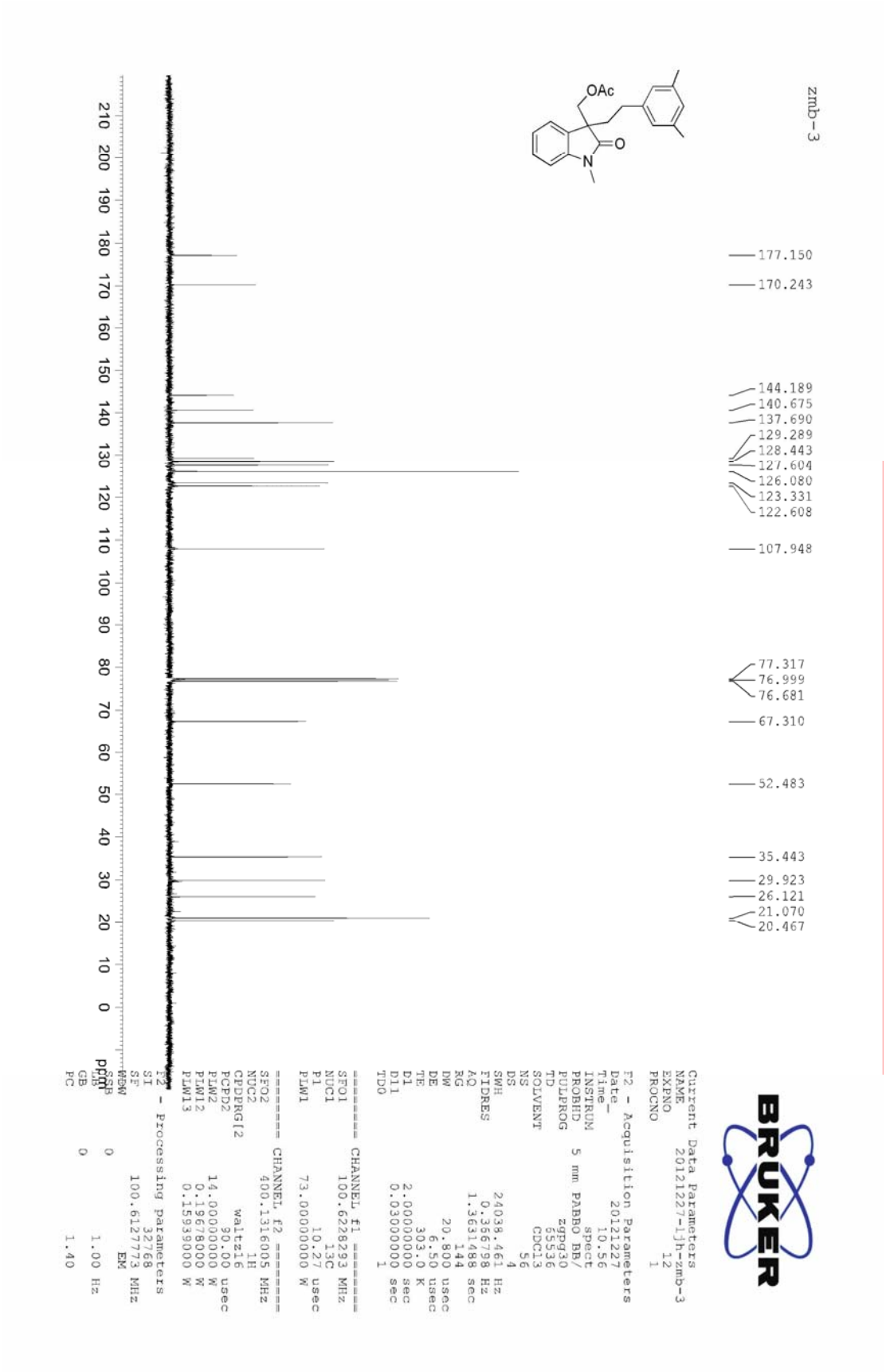
3-(3,5-Dimethylphenethyl)-1-methyl-3-(o-tolyl)indolin-2-one (3mg)



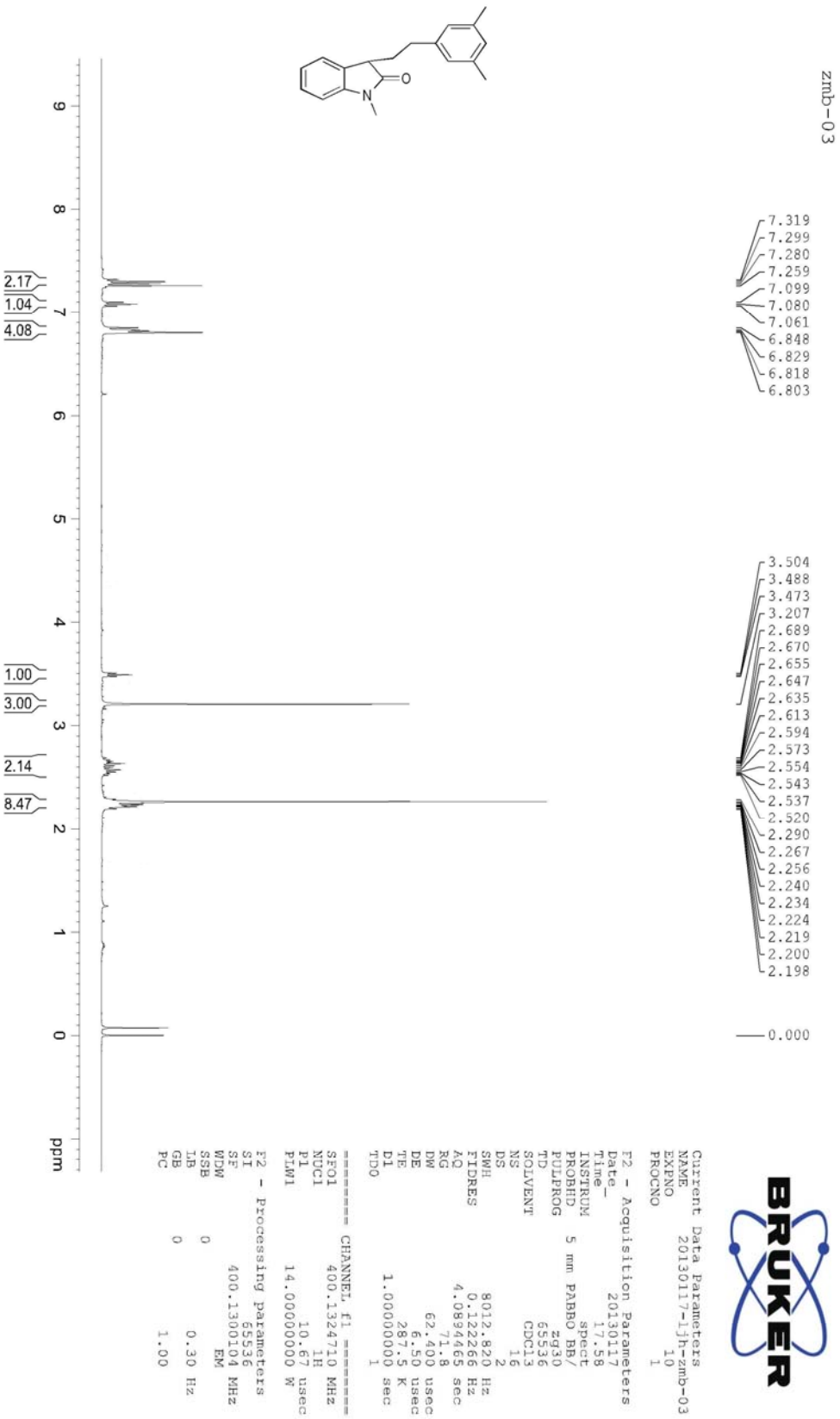
