

SUPPORTING INFORMATION

Combination of Fluoroalkylation and Kornblum–DeLaMare Rearrangement: A New Strategy for the Construction of (Z)- β - Perfluoroalkyl Enaminones with High Selectivity

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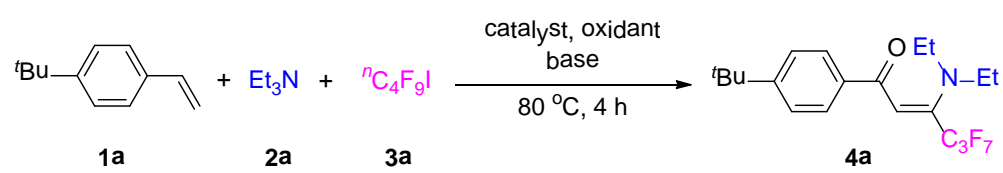
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General Information

All manipulations were carried out under air atmosphere. Column chromatography was generally performed on silica gel (300-400 mesh) and reactions were monitored by thin layer chromatography (TLC) using UV light to visualize the course of the reactions. The ^1H (400 MHz) and ^{13}C NMR (100 MHz) data were recorded using CDCl_3 as solvent at room temperature. ^{19}F NMR (282 MHz) data was recorded using CDCl_3 as solvent at room temperature. The chemical shifts (δ) are reported in ppm and coupling constants (J) in Hz. ^1H NMR spectra was recorded with tetramethylsilane ($\delta = 0.00$ ppm) as internal reference; ^{13}C NMR spectra was recorded with CDCl_3 ($\delta = 77.0$ ppm) as internal reference. IR, MS, and HRMS were performed by the State-authorized Analytical Center in Soochow University.

Table S1. Optimization of reaction conditions.^[a]



Entry	Catalyst	Oxidant	Yield
1	Co(acac)₂	TBHP	80%
2	Co(acac) ₂	Oxone	< 5%
3	Co(acac) ₂	H ₂ O ₂	< 5%
4	Co(acac) ₂	DDQ	< 5%
5	Co(acac) ₂	TBPB	< 5%
6	Co(acac) ₂	(^t BuO) ₂	< 5%
7	Co(acac) ₂	—	< 5%
8	—	TBHP	26%
9	I ₂	TBHP	23%
10	TBAI	TBHP	27%
11	CAN	TBHP	22%
12	[Ru(cymene)Cl ₂] ₂	TBHP	60%
13	Cu(acac) ₂	TBHP	66%
14	PdCl ₂	TBHP	25%
15	Fe(acac) ₂	TBHP	25%
16	CoCl ₂	TBHP	31 %
17	Co(OAc) ₂ ·4H ₂ O	TBHP	40%
18	Co(dppf)Cl ₂	TBHP	31%
19	CoC ₂ O ₄ ·2H ₂ O	TBHP	28%
20	Co(acac) ₃	TBHP	33%

[a] Reaction conditions: 0.5 mmol 1-(*tert*-butyl)-4-vinylbenzene (**1a**), 2.0 equiv triethylamine (**2a**), 2.0 equiv perfluorobutyl iodide (**3a**), 10 mol% catalyst, 5.8 equiv oxidant, 3.0 equiv DABCO, in 2.0 mL CCl₃CH₃ was stirred at 80 °C for 4 h.

General procedures for products 4, 5, 6

Styrene (0.5 mmol), amine (1.0 mmol), perfluoroalkyl iodide (1.0 mmol), cobalt(II) acetylacetonate (10 mmol %), DABCO (1.5 mmol) and TBHP (5.8 equiv, 70% aqueous solution, 400 uL) and 2.0 mL CCl₃CH₃ were added to a tube under air. The reaction mixture was stirred at 80 °C for 4 h. The reaction mixture was quenched with saturated Na₂SO₃ solution, extracted repeatedly with ethyl acetate, dried over Na₂SO₄. It was then removal of the organic solvent in vacuum and followed by flash silica gel column chromatographic purification afforded product with Petroleum ether/Ethyl acetate mixtures.

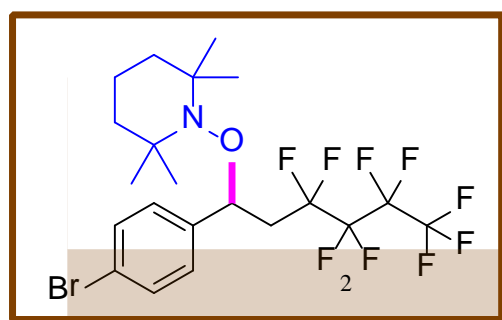
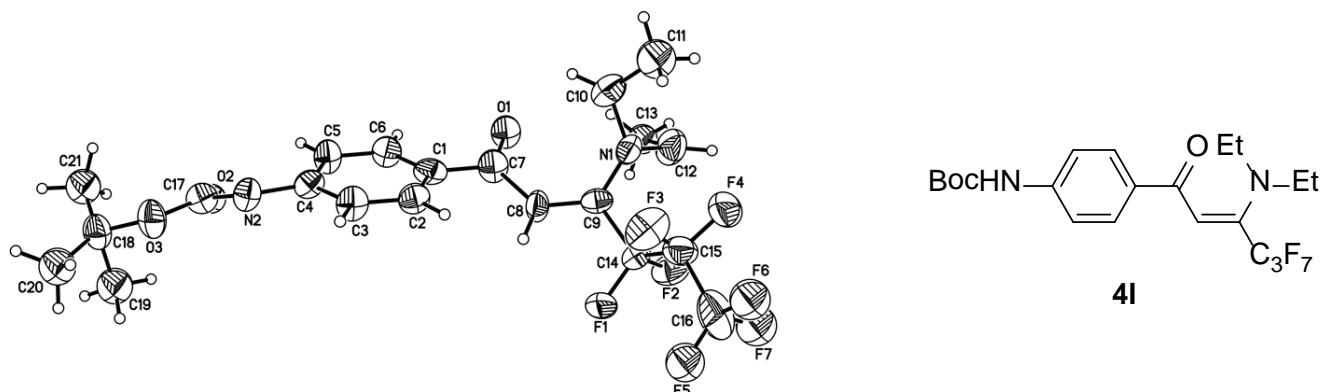
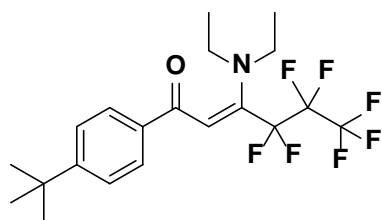


Figure S1. Trap of radical by TEMPO.

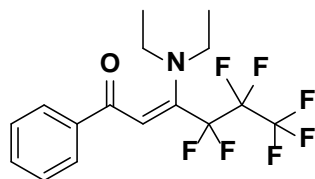


Scheme S1. X-ray crystal structure of product 4l.

Compound characterizations

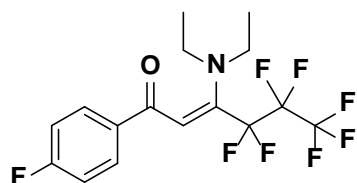


(Z)-1-(4-(tert-butyl)phenyl)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (4a). ^1H NMR (400 MHz, CDCl_3) δ 7.86 (d, $J = 8.3$ Hz, 2H), 7.48 (d, $J = 8.3$ Hz, 2H), 6.48 (s, 1H), 3.24 (q, $J = 7.0$ Hz, 4H), 1.34 (s, 9H), 1.10 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.8, 156.0, 146.1, 136.5, 128.1, 125.5, 106.4 (t, $J = 6.5$ Hz), 47.1, 35.0, 31.0, 13.1 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.46 (t, $J = 10.2$ Hz, 3F), -108.34--108.45 (m, 2F), -125.45--125.55 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{20}\text{H}_{24}\text{F}_7\text{NONa}$: 450.1644, Found: 450.1656. IR (KBr, cm^{-1}): ν 1646, 1451, 1404, 1383, 1341, 1253.



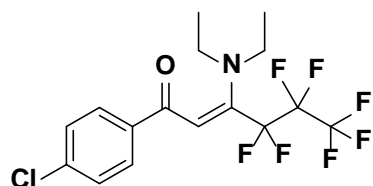
(Z)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluoro-1-phenylhex-2-en-1-one (4b). ^1H NMR (400 MHz, CDCl_3) δ 7.90 (d, $J = 7.5$ Hz, 2H), 7.54-7.50 (m, 1H), 7.47-7.44 (m, 2H), 6.46 (s, 1H), 3.26 (q, $J = 6.9$ Hz, 4H), 1.11 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.9, 146.5, 139.2, 132.2,

128.5, 128.1, 105.7(t, $J=6.2$ Hz), 47.3, 13.1 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.50 (t, $J = 10.2$ Hz, 3F), -108.26--108.37 (m, 2F), -125.43--125.53 (m, 2F). MS: Anal. Calcd. For $C_{16}H_{17}F_7NO$: 372, Found: 372 ($M+1^+$). IR (KBr, cm^{-1}): ν 1641, 1450, 1401, 1384, 1343, 1232.



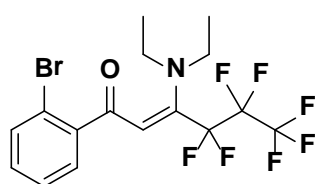
(Z)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluoro-1-(4-fluorophenyl)hex-2-en-1-one (4c).

1H NMR (400 MHz, $CDCl_3$) δ 7.94-7.91 (m, 2H), 7.14-7.10 (m, 2H), 6.41 (s, 1H), 3.21 (q, $J = 7.1$ Hz, 4H), 1.11 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.2, 166.5, 163.9, 146.7, 135.5, 130.6, 130.6, 115.6, 115.4, 105.0 (t, $J=6.4$ Hz), 47.3, 13.1 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.38 (t, $J = 10.3$ Hz, 3F), -106.79--106.89 (m, 1F), -108.15--108.26 (m, 2F), -125.32--125.42 (m, 2F). MS: Anal. Calcd. For $C_{16}H_{16}F_8NO$: 390, Found: 390 ($M+1^+$). IR (KBr, cm^{-1}): ν 1640, 1454, 1413, 1383, 1338, 1232.



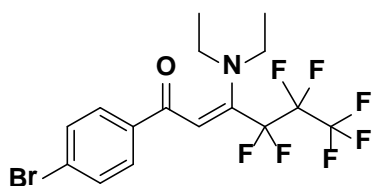
(Z)-1-(4-chlorophenyl)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (4d).

1H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, $J = 8.4$ Hz, 2H), 7.42 (d, $J = 8.3$ Hz, 2H), 6.39 (s, 1H), 3.28 (q, $J = 7.0$ Hz, 4H), 1.12 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.2, 146.9, 138.5, 137.6, 129.5, 128.7, 104.3 (t, $J=6.5$ Hz), 47.4, 13.2 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.40 (t, $J = 10.3$ Hz, 3F), -108.10--108.21 (m, 2F), -125.31--125.40 (m, 2F). HRMS: Anal. Calcd. For $C_{16}H_{16}^{35}ClF_7NO$: 406.0809, $C_{16}H_{16}^{37}ClF_7NO$: 408.0779, Found: 406.0815 ($M+1^+$), (^{35}Cl), , 408.0788 ($M+1^+$), (^{37}Cl). IR (KBr, cm^{-1}): ν 1647, 1453, 1405, 1386, 1330, 1240.



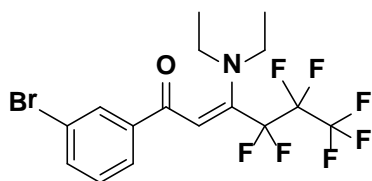
(Z)-1-(2-bromophenyl)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (4e).

^1H NMR (400 MHz, CDCl_3) δ 7.59 (d, $J = 7.9$ Hz, 1H), 7.50 (d, $J = 7.6$ Hz, 1H), 7.36 (t, $J = 7.5$ Hz, 1H), 7.27 (t, $J = 7.6$ Hz, 1H), 6.11 (s, 1H), 3.38 (q, $J = 7.0$ Hz, 4H), 1.18 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 187.5, 146.3, 142.7, 133.4, 131.3, 129.7, 127.4, 119.7, 107.6 (t, $J = 6.7$ Hz), 47.6, 13.6 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.41 (t, $J = 10.2$ Hz, 3F), -108.08--108.19 (m, 2F), -125.22--125.31 (m, 2F). MS: Anal. Calcd. For $\text{C}_{16}\text{H}_{16}^{79}\text{BrF}_7\text{NO}$: 450, $\text{C}_{16}\text{H}_{16}^{81}\text{BrF}_7\text{NO}$: 452, Found: 450 ($\text{M}+1^+$), (^{79}Br), 452 ($\text{M}+1^+$), (^{81}Br). IR (KBr, cm^{-1}): ν 1642, 1451, 1407, 1383, 1342, 1270.



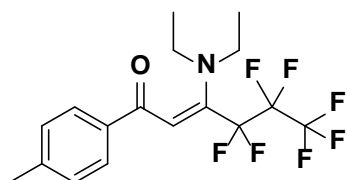
(Z)-1-(4-bromophenyl)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (4f).

^1H NMR (400 MHz, CDCl_3) δ 7.76 (d, $J = 8.6$ Hz, 2H), 7.59 (d, $J = 8.6$ Hz, 2H), 6.38 (s, 1H), 3.28 (q, $J = 7.0$ Hz, 4H), 1.11 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 185.3, 146.9, 138.0, 131.7, 129.6, 127.1, 104.3 (t, $J = 6.3$ Hz), 47.4, 13.2 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.37 (t, $J = 10.3$ Hz, 3F), -108.06--108.17 (m, 2F), -125.27--125.37 (m, 2F). MS: Anal. Calcd. For $\text{C}_{16}\text{H}_{16}^{79}\text{BrF}_7\text{NO}$: 450, $\text{C}_{16}\text{H}_{16}^{81}\text{BrF}_7\text{NO}$: 452, Found: 450 ($\text{M}+1^+$), (^{79}Br), 452 ($\text{M}+1^+$), (^{81}Br). IR (KBr, cm^{-1}): ν 1647, 1454, 1409, 1383, 1340, 1273.

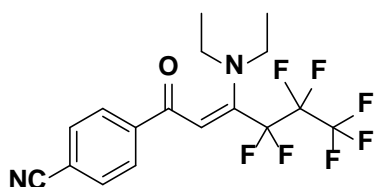


(Z)-1-(3-bromophenyl)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (4g).

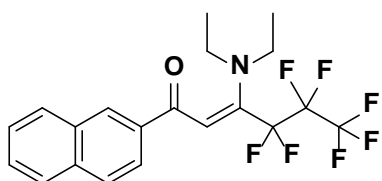
^1H NMR (400 MHz, CDCl_3) δ 8.03 (s, 1H), 7.80 (d, $J = 7.7$ Hz, 1H), 7.64 (d, $J = 7.8$ Hz, 1H), 7.33 (t, $J = 7.8$ Hz, 1H), 6.36 (s, 1H), 3.29 (q, $J = 6.9$ Hz, 4H), 1.12 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 184.7, 147.3, 141.1, 134.9, 131.1, 130.0, 126.6, 122.8, 103.8 (t, $J = 6.4$ Hz), 47.5, 13.2 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.34 (t, $J = 10.3$ Hz, 3F), -108.00--108.11 (m, 2F), -125.22--125.32 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{16}\text{H}_{16}^{79}\text{BrF}_7\text{NO}$: 450.0303, $\text{C}_{16}\text{H}_{16}^{81}\text{BrF}_7\text{NO}$: 452.0283, Found: 450.0285 ($\text{M}+1^+$), (^{79}Br), 452.0271 ($\text{M}+1^+$), (^{81}Br). IR (KBr, cm^{-1}): ν 1647, 1454, 1408, 1383, 1339, 1274.



(Z)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluoro-1-(p-tolyl)hex-2-en-1-one (4h). ^1H NMR (400 MHz, CDCl_3) δ 7.80 (d, $J = 7.5$ Hz, 2H), 7.26 (d, $J = 7.2$ Hz, 2H), 6.45 (s, 1H), 3.23 (q, $J = 6.9$ Hz, 4H), 2.41 (s, 3H), 1.10 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.8, 146.1, 143.0, 136.5, 129.2, 128.3, 106.4 (t, $J = 6.7$ Hz), 47.2, 21.5, 13.1 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.41 (t, $J = 10.1$ Hz, 3F), -108.30--108.40 (m, 2F), -125.40--125.49 (m, 2F). MS: Anal. Calcd. For $\text{C}_{17}\text{H}_{19}\text{F}_7\text{NO}$: 386, Found: 386 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1638, 1450, 1406, 1384, 1341, 1273.

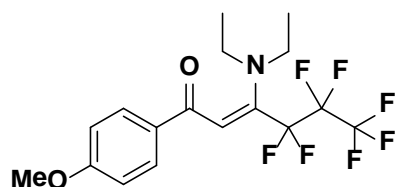


(Z)-4-(3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-enoyl)benzonitrile (4i). ^1H NMR (400 MHz, CDCl_3) δ 7.98 (d, $J = 8.0$ Hz, 2H), 7.77 (d, $J = 8.0$ Hz, 2H), 6.35 (s, 1H), 3.35 (q, $J = 7.0$ Hz, 4H), 1.15 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 183.9, 147.9, 142.7, 132.3, 128.4, 118.2, 115.1, 102.4 (t, $J = 6.7$ Hz), 47.8, 13.3 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.31 (t, $J = 10.3$ Hz, 3F), -107.85--107.96 (m, 2F), -125.11--125.21 (m, 2F). MS: Anal. Calcd. For $\text{C}_{17}\text{H}_{16}\text{F}_7\text{N}_2\text{O}$: 397, Found: 397 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1638, 1449, 1402, 1384, 1350, 1230.



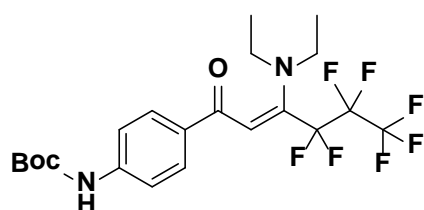
(Z)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluoro-1-(naphthalen-2-yl)hex-2-en-1-one (4j). ^1H NMR (400 MHz, CDCl_3) δ 8.37 (s, 1H), 8.01 (d, $J = 8.6$ Hz, 1H), 7.94 (d, $J = 7.8$ Hz, 1H), 7.88-7.83 (m, 2H), 7.56-7.49 (m, 2H), 6.63 (s, 1H), 3.29 (q, $J = 7.0$ Hz, 4H), 1.12 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.7, 146.5, 136.5, 135.2, 132.5, 129.5, 129.4, 128.4, 128.1, 127.7, 126.6, 124.2, 105.9 (t, $J = 6.4$ Hz), 47.3, 13.1 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.29 (t, $J = 10.3$ Hz, 3F), -108.08--108.19 (m, 2F), -125.22--

125.32 (m, 2F). HRMS: Anal. Calcd. For $C_{20}H_{19}F_7NO$: 422.1355, Found: 422.1362 ($M+1^+$). IR (KBr, cm^{-1}): ν 1639, 1454, 1410, 1383, 1334, 1274.



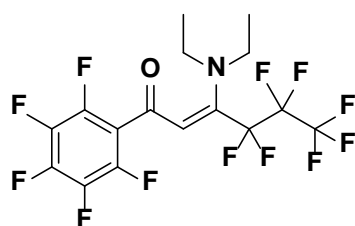
(Z)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluoro-1-(4-fluorophenyl)hex-2-en-1-one (4k).

1H NMR (400 MHz, $CDCl_3$) δ 7.90 (d, $J = 8.8$ Hz, 2H), 6.94 (d, $J = 8.8$ Hz, 2H), 6.46 (s, 1H), 3.85 (s, 3H), 3.22 (q, $J = 7.0$ Hz, 4H), 1.09 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.1, 162.9, 145.8, 132.0, 130.3, 113.6, 106.9 (t, $J = 6.1$ Hz), 55.3, 47.0, 13.0 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.45 (t, $J = 10.2$ Hz, 3F), -108.42--108.53 (m, 2F), -125.46--125.55 (m, 2F). HRMS: Anal. Calcd. For $C_{17}H_{19}F_7NO_2$: 402.1304, Found: 402.1273 ($M+1^+$). IR (KBr, cm^{-1}): ν 1644, 1451, 1408, 1384, 1341, 1250.



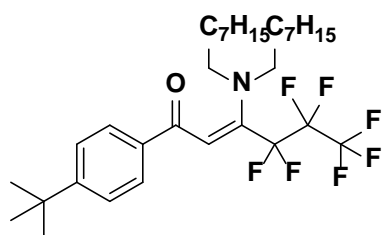
(Z)-tert-butyl (4-(3-(diethylamino)-4,4,5,5,6,6,6-heptafluorohex-2-enoyl)phenyl)carbamate (4l).

1H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, $J = 8.2$ Hz, 2H), 7.51 (d, $J = 8.1$ Hz, 2H), 7.30 (s, 1H), 6.46 (s, 1H), 3.23 (q, $J = 6.8$ Hz, 4H), 1.50 (s, 9H), 1.09 (t, $J = 6.9$ Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.1, 152.4, 146.0, 142.6, 133.4, 129.5, 117.5, 106.2 (t, $J = 6.6$ Hz), 80.9, 47.1, 28.1, 13.0 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.44 (t, $J = 10.2$ Hz, 3F), -108.33--108.44 (m, 2F), -125.43--125.52 (m, 2F). HRMS: Anal. Calcd. For $C_{21}H_{26}F_7N_2O_3$: 487.1832, Found: 487.1801 ($M+1^+$). IR (KBr, cm^{-1}): ν 1647, 1450, 1406, 1383, 1339, 1279.



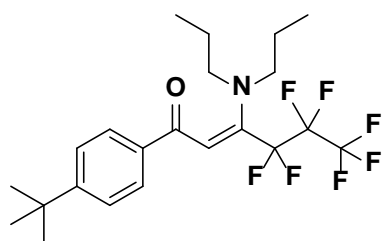
(Z)-3-(diethylamino)-4,4,5,5,6,6,6-heptafluoro-1-(perfluorophenyl)hex-2-en-1-one

(4m). ^1H NMR (400 MHz, CDCl_3) δ 5.89 (s, 1H), 3.46 (q, $J = 7.0$ Hz, 4H), 1.19 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 175.5, 147.7, 105.0 (t, $J = 6.4$ Hz), 48.5, 13.2 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.35 (t, $J = 10.2$ Hz, 3F), -108.00--108.10 (m, 2F), -124.94--125.03 (m, 2F), -142.07--142.19 (m, 2F), -151.93--152.08 (m, 1F), -160.76--160.94 (m, 2F). MS: Anal. Calcd. For $\text{C}_{16}\text{H}_{12}\text{F}_{12}\text{NO}$: 462, Found: 462 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1648, 1450, 1409, 1383, 1338, 1273.



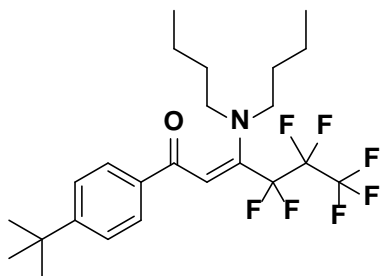
(Z)-1-(4-(tert-butyl)phenyl)-3-(dioctylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one

(5a). ^1H NMR (400 MHz, CDCl_3) δ 7.85 (d, $J = 8.2$ Hz, 2H), 7.47 (d, $J = 8.2$ Hz, 2H), 6.41 (s, 1H), 3.17 (t, $J = 7.4$ Hz, 4H), 1.56-1.50 (m, 4H), 1.34 (s, 9H), 1.27-1.20 (m, 20H), 0.86 (t, $J = 6.6$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.4, 155.7, 146.9, 136.8, 128.1, 125.4, 104.7 (t, $J = 5.8$ Hz), 53.2, 35.0, 31.7, 31.1, 29.2, 29.2, 27.8, 26.7, 22.6, 14.0. Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.31 (t, $J = 10.4$ Hz, 3F), -107.01--107.12 (m, 2F), -124.95--125.04 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{32}\text{H}_{49}\text{NOF}_7$: 596.3702, Found: 596.3683 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1647, 1464, 1400, 1385, 1340, 1230.

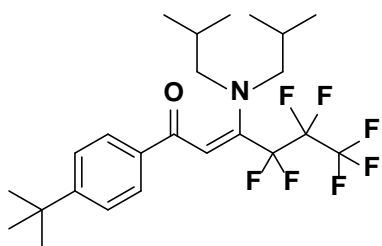


(Z)-1-(4-(tert-butyl)phenyl)-3-(dipropylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one

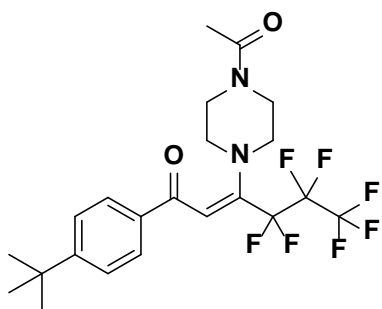
(5b). ^1H NMR (400 MHz, CDCl_3) δ 7.86 (d, $J = 8.2$ Hz, 2H), 7.48 (d, $J = 8.2$ Hz, 2H), 6.43 (s, 1H), 3.16 (t, $J = 7.0$ Hz, 4H), 1.62-1.55 (m, 4H), 1.34 (s, 9H), 0.85 (t, $J = 7.3$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.4, 155.7, 147.2, 136.8, 128.0, 125.4, 104.5 (t, $J = 7.0$ Hz), 54.7, 34.9, 31.0, 21.0, 11.0 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.46 (t, $J = 10.4$ Hz, 3F), -106.87--106.98 (m, 2F), -125.10--125.19 (m, 2F). MS: Anal. Calcd. For $\text{C}_{22}\text{H}_{29}\text{F}_7\text{NO}$: 456, Found: 456 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1639, 1455, 1416, 1383, 1333, 1274.



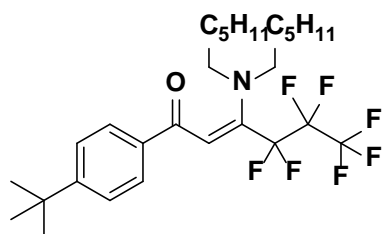
(Z)-1-(4-(tert-butyl)phenyl)-3-(dibutylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (5c). ^1H NMR (400 MHz, CDCl_3) δ 7.86 (d, $J = 7.9$ Hz, 2H), 7.48 (d, $J = 8.0$ Hz, 2H), 6.42 (s, 1H), 3.18 (t, $J = 7.3$ Hz, 4H), 1.57-1.49 (m, 4H), 1.34 (s, 9H), 1.29-1.23 (m, 4H), 0.88 (t, $J = 7.3$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.4, 155.7, 147.1, 136.8, 128.0, 125.4, 104.6 (t, $J = 6.8$ Hz), 52.9, 35.0, 31.1, 29.9, 19.8, 13.7 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.43 (t, $J = 10.4$ Hz, 3F), -107.05--107.17 (m, 2F), -125.08--125.18 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{24}\text{H}_{33}\text{F}_7\text{NO}$: 484.2450, Found: 484.2451 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1638, 1454, 1414, 1383, 1332, 1274.



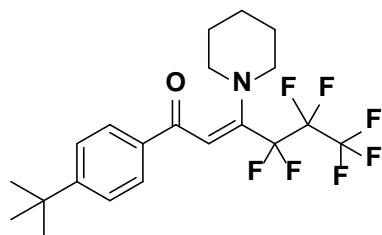
(Z)-1-(4-(tert-butyl)phenyl)-3-(diisobutylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (5d). ^1H NMR (400 MHz, CDCl_3) δ 7.86 (d, $J = 8.5$ Hz, 2H), 7.47 (d, $J = 8.5$ Hz, 2H), 6.35 (s, 1H), 3.03 (d, $J = 6.6$ Hz, 4H), 2.01-1.94 (m, 2H), 1.34 (s, 9H), 0.87 (d, $J = 6.7$ Hz, 12H); ^{13}C NMR (100 MHz, CDCl_3) δ 185.8, 155.5, 147.6, 137.2, 127.9, 125.4, 102.0 (t, $J = 5.5$ Hz), 60.8, 34.9, 31.1, 26.1, 19.9 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.21 (t, $J = 10.8$ Hz, 3F), -104.38--104.48 (m, 2F), -123.79--123.88 (m, 2F). MS: Anal. Calcd. For $\text{C}_{24}\text{H}_{33}\text{F}_7\text{NO}$: 484, Found: 484 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1638, 1454, 1401, 1384, 1338, 1273.



(Z)-3-(4-acetylpiperazin-1-yl)-1-(4-(tert-butyl)phenyl)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (5e). ^1H NMR (400 MHz, CDCl_3) δ 7.84 (d, $J = 8.3$ Hz, 2H), 7.51 (d, $J = 8.3$ Hz, 2H), 6.60 (s, 1H), 3.64-3.61 (m, 2H), 3.50-3.48 (m, 2H), 3.09-3.07 (m, 4H), 2.09 (s, 3H), 1.35 (s, 9H); ^{13}C NMR (100 MHz, CDCl_3) δ 188.4, 168.8, 157.0, 146.1 (t, $J = 23$ Hz), 135.2, 128.3, 125.6, 112.5 (t, $J = 5.0$ Hz), 51.6, 50.8, 45.9, 41.0, 35.0, 30.8, 21.0 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.43 (t, $J = 9.5$ Hz, 3F), -110.49--110.59 (m, 2F), -125.43--125.51 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{22}\text{H}_{25}\text{F}_7\text{N}_2\text{O}_2\text{Na}$: 505.1702, Found: 505.1701. IR (KBr, cm^{-1}): ν 1655, 1458, 1426, 1385, 1343, 1229.

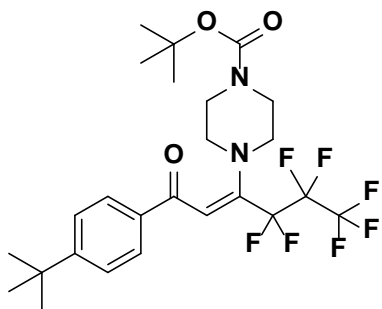


(Z)-1-(4-(tert-butyl)phenyl)-3-(dihexylamino)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (5f). ^1H NMR (400 MHz, CDCl_3) δ 7.83 (d, $J = 8.4$ Hz, 2H), 7.46 (d, $J = 8.5$ Hz, 2H), 6.39 (s, 1H), 3.15 (t, $J = 7.6$ Hz, 4H), 1.55-1.49 (m, 4H), 1.33 (s, 9H), 1.25-1.20 (m, 12H), 0.83 (t, $J = 6.8$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.4, 155.7, 146.9, 136.8, 128.0, 125.4, 104.7 (t, $J = 6.8$ Hz), 53.2, 35.0, 31.4, 31.1, 27.8, 26.3, 22.5, 13.9 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.30 (t, $J = 10.5$ Hz, 3F), -107.02--107.13 (m, 2F), -124.96--125.06 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{28}\text{H}_{41}\text{NOF}_7$: 540.3076, Found: 540.3054 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1638, 1449, 1407, 1386, 1328, 1272.

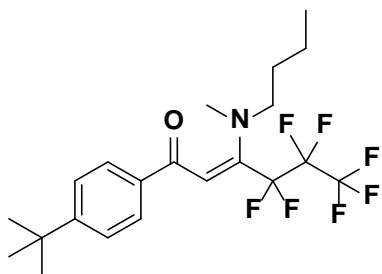


(Z)-1-(4-(tert-butyl)phenyl)-4,4,5,5,6,6,6-heptafluoro-3-(piperidin-1-yl)hex-2-en-1-one (5g). ^1H NMR (400 MHz, CDCl_3) δ 7.84 (d, $J = 8.3$ Hz, 2H), 7.48 (d, $J = 8.3$ Hz, 2H), 6.36 (s, 1H), 3.07 (s, 4H), 1.61 (s, 6H), 1.34 (s, 9H); ^{13}C NMR (100 MHz, CDCl_3) δ 187.8, 156.2, 148.2, 136.2, 128.2, 125.5, 106.8 (t, $J = 6.2$ Hz), 53.0, 35.0, 31.0, 26.1, 23.6 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.40 (t, $J = 9.8$ Hz, 3F), -109.64--109.75

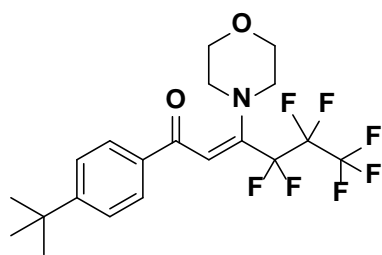
(m, 2F), -125.03--125.12 (m, 2F). HRMS: Anal. Calcd. For $C_{21}H_{25}F_7NO$: 440.1824, Found: 440.1850 ($M+1^+$). IR (KBr, cm^{-1}): ν 1647, 1454, 1408, 1383, 1338, 1273.



(Z)-tert-butyl 4-(1-(4-(tert-butyl)phenyl)-4,4,5,5,6,6,6-heptafluoro-1-oxohex-2-en-3-yl)piperazine-1-carboxylate (5h). 1H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, $J = 8.1$ Hz, 2H), 7.50 (d, $J = 8.1$ Hz, 2H), 6.53 (s, 1H), 3.46-3.44 (m, 4H), 3.07-3.05 (m, 4H), 1.45 (s, 9H), 1.35 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 188.4, 157.0, 154.4, 146.7, 135.5, 128.4, 125.7, 111.1 (t, $J = 5.0$ Hz), 80.0, 51.4, 42.8, 35.1, 31.0, 28.3 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.35 (t, $J = 9.6$ Hz, 3F), -110.20--110.30 (m, 2F), -125.34--125.42 (m, 2F). HRMS: Anal. Calcd. For $C_{25}H_{32}N_2O_3F_7$: 541.2301, Found: 541.2285 ($M+1^+$). IR (KBr, cm^{-1}): ν 1660, 1461, 1417, 1367, 1343, 1227.

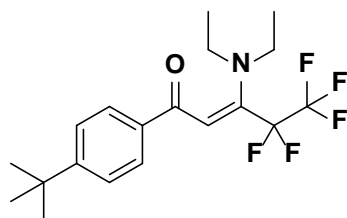


(Z)-3-(butyl(methyl)amino)-1-(4-(tert-butyl)phenyl)-4,4,5,5,6,6,6-heptafluorohex-2-en-1-one (5i). 1H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, $J = 8.1$ Hz, 2H), 7.48 (d, $J = 8.1$ Hz, 2H), 6.32 (s, 1H), 3.24 (t, $J = 7.4$ Hz, 2H), 2.87 (s, 3H), 1.62-1.56 (m, 2H), 1.33-1.26 (m, 11H), 0.92 (t, $J = 7.3$ Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.7, 155.7, 147.0, 136.8, 128.1, 125.4, 103.1 (t, $J = 6.4$ Hz), 55.1, 43.8, 35.0, 31.1, 30.6, 19.7, 13.7 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -80.50 (t, $J = 9.9$ Hz, 3F), -107.84--107.95 (m, 2F), -125.42--125.50 (m, 2F). MS: Anal. Calcd. For $C_{21}H_{27}F_7NO$: 442, Found: 442 ($M+1^+$). IR (KBr, cm^{-1}): ν 1647, 1454, 1408, 1383, 1334, 1273.



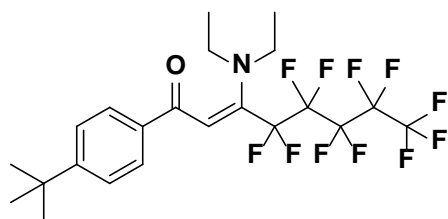
(Z)-1-(4-(tert-butyl)phenyl)-4,4,5,5,6,6,6-heptafluoro-3-morpholinohex-2-en-1-one

(5j). ^1H NMR (400 MHz, CDCl_3) δ 7.85 (d, $J = 7.9$ Hz, 2H), 7.50 (d, $J = 8.0$ Hz, 2H), 6.47 (s, 1H), 3.71 (t, $J = 4.0$ Hz, 4H), 3.13 (t, $J = 4.0$ Hz, 4H), 1.35 (s, 9H); ^{13}C NMR (100 MHz, CDCl_3) δ 188.2, 156.7, 146.5, 135.7, 128.3, 125.6, 109.0 (t, $J = 5.9$ Hz), 66.5, 52.0, 35.1, 31.0 Carbons corresponding to C_3F_7 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.39 (t, $J = 9.6$ Hz, 3F), -109.54--109.64 (m, 2F), -125.27--125.35 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{20}\text{H}_{23}\text{F}_7\text{NO}_2$: 442.1617, Found: 442.1614 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1655, 1451, 1406, 1384, 1343, 1231.



(Z)-1-(4-(tert-butyl)phenyl)-3-(diethylamino)-4,4,5,5,5-pentafluoropent-2-en-1-one

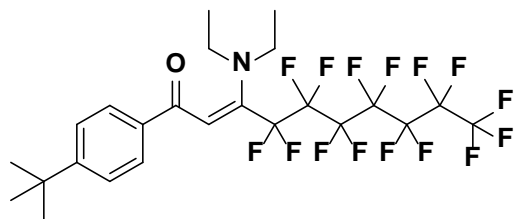
(6a). ^1H NMR (400 MHz, CDCl_3) δ 7.85 (d, $J = 8.3$ Hz, 2H), 7.48 (d, $J = 8.3$ Hz, 2H), 6.49 (s, 1H), 3.25 (q, $J = 7.0$ Hz, 4H), 1.34 (s, 9H), 1.08 (t, $J = 7.1$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.7, 155.9, 145.6, 136.5, 128.1, 125.4, 105.9 (t, $J = 5.7$ Hz), 47.1, 35.0, 31.0, 12.9 Carbons corresponding to C_2F_5 group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -82.82 (s, 3F), -111.11 (s, 2F). MS: Anal. Calcd. For $\text{C}_{19}\text{H}_{25}\text{F}_5\text{NO}$: 378, Found: 378 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1640, 1450, 1408, 1383, 1331, 1273.



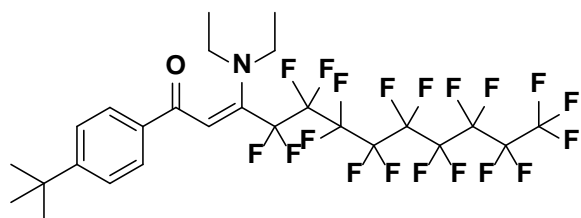
(Z)-1-(4-(tert-butyl)phenyl)-3-(diethylamino)-4,4,5,5,6,6,7,7,8,8,8-undecafluorooct-2-en-1-one (6b).

^1H NMR (400 MHz, CDCl_3) δ 7.86 (d, $J = 8.3$ Hz, 2H), 7.48 (d, $J = 8.3$ Hz, 2H), 6.49 (s, 1H), 3.24 (q, $J = 6.9$ Hz, 4H), 1.34 (s, 9H), 1.10 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.8, 156.0, 146.3, 136.5, 128.1, 125.5, 106.6 (t, $J = 6.4$ Hz), 47.2, 35.0, 31.1, 13.1 Carbons corresponding to C_5F_{11} group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.98 (t, $J = 10.0$

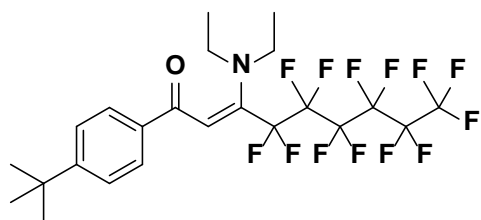
Hz, 3F), -107.67 (t, $J = 14.9$ Hz, 2F), -121.28--121.36 (m, 2F), -122.61--122.71 (m, 2F), -126.24--126.34 (m, 2F). MS: Anal. Calcd. For $C_{22}H_{25}F_{11}NO$: 528, Found: 528 ($M+1^+$). IR (KBr, cm^{-1}): ν 1647, 1451, 1400, 1387, 1358, 1250.



(Z)-1-(4-(tert-butyl)phenyl)-3-(diethylamino)-4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-pentadecafluorodec-2-en-1-one (6c). 1H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, $J = 8.0$ Hz, 2H), 7.49 (d, $J = 8.0$ Hz, 2H), 6.50 (s, 1H), 3.25 (q, $J = 6.8$ Hz, 4H), 1.34 (s, 9H), 1.10 (t, $J = 6.8$ Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 156.0, 146.4, 136.6, 128.2, 125.5, 106.7 (t, $J = 6.1$ Hz), 47.2, 35.0, 31.0, 13.1 Carbons corresponding to C_7F_{15} group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.23 (t, $J = 9.9$ Hz, 3F), -107.75 (t, $J = 14.7$ Hz, 2F), -121.22--121.26 (m, 2F), -121.78--121.85 (m, 2F), -122.14--122.20 (m, 2F), -123.01--123.04 (m, 2F), -126.44--126.50 (m, 2F). HRMS: Anal. Calcd. For $C_{24}H_{25}F_{15}NO$: 628.1697, Found: 628.1637 ($M+1^+$). IR (KBr, cm^{-1}): ν 1638, 1450, 1406, 1384, 1335, 1278.



(Z)-1-(4-(tert-butyl)phenyl)-3-(diethylamino)-4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-nonadecafluorododec-2-en-1-one (6d). 1H NMR (400 MHz, $CDCl_3$) δ 7.86 (d, $J = 8.2$ Hz, 2H), 7.48 (d, $J = 8.2$ Hz, 2H), 6.49 (s, 1H), 3.24 (q, $J = 6.8$ Hz, 4H), 1.34 (s, 9H), 1.10 (t, $J = 6.9$ Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 156.0, 146.4, 136.6, 128.2, 125.5, 106.7 (t, $J = 6.4$ Hz), 47.2, 35.0, 31.0, 13.1 Carbons corresponding to C_9F_{19} group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, $CDCl_3$) δ -81.16 (t, $J = 9.6$ Hz, 3F), -107.72 (t, $J = 14.2$ Hz, 2F), -121.17--121.23 (m, 2F), -121.76--122.13 (m, 8F), -122.98--123.03 (m, 2F), -126.43--126.47 (m, 2F). HRMS: Anal. Calcd. For $C_{26}H_{24}F_{19}NONa$: 750.1452, Found: 750.1461. IR (KBr, cm^{-1}): ν 1638, 1453, 1406, 1390, 1249.



(Z)-1-(4-(tert-butyl)phenyl)-3-(diethylamino)-4,4,5,5,6,6,7,7,8,8,9,9,9-tridecafluoronon-2-en-1-one (6e). ^1H NMR (400 MHz, CDCl_3) δ 7.85 (d, $J = 8.1$ Hz, 2H), 7.48 (d, $J = 8.1$ Hz, 2H), 6.48 (s, 1H), 3.24 (q, $J = 7.0$ Hz, 4H), 1.34 (s, 9H), 1.10 (t, $J = 7.0$ Hz, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 186.8, 156.0, 146.4, 136.5, 128.1, 125.5, 106.6 (t, $J = 6.4$ Hz), 47.2, 35.0, 31.1 13.1 Carbons corresponding to C_6F_{13} group can not be identified due to C-F coupling; ^{19}F NMR (282 MHz, CDCl_3) δ -80.90 (t, $J = 10.0$ Hz, 3F), -107.61 (t, $J = 15.2$ Hz, 2F), -121.04--121.17 (m, 2F), -121.79--121.89 (m, 2F), -122.76--122.84 (m, 2F), -126.18--126.23 (m, 2F). HRMS: Anal. Calcd. For $\text{C}_{23}\text{H}_{25}\text{F}_{13}\text{NO}$: 578.1729, Found: 578.1728 ($\text{M}+1^+$). IR (KBr, cm^{-1}): ν 1645, 1454, 1401, 1387, 1356, 1249.

XRD data of the comound 4l.

