Electronic Supplementary Information

Access to CF_3-benzofulvenes via palladium-catalyzed cascade arylation/Trost-Oppolzer cyclization/double-bond isomerization

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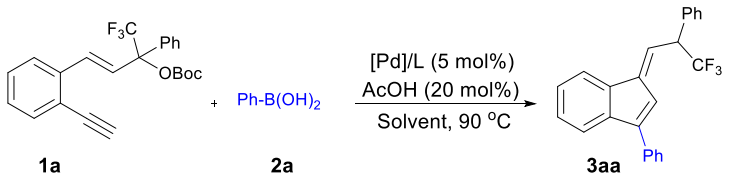
1. **Table S1** Optimization of the Reaction Conditions [a]

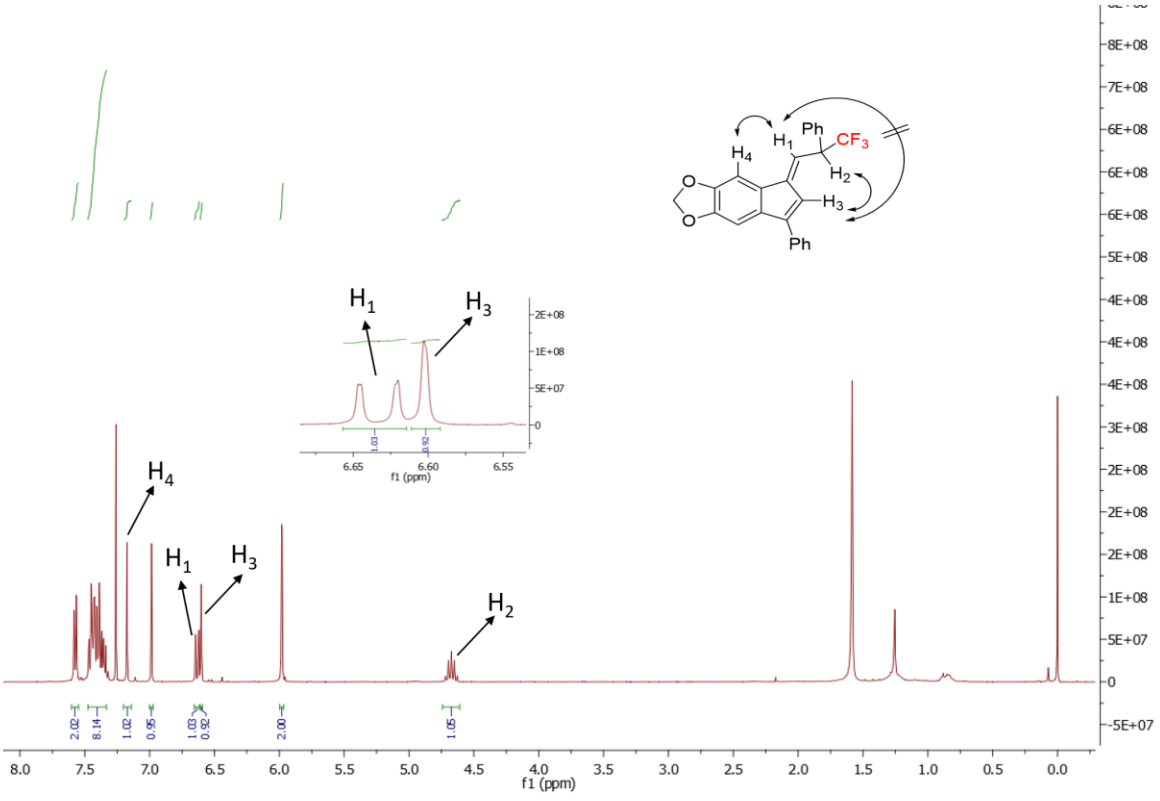


1a 2a 3aa

Entry	[Pd]/L	Solvent	Yield (%)
1	$Pd(PPh_3)_4$	THF	60
2	$Pd(PPh_3)_4$	CH_3CN	51
3	$Pd(PPh_3)_4$	DMF	33
4	$Pd(PPh_3)_4$	DMSO	25
5	$Pd(PPh_3)_4$	1,4-dioxane	81
6	$Pd(PPh_3)_4$	$CHCl_3$	27
7	$Pd(dba)_3.CHCl_3/PCy_3$	1,4-dioxane	-
8	$Pd(dba)_3.CHCl_3$/DPPE	1,4-dioxane	-
9	$Pd(dba)_3.CHCl_3/P(2\text{-furyl})_3$	1,4-dioxane	-
10	$PdCl_2$	1,4-dioxane	-
11	$Pd(OAc)_2$	1,4-dioxane	32
12[b]	$Pd(PPh_3)_4$	1,4-dioxane	-
13	-	1,4-dioxane	-

[a]Experiment by using **1a** (0.24 mmol), **2a** (0.29 mmol), Pd-source (5 mol%), Ligand (10 mol%), and AcOH (20 mol%) in 3 mL of solvent at 90 °C for 12 h. Isolated yields. [b]Reaction at 50 °C.

2. 2D-NMR analysis of compound 3la



^{1}H NMR spectrum of **3la** recorded in $CDCl_3$ at 25 °C

Strong cross-peaks were observed between the indene proton (H3) and the H2 proton, as well as between the alkylidine proton (H1) and the aromatic proton (H4). Further, we didn't observe any NOE impact between the alkylidine proton (H1) and the indene proton (H3), indicating that the near proximity requirement for the appearance of cross peaks and NOE was not met. These findings unambiguously demonstrate the formation of an E-conformer over a Z-isomer.

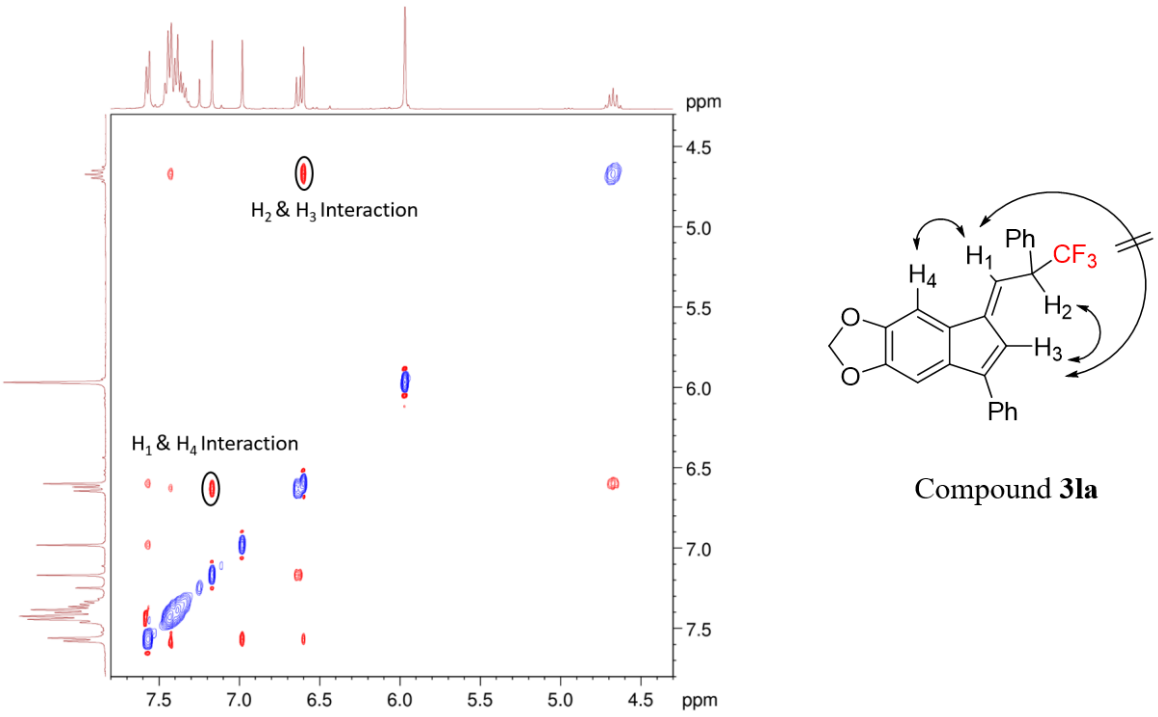
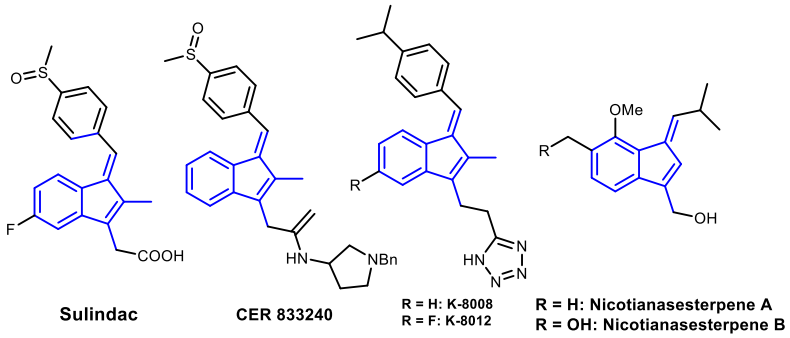


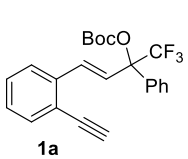
Figure S1. 1H-1H 2D-NOESY spectrum of **3la** recorded in $CDCl_3$ on 400 MHz at 25 °C

3. Fig. S2 Representative examples of bioactive benzofulvenes.

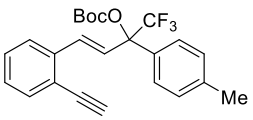


4. General information:

All the reactions were performed in an oven-dried glass apparatus, the air and moisture-sensitive reactions were carried out under an inert atmosphere (nitrogen), using freshly distilled anhydrous solvents. Commercially available reagents were used as such without further purification. All reactions were monitored by thin-layer chromatography on silica plates using UV light and anisaldehyde for visualization. Column chromatography was performed on silica gel (100-200 mesh) using hexanes and ethyl acetate as eluent. ^{1}H NMR was recorded in $CDCl_3$ on 500 and 400 MHz, ^{13}C NMR was recorded on 125 MHz, 100 MHz and 75 MHz. ^{19}F NMR was recorded on 377 MHz. Chemical shifts were reported in δ (ppm) relative to TMS as an internal standard and *J* values were given in Hz (hertz). Multiplicity is indicated as, s (singlet); d (doublet); t (triplet); m (multiplet); dd (doublet of doublets), etc. δ 7.26 and *δ* 1.56 corresponding to $CDCl_3$ and moisture respectively in ^{1}H NMR, δ 77.16 is related to $CDCl_3$ in ^{13}C NMR. FT-IR spectra were recorded on Alpha (Bruker) Infrared Spectrophotometer. High-resolution mass spectra (HRMS) [ESI^+, ESI^-] were obtained by using either a TOF or a double-focusing spectrometer, reported compounds. Raw materials required for the synthesis of compound **1a-1t** were prepared according to the literature procedure.[1]



1a



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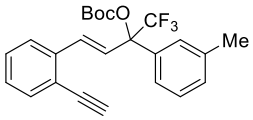

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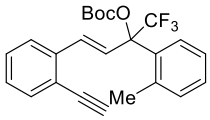

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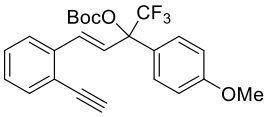
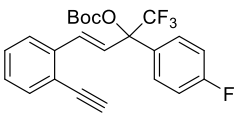


1e



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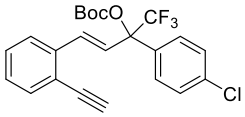
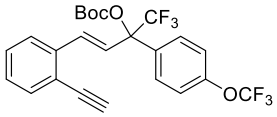
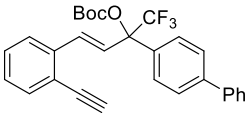


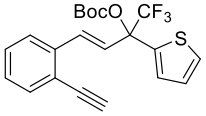
1g



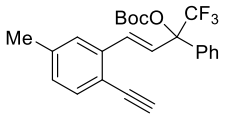
1h



1i



1j



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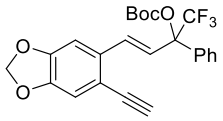
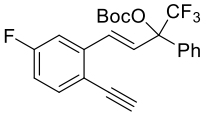


1l



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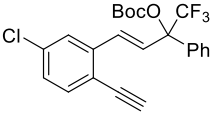
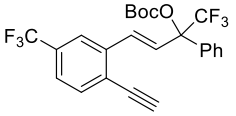
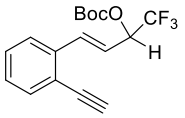


1n



1o



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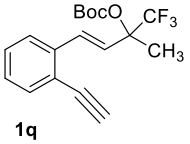

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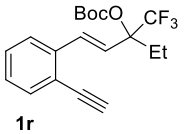
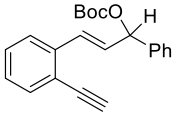


1r



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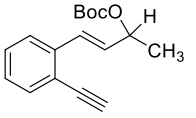
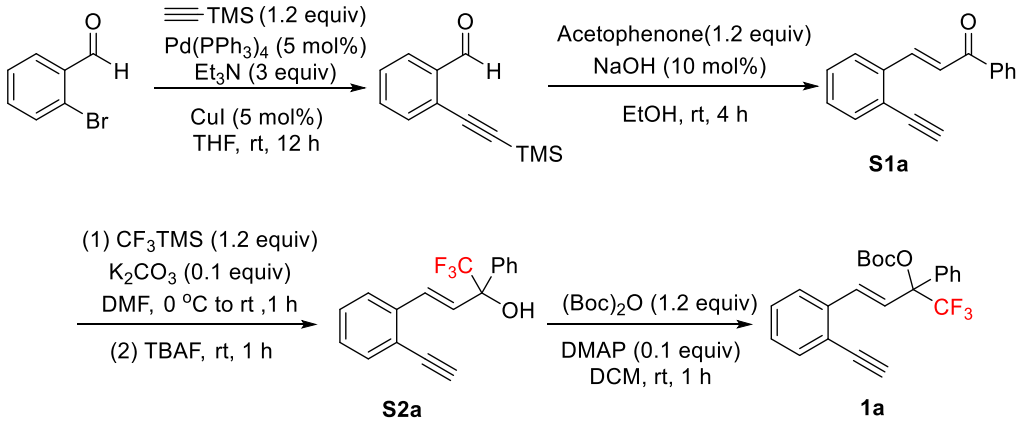


1t

5. Experimental procedures and characterization data of Starting materials

General reaction:



General procedure A:

Under argon atmosphere, to a solution of 2-bromobenzaldehyde (3.5 g, 18.90 mmol) in THF solvent were added trimethylsilyl acetylene (2.22 g, 22.70 mmol), Et_3N (50 mL), $PdCl_2(PPh_3)_2$ (0.658 g, 0.94 mmol) and CuI (0.035 g, 1.89 mmol) at room temperature. The reaction mixture was stirred at room temperature for 12 h, then filtered through a short pad of silica gel and washed with ethyl acetate. After the removal of solvent, the crude residue was purified by flash chromatography on silica gel (petroleum ether/ ethyl acetate = 100:1, v/v) to afford the desired product 2-((trimethylsilyl)ethynyl)benzaldehyde (3.6 g, 95% yield).

