Supporting Information

Photochemical C-F Activation Enables Defluorinative Alkylation of Trifluoroacetates and -Acetamides

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General Considerations:

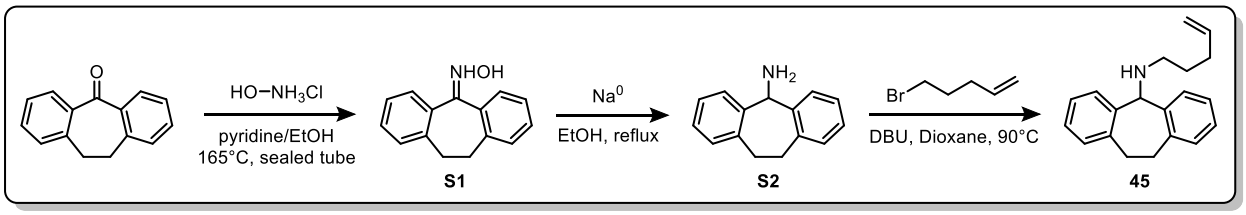
All chemical transformations requiring inert atmospheric conditions or vacuum distillation utilized Schlenk line techniques with a dual-bank manifold. *N,N*-Dimethylformamide was distilled over CaH_2, degassed with argon, and stored over 5 Å molecular sieves. All other reagents were purchased and used as received from their respective suppliers unless otherwise noted. 4-(4-Methoxybenzoyl)benzonitrile (benzophenone **5**) was prepared as outlined in our previous report.[1] Reactions were monitored by ^{1}H NMR, ^{19}F NMR, or TLC using silica gel F254 plates (60 Å porosity, 250 μm thickness). TLC analysis was performed using EtOAc/hexanes and visualized using permanganate stain, ceric ammonium molybdate (Hanessian's) stain, and/or UV light. Flash chromatography was accomplished using an automated system (monitoring at 254 nm and 280 nm in conjunction with an evaporative light scattering detector) with silica cartridges (60 Å porosity, 20-40 μm). Accurate mass measurement analyses were conducted using electron ionization (EI) or electrospray ionization (ESI). The signals were mass measured against an internal lock mass reference of perfluorotributylamine (PFTBA) for EI-GCMS, and leucine enkephalin for ESI-LCMS. The utilized software calibrates the instruments and reports measurements by use of neutral atomic masses. The mass of the electron is not included. IR spectra were recorded using either neat oil or solid products. Data are presented as follows: wavenumber (cm^{-1}) peak shape/intensity (w = weak, m = medium, s = strong, vs = very strong, br = broad). Melting points (°C) are uncorrected. NMR spectra [^{1}H, ^{13}C (^{1}H decoupled), ^{11}B, ^{19}F (^{1}H coupled and decoupled)] were obtained at 298 K. ^{1}H NMR (600.4 MHz) chemical shifts are referenced to residual, non-deuterated $CHCl_3$ (δ 7.26), DMSO (δ 2.50) or MeOH (δ 3.31). ^{13}C (^{1}H decoupled) NMR (151 MHz) chemical shifts are reported relative to $CDCl_3$ (δ 77.3), DMSO-d_6 (δ 39.5) or CD_3OD (δ 49.1). ^{19}F NMR (471 MHz) spectra are ^{1}H coupled unless otherwise noted. ^{19}F NMR spectra were referenced to either hexafluorobenzene (δ −161.64) or α,α,α-trifluorotoluene (-63.72). Data are presented as follows: chemical shift (ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad), coupling constant *J* (Hz) and integration.

Preparation of Non-Commercial Starting Materials

The following compounds were prepared according to the established procedures, and all spectral data matched that which was reported in the literature:

tert-Butyl 4-methylenepiperidine-1-carboxylate,[2] (3a*R*,6*S*,6a*R*)-2,2-dimethyl-5-vinyltetrahydro furo[2,3-d][1,3]dioxol-6-yl acetate,[3] 4-(3,3-dimethylbut-1-en-2-yl)morpholine, (3a*R*,5a*R*,8a*S*, 8b*R*)-2,2,7,7-tetramethyl-5-methylenetetrahydro-5H-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran,[4] *tert*-butyl ((3,3-dimethylbut-1-en-2-yl)oxy)dimethylsilane,[5] (*Z*)-(p rop-1-en-1-yloxy)menthol[6] N-phenylhex-5-enamide.[7]

N-(Pent-4-en-1-yl)-10,11-dihydro-5H-dibenzo[7]annulen-5-amine, S1



10,11-Dihydro-5H-dibenzo[7]annulen-5-one oxime (S1): Dibenzosuberone (4.10 g, 19.7 mmol, 1.0 equiv) and hydroxylamine hydrochloride (10.26 g, 147.5 mmol, 7.5 equiv) were added to a 250 mL screw cap tube and dissolved in EtOH/pyridine (4:1, 75 mL). The tube was then tightly capped and heated to 165 °C for 12 h. The reaction was removed from the heating bath and allowed to come to rt before opening the cap. The mixture was then partitioned between aq HCl (100 mL, 2 M) and $CHCl_3$ (150 mL), and the layers were separated. The aq layer was extracted with an additional portion of $CHCl_3$ (100 mL), and the combined organic extracts were washed with brine, dried (Na_2SO_4), and the solvent was removed via rotary evaporation to yield a light brown solid, which was recrystallized from cyclohexane and a minimal amount of $CHCl_3$ to yield the desired product as an off-white powdered solid (2.95 g, 67%). All spectral data matched that reported in the literature.[8]

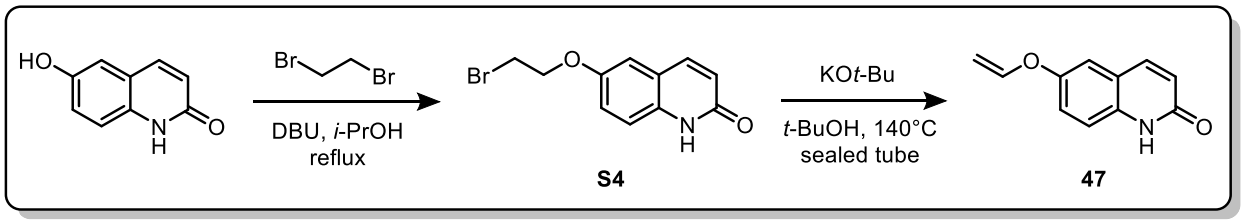
10,11-Dihydro-5H-dibenzo[7]annulen-5-amine (S2): 10,11-Dihydro-5H-dibenzo[7]annulen-5-one oxime, **S1**, (2.70 g, 12.1 mmol, 1.0 equiv) was added to a 250 mL round-bottom flask and dissolved in anhyd EtOH (100 mL), and the reaction solution was heated to a gentle reflux. Solid

Na ribbon (~3.4 g, 145 mmol, 12 equiv) was added in small portions while refluxing under air. Each ribbon reacted vigorously on the surface of the soln, and the reaction was judged to be complete when sodium ribbon was added and was not consumed. The reaction was then removed from the heating bath, allowed to return to rt ,and slowly quenched with sat. aq NH_4Cl (100 mL). The soln was concentrated to approximately half the total volume by rotary evaporation. The resulting soln was diluted with brine (50 mL) and extracted with $CHCl_3$ (3 x 50 mL). The combined organic extracts were dried (Na_2SO_4), and the solvent was removed via rotary evaporation to yield the desired compound as a tan crystalline solid (2.45 g, 97% yield). All spectral data matched that reported in the literature.[8]

***N*-(Pent-4-en-1-yl)-10,11-dihydro-5H-dibenzo[7]annulen-5-amine, 45:** To a 25 mL microwave vial was added 10,11-dihydro-5H-dibenzo[7]annulen-5-amine, **S2**, (1.08 g, 5.16 mmol, 1.0 equiv). The vial was sealed and placed under an argon atmosphere. Dioxane (5 mL), DBU (1.56 mL, 10.3 mmol, 2.0 equiv) and 5-bromo-1-pentene (920 µL, 7.74 mmol, 1.5 equiv) were each added via syringe. The reaction was then heated to 90 °C for 16 h. The solvent was then removed via rotary evaporation, and the crude material was purified via automated flash silica column chromatography to yield the desired compound as a dense, yellow oil (0.840 g, 59% yield).

^{1}H NMR ($CDCl_3$, 600 MHz) δ ppm 7.27 (d, *J* = 8.8, 2H), 7.19-7.10 (m, 6H), 5.77 (ddt, *J* = 16.9, 10.1, 6.7 Hz, 1H), 4.96 (dd, *J* = 17.1, 1.8 Hz, 1H), 4.91 (d, *J* = 10.1 Hz, 1H), 4.81 (s, 1H), 3.78-3.68 (m, 2H), 3.02-2.93 (m, 2H), 2.56 (t, *J* = 7.0 Hz, 2H), 2.07 (q, *J* = 7.2 Hz, 2H), 1.60-1.53 (m, 2H), 1.44 (br s, 1H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 140.9, 140.2, 138.9, 130.7, 129.2, 127.6, 126.1, 114.8, 48.2, 32.7, 31.9, 29.8. **FT-IR** (cm^{-1}, neat, ATR) 3270 (w), 3062 (w), 1443 (m). **HRMS** (ESI) calcd for $C_{20}H_{24}N$ [M + H^+]: 278.1909, found: 278.1916.

6-(Vinyloxy)quinolin-2(1H)-one, S5



6-(2-Bromoethoxy)quinolin-2(1H)-one, S4: 6-Hydroxyquinolin-2(1H)-one (5.00 g, 31.0 mmol, 1.0 equiv) was added to a 250 mL round-bottom flask and dissolved in *i*-PrOH (125 mL). DBU (7.02 mL, 46.5 mmol, 1.5 equiv) and 1,2-dibromoethane (6.71 mL, 77.6 mmol, 2.5 equiv) were added via syringe, and the flask was fitted with a reflux condenser and heated to 110 °C. After 16 h, the reaction had reached approximately 50% conversion, and so an additional portion of DBU (7.02 mL, 46.5 mmol, 1.5 equiv) and 1,2-dibromoethane (6.71 mL, 77.6 mmol, 2.5 equiv) were added via syringe, and the reaction was heated for an additional 16 h. The reaction was then removed from the heat and concentrated to dryness via rotary evaporation. The crude material was then passed through a short silica plug, eluting with EtOAc/EtOH (9:1). The solvent was then removed to yield the desired compound as a light brown powdered solid (3.32 g, 40%). All spectral data matched that reported in the literature.[9]

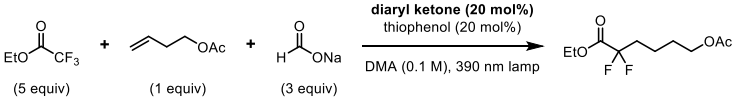
6-(Vinyloxy)quinolin-2(1H)-one, 47: 6-(2-Bromoethoxy)quinolin-2(1H)-one (710 mg, 2.65 mmol, 1.0 equiv) and KO*t*-Bu (1.49 g, 13.2 mmol, 5.0 equiv) were added to a 100 mL screw cap tube and dissolved in anhyd *t*-BuOH (12 mL). The tube was tightly sealed and heated to 140 °C for 16 h. The reaction was then concentrated to dryness via rotary evaporation, and the crude material was passed through a short silica plug, eluting with EtOAc/EtOH (9:1). The solvent was then removed to yield the desired compound as a white powdered solid (491 mg, 99%; mp = 195-205 °C decomp).

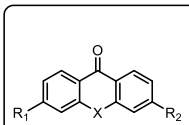
^{1}H NMR ($CDCl_3$, 600 MHz) δ ppm 11.72 (s, 1H), 7.86 (d, J = 9.5 Hz, 1H), 7.37 (d, J = 2.7 Hz, 1H), 7.31-7.24 (m, 2H), 6.85 (dd, J = 13.7, 6.0 Hz, 1H), 6.52 (d, J = 9.6 Hz, 1H), 4.70 (d, J = 13.5 Hz, 1H), 4.47 (d, J = 5.8 Hz, 1H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 161.6, 150.7, 148.9, 139.6, 135.0, 122.7, 120.9, 119.7, 116.6, 114.1, 94.8. **FT-IR** (cm^{-1}, neat, ATR) 3360 (br), 1661 (vs), 1621 (s), 1427 (m). **HRMS** (ESI) calcd for $C_{11}H_{10}NO_2$ [M + H^+]: 188.0712, found: 188.0697.

Optimization of DFA of Ethyl Trifluoroacetate

General Procedure: To a 1-dram, septum cap vial was added diaryl ketone (0.005 g, 0.02 mmol, 0.20 equiv), sodium formate (0.025 g, 0.30 mmol, 3.0 equiv), and alkene (0.10 mmol, 1.0 equiv), if solid. Anhyd solvent (1.0 mL) was then added, the vial capped, and the reaction soln was sparged with argon for 60 sec. Ethyl trifluoroacetate (60 µL, 0.50 mmol, 5.0 equiv), thiol (0.02 mmol, 0.20 equiv), and alkene (0.10 mmol, 1.0 equiv), if liquid, were added by syringe, and the vial was sealed with Parafilm®. The reaction was then irradiated with a Kessil® PR160-390 nm lamp at a distance of 2 cm. The reaction was cooled with two compact fans ensuring that the surface temperature of the vial did not exceed 35 °C. After 16 h of irradiation, the reaction was quenched slowly with distilled H_2O (1 mL) and extracted with Et_2O (2 x 2 mL). The combined organic extracts were washed with H_2O (1 mL) followed by brine (1 mL), dried (Na_2SO_4), and the solvent was removed via rotary evaporation. The crude reaction material was analyzed by either GCMS using 4,4'-di-*tert*-butylbiphenyl as an internal standard (uncorrected P/IS values) or ^{19}F NMR in $CDCl_3$ using 5-bromo-3-trifluoromethyl pyridine as an internal standard.

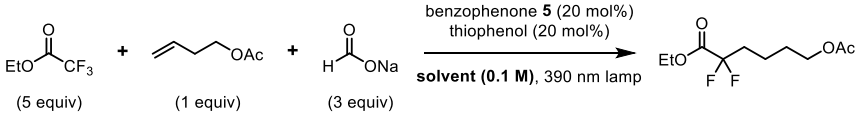
Table S1: Optimization of Diaryl Ketone Catalyst





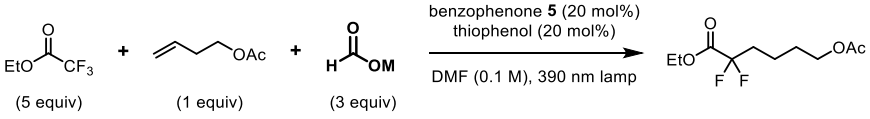
R_1 / R_2 / X	GCMS P/IS ratio
CN / OMe / H,H	2.77
CF_3 / OMe / H,H	2.12
Ac / OMe / H,H	2.44
Cl / Cl / H,H	1.52
F / F / H,H	2.34
OH /H / H,H	2.20
H / H / O	1.95

Table S2: Optimization of Solvent



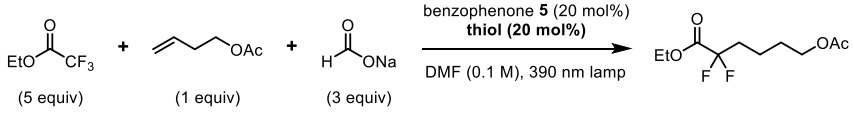
solvent	GCMS P/IS ratio
DMA	2.77
DMSO	4.26
DMF	5.22
NMP	2.34
2-Pyrrolidone	2.66

Table S3: Optimization of Formate Cation



M^+	GCMS P/IS ratio
Na	5.22
Li	2.02
K	0.96
Cs	1.05
NH_4, NEt_4, NBu_4	< 0.50

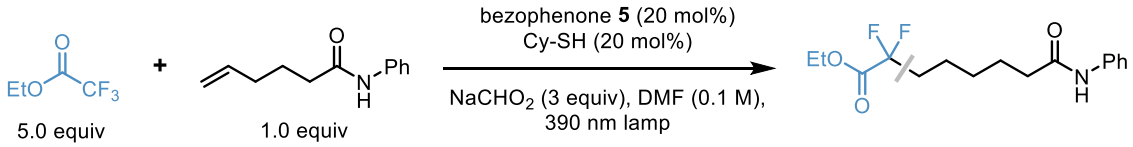
Table S4: Optimization of Thiol



thiol	GCMS P/IS ratio
Ph-SH	5.22
Cy-SH	6.30
Mes-SH	< 0.50
TRIP-SH	< 0.50
Mesna	< 0.50

(Mes-SH = 2,4,6-trimethylthiophenol, TRIP-SH = 2,4,6-triisopropylthiophenol, Mesna = sodium 2-mercaptoethanesulfonate)

Table S5: Final Optimization Data

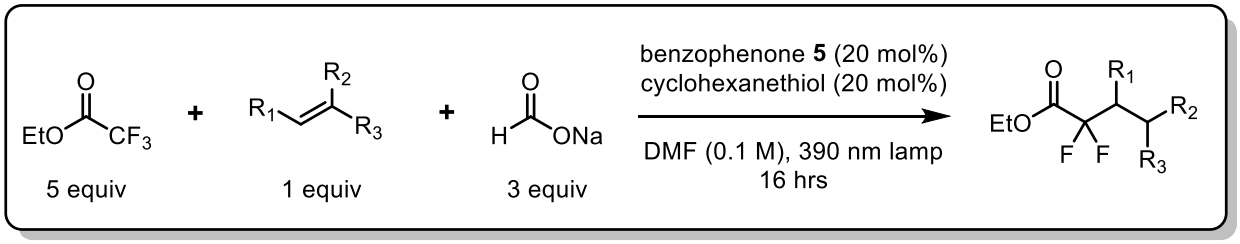


Entry	Variation of Conditions	^{19}F NMR Yield
1	none	99%
2	CzIPN instead of benzophenone **5**	29%
3	DPAIPN instead of benzophenone **5**	61%
4	1 mol% benzophenone **5**	90%
5	w/out benzophenone **5**	42%
6	w/out light	0%
7	$(CyS)_2$ instead of CySH	90%*
8	1 h instead of 16 h	98%
9	"zero precautions"	60%

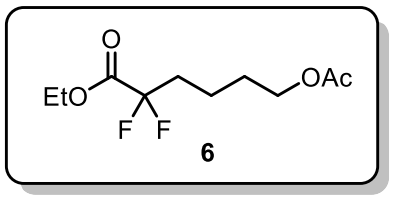
*additional byproducts present

- CzIPN = 2,4,5,6-Tetrakis(9*H*-carbazol-9-yl) isophthalonitrile, DPAIPN = 2,4,5,6-Tetrakis(*N,N*-diphenylamino) isophthalonitrile
- In the case of $(CyS)_2$ we observed larger amounts of thiol radical addition to the alkene
- The formation of the desired product in the absence of benzophenone **5** is due to the presence of trace disulfide impurities in commercial cyclohexanethiol that could not be removed.
- "Zero precautions" indicates that non-anhydrous solvent was used, and the reaction was capped under air without sparging.

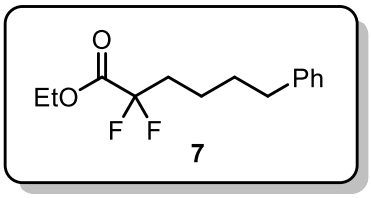
General Procedure A: DFA of Ethyl Trifluoroacetate



To a 2 dram, septum capped vial was added was added benzophenone **5** (0.024 g, 0.1 mmol, 0.20 equiv), sodium formate (0.102 g, 1.50 mmol, 3.0 equiv) and alkene (0.50 mmol, 1.0 equiv), if solid. Anhyd DMF (5.0 mL) was then added, the vial was capped, and the reaction soln was sparged with argon for 2 min. Ethyl trifluoroacetate (300 µL, 2.50 mmol, 5.0 equiv), cyclohexanethiol (12 µL, 0.10 mmol, 0.20 equiv) and alkene (0.50 mmol, 1.0 equiv), if liquid, were added by syringe, and the vial was sealed with Parafilm. The reaction was then irradiated with a Kessil® PR160-390 nm lamp at a distance of 2 cm. The reaction was cooled with two compact fans, ensuring that the surface temperature of the vial did not exceed 35 °C. After 16 h of irradiation, the reaction was quenched slowly with distilled H_2O (20 mL) and extracted with either Et_2O or EtOAc (2 x 25 mL). The combined organic extracts were washed with H_2O (25 mL) followed by brine (10 mL), dried (Na_2SO_4), and the solvent was removed via rotary evaporation. The crude material was then redissolved in CH_2Cl_2 and evaporated onto 5 g of silica to be purified via automated flash silica column chromatography.

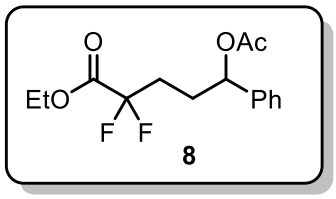


Ethyl 6-Acetoxy-2,2-difluorohexanoate, 6 (0.110 g, 98%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.33 (q, J = 7.1 Hz, 2H), 4.07 (t, J = 6.4 Hz, 2H), 2.13-2.06 (m, 2H), 2.05 (s, 3H), 1.72-1.67 (m, 2H), 1.59-1.54 (m, 2H), 1.35 (t, J = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 171.4, 164.5 (t, J = 31 Hz), 116.4 (t, J = 250 Hz), 64.0, 63.1, 34.3 (t, J = 23 Hz), 28.3, 21.2, 18.5 (t, J = 4.7 Hz), 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -107.1 (t, J = 15 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2963 (w), 1725 (m), 1142 (vs), 1075, 726 (m). **HRMS** (EI) calcd for $C_8H_{14}F_2O_3$ [M – CH_3CO^+]: 196.0911, found: 196.0903.



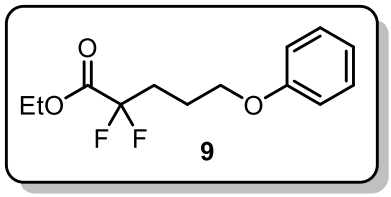
7

Ethyl 2,2-Difluoro-6-phenylhexanoate, 7 (0.102 g, 80%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.28 (t, *J* = 7.5 Hz, 2H), 7.21 – 7.14 (m, 3H), 4.31 (q, *J* = 7.2 Hz, 2H), 2.63 (t, *J* = 7.7 Hz, 2H), 2.15 – 2.03 (m, 2H), 1.73 – 1.63 (m, 2H), 1.55 – 1.48 (m, 2H), 1.33 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.6 (t, *J* = 33 Hz), 142.1, 128.7, 128.6, 126.2, 116.6 (t, *J* = 250.1 Hz), 63.0, 35.8, 34.6 (t, *J* = 23 Hz), 31.1, 21.4, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.8 (t, *J* = 16.8 Hz). **FT-IR** (cm^{-1}, neat, ATR) 2930 (w), 1761 (s), 1178 (s), 1094 (vs). **HRMS** (EI) calcd for $C_{14}H_{18}F_2O_2$ [M^+]: 256.1275, found: 256.1288.



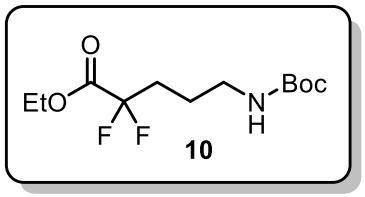
8

Ethyl 5-Acetoxy-2,2-difluoro-5-phenylpentanoate, 8 (0.131 g, 87%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.38-7.34 (m, 2H), 7.33-7.29 (m, 3H), 5.77 (t, *J* = 6.4 Hz, 1H), 4.31 (q, *J* = 7.1 Hz, 2H), 2.17-1.97 (m, 7H), 1.33 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 170.4, 164.3 (t, *J* = 33 Hz), 139.8, 128.9, 128.6, 126.6, 116.10 (t, *J* = 251 Hz), 74.9, 63.2, 31.0 (t, *J* = 24 Hz), 28.5 (t, *J* = 4.2 Hz), 21.4, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.14 (s, 1F), -106.16 (s, 1F). **FT-IR** (cm^{-1}, neat, ATR) 2941 (w), 1737 (s), 1228 (s), 1022 (vs). **HRMS** (EI) calcd for $C_{13}H_{15}F_2O_3$ [M - CH_3CO^+]: 257.0989, found: 257.0994.

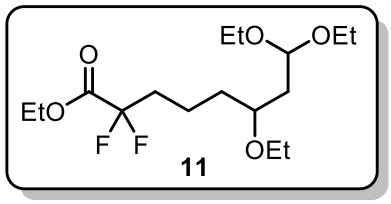


9

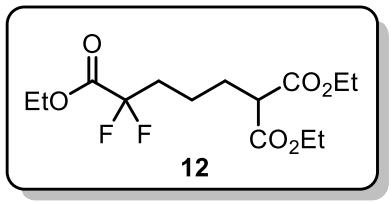
Ethyl 2,2-Difluoro-5-phenoxypentanoate, 9 (0.078 g, 60%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.28 (t, *J* = 7.7 Hz, 2H), 6.95 (t, *J* = 7.4 Hz, 1H), 6.89 (d, *J* = 8.7 Hz, 2H), 4.33 (q, *J* = 7.2 Hz, 2H), 4.01 (t, *J* = 6.1 Hz, 2H), 2.35 – 2.24 (m, 2H), 2.03 – 1.96 (m, 2H), 1.35 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.5 (t, *J* = 33 Hz), 158.9, 129.8, 121.2, 116.4 (t, *J* = 251 Hz), 114.7, 66.67, 63.18, 31.7 (t, *J* = 24 Hz), 22.0 (t, *J* = 4 Hz), 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.1 (t, *J* = 18 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2936 (w), 1762 (s), 1498 (m), 1243 (vs), 1193 (vs). **HRMS** (EI) calcd for $C_{13}H_{16}F_2O_3$ [M^+]: 258.1068, found: 258.1082.



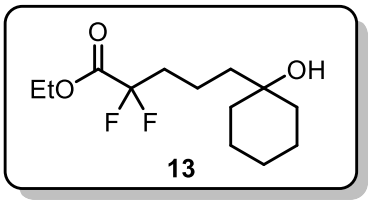
Ethyl 5-((*tert*-Butoxycarbonyl)amino)-2,2-difluoropentanoate, 10 (0.112 g, 80%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.58 (br s, 1H), 4.32 (q, *J* = 7.1 Hz, 2H), 3.21-3.14 (m, 2H), 2.15-2.04 (m, 2H), 1.72-1.66 (m, 2H), 1.44 (s, 9H), 1.35 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.4 (t, *J* = 33.2 Hz), 156.2, 116.3 (t, *J* = 252 Hz), 79.7, 63.2, 40.0, 32.0 (t, *J* = 24 Hz), 28.6, 22.6, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.9 (t, *J* = 17 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3410 (br), 2979 (w), 1761 (s), 1689 (vs), 1249 (s), 1168 (vs). **HRMS** (ESI) calcd for $C_8H_{13}F_2NO_4$ [M – *t*-Bu + H^+]: 225.0813, found: 225.0824.



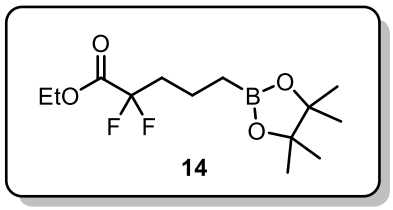
Ethyl 6,8,8-Triethoxy-2,2-difluorooctanoate, 11 (0.105 g, 62%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.63 (dd, *J* = 7.3, 4.3 Hz, 1H), 4.31 (q, *J* = 7.1 Hz, 2H), 3.71-3.57 (m, 2H), 3.54-3.43 (m, 4H), 3.41-3.37 (m, 1H), 2.17-2.00 (m, 2H), 1.80 (ddd, *J* = 14.2, 8.1, 4.3 Hz, 1H), 1.69 (ddd, *J* = 14.1, 7.3, 4.5 Hz, 1H), 1.58-1.45 (m, 4H), 1.34 (t, *J* = 7.1 Hz, 3H), 1.20 (q, *J* = 7.0 Hz, 6H), 1.16 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.6 (t, *J* = 33 Hz), 116.5 (t, *J* = 250 Hz), 100.9, 75.7, 64.8, 63.0, 61.7, 61.6, 39.0, 34.9 (t, *J* = 23 Hz), 34.1, 17.6 (t, *J* = 4.3 Hz), 15.9, 15.7, 15.6, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.8 (t, *J* = 18.2 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2975 (w), 1766 (m), 1097 (vs), 1059 (vs). **HRMS** (EI) calcd for $C_{14}H_{25}F_2O_5$ [M – Et^+]: 311.1670, found: 311.1676.



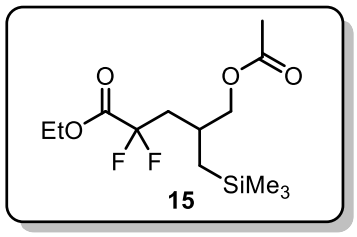
Triethyl 5,5-Difluoropentane-1,1,5-tricarboxylate, 12 (0.159 g, 98%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ ppm 4.32 (q, *J* = 7.1 Hz, 2H), 4.20 (qd, *J* = 7.2, 3.2 Hz, 4H), 3.32 (t, *J* = 7.5 Hz, 1H), 2.15-2.04 (m, 2H), 1.98-1.91 (m, 2H), 1.56-1.50 (m, 2H), 1.35 (t, *J* = 7.1 Hz, 3H), 1.27 (t, *J* = 7.1 Hz, 6H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 169.3, 164.4 (t, *J* = 33 Hz), 116.2 (t, *J* = 250 Hz), 63.1, 61.8, 51.9, 34.4 (t, *J* = 23 Hz), 28.4, 19.7 (t, *J* = 4.4 Hz), 14.3, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.0 (t, *J* = 16.8 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2982 (w), 1750 (vs), 1730 (vs), 1252 (m), 1155 (vs), 1097 (vs). **HRMS** (EI) calcd for $C_{14}H_{22}F_2O_6$ [M^+]: 324.1384, found: 324.1398.



Ethyl 2,2-Difluoro-5-(1-hydroxycyclohexyl)pentanoate, 13 (0.119 g, 90%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.30 (q, *J* = 7.1 Hz, 2H), 2.10-1.98 (m, 2H), 1.60-1.37 (m, 13H), 1.36-1.19 (m, 5H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.6 (t, *J* = 33 Hz), 116.5 (t, *J* = 250 Hz), 71.4, 63.0, 41.8, 37.6, 35.2 (t, *J* = 23 Hz), 26.0, 22.4, 15.5 (t, *J* = 4.4 Hz), 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.7 (t, *J* = 16.8 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3427 (br), 2930 (m), 1760 (vs), 1187 (m). **HRMS** (EI) calcd for $C_{13}H_{22}F_2O_3$ [M^+]: 264.1537, found: 264.1532.

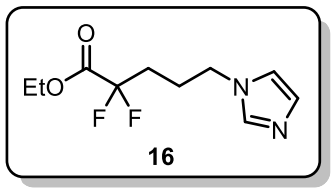


Ethyl 2,2-Difluoro-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)pentanoate, 14 (3.71 g, 50%) was prepared according to General Procedure A from with the following modification: 25.0 mmol scale with 5.0 mol % of benzophenone catalyst **5** was used. Vacuum distillation (bp = 88-100 °C, 0.3 mm Hg) afforded the title product as a clear, colorless oil. **^{1}H NMR** ($CDCl_3$, 500 MHz) ppm δ 4.31 (q, *J* = 7.1 Hz, 2H), 2.12-2.02 (m, 2H), 1.63-1.53 (m, 2H), 1.34 (t, *J* = 7.2 Hz, 3H), 1.23 (s, 12H), 0.82 (t, *J* = 7.8 Hz, 2H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.6 (t, *J* = 33 Hz), 116.5 (t, *J* = 250 Hz), 83.3, 62.8, 36.9 (t, *J* = 23 Hz), 24.9, 16.4 (t, *J* = 4.4 Hz), 14.1 (s). **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.8 (t, *J* = 18.3 Hz, 2F). **^{11}B NMR** ($CDCl_3$, 128 MHz) δ ppm 33.0. **FT-IR** (cm^{-1}, neat, ATR) 2980 (w), 1767 (m), 1372 (s), 1143 (vs). **HRMS** (ESI) calcd for $C_{13}H_{23}BF_2O_4$ [M^+]: 293.1736, found: 293.1737.



Ethyl 5-Acetoxy-2,2-difluoro-4-((trimethylsilyl)methyl) pentanoate, 15 (0.069 g, 44%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.32 (q, *J* = 7.1 Hz, 2H), 4.03 (dd, *J* = 11.0, 4.6 Hz, 1H), 3.89 (dd, *J* = 11.0, 6.1 Hz, 1H), 2.30-2.22 (m, 1H), 2.21-2.15 (m, 1H), 2.06 (s, 3H), 2.12-1.98 (m, 1H), 1.35 (t, *J* = 7.2 Hz, 3H), 0.68 (dd, *J* = 12.4, 6.9 Hz, 2H), 0.04 (s, 9H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 171.2, 164.5 (t, *J* = 33 Hz), 116.4 (t, *J* = 2.2 Hz), 68.5, 63.2, 39.1 (t, *J* = 22 Hz), 29.0 (t, *J* = 3.3 Hz), 21.1, 20.4, 14.2, -0.7. **^{19}F NMR** ($CDCl_3$, 471 MHz, with ^{1}H decoupling) δ ppm -103.2 (d, *J* = 260.9 Hz,

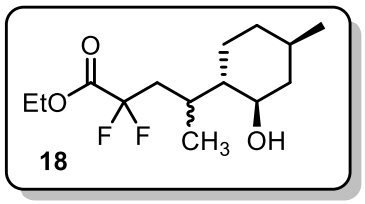
1F), -104.1 (d, $J_{F\text{-}F}$ = 260.9 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 3346 (br), 2955 (w), 1742 (s), 1231 (vs), 1042 (m). **HRMS** (EI) calcd for $C_{12}H_{21}F_2O_4Si$ [M – CH_3^+]: 295.1177, found: 295.1186.



16

Ethyl 2,2-Difluoro-5-(1H-imidazol-1-yl)pentanoate, 16 (0.072 g, 62%) was prepared according to General Procedure A with the following modifications: 5.0 equiv of sodium formate and 10.0 equiv of ethyl trifluoroacetate were used. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.48 (s, 1H), 7.08 (s, 1H), 6.91 (s, 1H), 4.32 (q, *J* = 7.1 Hz, 2H), 4.03 (t, *J* = 6.5 Hz, 2H), 2.08-1.99 (m, 4H), 1.34 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.1 (t, *J* = 32.6 Hz), 137.4, 130.2, 118.8, 115.9 (t, *J* = 251.0 Hz), 63.4, 46.2, 31.5 (t, *J* = 23.7 Hz), 23.6 (t, *J* = 4.0 Hz), 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.8 (t, *J* = 16.8 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2963 (w), 1725 (m), 1142 (vs), 1075, 726 (m). **HRMS** (ESI) calcd for $C_{10}H_{14}F_2N_2O_2$ [M^+]: 233.1102, found: 233.1108.

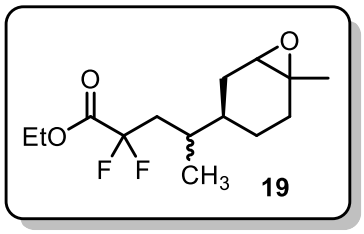
***tert*-Butyl 4-(3-Ethoxy-2,2-difluoro-3-oxopropyl)piperidine-1-carboxylate, 17** (0.135 g, 84%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.33 (q, *J* = 7.1 Hz, 2H), 4.06 (br s, 2H), 2.75-2.65 (br m, 2H), 2.02 (td, *J* = 17.8, 6.4 Hz, 2H), 1.82-1.76 (m, 1H), 1.74 (d, 2H), 1.45 (s, 9H), 1.36 (t, *J* = 7.1 Hz, 3H), 1.27-1.15 (m, 2H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.7 (t, *J* = 33 Hz), 155.0, 116.4 (t, *J* = 251 Hz), 79.8, 63.20, 40.9 (t, *J* = 22 Hz), 32.6, 30.7 (t, *J* = 3.3 Hz), 28.7, 14.3. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -103.6 (d, *J* = 108 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2925 (w), 1766 (s), 1690 (vs), 1168 (s). **HRMS** (ESI) calcd for $C_{15}H_{25}F_2NO_4$ [M^+]: 321.1752, found: 321.1783.



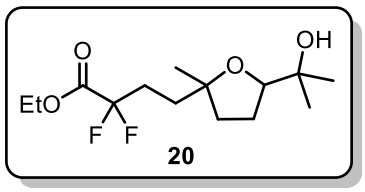
18

Ethyl 2,2-Difluoro-4-((1*S*,2*R*,4*R*)-2-hydroxy-4-methyl cyclohexyl)pentanoate, 18 (0.128 g, 92%) was prepared according to General Procedure A. The diastereomeric ratio was determined to be 1.2:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.32 (q, *J* = 7.1 Hz, 2H), 3.40 (td, *J* = 10.4, 4.4 Hz, 1H), 2.44 (q, *J* = 7.8 Hz, 1H), 2.13-1.94 (m, 3H), 1.68 (d, *J* = 12.5 Hz, 1H), 1.55 (dq, *J* = 13.3, 3.4 Hz, 1H), 1.48-1.38 (m, 2H), 1.35 (t, *J* = 7.2 Hz, 3H), 1.29-1.16 (m, 1H), 1.04 (qd, *J* = 13.0, 3.5 Hz, 1H), 0.99-0.93 (m, 1H), 0.91 (t, *J* = 6.8 Hz, 6H), 0.88-0.82 (m, 1H). **^{13}C**

NMR ($CDCl_3$, 151 MHz) δ ppm 165.1 (t, J = 33 Hz), 117.5 (dd, J = 252, 250 Hz), 71.0, 63.2, 50.7, 45.0, 37.1 (t, J = 22 Hz), 34.7, 31.9, 26.7 (dd, J = 4.0, 1.7 Hz), 25.1, 22.4, 18.8, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -102.9, -103.8 (ABq, J_{AB} = 258 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3415 (br), 2987 (m), 1766 (s), 1130 (m), 1190 (s). **HRMS** (ESI) calcd for $C_{14}H_{25}F_2O_3$ [M + H$^+$]: 279.1772, found: 279.1742.

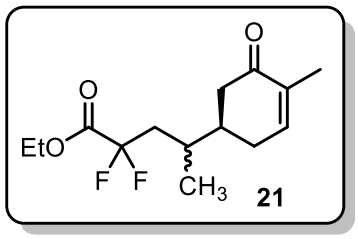


Ethyl 2,2-Difluoro-4-((3*R*)-6-methyl-7-oxabicyclo[4.1.0] heptan-3-yl)pentanoate, 19 (0.108 g, 82%) was prepared according to General Procedure A. The diastereomeric ratio was determined to be 3.6:3.1:1.4:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.31 (q, J = 7.2, 2H), 3.17-2.87 (m, 1H), 2.23-1.96 (m, 2H), 1.94-1.53 (m, 5H), 1.51-1.43 (m, 1H), 1.34 (t, J = 7.1 Hz, 3H), 1.29 (d, J = 2.5 Hz, 3H), 1.23-0.96 (m, 2H), 0.96-0.84 (m, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.79 and 164.78 and 164.76 (t, J = 33 Hz), 116.98 and 116.96 and 116.94 (t, J = 251 Hz), 63.1, 61.04, 60.98, 59.6, 59.5, 58.1, 58.0, 57.80, 57.76, 39.0, 38.9, 38.8, 38.74, 38.69, 38.54, 38.47, 38.46, 38.39, 38.36, 38.33, 38.31, 38.18, 38.16, 34.7, 34.6, 31.50 and 31.4 and 31.2 (t, J = 2.6 Hz), 31.09, 31.07, 31.05, 30.95, 30.6, 30.0, 29.5, 29.4, 29.3, 28.3, 27.8, 26.6, 25.5, 24.7, 24.6, 24.1, 23.27, 23.26, 22.7, 21.5, 17.02 (t, J = 17 Hz), 16.95, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -103.4 – -106.5 (m, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2966 (w), 1765 (s), 1189 (s), 1028 (vs). **HRMS** (EI) calcd for $C_{14}H_{22}F_2O_3$ [M$^+$]: 276.1537, found: 276.1547.

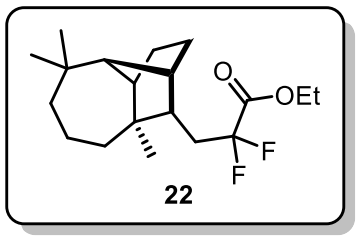


Ethyl 2,2-Difluoro-4-(5-(2-hydroxypropan-2-yl)-2-methyl tetrahydrofuran-2-yl)butanoate, 20 (0.087 g, 59%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.33 (q, J = 7.2 Hz, 2H), 3.79 and 3.71 (dd, J = 8.3, 6.5 Hz and dd, J = 8.9, 6.1 Hz, 1H), 2.34-2.08 (m, 2H), 1.92-1.60 (m, 7H), 1.36 and 1.35 (t, J = 7.1, 3H), 1.22-1.19 (m, 6H), 1.12-1.10 (m, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.61 and 164.57 (t, J = 33 Hz), 116.8 (t, J = 250 Hz), 86.0, 85.4, 81.97, 81.92, 71.4, 71.0, 63.2, 63.1, 37.87, 37.86, 33.3 and 32.5 (t, J = 3.7 Hz), 30.18 and 30.13 (t, J = 23 Hz), 27.8, 27.6, 26.7, 26.6, 26.5, 25.6, 24.5, 24.3, 14.3 (d, J = 3.3 Hz). **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -104.7 – -106.7 (m, 2F). **FT-IR** (cm^{-1}, neat, ATR)

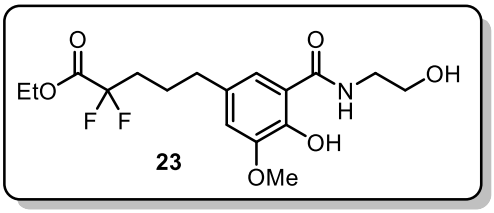
3460 (br), 2974 (w), 1761 (m), 1183 (s), 1066 (vs). **HRMS** (EI) calcd for $C_{13}H_{21}F_2O_4$ [M – Me^+]: 279.1408, found: 279.1413.



Ethyl 2,2-Difluoro-4-((*R*)-4-methyl-5-oxocyclohex-3-en-1-yl)pentanoate, 21 (0.073 g, 53%) was prepared according to General Procedure A with the following modifications: 10.0 equiv of ethyl trifluoroacetate were used. The diastereomeric ratio was determined to be 1:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 6.74-6.73 (m, 1H), 4.33 (q, *J* = 7.1, 2H), 2.49-2.42 (m, 1H), 2.37-2.26 (m, 1H), 2.23-2.04 (m, 4H), 1.99-1.81 (m, 2H), 1.77 (t, *J* = 1.2 Hz, 3H), 1.36 (t, *J* = 7.1 Hz, 3H), 1.02 and 1.01 (d, *J* = 3.5 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 200.0, 199.9, 164.6 (t, *J* = 33 Hz), 144.9, 144.8, 135.87, 135.85, 116.64 and 116.63 (t, *J* = 251 Hz), 63.3, 42.2, 40.92, 40.86, 40.7, 38.6 and 38.4 (t, *J* = 22 Hz), 31.4 and 31.3 (t, *J* = 2.9 Hz), 30.1, 28.6, 17.1, 17.0, 15.94, 15.93, 14.26. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -102.9 – -105.0 (m, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2981 (w), 1764 (s), 1674 (vs), 1056 (m). **HRMS** (EI) calcd for $C_{14}H_{20}F_2O_3$ [M^+]: 274.1381, found: 274.1376.

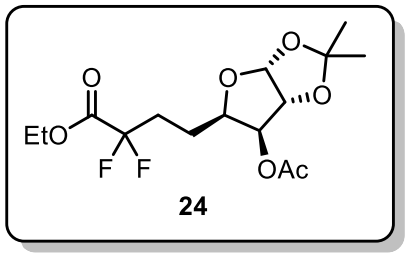


Ethyl 2,2-Difluoro-3-((4*R*,8a*S*,9*R*)-4,8,8-trimethyldecahydro-1,4-methanoazulen-9-yl)propanoate, 22 (0.152 g, 93%) was prepared according to General Procedure A. The diastereomeric ratio was determined to be 1:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.43-4.24 (m, 2H), 2.13-1.93 (m, 4H), 1.73-1.64 (m, 1H), 1.60-1.50 (m, 4H), 1.39-1.29 (m, 10H), 1.00 (s, 3H), 0.94 (s, 3H), 0.77 (s, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 165.1 (t, *J* = 33 Hz), 117.4 (t, *J* = 250 Hz), 63.0, 61.6, 45.1, 43.5, 42.7, 40.98, 40.7, 40.3, 33.5, 33.0, 31.2 (t, *J* = 22 Hz), 29.8, 26.2, 24.9, 21.8, 21.3, 14.3. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -102.6, -104.7 (AB, J_{AB} = 255 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2955 (m), 1767 (s), 1087 (vs). **HRMS** (EI) calcd for $C_{19}H_{30}F_2O_2$ [M^+]: 328.2214, found: 328.2225.



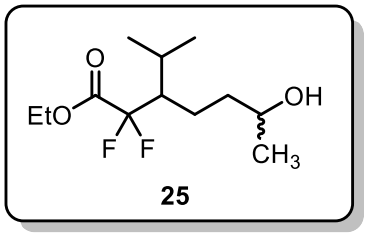
Ethyl 2,2-Difluoro-5-(4-hydroxy-3-((2-hydroxy ethyl) carbamoyl)-5-methoxyphenyl)pentanoate, 23 (0.086 g, 46%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless

oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 11.21 (s, 1H), 7.34 (s, 1H), 6.96 (s, 1H), 6.77 (s, 1H), 4.30 (q, J = 7.1 Hz, 2H), 3.87 (s, 3H), 3.84 (br s, 2H), 3.61 (br s, 2H), 2.73 (br s, 1H), 2.57 (t, J = 7.6 Hz, 2H), 2.08-1.97 (m, 2H), 1.81-1.72 (m, 2H), 1.32 (t, J = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 170.1, 164.6 (t, J = 33 Hz), 148.90, 148.87, 131.4, 117.8, 116.5 (t, J = 251 Hz), 115.2, 115.0, 63.2, 62.2, 56.4, 42.6, 34.9, 33.9 (t, J = 23 Hz), 23.3 (t, J = 3.9 Hz), 14.1. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm 106.7 (t, J = 18.0 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3375 (br), 2937 (w), 1760 (m), 1642 (m), 1265 (vs), 1091 (vs). **HRMS** (ESI) calcd for $C_{17}H_{24}F_2NO_6$ [M + H^+]: 376.1572, found: 376.1560.



24

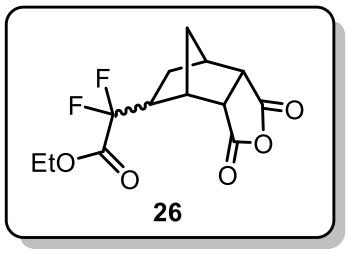
Ethyl 4-((3a*R*,5*R*,6*S*,6a*R*)-6-Acetoxy-2,2-dimethyltetrahydrofuro[2,3-d][1,3]dioxol-5-yl)-2,2-difluorobutanoate, 24 (0.112 g, 64%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 5.88 (d, J = 3.8 Hz, 1H), 5.15 (d, J = 2.9 Hz, 1H), 4.51 (d, J = 3.8 Hz, 1H), 4.31 (q, J = 7.1 Hz, 2H), 4.24 (ddd, J = 8.3, 5.2, 2.9 Hz, 1H), 2.36-2.23 (m, 1H), 2.17-2.05 (m, 4H), 1.90-1.79 (m, 1H), 1.76-1.69 (m, 1H), 1.50 (s, 3H), 1.34 (t, J = 7.1 Hz, 3H), 1.30 (s, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 170.1, 164.3 (t, J = 33 Hz), 116.1 (t, J = 250 Hz), 112.2, 104.7, 83.9, 78.3, 63.2, 31.6 (t, J = 24 Hz), 26.9, 26.4, 21.0, 20.6, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -107.60 (s, 1F), -107.63 (s, 1F). **FT-IR** (cm^{-1}, neat, ATR) 2988 (w), 1745 (m), 1215 (m), 1070 (m). **HRMS** (EI) calcd for $C_{15}H_{22}F_2O_7Na$ [M + Na^+]: 375.1231, found: 375.1225.



25

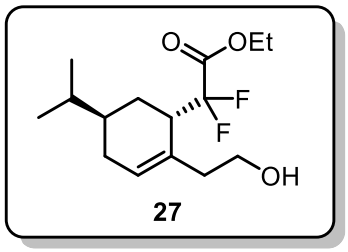
Ethyl 2,2-Difluoro-6-hydroxy-3-isopropylheptanoate, 25 (0.083 g, 59%) was prepared according to General Procedure A. The diastereomeric ratio was determined to be 1:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.31 (q, J = 7.1 Hz, 2H), 3.79-3.73 (m, 1H), 2.09-2.00 (m, 1H), 1.94-1.88 (m, 1H), 1.74-1.64 (m, 1H), 1.57-1.42 (m, 4H), 1.34 (t, J = 7.1 Hz, 3H), 1.19 (d, J = 6.2 Hz, 3H), 0.99 (d, J = 7.0 Hz, 3H), 0.92 (d, J = 6.9 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 165.1 (t, J = 33 Hz), 119.8 and 118.1 (dd, J = 256, 253 Hz), 68.4, 68.2, 63.0, 47.9 and 47.8 (t, J = 20 Hz), 38.9, 38.6, 27.2 (dd, J = 8.5, 4.6 Hz), 23.9, 23.8, 21.8, 20.1 (dd, J = 4.6, 2.5 Hz), 19.9 (dd,

J = 4.5, 2.5 Hz), 18.4, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -104.3 and -104.9 (d, J = 34 Hz, 1F), 109.7 and 110.3 (d, J = 28 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 3380 (br), 2966 (w), 1759 (s), 1073 (s). **HRMS** (EI) calcd for $C_{12}H_{21}F_2O_2$ [M – OH$^+$]: 325.1510, found: 235.1519.



26

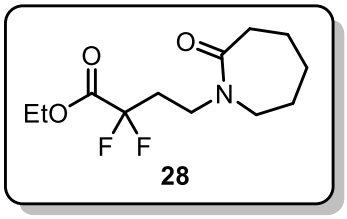
Ethyl 2-((3a*R*,4*R*,7*R*,7a*S*)-1,3-Dioxooctahydro-4,7-methanoisobenzofuran-5-yl)-2,2-difluoroacetate, 26 (0.094 g, 65%) was prepared according to General Procedure A. The diastereomeric ratio was determined to be 2:1 (exo:endo) via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. The exo diastereomer was fully characterized. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.42-4.27 (m, 2H), 3.51-3.42 (m, 2H), 3.01-2.86 (m, 2H), 2.38-2.26 (m, 1H), 1.99 (d, J = 10.8 Hz, 1H), 1.91-1.86 (m, 1H), 1.76 (ddd, J = 14.3, 9.1, 2.6 Hz, 1H), 1.60 (dd, J = 10.9, 2.8 Hz, 1H), 1.36 (t, J = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 171.3, 170.9, 163.5 (t, J = 33 Hz), 115.7 (t, J = 253 Hz), 63.6, 50.2, 49.2, 41.5 (t, J = 23 Hz), 41.2 (t, J = 2.8 Hz), 41.0 (d, J = 2.4 Hz), 39.8, 27.1 (t, J = 2.9 Hz), 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -111.1 (d, J = 15 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2987 (w), 1860 (w), 1780 (s), 1762 (s), 1081 (vs). **HRMS** (EI) calcd for $C_{13}H_{14}F_2O_5$ [M$^+$]: 288.0809, found: 288.0808.



27

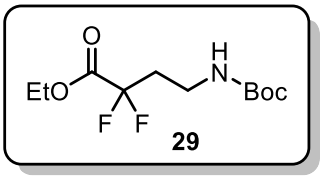
Ethyl 2,2-Difluoro-2-((1*S*,5*R*)-2-(2-hydroxyethyl)-5-isopropylcyclohex-2-en-1-yl)acetate, 27 (0.078 g, 54%) was prepared according to General Procedure A with the following modifications: 5.0 equivalents of sodium formate and 10.0 equivalent of ethyl trifluoroacetate were used. The diastereomeric ratio was determined to be >20:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 5.84 (t, J = 3.0 Hz, 1H), 4.34 (qd, J = 7.1, 2.3 Hz, 2H), 3.74 (dd, J = 7.2, 5.4 Hz, 2H), 2.93 (ddd, J = 16.8, 10.4, 6.1 Hz, 1H), 2.53-2.46 (m, 1H), 2.41-2.34 (m, 1H), 2.16 (td, J = 18.0, 4.9 Hz, 1H), 1.79-1.70 (m, 2H), 1.56-1.47 (m, 2H), 1.40-1.28 (m, 5H), 0.87 (d, J = 6.7 Hz, 6H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.7 (t, J = 33 Hz), 131.1, 128.5 (d, J = 2.1 Hz), 118.1 (dd, J = 258, 253 Hz), 63.1, 60.9, 41.4 (t, J = 21 Hz), 39.7 (d, J = 3.2 Hz), 34.7 (d, J = 2.7 Hz), 32.6, 29.4, 27.5 (d, J = 6.5 Hz), 20.0, 19.7, 14.3. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -99.6 (d, J = 251 Hz, 1F), -107.2 (d, J = 251 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR)

3395 (br), 2958 (m), 1760 (m), 1056 (vs). **HRMS** (EI) calcd for $C_{15}H_{24}F_2O_3Na$ [M + Na^+]: 313.1591, found: 313.1576.



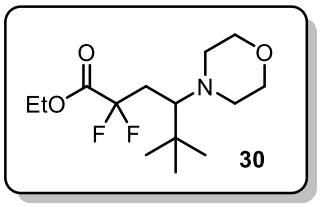
28

Ethyl 2,2-Difluoro-4-(2-oxoazepan-1-yl)butanoate, 28 (0.078 g, 59%) was prepared according to General Procedure A with the following modifications: 10.0 equiv of ethyl trifluoroacetate were used. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.33 (q, *J* = 7.1 Hz, 2H), 3.56 (t, *J* = 7.2 Hz, 2H), 3.37-3.35 (m, 2H), 2.52-2.47 (m, 2H), 2.34 (tt, *J* = 17.1, 7.3 Hz, 2H), 1.76-1.61 (m, 6H), 1.36 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 176.2, 164.1 (t, *J* = 33 Hz), 115.6 (t, *J* = 251 Hz), 63.3, 50.8, 42.7 (t, *J* = 5.2 Hz), 37.5, 33.3 (t, *J* = 23 Hz), 30.2, 28.9, 23.6, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -107.1 (t, *J* = 15.4 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2933 (w), 1761 (s), 1641 (s), 1191 (vs). **HRMS** (ESI) calcd for $C_{12}H_{20}F_2NO_3$ [M + H^+]: 264.1411, found: 264.1391.



29

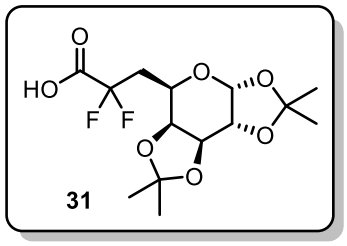
Ethyl 4-((*tert*-Butoxycarbonyl)amino)-2,2-difluorobutanoate, 29 (0.353 g, 66%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.72 (br s, 1H), 4.33 (q, *J* = 7.2 Hz, 2H), 3.36 (q, *J* = 6.1 Hz, 2H), 2.30 (tt, *J* = 16.8, 6.6 Hz, 2H), 1.43 (s, 9H), 1.35 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.3 (t, *J* = 32 Hz), 155.9, 115.9 (t, *J* = 251 Hz), 79.9, 63.3, 35.1 (t, *J* = 23 Hz), 34.3, 28.6, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.71 (t, *J* = 18.3 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3410 (br), 2981 (w), 1762 (s), 1694 (s), 1514 (m), 1166 (s). **HRMS** (ESI) calcd for $C_{11}H_{19}F_2NO_4Na$ [M + Na^+]: 297.1180, found: 297.1203.



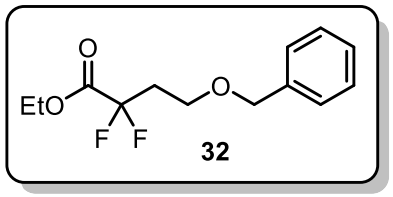
30

Ethyl 2,2-Difluoro-5,5-dimethyl-4-morpholinohexanoate, 30 (0.078 g, 53%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.34 (qd, *J* = 7.2, 4.0 Hz, 2H), 3.58-3.50 (m, 4H), 2.83-2.75 (m, 2H), 2.72-2.68 (m, 2H), 2.51-2.48 (m, 1H), 2.48-2.38 (m, 1H), 2.04 (dq, *J* = 15.7, 1.4 Hz, 1H), 1.36 (t, *J* = 7.1 Hz, 3H), 0.95 (s, 9H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.8 (t, *J* = 33.0 Hz), 116.7 (dd, *J* = 247.6, 252.2 Hz), 67.7, 67.3 (dd, *J* = 5.0, 2.3 Hz), 63.0, 51.3, 38.2, 32.4 (t, *J* = 23.5 Hz), 28.5, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -102.1 (d, *J* =

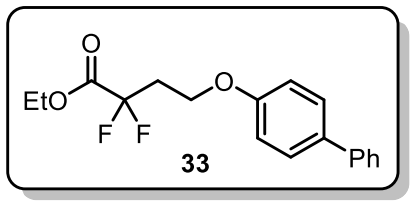
259 Hz, 1F), -107.7 (d, J = 257 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 2956 (w), 1767 (m), 1292 (m), 1168 (s). **HRMS** (EI) calcd for $C_{13}H_{22}F_2NO_3$ [M – CH_3^+]: 278.1568, found: 278.1561.



2,2-Difluoro-3-((3aR,5R,5aS,8aS,8bR)-2,2,7,7-tetramethyl tetrahydro-5H-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-yl) propanoic acid, 31 (0.135 g, 74%) was prepared according to General Procedure A. The desired compound was isolated as the corresponding carboxylic acid, a dense, colorless oil, after treatment with 2 M aq NaOH followed by neutralization with conc. HCl and extraction with EtOAc (3 x 10 mL). The diastereomeric ratio was determined to be >20:1 via crude ^{1}H NMR. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 5.16 (d, J = 2.4 Hz, 1H), 4.52 (d, J = 5.2 Hz, 1H), 4.23 (d, J = 1.6 Hz, 1H), 3.89 (dd, J = 9.8, 5.2 Hz, 1H), 3.45 (t, J = 9.9 Hz, 1H), 2.53 (q, J = 12.5 Hz, 1H), 2.42- 2.26 (m, 1H), 1.47 (s, 3H), 1.46 (s, 3H), 1.36 (s, 3H), 1.35 (s, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 166.6, 114.8 (t, J = 252 Hz), 111.6, 109.7, 96.8, 75.9, 74.5, 72.7, 68.0, 67.9, 37.5 (t, J = 24.3 Hz), 28.2, 28.0, 26.1, 26.0. **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -103.2 (d, J = 258 Hz, 1F), -108.4 (d, J = 258 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 3510 (br), 2988 (w), 1768 (m), 1144 (m), 1065 (vs). **HRMS** (ESI) calcd for $C_{14}H_{20}F_2O_7Na$ [M + Na^+]: 361.1075, found: 361.1083.

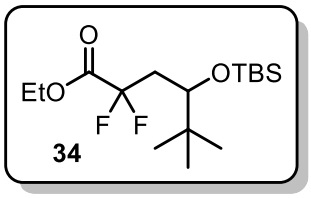


Ethyl 4-(Benzyloxy)-2,2-difluorobutanoate, 32 (0.066 g, 51%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.37-7.26 (m, 5H), 4.46 (s, 2H), 4.18 (q, J = 7.2 Hz, 2H), 3.66 (t, J = 6.1 Hz, 2H), 2.43 (tt, J = 15.3, 6.1 Hz, 2H), 1.25 (t, J = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.3 (t, J = 32 Hz), 138.0, 128.7, 128.0, 115.6 (t, J = 250 Hz), 73.6, 63.7 (t, J = 6.2 Hz), 63.0, 35.6 (t, J = 24 Hz), 14.1. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.6 (t, J = 15.4 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2983 (w), 1766 (s), 1373 (m), 1228 (m). **HRMS** (EI) calcd for $C_{13}H_{16}F_2O_3$ [M^+]: 258.1044, found: 258.1044.

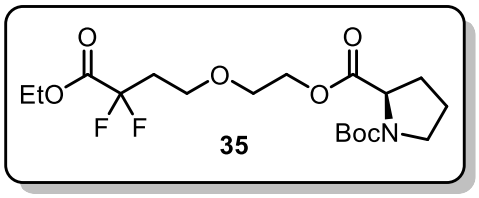


Ethyl 4-([1,1'-Biphenyl]-4-yloxy)-2,2-difluorobutanoate, 33 (0.107 g, 67%) was prepared according to General Procedure A with the following modifications: 5.0 equiv of sodium formate and 10.0 equiv of ethyl trifluoroacetate were used. The desired compound was obtained as a white solid (mp = 68-70 °C). **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm

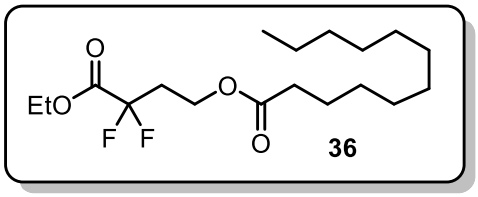
7.56-7.48 (m, 4H), 7.42 (t, J = 7.7 Hz, 2H), 7.31 (t, J = 7.4 Hz, 1H), 6.93 (d, J = 8.6 Hz, 2H), 4.34 (q, J = 7.2 Hz, 2H), 4.22 (t, J = 6.2 Hz, 2H), 2.64 (tt, J = 15.4, 6.2 Hz, 2H), 1.33 (t, J = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.1 (t, J = 32 Hz), 157.9, 140.9, 134.8, 129.0, 128.5, 127.1, 127.0, 115.3 (t, J = 250 Hz), 115.0, 63.3, 61.6 (t, J = 6.2 Hz), 35.1 (t, J = 24 Hz), 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.5 (t, J = 15 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2988 (w), 1773 (vs), 1479 (m), 1229 (s). **HRMS** (EI) calcd for $C_{18}H_{18}F_2O_3$ [M^+]: 320.1224, found: 320.1242.