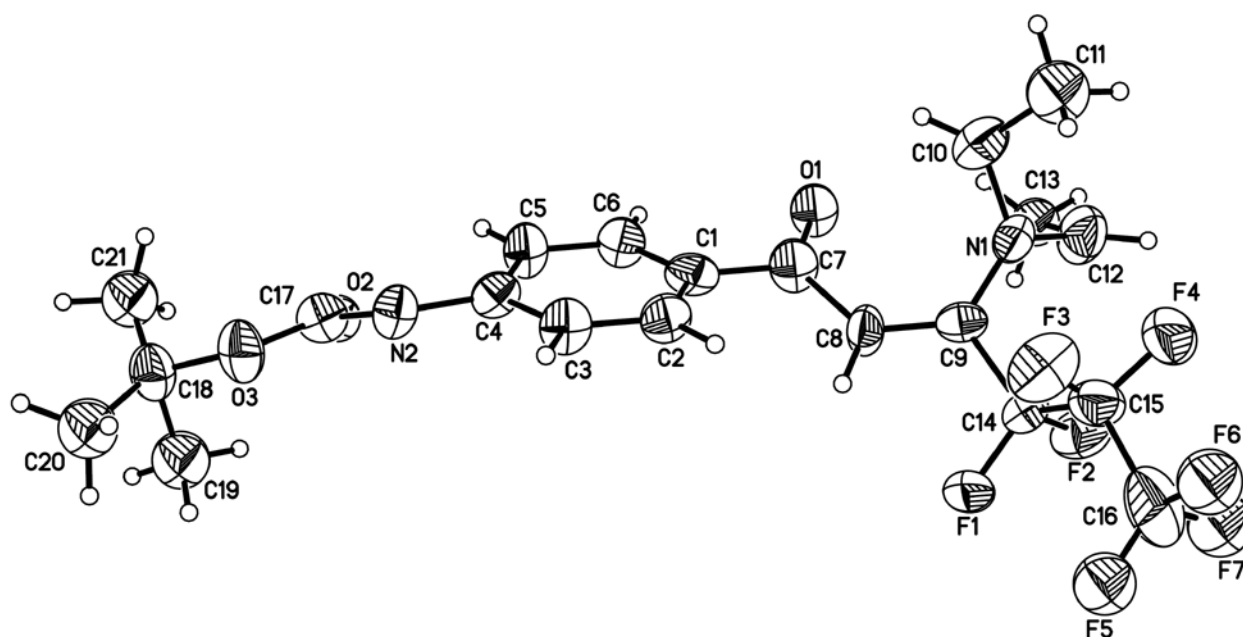


Figure S2. ORTEP structural drawing of **4l**. Ellipsoids are drawn at the 30% probability level, and hydrogen atoms are omitted for clarity.

Table S1. Crystallography data for **4l**

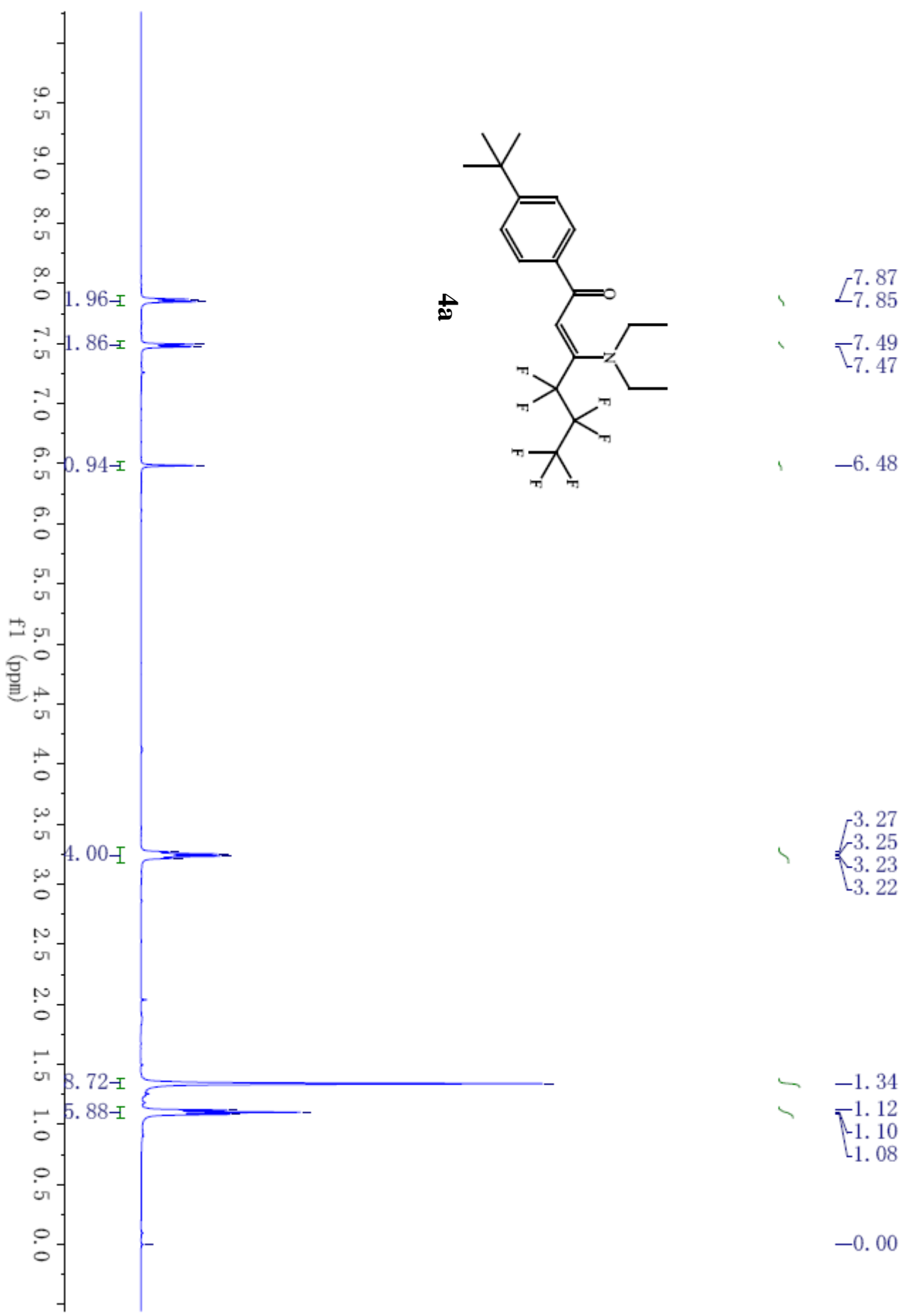
complex	4l
Empirical formula	$C_{21}H_{22}F_7N_2O_3$
Formula weight($g\ mol^{-1}$)	483.41
Temperature	293 (2) K
Wavelength	0.71070 Å
Crystal system	orthorhombic □
space group	P 21
Unit cell dimensions	$a = 26.437(9)$ Å
	$b = 10.311(3)$ Å
	$c = 9.126(3)$ Å
	$\alpha = 90^\circ$ $\beta = 90^\circ$ $\gamma = 90^\circ$
Volume (Å ³)	2487.7(13)
Z	4
$\rho(g\ cm^{-3})$	1.291
F(000)	996
Crystal size(mm ³)	0.65 x 0.20 x 0.20
Theta range for data collection	3.04 ° to 25.35 °
Limiting indices	-31 ≤ h ≤ 31

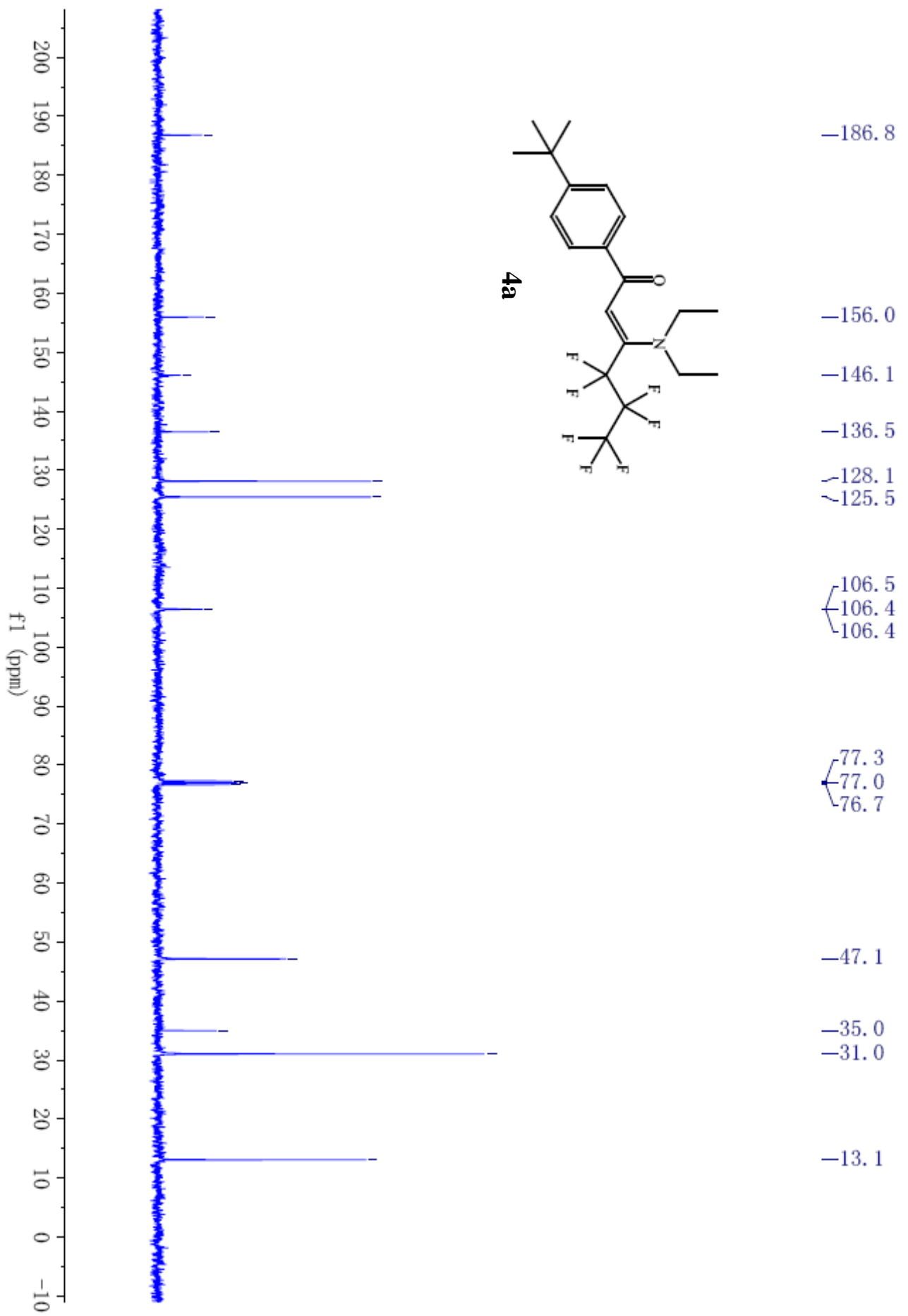
	-12 < = k < = 12
	-9 < = l < = 10
Reflections collected / unique	19746 / 4224
Data / restraints / parameters	4224 / 17 / 290
GOF	1.136
<i>RI</i> , <i>wR2</i> [<i>I</i> > 2σ(<i>I</i>)]	<i>RI</i> = 0.1049 <i>wR2</i> = 0.2433
<i>RI</i> , <i>wR2</i> (all data)	<i>RI</i> = 0.1706 <i>wR2</i> = 0.2747
Largest diff. peak and hole(e Å ³)	1.199 and -0.240

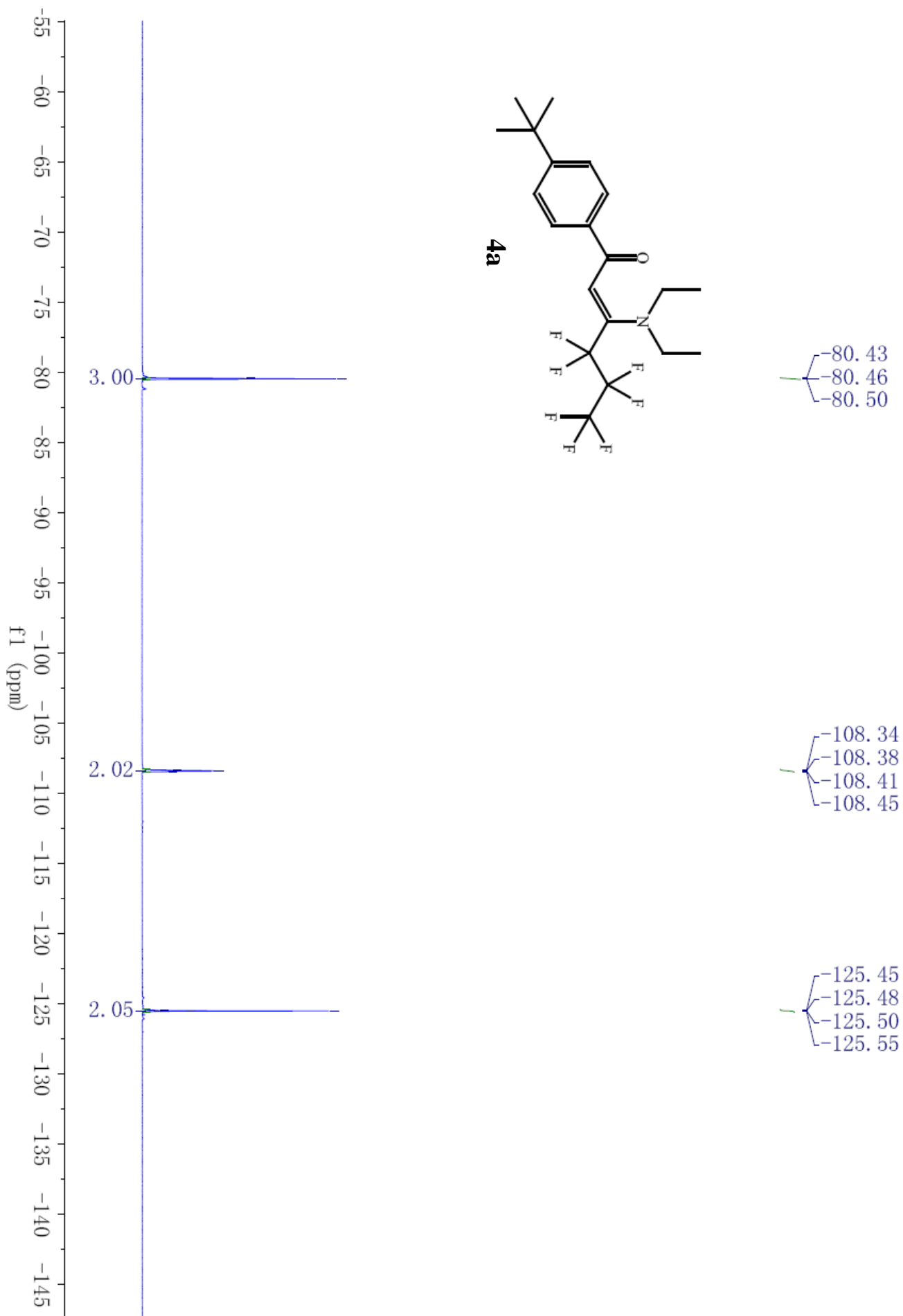
Table S2. Bond lengths [Å] and angles [°] for **4l**

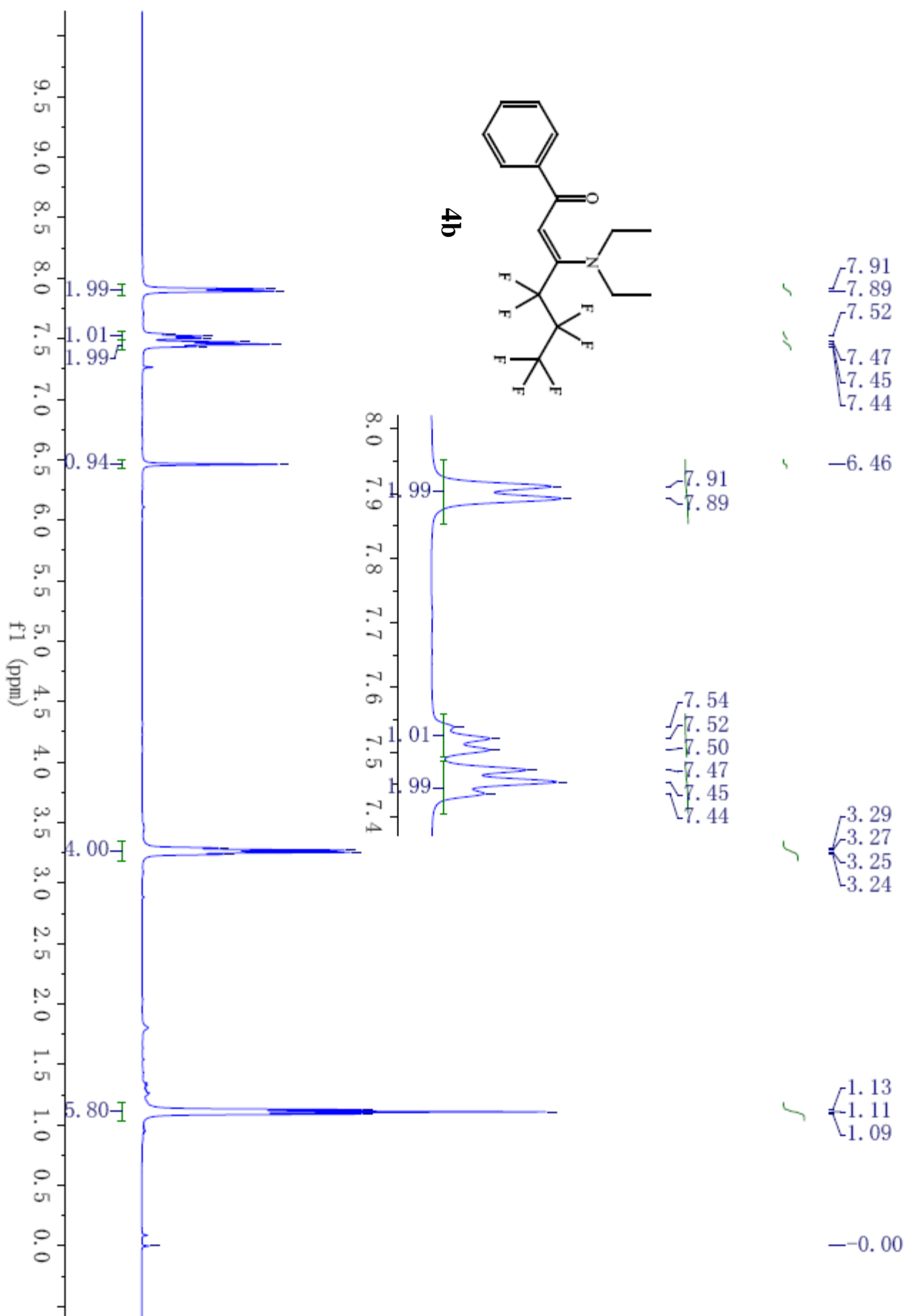
F(1)-C(14)	1.346(9)	F(2)-C(14)	1.355(9)
F(3)-C(15)	1.320(11)	F(4)-C(15)	1.338(11)
F(5)-C(16)	1.192(14)	F(6)-C(16)	1.391(15)
F(7)-C(16)	1.419(18)	F(5A)-C(16)	1.228(16)
F(6A)-C(16)	1.309(15)	F(7A)-C(16)	2.151(11)
O(1)-C(7)	1.226(8)	O(2)-C(17)	1.284(13)
O(2A)-C(17)	1.486(11)	N(1)-C(9)	1.384(9)
O(3)-C(18)	81.9(4)	N(1)-C(10)	1.440(11)
N(1)-C(12)	1.466(11)	N(2)-C(17)	1.339(10)
N(2)-C(4)	1.422(9)	C(17)-O(3)-C(18)	124.1(6)
C(9)-N(1)-C(10)	122.3(7)	C(9)-N(1)-C(12)	122.0(7)
C(10)-N(1)-C(12)	112.4(8)	C(17)-N(2)-C(4)	127.1(6)
F(1)-C(14)-F(2)	105.7(6)	F(1)-C(14)-C(9)	111.1(6)
F(2)-C(14)-C(9)	111.6(6)	F(3)-C(15)-F(4)	108.1(8)
F(5)-C(16)-F(7A)	77.3(13)	F(5)-C(16)-F(6A)	125.9(11)
F(7A)-C(16)-F(6A)	107.7(13)	F(5)-C(16)-F(6)	110.8(11)
F(7A)-C(16)-F(6)	133.9(13)	F(6A)-C(16)-F(6)	29.9(7)
F(5)-C(16)-F(7)	105.9(13)	F(7A)-C(16)-F(7)	29.8(9)
F(6A)-C(16)-F(7)	84.3(10)	F(6)-C(16)-F(7)	114.0(10)
F(5)-C(16)-F(5A)	34.5(7)	F(7A)-C(16)-F(5A)	111.5(13)

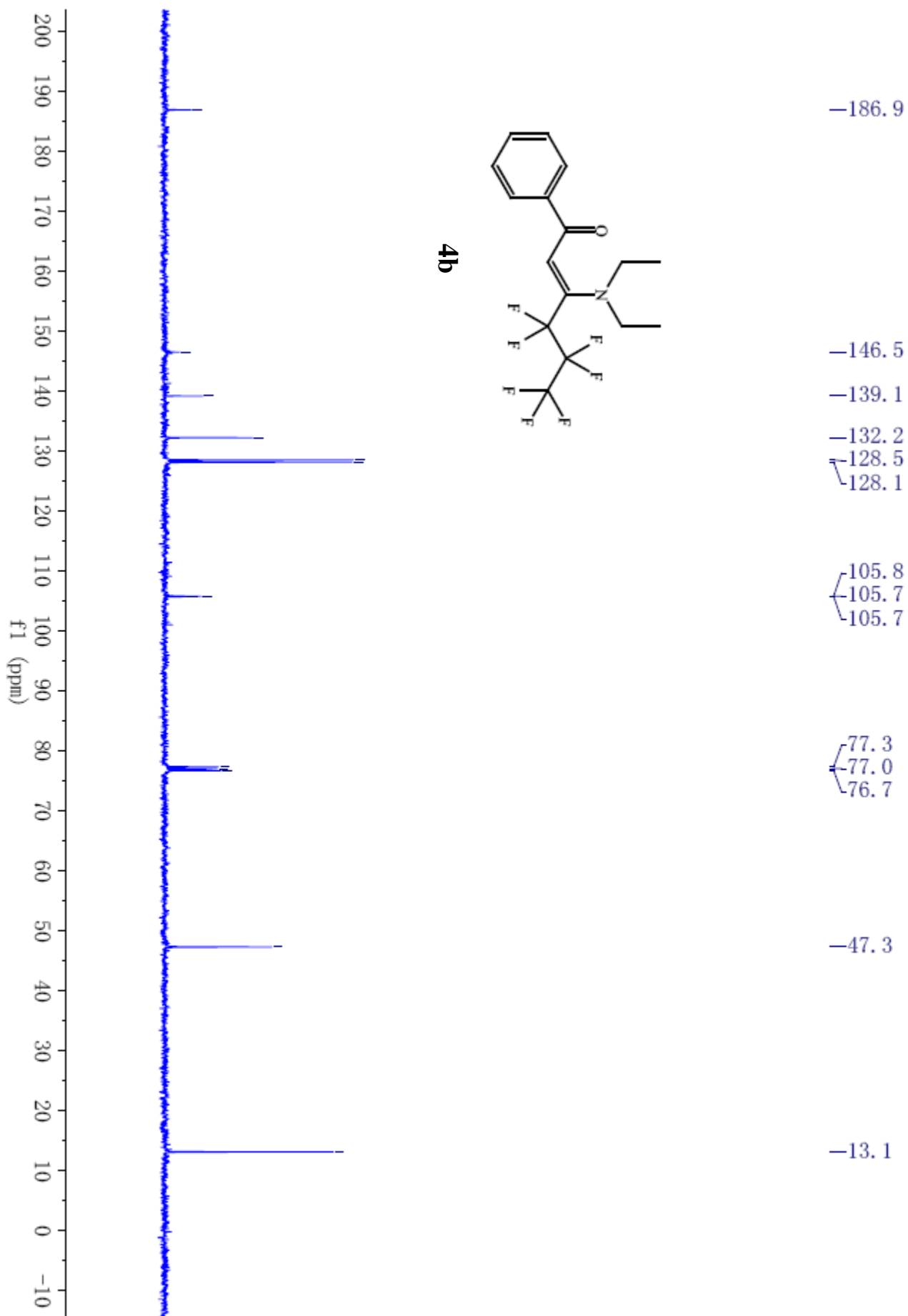
F(6A)-C(16)-F(5A)	116.1(10)	F(6)-C(16)-F(5A)	89.4(9)
F(7)-C(16)-F(5A)	140.4(13)		



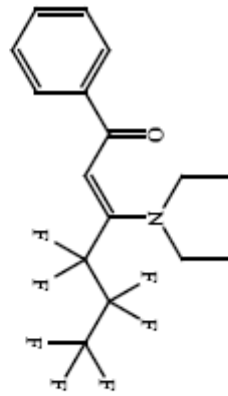








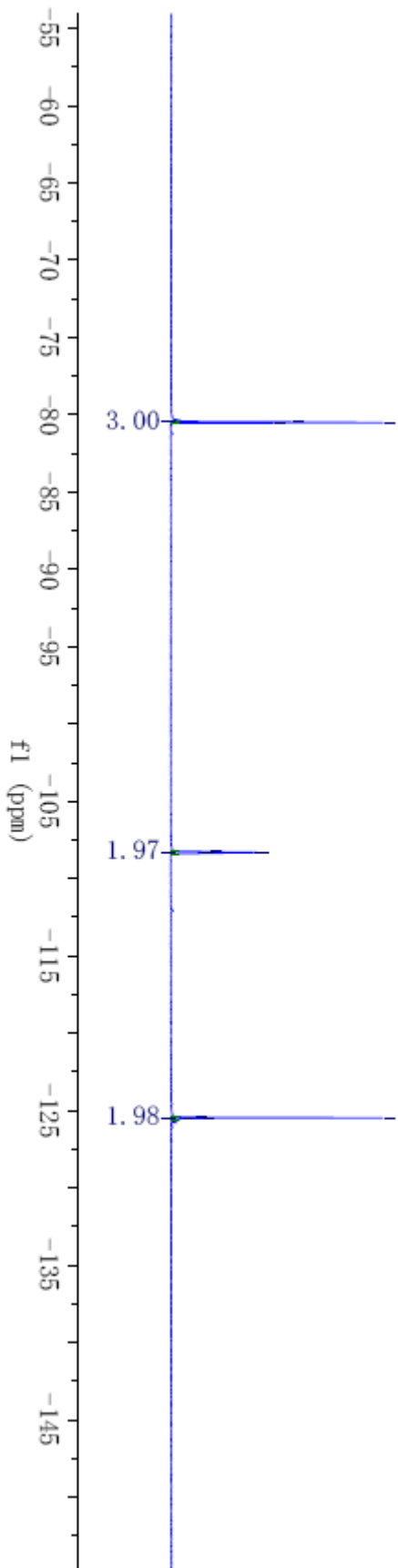
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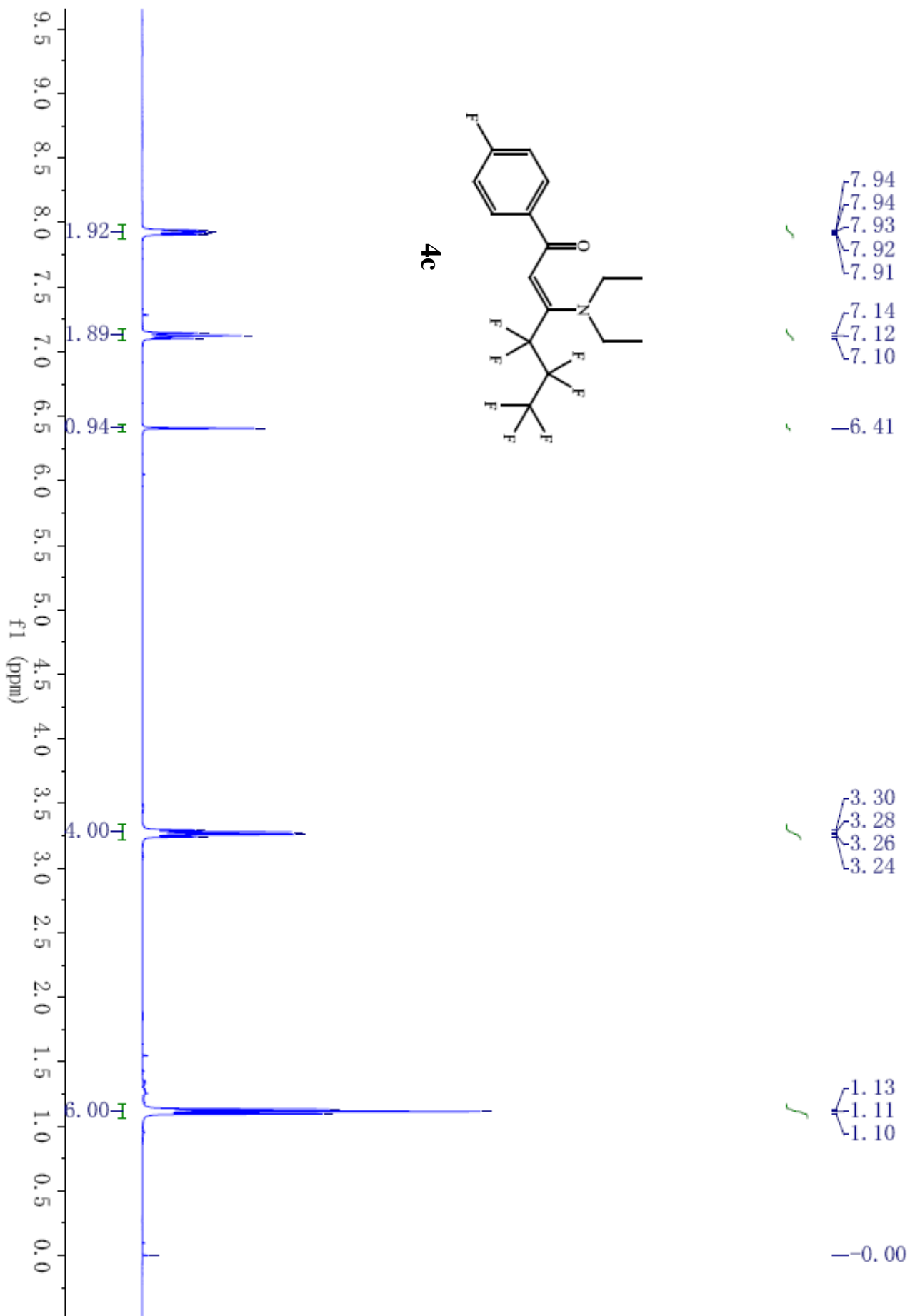


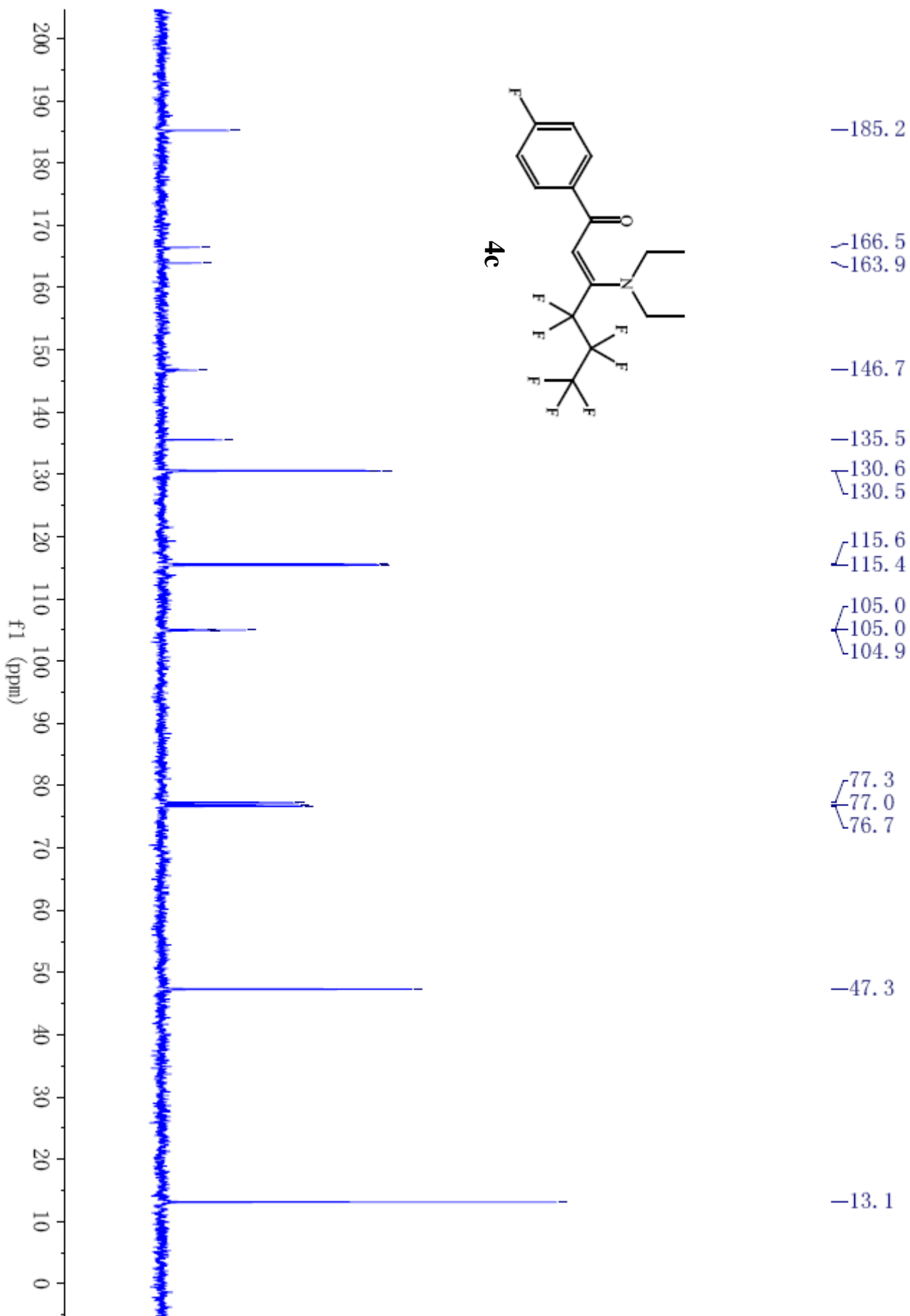
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-80.54

-108.26
-108.30
-108.33
-108.37

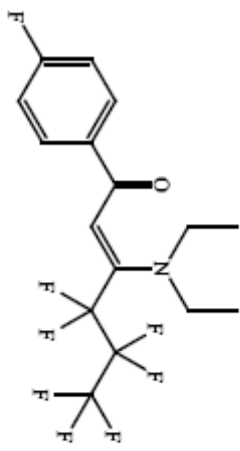
-125.43
-125.48
-125.50
-125.53







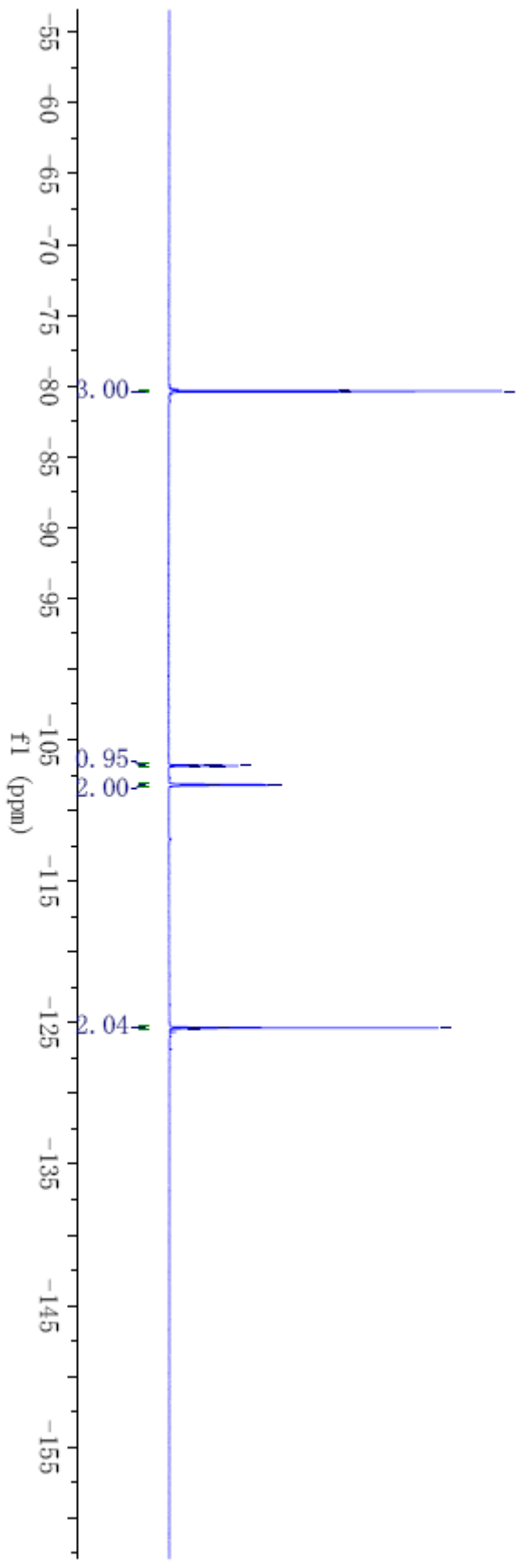
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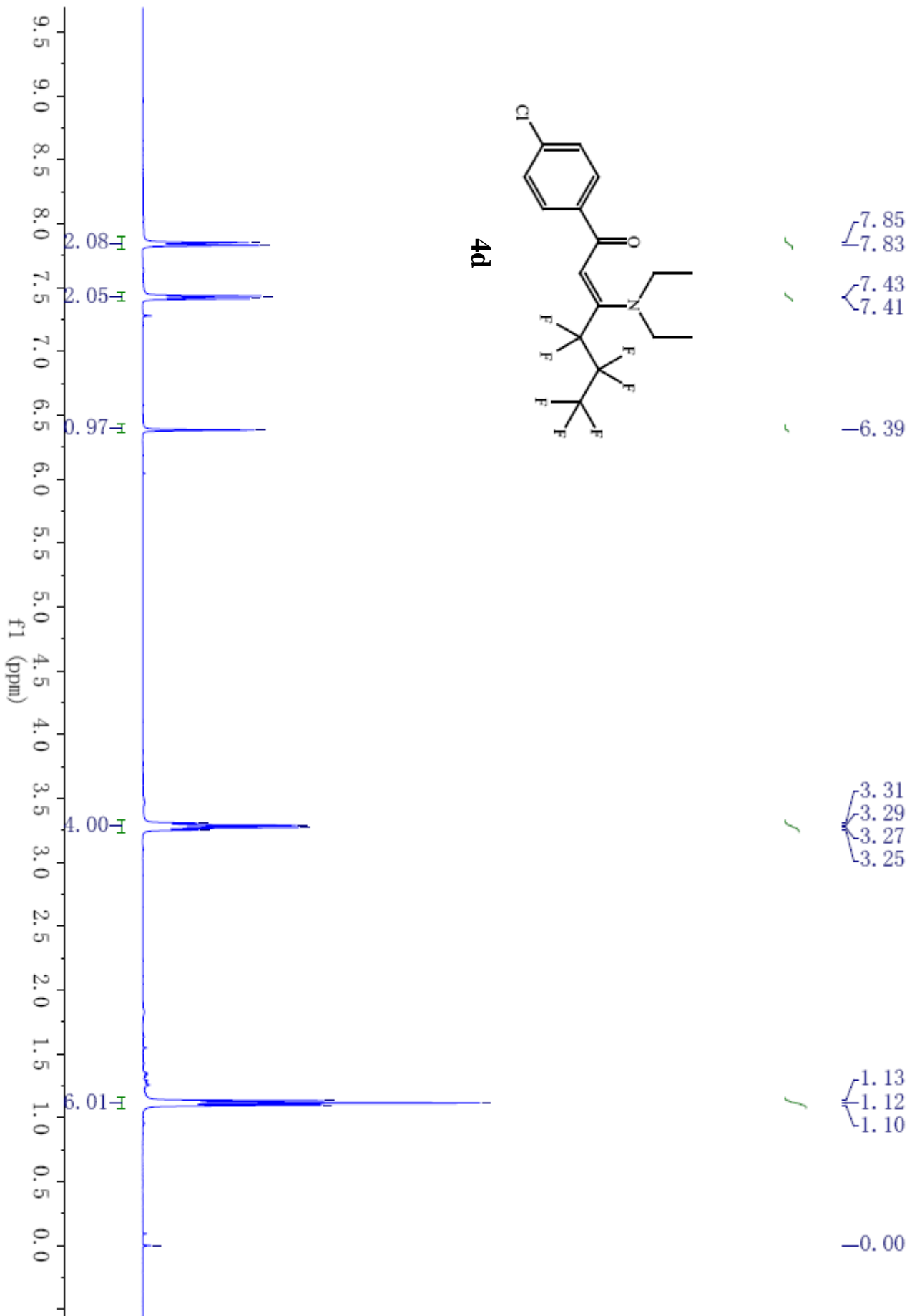


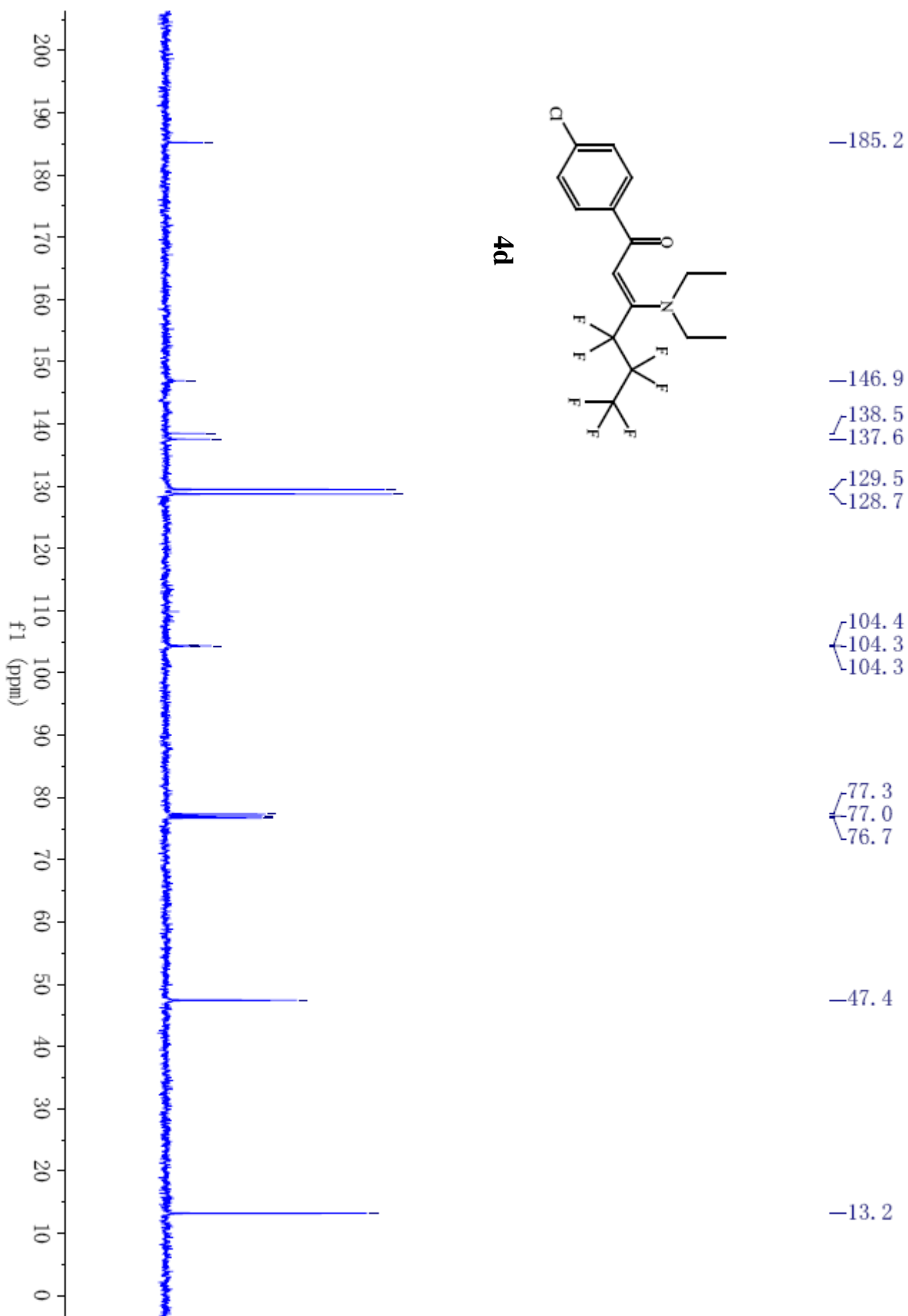
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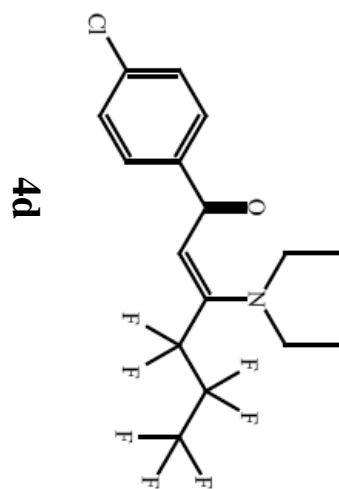
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-108.26