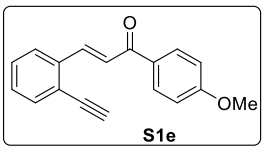
To a solution of 2-((trimethylsilyl)ethynyl)benzaldehyde (2.02 g, 10.0 mmol) in methanol (25 mL) were added acetophenone (1.2 g, 10 mmol) and 10% NaOH aqueous solution (3.6 mL, 11.0 mmol) at room temperature. The reaction mixture was stirred at room temperature for 3 h, then the solution was quenched with water and extracted with EtOAc (20 mL). The organic layer was separated and the aqueous layer was extracted with EtOAc (3x 10 mL). The combined organic layers were washed with brine, dried over $MgSO_4$, and concentrated under reduced pressure. The residue was purified by flash chromatography on silica gel (petroleum ether/ethyl acetate = 100:1 to 30:1, v/v) to afford **S1a** (1.9 g, 82%).

According to the literature procedure,[2] α, β unsaturated ketone **S1a** (10 mmol, 1 equiv) and $TMSCF_3$ (1.7 mL, 12 mmol, 1.2 equiv) were suspended in anhydrous DMF (20 mL). To this solution, dry K_2CO_3 (13.8 mg, 0.1 equiv) was added and the mixture was stirred vigorously at room temperature under N_2 atmosphere. Completion of the reaction was monitored by TLC. To this reaction mixture, tetrabutylammonium fluoride (1 M, 3.2 mL, 12mmol) was added and stirred for 1 h at room temperature. The reaction mixture was diluted with the water, then

extracted with ethyl acetate (3 × 30 mL) and the combined organic layers were finally washed with brine solution, dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude product **S2a** was further purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 90:10).

To the stirred solution of alcohol **S2a** (10 mmol, 1 equiv) in DCM (10 mL), were added Boc-anhydride (2.75 mL, 12 mmol, 1.2 equiv) and DMAP (12.2 mg, 0.1 equiv) at 0 °C, and the solution was warmed to room temperature and stirred until completion of the starting material monitored by TLC. Then, the reaction mixture was concentrated under reduced pressure, and the obtained residue was purified by using column chromatography on silica gel using hexane/ethyl acetate (9:1) as eluent to afford the pure CF_3-allyl carbonates (**1**). Most of the compounds were reported in the literature and the data of unknown were summarized below.[1,2]

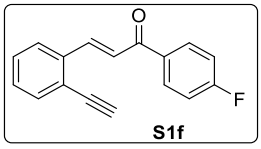
(*E*)-3-(2-Ethynylphenyl)-1-(4-methoxyphenyl)prop-2-en-1-one (S1e)



S1e

Following general procedure **A,** 2-((trimethylsilyl)ethynyl)benzaldehyde (1g, 4.95 mmol), 4-methoxy acetophenone (0.742 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1e** as a red color oil, yield 82% (1.06 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.25 (d, J = 15.8 Hz, 1H), 8.04 (d, J = 8.9 Hz, 2H), 7.75 (d, J = 7.5 Hz, 1H), 7.66 (m, 3H), 7.41 (m, 2H), 7.00 (m, 1H), 3.89 (s, 3H), 3.44 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 188.9, 163.6, 141.6, 137.3, 133.8, 131.0, 130.8, 129.7, 129.2, 126.6, 124.2, 123.2, 113.9, 83.6, 81.5, 55.6; **IR (neat)**: ν_{max} = 3296,1664 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{15}O_2$ $[M+H]^+$: 263.1066, found: 263.1062.

(*E*)-3-(2-Ethynylphenyl)-1-(4-fluorophenyl)prop-2-en-1-one (S1f)

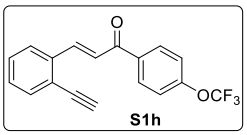


S1f

Following general procedure **A,** 2-((trimethylsilyl)ethynyl)benzaldehyde (1g, 4.95 mmol), 4-fluoro acetophenone (0.683 g, 4.95 mmol), Aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1f** as yellow color solid, mp:113 – 115 °C yield 75%

(0.928 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.25 (d, J = 15.8 Hz, 1H), 8.07 (m, 2H), 7.76 (m, 1H), 7.61 (m, 2H), 7.42 (m, 2H), 7.19 (m, 2H), 3.45 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 189.1, 165.7 (d, J = 254.5 Hz), 142.6, 136.8, 134.5, 133.8, 131.3 (d, J = 9.2 Hz), 130.0, 129.2, 126.6, 123.8, 123.4, 115.8 (d, J = 21.8 Hz), 83.7, 81.4; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –105.42 (s, F); **IR (KBr)**: ν_{max} = 3301,1668 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{17}H_{12}FO$ $[M+H]^+$: 251.0866, found: 251.0864.

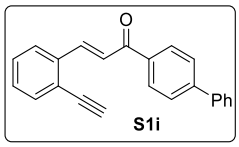
(*E*)-3-(2-Ethynylphenyl)-1-(4-(trifluoromethoxy)phenyl)prop-2-en-1-one (S1h)



S1h

Following general procedure **A,** 2-((trimethylsilyl)ethynyl) benzaldehyde (1g, 4.95 mmol), 4-trifluoromethoxy acetophenone (1 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1h** as a redd colour oil, yield 72% (1.12 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.27 (d, J = 15.8 Hz, 1H), 8.09 (m, 2H), 7.76 (m, 1H), 7.61 (m, 2H), 7.42 (m, 2H), 7.35 (m, 2H), 3.45 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 189.1, 152.5, 143.0, 136.7, 136.4, 133.8, 130.6, 130.4, 130.1, 129.2, 126.6, 123.6, 120.5, 120.4 (q, J = 258.6 Hz).83.8, 81.3; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –57.60 (s, 3F); **IR (neat)**: ν_{max} = 3296,1668 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{12}F_3O_2$ $[M+H]^+$: 317.0783, found: 317.0779.

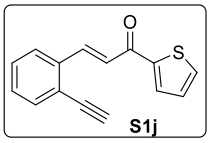
(*E*)-1-([1,1'-Biphenyl]-4-yl)-3-(2-ethynylphenyl)prop-2-en-1-one (S1i)



S1i

Following general procedure **A,** 2-((trimethylsilyl)ethynyl)benzaldehyde (1g, 4.95 mmol), 1-([1,1'-biphenyl]-4-yl)ethan-1-one (0.970 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1i** as a colourless oil, yield 75% (114.29 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.30 (d, J = 15.8 Hz, 1H), 8.09 (d, J = 8.3 Hz, 2H), 8.01 (d, J = 8.3 Hz, 1H), 7.76 (d, J = 7.7 Hz, 1H), 7.71 (d, J = 8.3 Hz, 1H), 7.67 (d, J = 1.5 Hz, 1H), 7.65 (m, 1H), 7.62 (s, 1H), 7.56 (d, J = 7.4 Hz, 1H), 7.47 (m, 2H), 7.40 (m, 3H), 3.44 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 197.8, 190.0, 145.6, 142.2, 139.9, 137.0, 136.8, 133.8, 129.9, 129.3, 129.2, 129.0, 128.3, 127.3, 126.5, 124.1, 123.3, 83.7, 81.2; **IR (neat)**: ν_{max} = 3292,1665 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{23}H_{17}O$ $[M+H]^+$: 309.1273, found: 309.1270.

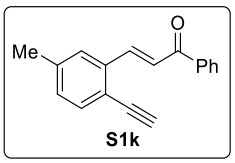
(*E*)-3-(2-Ethynylphenyl)-1-(thiophen-2-yl)prop-2-en-1-one (S1j)



S1j

Following general procedure **A,** 2-((trimethylsilyl)ethynyl)benzaldehyde (1g, 4.95 mmol), 2-acetyl thiophene (0.623 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1j** as a light yellow colour oil, yield 70% (0.824 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.21 (d, J = 15.7 Hz, 1H), 7.77 (d, J = 3.7 Hz, 1H), 7.65 (d, J = 7.5 Hz, 1H), 7.59 (d, J = 4.9 Hz, 1H), 7.50 (m, 1H), 7.42 (s, 1H), 7.33 (m, 1H), 7.28 (m, 1H), 7.11 (m, 1H), 3.37 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 182.2, 145.5, 141.6, 136.8, 134.1, 133.8, 132.0, 129.9, 129.1, 128.3, 126.7, 123.9, 123.4, 83.8, 81.4; **IR (neat)**: ν_{max} = 3295,1672 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{15}H_{11}OS$ $[M+H]^+$: 239.0525, found: 239.0522.

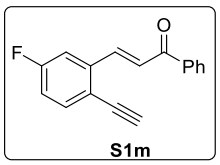
(*E*)-3-(2-Ethynyl-5-methylphenyl)-1-phenylprop-2-en-1-one (S1k)



S1k

Following general procedure **A,** 5-methyl-2-((trimethylsilyl)ethynyl)benzaldehyde (1.069 g, 4.95 mmol), acetophenone (0.594 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1k** as a yellow colour solid, mp: 117 – 118 °C, yield 85% (1.03 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.24 (d, J = 15.8 Hz, 1H), 8.05 (m, 2H), 7.63 (m, 3H), 7.53 (m, 3H), 7.16 (d, J = 7.9 Hz, 1H), 3.39 (s, 1H), 2.40 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 190.8, 142.6, 139.4, 138.2, 136.8, 133.7, 132.9, 130.9, 128.7, 128.4, 127.1, 124.0, 120.5, 82.9, 81.5, 21.6; **IR (KBr)**: ν_{max} = 3290,1662 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{15}O$ $[M+H]^+$: 247.1117, found: 247.1114.

(*E*)-3-(2-ethynyl-5-fluorophenyl)-1-phenylprop-2-en-1-one (S1m)

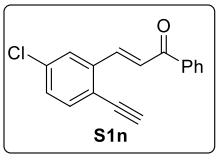


S1m

Following general procedure **A,** 5-fluoro-2-((trimethylsilyl)ethynyl)benzaldehyde (1.089 g, 4.95 mmol), acetophenone (0.594 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1m** as a yellow colour solid, mp: 123 – 125 °C, yield 75% (0.928 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.21 (dd, J = 15.8, 1.4 Hz, 1H), 8.05 (m, 2H), 7.63 (m, 2H), 7.56 (m, 2H), 7.52 (m, 1H), 7.44 (dd, J = 9.6, 2.6 Hz, 1H), 7.13 (m, 1H), 3.41 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 190.3, 164.0, 161.5, 141.2, 139.4 (d, J = 8.0 Hz),

137.9, 135.6 (d, *J* = 8.5 Hz), 133.2, 128.8 (d, *J* = 6.9 Hz), 125.2, 119.5 (d, *J* = 2.8 Hz), 117.4 (d, *J* = 22.4 Hz), 113.1 (d, *J* = 22.9 Hz), 83.4, 80.4; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –104.52 (s, F); **IR (KBr)**: ν_{max} = 3298,1666 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{17}H_{12}FO$ $[M+H]^+$: 251.0866, found: 251.0864.

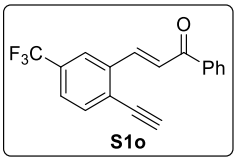
(*E*)-3-(5-Chloro-2-ethynylphenyl)-1-phenylprop-2-en-1-one (S1n)



S1n

Following general procedure **A,** 5-chloro-2-((trimethylsilyl)ethynyl)benzaldehyde (1.168 g, 4.95 mmol), acetophenone (0.594 g, 4.95 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1n** as a red colour oil, yield 78% (1.02 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.14 (m, 1H), 7.99 (m, 2H), 7.67 (m, 1H), 7.54 (m, 1H), 7.51 (m, 1H), 7.47 (m, 2H), 7.43 (m, 1H), 7.26 (dd, *J* = 8.3, 2.1 Hz, 1H), 3.40 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 189.2, 139.9, 137.7, 136.9, 134.3, 133.9, 132.2, 128.9, 127.8, 127.7, 125.5, 124.1, 120.8, 83.5, 79.4; **IR (neat)**: ν_{max} = 3295,1663 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{17}H_{12}ClO$ $[M+H]^+$: 267.0571, found: 267.0569.

