Electronic Supplementary Material (ESI) for Green Chemistry.

Metal-free Regioselective Fluoroalkylfluoroalkylselenolation of Unactivated Alkenes: Incorporation of Two Photoinduced Process

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1. General information

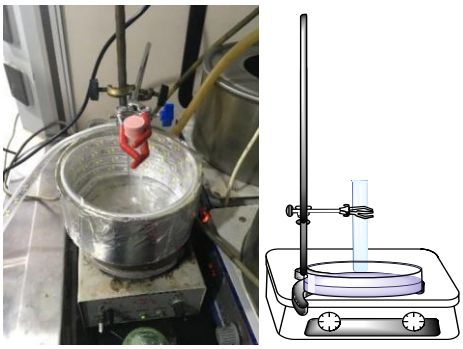
Unless stated otherwise, all reactions were carried out under an argon atmosphere. All solvents were purified and dried according to standard methods prior to use. Reactions were monitored by thin layer chromatography (TLC). Column chromatography purifications were carried out using silica gel GF254. ^{1}H NMR, ^{19}F NMR, ^{13}C NMR, and ^{31}P NMR spectra were recorded on Bruker instrument (300MHz, 282MHz, 75MHz or 125MHz and 131MHz) spectrometer in $CDCl_3$. ^{1}H NMR and ^{13}C NMR chemical shifts were determined relative to internal standard TMS at δ 0.0 ppm, ^{19}F NMR chemical shifts were determined relatived to $CFCl_3$ (δ 0.0 ppm) as inter standard. Data for ^{1}H NMR, ^{19}F NMR, and ^{13}C NMR are recorded as follows: chemical shift (δ, ppm), multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet or unresolved, br = broad, q = quartet, coupling constant (s) in Hz, integration). Data for, ^{31}P NMR is reported in terms of chemical shift (δ, ppm). High resolution mass spectra (HRMS) were obtained by ESI and EI ionization source. Gas chromatography-mass analysis was carried out on an Agilent Technologies 7890B GC system with an Agilent 5973C VL MSD and a HP-5MS column (0.25 mm × 30 M, film: 0.25 μm). Liquid chromatography-mass analysis was carried out on an Agilent Technologies C6100 system with an Agilent DAD717C MSD.

Materials: Commercial grade reagents and solvents were purchased from Energy-Chemical, Innochem, TCI, aladin, adamas-beta, Ark Pharm and used as received without further purifications. The preparation of **3a**, **3b** and alkenes were accomplished following the reported procedures.[1-3]

2. General procedure for fluoroalkylfluoroalkylselenolation of unactivated alkenes.

2.1 General procedure

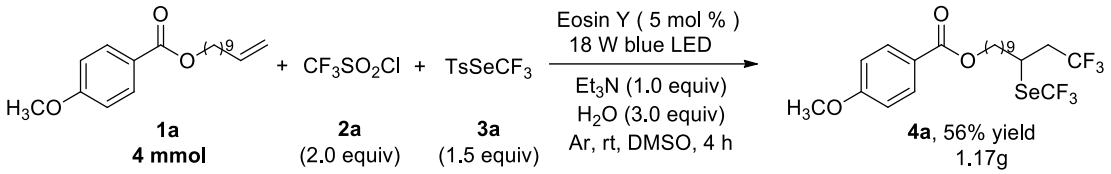
To an oven-dried 10 mL quartz test tube with a magnetic stirring bar was added alkenes **1** (0.2 mmol), **3** (0.3 mmol, 1.5 equiv), Eosin Y (5 mmol %) and Et_3N (0.2 mmol, 1.0 equiv). Then, air was withdrawn and backfilled with Ar (three times). **2** (0.4 mmol, 2.0 equiv), DMSO (2.0 mL), and H_2O (0.6 mmol, 3 equiv) were added by syringe. Thereafter, the test tube was transferred to a blue light photoreactor (18 W, see Scheme S1 for details), where it was irradiated for 4 h. Then, the reaction was quenched with water (2 mL), extracted with ethyl acetate (3×2 mL), the combined organic layer was dried over anhydrous sodium sulfate, concentrated in vacuo, and purified by column chromatography (cyclohexane/ ethyl acetate, 20:1 to 5:1) to afford the product.



Scheme S1. Placement of blue light around quartz test tube.

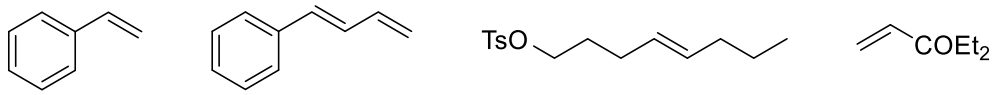
Instructions on placement of light source: One 18 W blue light LED annular tubes was placed in the 1L petri dish and the inside diameter is 12 cm.

2.2 General procedure of scale-up experiment



To an oven-dried 25 mL quartz test tube with a magnetic stirring bar was added alkene **1a** (4 mmol), **3a** (6 mmol, 1.5 equiv), Eosin Y (5 mmol %) and Et_3N (4 mmol, 1.0 equiv). Then, air was withdrawn and backfilled with Ar (three times). **2a** (8 mmol, 2.0 equiv), DMSO (20 mL), and H_2O (12 mmol, 3 equiv) were added by syringe. Thereafter, the test tube was transferred to a blue light photoreactor (18 W, see Scheme S1 for details), where it was irradiated for 4 h. Then, the reaction was quenched with water (20 mL), extracted with ethyl acetate (3×20 mL), the combined organic layer was dried over anhydrous sodium sulfate, concentrated in vacuo, and purified by column chromatography (cyclohexane/ ethyl acetate, 20:1 to 10:1) to afford the product.

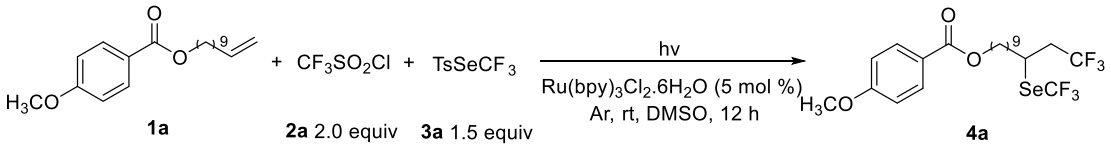
Unsuccessful substrates:



Some alkenes such as styrene and internal alkenes were not suitable for current condition.

2.3 Optimization of reaction conditions

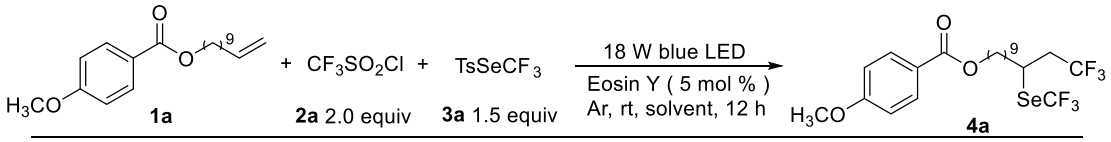
Table S1. Light sources screening



Entry	Light	Yield [%][a]
1	254 nm (25 W)	0
2	CFL light (25 W)	trace
3	blue light (18 W)	14
4	white light (18 W)	10
5	green light (18 W)	11

[a] Unless otherwise noted, the reactions were carried out in 0.1 mmol scale, Eosin Y (5 mol %), DMSO (1.0 mL) were used. The reaction mixtures were irradiated with indicated light sourse at room temperature for 12 h. Yields reffered to isolated yields.

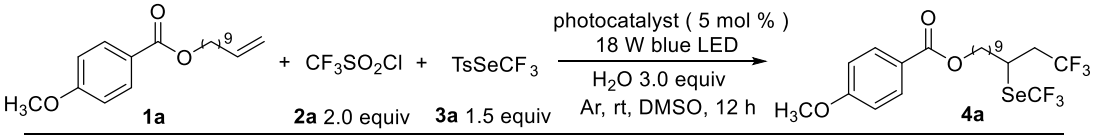
Table S2. Solvents screening



Entry	Solvent	Yield [%][a]
1	DMSO	25
2	DMF	20
3	DMAc	17
4	CH_2Cl_2	trace
5	CH_3CN	trace
6	THF	trace
7	acetone	trace
8	toluene	trace

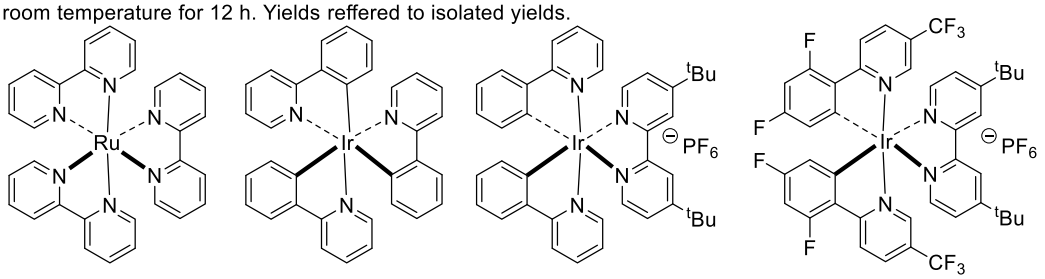
[a] Unless otherwise noted, the reactions were carried out in 0.1 mmol scale, Eosin Y (5 mol %), DMSO (1.0 mL) were used. The reaction mixtures were irradiated with indicated light sourse at room temperature for 12 h. Yields reffered to isolated yields.

Table S3. Photocatalyst screening.

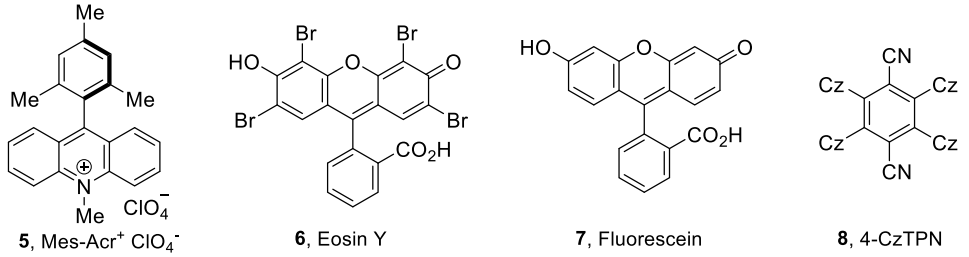


Entry	photocatalyst	Yield [%][a]
1	$Ru(bpy)_3Cl_2 \cdot 6H_2O$	14
2	*fac*-Ir(ppy)$_3$	24
3	$Ir(ppy)_2(dtppy)PF_6$	22
4	$Ir(dF\text{-}CF_3\text{-}ppy)_2(dtppy)PF_6$	20
5	Mes-Acr$^+$ ClO_4^-	38
6	Eosin Y	56
7	Fluorescein	34
8	4-CzTPN	40

[a] Unless otherwise noted, the reactions were carried out in 0.1 mmol scale, indicated photocatalyst (5 mol %), H_2O (0.3 mmol), DMSO (1.0 mL) were used. The reaction mixtures were irradiated with 18 W blue LED at room temperature for 12 h. Yields reffered to isolated yields.

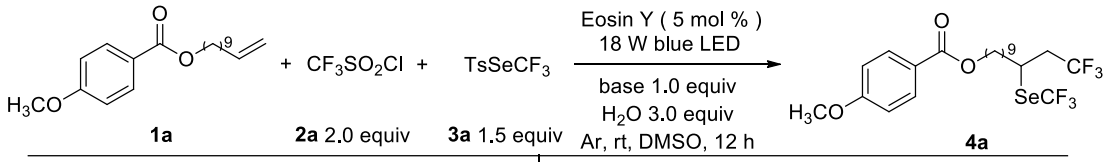


1, $Ru^{2+}(bpy)_3$, **2**, *fac*-Ir(ppy)$_3$ **3**, $Ir(ppy)_2(dtppy)PF_6$ **4**, $Ir(dF\text{-}CF_3\text{-}ppy)_2(dtppy)PF_6$



5, Mes-Acr$^+$ ClO_4^- **6**, Eosin Y **7**, Fluorescein **8**, 4-CzTPN

Table S4. Bases screening.

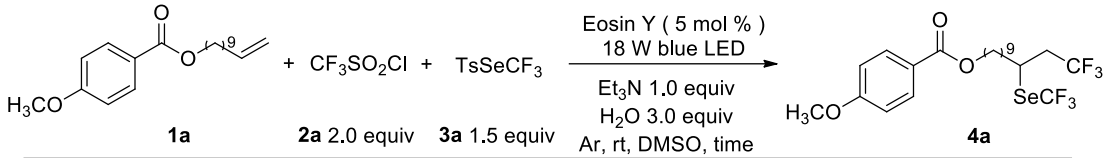


1a **2a** 2.0 equiv **3a** 1.5 equiv **4a**

Entry	Base	Yield [%][a]	Entry	Base	Yield [%][a]
1	$NaHCO_3$	48	8	K_3PO_4	36
2	K_2HPO_4	44	9	LiO^tBu	74
3	$KHCO_3$	45	10	KO^tBu	65
4	NaOAc	46	11	Cs_2CO_3	64
5	Na_2CO_3	50	12	Et_3N	76
6	K_2CO_3	52	13	DIPEA	60
7	Na_3PO_4	35	14	DBU	40

[a] Unless otherwise noted, the reactions were carried out in 0.1 mmol scale, Eosin Y (5 mol %), H_2O (0.3 mmol), indicated base (0.1 mmol), DMSO (1.0 mL) were used. The reaction mixtures were irradiated with 18 W blue LED at room temperature for 12 h. Yields reffered to isolated yields.

Table S5. Reaction time screening.



1a **2a** 2.0 equiv **3a** 1.5 equiv **4a**

Entry	Time (h)	Yield [%][a]
1	2	84
2	4	86
3	6	81
4	8	76
5	12	73

[a] Unless otherwise noted, the reactions were carried out in 0.1 mmol scale, Eosin Y (5 mol %), H_2O (0.3 mmol), Et_3N (0.1 mmol), DMSO (1.0 mL) were used. The reaction mixtures were irradiated with 18 W blue LED at room temperature for indicated time. Yields reffered to isolated yields.

3. Mechanistic study

3.1 Redox potentials

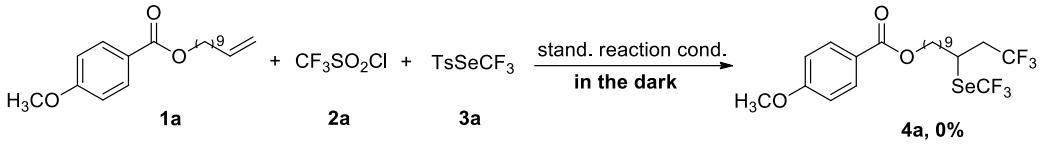
The redox potential of Eosin Y in the ground state is $EY/EY^{\bullet-}$ = -1.06 V vs SCE, the excited triplet state of Eosin Y was estimated to be $^3EY^*/EY^{\bullet-}$ = +0.83 V vs SCE,[4] and the redox potential of the oxidation of the excited state is $EY^{\bullet+}/^3EY^*$ = -1.1 V vs SCE.[5]

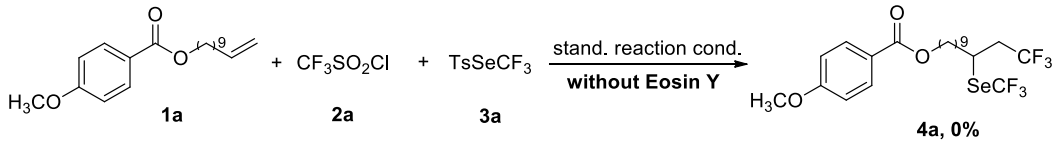
The oxidation potential of CF_3SO_2Cl is -0.18 V vs SCE.[6]

$TsSeCF_3$ **3a** was found to be easily reduced in DMSO at a potential close to -0.90 V. No anodic peak potential could be observed up to oxidation of solvent/electrolyte for **3a** (onset at + 1.65 V for CH_3CN, + 1.40 V for DMF, + 0.85 V for DMSO and + 1.35 V for THF).[7]

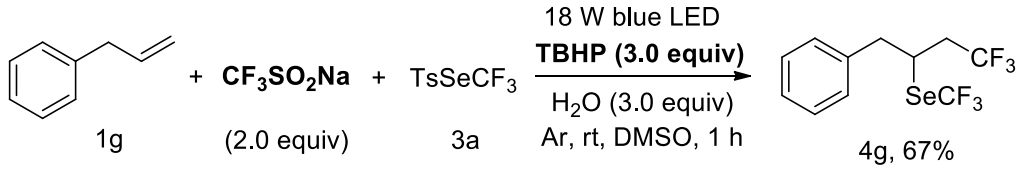
3.2 Control experiments

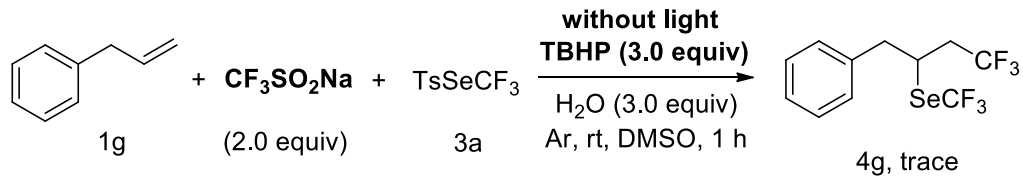
Under the standard conditions, without light and in the dark environment, no difunctionalized product could be observed (eqn 1); In the absence of photocatalyst Eosin Y, no desired product could be detected (eqn 2).

(1) 

(2) 

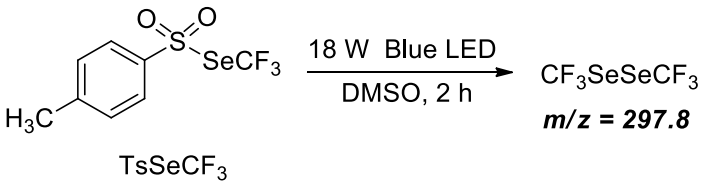
We choose tert-butyl hydroperoxide (TBHP) as the oxidant instead of Eosin Y catalyzed photoredox cycle to produce •CF_3 under 18 W blue LED irradiation, the reaction was completed within 1 h with 67% yield (eqn 3). In addition, this reaction did not proceed under dark condition (eqn 4).

(3) 

(4) 

3.3 Detection of $CF_3SeSeCF_3$

For spectroscopic investigations of $CF_3SeSeCF_3$, see: C. J. Marsden, *J. Fluorine Chem.* 1975, **5**, 401.



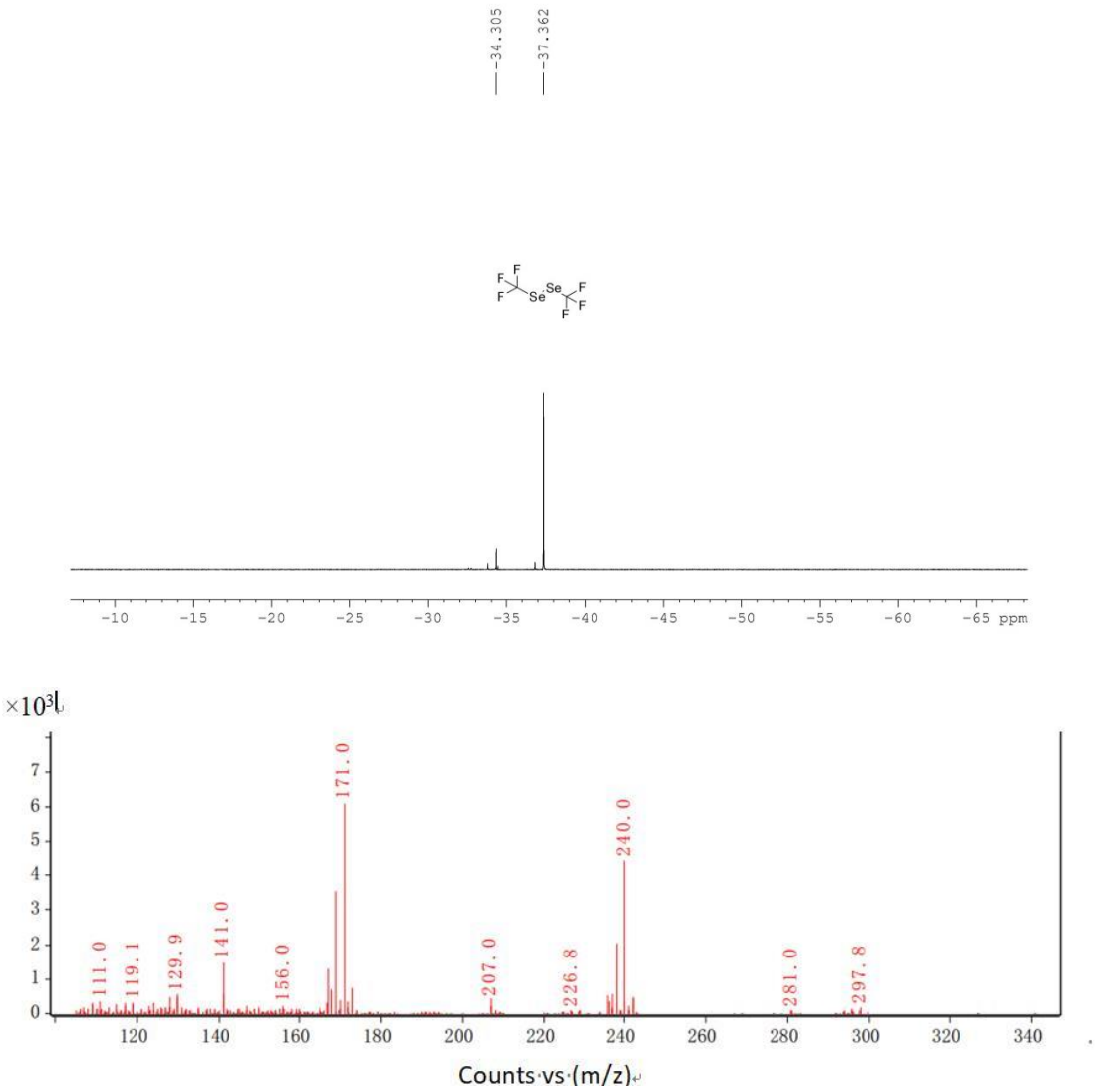
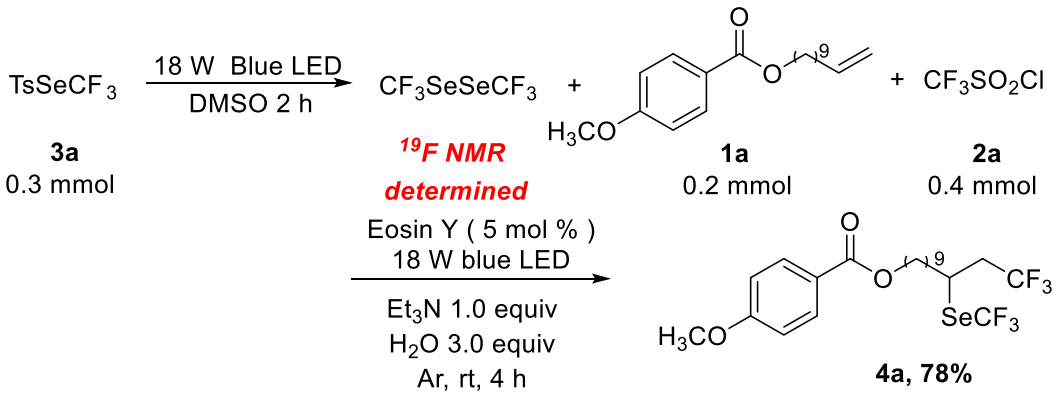


Figure S1. ^{19}F NMR and GC-MS of $CF_3SeSeCF_3$.

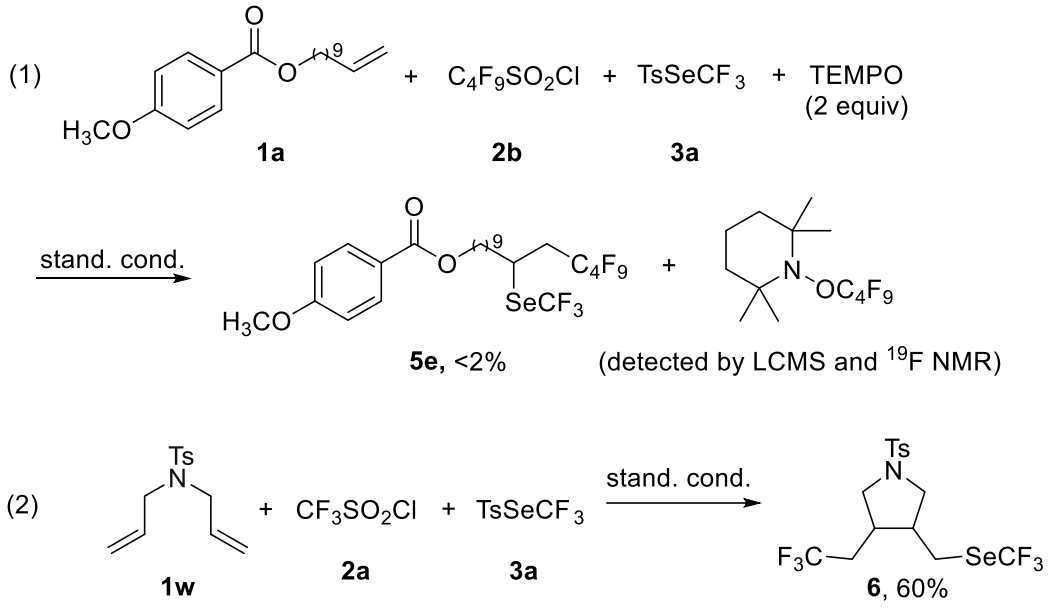
3.4 Replacing $TsSeCF_3$ with $CF_3SeSeCF_3$ experiment.



To an oven-dried 10 mL quartz test tube with a magnetic stirring bar, $TsSeCF_3$ **3a (**0.3 mmol**)** and 2.0 mL DMSO were added, air was withdrawn and backfilled with Ar (three times). The reaction mixture was irradiated under 18 W blue LED for 2 hours till **3a** was fully converted to $CF_3SeSeCF_3$ determined by ^{19}F NMR. Then **1a** (0.2 mmol), **2a** (0.4 mmol, 2.0 equiv), Eosin Y (5 mol%), Et_3N (0.2 mmol, 1.0 equiv) and H_2O (0.6 mmol, 3.0 equiv) were added by syringe. Thereafter, the test tube was transferred to a blue light photoreactor, where it was irradiated for 4 h. Then, the reaction was quenched with water (2 mL), extracted with ethyl acetate (3×2 mL), dried over anhydrous sodium sulfate, concentrated in vacuo, and purified by column chromatography (cyclohexane/ ethyl acetate, 20:1 to 10:1) to afford the product.

3.5 Radical trapping and radical clock experiments.

When the radical scavenger TEMPO (2,2,6,6-tetromethyl-1-piperidinyloxy, 2.0 equiv) was added under the standard conditions, the reaction was completely suppressed, and the radical trapping product $^nC_4F_9$-TEMPO was observed in ^{19}F NMR and detected by LC-MS. The radical clock experiment with *N*-diallyl-4-methylbenzenesulfonamide **1w** led to the formation of the cyclization product **6** in 60% yield. These results suggesting that the $^nC_4F_9$ radical was likely generated in situ in the presence of Eosin Y catalyst through a single electron-transfer process.



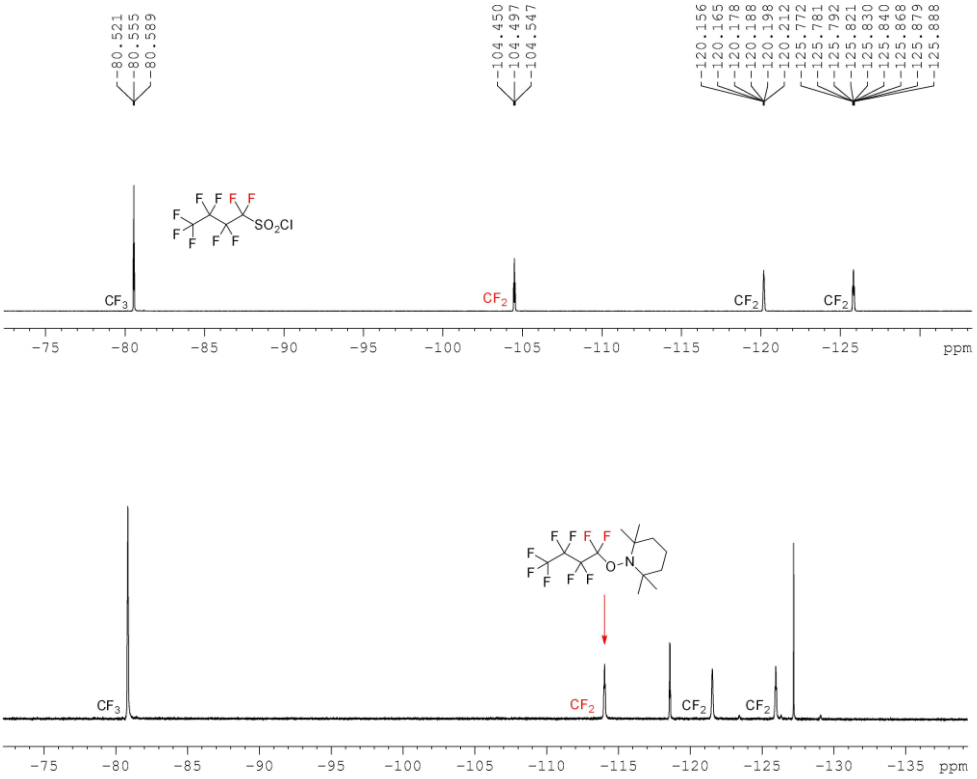


Figure S2. ^{19}F NMR of $C_4F_9SO_2Cl$ and $^{n}C_4F_9$-TEMPO.

3.6 Stern-Volmer fluorescence quenching study

Emission spectra of Eosin Y were recorded with a HITACHI spectrofluorophotometer F-7000 using a 10^{-4}M degassed DMSO solution of the Eosin Y catalyst. Emission intensities were recorded by using a HITACHI spectrofluorophotometer F-7000.

DMSO was degassed with a stream of argon for 30 min, 60 mL of 10^{-4}M stock solution of the Eosin Y catalyst in DMSO were prepared. For each experiment 2 mL of the resulting solution were put in a sealable 10 mm quartz cuvette equipped. Et_3N, **1a**, $TsSeCF_3$ **3a** and CF_3SO_2Cl **2a** each was used to prepare a 3 mL of 2.5×10^{-2}M solution of these quenchers. Then, the latter solution was added by aliquots into the solution of pure Eosin Y in the sealable cuvette. All solutions were excited at 420 nm and the fluorescence emission spectra were recorded.

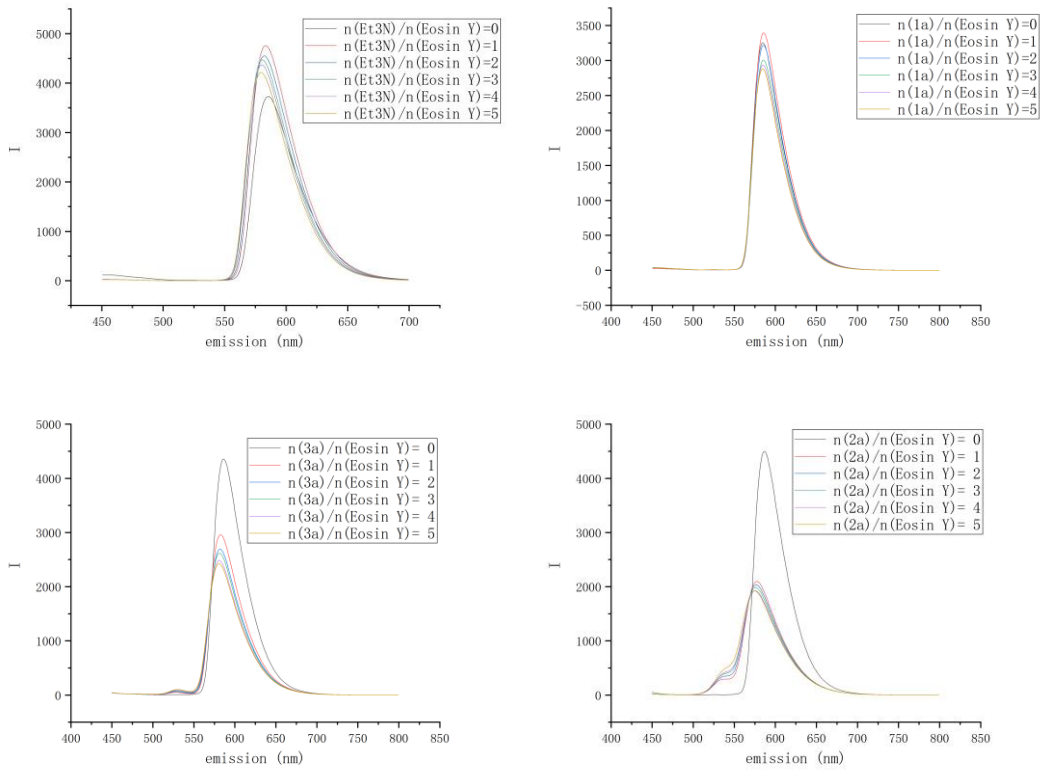
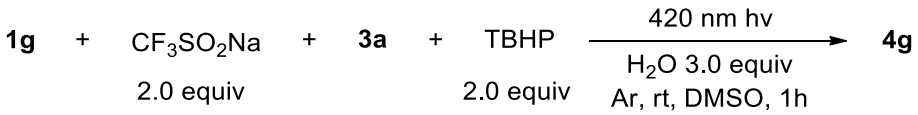


Figure S3. Stern–Volmer experiment for the emission quenching of Eosin Y (2×10^{-4} M) in DMSO by various concentration of quencher: Et_3N, 1a, $TsSeCF_3$ 3a and CF_3SO_2Cl 2a.

Quenching experiment of Eosin Y with Et_3N, **1a** and **3a** have been conducted, Et_3N did not quench the excited state of Eosin Y at 420 nm in DMSO, whereas alkene 1a and $TsSeCF_3$ **3a** showed much weaker quenching efficiency than **2a**. We observed that reagent **3a** would quantitatively convert to $CF_3SeSeCF_3$ under light in DMSO within 1 hour. Furthermore, as mentioned above, compared with $TsSeCF_3$ (−0.90 V vs SCE), CF_3SO_2Cl (−0.18 V vs SCE) is much easier to be reduced than $TsSeCF_3$. Moreover, replacing $CF_3SeSeCF_3$ with $TsSeCF_3$ led to slightly decreased in yield (78%). Taking these experiment results into account, a different quenching cycle was not likely happened in this transformation.

3.7 Determination of quantum yield



To an oven-dried 25 mL quartz test round-bottom flask with a magnetic stirring bar was added allylbenzene (1.0 mmol), $TsSeCF_3$ (1.5 mmol, 1.5 equiv), CF_3SO_2Na (2.0 mmol, 2.0 equiv) and TBHP (2.0 mmol, 2.0 equiv) .Then, air was withdrawn and backfilled with Ar (three times). DMSO (10 mL) and H_2O (3.0 mmol, 3 equiv) was added by syringe. The reaction mixture was stirred and irradiated (λ = 420 nm, PLS-LED100B) for 3600 s (60 min). After irradiation, the solution was measured the unit area photon flux (TBQ - 5 photosynthetic active radiation meter, TRM-SCY).

And the yield of formed product was determined by ^{1}H NMR based on a mesitylene standard. The quantum yield is calculated using the following equation:

$$\Phi = \frac{\text{mol product}}{\text{flux} \cdot S \cdot t}$$

Where, Φ is quantum yield, S (m^2) is the irradiation area, and t (s) is the photoreaction time. Experiment: 118.18 mg of allylbenzene, 454.74 mg of $TsSeCF_3$, 32.40 mg of Eosin Y, 148 μL of Et_3N, and 54 μL of H_2O, after 3600 s, the unit area photon flux was 40.2 $\mu mol \cdot s^{-1} \cdot m^{-2}$ (average of five experiments), the irradiation area was 4.31×10^{-4} m^2, and the product yield was 55%.