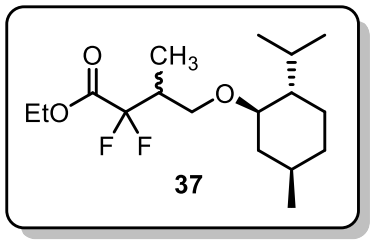
Ethyl 4-((*tert*-Butyldimethylsilyl)oxy)-2,2-difluoro-5,5-dimethylhexanoate, 34 (0.130 g, 77%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 4.31 (q, J = 7.2 Hz, 2H), 3.70 (dd, J = 4.8, 3.3 Hz, 1H), 2.41 (dddd, J = 27.6, 16.0, 13.6, 3.3 Hz, 1H), 2.07 (dddd, J = 30.0, 16.0, 8.0, 4.7 Hz, 1H), 1.35 (t, J = 7.1 Hz, 3H), 0.89 (s, 9H), 0.87 (s, 9H), 0.08 (s, 3H), 0.07 (s, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 163.5 (t, J = 33 Hz), 114.8 (t, J = 251 Hz), 72.5 (d, J = 3.4 Hz), 61.8, 38.4 (t, J = 22 Hz), 35.1, 25.1, 24.6, 17.4, 12.9, 0.0, -5.5. **^{19}F NMR** (471 MHz, $CDCl_3$, ^{1}H decoupled) δ ppm -104.1 (d, J = 258 Hz, 1F), -106.1 (d, J = 258 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 2958 (w), 1769 (m), 1111 (vs), 1083 (vs). **HRMS** (EI) calcd for $C_{15}H_{29}F_2O_3Si$ [$M - CH_3^+$]: 323.1854, found: 323.1862.



1-(*tert*-Butyl) 2-(2-(4-Ethoxy-3,3-difluoro-4-oxobutoxy) Ethyl (*R*)-Pyrrolidine-1,2-dicarboxylate, 35 (0.174 g, 85%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm ^{1}H NMR (600 MHz, $CDCl_3$) δ 4.35-4.10 (m, 5H), 3.62 (t, J = 6.2 Hz, 2H), 3.60-3.32 (m, 4H), 2.35 (tt, J = 15.3, 6.2 Hz, 2H), 2.26-2.10 (m, 1H), 1.99-1.88 (m, 2H), 1.87-1.78 (m, 1H), 1.42 and 1.38 (s, 9H), 1.32 (t, J = 7.1 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 173.4, 173.1, 164.10 and 164.08 (t, J = 32 Hz), 154.6, 154.0, 115.4 and 115.3 (t, J = 250 Hz), 80.1, 79.9, 69.2, 64.5 (m), 63.9, 63.8, 63.0, 59.3, 59.0, 46.8, 46.6, 35.4 and 35.3 (t, J = 24, 10.4 Hz), 31.1, 30.1, 28.6, 28.5, 24.5, 23.8, 14.2. **^{19}F NMR** (471 MHz, $CDCl_3$) δ ppm -106.9 (t, J = 16 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2979 (w), 1749 (s), 1696 (vs), 1392 (vs), 1366 (m). **HRMS** (ESI) calcd for $C_{18}H_{29}F_2NO_7$ [$M + Na^+$]: 432.1810, found: 432.1805.

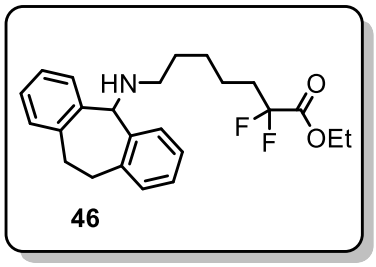


4-Ethoxy-3,3-difluoro-4-oxobutyldodecanoate, 36 (0.159 g, 91%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ ppm 4.33 (q, *J* = 7.1 Hz, 2H), 4.27 (t, *J* = 6.4 Hz, 2H), 2.45 (tt, *J* = 15.9, 6.4 Hz, 2H), 2.26 (t, *J* = 7.6 Hz, 2H), 1.59 (q, *J* = 8.2, 7.7 Hz, 2H), 1.36 (t, *J* = 7.1 Hz, 3H), 1.26 (d, *J* = 16.3 Hz, 16H), 0.87 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR** (151 MHz, $CDCl_3$) δ ppm 173.6, 164.0 (t, *J* = 32.4 Hz), 115.1 (t, *J* = 251.0 Hz), 63.3, 57.5 (t, *J* = 5.9 Hz), 34.3, 34.2 (t, *J* = 23.5), 32.2, 29.9, 29.7, 29.6, 29.5, 29.4, 25.0, 23.0, 14.4, 14.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.4 (t, *J* = 15.2 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 2925 (m), 1742 (vs), 1096 (vs). **HRMS** (EI) calcd for $C_{15}H_{27}F_2O_2$ [M – CO_2Et^+]: 277.1979, found: 277.1992.



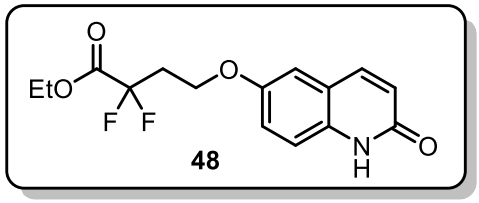
Ethyl 2,2-Difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanoate, 37 (0.146 g, 92%) was prepared according to General Procedure A. The diastereomeric ratio was determined to be 1:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** (600 MHz, $CDCl_3$) δ ppm 4.34-4.20 (m, 2H), 3.72 and 3.50 (dd, *J* = 8.9, 7.2 Hz, and dd, *J* = 9.3, 7.0 Hz, 1H), 3.44 and 3.13 (dd, *J* = 9.3, 5.7 Hz and ddd, *J* = 8.9, 6.9, 1.9 Hz, 1H), 2.97 (dtd, *J* = 14.9, 10.6, 4.1 Hz, 1H), 2.70-2.47 (m, 1H), 2.19-2.10 (m, 1H), 2.08-2.02 (m, 1H), 1.68-1.57 (m, 2H), 1.36-1.28 (m, 4H), 1.22-1.12 (m, 1H), 1.10 and 1.08 (d, *J* = 7.0 Hz, 3H), 0.98-0.92 (m, 1H), 0.91 (d, *J* = 6.6 Hz, 3H), 0.88 and 0.87 (d, *J* = 4.0 Hz, 3H), 0.86-0.76 (m, 2H), 0.74 (d, *J* = 7.0, 3H). **^{13}C NMR** (151 MHz, $CDCl_3$) δ ppm 164.4 and 164.2 (dd, *J* = 33, 14 Hz), 116.9 and 116.7 (dd, *J* = 279, 250 Hz), 80.0, 79.8, 67.7 and 67.2 (dd, *J* = 6.5, 3.4 Hz), 62.8, 62.7, 48.6, 48.5, 40.3, 39.9, 39.6 and 39.32 (t, *J* = 22 Hz), 34.8, 31.8, 31.8, 25.7, 25.6, 23.5, 23.5, 22.6, 22.6, 21.3, 21.2, 16.4, 16.3, 14.2, 14.2, 10.7 and 10.0 (t, *J* = 4.5 Hz). **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -110.0 and -110.5 (d, *J* = 146 Hz, 1F), -114.1 and -118.5 (d, *J* =258 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 2925 (m), 1742 (vs), 1096 (vs). **HRMS** (EI) calcd for $C_{16}H_{27}F_2O_3$ [M – CH_3^+]: 305.1928, found: 305.1951.

Ethyl 7-((10,11-Dihydro-5H-dibenzo[a,d][7]annulen-5-yl)amino)-2,2-difluoroheptanoate, 46



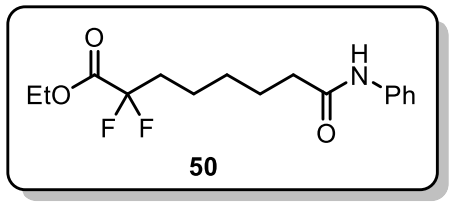
46

(0.084 g, 42%) was prepared according to General Procedure A. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.29-7.24 (m, 2H), 7.18-7.10 (m, 6H), 4.79 (s, 1H), 4.30 (q, *J* = 7.1 Hz, 2H), 3.76-3.68 (m, 2H), 2.99-2.92 (m, 2H), 2.53 (t, *J* = 7.0 Hz, 2H), 2.07-1.95 (m, 2H), 1.49-1.40 (m, 5H), 1.38-1.31 (m, 5H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 164.7 (t, *J* = 33.0 Hz), 140.2, 130.7, 129.3, 127.7, 126.1, 116.6 (t, *J* = 250 Hz), 63.0, 48.5, 34.7 (t, *J* = 23.2 Hz), 32.6, 30.2, 27.1, 21.6, 14.3. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.7 (t, *J* = 16.8 Hz). **FT-IR** (cm^{-1}, neat, ATR) 2928 (w), 1760 (m), 1030 (s). **HRMS** (ESI) calcd for $C_{24}H_{30}F_2NO_2$ [M + H^+]: 402.2245, found: 402.2246.



48

Ethyl 2,2-Difluoro-4-((2-oxo-1,2-dihydroquinolin-6-yl)oxy)butanoate, 48 (0.065 g, 42%) was prepared according to General Procedure A. The desired compound was obtained as a white solid (mp = 199-204 °C, decomp). **^{1}H NMR** (600 MHz, DMSO-*d*$_6$) δ ppm 10.17 (s, 1H), 6.85 (d, *J* = 8.7 Hz, 1H), 6.74 (dd, *J* = 8.7, 2.8 Hz, 1H), 6.42 (d, *J* = 2.8 Hz, 1H), 4.24 (q, *J* = 7.1 Hz, 2H), 4.07-4.00 (m, 2H), 3.79-3.74 (m, 1H), 3.43-3.37 (m, 1H), 2.62-2.52 (m, 2H), 1.18 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (151 MHz, DMSO-*d*$_6$) δ ppm 168.6, 163.1 (t, *J* = 33 Hz), 153.2, 131.6, 123.1, 116.4, 115.4 (t, *J* = 250 Hz), 114.0, 113.0, 62.8, 61.4, 44.3, 41.8, 34.0 (t, *J* = 24 Hz), 27.2, 13.6. **^{19}F NMR** (DMSO-*d*$_6$, 471 MHz) δ ppm -103.4 (t, *J* = 17 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3646 (br), 2996 (w), 1761 (m), 1670 (vs), 1253 (m). **HRMS** (ESI) calcd for $C_{15}H_{16}F_2NO_4$ [M + H^+]: 312.1047, found: 312.1050.

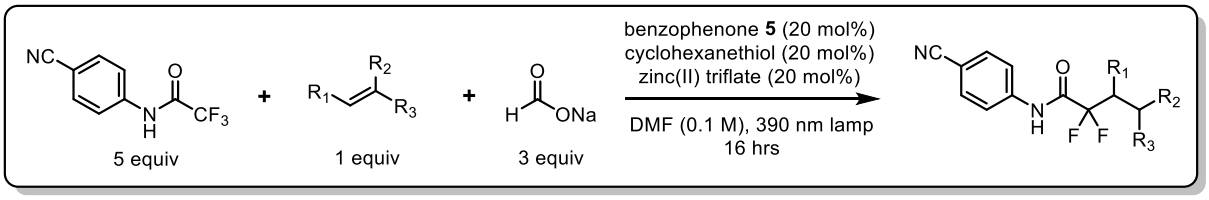


50

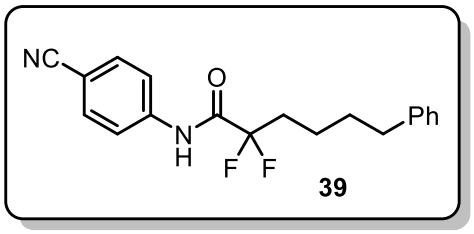
Ethyl 2,2-Difluoro-8-oxo-8-(phenylamino)octanoate, 50 (4.801 g, 90%) was prepared according to General Procedure A with the following modification: 17.0 mmol scale with 5.0 mol % of benzophenone catalyst **5** was used.. The desired compound was obtained as a white solid (mp = 66-68 °C). **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 7.50 (d, *J* = 8.0 Hz, 2H), 7.32 (t, *J* = 7.9, 2H), 7.13 (br s, 1H), 7.1 (t, *J* = 7.4, 1H), 4.32 (q, *J* = 7.1 Hz, 2H), 2.36 (t, *J* = 7.4 Hz, 2H), 2.13-2.02 (m, 2H), 1.78-1.73 (m, 2H), 1.56-1.49 (m, 2H), 1.49-1.41 (m, 2H), 1.35 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 171.1,

164.7 (t, J = 33 Hz), 138.1, 129.3, 124.6, 120.0, 116.5 (t, J = 250 Hz), 63.1, 37.6, 34.5 (t, J = 23 Hz), 28.9, 25.3, 21.5 (t, J = 4.3 Hz), 14.3. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.8 (t, J = 17 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3396 (br), 2930 (w), 1759 (s), 1661 (s), 1599 (s), 1542 (s), 1098 (s). **HRMS** (ESI) calcd for $C_{16}H_{21}F_2NO_3Na$ [M + Na^+]: 336.1387, found: 336.1385.

General Procedure B: DFA of *N*-(4-Cyanophenyl)-trifluoroacetamide

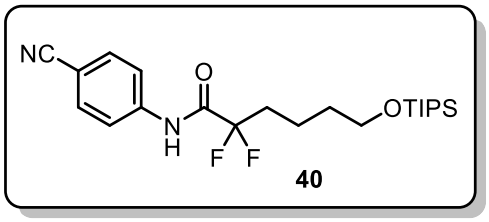


To a 40 mL, septum capped vial was added was added benzophenone **5** (0.048 g, 0.20 mmol, 0.20 equiv), sodium formate (0.204 g, 3.00 mmol, 3.0 equiv), zinc(II) trifluoromethanesulfonate (0.73 mg, 0.20 mmol, 0.20 equiv), *N*-(4-cyanophenyl)-trifluoroacetamide (1.07 g, 5.0 mmol, 5.0 equiv) and alkene (1.0 mmol, 1.0 equiv), if solid. Anhyd DMF (10.0 mL) was then added, the vial was capped, and the reaction solution was sparged with argon for 5 min. Cyclohexanethiol (24 µL 0.20 mmol, 0.20 equiv) and alkene (1.0 mmol, 1.0 equiv), if liquid, were added by syringe, and the vial was sealed with Parafilm. The reaction was then irradiated with a Kessil® PR160-390 nm lamp at a distance of 2 cm. The reaction was cooled with two compact fans, ensuring that the surface temperature of the vial did not exceed 35 °C. After 16 h of irradiation, the reaction was quenched slowly with distilled H_2O (40 mL) and extracted with either Et_2O or EtOAc (2 x 40 mL). The combined organic extracts were washed with H_2O (50 mL) followed by brine (10 mL), dried (Na_2SO_4), and the solvent was removed via rotary evaporation. The resulting crude solid was then washed with a 2:1 hexanes/Et_2O mixture and filtered (2 x 50 mL) to separate the unreacted, crystalline *N*-(4-cyanophenyl)-trifluoroacetamide (typically >90% recovery). The filtrate was then evaporated onto 5 grams of silica be purified via automated flash silica column chromatography.



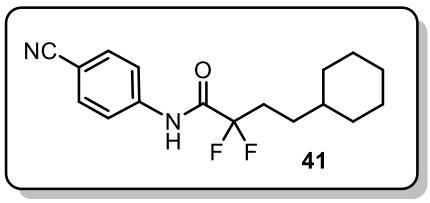
***N*-(4-Cyanophenyl)-2,2-difluoro-6-phenylhexanamide, 39** (0.230 g, 70%) was prepared according to General Procedure B. The desired compound was obtained as a white solid (mp = 73-75 °C). **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 8.12 (s, 1H), 7.74-7.67 (m, 2H), 7.67-7.61 (m, 2H), 7.27-7.23 (m, 2H), 7.18-7.12 (m, 3H), 2.61 (t, *J* = 7.7 Hz, 2H), 2.27-2.12 (m, 2H), 1.72-1.66 (m, 2H), 1.57-1.49 (m, 2H). **^{13}C NMR** ($CDCl_3$, 151 MHz) δ ppm 162.7 (t, *J* = 30 Hz), 142.0, 140.3, 133.7, 128.6 (d, *J* = 7.0 Hz), 126.2, 120.5, 118.6, 118.4 (t, *J* = 254 Hz), 109.1, 35.7, 33.7 (t, *J* = 23 Hz), 31.1, 21.4 (t, *J* = 4.1 Hz). **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.2 (t, *J* = 18.5 Hz, 2F).

FT-IR (cm^{-1}, neat, ATR) 3310 (br), 2897 (w), 2229 (m), 1711 (m), 1596 (s), 1528 (vs). **HRMS** (ESI^-) calcd for $C_{19}H_{17}F_2N_2O$ [M – H^-]: 327.1309, found: 327.1297.



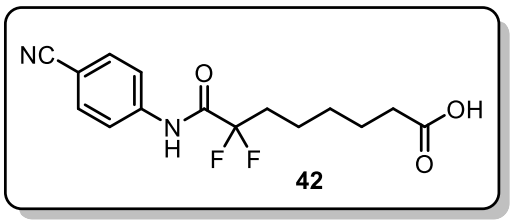
40

***N*-(4-Cyanophenyl)-2,2-difluoro-6-((triisopropylsilyl) oxy)hexanamide, 40** (0.323 g, 76%) was prepared according to General Procedure B. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 8.10 (br s, 1H), 7.76-7.70 (m, 2H), 7.70-7.63 (m, 2H), 3.74-3.67 (m, 2H), 2.43-1.87 (m, 2H), 1.65-1.58 (m, 4H), 1.09-0.99 (m, 21H). **^{13}C NMR** (151 MHz, $CDCl_3$) δ ppm 162.8 (t, J = 30 Hz), 140.3, 133.7, 120.4, 118.6, 118.5 (t, J = 256 Hz), 109.1, 62.9, 33.8 (t, J = 23 Hz), 32.5, 18.5 (t, J = 4.4 Hz), 18.3, 12.2. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -105.4 (t, J = 16.5 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3396 (br), 2942 (m), 2230 (m), 1717 (m), 1598 (s), 1531 (s). **HRMS** (ESI) calcd for $C_{22}H_{35}F_2N_2O_2Si$ [M + H^+]: 425.2436, found: 425.2445.



41

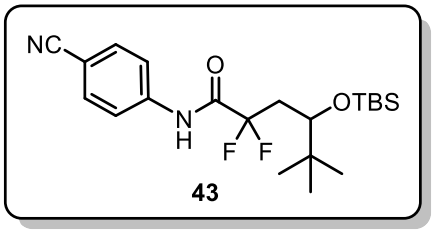
***N*-(4-Cyanophenyl)-4-cyclohexyl-2,2-difluorobutanamide, 41** (0.355 g, 58%) was prepared according to General Procedure B. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 8.16 (s, 1H), 7.74 (d, J = 8.8 Hz, 2H), 7.70-7.59 (d, J = 8.7 Hz, 2H), 2.27-2.08 (m, 2H), 1.74-1.68 (m, 4H), 1.67-1.62 (m, 1H), 1.41 – 1.33 (m, 2H), 1.31-1.08 (m, 4H), 0.96 – 0.85 (m, 2H). **^{13}C NMR** (151 MHz, $CDCl_3$) δ ppm 162.9 (t, J = 29 Hz), 140.3, 133.7, 120.4, 118.7, 118.8 (t, J = 253 Hz), 109.0, 37.5, 33.2, 31.5 (t, J = 23 Hz), 28.9 (t, J = 3.7 Hz), 26.7, 26.4. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.4 (t, J = 18 Hz). **FT-IR** (cm^{-1}, neat, ATR) 3932 (br), 2924 (m), 2229 (w), 1705 (m), 1596 (s), 1529 (vs). **HRMS** (EI) calcd for $C_{17}H_{21}F_2N_2O$ [M + H^+]: 307.1622, found: 307.1627.



42

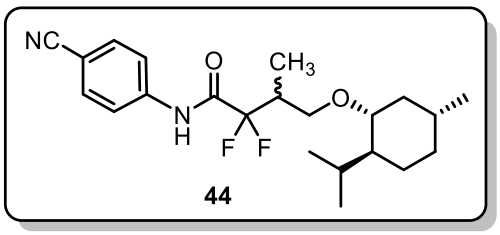
8-((4-Cyanophenyl)amino)-7,7-difluoro-8-oxooctanoic acid, 42 (0.258 g, 83%) was prepared according to General Procedure B. The desired compound was obtained as the corresponding carboxylic acid (white solid, mp = 180-182 °C) after treatment with HCl in dioxane (2 M) at 75 °C for 2 h. **^{1}H NMR** (CD_3OD, 600 MHz) δ ppm 7.91-

7.87 (m, 2H), 7.75-7.71 (m, 2H), 2.29 (t, J = 7.4 Hz, 2H), 2.22-2.12 (m, 2H), 1.67-1.59 (m, 2H), 1.57-1.50 (m, 2H), 1.47-1.38 (m, 2H). **^{13}C NMR** (151 MHz, CD_3OD) δ ppm 177.5, 165.3 (t, J = 21 Hz), 143.0, 134.4, 122.3, 119.7, 119.4 (t, J = 252 Hz), 109.3, 35.1 (t, J = 23 Hz), 34.8, 29.8, 25.8, 22.6 (t, J = 4.4 Hz). **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -106.8 (t, J = 17.0 Hz, 2F). **FT-IR** (cm^{-1}, neat, ATR) 3285 (v br) 2239 (w), 1718 (m), 1598 (m). **HRMS** (EI) calcd for $C_{15}H_{17}F_2N_2O_3$ [M + H^+]: 311.1207, found: 311.1184.



43

4-((*tert*-Butyldimethylsilyl)oxy)-*N*-(4-cyanophenyl)-2,2-difluoro-5,5-dimethylhexanamide, 43 (0.613 g, 75%) was prepared according to General Procedure B. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 8.14 (br s, 1H), 7.74 (d, J = 8.8 Hz, 2H), 7.67 (d, J = 8.6 Hz, 2H), 3.76 (dd, J = 4.9, 3.2 Hz, 1H), 2.57 (dddd, J = 30.8, 15.7, 12.0, 2.9 Hz, 1H), 2.19 (dddd, J = 31.8, 16.1, 8.1, 5.1 Hz, 1H), 0.90 (s, 9H), 0.89 (s, 9H), 0.09 (s, 6H). **^{13}C NMR** (151 MHz, $CDCl_3$) δ ppm 162.9 (t, J = 116 Hz), 140.3, 133.7, 120.4, 118.6, 118.0 (t, J_{C-F} = 254 Hz), 109.1, 73.8, 38.7 (t, J = 21.8 Hz), 36.4, 26.4, 26.0, 18.7, -3.0. **^{19}F NMR** ($CDCl_3$, 471 MHz) δ ppm -102.55 (ddd, J = 257.0, 31.1, 7.9 Hz, 1F), -104.48 (ddd, J = 257.2, 32.5, 12.1 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 3401 (br), 2957 (m), 2229 (w), 1719 (s), 1532 (s). **HRMS** (ESI) calcd for $C_{21}H_{33}F_2N_2O_2Si$ [M + H^+]: 411.2279, found: 411.2274.

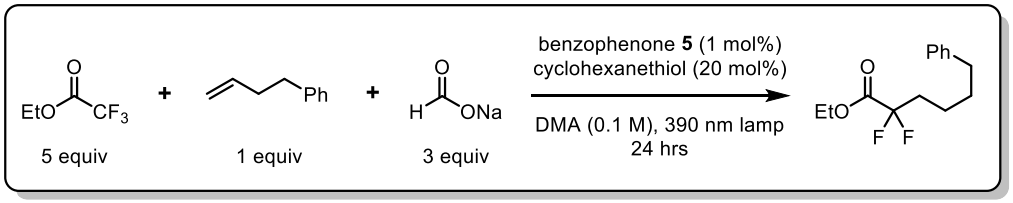


44

***N*-(4-Cyanophenyl)-2,2-difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanamide, 44** (0.240 g, 61%) was prepared according to General Procedure B. The diastereomeric ratio was determined to be 1.5:1 via crude ^{1}H NMR. The desired compound was obtained as a dense, colorless oil. **^{1}H NMR** ($CDCl_3$, 600 MHz) δ ppm 8.23 and 8.10 (s, 1H), 7.74-7.70 (m, 2H), 7.68-7.65 (m, 2H), 3.77-3.63 (m, 1H), 3.41 and 3.26 (dd, J = 9.7, 5.8 and J = 9.2 and 6.1 Hz, 1H), 3.00-2.94 (m, 1H), 2.88-2.67 (m, 1H), 2.10-1.91 (m, 2H), 1.65-1.45 (m, 2H), 1.33-1.22 (m, 1H), 1.17 and 1.13 (d, J = 7.1 Hz, 3H), 1.07-0.82 (m, 5H), 0.79-0.59 (m, 8H). **^{13}C NMR** (151 MHz, $CDCl_3$) δ ppm 162.6 (t, J = 35 Hz), 140.7, 140.6, 133.7, 120.2, 120.1, 118.77, 118.75, 108.7, 108.6, 80.2, 80.1, 67.8 and 67.6 (t, J = 4.6 Hz), 48.49, 48.48, 40.4, 40.3, 39.0 and 38.5 (t, J = 22 Hz), 34.8, 34.7, 31.7, 31.6, 25.7, 25.6, 23.32, 23.27, 22.6, 22.5, 21.12,

21.09, 16.3, 16.2, 10.6 and 10.0 (t, J = 4.2 Hz). **^{19}F NMR** ($CDCl_3$, 471 MHz, ^{1}H decoupled) δ ppm -108.0 and -108.6 (dd, J = 76.0, 9.9 Hz, 1F), -114.4 and -119.6 (dd, J = 256.8, 19.6 and J = 254.5, 22.5 Hz, 1F). **FT-IR** (cm^{-1}, neat, ATR) 3315 (br), 2952 (m), 2922 (w), 1717 (m), 1596 (s), 1530 (vs). **HRMS** (ESI) calcd for $C_{22}H_{31}F_2N_2O_2$ [M + H^+]: 393.2354, found: 393.2359.

Procedure for Large Scale DFA of Ethyl Trifluoroacetate



To a 1 L Wheaton standard, wide-mouth bottle was added benzophenone **5** (0.119 g, 0.50 mmol, 0.01 equiv) and sodium formate (10.20 g, 0.15 mol, 3.0 equiv). Anhyd DMF (500 mL) was then added via cannula, the vial sealed with a 24/40 rubber septum, and the reaction solution was sparged with argon for 25 min. Ethyl trifluoroacetate (30 mL, 0.25 mol, 5.0 equiv), cyclohexanethiol (1.20 mL 10.0 mmol, 0.20 equiv), and 4-phenyl-1-butene (6.61 g, 0.05 mol, 1.0 equiv) were added by syringe, and the bottle was sealed with Parafilm. The reaction was then irradiated with two Kessil® PR160-390 nm lamps at a distance of 4 cm. A balloon of argon was then fitted to the reaction (via syringe and 18G needle) for pressure equalization. The reaction was cooled with two compact fans, ensuring that the surface temperature of the vial did not exceed 35 °C (see images below). After 24 h of irradiation, the reaction was quenched slowly with distilled H_2O (250 mL) and extracted with Et_2O (2 x 250 mL). The combined organic extracts were washed with H_2O (250 mL) followed by brine (50 mL), dried (Na_2SO_4), and the solvent was removed via rotary evaporation. The crude material was then purified via short path, high vacuum distillation (bp = 110-114 °C, 0.27 mm Hg) to afford the desired compound as a colorless oil (8.91 g, 0.035 mol, 70%).

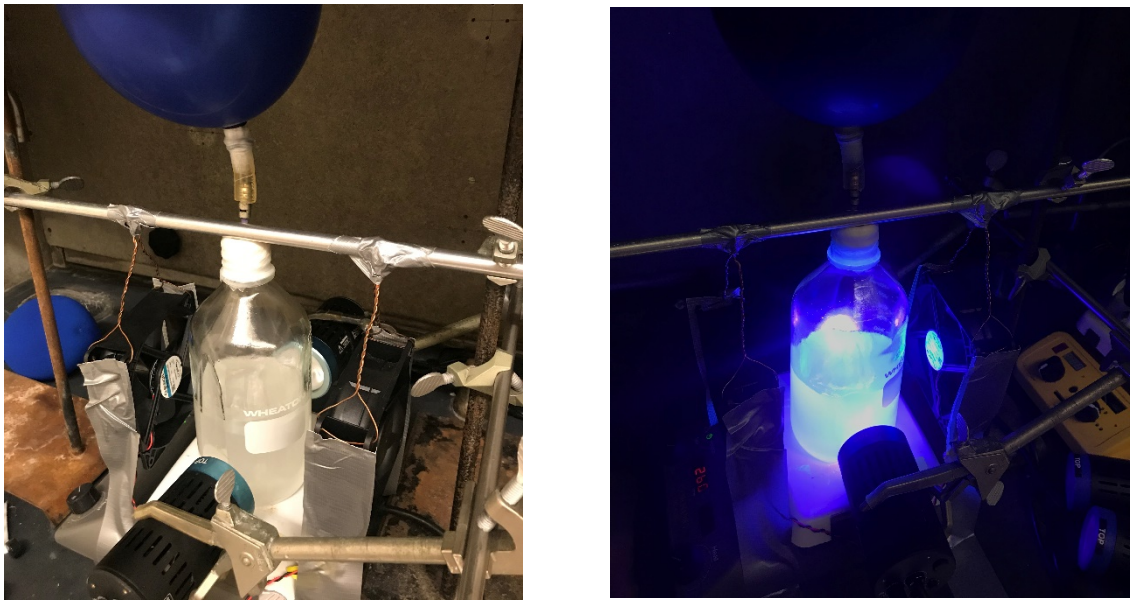


Figure S#. Reaction set up for large scale DFA

Quantum Yield Experiments

To confirm the radical chain nature of the DFA mechanism, quantum yield experiments were performed according to the procedure described by Jui *et al*.[10]

Determination of light intensity for 390 nm PR160 Lamp

The photon flux of the light source was determined by standard potassium ferrioxalate actinometry. A 0.15 M soln of potassium ferrioxalate was prepared by dissolving 2.21 g of potassium ferrioxalate hydrate in 30 mL of 0.05 M H_2SO_4. A quenching soln was prepared by dissolving 50 mg of phenanthroline and 11.25 g of NaOAc in 50 mL of 0.5 M H_2SO_4. Both solutions were covered in foil and stored in the dark. A 1 dram septum capped vial was then charged with 2 mL of the ferrioxolate soln and irradiated for 10.0 s with a Kessil PR160 390 nm lamp (100% power) at a distance of exactly 2.0 cm. After irradiation, 0.35 mL of the quenching soln was added to the vial. The soln was then allowed to rest for 30 min in the dark. The absorbance of the soln was measured at 510 nm and compared to that of a non-irradiated standard soln of ferrioxalate. Conversion was calculated using eq 1.

$$\text{mol } Fe^{2+} = \frac{V \times \Delta A}{l \times \varepsilon} \quad \text{(eq 1)}$$

V = final volume of the soln; ΔA = difference in absorbance at 510 nm; l = path length; ε = molar absorptivity of ferrioxalate at 510 nm. The average value of three experiments was 3.707×10^{-6} mol of Fe^{2+}.

The photon flux can then be calculated using eq 2.

$$\text{Photon flux} = \frac{\text{mol } Fe^{2+}}{\phi \times t \times f} \quad \text{(eq 2)}$$

ϕ = quantum yield of ferrioxalate actinometer (1.13 at 390 nm)[11]; t = time ; f = fraction of light absorbed at λ = 390 nm (0.99).[11] The average photon flux was calculated to be 3.31×10^{-7} einsteins s^{-1}

Determination of Quantum Yield for DFA of Ethyl Trifluoroacetate

The quantum yield was determined by irradiating a 0.1 mmol scale DFA reaction using 3-butenyl acetate as the alkene (see General Optimization Procedure) for 10 min. ^{19}F NMR was

used to determine the yield (average of three experiments = 27% yield). The quantum yield (ϕ) of the reaction was determined using eq 3.

$$\phi = \frac{\text{mol of product}}{\text{photon flux} \times t \times f} \quad \text{(eq 3)}$$

The fraction of emitted light that is absorbed by benzophenone **5** was determined by integrating the overlap of the absorption of benzopheone **5** and the emission of the PR160 390 nm lamp.

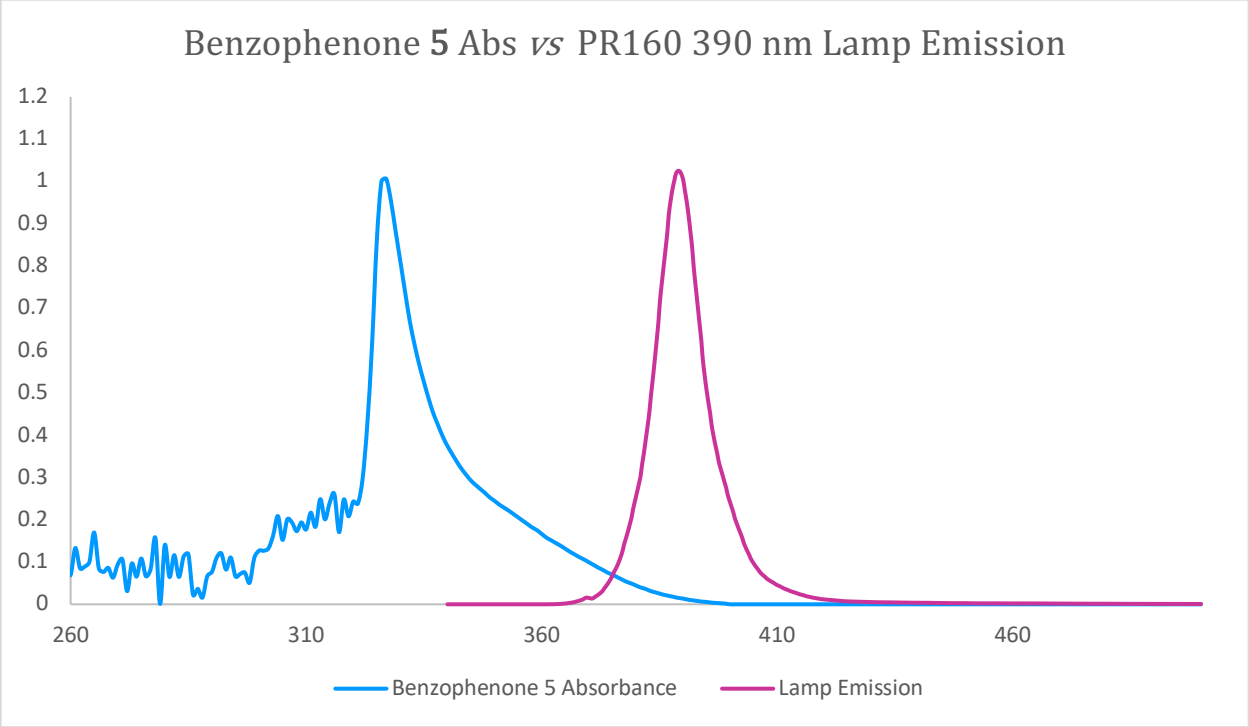


Figure S1. Benzophenone **5** absorbance *vs* Kessil Lamp emission

Based on the overlap between benzophenone **5**'s absorption spectra and the reported emission for the Kessil PR160 390 nm lamp, approximately 5.5% of all light emitted by the lamp is absorbed by benzophenone **5**. The quantum yield was therefore calculated to be 4.94.

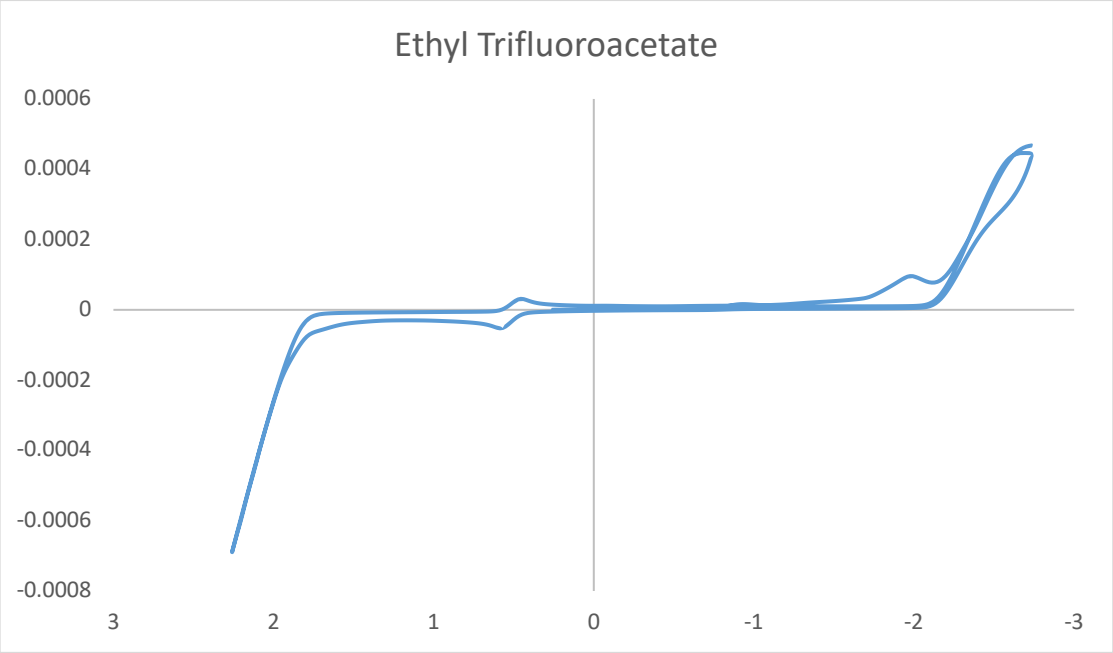
$$\phi = \frac{5.40 \times 10^{-5}\ \text{mol}}{3.31 \times 10^{-7}\text{E/s} \times 600\ \text{s} \times 0.05} = 4.94$$

Cyclic Voltammetry Studies

Cyclovoltammetry experiments were carried out on a CHI electrochemical workstation using a glassy carbon working electrode, Ag/AgCl pseudoreference electrode, and Pt wire counter electrode. The measurements were taken at room temperature in anhyd DMF containing 0.1 M Bu_4NPF_6 as electrolyte. Voltammograms were calibrated to either $Fe(Cp)_2$ or $Ag(NO_3)$ as internal standards.[12,13]

Ethyl Trifluoroacetate

36 µL (0.30 mmol) of ethyl trifluoroacetate was dissolved in 10 mL of DMF, and 18 mg (0.10 mmol) of $Fe(Cp)_2$ was added as an internal standard, $E_{1/2}$ = -2.0 V vs SCE. A scan rate of 0.1 V/s was used for the reported voltammogram.

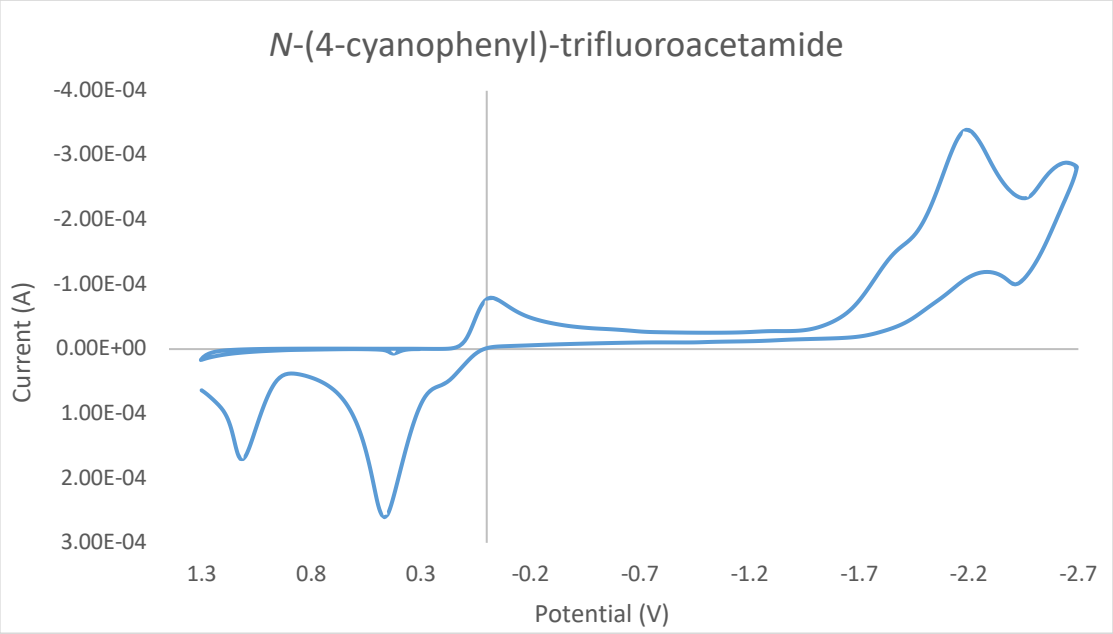


N-(4-Cyanophenyl)-trifluoroacetamide

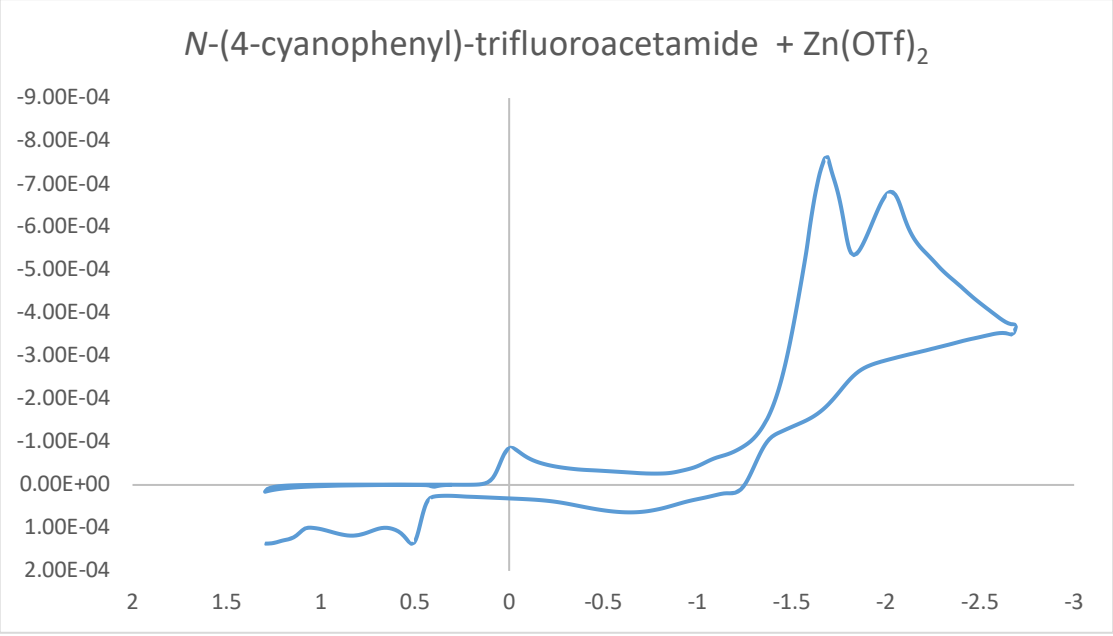
64 mg (0.30 mmol) of *N*-(4-cyanophenyl)-trifluoroacetamide was dissolved in 10 mL of DMF, and 17 mg (0.10 mmol) of $Ag(NO_3)$ was added as an internal standard. After measuring the potential of *N*-(4-cyanophenyl)-trifluoroacetamide, 109 mg (0.30 mmol) of $Zn(OTf)_2$ was added

and the measurement was repeated. A scan rate of 0.1 V/s was used for the reported voltammogram.

For *N*-(4-cyanophenyl)-trifluoroacetamide, $E_{1/2}$ = -2.2 V vs SCE



With a 1:1 ratio of *N*-(4-cyanophenyl)-trifluoroacetamide and $Zn(OTf)_2$, $E_{1/2}$ = -1.7 V vs SCE.



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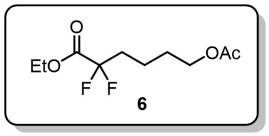
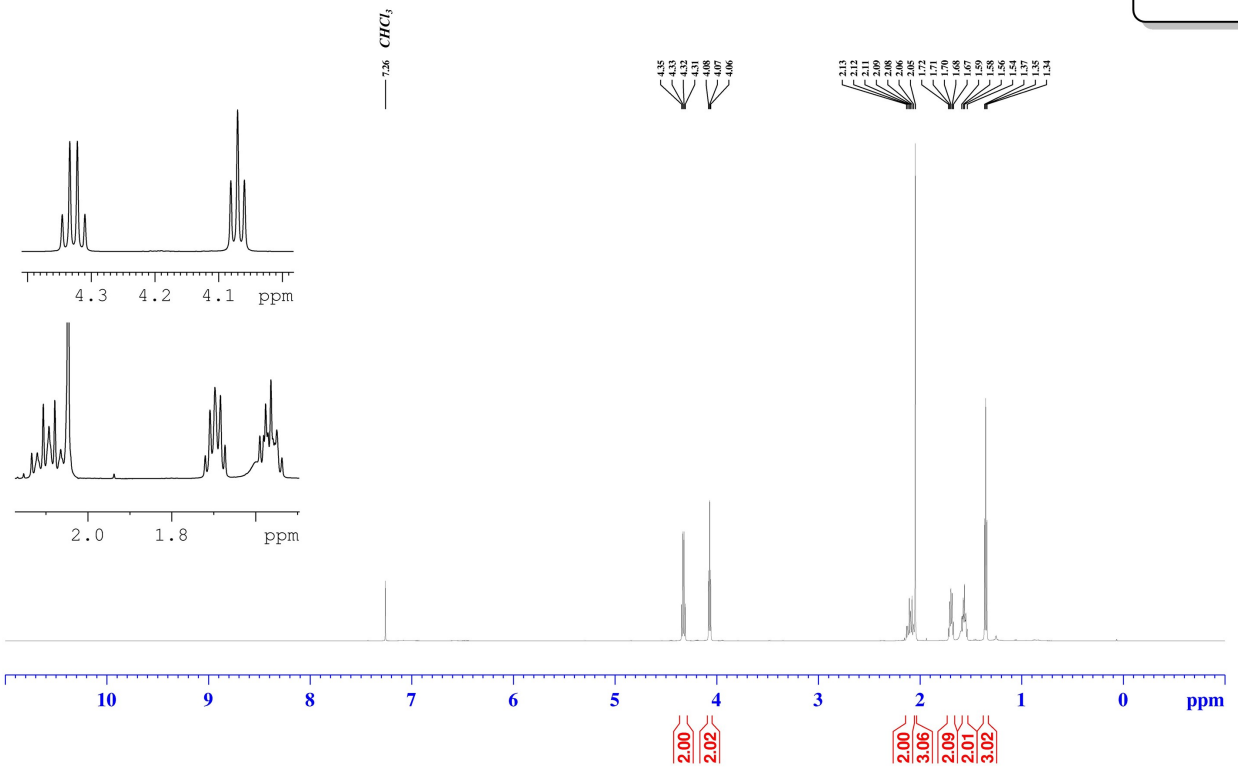
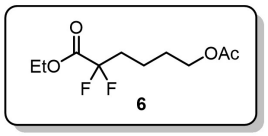
NMR Spectra of Synthesized Compounds

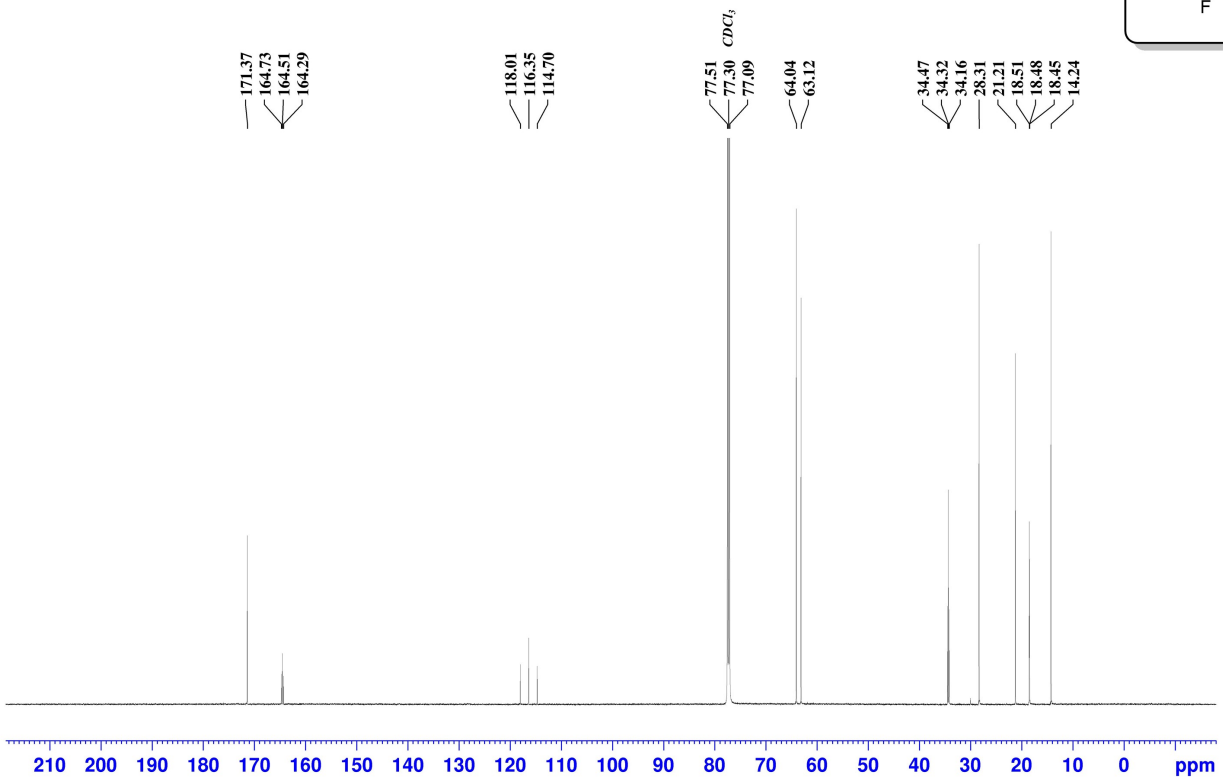
Ethyl 6-Acetoxy-2,2-difluorohexanoate, ^{1}H NMR
600 MHz, $CDCl_3$



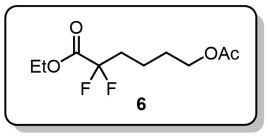


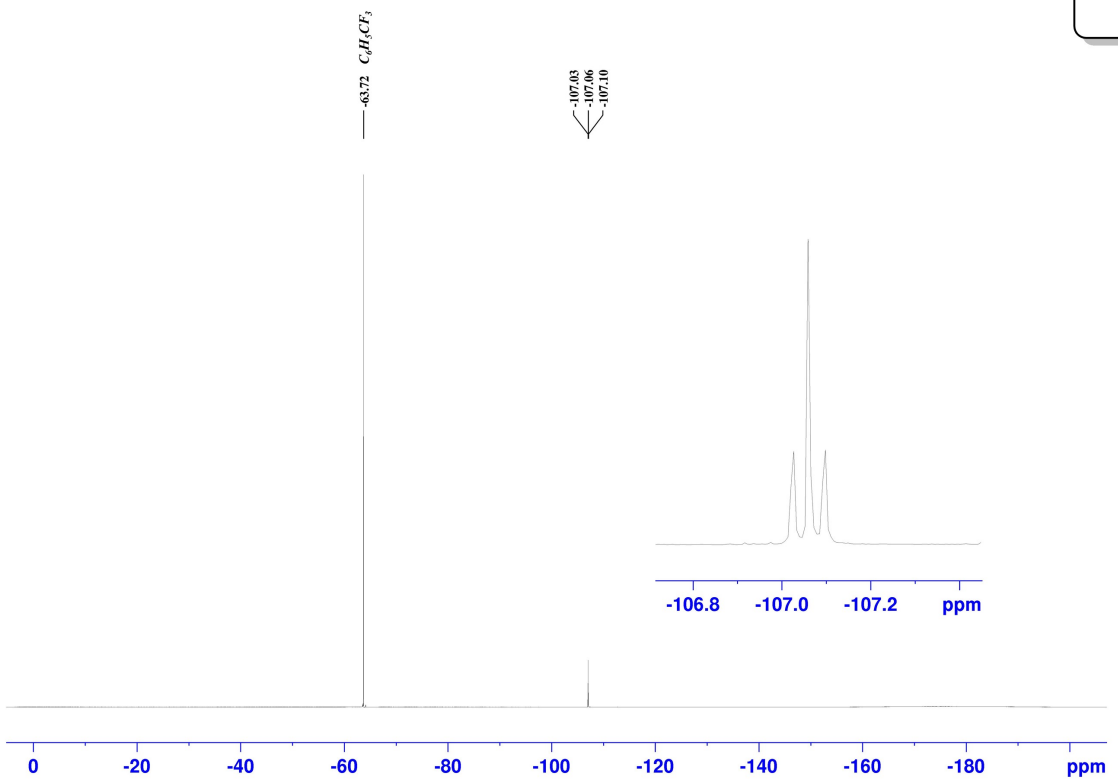
Ethyl 6-Acetoxy-2,2-difluorohexanoate, ^{13}C NMR
151 MHz, $CDCl_3$



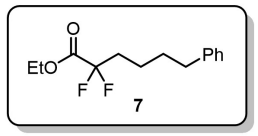


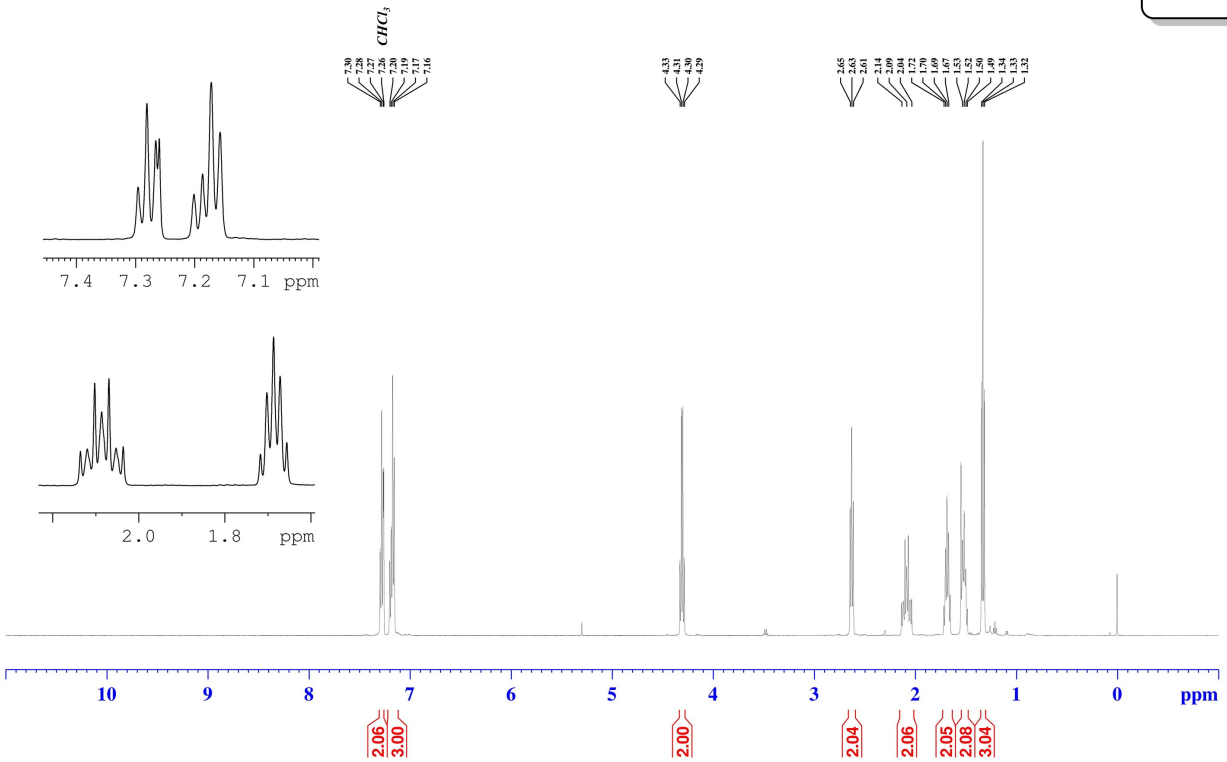
Ethyl 6-Acetoxy-2,2-difluorohexanoate, ^{19}F NMR
471 MHz, $CDCl_3$



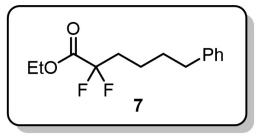


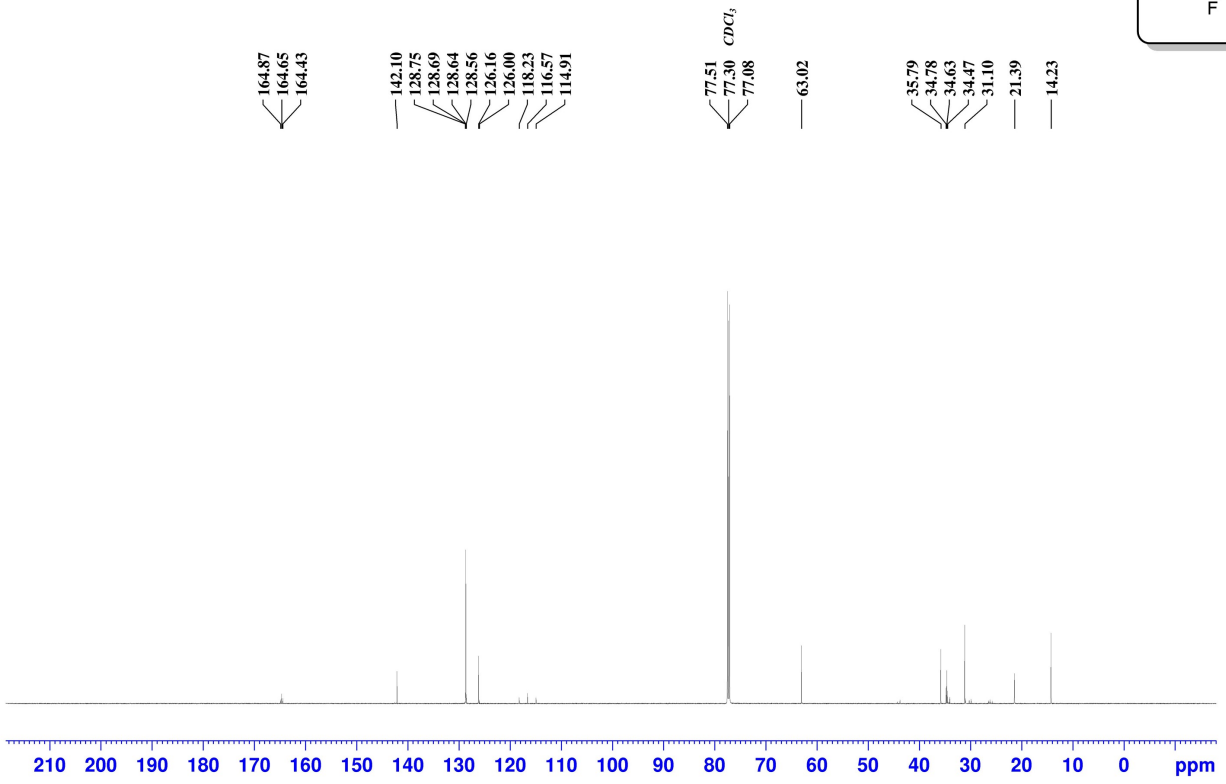
Ethyl 2,2-Difluoro-6-phenylhexanoate, ^{1}H NMR
600 MHz, $CDCl_3$



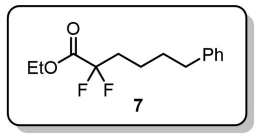


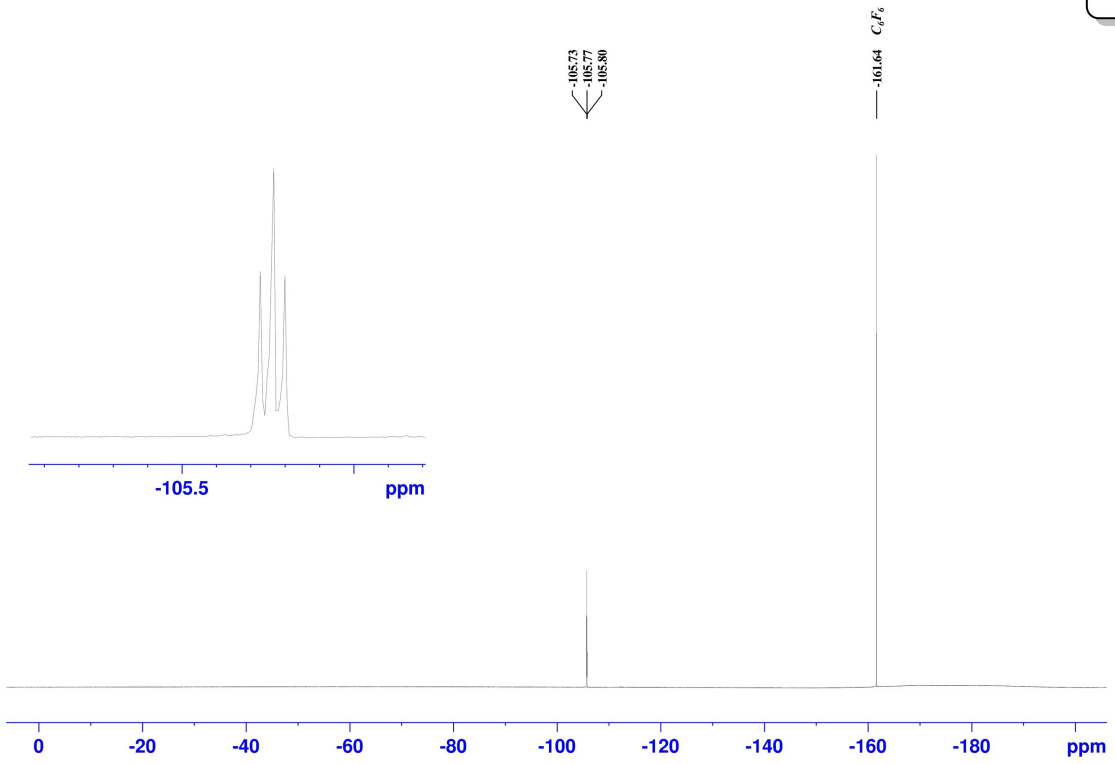
Ethyl 2,2-Difluoro-6-phenylhexanoate, ^{13}C NMR
151 MHz, $CDCl_3$