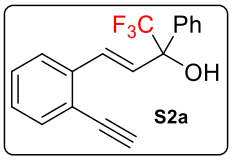
(*E*)-3-(2-Ethynyl-5-(trifluoromethyl)phenyl)-1-phenylprop-2-en-1-one (S1o)



S1o

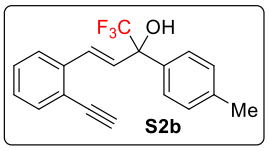
Following general procedure **A,** 5-(trifluoromethyl)-2-((trimethylsilyl)ethynyl)benzaldehyde (1.336 g, 4.95 mmol), acetophenone (0.594 g, 4.95 mmol), Aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S1o** as a yellow colour solid, mp: 116 – 117 °C, yield 70% (1.03 g); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 8.26 (d, *J* = 15.8 Hz, 1H), 8.06 (q, *J* = 1.7 Hz, 1H), 8.04 (t, *J* = 1.7 Hz, 1H), 7.97 (m, 1H), 7.95 (d, *J* = 1.4 Hz, 1H), 7.69 (m, 1H), 7.55 (m, 2H), 7.49 (m, 2H), 3.57 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 190.1, 140.6, 137.8, 134.3, 133.3, 133.2, 131.2 (q, *J* = 32.9 Hz), 128.8, 128.7, 128.7, 128.4, 125.5, 123.3, 123.2, 86.1, 80.2; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –58.65 (s, 3F); **IR (KBr)**: ν_{max} = 3300,1670 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{12}F_3O$ $[M+H]^+$: 301.0834, found: 301.0831.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (S2a)



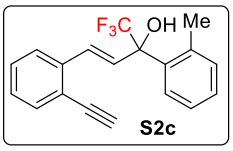
Following general procedure **A,** (*E*)-3-(2-ethynylphenyl)-1-phenylprop-2-en-1-one **S1a** (69 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.14 mg, 0.03 mmol) were taken in 3mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2a** as a colourless oil, yield 82% (74.29 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (m, 2H), 7.55 (m, 1H), 7.49 (m, 1H), 7.43 (m, 4H), 7.29 (m, J = 7.6, 1.2 Hz, 1H), 7.22 (m, 1H), 6.80 (d, J = 16.1 Hz, 1H), 3.26 (s, 1H), 3.02 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 137.7, 137.4, 133.4, 131.3, 129.2, 128.9, 128.8, 128.5, 128.3, 126.9, 125.6, 122.3 (q, J = 286.1 Hz), 121.5, 82.6, 81.7, 77.5 (q, J = 28.9 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.32 (s, 3F); **IR (neat)**: ν_{max} = 3290 2920, 1450, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{14}F_3O$ $[M+H]^+$: 303.0952, found: 303.1486.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(*p*-tolyl)but-3-en-2-ol (S2b)



Following general procedure **A,** (*E*)-3-(2-ethynylphenyl)-1-(*p*-tolyl)prop-2-en-1-one **S1b** (73 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2b** as a reddish colour oil, yield 85%, (80.60 mg); **^{1}H NMR (**500 MHz, $CDCl_3$) δ 7.55 (m, 3H), 7.50 (m, 1H), 7.38 (m, 1H), 7.34 (m, 1H), 7.23 (m, 3H), 6.80 (d, J = 16.1 Hz, 1H), 3.28 (s, 1H), 2.98 (s, 1H), 2.36 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 138.8, 137.8, 134.5, 133.4, 131.0, 129.2, 129.1, 128.9, 128.2, 126.8, 125.6, 121.5, 125.1 (q, J = 275.3 Hz), 82.6, 81.7, 77.4 (q, J = 28.9 Hz), 21.2; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.39 (s, 3F); **IR (neat)**: ν_{max} = 3299, 2924, 1491 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{16}F_3O$ $[M+H]^+$: 317.1182, found: 317.1185.

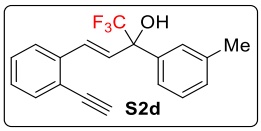
(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(*o*-tolyl)but-3-en-2-ol (S2c)



Following general procedure **A,** (*E*)-3-(2-ethynylphenyl)-1-(*o*-tolyl)prop-2-en-1-one **S1c** (73 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (41 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2c** as

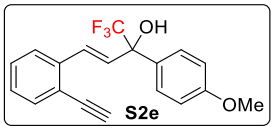
a reddish colour oil, yield 84% (79.65 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.75 (s, 1H), 7.56 (d, J = 7.7 Hz, 1H), 7.48 (m, 1H), 7.41 (m, 1H), 7.23 (m, 1H), 7.16 (m, 2H), 7.14 (m, 2H), 6.66 (m, 1H), 3.15 (s, 1H), 2.79 (s, 1H), 2.42 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 138.2, 137.8, 137.3, 133.5, 131.1, 129.7, 129.2, 128.9, 128.4, 128.2, 127.5, 125.6, 125.1 (q, J = 286.0 Hz), 124.0, 121.6, 82.6, 81.7, 77.5 (q, J = 29.0 Hz), 21.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.32 (s, 3F); **IR (neat)**: ν_{max} = 3295, 2920, 1495 cm^{-1}; **HRMS (ESI)**: m/z calcd for $C_{19}H_{15}F_3O$ $[M+H]^+$: 317.1142, found: 317.1144.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(*m*-tolyl)but-3-en-2-ol (S2d)



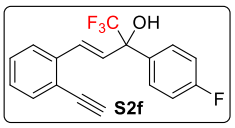
Following general procedure **A,** (*E*)-3-(2-ethynylphenyl)-1-(*m*-tolyl)prop-2-en-1-one **S1d** (73 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2d** as a reddish colour oil, yield 86% (81.55 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.49 (m, 1H), 7.42(m, 4H), 7.26 (m, 2H), 7.17 (m, 2H), 6.72 (d, J = 16.1 Hz, 1H), 3.20 (s, 1H), 2.9 (s, 1H), 2.29 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 162.8, 138.3, 138.0, 135.4, 133.3, 133.1, 129.4, 129.2, 128.8, 128.1, 127.9, 125.6 (q, J = 286.9 Hz), 125.5, 121.5, 121.3, 82.5, 81.5, 79.1 (q, J = 28.5 Hz), 22.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.28 (s, 3F); **IR (neat)**: ν_{max} = 3289, 2924, 1490 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{16}F_3O$ $[M+H]^+$: 317.1150, found: 317.1152.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(4-methoxyphenyl)but-3-en-2-ol (S2e)



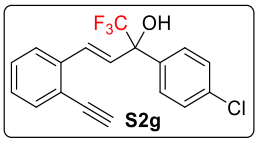
Following general procedure **A**, (*E*)-3-(2-ethynylphenyl)-1-(4-methoxyphenyl)prop-2-en-1-one **S1e** (78 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2e** as a reddish colour oil, yield 86% (85.68 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.57 (d, J = 8.5 Hz, 3H), 7.50 (dd, J = 7.7, 1.2 Hz, 1H), 7.41(m, 2H), 7.29 (m, 1H), 6.96 (m, 2H), 6.81 (d, J = 10.0 Hz, 1H), 3.81 (s, 3H), 3.30 (s, 1H), 2.95 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 159.9, 137.8, 133.4, 131.1, 129.5, 129.2, 128.9, 128.4, 128.2, 125.6, 125.2 (q, J = 286.0 Hz), 121.5, 113.8, 82.6, 81.7, 77.5 (q, J = 36.4 Hz), 55.4; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.64 (s, 3F); **IR (neat)**: ν_{max} = 3285, 2925, 1485 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3O_2$ $[M–H]^-$: 331.1296, found: 331.1299.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(4-fluorophenyl)but-3-en-2-ol (S2f)



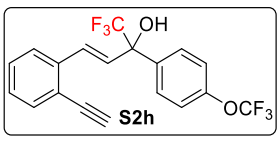
Following general procedure **A**, (*E*)-3-(2-ethynylphenyl)-1-(4-fluorophenyl)prop-2-en-1-one **S1f** (75 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol) and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2f** as a yellow oil, yield 78% (74.89 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.46 (d, J = 8.5 Hz, 2H), 7.38 (dd, J = 19.1, 7.7 Hz, 2H), 7.27 (m, 4H), 7.09 (m, 1H), 6.65 (m, 1H), 3.19 (s, 1H), 3.01 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 138.7 (d, J = 29.0 Hz),137.7, 135.1 (d, J = 115.2 Hz), 133.4, 130.9, 129.1, 129.1, 129.0, 128.8, 128.1, 126.8, 125.8 (q, J = 285.3 Hz), 82.5, 81.6, 77.4 (q, J = 29.0 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.41(s, 3F), –80.96 (s, 1F); **IR (neat)**: ν_{max} = 3299, 2924, 1491 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{13}F_4O$ $[M+H]^+$: 321.1484, found: 321.1486.

(*E*)-2-(4-Chlorophenyl)-4-(2-ethynyl phenyl)-1,1,1-trifluoro but-3-en-2-ol (S2g)



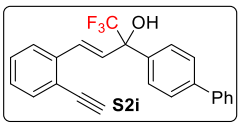
Following general procedure **A**, (*E*)-3-(2-ethynylphenyl)-1-(4-chlorophenyl)prop-2-en-1-one **S1g** (79 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol) and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2g** as a reddish colour oil, yield 80% (80.65 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.58 (d, J = 8.6 Hz, 2H), 7.54 (d, J = 7.8 Hz, 1H), 7.49 (dd, J = 7.7, 1.2 Hz, 1H), 7.39 (m, 4H), 7.24 (m, 1H), 6.78 (s, 1H), 3.29 (s, 1H), 2.95 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 137.4, 135.8, 135.1, 133.5, 131.9, 129.2, 128.6, 128.6, 128.5, 128.3, 125.6, 124.9 (q, J = 286.1 Hz), 121.6, 82.7, 81.6, 77.6 (q, J = 28.9 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.63 (s, 3F); **IR (neat)**: ν_{max} = 3285, 2910, 1480 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{13}ClF_3O$ $[M+H]^+$: 337.1482, found: 337.1485.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(4-(trifluoromethoxy)phenyl)but-3-en-2-ol (S2h)



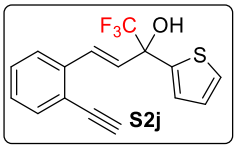
Following general procedure **A**, (*E*)-3-(2-ethynylphenyl)-1-(4(trifluoromethoxy)phenyl)prop-2-en-1-one **S1h** (94 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2h** as a reddish colour oil, yield 78% (90.34 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.79 (d, J = 8.3 Hz, 2H), 7.68 (m, 2H), 7.56 (m, 1H), 7.52 (m, 1H), 7.40 (m, 1H), 7.33 (dd, J = 7.7, 1.3 Hz, 1H), 7.28 (m, 1H), 6.81 (d, J = 16.2 Hz, 1H), 3.29 (s, 1H), 2.96 (s, J = 7.4 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 141.2, 137.3, 133.6, 132.3, 131.1 (q, J = 32.6 Hz), 129.3, 128.6, 128.1, 127.6, 125.6, 125.4, 125.4, 122.0 (q, J = 286.1 Hz), 121.7, 82.7, 81.6, 77.4 (q, J = 28.9 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –62.25 (s, 3F), –76.35 (s, 3F); **IR (neat)**: ν_{max} = 3275, 2890, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{13}F_6O_2$ $[M+H]^+$: 387.1275, found: 387.1277.

(*E*)-2-([1,1'-Biphenyl]-4-yl)-4-(2-ethynyl phenyl)-1,1,1-trifluoro but-3-en-2-ol (S2i)



Following general procedure **A**, (*E*)-1-([1,1'-biphenyl]-4-yl)-3-(2-ethynylphenyl)prop-2-en-1-one **S1i** (92 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added obtain compound **S2i** as a brown colour oil, yield 76% (86.18 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.74 (d, J = 7.4 Hz, 2H), 7.63 (m, 5H), 7.52 (d, J = 7.3 Hz, 1H), 7.44 (m, 3H), 7.37 (m, 2H), 7.28 (m, 1H), 6.87 (d, J = 16.1 Hz, 1H), 3.32 (s, 1H), 2.90 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 141.8, 140.5, 137.7, 136.3, 133.5, 131.4, 129.2, 128.9, 128.7, 128.3, 127.8, 127.4, 127.3, 127.2, 125.6, 125.1 (q, J = 286.1 Hz), 121.6, 82.6, 81.7, 77.5 (q, J = 29.4 Hz); **^{19}F NMR** (377 MHz, $CDCl_3$) δ –78.36 (s, 3F); **IR (neat)**: ν_{max} = 3296, 2890, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{18}F_3O$ $[M+H]^+$: 379.1242, found: 379.1245.

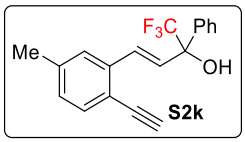
(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-(thiophen-2-yl)but-3-en-2-ol (S2j)



Following general procedure **A**, (*E*)-3-(2-ethynylphenyl)-1-(thiophen-2-yl)prop-2-en-1-one **S1j** (71 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2j** as a brown colour oil, yield 76% (70.45 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.50 (m, 1H), 7.41 (dd, J = 16.5, 8.6 Hz, 2H), 7.29 (m, 2H), 7.19 (m, 2H), 6.96 (dd, J = 5.1,

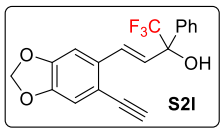
3.7 Hz, 1H), 6.64 (d, J = 16.0 Hz, 1H), 3.22 (s, 1H), 3.02 (s, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 140.8, 137.4, 133.4, 131.7, 129.1, 128.3, 127.4, 127.2, 126.9, 126.8, 125.7, 124.5 (q, J = 286.1 Hz), 121.6, 82.6, 81.6, 76.5 (q, J = 30.6 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –79.24 (s, 3F); **IR (neat)**: ν_{max} = 3296, 2890, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{16}H_{12}F_3OS$ $[M+H]^+$: 309.0891, found: 309.0895.

(*E*)-4-(2-Ethynyl-5-methylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (S2k)



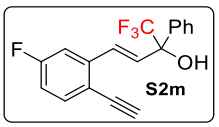
Following general procedure **A**, (*E*)-3-(2-ethynyl-5-methylphenyl)-1-phenylprop-2-en-1-one **S1k** (73 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2k** as a yellow colour oil, yield 85% (80.58 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.69 (m, 2H), 7.45 (m, 6H), 7.06 (dd, J = 7.9, 0.9 Hz, 1H), 6.80 (d, J = 16.2 Hz, 1H), 3.24 (s, 1H), 2.87 (s, 1H), 2.36 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 140.1, 139.3, 138.2, 137.5, 137.4, 133.4, 131.4, 129.3, 128.9, 128.5, 126.9, 126.2, 125.1 (q, J = 286.1 Hz), 118.7, 81.9, 77.8 (q, J = 29.1 Hz), 21.6; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.4 (s, 3F); **IR (neat)**: ν_{max} = 3290, 2885, 1470 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{16}F_3O$ $[M+H]^+$: 317.1144, found: 317.1146.

(*E*)-4-(6-Ethynylbenzo[*d*][1,3]dioxol-5-yl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (S2l)



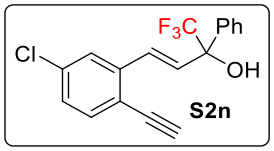
Following general procedure **A**, (*E*)-3-(6-ethynylbenzo[*d*][1,3]dioxol-5-yl)-1-phenylprop-2-en-1-one **S1l** (82 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2l** as a reddish colour oil, yield 82% (85.11 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.64 (d, J = 7.4 Hz, 2H), 7.45 (m, 4H), 7.02 (s, 1H), 6.89 (s, 1H), 6.61 (d, J = 16.1 Hz, 1H), 5.97 (m, J = 0.9 Hz, 2H), 3.21 (s, 1H), 2.76 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.0, 147.7, 137.4, 133.2, 131.1, 128.9, 128.5, 126.9, 125.1 (q, J = 286.1 Hz), 115.5, 112.3, 105.0, 101.9, 81.5, 81.5, 77.5 (q, J = 29.1 Hz), 29.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.41 (s, 3F); **IR (neat)**: ν_{max} = 3465, 3280, 1645 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3O_3$ $[M+H]^+$: 347.0886, found: 347.0889.

