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Supporting Information

Divergent synthesis of unique trifluoromethyl alcohols through Lewis acid-catalyzed anti-Meinwald rearrangement

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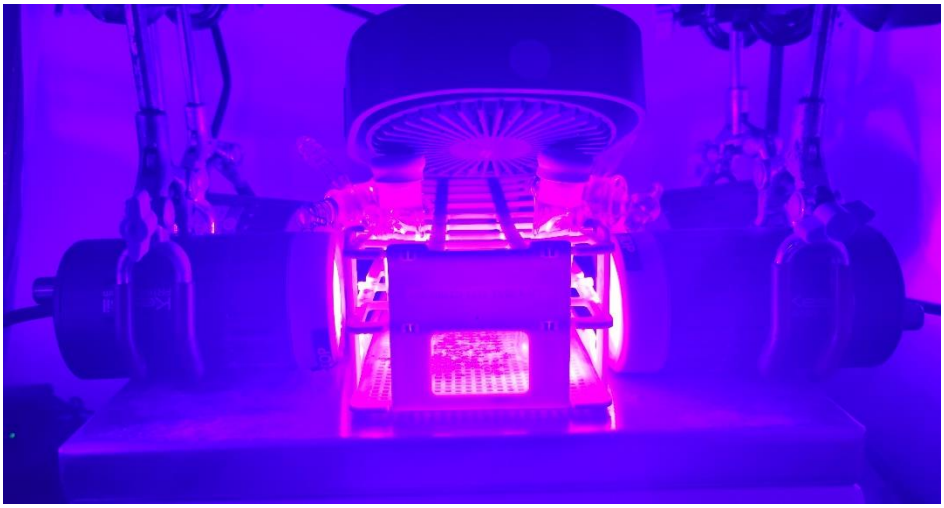
1. Materials and methods

Commercial reagents were used without purification and reactions were run under Ar atmosphere with exclusion of moisture from reagents using standard techniques for manipulating air-sensitive compounds. All reactions, unless noted, were performed in oven-dried glassware with magnetic stirring under an inert atmosphere of dry argon.

^{1}H NMR spectra (500 MHz), ^{13}C NMR spectra (126 MHz) and ^{19}F NMR spectra (376 MHz) were recorded using Bruker Avance 500 spectrometer with $CDCl_3$, DMSO-d_6 as solvent. NMR spectra were calibrated using the solvent residual signals ($CDCl_3$: δ ^{1}H = 7.26, δ ^{13}C = 77.16; DMSO-d_6: δ ^{1}H = 2.50, δ ^{13}C = 39.52). Chemical shifts (δ) were expressed in ppm and coupling constants (J) in Hertz (Hz). Splitting patterns are reported as: s (singlet), d (doublet), t (triplet), q (quadruplet), p (pentuplet), dd (doublet of doublet), dt (doublet of triplet), m (multiplet), br (broad single) or combinations thereof. Integration of the signals is presented as the number of hydrogen atoms. Thin layer chromatography (TLC) was performed using MilliporeSigma glass TLC plates (silica gel 60 coated with F_{254}, 250 μm) and spots were visualized using UV light (254 nm). SiliaFlash® P60 silica gel (particle size: 40-63 μm, pore size: 60 Å) was used for flash column chromatography. A hexane/EtOAc solvent system was used as mobile phase and commercial silica cartridges (12-80 g, Grace®) as stationary phase. High-resolution mass spectra (HRMS) were recorded on an Agilent MSD-Trap-XCT or Q-Tof micro mass spectrometer. were recorded on a Thermo Fisher Scientific Q-Exactive-GC. Ultraviolet-visible absorption experiments were performed using a Metash UV-8000S(T) spectrophotometer. Kessil lamps were purchased from Tansoole, with precise wavelengths (427 nm). Trifluoromethyl ketones, DBU or other base were purchased from Bide Pharm, Tansoole, Fisher, Adamas, TCI or Energy Chemical and used without further purification.

2. Setup for photochemical reactions

The reaction setup is depicted in **Figure S1**. The reaction setup consists of commercially available Kessil lamps which were purchased from Tansoole, with precise wavelengths (427 nm), cooling of the setup was performed by two commercially available fans to keep the temperature around 30 °C. Magnetic stirring was performed at 500 rpm.

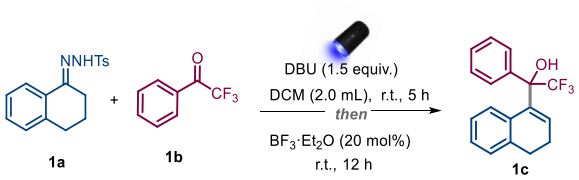


• **Figure S1.** Kessil reaction setup. reaction was performed under room temperature controlled by fans.

3. Optimization of reaction conditions

Screening of reaction conditions

Control experiments



Entry	Controlled parameter	Yield [%][a,b]
1	Standard conditions	85
2	No light	n.d.
3	No base	n.d.
4	$BF_3{\cdot}Et_2O$ 10 mol%.	70
5	$BF_3{\cdot}Et_2O$ 300 mol%	89
6	No Lewis acids	n.d.

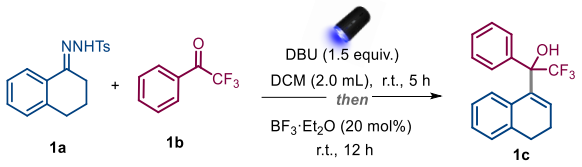
Table S1: a: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) in 2.0 mL **DCM** (0.1 M), **DBU** (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%). room temperature (r.t.), 12 h. **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

Screening of Lewis acids

Entry	Lewis acids	Yield [%][a,b]
1	BBr_3	93
2	BCl_3	90

Table S2: a: Reaction conditions: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) in 2.0 mL **DCM** (0.1 M), DBU (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%). room temperature (r.t.), 12 h. **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected. **Note:** Although BCl_3 and BBr_3 afforded slightly higher yields than $BF_3{\cdot}Et_2O$ in this reaction, $BF_3{\cdot}Et_2O$ was selected as the optimal Lewis acids owing to its superior handling properties, commercial availability, and operational safety.

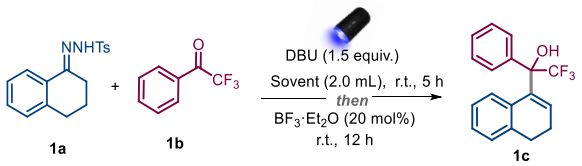
Screening of concentration



Entry	Concentration	Yield [%][a,b]
1	0.8 M	65
2	0.6 M	72
3	0.2 M	75
4	0.1 M	85

Table S3 a: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) in 2.0 mL DCM (0.1 M), DBU (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%). room temperature (r.t.), 12 h. **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

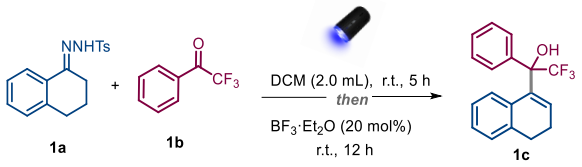
Screening of solvents



Entry	Solvents	Yield [%][a,b]
1	ACN	87
2	EA	89
3	THF	89
4	DMSO	n.d.

Table S4 a: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) in 2.0 mL DCM (0.1 M), DBU (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%), room temperature (r.t.), 12 h. **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

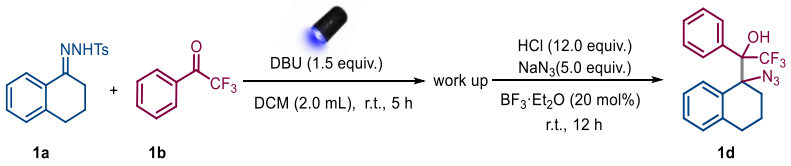
Screening of reaction time



Entry	Reaction time (h)	Yield [%][a,b]
1	2	44
2	4	55
3	6	67
4	8	73
5	10	76
6	12	85

Table S5 a: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) 1**b** (0.3 mmol, 2.0 equiv), DBU (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%). room temperature (r.t.). **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

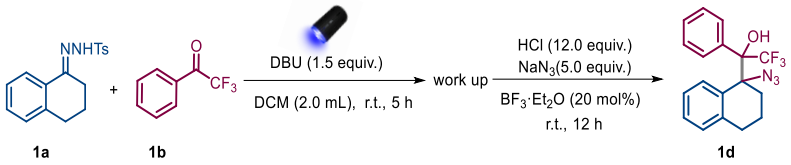
Screening of nucleophilic addition of carbocation reaction



Entry	Controlled parameter	Yield [%][a,b]
1	Standard conditions	76
2	H_2O	15
3	HCl 1.0 equiv.	n.d.
4	HCl 5.0 equiv.	52
5	HCl 9.0 equiv.	69
6	CH_3COOH	n.d.
7	H_3PO_4	n.d.
8	H_3BO_3	25
9	NaN_3 2.0 equiv.	40
10	NaN_3 8.0 equiv.	78

Table S6 a: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) 1**b** (0.3 mmol, 2.0 equiv), DBU (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%). room temperature (r.t.). **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

Screening of nucleophilic addition of carbocation reaction

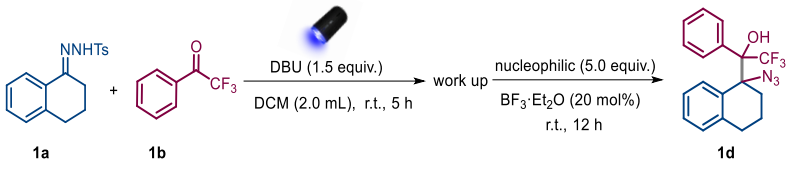


1a 1b 1d

Entry	Controlled parameter	Yield [%][a,b]
1	Standard conditions	76
2	H_2O	15
3	HCl 1.0 equiv.	n.d.
4	HCl 5.0 equiv.	52
5	HCl 9.0 equiv.	69
6	CH_3COOH	n.d.
7	H_3PO_4	n.d.
8	H_3BO_3	25
9	NaN_3 2.0 equiv.	40
10	NaN_3 8.0 equiv.	78

Table S7 a: Reaction conditions: **1a** (0.2 mmol, 1.0 equiv.) 1**b** (0.3 mmol, 2.0 equiv), DBU (0.3 mmol, 1.5 equiv.), $BF_3{\cdot}Et_2O$ (20 mol%). room temperature (r.t.). **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

Screening of nucleophilic



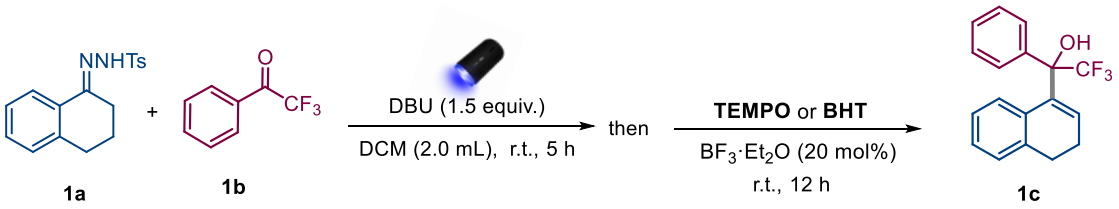
1a 1b 1d

Entry	Nucleophile	Yield [%][a,b]
1	Dimethyl sulfide (DMS)	n.d.
2	Trimethylphosphine (PMe_3)	n.d.
3	Sodium borohydride ($NaBH_4$)	n.d.
4	Sodium thiocyanate (NaSCN)	n.d.
5	Potassium thiocyanate (KSCN)	n.d.
6	Trimethylsilyl cyanide (TMSCN)	n.d.
7	Sodium chloride (NaCl)	n.d.
8	Sodium methoxide (NaOMe)	n.d.
9	1-Methylindole	n.d.
10	NaN_3	Desired product

Table S8 a: Standard conditions: **1a** (0.2 mmol, 1.0 equiv.), Nucleophile (5.0 equiv.), $BF_3 \cdot Et_2O$ (20 mol%). room temperature. **b:** Yields were determined by ^1H NMR using 1,3,5-trimethoxybenzene as the internal standard. n.d. = not detected.

Quenching experiments

The reaction was operated under standard conditions with extra 2,2,6,6-tetramethyl-1 piperinedinyloxy (TEMPO) or Butylated Hydroxytoluene (BHT), and the yields were not significantly inhibited, indicating that the reaction was not proceeding through radical mechanism.



1a 1b 1c

Entry	Quencher (3.0 equiv.)	Yield [%][a]
1	TEMPO	63
2	BHT	69

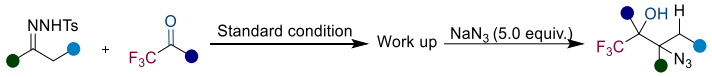
[a]Yield was determined by 1H NMR with 1,3,5-trimethoxybenzene as the internal standard.

4. General procedures for synthesizing products and starting material

4.1 General procedure for the synthesis of trifluoromethyl alcohols/ketones (Procedure A)

A dry 5 mL Schlenk tube containing a stirring bar was charged with 0.2 mmol of *N*-tosylhydrazone (1.0 equiv.), 0.4 mmol of trifluoroacetophenone (2.0 equiv.). After purging the flask three times under vacuum and three times under argon, it was charged with 0.15 mmol of DBU (1.5 equiv.) and DCM (2.0 mL) successively. The reaction was kept for 5 h under 40 W Kessil lamp reaction setup (the progress can be monitored *via* TLC). The resulting mixture was then subjected to aqueous treatment (using distilled water, or brine in case of slurry phase separation) and extracted three times with ethyl acetate. The complex organic layer was dried over anhydrous sodium sulfate, filtered, and concentrated in vacuum. Then, $BF_3 \cdot Et_2O$ (20 mol%) was added dropwise in ethyl acetate (2.0 mL) at room temperature, the product was purified by flash chromatography using ethyl acetate and hexane as solvents.

4.2 General procedure for the synthesis of azide-containing trifluoromethyl alcohols (Procedure B)

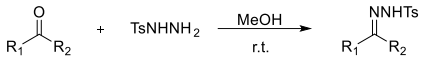


A dry 5 mL Schlenk tube containing a stirring bar was charged with 0.1 mmol of *N*-tosylhydrazone (1.0 equiv.), 0.2 mmol of Trifluoroacetophenone (2.0 equiv.). After purging the flask three times under vacuum and three times under argon, it was charged with 0.15 mmol of DBU (1.5 equiv.), DCM (2.0 mL) successively. The reaction was kept for 5 h under 40 W Kessil lamp reaction setup (the progress can be monitored *via* TLC). The resulting mixture was then subjected to aqueous treatment (using distilled water; or brine in case of slurry phase separation) and extracted three times with ethyl acetate. The combined organic layer was dried over anhydrous sodium sulfate, filtered, and concentrated under vacuum. Then add 1.0 mmol sodium azide (5.0 equiv.), DCM (2.0 mL), 3 M hydrochloric acid solution (12.0 equiv.) to stir in room temperature for 10 minutes, then (1.0 equiv.) boron trifluoride diethyl etherate was added

and the reaction was kept overnight. After usual workup, the residue was purified by flash chromatography over silica gel (petroleum ether/ethyl acetate) to give the desired product.

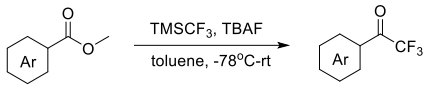
4.3 General procedure for the synthesis of starting material

Synthesis of *N*-tosylhydrazones



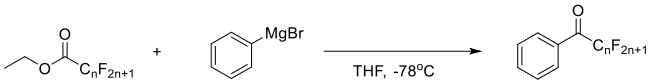
N-tosylhydrazones were prepared according to a reported procedure.[1] To a stirred solution of tosylhydrazide (10 mmol) in MeOH (10 mL) at room temperature, ketone (1.0 equiv.) was added dropwise (or portionwise if solid). The reaction was completed within 0.5-3 h. After that, the solvent was removed directly under reduced pressure, and further purified by recrystallization or *via* silica gel chromatography (hexane/EtOAc = 2:1).

synthesis of trifluoromethyl ketones:



To a solution of methyl 4-methylbenzoate (4.0 mmol, 1.0 equiv.) in toluene (20 mL) was added $TMSCF_3$ (8.0 mmol, 2.0 equiv.) at room temperature under Ar. The reaction mixture was cooled to -78ºC, TBAF (1.0 M in THF, 0.1 equiv.) was then added. After stirring for 0.5 h at -78ºC, the reaction mixture was allowed to warm to room temperature and stirred for a further 12 h. Hydrochloric acid (2.0 M, 1.5 equiv.) was then added and the resulting mixture stirred for a further 2 h. The resulting suspension was quenched with saturated aqueous $NaHCO_3$ and extracted with ethyl acetate. The combined organic layers were dried over Na_2SO_4, filtered, and concentrated. The residue was purified by flash column chromatography to give trifluoromethyl ketones.[2]

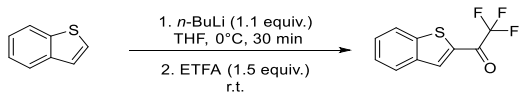
Synthesis of Polyfluoroketones



Under N_2, ArMgBr (4.0 mmol) was added to a solution of corresponding polyfluoroester (6.0 mmol, 1.5 equiv) in THF (2.0 mL) at -78 °C, and the mixture was stirred for 1 h at the same temperature. The reaction mixture was then treated with aqueous NH_4Cl and quenched with DCM. The organic layer was

washed with brine and dried over anhydrous $MgSO_4$. The residue was purified by flash column chromatography to give the corresponding ketones.[2]

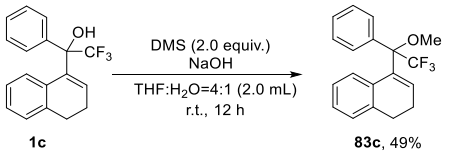
Synthesis of 1-(benzo[b]thiophen-2-yl)-2,2,2-trifluoroethan-1-one



n-BuLi (2.5 M solution in hexanes, 1.2 mL, 2.2 mmol) was added dropwise over 20 min to a stirred solution of thianaphthene (0.2 mL, 2 mmol) in THF (4.0 mL) at 0℃ (ice bath). Once the addition was complete, stirring continued for 30 min before the solution was cooled to -78℃. Ethyl trifluoroacetate (0.35 mL, 3 mmol) was added dropwise at this temperature to the reaction mixture. The solution was then allowed to warm to ambient temperature and stirring was continued overnight. The reaction was quenched with saturated aqueous NH_4Cl and the aqueous layer was extracted with diethyl ether. The combined organic phases were dried over $MgSO_4$, filtered and concentrated. The residue was purified by flash chromatography (hexanes/EtOAc = 100:1) to afford the title compound as a yellow oil (58%, 155 mg). The spectral data were consistent with those previously reported in literature.[3]

4.4 Procedures of post-functionalization

Method A for the transformation of compound 1c



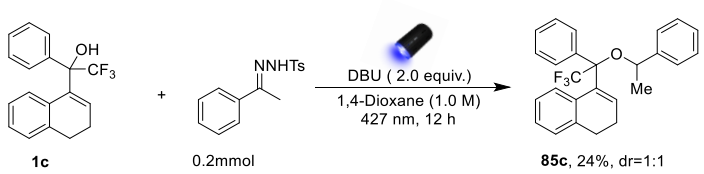
1c **83c**, 49%

A dry 5 mL Schlenk tube containing a stirring bar was charged with 1c (0.2 mmol), DMS (0.4 mmol, 2.0 equiv.), NaOH (0.4 mmol, 2.0 equiv.), THF and water (2.0 mL). The reaction was stirred for 12 h at room temperature. Then the resulting mixture was concentrated in vacuo. The product was purified via column chromatography with ethyl acetate and hexane as solvents.

Method B for the transformation of compound 1c[1]

A dry 5 mL Schlenk tube containing a stirring bar was charged with **1c** (0.2 mmol) and DDQ (0.6 mmol, 3.0 equiv.). After purging the flask three times under vacuum and three times under argon, the tube was charged with anhydrous toluene (2 mL). The reaction was stirred for 5 h at 80℃. Then the resulting mixture was concentrated in vacuo. The product was purified via column chromatography with ethyl acetate and hexane as solvents.

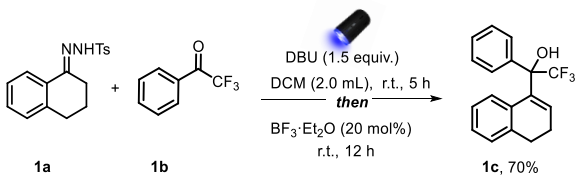
Method C for the transformation of compound 1c



A dry 5 mL Schlenk tube containing a stirring bar was charged with *N*-tosylhydrazone (0.2 mmol, 1.0 equiv.). After purging the flask three times under vacuum and three times under argon, the tube was sequentially charged with 1c (2.0 mmol, 10.0 equiv.), DBU (0.4 mmol, 2.0 equiv.) and anhydrous 1,4-dioxane (0.8 mL), successively. The reaction was kept for 16 h under 40 W 427 nm Kessil lamp reaction setup (the progress can be monitored *via* TLC). Then, the resulting mixture was concentrated in vacuo. Products were purified via column chromatography with ethyl acetate and hexane as solvents.[4]

4.5 General procedure for the gram-scale synthesis

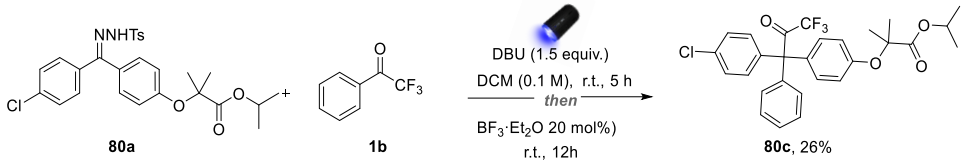
Synthesis of 1c in gram scale:



Following the general procedure, the reaction with **1a** (1.57 g, 5.0 mmol), **1b** (1.4 g, 10.0 mmol, 2.0 equiv.), DBU (7.5 mmol, 1.5 equiv.), DCM (50 mL) under Ar for 12 h at 25 °C, after work up $BF_3{\cdot}Et_2O$ (20 mol%). was added dropwise in ethyl acetate at room temperature for 12 h. After usual work up, the

residue was purified by flash chromatography over silica gel (petroleum ether/ethyl acetate) to give the desired product. **1c** as a yellow solid (1.1 g, 70% yield).

Synthesis of 80c in gram scale:



Following the general procedure, the reaction with **80a** (942 mg, 3.0 mmol), **1b** (840 mg, 6.0 mmol, 2.0 equiv.), DBU (4.5 mmol, 1.5 equiv.), DCM (30 mL) under Ar for 12 h at 25 °C. After work up, $BF_3 \cdot Et_2O$ (0.2 equiv.) was added dropwise in ethyl acetate (0.1 M) at room temperature for 12 h. After usual work up, the residue was purified by flash chromatography over silica gel (petroleum ether/ethyl acetate) to give the desired product **80c** as a yellow solid (400 mg, 26% yield).

5. General Procedures for cell-based Biological Assays

5.1 Cell proliferation assay

The HCT116 and DLD1 cells were seeded in 96-well plates (5000 cells/well) overnight and incubated with various concentrations of the obtained pseudo-natural products for 24 h, respectively. Then, 10 μL cell counting kit-8 (CCK-8) enhanced solution (Meilunbio, China) was added to each well and the absorbance was measured at 450 nm using the BioTek Cytation 5 (Agilent Technologies, USA) after incubation for 2 h. The cell viability rate was calculated using the following formula. Cell viability rate = [(AE-AB)/(AC-AB)] ×100%, where A represents absorbance, E denotes the experimental well, C is the control well, and B is the blank well.

5.2 Cell Calcein-AM staining

The 96-well plates were seeded with 5000 cells/well of HCT116 and DLD1 cells, respectively. After treatment with various concentrations of 31C (0, 0.3, 1, 3, 10, 30 μM) for 24 h, the cells were cleaned with PBS and then incubation with 100 μL staining solution, consisting of 10 mL PBS and 5 μL Calcein-AM solution (Meilunbio, China). Following a 10-min incubation in the dark, fluorescence images were acquired using the Operetta CLS's high-content cell imaging analysis system (PerkinElmer, USA). The live cells were visualized based on Calcein-AM fluorescence (Ex/Em: 488/515 nm).

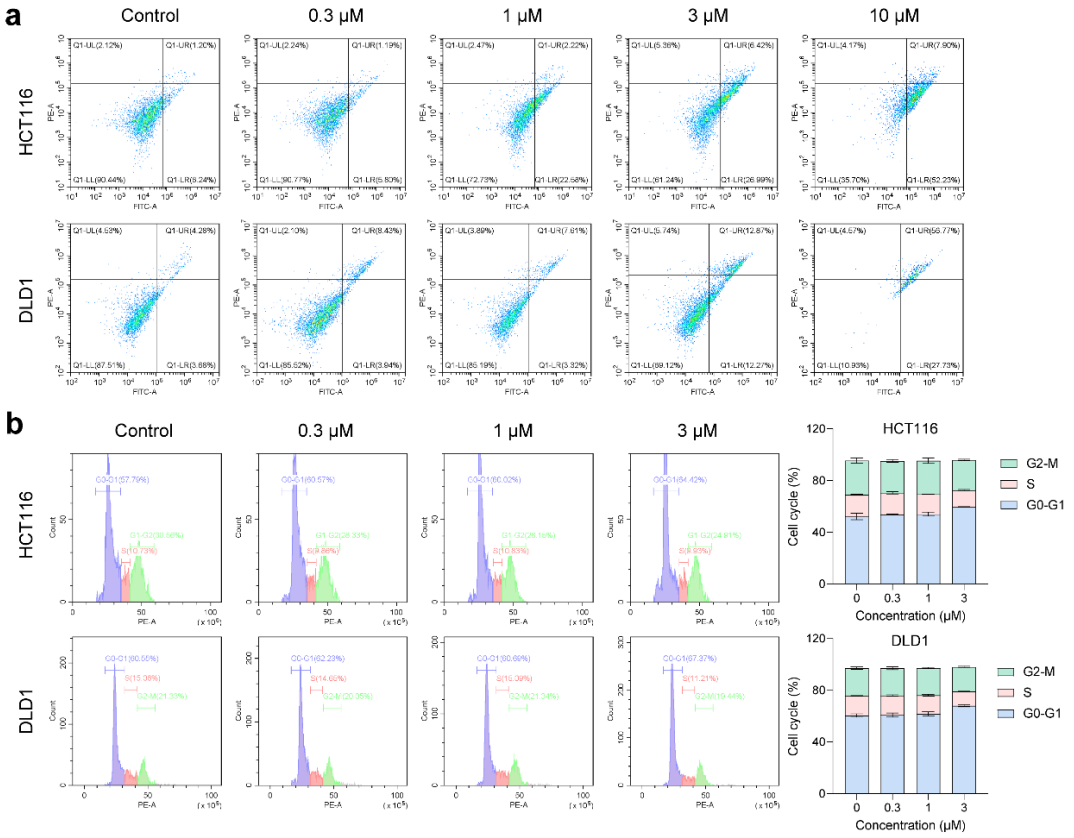
5.3 Cell apoptosis assay

The HCT116 and DLD1 cells treated with various concentrations of 31C for 24 h were harvested

and washed with pre-cooled PBS, followed by resuspension in binding buffer. To each sample, 5 μL Annexin V-FITC and 10 μL PI (Annexin V-FITC/PI Apoptosis detection Kit, Meilunbio, China) were added. The samples were gently mixed and incubated in the dark at room temperature for 10 min. The apoptotic cells were subsequently analyzed by flow cytometry (Beckman, USA).

5.4 Cell cycle assay

As cell apoptosis assay, the cells treated with various concentrations of 31C for 24 h were collected, washed with pre-cooled PBS and fixed in pre-cooled 70% ethanol overnight at 4°C. After fixation, the cells were centrifuged to remove the ethanol and then resuspended in 500 μL of staining solution containing 25 μL propidium iodide (PI), 10 μL RNase A, and 500 μL staining buffer from the Cell Cycle and Apoptosis Analysis Kit (Meilunbio, China). The samples were incubated in the dark at 37°C for 30 min and subsequently analyzed by flow cytometry.



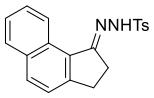
Scheme S1. Pseudo-natural product 31C induces apoptosis without affecting cell cycle distribution in human colorectal cancer HCT116 and DLD1 cells. Flow cytometry analysis of the apoptosis cells (a) and cell cycle distribution (b) following treatment with various concentrations of 31C after 24 h.

6. Characterization data of synthesized starting material

The NMR dates of **1a, 2a, 3a, 4a, 5a, 6a, 7a, 8a, 9a, 10a, 11a, 13a, 14a, 16a, 17a, 63a, ,64a, 65a, 66a, 67a, 68a, 69a, 70a, 71a, 72a, 73a, 74a,77a, 78a, 79a, 80a,81a, 82a** had been reported by our group's previous articles.[1,5-8]

Characterization data for the *N*-tosylhydrazones

N'-(2-bromobenzylidene)-4-methylbenzenesulfonohydrazide (12a)

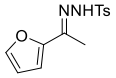


Following the general procedure, it was obtained as a white solid by recrystallization (isolated yield: 85%).

^{1}H NMR (500 MHz, DMSO-d_6) δ 10.40 (s, 1H), 8.97 (dd, J = 8.5, 1.2 Hz, 1H), 7.98 – 7.89 (m, 4H), 7.65 (m, 1H), 7.53 (m, 1H), 7.46 (dd, J = 11.2, 8.2 Hz, 3H), 3.14 – 3.07 (m, 2H), 2.92 – 2.85 (m, 2H), 2.34 (s, 3H).

^{13}C NMR (126 MHz, DMSO-d_6) δ 165.5, 150.6, 143.9, 136.6, 133.0, 132.1, 130.8, 129.9, 128.9, 128.6, 128.3, 128.1, 126.3, 125.1, 124.2, 28.9, 28.3, 21.5.

ESI-MS: calcd. for $C_{20}H_{17}N_2O_2S$ $[M+H]^+$: 350.1084, found: 350.1091.

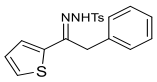


N'-(1-(furan-2-yl) ethylidene)-4-methylbenzenesulfonohydrazide (15a)

Following the general procedure, it was obtained as a white solid by recrystallization (isolated yield: 75%).**15a** was known in the published literature.[9]

^{1}H NMR (500 MHz, DMSO-d_6) δ 11.35 (s, 1H), 7.86 (s, 1H), 7.75 (d, J = 8.4 Hz, 2H), 7.41 (dd, J = 18.8, 8.2 Hz, 4H), 7.19 (d, J = 8.0 Hz, 2H), 2.34 (s, 3H), 2.28 (s, 3H).

ESI-MS: calcd. for $C_{13}H_{13}N_2O_3S$ $[M+H]^+$: 278.0720, found: 278.0731.

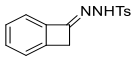


4-methyl-N'-(2-phenyl-1-(thiophen-2-yl) ethylidene) benzenesulfonohydrazide (18a)

Following the general procedure, it was obtained as a white solid by recrystallization (isolated yield: 77%). **18a** was known in the published literature.[10]

^{1}H NMR (500 MHz, DMSO-d_6) δ 11.50 (s, 1H), 7.95 (s, 1H), 7.78 (d, J = 8.0 Hz, 2H), 7.70 (d, J = 8.3 Hz, 2H), 7.68 – 7.66 (m, 2H), 7.64 (d, J = 8.3 Hz, 2H), 7.46 (t, J = 7.6 Hz, 2H), 7.41 (d, J = 8.1 Hz, 2H), 7.40 – 7.35 (m, 1H), 2.35 (s, 3H).

ESI-MS: calcd. for $C_{19}H_{17}N_2O_2S_2$ $[M+H]^+$: 371.0882, found: 371.0885.

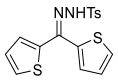


***N*-(bicyclo [4.2.0] octa-1,3,5-trien-7-ylidene)-4-methylbenzenesulfonohydrazide (76a)**

Following the general procedure , it was obtained as a white solid by recrystallization (isolated yield: 90%). **75a** was known in the published literature.[11]

^{1}H NMR (500 MHz, DMSO-d_6) δ 11.43 (s, 1H), 7.92 (s, 1H), 7.77 (d, J = 8.3 Hz, 2H), 7.62 (s, 4H), 7.43 – 7.39 (m, 4H), 6.28 (t, J = 2.2 Hz, 2H), 2.36 (s, 3H).

ESI-MS: calcd. for $C_{15}H_{13}N_2O_2S$ $[M+H]^+$: 286.0771, found: 286.0785.



***N*-(di(thiophen-2-yl) methylene)-4-methylbenzenesulfonohydrazide (77a)**

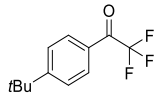
Following the general procedure, it was obtained as a white solid by recrystallization (isolated yield: 90%).

^{1}H NMR (500 MHz, DMSO-d_6) δ 11.34 (s, 1H), 7.87 (s, 1H), 7.75 (d, J = 8.3 Hz, 2H), 7.49 – 7.45 (m, 2H), 7.42 – 7.38 (m, 4H), 2.35 (s, 3H), 1.25 (s, 10H).

^{13}C NMR (126 MHz, DMSO-d_6) δ 144.6, 144.1, 142.5, 136.0, 132.3, 130.9, 130.4, 130.0, 129.8, 129.8, 128.5, 128.1, 127.9, 21.5.

ESI-MS: calcd. for $C_{16}H_{13}N_2O_2S_3$ $[M+H]^+$: 363.0212, found: 363.0225.

Characterization data for the synthesis ketones

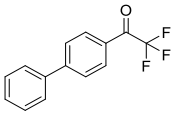


1-(4-(*tert*-butyl) phenyl)-2,2,2-trifluoroethan-1-one (20b)

The reaction was carried out on 5 mmol scale. The compound **20b** was obtained in 65% yield as a colorless oil after flash column chromatography (hexane). **20b** was known in the published literature.[12]

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.08 – 8.03 (m, 2H), 7.64 – 7.55 (m, 2H), 1.39 (s, 9H).

ESI-MS: calcd. for: $C_{12}H_{13}OF_3$ $[M+H]^+$: 231.0991, found: 230.0998.

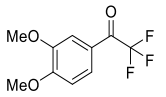


1-([1,1'-biphenyl]-4-yl)-2,2,2-trifluoroethan-1-one (21b)

The reaction was carried out on 10 mmol scale. The compound **21b** was obtained in70% yield as a white solid after flash column chromatography (hexane). **21b** was known in the published literature.[13]

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.20 (d, J = 8.1 Hz, 2H), 7.82 – 7.76 (m, 2H), 7.69 (dd, J = 9.0, 7.5 Hz, 2H), 7.57 – 7.47 (m, 3H).

ESI-MS: calcd. for: $C_{14}H_9OF_3$ $[M+H]^+$: 251.0678, found: 251.0685.

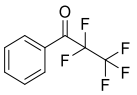


1-(3,4-dimethoxyphenyl)-2,2,2-trifluoroethan-1-one (35b)

The reaction was carried out on 10 mmol scale. The compound **34b** was obtained in 65% yield as a white solid after flash column chromatography (hexane). **34b** was known in the published literature.[14]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.73 (m, 1H), 7.57 (d, *J* = 2.0 Hz, 1H), 6.95 (d, *J* = 8.5 Hz, 1H), 3.99 (s, 3H), 3.95 (s, 3H).

ESI-MS: calcd. for: $C_{10}H_9O_3F_3$ $[M+H]^+$: 235.0577, found: 2234.0569.

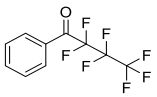


2,2,3,3,3-pentafluoro-1-phenylpropan-1-one (38b)

The reaction was carried out on 4 mmol scale. The compound **37b** was obtained in70% yield as a colorless oil after flash column chromatography (hexane). **37b** was known in the published literature.[15]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 – 7.57 (m, 2H), 7.48 – 7.42 (m, 2H), 7.38 – 7.32 (m, 1H).

ESI-MS: calcd. for: $C_9H_5OF_5$ $[M+H]^+$: 225.0333, found: 225.0339.

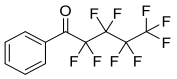


2,2,3,3,4,4,4-heptafluoro-1-phenylbutan-1-one (39b)

The reaction was carried out on 4 mmol scale. The compound **38b** was obtained in 63% yield as a colorless oil after flash column chromatography (hexane). **38b** was known in the published literature.[15]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 – 7.57 (m, 2H), 7.48 – 7.43 (m, 2H), 7.38 – 7.32 (m, 1H).

ESI-MS: calcd. for: $C_{10}H_5OF_7$ $[M+H]^+$: 274.0229, found: 274.0235.

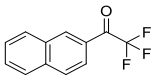


2,2,3,3,4,4,5,5,5-nonafluoro-1-phenylpentan-1-one (40b)

The reaction was carried out on 4 mmol scale. The compound **39b** was obtained in 63% yield as a colorless oil after flash column chromatography (hexane). **39b** was known in the published literature.[16]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 – 7.55 (m, 2H), 7.45 (dd, *J* = 8.5, 7.0 Hz, 2H), 7.37 – 7.32 (m, 1H).

ESI-MS: calcd. for: $C_{11}H_5OF_9$ $[M+H]^+$: 324.0197, found: 324.0220.



2,2,2-trifluoro-1-(naphthalen-2-yl) ethan-1-one (41b)

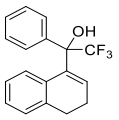
The reaction was carried out on 4 mmol scale. The compound **40b** was obtained in 63% yield as a colorless oil after flash column chromatography (hexane).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.63 (s, 1H), 8.08 (dd, J = 8.8, 1.8 Hz, 1H), 8.00 (d, J = 8.2 Hz, 1H), 7.96 – 7.87 (m, 2H), 7.70 (dd, J = 8.2, 6.9 Hz, 1H), 7.65 – 7.59 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 180.3, 136.5, 133.2 (q, $J_{C=F}$ = 2.8 Hz), 132.2, 130.2, 130.1, 129.1, 128.0, 127.4, 127.2, 124.1, 118.1.

ESI-MS: calcd. for: $C_{12}H_7OF_3$ $[M+H]^+$: 225.0522, found: 225.0530.

7. Characterization data of synthesis trifluoromethyl alcohols products



1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (1c)

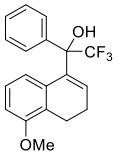
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a little yellow solid (isolated yield: 85%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.75 – 7.66 (m, 2H), 7.40 (m, 3H), 7.17 (dd, J = 7.8, 1.4 Hz, 1H), 7.08 (m, 2H), 6.93 (td, J = 7.7, 1.5 Hz, 1H), 6.76 (m, 1H), 2.91 (s, 1H), 2.88 – 2.77 (m, 2H), 2.50 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.9, 136.9, 133.4, 130.9, 130.0, 128.6, 128.3, 127.8, 127.3, 127.0, 126.7, 126.0,125.0 (q, $J_{C=F}$ = 287.3 Hz),79.8 (q, $J_{C=F}$ = 27.7 Hz), 27.9, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.44.

ESI-MS: calcd. for $C_{18}H_{15}F_3O$ $[M+H]^+$: 305.1148, found: 305.1159.



2,2,2-trifluoro-1-(5-methoxy-3,4-dihydronaphthalen-1-yl)-1-phenylethan-1-ol (2c)

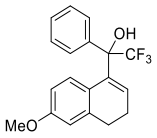
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 70%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 – 7.62 (m, 2H), 7.41 – 7.33 (m, 3H), 6.87 (t, J = 8.1 Hz, 1H), 6.75 (tq, J = 4.5, 2.1 Hz, 1H), 6.70 (ddd, J = 7.6, 6.7, 1.0 Hz, 2H), 3.82 (s, 3H), 2.97 – 2.89 (m, 2H), 2.73 – 2.64 (m, 1H), 2.46 – 2.40 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 156.0, 137.2 133.3, 132.0, 130.4, 128.7, 128.3, 127.4, 126.2, 126.1 (q, $J_{C=F}$ = 190.3 Hz), 119.4, 109.8, 79.9 (q, $J_{C=F}$ = 10.9 Hz), 55.6, 23.0, 19.3.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.48.

ESI-MS: calcd. for $C_{19}H_{17}F_3O_2$ $[M+H]^+$:335.1253, found m/z: 335.1242.



2,2,2-trifluoro-1-(6-methoxy-3,4-dihydronaphthalen-1-yl)-1-phenylethan-1-ol (3c)

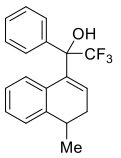
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 72%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.66 (d, J = 5.8 Hz, 2H), 7.41 – 7.33 (m, 3H), 6.97 (d, J = 8.8 Hz, 1H), 6.67 (d, J = 2.5 Hz, 1H), 6.59 (s, 1H), 6.41 (dd, J = 8.8, 2.8 Hz, 1H), 3.70 (s, 3H), 3.02 (s, 1H), 2.79 – 2.69 (m, 2H), 2.46 – 2.39 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 158.2, 139.9, 137.1, 133.1, 128.6, 128.3, 128.0, 127.5, 127.4, 125.1 (q, $J_{C=F}$ = 287.3 Hz), 123.9, 114.0, 110.6, 80.0 (q, $J_{C=F}$ = 26.5 Hz), 55.2, 28.5, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.47.

ESI-MS: calcd. for$C_{19}H_{17}F_3O_2$ $[M+H]^+$: 335.1253, found m/z : 335.1257.



2,2,2-trifluoro-1-(4-methyl-3,4-dihydronaphthalen-1-yl)-1-phenylethan-1-ol (4c)

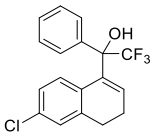
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 68%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 – 7.61 (m, 2H), 7.39 – 7.33 (m, 3H), 7.17 (ddt, *J* = 6.9, 6.0, 1.0 Hz, 1H), 7.13 – 7.02 (m, 2H), 6.89 (tt, *J* = 7.6, 1.8 Hz, 1H), 6.64 (m, 1H), 2.98 – 2.90 (m, 1H), 2.89 (s, 1H), 2.61 (m, 1H), 2.35 – 2.25 (m, 1H), 1.31 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 142.8, 137.0, 132.7, 129.9, 128.6, 128.3, 127.4, 127.3, 126.7, 126.6, 125.8,125.0 (q, $J_{C=F}$ = 287.3 Hz), 79.8 (q, $J_{C=F}$ = 26.5 Hz),31.8, 31.0, 19.6.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.66.

ESI-MS: calcd. for $C_{19}H_{17}F_3O$ $[M+H]^+$: 319.1304, found m/z: 319.1326.



1-(6-chloro-3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (5c)

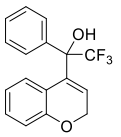
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 74%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 – 7.55 (m, 2H), 7.42 – 7.33 (m, 3H), 7.12 (dd, *J* = 2.2, 1.1 Hz, 1H), 7.04 (d, *J* = 8.6 Hz, 1H), 6.86 (dd, *J* = 8.6, 2.4 Hz, 1H), 6.73 (m, 1H), 2.93 (s, 1H), 2.78 (t, *J* = 7.9 Hz, 2H), 2.47 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.7, 136.5, 133.0, 132.5, 130.3, 129.6, 128.8, 128.4, 128.2, 127.8, 126.0, 125.0 (q, $J_{C=F}$ = 286.0 Hz), 79.8 (q, $J_{C=F}$ = 26.5 Hz), 27.9, 23.3.

^{19}F NMR (376 MHz, $CDCl_3$) δ -73.35.

ESI-MS: calcd. for $C_{18}H_{14}ClF_3O$ $[M+H]^+$: 339.0758, found: 339.0764.



1-(2H-chromen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (6c)

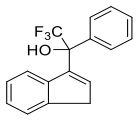
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 70%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 (d, *J* = 8.1 Hz, 2H), 7.41 – 7.35 (m, 3H), 7.04 – 6.98 (m, 1H), 6.94 (dd, *J* = 8.0, 1.6 Hz, 1H), 6.79 (dd, *J* = 8.1, 1.3 Hz, 1H), 6.63 – 6.58 (m, 1H), 6.36 (s, 1H), 4.83 (dd, *J* = 4.2, 1.9 Hz, 2H), 3.10 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 155.4, 136.0, 131.2, 129.4, 129.0, 128., 127.3, 127.3, 124.7 (q, $J_{C=F}$ = 287.3 Hz), 122.7, 121.2, 119.8, 116.6, 79.0 (q, $J_{C=F}$ = 27.7 Hz), 64.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.99.

ESI-MS: calcd. for $C_{17}H_{13}F_3O_2$ $[M+H]^+$: 307.0940, found: 307.0955.



2,2,2-trifluoro-1-(1H-inden-3-yl)-1-phenylethan-1-ol (7c)

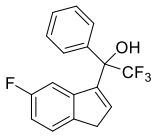
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 81%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.66 – 7.60 (m, 2H), 7.49 (dt, *J* = 7.5, 1.0 Hz, 1H), 7.41 – 7.34 (m, 3H), 7.18 (td, *J* = 7.4, 1.2 Hz, 1H), 7.08 (td, *J* = 7.6, 1.1 Hz, 1H), 7.02 (dt, *J* = 7.8, 1.0 Hz, 1H), 6.91 (m, 1H), 3.66 – 3.52 (m, 2H), 2.89 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.0, 141.7, 140.2, 135.7, 132.7, 128.9, 128.3, 127.4, 126.2, 125.2,125.0 (q, $J_{C=F}$ = 287.3 Hz), 123.9, 122.6, 78.2 (q, $J_{C=F}$ = 27.7 Hz), 38.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.79.

ESI-MS: calcd. for $C_{17}H_{13}F_3O$ $[M+H]^+$: 291.0991, found m/z: 291.0987.



2,2,2-trifluoro-1-(5-fluoro-1H-inden-3-yl)-1-phenylethan-1-ol (8c)

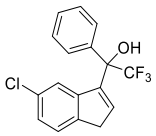
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 68%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (m, 2H), 7.40 – 7.33 (m, 4H), 6.95 (h, *J* = 2.3 Hz, 1H), 6.84 (m, 1H), 6.71 (dd, *J* = 9.6, 2.5 Hz, 1H), 3.53 (ddt, *J* = 6.0, 2.1, 1.0 Hz, 2H), 2.93 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 166.4 (d, $J_{C=F}$ = 241.7 Hz), 148.1 (d, $J_{C=F}$ = 9.6 Hz), 144.6, 143.8, 139.8, 139.3, 133.7, 133.0, 131.9,129.5 (q, $J_{C=F}$ = 286.0 Hz), 129.1 (d, $J_{C=F}$ = 9.1 Hz), 116.8 (d, $J_{C=F}$ = 23.3 Hz), 114.5 (d, $J_{C=F}$ = 24.3 Hz). 82.8 (q, $J_{C=F}$ = 27.7 Hz), 42.6.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.84, -116.61.

ESI-MS: calcd. for $C_{17}H_{12}F_4O$ $[M+H]^+$: 309.0897, found m/z: 309.0894.



1-(5-chloro-1H-inden-3-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (9c)

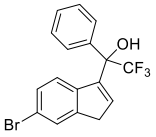
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 62%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.57 (m, 2H), 7.39 – 7.33 (m, 4H), 7.12 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.01 (d, *J* = 1.9 Hz, 1H), 6.92 (h, *J* = 2.2 Hz, 1H), 3.61 – 3.47 (m, 2H), 2.90 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 148.09, 146.7, 144.5, 139.7, 138.8, 136.8, 133.8, 133.0, 131.9, 130.0, 129.5 (q, $J_{C=F}$ = 287.3 Hz), 129.3, 127.5, 83.8 (q, $J_{C=F}$ = 27.7 Hz), 42.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.85.

ESI-MS: calcd. for $C_{17}H_{12}ClF_3O$ $[M+H]^+$: 325.0602, found: 325.0615.



1-(6-bromo-1H-inden-3-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (10c)

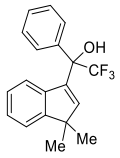
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 37%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 – 7.54 (m, 3H), 7.37 – 7.34 (m, 3H), 7.18 (dd, J = 8.3, 1.9 Hz, 1H), 6.87 – 6.82 (m, 2H), 3.61 – 3.49 (m, 2H), 2.93 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.6, 145.3, 144.6, 139.9, 137.5, 133.9, 133.7, 133.0, 131.9, 131.8, 129.5 (q, $J_{C=F}$ = 287.3 Hz), 128.5, 124.2, 82.5 (q, $J_{C=F}$ = 15.1 Hz), 43.0.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.84.

ESI-MS: calcd. for $C_{17}H_{12}BrF_3O$ $[M+H]^+$: 369.0096, found:369.0105.



1-(1,1-dimethyl-1H-inden-3-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (11c)

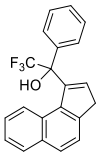
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 80%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (dd, J = 6.8, 3.0 Hz, 2H), 7.39 – 7.30 (m, 4H), 7.16 (td, J = 7.4, 1.2 Hz, 1H), 7.01 (td, J = 7.6, 1.1 Hz, 1H), 6.91 (d, J = 7.6 Hz, 1H), 6.70 (q, J = 2.4 Hz, 1H), 2.88 (s, 1H), 1.43 (d, J = 7.6 Hz, 6H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 153.6, 145.0, 139.3, 135.9, 135.5, 128.8, 128.2, 127.3, 126.3, 125.7,124.8 (q, $J_{C=F}$ = 281.0 Hz), 122.9, 121.3, 77.5 (q, $J_{C=F}$ = 16.8 Hz), 49.0, 24.8, 24.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.87.

ESI-MS: calcd. for $C_{19}H_{17}F_3O$ $[M+H]^+$: 319.1304, found:319.1316.



1-(3H-cyclopenta[a]naphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (12c)

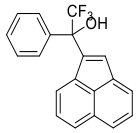
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 67%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.21 (dd, *J* = 8.8, 1.1 Hz, 1H), 7.80 – 7.73 (m, 2H), 7.65 (dd, *J* = 7.6, 3.5 Hz, 3H), 7.34 – 7.27 (m, 4H), 7.17 (h, *J* = 2.6 Hz, 1H), 7.12 (m, 1H), 3.79 – 3.64 (m, 2H), 3.15 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 140.8, 137.2, 135.8, 135.3, 133.3, 129.0, 128.4, 128.2, 128.1, 127.6, 127.3, 126.8, 125.1, 125.4 (q, $J_{C=F}$ = 287.3 Hz), 124.6, 125.4 (q, $J_{C=F}$ = 287.3 Hz), 122.3, 78.5 (q, $J_{C=F}$ = 27.7 Hz), 39.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -75.41.

ESI-MS: calcd. for $C_{21}H_{15}F_3O$ $[M+H]^+$: 341.1148, found m/z: 341.1159.



1-(acenaphthylen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (13c)

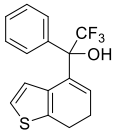
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 52%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.84 (dd, *J* = 8.2, 0.6 Hz, 1H), 7.80 – 7.74 (m, 2H), 7.73 – 7.68 (m, 2H), 7.59 (dd, *J* = 8.2, 6.8 Hz, 1H), 7.40 – 7.34 (m, 5H), 7.31 (dd, *J* = 7.0, 0.7 Hz, 1H), 3.15 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.2, 137.6, 137.1, 137.1, 136.7, 129.3, 128.9, 128.6, 128.2, 128.2, 127.9, 127.7, 127.6, 127.4, 126.1, 125.5, 124.6 (q, $J_{C=F}$ = 166.3 Hz), 77.8 (q, $J_{C=F}$ = 27.7 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.52.

ESI-MS: calcd. for $C_{20}H_{13}F_3O$ $[M+H]^+$: 327.0991, found: 327.101.



1-(6,7-dihydrobenzo[b]thiophen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (14c)

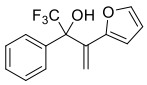
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 77%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 – 7.59 (m, 2H), 7.36 (m, 3H), 6.75 (d, *J* = 5.3 Hz, 1H), 6.49 (d, *J* = 5.3 Hz, 1H), 6.35 (m, 1H), 2.91 – 2.84 (m, 2H), 2.73 (s, 1H), 2.62 – 2.55 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.9, 136.5, 131.9, 131.5, 128.7, 128.2, 127.5, 126.8 (q, $J_{C=F}$ = 213.0 Hz), 126.2, 123.7, 120.3, 79.4 (q, $J_{C=F}$ = 29.0 Hz),24.4, 22.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.70.

ESI-MS: calcd. for $C_{16}H_{13}F_3OS$ $[M+H]^+$: 311.0712, found m/z: 311.0683.



1,1,1-trifluoro-3-(furan-2-yl)-2-phenylbut-3-en-2-ol (15c)

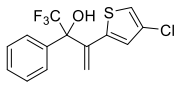
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 35%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 – 7.59 (m, 2H), 7.37 (dd, *J* = 5.2, 2.1 Hz, 3H), 7.28 (dd, *J* = 1.9, 0.7 Hz, 1H), 6.20 (dd, *J* = 3.4, 1.8 Hz, 1H), 6.10 (q, *J* = 1.5 Hz, 1H), 5.92 (d, *J* = 3.4 Hz, 1H), 5.73 (q, *J* = 2.1 Hz, 1H), 3.07 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.2, 142.0, 136.3, 135.1, 128.9, 128.2, 127.1, 124.0 (q, $J_{C=F}$ = 150.0 Hz), 114.8, 111.3, 110.1, 79.0 (q, $J_{C=F}$ = 29.0 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -75.04.

ESI-MS: calcd. for $C_{14}H_{11}F_3O_2$ $[M+H]^+$: 269.0784, found:269.0795.



3-(4-chlorothiophen-2-yl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (16c)

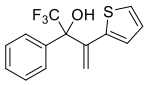
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a purple oil (isolated yield: 66%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (dd, *J* = 6.6, 3.1 Hz, 2H), 7.40 (dp, *J* = 5.2, 2.0 Hz, 3H), 6.66 – 6.57 (m, 2H), 5.79 (s, 1H), 5.75 (d, *J* = 1.7 Hz, 1H), 2.94 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.2, 139.0, 135.6, 130.7, 129.6, 128.7, 127.8, 127.1, 126.2, 122.6 (q, $J_{C=F}$ = 287.3 Hz), 118.3, 79.9 (q, $J_{C=F}$ = 27.7 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.66.

ESI-MS: calcd. for $C_{14}H_{10}ClF_3OS$ $[M+H]^+$: 319.0166, found: 319.0184.



1,1,1-trifluoro-2-phenyl-3-(thiophen-2-yl) but-3-en-2-ol (17c)

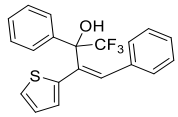
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a purple oil (isolated yield: 75%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.70 – 7.64 (m, 2H), 7.43 – 7.38 (m, 3H), 7.11 (dd, *J* = 5.1, 1.2 Hz, 1H), 6.82 (dd, *J* = 5.1, 3.7 Hz, 1H), 6.75 (dd, *J* = 3.7, 1.3 Hz, 1H), 5.86 (q, *J* = 1.4 Hz, 1H), 5.77 (q, *J* = 1.9 Hz, 1H), 2.90 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 134.0, 139.2, 135.9, 129.1, 128.3, 127.6, 127.4, 127.0, 125.8, 122.4 (q, $J_{C=F}$ = 286.0 Hz), 117.8, 79.8 (q, $J_{C=F}$ = 30.2 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.63.

ESI-MS: calcd. for $C_{14}H_{11}F_3OS$ $[M+H]^+$: 285.0555, found: 285.0528.



1,1,1-trifluoro-2,4-diphenyl-3-(thiophen-2-yl) but-3-en-2-ol (18c)

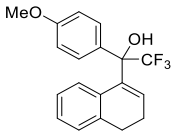
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 33%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.73 – 7.67 (m, 2H), 7.47 – 7.41 (m, 3H), 7.24 (dd, *J* = 5.2, 1.2 Hz, 1H), 7.17 (tt, *J* = 5.7, 2.2 Hz, 4H), 7.00 – 6.95 (m, 2H), 6.89 (dd, *J* = 5.1, 3.5 Hz, 1H), 6.61 (dd, *J* = 3.5, 1.2 Hz, 1H), 2.86 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.1, 136.5, 135.9, 135.6, 134.0,130.4 (q, $J_{C=F}$ = 254.5 Hz), 131.4, 130.2, 129.6, 129.5, 129.1, 128.4, 128.1, 128.0, 127.7, 80.2 (q, $J_{C=F}$ = 29.0 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -72.86.

ESI-MS: calcd. for $C_{20}H_{15}F_3OS$ $[M+H]^+$: 361.0868, found m/z: 361.0874.



1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(4-methoxyphenyl)ethan-1-ol (19c)

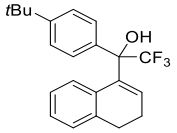
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 42%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.57 – 7.50 (m, 2H), 7.14 – 7.10 (m, 1H), 7.05 (ddt, *J* = 7.7, 4.0, 2.0 Hz, 2H), 6.92 – 6.84 (m, 3H), 6.68 (m, 1H), 3.79 (s, 3H), 2.80 (s, 1H), 2.77 (td, *J* = 7.6, 6.9, 3.3 Hz, 2H), 2.44 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 164.4, 142.5, 138.1, 135.7, 134.4, 133.6, 133.3, 132.5, 131.6, 131.4, 130.7, 129.3 (q, $J_{C=F}$ = 161.3 Hz), 118.3, 84.2 (q, $J_{C=F}$ = 27.7 Hz), 59.9, 32.6, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.77.

ESI-MS: calcd. for $C_{19}H_{17}F_3O_2$ $[M+H]^+$: 335.1253, found: 335.1242.



1-(4-(*tert*-butyl) phenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (20c)

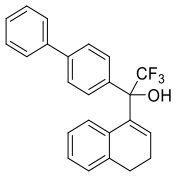
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 55%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 – 7.50 (m, 2H), 7.39 – 7.33 (m, 2H), 7.12 (ddd, *J* = 7.4, 1.6, 0.8 Hz, 1H), 7.04 (ddd, *J* = 14.1, 7.7, 1.3 Hz, 2H), 6.93 – 6.87 (m, 1H), 6.69 (tq, *J* = 4.1, 1.9 Hz, 1H), 2.82 (s, 1H), 2.81 – 2.73 (m, 2H), 2.49 – 2.40 (m, 2H), 1.31 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 156.2, 142.6, 138.4, 138.2, 135.7, 134.4, 132.5, 131.6, 131.6, 131.4, 130.7, 129.9, 129.7 (q, $J_{C=F}$ = 287.3 Hz), 84.4 (q, $J_{C=F}$ = 27.9 Hz), 39.2, 36.0, 32.6, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.50.

ESI-MS: calcd. for $C_{22}H_{23}F_3O$ $[M+H]^+$: 361.1774, found: 361.1789.



1-([1,1'-biphenyl]-4-yl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (21c)

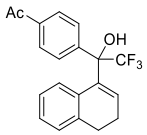
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 75%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.70 (d, *J* = 8.2 Hz, 2H), 7.62 – 7.57 (m, 4H), 7.46 – 7.40 (m, 2H), 7.37 – 7.32 (m, 1H), 7.13 (dd, *J* = 7.5, 1.4 Hz, 1H), 7.11 – 7.02 (m, 2H), 6.91 (td, *J* = 7.7, 1.5 Hz, 1H), 6.74 (m, 1H), 2.90 (s, 1H), 2.83 – 2.77 (m, 2H), 2.47 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 146.0, 145.1, 142.5, 140.5, 138.0, 135.6, 134.7, 133.5, 132.5, 132.4, 132.2, 131.8, 131.7, 131.6, 131.4, 130.7, 129.2 (q, $J_{C=F}$ = 176.4 Hz), 84.4 (q, $J_{C=F}$ = 27.7 Hz), 32.6, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.47.

ESI-MS: calcd. for $C_{24}H_{19}F_3O$ $[M+H]^+$: 381.1461, found: 381.1485



(*R*)-1-(4-(1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-hydroxyethyl)phenyl)ethan-1-one (22c)

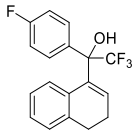
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 10:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.95 – 7.89 (m, 2H), 7.74 (d, *J* = 8.2 Hz, 2H), 7.11 (dd, *J* = 7.5, 1.4 Hz, 1H), 7.05 – 6.98 (m, 2H), 6.89 – 6.83 (m, 1H), 6.73 (m, 1H), 3.08 (s, 1H), 2.78 (t, *J* = 7.9 Hz, 2H), 2.58 (s, 3H), 2.45 (tt, *J* = 7.6, 5.0 Hz, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 197.9, 142.0, 137.7, 137.1, 133.0, 130.6, 130.5, 128.2, 127.9, 127.7, 127.2, 126.4, 126.04, 125.8 (q, $J_{C=F}$ = 287.3 Hz) ,79.8 (q, $J_{C=F}$ = 27.7 Hz), 27.8, 26.7, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.31.

ESI-MS: calcd. for $C_{20}H_{18}F_3O_2$ $[M+H]^+$: 347.1253, found: 347.1259.



(*R*)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(4-fluorophenyl) ethan-1-ol (22c)

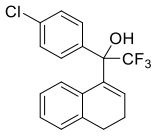
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (dd, *J* = 8.6, 5.4 Hz, 2H), 7.13 (dd, *J* = 7.5, 1.4 Hz, 1H), 7.08 – 6.99 (m, 4H), 6.90 (td, *J* = 7.7, 1.5 Hz, 1H), 6.71 (m, 1H), 2.87 (s, 1H), 2.82 – 2.73 (m, 2H), 2.45 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 167.6 (d, J = 247.7 Hz), 142.5, 137.9, 137.3 (d, $J_{C=F}$ = 2.6 Hz), 135.4, 134.9 (d, $J_{C=F}$ = 2.6 Hz), 134.0 (d, $J_{C=F}$ = 8.3 Hz), 132.6, 131.8, 131.3, 130.7, 129.5 (q, $J_{C=F}$ = 286.0 Hz), 119.9 (d, $J_{C=F}$ = 21.6 Hz), 84.2 (q, $J_{C=F}$ = 27.9 Hz), 32.5, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.75, -113.55.

ESI-MS: calcd. for $C_{18}H_{14}F_4O$ $[M+H]^+$: 323.1054, found: 323.1067.



(*R*)-1-(4-chlorophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (23c)

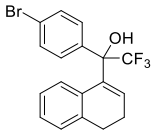
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 35%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.60 – 7.55 (m, 2H), 7.36 – 7.31 (m, 2H), 7.13 (dd, J = 7.3, 1.4 Hz, 1H), 7.06 (td, J = 7.4, 1.3 Hz, 1H), 7.03 (dd, J = 8.0, 1.2 Hz, 1H), 6.94 – 6.89 (m, 1H), 6.71 (tq, J = 4.5, 2.1 Hz, 1H), 2.89 (s, 1H), 2.79 (t, J = 8.6 Hz, 2H), 2.49 – 2.42 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.8, 135.5, 134.8, 133.0, 130.6, 130.4, 128.9, 128.5, 127.9, 127.2, 126.5, 126.1, 124.7 (q, $J_{C=F}$ = 288.5 Hz), 79.5 (q, $J_{C=F}$ = 27.9 Hz), 53.5, 27.8, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.60.

ESI-MS: calcd. for $C_{18}H_{14}ClF_3O$ $[M+H]^+$: 339.0758, found m/z: 339.0761



(*R*)-1-(4-bromophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (24c)

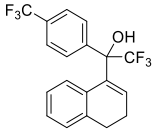
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 45%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54 – 7.46 (m, 4H), 7.13 (dd, J = 7.4, 1.4 Hz, 1H), 7.09 – 7.00 (m, 2H), 6.94 – 6.89 (m, 1H), 6.71 (m, 1H), 2.92 (s, 1H), 2.81 – 2.75 (m, 2H), 2.50 – 2.42 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 136.0, 132.9, 131.5, 130.6, 130.4, 129.2, 128.0, 127.2, 126.5, 126.1, 124.7 (q, $J_{C=F}$ = 288.5 Hz), 123.1, 79.6 (q, $J_{C=F}$ = 27.8 Hz), 27.8, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.62.

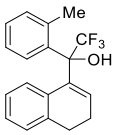
ESI-MS: calcd. for $C_{18}H_{14}BrF_3O$ $[M+H]^+$: 383.0253, found m/z: 383.0264



(*R*)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(4-(trifluoromethyl) phenyl) ethan-1-ol (25c)

Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 80%).

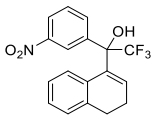
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.79 (d, *J* = 8.1 Hz, 2H), 7.63 (d, *J* = 8.3 Hz, 2H), 7.14 (dd, *J* = 7.5, 1.4 Hz, 1H), 7.07 (td, *J* = 7.4, 1.3 Hz, 1H), 7.00 (dd, *J* = 8.0, 1.3 Hz, 1H), 6.91 (td, *J* = 7.7, 1.5 Hz, 1H), 6.76 (m, 1H), 3.02 (s, 1H), 2.81 (t, *J* = 7.9 Hz, 2H), 2.52 – 2.44 (m, 2H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 145.6, 142.5, 137.6, 135.6, 135.4, 135.2, 132.7, 132.6, 131.98, 132.0, 130.8, 129.9 (d, *J* = 3.8 Hz),129.3 (q, $J_{C=F}$ = 288.5 Hz), 128.8 (q, $J_{C=F}$ = 287.3 Hz), 84.4 (q, $J_{C=F}$ = 27.6 Hz), 32.5, 28.1.
^{19}F NMR (376 MHz, $CDCl_3$) δ -62.66, -74.42.
ESI-MS: calcd. for $C_{19}H_{15}F_6O$ $[M+H]^+$: 373.1022, found: 373.1036



(*R*)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(o-tolyl) ethan-1-ol (26c)

Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 72%).

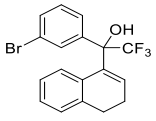
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.51 (d, *J* = 2.3 Hz, 1H), 7.45 (d, *J* = 7.9 Hz, 1H), 7.31 – 7.25 (m, 1H), 7.21 – 7.14 (m, 2H), 7.10 – 7.04 (m, 2H), 6.93 (td, *J* = 7.7, 1.5 Hz, 1H), 6.73 (tq, *J* = 4.4, 2.0 Hz, 1H), 2.85 (s, 1H), 2.84 – 2.76 (m, 2H), 2.49 (m, 2H), 2.40 (s, 3H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 142.6, 141.5, 138.2, 135.7, 134.5, 134.5, 134.2, 132.8, 132.5, 132.5, 132.5, 131.7, 131.3, 130.7, 129.7 (q, $J_{C=F}$ = 287.3 Hz), 129.14, 84.5 (q, $J_{C=F}$ = 27.5 Hz), 32.6, 28.1, 26.3.
^{19}F NMR (376 MHz, $CDCl_3$) δ -74.45.
ESI-MS: calcd. for $C_{19}H_{16}F_3O$ $[M+H]^+$: 319.1304, found: 319.1321.



1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(3-nitrophenyl) ethan-1-ol (27c)

Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 45%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.52 (t, *J* = 2.1 Hz, 1H), 8.20 (m, 1H), 7.95 (m, 1H), 7.53 (t, *J* = 8.0 Hz, 1H), 7.13 (dd, *J* = 7.4, 1.4 Hz, 1H), 7.05 (td, *J* = 7.4, 1.3 Hz, 1H), 6.98 (dd, *J* = 8.1, 1.2 Hz, 1H), 6.91 – 6.85 (m, 1H), 6.78 (m, 1H), 3.07 (s, 1H), 2.80 (t, *J* = 7.9 Hz, 2H), 2.57 – 2.41 (m, 2H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 153.0, 144.0, 142.6, 138.2, 137.2, 136.0, 134.9, 134.0, 132.8, 132.1, 130.9, 130.9, 129.6 (q, $J_{C=F}$ = 175.1 Hz), 128.5, 127.4, 84.1 (q, $J_{C=F}$ = 27.9 Hz) 32.4, 28.1.
^{19}F NMR (376 MHz, $CDCl_3$) δ -74.47.
ESI-MS: calcd. for $C_{18}H_{14}F_3NO_3$ $[M+H]^+$: 350.0999, found m/z: 350.1017.



1-(3-bromophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (28c)

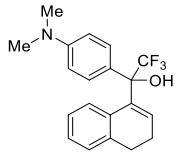
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 79%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.87 (s, 1H), 7.58 – 7.53 (m, 1H), 7.49 (m, 1H), 7.22 (t, J = 7.9 Hz, 1H), 7.15 (dd, J = 7.5, 1.5 Hz, 1H), 7.08 (td, J = 7.3, 1.3 Hz, 1H), 7.02 (dd, J = 8.0, 1.3 Hz, 1H), 6.96 – 6.91 (m, 1H), 6.73 (m, 1H), 2.95 (s, 1H), 2.79 (t, J = 8.6 Hz, 2H), 2.50 – 2.43 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.3, 137.9, 132.9, 131.9, 130.5, 130.4, 129.8, 128.0, 127.3, 126.5, 126.2, 124.7 (q, $J_{C=F}$ = 286.0 Hz), 122.6, 79.4 (q, $J_{C=F}$ = 27.9 Hz), 27.8, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.45.

ESI-MS: calcd. for $C_{18}H_{14}BrF_3O$ $[M+H]^+$: 383.0253, found: 383.0271.



1-(3,4-dihydronaphthalen-1-yl)-1-(4-(dimethylamino)phenyl)-2,2,2-trifluoroethan-1-ol (29c)

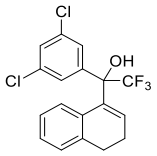
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 55%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.44 (d, J = 8.7 Hz, 2H), 7.11 (d, J = 7.5 Hz, 1H), 7.09 (d, J = 8.3 Hz, 1H), 7.04 (t, J = 7.4 Hz, 1H), 6.91 (t, J = 7.7 Hz, 1H), 6.70 – 6.64 (m, 3H), 2.95 (s, 6H), 2.78 – 2.75 (m, 2H), 2.45 – 2.40 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 155.1, 142.6, 138.3, 135.9, 134.1, 132.8, 132.4, 131.8 (q, $J_{C=F}$ = 194.0 Hz) 131.5, 131.5, 130.7, 128.7, 116.5, 84.3 (q, $J_{C=F}$ = 28.1 Hz), 45.0, 32.7, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.77.

ESI-MS: calcd. for $C_{20}H_{20}F_3NO$ $[M+H]^+$: 348.1570, found: 348.1598.



1-(3,5-dichlorophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (30c)

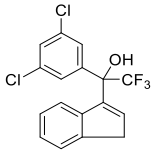
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 80%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.54 (s, 2H), 7.35 (t, J = 1.9 Hz, 1H), 7.15 (d, J = 6.8 Hz, 1H), 7.09 (td, J = 7.1, 1.9 Hz, 1H), 7.01 – 6.94 (m, 2H), 6.71 (s, 1H), 2.93 (s, 1H), 2.79 (t, J = 8.4 Hz, 2H), 2.50 – 2.43 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 140.6, 138.0, 135.1, 132.6, 131.0, 130.2, 129.2, 128.2, 127.6, 126.4, 126.3, l27.8, 124.5 (q, $J_{C=F}$ = 194.0 Hz), 79.3 (q, $J_{C=F}$ = 27.9 Hz), 23.8, 23.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.46.

ESI-MS: calcd. for $C_{18}H_{13}Cl_2F_3O$ $[M+H]^+$: 373.0368, found: 373.0376.



(*R*)-1-(3,5-dichlorophenyl)-2,2,2-trifluoro-1-(1H-inden-3-yl)ethan-1-ol (31c)

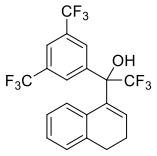
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 54%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 – 7.46 (m, 3H), 7.36 (s, 1H), 7.20 (td, J = 7.4, 1.2 Hz, 1H), 7.12 (td, J = 7.6, 1.2 Hz, 1H), 7.04 (dt, J = 7.7, 1.0 Hz, 1H), 6.90 (h, J = 2.4 Hz, 1H), 3.67 – 3.52 (m, 2H), 3.04 (s 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 148.6, 145.5, 143.8, 143.6, 139.7, 138.0, 133.9, 131.0, 130.7, 130.2, 128.8, 126.9, 126.8 (q, $J_{C=F}$ = 287.3 Hz), 84.1 (q, $J_{C=F}$ = 27.8 Hz), 43.3.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.82.

ESI-MS: calcd. for $C_{17}H_{11}Cl_2F_3O$ $[M+H]^+$: 359.0212, found: 359.0219.



1-(3,5-bis(trifluoromethyl)phenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (32c)

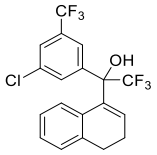
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 87%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.09 (s, 2H), 7.87 (s, 1H), 7.15 (d, J = 7.4 Hz, 1H), 7.10 – 7.05 (m, 1H), 6.94 – 6.90 (m, 2H), 6.81 (s, 1H), 3.07 (s, 1H), 2.80 (t, J = 7.4 Hz, 2H), 2.55 – 2.43 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.6, 142.6, 137.0, 136.6, 136.3 (d, $J_{C=F}$ = 6.1 Hz), 134.7, 132.9, 132.4, 132.3, 131.0, 130.7,129.0 (q, $J_{C=F}$ = 287.3 Hz), 127.8 (q, $J_{C=F}$ = 287.4 Hz), 127.6, 84.1 (q, $J_{C=F}$ = 28.1 Hz), 32.4, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -62.88, -74.57.

ESI-MS: calcd. for $C_{20}H_{13}F_9O$ $[M+H]^+$: 441.0895, found: 441.0868.



1-(3-chloro-5-(trifluoromethyl)phenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (33c)

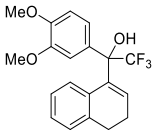
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 70%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.82 (d, J = 7.1 Hz, 2H), 7.61 (d, J = 1.9 Hz, 1H), 7.16 (d, J = 6.9 Hz, 1H), 7.09 (td, J = 7.0, 2.0 Hz, 1H), 6.95 (m, 2H), 6.76 (s, 1H), 3.05 (s, 1H), 2.80 (t, J = 7.5 Hz, 2H), 2.54 – 2.42 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 140.4, 138.0, 135.2, 132.5, 132.2, 131.4 (d, $J_{C=F}$ = 6.1 Hz), 131.1, 130.2, 128.3, 127.6, 126.4, 126.2, 123.8 (q, $J_{C=F}$ = 126.0 Hz), 122.7, 79.3 (q, $J_{C=F}$ = 27.7 Hz), 27.8, 23.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -62.73, -74.51.

ESI-MS: calcd. for $C_{19}H_{13}ClF_6O$ $[M+H]^+$: 407.0632, found: 407.0645.



1-(3,4-dihydronaphthalen-1-yl)-1-(3,4-dimethoxyphenyl)-2,2,2-trifluoroethan-1-ol (34c)

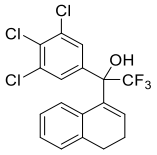
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 50%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.24 (s, 1H), 7.12 (d, J = 6.1 Hz, 1H), 7.10 – 7.02 (m, 3H), 6.90 (t, J = 6.9 Hz, 1H), 6.80 (d, J = 8.5 Hz, 1H), 6.67 (s, 1H), 3.88 (s, 3H), 3.85 (s, 3H), 2.94 (s, 1H), 2.75 (M, 2H), 2.45 – 2.40 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 149.2, 148.7, 137.8, 133.5, 131.0, 129.2, 127.8, 127.0, 126.7, 126.0, 124.7 (q, $J_{C=F}$ = 219.2 Hz), 120.2, 110.5, 110.4, 79.6 (q, $J_{C=F}$ = 27.7 Hz), 56.0, 55.8, 27.9, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.65.

ESI-MS: calcd. for $C_{20}H_{19}F_3O_3$ $[M+H]^+$: 365.1359, found: 365.1364.



1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(3,4,5-trichlorophenyl)ethan-1-ol (35c)

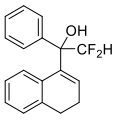
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 69%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.66 (s, 2H), 7.18 – 7.14 (m, 1H), 7.11 (m, 2.7 Hz, 1H), 7.00 – 6.96 (m, 2H), 6.72 (m, 1H), 2.94 (s, 1H), 2.82 – 2.75 (m, 2H), 2.51 – 2.43 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.9, 137.6, 134.4, 132.3, 132.2, 131.3, 130.1, 128.3, 127.8, 127.6, 126.4, 126.2, 124.4 (q, $J_{C=F}$ =287.3 Hz), 79.1 (q, $J_{C=F}$ = 27.7 Hz), 27.8, 23.47.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.48.

ESI-MS: calcd. for $C_{18}H_{12}Cl_3F_3O$ $[M+H]^+$: 406.9979, found: 406.9991



1-(3,4-dihydronaphthalen-1-yl)-2,2-difluoro-1-phenylethan-1-ol (36c)

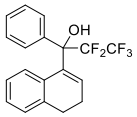
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 – 7.54 (m, 2H), 7.40 – 7.29 (m, 3H), 7.15 – 7.01 (m, 3H), 6.90 (td, J = 7.7, 1.5 Hz, 1H), 6.59 (m, 1H), 6.04 (t, J = 55.2 Hz, 1H), 2.83 – 2.73 (m, 2H), 2.71 (s, 1H), 2.47 – 2.38 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.2, 142.5, 139.5, 136.1, 133.9, 133.1, 132.9, 132.5, 131.6, 131.4, 131.1, 130.7, 121.3 (t, $J_{C=F}$ = 250.4 Hz), 83.0 (t, $J_{C=F}$ = 20.4 Hz), 32.67, 28.01.

^{19}F NMR (376 MHz, $CDCl_3$) δ -126.36, -127.08, -128.23, -128.96.

ESI-MS: calcd. or $C_{18}H_{16}F_2O$ $[M+H]^+$: 287.1242, found: 287.1253.



1-(3,4-dihydronaphthalen-1-yl)-2,2,3,3,3-pentafluoro-1-phenylpropan-1-ol (37c)

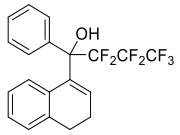
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 39%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (dt, J = 8.2, 1.7 Hz, 2H), 7.39 – 7.32 (m, 3H), 7.11 (dd, J = 7.4, 1.4 Hz, 1H), 7.07 – 7.00 (m, 2H), 6.92 – 6.82 (m, 2H), 2.89 (s, 1H), 2.74 (td, J = 7.1, 3.5 Hz, 2H), 2.48 – 2.32 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.2, 136.9, 134.0, 131.0, 130.1, 128.6, 128.2, 127.8, 127.4, 126.9, 126.2, 125.9, 124.2 (q, $J_{C=F}$ = 352.4 Hz), 80.2 (t, $J_{C=F}$ = 22.7 Hz), 28.0, 23.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -76.01, -113.75, -114.48.

ESI-MS: calcd. for $C_{19}H_{15}F_5O$ $[M+H]^+$: 355.1116, found: 355.1125.



1-(3,4-dihydronaphthalen-1-yl)-2,2,3,3,4,4,4-heptafluoro-1-phenylbutan-1-ol (38c)

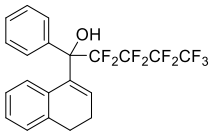
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 35%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.74 – 7.67 (m, 2H), 7.36 (dq, *J* = 12.1, 6.8 Hz, 3H), 7.14 (d, *J* = 7.4 Hz, 1H), 7.08 – 6.99 (m, 2H), 6.91 (td, *J* = 7.7, 1.5 Hz, 1H), 6.82 – 6.78 (m, 1H), 2.91 (s, 1H), 2.78 – 2.66 (m, 2H), 2.49 – 2.34 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.3, 136.8, 134.1, 130.8, 129.9, 128.6, 128.2, 127.9, 127.58, 127.0, 126.0, 126.0, 120.1 (q, $J_{C=F}$ = 287.5 Hz), 80.1 (t, $J_{C=F}$ = 33.9 Hz), 27.9, 23.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -80.95, -109.96, -119.03, -119.27.

ESI-MS: calcd. for $C_{20}H_{15}F_7O$ $[M+H]^+$: 405.1084, found: 405.1071.



1-(3,4-dihydronaphthalen-1-yl)-2,2,3,3,4,4,5,5,5-nonafluoro-1-phenylpentan-1-ol (39c)

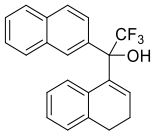
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 20:1) to give the title compound as a colorless oil (isolated yield: 26%).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.73 – 7.67 (m, 2H), 7.40 – 7.32 (m, 3H), 7.13 (dd, *J* = 7.5, 1.4 Hz, 1H), 7.08 – 7.00 (m, 2H), 6.90 (td, *J* = 7.7, 1.5 Hz, 1H), 6.81 (t, *J* = 5.2 Hz, 1H), 2.86 (s, 1H), 2.78 – 2.68 (m, 2H), 2.48 – 2.33 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.3, 136.8, 134.1, 130.8, 129.9, 128.6, 128.2, 127.9, 127.6 127.0, 126.1, 126.0, 121.0(t, $J_{C=F}$ = 32.8 Hz), 118.8 (td, $J_{C=F}$ = 33.8, 31.0, 10.7 Hz), 116.6 (q, $J_{C=F}$ = 31.5 Hz), 114.3 (t, $J_{C=F}$ = 25.2 Hz), 112.4 (t, $J_{C=F}$ = 37.8 Hz), 108.9 (q, $J_{C=F}$ = 37.8 Hz), 80.7 (t, $J_{C=F}$ = 22.7 Hz), 28.0, 23.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -80.59, -108.69, -109.49, -109.69, -110.38, -115.06, -115.85, -116.22, -116.98, -124.86, -124.88, -124.90, -124.92, -124.95, -124.97, -125.64, -125.65, -125.68, -125.70, -125.72, -125.74, -125.82, -125.82, -125.84, -125.87, -125.89, -125.91, -125.93, -126.60, -126.62, -126.65, -126.66, -126.69, -126.71.

ESI-MS: calcd. for $C_{21}H_{16}F_9O$ $[M+H]^+$: 455.1052, found: 455.1045.



1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(naphthalen-2-yl) ethan-1-ol (40c)

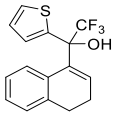
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 66%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.19 – 8.15 (m, 1H), 7.89 – 7.76 (m, 3H), 7.72 (dd, *J* = 8.7, 1.9 Hz, 1H), 7.53 – 7.47 (m, 2H), 7.12 (dd, *J* = 7.5, 1.4 Hz, 1H), 7.06 (dd, *J* = 8.0, 1.2 Hz, 1H), 7.01 (td, *J* = 7.4, 1.2 Hz, 1H), 6.83 – 6.77 (m, 2H), 2.92 (s, 1H), 2.85 – 2.76 (m, 2H), 2.55 – 2.44 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 142.5, 139.1, 138.1, 138.0, 137.6, 135.5, 134.9, 133.3, 132.7, 132.5, 132.3, 132.3, 132.3, 131.8, 131.7, 131.3, 130.9, 129.8 (q, $J_{C=F}$ = 287.3 Hz), 129.4, 84.7 (q, $J_{C=F}$ = 27.7 Hz), 32.6, 28.2.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.23.

ESI-MS: calcd. for $C_{22}H_{17}F_3O$ $[M+H]^+$: 355.1304, found: 355.1321.



1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(thiophen-2-yl) ethan-1-ol (41c)

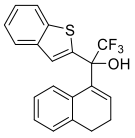
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 35%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.37 (dd, *J* = 5.0, 1.3 Hz, 1H), 7.23 (dd, *J* = 8.1, 1.2 Hz, 1H), 7.17 – 7.12 (m, 2H), 7.09 (td, *J* = 7.4, 1.3 Hz, 1H), 7.03 – 6.95 (m, 2H), 6.71 (m, 1H), 3.07 (s, 1H), 2.76 (m, 2H), 2.45 – 2.36 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 141.3, 137.9, 133.50 130.9, 130.1, 127.9, 127.6, 127.2, 127.2, 126.9, 126.3, 126.1, 124.5 (q, $J_{C=F}$ = 287.3 Hz), 78.5 (q, $J_{C=F}$ = 30.2 Hz) 27.9, 23.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -75.01.

ESI-MS: calcd. for $C_{16}H_{13}F_3OS$ $[M+H]^+$: 311.0712, found: 311.0725.



1-(benzo[b]thiophen-2-yl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (42c)

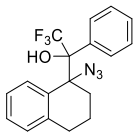
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 25%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.84 – 7.78 (m, 1H), 7.75 – 7.69 (m, 1H), 7.41 (s, 1H), 7.37 – 7.29 (m, 3H), 7.15 (dd, *J* = 7.5, 1.5 Hz, 1H), 7.08 (td, *J* = 7.4, 1.3 Hz, 1H), 6.99 – 6.93 (m, 1H), 6.75 (m, 1H), 3.16 (s, 1H), 2.83 – 2.72 (m, 2H), 2.49 – 2.37 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 146.8, 145.2, 144.0, 142.5, 137.9, 135.4, 135.1, 132.6, 132.0, 131.0, 130.8, 129.5, 129.1, 129.1, 128.8, 127.0, 121.9 (q, $J_{C=F}$ = 287.3 Hz), 83.5 (q, $J_{C=F}$ = 29.0 Hz), 32.6, 28.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.55.

ESI-MS: calcd. for $C_{20}H_{16}F_3OS$ $[M+H]^+$: 361.0868, found: 361.0879.



1-((*R*)-1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (43c)

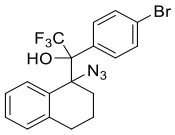
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 76%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 7.2, 2.2 Hz, 1H), 7.54 – 7.47 (m, 2H), 7.22 – 7.15 (m, 3H), 7.13 – 7.06 (m, 2H), 7.01 – 6.96 (m, 1H), 3.90 (s, 1H), 2.76 – 2.66 (m, 1H), 2.62 – 2.47 (m, 2H), 2.43 (m, 1H), 2.10 (m, 1H), 1.66 (m, 3.4 Hz, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.3, 134.6, 132.2, 129.9, 129.1, 128.4, 128.4, 127.6 (q, $J_{C=F}$ = 289.8 Hz), 127.5, 127.2, 126.0, 80.9 (q, $J_{C=F}$ = 29.0 Hz), 70.5, 33.8, 29.6, 20.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.05.

ESI-MS: calcd. for $C_{18}H_{16}F_3N_3O$ $[M+H]^+$: 348.1318, found: 348.1329.



1-(1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-1-(4-bromophenyl)-2,2,2-trifluoroethan-1-ol (44c)

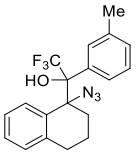
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 65%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.75 – 7.71 (m, 1H), 7.44 – 7.39 (m, 2H), 7.35 – 7.30 (m, 2H), 7.17 – 7.09 (m, 2H), 7.04 – 6.99 (m, 1H), 3.98 (s, 1H), 2.73 (dt, *J* = 15.4, 4.0 Hz, 1H), 2.59 – 2.36 (m, 3H), 2.09 (m, 1H), 1.70 – 1.64 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.3, 133.9, 132.2, 131.9, 130.8, 129.8, 129.3, 129.0, 128.7 126.2, 124.9 (q, $J_{C=F}$ =277.2 Hz), 80.7 (q, $J_{C=F}$ = 27.7 Hz), 70.3, 33.9, 29.6, 19.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.65.

ESI-MS: calcd. for $C_{18}H_{15}BrF_3N_3O$ $[M+H]^+$: 426.0423, found: 426.0439.



1-((*R*)-1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-(m-tolyl)ethan-1-ol (45c)

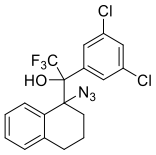
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 65%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.82 – 7.72 (m, 1H), 7.33 – 7.27 (m, 2H), 7.15 – 7.10 (m, 2H), 7.07 (t, *J* = 7.7 Hz, 1H), 7.03 – 6.96 (m, 2H), 3.82 (s, 1H), 2.68 (m, 1H), 2.60 – 2.51 (m, 1H), 2.50 – 2.39 (m, 2H), 2.24 (s, 3H), 2.09 (m, 1H), 1.70 – 1.61 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.4, 137.1, 134.4, 132.3, 129.9, 129.1, 128.9, 128.4, 128.0, 127.5 (q, $J_{C=F}$ =264.6 Hz), 127.3, 125.9, 124.2, 80.9 (q, $J_{C=F}$ =26.5 Hz), 70.4, 33.7, 29.6, 21.5, 20.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -69.94.

ESI-MS: calcd. for $C_{19}H_{18}F_3N_3O$ $[M+H]^+$: 362.1475, found: 362.1487.



1-(1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-1-(3,5-dichlorophenyl)-2,2,2-trifluoroethan-1-ol (46c)

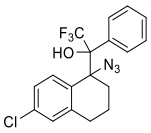
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 49%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 (dd, *J* = 7.2, 2.1 Hz, 1H), 7.45 (d, *J* = 1.8 Hz, 2H), 7.21 (t, *J* = 1.9 Hz, 1H), 7.20 – 7.13 (m, 2H), 7.07 – 7.03 (m, 1H), 3.95 (s, 1H), 2.76 (dt, *J* = 16.6, 4.6 Hz, 1H), 2.59 (m, 1H), 2.49 – 2.35 (m, 2H), 2.11 (m, 1H), 1.72 – 1.64 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.4, 138.1, 134.3, 131.4, 129.5, 129.4, 129.0, 128.7, 126.4, 126.0, 124.6 (q, $J_{C=F}$ =281.0 Hz), 80.3 (q, $J_{C=F}$ =26.5 Hz), 70.1, 34.0, 29.6, 19.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.05.

ESI-MS: calcd. for $C_{18}H_{14}Cl_2F_3N_3O$ $[M+H]^+$: 416.0539, found: 416.0547.



1-(1-azido-6-chloro-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (47c)

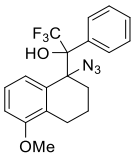
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 72%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 (dd, *J* = 7.2, 2.1 Hz, 1H), 7.45 (d, *J* = 1.8 Hz, 2H), 7.21 (t, *J* = 1.9 Hz, 1H), 7.20 – 7.13 (m, 2H), 7.07 – 7.02 (m, 1H), 3.95 (s, 1H), 2.76 (m, 1H), 2.59 (m, 1H), 2.47 – 2.36 (m, 2H), 2.11 (m, 1H), 1.76 – 1.64 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.4, 138.0, 134.3, 131.4, 129.5, 129.4, 129.0, 128.7, 126.1, 126.0, 124.6 (q, $J_{C=F}$ =290.0 Hz), 80.3 (q, $J_{C=F}$ =26.5 Hz), 70.1, 34.0, 29.6, 19.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.52.

ESI-MS: calcd. for $C_{18}H_{15}ClF_3N_3O$ $[M+H]^+$: 382.0929, found: 382.0933.



1-(1-azido-5-methoxy-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (48c)

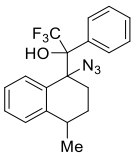
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 45%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (dd, J = 6.8, 3.0 Hz, 2H), 7.39 (d, J = 8.2 Hz, 1H), 7.21 (dd, J = 5.1, 1.9 Hz, 3H), 7.07 (t, J = 8.1 Hz, 1H), 6.69 (d, J = 8.1 Hz, 1H), 3.77 (s, 3H), 3.49 (s, 1H), 2.88 (m, 1H), 2.46 – 2.39 (m, 1H), 2.32 (m, 2H), 2.14 (m, 1H), 1.65 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 156.5, 134.8, 133.1, 128.1, 128.3, 127.6, 127.2, 126.1, 125.1 (q, $J_{C=F}$ =290.0 Hz),121.7, 109.5, 80.8 (q, $J_{C=F}$ =26.5 Hz), 70.5, 55.4, 33.3, 22.4, 18.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.27.

ESI-MS: calcd. for $C_{19}H_{18}F_3N_3O_2$ $[M+H]^+$: 378.1424, found: 378.1437.



1-(1-azido-4-methyl-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (49c)

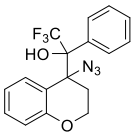
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 65%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.76 (d, J = 8.0 Hz, 1H), 7.49 – 7.45 (m, 2H), 7.25 – 7.21 (m, 1H), 7.21 – 7.13 (m, 4H), 7.09 (m, 1H), 3.95 (s, 1H), 2.69 – 2.43 (m, 3H), 2.12 – 2.04 (m, 1H), 1.46 – 1.36 (m, 1H), 1.26 (d, J = 6.8 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.1, 134.7, 131.8, 129.9, 128.6, 128.3, 127.5, 127.2, 126.6 (q, $J_{C=F}$ =190.3 Hz), 126.4, 125.8, 80.7 (q, $J_{C=F}$ =27.7 Hz), 71.0, 32.5, 32.0, 29.3, 21.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -69.80.

ESI-MS: calcd. for $C_{19}H_{18}F_3N_3O$ $[M+H]^+$: 362.1475, found: 362.1489.



1-(4-azidochroman-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (50c)

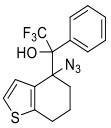
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 50%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.66 – 7.58 (m, 3H), 7.27 (d, J = 3.2 Hz, 3H), 7.16 (m, 1H), 6.87 – 6.77 (m, 2H), 4.46 (m, 1H), 4.07 (m, 1H), 3.62 (s, 1H), 2.63 (m, 1H), 2.28 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 155.7, 134.2, 130.7, 129.8, 128.7, 127.9, 127.1, 124.9 (q, $J_{C=F}$ =290.0 Hz), 120.6, 118.0, 117.7, 80.7 (q, $J_{C=F}$ =26.5 Hz), 66.5, 62.7, 32.6.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.18.

ESI-MS: calcd. for $C_{17}H_{15}F_3N_3O_2$ $[M+H]^+$: 350.1111, found: 350.1120.



1-(4-azido-4,5,6,7-tetrahydrobenzo[b]thiophen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (51c)

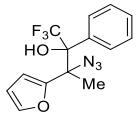
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 46%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 – 7.53 (m, 2H), 7.25 – 7.19 (m, 4H), 6.94 (dd, J = 5.4, 0.9 Hz, 1H), 4.00 (s, 1H), 2.84 (m, 1H), 2.57 – 2.37 (m, 3H), 2.15 – 2.08 (m, 1H), 1.84 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 142.1, 134.5, 130.4, 128.5, 127.6, 127.5, 127.2, 125.2 (q, $J_{C=F}$ =277.2 Hz), 121.9, 80.5 (q, $J_{C=F}$ =26.5 Hz), 70.2, 32.8, 24.7, 20.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.05.

ESI-MS: calcd. for $C_{16}H_{14}F_3N_3OS$ $[M+H]^+$: 354.0882, found: 354.0891.



3-azido-1,1,1-trifluoro-3-(furan-2-yl)-2-phenylbutan-2-ol (52c)

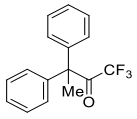
Prepared according to the general procedure B for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 33%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 – 7.61 (m, 1H), 7.51 – 7.47 (m, 2H), 7.38 – 7.35 (m, 3H), 6.44 (dd, J = 3.4, 1.8 Hz, 1H), 6.38 (dd, J = 3.4, 0.8 Hz, 1H), 3.92 (s, 1H), 1.57 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 152.0, 143.4, 133.9, 128.9, 127.8, 127.2, 125.0 (q, $J_{C=F}$ =299.9 Hz), 110.7, 109.2, 80.5 (q, $J_{C=F}$ =26.5 Hz), 67.3, 20.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -71.23.

ESI-MS: calcd. for $C_{14}H_{12}F_3N_3O_2$ $[M+H]^+$: 312.0954, found: 312.0966.



1,1,1-trifluoro-3,3-diphenylbutan-2-one (53c)

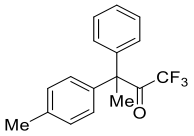
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 90%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41 – 7.32 (m, 6H), 7.19 – 7.12 (m, 4H), 2.08 (q, J = 1.4 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 192.1 (q, $J_{C=F}$ =31.5 Hz), 140.5, 128.7, 128.3, 128.2, 127.8, 116.3 (q, $J_{C=F}$ =296.1 Hz), 59.7, 24.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.12.

ESI-MS: calcd. for $C_{16}H_{13}F_3O$ $[M+H]^+$: 279.0991, found: 279.0965.



1,1,1-trifluoro-3-phenyl-3-(p-tolyl) butan-2-one (54c)

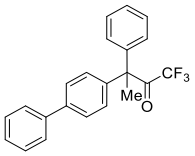
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 – 7.31 (m, 3H), 7.18 (d, J = 8.0 Hz, 2H), 7.14 – 7.09 (m, 2H), 7.06 – 7.00 (m, 2H), 2.37 (s, 3H), 2.03 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.8 (q, $J_{C=F}$ =315.0 Hz), 145.6, 142.3, 141.8, 134.1, 133.3, 132.8, 132.7, 132.3, 121.3 (q, $J_{C=F}$ =31.5 Hz), 64.0, 29.5, 25.7.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.12.

ESI-MS: calcd. for $C_{17}H_{15}F_3O$ $[M+H]^+$: 293.1148, found: 293.1164.



3-([1,1'-biphenyl]-4-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (55c)

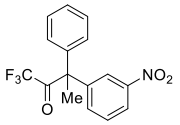
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 71%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 – 7.62 (m, 6H), 7.51 – 7.45 (m, 4H), 7.44 – 7.38 (m, 3H), 7.38 – 7.33 (m, 1H), 1.35 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 197.6 (q, $J_{C=F}$ =40.3 Hz), 142.1, 140.3, 138.2, 130.7, 128.9, 128.9, 128.3, 127.9, 127.8, 127.2, 127.1, 125.9, 123.5 (q, $J_{C=F}$ =281.0 Hz), 68.1, 23.7.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.12.

ESI-MS: calcd. for $C_{22}H_{17}F_3O$ $[M+H]^+$: 355.1304, found: 355.1325.



1,1,1-trifluoro-3-(3-nitrophenyl)-3-phenylbutan-2-one (56c)

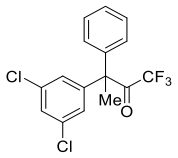
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 90%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.47 (t, J = 2.0 Hz, 1H), 8.33 (m, 1H), 7.95 (dt, J = 7.7, 1.4 Hz, 1H), 7.69 (t, J = 8.0 Hz, 1H), 7.52 – 7.32 (m, 5H), 1.31 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.5 (q, $J_{C=F}$ =40.3 Hz), 141.9, 139.0, 137.7, 134.6, 134.5, 134.3, 133.1, 132.9, 130.5, 129.1, 127.4 (q, $J_{C=F}$ =282.2 Hz), 73.2, 28.2.

^{19}F NMR (376 MHz, $CDCl_3$) δ -66.89.

ESI-MS: calcd. for $C_{16}H_{12}F_3NO_3$ $[M+H]^+$: 324.0842, found: 324.0855.



3-(3,5-dichlorophenyl)-1,1,1-trifluoro-3-phenylbutan-2-one (57c)

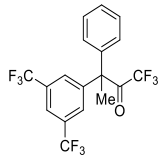
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 50%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.50 (d, J = 1.9 Hz, 2H), 7.46 (t, J = 1.9 Hz, 1H), 7.45 – 7.42 (m, 2H), 7.40 (m, 2H), 7.37 – 7.33 (m, 1H), 1.33 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 197.5 (q, $J_{C=F}$ =27.7 Hz), 142.0, 139.9, 134.4, 133.0, 132.9, 131.5, 130.5, 130.4, 127.7 (q, $J_{C=F}$ =281.0 Hz), 73.1, 28.2.

^{19}F NMR (376 MHz, $CDCl_3$) δ -66.85.

ESI-MS: calcd. for $C_{16}H_{11}Cl_2F_3O$ $[M+H]^+$: 347.0212, found: 347.0234.



3-(3,5-bis(trifluoromethyl)phenyl)-1,1,1-trifluoro-3-phenylbutan-2-one (58c)

Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 80%).

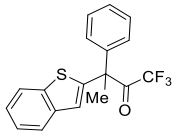
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.13 – 8.01 (m, 2H), 7.99 (td, J = 1.7, 0.9 Hz, 1H), 7.47 (d, J = 7.0 Hz, 2H), 7.42 (m, 2H), 7.40 – 7.35 (m, 1H), 1.30 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.5 (q, $J_{C=F}$ =32.8 Hz), 141.6, 139.4, 133.1, 133.0, 130.5, 128.7, 128.2, 128.1, 128.1, 126.5, 122.3 (q, $J_{C=F}$ =265.9 Hz), 73.4, 28.1.

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.5 (q, $J_{C=F}$ =32.8 Hz), 141.6, 139.4, 133.4, 133.1, 133.0, 131.9, 130.5, 128.7, 126.5, 122.3 (q, $J_{C=F}$ =265.9 Hz) 73.37, 28.12.

^{19}F NMR (376 MHz, $CDCl_3$) δ -62.82, -63.00, -66.73.

ESI-MS: calcd. for $C_{16}H_{12}F_9O$ $[M+H]^+$: 415.0739, found: 415.0745.



3-(benzo[b]thiophen-2-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (59c)

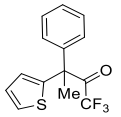
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 36%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.90 – 7.87 (m, 1H), 7.86 – 7.83 (m, 1H), 7.57 (s, 1H), 7.45 (t, J = 7.4 Hz, 2H), 7.44 – 7.38 (m, 4H), 7.38 – 7.33 (m, 1H), 1.51 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 197.7 (q, $J_{C=F}$ =24.0 Hz), 144.6, 143.9, 142.3, 139.4, 133.0, 132.8, 130.6, 129.9, 129.6, 129.5, 128.8, 127.9 (q, $J_{C=F}$ =350.3 Hz), 127.1, 74.3, 27.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -67.86.

ESI-MS: calcd. for $C_{18}H_{13}F_3OS$ $[M+H]^+$: 335.0712, found: 335.0733.



1,1,1-trifluoro-3-phenyl-3-(thiophen-2-yl) butan-2-one (60c)

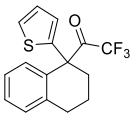
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 44%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45 – 7.36 (m, 5H), 7.36 – 7.29 (m, 2H), 7.11 (dd, J = 5.1, 3.6 Hz, 1H), 1.44 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.0 (q, J_{C-F} =24.9 Hz), 137.8, 134.0, 128.3, 128.0, 128.0, 127.2, 126.8, 125.8, 123.0 (q, J_{C-F} =281.0 Hz), 69.5, 23.2.

^{19}F NMR (376 MHz, $CDCl_3$) δ -68.32.

ESI-MS: calcd. for $C_{14}H_{11}F_3OS$ $[M+H]^+$: 285.0555, found: 285.0572.



2,2,2-trifluoro-1-(1-(thiophen-2-yl)-1,2,3,4-tetrahydronaphthalen-1-yl)ethan-1-one (61c)

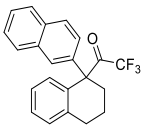
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 47%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.28 (m, 2H), 7.24 (d, J = 1.4 Hz, 1H), 7.22 – 7.17 (m, 1H), 6.97 – 6.91 (m, 2H), 6.54 (dd, J = 3.6, 1.2 Hz, 1H), 2.90 (q, J = 5.5 Hz, 2H), 2.64 – 2.53 (m, 1H), 2.37 – 2.27 (m, 1H), 1.91 (m, 1H), 1.69 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.2 (q, J_{C-F} =31.5 Hz), 150.5, 141.4, 136.9, 135.2, 134.0, 133.2, 133.1, 131.0, 130.9, 130.8, 120.9 (q, J_{C-F} =283.5 Hz), 62.6, 38.4, 33.6, 23.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -69.23.

ESI-MS: calcd. for $C_{16}H_{13}F_3OS$ $[M+H]^+$: 311.0712, found: 311.0725.



1-(3,4-dihydro-[1,2'-binaphthalen]-1(2H)-yl)-2,2,2-trifluoroethan-1-one (62c)

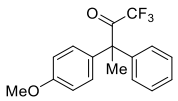
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 27%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.84 – 7.80 (m, 2H), 7.64 (dd, J = 8.1, 1.3 Hz, 1H), 7.49 – 7.40 (m, 2H), 7.37 – 7.31 (m, 2H), 7.25 – 7.18 (m, 2H), 7.07 (d, J = 2.0 Hz, 1H), 6.87 (dd, J = 7.7, 1.2 Hz, 1H), 2.93 (m, 2H), 2.70 (m, 1H), 2.50 – 2.42 (m, 1H), 1.82 (m, 1H), 1.49 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.8 (q, J_{C-F} =26.5 Hz), 144.5, 142.6, 137.3, 137.0, 136.0, 135.3, 134.5, 133.8, 133.0, 132.9, 132.1, 132.1, 131.3, 131.0, 130.8, 123.4 (q, J_{C-F} =297.9 Hz), 65.6, 36.9, 33.8, 22.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -69.74.

ESI-MS: calcd. for $C_{22}H_{17}F_3O$ $[M+H]^+$: 355.1304, found: 355.1322.



1,1,1-trifluoro-3-(4-methoxyphenyl)-3-phenylbutan-2-one (63c)

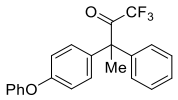
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 90%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 – 7.29 (m, 3H), 7.11 – 7.04 (m, 4H), 6.92 – 6.87 (m, 2H), 3.82 (s, 3H), 2.01 (q, J = 1.4 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 197.5 (q, $J_{C=F}$ =23.9 Hz), 159.0, 141.3, 131.7, 129.5, 128.6, 128.0, 127.6, 119.3 (q, $J_{C=F}$ =268.4 Hz), 114.0, 59.0, 55.3, 24.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.12.

ESI-MS: calcd. for $C_{17}H_{15}F_3O_2$ $[M+H]^+$: 309.1097, found: 309.1103.



1,1,1-trifluoro-3-(4-phenoxyphenyl)-3-phenylbutan-2-one (64c)

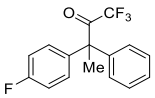
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 31%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.40 – 7.31 (m, 5H), 7.16 – 7.11 (m, 3H), 7.09 – 7.03 (m, 4H), 6.99 – 6.94 (m, 2H), 2.03 (q, J = 1.4 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 197.3 (q, $J_{C=F}$ =37.8 Hz), 157.0, 156.5, 140.6, 134.7, 129.9, 129.7, 128.7, 128.0, 127.8, 127.3 (q, $J_{C=F}$ =315.0 Hz), 123.0, 119.5, 118.3, 59.1, 24.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -68.03.

ESI-MS: calcd. for $C_{22}H_{17}F_3O_2$ $[M+H]^+$: 371.1253, found: 371.1264.



1,1,1-trifluoro-3-(4-fluorophenyl)-3-phenylbutan-2-one (65c)

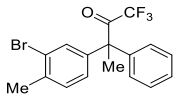
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 – 7.53 (m, 2H), 7.50 – 7.45 (m, 5H), 7.13 – 7.07 (m, 2H), 1.29 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 191.1 (q, $J_{C=F}$ =22.1 Hz), 167.0 (d, $J_{C=F}$ = 246.5 Hz), 138.7, 136.3, 134.0, 133.5, 132.4, 132.4, 128.1 (q, $J_{C=F}$ =280.1 Hz), 120.0 (d, $J_{C=F}$ = 21.8 Hz), 72.1, 28.3.

^{19}F NMR (376 MHz, $CDCl_3$) δ -67.03, -114.04.

ESI-MS: calcd. for $C_{16}H_{12}F_4O$ $[M+H]^+$: 297.0897, found: 297.0915.



3-(3-bromo-4-methylphenyl)-1,1,1-trifluoro-3-phenylbutan-2-one (66c)

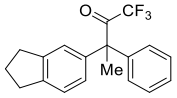
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41 – 7.32 (m, 3H), 7.28 (d, J = 2.1 Hz, 1H), 7.21 (dd, J = 8.1, 0.8 Hz, 1H), 7.14 – 7.10 (m, 2H), 6.92 (dd, J = 8.0, 2.1 Hz, 1H), 2.40 (s, 3H), 2.03 (d, J = 1.3 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.3 (q, $J_{C=F}$ =31.5 Hz), 144.8, 144.5, 142.3, 136.6, 135.5, 133.5, 132.7, 132.6, 131.9, 129.9, 120.9 (q, $J_{C=F}$ =296.1 Hz), 63.7, 29.2, 27.2.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.14.

ESI-MS: calcd. for $C_{17}H_{14}BrF_3O$ $[M+H]^+$: 371.0253, found: 371.0264.



3-(2,3-dihydro-1H-inden-5-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (67c)

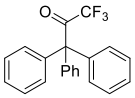
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 40%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39 – 7.29 (m, 3H), 7.20 (d, J = 7.9 Hz, 1H), 7.16 – 7.10 (m, 2H), 6.99 (d, J = 1.8 Hz, 1H), 6.88 (dd, J = 7.9, 2.0 Hz, 1H), 2.90 (m, 4H), 2.08 (q, J = 7.5 Hz, 2H), 2.03 (q, J = 1.4 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 192.3 (q, $J_{C=F}$ =31.5 Hz), 144.9, 144.0, 141.1, 138.0, 128.5, 128.2, 127.6, 126.1, 124.4, 124.0, 116.3 (q, $J_{C=F}$ =296.1 Hz), 59.5, 32.9, 32.5, 25.4, 24.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -70.09.

ESI-MS: calcd. for $C_{19}H_{17}F_3O$ $[M+H]^+$: 319.1304, found: 319.1328.



1,1,1-trifluoro-3,3,3-triphenylpropan-2-one (68c)

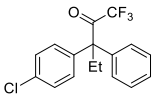
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 45%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 – 7.65 (m, 1H), 7.49 – 7.42 (m, 2H), 7.41 – 7.38 (m, 2H), 7.37 – 7.32 (m, 2H), 7.32 – 7.28 (m, 3H), 7.27 – 7.24 (m, 3H), 7.12 – 6.97 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 190.7 (q, $J_{C=F}$ =30.2 Hz), 139.1, 137.1, 137.0, 130.1, 129.6 (q, $J_{C=F}$ =226.8 Hz), 128.8, 128.4, 128.4, 128.2, 128.1, 127.9, 127.8, 127.7, 127.3, 127.0, 126.9, 71.7.

^{19}F NMR (376 MHz, $CDCl_3$) δ -68.03.

ESI-MS: calcd. for $C_{21}H_{14}F_3O$ $[M+H]^+$: 341.1148, found: 341.1159.



3-(4-chlorophenyl)-1,1,1-trifluoro-3-phenylpentan-2-one (69c)

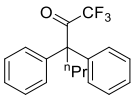
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 60%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 – 7.52 (m, 2H), 7.52 – 7.43 (m, 3H), 7.37 (s, 4H), 1.71 – 1.61 (m, 1H), 1.18 (dq, J = 14.7, 7.4 Hz, 1H), 0.71 (t, J = 7.5 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 192.6 (q, J_{C-F} =37.8 Hz), 134.5, 133.8, 131.4, 129.3, 128.9, 128.3, 128.2, 127.1, 123.4 (q, J_{C-F} =281.0 Hz), 70.8, 28.7, 8.4.

^{19}F NMR (376 MHz, $CDCl_3$) δ -66.93.

ESI-MS: calcd. for $C_{17}H_{14}ClF_3O$ $[M+H]^+$: 327.0758, found: 327.0764.



1,1,1-trifluoro-3,3-diphenylhexan-2-one (71c)

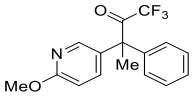
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 77%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, J = 6.7 Hz, 2H), 7.53 – 7.36 (m, 7H), 7.35 – 7.31 (m, 1H), 1.70 (m 1H), 1.29 – 1.19 (m, 1H), 1.16 – 1.02 (m, 2H), 0.67 (t, J = 7.2 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 193.3 (q, J_{C-F} =29.0 Hz), 136.3, 131.8, 129.1, 128.8, 128.2, 128.0, 127.8, 127.1, 123.5 (q, J_{C-F} =281.0 Hz), 70.7, 37.6, 17.7, 13.9.

^{19}F NMR (376 MHz, $CDCl_3$) δ -66.92.

ESI-MS: calcd. for $C_{18}H_{17}F_3O$ $[M+H]^+$: 307.1304, found: 307.1297.



1,1,1-trifluoro-3-(6-methoxypyridin-3-yl)-3-phenylbutan-2-one (72c)

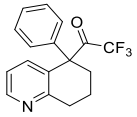
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 30%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.26 (d, J = 2.4 Hz, 1H), 7.66 (dd, J = 8.6, 2.5 Hz, 1H), 7.58 – 7.52 (m, 2H), 7.50 – 7.41 (m, 3H), 6.77 (dd, J = 8.5, 0.8 Hz, 1H), 3.96 (s, 3H), 1.27 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.2 (q, J_{C-F} =26.5 Hz), 163.8, 144.6, 136.6, 131.4, 129.3, 128.0, 127.2, 126.8, 123.4 (q, J_{C-F} =281.0 Hz), 110.5, 65.9, 53.6, 23.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -66.74.

ESI-MS: calcd. for $C_{16}H_{14}F_3NO_2$ $[M+H]^+$: 310.1049, found: 310.1055.



2,2,2-trifluoro-1-(5-phenyl-5,6,7,8-tetrahydroquinolin-5-yl) ethan-1-one (73c)

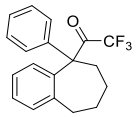
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 57%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.50 (dd, J = 4.9, 1.7 Hz, 1H), 7.85 (m, 1H), 7.64 – 7.39 (m, 5H), 7.17 (dd, J = 7.9, 4.8 Hz, 1H), 3.14 (m, 1H), 2.98 (dt, J = 17.5, 7.8 Hz, 1H), 1.92 – 1.68 (m, 3H), 1.27 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 195.3 (q, $J_{C=F}$ =39.1 Hz), 159.0, 149.2, 133.7, 129.3, 128.9, 128.3, 127.8, 126.6, 123.7 (q, $J_{C=F}$ =281.0 Hz), 120.5, 68.0, 30.6, 27.4, 17.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -63.61.