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-125.37
-125.42





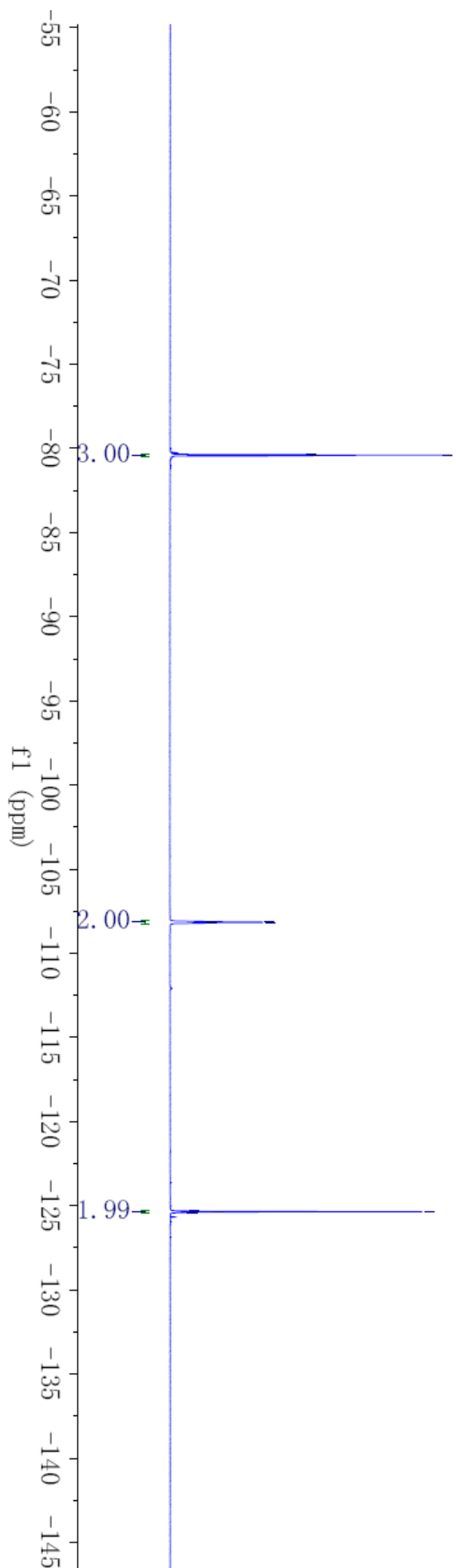


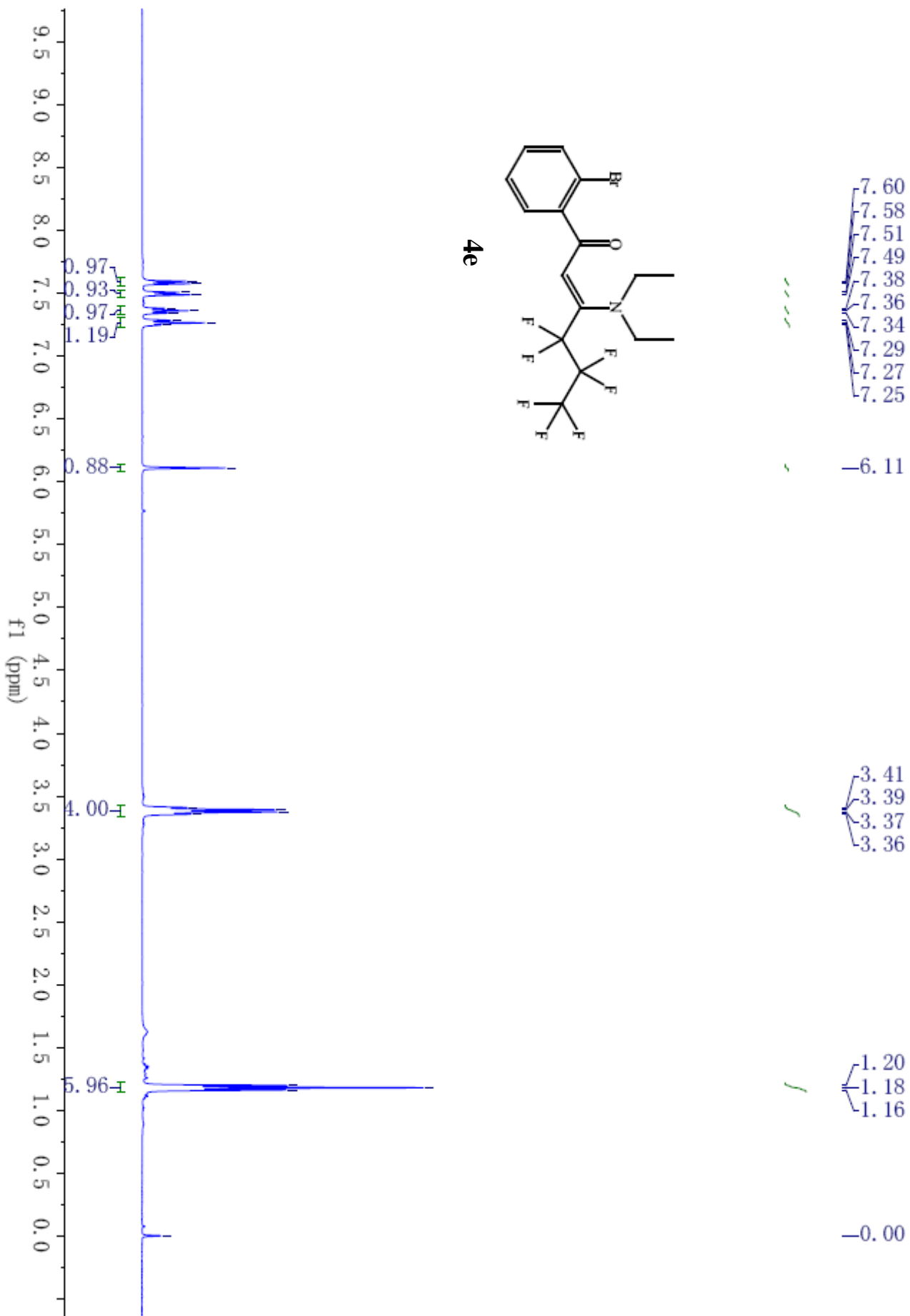


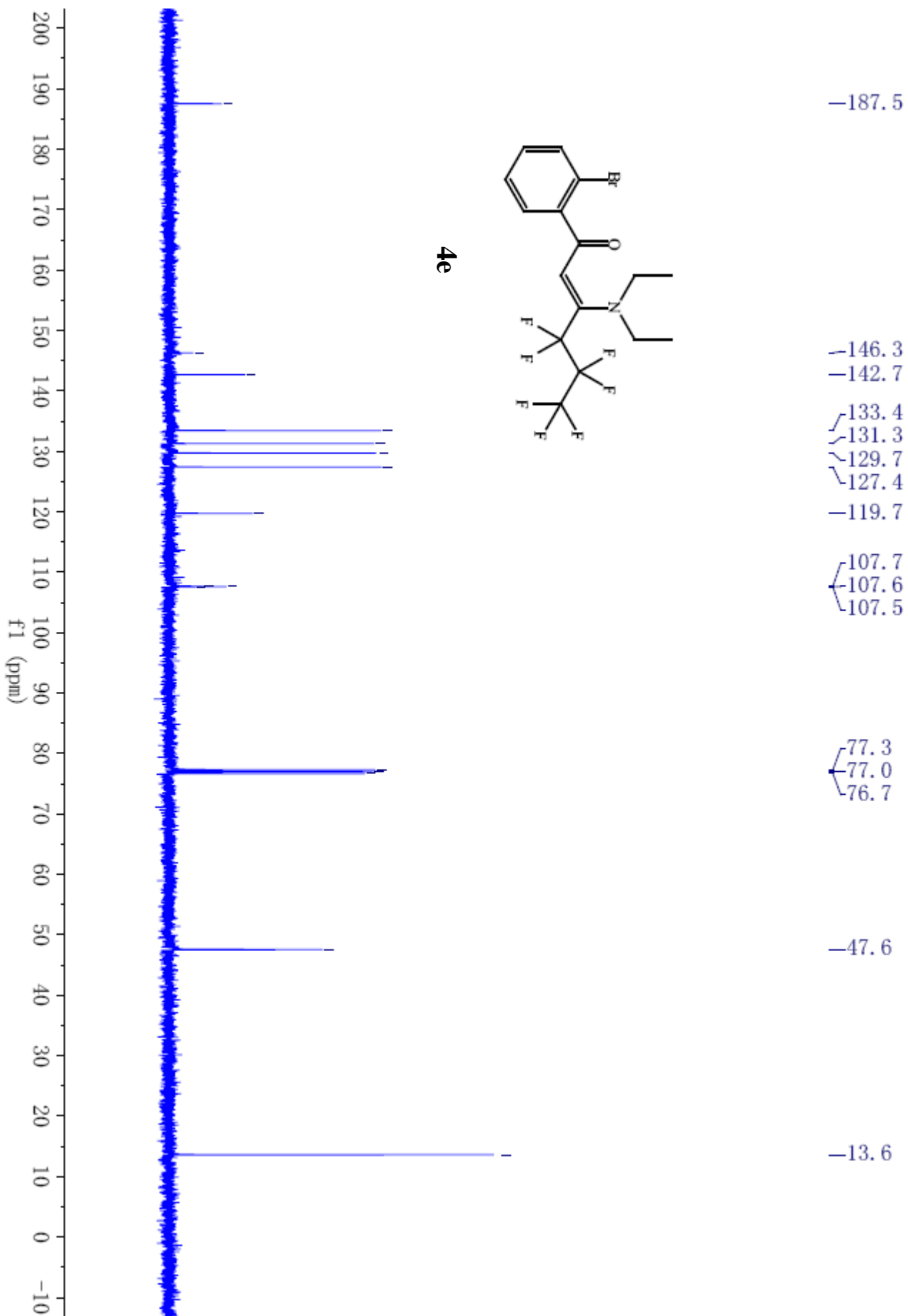
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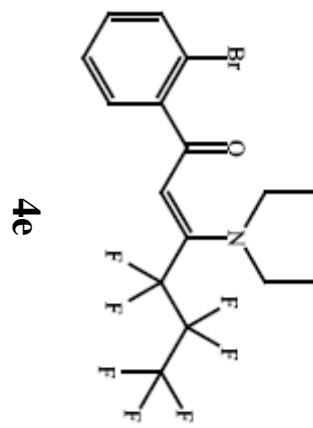
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-125.36
-125.40





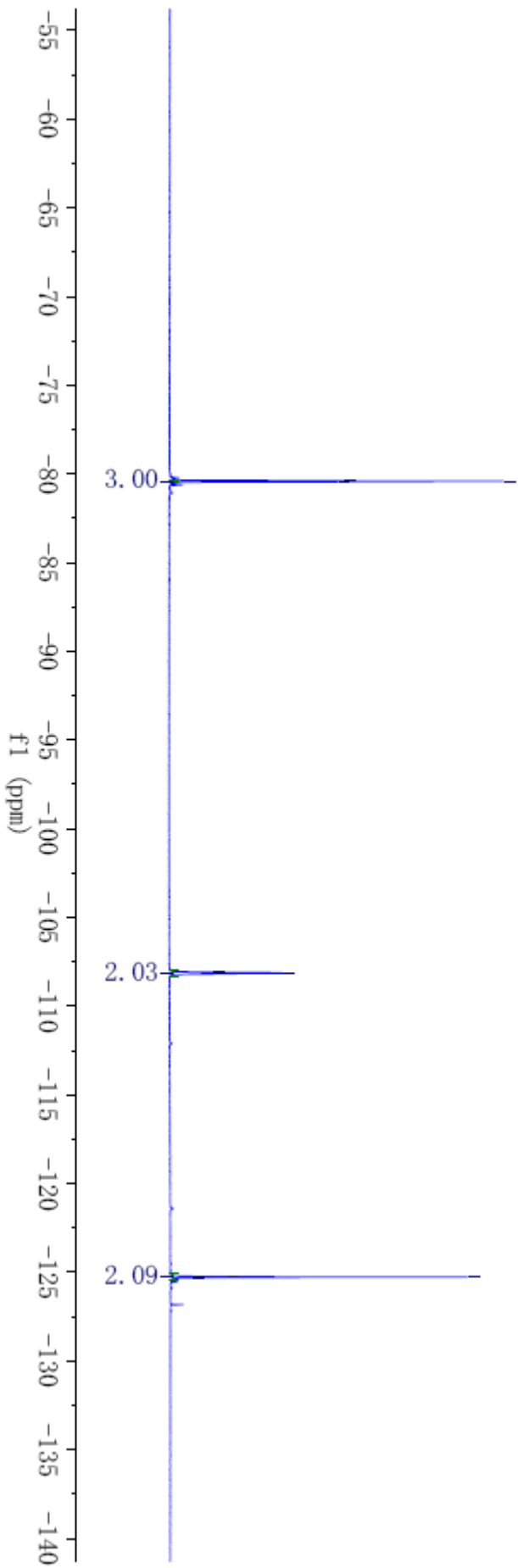


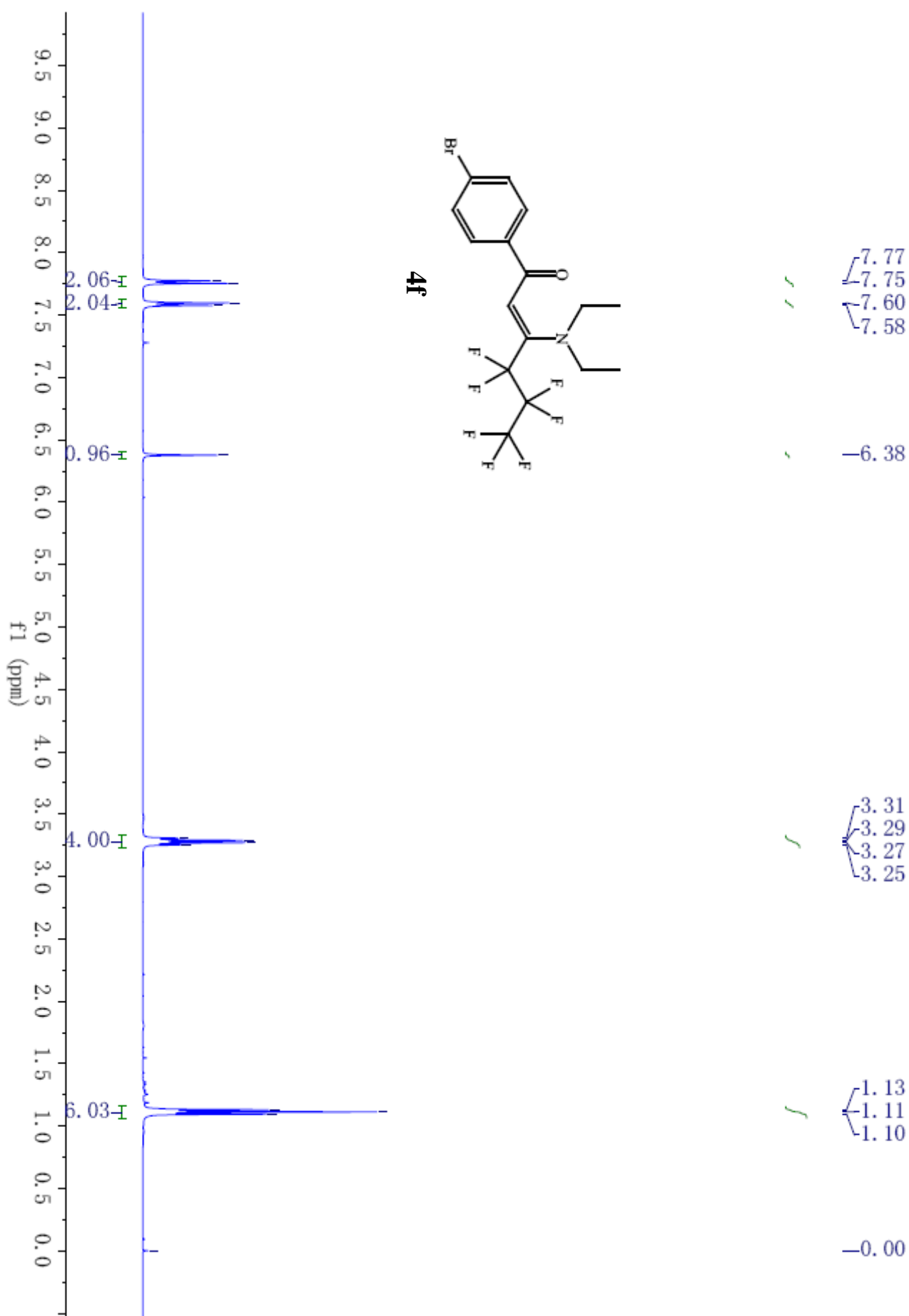


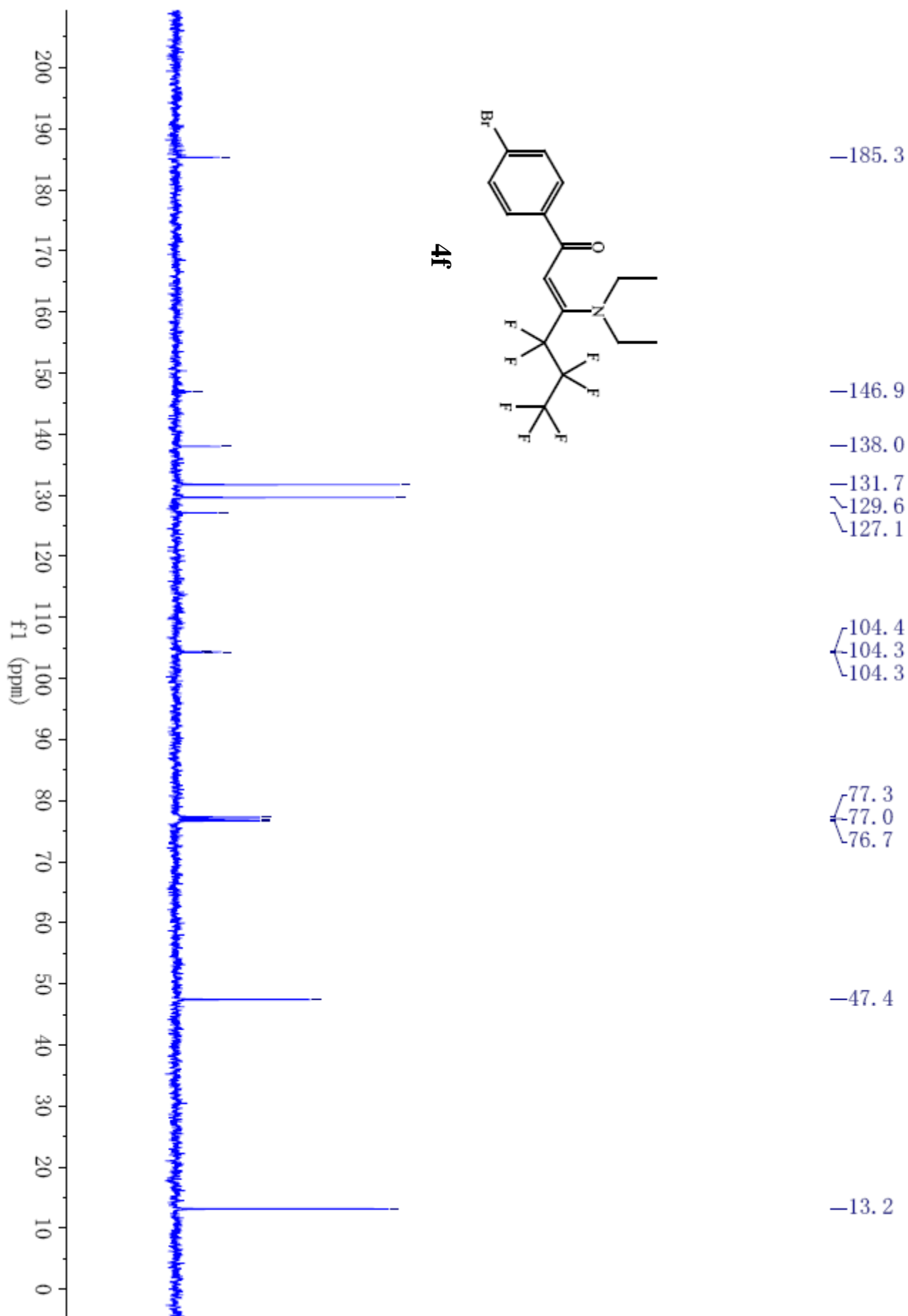
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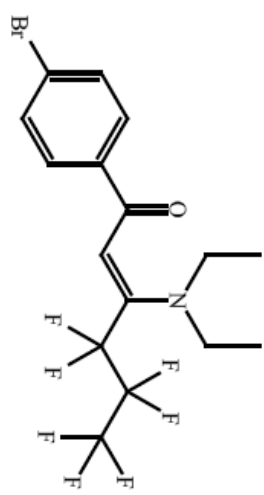
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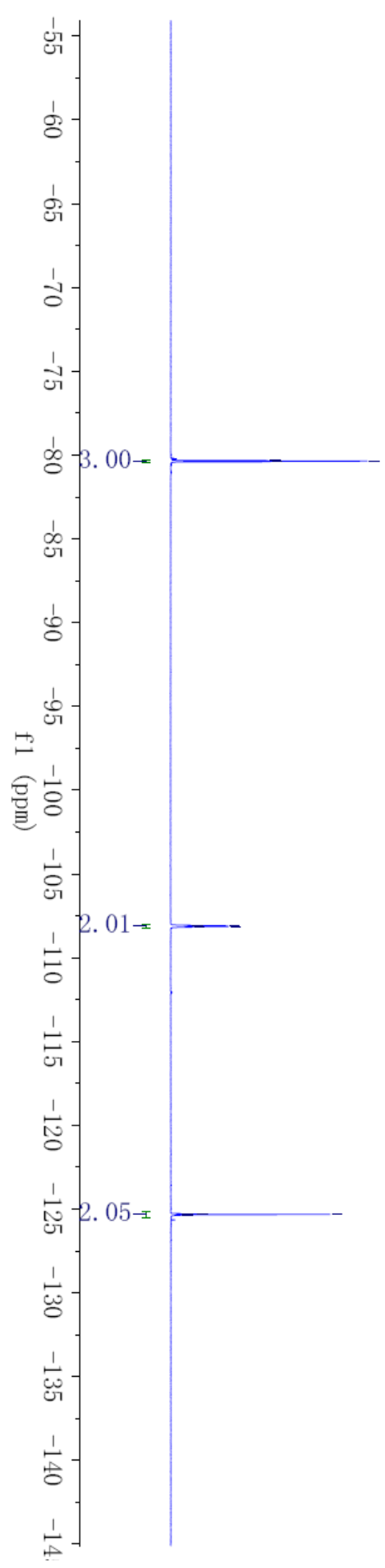


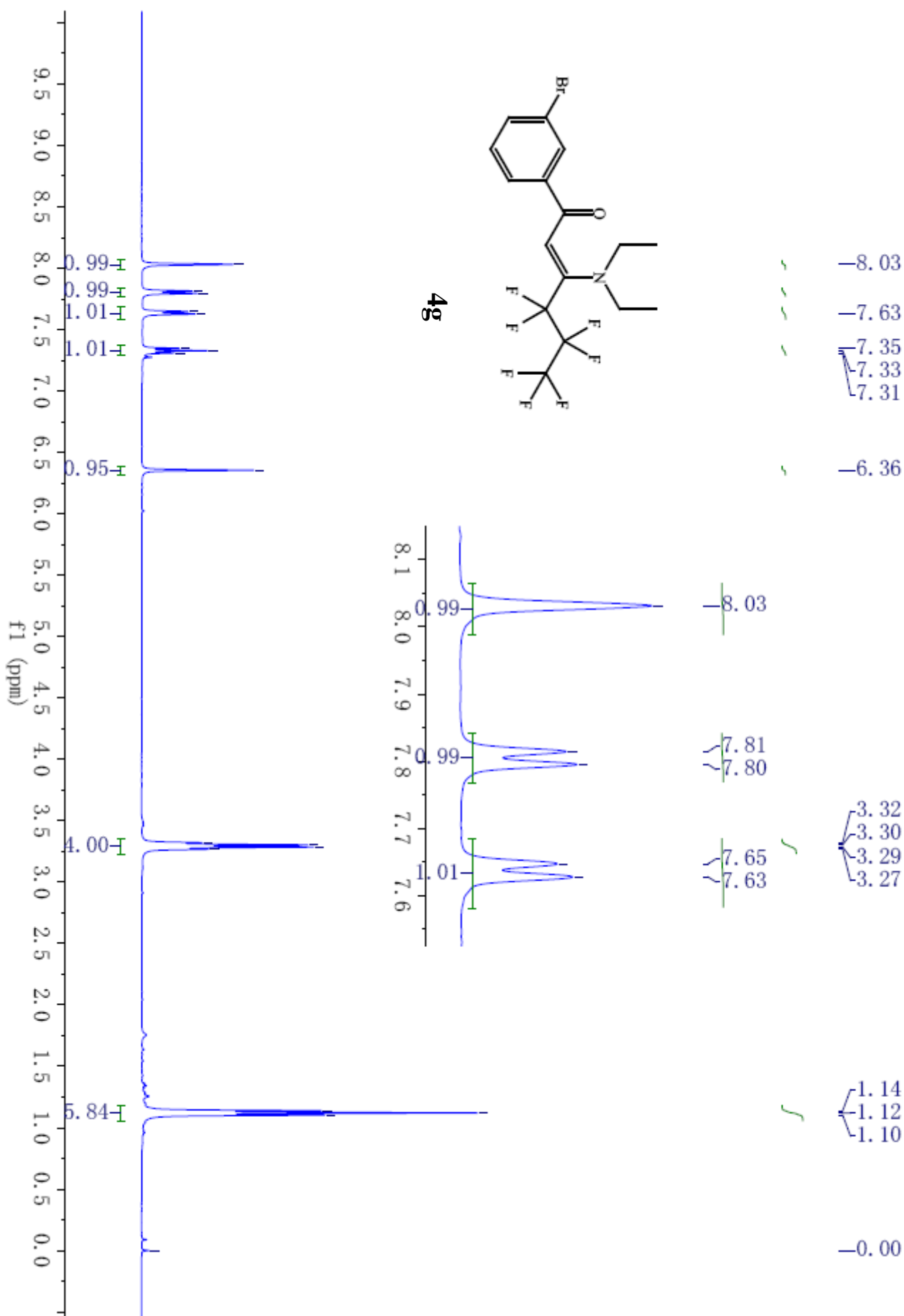
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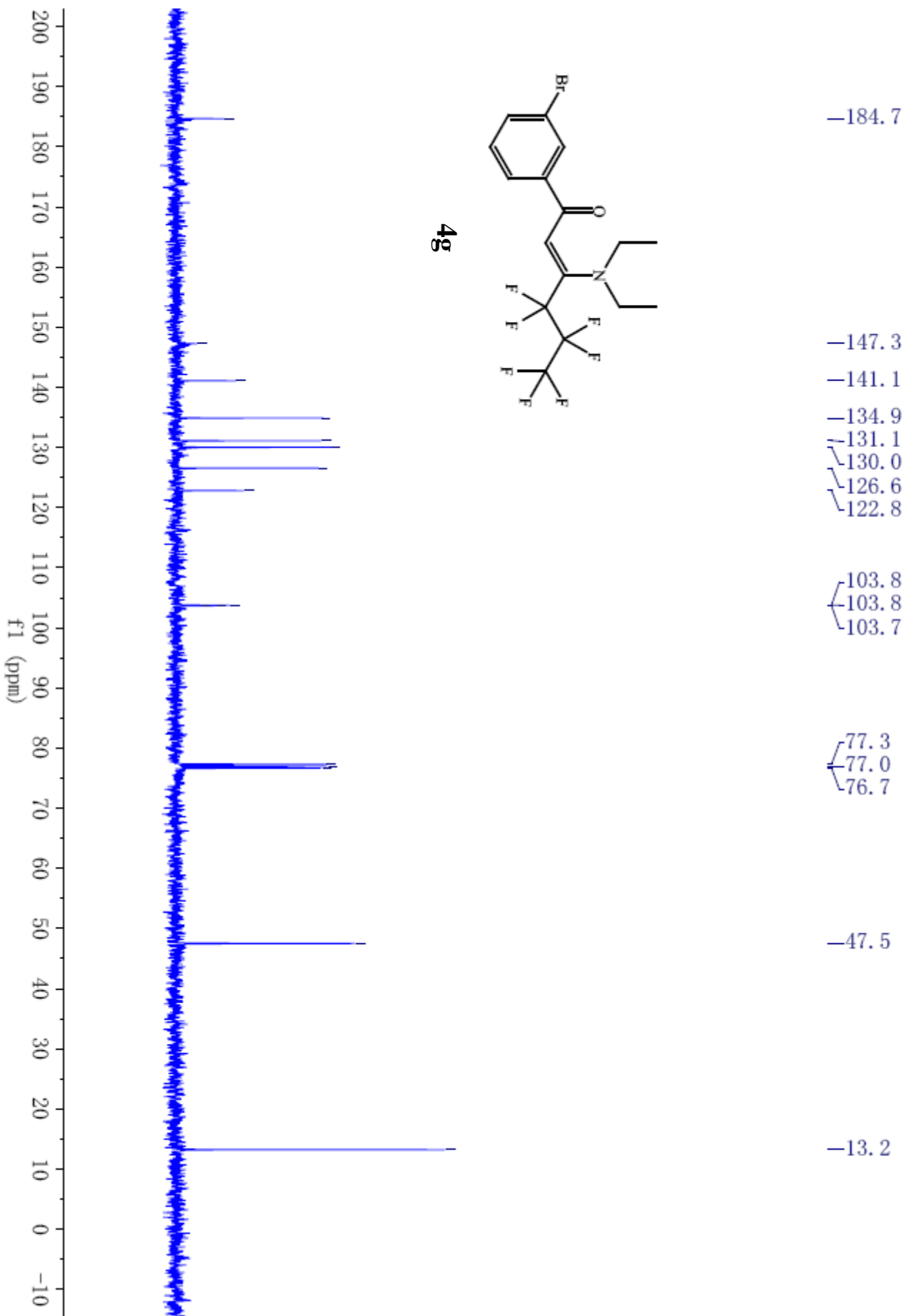
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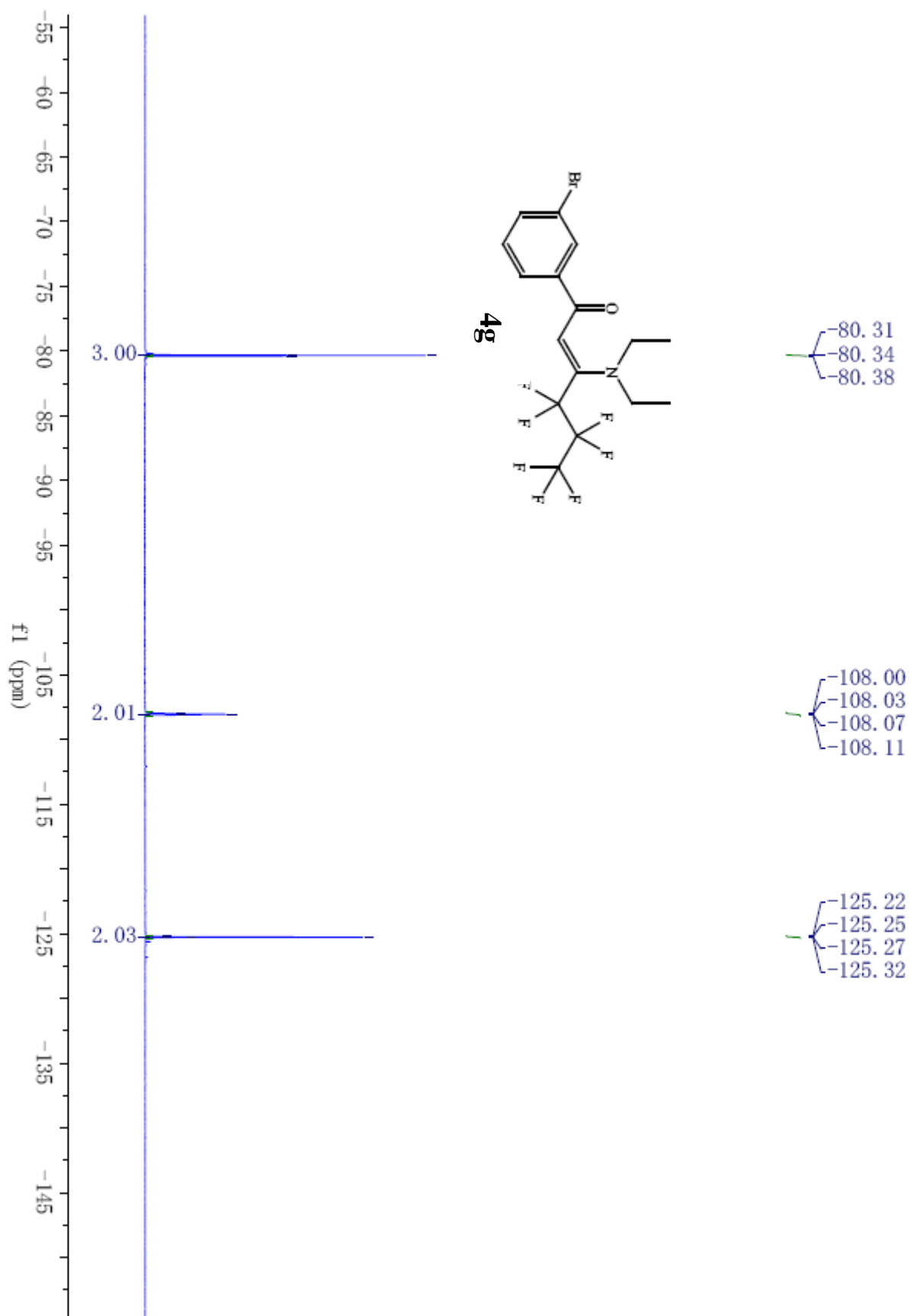
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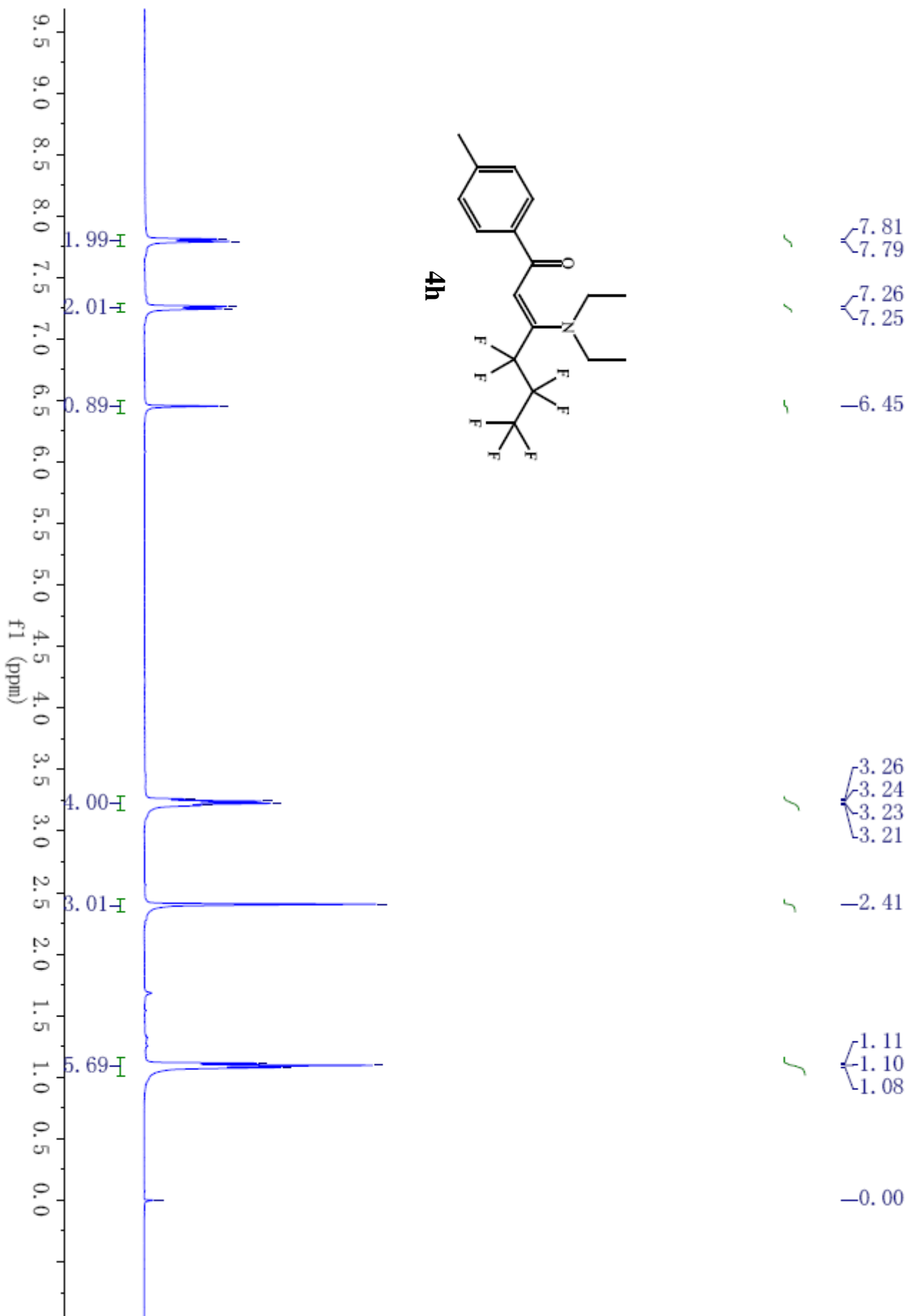
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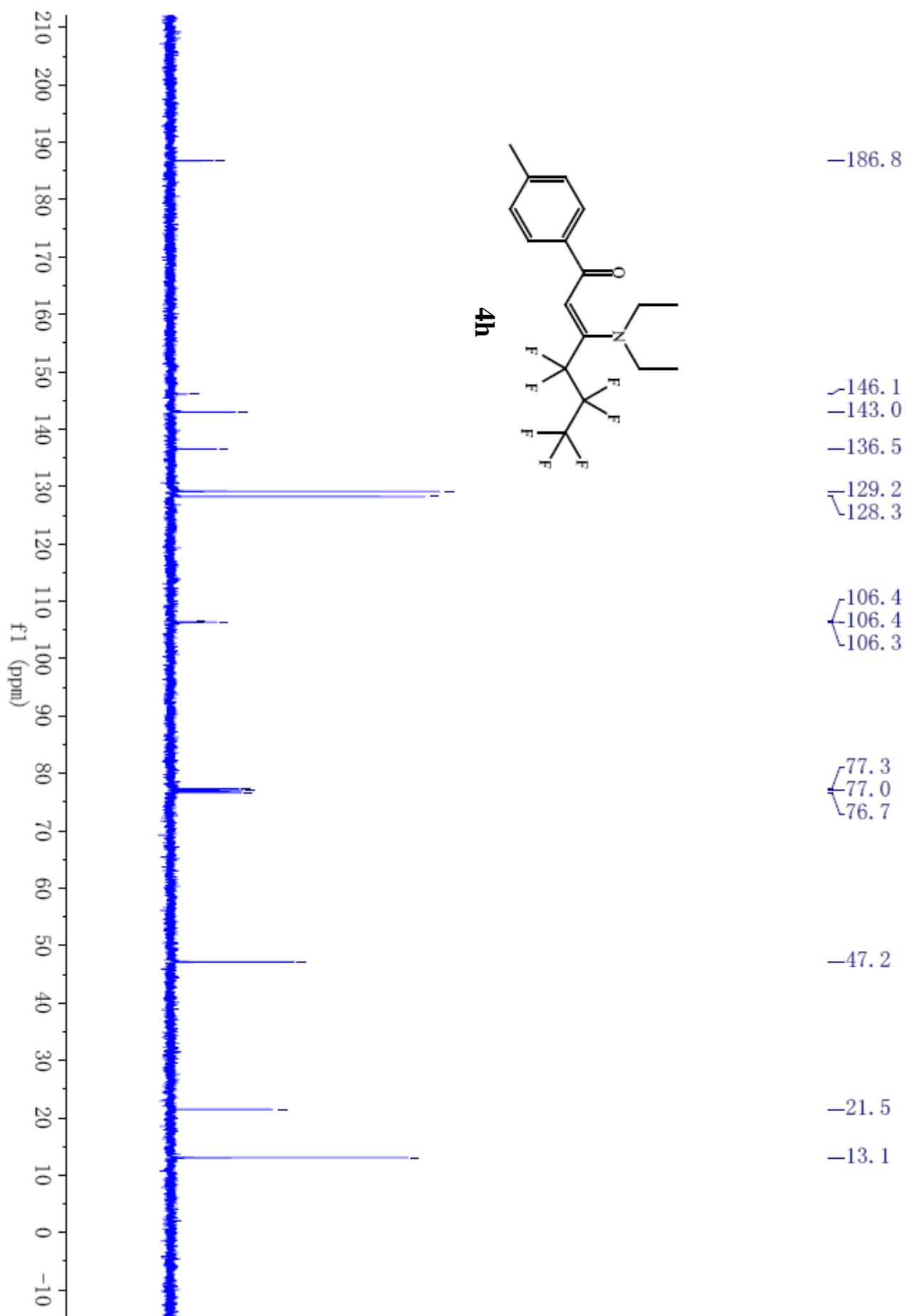