(*E*)-4-(2-Ethynyl-5-fluorophenyl)-1,1,1-trifluoro-2-phenyl but-3-en-2-ol (S2m)



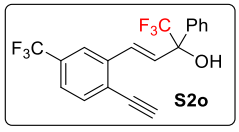
Following general procedure **A**, (*E*)-3-(2-ethynyl-5-fluorophenyl)-1-phenylprop-2-en-1-one **S1m** (75 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2m** as a reddish colour oil, yield 78% (74.88 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.67 (m, 2H), 7.48 (m, J = 7.3, 4.4 Hz, 1H), 7.44 (m, 4H), 7.28 (m, 1H), 6.96 (m, 1H), 6.79 (d, J = 16.1 Hz, 1H), 3.27 (s, 1H), 2.82 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 162.9 (d, J = 250.2 Hz), 140.1 (d, J = 8.1 Hz), 137.1, 135.3 (d, J = 8.6 Hz), 130.4, 129.9, 129.1, 128.6, 126.8, 125.0 (q, J = 286.1 Hz), 117.7, 115.8 (d, J = 22.4 Hz), 112.4 (d, J = 23.0 Hz), 82.3, 80.7, 77.5 (q, J = 28.8 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.41(s, 3F), –80.96 (s, 1F); **IR (neat)**: ν_{max} = 3480, 3290, 1600 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{13}F_4O$ $[M+H]^+$: 321.0714, found: 321.0716.

(*E*)-4-(5-Chloro-2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (S2n)



Following general procedure **A**, (*E*)-3-(2-ethynyl-5-chlorophenyl)-1-phenylprop-2-en-1-one **S1n** (79 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg, 0.03 mmol) were taken in 3 mL of DMF. After that TBAF (1 M, 0.09 mL) was added to obtain the compound **S2n** as a reddish colour oil, yield 78% (78.62 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.67 (m, 2H), 7.52 (d, J = 2.1 Hz, 1H), 7.41 (m, 3H), 7.37 (m, 2H), 7.24 (m, 1H), 6.81 (m, 1H), 3.31 (s, 1H), 3.14 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 139.4, 137.1, 135.3, 134.6, 130.2, 130.0, 129.1, 128.6, 128.4, 126.8, 124.9 (q, J = 256.2 Hz), 125.7, 120.0, 83.5, 80.7, 77.5 (q, J = 29.0 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.63 (s, 3F); **IR (neat)**: ν_{max} = 3475, 3290, 1601 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{13}ClF_3O$ $[M+H]^+$: 337.1054, found: 337.1055.

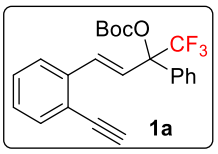
(*E*)-4-(2-Ethynyl-5-(trifluoromethyl)phenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol (S2o)



Following general procedure **A**, (*E*)-3-(2-ethynyl-5-(trifluoromethyl)phenyl)-1-phenylprop-2-en-1-one **S1o** (90 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg,0.03 mmol) were taken in 3 mL of DMF. Then TBAF (1 M, 0.09 mL) was added to obtain the

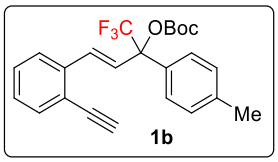
compound **S2o** as a reddish colour oil, yield 72% (79.70 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.78 (s, 1H), 7.68 (m, 2H), 7.60 (d, J = 8.1 Hz, 1H), 7.49 (dd, J = 8.1, 1.1 Hz, 1H), 7.45 (m, 4H), 6.91 (m, 1H), 3.43 (s, 1H), 2.93 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 141.18, 137.31, 133.56, 132.28, 131.13 (q, J = 32.7 Hz), 129.27, 128.61, 128.10, 127.58, 125.61, 125.44, 125.41, 124.89 (q, J = 286.1 Hz), 121.66, 82.74, 81.58, 77.39 (q, J = 28.9 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –62.99 (s, 3F), –76.39 (s, 3F); **IR (neat)**: ν_{max} = 2965, 1660, 1130 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{13}F_6O$ $[M+H]^+$: 371.1463, found: 371.1465.

(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate (1a)



Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol **S2a** (120.6 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3mL of DCM to obtain the compound **1a** as a white solid, yield 85% (102.51 mg), mp: 57 – 58 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.62 (d, J = 7.6 Hz, 1H), 7.57 (m, J = 7.3 Hz, 2H), 7.54 (m, 2H), 7.45 (m, 3H), 7.38 (m, 1H), 7.29 (m, 1H), 6.93 (d, J = 16.5 Hz, 1H), 3.33 (s, 1H), 1.47 (s, J = 3.8 Hz, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.3, 149.9, 138.1, 134.8, 134.2, 133.4, 129.2, 129.2, 128.4, 127.1, 125.5, 124.1, 123.5 (q, J = 284.9 Hz), 121.8, 83.7, 83.3 (q, J = 29.1 Hz), 82.6, 81.5, 27.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –83.87 (s, 3F); **IR (KBr)**: ν_{max} = 2921, 2853, 1762 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{12}F_3$ $[M–OBoc]^-$: 285.0885, found: 285.0886.

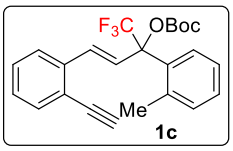
(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*p*-tolyl)but-3-en-2-yl) carbonate (1b)



Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*p*-tolyl)but-3-en-2-ol **S2b** (124.8 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3mL of DCM to obtain the compound **1b** as a white solid, yield 82% (102.23 mg), mp: 58 – 60 °C; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.54 (d, J = 7.9 Hz, 1H), 7.48 (m, 1H), 7.37 (d, J = 7.9 Hz, 2H), 7.29 (m, 1H), 7.22 (m, 3H), 7.10 (m, J = 7.9 Hz, 1H), 6.83 (d, J = 16.5 Hz, 1H), 3.25 (s, 1H), 2.30 (s, 3H), 1.35 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9,

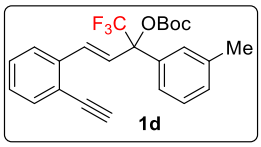
139.2, 138.2, 134.1, 133.4, 131.7, 129.2, 129.2, 128.4, 127.0, 125.6, 124.3, 123.5 (q, J = 284.8 Hz), 121.8, 83.6, 83.3 (q, J = 29.2 Hz), 82.6, 81.6, 27.8, 21.2; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.67 (s, 3F); **IR (KBr)**: ν_{max} = 2921, 2853, 1762 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3$ [M–OBoc]$^-$: 299.1042, found: 299.1043.

(*E*)-*Tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*o*-tolyl)but-3-en-2-yl)carbonate (1c)



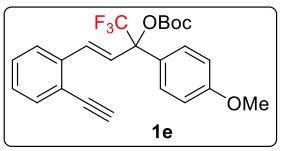
Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*o*-tolyl)but-3-en-2-ol **S2c** (124.8 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (36.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1c** as a white solid, yield 86% (107.32 mg), mp: 58 – 60 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.60 (m, 1H), 7.54 (m, 2H), 7.45 (m, 1H), 7.37 (m, 1H), 7.24 (m, 5H), 6.90 (m, 1H), 3.28 (s, 3H), 2.47 (s, 9H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 150.1, 138.3, 137.2, 133.3, 133.1, 132.9, 132.0, 129.2, 129.05, 128.5, 128.4, 126.6, 125.8, 125.3, 124.2 (q, J = 286.2 Hz),121.8, 85.1 (q, J = 29.3 Hz), 83.6, 82.6, 81.4, 27.7, 21.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.67 (s, 3F); **IR (KBr):** ν_{max} = 2920, 2852, 1760 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3$ [M–OBoc]$^-$: 299.10421, found: 299.10422.

(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*m*-tolyl)but-3-en-2-yl) carbonate (1d)



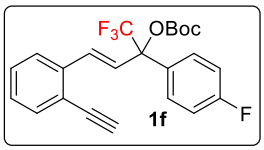
Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*m*-tolyl)but-3-en-2-ol **S2d** (124.8 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1d** as a white solid, yield 84% (104.83 mg), mp: 60 – 62 °C; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.63 (d, J = 7.8 Hz, 1H), 7.53 (m, 2H), 7.36 (m, 3H), 7.33 (m, 2H), 7.23 (m, 1H), 6.92 (d, J = 16.6 Hz, 1H), 3.33 (s, 1H), 2.39 (s, 3H), 1.42 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 138.2, 138.1, 134.7, 134.1, 133.4, 130.0, 129.2, 128.4, 128.4, 127.8, 125.6, 124.3, 124.3, 123.5 (q, J = 284.9 Hz),121.8, 83.7, 83.4 (q, J = 29.2 Hz), 82.6, 81.6, 27.8, 21.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.67 (s, 3F); **IR (KBr):** ν_{max} = 2919, 2845, 1755 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3$ [M–OBoc]$^-$: 299.10421, found: 299.10427.

(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-methoxyphenyl)but-3-en-2-yl) carbonate (1e)



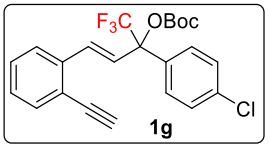
Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-mthoxyphenyl) but-3-en-2-ol **S2e** (129.6 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1e** as a white solid, yield 80% (103.68 mg), mp: 67 – 69 °C; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.36 (m, 1H), 7.31 (m, 1H), 7.23 (m, 2H), 7.12 (m, 2H), 6.84 (m, 2H), 6.57 (m, 1H), 6.34 (d, J = 8.8 Hz, 1H), 3.74 (s, 3H), 2.87 (s, 1H), 1.36 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 160.2, 149.9, 138.2, 134.1, 133.4, 131.1, 129.2, 128.6, 128.4, 126.6, 125.6, 124.2, 123.5 (q, J = 284.7 Hz), 113.9, 83.6, 83.3 (q, J = 29.3 Hz), 82.6, 81.6, 55.4, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.67 (s, 3F); **IR (KBr)**: ν_{max} = 2925, 2855, 1758 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3$ $[M–OBoc]^-$: 315.0991, found: 315.0992.

(*E*)-*Tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-fluorophenyl)but-3-en-2-yl) carbonate (1f)



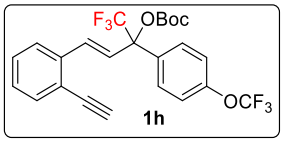
Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-fluorophenyl)b-ut-3-en-2-ol **S2f** (126.6 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1f** as a white solid, yield 78% (98.28 mg), mp: 55 – 57 °C; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.61 (d, J = 7.9 Hz, 1H), 7.54 (m, 4H), 7.37 (m, J = 7.6, 1.2 Hz, 1H), 7.31 (m, 1H), 7.15 (m, 2H), 6.88 (d, 1H), 3.33 (s, 1H), 1.43 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 163.2 (d, J = 249.0 Hz), δ 149.9, 137.9, 134.6, 133.4, 130.6 (d, J = 3.1 Hz), 129.3, 129.2, 128.6, 125.6, 123.7, 123.4 (q J = 285.1 Hz), 121.8, 115.6 (d, J = 21.9 Hz), 83.9, 82.6, 81.5, 77.4, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.56 (s, 3F), –112.56 (s, 1F); **IR (KBr)**: ν_{max} = 2920, 2850, 1750 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{11}F_4O[M–Boc]^-$: 319.0493, found: 319.0494.

(*E*)-*Tert*-butyl(2-(4-chlorophenyl)-4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-yl) carbonate (1g)



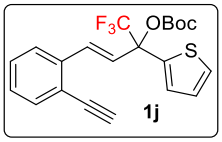
Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-chlorophenyl)but-3-en-2-ol **S2g** (130.80 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1g** as a white solid, yield 82% (107.25 mg), mp: 62 – 64 °C; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.61 (d, J = 7.8 Hz, 1H), 7.54 (m, 4H), 7.42 (m, 3H), 7.32 (m, 1H), 6.86 (d, J = 16.5 Hz, 1H), 3.34 (s, 1H), 1.43 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 137.9, 135.5, 134.7, 133.4, 133.4, 129.2, 128.7, 128.6, 127.1, 126.1 (q, J = 284.8 Hz), 125.1, 123.5, 121.9, 84.1, 83.1 (q, J = 29.3 Hz), 82.7, 81.5, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.67 (s, 3F); **IR (KBr):** ν_{max} = 2910, 2845, 1750 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{11}F_3Cl$ $[M–OBoc]^-$: 319.0580, found: 319.0578

(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-(trifluoromethoxy)phenyl)but-3-en-2-yl) carbonate (1h)



Following general procedure **A**, (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-(trifluoromethoxy)phenyl)but-3-en-2-ol **S2h** (145.8 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1h** as a white solid, yield 76%, (110.80 mg), mp: 74 – 76 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.62 (d, J = 7.6 Hz, 1H), 7.57 (d, J = 7.3 Hz, 2H), 7.54 (m, 1H), 7.45 (m, 3H), 7.38 (m, 1H), 7.29 (m, 1H), 6.93 (d, J = 16.5 Hz, 1H), 3.33 (s, 1H), 1.47 (d, J = 3.8 Hz, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 138.8, 137.8, 135.1, 133.5, 131.5 (q, J = 32.8 Hz),129.3, 128.7, 127.8, 125.6, 125.5, 125.5, 123.9 (q, J = 272.3 Hz), 123.4, 121.91, 84.29, 83.0 (q, J = 29.6 Hz), 82.7, 81.5, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –62.59 (s, 3F), –76.24 (s, 3F); **IR (KBr):** ν_{max} = 2905, 2840, 1740 cm^{-1}; **HRMS (ESI)**: m/z calcd for $C_{19}H_{11}OF_6$ $[M–OBoc]^-$: 369.07086, found: 369.07197.