Sample quantum yield calculation:

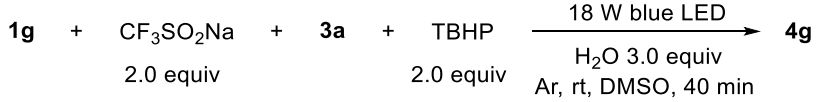
$$\Phi = \frac{1 \times 10^3 \times 0.55}{40.2 \times 4.31 \times 10^{-4} \times 3600} = 8.8$$

Scheme S2. Placement of TBQ - 5 photosynthetic active radiation meter and TRM-SCY

3.8 "Light/Dark" experiment:

To an oven-dried 10 mL quartz test tube with a magnetic stirring bar was added allylbenzene (0.4 mmol), $TsSeCF_3$ (0.6 mmol, 1.5 equiv), CF_3SO_2Na (2.0 equiv), TBHP (2.0 equiv), and mesitylene (0.4 mmol) as internal standard. Then, air was withdrawn and backfilled with Ar (three times). DMSO (4 mL) and H_2O (1.2 mmol, 3 equiv) was added by syringe. Thereafter, the reaction was alternatively irradiated with a blue light photoreactor (18 W, see Scheme S1 for details) and kept in the dark in a five-minute interval. The yield was determined by ^{1}H NMR.

We observed that product formation occurred only during periods of constant irradiation. The study of quantum yield measurements and "light/dark" experiments for radical chain reactions, see: M. A. Cismesia and T. P. Yoon, *Chem. Sci.*, 2015, **6**, 5426.



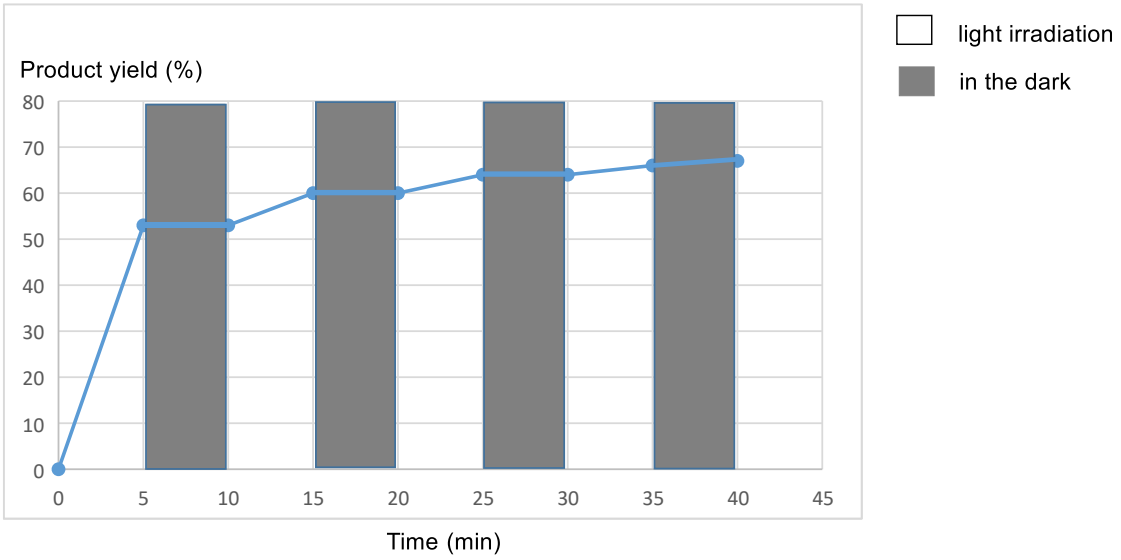
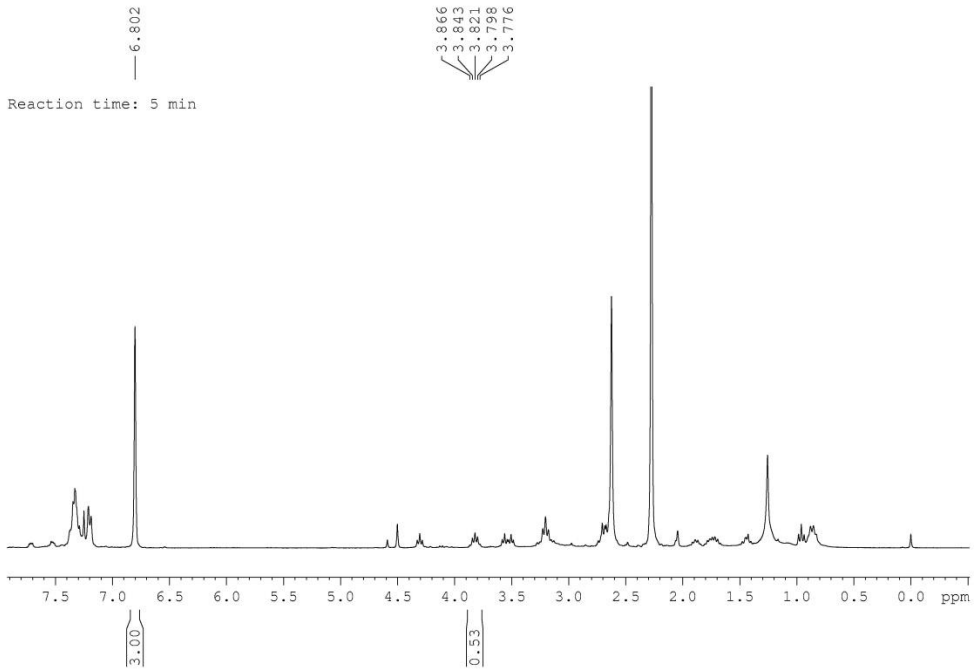
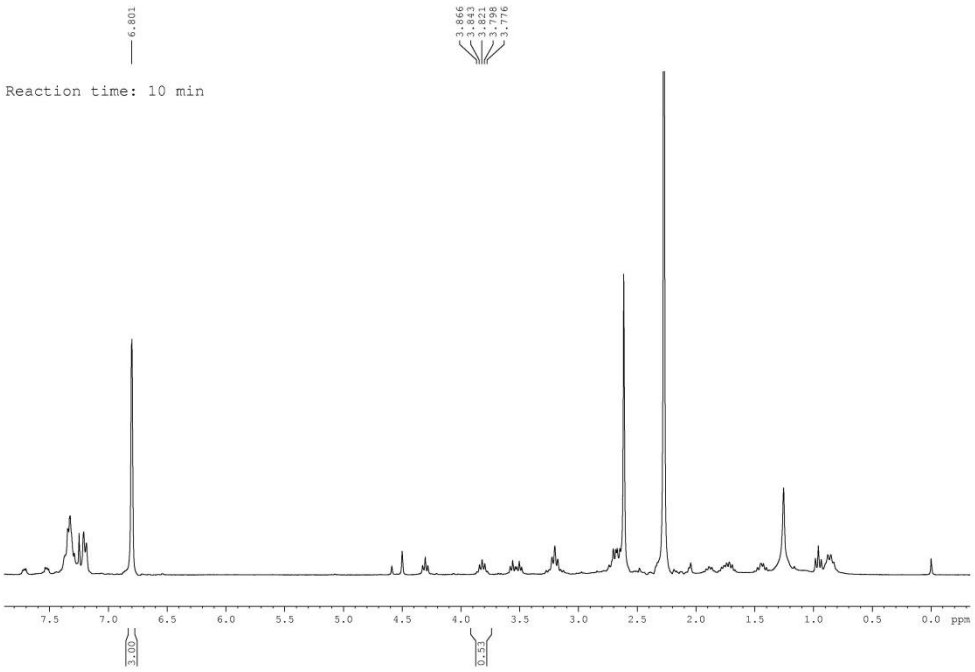
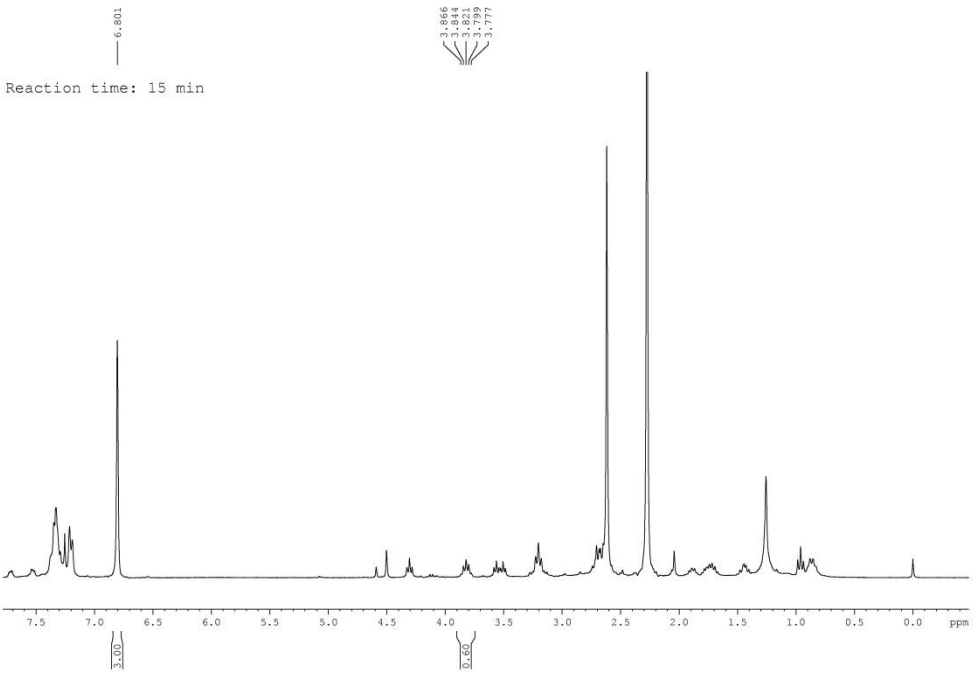


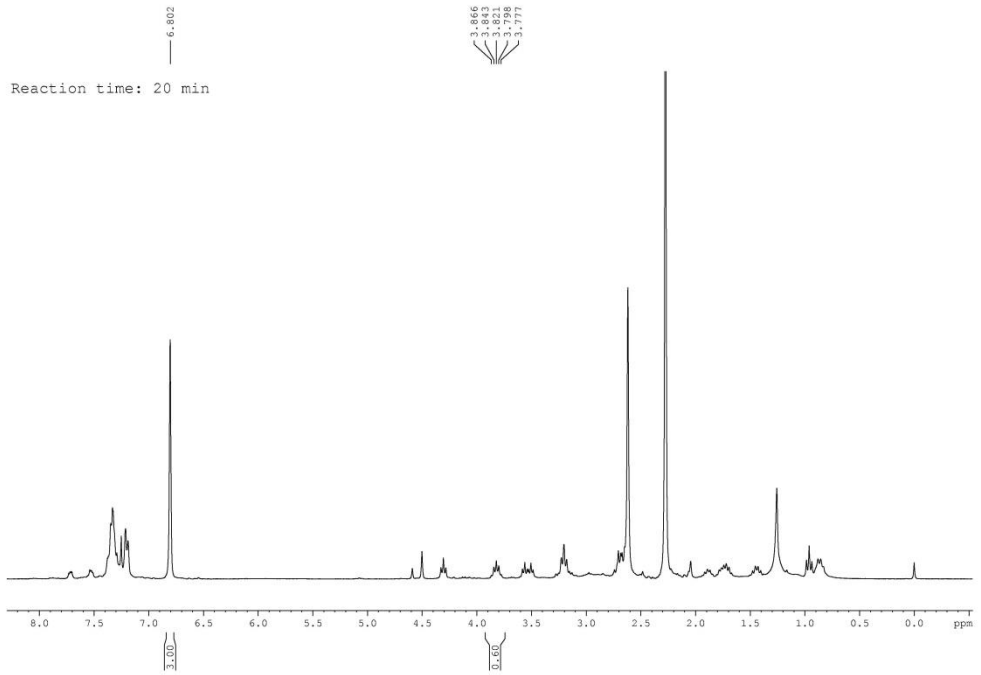
Figure S4. "Light/Dark" experiment.

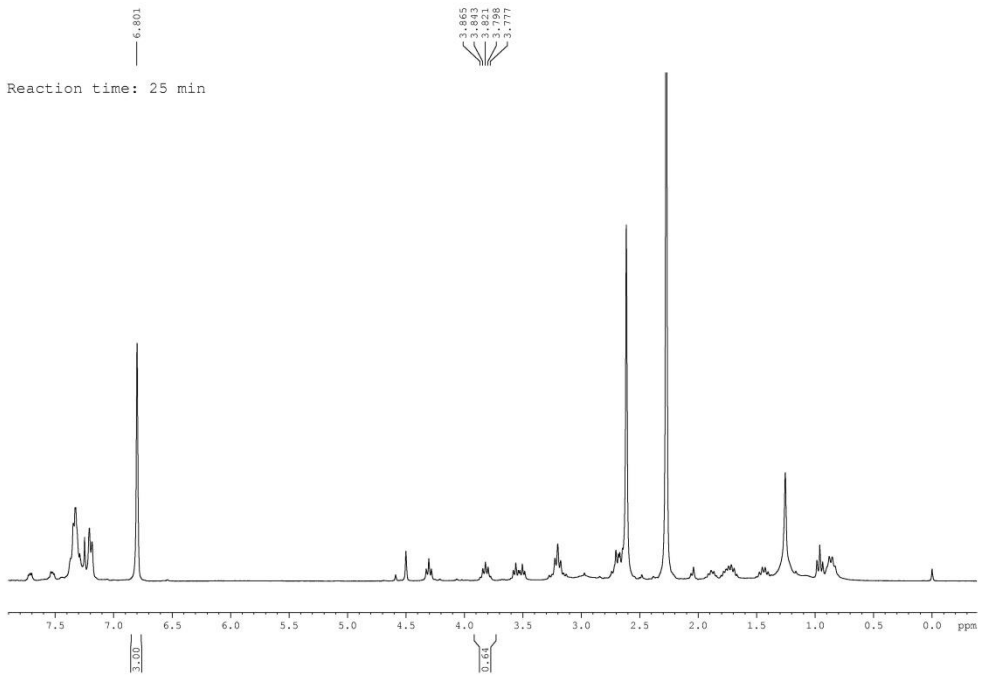
The crude ^{1}HNMR of light/dark experiment:

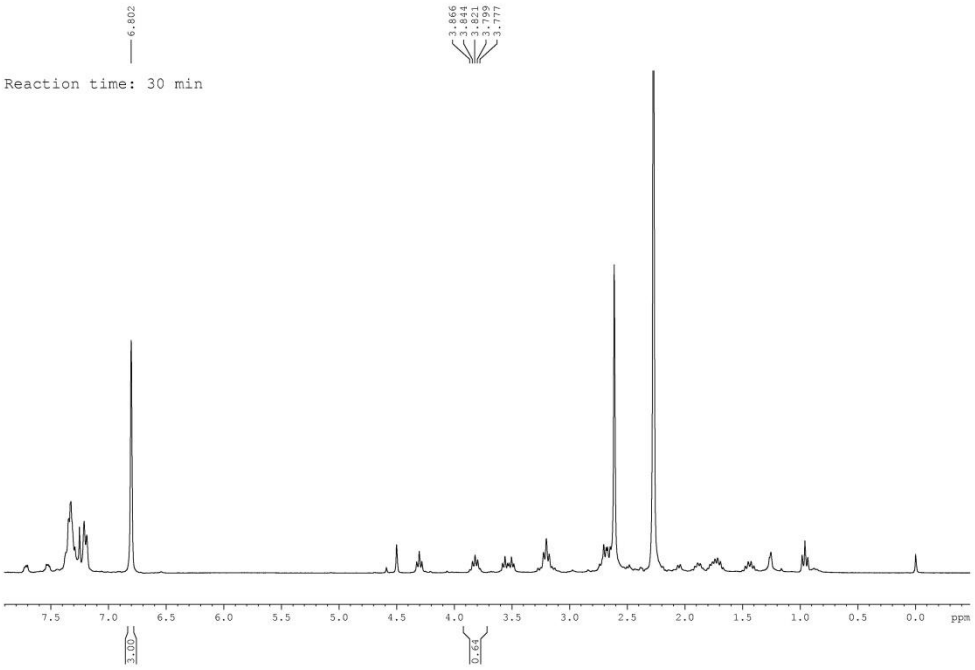


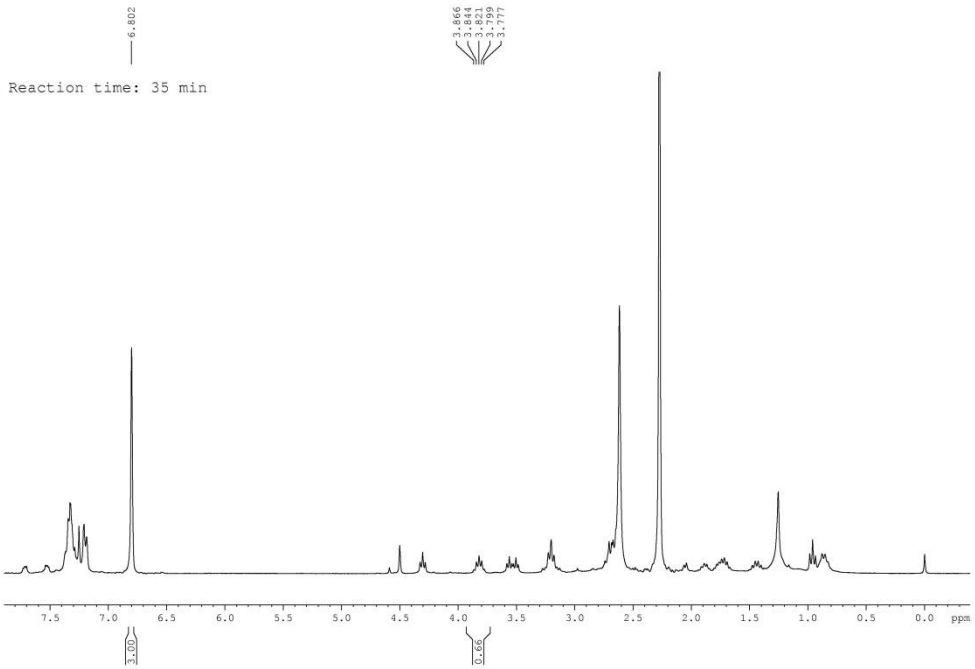

6.801
3.866
3.843
3.821
3.798
3.776
Reaction time: 10 min
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm
3.00
0.53

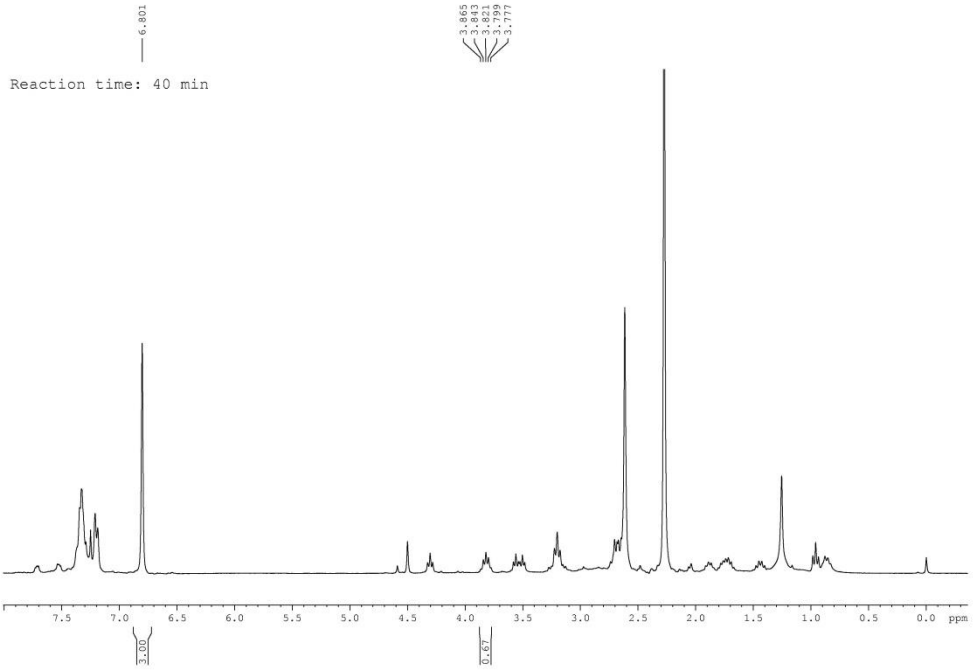

6.801
3.866
3.844
3.821
3.799
3.777
Reaction time: 15 min
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm
3.00
0.60


6.802
3.866
3.843
3.821
3.798
3.777
Reaction time: 20 min
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
3.00
0.60

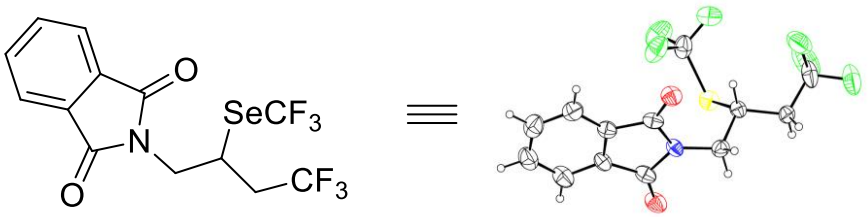

6.801
3.865
3.843
3.821
3.798
3.777
Reaction time: 25 min
7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 ppm
3.00
0.64


6.802
3.866
3.844
3.821
3.799
3.777
Reaction time: 30 min
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm
3.00
0.64


6.802
3.866
3.844
3.821
3.799
3.777
Reaction time: 35 min
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ppm
3.00
0.66



4. X-ray structure of 4h



4h, CCDC: 1974072

Bond precision:	C-C = 0.0073 A	Wavelength=1.54184	
Cell:	a=10.4389(2) alpha=90 293 K Calculated 3113.27(11) P 21/n -P 2yn	b=21.5791(4) beta=109.581(2)	c=14.6690(3) gamma=90
Temperature:			
Reported			

Volume Space group Hall group	3113.26(11)		
P 1 21/n 1 -P 2yn			
Moiety formula C13 H9 F6 N O2 Se	2(C13 H9 F6 N O2 Se) C26 H18 F12 N2 O4 Se2		
Sum formula Mr Dx,g cm-3 Z Mu (mm-1) F000 F000' h,k,lmax Nref Tmin,Tmax Tmin'	C13 H9 F6 N O2 Se		
404.17 1.725 8 3.968 1584.0 1583.84 12,25,17 5505 0.514,0.621 0.466	808.34 1.725 4 3.968 1584.0		
12,25,17 5495			
0.015,1.000			
Correction method= # Reported T Limits: Tmin=0.015 Tmax=1.000			
AbsCorr = MULTI- SCAN Data completeness= 0.998	Theta(max)= 66.573		
R(reflections)= 0.0574(4530)	wR2(reflections)= 0.1635(5495)		
S = 1.036	Npar= 415		

The following ALERTS were generated. Each ALERT has the format

test-name_ALERT_alert-type_alert-level.

Click on the hyperlinks for more details of the test.

Alert level C

PLAT234_ALERT_4_C Large Hirshfeld Difference C24 --C25 . 0.16 Ang.

PLAT341_ALERT_3_C Low Bond Precision on C-C Bonds ..... 0.00727 Ang.

PLAT601_ALERT_2_C Structure Contains Solvent Accessible VOIDS of . 40 Ang**3

PLAT906_ALERT_3_C Large K Value in the Analysis of Variance ..... 4.353 Check

PLAT911_ALERT_3_C Missing FCF Refl Between Thmin & STh/L= 0.595 10 Report

PLAT978_ALERT_2_C Number C-C Bonds with Positive Residual Density. 0 Info

Alert level G

PLAT002_ALERT_2_G Number of Distance or Angle Restraints on AtSite 2 Note

PLAT003_ALERT_2_G Number of Uiso or Uij Restrained non-H Atoms ... 2 Report

PLAT042_ALERT_1_G Calc. and Reported MoietyFormula Strings Differ Please Check

PLAT045_ALERT_1_G Calculated and Reported Z Differ by a Factor ... 2.00 Check

PLAT172_ALERT_4_G The CIF-Embedded .res File Contains DFIX Records 1 Report

PLAT177_ALERT_4_G The CIF-Embedded .res File Contains DELU Records 1 Report

PLAT199_ALERT_1_G Reported _cell_measurement_temperature ..... (K) 293 Check

PLAT200_ALERT_1_G Reported _diffrn_ambient_temperature ..... (K) 293 Check

PLAT242_ALERT_2_G Low MainMol Ueq as Compared to Neighbors of C12 Check

PLAT242_ALERT_2_G Low MainMol Ueq as Compared to Neighbors of C13 Check

PLAT242_ALERT_2_G Low MainMol Ueq as Compared to Neighbors of C25 Check

PLAT242_ALERT_2_G Low MainMol Ueq as Compared to Neighbors of C26 Check

PLAT790_ALERT_4_G Centre of Gravity not Within Unit Cell: Resd. # 2 Note

C13 H9 F6 N O2 Se

PLAT793_ALERT_4_G Model has Chirality at C10 (Centro SPGR) R Verify

PLAT793_ALERT_4_G Model has Chirality at C23 (Centro SPGR) R Verify

PLAT860_ALERT_3_G Number of Least-Squares Restraints ..... 2 Note

PLAT909_ALERT_3_G Percentage of I>2sig(I) Data at Theta(Max) Still 67% Note

PLAT933_ALERT_2_G Number of OMIT Records in Embedded .res File ... 8 Note

0 **ALERT level A** = Most likely a serious problem - resolve or explain

0 **ALERT level B** = A potentially serious problem, consider carefully

6 **ALERT level C** = Check. Ensure it is not caused by an omission or oversight

18 **ALERT level G** = General information/check it is not something unexpected

4 ALERT type 1 CIF construction/syntax error, inconsistent or missing data

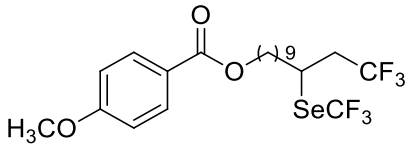
9 ALERT type 2 Indicator that the structure model may be wrong or deficient

5 ALERT type 3 Indicator that the structure quality may be low

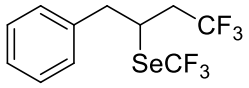
6 ALERT type 4 Improvement, methodology, query or suggestion

0 ALERT type 5 Informative message, check

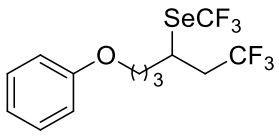
5. Characterization of products



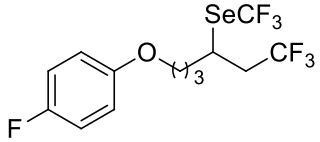
12,12,12-trifluoro-10-((trifluoromethyl)selanyl)dodecyl 4-methoxybenzoate (4a): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.7 Hz, 2H), 6.92 (d, *J* = 8.7 Hz, 2H), 4.28 (t, *J* = 6.7 Hz, 2H), 3.86 (s, 3H), 3.68-3.46 (m, 1H), 2.93-2.48 (m, 2H), 1.93-1.68 (m, 4H), 1.47-1.18 (m, 12H).
^{19}F NMR (282 MHz, $CDCl_3$) -33.18 (s), -64.28 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 166.60, 163.37, 131.67, 125.91 (q, $J_{C\text{-}F}$ = 276.8 Hz), 123.07, 122.88 (q, $J_{C\text{-}F}$ = 329.0 Hz), 113.68, 64.92, 55.55, 40.78 (q, $J_{C\text{-}F}$ = 28.1 Hz), 37.16, 34.78, 29.49, 29.42 29.34, 29.07, 28.88, 27.32, 26.14.
HRMS (ESI): $C_{21}H_{28}F_6O_3Se+Na^+$ Calcd: 545.1001, Found: 545.1006.



(4,4,4-trifluoro-1-phenylbutan-2-yl)(trifluoromethyl)selane (4b): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.40-7.28 (m, 3H), 7.21 (d, *J* = 6.8 Hz, 2H), 3.90-3.72 (m, 1H), 3.31-3.09 (m, 2H), 2.76-2.60 (m, 2H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.20 (s), -63.69 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 137.10, 129.33, 128.97, 127.62, 125.82 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.88 (q, $J_{C\text{-}F}$ = 328.4 Hz), 41.35, 39.28 (q, $J_{C\text{-}F}$ = 29.2 Hz), 37.34.
HRMS (EI): $C_{11}H_{10}F_6Se^+$ Calcd: 335.9852, Found: 335.9856.

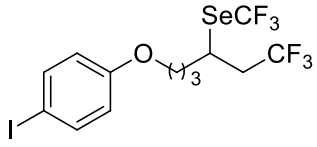


(1,1,1-trifluoro-6-phenoxyhexan-3-yl)(trifluoromethyl)selane (4c): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.28 (t, *J* = 7.8 Hz, 2H), 7.02-6.79 (m, 3H), 4.00 (t, *J* = 5.2 Hz, 2H), 3.72-3.55 (m, 1H), 2.97-2.55 (m, 2H), 2.24-1.82 (m, 4H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.02 (s), -64.20 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 158.81, 129.64, 125.87 (q, $J_{C\text{-}F}$ = 274.7 Hz), 122.68 (q, $J_{C\text{-}F}$ = 328.9 Hz), 121.02, 114.54, 66.82, 40.97 (q, $J_{C\text{-}F}$ = 28.1 Hz), 36.92, 31.81, 27.37.
HRMS (EI): $C_{13}H_{14}F_6OSe^+$ Calcd: 380.0114, Found: 380.0120.

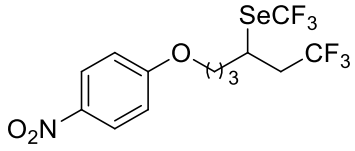


(1,1,1-trifluoro-6-(4-fluorophenoxy)hexan-3-yl)(trifluoromethyl)selane (4d): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 6.97 (t, *J* = 8.6 Hz, 2H), 6.88-6.76 (m, 2H), 3.96 (t, *J* = 5.5 Hz, 2H), 3.73-3.56 (m, 1H), 2.94-2.59 (m, 2H), 2.27-1.79 (m, 4H).

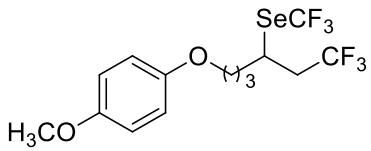
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.01 (s), -64.20 (s), -124.35 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 157.46 (d, $J_{C\text{-}F}$ = 237.0 Hz), 154.95 (d, $J_{C\text{-}F}$ = 2.1 Hz), 125.86 (q, $J_{C\text{-}F}$ = 276.9 Hz), 122.82 (q, $J_{C\text{-}F}$ = 329.1 Hz), 115.90 (d, $J_{C\text{-}F}$ = 25 Hz), 115.42 (d, $J_{C\text{-}F}$ = 7.9 Hz), 67.58, 41.01 (q, $J_{C\text{-}F}$ = 28.1 Hz), 36.88, 31.76, 27.37.
HRMS (EI): $C_{13}H_{13}F_7OSe^+$ Calcd: 398.0020, Found: 398.0022.



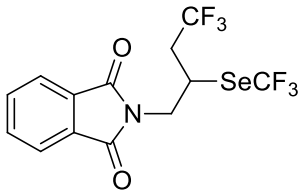
(1,1,1-trifluoro-6-(4-iodophenoxy)hexan-3-yl)(trifluoromethyl)selane (4e): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.8 Hz, 2H), 6.66 (d, *J* = 8.8 Hz, 2H), 3.96 (t, *J* = 5.4 Hz, 2H), 3.52-3.70 (m, 1H), 2.94-2.56 (m, 2H), 2.20-1.83 (m, 4H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.00 (s), -64.20 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 158.71, 138.39, 125.84 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.80 (q, $J_{C\text{-}F}$ = 329.0 Hz), 116.95, 83.09, 67.05, 40.98 (q, $J_{C\text{-}F}$ = 28.1 Hz), 36.83, 31.70, 27.25.
HRMS (EI): $C_{13}H_{13}F_6IOSe^+$ Calcd: 505.9080, Found: 505.9072.



(1,1,1-trifluoro-6-(4-nitrophenoxy)hexan-3-yl)(trifluoromethyl)selane (4f): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.21 (d, *J* = 9.2 Hz, 2H), 6.94 (d, *J* = 9.2 Hz, 2H), 4.11 (t, *J* = 4.8 Hz, 2H), 3.74-3.56 (m, 1H), 2.99-2.56 (m, 2H), 2.24-2.07 (m, 2H), 2.04-1.87 (m, 2H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -32.94 (s), -64.19 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 163.82, 141.79, 126.11, 125.81 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.76 (q, $J_{C\text{-}F}$ = 329.2 Hz), 114.50, 67.80, 41.04 (q, $J_{C\text{-}F}$ = 28.1 Hz), 36.70, 31.55, 27.14.
HRMS (ESI): $C_{13}H_{13}F_6NO_3Se+Na^+$ Calcd: 447.9857, Found: 447.9854.



(1,1,1-trifluoro-6-(4-methoxyphenoxy)hexan-3-yl)(trifluoromethyl)selane (4g): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 6.83 (s, 4H), 3.95 (t, *J* = 5.5 Hz, 2H), 3.77 (s, 3H), 3.71-3.58 (m, 1H), 2.95-2.54 (m, 2H), 2.18-1.81 (m, 4H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.03 (s), -64.20 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 154.07, 152.97, 125.87 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.84 (q, $J_{C\text{-}F}$ = 328.3 Hz), 115.54, 114.80, 67.62, 55.86, 40.98 (q, $J_{C\text{-}F}$ = 28.4 Hz), 36.91, 31.83, 27.44.
HRMS (EI): $C_{14}H_{16}F_6O_2Se^+$ Calcd: 410.0220, Found:410.0213.



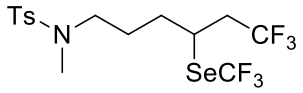
2-(4,4,4-trifluoro-2-((trifluoromethyl)selanyl)butyl)isoindoline-1,3-dione (4h): colorless solid, mp: 35-37 ℃.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.89 (d, *J* = 3.2 Hz, 2H), 7.79 (d, *J* = 2.9 Hz, 2H), 4.08 (d, *J* = 7.1 Hz, 2H), 4.05-3.89 (m, 1H), 2.96-2.63 (m, 2H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.08 (s), -64.08 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 168.04, 134.61, 131.71, 125.58 (q, $J_{C\text{-}F}$ = 276.1 Hz), 123.85, 122.52 (q, $J_{C\text{-}F}$ = 329.4 Hz), 41.85, 38.83 (q, $J_{C\text{-}F}$ = 29.3 Hz), 34.34.

HRMS (ESI): $C_{13}H_9F_6NO_2Se+H^+$ Calcd: 427.9595, Found: 427.9583.



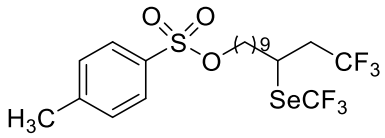
N,4-dimethyl-N-(6,6,6-trifluoro-4-((trifluoromethyl)selanyl)hexyl)benzenesulfonamide (4i): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.66 (d, *J* = 8.1 Hz, 2H), 7.32 (d, *J* = 8.0 Hz, 2H), 3.68-3.47 (m, 1H), 3.18-2.89 (m, 2H), 2.86-2.54 (m, 5H), 2.43 (s, 3H), 2.11-1.92 (m, 1H), 1.91-1.72 (m, 2H), 1.72-1.59 (m, 1H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -32.98 (s), -64.18 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 143.62., 134.46, 129.88, 127.54, 125.81 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.77 (q, $J_{C\text{-}F}$ = 329.3 Hz), 49.34, 41.13 (q, $J_{C\text{-}F}$ = 27.83 Hz), 36.77, 34.83, 31.82, 25.53, 21.65.

HRMS (ESI): $C_{15}H_{19}F_6NO_2SSe+Na^+$ Calcd: 494.0098, Found: 494.0097.



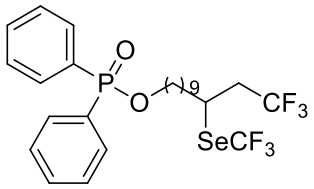
12,12,12-trifluoro-10-((trifluoromethyl)selanyl)dodecyl 4-methylbenzenesulfonate (4j): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.79 (d, *J* = 8.1 Hz, 2H), 7.35 (d, *J* = 8.0 Hz, 2H), 4.02 (t, *J* = 6.4 Hz, 2H), 3.64-3.47 (m, 1H), 2.96-2.52 (m, 2H), 2.45 (s, 3H), 1.98-1.70 (m, 2H), 1.70-1.59 (m, 2H), 1.24 (s, 12H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.18 (s), -64.28 (s).

^{13}C NMR (125 MHz, $CDCl_3$) δ 144.78, 133.38, 129.94, 128.03, 125.92 (q, $J_{C\text{-}F}$ = 276.6 Hz), 122.88 (q, $J_{C\text{-}F}$ = 328.8 Hz), 70.79, 40.86, (q, $J_{C\text{-}F}$ = 27.9 Hz), 37.16, 34.80, 29.34, 29.26, 29.01, 28.98, 28.94, 27.31, 25.44, 21.76.