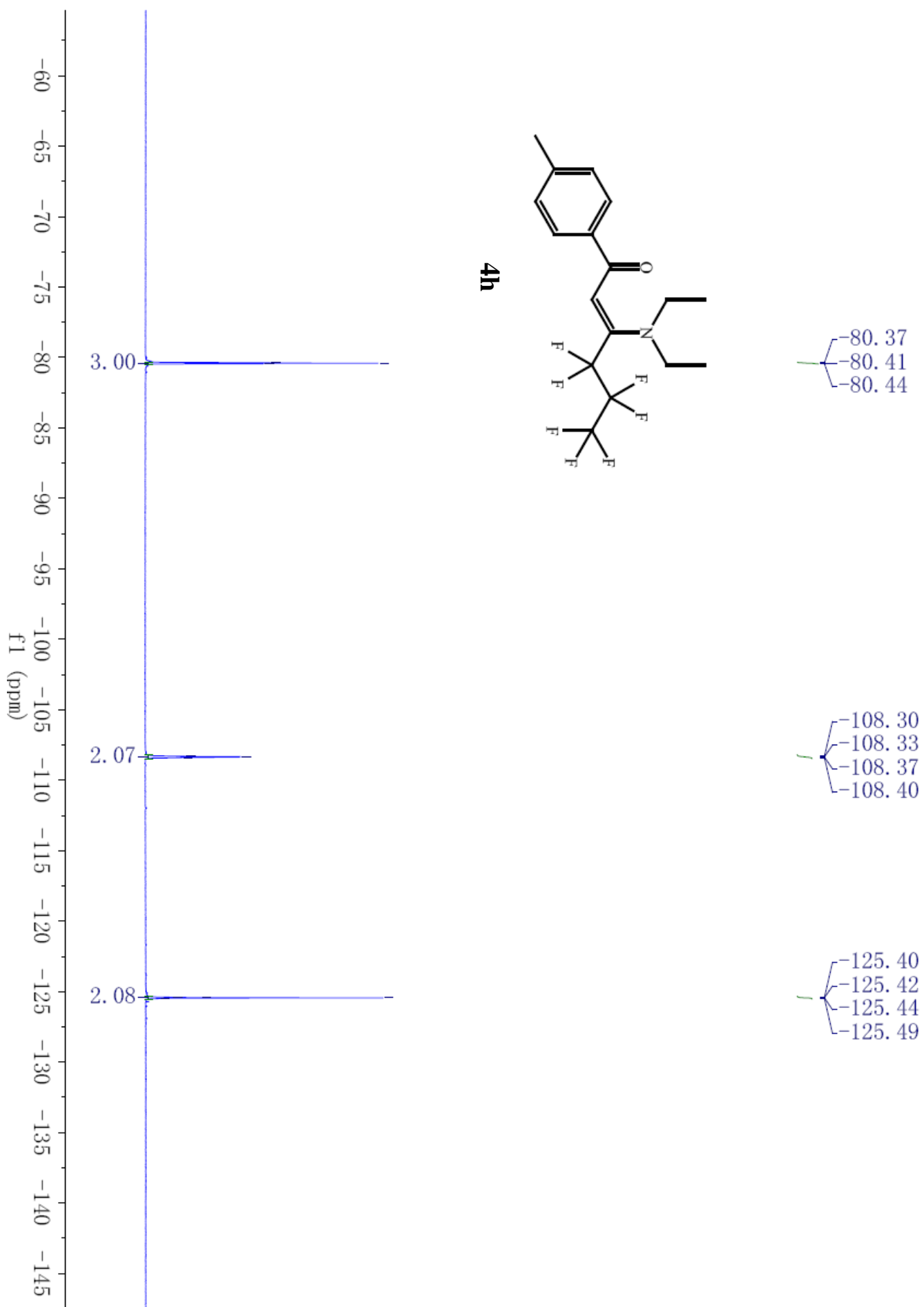


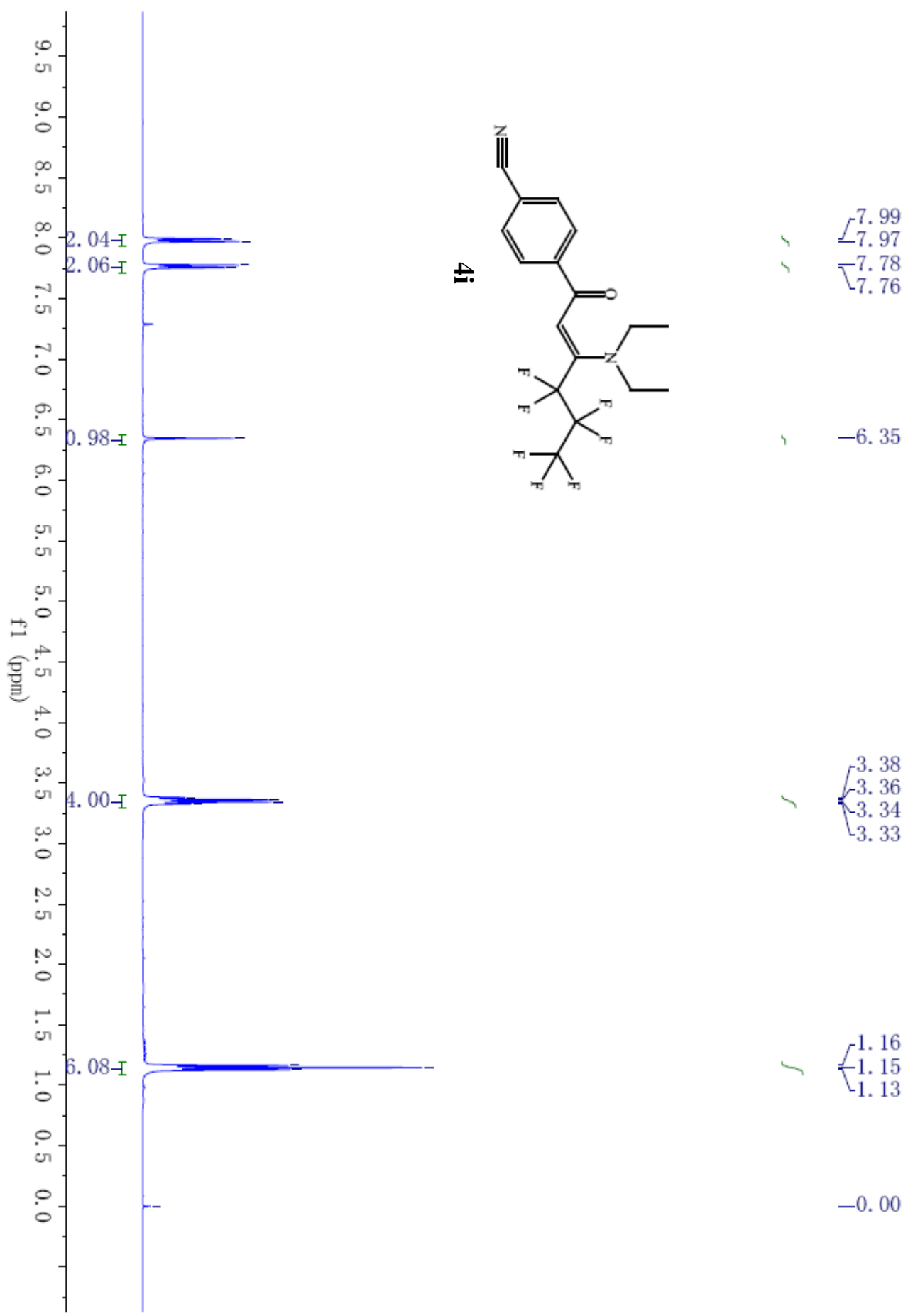


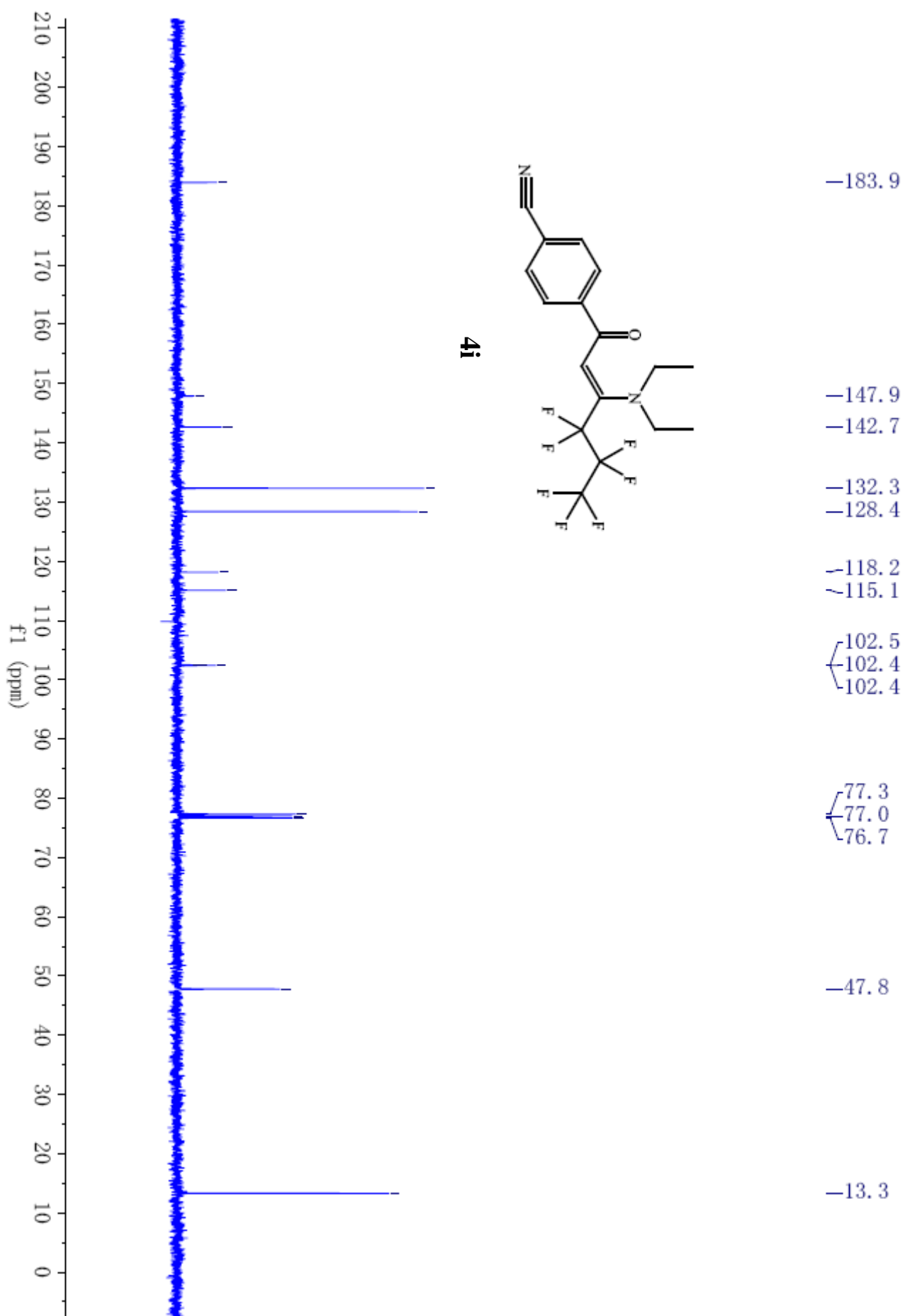




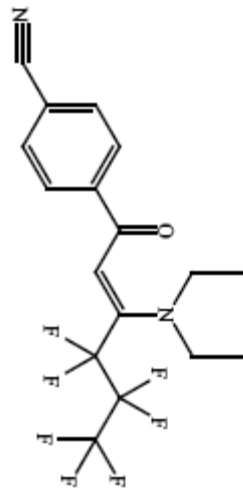








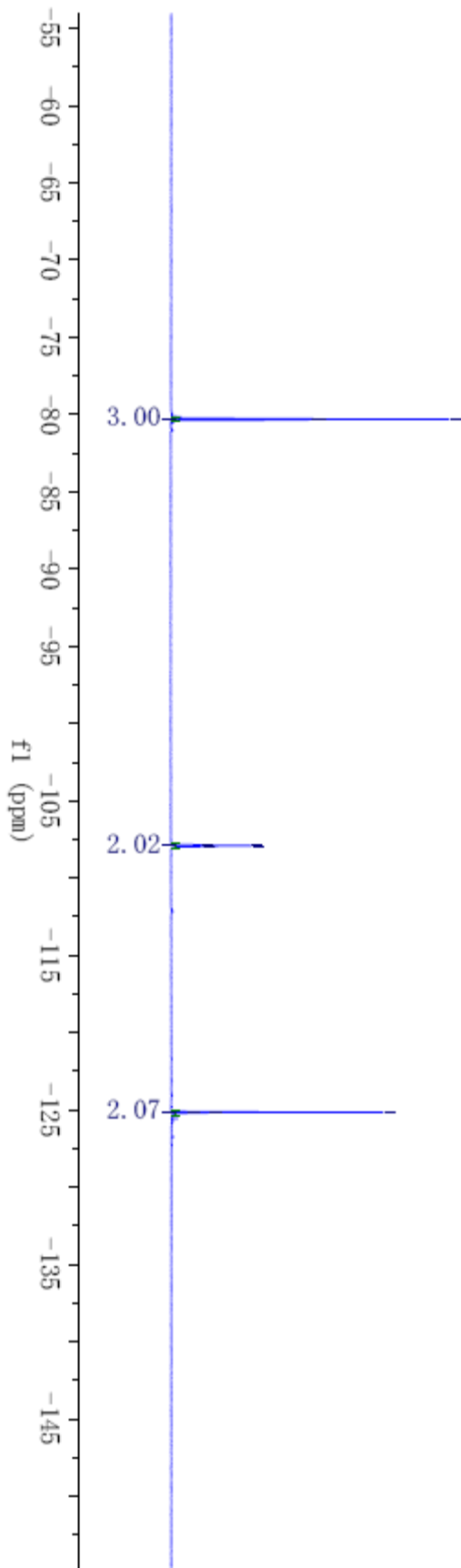
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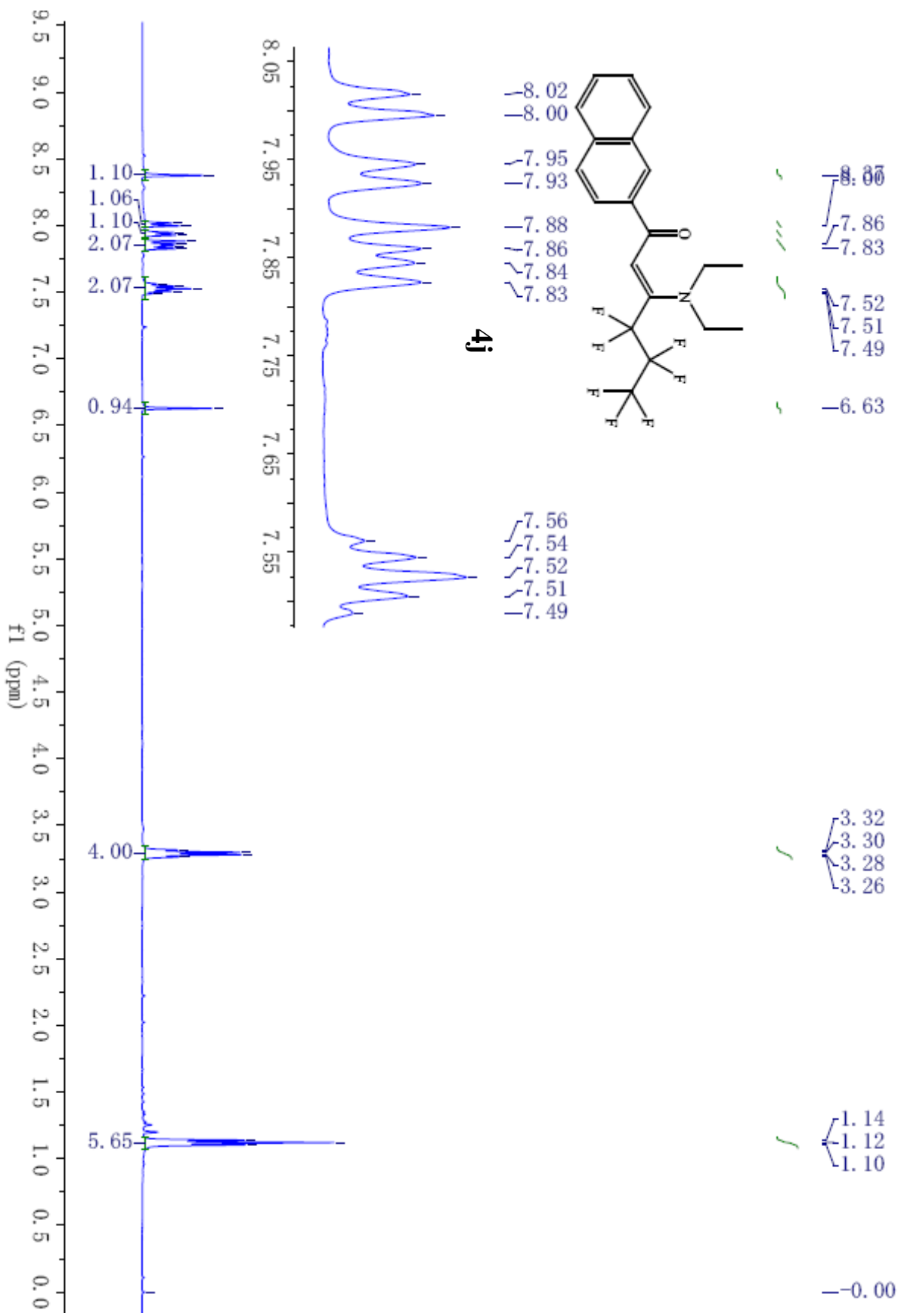


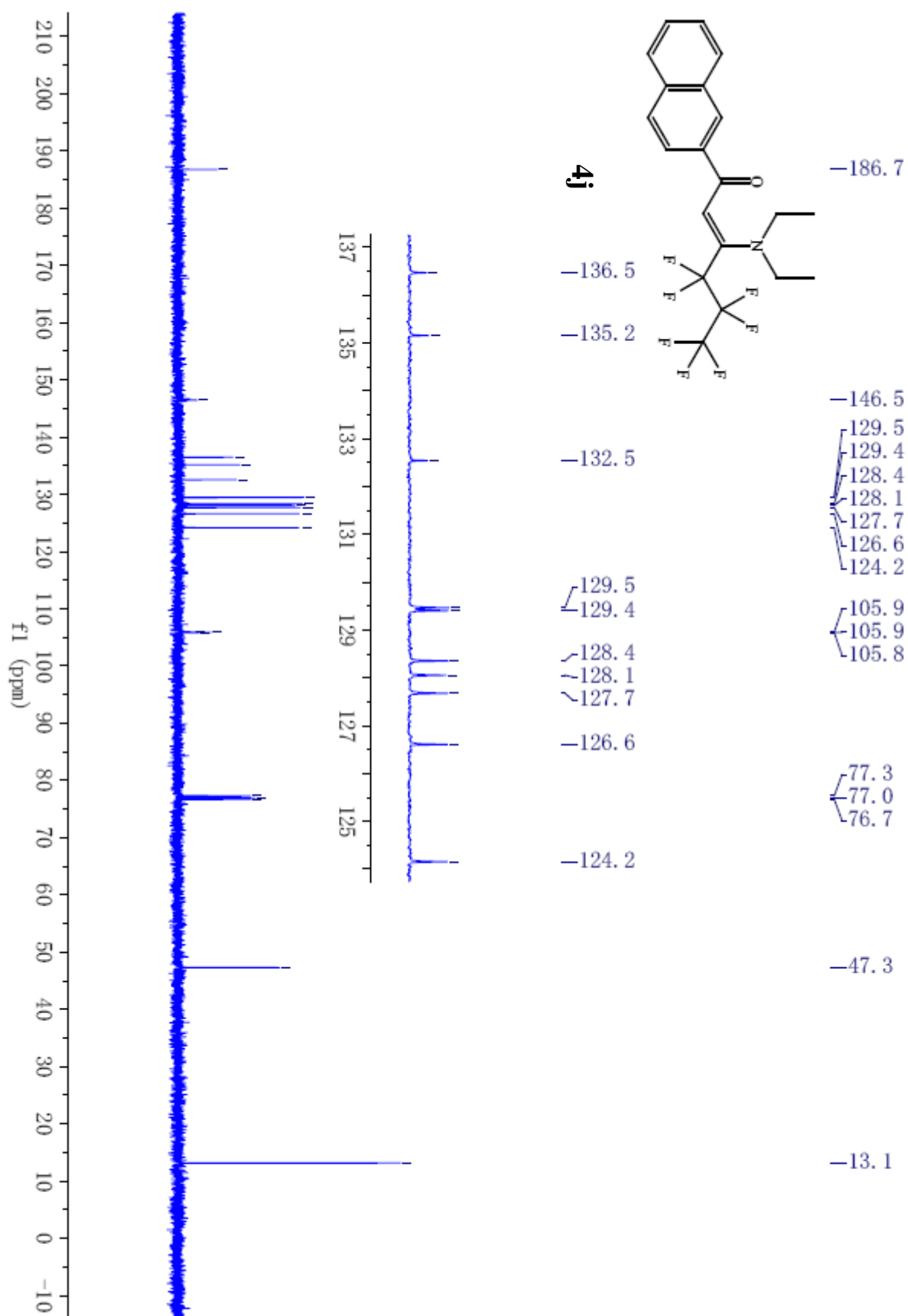
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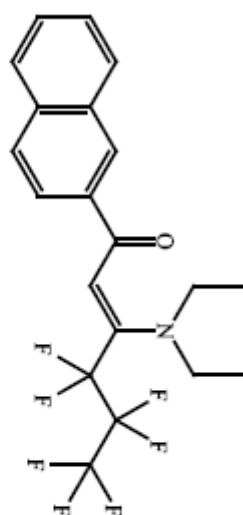
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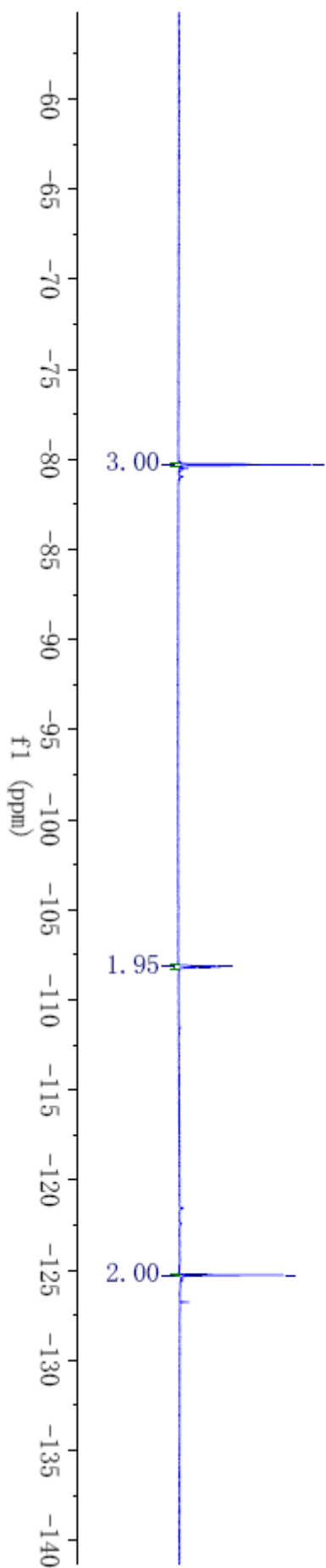


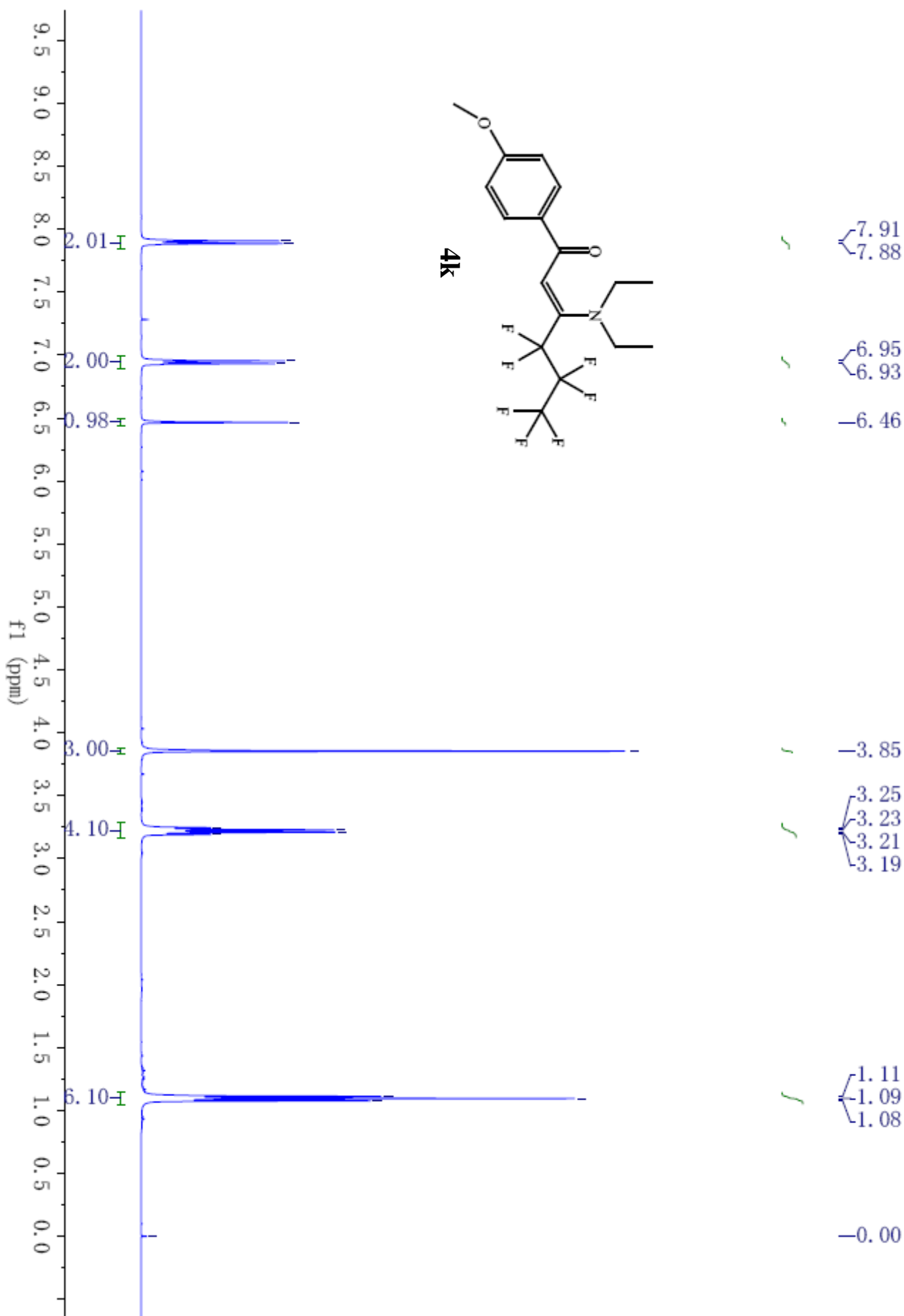
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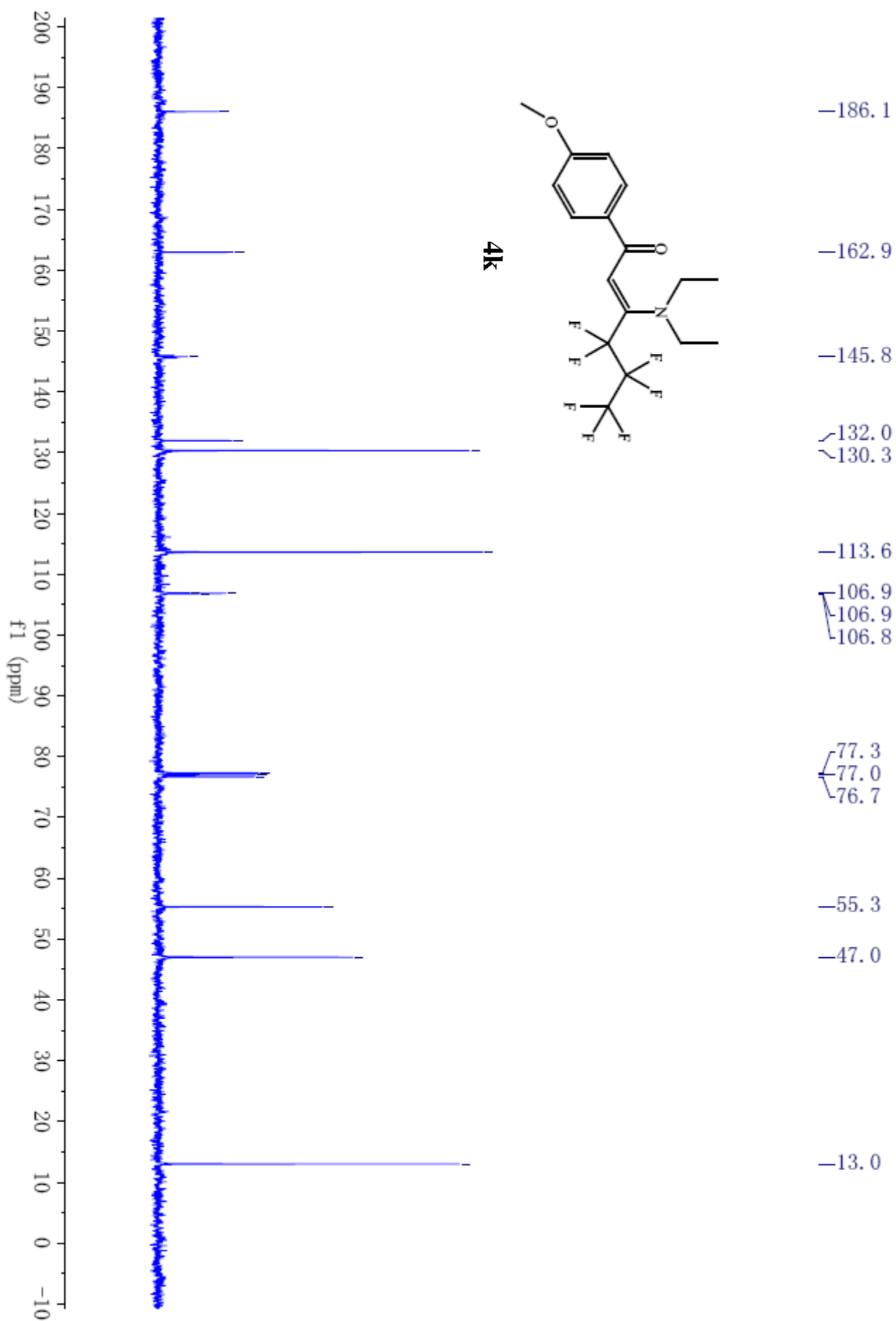
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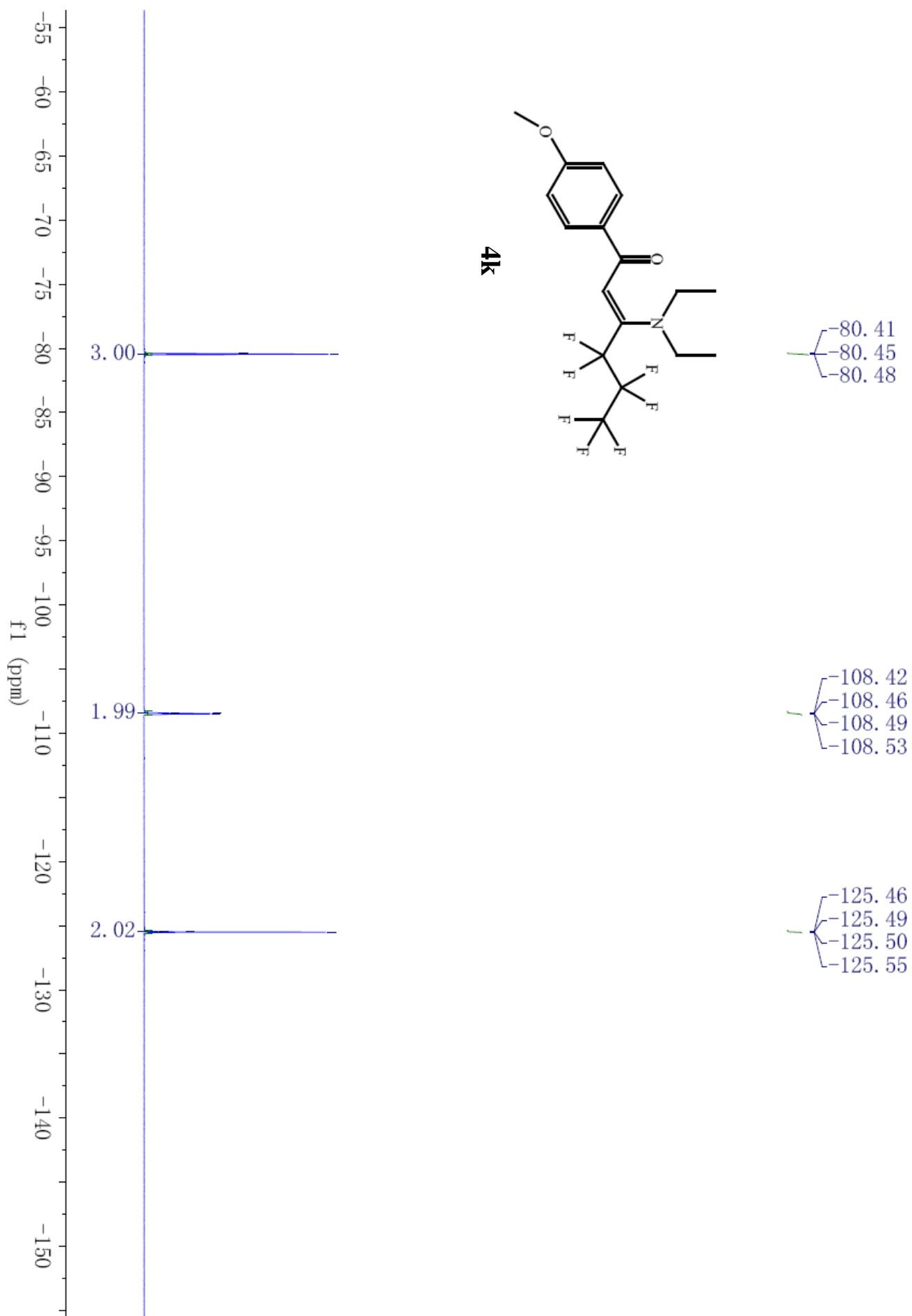
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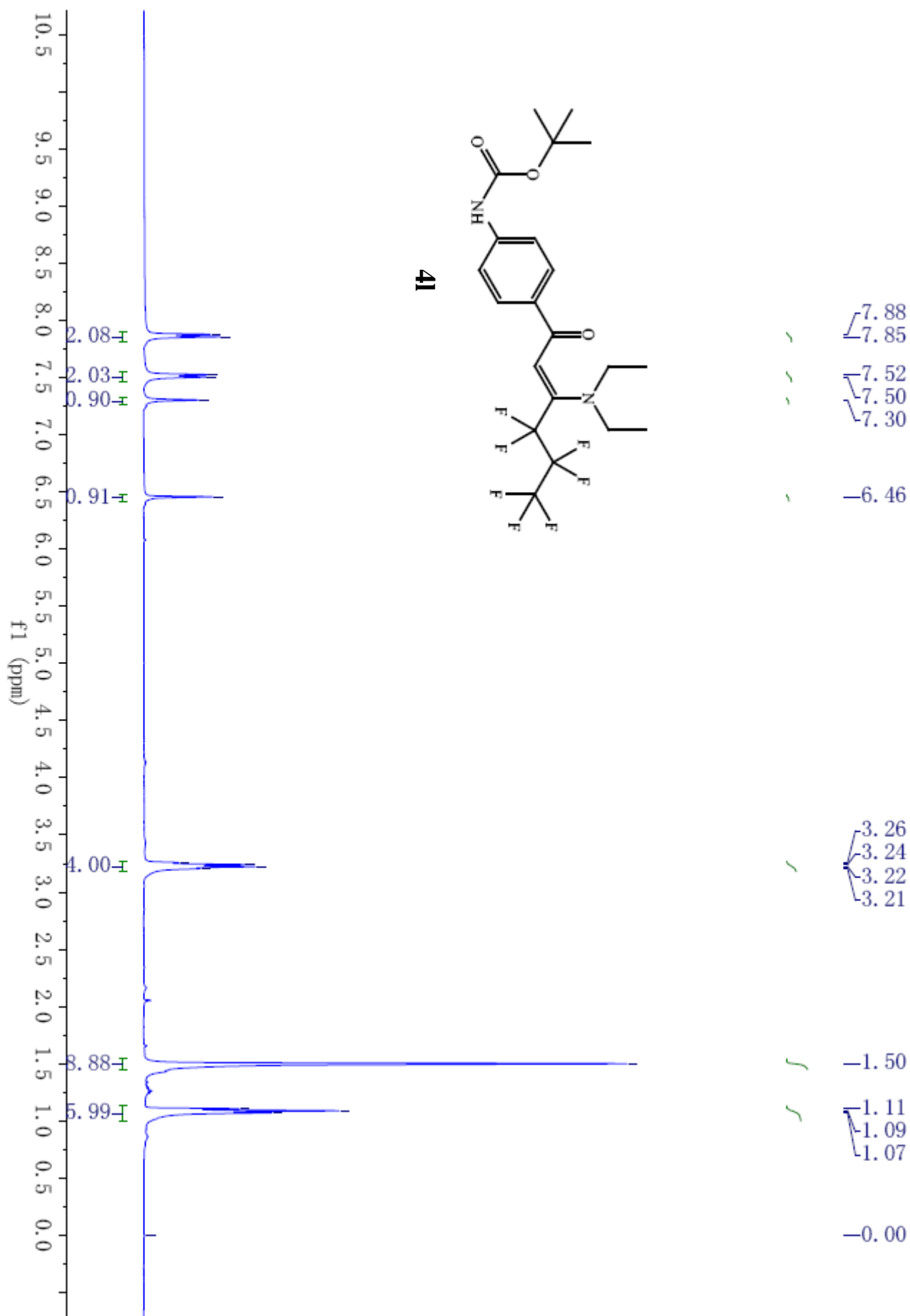
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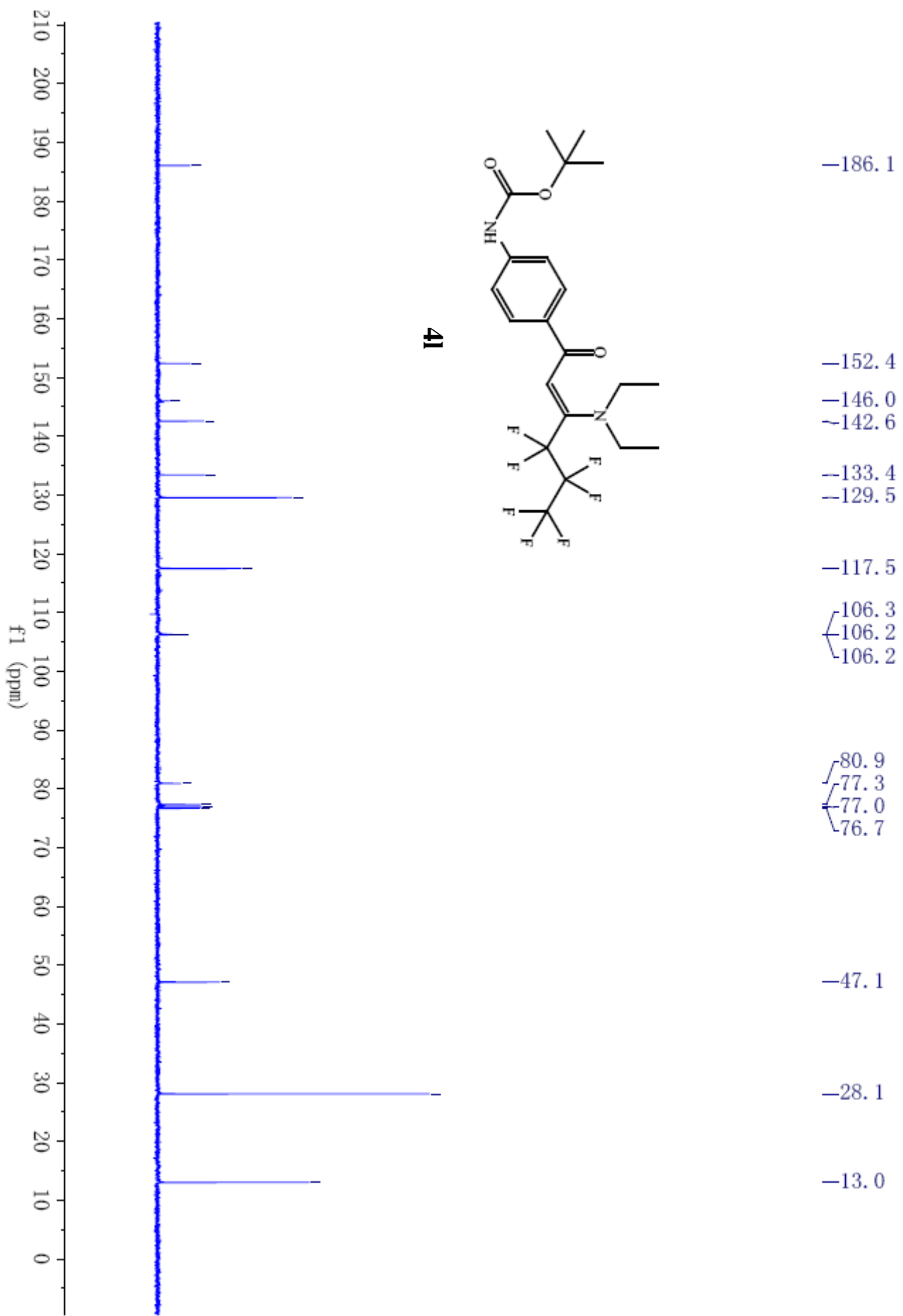