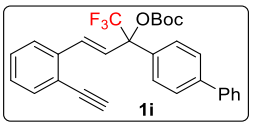
(*E*)-*Tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(thiophen-2-yl)but-3-en-2-yl) carbonate (1j)



Following general procedure **A**, (E)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(thiophen-2-yl)but-3-en-2-ol **S2j** (122.4 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1j** as a yellow colour oil,

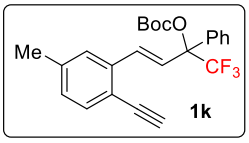
yield 68%, (83.23 mg), mp: 64 – 65 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.47 (dd, J = 7.7, 1.0 Hz, 1H), 7.45 (m, 2H), 7.38 (m, 1H), 7.29 (m, 1H), 7.12 (d, J = 3.1 Hz, 1H), 7.06 (m, 1H), 6.72 (m, 2H), 3.02 (s, 1H), 1.46 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.0, 140.5, 134.1, 134.0, 133.5, 130.4, 129.5, 128.7, 128.3, 127.3, 126.8, 125.4 (q, J = 274.4 Hz), 121.4, 83.1, 82.7, 80.3, 77.6 (q, J = 44.6 Hz), 72.9, 27.9; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –79.24 (s, 3F); **IR (KBr)**: ν_{max} = 3296, 2890, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{16}H_{10}F_3S$ $[M–OBoc]^-$: 291.0450, found: 291.0449.

(*E*)-2-([1,1'-Biphenyl]-4-yl)-4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-yl tert-butyl carbonate (1i)



Following general procedure **A**, (*E*)-2-([1,1'-biphenyl]-4-yl)-4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-ol **S2i** (143.4 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1i** as a white solid, yield 76%, (108.98 mg), mp: 65 – 67 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.67 (m, 5H), 7.61 (m, 3H), 7.55 (m, 1H), 7.48 (m, 2H), 7.37 (m, 2H), 7.29 (m, 1H), 6.96 (d, J = 16.6 Hz, 1H), 3.34 (s, 1H), 1.53 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 142.1, 140.3, 138.2, 134.3, 133.7, 133.4, 129.2, 128.9, 128.5, 127.8, 127.6, 127.3, 127.2, 125.6, 124.1, 123.5 (q, J = 284.8 Hz), 121.8, 83.8, 83.6 (q, J = 29.2 Hz), 82.6, 81.6, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.67 (s, 3F); **IR (KBr)**: ν_{max} = 2965, 1660, 1130 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{16}F_3$ $[M–OBoc]^-$: 361.1745, found: 361.1740.

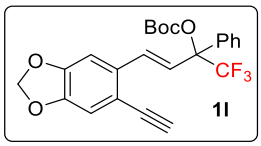
(*E*)-*Tert*-butyl (4-(2-ethynyl-5-methylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate (1k)



Following general procedure **A**, (*E*)-4-(2-ethynyl-5-methylphenyl)-1,1,1-trifluoro-2-phenylbu -t-3-en-2-ol **S2k** (124.8 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1k** as a white solid, yield 85% (106.08 mg), mp: 55 – 57 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.57 (d, J = 7.0 Hz, 2H), 7.54 (m, 1H), 7.45 (m, 5H), 7.09 (m,1H), 6.91 (d, J = 16.5 Hz, 1H), 3.28 (s, 1H), 2.38 (s, 3H), 1.42 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 139.4, 137.9, 134.9, 134.3, 133.3, 129.4, 129.2, 128.5, 127.7, 127.2, 126.2, 123.8, 123.5 (q, J = 284.9 Hz), 119.0, 83.7, 81.9, 83.4 (q, J

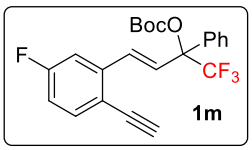
= 29.2 Hz), 27.8, 21.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.40 (s, 3F); IR (KBr): ν_{max} = 3297, 1757, 1484 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{14}F_3$ $[M–OBoc]^-$: 299.10422, found: 299.10425.

(*E*)-*Tert*-butyl (4-(6-ethynylbenzo[*d*][1,3]dioxol-5-yl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate (1l)



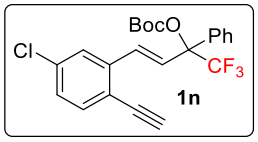
Following general procedure **A**, (*E*)-4-(6-ethynylbenzo[*d*][1,3]dioxol-5-yl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol **S2l** (133.8 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1l** as a white solid, yield 78% (104.36 mg); mp: 72 – 74 °C; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.42 (m, 3H), 7.28 (m, 2H), 6.86 (d, J = 31.2 Hz, 2H), 6.58 (d, J = 8.8 Hz, 1H), 6.38 (d, J = 8.8 Hz, 1H), 5.99 (d, J = 1.9 Hz, 2H), 2.75 (s, 1H), 1.45 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 149.3, 147.9, 134.8, 133.9, 133.5, 129.9, 129.2, 128.4, 127.1, 126.3 (q, J = 285.1 Hz), 122.4, 115.8, 112.3, 105.0, 101.9, 83.7, 83.1 (q, J = 31.1 Hz), 81.5, 27.8; **^{19}F NMR** (377 MHz, $CDCl_3$) δ –66.52 (s, 3F); **IR (KBr)**: ν_{max} = 3285, 1746, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{12}F_3O_2$ $[M–OBoc]^-$: 329.0786, found: 329.0783.

(*E*)-*Tert*-butyl(4-(2-ethynyl-5-fluorophenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate (1m)



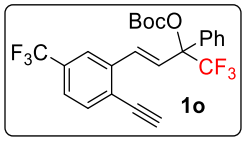
Following general procedure **A**, (*E*)-4-(2-Ethynyl-5-fluorophenyl)-1,1,1-trifluoro-2-phenylb ut-3-en-2-ol **S2m** (126.0 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1m** as a white solid, yield 78% (98.28 mg), mp: 55 – 57 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.53 (m, 3H), 7.42 (m, 5H), 7.21 (m, 1H), 6.85 (d, J = 16.6 Hz, 1H), 3.29 (s, 1H), 1.35 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 162.9 (d, J = 250.2 Hz), 149.89, 140.50 (d, J = 8.1 Hz), 135.27 (d, J = 8.6 Hz), 134.55, 133.31, 129.4, 128.5, 127.1, 125.5, 123.4 (q, J = 284.9 Hz), 117.9 (d, J = 2.8 Hz), 115.9 (d, J = 22.4 Hz), 112.4 (d, J = 23.0 Hz), 83.9, 83.2 (q, J = 29.4 Hz), 82.3, 80.6, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.54 (s, 3F), –116.49 (s, 1F); **IR (KBr)**: ν_{max} = 3285, 1745, 1476 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{11}F_4O[M–Boc]^-$: 319.0494, found: 319.0495.

(*E*)-*Tert*-butyl (4-(5-chloro-2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate (1n)



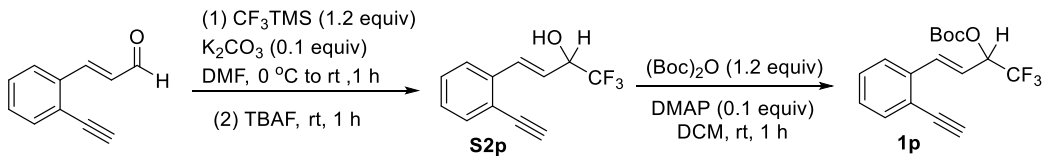
Following general procedure **A**, (*E*)-4-(2-Ethynyl-5-chlorophenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol **S2n** (130.8 mg, 0.30 mmol), $(Boc)_2O$ 0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL DCM to obtain the compound **1n** as a white solid, yield 82% (107.25 mg); mp: 65 – 66 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.57 (m, 2H), 7.50 (m, 1H), 7.47 (m, 4H), 7.33 (m, 1H), 6.98 (m, 1H), 6.92 (d, J = 16.5 Hz, 1H), 3.30 (s, 1H), 1.44 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 146.9, 139.7, 135.3, 134.5, 133.1, 129.4, 128.6, 128.5, 127.1, 125.7, 125.6, 123.4 (q, J = 284.9 Hz), 120.3, 85.3, 83.9, 83.5, 83.1 (q, J = 29.4 Hz), 27.6; **^{19}F NMR (376 MHz, $CDCl_3$) δ** –76.40 (s, 3F); **IR (KBr)**: ν_{max} = 3285, 1746, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{18}H_{11}ClF_3$ $[M–OBoc]^–$: 319.0580, found: 319.0494.

(*E*)-*Tert*-butyl (4-(2-ethynyl-5-(trifluoromethyl)phenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate (1o)



Following general procedure **A**, (*E*)-4-(2-ethynyl-5-(trifluoromethyl)phenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol **S2o** (141.0 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1o** as a white solid, yield 75% (105.75 mg), mp: 68 – 70 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.84 (s, 1H), 7.63 (d, J = 8.1 Hz, 1H), 7.55 (m, 4H), 7.47 (m, 3H), 7.02 (m, 1H), 3.46 (s, 1H), 1.43 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 138.8, 134.4, 133.9, 133.1, 131.2 (q, J = 32.9 Hz), 129.4, 128.6, 127.1, 126.2, 124.9, 124.9, 123.8 (q, J = 281.7 Hz), 122.5, 122.5, 84.9, 84.0, 83.1 (q, J = 29.3 Hz), 80.4, 27.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –62.99 (s, 3F), –76.39 (s, 3F); **IR (KBr)**: ν_{max} = 3285, 1746, 1475 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{19}H_{11}F_6$ $[M–OBoc]^–$: 353.0758, found: 353.0759.

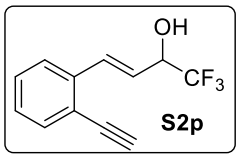
5.1 General procedure for the synthesis of (*E*)-tert-butyl (4-(2-ethynyl phenyl)-1,1,1-trifluorobut-3-en-2-yl) carbonate (General procedure B)



According to the literature procedure,[2] α, β unsaturated aldehyde (10 mmol, 1 equiv) and $TMSCF_3$ (1.7 mL, 12 mmol, 1.2 equiv) were suspended in anhydrous DMF (20 mL). To this solution, dry K_2CO_3 (13.8 mg, 0.1 equiv) was added and the mixture was stirred vigorously at room temperature under N_2 atmosphere. Completion of the reaction was monitored by TLC. To this reaction mixture tetrabutylammonium fluoride (1 M, 3.2 mL, 12mmol) was added and stirred for 1 h at room temperature. The reaction mixture was diluted with the water, then extracted with ethyl acetate (3 × 30 mL). The combined organic layers were finally washed with brine solution, dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude product was further purified by column chromatography to get the compound **S2p** in 76% yield as a red colour oil.

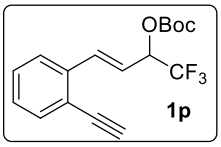
To the stirred solution of alcohol **S2p** (10 mmol, 1 equiv) in DCM (10 mL), was added Boc-anhydride (2.75 mL, 12 mmol, 1.2 equiv) and DMAP (12.2 mg, 0.1 equiv) at 0 °C, and the solution was warmed to room temperature and stirred until completion of the starting material monitored by TLC. Then, the reaction mixture was concentrated under reduced pressure, and the obtained residue was purified using column chromatography on silica gel using hexane/ethyl acetate (9:1) as eluent to afford the pure CF_3-allyl carbonate **1p** in 74% yield.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluorobut-3-en-2-ol (S2p)



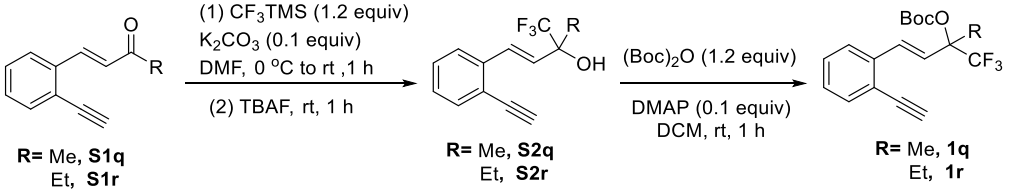
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (m, 2H), 7.34 (m, 2H), 7.26 (m, 1H), 6.29 (dd, J = 16.0, 6.5 Hz, 1H), 4.88 (m, 1H), 3.35 (s, 1H), 2.66 (s, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 137.5, 134.2, 133.5, 129.2, 128.5, 127.2 (q, J = 281.4 Hz), 125.5, 122.9, 121.5, 82.6, 81.6, 71.8 (q, J = 32.3 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.93 (s, 3F); **IR (neat)**: ν_{max} = 2805, 1400, 1045 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{12}H_{10}F_3O$ $[M+H]^{+:}$ 227.0639, found: 227.0319.

(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-yl) carbonate (1p)



^{1}H NMR (300 MHz, $CDCl_3$) δ 7.51 (m, 2H) 7.35 (m, 2H), 7.26 (m, 1H), 6.16 (dd, J = 16.0, 7.7 Hz, 1H), 5.64 (m, 1H), 3.28 (s, 1H), 1.45 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.7, 137.0, 136.3, 133.3, 129.1, 128.6, 125.8 (q, J = 281.4 Hz), 125.5, 121.7, 119.3, 84.1, 82.6, 81.3, 73.8 (q, J = 33.5 Hz), 27.7; **^{19}F NMR** (377 MHz, $CDCl_3$) δ –63.38 (s, 3F); **IR (KBr)**: ν_{max} = 3125, 1556, 1226 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{17}H_{16}F_3O_3$ $[M–H]^–$: 325.1052, found: 325.1845.

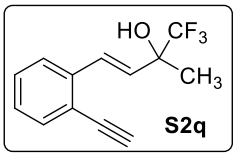
5.2 General procedure for the synthesis of alkyl substituted 2-alkynyl CF_3-allyl carbonates (1q and 1r) General procedure C:



According to the literature procedure, α, β unsaturated aldehydes (10 mmol, 1 equiv) and $TMSCF_3$ (1.7 mL, 12 mmol, 1.2 equiv) were suspended in anhydrous DMF (20 mL). To this solution, dry K_2CO_3 (13.8 mg, 0.1 equiv) was added and the mixture was stirred vigorously at room temperature under N_2 atmosphere. Completion of the reaction was monitored by TLC. To this reaction mixture tetrabutylammonium fluoride (1 M, 3.2 mL, 12mmol) was added and stirred for 1 h at room temperature. The reaction mixture was diluted with the water, then extracted with ethyl acetate (3 × 30 mL). The combined organic layers were finally washed with brine solution, dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude product **S2q** was further purified by column chromatography.

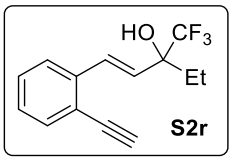
To the stirred solution of alcohol **S2q** (10 mmol, 1 equiv) in DCM (10 mL), was added Boc-anhydride (2.75 mL, 12 mmol, 1.2 equiv) and DMAP (12.2 mg, 0.1 equiv) at 0 °C, and the solution was warmed to room temperature and stirred until completion of the starting material monitored by TLC. Then, the reaction mixture was concentrated under reduced pressure, and the obtained residue was purified using column chromatography on silica gel using hexane/ethyl acetate (9:1) as eluent to afford the pure CF_3-allyl carbonates (**1q** and **1r)**.

