Supporting Information

Ligand-enabled *ortho*-C−H olefination of phenylacetic amides with unactivated alkenes

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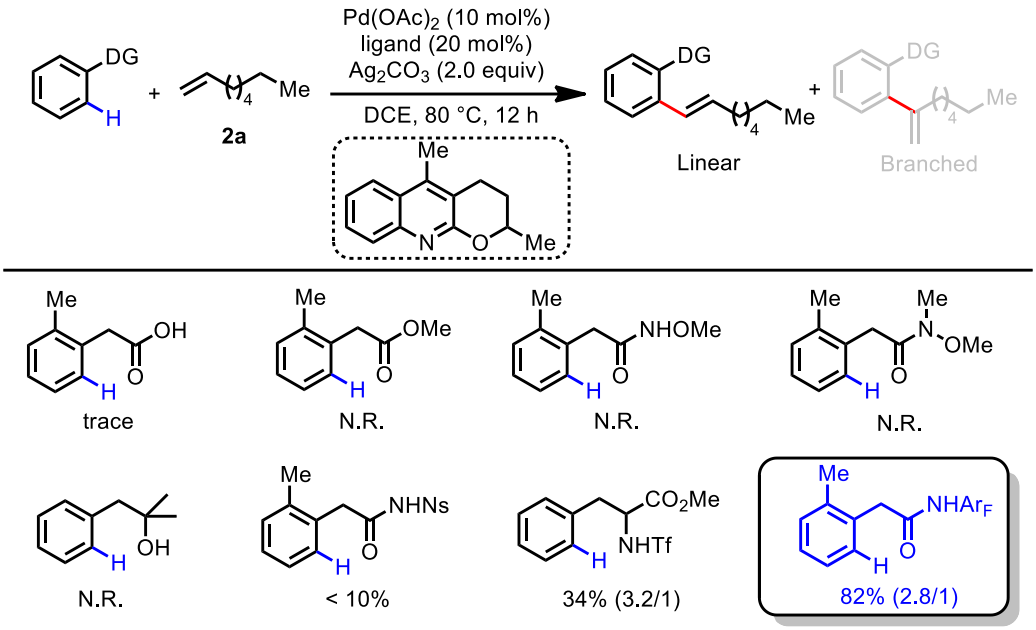
Table of Contents

1. General Information

Unless otherwise noted, all reagents were purchased from commercial suppliers and used without further purification. The solvents were purchased from commercial suppliers and dried by 4A molecular sieves. ^{1}H-NMR and ^{13}C-NMR spectra were recorded at 25 ºC on Agilent AV 400 and Varian Inova 400M NMR spectrometers ($CDCl_3$ as solvent). Chemical shifts for ^{1}H NMR spectra are reported as δ in units of parts per million (ppm) downfield from $SiMe_4$ (δ 0.0) and relative to the signal of $SiMe_4$ (δ 0.00 singlet). Multiplicities were given as: s (singlet); d (doublet); t (triplet); q (quartet); dd (doublet of doublets); dt (doublet of triplets); m (multiplets) and etc. Coupling constants are reported as a *J* value in Hz. ^{13}C NMR spectra are reported as δ in units of parts per million (ppm) downfield from $SiMe_4$ (δ 0.0) and relative to the signal of chloroform-*d* (δ 77.00 triplet). High resolution mass spectra were recorded at the Center for Mass Spectrometry (Agilent Technologies 6224 TOF LC/MS), Shanghai Institute of Organic Chemistry. Flash chromatography was performed using 300-400 mesh silica gel with the indicated solvent system.

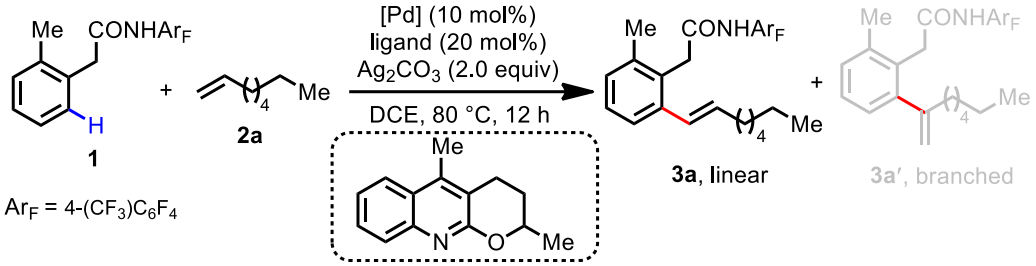
2. Optimization of Conditions.

Table S1. Intinal screening using a weakly monodentate auxiliary.[a,b,c]



[a]Reaction conditions : Substrates (0.1 mmol), **2a** (3.0 equiv), $Pd(OAc)_2$ (10 mol%), ligand (20 mol%), Ag_2CO_3 (2.0 equiv), DCE (2.0 mL), 80 °C, 12 h. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^1H NMR analysis.

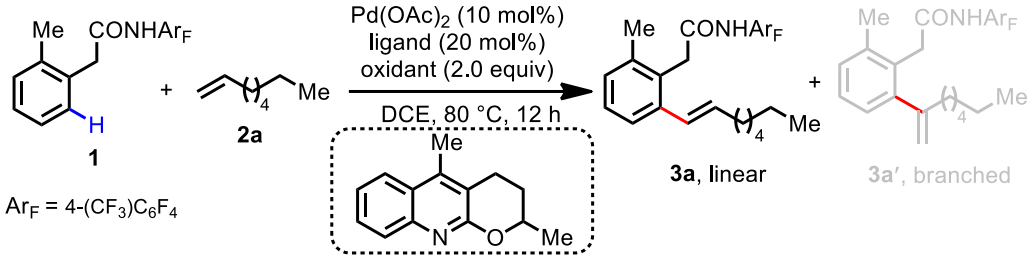
Table S2. Screening the Catalysts.[a,b,c]



Entry	Catalyst	Oxidant	Time (h)	Yield (%)
1	**$Pd(OAc)_2$**	**Ag_2CO_3 (2.0)**	**12**	**82 (2.8/1)**
2	$Pd(OPiv)_2$	Ag_2CO_3 (2.0)	12	82 (2.8/1)
3	$Pd(TFA)_2$	Ag_2CO_3 (2.0)	12	32 (2.5/1)
4	$PdCl_2$	Ag_2CO_3 (2.0)	12	37 (3.0/1)
5	$Pd(PPh_3)_2Cl_2$	Ag_2CO_3 (2.0)	12	0
6	$Pd(CH_3CN)_4(BF_4)_2$	Ag_2CO_3 (2.0)	12	29 (2.3/1)
7	$Pd_2(dba)_3$	Ag_2CO_3 (2.0)	12	51 (2.6/1)

[a]Reaction conditions : **1** (0.1 mmol), **2a** (3.0 equiv), catalyst (10 mol%), ligand (20 mol%), Ag_2CO_3 (2.0 equiv), DCE (2.0 mL), 80 °C, 12 h. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^{1}H NMR analysis.

Table S3. Screening the Oxidants.[a,b,c]

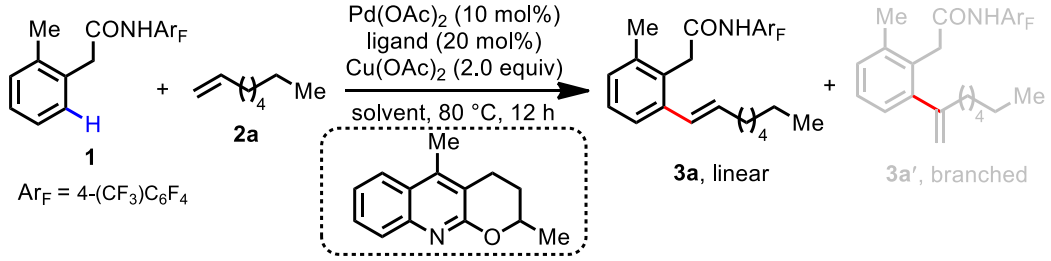


Ar$_F$ = 4-(CF$_3$)C$_6$F$_4$

Entry	Oxidant	Yield (%)	Entry	Oxidant	Yield (%)
1	Ag_2CO_3 (2.0)	82 (2.8/1)	**8**	**$Cu(OAc)_2$ (2.0)**	**83 (3.6/1)**
2	AgOAc (2.0)	82 (2.6/1)	9	$Cu(OPiv)_2$ (2.0)	28 (3.0/1)
3	Ag_2O (2.0)	37 (2.4/1)	10	$Cu(OTf)_2$ (2.0)	trace
4	$AgNO_3$ (2.0)	27 (2.7/1)	11	$CuCl_2$ (2.0)	trace
5	AgOTf (2.0)	21 (2.2/1)	12	BQ (2.0)	35 (3.3/1)
6	$AgBF_4$ (2.0)	trace	13	NMO (2.0)	17 (2.9/1)
7	AgF (2.0)	47 (2.8/1)	14	$K_2S_2O_8$ (2.0)	trace

[a]Reaction conditions : **1** (0.1 mmol), **2a** (3.0 equiv), $Pd(OAc)_2$ (10 mol%), ligand (20 mol%), oxidant (2.0 equiv), DCE (2.0 mL), 80 °C, 12 h. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^{1}H NMR analysis.

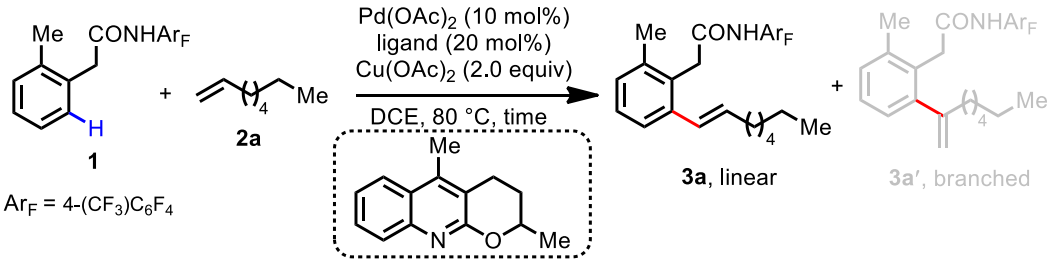
Table S4. Screening the Solvents.[a,b,c]



Entry	Solvent	Yield (%)	Entry	Solvent	Yield (%)
1	**DCE**	**83 (3.6/1)**	8	DMF	trace
2	dioxane	31 (2.5/1)	9	HFIP	25 (0.7/1)
3	THF	33 (2.1/1)	10	*t*-AmylOH	37 (1.6/1)
4	DCM	73 (3.0/1)	11	hexane	trace
5	MeCN	21 (2.3/1)	12	PhCF$_3$	67 (2.7/1)
6	acetone	41 (1.6/1)	13	toluene	70 (2.8/1)
7	DME	trace	14	DMSO	trace

[a]Reaction conditions : **1** (0.1 mmol), **2a** (3.0 equiv), Pd(OAc)$_2$ (10 mol%), ligand (20 mol%), Cu(OAc)$_2$ (2.0 equiv), solvent (2.0 mL), 80 °C, 12 h. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^{1}H NMR analysis.

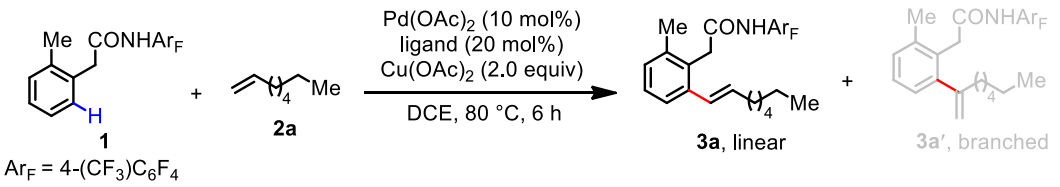
Table S5. Screening the Reaction Time.[a,b,c]

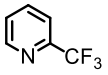
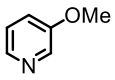
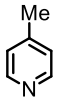
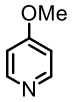
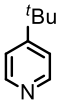
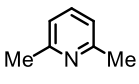
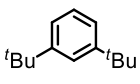
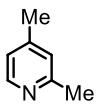
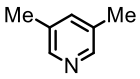
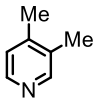
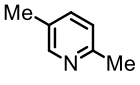
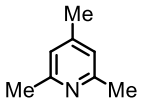
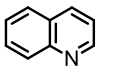
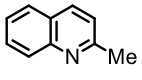
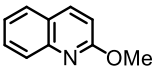
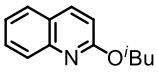
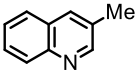
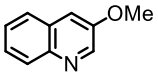
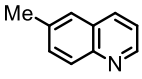
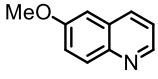
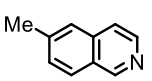
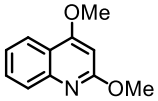
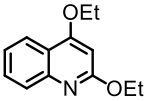
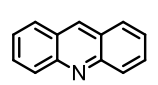
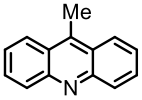
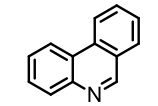
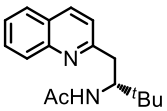
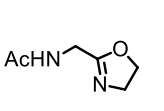
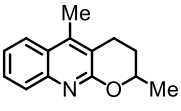
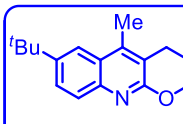
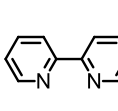


Entry	Catalyst	Oxidant	Time (h)	Yield (%)
1	$Pd(OAc)_2$	$Cu(OAc)_2$ (2.0)	3	69 (3.6/1)
2	**$Pd(OAc)_2$**	**$Cu(OAc)_2$ (2.0)**	**6**	**85 (3.8/1)**
3	$Pd(OAc)_2$	$Cu(OAc)_2$ (2.0)	12	83 (3.6/1)
4	$Pd(OAc)_2$	$Cu(OAc)_2$ (2.0)	18	80 (3.5/1)

[a]Reaction conditions : **1** (0.1 mmol), **2a** (3.0 equiv), $Pd(OAc)_2$ (10 mol%), ligand (20 mol%), $Cu(OAc)_2$ (2.0 equiv), DCE (2.0 mL), 80 °C, time. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^{1}H NMR analysis.

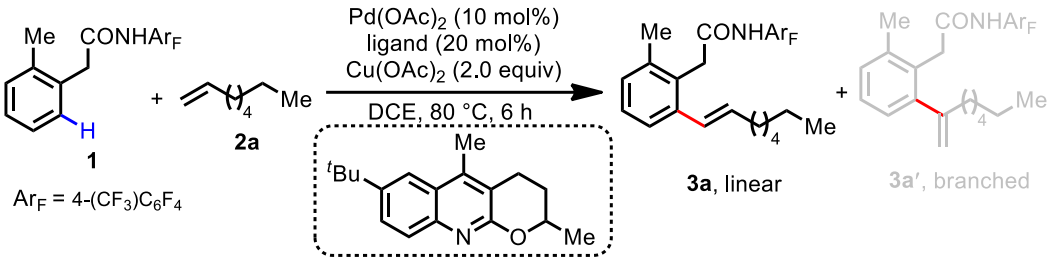
Table S6. Screening the Ligands.[a,b,c]



—					
trace	76% (2.4/1)	77% (2.1/1)	trace	trace	55% (2.6/1)
					
64% (2.5/1)	62% (2.5/1)	58% (2.8/1)	81% (1.3/1)	trace	83% (2.3/1)
					
43% (2.3/1)	63% (2.9/1)	76% (1.9/1)	73% (1.5/1)	79% (2.3/1)	62% (2.0/1)
					
42% (2.3/1)	46% (2.5/1)	81% (2.6/1)	54% (2.9/1)	61% (2.5/1)	60% (2.7/1)
					
56% (2.2/1)	47% (2.7/1)	54% (2.9/1)	70% (1.8/1)	77% (1.7/1)	46% (2.1/1)
					
57% (1.5/1)	N.R.	85% (3.8/1)	88% (3.7/1)	N.R.	N.R.

[a]Reaction conditions : **1** (0.1 mmol), **2a** (3.0 equiv), Pd(OAc)$_2$ (10 mol%), ligand (20 mol%), Cu(OAc)$_2$ (2.0 equiv), DCE (2.0 mL), 80 °C, 6 h. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^{1}H NMR analysis.

Table S7. Screening the Amount of Reagents.[a,b,c]

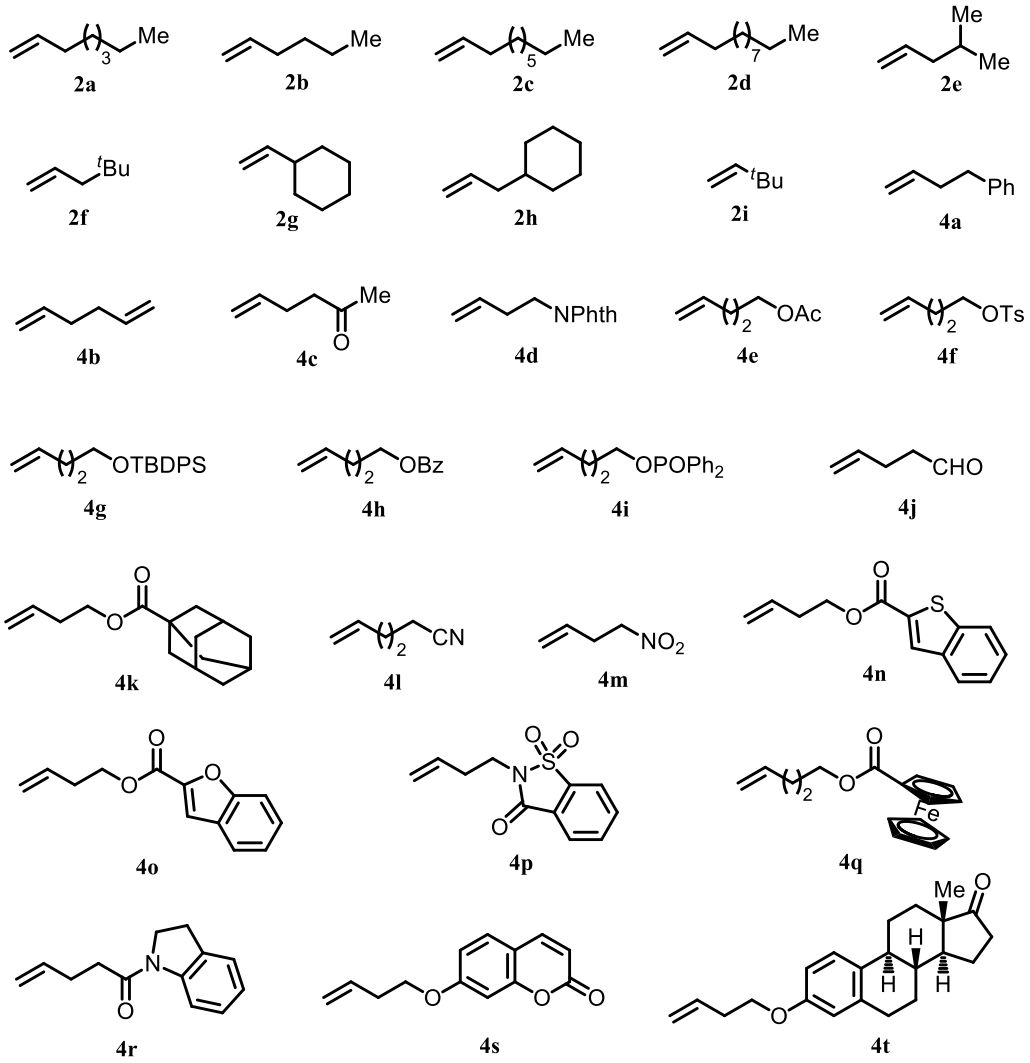


Entry	Catalyst (mol%)	Oxidant (equiv)	Amosphere	Yield (%)
1	$Pd(OAc)_2$ (10)	$Cu(OAc)_2$ (2.0)	Air	88 (3.7/1)
2	$Pd(OAc)_2$ (10)	—	Air	<10
3	$Pd(OAc)_2$ (10)	—	O_2	32 (4.1/1)
4[d]	$Pd(OAc)_2$ (10)	—	O_2	50 (4.0/1)
5[e]	$Pd(OAc)_2$ (10)	—	O_2	46 (4.0/1)
6	$Pd(OAc)_2$ (10)	$Cu(OAc)_2$ (0.5)	O_2	89 (3.7/1)
7	$Pd(OAc)_2$ (10)	$Cu(OAc)_2$ (0.3)	O_2	89 (4.0/1)
8	$Pd(OAc)_2$ (10)	$Cu(OAc)_2$ (0.2)	O_2	90 (4.2/1)
9[f]	$Pd(OAc)_2$ (10)	$Cu(OAc)_2$ (0.2)	O_2	81 (3.5/1)
10[g]	**$Pd(OAc)_2$ (5)**	**$Cu(OAc)_2$ (0.2)**	**O_2**	**87 (4.0/1)**

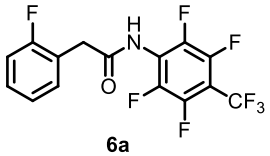
[a]Reaction conditions : **1** (0.1 mmol), **2a** (3.0 equiv), $Pd(OAc)_2$ (10 mol%), ligand (20 mol%), $Cu(OAc)_2$ (2.0 equiv), DCE (2.0 mL), 80 °C, 6 h. [b]Isolated yield. [c]The data in parentheses is the ratio of linear and branched isomers which was determined by ^{1}H NMR analysis. [d]12 h. [e]At 100 °C. [f]**2a** (2.0 equiv) was used. [g]ligand (10 mol%) was used.

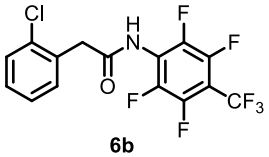
3. Structures of Substrates

Aliphatic alkenes



Phenylacetic amides


6a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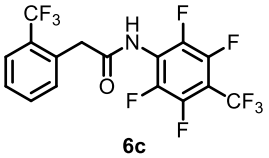
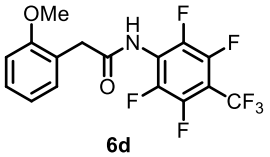
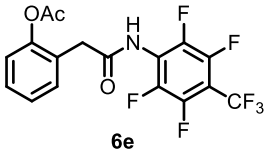
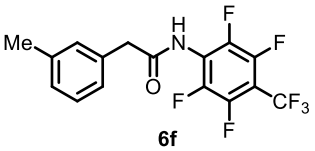

6c


6d


6e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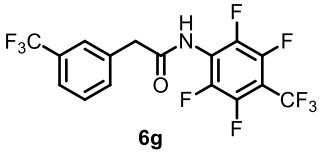
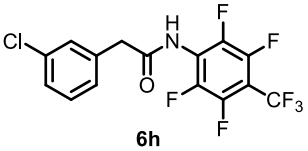
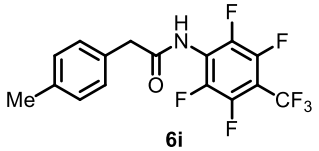
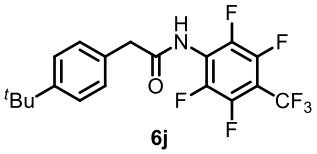

6g


6h


6i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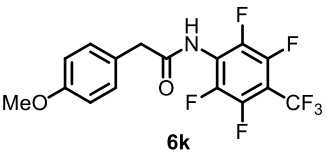
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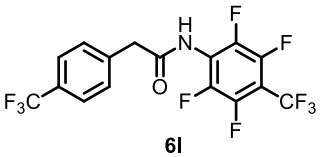
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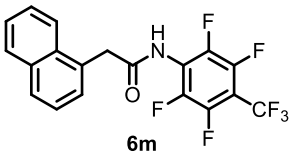
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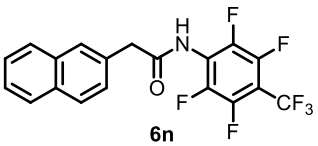
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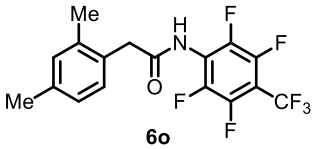
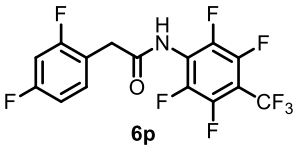

6o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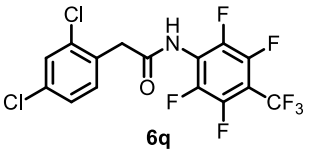
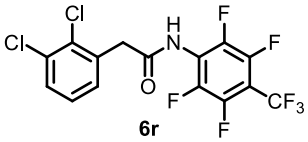

6q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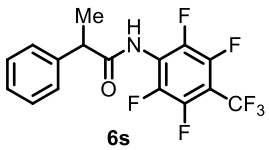
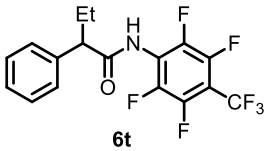
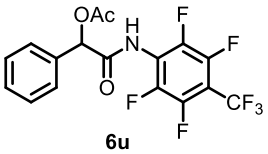
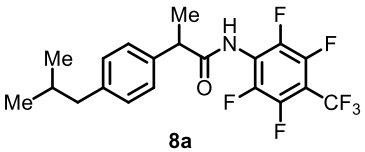
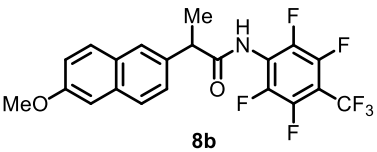
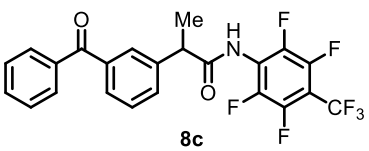

6s


6t


6u

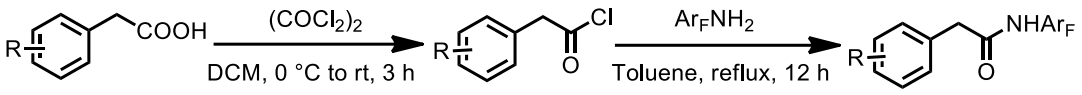

8a


8b


8c

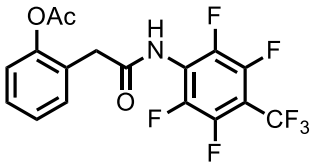
4. Experimental Section

4.1 Preparation of Phenylacetic Amides



The previous reported procedure was followed.[1] To an oven-dried 50 mL round-bottom flask, 2,3,5,6-tetrafluoro-4-(trifluoromethyl)aniline (3.0 mmol) was dissolved in toluene (15.0 mL). Acid chloride (3.0 mmol), prepared from the corresponding carboxylic acid and oxalyl chloride, was added *via* syringe. Then, the mixture was heated to reflux under N_2 for 12 h. After cooling to room temperature, the mixture was concentrated in *vacuo* and the solid was recrystallized from ethyl acetate/hexane to give the pure amide substrates. Phenylacetic amides **6e**, **6j**, **6o, 6q, 6r**, **6t** and **8c** had been synthesized and characterized. Other phenylacetic amides were synthesized and characterized before according the same procedure.[1]

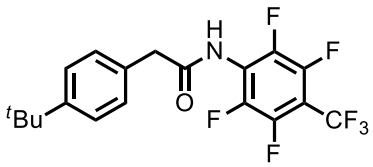
2-(2-Oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl acetate (6e)



6e

White solid: **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.45-7.36 (m, 3H), 7.31 (d, *J* = 7.4 Hz, 1H), 7.14 (d, *J* = 8.0 Hz, 1H), 3.73 (s, 2H), 2.38 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 170.5, 168.0, 149.0, 131.1, 129.7, 127.2, 126.2, 123.0, 38.2, 20.8; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{17}H_{14}F_7N_2O_3$: 427.0887, found: 427.0881.

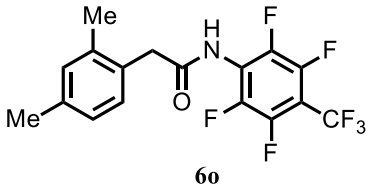
2-(4-(*Tert*-butyl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (6j)



6j

White solid: **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.43 (d, *J* = 7.4 Hz, 2H), 7.27 (d, *J* = 7.6 Hz, 2H), 7.12 (s, 1H), 3.79 (s, 2H), 1.33 (s, 9H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 169.2, 151.2, 130.2, 129.1, 126.4, 43.0, 34.658, 31.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{19}H_{20}F_7N_2O$: 425.1458, found: 425.1453.

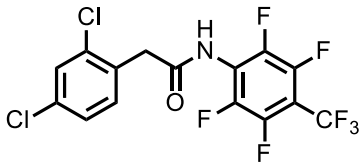
2-(2,4-Dimethylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (6o)



6o

White solid: **^{1}H NMR (400 MHz, acetone-d^6)** δ 9.42 (s, 1H) 7.22 (d, *J* = 7.6 Hz, 1H), 7.06 (s, 1H), 7.01 (d, *J* = 7.6 Hz, 1H), 3.89 (s, 2H), 2.35 (s, 3H), 2.31 (s, 3H); **^{13}C NMR (100 MHz, acetone-d^6)** δ 169.4, 137.5, 137.3, 131.6, 131.0, 130.9, 127.2, 40.6, 20.7, 19.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{17}H_{16}F_7N_2O$: 397.1145, found: 397.1141.

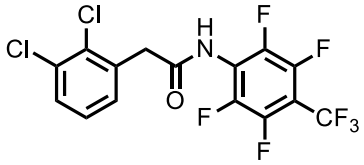
2-(2,4-Dichlorophenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (6q)



6q

White solid: **^{1}H NMR (400 MHz, acetone-d^6)** δ 9.74 (s, 1H), 7.56 (s, 2H), 7.42 (d, *J* = 8.3 Hz, 1H), 4.11 (s, 2H); **^{13}C NMR (100 MHz, acetone-d^6)** δ 167.9, 135.8, 134.0, 133.9, 132.7, 129.4, 127.9, 40.0; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{15}H_{10}Cl_2F_7N_2O$: 437.0053, found: 437.0051.

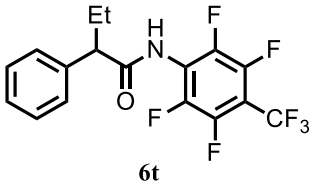
2-(2,3-Dichlorophenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (6r)



6r

White solid: **^{1}H NMR (400 MHz, acetone-d^{6})** δ 9.77 (s, 1H), 7.57 (d, *J* = 8.0 Hz, 1H), 7.51 (d, *J* = 7.7 Hz, 1H), 7.38 (t, *J* = 7.8 Hz, 1H), 4.17 (s, 2H); **^{13}C NMR (100 MHz, acetone-d^{6})** δ 167.9, 136.2, 133.1, 133.0, 131.2, 130.0, 128.438, 41.4; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{15}H_{10}Cl_2F_7N_2O$: 437.0053, found: 437.0051.

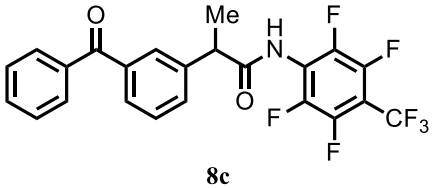
2-Phenyl-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)butanamide (6t)



6t

White solid: **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.42-7.36 (m, 2H), 7.35-7.26 (m, 3H), 6.96 (s, 1H), 3.55 (t, *J* = 7.5 Hz, 1H), 2.33-2.20 (m, 1H), 1.94-1.82 (m, 1H), 0.94 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 171.4, 138.4, 129.3, 128.0, 128.0, 55.0, 26.2, 12.0; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{17}H_{16}F_7N_2O$: 397.1145, found: 397.1142.

2-(3-Benzoylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)propanamide (8c)



8c

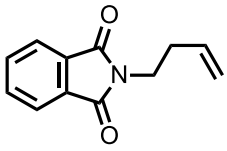
White solid: **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.82 (s, 1H), 7.75 (d, *J* = 7.3 Hz, 2H), 7.70 (d, *J* = 7.5 Hz, 1H), 7.65-7.58 (m, 2H), 7.54-7.44 (m, 3H), 7.40 (s, 1H), 3.95 (q, *J* = 7.0 Hz, 1H), 1.63 (d, *J* = 6.9 Hz, 3H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 197.1,

171.6, 140.8, 138.1, 137.1, 132.8, 131.5, 129.9, 129.8, 129.2, 129.1, 128.4, 46.9, 18.6; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{23}H_{18}F_7N_2O_2$: 487.1251, found: 487.1243.

4.2 Preparation of Unactivated Alkenes

Alkenes **2a-2i, 4a-4c, 4j, 4l-4m** were purchased from commercial vendors and used without further purification.

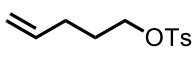
2-(But-3-en-1-yl)isoindoline-1,3-dione (4d)[2]



4d

To an oven-dried 50 mL round-bottom flask equipped with a magnetic stir bar, potassium phtalimid (2.94 g, 15.8 mmol), 4-bromo-1-buten (1.70 g, 12.6 mmol), TBAB (0.2 g, 0.62 mmol) were added in MeCN (30 ml). The mixture was then heated to reflux for 5 h. After cooling to ambient temperature, the mixture was filtered to remove the excess of phtalimid and the filtrate was then evaporated under reduced pressure. After dissolved in DCM (100 ml), The residue was washed with brine twice. The organic phase was dried over Na_2SO_4 and the crude mixture was purified by column chromatography on silica gel using hexane/EtOAc (10:1) as eluent to afford *N*-(3-butenyl)phthalimide as a white solid. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.84-7.78 (m, 2H), 7.72-7.66 (m, 2H), 5.82-5.72 (m, 1H), 5.07-4.99 (m, 2H), 3.75 (t, *J* = 7.1 Hz, 2H), 2.43 (q, *J* = 7.0 Hz, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.0, 134.3, 133.6, 131.9, 122.9, 117.3, 37.1, 32.6.

Pent-4-en-1-yl 4-methylbenzenesulfonate (4f)[3]

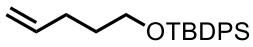


4f

To an oven-dried 100 mL round-bottom flask equipped with a magnetic stir bar, TsCl (1.90 g 10 mmol,) and DMAP (0.12 g, 1 mmol) were added. Dichloromethane (30 mL)

and triethylamine (1.8 mL, 12 mmol) were then added *via* syringe and the flask was cooled to 0 °C with an ice bath, after which 4-penten-1-ol (1.0 mL 10.0 mmol) was added dropwise *via* syringe. The mixture was allowed to warm to room temperature and stirring was continued for an additional 2 hours. The reaction mixture was quenched by the slow addition of water (10 mL). After drying of the organic phase over Na_2SO_4 and concentration under reduced pressure, the crude reaction product was purified by column chromatography on silica gel using hexane/EtOAc (10:1) as eluent to afford the product as a colorless oil. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.78 (d, *J* = 8.2 Hz, 2H), 7.34 (d, *J* = 7.9 Hz, 2H), 5.74-5.62 (m, 1H), 4.98-4.92 (m, 2H), 4.03 (td, *J* = 6.5, 1.6 Hz, 2H), 2.44 (s, 3H), 2.08 (q, *J* = 7.3 Hz, 2H), 1.79-1.69 (m, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 144.7, 136.6, 133.1, 129.8, 127.8, 115.8, 69.876, 29.3, 27.9, 21.6.

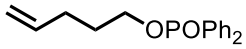
***Tert*-butyl(pent-4-en-1-yloxy)diphenylsilane (4g)[4]**



4g

To a stirred solution of 4-penten-1-ol (1) (2.50 mL, 24.2 mmol), imidazole (1.98 g, 29.0 mmol), and a catalytic amount of DMAP in DMF (25 mL) was added TBDPSCl (6.61mL, 25.4mmol) at 0 °C and stirring was continued for 19 h at rt. The reaction mixture was diluted with Et_2O and washed with 10% HCl, saturated aqueous $NaHCO_3$. The residue upon work up was chromatographed on silicagel with hexane/EtOAc (19:1) as eluant to give silyl ether as a colorless oil. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.73-7.65 (m, 4H), 7.46-7.36 (m, 6H), 5.87-5.77 (m, 1H), 5.06-4.91 (m, 2H), 3.72-3.66 (m, 2H), 2.21-2.12 (m, 2H), 1.72-1.64 (m, 2H), 1.07 (s, 9H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 138.5, 135.6, 134.0, 129.5, 127.6, 63.3, 31.8, 30.1, 26.9, 19.2.

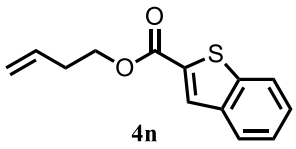
Pent-4-en-1-yl diphenylphosphinate (4i)



4i

To a dry, 100 mL round-bottom flask equipped with a magnetic stir bar was added diphenylphosphinic chloride (2.3 mL 12 mmol). Dichloromethane (30 mL) and triethylamine (2.8 mL, 20 mmol) were added *via* syringe and the flask was cooled to 0 °C with an ice bath, after which 4-penten-1-ol (1.0 mL 10.0 mmol) was added dropwise *via* syringe. The mixture was allowed to warm to room temperature and stirring was continued for an additional 2 hours. The reaction mixture was quenched by the slow addition of water (10 mL). After drying of the organic phase over Na_2SO_4 and concentration under reduced pressure, the crude reaction product was purified by column chromatography on silica gel using hexane/EtOAc (10:1) as eluent to afford the product as a colorless oil. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 10.45 (s, 1H), 7.73 (dd, *J* = 12.3, 7.6 Hz, 4H), 7.50 (t, *J* = 7.4 Hz, 2H), 7.45-7.35 (m, 4H), 7.24-7.20 (m, 1H), 7.13 (d, *J* = 4.7 Hz, 2H), 6.82 (d, *J* = 15.5 Hz, 1H), 5.87 (dt, *J* = 15.0, 7.3 Hz, 1H), 4.11-4.07 (m, 2H), 4.06 (s, 2H), 2.50 (dd, *J* = 12.0, 7.6 Hz, 2H), 2.44 (s, 3H), 1.95-1.87 (m, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 137.3, 132.1 (d, $J_{c\text{-}p}$ = 2.7 Hz), 131.5 (d, $J_{c\text{-}p}$ = 136.4 Hz), 131.6 (d, $J_{c\text{-}p}$ = 100.3 Hz), 128.5 (d, $J_{c\text{-}p}$ = 13.1 Hz), 115.3, 62.3 (d, $J_{c\text{-}p}$ = 6.0 Hz), 29.7, 29.6; **^{31}P NMR (162 MHz, $CDCl_3$)** δ 31.4.

But-3-en-1-yl benzo[b]thiophene-2-carboxylate (4n)[5]

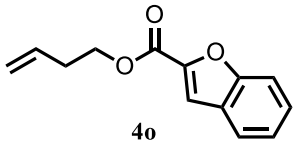


4n

A solution of DCAD (10 mmol) in DCM (15 mL) was slowly added at 22 °C via cannula to a solution of PPh_3 (2.62 g, 10 mmol), but-3-ene-1-ol (0.86 mL, 10 mmol) and benzo[b]thiophene-2-carboxylic acid (1.78 g, 10 mmol) in DCM (10 mL). The resulting cloudy mixture was stirred at the same temperature 12 h. Filtration of the mixture afforded reduced DCAD as a white powder. The filtrate was concentrated in vacuo to afford the crude product. The crude product was purified by column chromatography on silica gel using hexane/EtOAc (10:1) as eluent to afford the product as a colorless oil. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.06 (s, 1H), 7.87 (t, *J* = 6.9 Hz, 2H), 7.48-7.38 (m, 2H), 5.94-5.82 (m, 1H), 5.20 (d, *J* = 17.2 Hz, 1H), 5.13 (d, *J* =

10.2 Hz, 1H), 4.40 (td, *J* = 6.8, 1.0 Hz, 2H), 2.54 (q, *J* = 6.6 Hz, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 162.7, 142.2, 138.7, 133.7, 133.6, 130.4, 126.9, 125.5, 124.8, 122.71, 117.6, 64.5, 33.1.

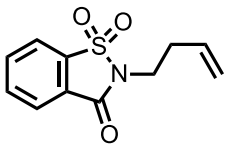
But-3-en-1-yl benzofuran-2-carboxylate (4o)[7]



4o

A solution of DCAD (10 mmol) in DCM (15 mL) was slowly added at 22 °C via cannula to a solution of PPh_3 (2.62 g, 10 mmol), but-3-ene-1-ol (0.86 mL, 10 mmol) and benzofuran-2-carboxylic acid (1.62 g, 10 mmol) in DCM (10 mL). The resulting cloudy mixture was stirred at the same temperature 12 h. Filtration of the mixture afforded reduced DCAD as a white powder. The filtrate was concentrated in vacuo to afford the crude product. The crude product was purified by column chromatography on silica gel using hexane/EtOAc (10:1) as eluent to afford the product as a colorless oil. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.67 (d, *J* = 7.9 Hz, 1H), 7.58 (d, *J* = 8.4 Hz, 1H), 7.51 (s, 1H), 7.44 (t, *J* = 7.5 Hz, 1H), 7.32-7.26 (m, 1H), 5.92-5.80 (m, 1H), 5.22-5.15 (m, 1H), 5.12 (d, *J* = 10.3 Hz, 1H), 4.43 (td, *J* = 6.8, 1.8 Hz, 2H), 2.55 (q, *J* = 6.6 Hz, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 159.5, 155.7, 145.5, 133.5, 127.6, 126.9, 123.7, 122.8, 117.6, 113.8, 112.3, 64.4, 33.1.

2-(But-3-en-1-yl)benzo[d]isothiazol-3(2H)-one 1,1-dioxide (4p)[6]

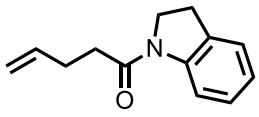


4p

To an oven-dried 50 mL round-bottom flask equipped with a magnetic stir bar, saccharin (1.83 g, 10 mmol), dry DMF (10 mL) was added *via* syringe and the flask was cooled to 0 °C with an ice bath, NaH (1.0 mL 10.0 mmol,) was added in batch. Then the reaction mixture was continued for 1 h at rt. 4-Bromo-1-buten (2.0 mL, 20.0

mmol) was added *via* syringe and stirred for 12 h at 120 °C. The resulting mixture was cooled to room temperature and poured into water, extracted the mixture by methylene chloride (50 mL).The combined organic layer was washed by water (50 mL), and dried over Na_2SO_4, the crude reaction product was purified by column chromatography on silica gel using hexane/EtOAc (10:1) as eluent to afford the product as a colorless solid. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.03 (d, *J* = 7.8 Hz, 1H), 7.90 (d, *J* = 7.2 Hz, 1H), 7.92-7.78 (m, 2H), 5.87-5.76 (m, 1H), 5.15 (d, *J* = 17.1 Hz, 1H), 5.08 (d, *J* = 10.2 Hz, 1H), 3.82 (t, *J* = 7.5 Hz, 2H), 2.58 (q, *J* = 6.7 Hz, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 158.8, 137.6, 134.6, 134.2, 133.7, 127.3, 125.1, 120.8, 118.0, 38.5, 32.6.

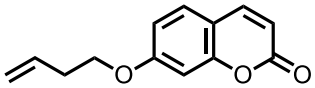
1-(Indolin-1-yl)pent-4-en-1-one (4r)[7]



4r

An oven-dried 250 mL 2-neck flask under argon was charged with pent-4-enoic acid (1.02 mL, 10 mmol), EDCI (2.11 g, 11 mmol), HOBt (1.48 g, 11 mmol), indoline (1.12 mL, 10 mmol), DIPEA (5.0 mL, 30 mmol). DCM (30 mL) was added *via* syringe. After stirring for an additional 20 h at room temperature, the reaction mixture was quenched with H_2O (30 mL). The organic solution was separated and the aqueous layer was extracted with DCM (2×30 mL). The combined organic layer was washed with brine (30 mL), and dried over Na_2SO_4. After evaporation of the solvent, the residue was purified by column chromatography on silica gel using hexane/EtOAc (5:1) as eluent to afford the product as a colorless solid. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.24 (d, *J* = 7.9 Hz, 1H), 7.22-7.15 (m, 2H), 7.00 (t, *J* = 7.4 Hz, 1H), 5.98-5.86 (m, 1H), 5.10 (d, *J* = 17.1 Hz, 1H), 5.02 (d, *J* = 10.2 Hz, 1H), 4.03 (t, *J* = 8.4 Hz, 2H), 3.18 (t, *J* = 8.4 Hz, 2H), 2.50 (s, 4H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 170.4, 143.0, 137.3, 130.9, 127.5, 124.4, 123.5, 116.9, 115.3, 47.9, 35.1, 28.5, 28.0.

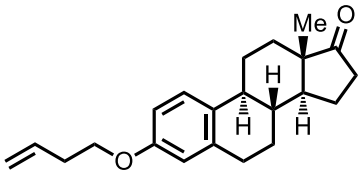
7-(But-3-en-1-yloxy)-2H-chromen-2-one (4s)[5]



4s

To a solution of 7-hydroxy-2H-chromen-2-one (1.62 g, 10 mmol) and K_2CO_3 (5.50 g, 40 mmol) in CH_3CN (40 mL) was added 4-bromo-but-1-ene (1.60 mL, 15 mmol), and the mixture was heated to reflux for 12 h. It was then cooled to room temperature and the solvent was removed in *vacuo*. The residue was partitioned between HCl and water and the aqueous layer was extracted with CH_2Cl_2 (2x10 mL). The combined organic extracts were washed with water (2 x 10 mL), dried over Na_2SO_4 and concentrated in vacuo. The crude product was purified by column chromatography on silica gel using hexane/EtOAc (5:1) as eluent to afford the product as a colorless solid. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.58 (d, *J* = 9.5 Hz, 1H), 7.31 (d, *J* = 8.6 Hz, 1H), 6.78 (d, *J* = 8.6 Hz, 1H), 6.72 (s, 1H), 6.18 (dd, *J* = 9.5, 1.2 Hz, 1H), 5.91-5.79 (m, 1H), 5.14 (d, *J* = 17.2 Hz, 1H), 5.08 (d, *J* = 10.2 Hz, 1H), 4.01 (t, *J* = 6.6 Hz, 2H), 2.56-2.48 (m, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 161.9, 161.0, 155.6, 143.3, 133.6, 128.6, 117.3, 112.8, 112.7, 112.3, 101.2, 67.6, 33.1.

(8R,9S,13S,14S)-3-(but-3-en-1-yloxy)-13-methyl-7,8,9,11,12,13,15,16-octahydro-6H-cyclopenta[a]phenanthren-17(14H)-one (4t)[5]



4t

To a solution of estrone (1.40 g, 5 mmol) and K_2CO_3 (2.76 g, 20 mmol) in CH_3CN (20 mL) was added 4-bromo-but-1-ene (1.0 mL, 10 mmol), and the mixture was heated to reflux for 12 h. It was then cooled to room temperature and the solvent was removed in *vacuo*. The residue was partitioned between HCl and water and the aqueous layer was extracted with CH_2Cl_2 (2x10 mL). The combined organic extracts were washed with water (2 x 10 mL), dried over Na_2SO_4 and concentrated in vacuo.

The crude product was purified by column chromatography on silica gel using hexane/EtOAc (4:1) as eluent to afford the product as a colorless solid. **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.20 (d, *J* = 8.5 Hz, 1H), 6.72 (d, *J* = 8.5 Hz, 1H), 6.66 (s, 1H), 5.96-5.85 (m, 1H), 5.17 (d, *J* = 17.2 Hz, 1H), 5.10 (d, *J* = 10.3 Hz, 1H), 3.99 (t, *J* = 6.7 Hz, 2H), 2.89 (d, *J* = 8.7 Hz, 2H), 2.56-2.46 (m, 3H), 2.40 (d, *J* = 9.8 Hz, 1H), 2.26 (d, *J* = 9.9 Hz, 1H), 2.17-1.92 (m, 4H), 1.69-1.40 (m, 6H), 0.91 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 220.9, 156.9, 137.7, 134.5, 132.0, 126.2, 116.8, 114.6, 112.2, 67.1, 50.4, 48.0, 43.9, 38.3, 35.8, 33.7, 31.6, 29.6, 26.5, 25.9, 21.6, 13.8.

4.3 General Procedure for *ortho*-C(sp^2)–H Olefination of Phenylacetic Amide 1 with Aliphatic Alkenes.

Phenylacetic amide **1** (0.10 mmol, 36.5 mg), $Pd(OAc)_2$ (0.005 mmol, 5 mol%), **L22** (0.01 mmol, 2.7 mg) and $Cu(OAc)_2$ (0.02 mmol, 3.6 mg) were weighed in air and placed in an oven-dried sealed tube (35 mL) with a magnetic stir bar. The tube was evacuated and refilled with O_2 three times. DCE (2.0 mL) was added *via* syringe and the reaction mixture was stirred for 5 min. Then, aliphatic alkenes **2** (0.30 mmol) was added *via* syringe and the mixture was heated to 80 °C for 6 hours under vigorous stirring. After cooling to ambient temperature, the reaction mixture was diluted with ethyl acetate and filtered through a pad of celite. The filtrate was concentrated in *vacuo* and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (19/1 to 9/1) to give the desired olefination products.

4.4 General Procedure for *ortho*-C(sp^2)–H Olefination of Phenylacetic Amides with Unactivated Alkenes 2e.

Phenylacetic amides **6** (0.10 mmol), $Pd(OAc)_2$ (0.005 mmol, 5 mol%), **L22** (0.01 mmol, 2.7 mg) and $Cu(OAc)_2$ (0.02 mmol, 3.6 mg) were weighed in air and placed in an oven-dried sealed tube (35 mL) with a magnetic stir bar. The tube was evacuated and refilled with O_2 three times. DCE (2.0 mL) was added *via* syringe and the reaction mixture was stirred for 5 min. Then, aliphatic alkenes **2e** (0.30 mmol, 38 μL) was added *via* syringe and the mixture was heated to 80 °C for 6 hours under vigorous

stirring. After cooling to ambient temperature, the reaction mixture was diluted with ethyl acetate and filtered through a pad of celite. The filtrate was concentrated in *vacuo* and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (19/1 to 9/1) to give the desired olefination products.

4.5 General Procedure for Late-Stage Diversification of Drug Molecules.

The starting material **8** (0.10 mmol), $Pd(OAc)_2$ (0.01 mmol, 2.2 mg), **L22** (0.02 mmol, 5.4 mg) and $Cu(OAc)_2$ (0.10 mmol, 18.2 mg) were weighed in air and placed in an oven-dried sealed tube (35 mL) with a magnetic stir bar. The tube was evacuated and refilled with O_2 three times. DCE (2.0 mL) was added *via* syringe and the reaction mixture was stirred for five minutes. Then, 1-octene **2a** (0.30 mmol, 47 μL) was added *via* syringe and the mixture was heated to 100 °C for 12 hours under vigorous stirring. After cooling to ambient temperature, the reaction mixture was diluted with ethyl acetate and filtered through a pad of celite. The filtrate was concentrated *in vacuo* and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (19/1 to 9/1) to give the desired olefination products.

4.6 General Procedure for Large Scale Synthesis.

Phenylacetic amide **1** (3.0 mmol, 1.09 g), $Pd(OAc)_2$ (0.15 mmol, 5 mol%), **L21** (0.30 mmol, 64.0 mg) and $Cu(OAc)_2$ (3.0 mmol, 0.54 g) were weighed in air and placed in an oven-dried sealed tube (100 mL) with a magnetic stir bar. The tube was evacuated and refilled with O_2 three times. DCE (60 mL) was added *via* syringe and the reaction mixture was stirred for 10 min. Then, 1-octene **2a** (9.0 mmol, 1.41 mL) was added *via* syringe and the mixture was heated to 80 °C for 12 hours under vigorous stirring. After cooling to ambient temperature, the reaction mixture was diluted with ethyl acetate and filtered through a pad of celite. The filtrate was concentrated *in vacuo* and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (19/1 to 9/1) to give the desired olefination products.

4.6 General Procedure for Hydrogenation.

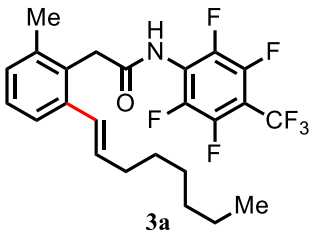
To two paralleled oven-dried round-bottom flask (50 mL) was added Pd/C (10 wt. % loading on carbon, 5.0 mg), amide **3a** (33.3 mg, 0.07 mmol) and EtOAc (2 mL). The reaction flask was evacuated and refilled with H_2 (3 times, balloon). After stirring at room temperature for 24 hours, the reaction mixture was filtered through a small pad of Celite. The solvent was removed under reduced pressure and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (9/1) to give the desired product as colorless oil (66.4 mg, 99%,).

4.7 General Procedure for Deprotection.

To a solution of **3i** (35.8 mg, 0.08 mmol) in MeOH (4 mL), BF_3•Et_2O (68.1 mg, 0.48 mmol) by was added *via* syringe. The reaction mixture was heated to 110 °C for 24 hours. After cooling to room temperature, triethylamine (101.0 mg, 1.0 mmol) was added *via* syringe. the reaction mixture was filtered through a small pad of Celite and the solvent was removed under vacuum. The solvent was removed under reduced pressure and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (19/1) to give the desired product as colorless oil (20.4 mg, 83%,)

5. Experimental Data

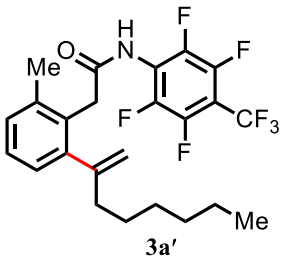
(*E*)-2-(2-methyl-6-(oct-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3a)



3a

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (41.4 mg, 87% yield), linear/branched ratio = 4.0/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.36 (d, *J* = 7.7 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.4 Hz, 1H), 6.81 (s, 1H), 6.61 (d, *J* = 15.5 Hz, 1H), 6.15 (dt, *J* = 15.4, 6.9 Hz, 1H), 3.93 (s, 2H), 2.39 (s, 3H), 2.24 (dd, *J* = 14.5, 7.2 Hz, 2H), 1.50-1.41 (m, 2H), 1.38-1.28 (m, 6H), 0.89 (t, *J* = 6.4 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 136.4, 129.8, 128.9, 128.5, 126.7, 125.5, 37.5, 33.3, 31.7, 29.2, 28.9, 22.6, 20.2, 14.0; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{24}H_{28}F_7N_2O$: 493.2084, found: 493.2081.

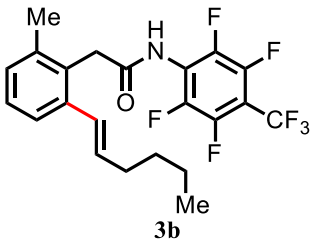
2-(2-Methyl-6-(oct-1-en-2-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3a′)



3a′

White solid: **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.23 (d, *J* = 7.4 Hz, 1H), 7.21 (t, *J* = 6.8 Hz, 1H), 7.06 (d, *J* = 7.3 Hz, 1H), 6.87 (s, 1H), 5.27 (d, *J* = 1.2 Hz, 1H), 4.93 (s, 1H), 3.87 (s, 2H), 2.39 (s, 3H), 2.35-2.27 (m, 2H), 1.45-1.39 (m, 2H), 1.33-1.26 (m, 6H), 0.87 (t, *J* = 6.8 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.9, 149.8, 144.9, 138.0, 129.8, 128.9, 127.9, 127.2, 114.7, 38.6, 38.4, 31.7, 29.0, 27.6, 22.6, 20.0, 14.0; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{24}H_{28}F_7N_2O$: 493.2084, found: 493.2078.

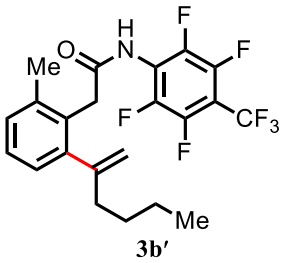
(*E*)-2-(2-(hex-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3b)



3b

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (41.5 mg, 92% yield). Linear/branched ratio = 4.6/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.36 (d, *J* = 7.6 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.2 Hz, 1H), 6.78 (s, 1H), 6.61 (d, *J* = 15.4 Hz, 1H), 6.14 (dt, *J* = 15.4, 6.9 Hz, 1H), 3.93 (s, 2H), 2.39 (s, 3H), 2.25 (dd, *J* = 14.2, 7.4 Hz, 2H), 1.44 (dd, *J* = 15.0, 7.6 Hz, 2H), 1.36 (dd, *J* = 14.5, 7.1 Hz, 2H), 0.92 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 136. 5, 129.8, 128.9, 128.5, 126.7, 125.5, 37.6, 33.0, 31.4, 22.2, 20.2, 13.9; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{24}F_7N_2O$: 465.1771, found: 465.1767.

2-(2-(Hex-1-en-2-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3b′)

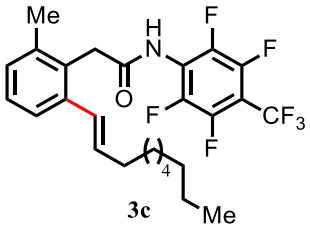


3b′

White solid: **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.25 (d, *J* = 7.3 Hz, 1H), 7.21 (t, *J* = 7.6 Hz, 1H), 7.06 (d, *J* = 7.6 Hz, 1H), 6.82 (s, 1H), 5.27 (s, 1H), 4.93 (s, 1H), 3.87 (s, 2H), 2.39 (s, 3H), 2.35-2.28 (m, 2H), 1.45-1.32 (m, 4H), 0.89 (t, *J* = 7.2 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.9, 149.8, 144.9, 138.0, 129.8, 129.0, 128.0, 127.2, 114.7, 38.5, 38.3, 29.8, 22.4, 20.0, 13.9; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{24}F_7N_2O$: 465.1771, found: 465.1769.

(*E*)-2-(2-(dec-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethy

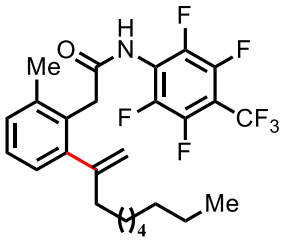
l)phenyl)acetamide (3c)



3c

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (43.7 mg, 87% yield). Linear/branched ratio = 4.3/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.36 (d, *J* = 7.7 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.1 Hz, 1H), 6.79 (s, 1H), 6.60 (d, *J* = 15.5 Hz, 1H), 6.15 (dt, *J* = 15.4, 6.9 Hz, 1H), 3.93 (s, 2H), 2.38 (s, 3H), 2.27-2.21 (m, 2H), 1.48-1.42 (m, 2H), 1.31-1.26 (m, 10H), 0.88 (t, *J* = 6.9 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 136.5, 129.8, 128.9, 128.5, 126.7, 125.5, 37.5, 33.3, 31.9, 29.5, 29.2, 29.2, 22.7, 20.2, 14.1; **HRMS (ESI-TOF) [M+NH_4]$^+$** calculated for $C_{26}H_{32}F_7N_2O$: 521.2397, found: 521.2394.

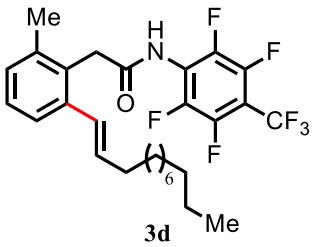
2-(2-(Dec-1-en-2-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3c′)



3c′

White solid: **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.25 (d, *J* = 6.9 Hz, 1H), 7.21 (t, *J* = 6.8 Hz, 1H), 7.06 (d, *J* = 7.2 Hz, 1H), 6.82 (s, 1H), 5.27 (s, 1H), 4.93 (s, 1H), 3.87 (s, 2H), 2.39 (s, 3H), 2.33-2.28 (m, 2H), 1.45-1.40 (m, 2H), 1.31-1.24 (m, 11H), 0.87 (t, *J* = 6.7 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.9, 149.9, 144.9, 138.0, 129.8, 128.9, 128.0, 127.2, 114.7, 38.6, 38.5, 31.8, 29.4, 29.3, 29.2, 27.7, 22.6, 20.0, 14.1; **HRMS (ESI-TOF) [M+NH_4]$^+$** calculated for $C_{26}H_{32}F_7N_2O$: 521.2397, found: 521.2394.

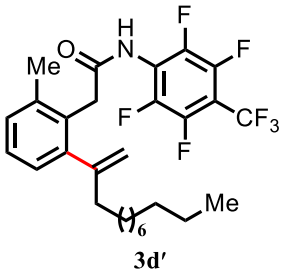
(*E*)-2-(2-(dodec-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3d)



3d

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (44.2 mg, 83% yield). Linear/branched ratio = 3.9/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.36 (d, *J* = 7.7 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.1 Hz, 1H), 6.80 (s, 1H), 6.61 (d, *J* = 15.1 Hz, 1H), 6.15 (dt, *J* = 15.5, 6.9 Hz, 1H), 3.93 (s, 2H), 2.39 (s, 3H), 2.24 (dd, *J* = 14.5, 7.1 Hz, 2H), 1.50-1.42 (m, 2H), 1.35-1.20 (m, 14H), 0.88 (t, *J* = 6.6 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 136.5, 129.8, 128.9, 128.5, 126. 7, 125.5, 37.5, 33.3, 31.9, 29.6, 29.6, 29.5, 29.3, 29.3, 29.2, 22.7, 20.2, 14.1; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{28}H_{36}F_7N_2O$: 549.2710, found: 549.2706.

2-(2-(Dodec-1-en-2-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3d′)

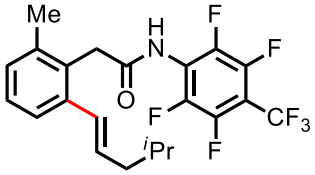


3d′

White solid: **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.23 (d, *J* = 7.3 Hz, 1H), 7.20 (t, *J* = 8.1 Hz, 1H), 7.06 (d, *J* = 7.8 Hz, 1H), 6.81 (s, 1H), 5.27 (s, 1H), 4.93 (s, 1H), 3.87 (s, 2H), 2.39 (s, 3H), 2.33-2.28 (m, 2H), 1.43-1.40 (m, 2H), 1.33-1.20 (m, 14H), 0.88 (t, *J* = 6.5 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.8, 149.9, 144.9, 138.0, 129.8, 128.9, 128.0, 127.1, 114.8, 38.6, 38.5, 31.9, 29.6, 29.5, 29.4, 29.3, 29.3, 27.7, 22.7, 20,0, 14.1; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{28}H_{36}F_7N_2O$: 549.2710, found: 549.2706.

(*E*)-2-(2-methyl-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifl

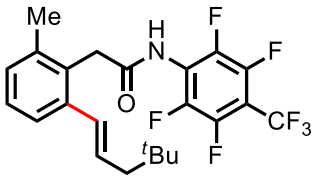
uoromethyl)phenyl)acetamide (3e)



3e

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (33.6 mg, 75% yield). Linear/branched ratio = 4.0/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.37 (d, *J* = 7.3 Hz, 1H), 7.25 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 7.5 Hz, 1H), 6.78 (s, 1H), 6.60 (d, *J* = 15.5 Hz, 1H), 6.18 (dt, *J* = 15.3, 7.7 Hz, 1H), 3.93 (s, 2H), 2.38 (s, 3H), 2.14 (td, *J* = 7.1, 1.2 Hz, 1H), 1.73 (td, *J* = 13.3, 6.6 Hz, 1H), 0.94 (d, *J* = 6.6 Hz, 1H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 135.1, 129.8, 128.9, 128.5, 127.8, 125.6, 42.6, 37.6, 28.5, 22.3, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{24}F_7N_2O$: 465.1771, found: 465.1767.

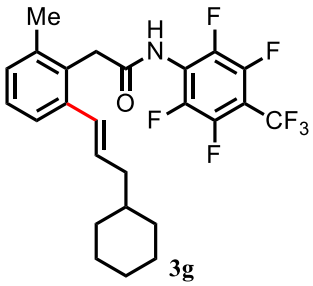
(*E*)-2-(2-(4,4-dimethylpent-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3f)



3f

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (30.1 mg, 65% yield). Linear/branched ratio = 7.2/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.38 (d, *J* = 7.3 Hz, 1H), 7.25 (t, *J* = 7.6 Hz, 1H), 7.19 (d, *J* = 7.3 Hz, 1H), 6.78 (s, 1H), 6.59 (d, *J* = 15.4 Hz, 1H), 6.18 (dt, *J* = 15.3, 7.7 Hz, 1H), 3.94 (s, 2H), 2.39 (s, 3H), 2.13 (d, *J* = 7.6 Hz, 1H), 0.94 (s, 9H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 133.5, 129.9, 128.9, 128.9, 128.5, 125.6, 47.8, 37.6, 31.3, 29.3, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{23}H_{26}F_7N_2O$: 479.1928, found: 479.1925.

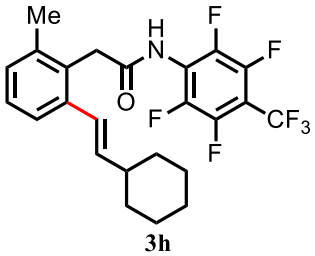
(*E*)-2-(2-(3-cyclohexylprop-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3g)



3g

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (37.3 mg, 77% yield). Linear/branched ratio = 6.2/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.37 (d, *J* = 7.7 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.3 Hz, 1H), 6.78 (s, 1H), 6.58 (d, *J* = 15.4 Hz, 1H), 6.14 (dt, *J* = 15.0, 7.3 Hz, 1H), 3.93 (s, 2H), 2.38 (s, 3H), 2.14 (t, *J* = 7.0 Hz, 2H), 1.74-1.63 (m, 4H), 1.43-1.36 (m, 1H), 1.29-1.15 (m, 4H), 1.00-0.89 (m, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.8, 137.7, 135.0, 129.8, 128.9, 128.5, 127.7, 125.6, 41.3, 38.0, 37.6, 33.1, 26.5, 26.3, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{25}H_{28}F_7N_2O$: 505.2804, found: 505.2802.

(*E*)-2-(2-(2-cyclohexylvinyl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3h)

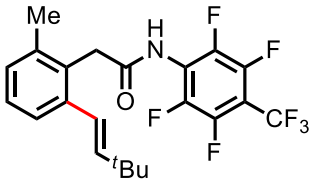


3h

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (34.2 mg, 72% yield). Linear/branched ratio = 9.2/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.34 (d, *J* = 7.5 Hz, 1H), 7.21 (t, *J* = 7.5 Hz, 1H), 7.15 (d, *J* = 7.3 Hz, 1H), 6.77 (s, 1H), 6.55 (d, *J* = 15.6 Hz, 1H), 6.07 (dd, *J* = 15.7, 6.9 Hz, 1H), 3.91 (s, 2H), 2.37 (s, 3H), 2.23-2.05 (m, 1H), 1.79-1.73 (m, 4H), 1.32-1.13 (m, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.6, 142.1, 138.9, 137.6, 129.7, 129.0, 128.4, 125.5, 124.3, 41.4, 37.6,

32.8, 26.0, 25.9, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{24}H_{23}F_7N_2O$: 491.1928, found: 491.1925.

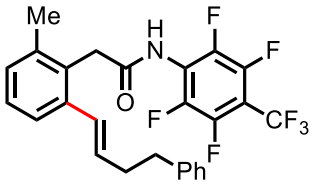
(*E*)-2-(2-(3,3-dimethylbut-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (3i)



3i

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (26.2 mg, 58% yield). Single isomer was obtained; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.35 (d, *J* = 7.5 Hz, 1H), 7.25 (t, *J* = 7.8 Hz, 1H), 7.18 (d, *J* = 7.6 Hz, 1H), 6.76 (s, 1H), 6.52 (d, *J* = 15.8 Hz, 1H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.6, 147.1, 138.9, 137.6, 129.7, 129.1, 128.4, 125.6, 121.7, 37.6, 33.8, 29.4, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{22}H_{24}F_7N_2O$: 465.1771, found: 465.1766.

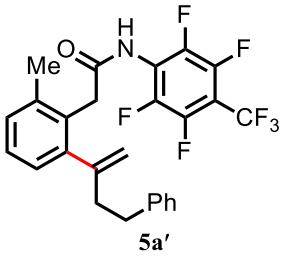
(*E*)-2-(2-methyl-6-(4-phenylbut-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5a)



5a

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (31.7 mg, 64% yield). Linear/branched ratio = 5.0/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.34-7.27 (m, 2H), 7.27-7.26 (m, 1H), 7.23-7.20 (m, 3H), 7.17 (d, *J* = 7.2 Hz, 1H), 6.70 (s, 1H), 6.60 (d, *J* = 15.5 Hz, 1H), 6.14 (dt, *J* = 15.5, 6.9 Hz, 1H), 3.84 (s, 2H), 2.81 (t, *J* = 7.5 Hz, 1H), 2.59 (q, *J* = 7.0 Hz, 2H), 2.37 (s, 3H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.4, 141.3, 138.6, 137.7, 134.9, 129.9, 129.1, 128.5, 128.4, 128.4, 127.7, 125.9, 125.6, 37.5, 35.5, 34.8, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{26}H_{24}F_7N_2O$: 513.1771, found: 513.1767.

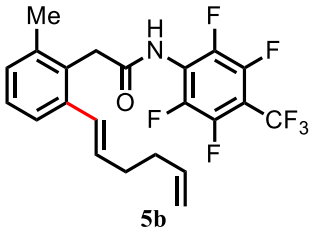
2-(2-Methyl-6-(4-phenylbut-1-en-2-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoro methyl)phenyl)acetamide (5a′)



5a′

White solid: **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.28-7.21 (m, 4H), 7.20-7.14 (m, 3H), 7.09 (d, *J* = 6.4 Hz, 1H), 6.76 (s, 1H), 5.35 (d, *J* = 1.3 Hz, 1H), 4.99 (s, 1H), 3.81 (s, 2H), 2.78 (t, *J* = 7.6 Hz, 2H), 2.68-2.64 (m, 2H), 2.39 (s, 3H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.8, 148.8, 144.4, 141.2, 138.1, 129.9, 129.1, 128.4, 128.3, 128.0, 127.1, 126.0, 115.4, 39.9, 38.4, 33.8, 20.0; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{26}H_{24}F_7N_2O$: 513.1771, found: 513.1766.

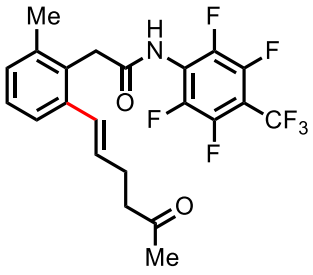
(*E*)-2-(2-(hexa-1,5-dien-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoro methyl)phenyl)acetamide (5b)



5b

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (24.9 mg, 56% yield). Linear/branched ratio = 4.2/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.35 (d, *J* = 7.7 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 7.9 Hz, 1H), 6.77 (s, 1H), 6.63 (d, *J* = 15.5 Hz, 1H), 6.14 (dt, *J* = 15.4, 6.7 Hz, 1H), 5.89-5.79 (m, 1H), 5.09-4.96 (m, 2H), 3.92 (s, 2H), 2.38 (s, 3H), 2.38-2.33 (m, 2H), 2.27-2.21 (m, 2H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.2, 138.6, 137.72, 137.71, 135.3, 129.9, 129.0, 128.5, 127.3, 125.6, 115.2, 37.6, 33.3, 32.5, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{22}H_{22}F_7N_2O$: 463.1615, found: 463.1612.

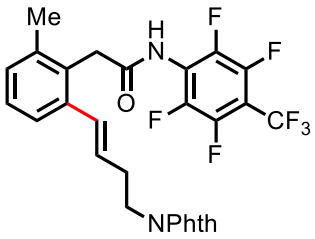
(*E*)-2-(2-methyl-6-(5-oxohex-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoro methyl)phenyl)acetamide (5c)



5c

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (32.1 mg, 70% yield). Linear/branched ratio = 4.7/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.29 (d, *J* = 7.6 Hz, 1H), 7.22 (t, *J* = 7.5 Hz, 1H), 7.17 (d, *J* = 6.8 Hz, 1H), 7.09 (s, 1H), 6.65 (d, *J* = 15.5 Hz, 1H), 6.08 (dt, *J* = 15.5, 6.7 Hz, 1H), 3.89 (s, 2H), 2.65 (t, *J* = 7.0 Hz, 2H), 2.52 (q, *J* = 7.2 Hz, 2H), 2.41 (s, 3H), 2.16 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 208.3, 168.5, 138.3, 137.8, 133.7, 130.0, 129.3, 128.3, 128.2, 125.5, 42.6, 37.4, 29.9, 27.1, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{22}F_7N_2O_2$: 479.1564, found: 479.1556.