ESI-MS: calcd. for $C_{17}H_{14}F_3NO$ $[M+H]^+$: 306.1100, found: 306.1112.



2,2,2-trifluoro-1-(5-phenyl-6,7,8,9-tetrahydro-5H-benzo [7] annulen-5-yl) ethan-1-one (74c)

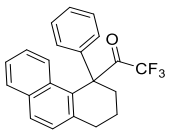
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 58%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.72 (d, J = 69.1 Hz, 2H), 7.53 (m, 1H), 7.50 – 7.43 (m, 3H), 7.24 (m, 2H), 7.14 (m, 1H), 3.03 (m, 1H), 2.89 – 2.80 (m, 1H), 1.95 – 1.81 (m, 2H), 1.51 – 1.41 (m, 3H), 1.36 – 1.25 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 193.7 (q, $J_{C=F}$ =21.4 Hz), 140.0, 137.2, 131.5, 129.1, 128.7, 128.2, 127.8, 126.4, 125.9, 123.9 (q, $J_{C=F}$ =282.2 Hz), 70.02, 35.3, 33.6, 26.7, 25.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -65.80.

ESI-MS: calcd. for $C_{19}H_{17}F_3O$ $[M+H]^+$: 319.1304, found: 319.1311.



2,2,2-trifluoro-1-(4-phenyl-1,2,3,4-tetrahydrophenanthren-4-yl) ethan-1-one (75c)

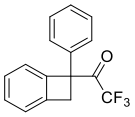
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 60%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.99 (d, J = 8.7 Hz, 1H), 7.89 – 7.78 (m, 2H), 7.73 (d, J = 7.6 Hz, 2H), 7.59 – 7.44 (m, 5H), 7.35 (d, J = 8.2 Hz, 1H), 3.09 (m, 1H), 2.92 (m, 1H), 1.91 (td, J = 12.4, 5.9 Hz, 1H), 1.82 (m, 1H), 1.52 (m, 1H), 1.40 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 196.9 (q, $J_{C=F}$ =16.4 Hz), 143.2, 137.4, 136.6, 135.5, 134.1, 133.9, 133.3, 133.1, 133.0, 131.7, 131.2, 130.8, 129.9, 129.6, 128.4 (q, $J_{C=F}$ =282.2 Hz), 74.9, 33.6, 32.3, 22.8.

^{19}F NMR (376 MHz, $CDCl_3$) δ -68.03.

ESI-MS: calcd. for $C_{22}H_{17}F_3O$ $[M+H]^+$: 355.1304, found: 355.1310.



2,2,2-trifluoro-1-(7-phenylbicyclo [4.2.0] octa-1,3,5-trien-7-yl) ethan-1-one (76c)

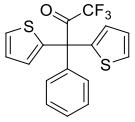
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 20:1) to give the title compound as a colorless oil (isolated yield: 52%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.55 – 7.50 (m, 1H), 7.42 – 7.31 (m, 7H), 7.21 – 7.16 (m, 1H), 4.36 (d, J = 14.2 Hz, 1H), 3.34 (d, J = 14.2 Hz, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 193.9 (q, J_{C-F} =30.0 Hz), 147.9, 146.5, 140.9, 134.4, 133.7, 132.9, 132.6, 131.4, 129.1, 128.8, 120.7 (q, J_{C-F} =282.2 Hz), 69.6, 47.3.

^{19}F NMR (376 MHz, $CDCl_3$) δ -71.70.

ESI-MS: calcd. for $C_{16}H_{11}F_3O$ $[M+H]^+$: 277.0835, found: 277.0841.



1,1,1-trifluoro-3-phenyl-3,3-di(thiophen-2-yl) propan-2-one (77c)

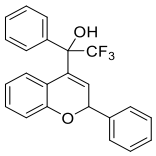
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 27%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 – 7.29 (m, 2H), 7.24 (dd, J = 5.3, 1.2 Hz, 1H), 7.20 – 7.14 (m, 3H), 7.02 – 6.98 (m, 1H), 6.80 (d, J = 5.3 Hz, 1H), 6.75 – 6.71 (m, 2H), 5.60 (d, J = 1.2 Hz, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 206.7 (q, J_{C-F} =23.9 Hz), 160.1, 141.5, 132.6, 129.9, 128.5, 127.7, 127.7, 126.5, 126.3, 126.2, 120.4 (q, J_{C-F} =302.4 Hz), 111.3, 49.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -78.12.

ESI-MS: calcd. for $C_{17}H_{11}F_3OS_2$ $[M+H]^+$: 353.0276, found: 353.0281.



2,2,2-trifluoro-1-phenyl-1-(2-phenyl-2H-chromen-4-yl) ethan-1-ol (78c)

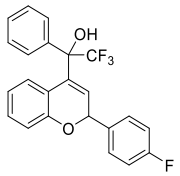
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a yellow oil (isolated yield: 75%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.75 – 7.66 (m, 2H), 7.57 – 7.51 (m, 2H), 7.47 – 7.37 (m, 6H), 7.06 (m, 1H), 6.96 (dd, J = 8.0, 1.6 Hz, 1H), 6.88 (dd, J = 8.1, 1.3 Hz, 1H), 6.63 (m, 1H), 6.39 (m, 1H), 5.94 (d, J = 3.4 Hz, 1H), 3.00 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 154.7, 139.8, 135.9, 131.0, 129.6, 129.0, 128.9, 128.7, 128.5, 127.3, 127.1, 125.9, 125.9, 124.6 (q, J_{C-F} =287.3 Hz), 121.1, 118.8, 116.9, 79.0 (q, J_{C-F} =29.0 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.97.

ESI-MS: calcd. for $C_{23}H_{17}F_3O_2$ $[M+H]^+$: 383.1253, found: 383.1264.



2,2,2-trifluoro-1-(2-(4-fluorophenyl)-2H-chromen-4-yl)-1-phenylethan-1-ol (79c)

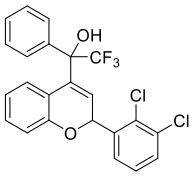
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as yellow oil (isolated yield: 42%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.72 – 7.65 (m, 2H), 7.53 – 7.47 (m, 2H), 7.45 – 7.36 (m, 3H), 7.14 – 7.09 (m, 2H), 7.06 (m, 1H), 6.97 (dd, J = 8.0, 1.6 Hz, 1H), 6.85 (dd, J = 8.1, 1.3 Hz, 1H), 6.64 (m, 1H), 6.34 (m, 1H), 5.92 (d, J = 3.4 Hz, 1H), 3.02 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 167.6 (d, $J_{C=F}$ = 247.3 Hz), 159.1, 140.5, 140.3, 136.0, 134.4, 133.8, 133.7, 133.2, 131.9, 130.2, 129.0 (q, $J_{C=F}$ = 226.8 Hz), 125.9, 123.5, 121.6, 120.4,83.7 (q, $J_{C=F}$ = 27.7 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.96, -113.05.

ESI-MS: calcd. for $C_{23}H_{15}F_4O_2$ $[M+H]^+$: 401.1159, found: 401.1165.



(1*R*)-1-(2-(2,3-dichlorophenyl)-2H-chromen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (80c)

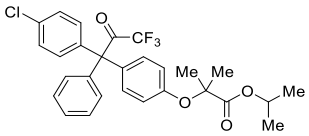
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as yellow oil (isolated yield: 56%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.77 – 7.67 (m, 2H), 7.60 (dd, J = 7.8, 1.6 Hz, 1H), 7.51 (dd, J = 8.0, 1.6 Hz, 1H), 7.46 – 7.40 (m, 3H), 7.30 (t, J = 7.9 Hz, 1H), 7.12 – 7.03 (m, 1H), 6.96 (dd, J = 8.0, 1.6 Hz, 1H), 6.91 (dd, J = 8.1, 1.3 Hz, 1H), 6.67 (m, 1H), 6.35 – 6.29 (m, 2H), 2.97 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 159.4, 144.2, 140.4, 138.3, 136.2, 135.1, 135.0, 134.5, 133.8, 133.2, 132.5, 132.0, 131.9, 131.1, 129.2 (q, $J_{C=F}$ = 282.2 Hz), 129.0, 126.1, 123.4, 121.5, 83.6 (q, $J_{C=F}$ = 27.7 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -75.05.

ESI-MS: calcd. for $C_{23}H_{15}Cl_2F_3O_2$ $[M+H]^+$: 451.0474, found: 451.0480.



isopropyl 2-(4-(1-(4-chlorophenyl)-3,3,3-trifluoro-2-oxo-1-phenylpropyl) phenoxy)-2-methylpropanoate (80c).

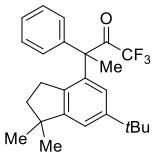
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a yellow solid (isolated yield: 39%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.40 – 7.27 (m, 5H), 7.23 – 7.18 (m, 2H), 7.16 – 7.10 (m, 4H), 6.86 – 6.80 (m, 2H), 5.08 (m, 1H), 1.64 (s, 6H), 1.18 (d, J = 6.2 Hz, 6H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 190.1 (q, $J_{C=F}$ = 25.6 Hz), 173.4, 155.5, 139.2, 139.1, 133.4, 131.4, 131.1, 129.5, 128.6, 128.5 (q, $J_{C=F}$ = 283.5 Hz), 118.1, 79.2, 69.7, 69.1, 25.4, 21.5.

^{19}F NMR (376 MHz, $CDCl_3$) δ -66.52.

ESI-MS: calcd. for $C_{28}H_{26}ClF_3O_4$ $[M+H]^+$: 519.1544, found: 519.1540.



3-(6-(*tert*-butyl)-1,1-dimethyl-2,3-dihydro-1H-inden-4-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (82c)

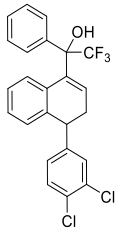
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 33%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43 – 7.35 (m, 3H), 7.29 – 7.25 (m, 2H), 7.17 (d, J = 1.7 Hz, 1H), 6.75 (d, J = 1.7 Hz, 1H), 2.52 – 2.36 (m, 2H), 2.09 (q, J = 1.5 Hz, 3H), 1.83 (t, J = 6.9 Hz, 2H), 1.29 (d, J = 10.9 Hz, 6H), 1.26 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 191.1 (q, $J_{C=F}$ = 25.2 Hz), 153.9, 150.0, 138.9, 138.3, 136.9, 128.6, 128.5, 127.8, 123.3, 118.3, 116.4 (q, $J_{C=F}$ = 281.0 Hz), 59.6, 43.4, 41.6, 34.8, 31.4, 30.3, 28.4, 28.3, 23.1.

^{19}F NMR (376 MHz, $CDCl_3$) δ -67.97.

ESI-MS: calcd. for $C_{25}H_{30}F_3O$ $[M+H]^+$: 403.2243, found: 403.2247.



(1*R*)-1-(4-(3,4-dichlorophenyl)-3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (83c)

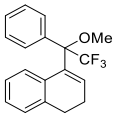
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 30%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 – 7.59 (m, 2H), 7.41 – 7.31 (m, 5H), 7.18 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.08 – 7.01 (m, 2H), 6.94 (td, *J* = 7.7, 1.5 Hz, 1H), 6.86 (dt, *J* = 7.5, 1.1 Hz, 1H), 6.63 (m, 1H), 4.06 (dd, *J* = 8.6, 6.6 Hz, 1H), 2.87 – 2.79 (m, 2H), 2.73 (m, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 148.2, 143.4, 141.4, 138.5, 137.2, 135.7, 135.4, 135.1, 134.9, 133.4, 133.0, 132.7, 132.6, 132.3, 132.2, 131.9, 131.7, 131.4, 129.6 (q, $J_{C=F}$ = 301.1 Hz), 84.5 (q, $J_{C=F}$ = 29.0 Hz), 47.2, 35.7.

^{19}F NMR (376 MHz, $CDCl_3$) δ -77.00.

ESI-MS: calcd. for $C_{24}H_{17}Cl_2F_3O$ $[M+H]^+$: 449.0681, found: 449.0692.



4-(2,2,2-trifluoro-1-methoxy-1-phenylethyl)-1,2-dihydronaphthalene (84c)

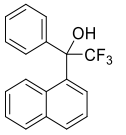
Prepared according to the general procedure A for the coupling reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 20:1) to give the title compound as a colorless oil (isolated yield: 71%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 – 7.57 (m, 2H), 7.34 – 7.29 (m, 3H), 7.15 – 7.10 (m, 1H), 7.07 – 7.01 (m, 2H), 6.87 (td, *J* = 7.7, 1.5 Hz, 1H), 6.75 (m, 1H), 3.46 (q, *J* = 1.5 Hz, 3H), 2.88 – 2.77 (m, 2H), 2.56 – 2.46 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 137.7, 137.1, 133.0, 131.7, 130.5, 128.4, 127.9, 127.7, 127.4, 126.8, 126.4, 126.14, 122.9 (q, $J_{C=F}$ = 292.3 Hz), 84.7 (q, $J_{C=F}$ = 25.2 Hz), 53.6, 28.0, 23.6.

^{19}F NMR (376 MHz, $CDCl_3$) δ -69.19.

ESI-MS: calcd. for $C_{19}H_{17}F_3O$ $[M+H]^+$: 319.1304, found: 319.1315.



2,2,2-trifluoro-1-(7-phenylbicyclo [4.2.0] octa-1,3,5-trien-7-yl)ethan-1-one (85c)

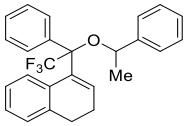
Prepared according to the general procedure A for the ring-opening reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a white solid (isolated yield: 89%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.02 – 7.96 (m, 2H), 7.94 (d, *J* = 8.2 Hz, 1H), 7.86 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.57 – 7.48 (m, 3H), 7.40 (m, 1H), 7.34 (dd, *J* = 5.2, 3.5 Hz, 3H), 7.25 (m, 1H), 3.21 (s, 1H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 138.4, 135.1, 133.6, 130.6, 129.0, 128.6, 128.3, 127.6, 127.1, 126.0, 125.6, 125.2 (q, $J_{C=F}$ = 287.3 Hz), 124.24, 80.8 (q, $J_{C=F}$ = 27.7 Hz).

^{19}F NMR (376 MHz, $CDCl_3$) δ -74.22.

ESI-MS: calcd. for $C_{18}H_{14}F_3O$ $[M+H]^+$: 303.0991, found: 303.0984.



4-(2,2,2-trifluoro-1-phenyl-1-(1-phenylethoxy) ethyl)-1,2-dihydronaphthalene (86c)

Prepared according to method C for the etherification reaction. Following workup, the product was purified by column chromatography (hexane:EtOAc, 100:1) to give the title compound as a colorless oil (isolated yield: 24%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 (s, 2H), 7.42 (d, *J* = 7.1 Hz, 2H), 7.38 – 7.32 (m, 5H), 7.27 – 7.24 (m, 1H), 7.16 (dd, *J* = 7.5, 1.3 Hz, 1H), 7.08 – 6.98 (m, 2H), 6.86 (m, 1H), 6.75 (dt, *J* = 5.1, 2.7 Hz, 1H), 4.97 (q, *J* = 6.5 Hz, 1H), 2.94 – 2.83 (m, 2H), 2.62 – 2.46 (m, 2H), 1.03 (d, *J* = 6.5 Hz, 2H).
^{13}C NMR (126 MHz, $CDCl_3$) δ 145.3, 138.3, 137.4, 133.0, 131.6, 131.2, 128.4, 128.1, 127.99, 128.0, 127.9, 127.4, 126.3, 126.8, 126.6 (q, $J_{C=F}$ = 249.5 Hz), 125.7, 125.5, 84.6 (q, $J_{C=F}$ = 26.5 Hz), 74.7, 28.2, 26.4, 23.7.
^{19}F NMR (376 MHz, $CDCl_3$) δ -64.44, -69.66.
ESI-MS: calcd. for $C_{26}H_{24}F_3O$ $[M+H]^+$: 409.1774, found: 409.1777.

8. Cheminformatic analysis of the obtained pseudo-natural products

Id	Smiles	NP_Like	QED	PMI1	PMI2
pnp_01	FC(F)(F)C(O)(c1ccccc1)C=1c2c(cccc2)CCC=1	-0.06	0.868	0.53	0.865
pnp_02	FC(F)(F)C(O)(c1ccc(C)cc1)C=1c2c(cccc2)CCC=1	-0.21	0.845	0.505	0.869
pnp_03	FC(F)(F)[C@](O)(c1ccc(N(C)C)cc1)C=1c2c(cccc2)CCC=1	-0.38	0.882	0.408	0.876
pnp_04	FC(F)(F)C(O)(c1ccc(F)cc1)C=1c2c(cccc2)CCC=1	-0.36	0.801	0.498	0.846
pnp_05	FC(F)(F)C(O)(c1c(C)cccc1)C=1c2c(cccc2)CCC=1	-0.2	0.845	0.5	0.85
pnp_06	FC(F)(F)C(O)(c1cc([N+](=O)[O-])ccc1)C=1c2c(cccc2)CCC=1	-0.55	0.661	0.463	0.835
pnp_07	Clc1cc(Cl)cc(C(O)(C(F)(F)F)C=2c3c(cccc3)CCC=2)c1	-0.34	0.708	0.529	0.865
pnp_08	FC(F)(F)C(O)(c1cc(C(F)(F)F)cc(C(F)(F)F)c1)C=1c2c(cccc2)CCC=1	-0.19	0.529	0.512	0.866
pnp_09	FC(F)(F)C(O)(c1cc(OC)c(OC)cc1)C=1c2c(cccc2)CCC=1	-0.05	0.869	0.441	0.903
pnp_10	Clc1c(Cl)cc(C(O)(C(F)(F)F)C=2c3c(cccc3)CCC=2)cc1Cl	-0.26	0.569	0.438	0.889
pnp_11	FC(F)C(O)(c1ccccc1)C=1c2c(cccc2)CCC=1	-0.18	0.898	0.516	0.871
pnp_12	FC(F)(F)[C@](O)(c1cc2c(cc1)cccc2)C=1c2c(cccc2)CCC=1	-0.11	0.633	0.454	0.866
pnp_13	FC(F)(F)C(F)(F)C(F)(F)C(O)(c1ccccc1)C=1c2c(cccc2)CCC=1	-0.14	0.645	0.568	0.759
pnp_14	FC(F)(F)C(O)(c1sc2c(c1)cccc2)C=1c2c(cccc2)CCC=1	-0.37	0.623	0.417	0.882
pnp_15	FC(F)(F)C(O)(c1sccc1)C=1c2c(cccc2)CCC=1	-0.31	0.864	0.509	0.88
pnp_16	FC(F)(F)C(O)(c1ccccc1)C=1c2c(OCC=1)cccc2	0.16	0.911	0.519	0.843
pnp_17	FC(F)(F)C(O)(c1ccccc1)C=1c2c(cc(OCc3ccccc3)cc2)CCC=1	-0.15	0.555	0.185	0.944
pnp_18	FC(F)(F)C(O)(c1ccccc1)C=1c2c(c(OC)ccc2)CCC=1	0.09	0.897	0.332	0.885
pnp_19	FC(F)(F)C(O)(c1ccccc1)C=1c2c([C@](C)CC=1)cccc2	0.38	0.823	0.49	0.86
pnp_20	FC(F)(F)C(O)(c1ccccc1)C=1c2c(cc(OC)cc2)CCC=1	0.01	0.897	0.384	0.868
pnp_21	FC(F)(F)C(O)(c1ccccc1)C=1c2c(ccc(F)c2)CC=1	-0.3	0.824	0.467	0.795
pnp_22	Brc1cc2c(C(C(O)(C(F)(F)F)c3ccccc3)=CC2)cc1	-0.06	0.803	0.232	0.929
pnp_23	FC(F)(F)C(O)(c1ccccc1)C=1c2c(C(C)(C)C=1)cccc2	0.14	0.842	0.438	0.843
pnp_24	FC(F)(F)C(O)(c1ccccc1)C=1c2c3c(ccc2)cccc3C=1	0.07	0.691	0.373	0.851
pnp_25	FC(F)(F)C(O)(c1ccccc1)C=1c2c3c(ccc2CC=1)cccc3	0.08	0.677	0.483	0.758
pnp_26	FC(F)(F)C(O)(c1ccccc1)C=1c2c(scc2)CCC=1	-0.54	0.864	0.479	0.855
pnp_27	FC(F)(F)C(O)(C(=C)c1occc1)c1ccccc1	-0.59	0.919	0.433	0.778
pnp_28	FC(F)(F)C(O)(c1ccccc1)C=1c2c(cccc2)CC=1	0.01	0.883	0.486	0.776
pnp_29	Clc1cc(Cl)cc([C@@](O)(C(F)(F)F)[C@]2(N=[N+]=[N-])c3c(cccc3)CCC2)c1	-0.21	0.357	0.506	0.897
pnp_30	FC(F)(F)[C@](O)(c1cc(C)ccc1)[C@]1(N=[N+]=[N-])c2c(cccc2)CCC1	-0.2	0.451	0.577	0.933
pnp_31	FC(F)(F)[C@](O)(c1ccccc1)[C@]1(N=[N+]=[N-])c2c(cccc2)CCC1	0.03	0.475	0.607	0.903
pnp_32	Clc1cc2c([C@@](N=[N+]=[N-])([C@](O)(C(F)(F)F)c3ccccc3)CCC2)cc1	-0.11	0.417	0.489	0.874
pnp_33	FC(F)(F)[C@](O)(c1ccccc1)[C@]1(N=[N+]=[N-])c2c([C@](C)CC1)cccc2	0.36	0.435	0.606	0.883
pnp_34	FC(F)(F)[C@](O)(c1ccccc1)[C@]1(N=[N+]=[N-])c2c(c(OC)ccc2)CCC1	0.15	0.463	0.464	0.924
pnp_35	FC(F)(F)[C@](O)(c1ccccc1)[C@]1(N=[N+]=[N-])c2c(OCC1)cccc2	-0.03	0.506	0.619	0.87
pnp_36	FC(F)(F)[C@@](O)([C@](N=[N+]=[N-])(C)c1occc1)c1ccccc1	-0.32	0.52	0.635	0.785
pnp_37	FC(F)(F)[C@](O)(c1ccccc1)[C@]1(N=[N+]=[N-])c2c(scc2)CCC1	-0.57	0.469	0.592	0.885
pnp_38	Clc1cc2c(C(C(O)(C(F)(F)F)c3ccccc3)=CCC2)cc1	-0.25	0.805	0.383	0.885
pnp_39	Clc1cc2C(C(O)(C(F)(F)F)c3ccccc3)=CCc2cc1	-0.27	0.846	0.44	0.796
pnp_40	FC(F)(F)C(O)(c1c(OC)cccc1)C=1c2c(cccc2)CCC=1	-0.07	0.897	0.486	0.844
pnp_41	FC(F)(F)C(O)(c1ccc(OC)cc1)C=1c2c(cccc2)CCC=1	-0.1	0.897	0.44	0.859
pnp_42	FC(F)(F)C(O)(c1ccc(C(C)(C)C)cc1)C=1c2c(cccc2)CCC=1	-0.23	0.721	0.382	0.88
pnp_43	FC(F)(F)C(O)(c1ccc(-c2ccccc2)cc1)C=1c2c(cccc2)CCC=1	-0.12	0.579	0.297	0.909
pnp_44	Clc1ccc(C(O)(C(F)(F)F)C=2c3c(cccc3)CCC=2)cc1	-0.34	0.805	0.429	0.874
pnp_45	Brc1ccc(C(O)(C(F)(F)F)C=2c3c(cccc3)CCC=2)cc1	-0.22	0.753	0.325	0.889
pnp_46	FC(F)(F)C(O)(c1ccc(C(F)(F)F)cc1)C=1c2c(cccc2)CCC=1	-0.22	0.692	0.359	0.88

pnp_47	Brc1cc(C(O)(C(F)(F)F)C=2c3c(cccc3)CCC=2)ccc1	-0.29	0.753	0.324	0.893
pnp_48	FC(F)(F)C(O)(c1cc(F)ccc1)C=1c2c(cccc2)CCC=1	-0.42	0.801	0.502	0.87
pnp_49	Clc1cc(Cl)cc(C(O)(C(F)(F)F)C=2c3c(cccc3)CC=2)c1	-0.28	0.763	0.548	0.826
pnp_50	Clc1cc(C(F)(F)F)cc(C(O)(C(F)(F)F)C=2c3c(cccc3)CCC=2)c1	-0.43	0.594	0.529	0.874
pnp_51	FC(F)(F)C(F)(F)C(O)(c1ccccc1)C=1c2c(cccc2)CCC=1	-0.15	0.76	0.501	0.765
pnp_52	FC(F)(F)C(F)(F)C(F)(F)C(F)(F)C(O)(c1ccccc1)C=1c2c(cccc2)CCC=1	-0.14	0.521	0.479	0.814
pnp_53	Brc1ccc([C@@](O)(C(F)(F)F)[C@]2(N=[N+]=[N-])c3c(cccc3)CCC2)cc1	-0.11	0.38	0.371	0.925
pnp_54	FC(F)(F)C(=O)C(C)(c1ccc(C)cc1)c1ccccc1	-0.58	0.817	0.512	0.73
pnp_55	Clc1cc(Cl)cc(C(C(=O)C(F)(F)F)(C)c2ccccc2)c1	-0.69	0.724	0.538	0.829
pnp_56	FC(F)(F)C(=O)C(C)(c1ccccc1)c1ccccc1	-0.36	0.825	0.536	0.683
pnp_57	FC(F)(F)C(=O)C(C)(c1sc2c(c1)cccc2)c1ccccc1	-0.76	0.632	0.434	0.777
pnp_58	FC(F)(F)C(=O)C(C)(c1sccc1)c1ccccc1	-0.82	0.826	0.535	0.69
pnp_59	FC(F)(F)C(=O)[C@@]1(c2sccc2)c2c(cccc2)CCC1	-0.61	0.798	0.596	0.768
pnp_60	FC(F)(F)C(=O)[C@@]1(c2cc3c(cc2)cccc3)c2c(cccc2)CCC1	-0.04	0.586	0.442	0.834
pnp_61	FC(F)(F)C(=O)C(C)(c1cnc(OC)cc1)c1ccccc1	-1.06	0.867	0.398	0.784
pnp_62	FC(F)(F)C(=O)[C@](C)(c1ccc(OC)cc1)c1ccccc1	-0.44	0.849	0.459	0.694
pnp_63	Brc1c(C)ccc(C(C(=O)C(F)(F)F)(C)c2ccccc2)c1	-0.68	0.725	0.344	0.805
pnp_64	FC(F)(F)C(=O)[C@@]1(c2ccccc2)c2c(cccc2)C1	0.17	0.818	0.548	0.711
pnp_65	FC(F)(F)C(=O)[C@@]1(c2ccccc2)c2c(cccc2)CCCC1	0.04	0.725	0.628	0.77
pnp_66	FC(F)(F)C(=O)[C@@]1(c2ccccc2)c2c3c(ccc2CCC1)cccc3	0.15	0.586	0.61	0.805
pnp_67	FC(F)(F)C(=O)[C@@]1(c2ccccc2)c2c(nccc2)CCC1	-0.1	0.844	0.606	0.797
pnp_68	FC(F)(F)C(=O)C(c1sccc1)(c1sccc1)c1ccccc1	-0.67	0.625	0.766	0.857
pnp_69	Clc1ccc(C(C(=O)C(F)(F)F)(CC)c2ccccc2)cc1	-0.63	0.757	0.441	0.821
pnp_70	FC(F)(F)C(=O)C(c1ccccc1)(c1ccccc1)c1ccccc1	-0.28	0.6	0.791	0.867
pnp_71	FC(F)(F)C(=O)C(C)(c1cc2c(cc1)CCC2)c1ccccc1	-0.46	0.807	0.411	0.768
pnp_72	FC(F)(F)C(=O)C(C)(c1cc([N+](=O)[O-])ccc1)c1ccccc1	-0.85	0.63	0.418	0.756
pnp_73	FC(F)(F)C(=O)C(CCC)(c1ccccc1)c1ccccc1	-0.14	0.767	0.677	0.837
pnp_74	FC(F)(F)C(=O)C(c1ccc(-c2ccccc2)cc1)(c1ccccc1)c1ccccc1	-0.33	0.326	0.384	0.925
pnp_75	FC(F)(F)C(=O)C(C)(c1cc(C(F)(F)F)cc(C(F)(F)F)c1)c1ccccc1	-0.45	0.55	0.537	0.835
pnp_76	FC(F)(F)C(=O)[C@](C)(c1ccc(Oc2ccccc2)cc1)c1ccccc1	-0.45	0.558	0.225	0.886
pnp_77	FC(F)(F)C(=O)[C@](C)(c1ccc(F)cc1)c1ccccc1	-0.74	0.773	0.501	0.737
pnp_78	Clc1c(Cl)cccc1C1Oc2c(C(C(O)(C(F)(F)F)c3ccccc3)=C1)cccc2	-0.13	0.467	/	/
pnp_79	FC(F)(F)C(O)(c1ccccc1)C=1c2c(OC(c3ccccc3)C=1)ccc(OC)c2	0.18	0.601	/	/
pnp_80	FC(F)(F)[C@@](O)(c1ccccc1)C=1c2c(O[C@](c3ccccc3)C=1)cccc2	0.2	0.634	0.514	0.85
pnp_81	Clc1ccc([C@](C(=O)C(F)(F)F)(c2ccc(OC(C(=O)OC(C)C)(C)C)cc2)c2ccccc2)cc1	-0.53	0.24	0.291	0.897
pnp_82	FC(F)(F)C(=O)[C@](C)(c1c2c(C(C)(C)C)CC2)cc(C(C)(C)C)c1)c1ccccc1	-0.02	0.562	0.567	0.787
pnp_83	Clc1c(Cl)ccc(C2c3c(C(C(O)(C(F)(F)F)c4ccccc4)=CC2)cccc3)c1	-0.23	0.443	/	/
pnp_84	FC(F)(F)[C@@](O)(c1ccccc1)C=1c2c(O[C@](c3ccc(F)cc3)C=1)cccc2	-0.05	0.564	0.416	0.845
pnp_85	FC(F)(F)C(OC)(c1ccccc1)C=1c2c(cccc2)CCC=1	-0.09	0.763	0.558	0.853

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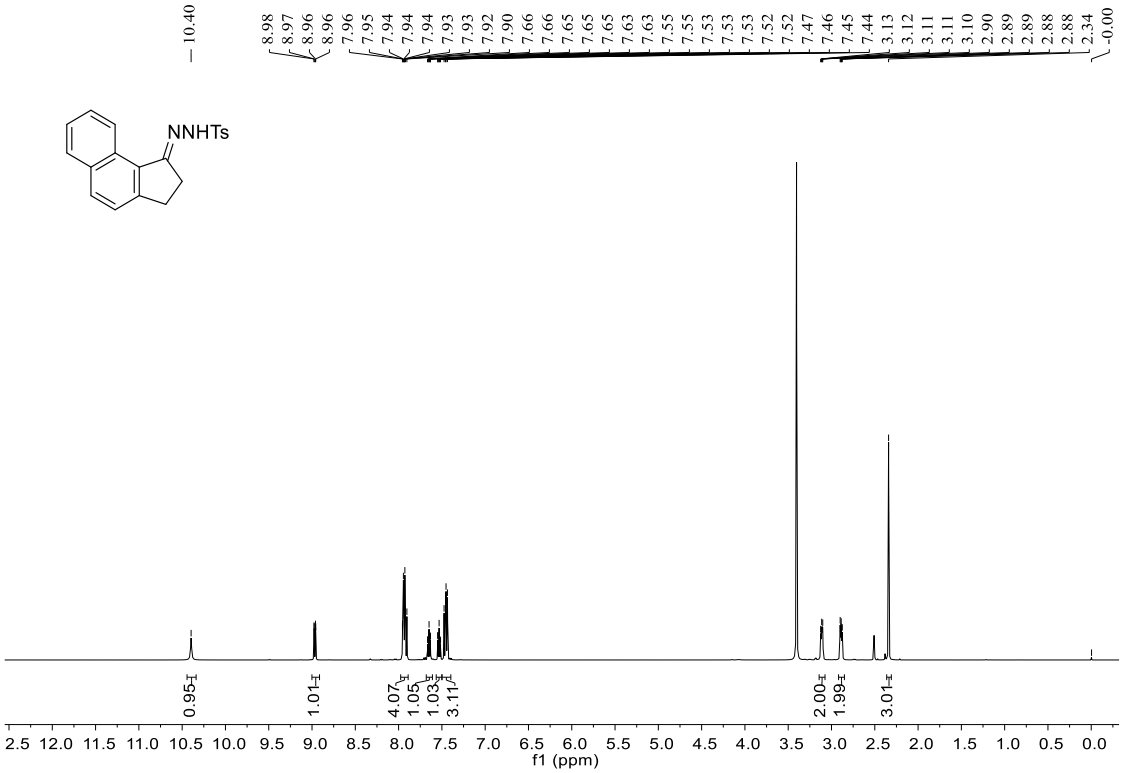
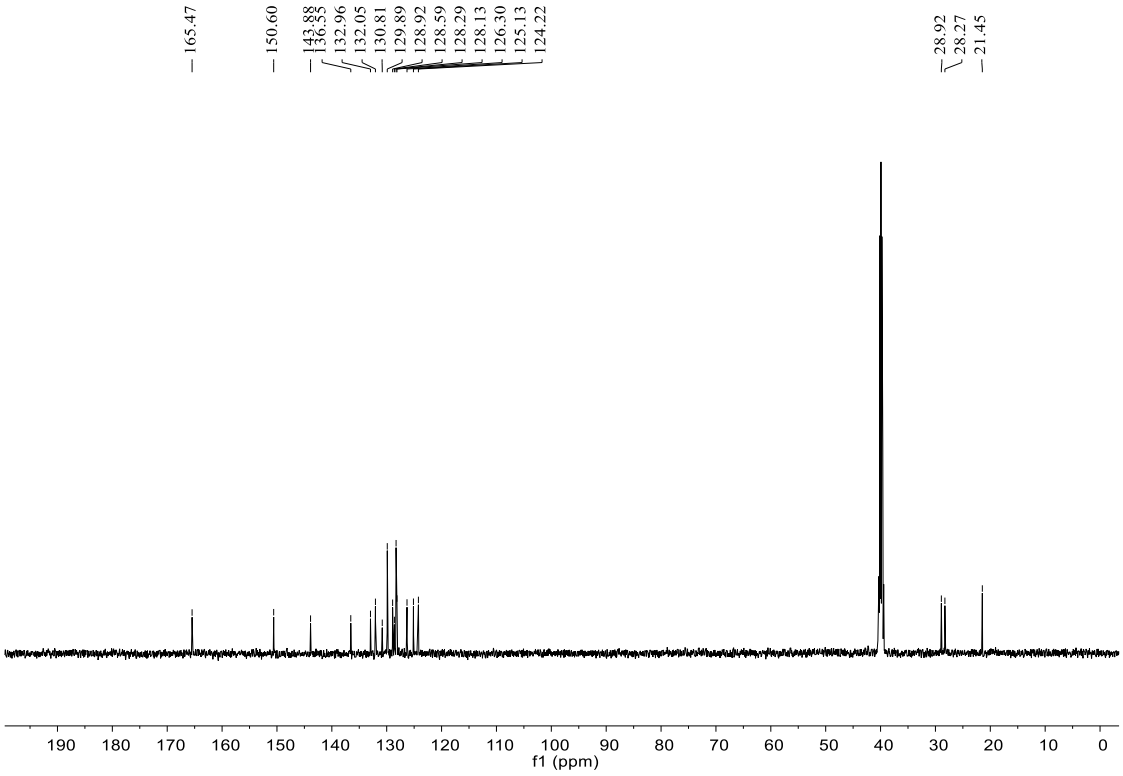
10. NMR spectra of synthesized starting material

N'-(4-methoxybenzylidene)-4-methylbenzenesulfonohydrazide (12a)

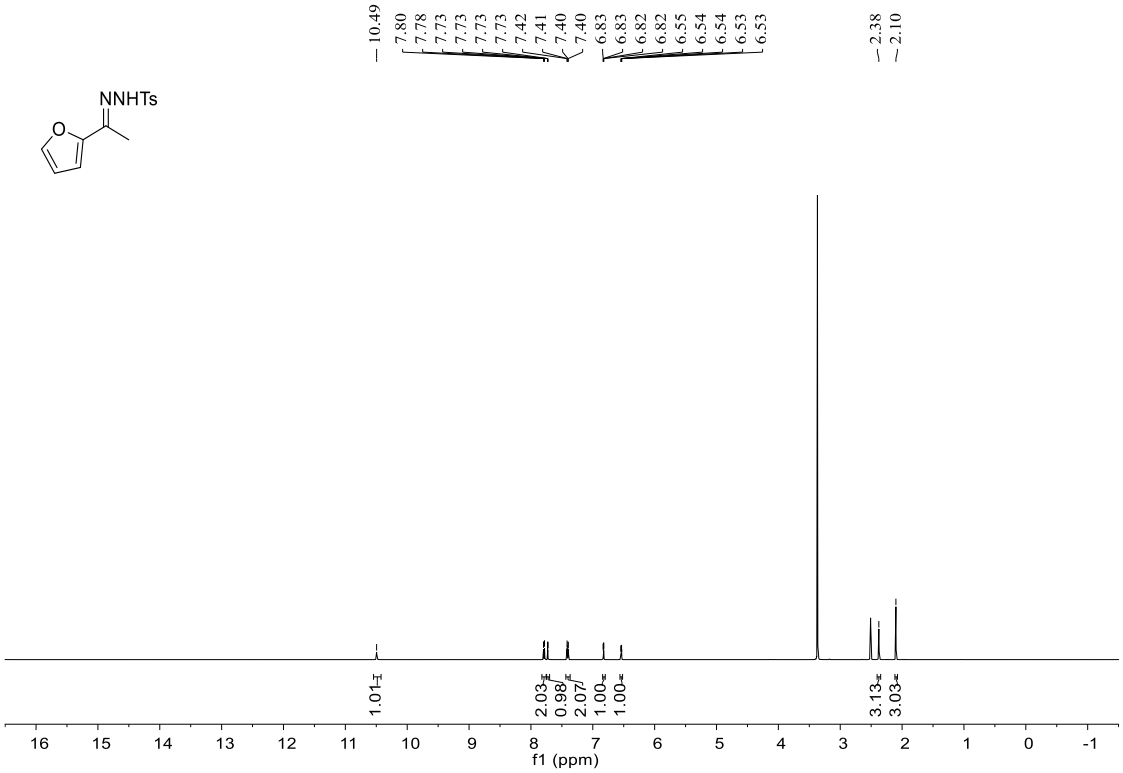


^{1}H NMR spectrum in DMSO-d_6.

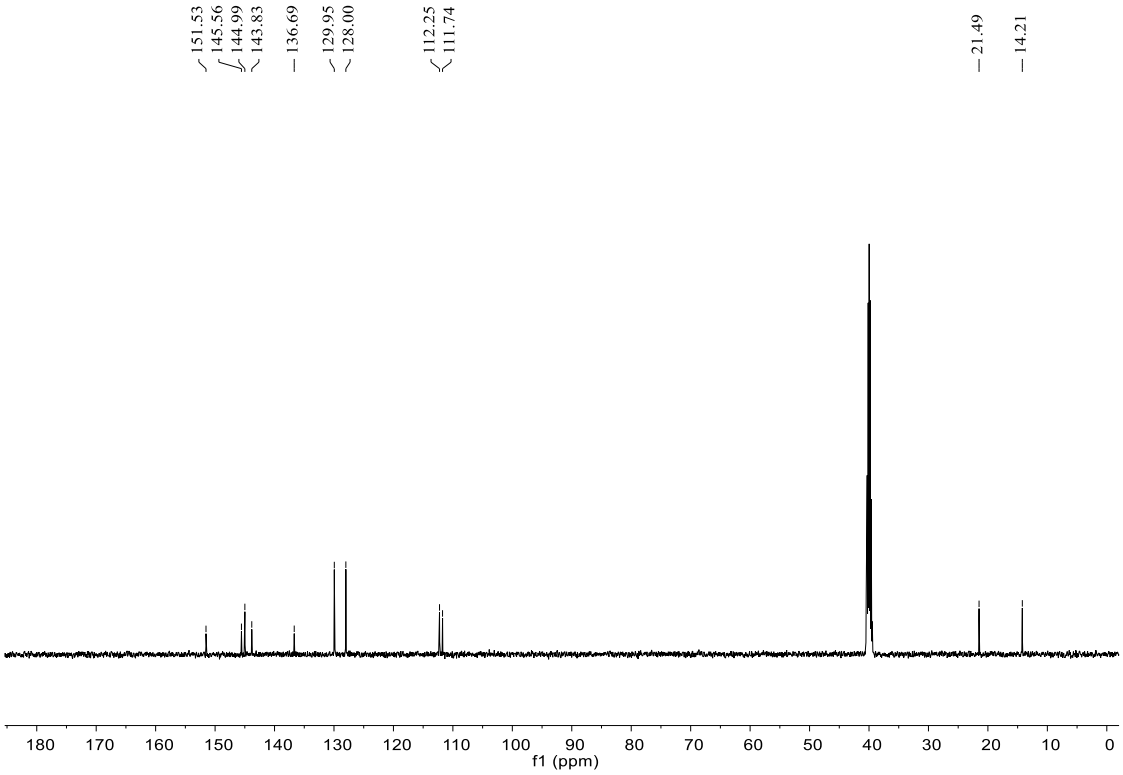


^{13}C NMR spectrum in DMSO-d_6.

***N*'-(1-(furan-2-yl) ethylidene)-4-methylbenzenesulfonohydrazide (15a)**

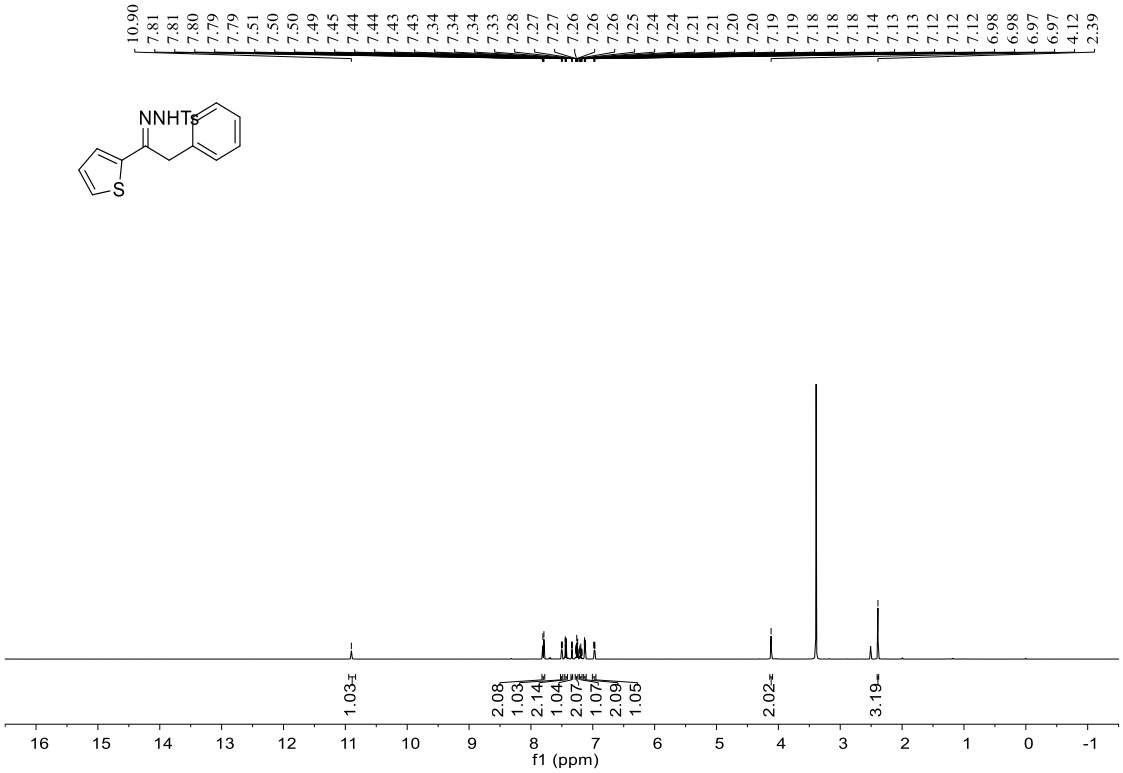


^{1}H NMR spectrum in $CDCl_3$.



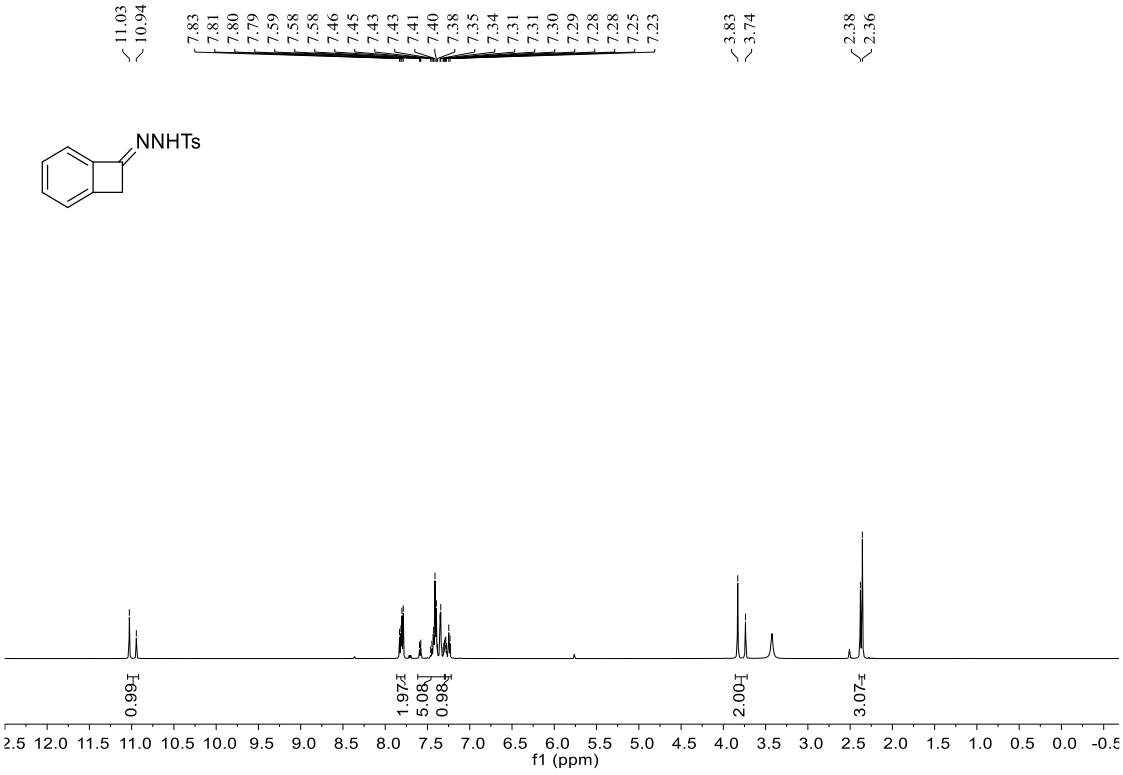
^{13}C NMR spectrum in $CDCl_3$.

4-methyl-*N*'-(2-phenyl-1-(thiophen-2-yl) ethylidene) benzenesulfonohydrazide (18a)



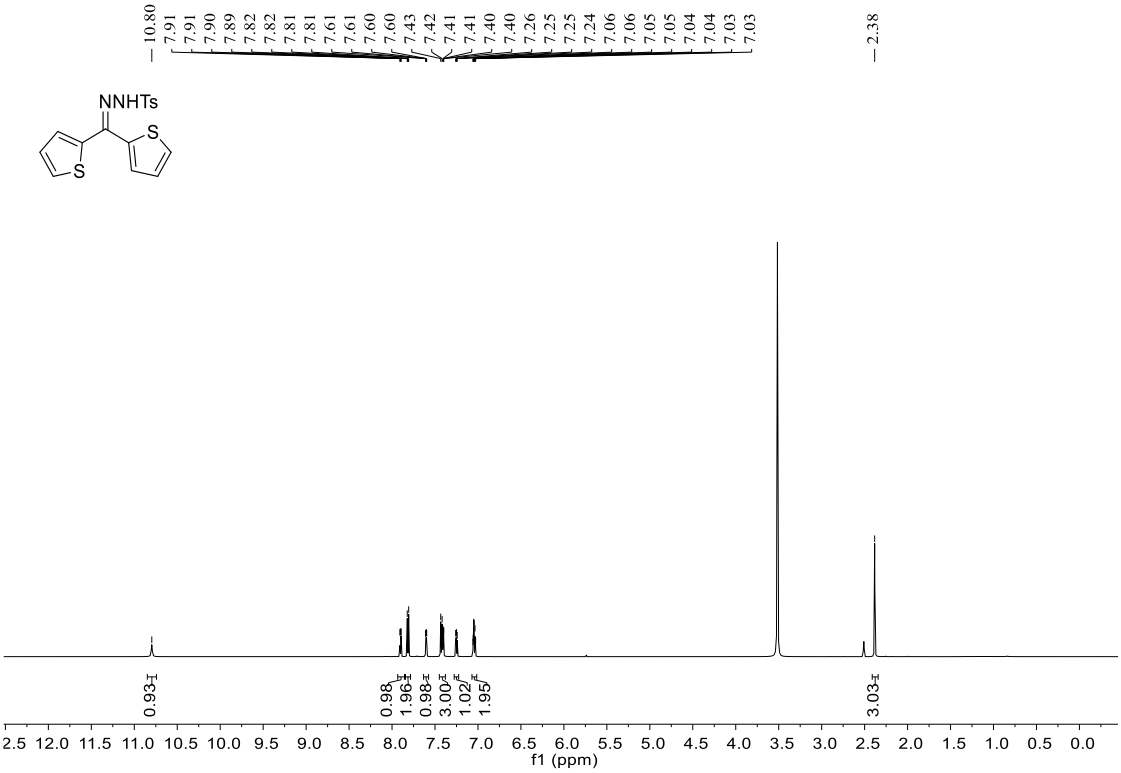
^{1}H NMR spectrum in DMSO-d_6.

***N*'-(bicyclo [4.2.0] octa-1,3,5-trien-7-ylidene)-4-methylbenzenesulfonohydrazide (75a)**

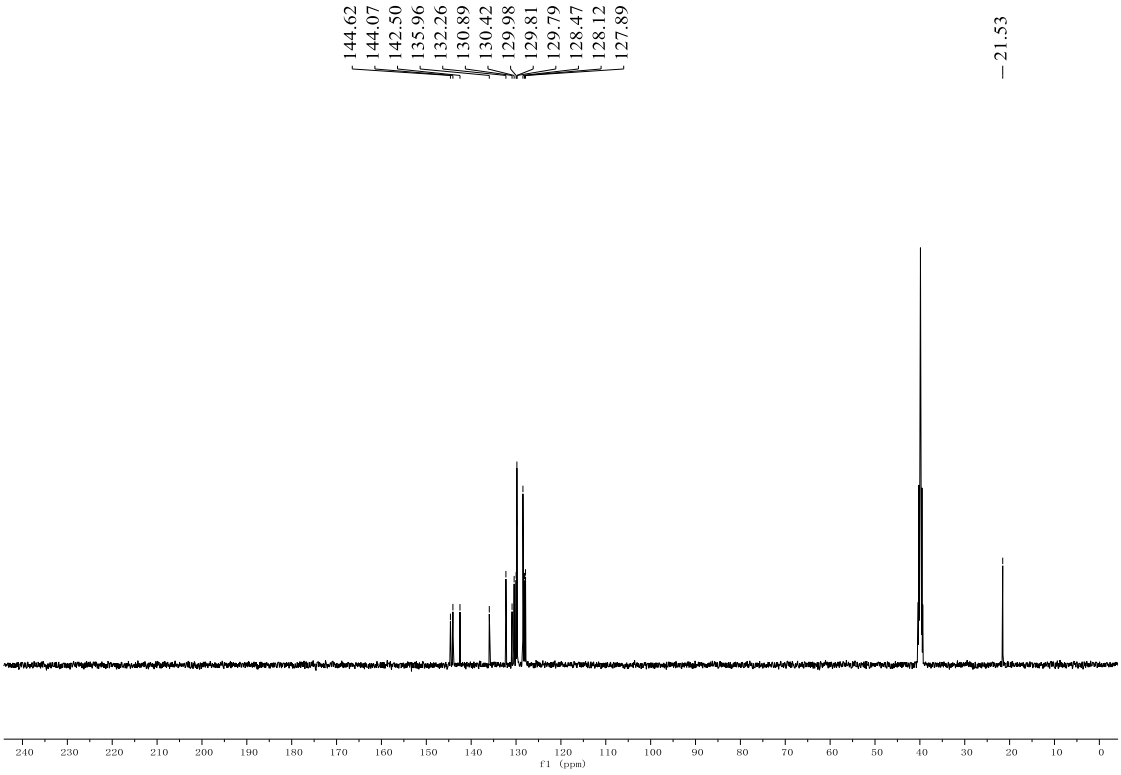


^{1}H NMR spectrum in DMSO-d_6.

***N′*-(di(thiophen-2-yl) methylene)-4-methylbenzenesulfonohydrazide (76a)**

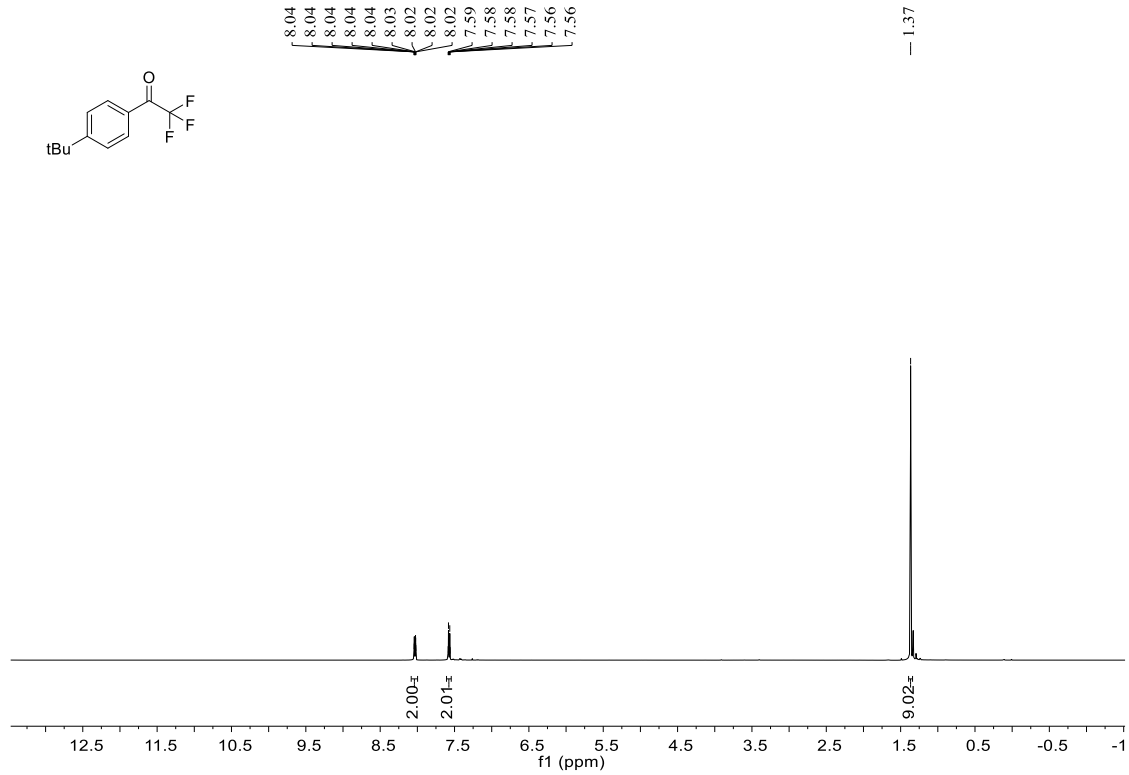


^{1}H NMR spectrum in DMSO-d_6



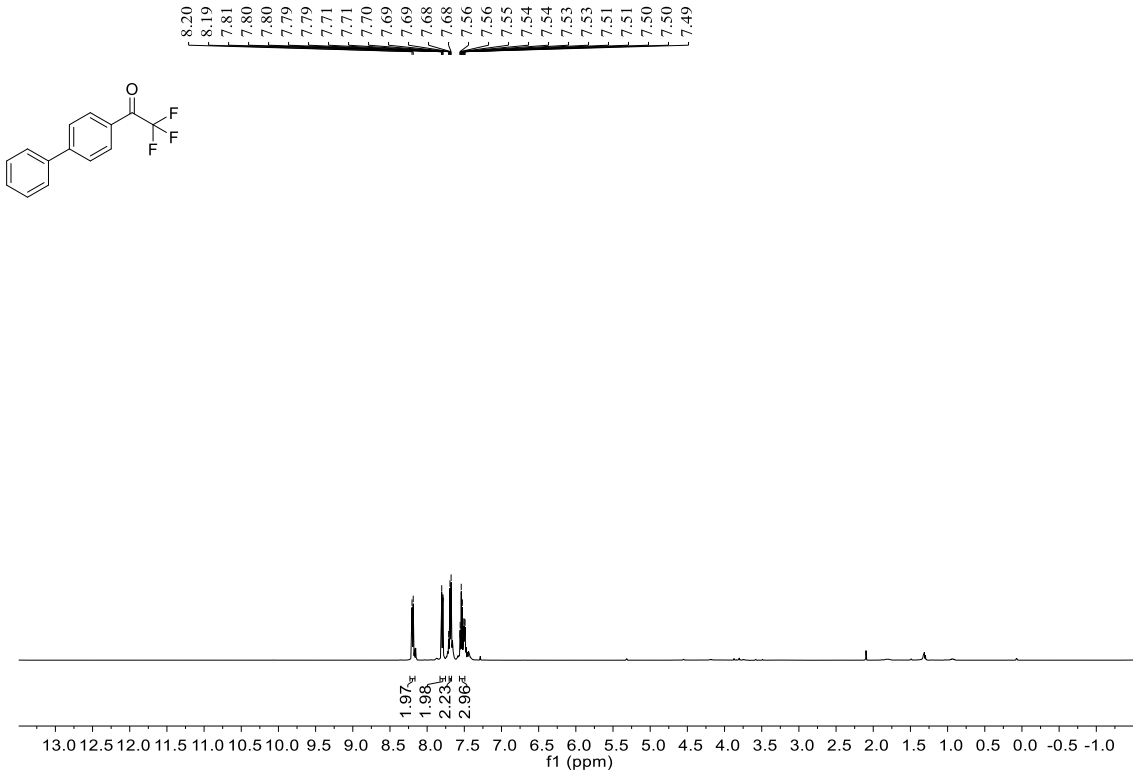
^{13}C NMR spectrum in DMSO-d_6.

1-(4-(*tert*-butyl) phenyl)-2,2,2-trifluoroethan-1-one (20b)[12]



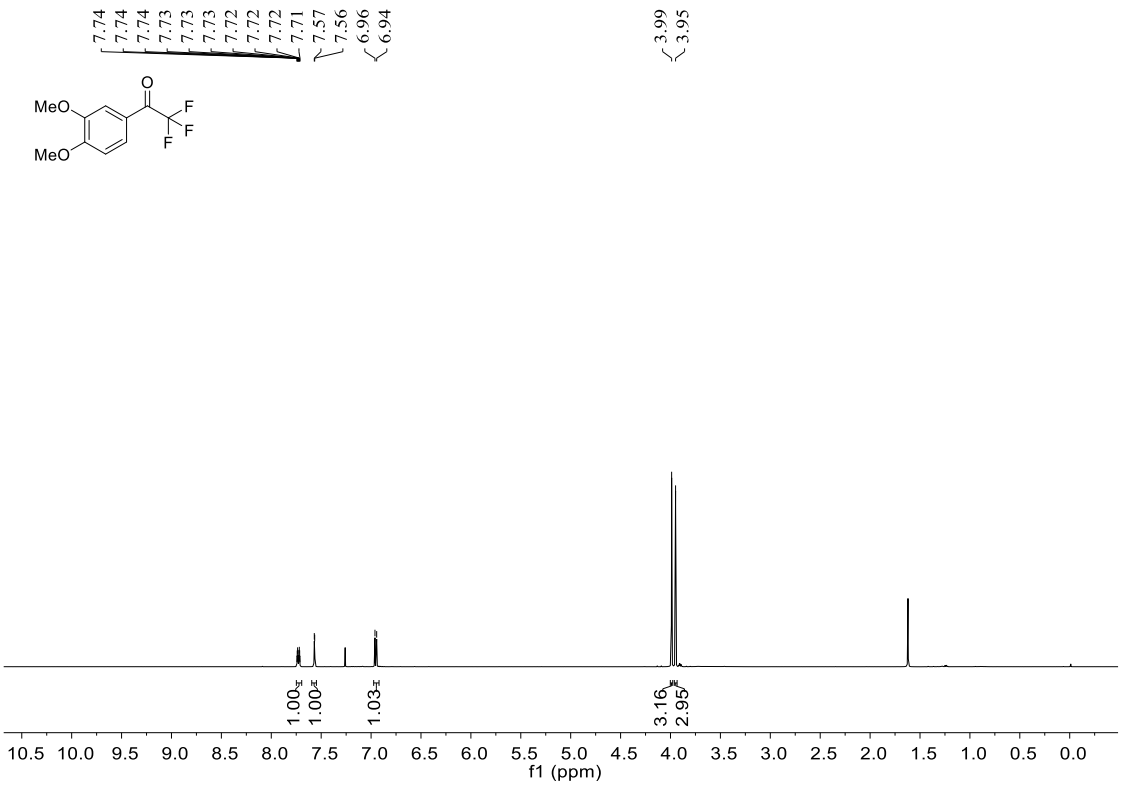
^{1}H NMR spectrum in $CDCl_3$.

1-([1,1'-biphenyl]-4-yl)-2,2,2-trifluoroethan-1-one (21b)[13]



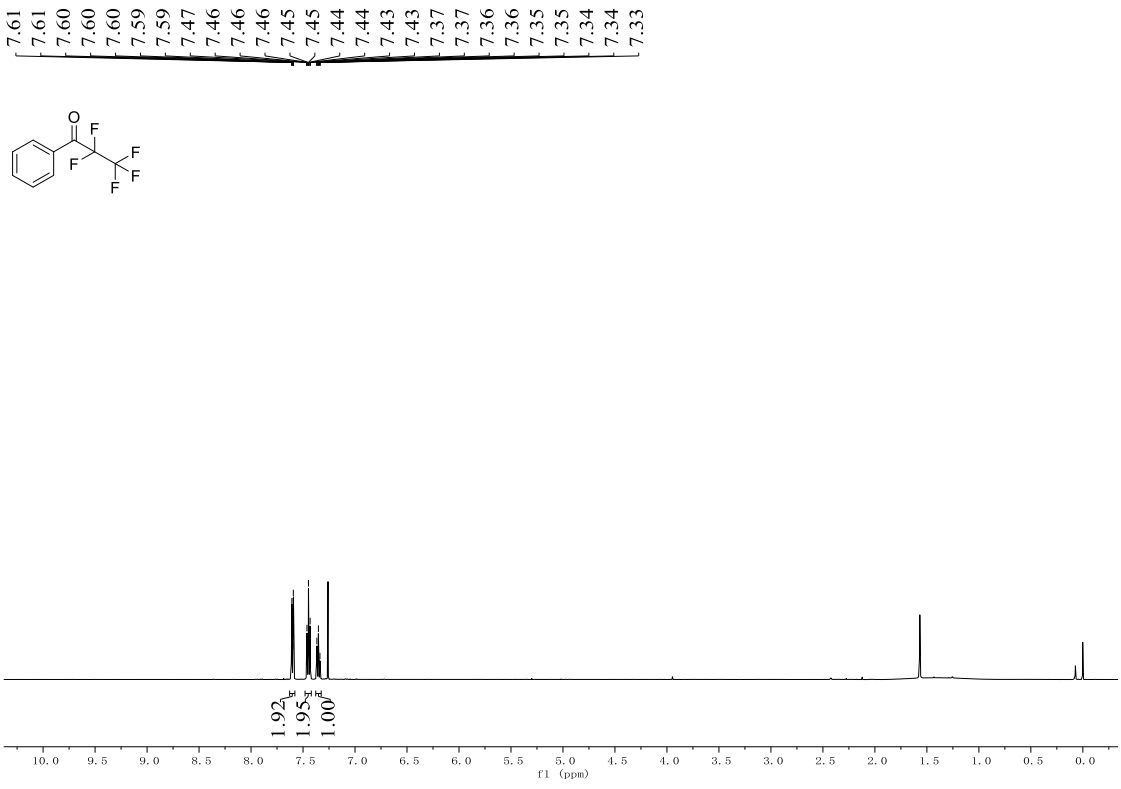
^{1}H NMR spectrum in $CDCl_3$.

1-(3,4-dimethoxyphenyl)-2,2,2-trifluoroethan-1-one (34b)[14]



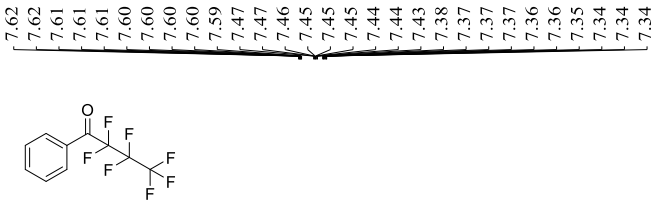
^{1}H NMR spectrum in $CDCl_3$.

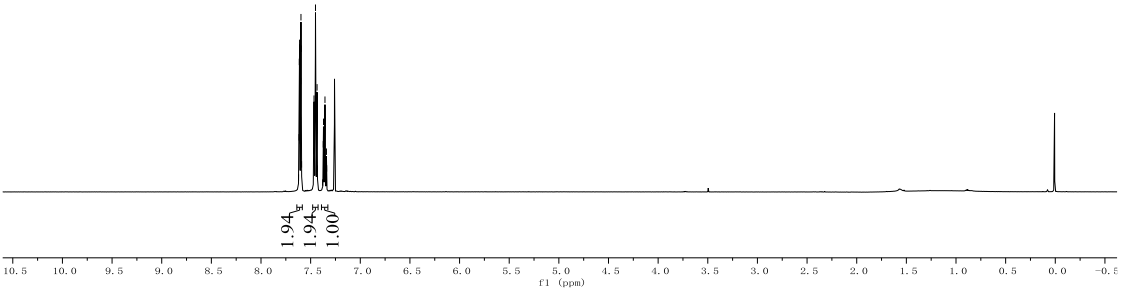
2,2,3,3,3-pentafluoro-1-phenylpropan-1-one (37b)[15]



^{1}H NMR spectrum in $CDCl_3$.

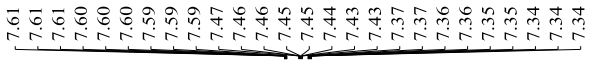
2,2,3,3,4,4,4-heptafluoro-1-phenylbutan-1-one (38b)[15]

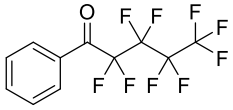


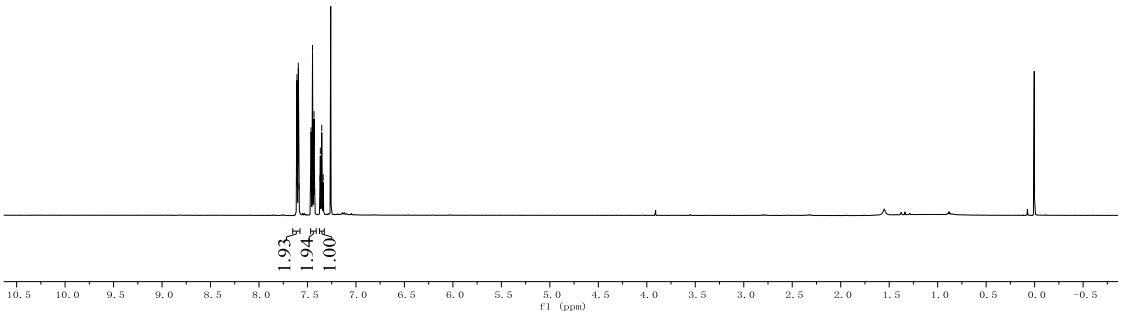


^{1}H NMR spectrum in $CDCl_3$.

2,2,3,3,4,4,5,5,5-nonafluoro-1-phenylpentan-1-one (39b)[16]

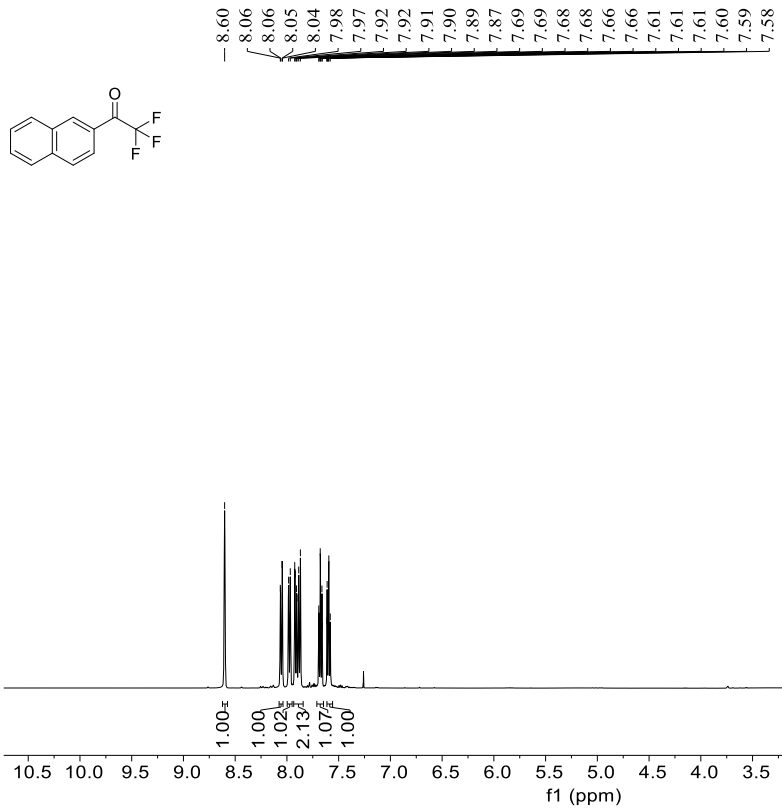




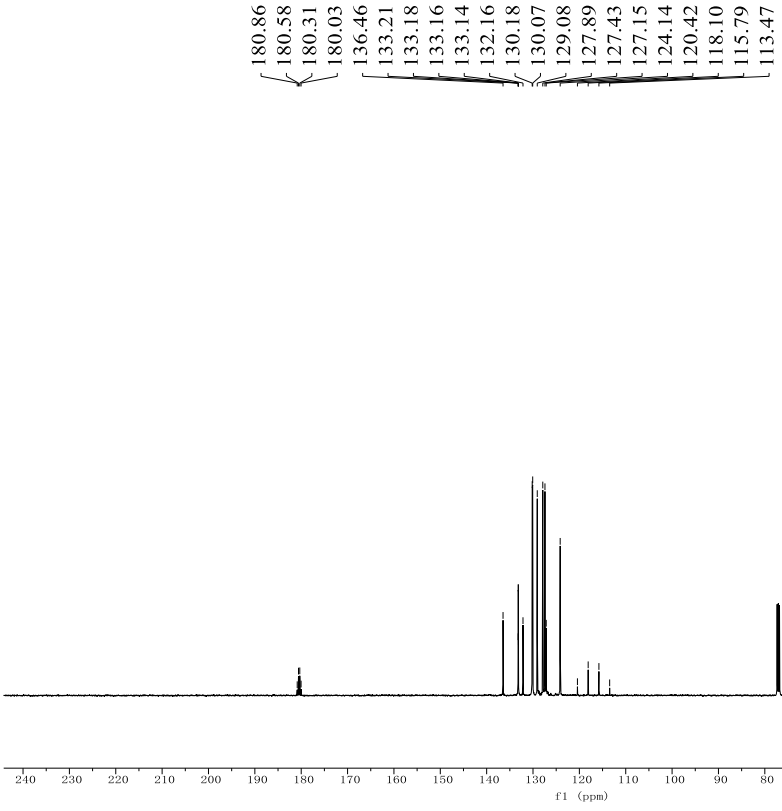


^{1}H NMR spectrum in $CDCl_3$.

2,2,2-trifluoro-1-(naphthalen-2-yl) ethan-1-one (40b)



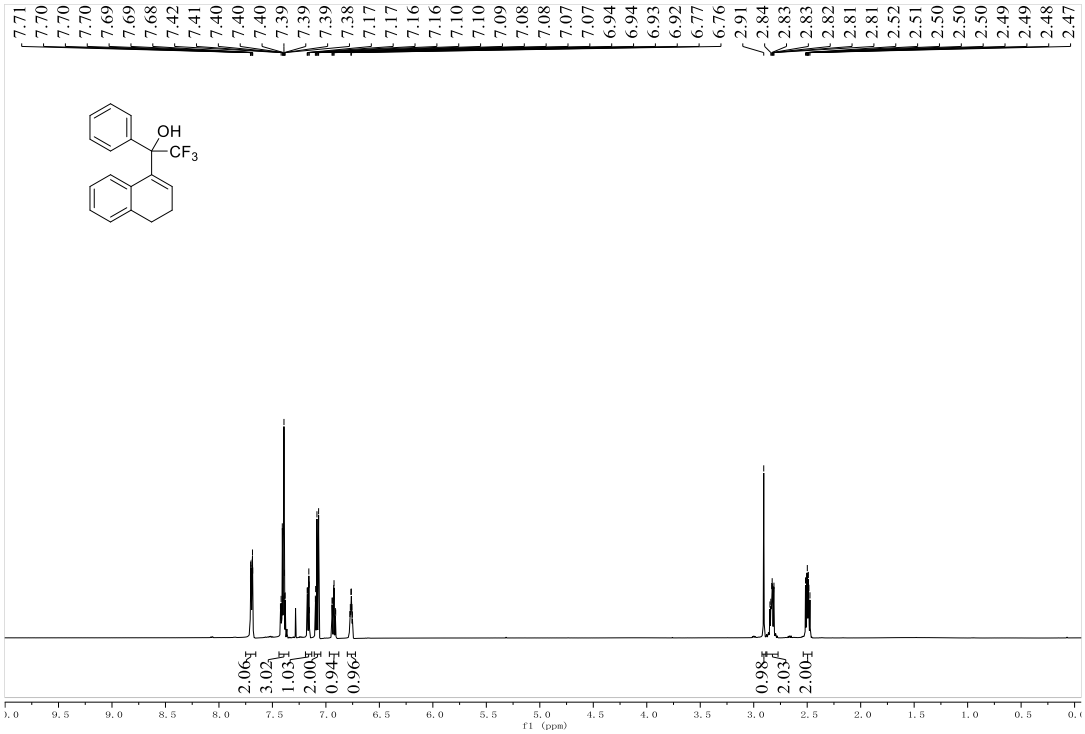
^{1}H NMR spectrum in $CDCl_3$.



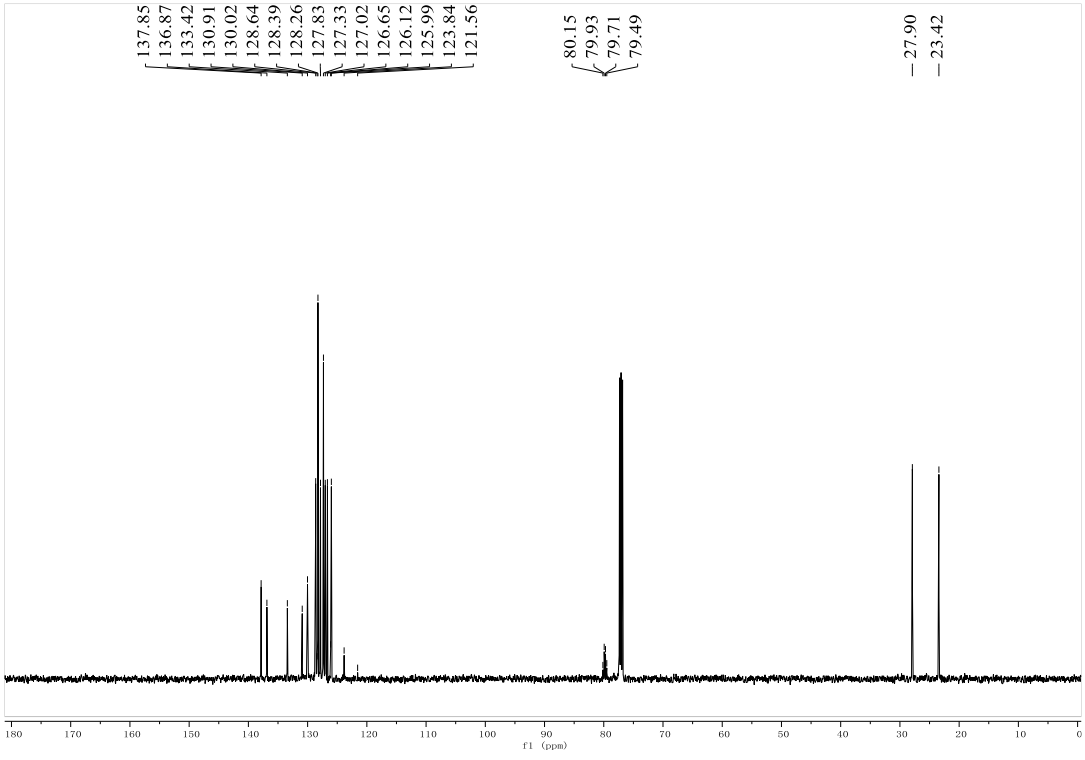
^{13}C NMR spectrum in $CDCl_3$.

11. NMR spectra of products and synthesized substrates

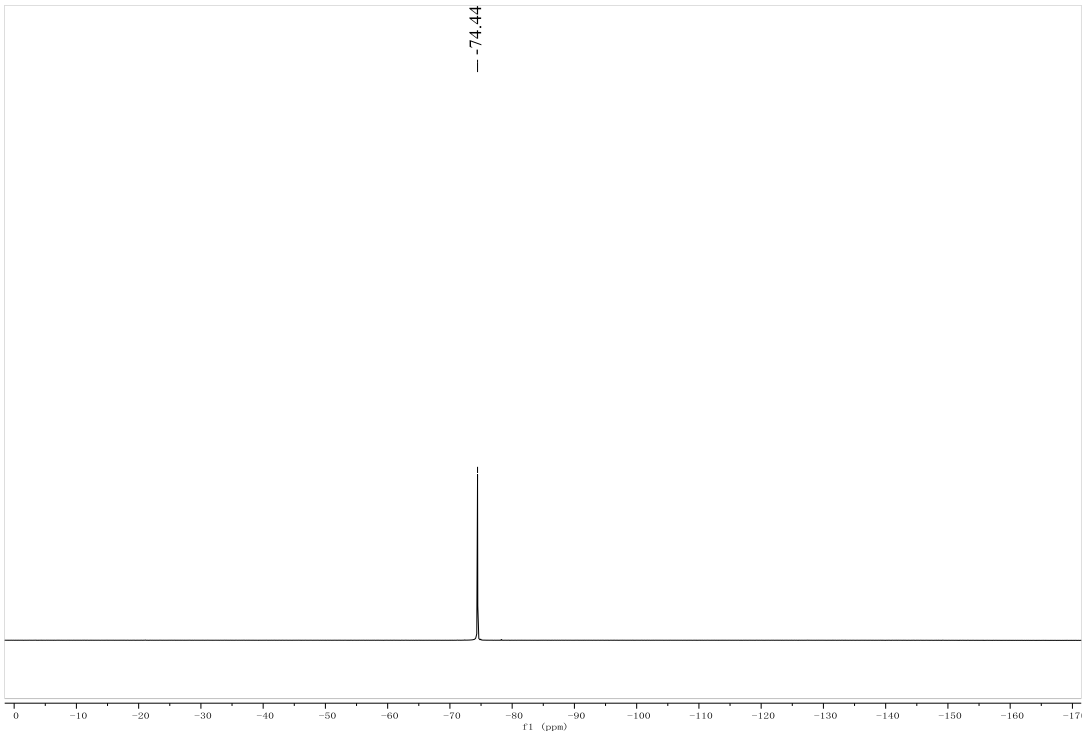
1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (1c)



^{1}H NMR spectrum in $CDCl_3$.

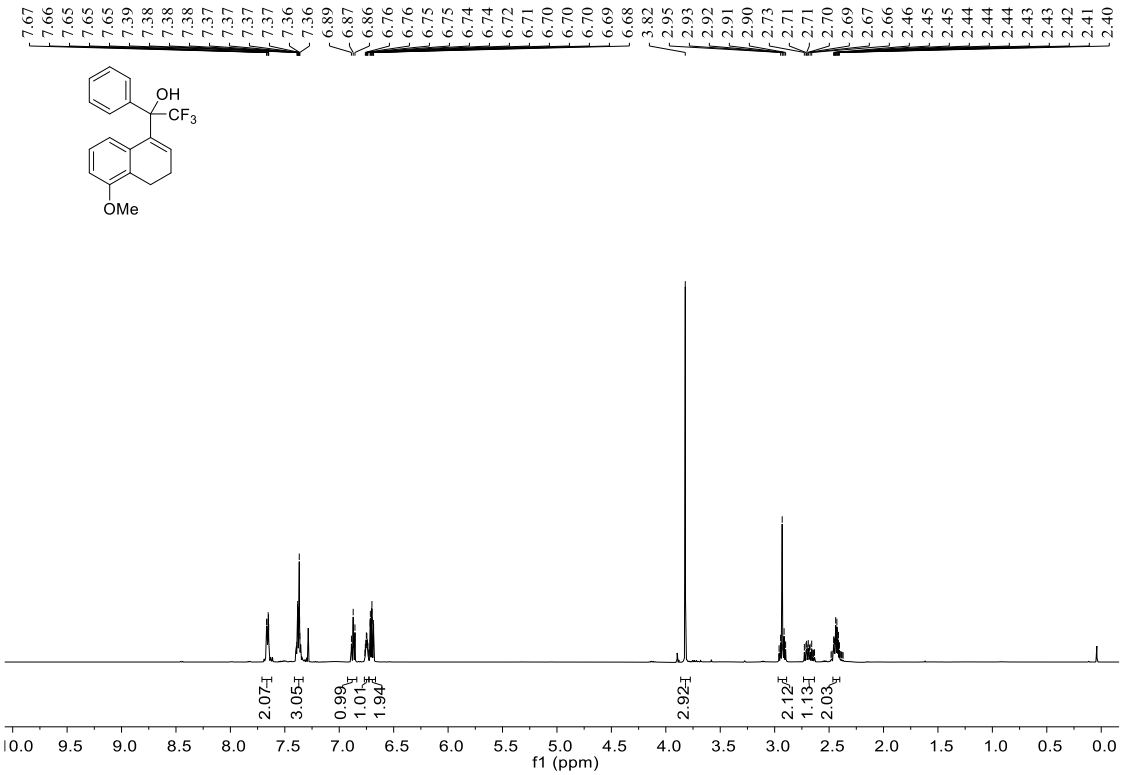


^{13}C NMR spectrum in $CDCl_3$.

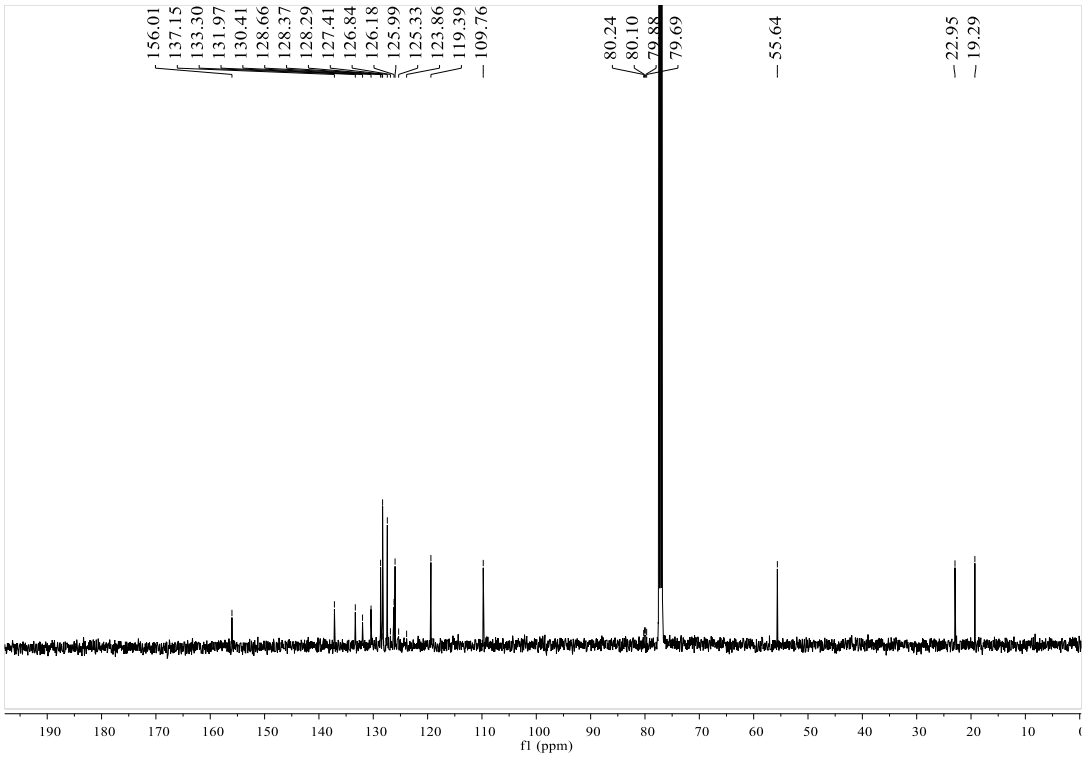


^{19}F NMR spectrum in $CDCl_3$.

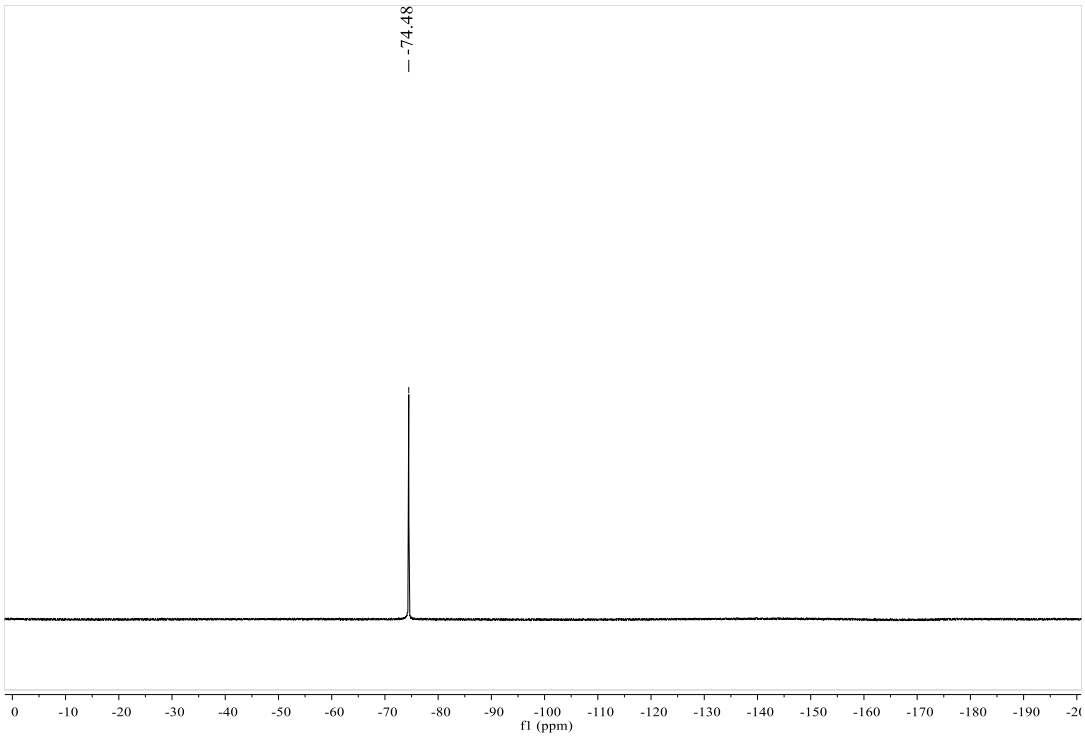
2,2,2-trifluoro-1-(5-methoxy-3,4-dihydronaphthalen-1-yl)-1-phenylethan-1-ol (2c)



^{1}H NMR spectrum in $CDCl_3$.

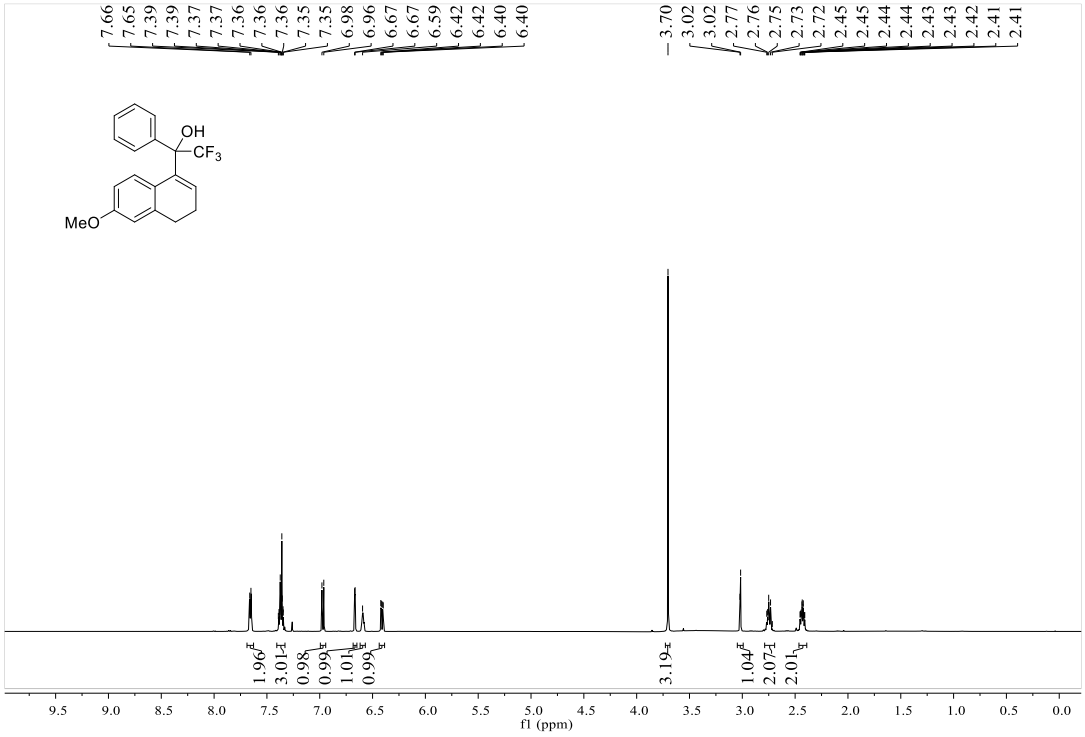


^{13}C NMR spectrum in $CDCl_3$.

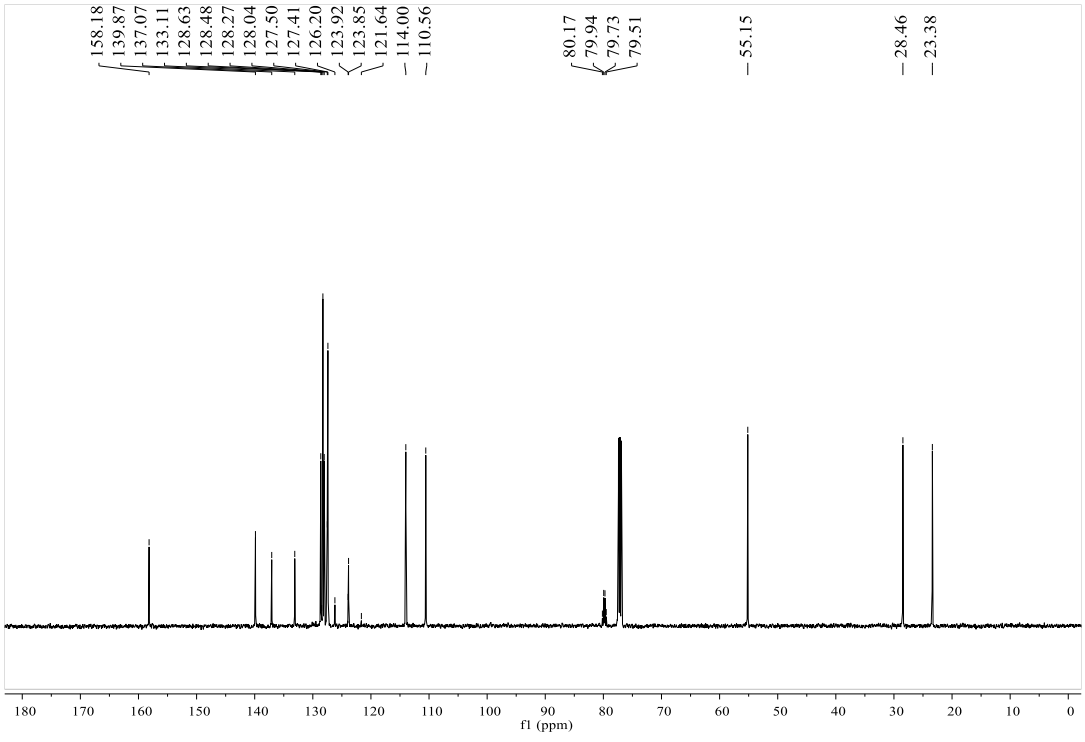


^{19}F NMR spectrum in $CDCl_3$.

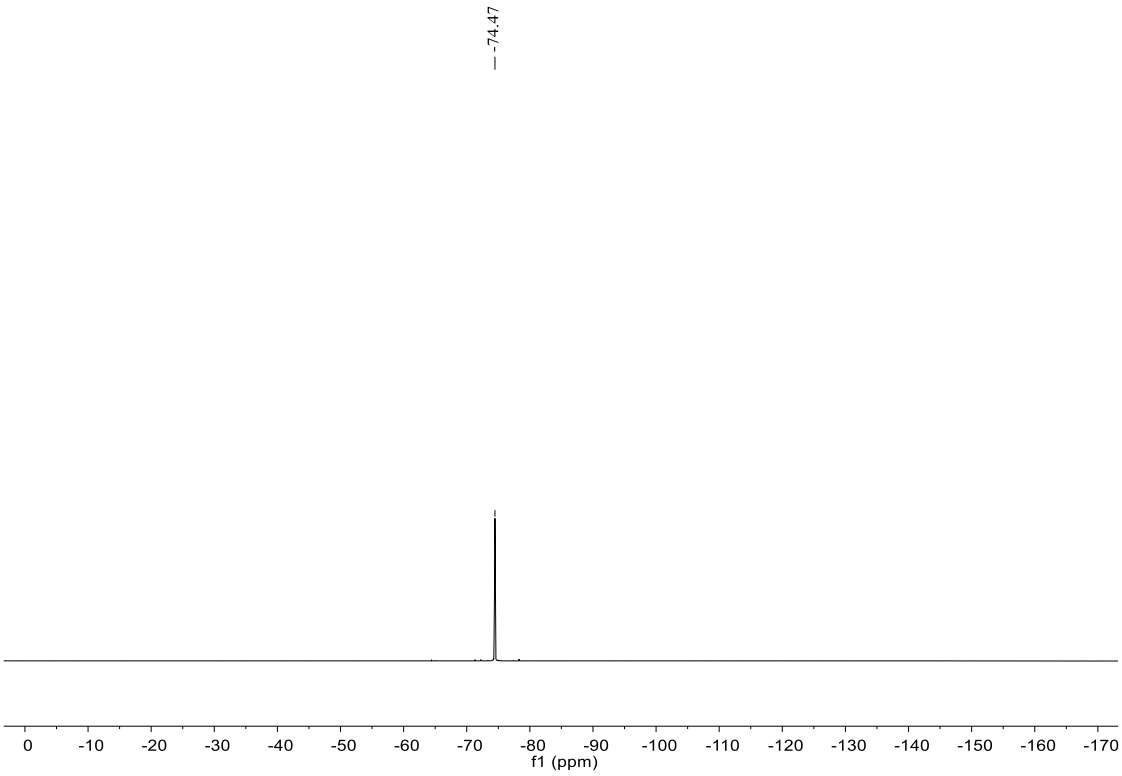
2,2,2-trifluoro-1-(6-methoxy-3,4-dihydronaphthalen-1-yl)-1-phenylethan-1-ol (3c)



^{1}H NMR spectrum in $CDCl_3$.

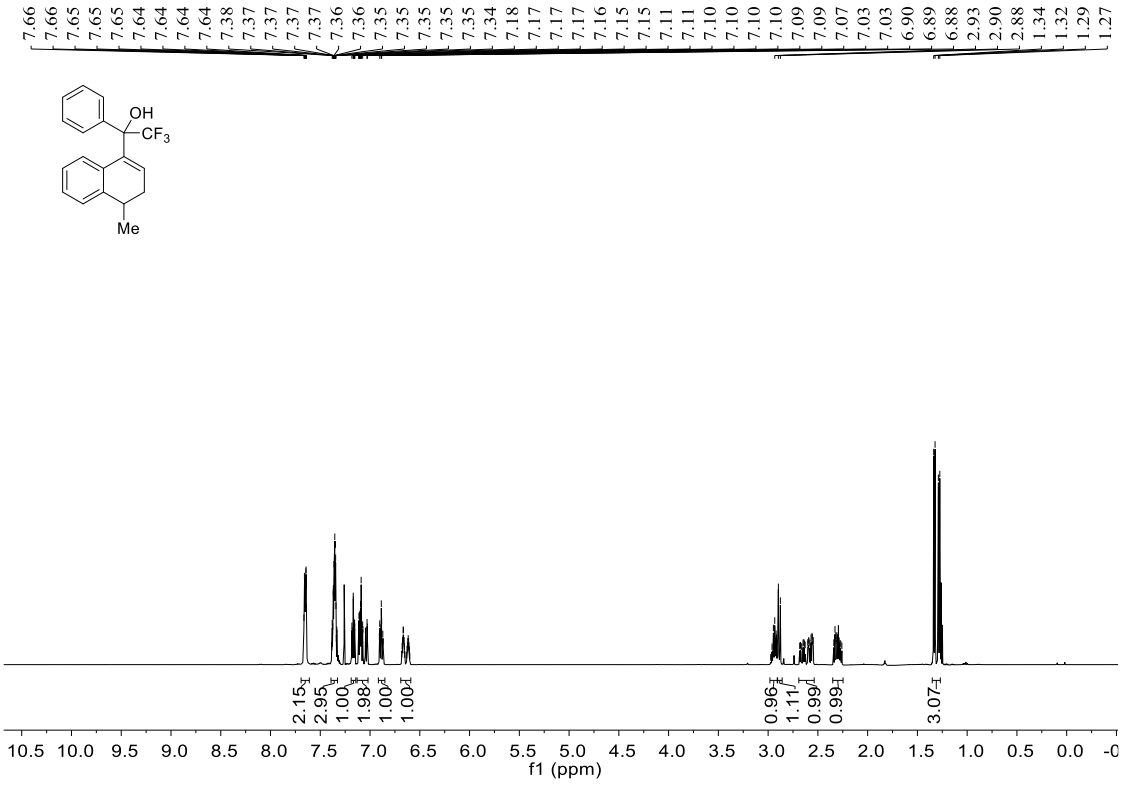


^{13}C NMR spectrum in $CDCl_3$.

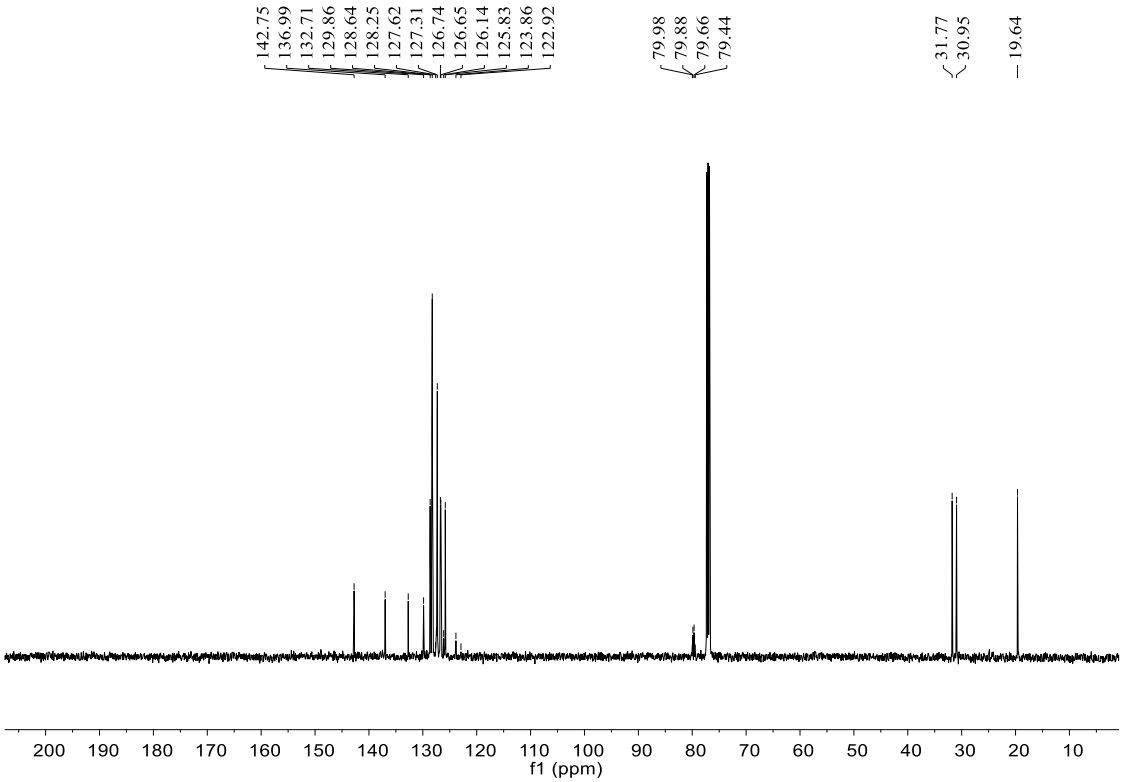


^{19}F NMR spectrum in $CDCl_3$.

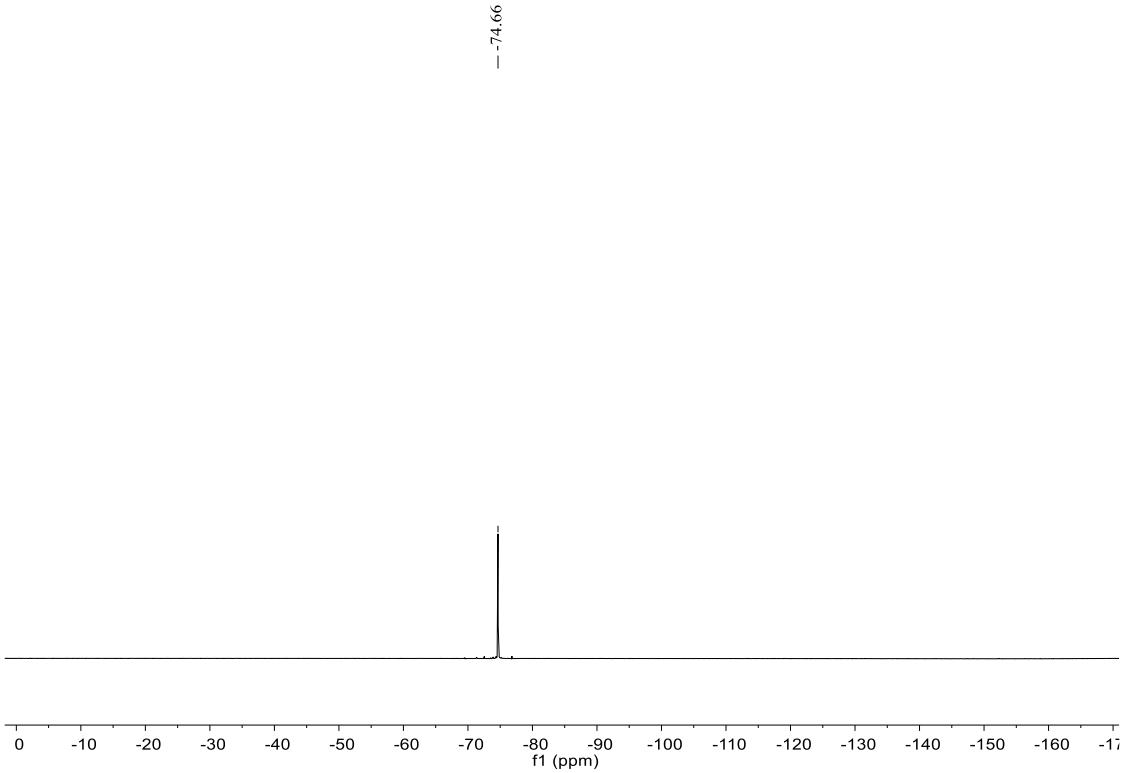
2,2,2-trifluoro-1-(4-methyl-3,4-dihydronaphthalen-1-yl)-1-phenylethan-1-ol (4c)



^{1}H NMR spectrum in $CDCl_3$.

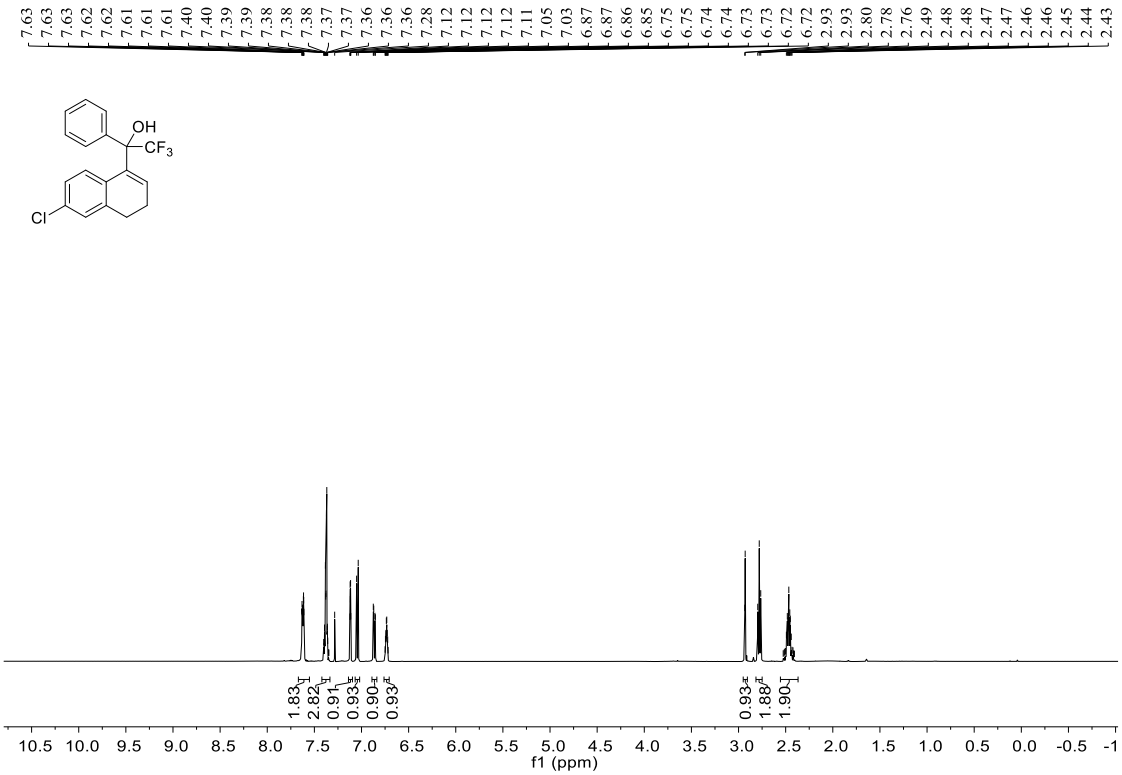


^{13}C NMR spectrum in $CDCl_3$.

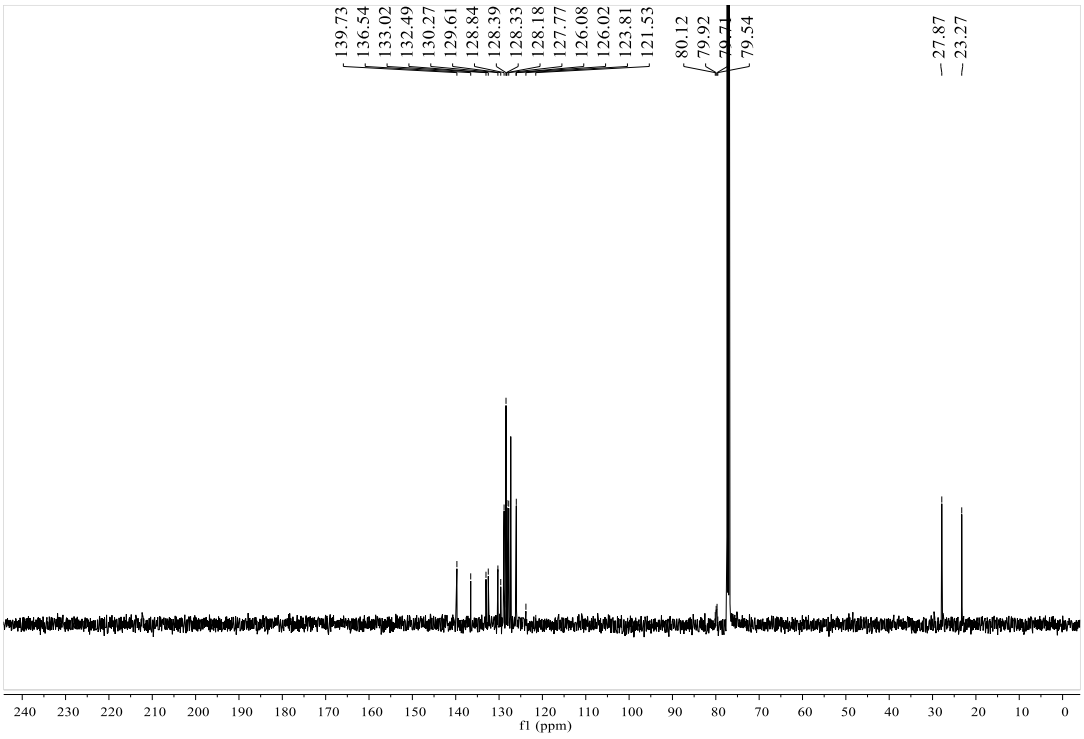


^{19}F NMR spectrum in $CDCl_3$.

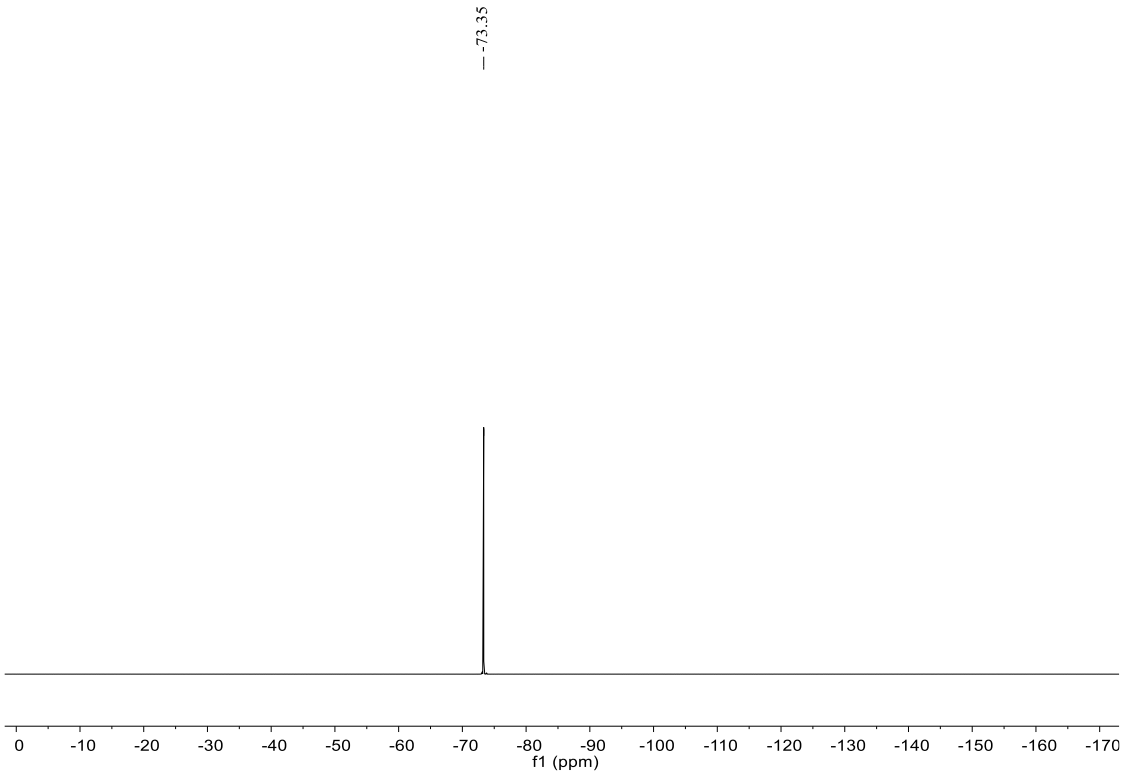
1-(6-chloro-3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (5c)



^{1}H NMR spectrum in $CDCl_3$.