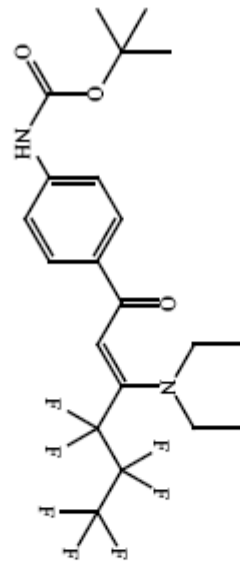










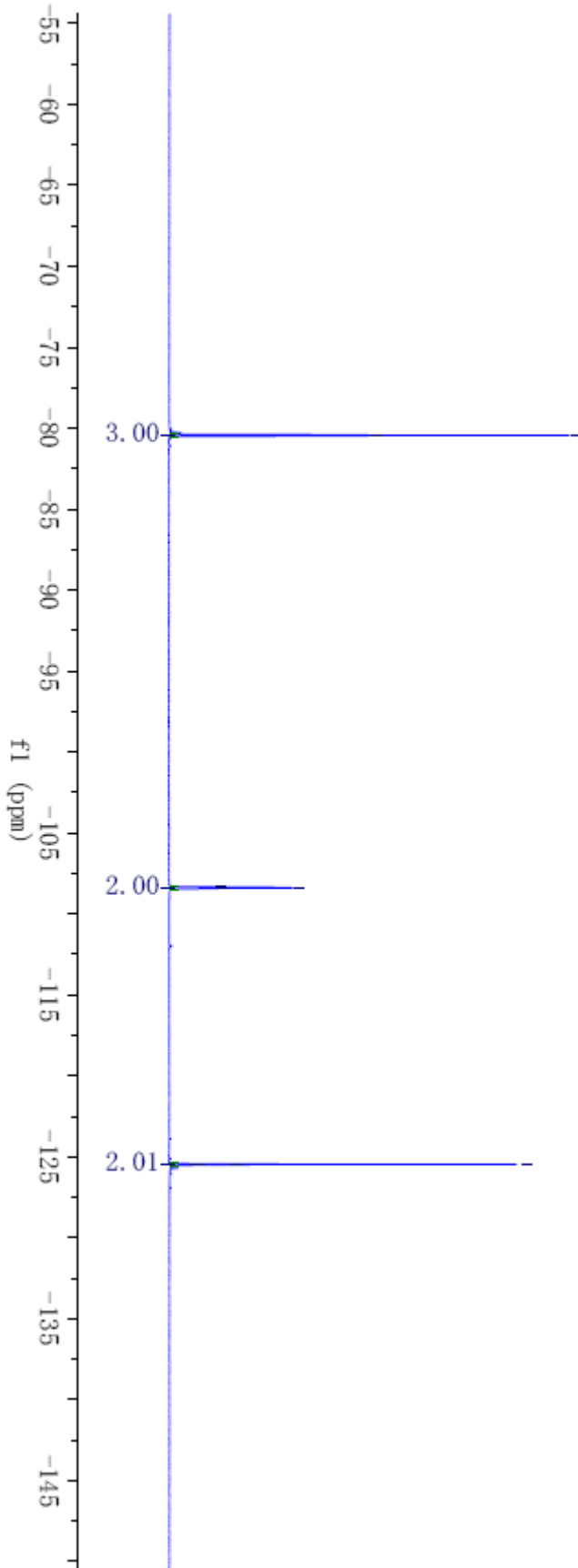


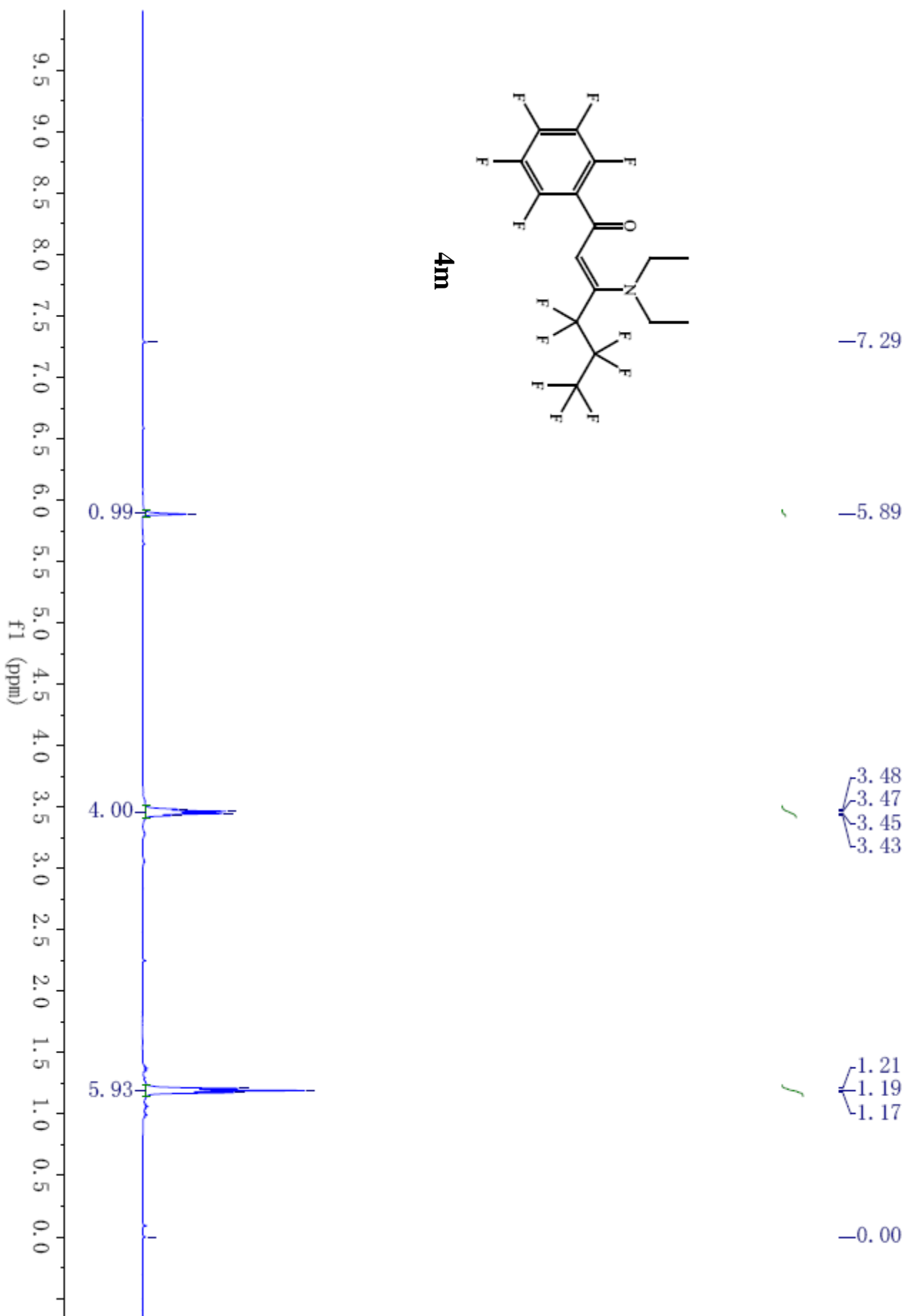
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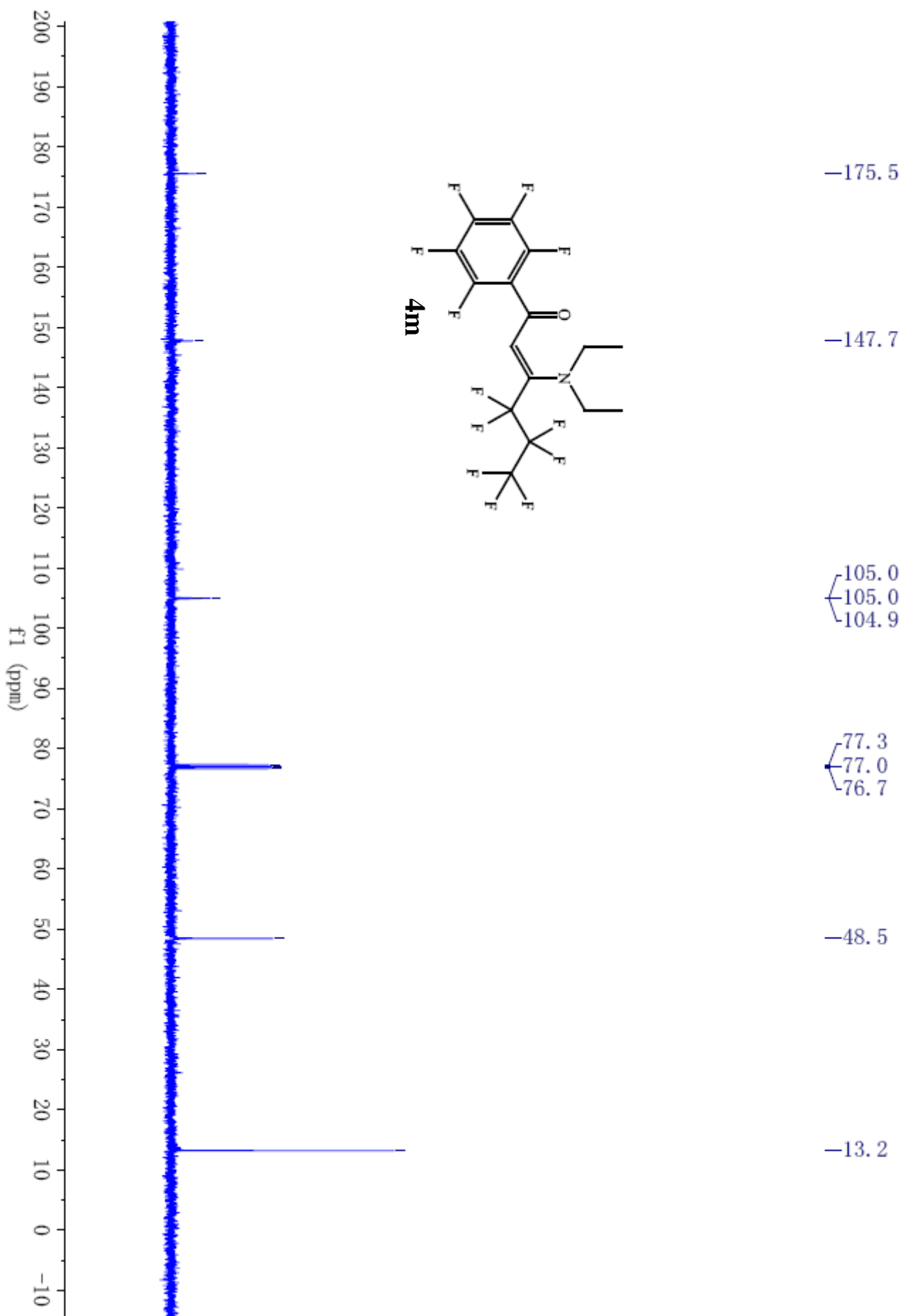
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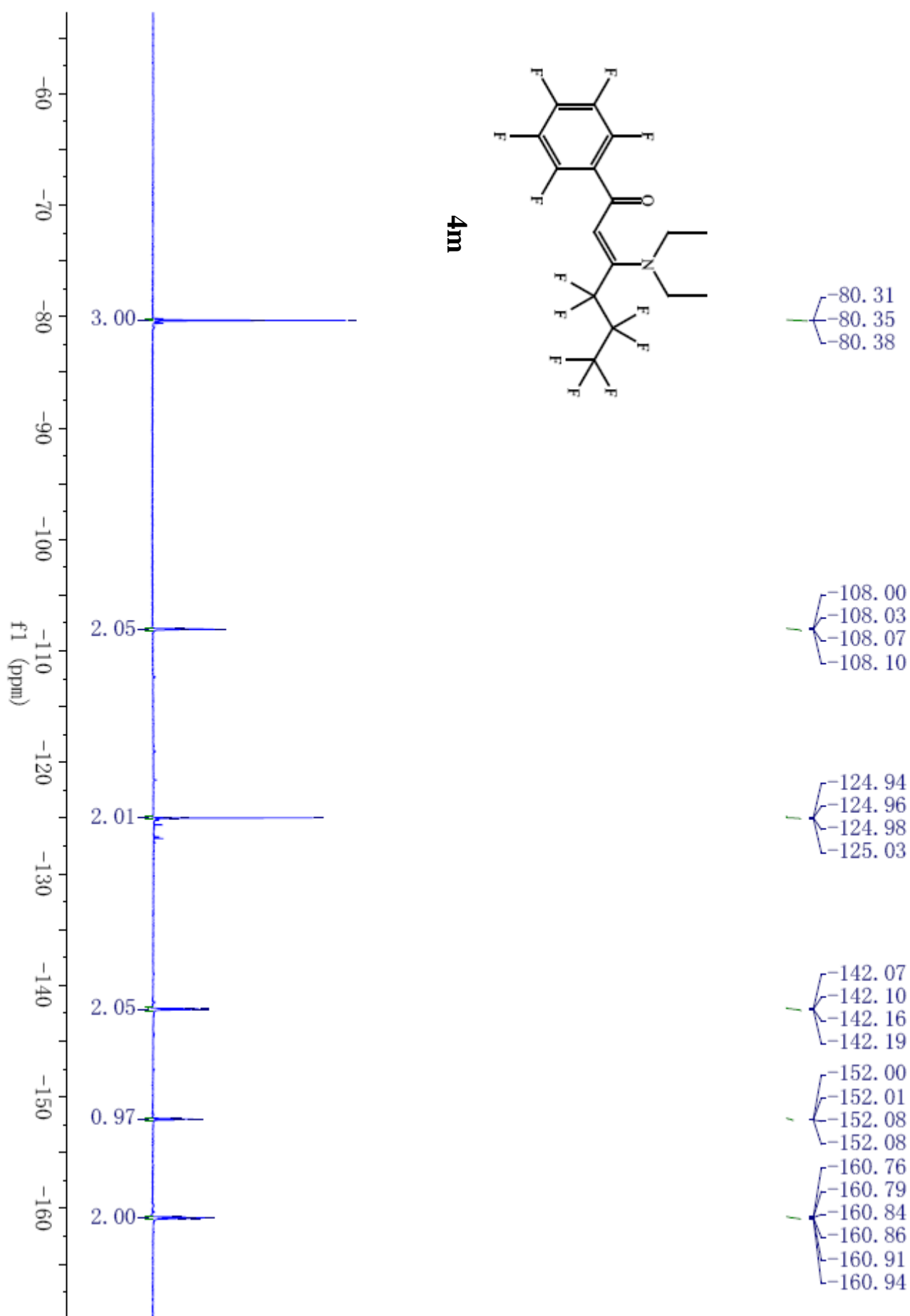
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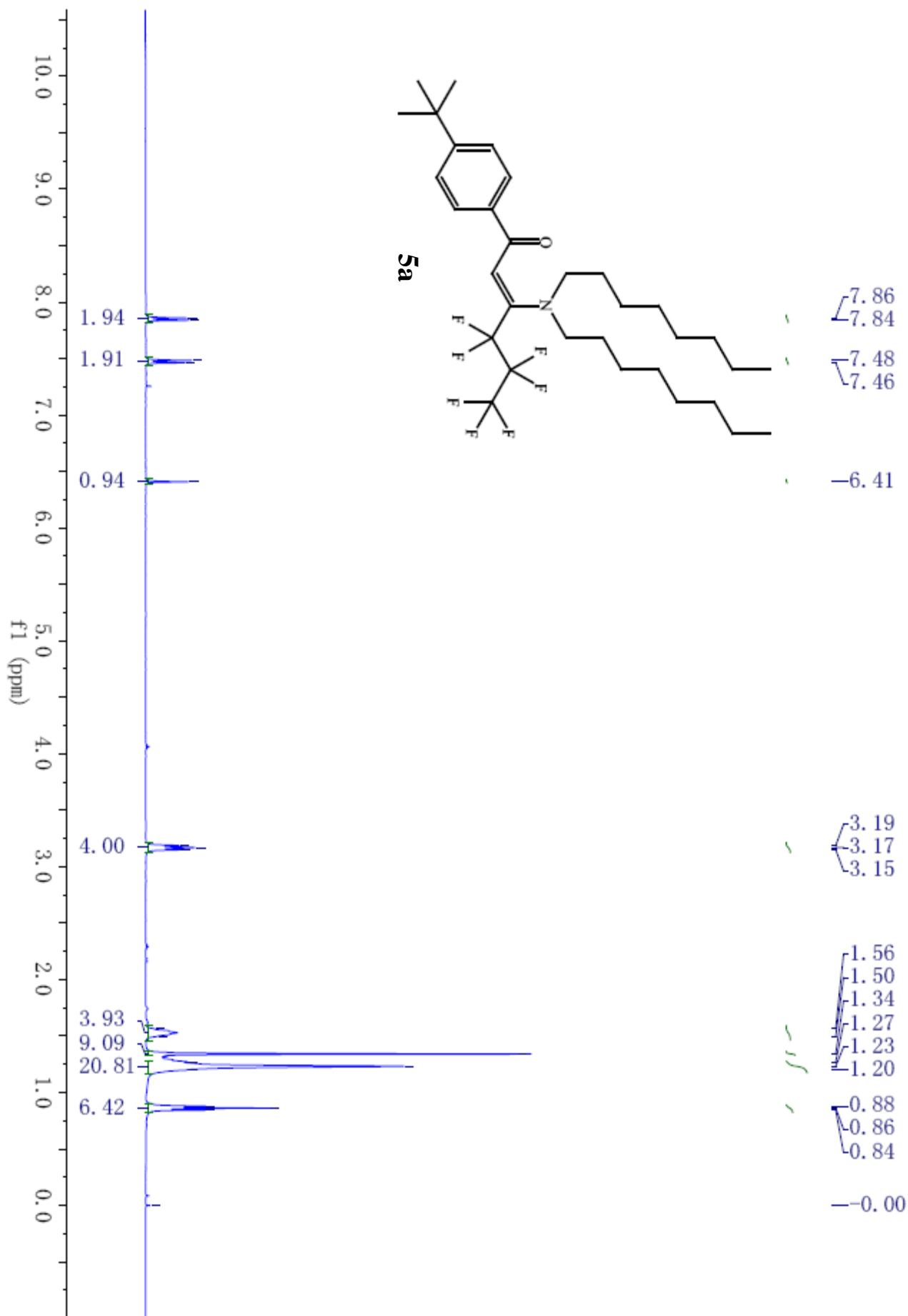
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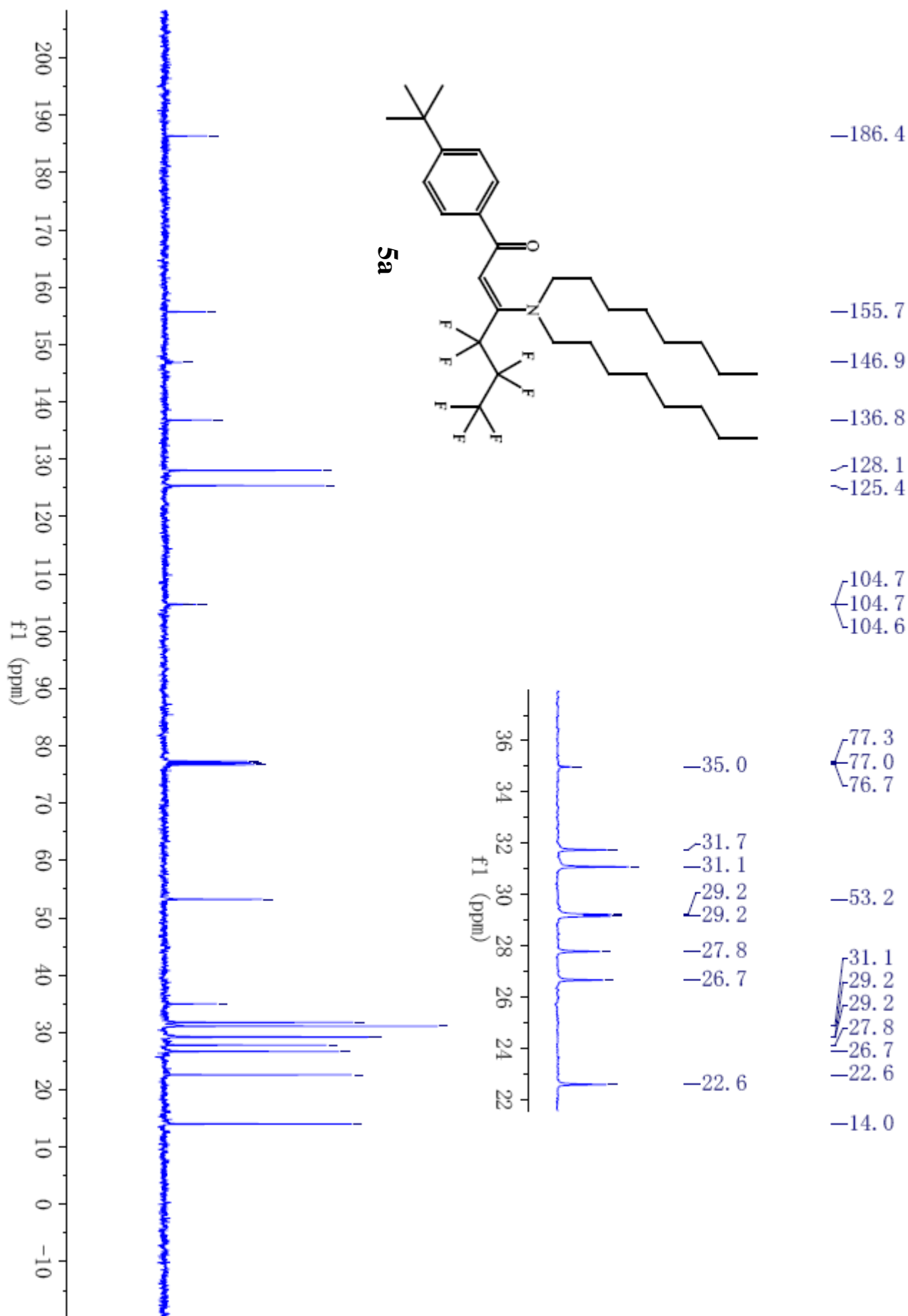


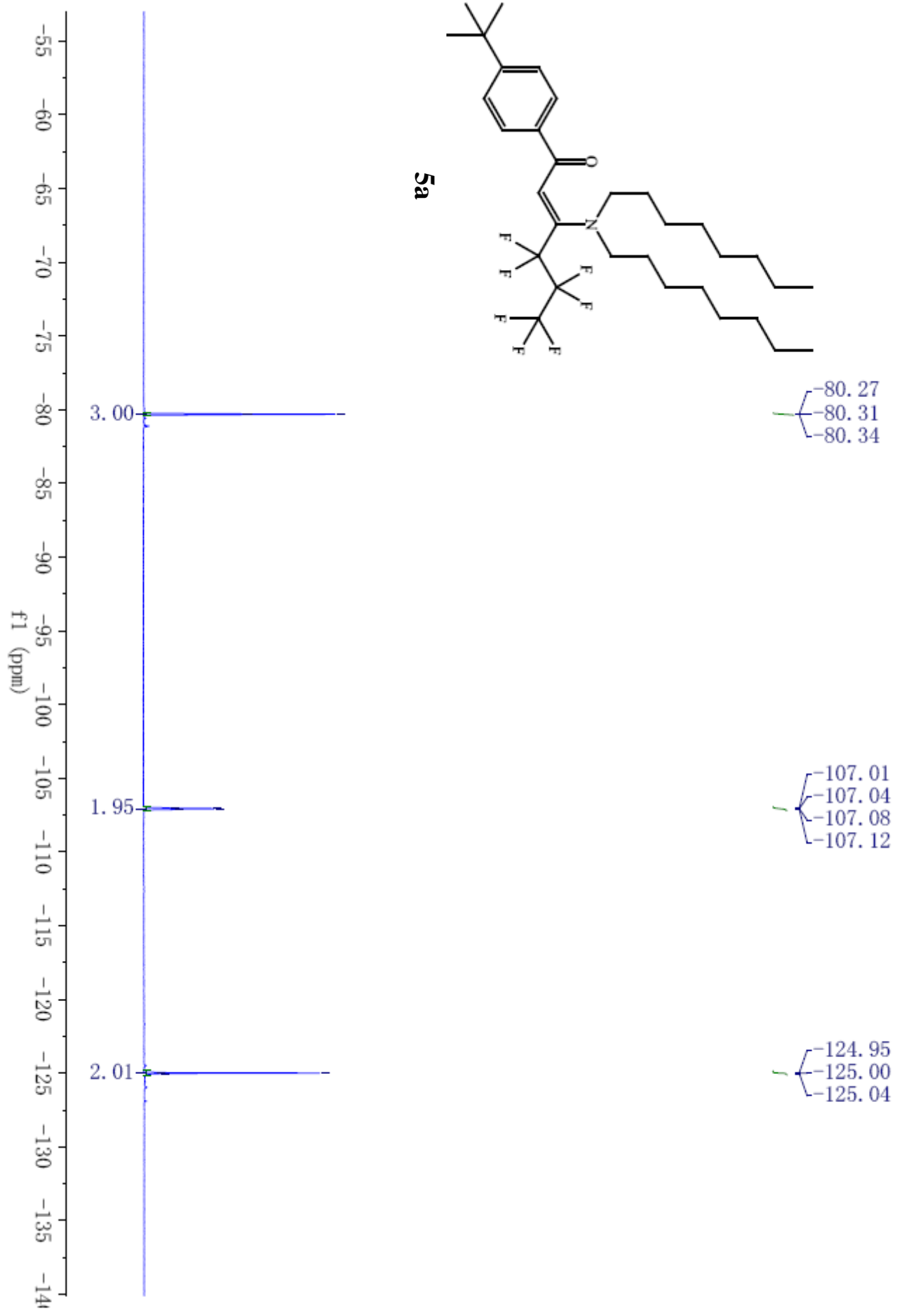
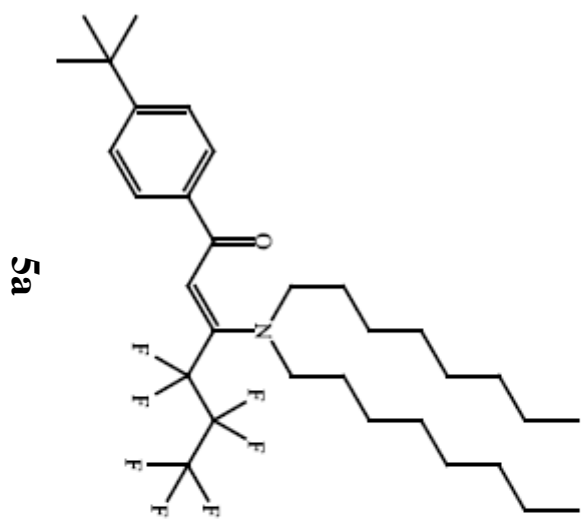