(3-(3,5-Dimethylphenethyl)-1-methyl-2-oxoindolin-3-yl)methyl acetate (3ng)



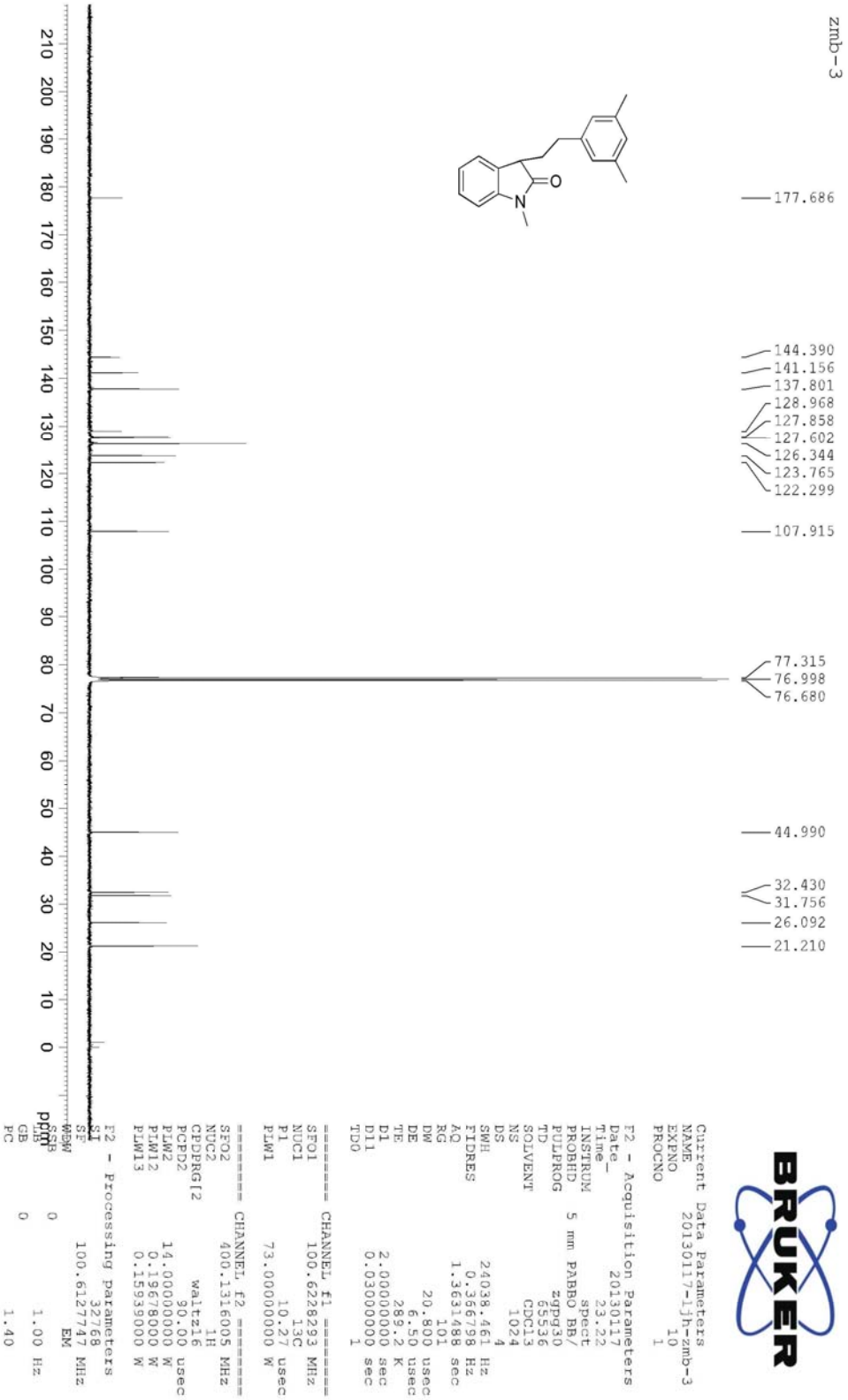
(3-(3,5-Dimethylphenethyl)-1-methyl-2-oxoindolin-3-yl)methyl acetate (3ng)



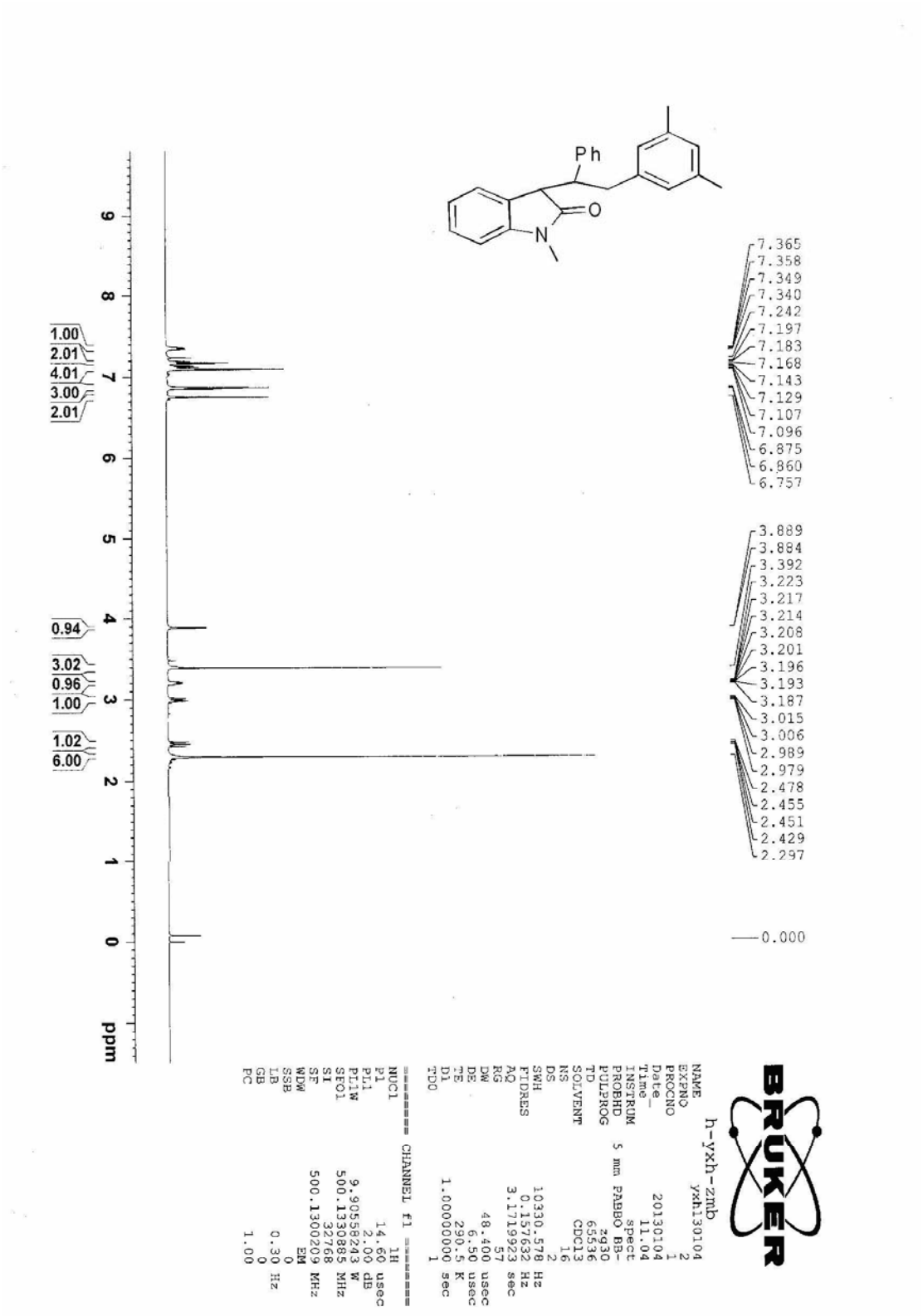
3-(3,5-Dimethylphenethyl)-1-methylindolin-2-one (3og)