(*E*)-2-(2-(4-(1,3-dioxoisoindolin-2-yl)but-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5d)

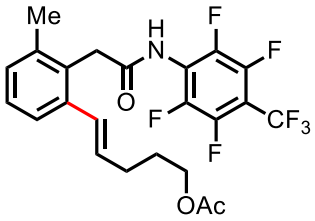


5d

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (48.5 mg, 86% yield). Linear/branched ratio = 7.0/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.81 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.68 (dd, *J* = 5.5, 3.0 Hz, 2H), 7.26 (d, *J* = 7.4 Hz, 1H), 7.20 (t, *J* = 7.5 Hz, 1H), 7.14 (d, *J* = 6.8 Hz, 1H), 6.95 (s, 1H), 6.65 (d, *J* = 15.5 Hz, 1H), 6.06 (dt, *J* = 15.2, 7.0 Hz, 1H), 3.87 (t, *J* = 6.7 Hz, 2H), 3.83 (s, 2H), 2.64 (q, *J* = 6.6 Hz, 2H), 2.34 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.4, 168.3, 138.0, 137.8, 134.0, 131.9, 131.4, 130.1, 129.6, 129.2, 128.4, 125.8, 123.3, 37.4, 37.3, 32.3, 20.2;

HRMS (ESI-TOF) [M+NH$_4$]$^+$ calculated for $C_{28}H_{23}F_7N_3O_3$: 582.1622, found: 582.1617.

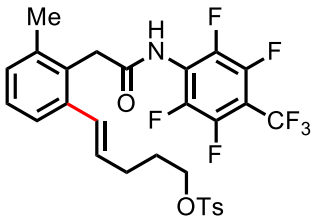
(*E*)-5-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)pent-4-en-1-yl acetate (5e)



5e

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (33.4 mg, 68% yield). Linear/branched ratio = 5.1/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.33 (d, *J* = 7.4 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 7.0 Hz, 1H), 7.03 (s, 1H), 6.65 (d, *J* = 15.5 Hz, 1H), 6.09 (dt, *J* = 15.4, 6.9 Hz, 1H), 4.14 (t, *J* = 6.6 Hz, 2H), 3.94 (s, 2H), 3.94 (s, 2H), 2.40 (s, 3H), 2.32 (q, *J* = 7.1 Hz, 2H), 2.07 (s, 3H), 1.86-1.78 (m, 2H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 171.4, 168.5, 138.4, 137.8, 134.1, 130.0, 129.1, 128.4, 128.1, 125.4, 63.5, 37.4, 29.4, 28.1, 21.0, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{23}H_{24}F_7N_2O_3$: 509.1670, found: 509.1660.

(*E*)-5-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)pent-4-en-1-yl 4-methylbenzenesulfonate (5f)

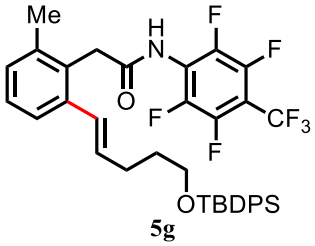


5f

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (34.7 mg, 58% yield). Linear/branched ratio = 6.2/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.78 (d, *J* = 8.3 Hz, 2H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.28 (d, *J* = 7.4 Hz, 1H), 7.22 (t, *J* = 7.5 Hz, 1H), 7.18 (d, *J* = 6.5 Hz, 1H), 7.09 (s, 1H), 6.63 (d, *J* = 15.5 Hz, 1H), 5.99 (dt,

J = 15.5, 7.1 Hz, 1H), 4.10 (t, *J* = 6.1 Hz, 2H), 3.92 (s, 2H), 2.44 (s, 3H), 2.39 (s, 3H), 2.33 (dd, *J* = 14.1, 7.1 Hz, 2H), 1.83 (dd, *J* = 13.2, 6.5 Hz, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.6, 144.9, 138.1, 137.7, 132.9, 132.7, 129.9, 129.9, 129.3, 129.0, 128.2, 127.8, 125.3, 69.5, 37.2, 28.9, 28.1, 21.6, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{28}H_{28}F_7N_2O_4S$: 621.1653, found: 621.1645.

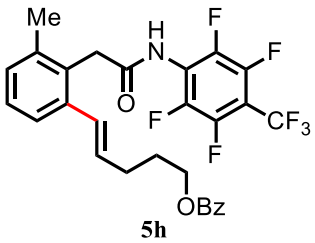
(*E*)-2-(2-(5-((tert-butyldiphenylsilyl)oxy)pent-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5g)



5g

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (55.7 mg, 83% yield). Linear/branched ratio = 4.8/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.69-7.61 (m, 4H), 7.44-7.34 (m, 6H), 7.31 (d, *J* = 7.5 Hz, 1H), 7.22 (d, *J* = 7.5 Hz, 1H), 7.18 (d, *J* = 7.6 Hz, 1H), 6.75 (s, 1H), 6.61 (d, *J* = 15.3 Hz, 1H), 6.17-6.09 (m, 1H), 3.89 (s, 2H), 3.72 (t, *J* = 6.2 Hz, 2H), 2.38 (s, 3H), 2.37-2.32 (m, 2H), 1.78-1.69 (m, 2H), 1.05 (s, 9H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 138.6, 137.7, 135.8, 135.5, 133.9, 129.8, 129.5, 128.9, 128.4, 127.6, 127.0, 125.6, 63.2, 37.5, 32.1, 29.7, 26.8, 20.2, 19.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{37}H_{40}F_7N_2O_2Si$: 705.2742, found: 705.2733.

(*E*)-5-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)pent-4-en-1-yl benzoate (5h)

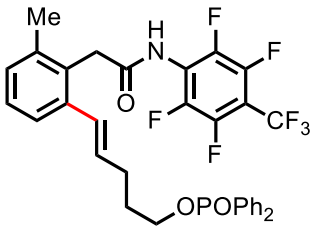


5h

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (49.8 mg, 90% yield). Linear/branched ratio = 5.0/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ

8.01 (d, *J* = 7.4 Hz, 2H), 7.55 (t, *J* = 7.2 Hz, 1H), 7.41 (t, *J* = 7.7 Hz, 2H), 7.23 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 7.0 Hz, 1H), 7.04 (s, 1H), 6.68 (d, *J* = 15.7 Hz, 1H), 6.15 (dt, *J* = 14.9, 7.0 Hz, 1H), 4.40 (t, *J* = 6.4 Hz, 2H), 3.93 (s, 2H), 2.42 (q, *J* = 7.2 Hz, 2H), 2.39 (s, 3H), 1.98 (dd, *J* = 13.5, 6.7 Hz, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.5, 166.8, 138.3, 137.8, 134.2, 133.0, 130.1, 129.9, 129.4, 129.1, 128.4, 128.3, 128.1, 125.4, 64.1, 37.4, 29.7, 28.1, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{28}H_{26}F_7N_2O_3$: 571.1826, found: 571.1818.

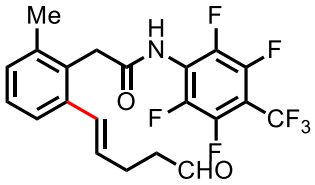
(*E*)-5-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)pent-4-en-1-yl diphenylphosphinate (5i)



5i

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (34.1 mg, 53% yield). Single isomer was obtained; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 10.45 (s, 1H), 7.76-7.71 (m, 4H), 7.50 (t, *J* = 7.4 Hz, 2H), 7.43-7.49 (m, 4H), 7.22 (t, *J* = 4.7 Hz, 2H), 7.13 (d, *J* = 4.7 Hz, 2H), 6.82 (d, *J* = 15.5 Hz, 1H), 5.87 (dt, *J* = 15.0, 7.3 Hz, 1H), 4.09 (q, *J* = 6.4 Hz, 2H), 4.06 (s, 2H), 2.50 (q, *J* = 6.2 Hz, 2H), 2.44 (s, 3H), 1.95-1.87 (m, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 169.4, 138.2, 138.1, 132.5 (d, $J_{c\text{-}p}$ = 2.7 Hz), 131.4, 131.3, 130.8, 130.4 (d, $J_{c\text{-}p}$ = 137.3 Hz), 129.5, 128.6, 128.5, 127.3, 124.6, 62.4 (d, $J_{c\text{-}p}$ = 6.0 Hz), 36.6, 28.7 (d, $J_{c\text{-}p}$ = 7.8 Hz), 28.3, 20.5; **^{31}P NMR ($CDCl_3$, 162 MHz)** δ 32.6; **HRMS (ESI-TOF) $[M+H]^+$** calculated for $C_{33}H_{28}F_7NO_3P$: 650.1690, found: 650.1677.

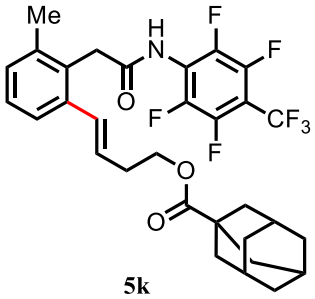
(*E*)-2-(2-methyl-6-(5-oxopent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoro methyl)phenyl)acetamide (5j)



5j

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (23.2 mg, 52% yield). Linear/branched ratio = 6.7/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 9.81 (s, 1H), 7.31 (d, *J* = 7.5 Hz, 1H), 7.23 (t, *J* = 7.7 Hz, 1H), 7.19 (d, *J* = 7.1 Hz, 1H), 6.91 (s, 1H), 6.67 (d, *J* = 15.4 Hz, 1H), 6.10 (dt, *J* = 15.5, 6.5 Hz, 1H), 3.90 (s, 2H), 2.67 (t, *J* = 6.8 Hz, 2H), 2.59 (q, *J* = 6.9 Hz, 2H) 2.40 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 201.6, 168.4, 138.1, 137.8, 133.2, 130.2, 129.2, 128.5, 128.4, 125.5, 43.0, 37.5, 25.6, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{20}F_7N_2O_2$: 465.1408, found: 465.1404.

(*E*)-4-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)but-3-en-1-yl adamantane-1-carboxylate (5k)

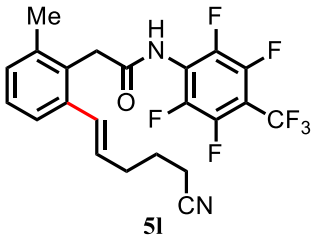


5k

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (43.8 mg, 74% yield). Linear/branched ratio = 13.2/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.33 (d, *J* = 7.7 Hz, 1H), 7.25 (t, *J* = 7.6 Hz, 1H), 7.20 (d, *J* = 7.4 Hz, 1H), 6.92 (s, 1H), 6.70 (d, *J* = 15.7 Hz, 1H), 6.07 (dt, *J* = 15.4, 6.9 Hz, 1H), 4.21 (t, *J* = 6.5 Hz, 2H), 3.91 (s, 2H), 2.57 (q, *J* = 6.4 Hz, 2H), 2.40 (s, 3H), 1.99 (s, 3H), 1.88 (d, *J* = 2.4 Hz, 6H), 1.70 (q, *J* = 12.3 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 177.7, 168.3, 138.3, 137.8, 131.2, 130.2, 129.4, 129.2, 128.5, 125.7, 62.9, 40.7, 38.8, 37.5, 36.5, 32.8, 27.9,

20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{31}H_{34}F_7N_2O_3$: 615.2452, found: 615..2443.

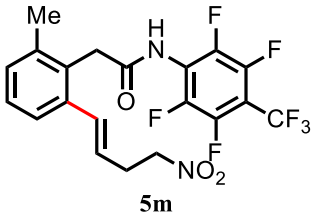
(*E*)-2-(2-(5-cyanopent-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5l)



5l

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 2/1). The desired product was obtained as a white solid (21.7 mg, 45% yield). Linear/branched ratio = 8.0/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.35 (d, *J* = 7.4 Hz, 1H), 7.25 (t, *J* = 7.6 Hz, 1H), 7.20 (d, *J* = 7.5 Hz, 1H), 6.90 (s, 1H), 6.71 (d, *J* = 15.6 Hz, 1H), 6.06 (dt, *J* = 14.9, 7.0 Hz, 1H), 3.92 (s, 2H), 2.46-2.40 (m, 4H), 2.40 (s, 3H), 1.86 (p, *J* = 7.1 Hz, 2H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.4, 138.0, 137.8, 132.5, 130.2, 129.3, 129.2, 128.5, 125.4, 119.5, 37.4, 32.0, 24.6, 20.2, 16.5; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{22}H_{21}F_7N_3O$: 476.1567, found: 476.1559.

(*E*)-2-(2-methyl-6-(4-nitrobut-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5m)

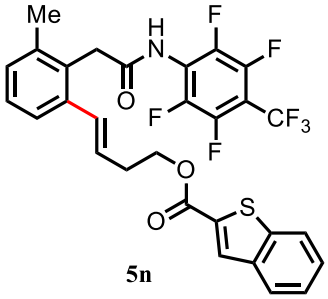


5m

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 2/1). The desired product was obtained as a white solid (20.0 mg, 43% yield). Linear/branched ratio > 20/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.31 (d, *J* = 7.4 Hz, 1H), 7.26 (t, *J* = 7.6 Hz, 1H), 7.23 (d, *J* = 7.5 Hz, 1H), 6.79 (s, 1H), 6.77 (d, *J* = 15.7 Hz, 1H), 6.03 (dt, *J* = 15.5, 7.0 Hz, 1H), 4.53 (t, *J* = 6.6 Hz, 2H), 3.89 (s, 2H), 2.94 (qd, *J* = 6.9, 1.4 Hz, 2H), 2.40 (s, 3H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.2, 137.8, 137.5, 131.5, 130.6, 129.3, 128.5, 128.0, 125.6, 74.9, 37.4,

30.9, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{20}H_{19}F_7N_3O_3$: 482.1309, found: 482.1303.

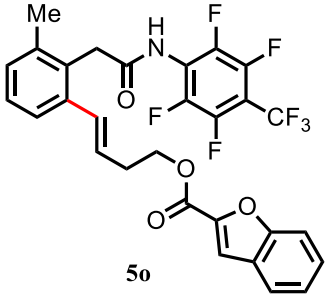
(*E*)-4-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)but-3-en-1-yl benzo[b]thiophene-2-carboxylate (5n)



5n

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (30.6 mg, 51% yield). Single isomer was obtained; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 8.03 (s, 1H), 7.86 (dd, *J* = 7.3, 1.1 Hz, 1H), 7.83 (dd, *J* = 8.1, 0.7 Hz, 1H), 7.46-7.36 (m, 3H), 7.25 (d, *J* = 7.6 Hz, 1H), 7.19 (d, *J* = 7.3 Hz, 1H), 6.88-6.77 (m, 2H), 6.17 (dt, *J* = 15.6, 7.0 Hz, 1H), 4.50 (t, *J* = 6.3 Hz, 2H), 3.93 (s, 2H), 2.75 (q, *J* = 6.3 Hz, 2H), 2.38 (s, 3H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.3, 162.8, 142.1, 138.6, 138.2, 137.8, 133.2, 130.7, 130.6, 130.2, 129.9, 129.2, 128.5, 127.0, 125.7, 125.5, 124.9, 122.7, 64.3, 37.5, 32.7, 20.2; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{29}H_{24}F_7N_2O_3S$: 613.1390, found: 613.1387.

(*E*)-4-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)but-3-en-1-yl benzofuran-2-carboxylate (5o)

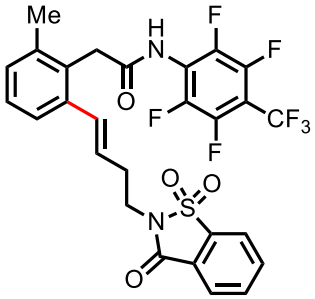


5o

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (30.5 mg, 53% yield). Linear/branched ratio > 20/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ

7.66 (d, *J* = 7.5 Hz, 1H), 7.58 (dd, *J* = 8.4, 0.8 Hz, 1H), 7.52 (d, *J* = 0.9 Hz, 1H), 7.44 (dt, *J* = 8.4, 1.3 Hz, 1H), 7.36 (d, *J* = 7.5 Hz, 1H), 7.30 (d, *J* = 7.6 Hz, 1H), 7.27 (d, *J* = 7.5 Hz, 1H), 7.24 (d, *J* = 7.6 Hz, 1H), 6.86 (s, 1H), 6.80 (d, *J* = 15.5 Hz, 1H), 6.16 (dt, *J* = 15.5, 6.9 Hz, 1H), 4.53 (t, *J* = 6.4 Hz, 2H), 3.93 (s, 2H), 2.76 (q, *J* = 6.4 Hz, 2H), 2.38 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.3, 159.5, 155.7, 145.2, 138.1, 137.8, 130.5, 130.3, 130,0, 129.2, 128.5, 127.7, 126.8, 125.7, 123.8, 122.8, 114.1, 112.3, 64.2, 37.5, 32.769, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{29}H_{24}F_7N_2O_4$: 597.1619, found: 597.1613.

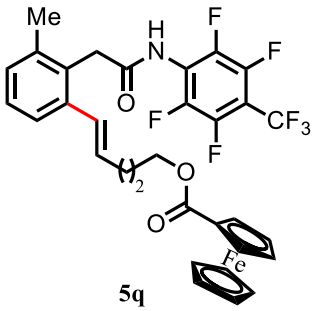
(*E*)-2-(2-(4-(1,1-dioxido-3-oxobenzo[d]isothiazol-2(3H)-yl)but-1-en-1-yl)-6-methyl phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5p)



5p

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 3/1). The desired product was obtained as a white solid (33.5 mg, 56% yield). Linear/branched ratio = 8.7/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.06-8.01 (m, 1H), 7.91-7.80 (m, 3H), 7.34 (d, *J* = 8.0 Hz, 1H), 7.23 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 7.1 Hz, 1H), 6.92 (s, 1H), 6.77 (d, *J* = 15.6 Hz, 1H), 6.12 (dt, *J* = 15.4, 7.1 Hz, 1H), 3.97 (t, *J* = 6.8 Hz, 2H), 3.86 (s, 2H), 2.81 (qd, *J* = 7.0, 1.4 Hz, 2H), 2.36 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.3, 159.0, 137.9, 137.8, 137.5, 134.8, 134.4, 130.5, 130.4, 130.2, 129.3, 128.4, 127.2, 125.7, 125.2, 120.9, 38.8, 37.4, 32.2, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{27}H_{23}F_7N_3O_4S$: 618.1292, found: 618.1288.

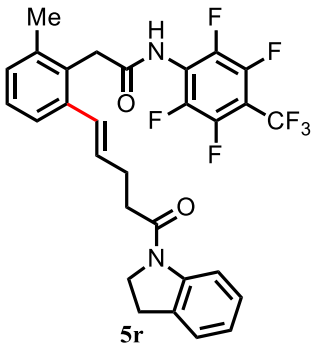
(*E*)-5-(3-methyl-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl)pent-4-en-1-yl ferrocene benzoate (5q)



5q

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a yellow solid (26.5 mg, 41% yield). Linear/branched ratio = 5.6/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.35 (d, *J* = 7.5 Hz, 1H), 7.23 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 7.3 Hz, 1H), 7.12 (s, 1H), 6.70 (d, *J* = 15.5 Hz, 1H), 6.14 (dt, *J* = 15.4, 6.9 Hz, 1H), 4.78 (t, *J* = 1.9 Hz, 2H), 4.39 (t, *J* = 1.9 Hz, 2H), 4.30 (t, *J* = 6.5 Hz, 2H), 4.19 (s, 5H), 3.95 (s, 2H), 2.44-2.37 (m, 2H), 2.40 (s, 3H), 1.96-1.88 (m, 2H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 172.1, 168.5, 138.4, 137.8, 134.2, 129.9, 129.2, 128.3, 128.2, 125.5, 71.4, 71.1, 70.0, 69.7, 63.2, 37.4, 29.5, 28.3, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{32}H_{30}F_7FeN_2O_3$: 679.1489, found: 679.1485.

(*E*)-2-(2-(5-(indolin-1-yl)-5-oxopent-1-en-1-yl)-6-methylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5r)

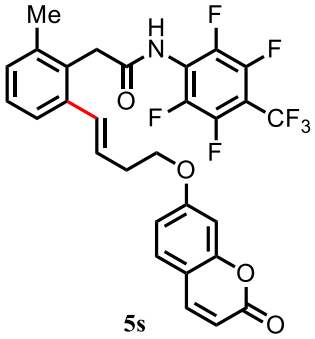


5r

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 2/1). The desired product was obtained as a white solid (20.6 mg, 37% yield). Linear/branched ratio = 9.6/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.97 (s, 1H), 7.89 (d, *J* = 8.0 Hz, 1H), 7.21 (d, *J* = 6.8 Hz, 1H), 7.18-7.10 (m, 3H), 7.03 (t, *J* = 7.7 Hz, 1H), 6.98-6.90 (m, 2H), 6.10-6.00 (m, 1H), 4.02 (t, *J* = 8.3 Hz, 2H), 3.91 (s, 2H), 3.16 (t, *J* = 8.3 Hz, 2H), 2.74-2.63 (m, 4H), 2.50 (s, 3H); **^{13}C NMR**

(100 MHz, $CDCl_3$) δ 171.2, 168.8, 142.1, 138.4, 138.1, 133.8, 130.8, 130.2, 130.2, 130.0, 127.7, 127.1, 125.8, 124.7, 124.0, 116.3, 47.7, 37.3, 34.3, 27.8, 27.7, 20.5; **HRMS (ESI-TOF) $[M+1]^+$** calculated for $C_{29}H_{24}F_7N_2O_2$: 565.1721, found: 565.1713.

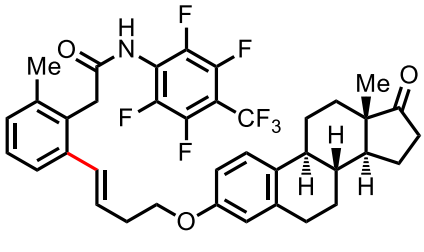
(*E*)-2-(2-methyl-6-(4-((2-oxo-2H-chromen-7-yl)oxy)but-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5s)



5s

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 4/1). The desired product was obtained as a white solid (27.0 mg, 47% yield). Single isomer was obtained; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.59 (d, *J* = 9.6 Hz, 1H), 7.35 (d, *J* = 7.4 Hz, 1H), 7.29 (d, *J* = 9.2 Hz, 1H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.19 (d, *J* = 7.3 Hz, 1H), 6.85 (s, 1H), 6.82-6.71 (m, 3H), 7.23 (d, *J* = 9.9 Hz, 1H), 6.17 (dd, *J* = 15.4, 7.6 Hz, 1H), 4.12 (t, *J* = 6.0 Hz, 2H), 3.93 (s, 2H), 2.75 (dd, *J* = 12.2, 6.0 Hz, 2H), 2.39 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.3, 161.9, 161.1, 155.8, 143.3, 138.2, 137.8, 131.1, 130.3, 130.2, 129.2, 128.6, 128.5, 125.8, 113.2, 112.8, 112.5, 101.2, 67.6, 37.6, 32.9, 20.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{29}H_{24}F_7N_2O_4$: 597.1619, found: 597.1615.

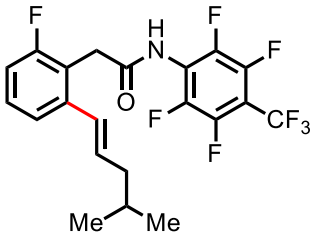
2-(2-methyl-6-((*E*)-4-(((8R,9S,13S,14S)-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthren-3-yl)oxy)but-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (5t)



5t

Substrate **1** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 3/1). The desired product was obtained as a white solid (31.8 mg, 56% yield). Linear/branched ratio = 8.5/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.31 (d, *J* = 7.3 Hz, 1H), 7.24 (s, 1H), 7.21 (d, *J* = 7.5 Hz, 1H), 7.18 (d, *J* = 7.1 Hz, 1H), 7.09 (d, *J* = 8.5 Hz, 1H), 6.87 (d, *J* = 15.5 Hz, 1H), 6.60 (dd, *J* = 8.6, 2.7 Hz, 1H), 6.54 (d, *J* = 2.6 Hz, 1H), 6.24-6.16 (m, 1H), 4.04 (t, *J* = 5.9 Hz, 2H), 3.93 (s, 2H), 2.85-2.79 (m, 2H), 2.72 (dd, *J* = 12.1, 6.0 Hz, 2H), 2.54 (s, 1H), 2.34 (d, *J* = 4.5 Hz, 1H), 2.16 (t, *J* = 8.9 Hz, 2H), 2.12-1.91 (m, 4H), 1.68-1.57 (m, 2H), 1.56-1.35 (m, 6H), 0.90 (s, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 221.0, 168.3, 156.5, 138.3, 137.9, 137.8, 132.5, 132.4, 130.6, 130.2, 129.4, 128.2, 126.2, 125.9, 114.5, 111.6, 66.8, 50.4, 48.0, 43.9, 38.2, 37.6, 35.9, 33.4, 31.5, 29.5, 26.4, 25.7, 21.6, 20.3, 13.7; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{38}H_{40}F_7N_2O_3$: 705.2922, found: 705.2912.

(*E*)-2-(2-fluoro-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7a)

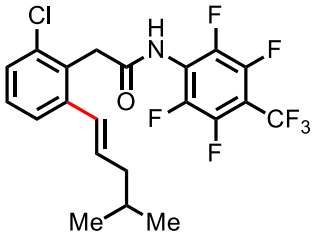


7a

Substrate **6a** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (32.5 mg, 72% yield). Linear/branched ratio = 6.0/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.34 (d, *J* = 8.0 Hz, 1H), 7.30 (d, *J* = 7.2 Hz, 1H), 7.05 (t, *J* = 8.8 Hz, 1H), 6.93 (s, 1H), 6.56 (d, *J* = 15.6 Hz, 1H), 6.22 (dt, *J* = 15.3, 7.7 Hz, 1H), 3.94 (s, 2H), 2.15 (d, *J* = 7.1 Hz, 2H), 1.73 (dt, *J* = 20.7, 7.1 Hz, 1H), 0.94 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.5, 161.2 (d, *J* = 243.6 Hz), 140.4 (d, *J* = 11.2 Hz), 135.9, 129.6 (d, *J* = 9.4 Hz), 126.2 (d, *J* = 30.8 Hz), 122.6 (d, *J* = 29.4 Hz), 117.6 (d, *J* = 15.0 Hz), 113.9 (d, *J* = 22.7 Hz), 42.5, 33.3 (d, *J* = 5.1 Hz), 28.4, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{21}F_8N_2O$: 469.1521, found: 469.1521.

(*E*)-2-(2-chloro-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(triflu

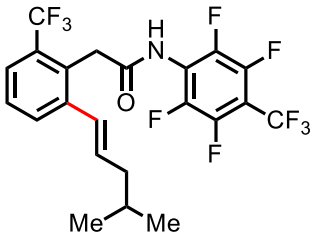
oromethyl)phenyl)acetamide (7b)



7b

Substrate **6b** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (34.8 mg, 74% yield). Linear/branched ratio = 5.5/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.43 (dd, *J* = 7.7, 1.0 Hz, 1H), 7.37 (dd, *J* = 8.0, 1.3 Hz, 1H), 7.27 (t, *J* = 7.6 Hz, 1H), 6.92 (s, 1H), 6.61 (d, *J* = 15.5 Hz, 1H), 6.16 (dt, *J* = 15.3, 7.7 Hz, 1H), 4.09 (s, 2H), 2.14 (td, *J* = 7.1, 1.4 Hz, 2H), 1.73 (dt, *J* = 13.5, 6.8 Hz, 1H), 0.94 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.3, 140.9, 136.1, 135.2, 129.4, 128.4, 128.4, 127.2, 126.0, 42.5, 38.1, 28.4, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{21}ClF_7N_2O$: 485.1225, found: 485.1225.

(*E*)-2-(2-(4-methylpent-1-en-1-yl)-6-(trifluoromethyl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7c)

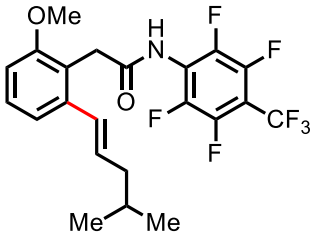


7c

Substrate **6c** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (34.7 mg, 69% yield). Linear/branched ratio = 6.3/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.71 (d, *J* = 8.1, Hz, 1H), 7.64 (d, *J* = 7.7, 1H), 7.44 (t, *J* = 7.9 Hz, 1H), 6.72 (s, 1H), 6.59 (d, *J* = 15.7 Hz, 1H), 6.20 (dt, *J* = 14.9, 7.3 Hz, 1H), 4.07 (s, 2H), 2.15 (t, *J* = 6.8 Hz, 2H), 1.74 (dt, *J* = 13.1, 6.5 Hz, 1H), 0.94 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.3, 141.2, 140.8, 136.8, 131.1, 128.5, 128.1, 126.5, 125.1 (q, *J* =

5.8 Hz), 124.4 (d, *J* = 235.9 Hz), 42.5, 37.1, 28.4, 22.3; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{22}H_{21}F_{10}N_2O$: 519.1489, found: 519.1487.

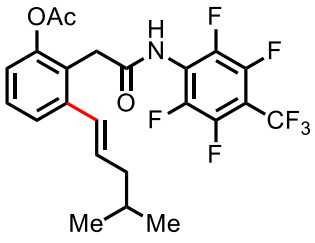
(*E*)-2-(2-methoxy-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7d)



7d

Substrate **6d** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired product was obtained as a white solid (30.6 mg, 66% yield). Linear/branched ratio = 5.8/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.66 (s, 1H), 7.27 (t, *J* = 7.8 Hz, 1H), 7.14 (d, *J* = 7.8 Hz, 1H), 6.87 (d, *J* = 8.2 Hz, 1H), 6.69 (d, *J* = 15.4 Hz, 1H), 6.14 (dt, *J* = 15.2, 7.8 Hz, 1H), 3.94 (s, 3H), 3.91 (s, 2H), 2.14 (t, *J* = 7.1 Hz, 2H), 1.73 (dt, *J* = 13.1, 6.5 Hz, 1H), 0.94 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 168.9, 156.9, 139.9, 134.8, 131.1, 128.8, 127.5, 119.8, 119.2, 109.0, 55.8, 42.5, 34.6, 28.5, 22.3; **HRMS (ESI-TOF) [M+1]$^+$** calculated for $C_{22}H_{21}F_7NO_2$: 464.1455, found: 464.1453.

(*E*)-3-(4-methylpent-1-en-1-yl)-2-(2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl)phenyl acetate (7e)

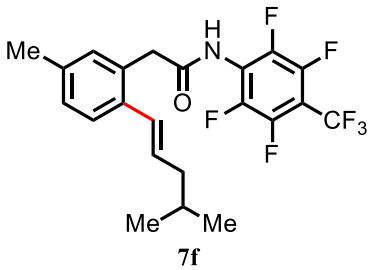


7e

Substrate **6e** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 9/1 to 5/1). The desired product was obtained as a white solid (28.1 mg, 57% yield). Linear/branched ratio = 4.6/1; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.45 (d, *J* = 7.7 Hz, 1H), 7.37 (s, 1H), 7.35 (t, *J* = 7.9 Hz, 1H), 7.00 (d, *J* = 8.0 Hz, 1H), 6.55 (d, *J* = 15.4, 1H), 6.22 (dt, *J* = 15.2, 7.7 Hz, 1H), 3.80 (s, 2H), 2.40 (s, 2H),

2.15 (td, *J* = 7.3, 1.2 Hz, 2H), 1.74 (dt, *J* = 13.2, 6.7 Hz, 1H), 0.94 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 171.0, 168.2, 149.4, 140.5, 135.7, 129.3, 126.4, 124.8, 123.1, 121.1, 42.5, 35.1, 28.4, 22.2, 20.8; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{23}H_{24}F_7N_2O_3$: 509.1670, found: 509.1663.

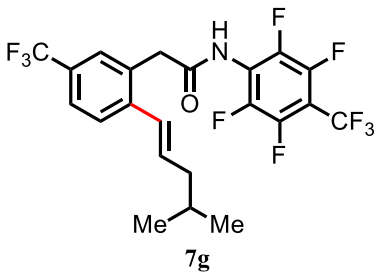
(*E*)-2-(5-methyl-2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7f)



7f

Substrate **6f** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (28.7 mg, 64% yield). Linear/branched ratio = 4.8/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.45 (d, *J* = 7.9 Hz, 1H), 7.15 (d, *J* = 8.4 Hz, 1H), 7.10 (s, 1H), 6.81 (s, 1H), 6.49 (d, *J* = 15.5 Hz, 1H), 6.16 (dt, *J* = 15.4, 7.8 Hz, 1H), 3.85 (s, 2H), 2.36 (s, 3H), 2.11 (td, *J* = 7.2, 1.3 Hz, 2H), 1.71 (dt, *J* = 13.4, 6.7 Hz, 1H), 0.92 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.7, 137.8, 135.1, 133.7, 131.6, 129.9, 129.6, 127.0, 126.6, 42.5, 41.7, 28.5, 22.3, 21.0; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{24}F_7N_2O$: 465.1771, found: 465.1770.

(*E*)-2-(2-(4-methylpent-1-en-1-yl)-5-(trifluoromethyl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7g)

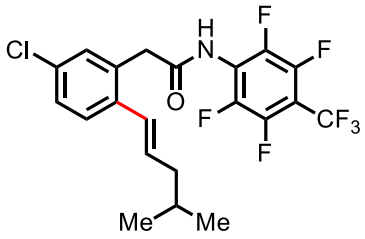


7g

Substrate **6g** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (24.1 mg, 48% yield). Linear/branched ratio = 4.7/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ

7.65 (d, *J* = 8.2 Hz, 1H), 7.58 (d, *J* = 8.2 Hz, 1H), 7.55 (s, 1H), 6.80 (s, 1H), 6.55 (d, *J* = 15.4 Hz, 1H), 6.31 (dt, *J* = 15.5, 7.8 Hz, 1H), 3.94 (s, 2H), 2.16 (s, 3H), 2.16 (td, *J* = 7.2, 1.1 Hz, 2H), 1.74 (dt, *J* = 13.3, 6.6 Hz, 1H), 0.94 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.6, 143.1, 141.6, 137.1, 130.6, 129.8, 127.6 (q, *J* = 4.2 Hz), 127.4, 126.0, 125.5 (q, *J* = 3.7 Hz), 42.6, 41.5, 28.4, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{21}F_{10}N_2O$: 519.1489, found: 519.1488.

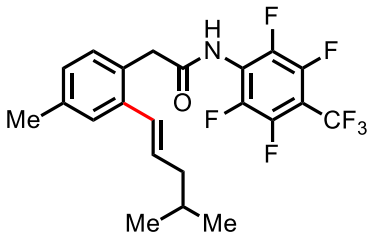
(*E*)-2-(5-chloro-2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7h)



7h

Substrate **6h** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired product was obtained as a white solid (29.9 mg, 64% yield). Linear/branched ratio = 4.9/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.48 (d, *J* = 8.2 Hz, 1H), 7.31 (dd, *J* = 11.2, 2.1 Hz, 1H), 7.30 (s, 1H), 6.77 (s, 1H), 6.47 (d, *J* = 15.5 Hz, 1H), 6.20 (dt, *J* = 15.5, 8.0 Hz, 1H), 3.85 (s, 2H), 2.12 (td, *J* = 7.2, 1.3 Hz, 2H), 1.72 (dt, *J* = 13.3, 6.7 Hz, 1H), 0.93 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.7, 136.6, 135.3, 133.3, 131.7, 130.7, 128.9, 128.4, 125.9, 42.5, 41.4, 28.4, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{21}ClF_7N_2O$: 485.1225, found: 485.1225.

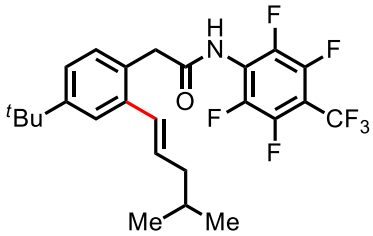
(*E*)-2-(4-methyl-2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7i)



7i

Substrate **6i** was olefinated by two paralleled runs following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid. (54.1 mg, 74% yield). Mono/di = 2.9/1, for mono: linear/branched ratio = 3.0/1. The spectra of diolefinated product is very messy and is not given; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.36 (s, 1H), 7.18 (d, *J* = 7.7 Hz, 1H), 7.10 (d, *J* = 7.7 Hz, 1H), 6.80 (s, 1H), 6.51 (d, *J* = 15.5 Hz, 1H), 6.19 (dt, *J* = 15.5, 7.8 Hz, 1H), 3.85 (s, 2H), 2.12 (td, *J* = 7.2, 1.3 Hz, 2H), 1.72 (dt, *J* = 12.9, 6.4 Hz, 1H), 0.93 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.9, 138.6, 137.8, 134.3, 130.9, 128.7, 127.7, 127.2, 126.9, 42.6, 41.3, 28.5, 22.3, 21.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{24}F_7N_2O$: 465.1771, found: 465.1768.

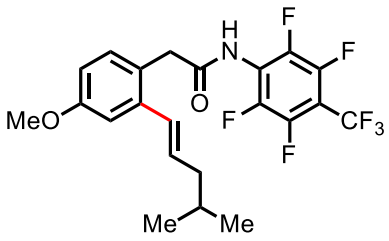
(*E*)-2-(4-(tert-butyl)-2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7j)



7j

Substrate **6j** was olefinated by two paralleled runs following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (61.6 mg, 71% yield). Mono/di = 2.7/1, for mono: linear/branched ratio = 4.6/1. The spectra of diolefinated product is very messy and is not given; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.53 (s, 1H), 7.31 (d, *J* = 8.0 Hz, 1H), 7.21 (d, *J* = 7.9 Hz, 1H), 6.79 (s, 1H), 6.53 (d, *J* = 15.4 Hz, 1H), 6.17 (dt, *J* = 15.5, 7.9 Hz, 1H), 3.85 (s, 2H), 2.13 (t, *J* = 7.0 Hz, 2H), 1.73 (dt, *J* = 13.4, 6.8 Hz, 1H), 1.34 (s, 9H), 0.93 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.9, 151.8, 137.5, 134.1, 130.7, 127.5, 127.2, 125.1, 124.0, 42.6, 41.3, 34.7, 31.3, 28.5, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{25}H_{30}F_7N_2O$: 507.2241, found: 507.2232.

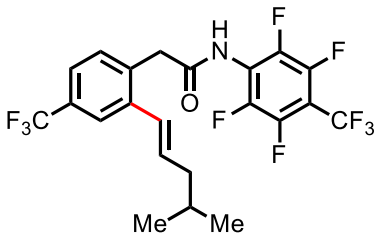
(*E*)-2-(4-methoxy-2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7k)



7k

Substrate **6k** was olefinated by two paralleled runs following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired olefination product was obtained as a white solid (63.9 mg, 67% yield). Mono/di = 3.2/1, for mono: linear/branched ratio = 4.0/1. The spectra of diolefinated product is very messy and is not given; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.21 (d, *J* = 8.4 Hz, 1H), 7.07 (d, *J* = 2.5 Hz, 1H), 6.84 (dd, *J* = 8.4, 2.6 Hz, 1H), 6.79 (s, 1H), 6.49 (d, *J* = 15.6 Hz, 1H), 6.20 (dt, *J* = 15.5, 8.4 Hz, 1H), 3.85 (s, 3H), 3.83 (s, 2H), 2.12 (td, *J* = 7.1, 1.3 Hz, 2H), 1.72 (dt, *J* = 13.3, 6.6 Hz, 1H), 1.34 (s, 9H), 0.93 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, CDCl$_3$)** δ 169.1, 159.8, 139.3, 134.7, 132.1, 126.9, 122.4, 113.3, 112.4, 55.3, 42.5, 40.9, 28.4, 22.3; **HRMS (ESI-TOF) [M+NH$_4$]$^+$** calculated for $C_{22}H_{24}F_7N_2O_2$: 481.1721, found: 481.1716.

(*E*)-2-(2-(4-methylpent-1-en-1-yl)-4-(trifluoromethyl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7l)

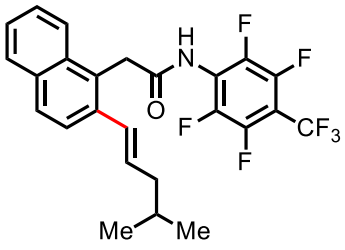


7l

Substrate **6l** was olefinated by two paralleled runs following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (64.1 mg, 62% yield). Mono/di = 5.2/1, for mono: linear/branched ratio = 5.2/1. The spectra of diolefinated product is very messy and is not given; **^{1}H NMR (400 MHz, CDCl$_3$)** δ 7.77 (s, 1H), 7.53 (d, *J* = 7.9 Hz, 1H), 7.42 (d, *J* = 8.0 Hz, 1H), 6.74 (s, 1H), 6.56 (d, *J* = 15.5 Hz, 1H), 6.28 (dt, *J* = 15.5, 8.4 Hz, 1H), 3.94 (s, 2H), 2.16 (td, *J* = 7.1, 0.9 Hz, 2H), 1.76 (dt, *J* = 13.6, 6.7 Hz, 1H), 0.95

(d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.5, 138.8, 136.6, 133.8, 131.3, 131.2, 130.9, 125.9, 124.3 (q, *J* = 3.7 Hz), 123.9 (q, *J* = 3.8 Hz), 42.6, 41.4, 28.4, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{22}H_{21}F_{10}N_2O$: 519.1489, found: 519.1488.

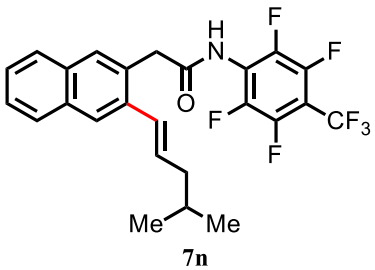
(*E*)-2-(2-(4-methylpent-1-en-1-yl)naphthalen-1-yl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7m)



7m

Substrate **6m** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (32.7 mg, 68% yield). Linear/branched ratio = 5.9/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 8.01 (s, 1H), 7.89-7.82 (m, 2H), 7.67 (d, *J* = 8.6 Hz, 1H), 7.60 (t, *J* = 8.4 Hz, 1H), 7.51 (t, *J* = 7.4 Hz, 1H), 6.84 (d, *J* = 15.4 Hz, 1H), 6.77 (s, 1H), 6.33 (dt, *J* = 15.4, 7.3 Hz, 1H), 4.37 (s, 2H), 2.23 (td, *J* = 7.2, 1.3 Hz, 2H), 1.80 (dt, *J* = 13.2, 6.6 Hz, 1H), 0.98 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.7, 136.1, 136.0, 133.0, 132.3, 129.1, 128.8, 127.7, 127.6, 126.1, 125.1, 124.9, 123.3, 42.8, 36.7, 28.5, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{25}H_{24}F_7N_2O$: 501.1771, found: 501.1769.

(*E*)-2-(3-(4-methylpent-1-en-1-yl)naphthalen-2-yl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7n)

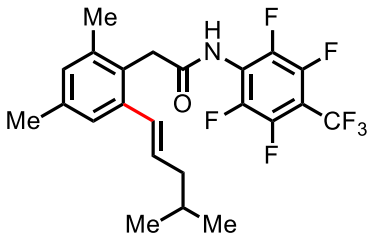


7n

Substrate **6n** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a

white solid (28.0 mg, 58% yield). Linear/branched ratio = 4.9/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.98 (s, 1H), 7.86-7.81 (m, 3H), 7.79 (s, 1H), 7.53-7.48 (m, 2H), 6.83 (s, 1H), 6.63 (d, *J* = 15.4 Hz, 1H), 6.32 (dt, *J* = 15.0, 7.3 Hz, 1H), 4.04 (s, 2H), 2.17 (td, *J* = 7.2, 1.2 Hz, 2H), 1.77 (dt, *J* = 13.4, 6.8 Hz, 1H), 0.96 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.6, 135.9, 135.1, 133.4, 132.6, 130.0, 129.1, 127.7, 127.3, 127.0, 126.8, 126.4, 126.0, 42.6, 42.2, 28.5, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{25}H_{24}F_7N_2O$: 501.1771, found: 501.1768.

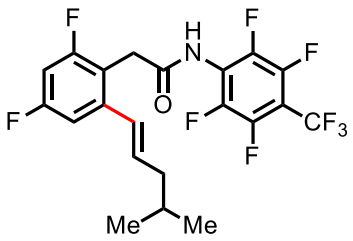
(*E*)-2-(2,4-dimethyl-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7o)



7o

Substrate **6o** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (33.8 mg, 73% yield). Linear/branched ratio = 4.1/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.18 (s, 1H), 7.00 (s, 1H), 6.79 (s, 1H), 7.56 (d, *J* = 15.4 Hz, 1H), 6.12 (dt, *J* = 15.4, 7.6 Hz, 1H), 3.88 (s, 2H), 2.34 (s, 3H), 2.33 (s, 3H), 2.13 (td, *J* = 7.2, 1.3 Hz, 2H), 1.73 (dt, *J* = 13.4, 6.7 Hz, 1H), 0.94 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.8, 138.6, 138.2, 137.5, 134.7, 130.7, 127.9, 126.1, 126.0, 42.6, 37.2, 28.5, 22.3, 21.1, 20.1; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{23}H_{26}F_7N_2O$: 479.1928, found: 479.1924.

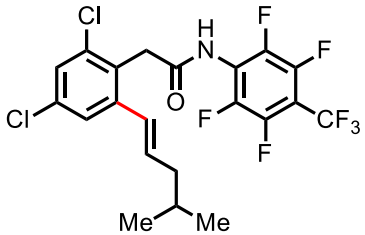
(*E*)-2-(2,4-difluoro-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7p)



7p

Substrate **6p** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (27.8 mg, 59% yield). Linear/branched ratio = 3.8/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.08-7.04 (m, 1H), 6.92 (s, 1H), 6.82-6.76 (m, 1H), 6.54 (dd, *J* = 15.5, 1.2 Hz, 1H), 6.23 (dt, *J* = 15.4, 7.2 Hz, 1H), 3.88 (d, *J* = 1.7 Hz, 2H), 2.14 (td, *J* = 7.1, 1.4 Hz, 2H), 1.80-1.68 (m, 1H), 0.94 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 167.3, 162.5 (dd, *J* = 247.4, 13.9 Hz), 161.3 (dd, *J* = 245.3, 13.0 Hz), 141.6 (dd, *J* = 10.3, 5.7 Hz), 136.9, 125.6, 113.7 (dd, *J* = 15.2, 3.7 Hz), 109. 4 (dd, *J* = 21.8, 3.2 Hz), 102.4 (t, *J* = 26.5 Hz), 42.4, 32.8 (d, *J* = 4.0 Hz), 28.3, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{20}F_9N_2O$: 487.1426, found: 487.1421.

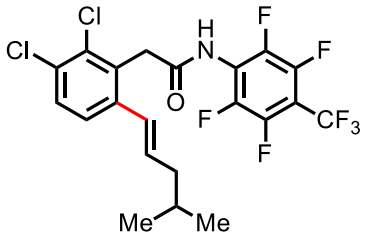
(*E*)-2-(2,4-dichloro-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7q)



7q

Substrate **6q** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired olefination product was obtained as a white solid (34.2 mg, 68% yield). Linear/branched ratio = 5.3/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.40 (d, *J* = 2.1 Hz, 1H), 7.38 (d, *J* = 2.1 Hz, 1H), 6.92 (s, 1H), 6.56 (d, *J* = 15.5 Hz, 1H), 6.18 (dt, *J* = 15.3, 7.4 Hz, 1H), 4.03 (s, 2H), 2.14 (td, *J* = 7.1, 1.4 Hz, 2H), 1.75 (dt, *J* = 13.5, 6.7 Hz, 1H), 0.94 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 166.9, 142.0, 137.4, 135.8, 134.6, 127.9, 127.0, 126.3, 126.0, 42.5, 37.6, 28.4, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{20}Cl_2F_7N_2O$: 519.0835, found: 519.0834.

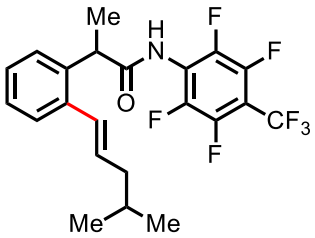
(*E*)-2-(2,3-dichloro-6-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (7r)



7r

Substrate **6r** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired olefination product was obtained as a white solid (41.8 mg, 83% yield). Linear/branched ratio = 4.6/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.43 (d, *J* = 8.5 Hz, 1H), 7.36 (d, *J* = 8.5 Hz, 1H), 6.92 (s, 1H), 6.56 (d, *J* = 15.4 Hz, 1H), 6.15 (dt, *J* = 15.4, 7.6 Hz, 1H), 4.12 (s, 2H), 2.14 (td, *J* = 7.2, 1.2 Hz, 2H), 1.73 (dt, *J* = 13.6, 6.6 Hz, 1H), 0.94 (d, *J* = 6.7 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 166.8, 139.1, 136.6, 133.4, 132.0, 130.4, 130.0, 126.7, 126.3, 42.5, 38.9, 28.438, 22.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{20}Cl_2F_7N_2O$: 519.0835, found: 519.0832.

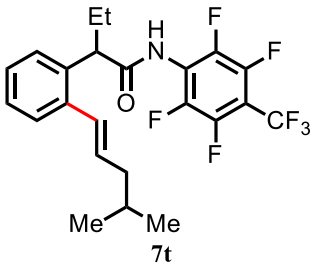
(*E*)-2-(2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)propanamide (7s)



7s

Substrate **6s** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (28.2 mg, 63% yield). Linear/branched ratio = 4.9/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.52-7.47 (m, 1H), 7.34-7.28 (m, 3H), 6.73 (s, 1H), 6.63 (d, *J* = 15.5 Hz, 1H), 6.15 (dt, *J* = 15.4, 7.6 Hz, 1H), 4.13 (q, *J* = 7.1 Hz, 1H), 2.14 (t, *J* = 7.0 Hz, 2H), 1.74 (dt, *J* = 13.3, 6.7 Hz, 1H), 1.62 (d, *J* = 7.1 Hz, 3H), 0.95 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 172.2, 137.5, 136.3, 134.8, 128.2, 128.1, 127.5, 127.3, 127.3, 43.6, 42.6, 28.5, 22.3, 22.3, 17.4; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{21}H_{24}F_7N_2O$: 465.1771, found: 465.1770.

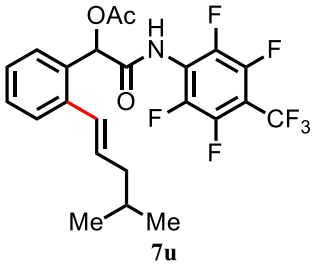
(*E*)-2-(2-(4-methylpent-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)butanamide (7t)



7t

Substrate **6t** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (25.8 mg, 56% yield). Linear/branched ratio = 5.3/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.50-7.47 (m, 1H), 7.32-7.28 (m, 3H), 6.75 (s, 1H), 6.65 (d, *J* = 15.6 Hz, 1H), 6.13 (dt, *J* = 15.4, 7.6 Hz, 1H), 3.89 (dd, *J* = 7.9, 6.8 Hz, 1H), 2.33 (dt, *J* = 14.1, 7.2 Hz, 1H), 2.15 (d, *J* = 7.0 Hz, 2H), 1.97-1.86 (m, 1H), 1.74 (dt, *J* = 13.4, 6.7 Hz, 1H), 0.950 (t, *J* = 7.4 Hz, 3H), 0.949 (d, *J* = 6.6 Hz, 6H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 171.5, 137.9, 135.0, 134.8, 128.1, 128.0, 127.6, 127.6, 127.5, 50.7, 42.6, 28.5, 25.1, 22.4, 22.3, 12.2; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{23}H_{26}F_7N_2O$: 479.1928, found: 479.1925.

(*E*)-1-(2-(4-methylpent-1-en-1-yl)phenyl)-2-oxo-2-((2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)amino)ethyl acetate (7u)

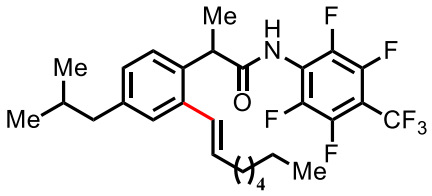


7u

Substrate **6u** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired olefination product was obtained as a white solid (30.5 mg, 62% yield). Linear/branched ratio = 5.2/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.50 (d, *J* = 6.6 Hz, 1H), 7.46 (dd, *J* = 7.6, 1.4 Hz, 1H), 7.41-7.35 (m, 1H), 7.33-7.28 (m, 1H), 6.75 (d, *J* = 15.5 Hz, 1H), 6.58 (s, 1H), 6.18 (dt, *J* = 15.4, 7.8 Hz, 1H), 2.23 (s, 3H), 2.15 (td, *J* = 7.1, 1.4 Hz, 2H), 1.74 (dt, *J* = 13.3, 6.7 Hz, 1H), 0.95 (d, *J* = 6.7 Hz, 3H), 0.94 (d, *J* = 6.7 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 169.4,

166.4, 138.1, 135.5, 130.7, 129.9, 128.3, 127.6, 127.6, 127.0, 72.7, 42.5, 29.7, 28.5, 22.3, 22.3, 20.8; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{23}H_{24}F_7N_2O_3$: 509.1670, found: 509.1663.

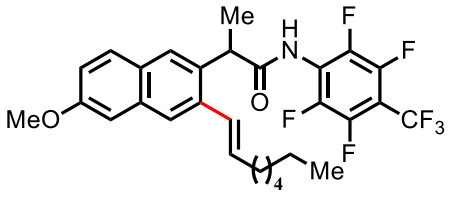
(*E*)-2-(4-isobutyl-2-(oct-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)propanamide (9a)



9a

Substrate **8a** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 9/1). The desired olefination product was obtained as a white solid (37.2 mg, 70% yield). Linear/branched ratio = 2.5/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.26 (s, 1H), 7.22 (d, *J* = 7.9 Hz, 1H), 7.08 (d, *J* = 7.9 Hz, 1H), 6.76 (s, 1H), 6.61 (d, *J* = 15.4 Hz, 1H), 6.14 (dt, *J* = 15.4, 7.8 Hz, 1H), 4.09 (q, *J* = 6.9 Hz, 1H), 2.48 (d, *J* = 7.2 Hz, 2H), 2.23 (dd, *J* = 14.6, 7.2 Hz, 2H), 1.88 (dt, *J* = 13.6, 6.7 Hz, 1H), 1.61 (d, *J* = 7.1 Hz, 3H), 1.49-1.42 (m, 2H), 1.35-1.27 (m, 6H), 0.92 (d, *J* = 6.7 Hz, 6H), 0.88 (t, *J* = 6.8 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 172.4, 141.8, 137.2, 135.7, 133.6, 128.9, 128.1, 127.0, 126.4, 43.0, 43.4, 33.4, 31.7, 30.1, 29.3, 28.9, 22.6, 22.4, 17.3, 14.0; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{28}H_{36}F_7N_2O$: 549.2710, found: 549.2707.

(*E*)-2-(6-methoxy-3-(oct-1-en-1-yl)naphthalen-2-yl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)propanamide (9b)

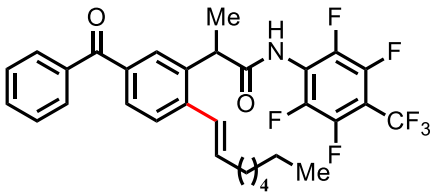


9b

Substrate **8b** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired olefination product was obtained as a white solid (35.1 mg, 63% yield). Linear/branched ratio = 2.9/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.83 (s, 1H), 7.72 (s, 1H), 7.71 (d, *J* = 7.9 Hz, 1H), 7.14 (d, *J* = 7.6 Hz, 1H),

7.13 (s, 1H), 6.77 (s, 1H), 6.70 (d, *J* = 15.3 Hz, 1H), 6.26 (dt, *J* = 15.4, 7.8 Hz, 1H), 4.19 (q, *J* = 7.2 Hz, 1H), 3.93 (s, 3H), 2.27 (q, *J* = 7.0 Hz, 2H), 1.73 (d, *J* = 7.1 Hz, 3H), 1.49-1.45 (m, 2H), 1.39-1.25 (m, 6H), 0.88 (t, *J* = 6.4 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 172.4, 158.3, 136.4, 136.4, 134.3, 132.6, 129.1, 128.3, 126.6, 126.4, 125.3, 119.2, 105.4, 55.4, 44.3, 33.4, 31.7, 29.3, 29.0, 22.6, 17.6, 14.1; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{29}H_{32}F_7N_2O_2$: 573.2347, found: 573.2342.

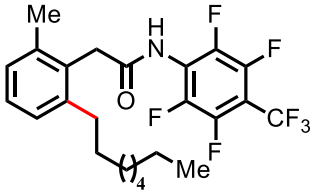
(*E*)-2-(5-benzoyl-2-(oct-1-en-1-yl)phenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)propanamide (9c)



9c

Substrate **8c** was olefinated following the general olefination procedure (eluent: hexane/ethyl acetate = 19/1 to 5/1). The desired olefination product was obtained as a white solid (32.4 mg, 56% yield). Linear/branched ratio = 3.8/1; **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.82 (s, 1H), 7.78 (d, *J* = 7.1 Hz, 2H), 7.72 (dd, *J* = 8.1, 1.5 Hz, 1H), 7.63-7.58 (m, 2H), 7.49 (t, *J* = 7.6 Hz, 2H), 6.83 (s, 1H), 6.68 (d, *J* = 15.4 Hz, 1H), 6.33 (dt, *J* = 15.4, 7.7 Hz, 1H), 4.17 (q, *J* = 7.3 Hz, 1H), 2.28 (q, *J* = 7.1 Hz, 2H), 1.66 (d, *J* = 7.1 Hz, 3H), 1.50-1.43 (m, 2H), 1.37-1.29 (m, 6H), 0.89 (t, *J* = 6.6 Hz, 3H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 195.8, 171.5, 141.7, 138.5, 137.4, 136.8, 136.4, 132.6, 120.0, 129.9, 129.4, 128.4, 127.2, 125.6, 44.1, 33.5, 31.7, 29.1, 28.9, 22.6, 17.4, 14.0; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{31}H_{32}F_7N_2O_2$: 597.2347, found: 597.2343.

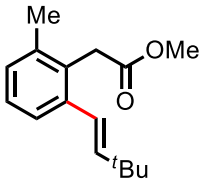
2-(2-Methyl-6-octylphenyl)-*N*-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)acetamide (10)



10

To two paralleled oven-dried round-bottom flask (50 mL) was added Pd/C (10 wt. % loading on carbon, 5.0 mg), amide **3a** (33.3 mg, 0.07 mmol) and EtOAc (2 mL). The reaction flask was evacuated and refilled with H_2 (3 times, balloon). After stirring at room temperature for 24 hours, the reaction mixture was filtered through a small pad of Celite. The solvent was removed under reduced pressure and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (9/1) to give the desired product as colorless oil (66.4 mg, 99%,); **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.22 (d, *J* = 7.5 Hz, 1H), 7.18-7.12 (m, 2H), 6.74 (s, 1H), 3.89 (s, 2H), 2.65 (t, *J* = 7.8 Hz, 1H), 2.38 (s, 3H), 1.63-1.56 (m, 2H), 1.39-1.35 (m, 2H), 1.32-1.22 (m, 8H), 0.88 (t, *J* = 6.7 Hz, 1H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 168.9, 142.3, 137.8, 129.9, 129.0, 128.4, 128.2, 37.2, 33.8, 31.8, 31.2, 29.7, 29.4, 29.2, 22.6, 20.2, 14.1; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{24}H_{30}F_7N_2O$: 495.2241, found: 495.2238.

(*E*)-methyl 2-(2-(3,3-dimethylbut-1-en-1-yl)-6-methylphenyl)acetate (11)



11

To a solution of **3i** (35.8 mg, 0.08 mmol) in MeOH (4 mL), BF_3•Et_2O (68.1 mg, 0.48 mmol) was added *via* syringe. The mixture was heated to 110 °C for 24 hours. After cooling to room temperature, triethylamine (101.0 mg, 1.0 mmol) was added *via* syringe. The reaction mixture was filtered through a small pad of Celite. The solvent was removed under reduced pressure and the residue was purified by flash chromatography on silica gel using an eluent of hexane/EtOAc (19/1) to give the desired product as colorless oil (20.4 mg, 83%,); **^{1}H NMR (400 MHz, $CDCl_3$)** δ 7.25 (d, *J* = 7.1 Hz, 1H), 7.13 (t, *J* = 7.6 Hz, 1H), 7.07 (d, *J* = 7.5 Hz, 1H), 6.54 (d, *J* = 15.8 Hz, 1H), 6.03 (d, *J* = 15.9 Hz, 1H), 3.73 (s, 2H), 3.67 (s, 3H), 2.34 (s, 3H), 1.12 (s, 9H); **^{13}C NMR (100 MHz, $CDCl_3$)** δ 171.9, 145.2, 138.8, 137.1, 130.2, 128.9, 127.2,

124.5, 122.8, 51.9, 35.2, 33.6, 29.6, 20.3; **HRMS (ESI-TOF) $[M+NH_4]^+$** calculated for $C_{16}H_{26}NO_2$: 264.1958, found: 264.1955.

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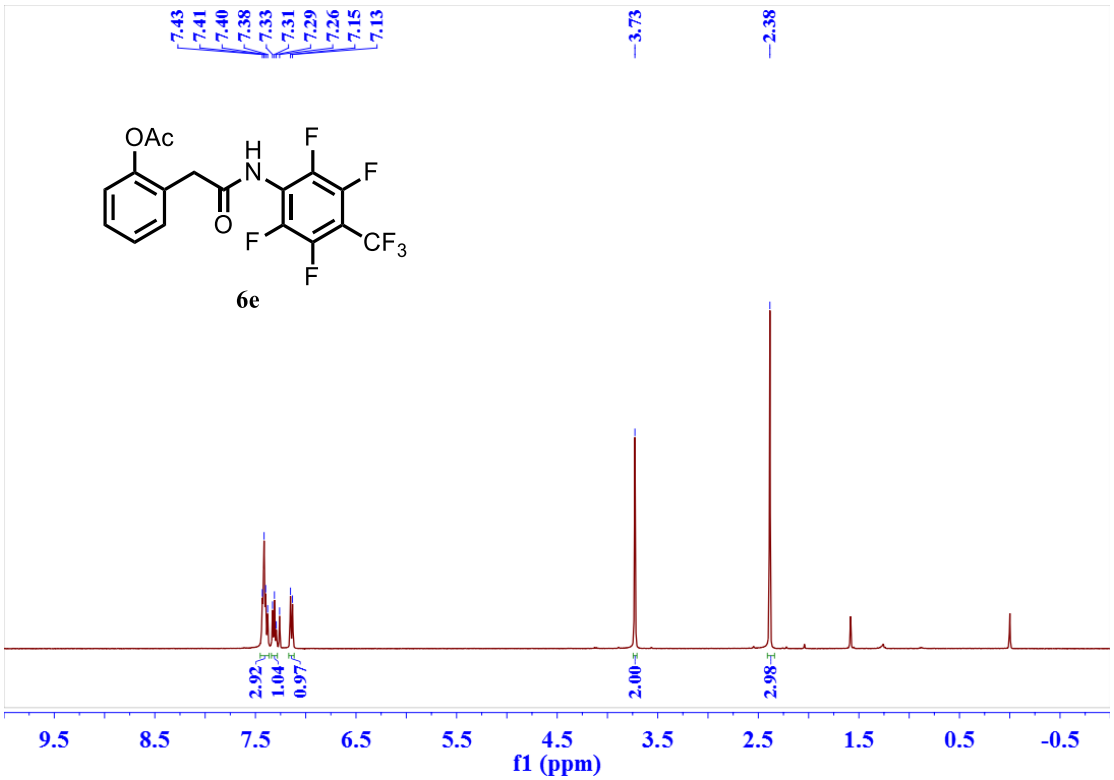
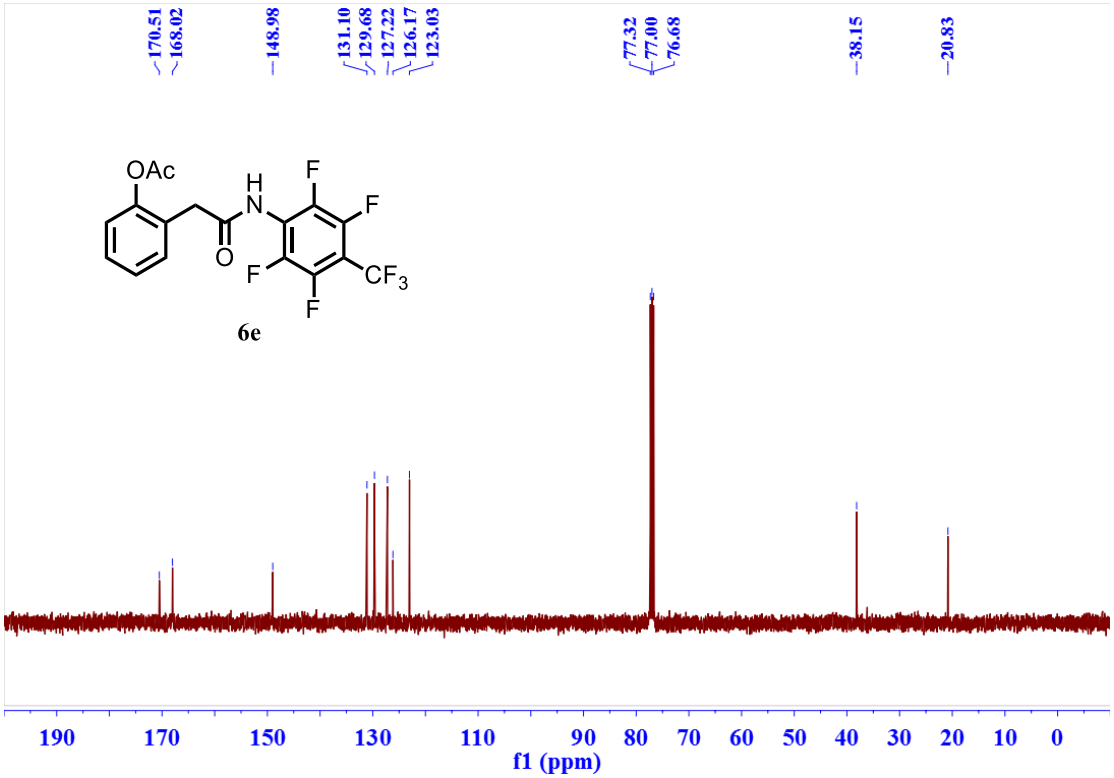
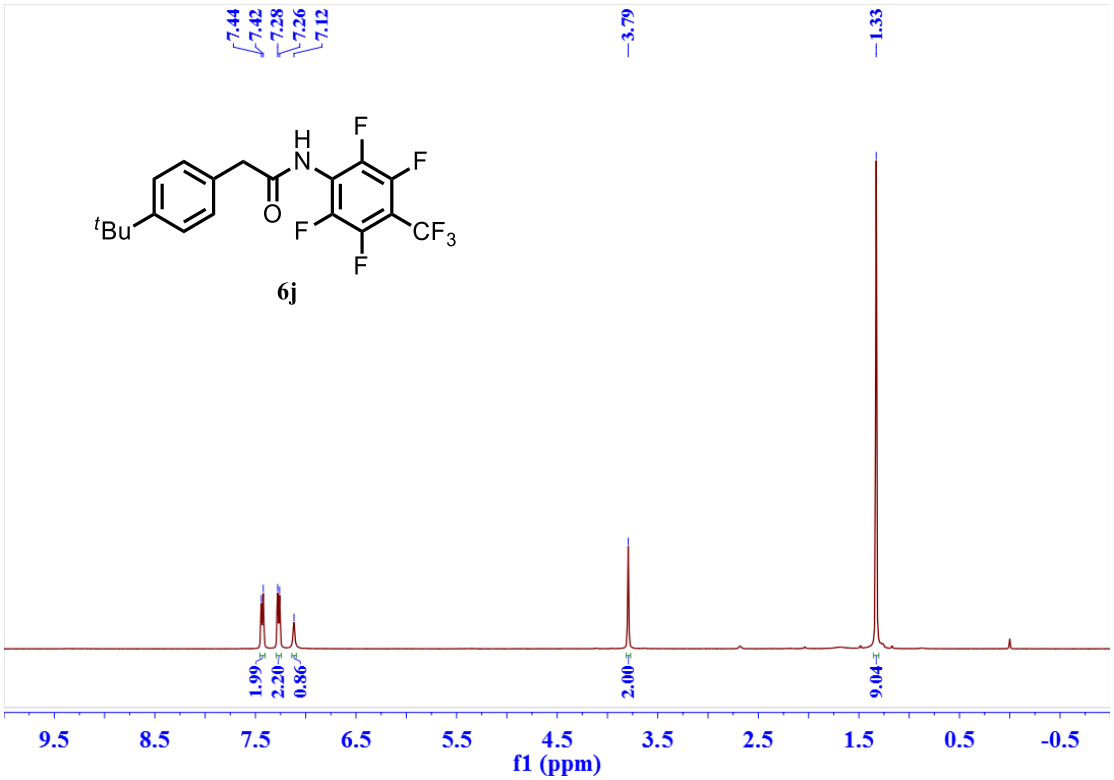
6. ^{1}H and ^{13}C NMR Spectra of Products



