Electronic Supplementary Material (ESI) for ChemComm.

Synthesis of α–CF_3 and α–CF_2H Amines via Aminofluorination of Fluorinated Alkenes

Ling Yang,[‡] Wen–Xin Fan,[‡] E Lin , Dong-Hang Tan, Qingjiang Li and Honggen Wang*

School of Pharmaceutical Sciences, Sun Yat–sen University, Guangzhou 510006, China

Supporting information

Content

I. General information

Unless otherwise noted, all commercially available materials were used without further purification. All reactions were carried out in reaction vessels (75 ML) with Teflon screw caps under air.

NMR–spectra were recorded on Bruker AvanceIII–400M and Ascend^{TM} 500M in solvents as indicate. Chemical shifts (δ) are given in ppm relative to tetramethylsilane (δ = 0). The residual solvent signals were used as references and the chemical shifts converted to the TMS scale ($CDCl_3$: δ_H = 7.26 ppm, δ_C = 77.16 ppm). The following abbreviations were used to describe peak splitting patterns: s (singlet), bs (broad singlet), d (doublet), t (triplet), q (quartet), m (multiplet), dd (doublet of doublets), dt (doublet of triplets). Coupling constants (*J*) were reported in hertz unit (Hz).

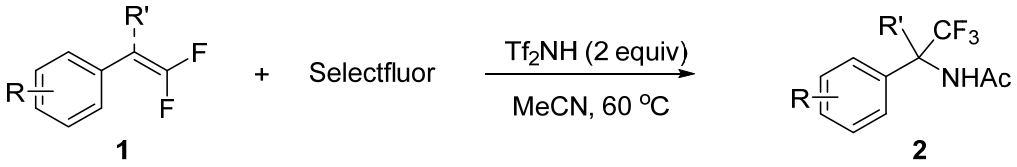
High–resolution mass spectra (HRMS) were recorded on a Bruker VPEXII spectrometer with EI and ESI mode unless otherwise stated.

Analytical thin layer chromatography was performed on Polygram SIL G/UV254 plates. Visualization was accomplished by UV light (254 nm), or $KMnO_4$ staining solutions followed by heating, also by Gas chromatograph-Mass spectrometer analysis (GC-MS) on Agilent Technologies 5977A MSD. Flash column chromatography was performed using silica gel (200–300 mesh).

No attempts were made to optimize yields for substrate synthesis.

All the starting materials[1–3] were prepared according to literature procedures.

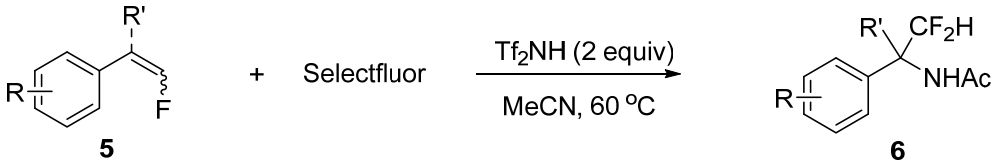
II. General procedures for the synthesis of α –CF_3 amines



General procedure A

To a solution of *gem*–difluoroalkene (0.5 mmol, 1.0 equiv), Selectfluor (1.0 mmol, 354 mg, 2.0 equiv) in MeCN (12.0 mL), was added Tf_2NH (1.0 mmol, 281 mg, 2.0 equiv) dissolved in MeCN (3.0 mL). The resulting mixture was stirred at 60 °C until the *gem*-difluoroalkene was consumed as monitored by TLC. The solvent was removed under reduced pressure. The crude product was purified by silica gel column chromatography (Petroleum ether/ EtOAc =3:1) to give product **2** as white solid.

III. General procedures for the synthesis of α –CF_2H amines

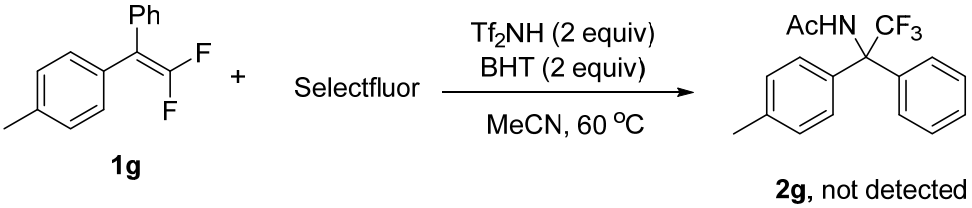


General procedure B

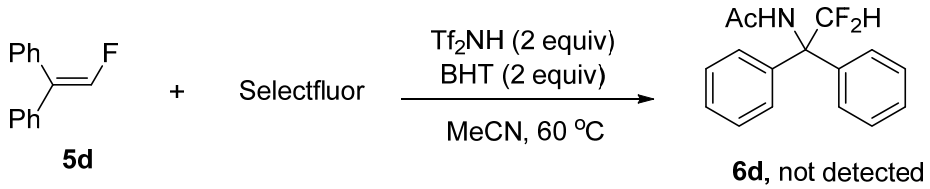
To a solution of monofluoroalkene (0.3 mmol, 1.0 equiv), Selectfluor (0.6 mmol, 213 mg, 2.0 equiv) in MeCN (6.0 mL), was added Tf_2NH (0.6 mmol, 169 mg, 2.0 equiv) dissolved in MeCN (3.0 mL). The resulting mixture was stirred at 60 °C until the monofluoroalkene was consumed as monitored by TLC. The solvent was removed under reduced pressure. The crude product was purified by silica gel column chromatography (Petroleum ether/ EtOAc =3:1) to give product **6** as white solid.

IV. Mechanistic Studies

i. Radical inhibition experiments

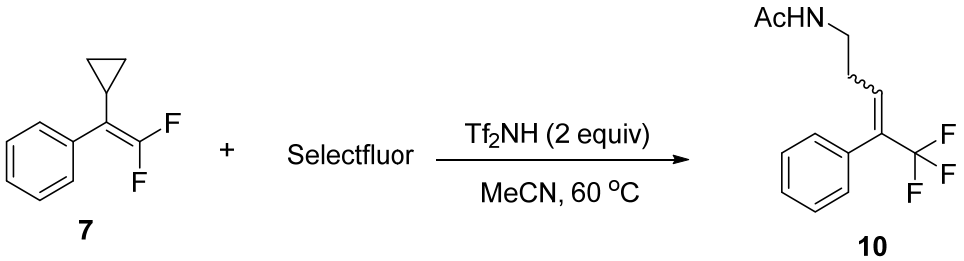


Following General procedure A, to a solution of *gem*–difluoroalkene **1g** (0.2 mmol, 46 mg, 1.0 equiv), Selectfluor (0.4 mmol, 142 mg, 2.0 equiv), BHT (0.4 mmol, 88 mg, 2.0 equiv) in MeCN (4.0 mL), was added Tf_2NH (0.4 mmol, 112 mg, 2.0 equiv) dissolved in MeCN (2.0 mL). The resulting mixture was stirred at 60 °C for 3 h. No desired product was observed by GC-MS.



Following General procedure B, to a solution of monofluoroalkene **5d** (0.1 mmol, 20 mg, 1.0 equiv), Selectfluor (0.2 mmol, 71 mg, 2.0 equiv), BHT (0.2 mmol, 44 mg, 2.0 equiv) in MeCN (2.0 mL), was added Tf_2NH (0.2 mmol, 57 mg, 2.0 equiv) dissolved in MeCN (1.0 mL). The resulting mixture was stirred at 60 °C for 13 h. No desired product was observed by GC-MS.

ii. Radical clock experiment

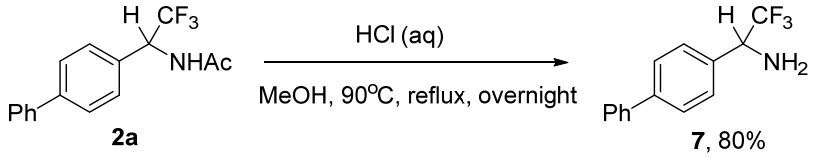


Following General procedure A, to a solution of

(1–cyclopropyl–2,2–difluorovinyl)–benzene (0.5 mmol, 90 mg, 1.0 equiv), Selectfluor (1.0 mmol, 354 mg, 2.0 equiv) in MeCN (12.0 mL), was added Tf_2NH (1.0 mmol, 281 mg, 2.0 equiv) in MeCN (3.0 mL). The resulting mixture was stirred at 60 °C for 45 min. Product **10** was obtained by chromatography (silica gel; petroleum ether/ EtOAc = 1:1) as a colorless oil (50 mg, 39%).

V. Derivatizations of product

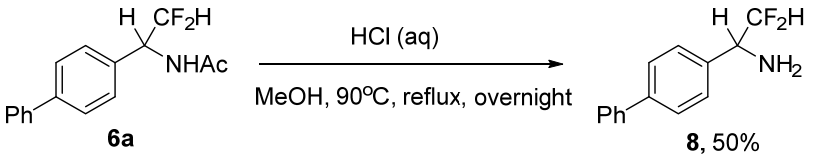
1-([1,1'-Biphenyl]-4-yl)-2,2,2-trifluoroethan-1-amine (7)



2a **7**, 80%

HCl aqueous (2N, 0.14 mL) was added to a solution of compound **2a** (0.1 mmol, 29 mg) in MeOH (3.0 mL). The reaction mixture was refluxed overnight at 90 ˚C. After the reaction was complete as monitored by TLC, the saturated $NaHCO_3$ was added, then extracted with EtOAc. The combined organic phases were dried over Na_2SO_4, filtered and concentrated under reduced pressure. The pure product was purified by flash column chromatography on silica with an eluent (Petroleum ether/ EtOAc 6:1 v/v) to afford the pure product **7** as a white solid (20 mg, 80 %).

1-([1,1'-Biphenyl]-4-yl)-2,2-difluoroethan-1-amine (8)

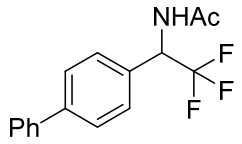


6a **8**, 50%

HCl aqueous (2N, 0.14 mL) was added to a solution of compound **6a** (0.1 mmol, 28 mg) in MeOH (3.0 mL). The reaction mixture was refluxed overnight at 90 ˚C. After the reaction was complete as monitored by TLC, the saturated $NaHCO_3$ was added, then extracted with EtOAc. The combined organic phases were dried over Na_2SO_4, filtered and concentrated under reduced pressure. The pure product was purified by flash column chromatography on silica with an eluent (Petroleum ether/ EtOAc 6:1 v/v) to afford the pure product **8** as a white solid (12 mg, 52 %).

VI. Characterization of Products

_N_–(1–([1,1'–Biphenyl]–4–yl)–2,2,2–trifluoroethyl)acetamide (2a)



2a

Following general procedure A, **2a** was obtained in 75% yield (110 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.24. m.p. = 231.7 – 232.5 ℃.

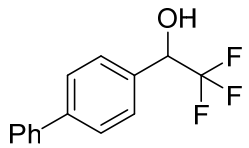
^{1}H NMR (400 MHz, $(CD_3)_2CO$) δ = 8.70 (d, *J* = 9.7 Hz, 1H), 7.31 – 7.15 (m, 6H), 7.03 (t, *J* = 7.6 Hz, 2H), 6.93 (t, *J* = 7.3 Hz, 1H), 5.37 (p, *J* = 8.7 Hz, 1H), 1.53 (s, 3H).

^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ = 169.5, 140.8, 139.5, 132.4, 129.0, 129.0, 127.8, 126.9, 126.8, 124.9 (q, *J* = 281.9 Hz), 52.9 (q, *J* = 30.2 Hz), 22.4.

^{19}F NMR (376 MHz, $(CD_3)_2CO$, composite pulse decoupling) δ = –72.58.

HRMS: *m/z* Calculated for $C_{16}H_{15}F_3NO$, $[M+H]^+$,294.1100; Found, 294.1088.

1–([1,1'– Bphenyl]–4–yl)–2,2,2–trifluoroethan–1–ol (3a)



3a

From entry 1, **3a** was obtained in 6% yield (3 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 60:1 v/v). R_f (Petroleum ether/EtOAc 64:1): 0.28. m.p. = 118.4 – 119.5 ℃.

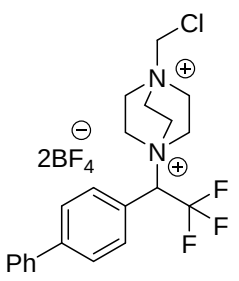
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.64 (d, *J* = 8.2 Hz, 2H), 7.60 (d, *J* = 7.8 Hz, 2H), 7.56 (d, *J* = 8.1 Hz, 2H), 7.46 (t, *J* = 7.6 Hz, 2H), 7.38 (t, *J* = 7.4 Hz, 1H), 5.08 (q, *J* = 6.8 Hz, 1H), 2.66 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 142.62, 140.45, 132.99, 129.00, 128.01, 127.83, 127.49, 127.31, 124.41 (q, *J* = 282.5 Hz), 72.76 (q, *J* = 31.8 Hz).

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –78.28.

HRMS: *m/z* Calculated for $C_{14}H_{11}F_3O$, $[M]^+$,252.0762; Found, 252.0765.

1–(1–([1,1'–Biphenyl]–4–yl)–2,2,2–trifluoroethyl)–4–(chloromethyl)–1,4–diazabicyclo[2.2.2]octane–1,4–diium (4a)



4a

Following General procedure A, to a solution of *gem*–difluoroalkene **1a** (1 mmol, 216 mg, 5.0 equiv), Selectfluor

(0.2 mmol, 71mg, 1.0 equiv), in MeCN (2.0 mL). The resulting mixture was stirred at 60 °C for 3 h. The crude product was given by silica gel column chromatography (Petroleum ether/ EtOAc =1:1 → MeCN). After recrystallization with MeCN and DCM, the pure product **4a** (11mg, 10%) was obtained as white solid. m.p. = 214.3 – 220.0 ℃.

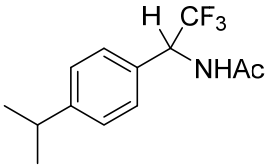
^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ = 8.00 (dt, *J* = 16.2 Hz, 8.5 Hz, 3H), 7.91 (d, *J* = 7.9 Hz, 1H), 7.77 (d, *J* = 7.9 Hz, 2H), 7.53 (t, *J* = 7.6 Hz, 2H), 7.46 (t, *J* = 7.2 Hz, 1H), 6.28 (q, *J* = 7.2 Hz, 1H), 5.77 (s, 2H), 4.72 (dt, *J* = 11.3 Hz, 8.0 Hz, 3H), 4.63 (dd, *J* = 8.6 Hz, 4.8 Hz, 3H), 4.50 (d, *J* = 7.9 Hz, 6H).

^{13}C NMR (101 MHz, $(CD_3)_2CO$) δ = 146.0, 139.6, 136.7, 130.1, 129.6, 129.4, 129.2, 128.0, 123.6 (q, *J* = 282.4), 122.6, 69.9, 76.3 (q, *J* = 30.8, 30.3), 53.0, 51.6.

^{19}F NMR (376 MHz, $(CD_3)_2CO$, composite pulse decoupling) δ = –59.65, –153.08.

HRMS: *m/z* Calculated for $C_{21}H_{23}ClF_3N_2$, $[M–2BF_4–H]^+$, 395.1496; Found, 395.1491.

***N*–(2,2,2–Trifluoro–1–(4–isopropylphenyl)ethyl)acetamide (2b)**



2b

Following general procedure A, **2b** was obtained in 60% yield (78 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.36. m.p. = 83.3 – 85.3 ℃.

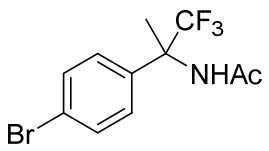
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.30 (d, *J* = 8.2 Hz, 2H), 7.25 (d, *J* = 6.8 Hz, 2H), 6.09 (d, *J* = 10.5 Hz, 1H), 5.69 (p, *J* = 8.0 Hz, 1H), 2.92 (sep, *J* = 6.9 Hz, 1H), 2.07 (s, 3H), 1.25 (d, *J* = 6.9 Hz, 6H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.7, 150.2, 130.3, 128.0, 127.2, 124.7 (q, *J* = 281.5 Hz), 54.1 (q, *J* = 31.3 Hz), 34.0, 24.0, 23.2.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –73.79.

HRMS: *m/z* Calculated for $C_{13}H_{17}F_3NO$, $[M+H]^+$, 260.1257; Found, 260.1248.

***N*–(2–(4–Bromophenyl)–1,1,1–trifluoropropan–2–yl)acetamide (2c)**



2c

Following general procedure A, **2c** was obtained in 58% yield (90 mg) as a white solid after column chromatography

(eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.21. m.p. = 165.0 – 166.0 ℃.

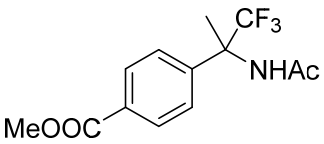
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.50 (d, *J* = 8.8 Hz, 2H), 7.30 (d, *J* = 8.8 Hz, 2H), 6.06 (s, 1H), 2.07 (s, 3H), 2.03 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.4, 135.6, 131.6, 128.7, 125.4 (q, *J* = 284.2 Hz), 122.8, 62.0 (q, *J* = 27.2 Hz), 23.9, 19.6, 19.6.

^{19}F NMR (376 MHz, $CDCl_3$, composite pulse decoupling) δ = –79.18.

HRMS: *m/z* Calculated for $C_{11}H_{12}BrF_3NO$, $[M+H]^+$, 310.0049; Found, 310.0036.

Methyl 4–(2–acetamido–1,1,1–trifluoropropan–2–yl)benzoate (2d)



2d

Following general procedure A, **2d** was obtained in 31% yield (45 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.14. m.p. = 157.5 – 158.4 ℃.

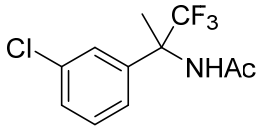
^{1}H NMR (400 MHz, $CDCl_3$) δ = 8.07 – 8.00 (m, 2H), 7.51 (d, *J* = 8.2 Hz, 2H), 6.12 (s, 1H), 3.91 (s, 3H), 2.08 (d, *J* = 2.7 Hz, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ = 169.3, 166.7, 141.4, 130.2, 129.7, 127.1, 125.5 (q, *J* = 284.6 Hz), 62.3 (q, *J* = 27.2 Hz), 52.3, 24.0, 19.8.

^{19}F NMR (376 MHz, $CDCl_3$, composite pulse decoupling) δ = –78.77.

HRMS: *m/z* Calculated for $C_{13}H_{15}F_3NO_3$, $[M+H]^+$, 290.0999; Found, 290.0985.

***N*–(2–(3–Chlorophenyl)–1,1,1–trifluoropropan–2–yl)acetamide (2e)**



2e

Following general procedure A, **2e** was obtained in 37% yield (49 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.27. m.p. = 126.6 – 127.5 ℃.

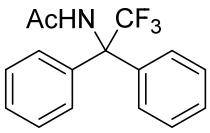
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.40 (s, 1H), 7.32 (m, 3H), 6.09 (s, 1H), 2.08 (s, 3H), 2.04 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.1, 138.4, 134.6, 129.7, 128.8, 127.4, 125.4 (q, *J* = 285.30 Hz), 125.2, 62.2 (q, *J* = 27.0 Hz), 24.2, 19.7.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –79.01.

HRMS: *m/z* Calculated for $C_{11}H_{12}ClF_3NO$, $[M+H]^+$, 266.0554; Found, 266.0545.

***N*–(2,2,2–Trifluoro–1,1–diphenylethyl)acetamide (2f)**



2f

Following general procedure A, **2f** was obtained in 65% yield (95 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.30. m.p. = 192.0 – 193.0 ℃.

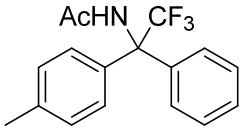
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.37 (s, 10H), 2.10 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.7, 137.0, 128.6, 128.4, 128.2 (d, *J* = 2.1 Hz), 125.6 (q, *J* = 288.0 Hz), 69.1 (q, *J* = 27.5 Hz), 24.3.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –67.43.

HRMS: *m/z* Calculated for $C_{16}H_{15}F_3NO$, $[M+H]^+$, 294.1100; Found, 294.1088.

***N*–(2,2,2–Trifluoro–1–phenyl–1–(p–tolyl)ethyl)acetamide (2g)**



2g

Following general procedure A, **2g** was obtained in 77% yield (118 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.27. m.p. = 158.0 – 160.0 ℃.

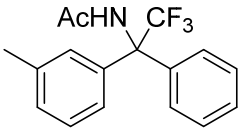
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.37 (s, 5H), 7.24 (d, *J* = 8.6 Hz, 2H), 7.17 (d, *J* = 8.4 Hz, 2H), 6.23 (s, 1H), 2.36 (s, 3H), 2.09 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.9, 138.5, 137.1, 134.1, 129.1, 128.5, 128.3, 128.1, 128.0, 125.6 (q, *J* = 288.0 Hz), 68.9 (q, *J* = 28.3 Hz), 24.2, 21.1.

^{19}F NMR (376 MHz, $CDCl_3$, composite pulse decoupling) δ = –67.62.

HRMS: *m/z* Calculated for $C_{17}H_{17}F_3NO$, $[M+H]^+$, 308.1257; Found, 308.1245.

***N*–(2,2,2–Trifluoro–1–phenyl–1–(o–tolyl)ethyl)acetamide (2h)**



2h

Following general procedure A, **2h** was obtained in 78% yield (119 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.28. m.p. = 165.1 – 165.9 ℃.

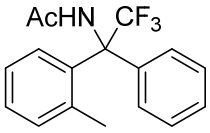
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.36 (s, 5H), 7.24 (d, *J* = 7.8 Hz, 1H), 7.19 – 7.10 (m, 3H), 6.22 (s, 1H), 2.34 (s, 3H), 2.10 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.4, 138.1, 137.1, 129.5, 128.7, 128.7, 128.6, 128.4, 128.3, 128.2, 125.7 (q, *J* = 288.0 Hz), 125.4, 69.2 (q, *J* = 27.7 Hz), 24.5, 21.8.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –67.11.

HRMS: *m/z* Calculated for $C_{17}H_{17}F_3NO$, $[M+H]^+$, 308.1257; Found, 308.1246.

***N*–(2,2,2–Trifluoro–1–phenyl–1–(o–tolyl)ethyl)acetamide (2i)**



2i

Following general procedure A, **2i** was obtained in 80% yield (113 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.24. m.p. = 176.9 – 179.9 ℃.

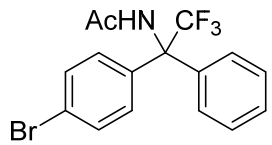
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.72 (d, *J* = 6.9 Hz, 1H), 7.41 – 7.27 (m, 5H), 7.21 (d, *J* = 7.6 Hz, 1H), 7.10 (d, *J* = 7.5 Hz, 2H), 6.32 (s, 1H), 2.11 (s, 3H), 1.80 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 167.8, 137.2, 135.8, 135.0, 132.9, 129.1, 128.7, 128.3 (d, *J* = 3.6 Hz), 128.2, 127.3, 125.9, 125.6 (q, *J* = 288.3 Hz), 67.8 (q, *J* = 27.7 Hz), 24.2, 21.7.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –69.09.

HRMS: *m/z* Calculated for $C_{17}H_{17}F_3NO$, $[M+H]^+$, 308.1257; Found, 308.1249.

***N*–(1–(4–Bromophenyl)–2,2,2–trifluoro–1–phenylethyl)acetamide (2j)**



2j

Following general procedure A, **2j** was obtained in 74% yield (138 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.31. m.p. = 164.0 – 165.0 ℃.

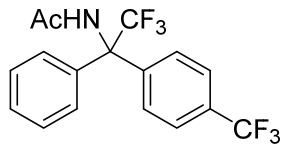
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.50 (d, *J* = 8.8 Hz, 2H), 7.39 – 7.32 (m, 5H), 7.28 (d, *J* = 8.3 Hz, 2H), 6.24 (s, 1H), 2.10 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 168.6, 136.5, 135.7, 131.5, 130.1, 129.0, 128.5, 128.2, 125.4 (q, *J* = 288.3 Hz), 123.0, 68.9 (q, *J* = 27.9 Hz), 24.4.

^{19}F NMR (376 MHz, $CDCl_3$, composite pulse decoupling) δ = –68.16.

HRMS: *m/z* Calculated for $C_{16}H_{13}BrF_3NO$, $[M+H]^+$, 372.0205; Found, 372.0201.

***N*–(2,2,2–Trifluoro–1–phenyl–1–(4–(trifluoromethyl)phenyl)ethyl)acetamide (2k)**



2k

Following general procedure A, **2k** was obtained in 59%

yield (106 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.29. m.p. = 166.0 – 167 ℃.

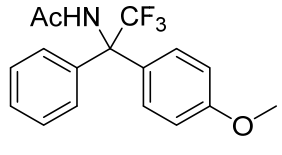
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.63 (d, *J* = 8.2 Hz, 2H), 7.55 (d, *J* = 8.4 Hz, 2H), 7.39 (d, *J* = 5.6 Hz, 3H), 7.32 (d, *J* = 8.5 Hz, 2H), 6.30 (s, 1H), 2.11 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.7, 140.4, 136.5, 130.7 (q, *J* = 32.7 Hz), 129.2, 129.0 (q, *J* = 2.3 Hz), 128.6, 128.2, 125.4 (q, *J* = 287.52 Hz) 125.3 (q, *J* = 3.6 Hz), 124.0 (q, *J* = 272.2 Hz), 69.0 (q, *J* = 27.6 Hz), 24.3.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –62.80, –68.10.

HRMS: *m/z* Calculated for $C_{17}H_{14}F_6NO$, $[M+H]^+$, 362.0974; Found, 362.0960.

***N*–(2,2,2–Trifluoro–1–(4–methoxyphenyl)–1–phenylethyl)acetamide (2l)**



2l

Following general procedure A, **2l** was obtained in 30% yield (48 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.19. m.p. = 140.0 – 142.0 ℃.

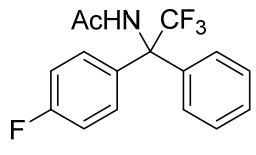
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.37 (s, 5H), 7.27 (d, *J* = 8.7 Hz, 2H), 6.88 (d, *J* = 8.5 Hz, 2H), 6.26 (s, 1H), 3.81 (s, 3H), 2.07 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.5, 159.6, 137.1, 129.6 (d, *J* = 1.8 Hz), 129.1, 128.5, 128.3, 128.2 (d, *J* = 2.3 Hz), 125.7 (q, *J* = 287.9 Hz), 113.7, 69.0 (q, *J* = 27.5 Hz), 55.4, 24.4.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –67.84.

HRMS: *m/z* Calculated for $C_{17}H_{17}F_3NO_2$, $[M+H]^+$, 324.1206; Found, 324.1203.

***N*–(2,2,2–Trifluoro–1–(4–fluorophenyl)–1–phenylethyl)acetamide (2m)**



2m

Following general procedure A, **2m** was obtained in 72% yield (112 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.30. m.p. = 181.9 – 182.6 ℃.

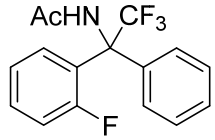
^{1}H NMR (400 MHz, CDCl3) δ = 7.41 – 7.34 (m, 7H), 7.05 (t, *J* = 8.7 Hz, 2H), 6.22 (s, 1H), 2.10 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.3, 162.5 (d, *J* = 248.9 Hz), 136.7, 132.4, 130.3 (d, *J* = 8.2 Hz), 128.8, 128.4, 128.1, 125.4 (q, *J* = 287.8 Hz), 115.1 (d, *J* = 21.8 Hz), 68.8 (q, *J* = 27.0 Hz), 24.4.

^{19}F NMR (376 MHz, $CDCl_3$, composite pulse decoupling) δ = –68.23, –113.33.

HRMS: *m/z* Calculated for $C_{16}H_{14}F_4NO$, $[M+H]^+$, 312.1006; Found, 312.0991.

***N*–(2,2,2–Trifluoro–1–(2–fluorophenyl)–1–phenylethyl)acetamide (2n)**



2n

Following general procedure A, **2n** was obtained in 53% yield (83 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.31. m.p. = 164.8 – 165.8 ℃.

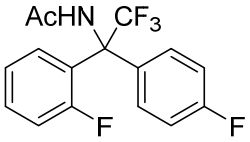
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.44 (ddd, *J* = 9.9 Hz, 7.3 Hz, 1.8 Hz, 1H), 7.40 – 7.36 (m, 4H), 7.34 – 7.30 (m, 2H), 7.19 (td, *J* = 7.9 Hz, 1.4, 1H), 7.04 (ddd, *J* = 12.8 Hz, 8.2 Hz, 1.1 Hz, 1H), 6.56 (s, 1H), 2.06 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.8, 160.3 (d, *J* = 249.3 Hz), 137.3, 130.5 (dd, *J* = 5.0 Hz, 2.7 Hz), 129.1, 128.7, 127.2, 125.1 (q, *J* = 288.1 Hz), 124.6 (d, *J* = 8.2 Hz), 124.1 (d, *J* = 3.6 Hz), 116.8, 116.6, 66.7 (q, *J* = 28.7 Hz), 24.3.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –69.03, –109.73.

HRMS: *m/z* Calculated for $C_{16}H_{14}F_4NO$, $[M+H]^+$, 312.1006; Found, 312.0992.

***N*–(2,2,2–Trifluoro–1–(2–fluorophenyl)–1–(4–fluorophenyl)ethyl)acetamide (2o)**



2o

Following general procedure A, **2o** was obtained in 81% yield (133 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.27. m.p. = 174.9 – 175.3 ℃.

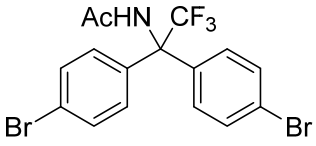
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.40 – 7.31 (m, 4H), 7.20 – 7.16 (m, 1H), 7.09 – 7.03 (m, 3H), 6.54 (s, 1H), 2.07 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.7, 162.8 (d, *J* = 249.3 Hz), 160.4 (d, *J* = 248.9 Hz), 133.1 (d, *J* = 3.6 Hz), 130.9, 130.8 (d, *J* = 2.7 Hz), 129.4, 129.4, 125.1 (q, *J* = 288.3 Hz), 124.2 (d, *J* = 3.6 Hz), 116.9 (d, *J* = 23.6 Hz), 115.7 (d, *J* = 21.8 Hz), 66.7 (q, *J* = 29.2 Hz), 24.4.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –69.35 (d, *J* = 6.9 Hz), –109.61, –112.61.

HRMS: *m/z* Calculated for $C_{16}H_{13}F_5NO$, $[M+H]^+$, 330.0912; Found, 330.0905.

***N*–(1,1–Bis(4–bromophenyl)–2,2,2–trifluoroethyl)acetamide (2p)**



2p

Following general procedure A, **2p** was obtained in 79% yield (177 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.36. m.p. = 199.0 – 199.8 ℃.

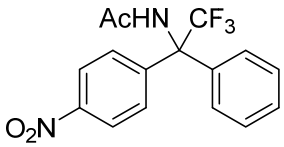
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.50 (d, *J* = 8.8 Hz, 4H), 7.25 (d, *J* = 8.8 Hz, 4H), 6.21 (s, 1H), 2.08 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 168.8, 135.2, 131.6, 130.1, 125.1 (q, *J* = 287.7 Hz), 123.3, 68.8 (q, *J* = 27.8 Hz, 27.4 Hz), 24.3.

^{19}F NMR (376 MHz, $CDCl_3$, composite pulse decoupling) δ = –68.94.

HRMS: *m/z* Calculated for $C_{16}H_{13}Br_2F_3NO$, $[M+H]^+$, 449.9310; Found, 449.9294.

***N*–(2,2,2–Trifluoro–1–(4–nitrophenyl)–1–phenylethyl)acetamide (2q)**



2q

Following general procedure A, **2q** was obtained in 62% yield (105 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.15. m.p. = 190.7 – 192.7 ℃.

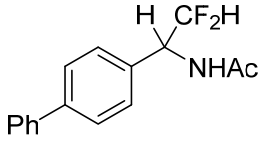
^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ = 8.49 (s, 1H), 7.81 (d, *J* = 6.9 Hz, 2H), 7.16 (d, *J* = 7.8 Hz, 2H), 6.98 (dq, *J* = 4.7 Hz, 2.4 Hz, 3H), 6.86 (d, *J* = 6.4 Hz, 2H), 1.57 (s, 3H).

^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ = 169.3, 146.9, 144.4, 136.0, 129.3, 128.8, 128.4, 128.1, 125.3 (q, *J* = 287.9 Hz), 123.2, 67.9 (q, *J* = 28.2 Hz), 23.4.

^{19}F NMR (471 MHz, $(CD_3)_2CO$, composite pulse decoupling) δ = –66.12.

HRMS: *m/z* Calculated for $C_{16}H_{14}F_3N_2O_3$, $[M+H]^+$, 339.0951; Found, 339.0956.

***N*–(1–([1,1'–Biphenyl]–4–yl)–2,2–difluoroethyl)acetamide (6a)**



6a

Following general procedure B, **6a** was obtained in 48% yield (40 mg) as a white solid after column chromatography

(eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.12. m.p. = 189.8 – 190.7 ℃.

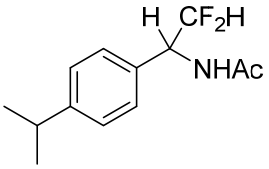
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.61 (d, *J* = 8.3 Hz, 2H), 7.57 (d, *J* = 7.3 Hz, 2H), 7.51 – 7.40 (m, 4H), 7.37 (t, *J* = 7.3 Hz, 1H), 6.14 (d, *J* = 8.7 Hz, 1H), 6.07 (td, *J* = 55.5 Hz, 2.1 Hz, 1H), 5.46 (td, *J* = 14.8 Hz, 14.2 Hz, 8.0 Hz, 1H), 2.10(s, 3H).

^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ = 170.1, 141.8, 141.3, 135.5, 129.8, 129.6, 128.4, 127.9, 127.8, 116.4 (t, *J* = 244.3 Hz), 55.2 (t, *J* = 22.6 Hz), 22.8.

^{19}F NMR (471 MHz, $(CD_3)_2CO$, composite pulse decoupling) δ = –125.77 (d, *J* = 279.2 Hz), –126.96 (d, *J* = 279.2 Hz).

HRMS: *m/z* Calculated for $C_{16}H_{16}F_2NO$, $[M+H]^+$, 276.1194; Found, 276.1187.

***N*–(2,2–Difluoro–1–(4–isopropylphenyl)ethyl)acetamide (6b)**



6b

Following general procedure B, **6b** was obtained in 60% yield (43 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.17. m.p. = 80.9 – 82.5 ℃.

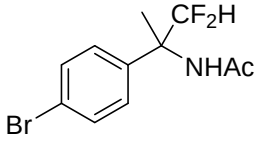
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.27 (d, *J* = 8.2 Hz, 2H), 7.24 (d, *J* = 8.4 Hz, 2H), 6.15 (t, *J* = 8.7 Hz, 1H), 6.01 (t, *J* = 55.6 Hz, 1H), 5.44 – 5.30 (m, 1H), 2.91 (sep, *J* = 7.0 Hz, 1H), 2.06 (s, 3H), 1.24 (d, *J* = 7.0 Hz, 6H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.9, 149.7, 131.5 (d, *J* = 4.5 Hz), 128.0, 127.2, 113.9 (t, *J* = 247.0 Hz), 54.7 (t, *J* = 20.9 Hz), 34.0, 24.0, 23.4.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –125.36 (d, *J* = 280.6 Hz), –127.17 (d, *J* = 280.5 Hz).

HRMS: *m/z* Calculated for $C_{13}H_{18}F_2NO$, $[M+H]^+$, 242.1351; Found, 242.1341.

***N*–(2–(4–Bromophenyl)–1,1–difluoropropan–2–yl)acetamide (6c)**



6c

Following general procedure B, **6c** was obtained in 73% yield (64 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.14. m.p. = 157.0 – 157.5 ℃.

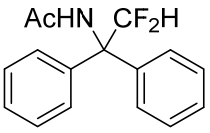
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.49 (d, *J* = 8.1 Hz, 2H), 7.28 (d, *J* = 8.2 Hz, 2H), 6.30 (t, *J* = 56.5 Hz, 1H), 6.02 – 5.91 (m, 1H), 2.03 (s, 3H), 1.72 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.9, 138.2, 131.9, 128.0, 122.3, 116.3 (t, *J* = 249.3 Hz), 60.7 (t, *J* = 20.9 Hz), 23.9, 20.4.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –128.10 (d, *J* = 276.6 Hz), –129.63 (d, *J* = 276.1 Hz).

HRMS: *m/z* Calculated for $C_{11}H_{13}BrF_2NO$, $[M+H]^+$, 292.0143; Found, 292.0150.

***N*–(2,2–Difluoro–1,1–diphenylethyl)acetamide (6d)**



6d

Following general procedure B, **6d** was obtained in 61% yield (50 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.28. m.p. = 158.0 – 159.8 ℃.

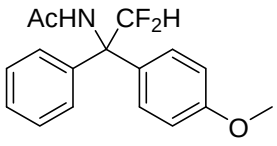
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.40 – 7.34 (m, 6H), 7.31 (dd, *J* = 7.6 Hz, 2.3 Hz, 4H), 7.14 (t, *J* = 56.7 Hz, 1H), 6.29 (s, 1H), 2.06 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.8, 139.0, 128.6, 128.5, 127.9, 114.6 (t, *J* = 249.8 Hz), 67.3 (t, *J* = 21.6 Hz), 23.7.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –123.12.

HRMS: *m/z* Calculated for $C_{16}H_{16}F_2NO$, $[M+H]^+$, 276.1194; Found, 276.1186.

***N*–(2,2–Difluoro–1–(4–methoxyphenyl)–1–phenylethyl)acetamide (6e)**



6e

Following general procedure B, **6e** was obtained in 50% yield (46 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.18. m.p. = 136.0 – 138.5 ℃.

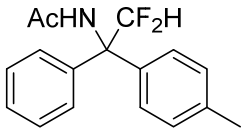
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.36 (td, *J* = 5.7 Hz, 2.8, 3H), 7.32 (dd, *J* = 7.8 Hz, 2.3, 3H), 7.22 – 7.19 (m, 2H), 7.11 (t, *J* = 56.9 Hz, 1H), 6.91 – 6.81 (m, 2H), 6.25 (s, 1H). 3.81 (s, 3H), 2.05 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.7, 159.5, 139.3, 131.0, 129.3, 128.6, 128.4, 127.8, 114.7 (t, *J* = 249.3 Hz), 113.9, 67.0 (t, *J* = 21.6 Hz), 55.4, 23.8.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –122.67 (d, *J* = 280.0 Hz), –123.84 (d, *J* = 280.0 Hz).

HRMS: *m/z* Calculated for $C_{17}H_{18}F_2NO_2$, $[M+H]^+$, 306.1300; Found, 306.1303.

***N*–(2,2–Difluoro–1–phenyl–1–(p–tolyl)ethyl)acetamide (6f)**



6f

Following general procedure B, **6f** was obtained in 67% yield (58 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.30. m.p. = 176.2 – 177.8 ℃.

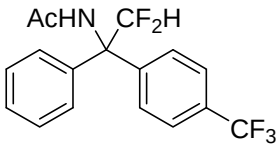
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.36 (dt, *J* = 4.8, 2.5 Hz, 3H), 7.31 (dd, *J* = 7.6 Hz, 2.4 Hz, 3H), 7.18 (s,4H), 7.12 (t, *J* = 56.7 Hz, 1H), 6.25 (s, 1H), 2.35 (s, 3H), 2.06 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.8, 139.2, 138.3, 136.0, 129.3, 128.6, 128.4, 127.9 (t, *J* = 2.0), 127.8 (t, *J* = 2.0 Hz), 114.6 (t, *J* = 249.4 Hz), 67.1 (t, *J* = 21.7 Hz), 23.7, 21.2.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = 122.87 (d, *J* = 280.6 Hz), 123.58 (d, *J* = 280.6 Hz).

HRMS: *m/z* Calculated for $C_{17}H_{18}F_2NO$, $[M+H]^+$, 290.1351; Found, 290.1339.

***N*–(2,2–Difluoro–1–phenyl–1–(4–(trifluoromethyl)phenyl)ethyl)acetamide (6g)**



6g

Following general procedure B, **6g** was obtained in 90% yield (92 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.29. m.p. = 153.0 – 153.6 ℃.

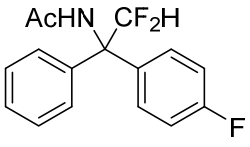
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.64 (d, *J* = 8.2 Hz, 2H), 7.48 (d, *J* = 8.2 Hz, 2H), 7.40 – 7.35 (m, 3H), 7.26 – 7.24 (m, 2H), 7.12 (t, *J* = 56.6 Hz, 1H), 6.33(s, 1H), 2.07 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 170.0, 143.0, 138.1 (d, *J* = 2.7 Hz), 130.6 (q, *J* = 32.8 Hz), 128.9, 128.8, 128.3, 128.0, 125.6 (q, *J* = 3.8 Hz), 124.0 (q, *J* = 272.2 Hz), 114.3 (t, *J* = 249.9 Hz), 67.2 (t, *J* = 21.9 Hz), 23.5.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –62.76, –122.30 (d, *J* = 281.2 Hz), –124.15 (d, *J* = 281.8 Hz).

HRMS: *m/z* Calculated for $C_{17}H_{15}F_5NO$, $[M+H]^+$, 344.1068; Found, 344.1056.

***N*–(2,2–Difluoro–1–(4–fluorophenyl)–1–phenylethyl)acetamide (6h)**



6h

Following general procedure B, **6h** was obtained in 63% yield (56 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.27. m.p. = 170.5 – 171.0 ℃.

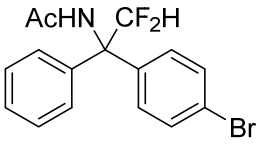
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.39 – 7.35 (m, 3H), 7.33 – 7.27 (m, 4H), 7.11 – 6.98 (m, 3H), 6.26 (s, 1H), 2.06 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.7, 162.5 (d, *J* = 248.4 Hz), 138.6, 134.7, 127.7 (t, *J* = 2.0 Hz), 128.6, 128.5, 127.7, 127.7, 127.7, 115.4 (d, *J* = 21.3 Hz), 114.4 (t, *J* = 249.7 Hz), 66.8 (t, *J* = 21.8 Hz), 23.6.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –113.63, –123.24, –123.25.

HRMS: *m/z* Calculated for $C_{16}H_{15}F_3NO$, $[M+H]^+$, 294.1100; Found, 294.1090.

***N*–(1–(4–Bromophenyl)–2,2–difluoro–1–phenylethyl)acetamide (6i)**



6i

Following general procedure B, **6i** was obtained in 47% yield (50 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.27. m.p. = 172.5 – 173.5 ℃.

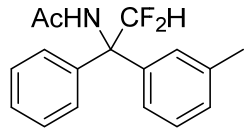
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.50 (d, *J* = 7.9 Hz, 2H), 7.41 – 7.34 (m, 3H), 7.27 (d, *J* = 6.3 Hz, 2H), 7.20 (d, *J* = 6.8 Hz, 2H), 7.03 (t, *J* = 56.6 Hz, 1H), 6.25 (s, 1H), 2.06 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.9, 138.3, 138.1, 131.7, 129.6, 128.7, 128.7, 127.9, 122.7, 114.3 (t, *J* = 249.8 Hz), 67.0 (t, *J* = 22.0 Hz), 23. 6.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –122.74 (d, *J* = 280.9 Hz), –123.76 (d, *J* = 280.9 Hz).

HRMS: *m/z* Calculated for $C_{16}H_{15}BrF_2NO$, $[M+H]^+$, 354.0300; Found, 354.0293.

***N*–(2,2–Difluoro–1–phenyl–1–(m–tolyl)ethyl)acetamide (6j)**



6j

Following general procedure B, **6j** was obtained in 79% yield (69 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.33. m.p. = 148.8 – 149.7 ℃.

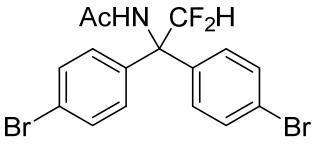
^{1}H NMR (400 MHz, $(CD_3)_2CO$) δ = 7.98 (s, 1H), 7.45 – 7.26 (m, 6H), 7.23 (dd, *J* = 15.1 Hz, 7.4 Hz, 2H), 7.19 – 7.12 (m, 1H), 7.09 (d, *J* = 7.2 Hz, 1H), 2.30 (s, 3H), 2.01 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.7, 139.1, 139.0, 138.3, 129.3, 128.6, 128.5, 128.4, 127.9 (t, *J* = 2.0 Hz), 125.1, 114.6 (t, *J* = 249.5 Hz), 67.3 (t, *J* = 21.6 Hz), 23.7, 21.8.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –122.72 (*J* = 280.24 Hz), –123.34 (*J* = 280.24 Hz).