(*E*)-4-(2-Ethynylphenyl)-1,1,1-trifluoro-2-methylbut-3-en-2-ol (S2q)



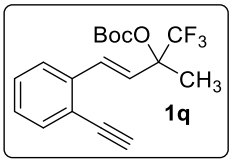
Following general procedure **C,** (*E*)-4-(2-ethynylphenyl)but-3-en-2-one **S1q (**51 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg,0.03 mmol), were taken in 3 mL of DMF. Then TBAF (1 M, 0.09 mL) was added to obtain the compound **S2q as** a reddish colour oil, yield 78% (56.16 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.51 (m, 2H), 7.36 (d, J = 16.2 Hz, 1H), 7.29 (m, 1H), 7.21 (m, 1H), 6.41 (d, J = 16.2 Hz, 1H), 3.15 (s, 1H), 2.33 (s, 1H), 1.59 (d, J = 0.7 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 137.6, 132.9, 130.8, 128.9, 128.4, 128.1, 125.7 (q, J = 285.1 Hz), 125.5, 122.4, 103.2, 100.2, 74.3 (q, J = 29.3 Hz), 22.2; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –63.48(s, 3F); **IR (neat)**: ν_{max} = 2850, 1435, 1125 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{13}H_{11}F_3O$ $[M+H]^+$: 241.0840, found: 241.1414.

(*E*)-1-(2-ethynylphenyl)-3-(trifluoromethyl)pent-1-en-3-ol (S2r)



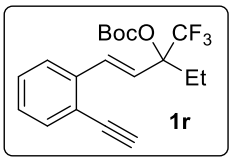
Following general procedure **C, (***E*)-1-(2-ethynylphenyl)pent-1-en-3-one **S1r (**55 mg, 0.30 mmol), $TMSCF_3$ (0.05 mL, 0.36 mmol), and K_2CO_3 (4.1 mg,0.03 mmol), were taken in 3 mL of DMF. Then TBAF (1 M, 0.09 mL) was added to obtain the compound **S2r** as a reddish colour oil, yield 76% (57.91 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.52 (m, 2H), 7.33 (m, 2H), 7.27 (m, 1H), 6.26 (d, J = 16.2 Hz, 1H), 3.35 (s, 1H), 2.22 (s, 1H), 1.91 (m, 2H), 0.99 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 138.0, 133.4, 131.0, 129.2, 128.1, 127.2, 125.7 (q, J = 274.7 Hz), 125.5, 121.4, 82.4, 81.8, 32.3, 27.2, 6.8; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.55(s, 3F); **IR (neat)**: ν_{max} = 2865, 1445, 1120 cm^{-1};; **HRMS (ESI):** m/z calcd for $C_{14}H_{13}F_3ONa$ $[M+Na]^+$: 277.0816, found: 277.0860.

(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-methylbut-3-en-2-yl) carbonate (1q)



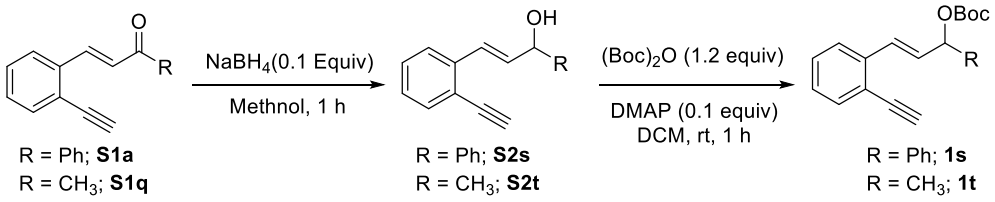
Following general procedure, **C,** (*E*)-4-(2-ethynylphenyl)-1,1,1-trifluoro-2-methylbut-3-en-2-ol **S2q** (72 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1q** as a white colour oil, yield 78% (79.56 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.52 (m, 2H), 7.33 (m, 1H), 7.27 (m, 2H), 6.34 (d, J = 16.4 Hz, 1H), 3.33 (s, 1H), 1.92 (m, 3H), 1.48 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 150.4, 138.5, 133.4, 132.6, 129.1, 128.4, 125.6, 125.5, 123.9 (q, J = 261.2 Hz), 121.7, 83.4, 82.4, 81.4, 29.8, 27.9, 17.7; **^{19}F NMR** (377 MHz, $CDCl_3$) δ –81.05(s, 3F); **IR (KBr)**: ν_{max} = 3135, 1625, 1235 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{13}H_{10}F_3$ $[M–OBoc]^–$: 223.0735, found: 223.0732.

(*E*)-*Tert*-butyl (1-(2-ethynylphenyl)-3-(trifluoromethyl)pent-1-en-3-yl) carbonate (1r)



Following general procedure, **C,** (*E*)-1-(2-ethynylphenyl)-3-(trifluoromethyl) pent-1-en-3-ol **S2r** (76 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1r** as a white colour oil, yield 76% (80.71 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.52 (dd, J = 15.5, 7.7 Hz, 2H), 7.33 (m, 1H), 7.28 (m, 2H), 6.32 (d, J = 16.5 Hz, 1H), 3.32 (s, 1H), 2.57 (m, 2H), 1.49 (s, 9H), 1.08 (t, J = 7.4 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 150.4, 137.9, 133.4, 131.8, 129.1, 128.2, 126.1, 125.4, 124.4 (q, J = 285.4 Hz), 122.9, 121.6, 83.7, 82.4, 81.7, 27.9, 25.3, 7.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.39; **IR (KBr)**: ν_{max} = 3156, 1625, 1246 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{14}H_{12}F_3$ $[M–OBoc]^-$: 237.0891, found: 237.0887.

4.3 General procedure for the synthesis of (*E*)-tert-butyl (3-(2-ethynyl phenyl)-1-phenylallyl) carbonate (1s and 1t) (General procedure D)

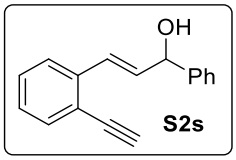


According to the literature procedure,[2] α, β unsaturated ketone **S1a** (10 mmol, 1 equiv) and sodium borohydride (1.7 mL, 12 mmol, 1.2 equiv) were suspended in methanol (20 mL). The

reaction mixture was stirred vigorously at room temperature under N_2 atmosphere. Completion of the reaction was monitored by TLC. The reaction mixture was diluted with the water, then extracted with ethyl acetate (3 × 30 mL). The combined organic layers were finally washed with brine solution, dried over anhydrous Na_2SO_4, and concentrated under reduced pressure. The crude product was further purified by column chromatography on silica gel to get the **S2s**.

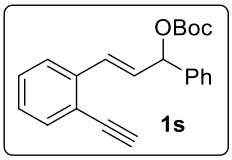
To the stirred solution of alcohol **S2s** (10 mmol, 1 equiv) in DCM (10 mL), was added Boc-anhydride (2.75 mL, 12 mmol, 1.2 equiv) and DMAP (12.2 mg, 0.1 equiv) at 0 °C, and the solution was warmed to room temperature and stirred until completion of the starting material monitored by TLC. Then, the reaction mixture was concentrated under reduced pressure, and the obtained residue was purified using column chromatography on silica gel using hexane/ethyl acetate (9:1) as eluent to afford the pure allyl carbonate (**1s)**.

(*E*)-3-(2-Ethynylphenyl)-1-phenylprop-2-en-1-ol (S2s)



Following general procedure **D,** (*E*)-3-(2-ethynylphenyl)-1-phenylprop-2-en-1-one **S1s** (116 mg, 0.50 mmol), sodium borohydride (22 mg, 0.6 mmol), were taken in 10 mL of methanol to obtain the compound **S2s** as a red colour oil, yield 78% (91.26 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.51 (m, 2H), 7.43 (m, 2H), 7.38 (m, 2H), 7.30 (m, 3H), 7.19 (m, 1H), 6.46 (m, 1H), 5.39 (d, J = 6.6 Hz, 1H), 3.31 (s, 1H), 2.31 (s, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 142.6, 138.7, 133.8, 133.3, 129.0, 128.7, 128.3, 127.9, 127.5, 126.5, 125.2, 121.1, 82.18, 82.1, 75.2; **IR (neat)**: ν_{max} = 2945, 1465 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{17}H_{13}$ $[M–OH]^-$: 217.1017, found: 217.1015

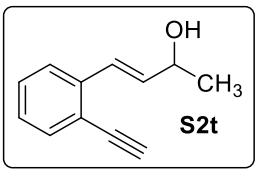
(*E*)-*Tert*-butyl (3-(2-ethynylphenyl)-1-phenylallyl) carbonate (1s)



Following general procedure, **C,** (*E*)-3-(2-ethynylphenyl)-1-phenylprop-2-en-1-ol **S2s** (69.6 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1s** as a white colour oil, yield 76% (76.15 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.34 (m, 4H), 7.21 (m, 2H), 7.15 (m, 2H), 7.04 (m, 2H), 6.26 (dd, J = 15.9, 7.0 Hz, 1H), 6.06 (d, J = 7.1 Hz, 1H), 3.12 (s, 1H), 1.30 (s, 9H); **^{13}C NMR** (101 MHz,

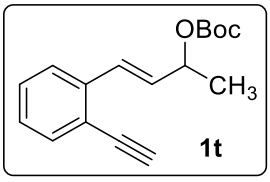
$CDCl_3$) δ 152.8, 139.1, 138.4, 133.3, 130.4, 129.5, 129.0, 128.7, 128.3, 127.7, 127.1, 125.2, 121.3, 82.6, 82.3, 81.8, 79.3, 27.9; **IR (KBr)**: ν_{max} = 3275, 1425 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{17}H_{13}$ $[M–OBoc]^–$: 217.1017, found: 217.1016

(*E*)-4-(2-Ethynylphenyl)but-3-en-2-ol (S2t)



Following general procedure **E, (***E*)-4-(2-ethynylphenyl)but-3-en-2-one **S1q** (51mg, 0,30 mmol), sodium borohydride (13 mg , 0.05 mmol), were taken in 10 mL of methanol to obtain the compound **S2t** as a red colour oil, yield 82% (42.31 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.51 (d, *J* = 7.6 Hz, 1H), 7.46 (m, 1H), 7.29 (m, 1H), 7.17 (m, 1H), 7.05 (d, *J* = 16.0 Hz, 1H), 6.36 (dd, *J* = 16.0, 6.4 Hz, 1H), 4.52 (m, 1H), 3.33 (s, 1H), 1.66 (s, 1H), 1.41 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 138.6, 135.5, 132.9, 128.8, 127.6, 127.3, 125.1, 121.9, 103.5, 99.5, 69.2, 23.3; **IR (neat)**: ν_{max} = 3165, 1645, 1465 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{12}H_{11}$ $[M–OH]^–$: 155.0867, found: 155.0853.

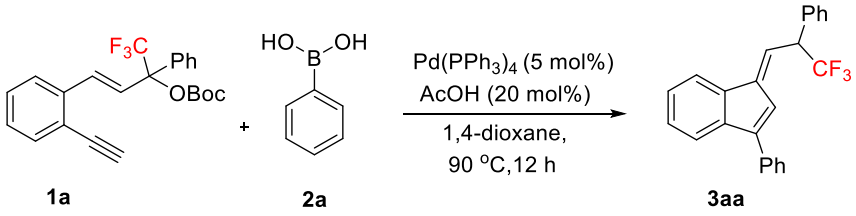
(*E*)-*Tert*-butyl (4-(2-ethynylphenyl)but-3-en-2-yl) carbonate (1t)



Following general procedure, **E, (***E*)-3-(2-ethynylphenyl)-1-phenylprop-2-en-1-ol **S2t** (51.60 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (3.6 mg, 0.03 mmol) were taken in 3 mL of DCM to obtain the compound **1t** as a white colour oil, yield 80% (65.28 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 7.9 Hz, 1H), 7.47 (dd, *J* = 7.7, 1.2 Hz, 1H), 7.30 (m, 1H), 7.20 (m, 1H), 7.15 (m, 1H), 6.33 (m, 1H), 5.36 (m, 1H), 3.32 (s, 1H), 1.50 (s, 9H), 1.47 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 152.9, 138.5, 133.3, 130.8, 129.4, 128.9, 127.6, 125.1, 121.2, 82.2, 82.1, 81.8, 74.1, 27.9, 20.6; **IR (KBr)**: ν_{max} = 3275, 1645, 1425 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{12}H_{11}$ $[M–OBoc]^–$: 155.0861, found: 155.0856

6. Experimental procedure and characterization data of products (3aa-3oa)

General reaction:

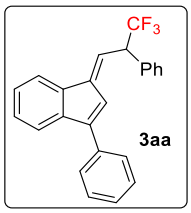


1a 2a 3aa

General procedure E:

To a stirred solution of (*E*)-*tert*-butyl (4-(2-ethynyl aryl)-1,1,1-trifluoro-2-aryl but-3-en-2-yl) carbonate **1a** (0.30 mmol) in 3 mL of 1,4-dioxane was added phenylboronic acid **2a** (0.36 mmol) at room temperature. Then $Pd(PPh_3)_4$ (5 mol%) and 20 mol% acetic acid were added to the reaction mixture and stirring continued at 90 °C (oil bath temperature) for 10 –12 h. The reaction progress was monitored by TLC. After completion of the reaction, the mixture was diluted with water and extracted with ethyl acetate (3 X 15 mL). The combined organic layers were dried over sodium sulphate and concentrated on rotary evaporation. The obtained crude product was purified using flash column chromatography (using 9.5:0.5 hexane/ethyl acetate as eluent) to get the pure product **3aa-3oa**. The characterization data of **3aa-3oa** were summarized below.

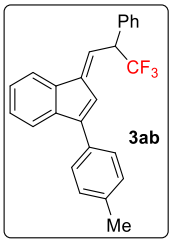
(*E*)-3-Phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene (3aa)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3aa** as a yellow colour oil, yield 80% (86.88 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.71 (m, 1H), 7.65 (m, 2H), 7.54 (m, 1H), 7.49 (m, 4H), 7.42 (m, 1H), 7.38 (m, 1H), 7.37 (m, 2H), 7.30 (m, 2H), 6.80 (dd, J = 9.8, 0.8 Hz, 1H), 6.73 (s, 1H), 4.81 (m, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 148.2, 143.5, 141.7, 137.5, 135.3, 134.9, 129.2, 129.0, 128.8, 128.6, 128.5, 128.2, 127.8, 126.1, 126.0 (q, J = 277.8 Hz). 121.2, 121.1, 120.7,

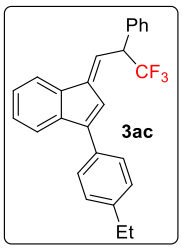
119.9, 50.7 (q, J = 28.4 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.31 (s, 3F); **IR (neat)**: ν_{max} = 2924, 1645 cm^{-1} **HRMS (ESI)**: m/z calcd for $C_{24}H_{18}F_3[M+H]^+$: 363.1506, found: 363.1502.