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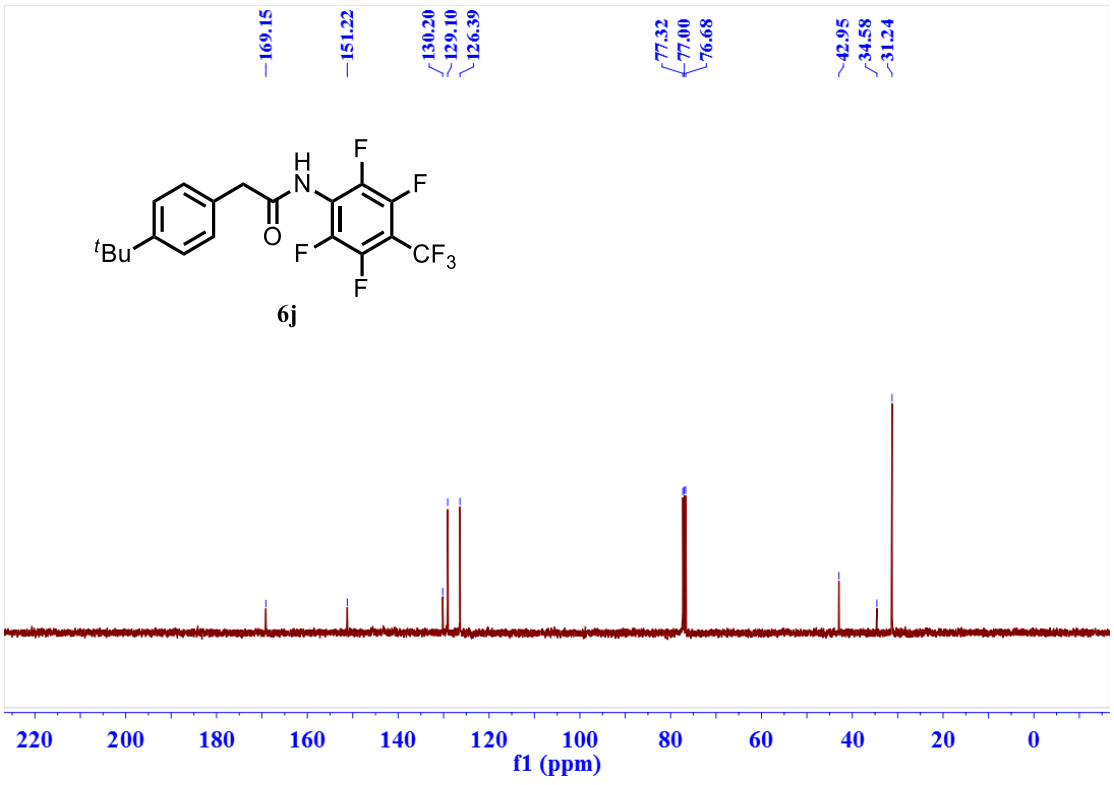
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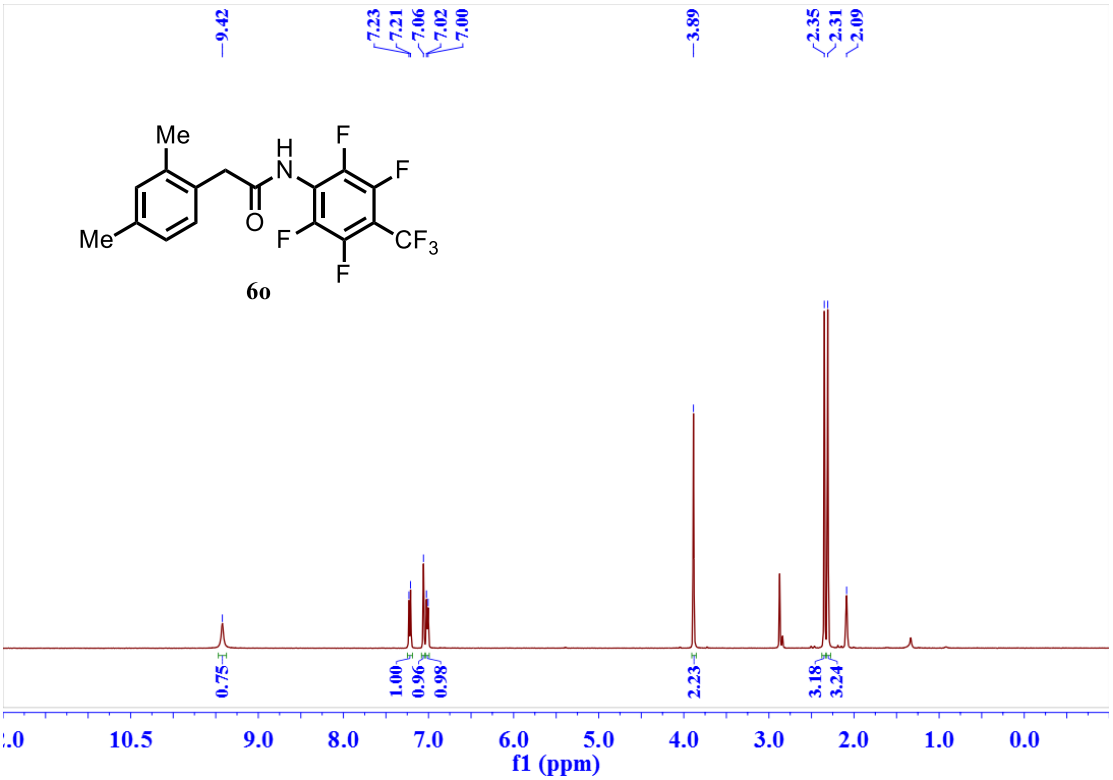
6j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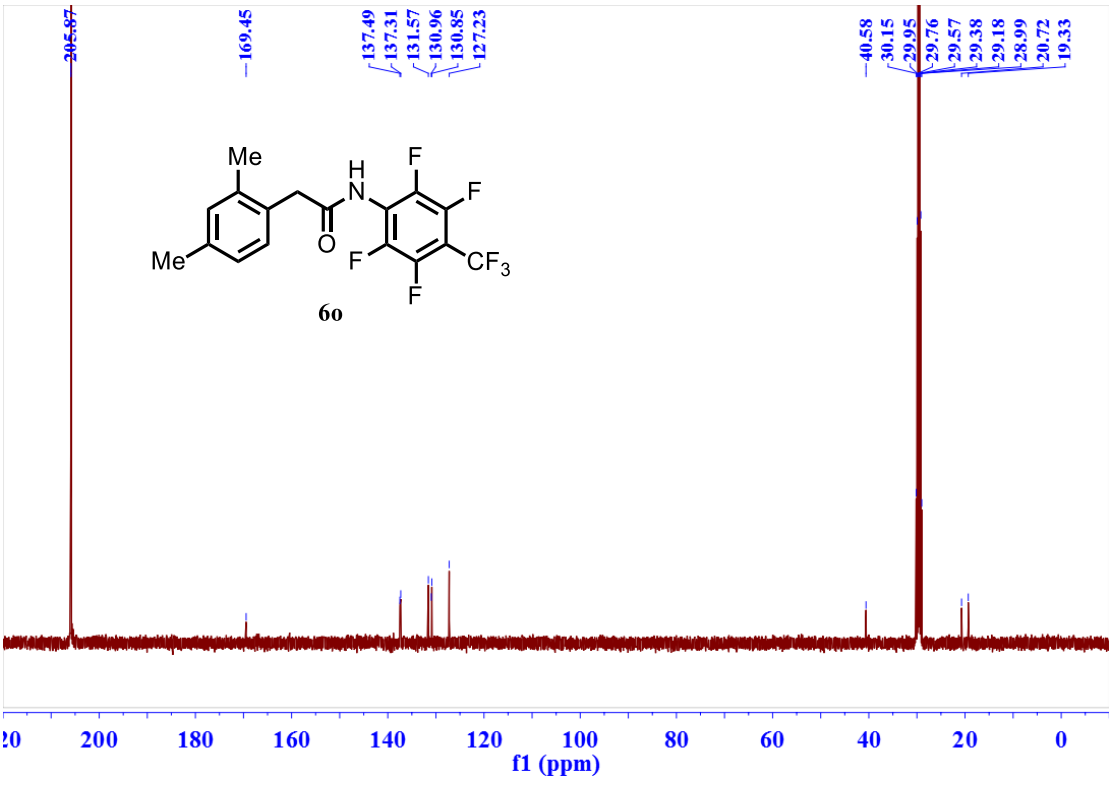
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F
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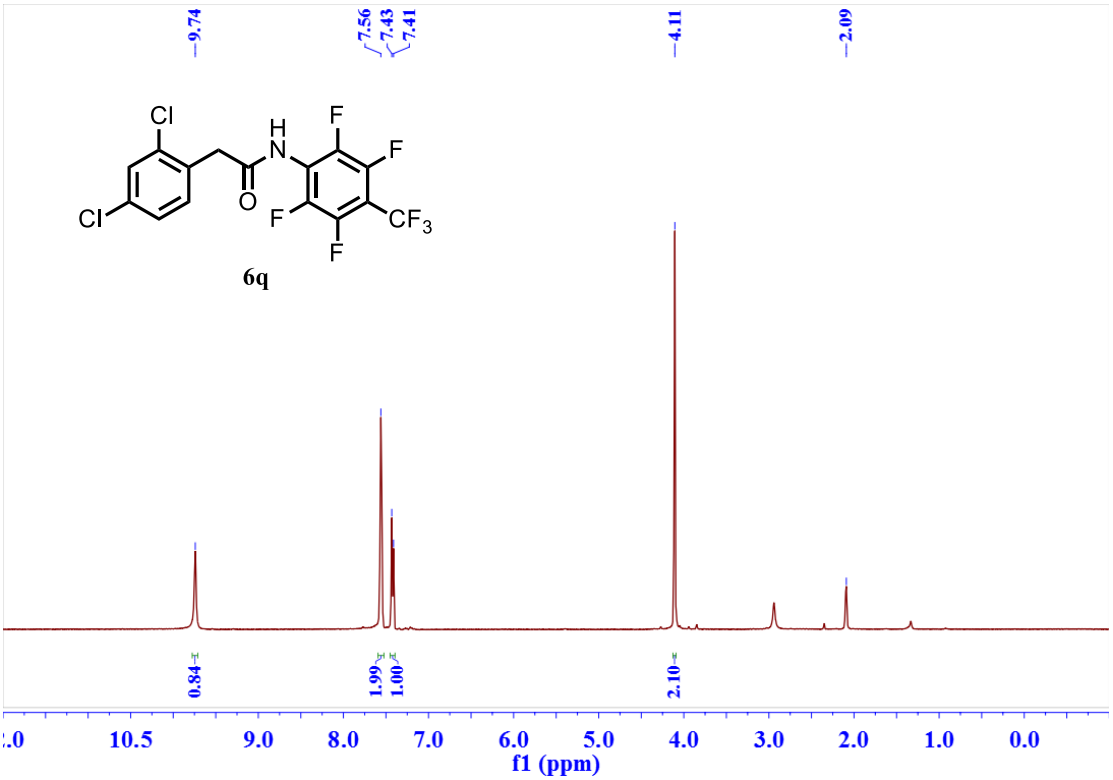
f1 (ppm)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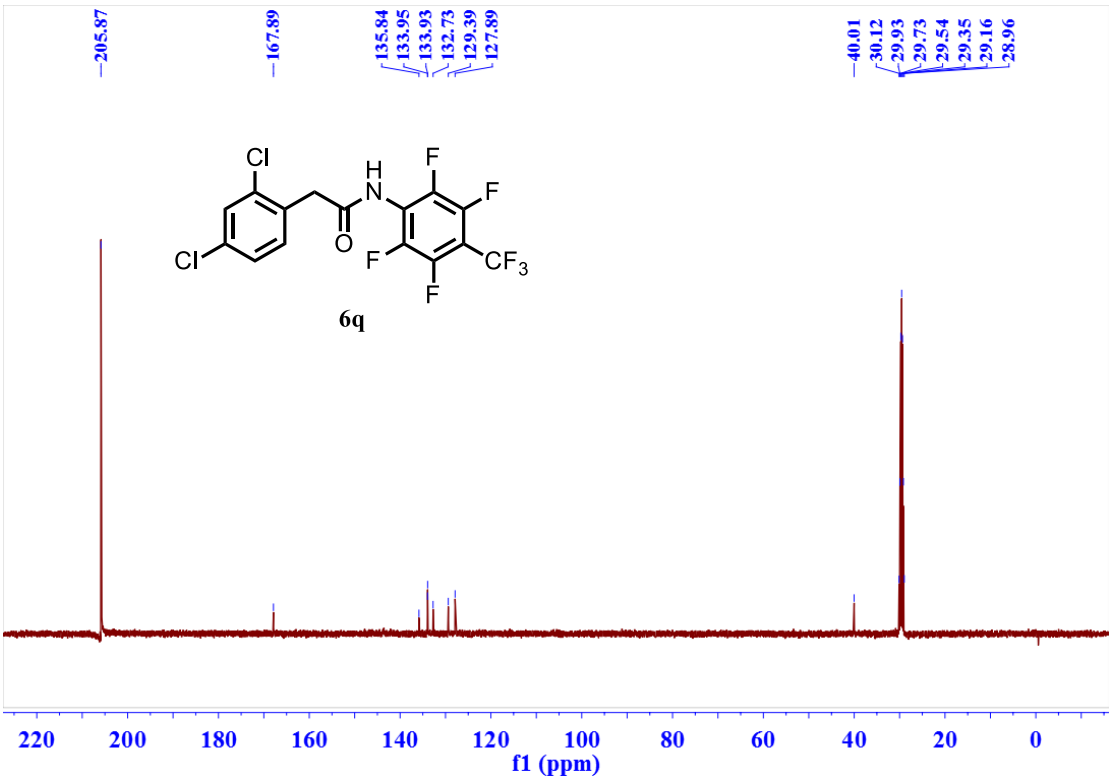
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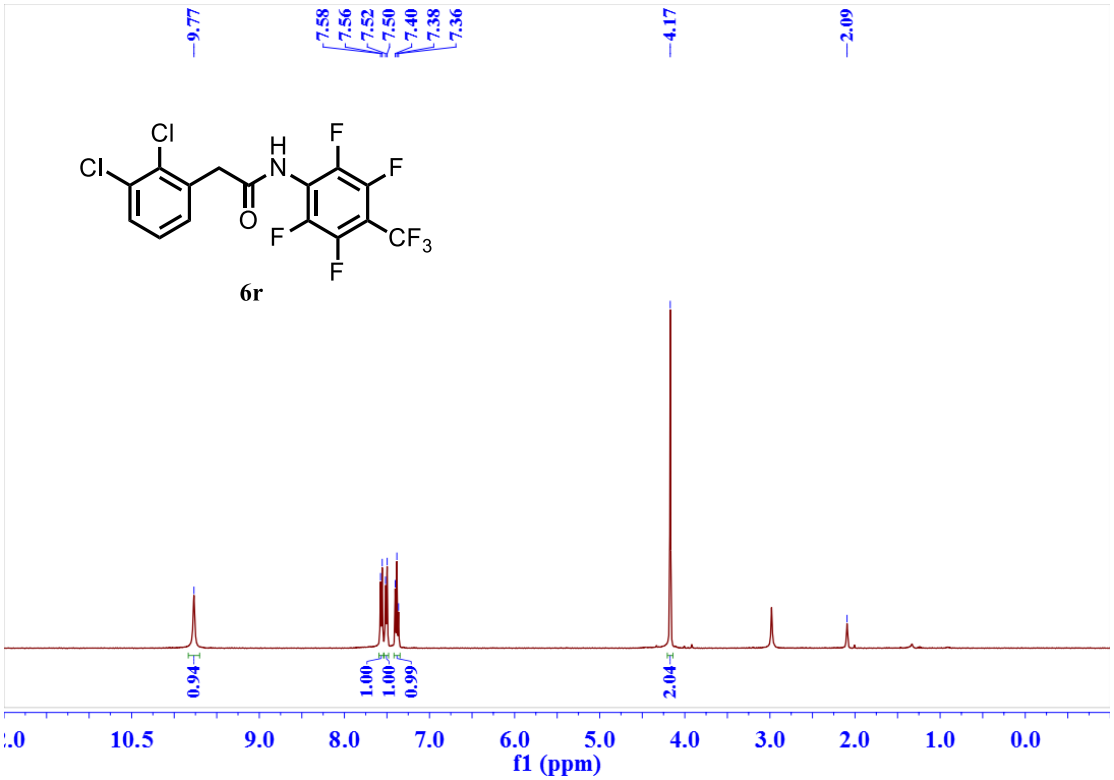
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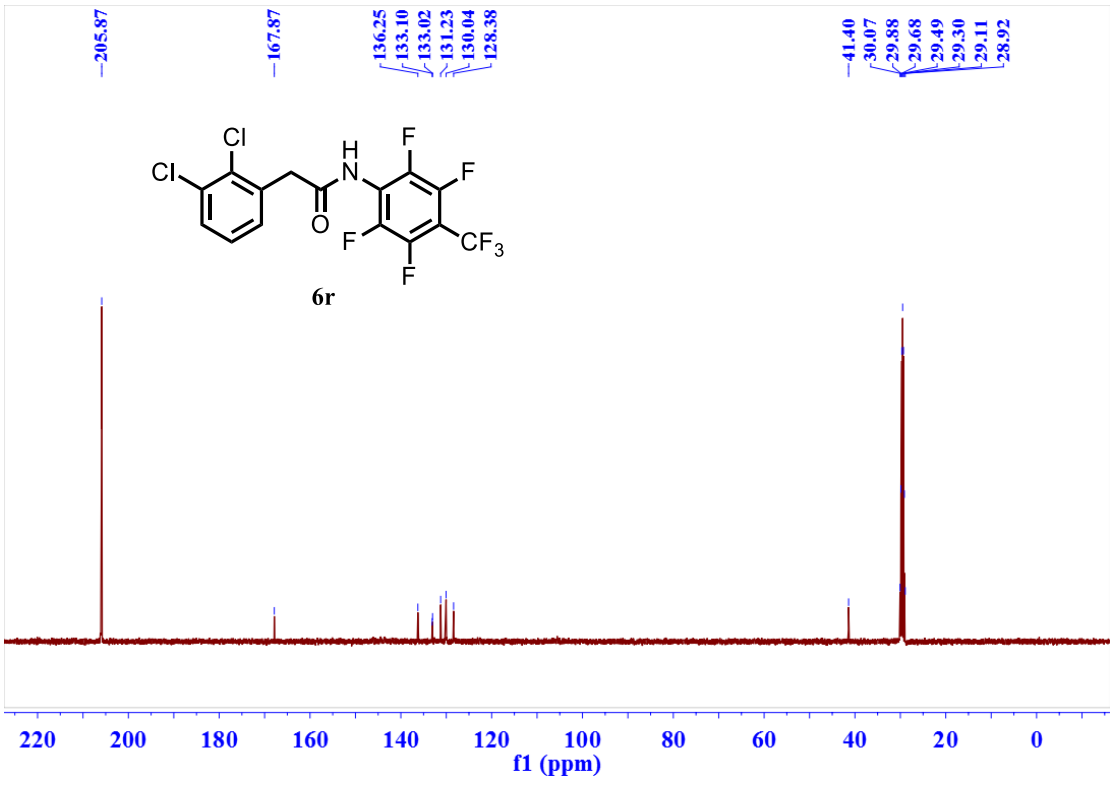
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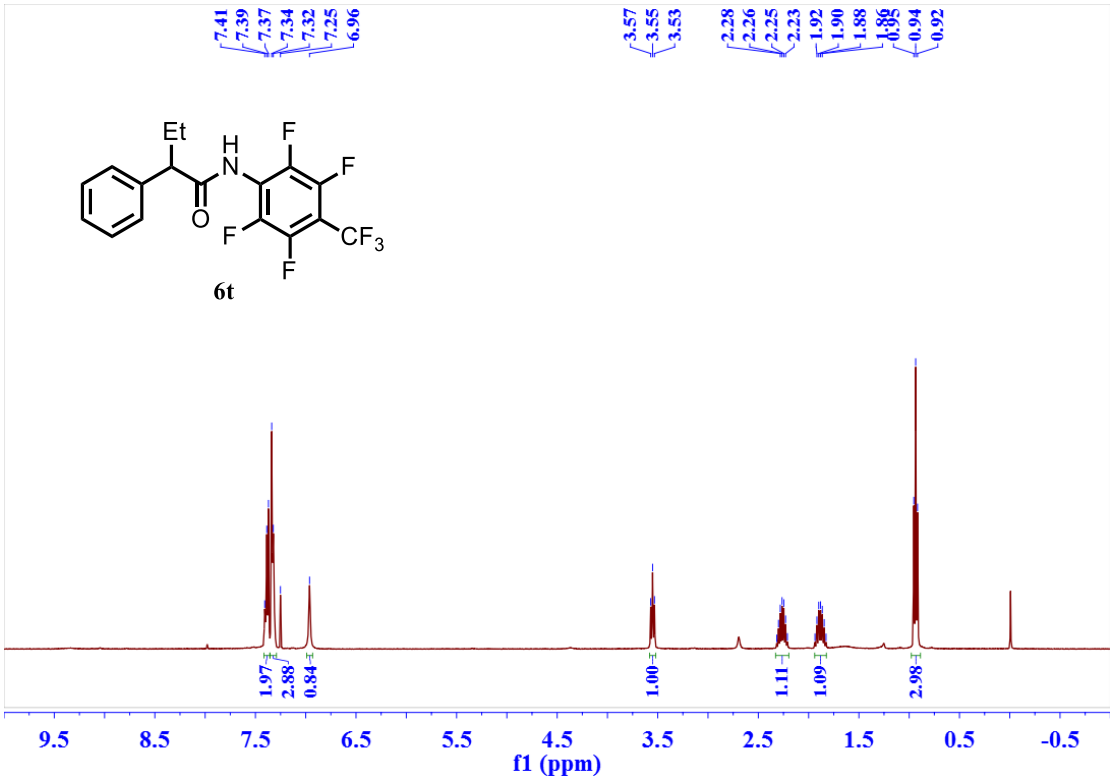
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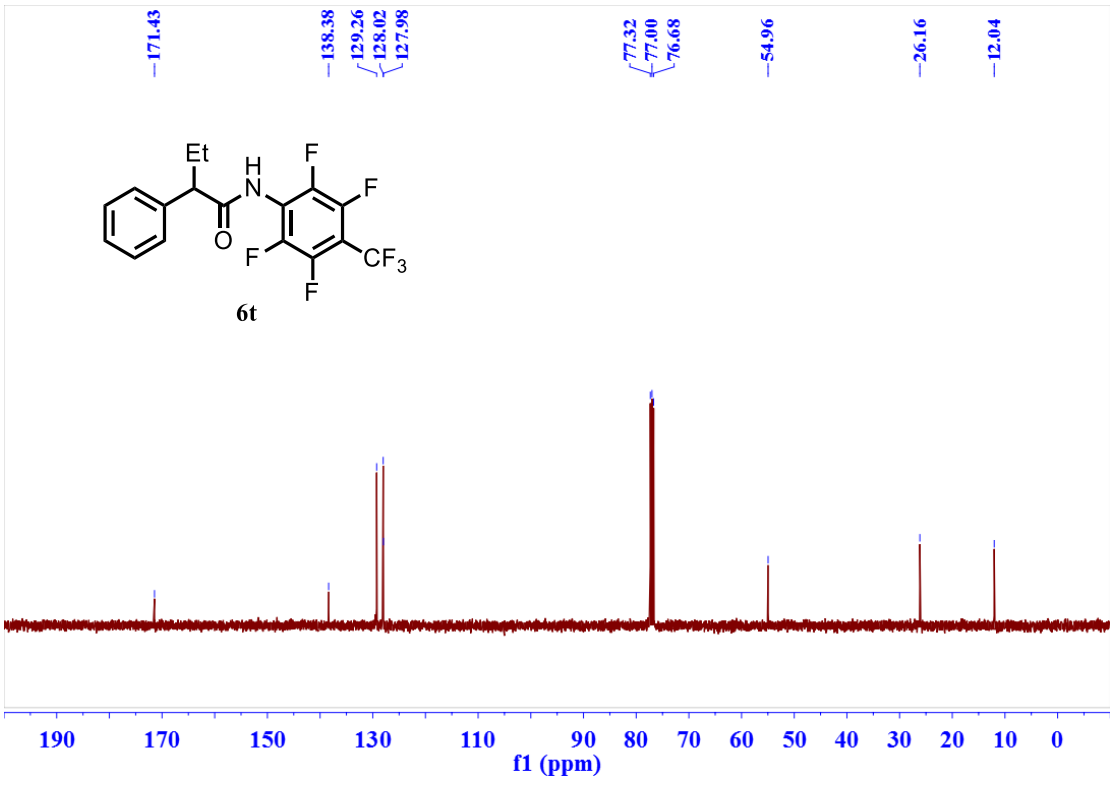
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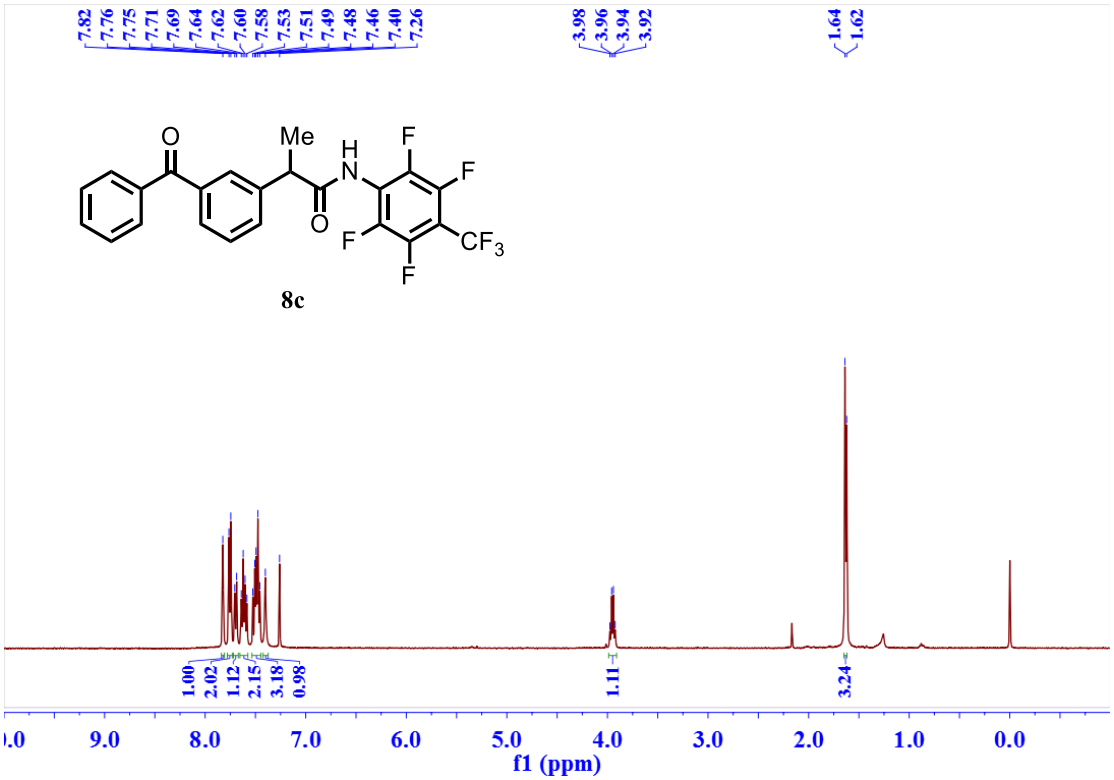
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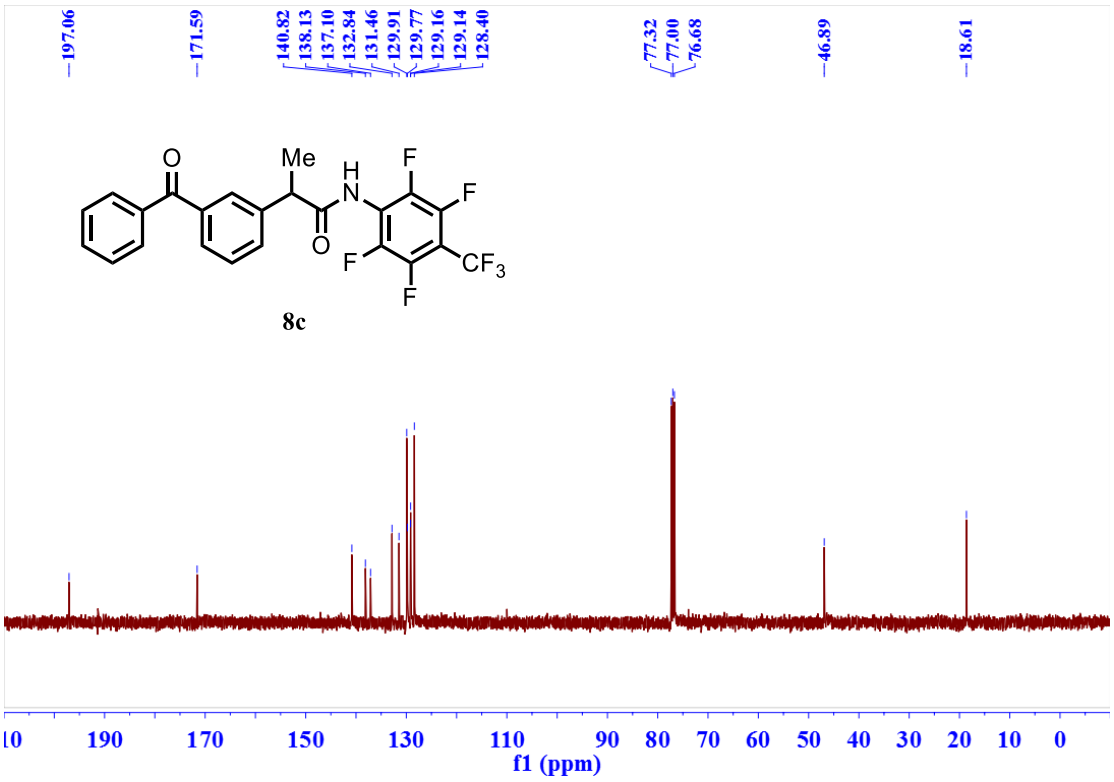
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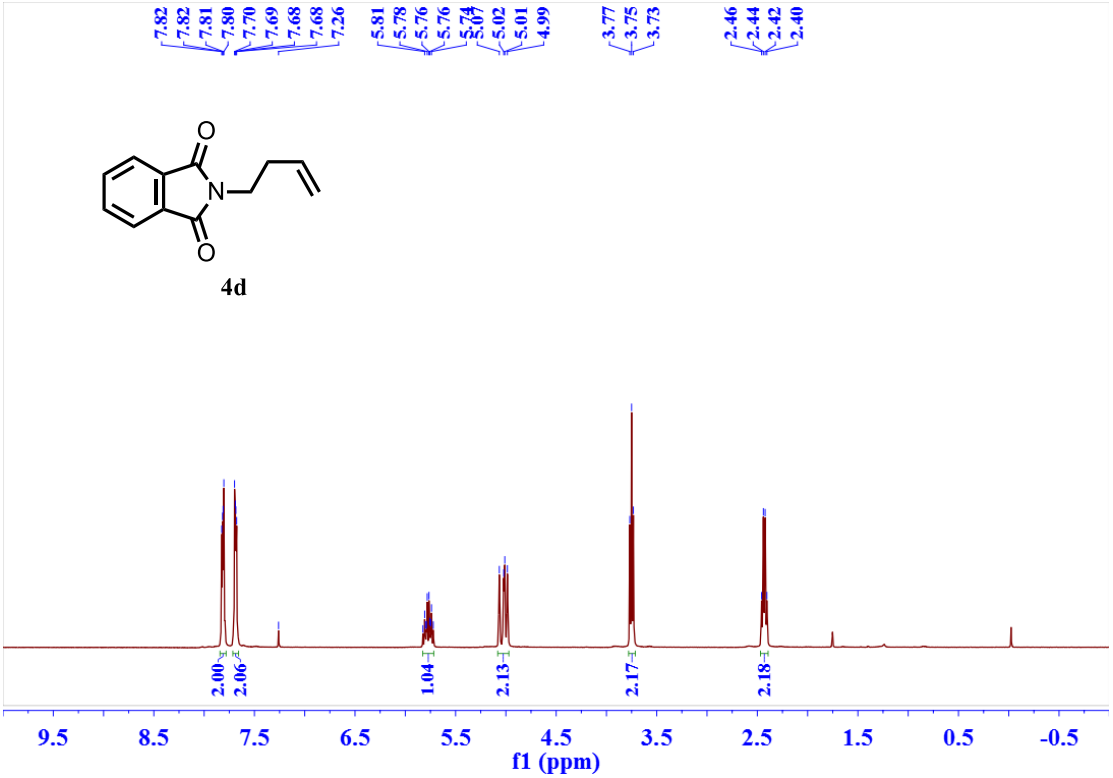
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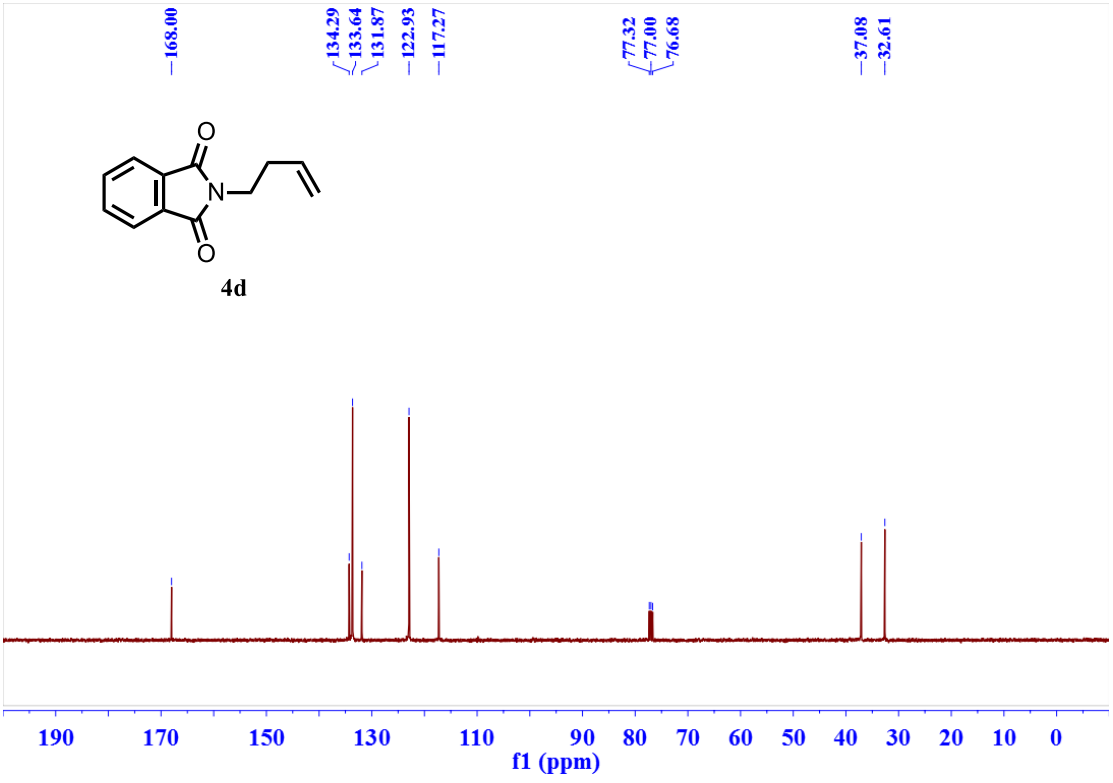
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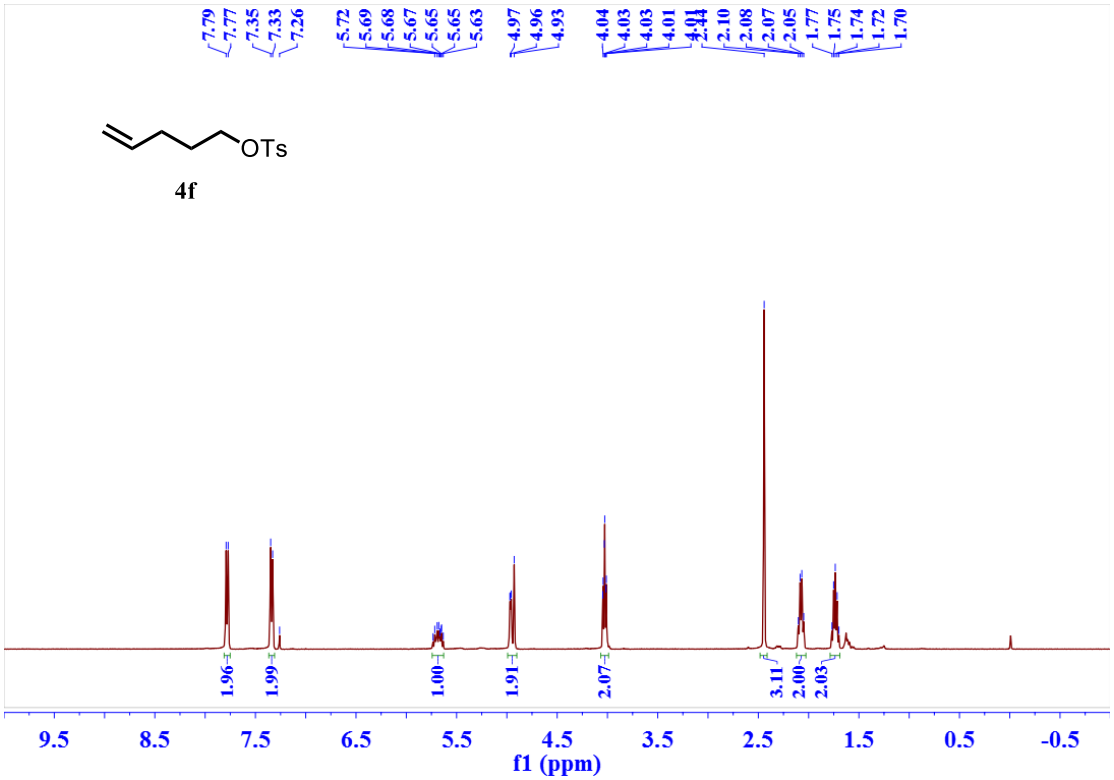
f1 (ppm)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4.93
4.04
4.03
4.03
4.01
2.10
2.08
2.07
2.05
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1.75
1.74
1.72
1.70
OTs
4f
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3.11
2.00
2.03
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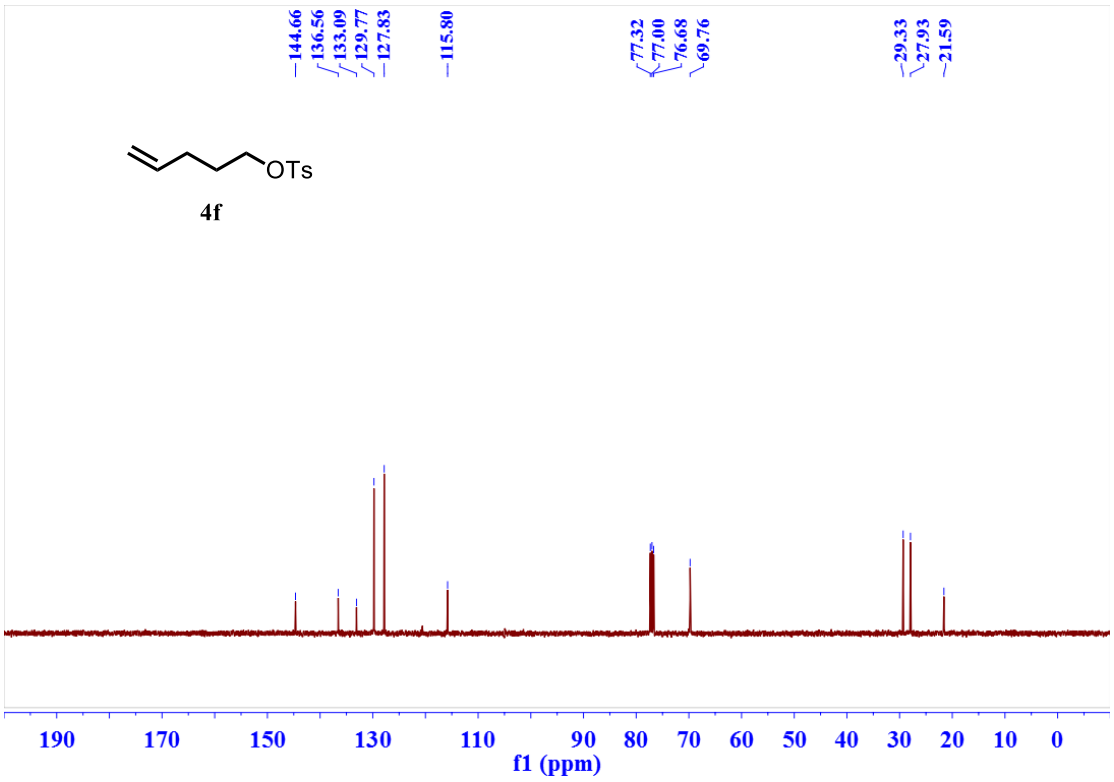
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21.59
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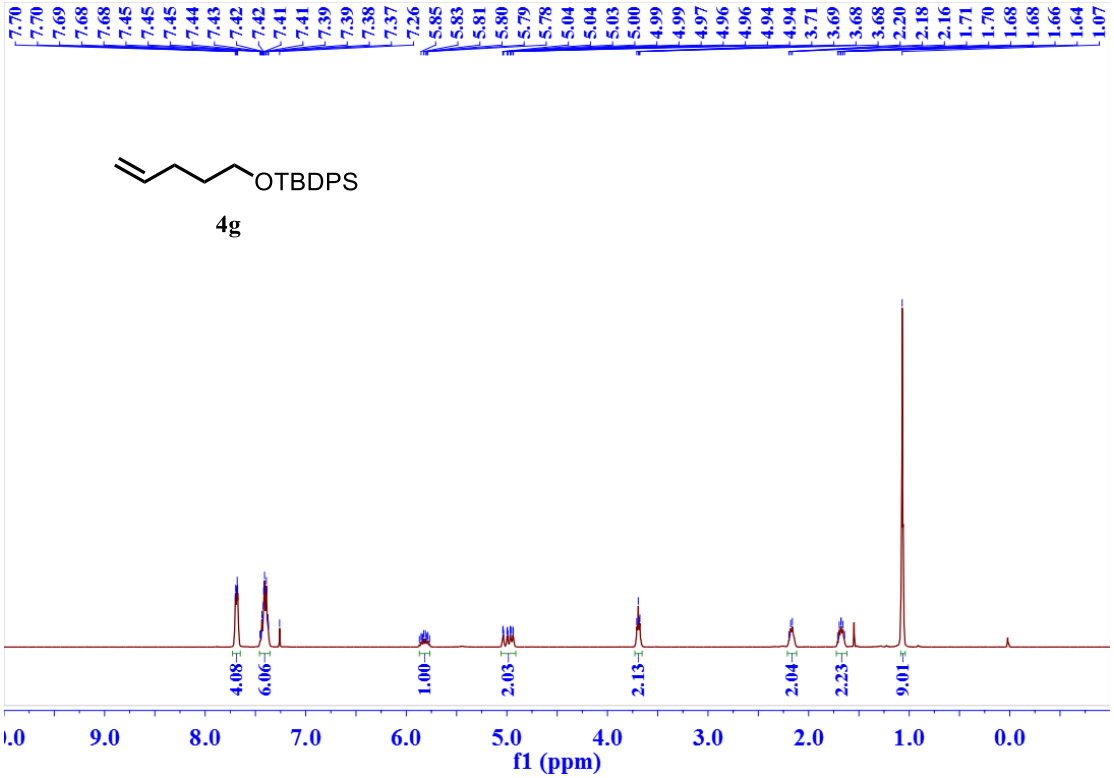
f1 (ppm)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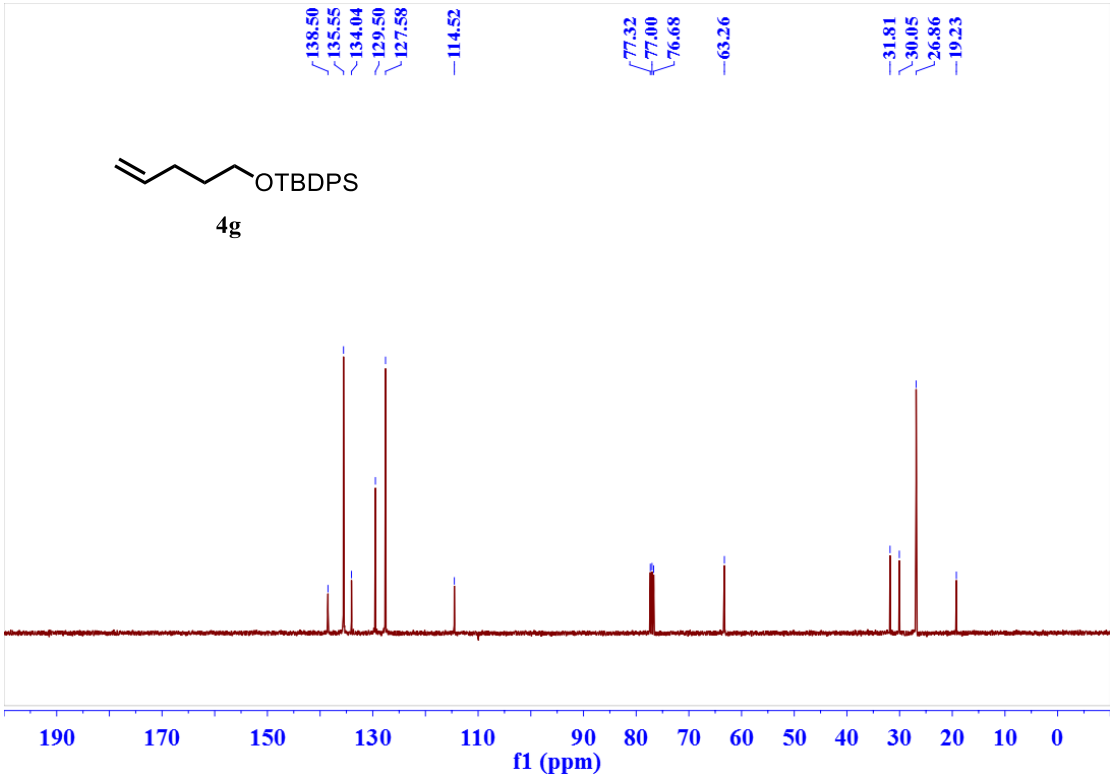
OTBDPS
4g
4.08 6.06 1.00 2.03 2.13 2.04 2.23 9.01
f1 (ppm)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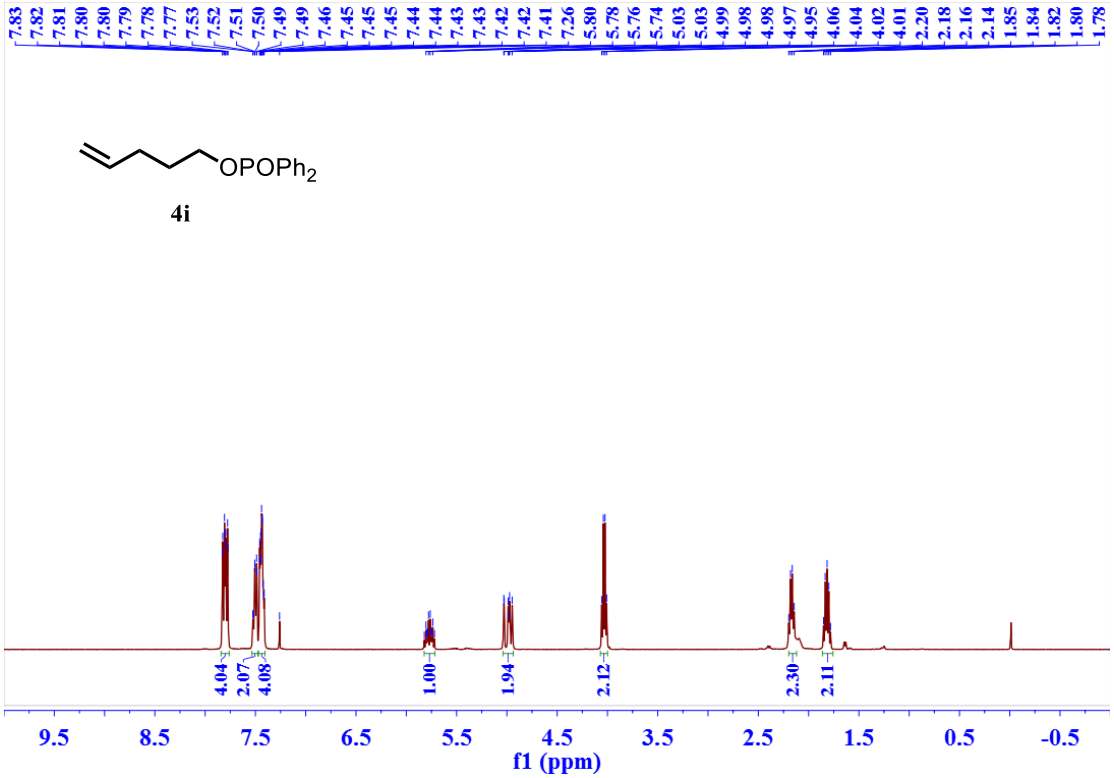
OTBDPS
4g
f1 (ppm)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OPOPh2
4i
4.04 2.07 4.08 1.00 1.94 2.12 2.30 2.11
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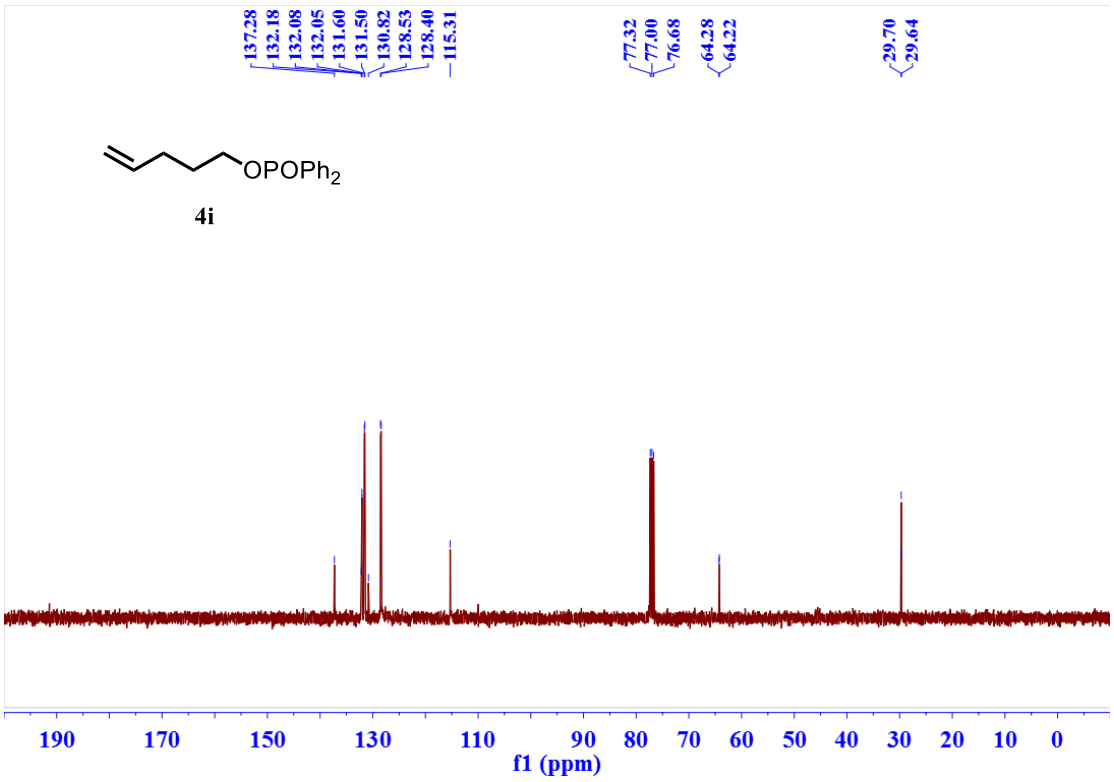
f1 (ppm)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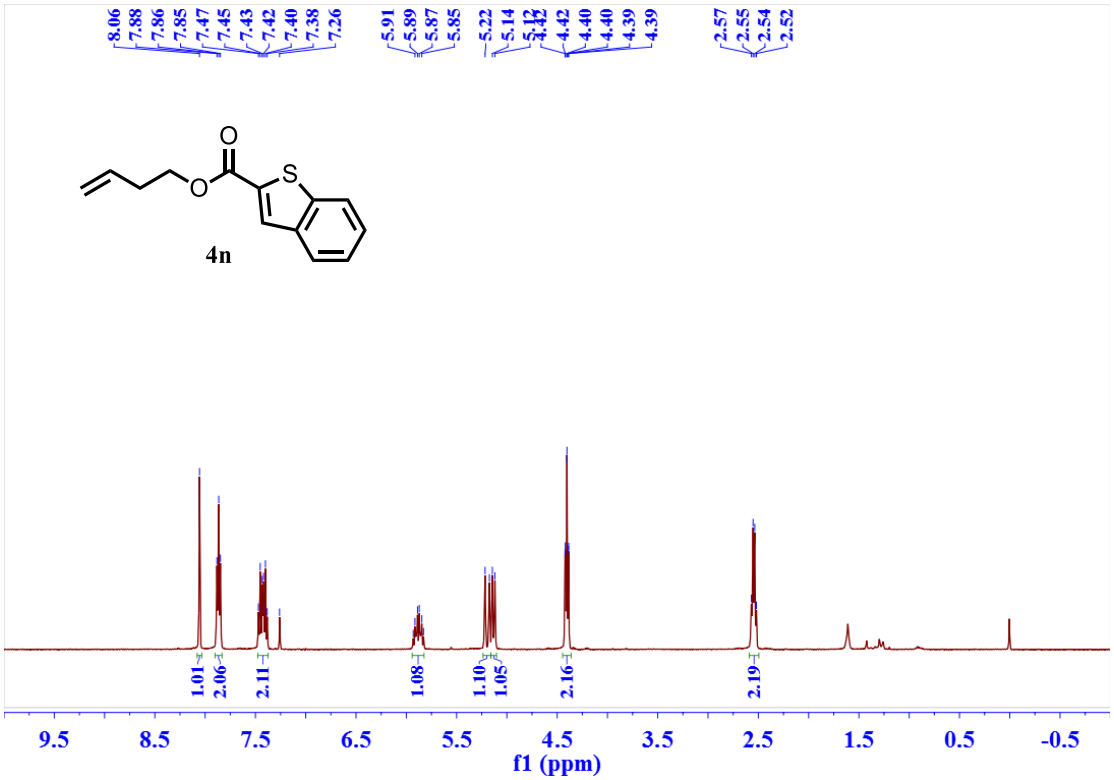
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5.85
5.22
5.14
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4.40
4.40
4.39
4.39
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2.55
2.54
2.52
O
O
S
4n
1.01
2.06
2.11
1.08
1.10
1.05
2.16
2.19
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1.5
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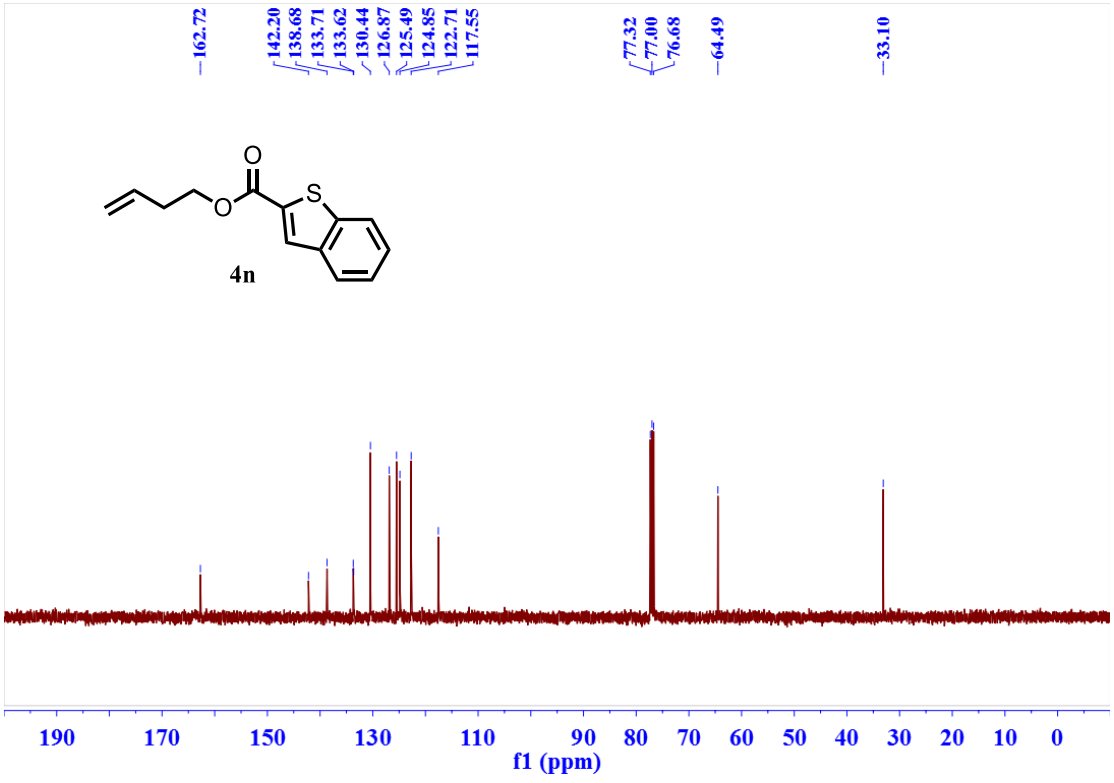
-0.5
f1 (ppm)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125.49
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122.71
117.55
77.32
77.00
76.68
64.49
33.10
O
O
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4n
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150
130
110
90
80
70
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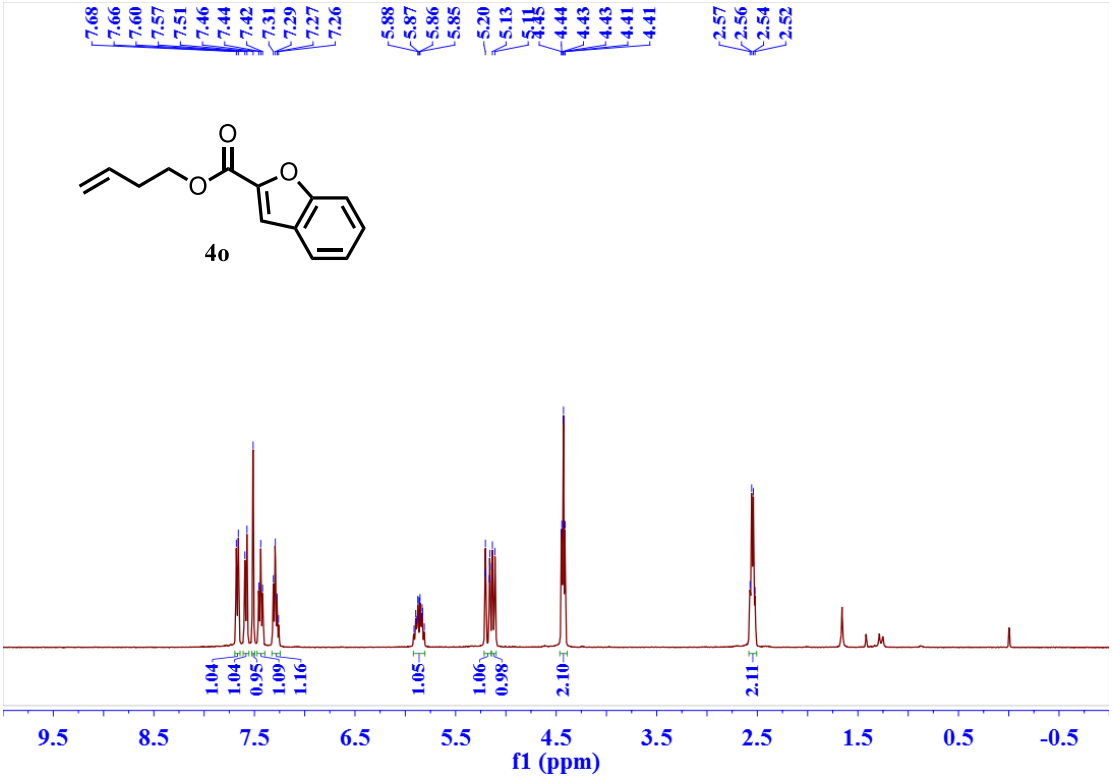
50
40
30
20
10
0
f1 (ppm)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5.88
5.87
5.86
5.85
5.20
5.13
4.44
4.43
4.43
4.41
4.41
2.57
2.56
2.54
2.52
O
O
O
4o
1.04
1.04
0.95
1.09
1.16
1.05
1.06
0.98
2.10
2.11
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4.5
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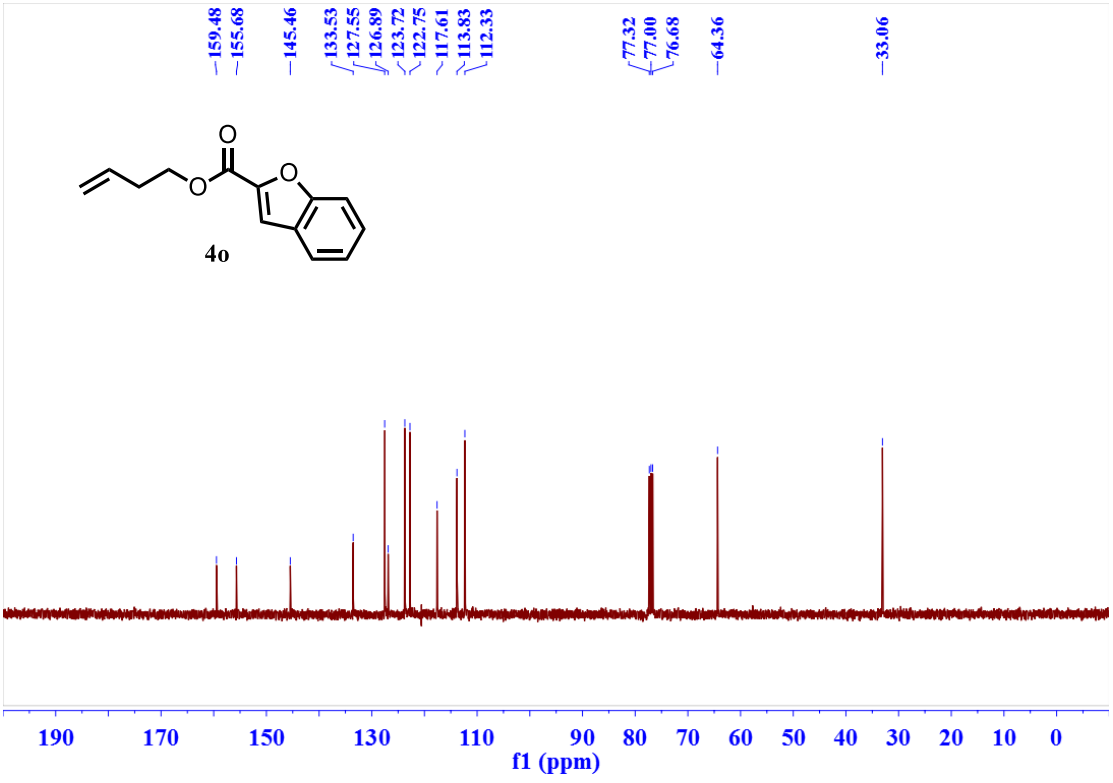
-0.5
f1 (ppm)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123.72
122.75
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113.83
112.33
77.32
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76.68
64.36
33.06
O
O
O
4o
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170
150
130
110
90
80
70
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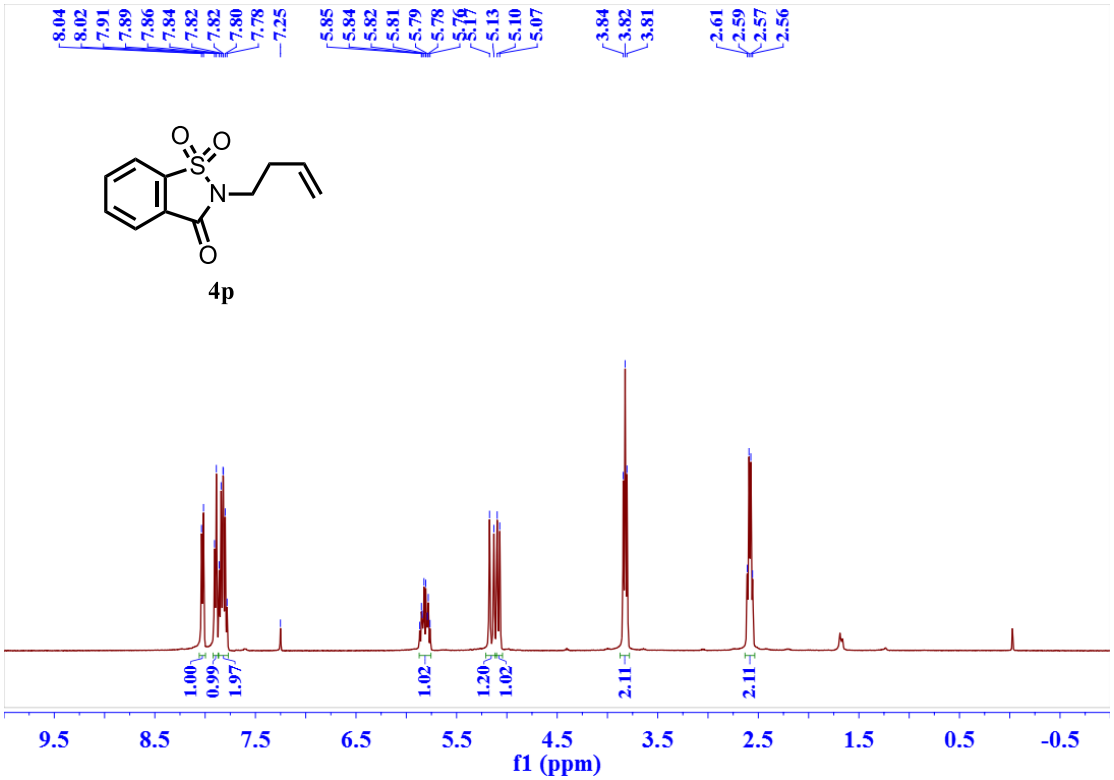
50
40
30
20
10
0
f1 (ppm)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7.84
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7.78
7.25
5.85
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5.13
5.10
5.07
3.84
3.82
3.81
2.61
2.59
2.57
2.56
4p
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0.99
1.97
1.02
1.20
1.02
2.11
2.11
9.5
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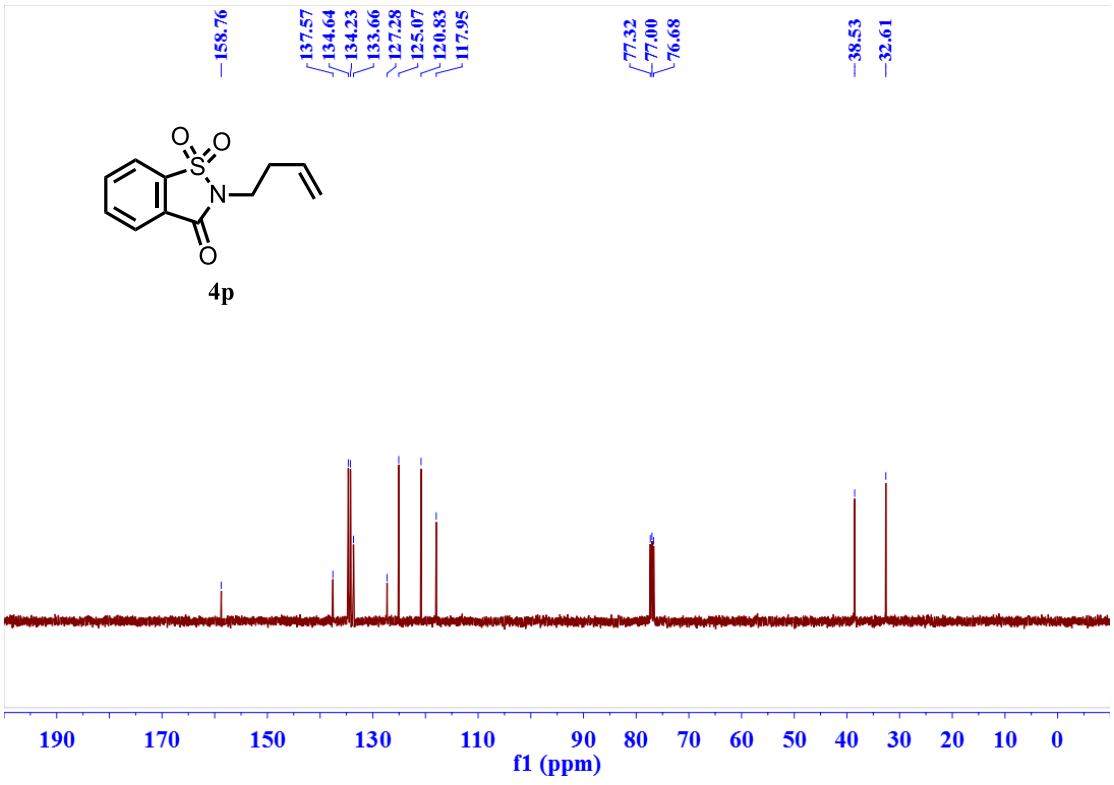
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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38.53
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4p
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170
150
130
110
90
80
70
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50
40
30
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10
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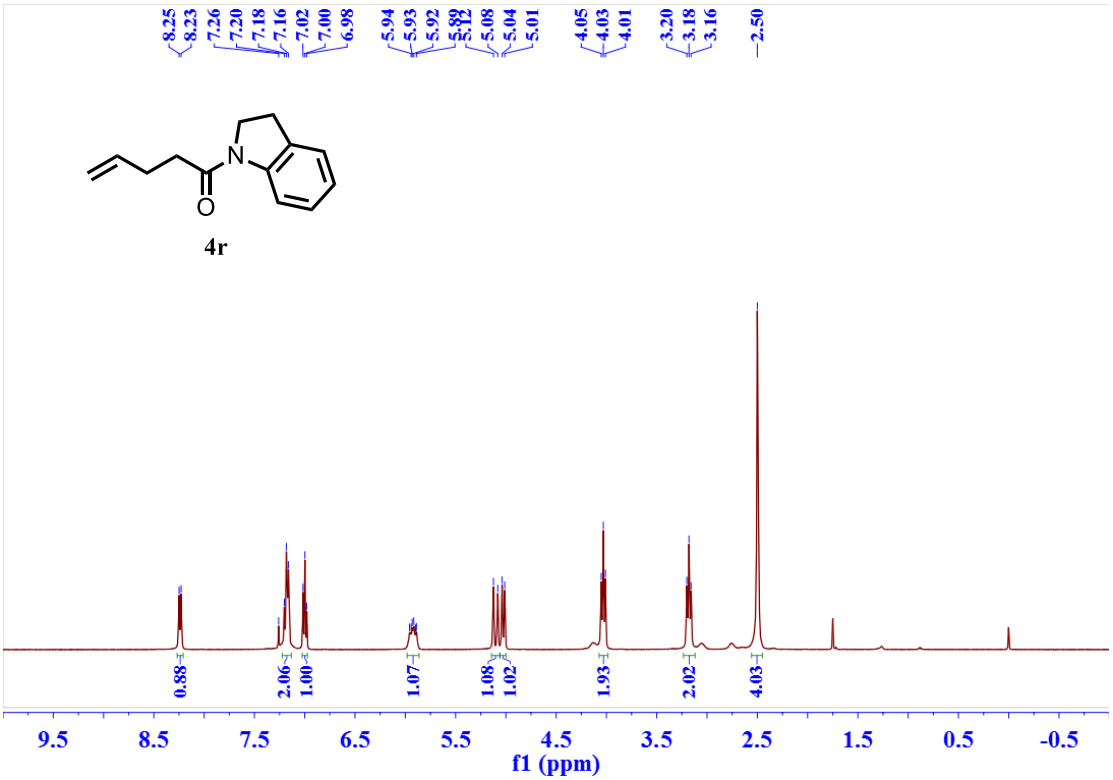
f1 (ppm)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5.93
5.92
5.89
5.12
5.08
5.04
5.01
4.05
4.03
4.01
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3.16
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2.02
4.03
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1.5
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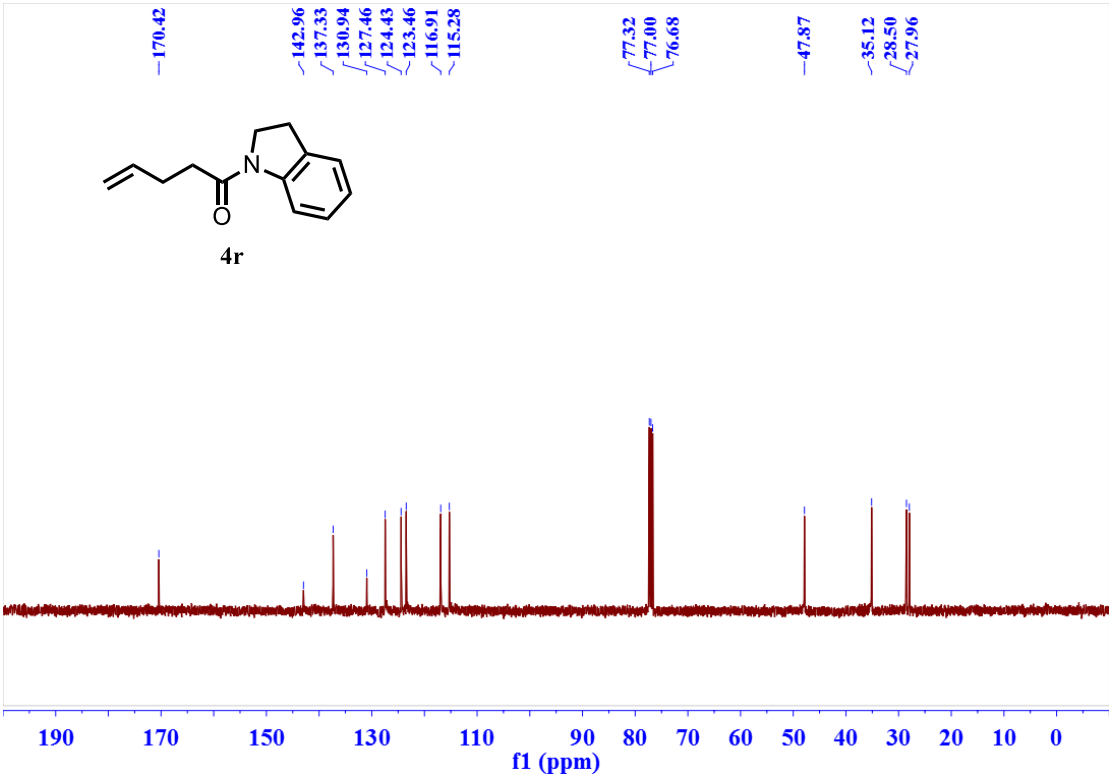
-0.5
f1 (ppm)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28.50
27.96
N
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4r
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50
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10
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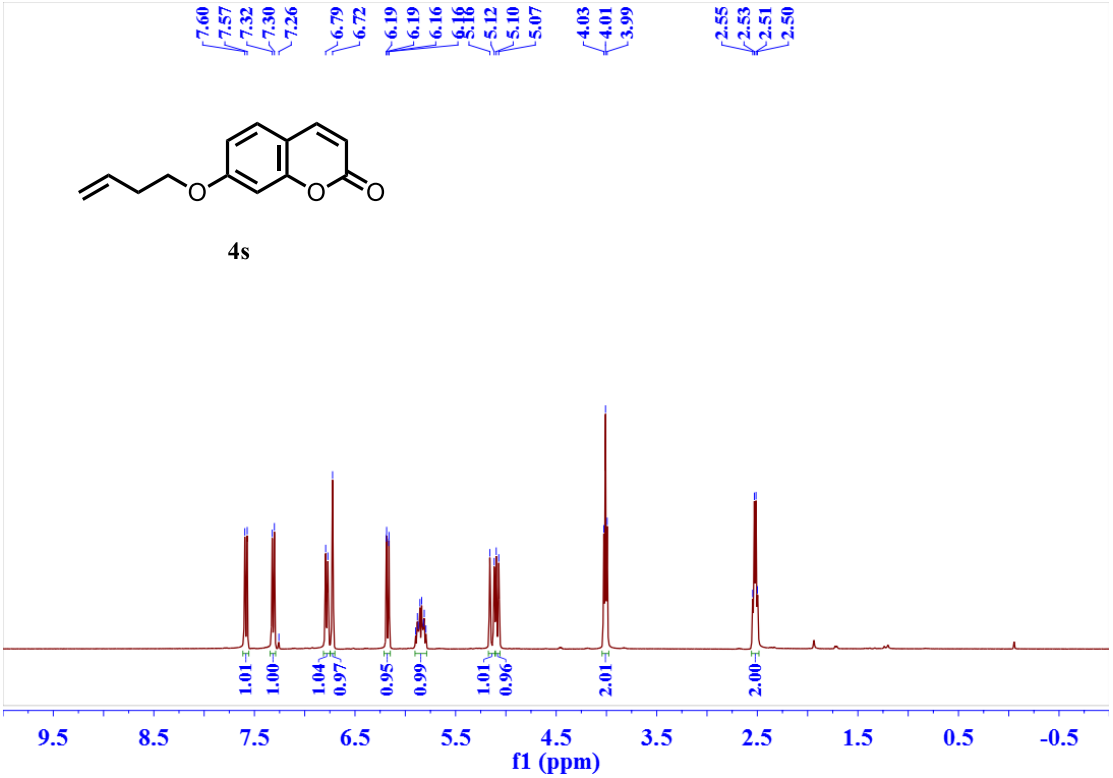
f1 (ppm)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6.19
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5.12
5.10
5.07
4.03
4.01
3.99
2.55
2.53
2.51
2.50
O
O
O
1.01
1.00
1.04
0.97
0.95
0.99
1.01
0.96
2.01
2.00
9.5
8.5
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5.5
4.5
3.5
2.5
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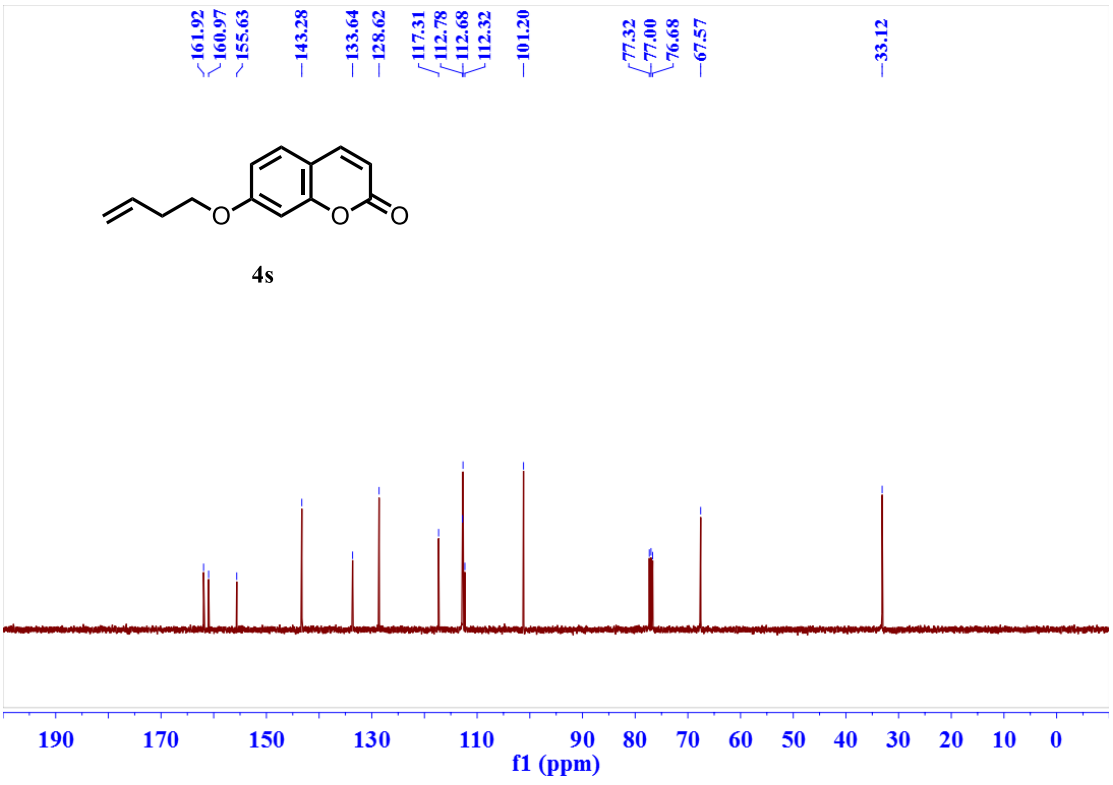
0.5
-0.5
f1 (ppm)