HRMS (ESI): $C_{20}H_{28}F_6O_3SSe+Na^+$ Calcd: 565.0721, Found: 565.0718.



12,12,12-trifluoro-10-((trifluoromethyl)selanyl)dodecyl diphenylphosphinate (4k): colorless oil.

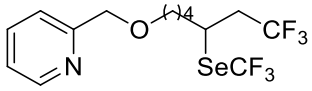
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.81 (dd, *J* = 12.0, 7.7 Hz, 4H), 7.58-7.39 (m, 6H), 4.02 (q, *J* = 6.5 Hz, 2H), 3.68-3.47 (m, 1H), 2.92-2.53 (m, 2H), 1.92-1.67 (m, 4H), 1.53-1.23 (m, 12H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.19 (s), -64.28 (s).

^{31}P NMR (121 MHz, $CDCl_3$) δ 31.16 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 132.75, 132.23, 132.19, 131.84, 131.71, 130.93, 128.72, 128.55, 125.91 (q, $J_{C\text{-}F}$ = 276.6 Hz), 122.88 (q, $J_{C\text{-}F}$ = 328.7 Hz), 65.07, 40.81 (q, $J_{C\text{-}F}$ = 27.9 Hz), 37.16, 34.80, 30.71, 29.45, 29.33, 29.20, 29.05, 27.33, 25.71.

HRMS (ESI): $C_{25}H_{31}F_6O_2PSe+Na^+$ Calcd: 611.1025, Found: 611.1018.



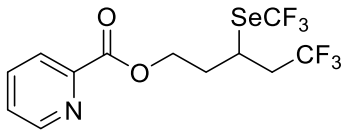
2-(((7,7,7-trifluoro-5-((trifluoromethyl)selanyl)heptyl)oxy)methyl)pyridine (4l): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.56 (d, *J* = 4.1 Hz, 1H), 7.70 (t, *J* = 7.6 Hz, 1H), 7.43 (d, *J* = 7.8 Hz, 1H), 7.23-7.12 (m, 1H), 4.63 (s, 2H), 3.58 (t, *J* = 5.9 Hz, 3H), 2.90-2.52 (m, 2H), 2.00-1.78 (m, 2H), 1.71-1.49 (m, 4H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.13 (s), -64.27 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 158.72, 149.22, 136.77, 125.87 (q, $J_{C\text{-}F}$ = 276.6 Hz), 122.83 (q, $J_{C\text{-}F}$ = 328.9 Hz), 122.48, 121.42, 73.98, 70.57, 40.78 (q, $J_{C\text{-}F}$ = 27.9 Hz), 37.02, 34.66, 29.19, 24.23.

HRMS (ESI): $C_{14}H_{17}F_6NOSe+Na^+$ Calcd: 432.0272, Found: 432.0273.



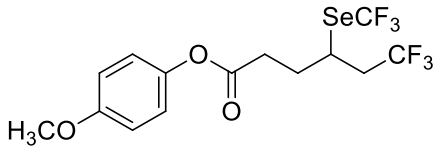
5,5,5-trifluoro-3-((trifluoromethyl)selanyl)pentyl picolinate (4m): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.78 (d, *J* = 4.5 Hz, 1H), 8.12 (d, *J* = 7.8 Hz, 1H), 7.87 (td, *J* = 7.7, 1.3 Hz, 1H), 7.51 (dd, *J* = 7.0, 5.3 Hz, 1H), 4.74-4.49 (m, 2H), 3.84-3.65 (m, 1H), 3.00-2.69 (m, 2H), 2.62-2.43 (m, 1H), 2.38-2.17 (m, 1H).

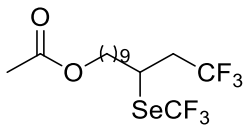
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.22 (s), -64.10 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 165.05, 150.18, 147.71, 137.24, 127.29, 124.81 (q, $J_{C\text{-}F}$ = 276.3 Hz), 122.74 (q, $J_{C\text{-}F}$ = 329.2 Hz), 125.31, 63.14, 40.75 (q, $J_{C\text{-}F}$ = 27.8 Hz), 33.66, 33.23.

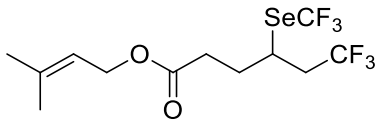
HRMS (ESI): $C_{12}H_{11}F_6NO_2Se+Na^+$ Calcd: 417.9752, Found: 417.9750.



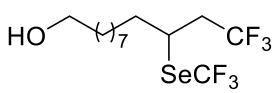
4-methoxyphenyl 6,6,6-trifluoro-4-((trifluoromethyl)selanyl)hexanoate (4n): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 6.99 (d, J = 9.0 Hz, 2H), 6.89 (d, J = 9.0 Hz, 2H), 3.80 (s, 3H), 3.76-3.58 (m, 1H), 2.98-2.61 (m, 4H), 2.53-2.33 (m, 1H), 2.20-1.88 (m, 1H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -32.88 (s), -64.05 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 171.30, 157.51, 144.05, 125.76 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.71 (q, $J_{C\text{-}F}$ = 329.2 Hz), 122.30, 114.65, 55.74, 41.48 (q, $J_{C\text{-}F}$ = 28.3 Hz), 36.40, 32.28, 29.89.
HRMS (ESI): $C_{14}H_{14}F_6O_3Se+Na^+$ Calcd: 446.9905, Found: 446.9898.



12,12,12-trifluoro-10-((trifluoromethyl)selanyl)dodecyl acetate (4o): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 4.05 (t, J = 6.6 Hz, 2H), 3.67-3.47 (m, 1H), 2.92-2.50 (m, 2H), 2.05 (s, 3H), 1.96-1.71 (m, 2H), 1.61 (s, 2H), 1.30 (s, 12H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.18 (s), -64.28 (s).
^{13}C NMR (125 MHz, $CDCl_3$) δ 171.42, 125.93 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.89 (q, $J_{C\text{-}F}$ = 328.8 Hz), 64.76, 40.83 (q, $J_{C\text{-}F}$ = 29.0 Hz), 37.17, 34.82, 29.47, 29.34, 29.30, 29.06, 28.72, 27.33, 26.00, 21.16.
HRMS (ESI): $C_{15}H_{24}F_6O_2Se+Na^+$ Calcd: 453.0738, Found: 453.0738.

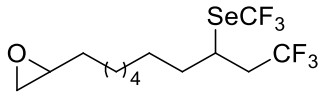


3-methylbut-2-en-1-yl 6,6,6-trifluoro-4-((trifluoromethyl)selanyl)hexanoate (4p): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 5.34 (t, J = 7.2 Hz, 1H), 4.60 (d, J = 7.3 Hz, 2H), 3.65-3.55 (m, 1H), 2.88-2.57 (m, 4H), 2.34-2.27 (m, 1H), 2.04-1.94 (m, 1H), 1.77 (s, 3H), 1.71 (s, 3H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -32.96 (s), -64.13 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 172.25, 139.76, 125.78 (q, $J_{C\text{-}F}$ = 276.5 Hz), 122.71 (q, $J_{C\text{-}F}$ = 328.5 Hz), 118.37, 61.86, 41.35 (q, $J_{C\text{-}F}$ = 28.4 Hz), 36.46, 32.32, 30.07, 25.89, 18.13.
HRMS (ESI): $C_{12}H_{16}F_6O_2Se+Na^+$ Calcd: 409.0112, Found: 409.0108.



12,12,12-trifluoro-10-((trifluoromethyl)selanyl)dodecan-1-ol (4q): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 3.70-3.52 (m, 3H), 2.88-2.50 (m, 2H), 1.93-1.71 (m, 2H), 1.60-1.49 (m, 3H), 1.35-1.27 (m, 11H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.18 (s), -64.28 (s).
^{13}C NMR (125 MHz, $CDCl_3$) δ 125.93 (q, $J_{C\text{-}F}$ = 276.7 Hz), 122.89 (q, $J_{C\text{-}F}$ = 328.7 Hz), 63.19, 40.83 (q, $J_{C\text{-}F}$ = 28.1 Hz), 37.17, 34.82, 32.90, 29.56, 29.47, 29.36, 29.07, 27.33, 25.84.

HRMS (ESI): $C_{13}H_{22}F_6OSe+Na^+$ Calcd: 411.0633, Found: 411.0620.



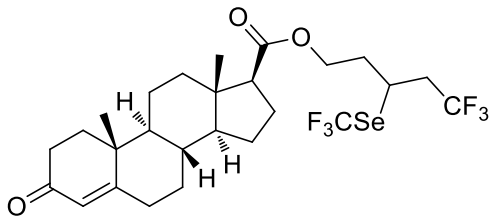
2-(10,10,10-trifluoro-8-((trifluoromethyl)selanyl)decyl)oxirane (4r): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 3.80 (s, 1H), 3.64 (dd, *J* = 11.1, 3.2 Hz, 1H), 3.61-3.53 (m, 1H), 3.48 (dd, *J* = 11.0, 7.1 Hz, 1H), 2.92-2.52 (m, 2H), 2.17 (s, 1H), 1.94-1.73 (m, 2H), 1.46 (s, 4H), 1.35 (s, 7H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.16 (s), -64.28 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 125.90 (q, $J_{C\text{-}F}$ = 276.8 Hz), 122.88 (q, $J_{C\text{-}F}$ = 326.6 Hz), 71.50, 71.12, 50.71, 40.82 (q, $J_{C\text{-}F}$ = 28.0 Hz), 37.12, 34.75, 34.23, 29.31, 28.96, 27.26, 25.53.

HRMS (EI): $C_{13}H_{20}F_6OSe^+$ Calcd: 386.0584, Found: 386.0587.



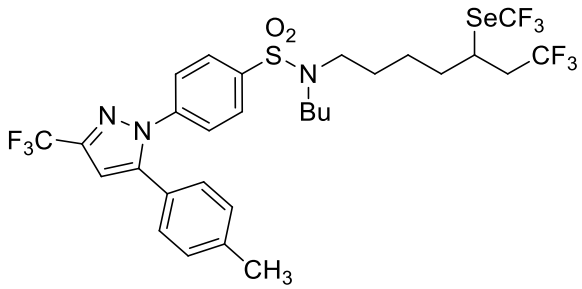
(8S,9S,10R,13S,14S,17S)-5,5,5-trifluoro-3-((trifluoromethyl)selanyl)pentyl 10,13-dimethyl-3-oxo-2,3,6,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1H-cyclopenta[a]phenanthrene-17-carboxylate (4s): colorless oil, d.r. = 1.5 : 1

^{1}H NMR (300 MHz, $CDCl_3$) δ 5.73 (s, 1H), 4.35-4.20 (m, 2H), 3.69 (s, 1H), 2.95-2.63 (m, 2H), 2.45-2.25 (m, 6H), 2.15-1.98 (m, 4H), 1.90-1.80 (m, 2H), 1.77-1.56 (m, 5H), 1.42-1.31 (m, 3H), 1.19 (s, 3H), 1.04-0.92 (m, 2H), 0.72 (s, 3H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.06/-33.25 (s), -64.20/-64.22(s)

^{13}C NMR (125 MHz, $CDCl_3$) δ 199.66, 173.72/173.71, 171.11, 125.77 (q, $J_{C\text{-}F}$ = 276.8 Hz), 124.10, 122.74 (q, $J_{C\text{-}F}$ = 329.1 Hz), 61.34/61.25, 55.44, 55.30/55.26, 53.81, 44.12/44.07, 41.10 (q, $J_{C\text{-}F}$ = 28.4 Hz)/41.03 (q, $J_{C\text{-}F}$ = 28.1 Hz), 38.74, 38.25, 35.86, 35.84, 34.09, 33.91/33.85, 33.44/33.32, 32.92, 32.04, 24.53, 23.74/23.71, 20.98/20.97, 17.51, 13.61/13.59.

HRMS (ESI): $C_{26}H_{34}F_6O_3Se+Na^+$ Calcd: 611.1471, Found: 611.1456.



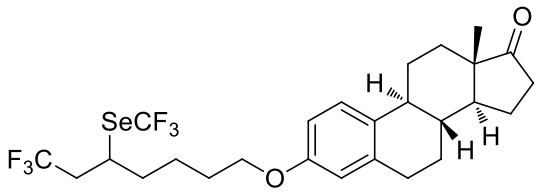
N-butyl-4-(5-(p-tolyl)-3-(trifluoromethyl)-1H-pyrazol-1-yl)-N-(7,7,7-trifluoro-5-((trifluoromethyl)selanyl)heptyl)benzenesulfonamide (4t): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (d, J = 8.5 Hz, 2H), 7.46 (d, J = 8.6 Hz, 2H), 7.13 (dd, J = 22.1, 8.1 Hz, 4H), 6.75 (s, 1H), 3.60-3.45 (m, 1H), 3.17-3.02 (m, 4H), 2.88-2.54 (m, 2H), 2.38 (s, 3H), 1.95-1.72 (m, 2H), 1.54-1.40 (m, 4H), 1.38-1.27 (m, 4H), 0.89 (t, J = 7.2 Hz, 3H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.10 (s), -62.96 (s), -64.24 (s).

^{13}C NMR (125 MHz, $CDCl_3$) δ 145.39, 144.24 (q, $J_{C\text{-}F}$ = 38.3 Hz), 142.44, 139.95, 139.53, 129.87, 128.85, 128.18, 125.84 (q, $J_{C\text{-}F}$ = 276.8 Hz), 125.82, 125.70, 122.81 (q, $J_{C\text{-}F}$ = 329.0 Hz), 122.27, 120.13, 106.37, 48.41, 48.03, 40.85 (q, $J_{C\text{-}F}$ = 28.0 Hz), 36.89, 34.39, 30.83, 28.38, 24.59, 21.45, 20.04, 13.78.

HRMS (ESI): $C_{29}H_{32}F_9N_3O_2SSe+Na^+$ Calcd: 760.1130, Found: 760.1124.



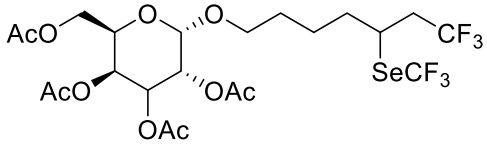
(8R,9S,13S,14S)-13-methyl-3-((7,7,7-trifluoro-5-((trifluoromethyl)selanyl)heptyl)oxy)-7,8,9,11,12,13,15,16-octahydro-6H-cyclopenta[a]phenanthren-17(14H)-one (4u): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.20 (d, J = 8.2 Hz, 1H), 6.71 (d, J = 8.9 Hz, 1H), 6.64 (s, 1H), 3.94 (d, J = 5.8 Hz, 2H), 3.69-3.51 (m, 1H), 3.04-2.58 (m, 4H), 2.51 (dd, J = 18.0, 8.1 Hz, 1H), 2.44-2.34 (m, 1H), 2.31-2.20 (m, 1H), 2.19-1.90 (m, 5H), 1.90-1.69 (m, 4H), 1.64-1.44 (m, 7H), 0.91 (s, 3H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.09 (s), -64.23 (s).

^{13}C NMR (125 MHz, $CDCl_3$) δ 221.14, 157.06, 137.93, 132.27, 126.50, 125.85 (q, $J_{C\text{-}F}$ = 276.8 Hz), 122.82 (q, $J_{C\text{-}F}$ = 328.9 Hz), 114.70, 112.23, 67.42, 50.56, 48.17, 44.13, 40.79 (q, $J_{C\text{-}F}$ = 28.0 Hz), 38.52, 37.03, 36.03, 34.65, 31.73, 29.80, 28.84, 26.70, 26.07, 24.26, 21.74, 14.00.

HRMS (ESI): $C_{26}H_{32}F_6O_2Se+Na^+$ Calcd: 593.1365, Found: 593.1363.



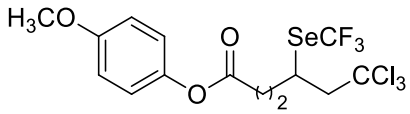
(2R,3S,5R,6S)-2-(acetoxymethyl)-6-((7,7,7-trifluoro-5-((trifluoromethyl)selanyl)heptyl)oxy)tetrahydro-2H-pyran-3,4,5-triyl triacetate (4v): colorless oil, d.r. = 1.1 : 1

^{1}H NMR (300 MHz, $CDCl_3$) δ 5.40 (s, 1H), 5.27-5.15 (m, 1H), 5.01 (d, J = 10.4 Hz, 1H), 4.50 (t, J = 6.4 Hz, 1H), 4.25-3.98 (m, 4H), 3.92 (t, J = 6.5 Hz, 1H), 3.82-3.61 (m, 2H), 2.95-2.63 (m, 2H), 2.37-2.17 (m, 3H), 2.06 (s, 8H), 1.99 (s, 4H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -33.34/-33.72 (s), -64.10/-64.33 (s).

^{13}C NMR (125 MHz, $CDCl_3$) δ 170.50/170.48, 170.35/170.33, 170.22, 169.42/169.41, 125.85 (q, $J_{C\text{-}F}$ = 276.6 Hz)/125.80 (q, $J_{C\text{-}F}$ = 276.6 Hz), 122.94 (q, $J_{C\text{-}F}$ = 329.3 Hz)/122.86 (q, $J_{C\text{-}F}$ = 329.3 Hz), 101.14/100.75, 71.00/70.98, 70.91/70.89, 68.75, 67.11/67.10, 66.29, 61.41/64.37, 40.65 (q, $J_{C\text{-}F}$ = 28.1 Hz)/40.25 (q, $J_{C\text{-}F}$ = 28.1 Hz), 34.55, 34.28, 33.49, 33.10, 29.83, 20.75/20.67, 20.71, 20.69/20.62.

HRMS (EI): $C_{22}H_{30}F_6O_{10}Se^+$ Calcd: 648.0908, Found: 648.0910.



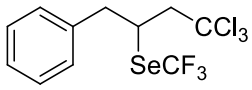
4-methoxyphenyl 6,6,6-trichloro-4-((trifluoromethyl)selanyl)hexanoate (5a): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 6.99 (d, *J* = 9.0 Hz, 2H), 6.88 (d, *J* = 9.0 Hz, 2H), 3.93-3.80 (m, 1H), 3.78 (s, 3H), 3.50 (dd, *J* = 15.7, 4.0 Hz, 1H), 3.22 (dd, *J* = 15.5, 6.6 Hz, 1H), 2.85 (t, *J* = 6.7 Hz, 2H), 2.70-2.55 (m, 1H), 2.27-2.07 (m, 1H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -31.51 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 171.30, 157.47, 144.04, 122.77 (q, $J_{C\text{-}F}$ = 329.6 Hz), 122.31, 114.62, 97.49, 60.90, 55.70, 40.50, 32.50, 31.12.

HRMS (ESI): $C_{14}H_{14}Cl_3F_3O_3Se+Na^+$ Calcd: 494.9011, Found: 494.9005.



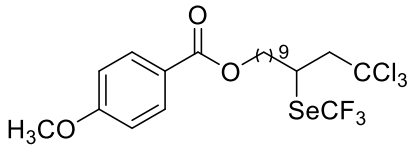
(4,4,4-trichloro-1-phenylbutan-2-yl)(trifluoromethyl)selane (5b): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.40-7.18 (m, 5H), 3.95 (dt, *J* = 12.3, 6.0 Hz, 1H), 3.45 (dd, *J* = 14.5, 6.2 Hz, 1H), 3.37-3.21 (m, 3H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -32.17 (s).

^{13}C NMR (75 MHz, $CDCl_3$) δ 137.56, 129.54, 128.86, 127.51, 122.97 (q, $J_{C\text{-}F}$ = 329.7 Hz), 97.76, 59.07, 42.32, 41.85.

HRMS (EI): $C_{11}H_{10}Cl_3F_3Se^+$ Calcd: 383.8965, Found: 383.8950.



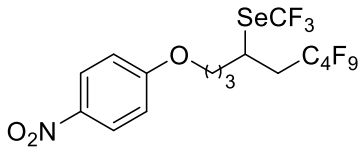
12,12,12-trichloro-10-((trifluoromethyl)selanyl)dodecyl 4-methoxybenzoate (5c): colorless oil.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.8 Hz, 2H), 4.28 (t, *J* = 6.6 Hz, 2H), 3.86 (s, 3H), 3.80-3.65 (m, 1H), 3.39 (dd, *J* = 15.6, 4.1 Hz, 1H), 3.19 (dd, *J* = 15.7, 7.0 Hz, 1H), 2.17-1.84 (m, 2H), 1.81-1.67 (m, 2H), 1.54-1.27 (m, 12H).

^{19}F NMR (282 MHz, $CDCl_3$) δ -32.46 (s).

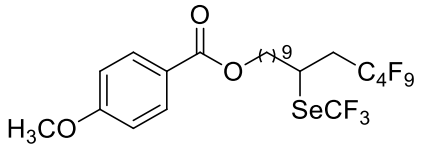
^{13}C NMR (125 MHz, $CDCl_3$) δ 166.60, 163.40, 131.67, 123.10, 122.97 (q, $J_{C\text{-}F}$ = 329.3 Hz), 113.70, 97.92, 64.92, 60.38, 55.55, 41.44, 35.97, 29.52, 29.41, 29.35, 29.10, 28.90, 27.44, 26.15.

HRMS (ESI): $C_{21}H_{28}Cl_3F_3O_3Se+Na^+$ Calcd: 593.0108, Found: 593.0099.

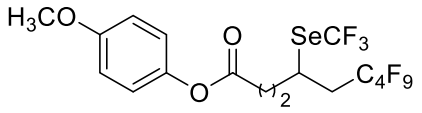


(6,6,7,7,8,8,9,9,9-nonafluoro-1-(4-nitrophenoxy)nonan-4-yl)(trifluoromethyl)selane (5d): colorless oil.

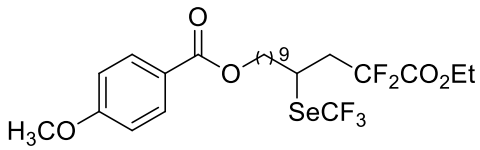
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.21 (d, *J* = 9.1 Hz, 2H), 6.94 (d, *J* = 9.0 Hz, 2H), 4.12 (d, *J* = 5.3 Hz, 2H), 3.88-3.68 (m, 1H), 2.99-2.49 (m, 2H), 2.28-1.88 (m, 4H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -32.99 (s), -81.48 (t, *J* = 9.6 Hz), -112.07—115.38 (m), -124.96 (d, *J* = 5.3 Hz), -126.34 (dd, *J* = 23.7, 12.5 Hz).
^{13}C NMR (125 MHz, $CDCl_3$) δ 163.83, 141.81, 126.09, 122.77 (q, $J_{C\text{-}F}$ = 329.4 Hz), 114.49, 67.78, 37.89 (t, $J_{C\text{-}F}$ = 20.7 Hz), 35.90, 32.23, 27.24.
HRMS (ESI): $C_{16}H_{13}F_{12}NO_3Se+Na^+$ Calcd: 597.9762, Found: 597.9758.



12,12,13,13,14,14,15,15,15-nonafluoro-10-((trifluoromethyl)selanyl)pentadecyl 4-methoxybenzoate (5e): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.8 Hz, 2H), 4.28 (t, *J* = 6.6 Hz, 2H), 3.85 (s, 3H), 3.78-3.62 (m, 1H), 2.92-2.39 (m, 2H), 2.03-1.66 (m, 4H), 1.58-1.28 (m, 12H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.27 (s), -81.56 (t, *J* = 9.6 Hz), -112.19—115.54 (m), -12.06 (dd, *J* = 12.0, 6.8 Hz), -126.40 (t, *J* = 11.6 Hz).
^{13}C NMR (75 MHz, $CDCl_3$) δ 166.57, 163.38, 131.66, 123.08, 122.89 (q, $J_{C\text{-}F}$ = 328.4 Hz), 113.66, 64.90, 55.49, 53.48, 38.79, 37.58 (t, $J_{C\text{-}F}$ = 21.8 Hz), 36.34, 35.45, 29.49, 29.34, 29.06, 28.88, 27.41, 26.14.
HRMS (ESI): $C_{24}H_{28}F_{12}O_3Se+Na^+$ Calcd: 695.0905, Found: 695.0894.

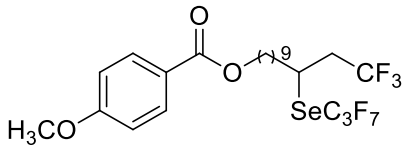


4-methoxyphenyl 6,6,7,7,8,8,9,9,9-nonafluoro-4-((trifluoromethyl)selanyl)nonanoate (5f): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.00 (d, *J* = 8.9 Hz, 2H), 6.89 (d, *J* = 8.9 Hz, 2H), 3.94-3.64 (m, 4H), 3.03-2.56 (m, 4H), 2.53-2.31 (m, 1H), 2.23-1.98 (m, 1H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -32.92 (s), -81.47 (d, *J* = 9.5 Hz), -112.07—115.01 (m), -124.96 (d, *J* = 8.7 Hz), -126.34 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 171.27, 157.52, 144.04, 122.30, 114.64, 55.73, 38.33 (t, $J_{C\text{-}F}$ = 20.3 Hz), 35.58, 32.42, 30.93, 30.54.
HRMS (ESI): $C_{17}H_{14}F_{12}O_3Se+Na^+$ Calcd: 596.9809, Found: 596.9801.

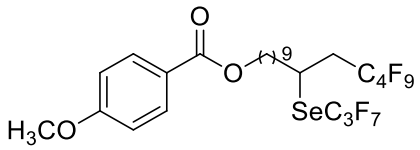


13-ethoxy-12,12-difluoro-13-oxo-10-((trifluoromethyl)selanyl)tridecyl 4-methoxybenzoate (5g): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.8 Hz, 2H), 6.92 (d, *J* = 8.8 Hz, 2H), 4.43-4.12 (m, 5H), 3.86 (s, 3H), 3.03-2.59 (m, 2H), 1.88-1.61 (m, 4H), 1.49-1.27 (m, 15H).

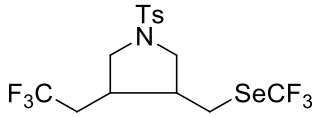
^{19}F NMR (282 MHz, $CDCl_3$) δ -33.09 (s), -102.10—103.31 (m), -106.45—107.85 (m).
^{13}C NMR (75 MHz, $CDCl_3$) δ 166.60, 163.37, 131.67, 123.09, 113.68, 64.93, 63.39, 55.56, 45.46 (t, $J_{C\text{-}F}$ = 23.3 Hz), 40.55, 29.61, 29.53, 29.43, 29.36, 28.89, 28.63, 27.34, 26.16, 23.51, 14.05.
HRMS (ESI): $C_{24}H_{33}F_5O_5Se+Na^+$ Calcd: 599.1307, Found: 599.1297.



12,12,12-trifluoro-10-((perfluoropropyl)selanyl)dodecyl 4-methoxybenzoate (5h): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.7 Hz, 2H), 6.92 (d, *J* = 8.7 Hz, 2H), 4.28 (t, *J* = 6.7 Hz, 2H), 4.16-4.03 (m, 1H), 3.86 (s, 3H), 2.84-2.41 (m, 2H), 1.86-1.65 (m, 4H), 1.48-1.29 (m, 12H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -64.32 (s), -80.16 (t, *J* = 9.2 Hz), -86.99 (s), -123.20 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 166.60, 163.39, 131.67, 125.83 (q, $J_{C\text{-}F}$ = 276.8 Hz), 123.09, 113.68, 64.92, 55.53, 41.09 (q, $J_{C\text{-}F}$ = 28.1 Hz), 36.67, 35.03, 29.85, 29.49, 29.35, 29.11, 28.89, 27.24, 26.15.
HRMS (ESI): $C_{23}H_{28}F_{10}O_3Se+Na^+$ Calcd: 645.0937, Found: 645.0916.

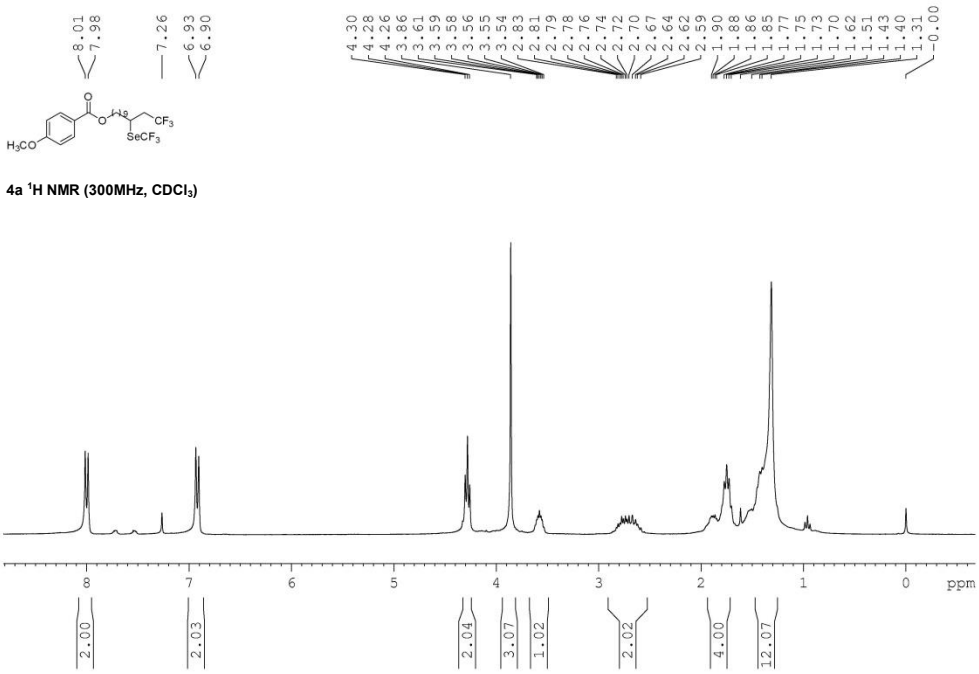


12,12,13,13,14,14,15,15,15-nonafluoro-10-((perfluoropropyl)selanyl)pentadecyl 4-methoxybenzoate (5i): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.5 Hz, 2H), 6.92 (d, *J* = 8.5 Hz, 2H), 4.36-4.17 (m, 3H), 3.86 (s, 3H), 2.81-2.36 (m, 2H), 1.92-1.66 (m, 4H), 1.48-1.28 (m, 12H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -80.17 (t, *J* = 9.3 Hz), -81.51 (t, *J* = 9.5 Hz), -87.11 (s), -113.94—114.05 (m), -123.21 (s), -125.05 (d, *J* = 9.0 Hz), -126.39 (t, *J* = 11.4 Hz).
^{13}C NMR (75 MHz, $CDCl_3$) δ 166.60, 163.42, 131.68, 123.14, 113.71, 64.92, 55.55, 53.50, 39.46 (t, $J_{C\text{-}F}$ = 20.9 Hz), 38.83, 29.85, 29.52, 29.45, 29.36, 28.96, 28.91, 26.17, 26.07.
HRMS (ESI): $C_{26}H_{28}F_{16}O_3Se+Na^+$ Calcd: 795.0840, Found: 795.0893.

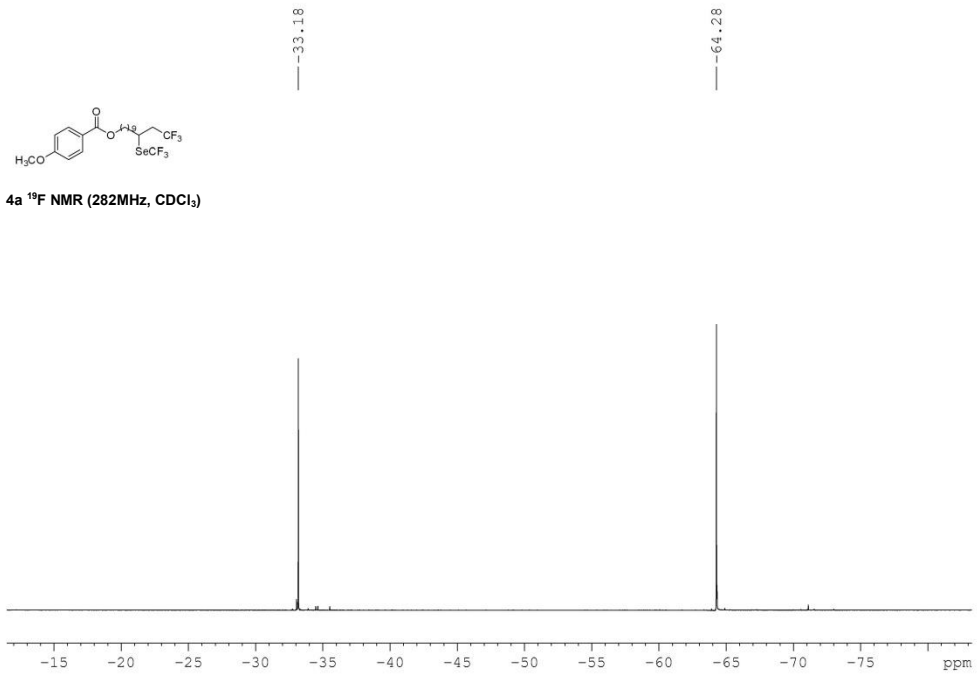


1-tosyl-3-(2,2,2-trifluoroethyl)-4-(((trifluoromethyl)selanyl)methyl)pyrrolidine (6): colorless oil.
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.72 (d, *J* = 7.9 Hz, 2H), 7.36 (d, *J* = 7.8 Hz, 2H), 3.60-3.47 (m, 1H), 3.46-3.32 (m, 2H), 3.11 (t, *J* = 9.1 Hz, 1H), 2.96 (d, *J* = 12.6 Hz, 1H), 2.58-2.40 (m, 5H), 2.31-2.14 (m, 2H), 2.07-1.97 (m, 1H).
^{19}F NMR (282 MHz, $CDCl_3$) δ -34.51 (s), -65.45 (s).
^{13}C NMR (75 MHz, $CDCl_3$) δ 144.26, 133.44, 130.11, 127.47, 126.24 (q, $J_{C\text{-}F}$ = 273.79 Hz), 122.21 (q, $J_{C\text{-}F}$ = 327.11 Hz), 52.07, 50.64, 41.55, 36.09, 32.24 (q, $J_{C\text{-}F}$ = 29.00 Hz), 23.53, 21.68.
HRMS (ESI): $C_{15}H_{17}F_6NO_2SSe+Na^+$ Calcd: 491.9941, Found: 491.9937.