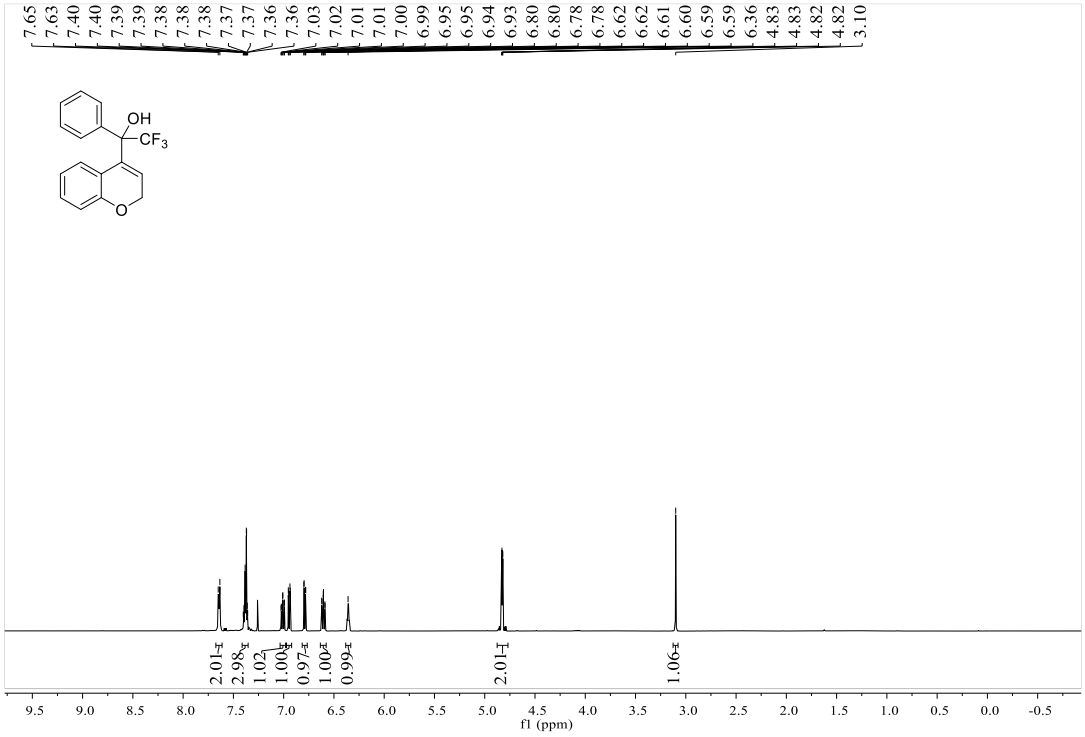


^{13}C NMR spectrum in $CDCl_3$.

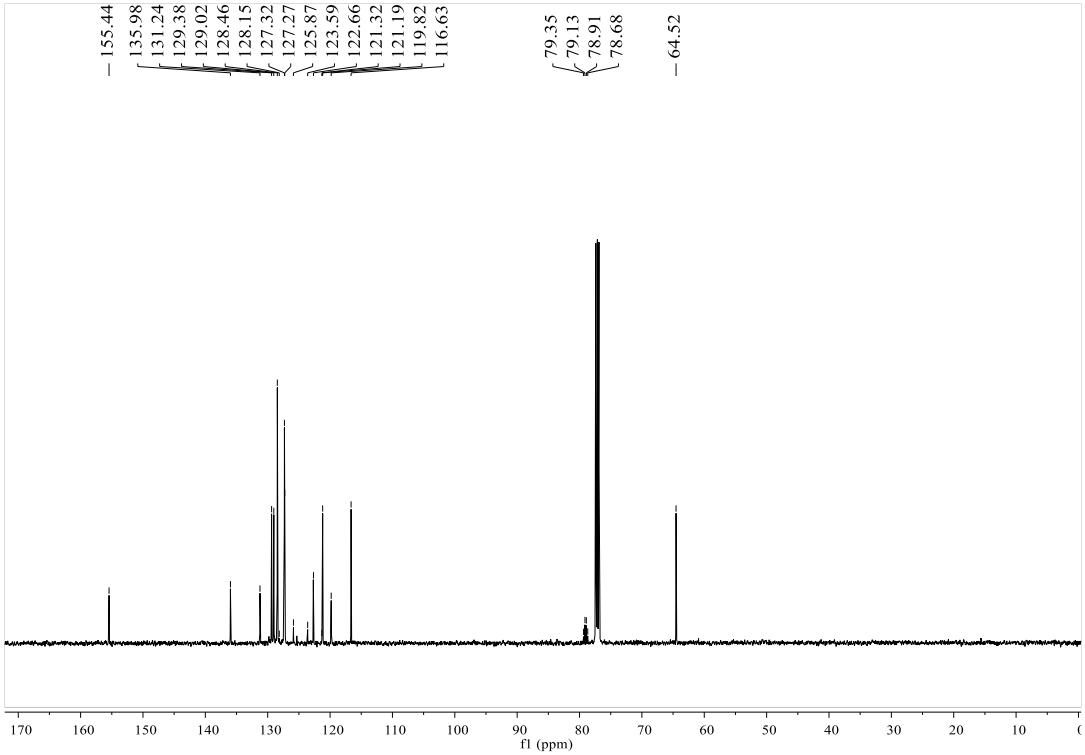


^{19}F NMR spectrum in $CDCl_3$.

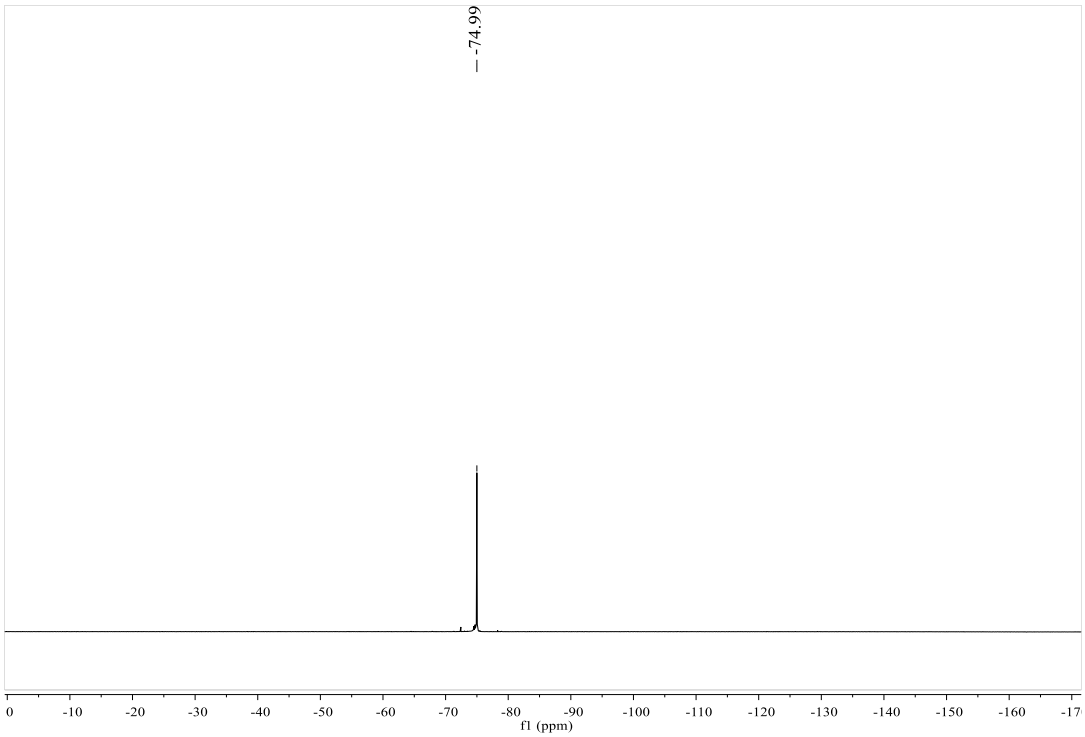
1-(2H-chromen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (6c)



^{1}H NMR spectrum in $CDCl_3$.

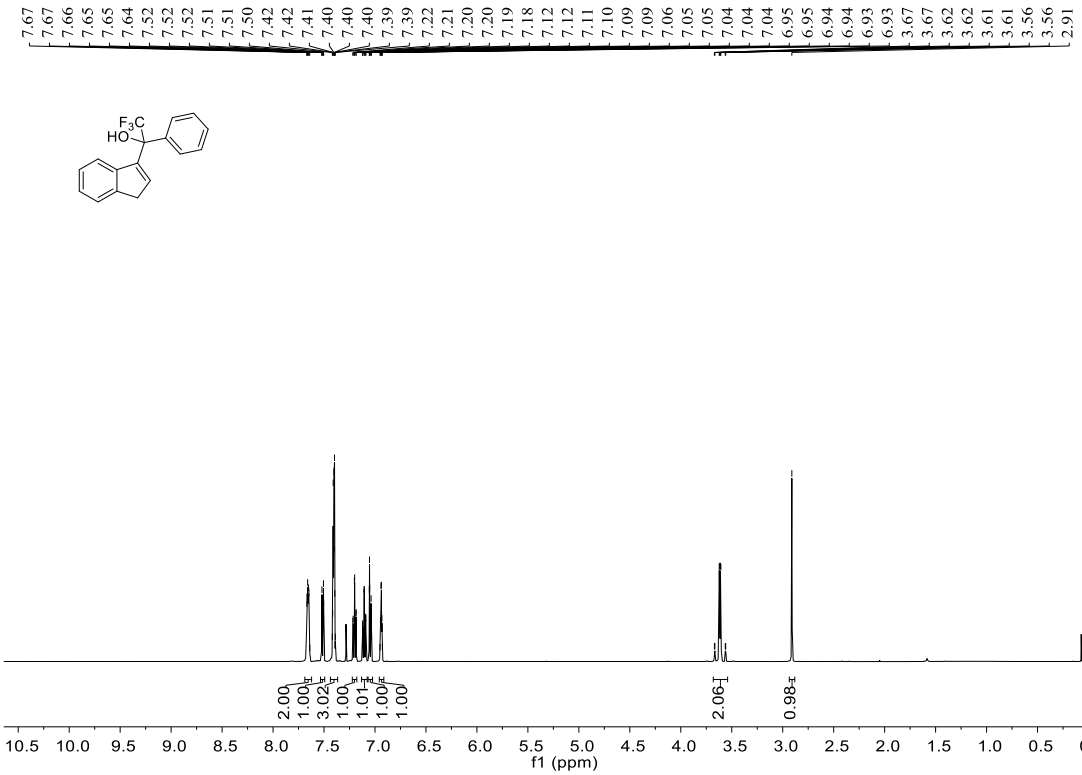


^{13}C NMR spectrum in $CDCl_3$.

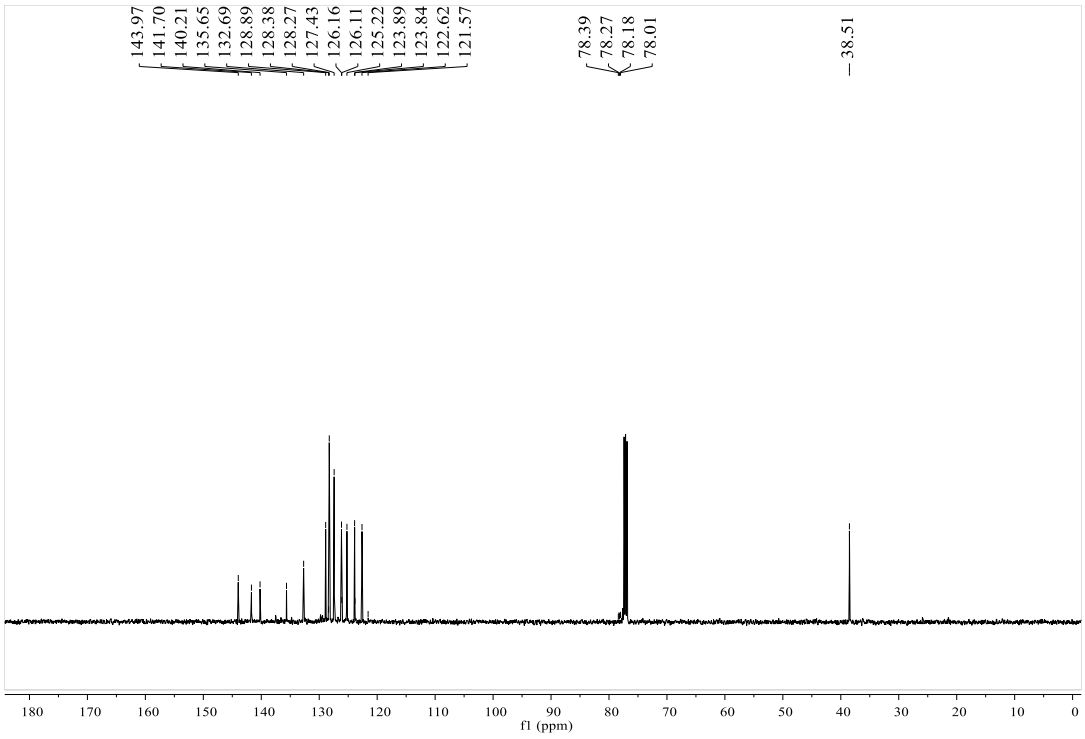


^{19}F NMR spectrum in $CDCl_3$.

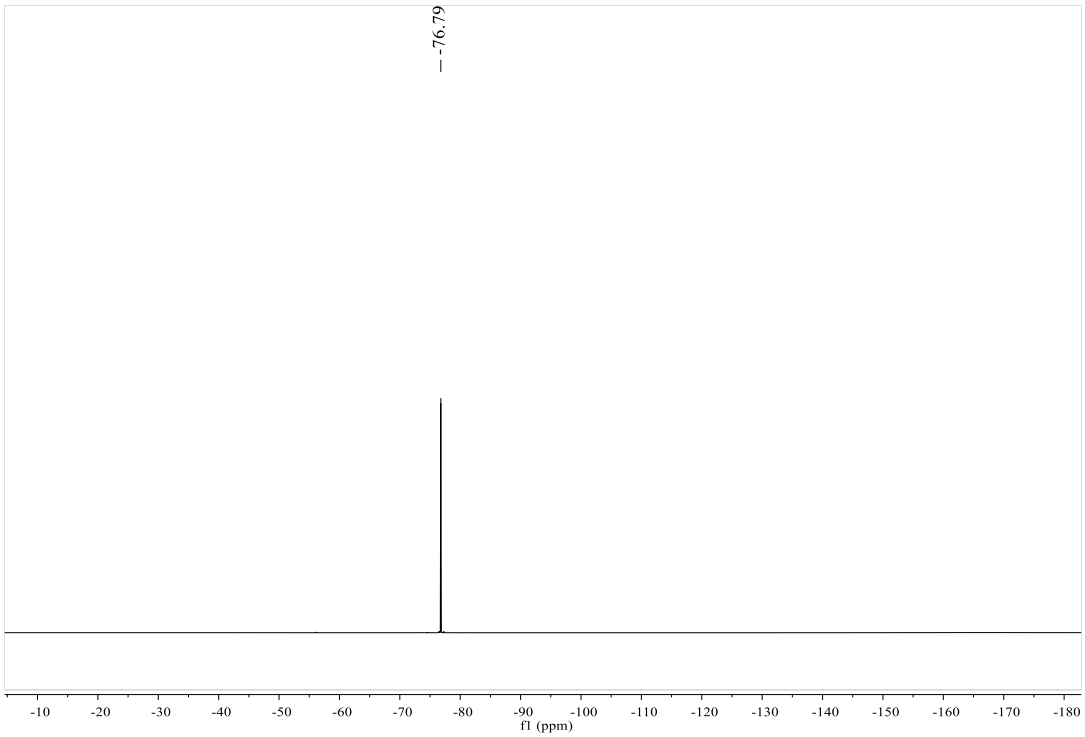
2,2,2-trifluoro-1-(1H-inden-3-yl)-1-phenylethan-1-ol (7c)



^{1}H NMR spectrum in $CDCl_3$.

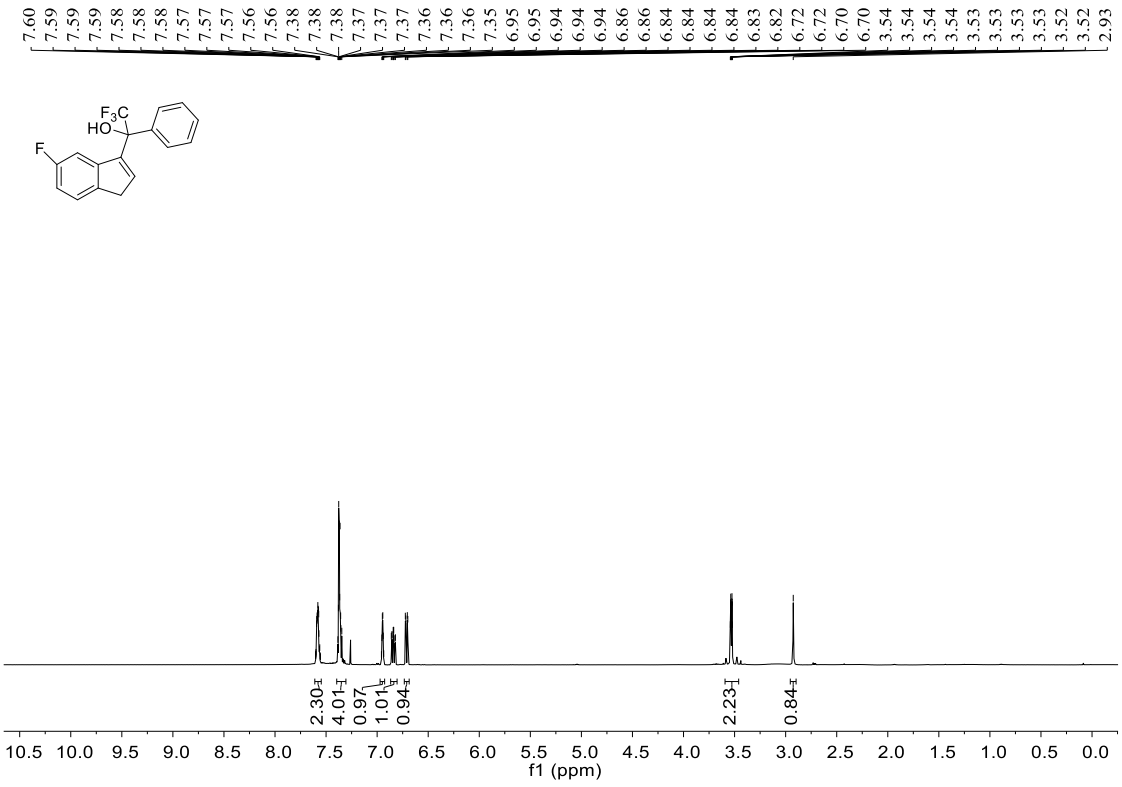


^{13}C NMR spectrum in $CDCl_3$.

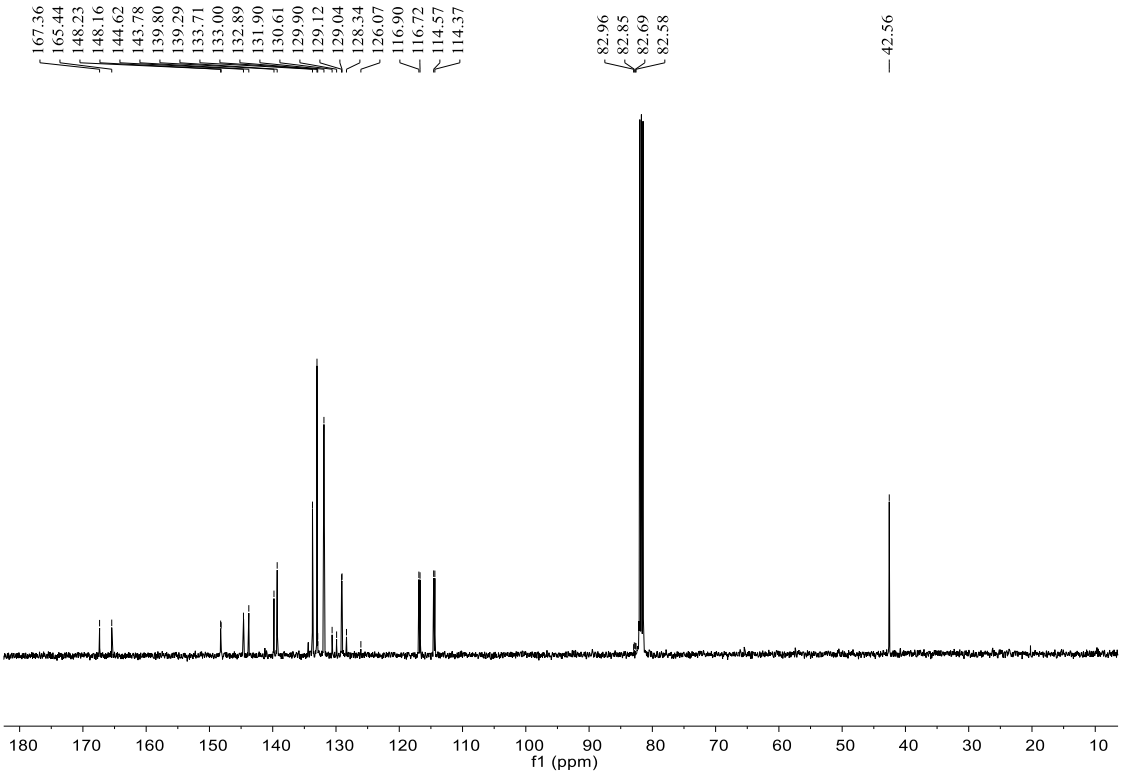


^{19}F NMR spectrum in $CDCl_3$.

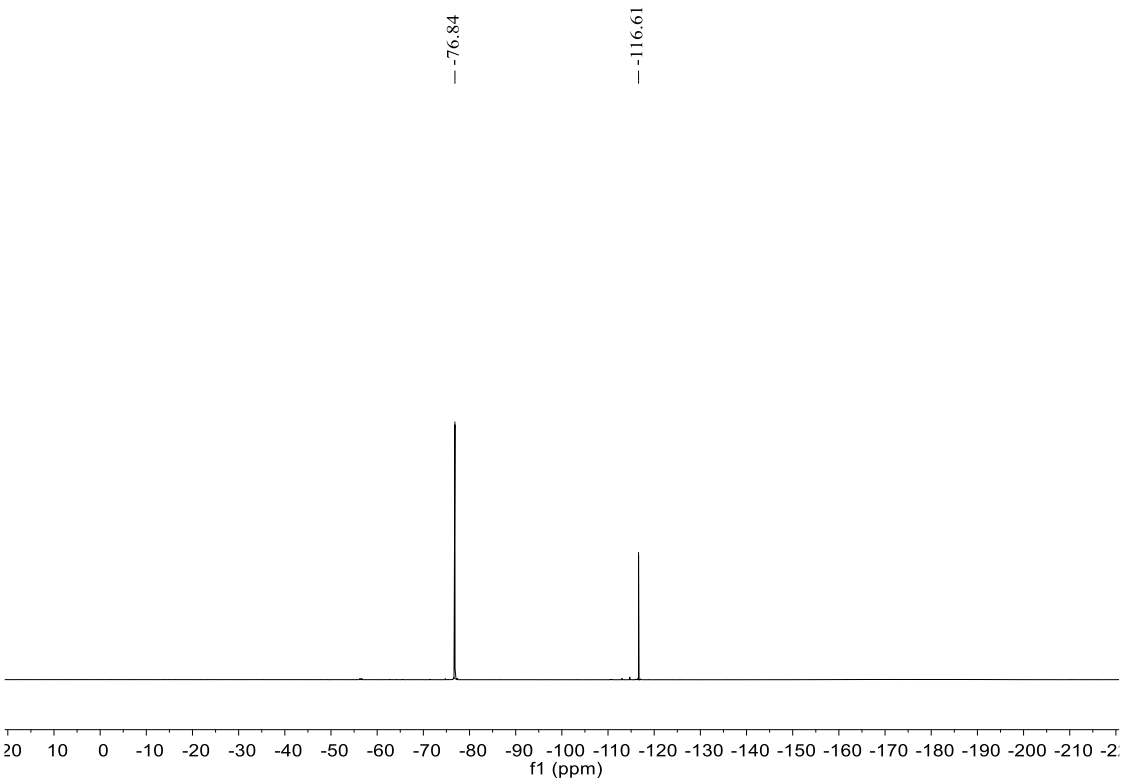
2,2,2-trifluoro-1-(5-fluoro-1H-inden-3-yl)-1-phenylethan-1-ol (8c)



^{1}H NMR spectrum in $CDCl_3$.

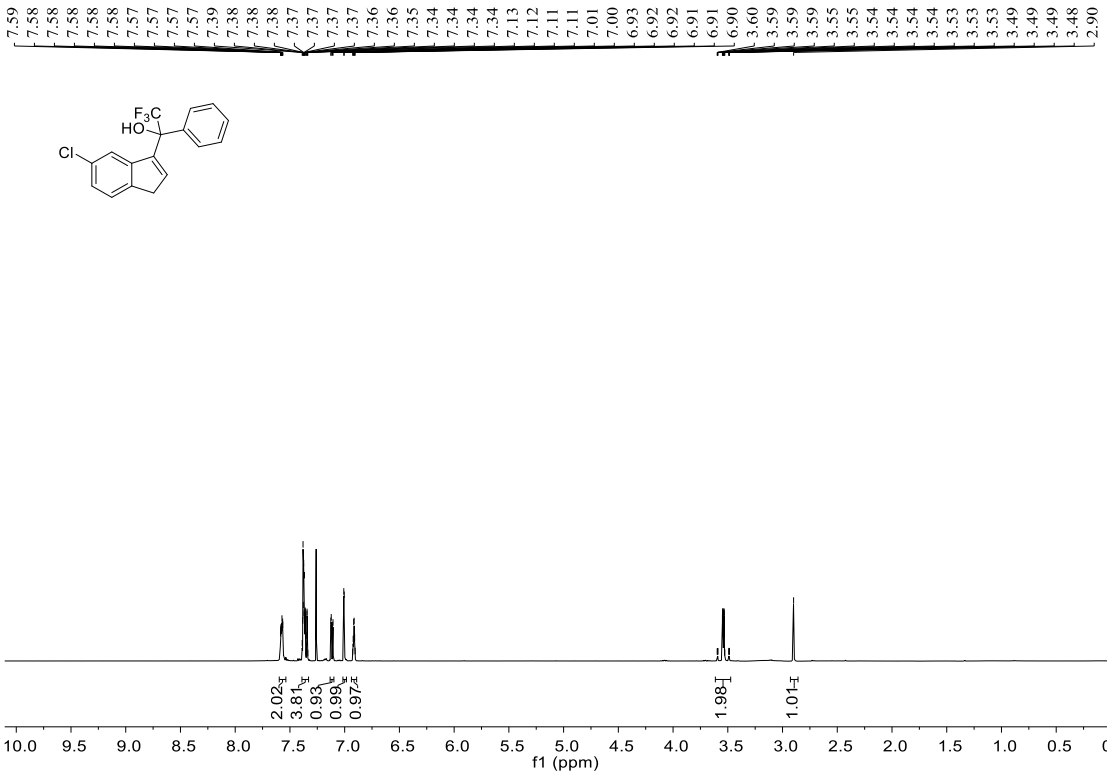


^{13}C NMR spectrum in $CDCl_3$.

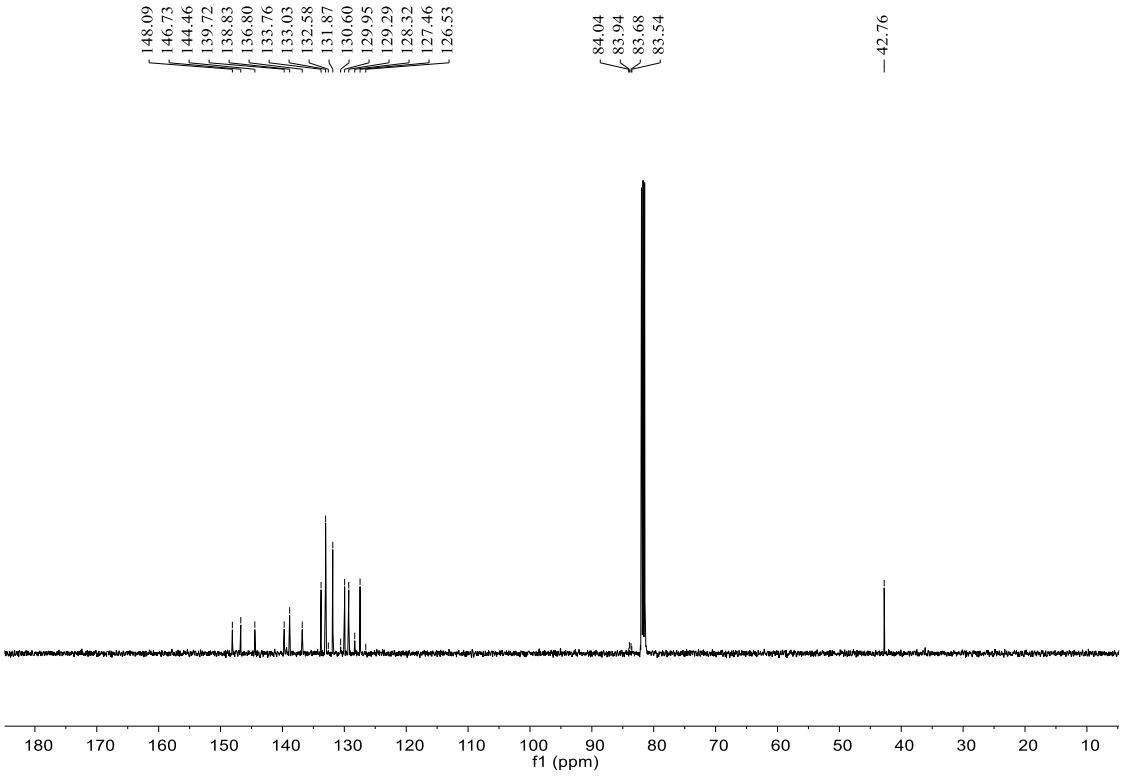


^{19}F NMR spectrum in $CDCl_3$.

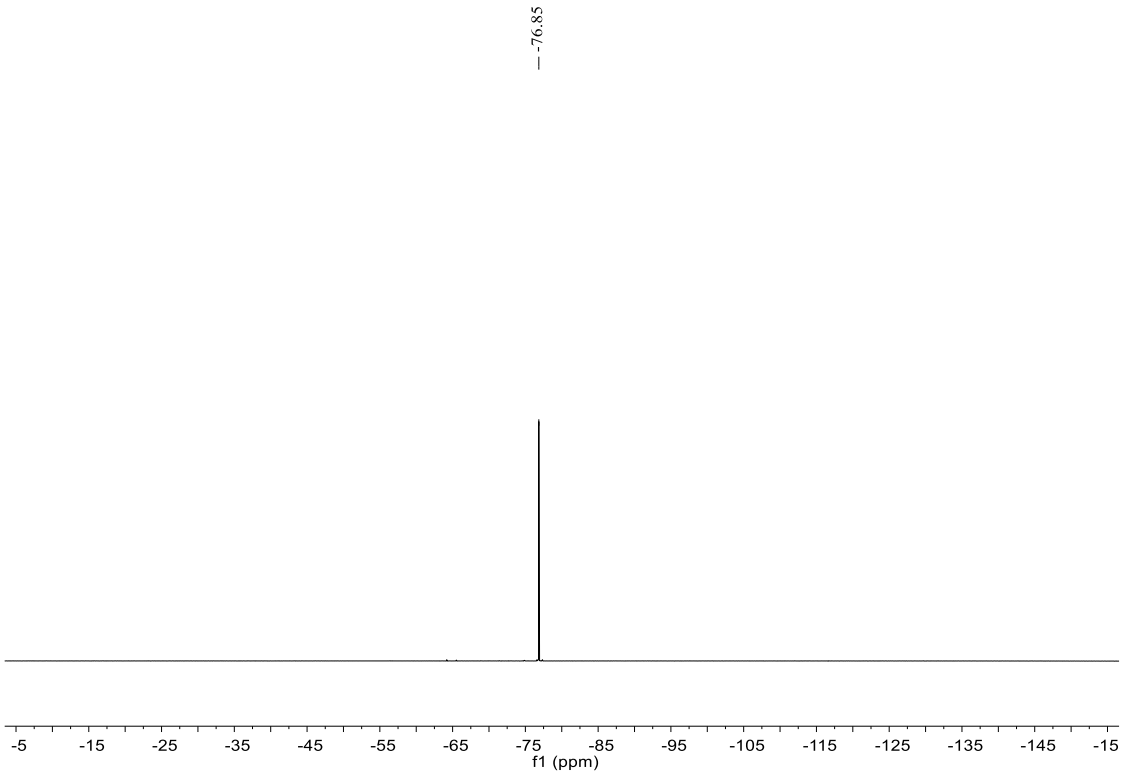
1-(5-chloro-1H-inden-3-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (9c)



^{1}H NMR spectrum in $CDCl_3$.

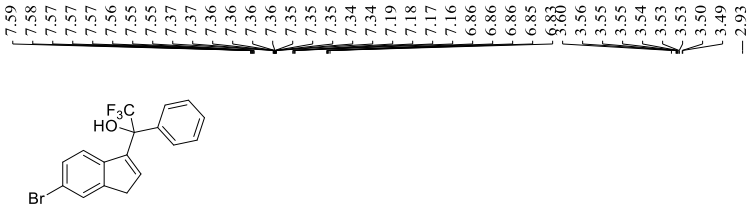


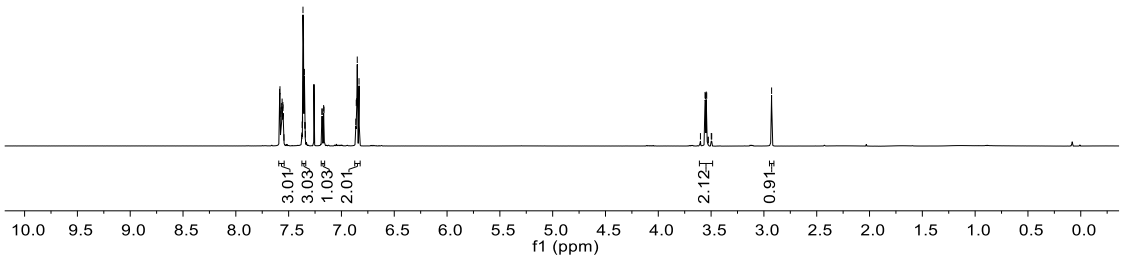
^{13}C NMR spectrum in $CDCl_3$.



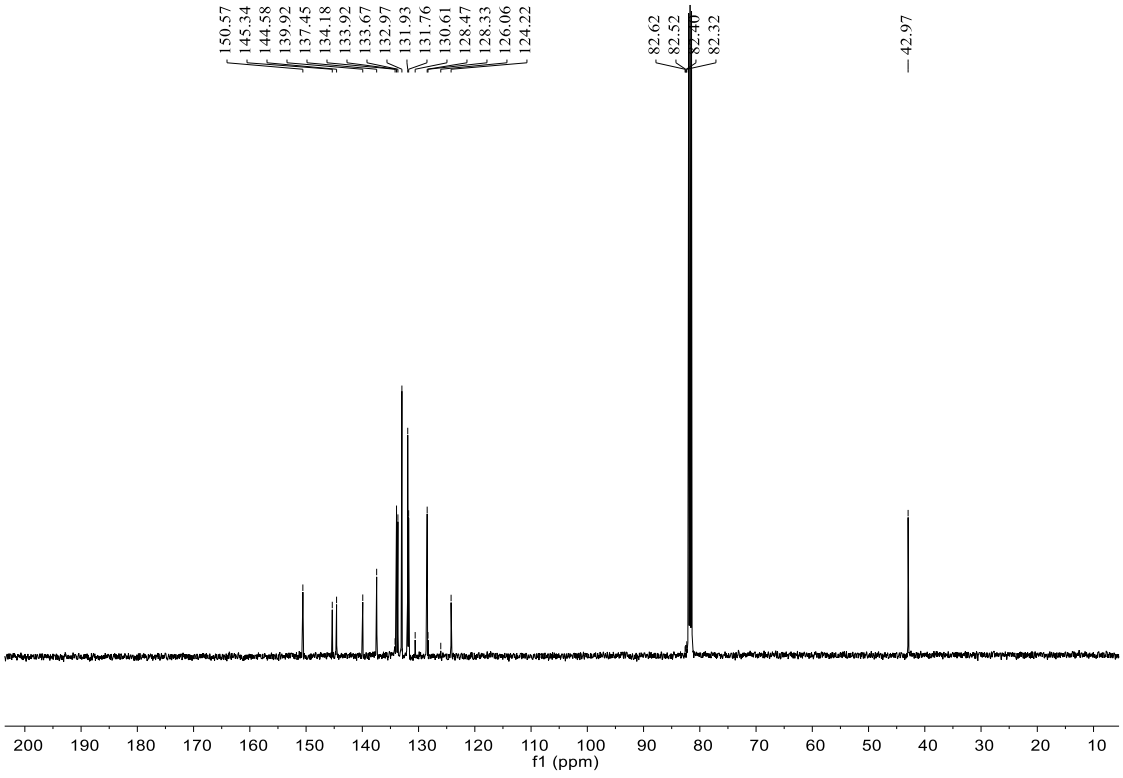
^{19}F NMR spectrum in $CDCl_3$.

1-(6-bromo-1H-inden-3-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (10c)

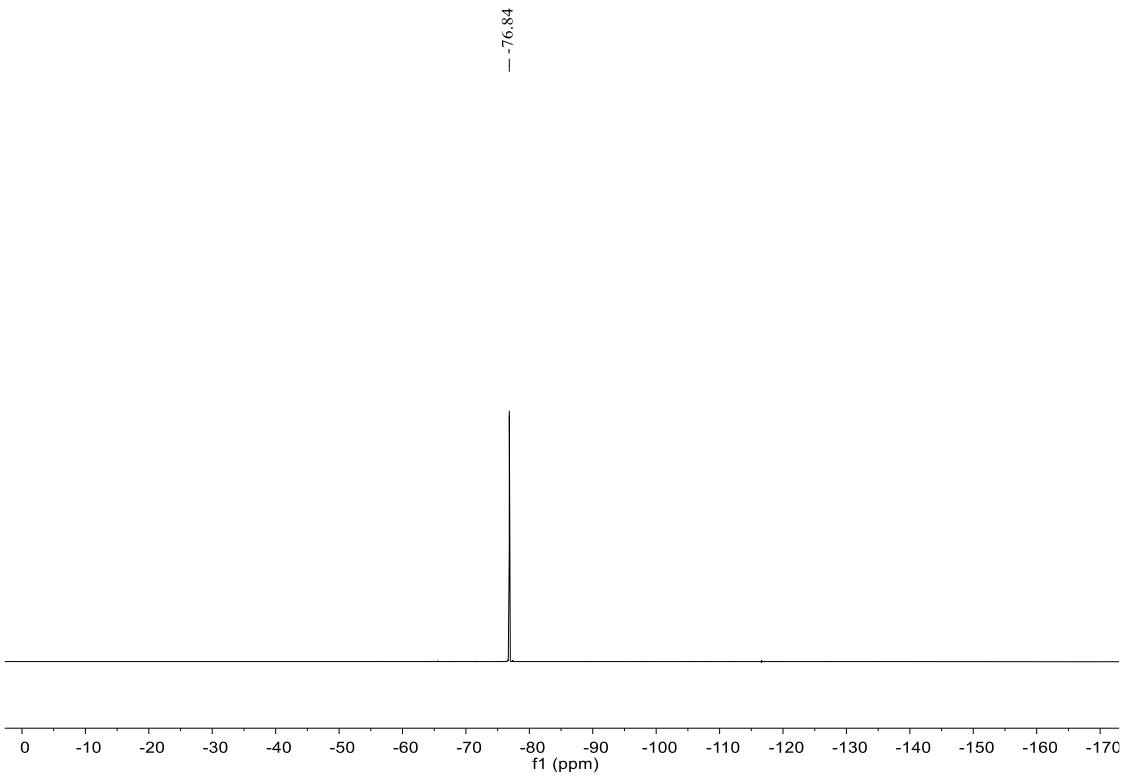




^{1}H NMR spectrum in $CDCl_3$.

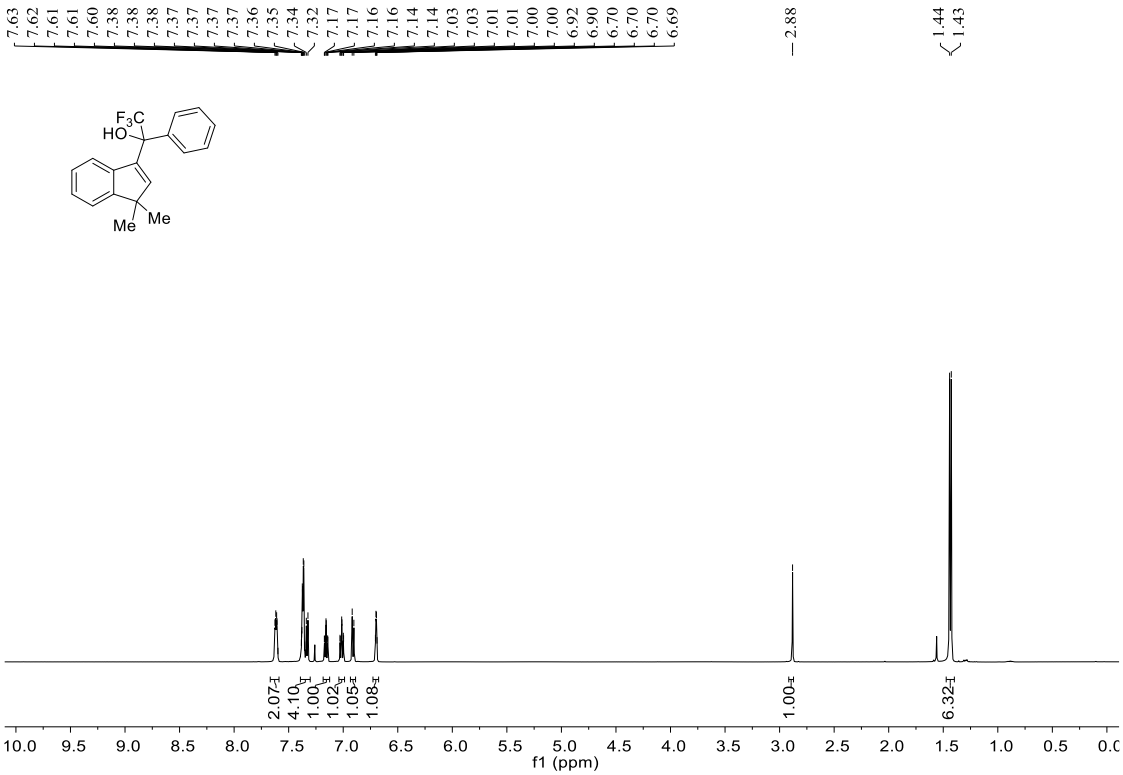


^{13}C NMR spectrum in $CDCl_3$.

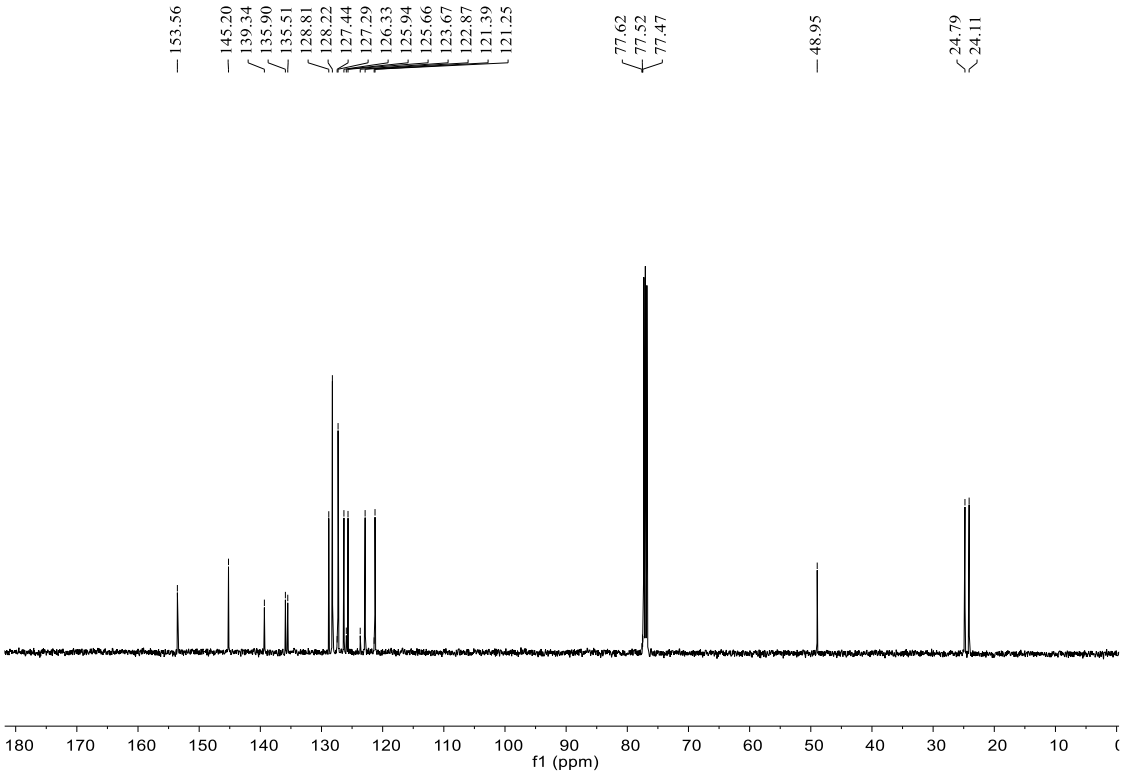


^{19}F NMR spectrum in $CDCl_3$.

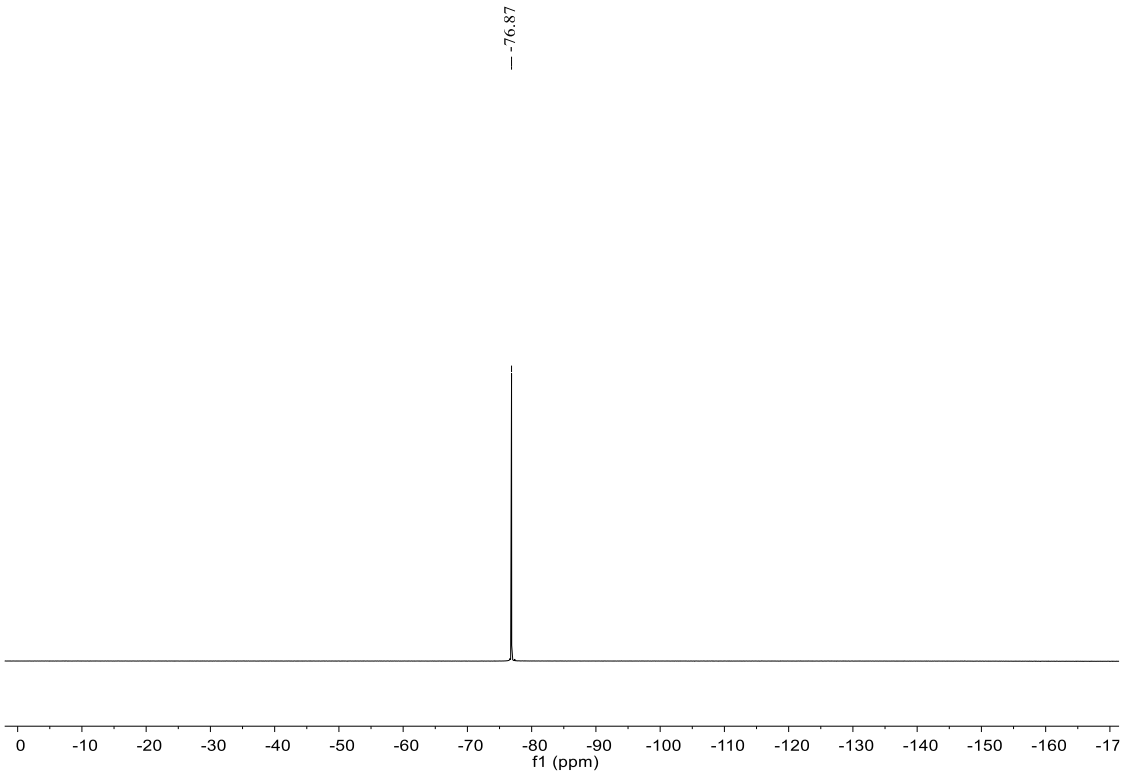
1-(1,1-dimethyl-1H-inden-3-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (11c)



^{1}H NMR spectrum in $CDCl_3$.

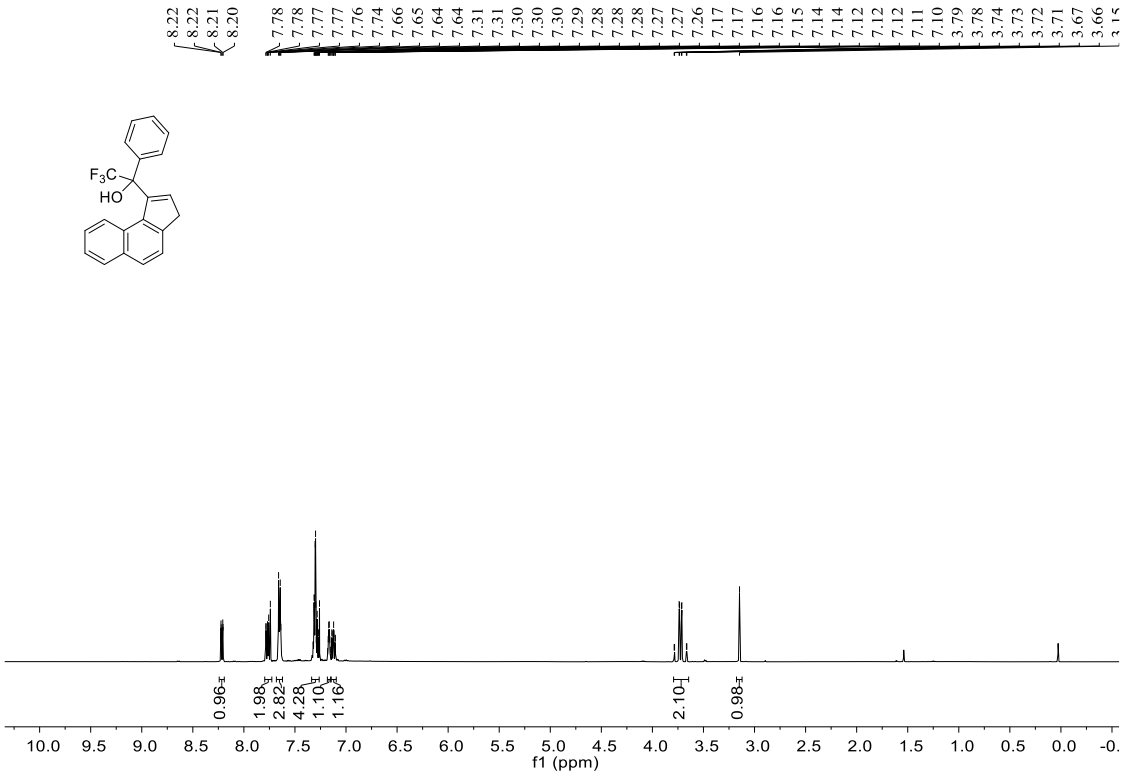


^{13}C NMR spectrum in $CDCl_3$.

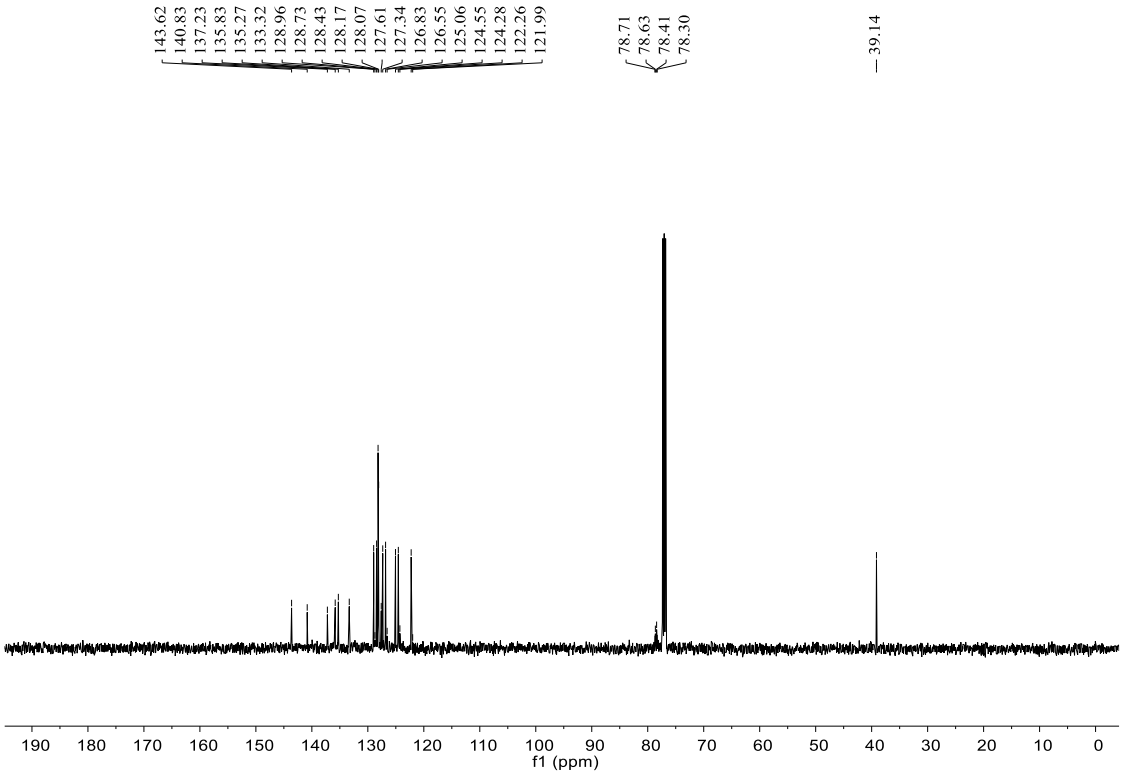


^{19}F NMR spectrum in $CDCl_3$.

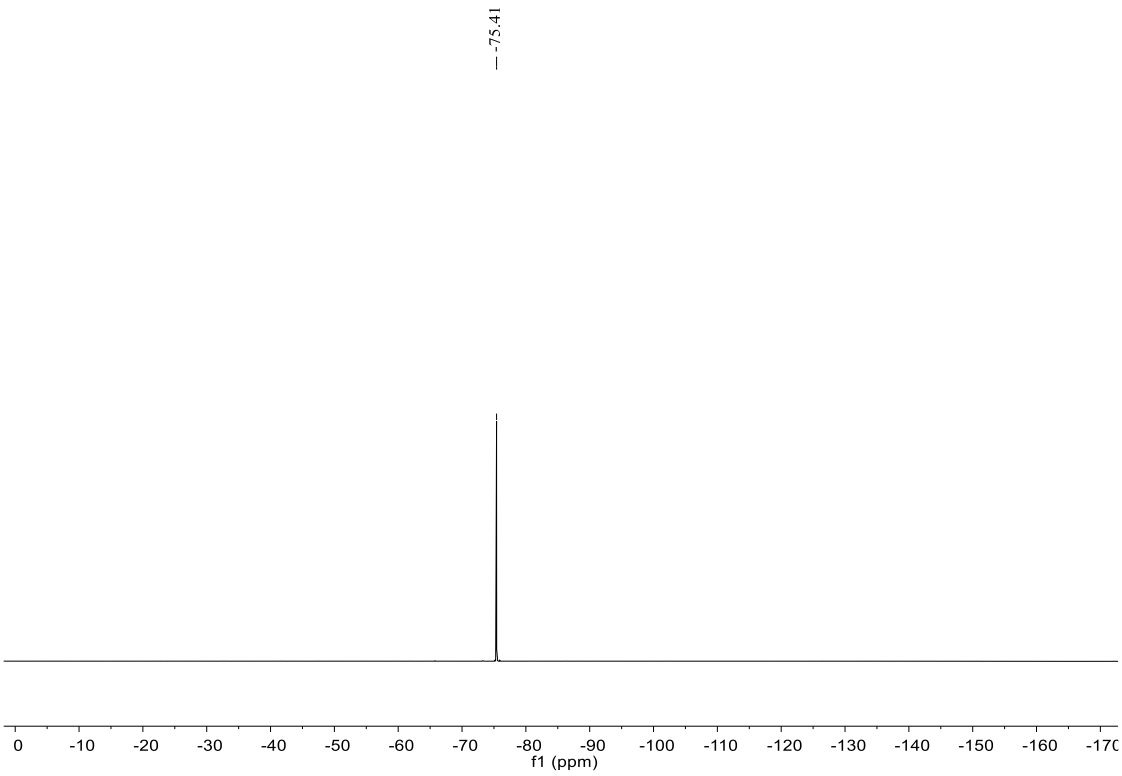
1-(3H-cyclopenta[a]naphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (12c)



^{1}H NMR spectrum in $CDCl_3$.

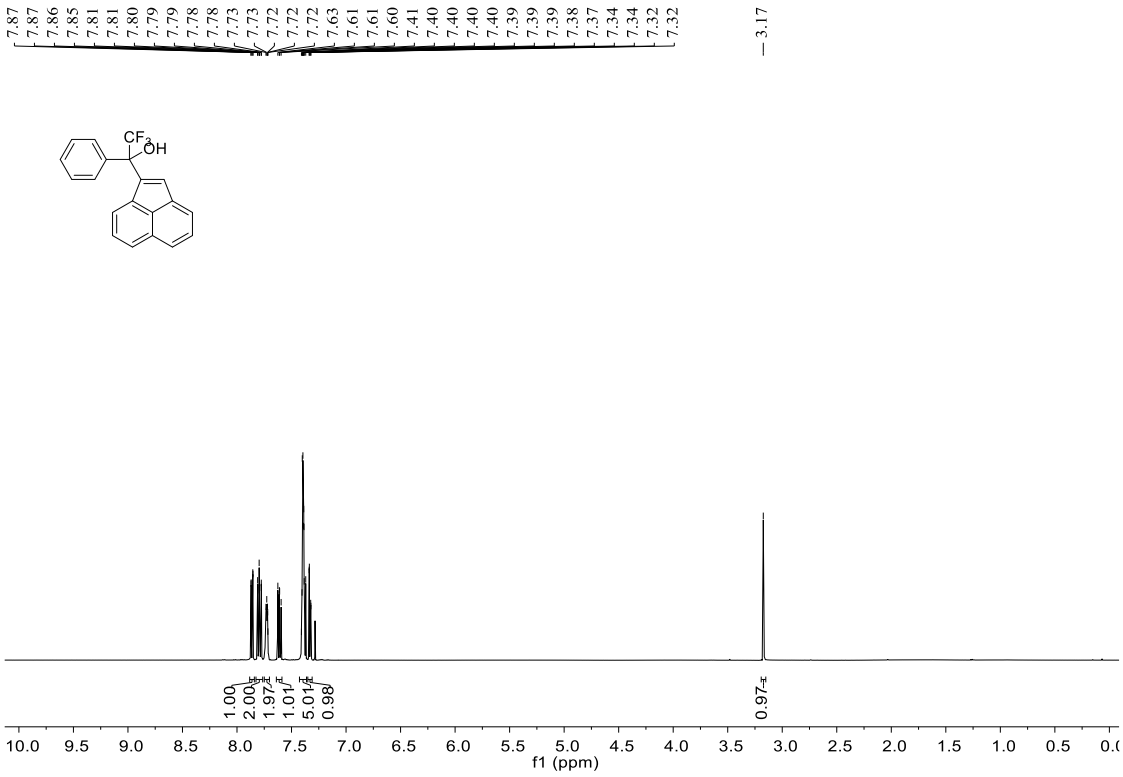


^{13}C NMR spectrum in $CDCl_3$.

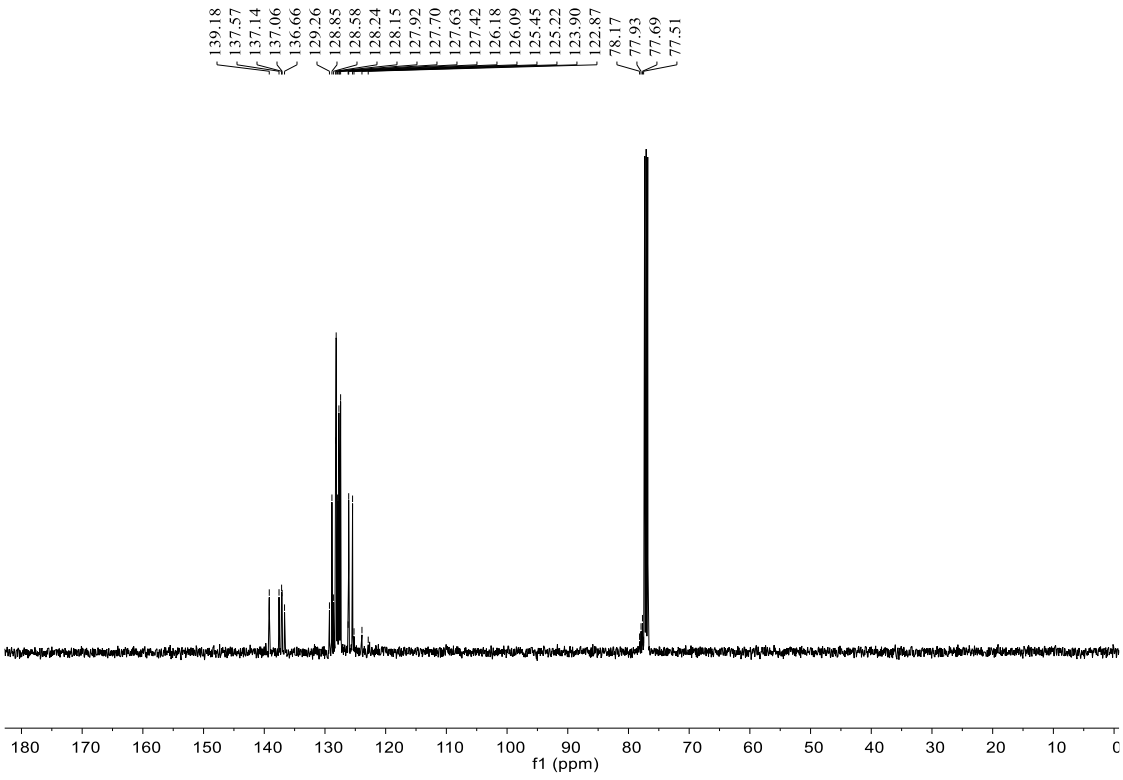


^{19}F NMR spectrum in $CDCl_3$.

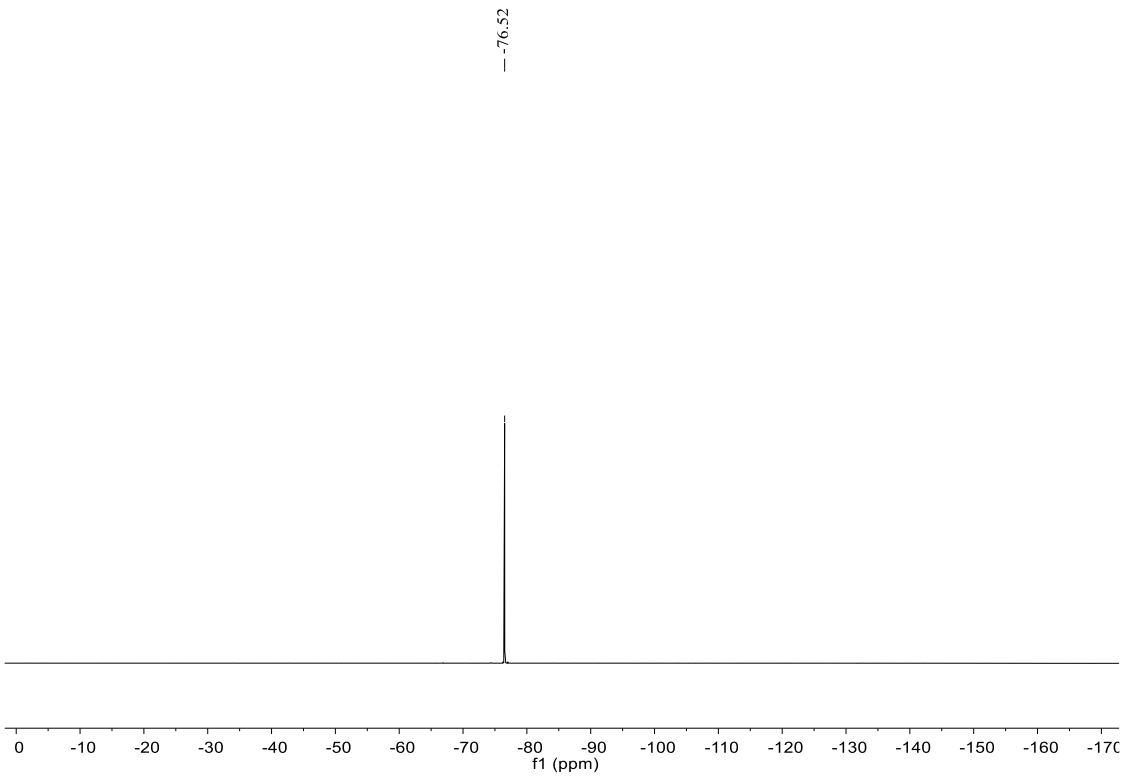
1-(acenaphthylen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (13c)



^{1}H NMR spectrum in $CDCl_3$.

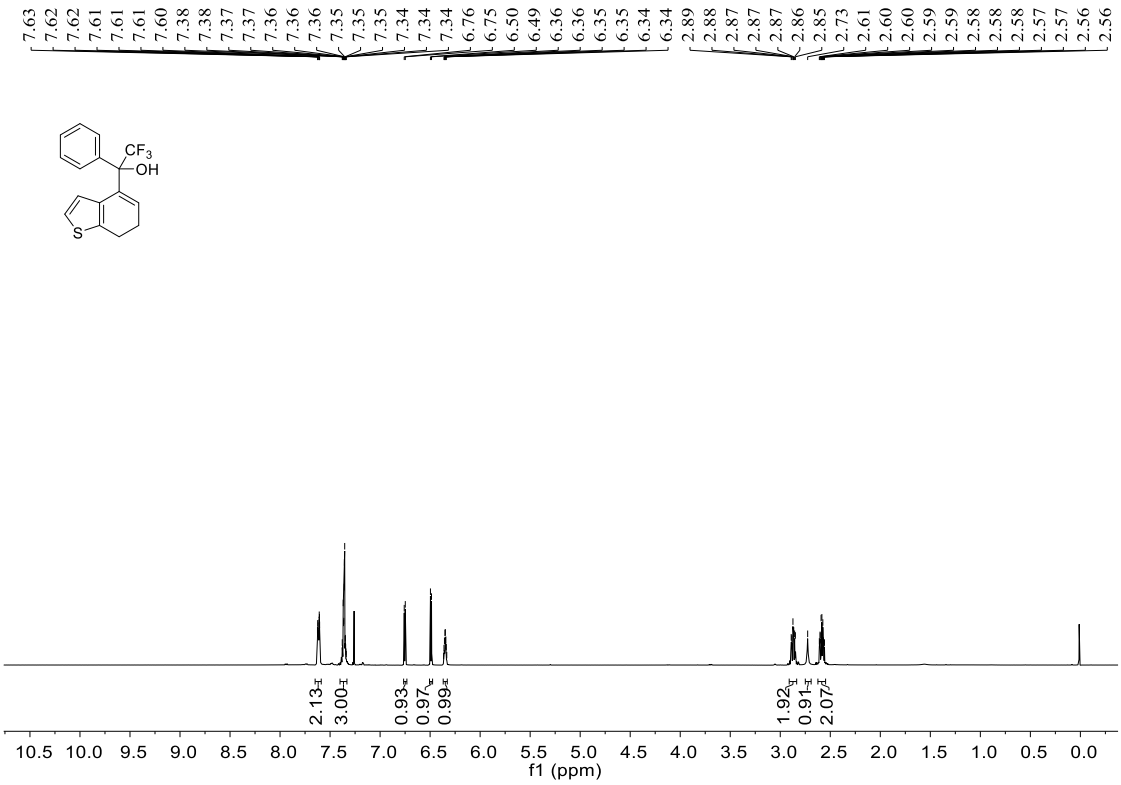


^{13}C NMR spectrum in $CDCl_3$.

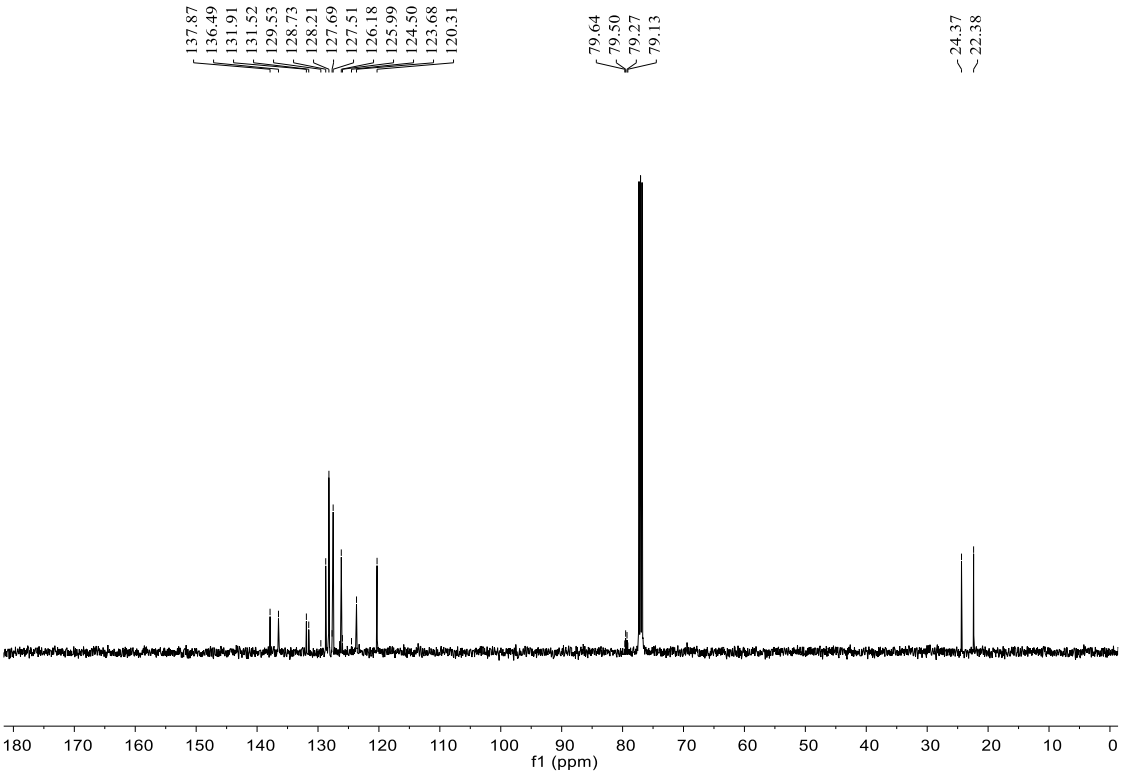


^{19}F NMR spectrum in $CDCl_3$.

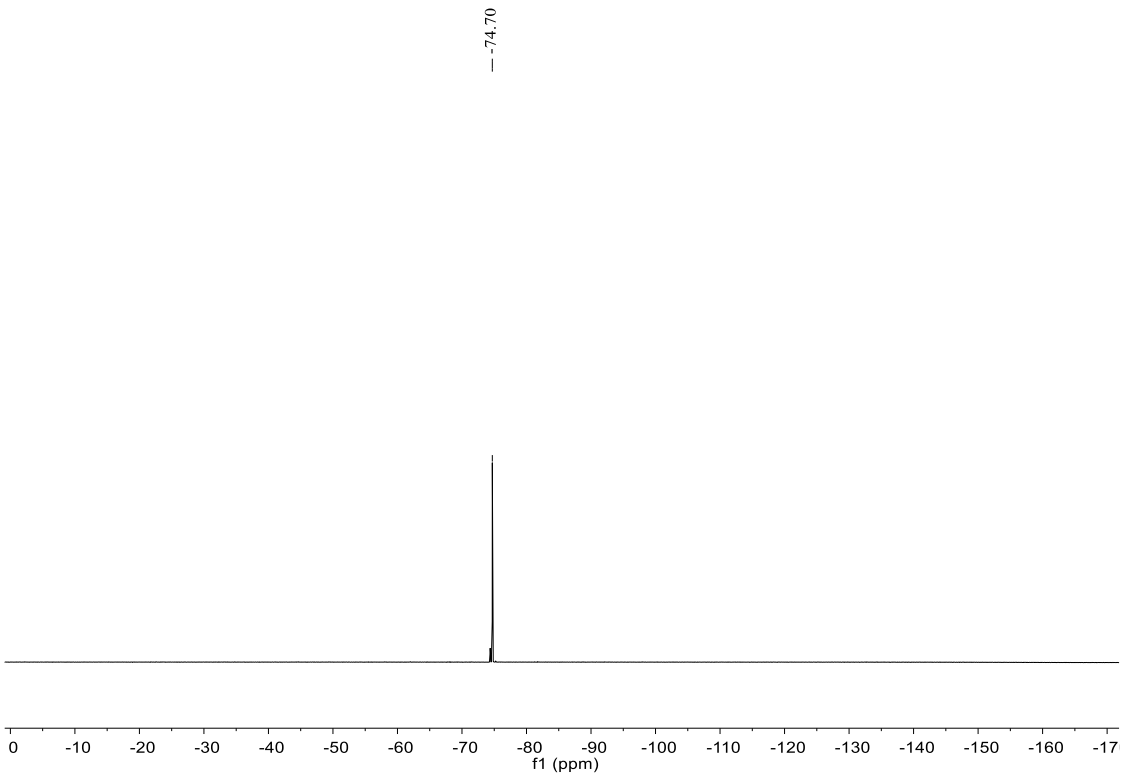
1-(6,7-dihydrobenzo[b]thiophen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (14c)



^{1}H NMR spectrum in $CDCl_3$.

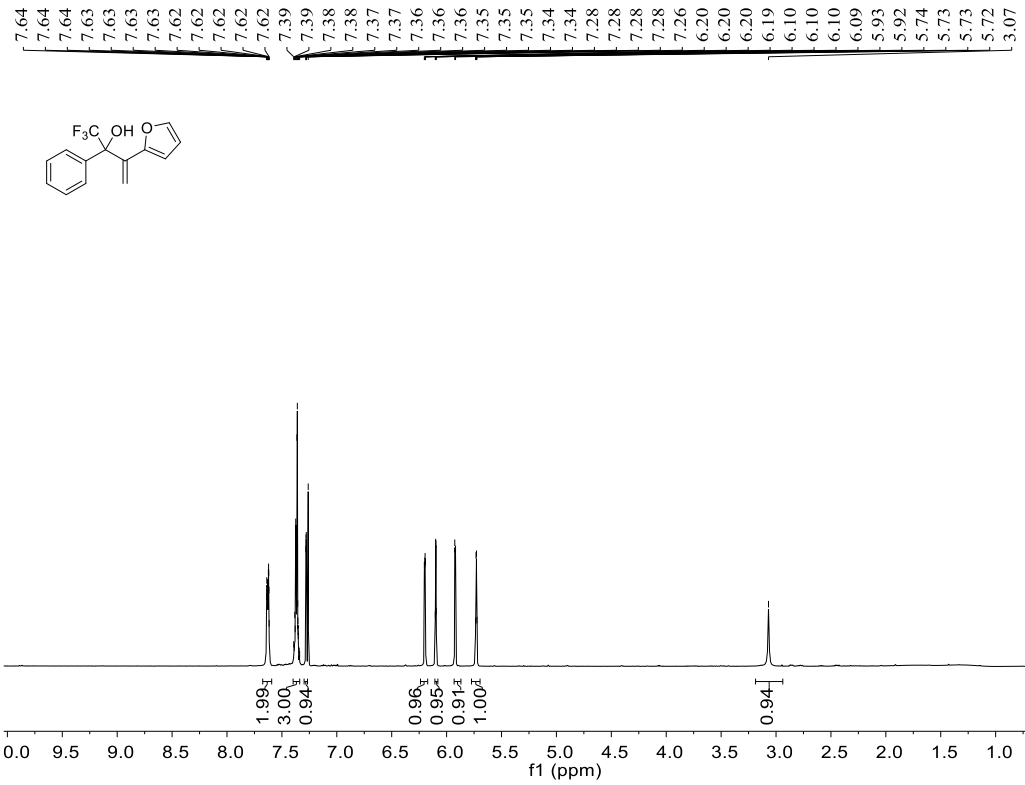


^{13}C NMR spectrum in $CDCl_3$.

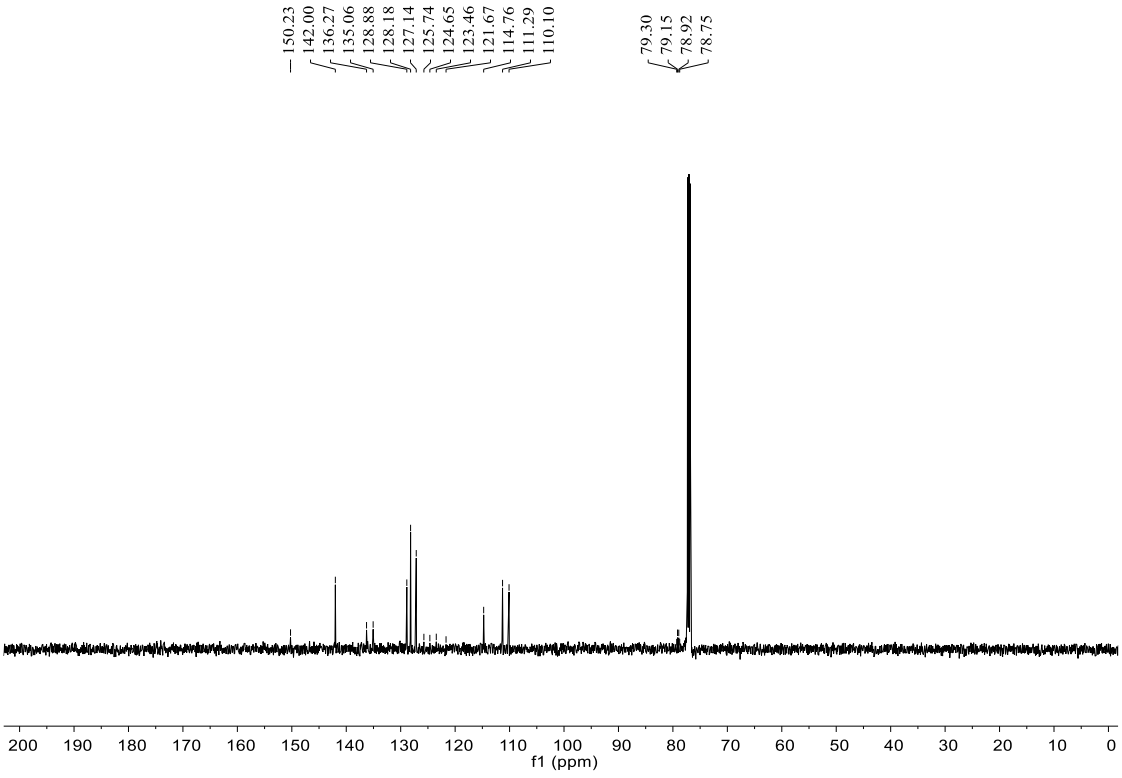


^{19}F NMR spectrum in $CDCl_3$.

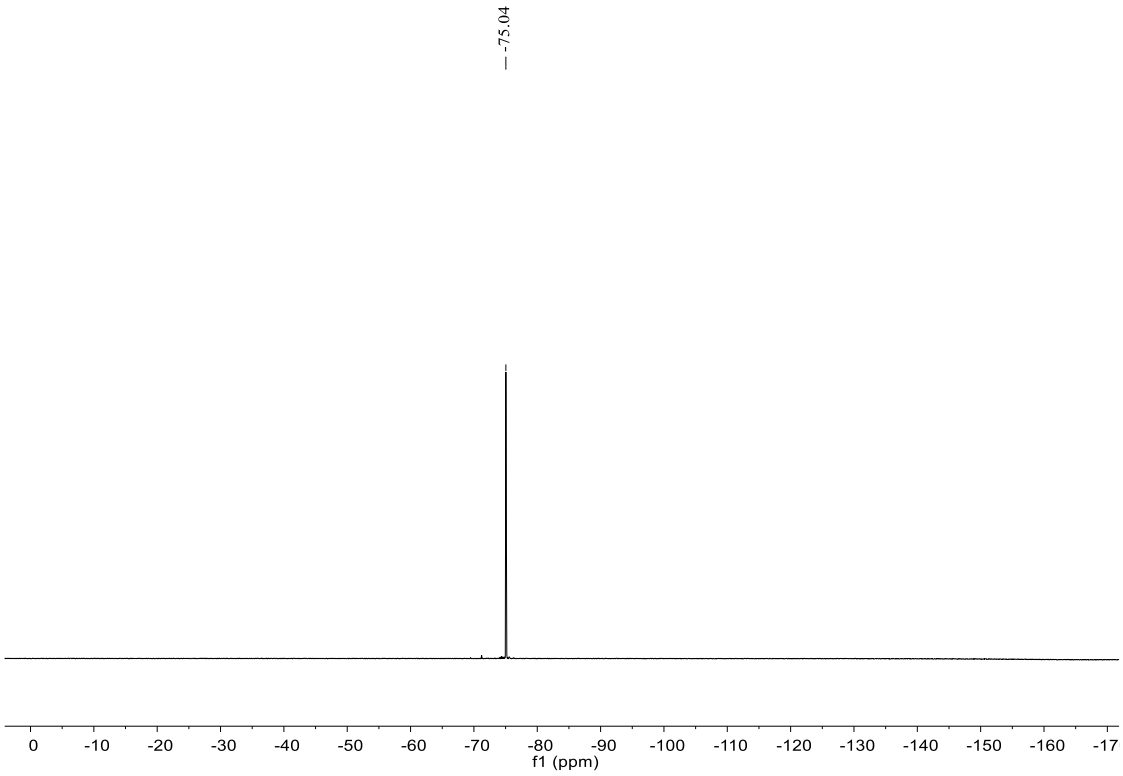
1,1,1-trifluoro-3-(furan-2-yl)-2-phenylbut-3-en-2-ol (15c)



^{1}H NMR spectrum in $CDCl_3$.

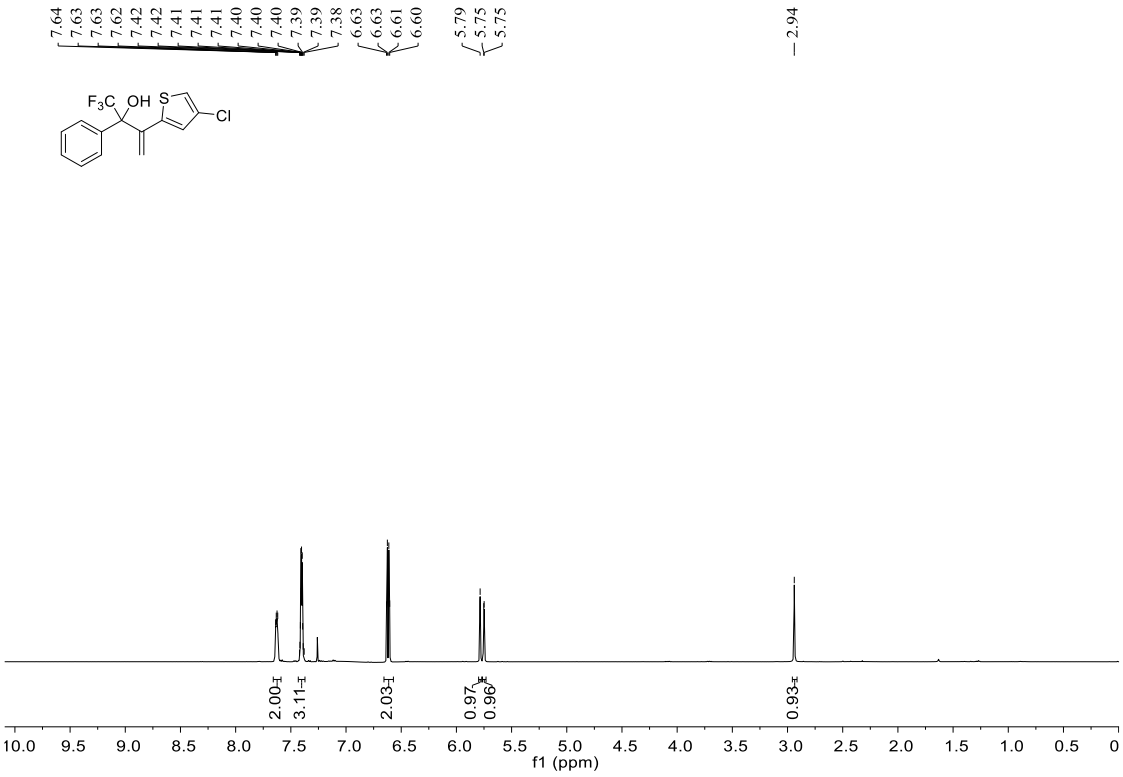


^{13}C NMR spectrum in $CDCl_3$.

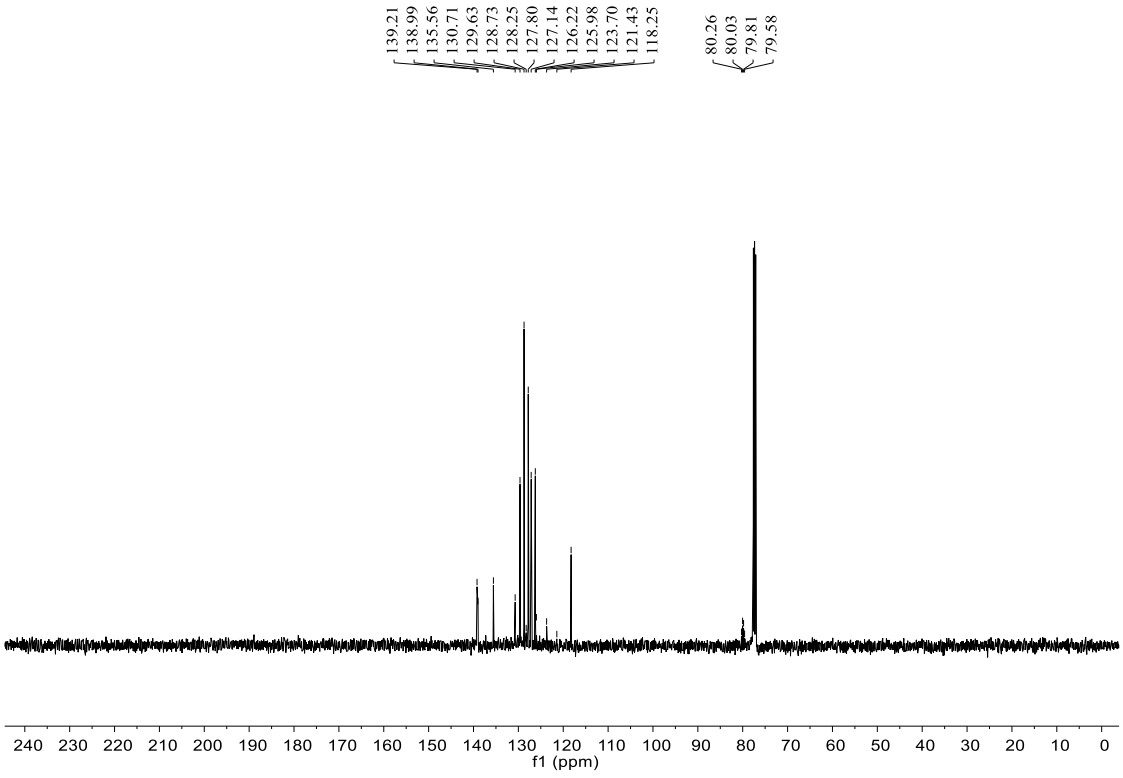


^{19}F NMR spectrum in $CDCl_3$.

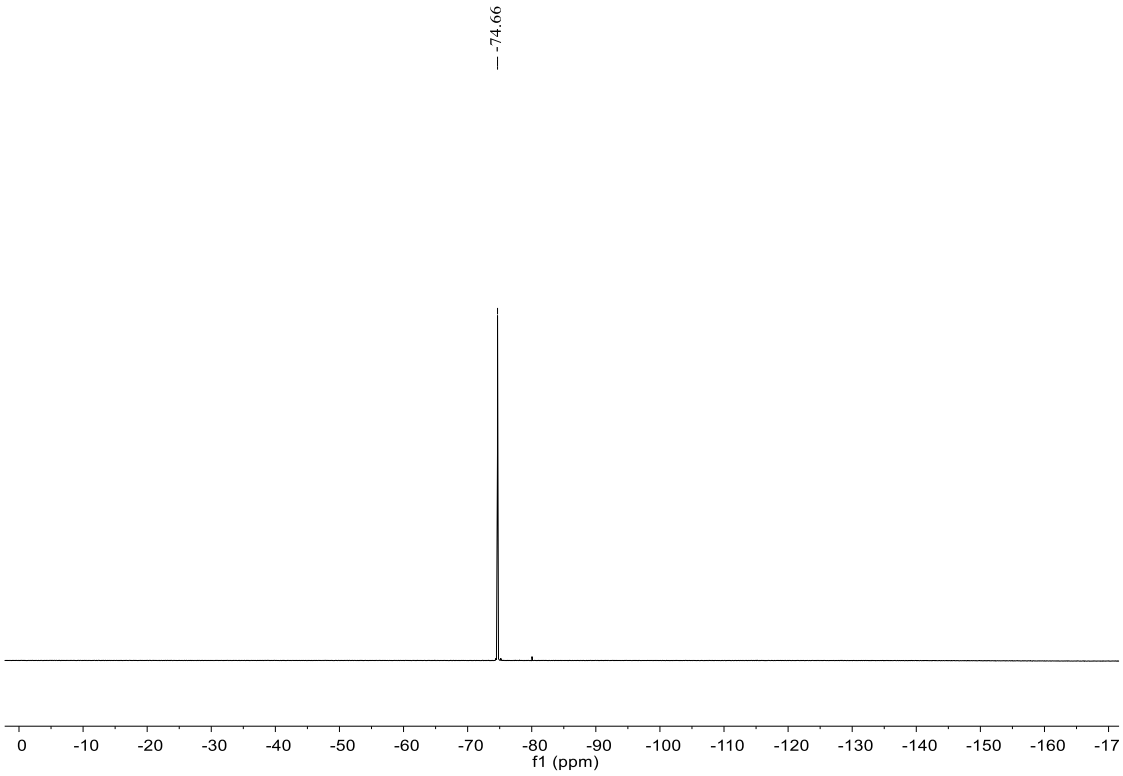
3-(4-chlorothiophen-2-yl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (16c)



^{1}H NMR spectrum in $CDCl_3$.

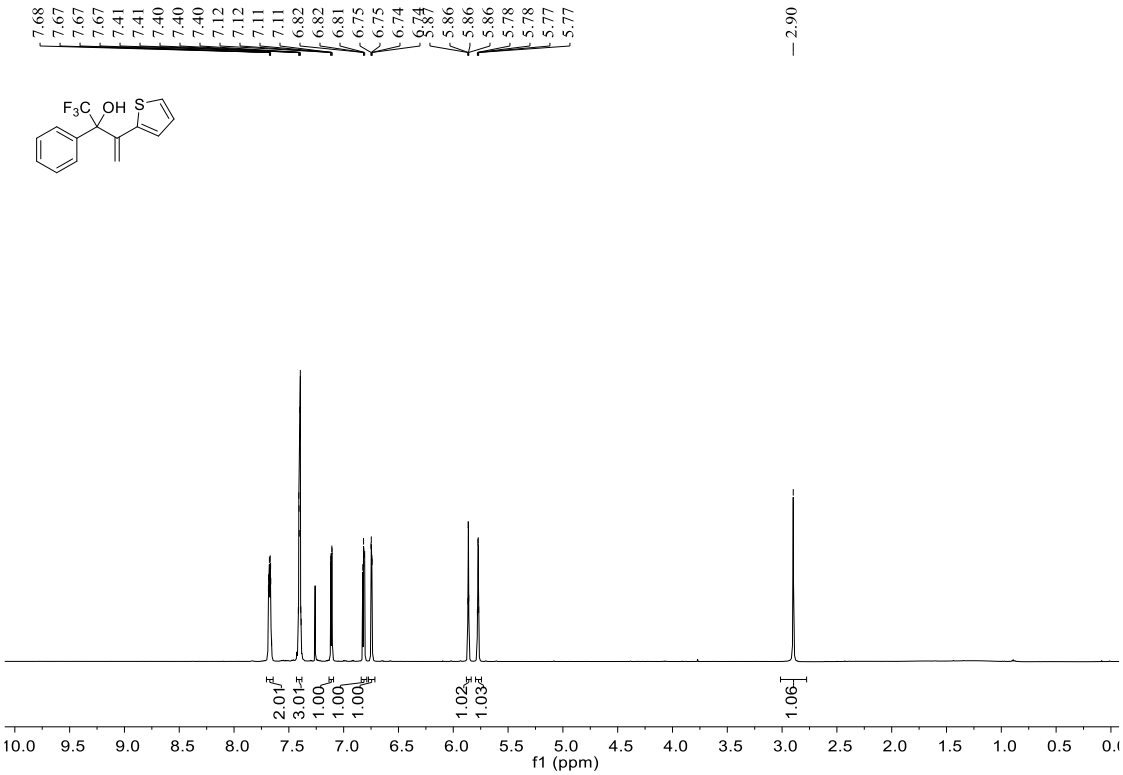


^{13}C NMR spectrum in $CDCl_3$.

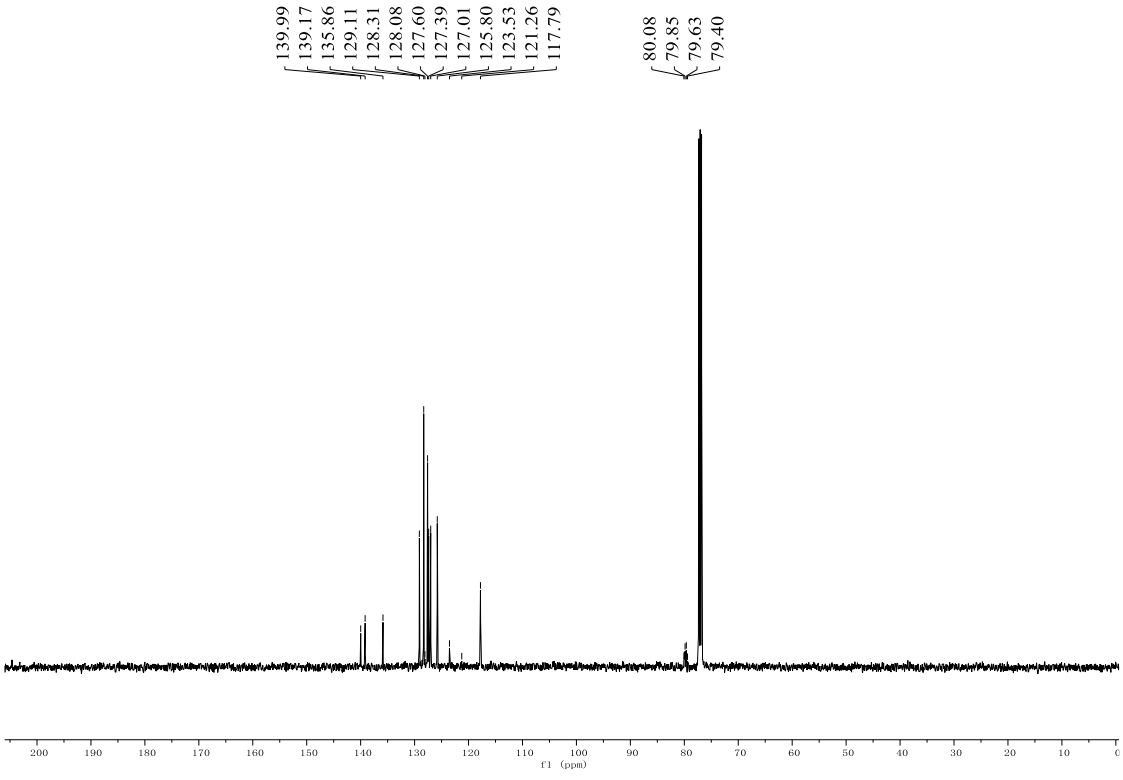


^{19}F NMR spectrum in $CDCl_3$.

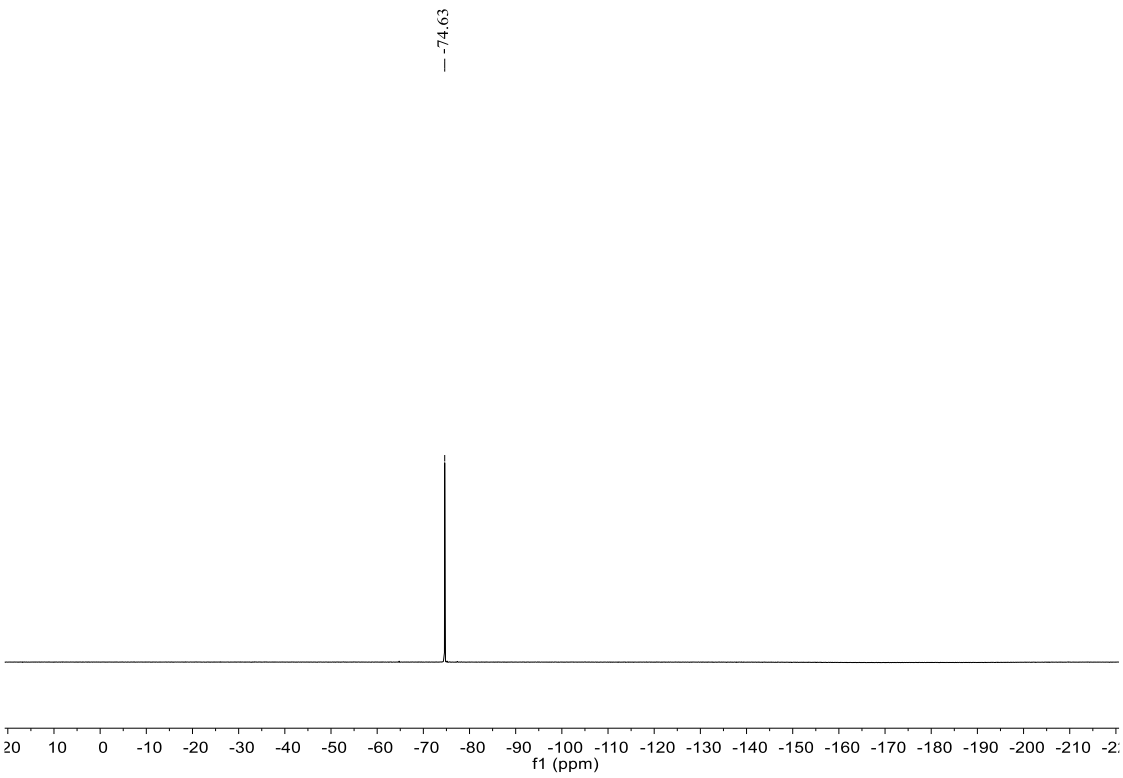
1,1,1-trifluoro-2-phenyl-3-(thiophen-2-yl)but-3-en-2-ol (17c)



^{1}H NMR spectrum in $CDCl_3$.

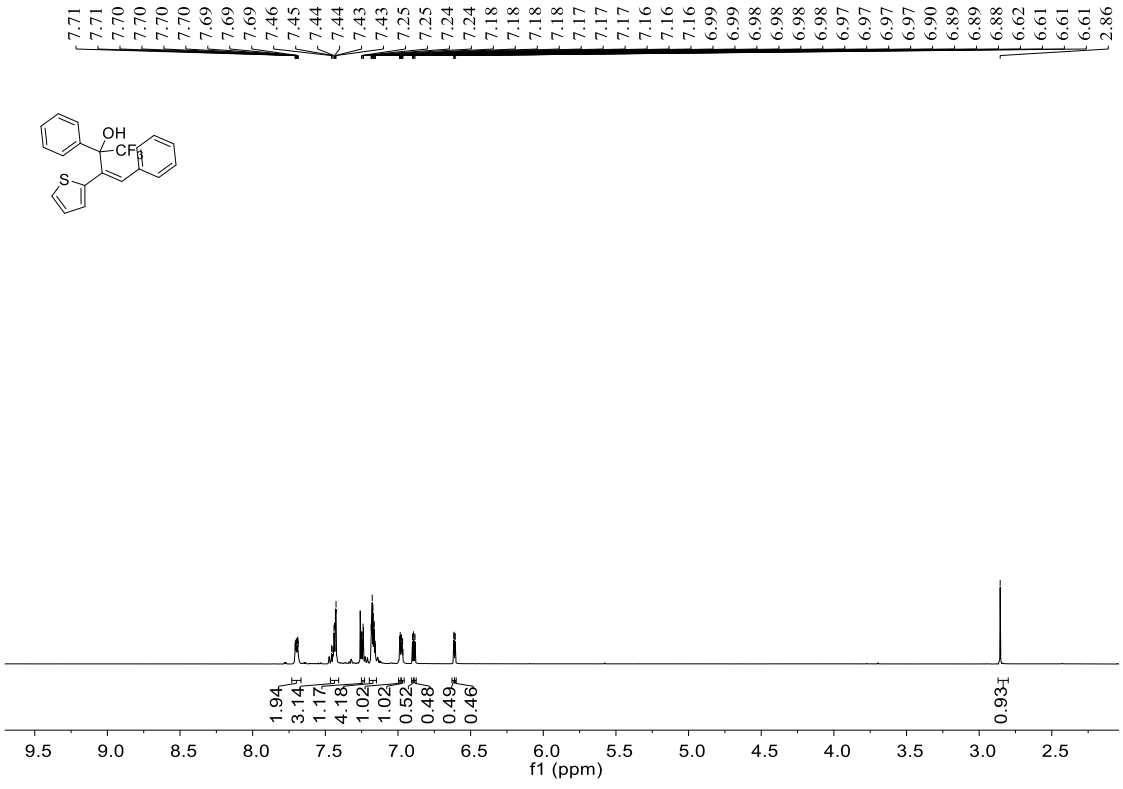


^{13}C NMR spectrum in $CDCl_3$.

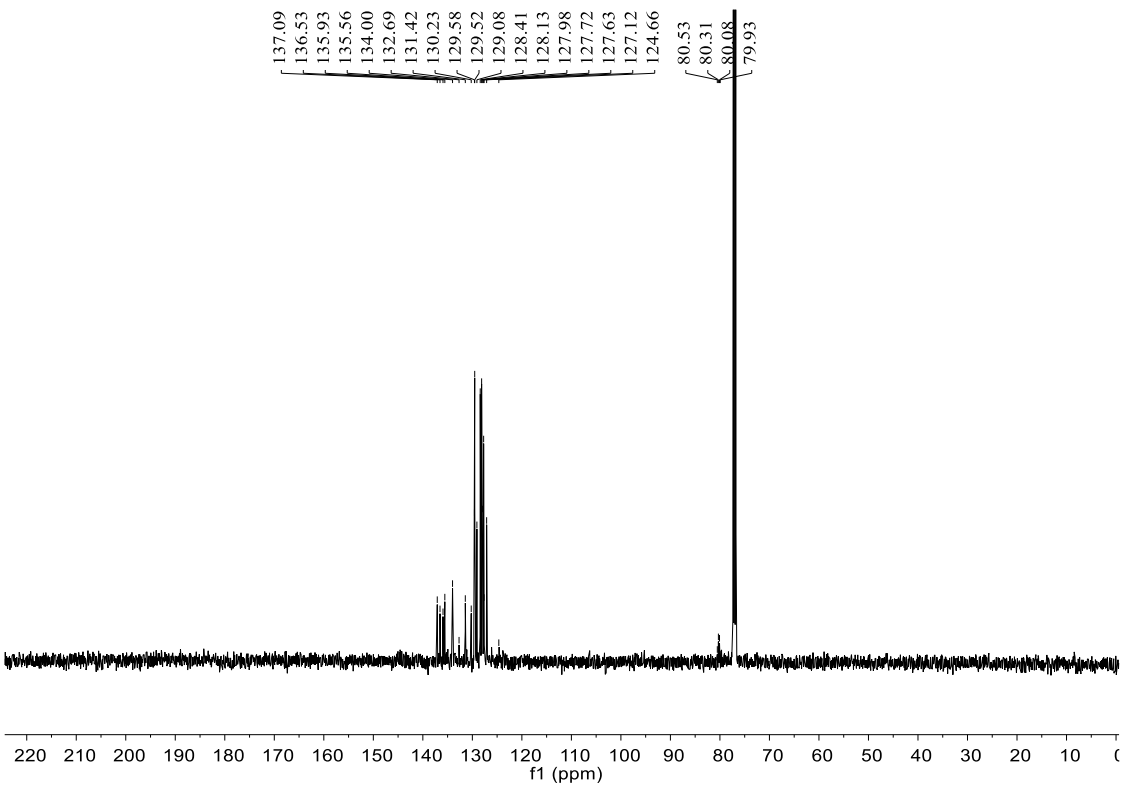


^{19}F NMR spectrum in $CDCl_3$.

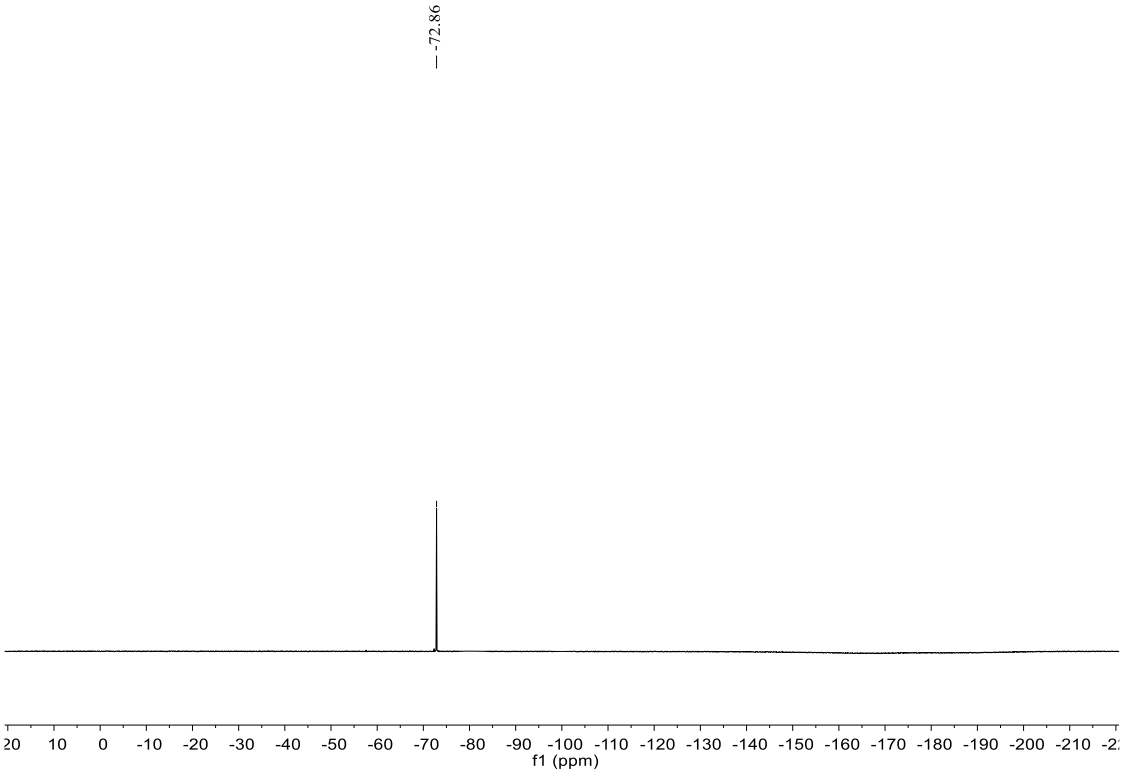
(*E*)-1,1,1-trifluoro-2,4-diphenyl-3-(thiophen-2-yl) but-3-en-2-ol (18c)



^{1}H NMR spectrum in $CDCl_3$.

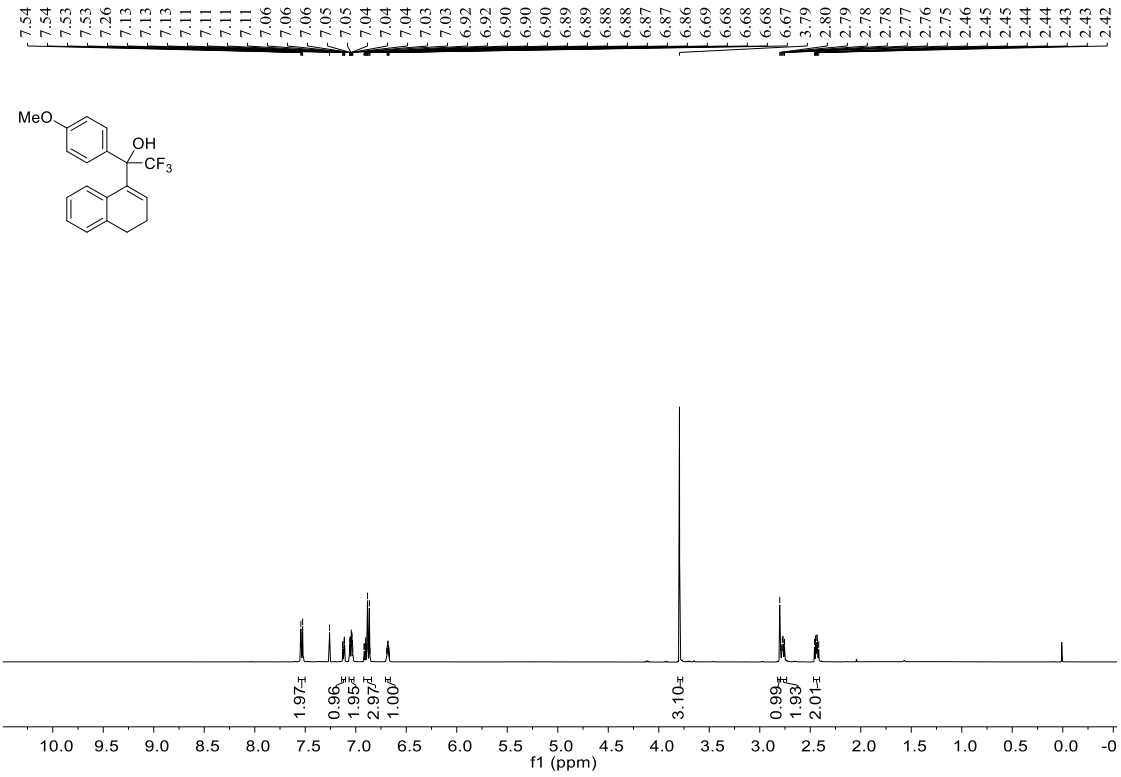


^{13}C NMR spectrum in $CDCl_3$.