HRMS: *m/z* Calculated for $C_{17}H_{18}F_2NO$, $[M+H]^+$, 290.1351; Found, 290.1343.

***N*–(1,1–Bis(4–bromophenyl)–2,2–difluoroethyl)acetamide (6k)**



6k

Following general procedure B, **6k** was obtained in 67% yield (87 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.34. m.p. = 198.5 – 199.9 ℃.

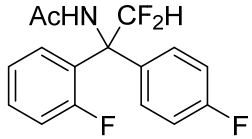
^{1}H NMR (400 MHz, $CDCl_3$) δ = 7.50 (d, *J* = 8.8 Hz, 4H), 7.17 (d, *J* = 8.7 Hz, 4H), 6.97 (t, *J* = 56.5 Hz, 1H), 6.20 (s, 1H), 2.06 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.8, 137.5, 131.9, 129.6, 123.1, 114.1 (t, *J* = 250.0 Hz), 66.8 (t, *J* = 21.6 Hz), 23.7.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –123.33 .

HRMS: *m/z* Calculated for $C_{16}H_{14}Br_2F_2NO$, $[M+H]^+$, 431.9405; Found, 431.9398.

***N*–(2,2–Difluoro–1–(2–fluorophenyl)–1–(4–fluorophenyl)ethyl)acetamide (6l)**



6l

Following general procedure B, **6l** was obtained in 71% yield (66 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum

ether/EtOAc 3:1): 0.35. m.p. = 170.6 – 171.6 ℃.

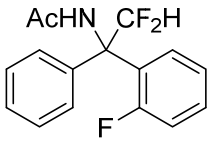
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.52 – 7.34 (m, 3H), 7.26 – 7.20 (m, 3H), 7.11 – 7.01 (m, 3H), 6.45 (s, 1H), 2.02 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$, composite pulse decoupling) δ = 170.3, 162.9 (d, *J* = 248.9 Hz), 160.5 (d, *J* = 248.0 Hz), 132.6, 130.47 (d, *J* =9.1 Hz), 129.6 (d, *J* = 8.2 Hz), 129.1 (dd, *J* = 5.0, 2.7 Hz), 126.9, 124.1 (d, *J* = 3.6 Hz), 117.1 (d, *J* = 22.7 Hz), 115.4 (d, *J* = 21.8 Hz), 112.7(t, *J* = 249.0 Hz), 65.0 (dd, *J* = 25.4 Hz, 20.4 Hz), 23.7.

^{19}F NMR (471 MHz, $CDCl_3$) δ = –109.96 (d, *J* = 4.8), –113.2, –121.59 (dd, *J* = 283.1 Hz, 5.6), –131.78 (d, *J* = 282.6 Hz).

HRMS: *m/z* Calculated for $C_{16}H_{14}F_4NO$, $[M+H]^+$, 312.1006; Found, 312.0998.

***N*–(2,2–Difluoro–1–(2–fluorophenyl)–1–phenylethyl)acetamide (6m)**



6m

Following general procedure B, **6m** was obtained in 72% yield (63 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.41. m.p. = 152.1 – 153.0 ℃.

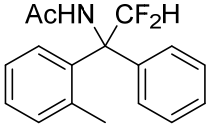
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.53 – 7.27 (m, 7H), 7.26 – 7.19 (m, 2H), 7.06 (dd, *J* = 12.4 Hz, 8.1 Hz, 1H), 6.49 (s, 1H), 2.03 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 170.2, 160.4 (d, *J* = 247.0 Hz), 136.7, 130.2 (d, *J* = 9.5 Hz), 129.2 – 128.9 (m), 128.8, 128.3, 127.6, 123.9 (d, *J* = 3.2 Hz), 116.9 (d, *J* = 22.7 Hz), 112.7 (dd, *J* = 248.8 Hz, 246.2 Hz), 65.2(dd, *J* = 24.9 Hz, 20.1 Hz), 23.6.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –109.94 (d, *J* = 4.3 Hz), –109.94 (dd, *J* = 282.80 Hz, 4.3 Hz), –131.78 (d, *J* = 282.6 Hz).

HRMS: *m/z* Calculated for $C_{16}H_{15}F_3NO$, $[M+H]^+$, 294.1100; Found, 294.1093.

***N*–(2,2–Difluoro–1–phenyl–1–(o–tolyl)ethyl)acetamide (6n)**



6n

Following general procedure B, **6n** was obtained in 71% yield (62 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 3:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.28. m.p. = 1179.9 – 180.9 ℃.

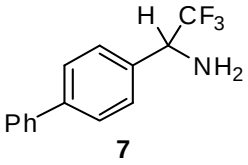
^{1}H NMR (500 MHz, $CDCl_3$) δ = 7.63 – 7.57 (m, 1H), 7.50 – 7.32 (m, 4H), 7.29 (t, *J* = 7.2 Hz, 2H), 7.18 (dd, *J* = 22.1 Hz, 7.5 Hz, 3H), 6.33 (s, 1H), 2.04 (s, 3H), 1.90 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ = 169.4, 137.5 (d, *J* = 4.1 Hz), 136.7, 135.9 (d, *J* = 1.8 Hz), 133.3, 128.8, 128.5, 128.2, 127.8, 127.7, 127.7, 125.8, 113.2 (t, *J* = 246.8 Hz), 66.8 (dd, *J* = 25.0 Hz, 18.6 Hz), 23.5, 22.1.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –120.68 (d, *J* = 79.2 Hz), –131.89 (d, *J* = 279.2 Hz).

HRMS: *m/z* Calculated for $C_{17}H_{18}F_2NO$, $[M+H]^+$, 290.1351; Found, 290.1337.

1–([1,1'–Biphenyl]–4–yl)–2,2,2–trifluoroethan–1–amine (7)



7

Following diversification procedure, **7** was obtained in 80% yield (20 mg) as a white solid after column chromatography (eluent = Petroleum ether/EtOAc 6:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.26.

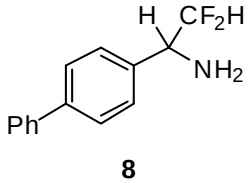
^{1}H NMR (400 MHz, $(CD_3)_2CO$)) δ = 7.72 – 7.65 (m, 4H), 7.59 (d, *J* = 8.3 Hz, 2H), 7.47 (t, *J* = 7.6 Hz, 2H), 7.40 – 7.34 (m, 1H), 5.19 (q, *J* = 7.9 Hz, 1H).

^{13}C NMR (126 MHz, $(CD_3)_2CO$)) δ = 142.1, 141.2, 135.5, 130.4, 129.8, 128.5, 127.8, 127.8, 126. 7 (q, *J* = 276.5 Hz), 66.1 (q, *J* = 28.2 Hz).

^{19}F NMR (376 MHz, $(CD_3)_2CO$), composite pulse decoupling) δ = –74.81.

HRMS: *m/z* Calculated for $C_{14}H_{13}F_3N$, $[M+H]^+$, 252.0995; Found, 252.1005.

1–([1,1'–Biphenyl]–4–yl)–2,2–difluoroethan–1–amine (8)



8

Following diversification procedure, **8** was obtained in 39% yield (90 mg) as a colorless liquid after column chromatography (eluent = Petroleum ether/EtOAc 6:1 v/v). R_f (Petroleum ether/EtOAc 3:1): 0.14.

^{1}H NMR (500 MHz, $(CD_3)_2CO$)) δ = 7.68 – 7.63 (m, 4H), 7.54 (d, *J* = 8.4 Hz, 2H), .46 (dd, *J* = 8.5 Hz, 6.9 Hz, 2H), 7.39 – 7.34 (m, 1H), 6.12 (td, *J* = 56.5 Hz, 5.5 Hz, 1H), 4.83 (ddd, *J* = 12.5 Hz, 10.1 Hz, 5.4 Hz, 1H).

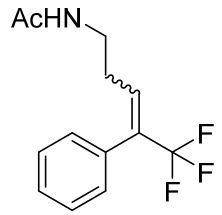
^{13}C NMR (101 MHz, $(CD_3)_2CO$)) δ = 141.51, 141.44, 137.44, 137.37, 130.08,

129.81, 128.35, 127.79, 118.41 (dd, *J*=245.0, 241.4), 67.20 (dd, *J*=23.8, 21.6).

^{19}F NMR (471 MHz, $(CD_3)_2CO$), composite pulse decoupling) δ = –123.15, (d, *J* = 275.2 Hz), –125.93 (d, *J* = 275.9 Hz).

HRMS: *m/z* Calculated for $C_{14}H_{14}F_2N$, $[M+H]^+$, 234.1089; Found, 234.1079.

***N*–(5,5,5–Trifluoro–4–phenylpent–3–en–1–yl)acetamide (10)**



10

Following general procedure A, **10** was obtained in 39% yield (90 mg) as a colorless liquid after column chromatography (eluent = Petroleum ether/EtOAc 1:1 v/v). R_f (Petroleum ether/EtOAc 1:1): 0.21. *Z*/*E* = 2:3.

***E* isomer ^{1}H NMR (500 MHz, $CDCl_3$)** δ = 7.41 – 7.33 (m, 3H), 7.23 – 7.19 (m, 2H), 6.40 (t, *J* = 7.5 Hz, 1H), 5.47 (s, 1H), 3.30 (q, *J* = 6.7 Hz, 2H), 2.24 (q, *J* = 7.2 Hz, 2H), 1.94 (s, 3H).

Mixture ^{13}C NMR (126 MHz, $CDCl_3$) δ = 171.7, 171.4, 137.7 (d, *J* = 3.2 Hz), 136.0, 136.0, 134.2, 134.1, 134.0, 133.9, 133.6, 132.7 (q, *J* = 5.7 Hz), 132.0, 131.9, 131.6, 129.6, 128.9, 128.8, 128.5, 128.4, 128.2, 123.9 (d, *J* = 275.7 Hz), 123.3 (d, *J* = 273.1 Hz), 120.8, 118.3, 40.1, 39.0, 38.7, 29.0, 28.4, 23.2, 23.1, 20.0, 13.5.

^{19}F NMR (471 MHz, $CDCl_3$, composite pulse decoupling) δ = –56.93, –66.00.

HRMS: *m/z* Calculated for $C_{13}H_{15}F_3NO$, $[M+H]^+$, 258.1100; Found, 258.1094.

VII. References

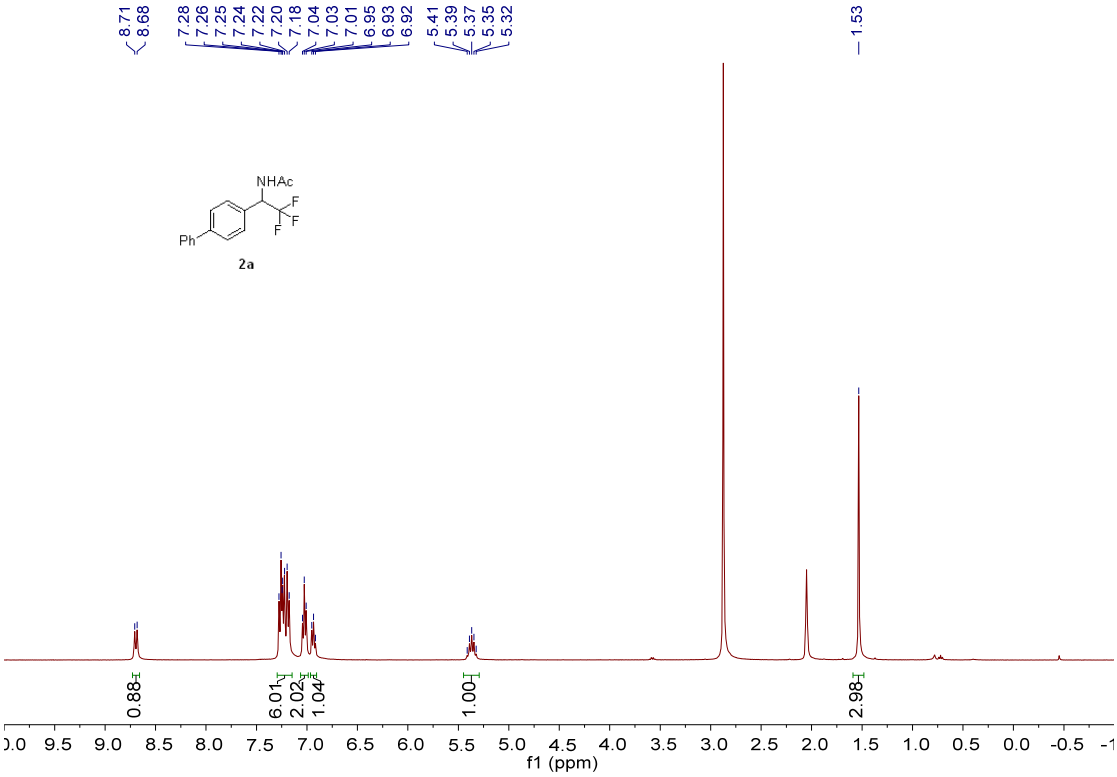
[1] Hu, M. Y. *et al*. *J. Am. Chem. Soc*. 2013, **135**, 17302

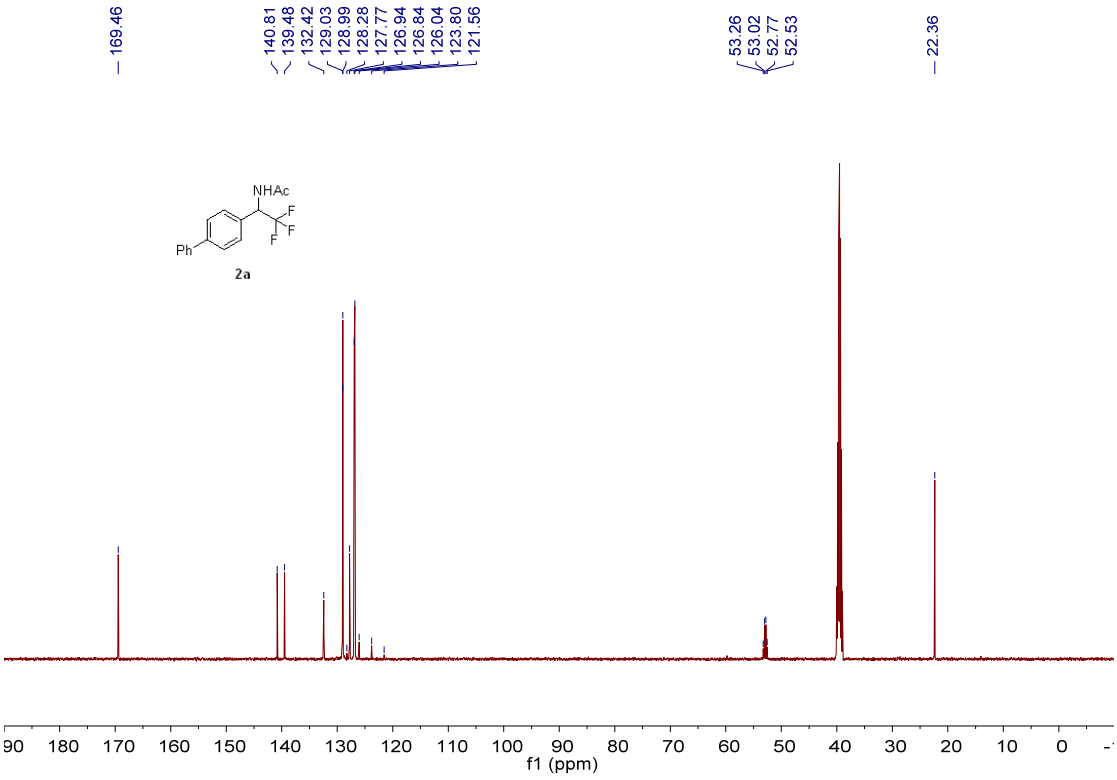
[2] Tan, D. H. *et al*. *Adv. Syn. Catal*. 2018, **360**, 1032.

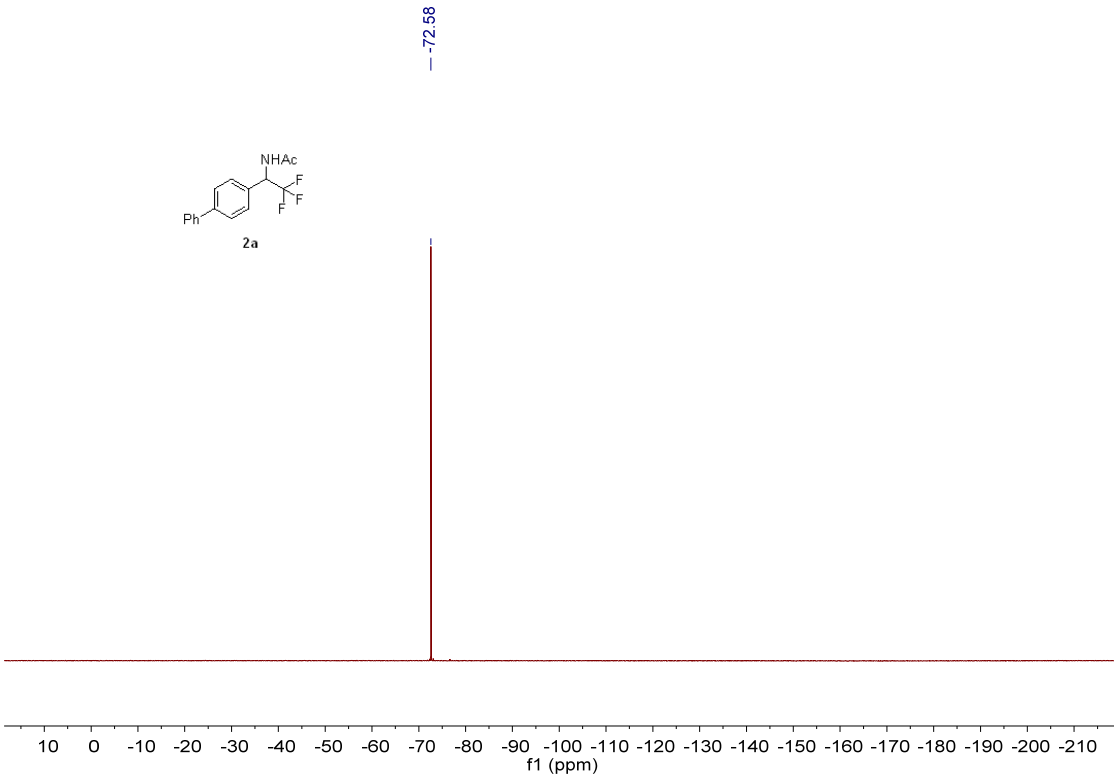
[3] Wu, J. J. *et al. RSC Adv.* 2015, **5**, 34498.

[4] Li, J. J. *et al. Chem. Commun.* 2017, **53***, 10299.*

VIII. NMR spectra for compounds



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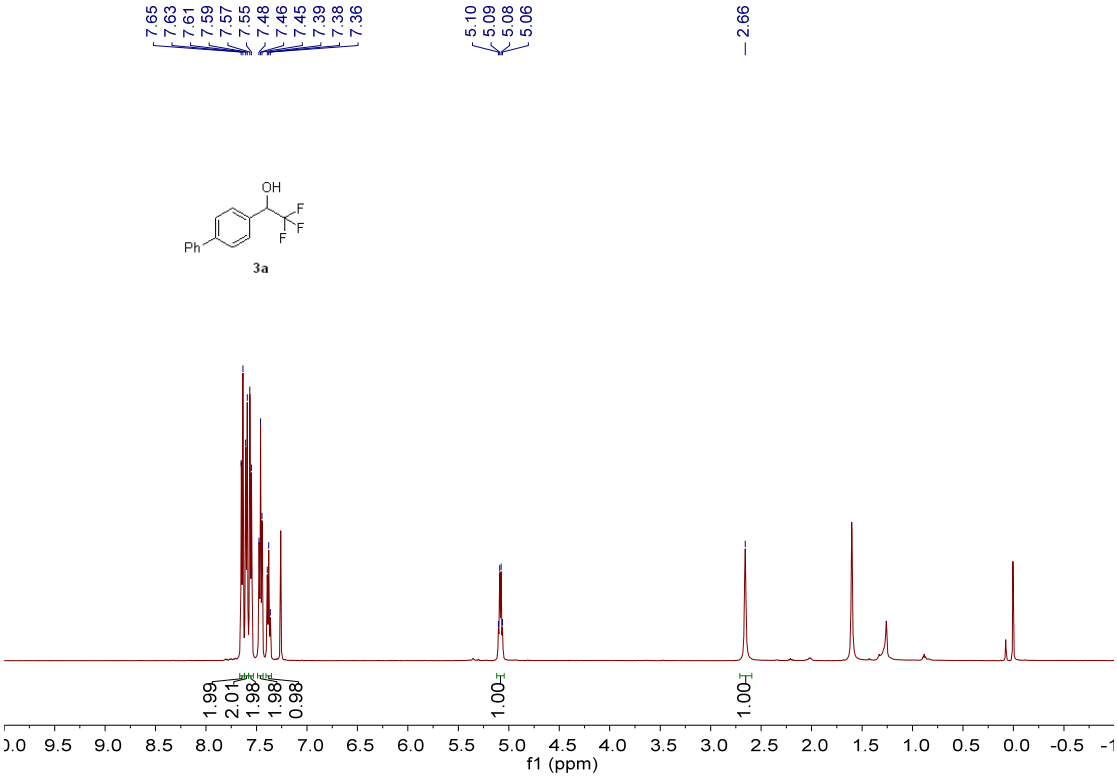
NHAc
F
F
F
Ph
2a
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)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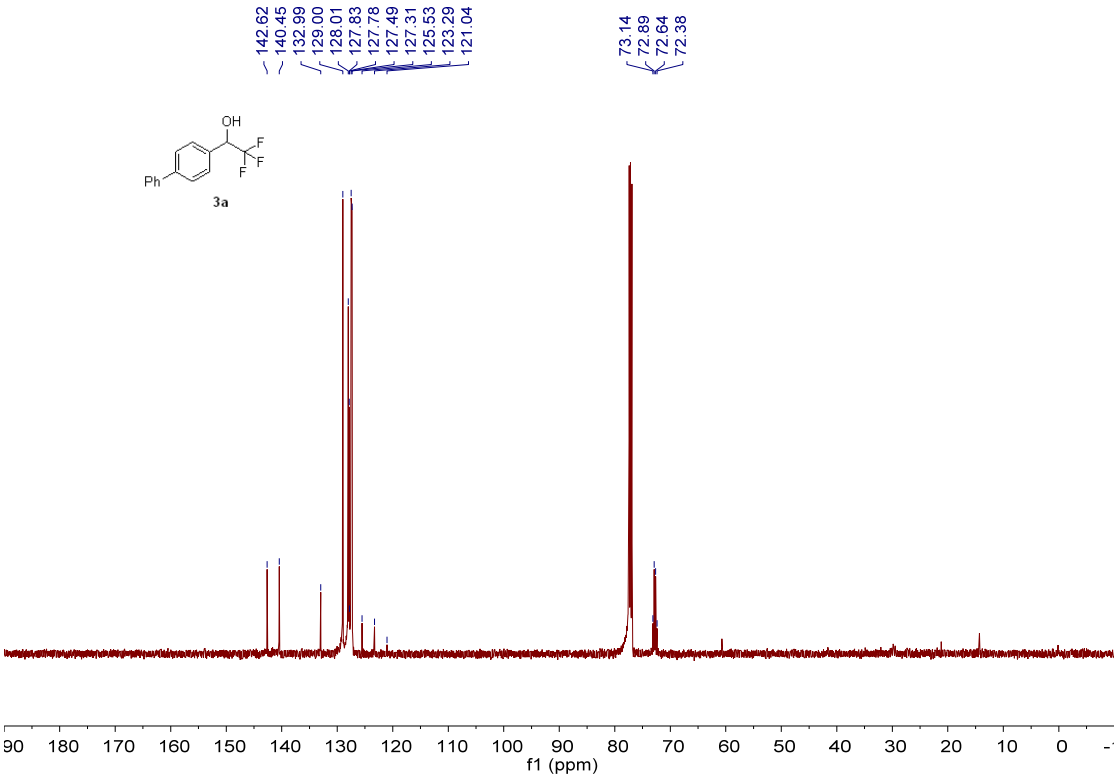
7.39
7.38
7.36
5.10
5.09
5.08
5.06
2.66
OH
F
F
F
Ph
3a
1.99
2.01
1.98
0.98
1.00
1.00
f1 (ppm)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72.64
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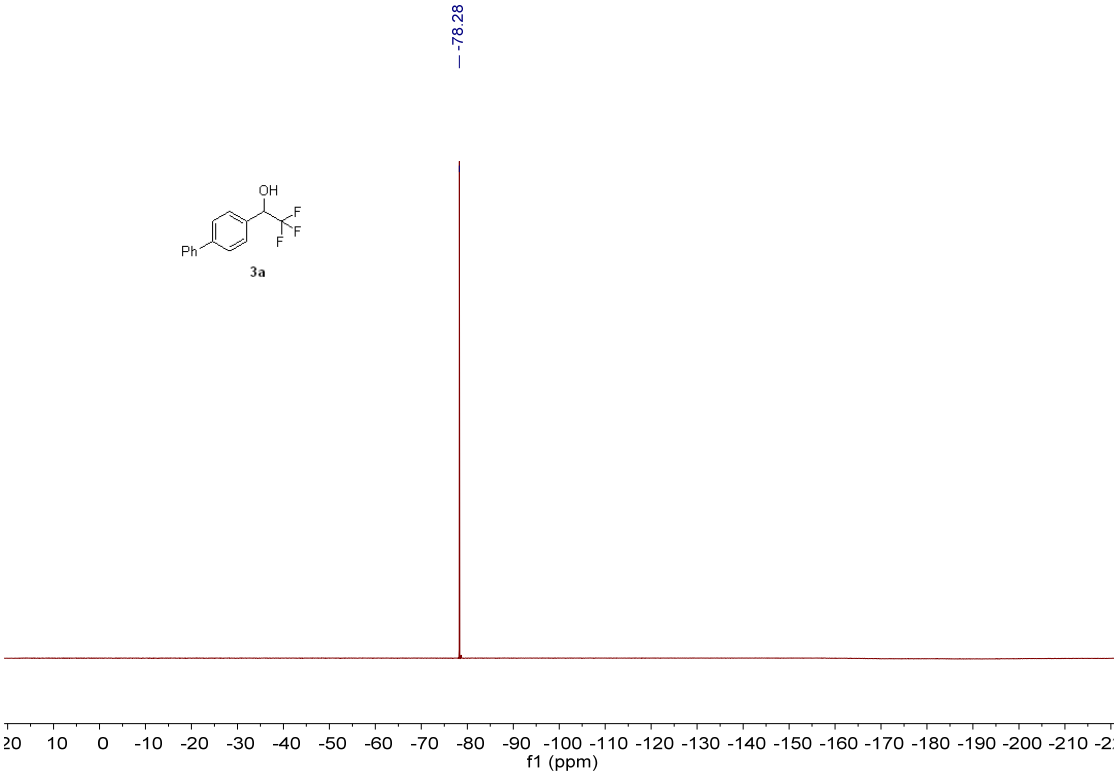
OH
F
F
F
Ph
3a
f1 (ppm)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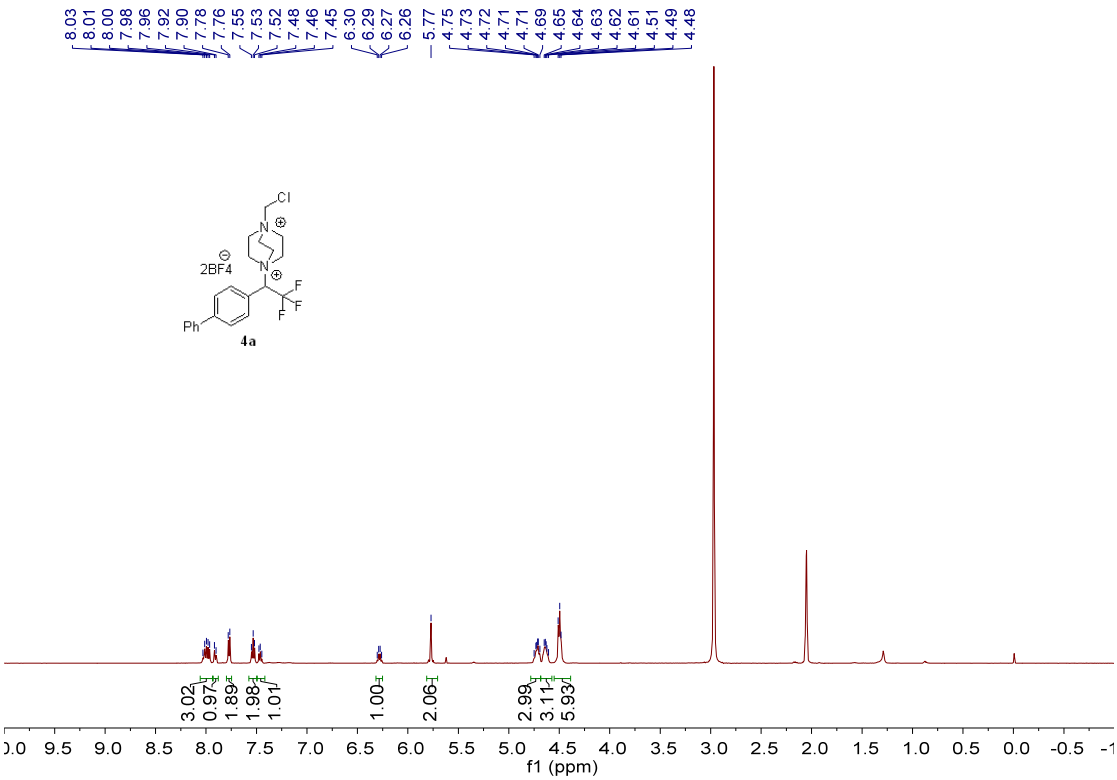
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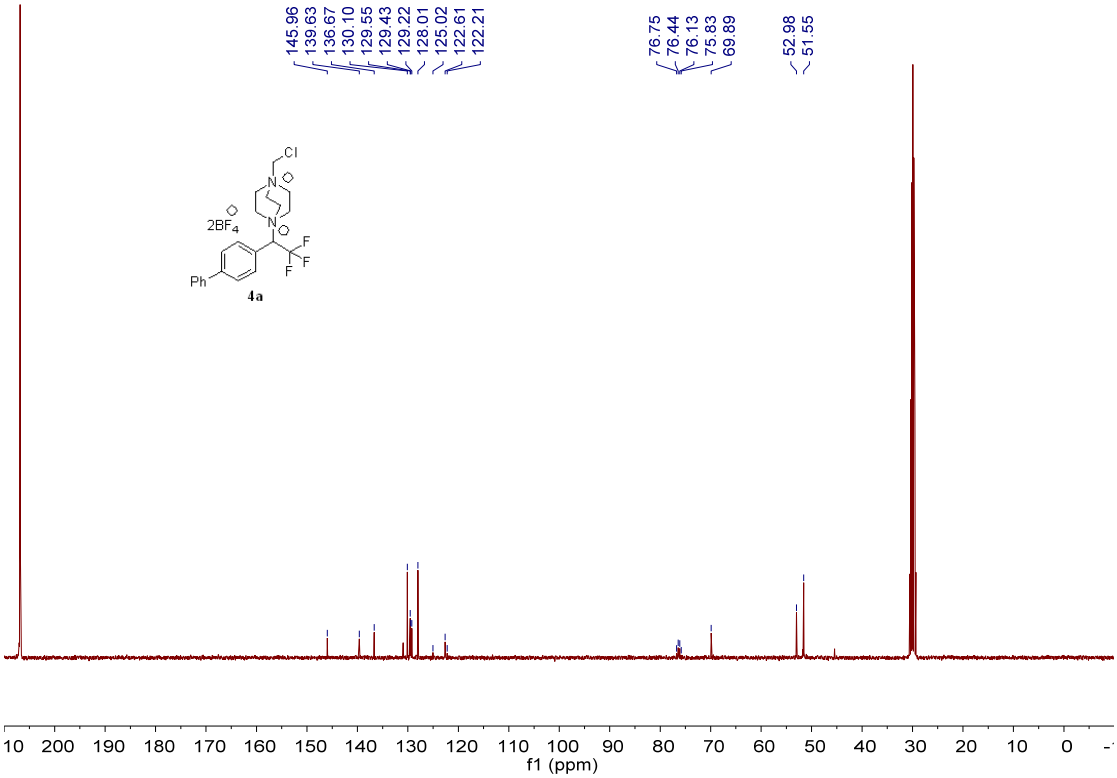
4.71
4.69
4.65
4.64
4.63
4.62
4.61
4.51
4.49
4.48
Cl
2BF4
F
F
F
Ph
4a
3.02
0.97
1.89
1.98
1.01
1.00
2.06
2.99
3.11
5.93
f1 (ppm)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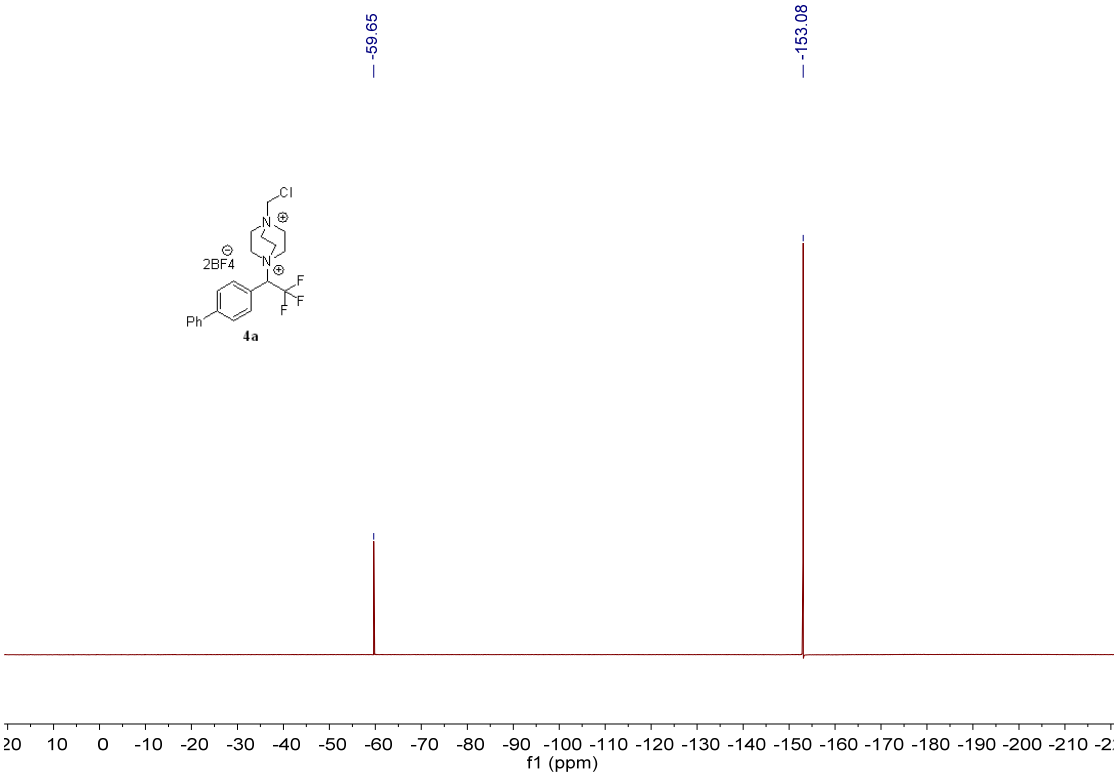
130.10
129.55
129.43
129.22
128.01
125.02
122.61
122.21
76.75
76.44
76.13
75.83
69.89
52.98
51.55
Cl
2BF4
F
F
F
Ph
4a
f1 (ppm)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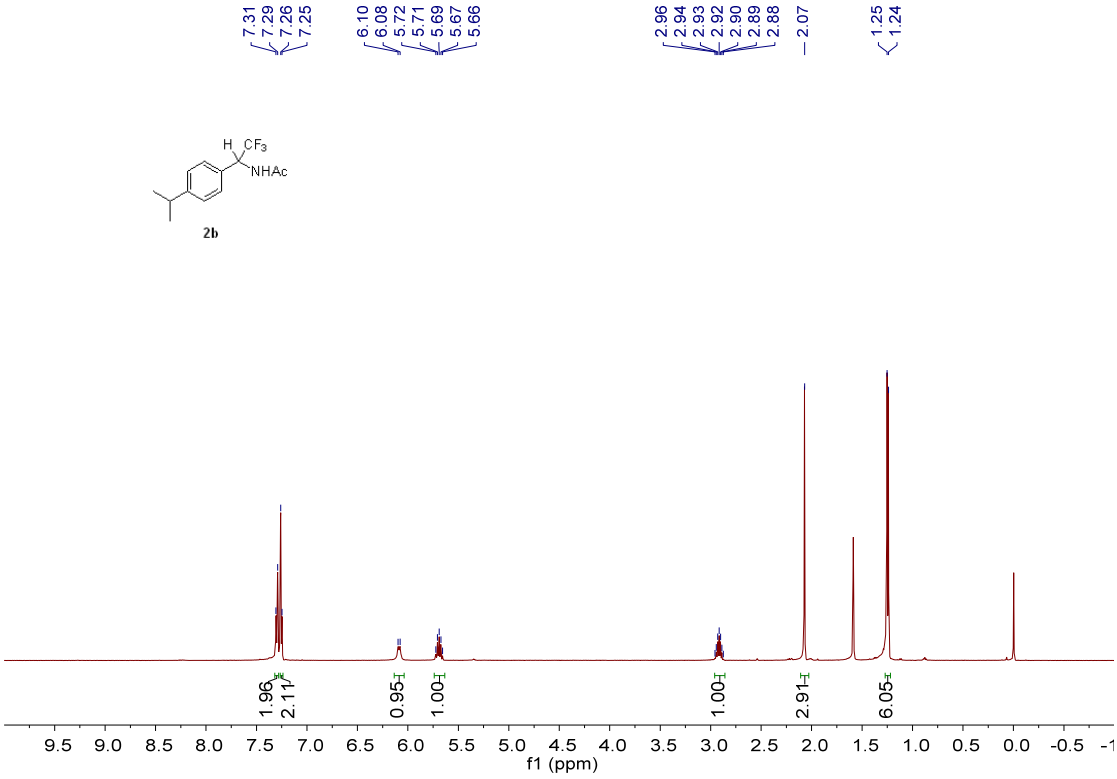
-153.08
Cl
2BF4
Ph
F
F
F
4a
f1 (ppm)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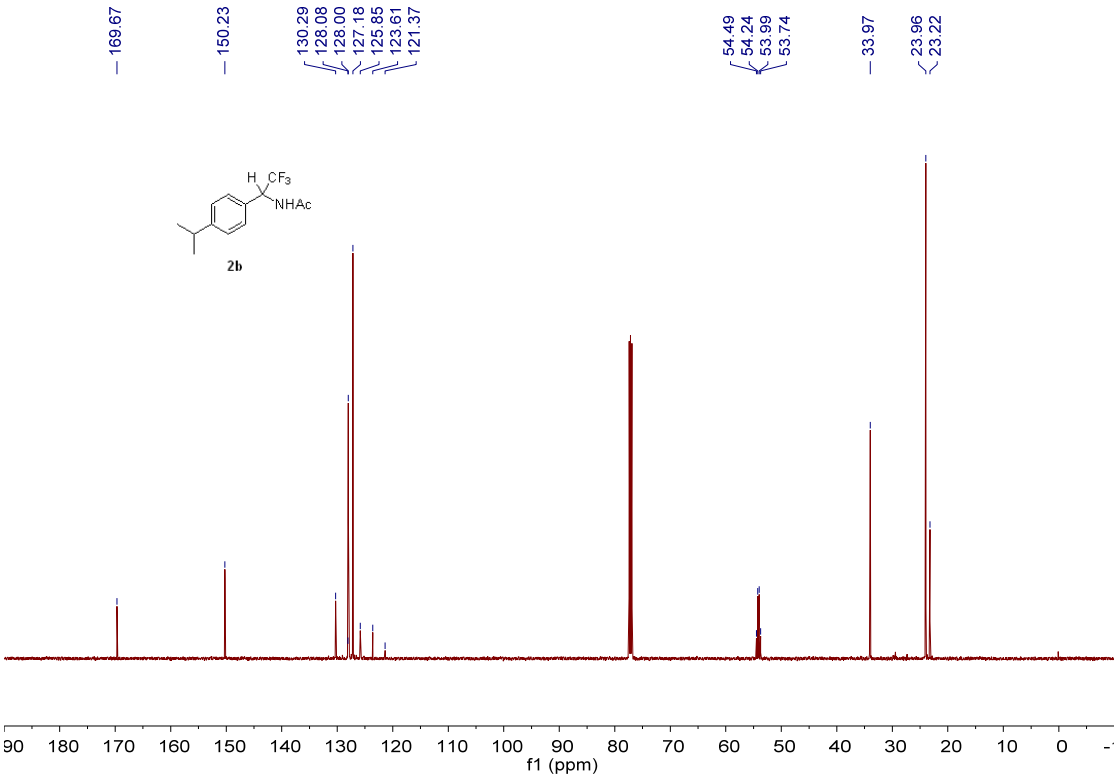
7.25
6.10
6.08
5.72
5.71
5.69
5.67
5.66
2.96
2.94
2.93
2.92
2.90
2.89
2.88
2.07
1.25
1.24
H
CF3
NHAc
2b
1.96
2.11
0.95
1.00
1.00
2.91
6.05
f1 (ppm)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125.85
123.61
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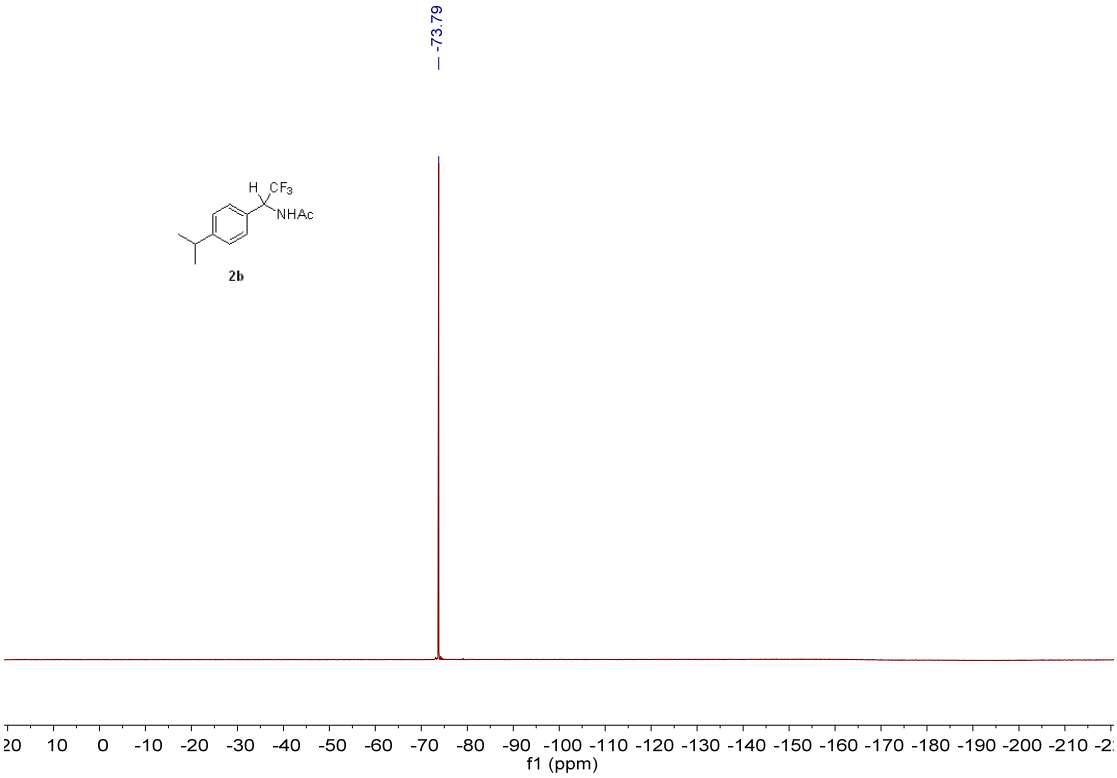
53.74
33.97
23.96
23.22
H
CF3
NHAc
2b
f1 (ppm)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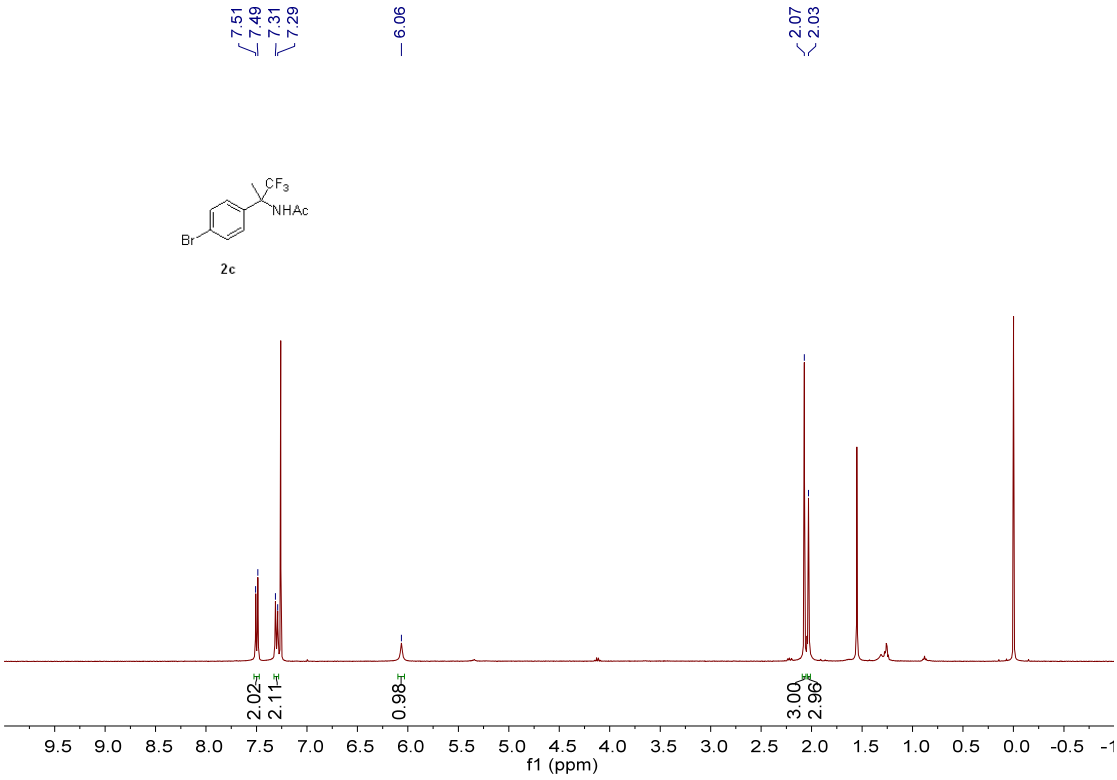
CF3
NHAc
2b
f1 (ppm)