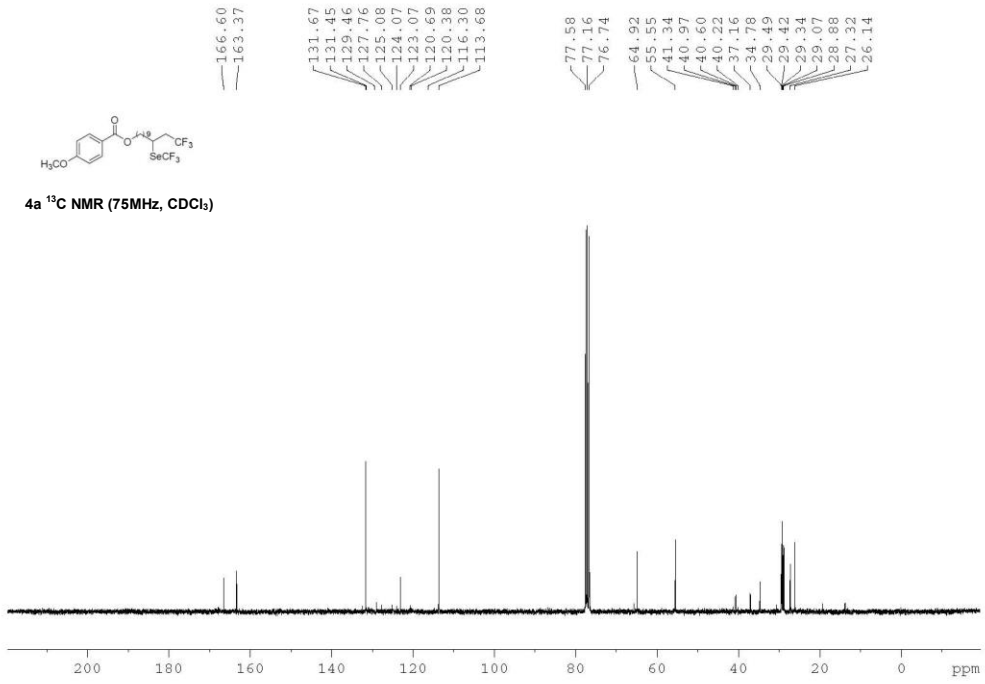
6. Copies of NMR spectra



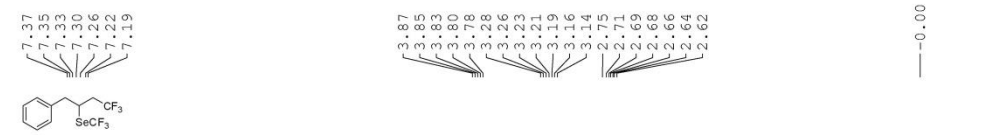
4a ^{1}H NMR (300MHz, $CDCl_3$)



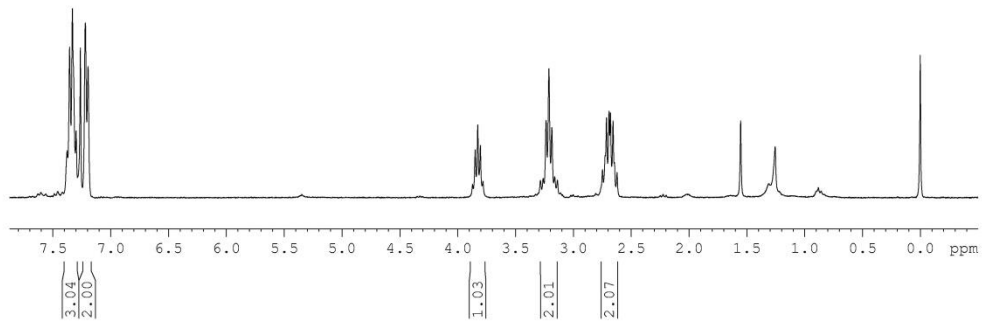
4a ^{19}F NMR (282MHz, $CDCl_3$)

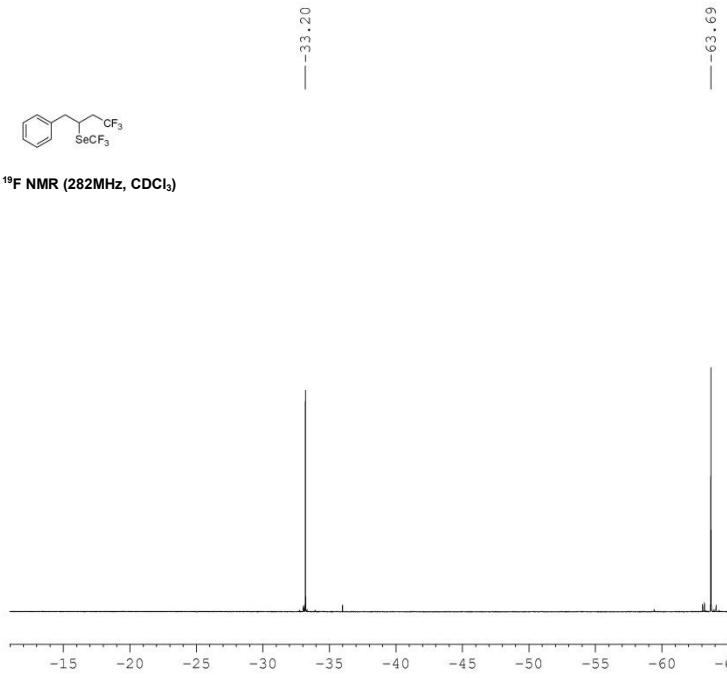


4a ^{13}C NMR (75MHz, $CDCl_3$)

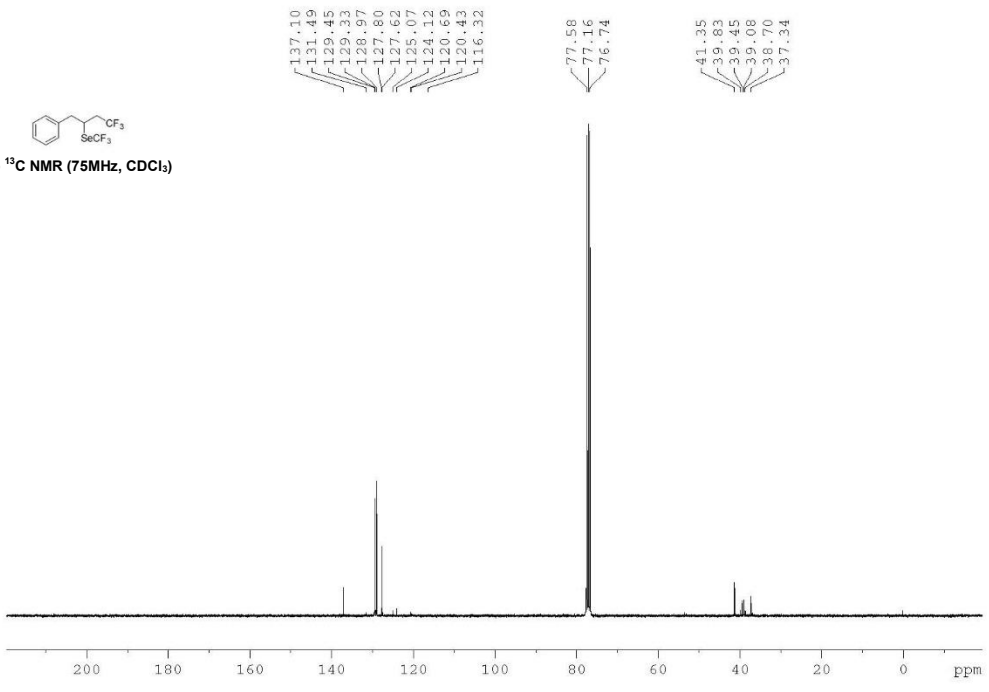


4b ^{1}H NMR (300MHz, $CDCl_3$)

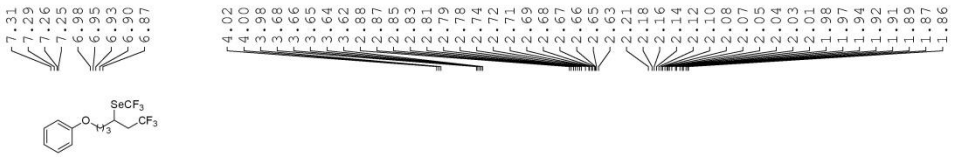




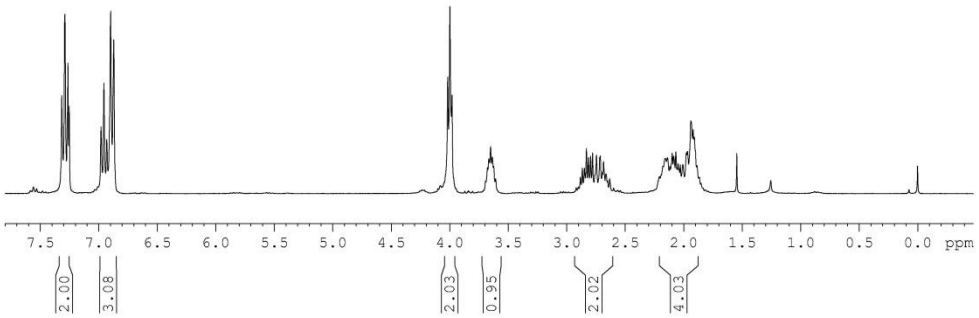
4b ^{19}F NMR (282MHz, $CDCl_3$)



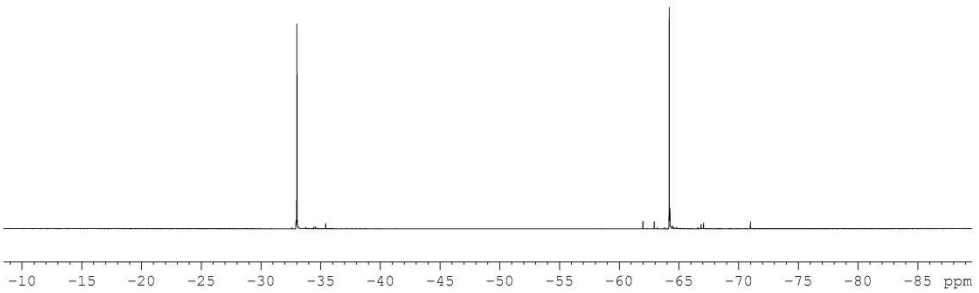
4b ^{13}C NMR (75MHz, $CDCl_3$)

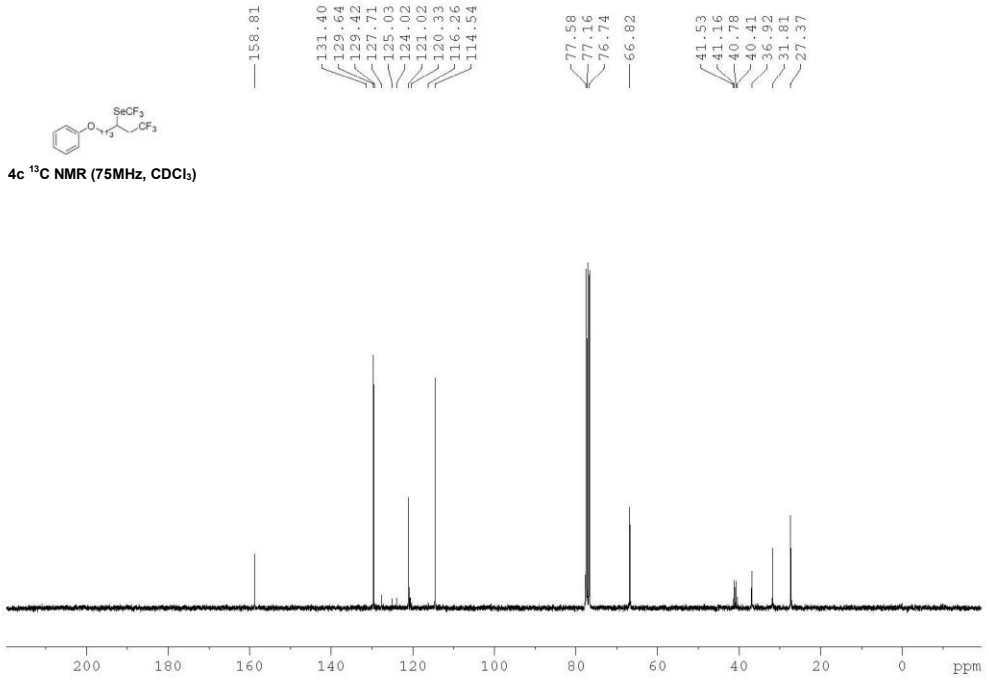


4c ^{1}H NMR (300MHz, $CDCl_3$)

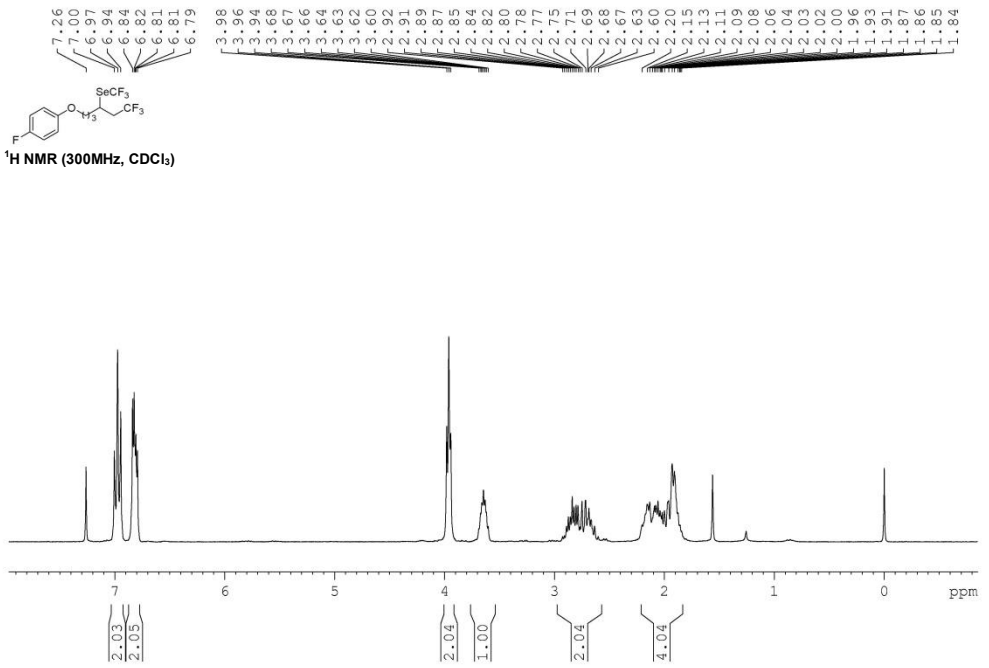


4c ^{19}F NMR (282MHz, $CDCl_3$)

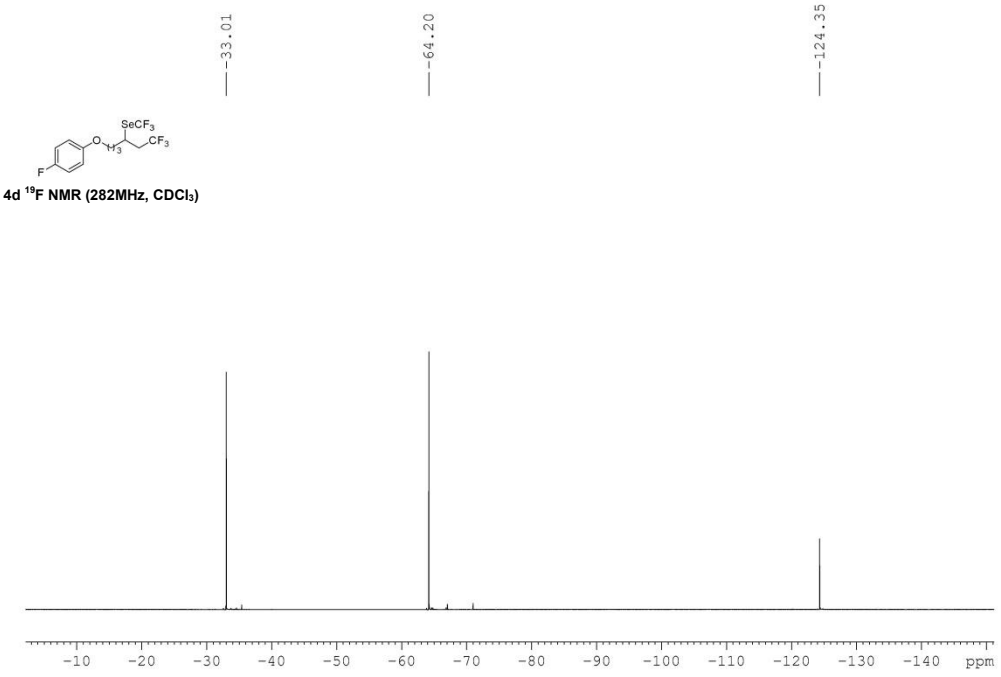




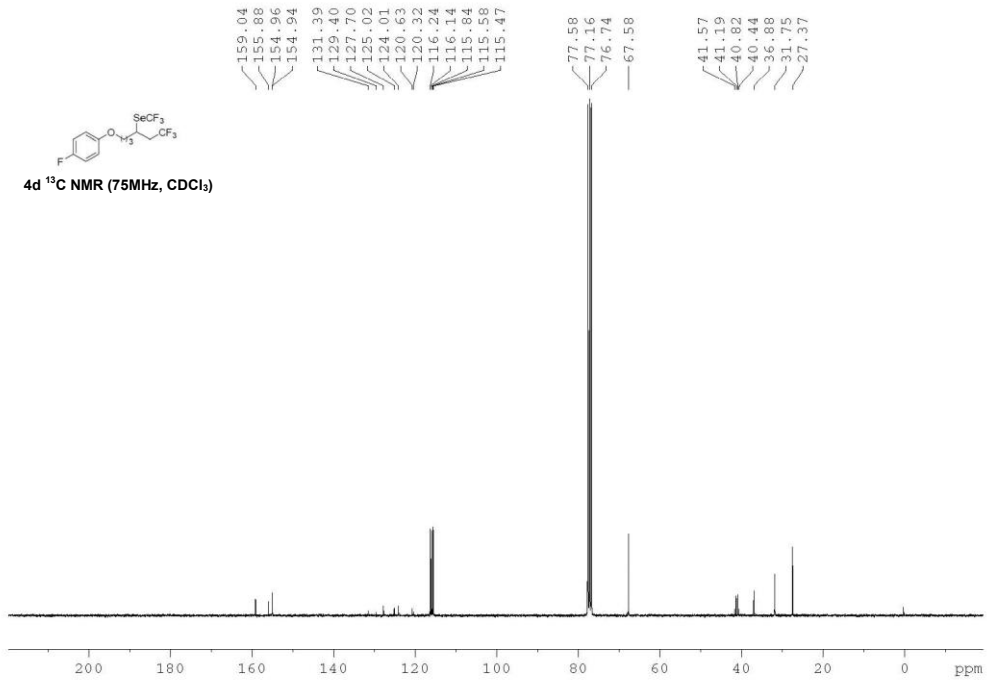
4c ^{13}C NMR (75MHz, $CDCl_3$)



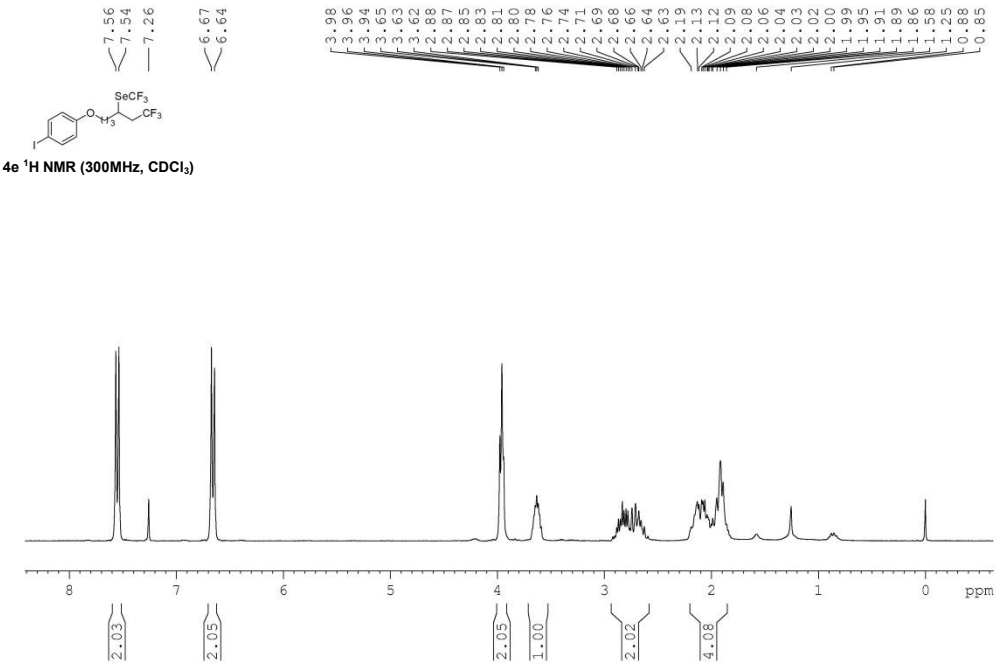
4d ^{1}H NMR (300MHz, $CDCl_3$)



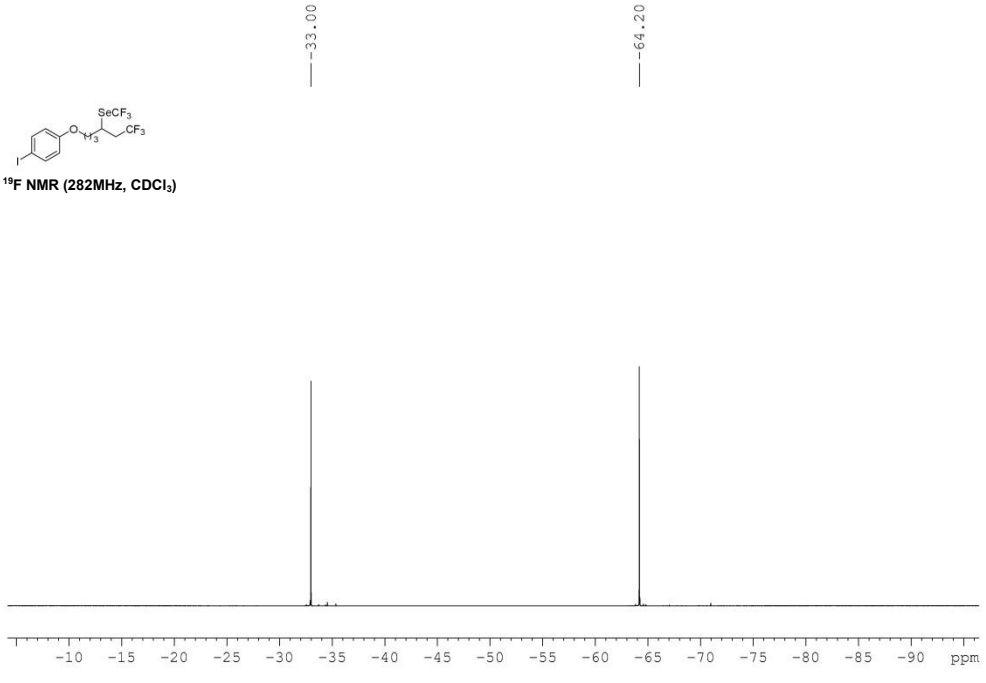
4d ^{19}F NMR (282MHz, $CDCl_3$)



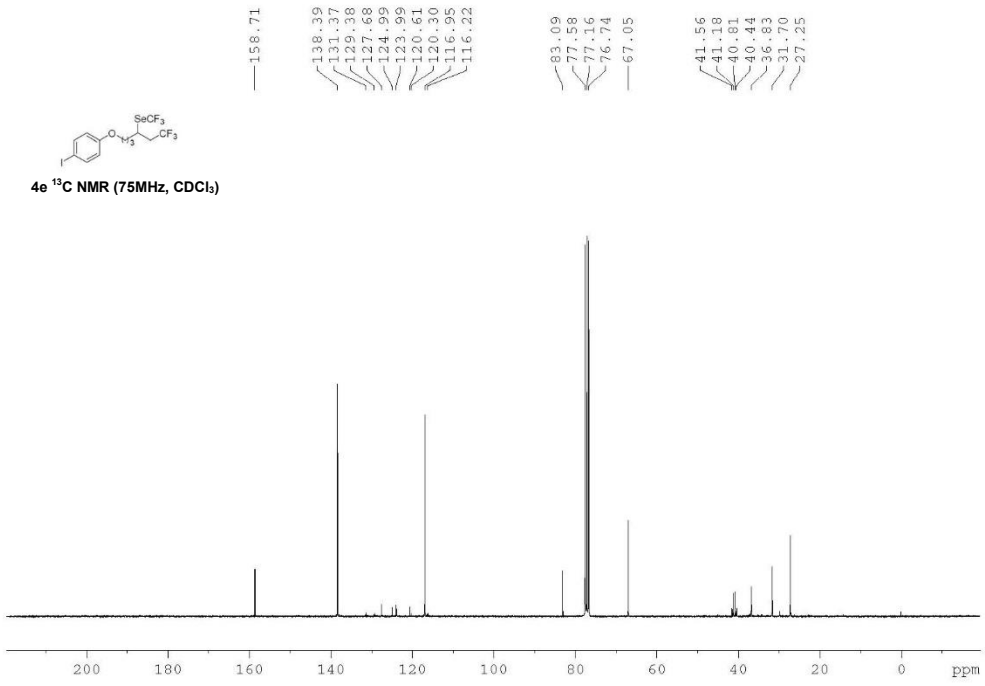
4d ^{13}C NMR (75MHz, $CDCl_3$)



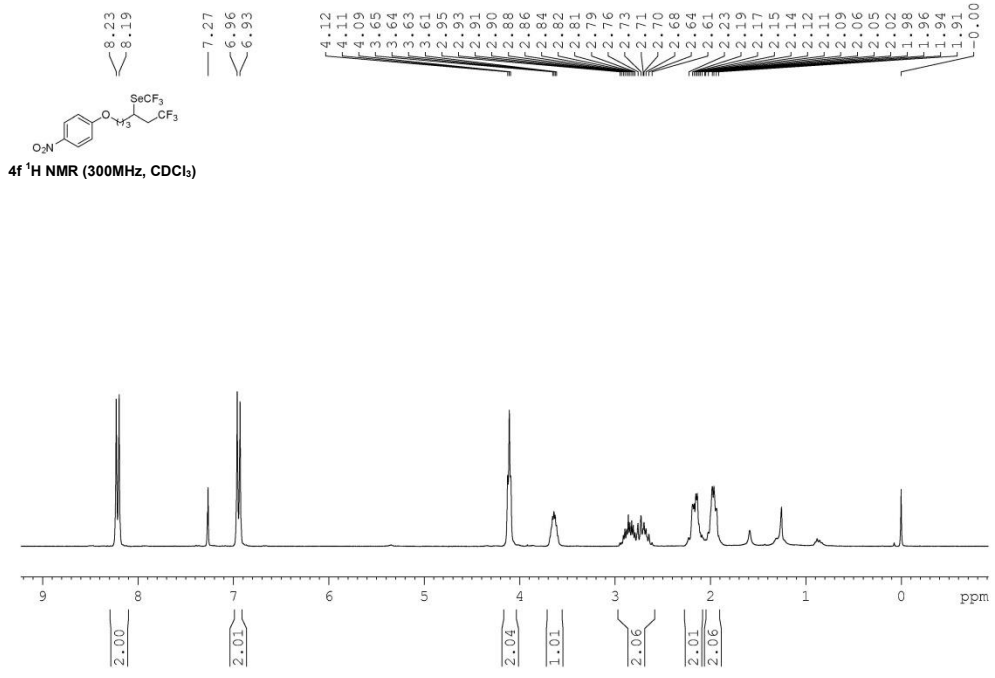
4e ^{1}H NMR (300MHz, $CDCl_3$)



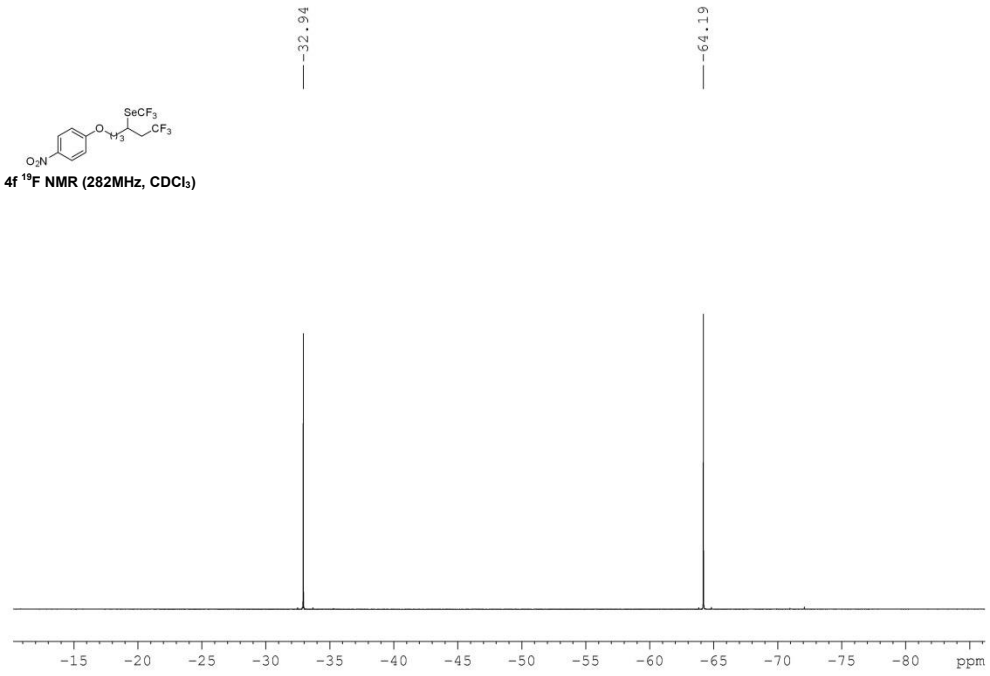
4e ^{19}F NMR (282MHz, $CDCl_3$)



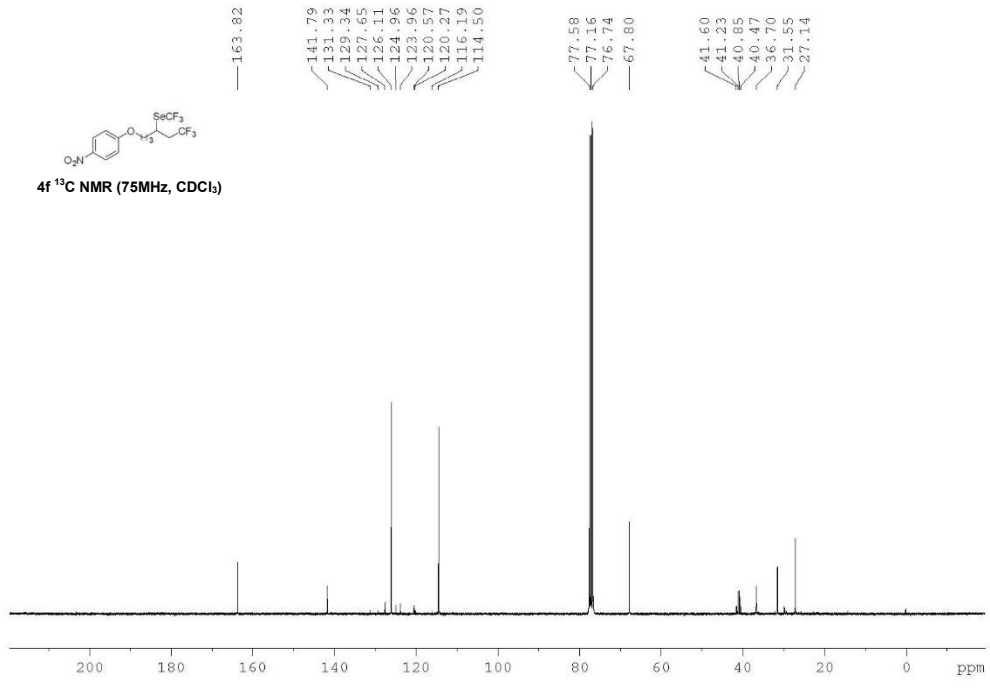
4e ^{13}C NMR (75MHz, CDCl$_3$)



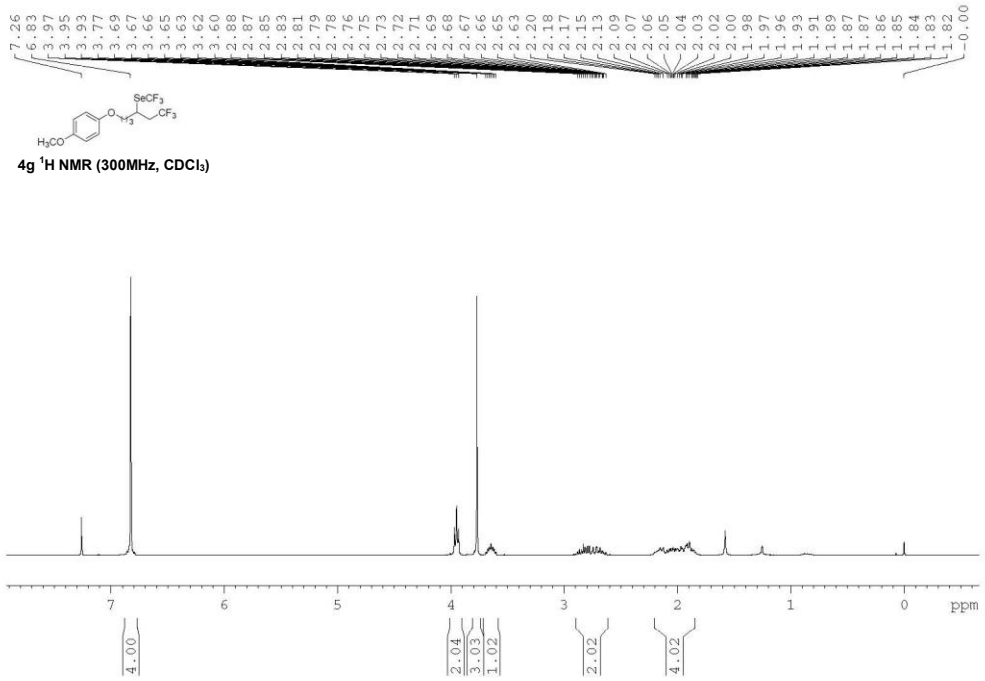
4f ^{1}H NMR (300MHz, CDCl$_3$)



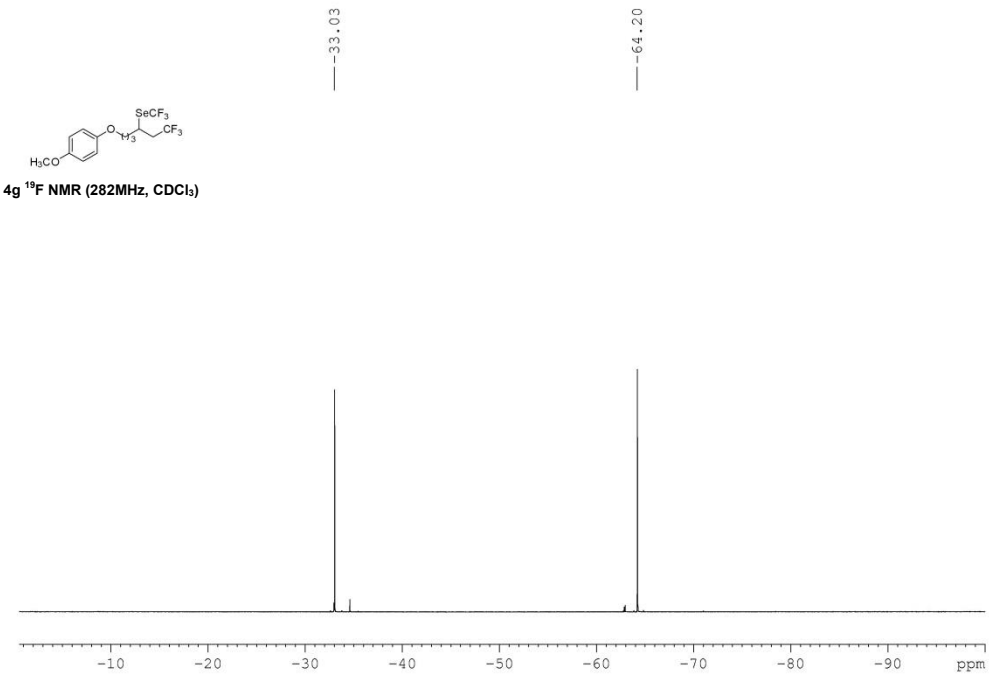
4f ^{19}F NMR (282MHz, $CDCl_3$)



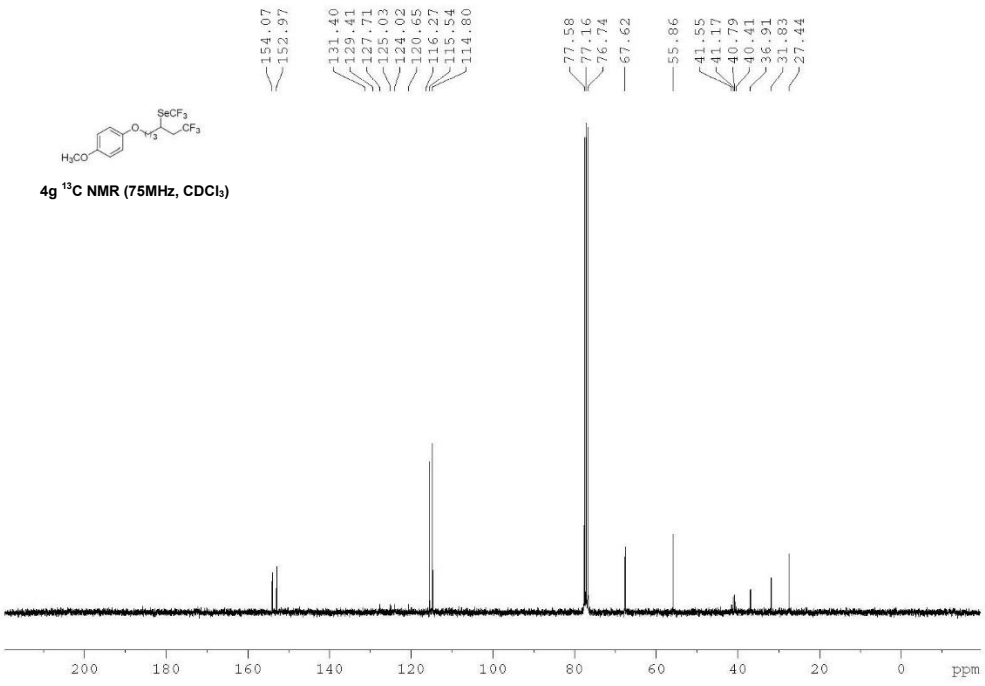
4f ^{13}C NMR (75MHz, $CDCl_3$)