4s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76.68
67.57
33.12
O
O
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150
130
110
90
80
70
60
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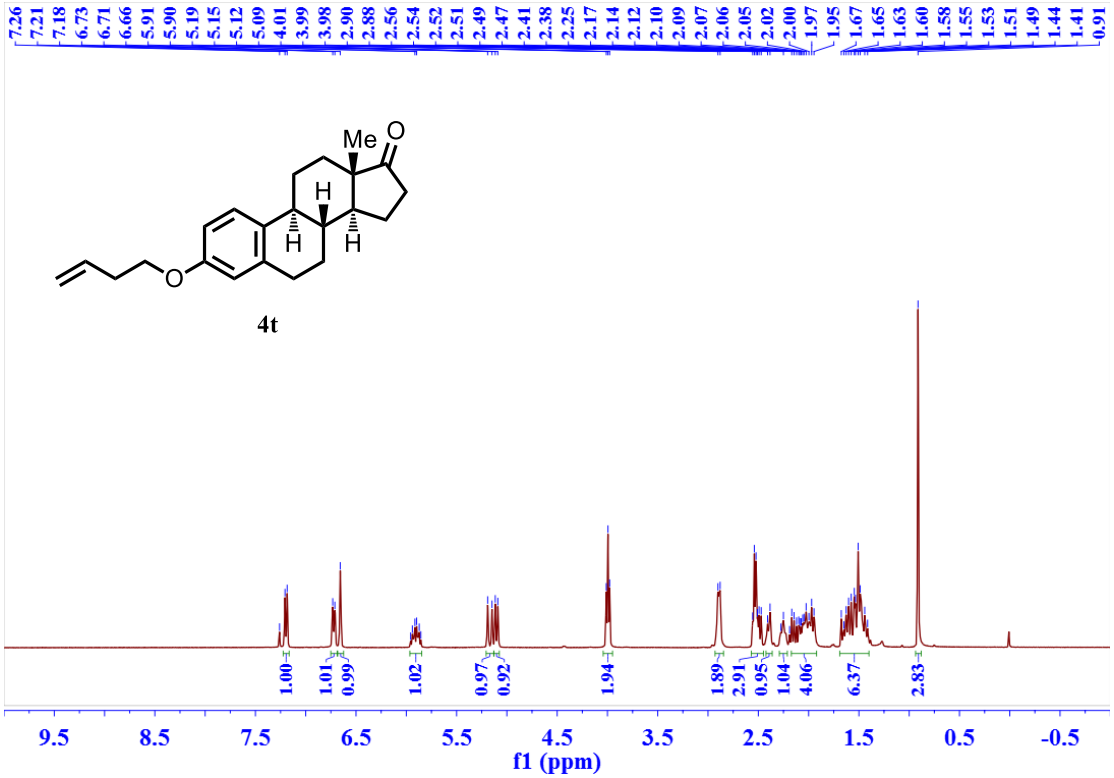
40
30
20
10
0
f1 (ppm)