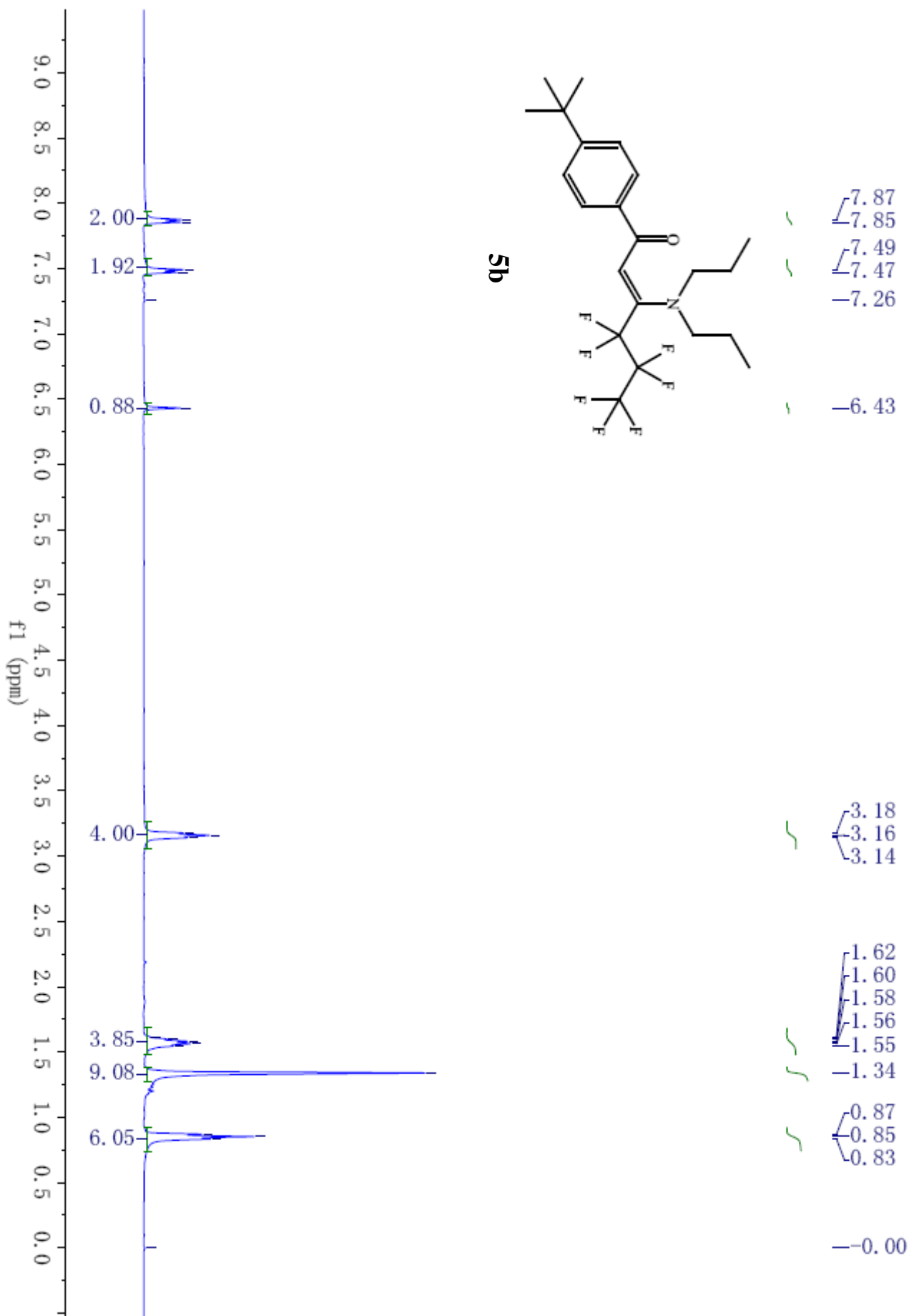


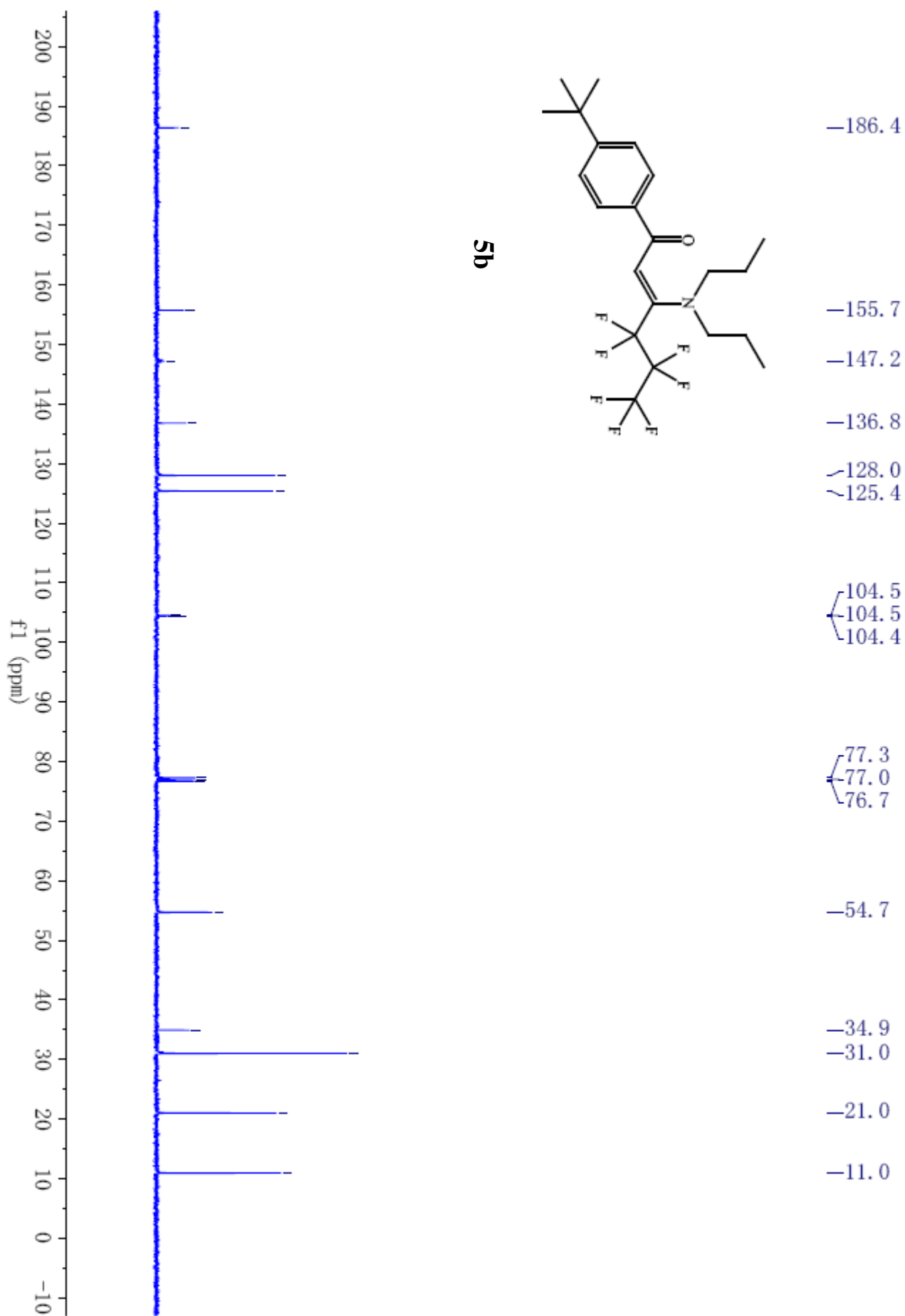


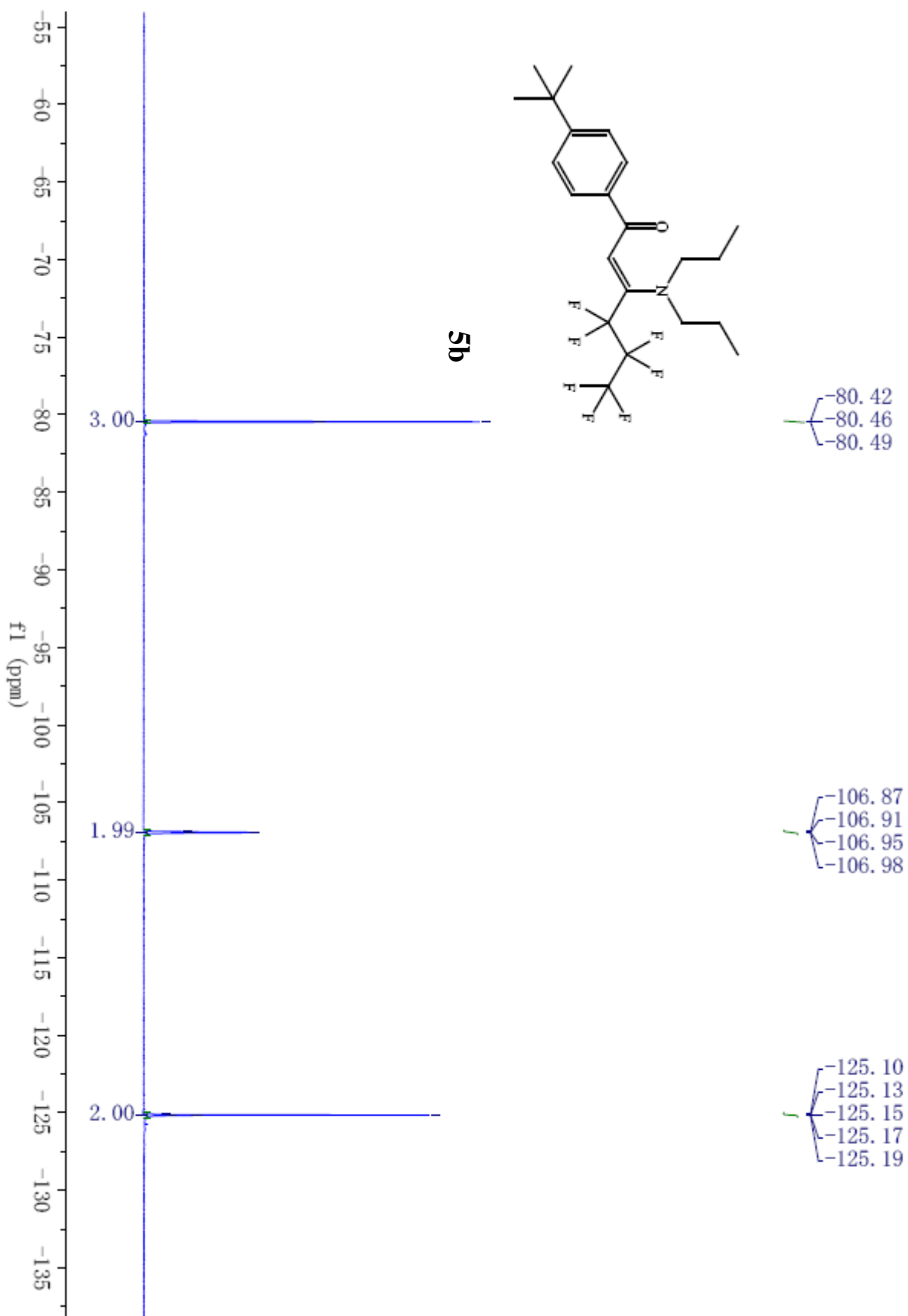


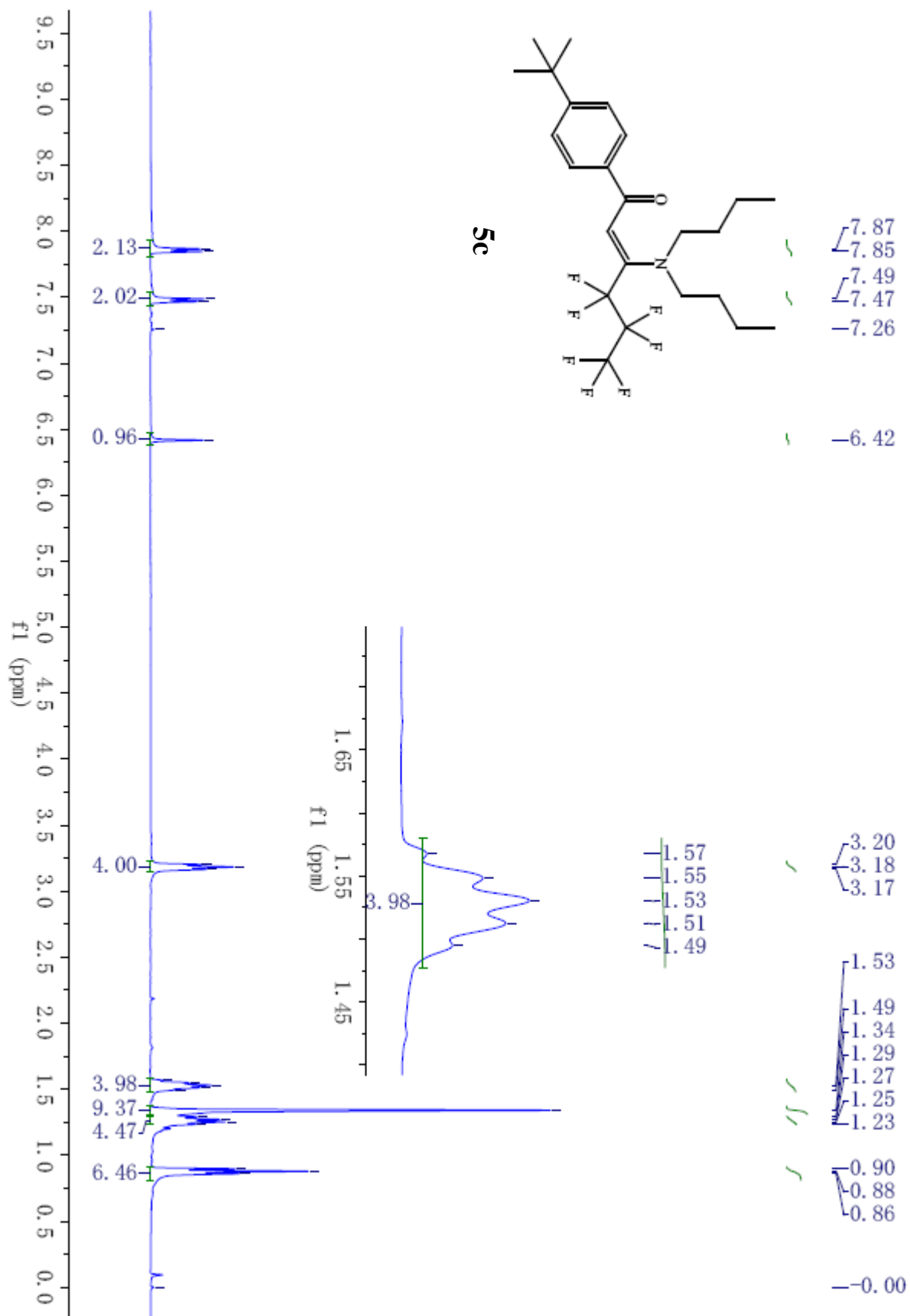


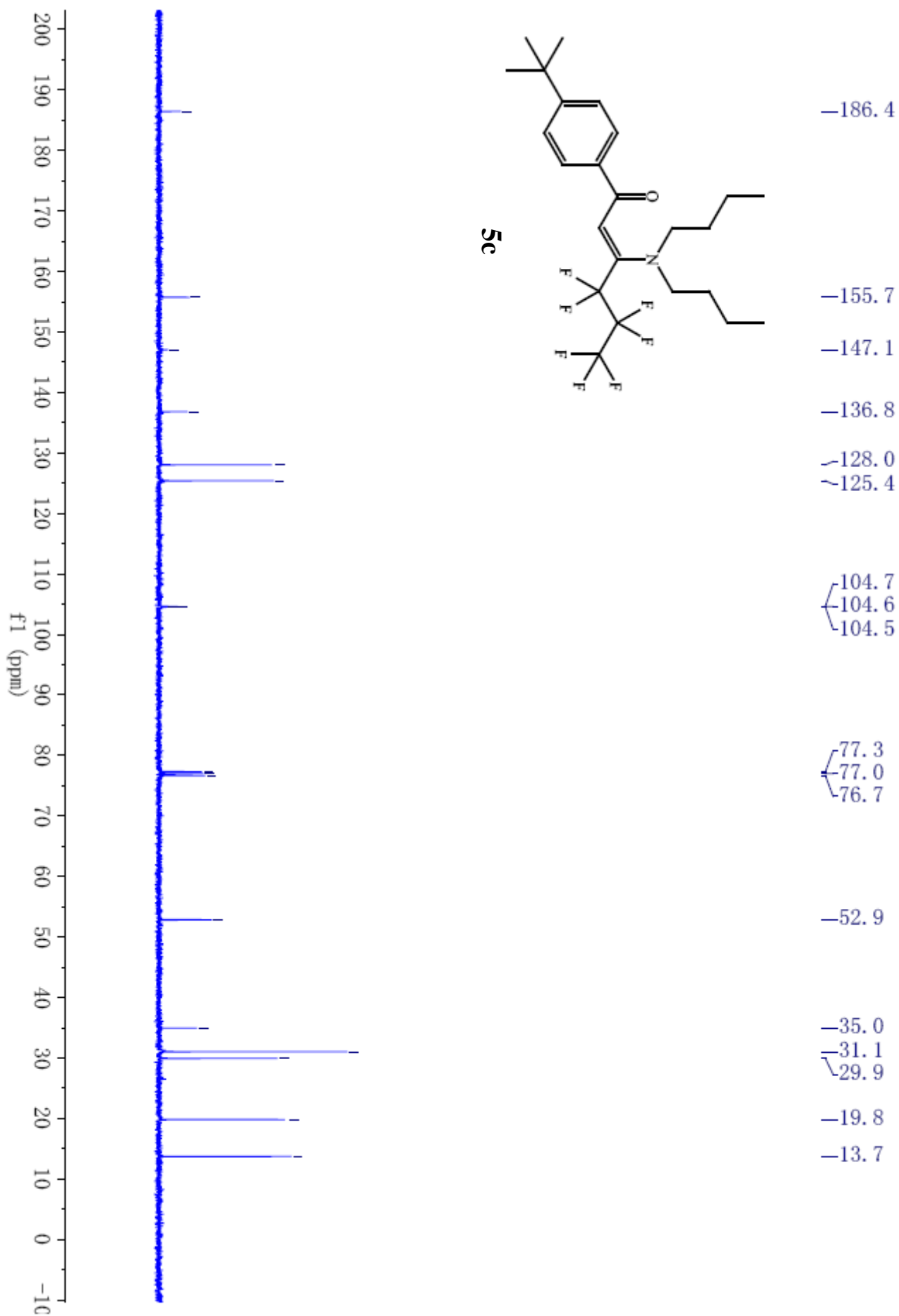


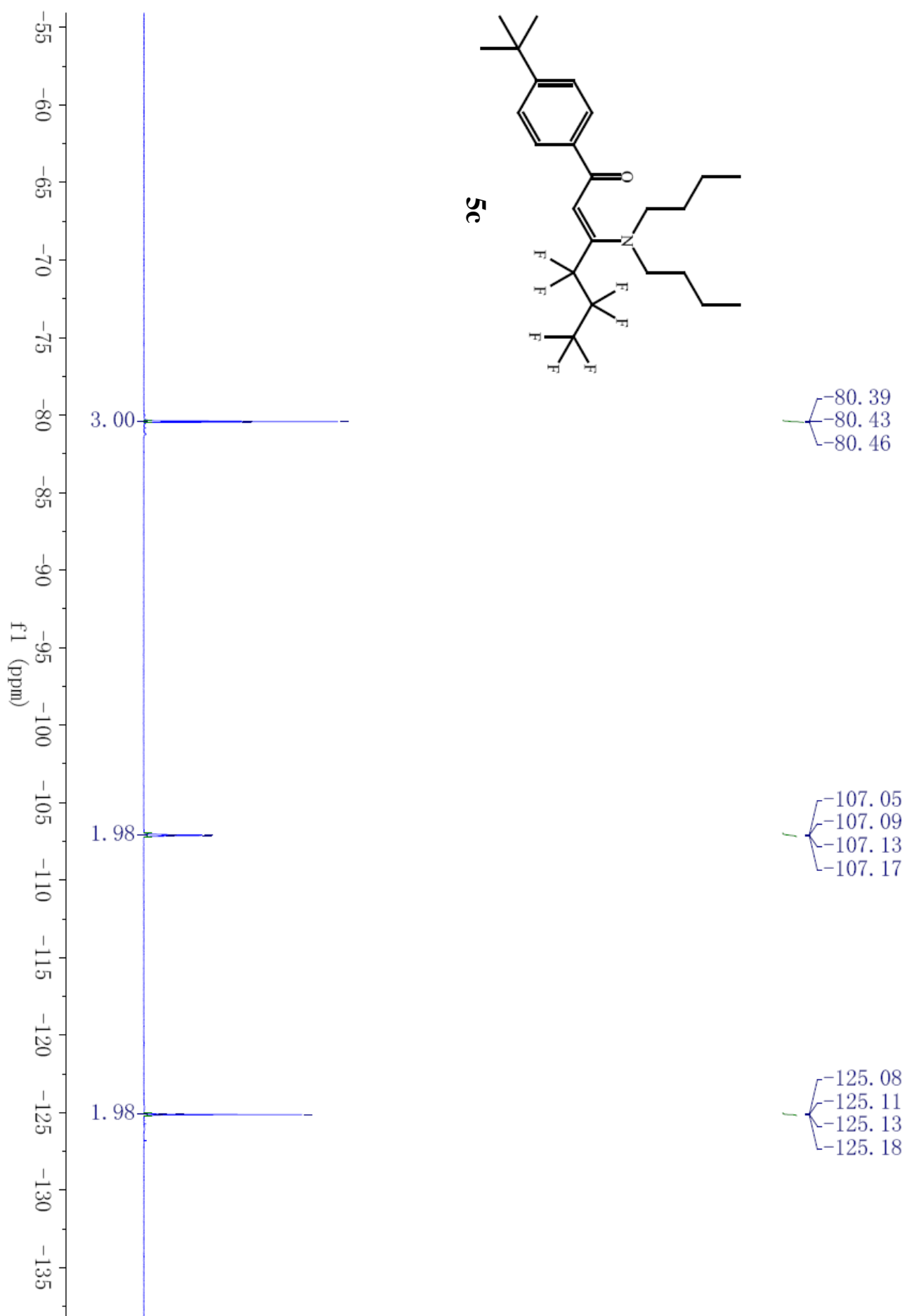


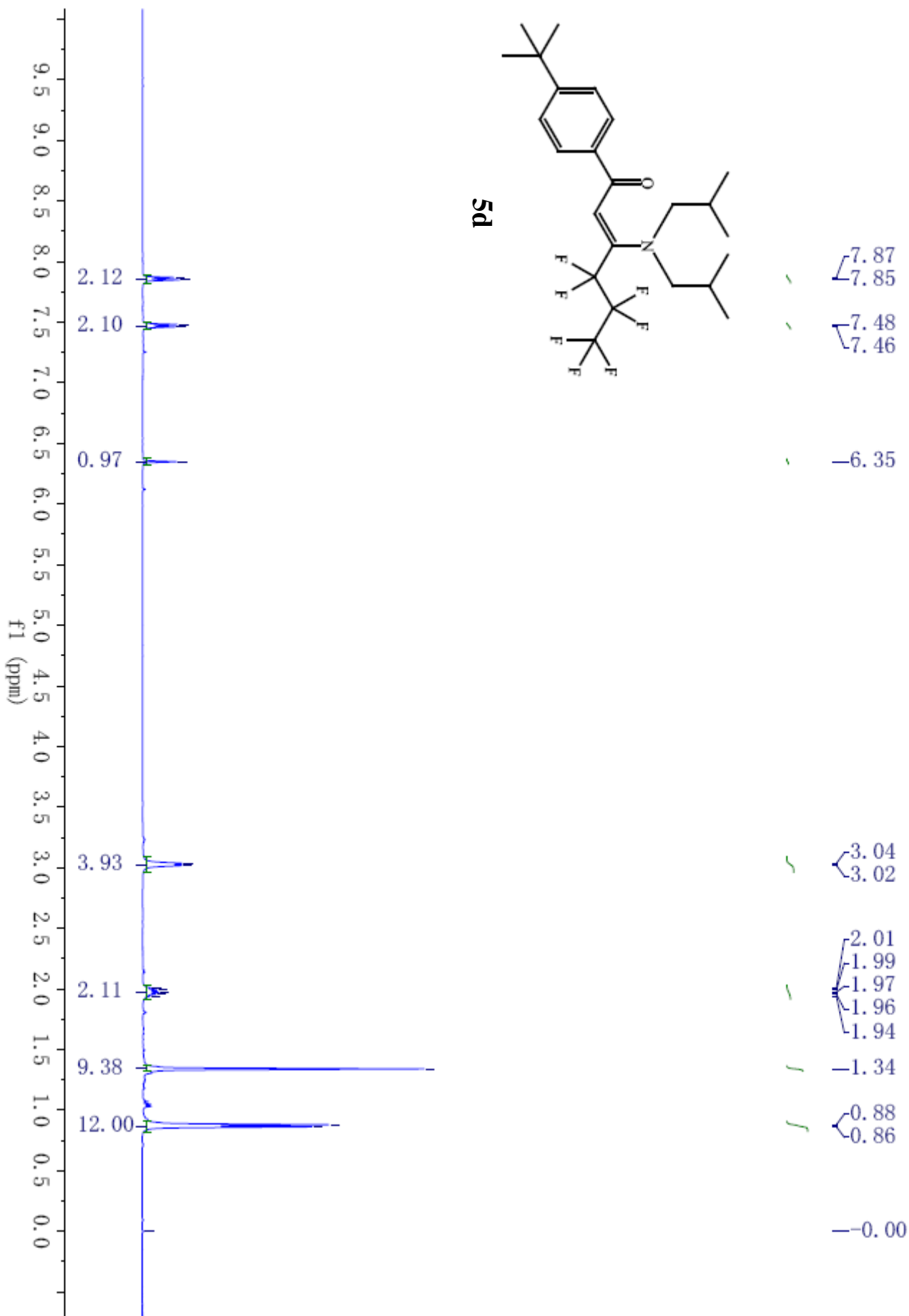


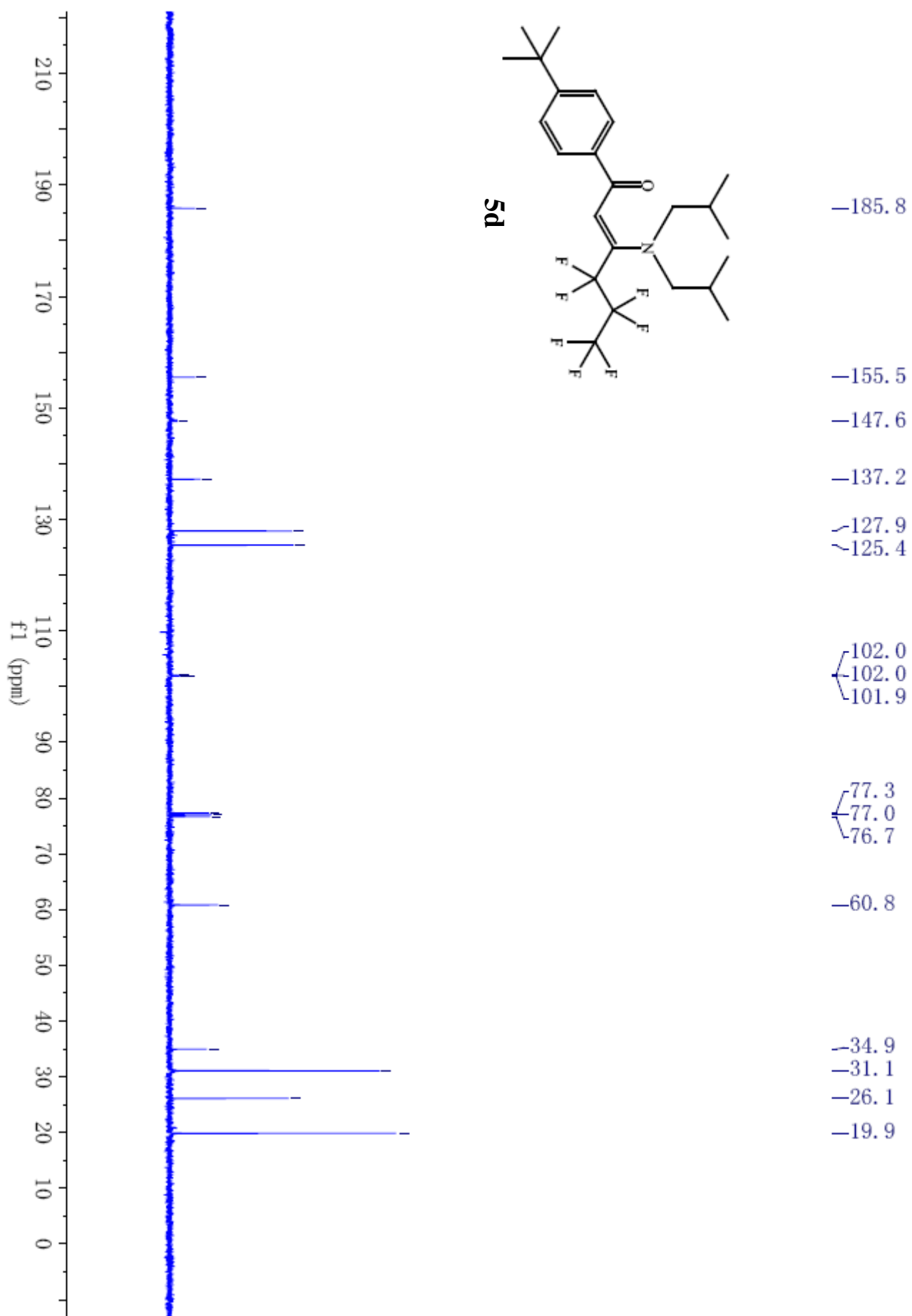




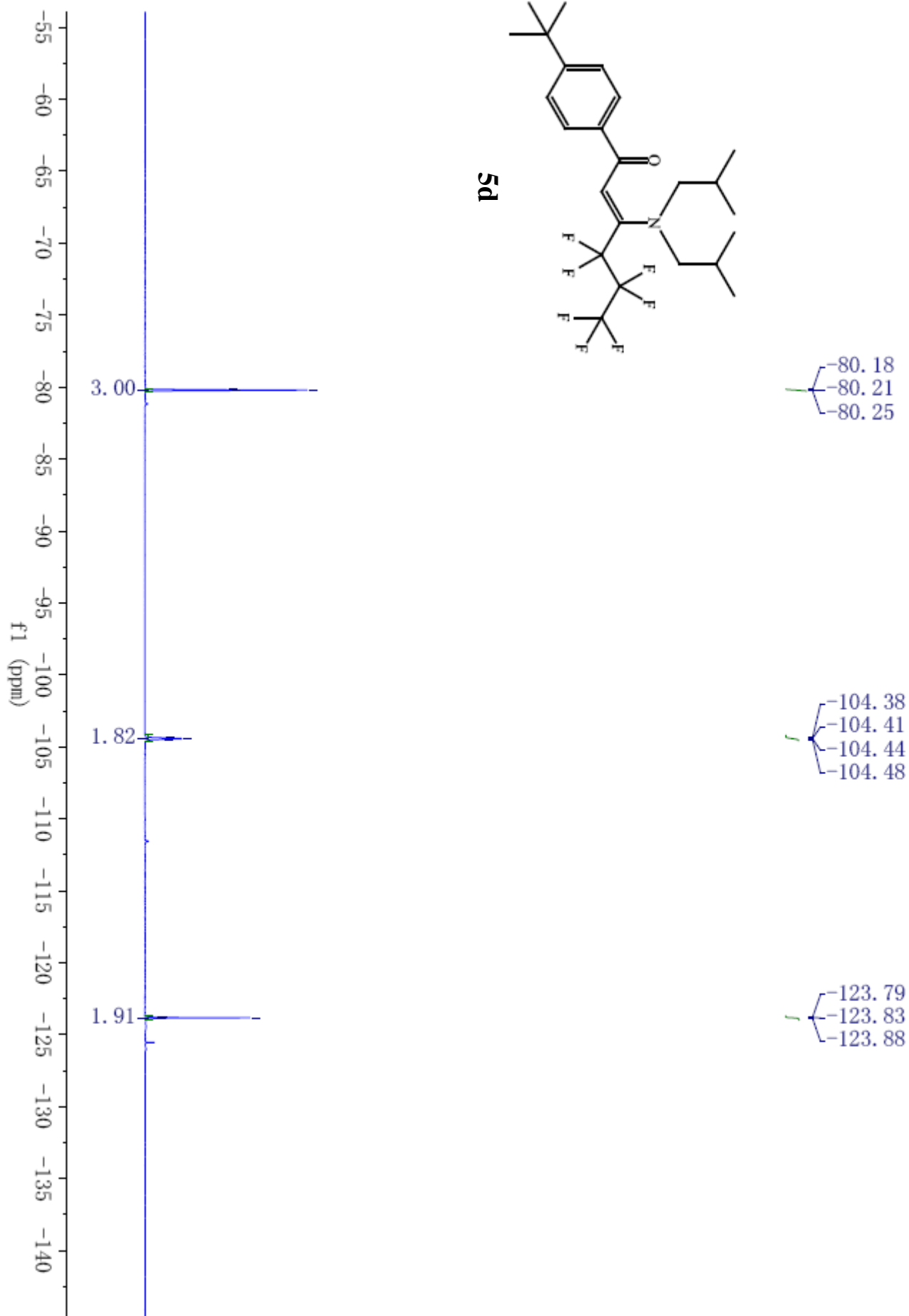
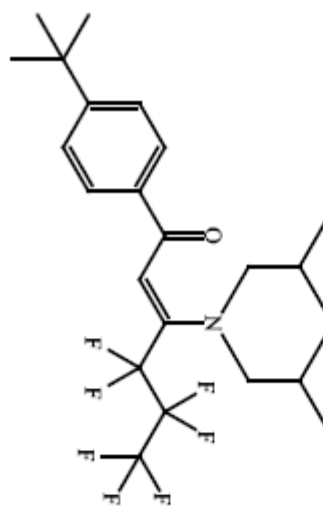


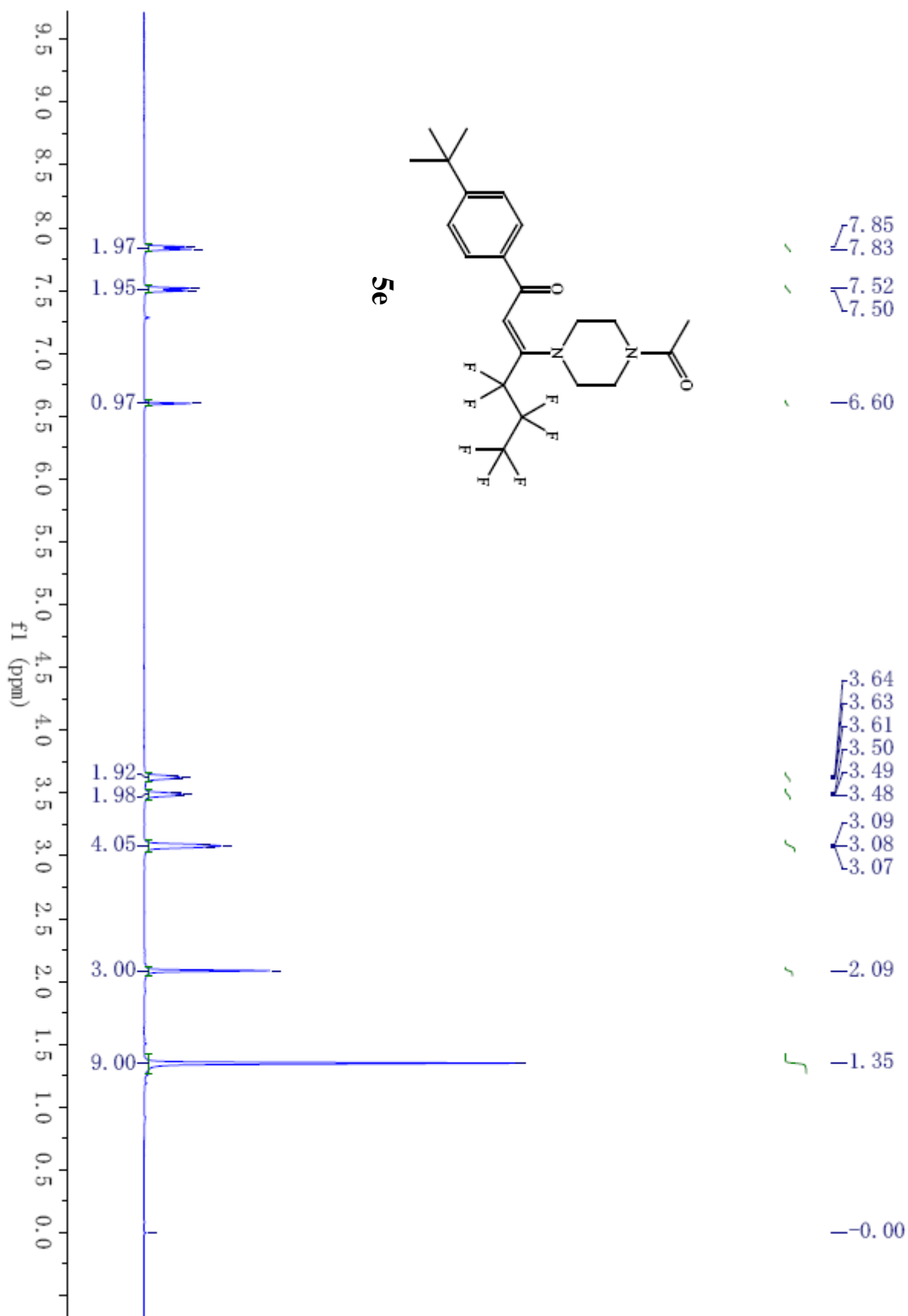


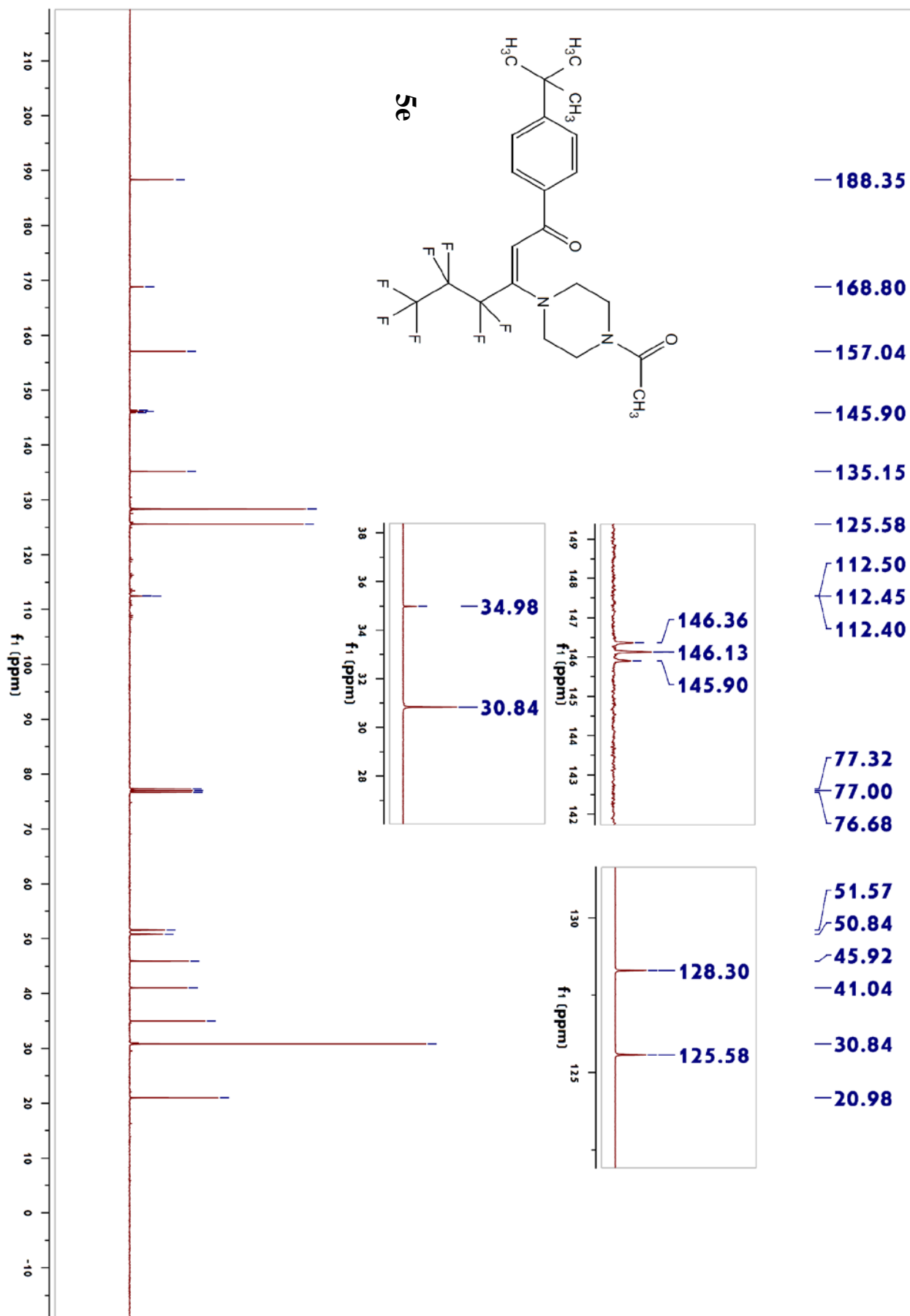


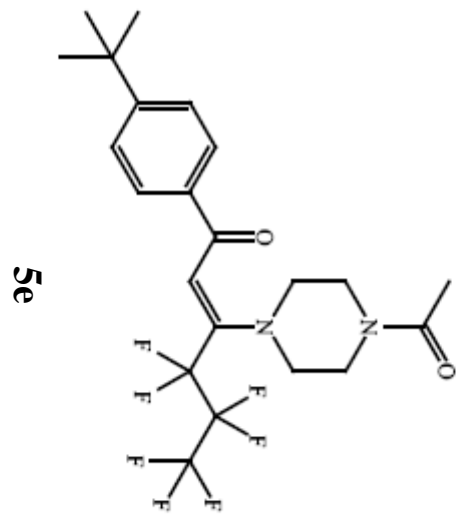


5d





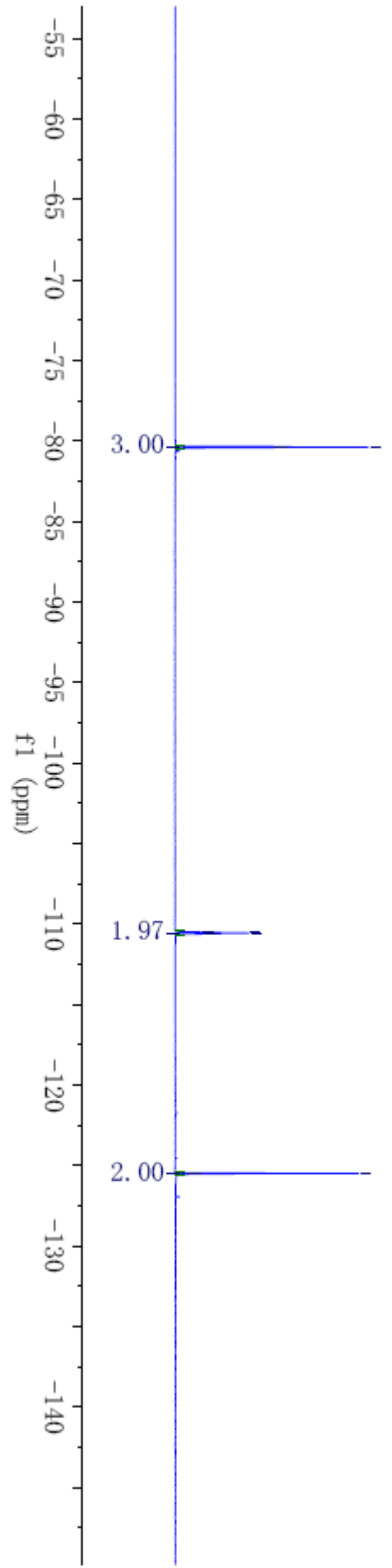


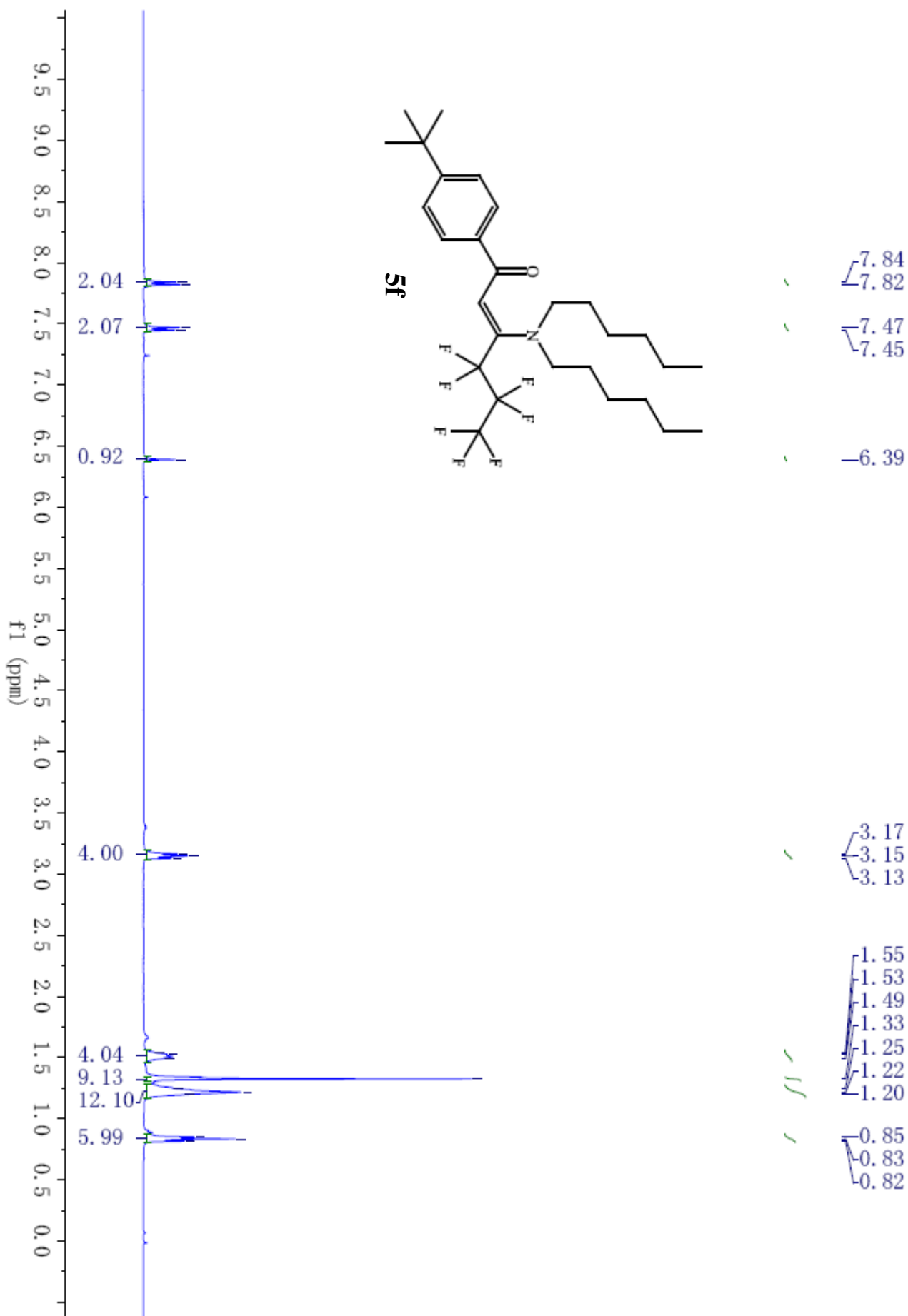


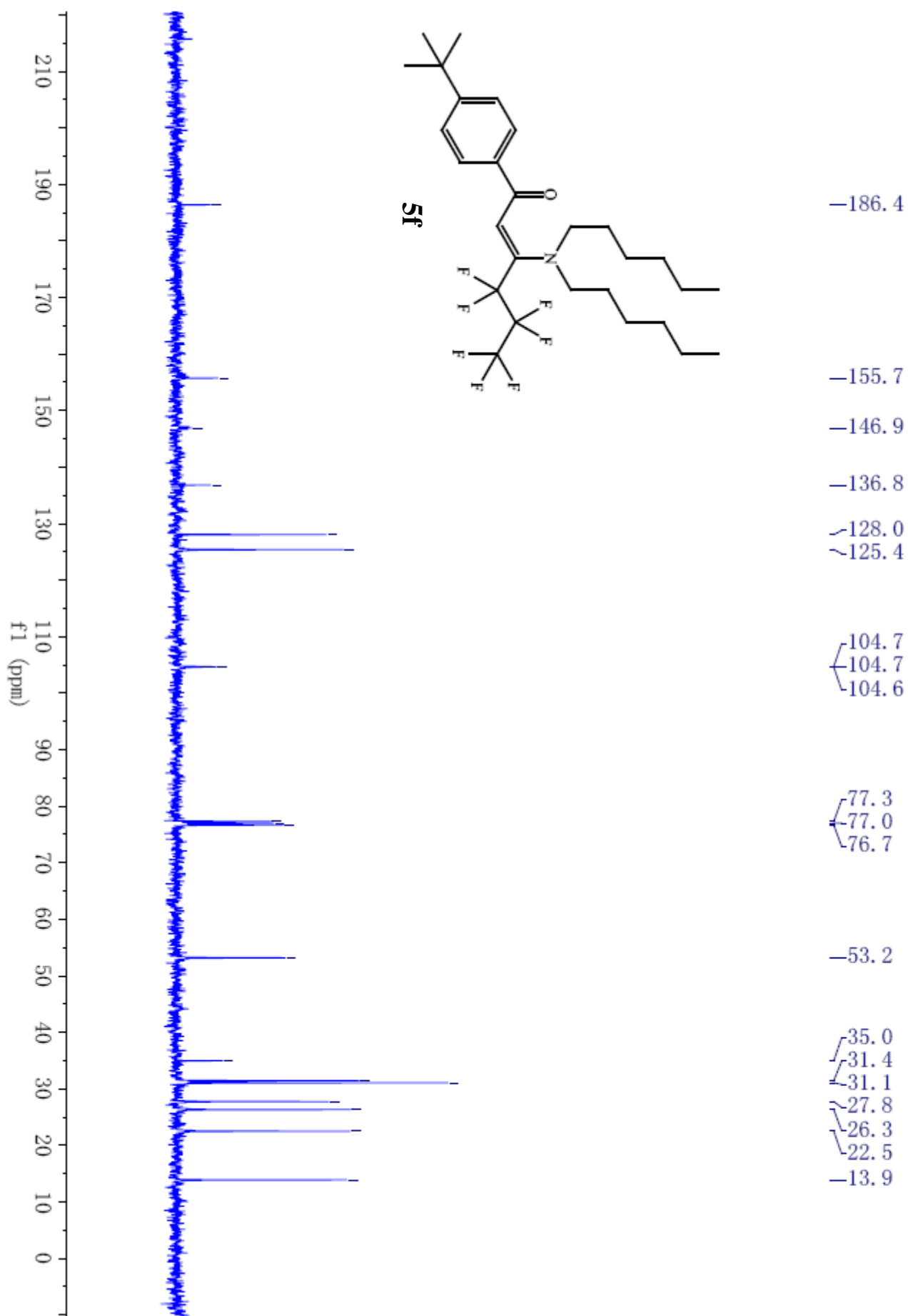
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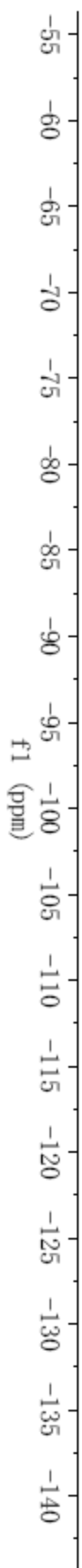
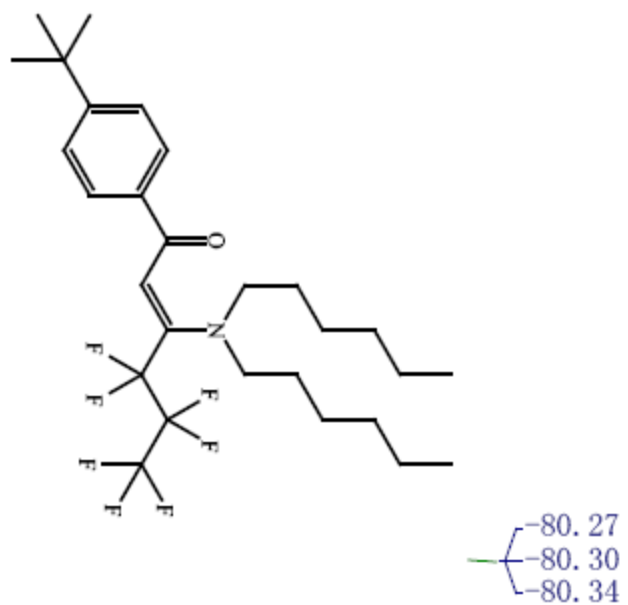
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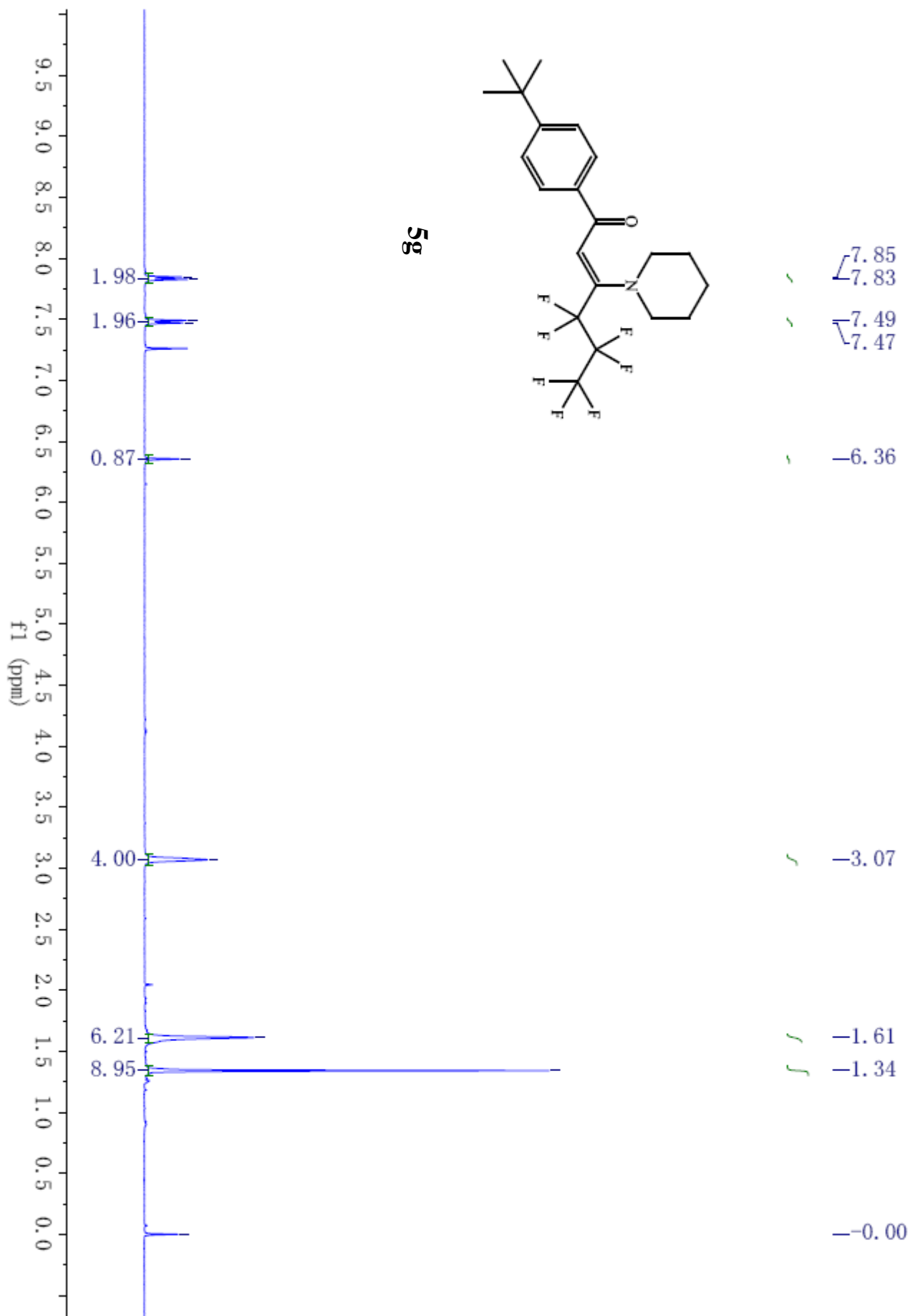