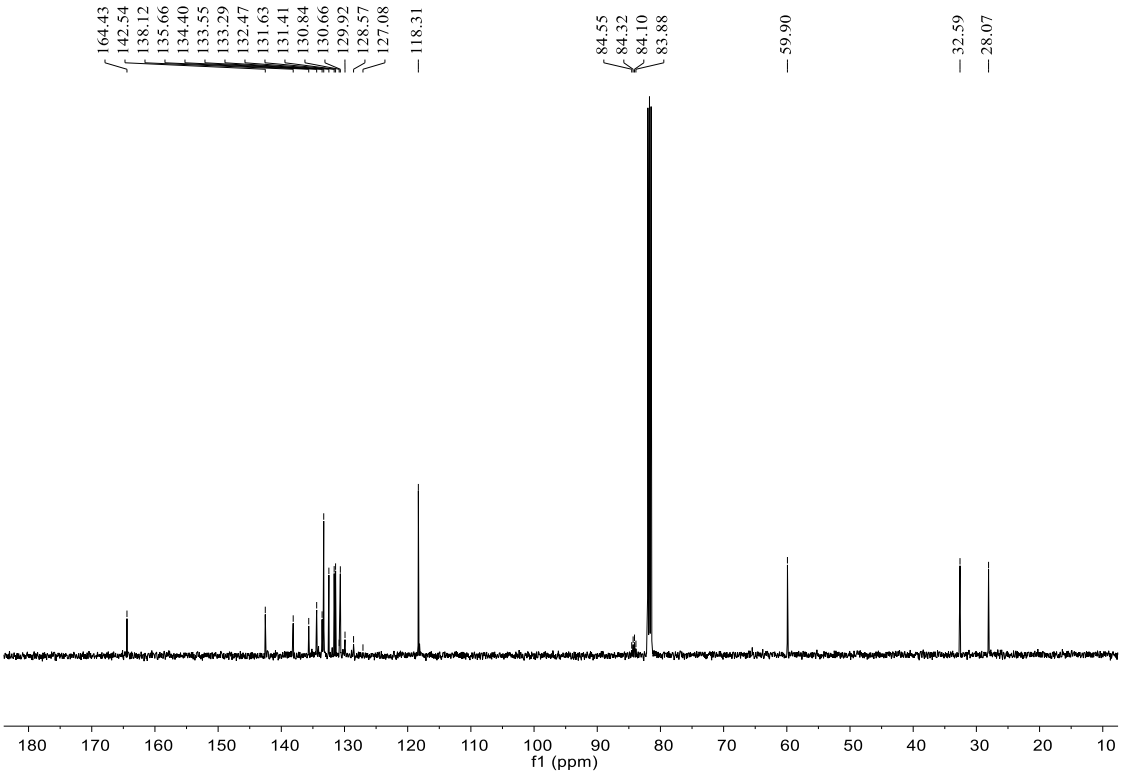


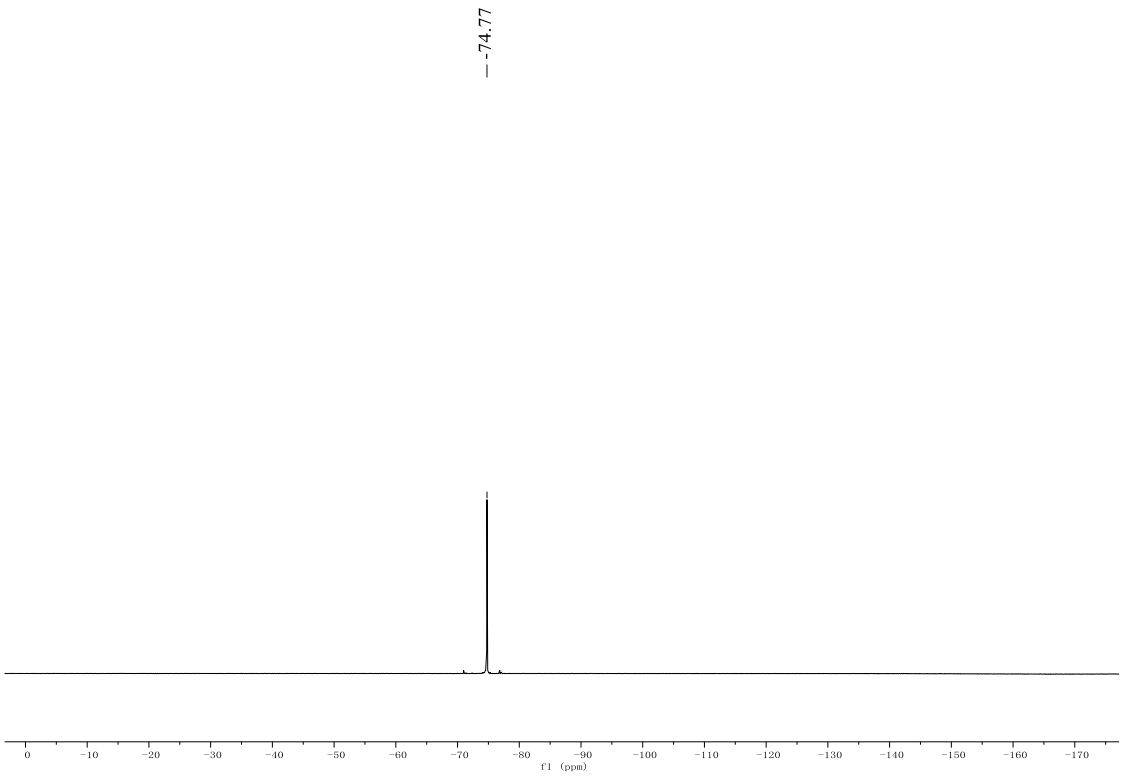
^{19}F NMR spectrum in $CDCl_3$.

1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(4-methoxyphenyl) ethan-1-ol (19c)



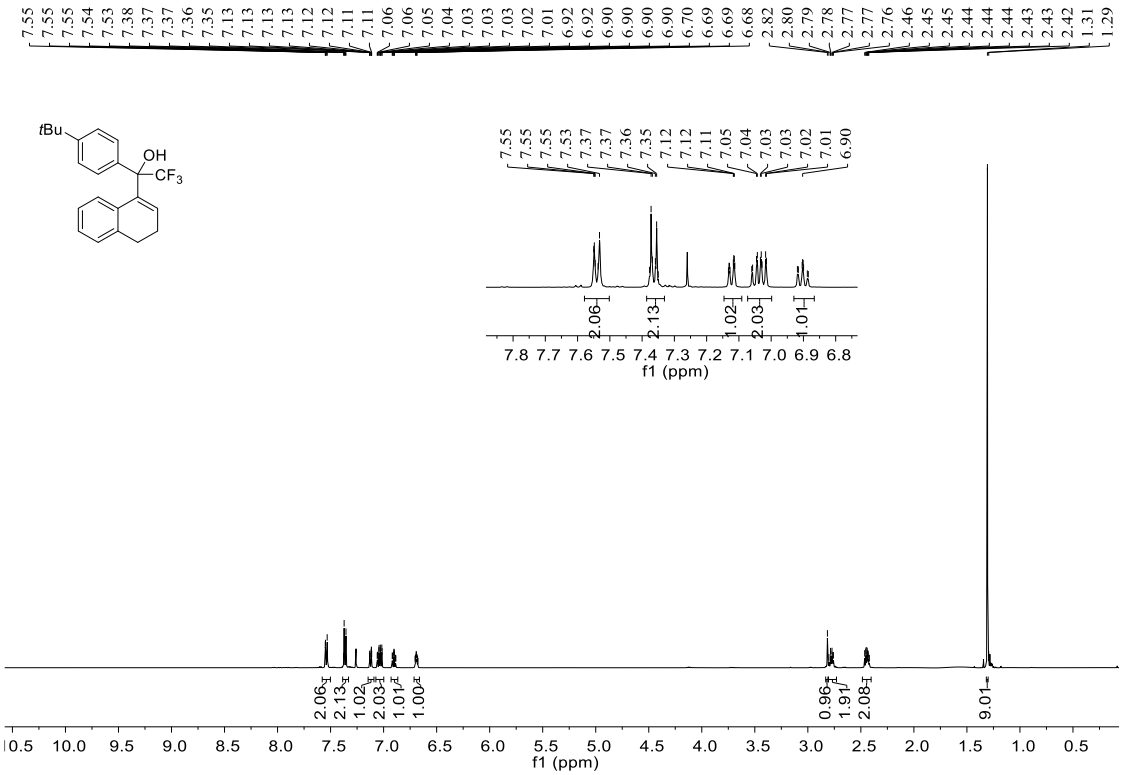
^{1}H NMR spectrum in $CDCl_3$.



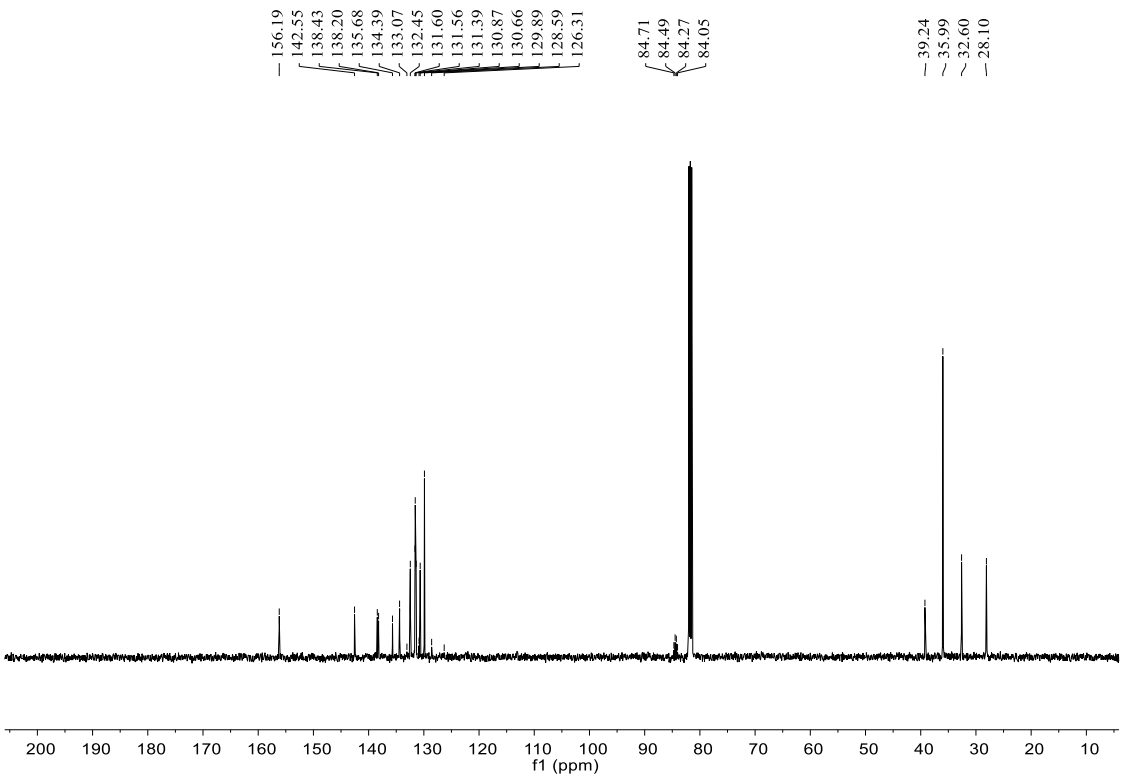


^{19}F NMR spectrum in $CDCl_3$.

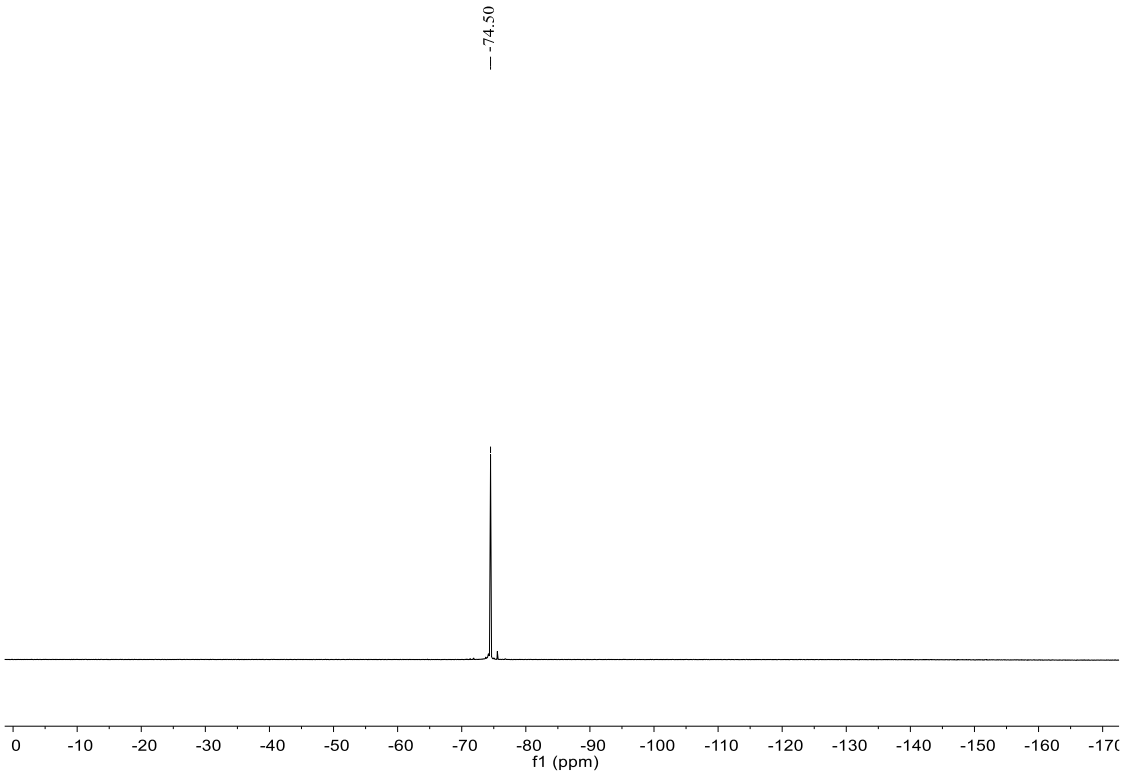
1-(4-(*tert*-butyl) phenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (20c)



^{1}H NMR spectrum in $CDCl_3$.

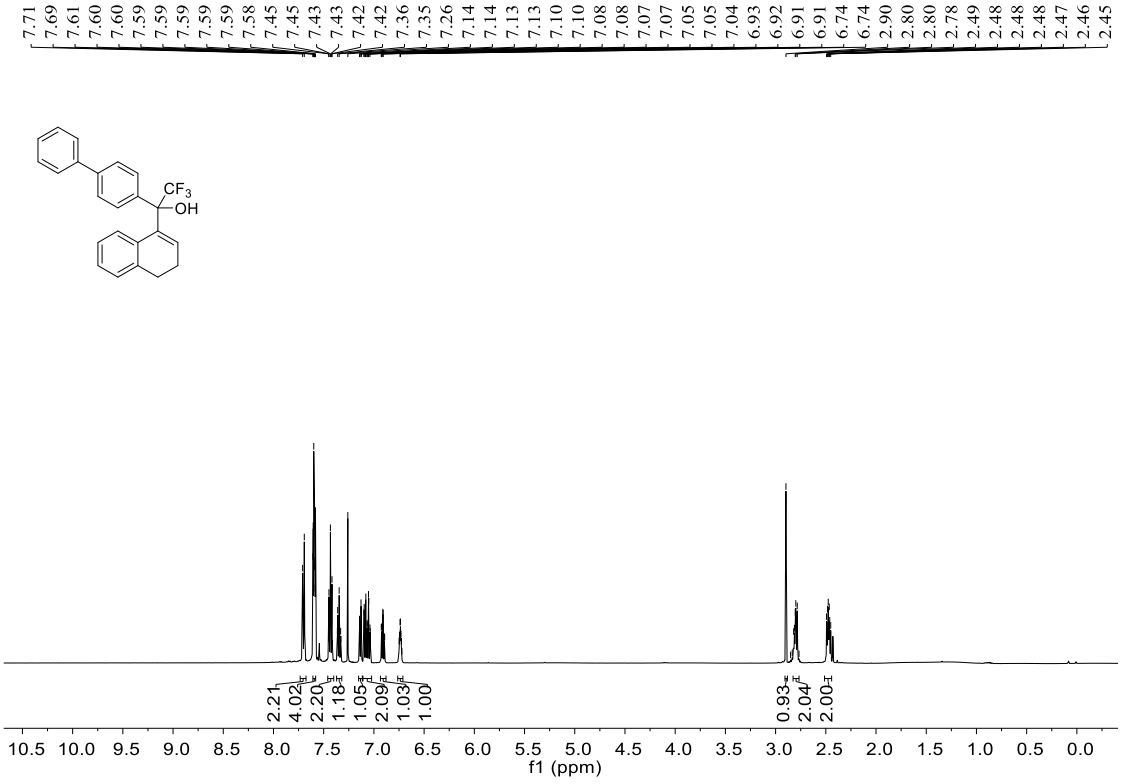


^{13}C NMR spectrum in $CDCl_3$.

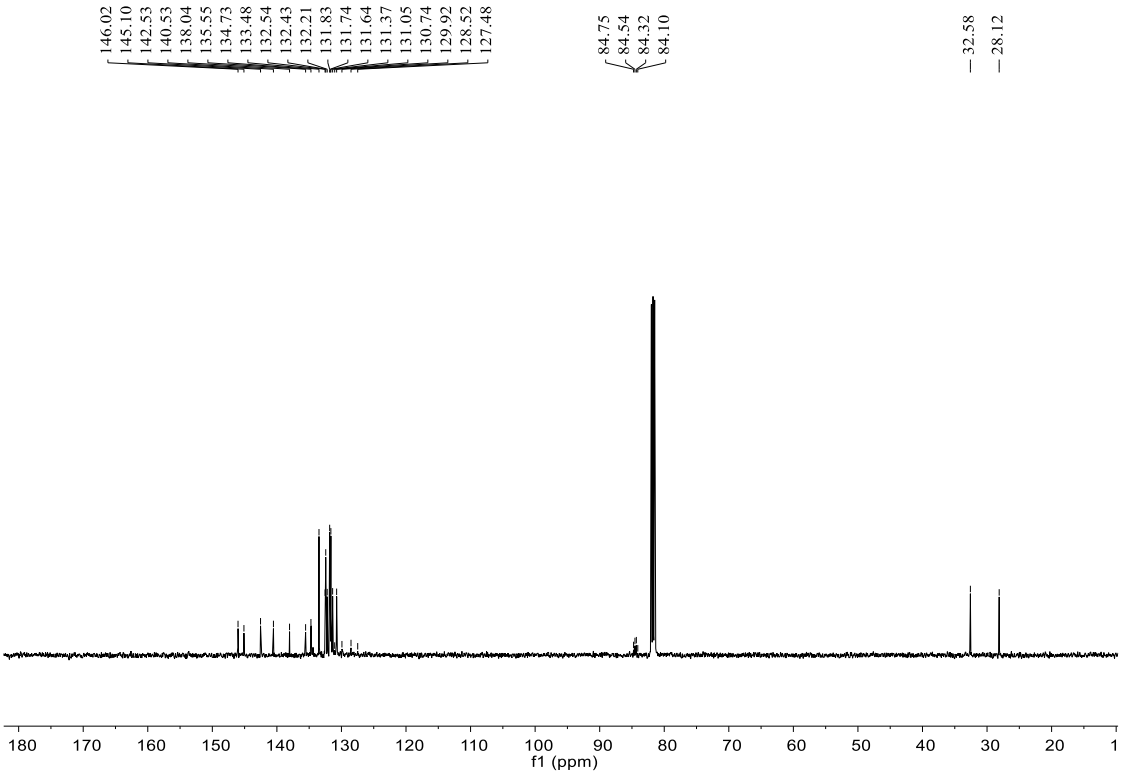


^{19}F NMR spectrum in $CDCl_3$.

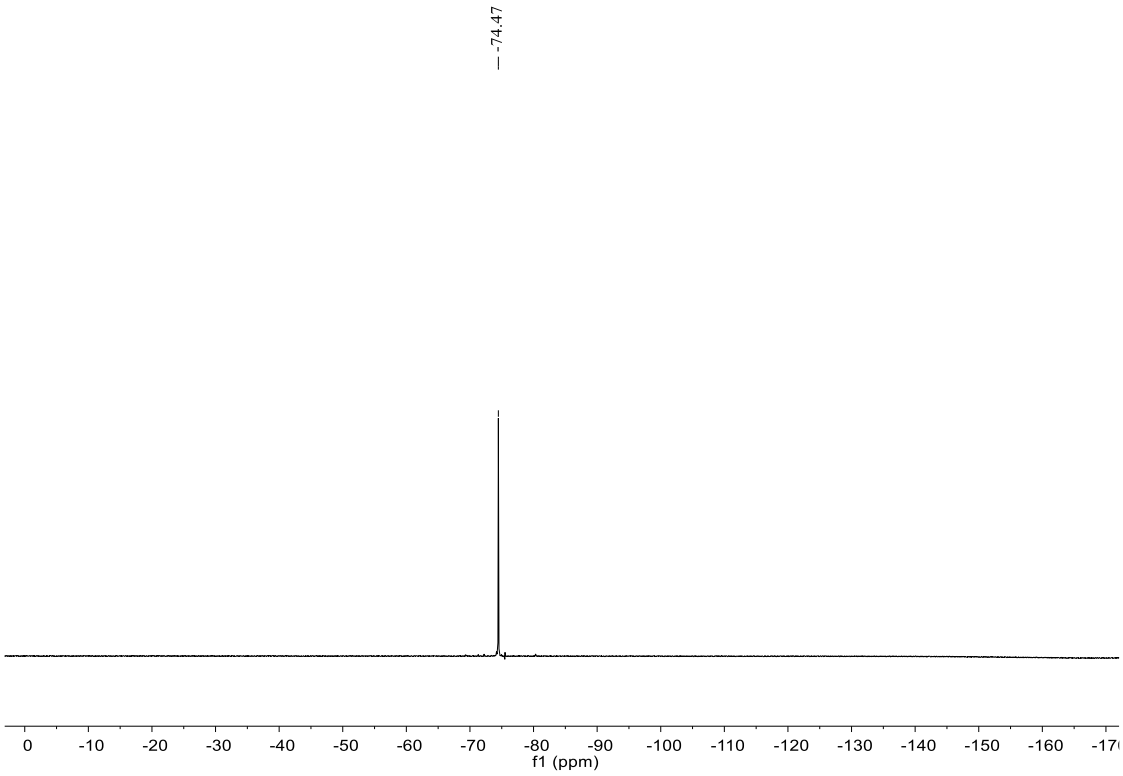
1-([1,1'-biphenyl]-4-yl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (21c)



^{1}H NMR spectrum in $CDCl_3$.

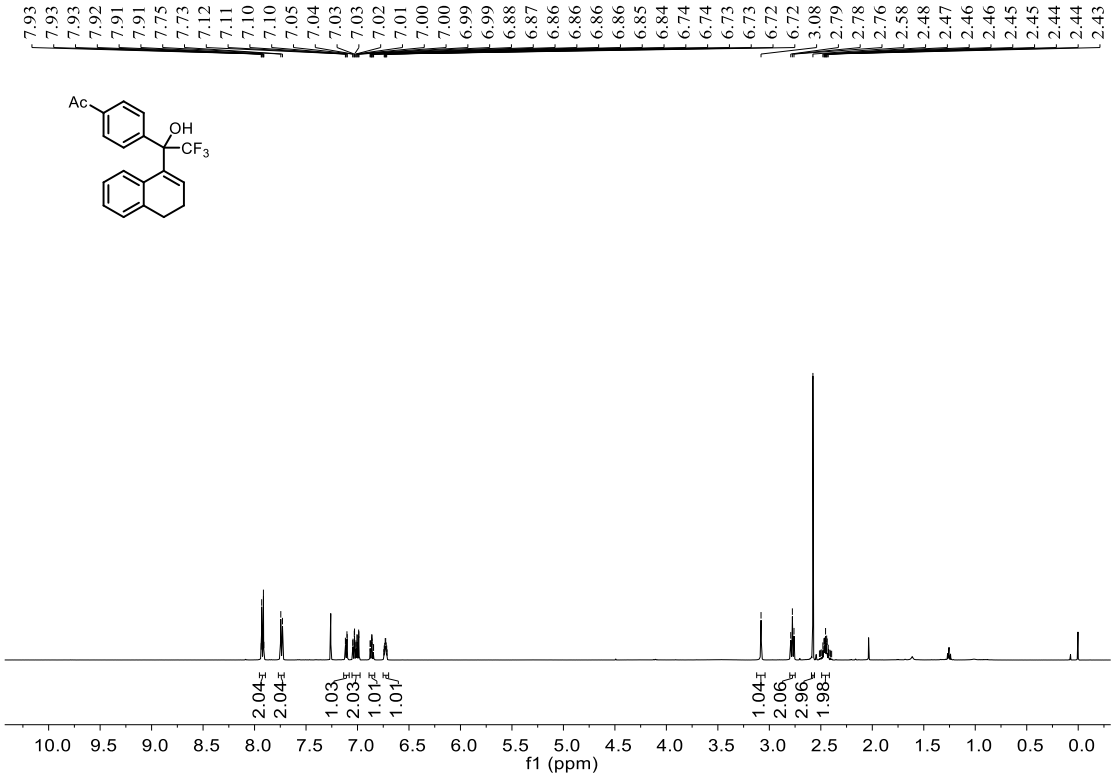


^{13}C NMR spectrum in $CDCl_3$.

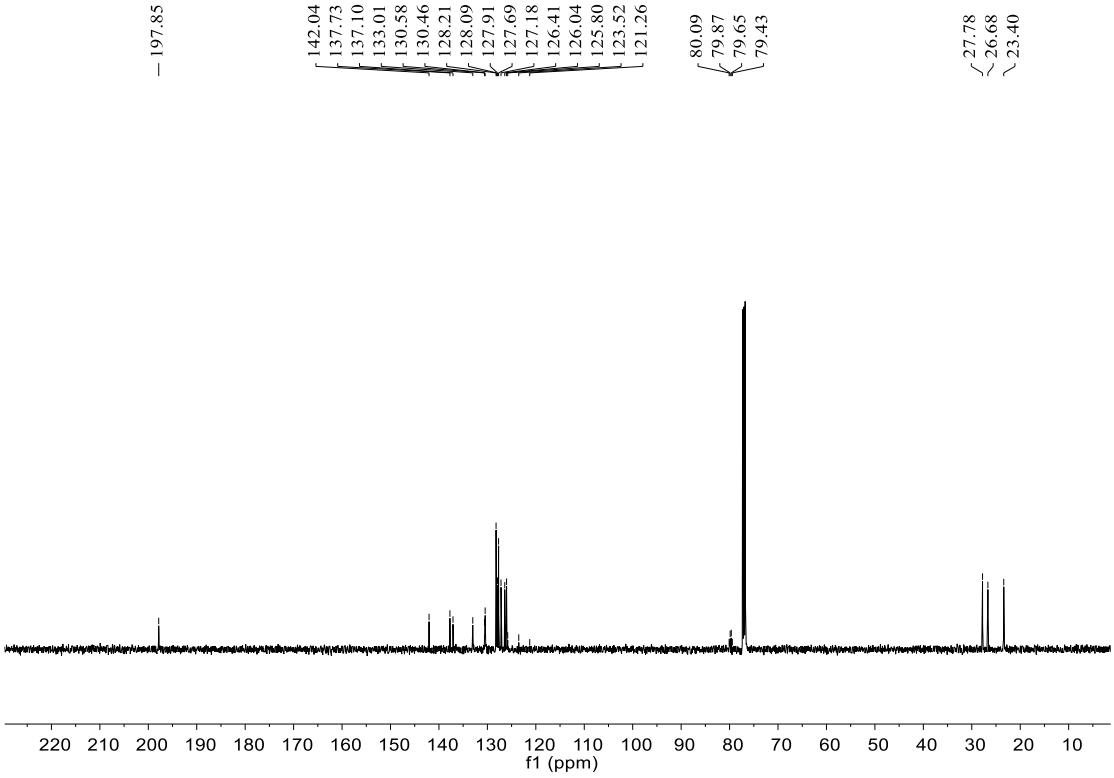


^{19}F NMR spectrum in $CDCl_3$.

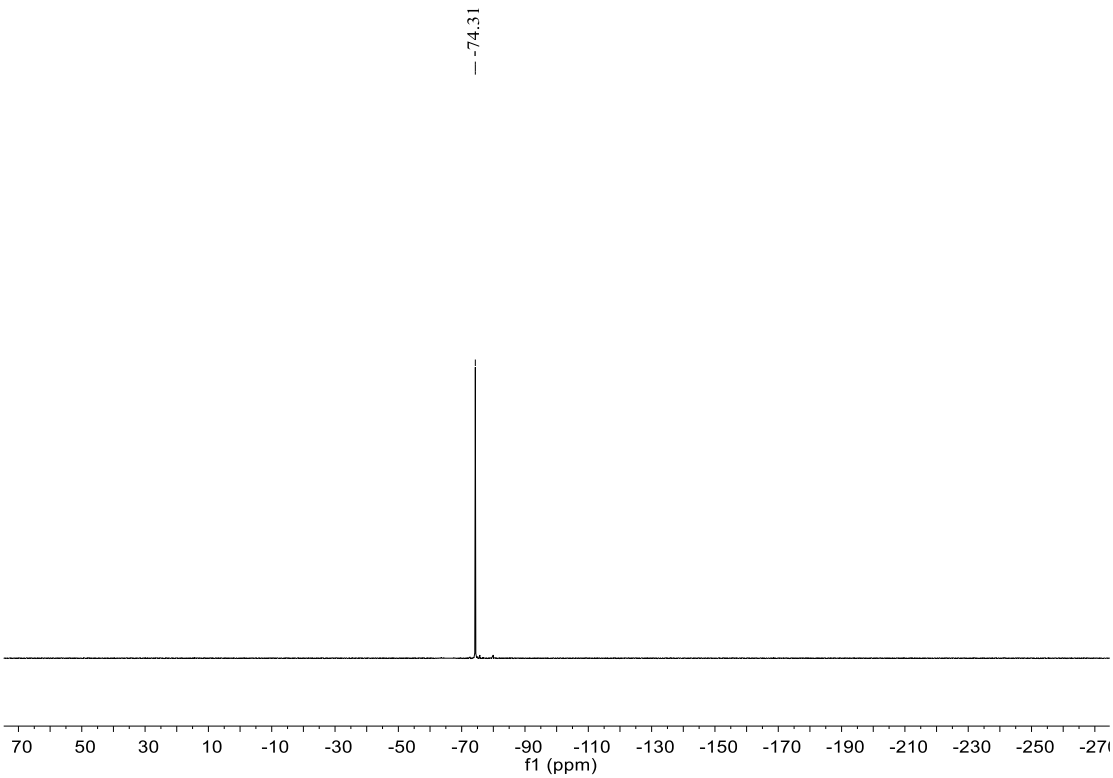
(*R*)-1-(4-(1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-hydroxyethyl)phenyl)ethan-1-one (22c)



^{1}H NMR spectrum in $CDCl_3$.

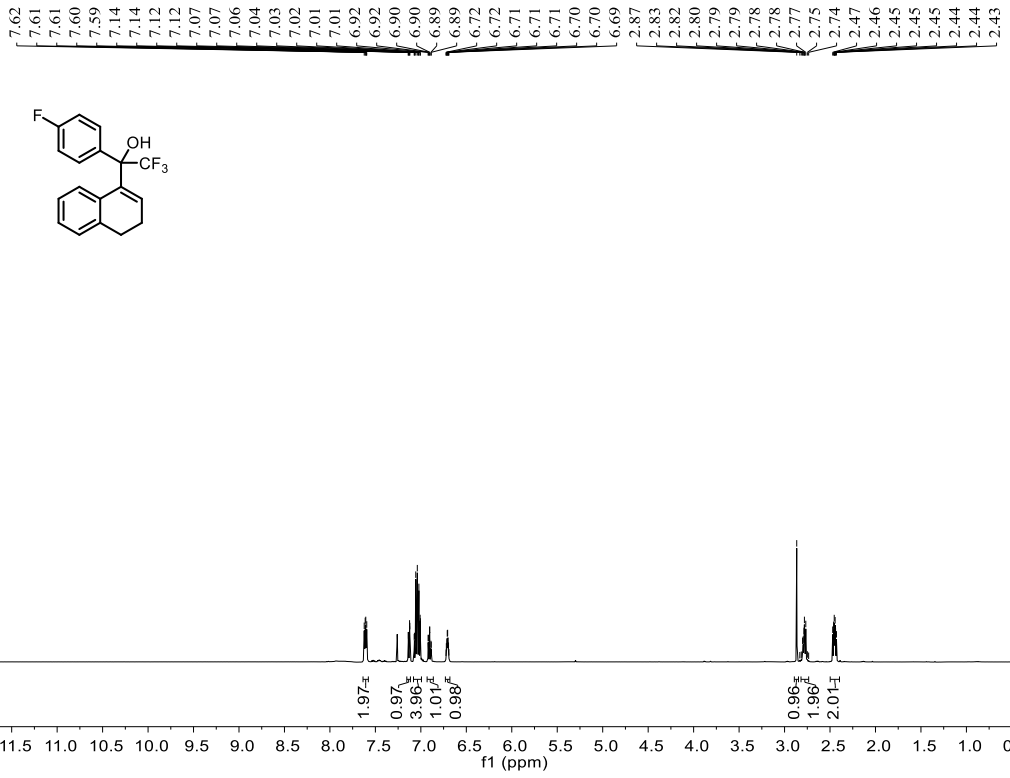


^{13}C NMR spectrum in $CDCl_3$.

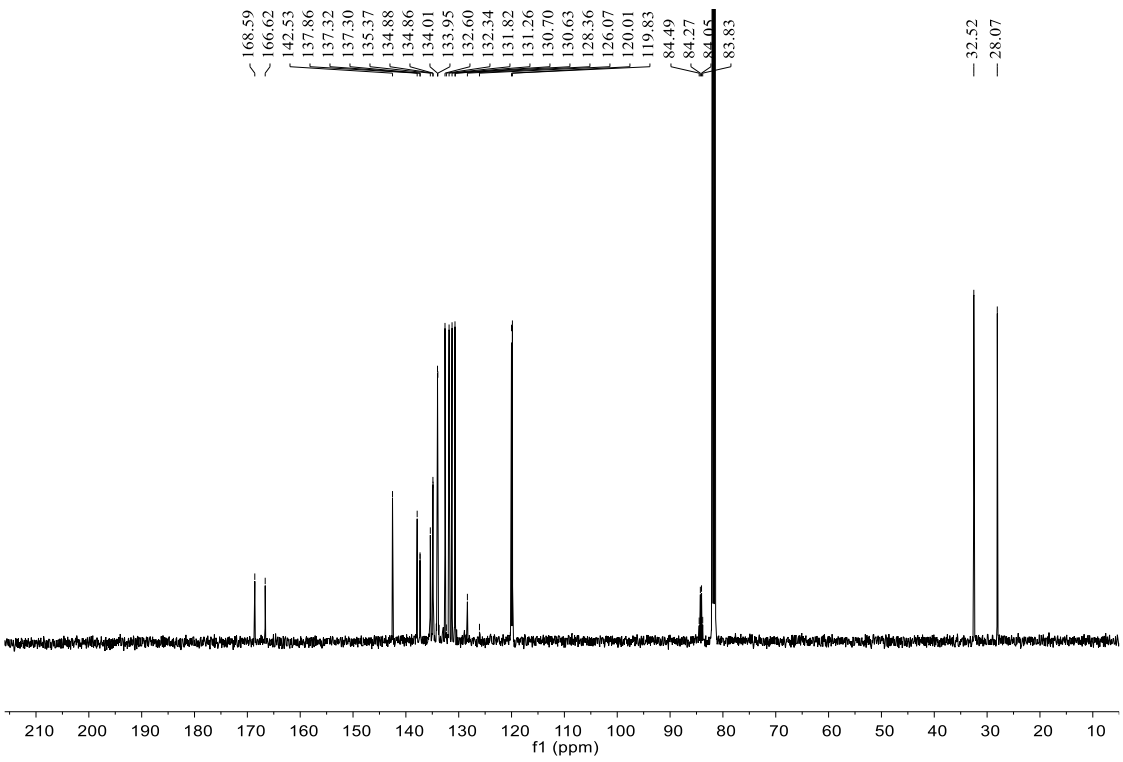


^{19}F NMR spectrum in $CDCl_3$.

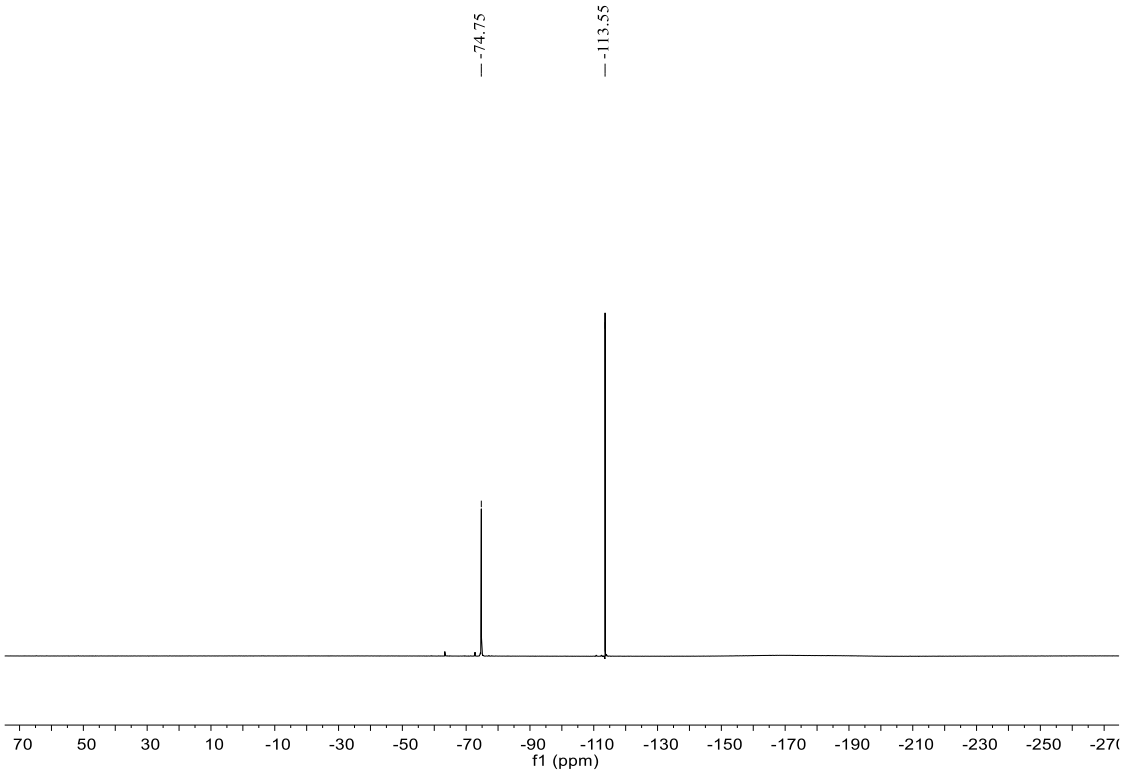
(*R*)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(4-fluorophenyl) ethan-1-ol (22c)



^{1}H NMR spectrum in $CDCl_3$.

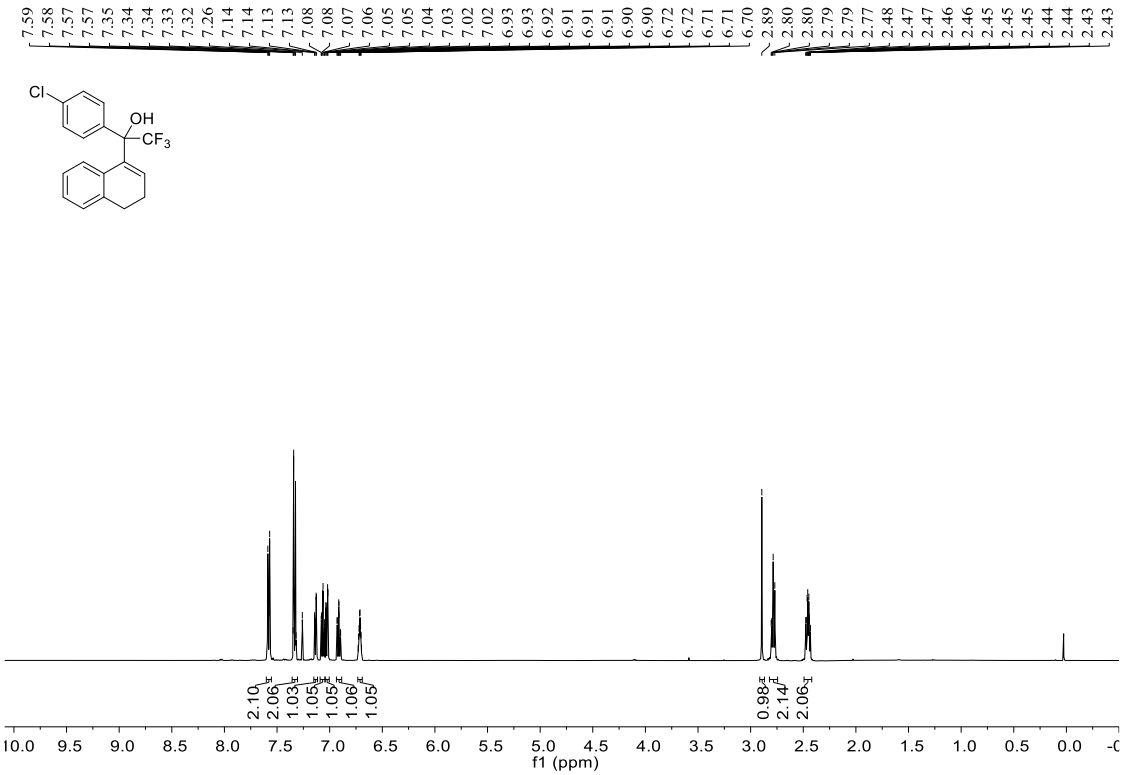


^{13}C NMR spectrum in $CDCl_3$.

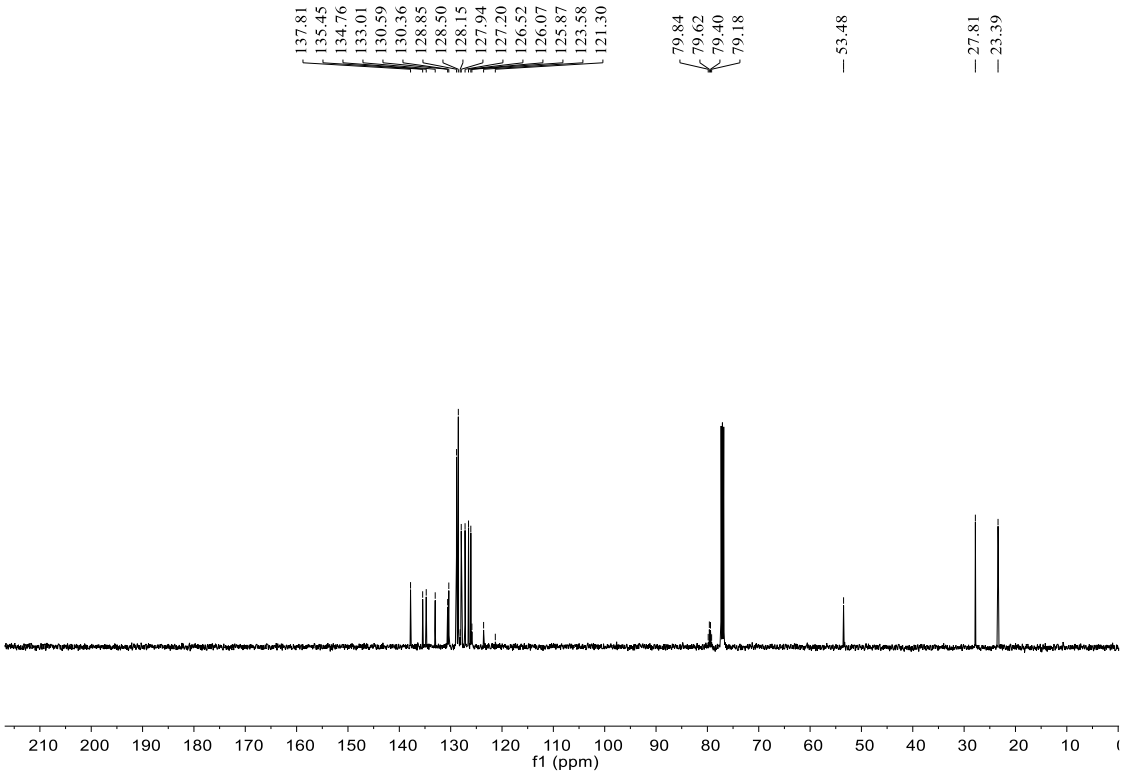


^{19}F NMR spectrum in $CDCl_3$.

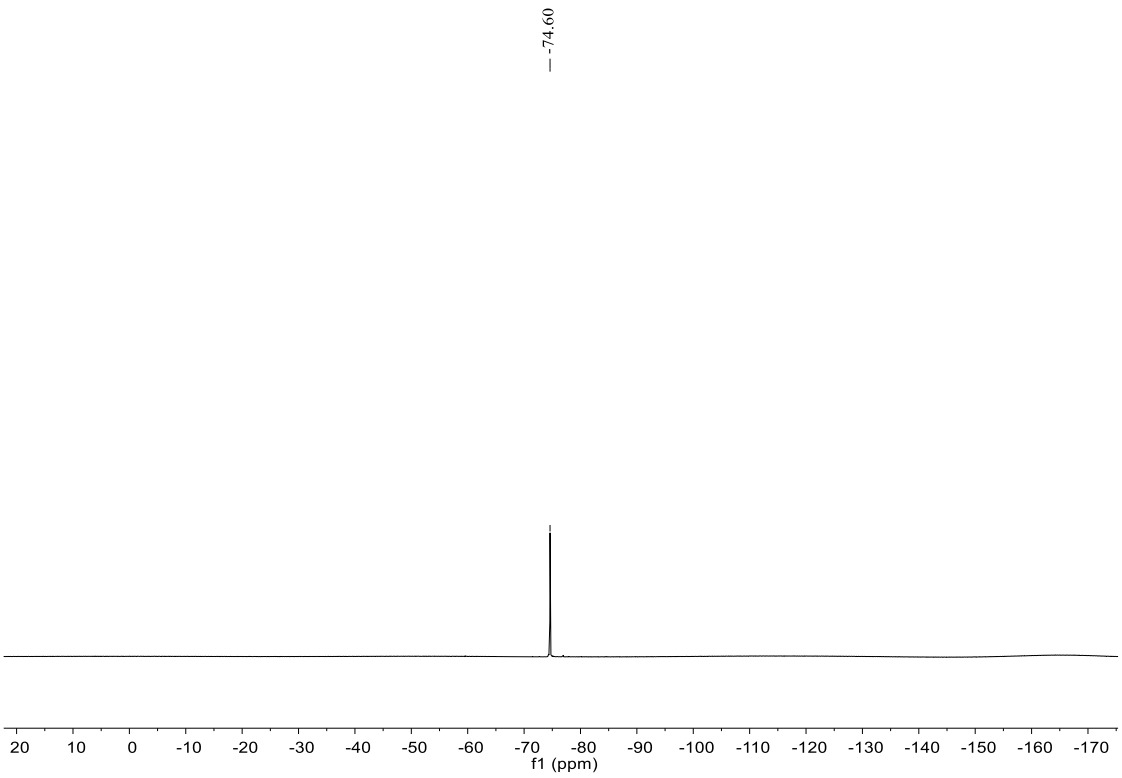
(*R*)-1-(4-chlorophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (23c)



^{1}H NMR spectrum in $CDCl_3$.

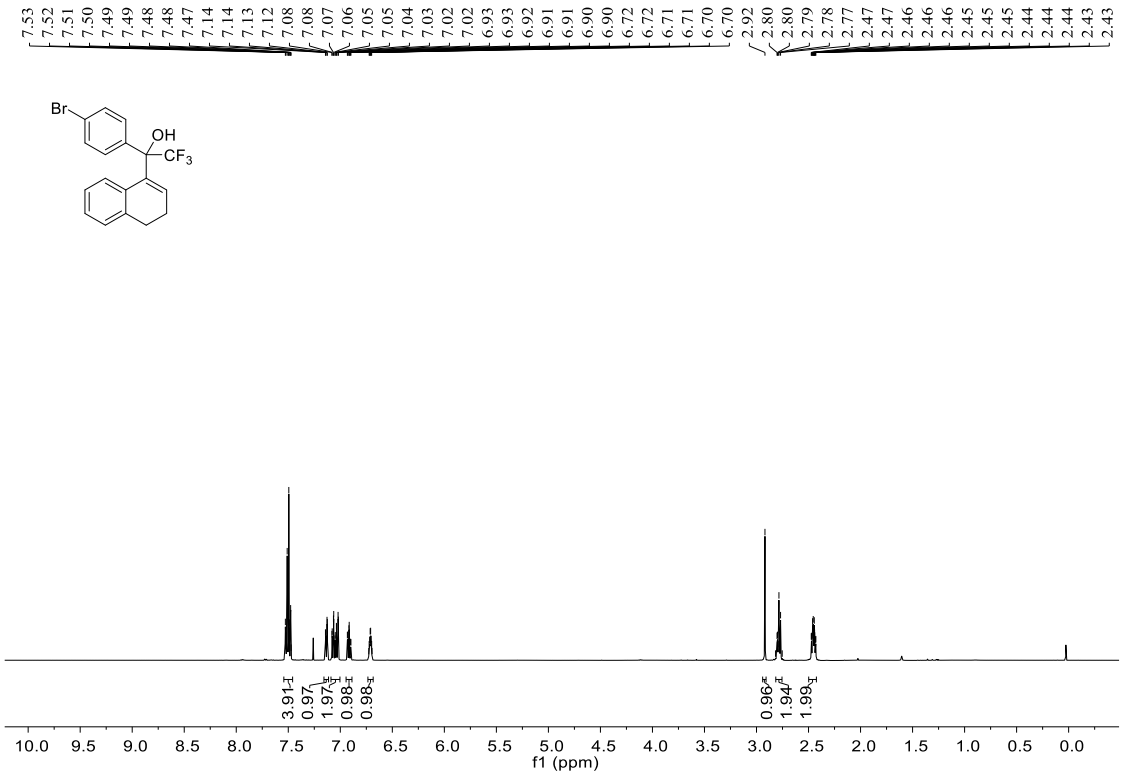


^{13}C NMR spectrum in $CDCl_3$.

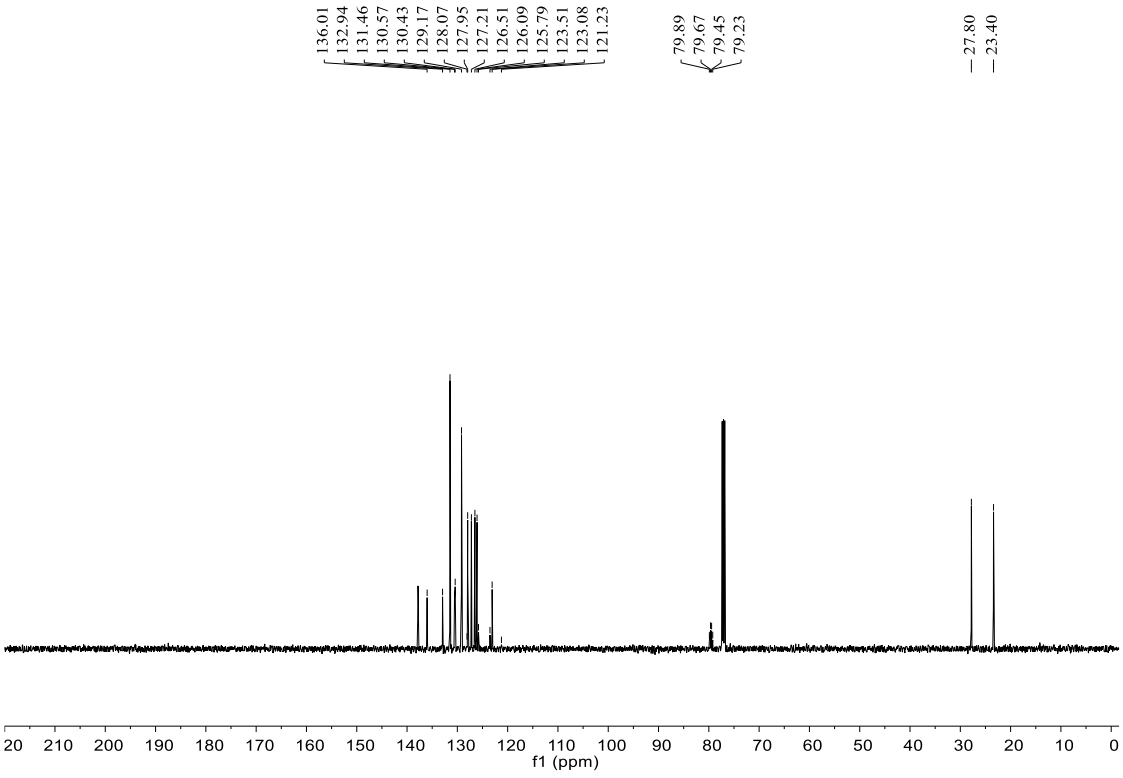


^{19}F NMR spectrum in $CDCl_3$.

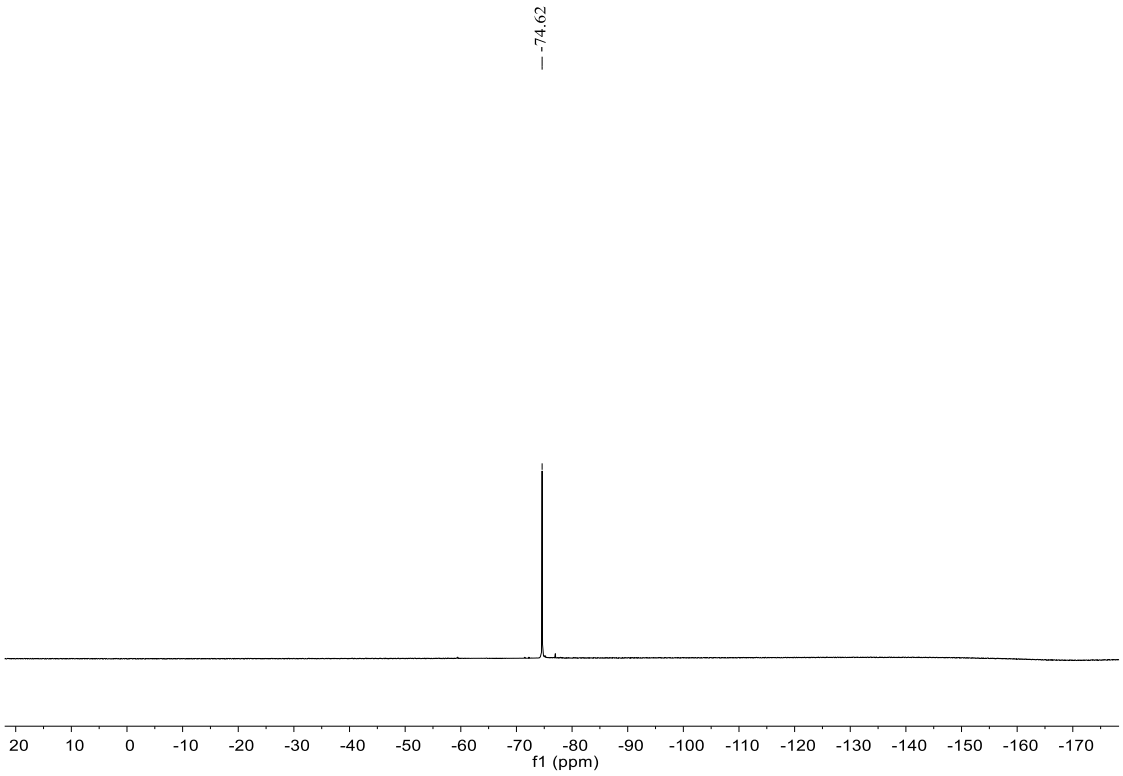
(*R*)-1-(4-bromophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (24c)



^{1}H NMR spectrum in $CDCl_3$.

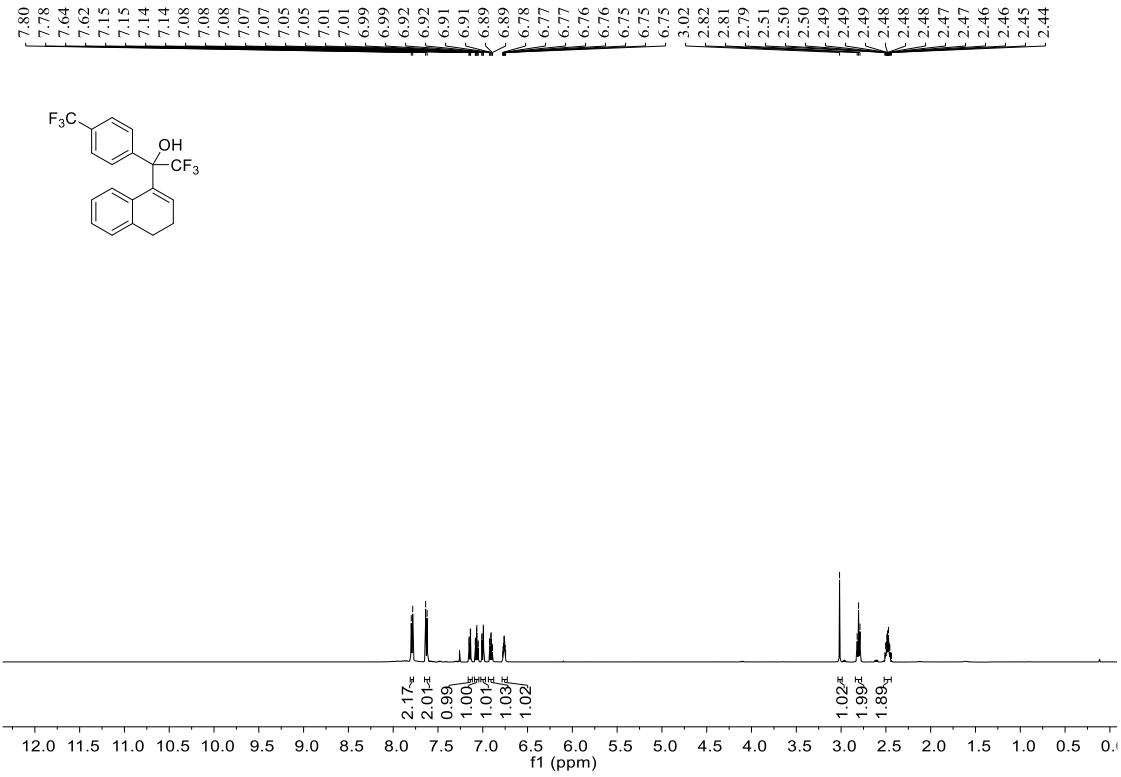


^{13}C NMR spectrum in $CDCl_3$.

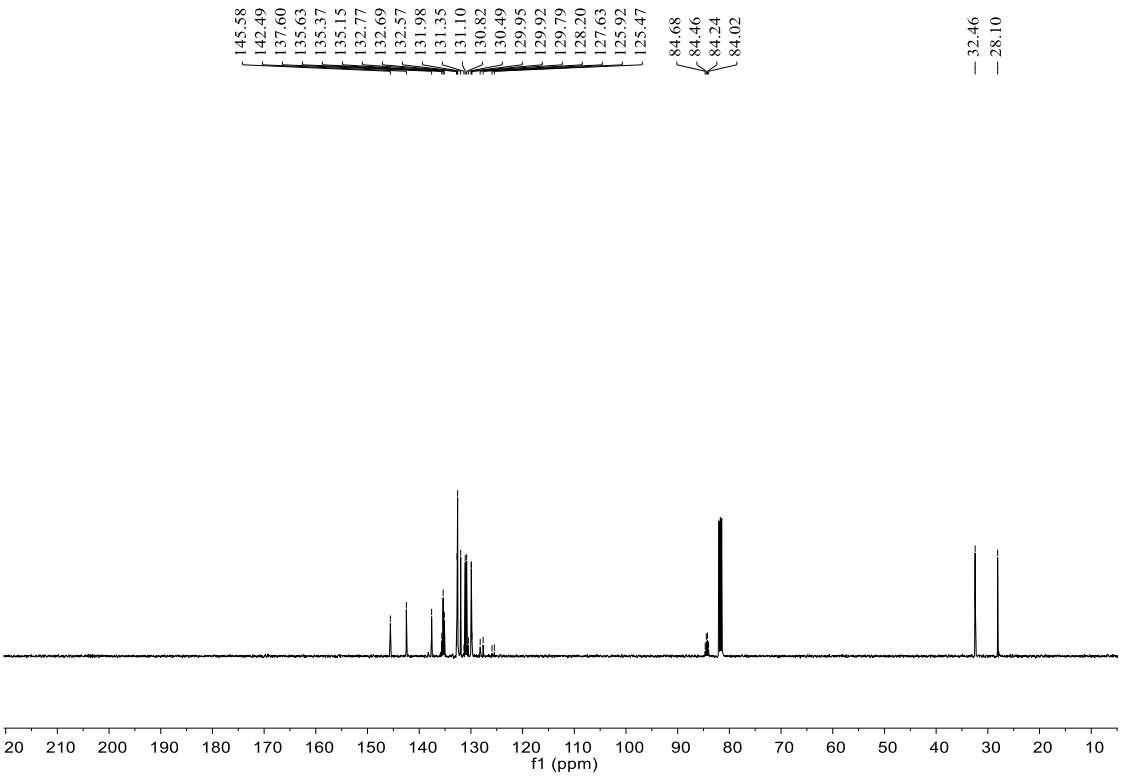


^{19}F NMR spectrum in $CDCl_3$.

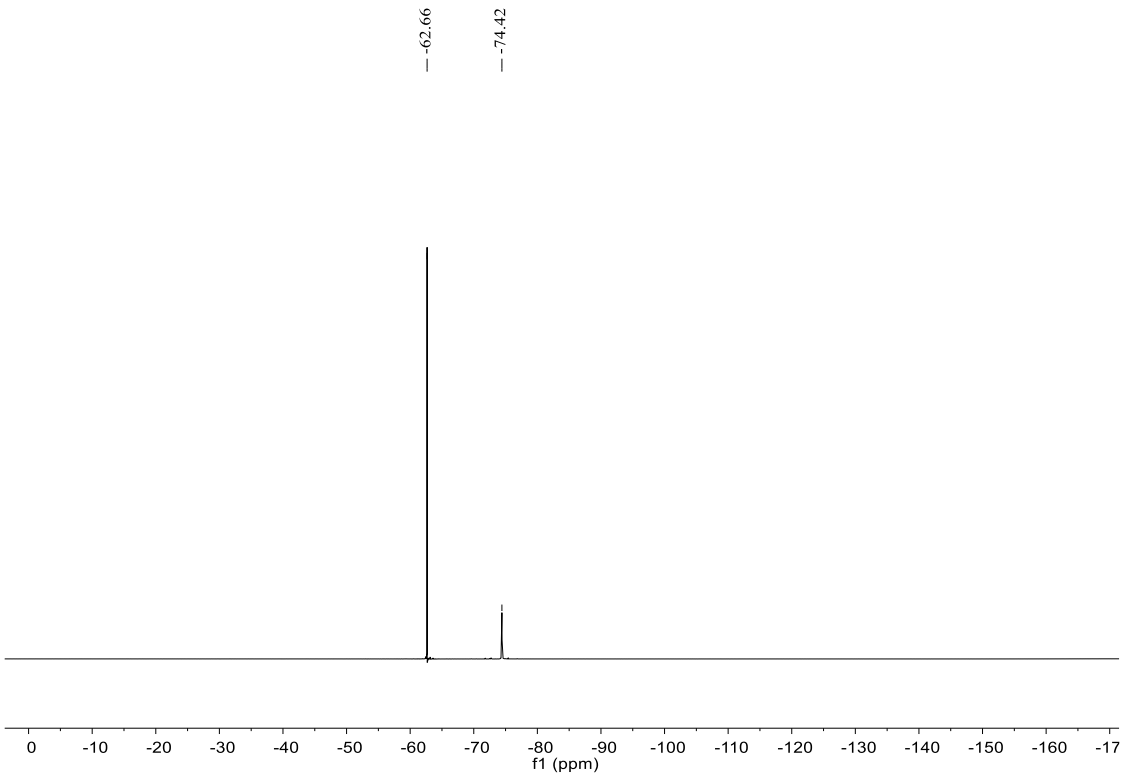
(*R*)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(4-(trifluoromethyl) phenyl) ethan-1-ol (25c)



^{1}H NMR spectrum in $CDCl_3$

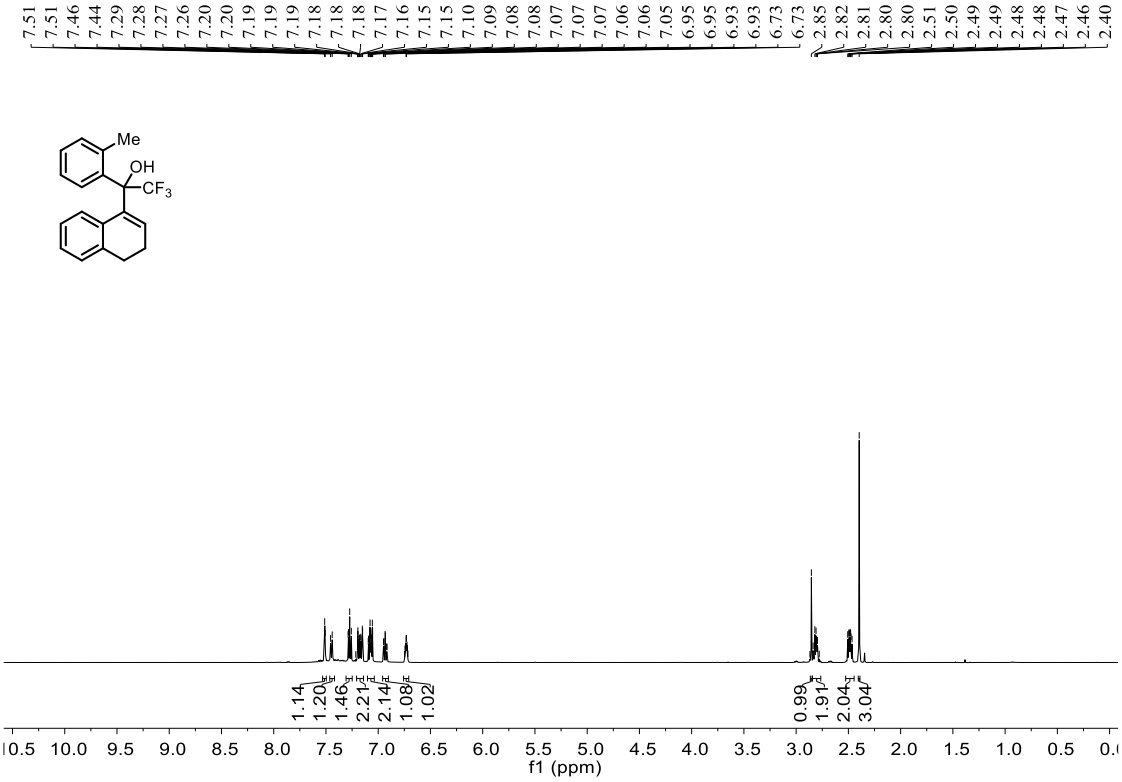


^{13}C NMR spectrum in $CDCl_3$.

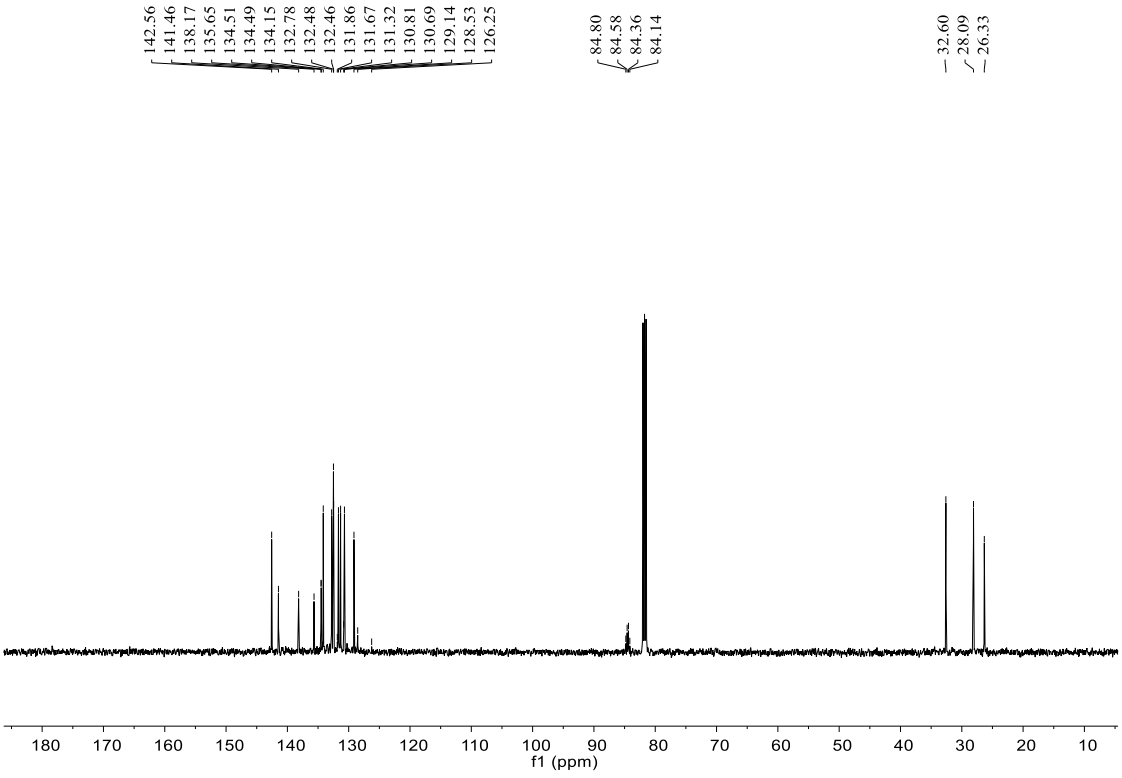


^{19}F NMR spectrum in $CDCl_3$.

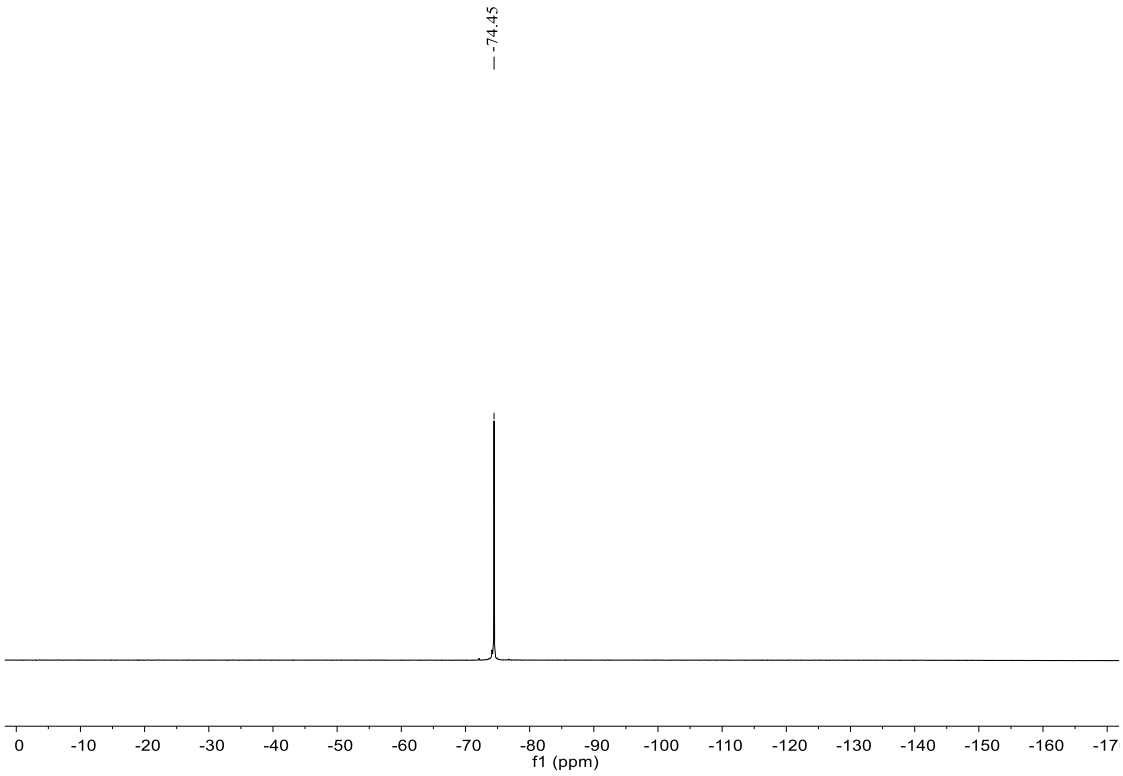
(*R*)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(o-tolyl) ethan-1-ol (26c)



^{1}H NMR spectrum in $CDCl_3$.

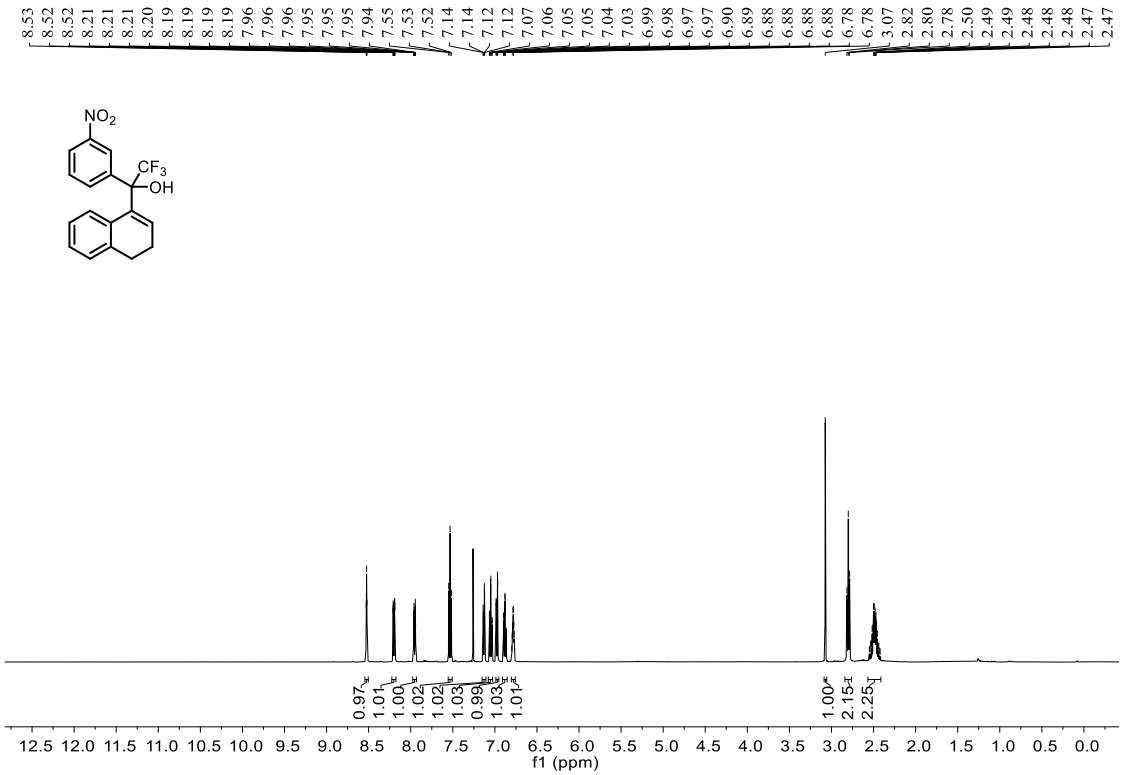


^{13}C NMR spectrum in $CDCl_3$.

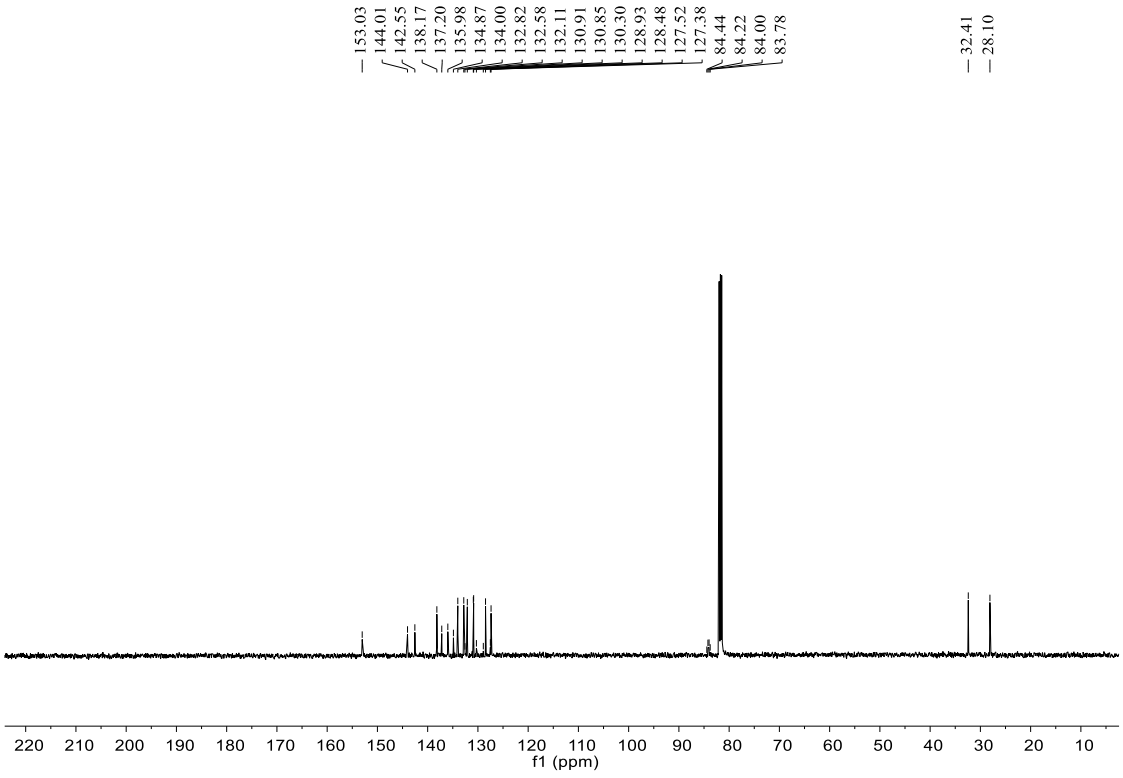


^{19}F NMR spectrum in $CDCl_3$.

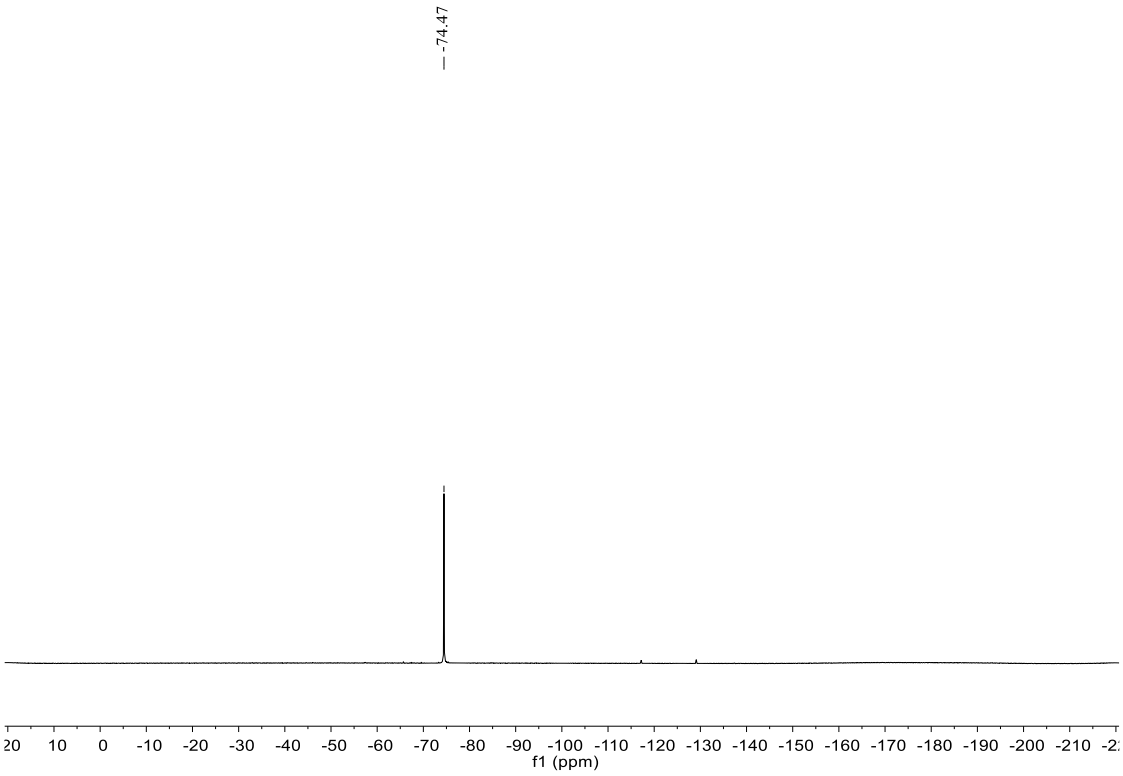
1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(3-nitrophenyl) ethan-1-ol (27c)



^{1}H NMR spectrum in $CDCl_3$.

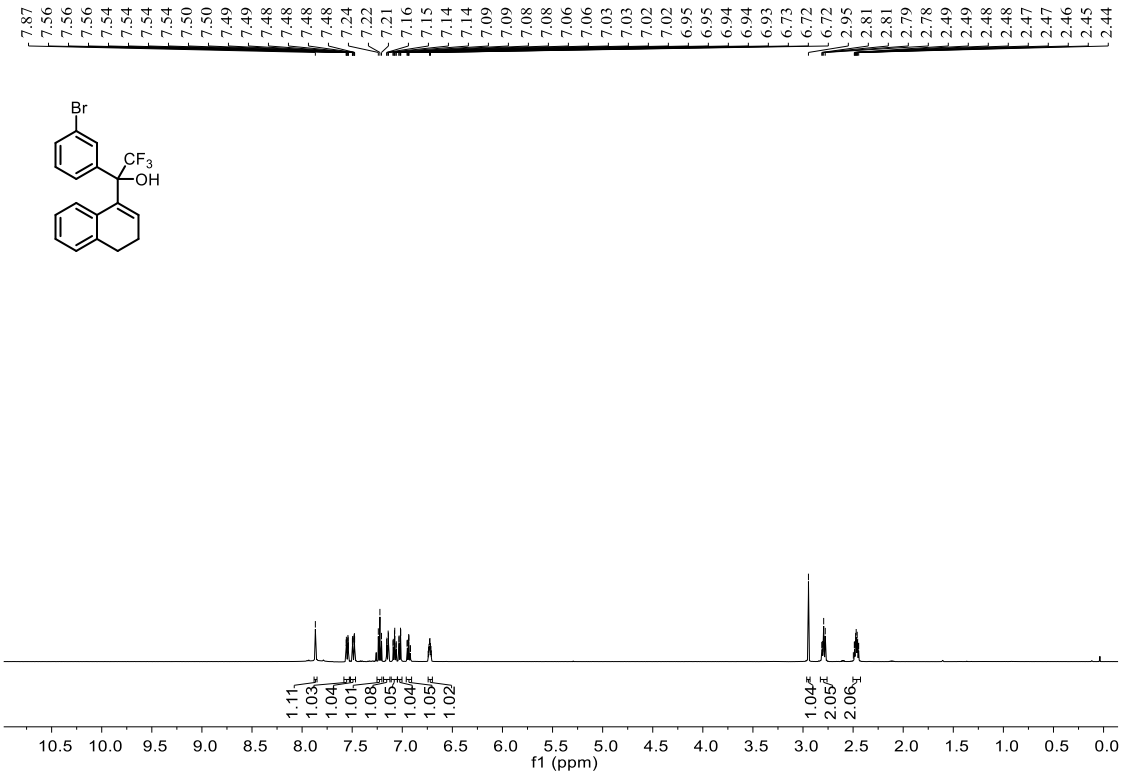


^{13}C NMR spectrum in $CDCl_3$.

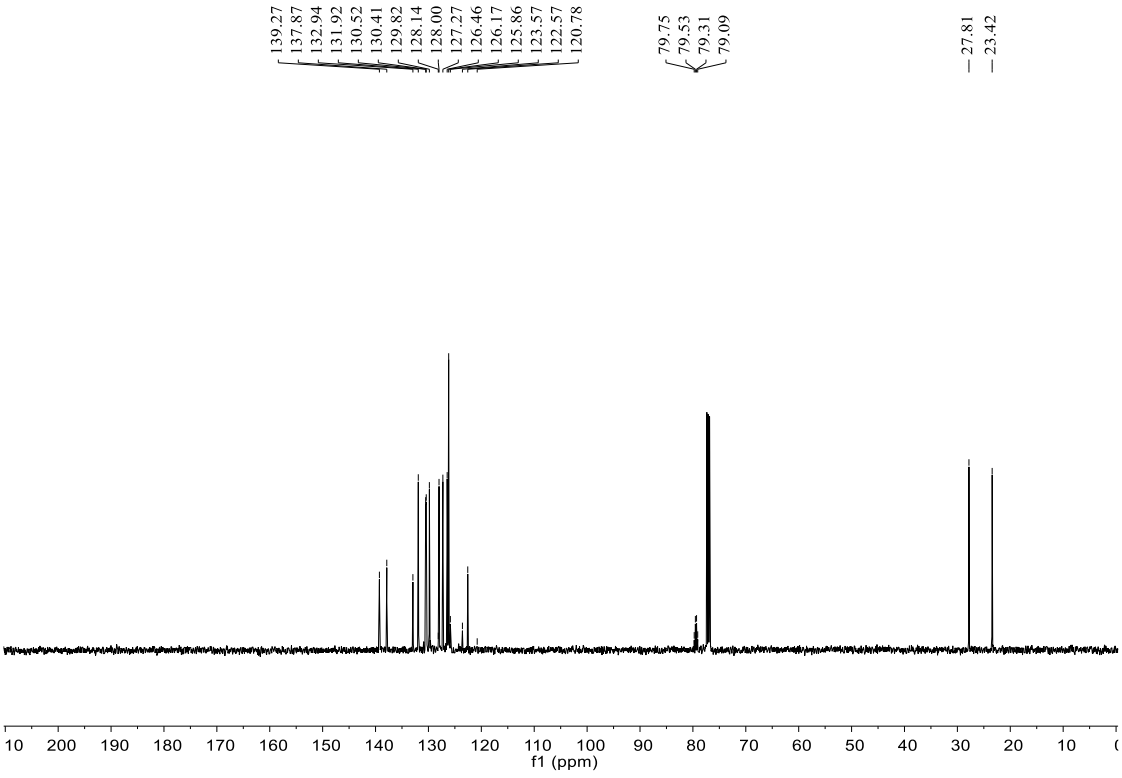


^{19}F NMR spectrum in $CDCl_3$.

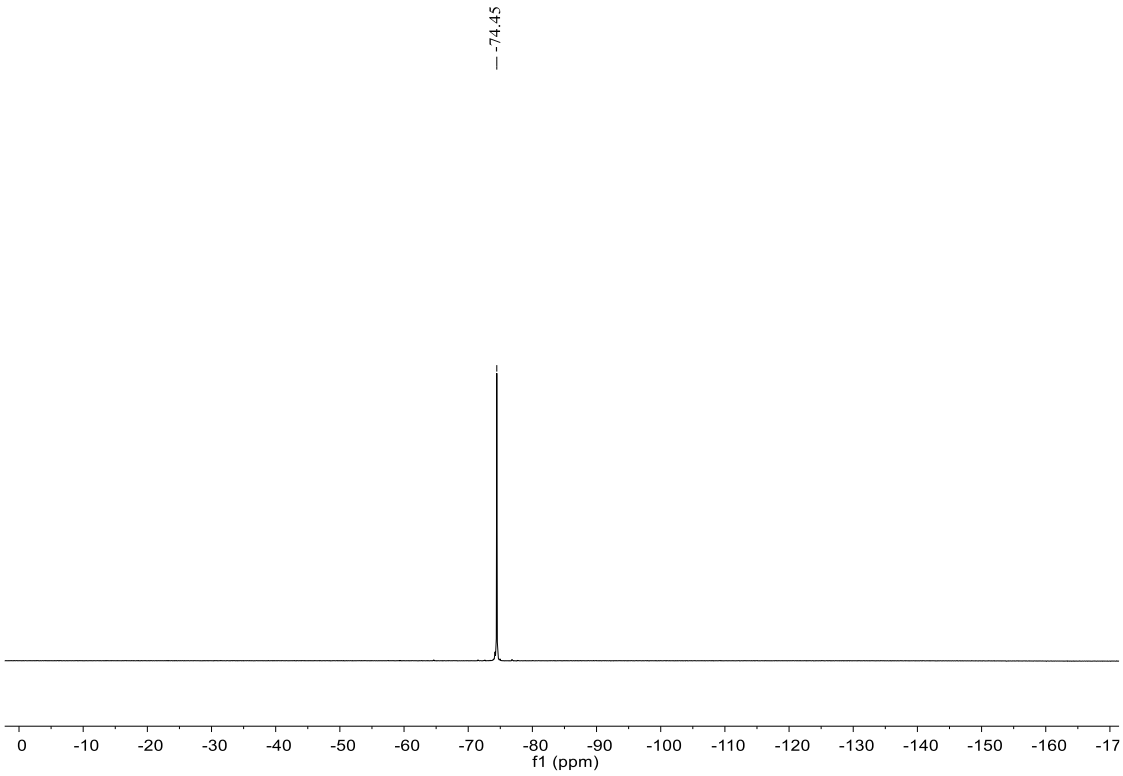
1-(3-bromophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (28c)



^{1}H NMR spectrum in $CDCl_3$.

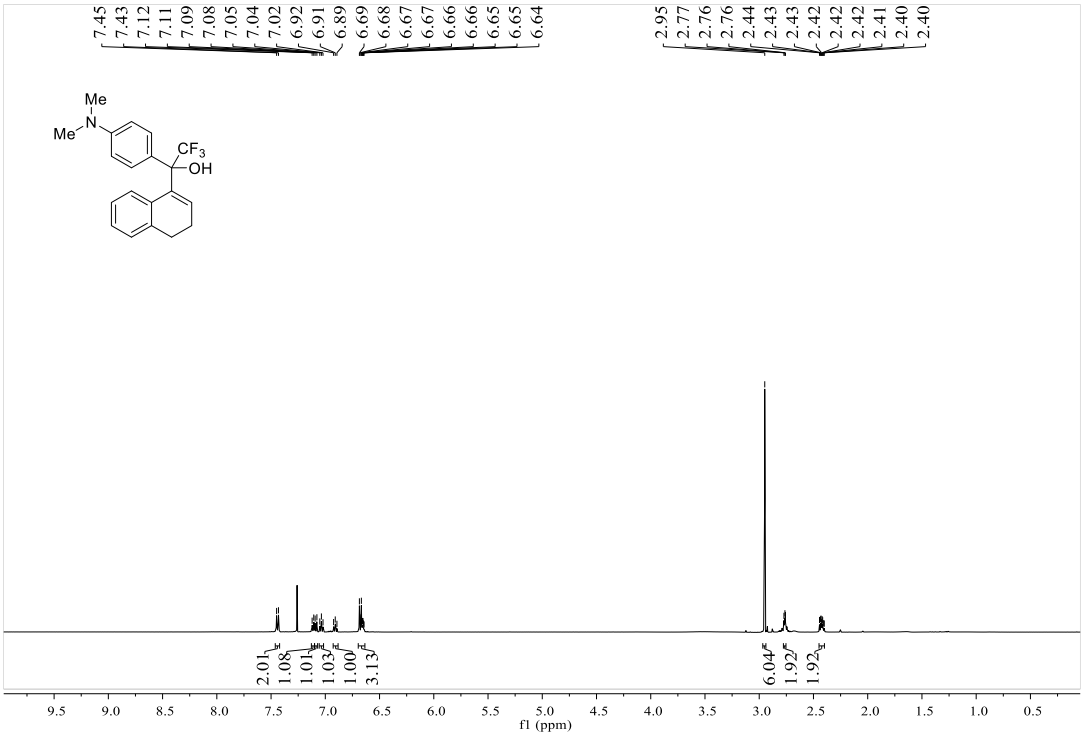


^{13}C NMR spectrum in $CDCl_3$.

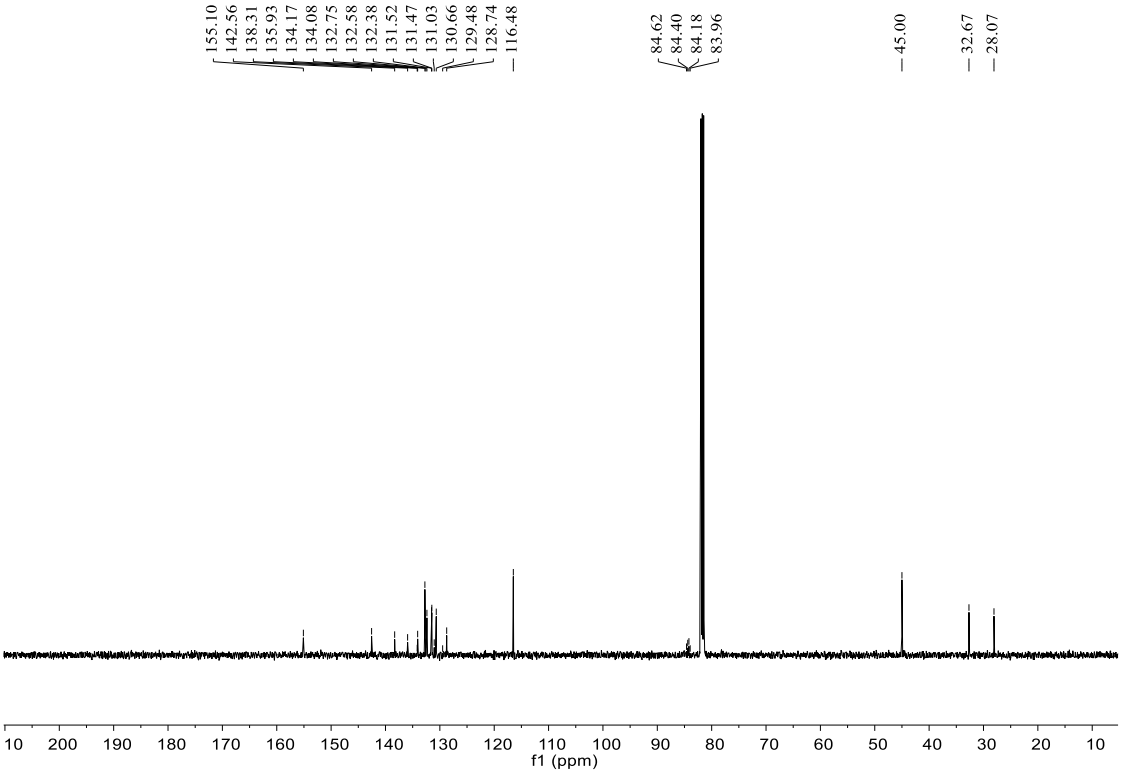


^{19}F NMR spectrum in $CDCl_3$.

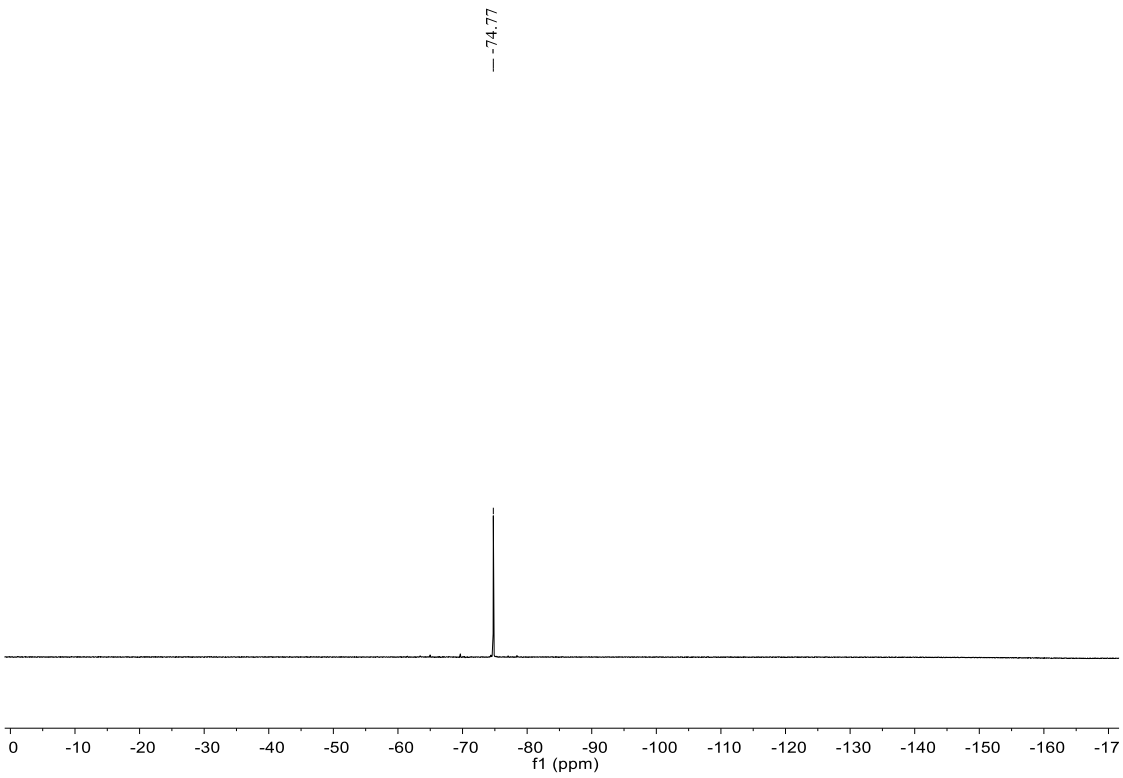
1-(3,4-dihydronaphthalen-1-yl)-1-(4-(dimethylamino) phenyl)-2,2,2-trifluoroethan-1-ol (29c)



^{1}H NMR spectrum in $CDCl_3$.

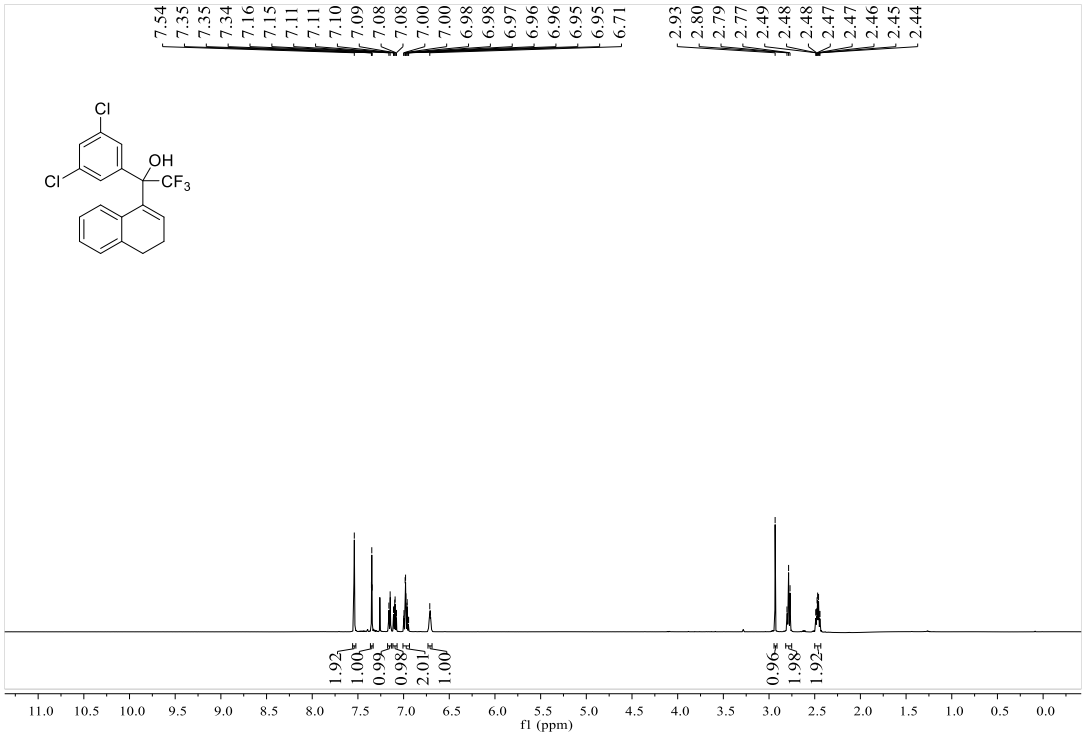


^{13}C NMR spectrum in $CDCl_3$.

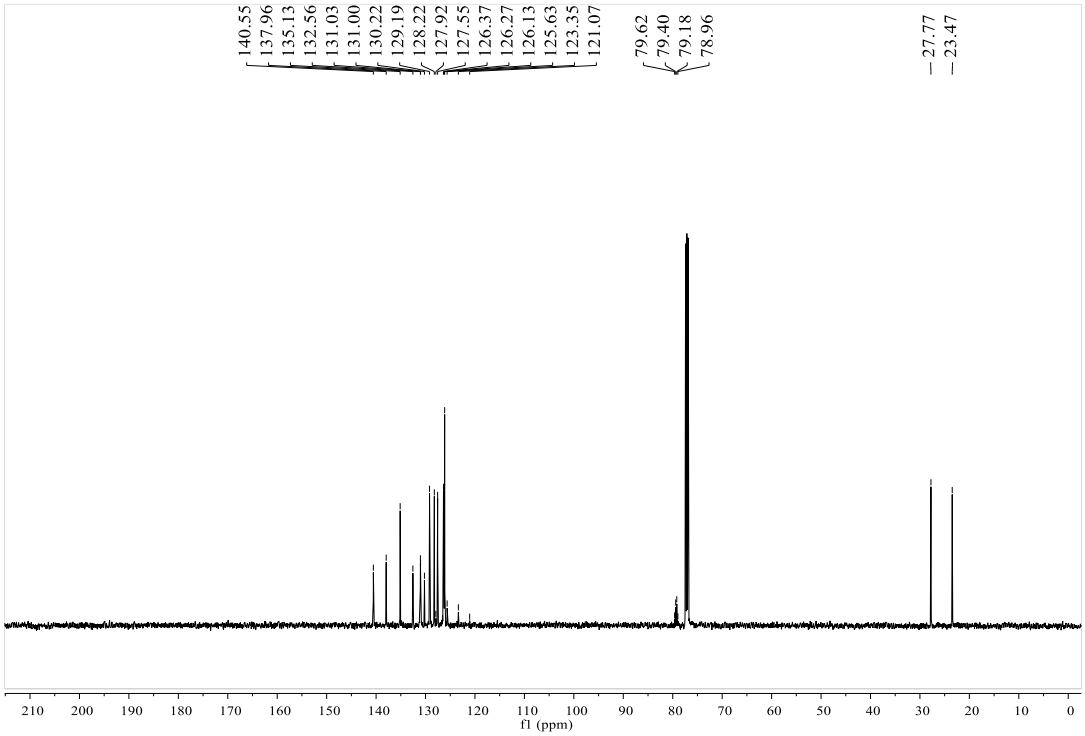


^{19}F NMR spectrum in $CDCl_3$.

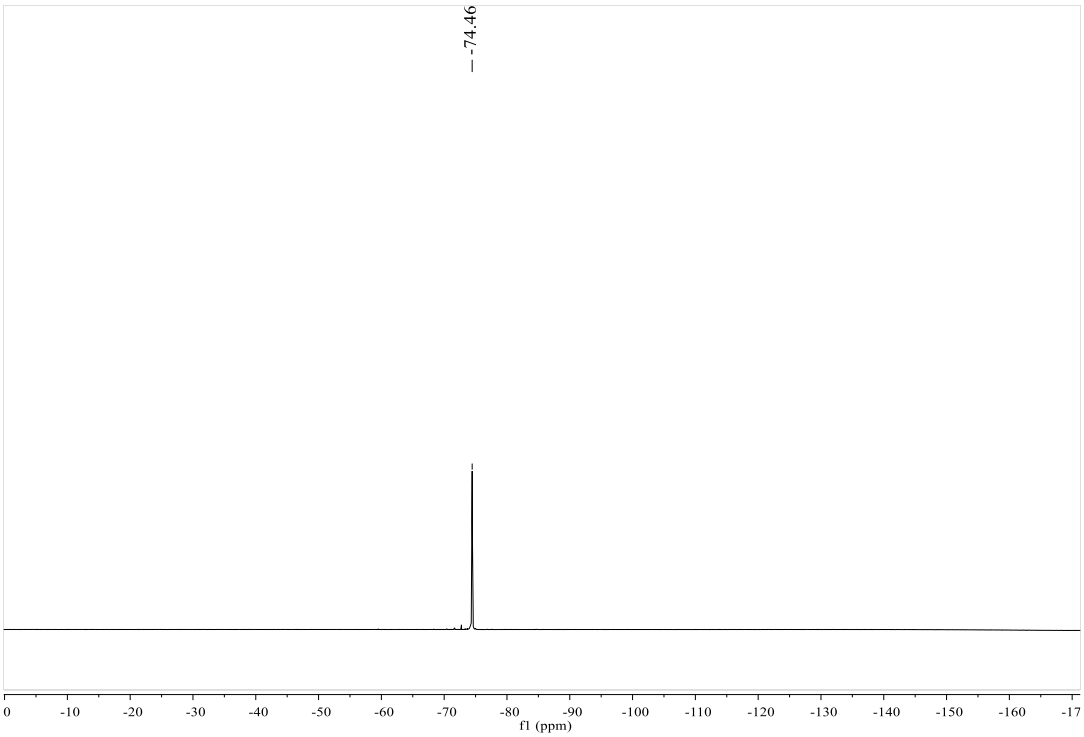
1-(3,5-dichlorophenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (30c)



^{1}H NMR spectrum in $CDCl_3$.

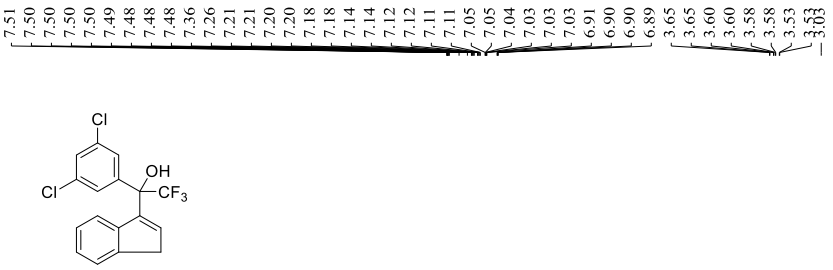


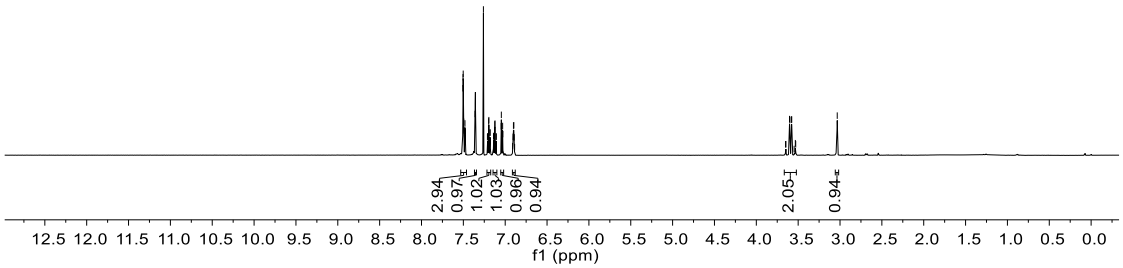
^{13}C NMR spectrum in $CDCl_3$.



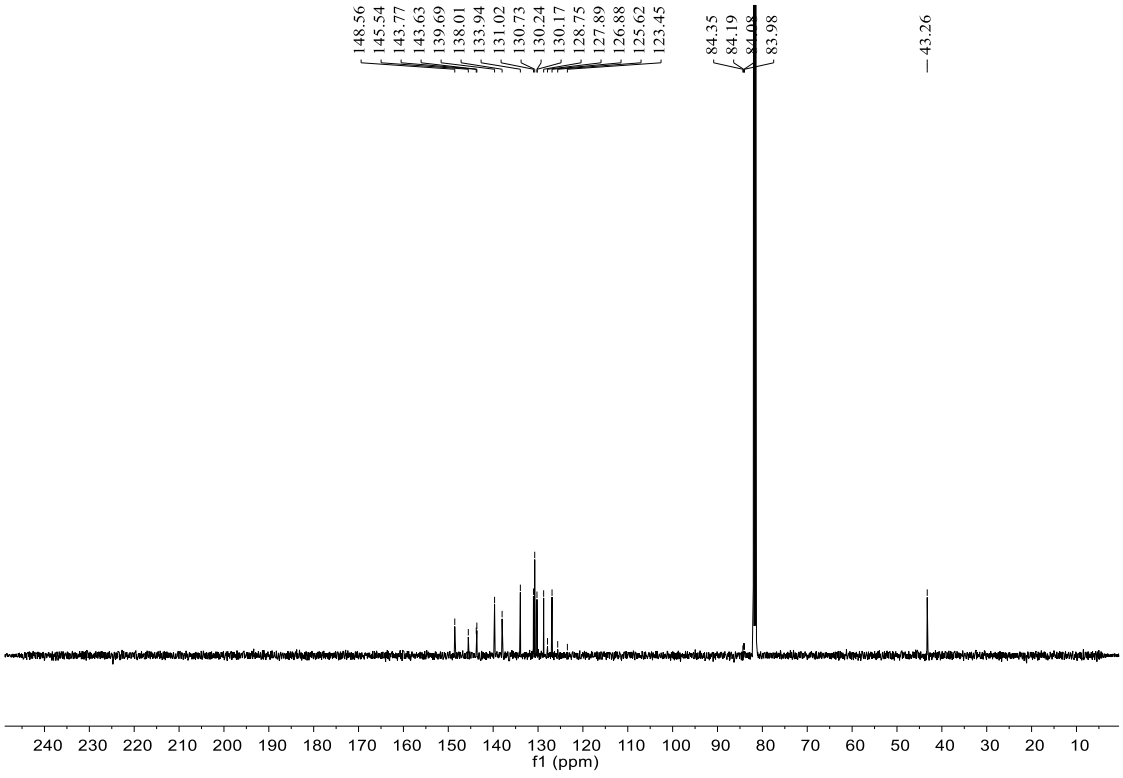
^{19}F NMR spectrum in $CDCl_3$.

1-(3,5-dichlorophenyl)-2,2,2-trifluoro-1-(1H-inden-3-yl) ethan-1-ol (31c)

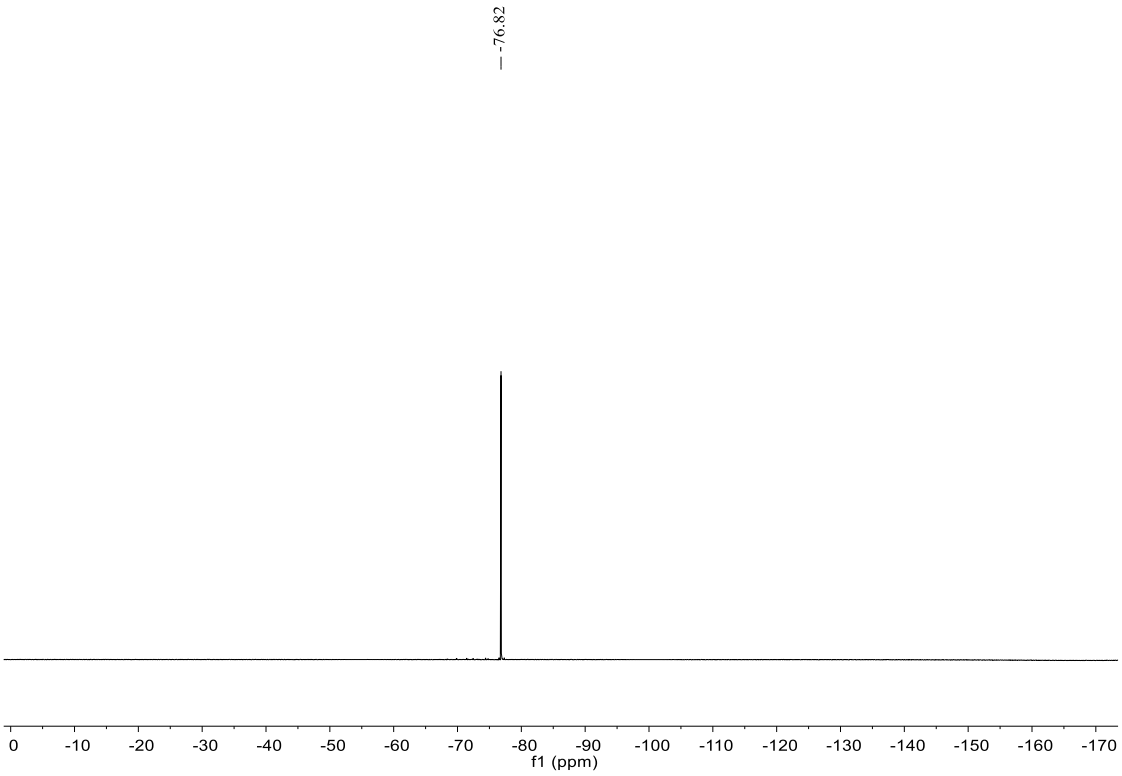




^{1}H NMR spectrum in $CDCl_3$.