4s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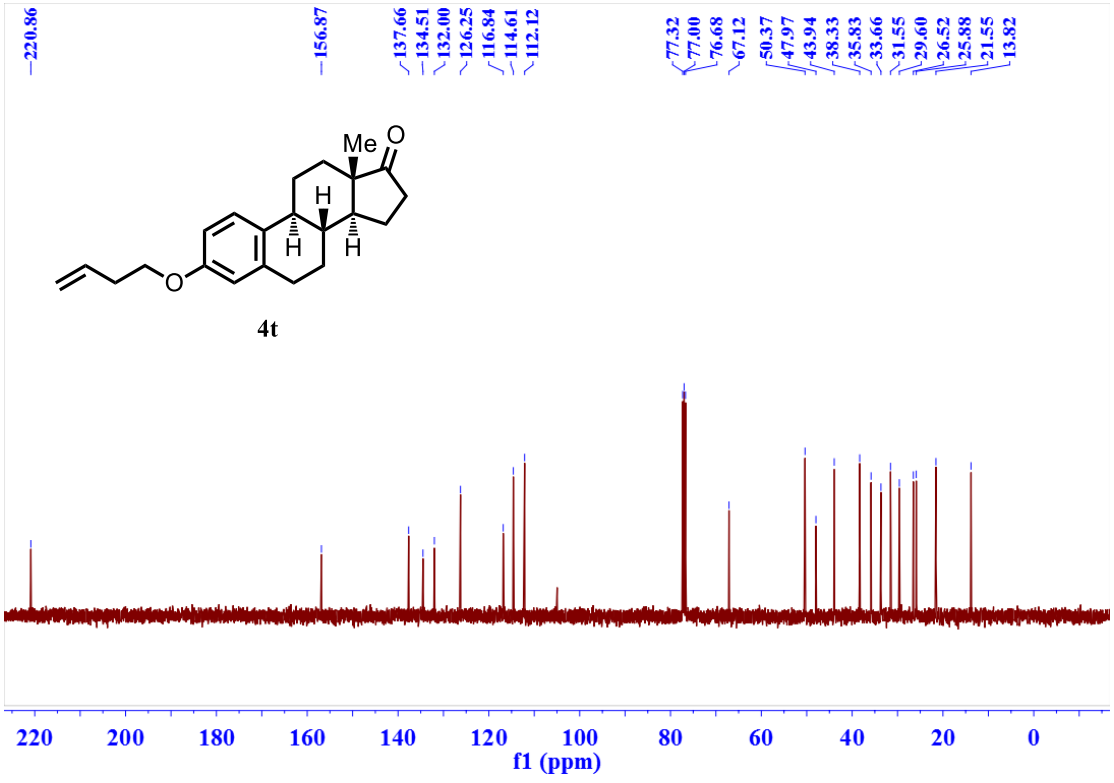
Me
O
H
H
H
O
4t
1.00 1.01 0.99 1.02 0.97 0.92 1.94 1.89 2.91 0.95 1.04 4.06 6.37 2.83
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)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Me
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H
H
H
O
4t
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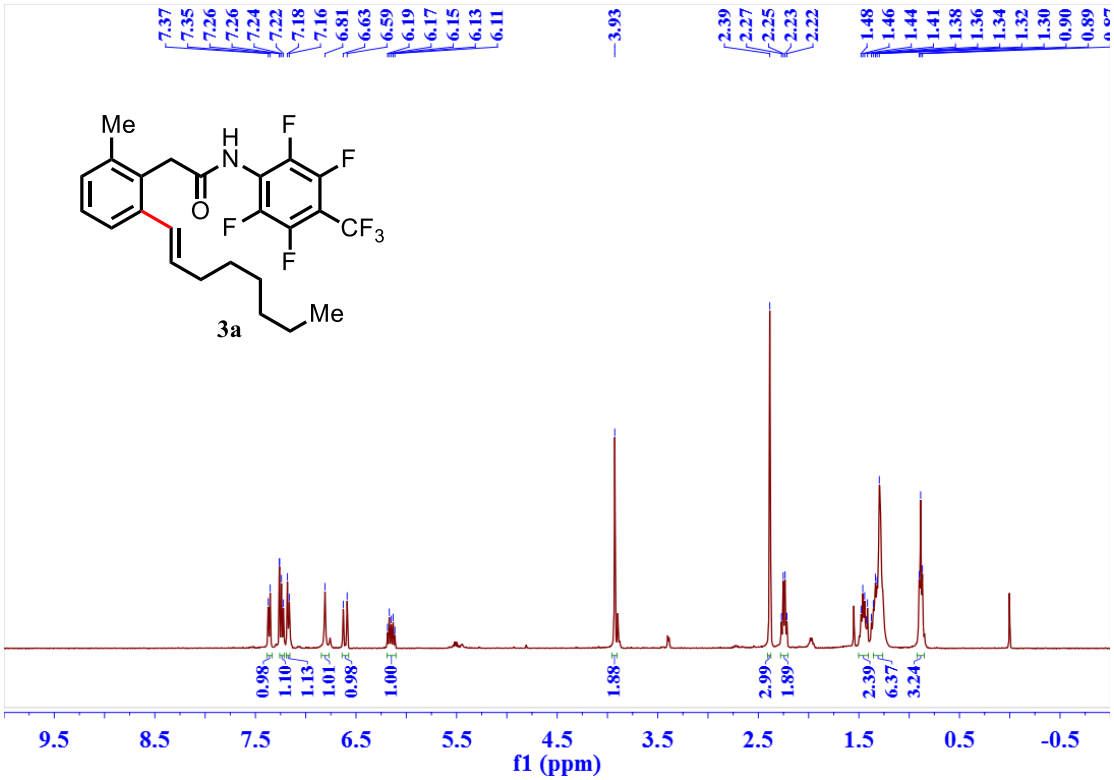
f1 (ppm)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6.13
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1.41
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0.89
Me
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O
F
F
F
F
CF3
Me
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1.01
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2.99
1.89
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6.37
3.24
9.5
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6.5
5.5
4.5
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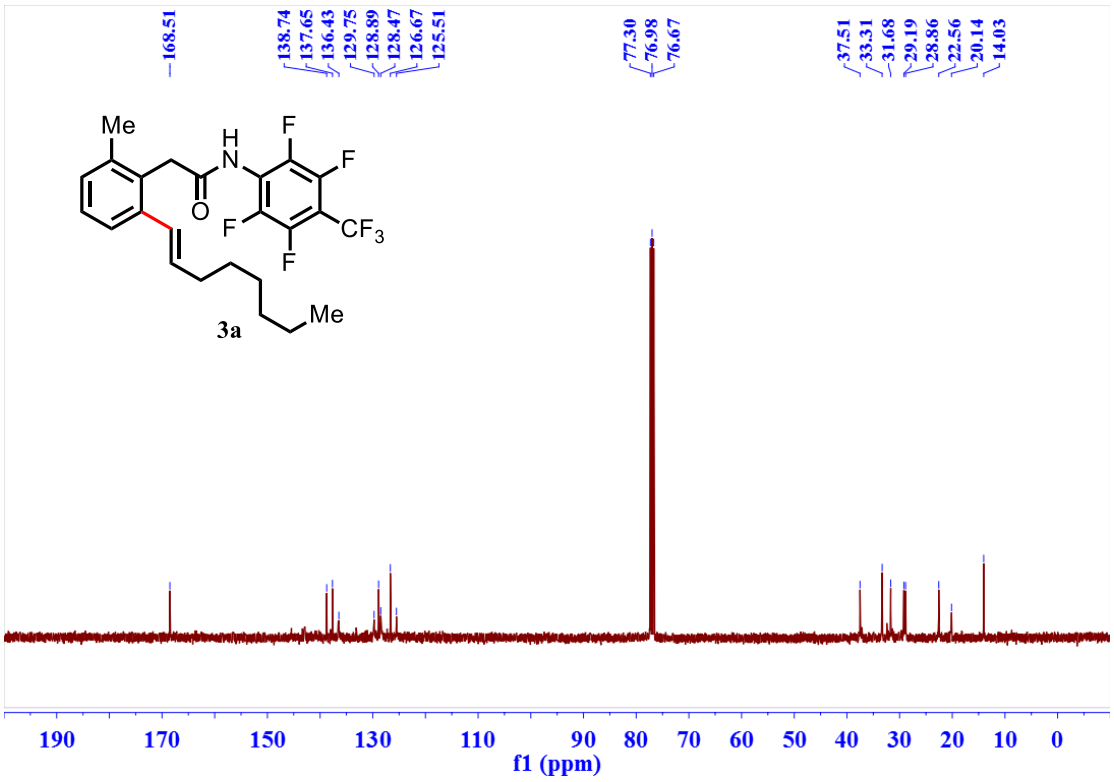
f1 (ppm)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N
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F
F
F
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130
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90
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70
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50
40
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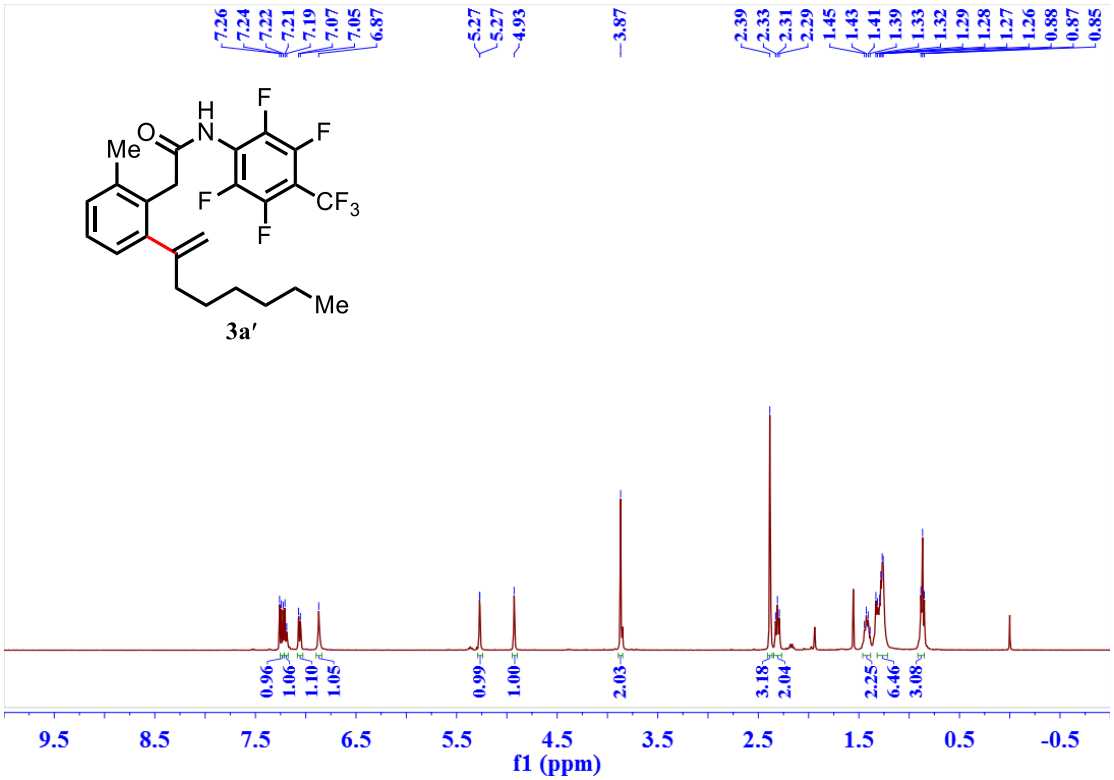
20
10
0
f1 (ppm)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2.29
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1.32
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1.27
1.26
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F
F
F
F
CF3
Me
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1.10
1.05
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1.00
2.03
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2.25
6.46
3.08
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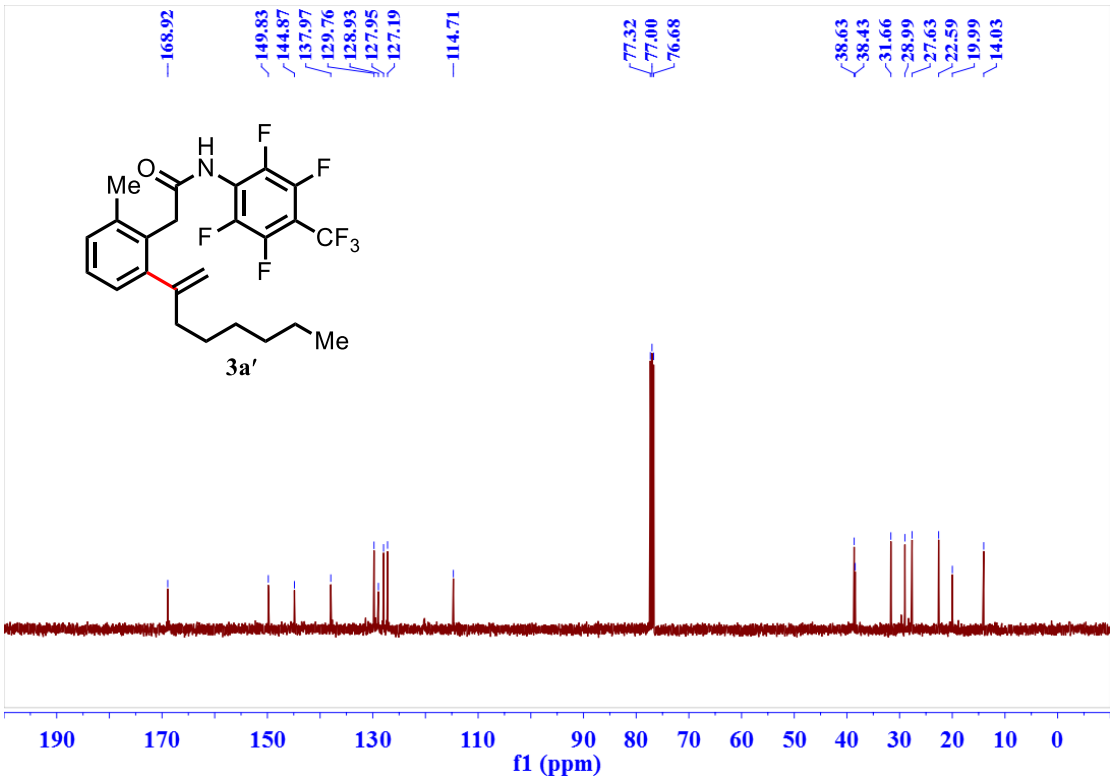
f1 (ppm)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38.43
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28.99
27.63
22.59
19.99
14.03
H
N
O
Me
F
F
F
F
CF3
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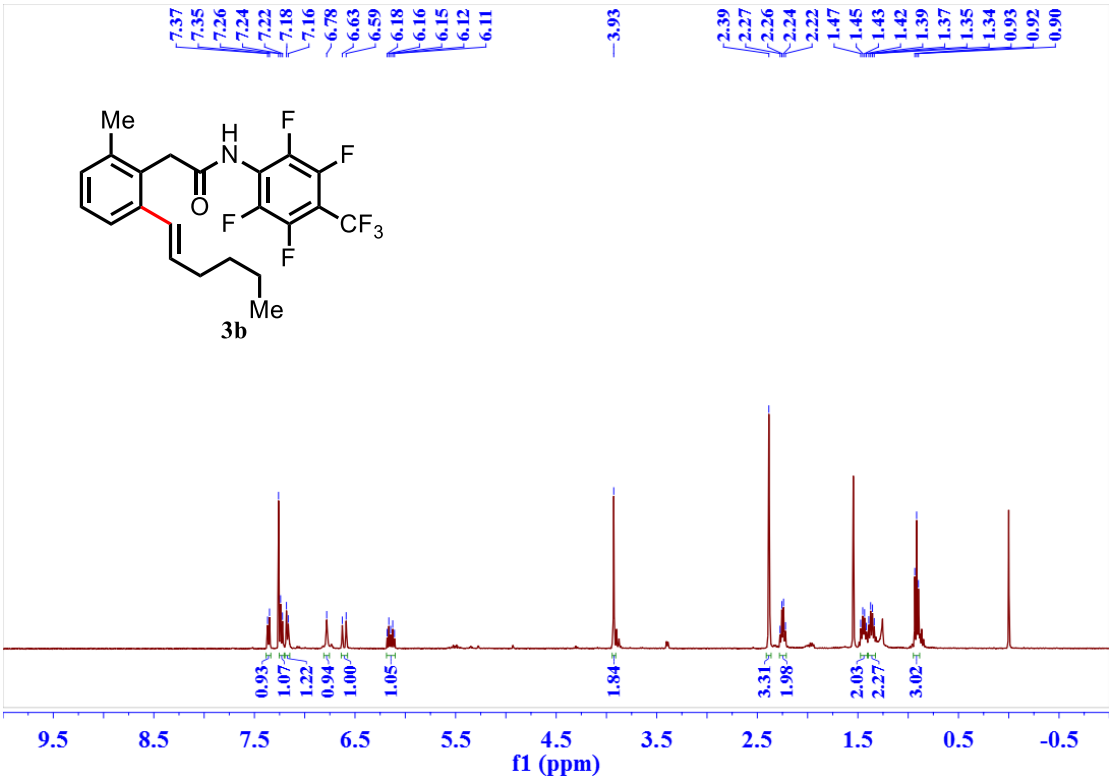
10
0
f1 (ppm)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2.24
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1.45
1.43
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1.37
1.35
1.34
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F
F
CF3
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3.02
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1.5
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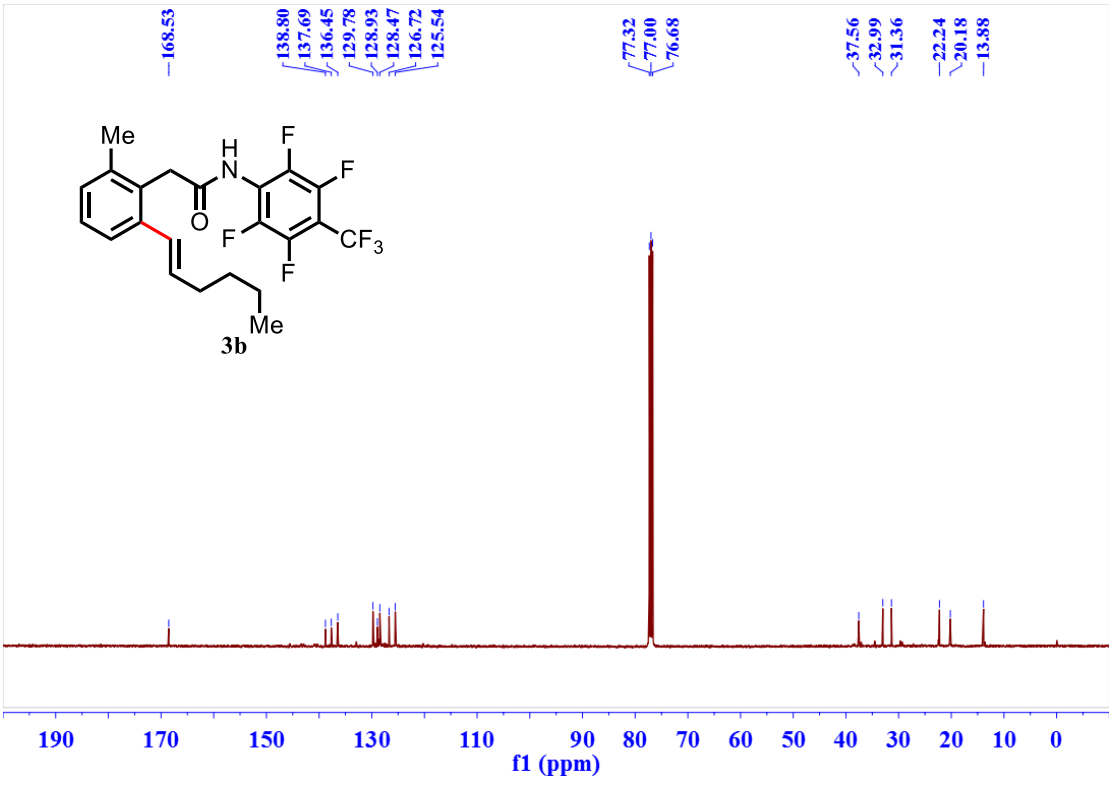
-0.5
f1 (ppm)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37.56
32.99
31.36
22.24
20.18
13.88
Me
H
N
O
F
F
F
F
CF3
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3b
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90
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50
40
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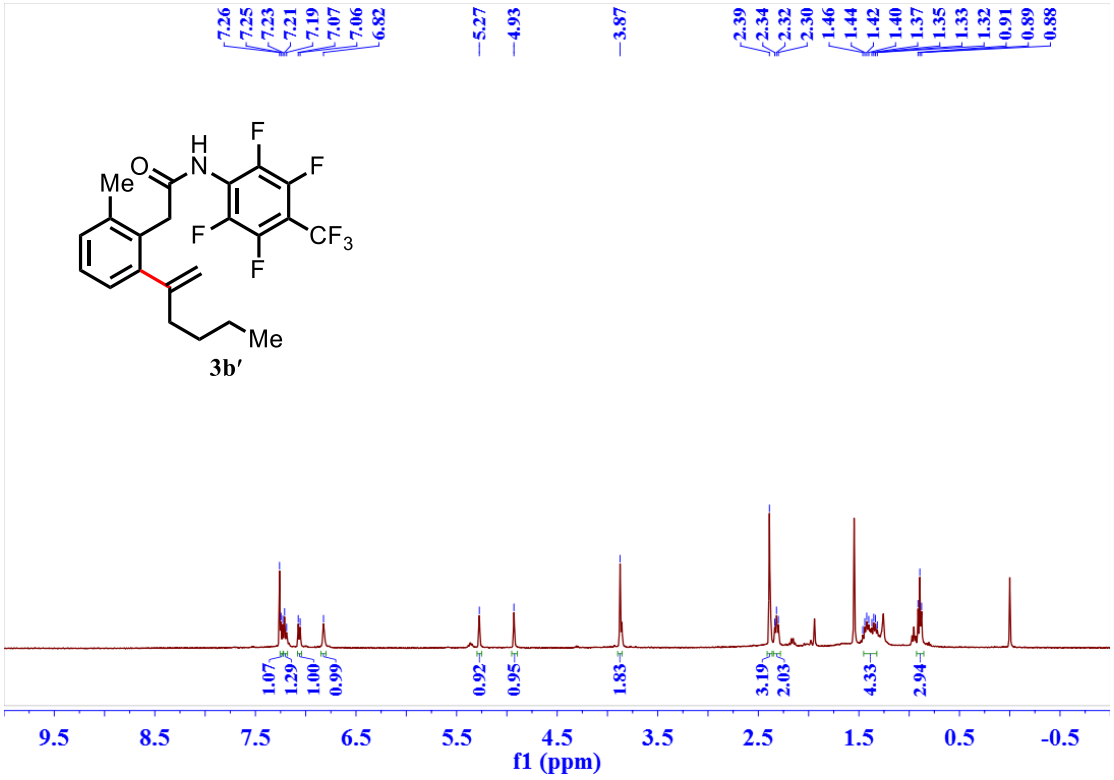
20
10
0
f1 (ppm)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1.40
1.37
1.35
1.33
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H
N
F
F
F
F
CF3
Me
3b′
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0.95
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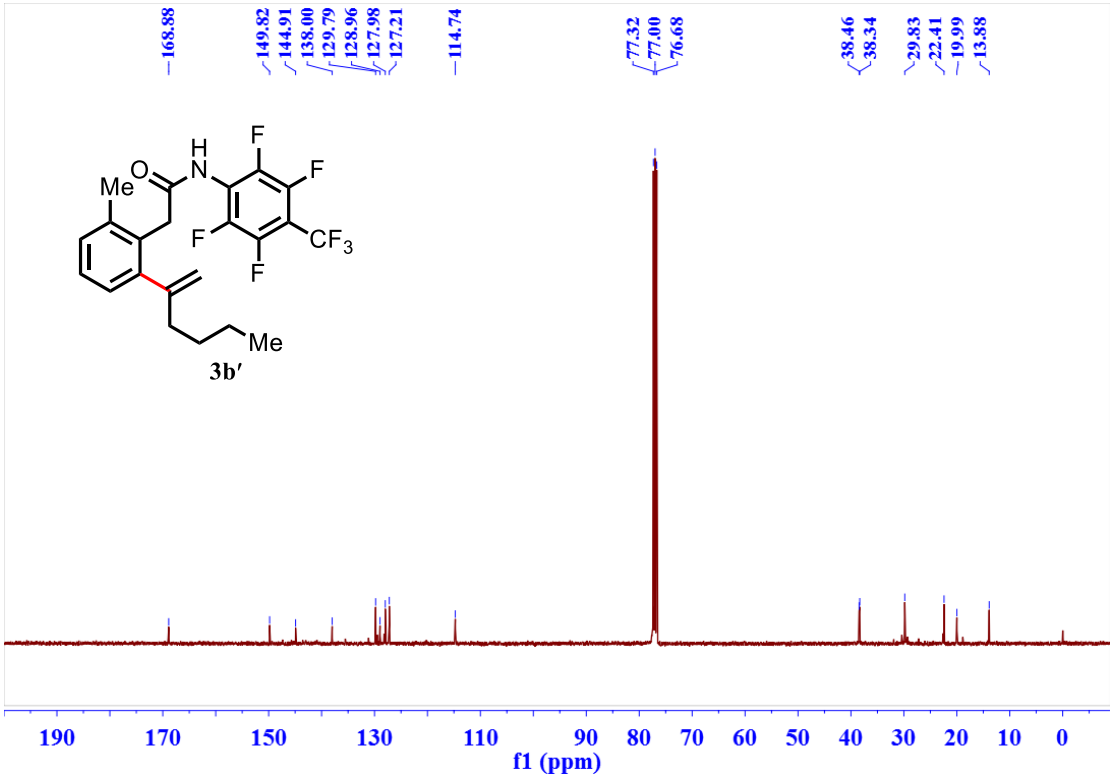
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Me
O
H
N
F
F
F
F
CF3
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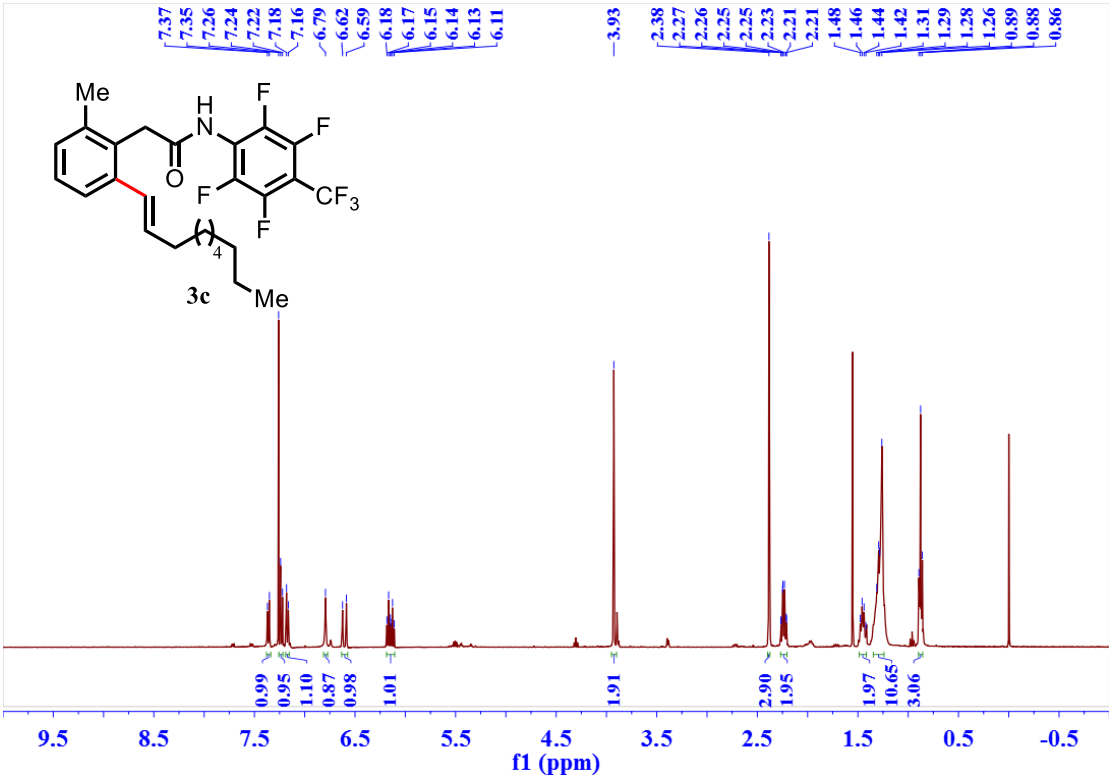
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2.25
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O
F
F
F
F
CF3
4
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Me
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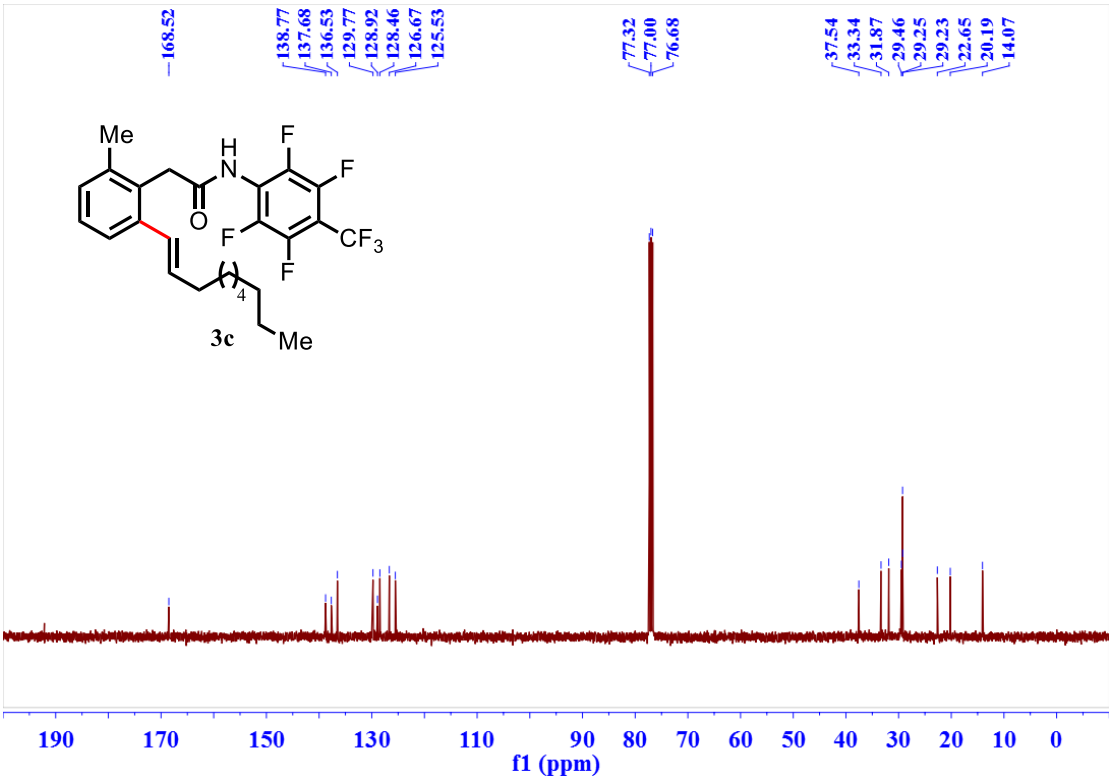
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CF3
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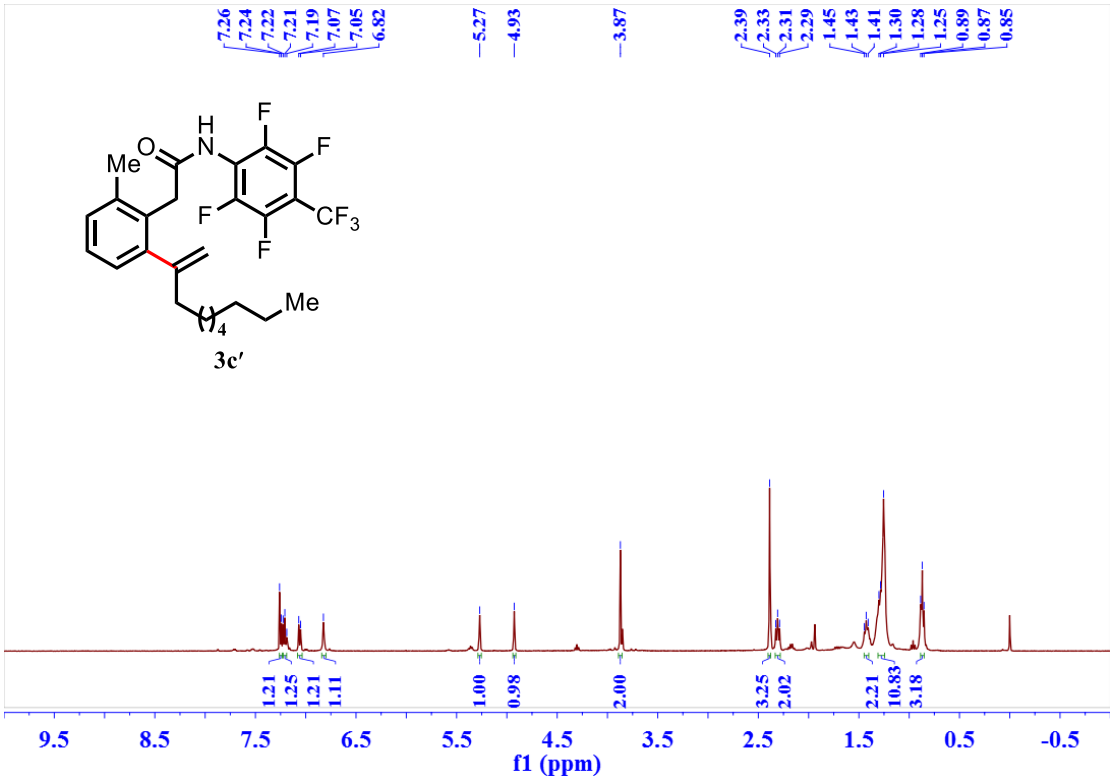
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F
CF3
Me
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3c′
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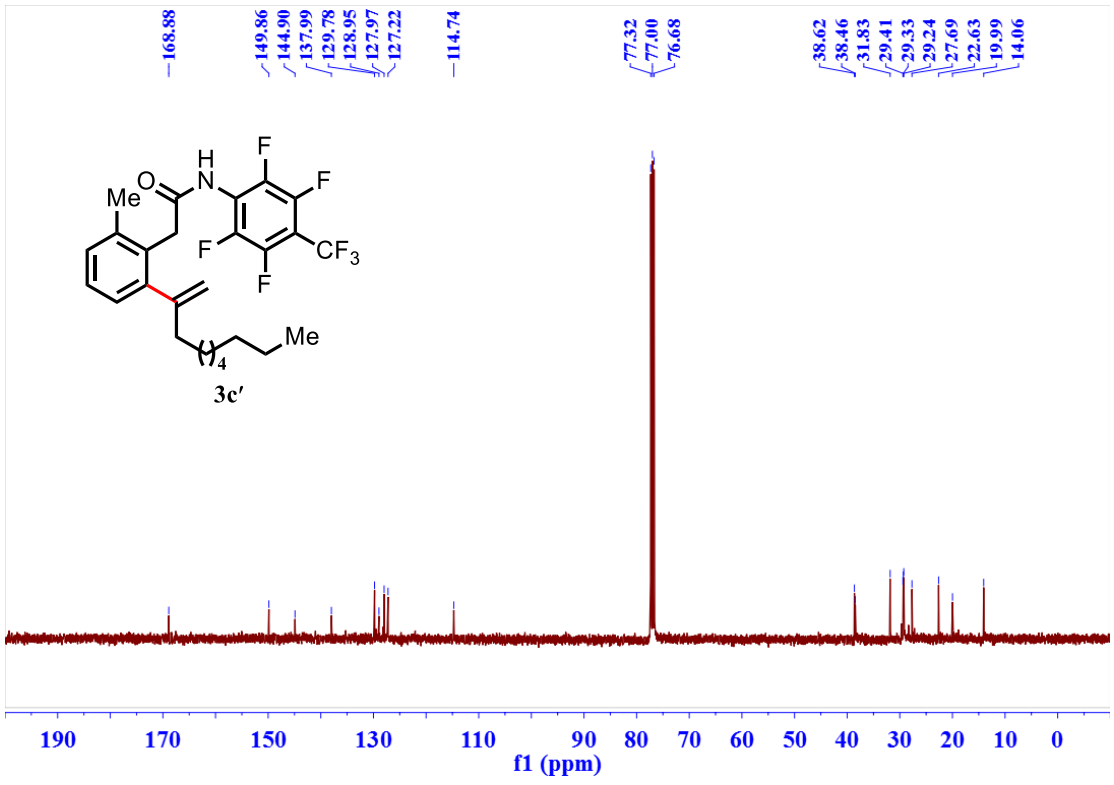
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F
F
F
CF3
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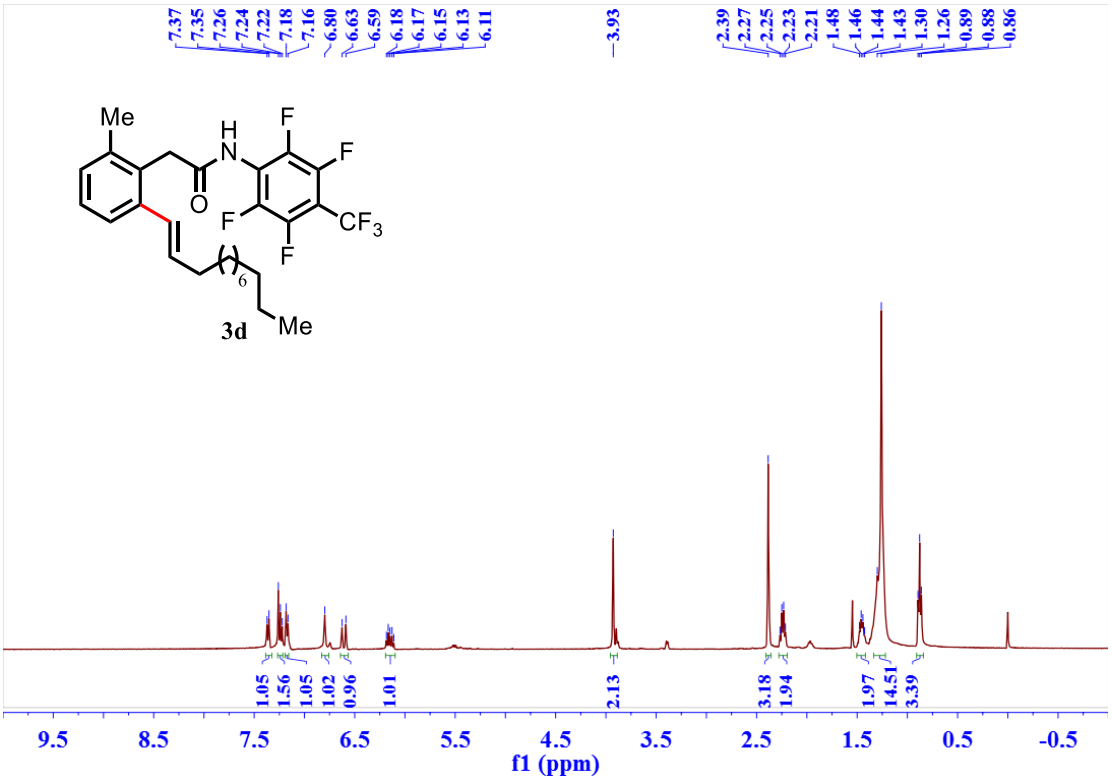
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F
F
F
CF3
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Me
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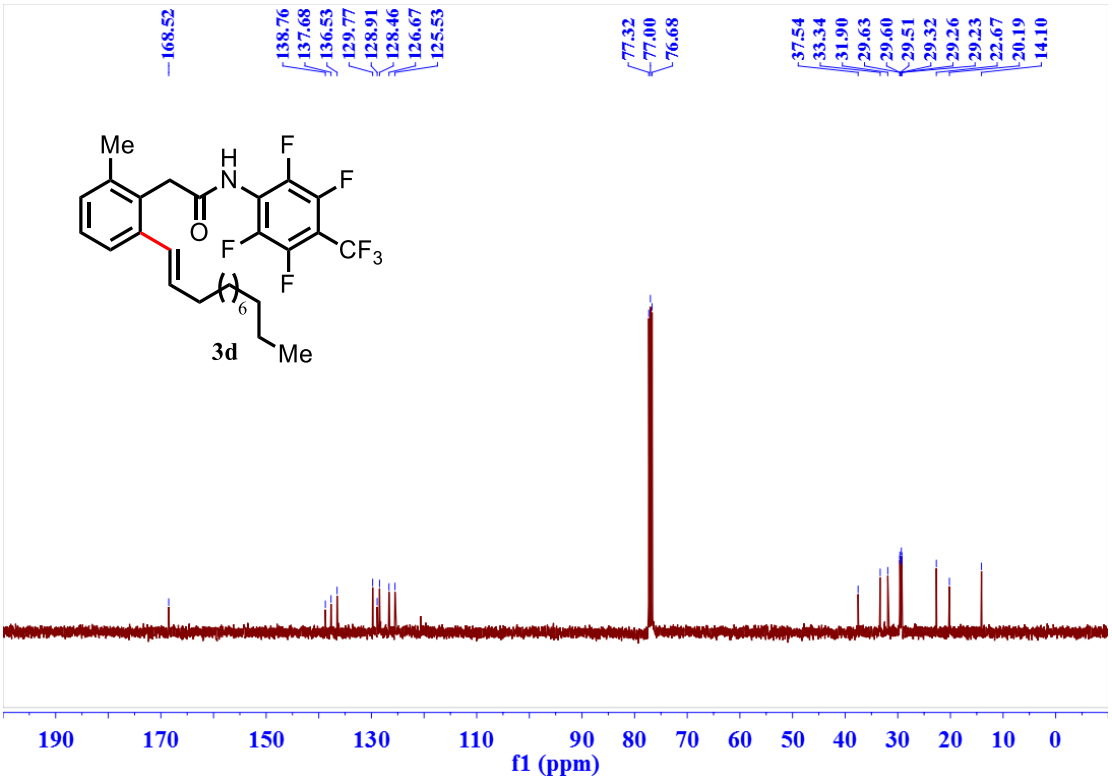
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Me
H
N
O
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F
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F
CF3
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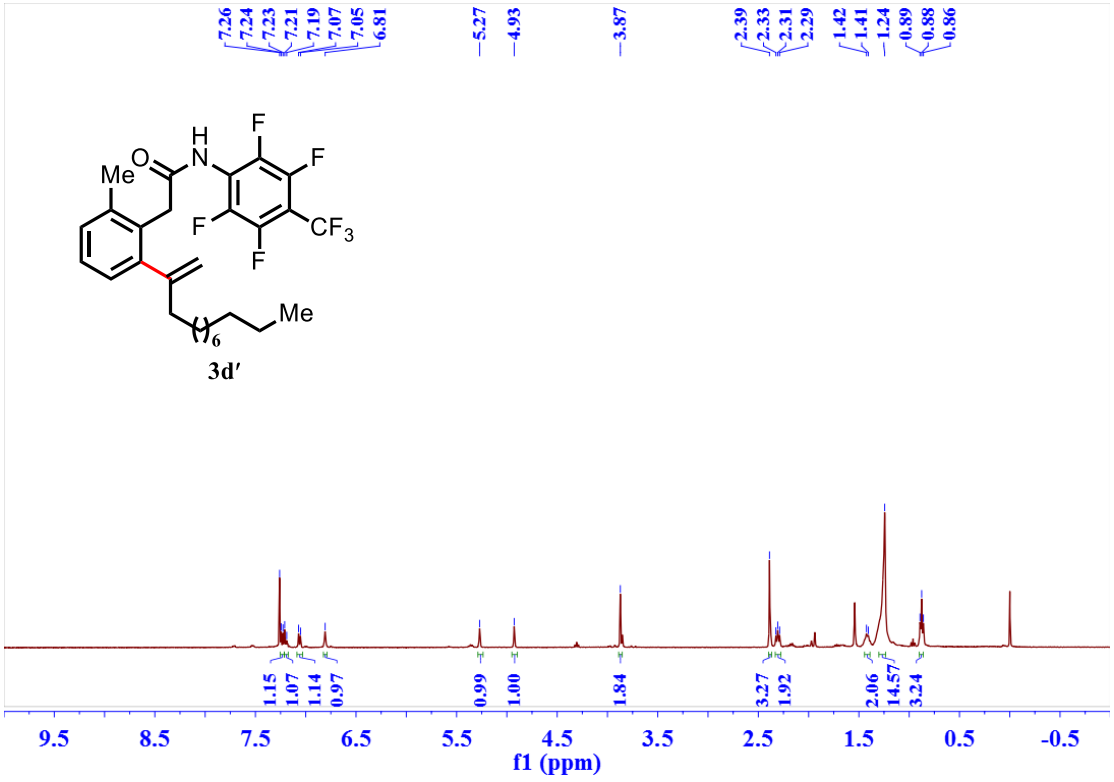
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CF3
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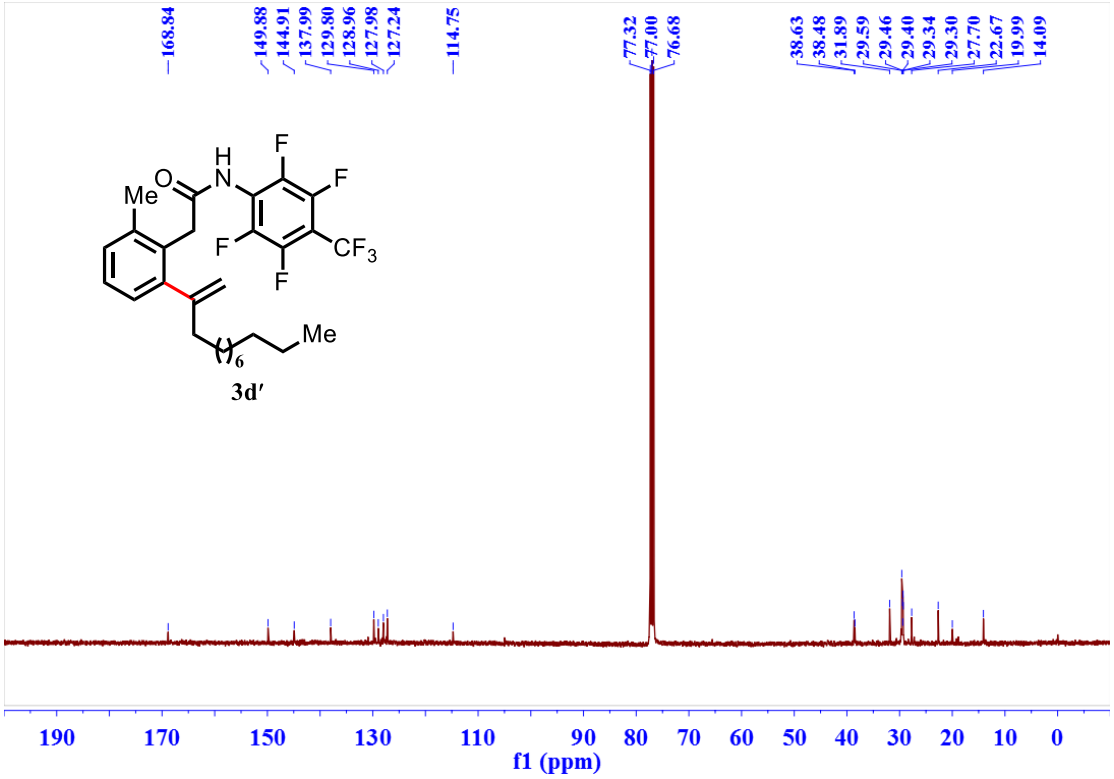
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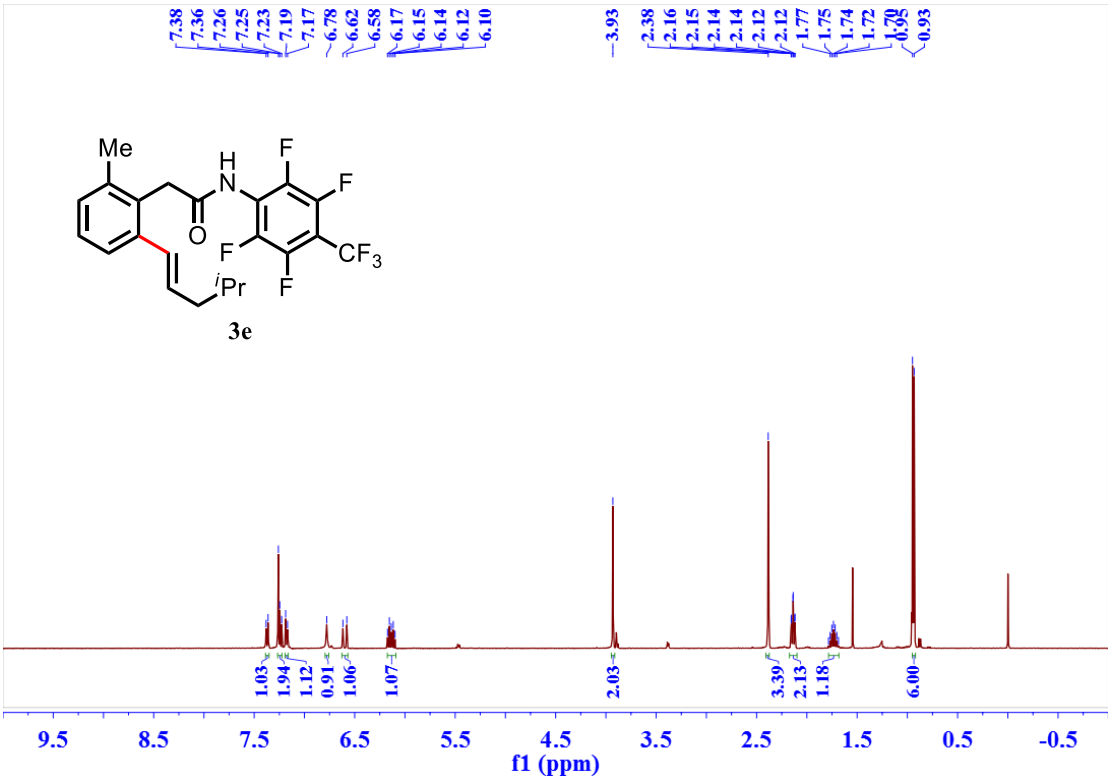
f1 (ppm)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O
F
F
F
F
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3e
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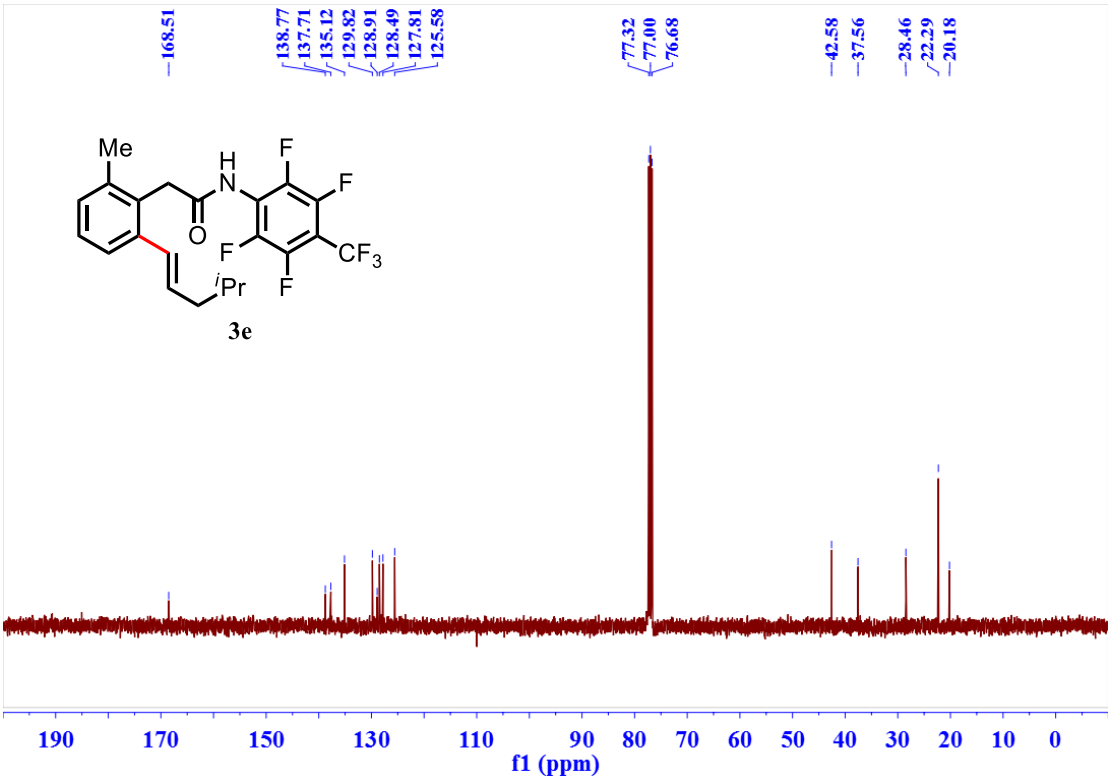
f1 (ppm)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F
F
F
F
CF3
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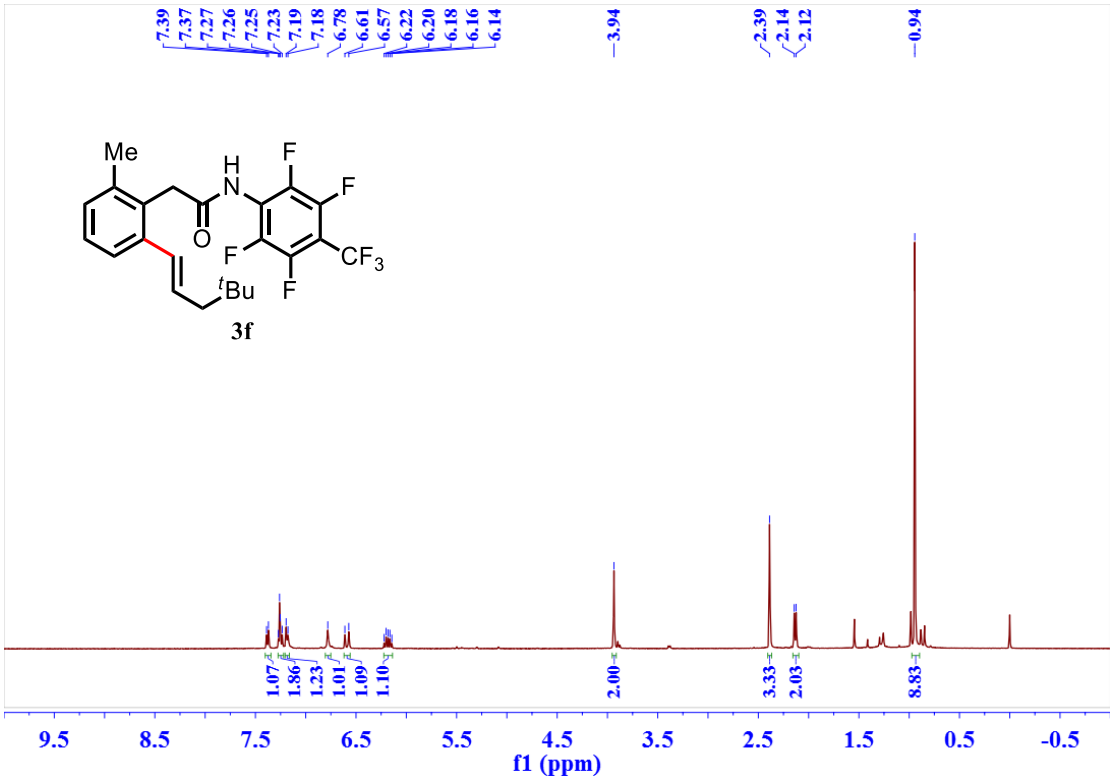
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O
F
F
F
F
CF3
tBu
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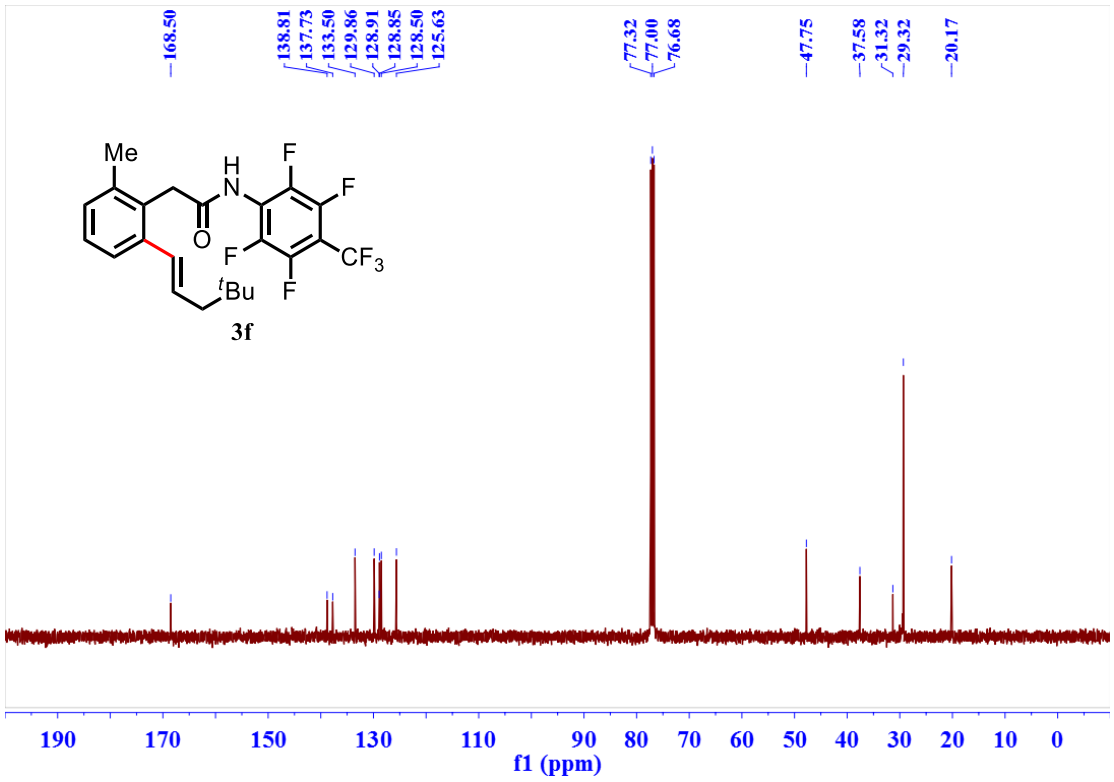
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F
CF3
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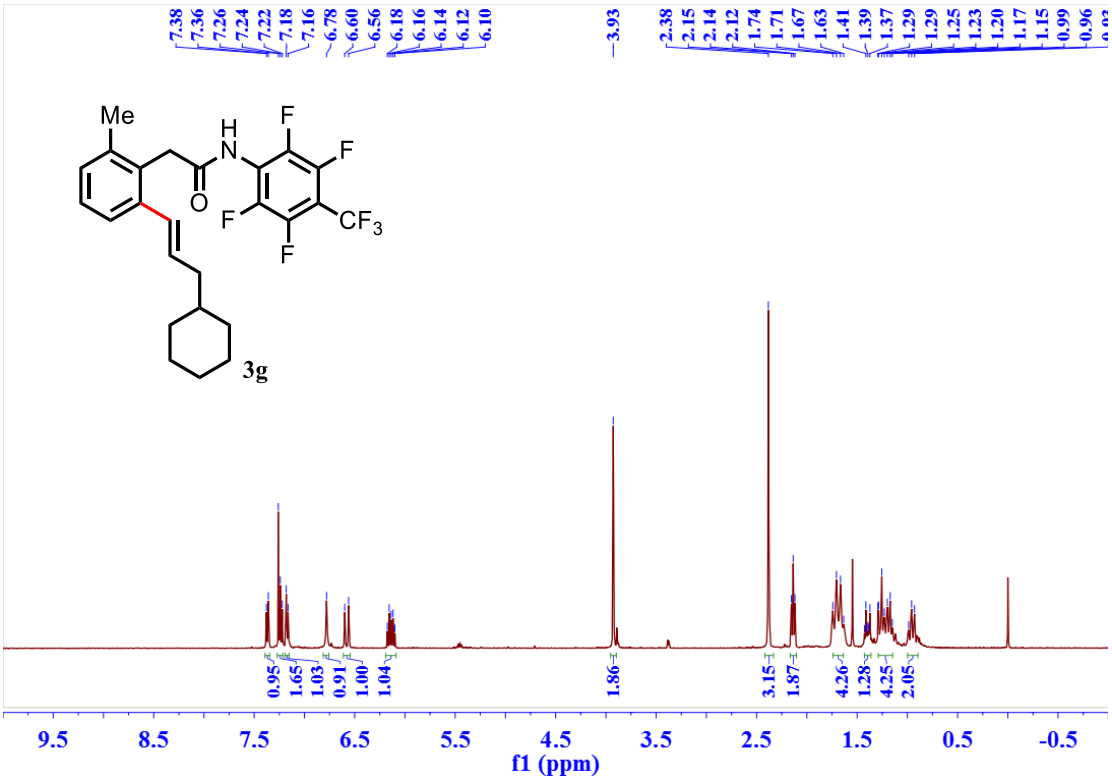
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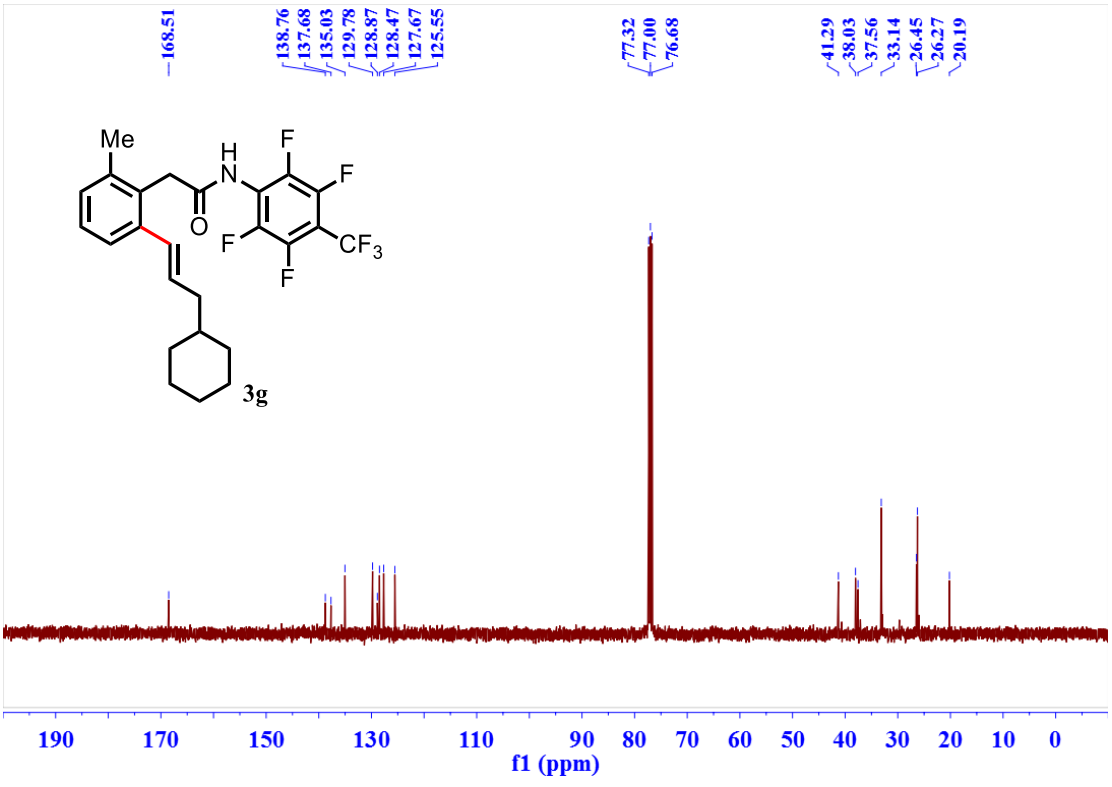
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F
F
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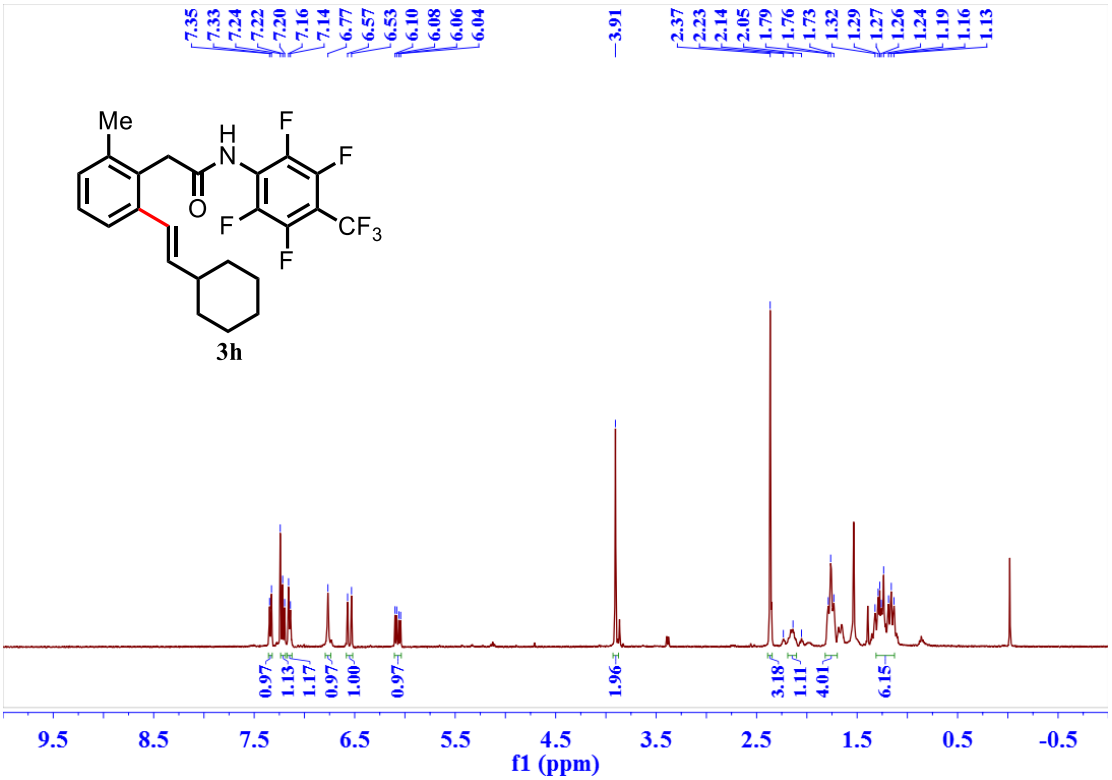
f1 (ppm)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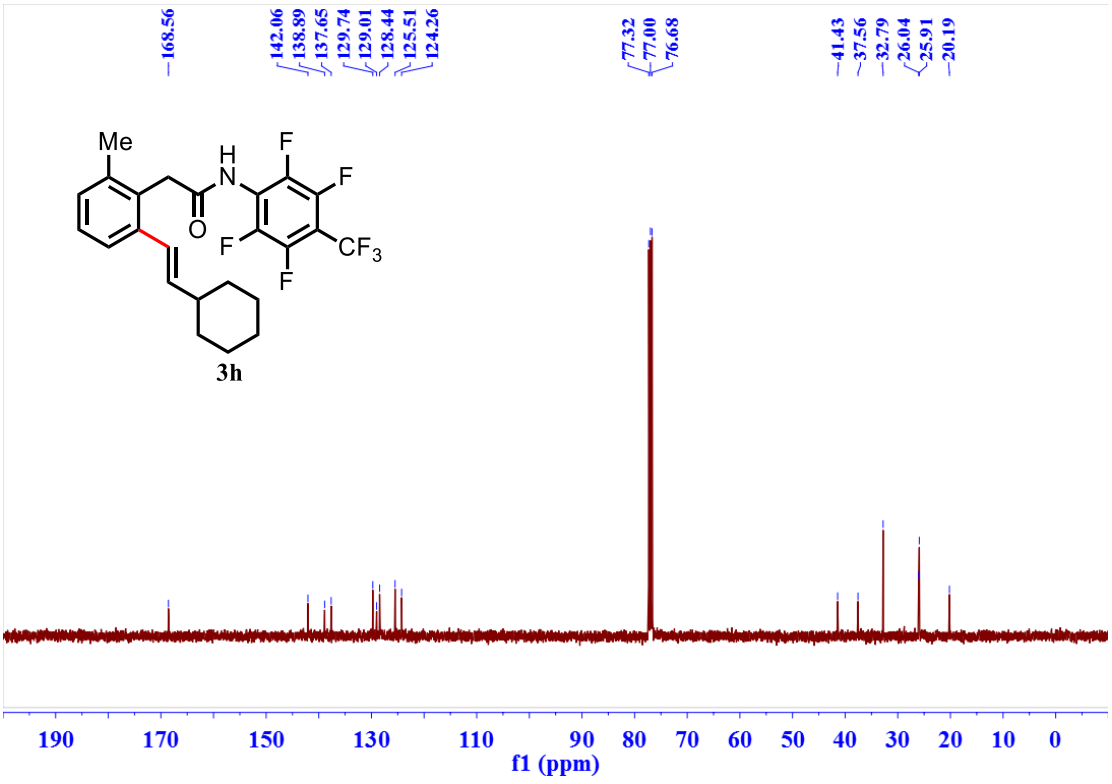
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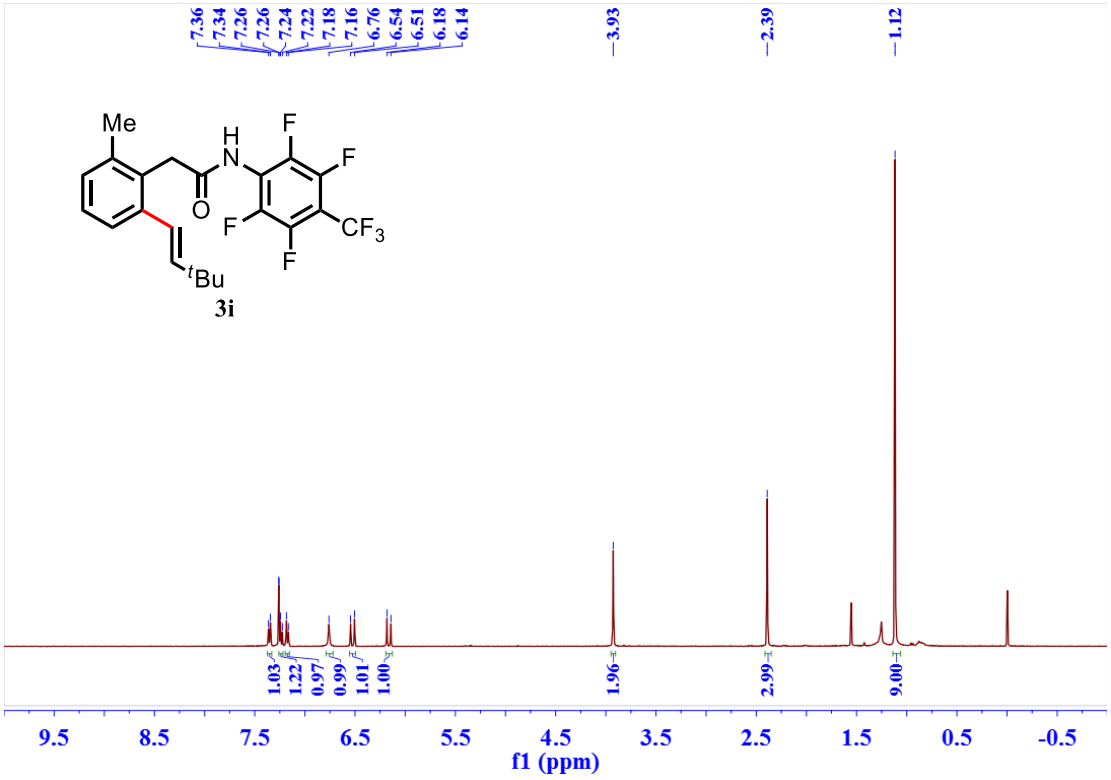
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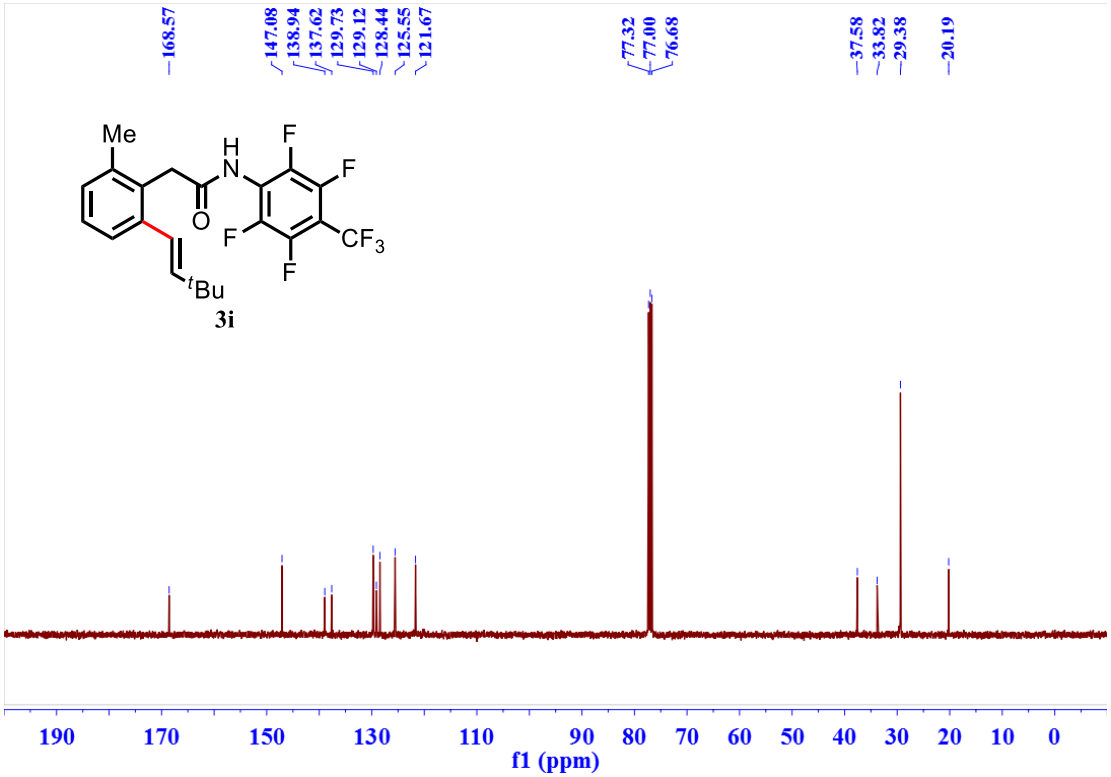
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CF3
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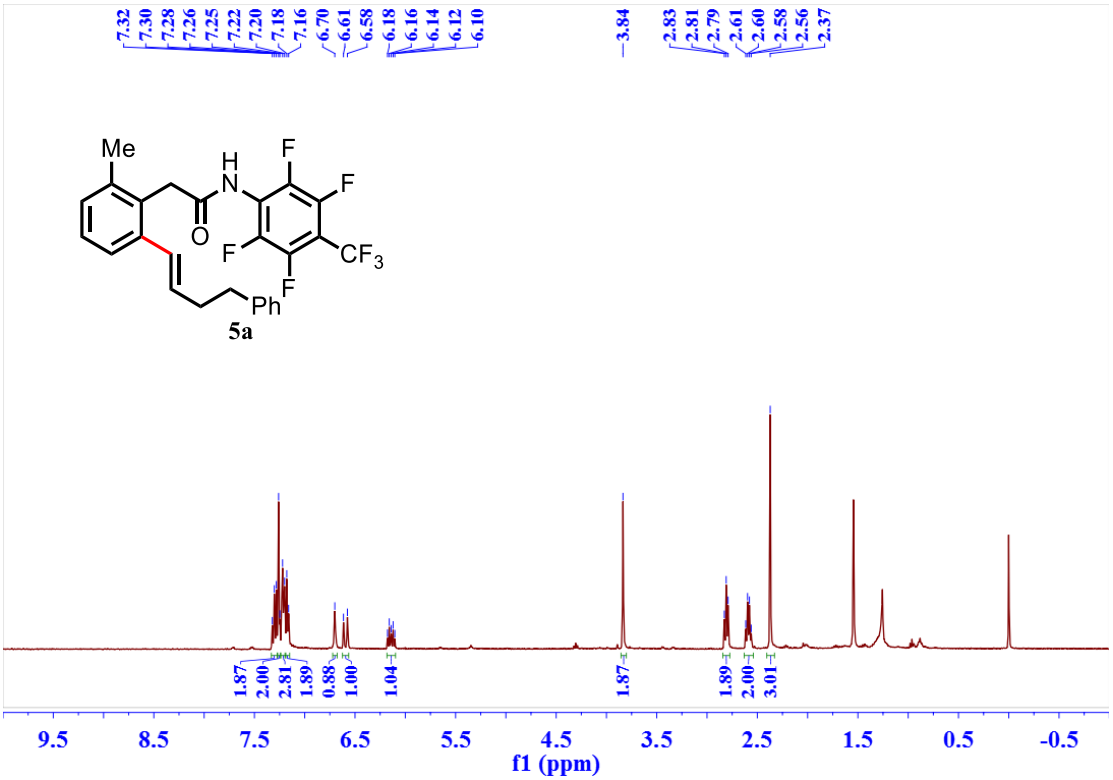
f1 (ppm)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F
CF3
Ph
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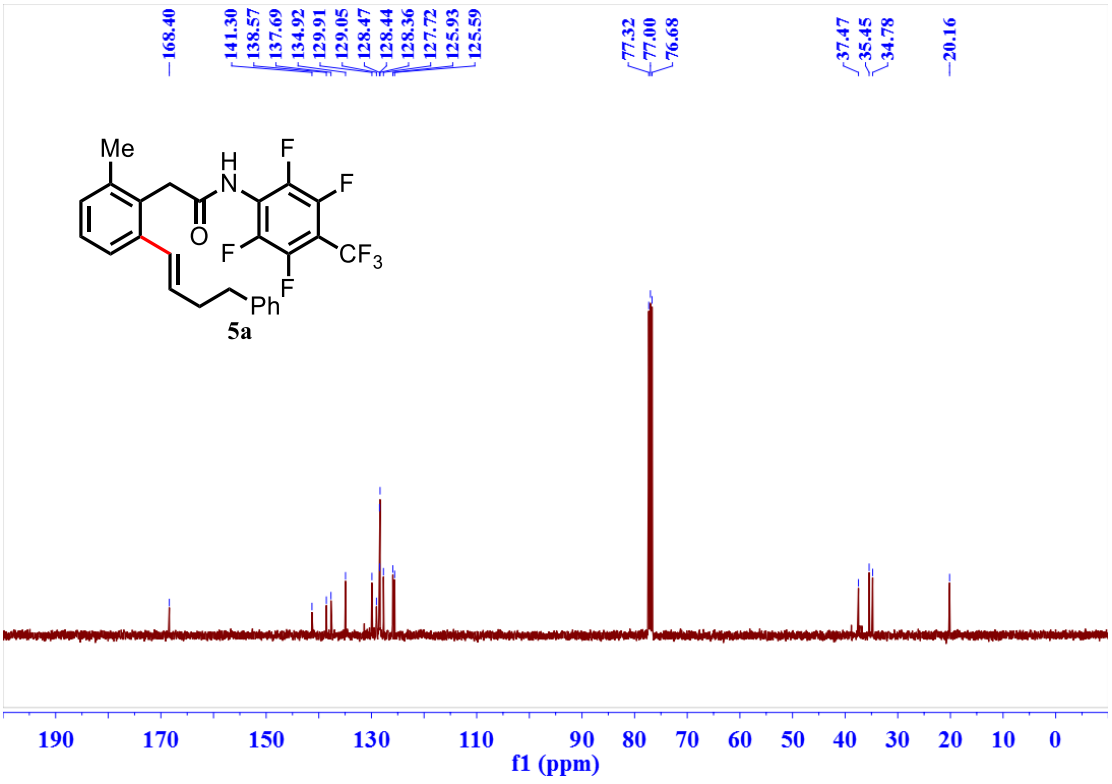
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F
F
CF3
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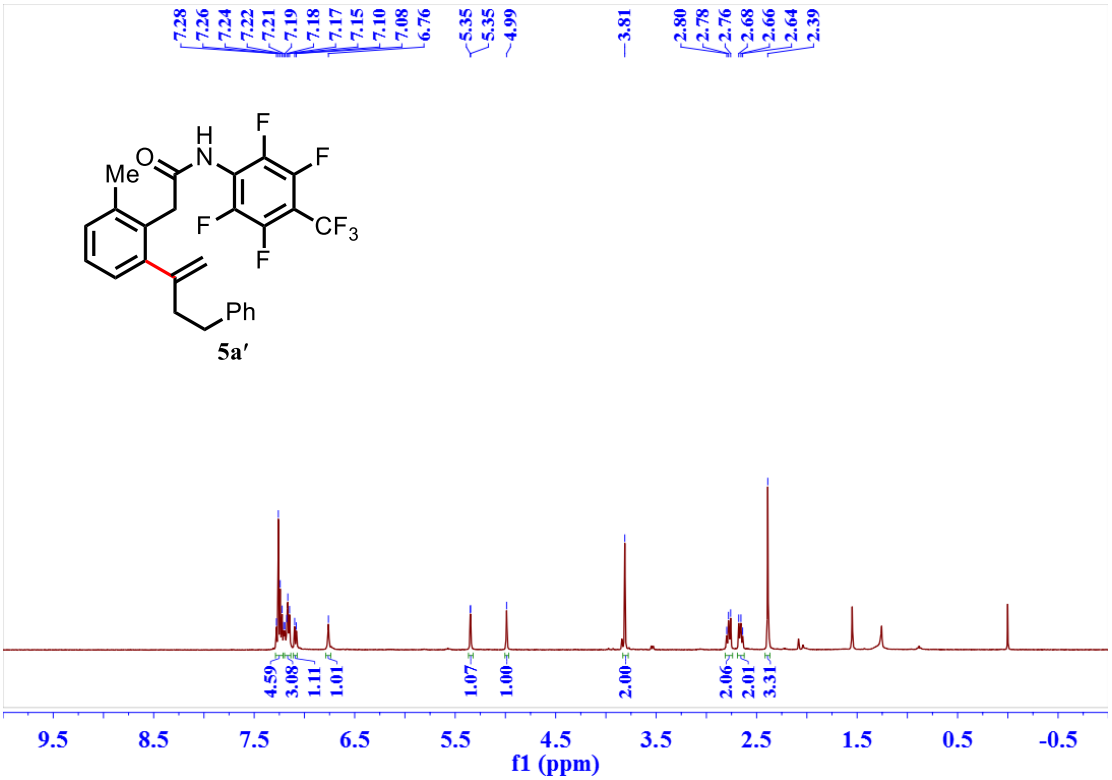
f1 (ppm)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CF3
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5a′
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3.08
1.11
1.01
1.07
1.00
2.00
2.06
2.01
3.31
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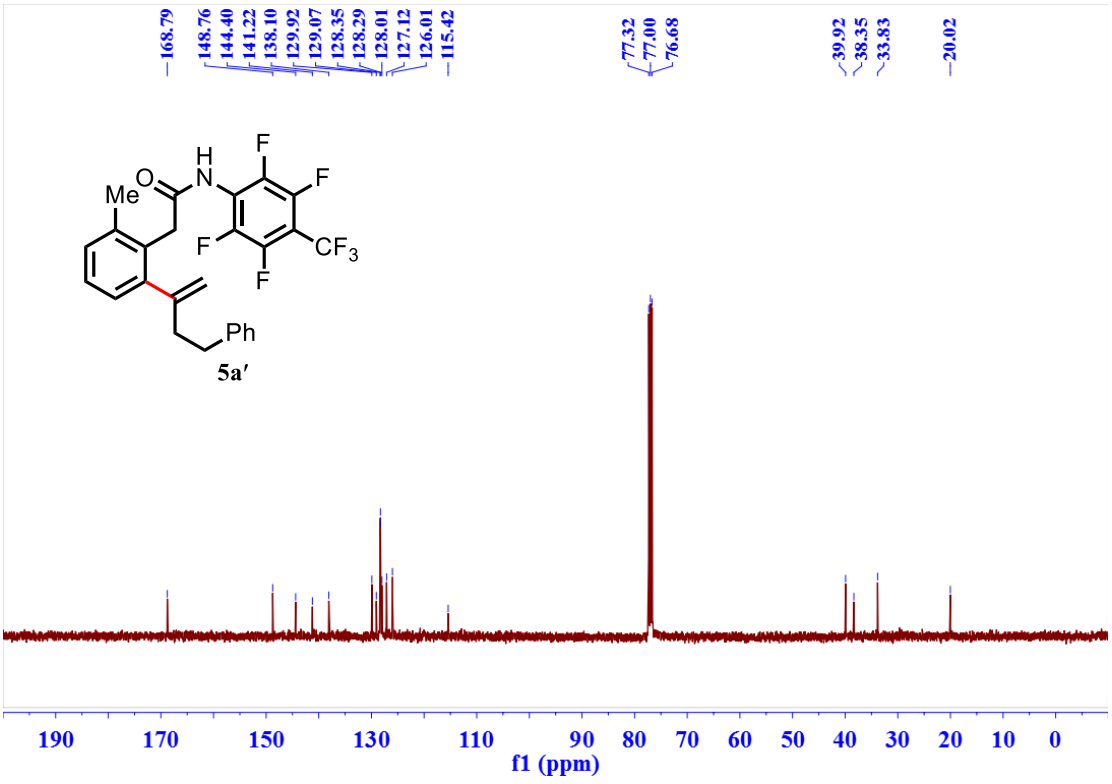
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77.00
76.68
39.92
38.35
33.83
20.02
Me
O
H
N
F
F
F
F
CF3
Ph
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90
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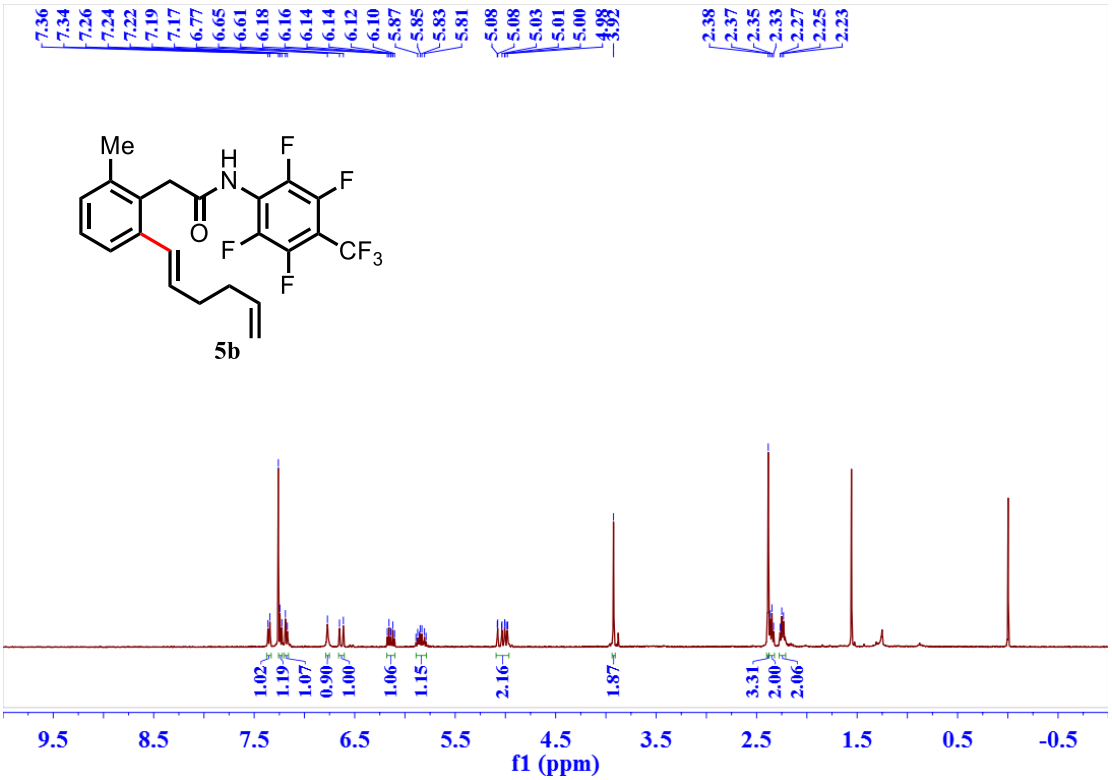
f1 (ppm)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6.14
6.12
6.10
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5.85
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5.81
5.08
5.08
5.03
5.01
5.00
4.98
4.92
2.38
2.37
2.35
2.33
2.27
2.25
2.23
Me
H
N
O
F
F
F
F
CF3
5b
1.02
1.19
1.07
0.90
1.00
1.06
1.15
2.16
1.87
3.31
2.00
2.06
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-0.5
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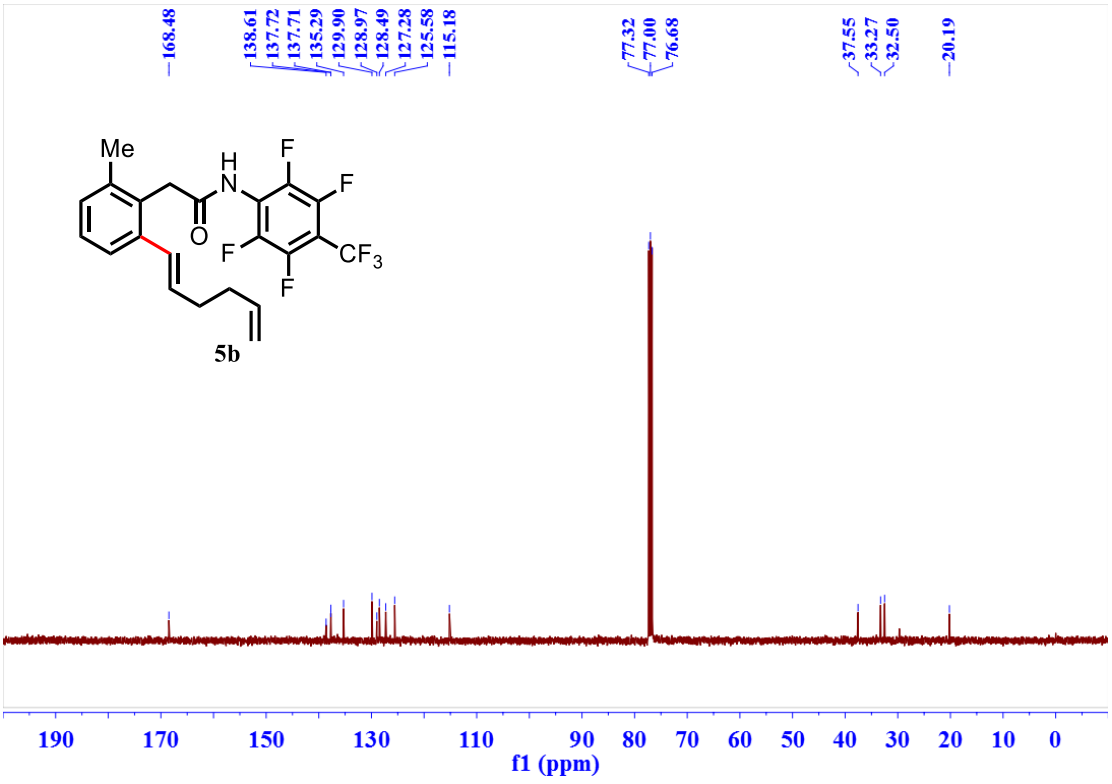
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37.55
33.27
32.50
20.19
Me
H
N
O
F
F
F
F
CF3
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150
130
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90
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70
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50
40
30
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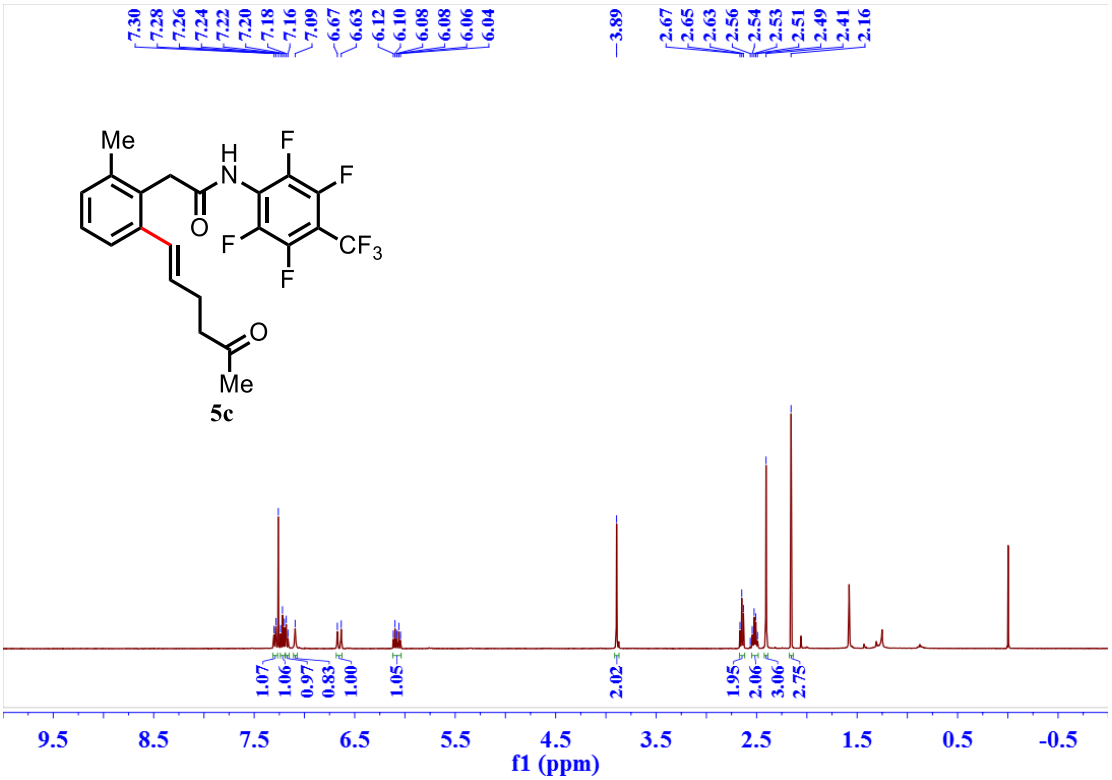
f1 (ppm)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6.63
6.12
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6.08
6.08
6.06
6.04
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2.63
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2.54
2.53
2.51
2.49
2.41
2.16
Me
H
N
O
F
F
F
F
CF3
O
Me
5c
1.07
1.06
0.97
0.83
1.00
1.05
2.02
1.95
2.06
3.06
2.75
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6.5
5.5
4.5
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1.5
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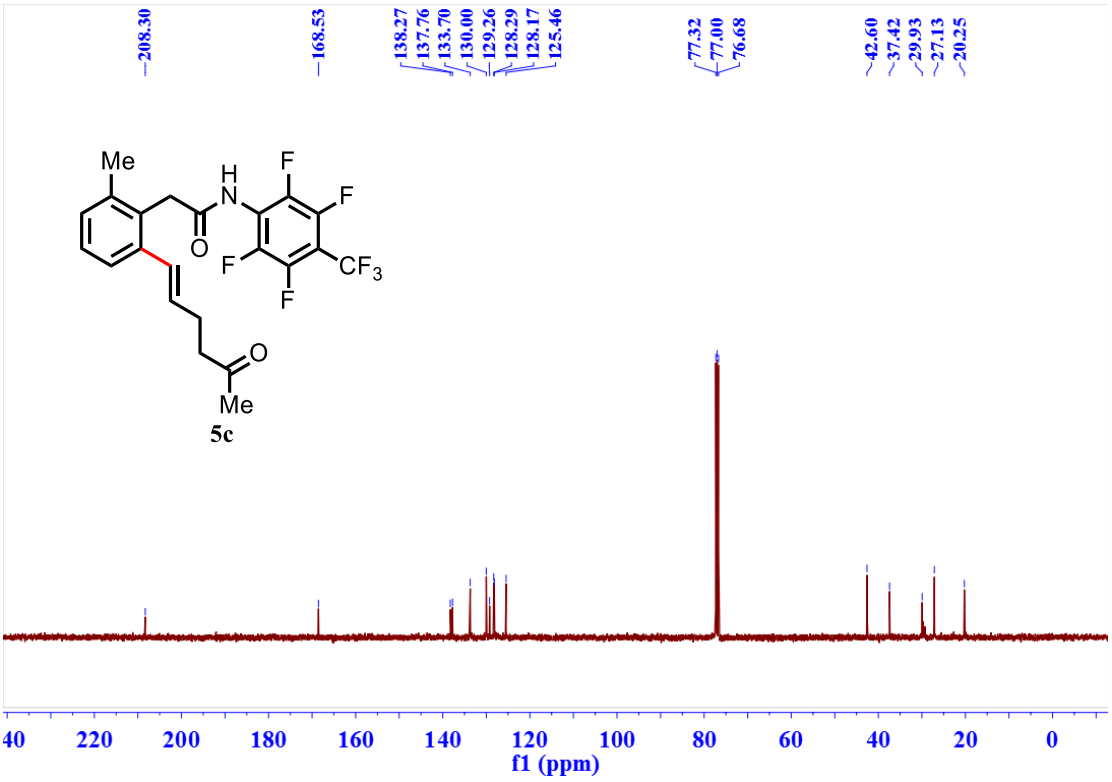
-0.5
f1 (ppm)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37.42
29.93
27.13
20.25
Me
H
N
O
F
F
F
F
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O
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5c
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100
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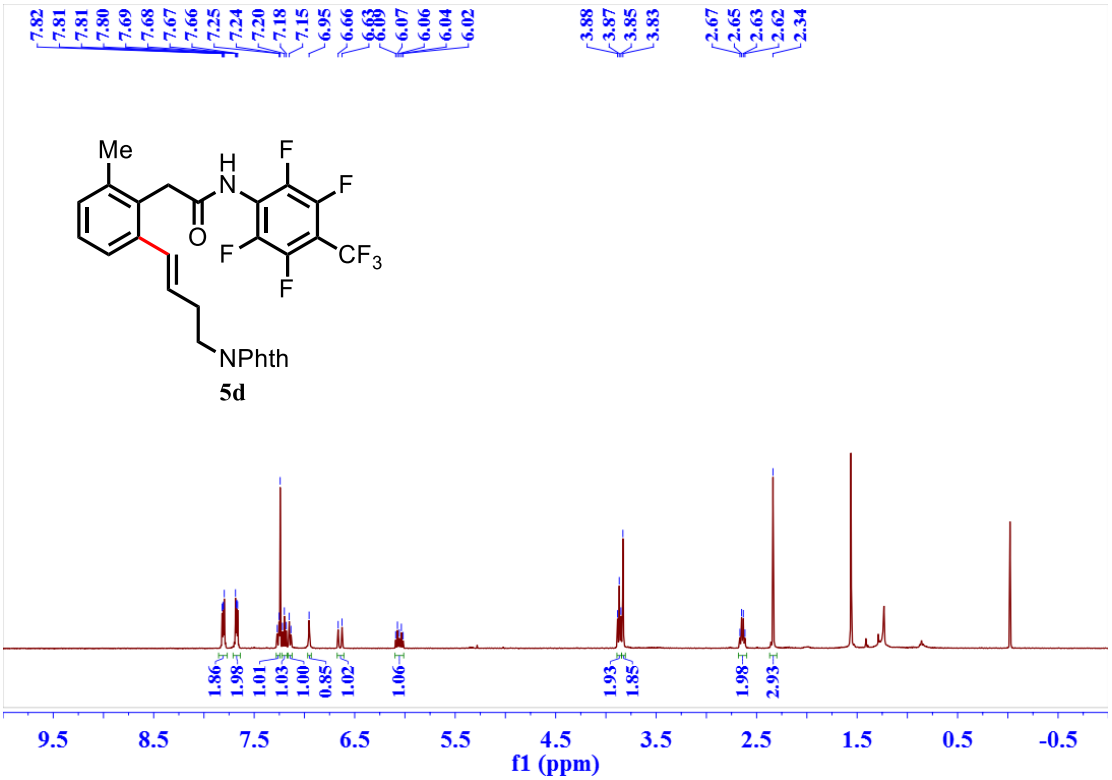
20
0
f1 (ppm)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7.15
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6.66
6.63
6.09
6.07
6.06
6.04
6.02
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3.87
3.85
3.83
2.67
2.65
2.63
2.62
2.34
Me
H
N
O
F
F
F
F
CF3
NPhth
5d
1.86
1.98
1.01
1.03
1.00
0.85
1.02
1.06
1.93
1.85
1.98
2.93
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5.5
4.5
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1.5
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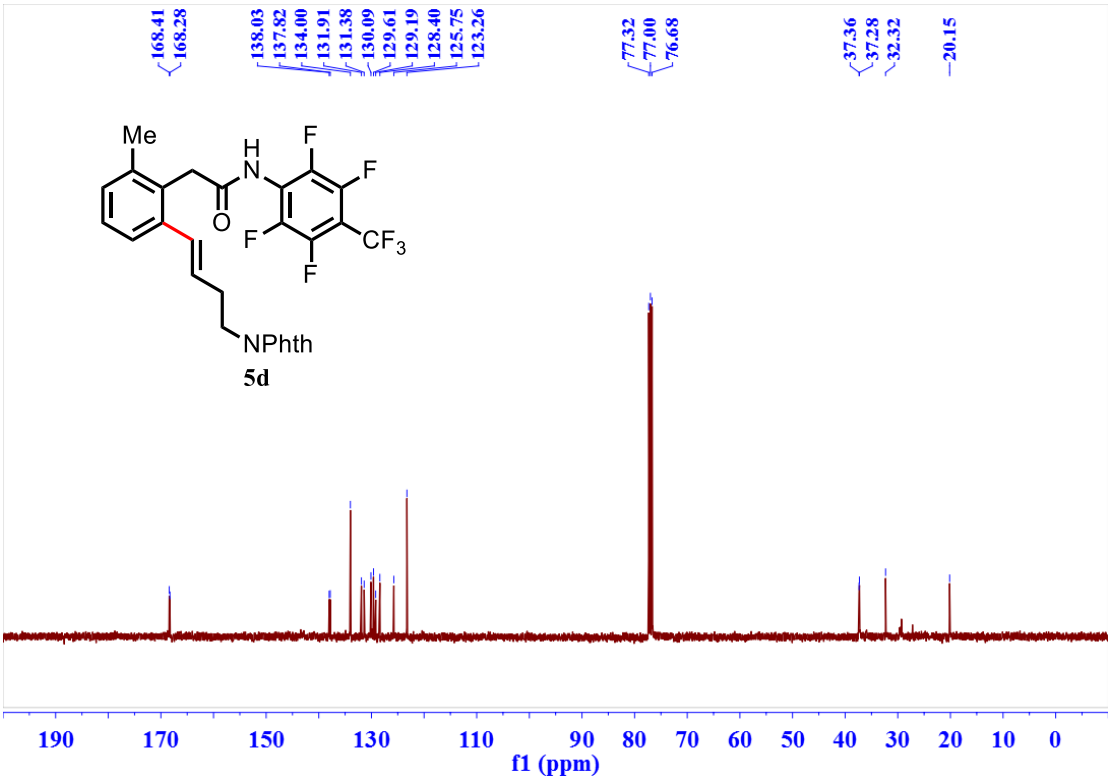
f1 (ppm)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123.26
77.32
77.00
76.68
37.36
37.28
32.32
20.15
Me
H
N
O
F
F
F
F
CF3
NPhth
5d
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170
150
130
110
90
80
70
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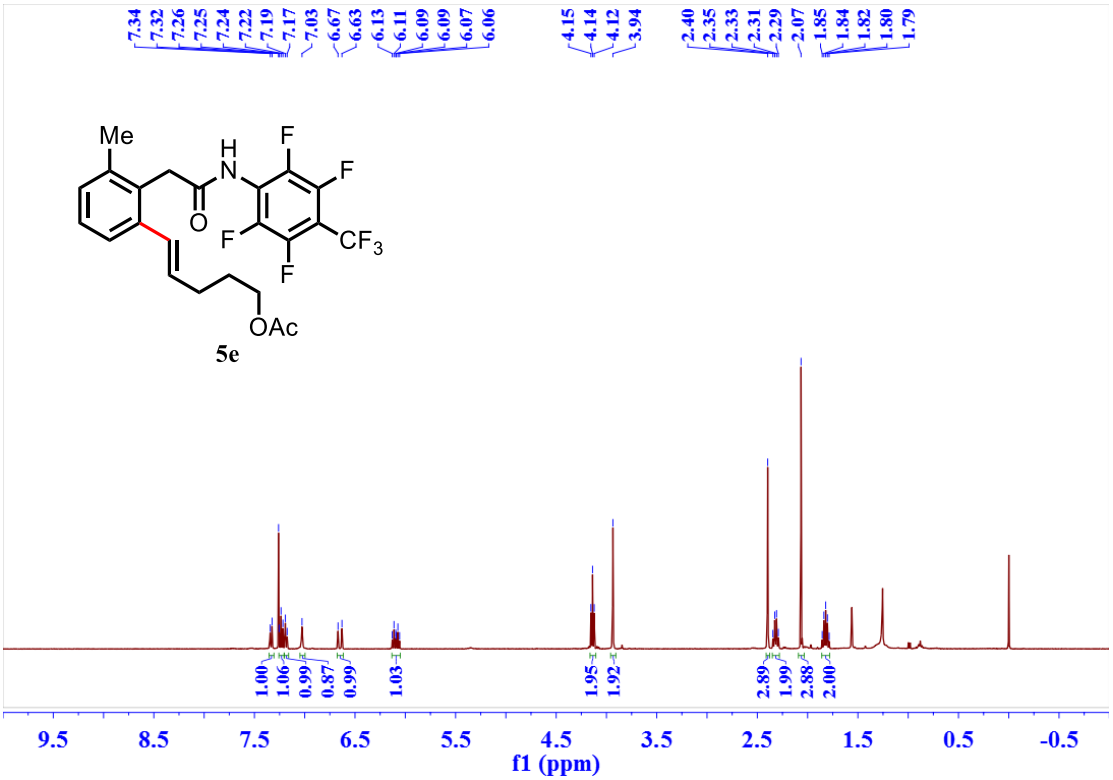
50
40
30
20
10
0
f1 (ppm)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6.63
6.13
6.11
6.09
6.09
6.07
6.06
4.15
4.14
4.12
3.94
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2.35
2.33
2.31
2.29
2.07
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1.84
1.82
1.80
1.79
Me
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N
O
F
F
F
F
CF3
OAc
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1.06
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0.87
0.99
1.03
1.95
1.92
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1.99
2.88
2.00
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6.5
5.5
4.5
3.5
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1.5
0.5
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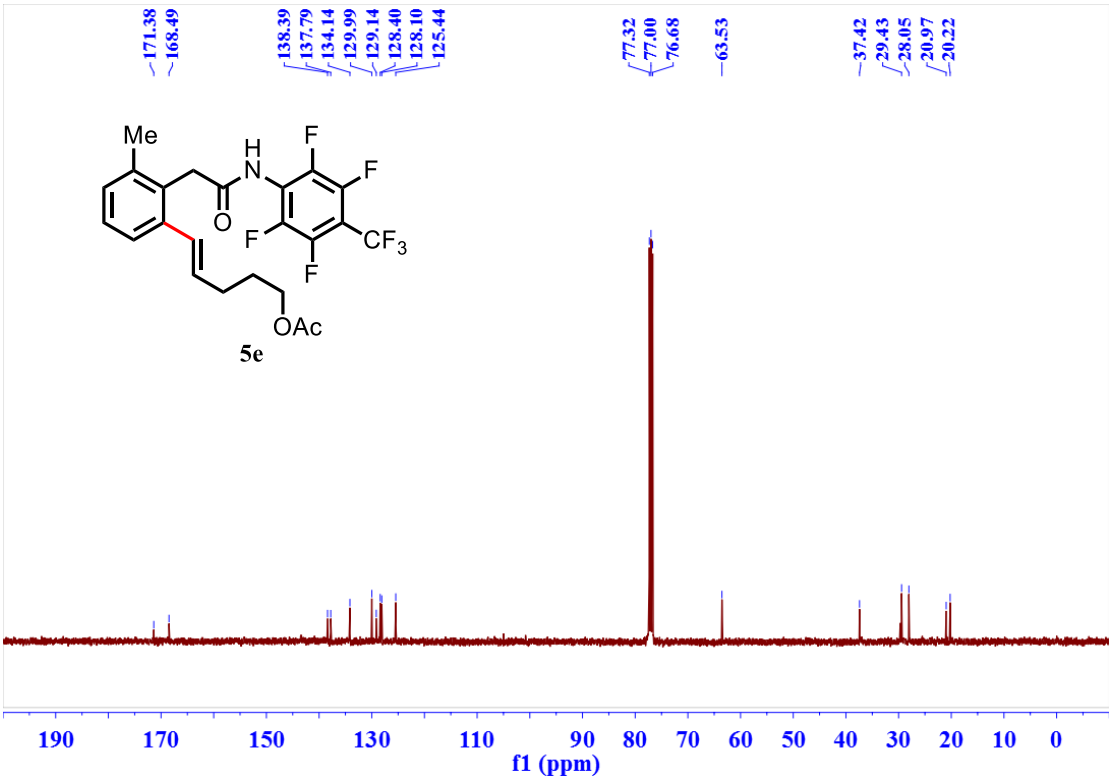
f1 (ppm)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29.43
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20.22
Me
H
N
O
F
F
F
F
CF3
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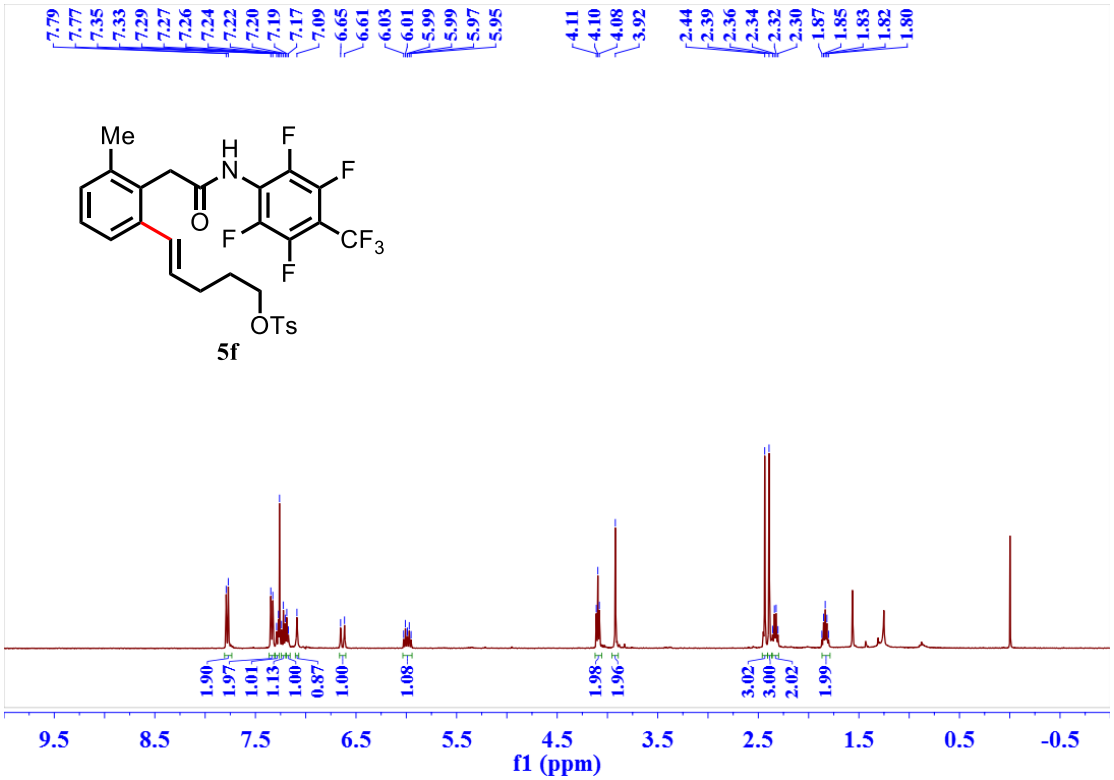
f1 (ppm)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7.33
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7.19
7.17
7.09
6.65
6.61
6.03
6.01
5.99
5.99
5.97
5.95
4.11
4.10
4.08
3.92
2.44
2.39
2.36
2.34
2.32
2.30
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1.82
1.80
Me
H
N
O
F
F
F
F
CF3
OTs
5f
1.90
1.97
1.01
1.13
1.00
0.87
1.00
1.08
1.98
1.96
3.02
3.00
2.02
1.99
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6.5
5.5
4.5
3.5
2.5
1.5
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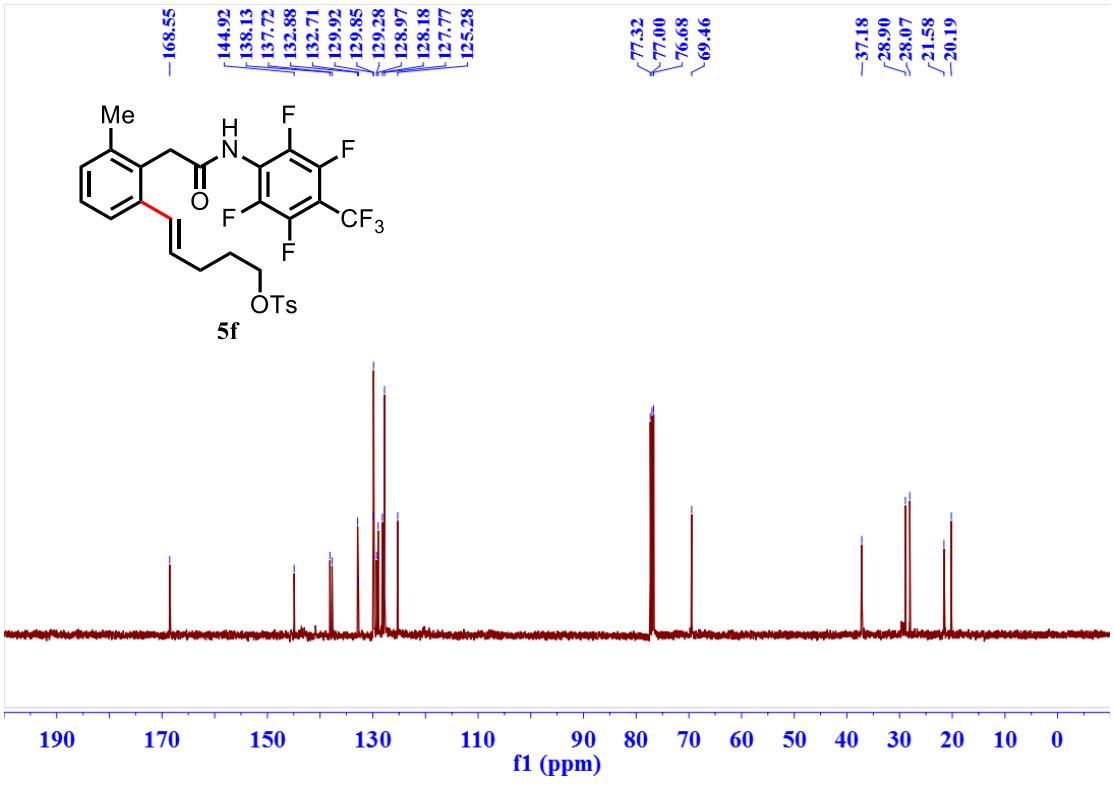
-0.5
f1 (ppm)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77.32
77.00
76.68
69.46
37.18
28.90
28.07
21.58
20.19
Me
H
N
O
F
F
F
F
CF3
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170
150
130
110
90
80
70
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50
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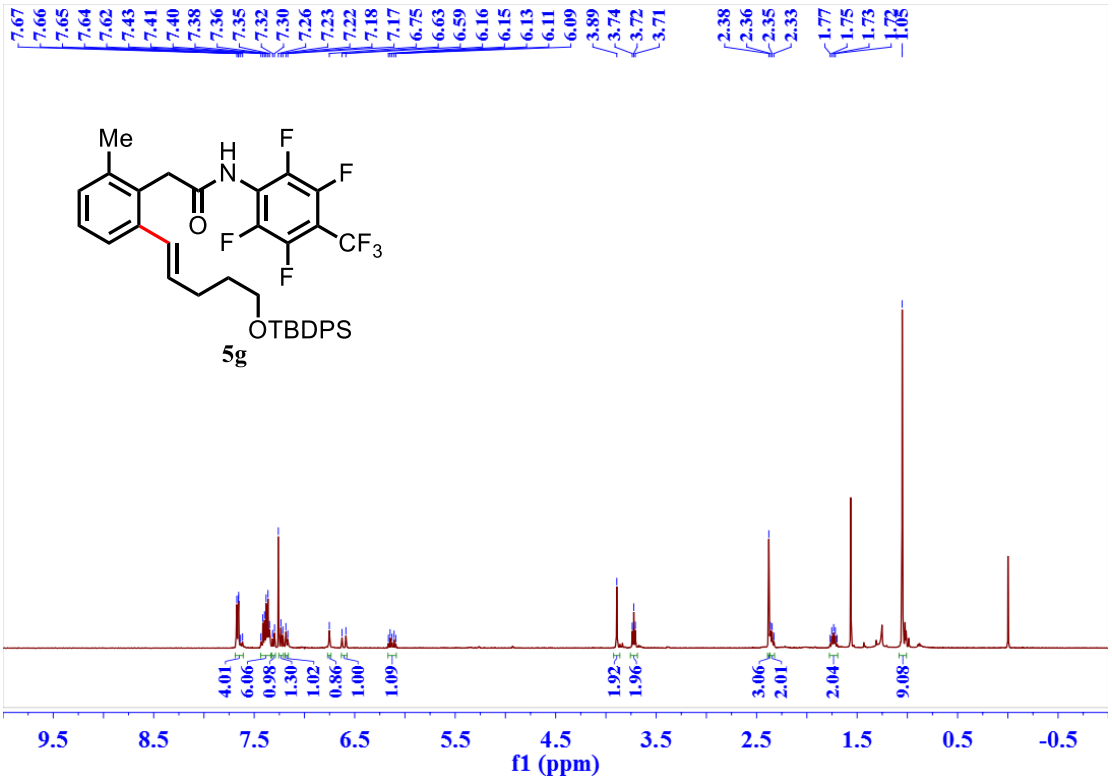
f1 (ppm)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7.18
7.17
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6.15
6.13
6.11
6.09
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3.71
2.38
2.36
2.35
2.33
1.77
1.75
1.73
1.72
1.05
Me
H
N
O
F
F
F
F
CF3
OTBDPS
5g
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6.06
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1.02
0.86
1.00
1.09
1.92
1.96
3.06
2.01
2.04
9.08
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6.5
5.5
4.5
3.5
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1.5
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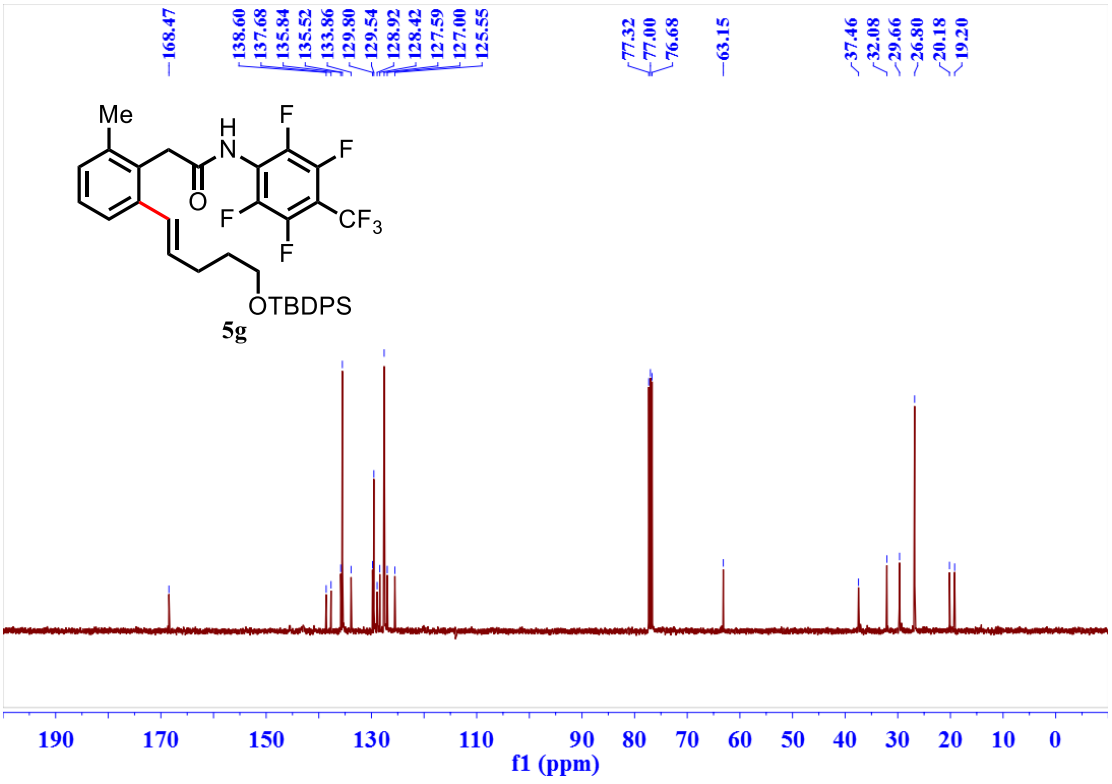
-0.5
f1 (ppm)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77.00
76.68
63.15
37.46
32.08
29.66
26.80
20.18
19.20
Me
H
N
O
F
F
F
F
CF3
OTBDPS
5g
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170
150
130
110
90
80
70
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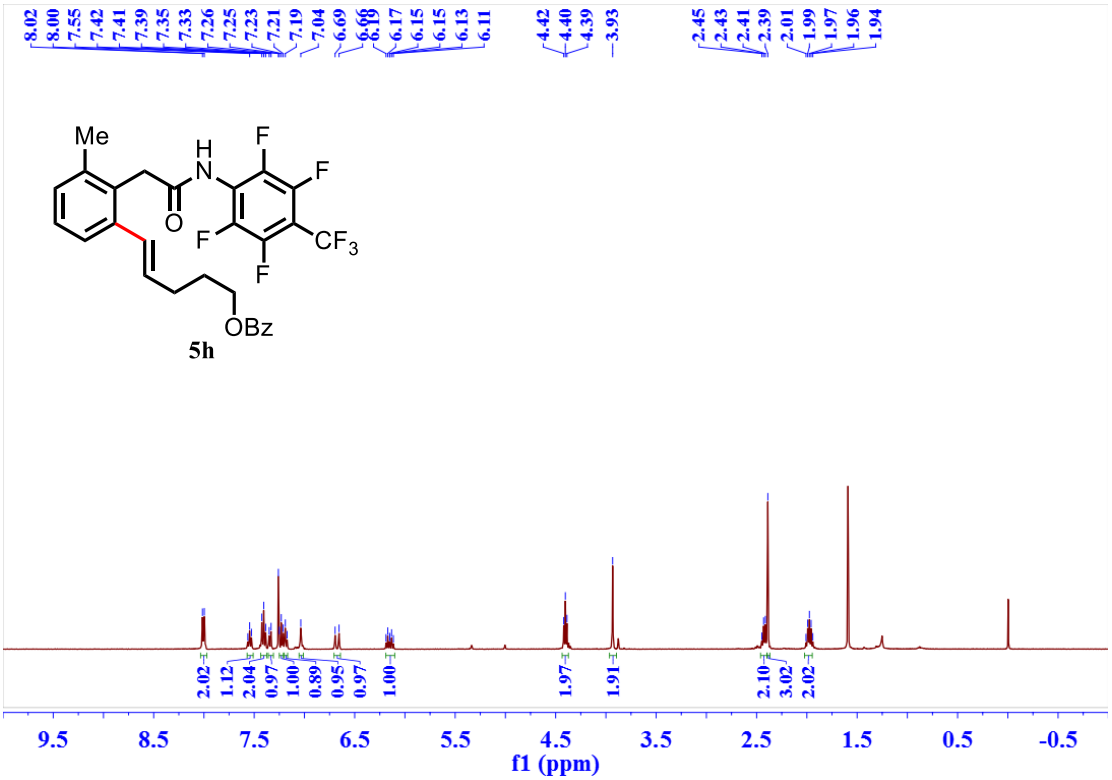
50
40
30
20
10
0
f1 (ppm)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7.19
7.04
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6.66
6.17
6.15
6.15
6.13
6.11
4.42
4.40
4.39
3.93
2.45
2.43
2.41
2.39
2.01
1.99
1.97
1.96
1.94
Me
H
N
O
F
F
F
F
CF3
OBz
5h
2.02
1.12
2.04
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1.00
0.89
0.95
0.97
1.00
1.97
1.91
2.10
3.02
2.02
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5.5
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3.5
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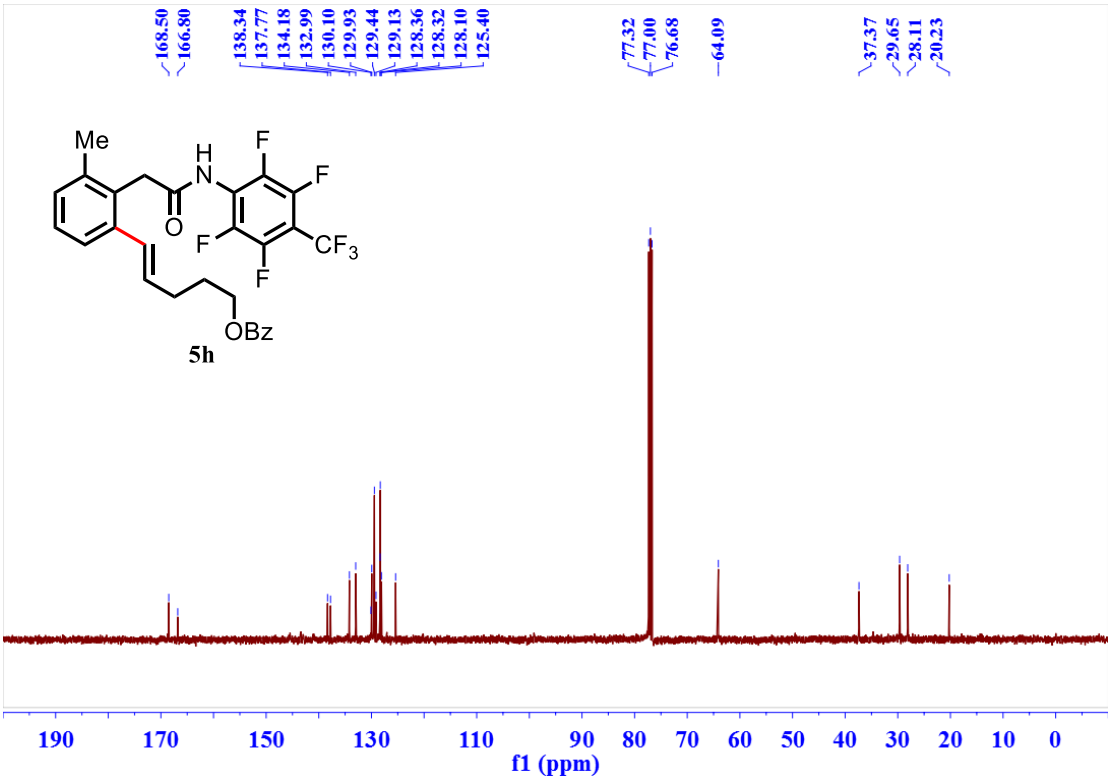
-0.5
f1 (ppm)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125.40
77.32
77.00
76.68
64.09
37.37
29.65
28.11
20.23
Me
H
N
O
F
F
F
F
CF3
OBz
5h
190
170
150
130
110
90
80
70
60
50
40
30
20
10
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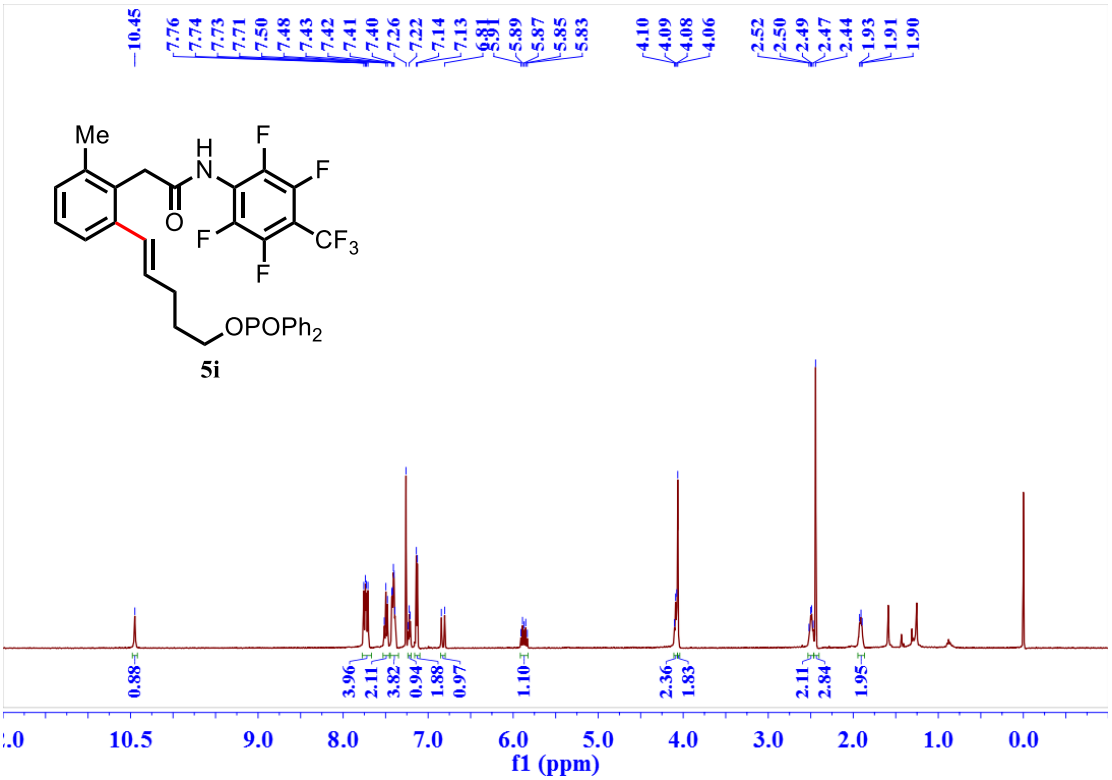
f1 (ppm)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5.87
5.85
5.83
4.10
4.09
4.08
4.06
2.52
2.50
2.49
2.47
2.44
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1.91
1.90
Me
H
N
O
F
F
F
F
CF3
OPOPh2
5i
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0.97
1.10
2.36
1.83
2.11
2.84
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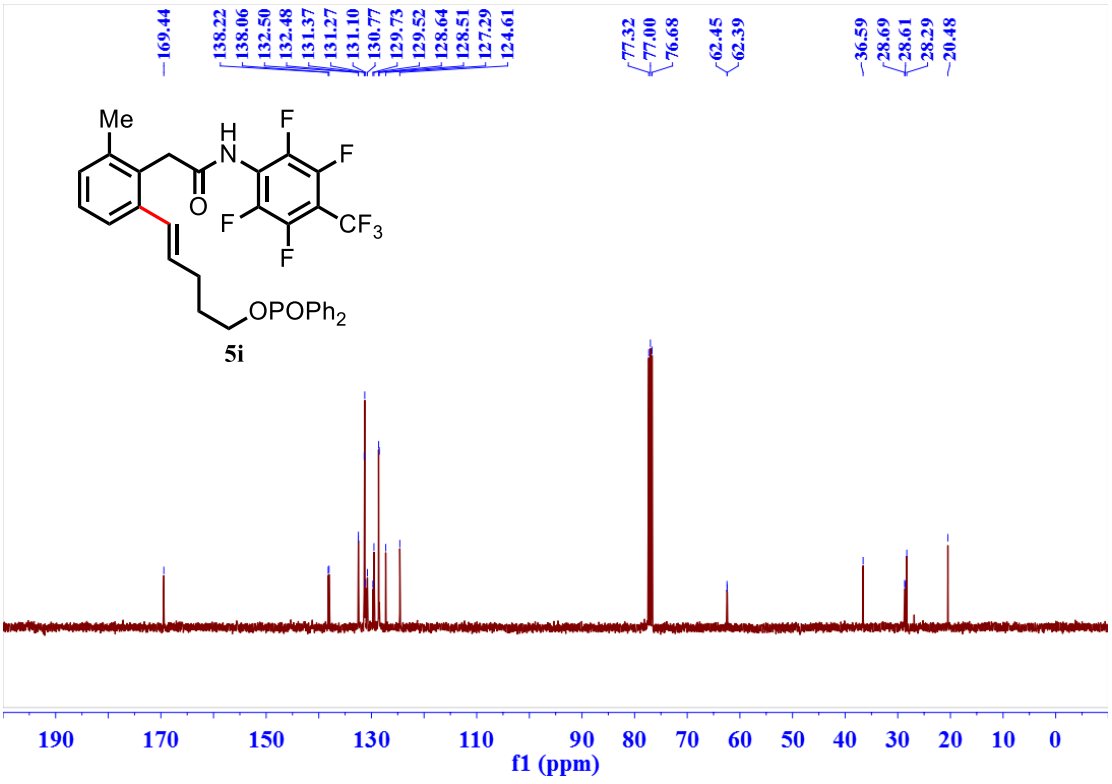
f1 (ppm)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62.45
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28.61
28.29
20.48
Me
H
N
O
F
F
F
F
CF3
OPOPh2
5i
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130
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90
80
70
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50
40
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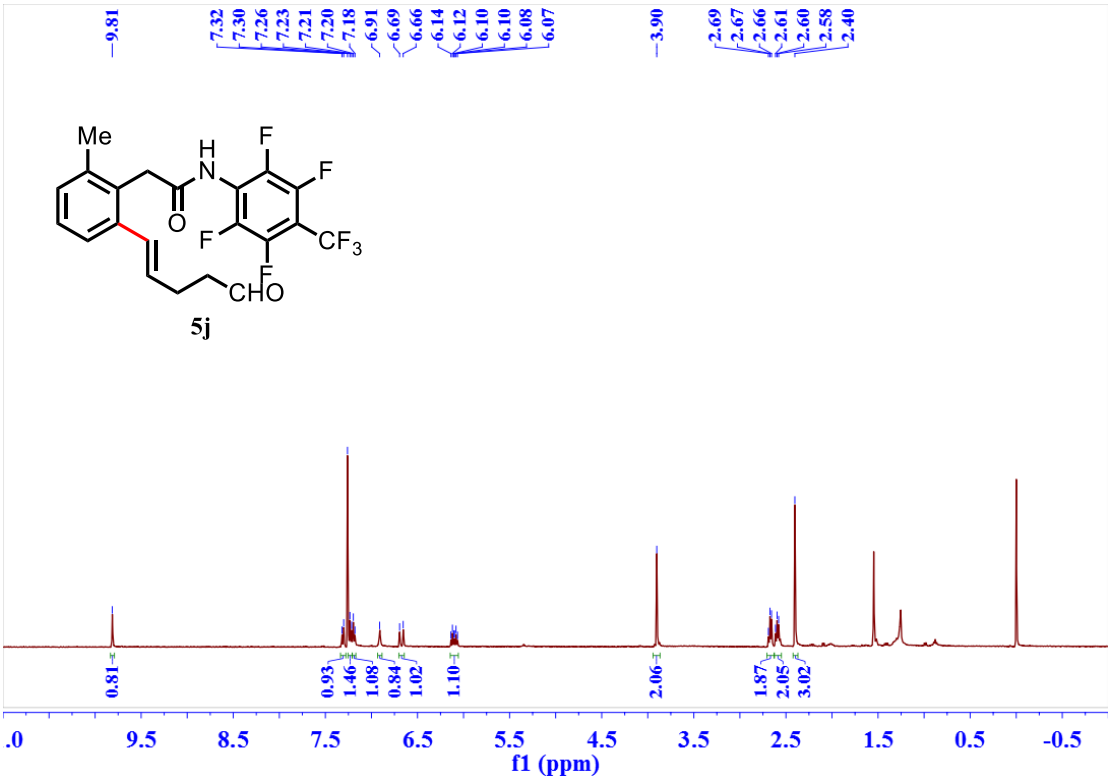
10
0
f1 (ppm)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6.10
6.10
6.08
6.07
3.90
2.69
2.67
2.66
2.61
2.60
2.58
2.40
Me
H
N
O
F
F
F
CF3
F
CHO
5j
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0.93
1.46
1.08
0.84
1.02
1.10
2.06
1.87
2.05
3.02
.0
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4.5
3.5
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1.5
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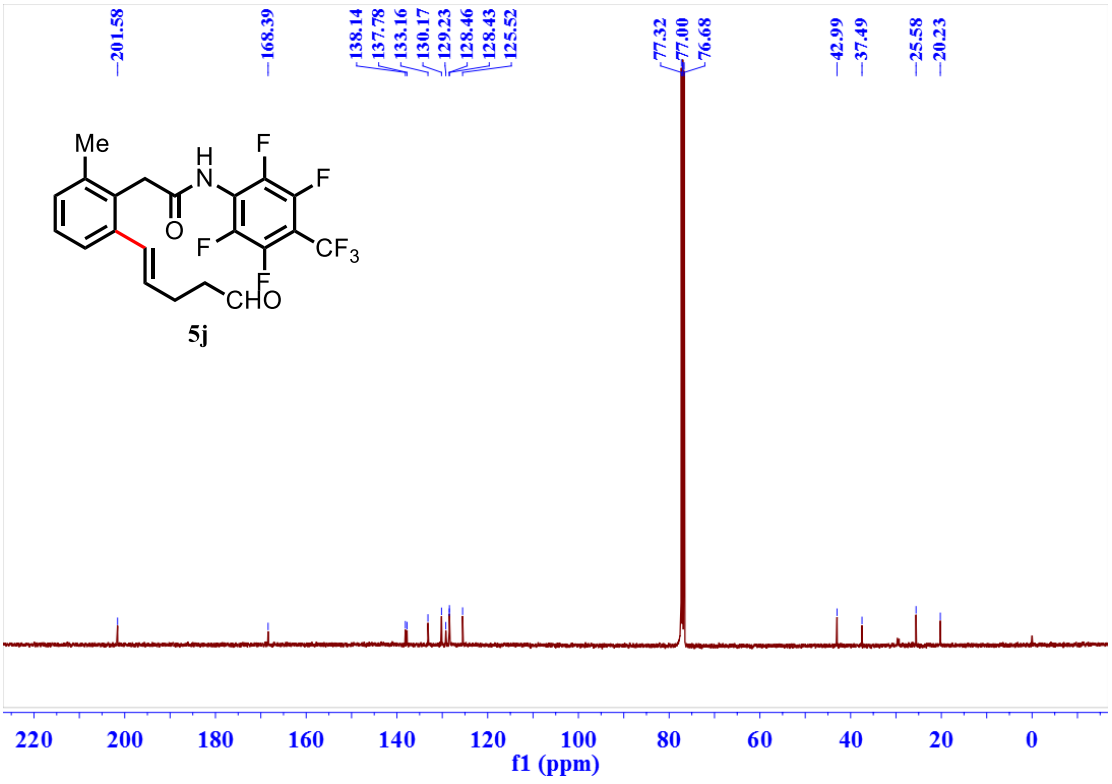
f1 (ppm)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76.68
42.99
37.49
25.58
20.23
Me
H
N
O
F
F
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CF3
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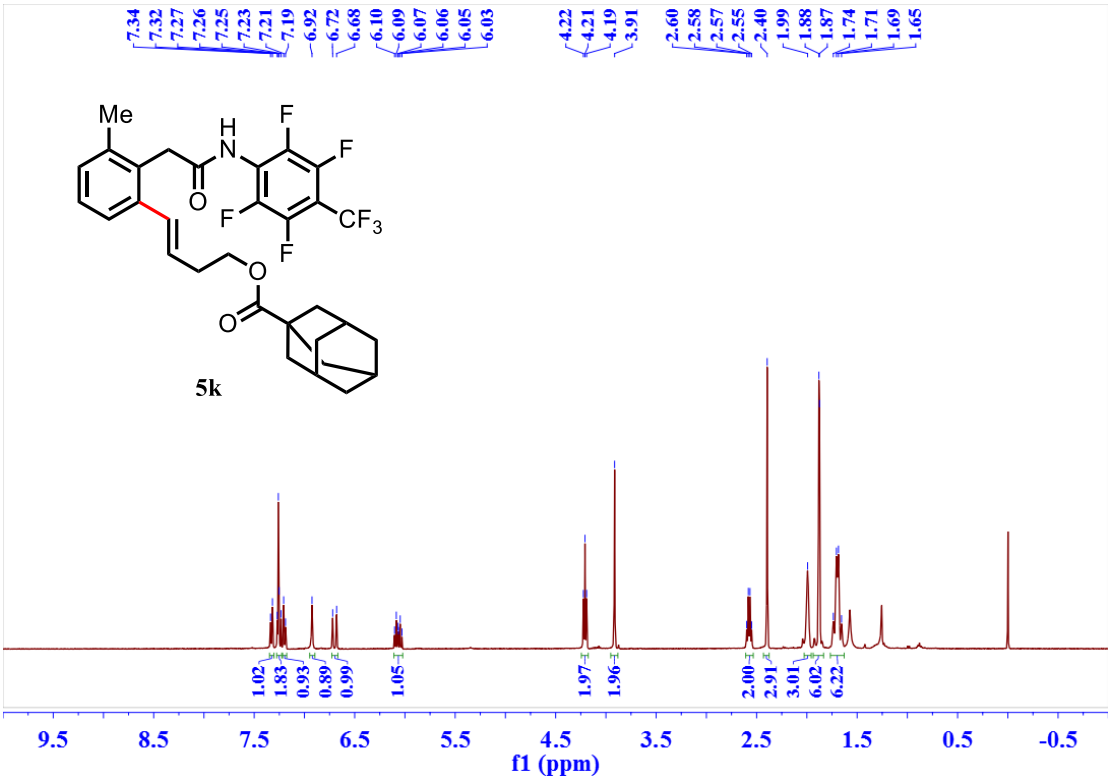
CHO
5j
220
200
180
160
140
120
100
80
60
40
20
0
f1 (ppm)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6.07
6.06
6.05
6.03
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2.40
1.99
1.88
1.87
1.74
1.71
1.69
1.65
Me
H
N
O
F
F
F
F
CF3
O
O
5k
1.02
1.83
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0.89
0.99
1.05
1.97
1.96
2.00
2.91
3.01
6.02
6.22
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6.5
5.5
4.5
3.5
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1.5
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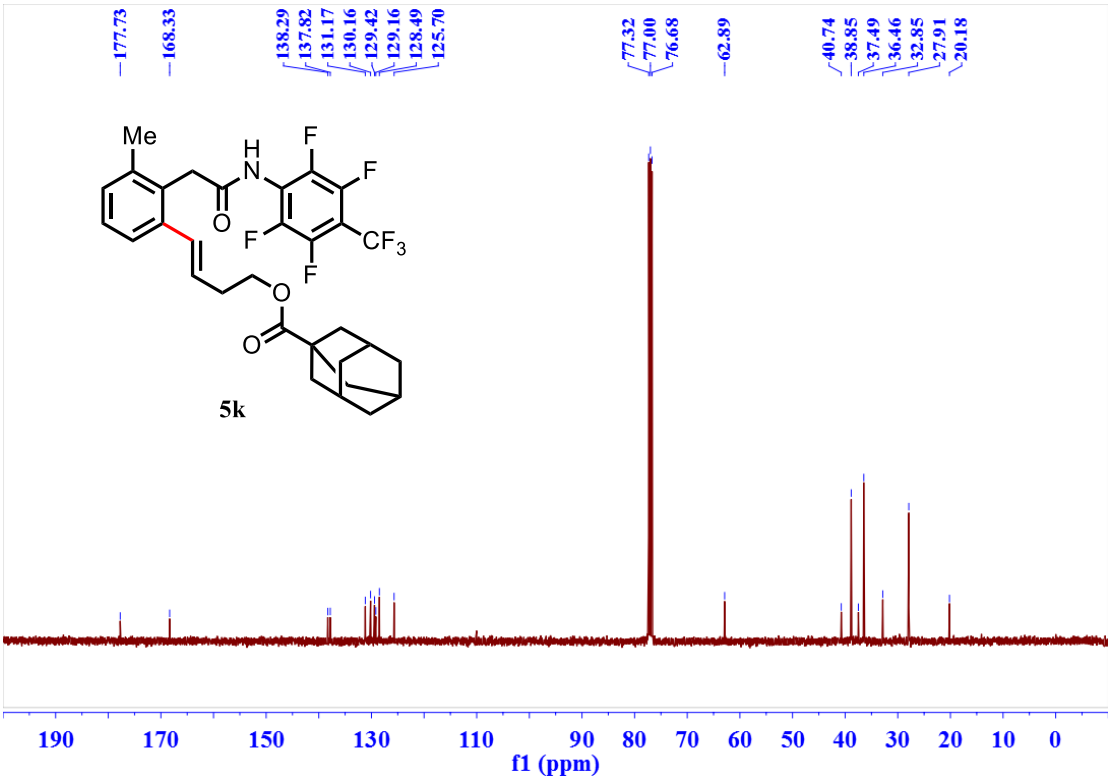
f1 (ppm)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76.68
62.89
40.74
38.85
37.49
36.46
32.85
27.91
20.18
Me
H
N
O
F
F
F
F
CF3
O
O
5k
190
170
150
130
110
90
80
70
60
50
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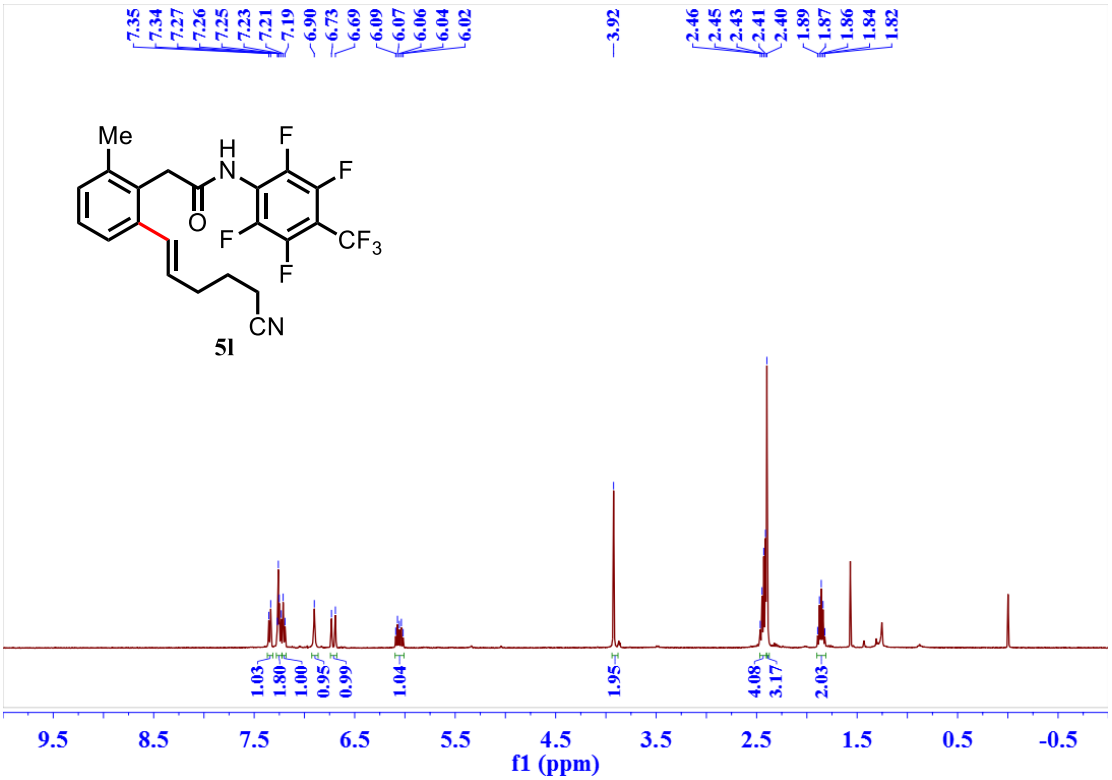
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6.06
6.04
6.02
3.92
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2.45
2.43
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2.40
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1.84
1.82
Me
H
N
O
F
F
F
F
CF3
CN
5l
1.03
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1.00
0.95
0.99
1.04
1.95
4.08
3.17
2.03
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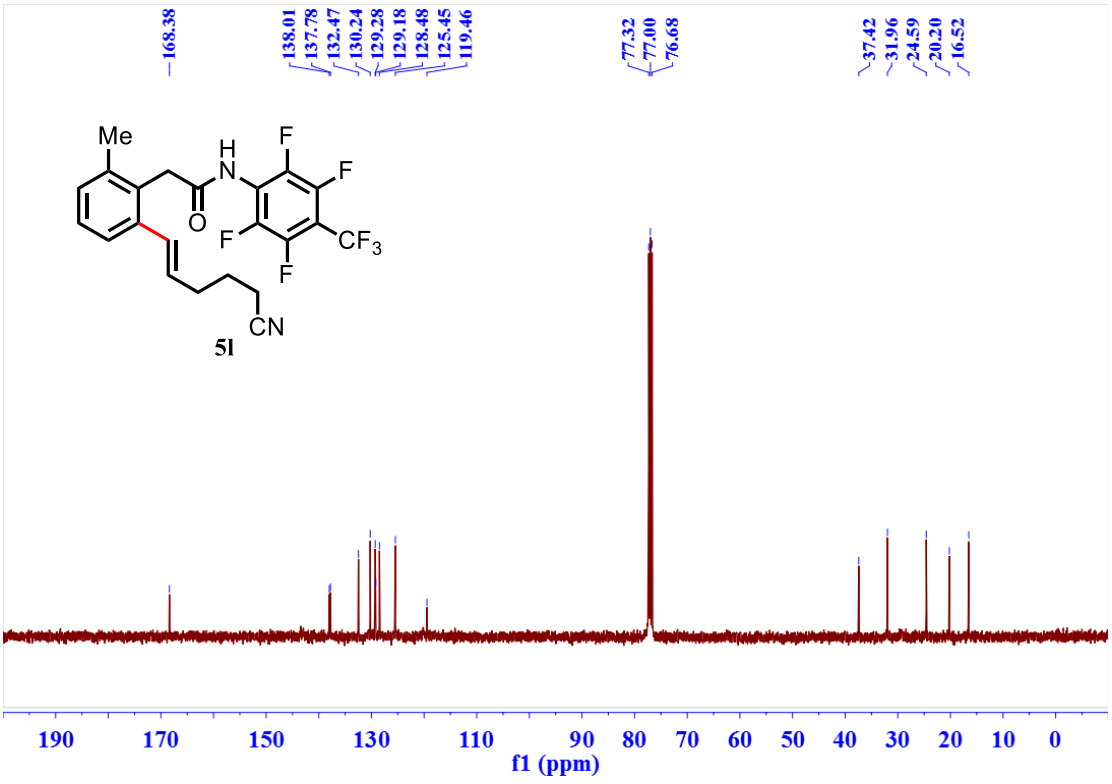
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76.68
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31.96
24.59
20.20
16.52
Me
H
N
O
F
F
F
F
CF3
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5l
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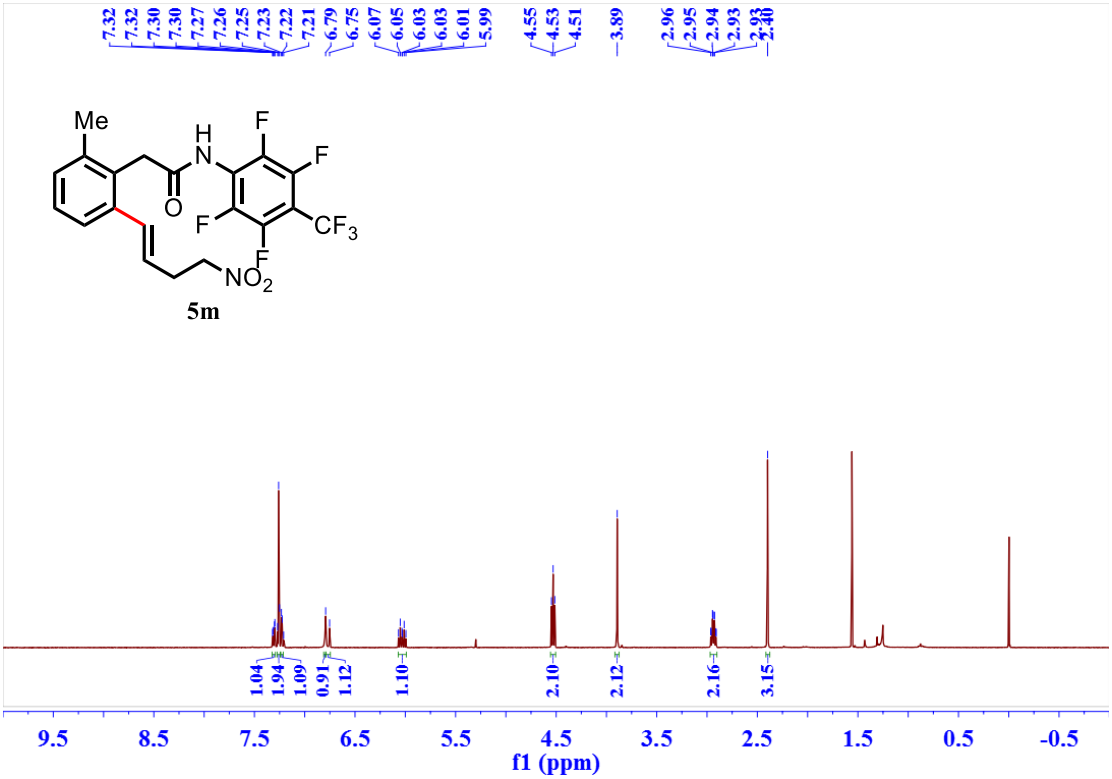
f1 (ppm)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2.93
2.40
Me
H
N
O
F
F
F
CF3
F
NO2
5m
1.04
1.94
1.09
0.91
1.12
1.10
2.10
2.12
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3.15
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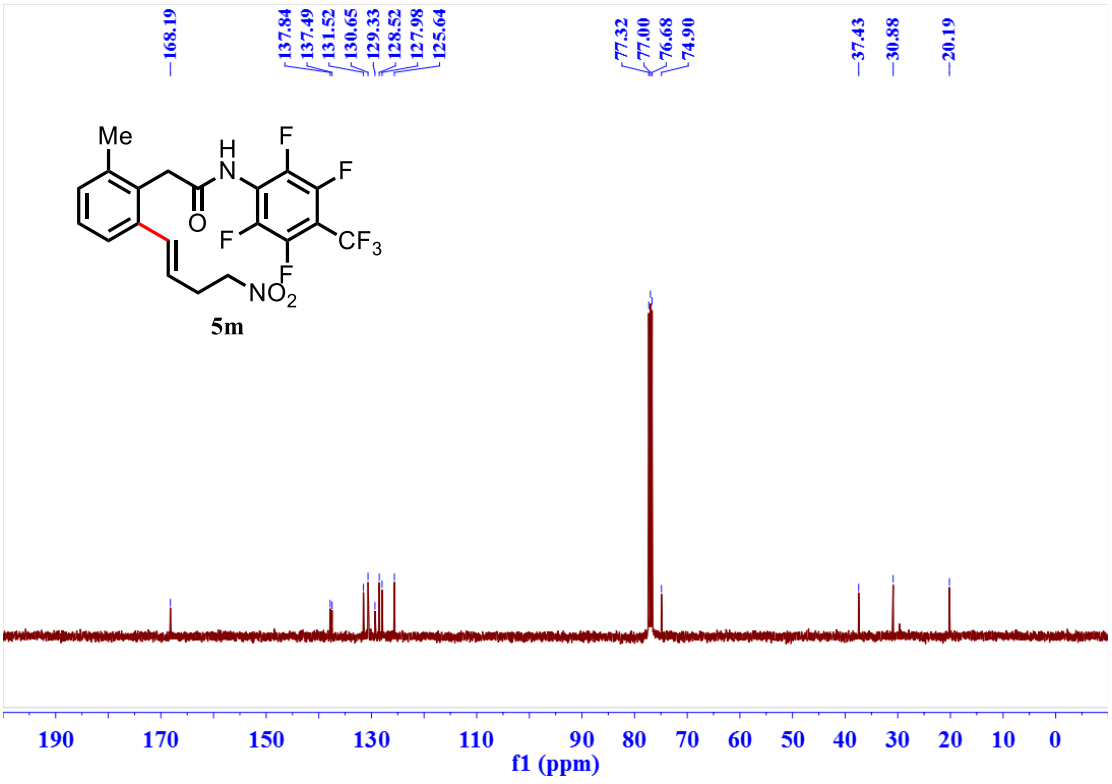
f1 (ppm)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74.90
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30.88
20.19
Me
H
N
O
F
F
F
CF3
F
NO2
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70
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50
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10
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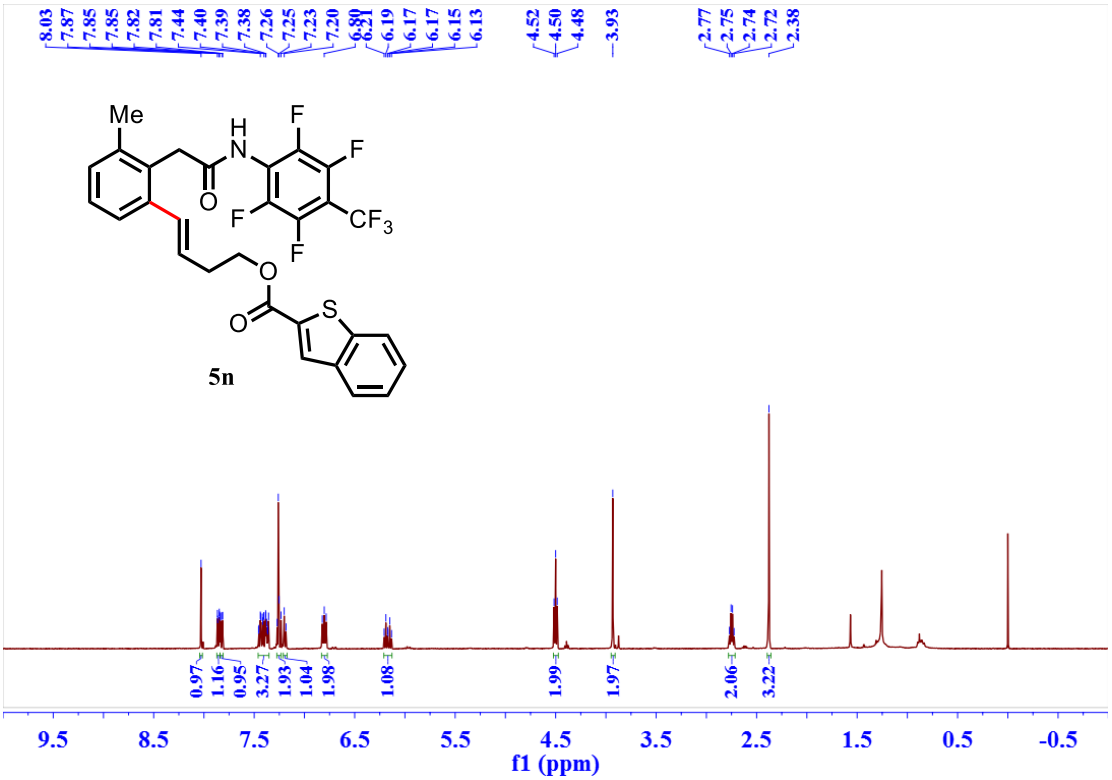
f1 (ppm)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6.21
6.19
6.17
6.17
6.15
6.13
4.52
4.50
4.48
3.93
2.77
2.75
2.74
2.72
2.38
Me
H
N
O
F
F
F
F
CF3
O
O
S
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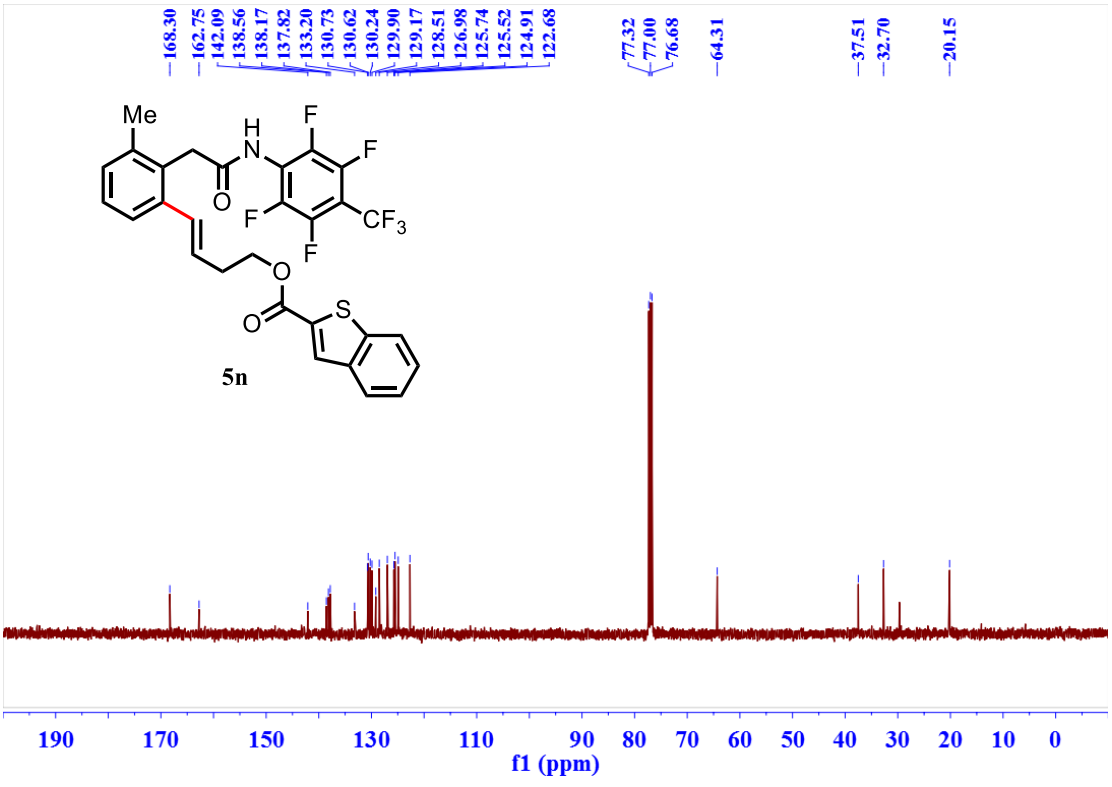
f1 (ppm)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125.74
125.52
124.91
122.68
77.32
77.00
76.68
64.31
37.51
32.70
20.15
Me
H
N
O
F
F
F
F
CF3
O
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90
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10
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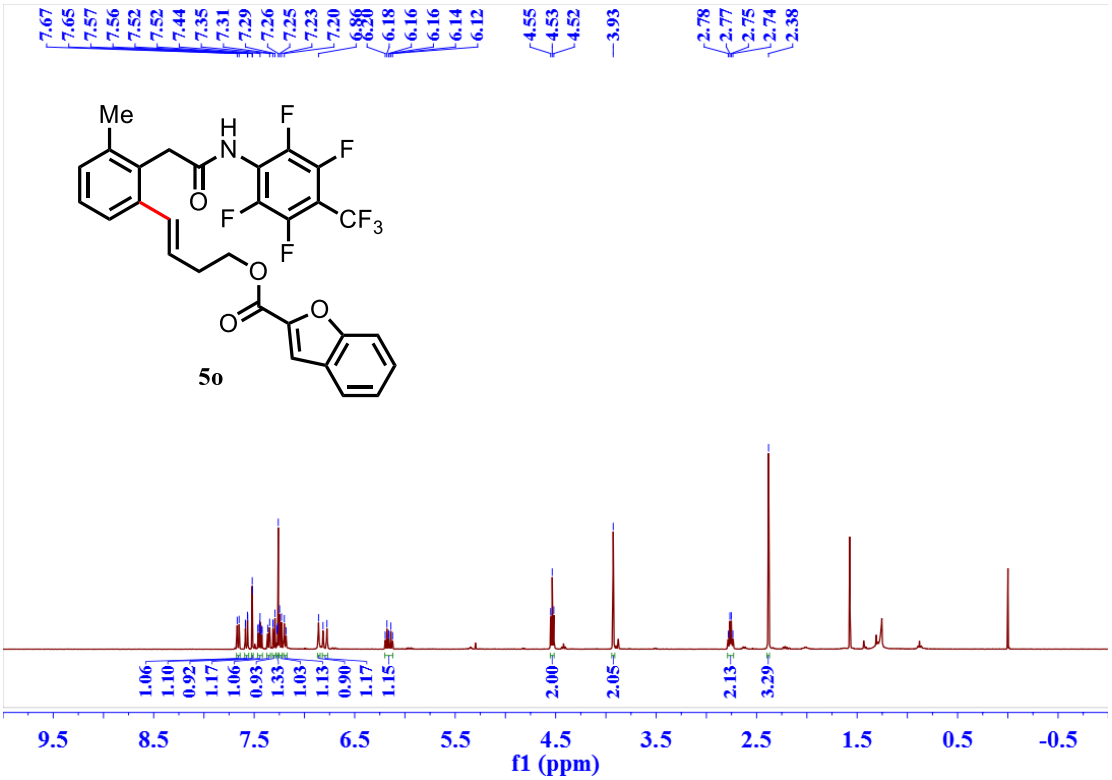
f1 (ppm)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6.18
6.16
6.16
6.14
6.12
4.55
4.53
4.52
3.93
2.78
2.77
2.75
2.74
2.38
Me
H
N
O
F
F
F
F
CF3
O
O
O
5o
1.06
1.10
0.92
1.17
1.06
0.93
1.33
1.03
1.13
0.90
1.17
1.15
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2.05
2.13
3.29
9.5
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6.5
5.5
4.5
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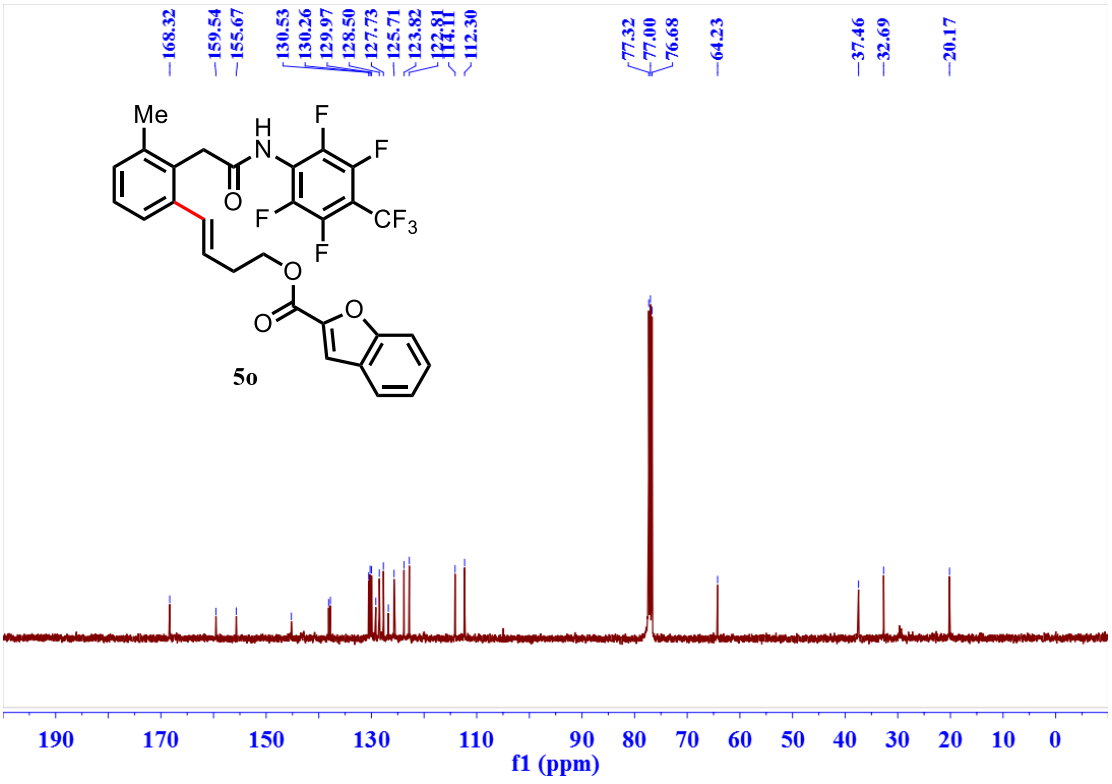
1.5
0.5
-0.5
f1 (ppm)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123.82
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77.00
76.68
64.23
37.46
32.69
20.17
Me
H
N
O
F
F
F
F
CF3
O
O
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130
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90
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50
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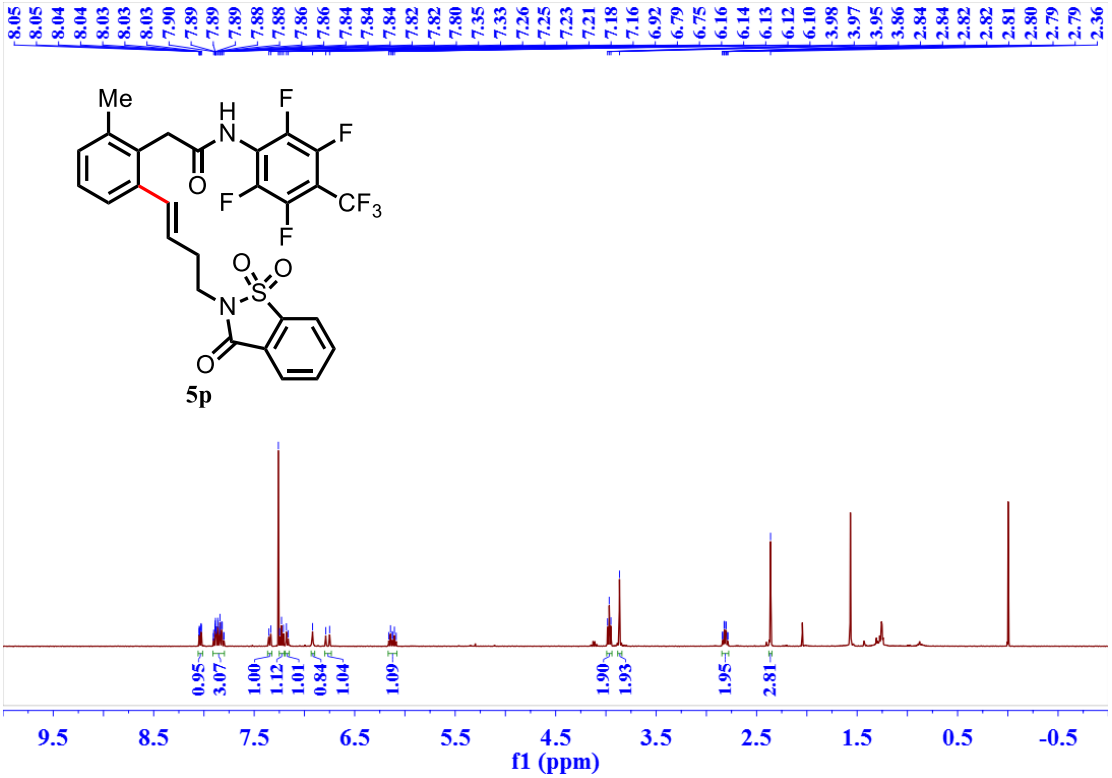
10
0
f1 (ppm)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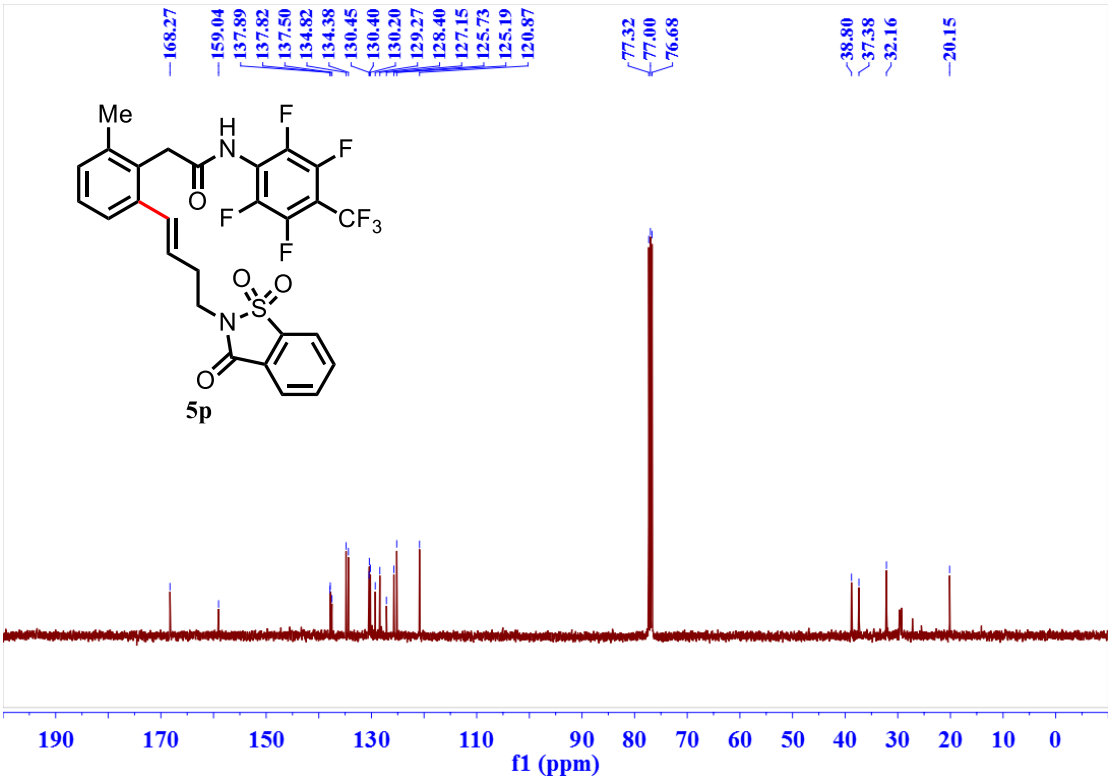
Me
H
N
O
F
F
F
F
CF3
O
O
S
N
O
5p
0.95 3.07 1.00 1.12 1.01 0.84 1.04 1.09 1.90 1.93 1.95 2.81
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)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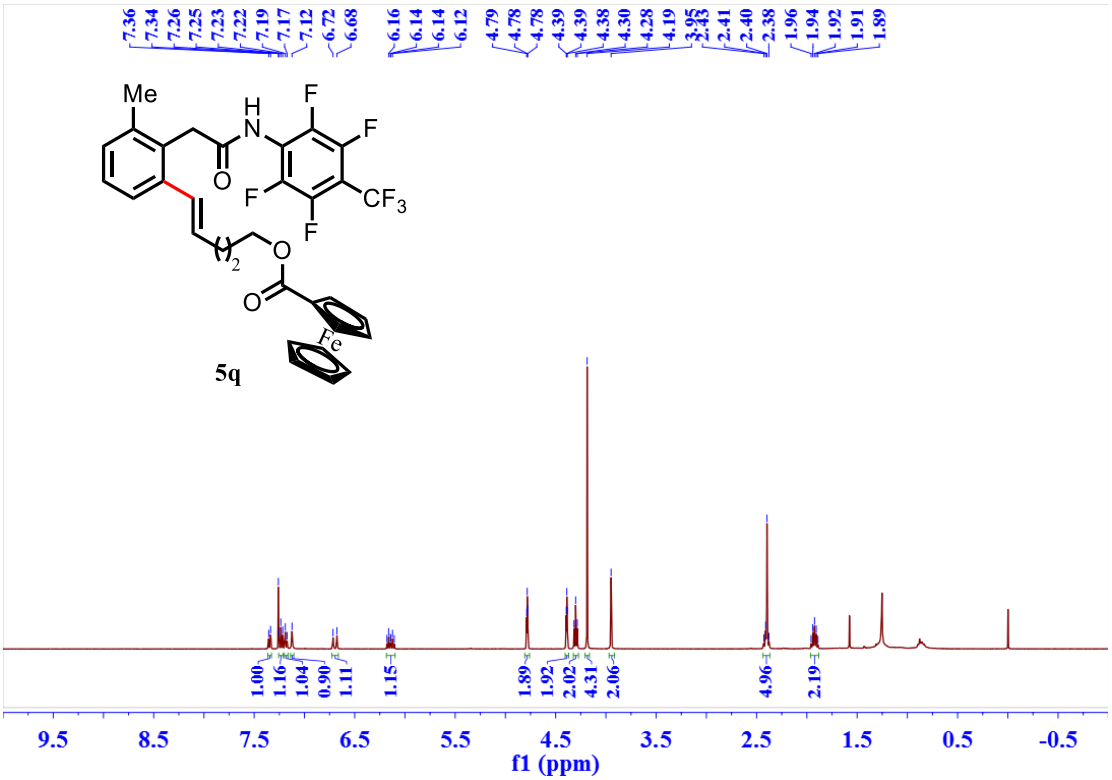
Me
H
N
O
F
F
F
F
CF3
O
O
S
N
O
5p
190 170 150 130 110 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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6.14
6.12
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4.78
4.78
4.39
4.39
4.38
4.30
4.28
4.19
3.95
2.43
2.41
2.40
2.38
1.96
1.94
1.92
1.91
1.89
Me
H
N
O
F
F
F
F
CF3
O
O
Fe
5q
1.00
1.16
1.04
0.90
1.11
1.15
1.89
1.92
2.02
4.31
2.06
4.96
2.19
9.5
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6.5
5.5
4.5
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1.5
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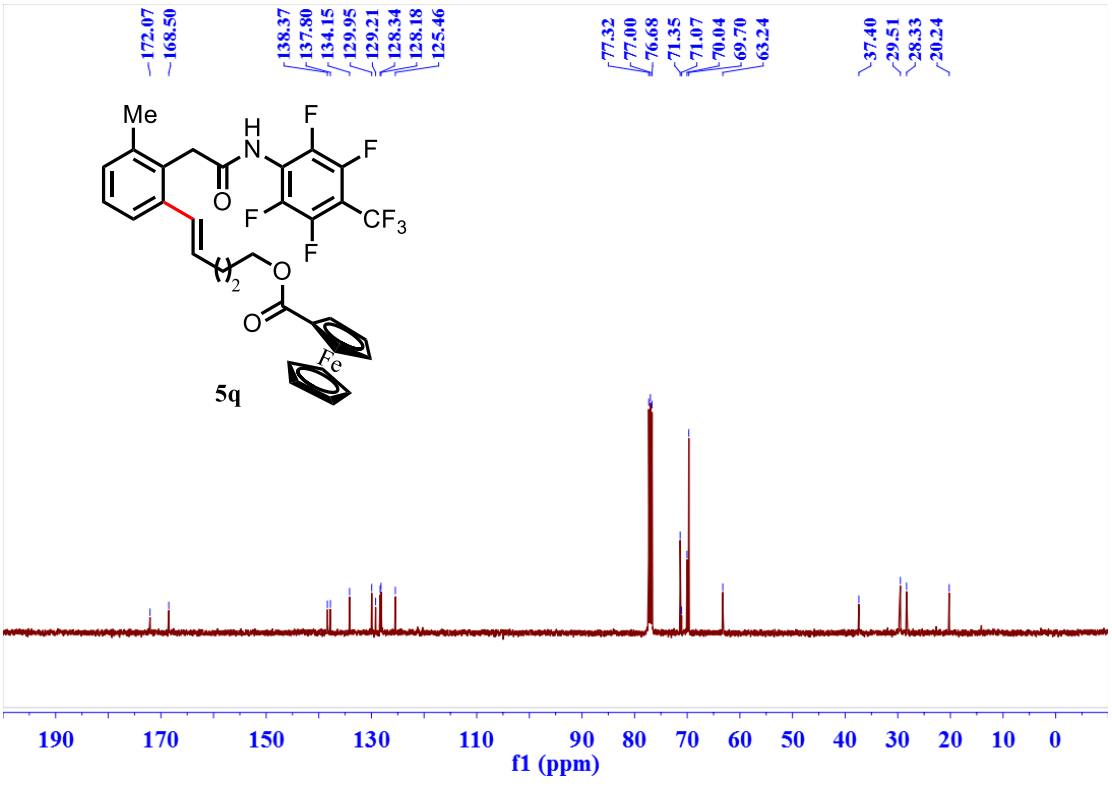
-0.5
f1 (ppm)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76.68
71.35
71.07
70.04
69.70
63.24
37.40
29.51
28.33
20.24
Me
H
N
O
F
F
F
F
CF3
O
O
Fe
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170
150
130
110
90
80
70
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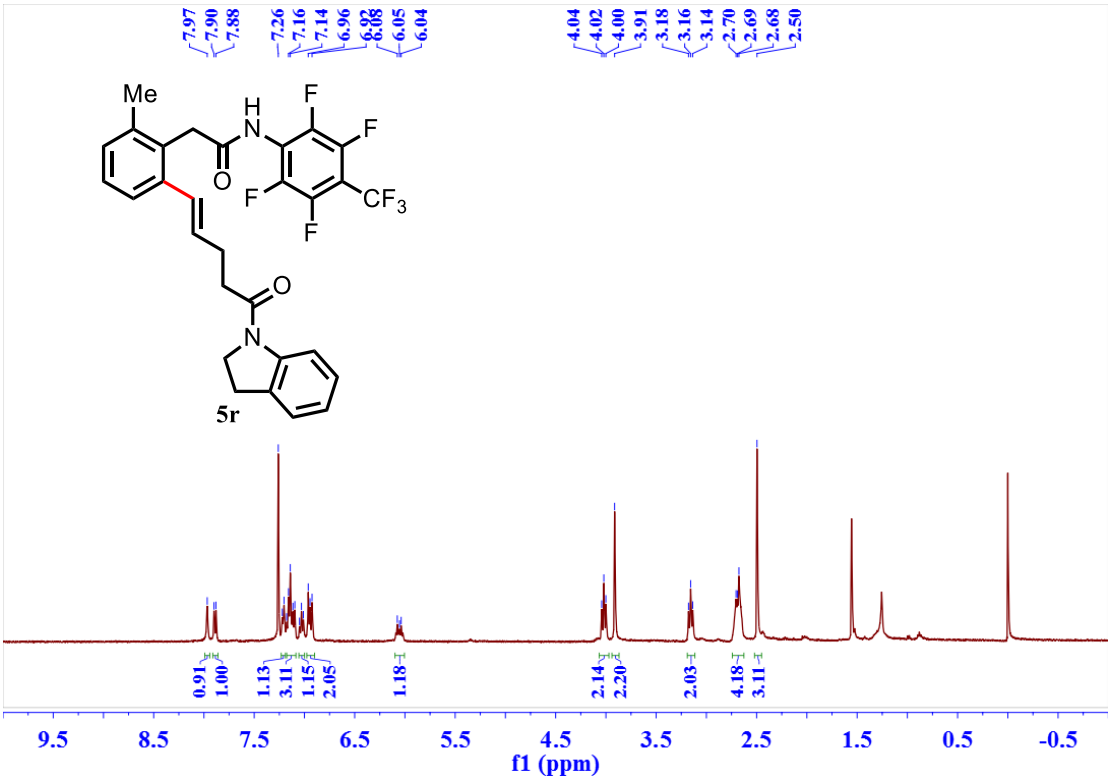
50
40
30
20
10
0
f1 (ppm)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3.14
2.70
2.69
2.68
2.50
Me
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O
F
F
F
F
CF3
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N
5r
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1.13
3.11
1.15
2.05
1.18
2.14
2.20
2.03
4.18
3.11
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6.5
5.5
4.5
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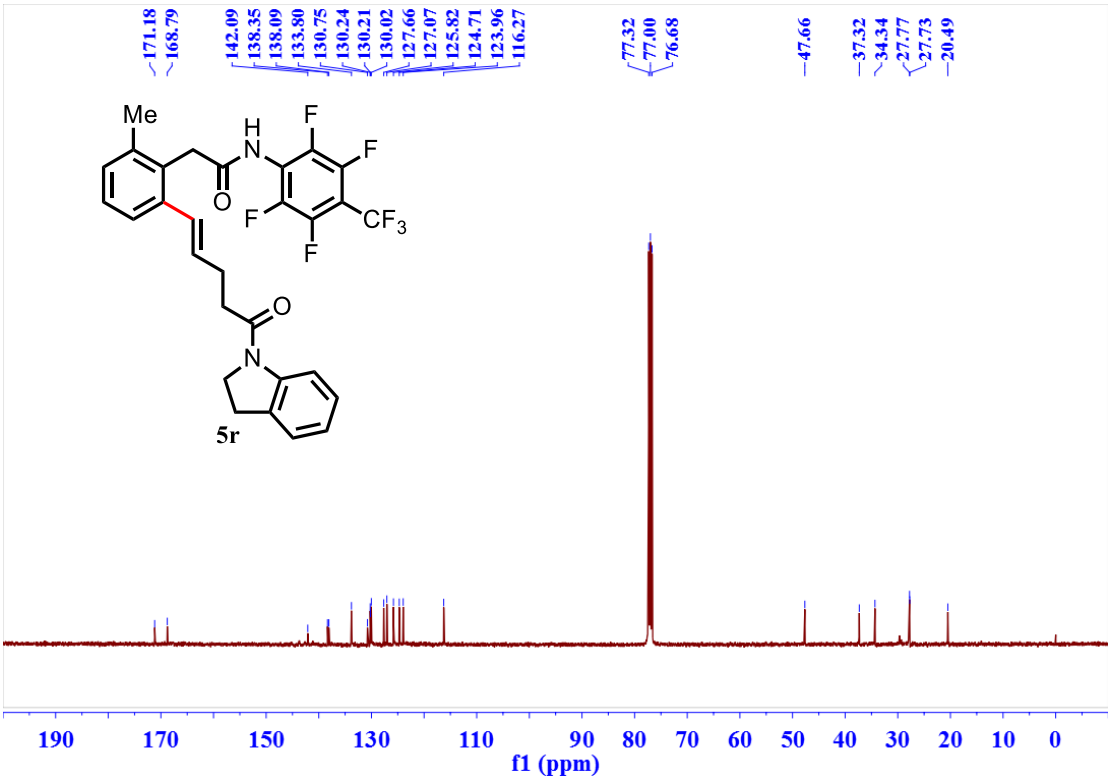
1.5
0.5
-0.5
f1 (ppm)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124.71
123.96
116.27
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77.00
76.68
47.66
37.32
34.34
27.77
27.73
20.49
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O
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F
F
F
CF3
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5r
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130
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50
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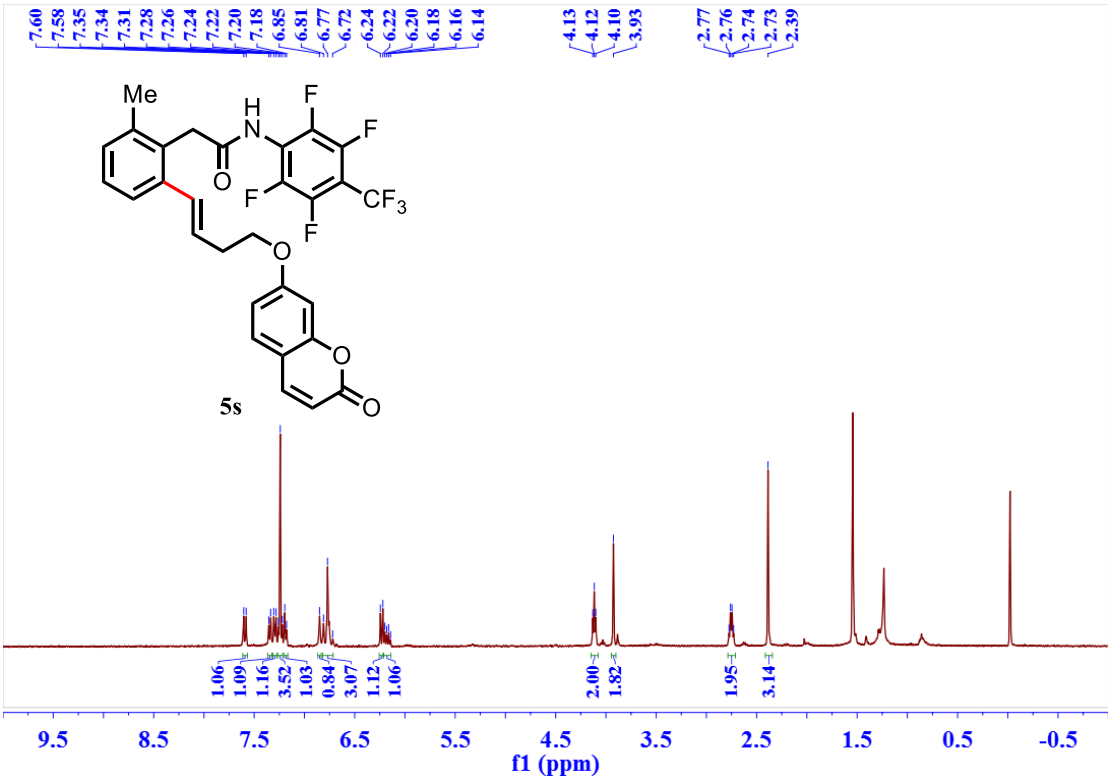
10
0
f1 (ppm)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6.72
6.24
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6.20
6.18
6.16
6.14
4.13
4.12
4.10
3.93
2.77
2.76
2.74
2.73
2.39
Me
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N
O
F
F
F
F
CF3
O
O
O
5s
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1.09
1.16
3.52
1.03
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3.07
1.12
1.06
2.00
1.82
1.95
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3.5
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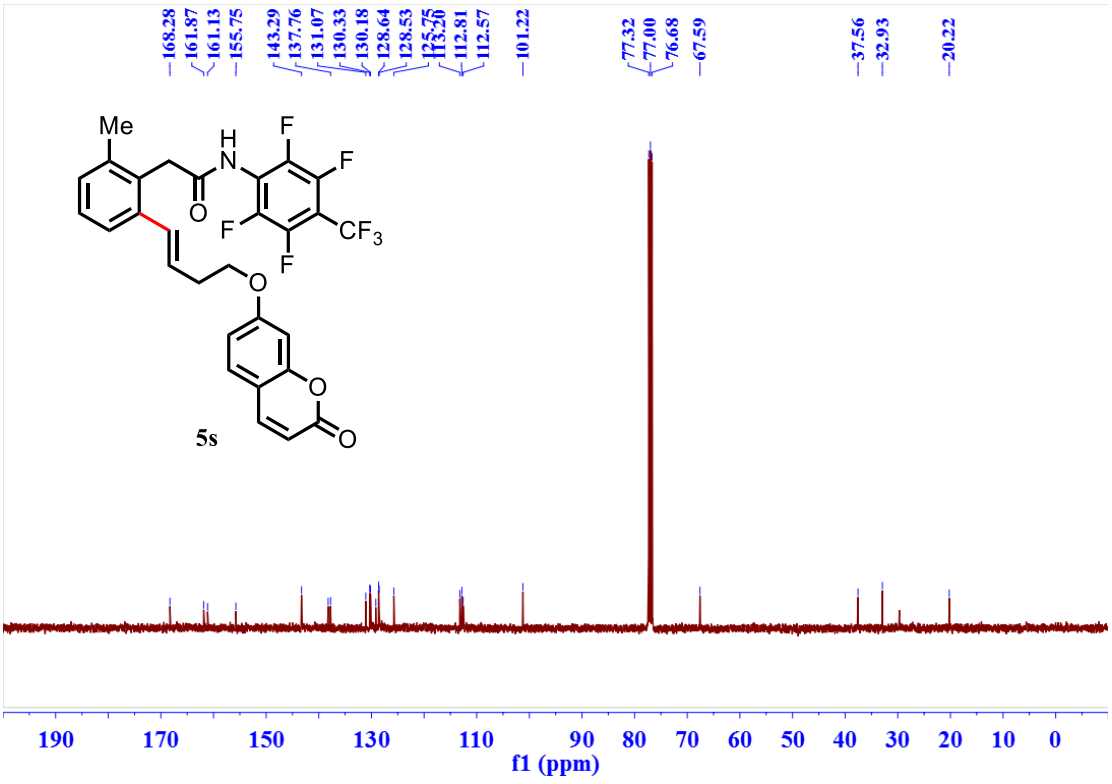
-0.5
f1 (ppm)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112.81
112.57
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77.32
77.00
76.68
67.59
37.56
32.93
20.22
Me
H
N
O
F
F
F
F
CF3
O
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150
130
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90
80
70
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50
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30
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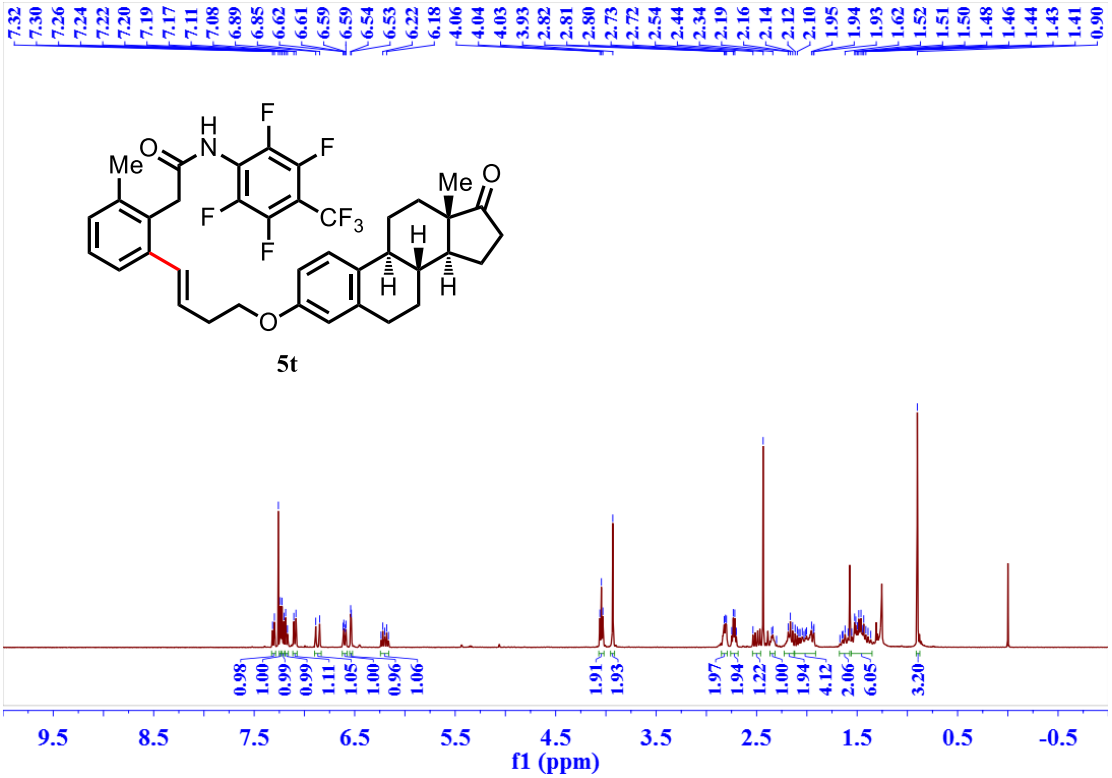
f1 (ppm)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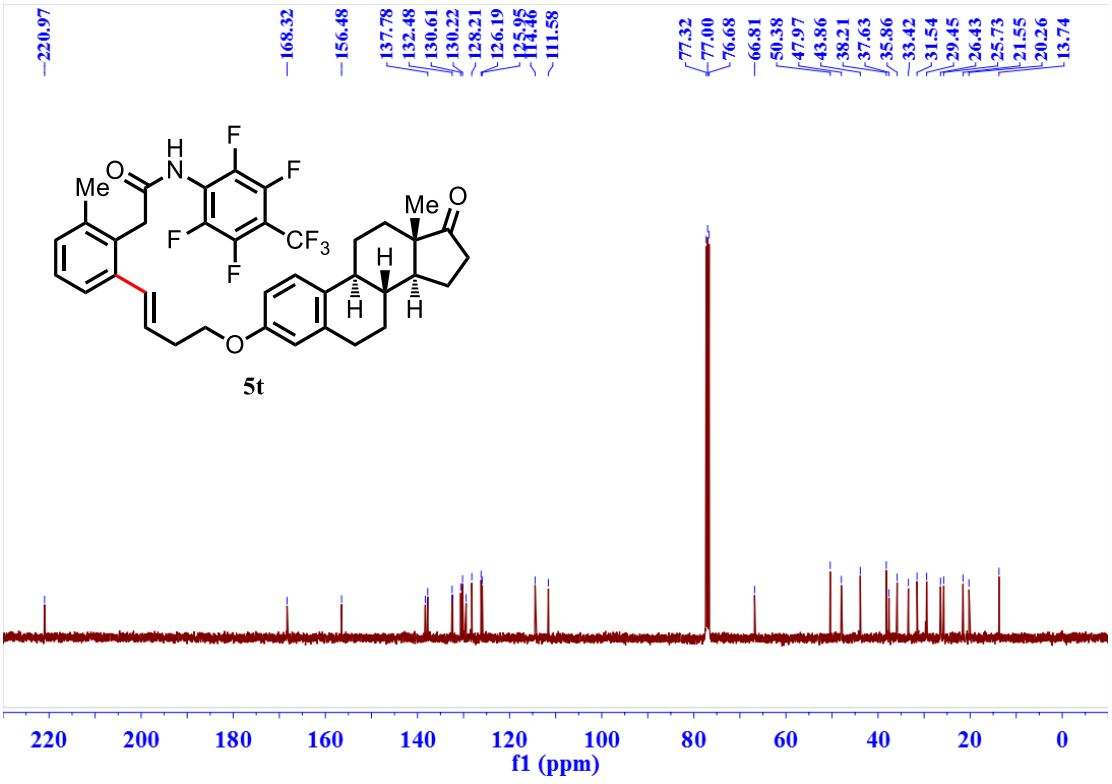
4.06 4.04 4.03 3.93 2.82 2.81 2.80 2.73 2.72 2.54 2.44 2.34 2.19 2.16 2.14 2.12 2.10 1.95 1.94 1.93 1.62 1.52 1.51 1.50 1.48 1.46 1.44 1.43 1.41 0.90
5t
0.98 1.00 0.99 0.99 1.11 1.05 1.00 0.96 1.06
1.91 1.93
1.97 1.94 1.22 1.00 1.94 4.12 2.06 6.05
3.20
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)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77.32 77.00 76.68
66.81
50.38 47.97 43.86 38.21 37.63 35.86 33.42 31.54 29.45 26.43 25.73 21.55 20.26 13.74
5t
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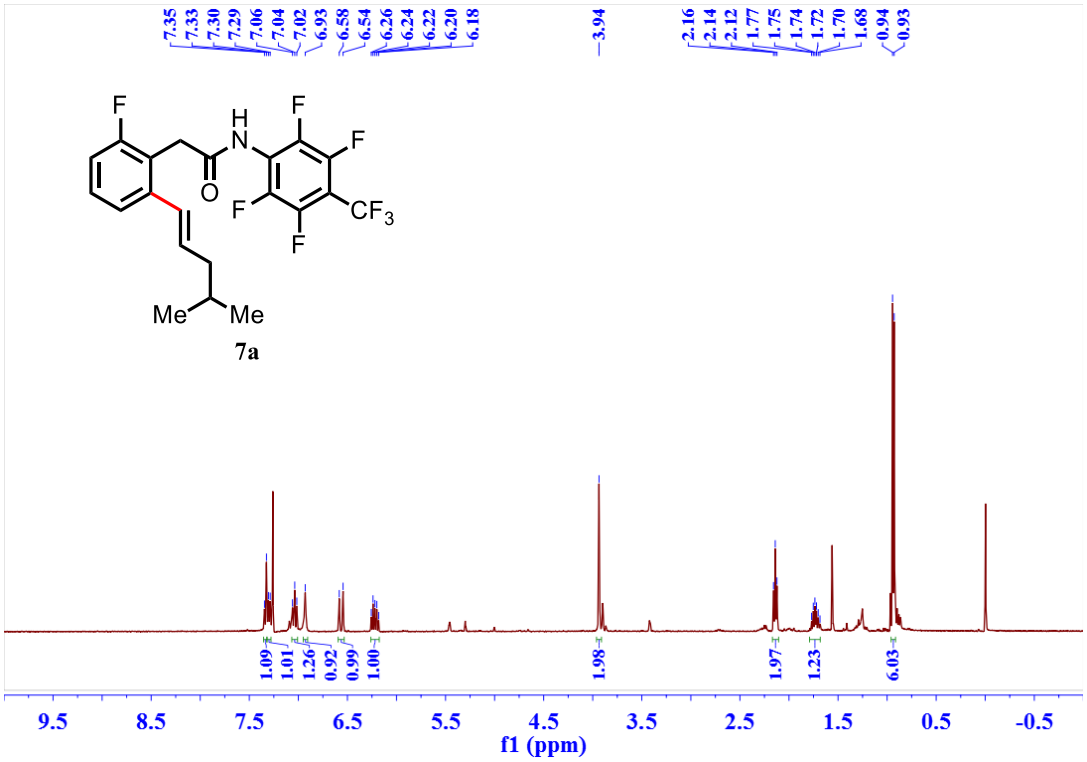
f1 (ppm)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0.93
F
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N
O
F
F
F
F
CF3
Me
Me
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6.03
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6.5
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4.5
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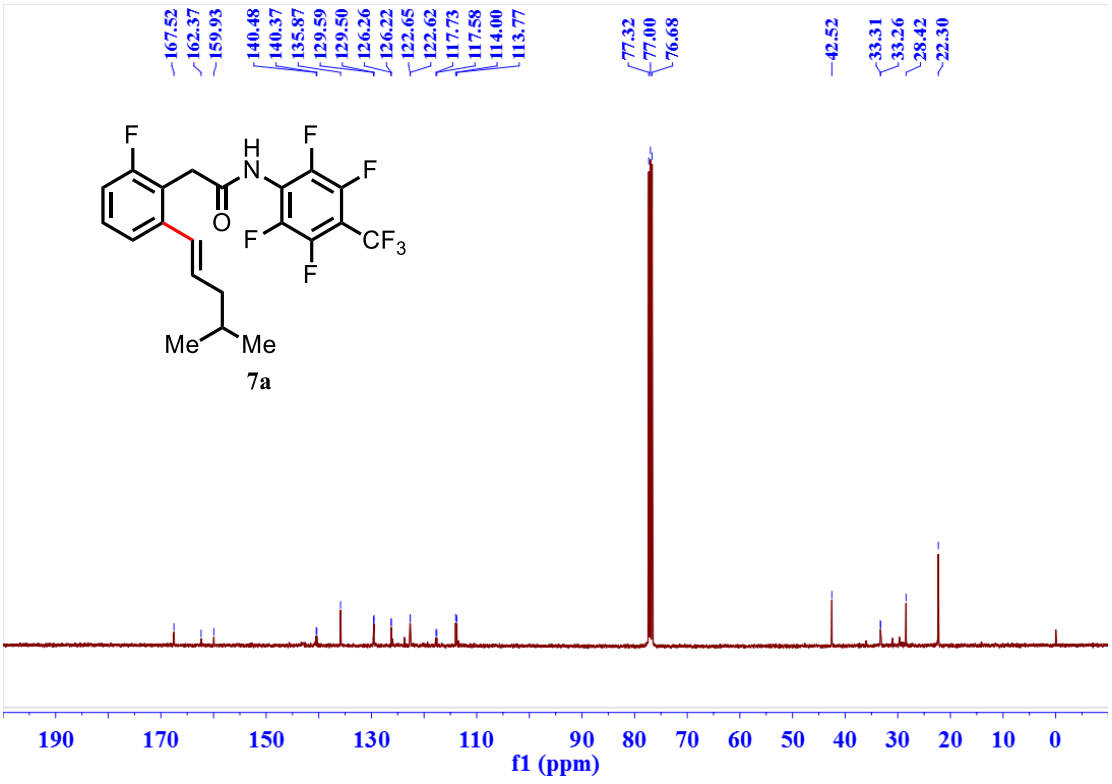
-0.5
f1 (ppm)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117.73
117.58
114.00
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77.00
76.68
42.52
33.31
33.26
28.42
22.30
F
H
N
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F
F
CF3
Me
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50
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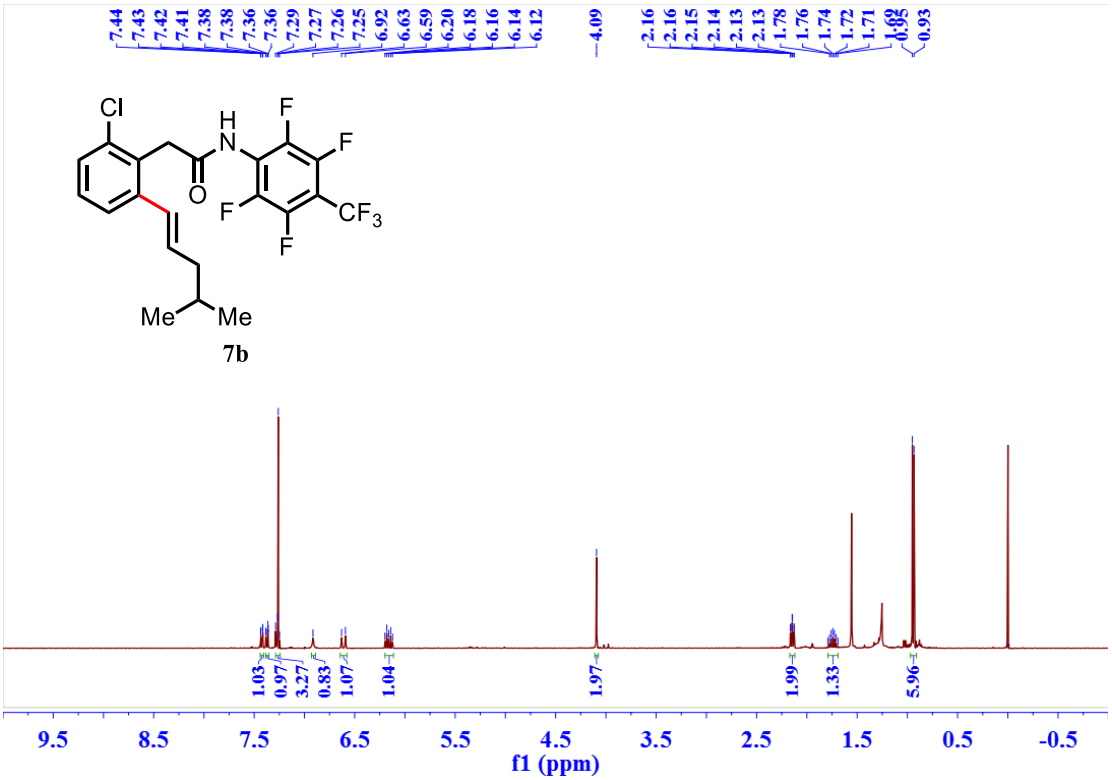
10
0
f1 (ppm)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7.43
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7.41
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6.92
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6.12
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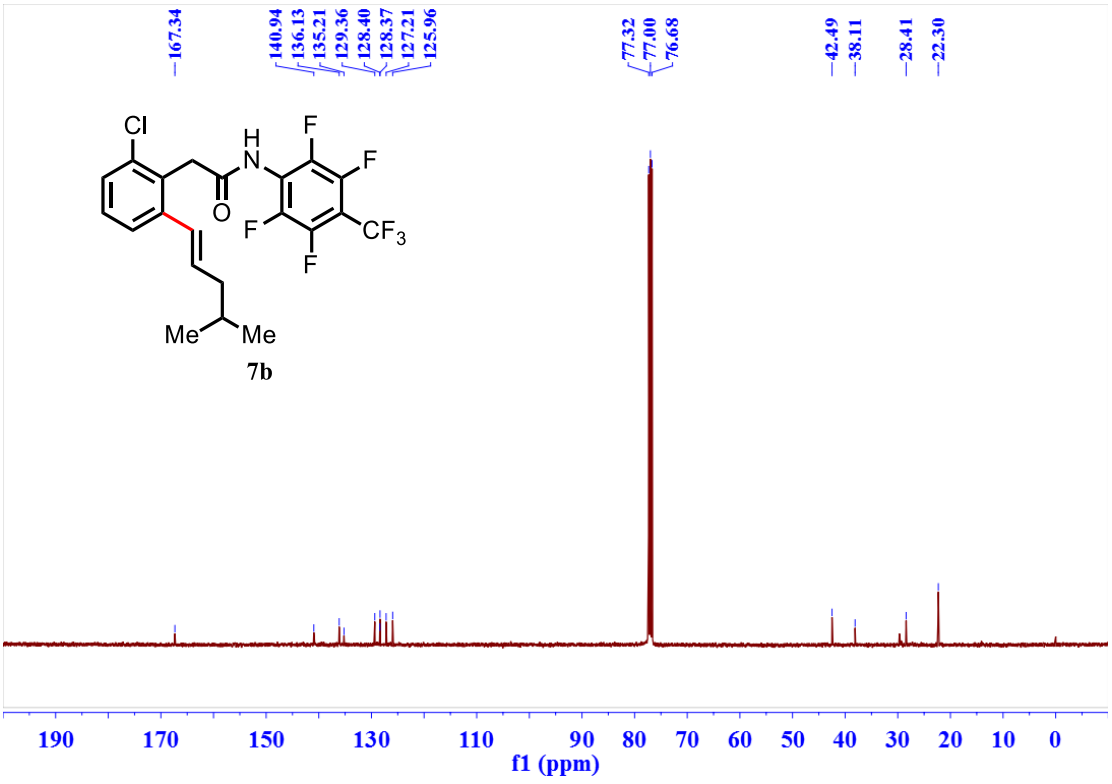
f1 (ppm)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77.00
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38.11
28.41
22.30
Cl
H
N
O
F
F
F
F
CF3
Me
Me
7b
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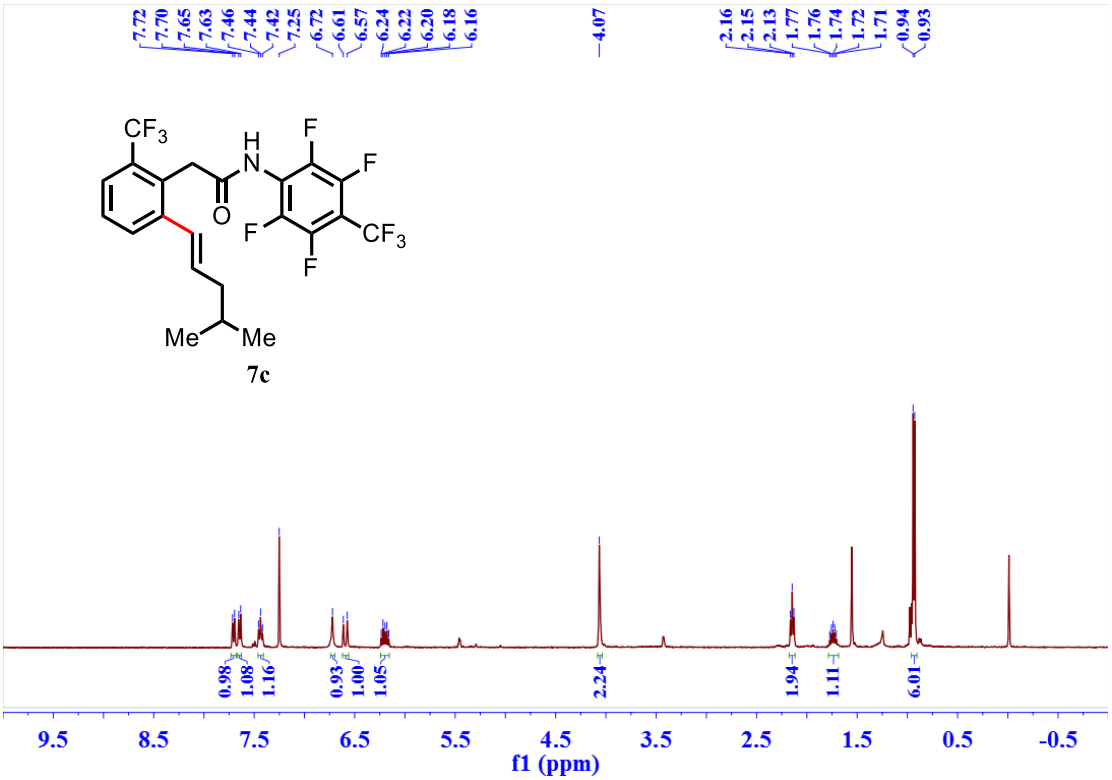
f1 (ppm)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6.22
6.20
6.18
6.16
4.07
2.16
2.15
2.13
1.77
1.76
1.74
1.72
1.71
0.94
0.93
CF3
H
N
O
F
F
F
F
CF3
Me
Me
7c
0.98
1.08
1.16
0.93
1.00
1.05
2.24
1.94
1.11
6.01
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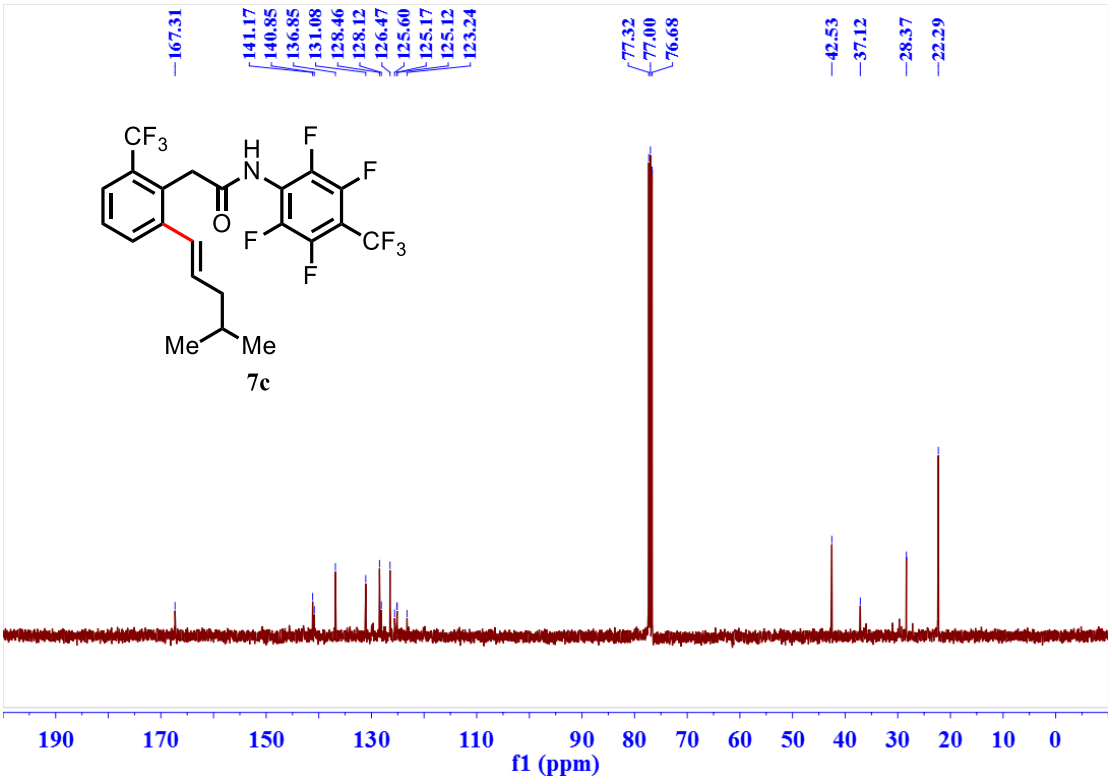
f1 (ppm)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126.47
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125.17
125.12
123.24
77.32
77.00
76.68
42.53
37.12
28.37
22.29
CF3
H
N
O
F
F
F
F
CF3
Me
Me
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90
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50
40
30
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10
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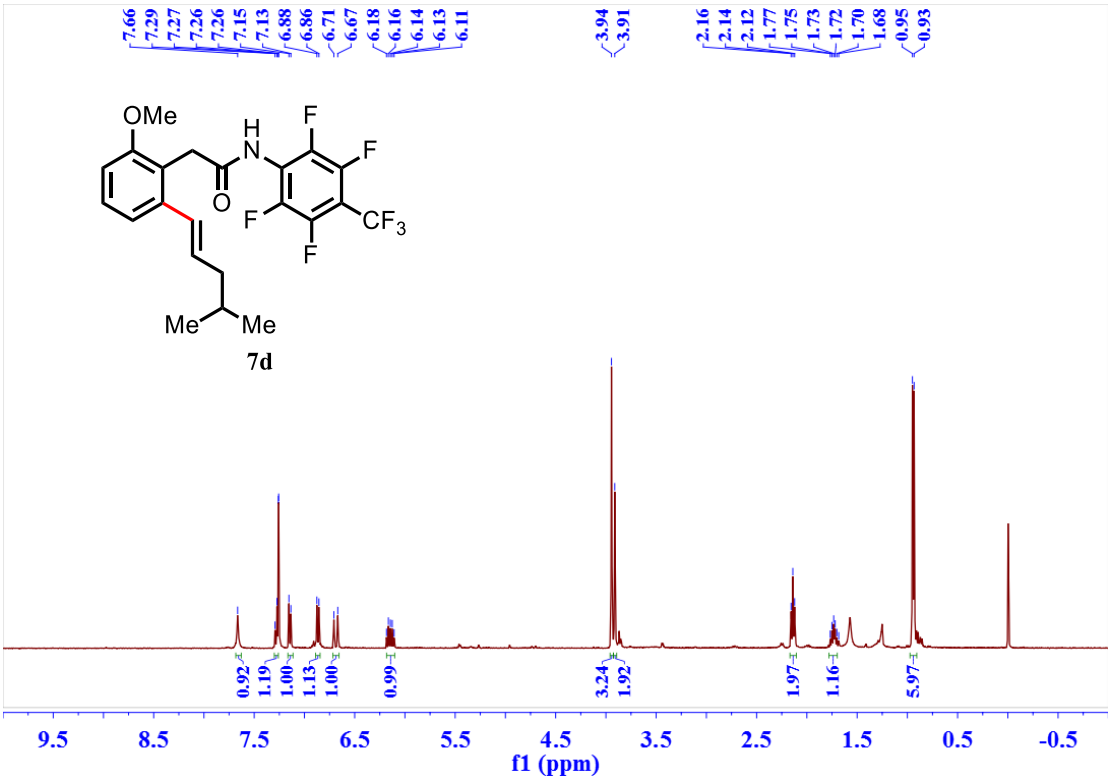
f1 (ppm)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6.16
6.14
6.13
6.11
3.94
3.91
2.16
2.14
2.12
1.77
1.75
1.73
1.72
1.70
1.68
0.95
0.93
OMe
H
N
O
F
F
F
F
CF3
Me
Me
7d
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1.19
1.00
1.13
1.00
0.99
3.24
1.92
1.97
1.16
5.97
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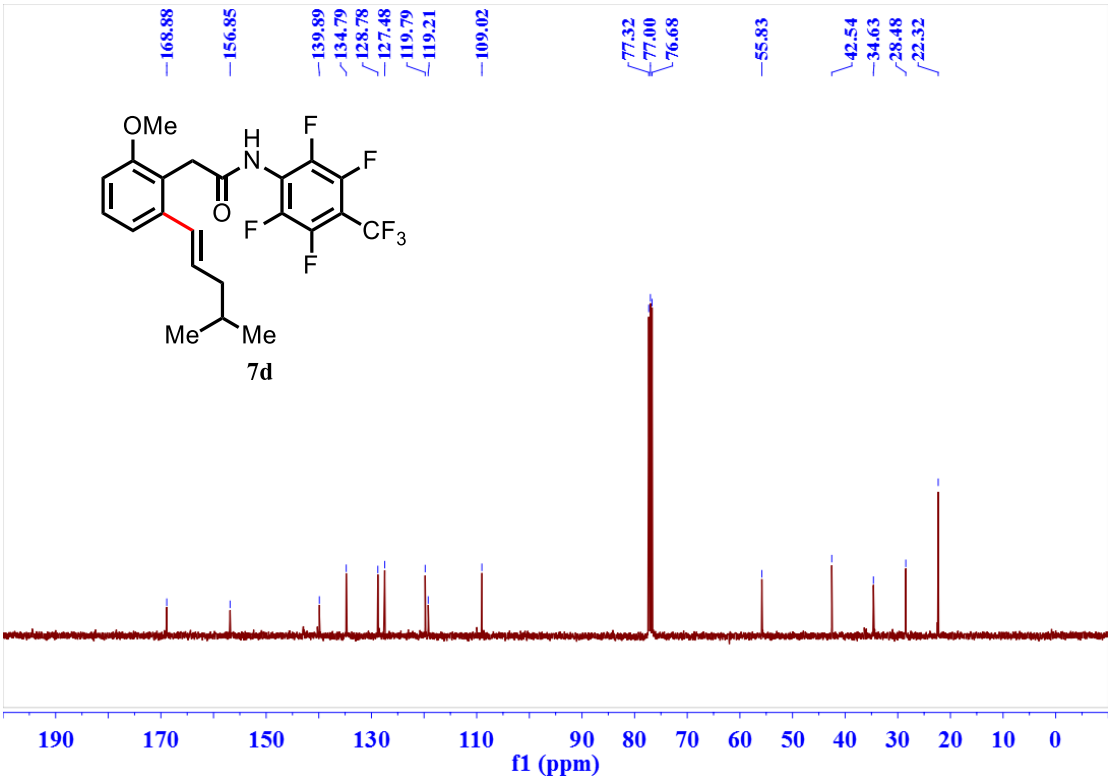
f1 (ppm)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77.00
76.68
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34.63
28.48
22.32
OMe
H
N
O
F
F
F
F
CF3
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170
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40
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10
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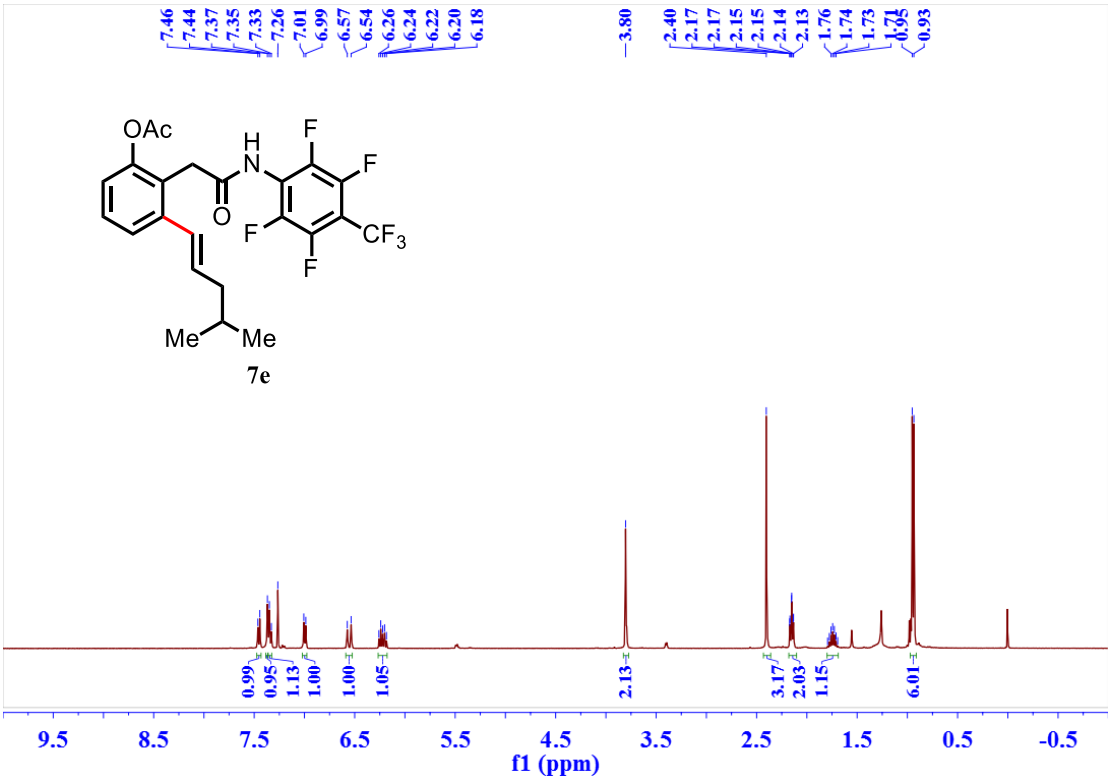
f1 (ppm)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6.22
6.20
6.18
3.80
2.40
2.17
2.17
2.15
2.15
2.14
2.13
1.76
1.74
1.73
1.71
0.95
0.93
OAc
H
N
O
F
F
F
F
CF3
Me
Me
7e
0.99
0.95
1.13
1.00
1.00
1.05
2.13
3.17
2.03
1.15
6.01
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4.5
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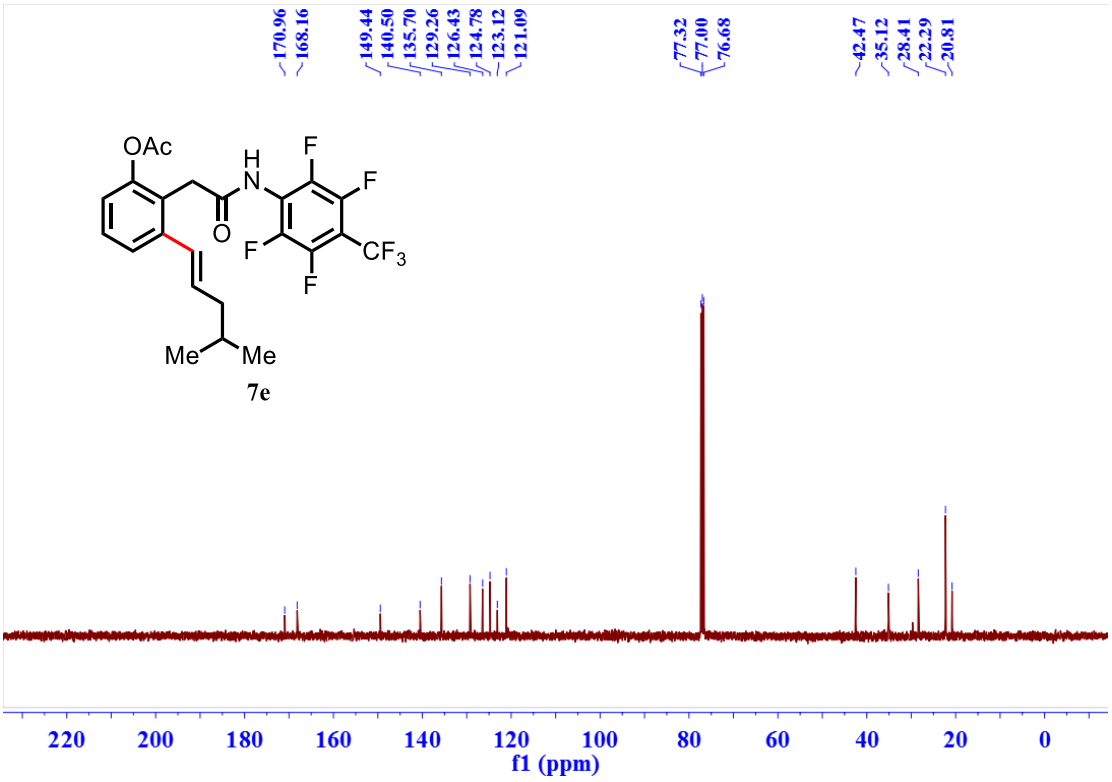
f1 (ppm)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124.78
123.12
121.09
77.32
77.00
76.68
42.47
35.12
28.41
22.29
20.81
OAc
H
N
O
F
F
F
F
CF3
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Me
7e
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140
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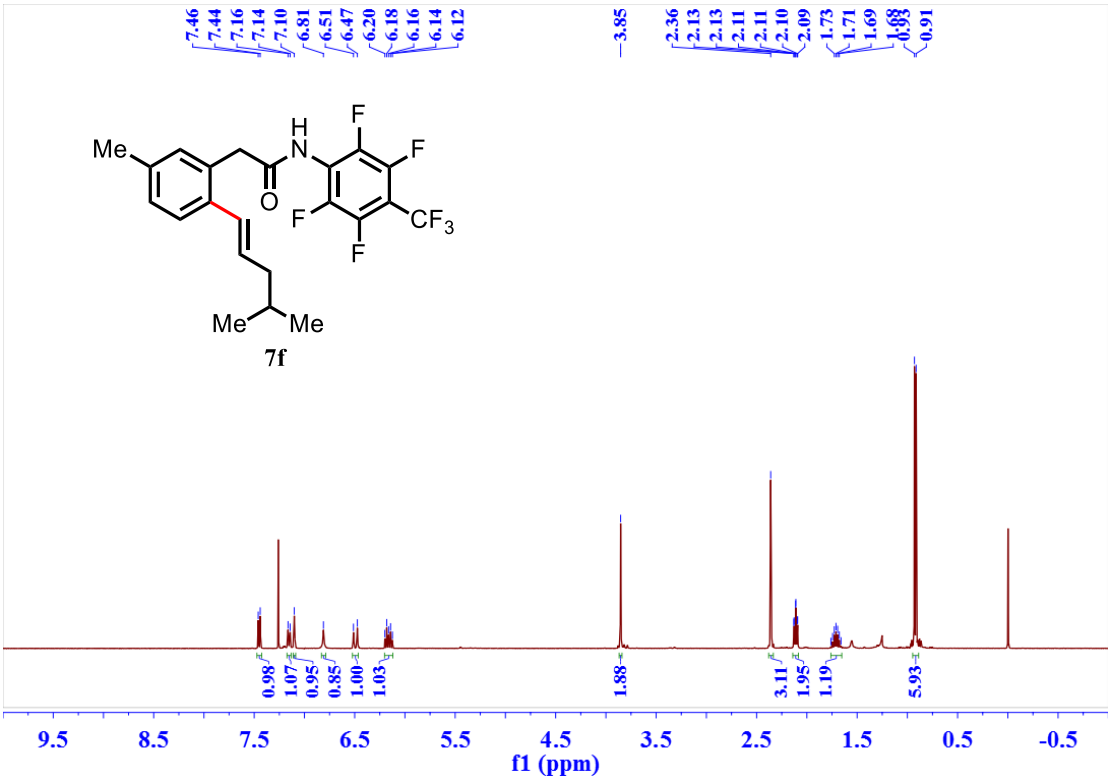
100
80
60
40
20
0
f1 (ppm)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6.47
6.20
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6.16
6.14
6.12
3.85
2.36
2.13
2.13
2.11
2.11
2.10
2.09
1.73
1.71
1.69
0.91
Me
H
N
O
F
F
F
F
CF3
Me
Me
7f
0.98
1.07
0.95
0.85
1.00
1.03
1.88
3.11
1.95
1.19
5.93
9.5
8.5
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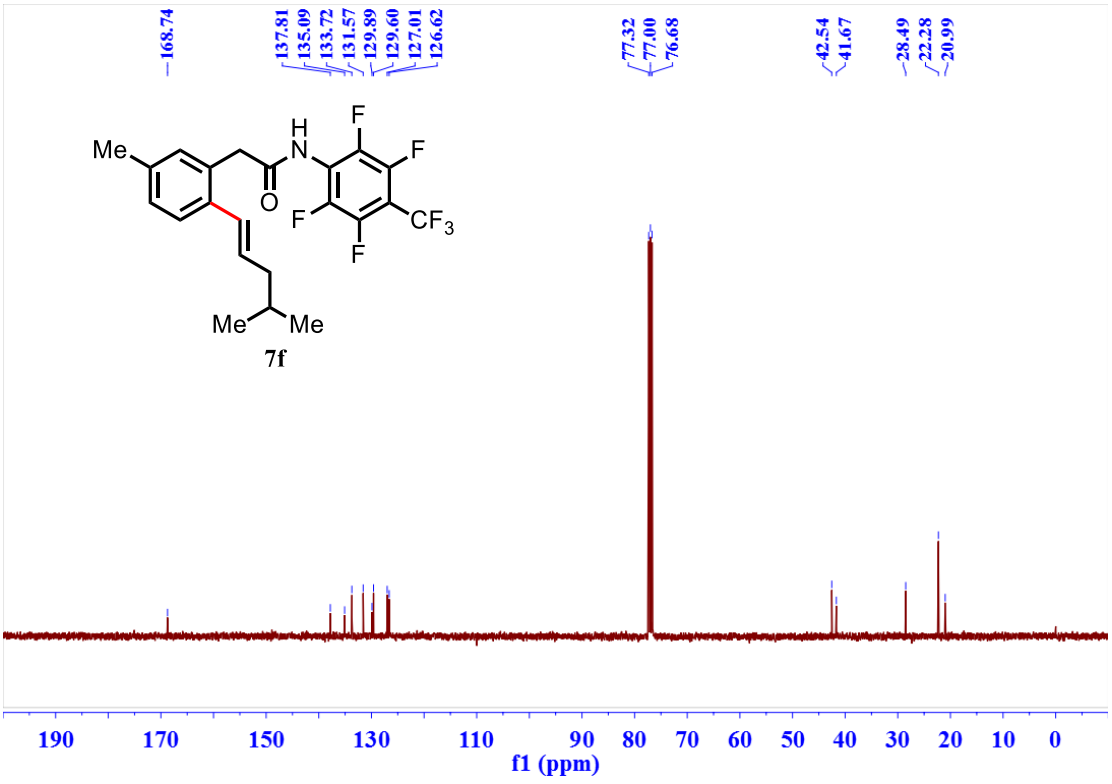
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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77.00
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41.67
28.49
22.28
20.99
Me
H
N
O
F
F
F
F
CF3
Me
Me
7f
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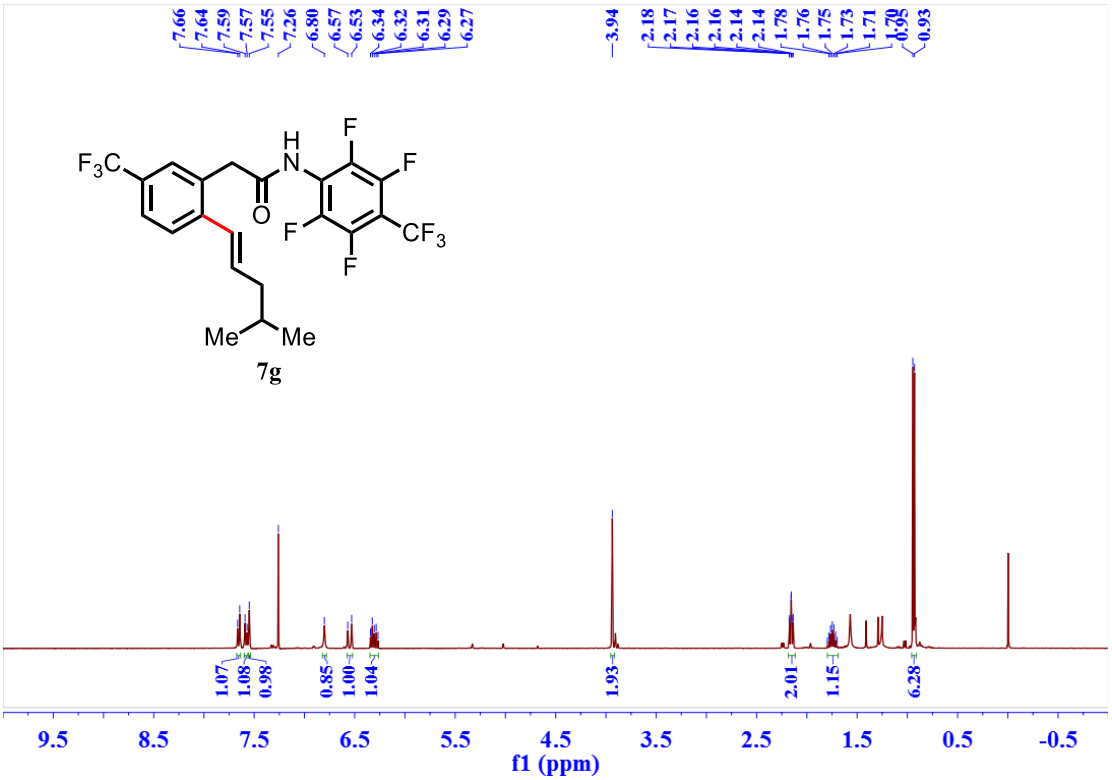
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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6.57
6.53
6.34
6.32
6.31
6.29
6.27
3.94
2.18
2.17
2.16
2.16
2.14
2.14
1.78
1.76
1.75
1.73
1.71
0.95
0.93
F3C
H
N
O
F
F
F
CF3
F
Me
Me
7g
1.07
1.08
0.98
0.85
1.00
1.04
1.93
2.01
1.15
6.28
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6.5
5.5
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1.5
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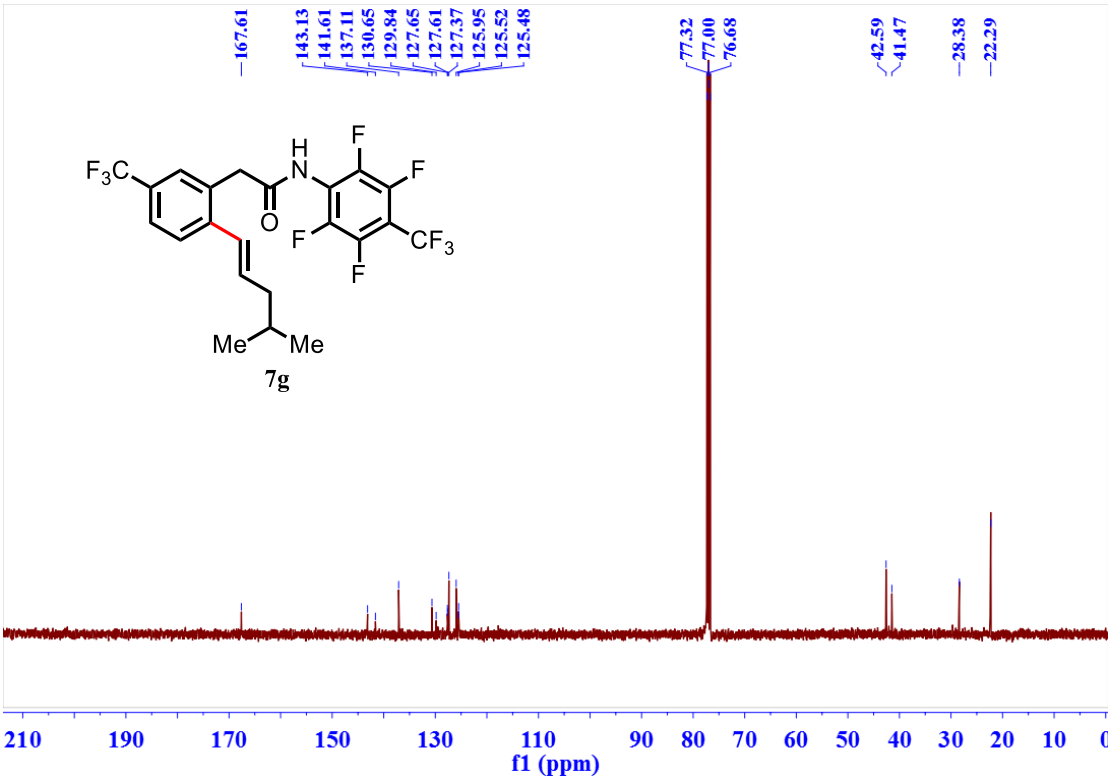
-0.5
f1 (ppm)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127.61
127.37
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125.52
125.48
77.32
77.00
76.68
42.59
41.47
28.38
22.29
F3C
H
N
O
F
F
F
CF3
F
Me
Me
7g
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190
170
150
130
110
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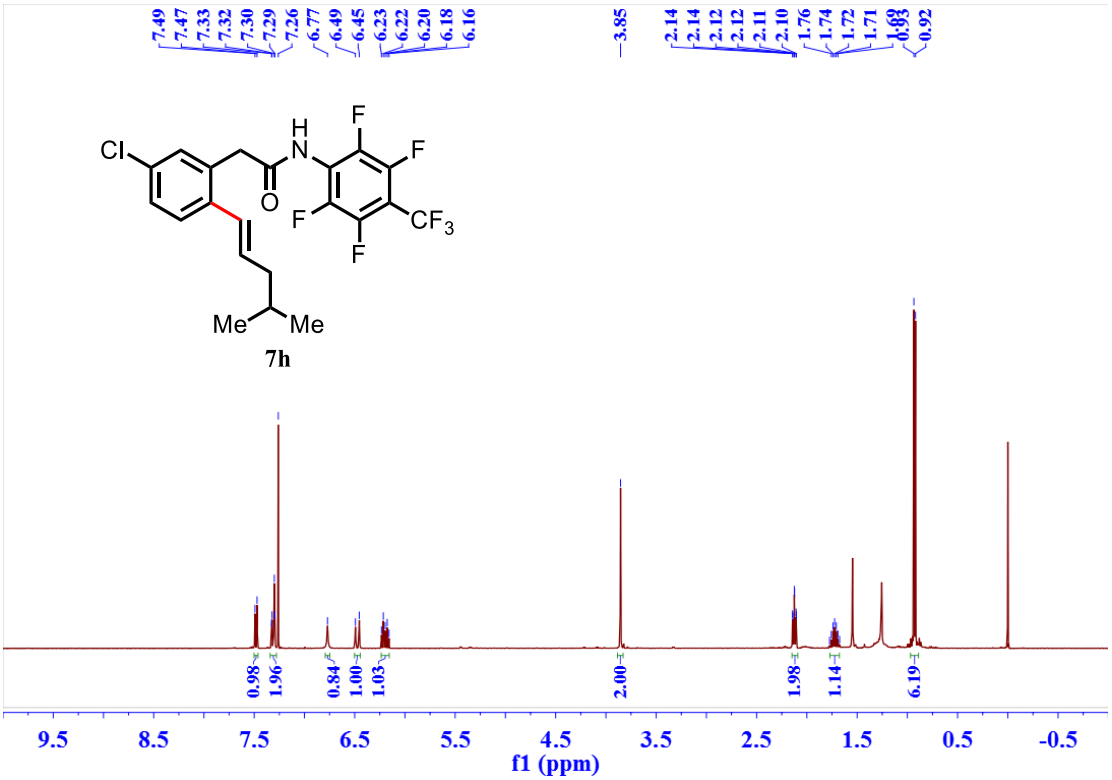
80
70
60
50
40
30
20
10
f1 (ppm)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6.20
6.18
6.16
3.85
2.14
2.14
2.12
2.12
2.11
2.10
1.76
1.74
1.72
1.71
0.93
0.92
Cl
H
N
O
F
F
F
F
CF3
Me
Me
7h
0.98
1.96
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1.00
1.03
2.00
1.98
1.14
6.19
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6.5
5.5
4.5
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1.5
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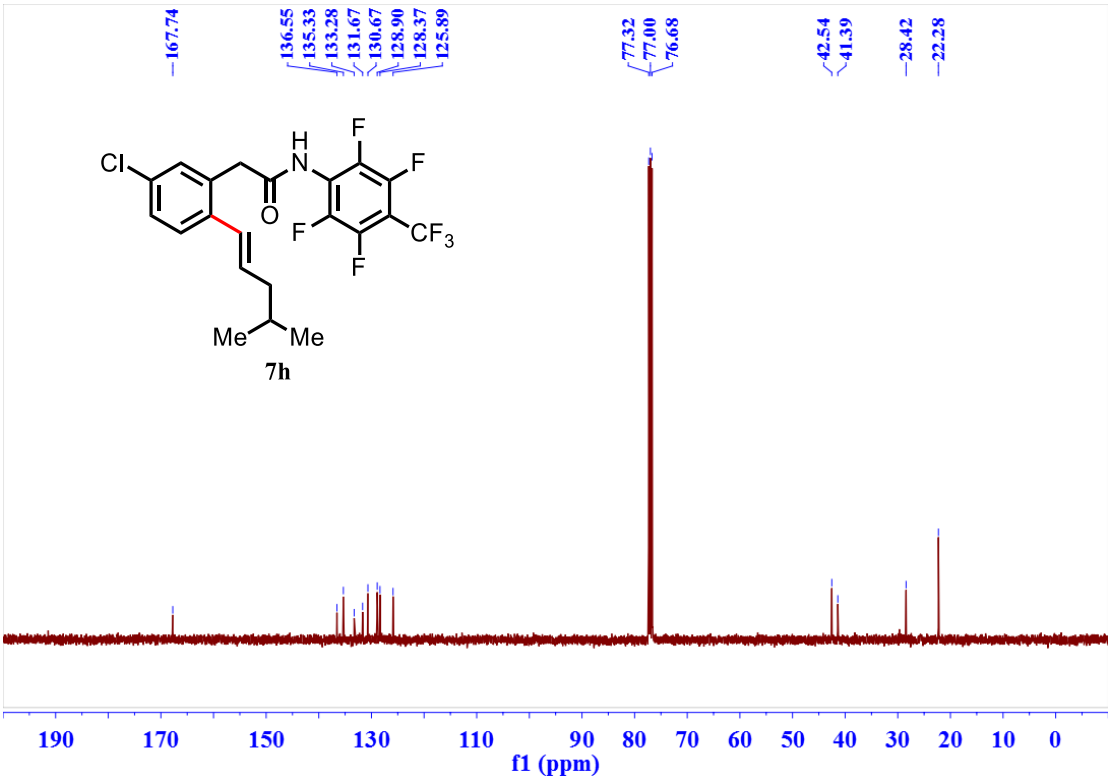
-0.5
f1 (ppm)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76.68
42.54
41.39
28.42
22.28
Cl
H
N
O
F
F
F
F
CF3
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Me
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170
150
130
110
90
80
70
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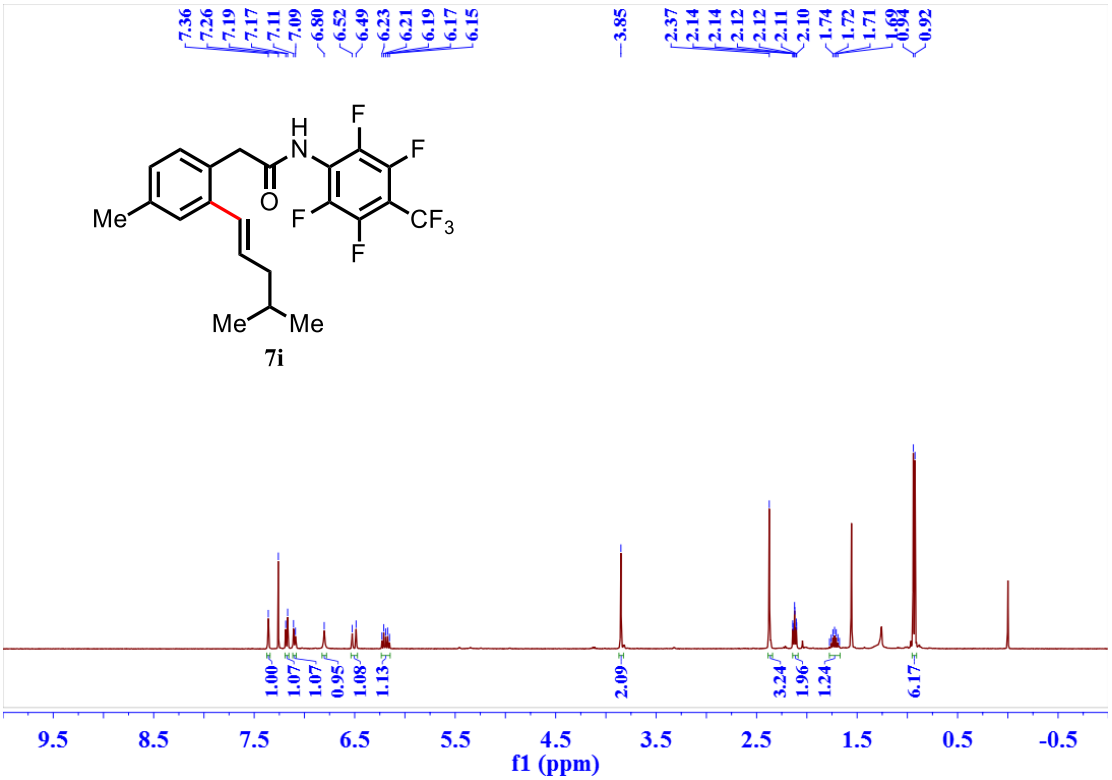
50
40
30
20
10
0
f1 (ppm)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6.15
3.85
2.37
2.14
2.14
2.12
2.12
2.11
2.10
1.74
1.72
1.71
0.94
0.92
Me
H
N
O
F
F
F
F
CF3
Me
Me
7i
1.00
1.07
1.07
0.95
1.08
1.13
2.09
3.24
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1.24
6.17
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6.5
5.5
4.5
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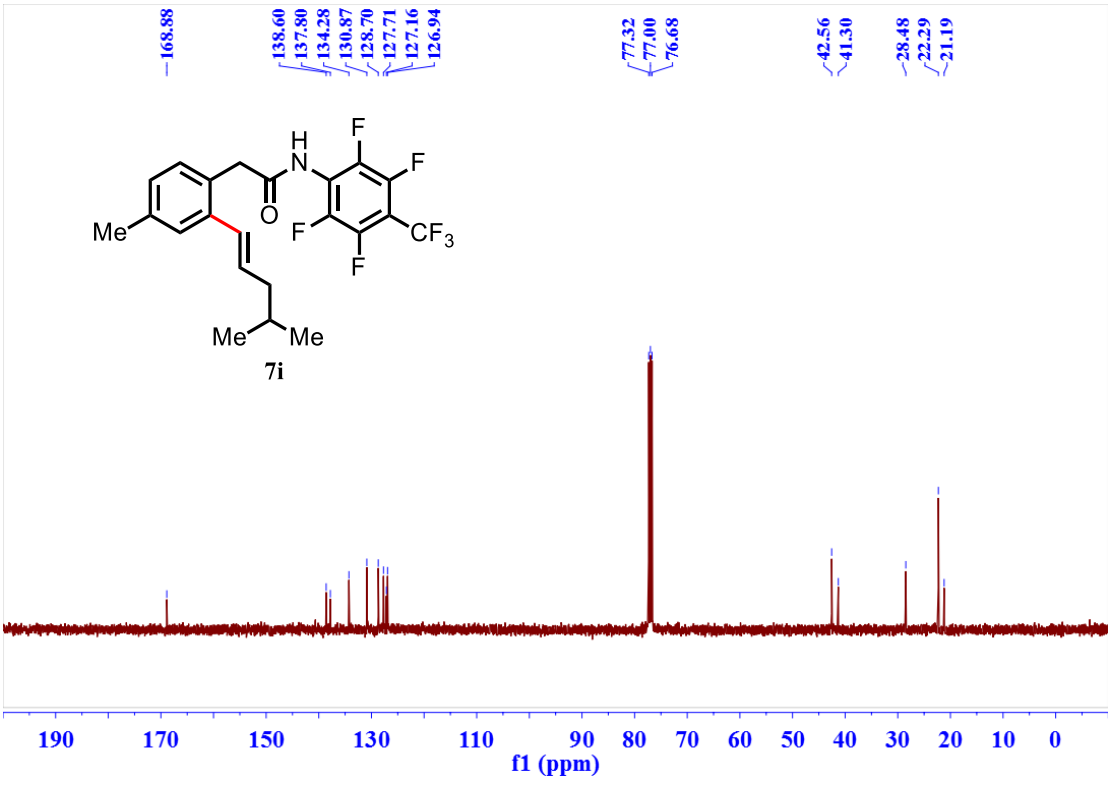
-0.5
f1 (ppm)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77.00
76.68
42.56
41.30
28.48
22.29
21.19
Me
H
N
O
F
F
F
F
CF3
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Me
7i
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170
150
130
110
90
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70
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50
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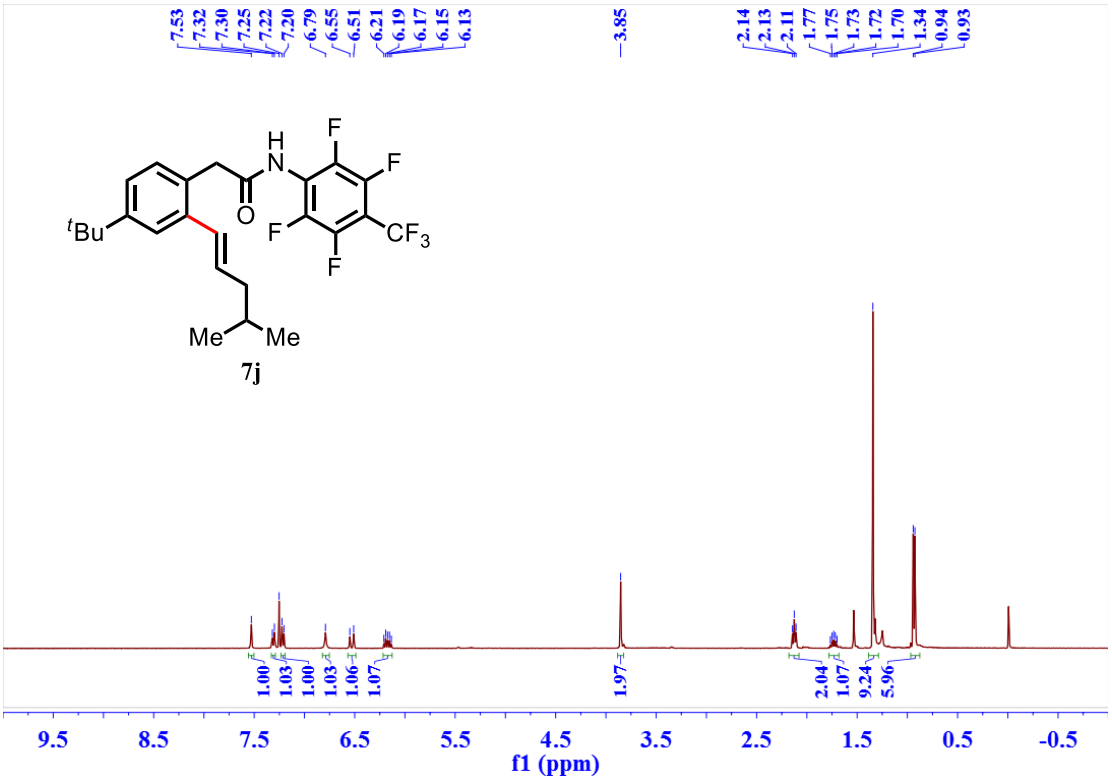
10
0
f1 (ppm)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6.15
6.13
3.85
2.14
2.13
2.11
1.77
1.75
1.73
1.72
1.70
1.34
0.94
0.93
H
N
O
F
F
F
F
CF3
tBu
Me
Me
7j
1.00
1.03
1.00
1.03
1.06
1.07
1.97
2.04
1.07
9.24
5.96
9.5
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6.5
5.5
4.5
3.5
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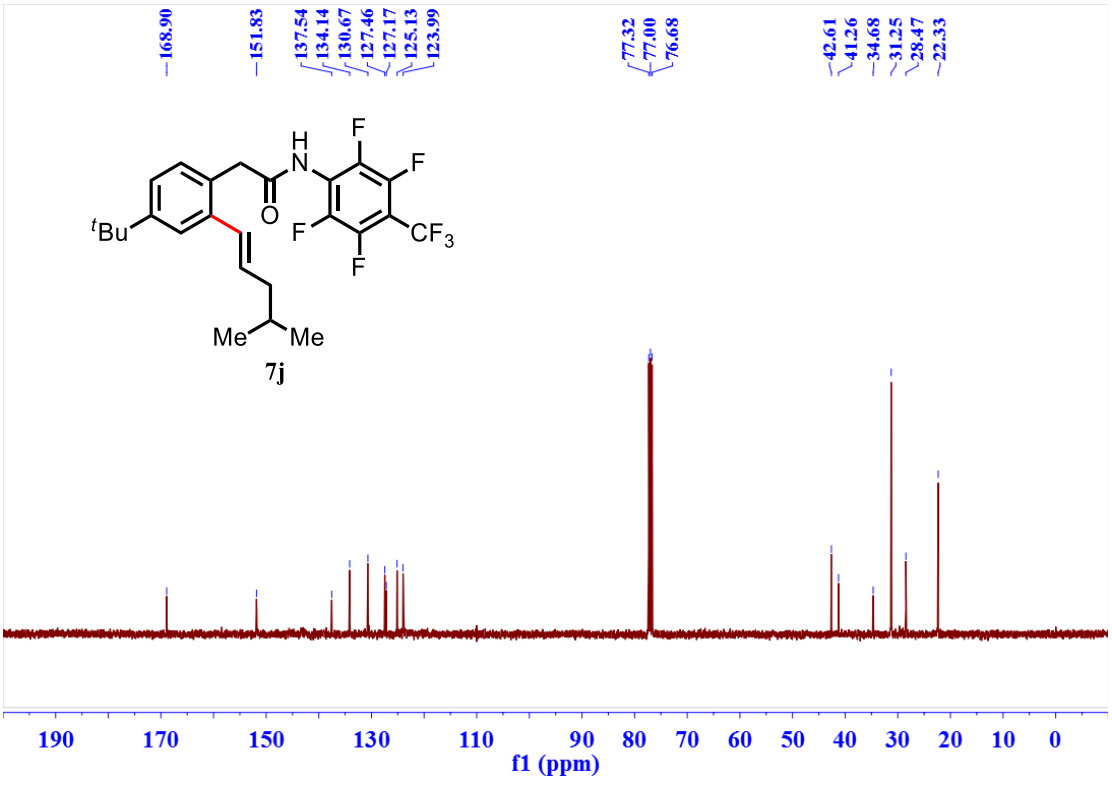
1.5
0.5
-0.5
f1 (ppm)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76.68
42.61
41.26
34.68
31.25
28.47
22.33
H
N
O
F
F
F
F
CF3
tBu
Me
Me
7j
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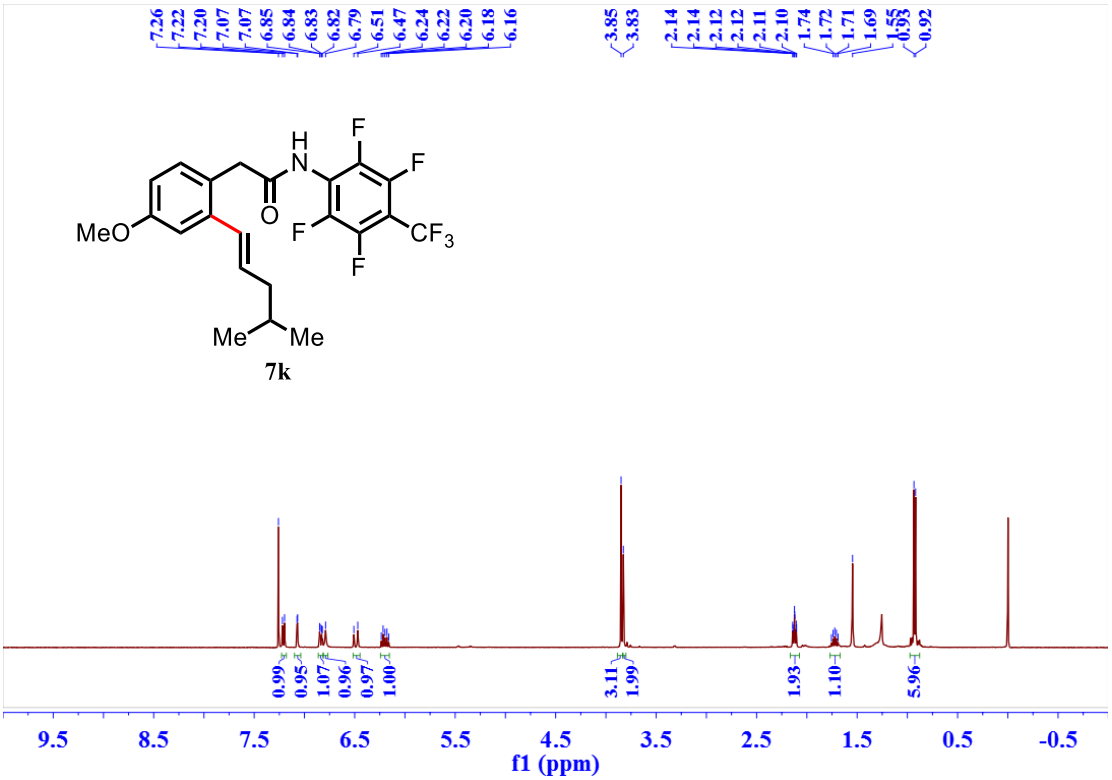
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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6.22
6.20
6.18
6.16
3.85
3.83
2.14
2.14
2.12
2.12
2.11
2.10
1.74
1.72
1.71
1.69
1.55
0.93
0.92
H
N
O
F
F
F
F
CF3
MeO
Me
Me
7k
0.99
0.95
1.07
0.96
0.97
1.00
3.11
1.99
1.93
1.10
5.96
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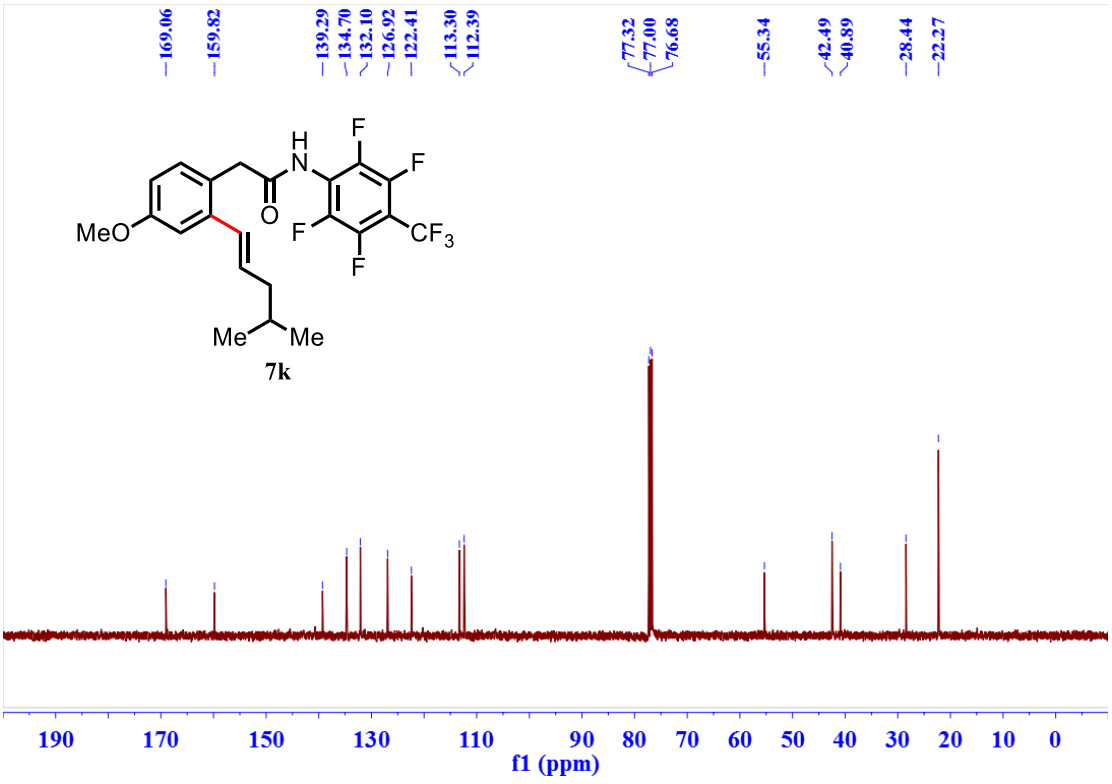
-0.5
f1 (ppm)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77.00
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55.34
42.49
40.89
28.44
22.27
H
N
O
F
F
F
F
CF3
MeO
Me
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7k
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170
150
130
110
90
80
70
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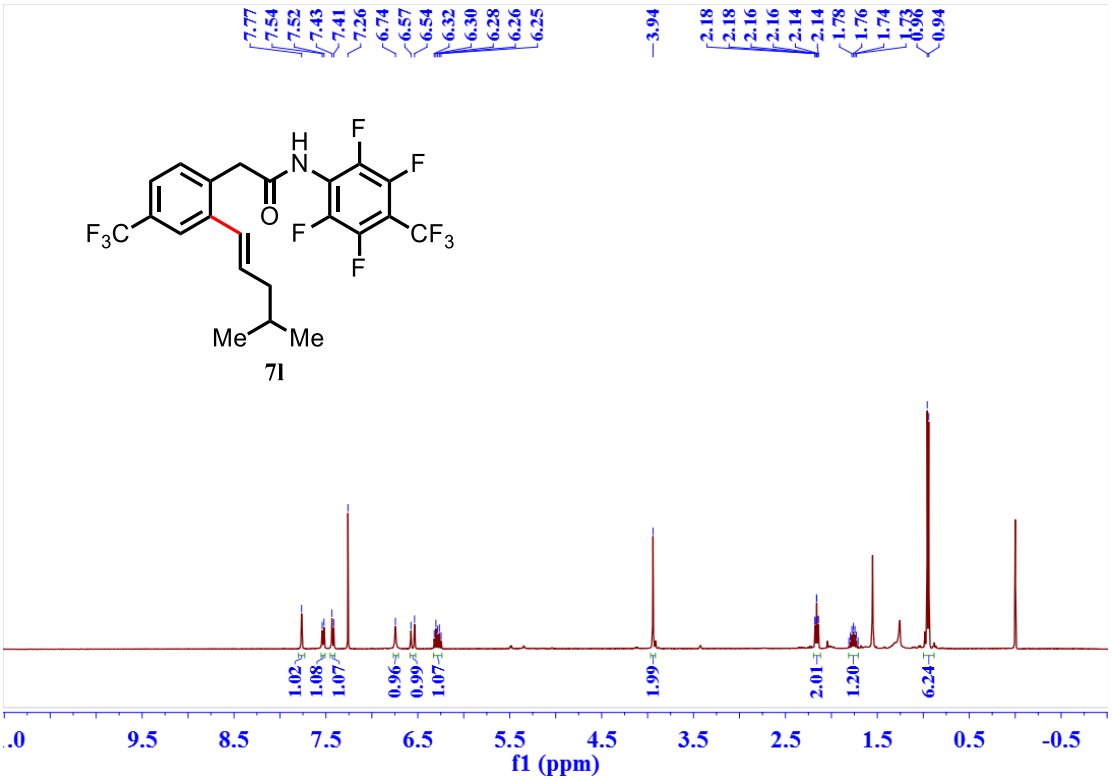
50
40
30
20
10
0
f1 (ppm)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6.28
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6.25
3.94
2.18
2.18
2.16
2.16
2.14
2.14
1.78
1.76
1.74
1.73
0.96
0.94
H
N
O
F
F
F
F
F3C
CF3
Me
Me
7l
1.02
1.08
1.07
0.96
0.99
1.07
1.99
2.01
1.20
6.24
.0
9.5
8.5
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6.5
5.5
4.5
3.5
2.5
1.5
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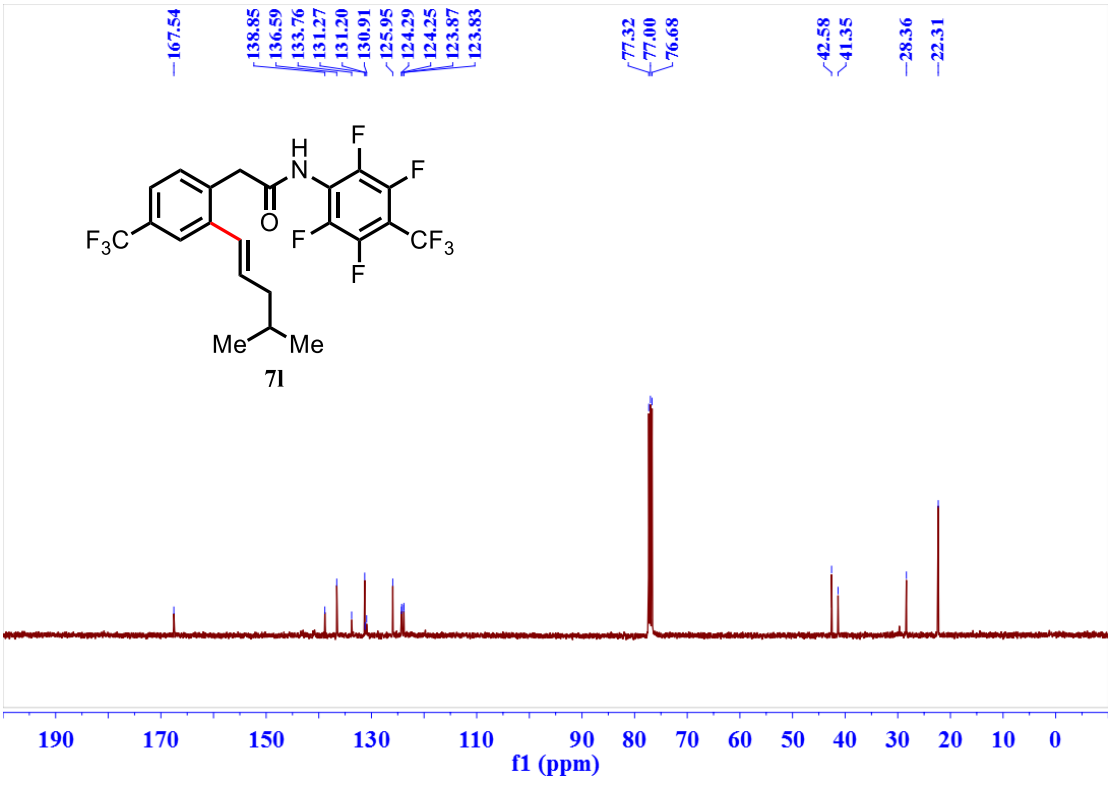
-0.5
f1 (ppm)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42.58
41.35
28.36
22.31
H
N
O
F
F
F
F
F3C
CF3
Me
Me
7l
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170
150
130
110
90
80
70
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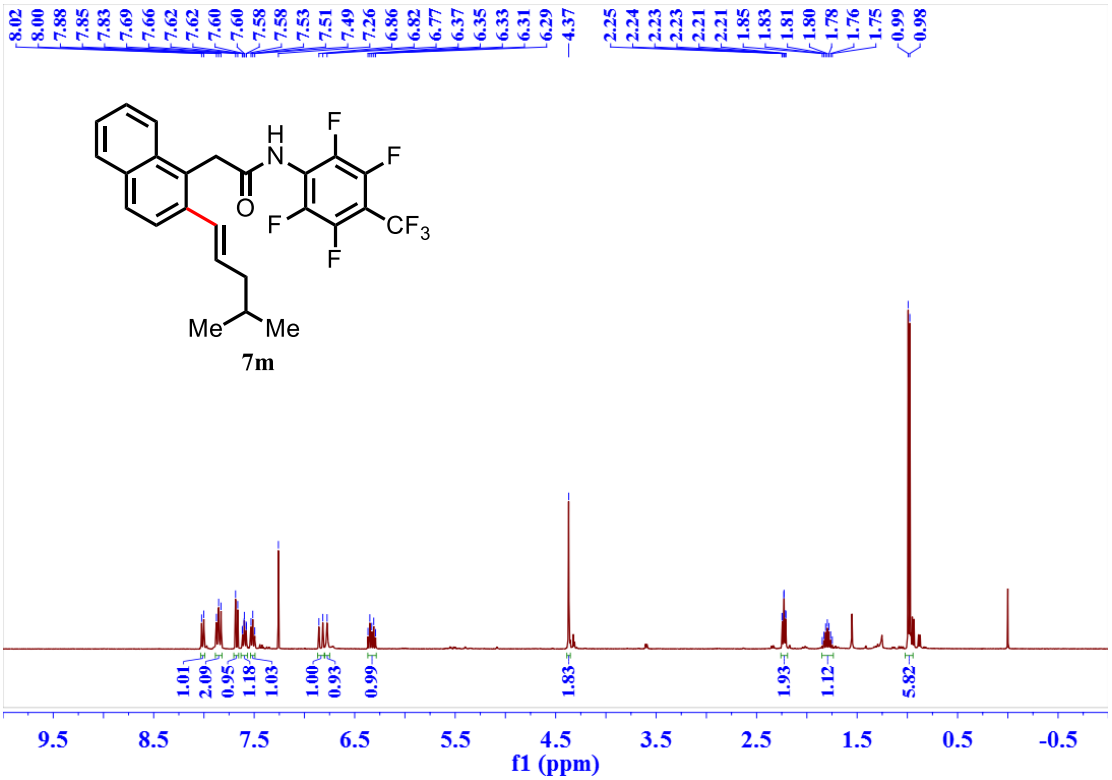
50
40
30
20
10
0
f1 (ppm)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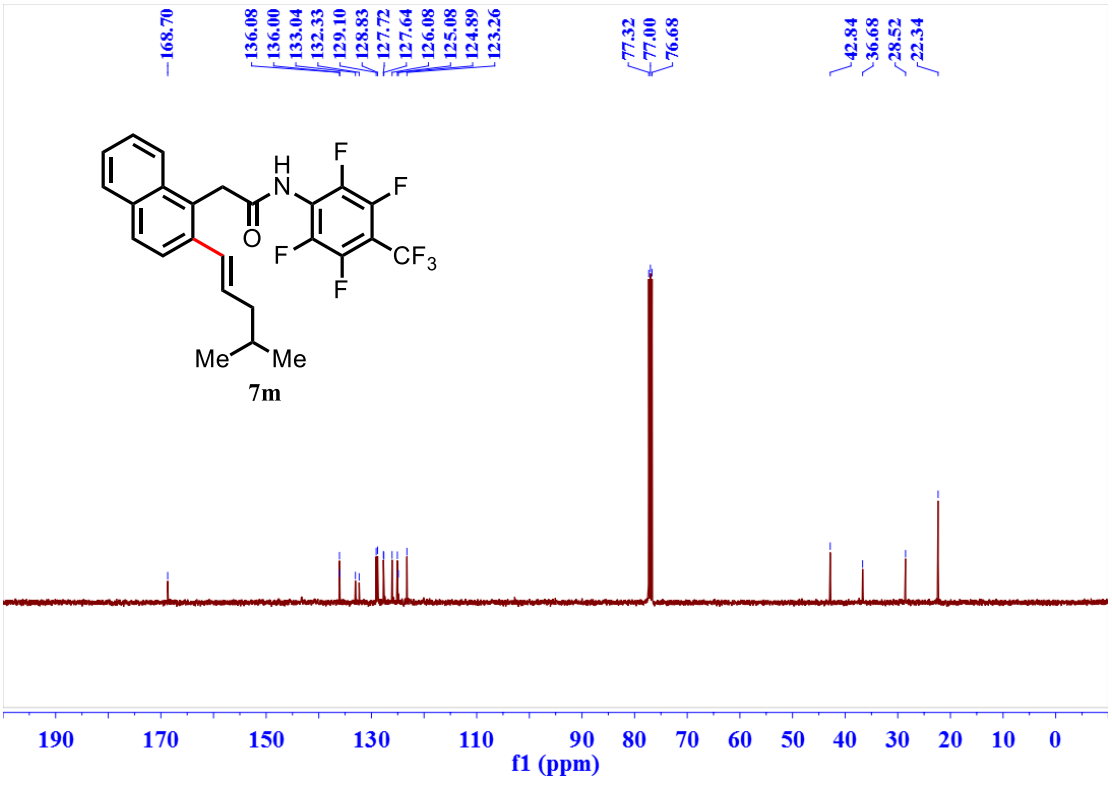
2.25 2.24 2.23 2.23 2.21 2.21 1.85 1.83 1.81 1.80 1.78 1.76 1.75 0.99 0.98
H
N
O
F
F
F
F
CF3
Me
Me
7m
1.01 2.09 0.95 1.18 1.03 1.00 0.93 0.99 1.83 1.93 1.12 5.82
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)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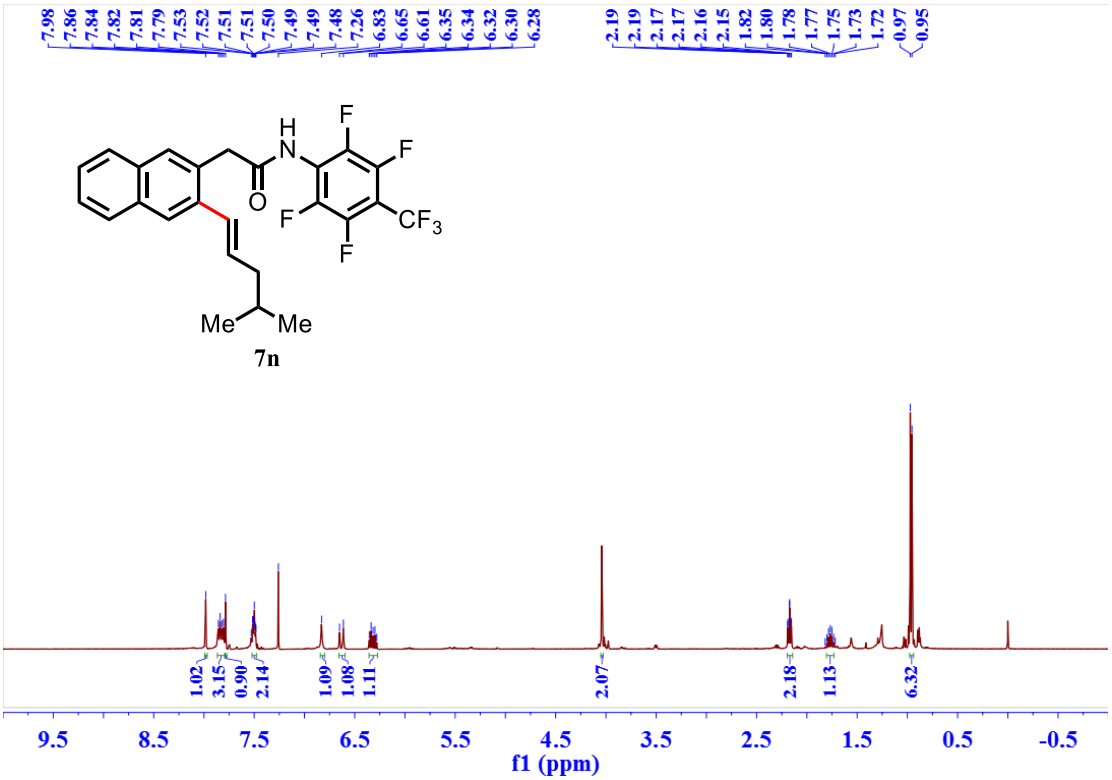
77.32 77.00 76.68
42.84 36.68 28.52 22.34
H
N
O
F
F
F
F
CF3
Me
Me
7m
190 170 150 130 110 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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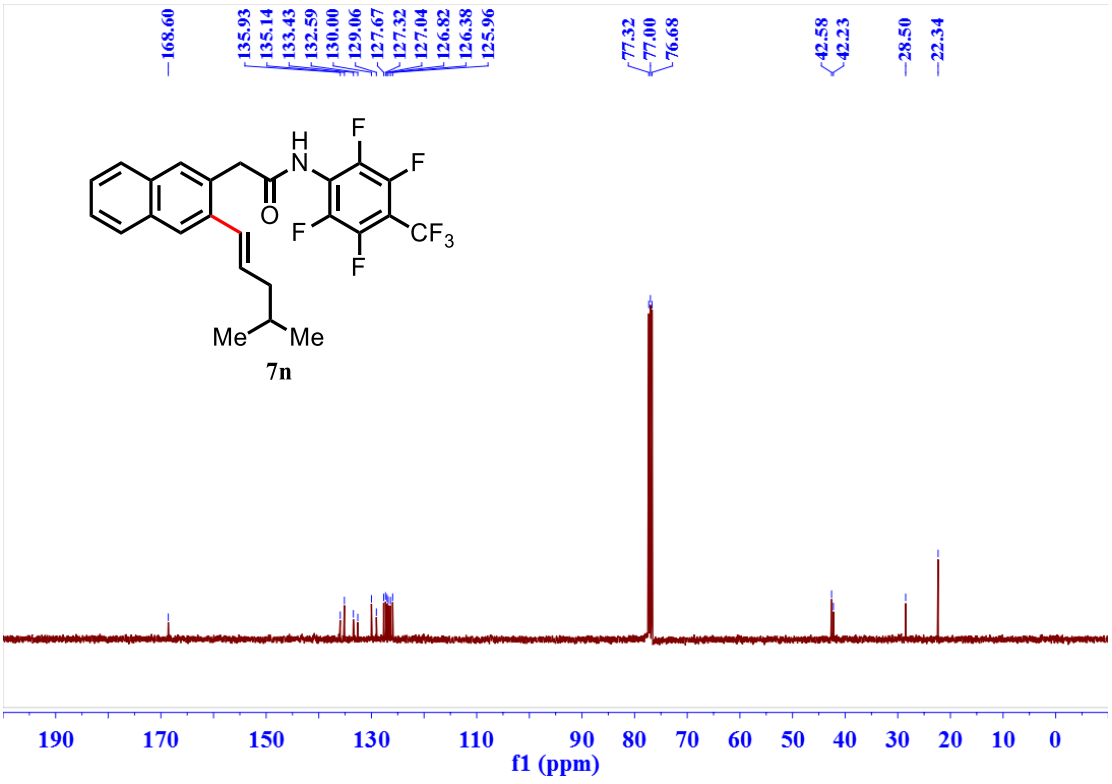
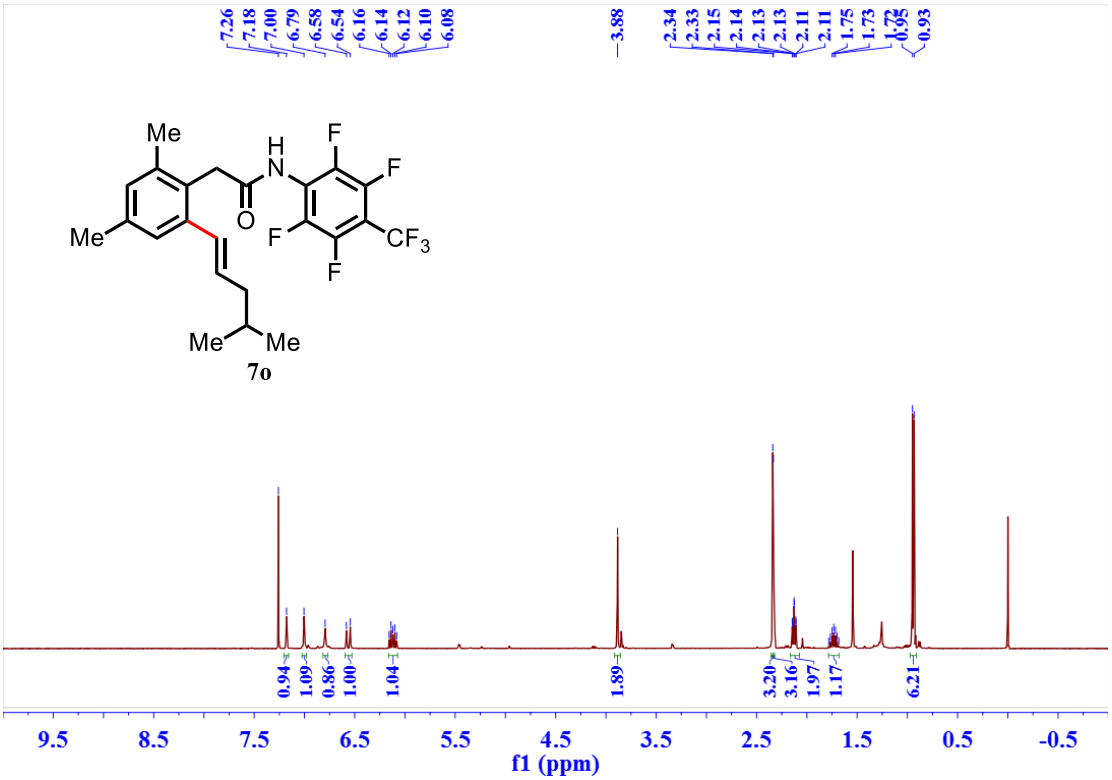
2.19 2.19 2.17 2.17 2.16 2.15 1.82 1.80 1.78 1.77 1.75 1.73 1.72 0.97 0.95
H
N
O
F
F
F
F
CF3
Me
Me
7n
1.02 3.15 0.90 2.14 1.09 1.08 1.11 2.07 2.18 1.13 6.32
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)