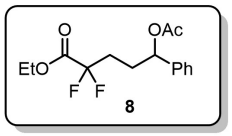


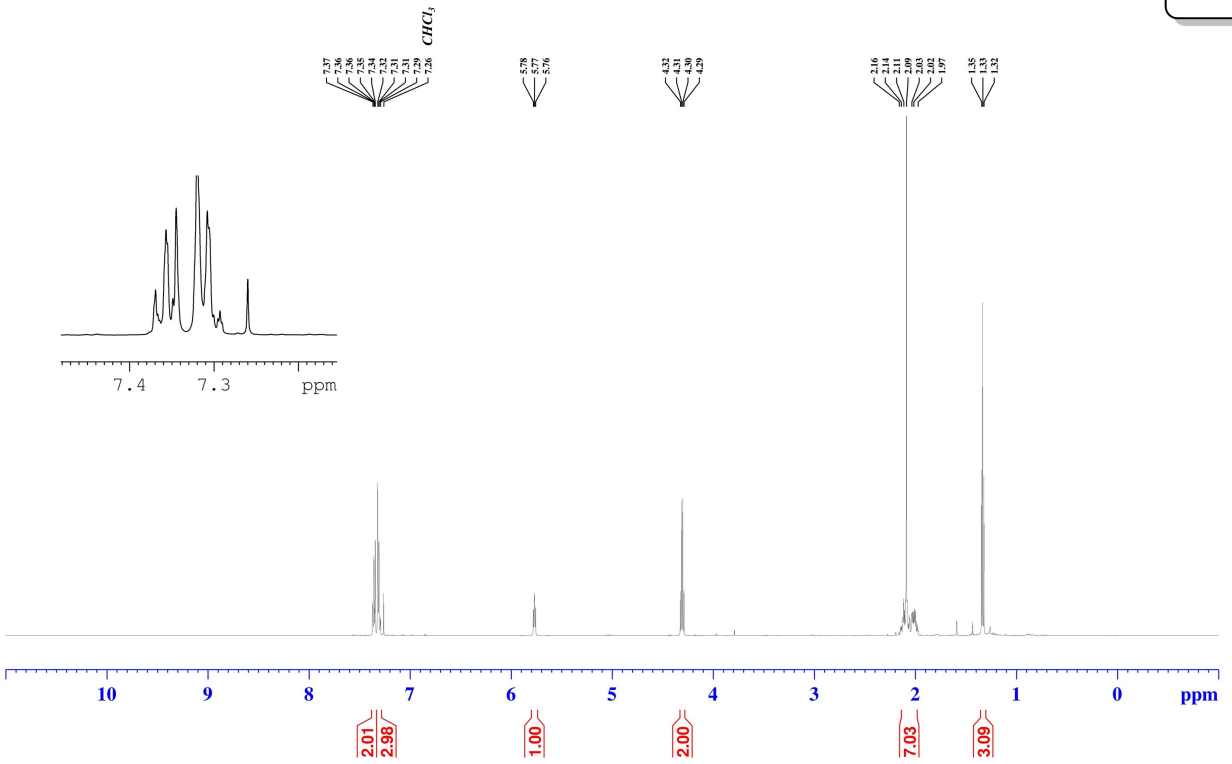
Ethyl 2,2-Difluoro-6-phenylhexanoate, ^{19}F NMR
471 MHz, $CDCl_3$



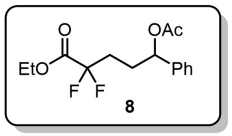


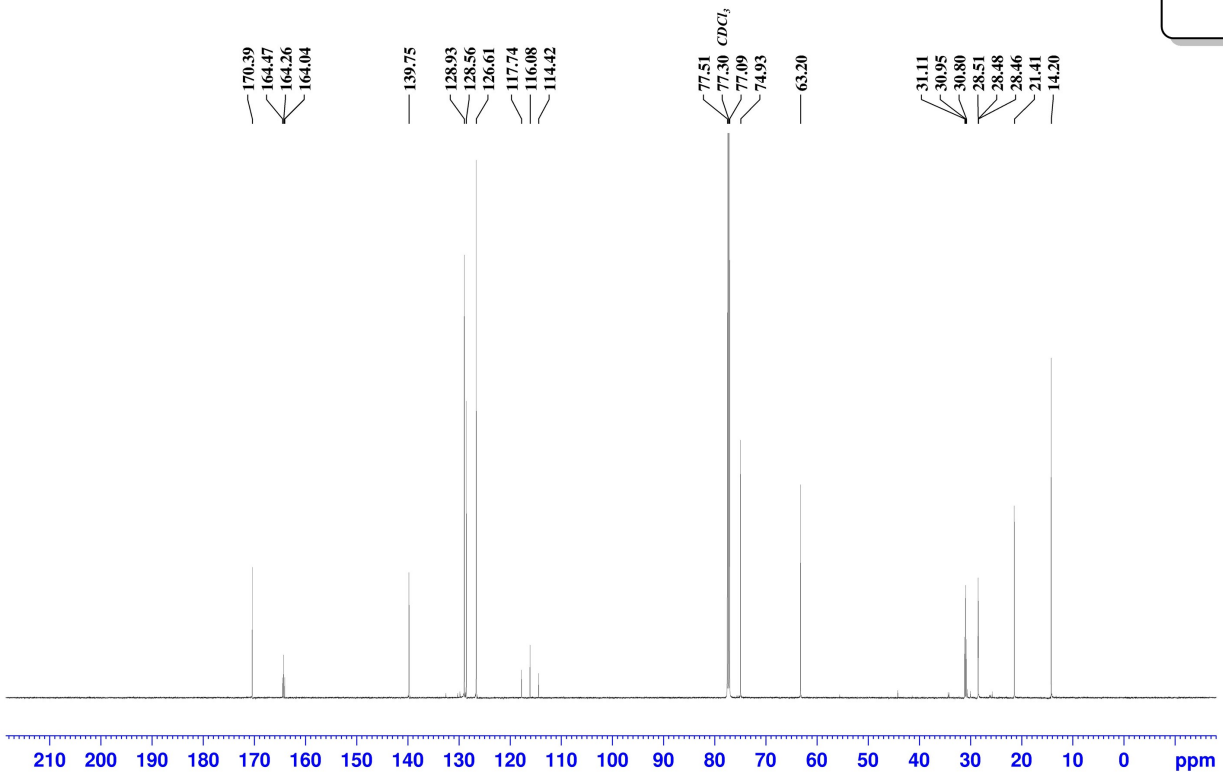
Ethyl 5-Acetoxy-2,2-difluoro-5-phenylpentanoate, ^{1}H NMR
600 MHz, $CDCl_3$



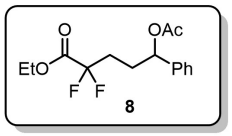


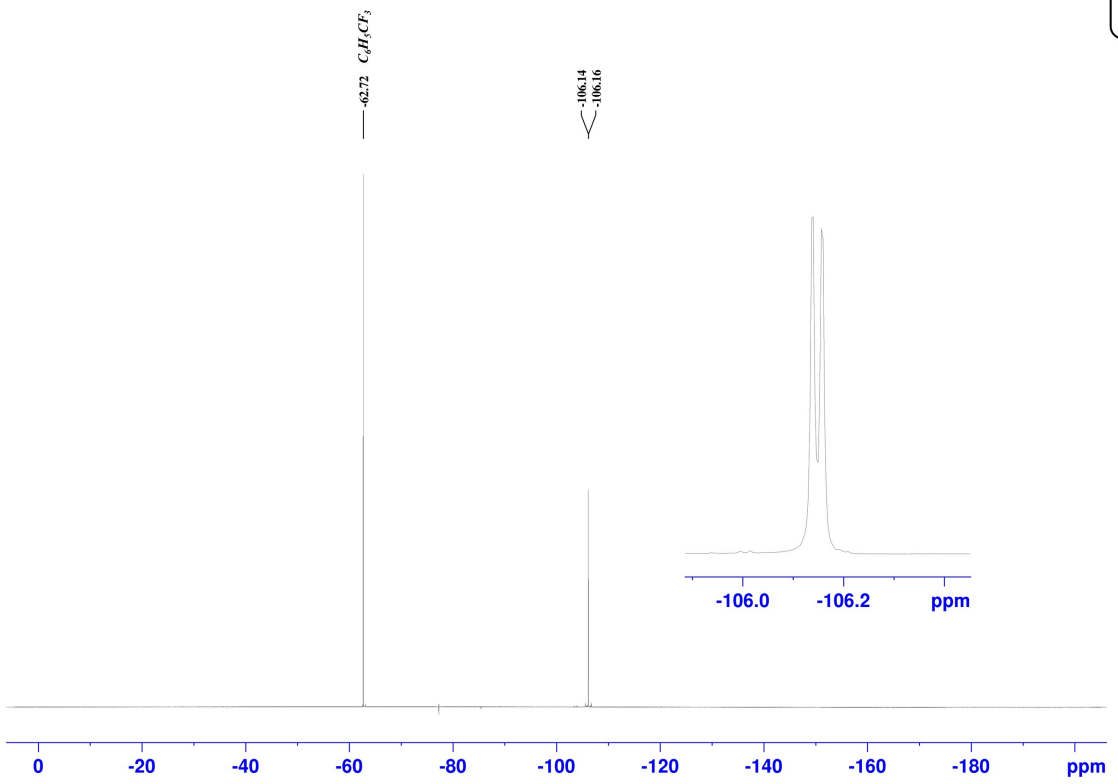
Ethyl 5-Acetoxy-2,2-difluoro-5-phenylpentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



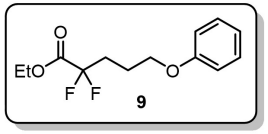


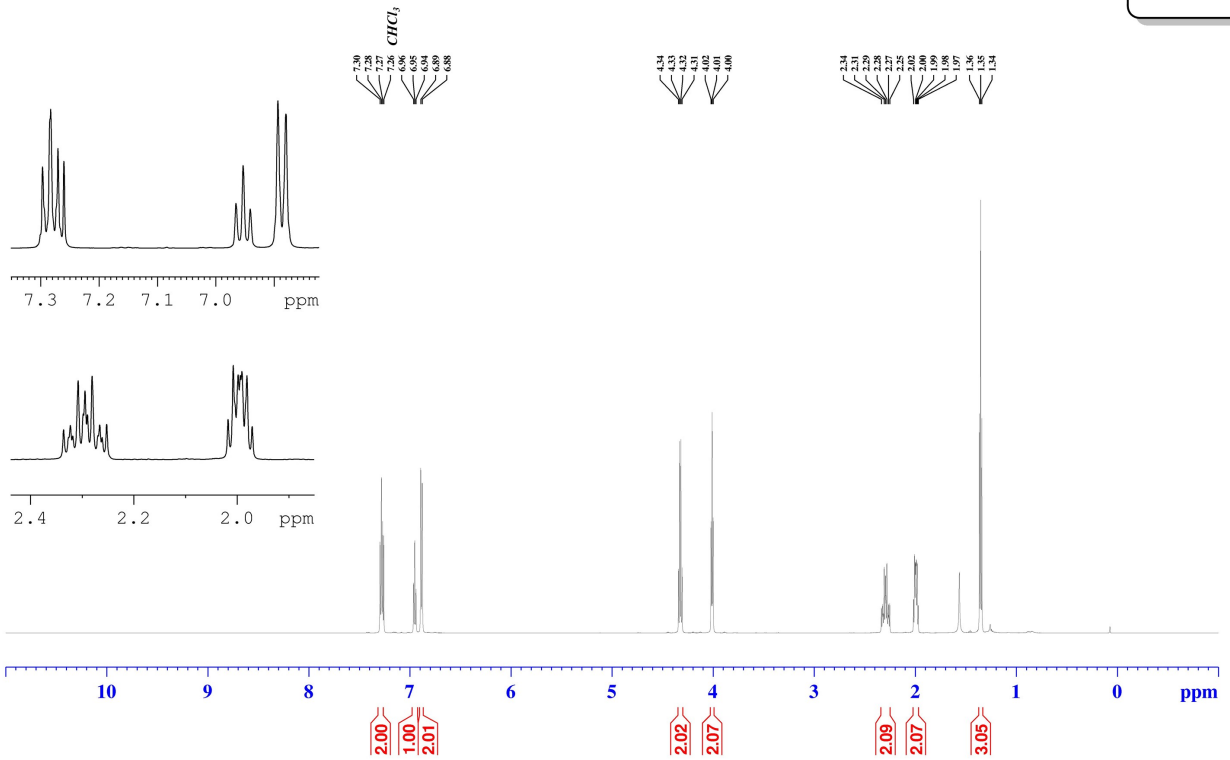
Ethyl 5-Acetoxy-2,2-difluoro-5-phenylpentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



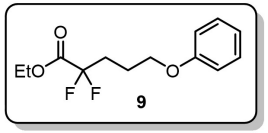


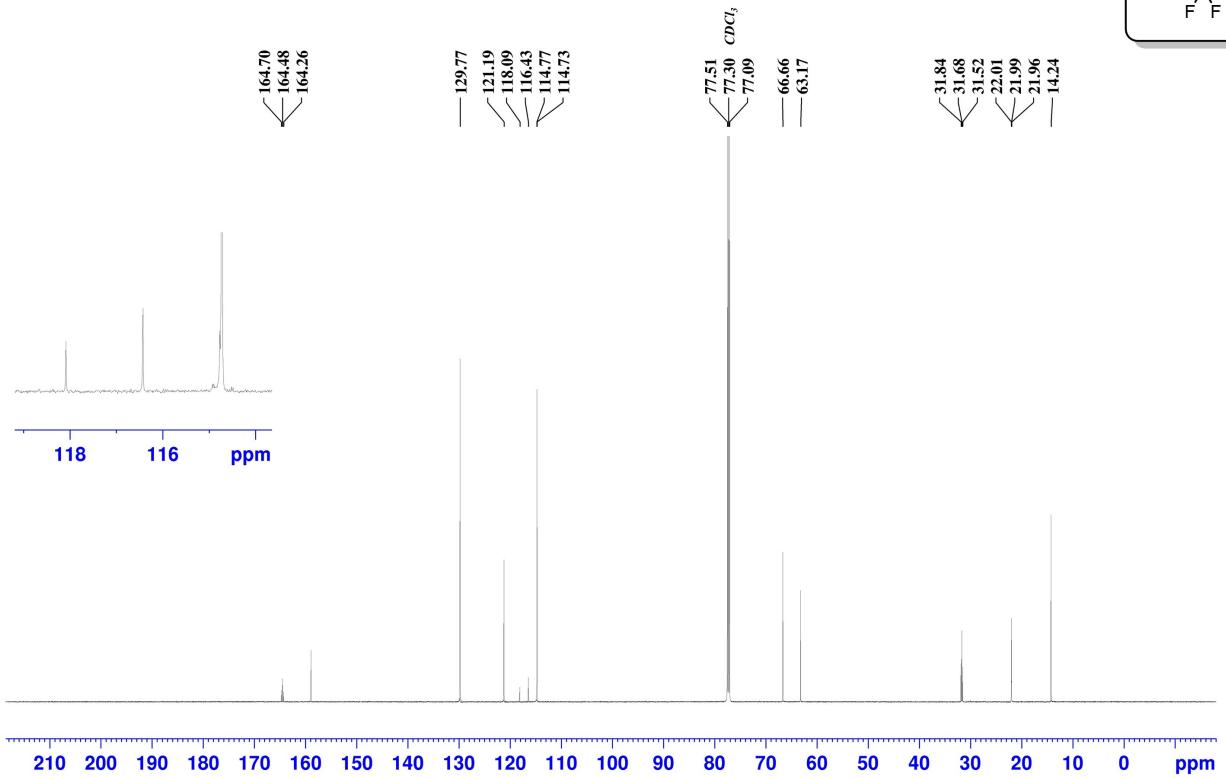
Ethyl 2,2-Difluoro-5-phenoxypentanoate, ^{1}H NMR
600 MHz, $CDCl_3$



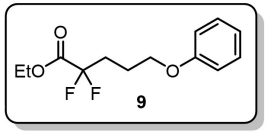


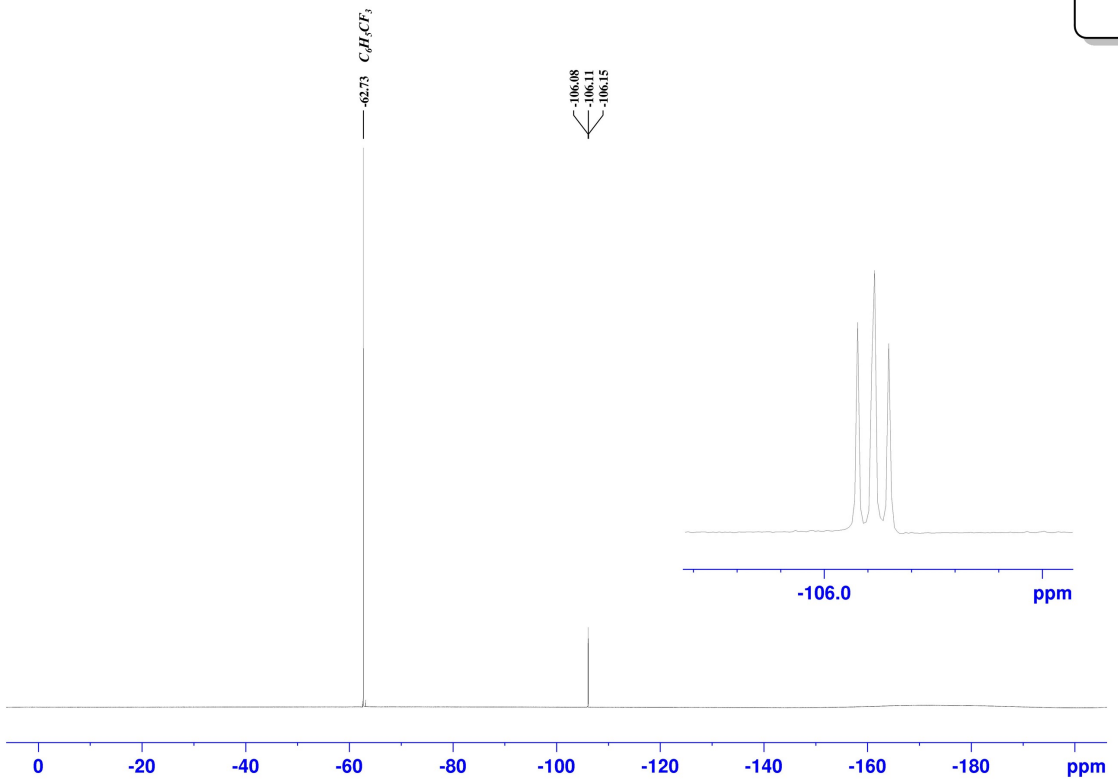
Ethyl 2,2-Difluoro-5-phenoxypentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



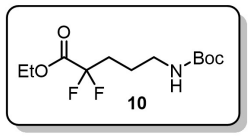


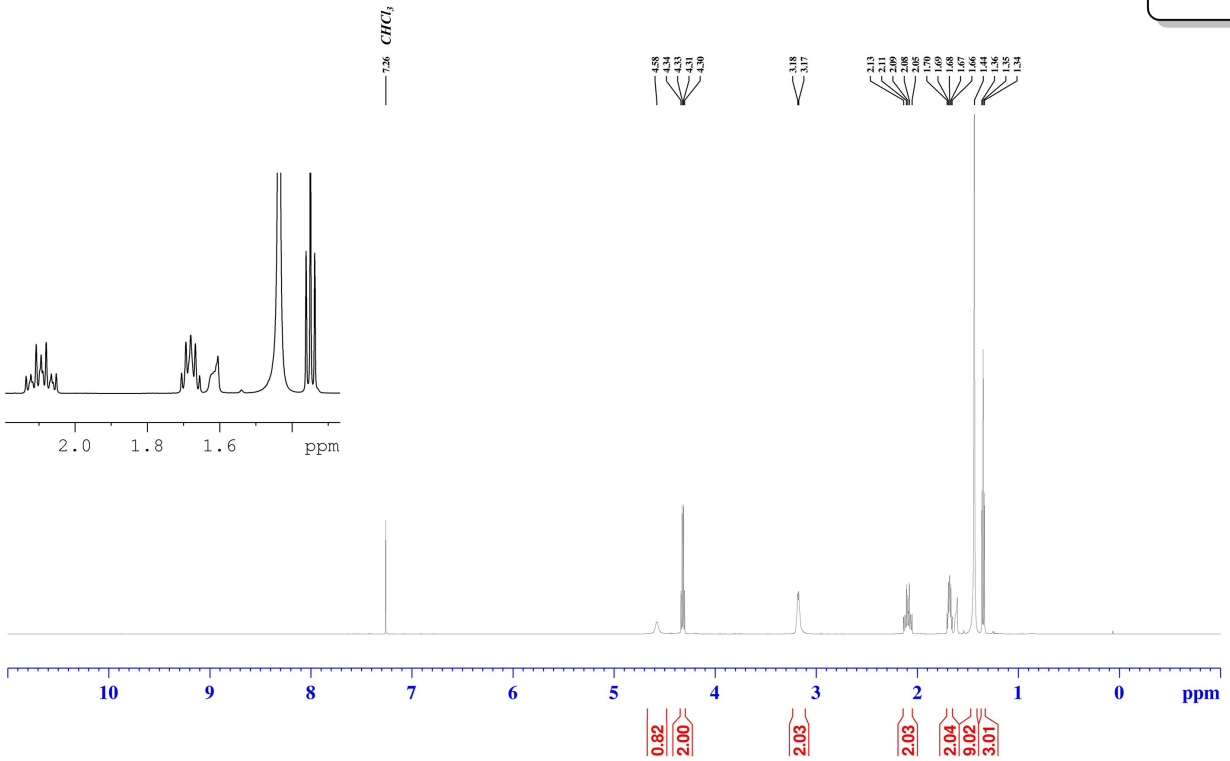
Ethyl 2,2-Difluoro-5-phenoxypentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



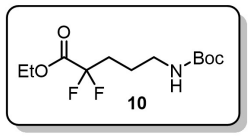


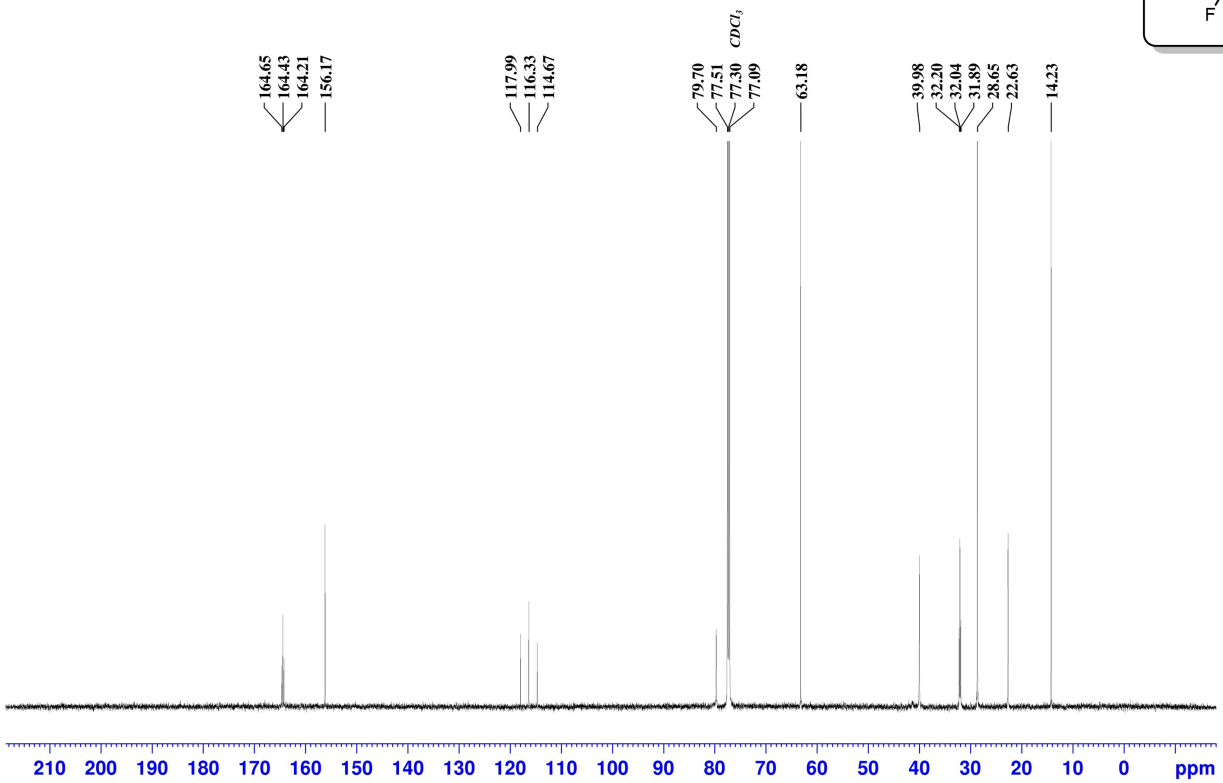
Ethyl 5-((*tert*-Butoxycarbonyl)amino)-2,2-difluoropentanoate, ^{1}H NMR 600 MHz, $CDCl_3$



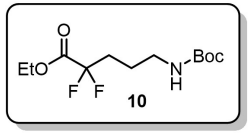


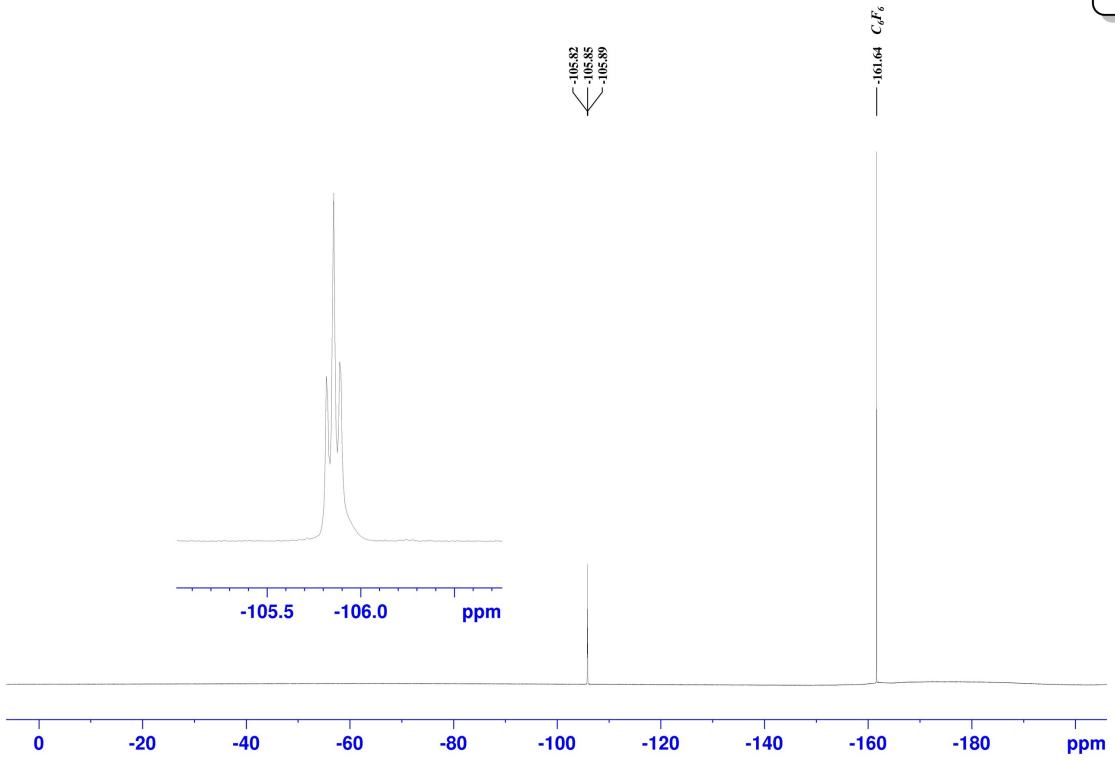
Ethyl 5-((*tert*-Butoxycarbonyl)amino)-2,2-difluoropentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



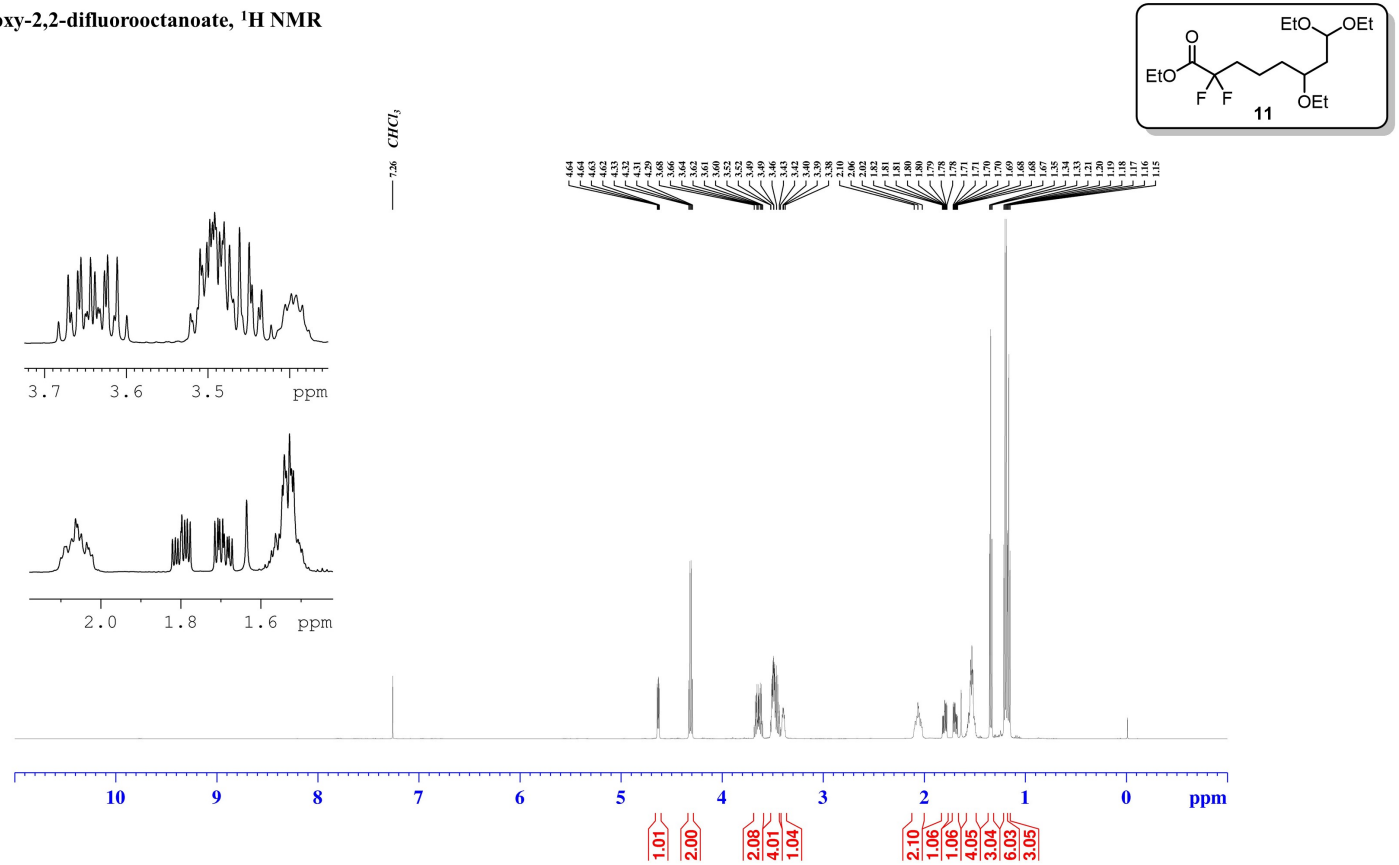


Ethyl 5-((*tert*-Butoxycarbonyl)amino)-2,2-difluoropentanoate, ^{19}F NMR
471 MHz, $CDCl_3$

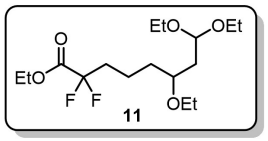


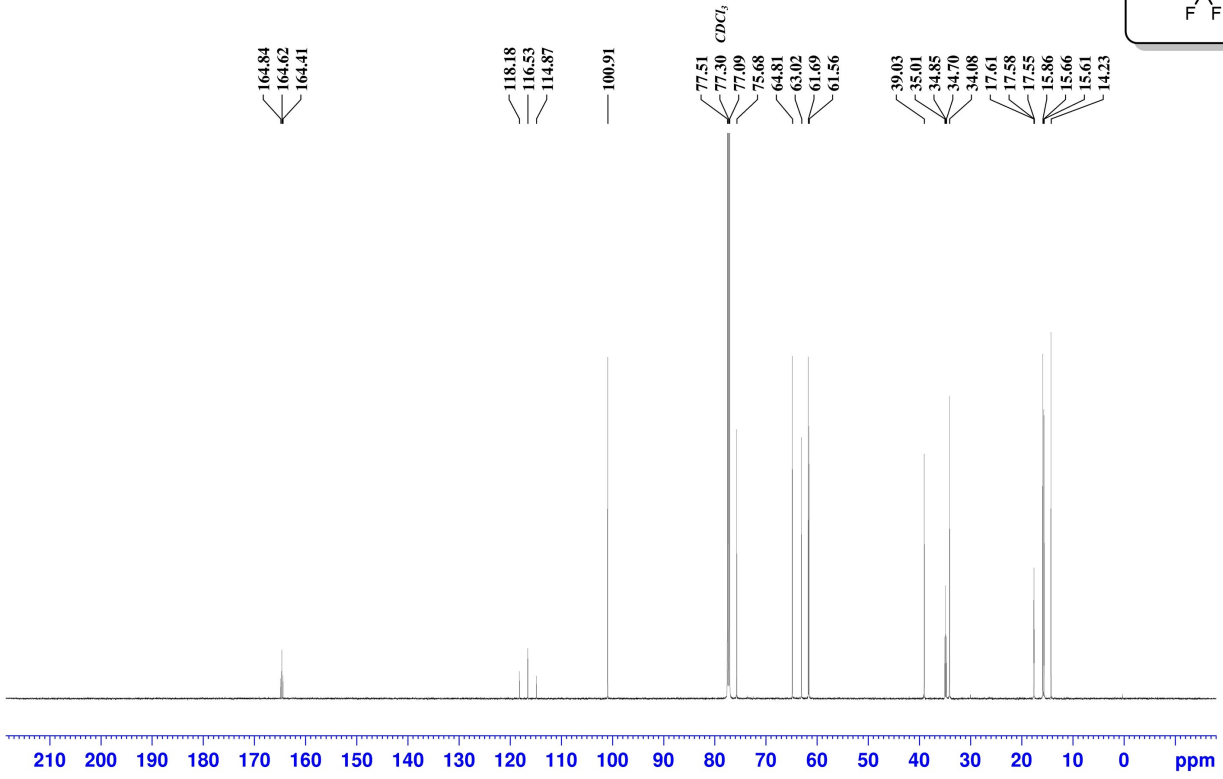


Ethyl 6,8,8-Triethoxy-2,2-difluorooctanoate, ^{1}H NMR 600 MHz, $CDCl_3$

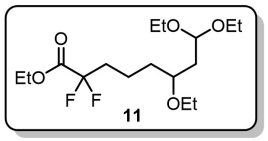


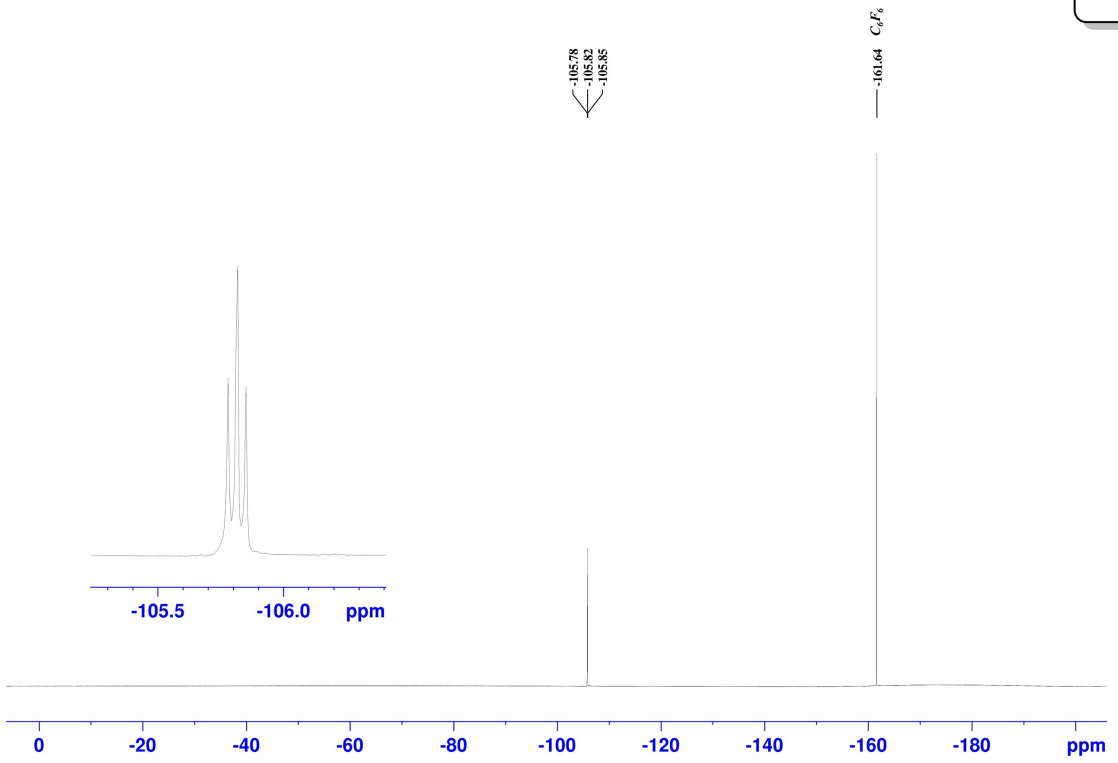
Ethyl 6,8,8-Triethoxy-2,2-difluorooctanoate, ^{13}C NMR
151 MHz, $CDCl_3$



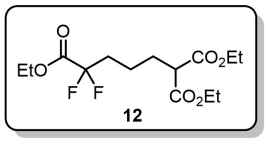


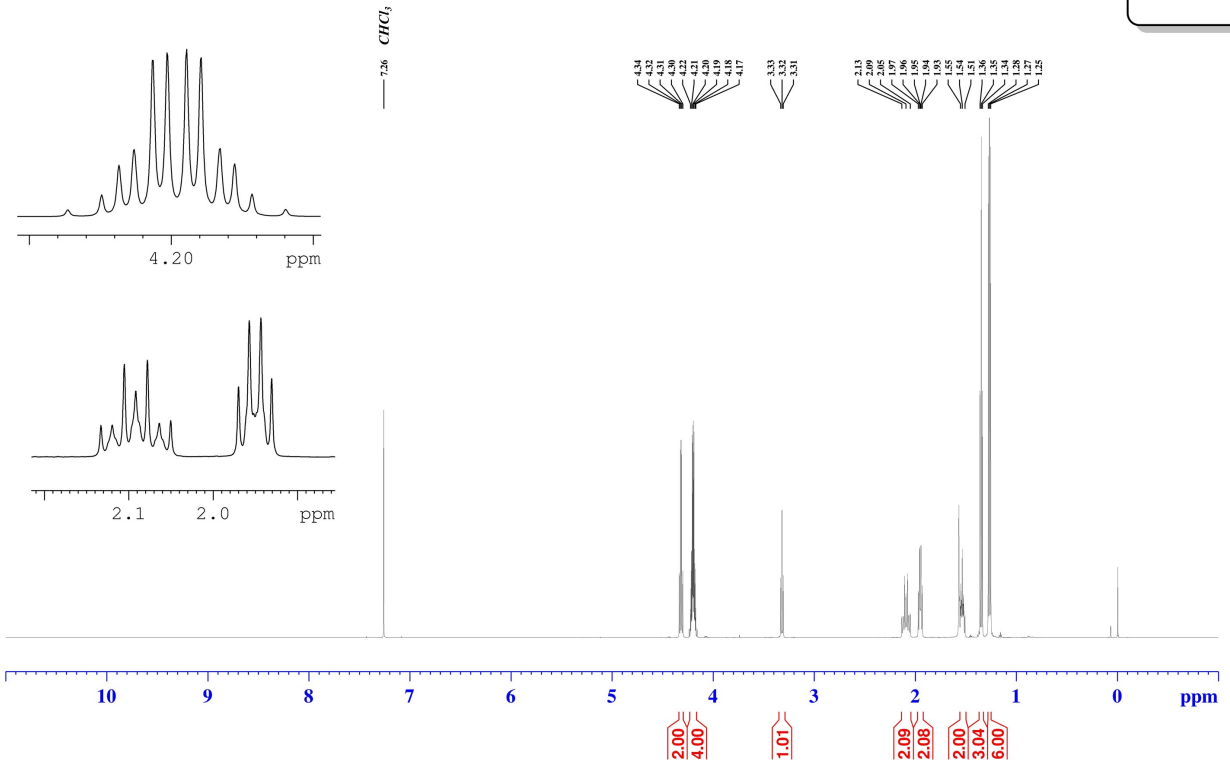
Ethyl 6,8,8-Triethoxy-2,2-difluorooctanoate, ^{19}F NMR
471 MHz, $CDCl_3$



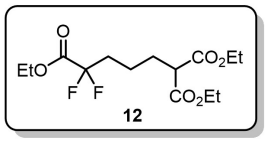


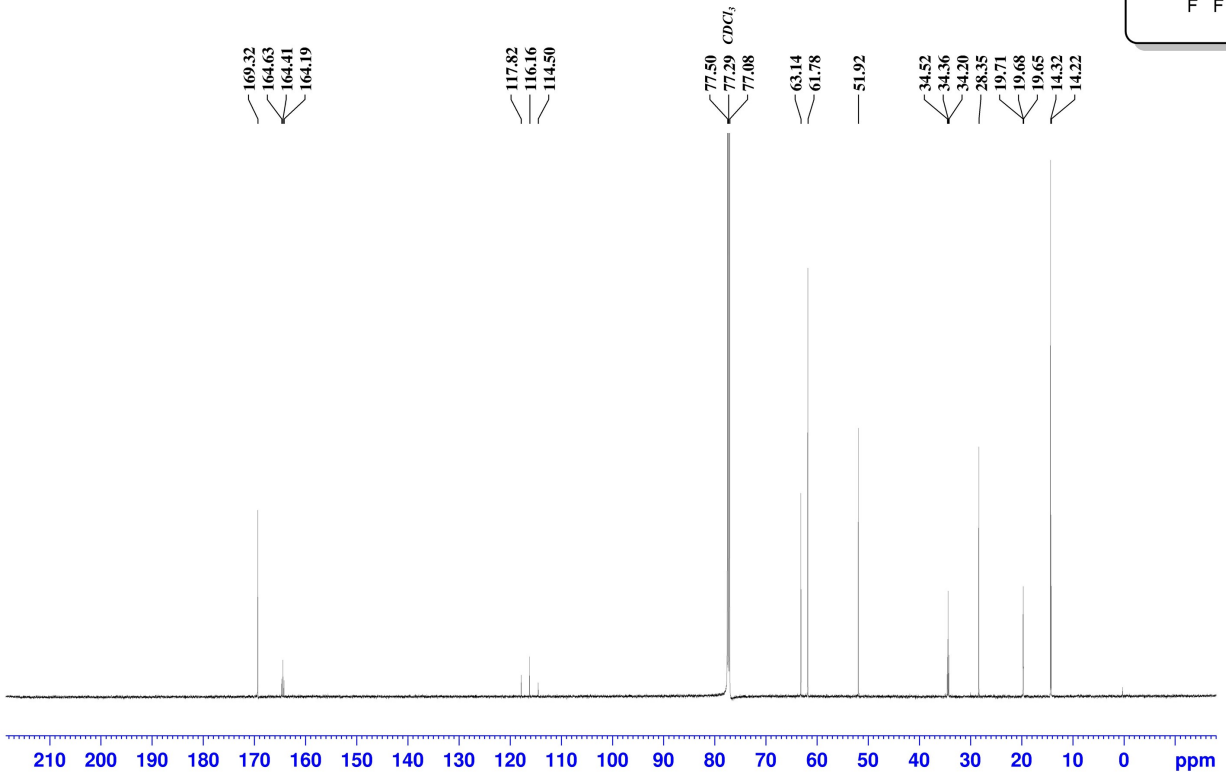
Triethyl 5,5-Difluoropentane-1,1,5-tricarboxylate, ^{1}H NMR
600 MHz, $CDCl_3$



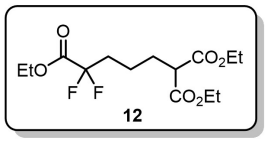


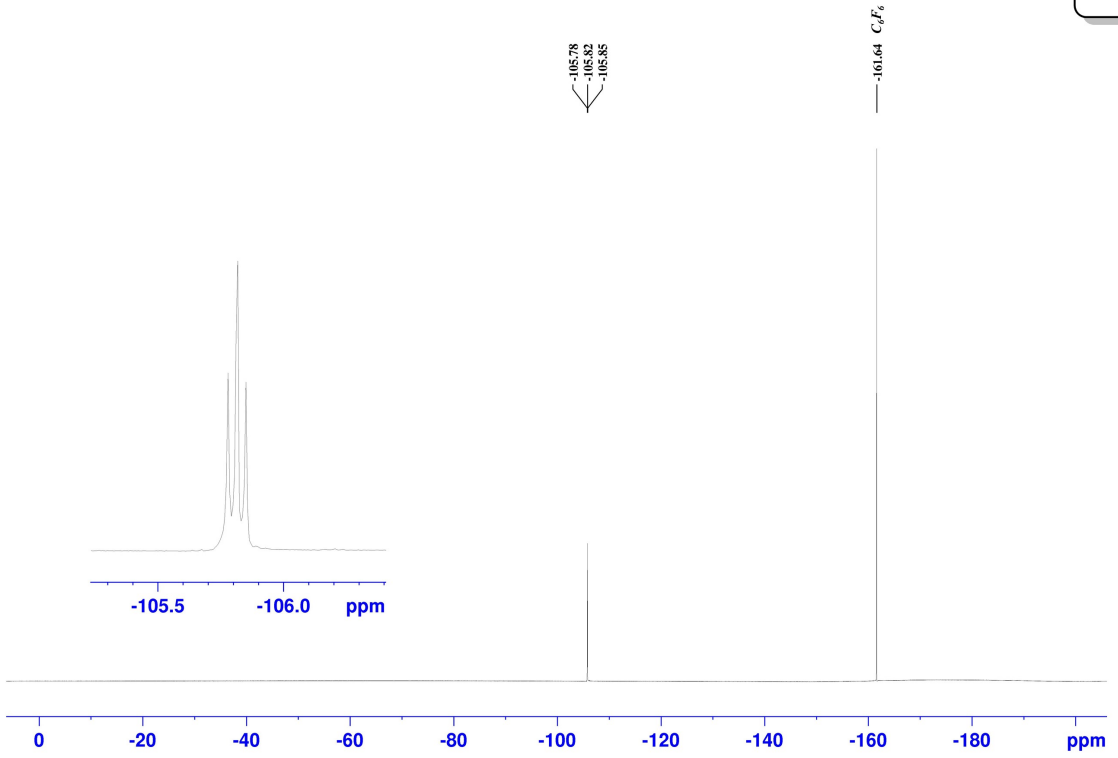
Triethyl 5,5-Difluoropentane-1,1,5-tricarboxylate, ^{13}C NMR
151 MHz, $CDCl_3$



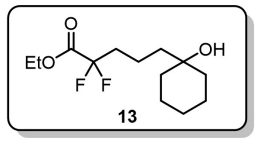


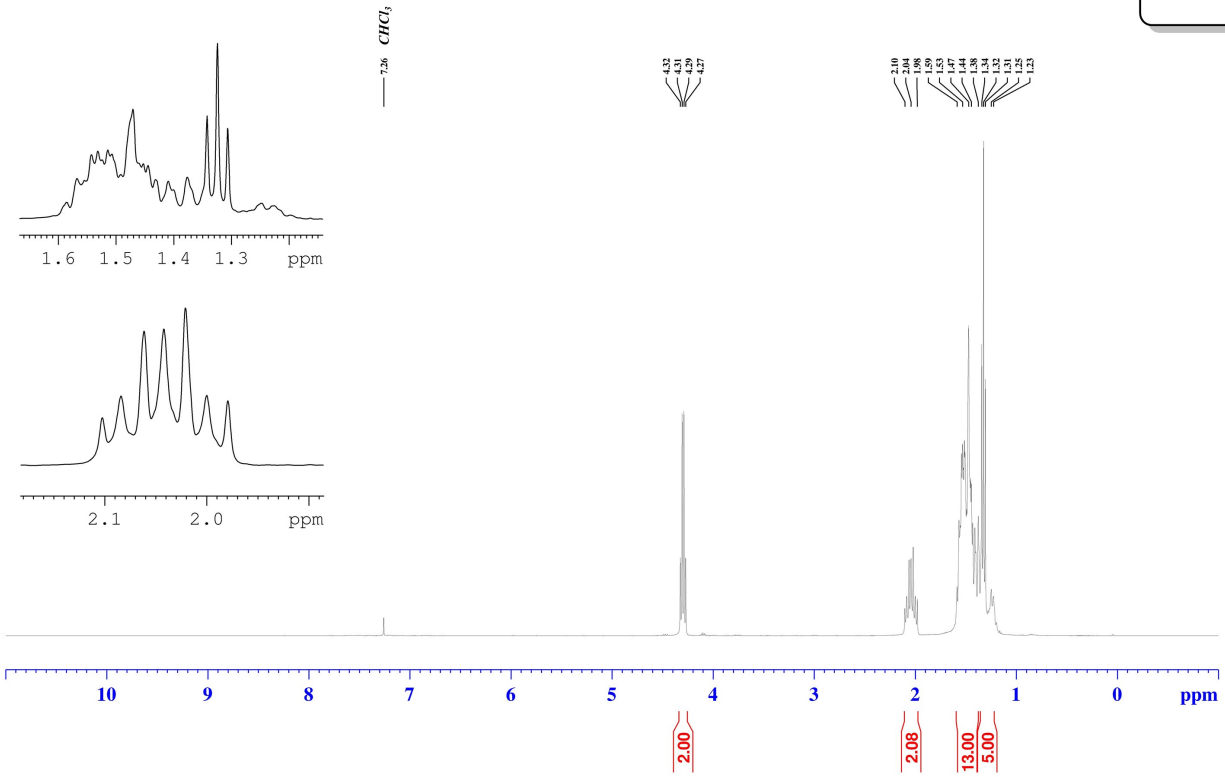
Triethyl 5,5-Difluoropentane-1,1,5-tricarboxylate, ^{19}F NMR
471 MHz, $CDCl_3$



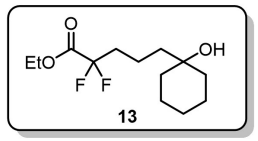


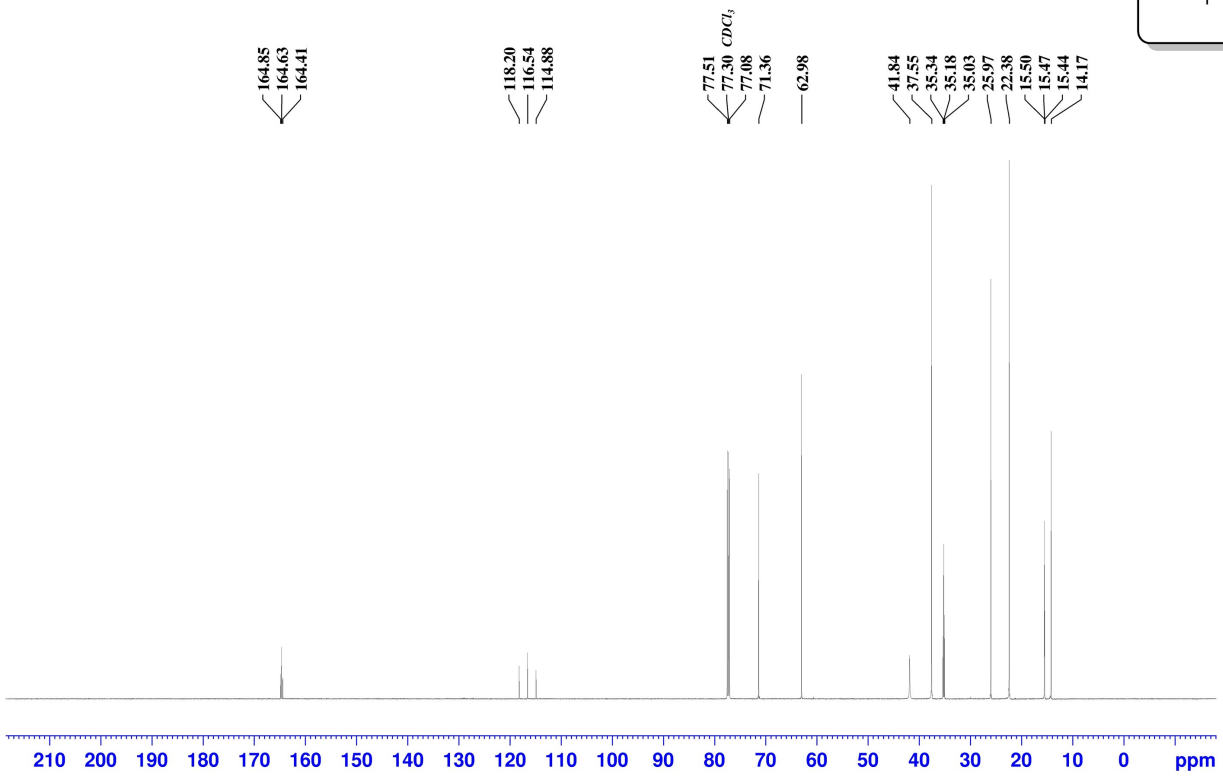
Ethyl 2,2-Difluoro-5-(1-hydroxycyclohexyl)pentanoate, ^{1}H NMR
600 MHz, $CDCl_3$



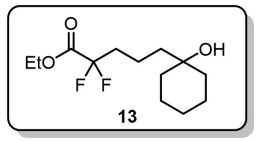


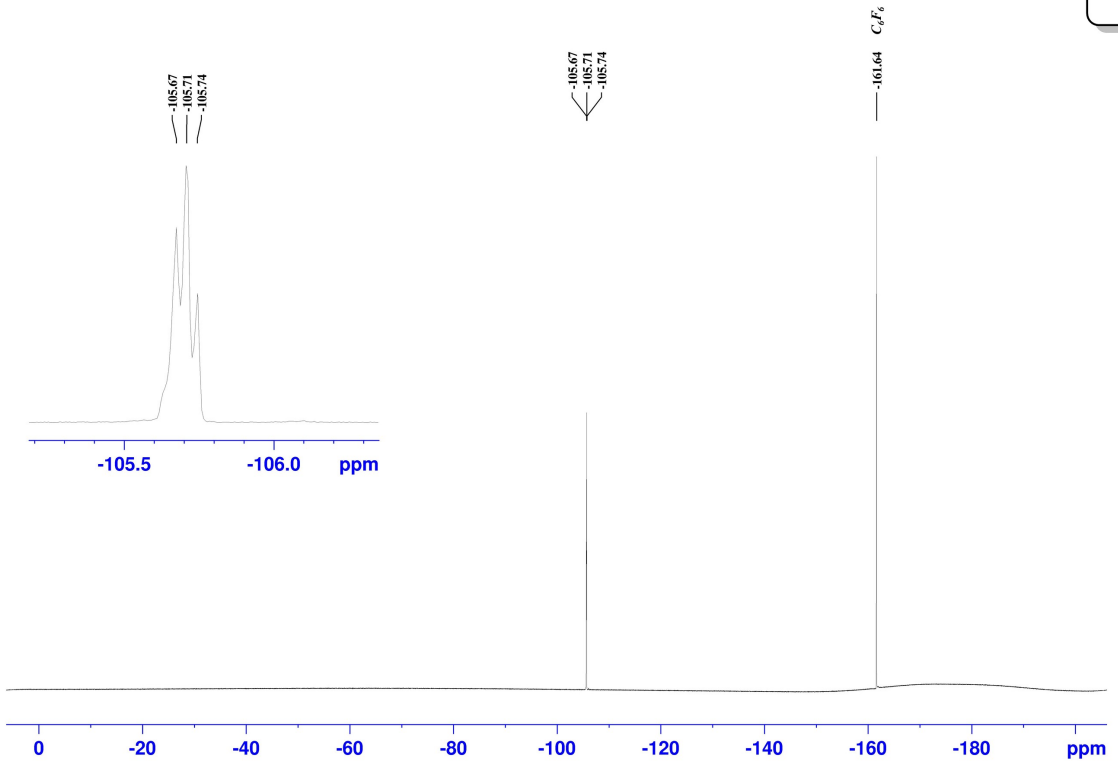
Ethyl 2,2-Difluoro-5-(1-hydroxycyclohexyl)pentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



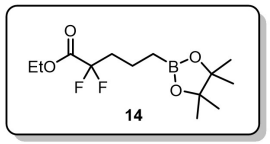


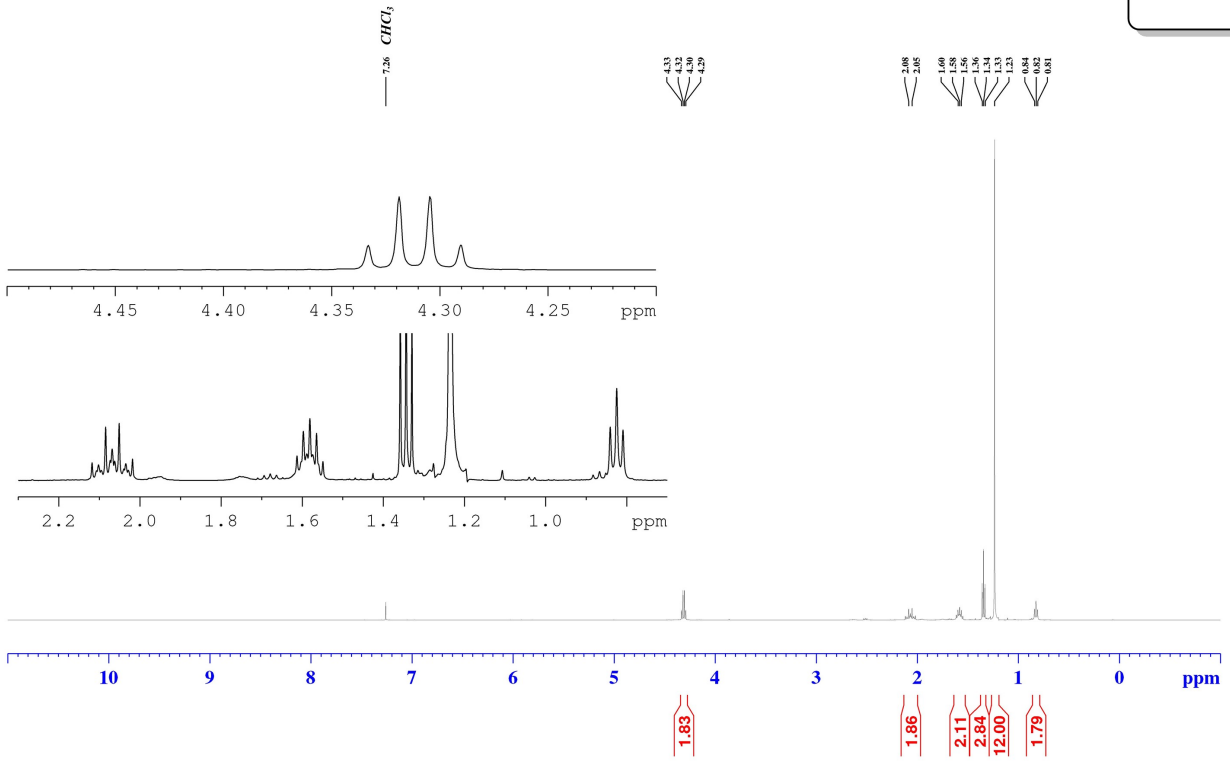
Ethyl 2,2-Difluoro-5-(1-hydroxycyclohexyl)pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



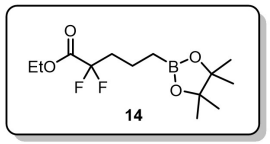


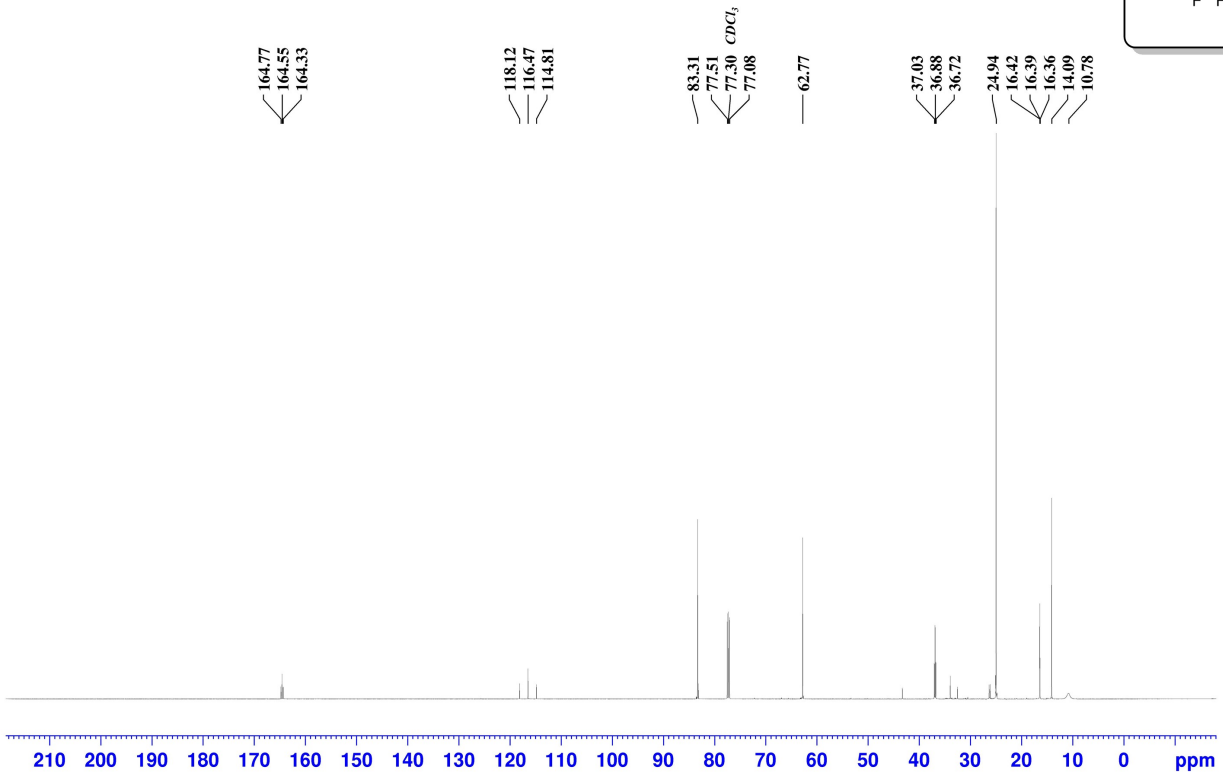
Ethyl 2,2-Difluoro-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan -2-yl)pentanoate, ^{1}H NMR 600 MHz, $CDCl_3$