7.51
7.49
7.31
7.29
6.06
2.07
2.03
CF3
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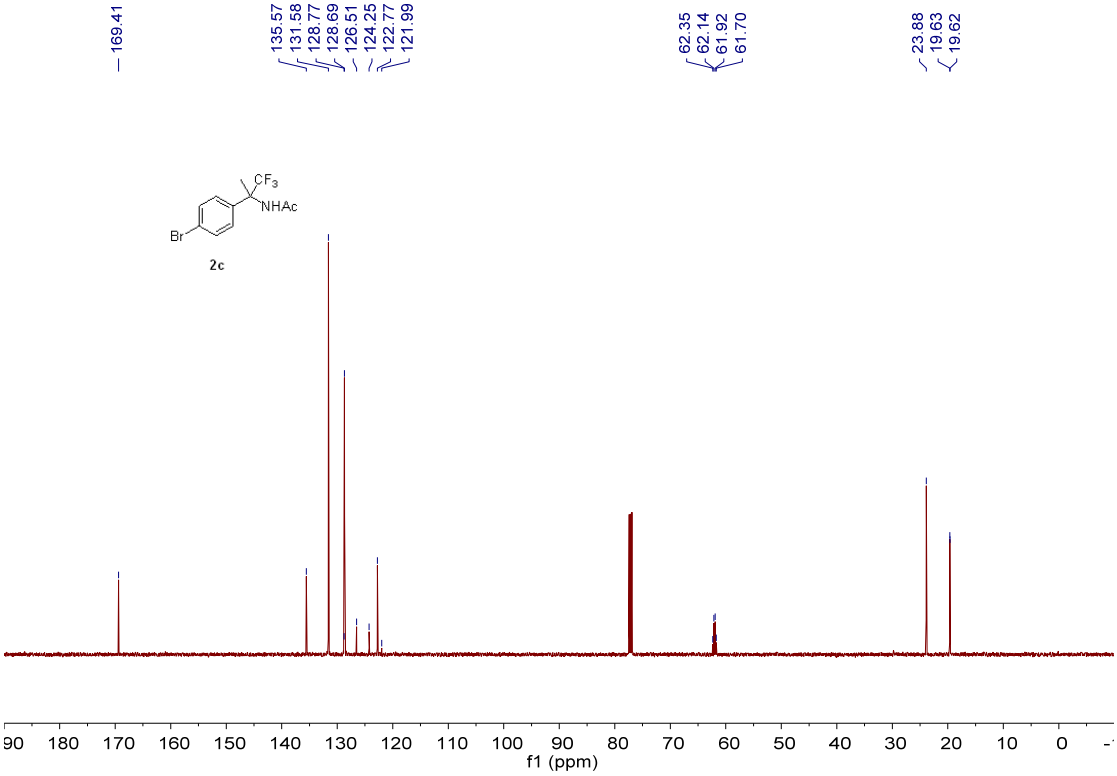
Br
2c
2.02
2.11
0.98
3.00
2.96
f1 (ppm)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124.25
122.77
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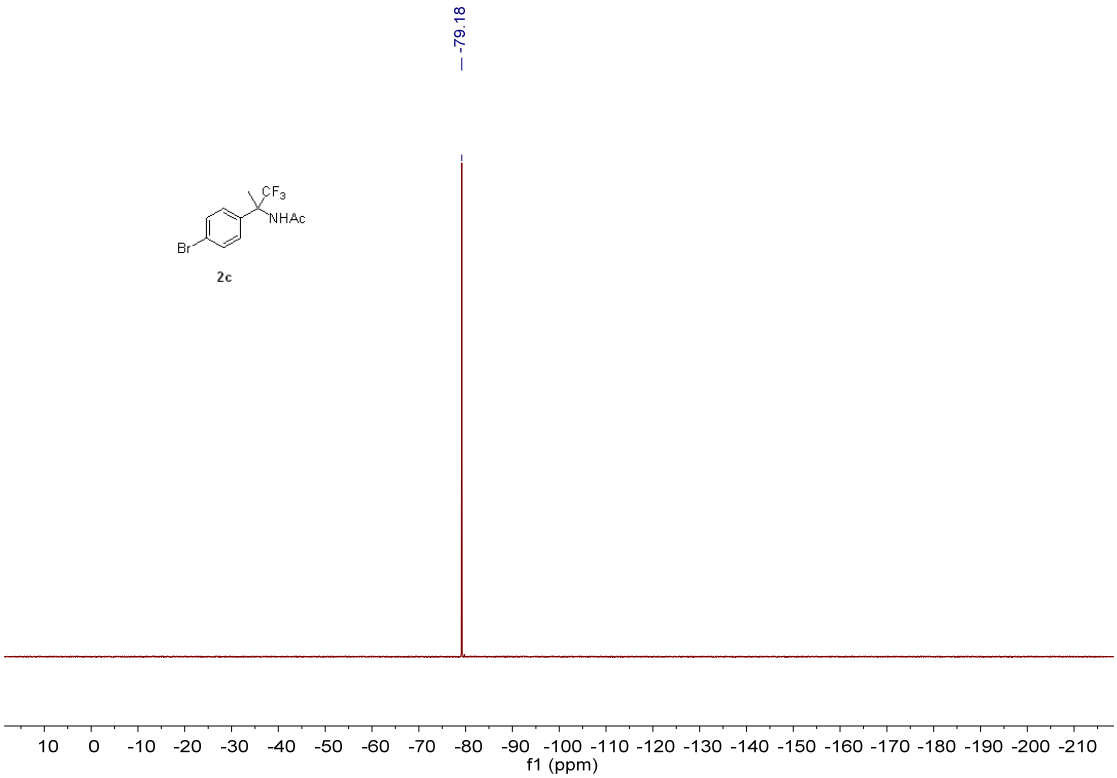
61.92
61.70
23.88
19.63
19.62
CF3
NHAc
Br
2c
f1 (ppm)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CF3
NHAc
Br
2c
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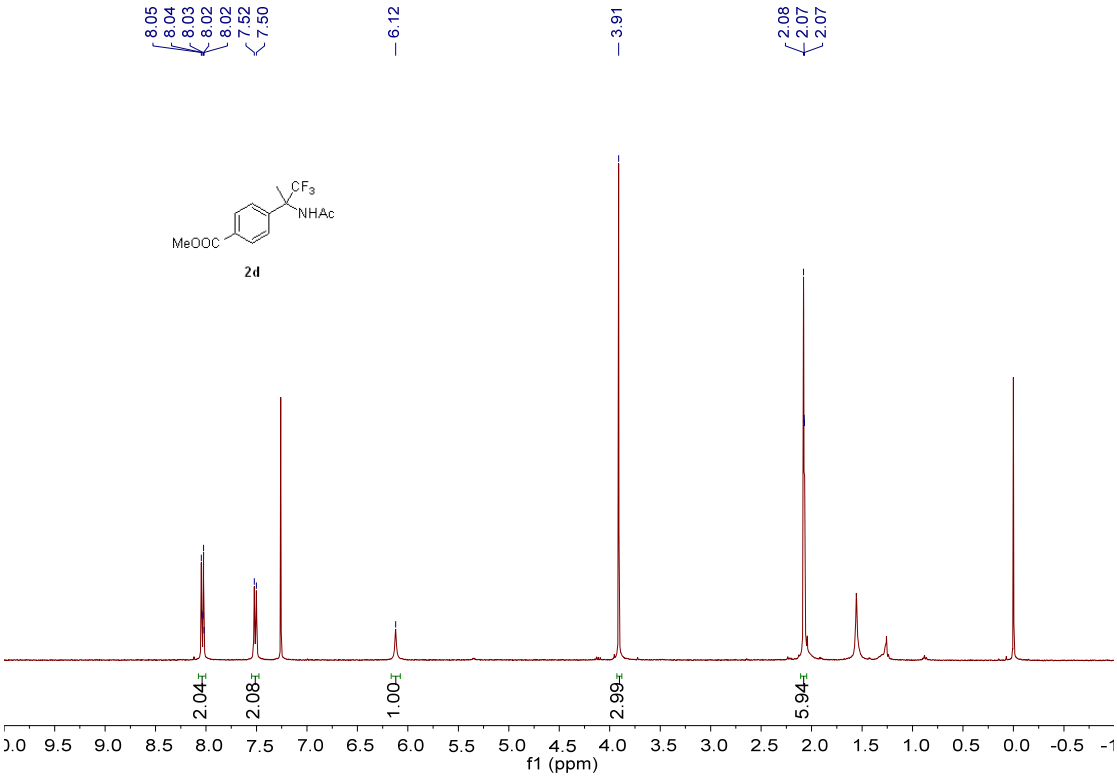
f1 (ppm)


8.05
8.04
8.03
8.02
8.02
7.52
7.50
6.12
3.91
2.08
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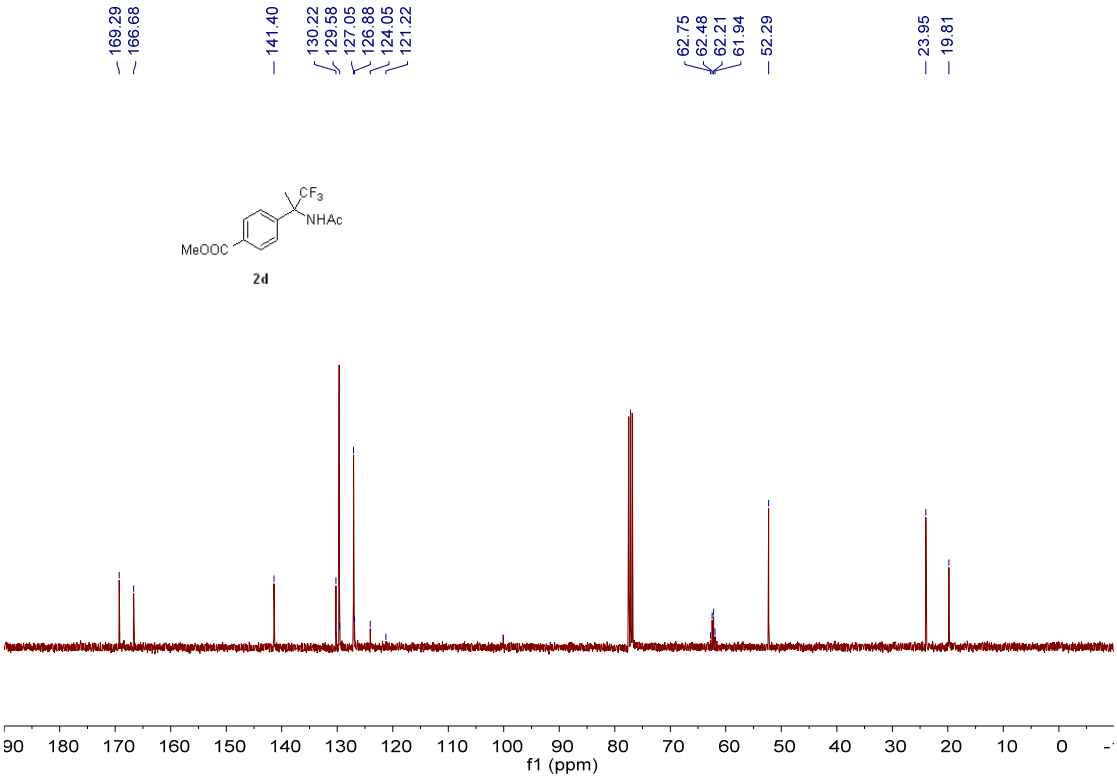
2.07
CF3
NHAc
MeOOC
2d
2.04
2.08
1.00
2.99
5.94
f1 (ppm)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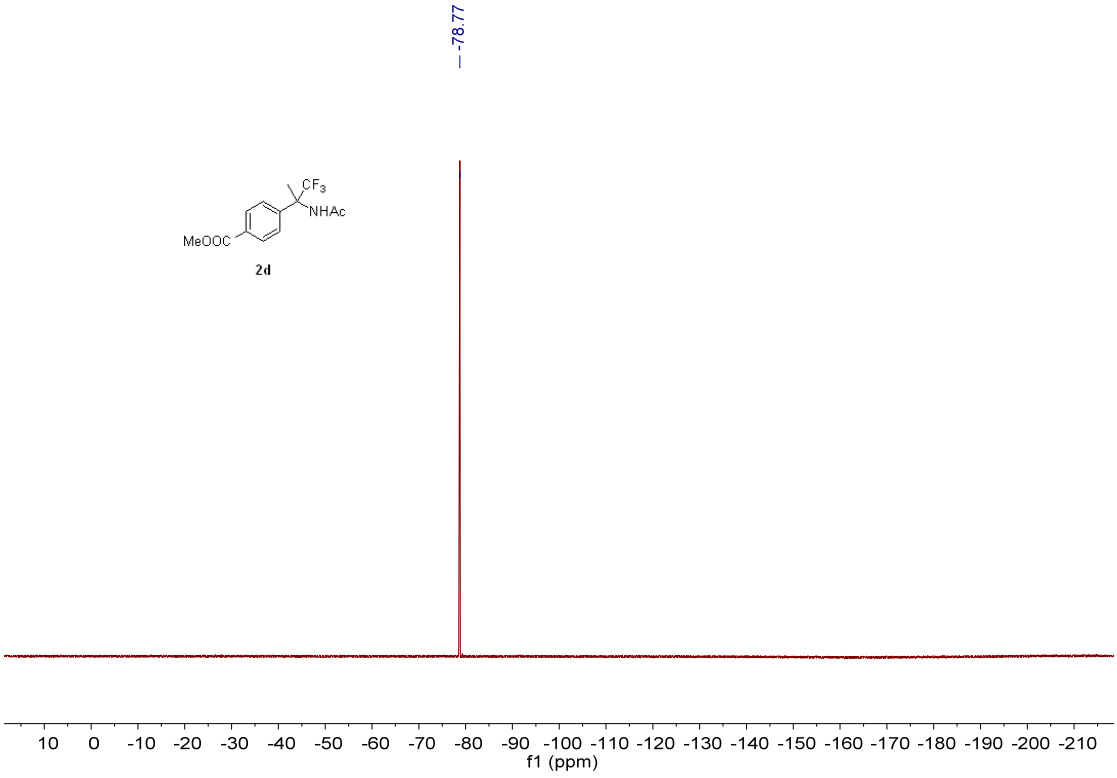
129.58
127.05
126.88
124.05
121.22
62.75
62.48
62.21
61.94
52.29
23.95
19.81
CF3
NHAc
MeOOC
2d
90 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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CF3
NHAc
MeOOC
2d
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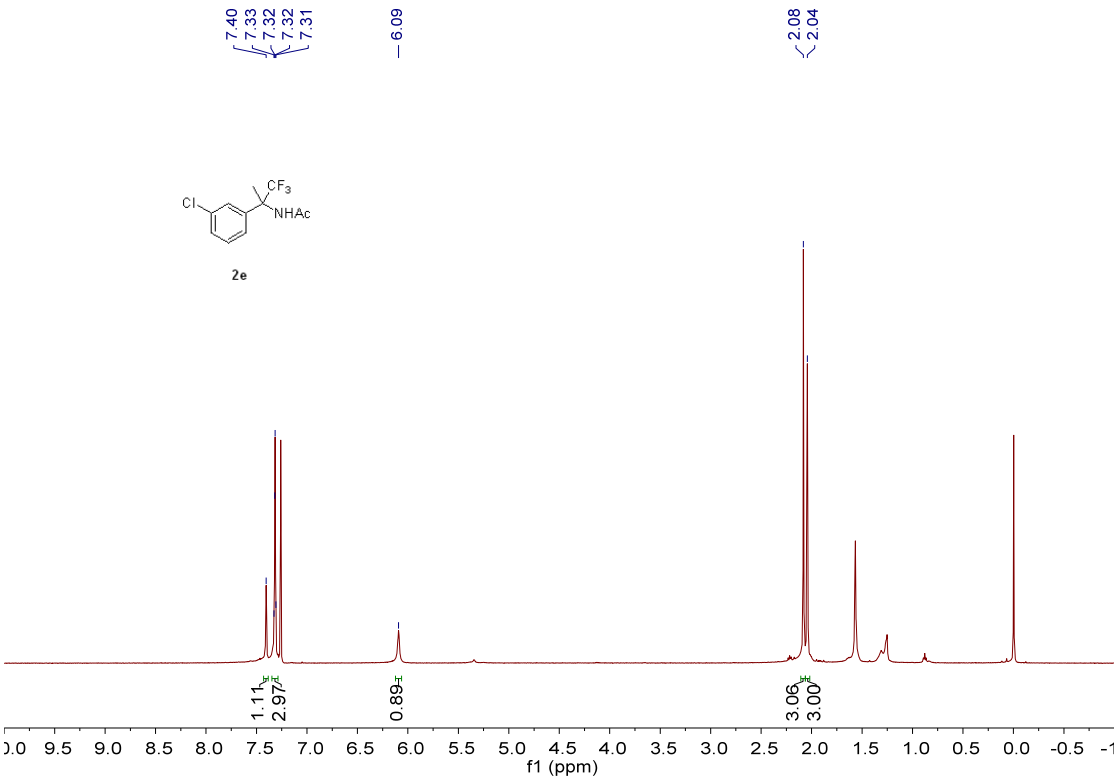
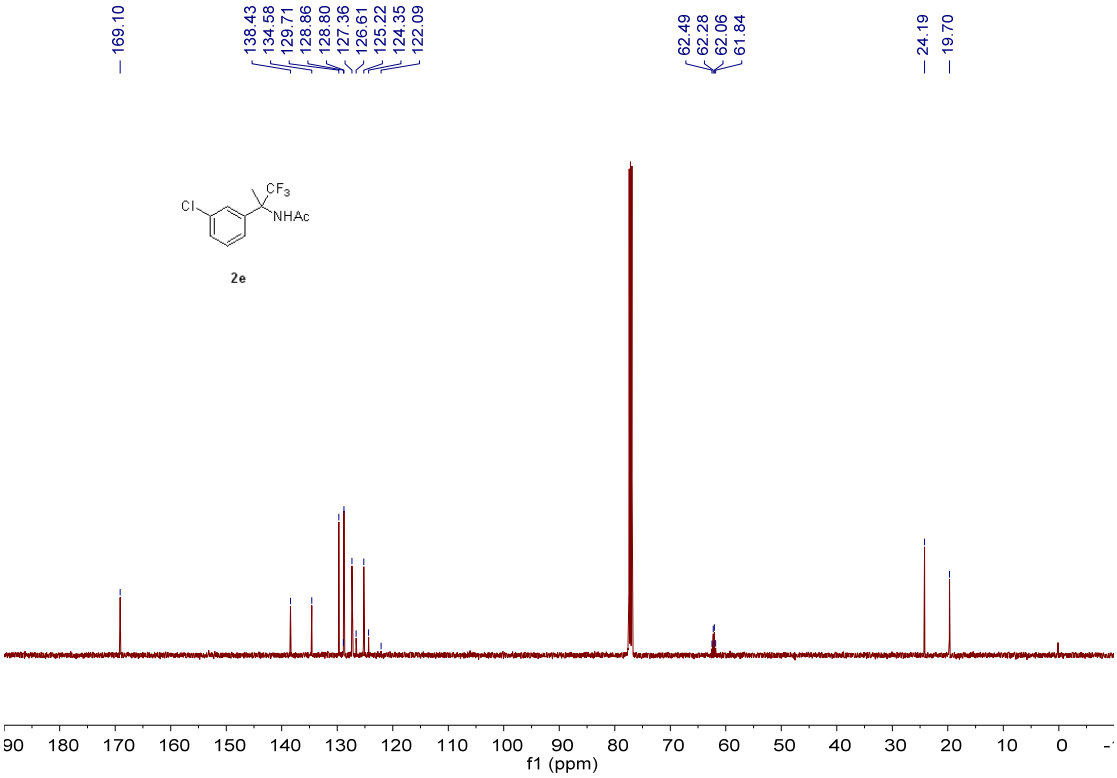
f1 (ppm)


7.40
7.33
7.32
7.32
7.31
6.09
2.08
2.04
CF3
NHAc
Cl
2e
1.11
2.97
0.89
3.06
3.00
f1 (ppm)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138.43
134.58
129.71
128.86
128.80
127.36
126.61
125.22
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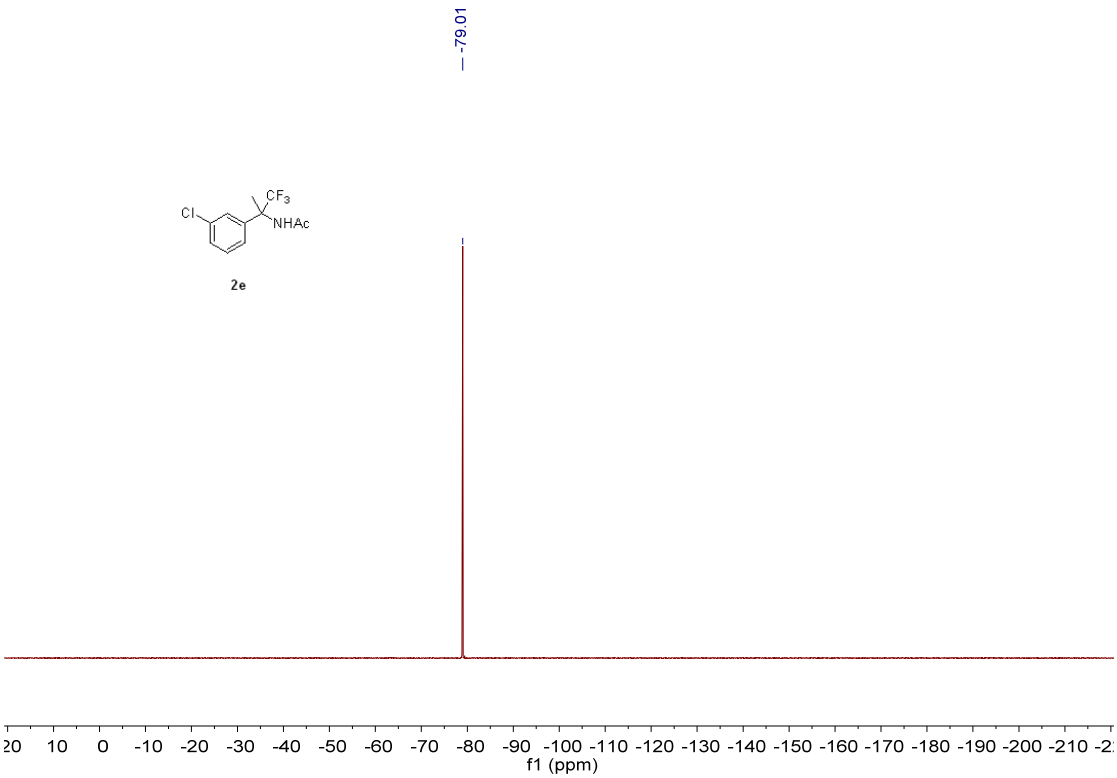
19.70
CF3
NHAc
Cl
2e
f1 (ppm)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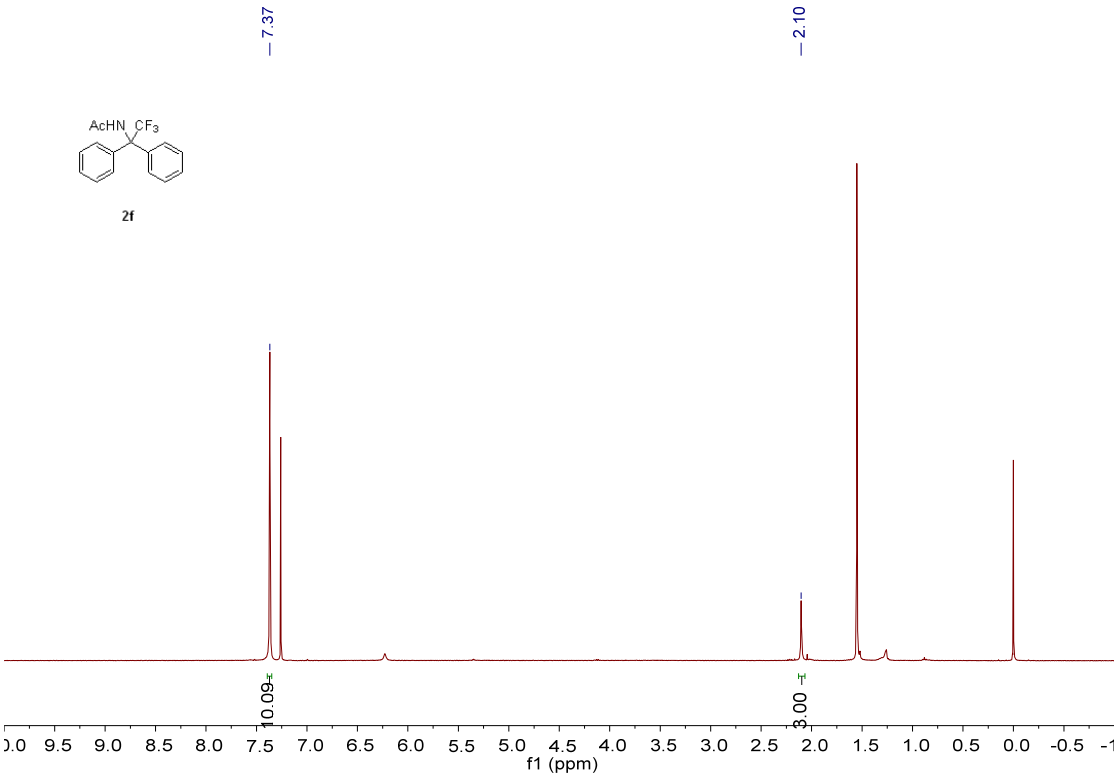
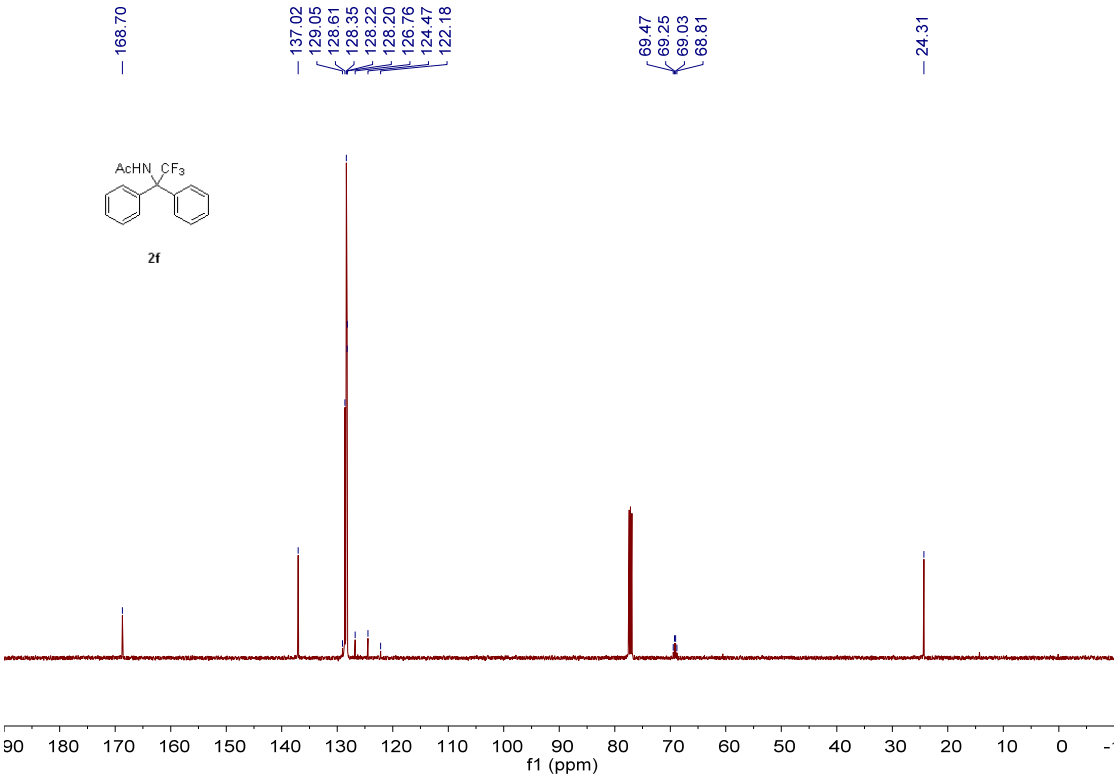
CF3
Cl
NHAc
2e
f1 (ppm)