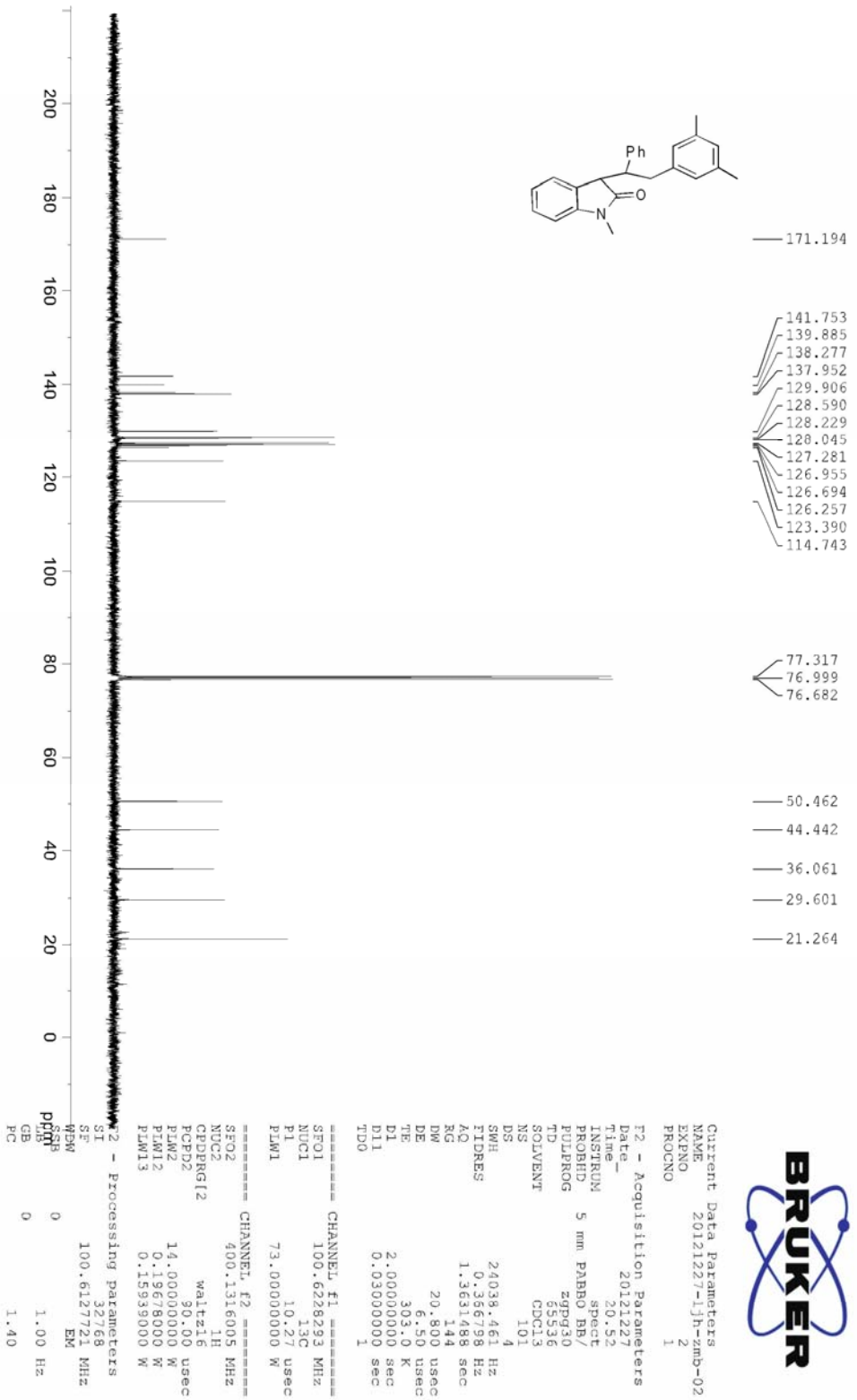
3-(3,5-Dimethylphenethyl)-1-methylindolin-2-one (3og)



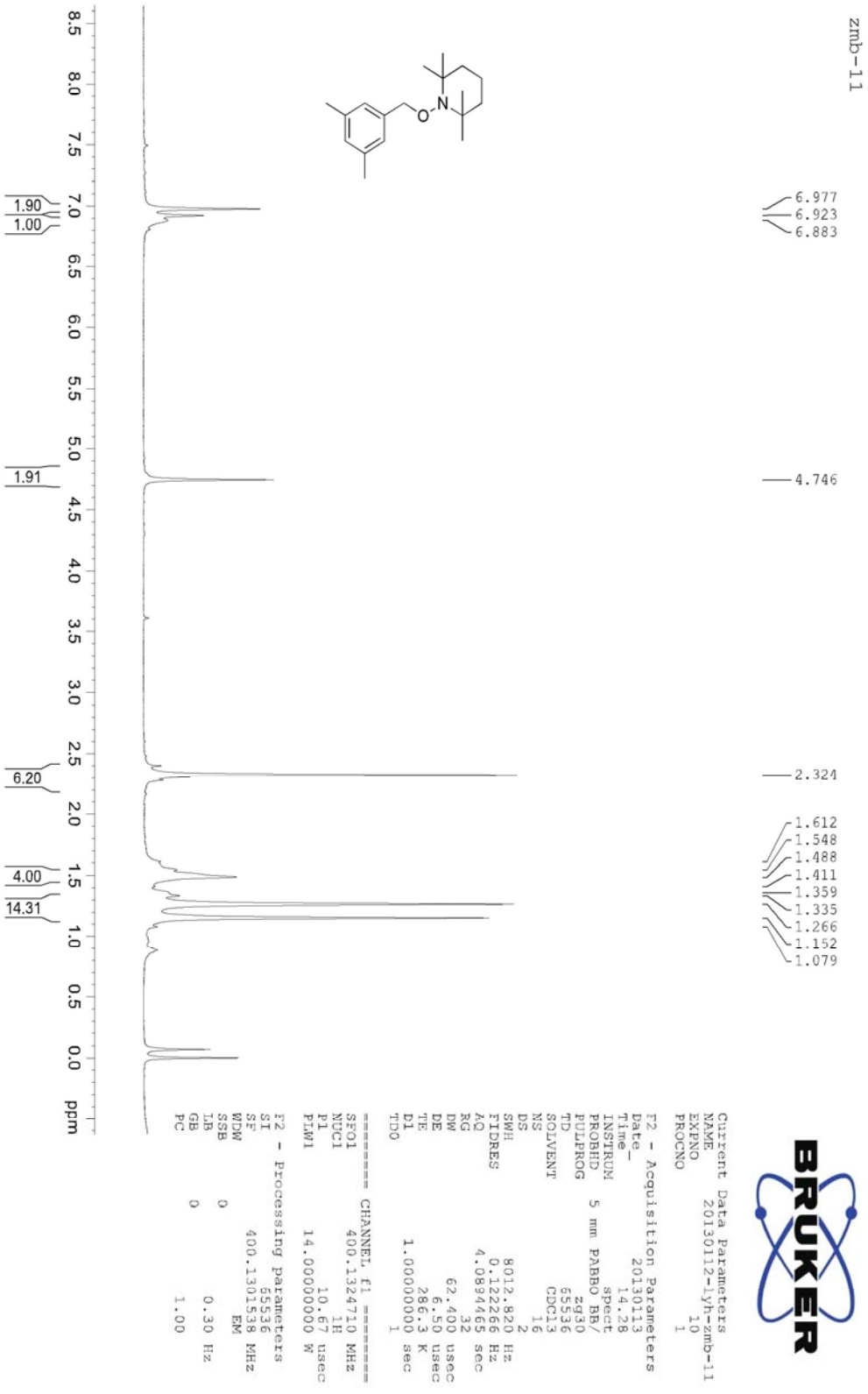