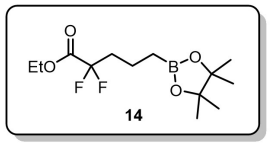


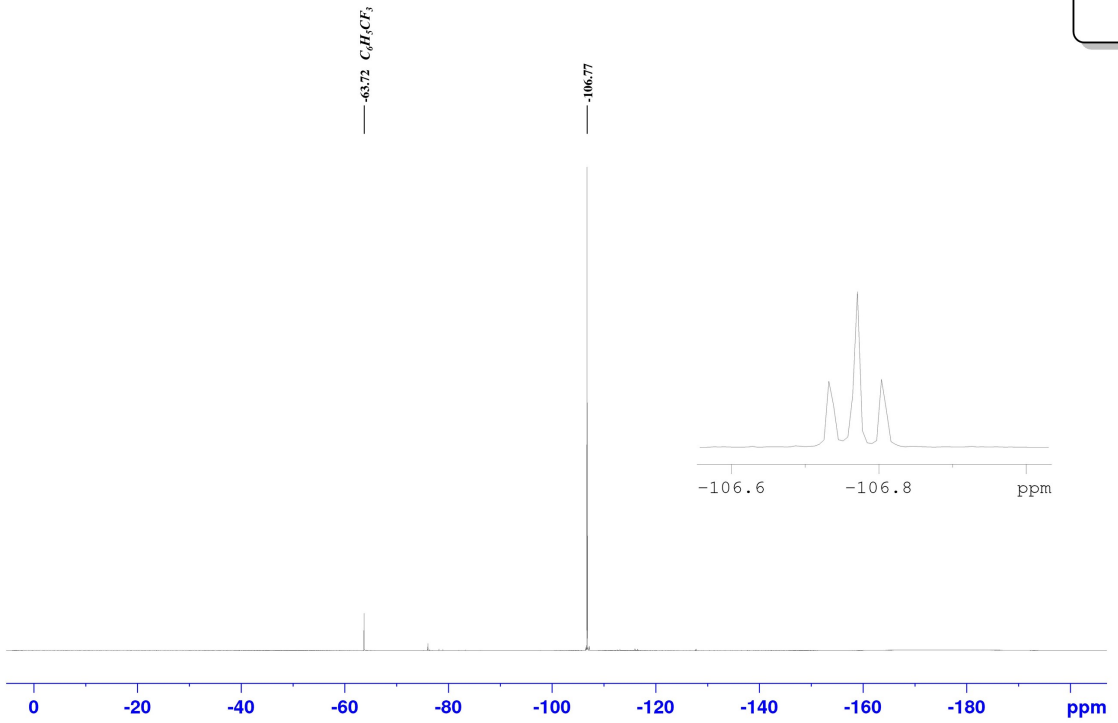
Ethyl 2,2-Difluoro-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan -2-yl)pentanoate, ^{13}C NMR
600 MHz, $CDCl_3$



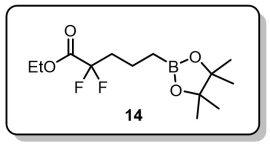


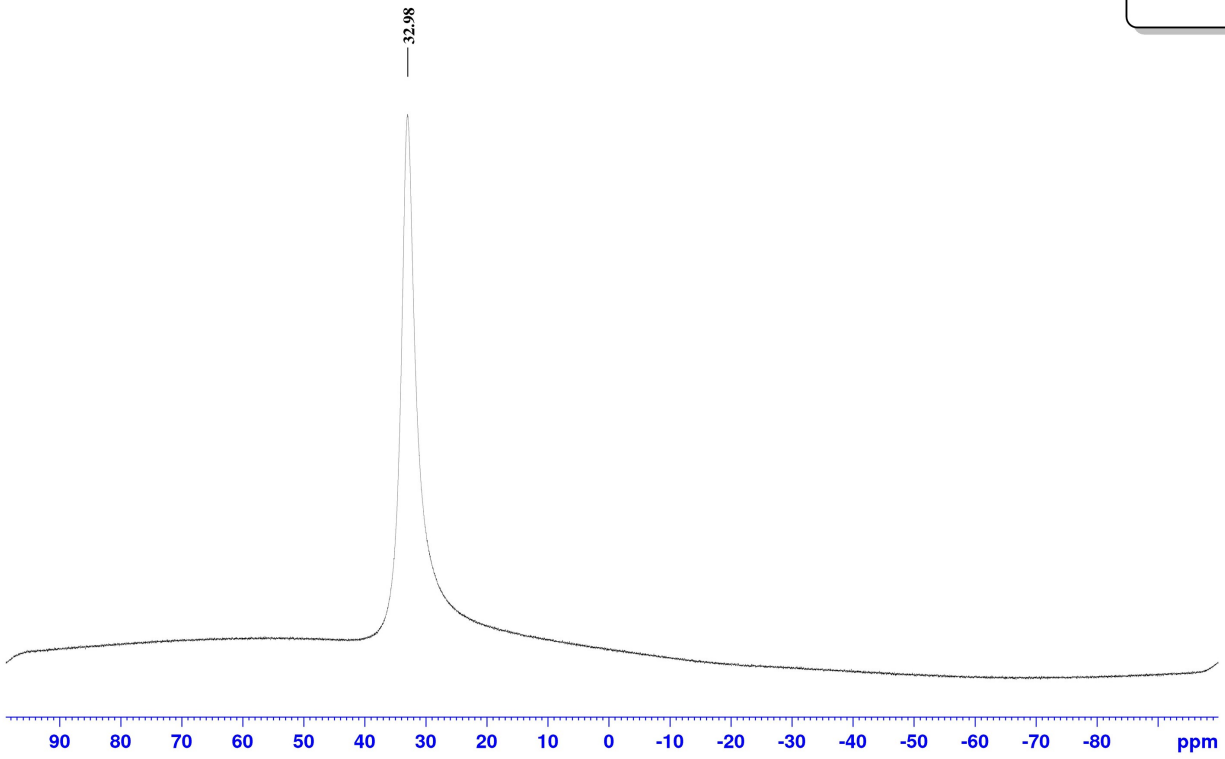
Ethyl 2,2-Difluoro-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan -2-yl)pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



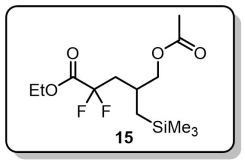


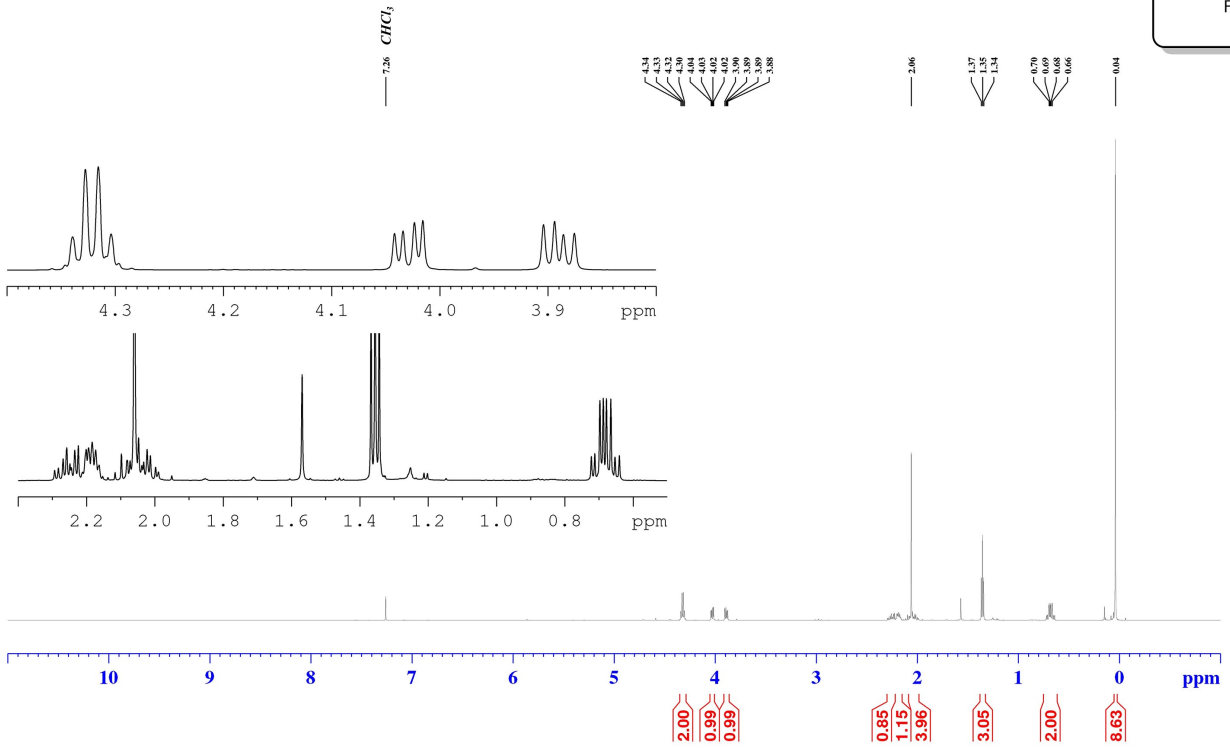
Ethyl 2,2-Difluoro-5-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan -2-yl)pentanoate, ^{11}B NMR
128 MHz, $CDCl_3$



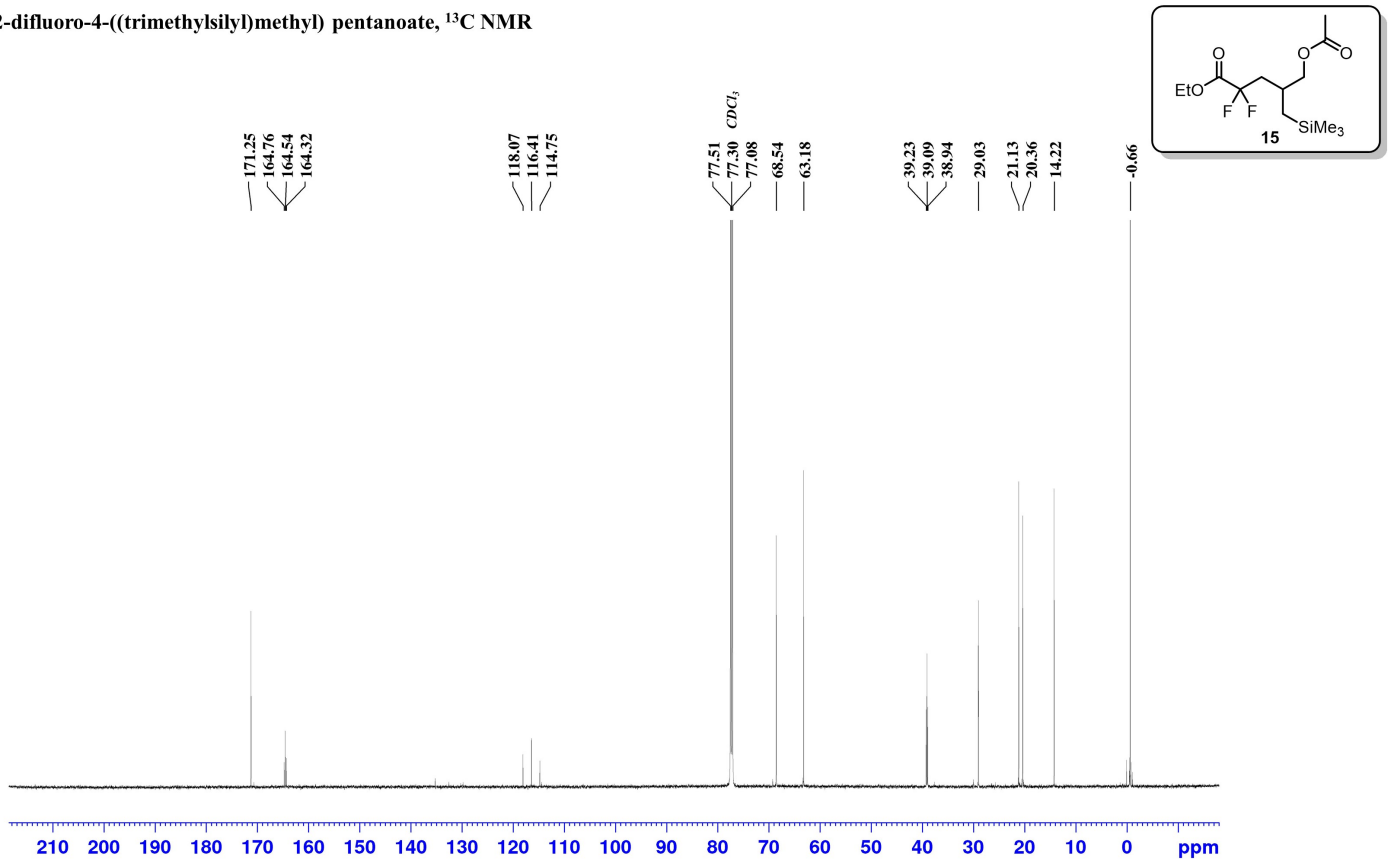


Ethyl 5-Acetoxy-2,2-difluoro-4-((trimethylsilyl)methyl) pentanoate, ^{1}H NMR
600 MHz, $CDCl_3$

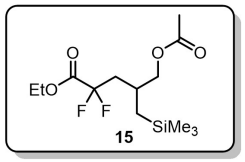


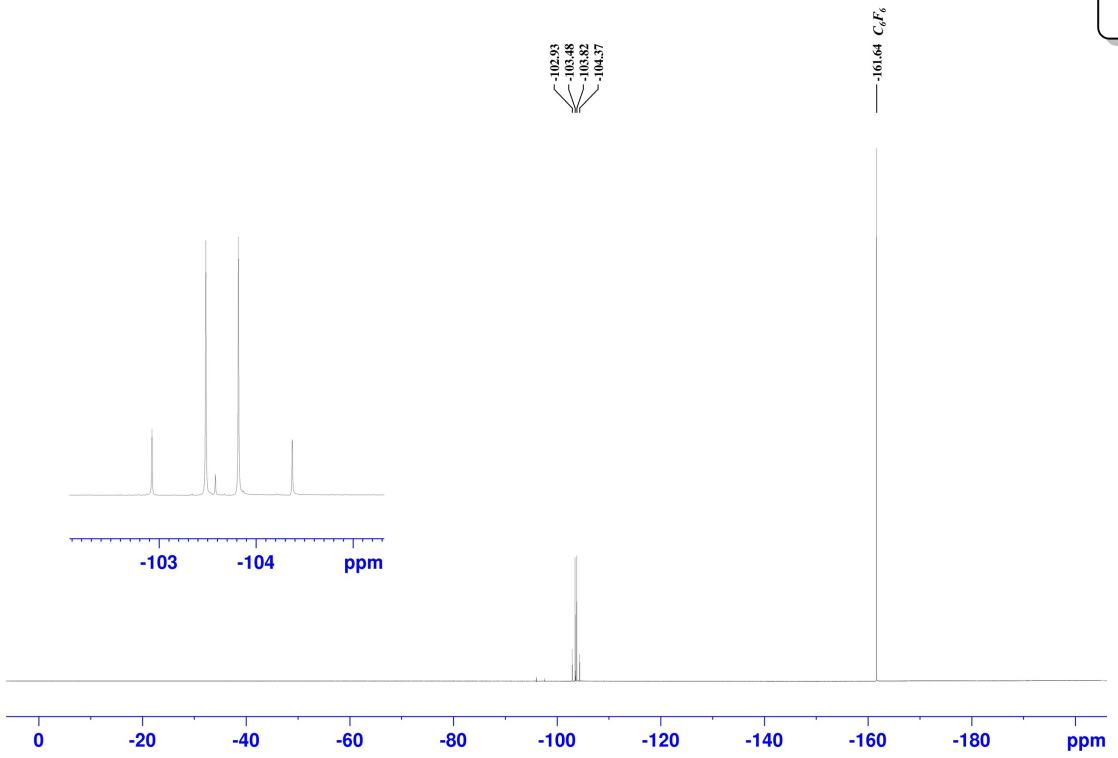


Ethyl 5-Acetoxy-2,2-difluoro-4-((trimethylsilyl)methyl) pentanoate, ^{13}C NMR
151 MHz, $CDCl_3$

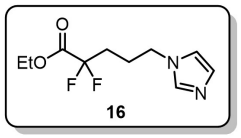


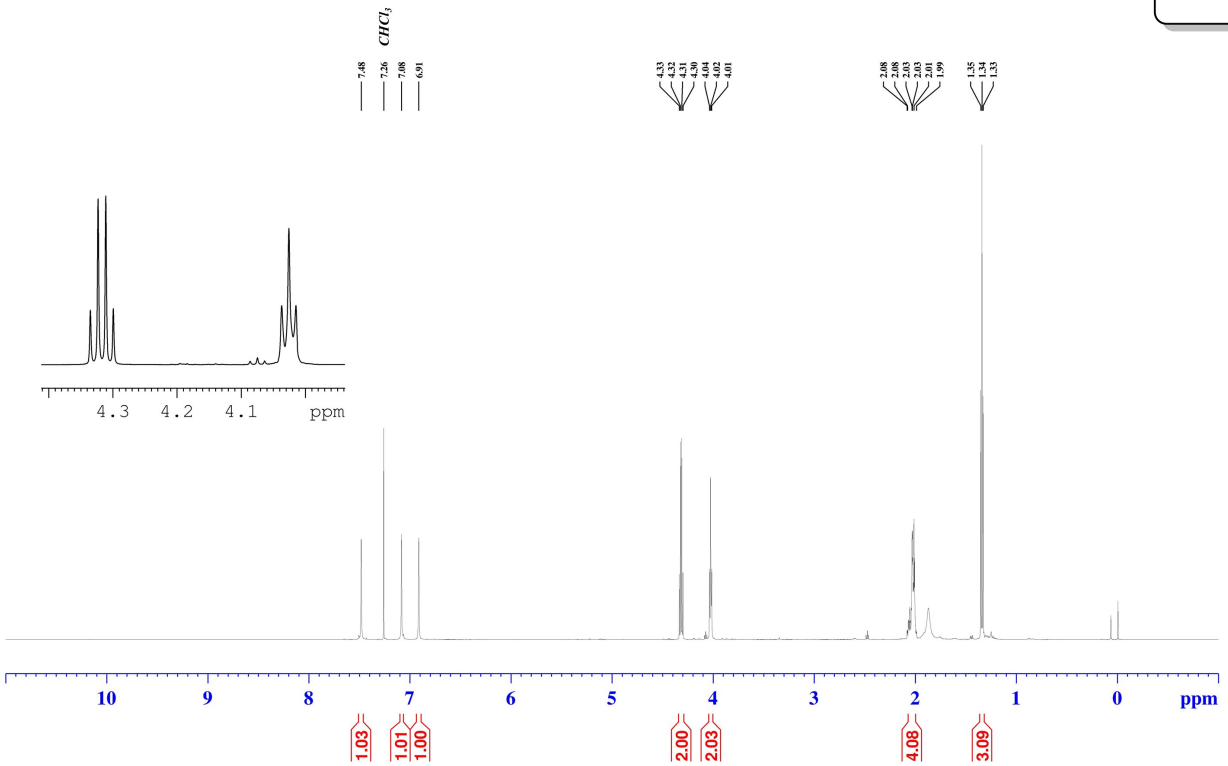
Ethyl 5-Acetoxy-2,2-difluoro-4-((trimethylsilyl)methyl) pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



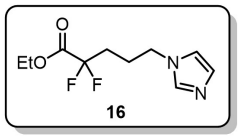


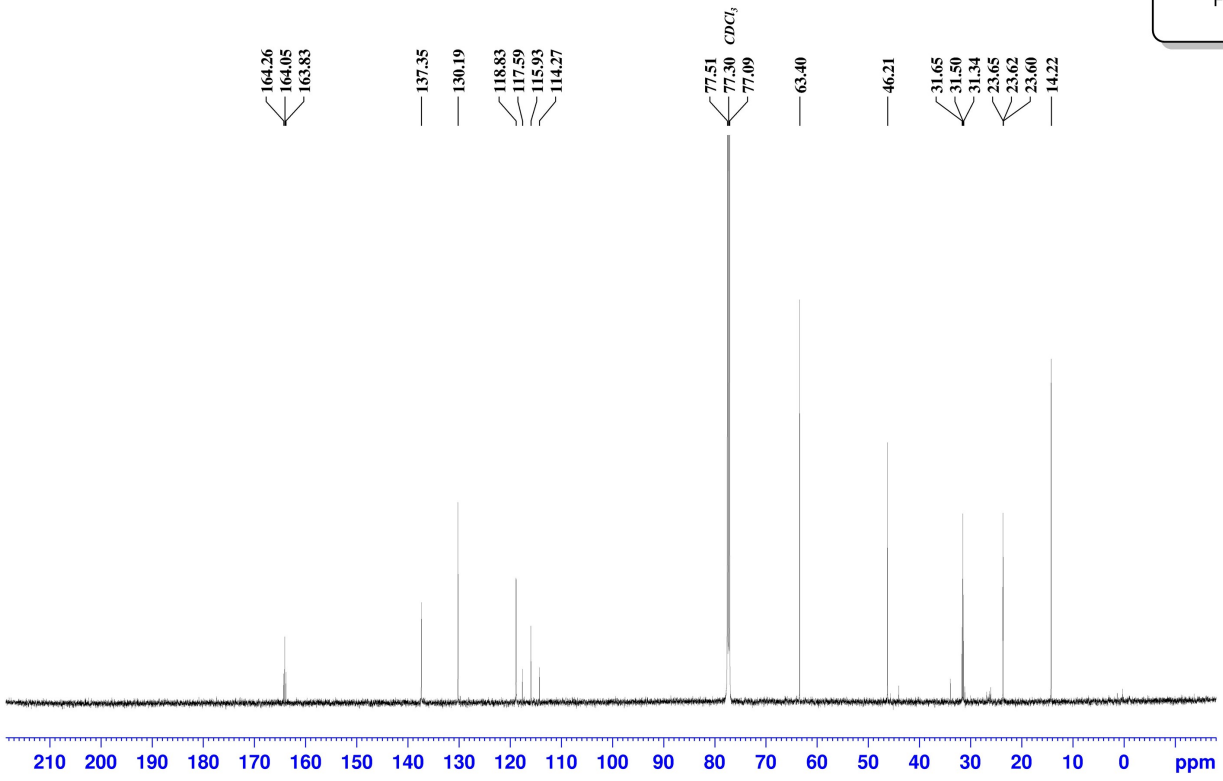
Ethyl 2,2-Difluoro-5-(1H-imidazol-1-yl)pentanoate, ^{1}H NMR
600 MHz, $CDCl_3$



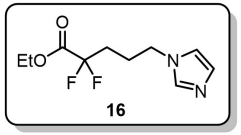


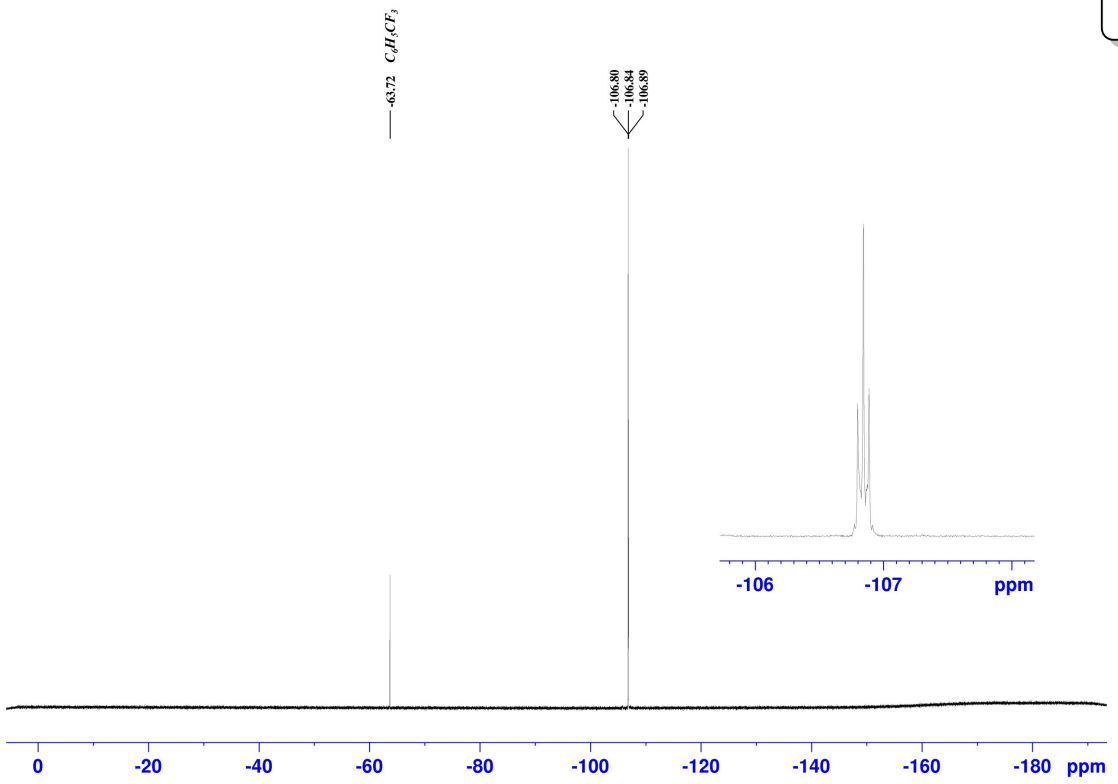
Ethyl 2,2-Difluoro-5-(1H-imidazol-1-yl)pentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



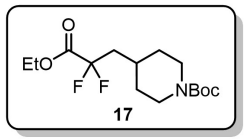


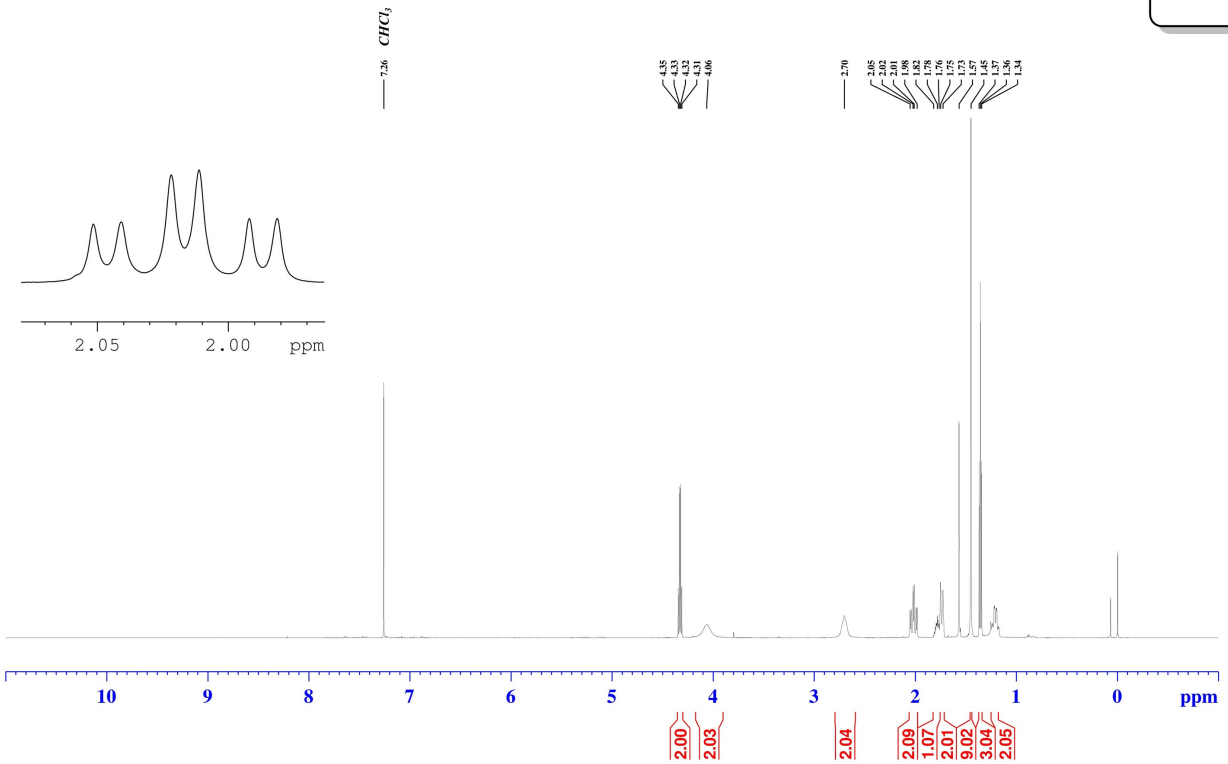
Ethyl 2,2-Difluoro-5-(1H-imidazol-1-yl)pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



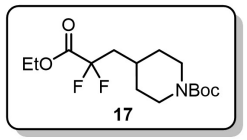


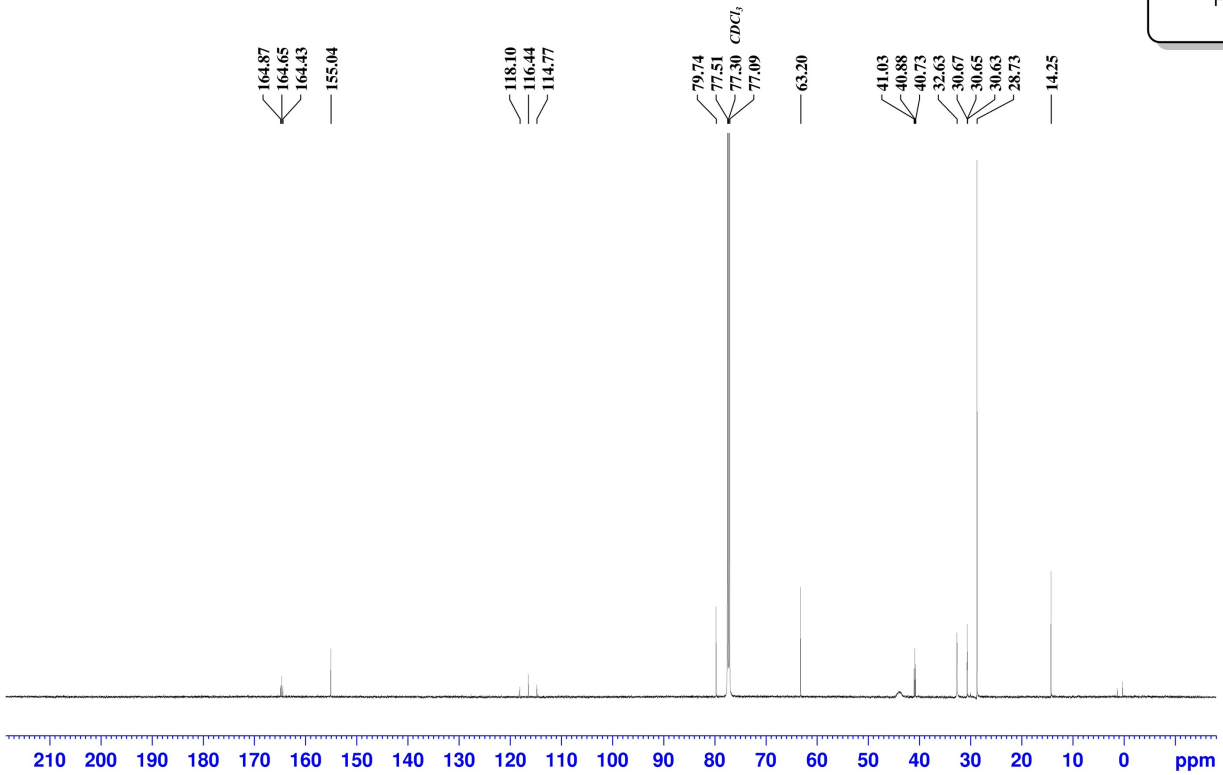
***tert*-Butyl 4-(3-Ethoxy-2,2-difluoro-3-oxopropyl)piperidine-1-carboxylate, ^{1}H NMR**
600 MHz, $CDCl_3$



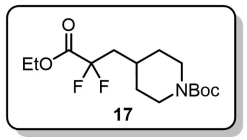


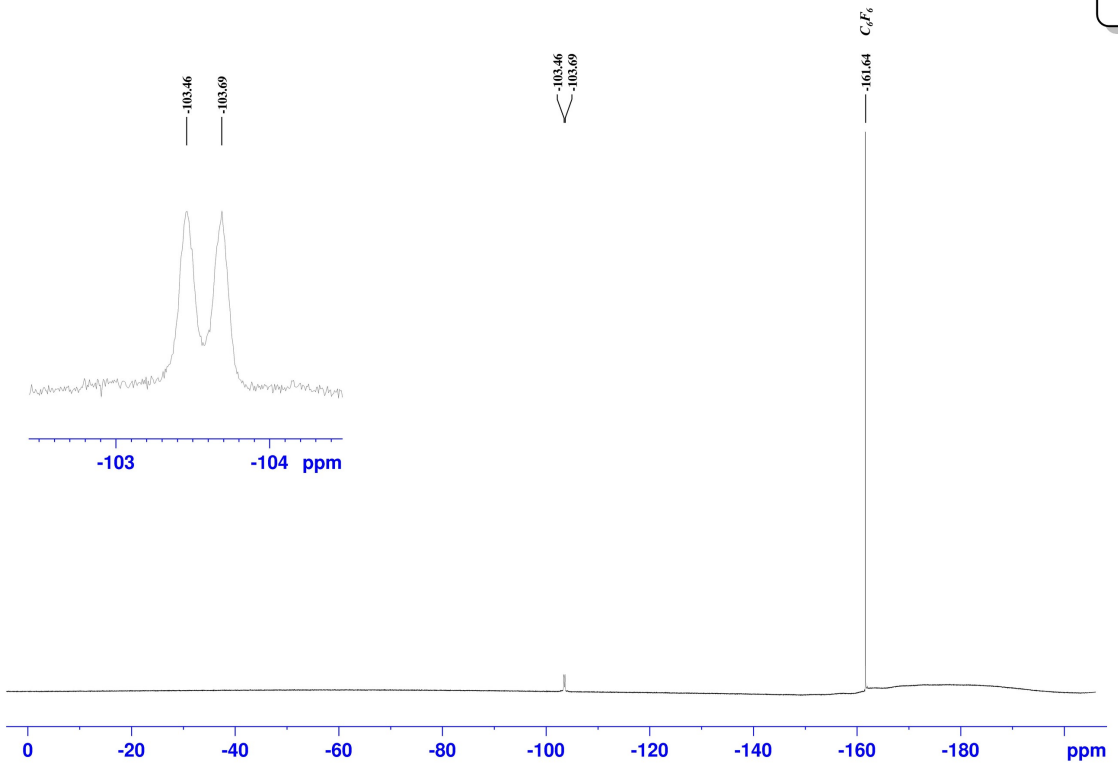
tert-Butyl 4-(3-Ethoxy-2,2-difluoro-3-oxopropyl)piperidine-1-carboxylate, ^{13}C NMR
151 MHz, $CDCl_3$



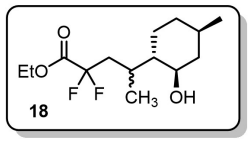


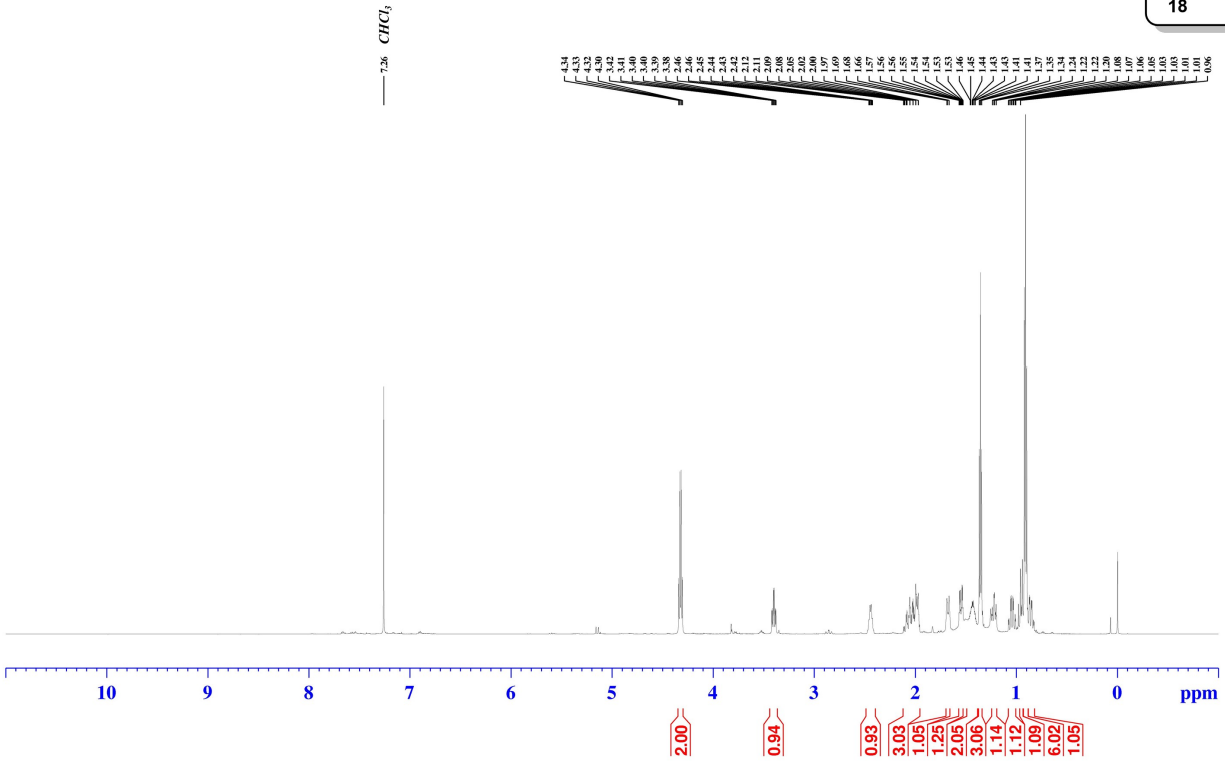
***tert*-Butyl 4-(3-Ethoxy-2,2-difluoro-3-oxopropyl)piperidine-1-carboxylate, ^{19}F NMR**
471 MHz, $CDCl_3$



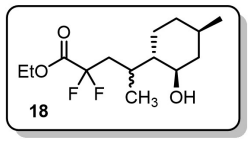


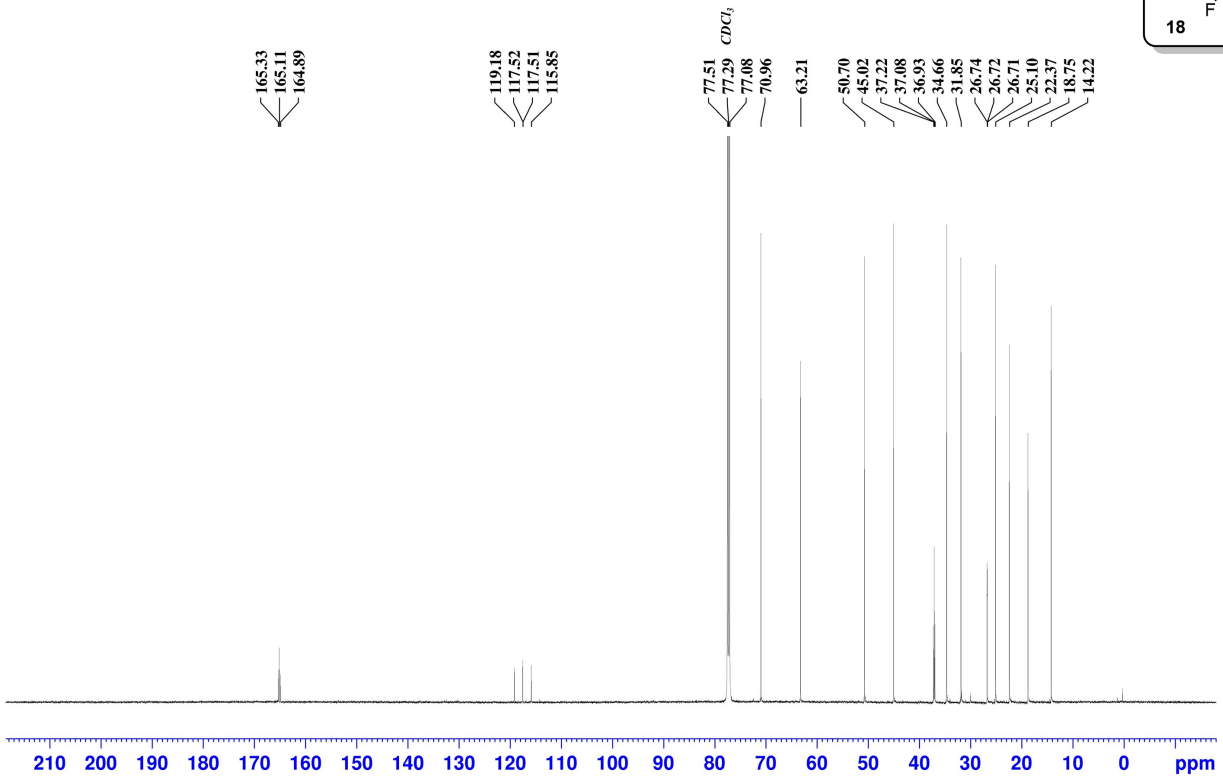
Ethyl 2,2-Difluoro-4-((1*S*,2*R*,4*R*)-2-hydroxy-4-methyl cyclohexyl)pentanoate, ^{1}H NMR
600 MHz, $CDCl_3$



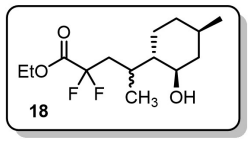


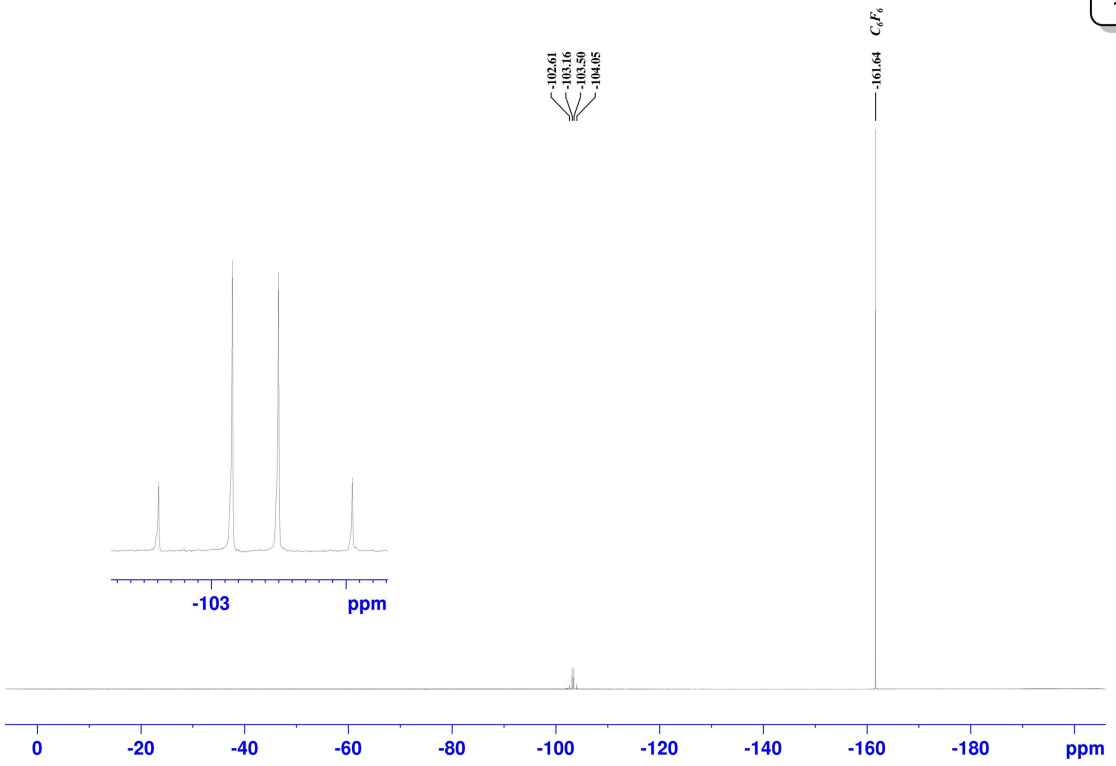
Ethyl 2,2-Difluoro-4-((1*S*,2*R*,4*R*)-2-hydroxy-4-methyl cyclohexyl)pentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



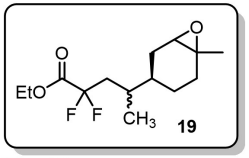


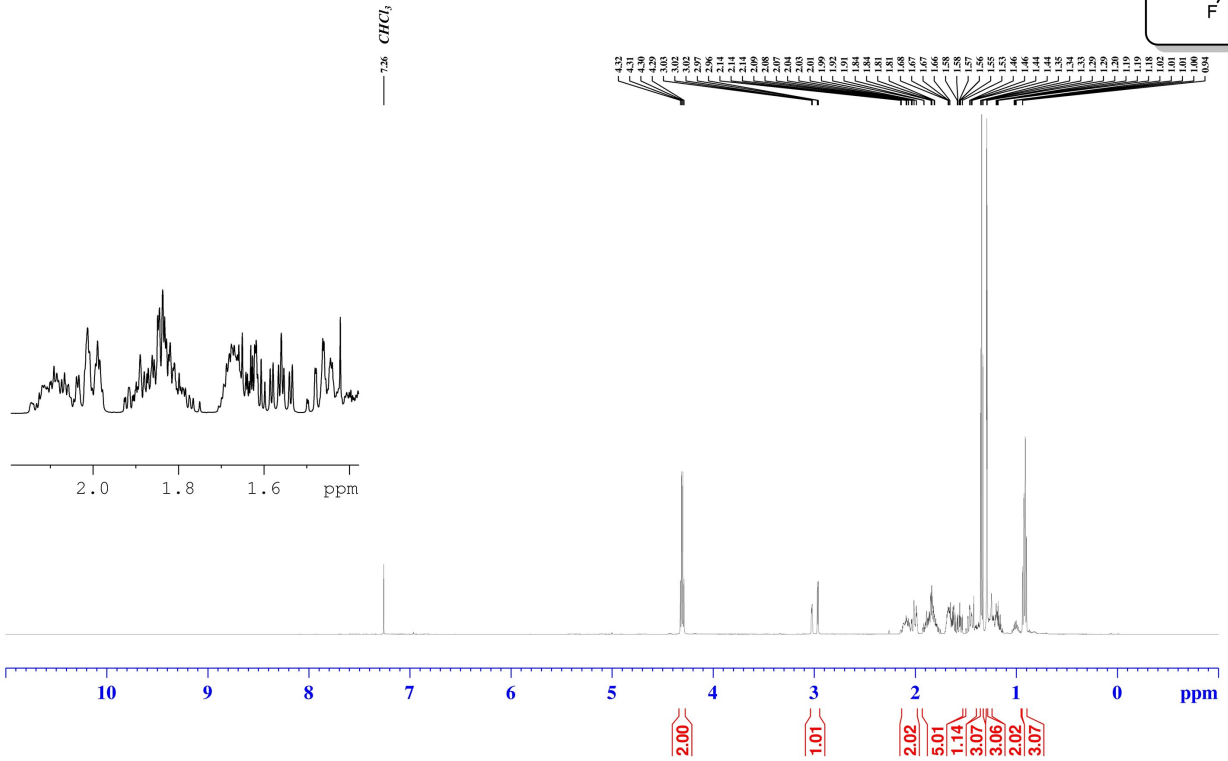
Ethyl 2,2-Difluoro-4-((1*S*,2*R*,4*R*)-2-hydroxy-4-methyl cyclohexyl)pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



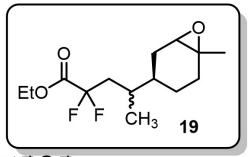


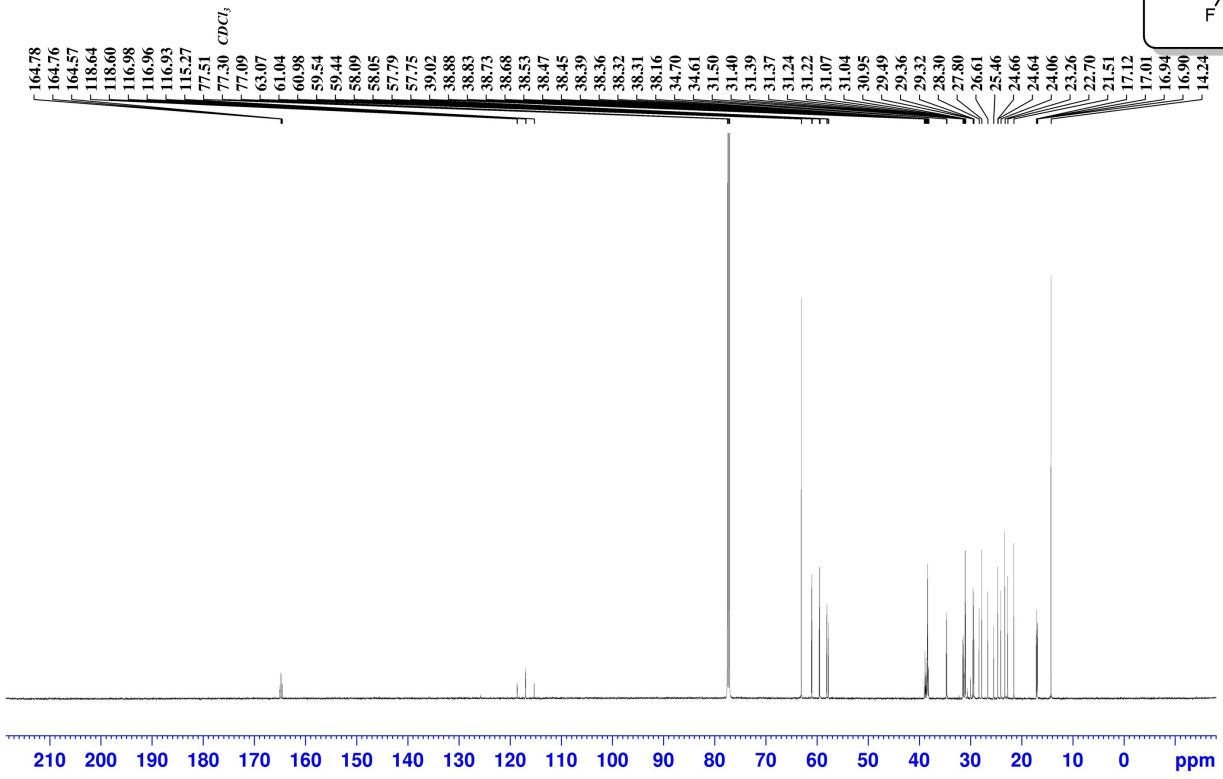
Ethyl 2,2-Difluoro-4-((3*R*)-6-methyl-7-oxabicyclo[4.1.0] heptan-3-yl)pentanoate, ^{1}H NMR 600 MHz, $CDCl_3$



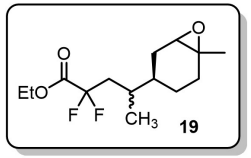


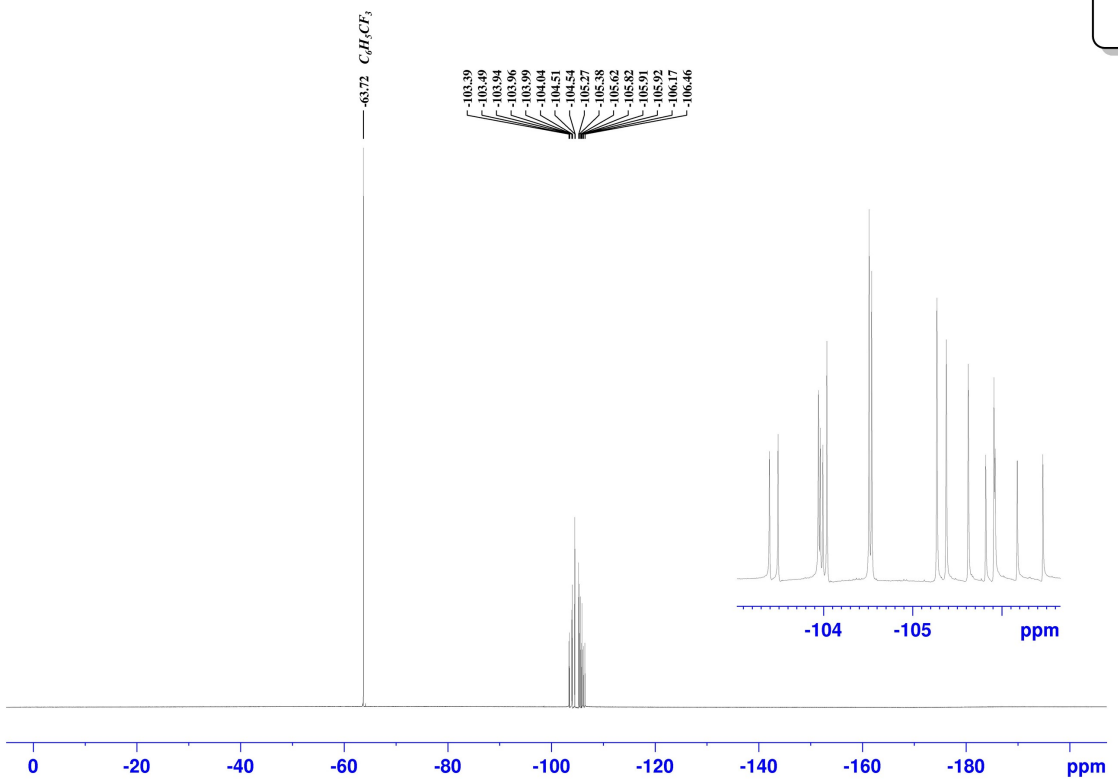
Ethyl 2,2-Difluoro-4-((3*R*)-6-methyl-7-oxabicyclo[4.1.0] heptan-3-yl)pentanoate, ^{13}C NMR
151 MHz, $CDCl_3$



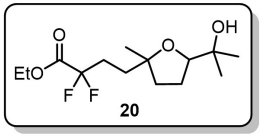


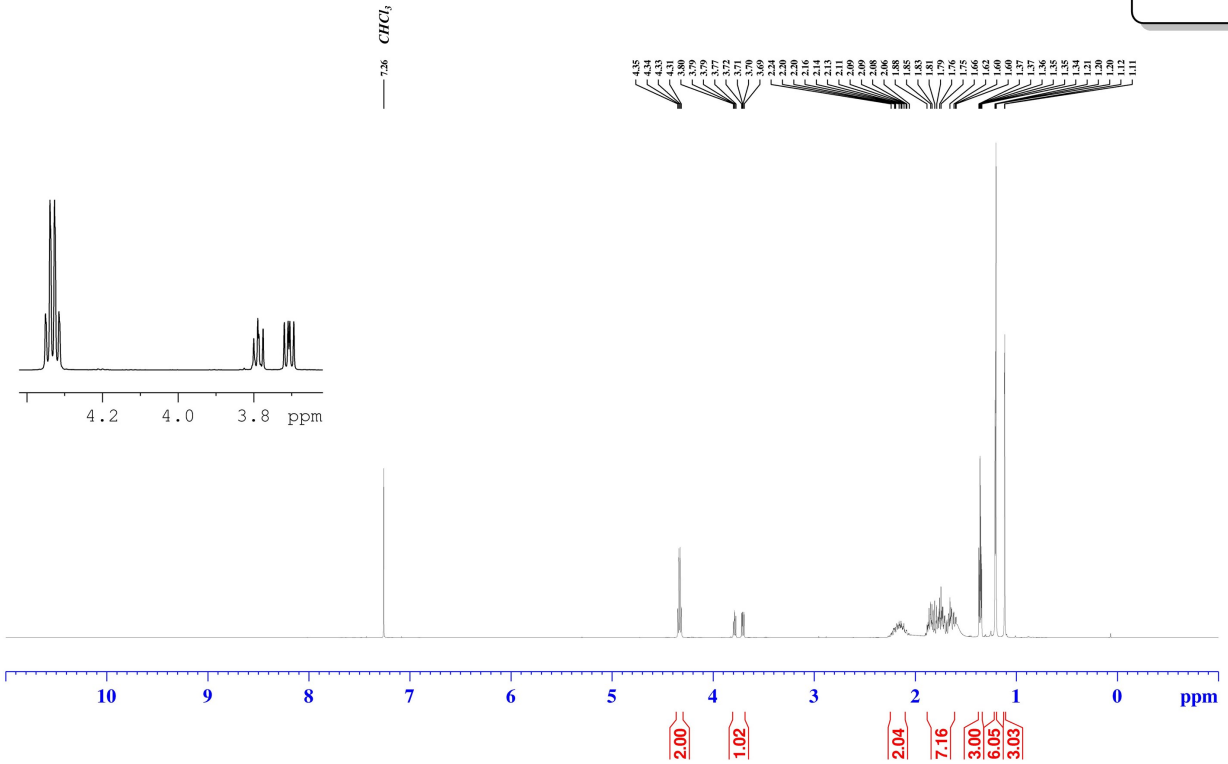
Ethyl 2,2-Difluoro-4-((3*R*)-6-methyl-7-oxabicyclo[4.1.0] heptan-3-yl)pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



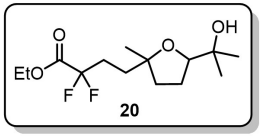


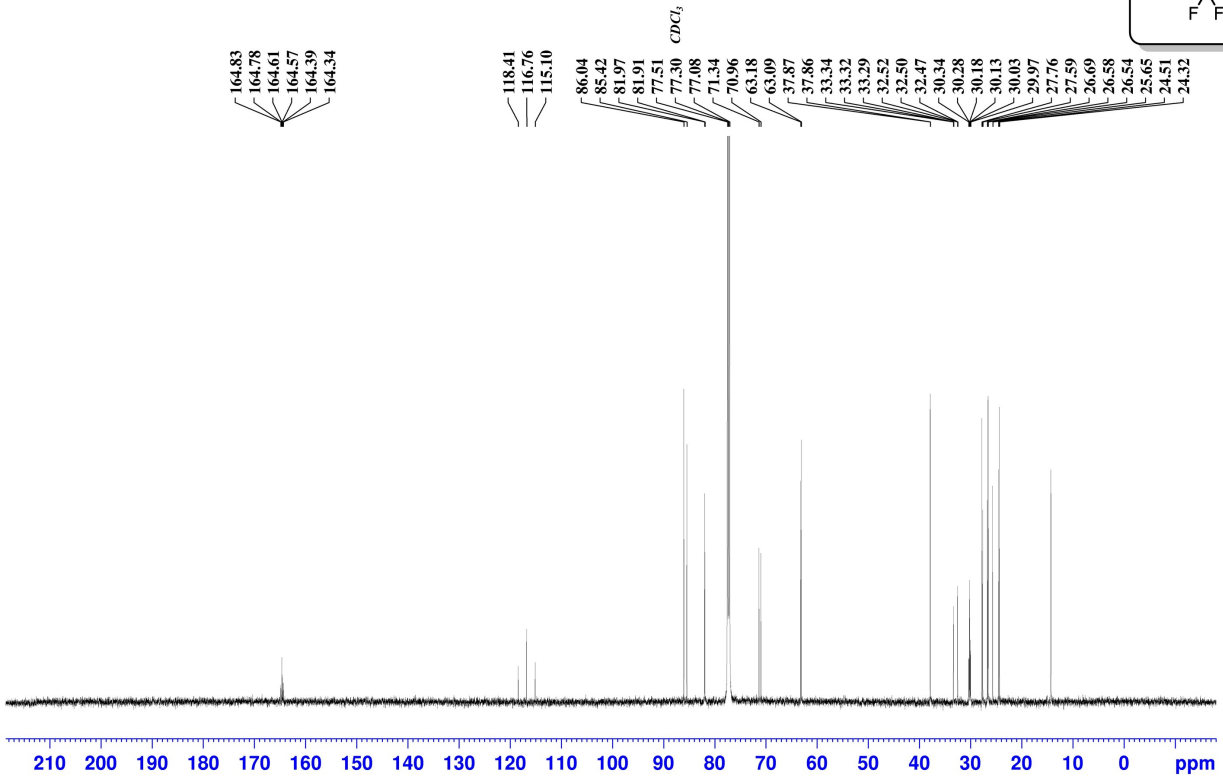
Ethyl 2,2-Difluoro-4-(5-(2-hydroxypropan-2-yl)-2-methyl tetrahydrofuran-2-yl)butanoate, ^{1}H NMR 600 MHz, $CDCl_3$



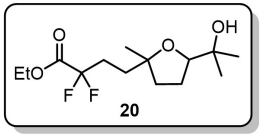


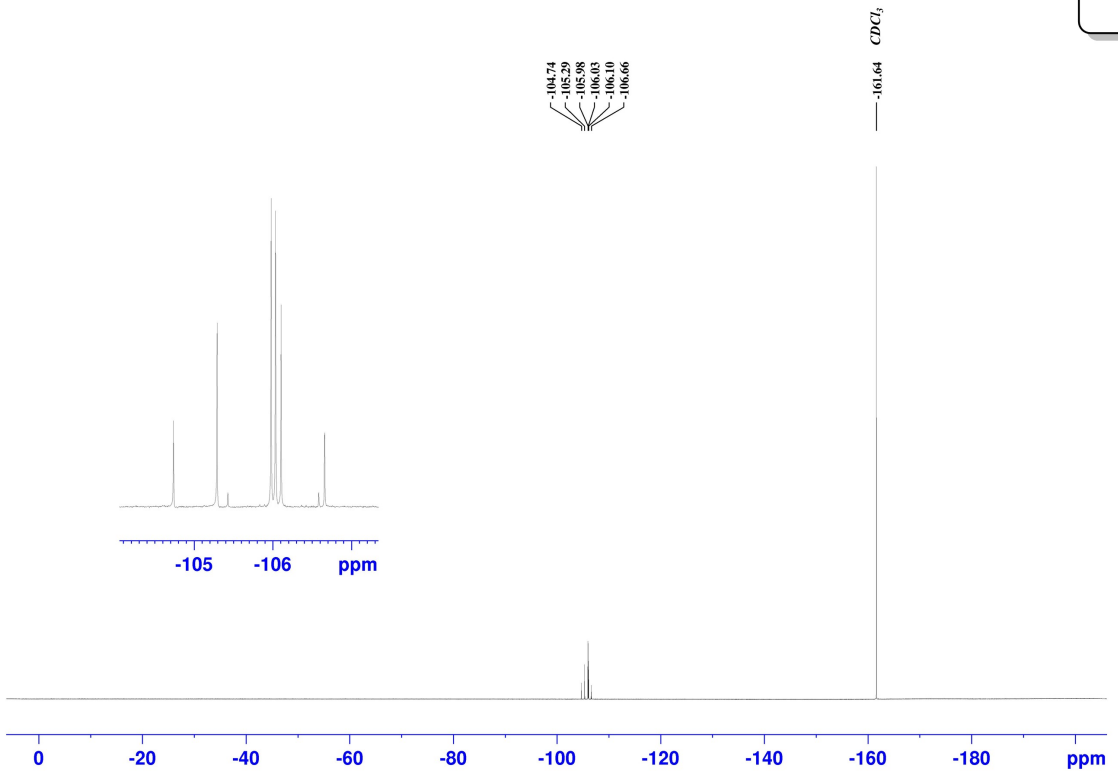
Ethyl 2,2-Difluoro-4-(5-(2-hydroxypropan-2-yl)-2-methyl tetrahydrofuran-2-yl)butanoate, ^{13}C NMR
151 MHz, $CDCl_3$