7.37
2.10
AcHN
CF3
2f
10.09
3.00
f1 (ppm)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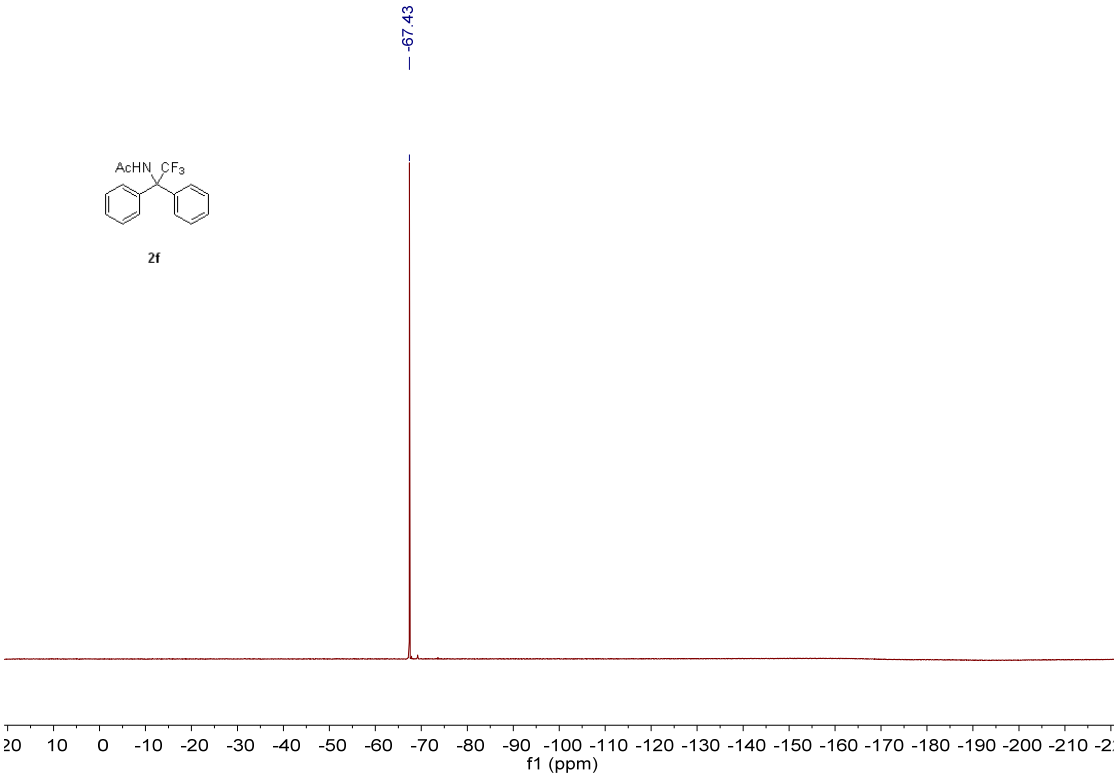
128.61
128.35
128.22
128.20
126.76
124.47
122.18
69.47
69.25
69.03
68.81
24.31
AcHN CF3
2f
f1 (ppm)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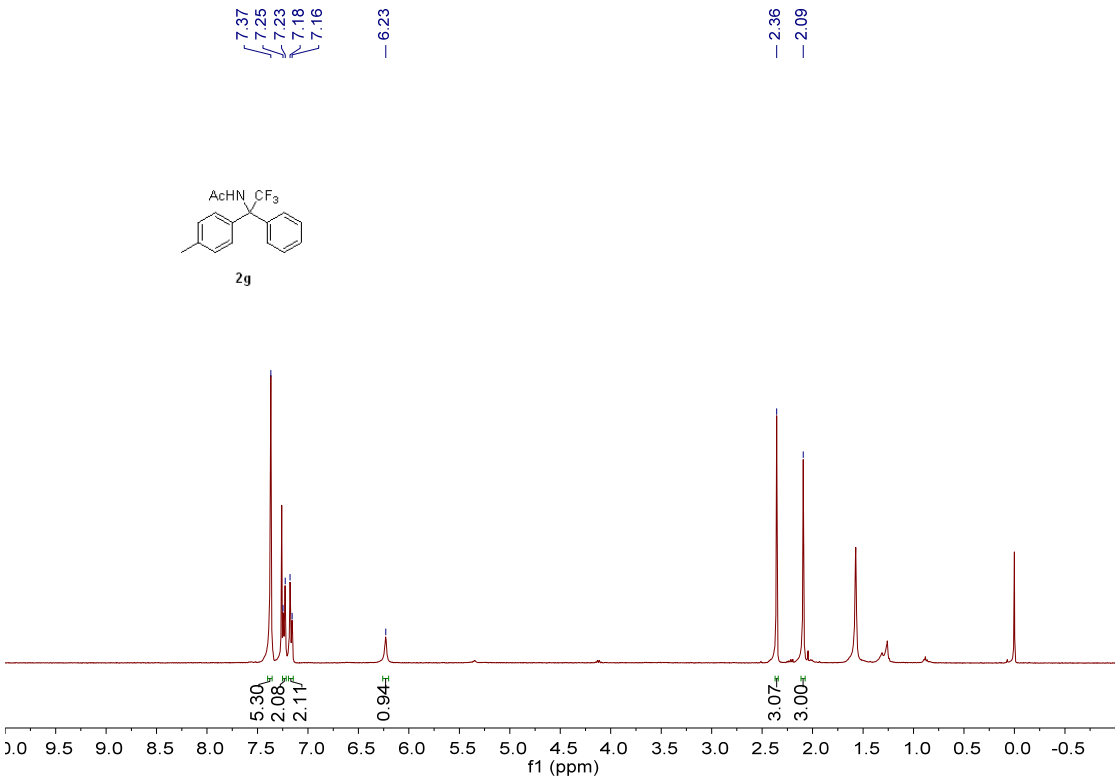
AcHN CF3
2f
f1 (ppm)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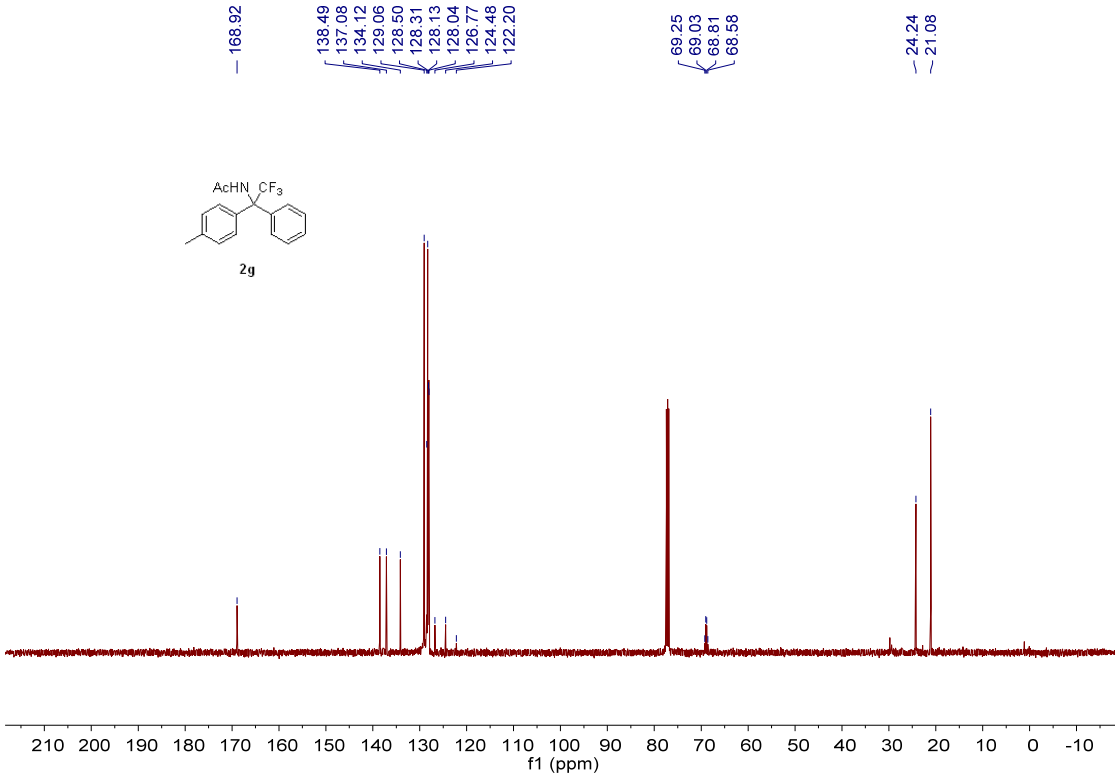
7.25
7.23
7.18
7.16
6.23
2.36
2.09
AcHN CF3
2g
5.30
2.08
2.11
0.94
3.07
3.00
f1 (ppm)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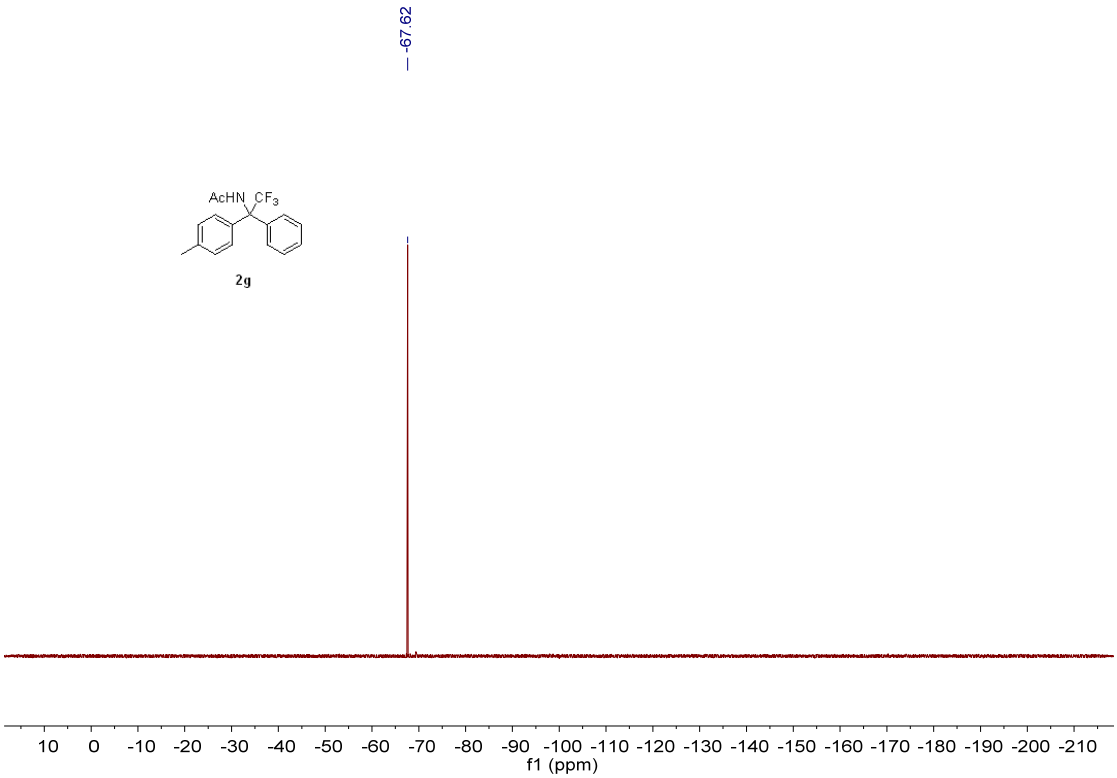
24.24
21.08
AcHN CF3
2g
f1 (ppm)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2g
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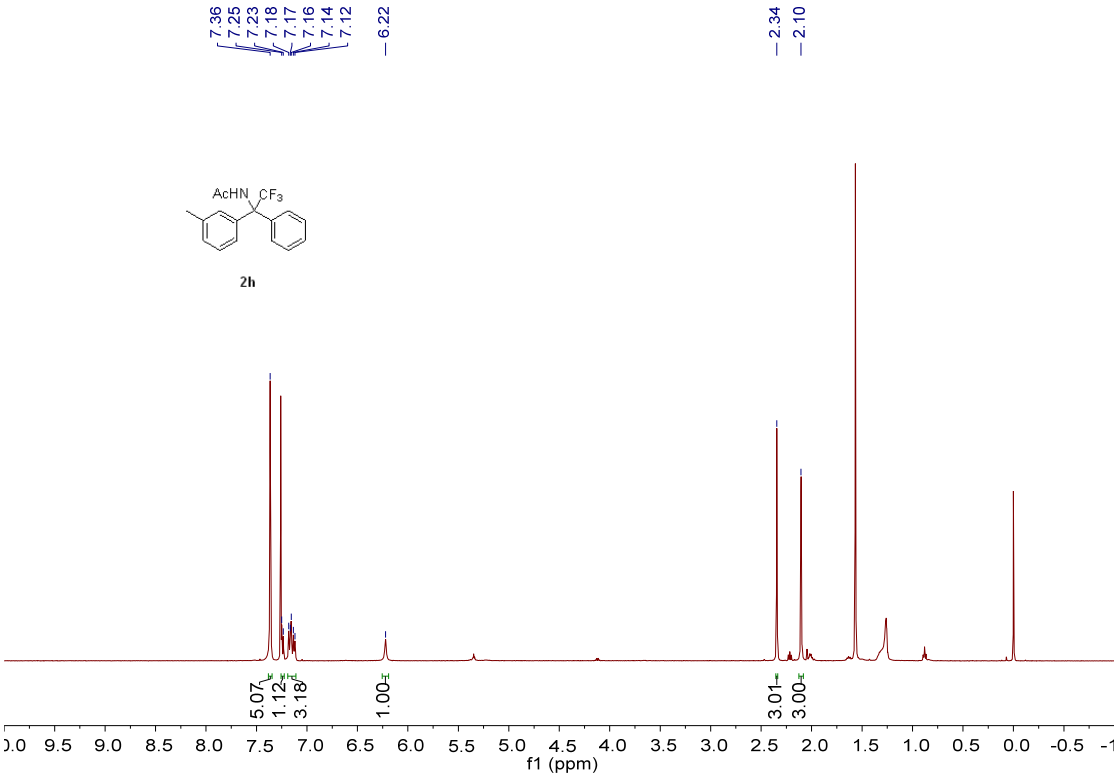
f1 (ppm)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7.25
7.23
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7.14
7.12
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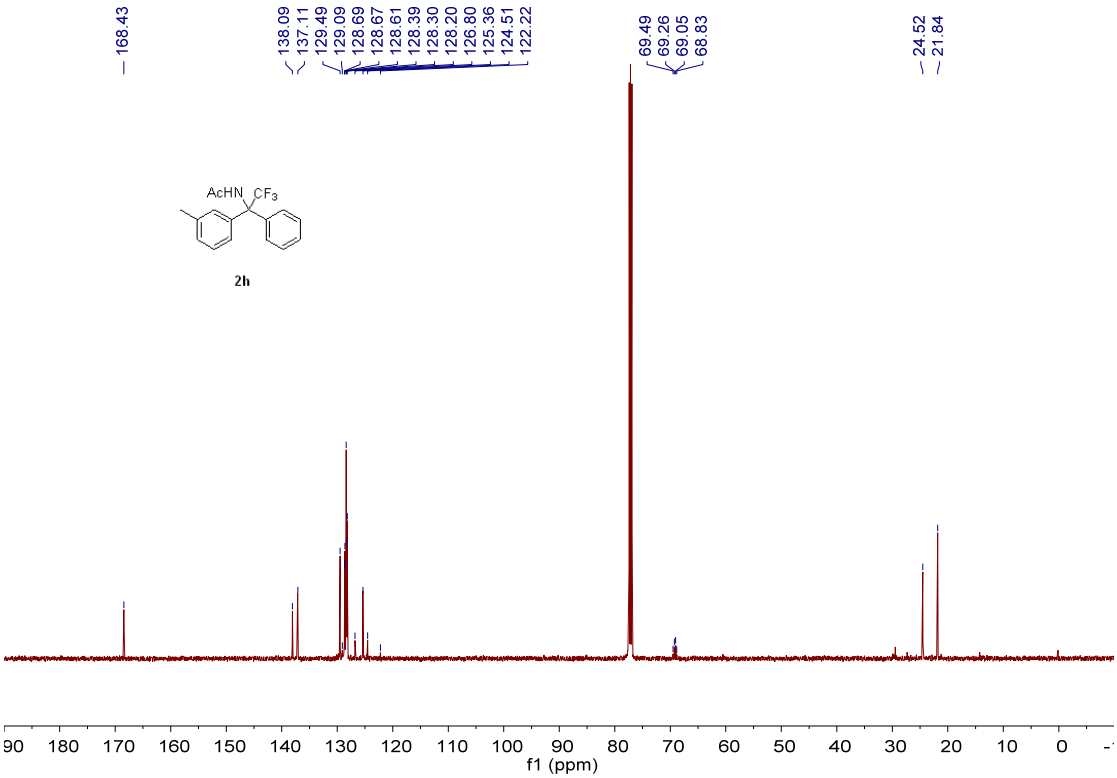
2h
5.07
1.12
3.18
1.00
3.01
3.00
f1 (ppm)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128.20
126.80
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122.22
69.49
69.26
69.05
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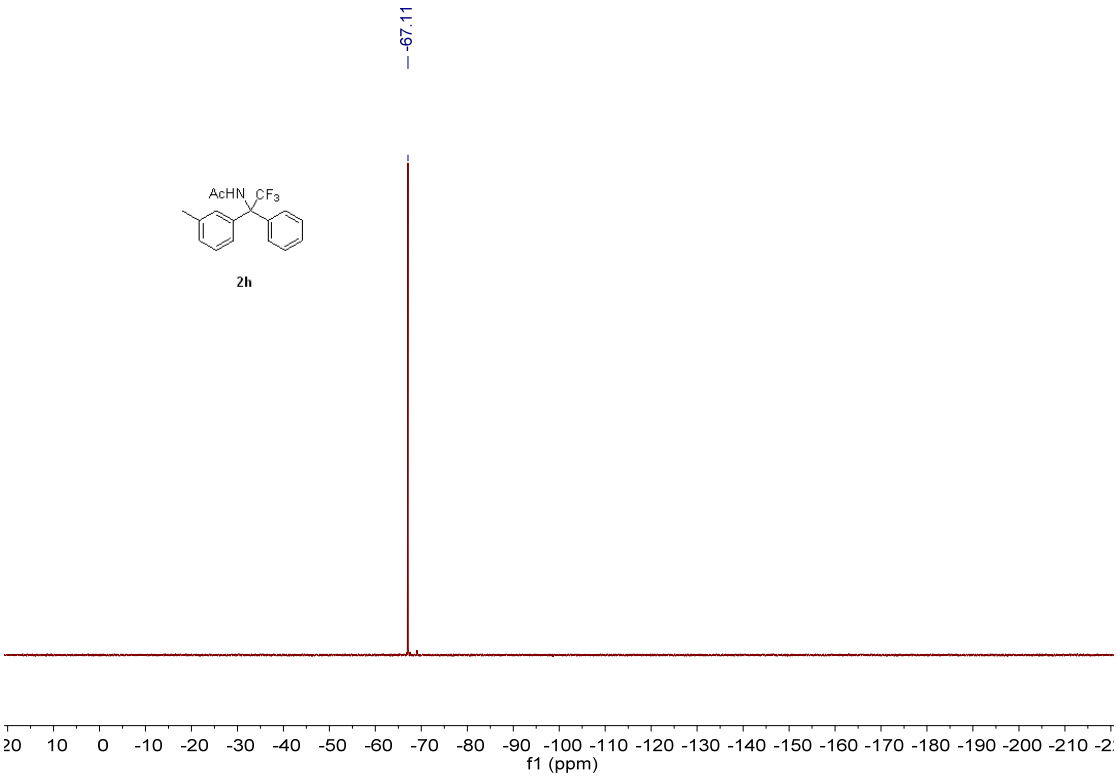
24.52
21.84
AcHN CF3
2h
f1 (ppm)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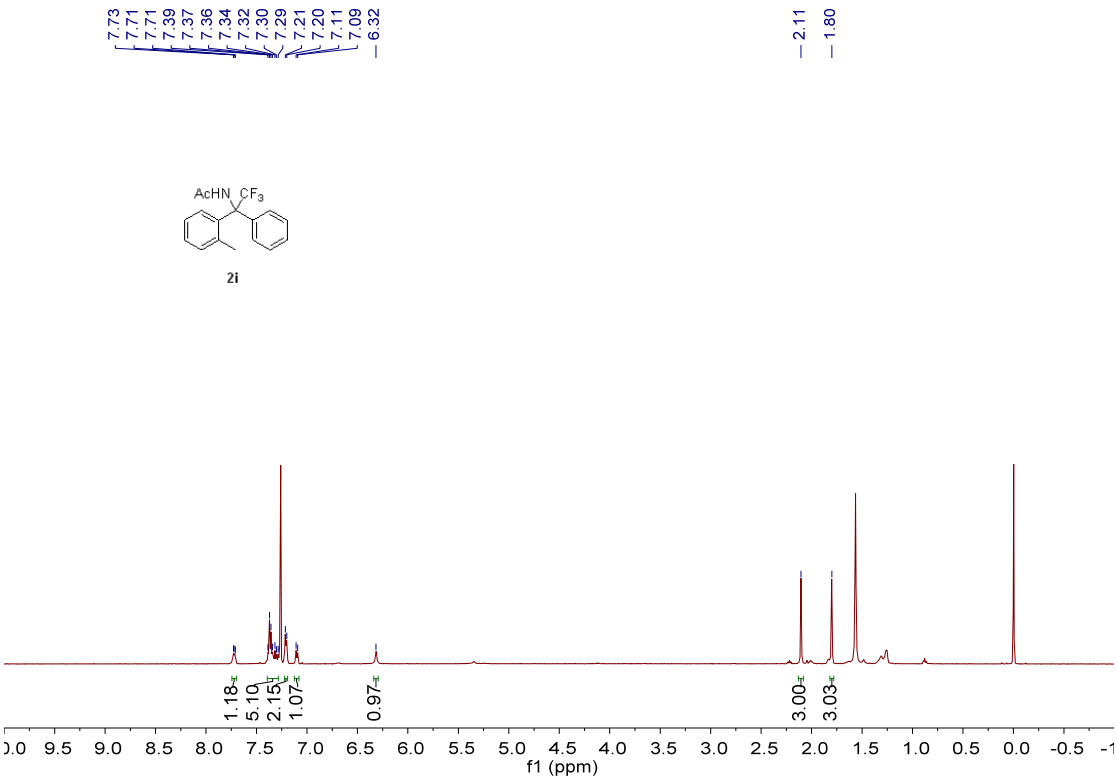
f1 (ppm)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7.32
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7.29
7.21
7.20
7.11
7.09
6.32
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2i
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5.10
2.15
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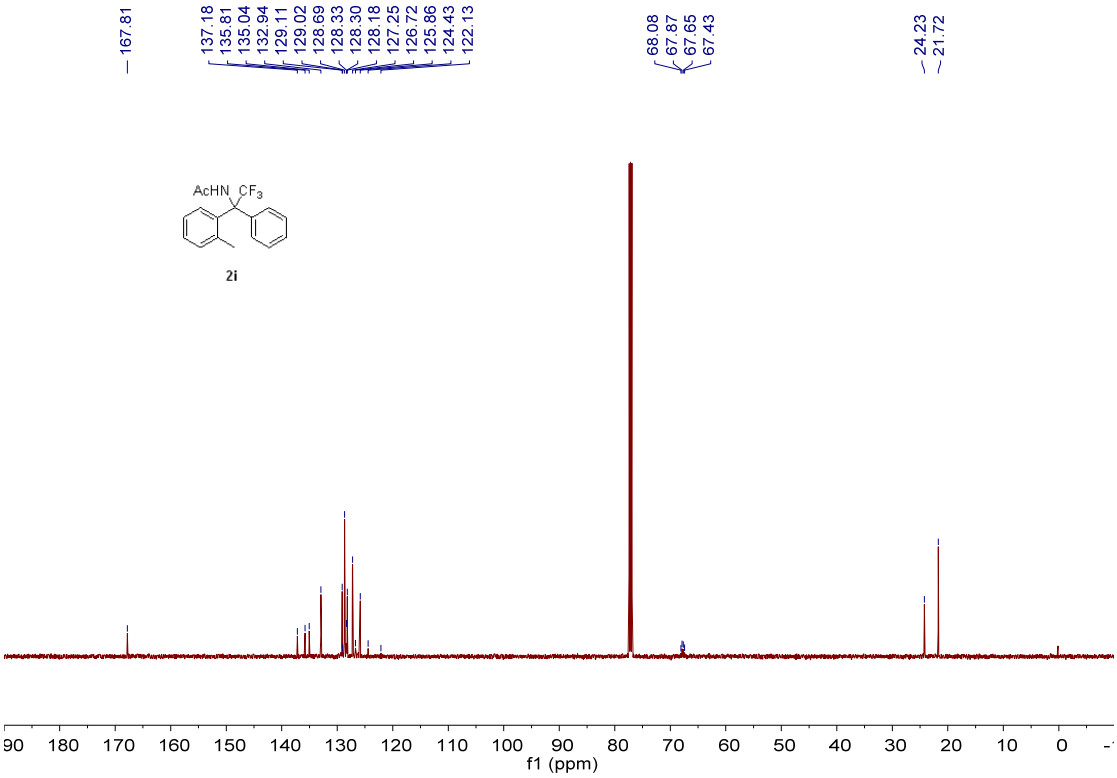
0.97
3.00
3.03
f1 (ppm)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126.72
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21.72
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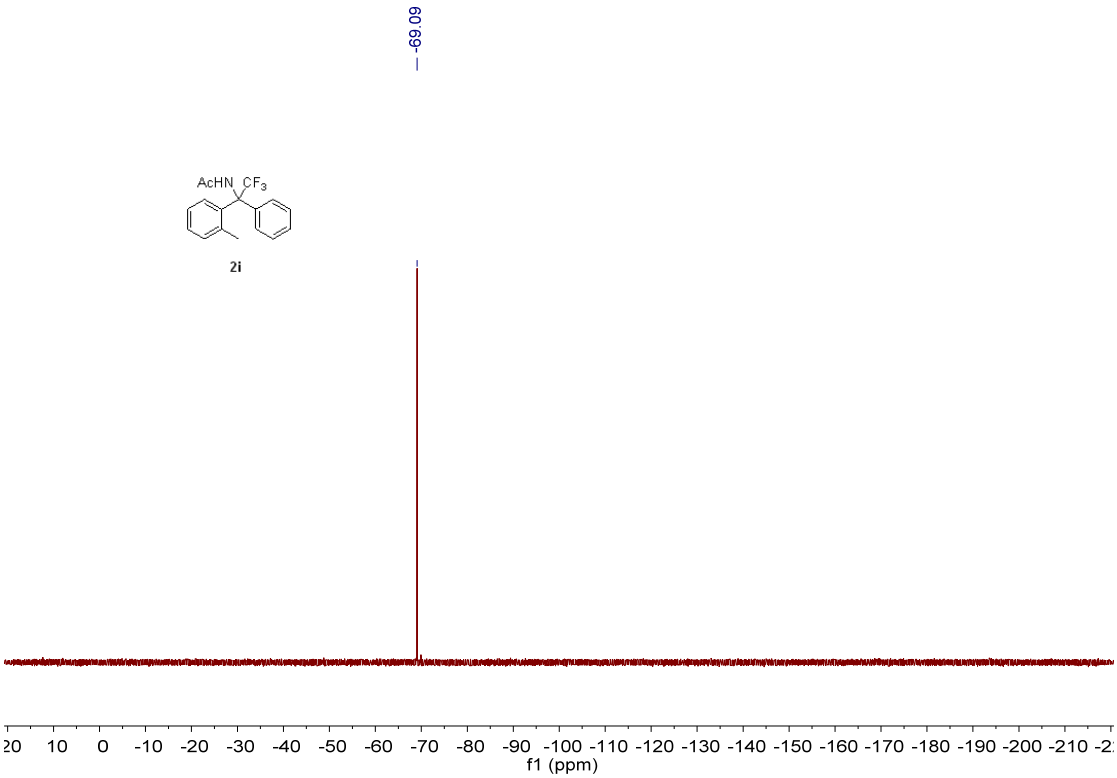
2i
f1 (ppm)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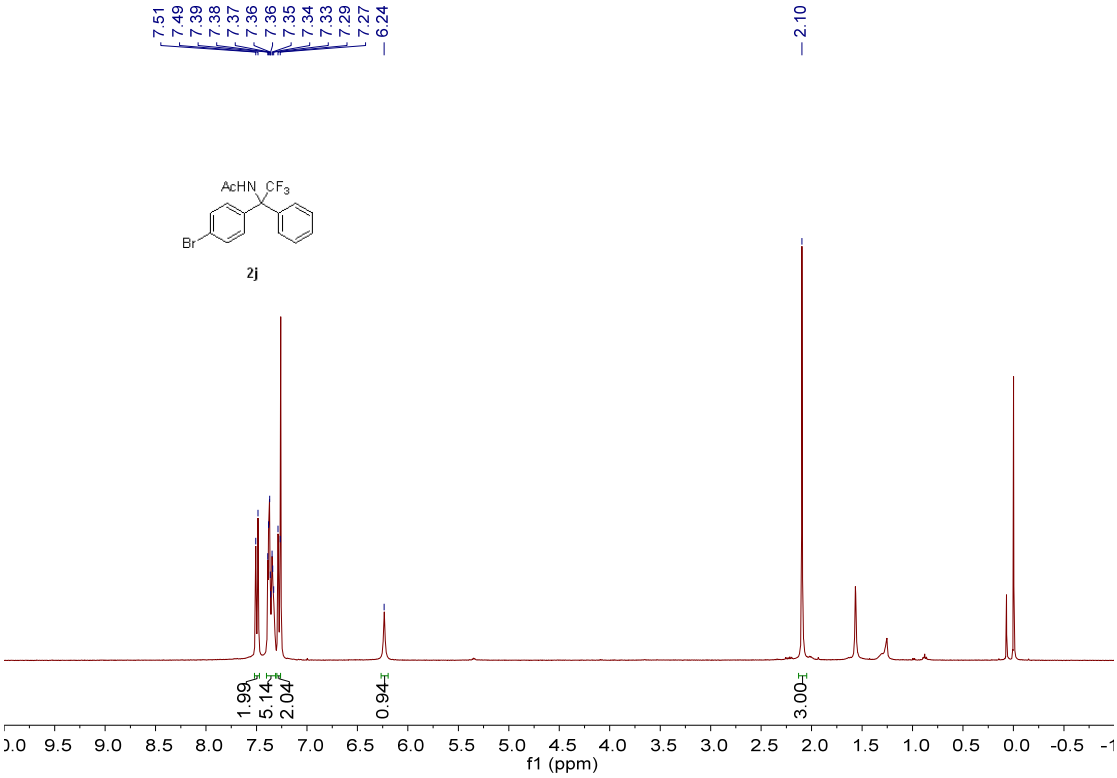
2i
f1 (ppm)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7.36
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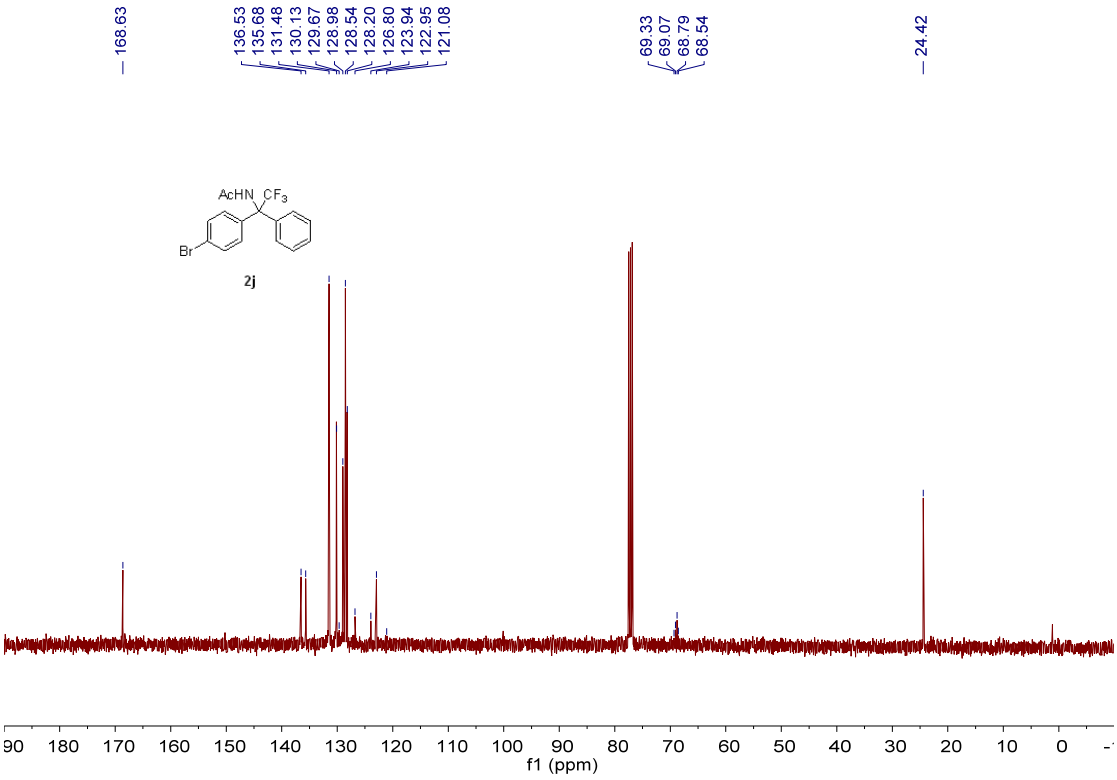
7.35
7.34
7.33
7.29
7.27
6.24
2.10
AcHN CF3
Br
2j
1.99
5.14
2.04
0.94
3.00
f1 (ppm)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123.94
122.95
121.08
69.33
69.07
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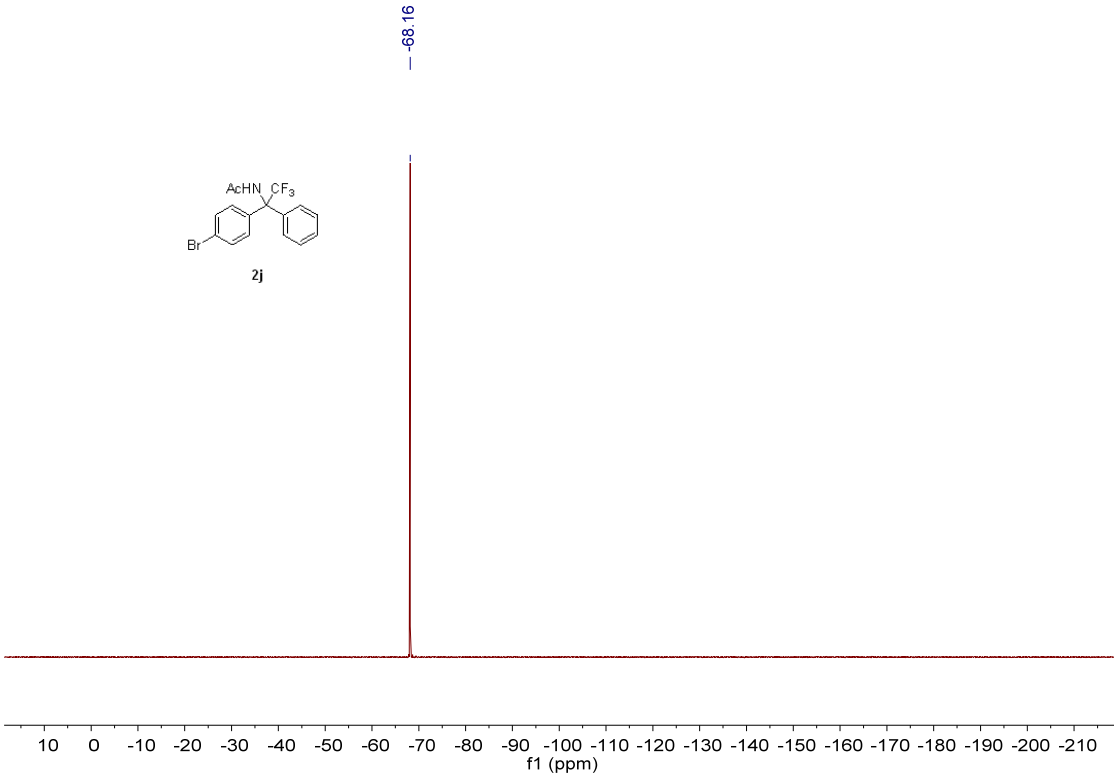
24.42
AcHN
CF3
Br
2j
90 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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AcHN
CF3
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2j
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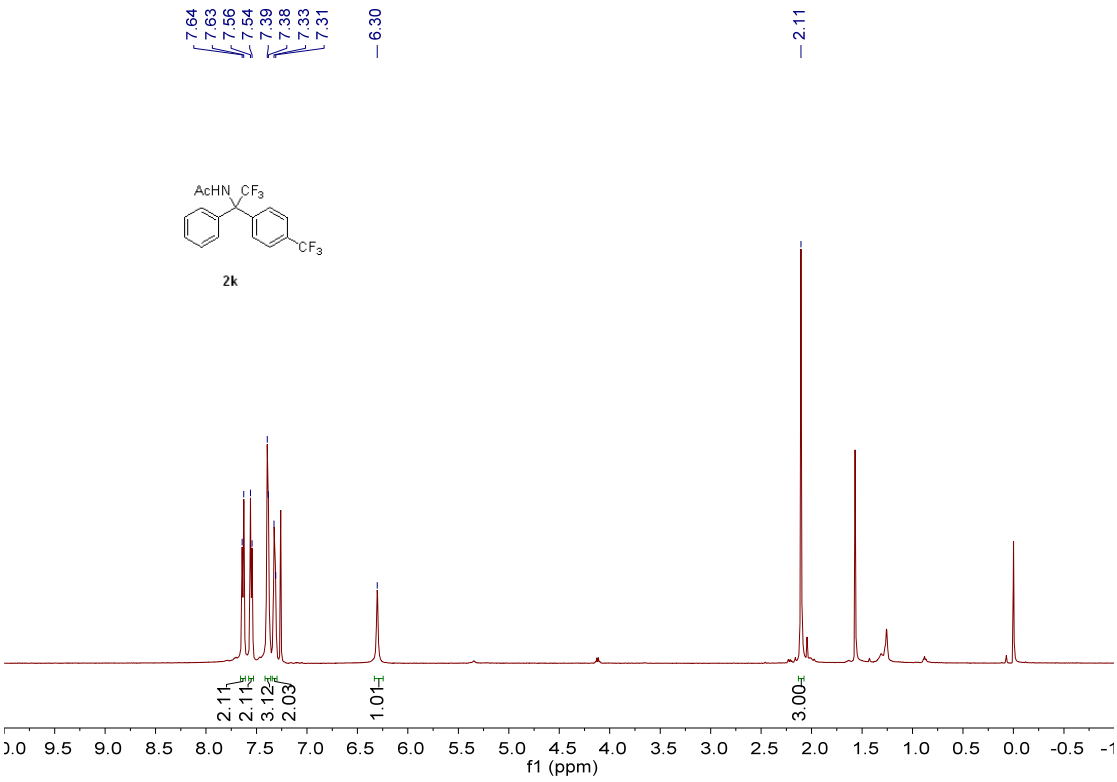
f1 (ppm)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7.39
7.38
7.33
7.31
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CF3
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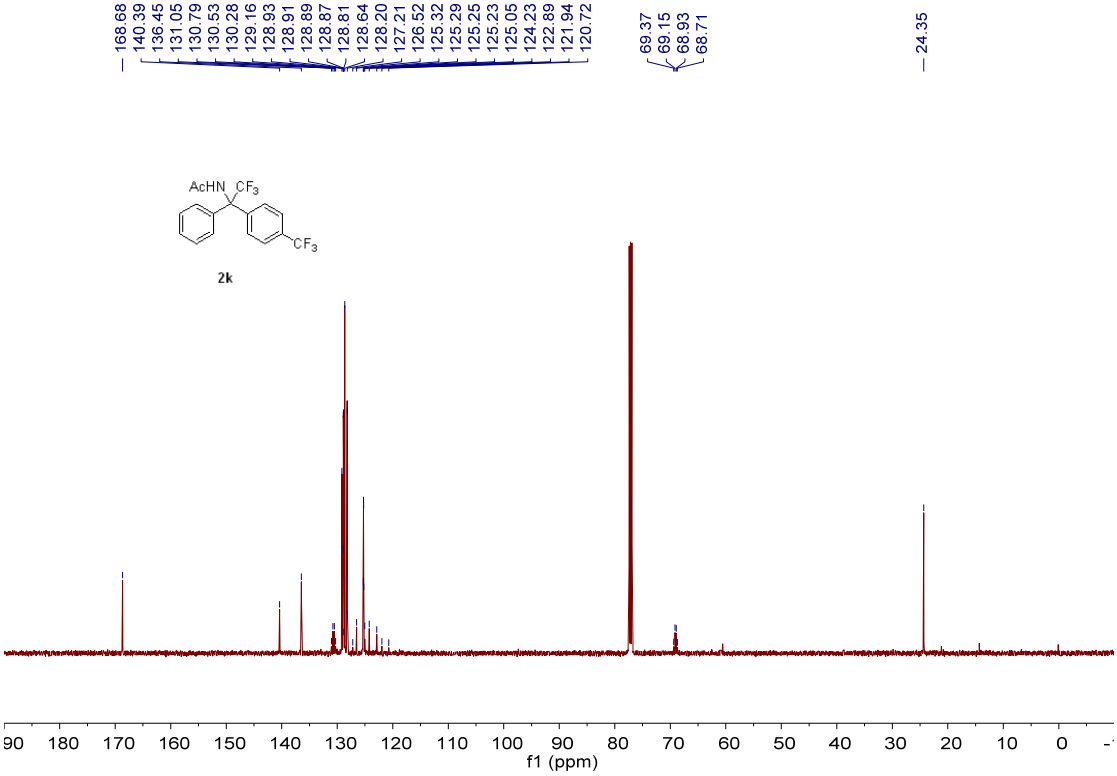
2.11
2.11
3.12
2.03
1.01
3.00
f1 (ppm)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128.20
127.21
126.52
125.32
125.29
125.25
125.23
125.05
124.23
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24.35
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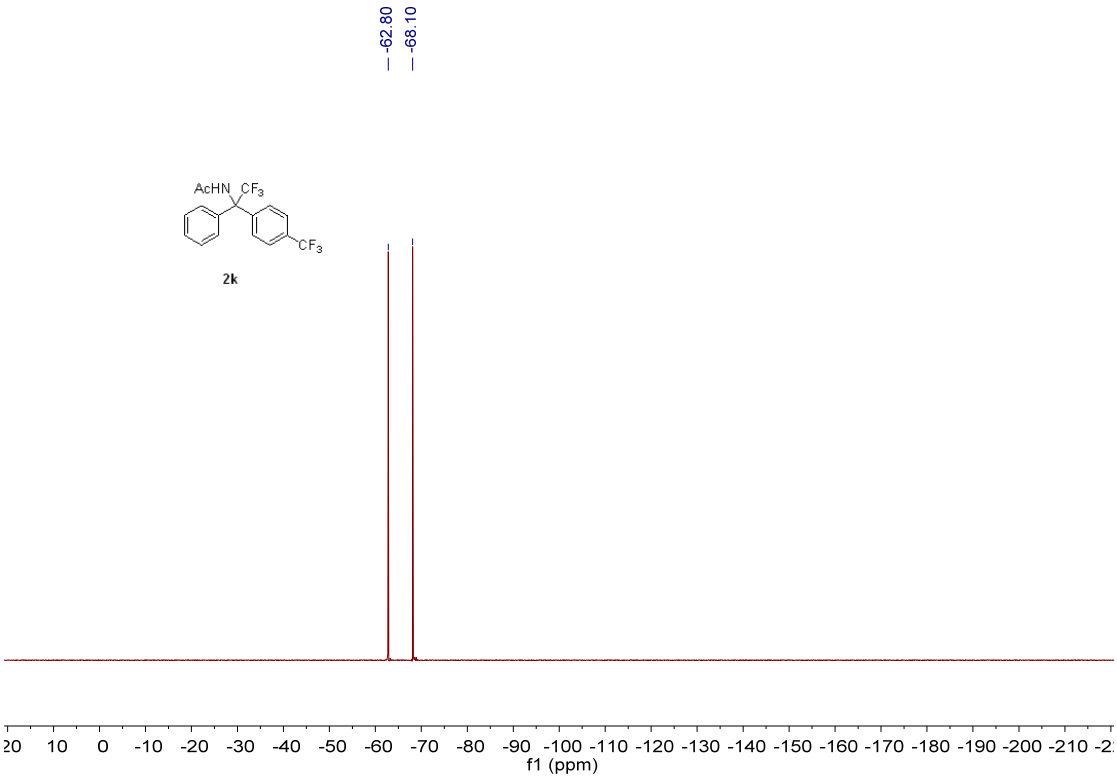
CF3
2k
f1 (ppm)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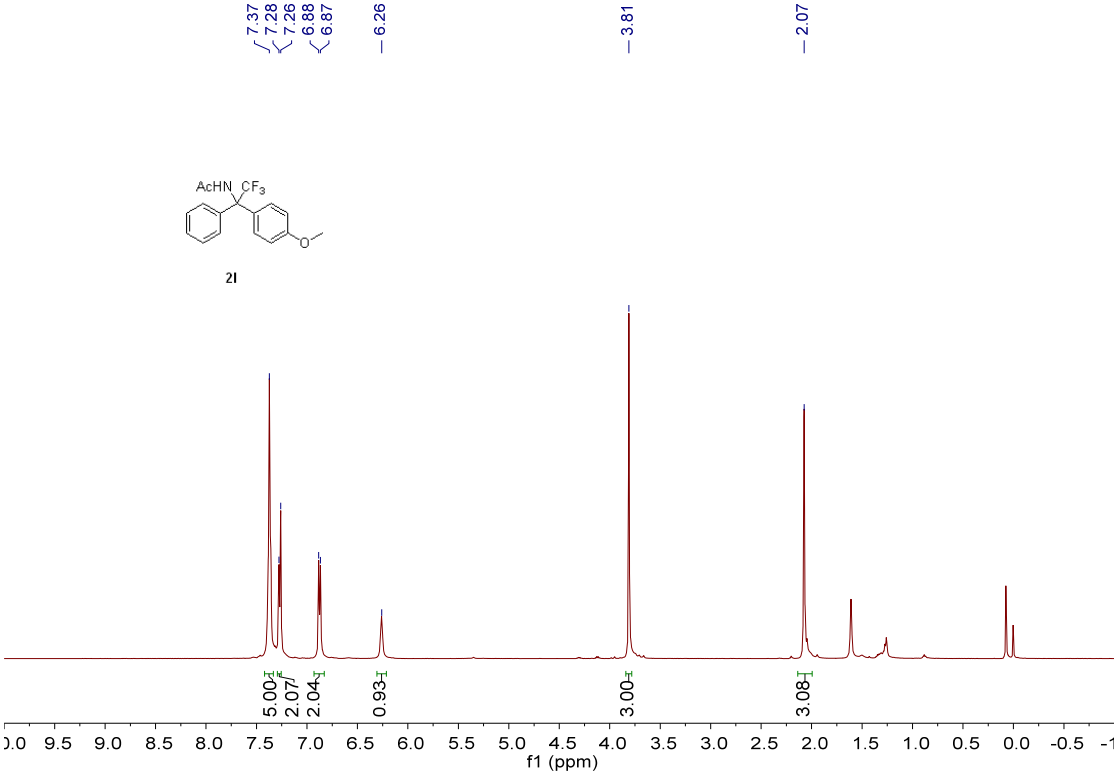
CF3
2k
f1 (ppm)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6.87
6.26
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AcHN CF3
O
2l
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2.07
2.04
0.93
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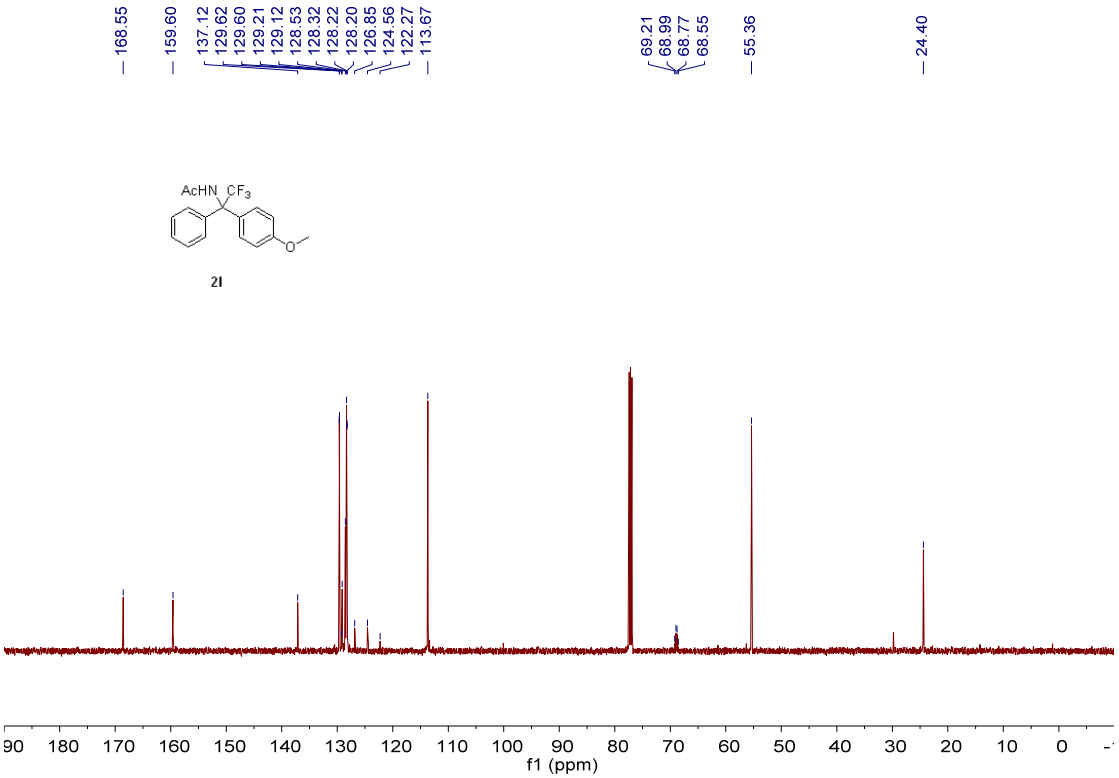
3.08
f1 (ppm)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124.56
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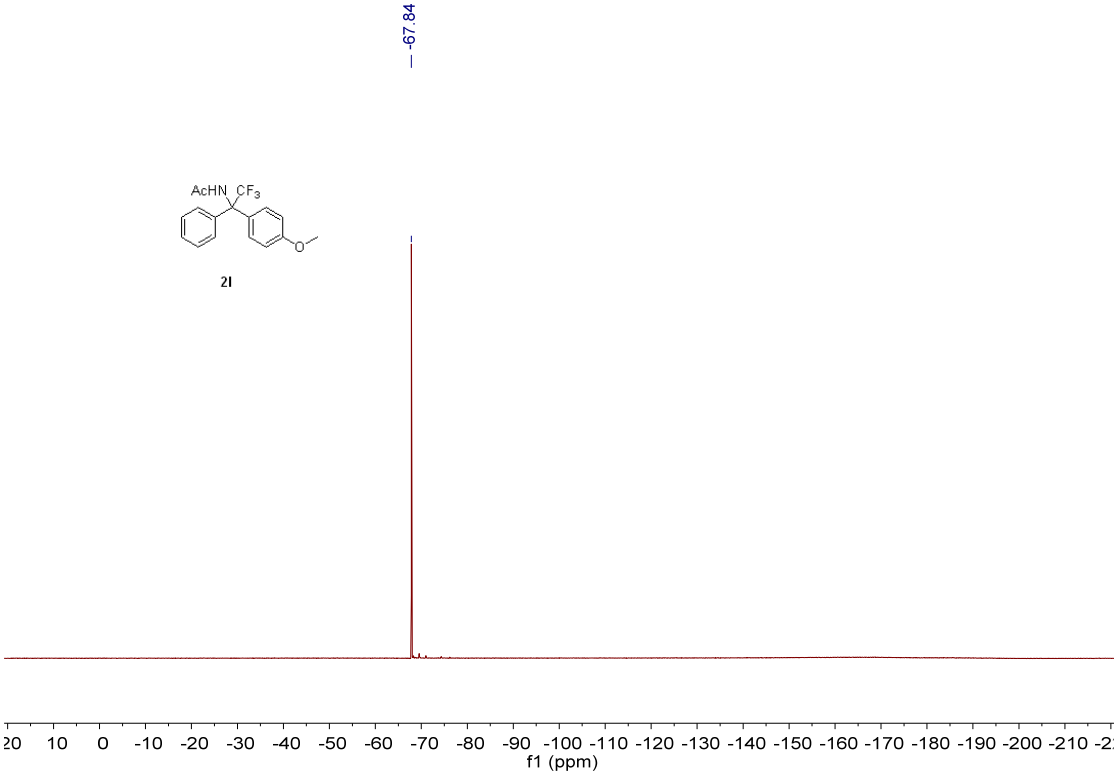
55.36
24.40
AcHN CF3
O
2l
f1 (ppm)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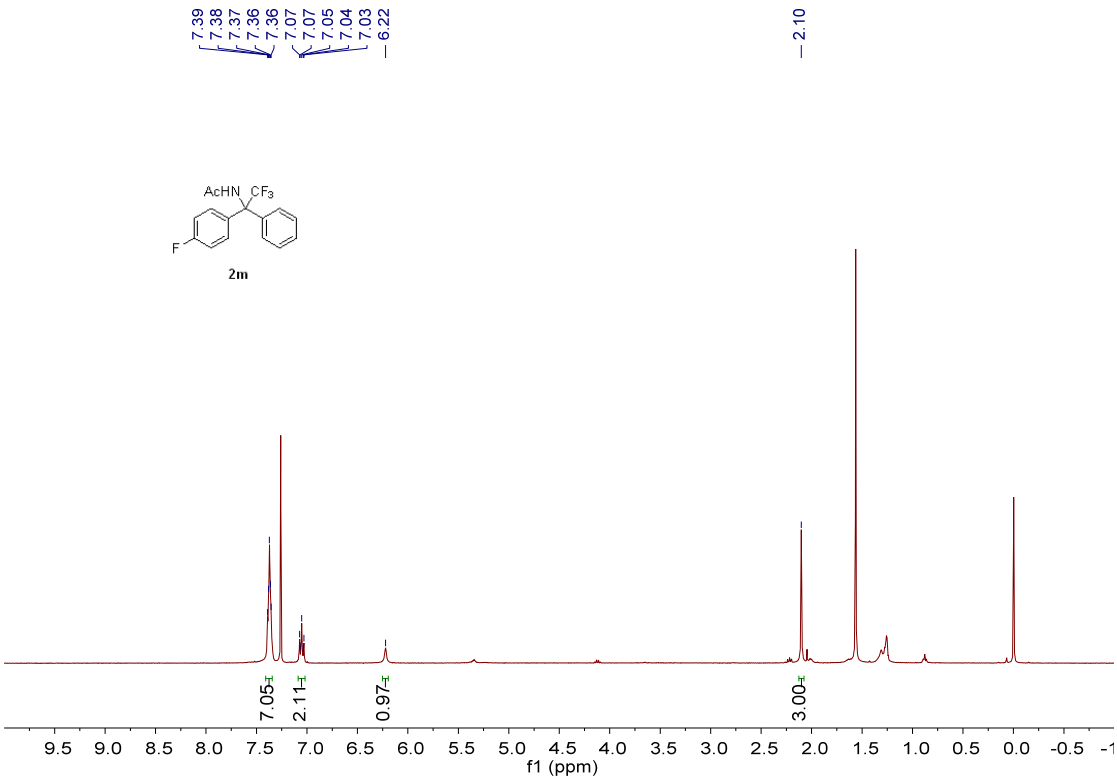
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7.38
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7.36
7.36
7.07
7.07
7.05
7.04
7.03
6.22
2.10
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F
2m
7.05
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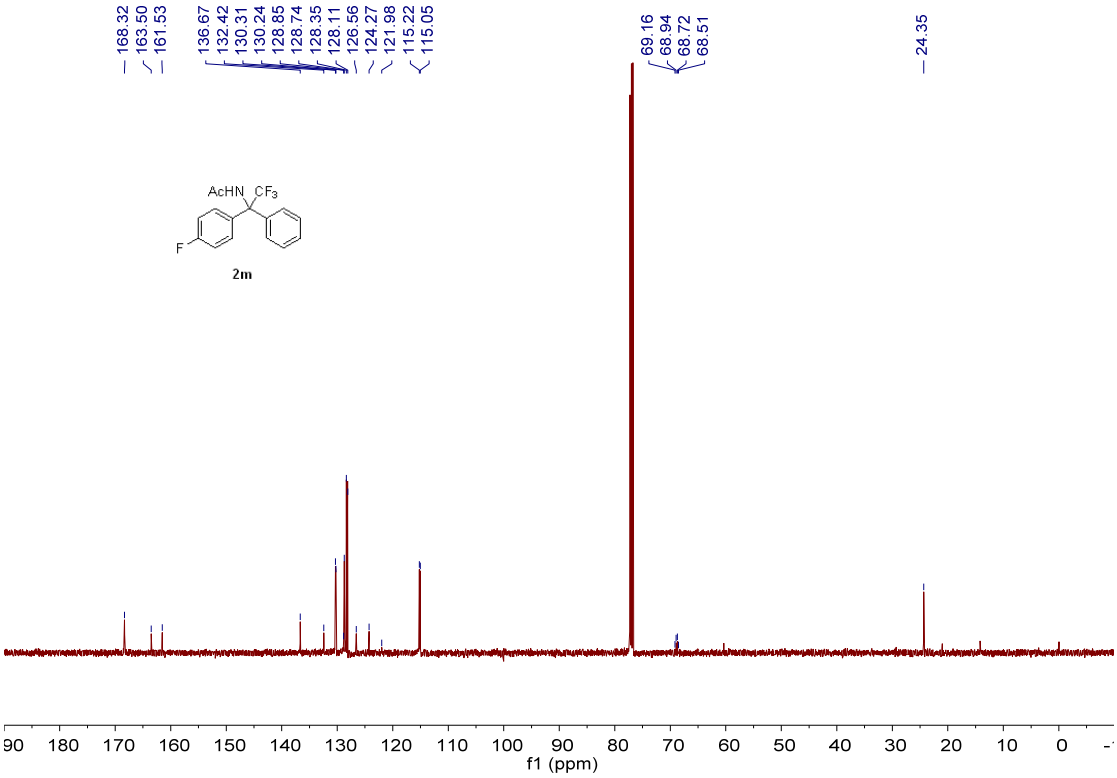
3.00
f1 (ppm)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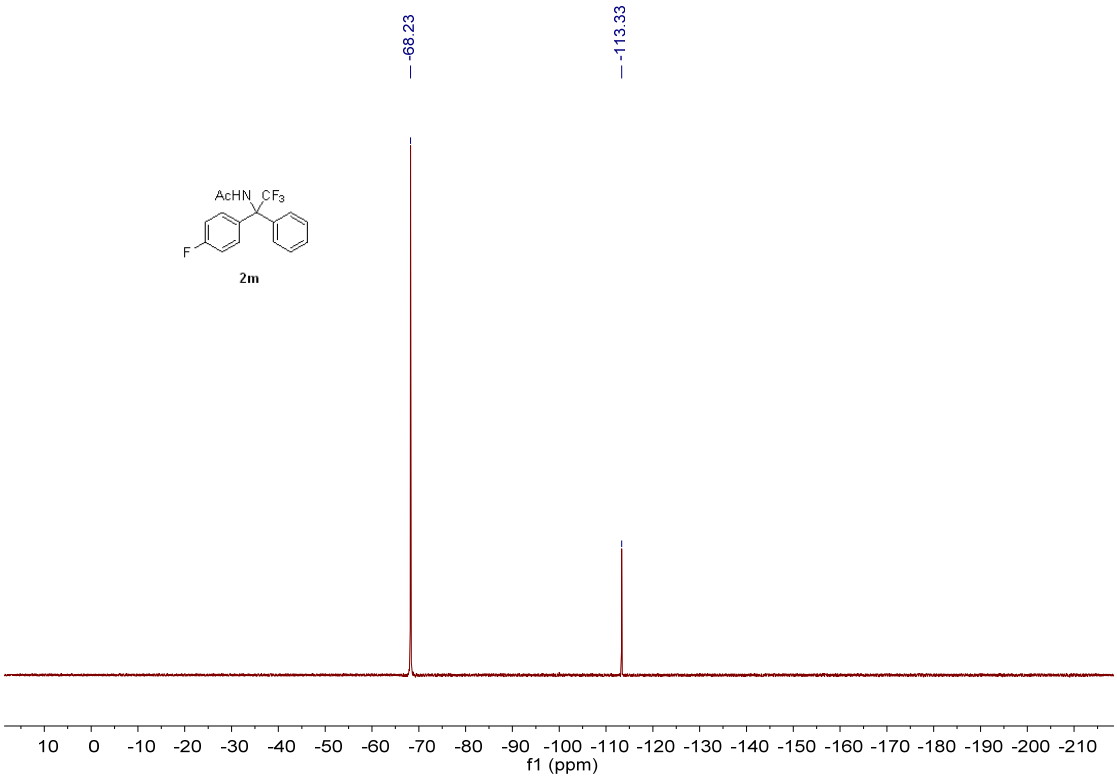
126.56
124.27
121.98
115.22
115.05
69.16
68.94
68.72
68.51
24.35
AcHN CF3
F
2m
f1 (ppm)