168.60
135.93 135.14 133.43 132.59 130.00 129.06 127.67 127.32 127.04 126.82 126.38 125.96
77.32 77.00 76.68
42.58 42.23
28.50
22.34
H
N
O
F
F
F
F
CF3
Me
Me
7n
190 170 150 130 110 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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7.00
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6.54
6.16
6.14
6.12
6.10
6.08
3.88
2.34
2.33
2.15
2.14
2.13
2.13
2.11
2.11
1.75
1.73
1.72
0.95
0.93
Me
H
N
F
F
O
F
Me
F
CF3
F
Me
Me
7o
0.94
1.09
0.86
1.00
1.04
1.89
3.20
3.16
1.97
1.17
6.21
9.5
8.5
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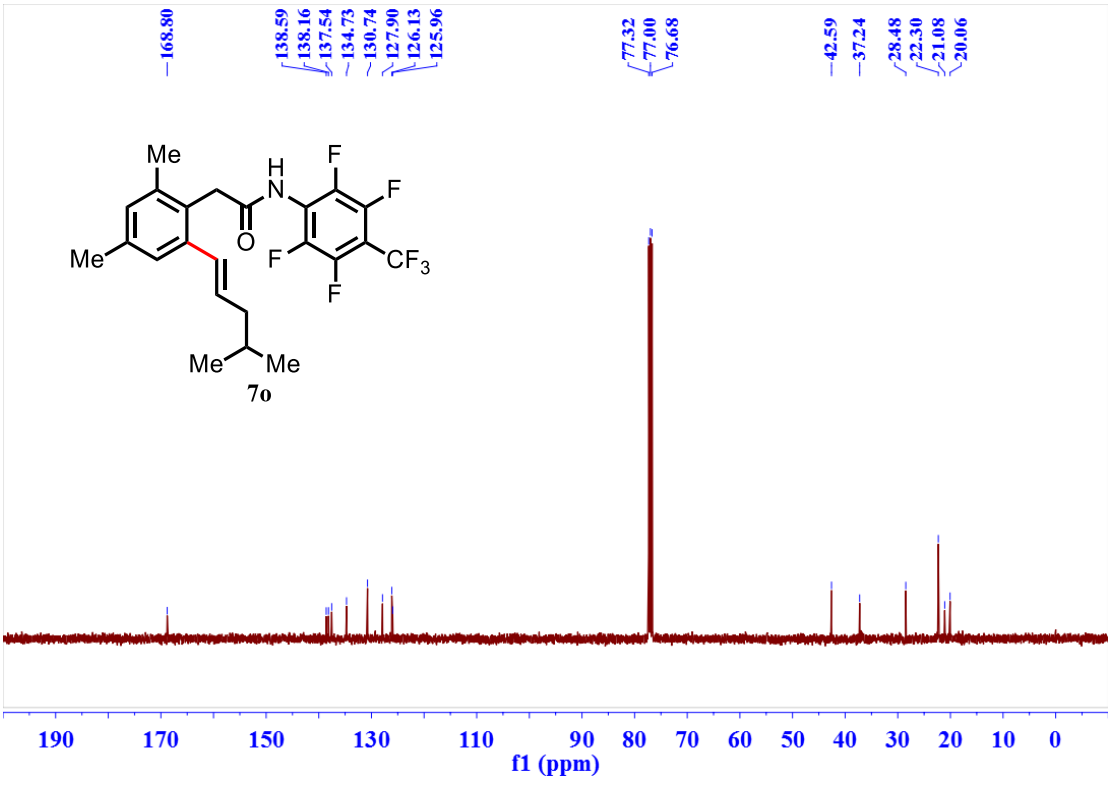
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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138.16
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130.74
127.90
126.13
125.96
77.32
77.00
76.68
42.59
37.24
28.48
22.30
21.08
20.06
Me
H
N
F
F
O
F
Me
F
CF3
F
Me
Me
7o
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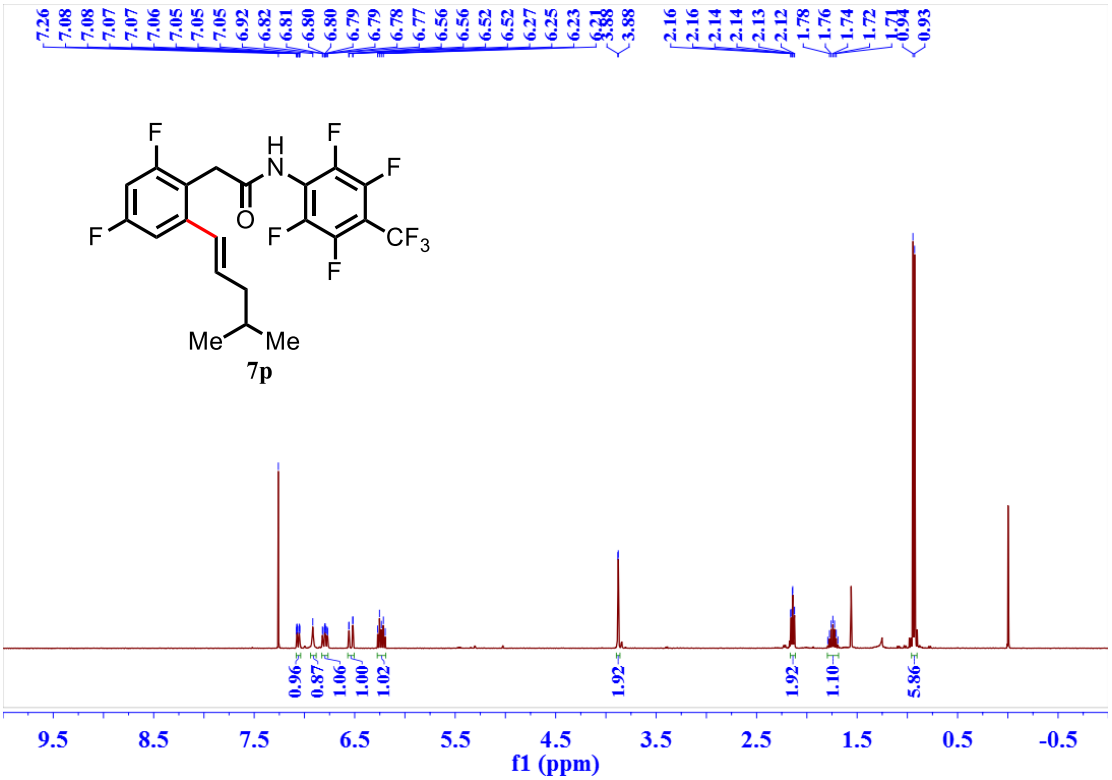
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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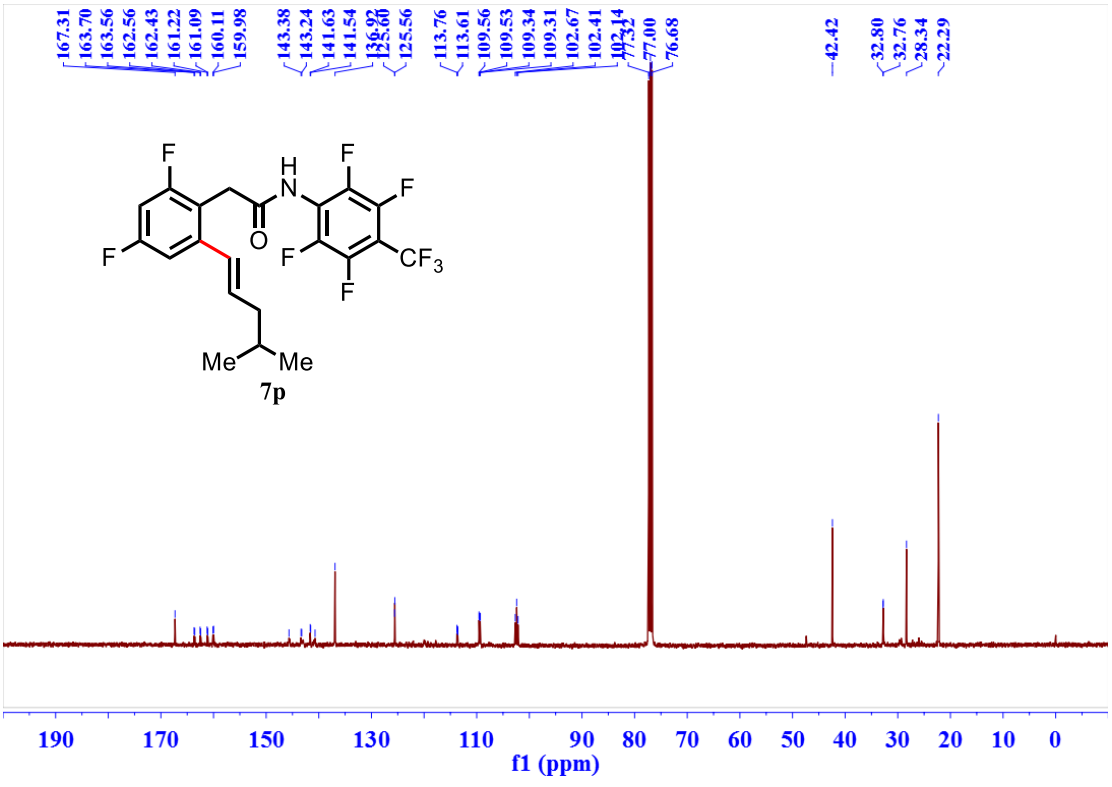
2.16 2.16 2.14 2.14 2.13 2.12 1.78 1.76 1.74 1.72 0.94 0.93
F H N F F O F F CF3 F Me Me
7p
0.96 0.87 1.06 1.00 1.02 1.92 1.92 1.10 5.86
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)