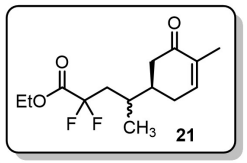


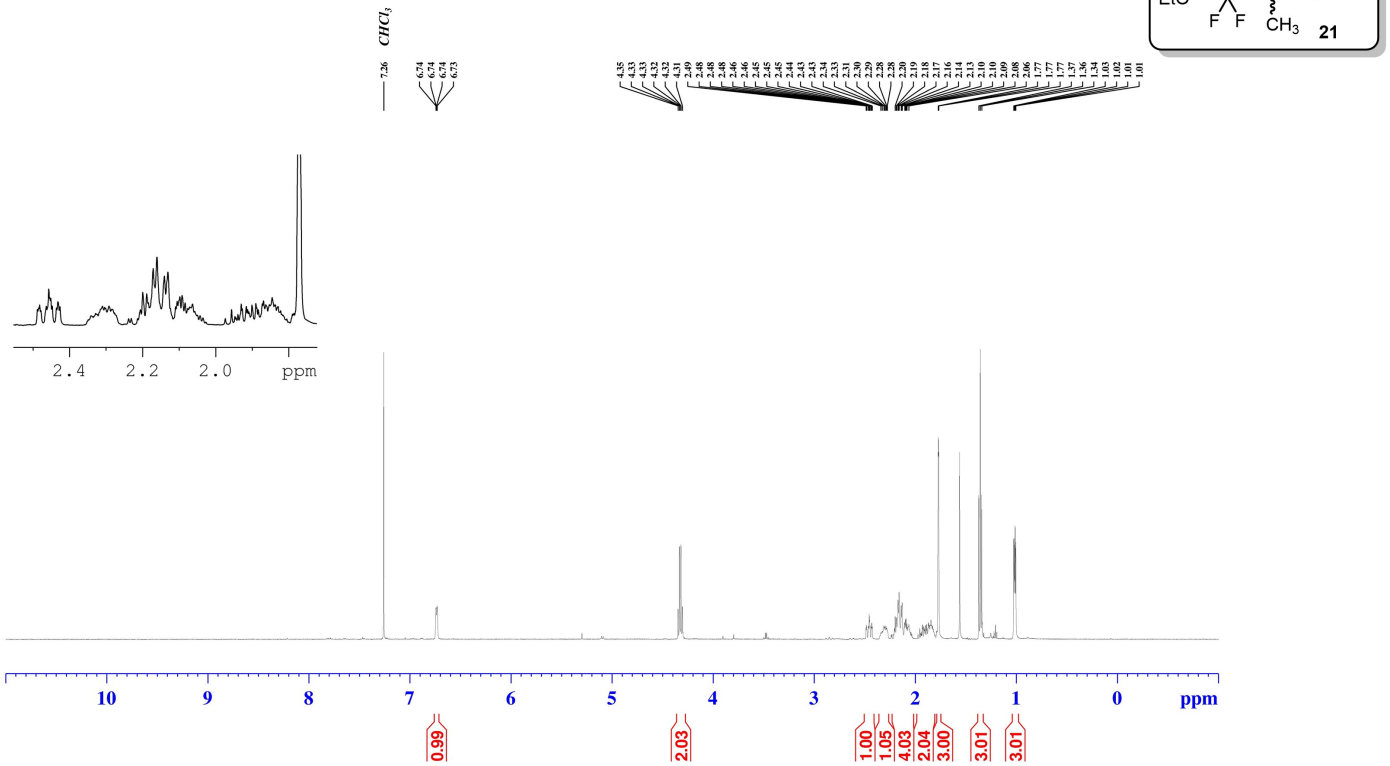
Ethyl 2,2-Difluoro-4-(5-(2-hydroxypropan-2-yl)-2-methyl tetrahydrofuran-2-yl)butanoate, ^{19}F NMR 471 MHz, $CDCl_3$



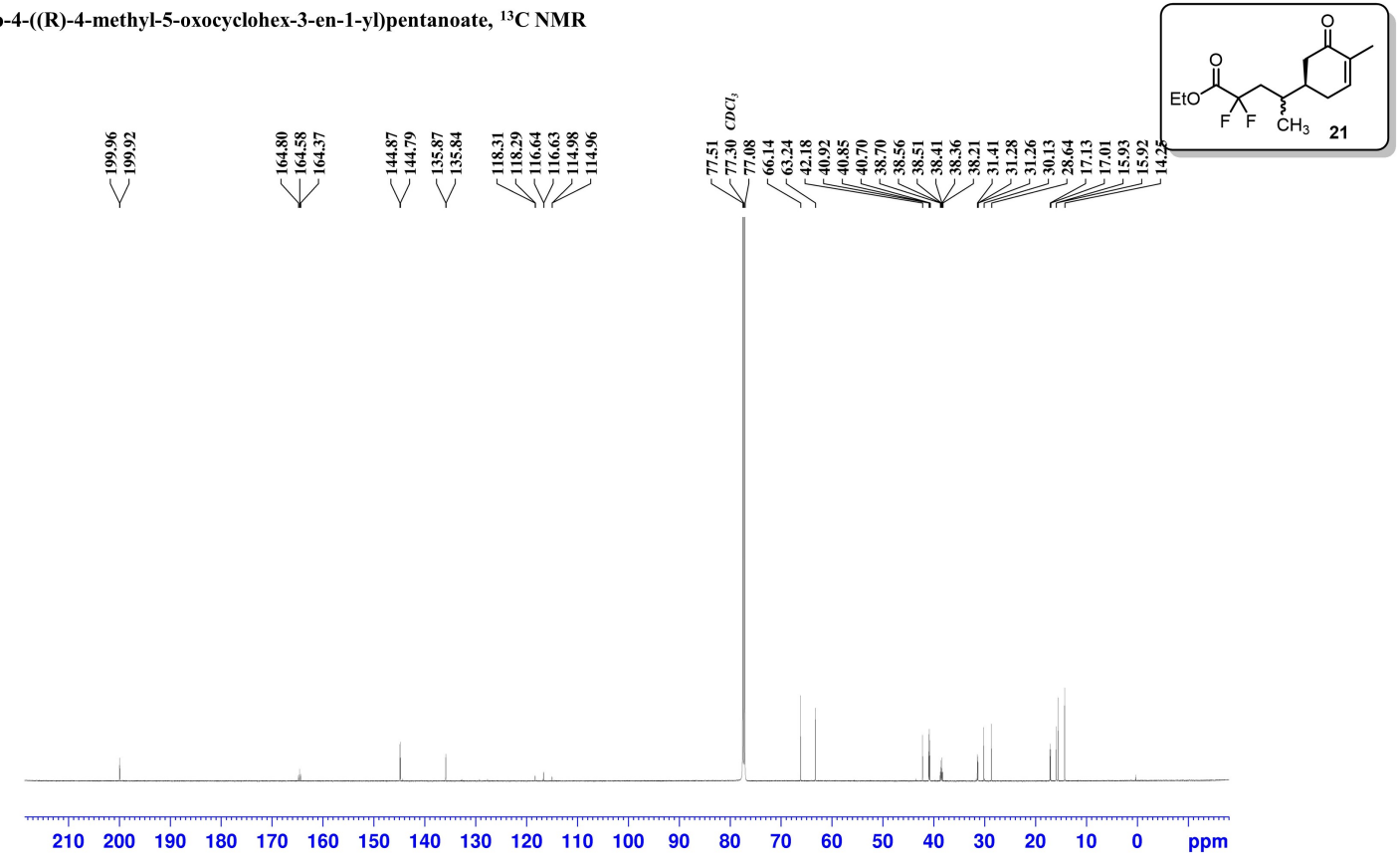


Ethyl 2,2-Difluoro-4-((R)-4-methyl-5-oxocyclohex-3-en-1-yl)pentanoate, ^{1}H NMR 600 MHz, $CDCl_3$

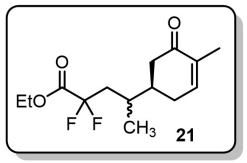


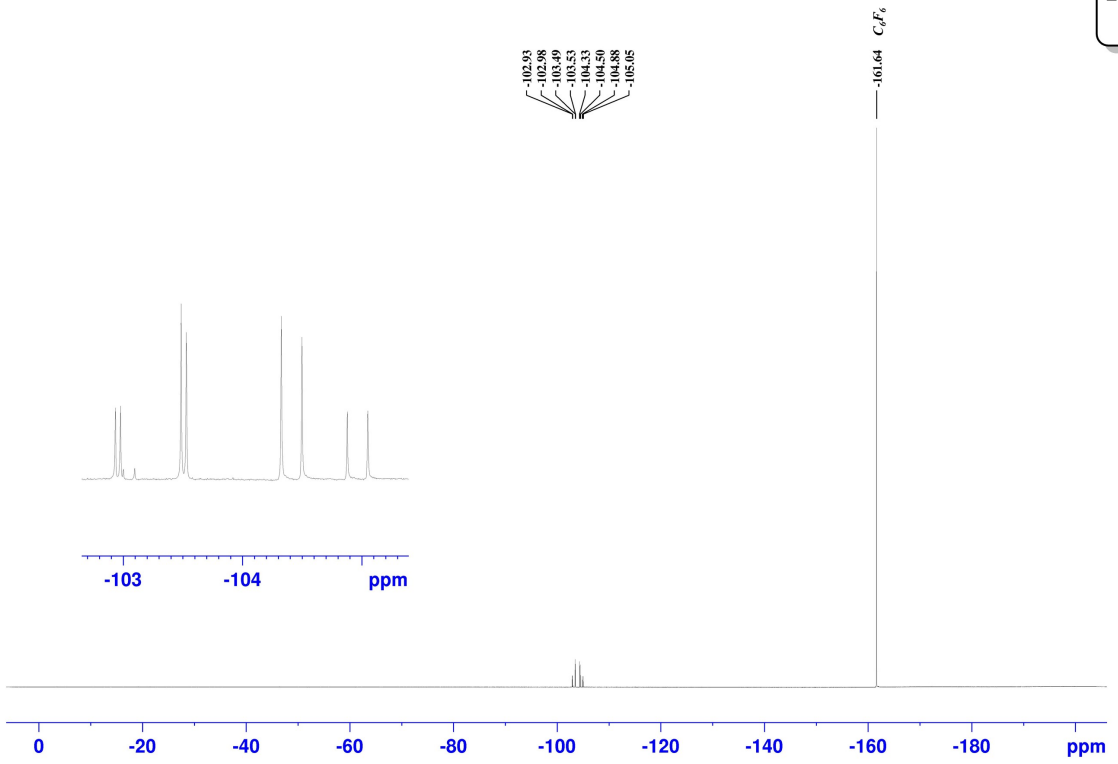


Ethyl 2,2-Difluoro-4-((R)-4-methyl-5-oxocyclohex-3-en-1-yl)pentanoate, ^{13}C NMR
151 MHz, $CDCl_3$

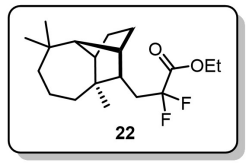


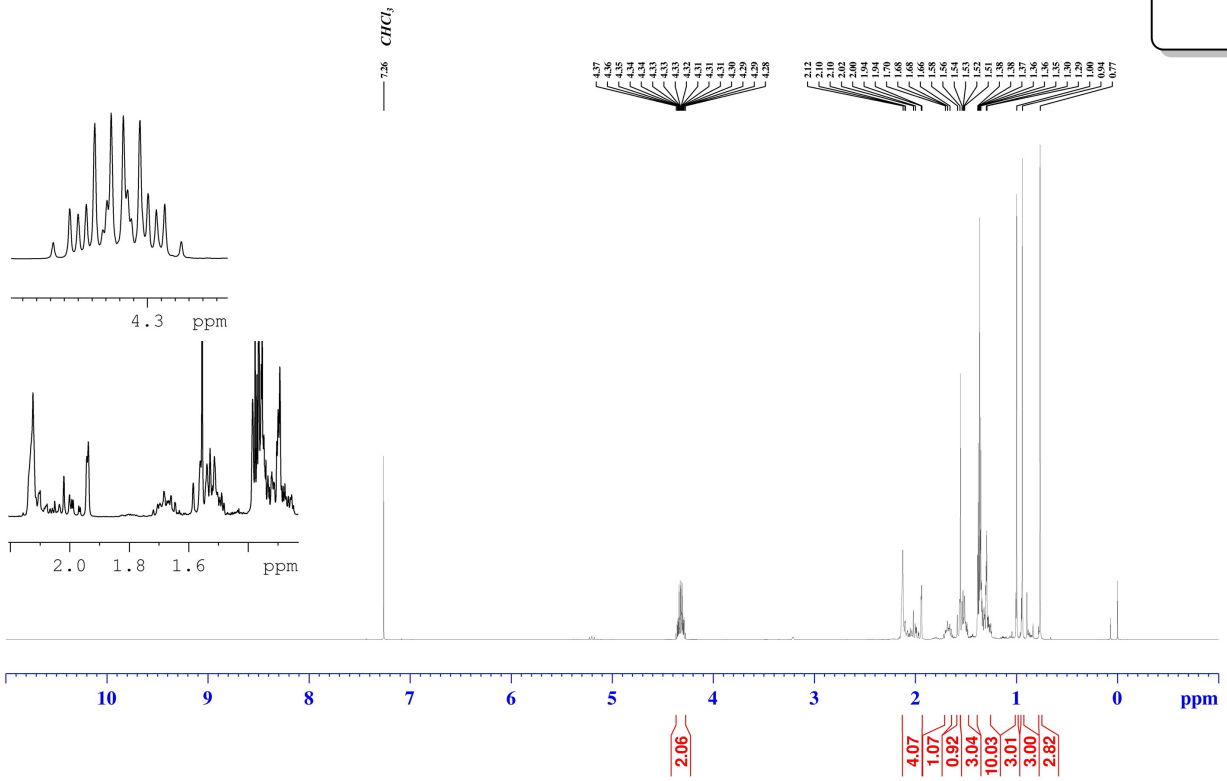
Ethyl 2,2-Difluoro-4-((*R*)-4-methyl-5-oxocyclohex-3-en-1-yl)pentanoate, ^{19}F NMR
471 MHz, $CDCl_3$



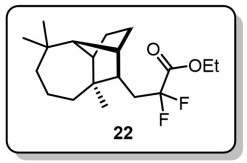


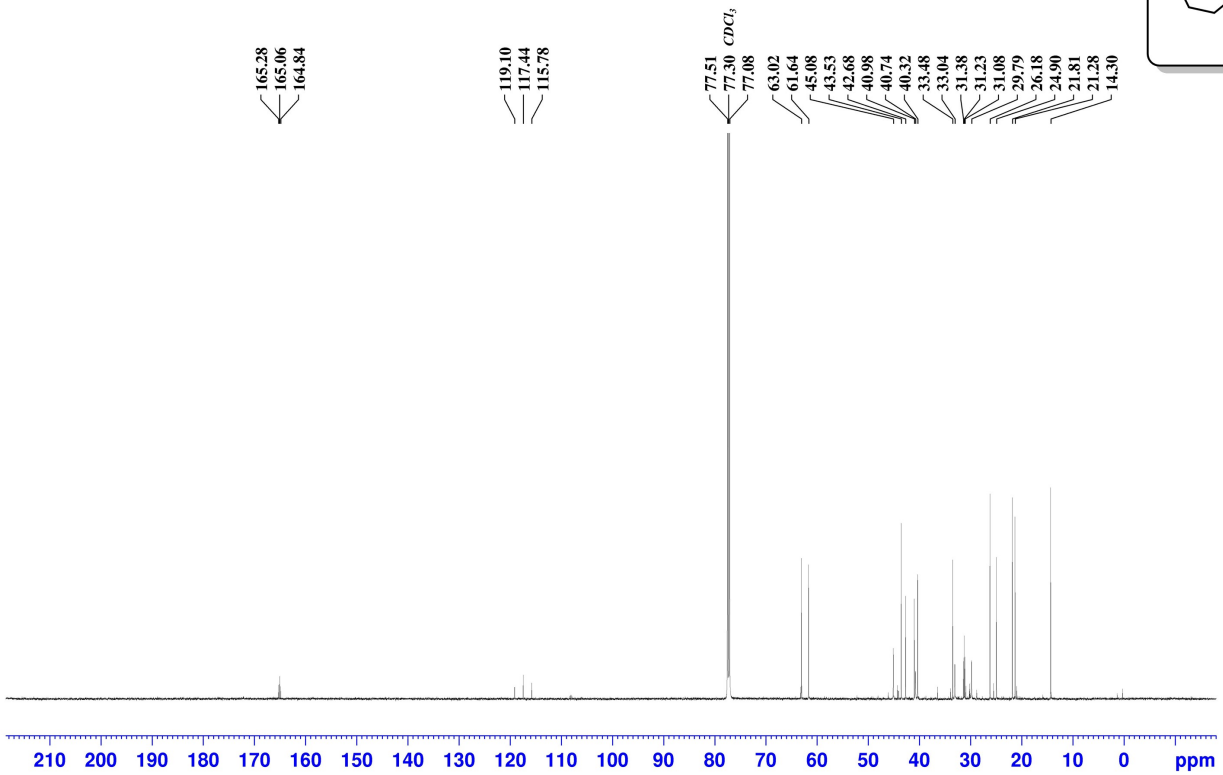
Ethyl 2,2-Difluoro-3-((4*R*,8a*S*,9*R*)-4,8,8-trimethyldecahydro-1,4-methanoazulen-9-yl)propanoate, ^{1}H NMR 600 MHz, $CDCl_3$



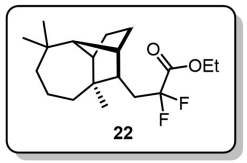


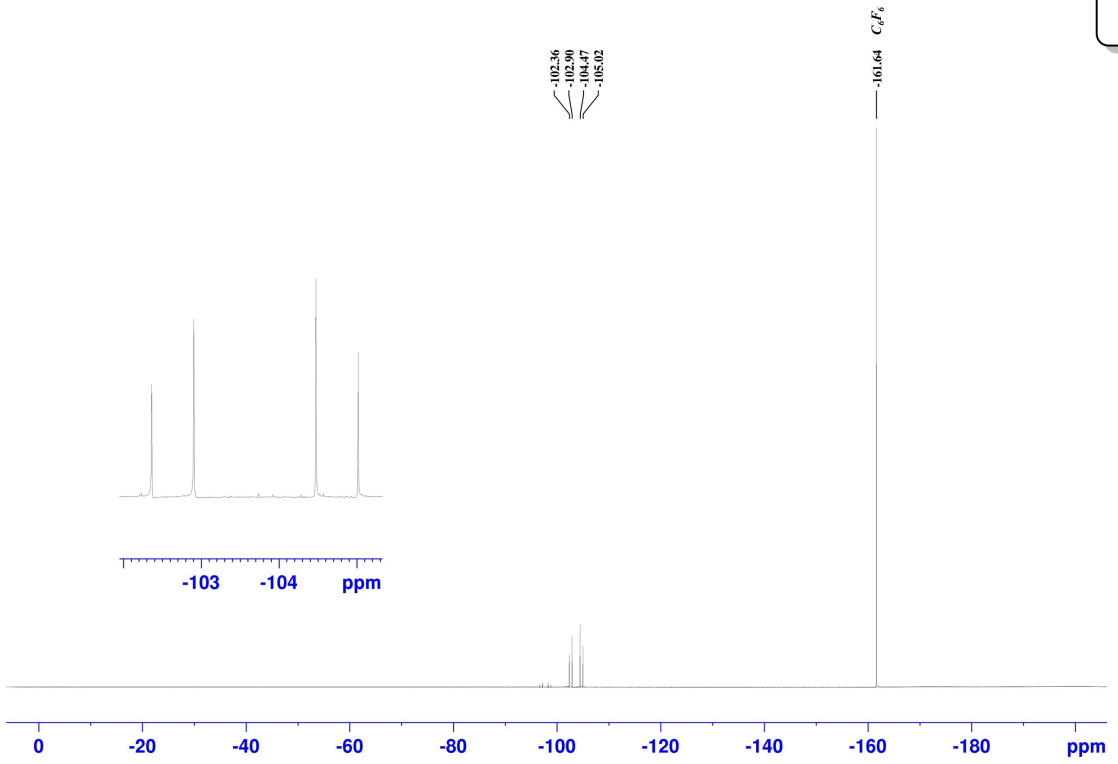
Ethyl 2,2-Difluoro-3-((4*R*,8a*S*,9*R*)-4,8,8-trimethyldecahydro-1,4-methanoazulen-9-yl)propanoate, ^{13}C NMR 151 MHz, $CDCl_3$



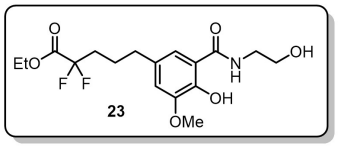


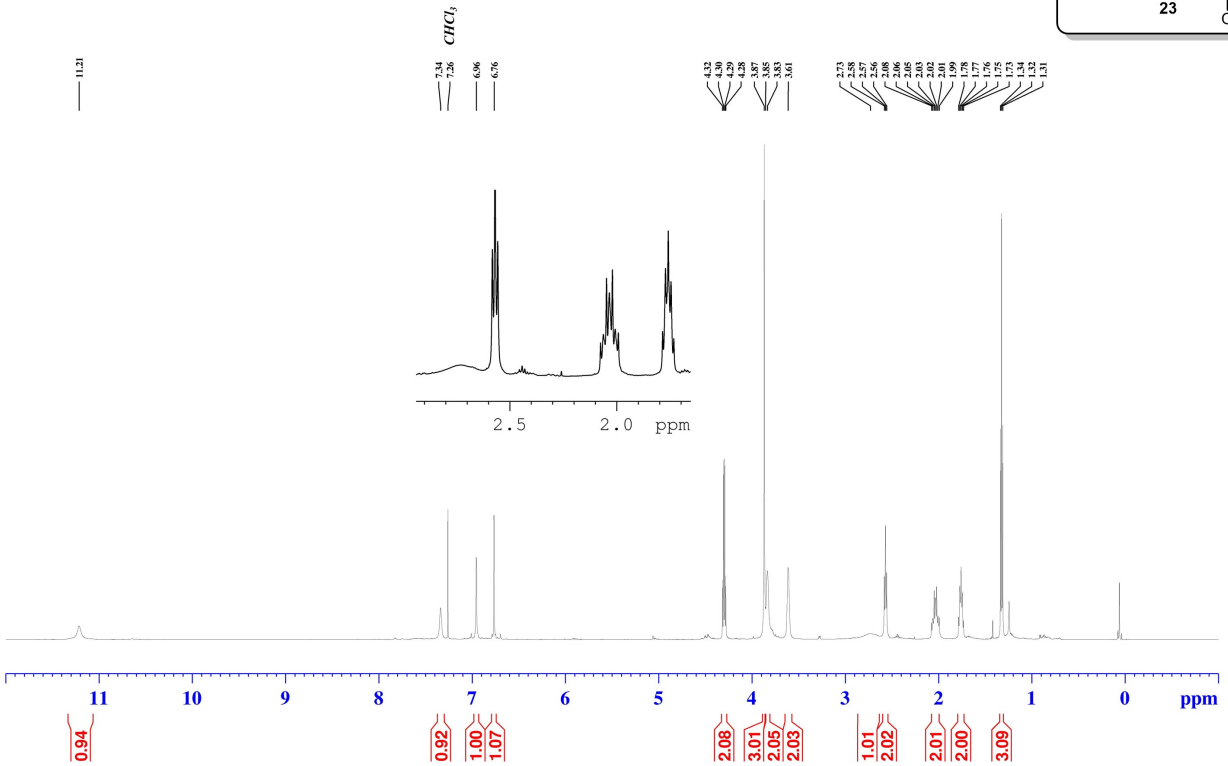
Ethyl 2,2-Difluoro-3-((4*R*,8a*S*,9*R*)-4,8,8-trimethyldecahydro-1,4-methanoazulen-9-yl)propanoate, ^{19}F NMR 471 MHz, $CDCl_3$



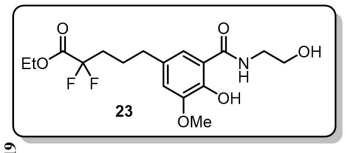


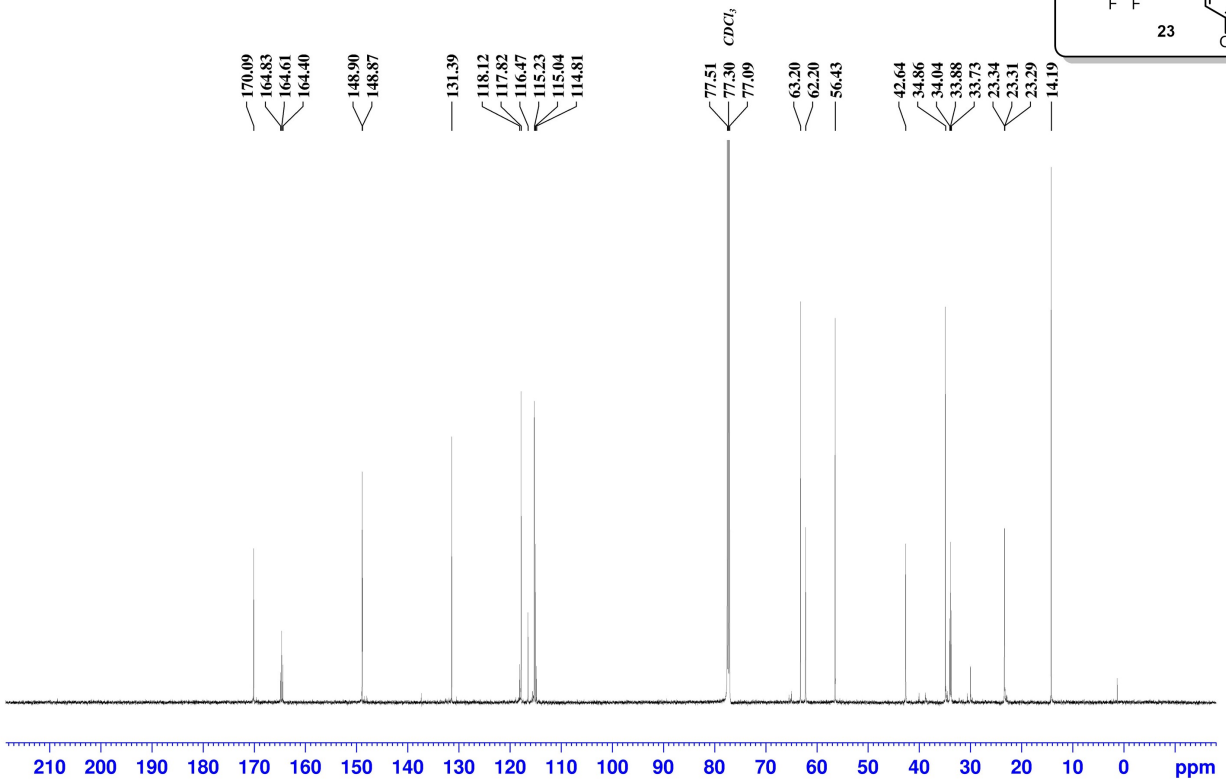
Ethyl 2,2-Difluoro-5-(4-hydroxy-3-((2-hydroxy ethyl) carbamoyl)-5-methoxyphenyl)pentanoate, ^{1}H NMR 600 MHz, $CDCl_3$



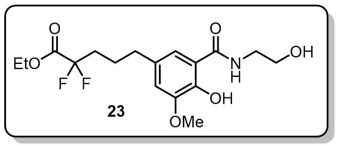


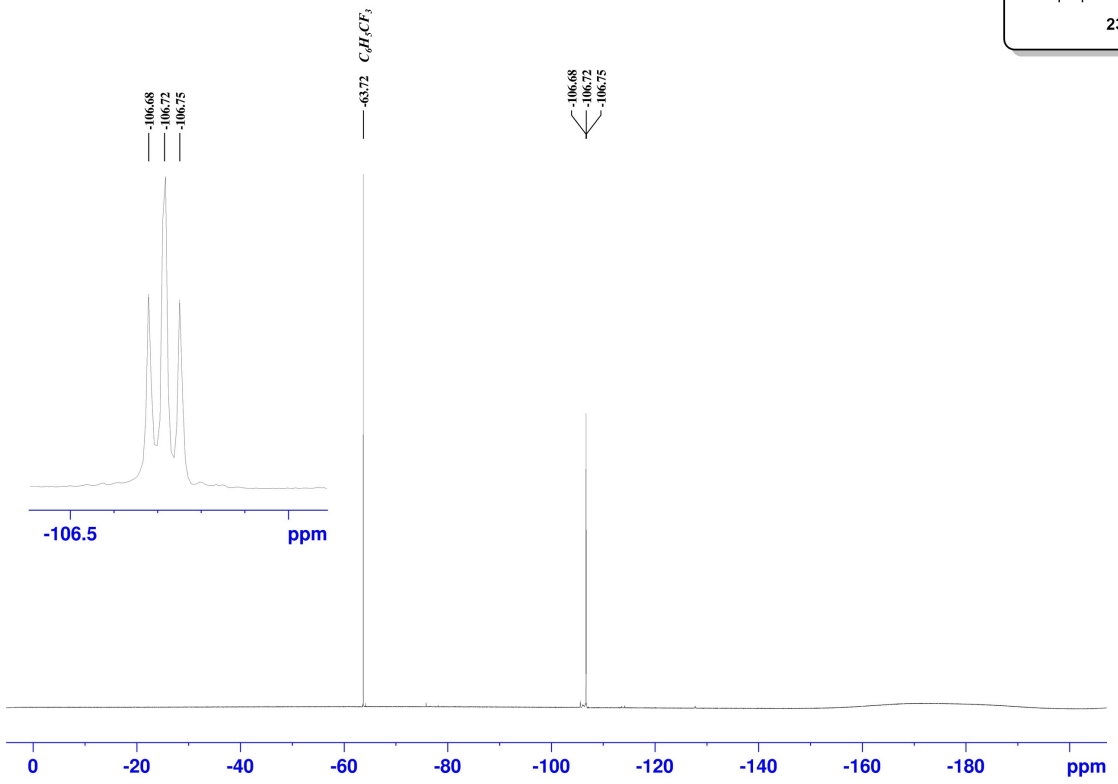
Ethyl 2,2-Difluoro-5-(4-hydroxy-3-((2-hydroxy ethyl) carbamoyl)-5-methoxyphenyl)pentanoate, ^{13}C NMR 151 MHz, $CDCl_3$



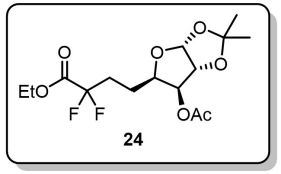


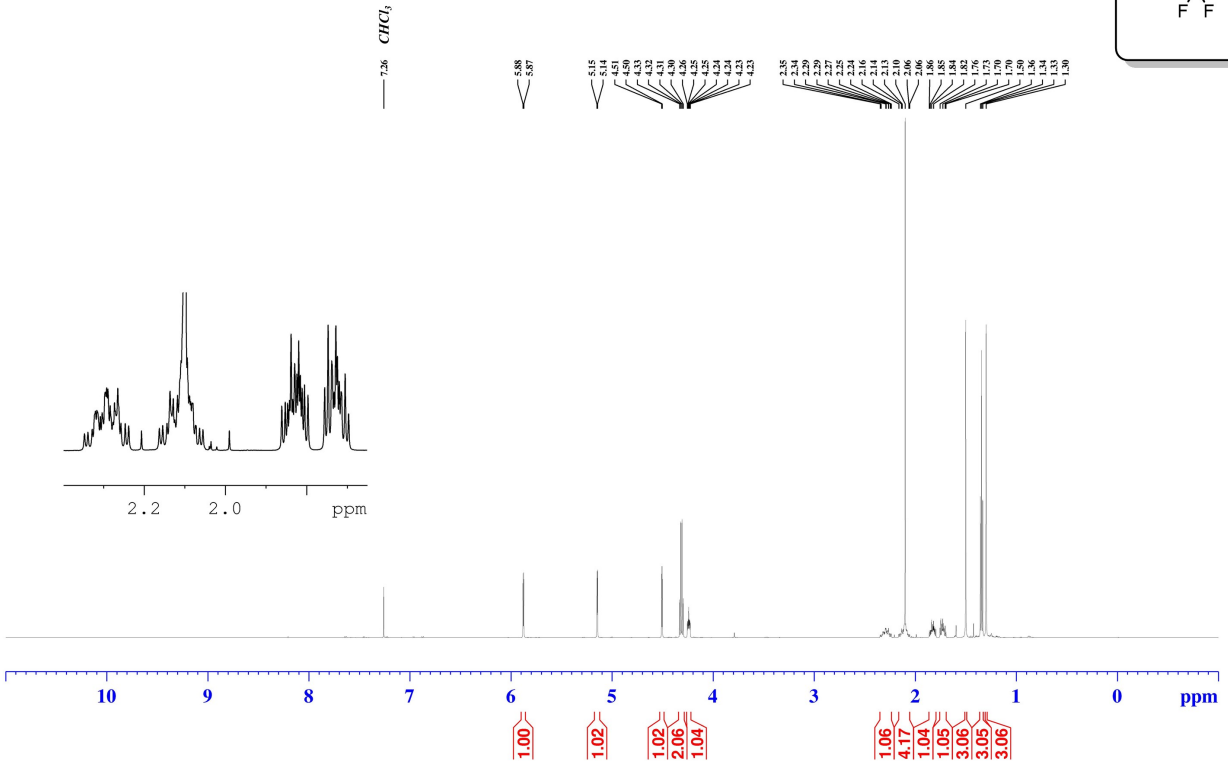
Ethyl 2,2-Difluoro-5-(4-hydroxy-3-((2-hydroxy ethyl) carbamoyl)-5-methoxyphenyl)pentanoate, ^{19}F NMR 471 MHz, $CDCl_3$



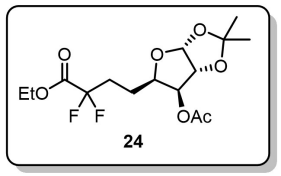


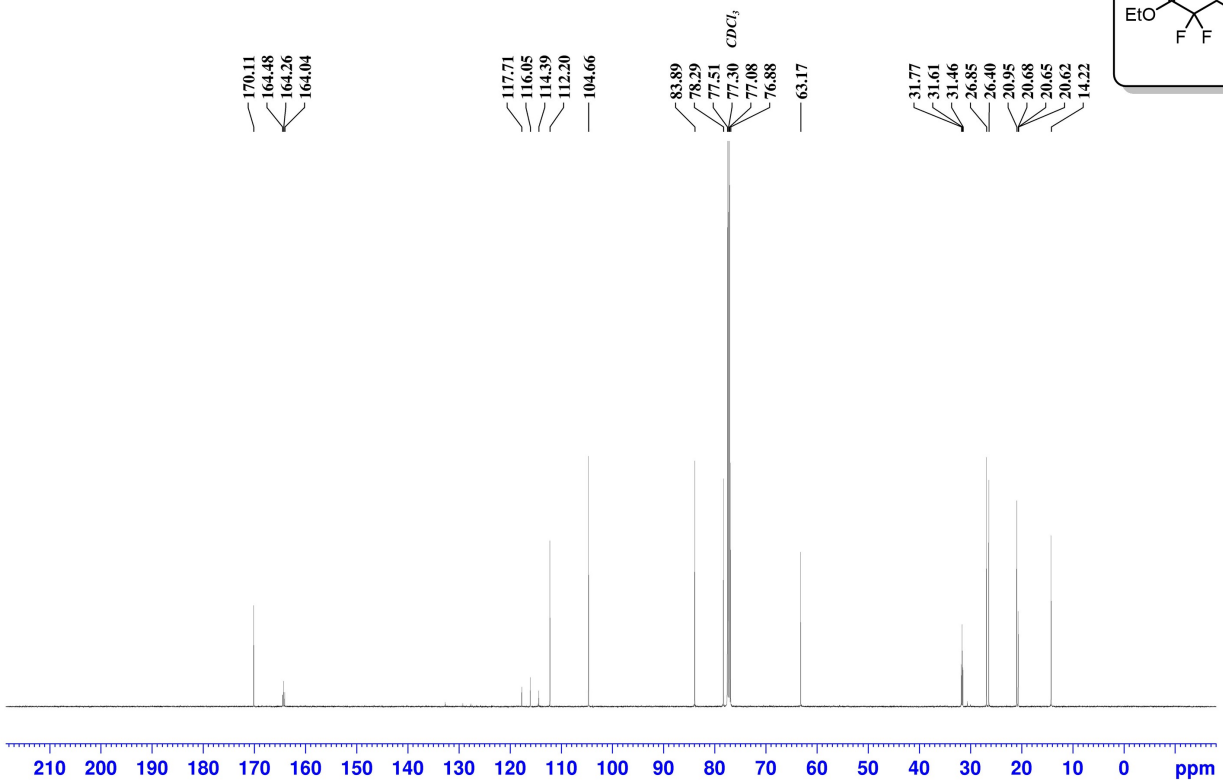
Ethyl 4-((3a*R*,5*R*,6*S*,6a*R*)-6-Acetoxy-2,2-dimethyltetra hydrofuro[2,3-d][1,3]dioxol-5-yl)-2,2-difluorobutanoate, ^{1}H NMR 600 MHz, $CDCl_3$



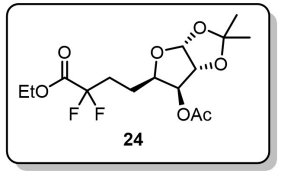


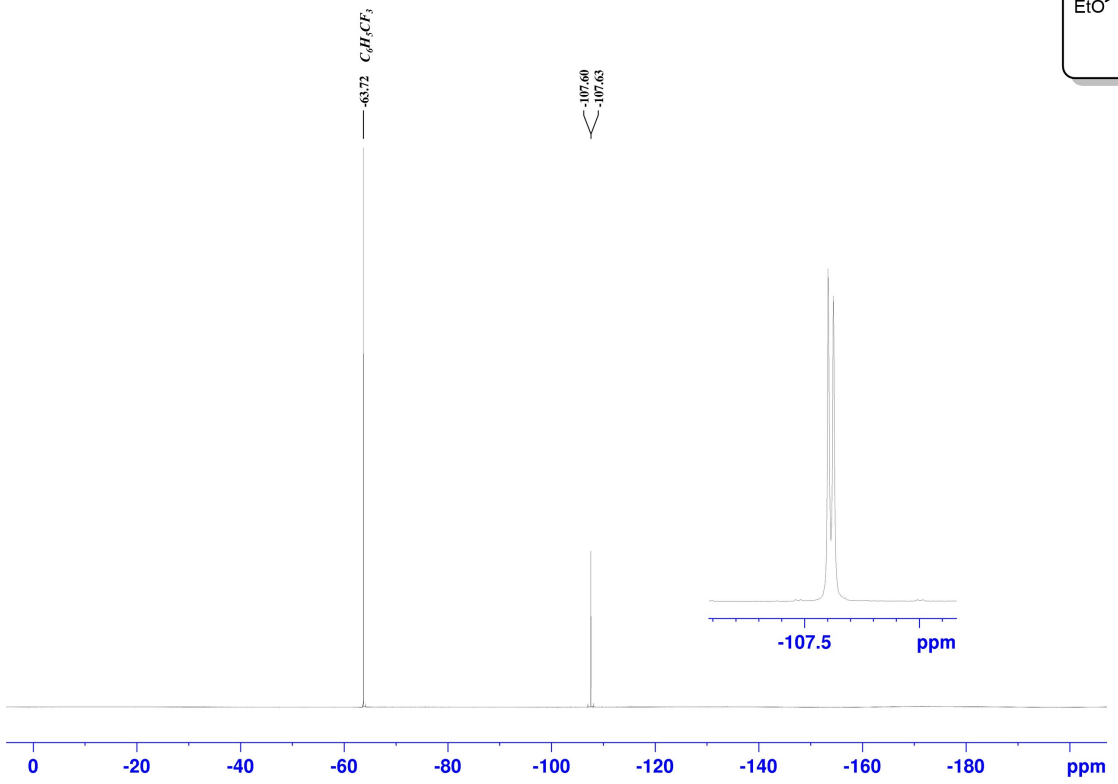
Ethyl 4-((3a*R*,5*R*,6*S*,6a*R*)-6-Acetoxy-2,2-dimethyltetra hydrofuro[2,3-d][1,3]dioxol-5-yl)-2,2-difluorobutanoate, ^{13}C NMR 151 MHz, $CDCl_3$



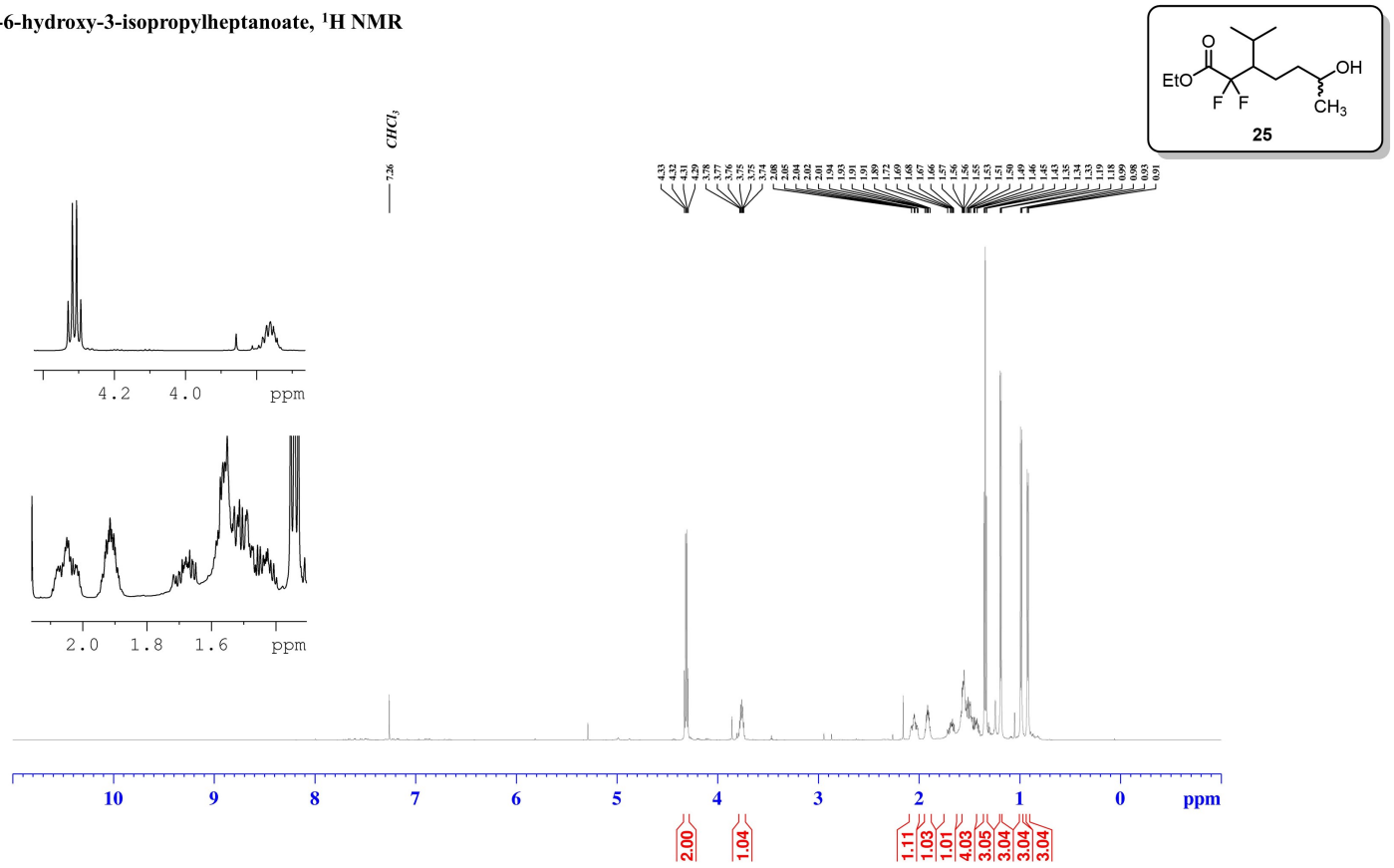


Ethyl 4-((3a*R*,5*R*,6*S*,6a*R*)-6-Acetoxy-2,2-dimethyltetra hydrofuro[2,3-d][1,3]dioxol-5-yl)-2,2-difluorobutanoate, ^{19}F NMR 471 MHz, $CDCl_3$

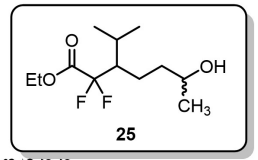


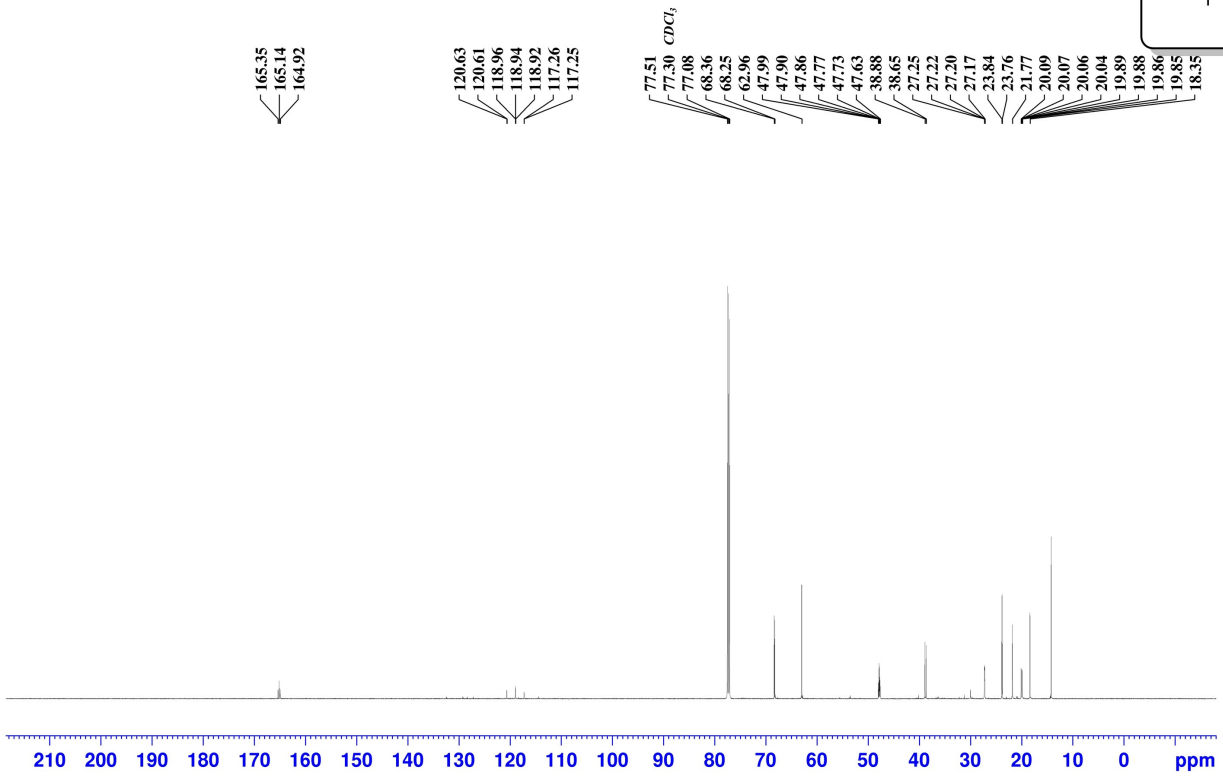


Ethyl 2,2-Difluoro-6-hydroxy-3-isopropylheptanoate, ^{1}H NMR 600 MHz, $CDCl_3$

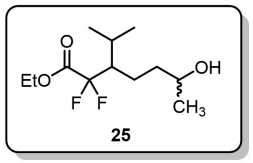


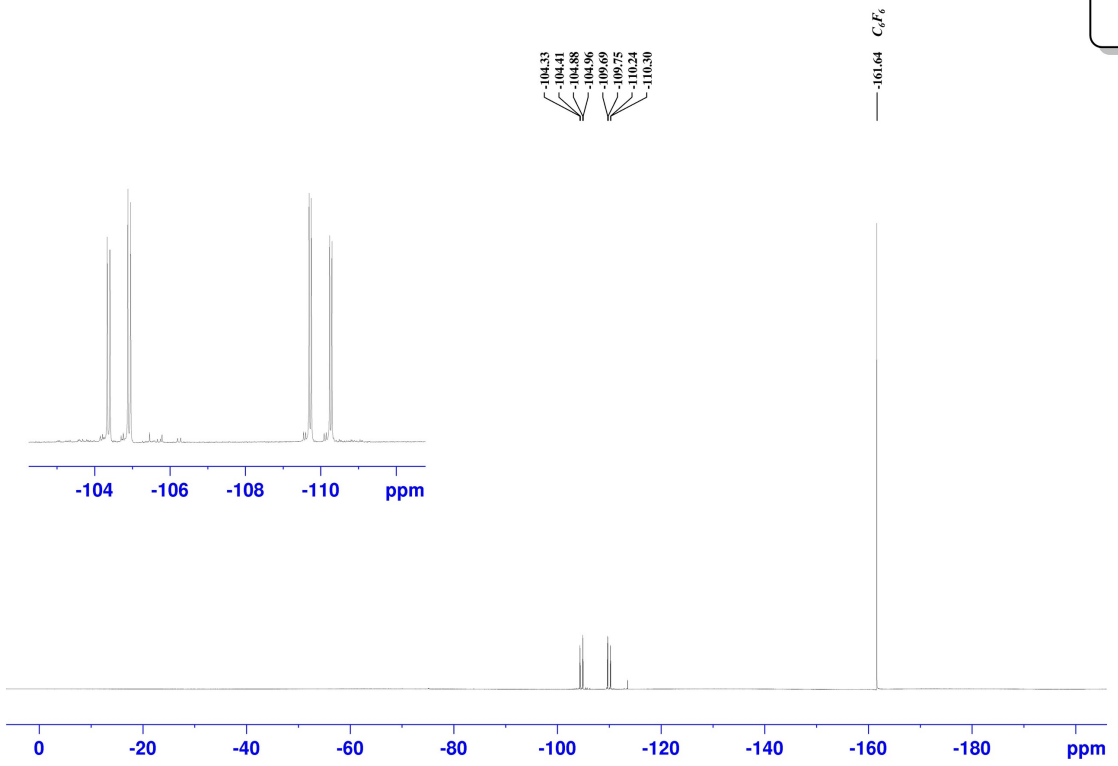
Ethyl 2,2-Difluoro-6-hydroxy-3-isopropylheptanoate, ^{13}C NMR
151 MHz, $CDCl_3$



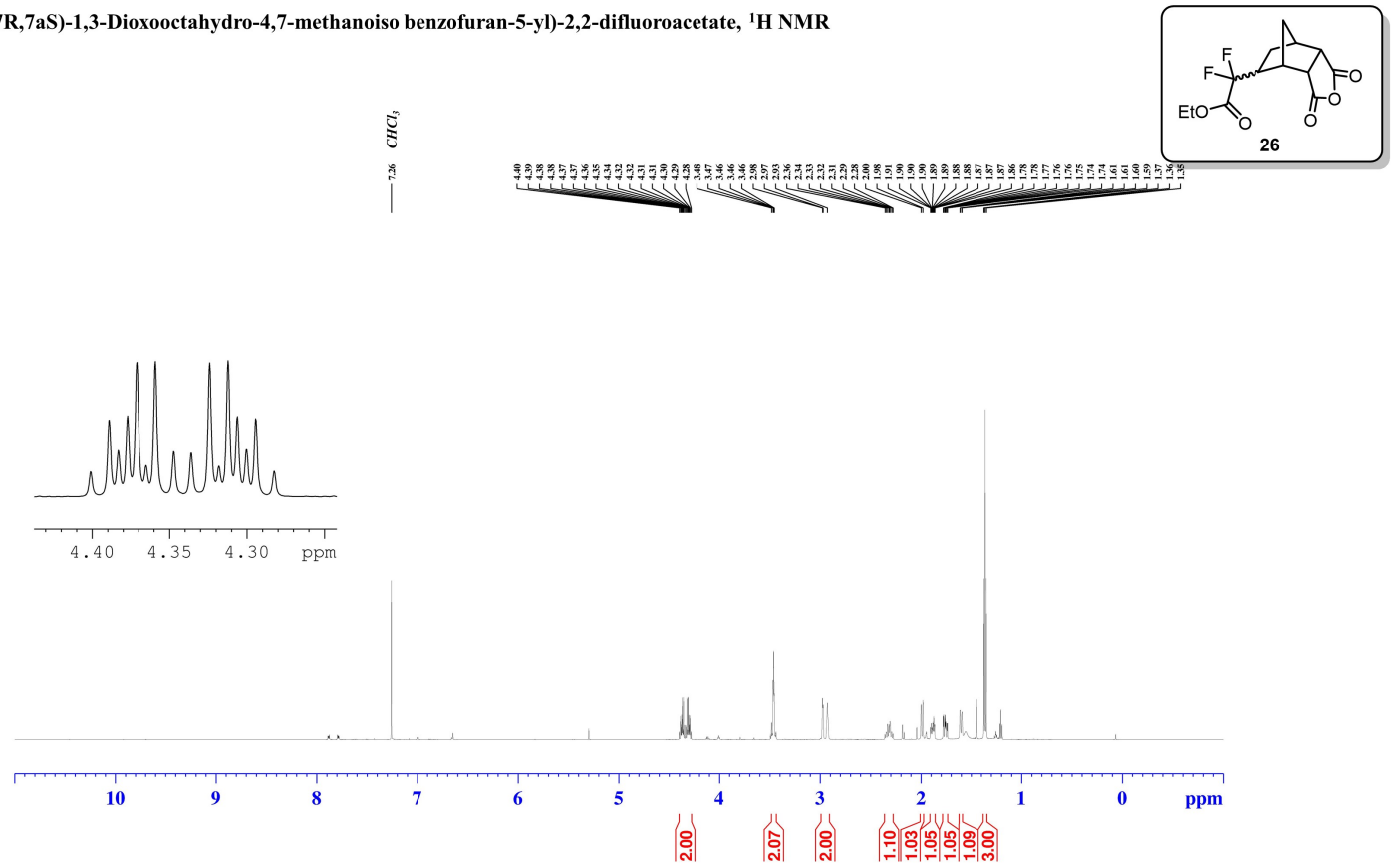


Ethyl 2,2-Difluoro-6-hydroxy-3-isopropylheptanoate, ^{19}F NMR
471 MHz, $CDCl_3$

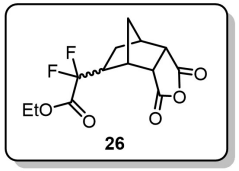


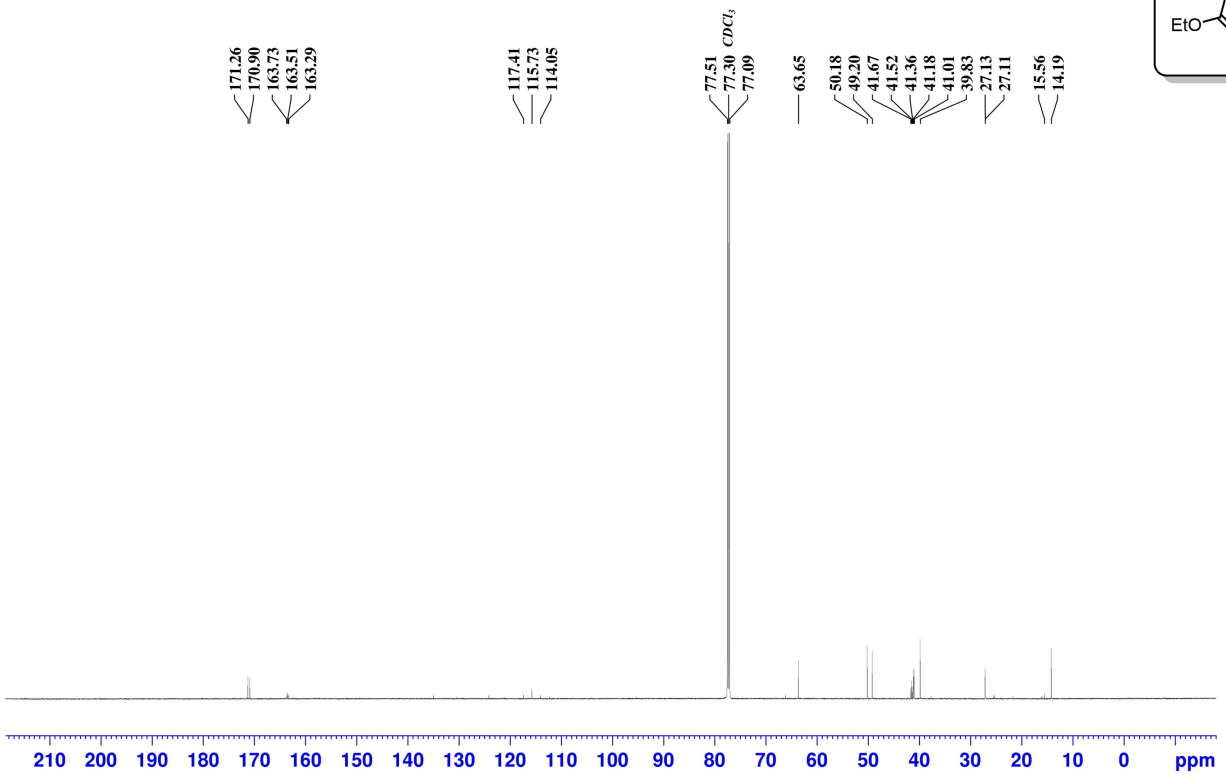


Ethyl 2-((3aR,4R,7R,7aS)-1,3-Dioxooctahydro-4,7-methanoiso benzofuran-5-yl)-2,2-difluoroacetate, ^{1}H NMR 600 MHz, $CDCl_3$

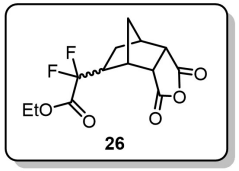


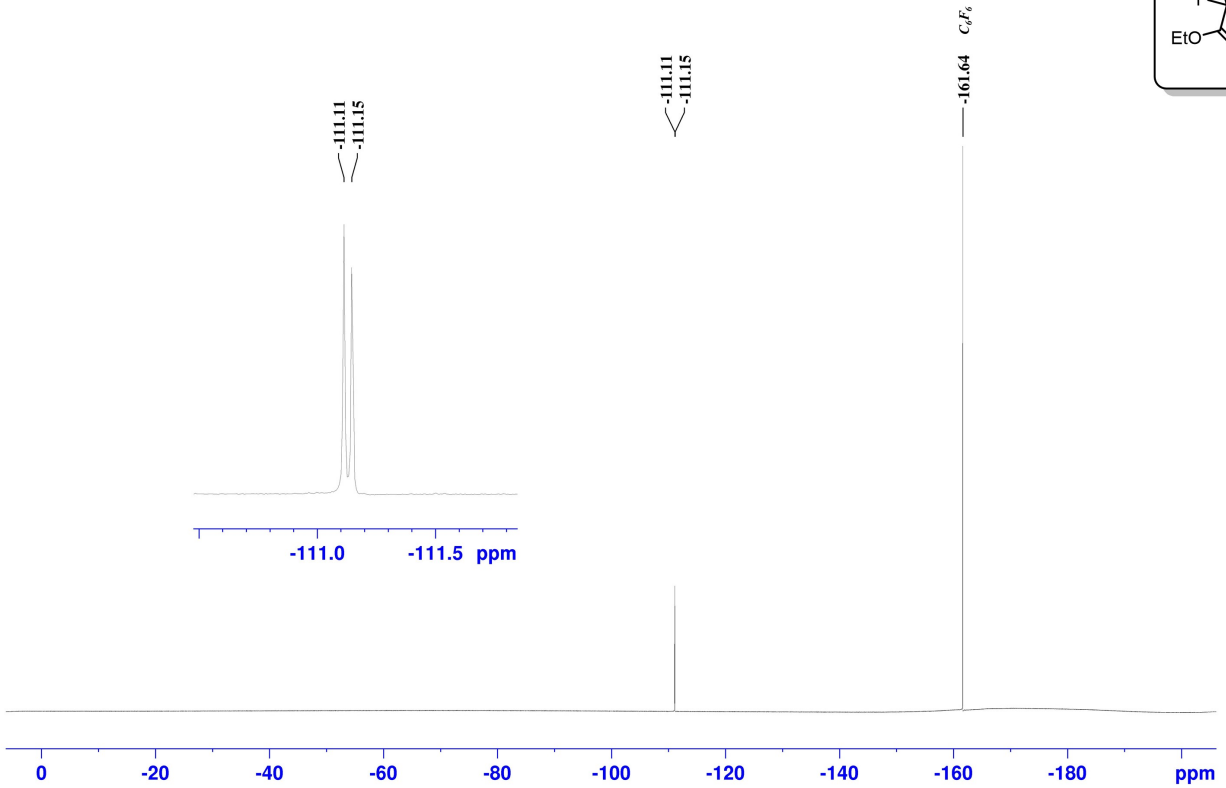
Ethyl 2-((3aR,4R,7R,7aS)-1,3-Dioxooctahydro-4,7-methanoiso benzofuran-5-yl)-2,2-difluoroacetate, ^{13}C NMR 151 MHz, $CDCl_3$