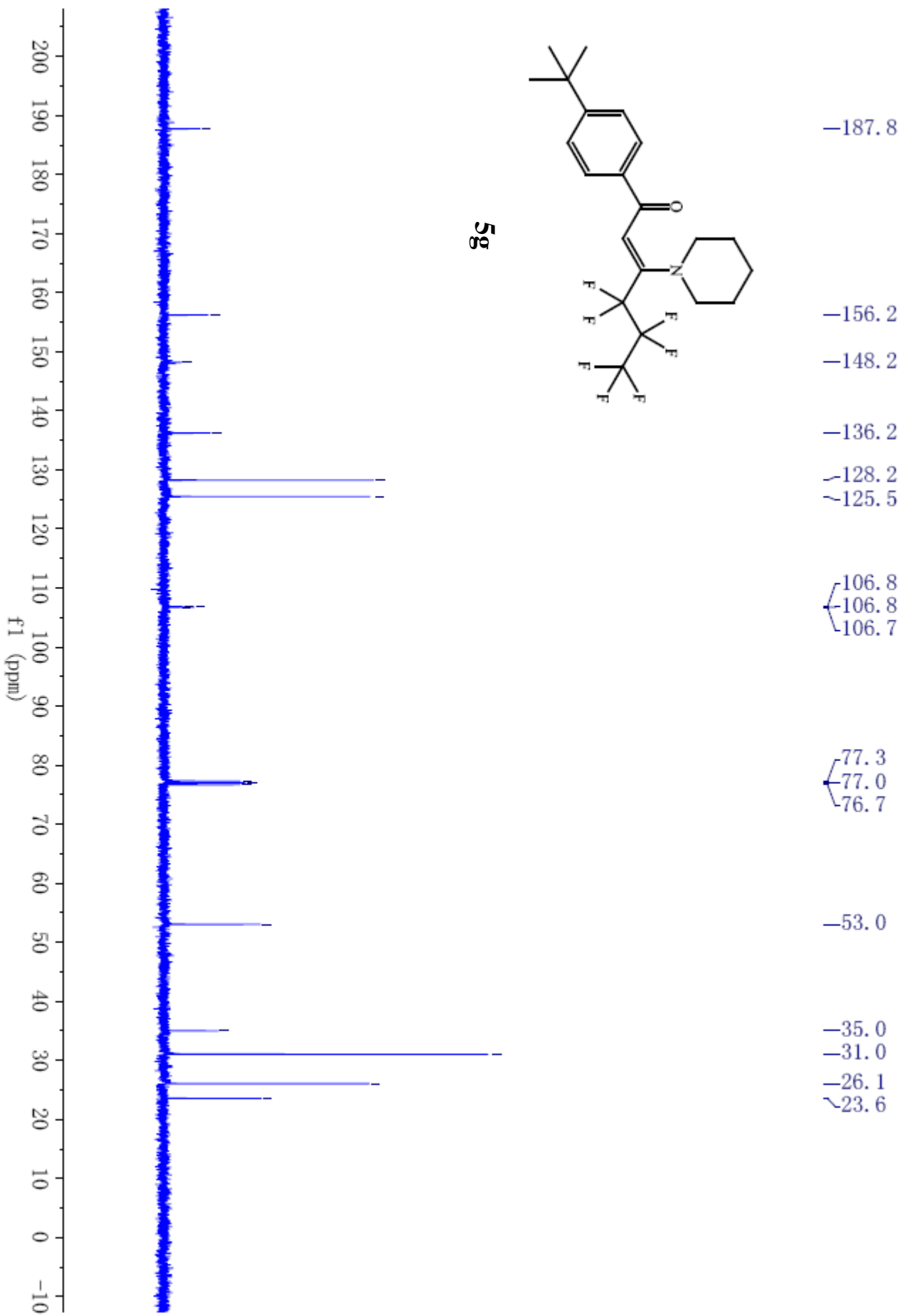




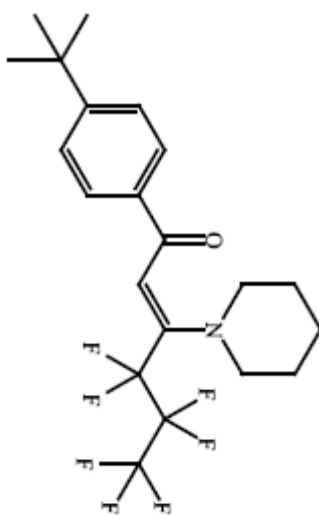
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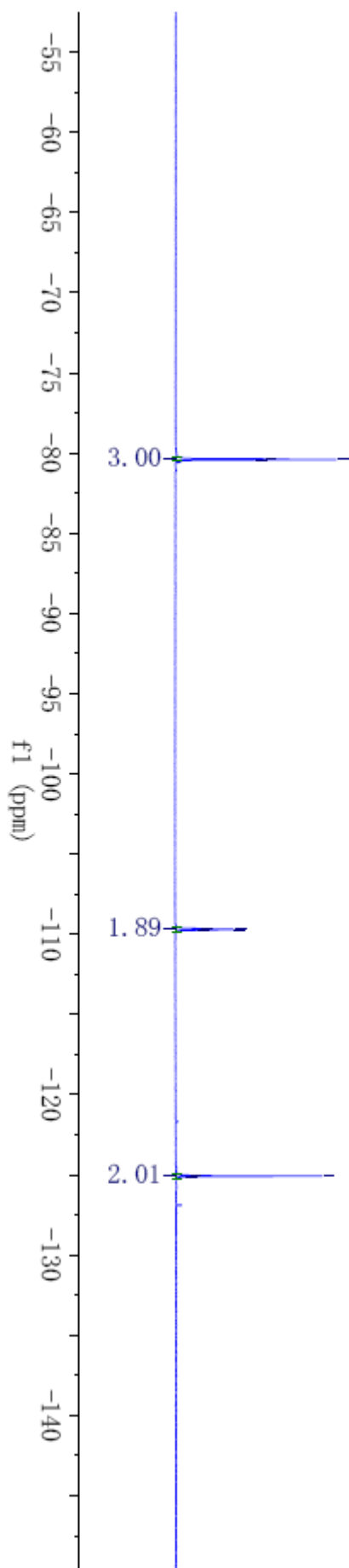
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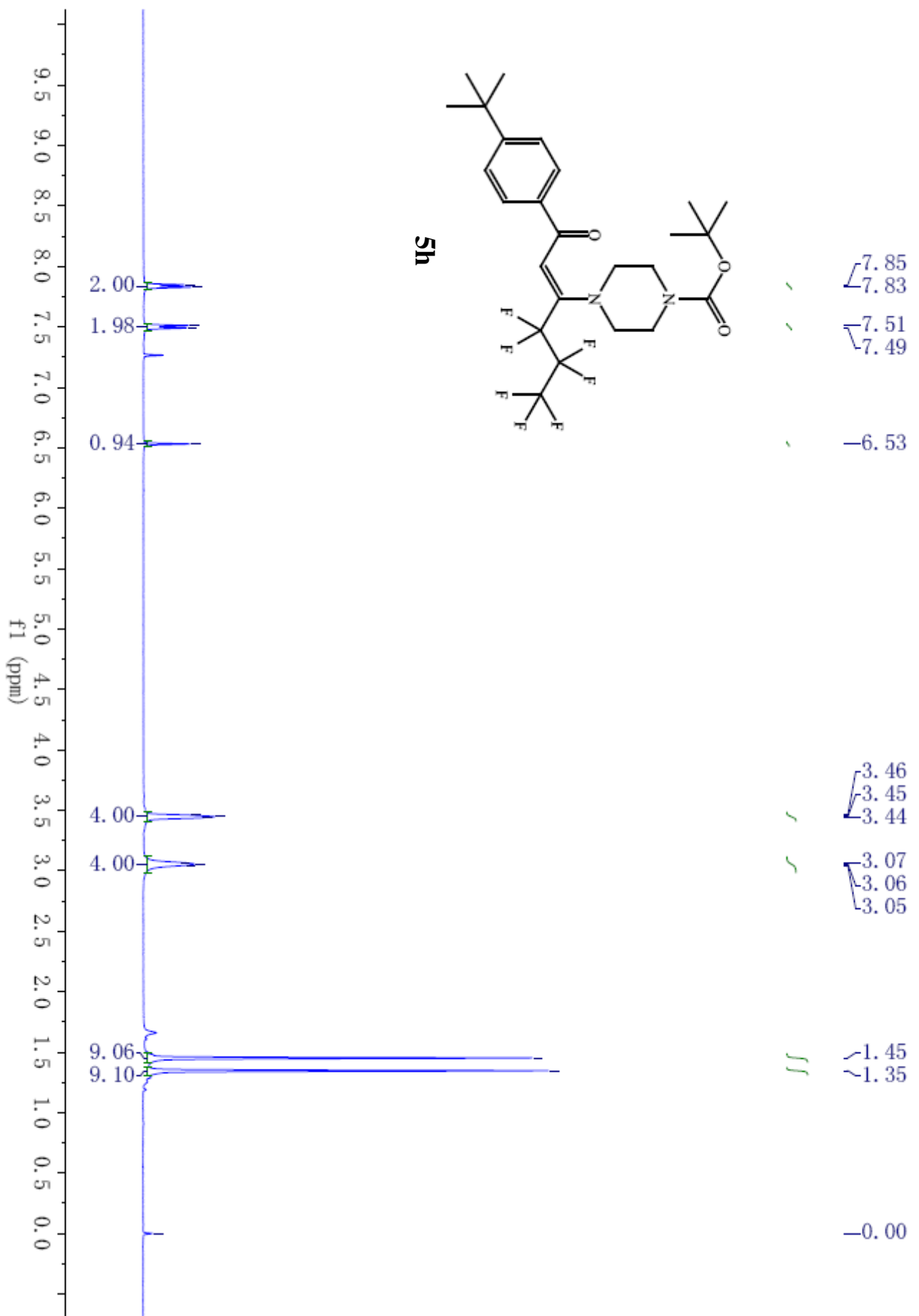


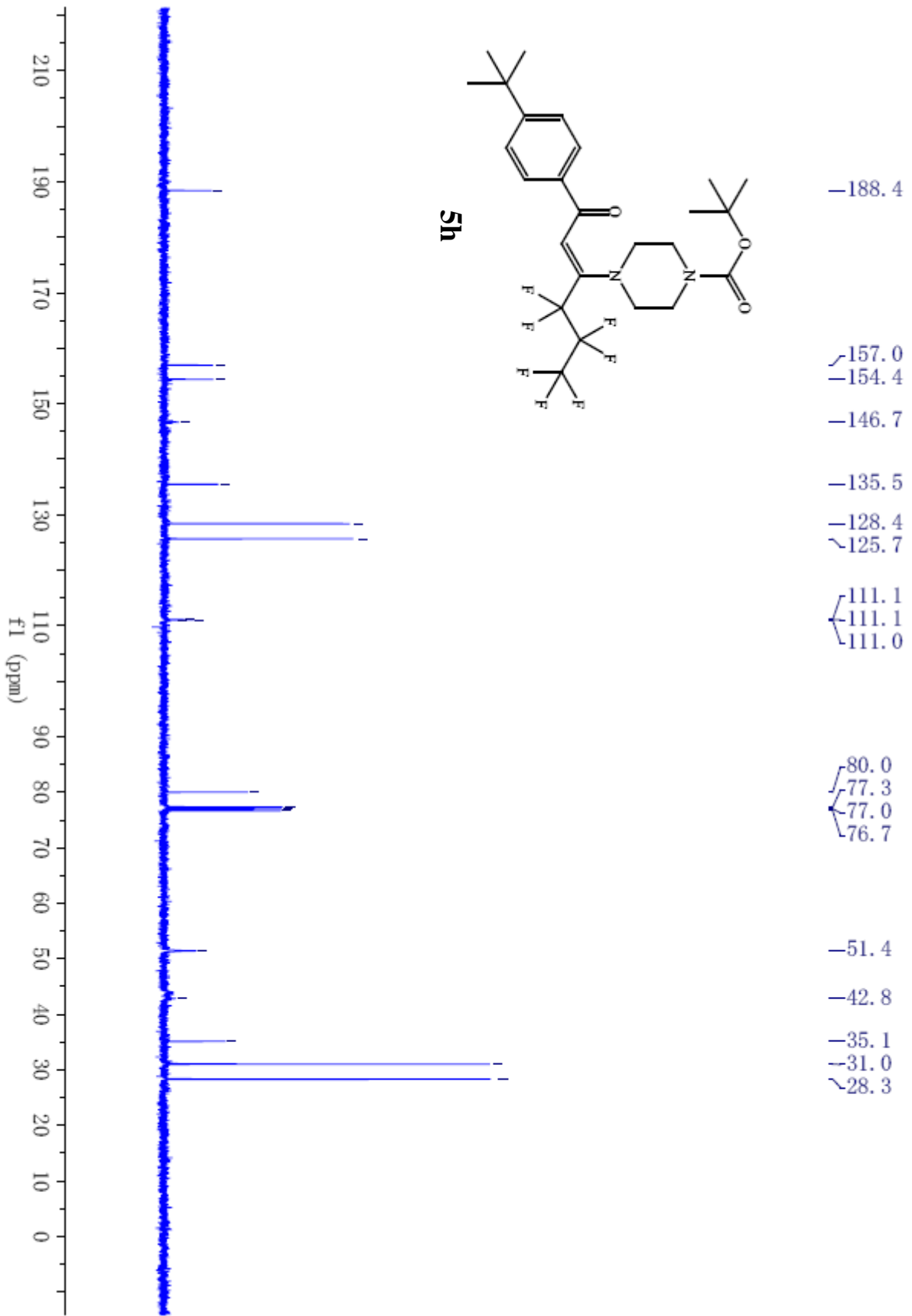
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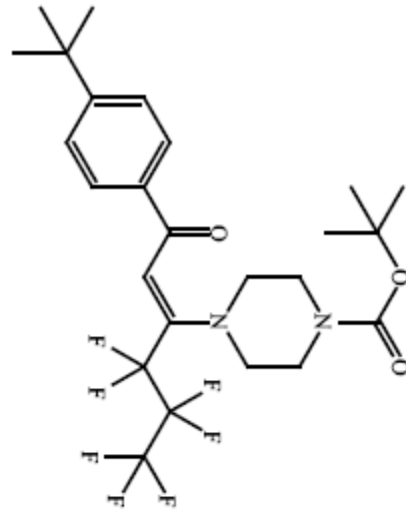
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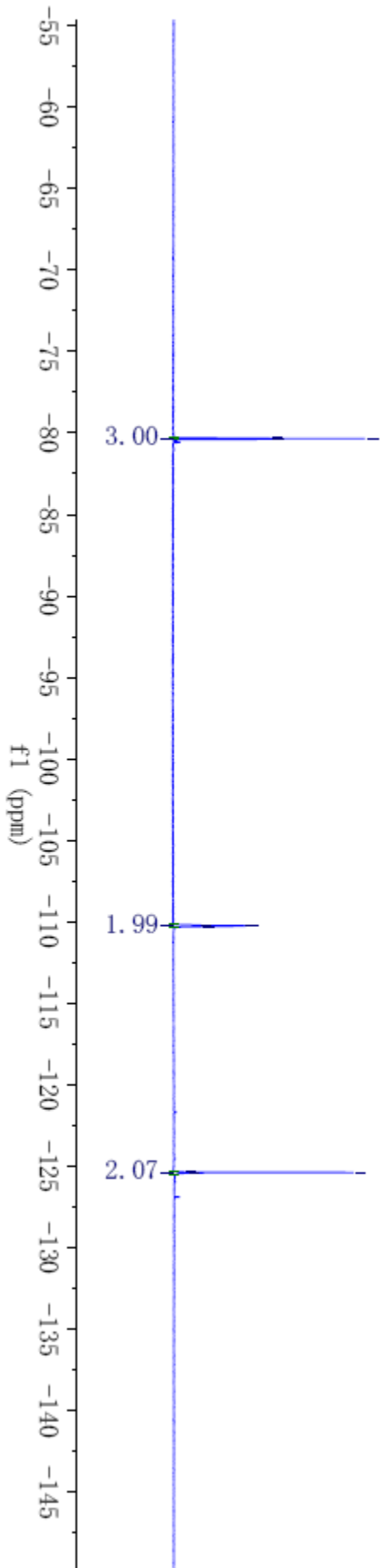
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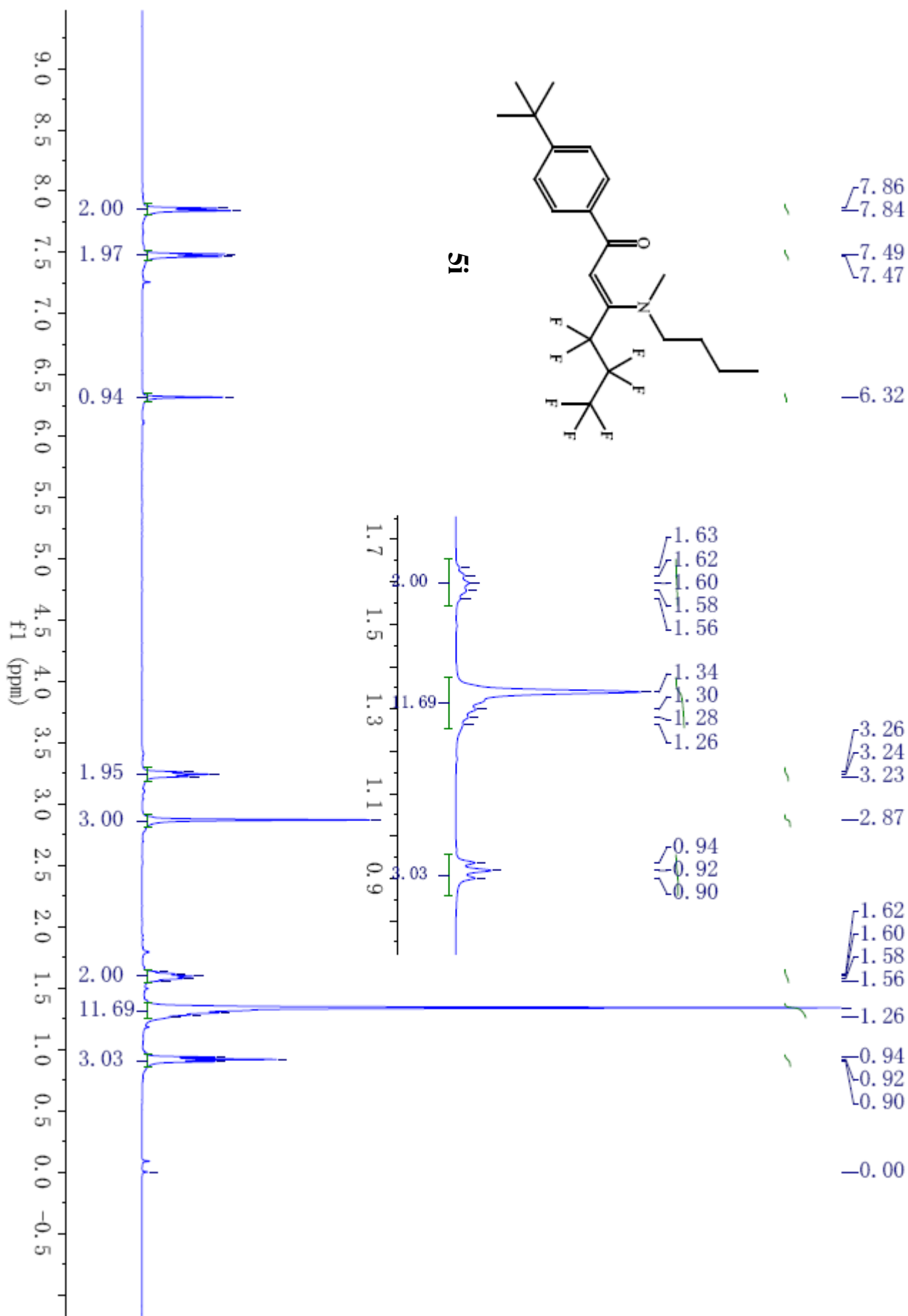


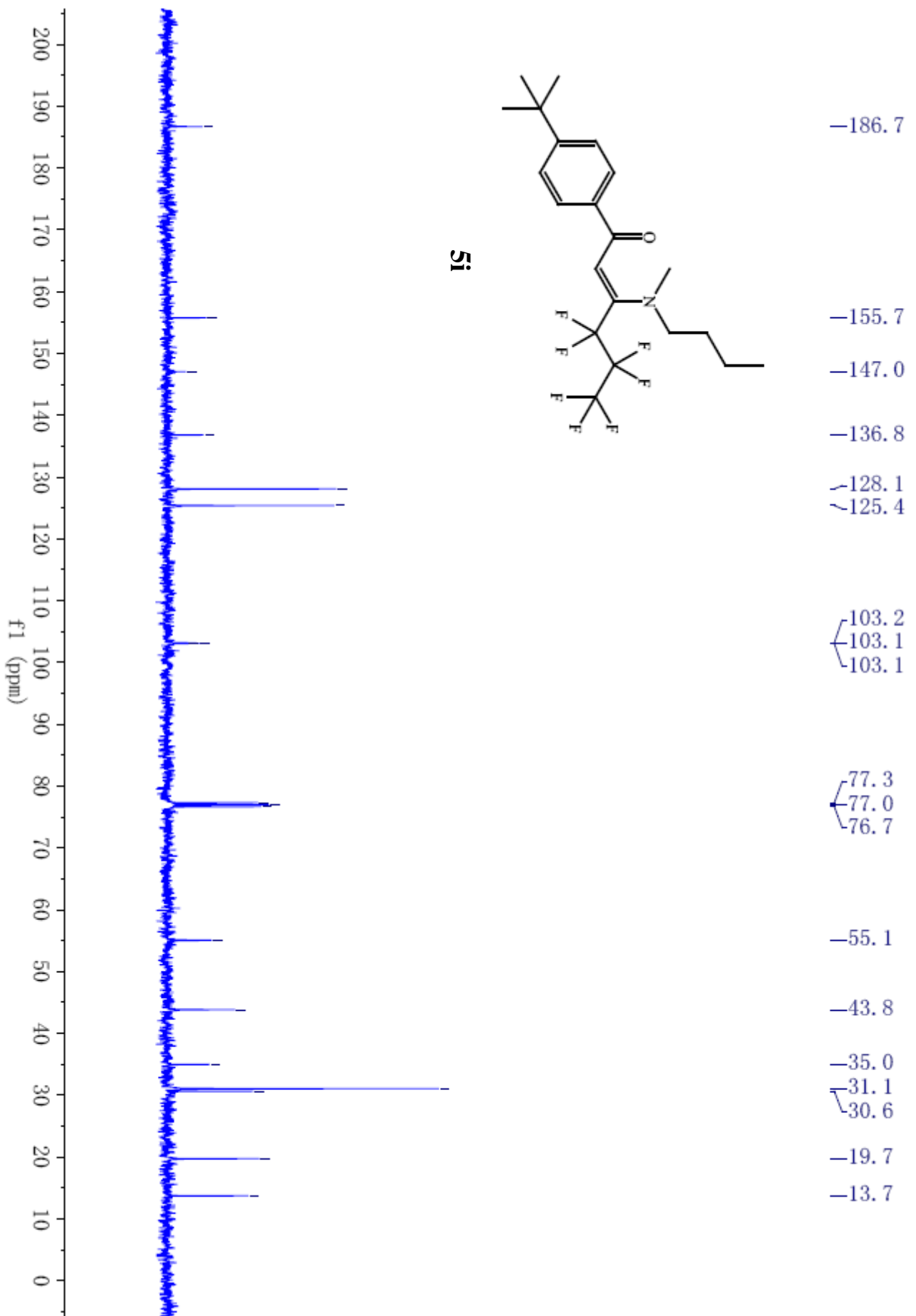
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-80.38

-110.20
-110.23
-110.26
-110.30

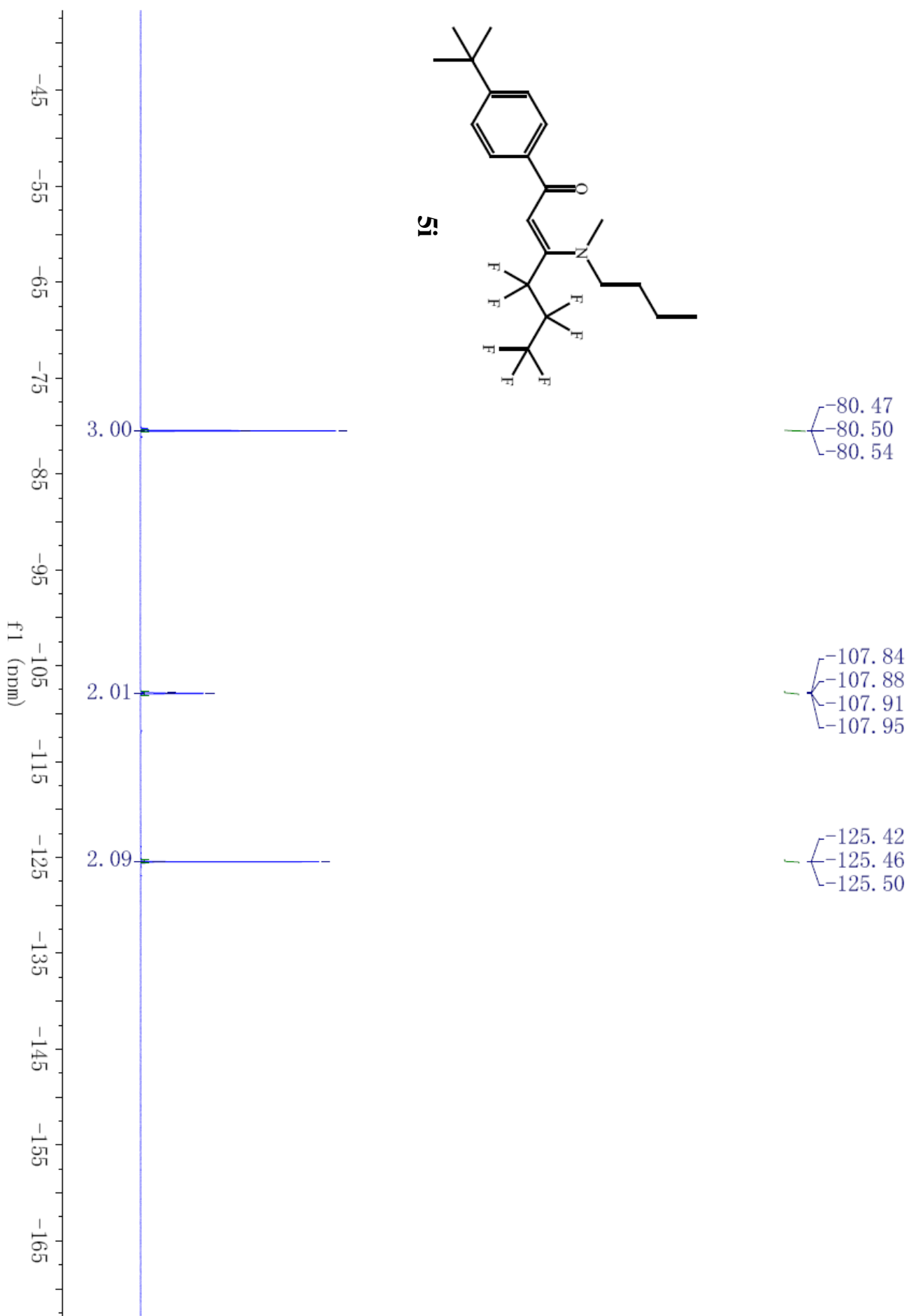
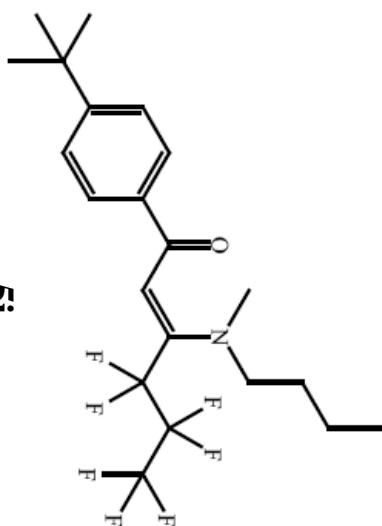
-125.34
-125.38
-125.42