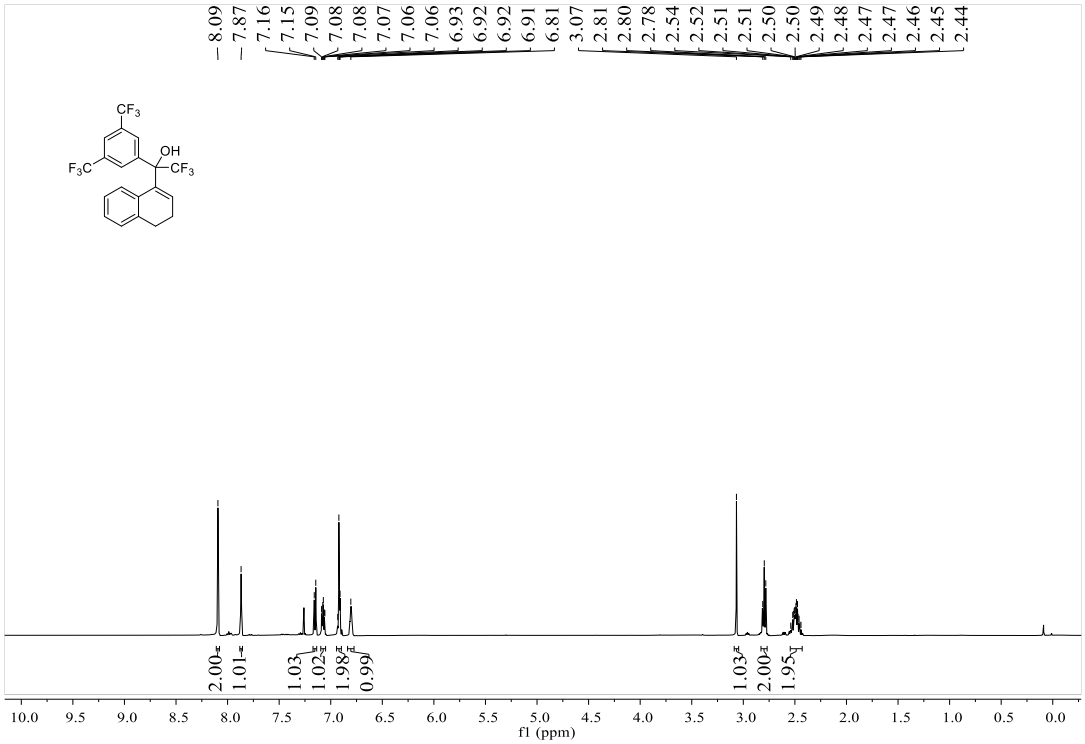


^{13}C NMR spectrum in $CDCl_3$.

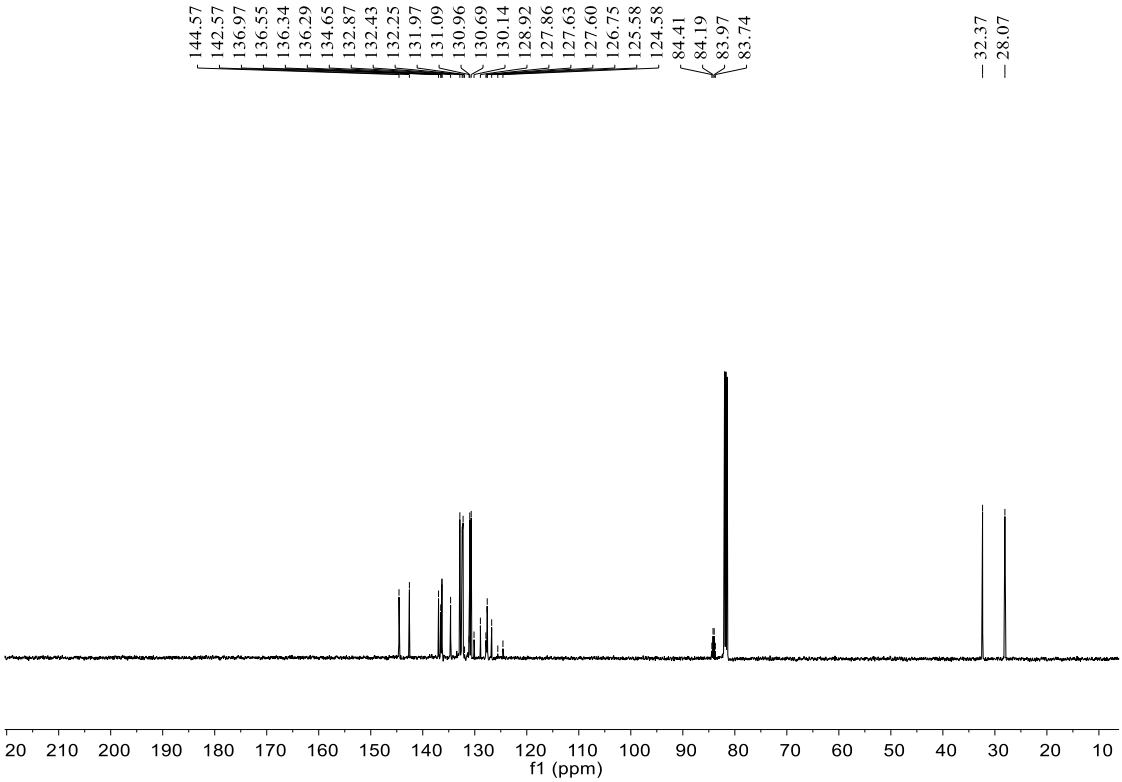


^{19}F NMR spectrum in $CDCl_3$.

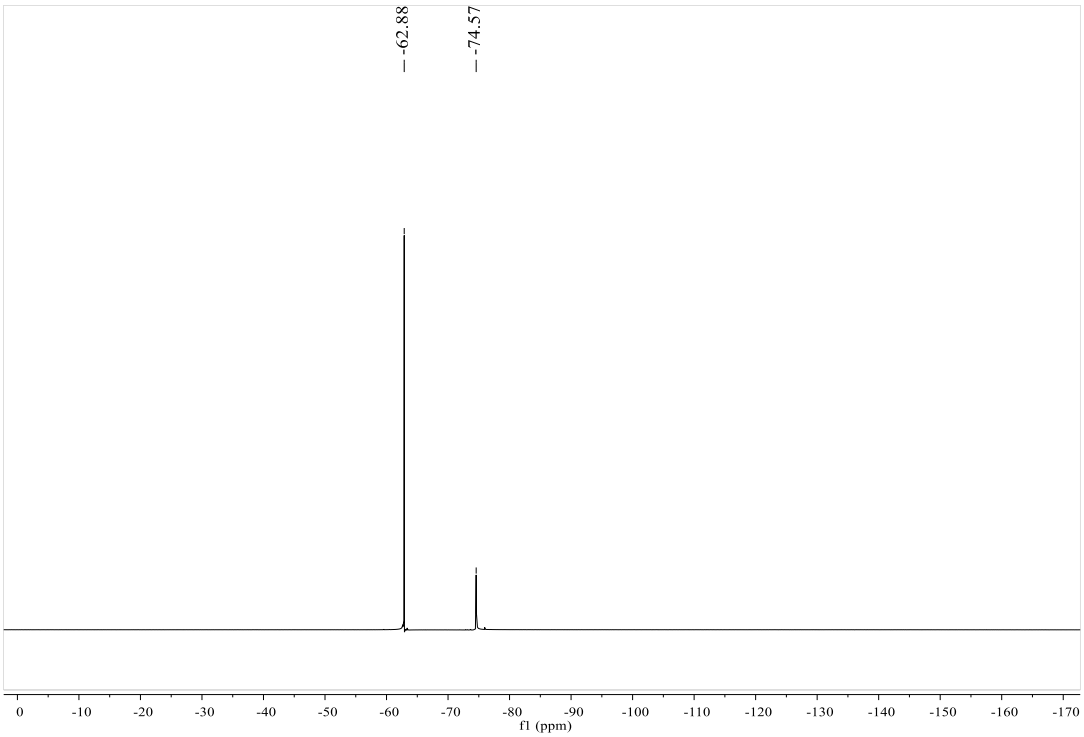
1-(3,5-bis(trifluoromethyl)phenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (32c)



^{1}H NMR spectrum in $CDCl_3$.

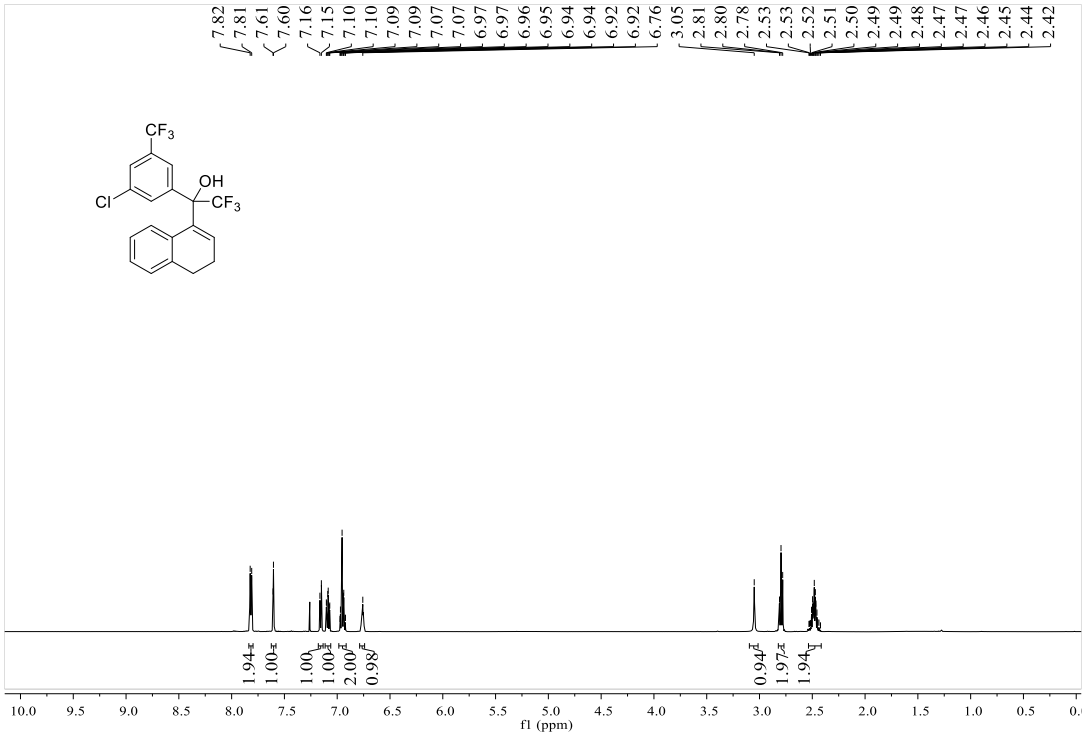


^{13}C NMR spectrum in $CDCl_3$.

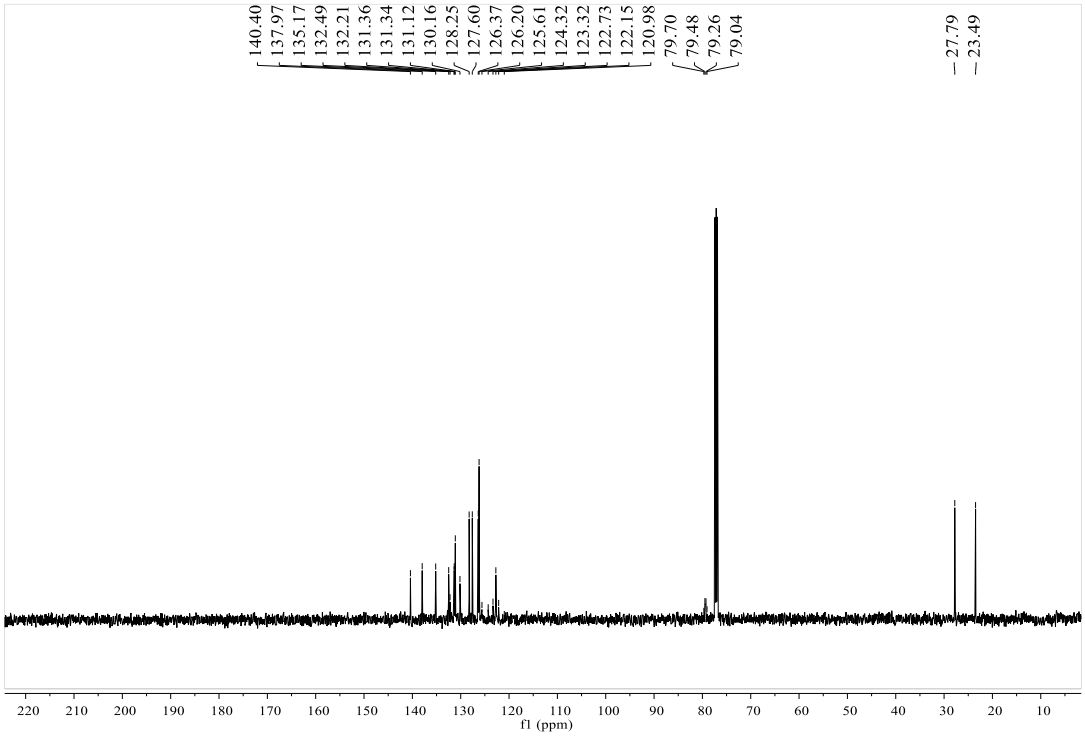


^{19}F NMR spectrum in $CDCl_3$.

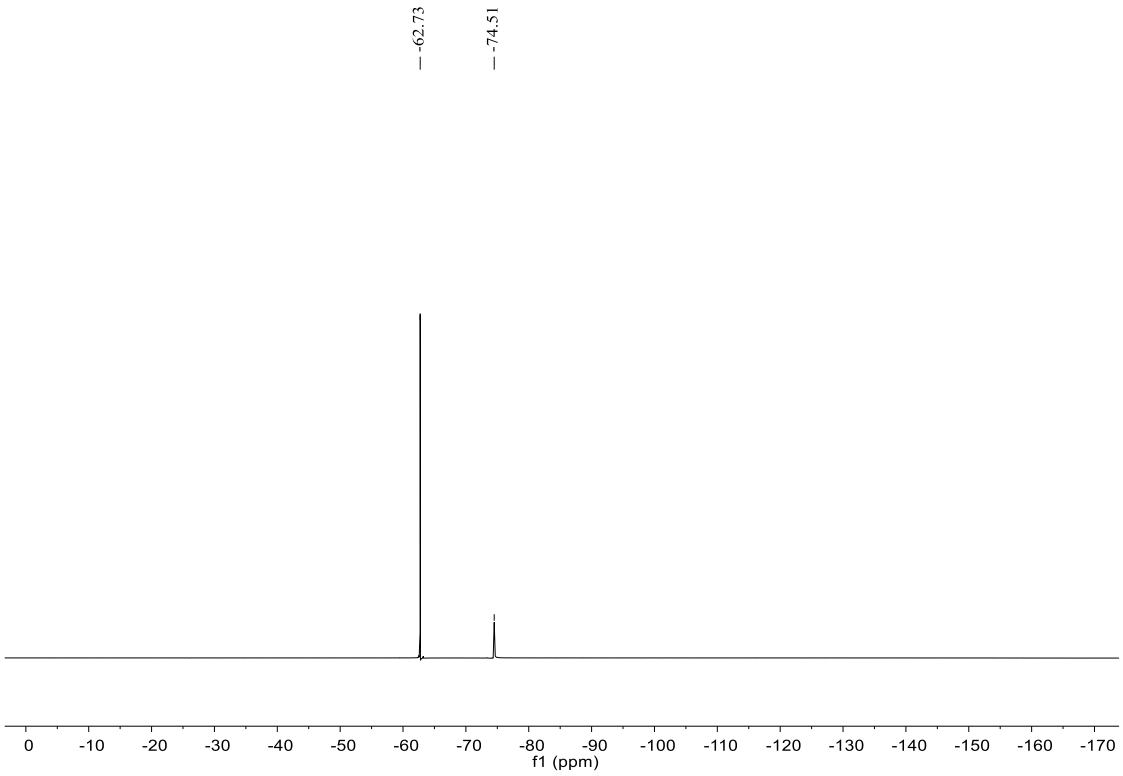
1-(3-chloro-5-(trifluoromethyl) phenyl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (33c)



^{1}H NMR spectrum in $CDCl_3$.

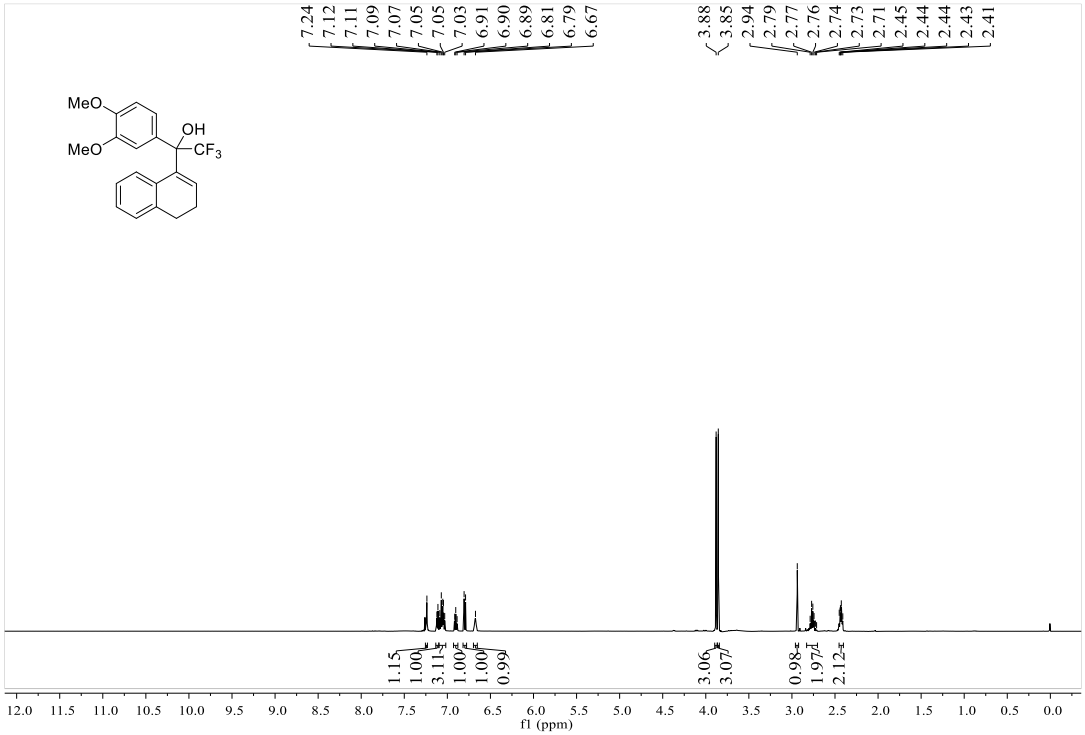


^{13}C NMR spectrum in $CDCl_3$.

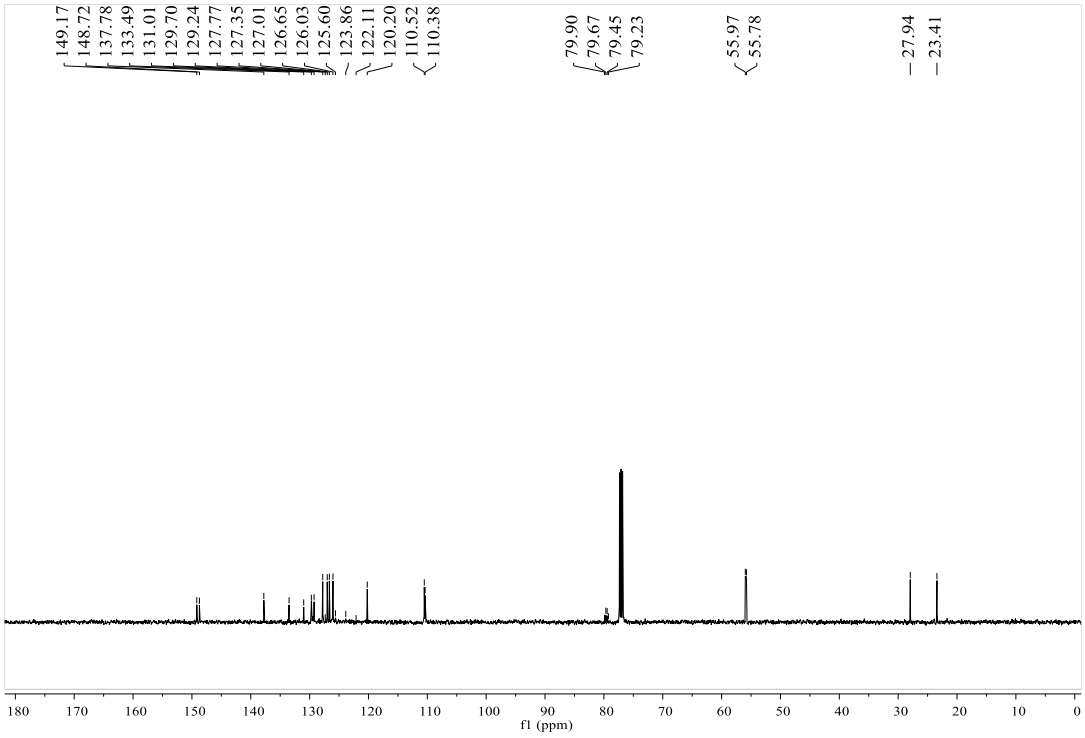


^{19}F NMR spectrum in $CDCl_3$.

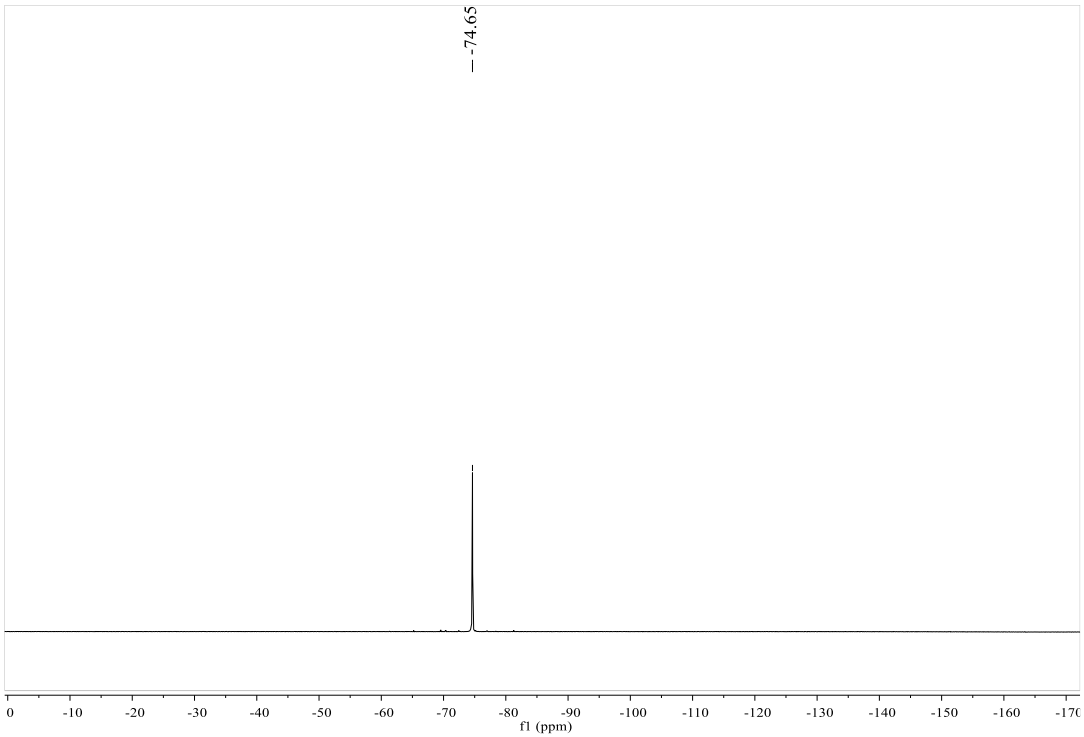
1-(3,4-dihydronaphthalen-1-Oyl)-1-(3,4-dimethoxyphenyl)-2,2,2-trifluoroethan-1-ol (34c)



^{1}H NMR spectrum in $CDCl_3$.

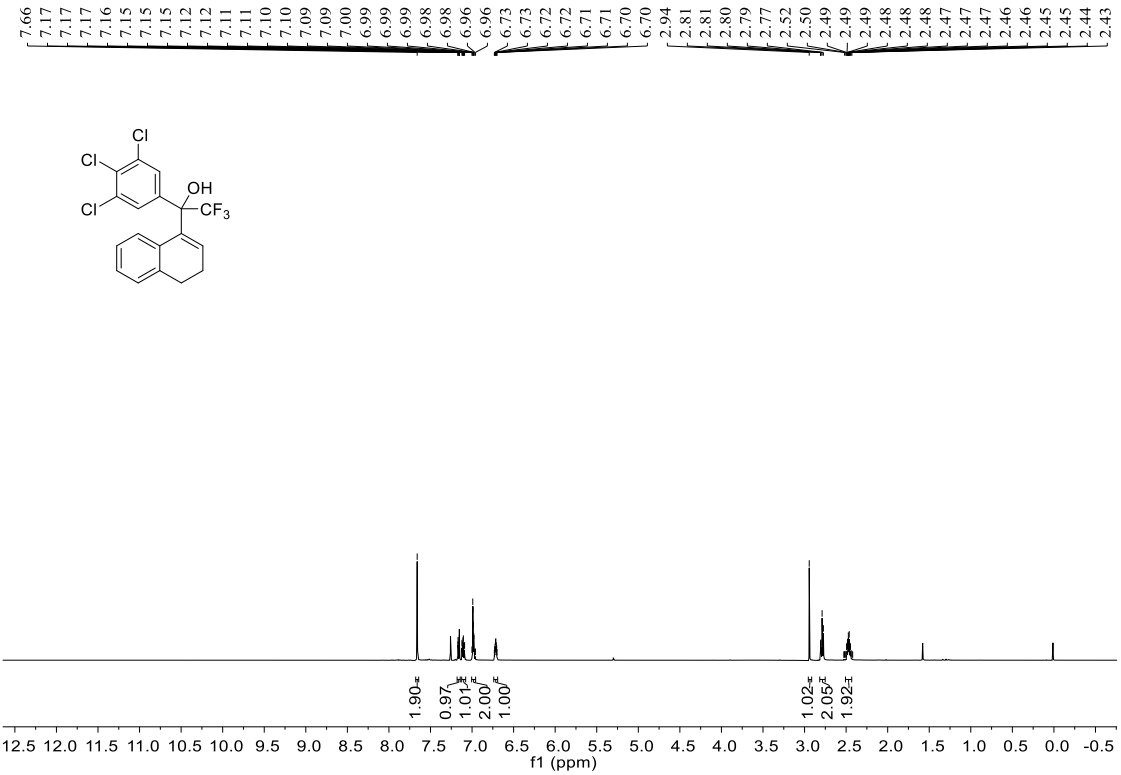


^{13}C NMR spectrum in $CDCl_3$.

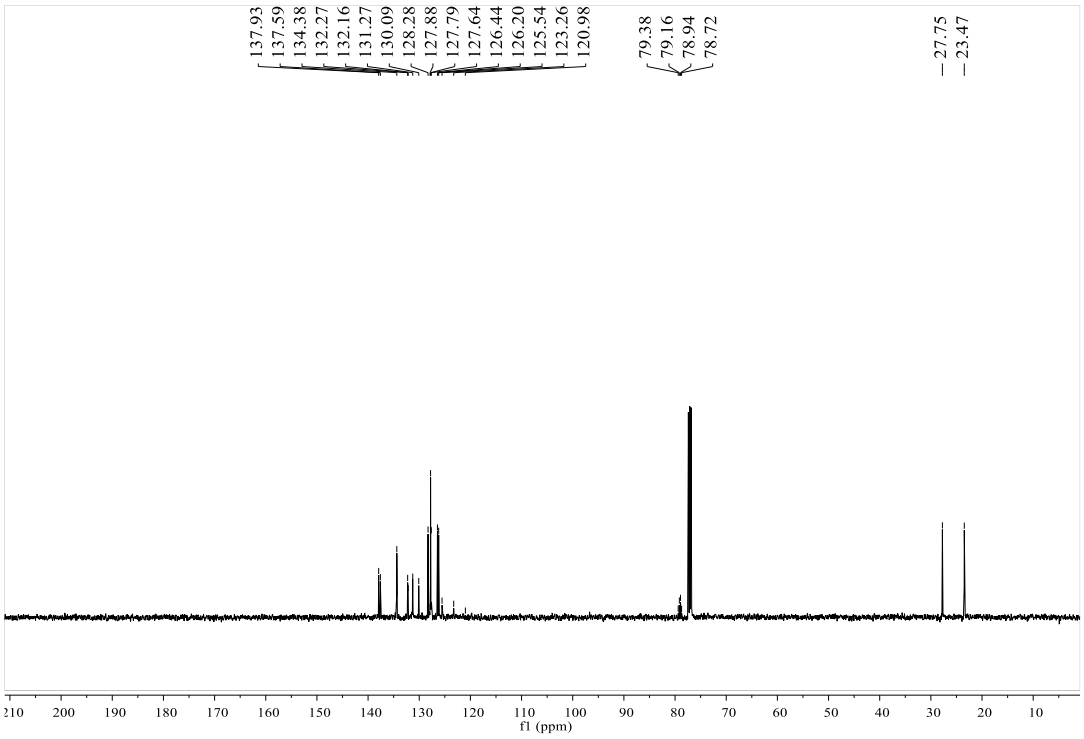


^{19}F NMR spectrum in $CDCl_3$.

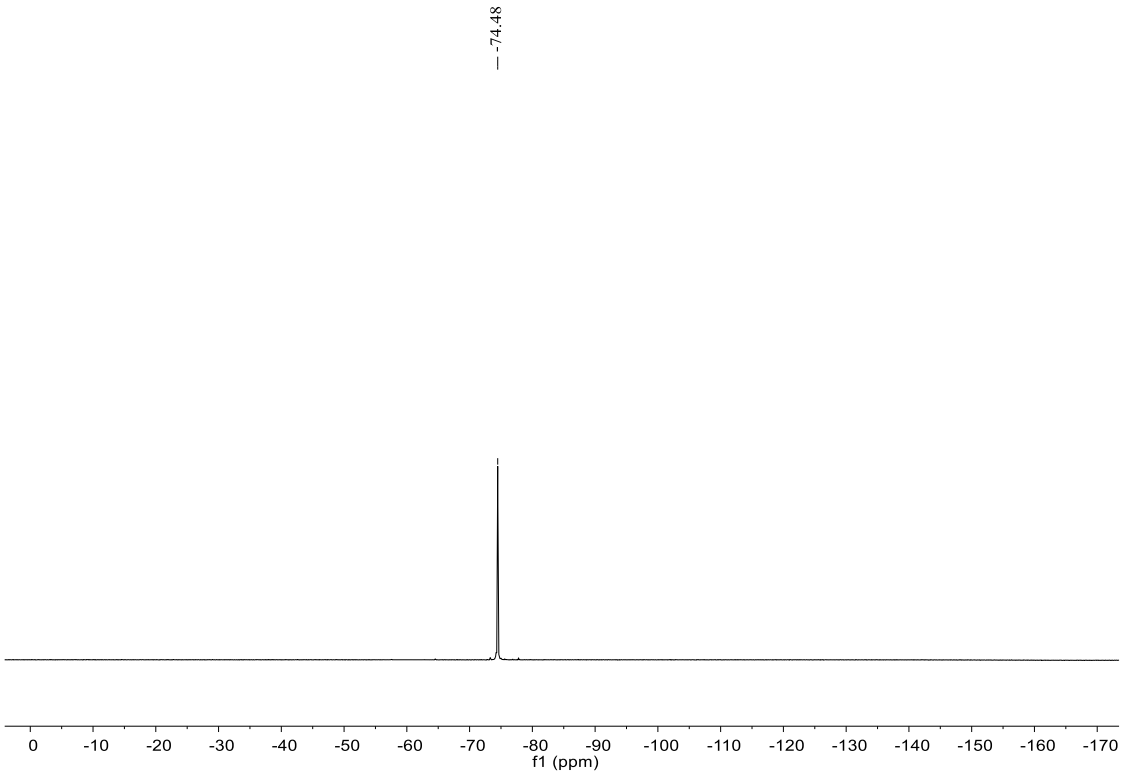
1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(3,4,5-trichlorophenyl) ethan-1-ol (35c)



^{1}H NMR spectrum in $CDCl_3$.

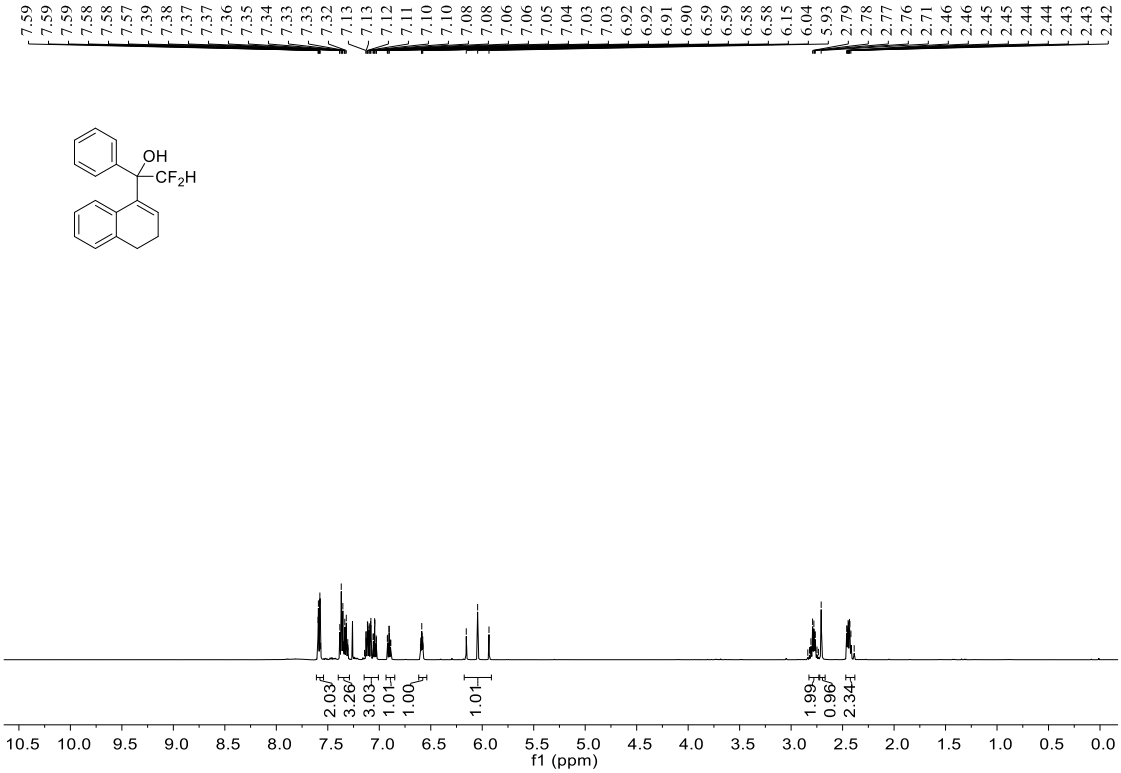


^{13}C NMR spectrum in $CDCl_3$.

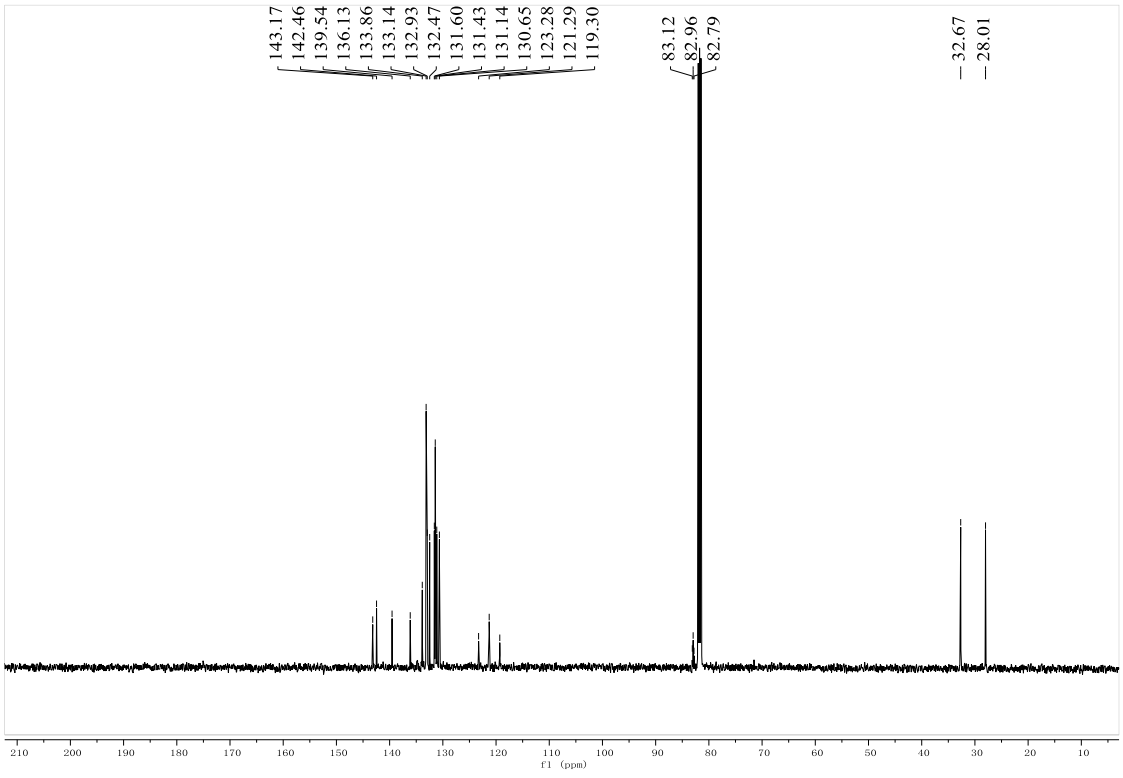


^{19}F NMR spectrum in $CDCl_3$.

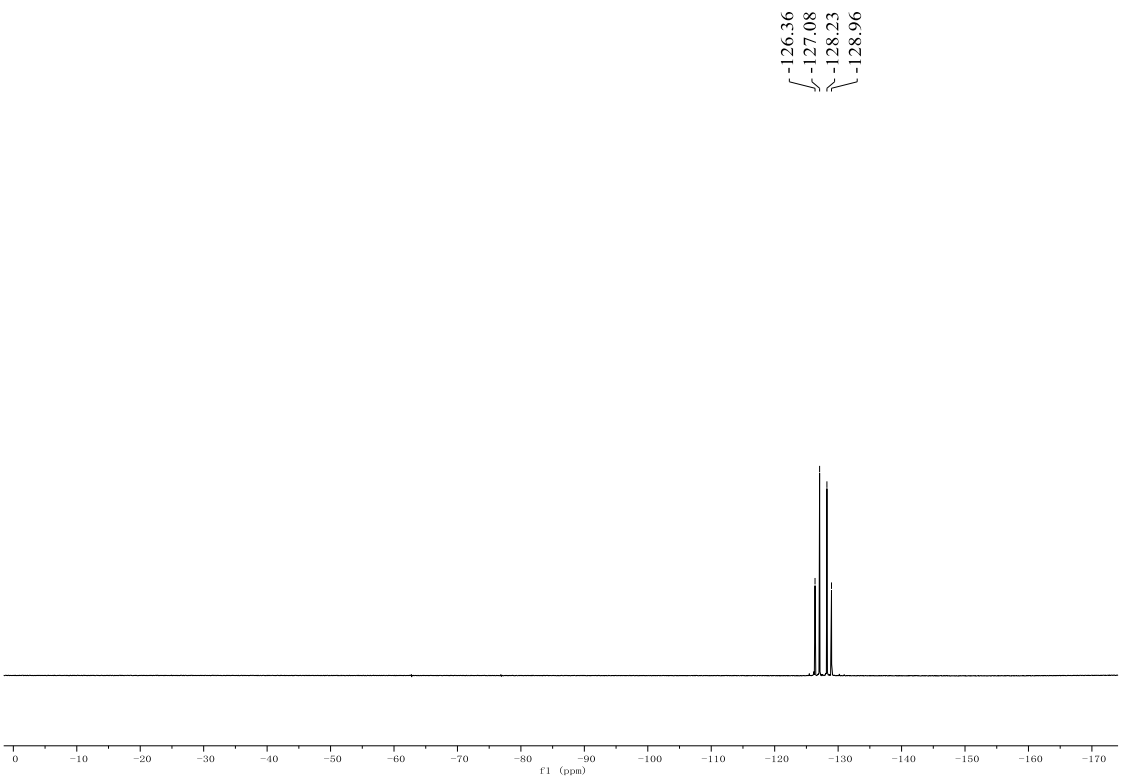
1-(3,4-dihydronaphthalen-1-yl)-2,2-difluoro-1-phenylethan-1-ol (36c)



^{1}H NMR spectrum in $CDCl_3$.

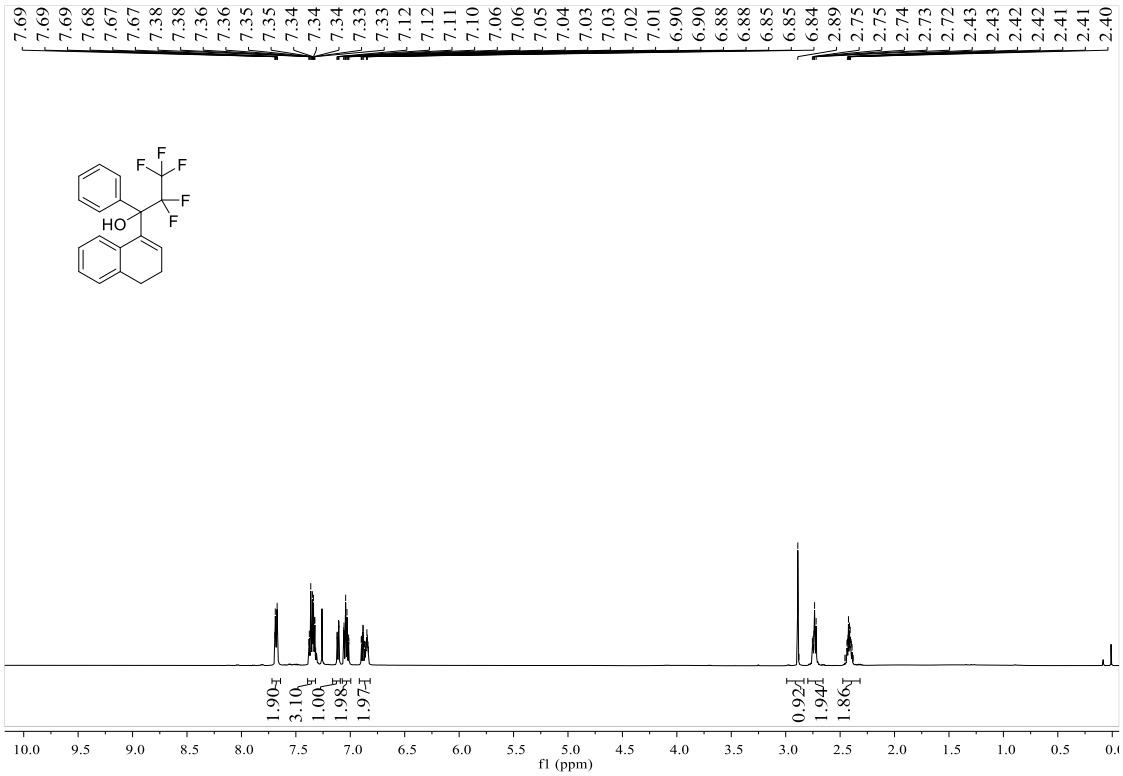


^{13}C NMR spectrum in $CDCl_3$.

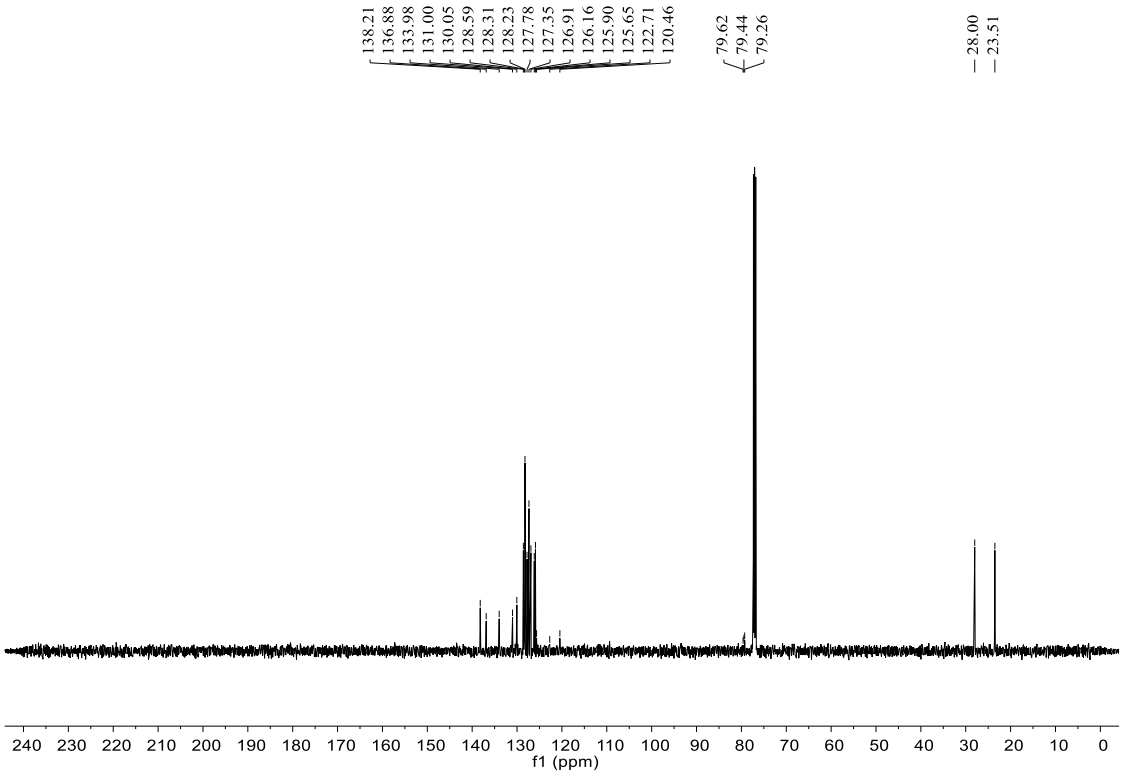


^{19}F NMR spectrum in $CDCl_3$.

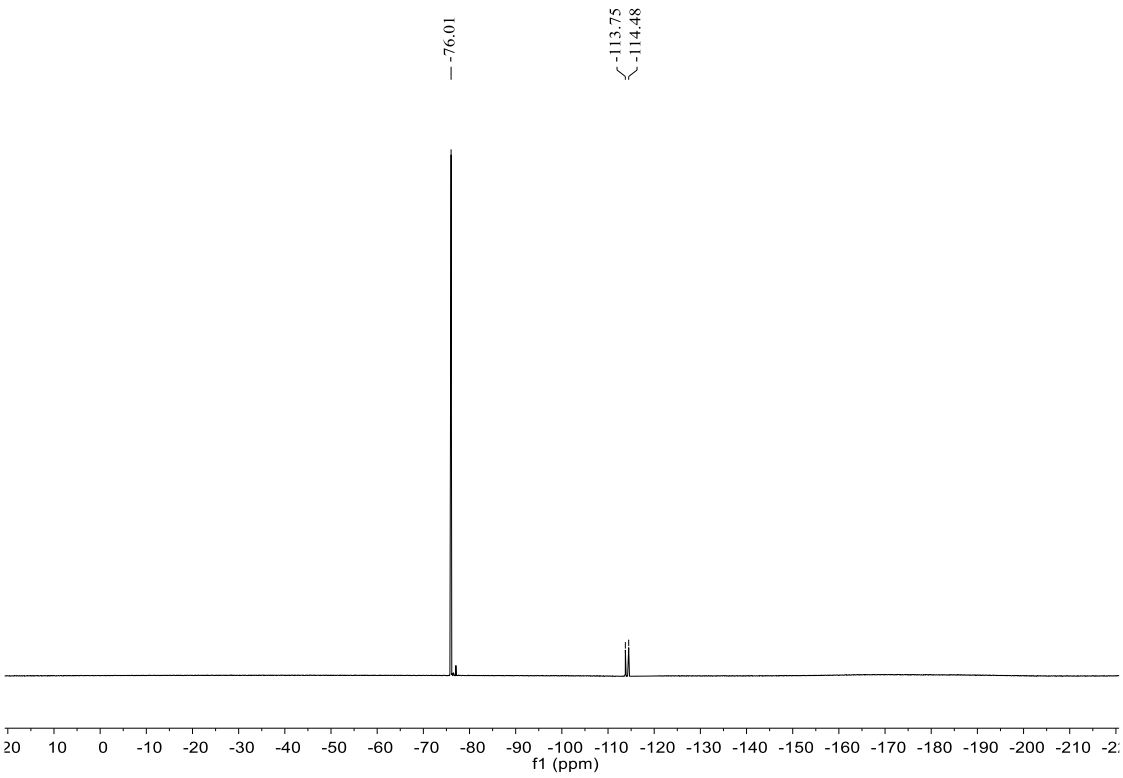
1-(3,4-dihydronaphthalen-1-yl)-2,2,3,3,3-pentafluoro-1-phenylpropan-1-ol (37c)



^{1}H NMR spectrum in $CDCl_3$.

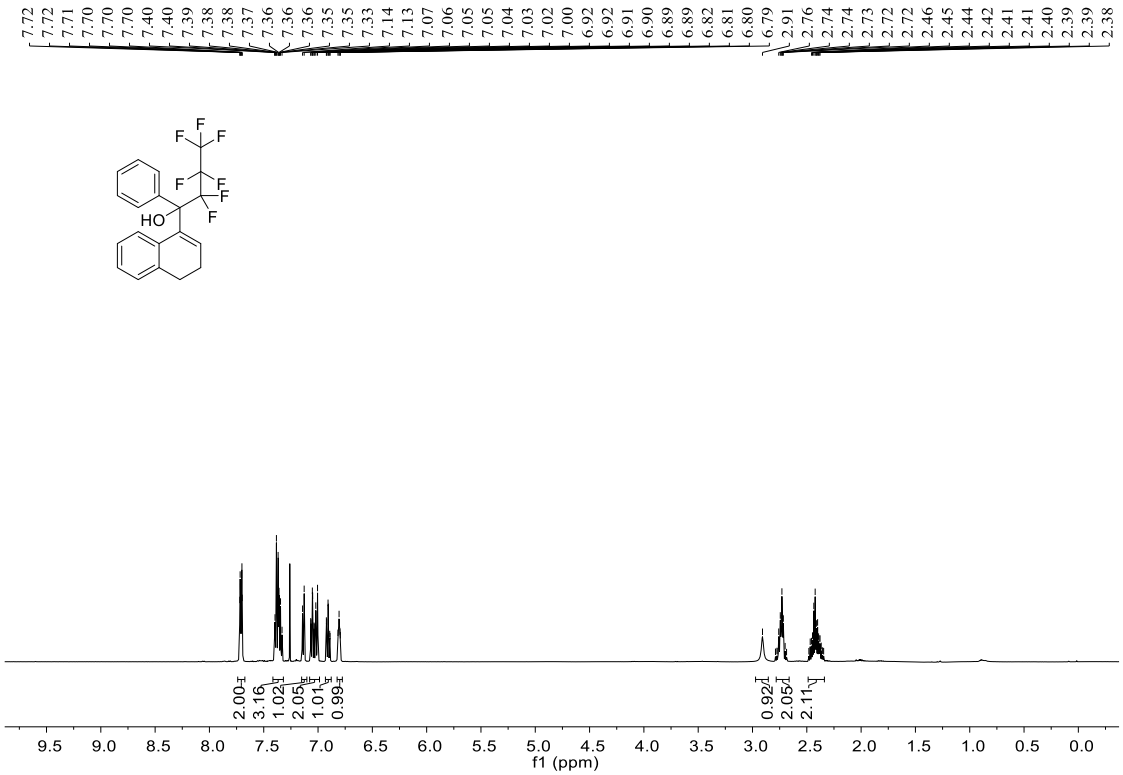


^{13}C NMR spectrum in $CDCl_3$.

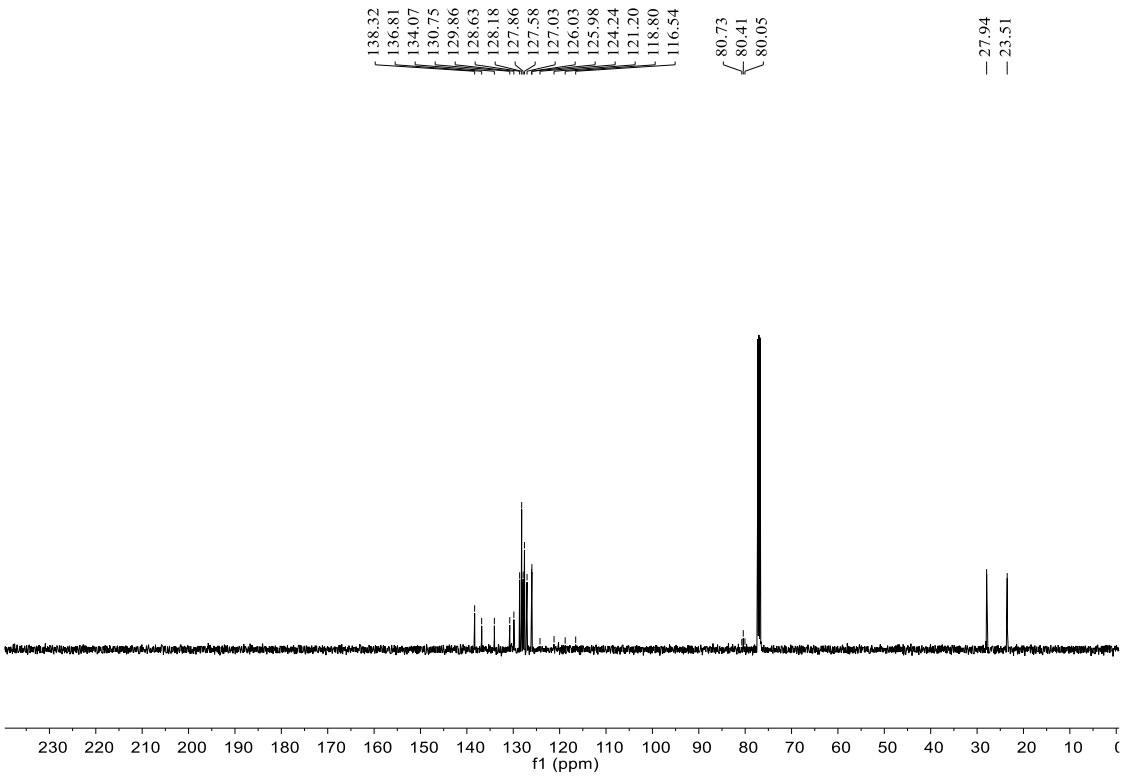


^{19}F NMR spectrum in $CDCl_3$.

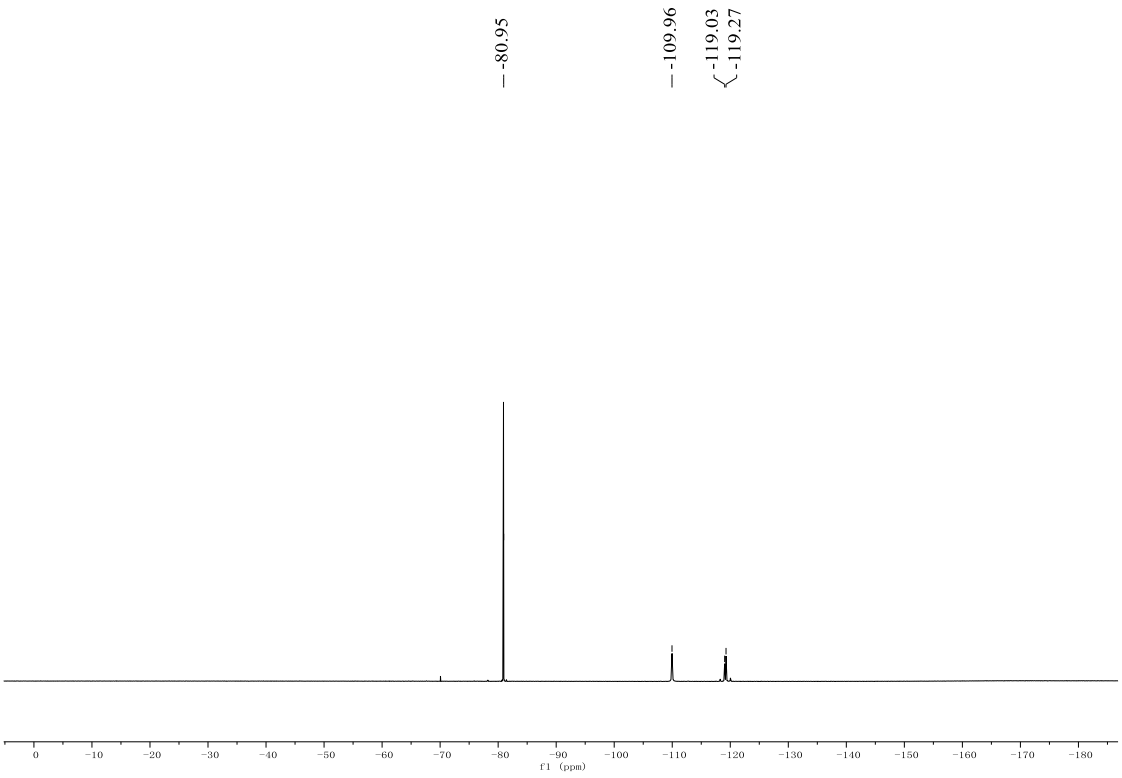
1-(3,4-dihydronaphthalen-1-yl)-2,2,3,3,4,4,4-heptafluoro-1-phenylbutan-1-ol (38c)



^{1}H NMR spectrum in $CDCl_3$.

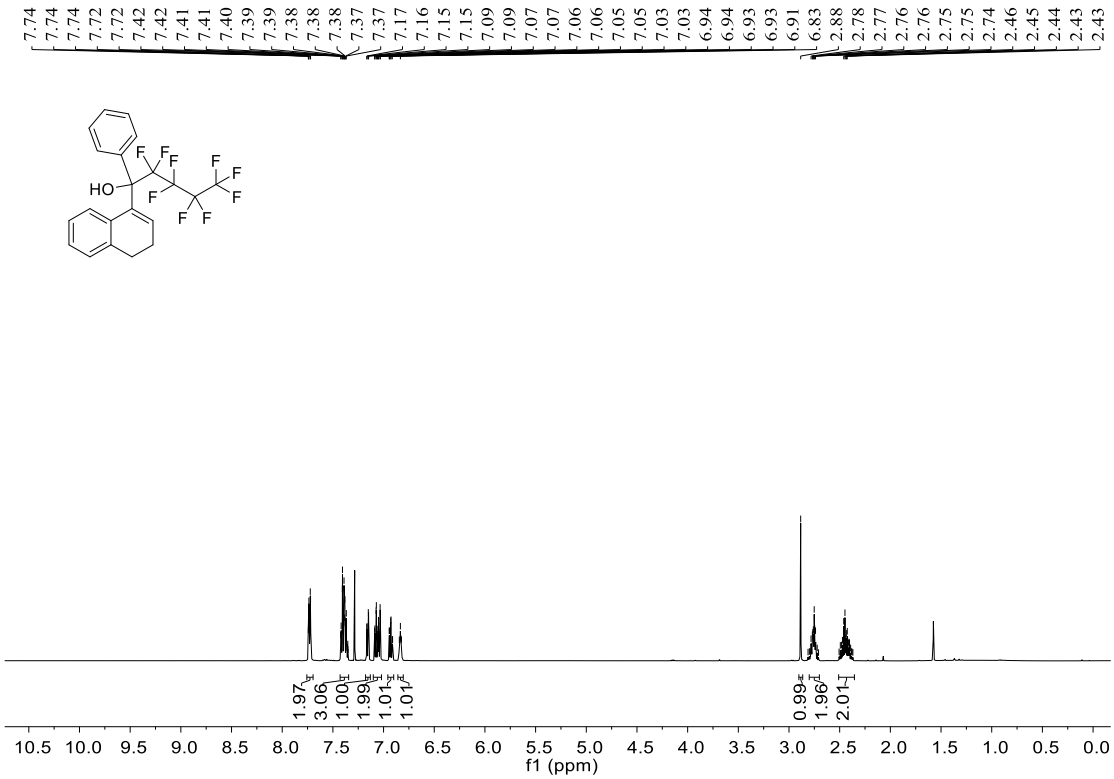


^{13}C NMR spectrum in $CDCl_3$.

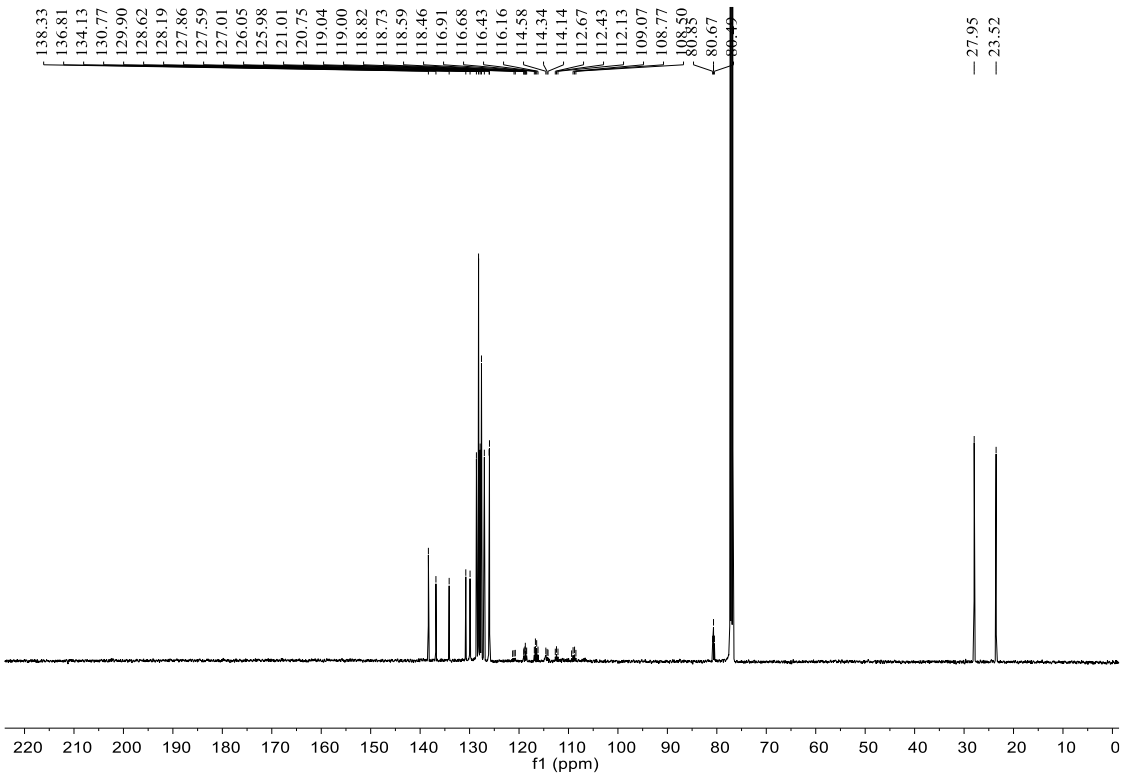


^{19}F NMR spectrum in $CDCl_3$.

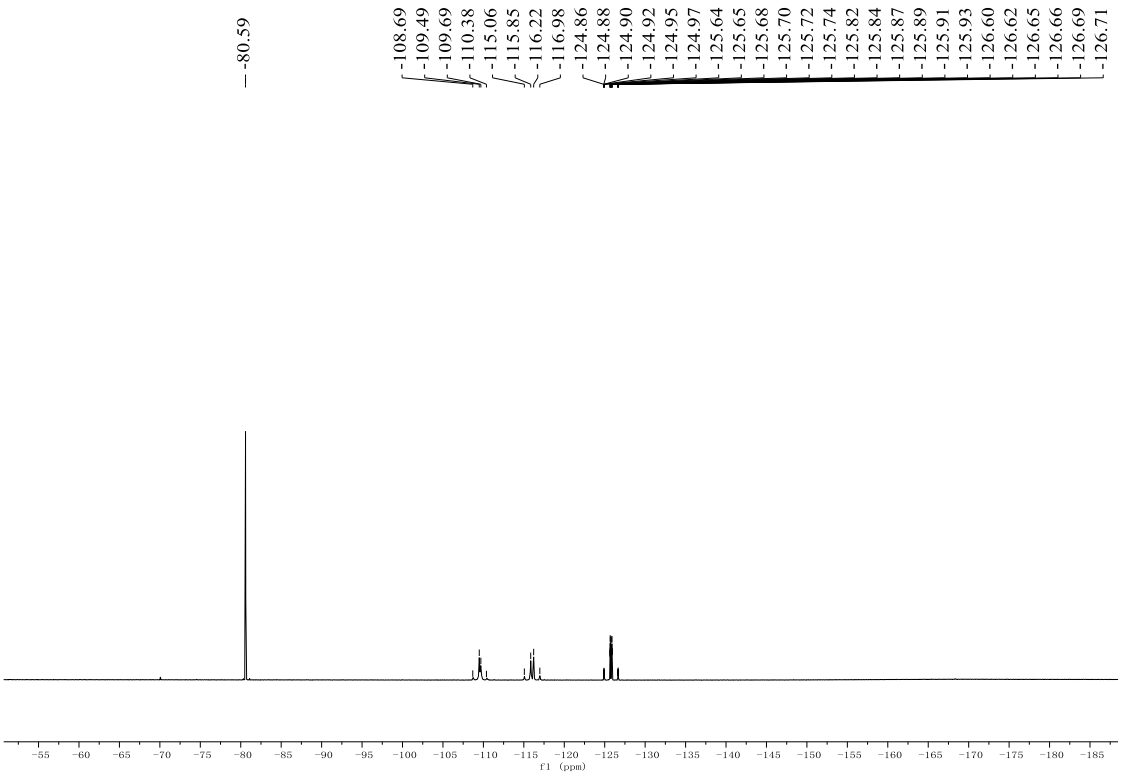
1-(3,4-dihydronaphthalen-1-yl)-2,2,3,3,4,4,5,5,5-nonafluoro-1-phenylpentan-1-ol (39c)



^{1}H NMR spectrum in $CDCl_3$.

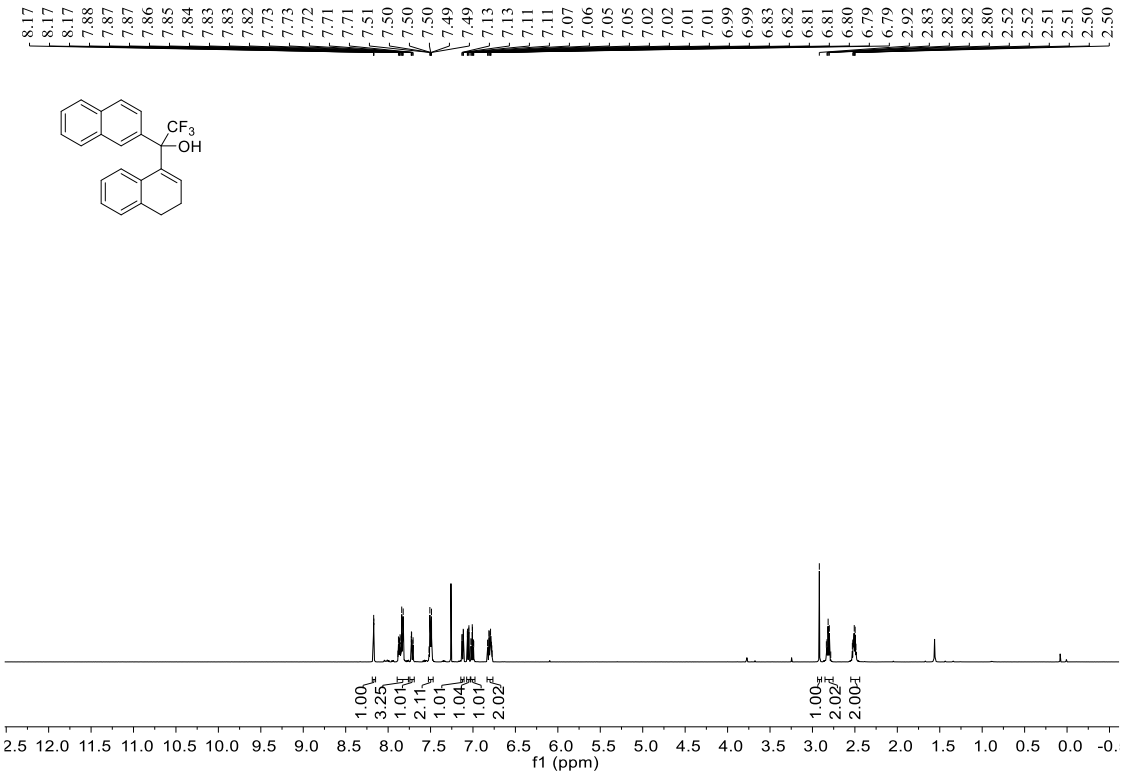


^{13}C NMR spectrum in $CDCl_3$.

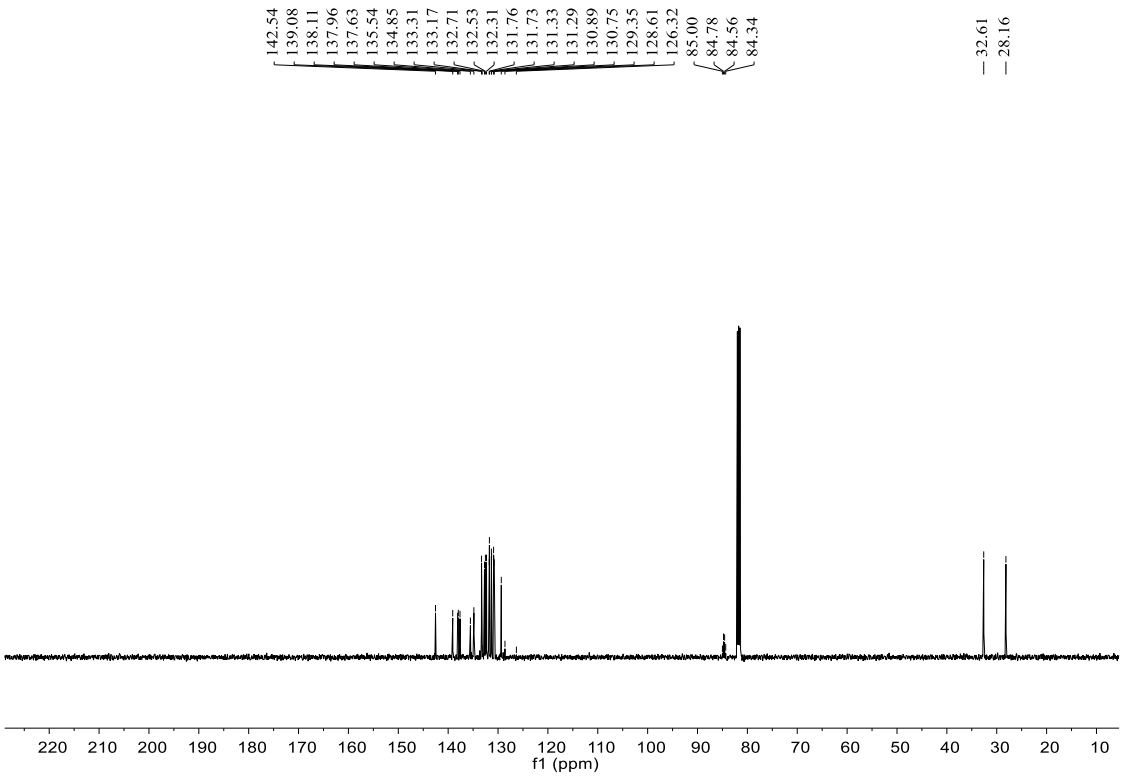


^{19}F NMR spectrum in $CDCl_3$.

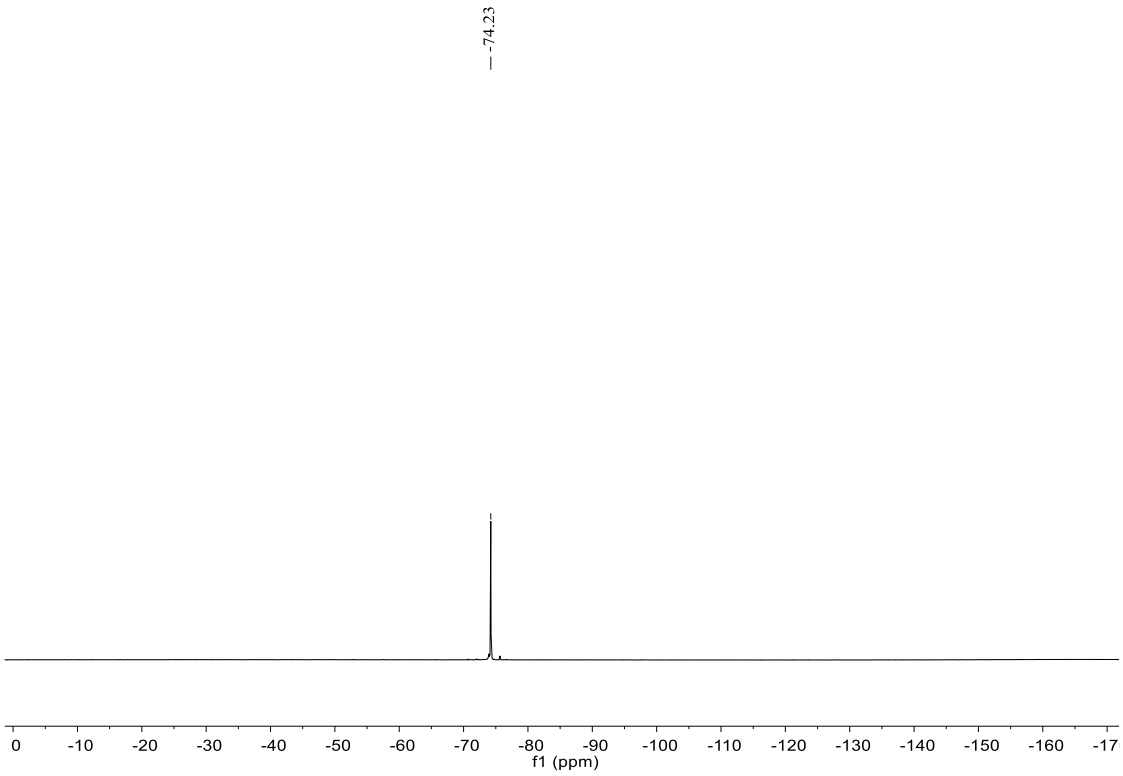
1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(naphthalen-2-yl) ethan-1-ol (40c)



^{1}H NMR spectrum in $CDCl_3$.

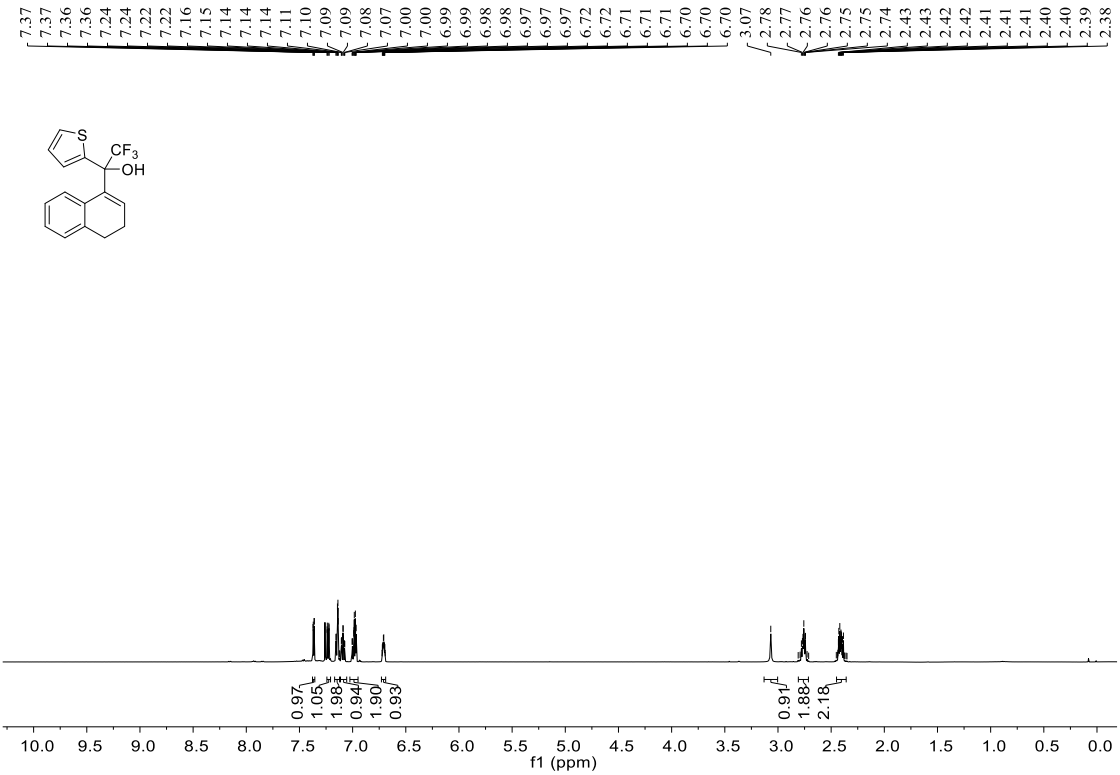


^{13}C NMR spectrum in $CDCl_3$.

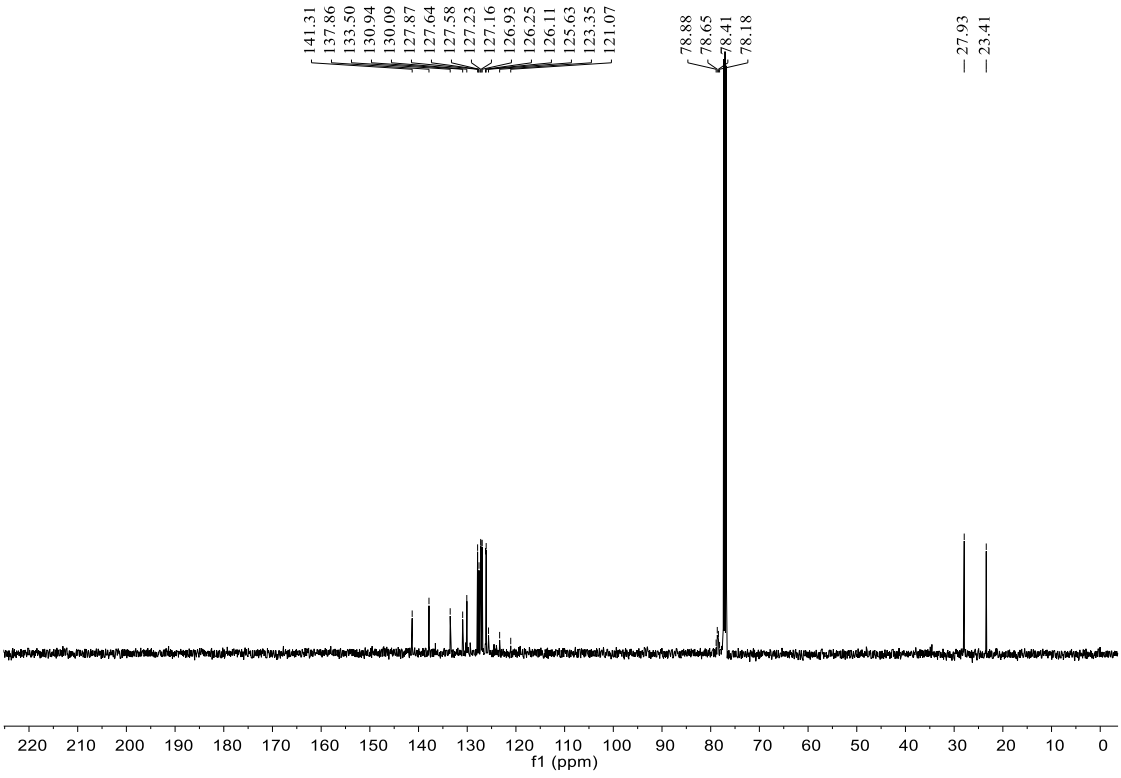


^{19}F NMR spectrum in $CDCl_3$.

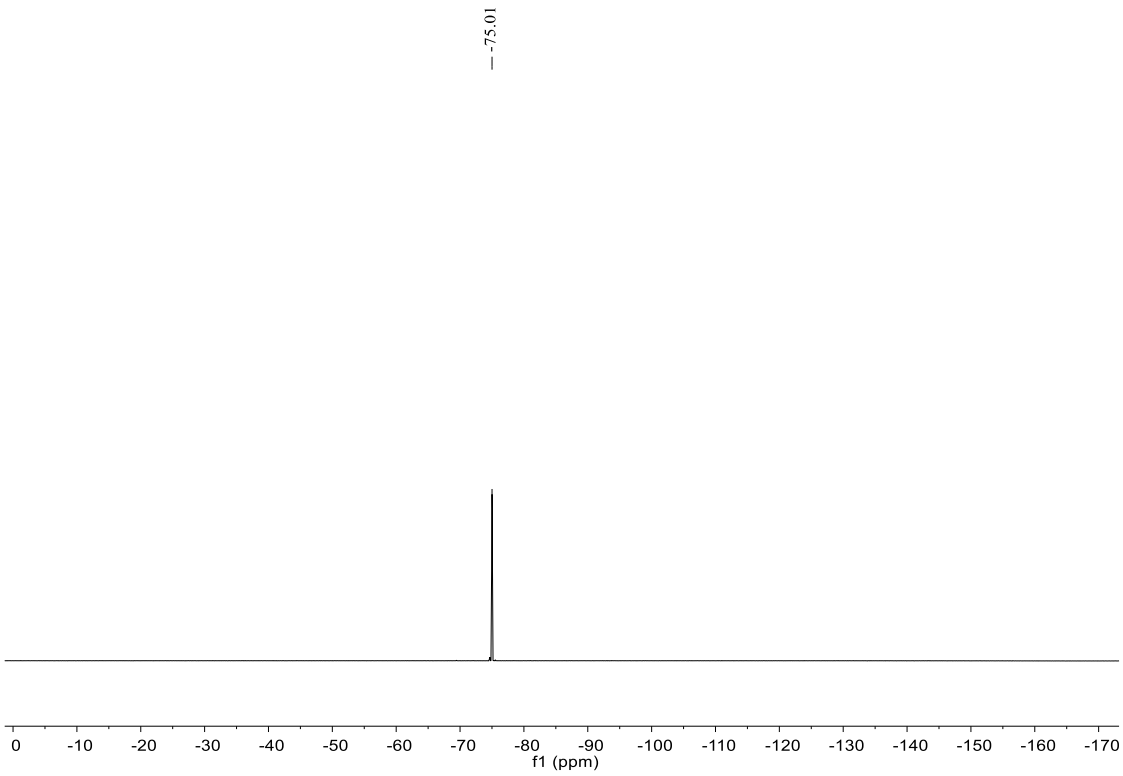
1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-(thiophen-2-yl) ethan-1-ol (41c)



^{1}H NMR spectrum in $CDCl_3$.

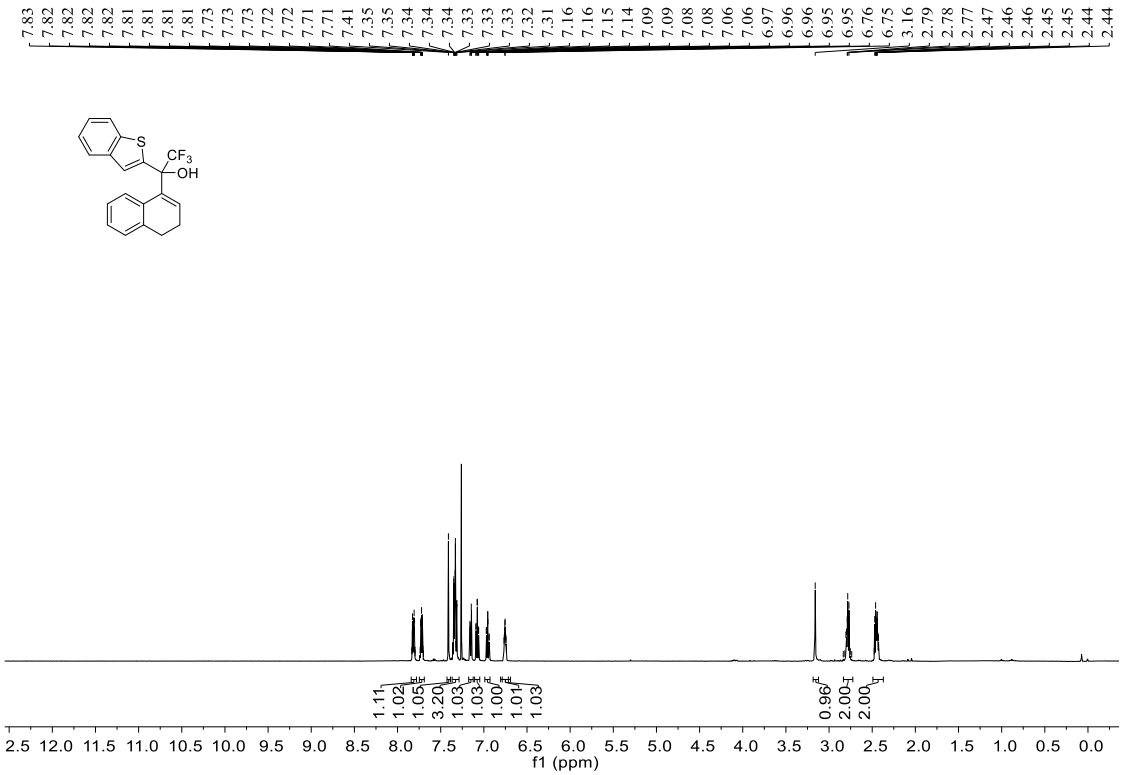


^{13}C NMR spectrum in $CDCl_3$.

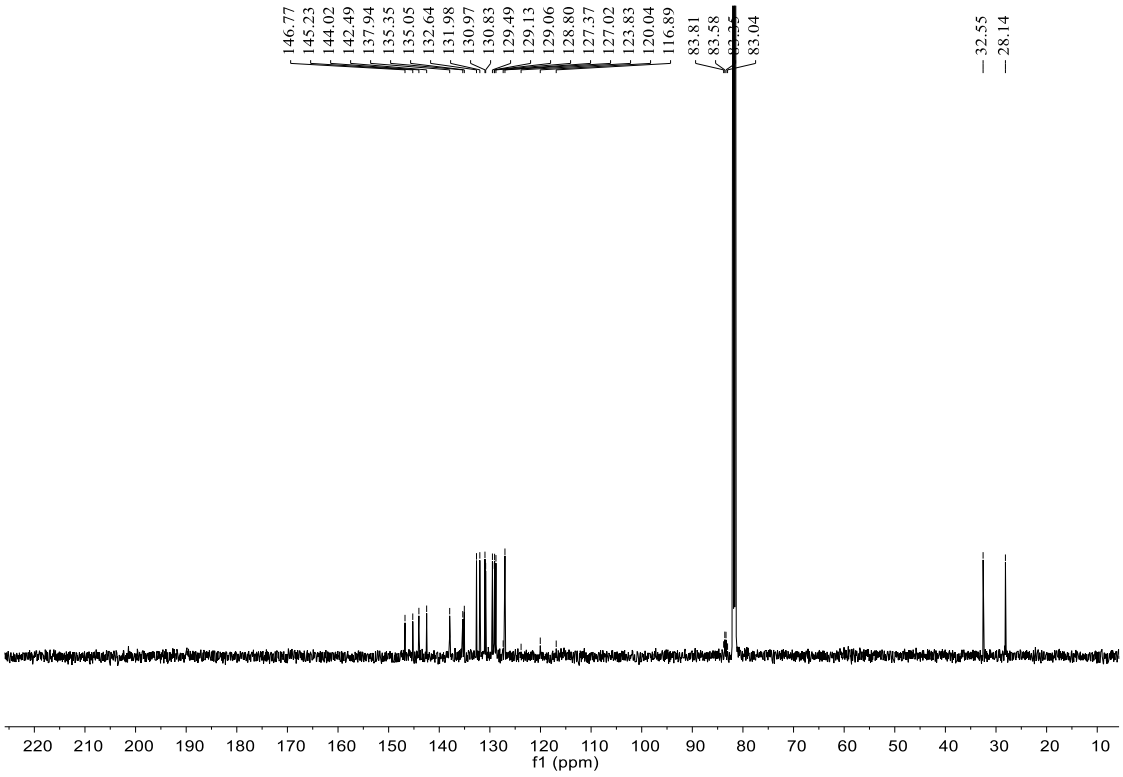


^{19}F NMR spectrum in $CDCl_3$.

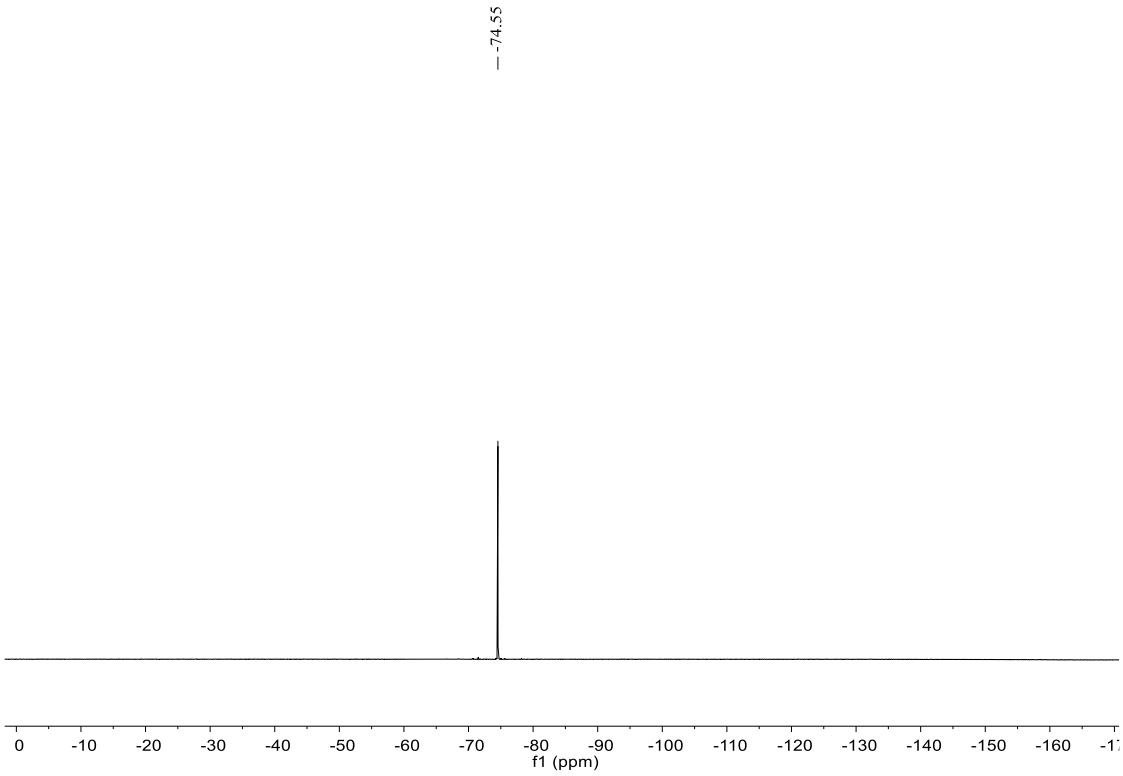
1-(benzo[b]thiophen-2-yl)-1-(3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoroethan-1-ol (42c)



^{1}H NMR spectrum in $CDCl_3$.

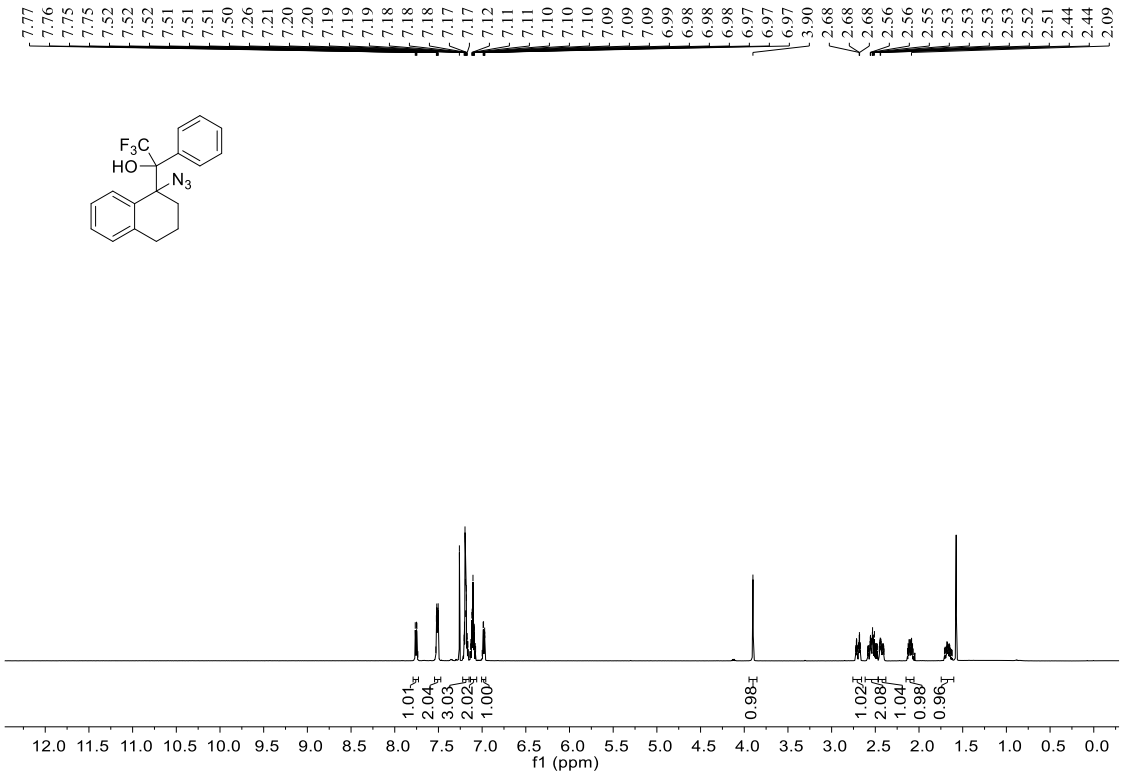


^{13}C NMR spectrum in $CDCl_3$.

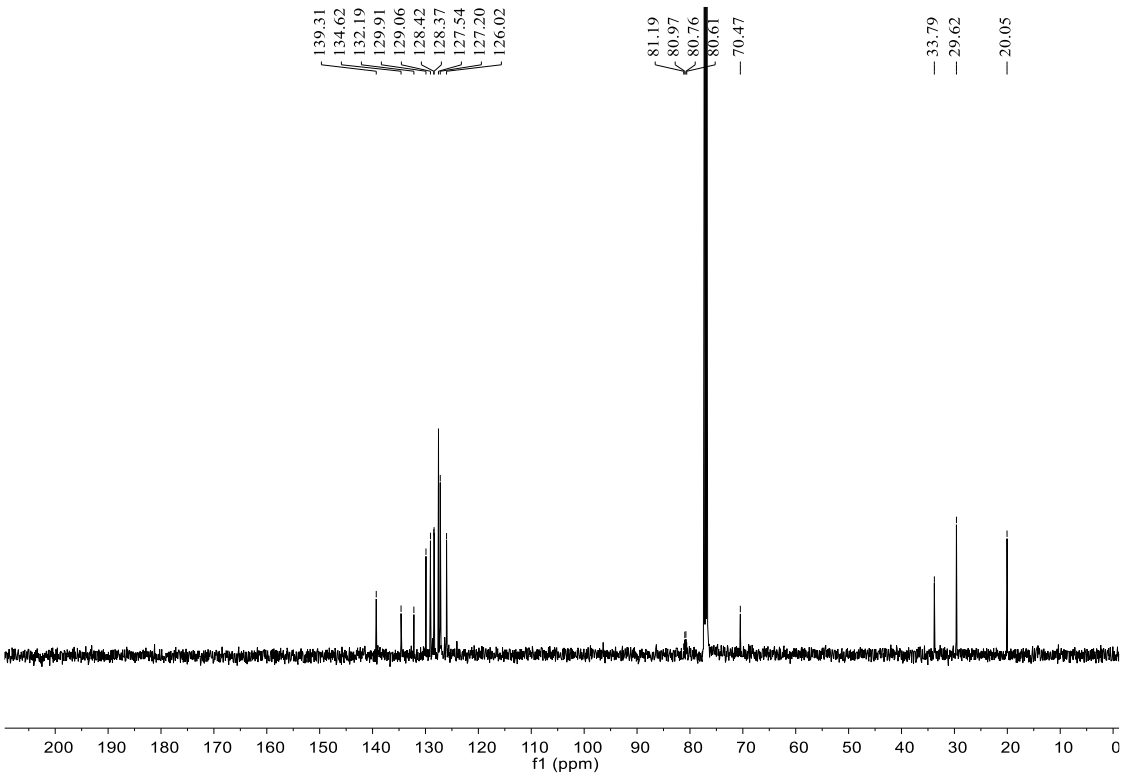


^{19}F NMR spectrum in $CDCl_3$.

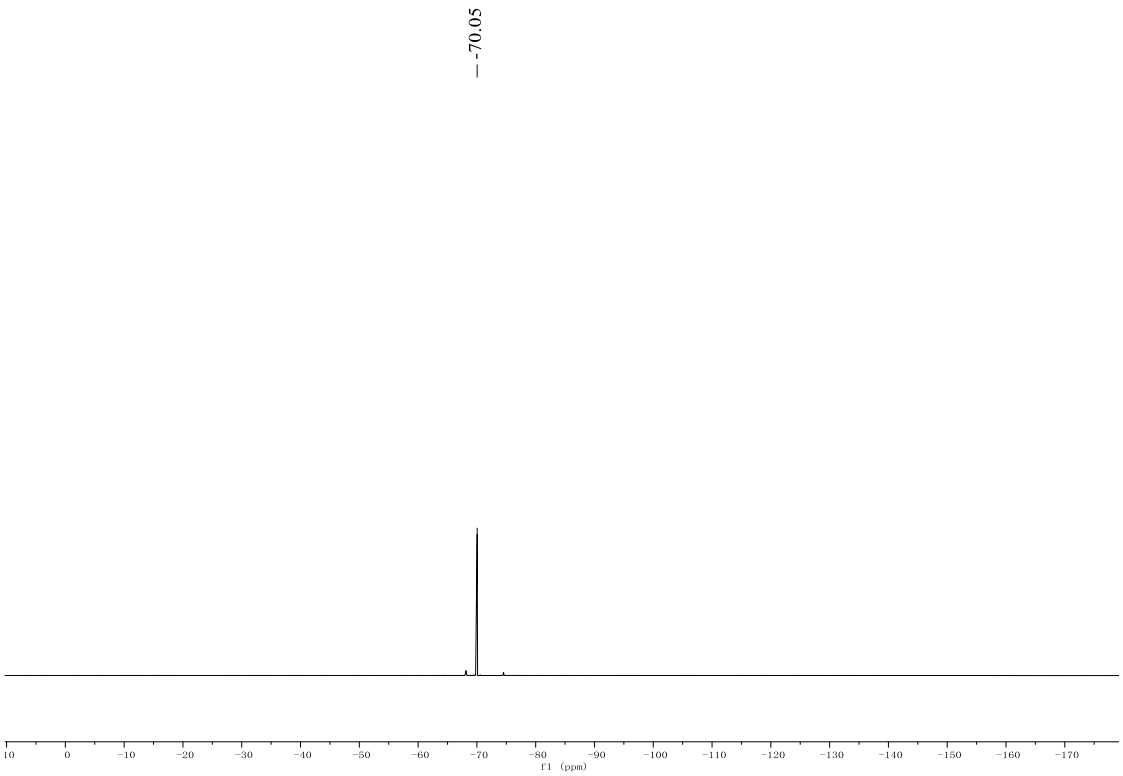
1-((*R*)-1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (43c)



^{1}H NMR spectrum in $CDCl_3$.

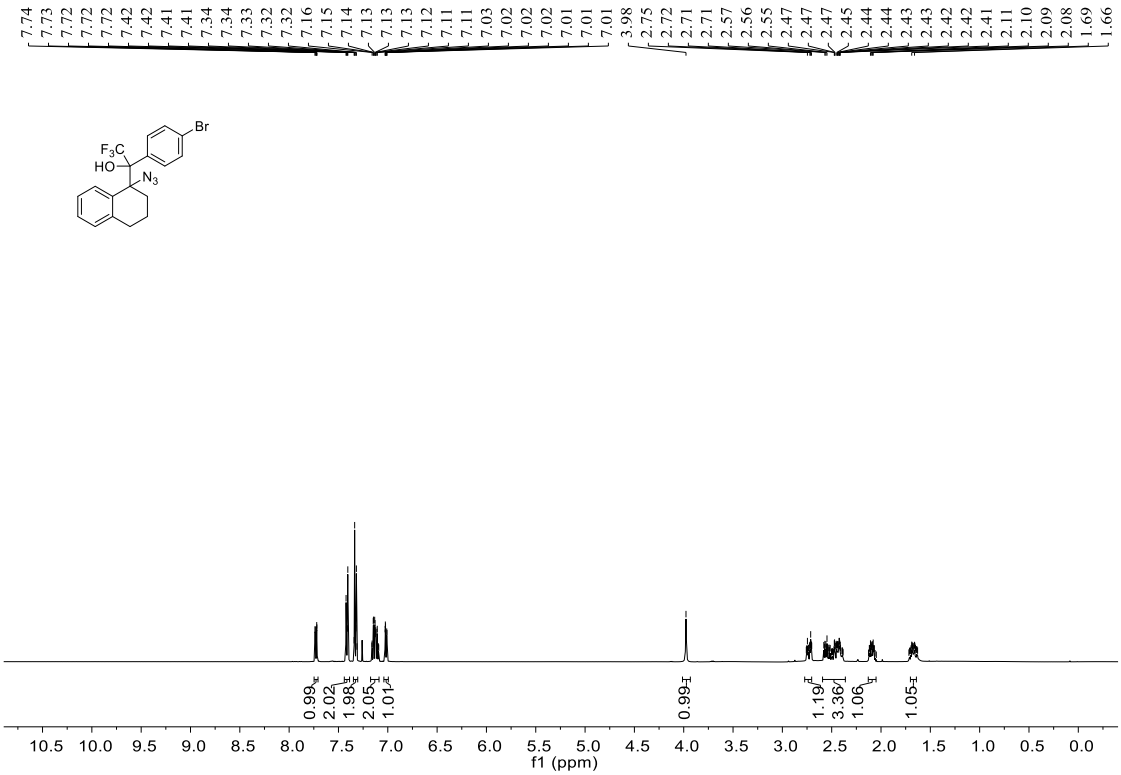


^{13}C NMR spectrum in $CDCl_3$.

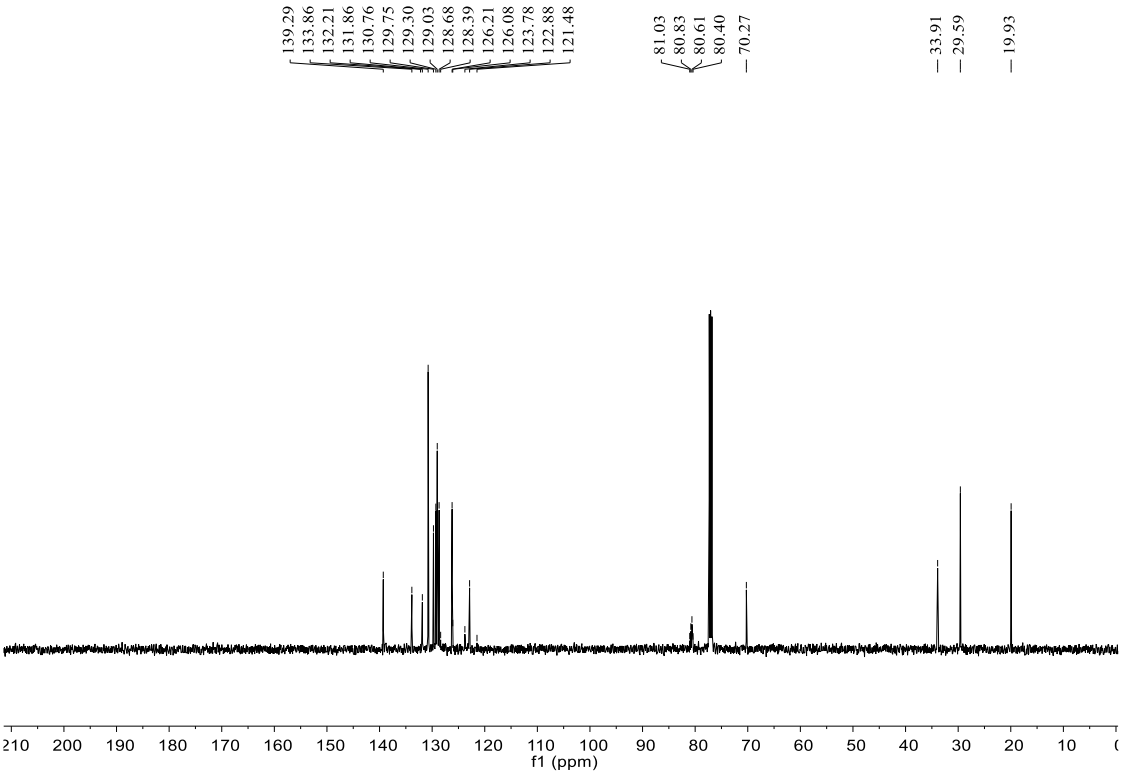


^{19}F NMR spectrum in $CDCl_3$.

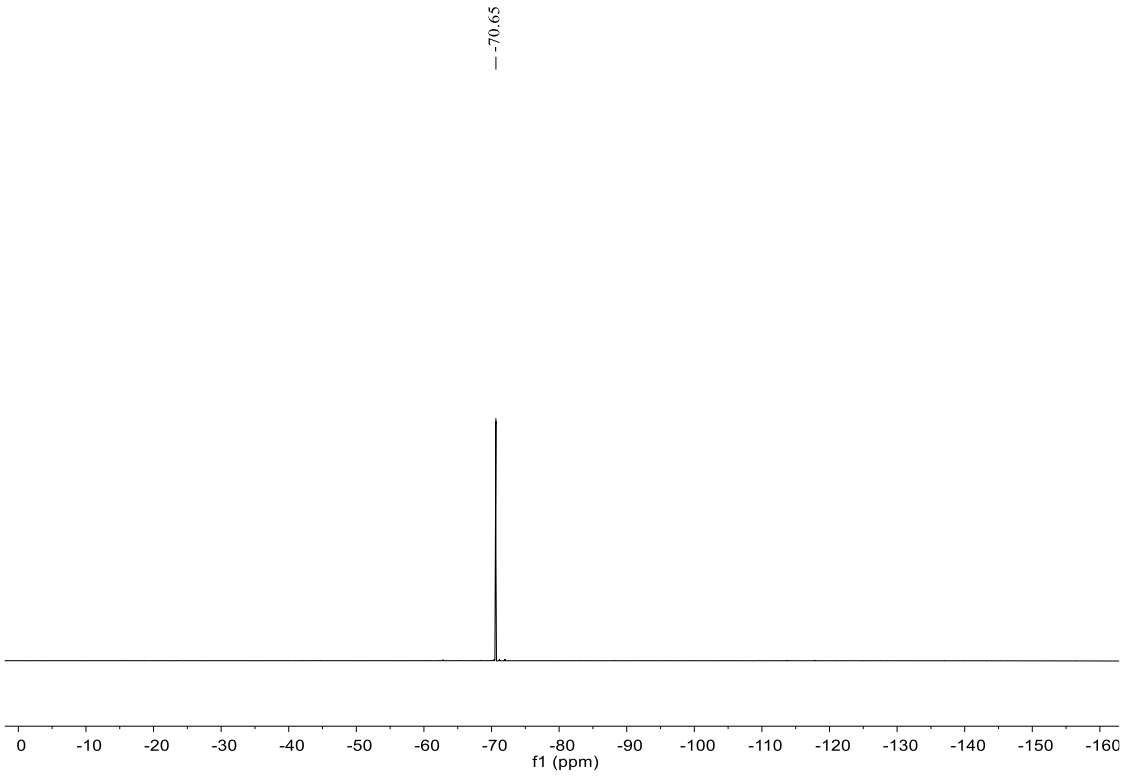
1-(1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-1-(4-bromophenyl)-2,2,2-trifluoroethan-1-ol (44c)



^{1}H NMR spectrum in $CDCl_3$.

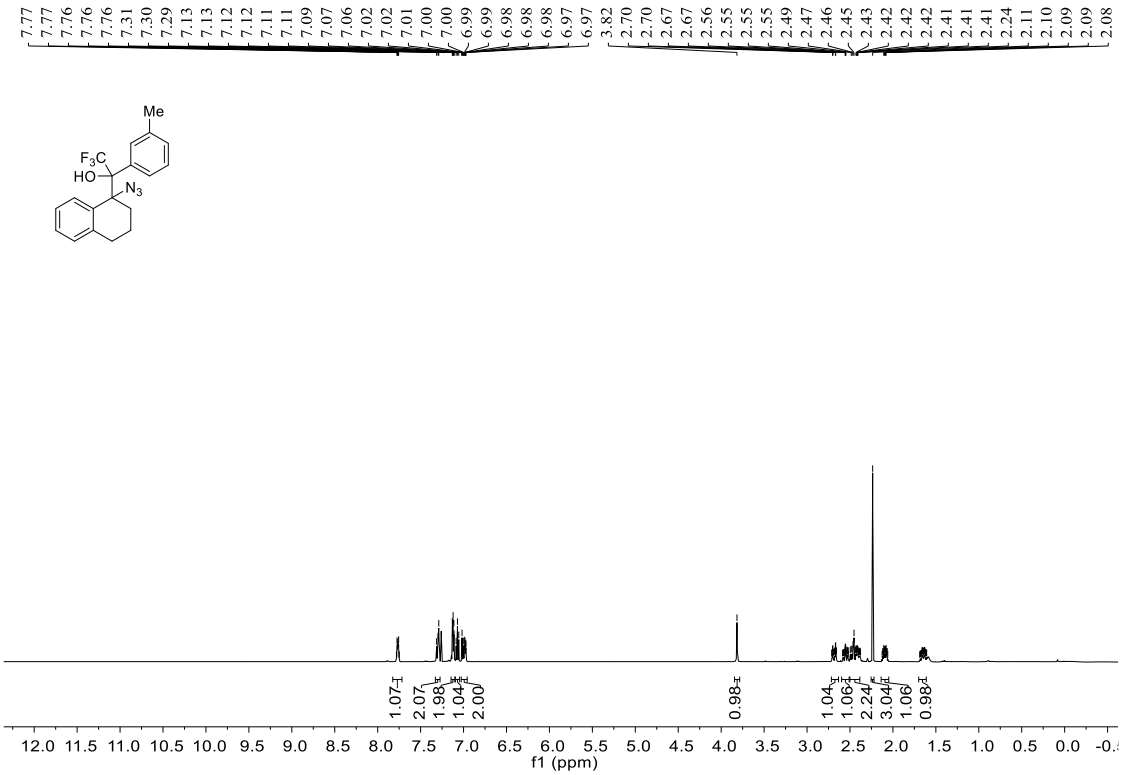


^{13}C NMR spectrum in $CDCl_3$.

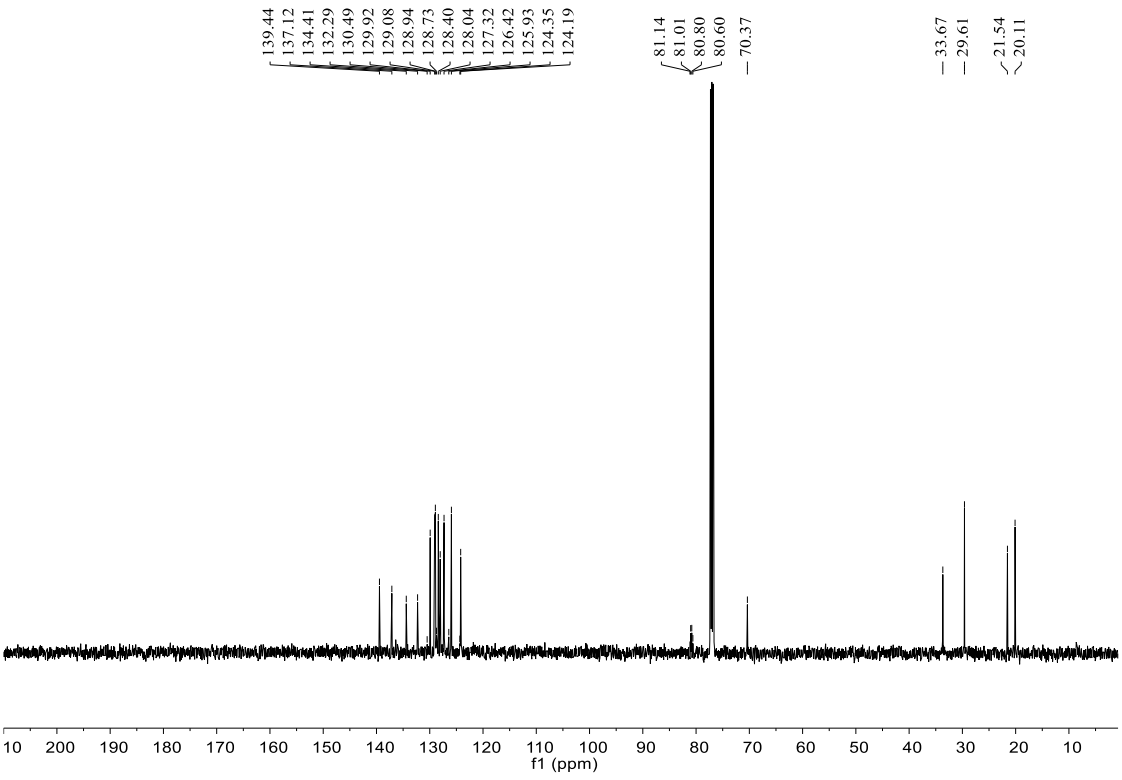


^{19}F NMR spectrum in $CDCl_3$.