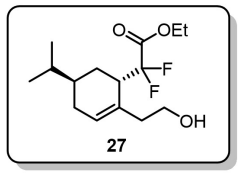


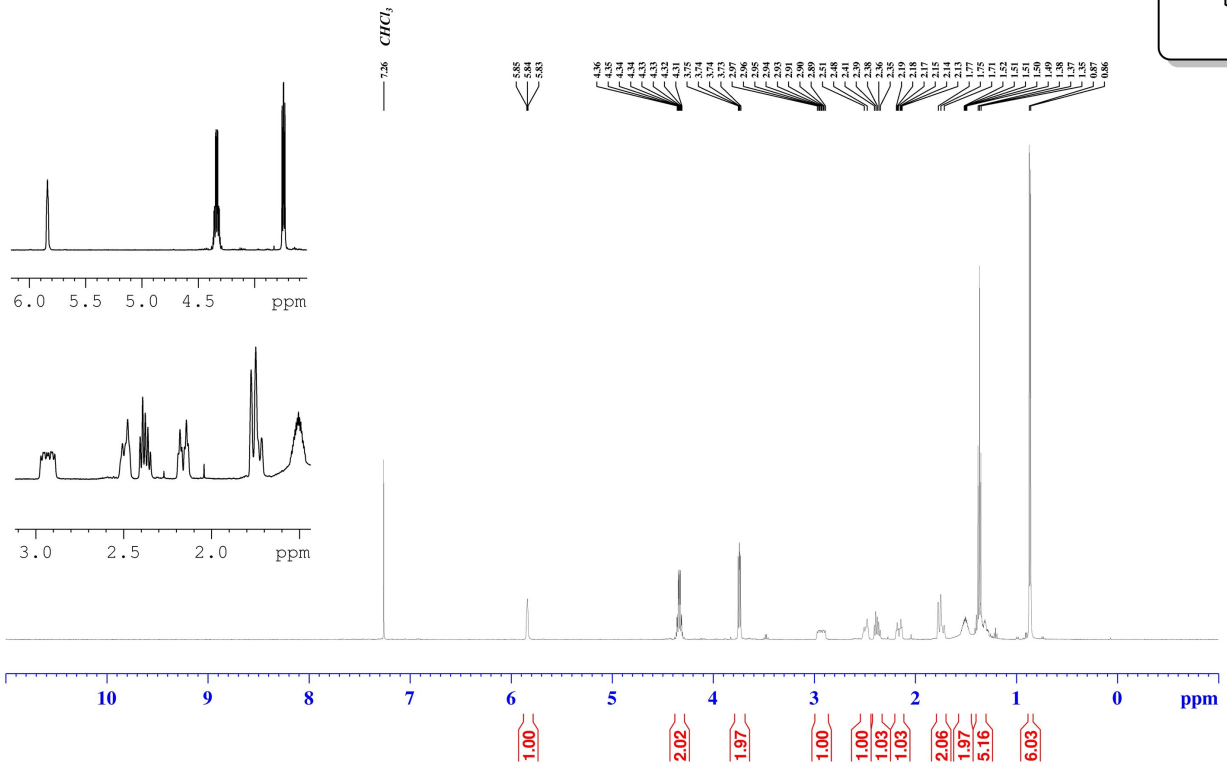
Ethyl 2-((3aR,4R,7R,7aS)-1,3-Dioxooctahydro-4,7-methanoiso benzofuran-5-yl)-2,2-difluoroacetate, ^{19}F NMR 471 MHz, $CDCl_3$



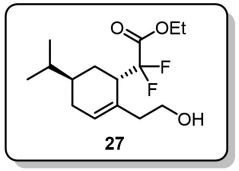


Ethyl 2,2-Difluoro-2-((1*S*,5*R*)-2-(2-hydroxyethyl)-5-isopropyl cyclohex-2-en-1-yl)acetate, ^{1}H NMR 600 MHz, $CDCl_3$





Ethyl 2,2-Difluoro-2-((1*S*,5*R*)-2-(2-hydroxyethyl)-5-isopropyl cyclohex-2-en-1-yl)acetate, ^{1}H NMR 600 MHz, $CDCl_3$



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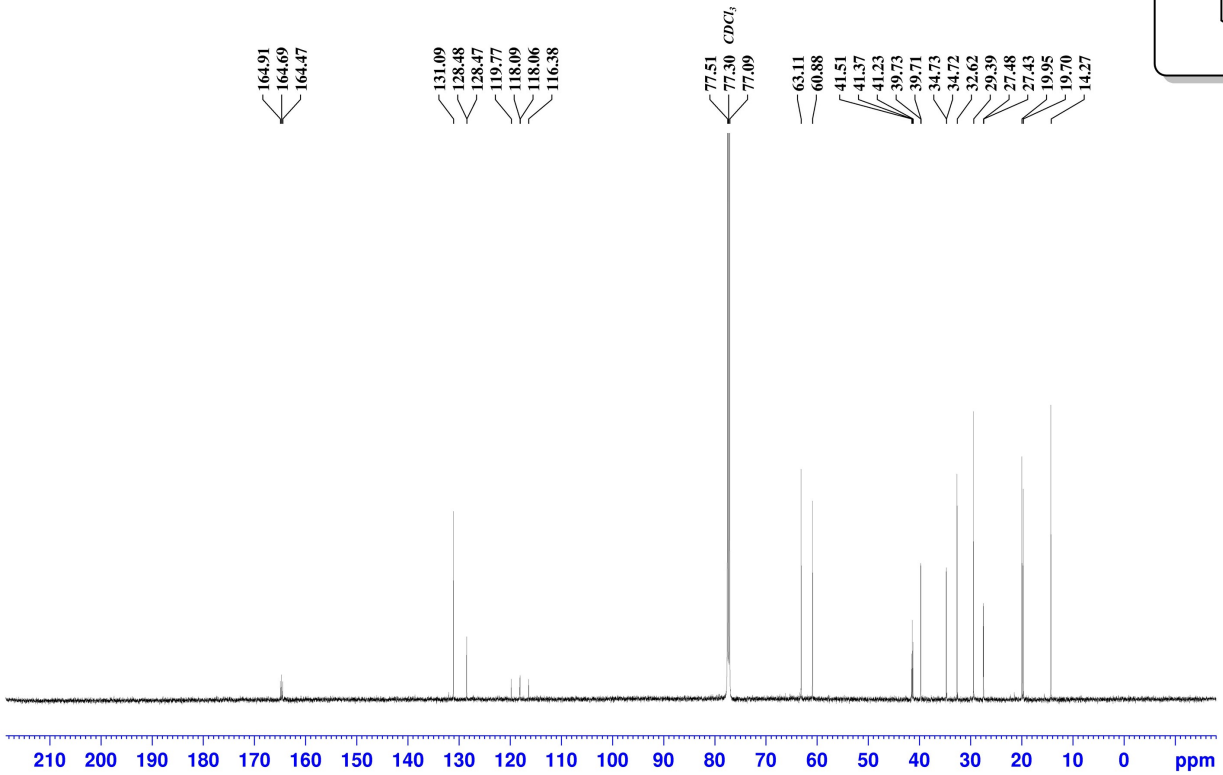
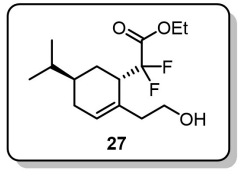
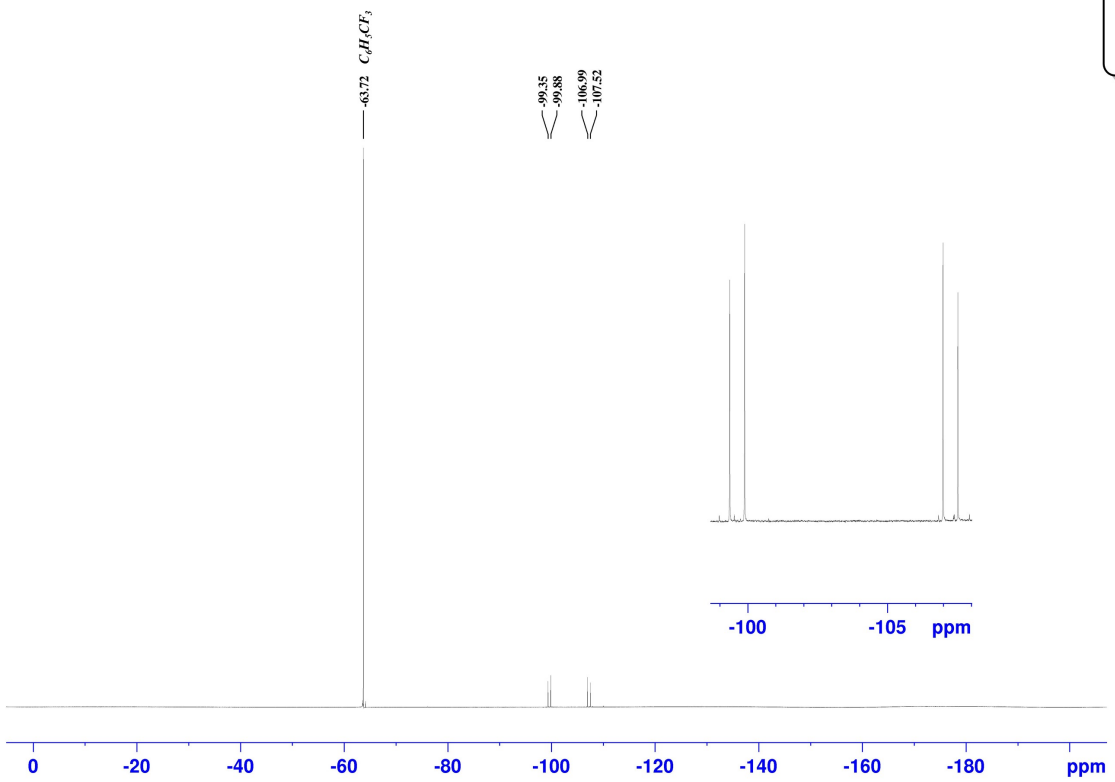
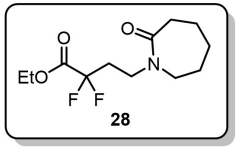


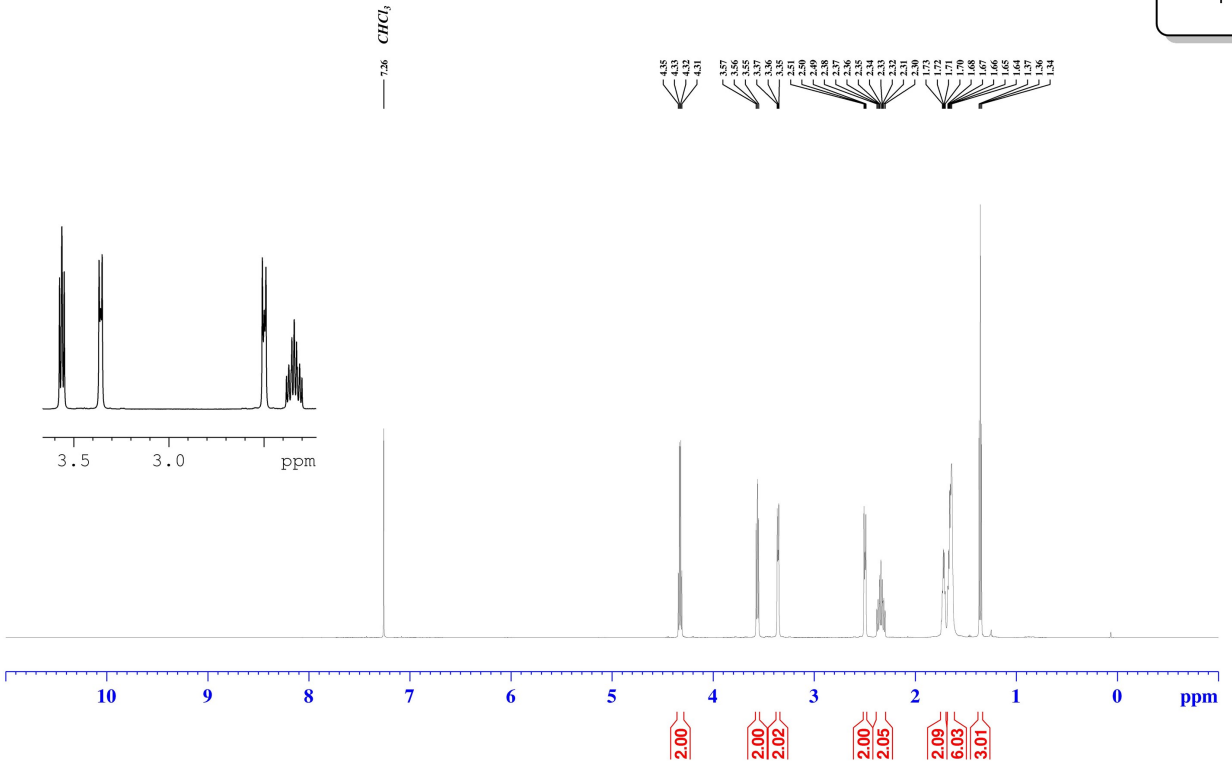
Ethyl 2,2-Difluoro-2-((1*S*,5*R*)-2-(2-hydroxyethyl)-5-isopropyl cyclohex-2-en-1-yl)acetate, ^{1}H NMR 600 MHz, $CDCl_3$



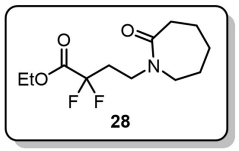


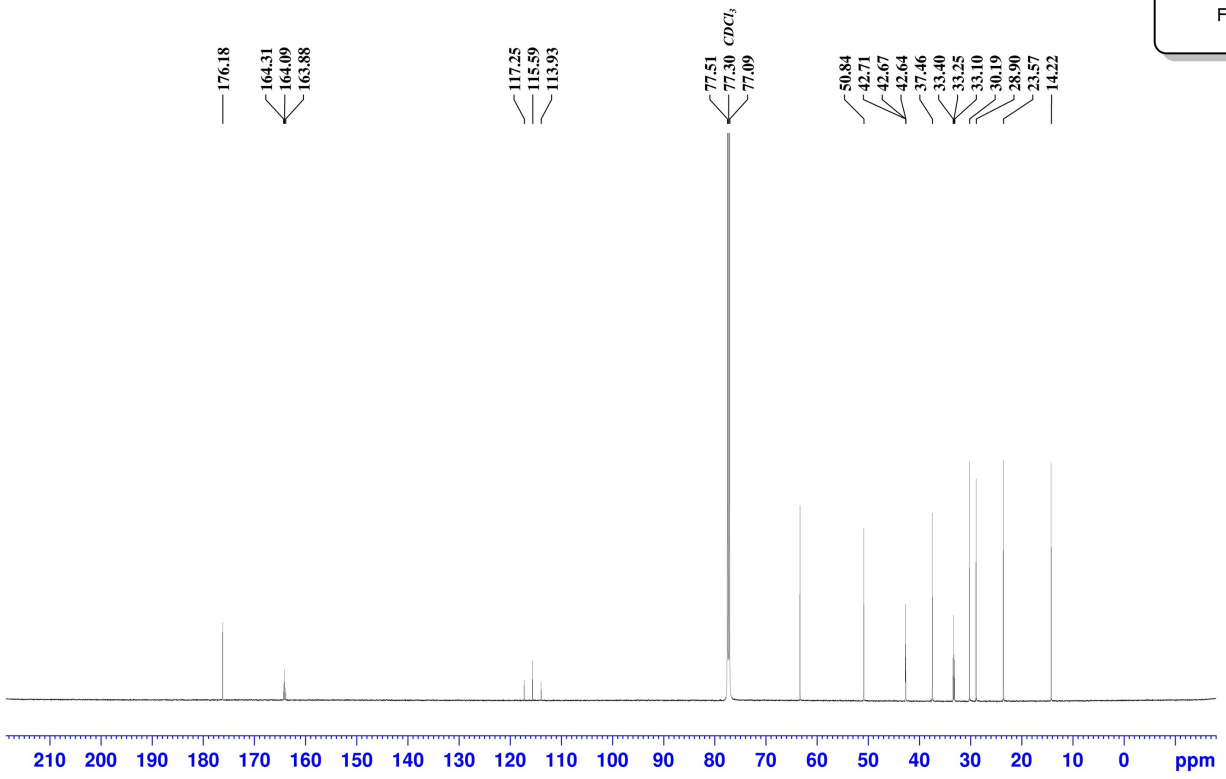
Ethyl 2,2-Difluoro-4-(2-oxoazepan-1-yl)butanoate, ^{1}H NMR 600 MHz, $CDCl_3$



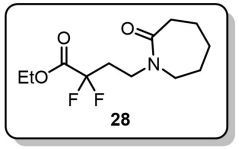


Ethyl 2,2-Difluoro-4-(2-oxoazepan-1-yl)butanoate, ^{13}C NMR
151 MHz, $CDCl_3$





Ethyl 2,2-Difluoro-4-(2-oxoazepan-1-yl)butanoate, ^{19}F NMR
471 MHz, $CDCl_3$



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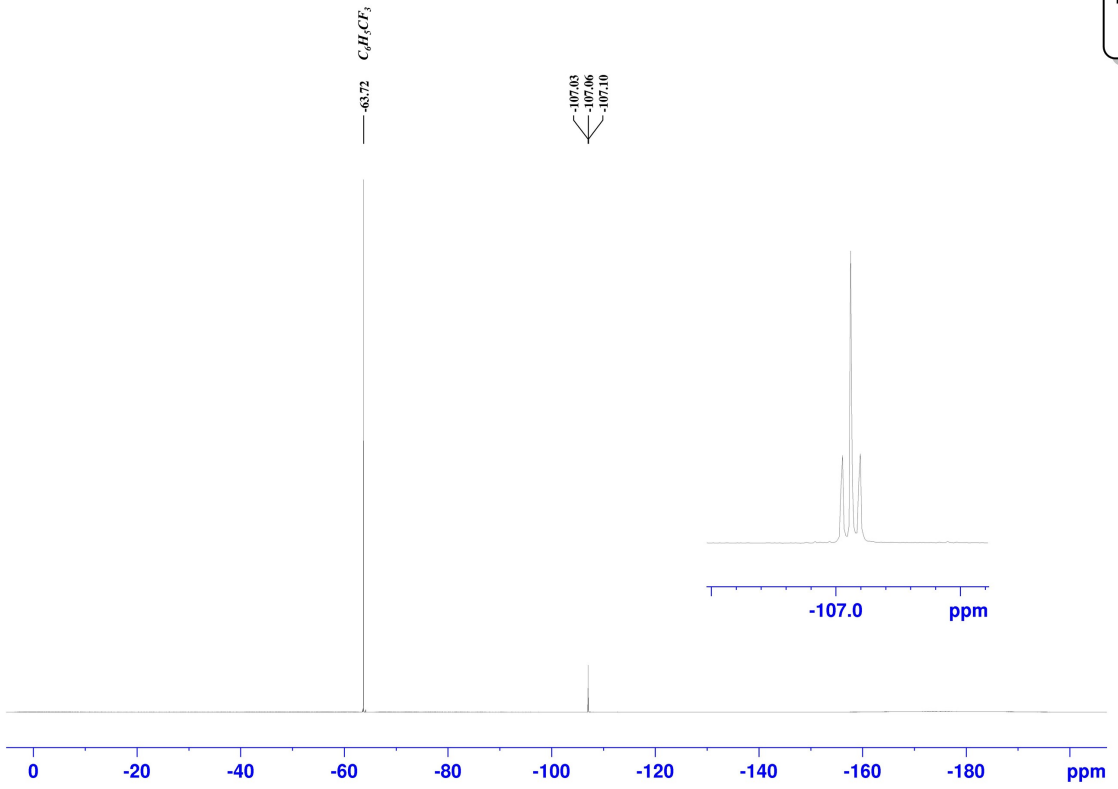
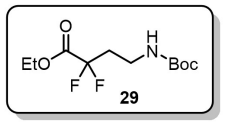
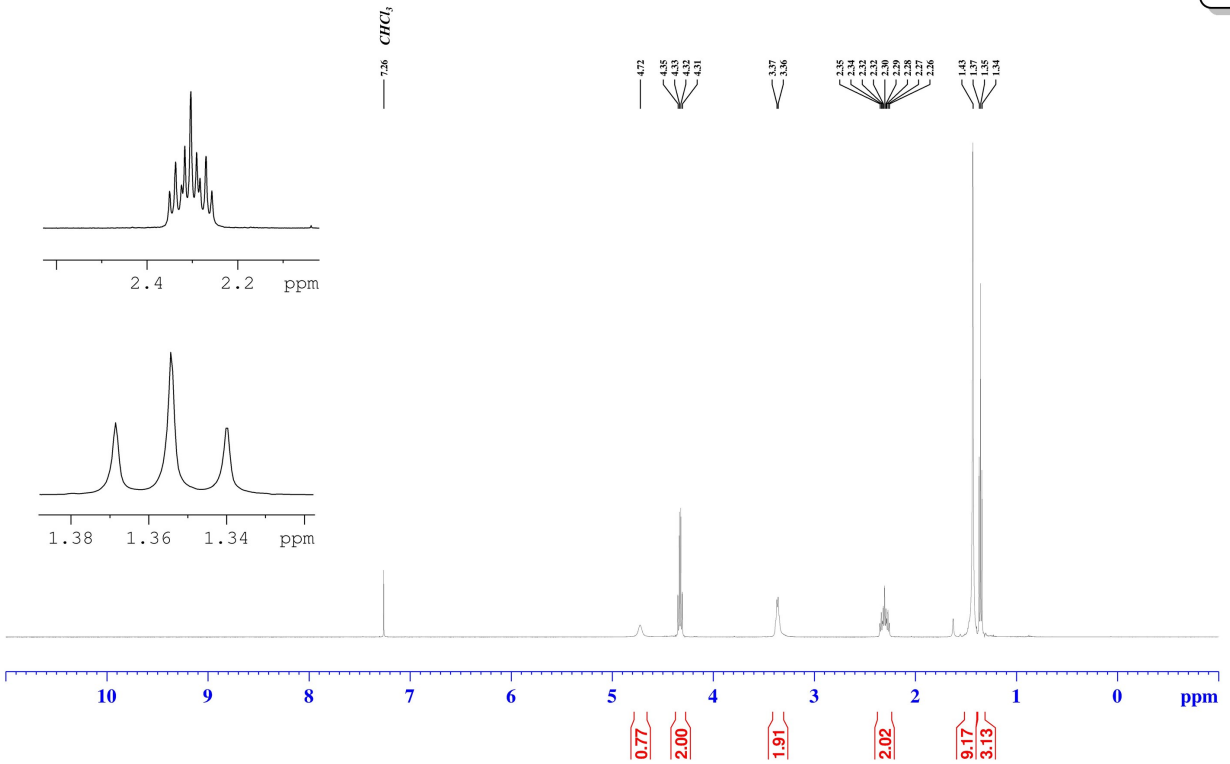
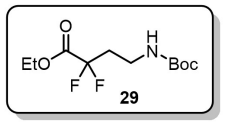


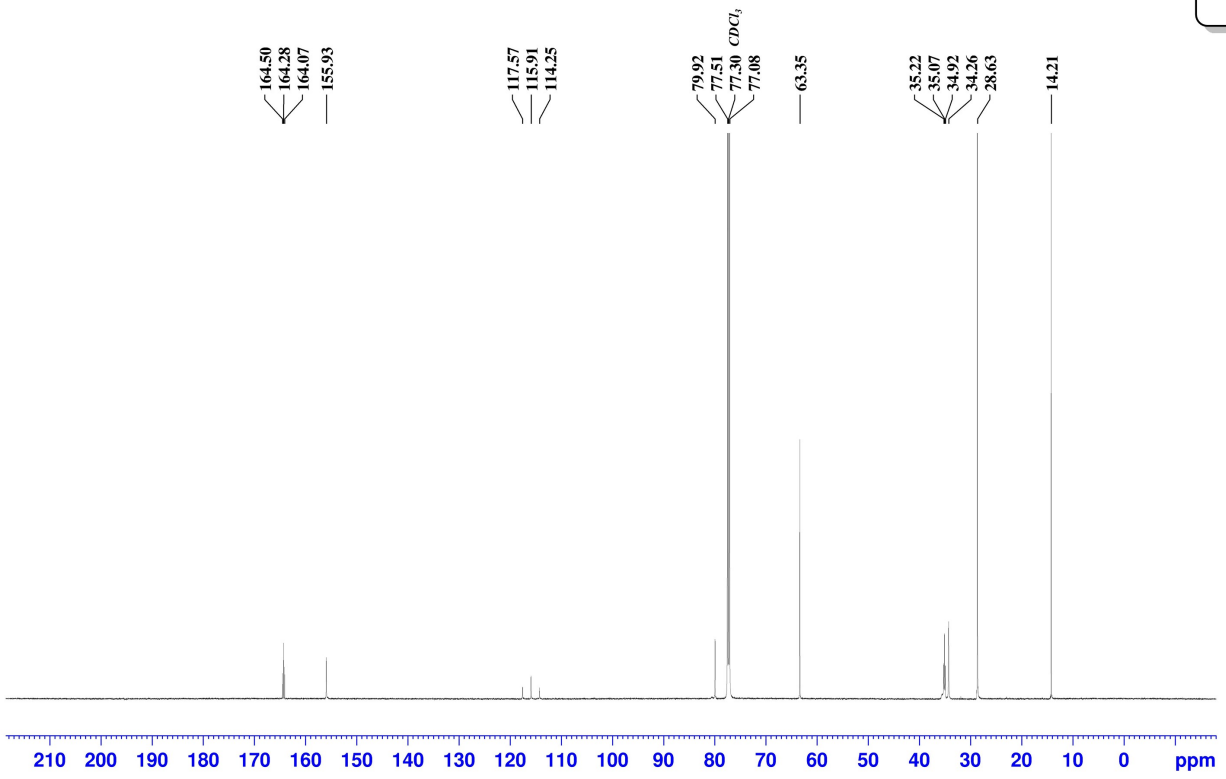
Ethyl 4-((*tert*-Butoxycarbonyl)amino)-2,2-difluorobutanoate, ^{1}H NMR 600 MHz, $CDCl_3$



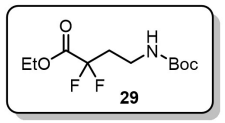


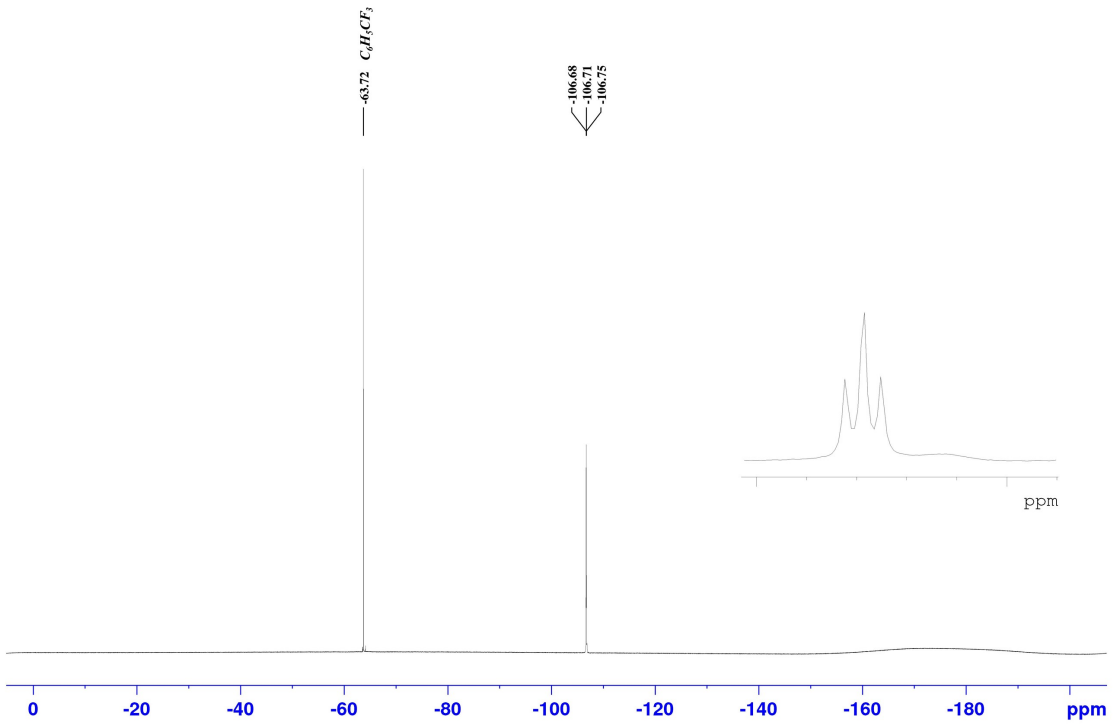
Ethyl 4-((*tert*-Butoxycarbonyl)amino)-2,2-difluorobutanoate, ^{13}C NMR
151 MHz, $CDCl_3$



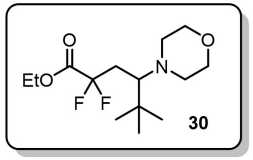


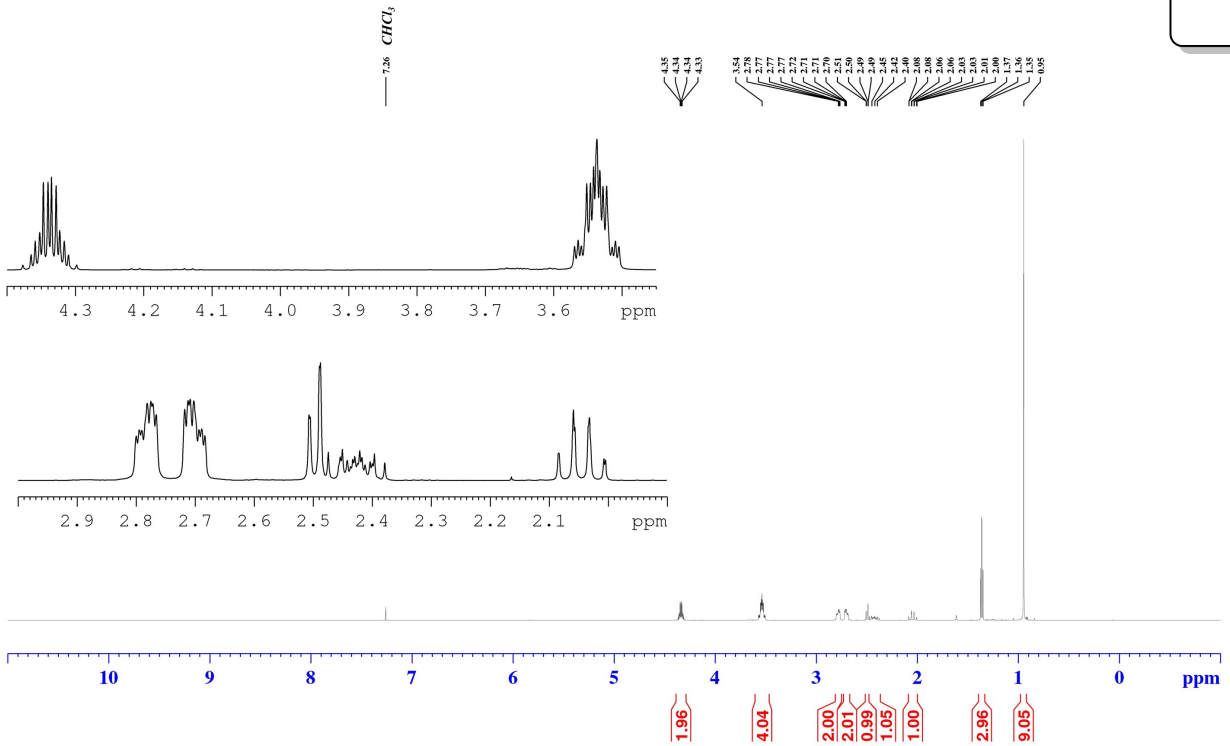
Ethyl 4-((*tert*-Butoxycarbonyl)amino)-2,2-difluorobutanoate, ^{19}F NMR
471 MHz, $CDCl_3$



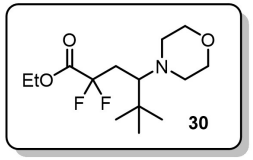


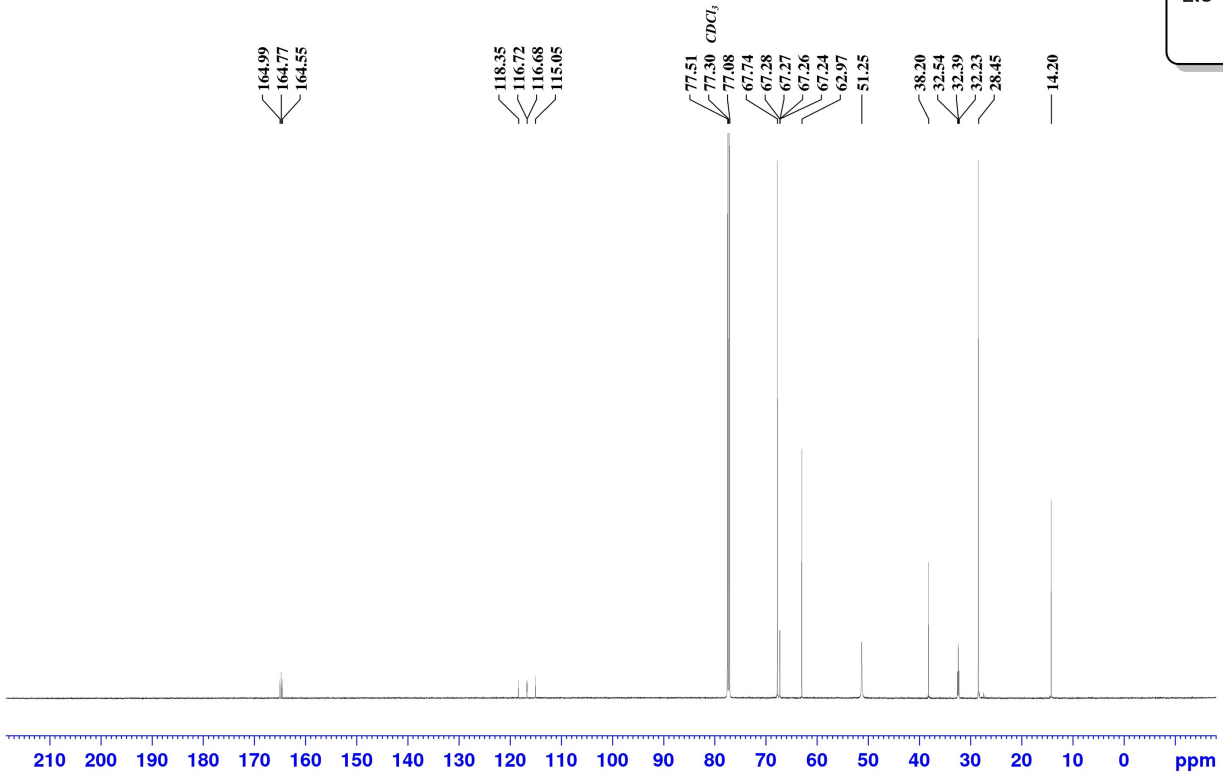
Ethyl 2,2-Difluoro-5,5-dimethyl-4-morpholinohexanoate, ^{1}H NMR
600 MHz, $CDCl_3$



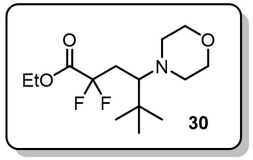


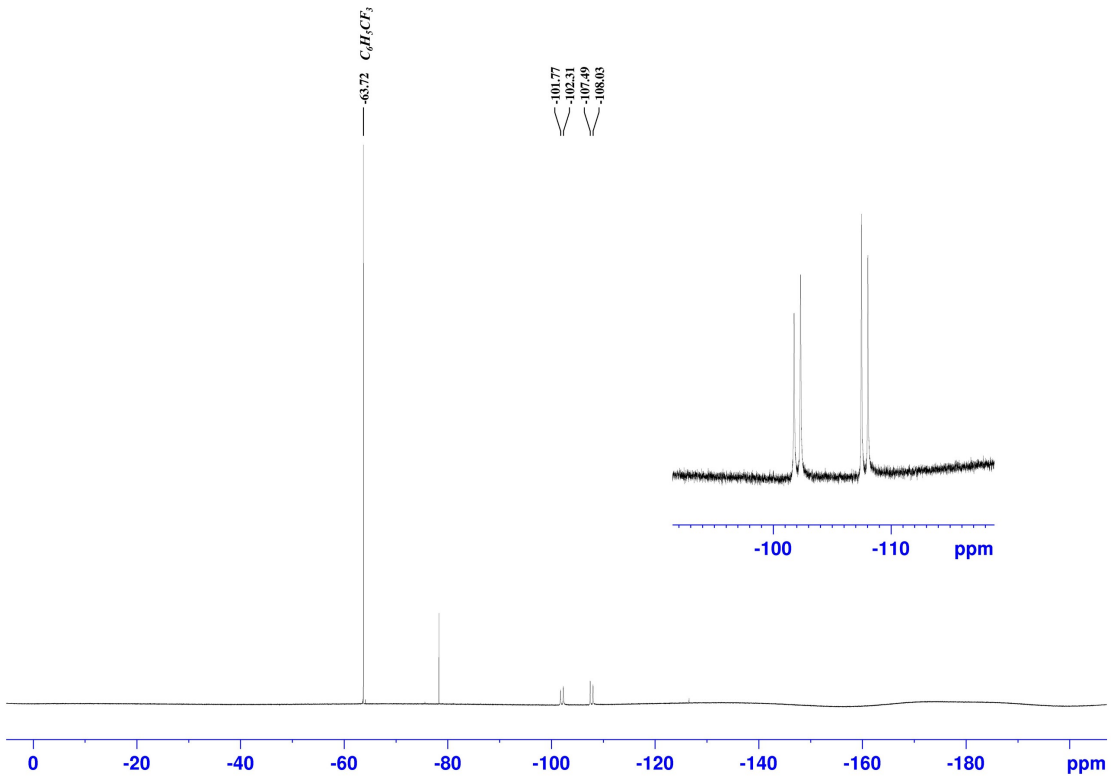
Ethyl 2,2-Difluoro-5,5-dimethyl-4-morpholinohexanoate, ^{13}C NMR
151 MHz, $CDCl_3$



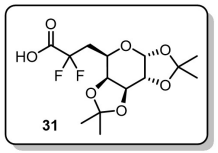


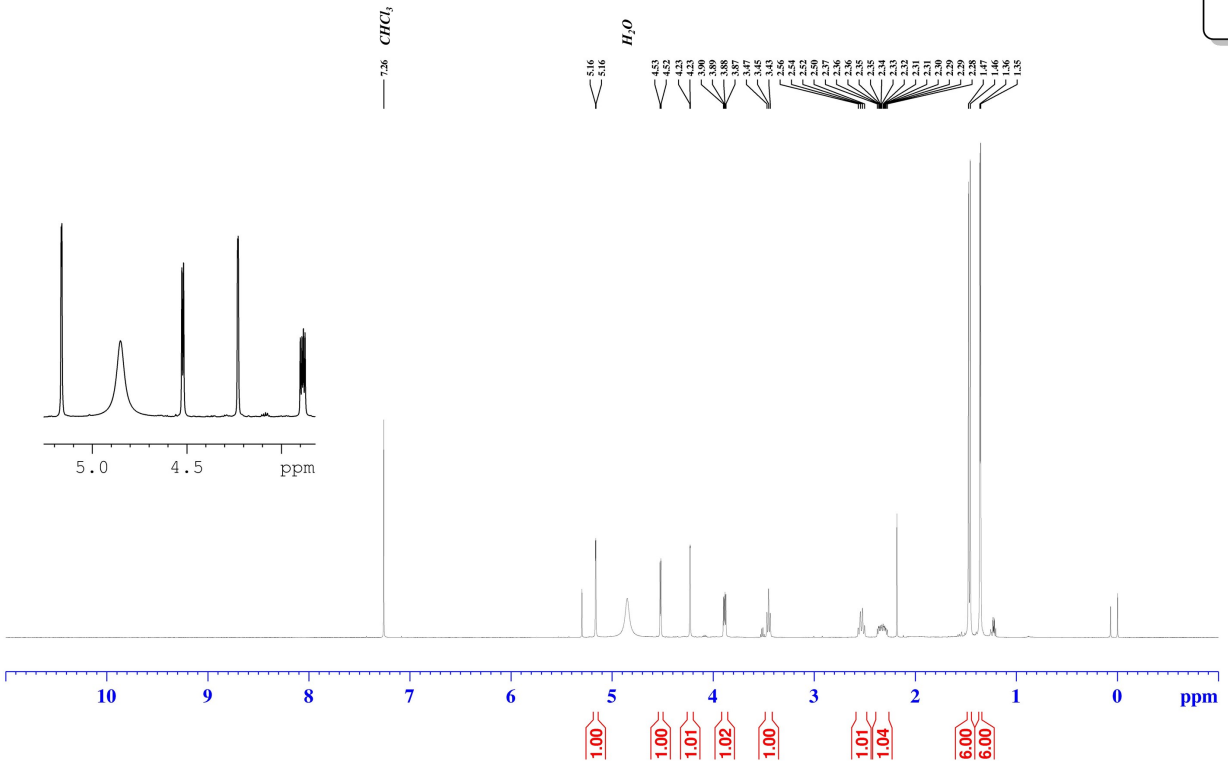
Ethyl 2,2-Difluoro-5,5-dimethyl-4-morpholinohexanoate, ^{19}F NMR
471 MHz, $CDCl_3$



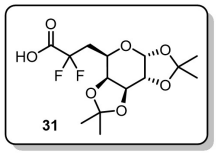


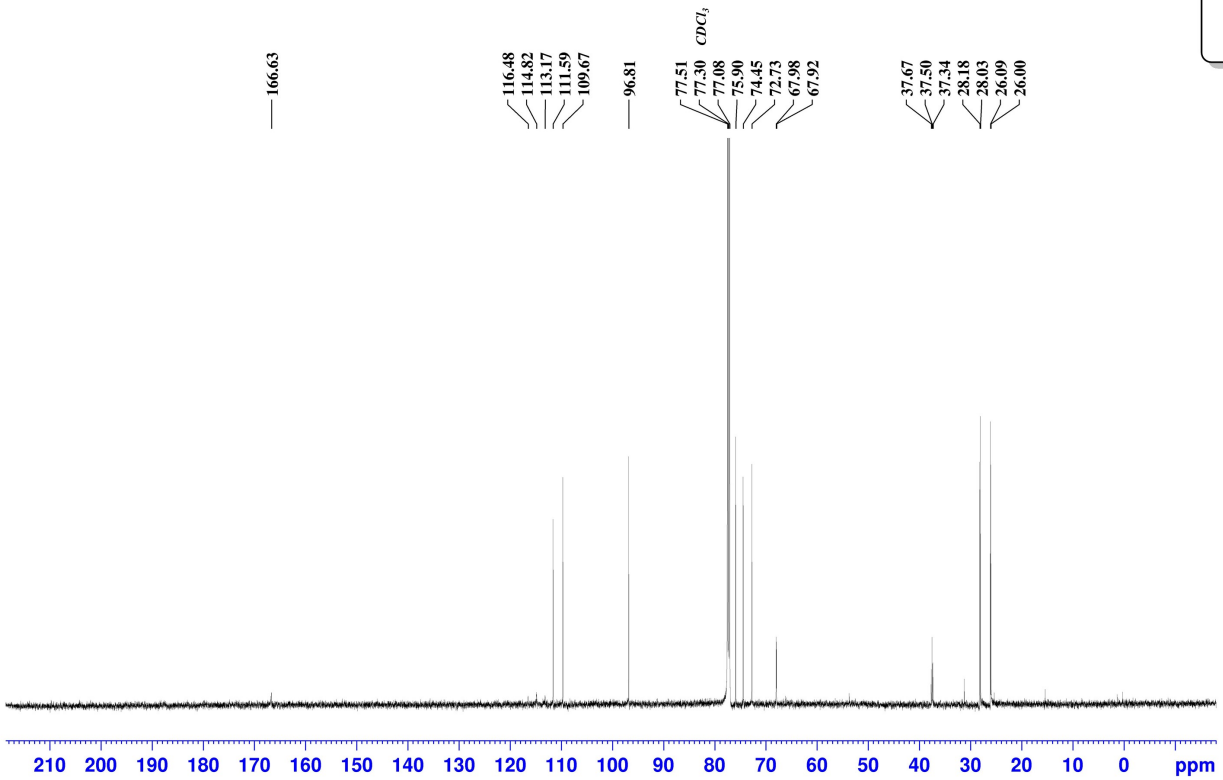
2,2-Difluoro-3-((3aR,5R,5aS,8aS,8bR)-2,2,7,7-tetramethyl tetrahydro-5H-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-yl) propanoic acid, ^{1}H NMR 600 MHz, $CDCl_3$



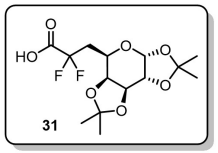


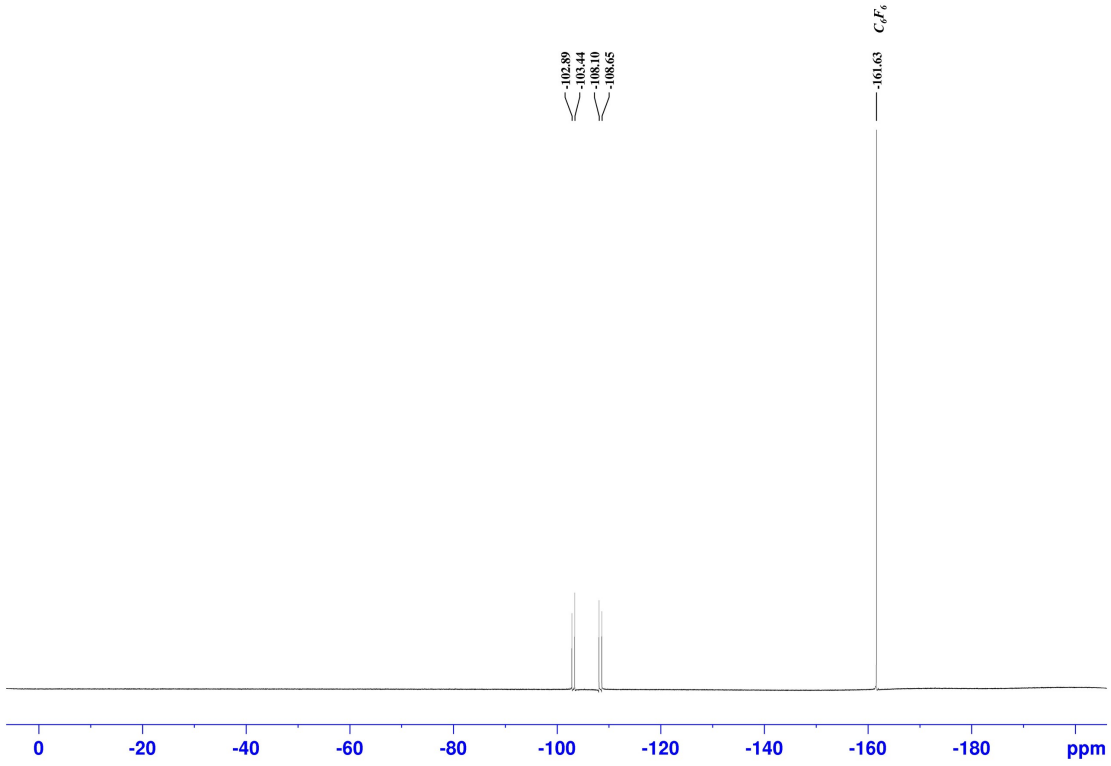
2,2-Difluoro-3-((3aR,5R,5aS,8aS,8bR)-2,2,7,7-tetramethyl tetrahydro-5H-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-yl) propanoic acid, ^{13}C NMR 151 MHz, $CDCl_3$



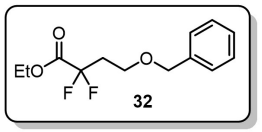


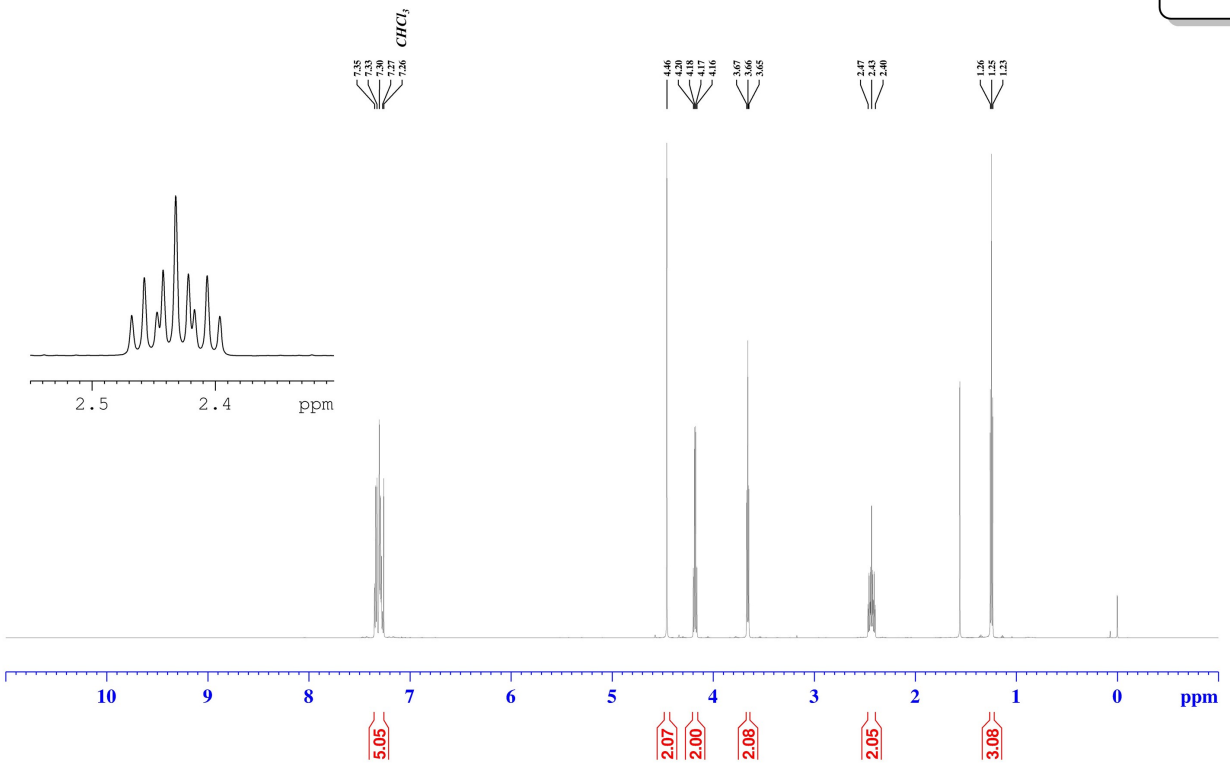
2,2-Difluoro-3-((3aR,5R,5aS,8aS,8bR)-2,2,7,7-tetramethyl tetrahydro-5H-bis([1,3]dioxolo)[4,5-b:4',5'-d]pyran-5-yl) propanoic acid, ^{19}F NMR 471 MHz, $CDCl_3$



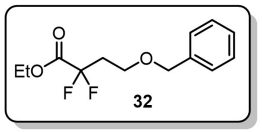


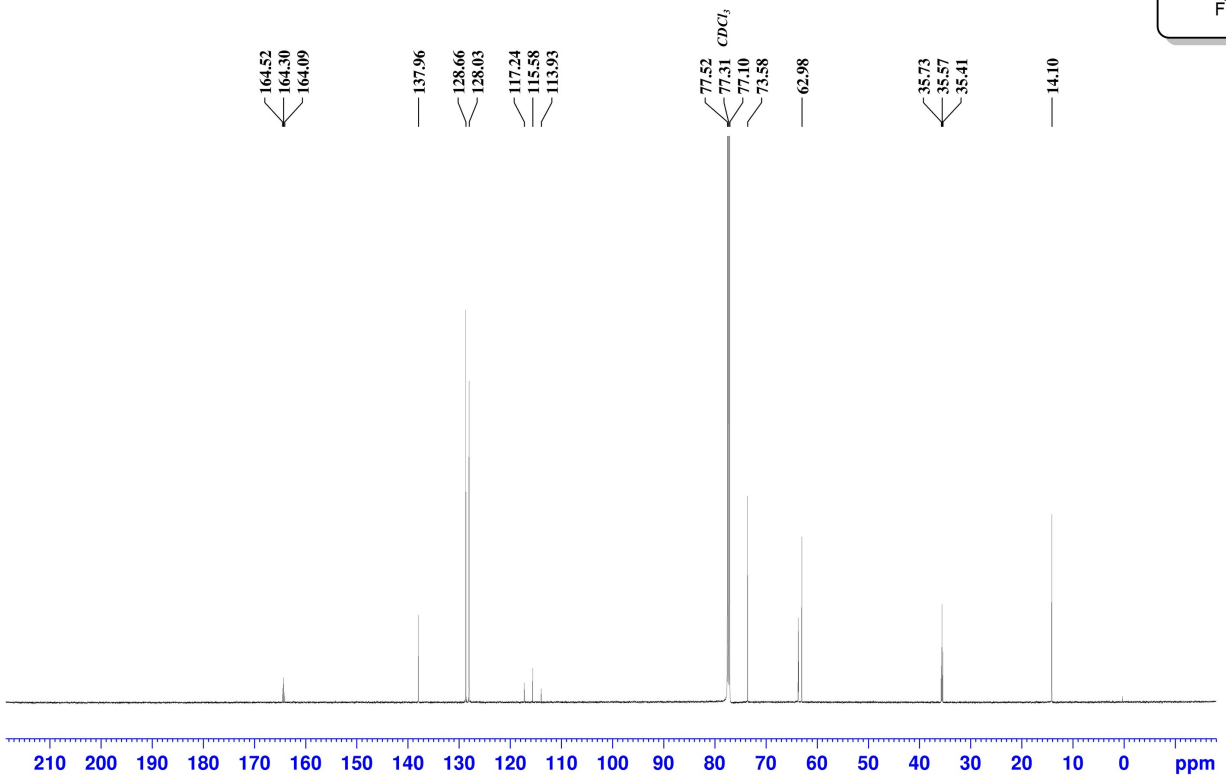
Ethyl 4-(Benzyloxy)-2,2-difluorobutanoate, ^{1}H NMR
600 MHz, $CDCl_3$



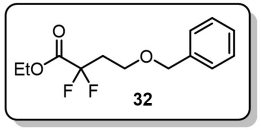


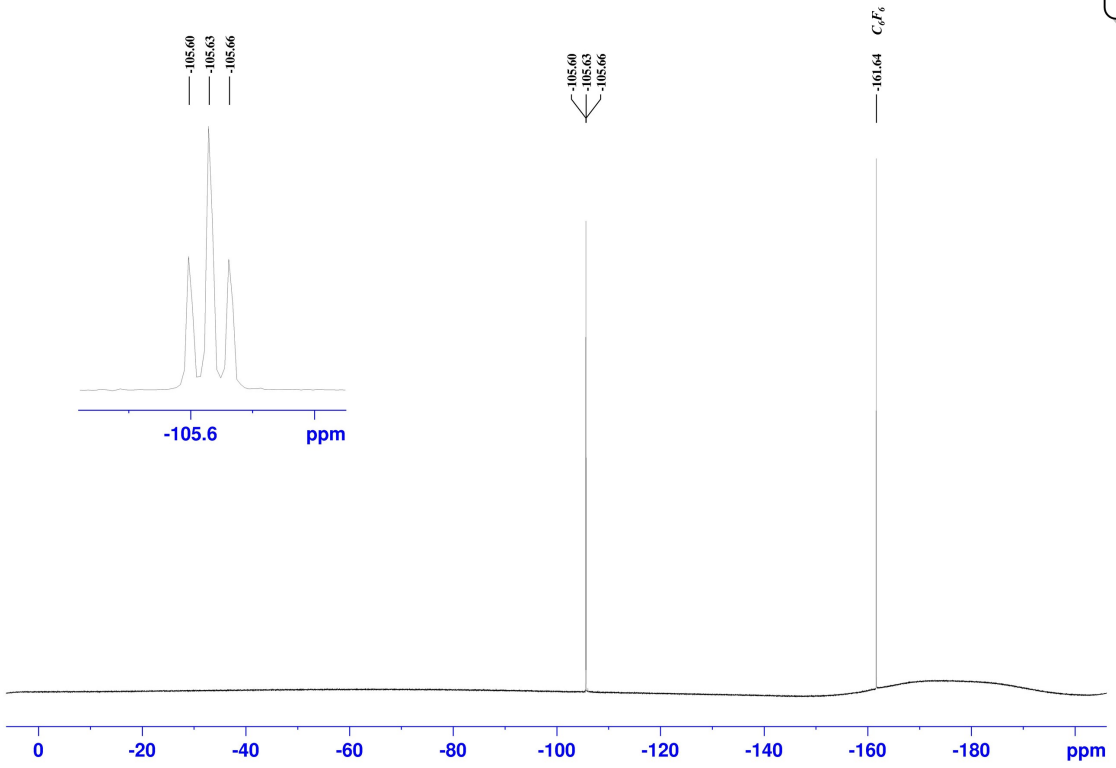
Ethyl 4-(Benzyloxy)-2,2-difluorobutanoate, ^{13}C NMR
151 MHz, $CDCl_3$



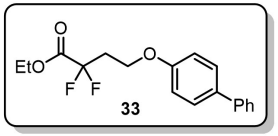


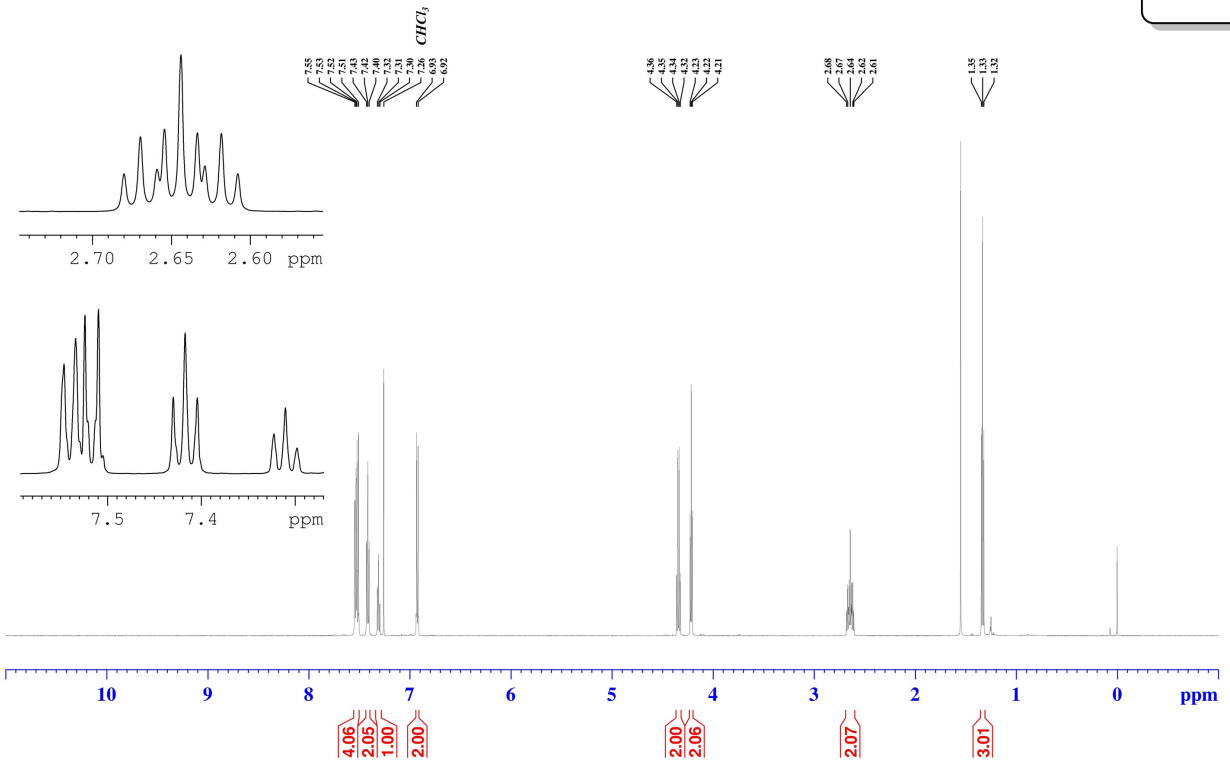
Ethyl 4-(Benzyloxy)-2,2-difluorobutanoate, ^{19}F NMR
471 MHz, $CDCl_3$



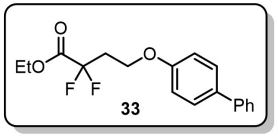


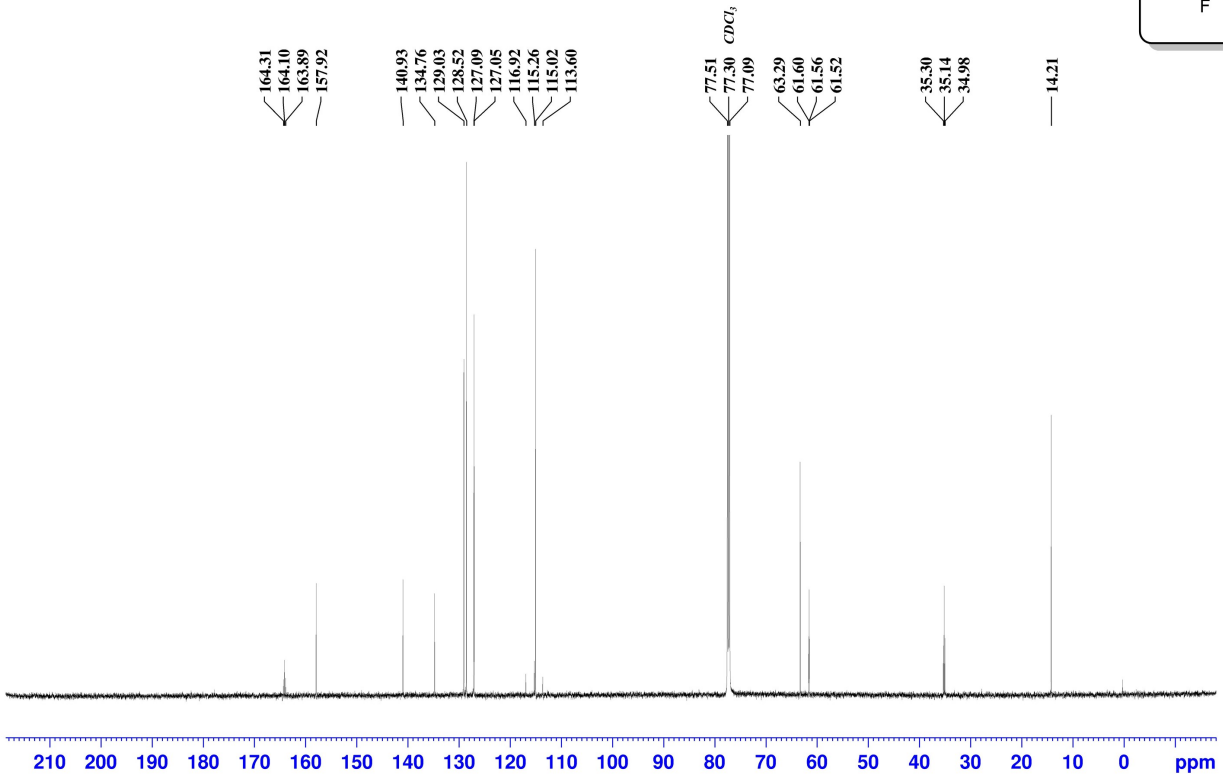
Ethyl 4-([1,1'-Biphenyl]-4-yloxy)-2,2-difluorobutanoate, ^{1}H NMR
600 MHz, $CDCl_3$