(*E*)-3-(*p*-Tolyl)-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene (3ab)



Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-methyl phenylboronic acid **2b** (48.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ab** as a yellow colour oil, yield 85% (95.91 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.71 (m, 1H), 7.52 (m, 3H), 7.45 (d, J = 7.4 Hz, 2H), 7.41 (m, 2H), 7.36 (m, 2H), 7.29 (m, 3H), 6.77 (d, J = 9.8 Hz, 1H), 6.70 (s, 1H), 4.71 (m, 1H), 2.42 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.1, 143.5, 141.8, 138.6, 137.6, 135.0, 132.3, 129.5, 129.1, 129.00, 128.5, 128.1, 127.6, 126.1 (q, J = 280.6 Hz), 126.0, 120.7, 120.7, 119.9, 77.4, 50.68 (q, J = 28.5 Hz), 21.5; **^{19}F NMR** (471 MHz, $CDCl_3$) δ –68.58 (s, 3F); **IR (neat):** ν_{max} = 2920, 1640 cm^{-1}; **HRMS (ESI)**: m/z calcd for $C_{25}H_{20}F_3[M+H]^+$: 377.1485, found: 377.1486.

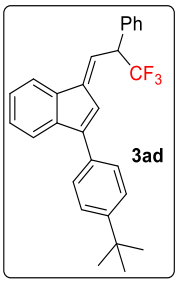
(*E*)-3-(4-Ethylphenyl)-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene (3ac)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-ethyl phenylboronic acid **2c** (54.0 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ac** as a yellow colour oil, yield 82% (95.97 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.62 (m, 1H), 7.46 (m, 3H), 7.35 (m, 2H), 7.31 (m, 3H), 7.22 (m, 4H), 6.68 (m, 1H), 6.61 (s, 1H), 4.63 (p, J = 9.2 Hz, 1H), 2.67 (m, 2H), 1.19 (dd, J = 9.4, 5.8 Hz, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.1, 145.0, 143.5, 141.8, 137.6, 135.0, 132.6, 129.4, 129.1, 129.0, 128.5, 128.4, 128.2, 127.9, 127.7,126.1 (q, J = 280.8 Hz), 126.0, 120.8, 119.9, 50.7 (q, J = 28.3 Hz), 28.9, 15.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.56 (s, 3F); **IR (neat):**

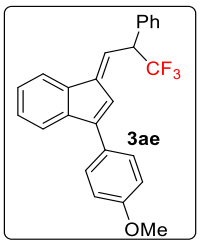
ν_{max} = 2920, 1640 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{26}H_{22}F_3[M+H]^+$: 391.1652, found: 391.1655.

(*E*)-3-(4-(*Tert*-butyl)phenyl)-1-(3,3,3-trifluoro-2-phenylpropylidene)-*1H*-indene (3ad)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-*tert*-butyl phenylboronic acid **2d** (64.0 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ad** as a yellow colour oil, yield 78% (97.85 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.71 (m, 1H), 7.56 (m, 3H), 7.46 (m, 4H), 7.34 (m, 3H), 7.25 (m, 2H), 6.78 (d, J = 9.8 Hz, 1H), 6.70 (s, 1H), 4.71 (p, J = 9.1 Hz, 1H), 1.37 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.1, 145.0, 143.5, 141.8, 137.6, 135.0, 132.6, 129.4, 129.1, 129.0, 128.5, 128.4, 128.2, 127.9, 127.7,126.1 (q, J = 280.8 Hz), 126.0, 120.8, 119.9, 50.7 (q, J = 28.3 Hz), 28.9, 15.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.98 (s, 3F); **IR (neat):** ν_{max} = 2925, 1646 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{28}H_{26}F_3[M+H]^+$: 419.1980, found: 419.1982.

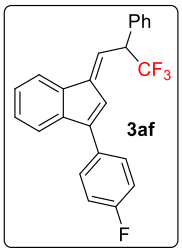
(*E*)-3-(4-Methoxyphenyl)-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene (3ae)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-methoxy phenylboronic acid **2e** (54.7 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ae** as a yellow colour oil, yield 80% (94.11 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.72 (m, 1H), 7.61 (m, 2H), 7.54 (m, 1H), 7.45 (d, J = 7.3 Hz, 2H), 7.41 (m, 3H), 7.34 (m, 2H), 7.01 (m, 2H), 6.76 (d, J = 10.1 Hz, 1H), 6.66 (s, 1H), 4.71 (m, 1H), 3.87 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 159.7, 148.0, 143.2, 141.7, 137.6, 135.3, 130.1, 128.8, 128.6, 128.2, 127.8, 127.0, 126.1 (q, J = 280.4 Hz), 126.1, 121.4, 121.3, 120.7, 119.9, 114.6, 55.4, 49.9 (q, J = 28.5 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.98 (s, 3F); **IR**

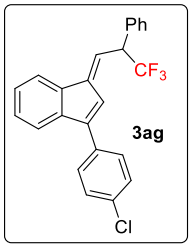
(neat): ν_{max} = 2950, 1600 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{20}F_3O$ $[M+H]^+$: 393.1440, found: 393.1442.

(*E*)-3-(4-Fluorophenyl)-1-(3,3,3-trifluoro-2-phenylpropylidene)-*1H*-indene (3af)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-fluoro phenylboronic acid **2f** (50.4 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3af** as a yellow colour oil, yield 75% (85.52 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.68 (m, 1H), 7.59 (m, 2H), 7.45 (m, 3H), 7.41 (m, 3H), 7.30 (m, 2H), 7.14 (m, 2H), 6.80 (d, J = 9.8 Hz, 1H), 6.68 (s, 1H), 4.82 (p, 1H); **^{13}C NMR (101 MHz, $CDCl_3$)** δ 162.9 (d, J = 248.1 Hz), 147.1, 143.4, 141.5, 137.5, 134.9, 131.3 (d, J = 2.9 Hz), 129.5, 129.4, 129.2, 128.9, 128.6, 128.3, 126.2, 126.0 (q, J = 280.6 Hz), 121.3, 121.1, 120.3 (d, J = 50.0 Hz), 115.8 (d, J = 21.5 Hz), 50.7 (q, J = 28.3 Hz); **^{19}F NMR** (471 MHz, $CDCl_3$) δ –68.53 (s, 3F), –112.73 (s, 1F)**; IR (neat)**: ν_{max} = 2925, 1650 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{17}F_4$ $[M+H]^+$: 381.1249, found: 381.1250.

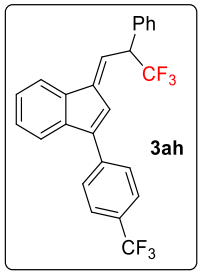
(*E*)-3-(4-Chlorophenyl)-1-(3,3,3-trifluoro-2-phenylpropylidene)-*1H*-indene (3ag)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-chloro phenylboronic acid **2g** (56.1 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ag** as a yellow colour oil, yield 78% (92.68 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.65 (m, 1H), 7.51 (m, 2H), 7.37 (m, 3H), 7.35 (m, 2H), 7.31 (m, 2H), 7.24 (m, 2H), 7.20 (m, 1H), 6.75 (m, 1H), 6.64 (s, 1H), 4.64 (p, J = 9.1 Hz, 1H); **^{13}C NMR (101 MHz, $CDCl_3$)** δ 146.9, 143.2, 141.2, 137.3, 134.7, 134.4, 133.6, 129.1, 128.9, 128.9, 128.9, 128.5, 128.2, 126.2, 125.9 (q, J = 279.9 Hz), 121.5, 121.4, 120.4, 119.9, 50.62 (q, J =

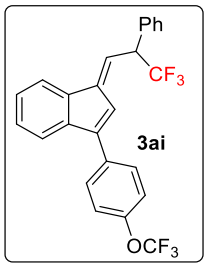
28.3 Hz); **^{19}F NMR** (471 MHz, $CDCl_3$) δ –68.57 (s, 3F); **IR (neat)**: ν_{max} = 2930, 1635 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{17}Cl\,F_3$ $[M+H]^+$: 397.0942, found: 397.0944.

(*E*)-1-(3,3,3-Trifluoro-2-phenylpropylidene)-3-(4-(trifluoromethyl)phenyl)-*1H*-indene (3ah)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-trifluoromethyl phenylboronic acid **2h** (68.4 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ah** as a yellow colour oil, yield 65% (83.87 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) *δ* 7.74 (m, 5H), 7.45 (m, 3H), 7.40 (m, 2H), 7.35 (m, 1H), 7.32 (m, 2H), 6.87 (d, *J* = 9.8 Hz, 1H), 6.78 (s, 1H), 4.77 (m, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ* 146.8, 143.2, 141.1, 138.8, 137.3, 134.8, 129.2, 129.2, 129.0, 128.7, 128.4, 128.0, 126.5, 125.8, 126.0 (q, *J* = 280.5 Hz), 125.8, 122.9 (q, *J* = 264.9 Hz), 122.5, 120.5, 120.2, 50.8 (q, *J* = 28.4 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) *δ* –62.54 (s, 3F), –68.52 (s, 3F); **IR (neat):** ν_{max} = 2920, 1645 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{17}F_6[M+H]^+$: 431.1210, found: 431.1212.

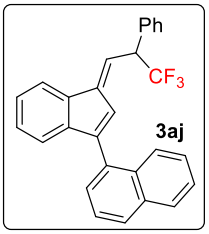
(*E*)-1-(3,3,3-Trifluoro-2-phenylpropylidene)-3-(4-(trifluoromethoxy)phenyl)-*1H*-indene (3ai)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 4-trifluoromethoxy phenylboronic acid **2i** (74.1 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ai** as a yellow colour oil, yield 68% (91.00 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.73 (m, 1H), 7.66 (m, 2H), 7.47 (m, 3H), 7.41 (m, 3H),

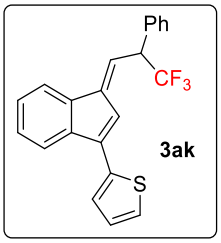
7.33 (m, 4H), 6.85 (d, J = 9.8, 0.8 Hz, 1H), 6.73 (s, 1H), 4.73 (p, J = 9.1 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 147.3, 144.8, 141.29, 139.3, 135.4, 132.8, 131.9, 129.2 (q, J = 66.5 Hz), 127.2, 127.2, 127.0, 126.6, 126.3, 124.3, 124.0 (q, J = 280.5 Hz), 119.8, 119.7, 119.3, 118.5, 118.1, 48.7 (q, J = 28.4 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –57.72 (s, 3F), –68.55 (s, 3F); **IR (neat)**: ν_{max} = 2910, 1650 cm^{-1}; **HRMS (ESI)**: m/z calcd for $C_{25}H_{17}F_6O[M+H]^+$: 447.1149, found: 447.1150.

(*E*)-1-(1-(3,3,3-Trifluoro-2-phenylpropylidene)-*1H*-inden-3-yl)naphthalene (3aj)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylb -ut-3-en-2-yl) carbonate **1a** (120.6 mg, 0.30 mmol), 1-napthyl phenylboronic acid **2j** (61.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3aj** as a yellow colour oil, yield 70% (86.9 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.83 (m, 3H), 7.62 (m, 1H), 7.46 (m, 3H), 7.36 (m, 2H), 7.32 (m, 4H), 7.16 (m, 1H), 7.13 (m, 1H), 6.94 (d, J = 7.4 Hz, 1H), 6.80 (dd, J = 9.7, 0.7 Hz, 1H), 6.71 (s, 1H), 4.63 (p, J = 9.1 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 147.4, 143.8, 143.4, 136.7, 135.0, 133.9, 133.2, 131.6, 129.2, 129.0, 128.8, 128.6, 128.5, 128.3, 127.5, 126.4, 126.3, 126.2, 126.1, 125.5, 123.8, 123.3 (q, J = 280.6 Hz), 121.5, 121.2, 119.8, 50.8 (q, J = 28.4 Hz); **^{19}F NMR** (471 MHz, $CDCl_3$) δ –68.56 (s, 3F); **IR (neat)**: ν_{max} = 2920, 1650 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{28}H_{20}F_3$ $[M+H]^+$: 413.1494, found: 413.1496.

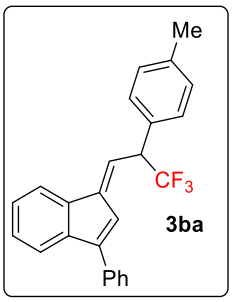
(*E*)-2-(1-(3,3,3-Trifluoro-2-phenylpropylidene)-*1H*-inden-3-yl)thiophene (3ak)



Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate **1a** (120.60 mg, 0.30 mmol), 2-thiophene boronic acid **2k** (46.0 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ak** as a yellow colour oil, yield 68% (75.08 mg);

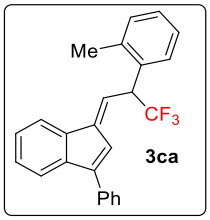
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (m, 1H), 7.55 (m, 2H), 7.39 (m, 2H), 7.34 (m, 1H), 7.30 (m, 2H), 7.23 (m, 2H), 7.07 (m, 2H), 6.73 (dd, J = 9.8, 0.8 Hz, 1H), 6.61 (s, 1H), 4.63 (p, J = 9.1 Hz, 1H); **^{13}C NMR** (151 MHz, $CDCl_3$) δ 143.4, 142.3, 141.5, 137.5, 136.1, 134.9, 129.2, 129.0, 128.5, 128.3, 127.4, 126.2, 126.1, 126.0 (q, J = 280.5 Hz), 123.1, 120.9, 120.6, 120.4, 119.9, 50.7 (q, J = 28.3 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –69.57 (s, 3F); **IR (neat)**: ν_{max} = 2930, 1600 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{22}H_{16}F_3S$ $[M+H]^+$: 369.0934, found: 369.0936.