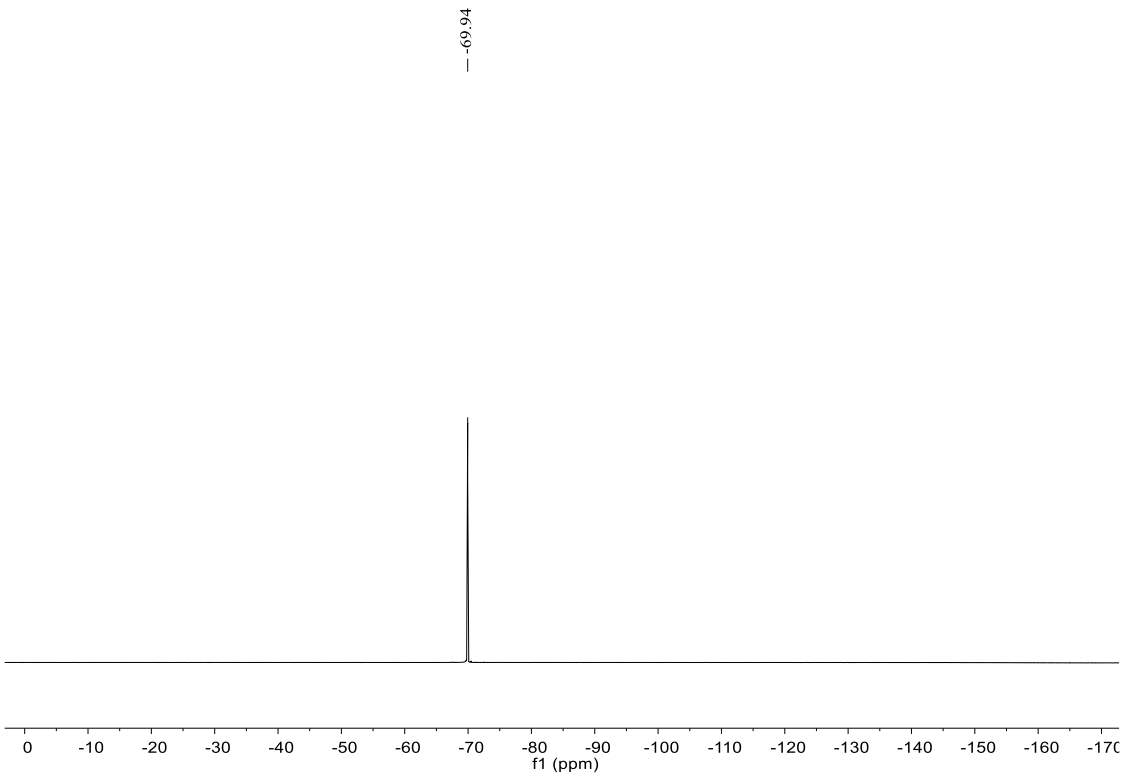
1-(1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-(m-tolyl) ethan-1-ol (45c)



^{1}H NMR spectrum in $CDCl_3$.

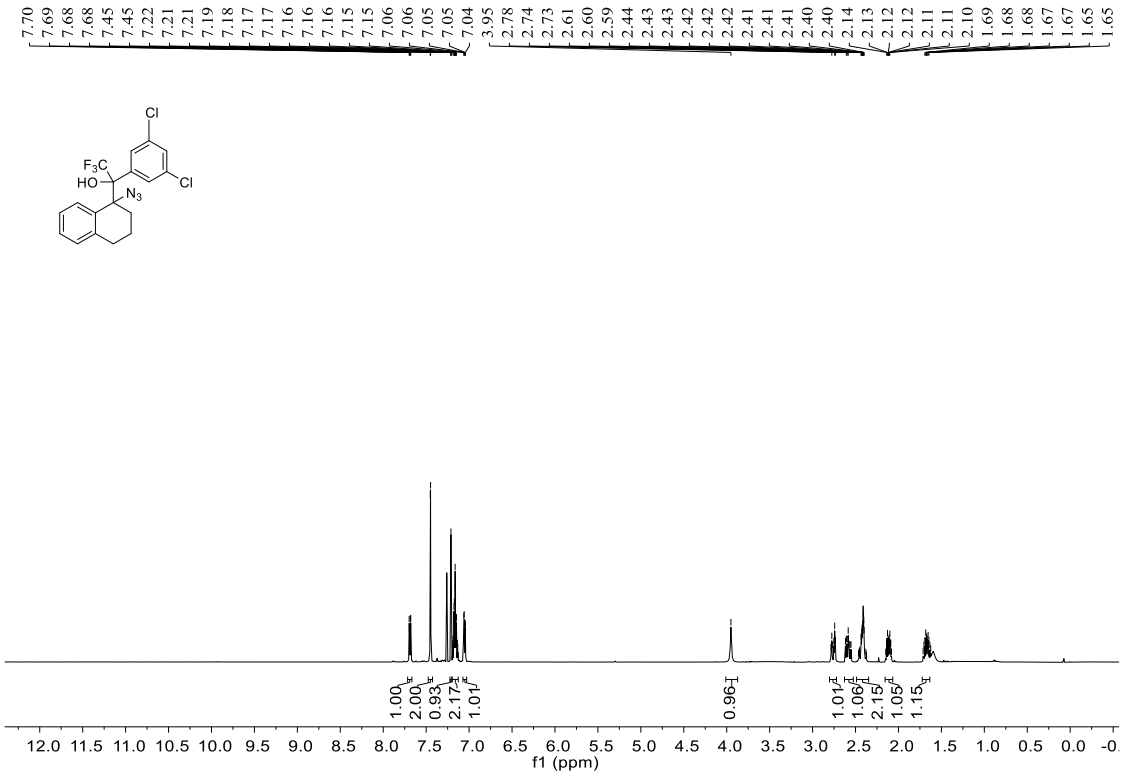


^{13}C NMR spectrum in $CDCl_3$.

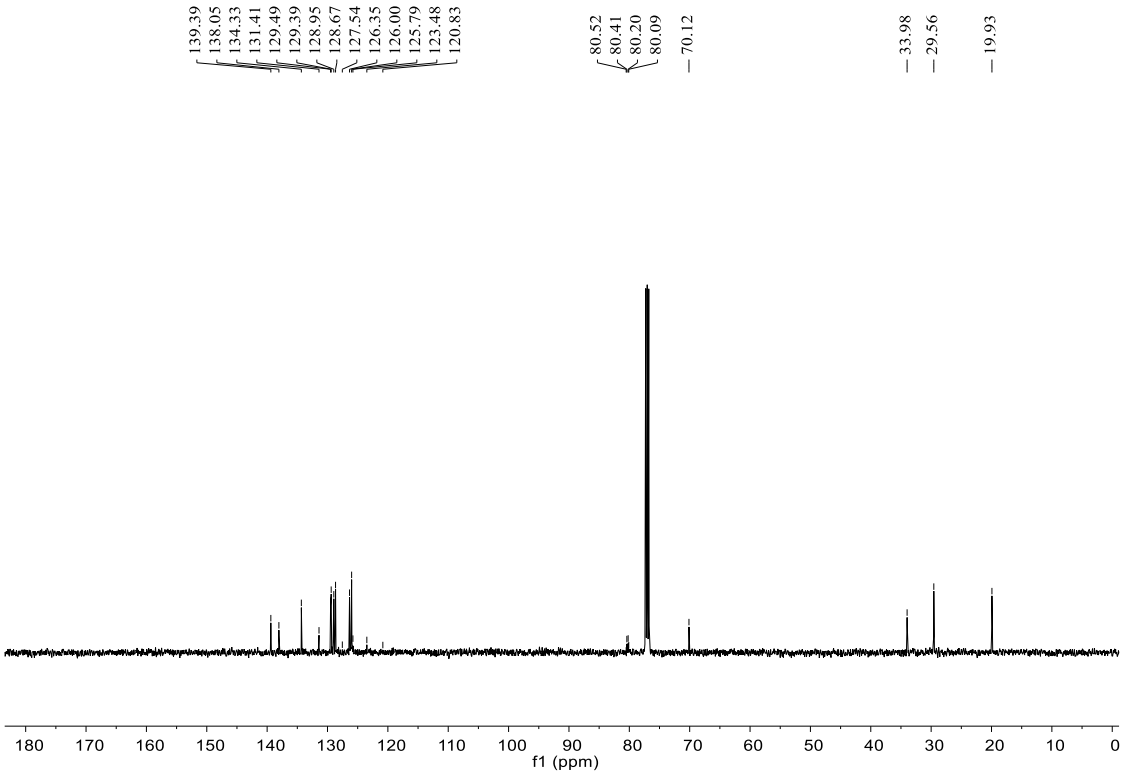


^{19}F NMR spectrum in $CDCl_3$.

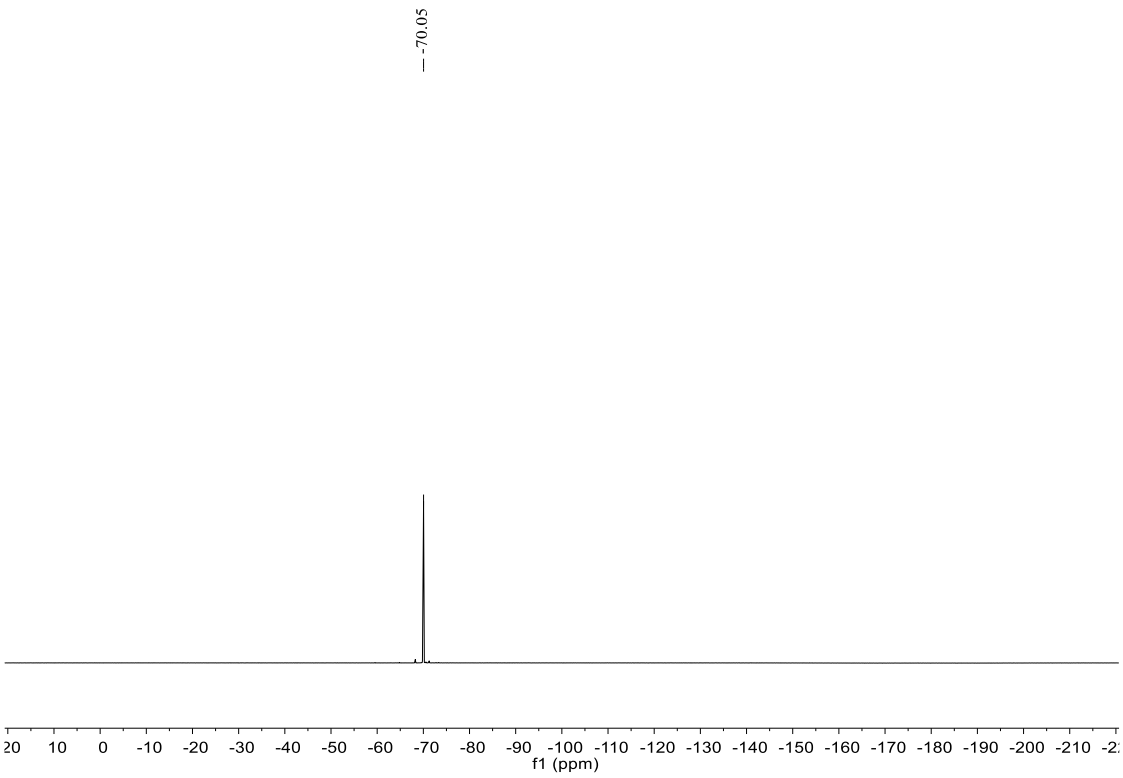
1-(1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-1-(3,5-dichlorophenyl)-2,2,2-trifluoroethan-1-ol (46c)



^{1}H NMR spectrum in $CDCl_3$.

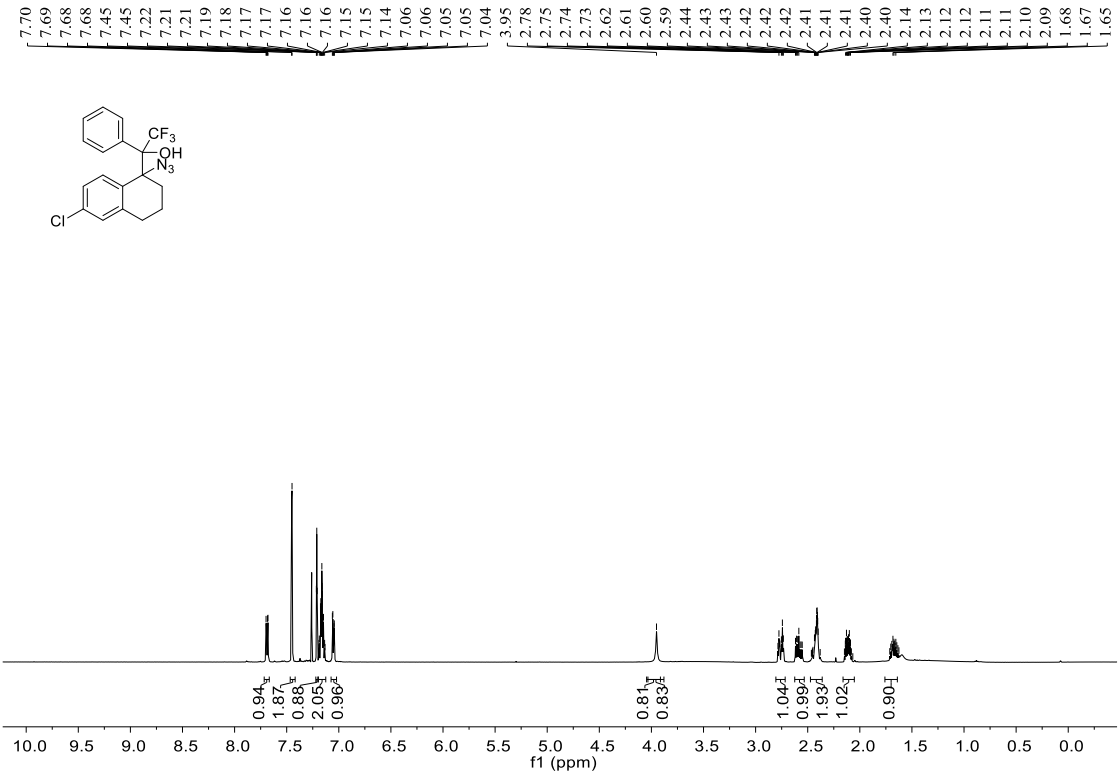


^{13}C NMR spectrum in $CDCl_3$.

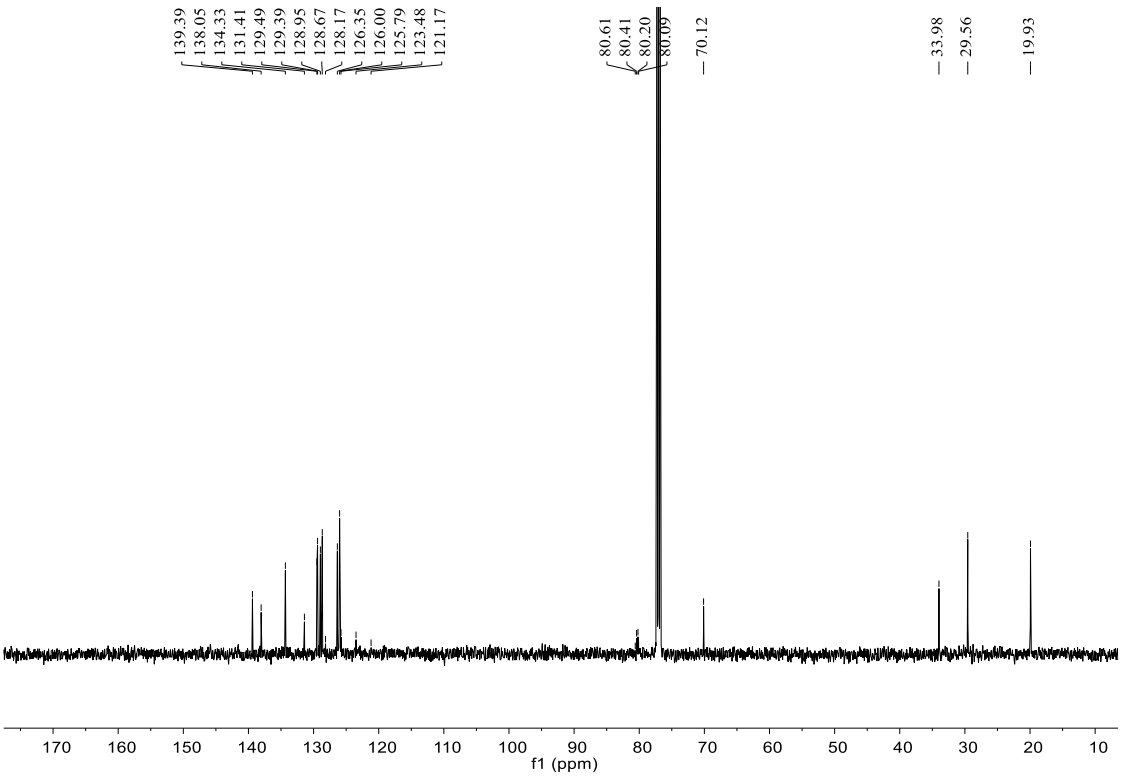


^{19}F NMR spectrum in $CDCl_3$.

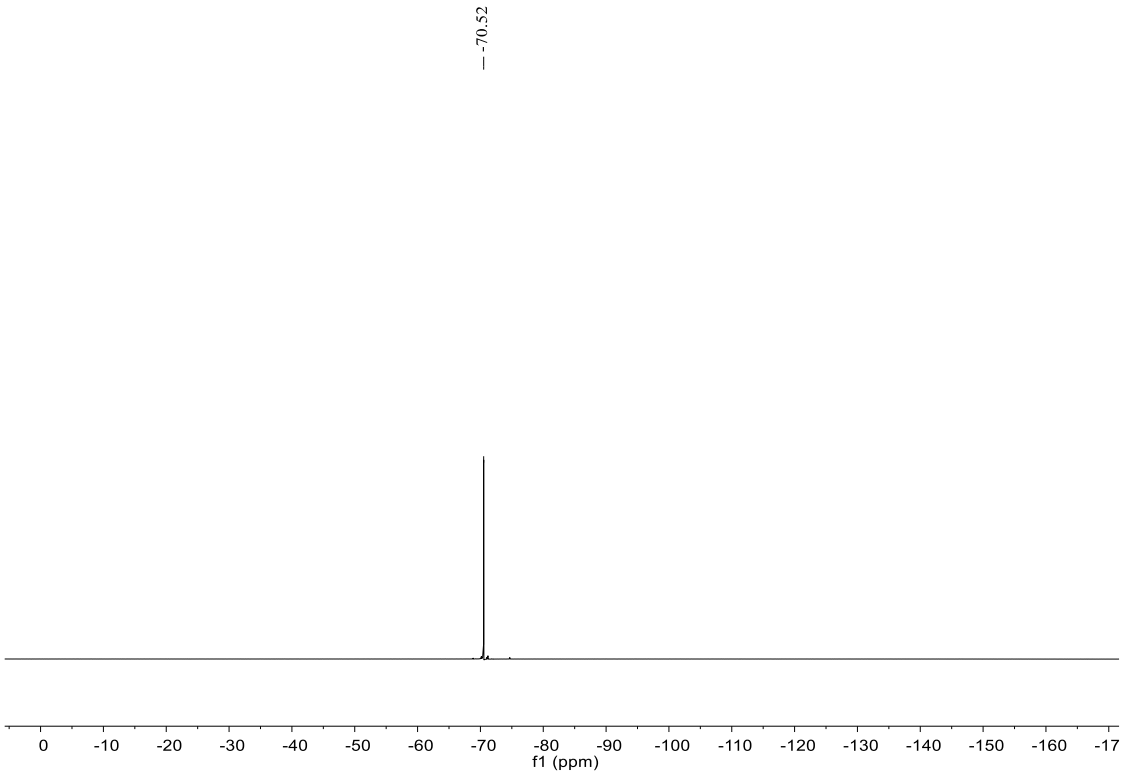
1-(1-azido-6-chloro-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (47c)



^{1}H NMR spectrum in $CDCl_3$.

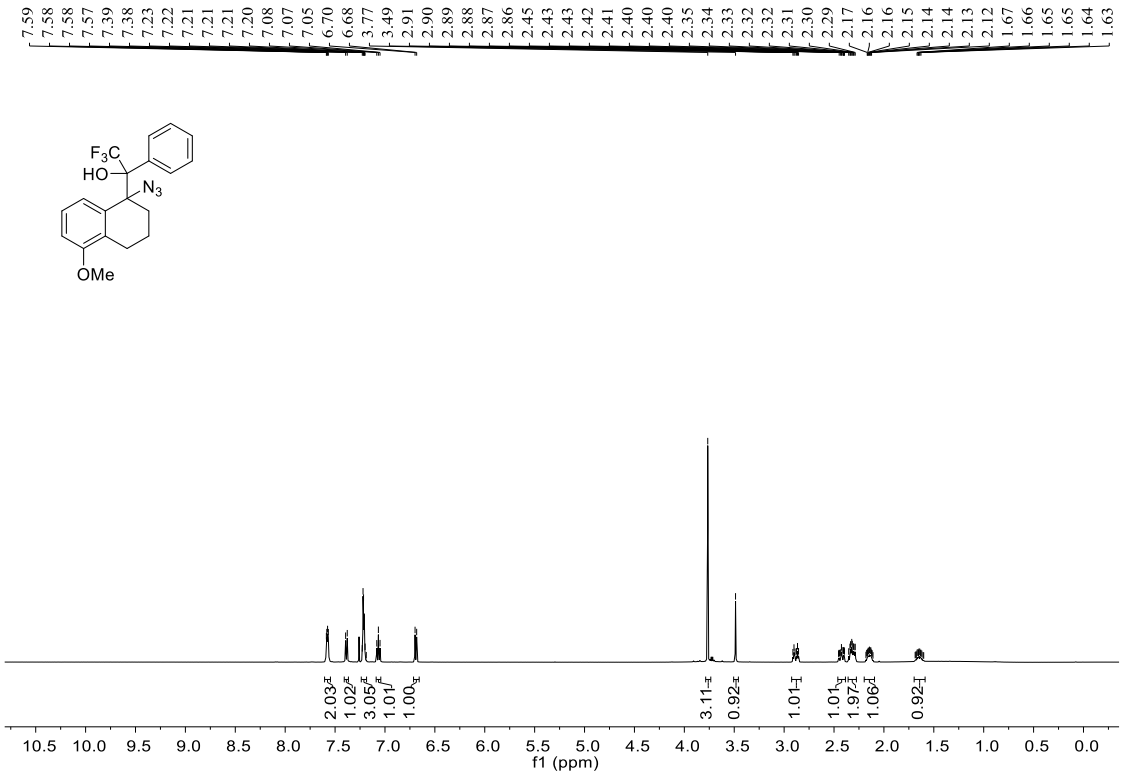


^{13}C NMR spectrum in $CDCl_3$.

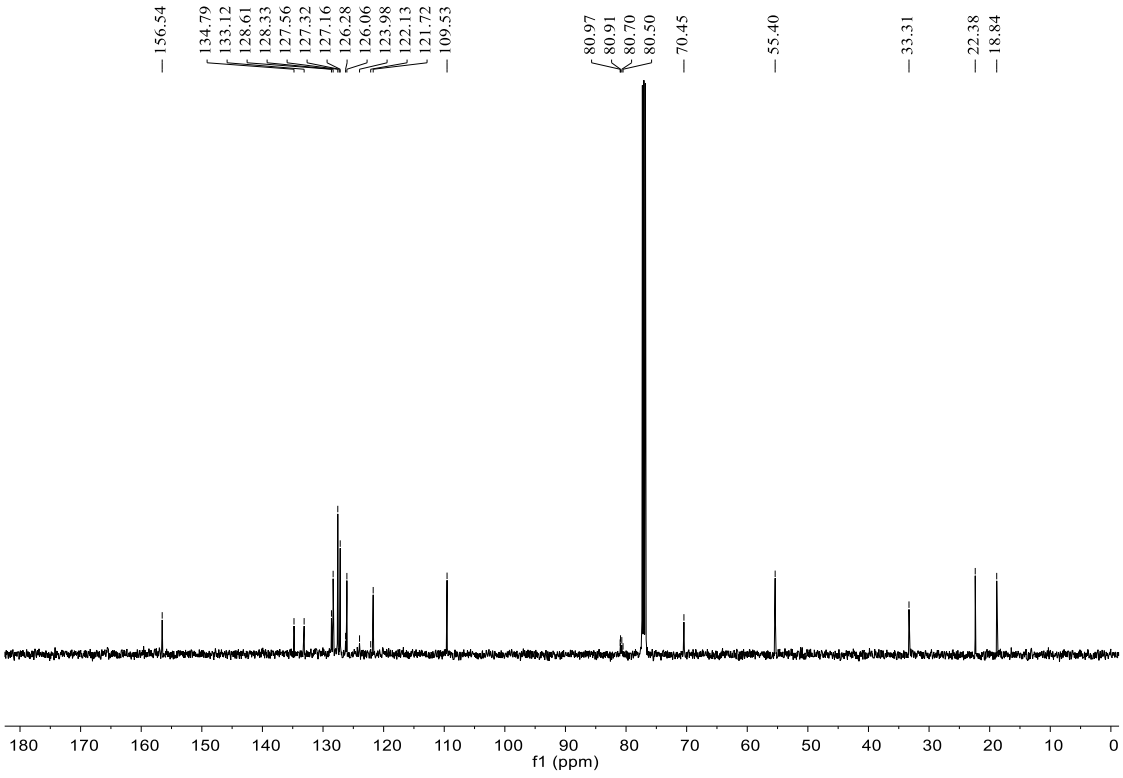


^{19}F NMR spectrum in $CDCl_3$.

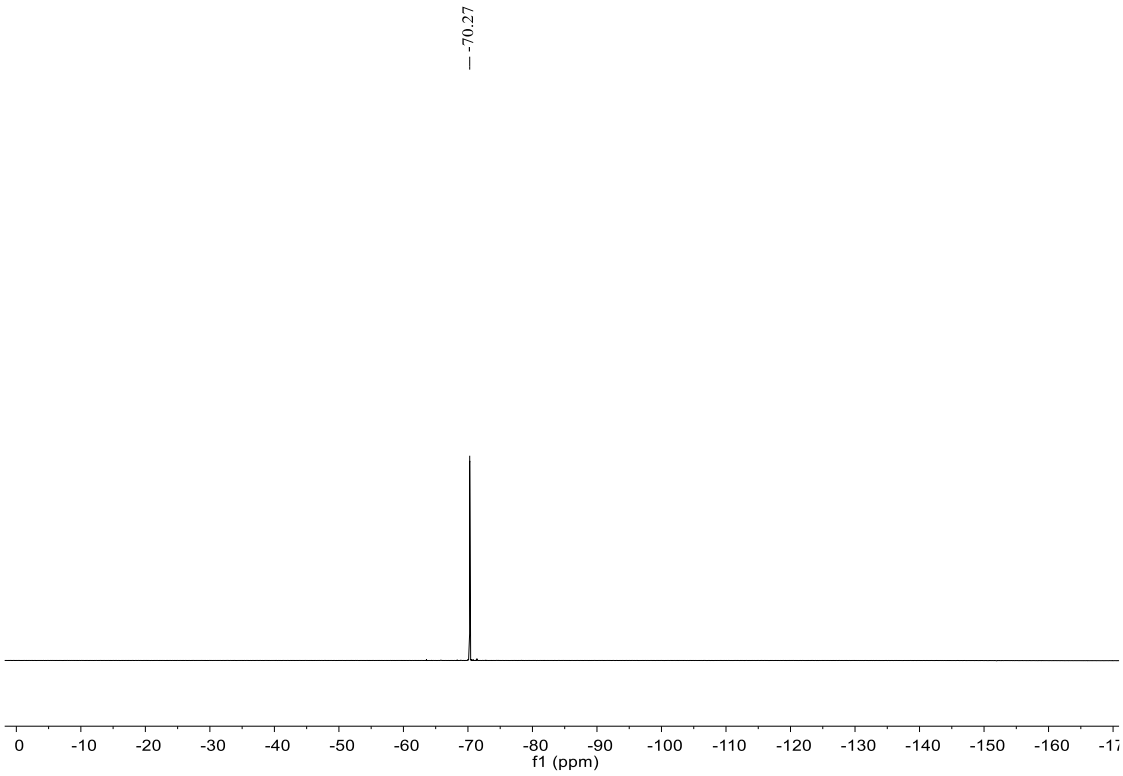
1-((*R*)-1-azido-1,2,3,4-tetrahydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (48c)



^{1}H NMR spectrum in $CDCl_3$.

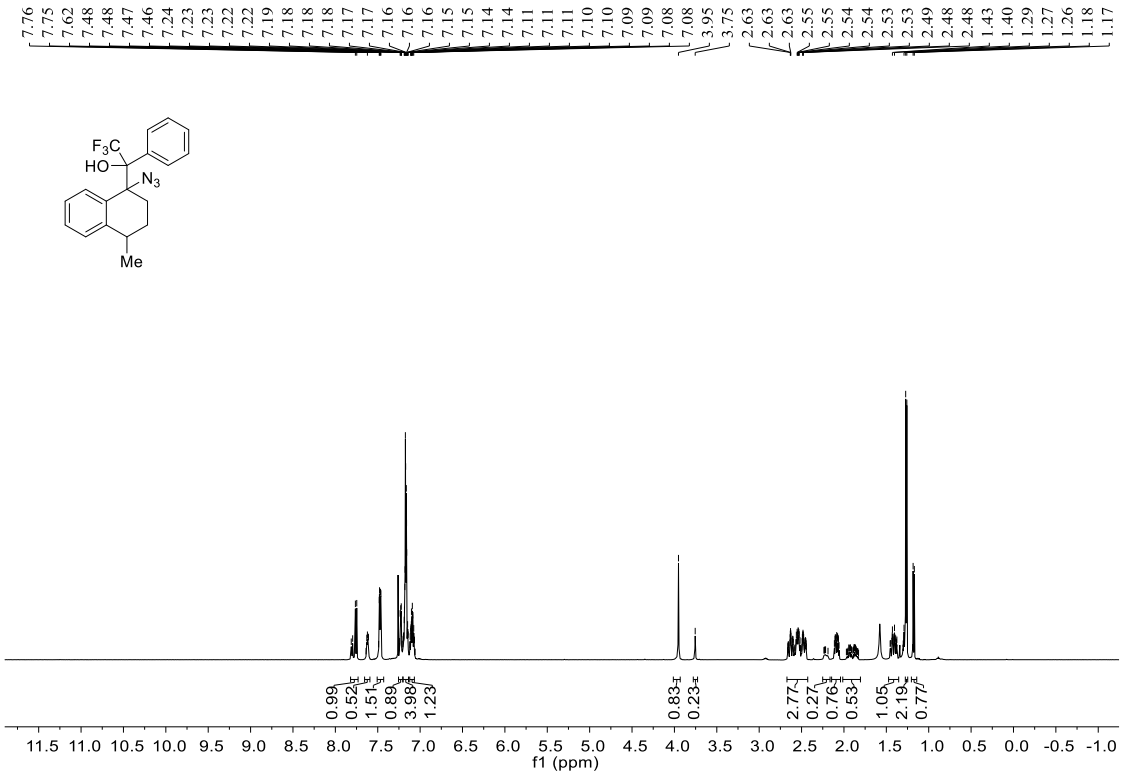


^{13}C NMR spectrum in $CDCl_3$.

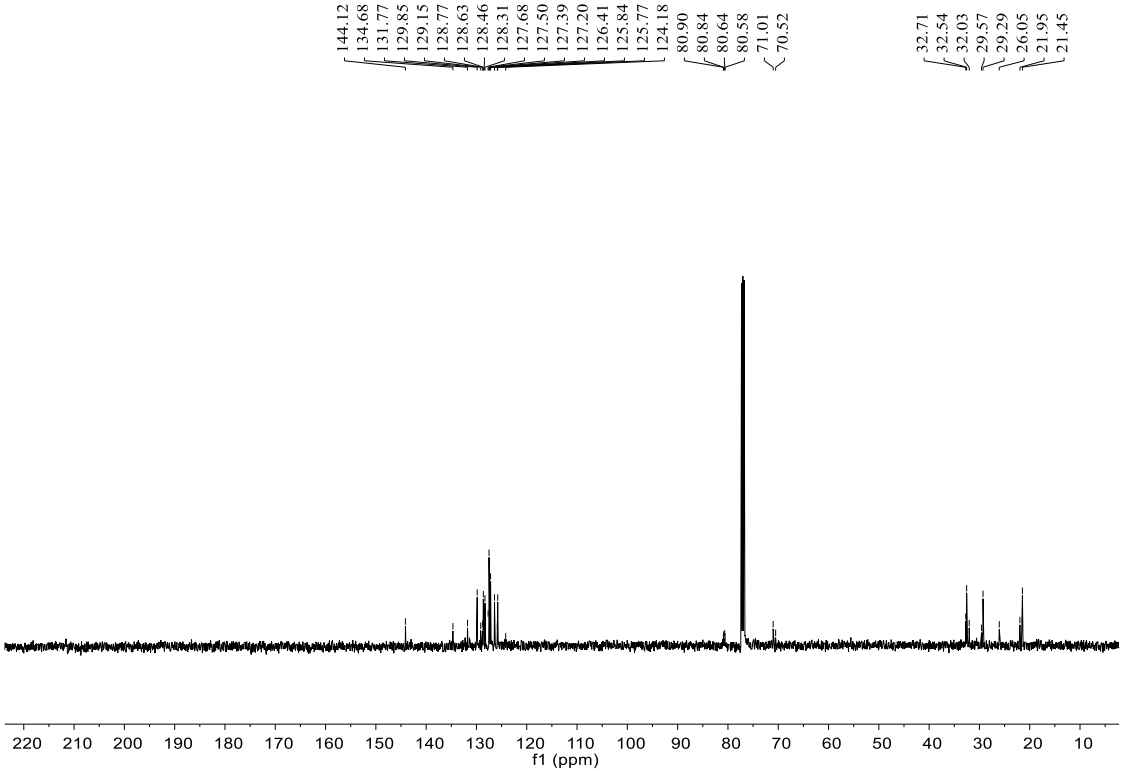


^{19}F NMR spectrum in $CDCl_3$.

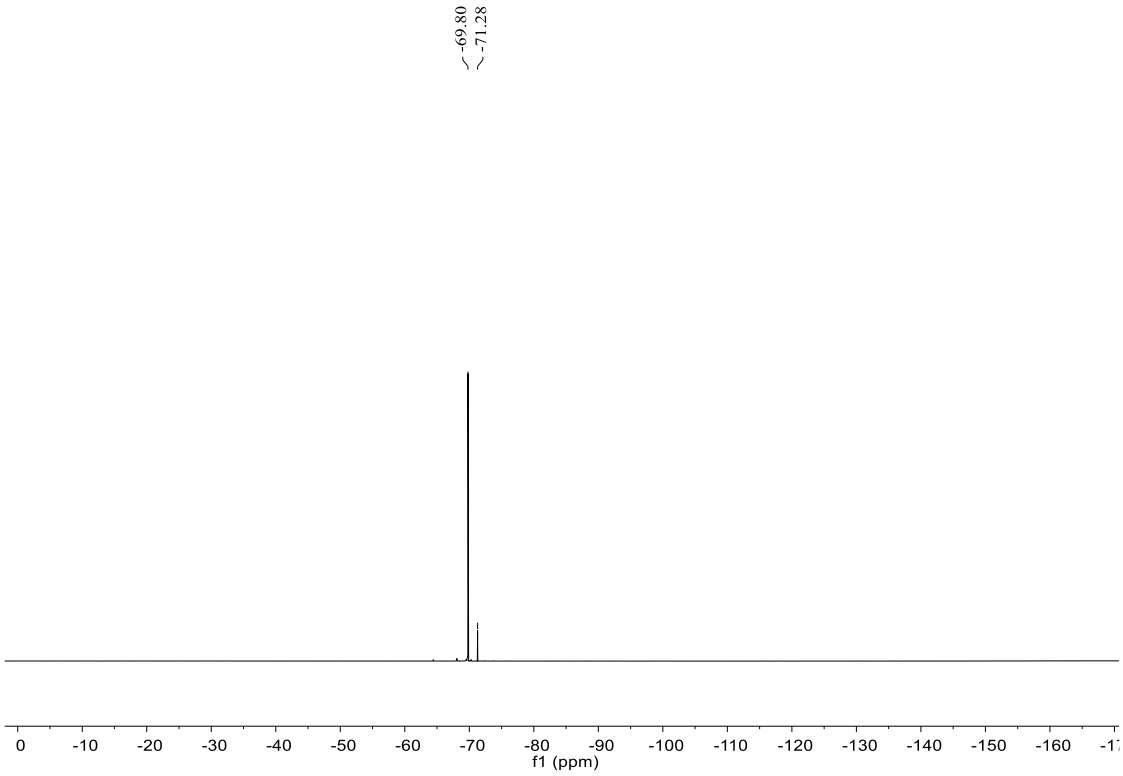
49c



^{1}H NMR spectrum in $CDCl_3$.

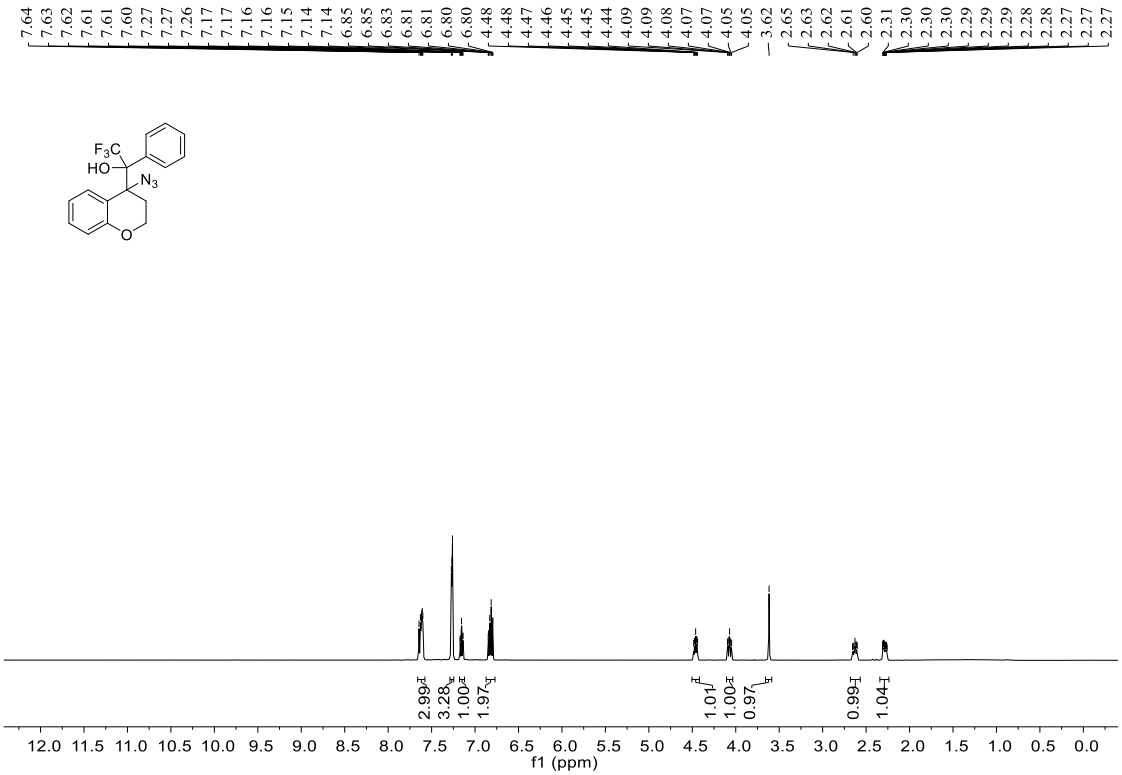


^{13}C NMR spectrum in $CDCl_3$.

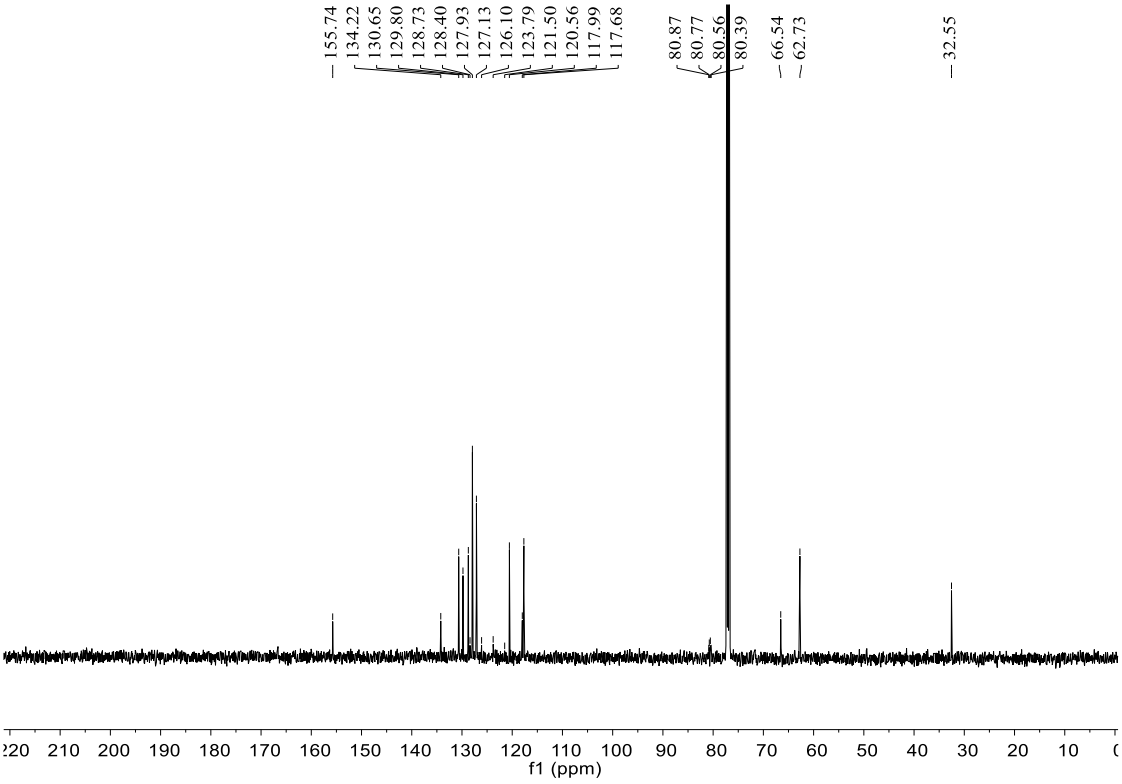


^{19}F NMR spectrum in $CDCl_3$.

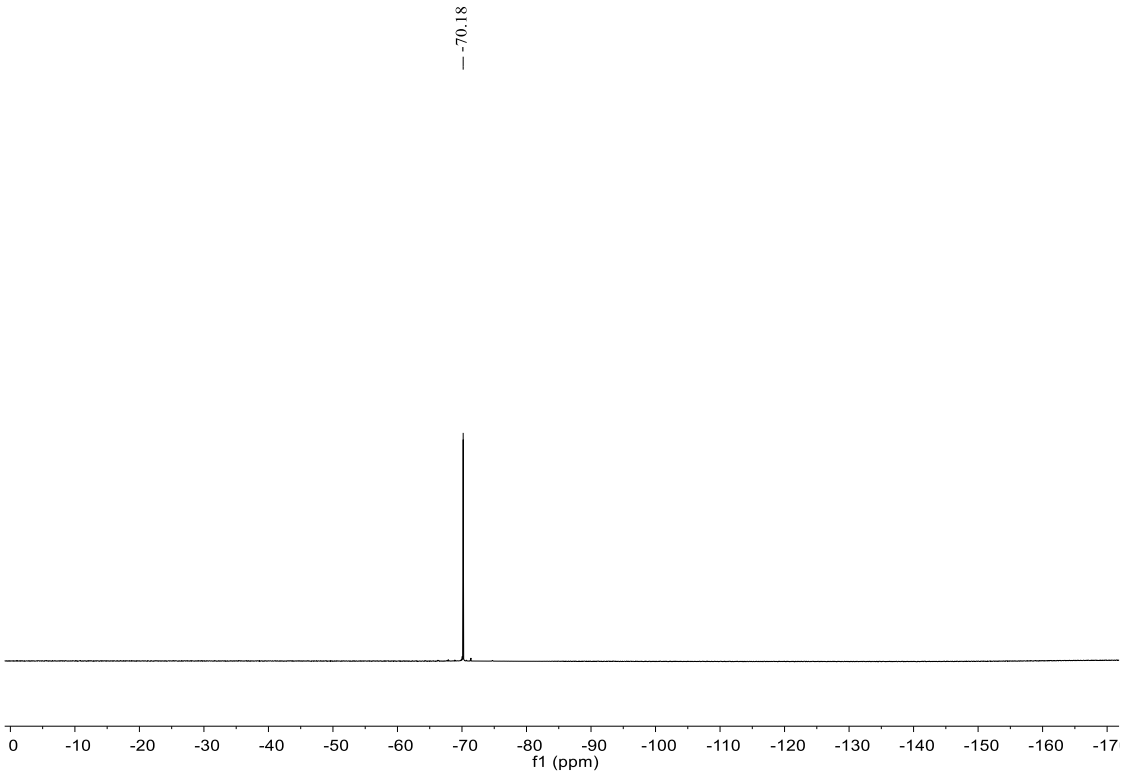
1-(4-azidochroman-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (50c)



^{1}H NMR spectrum in $CDCl_3$.

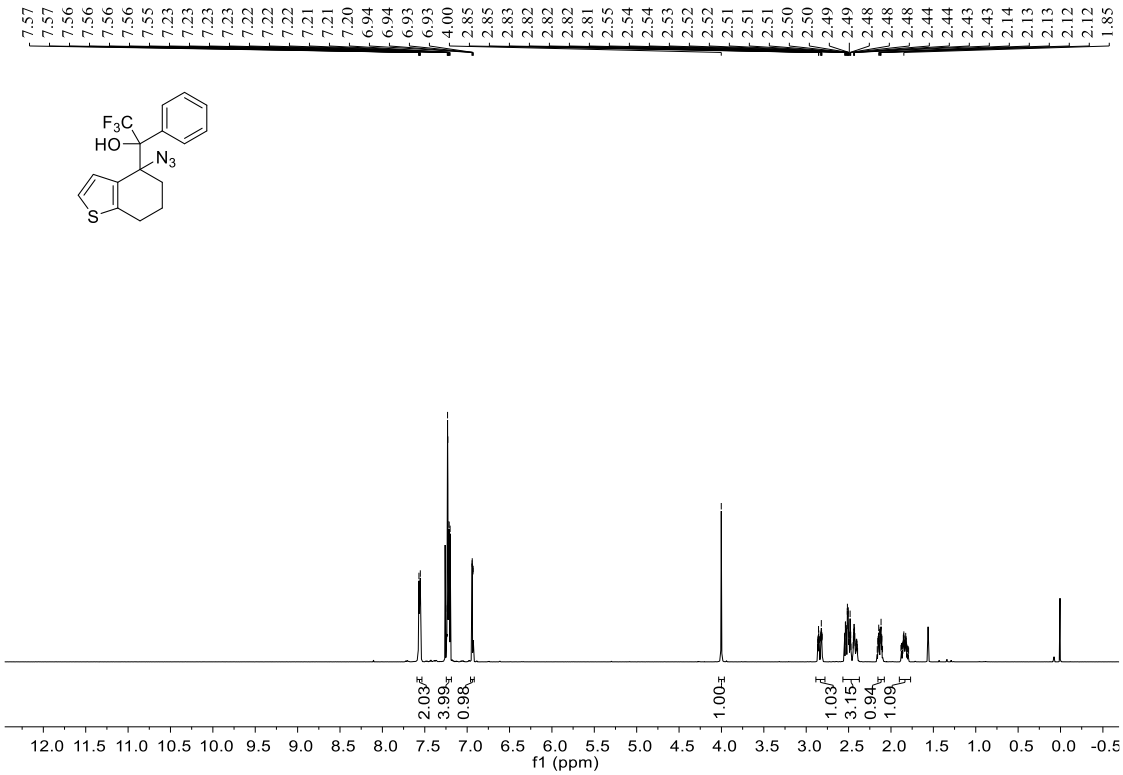


^{13}C NMR spectrum in $CDCl_3$.

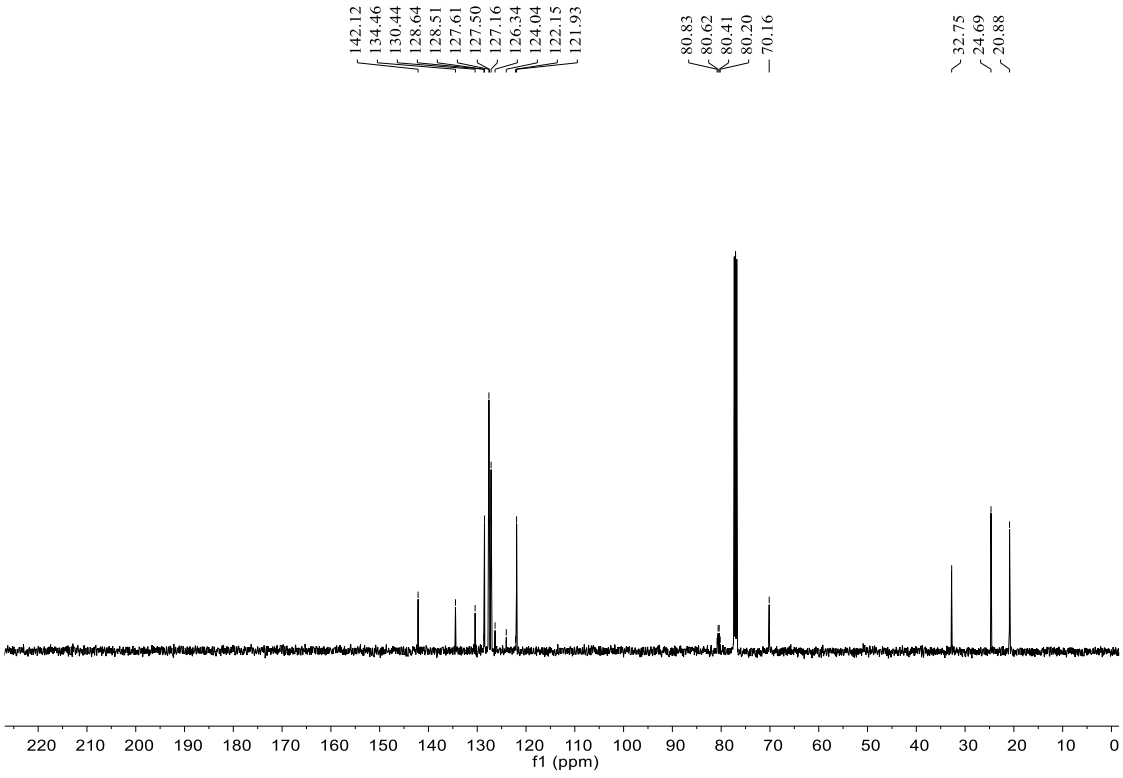


^{19}F NMR spectrum in $CDCl_3$.

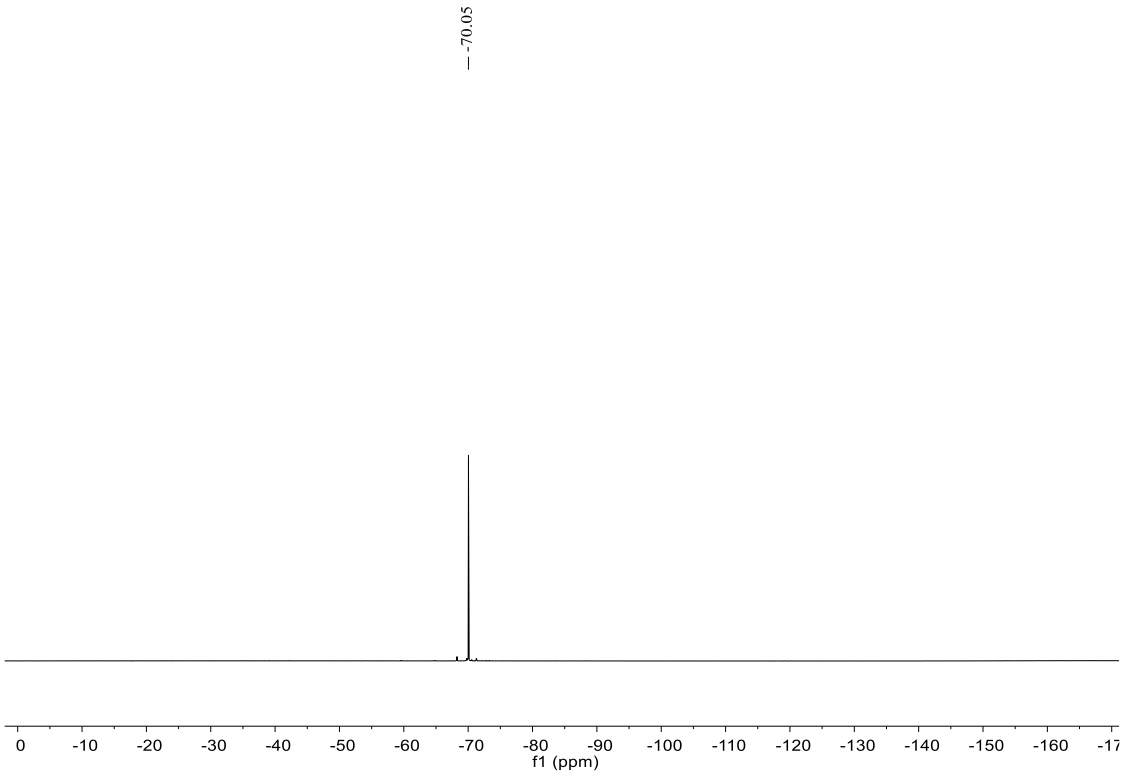
1-(4-azido-4,5,6,7-tetrahydrobenzo[b]thiophen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (51c)



^{1}H NMR spectrum in $CDCl_3$.

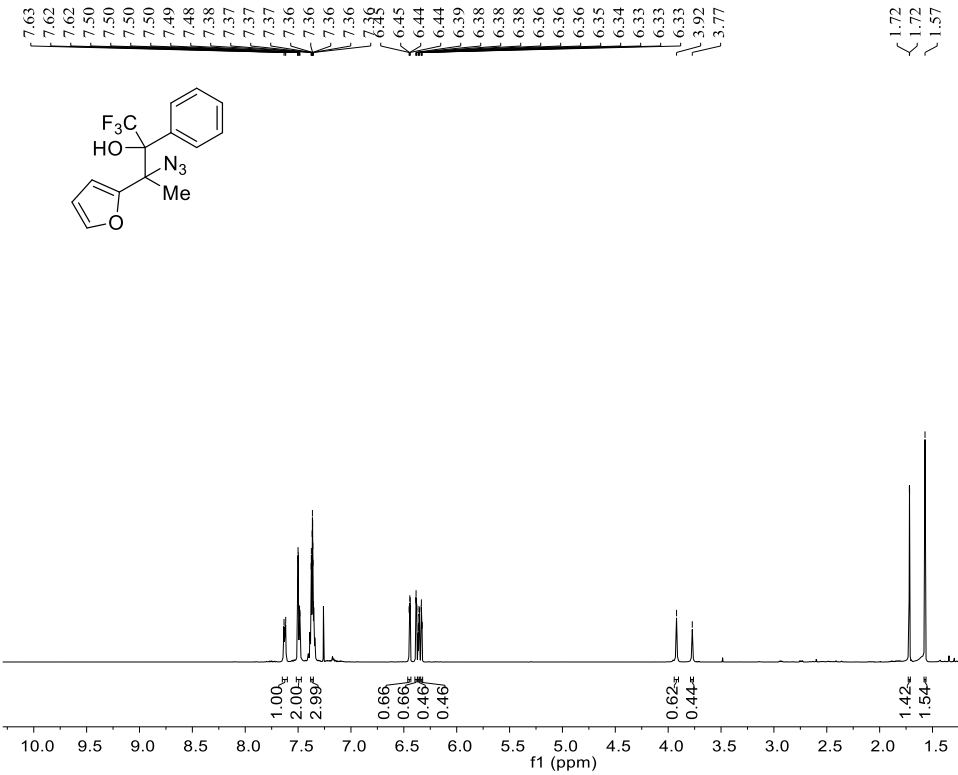


^{13}C NMR spectrum in $CDCl_3$.

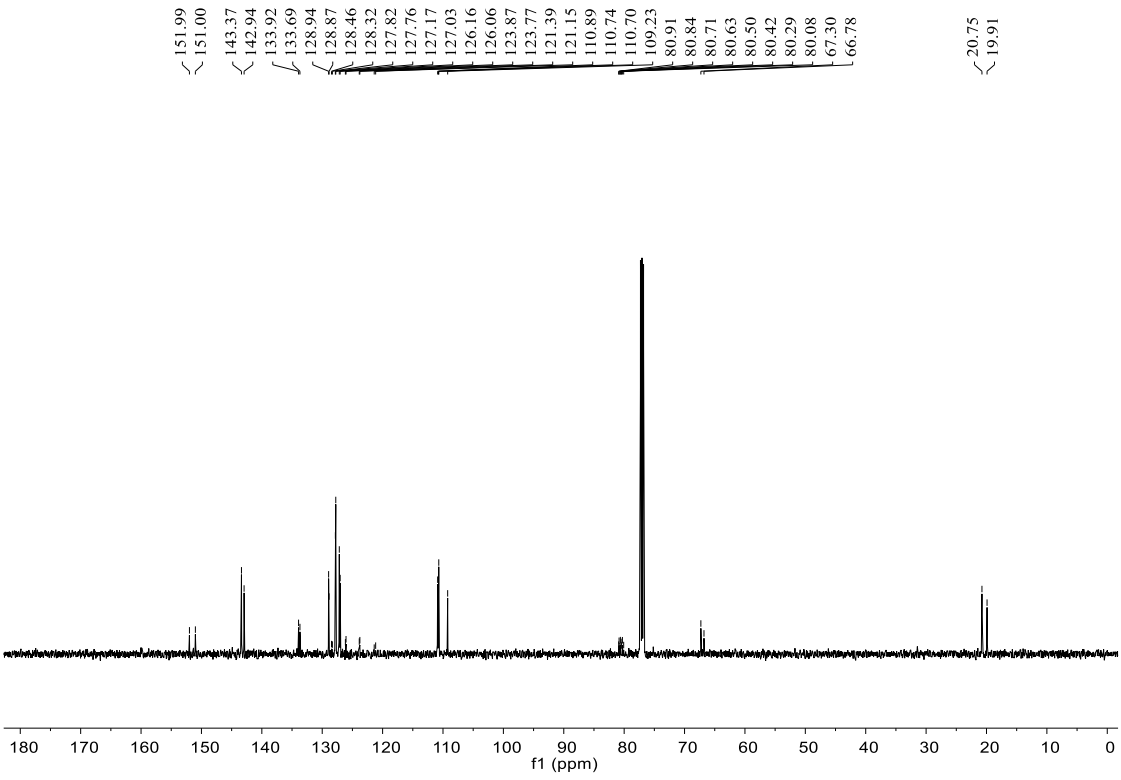


^{19}F NMR spectrum in $CDCl_3$.

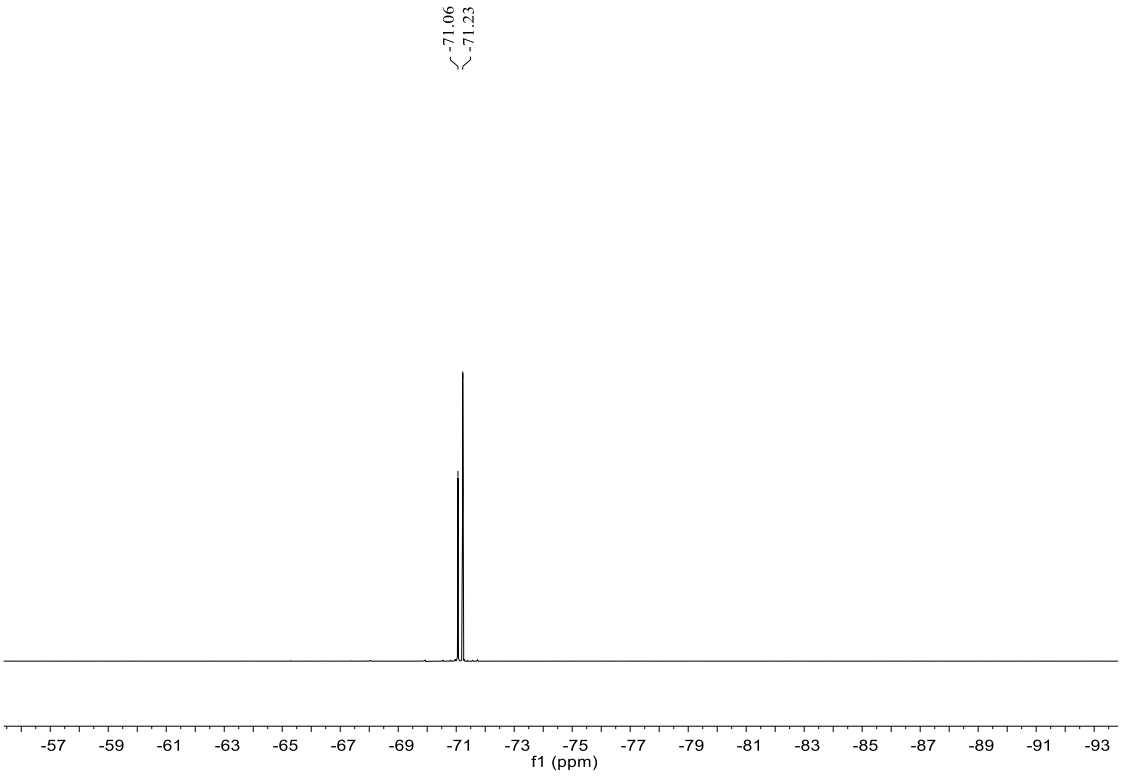
3-azido-1,1,1-trifluoro-3-(furan-2-yl)-2-phenylbutan-2-ol (52c)



^{1}H NMR spectrum in $CDCl_3$.

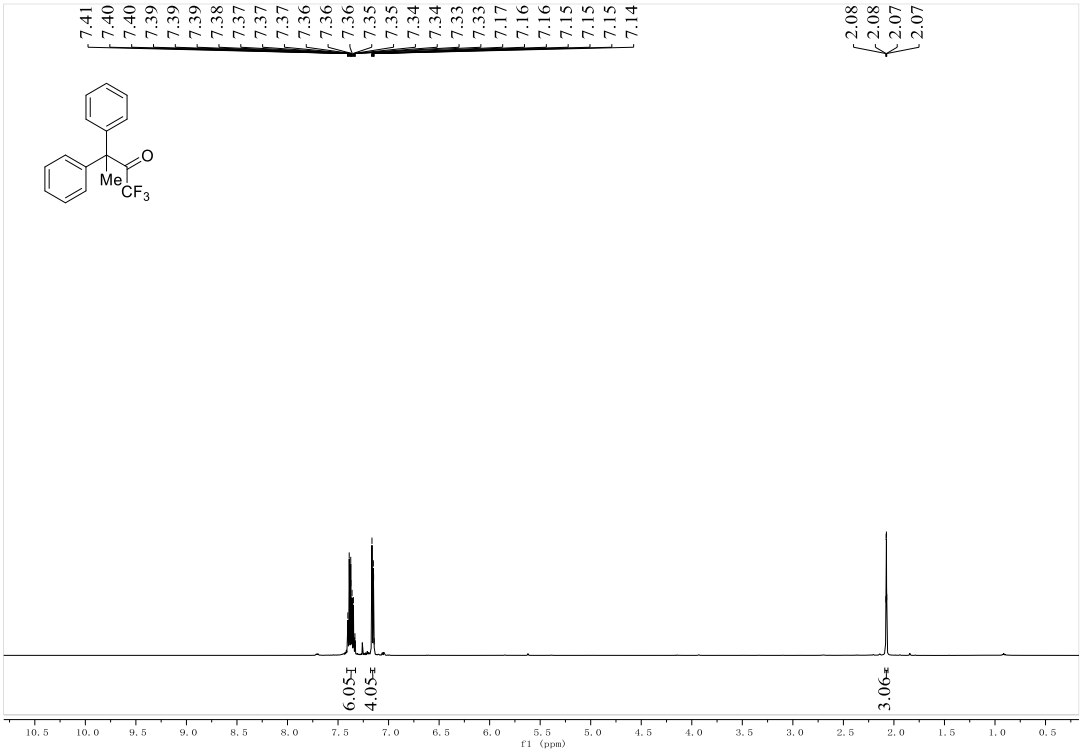


^{13}C NMR spectrum in $CDCl_3$.

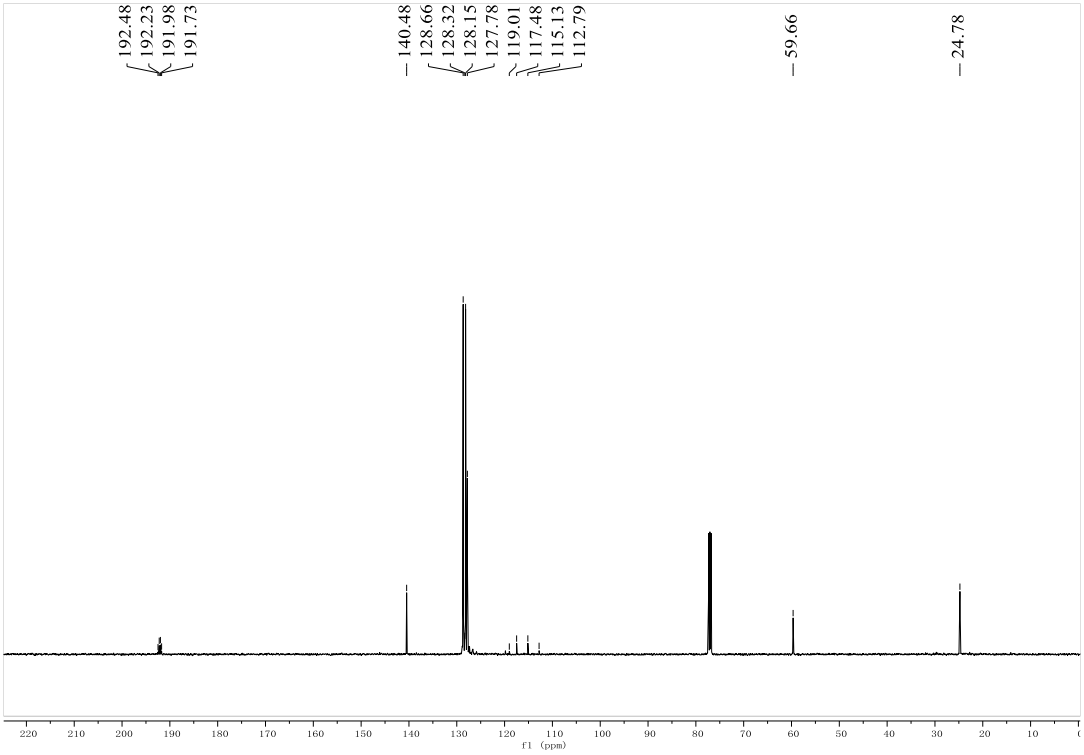


^{19}F NMR spectrum in $CDCl_3$.

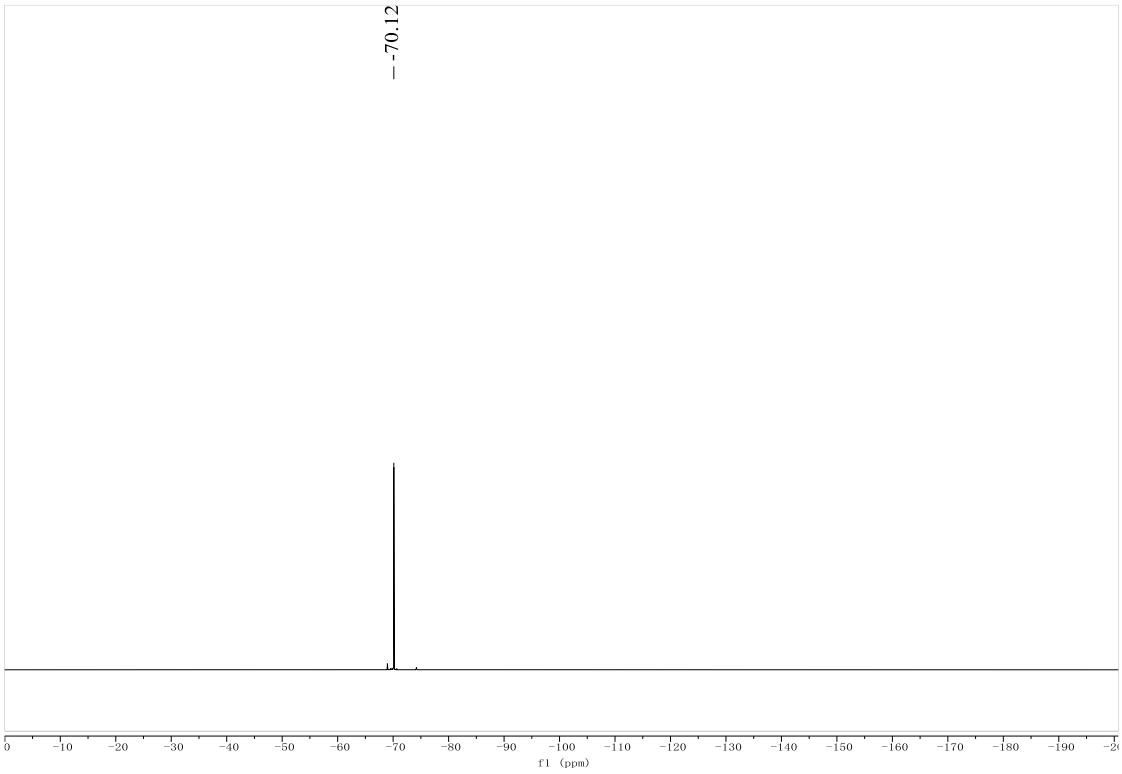
1,1,1-trifluoro-3,3-diphenylbutan-2-one (53c)



^{1}H NMR spectrum in $CDCl_3$.

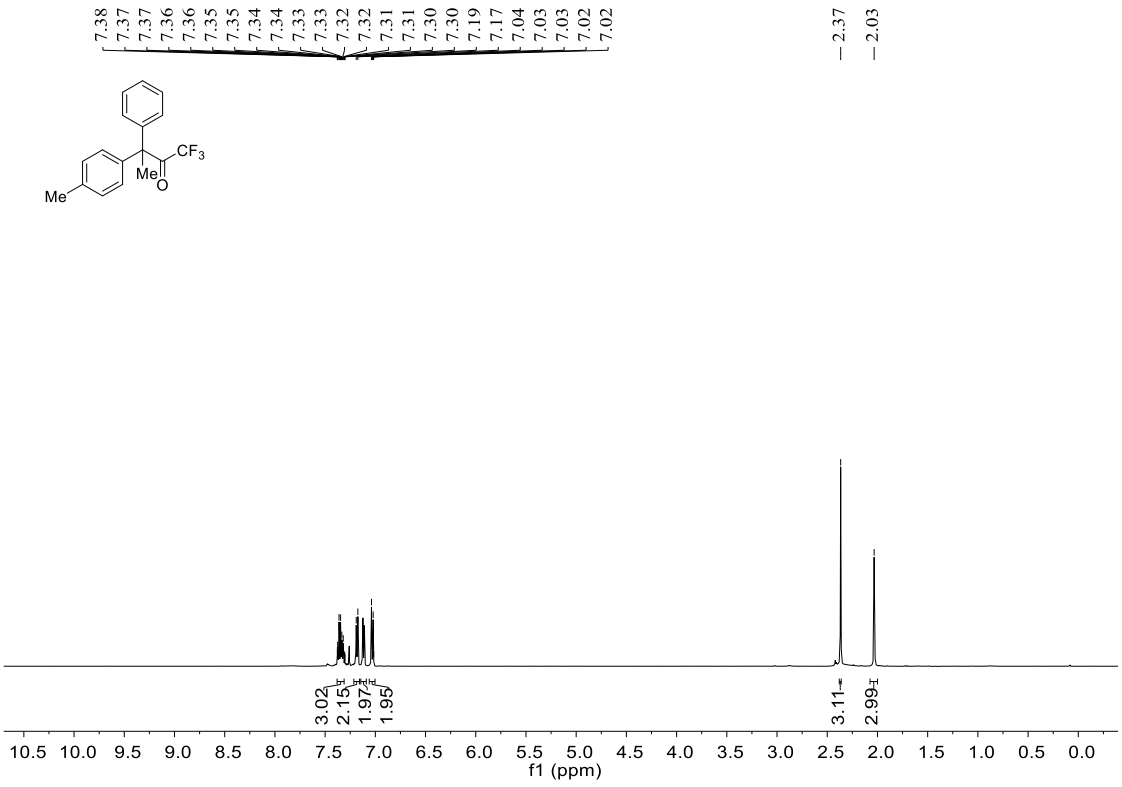


^{13}C NMR spectrum in $CDCl_3$.

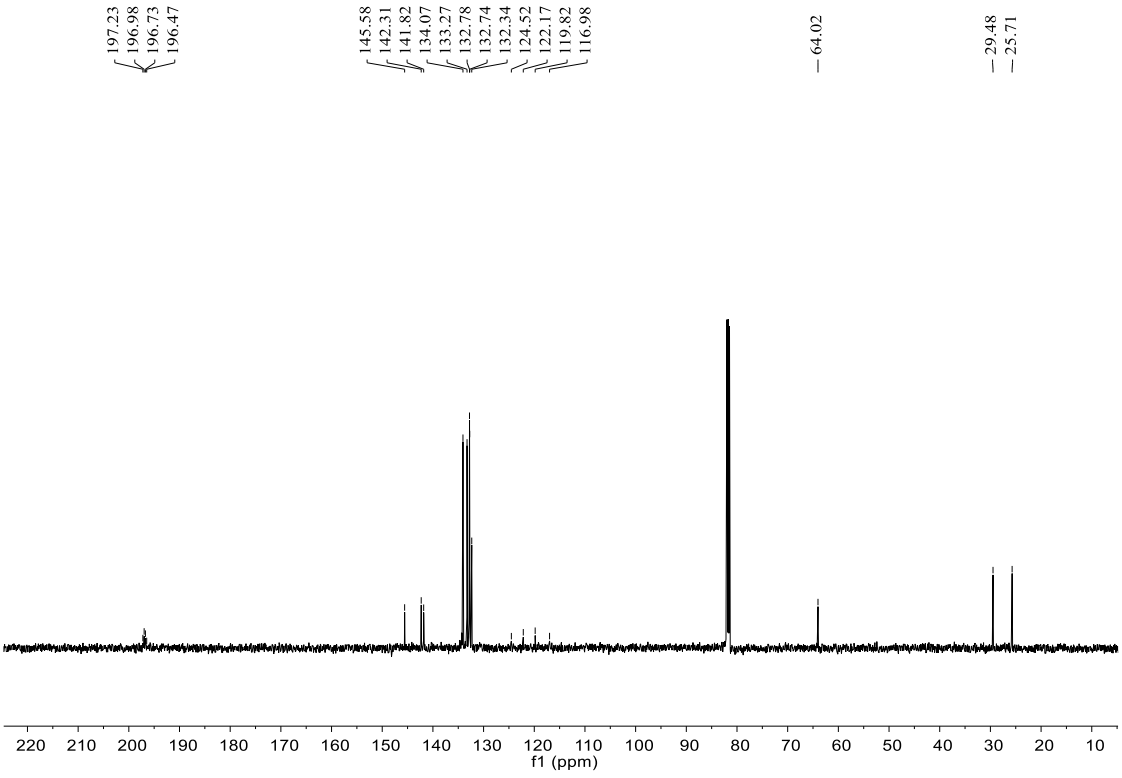


^{19}F NMR spectrum in $CDCl_3$.

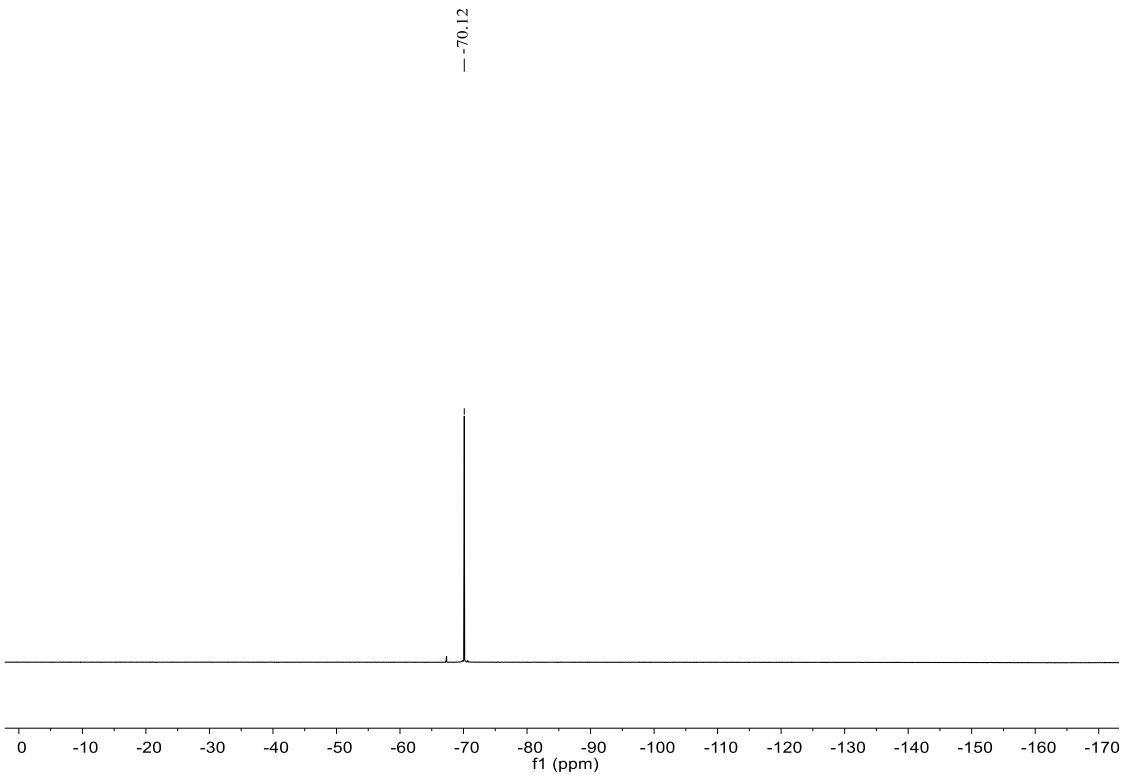
1,1,1-trifluoro-3-phenyl-3-(p-tolyl) butan-2-one (54c)



^{1}H NMR spectrum in $CDCl_3$.

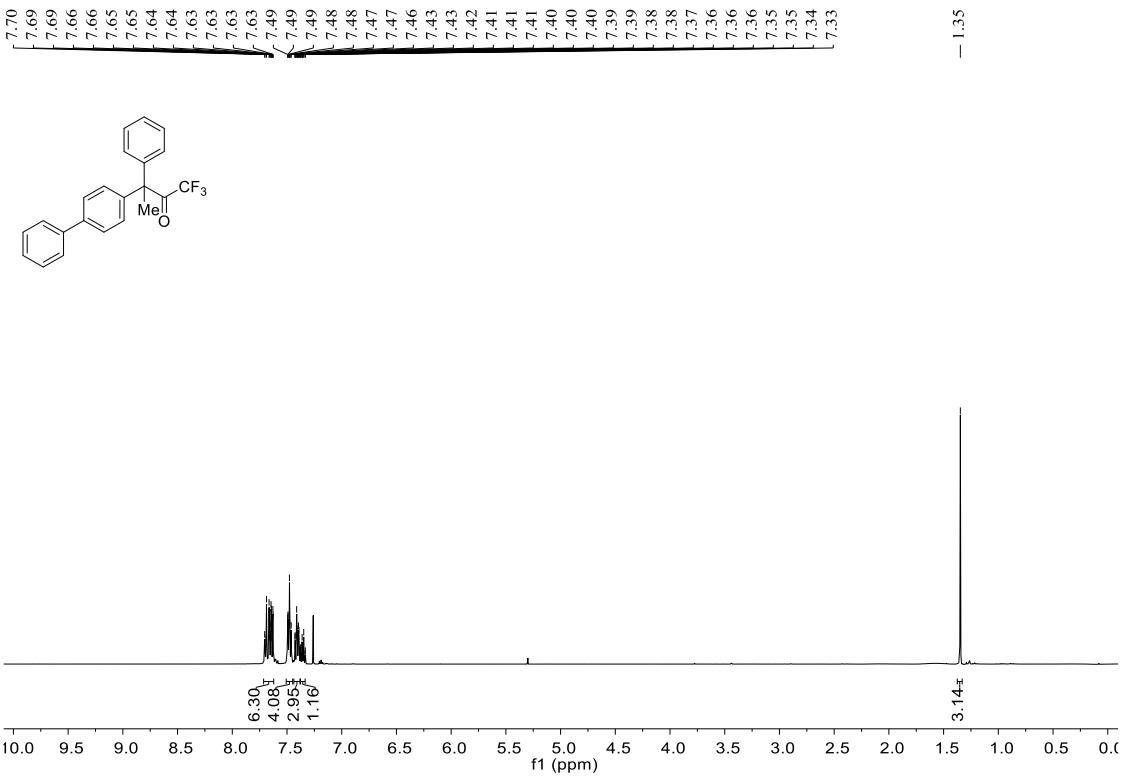


^{13}C NMR spectrum in $CDCl_3$.

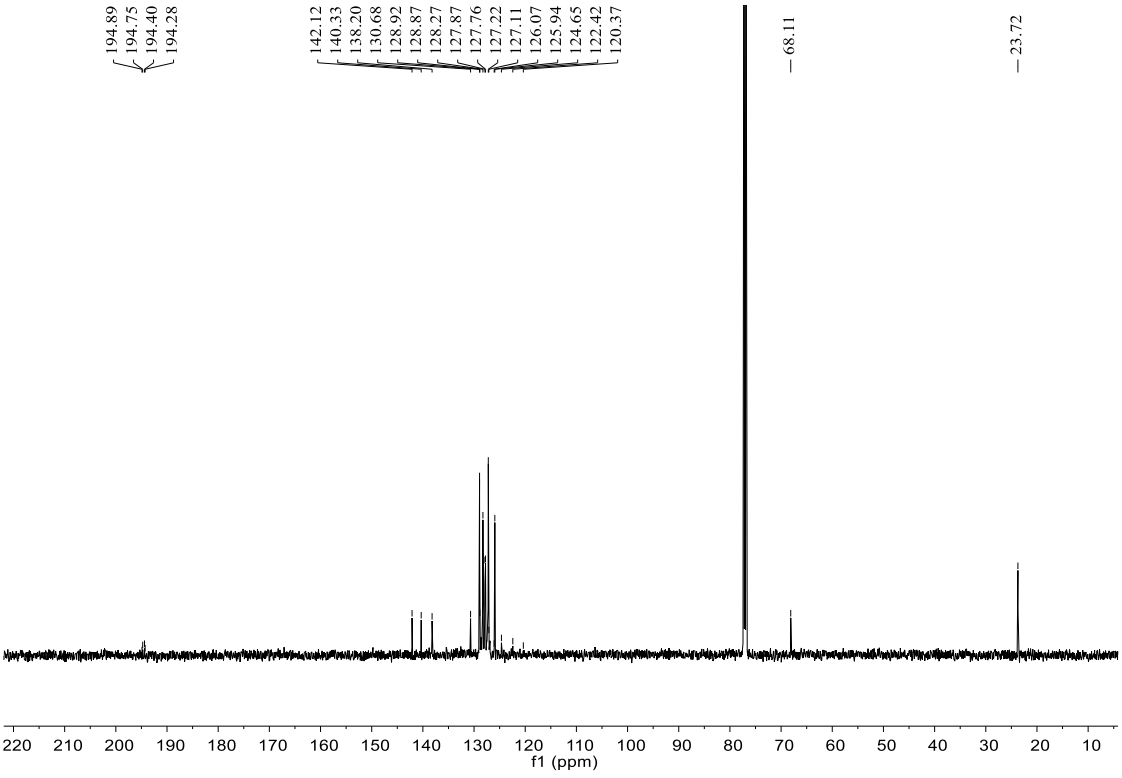


^{19}F NMR spectrum in $CDCl_3$.

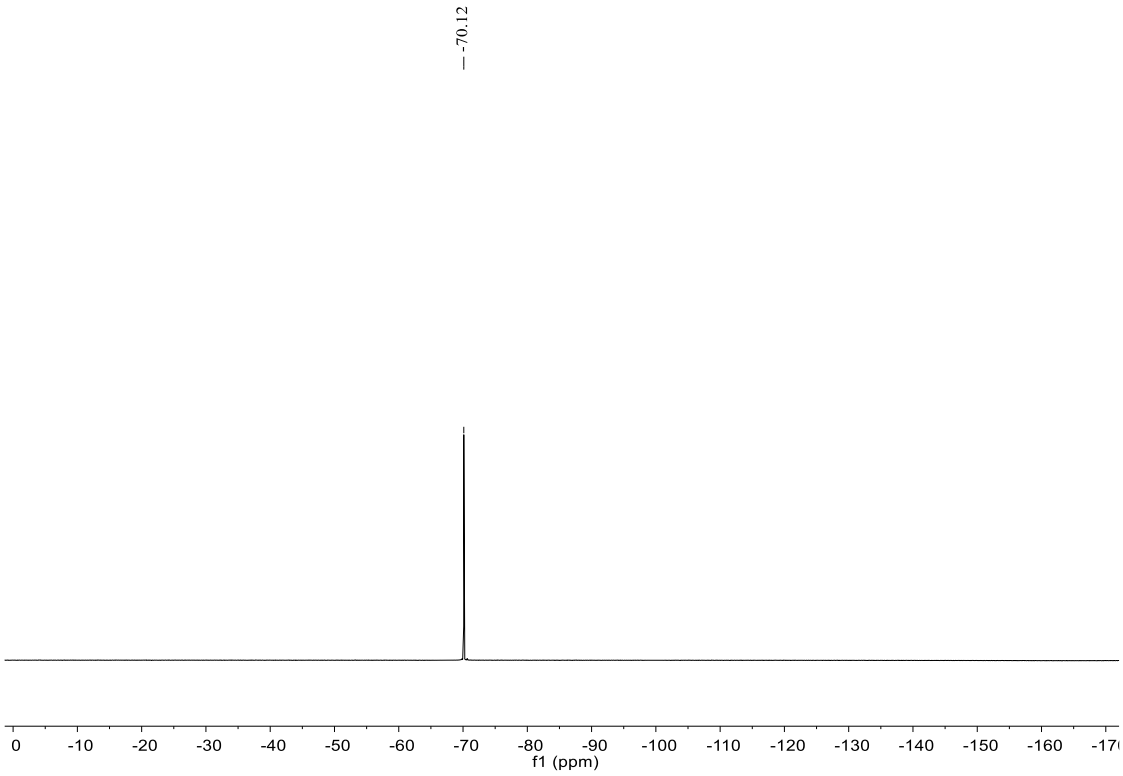
3-([1,1'-biphenyl]-4-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (55c)



^{1}H NMR spectrum in $CDCl_3$.

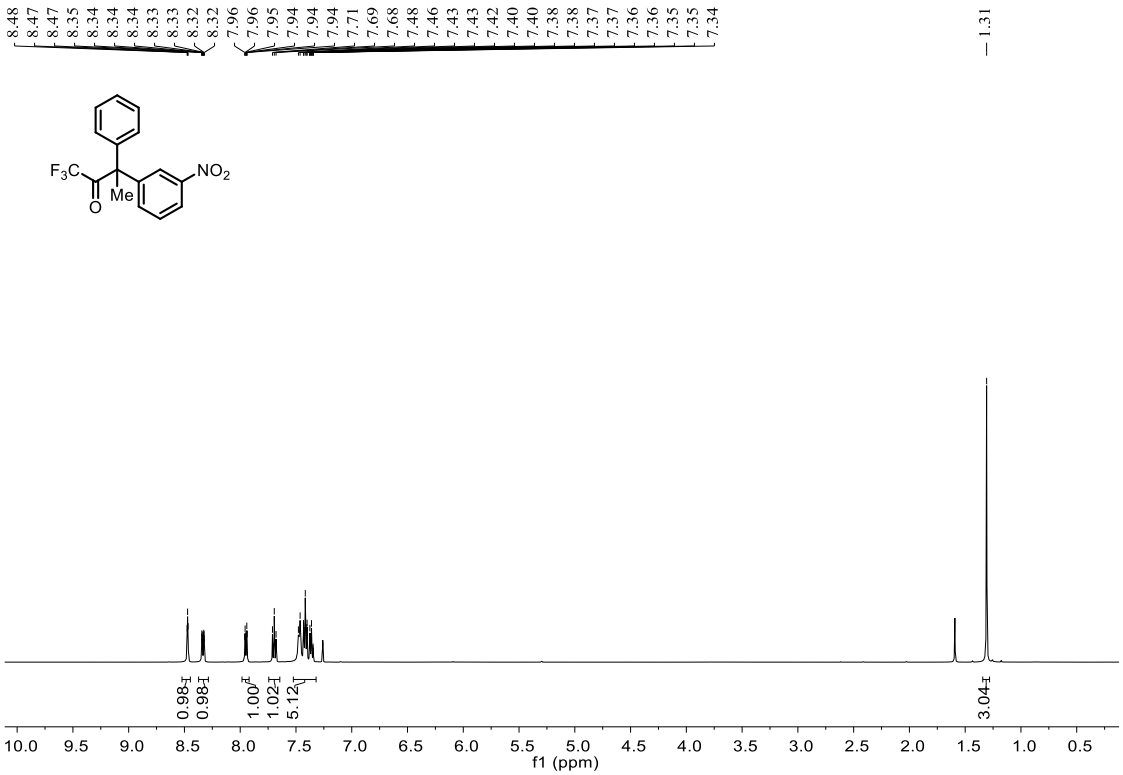


^{13}C NMR spectrum in $CDCl_3$.

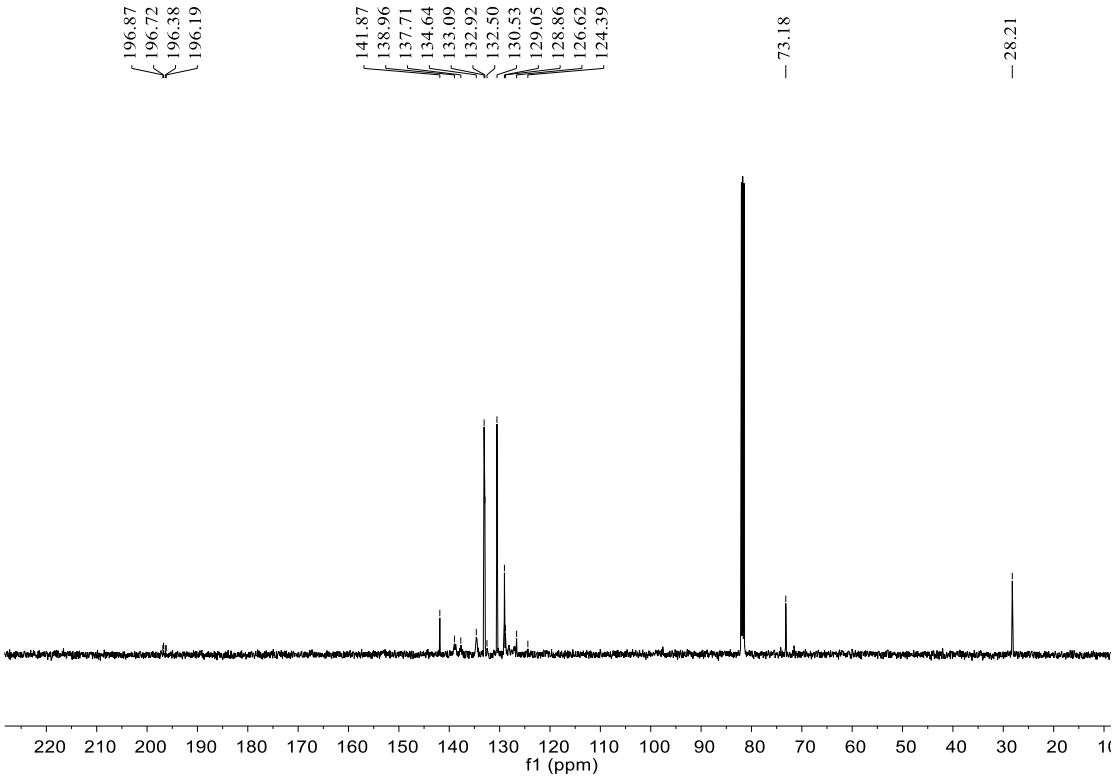


^{19}F NMR spectrum in $CDCl_3$.

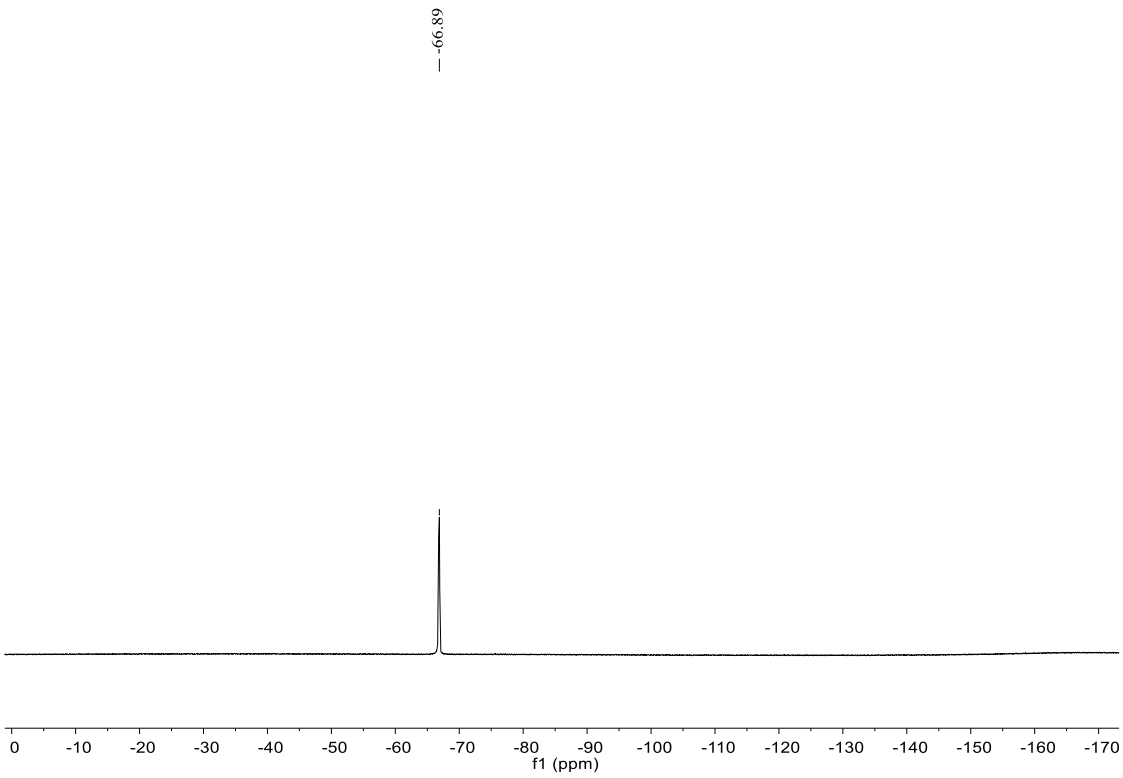
1,1,1-trifluoro-3-(3-nitrophenyl)-3-phenylbutan-2-one (56c)



^{1}H NMR spectrum in $CDCl_3$.

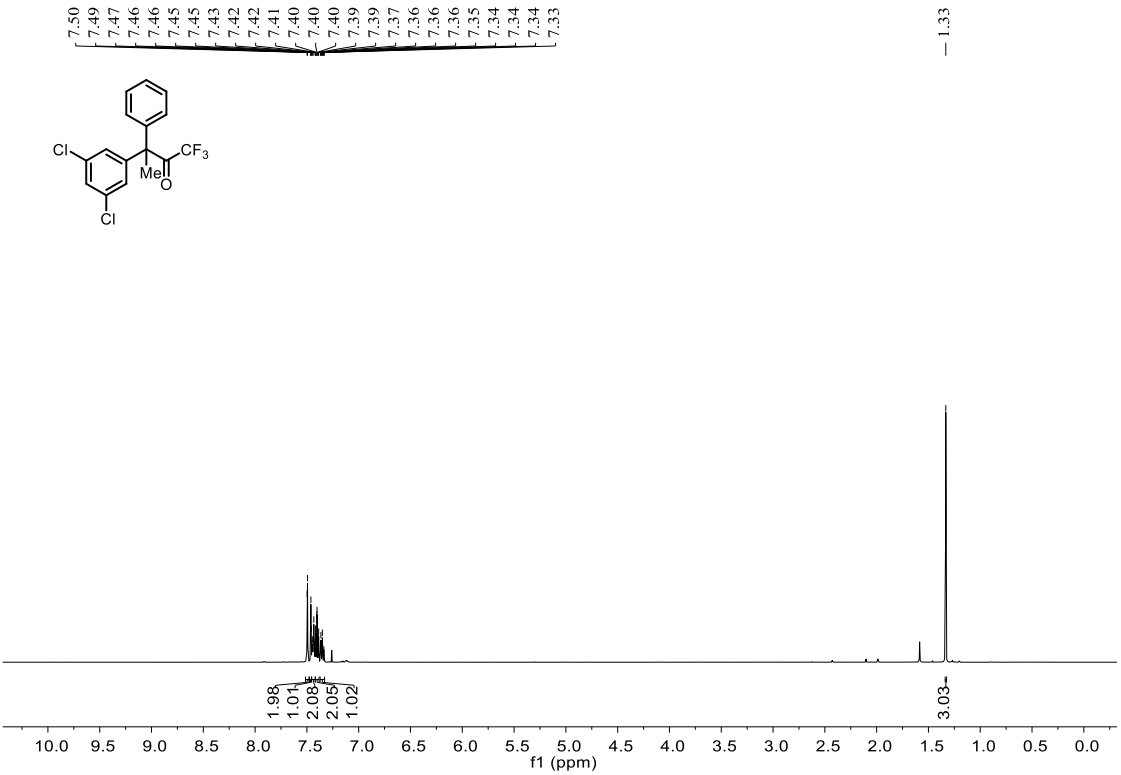


^{13}C NMR spectrum in $CDCl_3$.

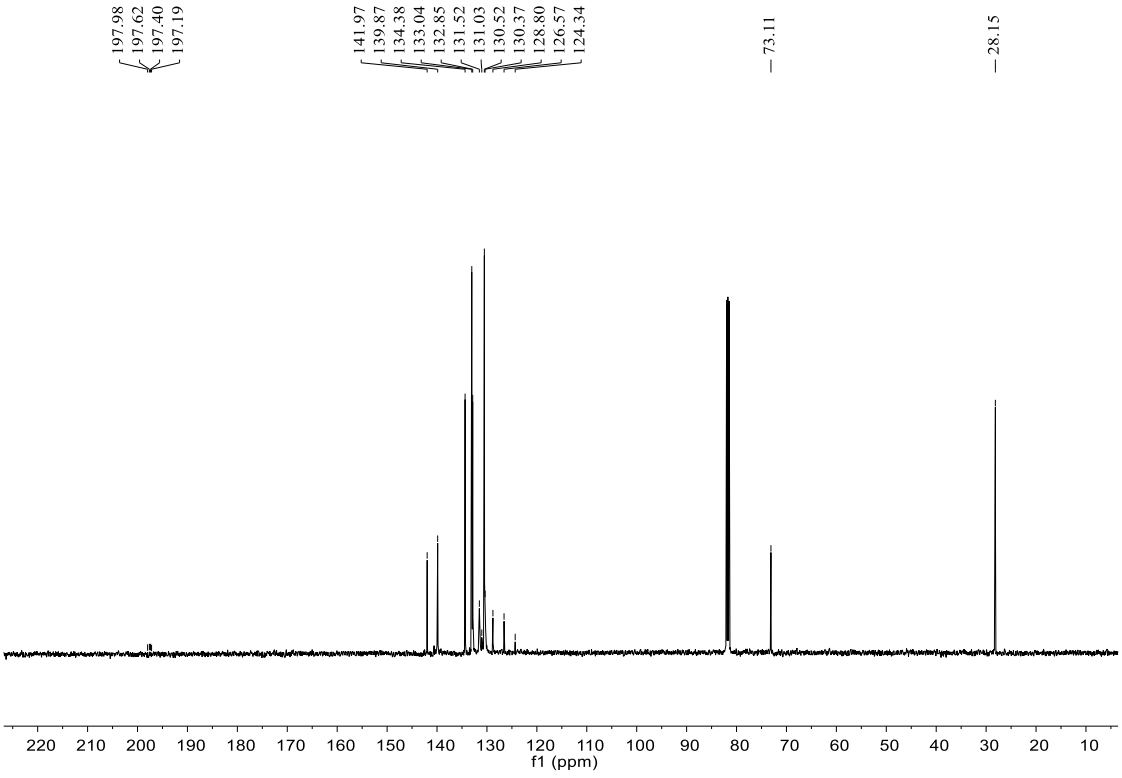


^{19}F NMR spectrum in $CDCl_3$.

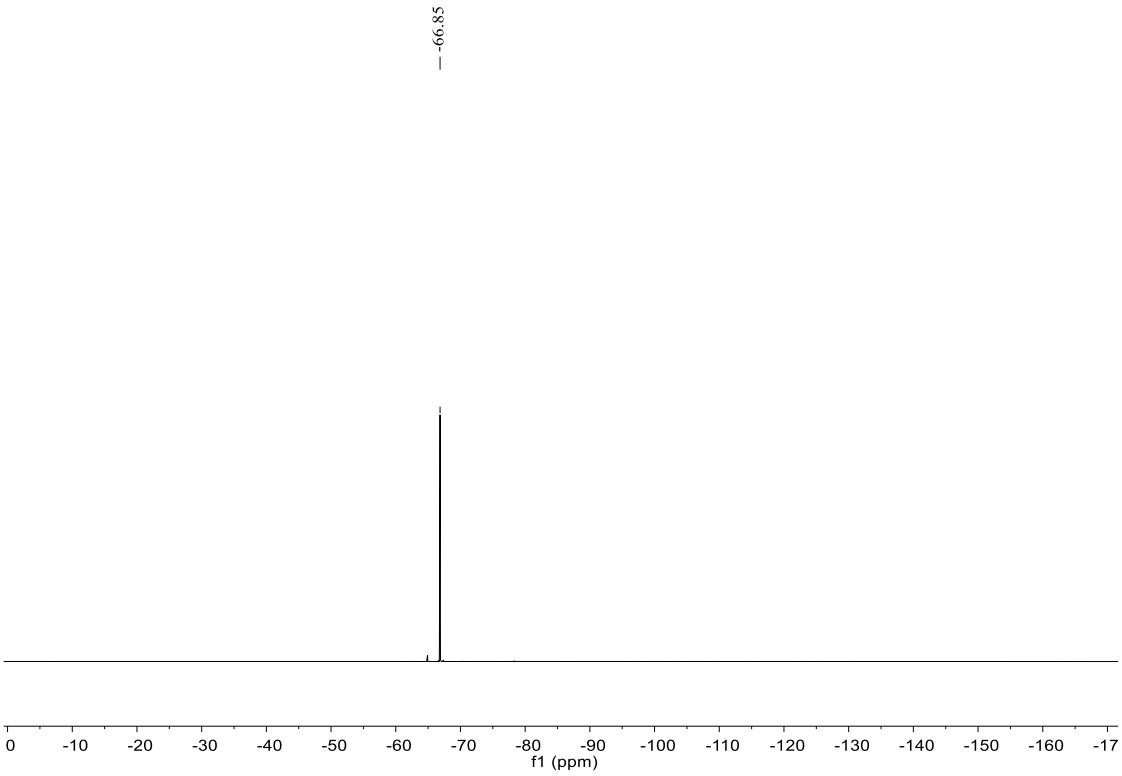
3-(3,5-dichlorophenyl)-1,1,1-trifluoro-3-phenylbutan-2-one (57c)



^{1}H NMR spectrum in $CDCl_3$.

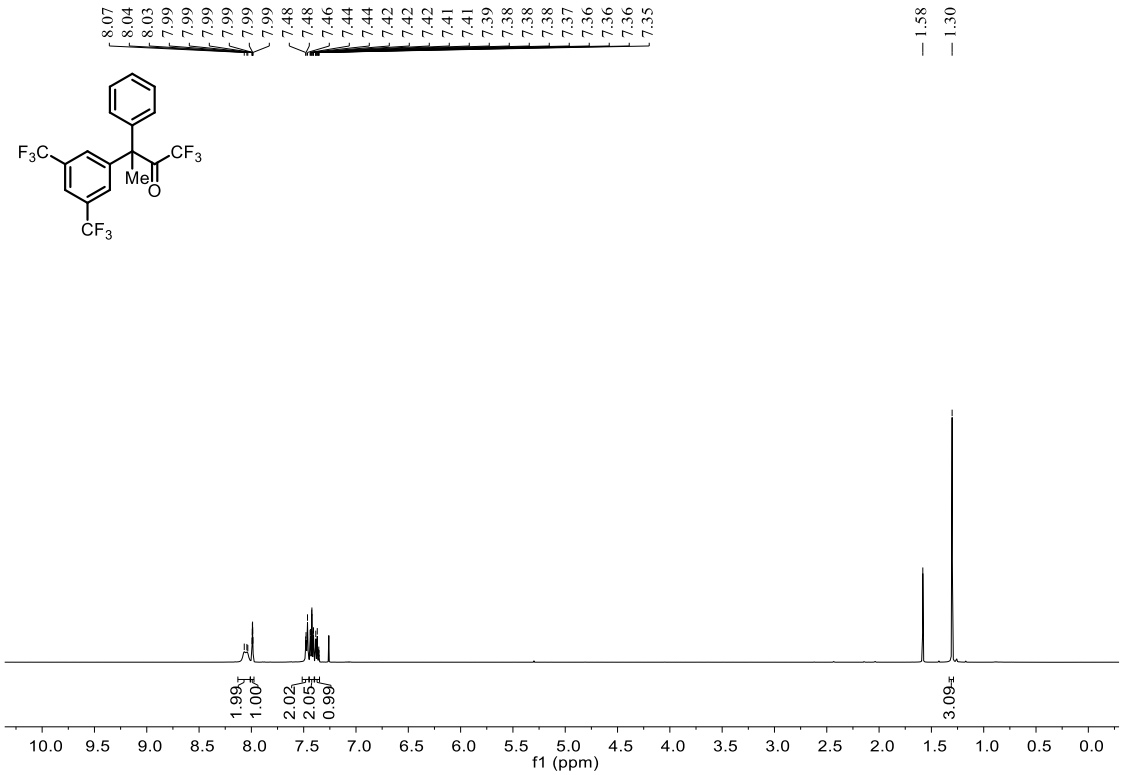


^{13}C NMR spectrum in $CDCl_3$

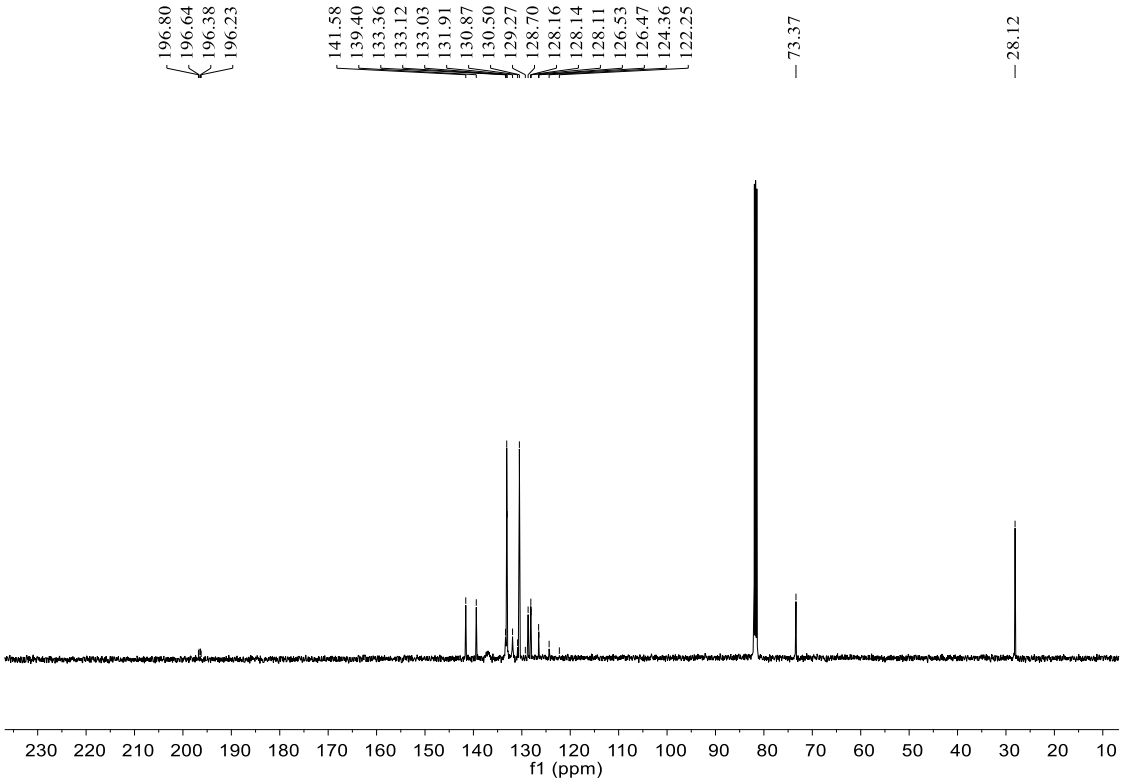


^{19}F NMR spectrum in $CDCl_3$.

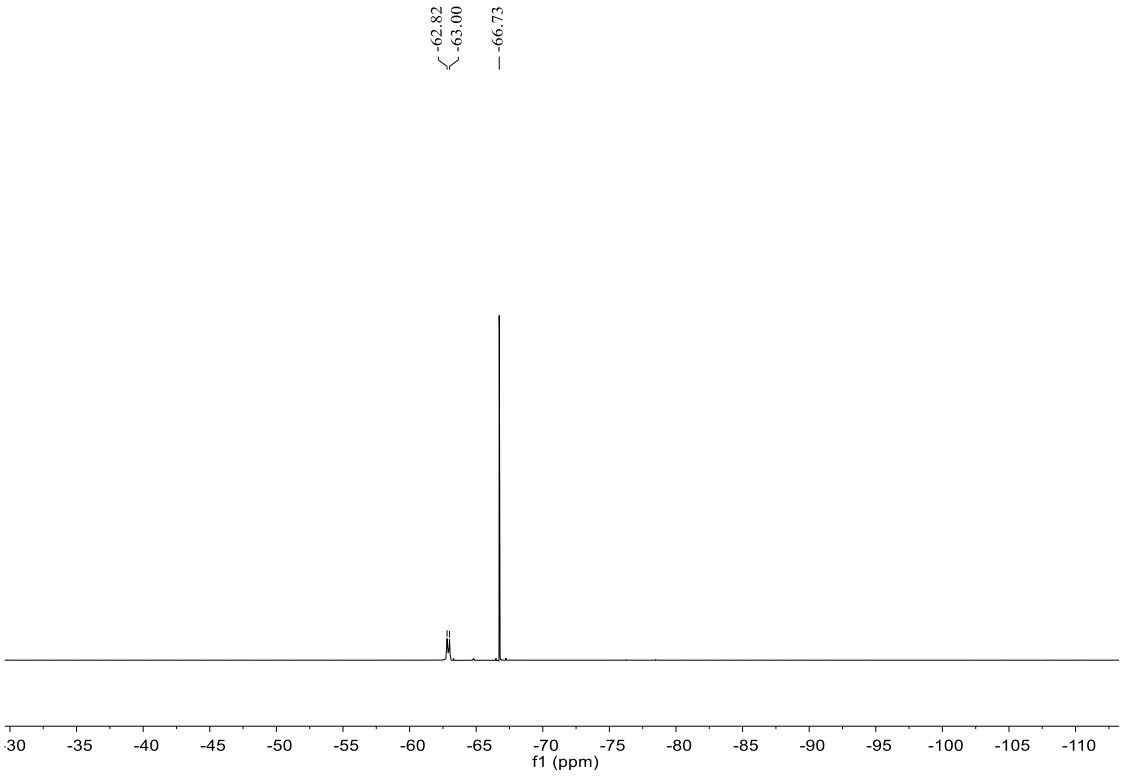
3-(3,5-bis(trifluoromethyl)phenyl)-1,1,1-trifluoro-3-phenylbutan-2-one (58c)



^{1}H NMR spectrum in $CDCl_3$.