167.31 163.70 163.56 162.56 162.43 161.22 161.09 160.11 159.98 143.38 143.24 141.63 141.54 136.92 125.60 125.56 113.76 113.61 109.56 109.53 109.34 109.31 102.67 102.41 102.14 77.32 77.00 76.68 42.42 32.80 32.76 28.34 22.29
F H N F F O F F CF3 F Me Me
7p
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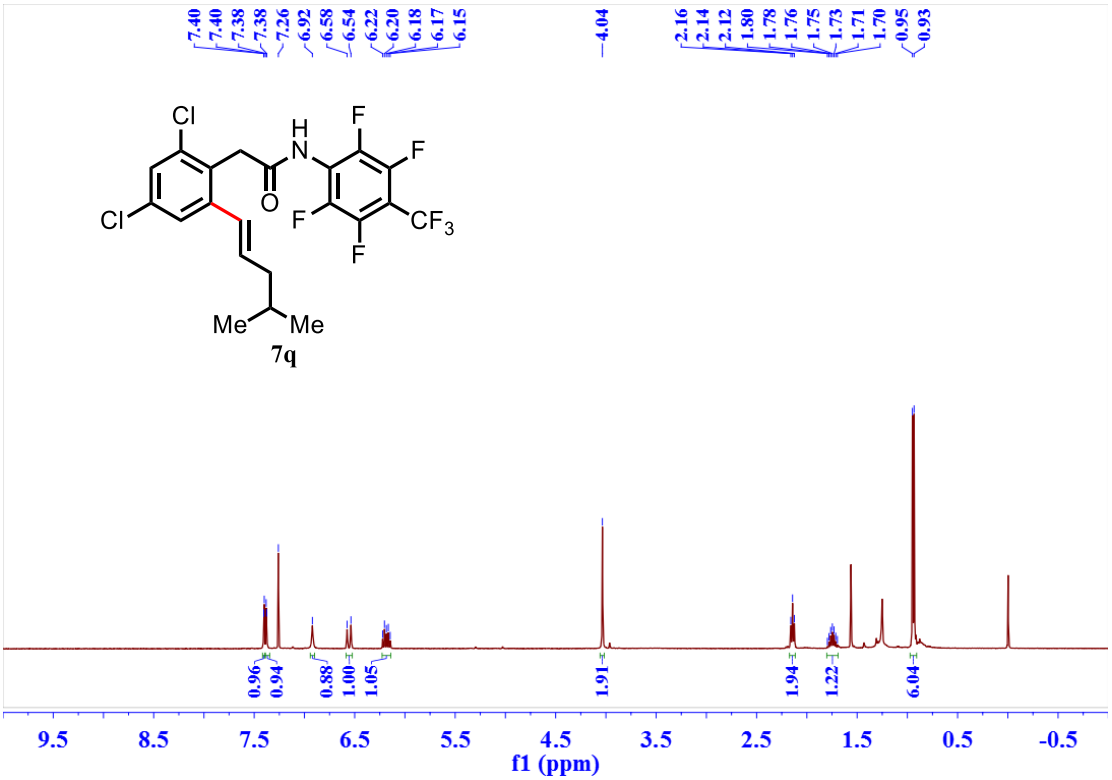
f1 (ppm)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7.38
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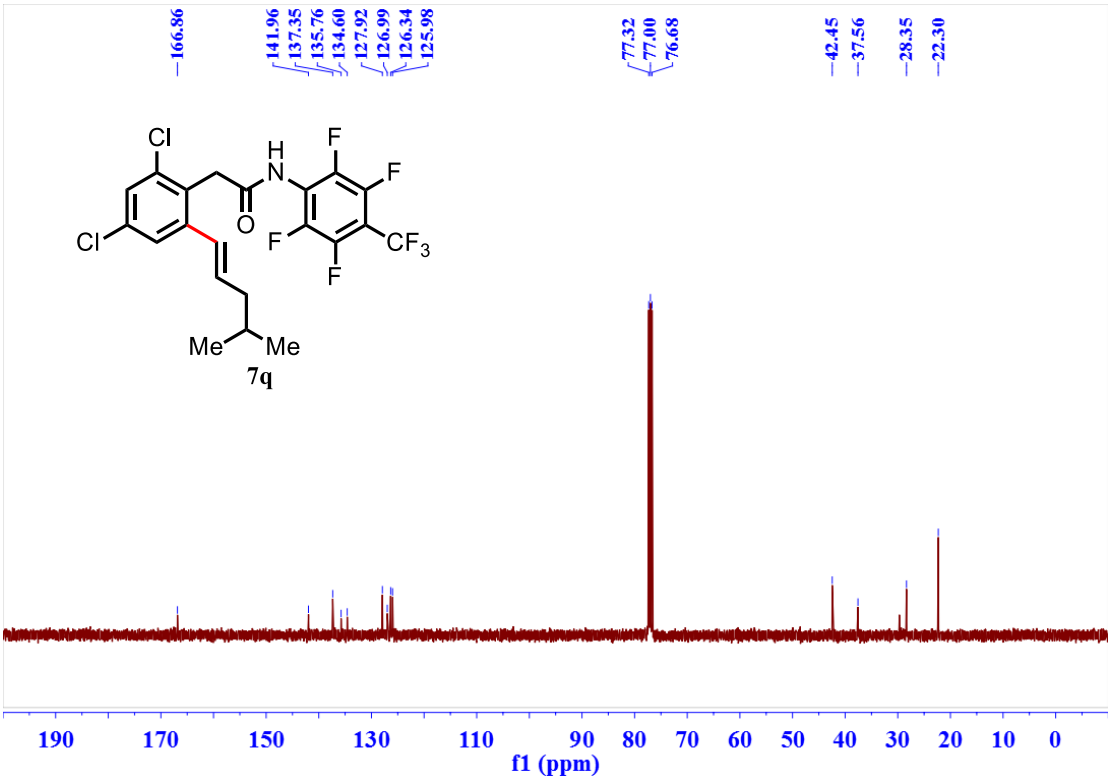
6.92
6.58
6.54
6.22
6.20
6.18
6.17
6.15
4.04
2.16
2.14
2.12
1.80
1.78
1.76
1.75
1.73
1.71
1.70
0.95
0.93
Cl
H
N
O
F
F
F
F
CF3
Cl
Me
Me
7q
0.96
0.94
0.88
1.00
1.05
1.91
1.94
1.22
6.04
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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127.92
126.99
126.34
125.98
77.32
77.00
76.68
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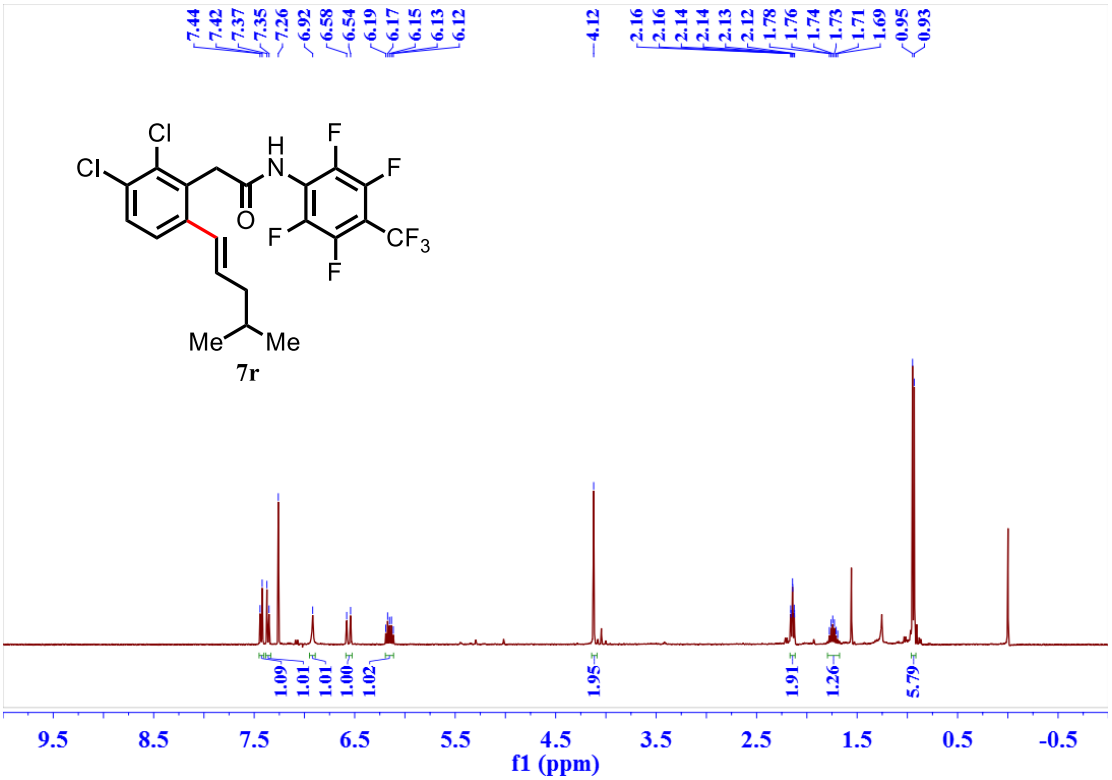
37.56
28.35
22.30
Cl
H
N
O
F
F
F
F
CF3
Cl
Me
Me
7q
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.35
7.26
6.92
6.58
6.54
6.19
6.17
6.15
6.13
6.12
4.12
2.16
2.16
2.14
2.14
2.13
2.12
1.78
1.76
1.74
1.73
1.71
1.69
0.95
0.93
Cl
Cl
H
N
O
F
F
F
F
CF3
Me
Me
7r
1.09
1.01
1.01
1.00
1.02
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1.91
1.26
5.79
9.5
8.5
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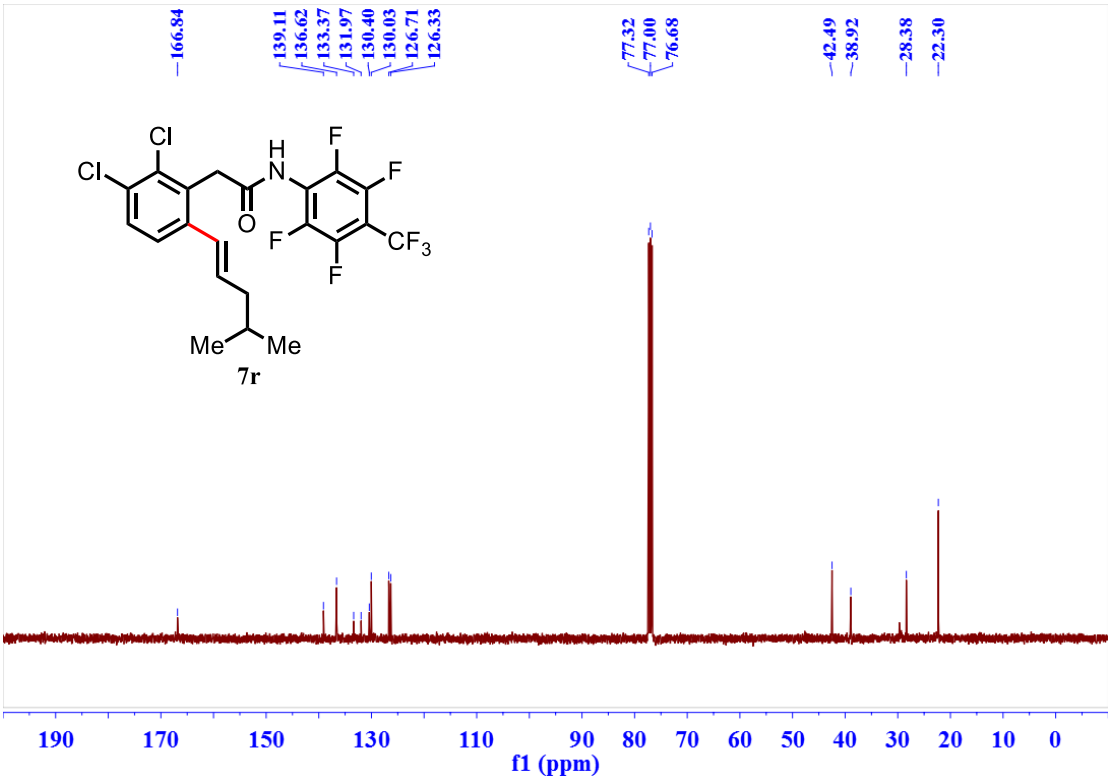
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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131.97
130.40
130.03
126.71
126.33
77.32
77.00
76.68
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38.92
28.38
22.30
Cl
Cl
H
N
O
F
F
F
F
CF3
Me
Me
7r
190
170
150
130
110
90
80
70
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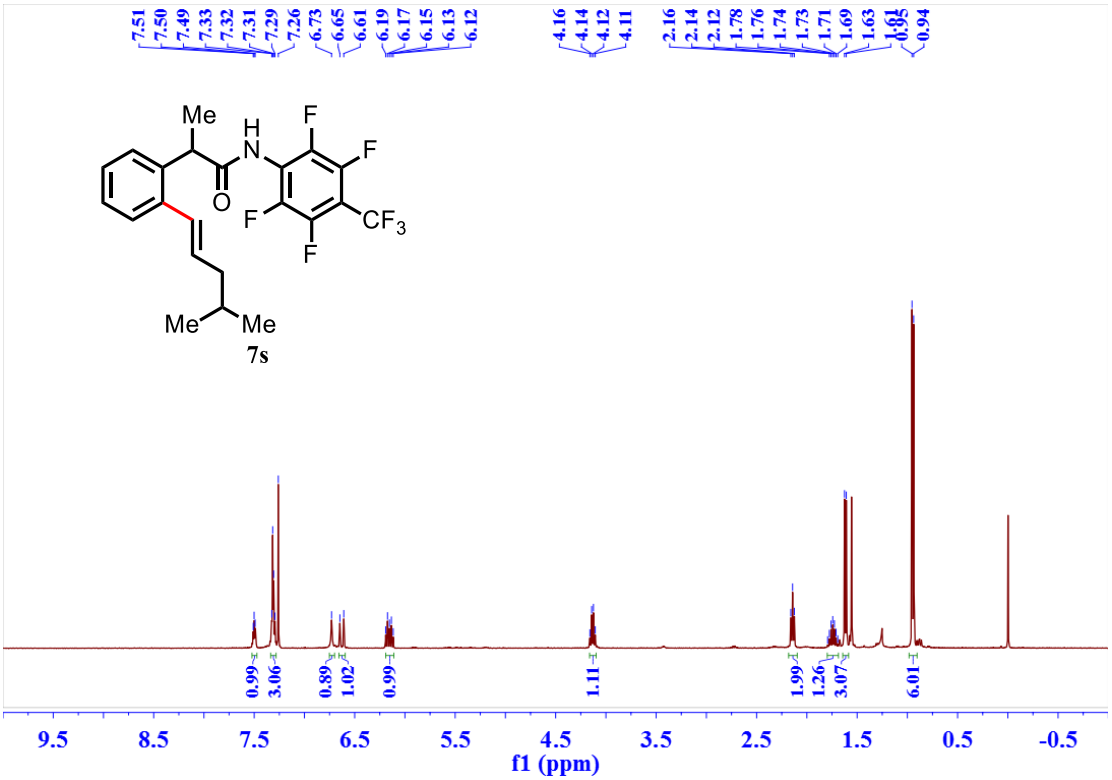
50
40
30
20
10
0
f1 (ppm)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7.31
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7.26
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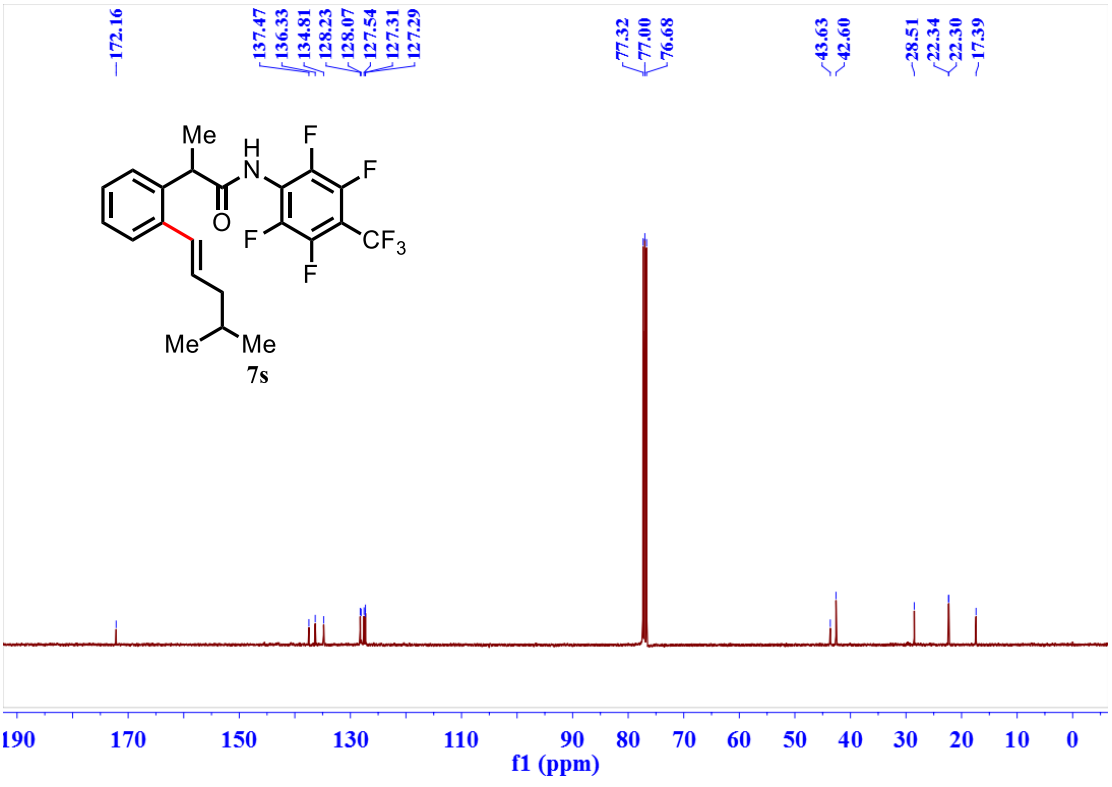
6.65
6.61
6.19
6.17
6.15
6.13
6.12
4.16
4.14
4.12
4.11
2.16
2.14
2.12
1.78
1.76
1.74
1.73
1.71
1.69
1.63
0.95
0.94
Me
H
N
O
F
F
F
F
CF3
Me
Me
7s
0.99
3.06
0.89
1.02
0.99
1.11
1.99
1.26
3.07
6.01
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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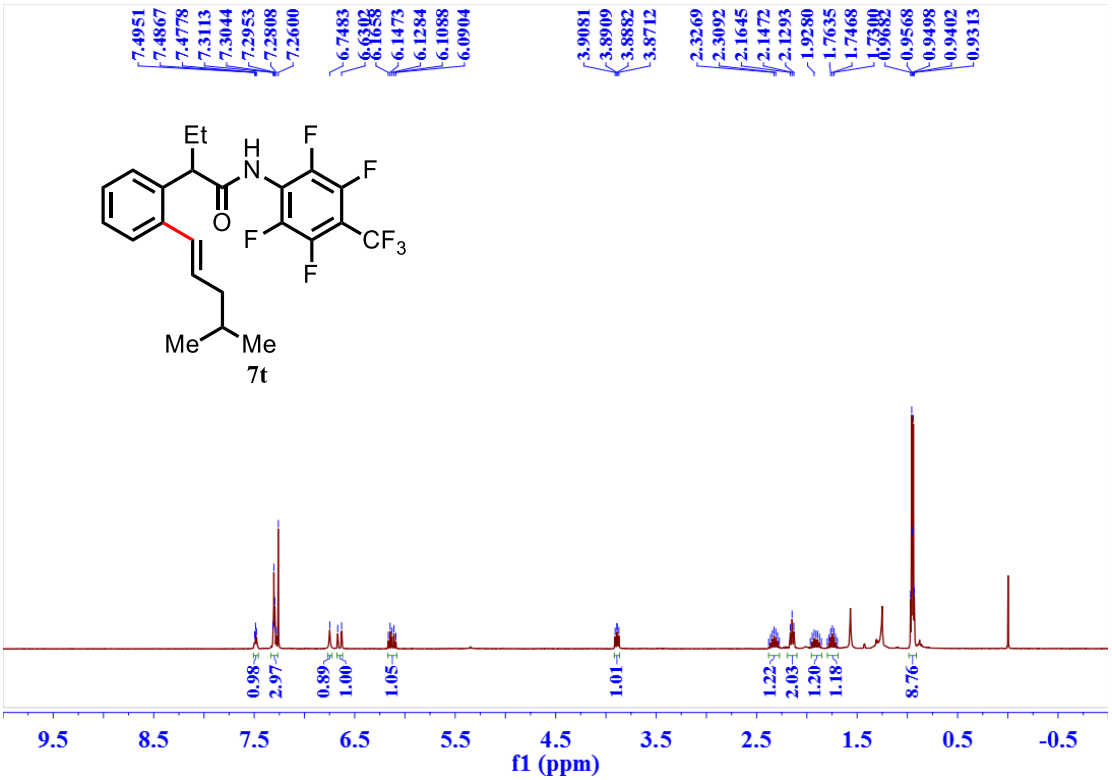
128.07
127.54
127.31
127.29
77.32
77.00
76.68
43.63
42.60
28.51
22.34
22.30
17.39
Me
H
N
O
F
F
F
F
CF3
Me
Me
7s
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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6.1473
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6.1088
6.0904
3.9081
3.8909
3.8882
3.8712
2.3269
2.3092
2.1645
2.1472
2.1293
1.9280
1.7635
1.7468
1.7310
0.9682
0.9568
0.9498
0.9402
0.9313
Et
H
N
O
F
F
F
F
CF3
Me
Me
7t
0.98
2.97
0.89
1.00
1.05
1.01
1.22
2.03
1.20
1.18
8.76
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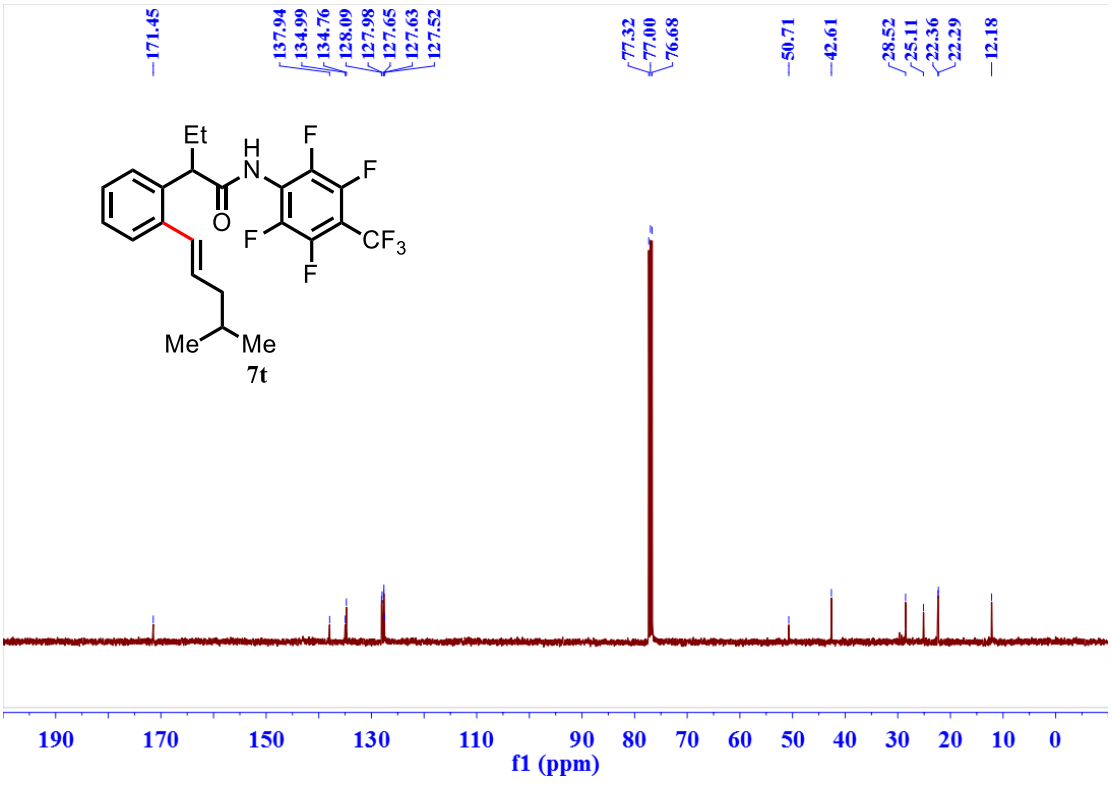
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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127.63
127.52
77.32
77.00
76.68
50.71
42.61
28.52
25.11
22.36
22.29
12.18
Et
H
N
O
F
F
F
F
CF3
Me
Me
7t
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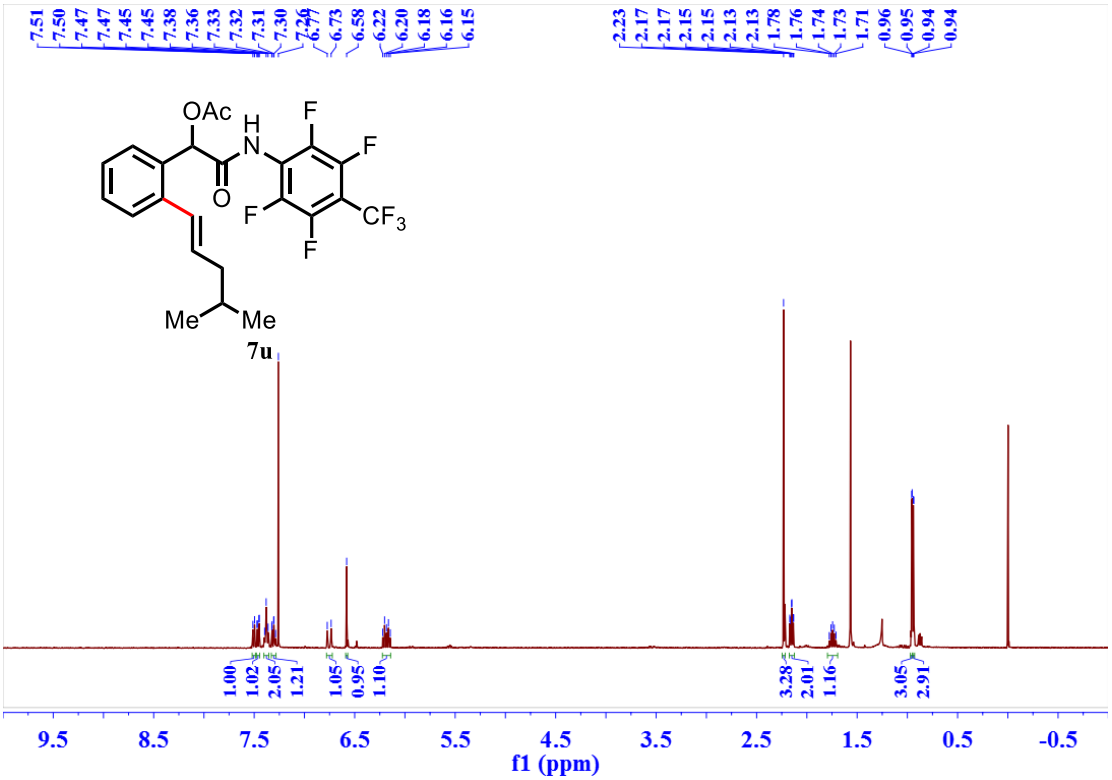
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.26
6.77
6.73
6.58
6.22
6.20
6.18
6.16
6.15
2.23
2.17
2.17
2.15
2.15
2.13
2.13
1.78
1.76
1.74
1.73
1.71
0.96
0.95
0.94
0.94
OAc
H
N
O
F
F
F
F
CF3
Me
Me
7u
1.00
1.02
2.05
1.21
1.05
0.95
1.10
3.28
2.01
1.16
3.05
2.91
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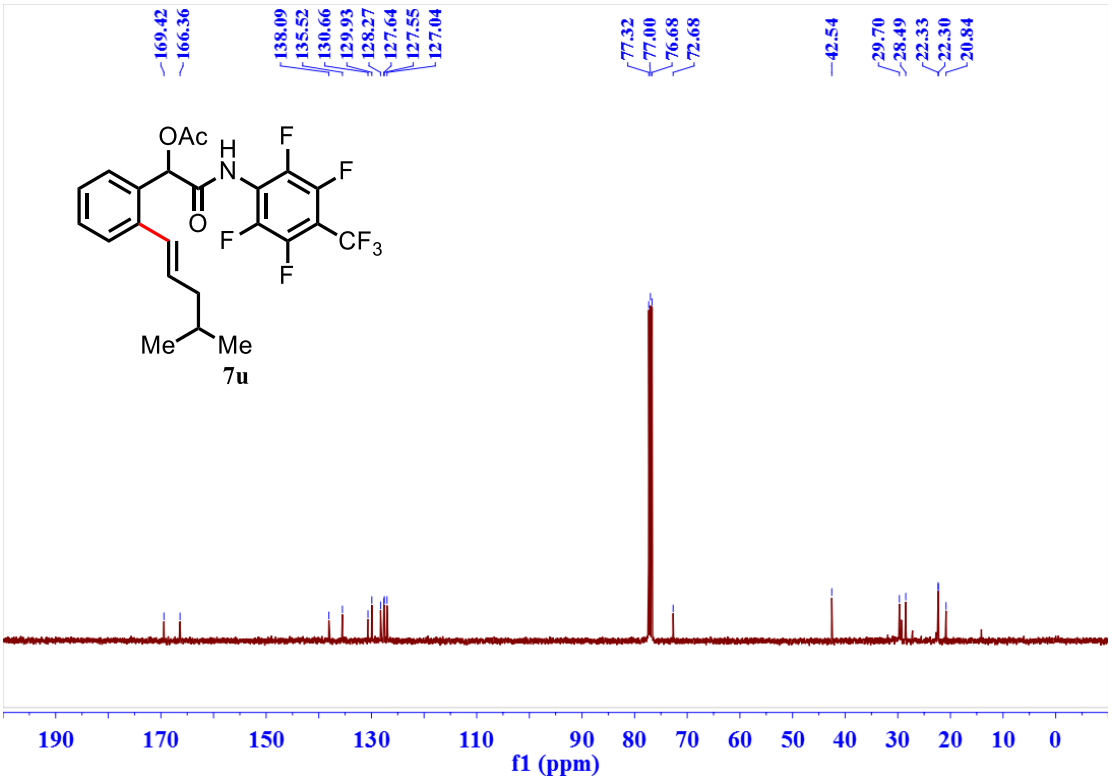
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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127.64
127.55
127.04
77.32
77.00
76.68
72.68
42.54
29.70
28.49
22.33
22.30
20.84
OAc
H
N
O
F
F
F
F
CF3
Me
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7u
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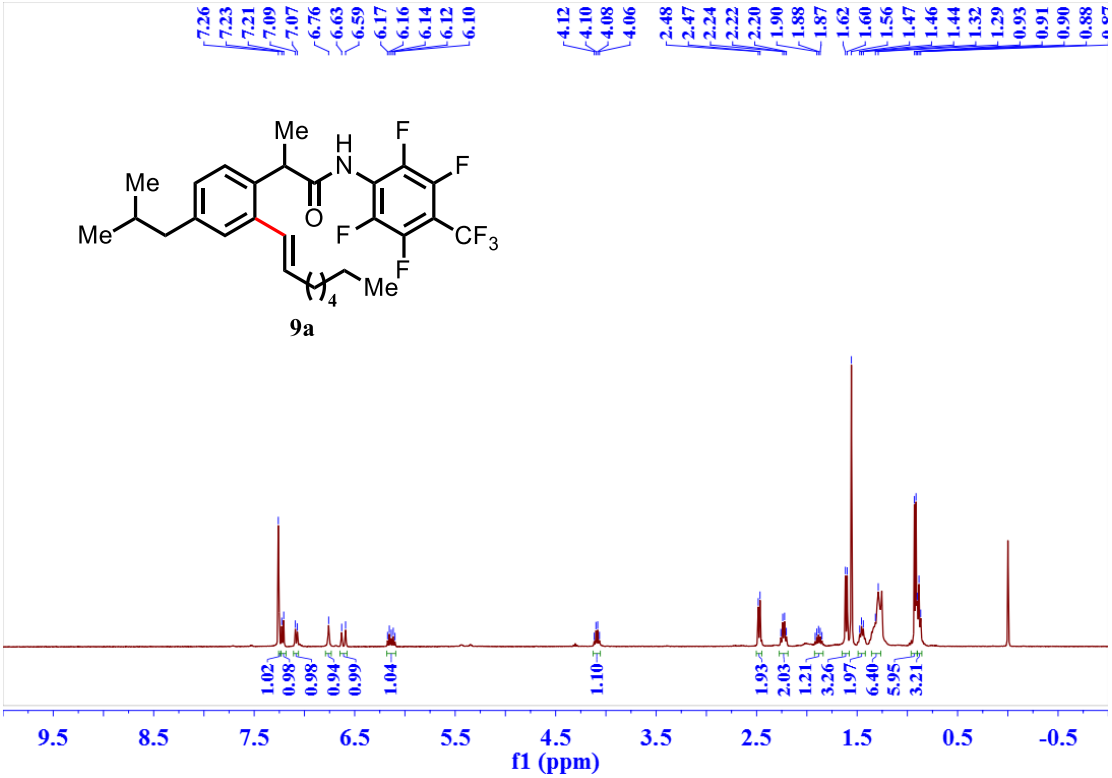
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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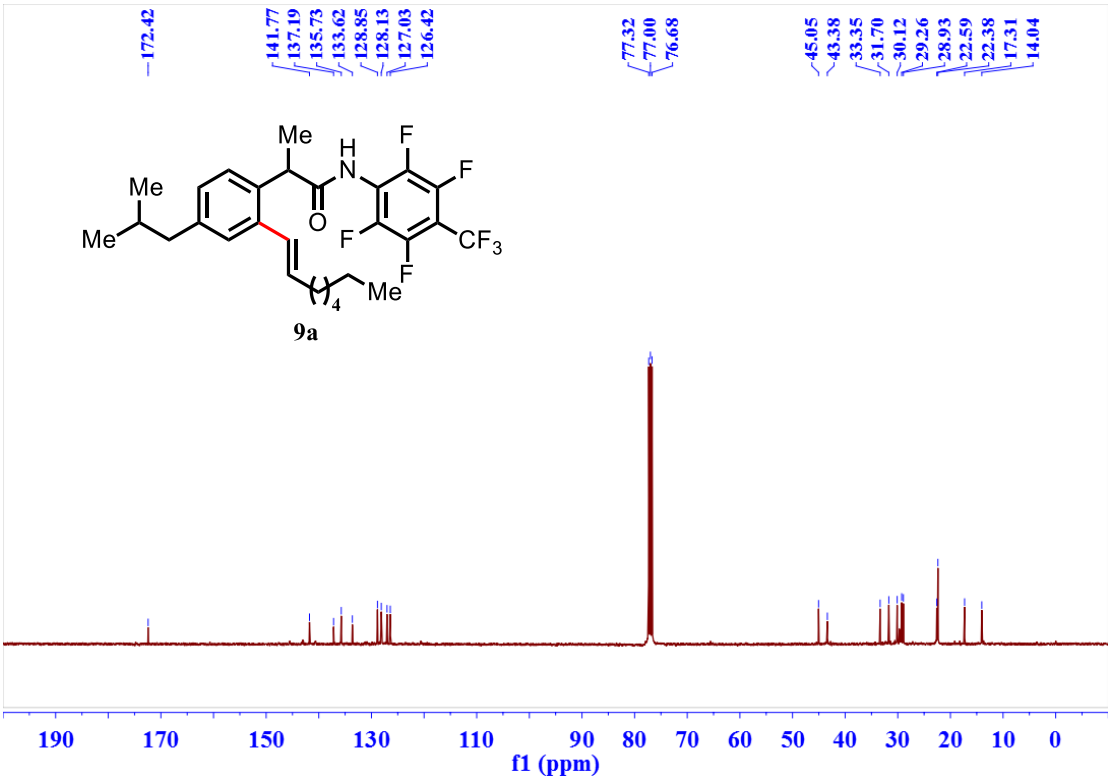
4.12 4.10 4.08 4.06 2.48 2.47 2.24 2.22 2.20 1.90 1.88 1.87 1.62 1.60 1.56 1.47 1.46 1.44 1.32 1.29 0.93 0.91 0.90 0.88
Me
H
N
F
F
Me
O
F
CF3
Me
F
4
Me
9a
1.02 0.98 0.98 0.94 0.99 1.04 1.10 1.93 2.03 1.21 3.26 1.97 6.40 5.95 3.21
9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.5
f1 (ppm)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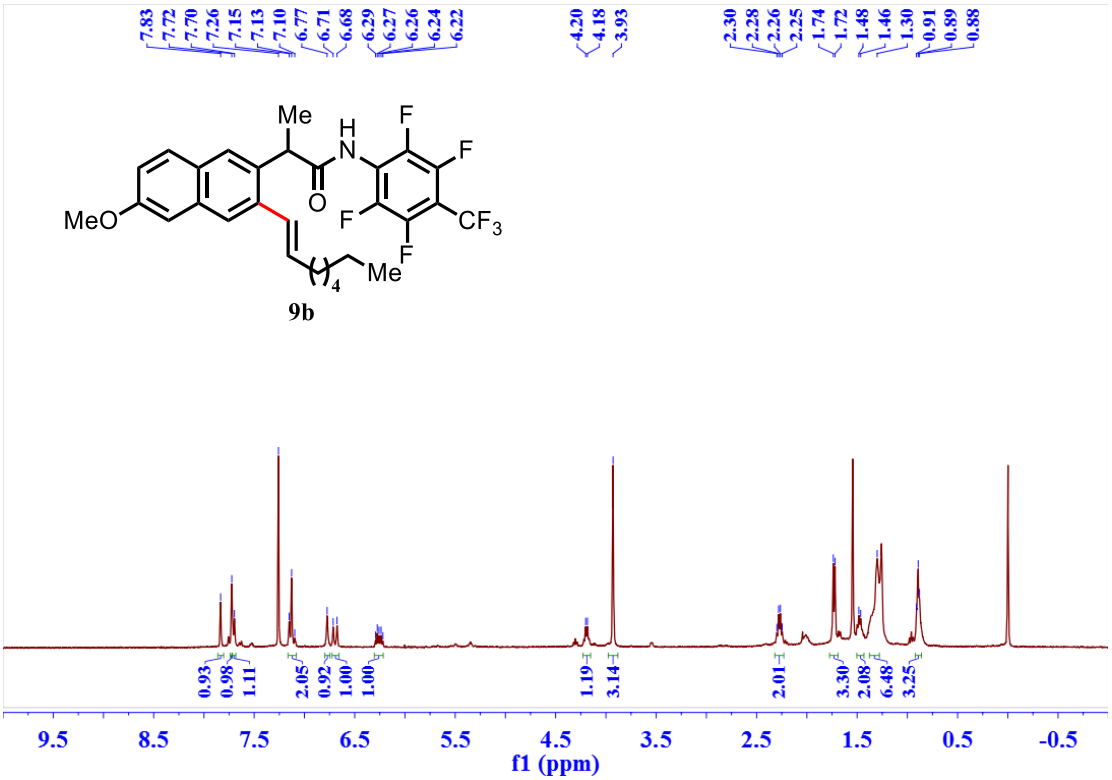
141.77 137.19 135.73 133.62 128.85 128.13 127.03 126.42
77.32 77.00 76.68
45.05 43.38 33.35 31.70 30.12 29.26 28.93 22.59 22.38 17.31 14.04
Me
H
N
F
F
Me
O
F
CF3
Me
F
4
Me
9a
190 170 150 130 110 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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6.27
6.26
6.24
6.22
4.20
4.18
3.93
2.30
2.28
2.26
2.25
1.74
1.72
1.48
1.46
1.30
0.91
0.89
0.88
Me
H
N
O
F
F
F
F
CF3
MeO
Me
4
9b
0.93
0.98
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2.05
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1.00
1.00
1.19
3.14
2.01
3.30
2.08
6.48
3.25
9.5
8.5
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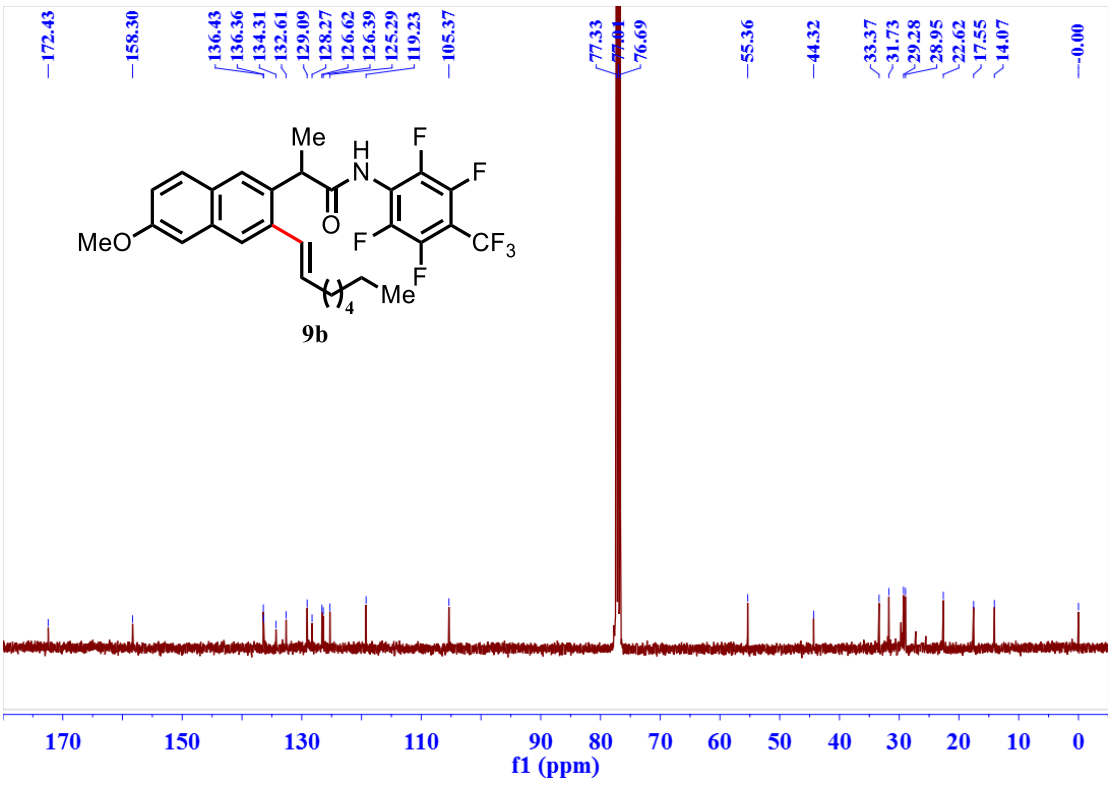
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)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126.39
125.29
119.23
105.37
77.33
77.04
76.69
55.36
44.32
33.37
31.73
29.28
28.95
22.62
17.55
14.07
0.00
Me
H
N
O
F
F
F
F
CF3
MeO
Me
4
9b
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150
130
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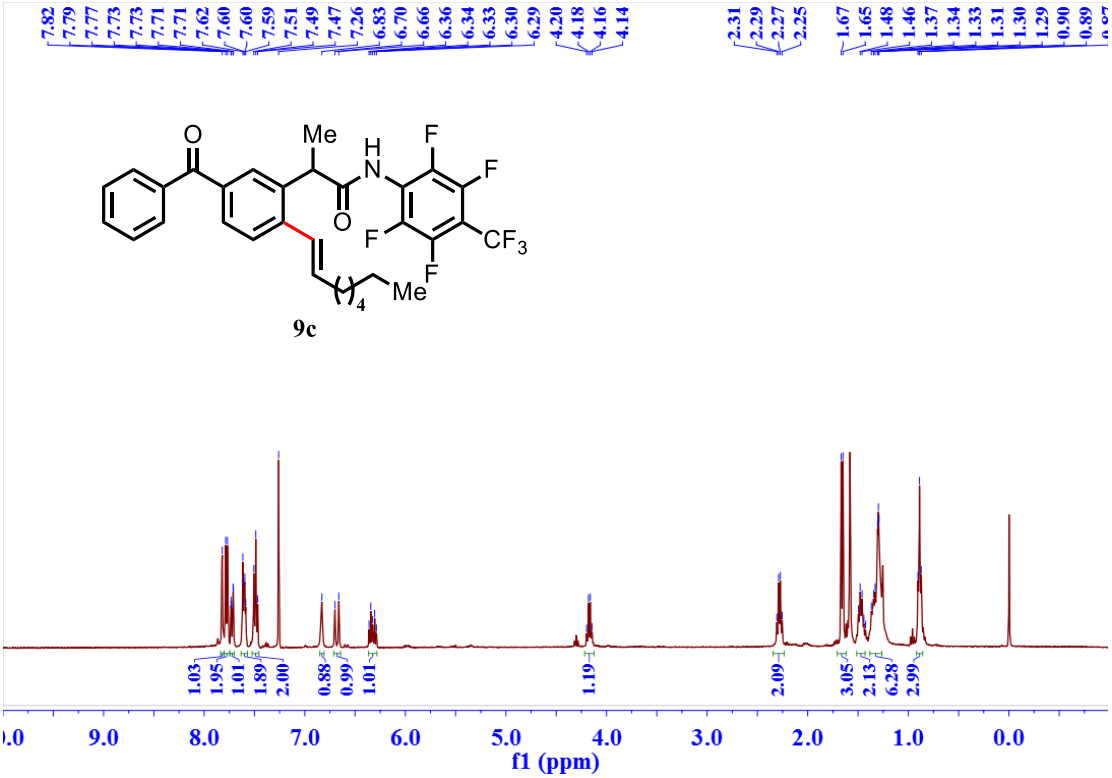
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.82 7.79 7.77 7.73 7.73 7.71 7.71 7.62 7.60 7.60 7.59 7.51 7.49 7.47 7.26 6.83 6.70 6.66 6.36 6.34 6.33 6.30 6.29 4.20 4.18 4.16 4.14 2.31 2.29 2.27 2.25 1.67 1.65 1.48 1.46 1.37 1.34 1.33 1.31 1.30 1.29 0.90 0.89
O Me H N F F F F CF3 O Me 4
9c
1.03 1.95 1.01 1.89 2.00 0.88 0.99 1.01 1.19 2.09 3.05 2.13 6.28 2.99
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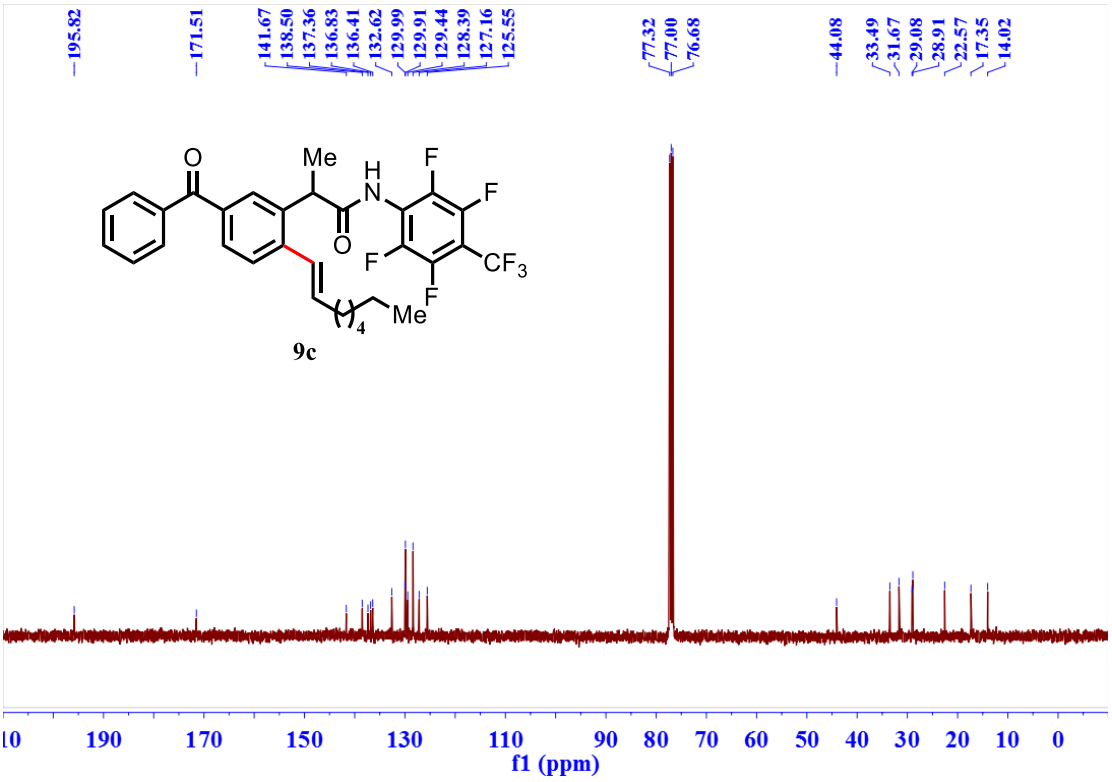
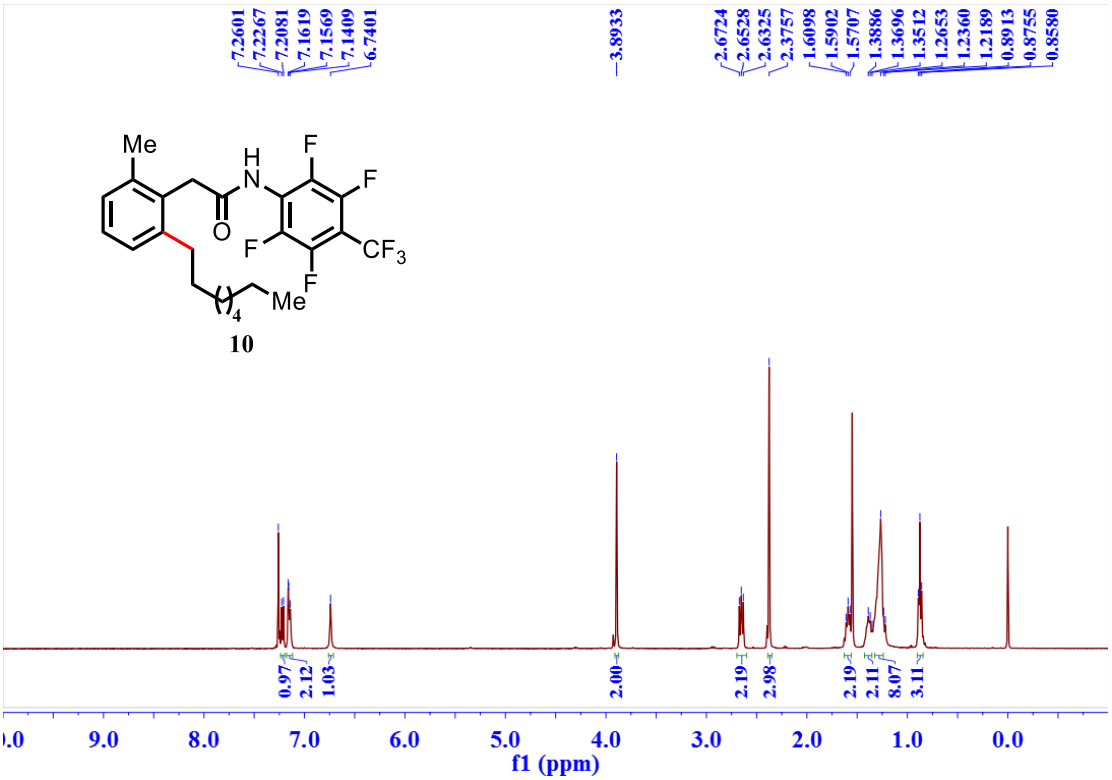
f1 (ppm)