3-(2-(3,5-Dimethylphenyl)-1-phenylethyl)-1-methylindolin-2-one (3pg)



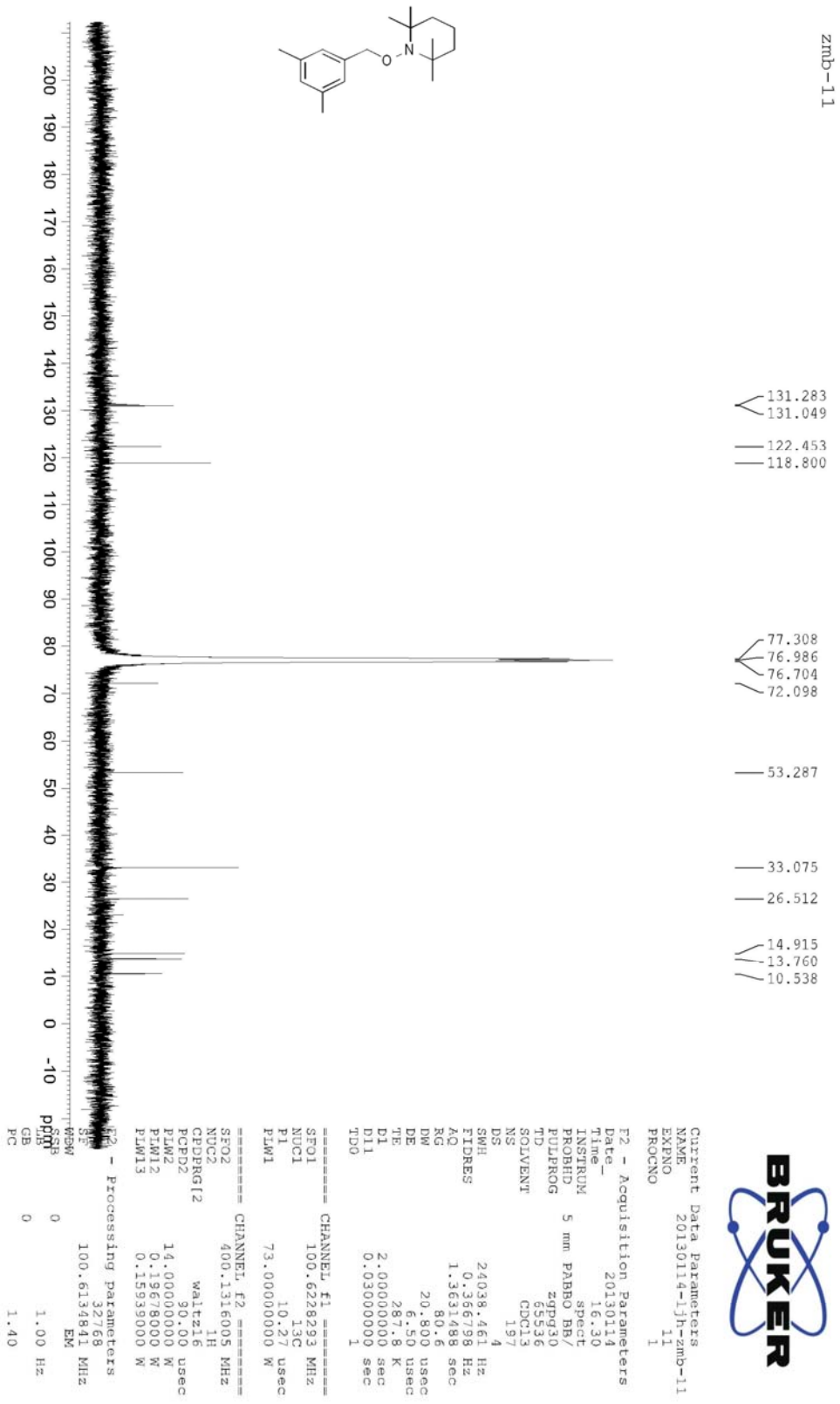
3-(2-(3,5-Dimethylphenyl)-1-phenylethyl)-1-methylindolin-2-one (3pg)