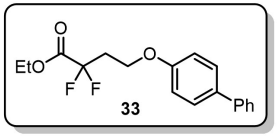


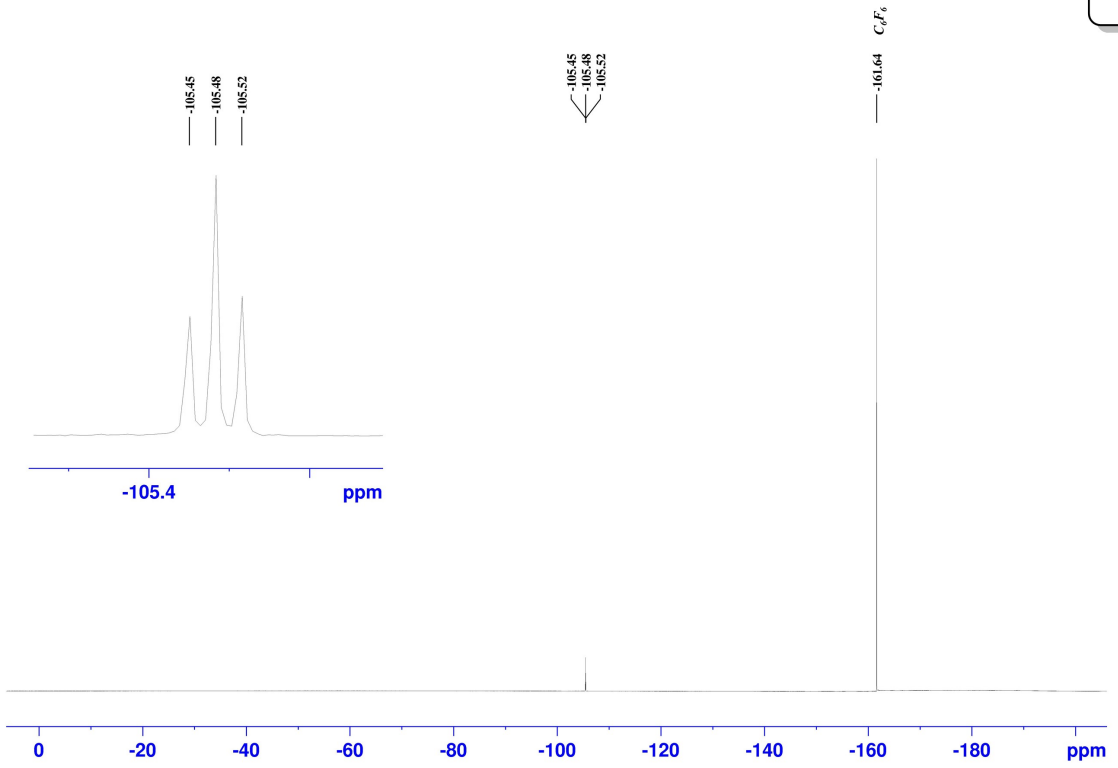
Ethyl 4-([1,1'-Biphenyl]-4-yloxy)-2,2-difluorobutanoate, ^{13}C NMR
151 MHz, $CDCl_3$



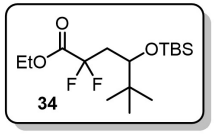


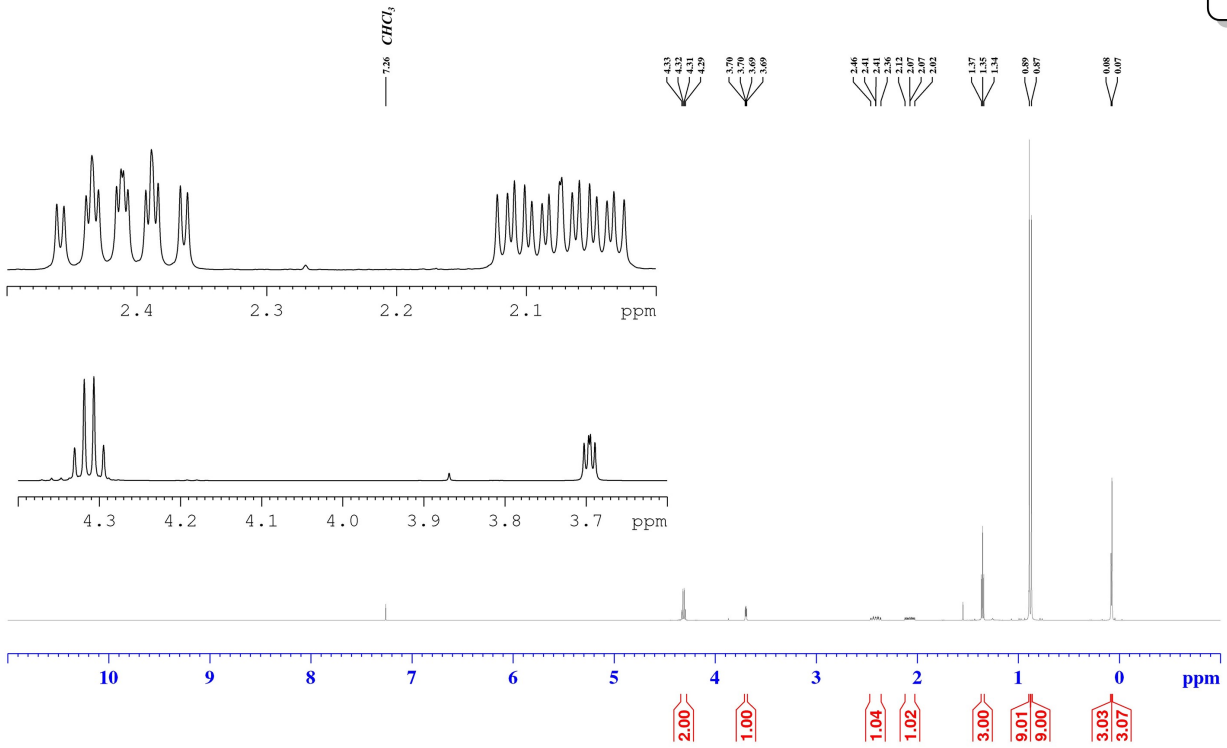
Ethyl 4-([1,1'-Biphenyl]-4-yloxy)-2,2-difluorobutanoate, ^{19}F NMR
471 MHz, $CDCl_3$



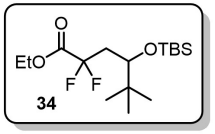


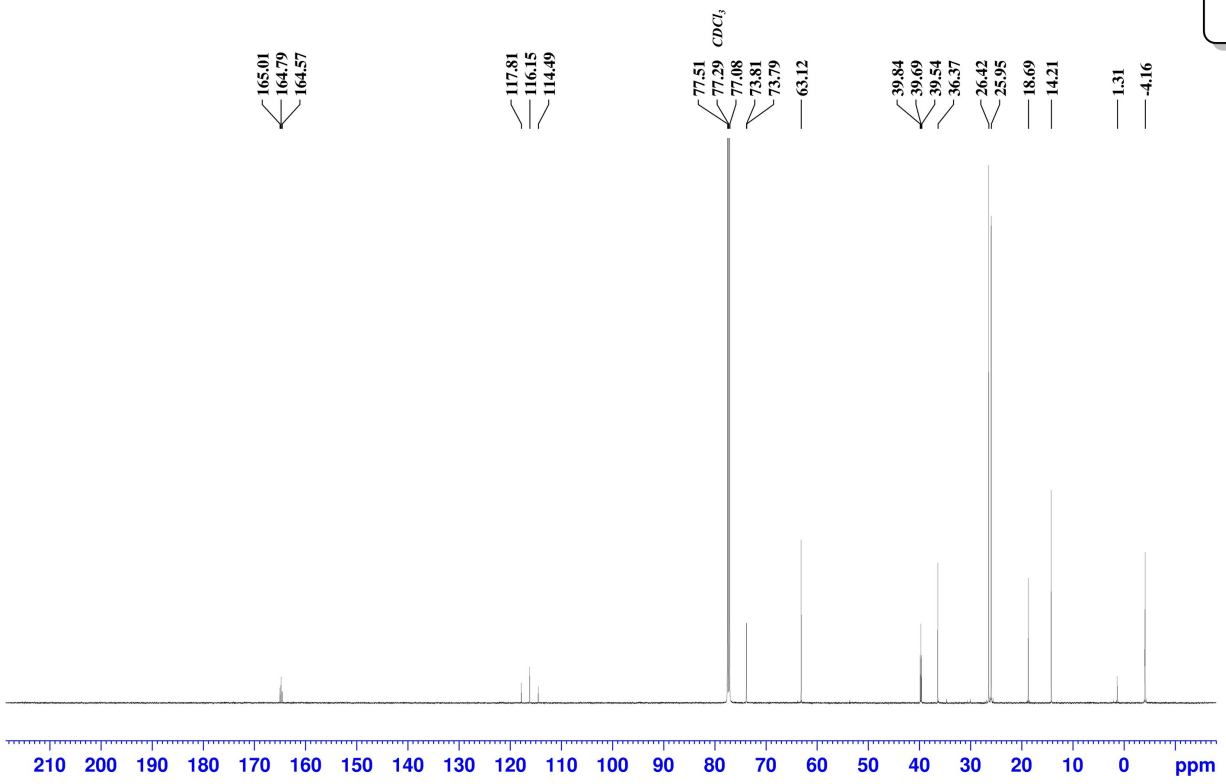
Ethyl 4-((*tert*-Butyldimethylsilyl)oxy)-2,2-difluoro-5,5-dimethylhexanoate, ^{1}H NMR
600 MHz, $CDCl_3$



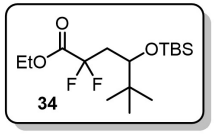


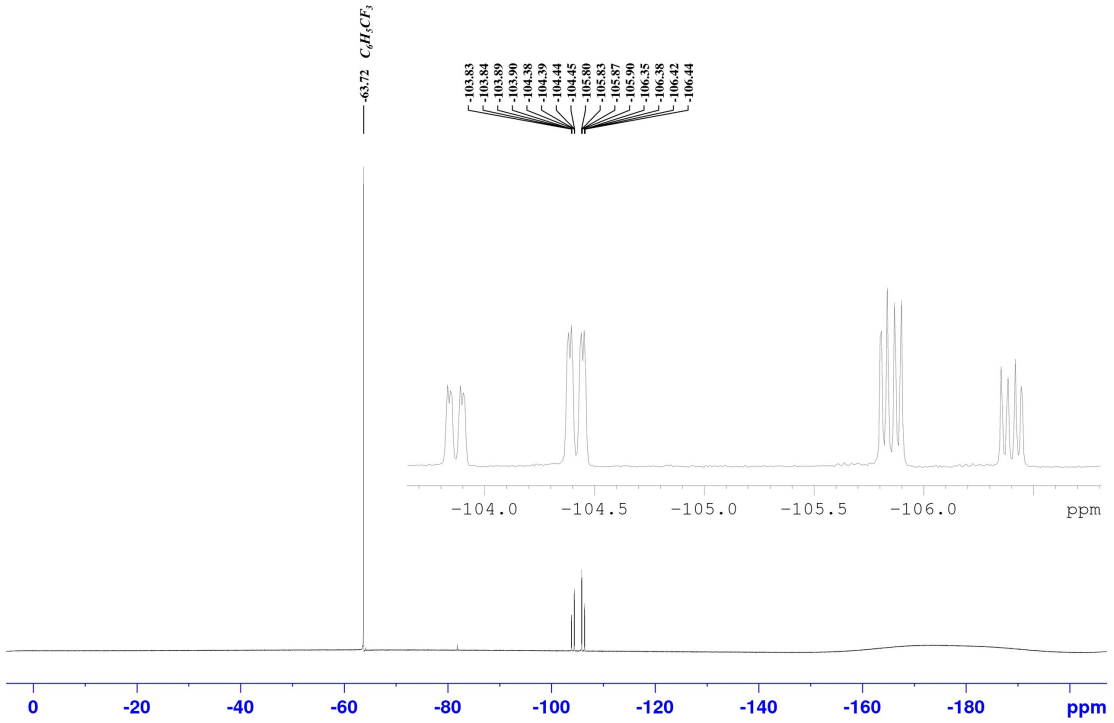
Ethyl 4-((*tert*-Butyldimethylsilyl)oxy)-2,2-difluoro-5,5-dimethylhexanoate, ^{13}C NMR 151 MHz, $CDCl_3$



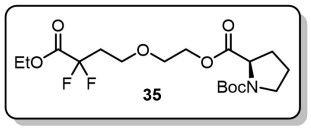


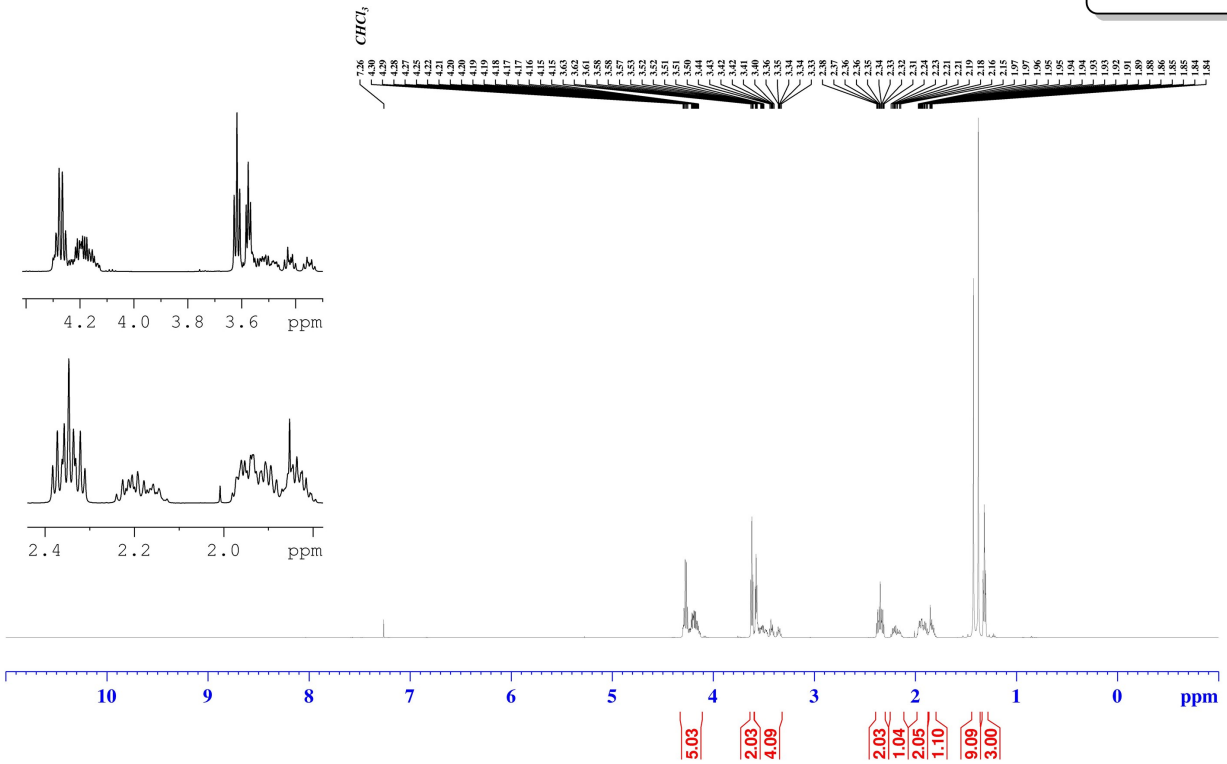
Ethyl 4-((*tert*-Butyldimethylsilyl)oxy)-2,2-difluoro-5,5-dimethylhexanoate, ^{19}F NMR
471 MHz, $CDCl_3$



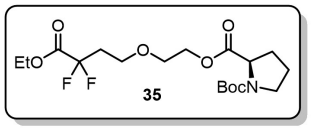


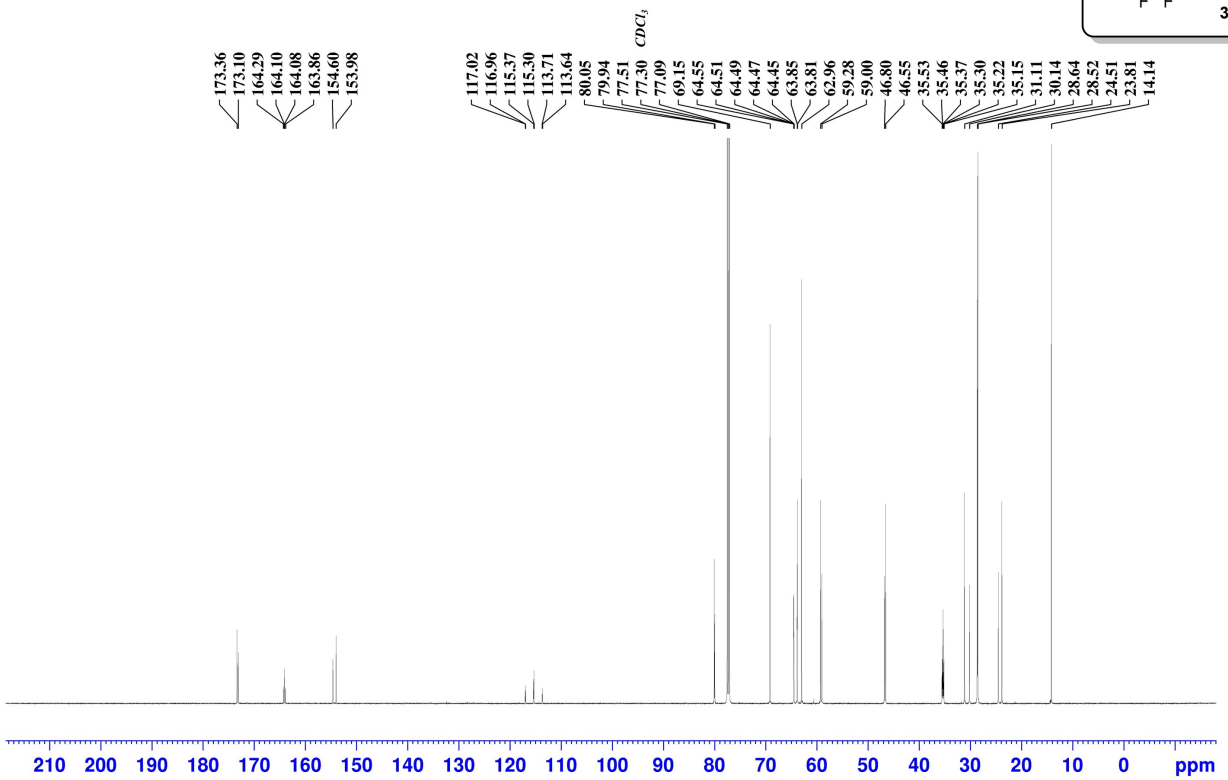
1-(*tert*-Butyl) 2-(2-(4-Ethoxy-3,3-difluoro-4-oxobutoxy) Ethyl (*R*)-Pyrrolidine-1,2-dicarboxylate, ^{1}H NMR 600 MHz, $CDCl_3$



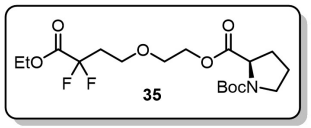


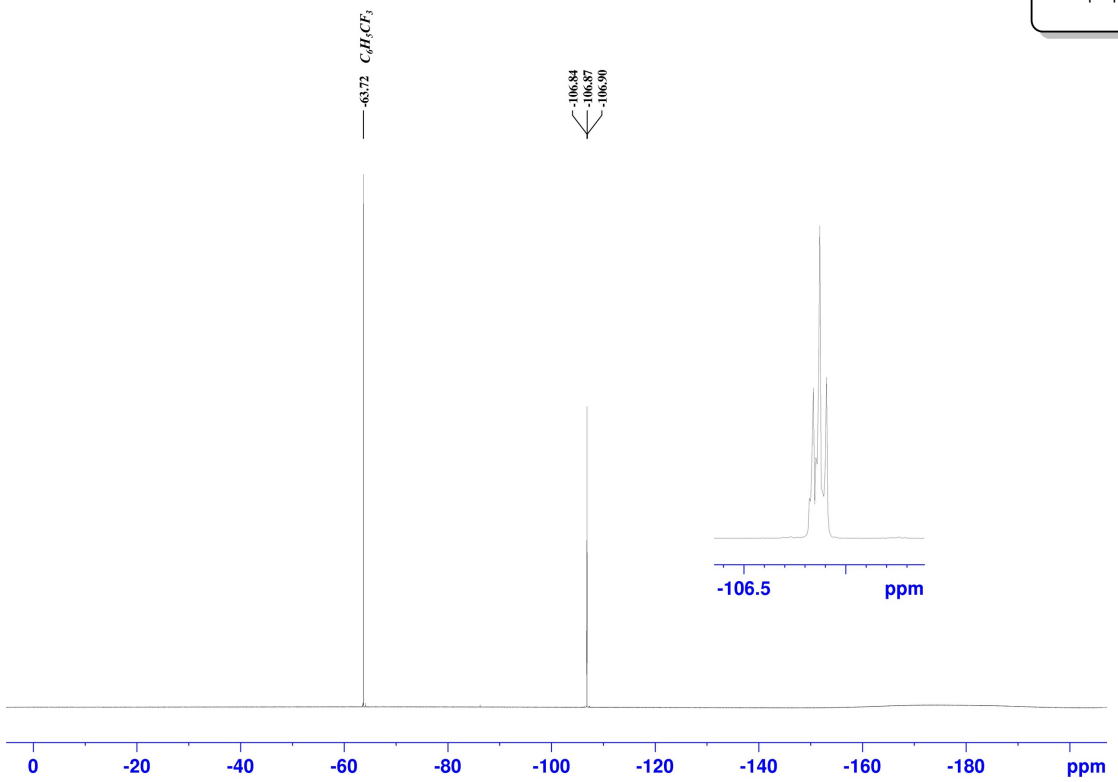
1-(*tert*-Butyl) 2-(2-(4-Ethoxy-3,3-difluoro-4-oxobutoxy) Ethyl (*R*)-Pyrrolidine-1,2-dicarboxylate, ^{13}C NMR 151 MHz, $CDCl_3$



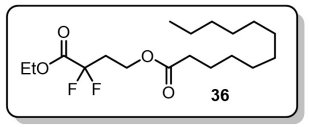


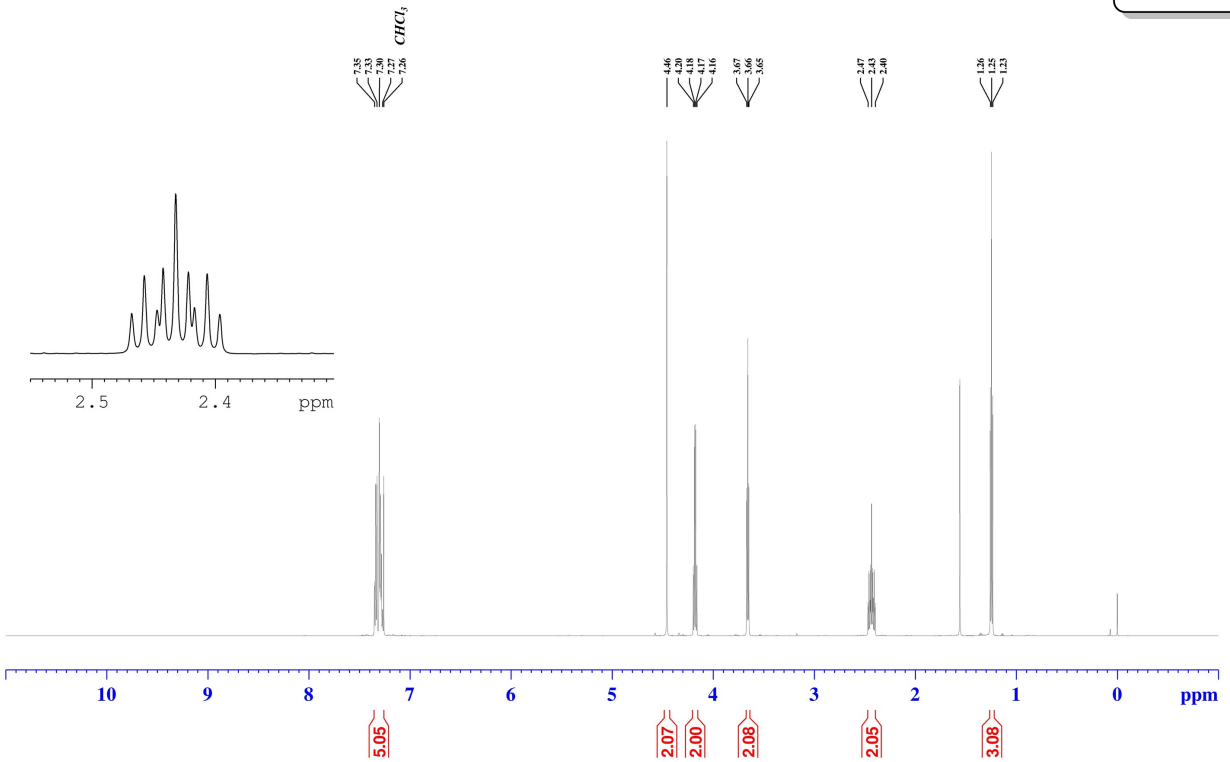
1-(*tert*-Butyl) 2-(2-(4-Ethoxy-3,3-difluoro-4-oxobutoxy) Ethyl (*R*)-Pyrrolidine-1,2-dicarboxylate, ^{19}F NMR 471 MHz, $CDCl_3$



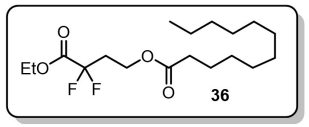


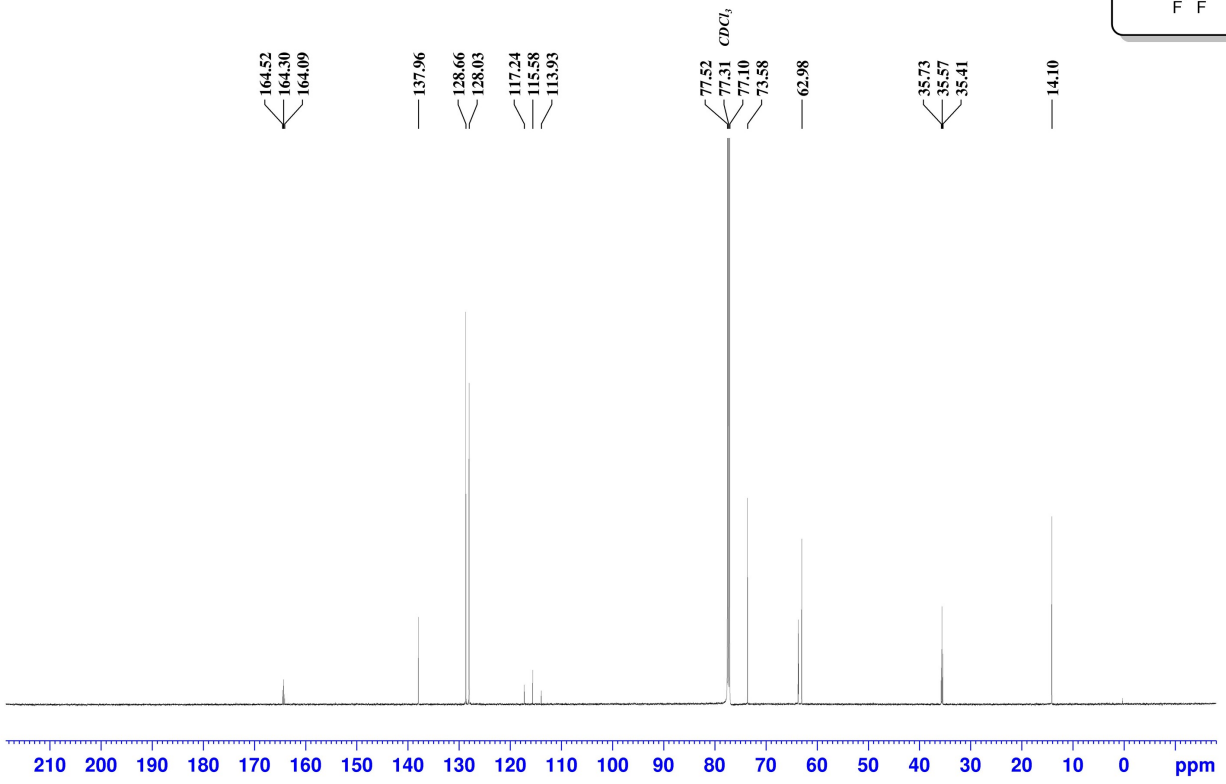
4-Ethoxy-3,3-difluoro-4-oxobutyldodecanoate, ^{1}H NMR
600 MHz, $CDCl_3$



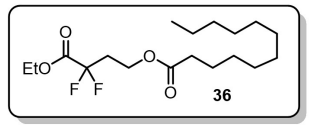


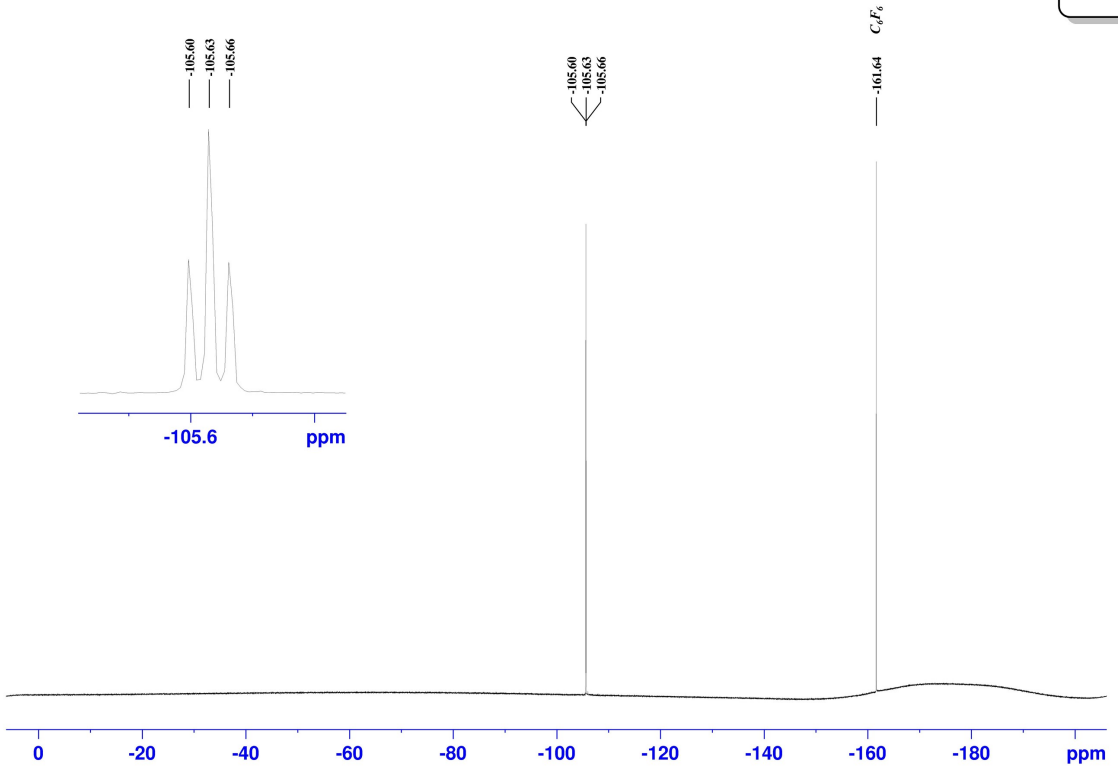
4-Ethoxy-3,3-difluoro-4-oxobutyldodecanoate, ^{13}C NMR
151 MHz, $CDCl_3$



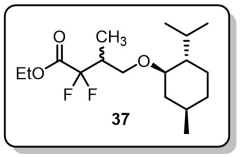


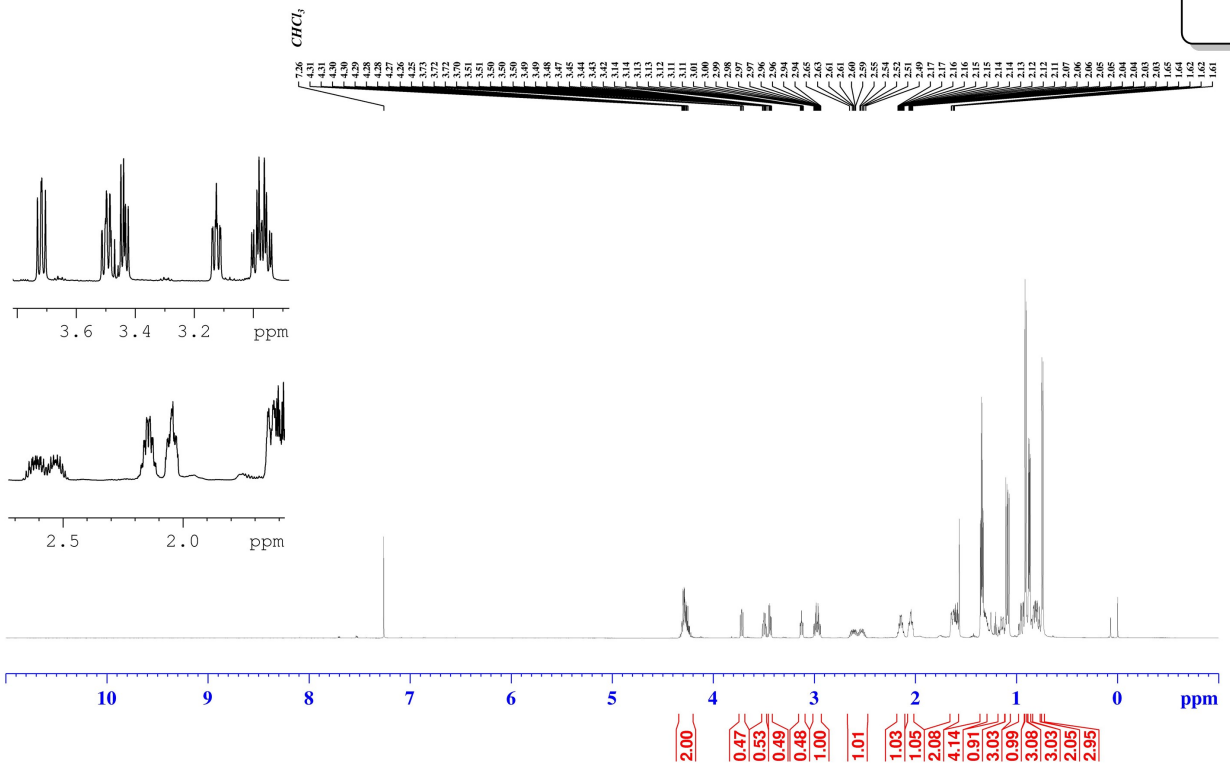
4-Ethoxy-3,3-difluoro-4-oxobutyldodecanoate, ^{19}F NMR
471 MHz, $CDCl_3$



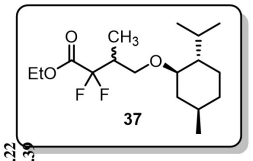


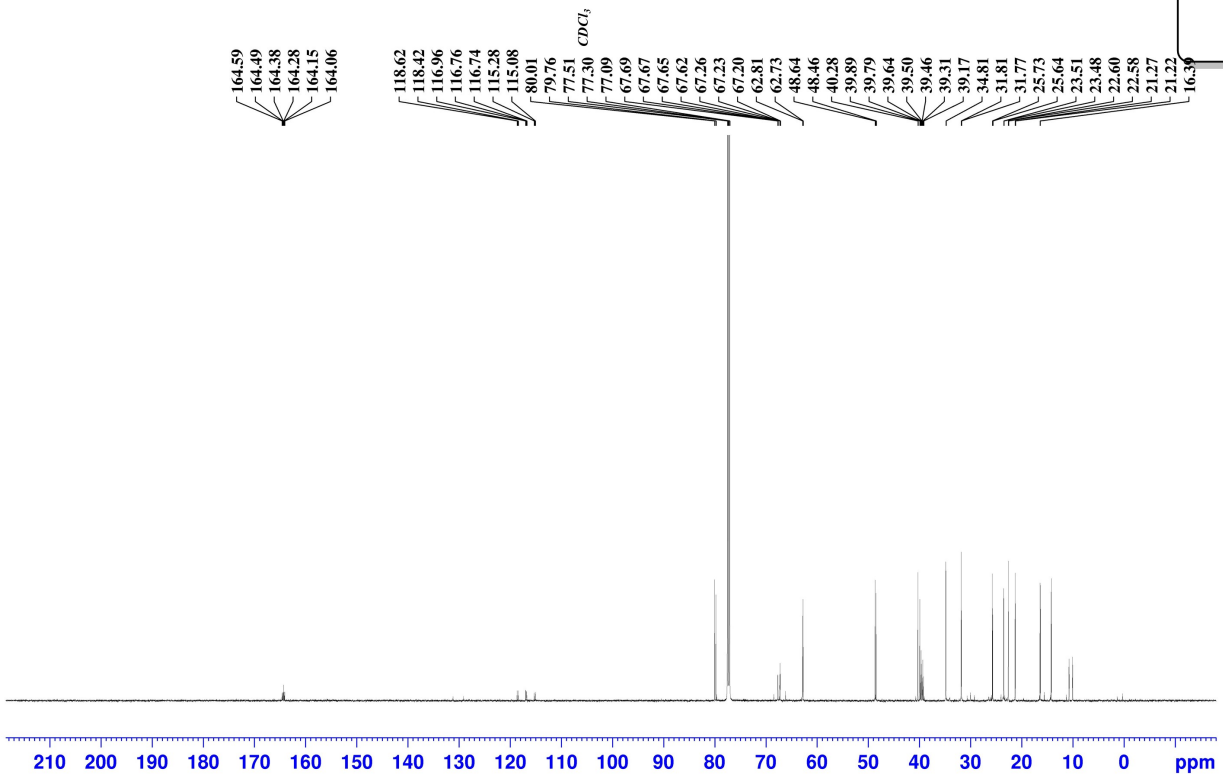
Ethyl 2,2-Difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanoate, ^{1}H NMR 600 MHz, $CDCl_3$



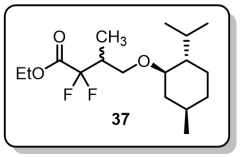


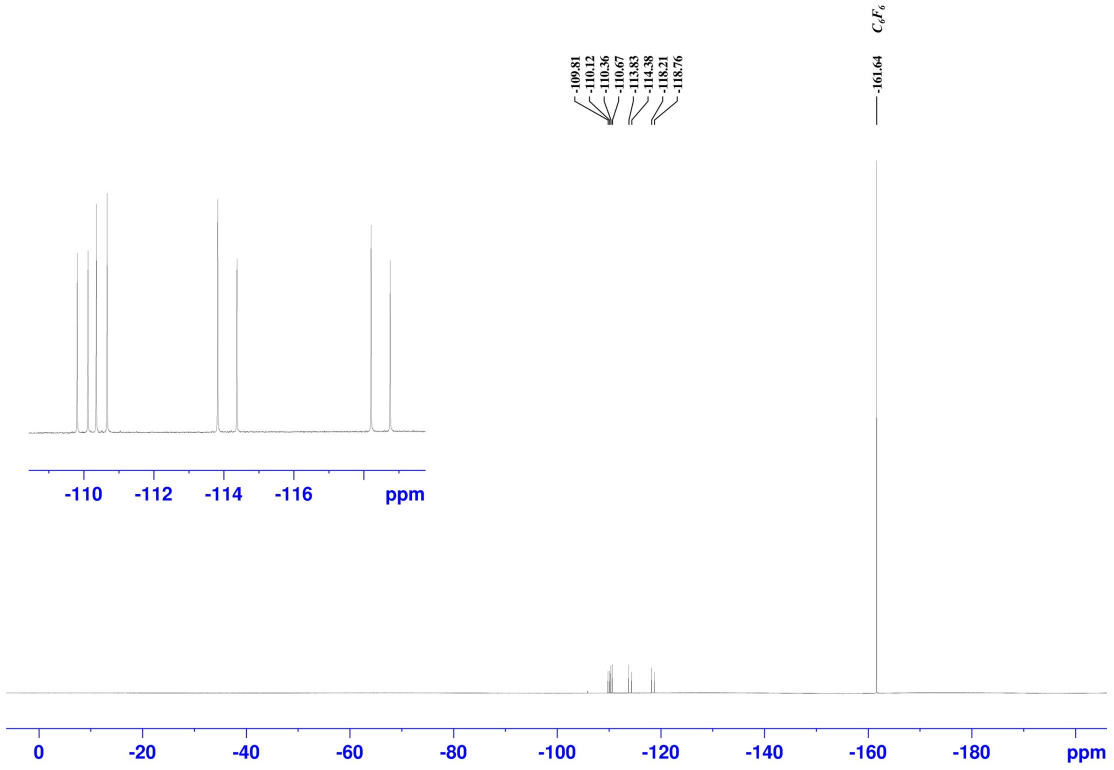
Ethyl 2,2-Difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanoate, ^{13}C NMR 151 MHz, $CDCl_3$



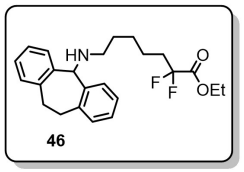


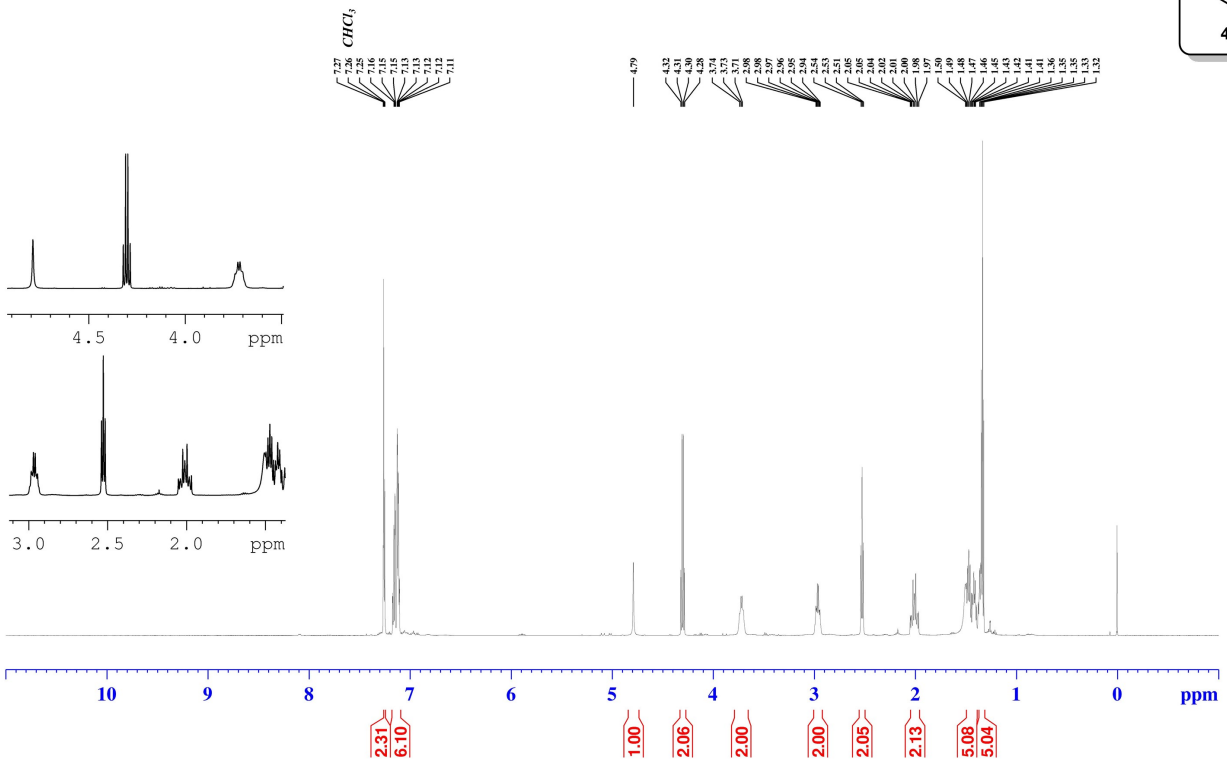
Ethyl 2,2-Difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanoate, ^{19}F NMR 471 MHz, $CDCl_3$



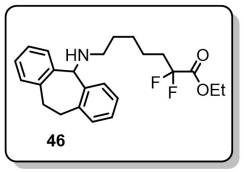


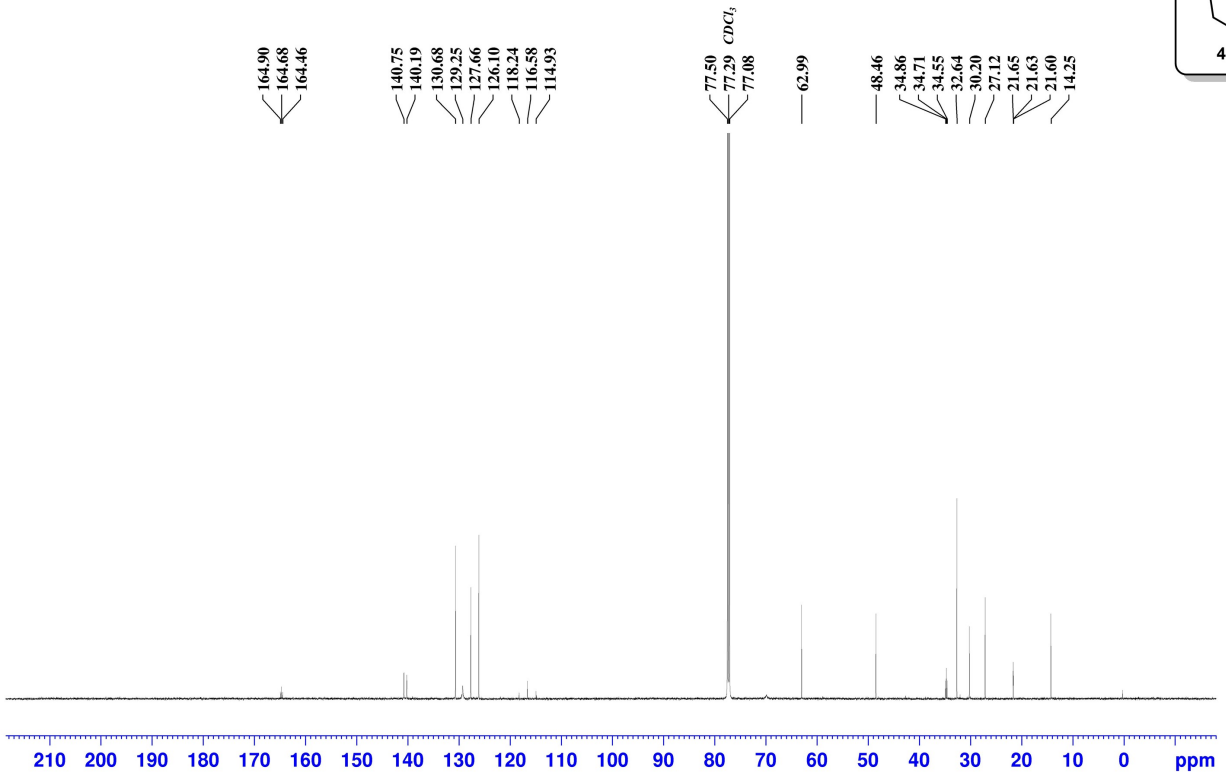
Ethyl 7-((10,11-Dihydro-5H-dibenzo[a,d][7]annulen-5-yl)amino)-2,2-difluoroheptanoate, ^{1}H NMR
600 MHz, $CDCl_3$



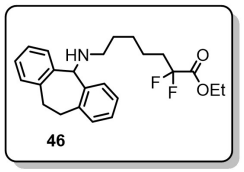


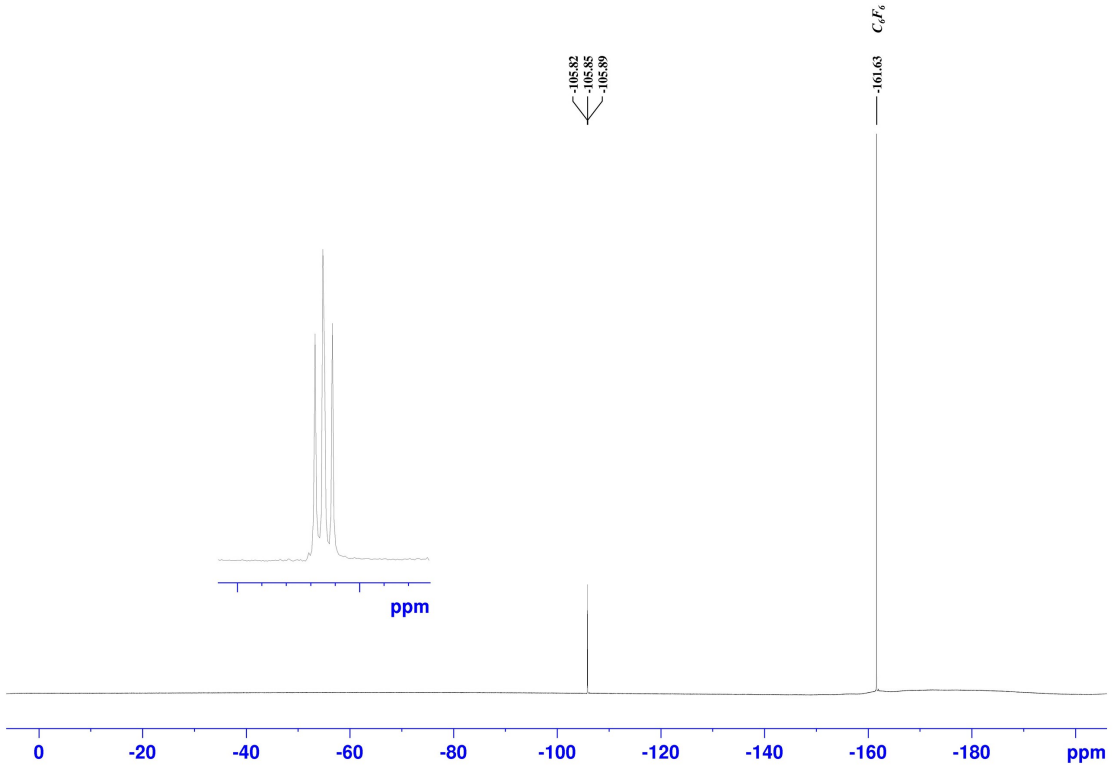
Ethyl 7-((10,11-Dihydro-5H-dibenzo[a,d][7]annulen-5-yl)amino)-2,2-difluoroheptanoate, ^{13}C NMR
151 MHz, $CDCl_3$



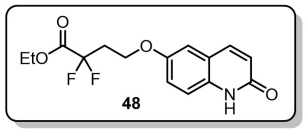


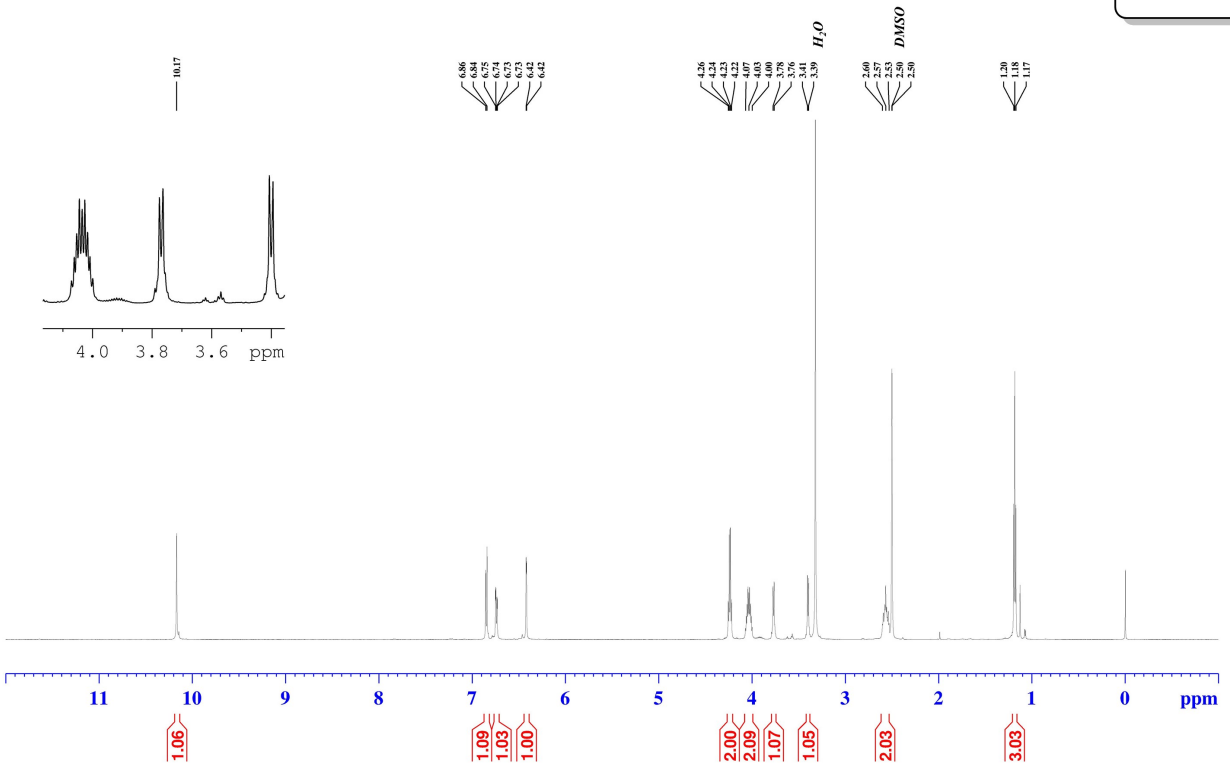
Ethyl 7-((10,11-Dihydro-5H-dibenzo[a,d][7]annulen-5-yl)amino)-2,2-difluoroheptanoate, ^{19}F NMR 471 MHz, $CDCl_3$



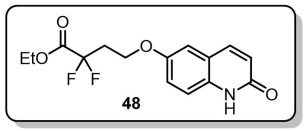


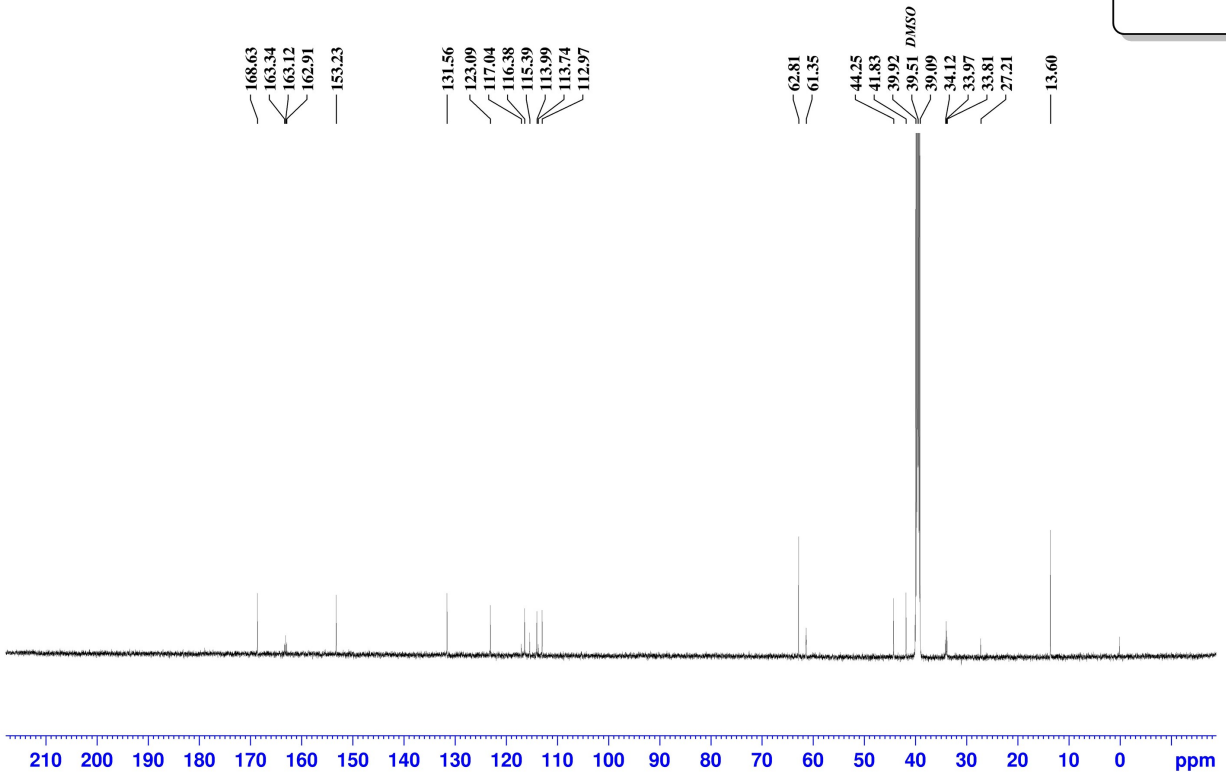
Ethyl 2,2-Difluoro-4-((2-oxo-1,2-dihydroquinolin-6-yl)oxy)butanoate, ^{1}H NMR 600 MHz, DMSO-*d6*



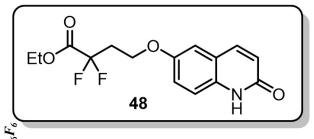


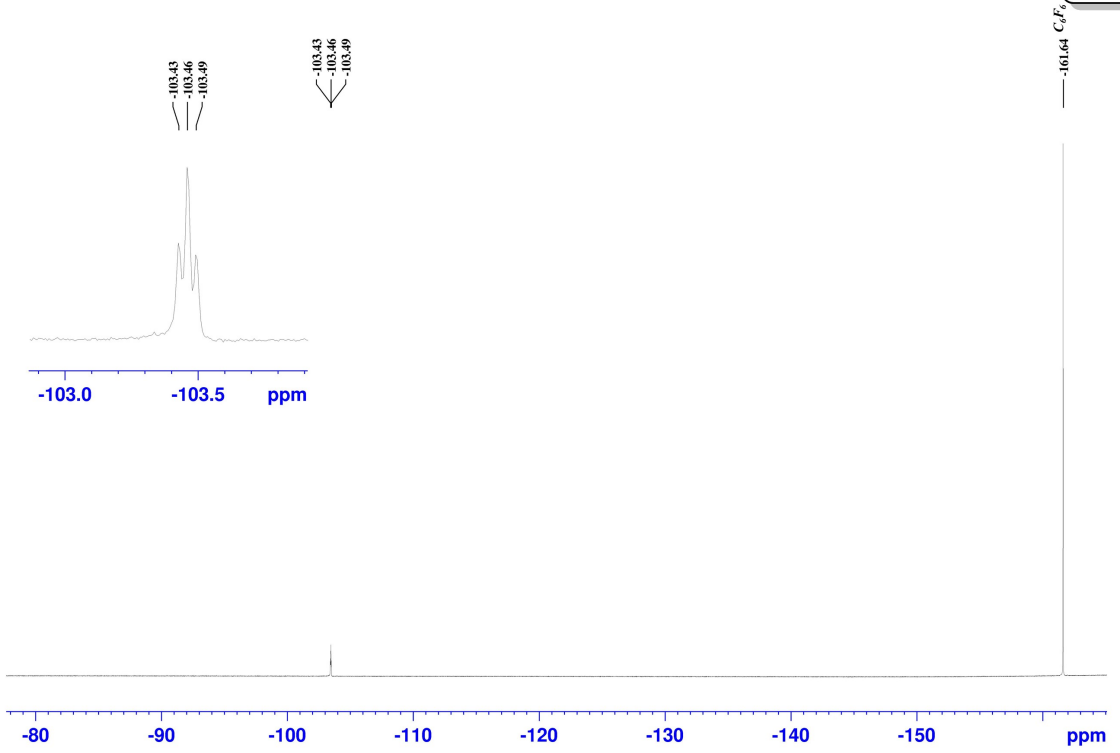
Ethyl 2,2-Difluoro-4-((2-oxo-1,2-dihydroquinolin-6-yl)oxy)butanoate, ^{13}C NMR
151 MHz, DMSO-*d6*