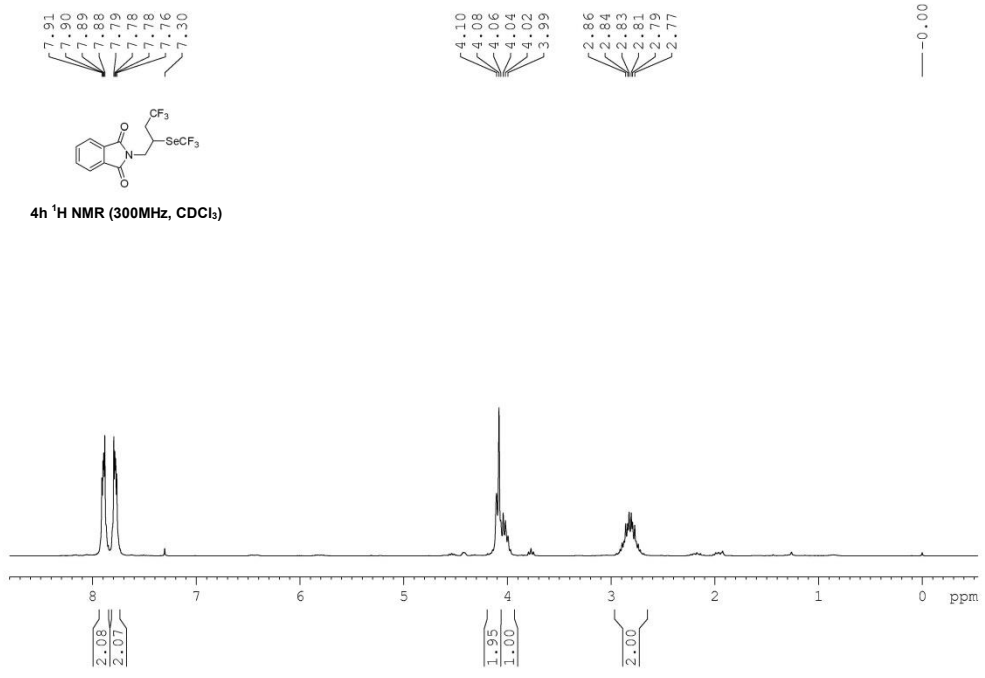
4g ^{1}H NMR (300MHz, $CDCl_3$)



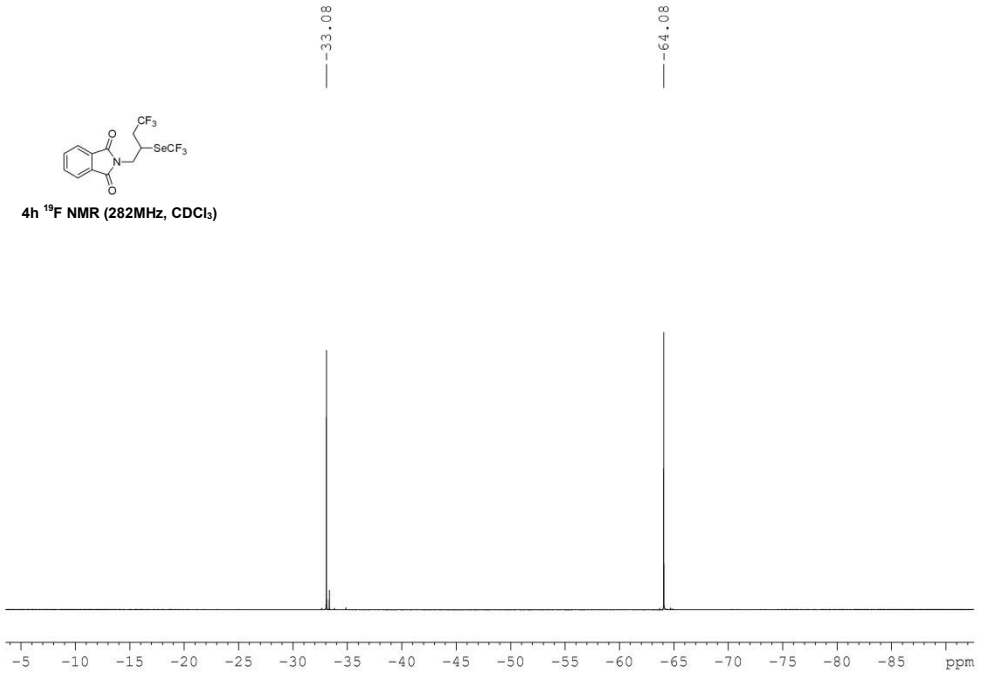
4g ^{19}F NMR (282MHz, $CDCl_3$)



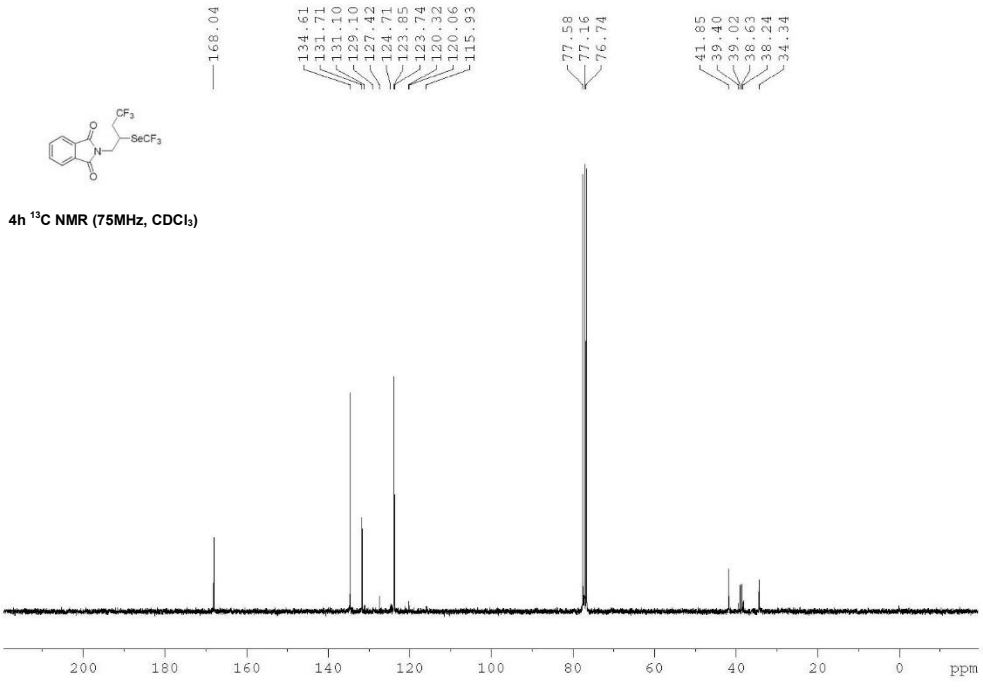
4g ^{13}C NMR (75MHz, $CDCl_3$)



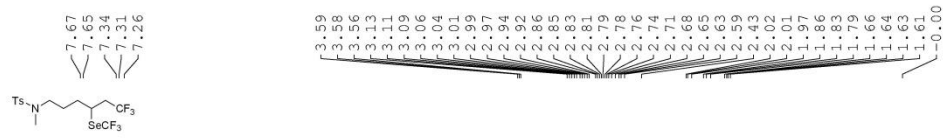
4h ^{1}H NMR (300MHz, $CDCl_3$)



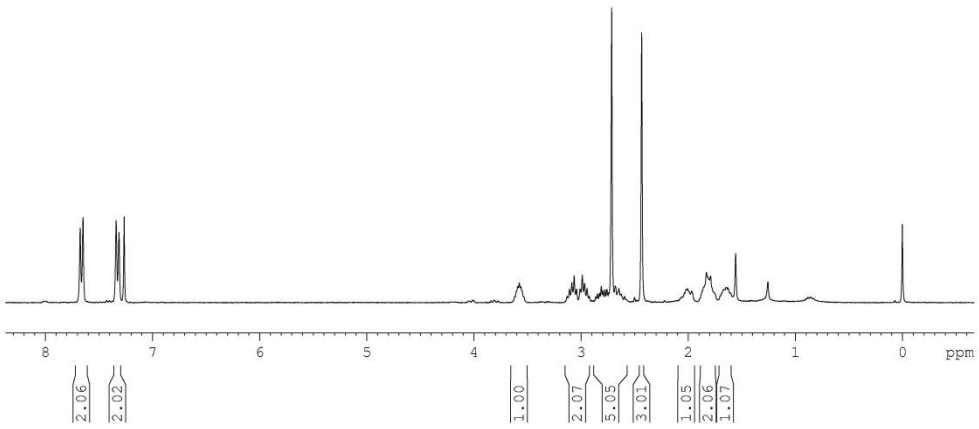
4h ^{19}F NMR (282MHz, CDCl$_3$)



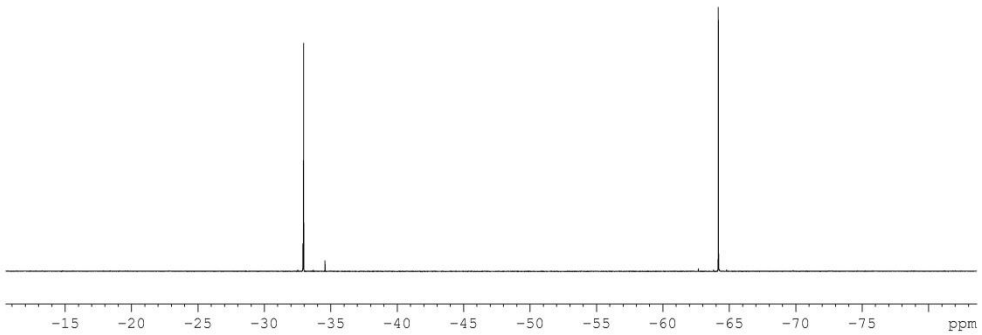
4h ^{13}C NMR (75MHz, CDCl$_3$)

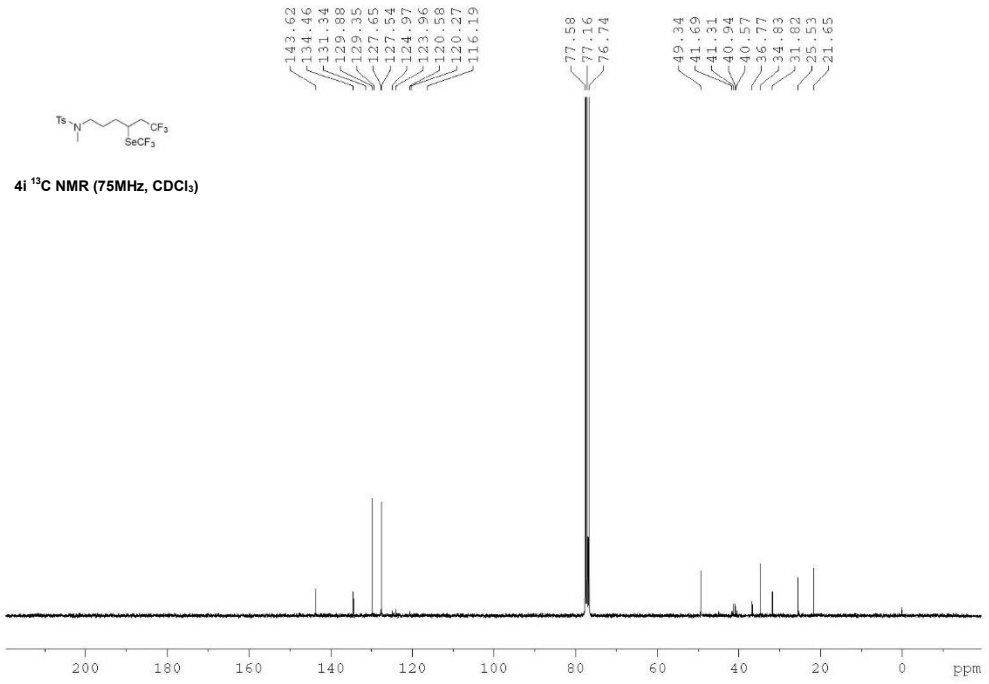


4i ^{1}H NMR (300MHz, $CDCl_3$)

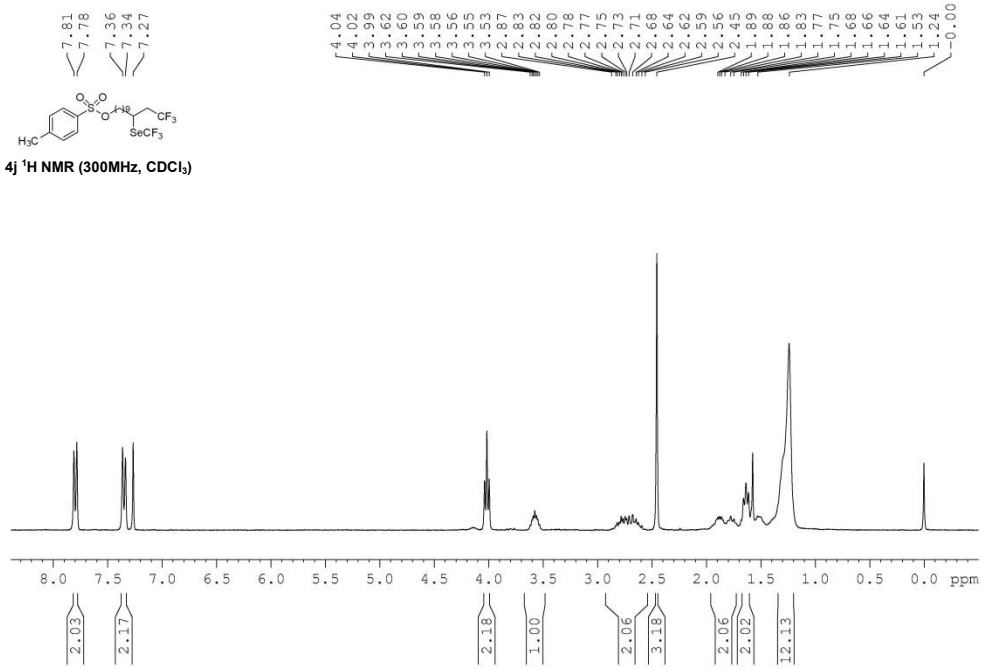


4i ^{19}F NMR (282MHz, $CDCl_3$)



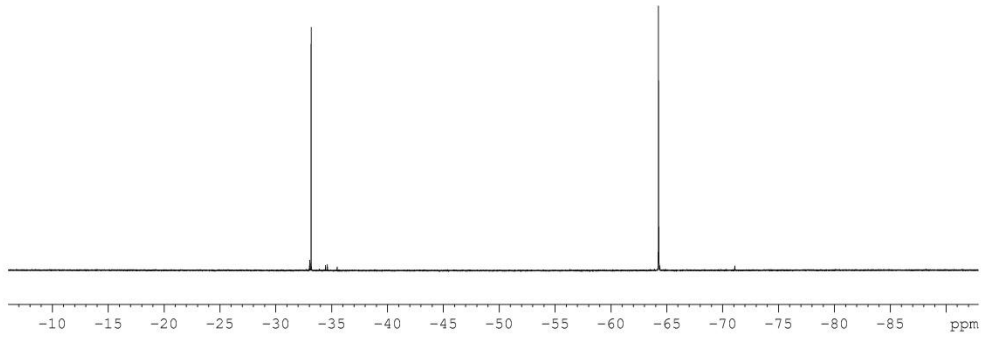


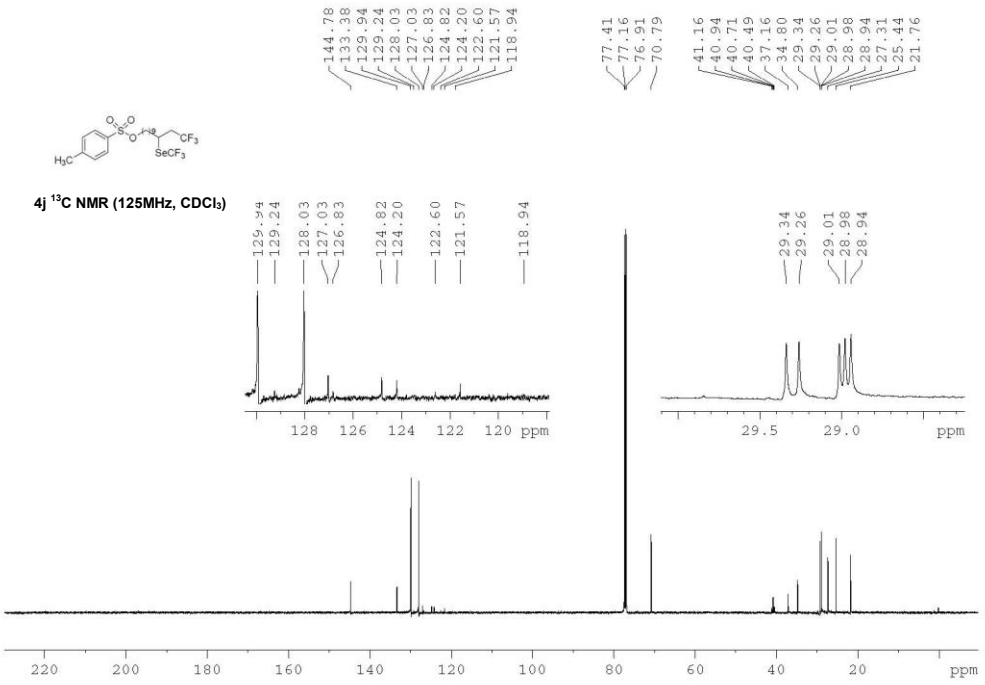
4i ^{13}C NMR (75MHz, $CDCl_3$)



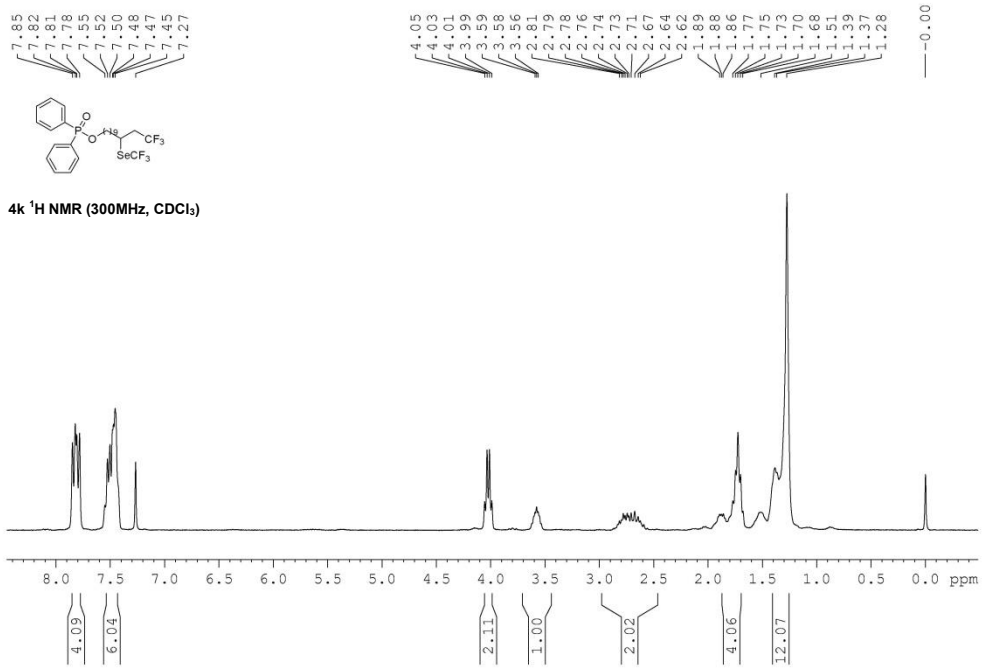
4j ^{1}H NMR (300MHz, $CDCl_3$)

4j ^{19}F NMR (282MHz, $CDCl_3$)

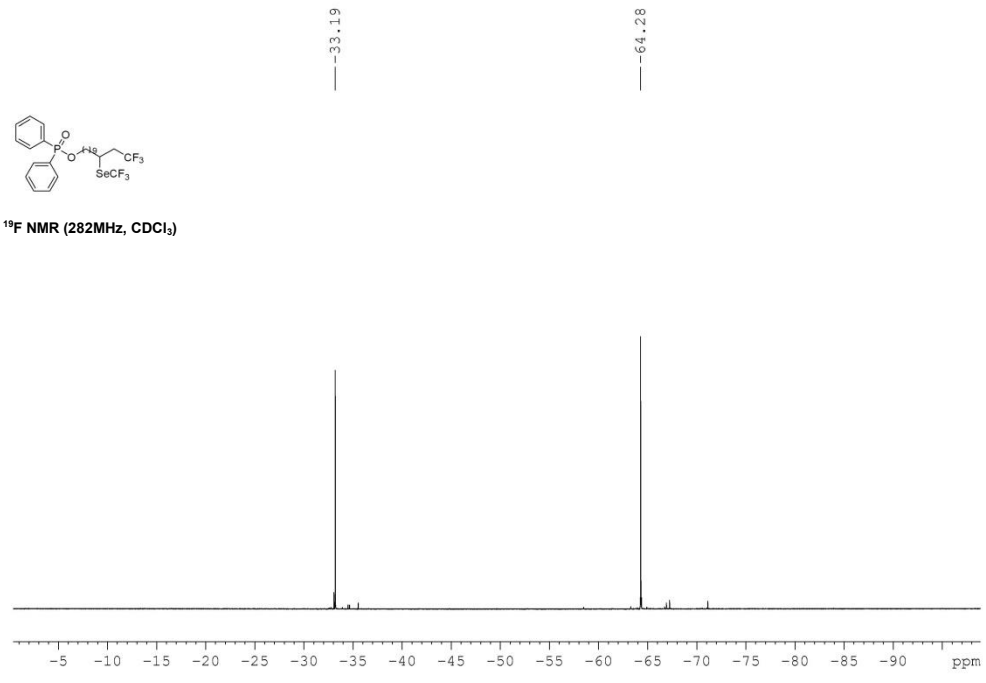




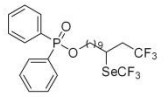
4j ^{13}C NMR (125MHz, $CDCl_3$)



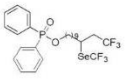
4k ^{1}H NMR (300MHz, $CDCl_3$)



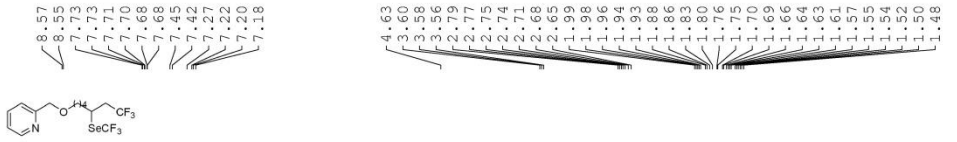
4k ^{19}F NMR (282MHz, $CDCl_3$)



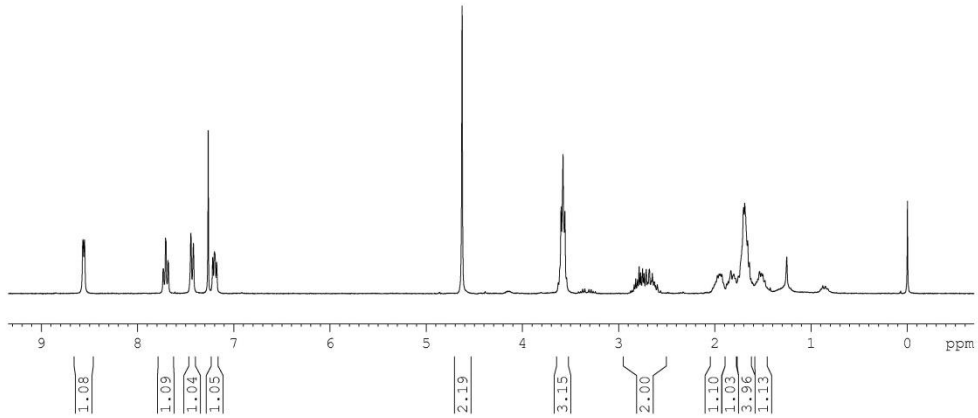
4k ^{31}P NMR (121MHz, CDCl$_3$)

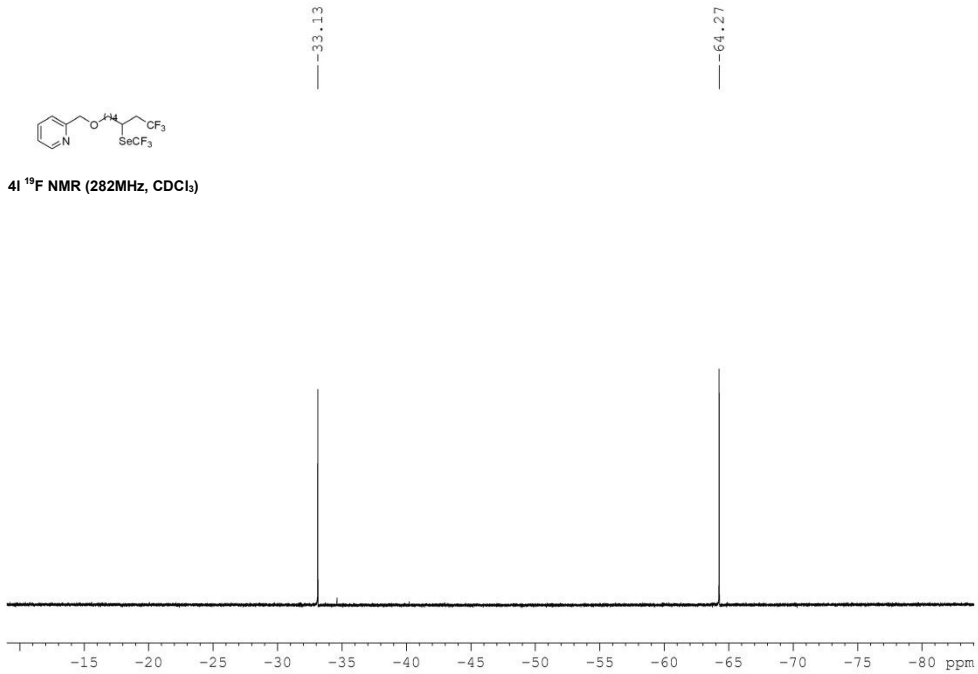


4k ^{13}C NMR (75MHz, CDCl$_3$)

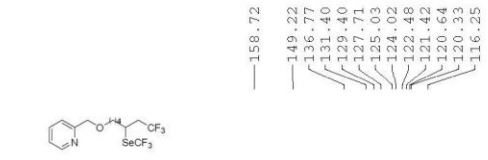


4l ^{1}H NMR (300MHz, $CDCl_3$)

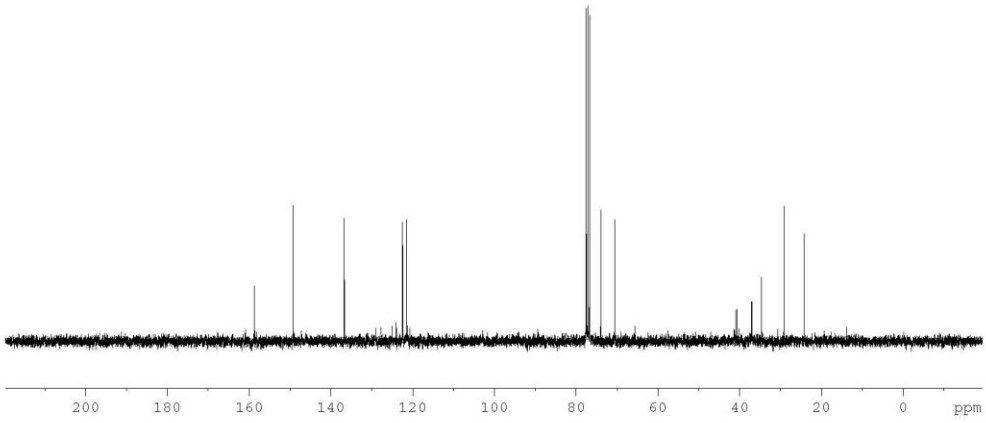


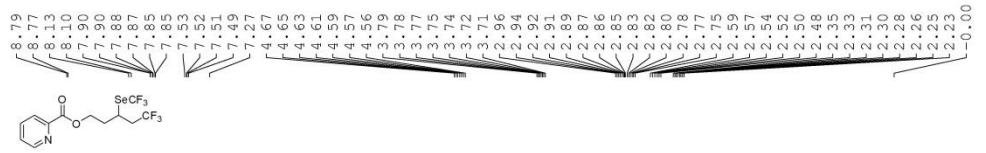


4l ^{19}F NMR (282MHz, $CDCl_3$)

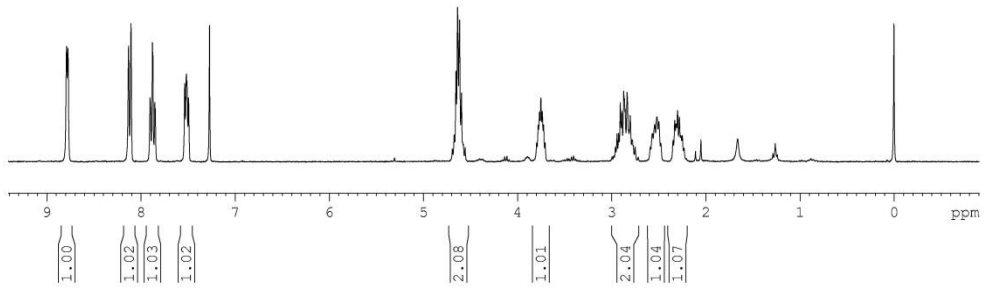


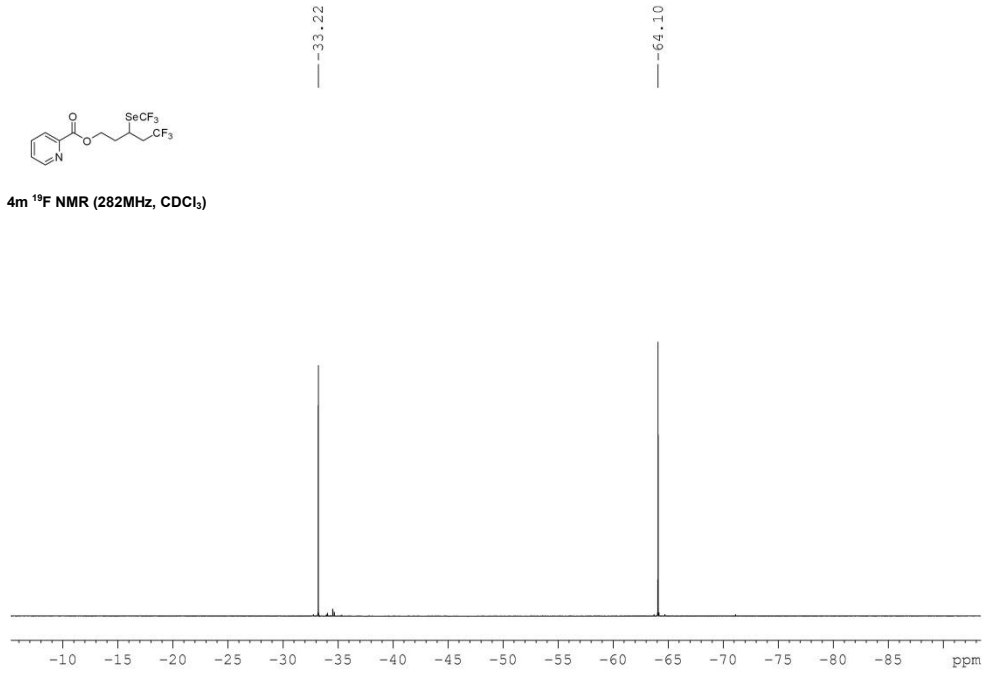
4l ^{13}C NMR (75MHz, $CDCl_3$)



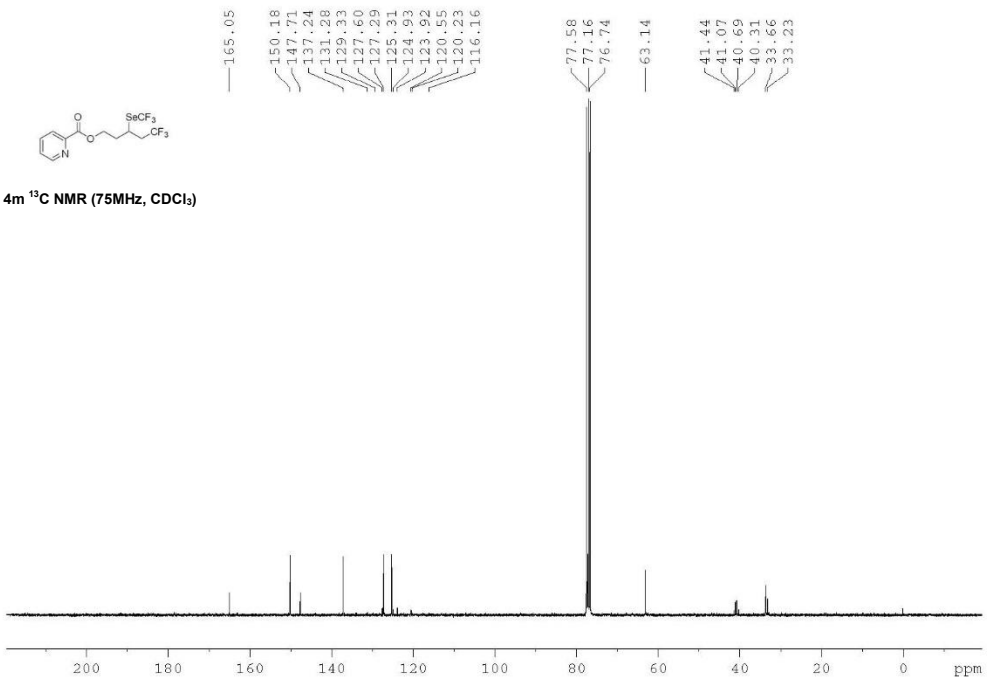


4m ^{1}H NMR (300MHz, $CDCl_3$)

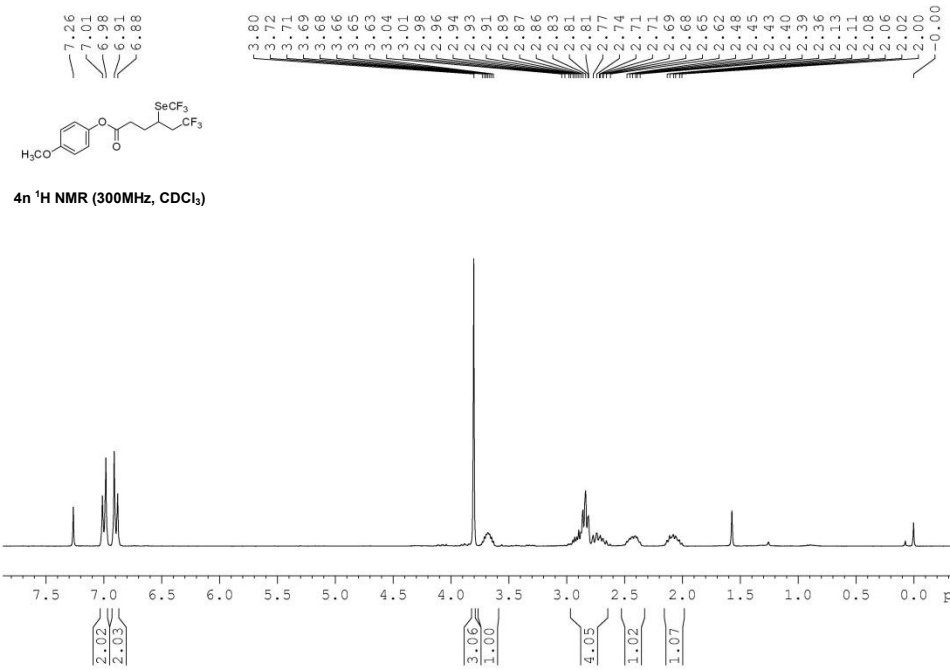




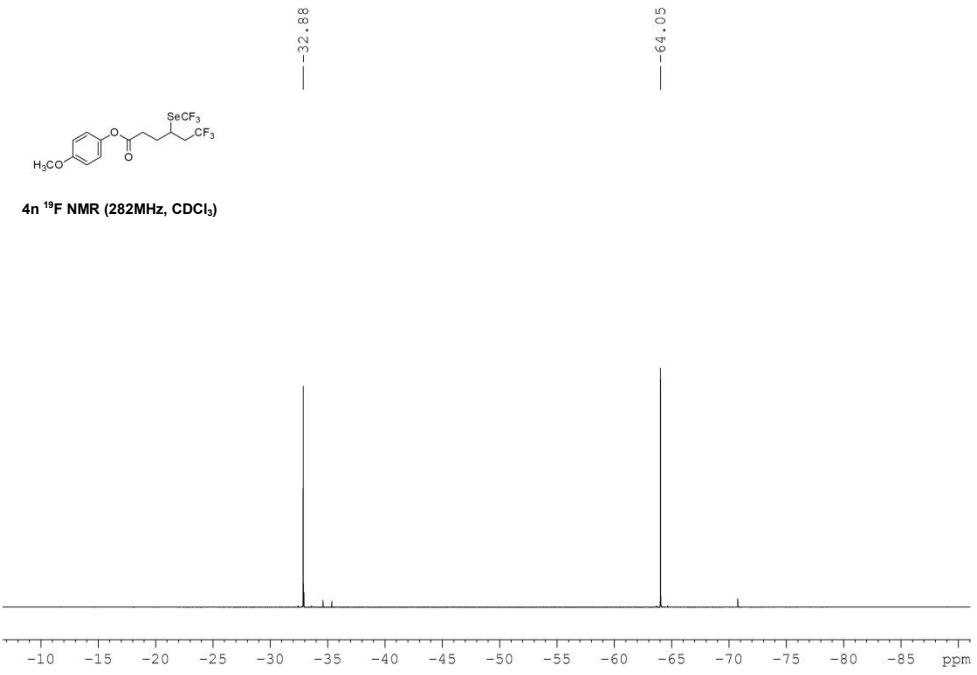
4m ^{19}F NMR (282MHz, $CDCl_3$)