-68.23
-113.33
AcHN CF3
F
2m
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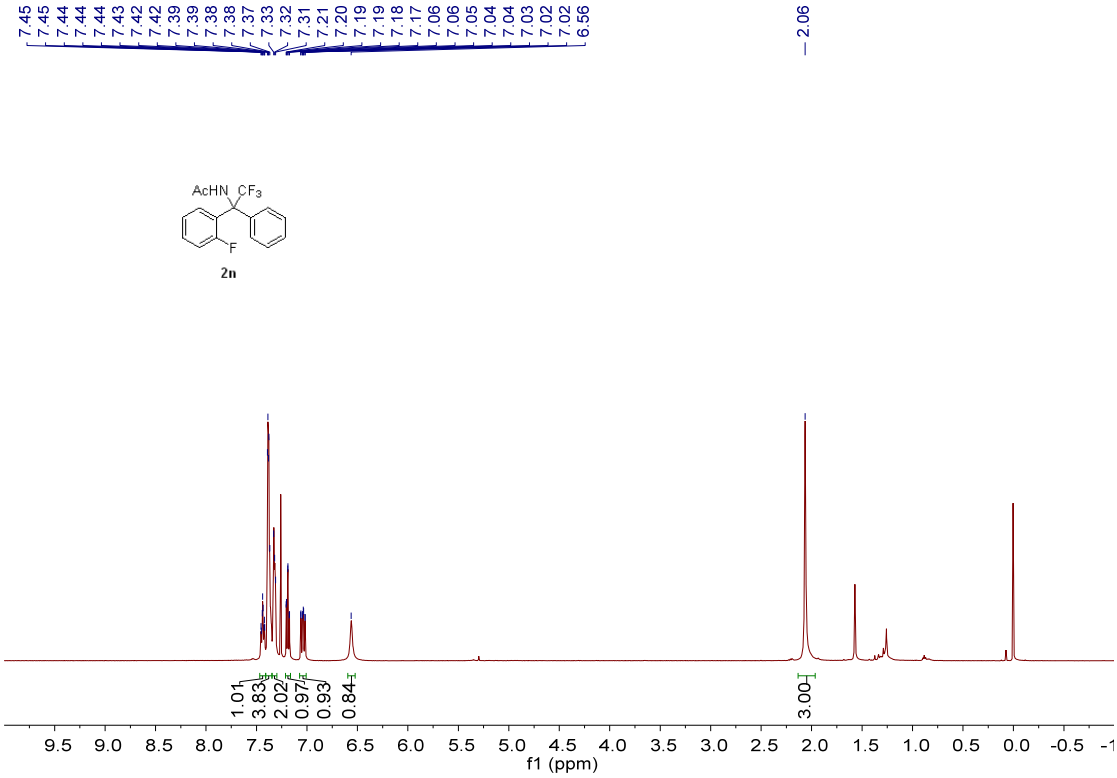
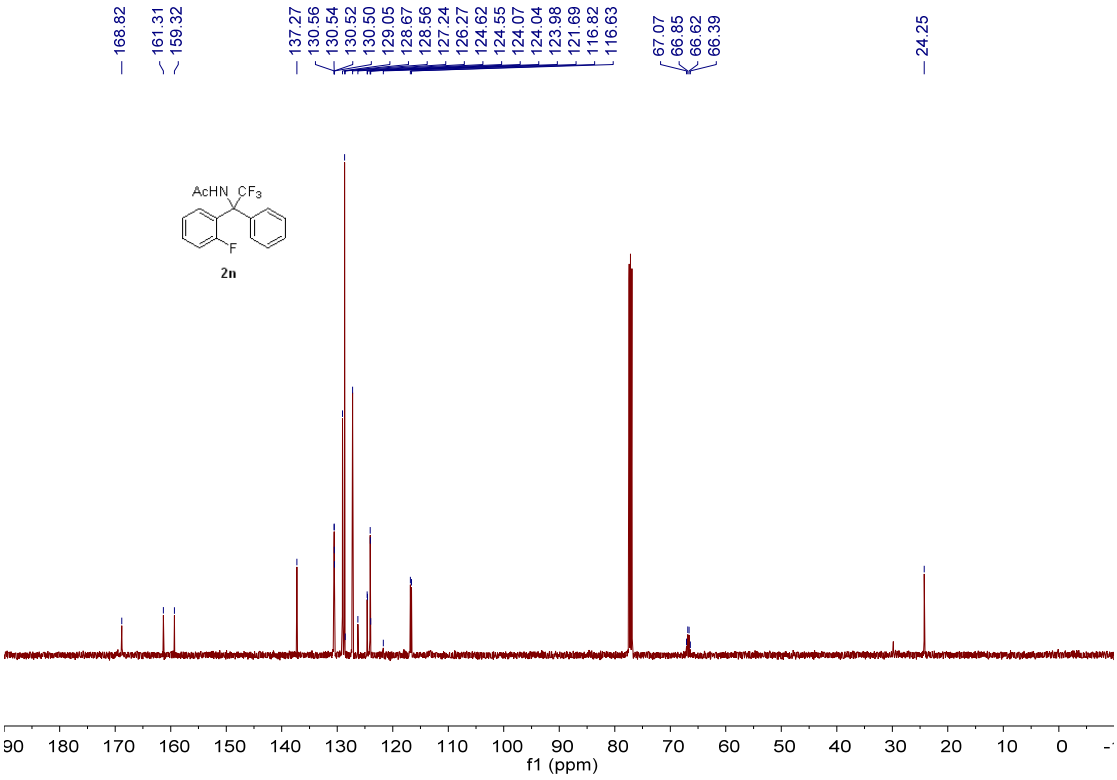
f1 (ppm)


7.45 7.45 7.44 7.44 7.44 7.43 7.42 7.42 7.39 7.39 7.38 7.38 7.37 7.33 7.32 7.31 7.21 7.20 7.19 7.19 7.18 7.17 7.06 7.06 7.05 7.04 7.04 7.03 7.02 7.02 6.56
2.06
AcHN CF3
F
2n
1.01 3.83 2.02 0.97 0.93 0.84 3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)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127.24
126.27
124.62
124.55
124.07
124.04
123.98
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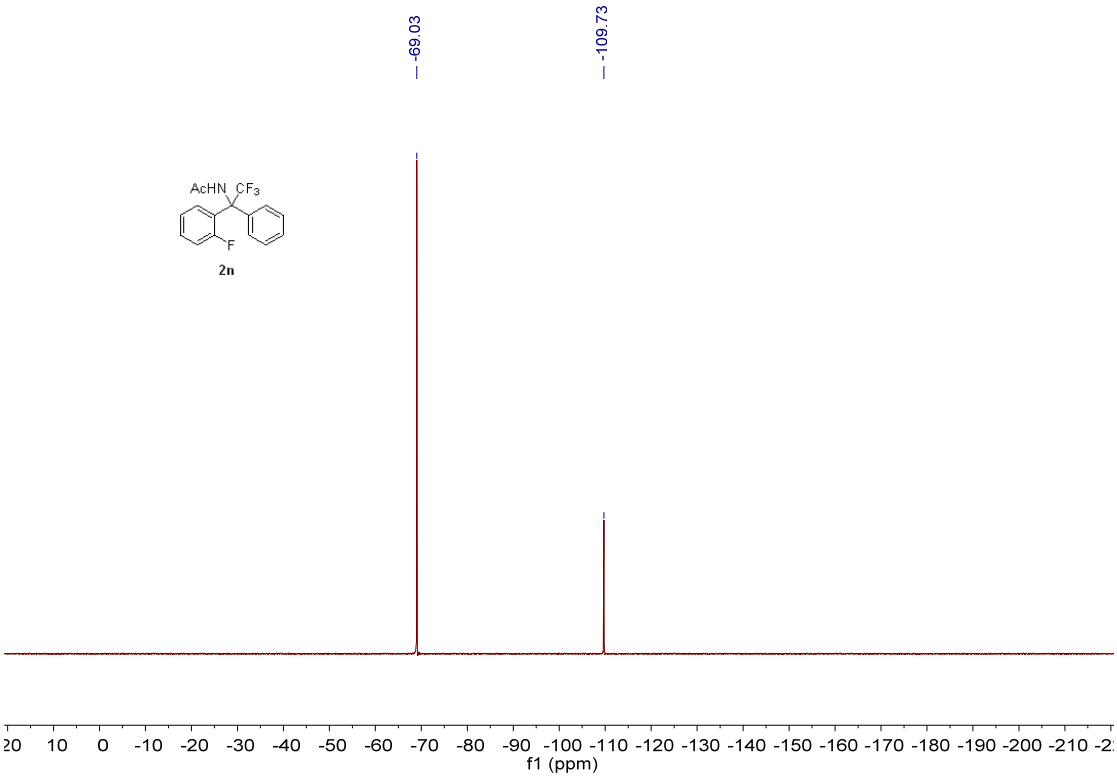
67.07
66.85
66.62
66.39
24.25
AcHN
CF3
F
2n
f1 (ppm)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CF3
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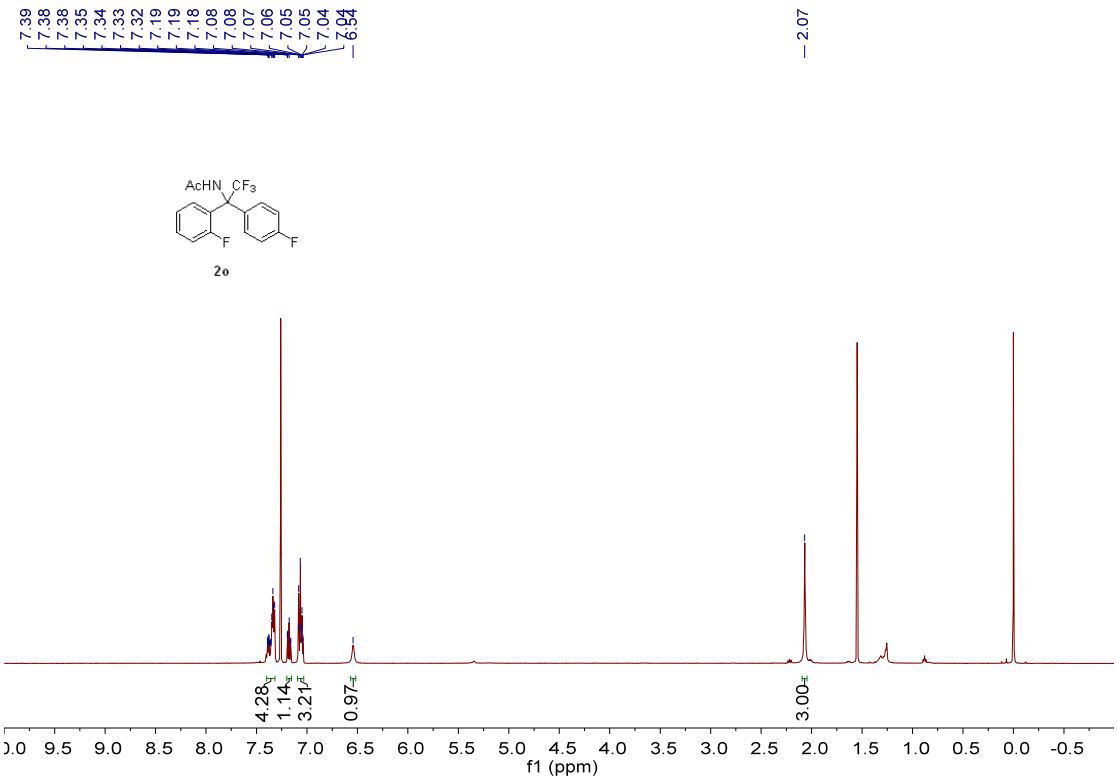
2n
f1 (ppm)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7.19
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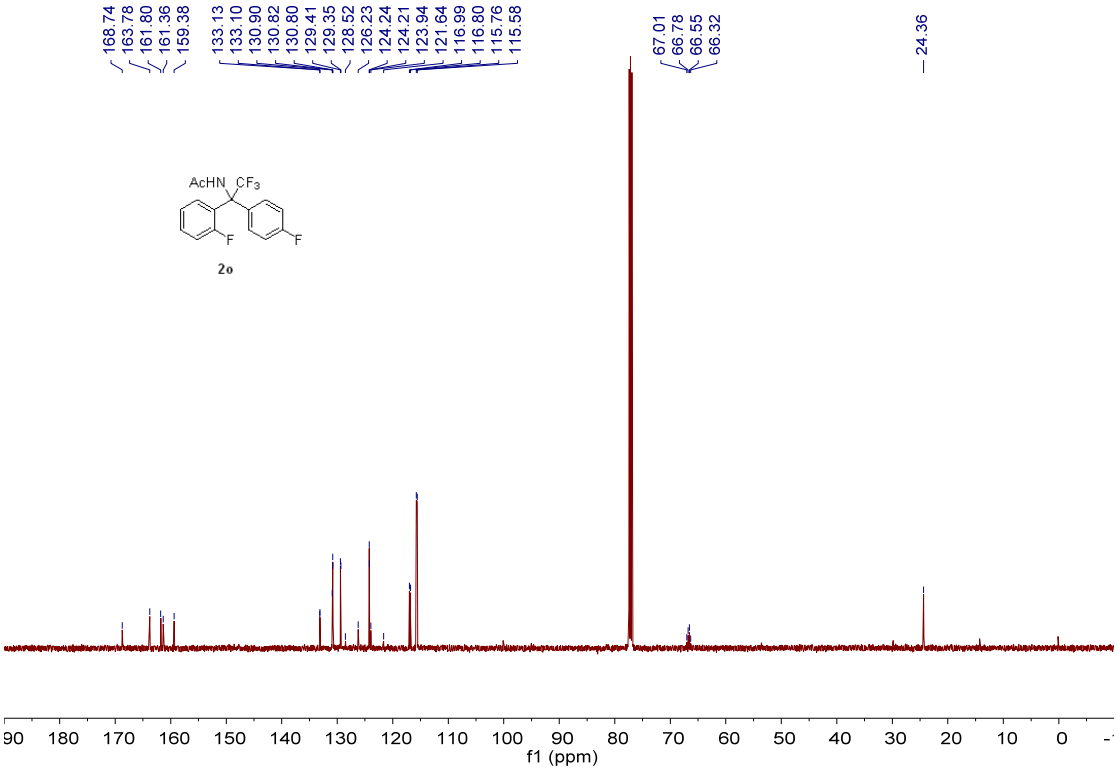
7.18
7.08
7.08
7.07
7.06
7.05
7.05
7.04
6.94
2.07
AcHN
CF3
F
F
2o
4.28
1.14
3.21
0.97
3.00
f1 (ppm)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133.13
133.10
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129.35
128.52
126.23
124.24
124.21
123.94
121.64
116.99
116.80
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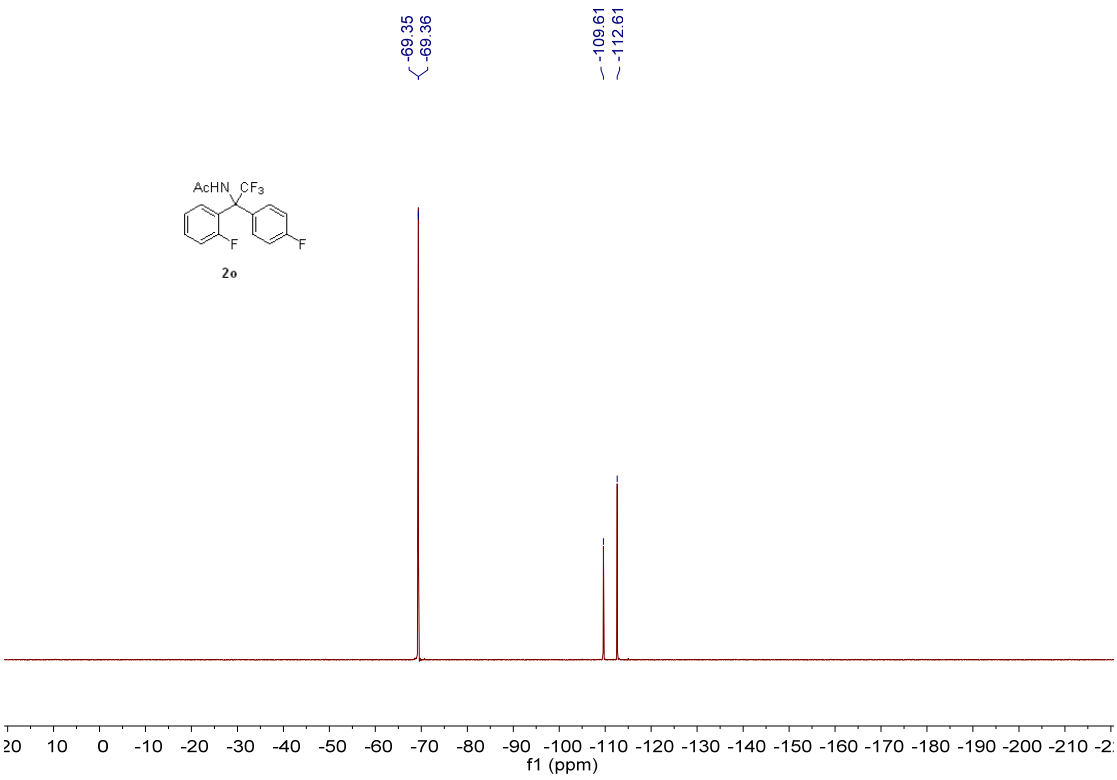
115.58
67.01
66.78
66.55
66.32
24.36
AcHN
CF3
F
F
2o
f1 (ppm)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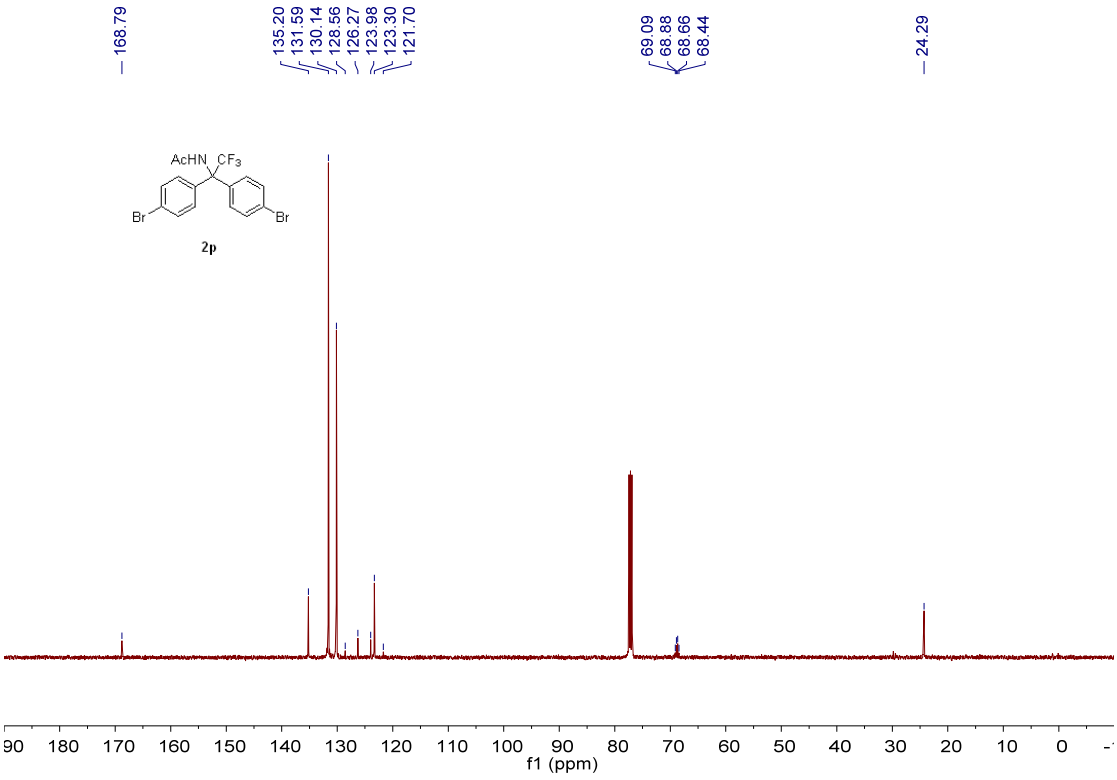
AcHN CF3
F
F
2o
f1 (ppm)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135.20
131.59
130.14
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126.27
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123.30
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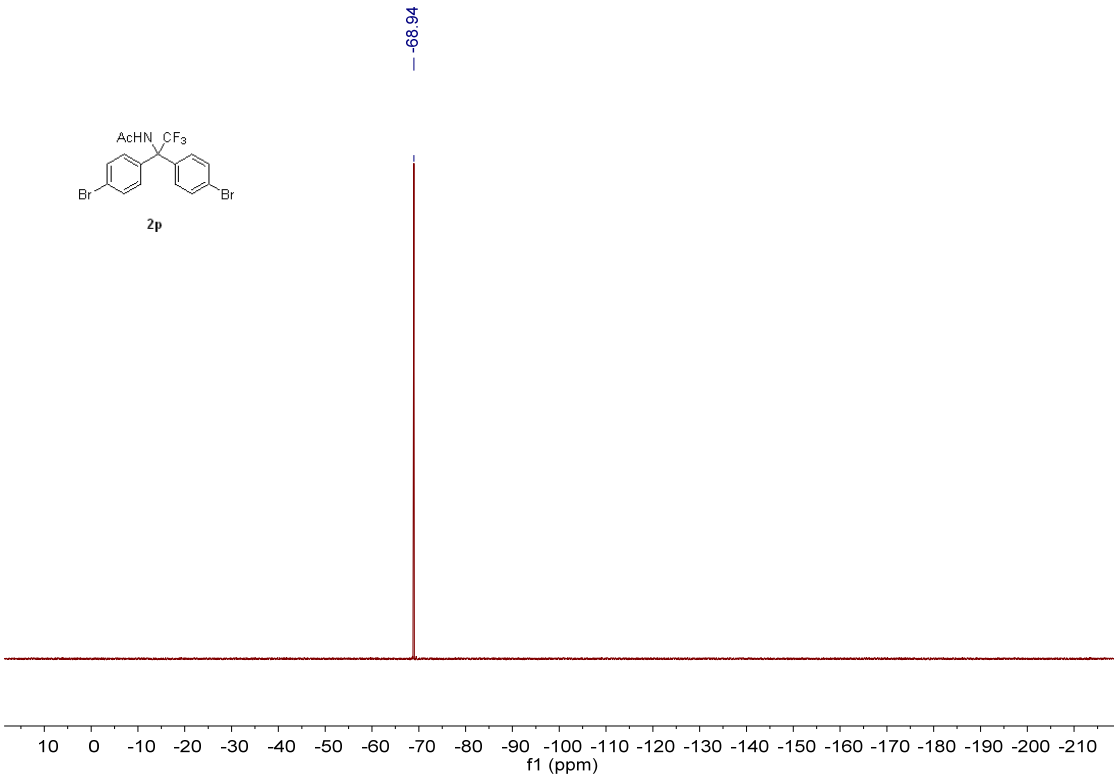
69.09
68.88
68.66
68.44
24.29
AcHN CF3
Br
Br
2p
f1 (ppm)