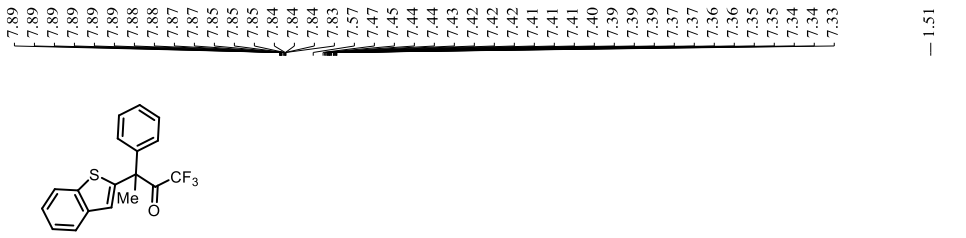


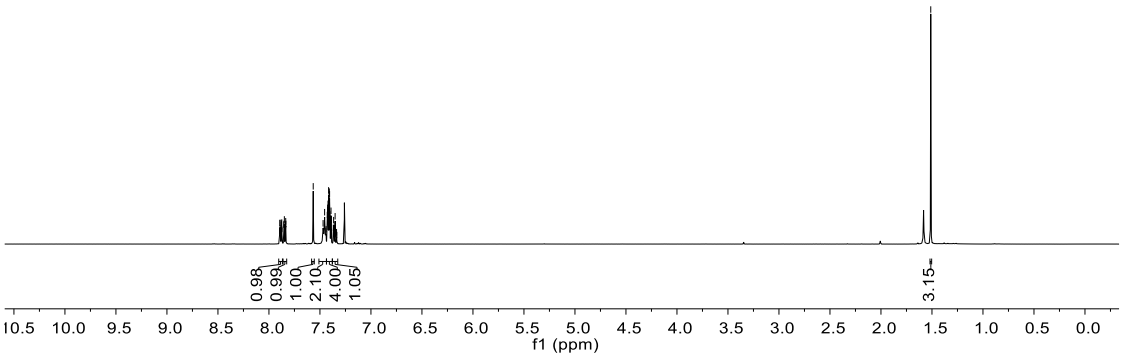
^{13}C NMR spectrum in $CDCl_3$.



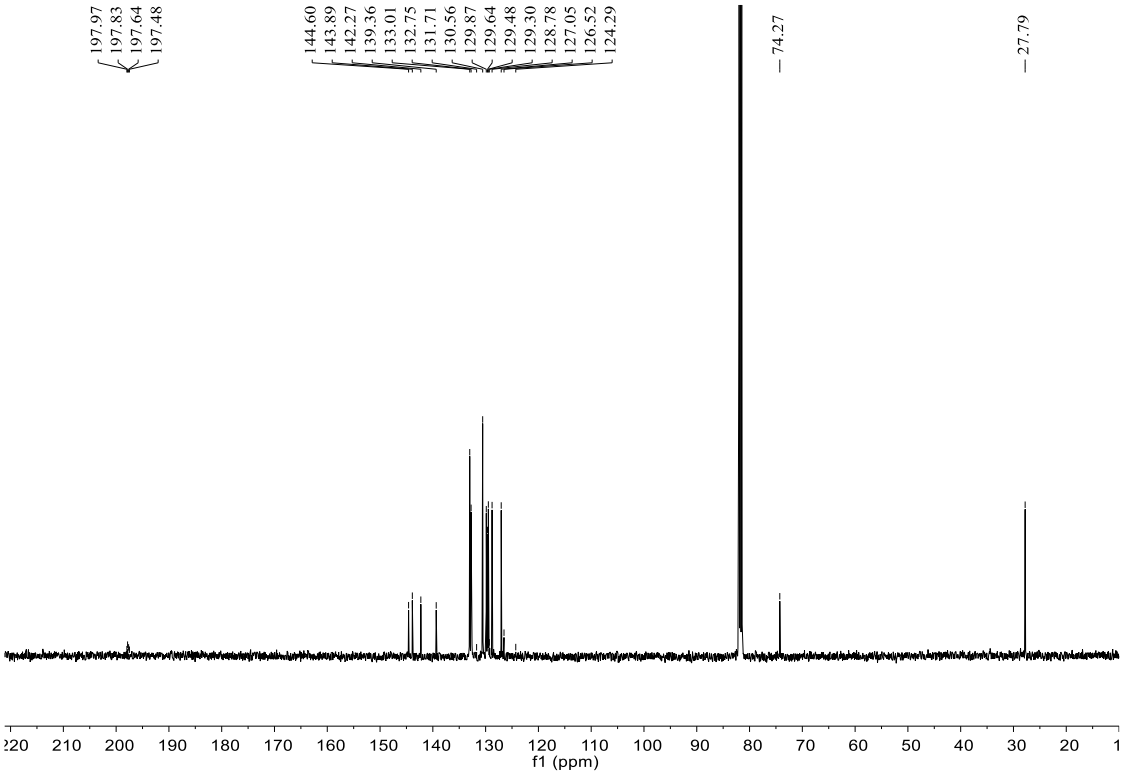
^{19}F NMR spectrum in $CDCl_3$.

3-(benzo[b]thiophen-2-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (59c)

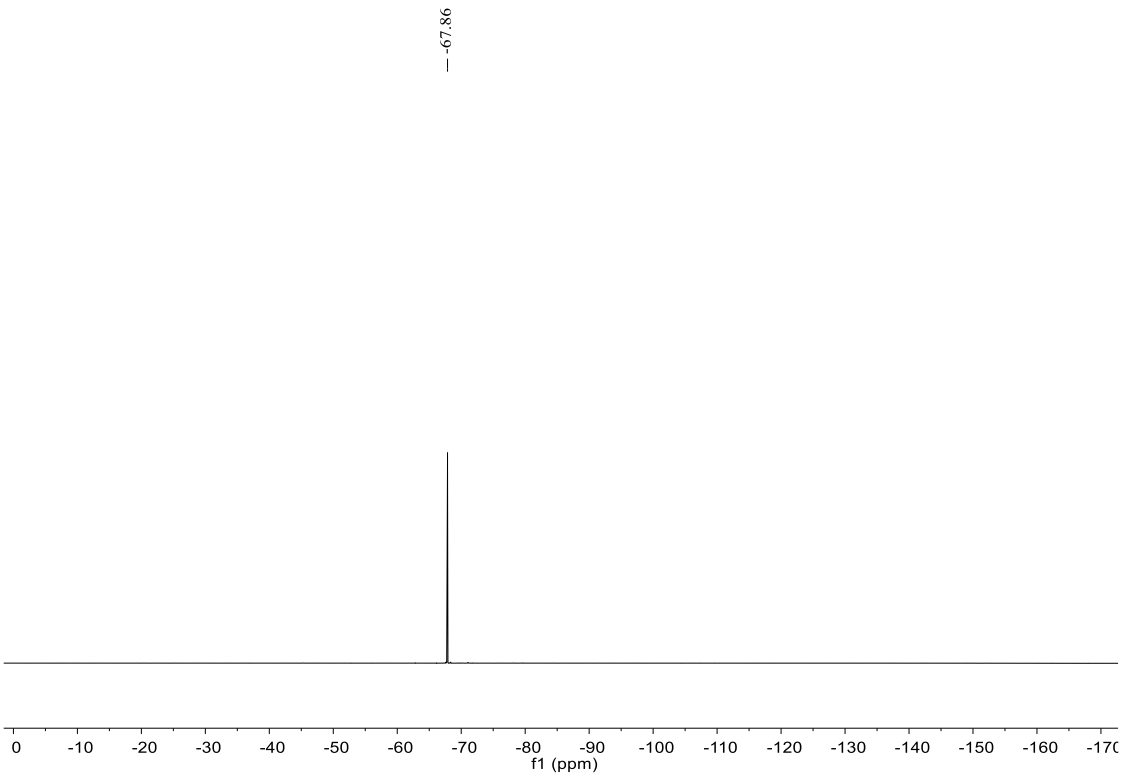




^{1}H NMR spectrum in $CDCl_3$.

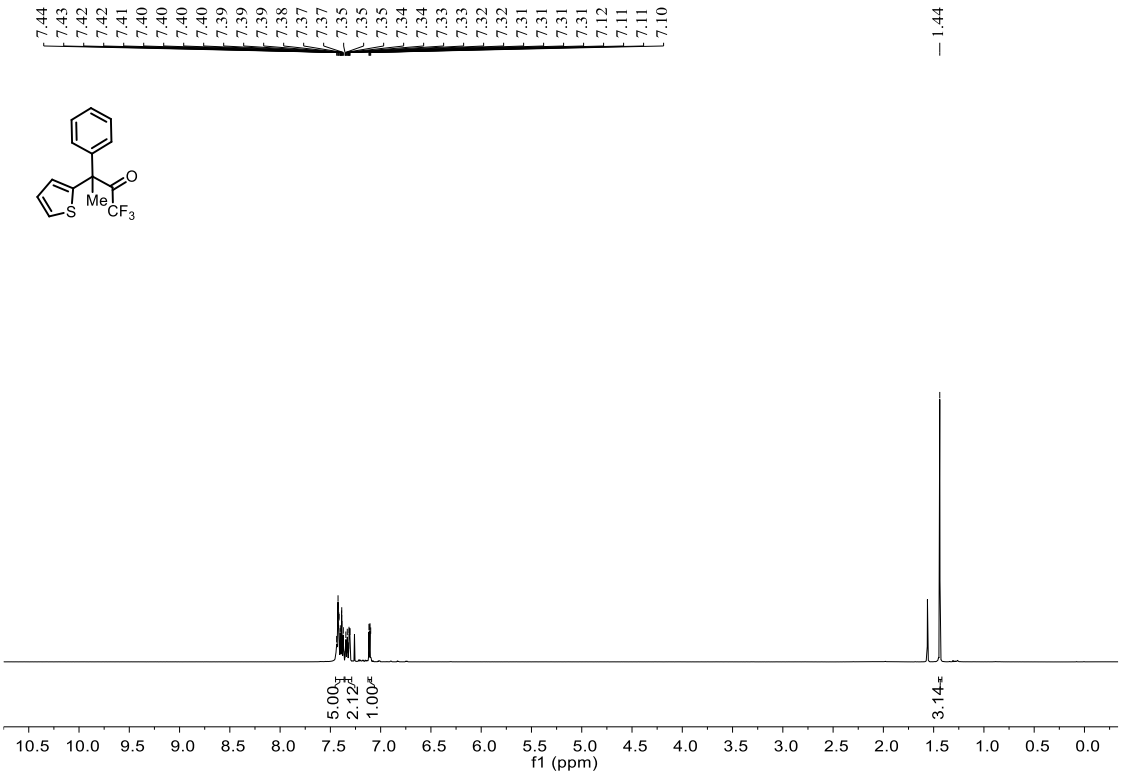


^{13}C NMR spectrum in $CDCl_3$.

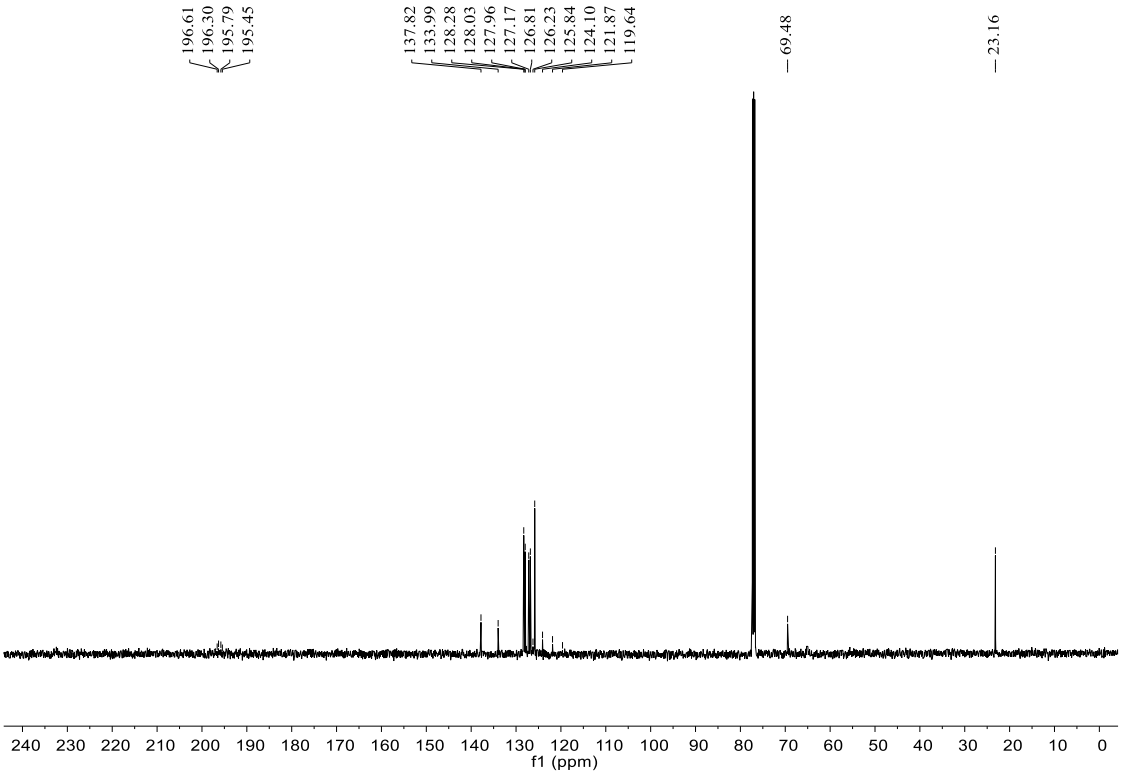


^{19}F NMR spectrum in $CDCl_3$.

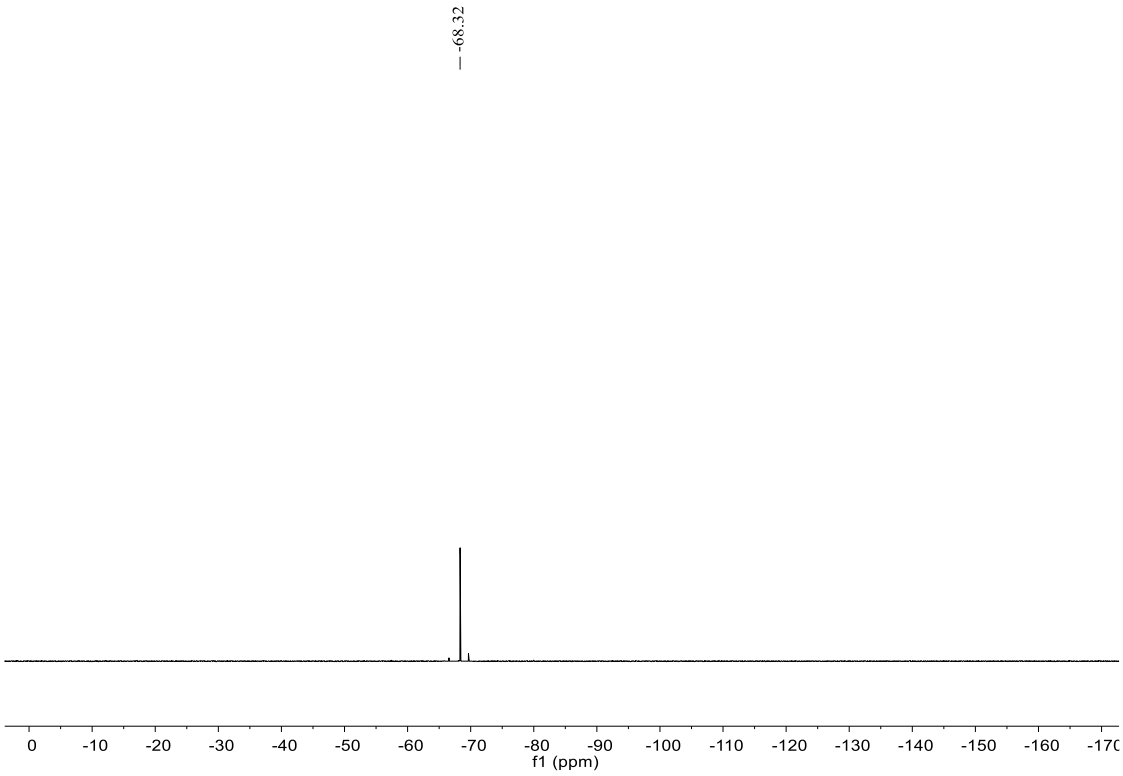
1,1,1-trifluoro-3-phenyl-3-(thiophen-2-yl) butan-2-one (60c)



^{1}H NMR spectrum in $CDCl_3$.

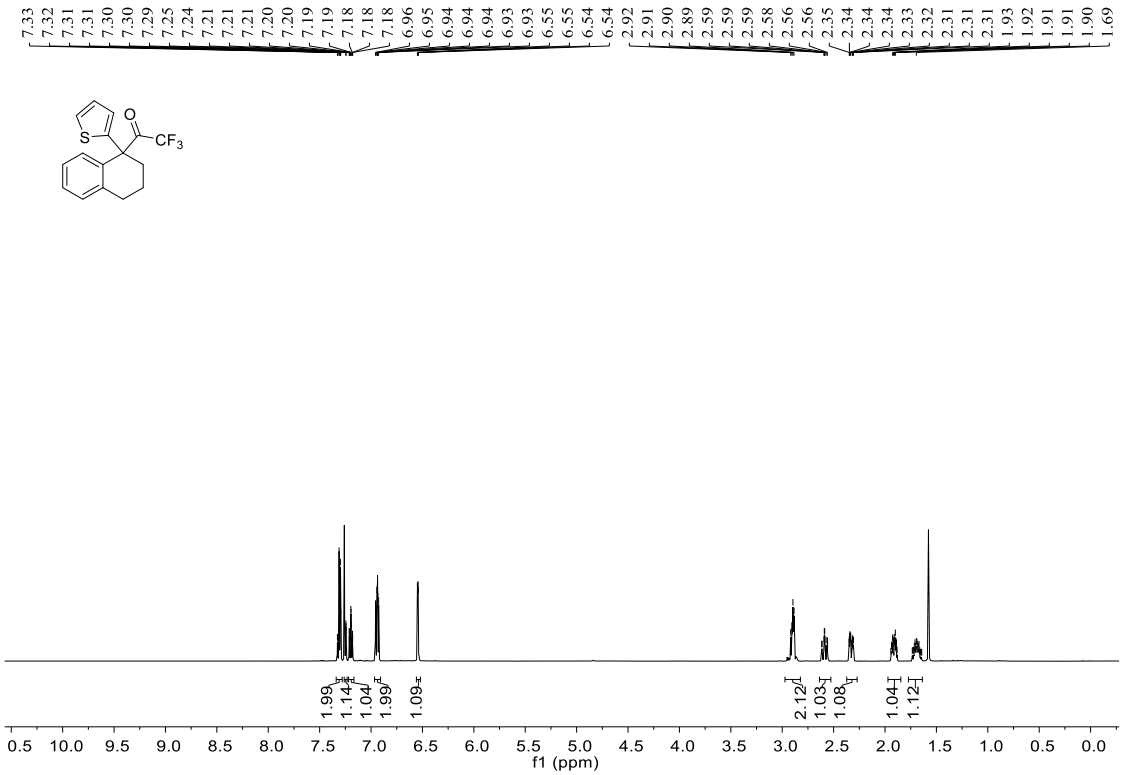


^{13}C NMR spectrum in $CDCl_3$.

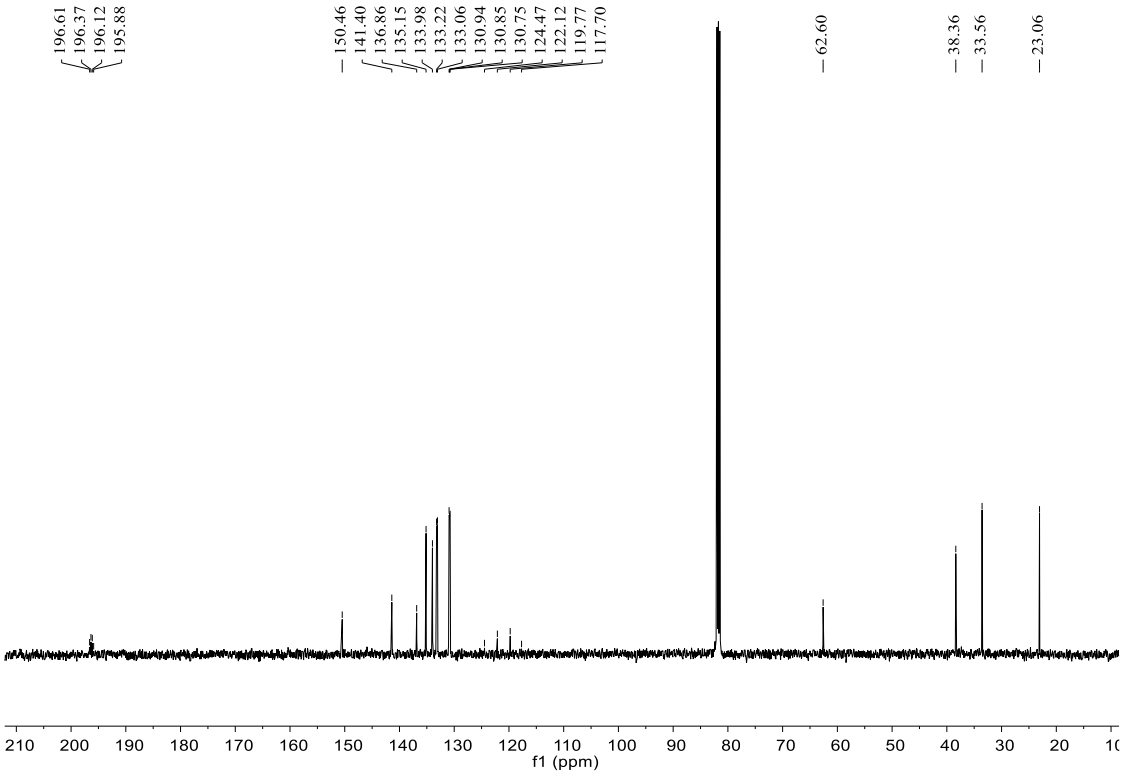


^{19}F NMR spectrum in $CDCl_3$.

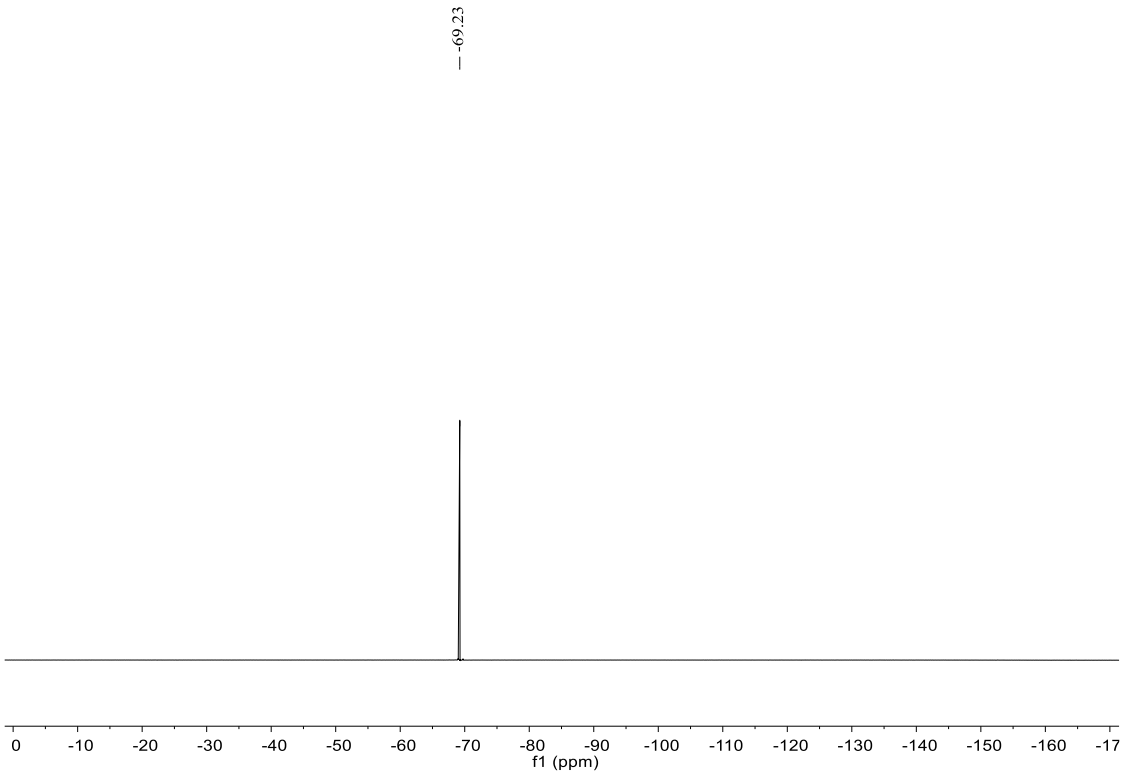
2,2,2-trifluoro-1-(1-(thiophen-2-yl)-1,2,3,4-tetrahydronaphthalen-1-yl) ethan-1-one (61c)



^{1}H NMR spectrum in $CDCl_3$.

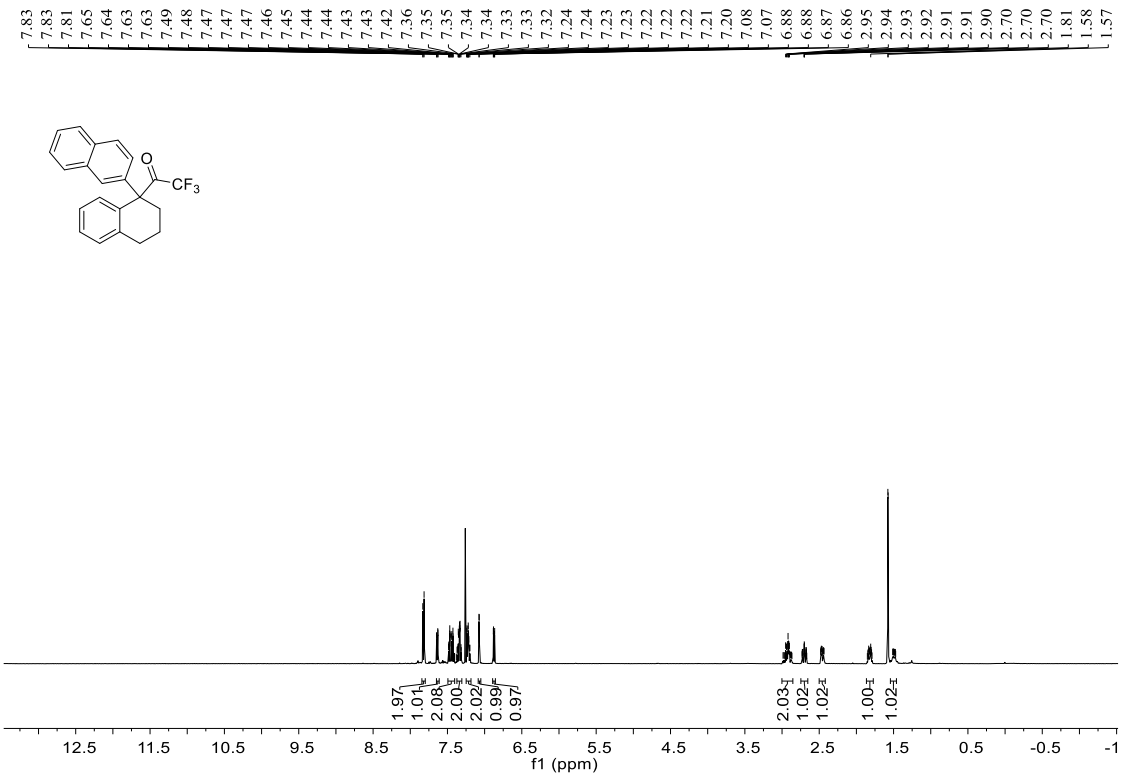


^{13}C NMR spectrum in $CDCl_3$.

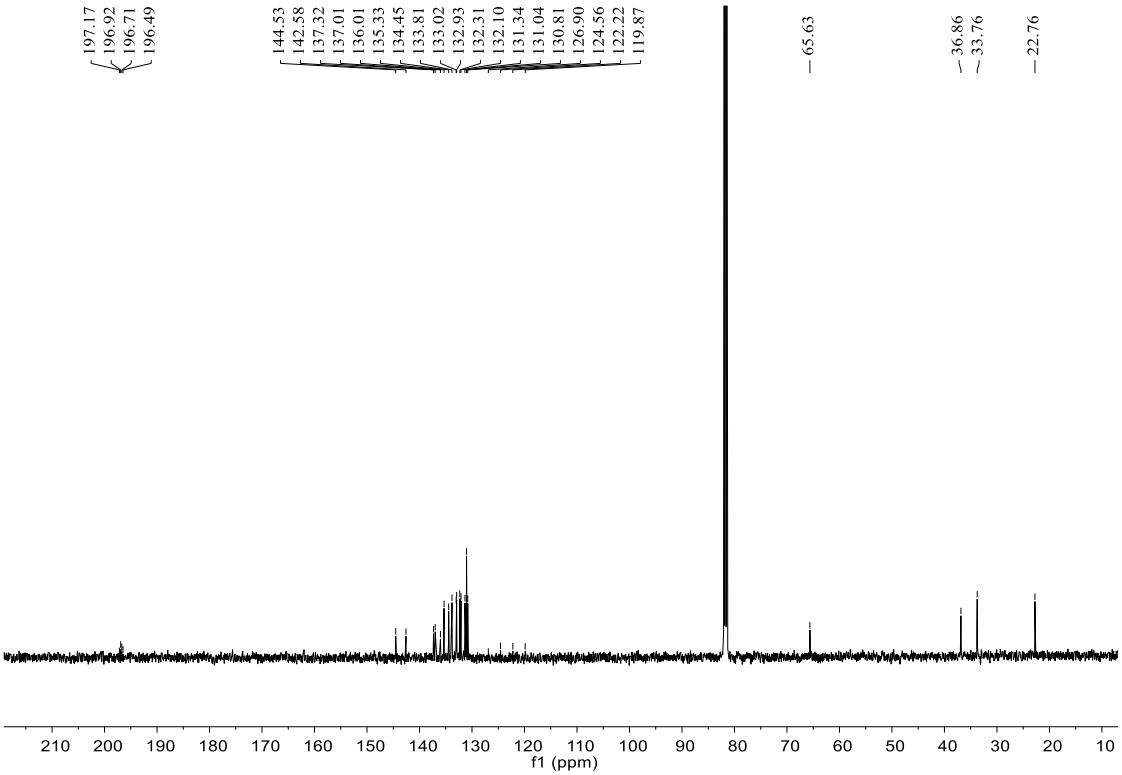


^{19}F NMR spectrum in $CDCl_3$.

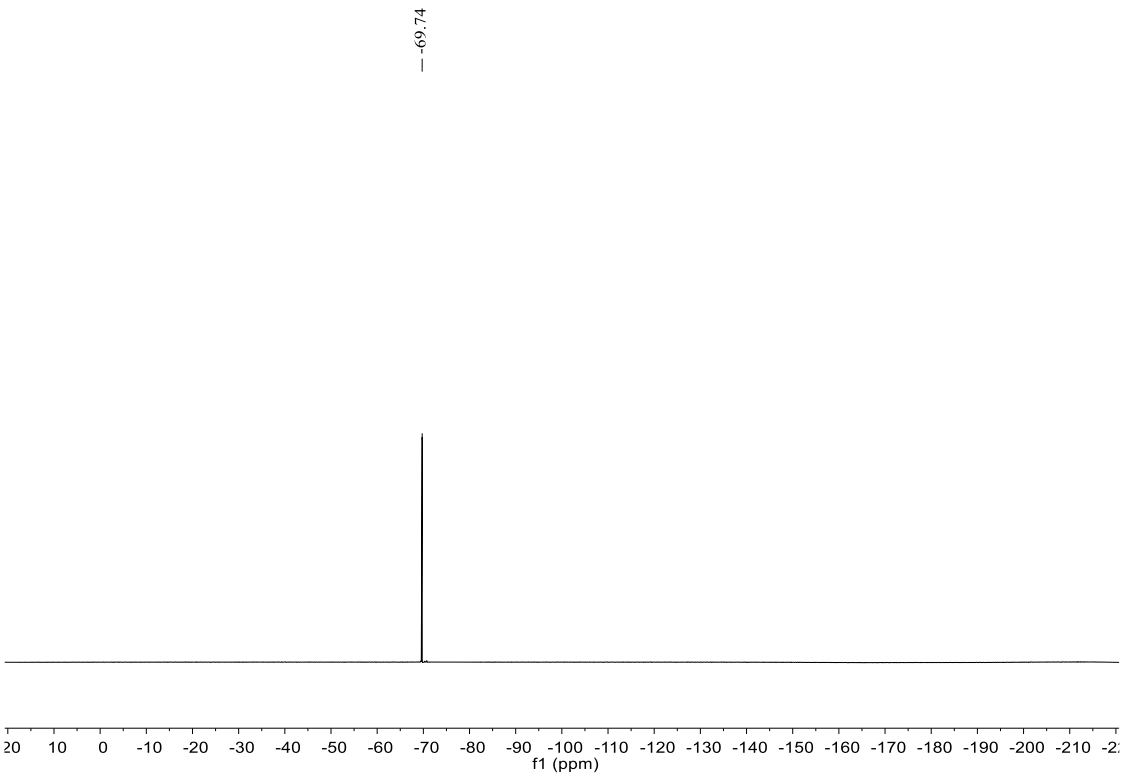
1-(3,4-dihydro-[1,2'-binaphthalen]-1(2H)-yl)-2,2,2-trifluoroethan-1-one (62c)



^{1}H NMR spectrum in $CDCl_3$.

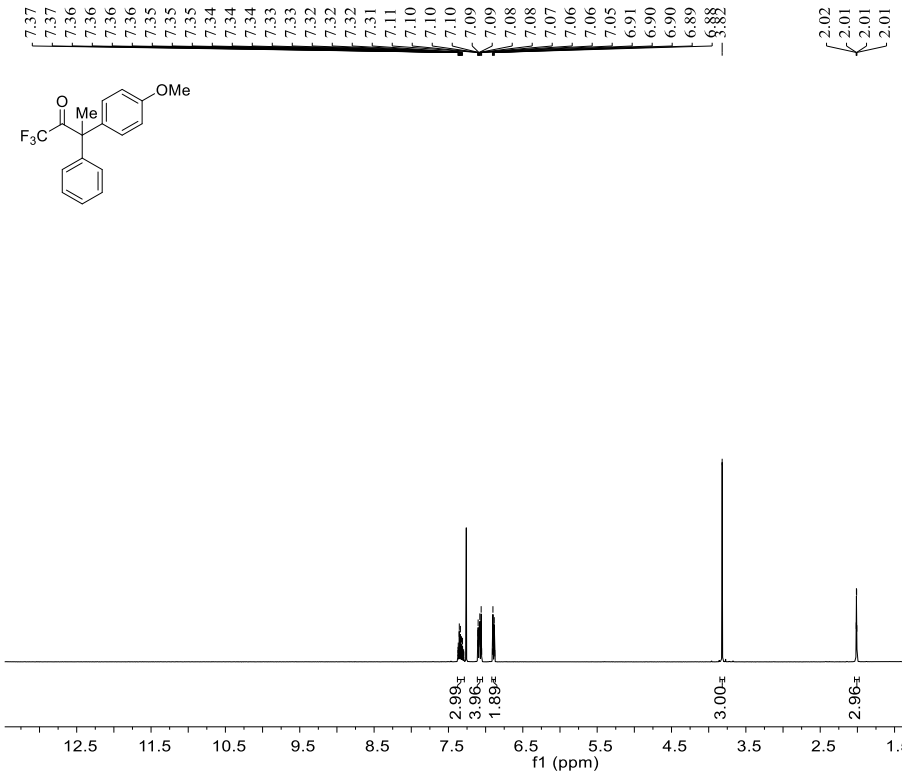


^{13}C NMR spectrum in $CDCl_3$.

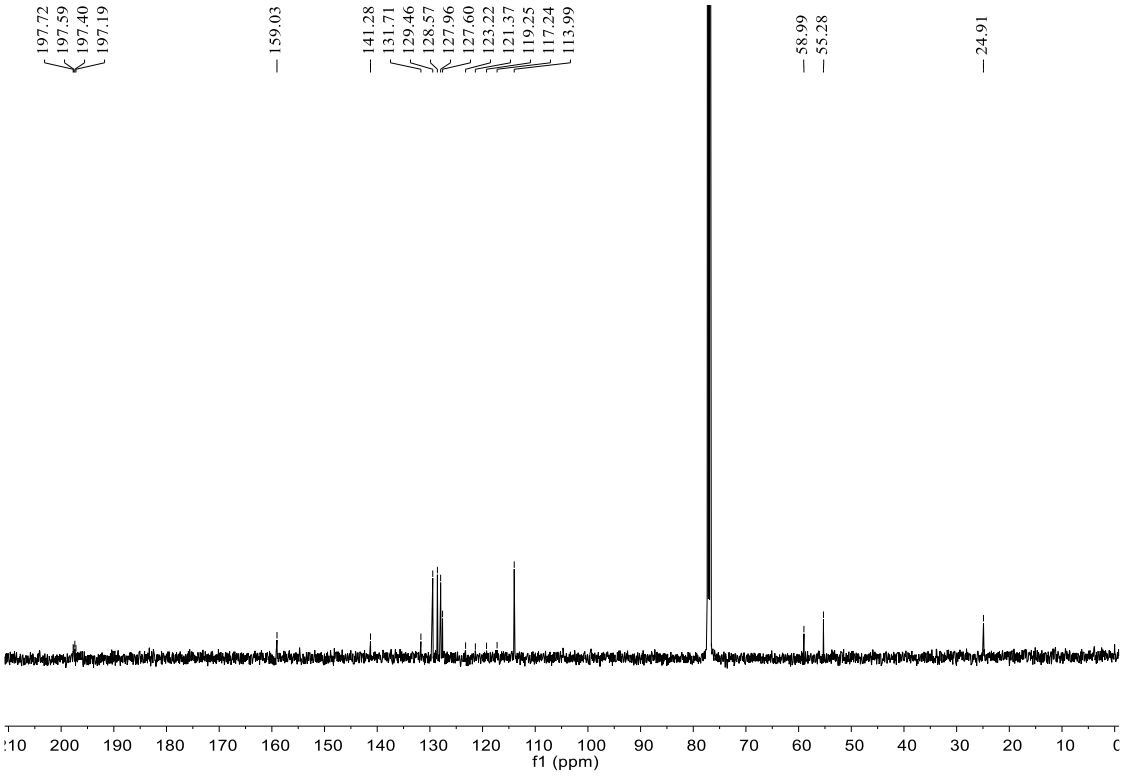


^{19}F NMR spectrum in $CDCl_3$.

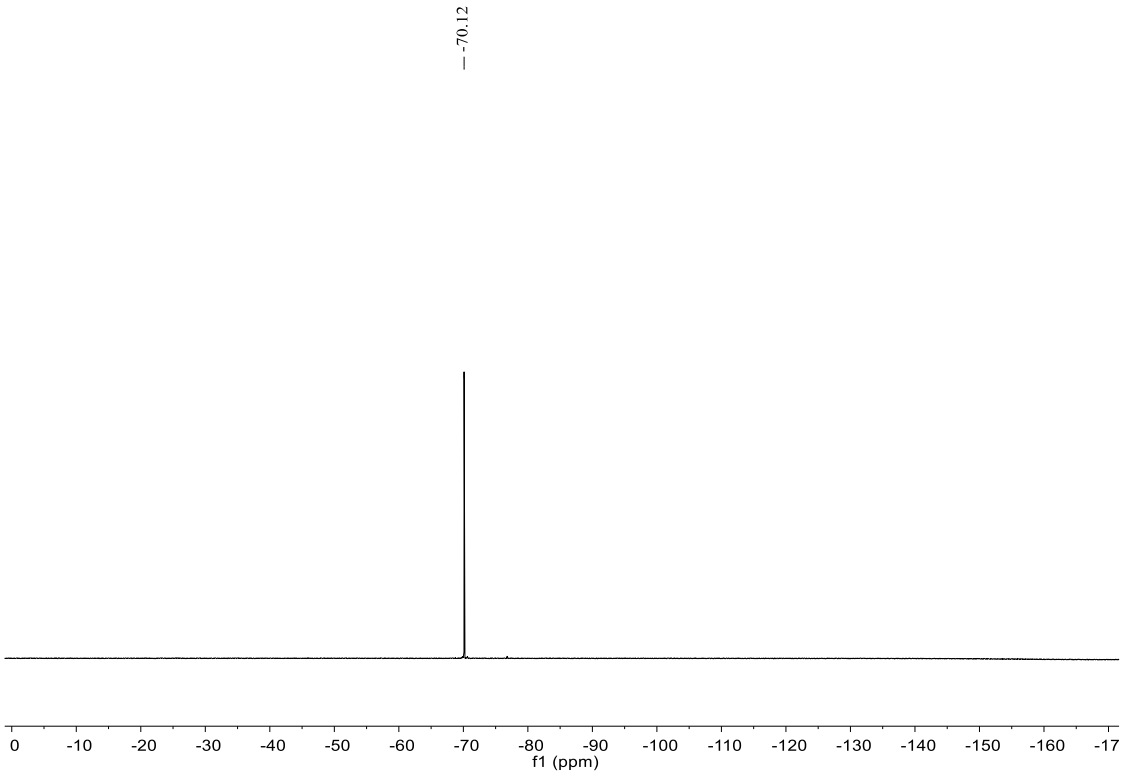
1,1,1-trifluoro-3-(4-methoxyphenyl)-3-phenylbutan-2-one (63c)



^{1}H NMR spectrum in $CDCl_3$.

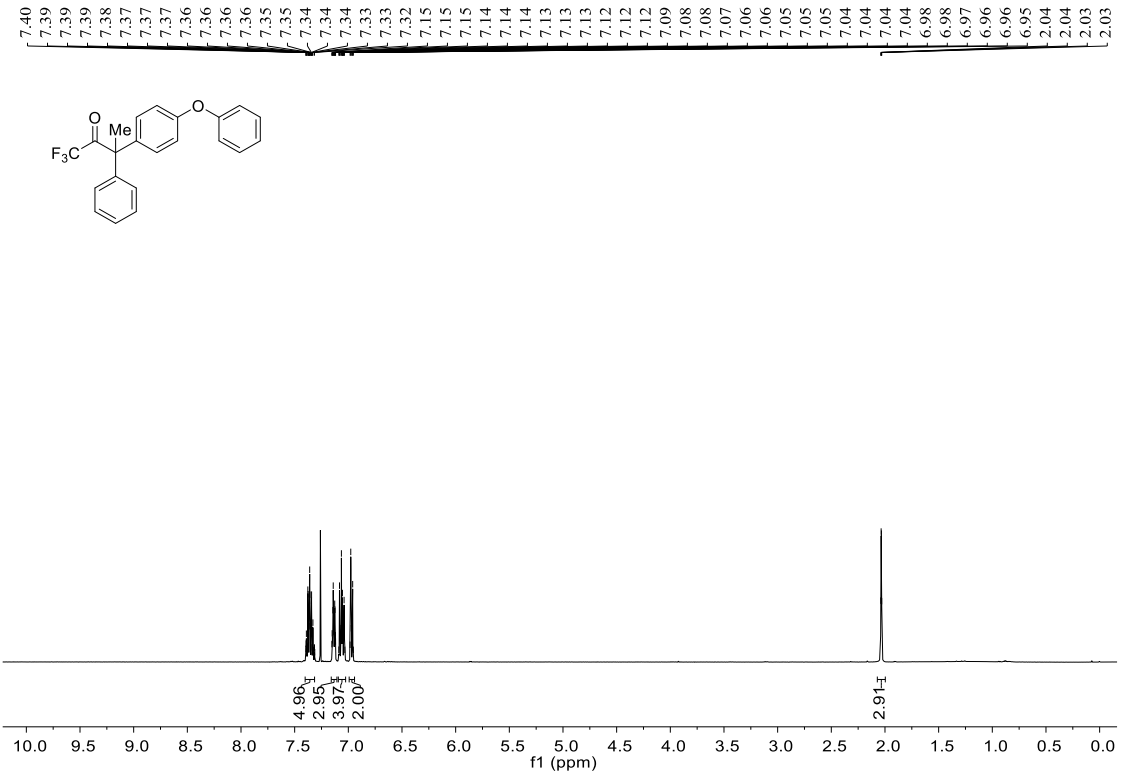


^{13}C NMR spectrum in $CDCl_3$.

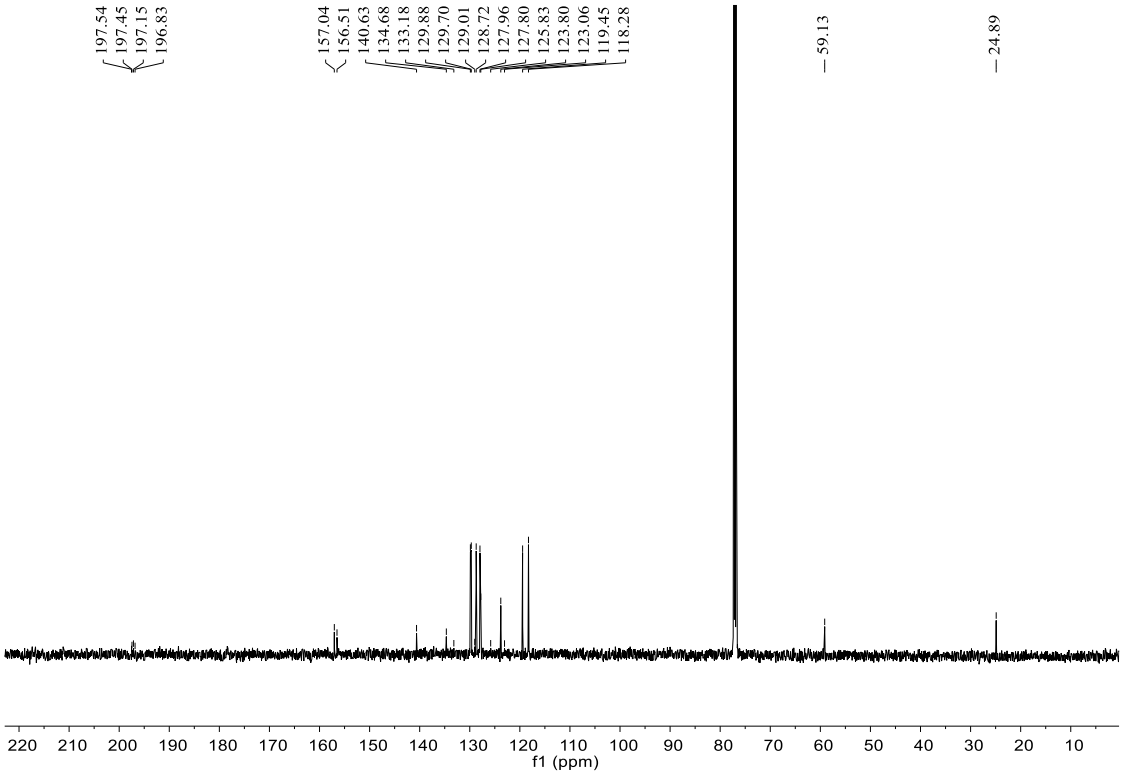


^{19}F NMR spectrum in $CDCl_3$.

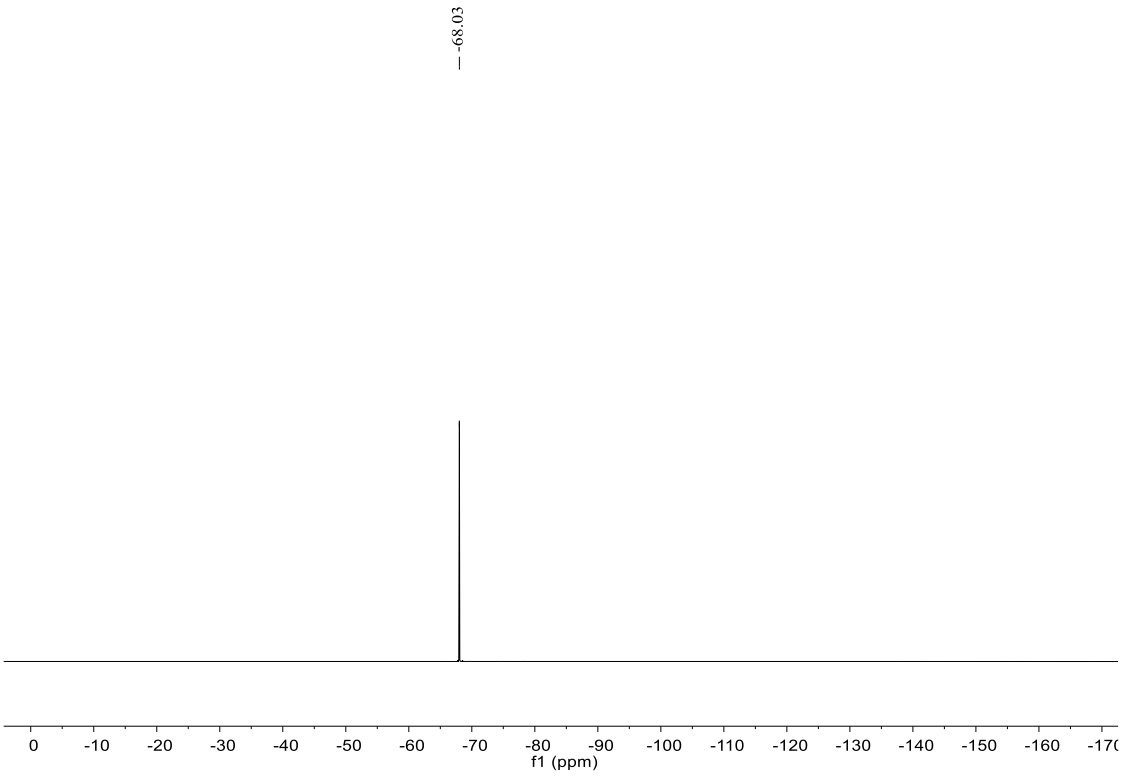
1,1,1-trifluoro-3-(4-phenoxyphenyl)-3-phenylbutan-2-one (64c)



^{1}H NMR spectrum in $CDCl_3$.

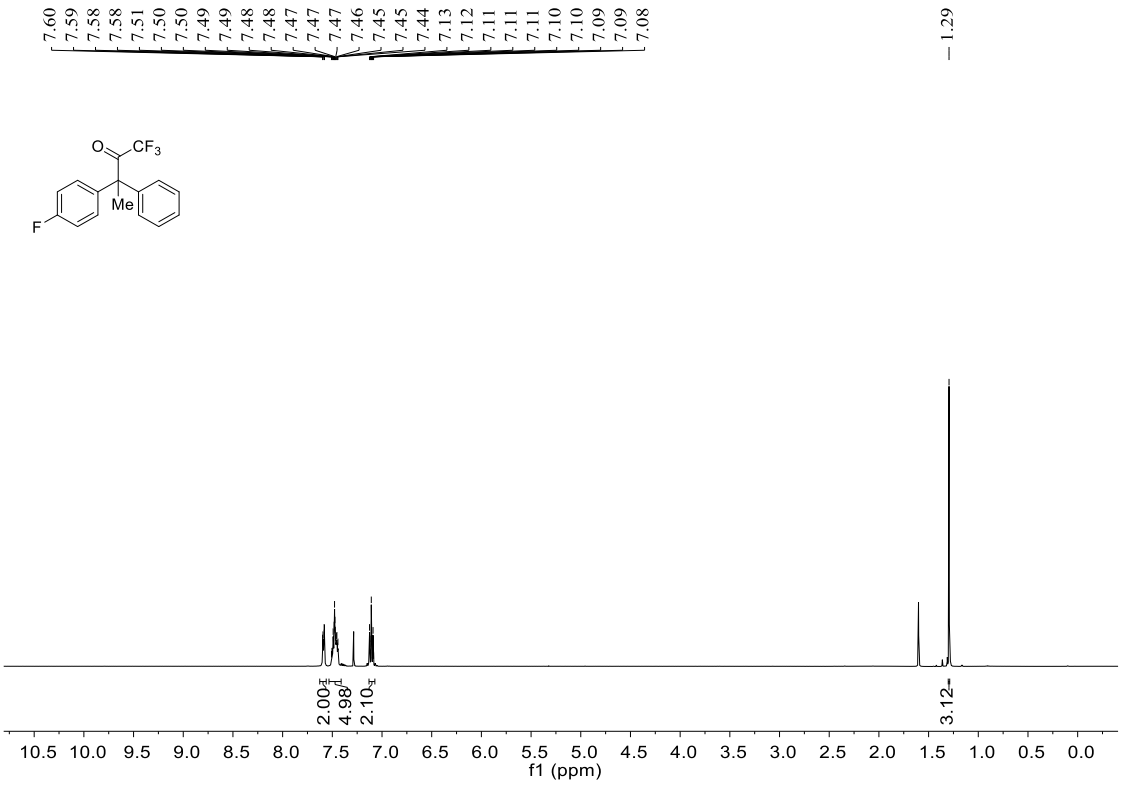


^{13}C NMR spectrum in $CDCl_3$.

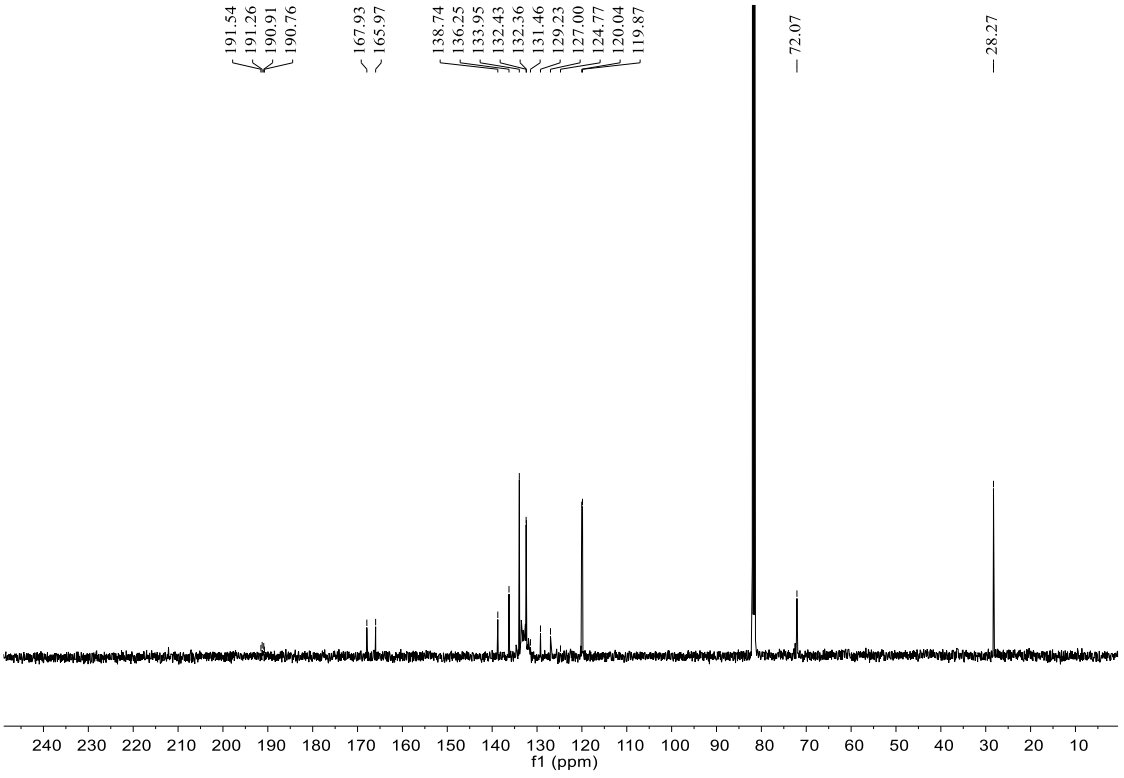


^{19}F NMR spectrum in $CDCl_3$.

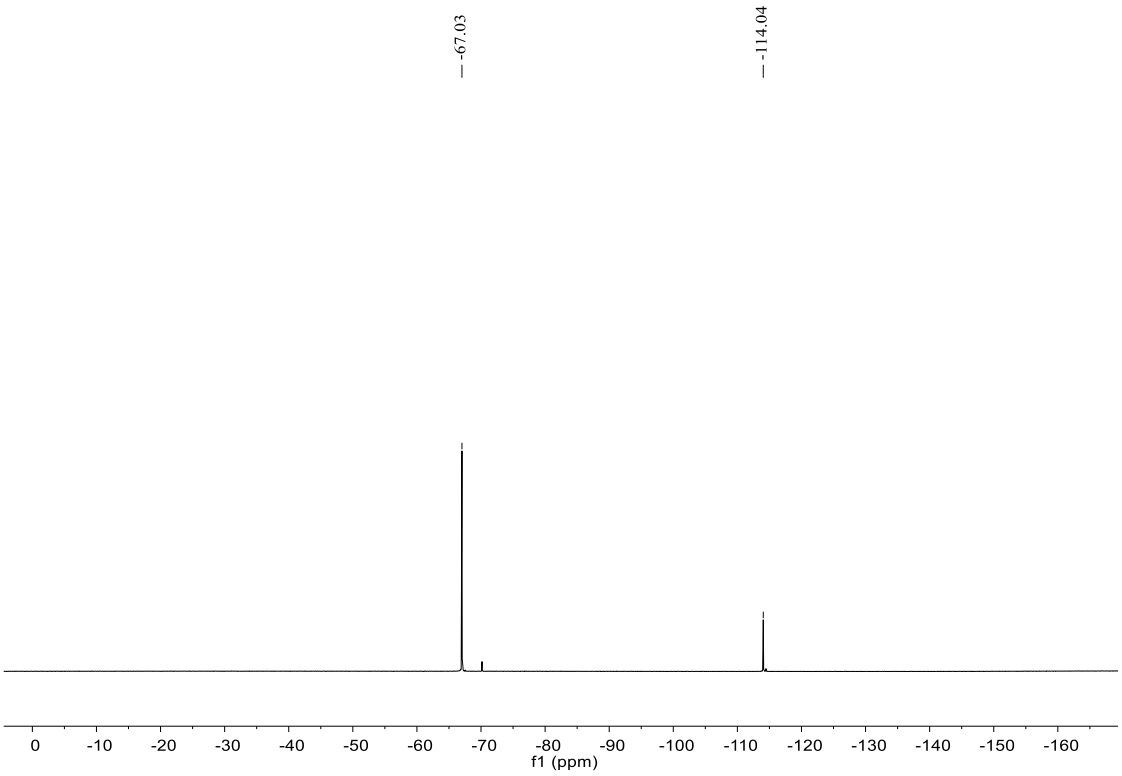
1,1,1-trifluoro-3-(4-fluorophenyl)-3-phenylbutan-2-one (65c)



^{1}H NMR spectrum in $CDCl_3$.

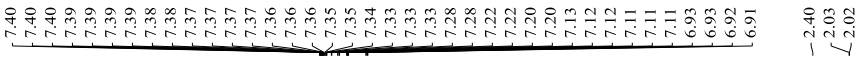


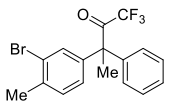
^{13}C NMR spectrum in $CDCl_3$.

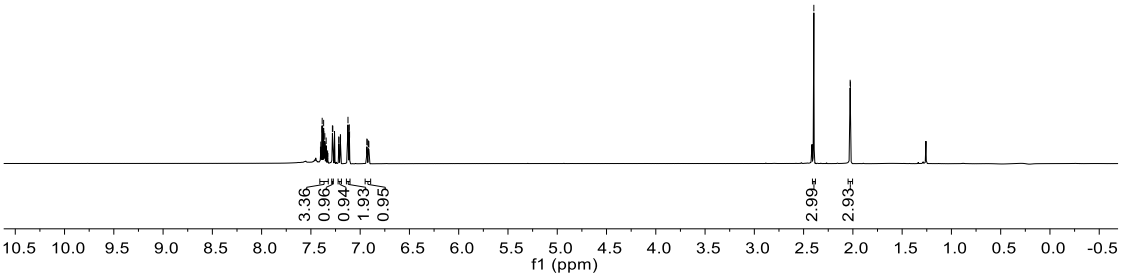


^{19}F NMR spectrum in $CDCl_3$.

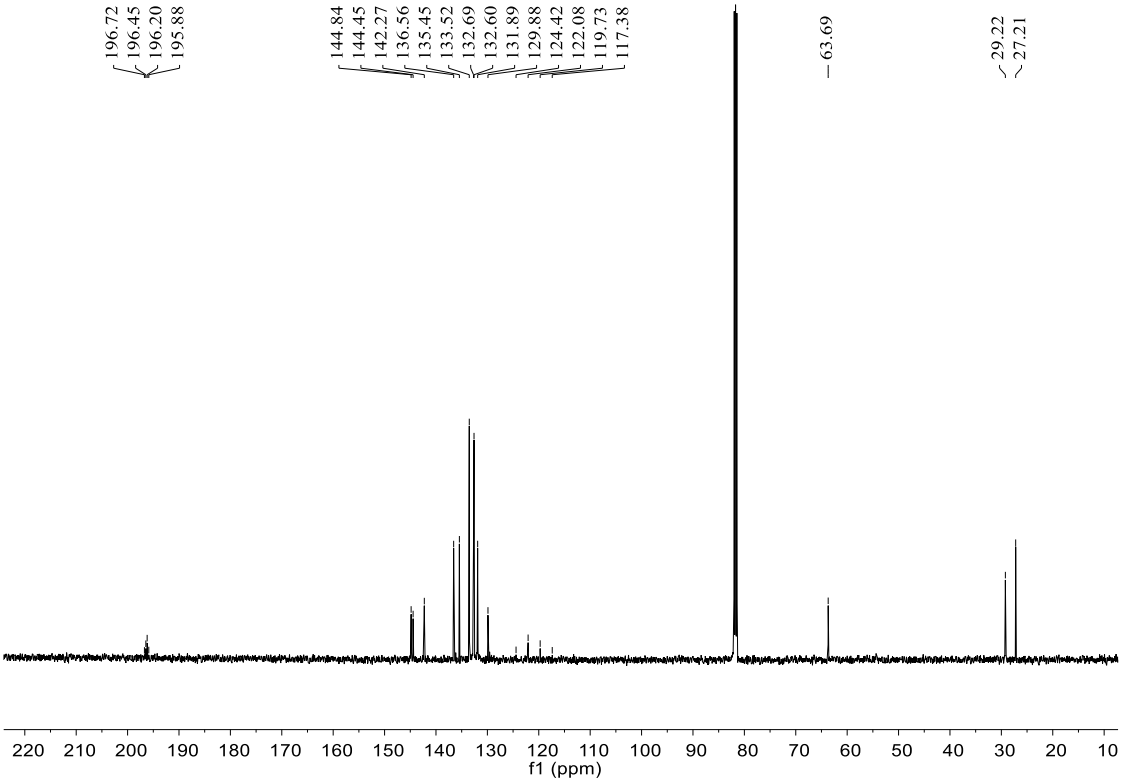
3-(3-bromo-4-methylphenyl)-1,1,1-trifluoro-3-phenylbutan-2-one (66c)



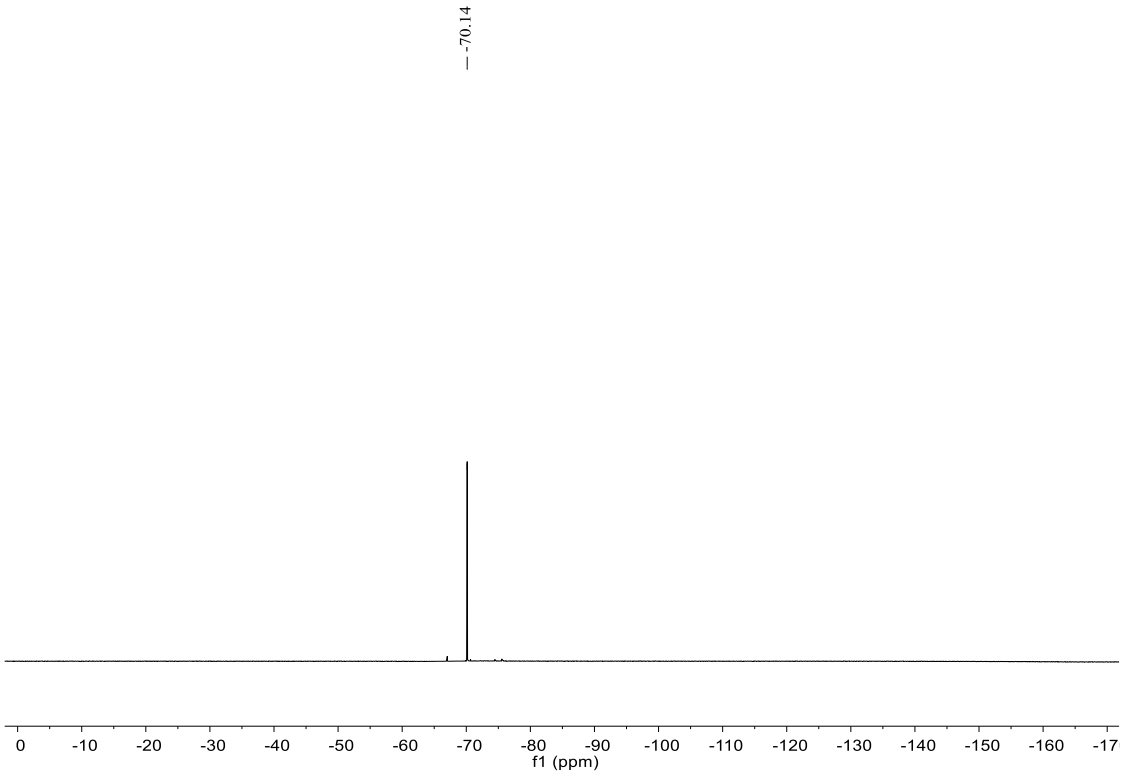




^{1}H NMR spectrum in $CDCl_3$.

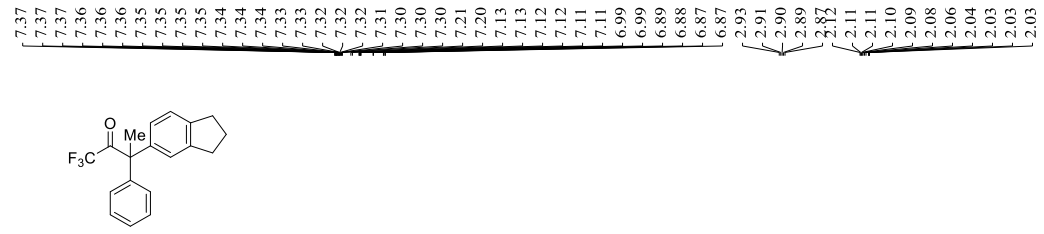


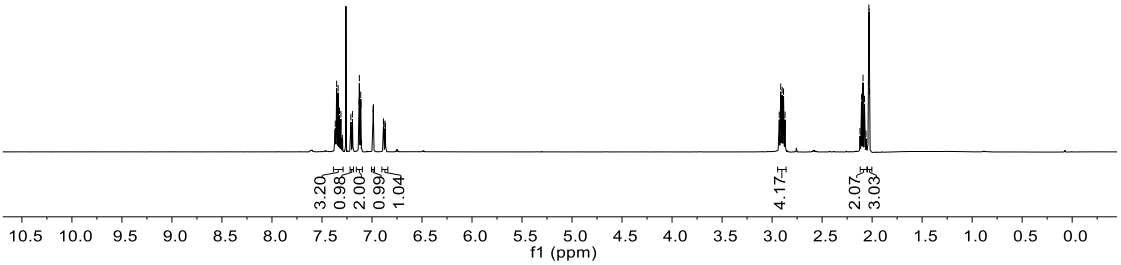
^{13}C NMR spectrum in $CDCl_3$.



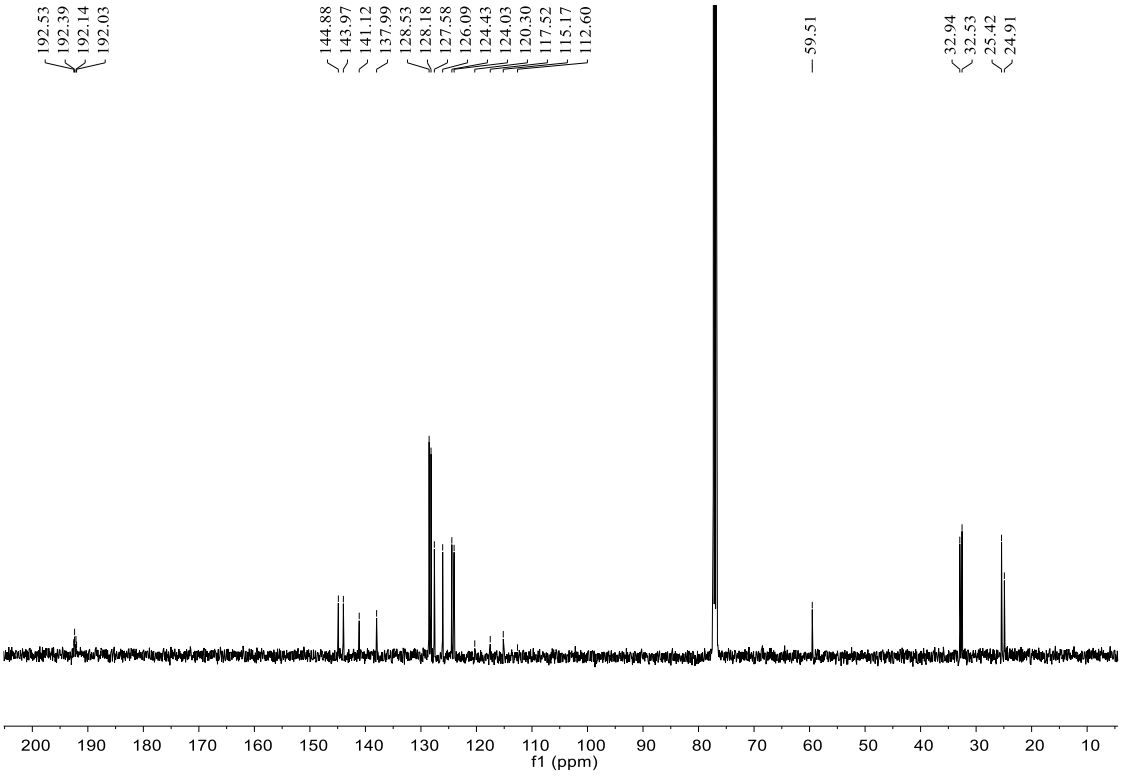
^{19}F NMR spectrum in $CDCl_3$.

3-(2,3-dihydro-1H-inden-5-yl)-1,1,1-trifluoro-3-phenylbutan-2-one (67c)

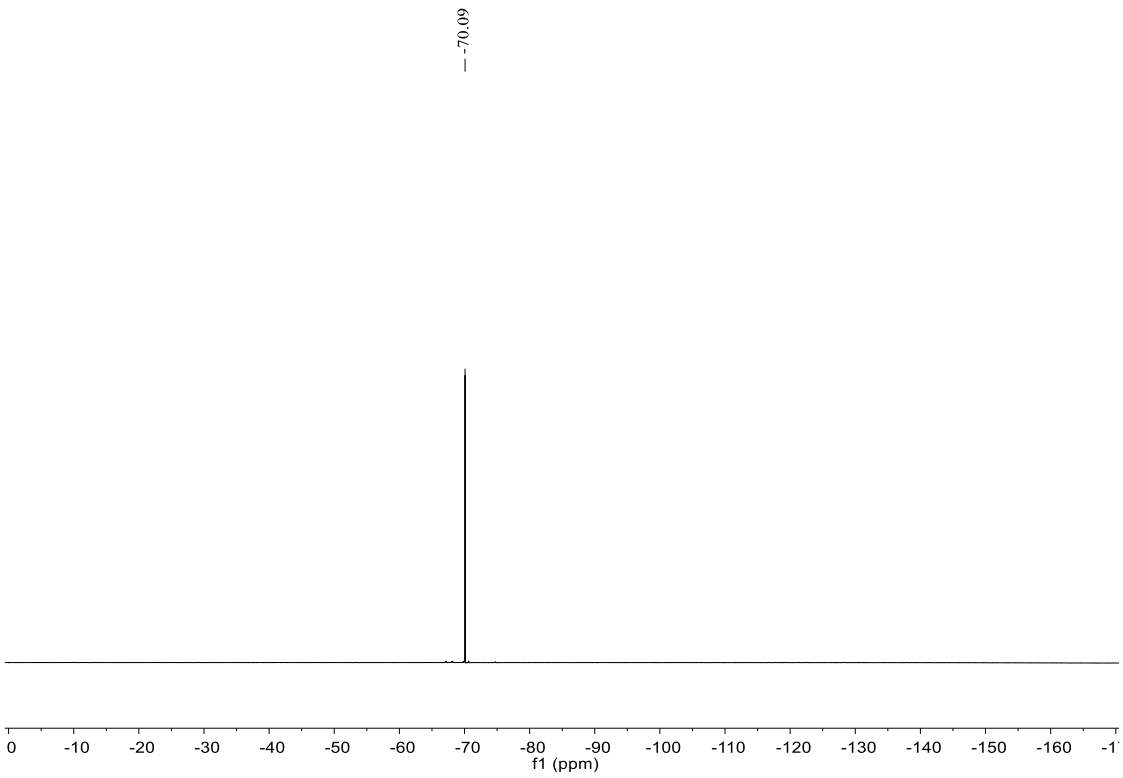




^{1}H NMR spectrum in $CDCl_3$.

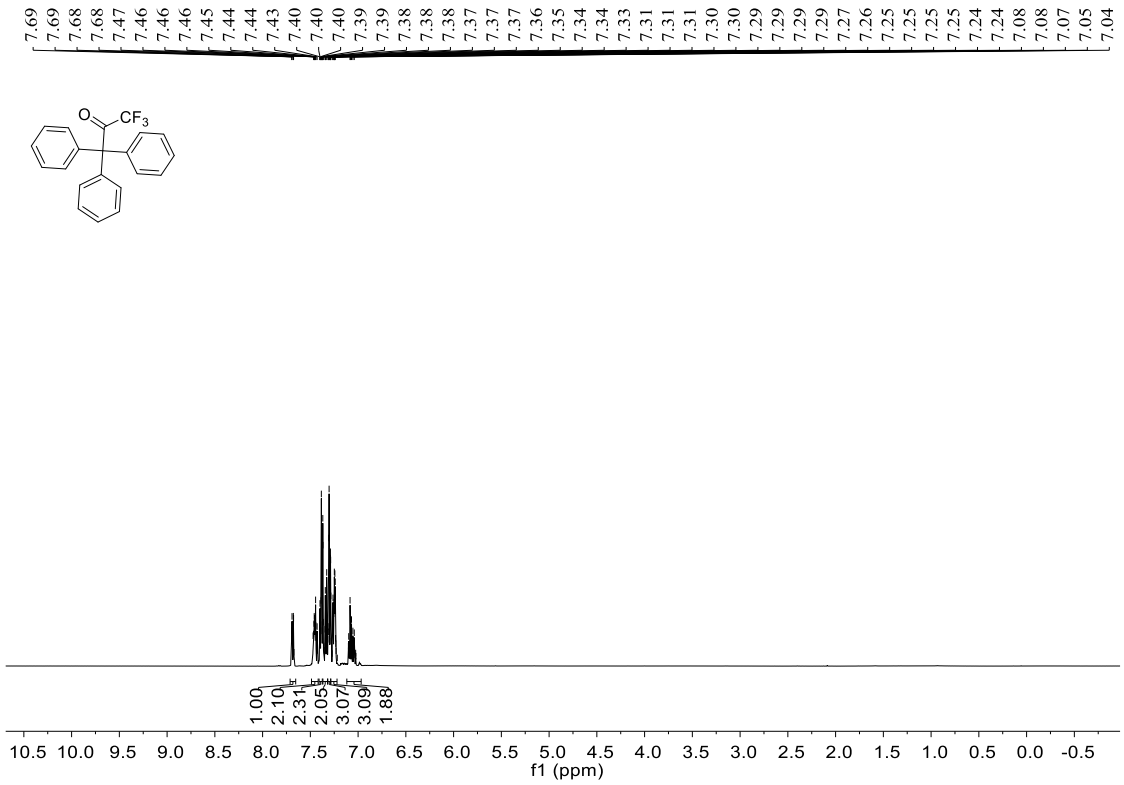


^{13}C NMR spectrum in $CDCl_3$.

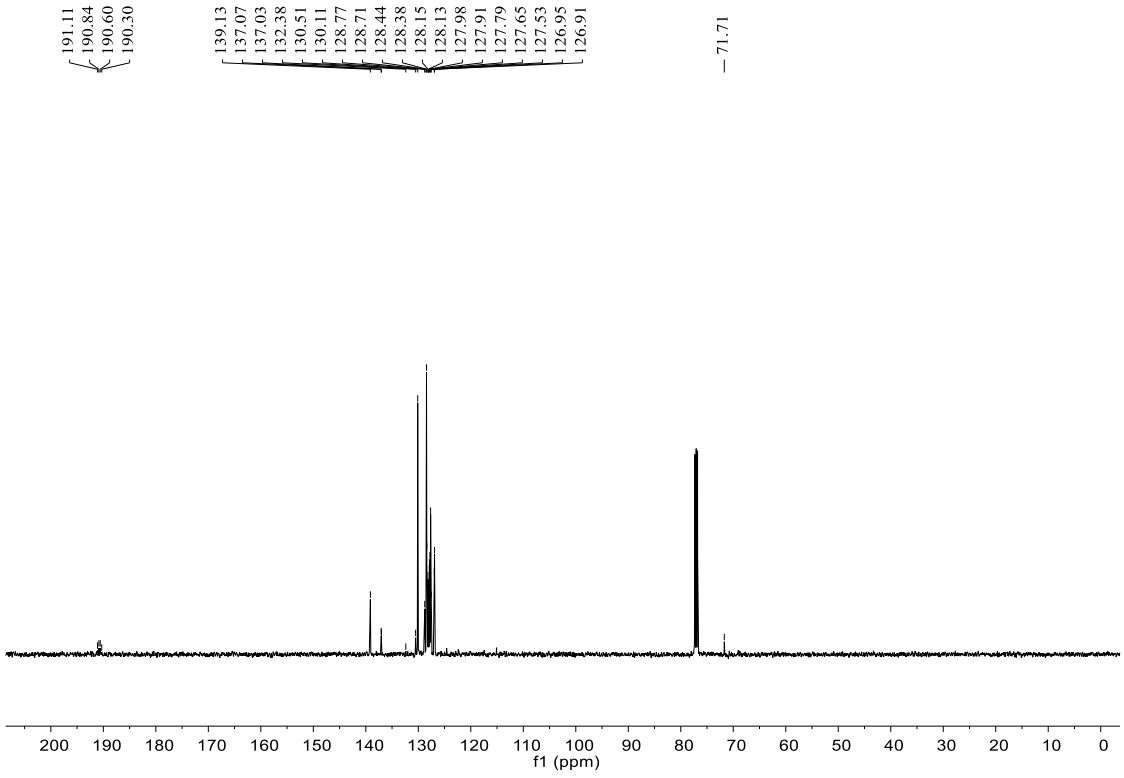


^{19}F NMR spectrum in $CDCl_3$.

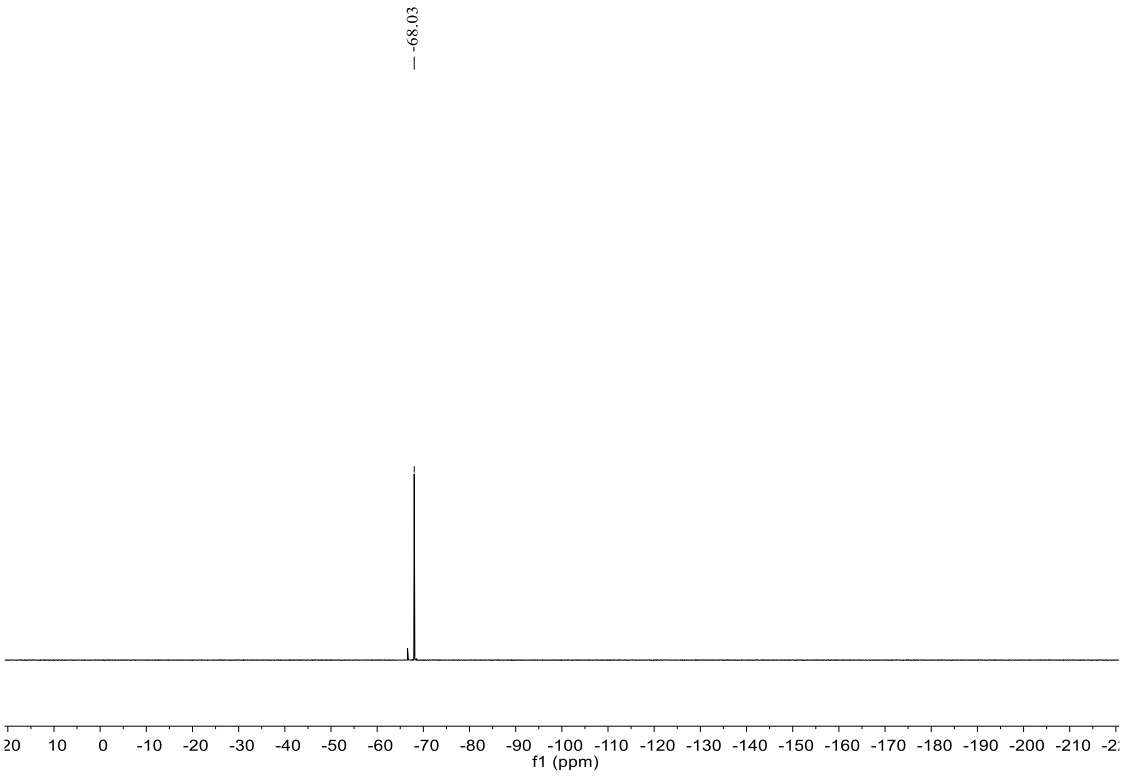
1,1,1-trifluoro-3,3,3-triphenylpropan-2-one (68c)



^{1}H NMR spectrum in $CDCl_3$.

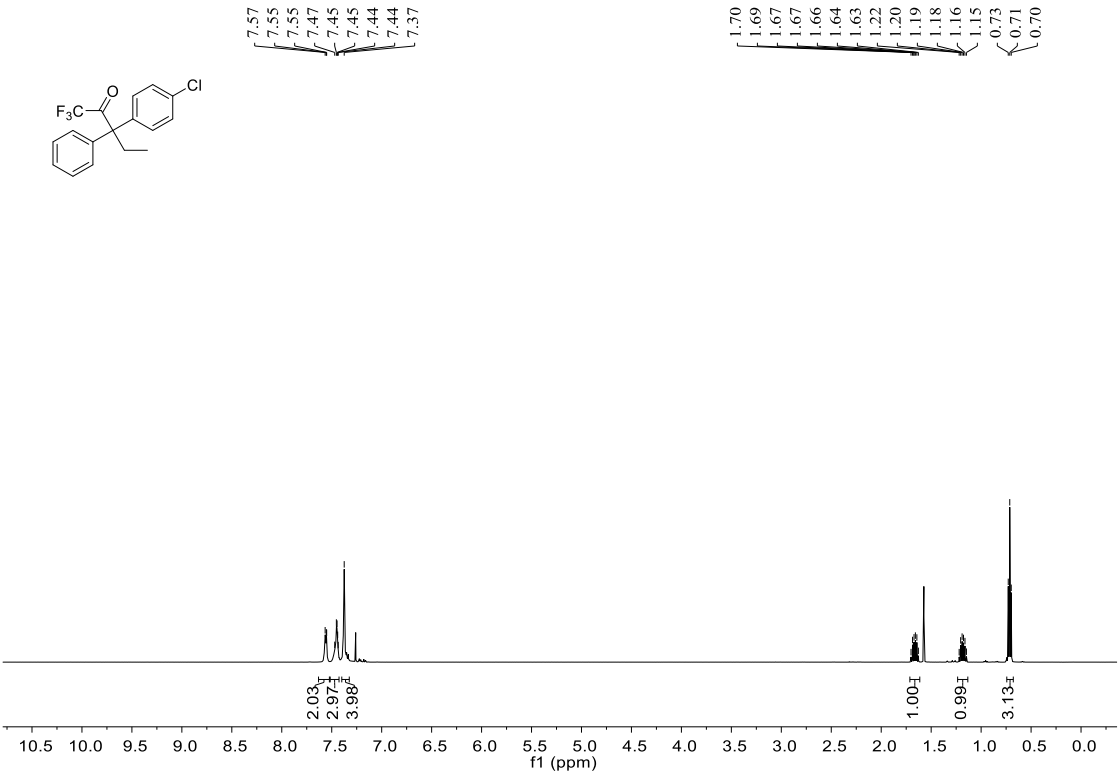


^{13}C NMR spectrum in $CDCl_3$.

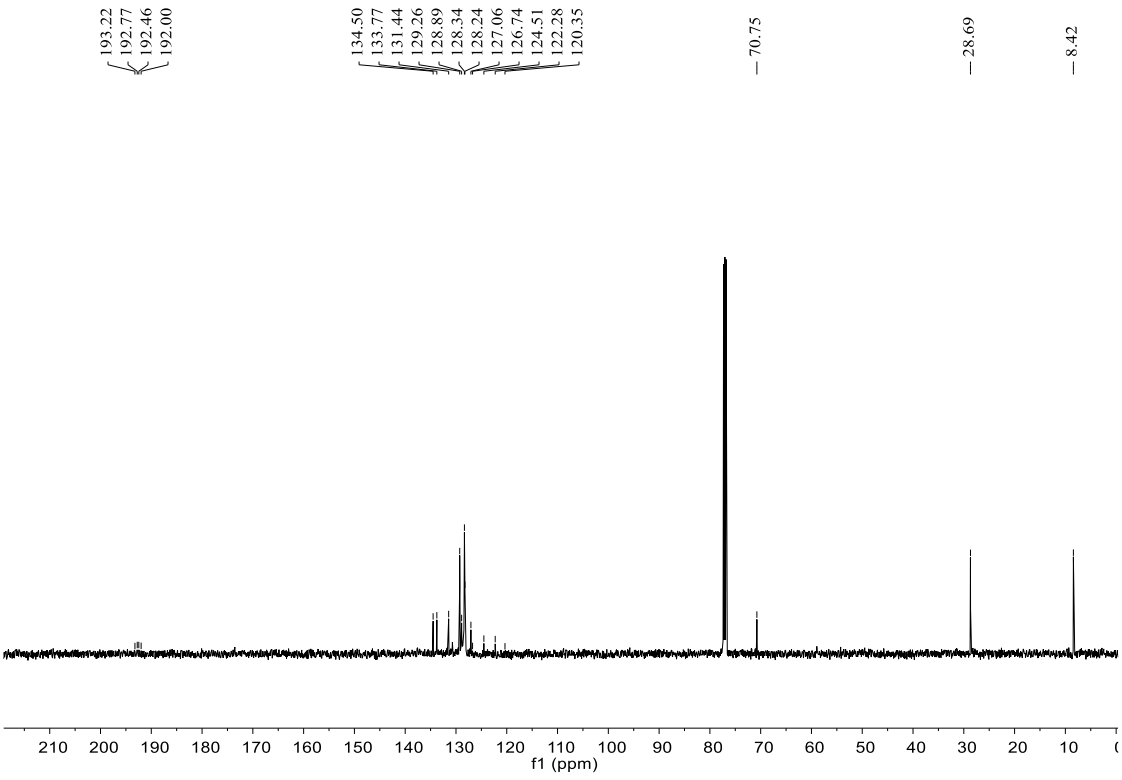


^{19}F NMR spectrum in $CDCl_3$.

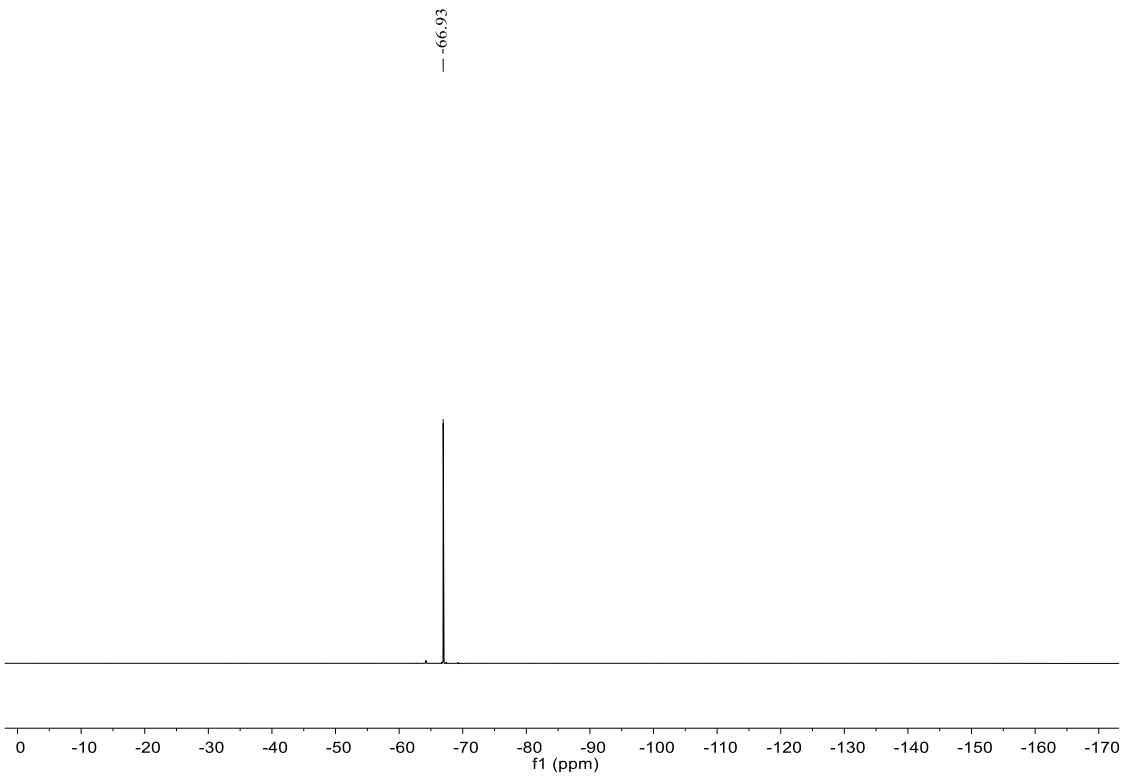
3-(4-chlorophenyl)-1,1,1-trifluoro-3-phenylpentan-2-one (69c)



^{1}H NMR spectrum in $CDCl_3$.

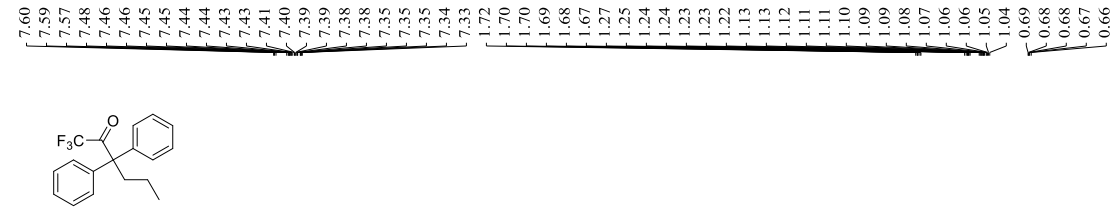


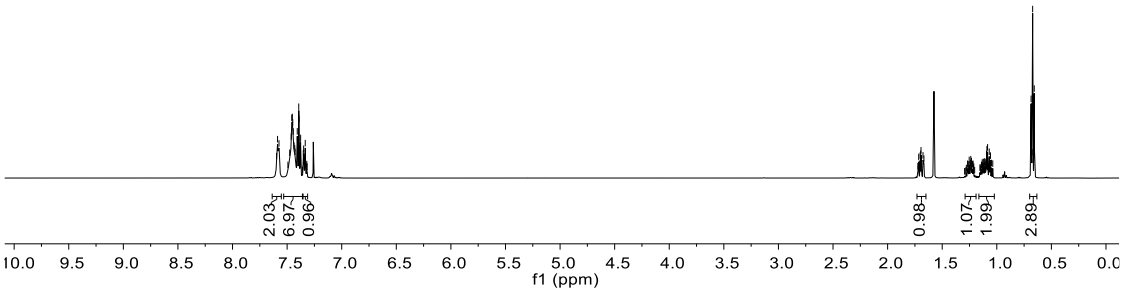
^{13}C NMR spectrum in $CDCl_3$.



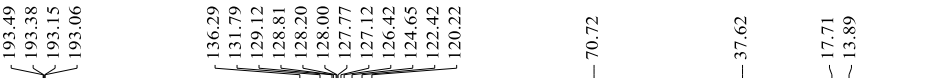
^{19}F NMR spectrum in $CDCl_3$.

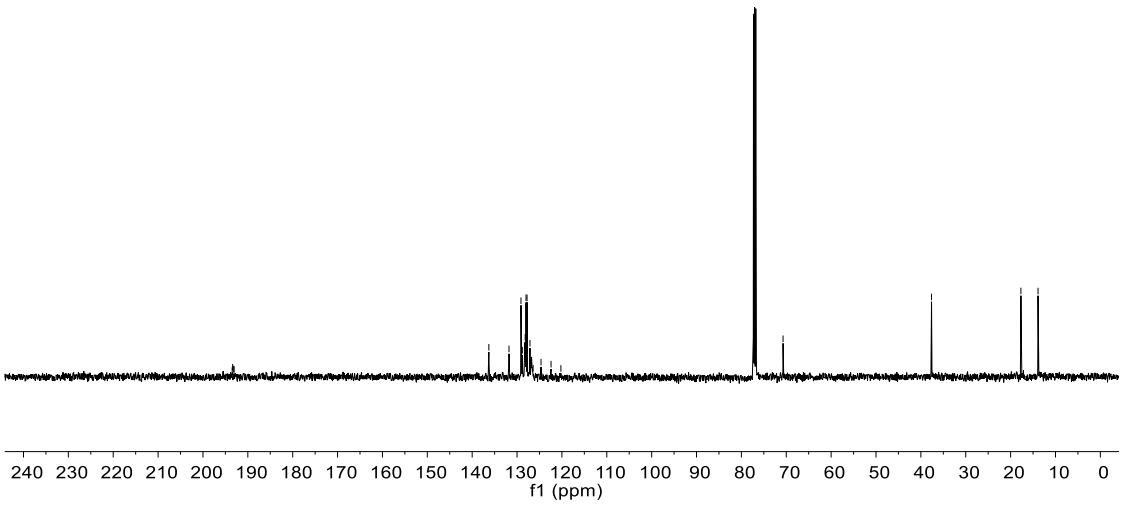
1,1,1-trifluoro-3,3-diphenylhexan-2-one (71c)



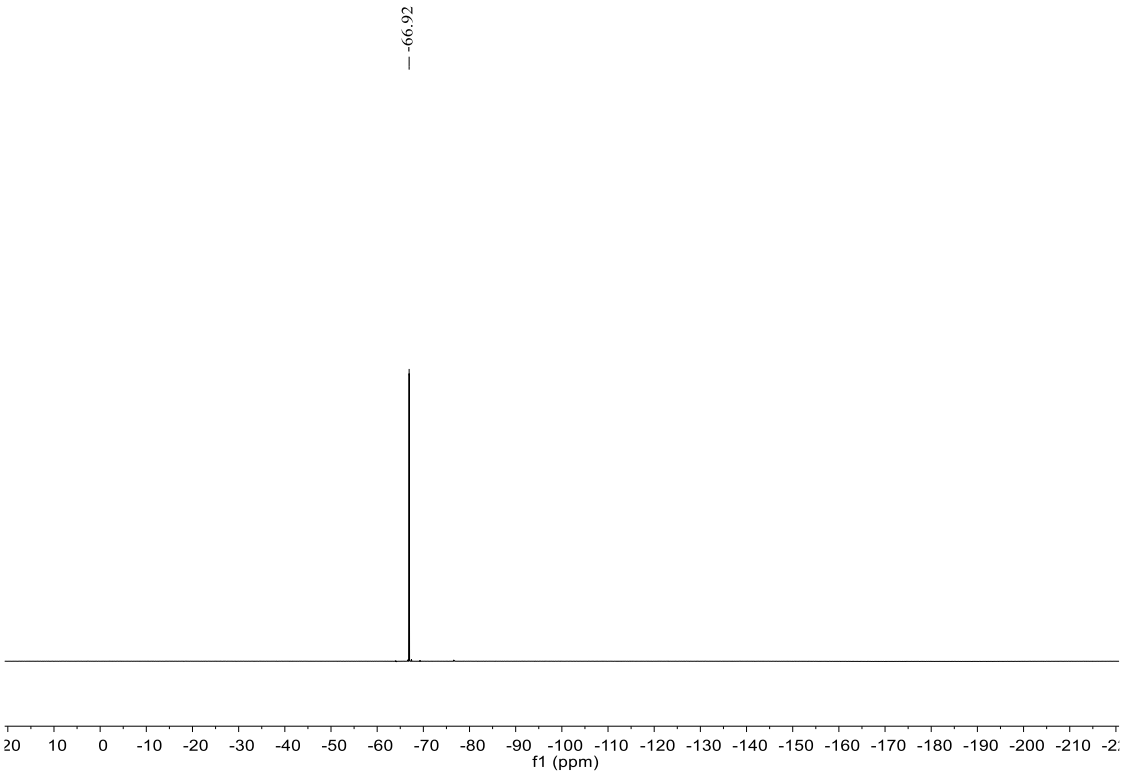


^{1}H NMR spectrum in $CDCl_3$.



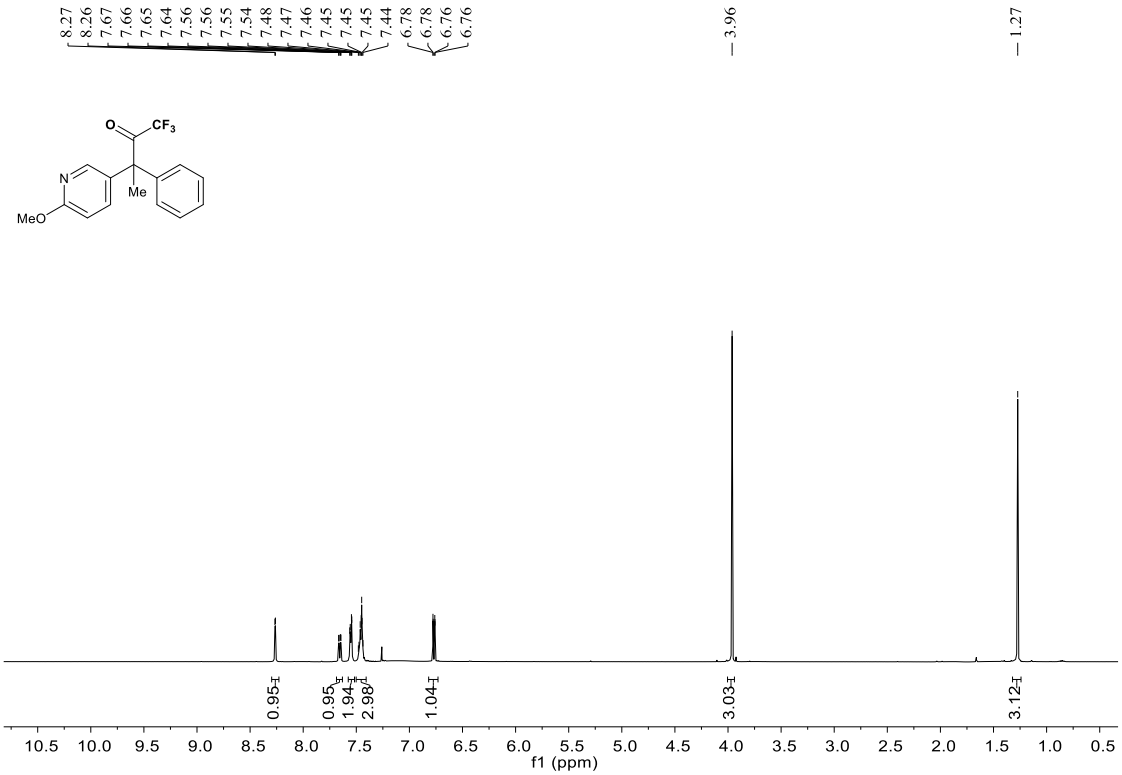


^{13}C NMR spectrum in $CDCl_3$.

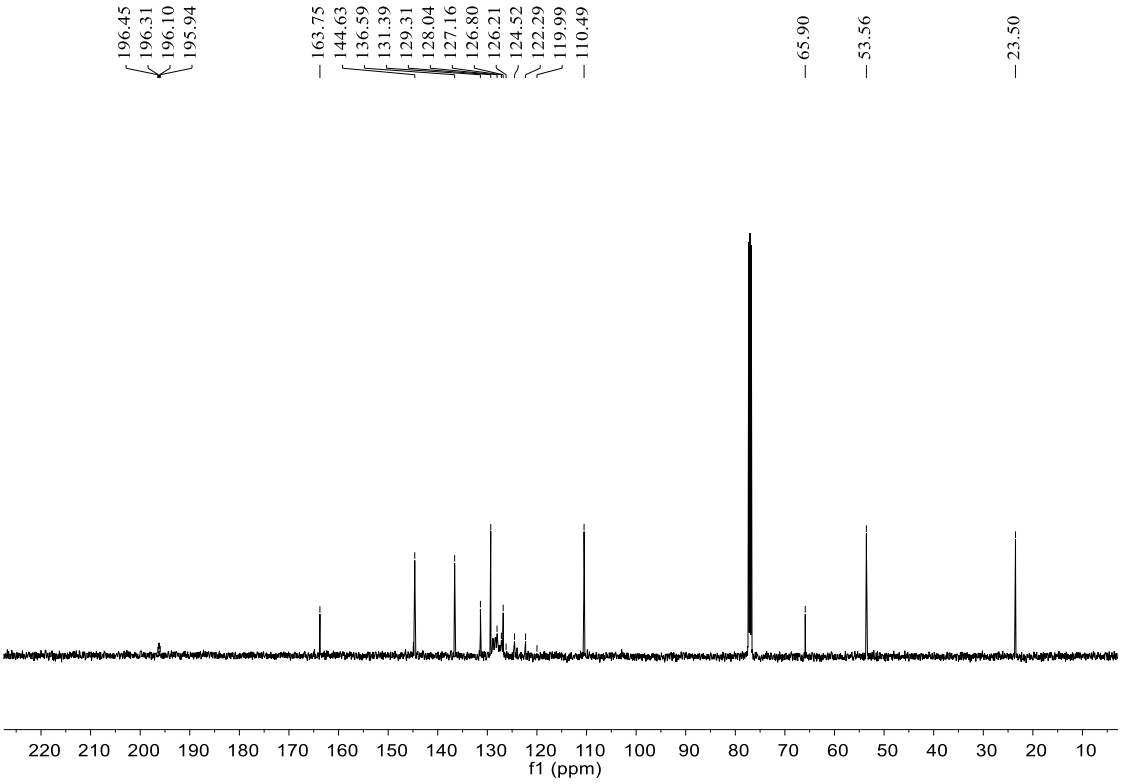


^{19}F NMR spectrum in $CDCl_3$.

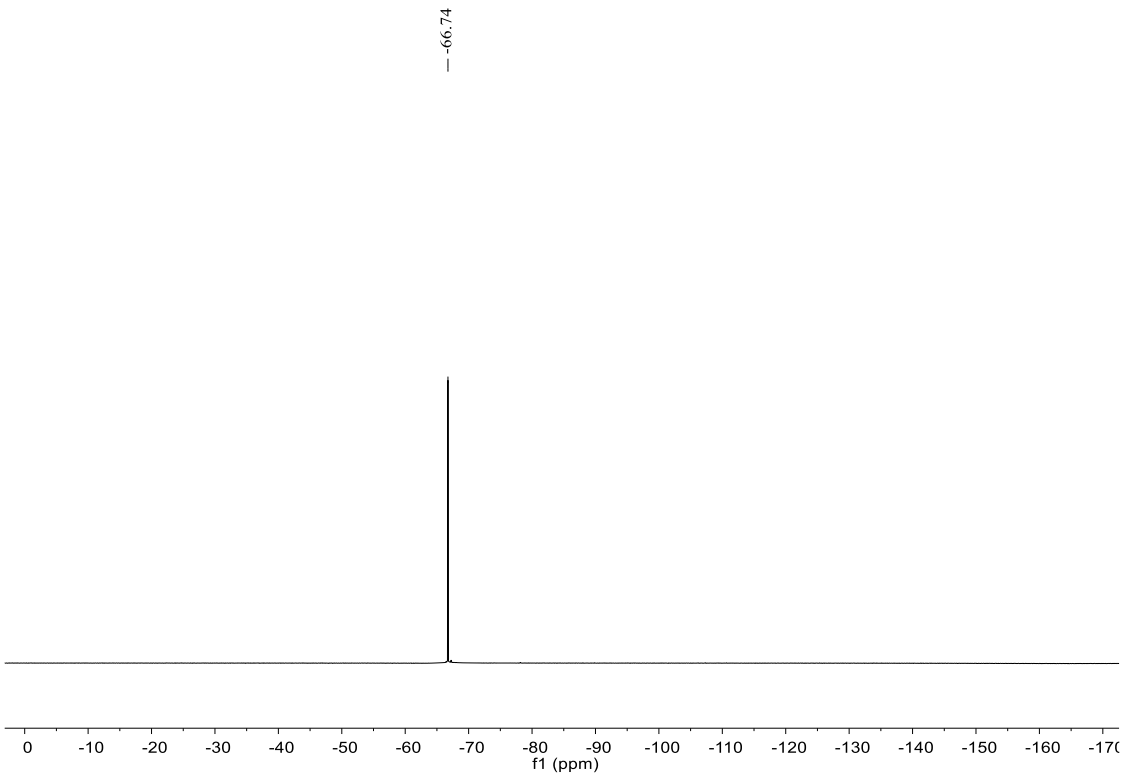
1,1,1-trifluoro-3-(6-methoxypyridin-3-yl)-3-phenylbutan-2-one (72c)



^{1}H NMR spectrum in $CDCl_3$.

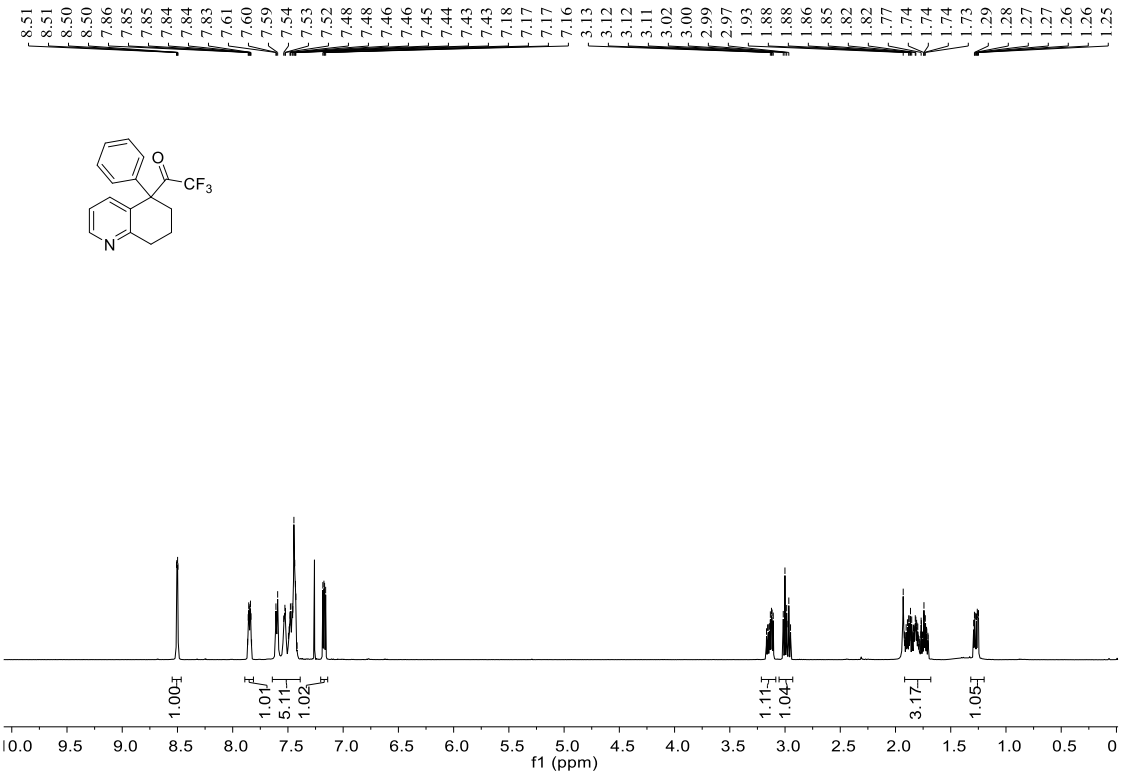


^{13}C NMR spectrum in $CDCl_3$.

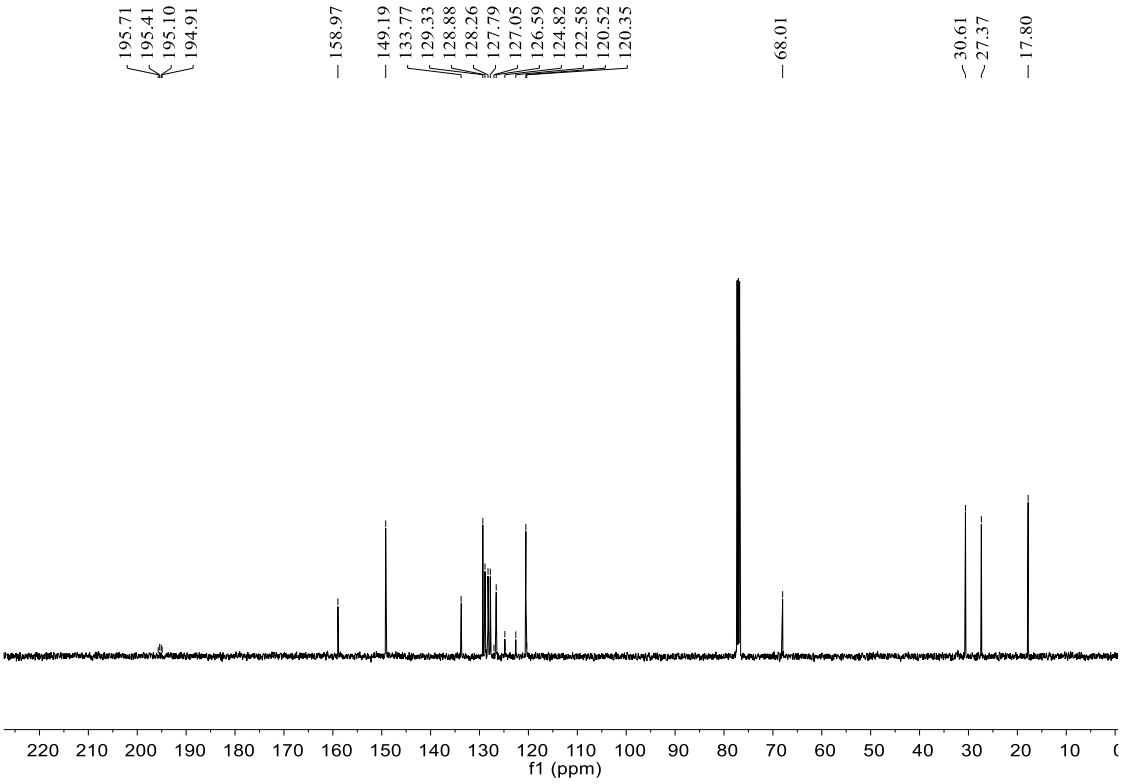


^{19}F NMR spectrum in $CDCl_3$.