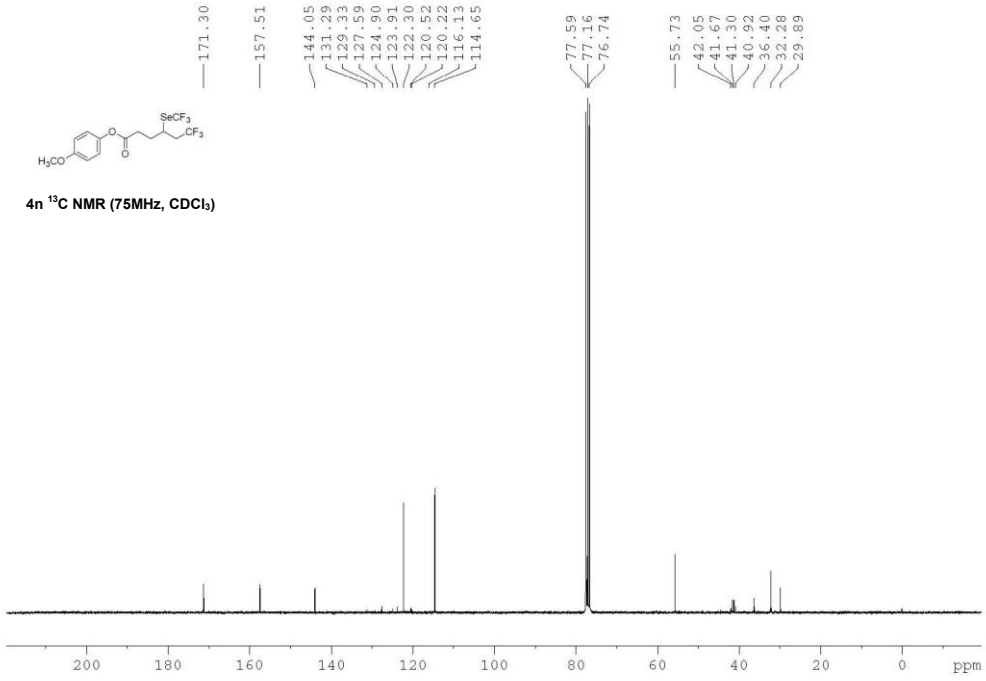
4m ^{13}C NMR (75MHz, $CDCl_3$)



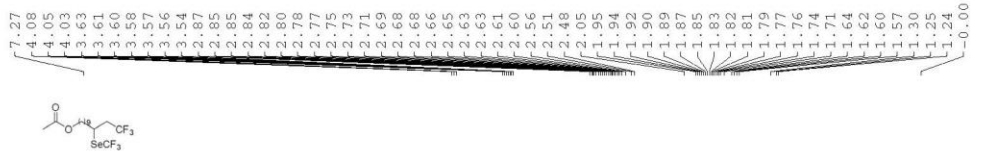
4n ^{1}H NMR (300MHz, $CDCl_3$)



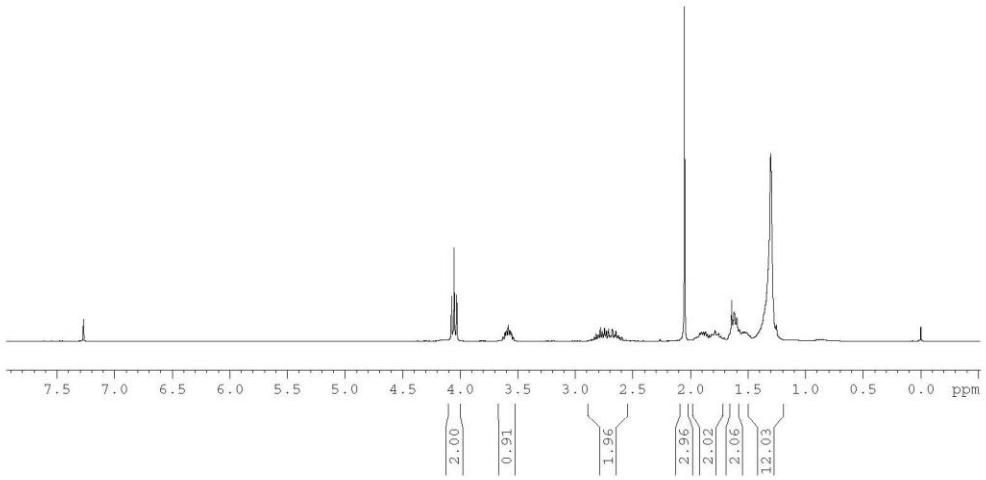
4n ^{19}F NMR (282MHz, $CDCl_3$)

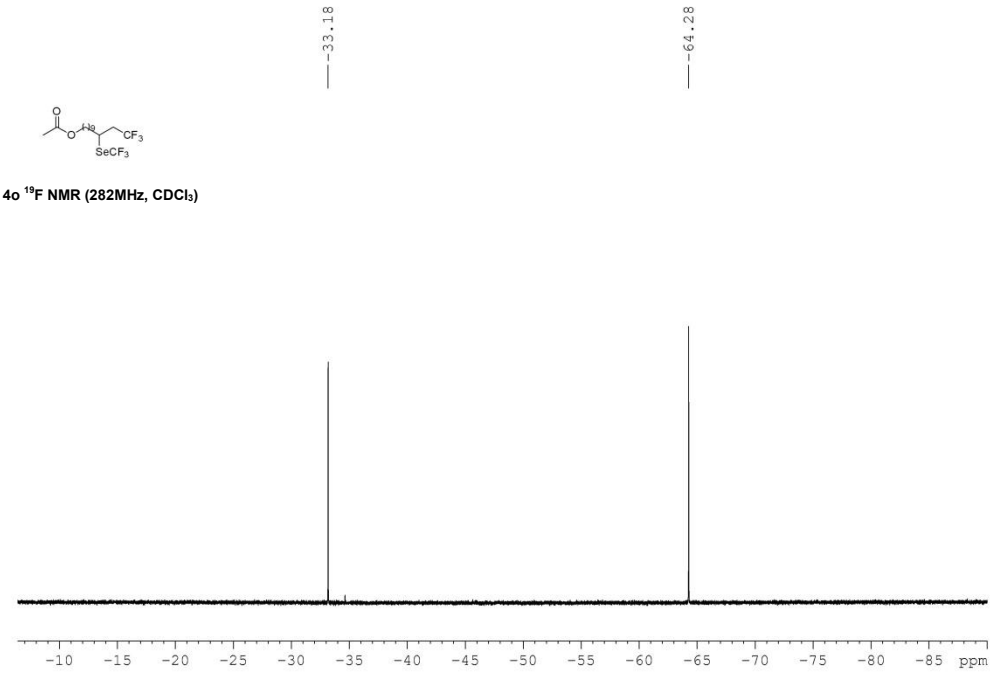


4n ^{13}C NMR (75MHz, CDCl$_3$)

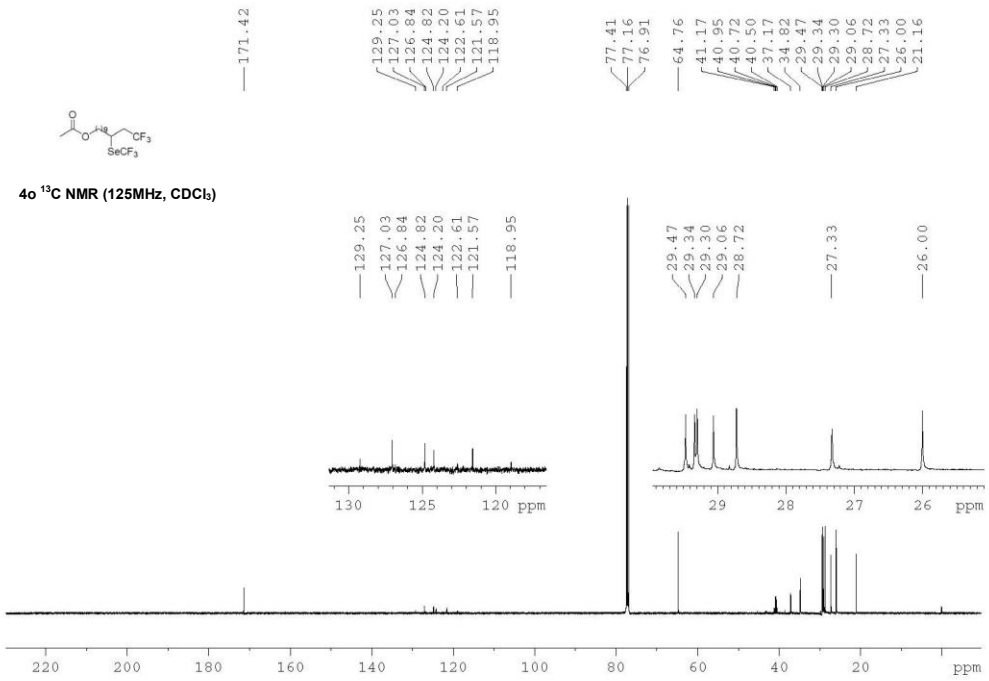


4o ^{1}H NMR (300MHz, CDCl$_3$)

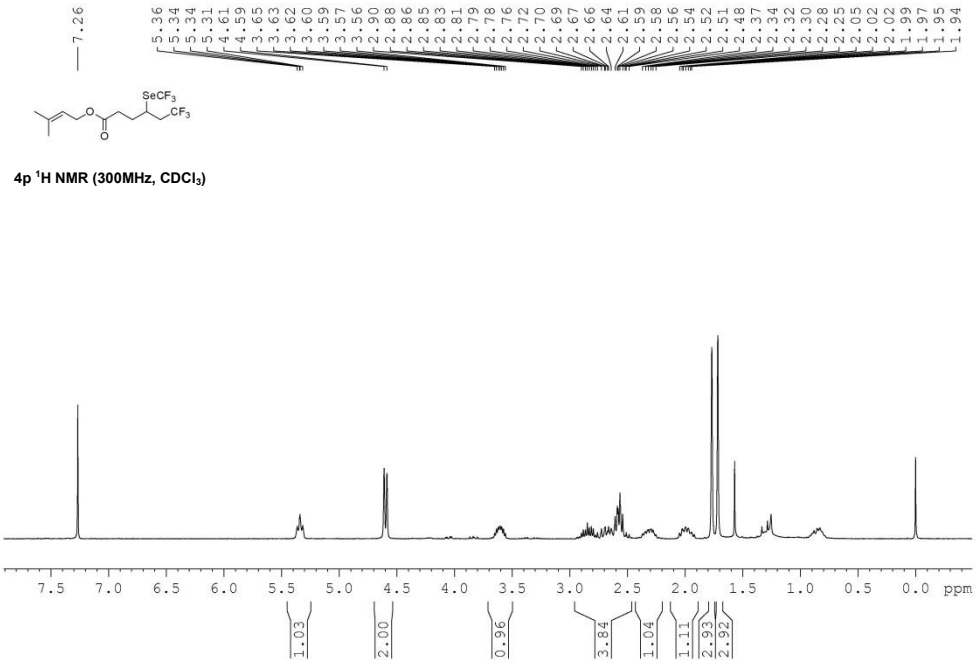




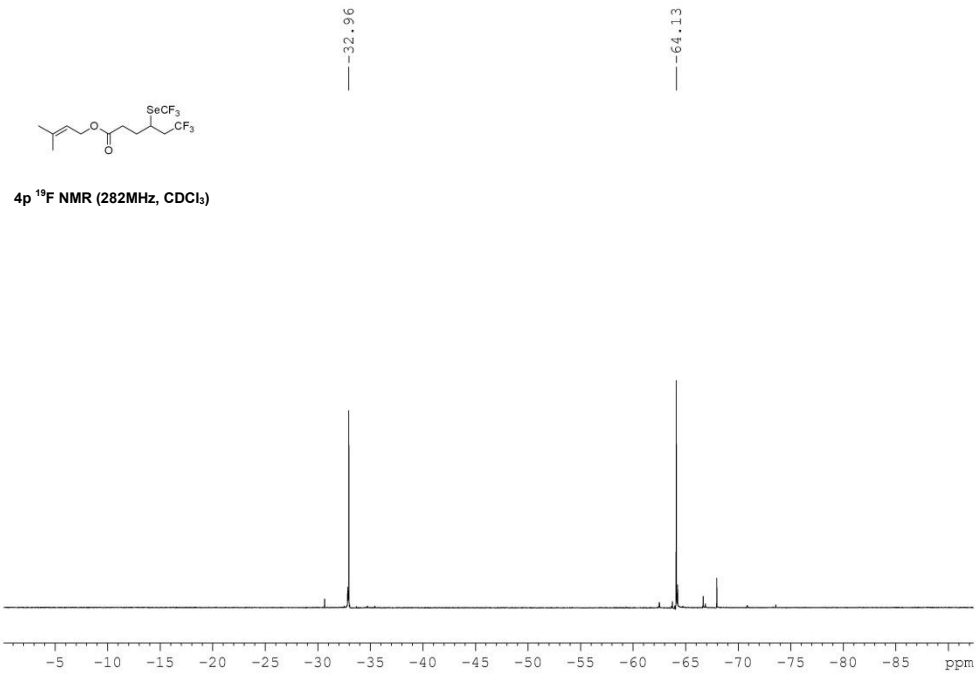
4o ^{19}F NMR (282MHz, $CDCl_3$)



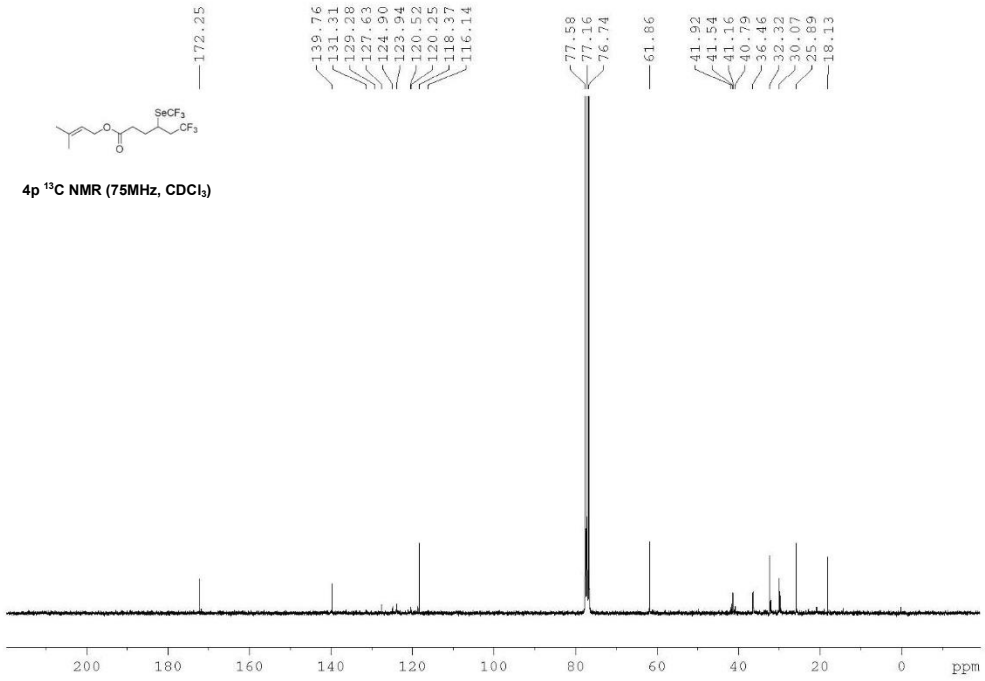
4o ^{13}C NMR (125MHz, $CDCl_3$)



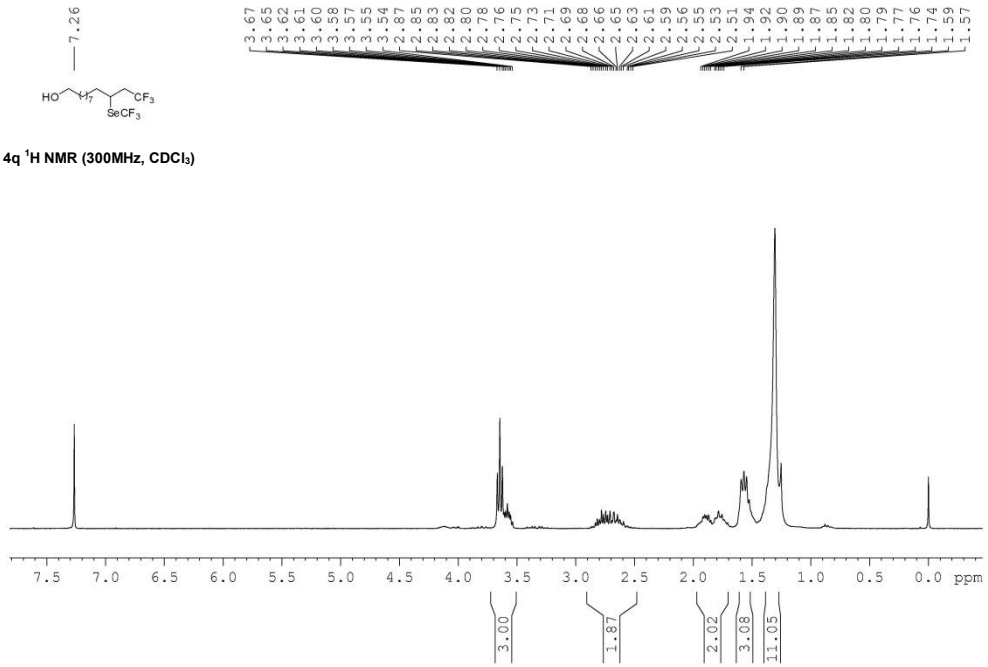
4p ^{1}H NMR (300MHz, $CDCl_3$)



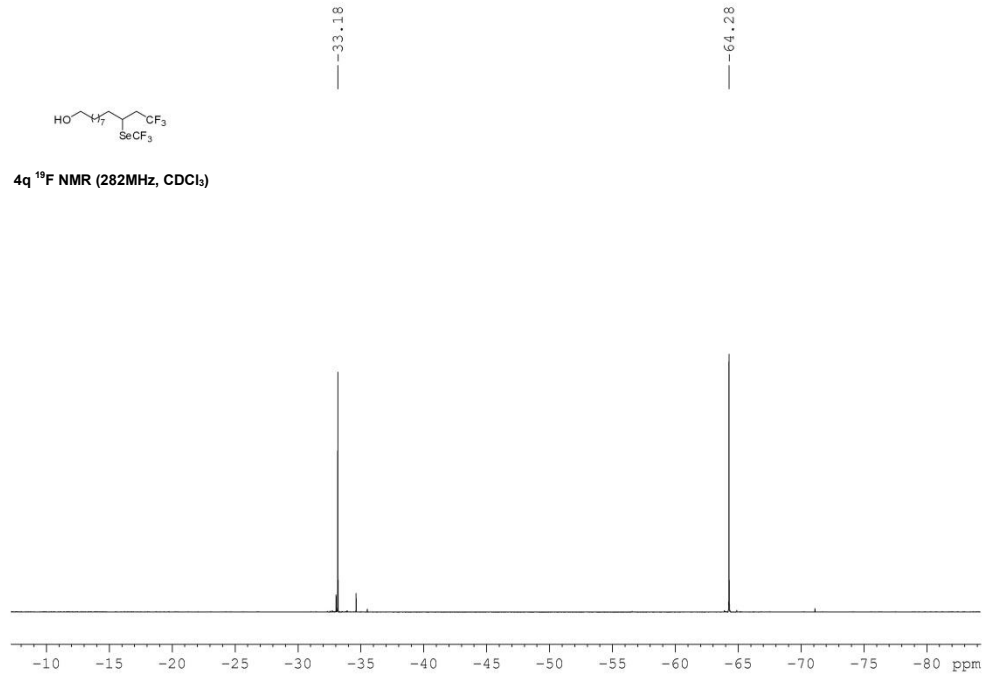
4p ^{19}F NMR (282MHz, $CDCl_3$)



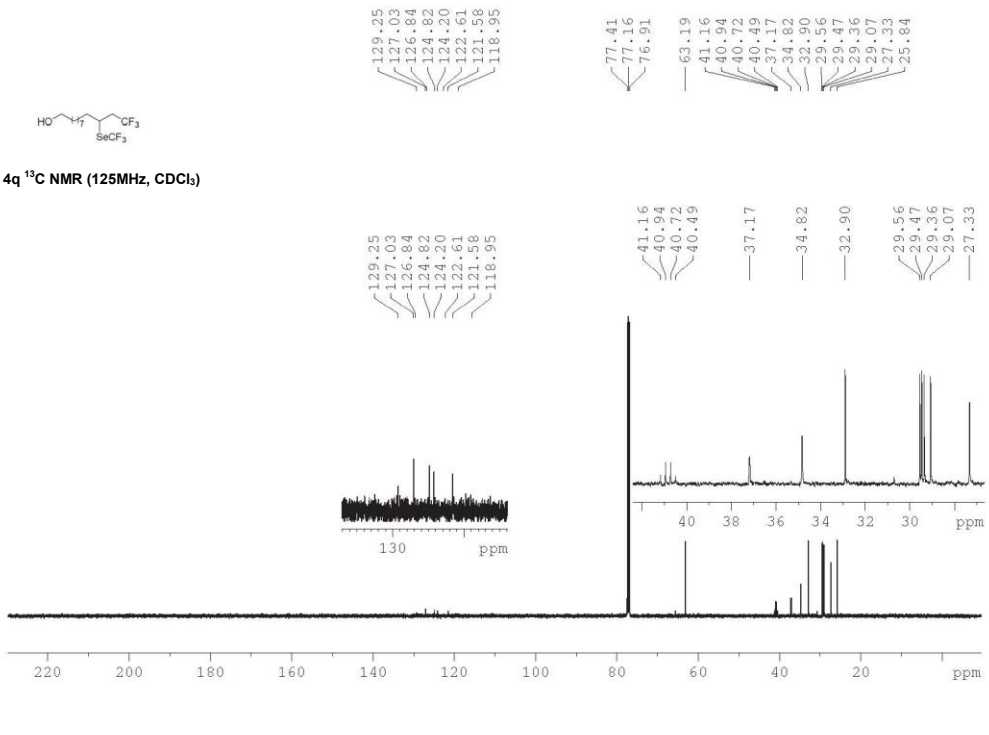
4p ^{13}C NMR (75MHz, $CDCl_3$)



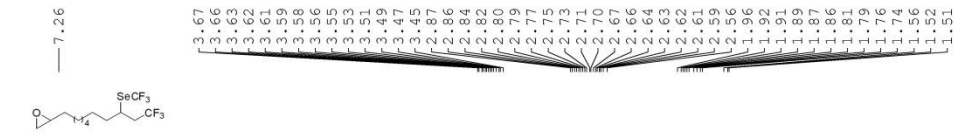
4q ^{1}H NMR (300MHz, $CDCl_3$)



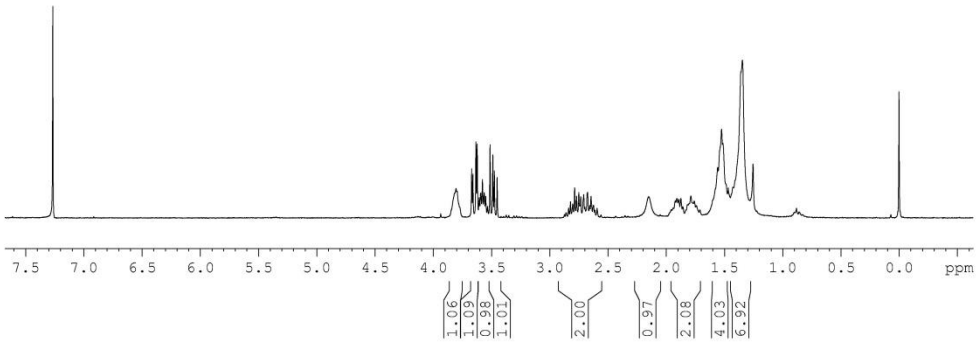
4q ^{19}F NMR (282MHz, CDCl$_3$)



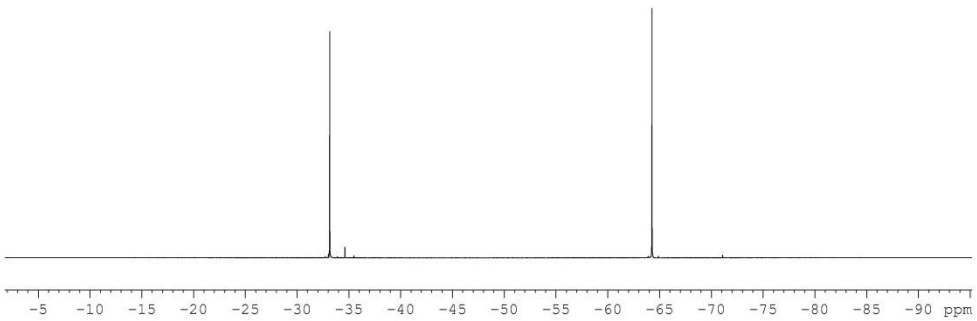
4q ^{13}C NMR (125MHz, CDCl$_3$)

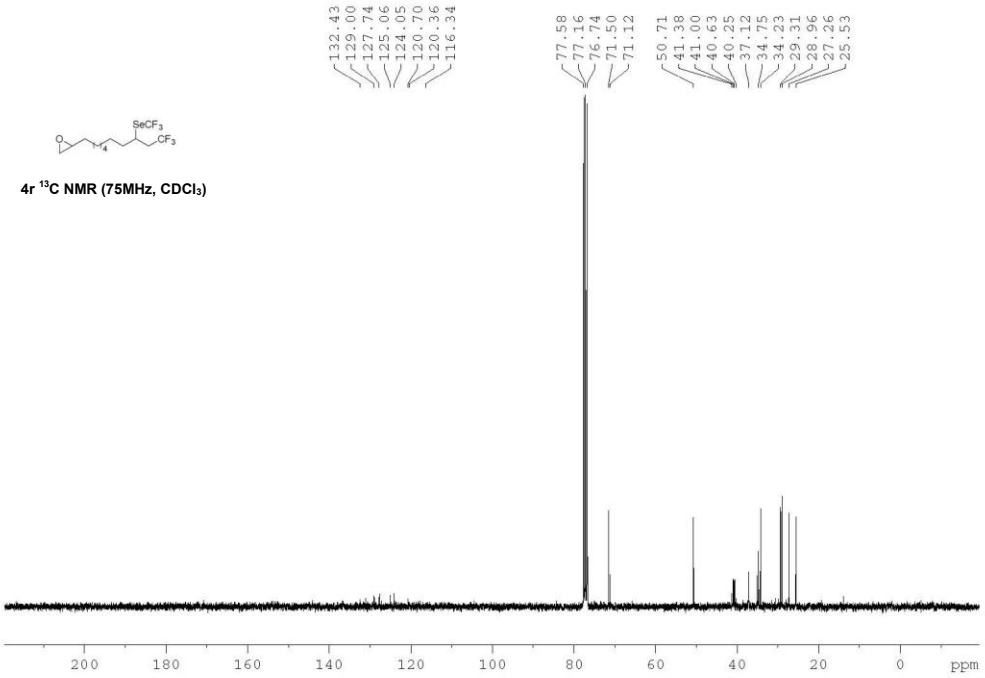


4r ^{1}H NMR (300MHz, $CDCl_3$)

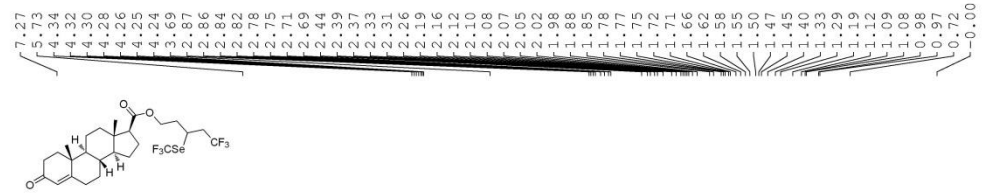


4r ^{19}F NMR (282MHz, $CDCl_3$)

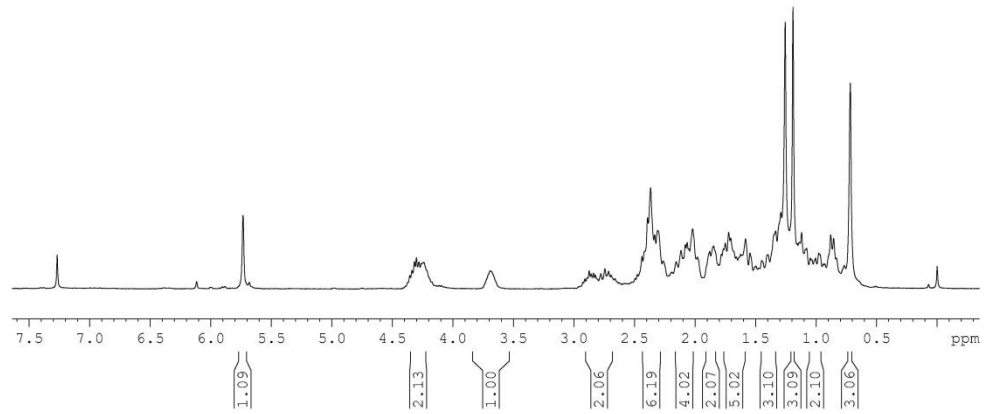


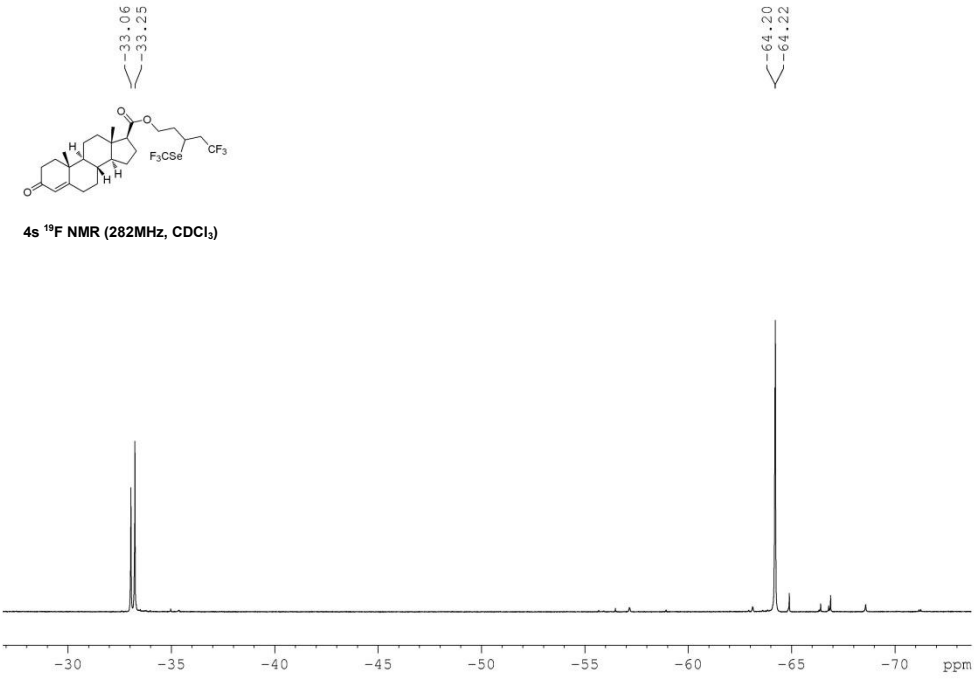


4r ^{13}C NMR (75MHz, $CDCl_3$)

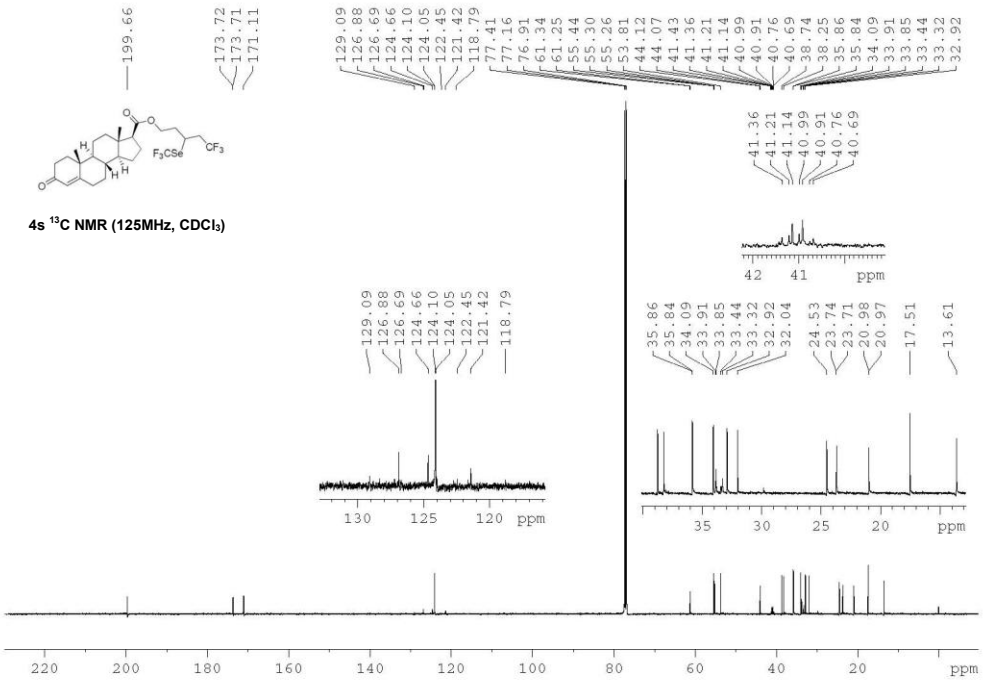


4s ^{1}H NMR (300MHz, $CDCl_3$)