-68.94
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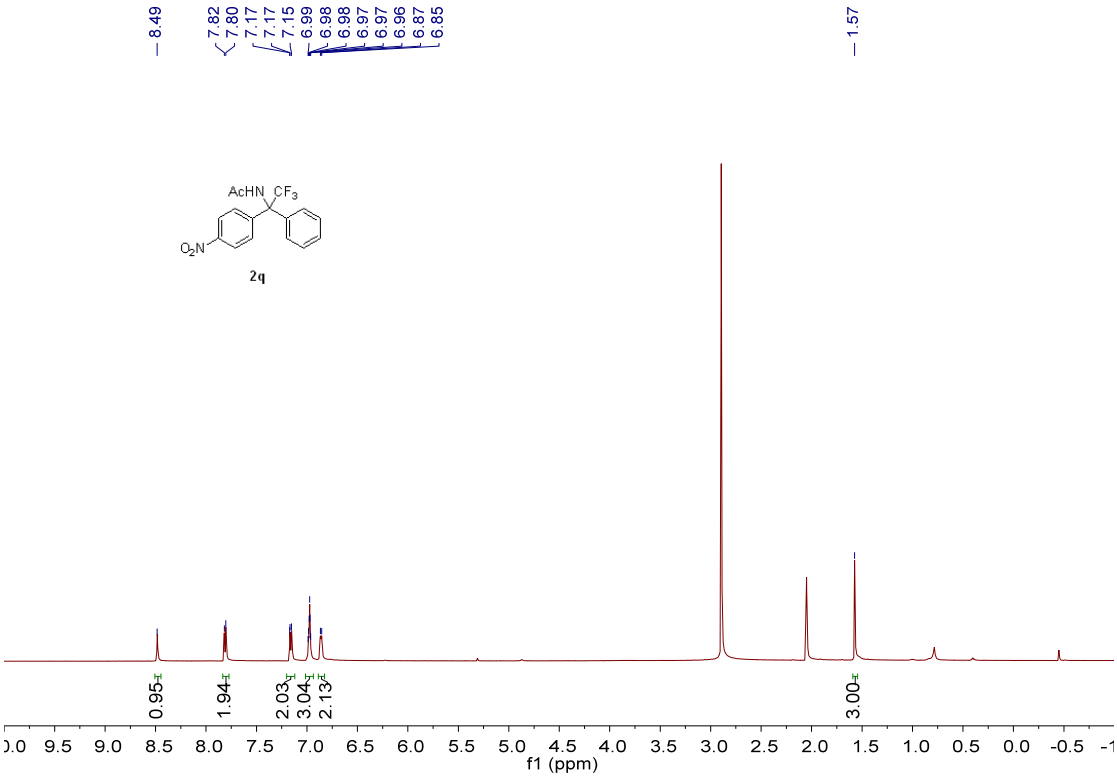
CF3
Br
Br
2p
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)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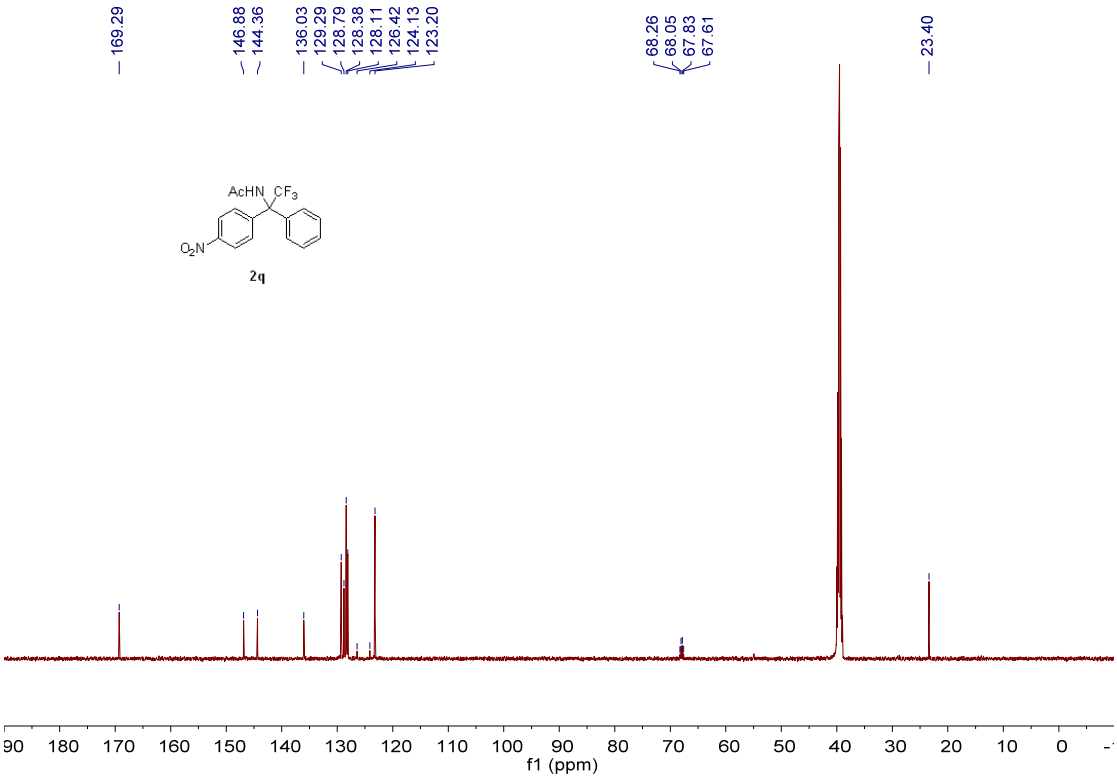
7.82
7.80
7.17
7.17
7.15
6.99
6.98
6.98
6.97
6.97
6.96
6.87
6.85
1.57
AcHN
CF3
O2N
2q
0.95
1.94
2.03
3.04
2.13
3.00
f1 (ppm)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146.88
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136.03
129.29
128.79
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128.11
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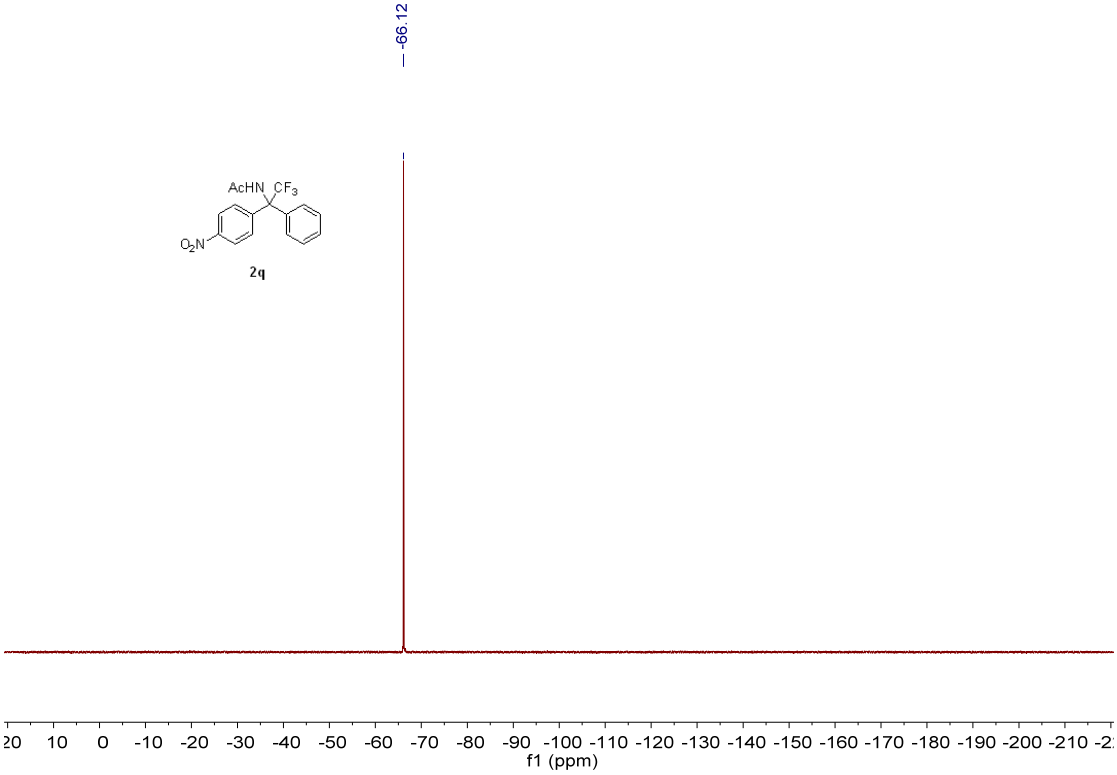
124.13
123.20
68.26
68.05
67.83
67.61
23.40
AcHN CF3
O2N
2q
f1 (ppm)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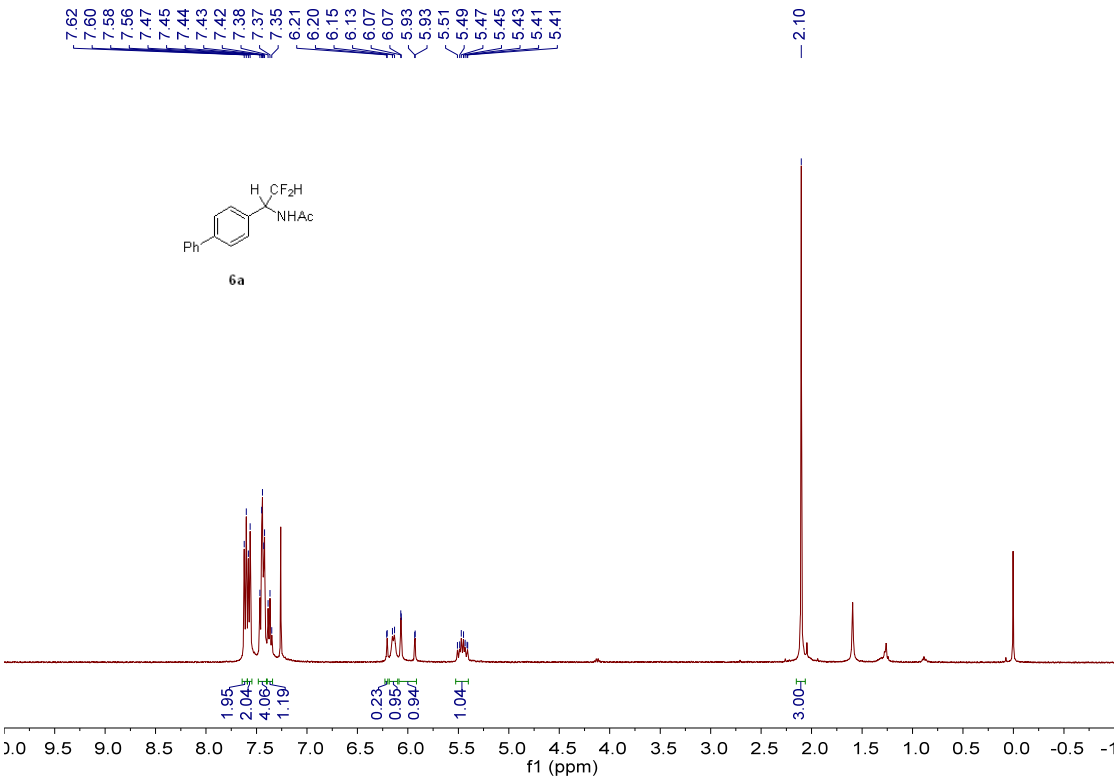
AcHN CF3
O2N
2q
f1 (ppm)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7.44
7.43
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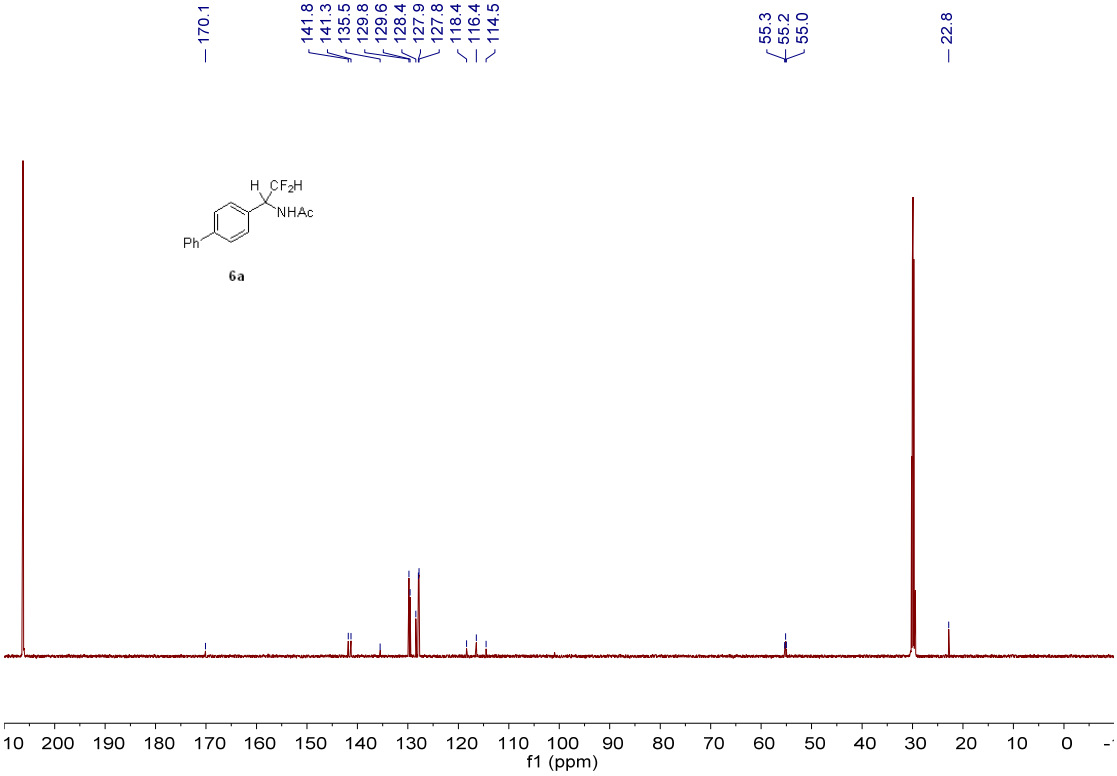
7.37
7.35
6.21
6.20
6.15
6.13
6.07
6.07
5.93
5.93
5.51
5.49
5.47
5.45
5.43
5.41
5.41
2.10
H CF2H
NHAc
Ph
6a
1.95
2.04
4.06
1.19
0.23
0.95
0.94
1.04
3.00
f1 (ppm)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127.9
127.8
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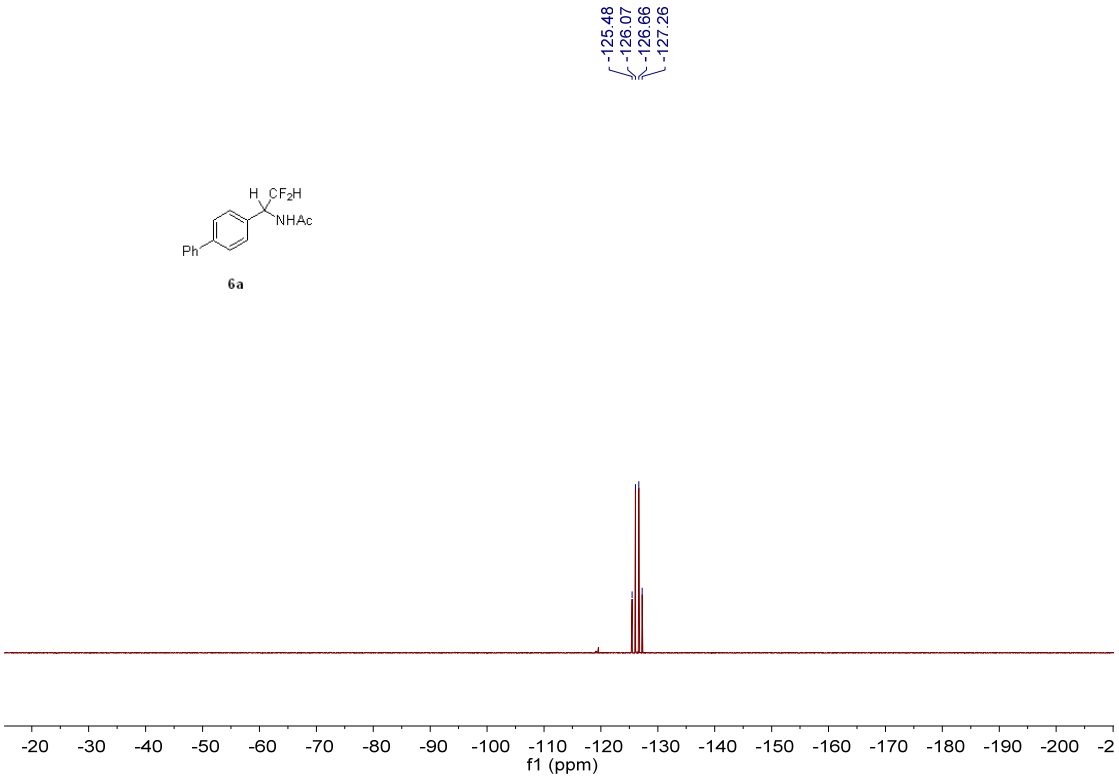
114.5
55.3
55.2
55.0
22.8
H CF2H
NHAc
Ph
6a
f1 (ppm)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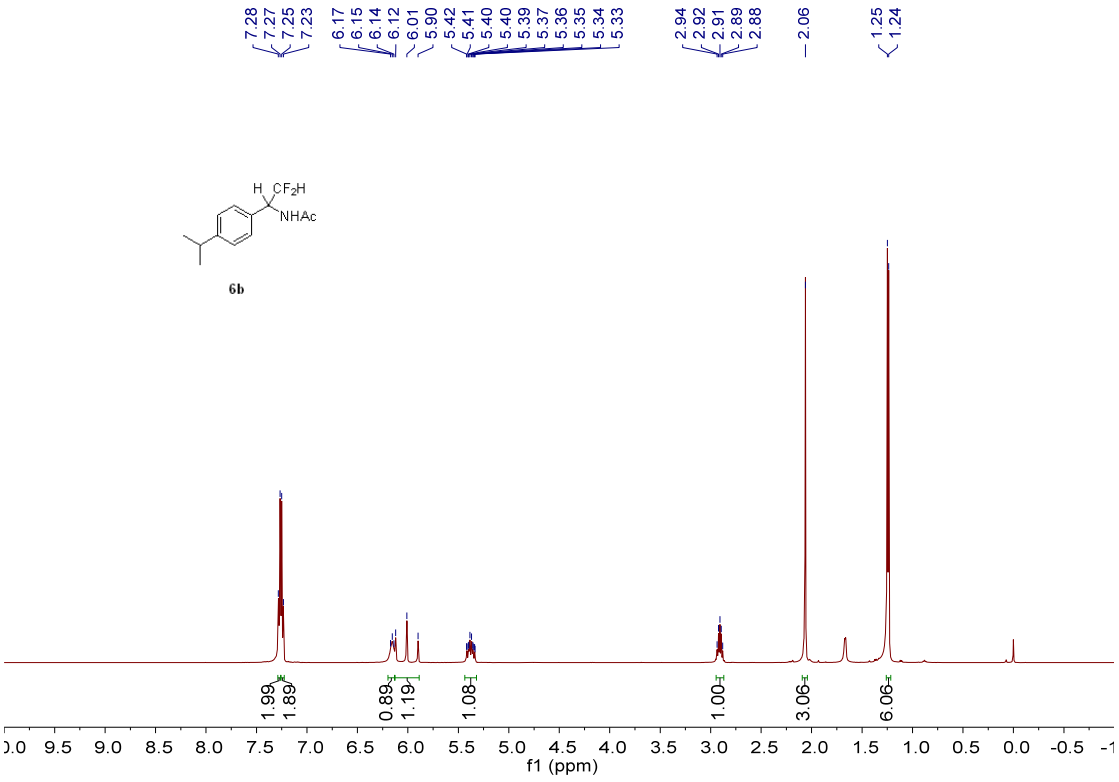
-126.07
-126.66
-127.26
H
CF2H
NHAc
Ph
6a
-20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -2
f1 (ppm)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6.15
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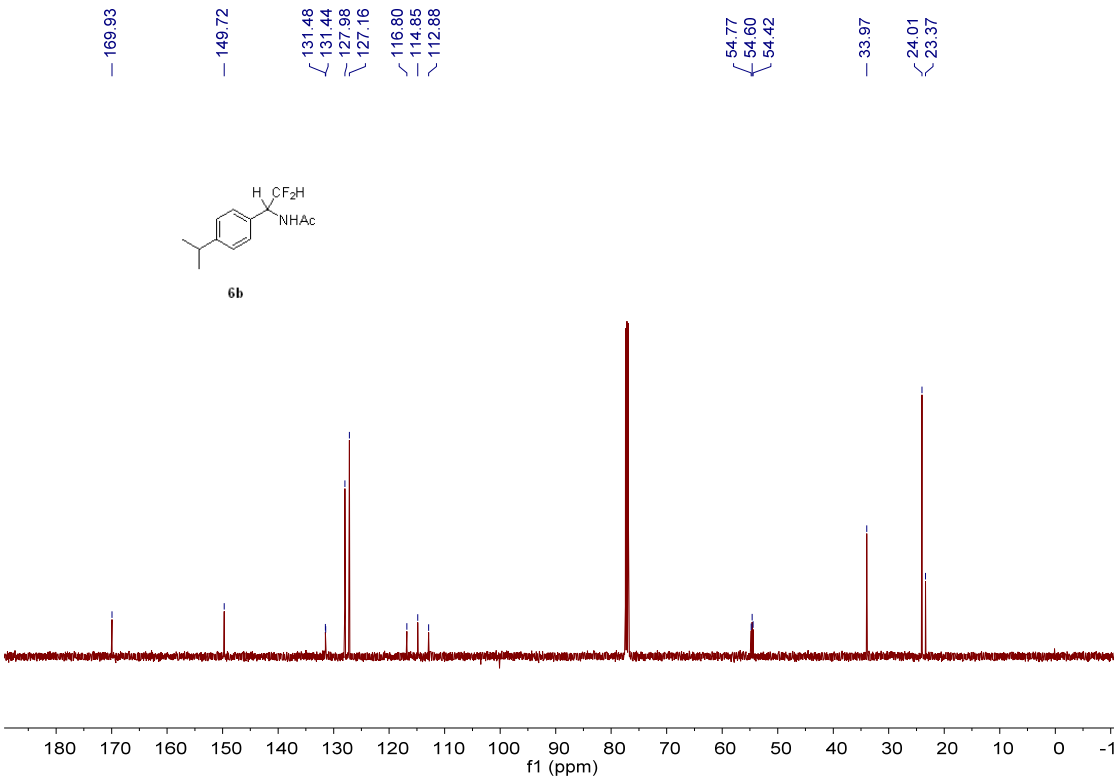
5.90
5.42
5.41
5.40
5.40
5.39
5.37
5.36
5.35
5.34
5.33
2.94
2.92
2.91
2.89
2.88
2.06
1.25
1.24
H
CF2H
NHAc
6b
1.99
1.89
0.89
1.19
1.08
1.00
3.06
6.06
f1 (ppm)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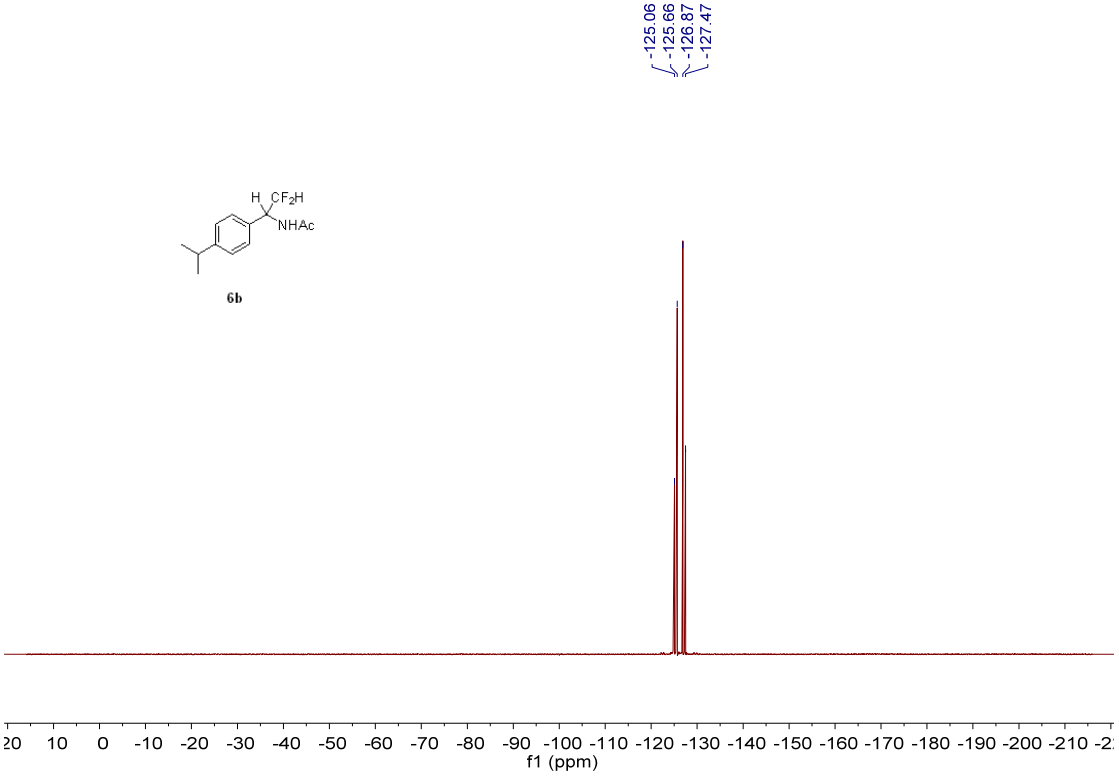
127.16
116.80
114.85
112.88
54.77
54.60
54.42
33.97
24.01
23.37
H
CF2H
NHAc
6b
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -1
f1 (ppm)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NHAc
6b
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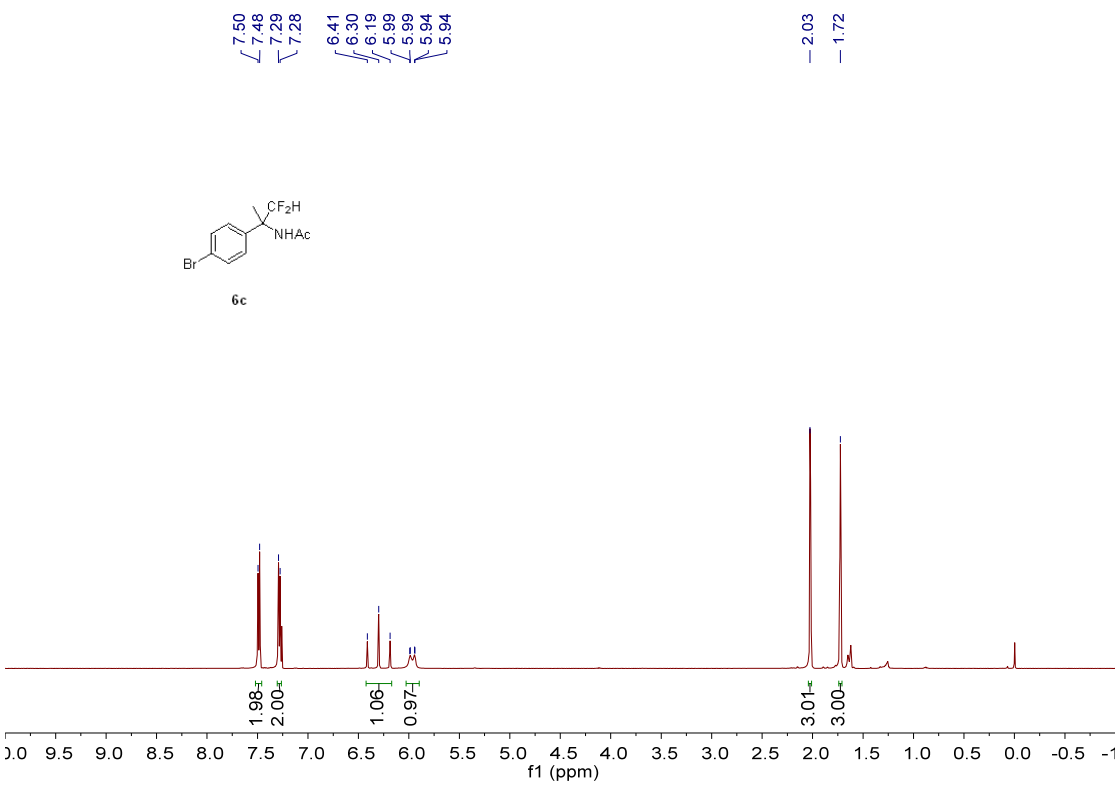
f1 (ppm)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7.48
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7.28
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6.30
6.19
5.99
5.99
5.94
5.94
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1.72
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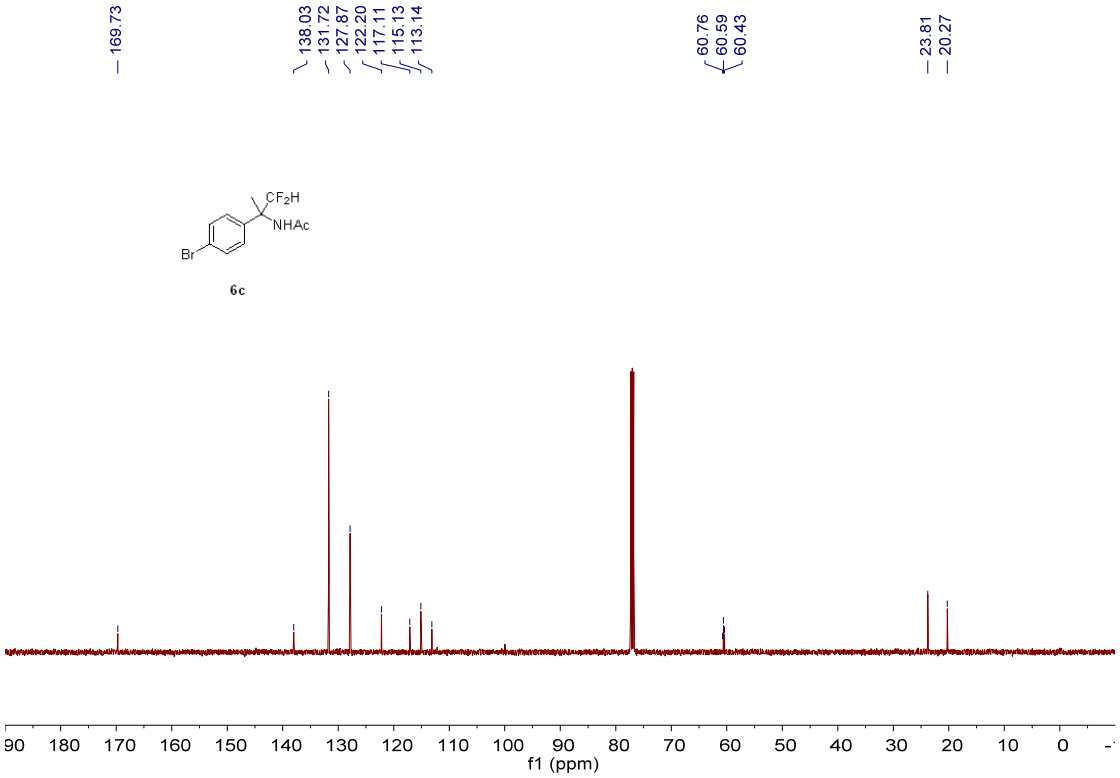
NHAc
Br
6c
1.98
2.00
1.06
0.97
3.01
3.00
f1 (ppm)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60.43
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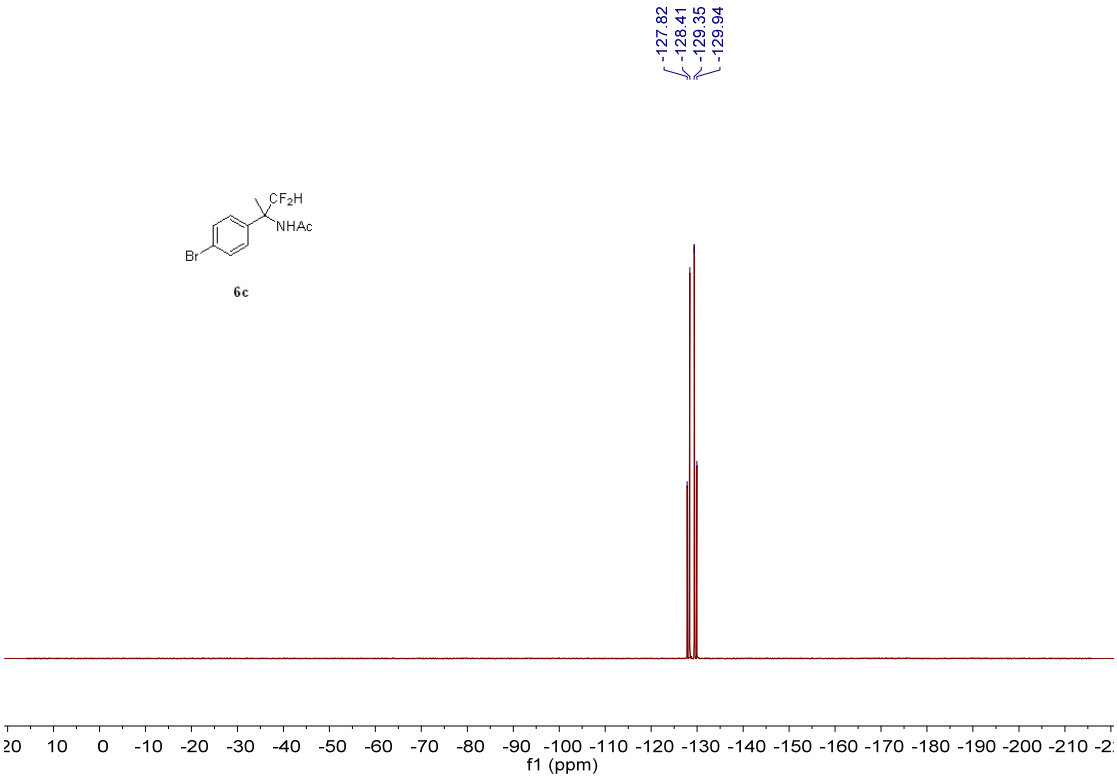
NHAc
Br
6c
f1 (ppm)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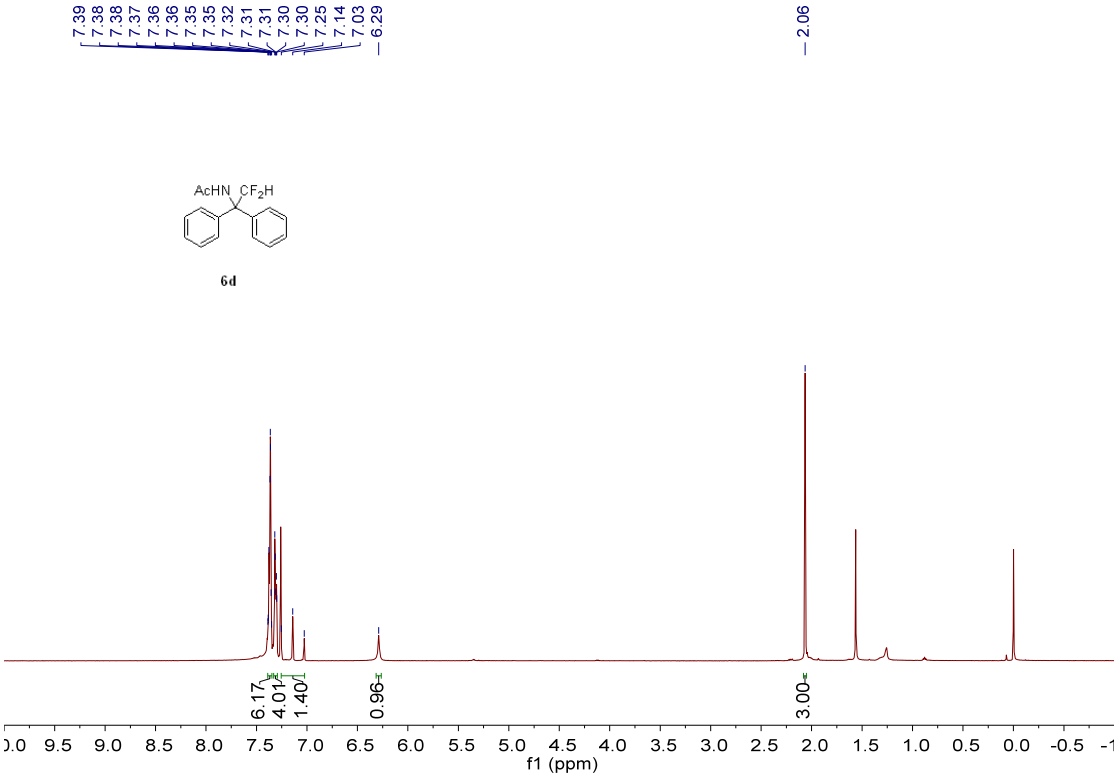
Br
6c
f1 (ppm)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7.30
7.30
7.25
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2.06
AcHN CF2H
6d
6.17
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1.40
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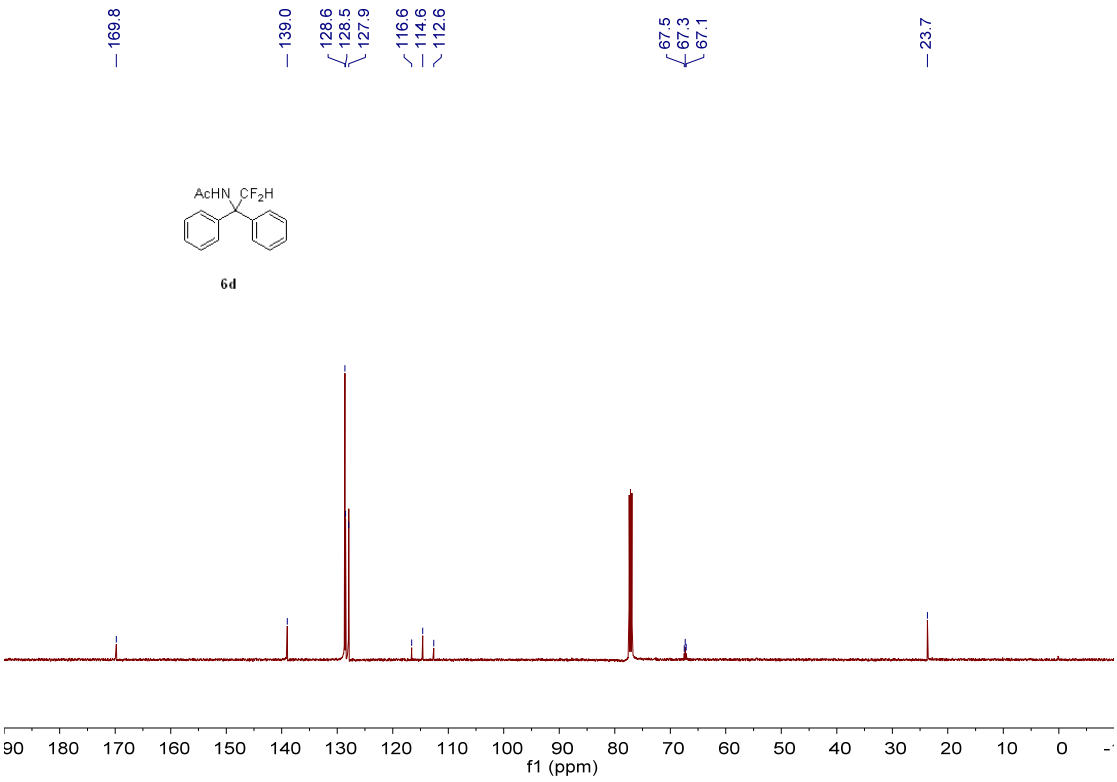
3.00
f1 (ppm)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112.6
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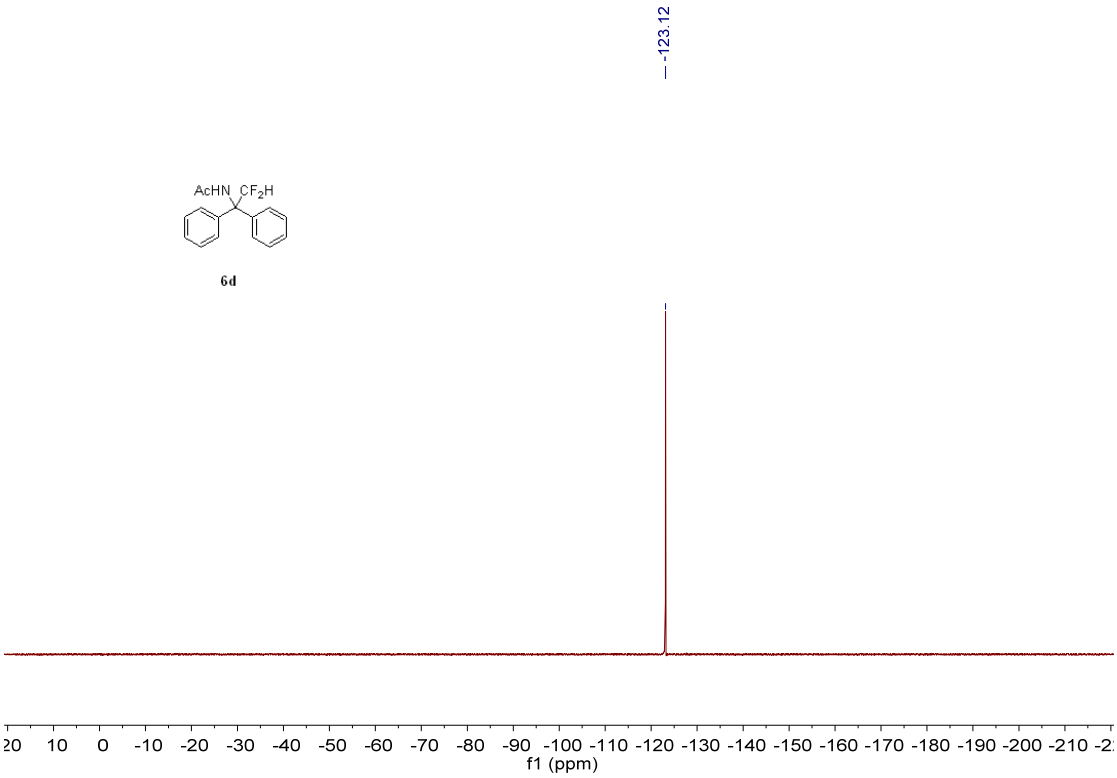
67.3
67.1
23.7
AcHN CF2H
6d
f1 (ppm)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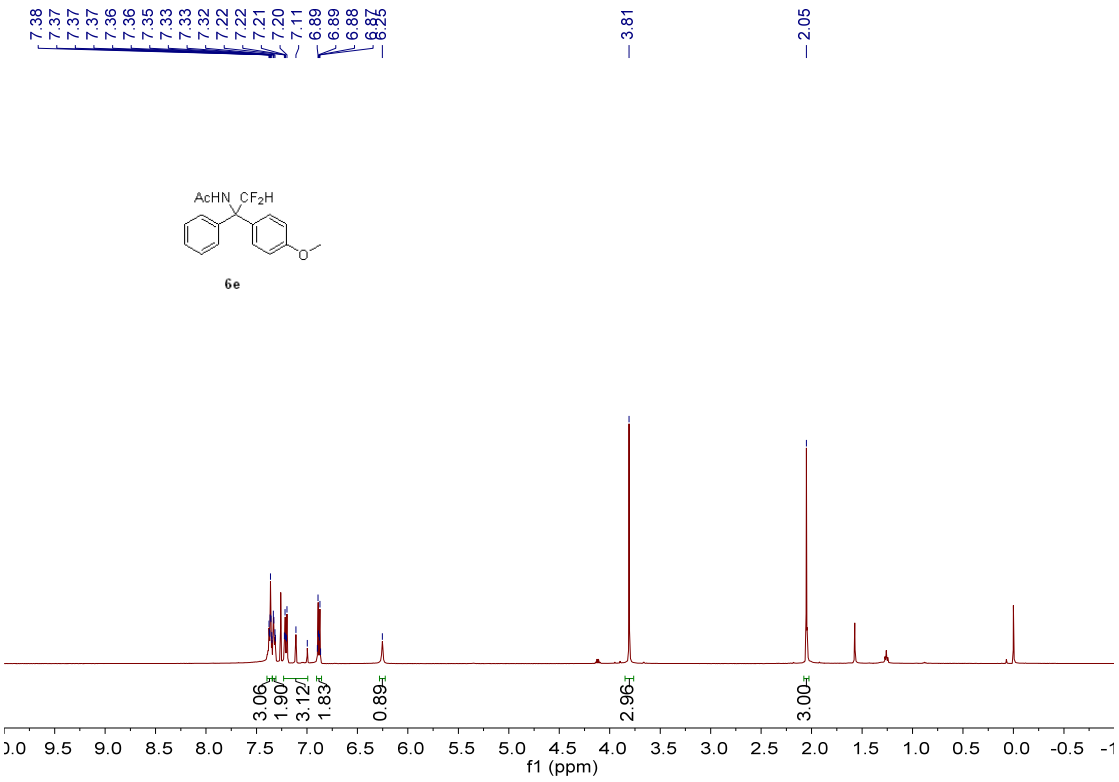
f1 (ppm)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7.21
7.20
7.11
6.89
6.89
6.88
6.87
6.85
3.81
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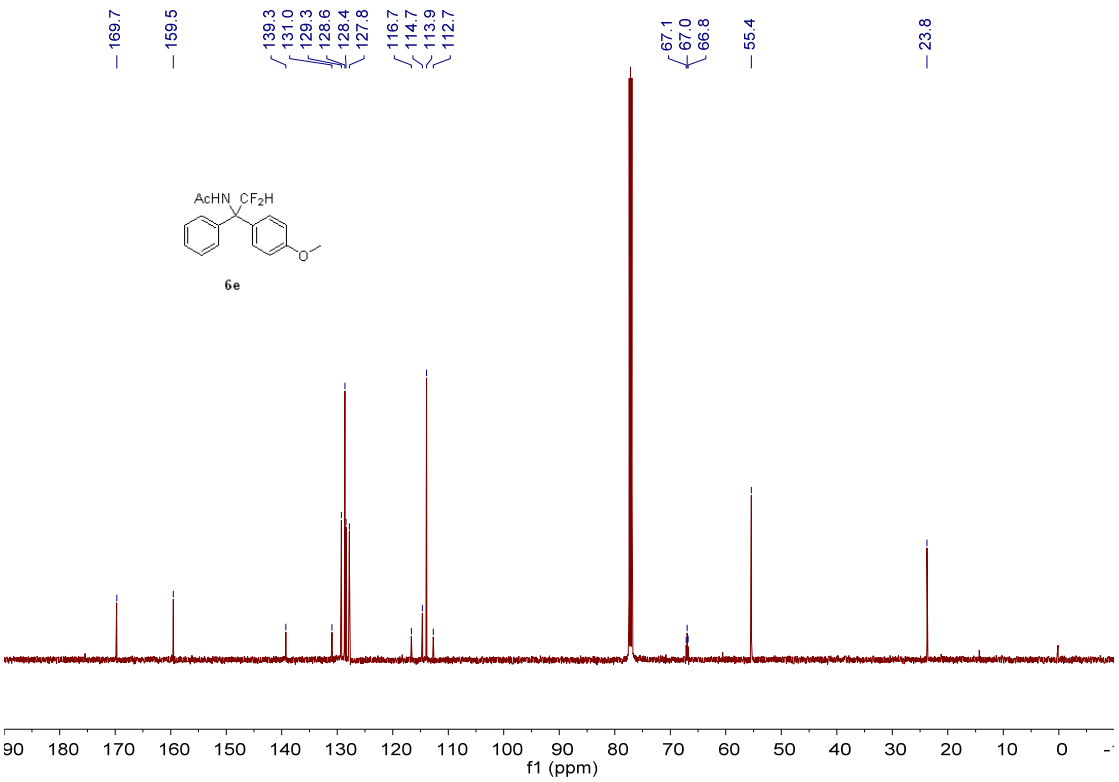
O
6e
3.06
1.90
3.12
1.83
0.89
2.96
3.00
f1 (ppm)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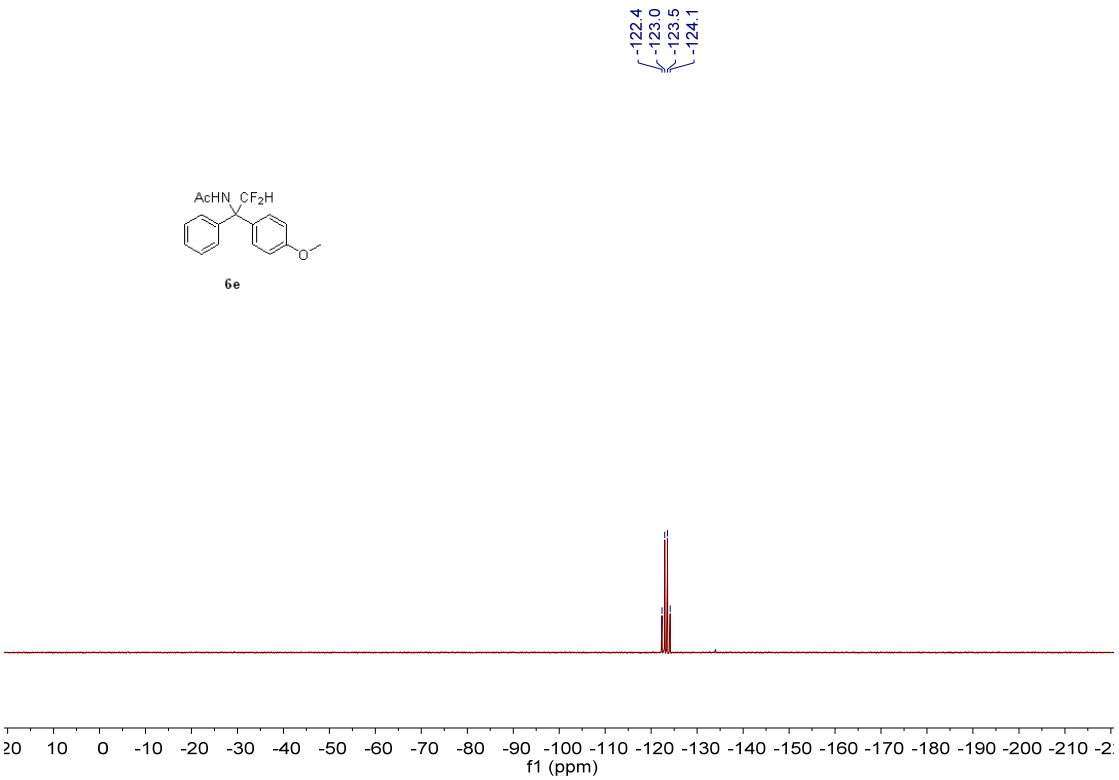
55.4
23.8
AcHN CF2H
O
6e
f1 (ppm)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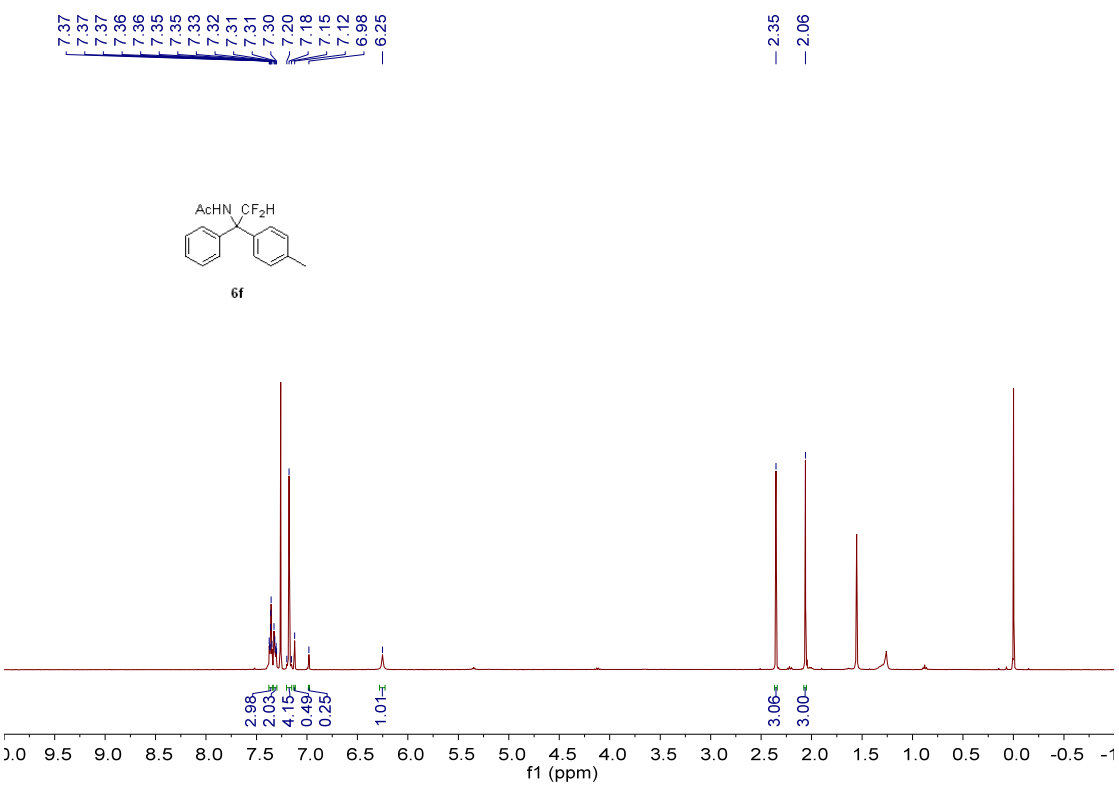
O
6e
f1 (ppm)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7.20
7.18
7.15
7.12
6.98
6.25
2.35
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AcHN CF2H
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2.98
2.03
4.15
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0.25
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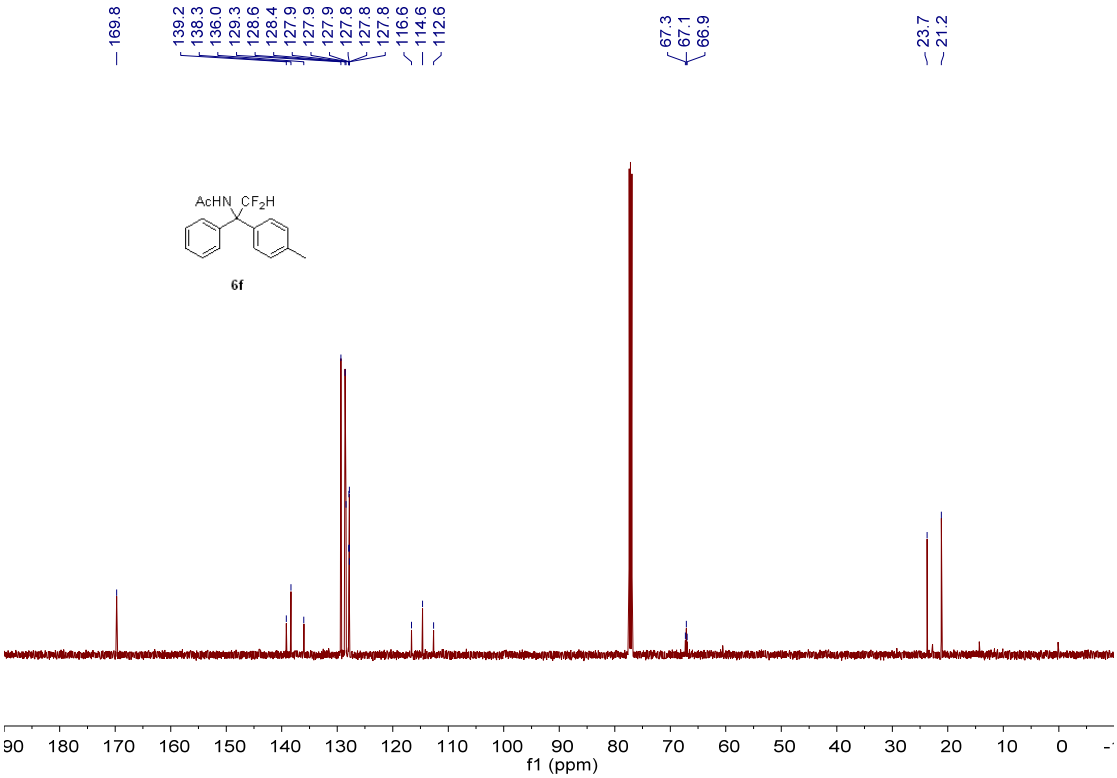
3.00
f1 (ppm)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128.4
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127.9
127.8
127.8
127.8
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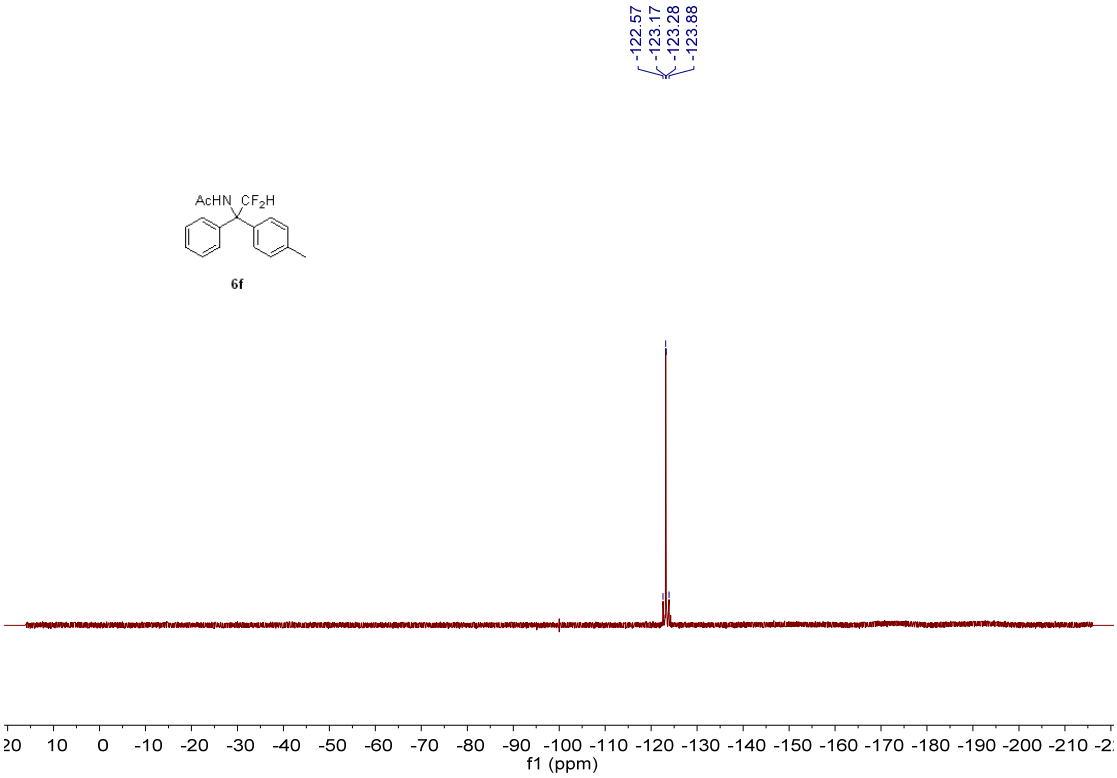
114.6
112.6
67.3
67.1
66.9
23.7
21.2
AcHN CF2H
6f
f1 (ppm)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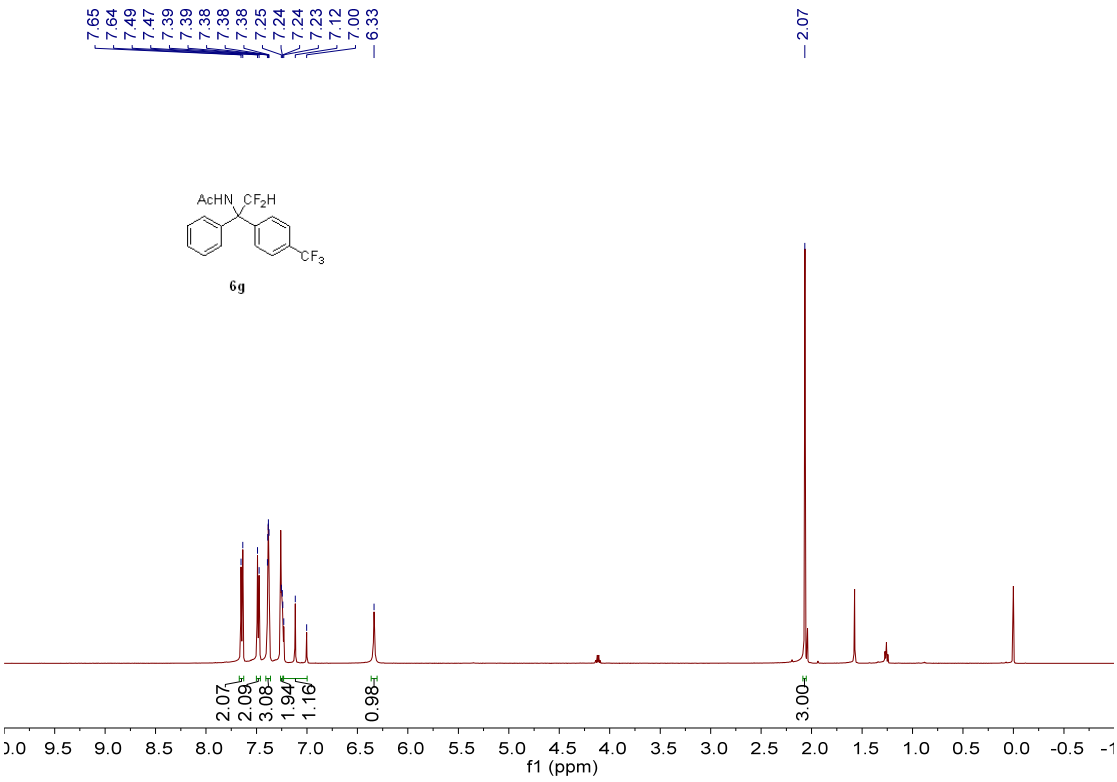
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7.12
7.00
6.33
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CF3
6g
2.07
2.09
3.08
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1.16
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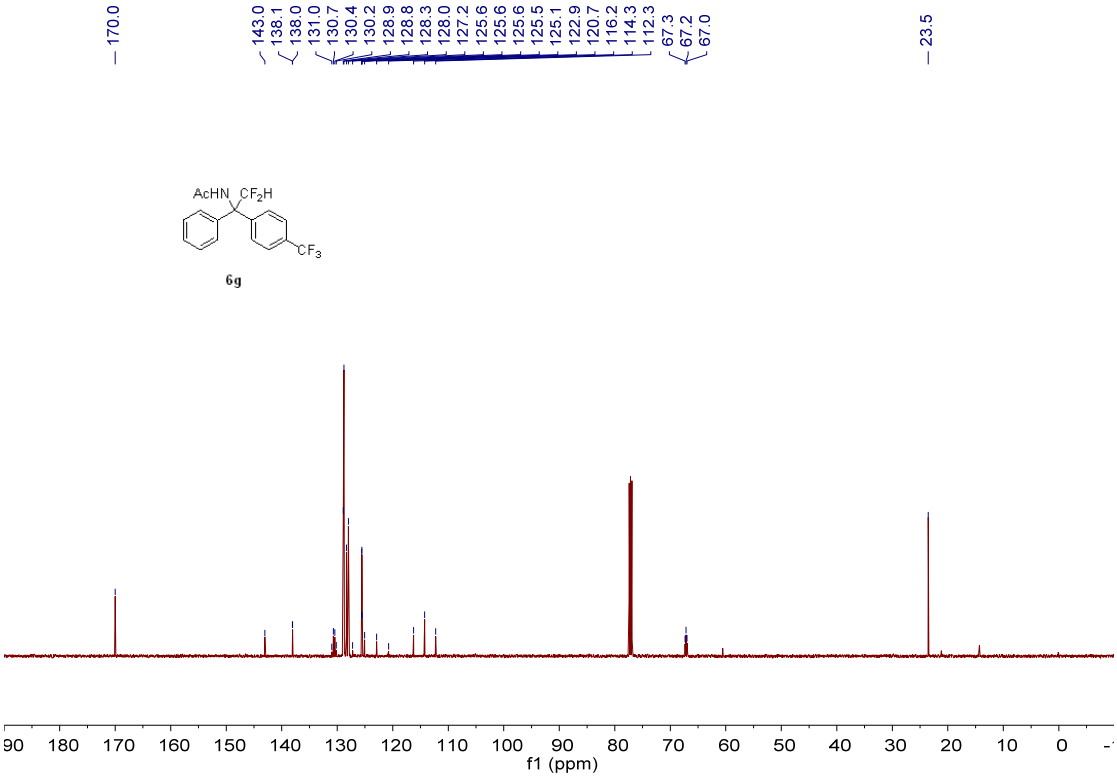
3.00
f1 (ppm)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127.2
125.6
125.6
125.6
125.5
125.1
122.9
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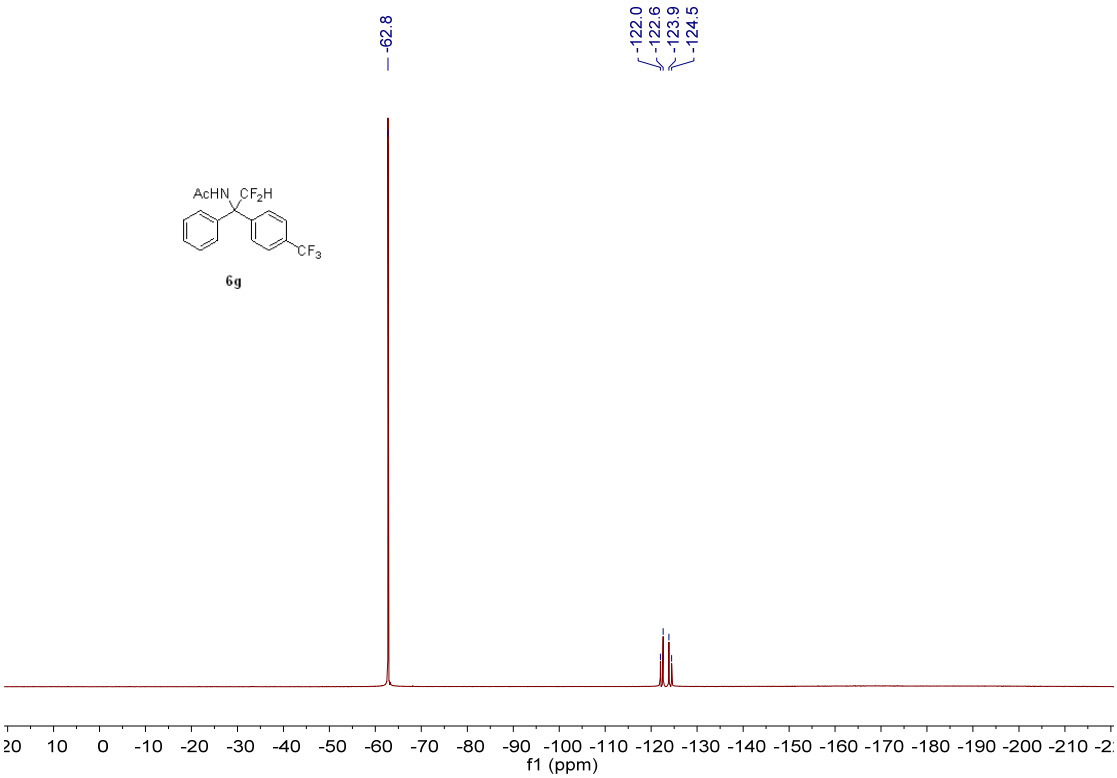
AcHN CF2H
CF3
6g
f1 (ppm)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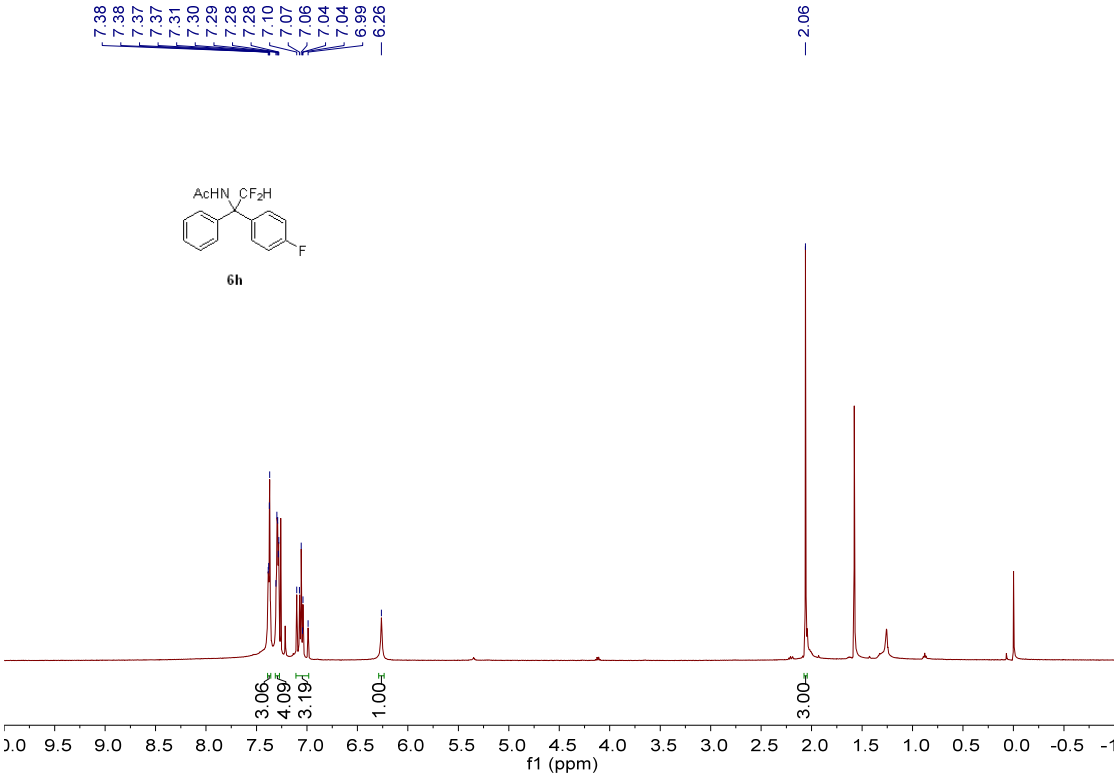
CF3
6g
f1 (ppm)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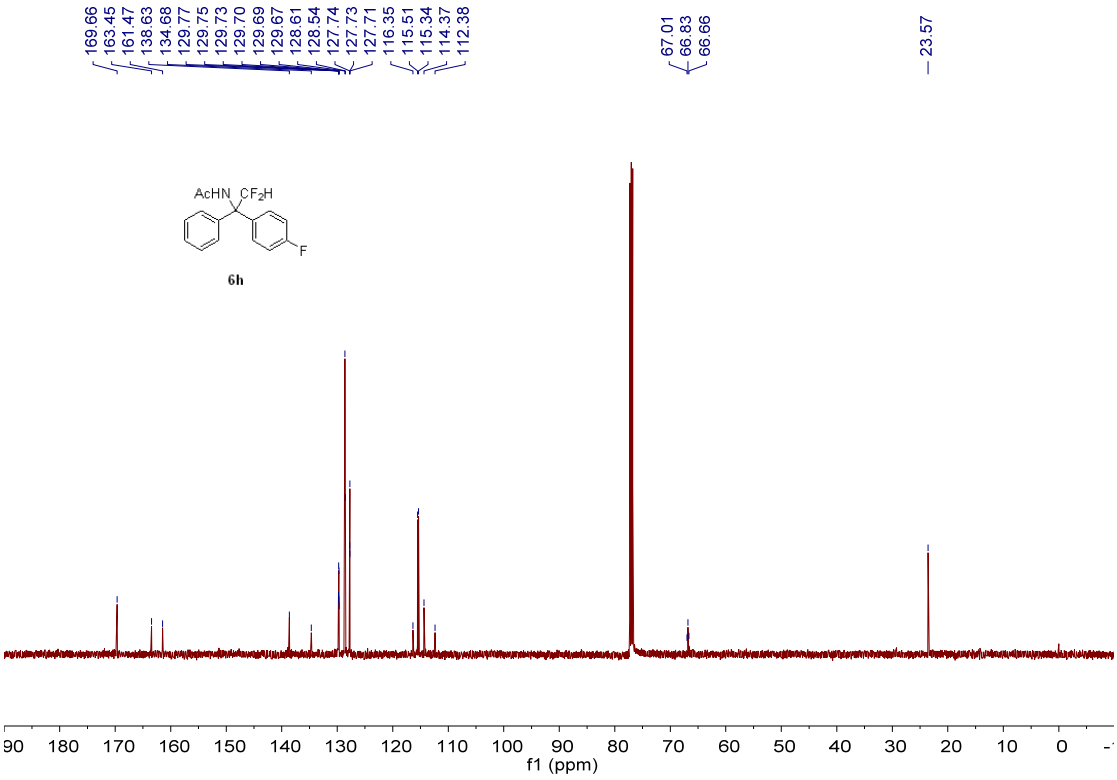
7.07
7.06
7.04
7.04
6.99
6.26
2.06
AcHN CF2H
F
6h
3.06
4.09
3.19
1.00
3.00
f1 (ppm)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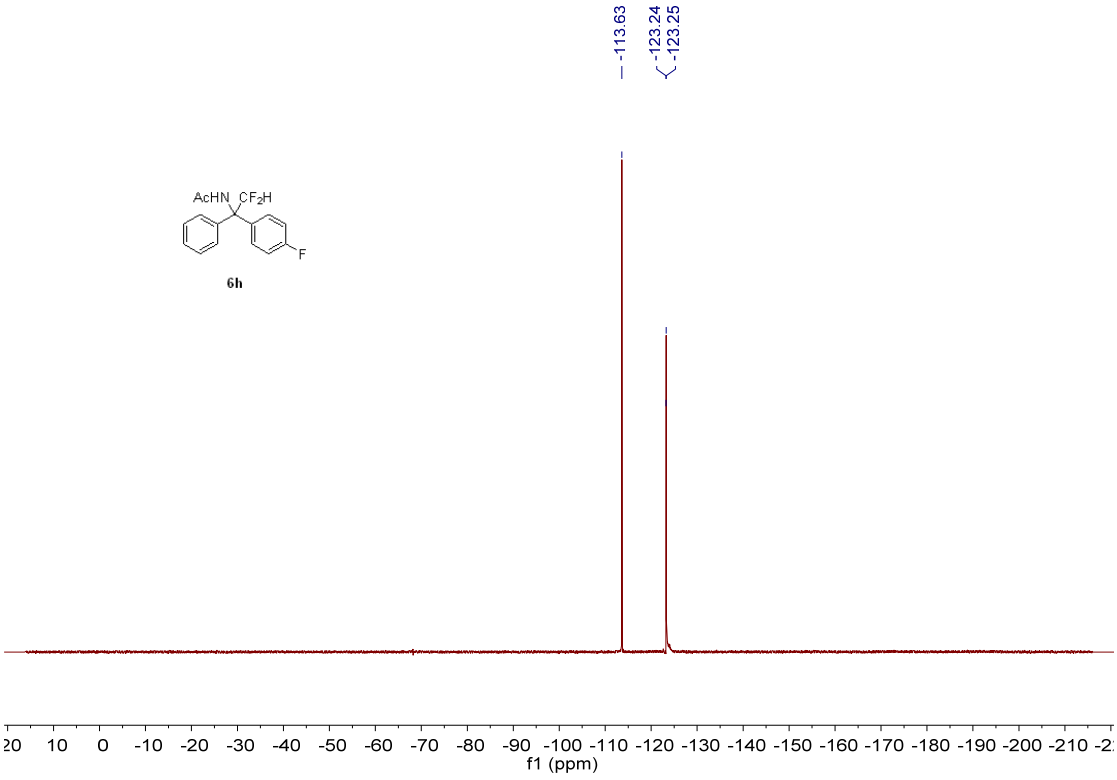
129.67
128.61
128.54
127.74
127.73
127.71
116.35
115.51
115.34
114.37
112.38
67.01
66.83
66.66
23.57
AcHN CF2H
F
6h
f1 (ppm)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-123.25
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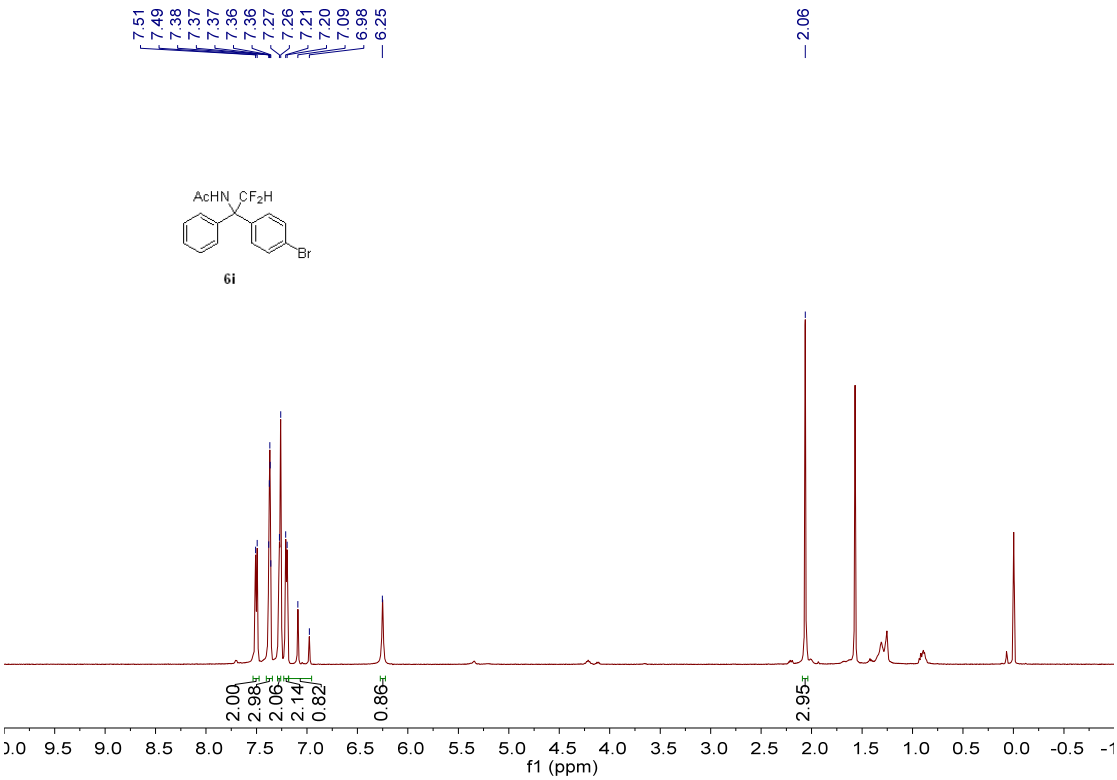
F
6h
f1 (ppm)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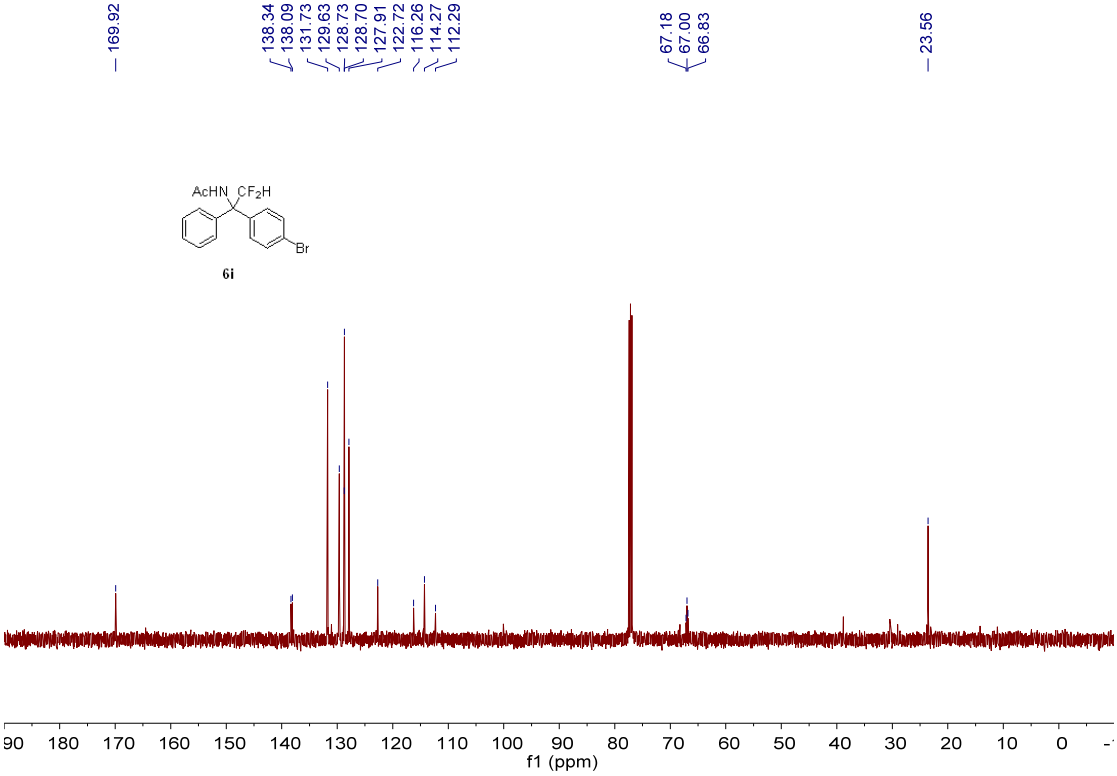
7.36
7.36
7.27
7.26
7.21
7.20
7.09
6.98
6.25
2.06
AcHN CF2H
Br
6i
2.00
2.98
2.06
2.14
0.82
0.86
2.95
f1 (ppm)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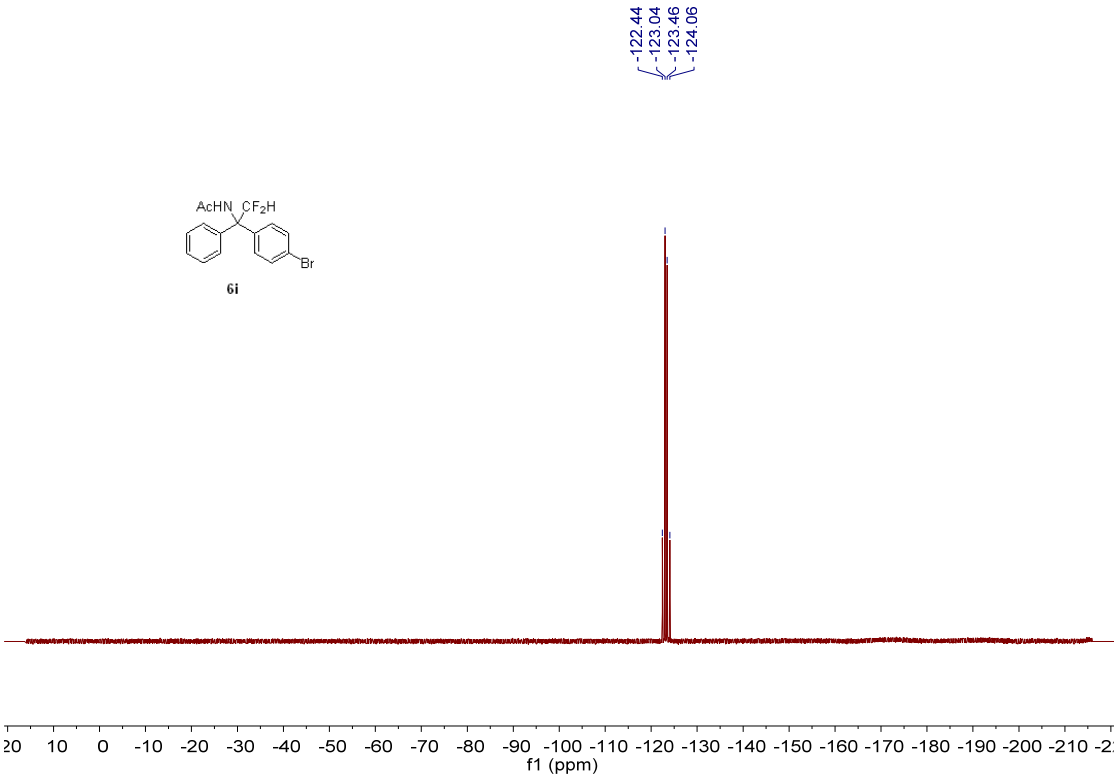
67.00
66.83
23.56
AcHN CF2H
Br
6i
f1 (ppm)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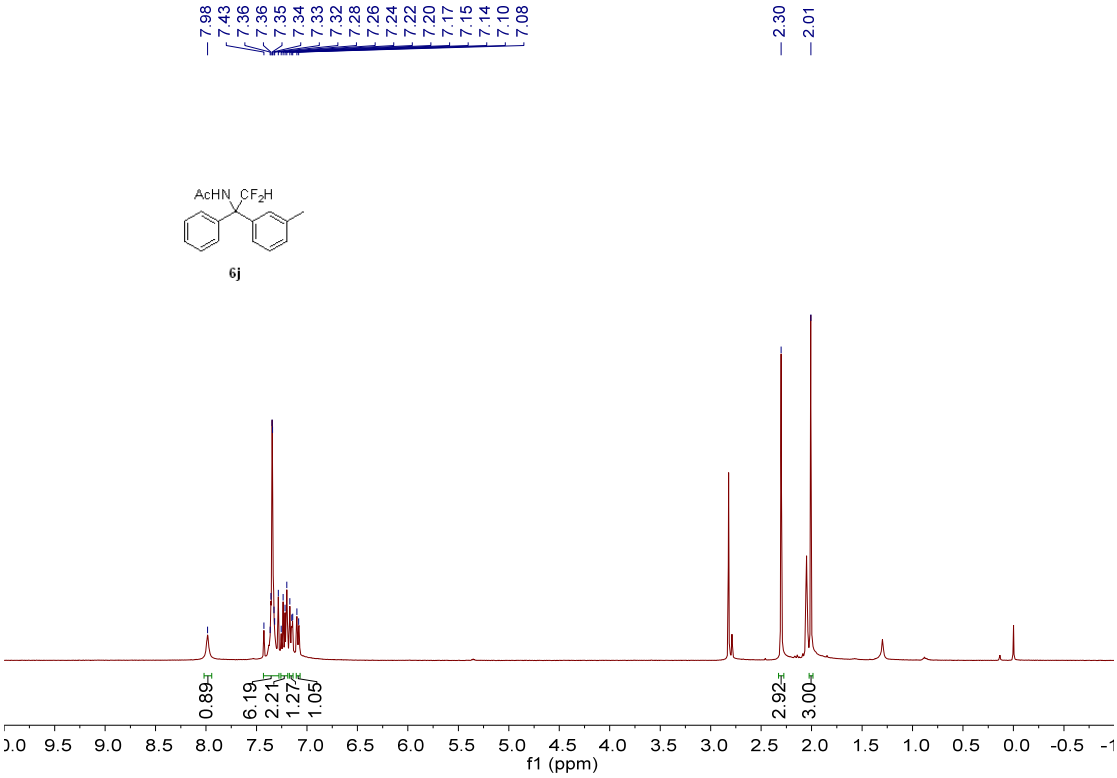
Br
6i
f1 (ppm)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7.34
7.33
7.32
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7.26
7.24
7.22
7.20
7.17
7.15
7.14
7.10
7.08
2.30
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6j
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6.19
2.21
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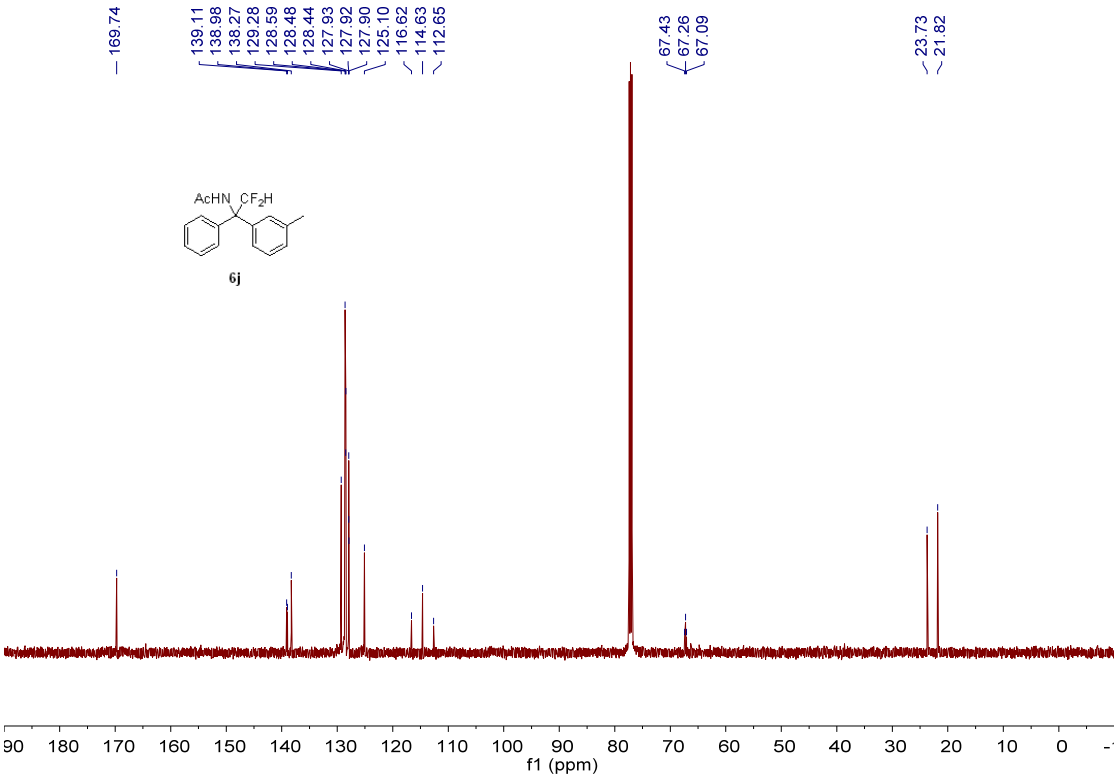
1.05
2.92
3.00
f1 (ppm)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128.59
128.48
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127.92
127.90
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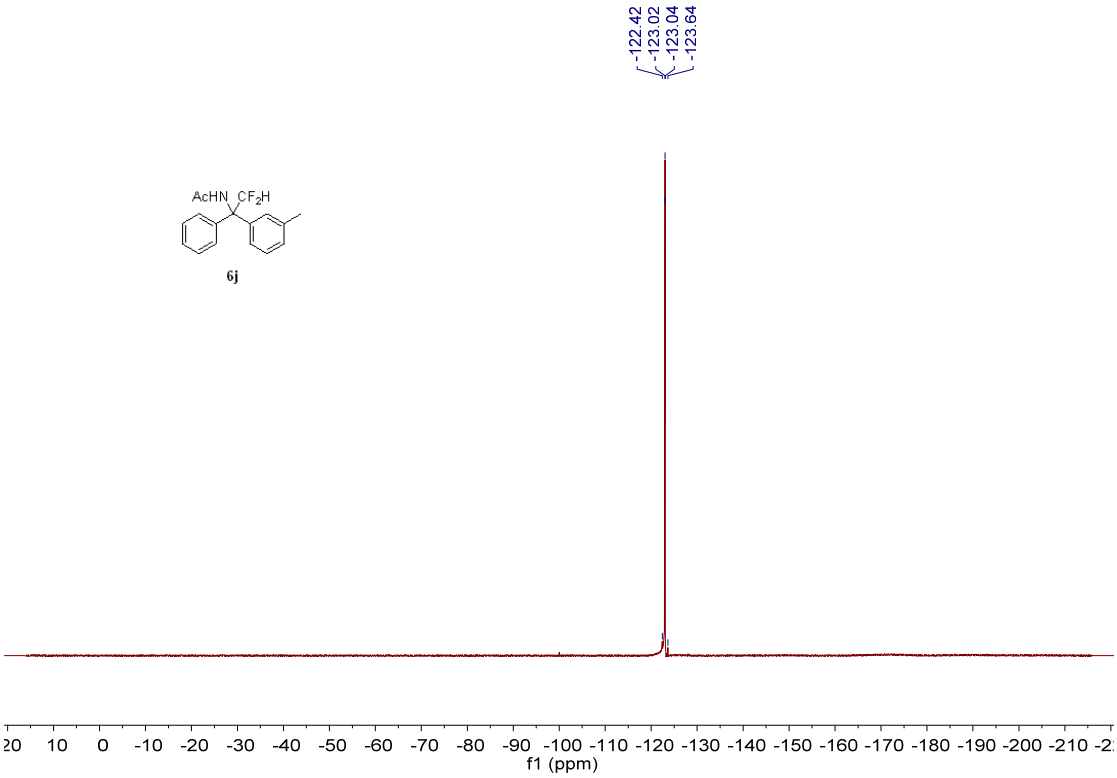
112.65
67.43
67.26
67.09
23.73
21.82
AcHN CF2H
6j
f1 (ppm)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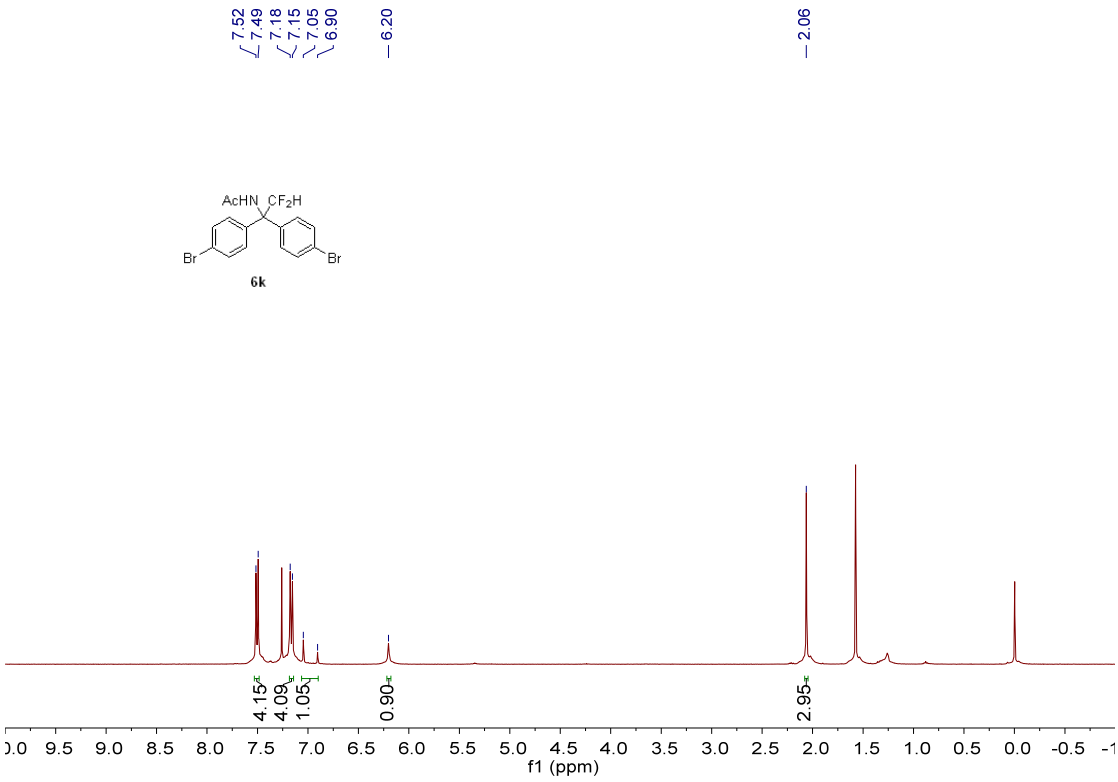
6j
f1 (ppm)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7.05
6.90
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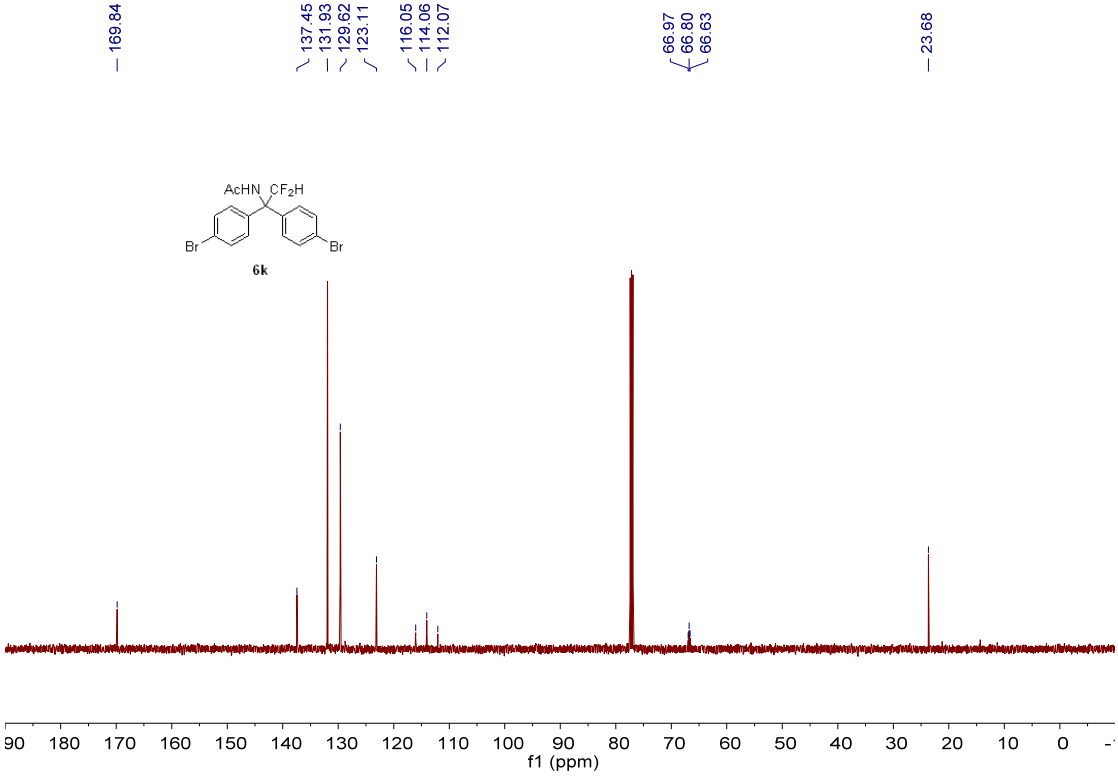
Br
Br
6k
4.15
4.09
1.05
0.90
2.95
f1 (ppm)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123.11
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66.80
66.63
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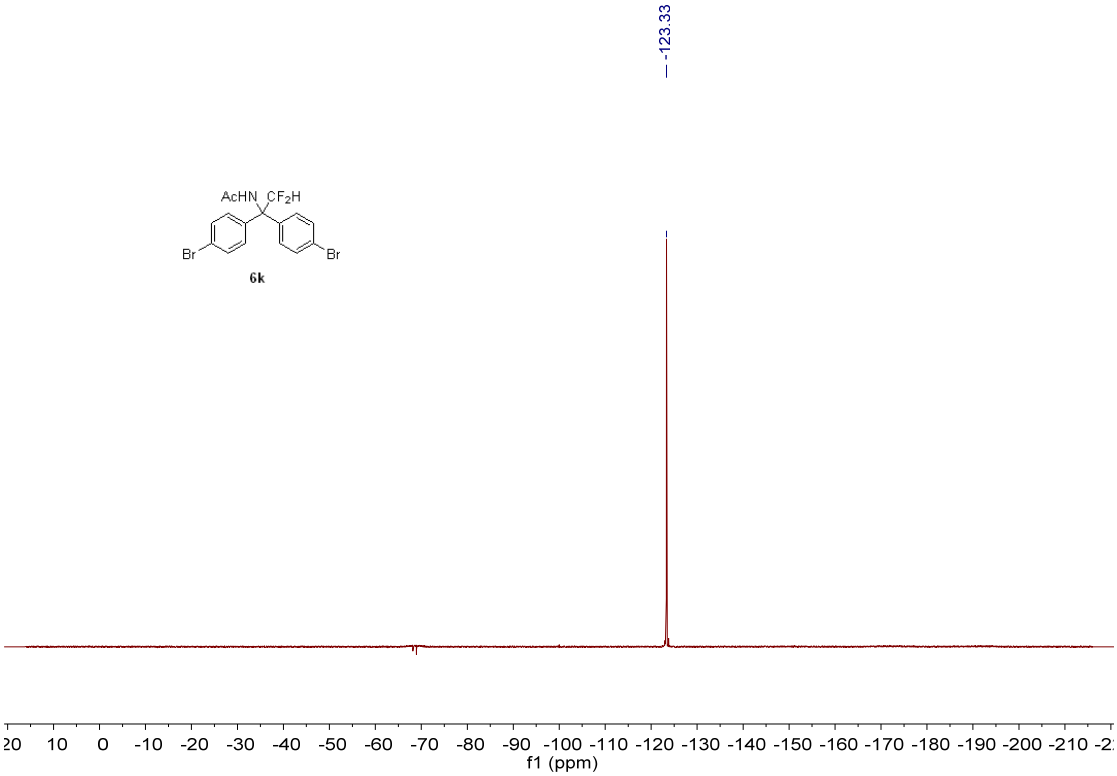
AcHN CF2H
Br
Br
6k
f1 (ppm)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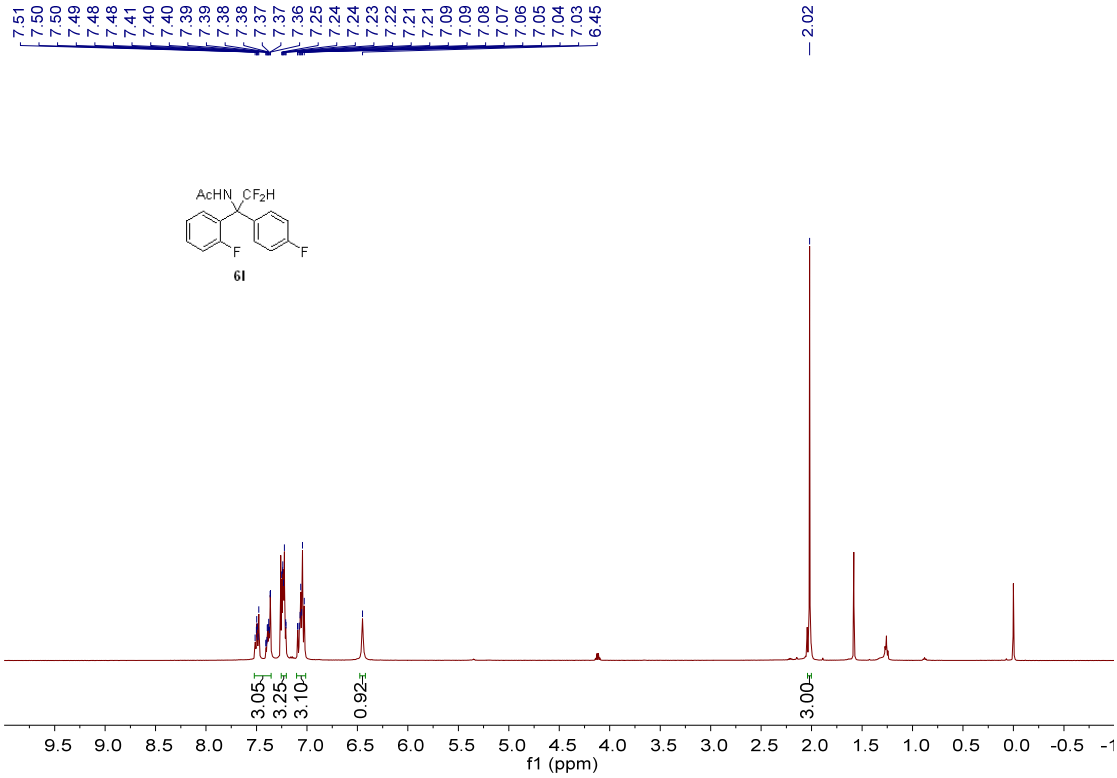
AcHN CF2H
Br
Br
6k
f1 (ppm)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7.37
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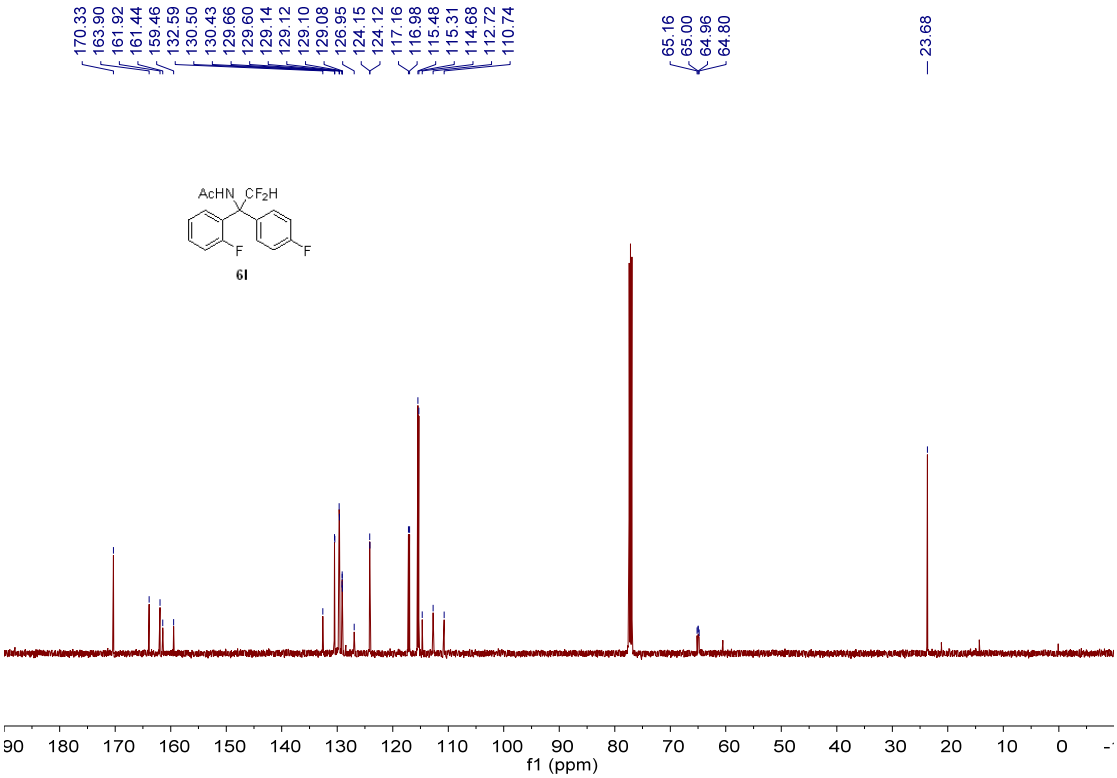
7.25
7.24
7.24
7.23
7.22
7.21
7.21
7.09
7.09
7.08
7.07
7.06
7.05
7.04
7.03
6.45
2.02
AcHN CF2H
F
F
6l
3.05
3.25
3.10
0.92
3.00
f1 (ppm)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129.60
129.14
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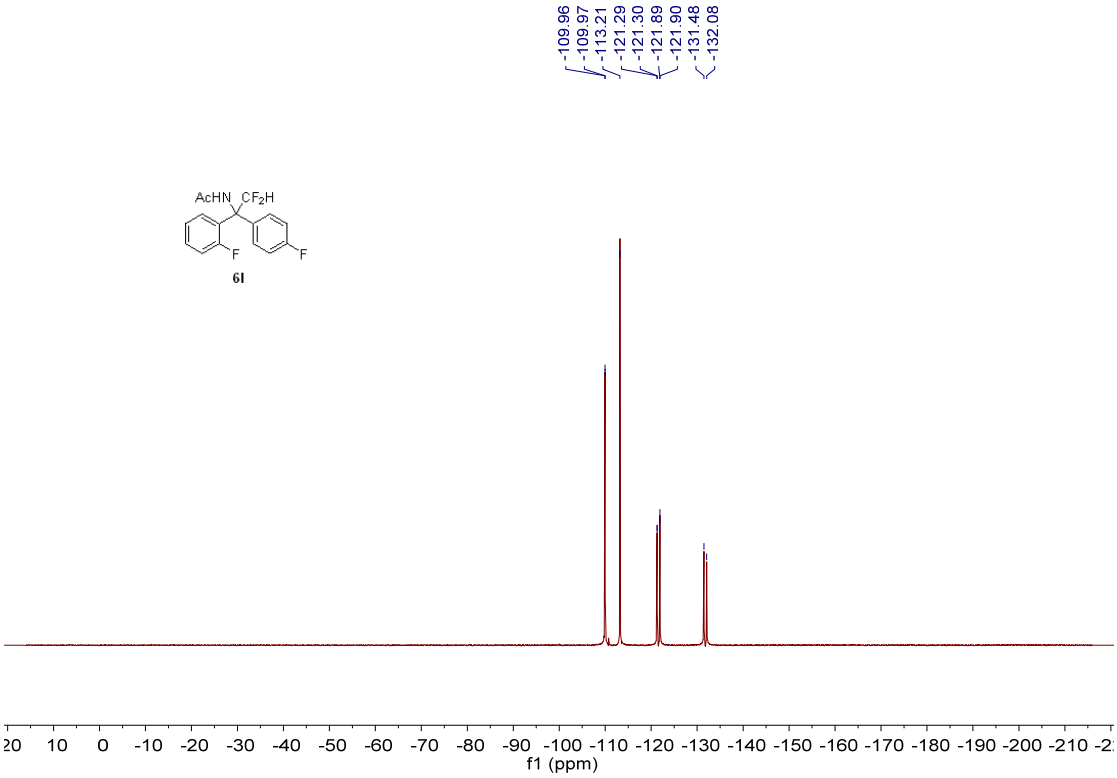
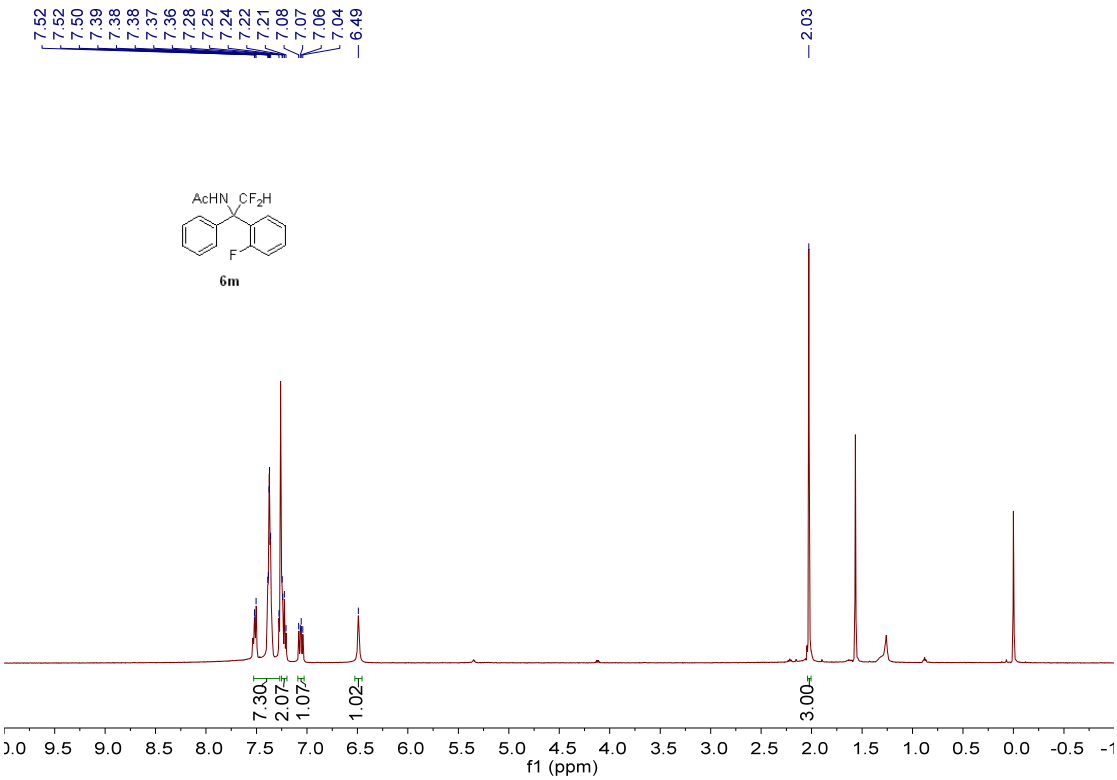
129.10
129.08
126.95
124.15
124.12
117.16
116.98
115.48
115.31
114.68
112.72
110.74
65.16
65.00
64.96
64.80
23.68
AcHN CF2H
F
F
6l
f1 (ppm)