195.82 171.51 141.67 138.50 137.36 136.83 136.41 132.62 129.99 129.91 129.44 128.39 127.16 125.55 77.32 77.00 76.68 44.08 33.49 31.67 29.08 28.91 22.57 17.35 14.02
O Me H N F F F F CF3 O Me 4
9c
190 170 150 130 110 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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7.1409
6.7401
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2.3757
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1.5902
1.5707
1.3886
1.3696
1.3512
1.2653
1.2360
1.2189
0.8913
0.8755
0.8580
Me
H
N
O
F
F
F
F
CF3
Me
4
10
0.97
2.12
1.03
2.00
2.19
2.98
2.19
2.11
8.07
3.11
9.0
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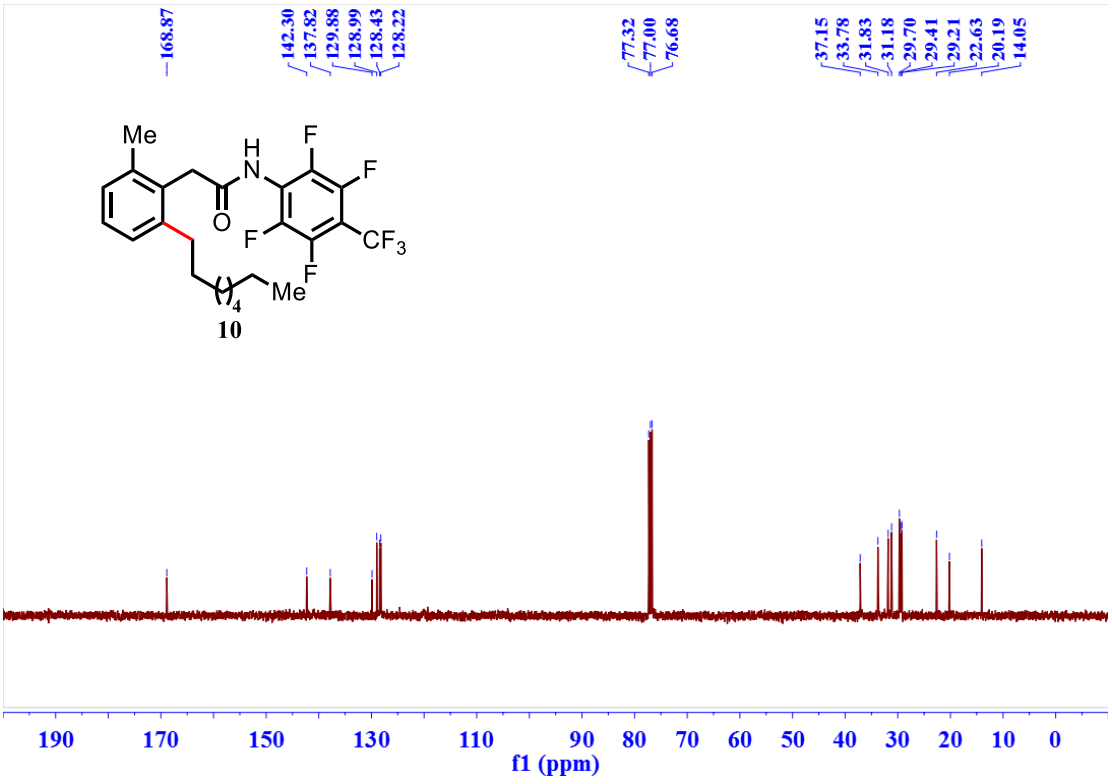
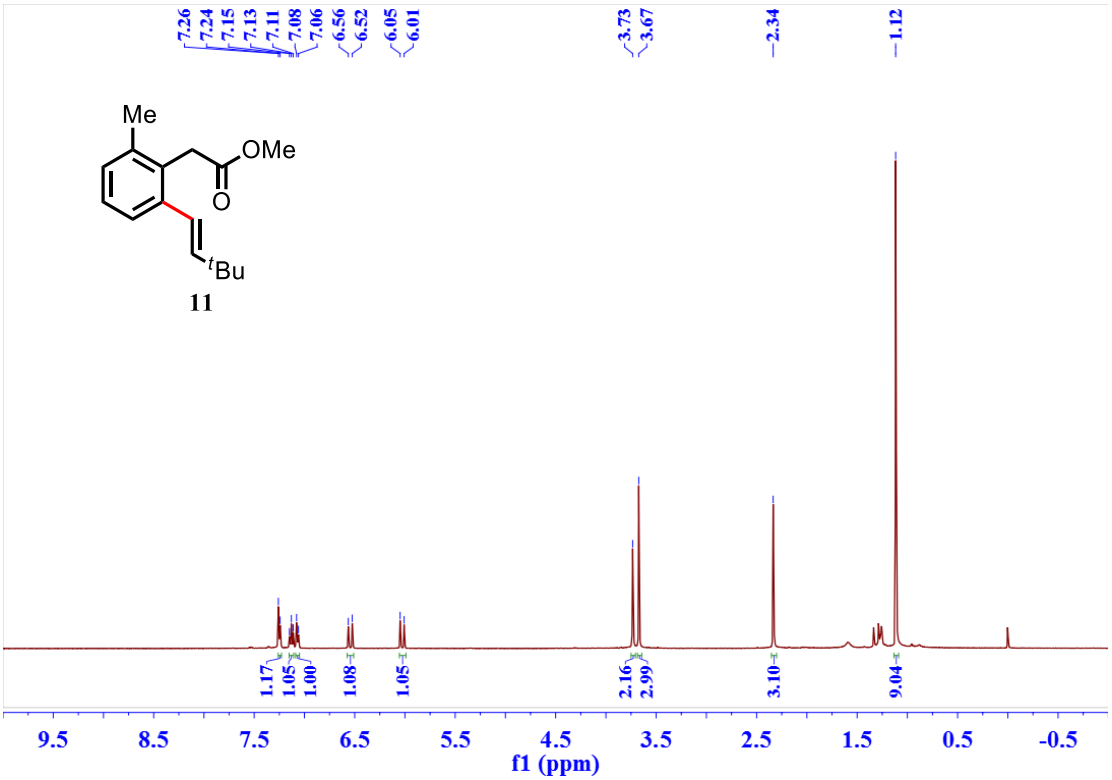
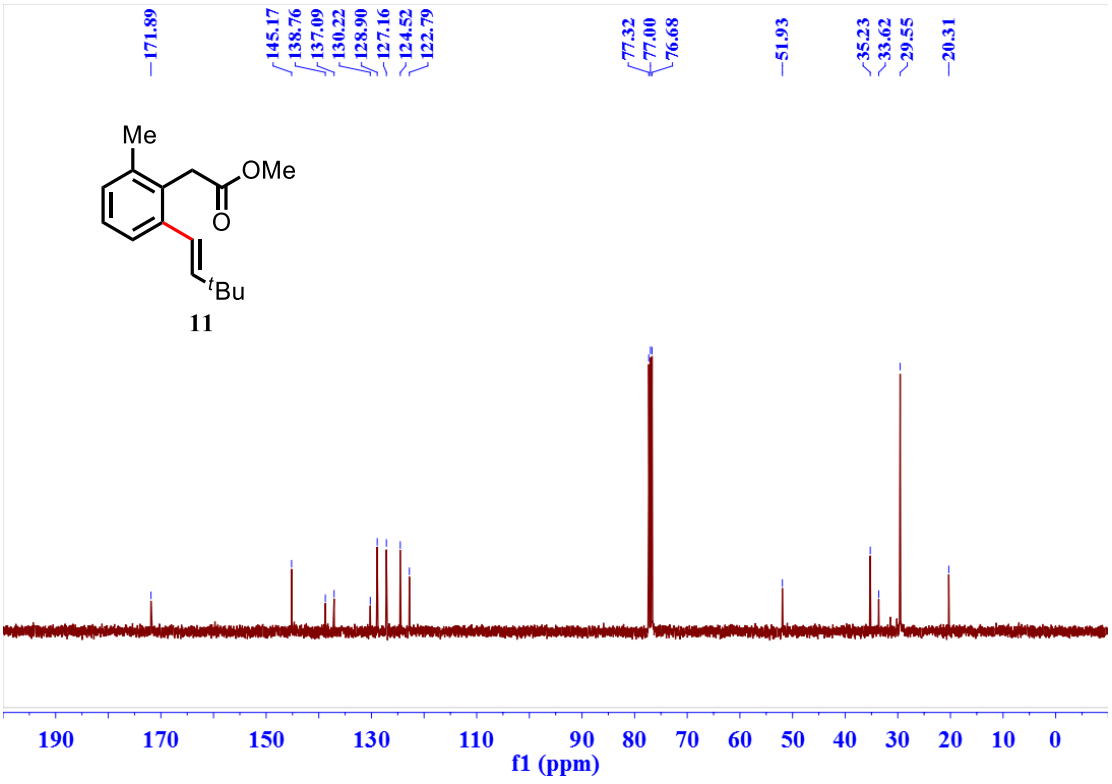
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
f1 (ppm)


168.87
142.30
137.82
129.88
128.99
128.43
128.22
77.32
77.00
76.68
37.15
33.78
31.83
31.18
29.70
29.41
29.21
22.63
20.19
14.05
Me
H
N
O
F
F
F
F
CF3
Me
4
10
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.26
7.24
7.15
7.13
7.11
7.08
7.06
6.56
6.52
6.05
6.01
3.73
3.67
2.34
1.12
Me
OMe
O
tBu
11
1.17
1.05
1.00
1.08
1.05
2.16
2.99
3.10
9.04
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
f1 (ppm)


171.89
145.17
138.76
137.09
130.22
128.90
127.16
124.52
122.79
77.32
77.00
76.68
51.93
35.23
33.62
29.55
20.31
Me
OMe
O
tBu
11
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
f1 (ppm)