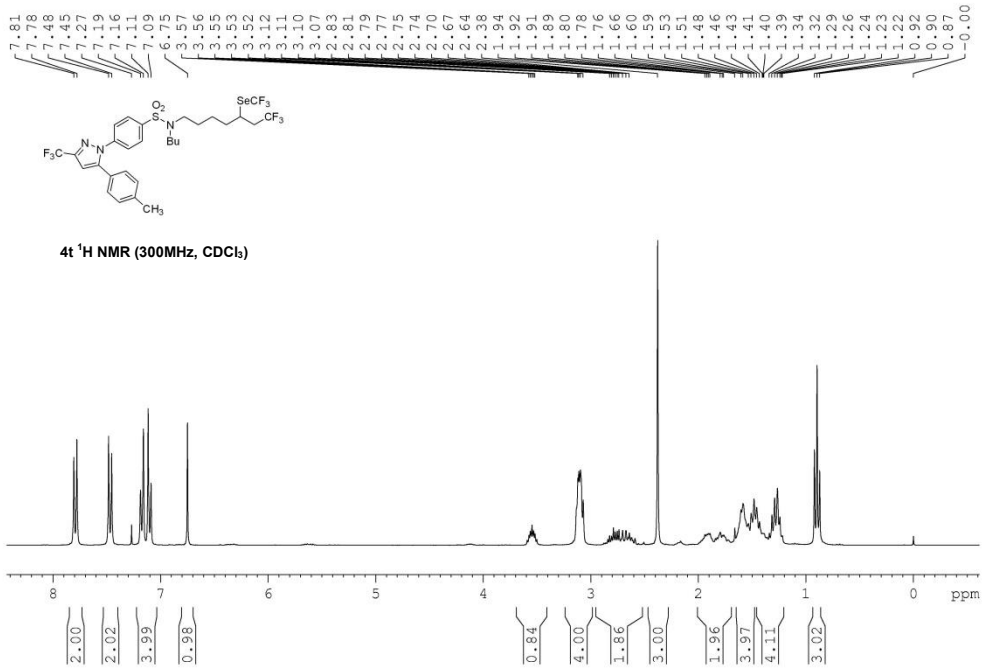




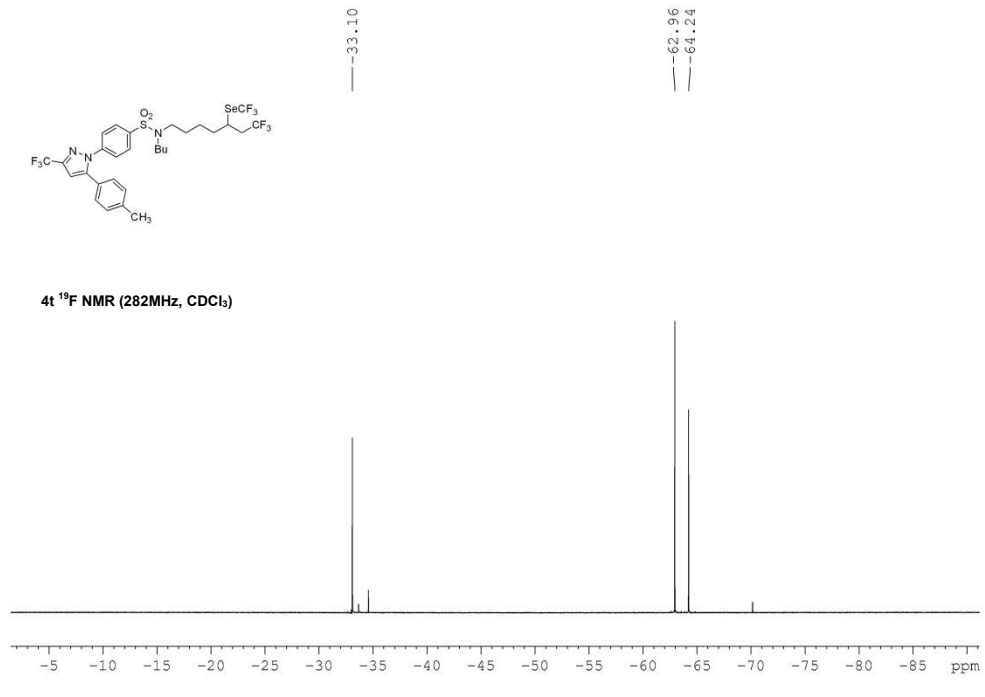
4s ^{19}F NMR (282MHz, $CDCl_3$)



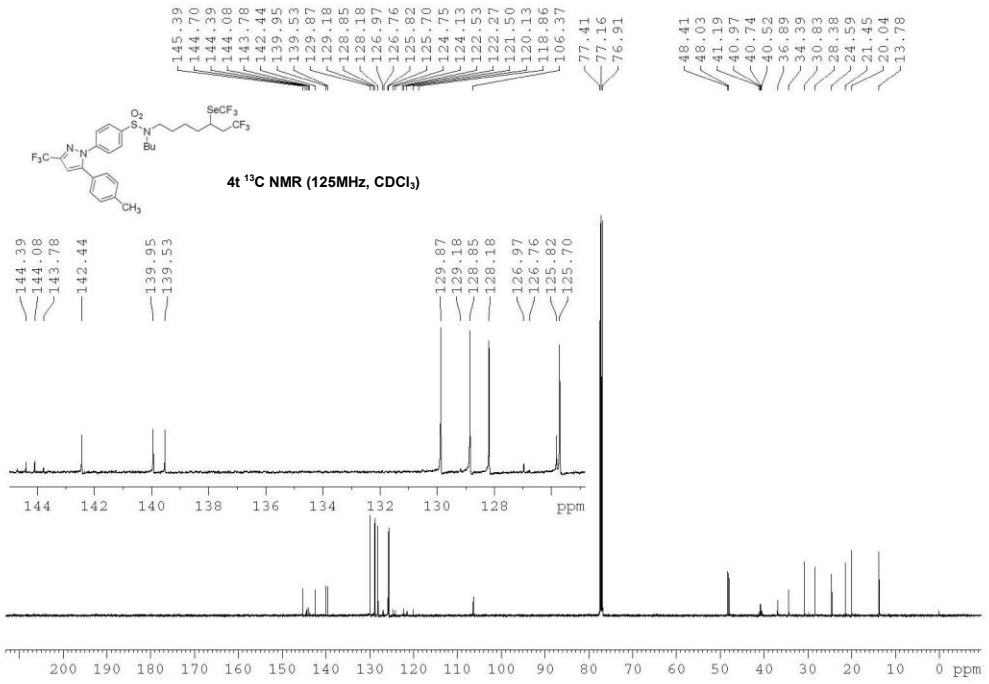
4s ^{13}C NMR (125MHz, $CDCl_3$)



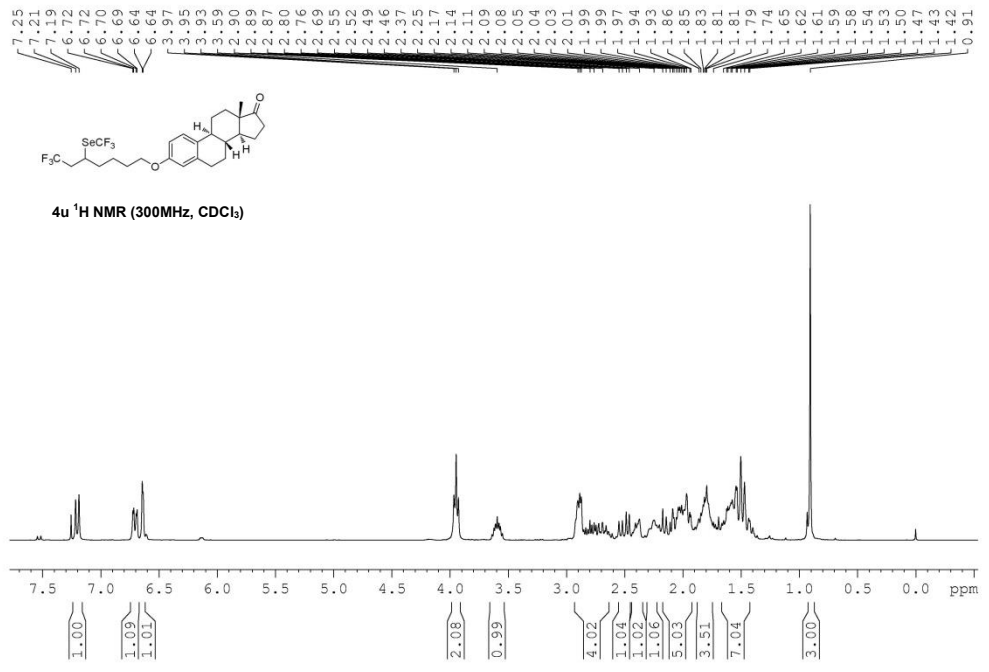
4t ^{1}H NMR (300MHz, $CDCl_3$)



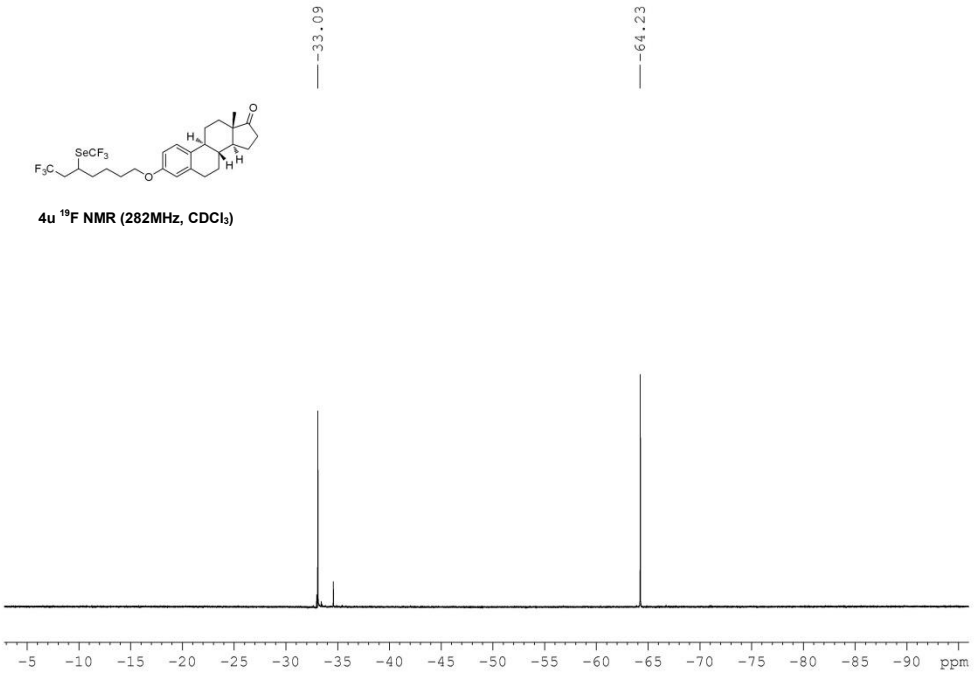
4t ^{19}F NMR (282MHz, $CDCl_3$)



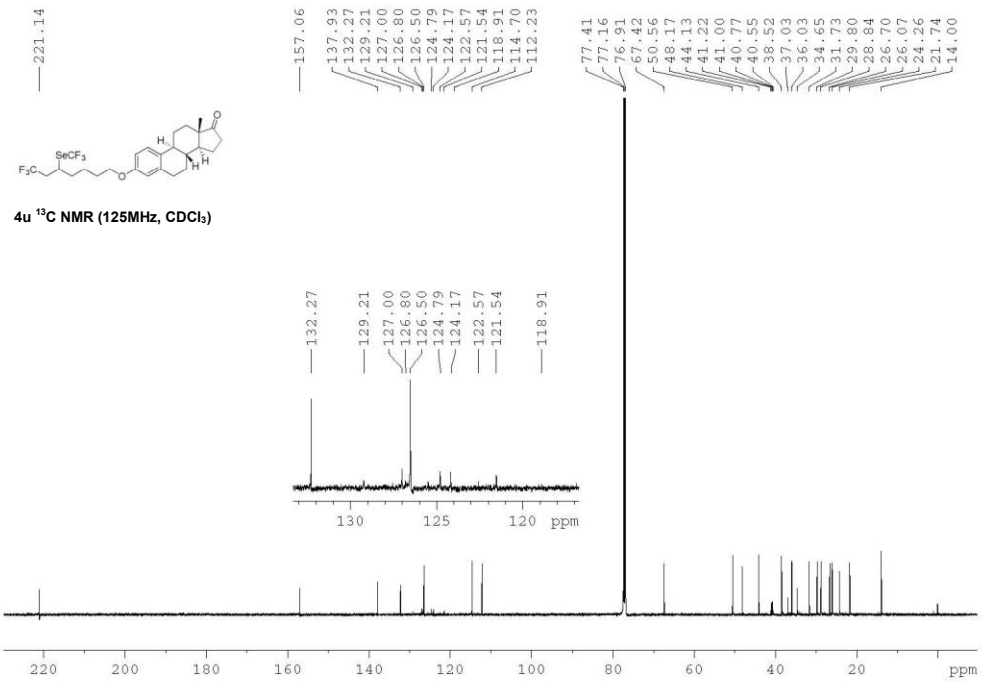
4t ^{13}C NMR (125MHz, $CDCl_3$)



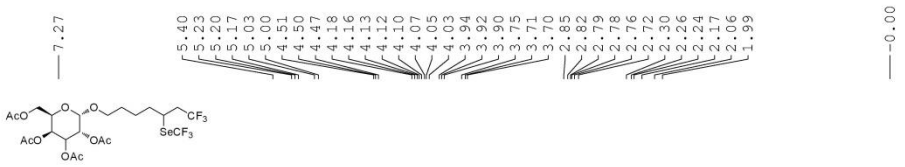
4u ^{1}H NMR (300MHz, $CDCl_3$)



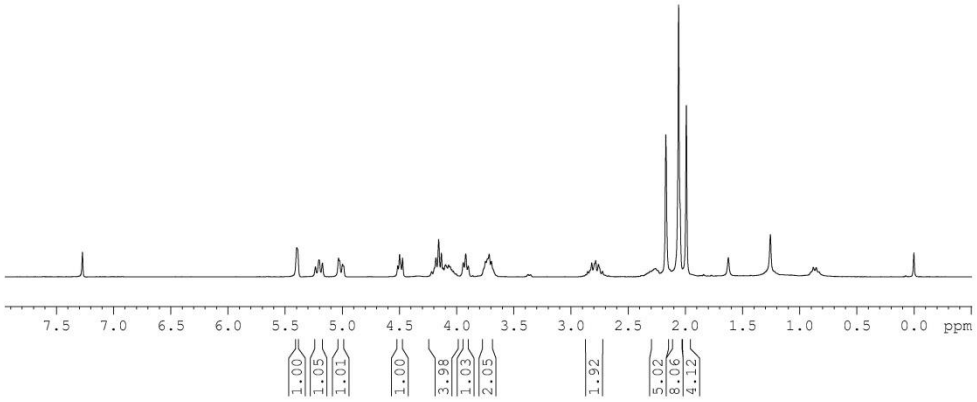
4u ^{19}F NMR (282MHz, $CDCl_3$)



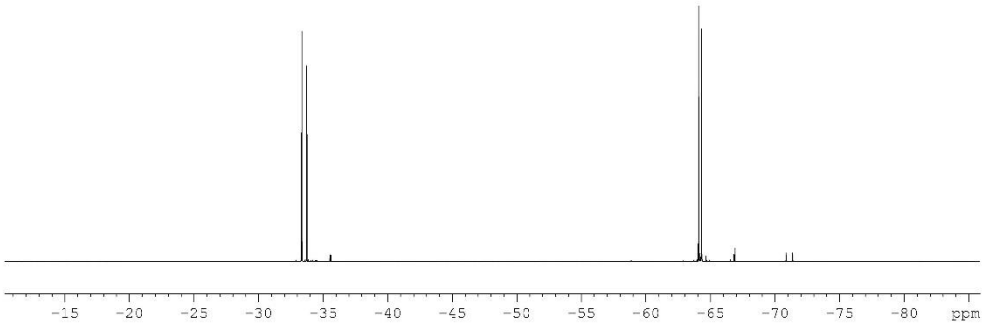
4u ^{13}C NMR (125MHz, $CDCl_3$)

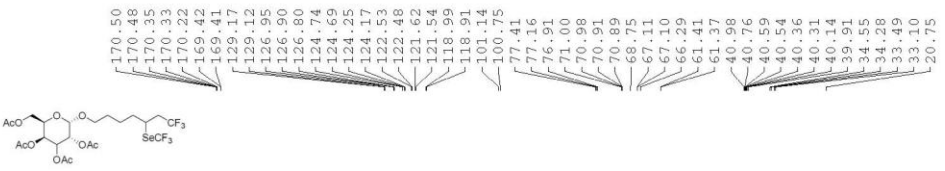


4v ^{1}H NMR (300MHz, CDCl$_3$)

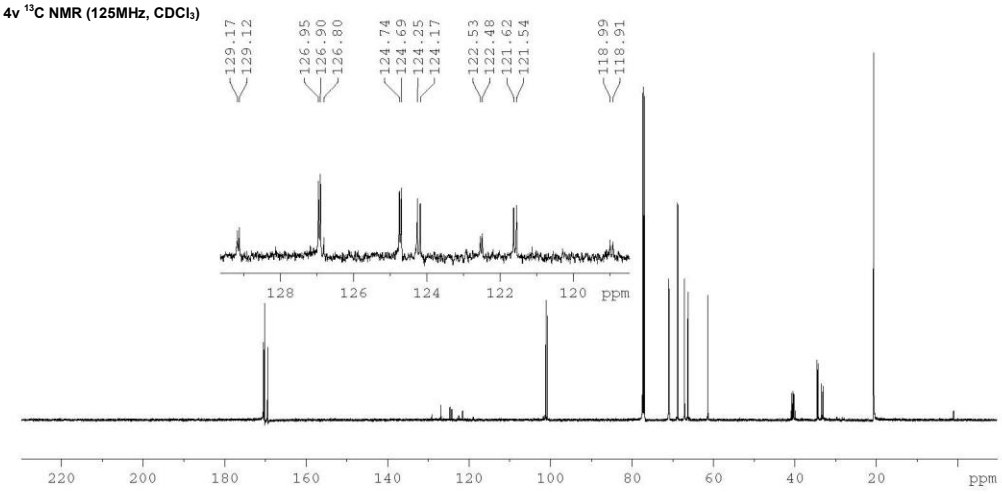


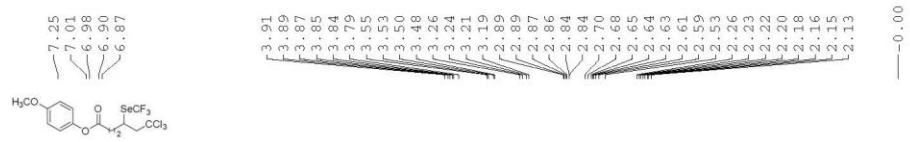
4v ^{19}F NMR (282MHz, CDCl$_3$)



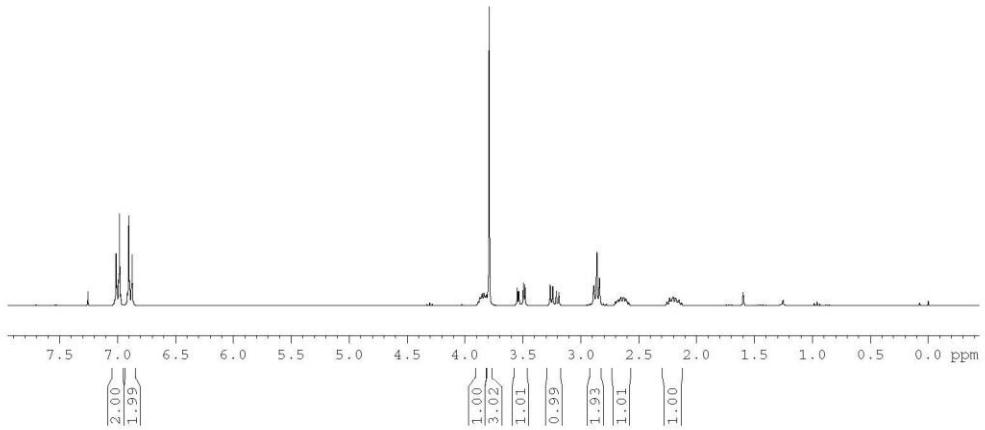


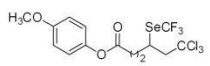
4v ^{13}C NMR (125MHz, CDCl$_3$)



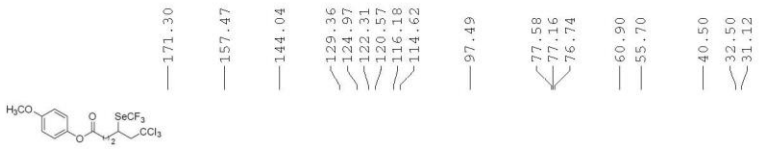


5a ^{1}H NMR (300MHz, CDCl$_3$)

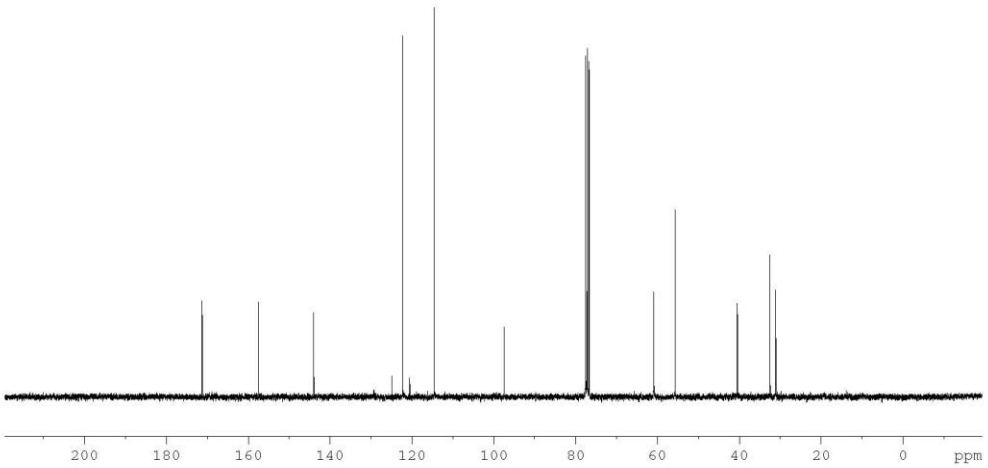


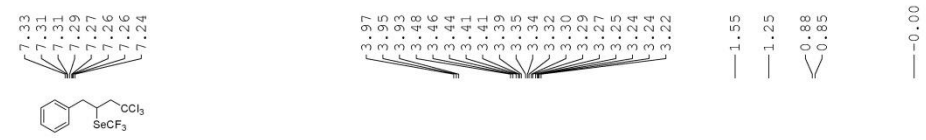


5a ^{19}F NMR (282MHz, $CDCl_3$)

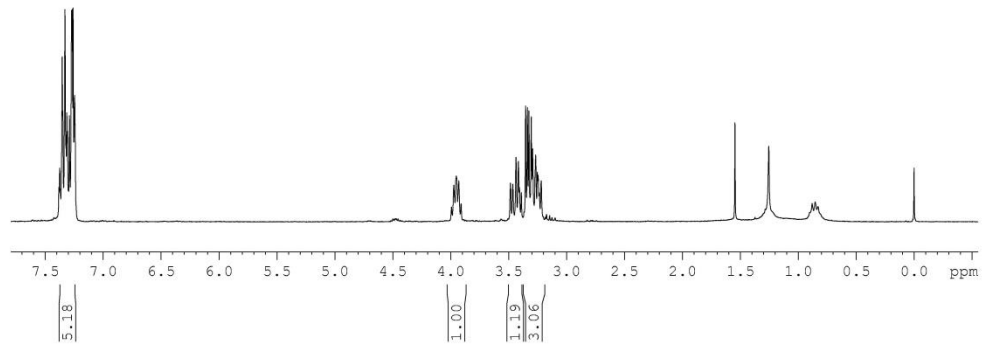


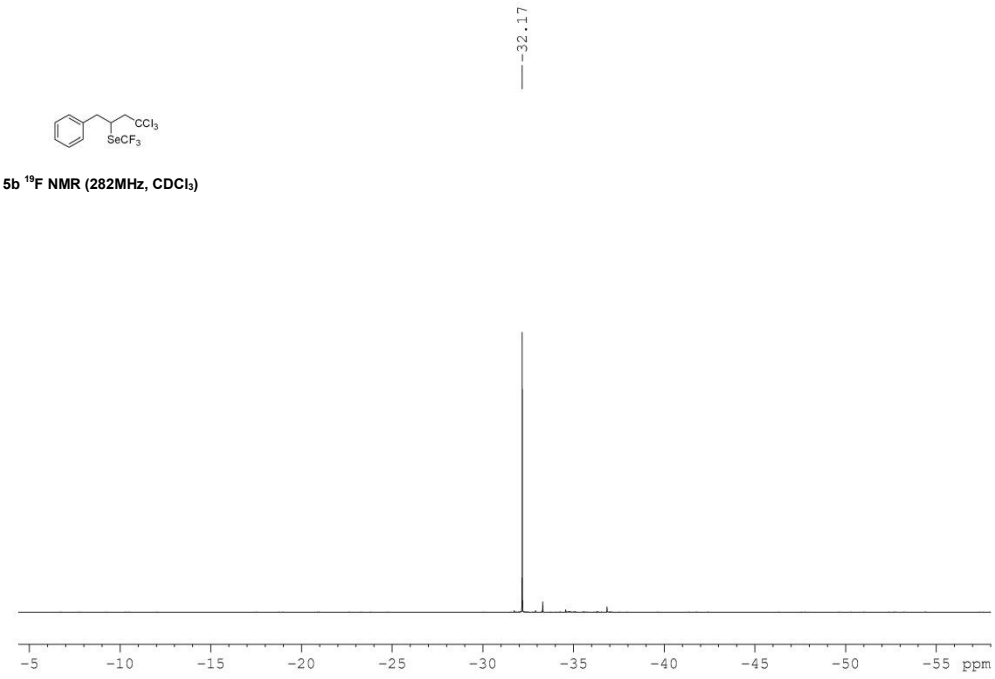
5a ^{13}C NMR (75MHz, $CDCl_3$)



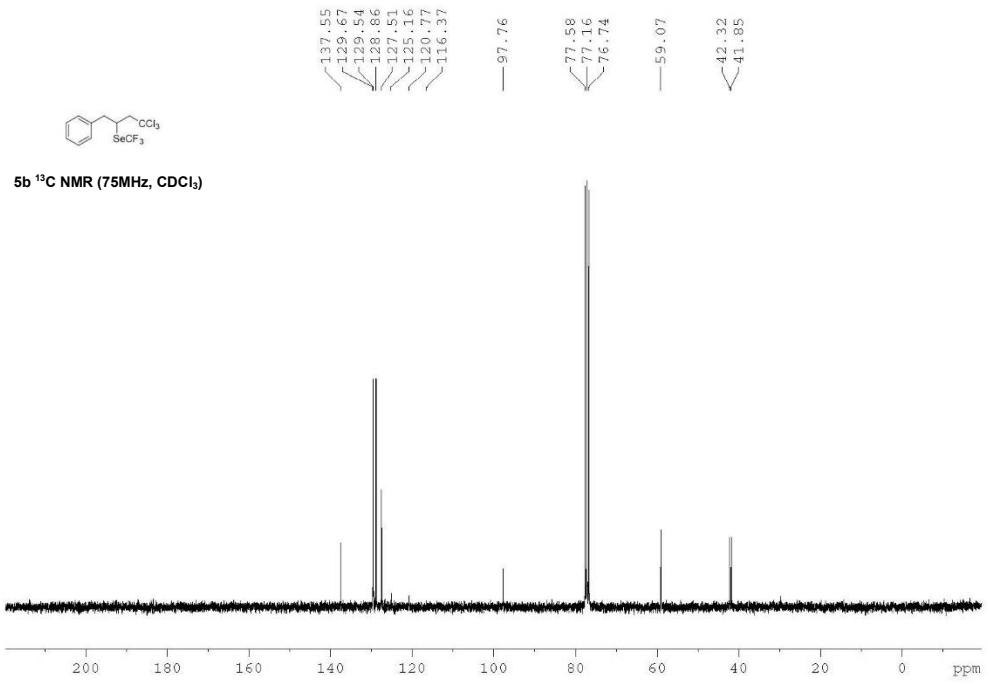


5b ^{1}H NMR (300MHz, $CDCl_3$)





5b ^{19}F NMR (282MHz, $CDCl_3$)



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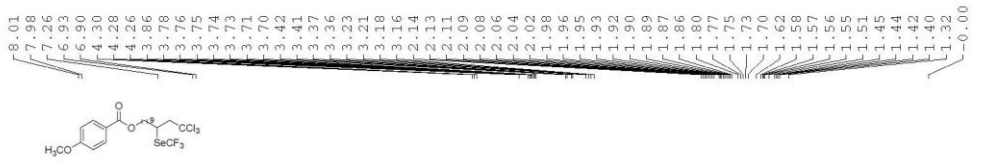
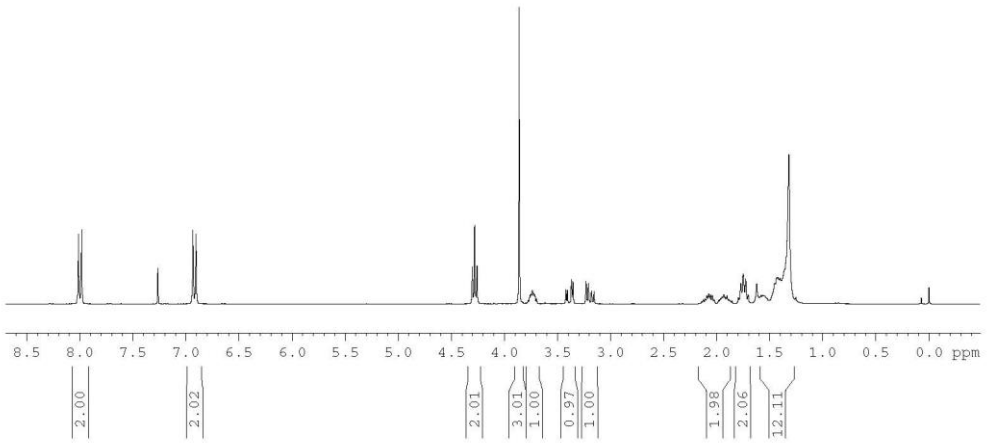
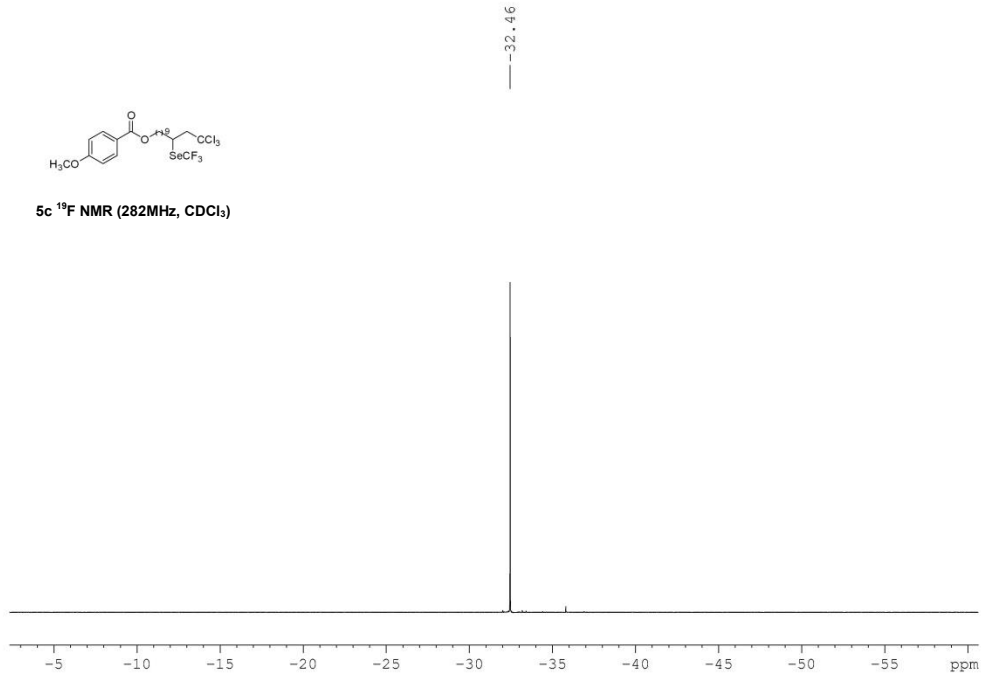
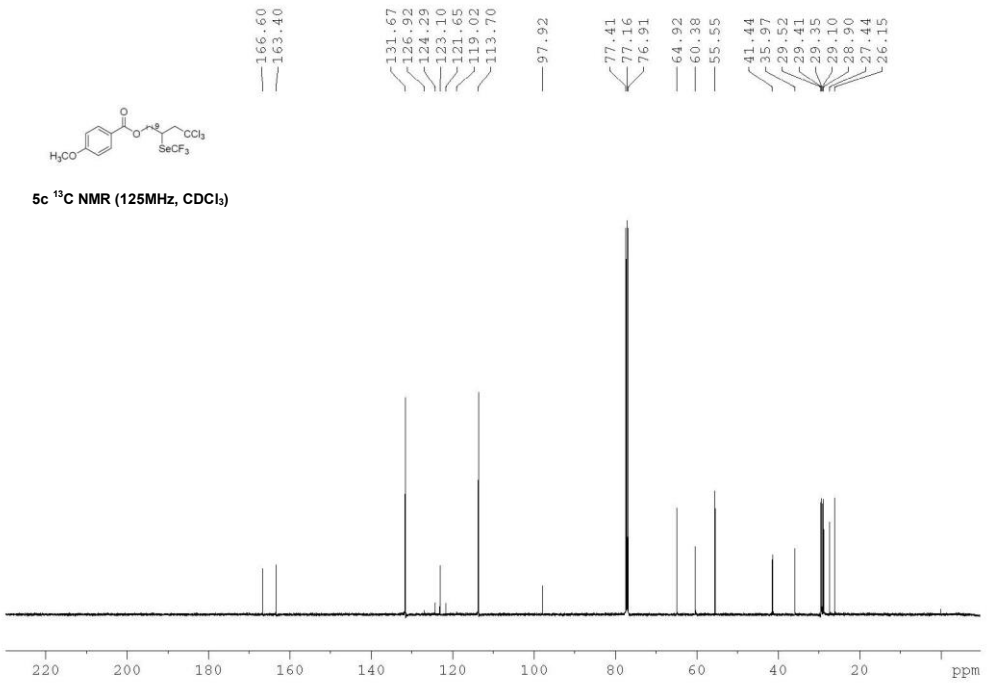


5c ^{1}H NMR (300MHz, $CDCl_3$)





5c ^{19}F NMR (282MHz, $CDCl_3$)



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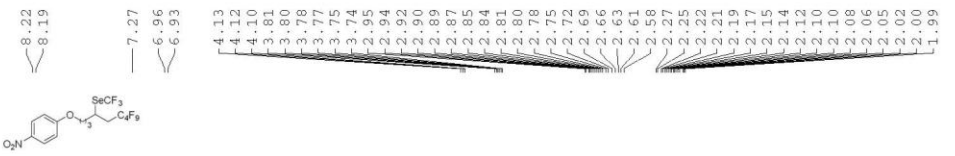