-109.96
-109.97
-113.21
-121.29
-121.30
-121.89
-121.90
-131.48
-132.08
AcHN CF2H
F
F
6l
f1 (ppm)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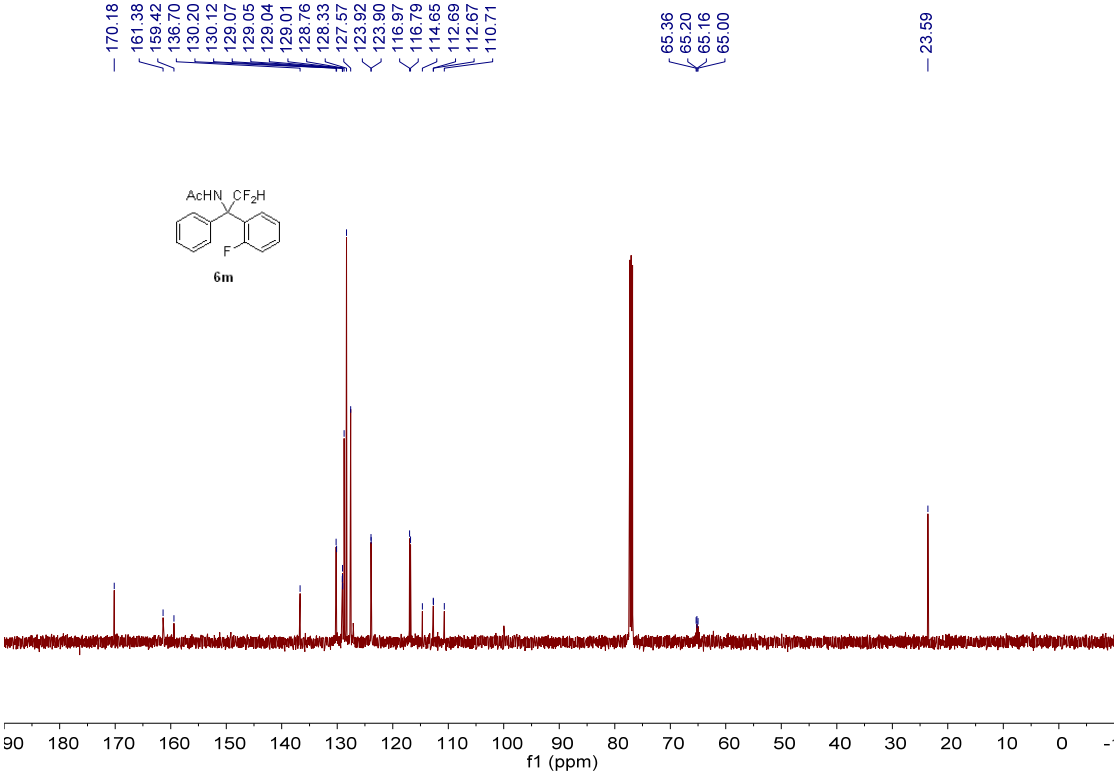
7.36
7.28
7.25
7.24
7.22
7.21
7.08
7.07
7.06
7.04
6.49
2.03
AcHN CF2H
F
6m
7.30
2.07
1.07
1.02
3.00
f1 (ppm)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129.05
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123.92
123.90
116.97
116.79
114.65
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110.71
65.36
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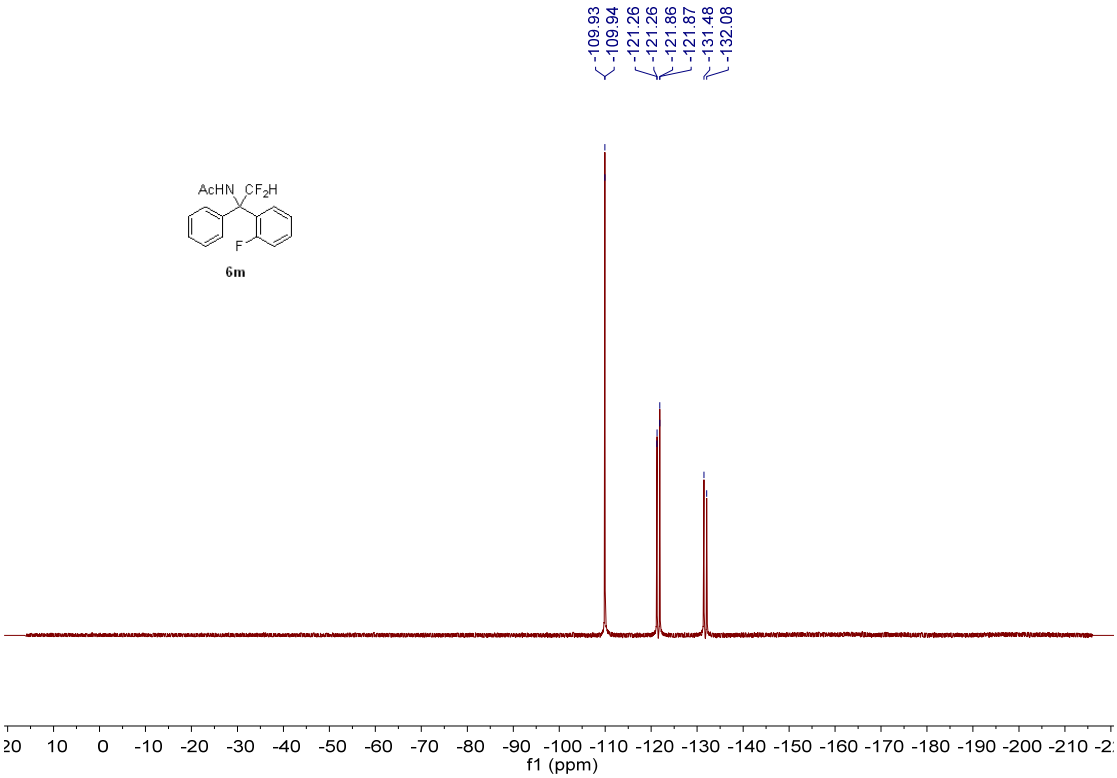
65.16
65.00
23.59
AcHN CF2H
F
6m
f1 (ppm)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-121.87
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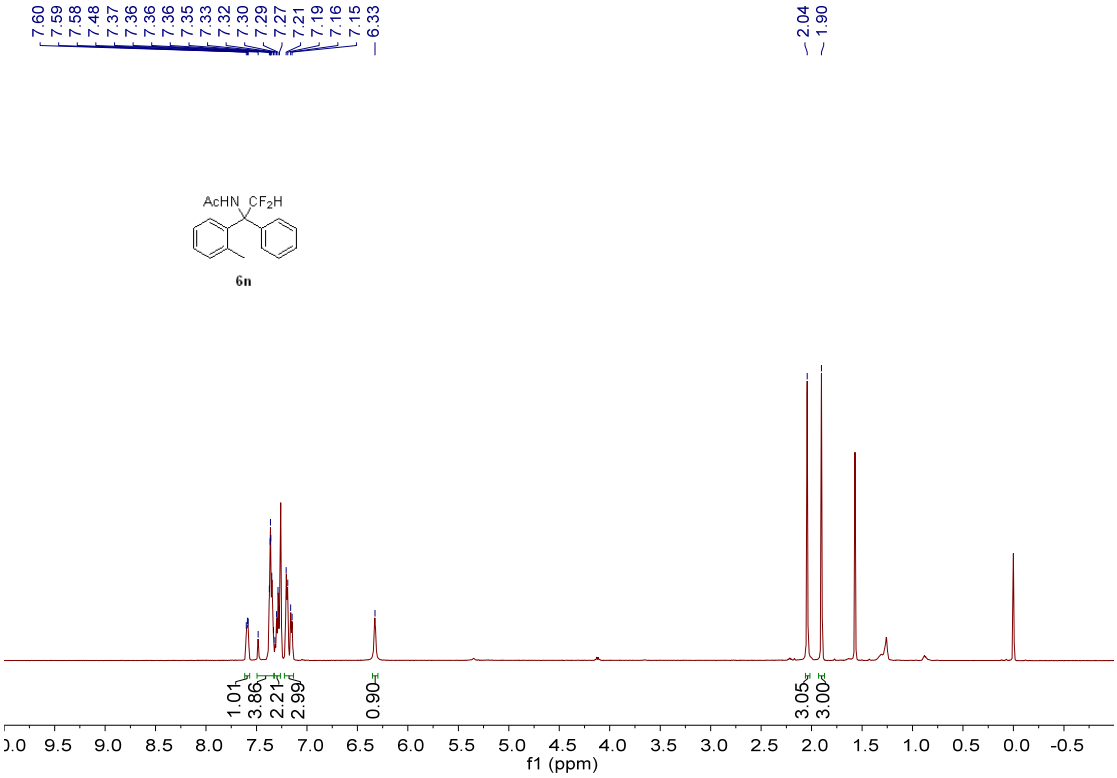
F
6m
f1 (ppm)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7.32
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7.29
7.27
7.21
7.19
7.16
7.15
6.33
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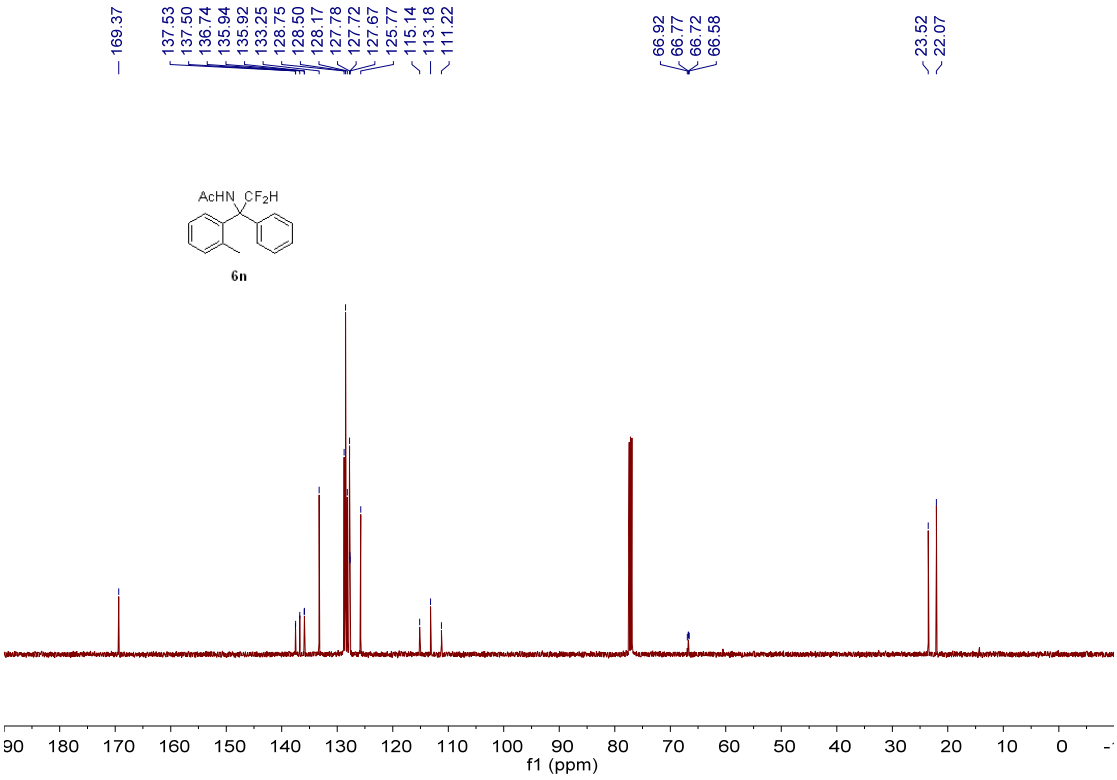
6n
1.01
3.86
2.21
2.99
0.90
3.05
3.00
f1 (ppm)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127.67
125.77
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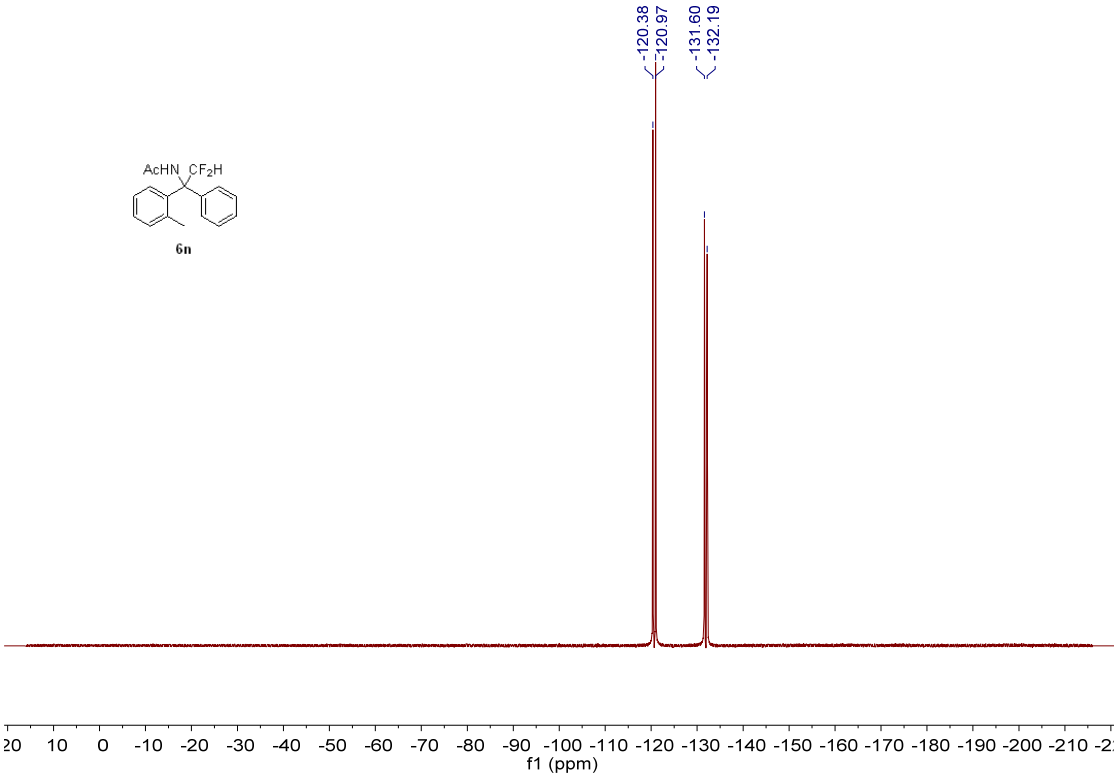
66.92
66.77
66.72
66.58
23.52
22.07
AcHN CF2H
6n
f1 (ppm)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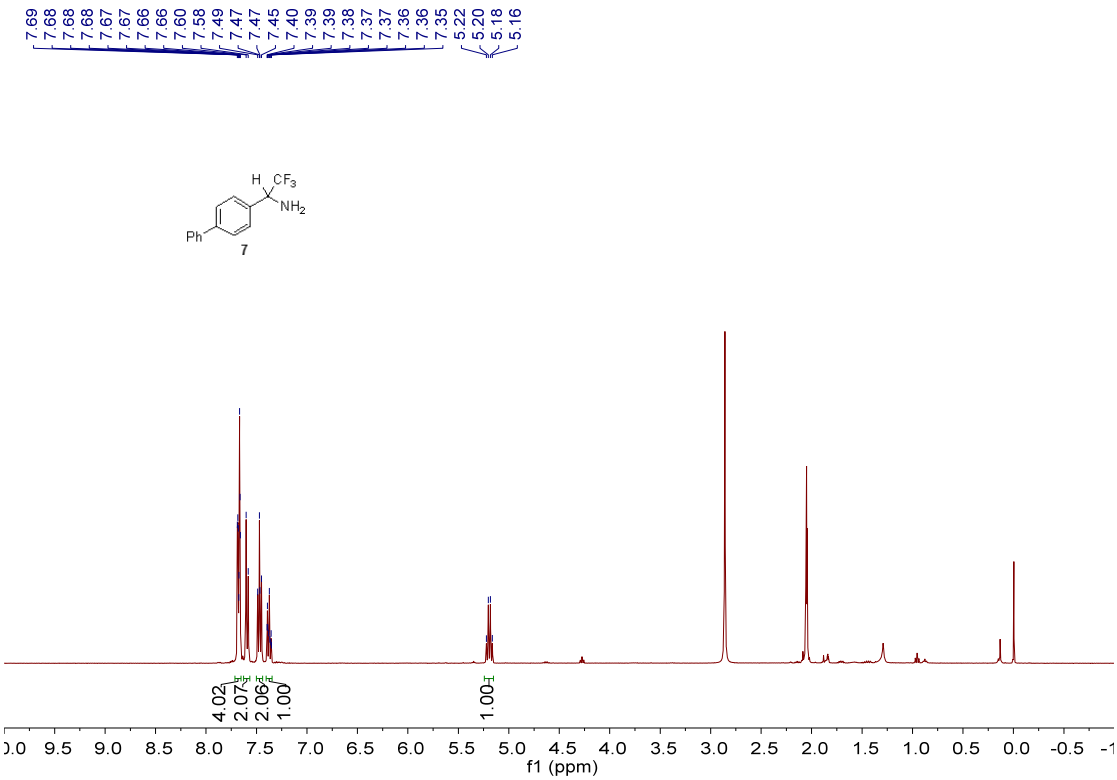
-132.19
AcHN CF2H
6n
f1 (ppm)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7.47
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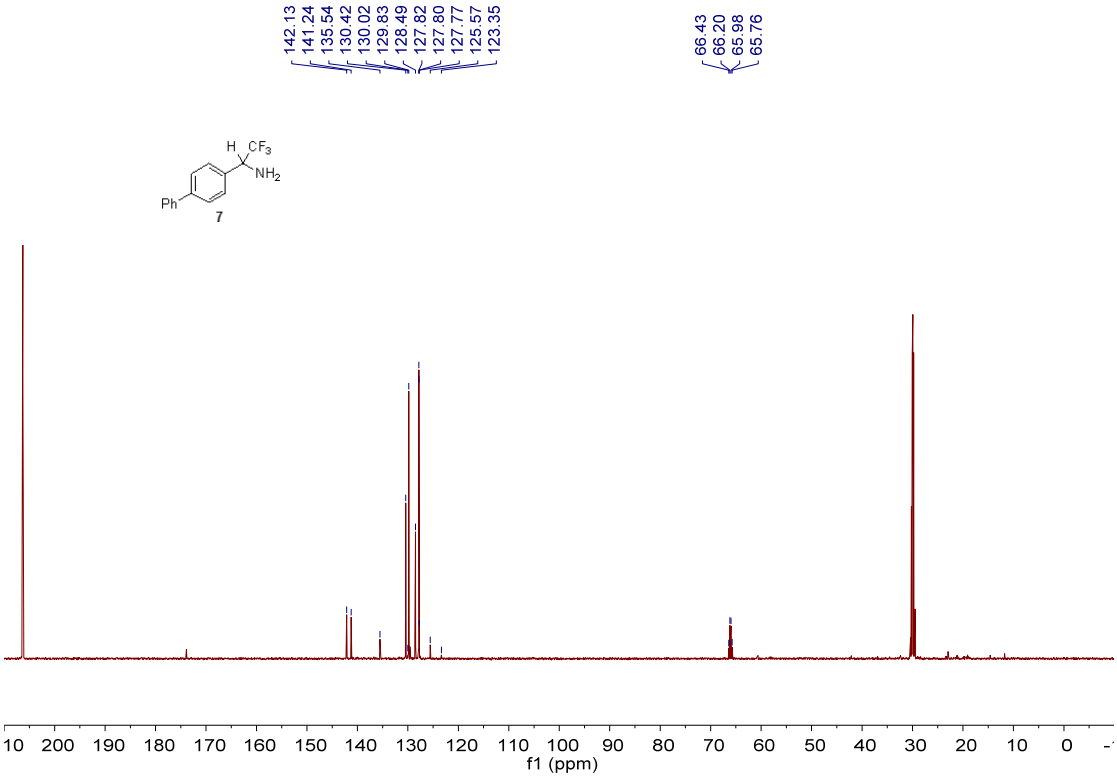
7.40
7.39
7.39
7.38
7.37
7.37
7.36
7.36
7.35
5.22
5.20
5.18
5.16
H
CF3
NH2
Ph
7
4.02
2.07
2.06
1.00
1.00
f1 (ppm)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127.80
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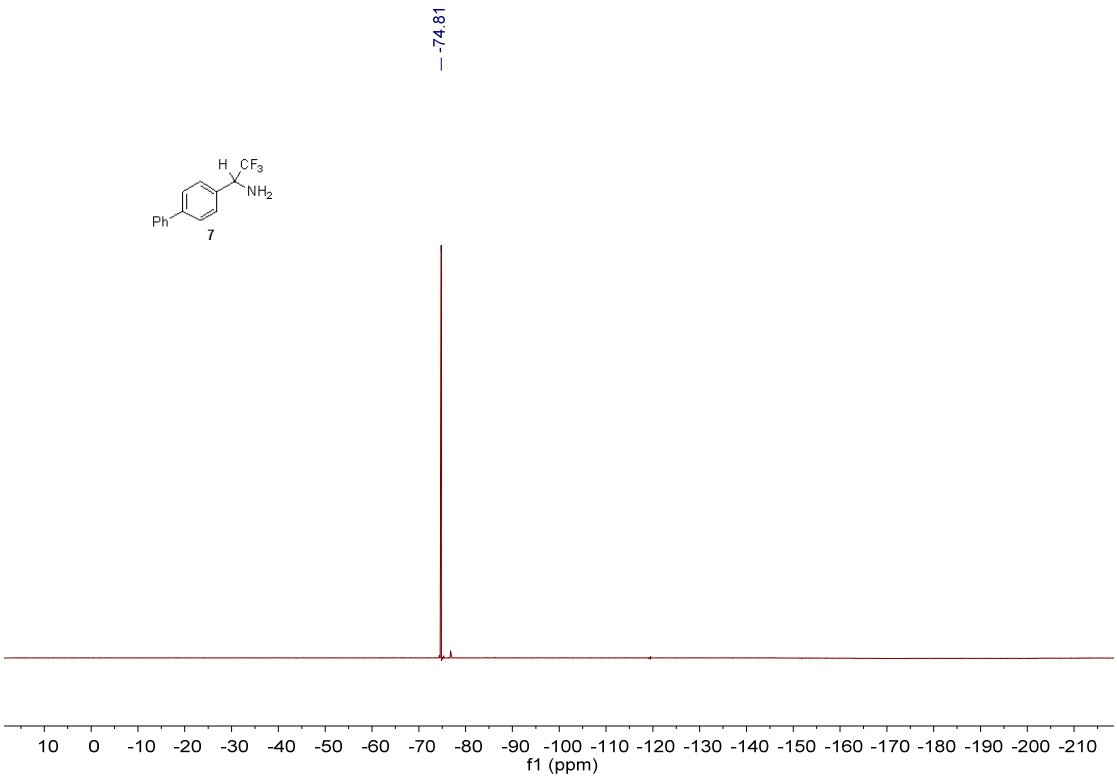
66.43
66.20
65.98
65.76
H
CF3
NH2
Ph
7
f1 (ppm)