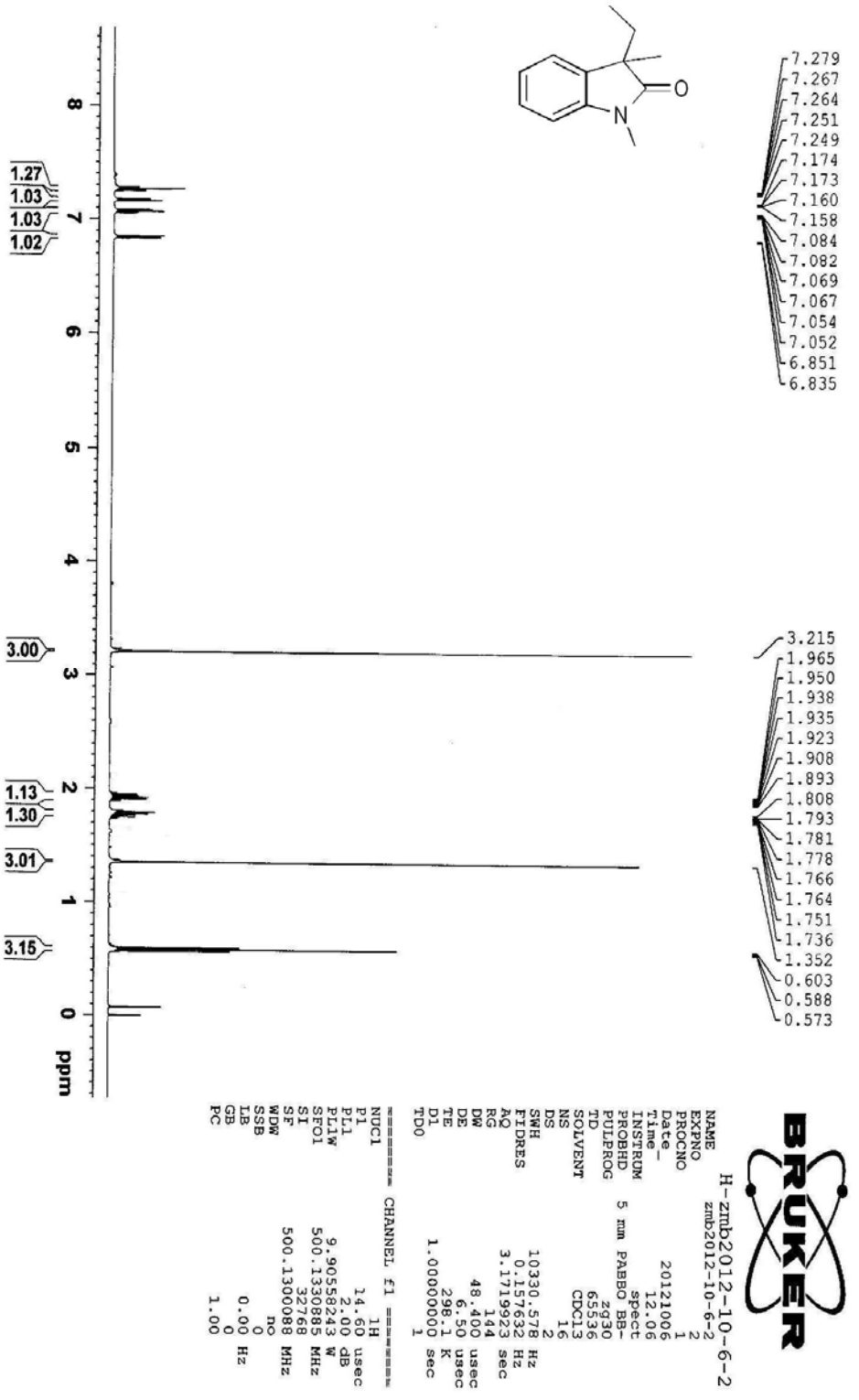
1-((3,5-Dimethylbenzyl)oxy)-2,2,6,6-tetramethylpiperidine (4ag)



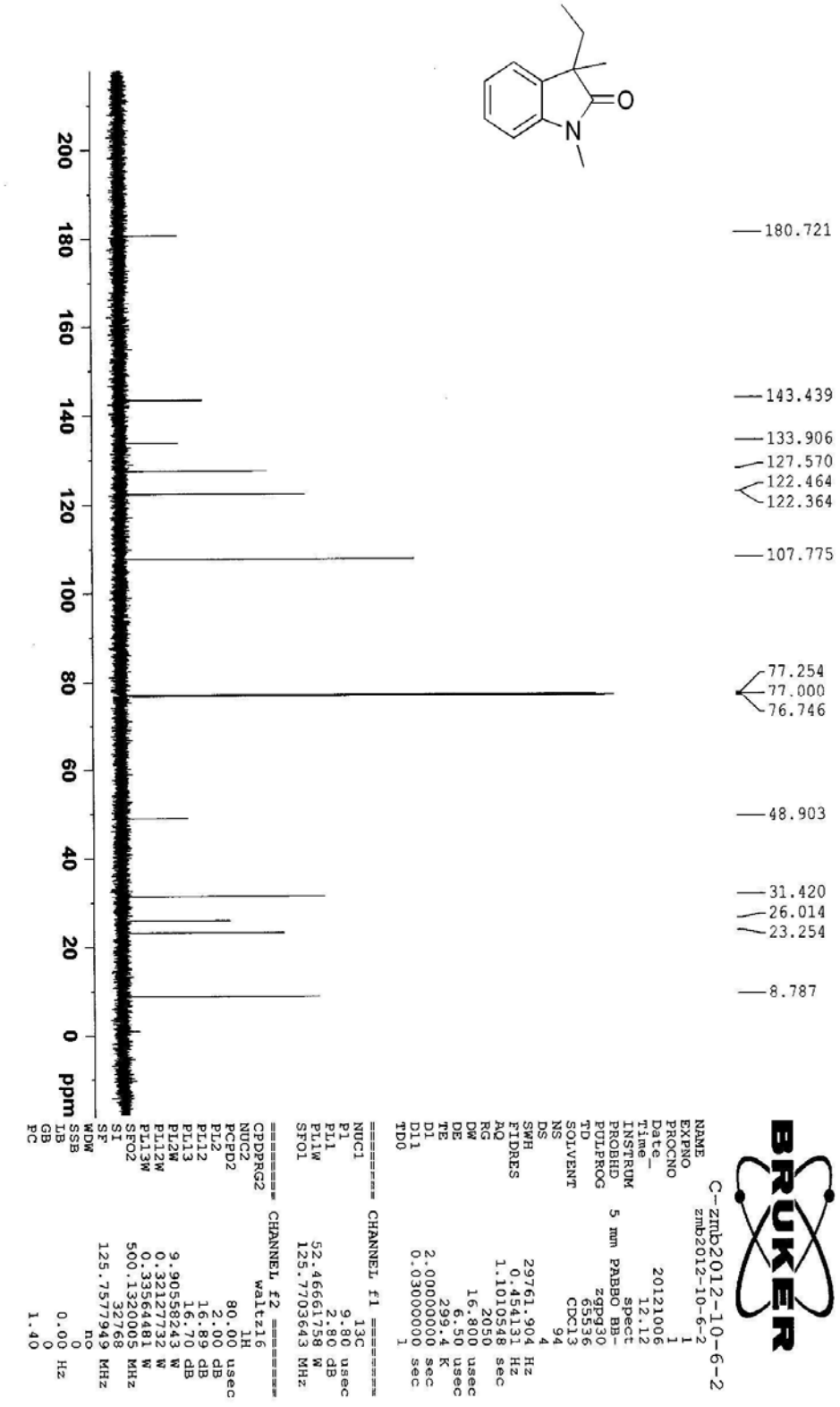