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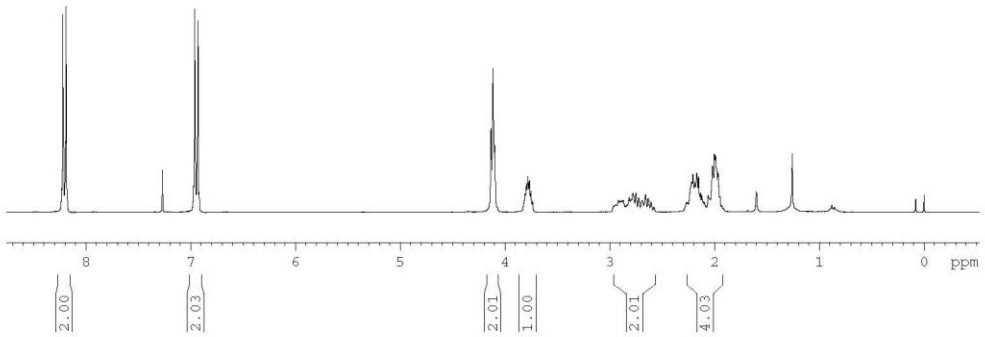
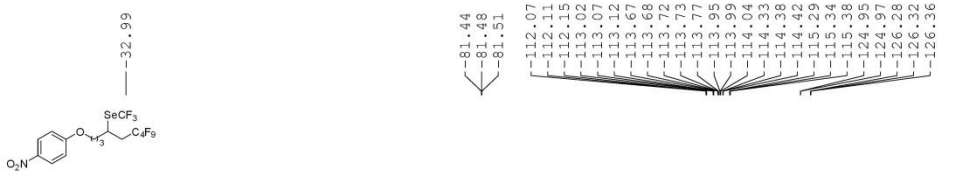
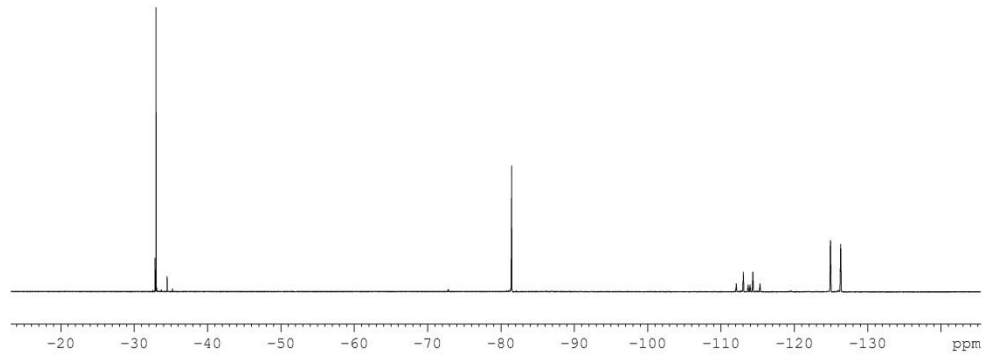
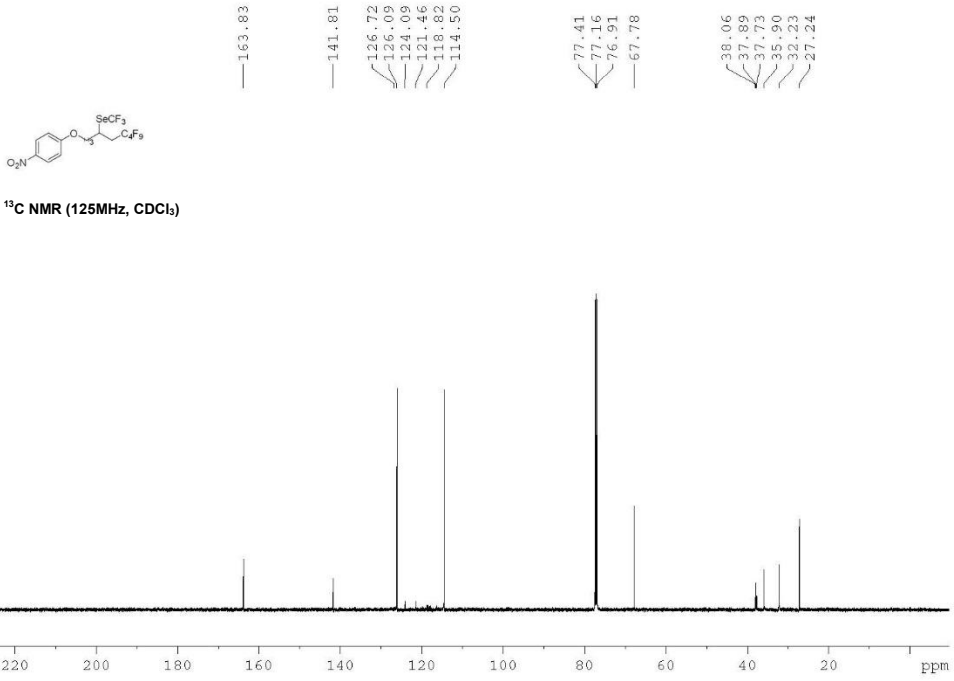




5d ^{19}F NMR (282MHz, $CDCl_3$)





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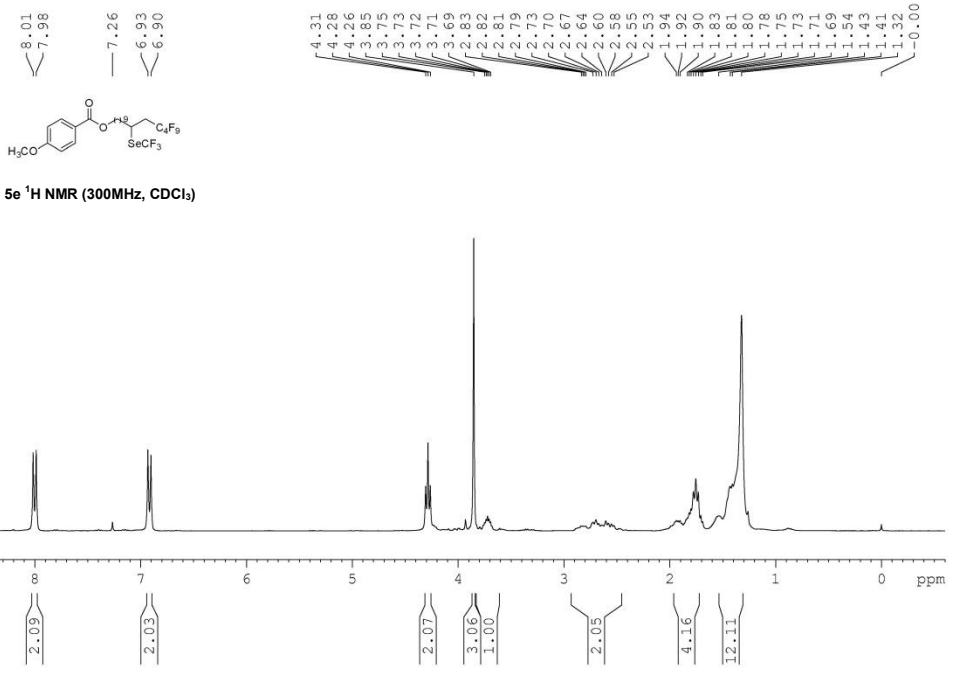

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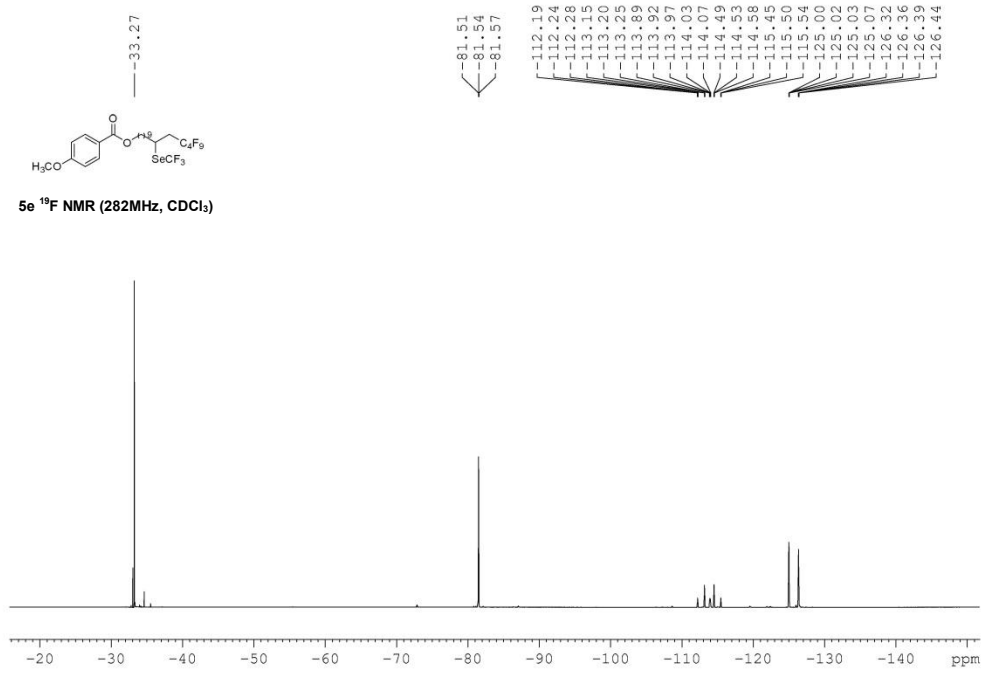

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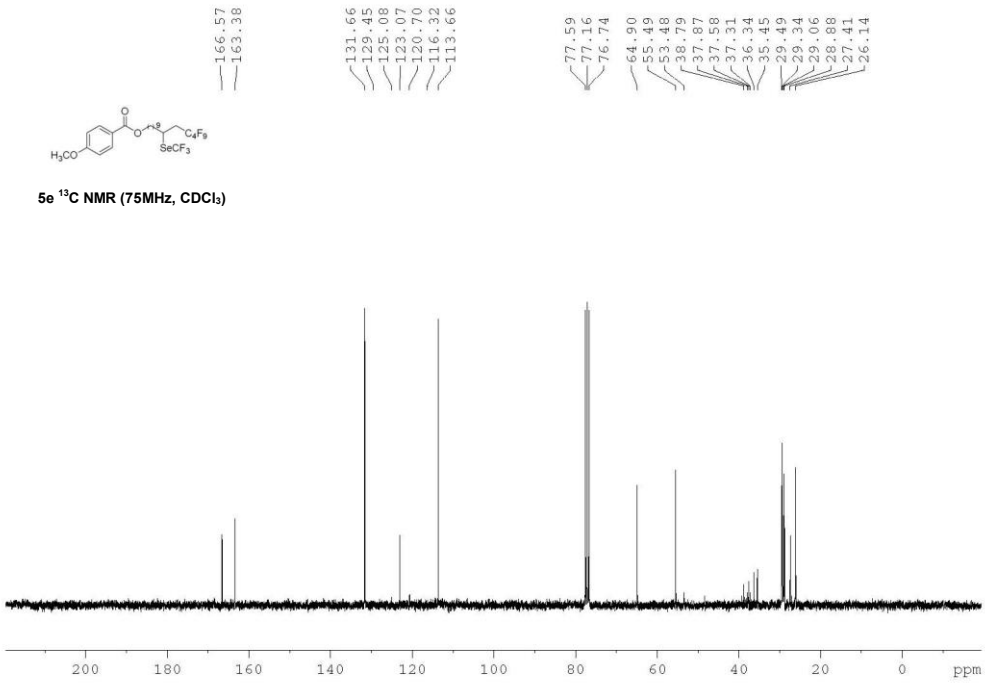
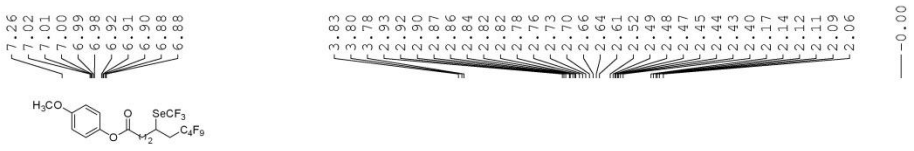


5e ^{13}C NMR (75MHz, $CDCl_3$)



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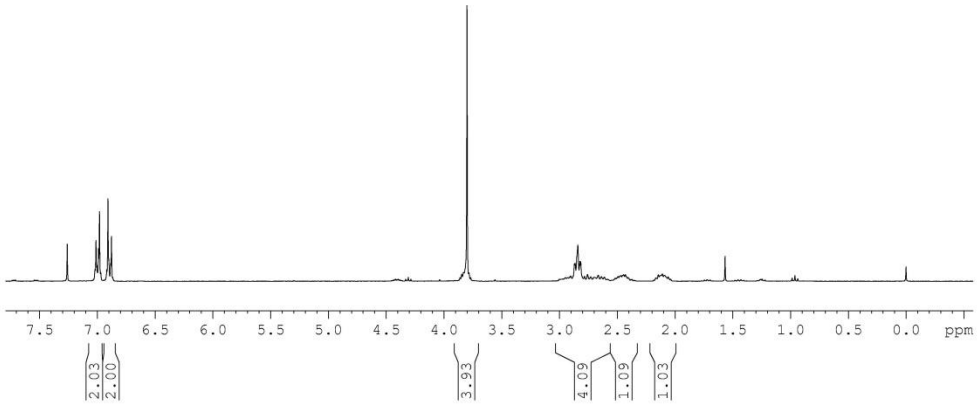

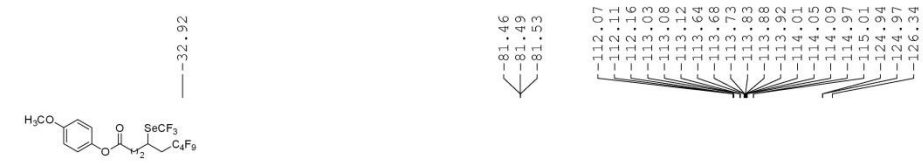

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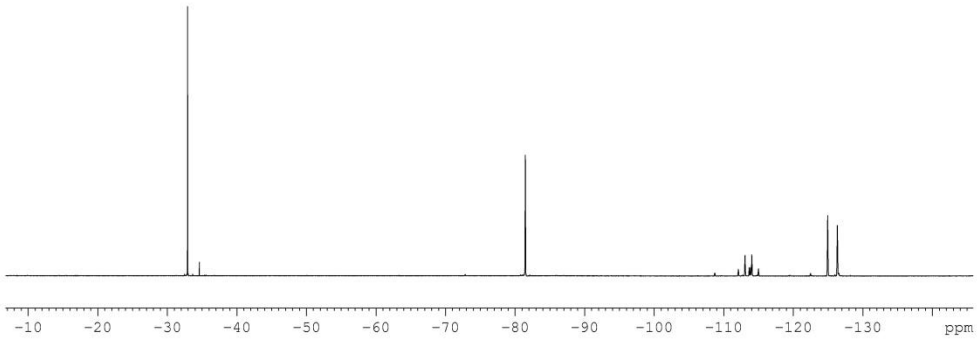
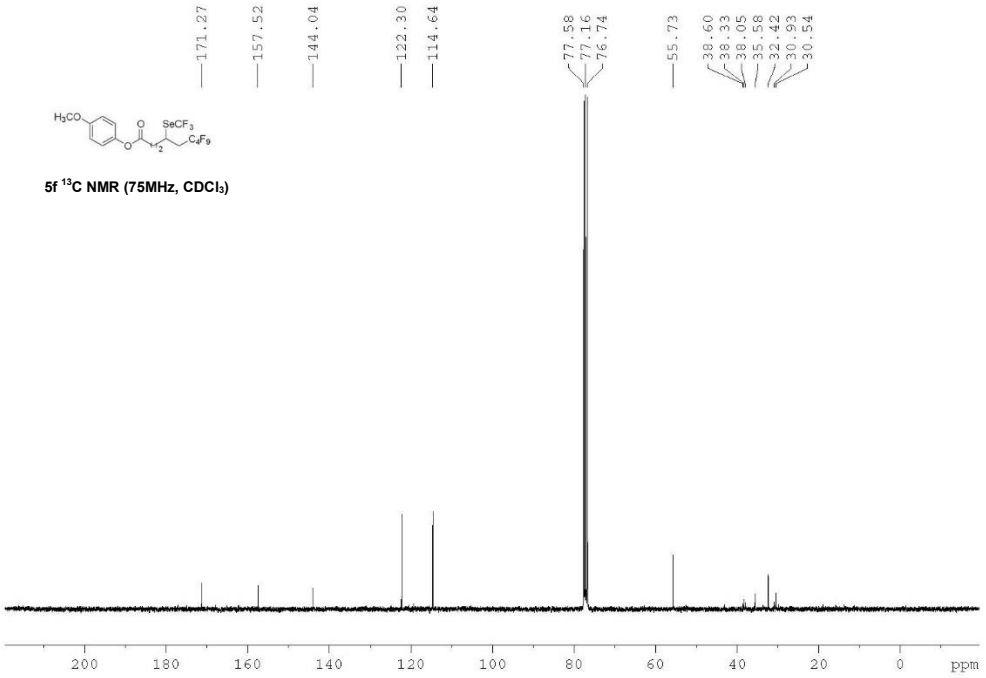
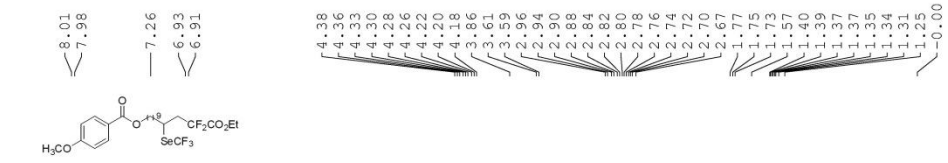




5f ^{13}C NMR (75MHz, $CDCl_3$)



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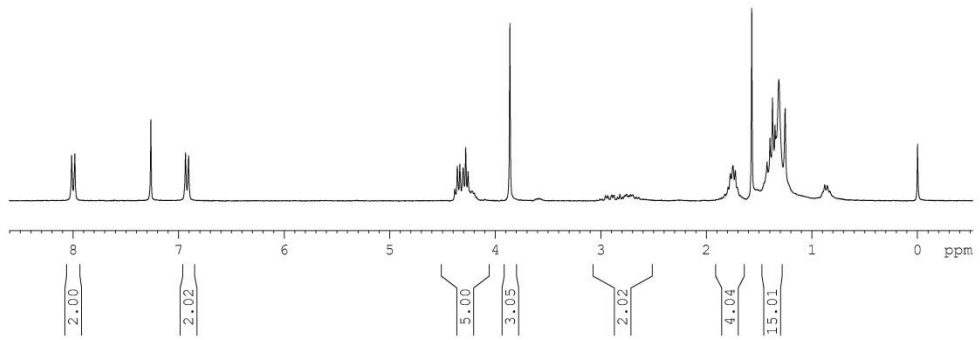

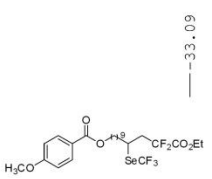

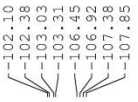

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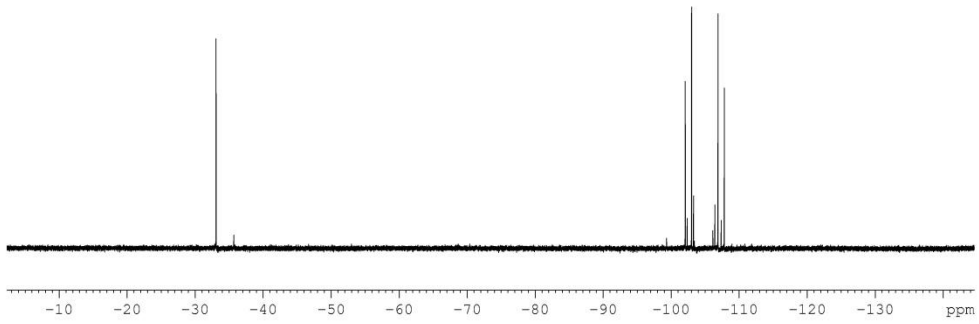
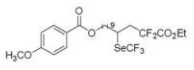
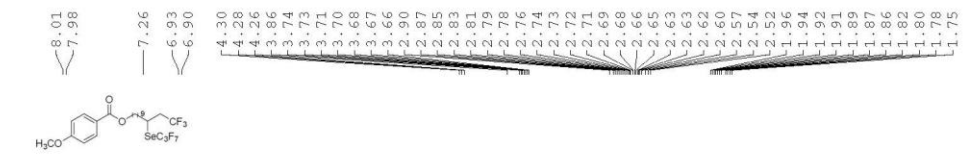




5g ^{13}C NMR (75MHz, $CDCl_3$)



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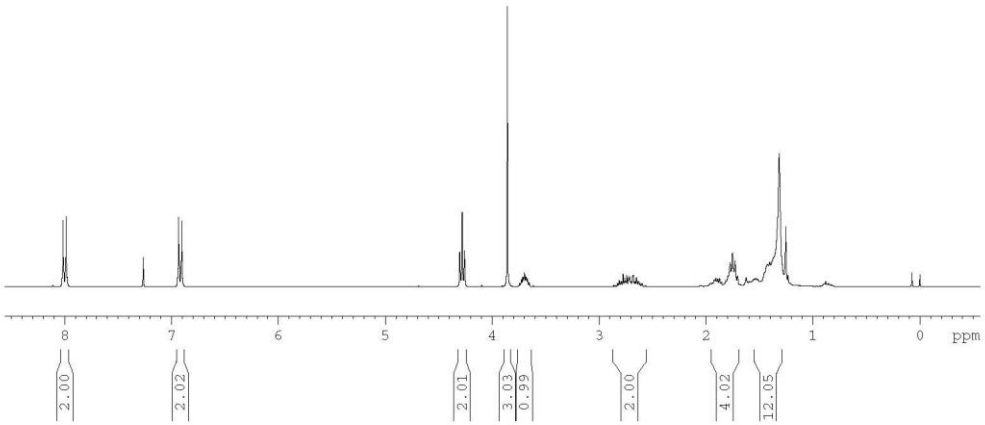
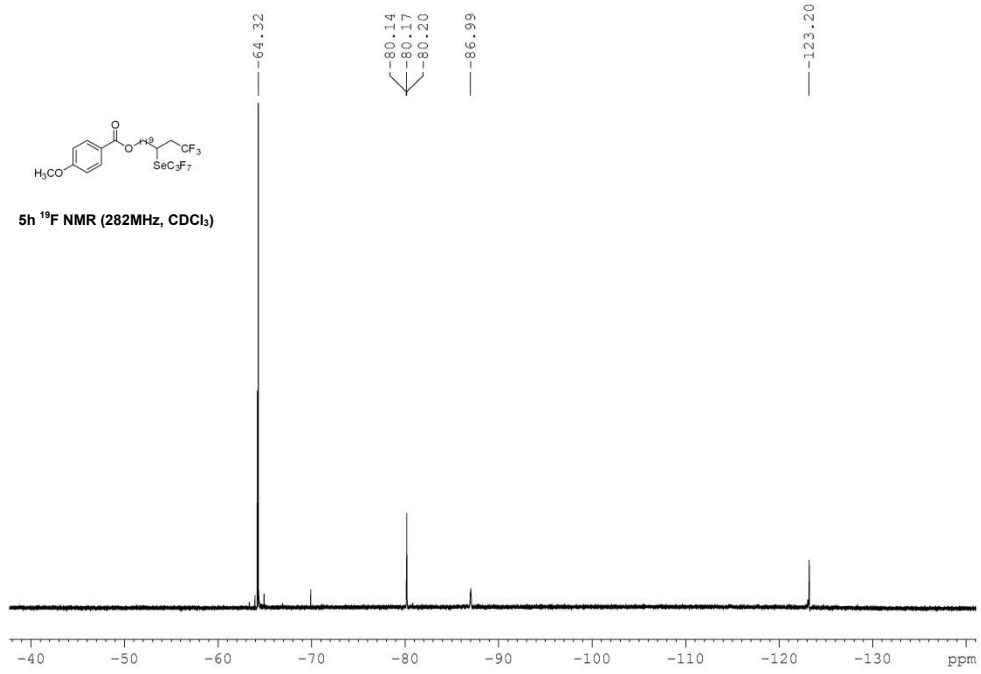
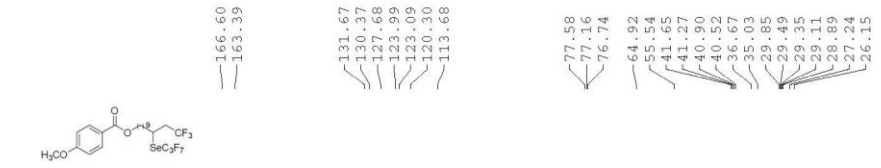




5h ^{19}F NMR (282MHz, $CDCl_3$)



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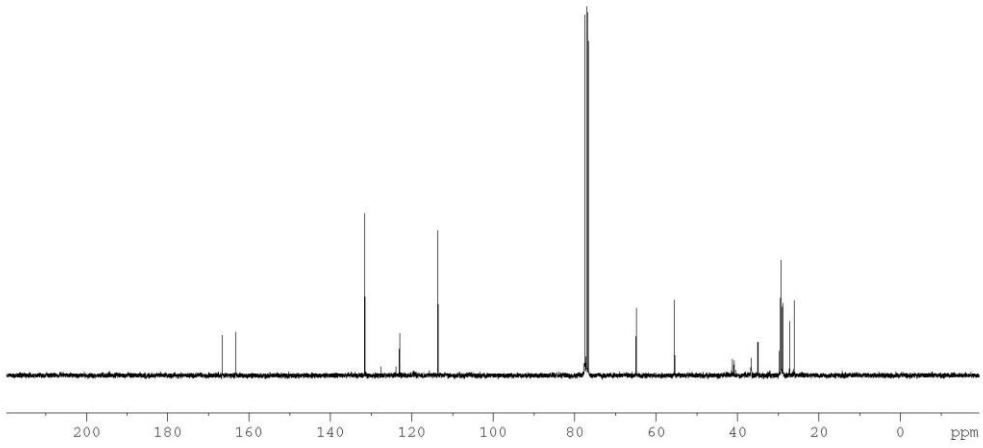
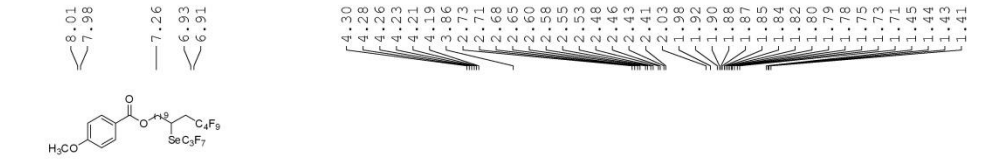
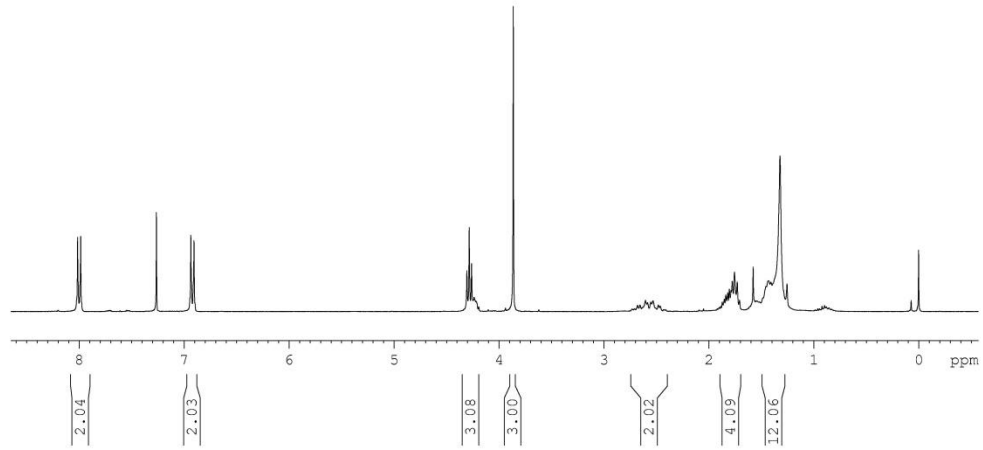
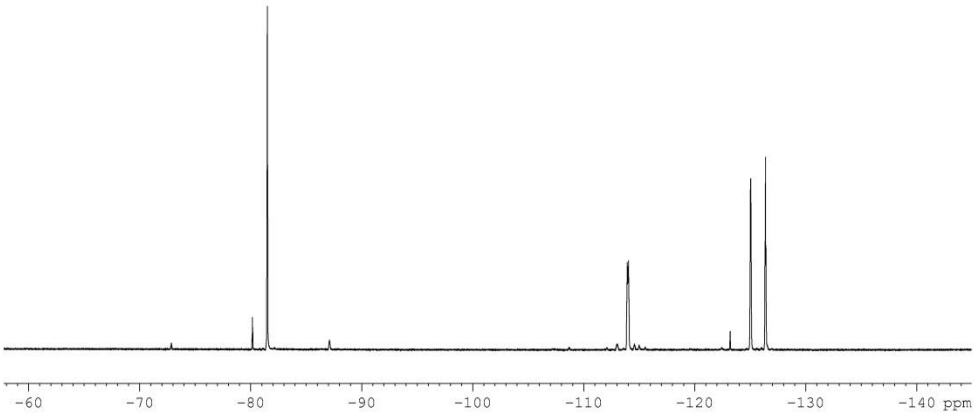


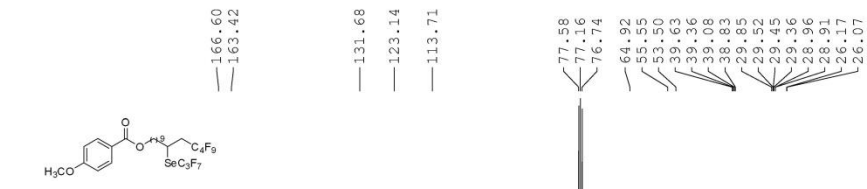


5i ^{1}H NMR (300MHz, $CDCl_3$)

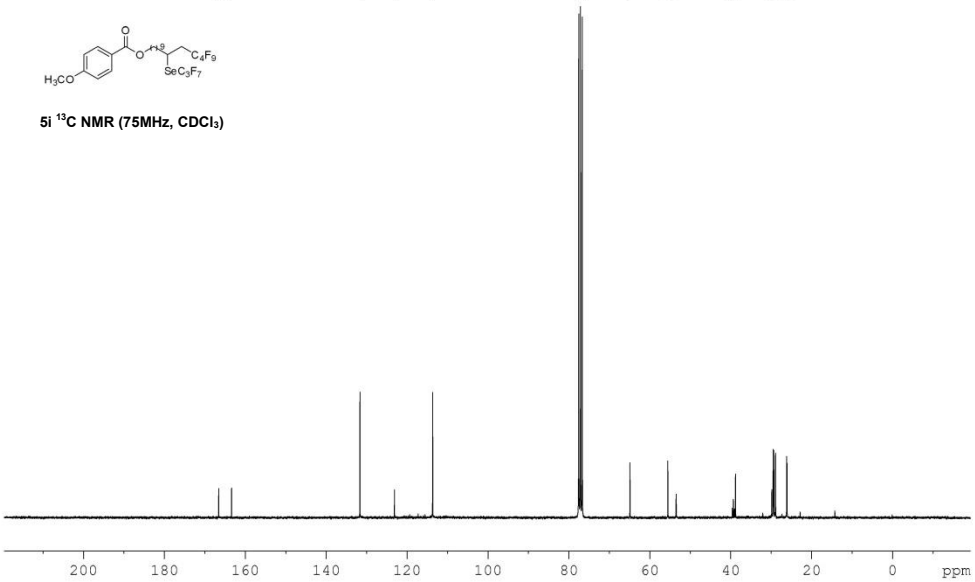


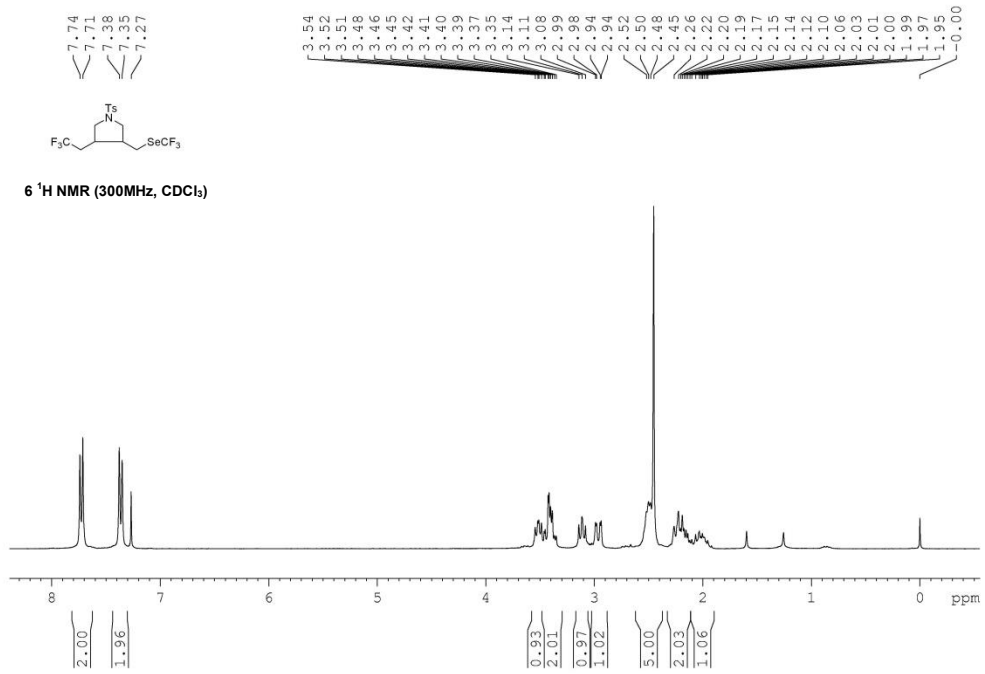
5i ^{19}F NMR (282MHz, $CDCl_3$)





5i ^{13}C NMR (75MHz, $CDCl_3$)





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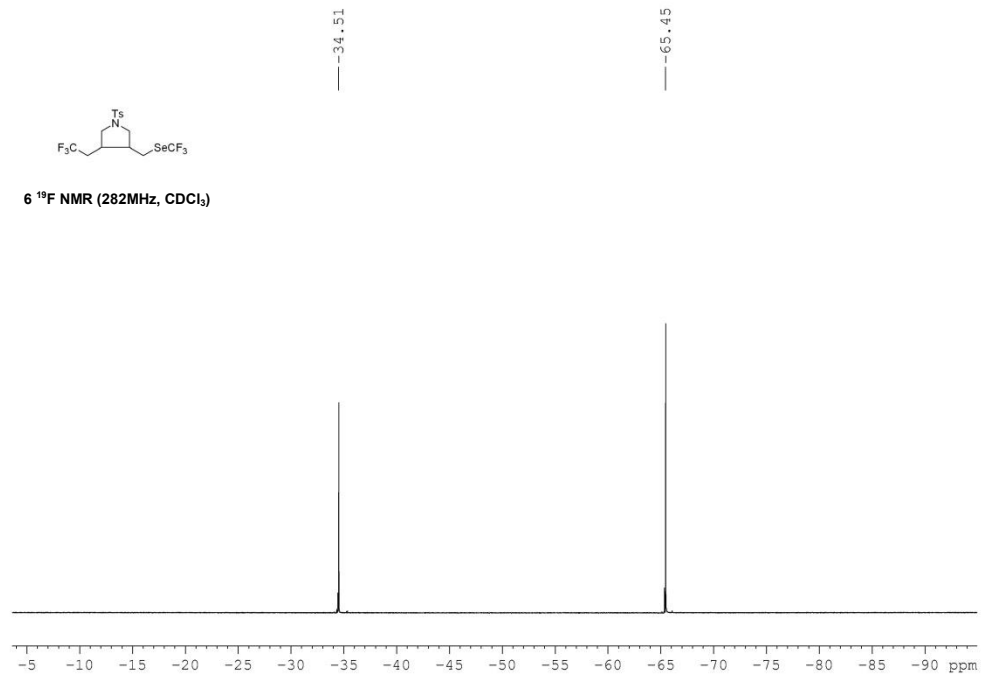
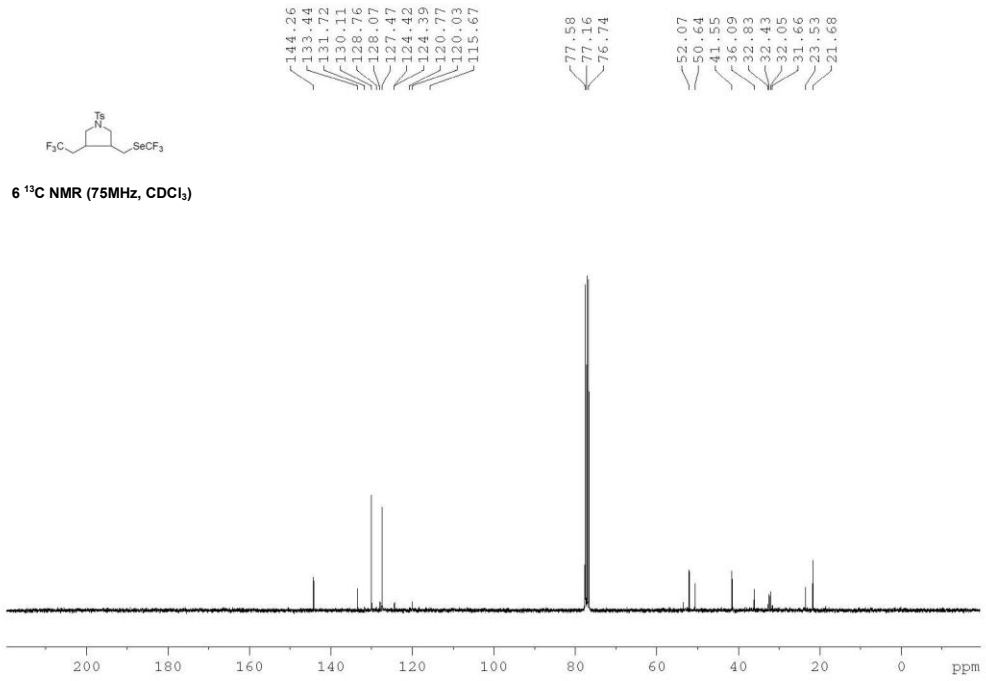


6 ^{19}F NMR (282MHz, $CDCl_3$)



6 ^{13}C NMR (75MHz, $CDCl_3$)

7. References

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