-74.81
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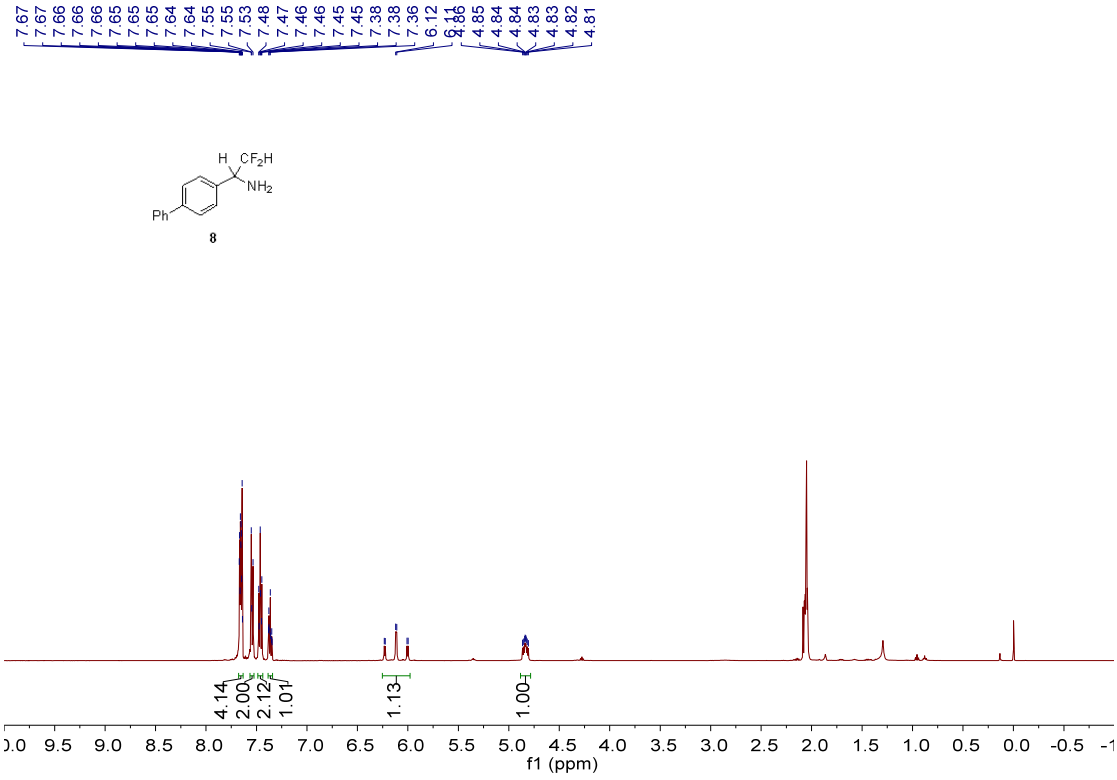
f1 (ppm)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7.48
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7.46
7.46
7.45
7.45
7.38
7.38
7.36
6.12
4.85
4.84
4.84
4.83
4.83
4.82
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CF2H
NH2
Ph
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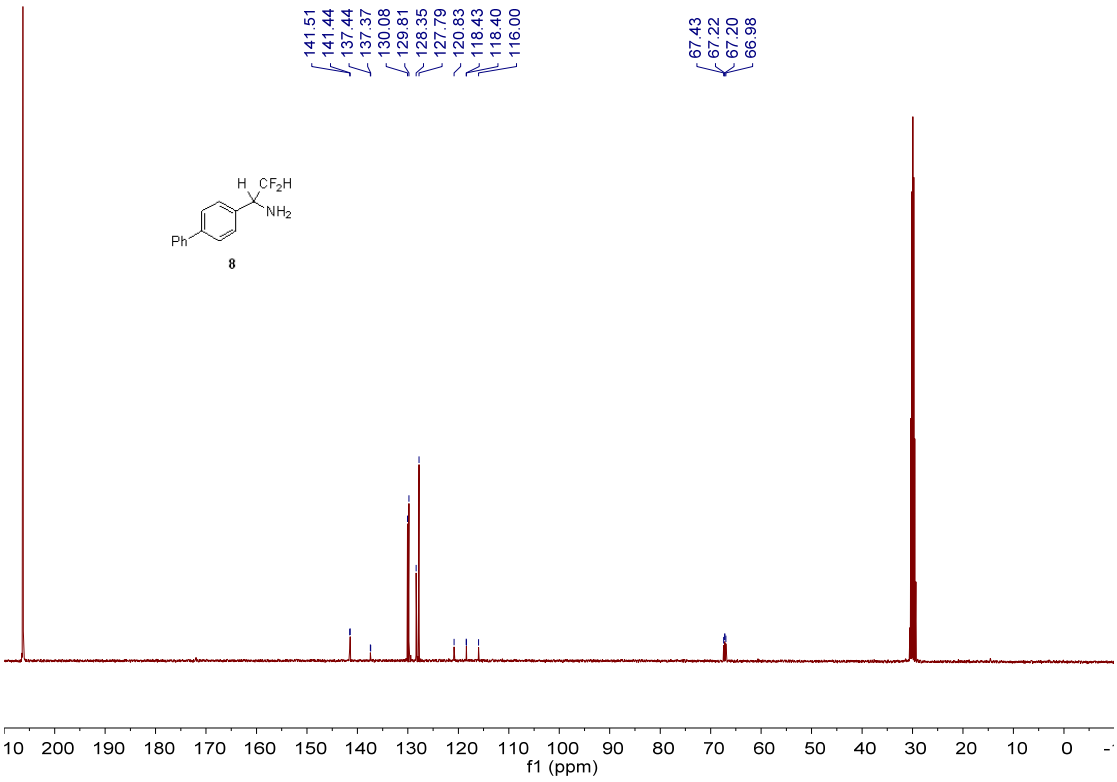
4.14
2.00
2.12
1.01
1.13
1.00
f1 (ppm)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118.40
116.00
67.43
67.22
67.20
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H
CF2H
NH2
Ph
8
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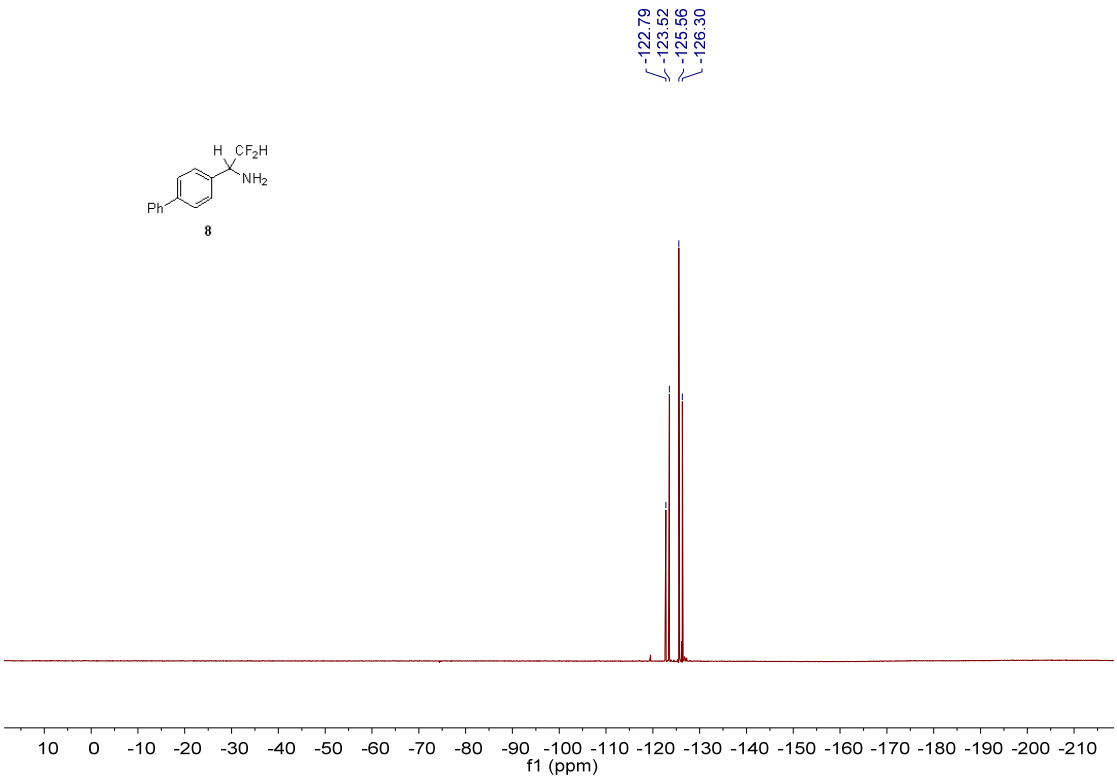
f1 (ppm)


-122.79
-123.52
-125.56
-126.30
H
CF2H
NH2
Ph
8
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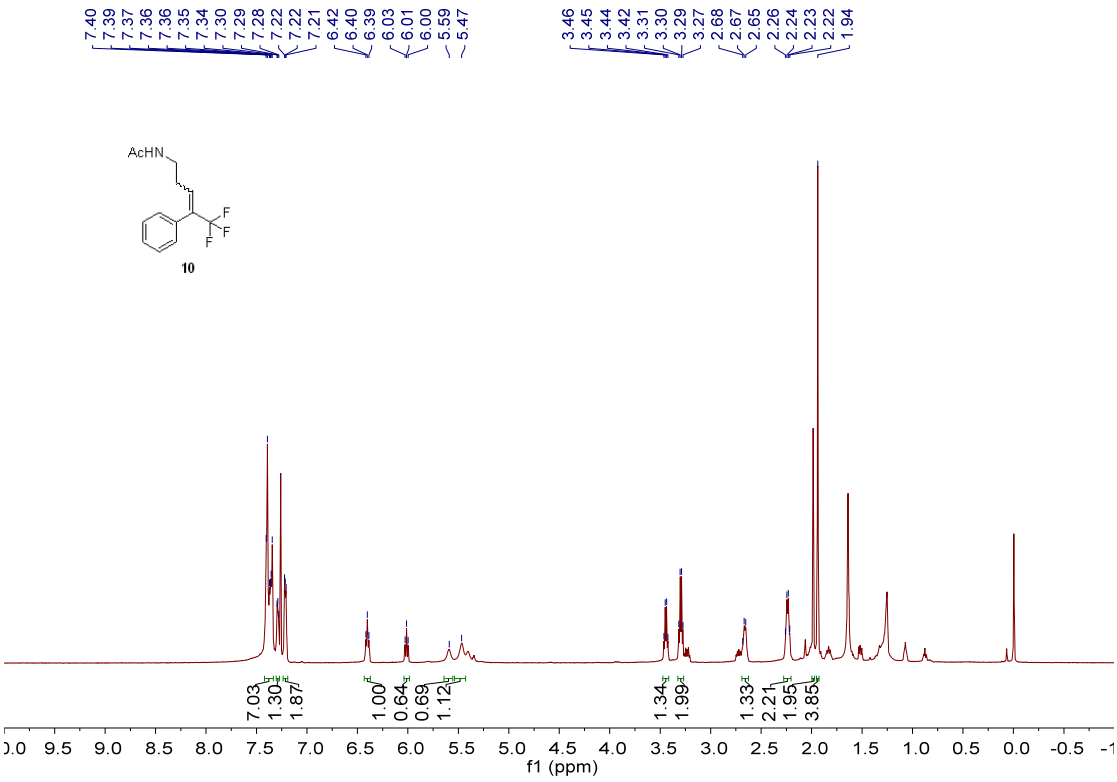
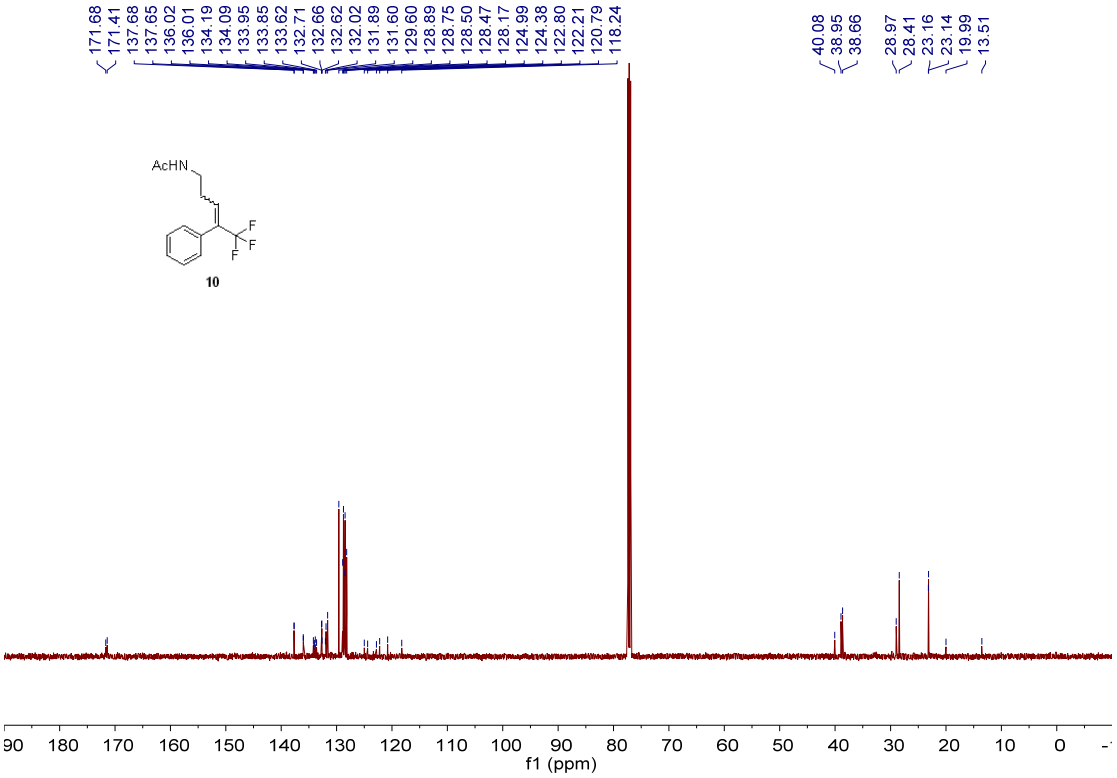
f1 (ppm)


7.40 7.39 7.37 7.36 7.36 7.35 7.34 7.30 7.29 7.28 7.22 7.22 7.21 6.42 6.40 6.39 6.03 6.01 6.00 5.59 5.47
3.46 3.45 3.44 3.42 3.31 3.30 3.29 3.27 2.68 2.67 2.65 2.26 2.24 2.23 2.22 1.94
AcHN
F F F
10
7.03 1.30 1.87 1.00 0.64 0.69 1.12 1.34 1.99 1.33 2.21 1.95 3.85
f1 (ppm)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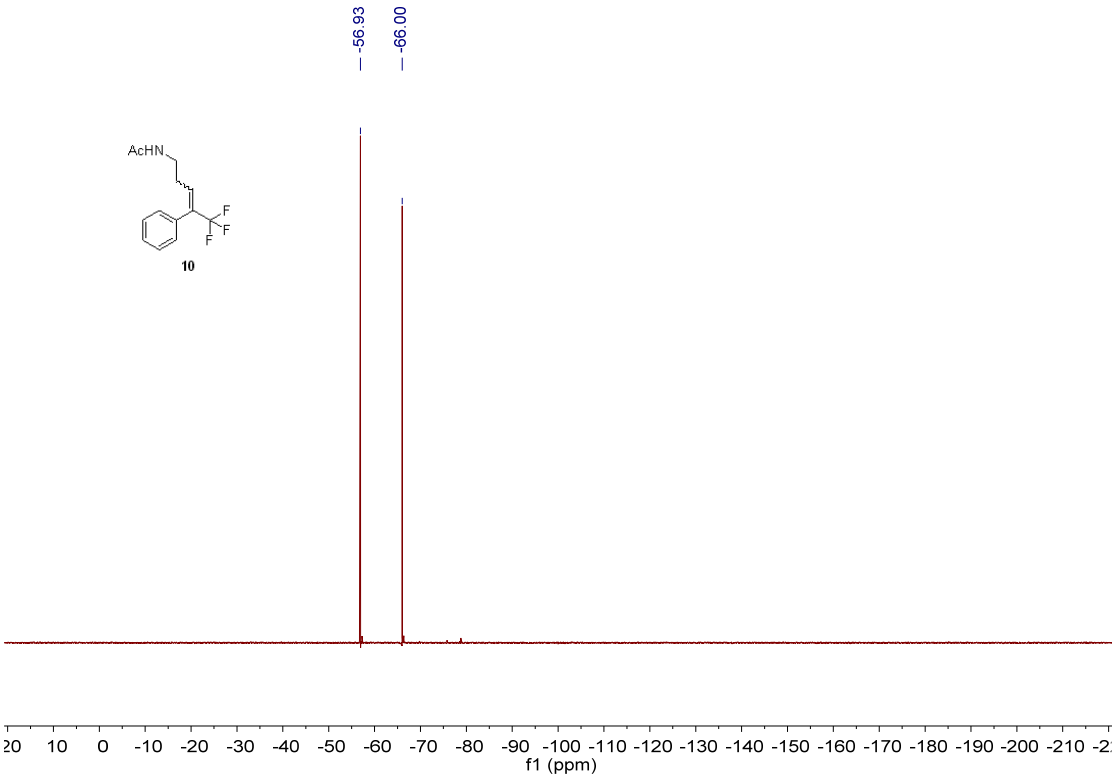
40.08 38.95 38.66 28.97 28.41 23.16 23.14 19.99 13.51
AcHN
F F F
10
f1 (ppm)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-66.00
AcHN
F
F
F
10
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -2
f1 (ppm)