1-((3,5-Dimethylbenzyl)oxy)-2,2,6,6-tetramethylpiperidine (4ag)



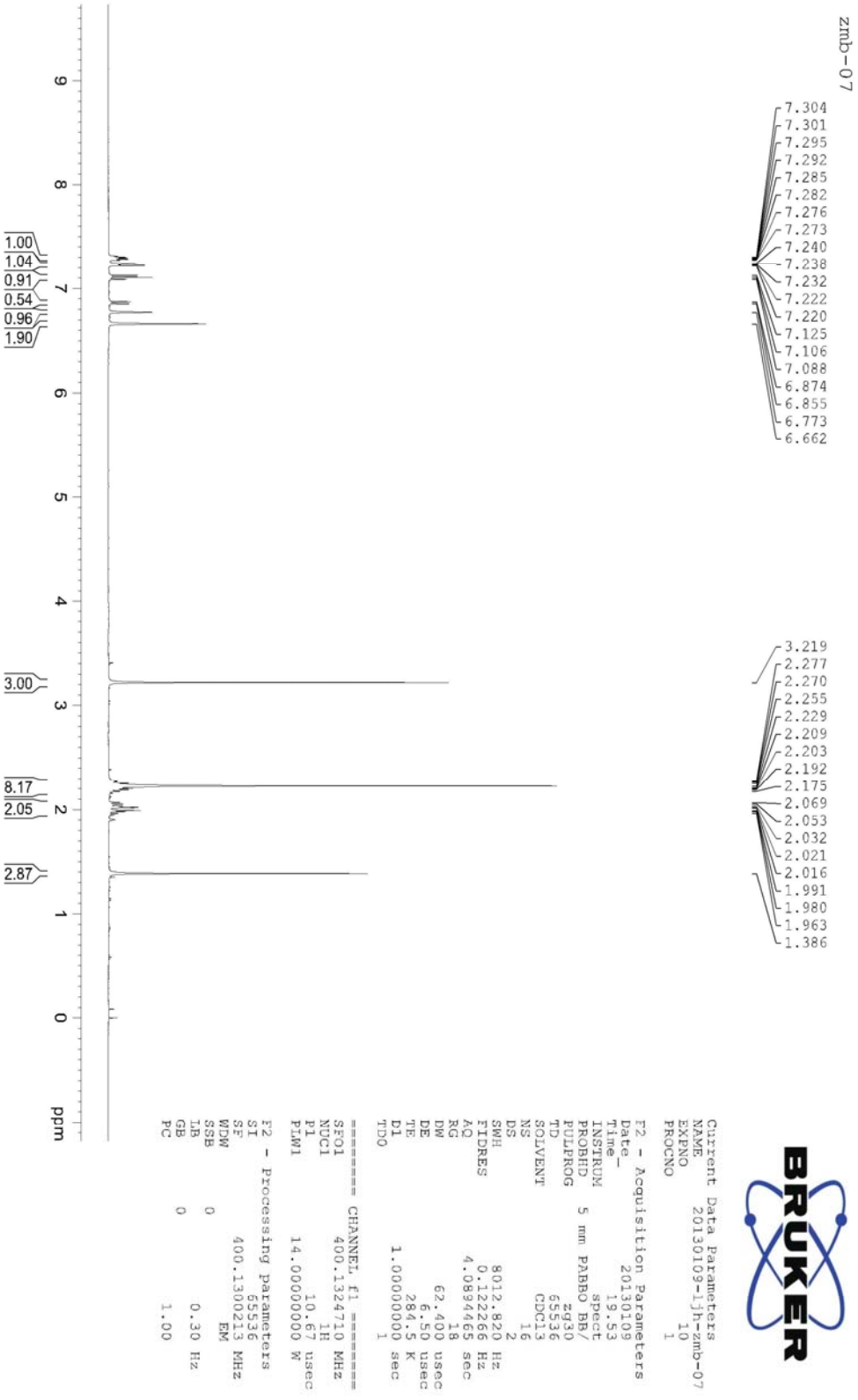
3-Ethyl-1,3-dimethylindolin-2-one (5aa)