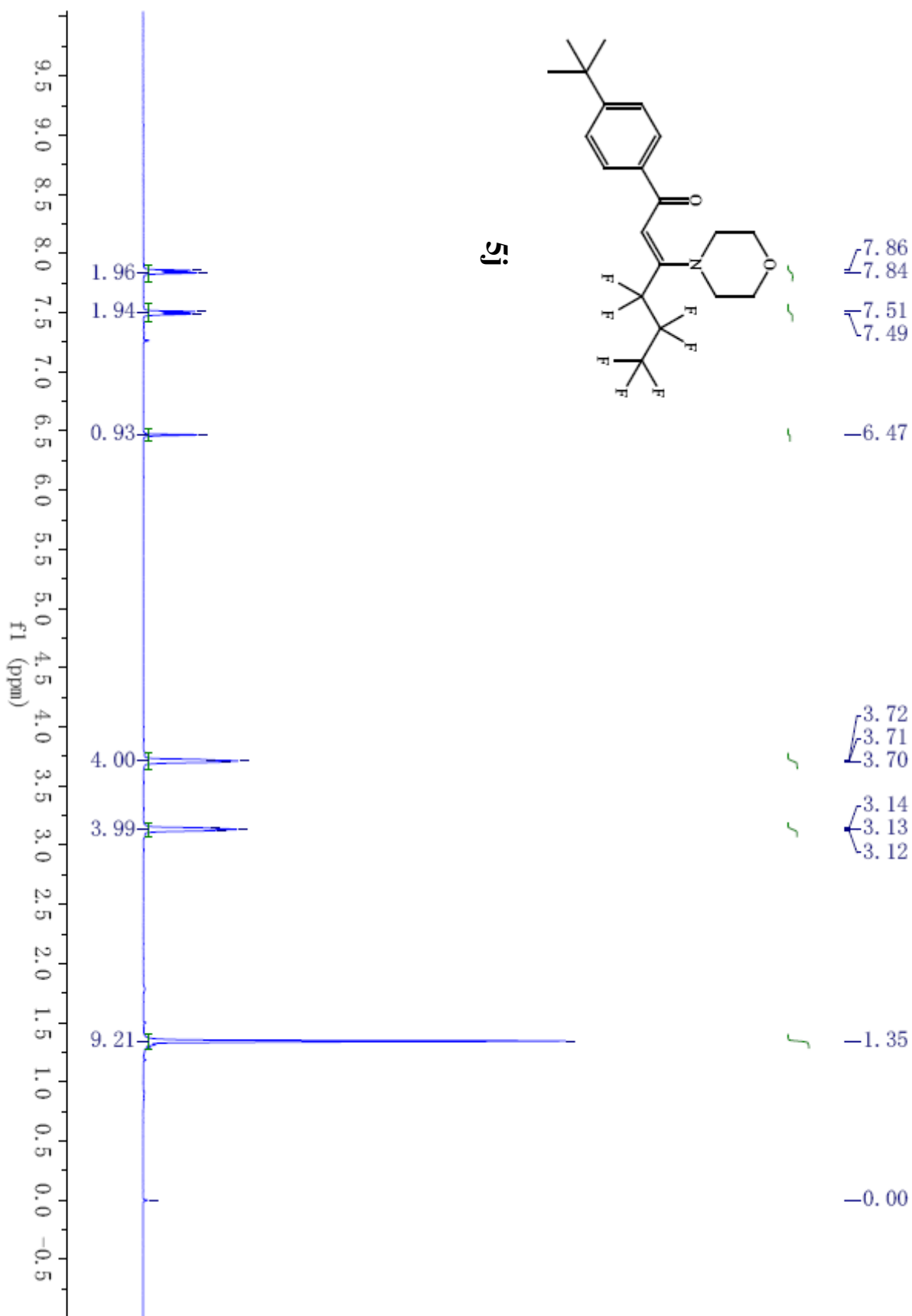


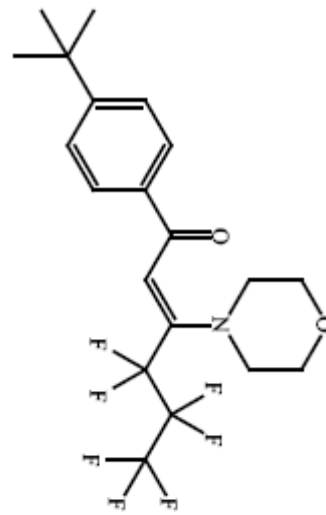




5i







-188.2

-156.7

-146.5

-135.7

-128.3

-125.6

109.1

109.0

108.9

77.3

77.0

76.7

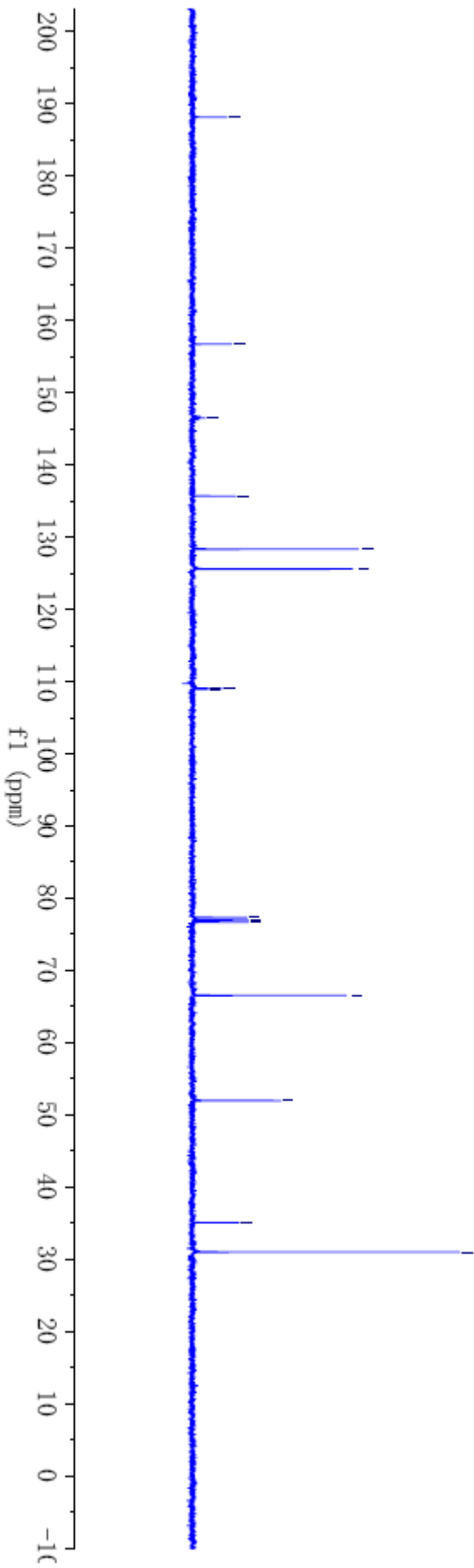
-66.5

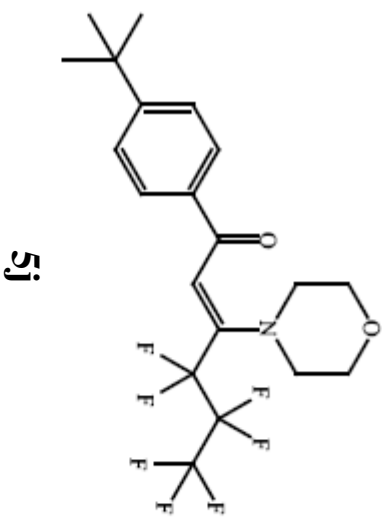
-52.0

-35.1

-31.0

5j

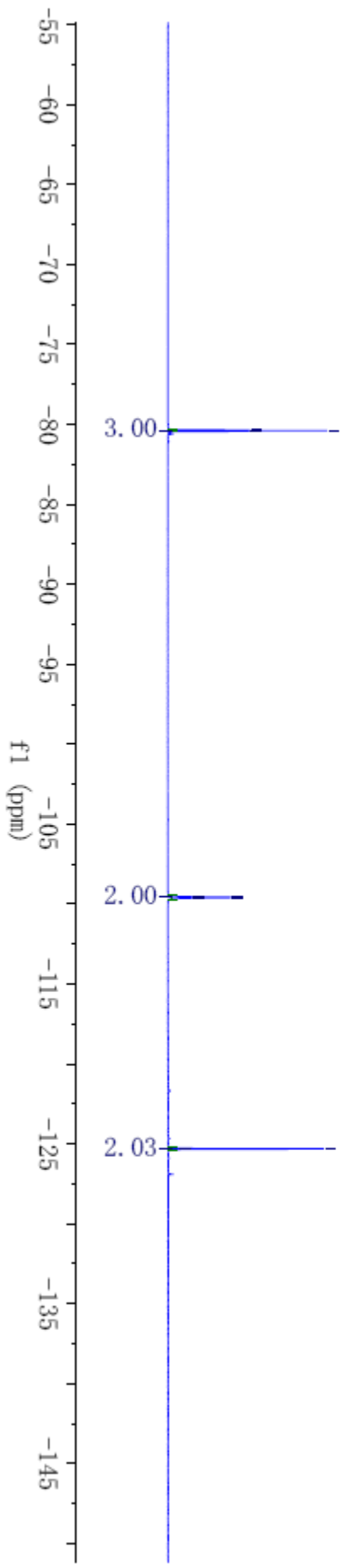


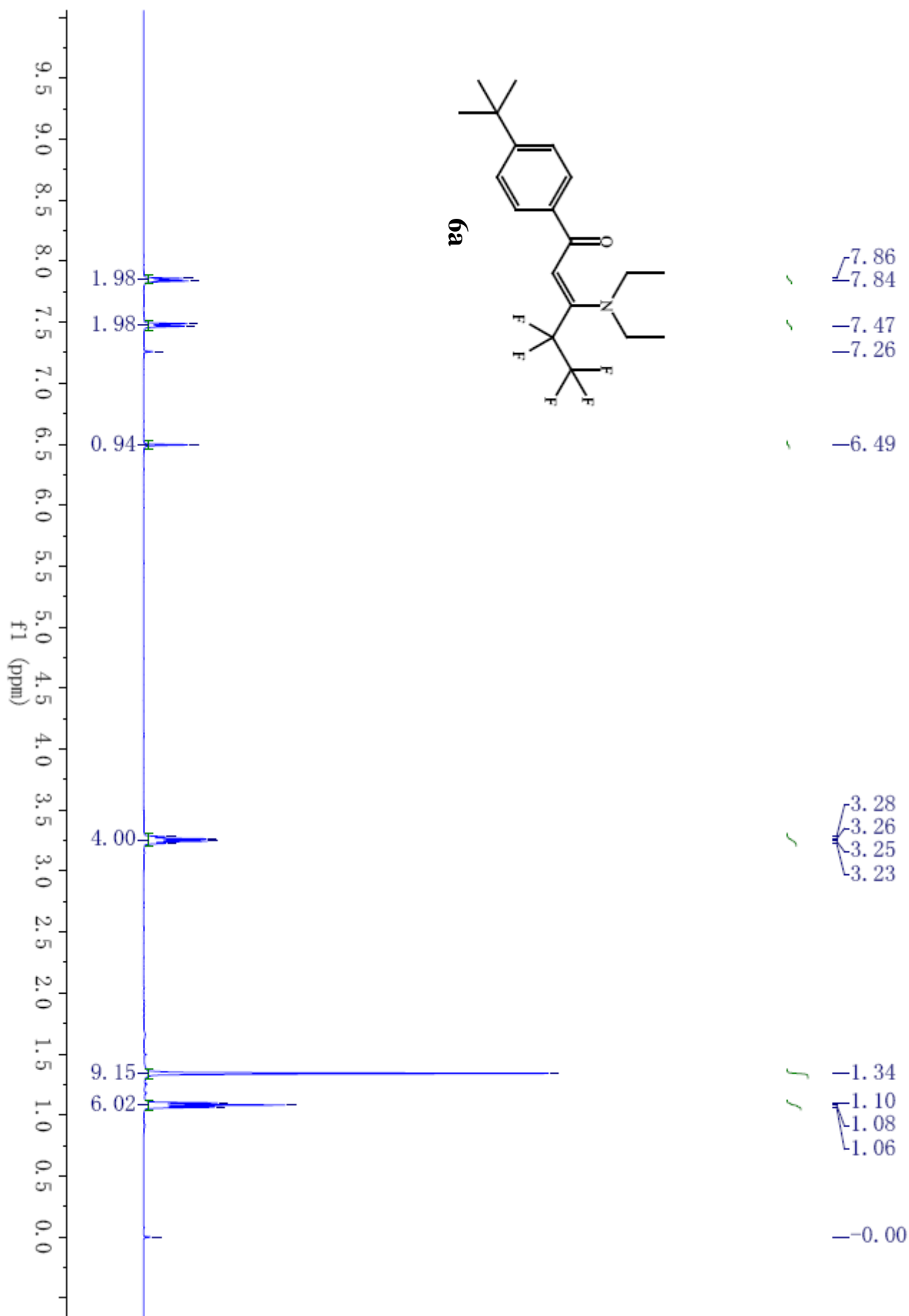


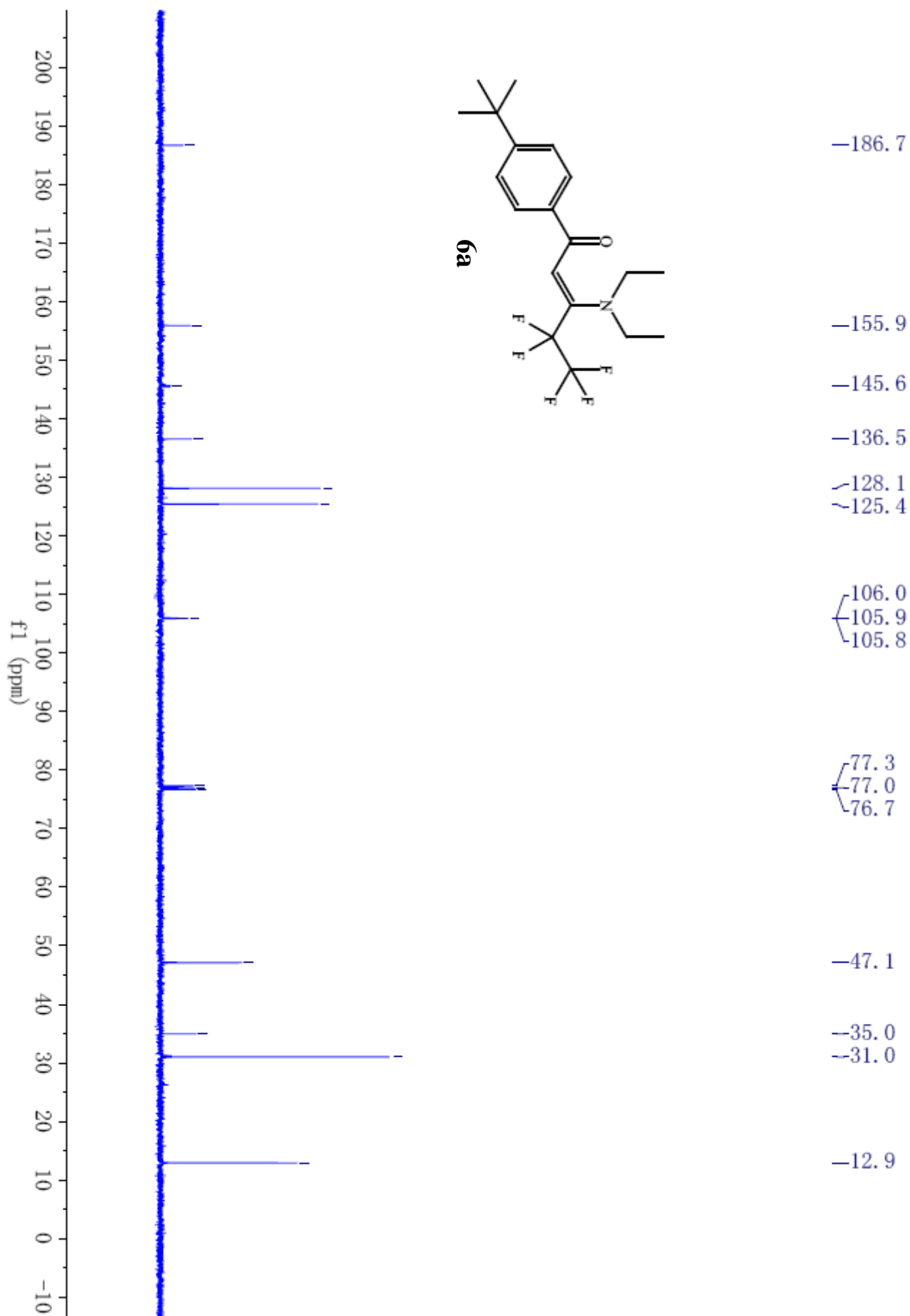
-80.35
-80.39
-80.42

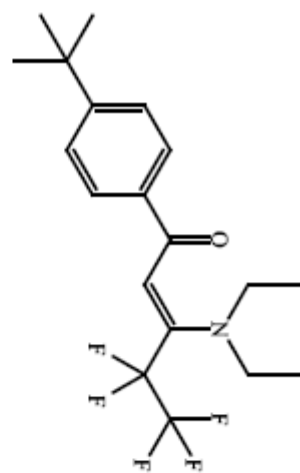
109.54
109.57
109.60
109.64

125.27
125.31
125.35

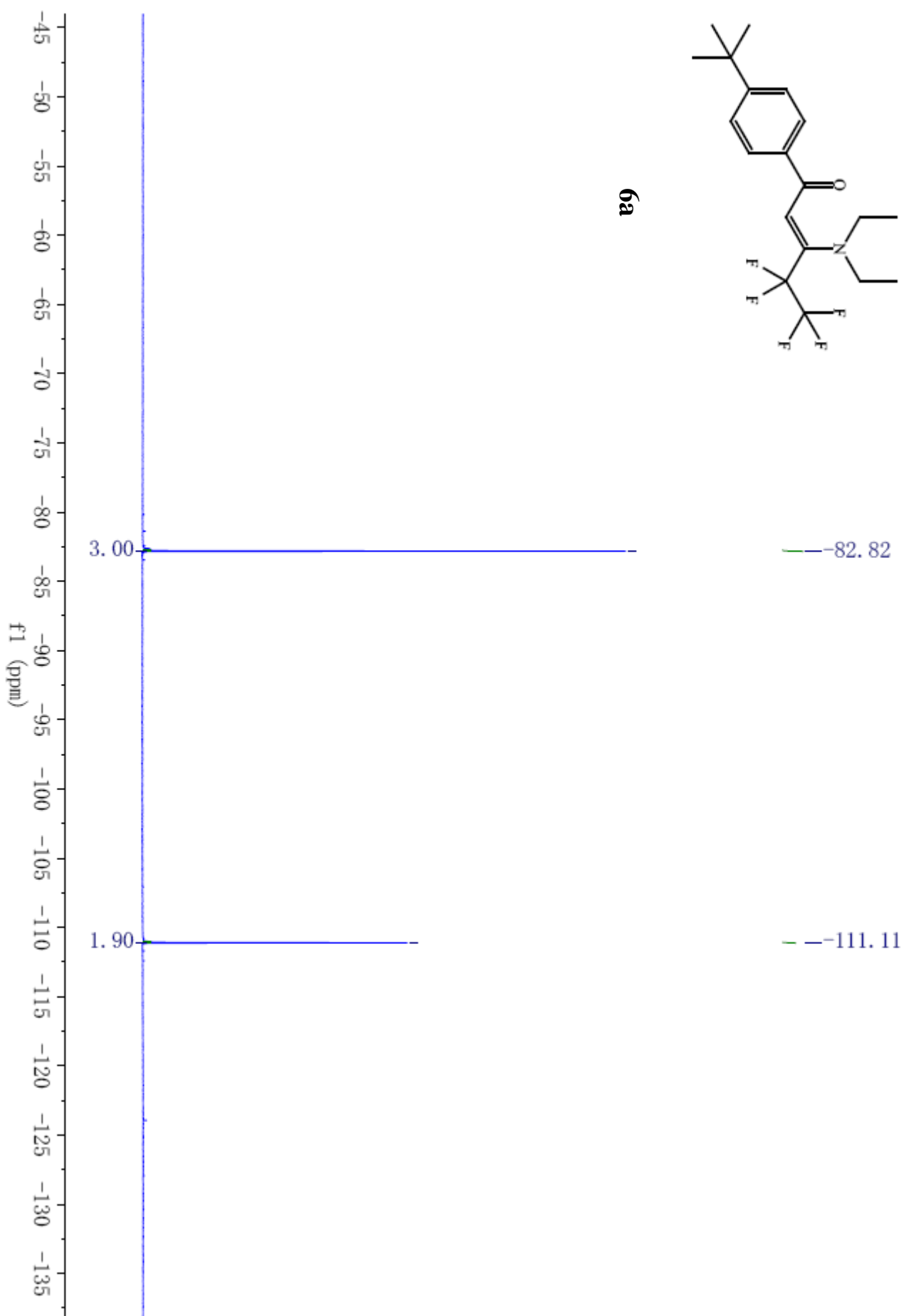


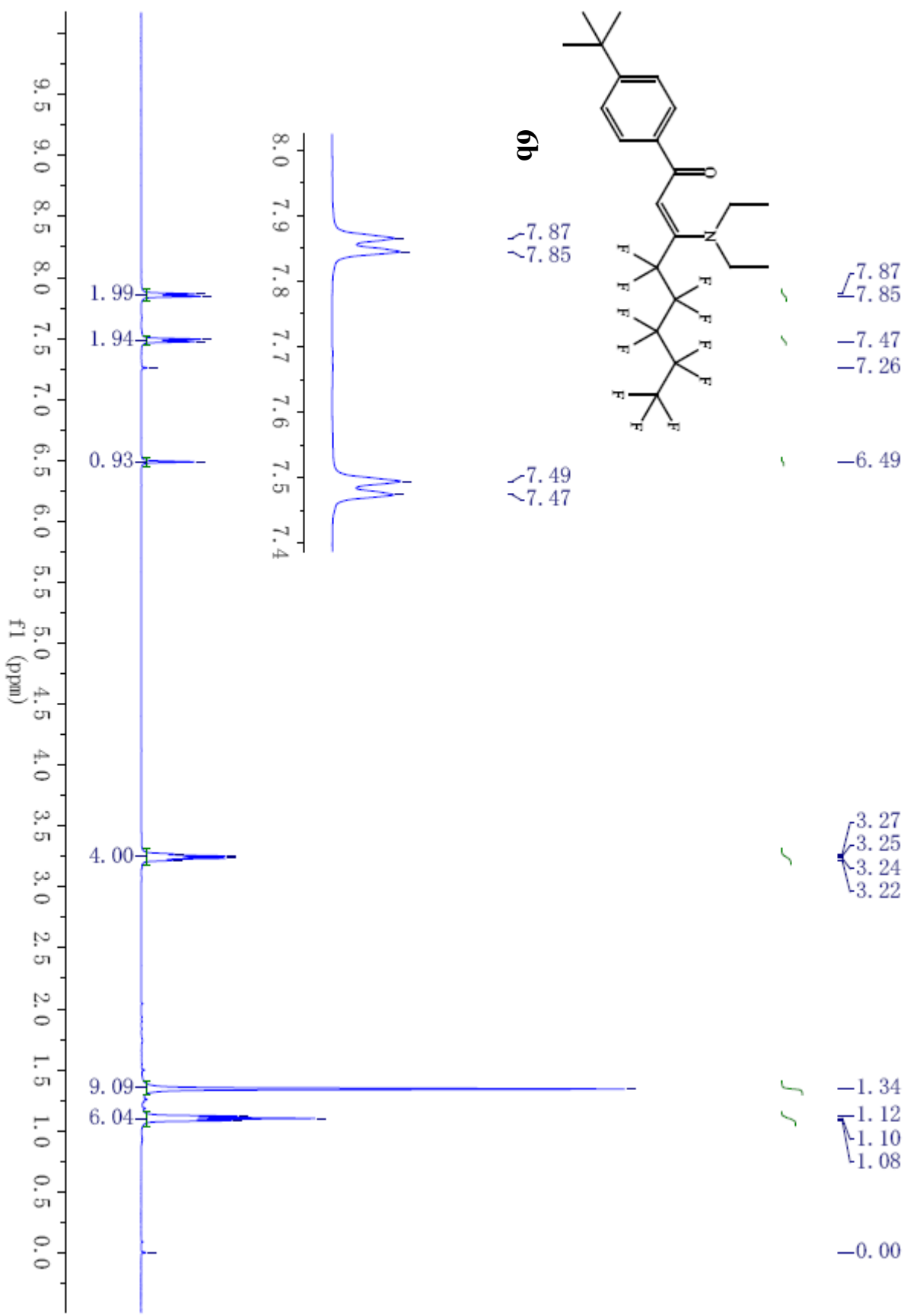


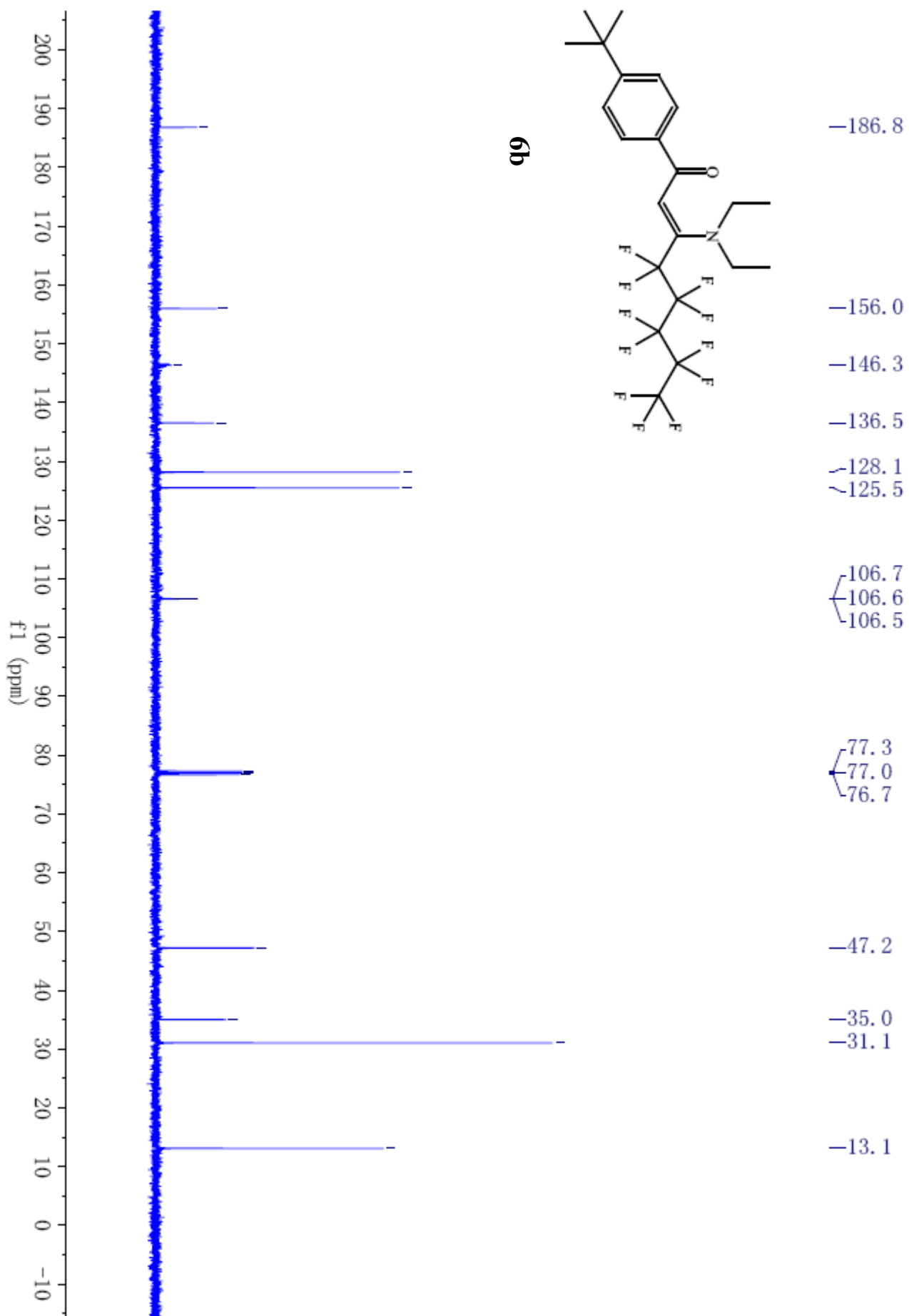


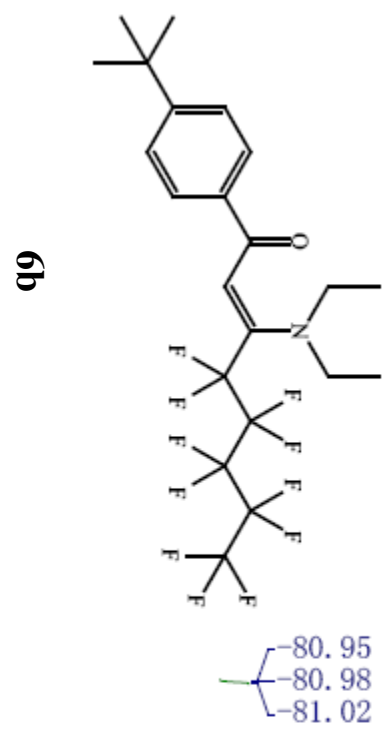


6a





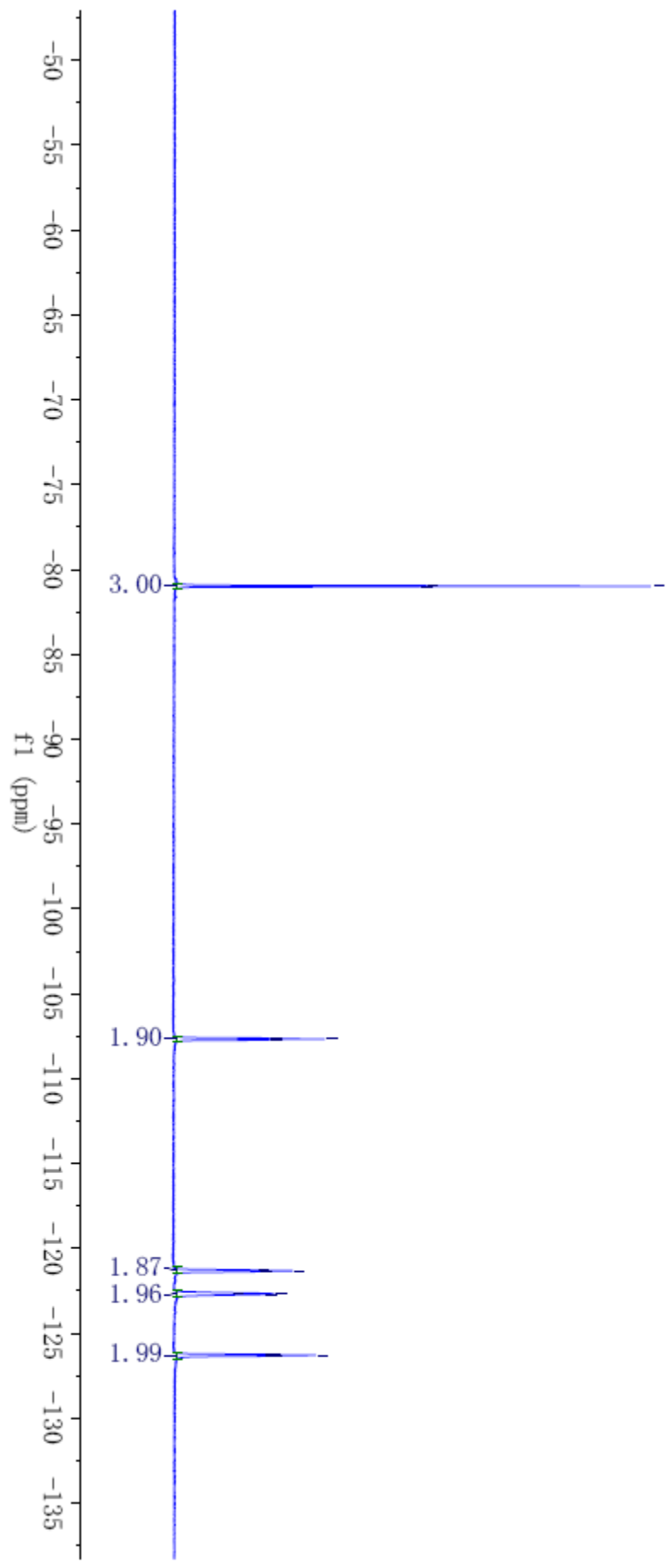


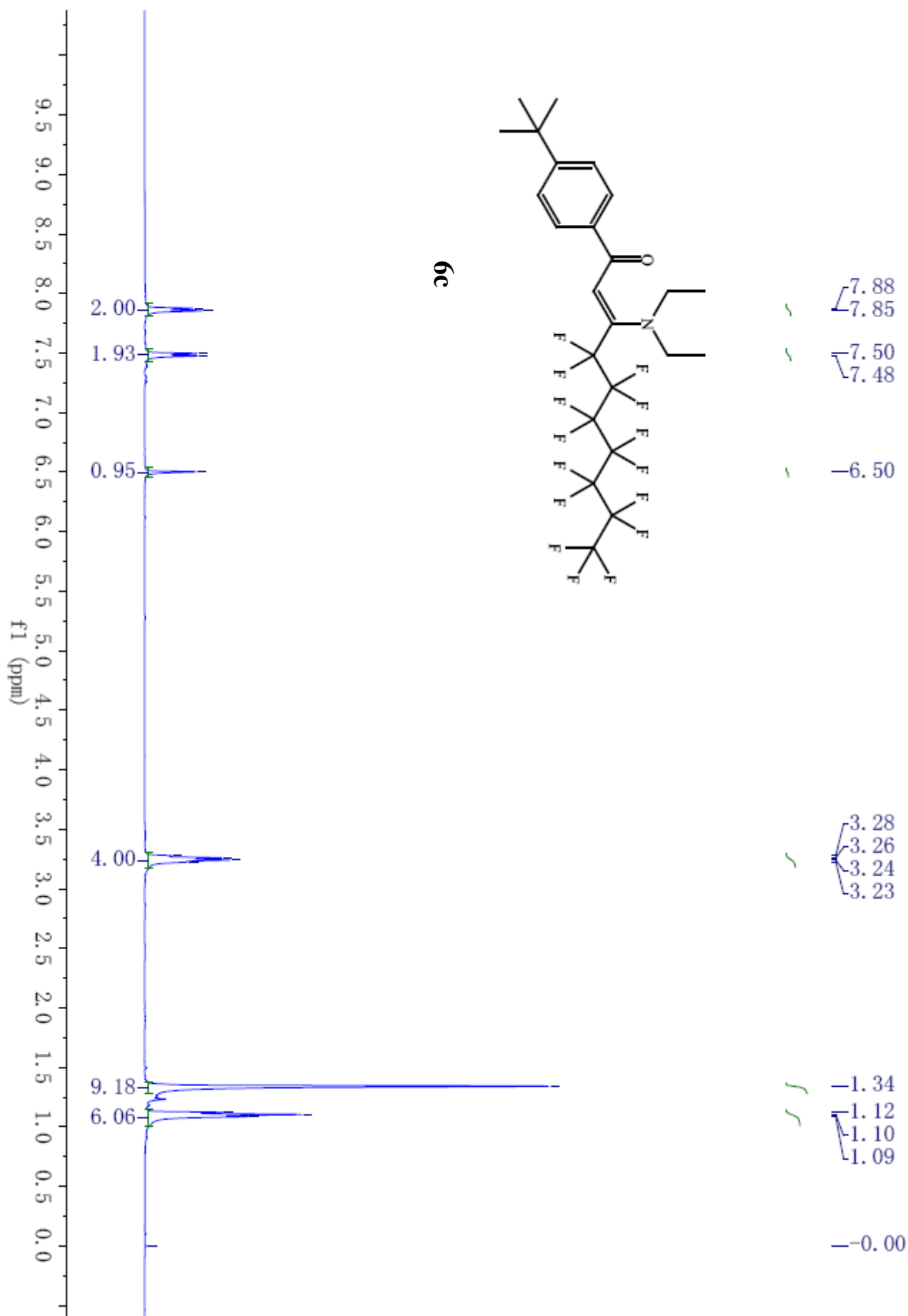


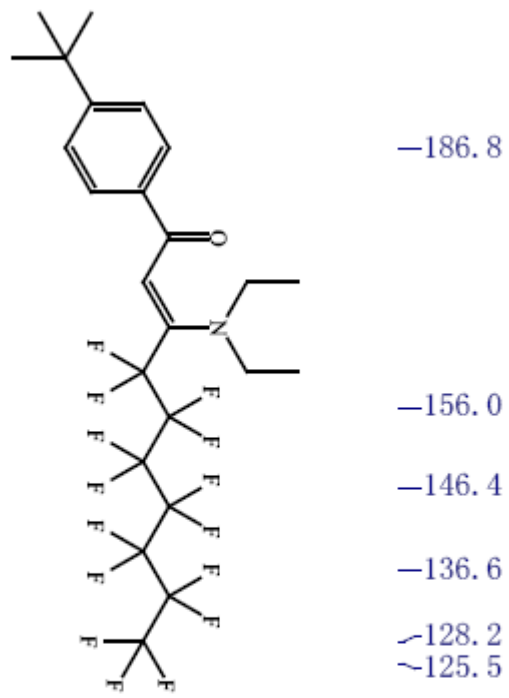
80.95
80.98
81.02

107.61
107.67
107.72

121.28
121.32
121.36
122.61
122.67
122.71
126.24
126.25
126.29
126.33
126.34

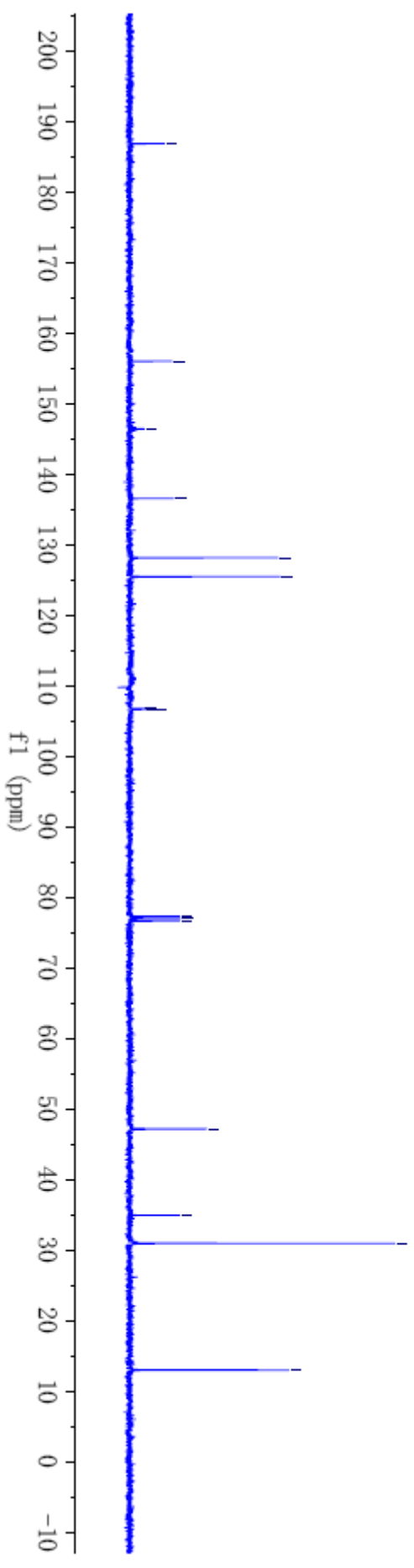


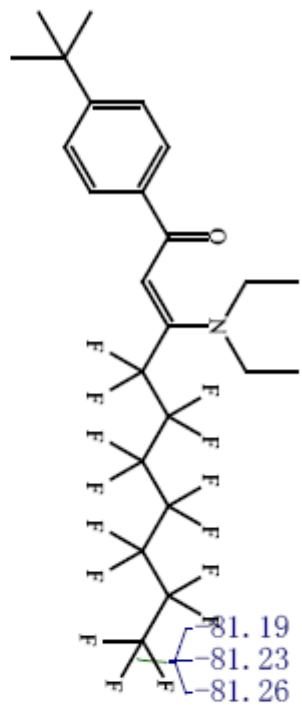




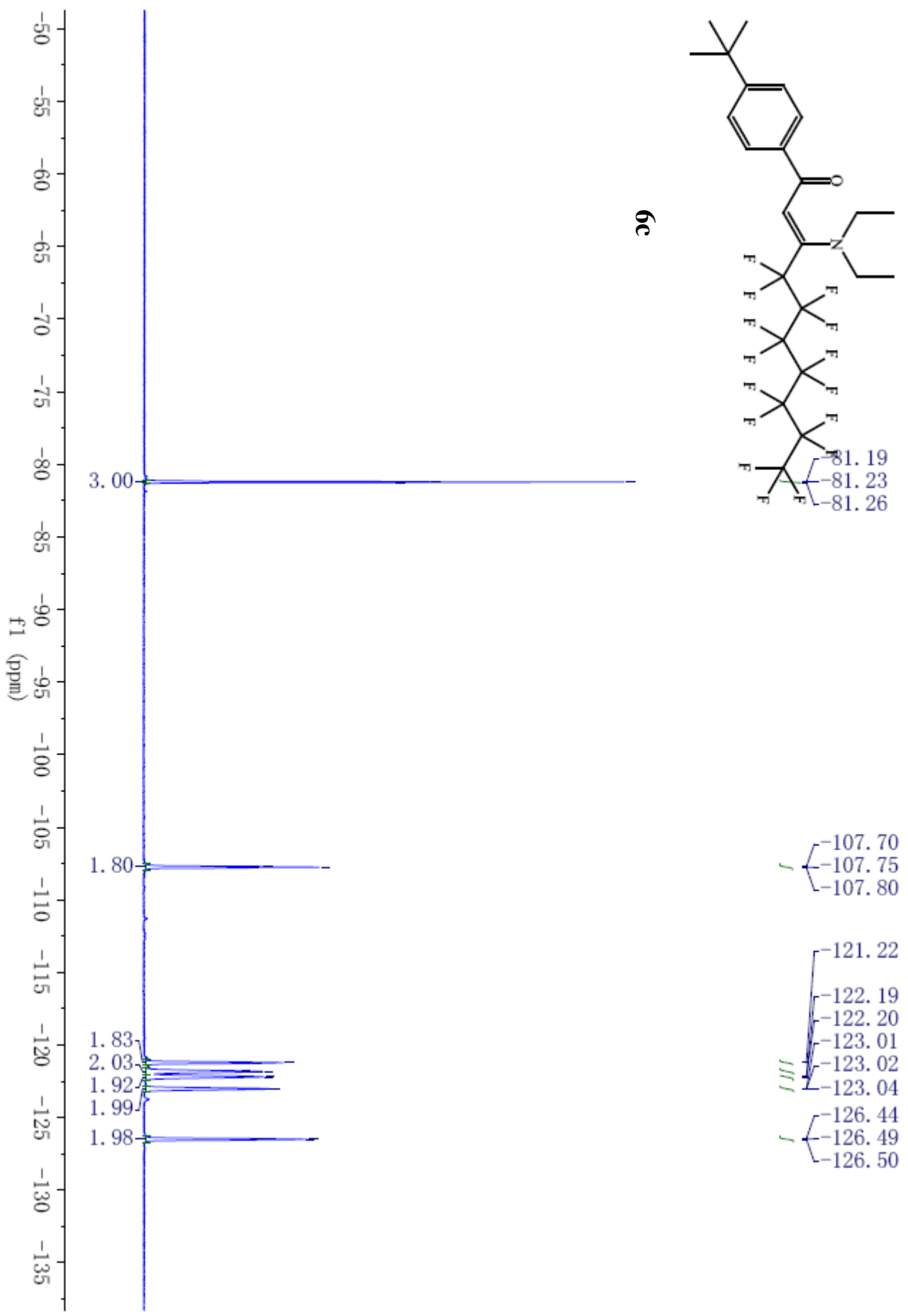
- 186.8
- 156.0
- 146.4
- 136.6
- 128.2
- 125.5
- 106.8
- 106.7
- 106.7
- 77.3
- 77.0
- 76.7
- 47.2
- 35.0
- 31.0
- 13.0

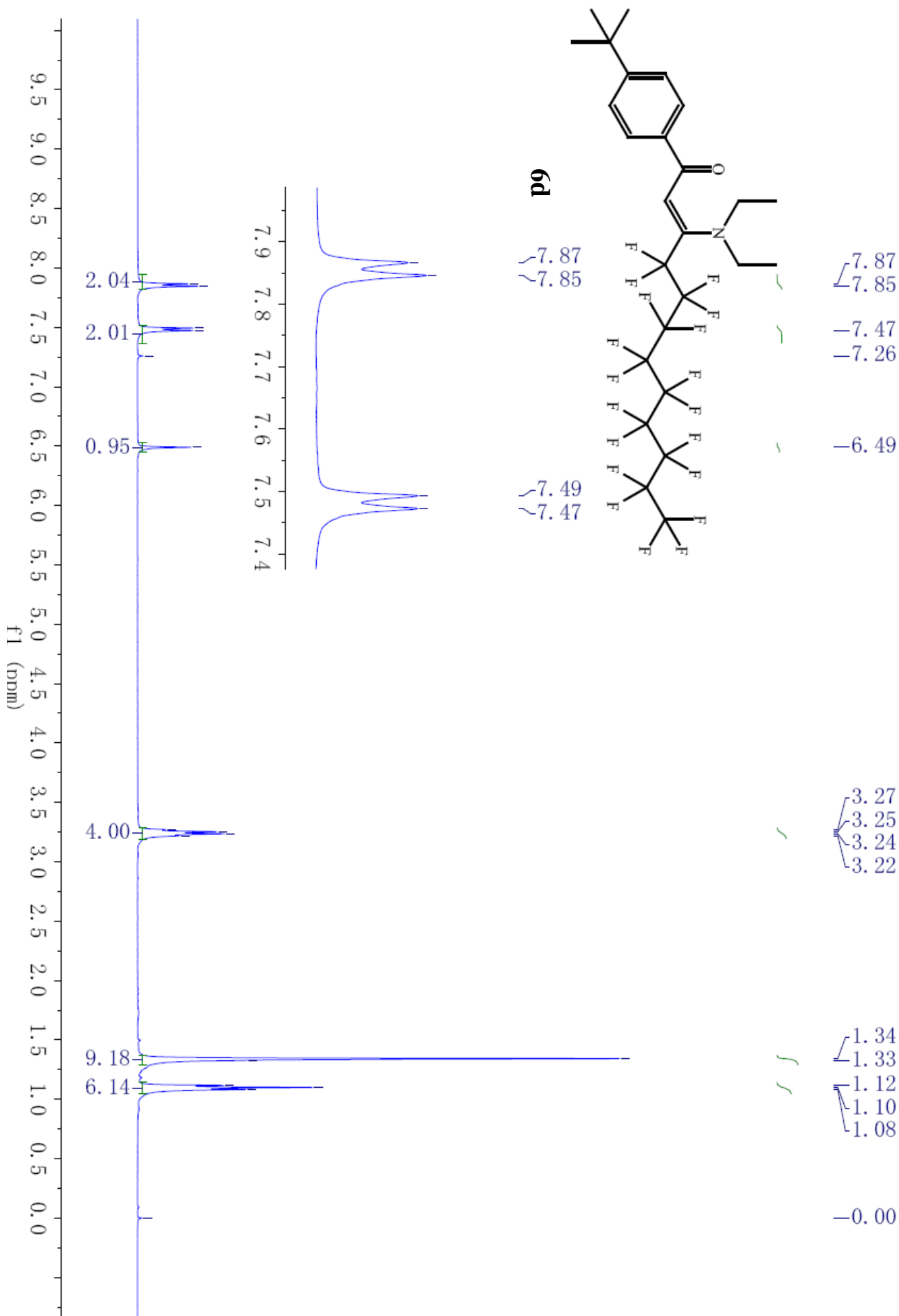
6c

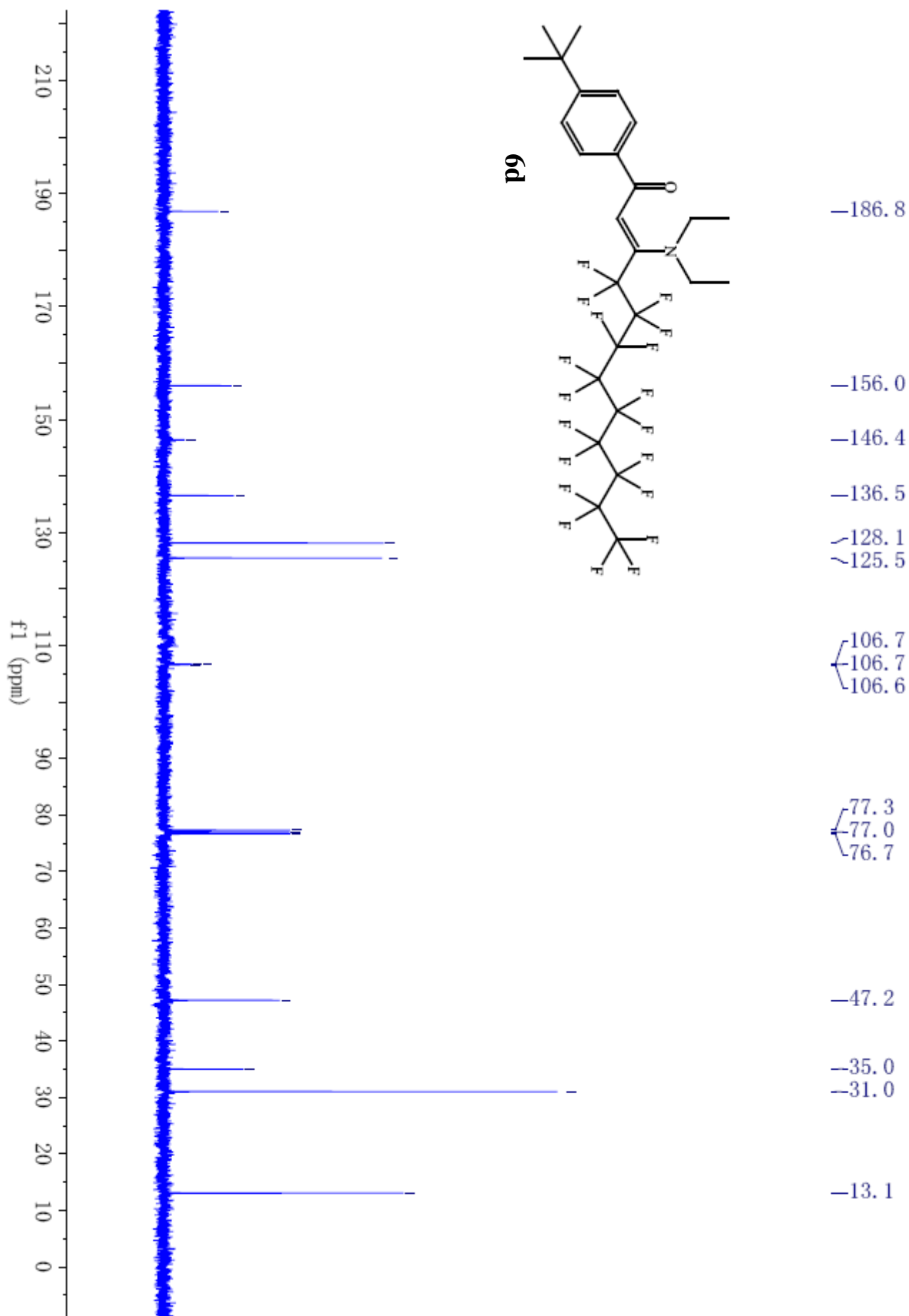


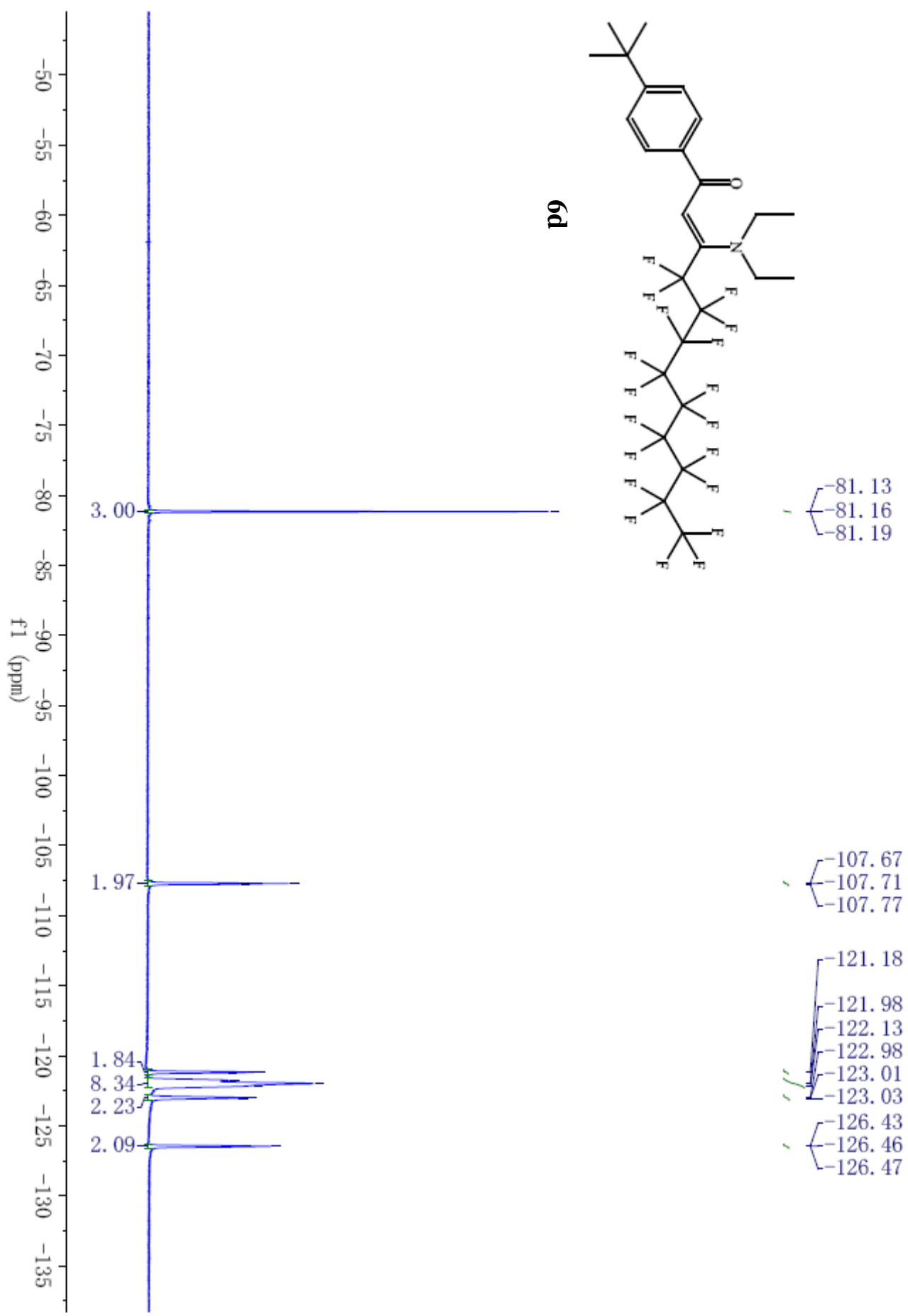


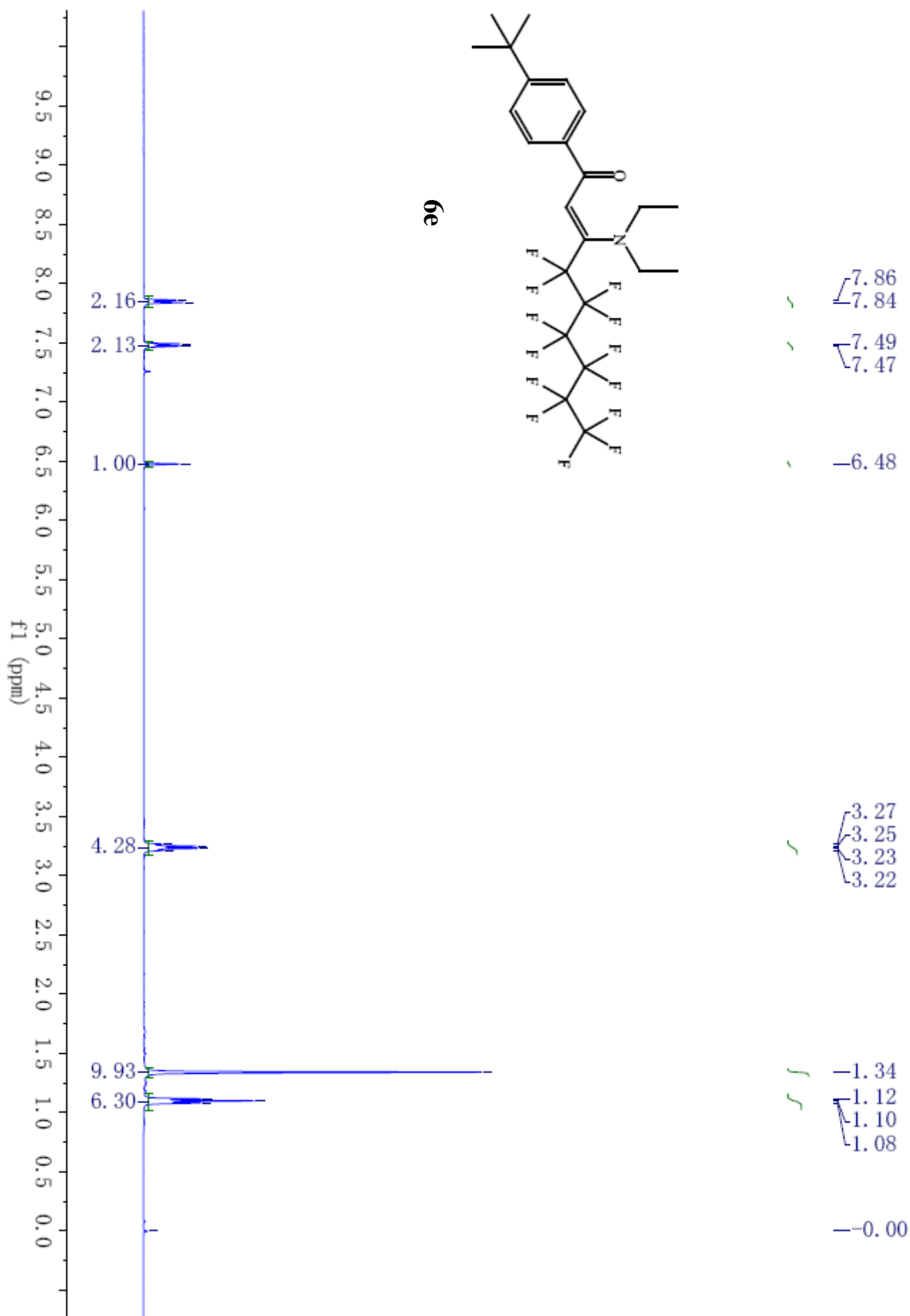
6c

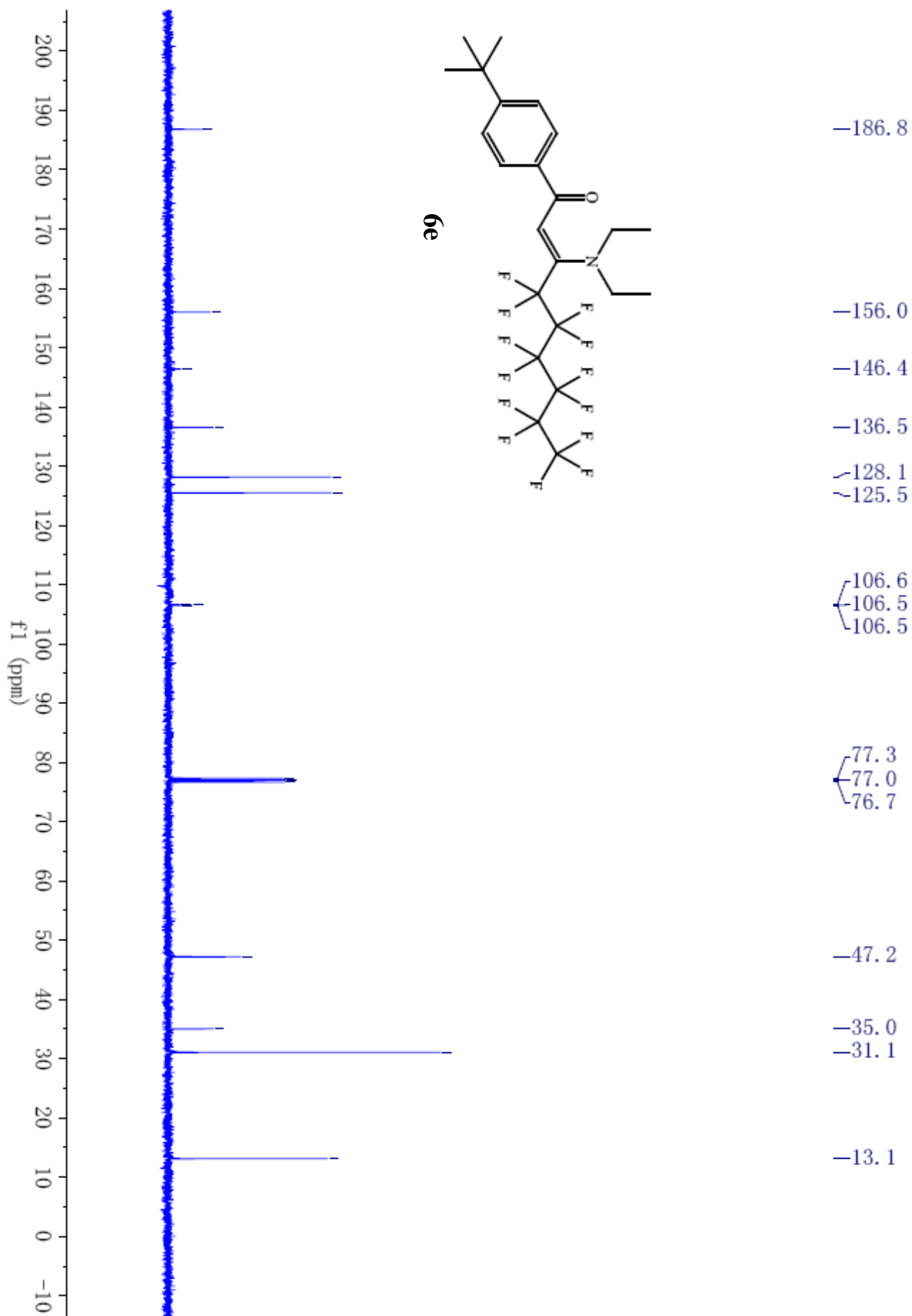


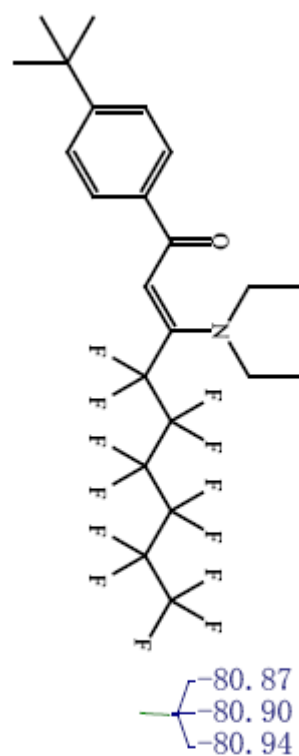












6e