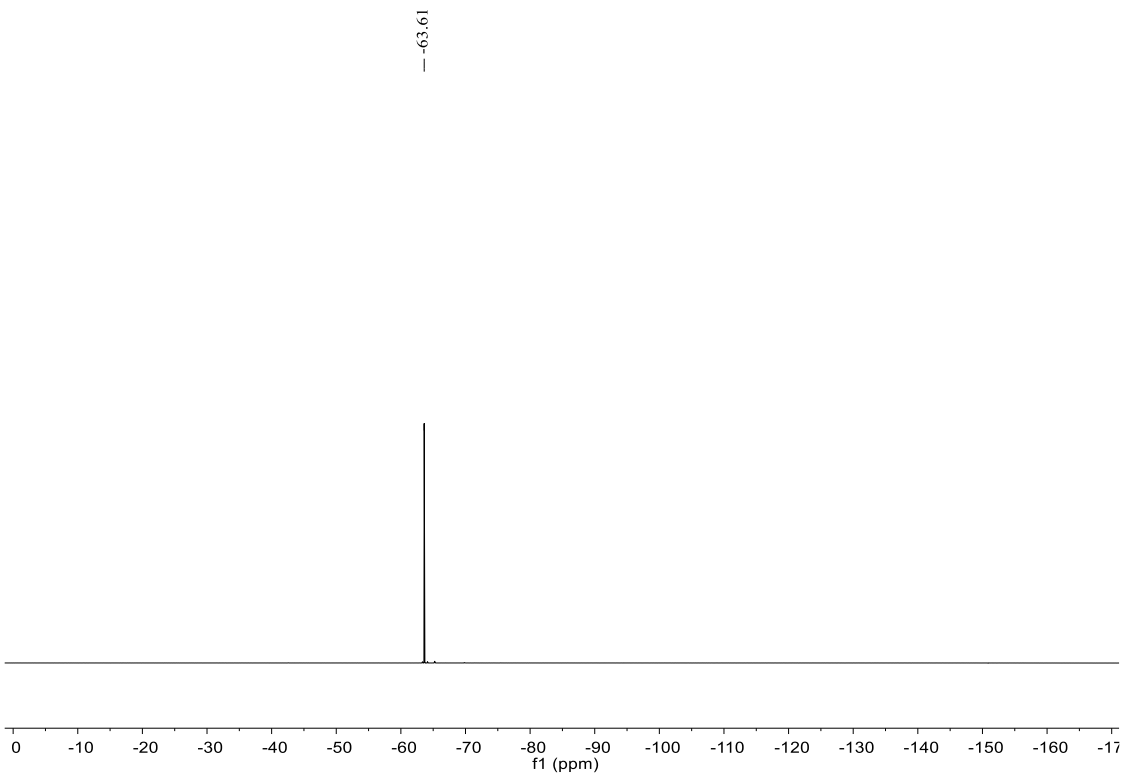
2,2,2-trifluoro-1-(5-phenyl-5,6,7,8-tetrahydroquinolin-5-yl) ethan-1-one (73c)



^{1}H NMR spectrum in $CDCl_3$.

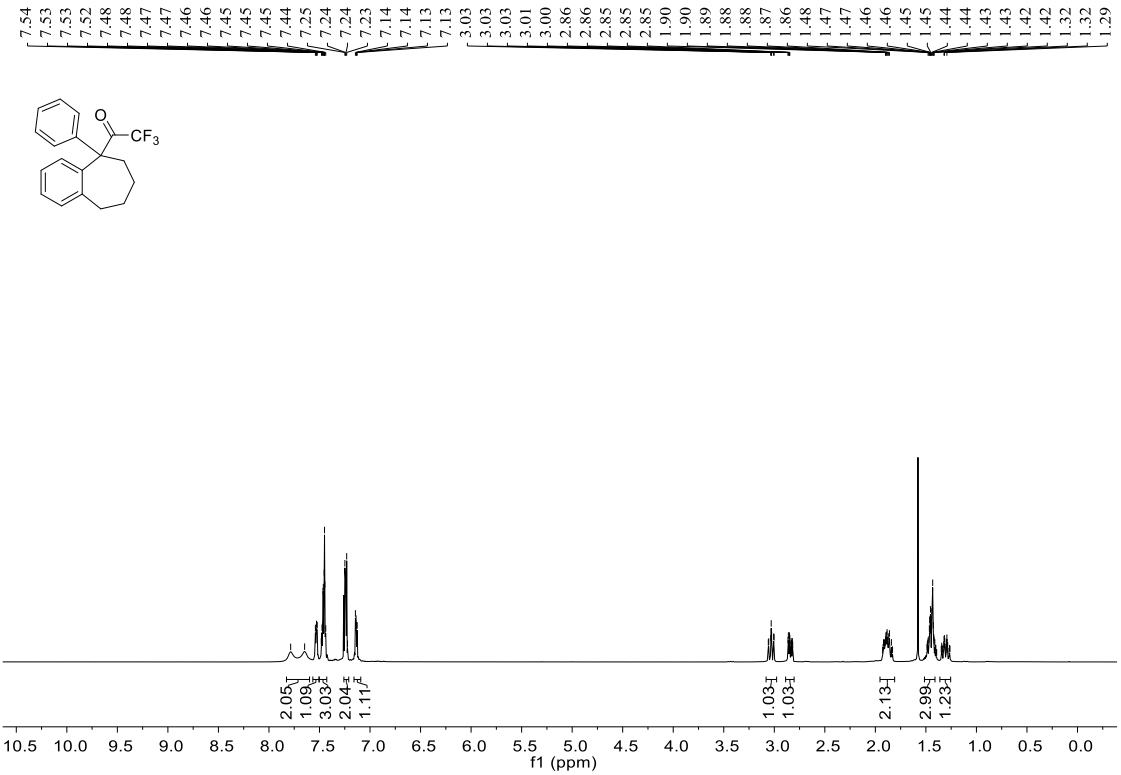


^{13}C NMR spectrum in $CDCl_3$.

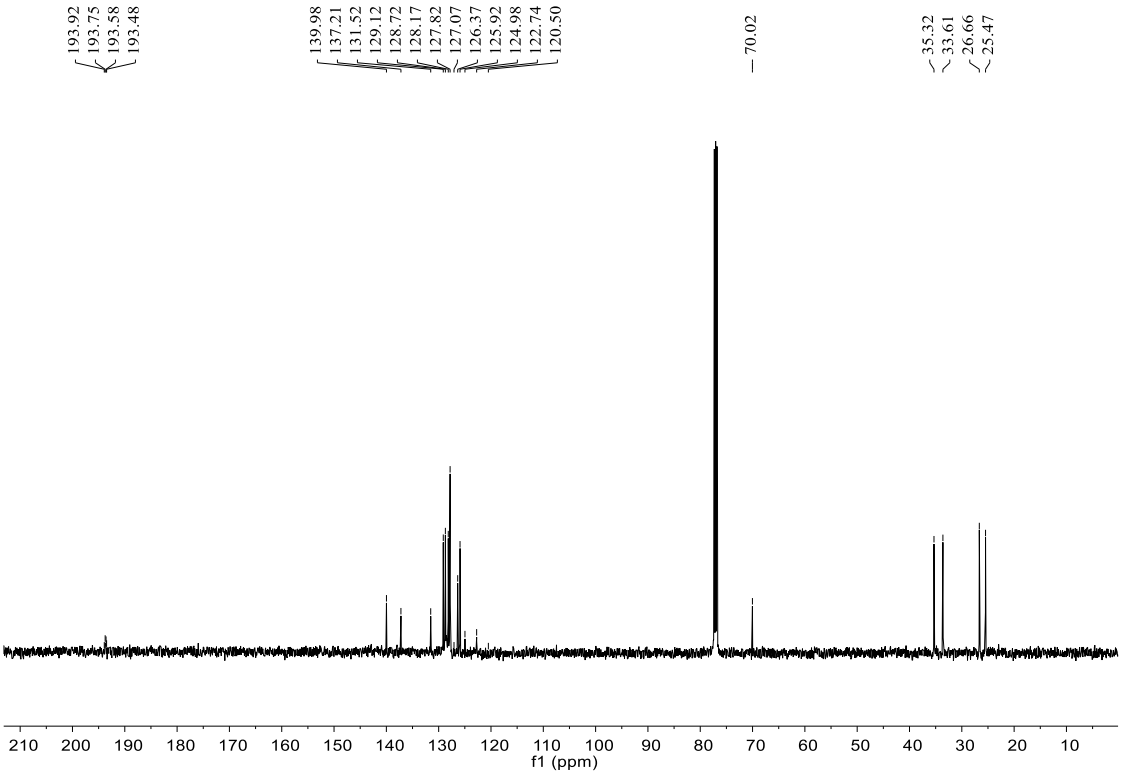


^{19}F NMR spectrum in $CDCl_3$.

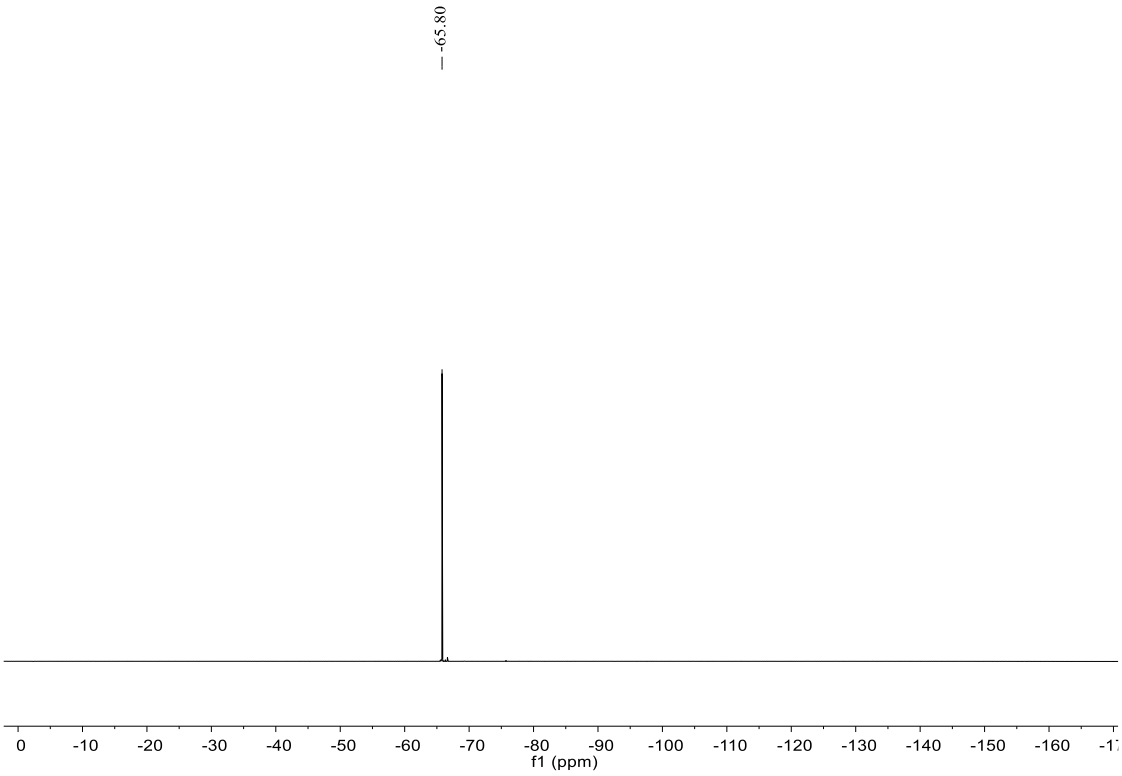
2,2,2-trifluoro-1-(5-phenyl-6,7,8,9-tetrahydro-5H-benzo [7] annulen-5-yl) ethan-1-one (74c)



^{1}H NMR spectrum in $CDCl_3$.

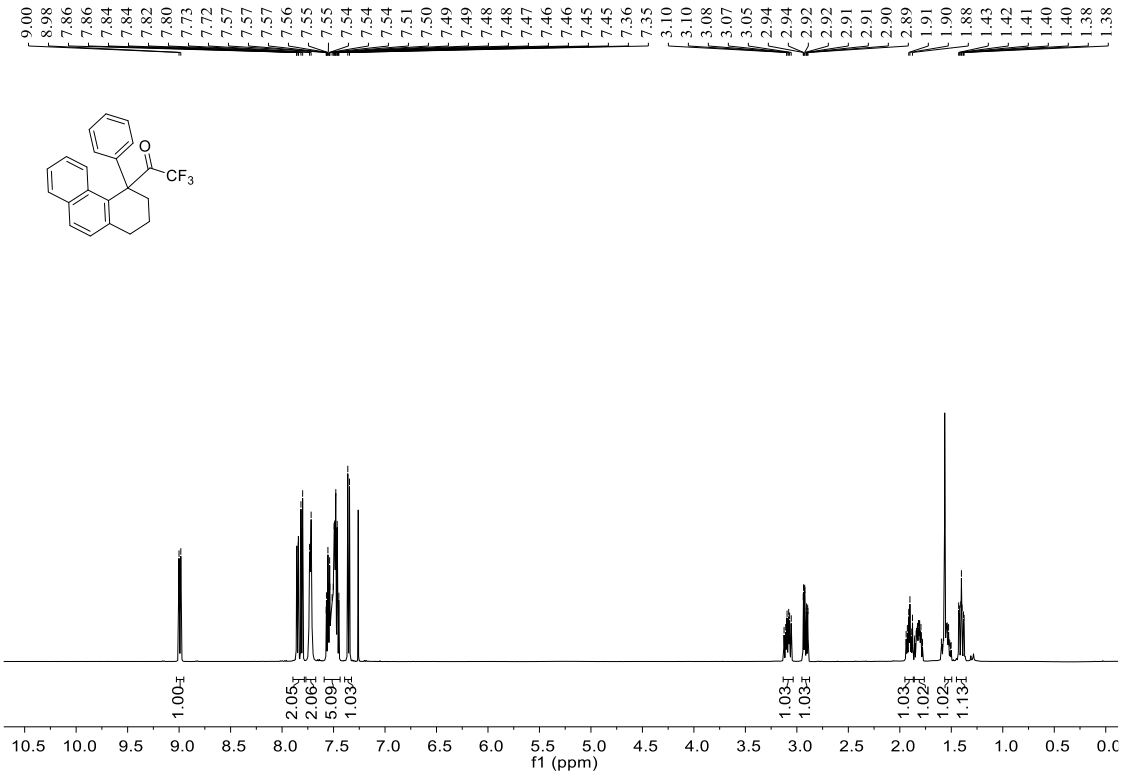


^{13}C NMR spectrum in $CDCl_3$.

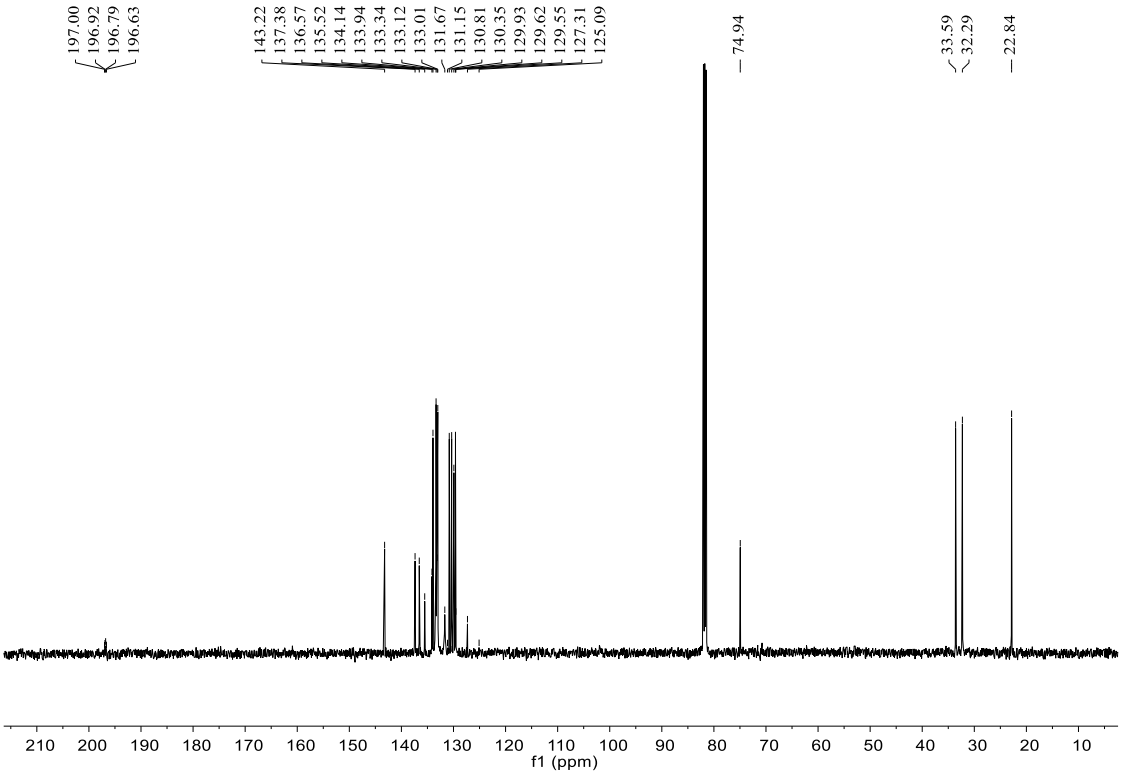


^{19}F NMR spectrum in $CDCl_3$.

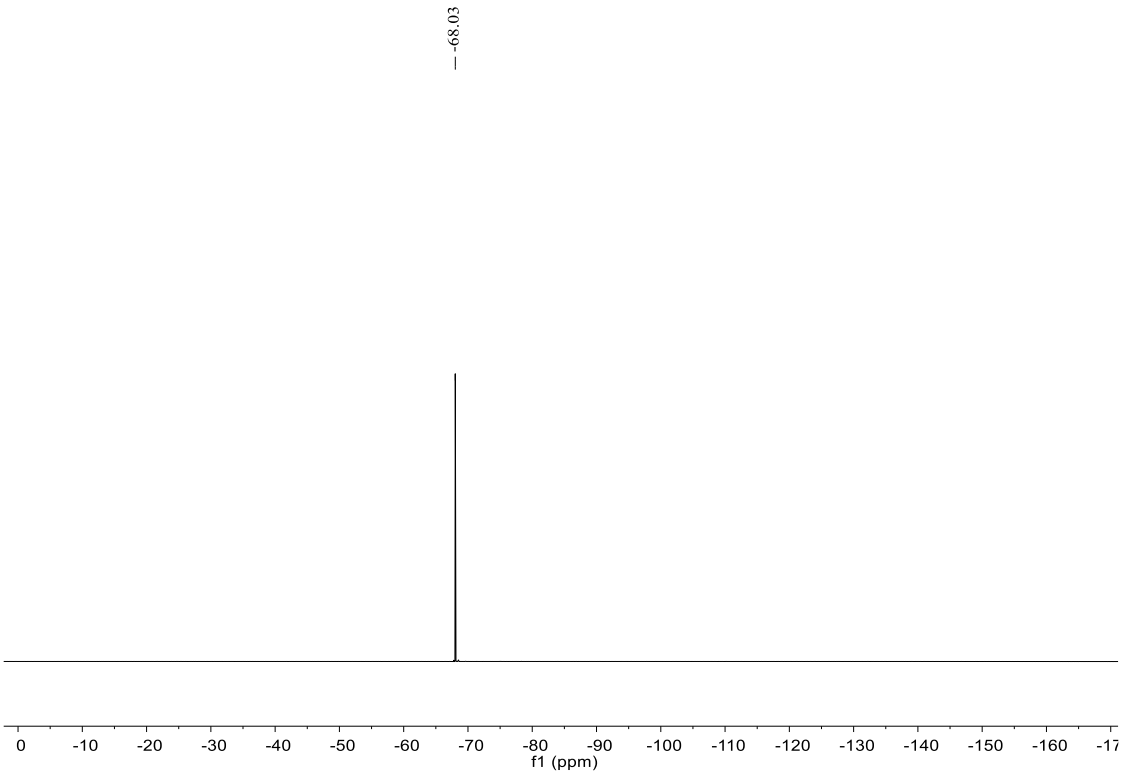
2,2,2-trifluoro-1-(4-phenyl-1,2,3,4-tetrahydrophenanthren-4-yl) ethan-1-one (75c)



^{1}H NMR spectrum in $CDCl_3$.

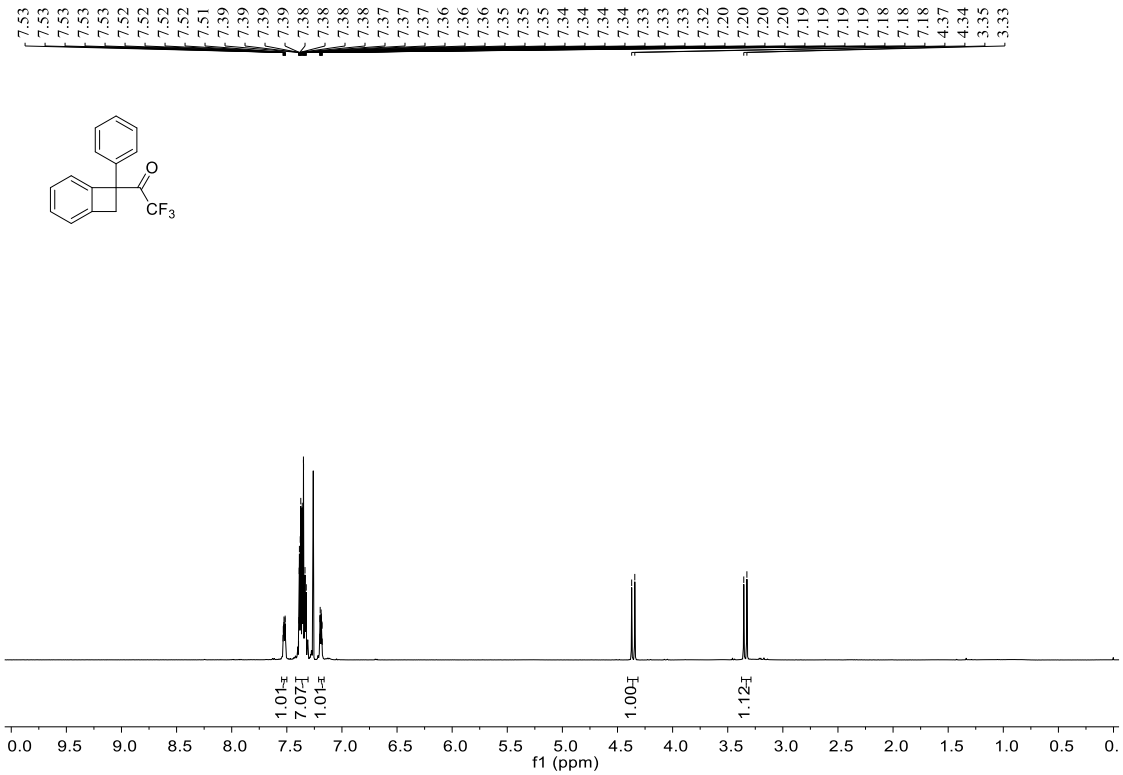


^{13}C NMR spectrum in $CDCl_3$.

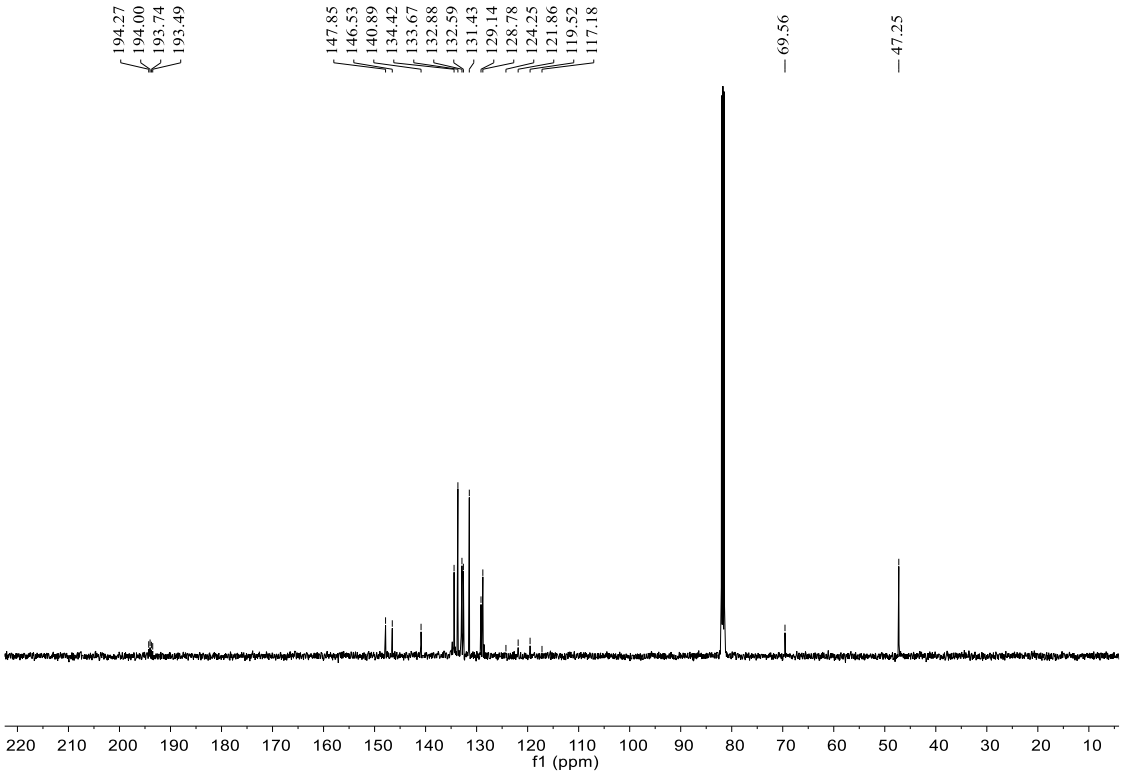


^{19}F NMR spectrum in $CDCl_3$.

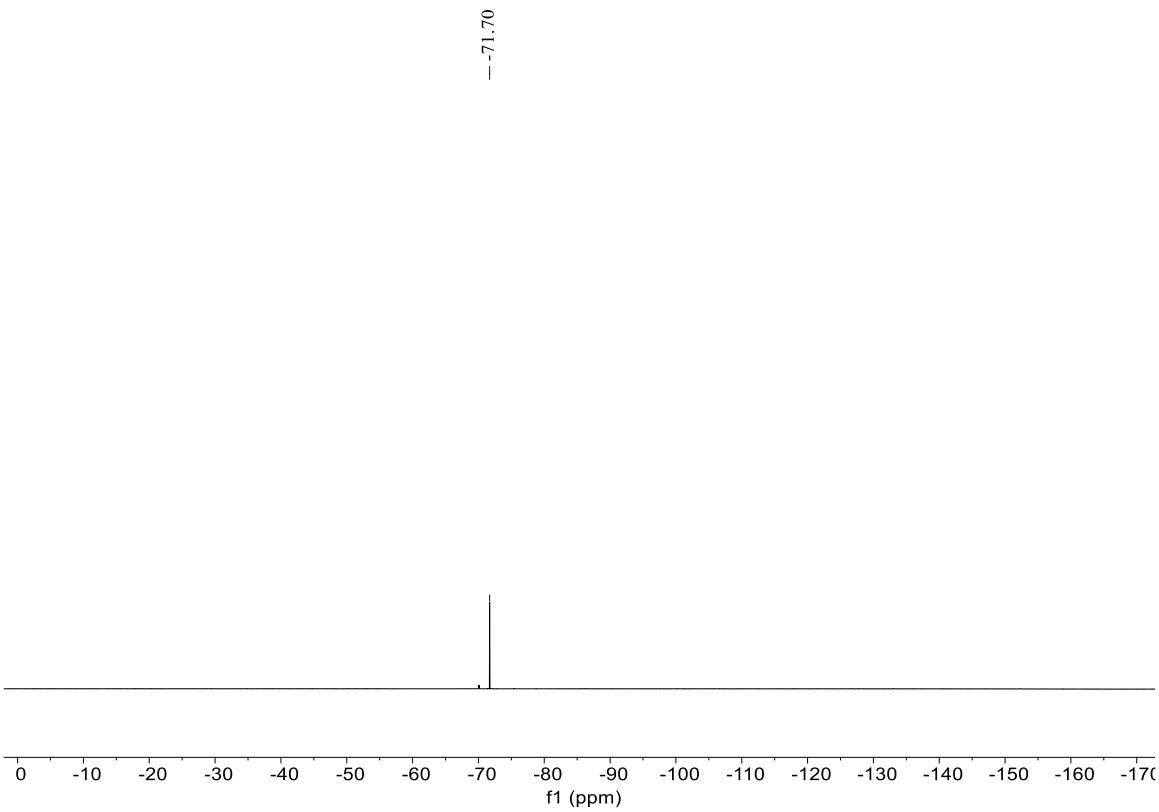
2,2,2-trifluoro-1-(7-phenylbicyclo [4.2.0] octa-1,3,5-trien-7-yl) ethan-1-one (76c)



^{1}H NMR spectrum in $CDCl_3$.

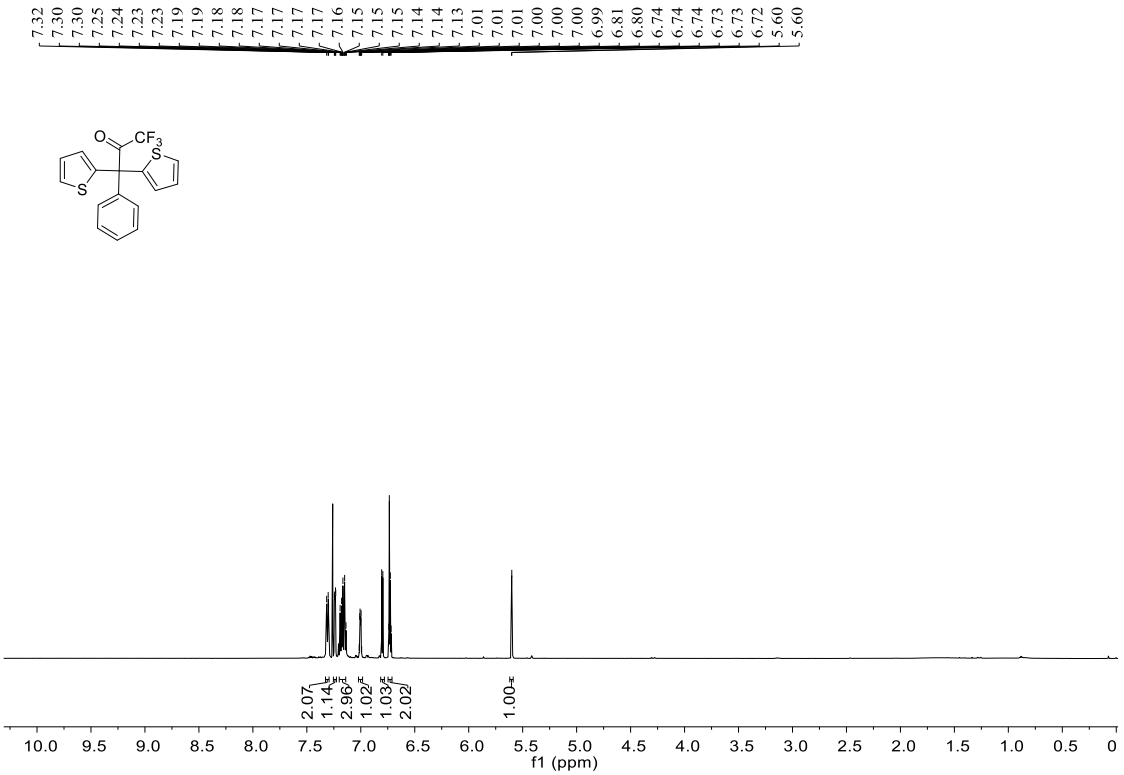


^{13}C NMR spectrum in $CDCl_3$.

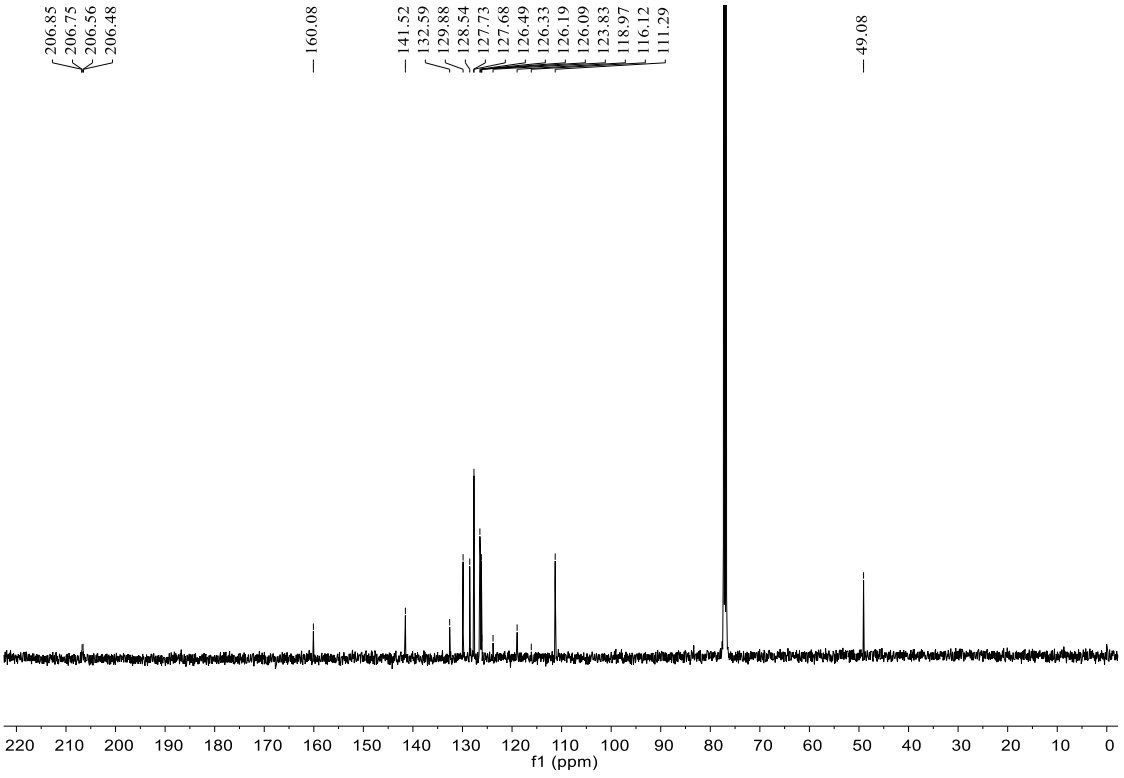


^{19}F NMR spectrum in $CDCl_3$.

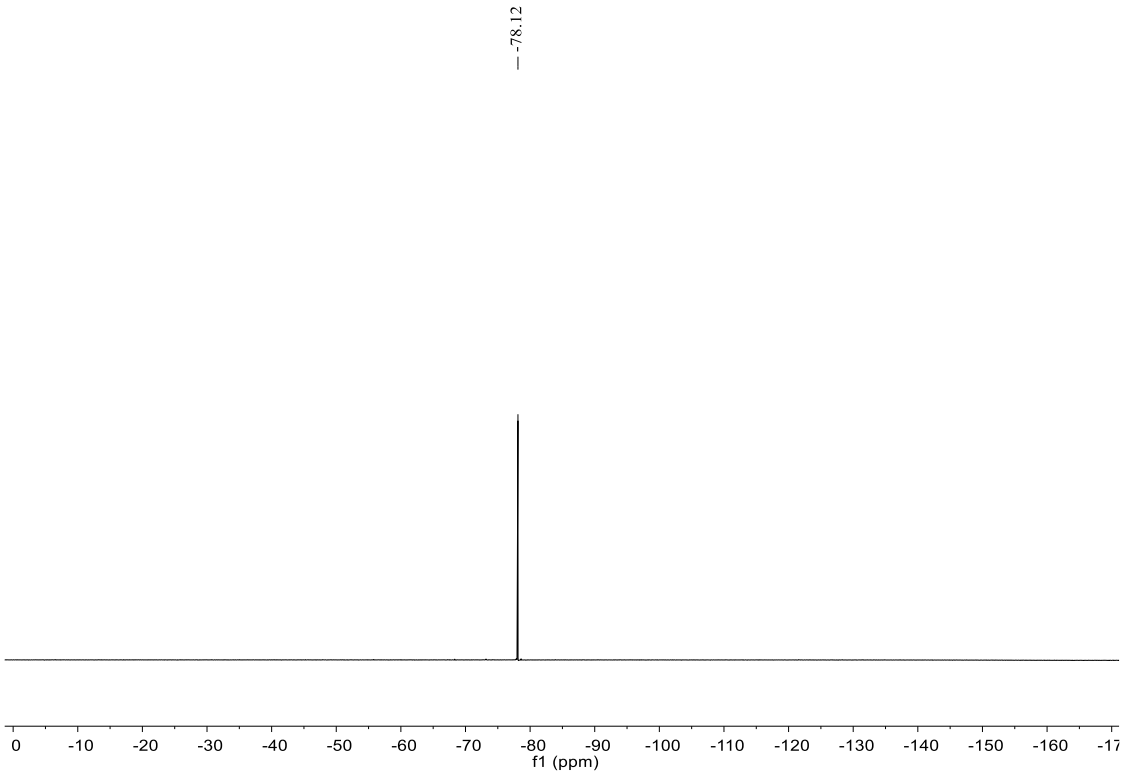
2,2,2-trifluoro-1-(7-phenylbicyclo [4.2.0] octa-1,3,5-trien-7-yl) ethan-1-one (77c)



^{1}H NMR spectrum in $CDCl_3$.

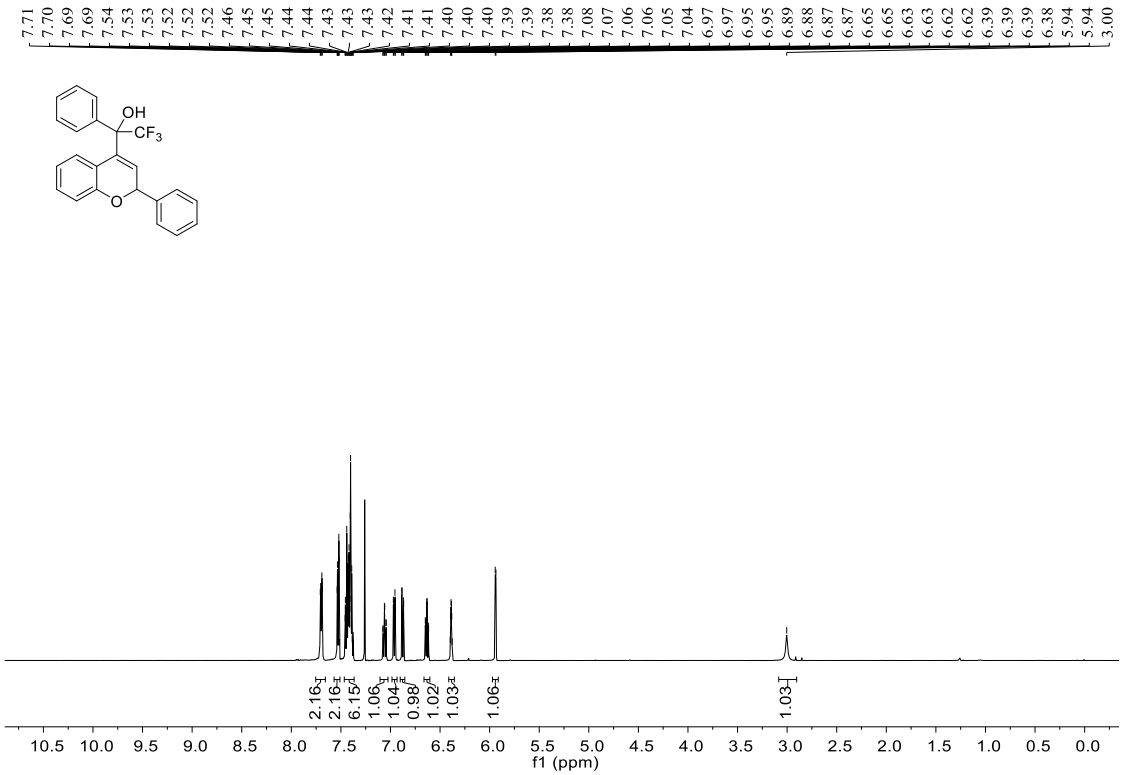


^{13}C NMR spectrum in $CDCl_3$.

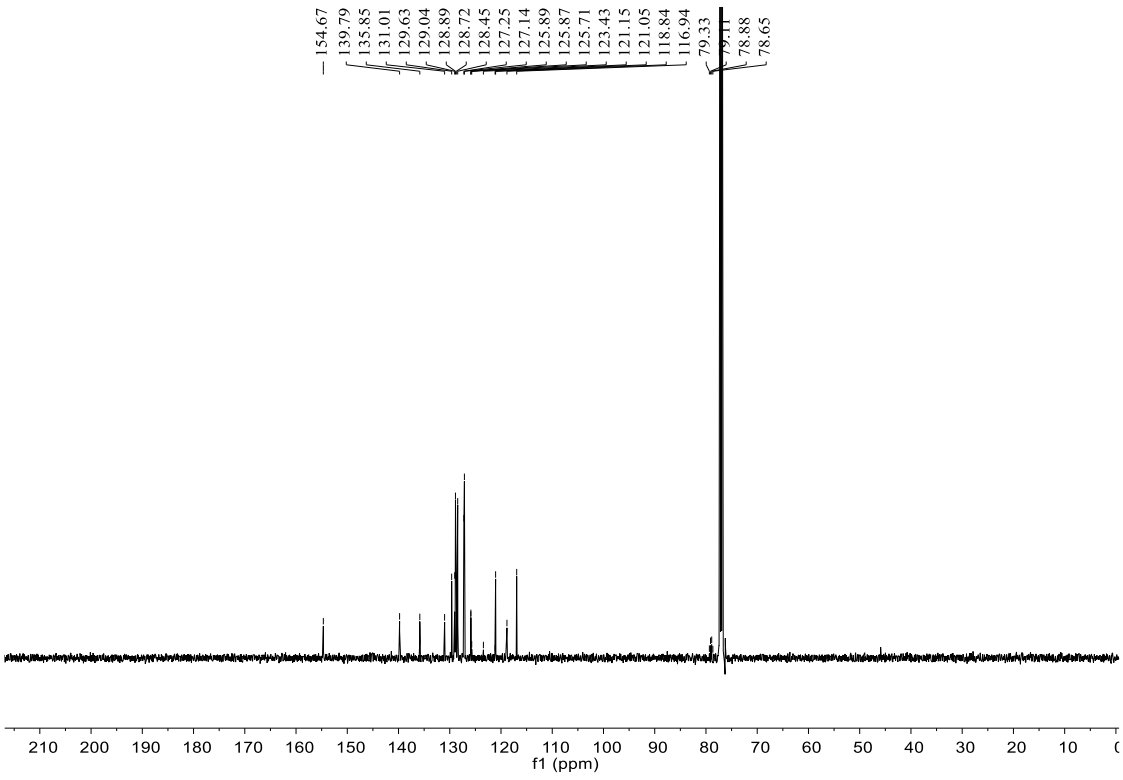


^{19}F NMR spectrum in $CDCl_3$.

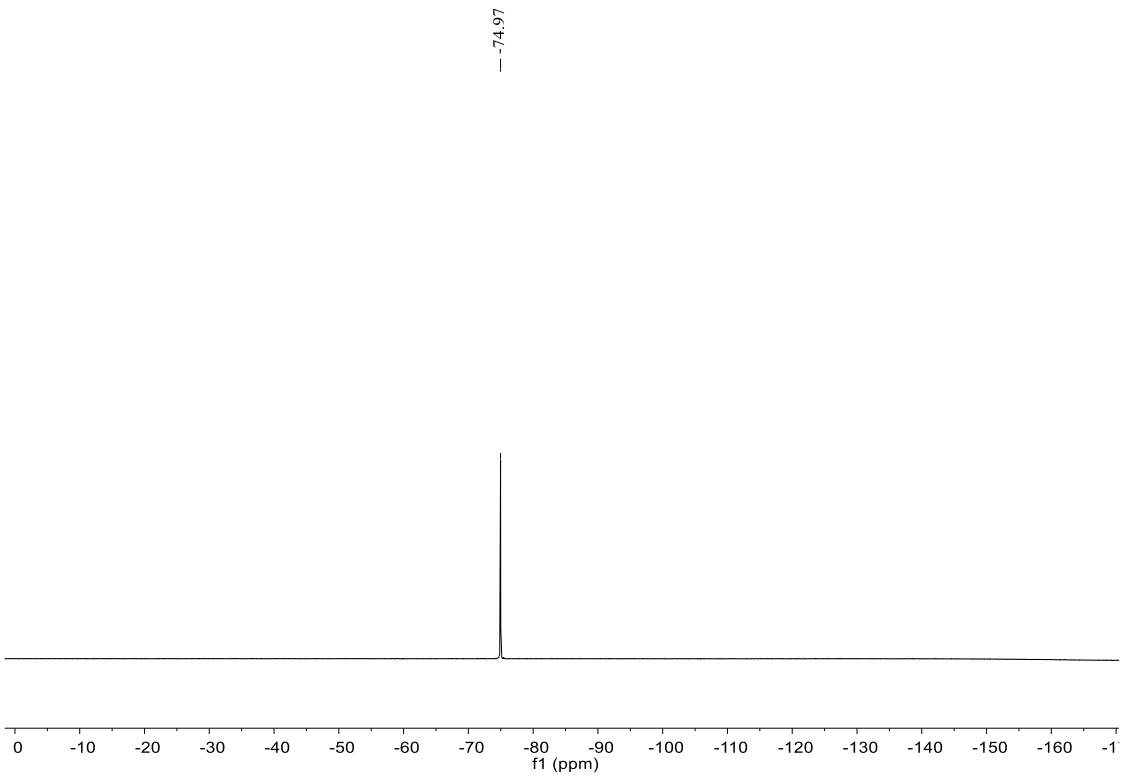
2,2,2-trifluoro-1-phenyl-1-(2-phenyl-2H-chromen-4-yl) ethan-1-ol (78c)



^{1}H NMR spectrum in $CDCl_3$.

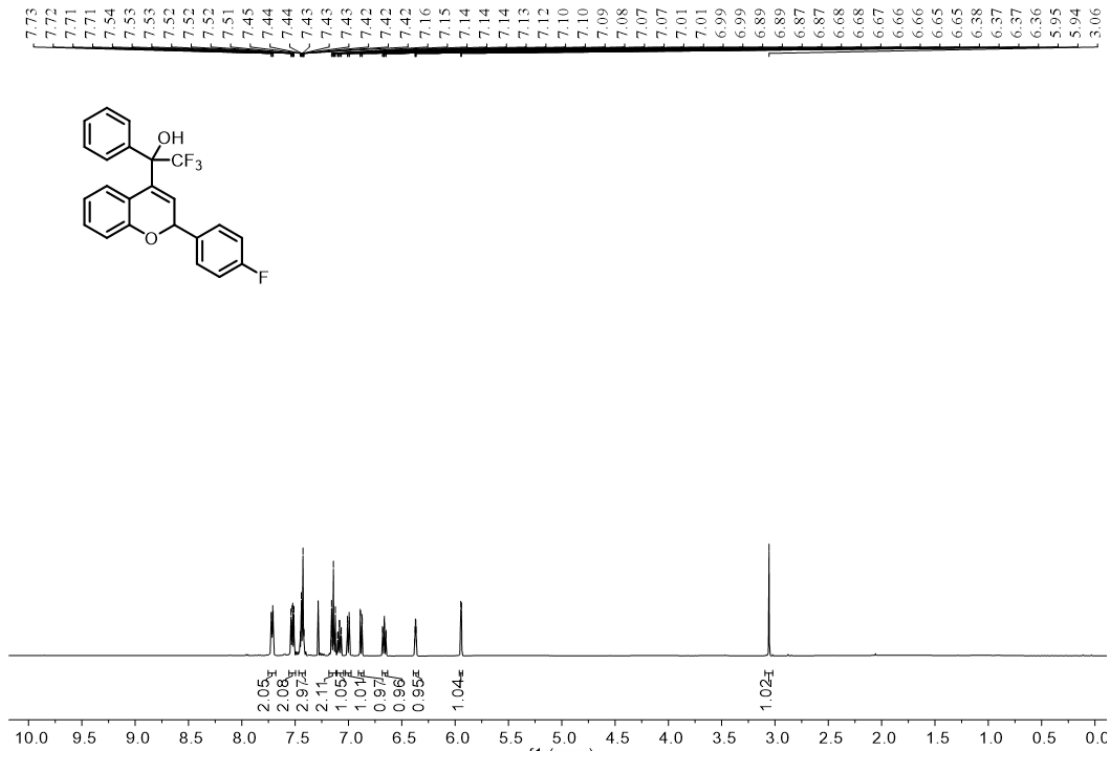


^{13}C NMR spectrum in $CDCl_3$.

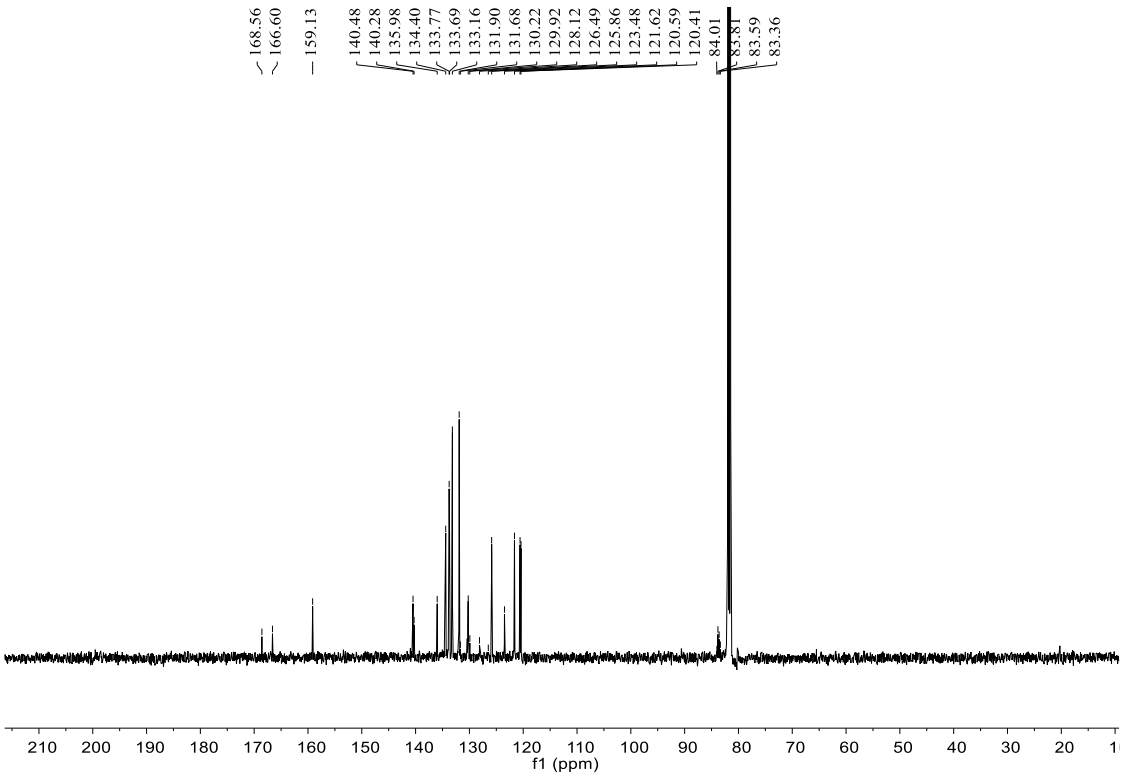


^{19}F NMR spectrum in $CDCl_3$.

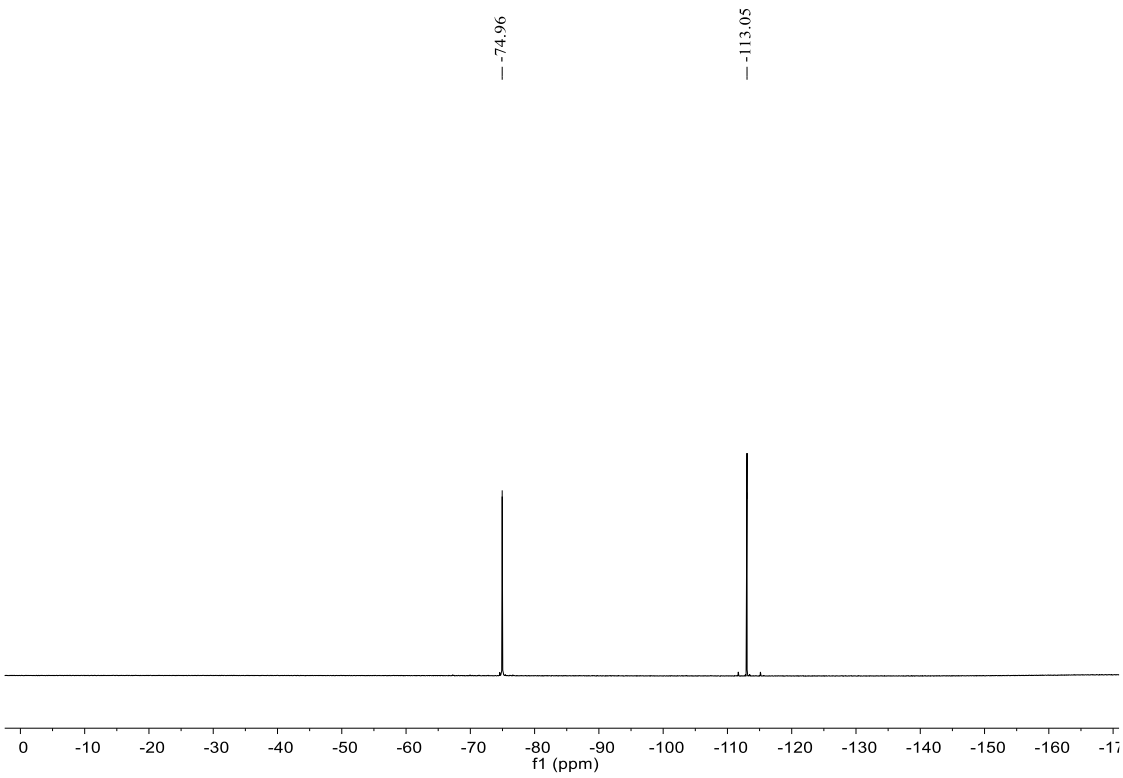
(1*R*)-2,2,2-trifluoro-1-(2-(4-fluorophenyl)-2H-chromen-4-yl)-1-phenylethan-1-ol (79c)



^{1}H NMR spectrum in $CDCl_3$.

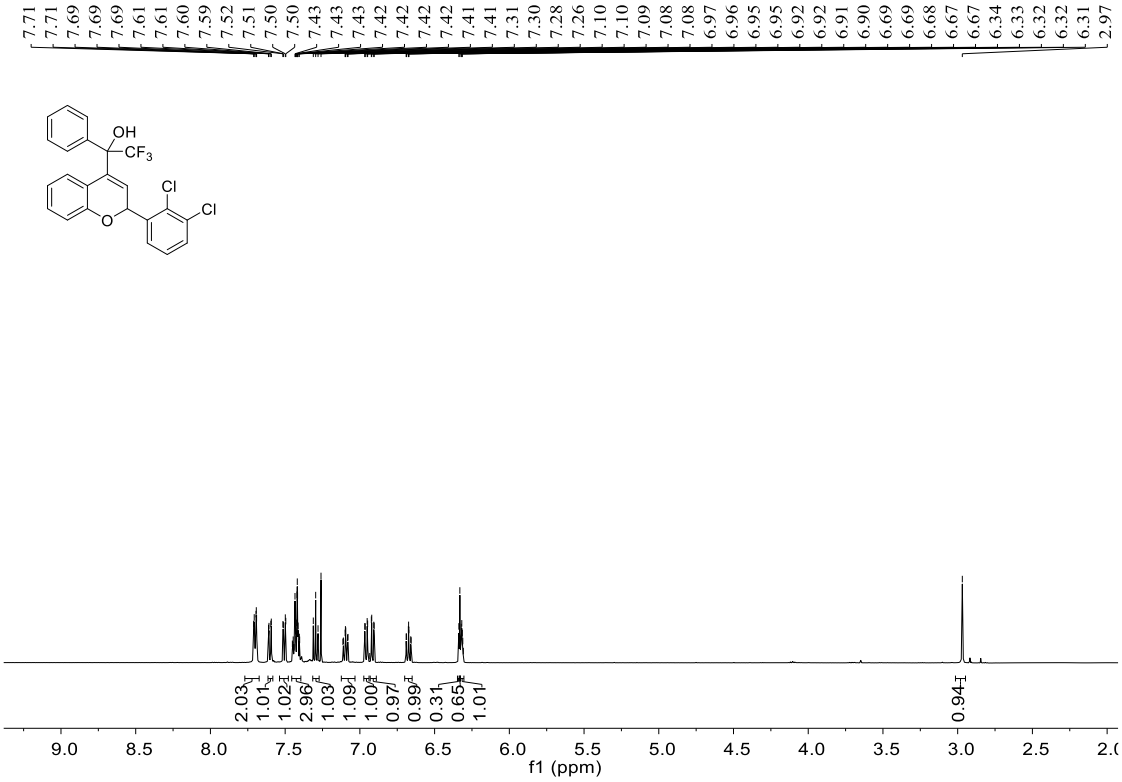


^{13}C NMR spectrum in $CDCl_3$.

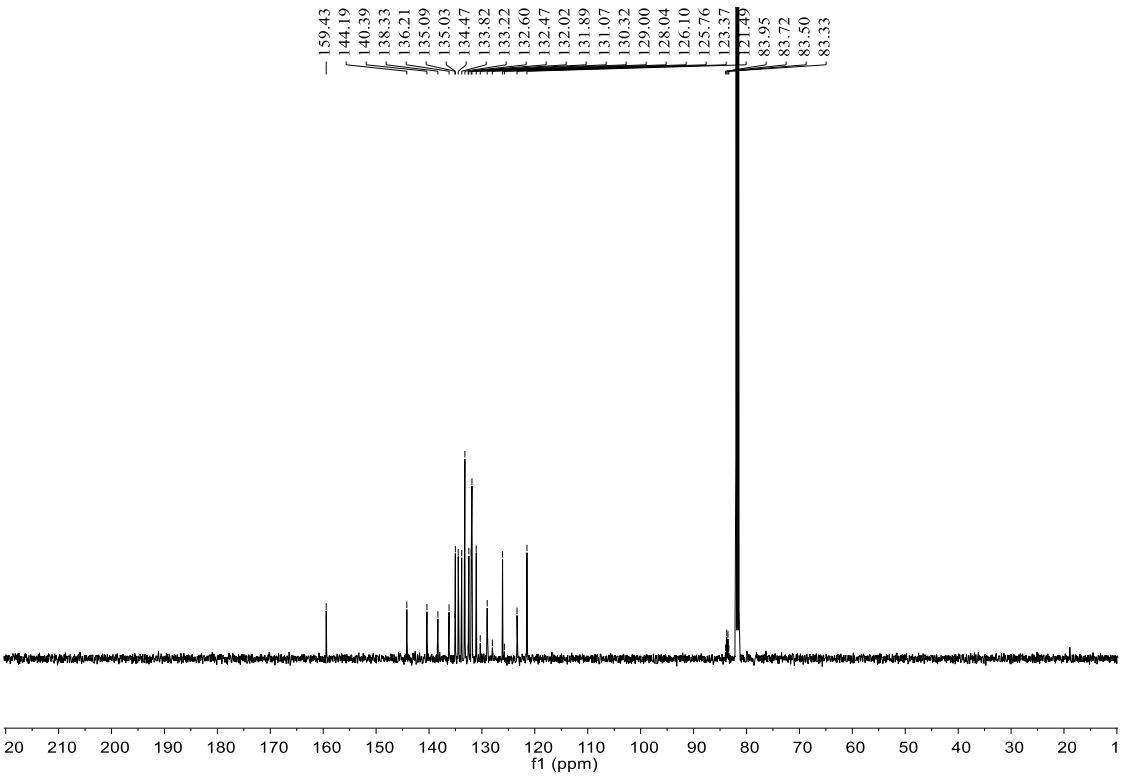


^{19}F NMR spectrum in $CDCl_3$.

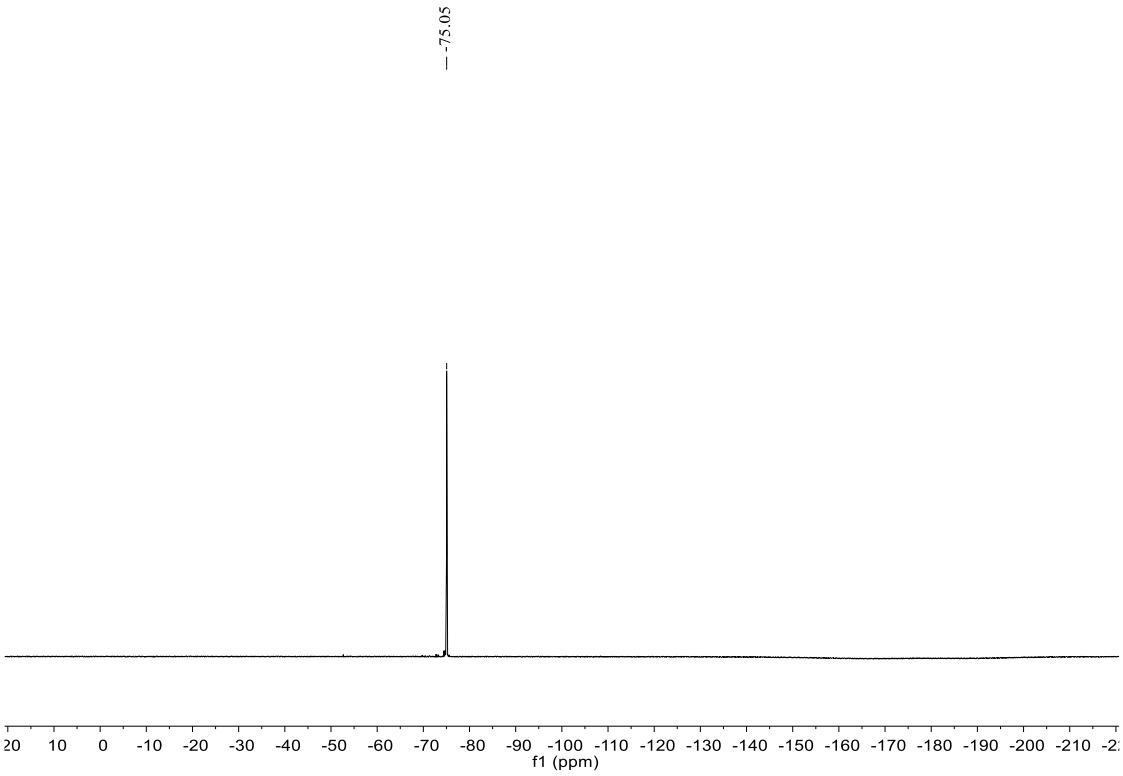
(1*R*)-1-(2-(2,3-dichlorophenyl)-2H-chromen-4-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (80c)



^{1}H NMR spectrum in $CDCl_3$.

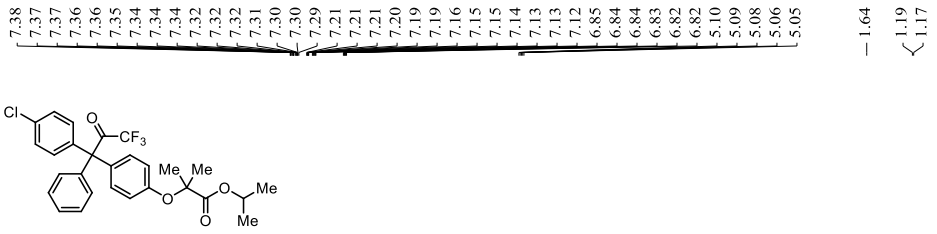


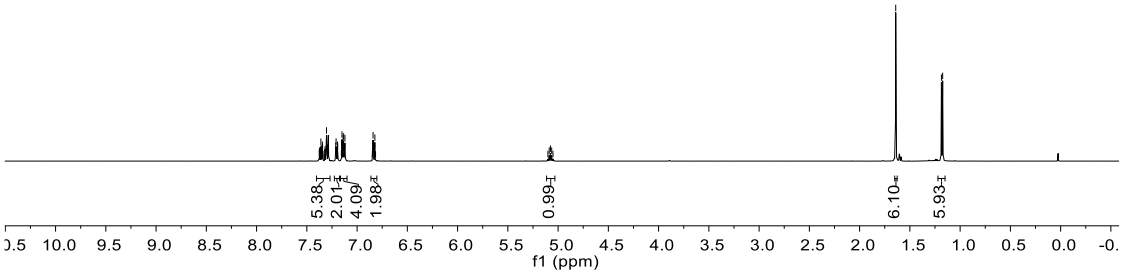
^{13}C NMR spectrum in $CDCl_3$.



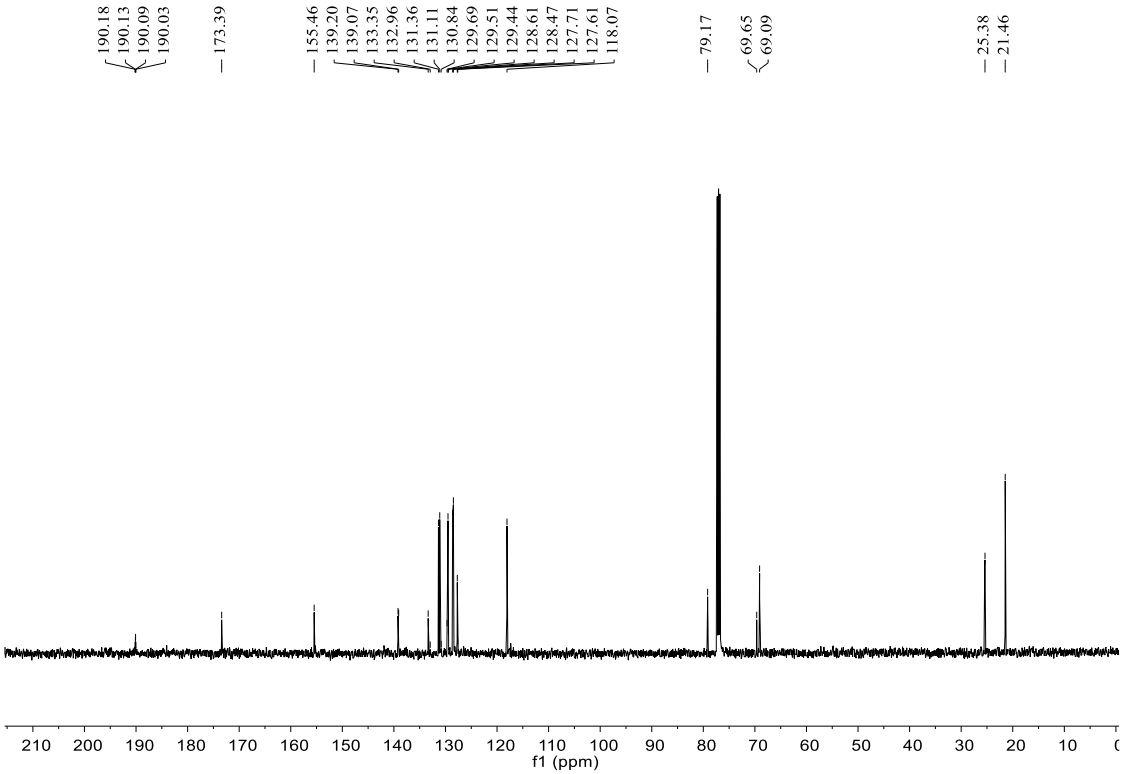
^{19}F NMR spectrum in $CDCl_3$.

80c

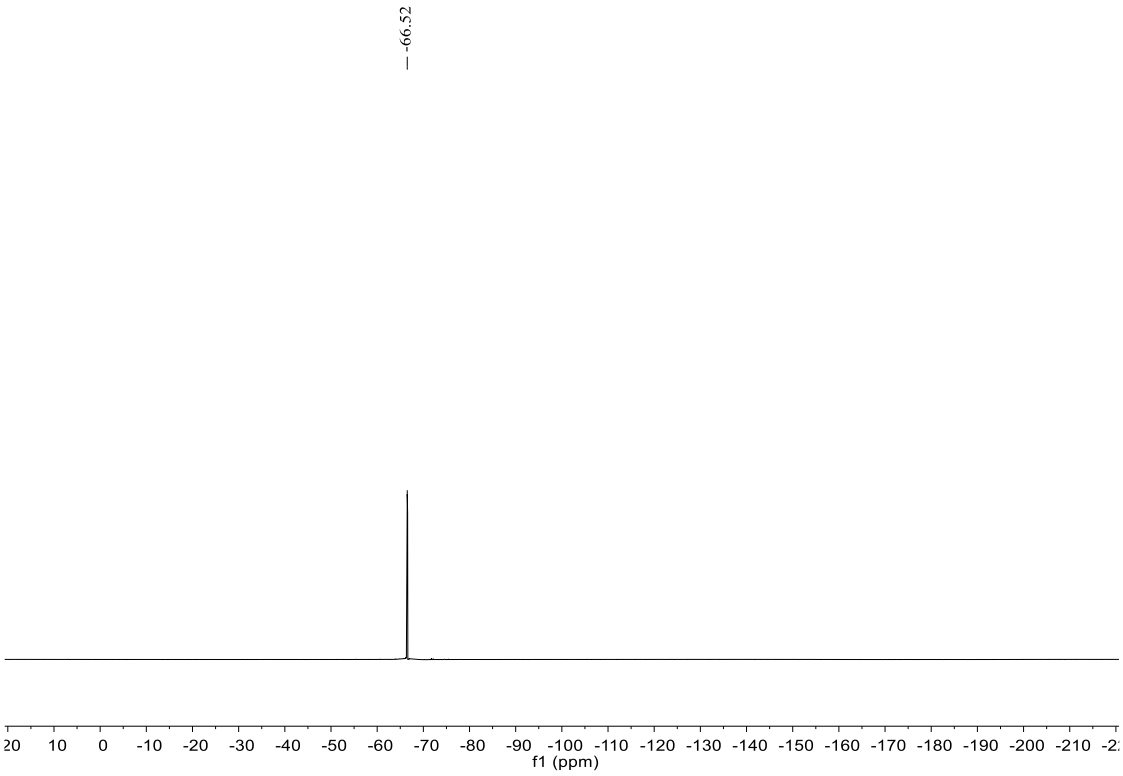




^{1}H NMR spectrum in $CDCl_3$.

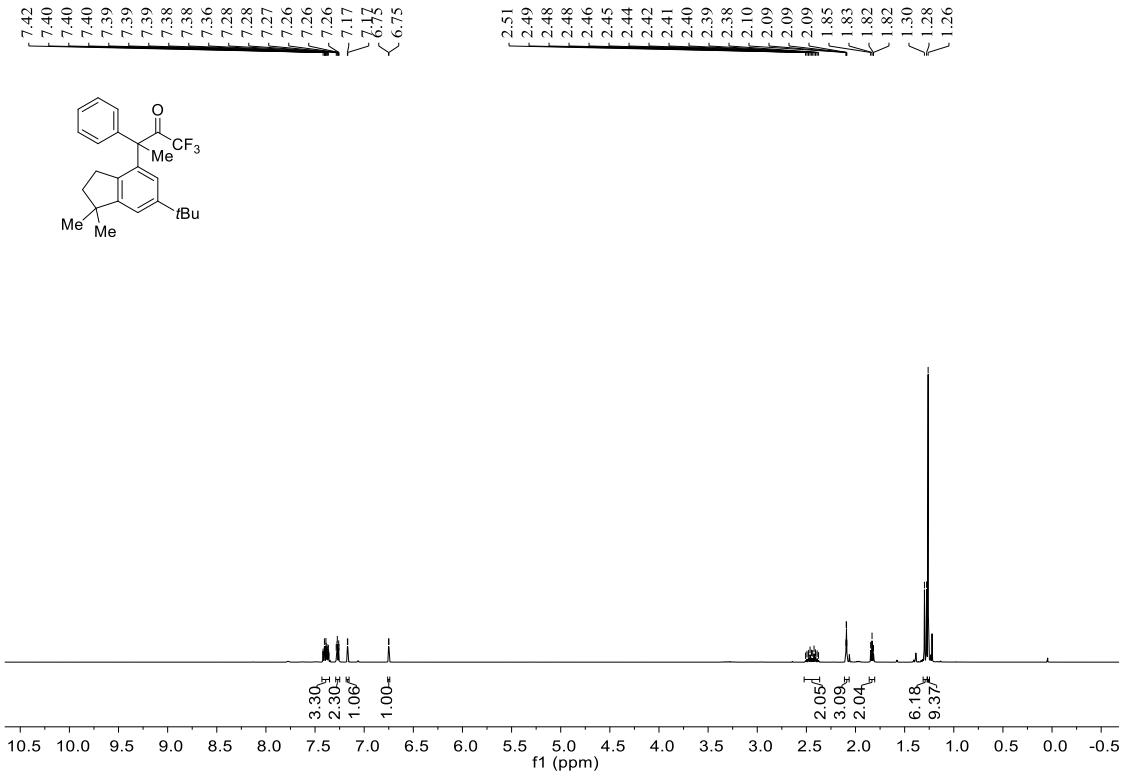


^{13}C NMR spectrum in $CDCl_3$.

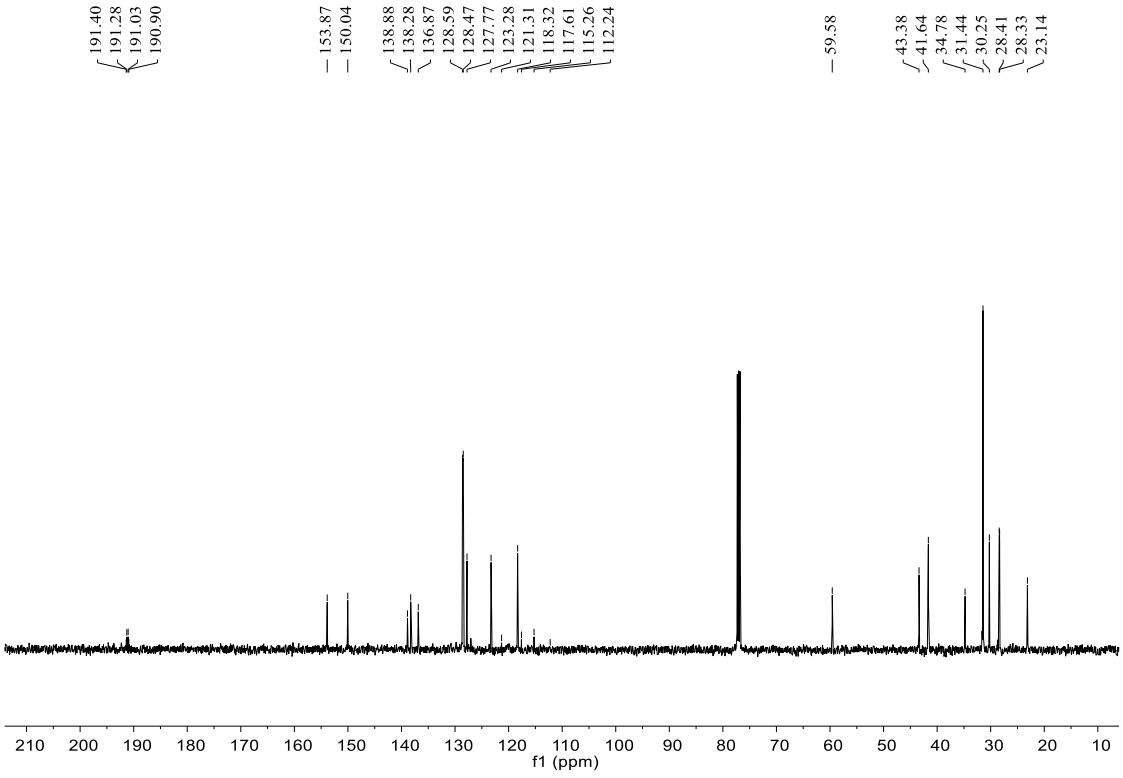


^{19}F NMR spectrum in $CDCl_3$.

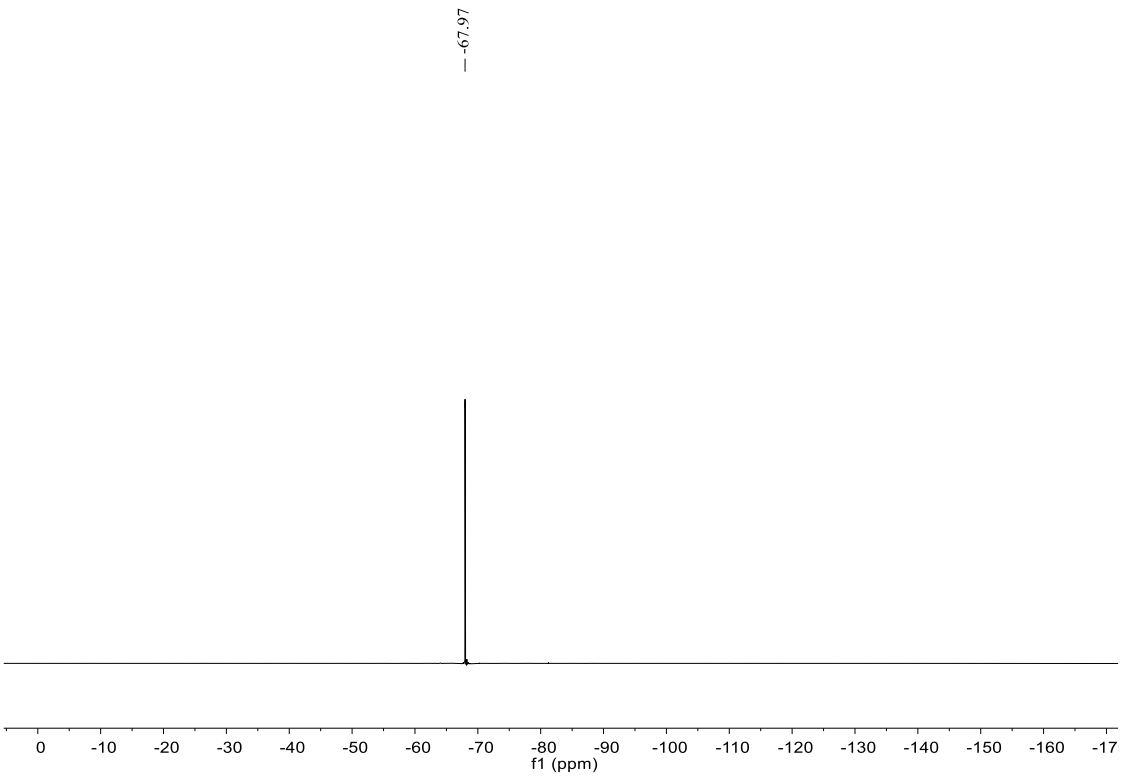
82c



^{1}H NMR spectrum in $CDCl_3$.

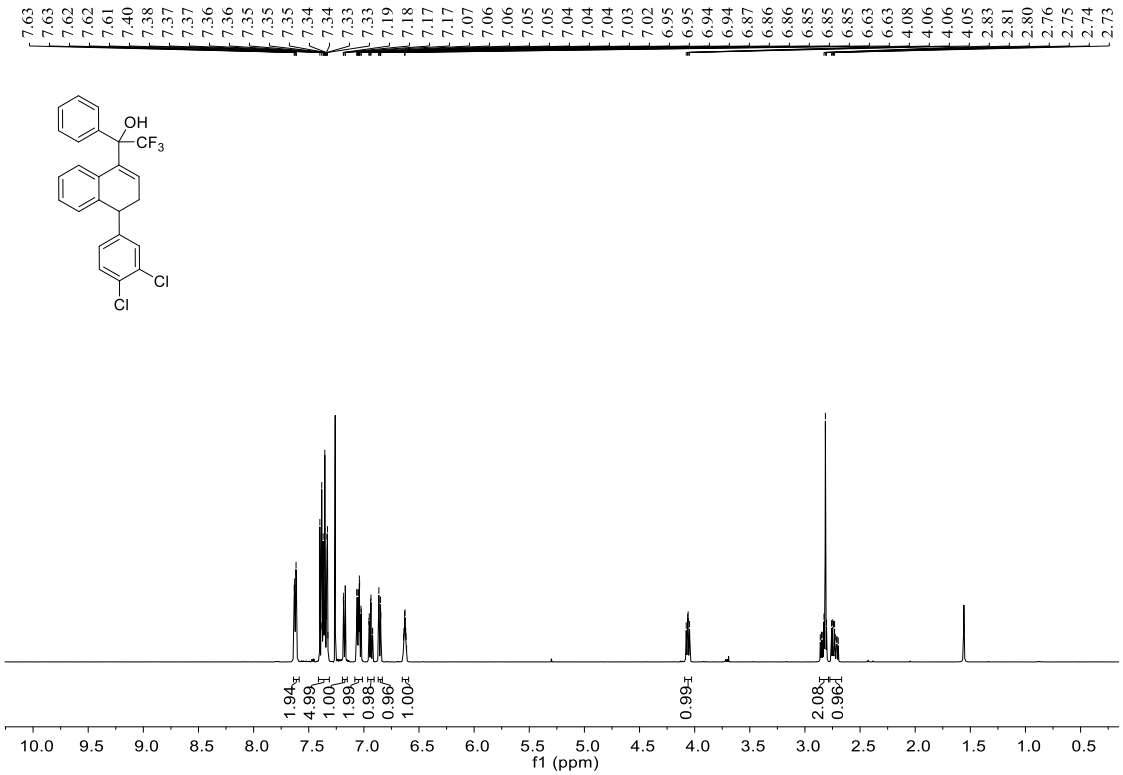


^{13}C NMR spectrum in $CDCl_3$.

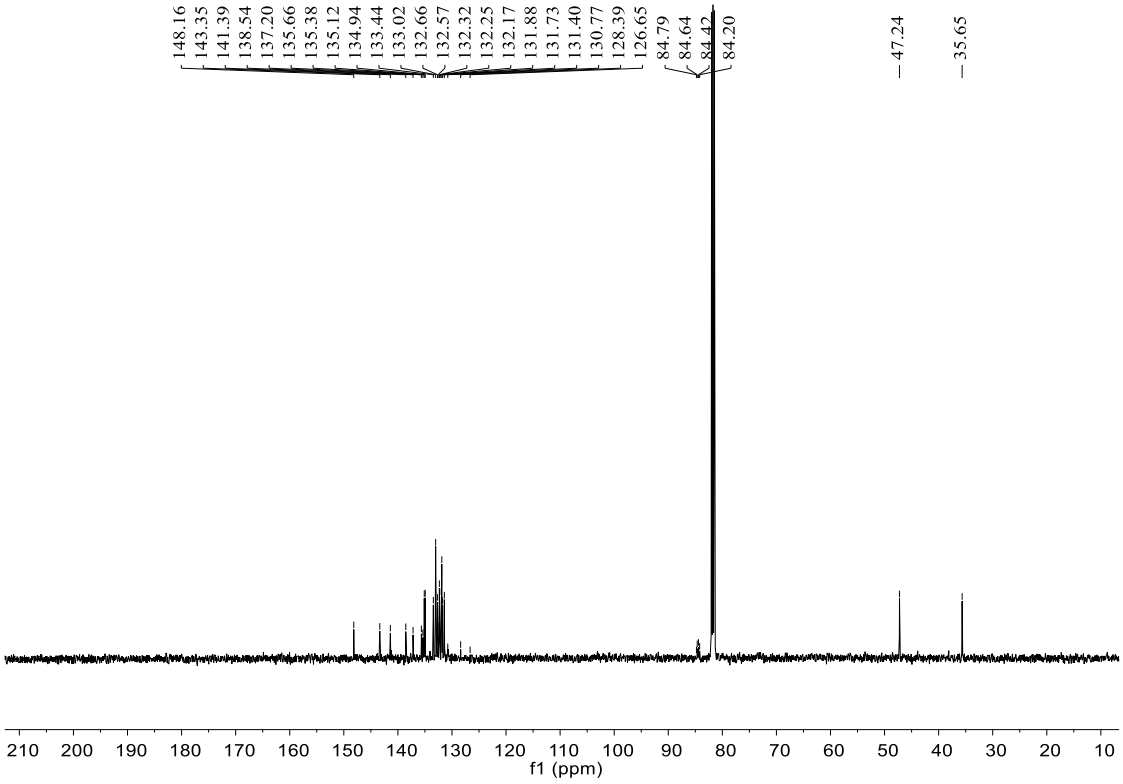


^{19}F NMR spectrum in $CDCl_3$.

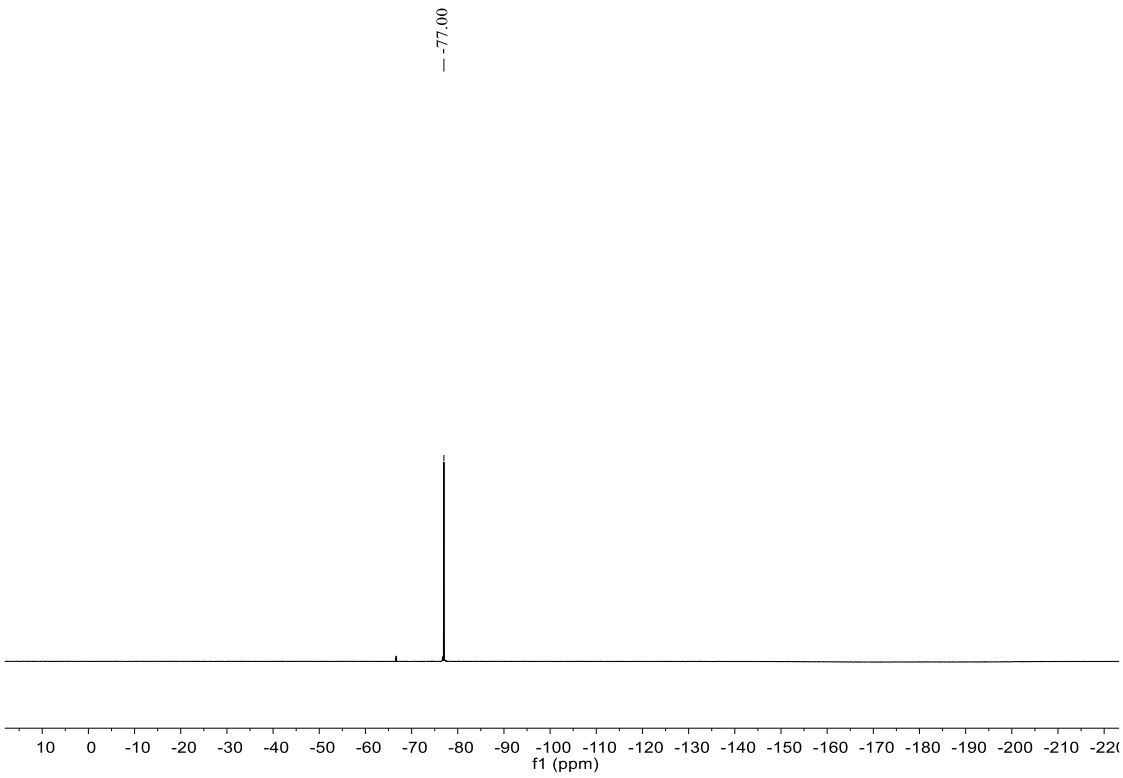
(1*R*)-1-(4-(3,4-dichlorophenyl)-3,4-dihydronaphthalen-1-yl)-2,2,2-trifluoro-1-phenylethan-1-ol (83c)



^{1}H NMR spectrum in $CDCl_3$.

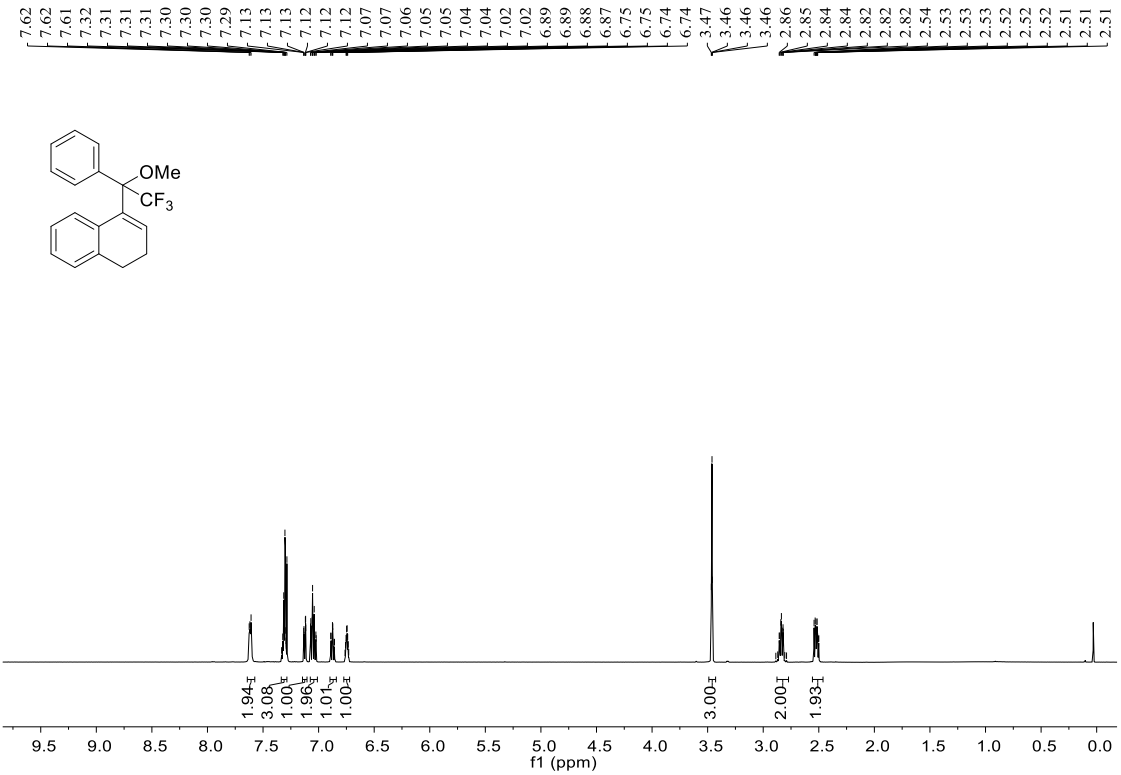


^{13}C NMR spectrum in $CDCl_3$.

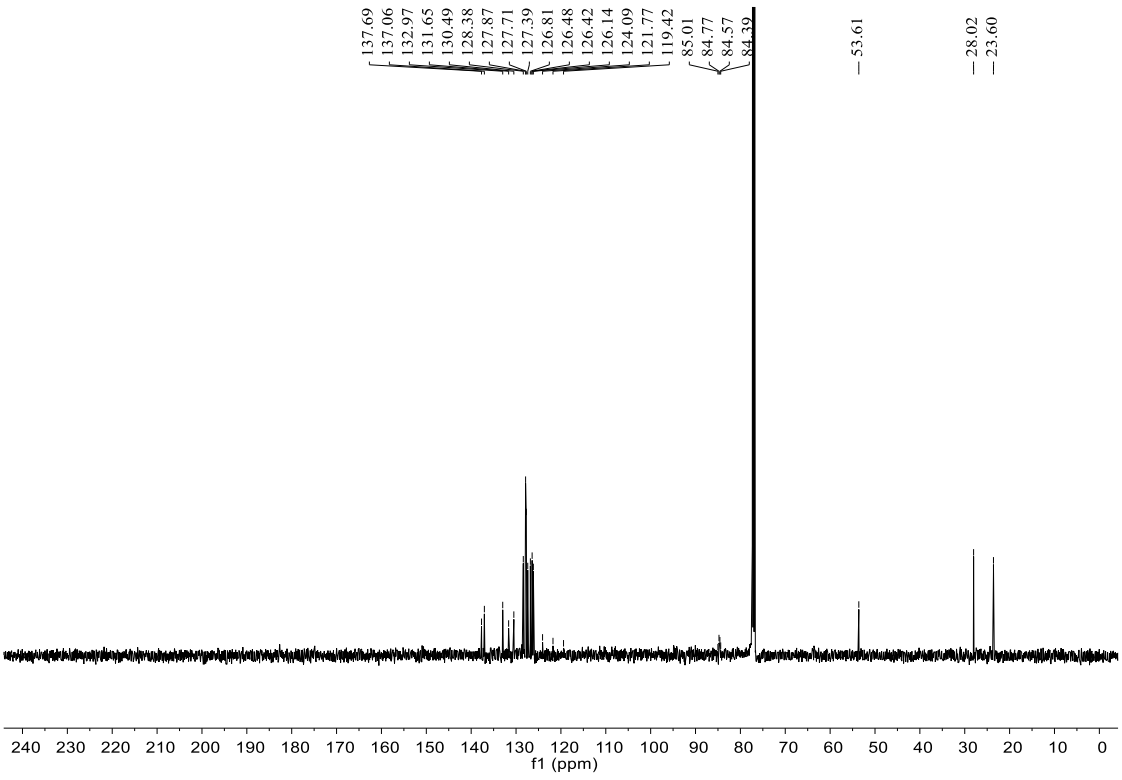


^{19}F NMR spectrum in $CDCl_3$.

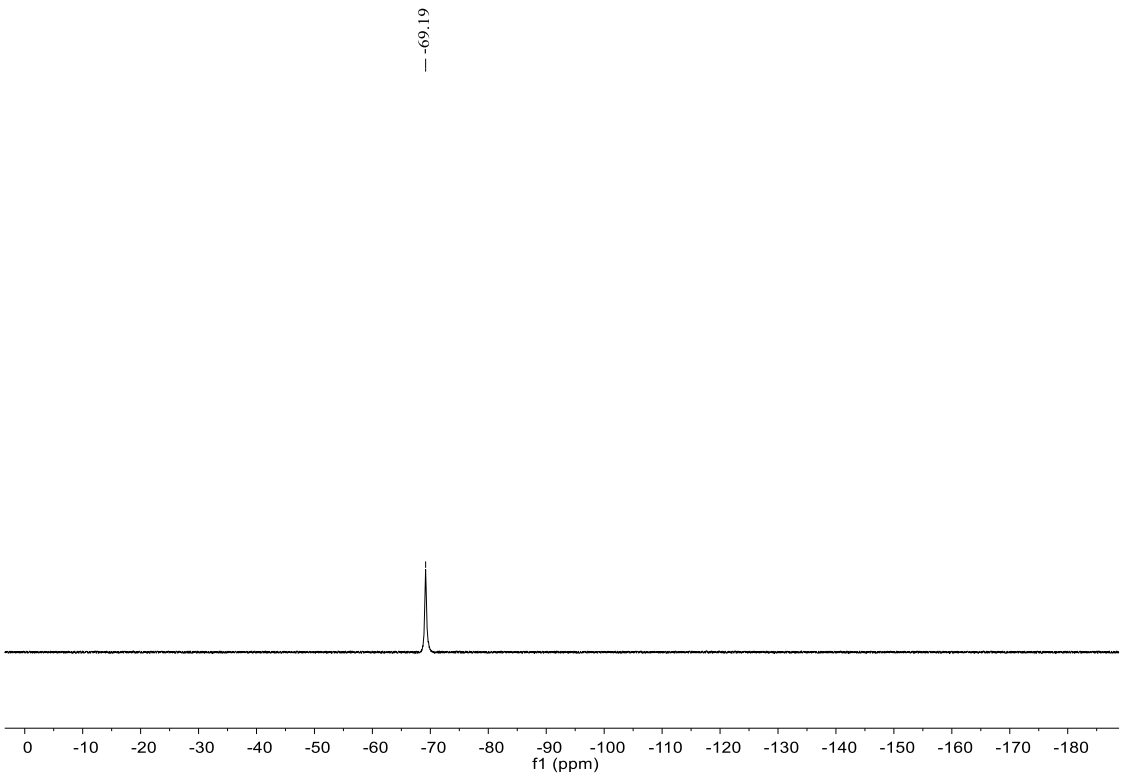
4-(2,2,2-trifluoro-1-methoxy-1-phenylethyl)-1,2-dihydronaphthalene (84c)



^{1}H NMR spectrum in $CDCl_3$.

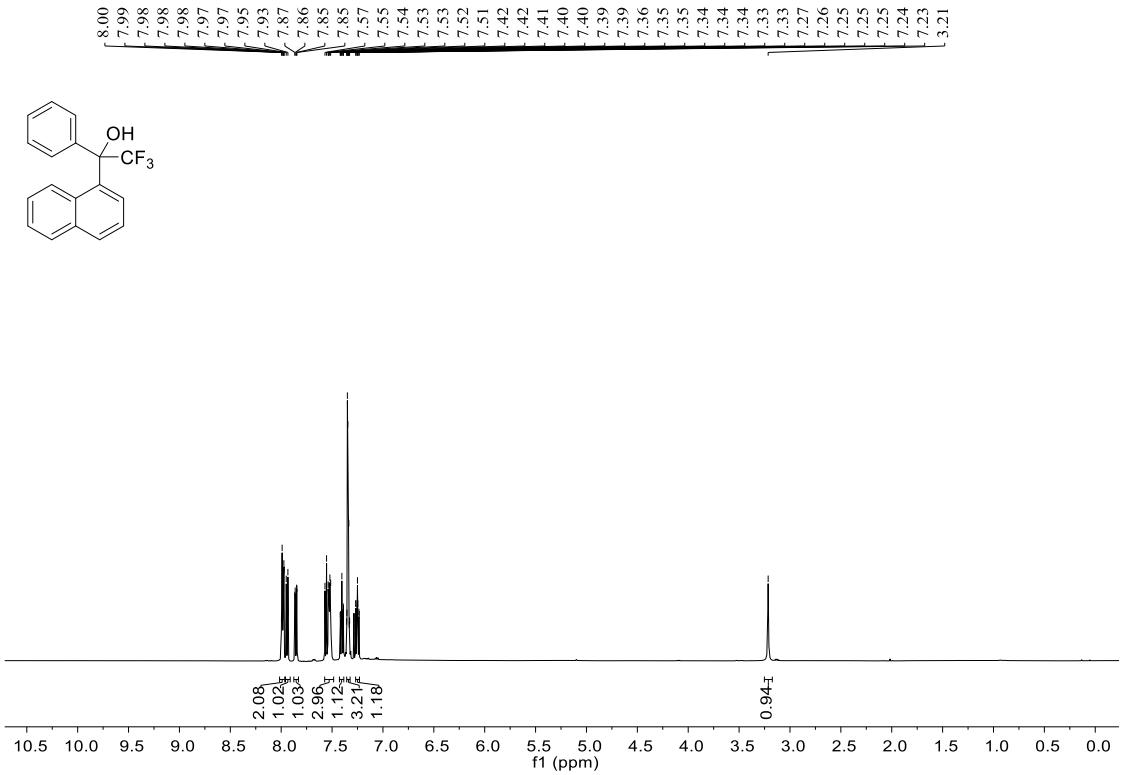


^{13}C NMR spectrum in $CDCl_3$.

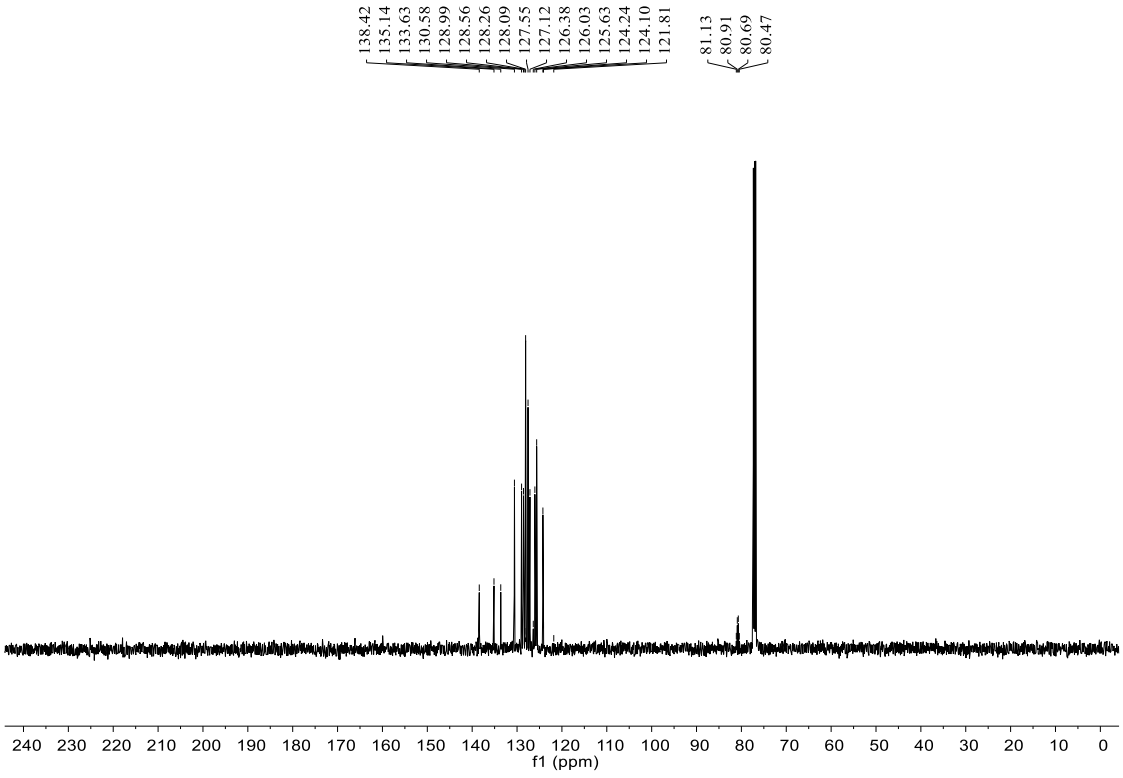


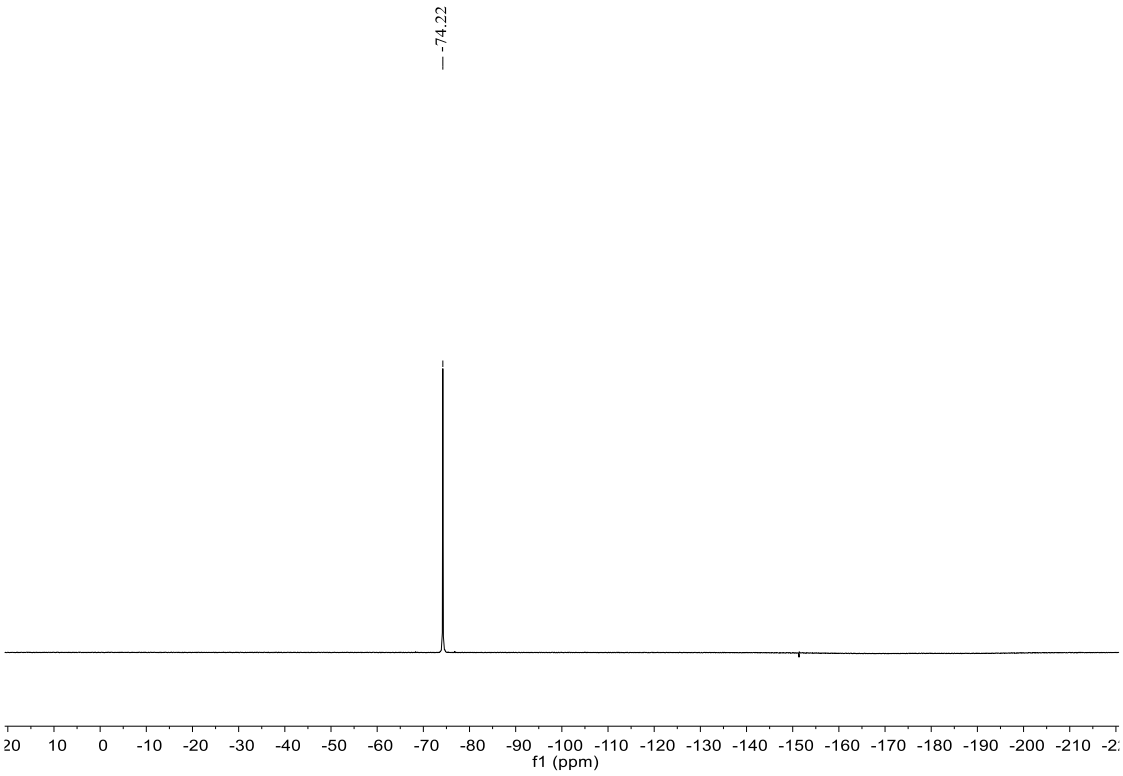
^{19}F NMR spectrum in $CDCl_3$.

2,2,2-trifluoro-1-(7-phenylbicyclo [4.2.0] octa-1,3,5-trien-7-yl) ethan-1-one (85c)



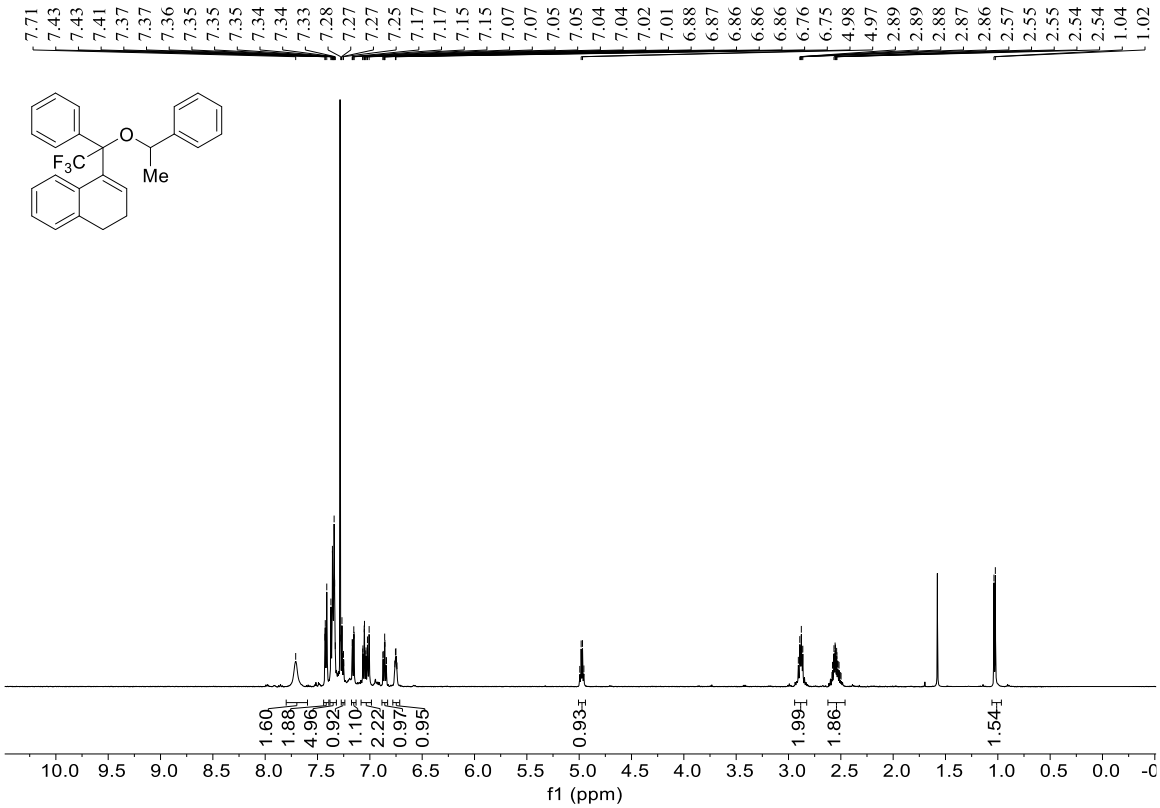
^{1}H NMR spectrum in $CDCl_3$.



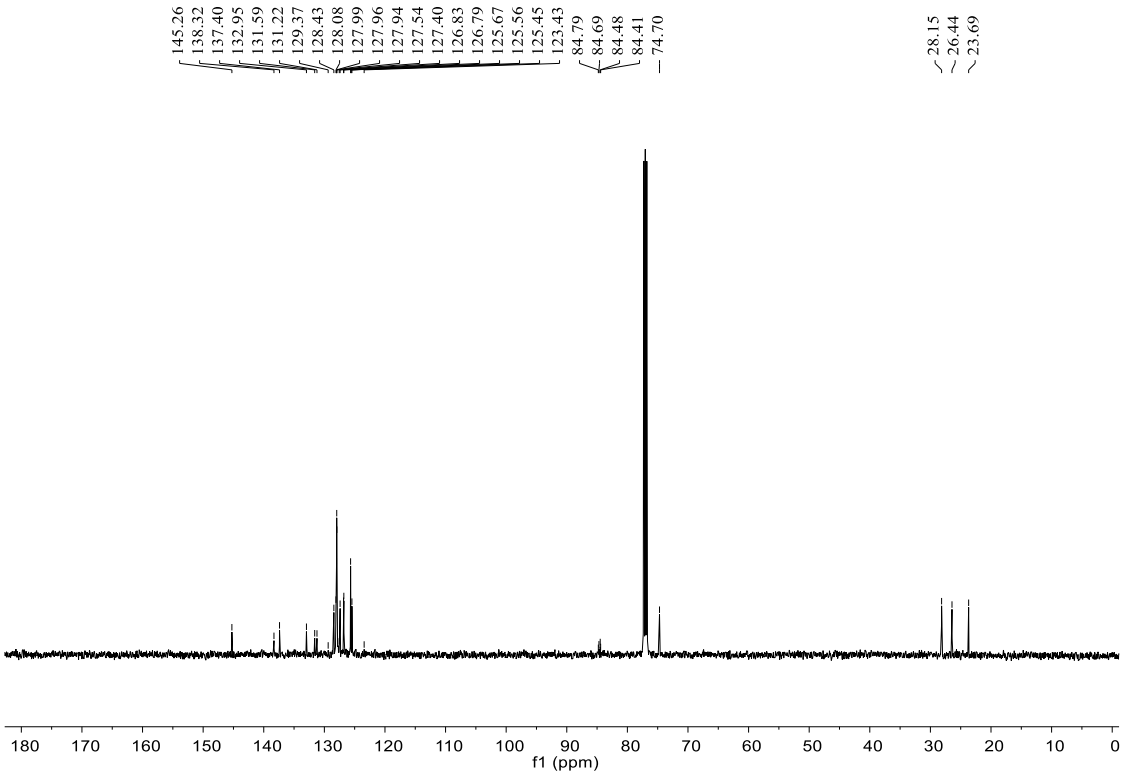


^{19}F NMR spectrum in $CDCl_3$.

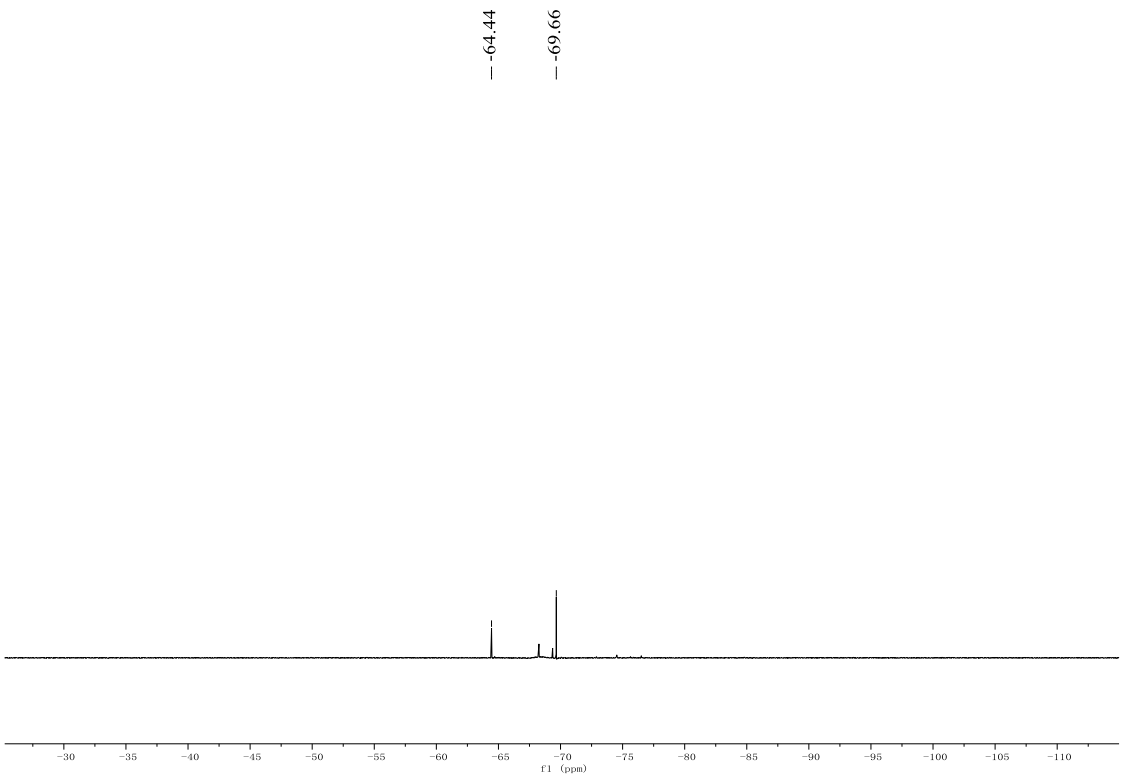
4-(2,2,2-trifluoro-1-phenyl-1-(1-phenylethoxy) ethyl)-1,2-dihydronaphthalene (86c)



^{1}H NMR spectrum in $CDCl_3$.



^{13}C NMR spectrum in $CDCl_3$.



^{19}F NMR spectrum in $CDCl_3$.