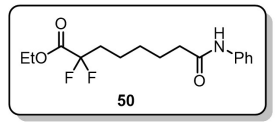


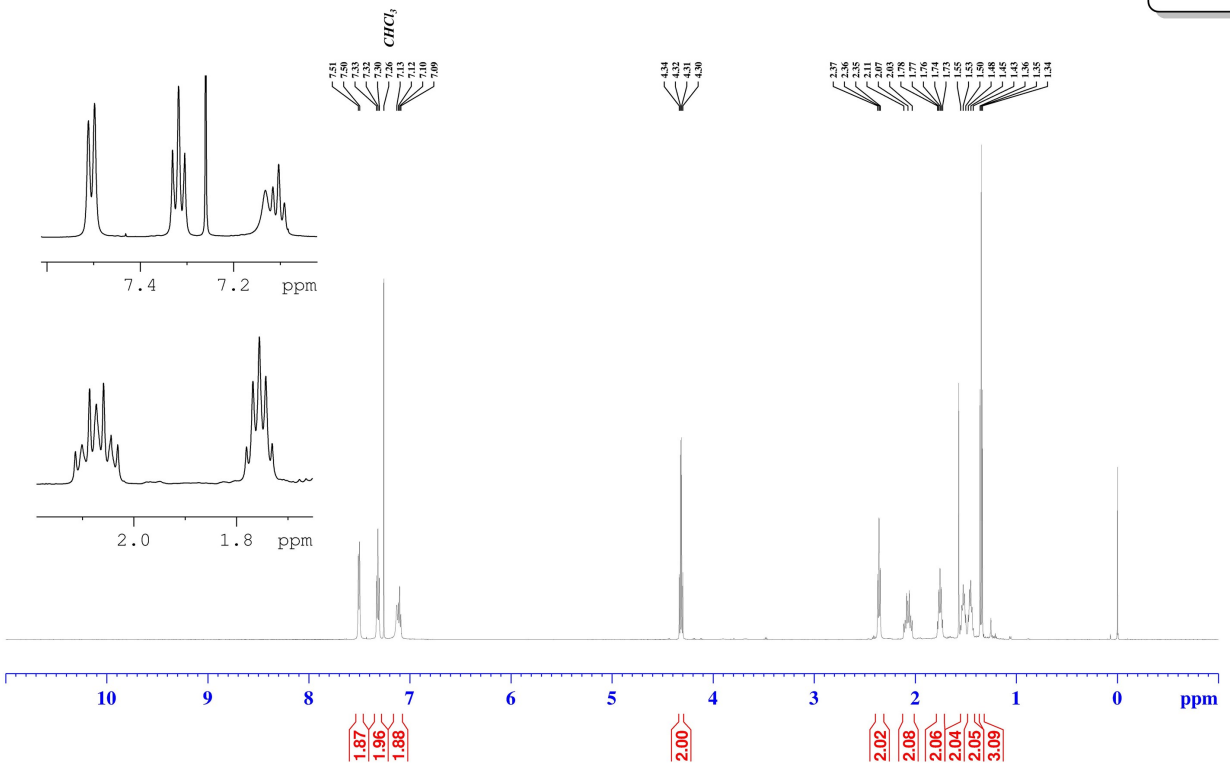
Ethyl 2,2-Difluoro-4-((2-oxo-1,2-dihydroquinolin-6-yl)oxy)butanoate, ^{19}F NMR
471 MHz, DMSO-*d6*



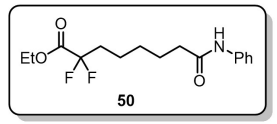


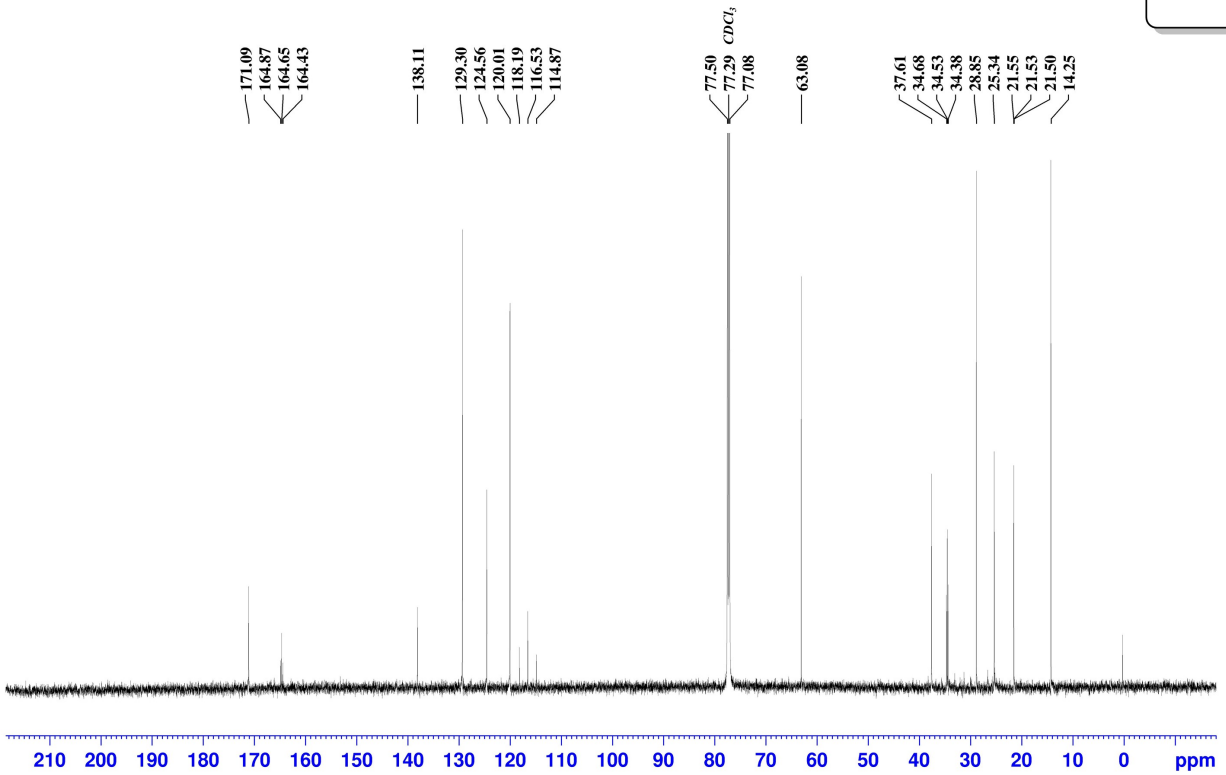
Ethyl 2,2-Difluoro-8-oxo-8-(phenylamino)octanoate, ^{1}H NMR
600 MHz, $CDCl_3$



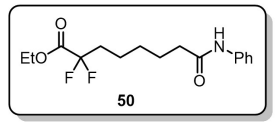


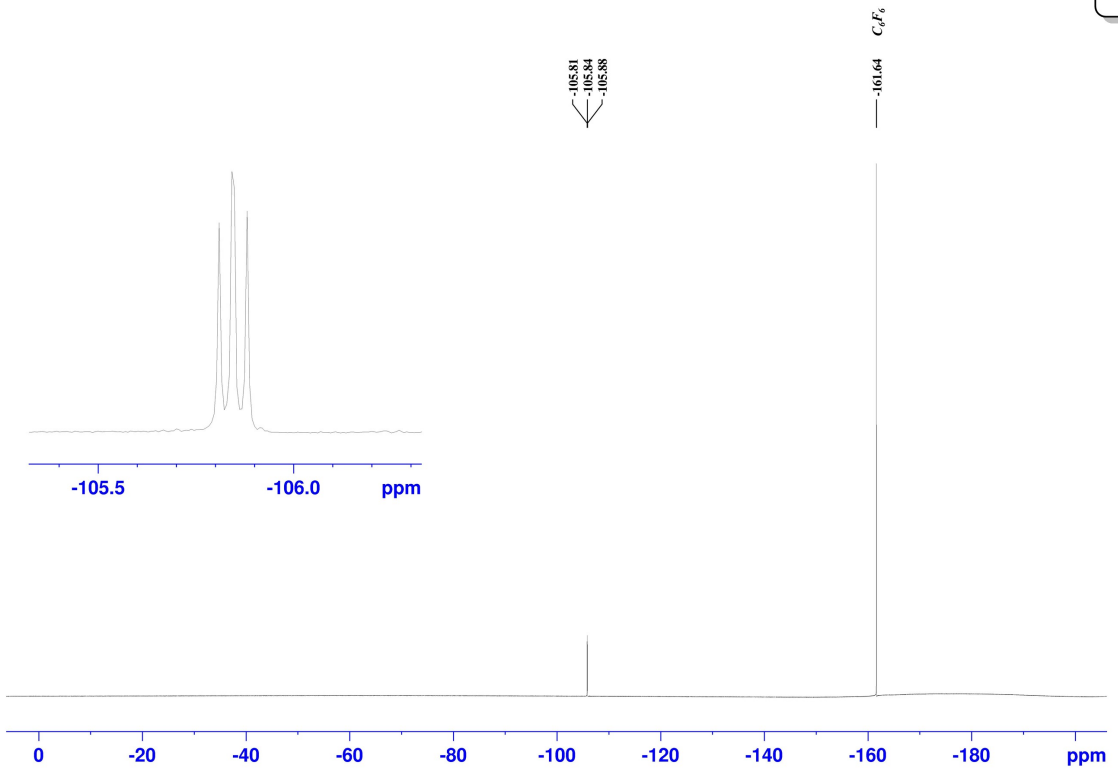
Ethyl 2,2-Difluoro-8-oxo-8-(phenylamino)octanoate, ^{13}C NMR
151 MHz, $CDCl_3$



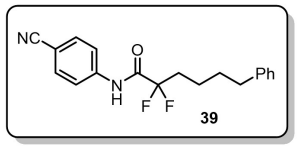


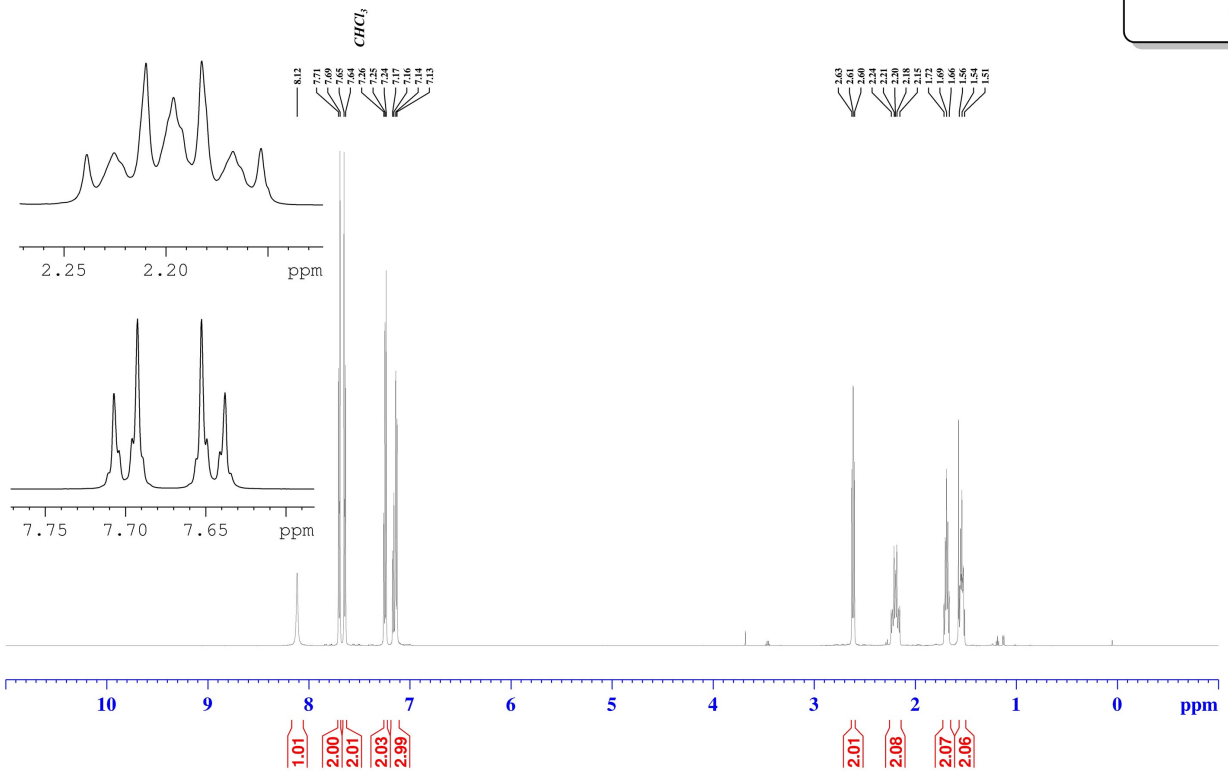
Ethyl 2,2-Difluoro-8-oxo-8-(phenylamino)octanoate, ^{19}F NMR
471 MHz, $CDCl_3$



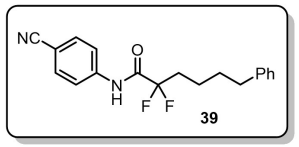


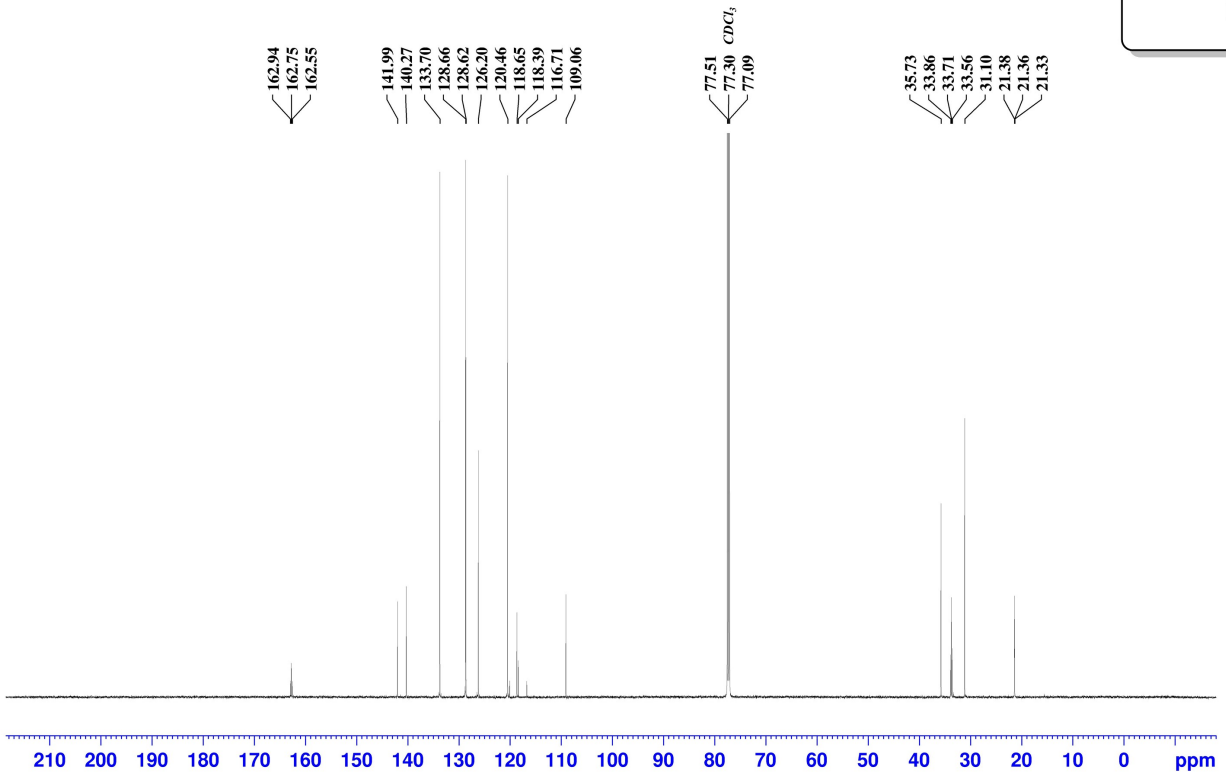
***N*-(4-Cyanophenyl)-2,2-difluoro-6-phenylhexanamide, ^{1}H NMR**
600 MHz, $CDCl_3$



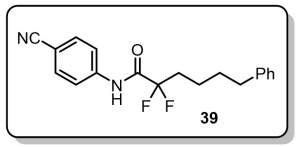


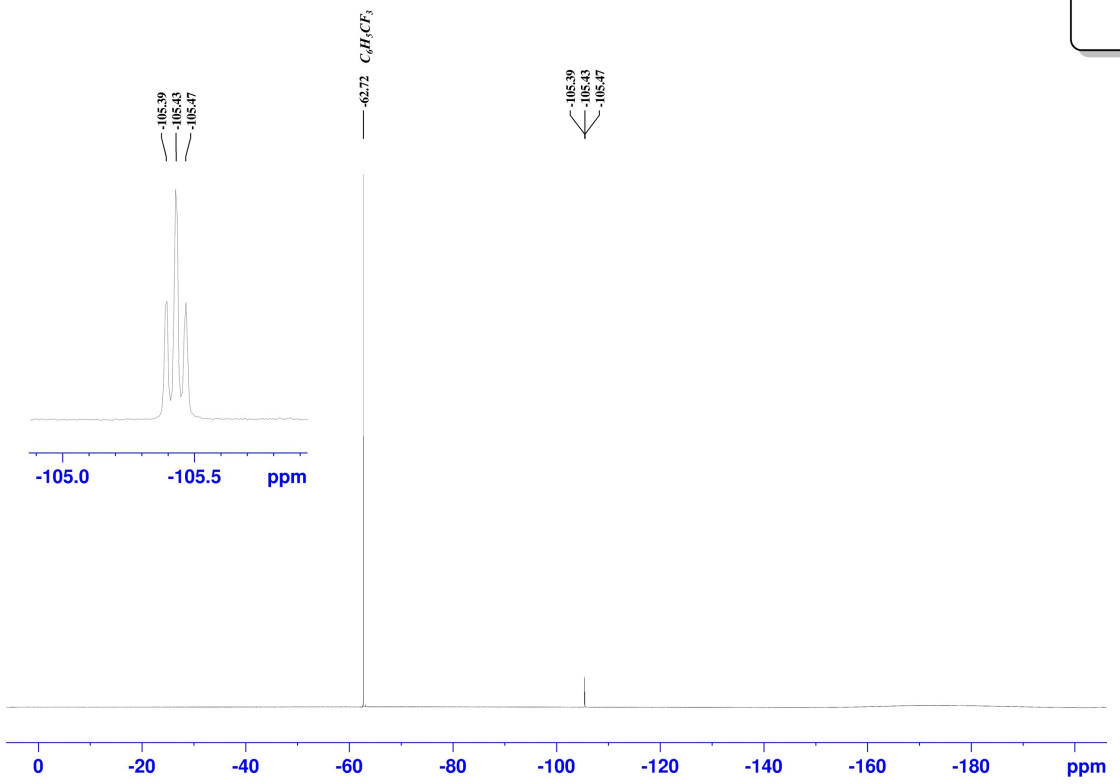
***N*-(4-Cyanophenyl)-2,2-difluoro-6-phenylhexanamide, ^{13}C NMR**
151 MHz, $CDCl_3$



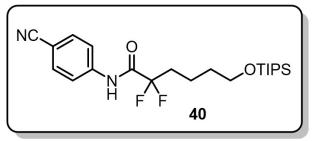


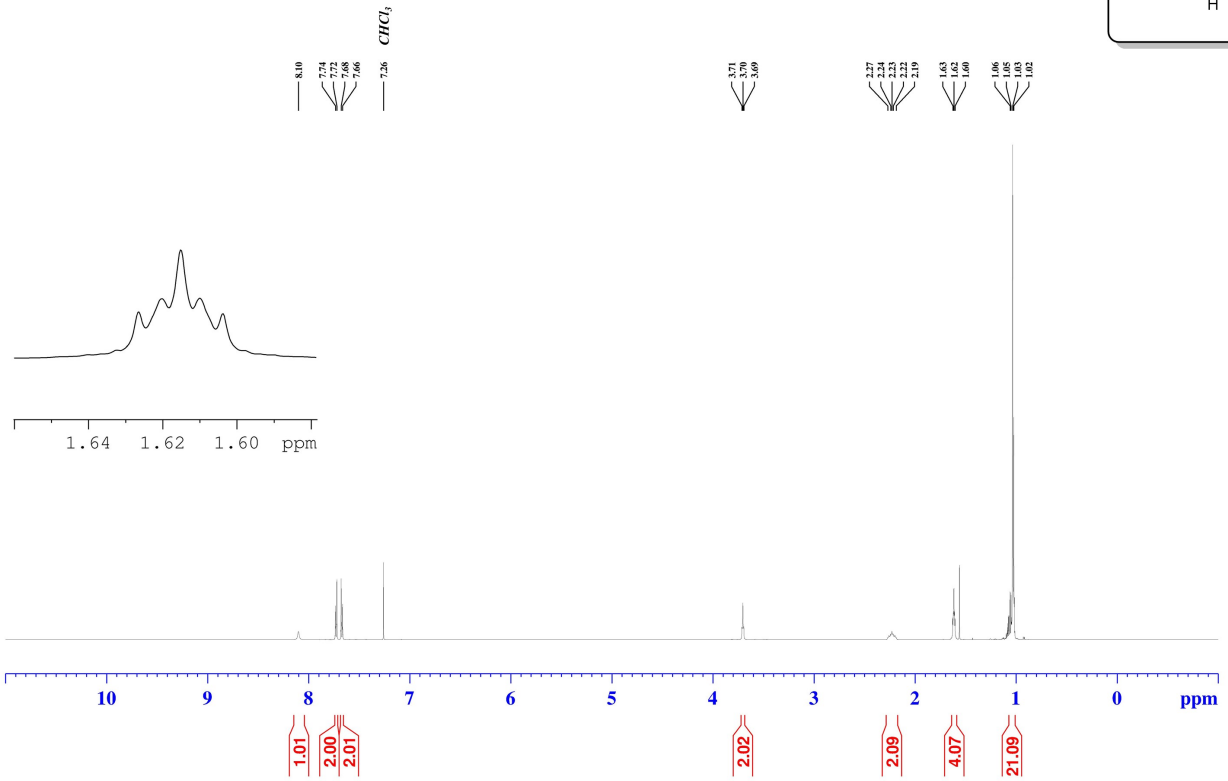
***N*-(4-Cyanophenyl)-2,2-difluoro-6-phenylhexanamide, ^{19}F NMR**
471 MHz, $CDCl_3$



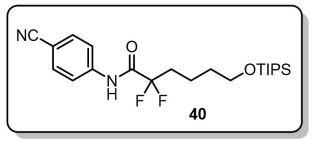


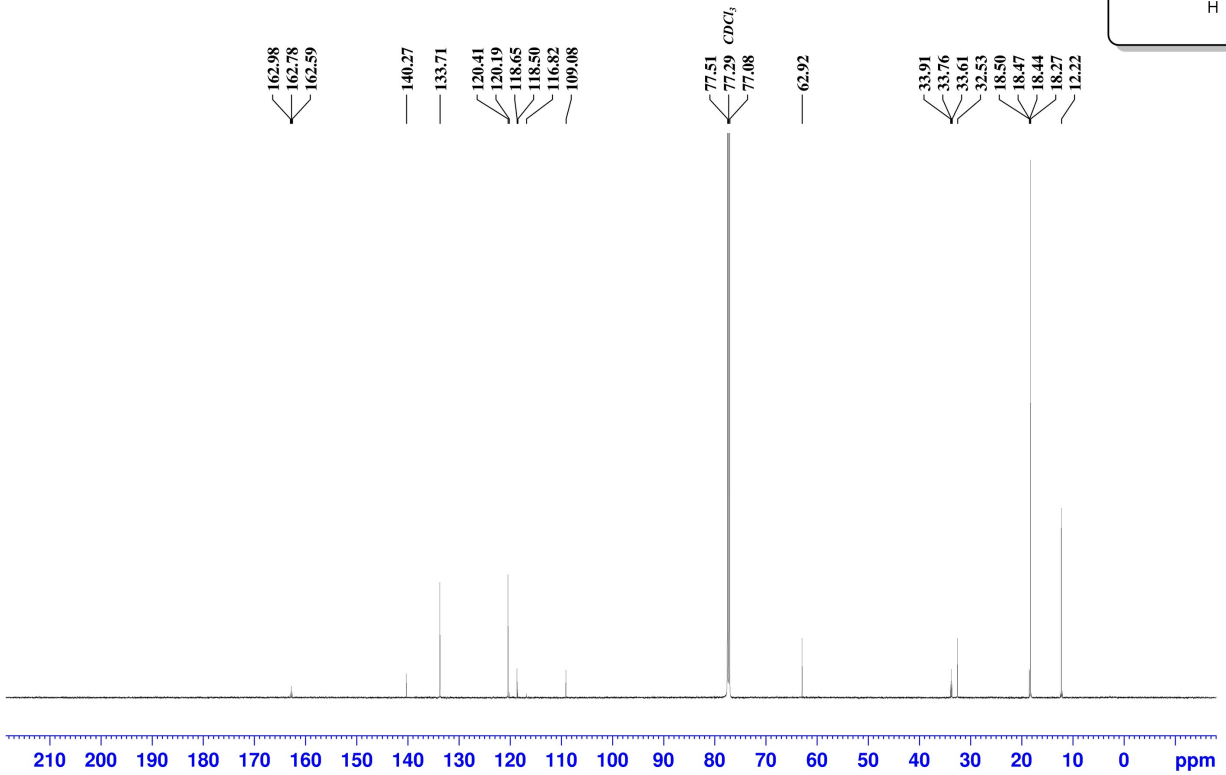
***N*-(4-Cyanophenyl)-2,2-difluoro-6-((triisopropylsilyl) oxy)hexanamide, ^{1}H NMR 600 MHz, $CDCl_3$**



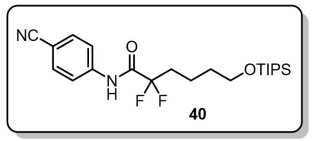


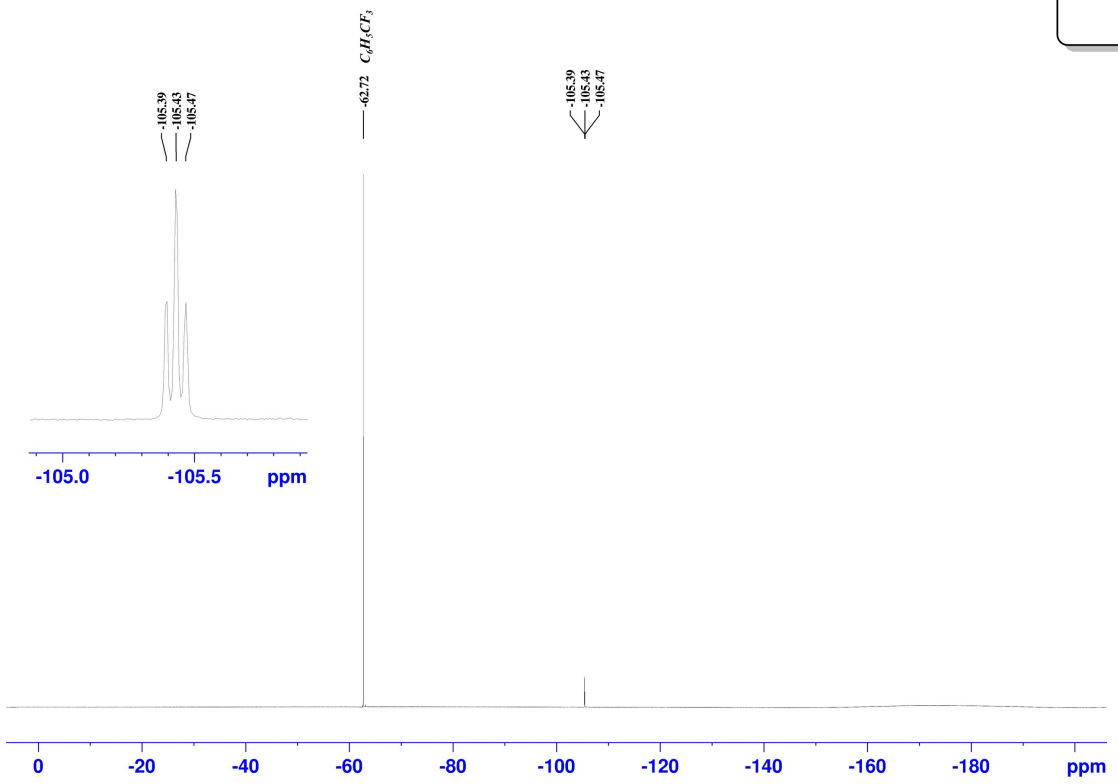
***N*-(4-Cyanophenyl)-2,2-difluoro-6-((triisopropylsilyl) oxy)hexanamide, ^{13}C NMR**
151 MHz, $CDCl_3$



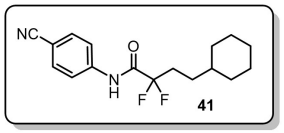


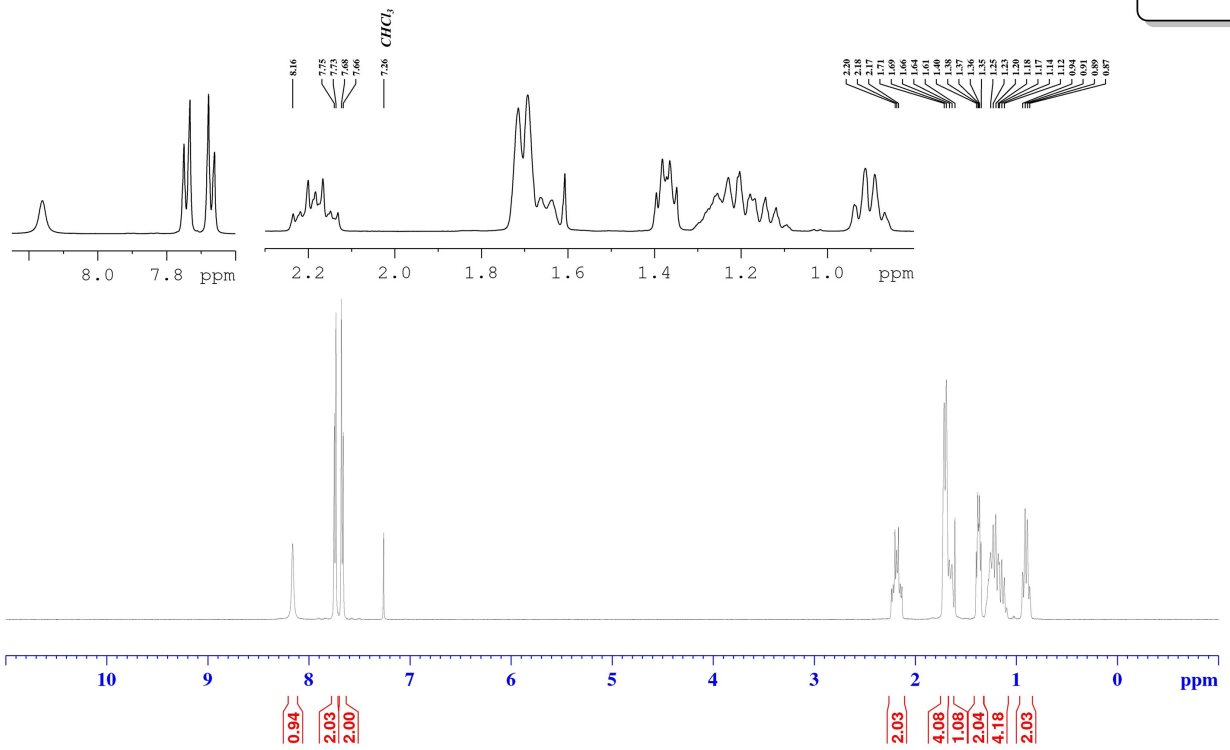
***N*-(4-Cyanophenyl)-2,2-difluoro-6-((triisopropylsilyl) oxy)hexanamide, ^{19}F NMR**
471 MHz, $CDCl_3$



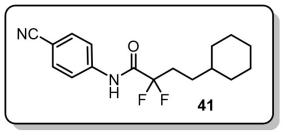


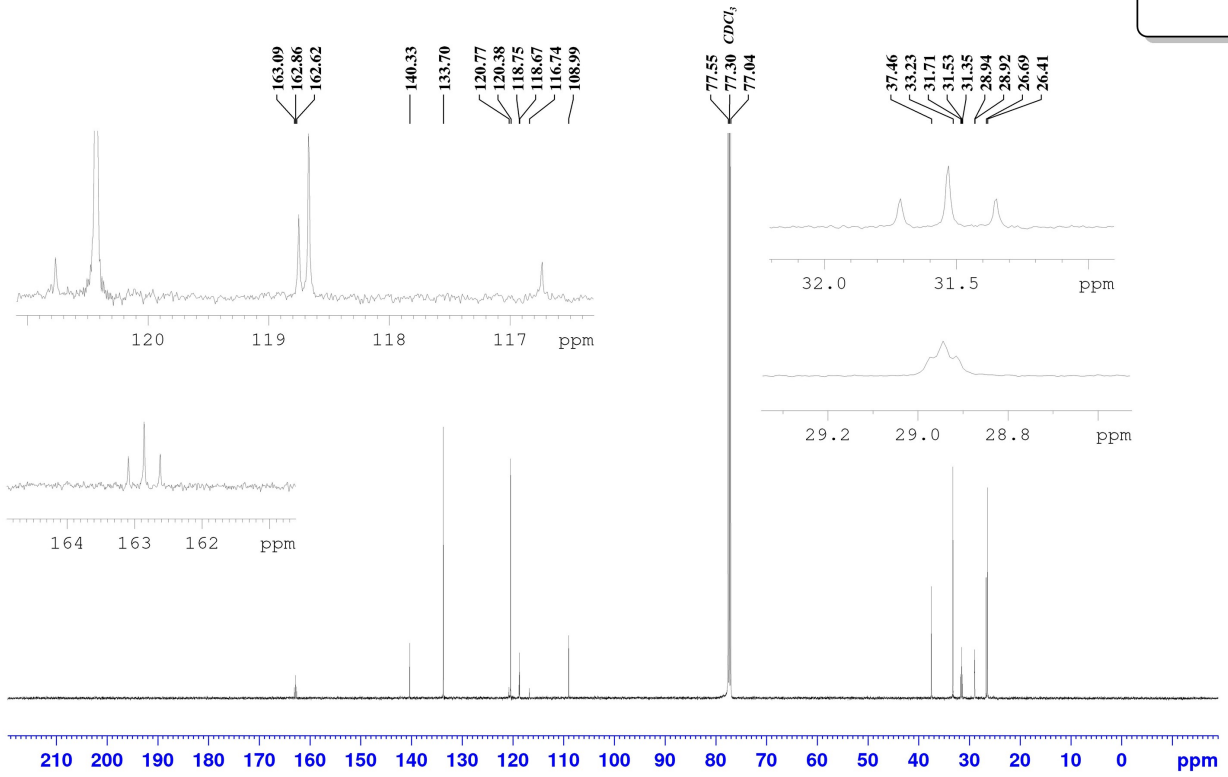
***N*-(4-Cyanophenyl)-4-cyclohexyl-2,2-difluorobutanamide, ^{1}H NMR**
600 MHz, $CDCl_3$



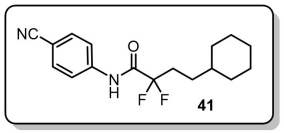


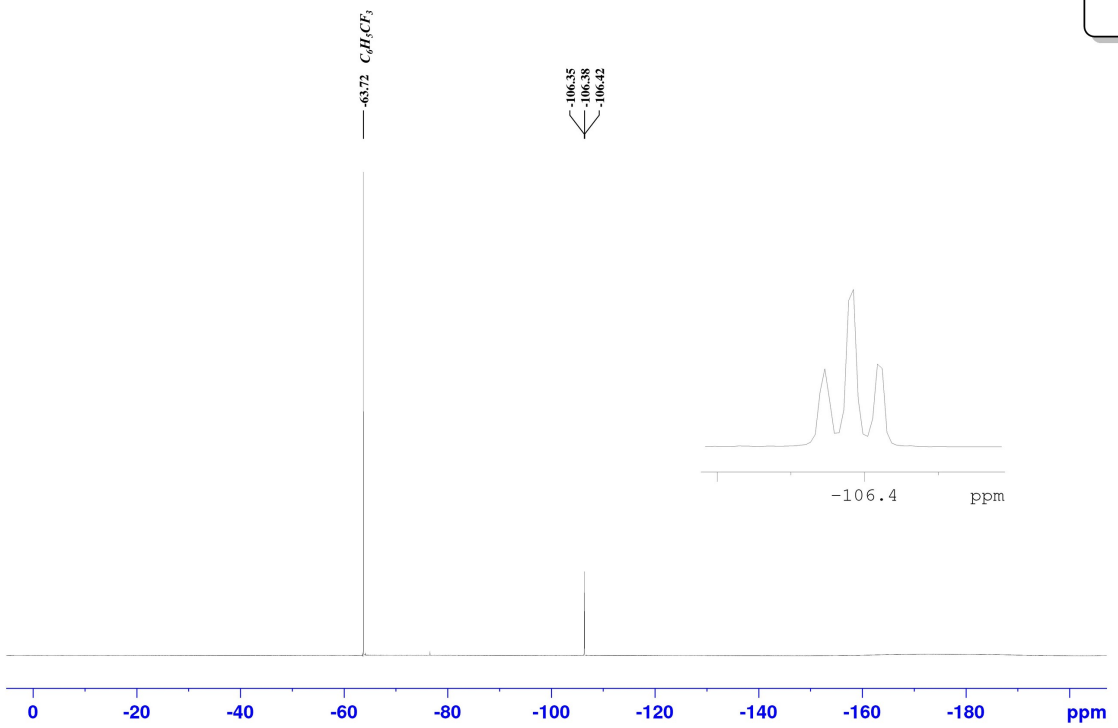
***N*-(4-Cyanophenyl)-4-cyclohexyl-2,2-difluorobutanamide, ^{13}C NMR**
151 MHz, $CDCl_3$



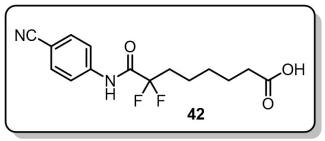


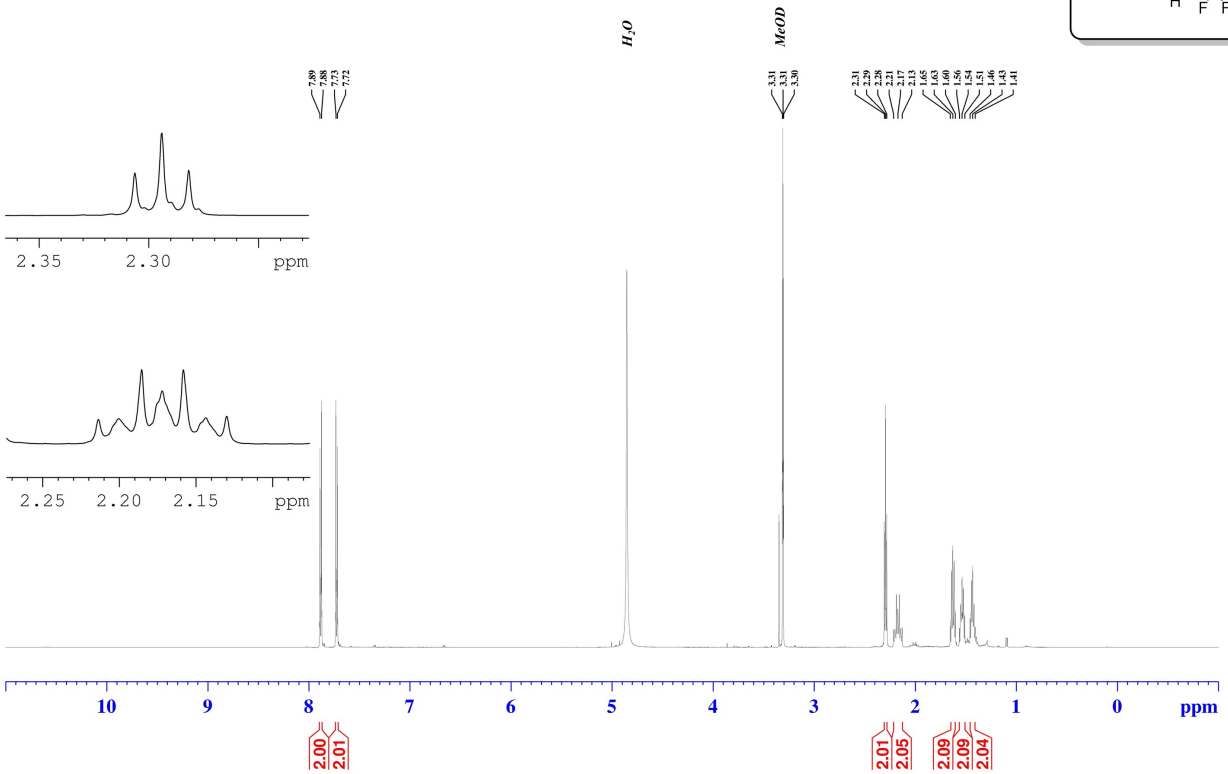
***N*-(4-Cyanophenyl)-4-cyclohexyl-2,2-difluorobutanamide, ^{19}F NMR**
471 MHz, $CDCl_3$



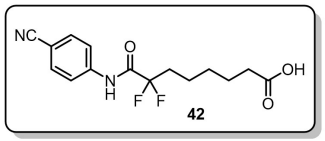


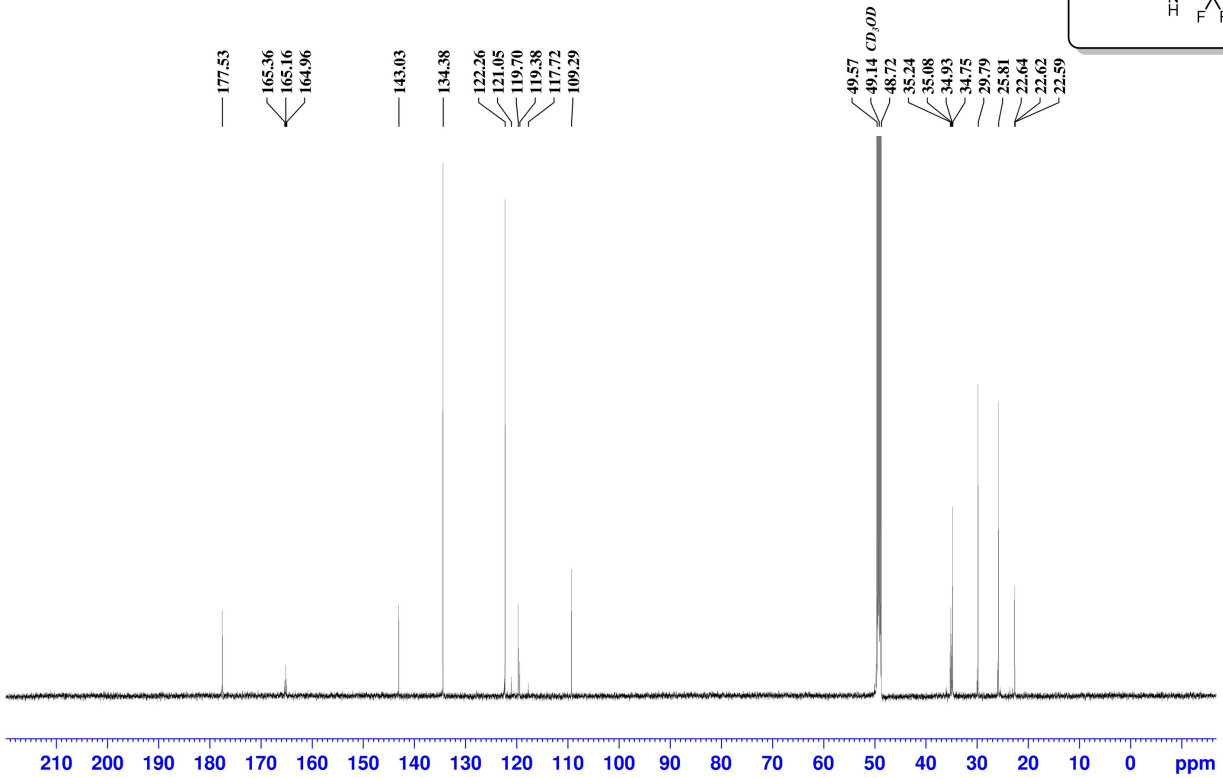
8-((4-Cyanophenyl)amino)-7,7-difluoro-8-oxooctanoic acid, ^{1}H NMR
600 MHz, CD_3OD



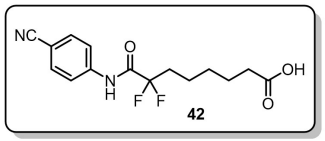


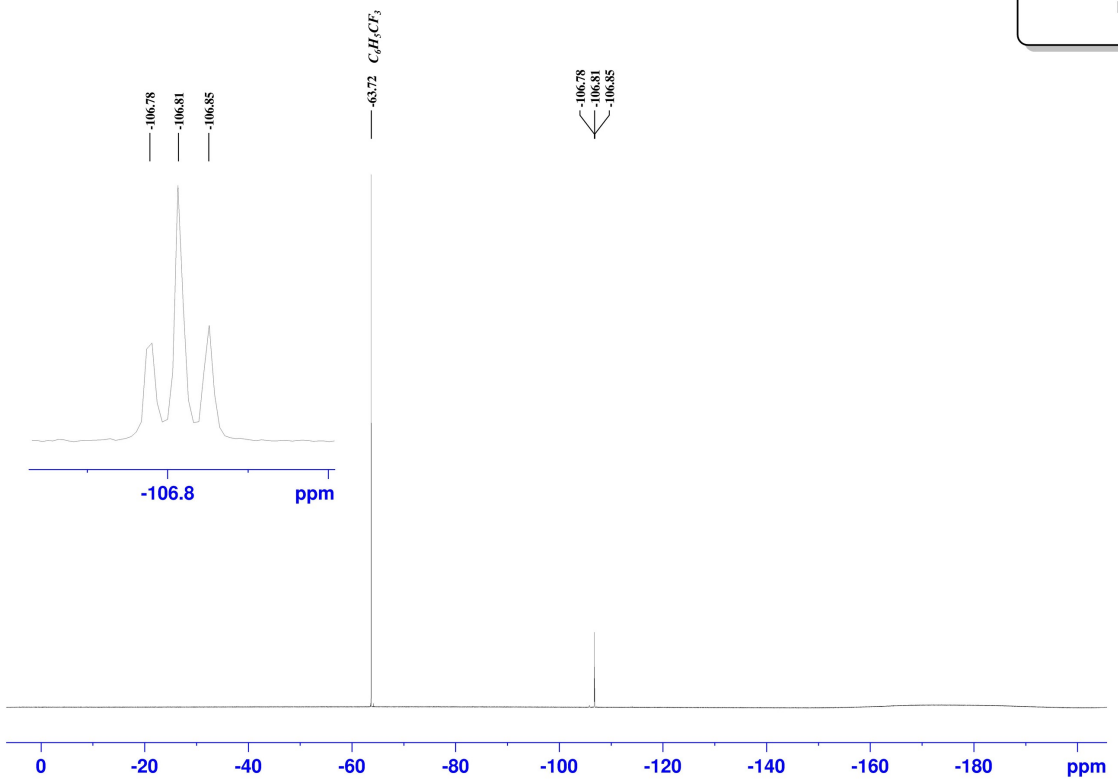
8-((4-Cyanophenyl)amino)-7,7-difluoro-8-oxooctanoic acid, ^{13}C NMR
151 MHz, CD_3OD



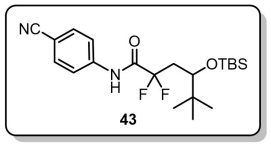


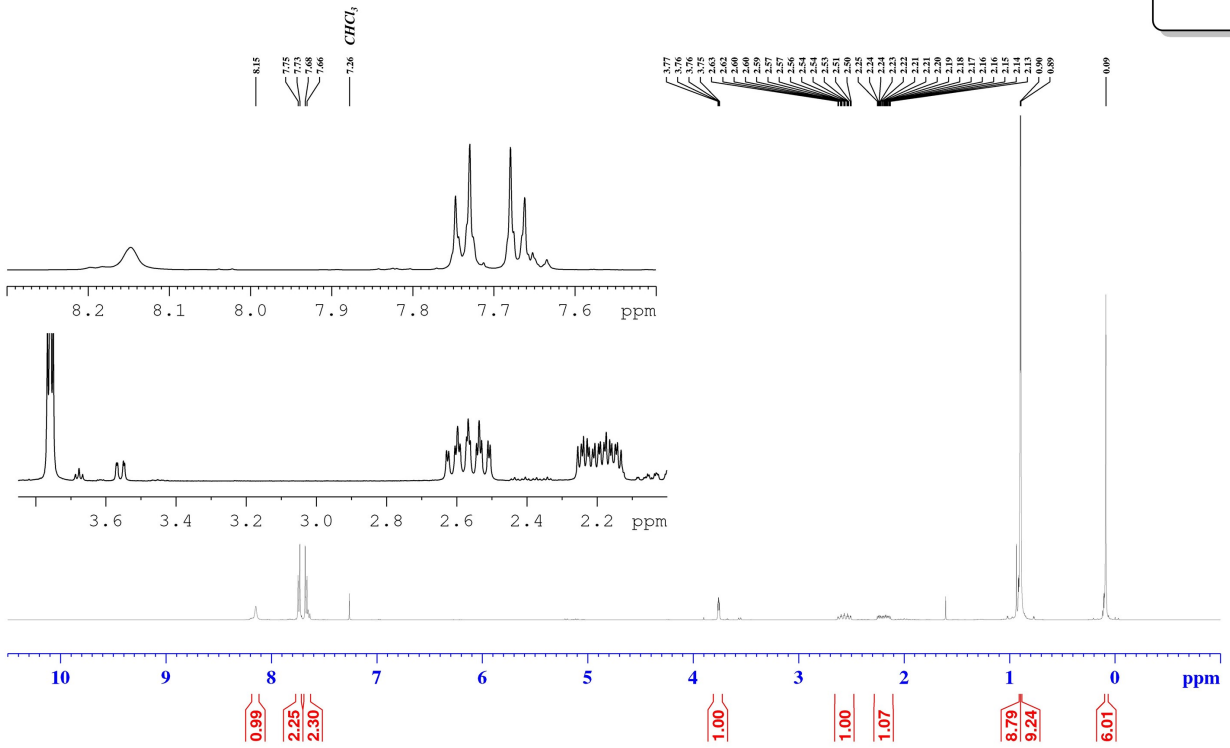
8-((4-Cyanophenyl)amino)-7,7-difluoro-8-oxooctanoic acid, ^{19}F NMR
471 MHz, CD_3OD



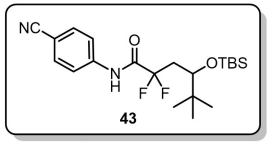


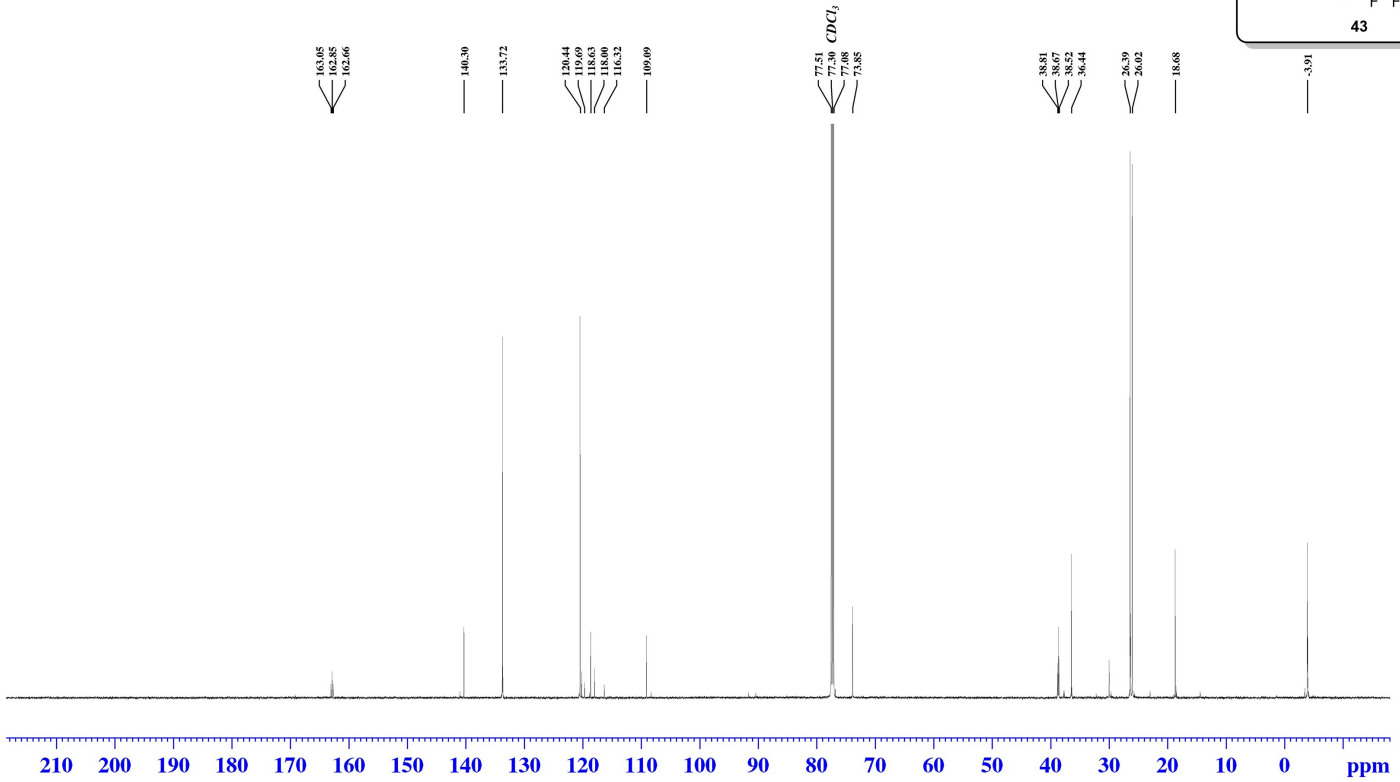
4-((*tert*-Butyldimethylsilyl)oxy)-*N*-(4-cyanophenyl)-2,2-difluoro-5,5-dimethylhexanamide, ^{1}H NMR 600 MHz, $CDCl_3$



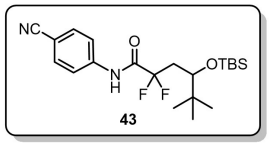


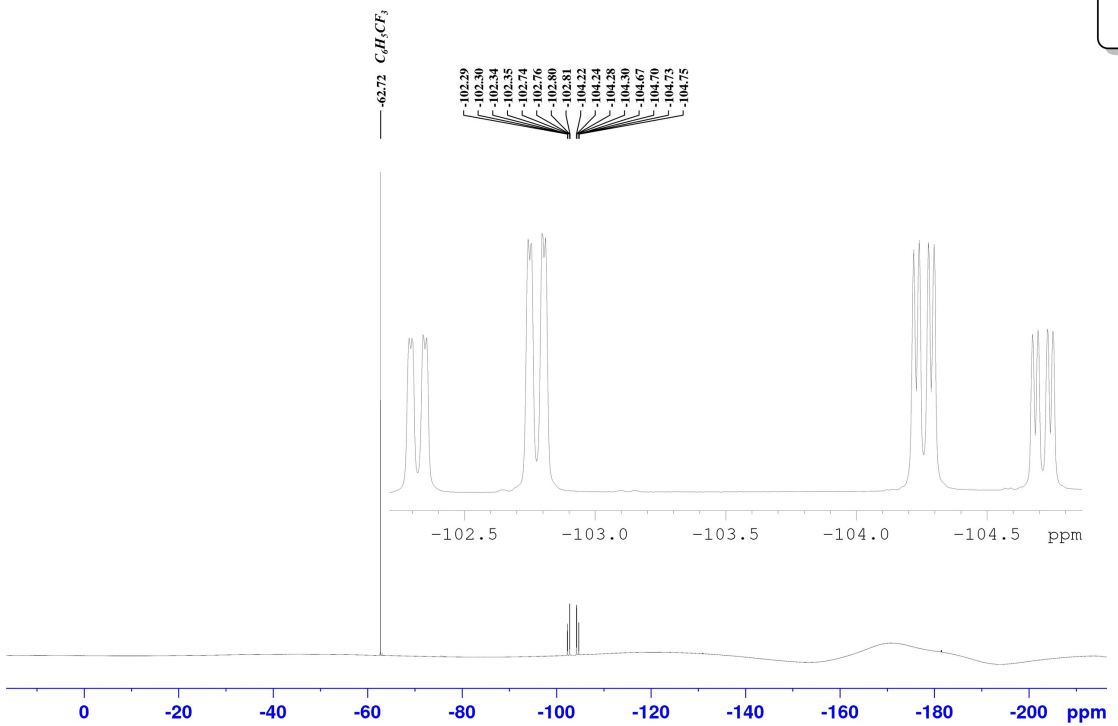
4-((*tert*-Butyldimethylsilyl)oxy)-*N*-(4-cyanophenyl)-2,2-difluoro-5,5-dimethylhexanamide, ^{13}C NMR 151 MHz, $CDCl_3$



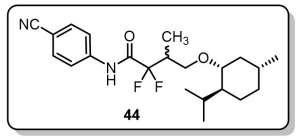


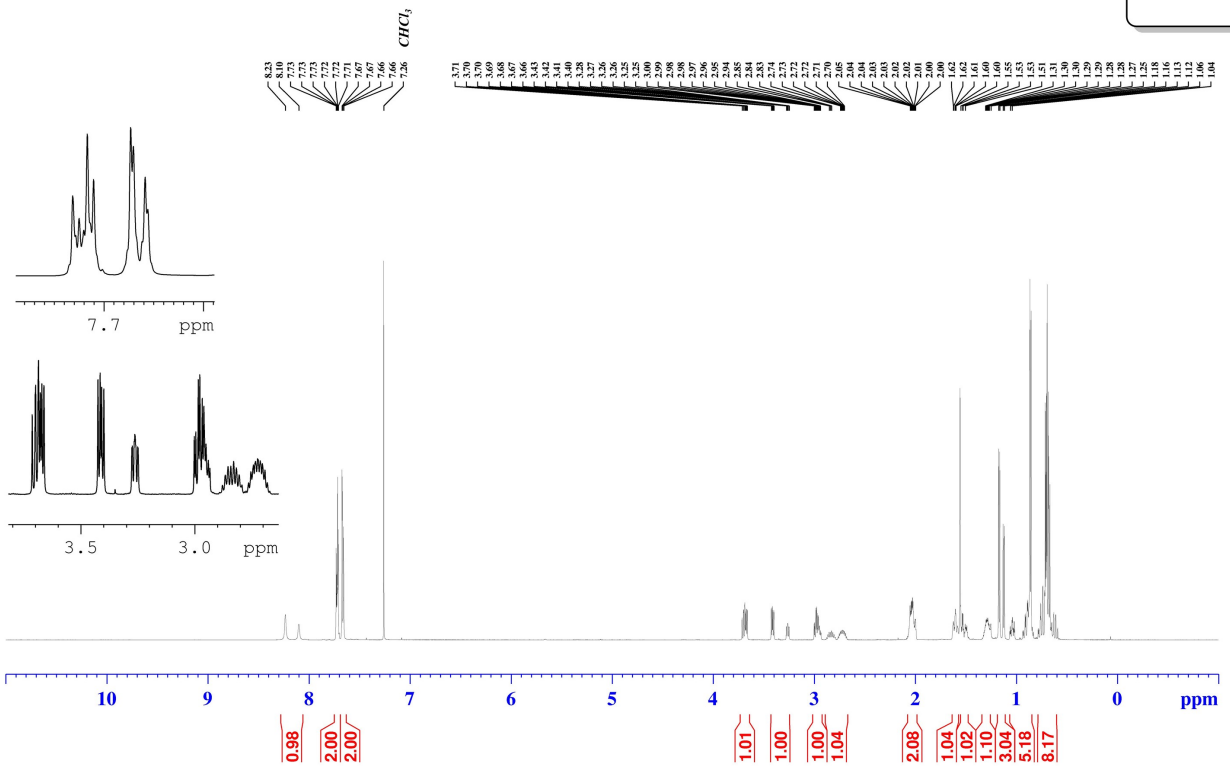
4-((*tert*-Butyldimethylsilyl)oxy)-*N*-(4-cyanophenyl)-2,2-difluoro-5,5-dimethylhexanamide, ^{19}F NMR 471 MHz, $CDCl_3$



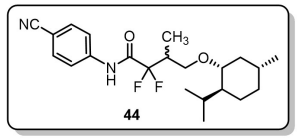


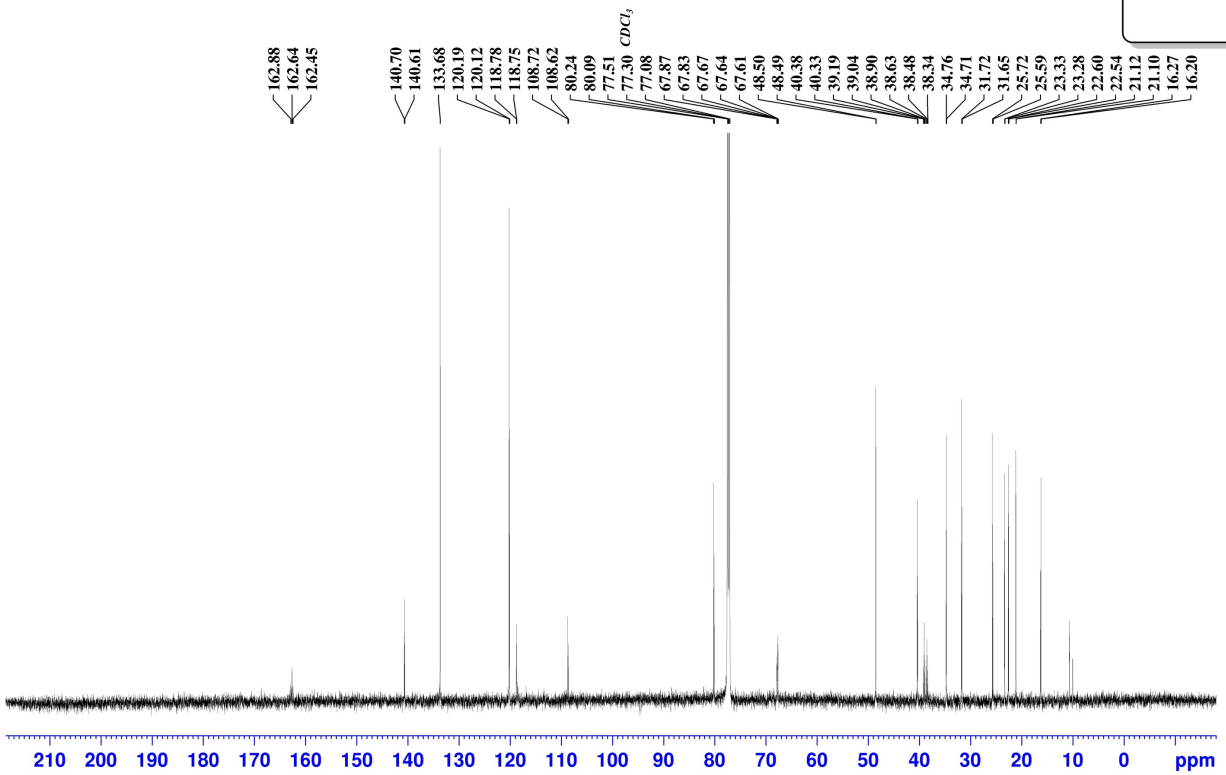
***N*-(4-Cyanophenyl)-2,2-difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanamide, ^{1}H NMR 600 MHz, $CDCl_3$**





***N*-(4-Cyanophenyl)-2,2-difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanamide, ^{13}C NMR 151 MHz, $CDCl_3$**





***N*-(4-Cyanophenyl)-2,2-difluoro-4-(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)-3-methylbutanamide, ^{19}F NMR 471 MHz, $CDCl_3$**