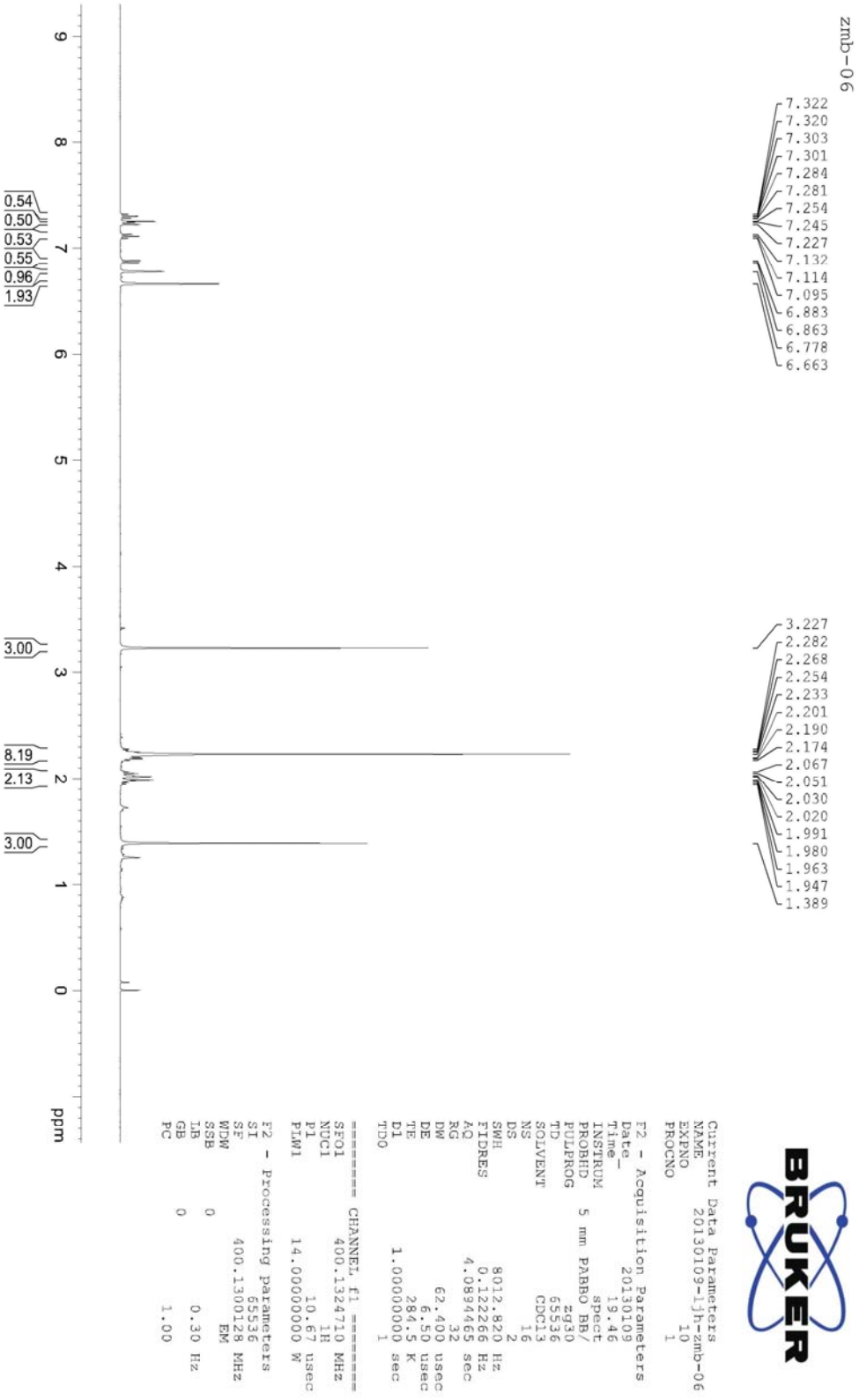
3-Ethyl-1,3-dimethylindolin-2-one (5aa)



3aa and 3aa-D1



3aa and 3aa-D5



3aa and 3aa-D8