(*E*)-3-Phenyl-1-(3,3,3-trifluoro-2-(*p*-tolyl)propylidene)-*1H*-indene (3ba)



Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*p*-tolyl)-but-3-en-2-yl) carbonate **1b** (124.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ba** as a yellow colour oil, yield 85% (95.88 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.61 (m, 1H), 7.55 (m, 2H), 7.44 (m, 1H), 7.38 (m, 2H), 7.31 (m, 1H), 7.23 (m, 2H), 7.21 (m, 2H), 7.11 (m, 2H), 6.72 (d, J = 9.9 Hz, 1H), 6.65 (s, 1H), 4.67 (p, 1H), 2.26 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.0, 143.3, 141.7, 138.4, 137.6, 135.3, 131.9, 130.3, 129.9, 128.8, 128.6, 128.2, 127.8, 126.1 (q, J = 280.5 Hz), 126.0, 121.4, 121.3, 120.7, 119.9, 50.3 (q, J = 28.3 Hz), 21.2; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.67 (s, 3F); **IR (neat)**: ν_{max} = 2950, 1600 cm^{-1}; **HRMS (ESI)**: m/z calcd for $C_{25}H_{20}F_3$ $[M+H]^+$: 377.1495, found: 377.1497.

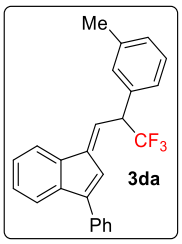
(*E*)-3-Phenyl-1-(3,3,3-trifluoro-2-(*o*-tolyl)propylidene)-1*H*-indene (3ca)



Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*o*-tolyl)-but-3-en-2-yl) carbonate **1c** (124.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ca** as a yellow colour oil, yield 82% (92.49 mg); **^{1}H**

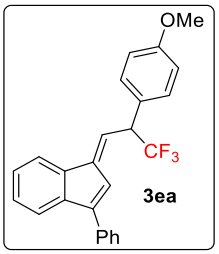
NMR (400 MHz, $CDCl_3$) δ 7.71 (m, 1H), 7.62 (m, 2H), 7.55 (m, 5H), 7.29 (m, 5H), 6.81 (m, 1H), 6.68 (s, 1H), 5.02 (p, J = 9.1 Hz, 1H), 2.48 (s, 3H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 148.2, 143.3, 141.7, 137.6, 136.5, 135.3, 133.6, 131.2, 129.3, 128.8, 128.6, 128.4, 128.2, 127.8, 126.9, 126.4 (q, J = 280.7 Hz),126.1, 121.7, 121.2, 120.7, 119.9, 45.9 (q, J = 28.3 Hz), 29.8; **^{19}F NMR** (471 MHz, $CDCl_3$) δ –68.11 (s, 3F); **IR (neat):** ν_{max} = 2900, 1650 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{20}F_3$ $[M+H]^+$: 377.1484, found: 377.1486.

(*E*)-3-Phenyl-1-(3,3,3-trifluoro-2-(*m*-tolyl)propylidene)-*1H*-indene (3da)



Following general procedure **E, (**(*E*)-*tert*-butyl (4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(*m*-tolyl)but-3-en-2-yl) carbonate **1d** (124.8 mg, 0.30 mmol), phenylboronic acid **2a** (48.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3da** as a yellow colour oil, yield 75% (84.60 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.71 (m, 3H), 7.53 (m, 4H), 7.31 (m, 5H), 7.13 (d, J = 5.7 Hz, 1H), 6.82 (m, 2H), 4.68 (p, J = 9.1 Hz, 1H), 2.46 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.1, 143.3, 141.7, 138.9, 137.6, 135.3, 134.8, 129.6, 129.3, 129.0, 128.8, 128.6, 128.4, 128.2, 127.8, 126.1 (q, J = 280.5 Hz), 126.1, 126.0, 121.3, 120.7, 119.9, 50.7 (q, J = 28.3 Hz), 21.60; **^{19}F NMR (**376 MHz, $CDCl_3$) δ –68.42 (s, 3F); **IR (neat):** ν_{max} = 2850, 1600 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{20}F_3$ $[M+H]^+$: 377.1482, found: 377.1483.

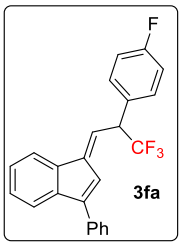
(*Z*)-3-Phenyl-1-(3,3,3-trifluoro-2-(4-methoxyphenyl)propylidene)-*1H*-indene (3ea)



Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-methoxyphenyl)but-3-en-2-yl)carbonate **1e** (129.6 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol% acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ea** as a yellow colour oil, yield 78% (91.72 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.70 (m, 1H), 7.65 (m, 2H), 7.51 (m, 1H), 7.48 (m, 2H), 7.42 (m, 3H), 7.32 (m, 2H), 6.93 (m, 2H), 6.78 (m, 1H), 6.72 (s, 1H), 4.67 (p, J = 9.1 Hz, 1H), 3.78

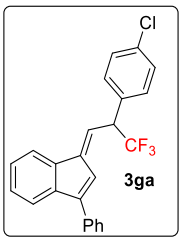
(s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 159.7, 148.0, 143.2, 141.7, 137.6, 135.3, 130.1, 128.8, 128.6, 128.2, 127.8, 127.0, 126.1 (q, *J* = 280.4 Hz), 126.1, 121.4, 121.3, 120.7, 119.9, 114.6, 55.4, 49.9 (q, *J* = 28.5 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.98 (s, 3F); **IR (neat):** ν_{max} = 2950, 1600 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{20}F_3O$ $[M+H]^+$: 393.1440, found: 393.1442.

(*E*)-3-Phenyl-1-(3,3,3-trifluoro-2-(4-fluorophenyl)propylidene)-*1H*-indene (3fa)



Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-fluoro phenyl)but-3-en-2-yl) carbonate **1f** (126.0 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3fa** as a yellow colour oil, yield 76% (86.64 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) *δ* 7.72 (m, 1H), 7.65 (m, 2H), 7.52 (d, *J* = 7.1 Hz, 1H), 7.49 (m, 5H), 7.29 (m, 2H), 7.12 (m, 2H), 6.75 (d, *J* = 9.7 Hz, 1H), 6.68 (s, 1H), 4.71 (p, *J* = 9.0 Hz, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) *δ* 163.7, 161.8, 148.5, 143.7, 141.7, 137.4, 135.2, 130.7 (d, *J* = 8.2 Hz), 128.9, 128.7, 128.3, 127.7, 126.2, 125.9 (q, *J* = 280.5 Hz), 121.0, 120.8, 120.6, 119.9, 116.2 (d, *J* = 21.7 Hz), 49.9 (q, *J* = 28.6 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) *δ* –68.95 (s, 3F), –113.32 (s, 1F); **IR (neat):** ν_{max} = 2950, 1650 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{17}F_4$ $[M+H]^+$: 381.1450, found: 381.1452.

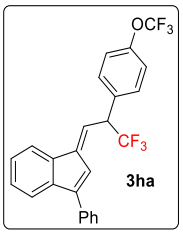
(*E*)-1-(2-(4-Chlorophenyl)-3,3,3-trifluoropropylidene)-3-phenyl-*1H*-indene (3ga)



Following general procedure **E**, *(E)-tert*-butyl (2-(4-chlorophenyl)-4-(2-ethynylphenyl)-1,1,1 -trifluorobut-3-en-2-yl) carbonate **1g** (130.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3mL of 1,4-dioxane was taken to furnish compound **3ga** as a yellow colour oil, yield 65% (77.22 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) *δ* 7.70 (m, 1H), 7.65 (m, 2H), 7.53 (m, 1H), 7.48 (m, 2H), 7.42 (m, 5H), 7.31 (m, 2H), 6.73 (d, *J* = 9.7 Hz, 1H), 6.67 (s, 1H), 4.70 (p, *J* = 9.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ* 148.6, 143.8, 141.7, 137.4, 135.1, 134.6, 133.5, 130.3, 129.4, 128.9,

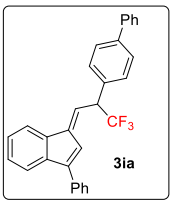
128.7, 128.4, 127.7, 126.2, 125.8 (q, J = 280.5 Hz), 121.0, 120.8, 120.2, 120.0, 50.0 (q, J = 28.6 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.72 (s, 3F); **IR (neat):** ν_{max} = 2980, 1640 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{17}ClF_3$ $[M+H]^+$: 397.0955, found: 397.0957.

(*E*)-3-Phenyl-1-(3,3,3-trifluoro-2-(4-(trifluoromethoxy)phenyl)propylidene)-1*H*-indene (3ha)



Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(4-(triflu -oromethoxy)phenyl)but-3-en-2-yl) carbonate **1h** (145.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ha** as a yellow colour oil, yield 70% (93.66 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.69 (m, 1H), 7.63 (m, 4H), 7.57 (d, J = 8.3 Hz, 2H), 7.52 (m, 1H), 7.49 (m, 2H), 7.43 (m, 1H), 7.32 (m, 2H), 6.75 (m, 1H), 6.67 (s, 1H), 4.79 (p, J = 8.9 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.9, 144.2, 141.7, 138.9, 137.3, 135.0, 129.5, 128.9 (q, J = 361.0 Hz), 128.9, 128.8, 128.5, 127.7, 126.3, 126.2, 126.1, 123.9 (q, J = 272.2 Hz), 120.8, 120.8, 120.0, 119.6, 50.5 (q, J = 28.6 Hz); **^{19}F NMR** (471 MHz, $CDCl_3$) δ –62.78 (s, 3F), -68.46 (s, 3F); **IR (neat):** ν_{max} = 2990, 1650 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{17}F_6O$ $[M+H]^+$: 447.1152, found: 447.1154.

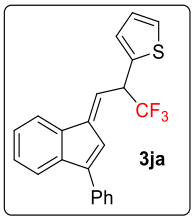
(*E*)-1-(2-([1,1'-Biphenyl]-4-yl)-3,3,3-trifluoropropylidene)-3-phenyl-*1H*-indene (3ia)



Following general procedure **E, (***E***)**-2-([1,1'-biphenyl]-4-yl)-4-(2-ethynylphenyl)-1,1,1-trifluo -robut-3-en-2-yl tertbutyl carbonate **1i** (143.4 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ia** as a yellow colour oil, yield 68% (89.35 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.73 (m, 1H), 7.66 (m, 2H), 7.60 (m, 3H), 7.54 (m, 3H), 7.49 (m, 5H), 7.39 (m, 1H), 7.31 (m, 2H), 7.27 (m, 1H), 6.83 (m, 1H), 6.76 (s, 1H), 4.77 (p, J = 9.1 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.30, 143.5, 141.7, 141.5, 140.5, 137.5, 135.3, 133.9, 129.4, 128.9, 128.8, 128.6, 128.2, 127.9, 127.8, 127.7, 127.3, 126.1 (q, J = 280.4 Hz),

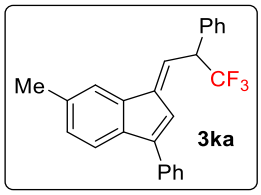
126.0, 121.2, 121.0, 120.8, 120.0, 50.4 (q, J = 28.5 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –69.50 (s, 3F); **IR (neat):** ν_{max} = 2995, 1660, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{30}H_{22}F_3$ $[M+H]^+$: 439.1592, found: 439.1596.

(*E*)-2-(1,1,1-Trifluoro-3-(3-phenyl-*1H*-inden-1-ylidene)propan-2-yl)thiophene (3ja)



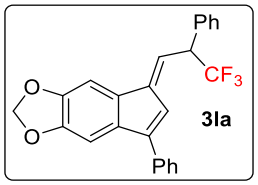
Following general procedure **E**, *(E)-tert*-butyl(4-(2-ethynylphenyl)-1,1,1-trifluoro-2-(thiophe -n-2-yl)but-3-en-2-yl) carbonate **1j** (122.4 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ja** as a yellow colour oil, yield 60% (66.24 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.72 (m, 1H), 7.67 (m, 2H), 7.53 (m, 1H), 7.50 (m, 2H), 7.41 (m, 1H), 7.34 (m, 3H), 7.16 (d, J = 3.6 Hz, 1H), 7.03 (m, 1H), 6.74 (s, 1H), 6.69 (m, 1H), 5.09 (m, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.5, 143.8, 141.8, 137.4, 136.1, 135.2, 128.8, 128.7, 128.4, 127.8, 127.3, 127.3, 126.2, 126.2, 125.3 (q, J = 280.4 Hz), 121.0, 120.8, 120.1, 120.0, 46.0 (q, J = 30.1 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –69.57 (s, 3F); **IR (neat):** ν_{max} = 2980, 1640 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{22}H_{16}F_3S$ $[M+H]^+$: 369.0900, found: 369.0901.

(*E*)-6-methyl-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-*1H*-indene (3ka)



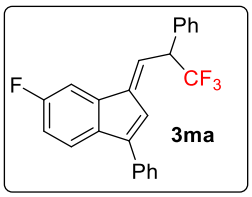
Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynyl-5-methylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate **1k** (124.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ka** as a yellow colour oil, yield 85% (95.88 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.64 (m, 2H), 7.51 (s, 1H), 7.44 (m, 4H), 7.41 (m, 5H), 7.10 (d, J = 7.7 Hz, 1H), 6.77 (d, J = 9.8 Hz, 1H), 6.66 (s, 1H), 4.79 (m, 1H), 2.41 (s, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.2, 143.6, 139.2, 137.9, 136.0, 135.4, 135.1, 129.4, 129.1, 129.0, 128.8, 128.6, 128.5, 127.7, 126.1 (q, J = 280.5 Hz), 120.9, 120.6, 120.5, 120.5, 50.7 (q, J = 28.2 Hz), 21.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.59 (s, 3F); **IR (neat):** ν_{max} = 2990, 1660, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{20}F_3$ $[M+H]^+$: 377.1492, found: 377.1494.

(*E*)-7-Phenyl-5-(3,3,3-trifluoro-2-phenylpropylidene)-5*H*-indeno[5,6-*d*][1,3]dioxole (3la)



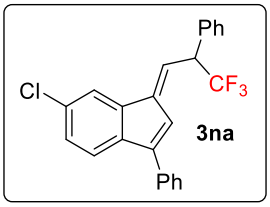
Following general procedure **E**, *(E)-tert*-butyl(4-(6-ethynylbenzo[*d*][1,3]dioxol-5-yl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl)carbonate **1l** (133.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3la** as a yellow colour oil, yield 80% (97.44 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.60 (m, 2H), 7.48 (m, 8H), 7.16 (d, J = 6.6 Hz, 1H), 6.98 (s, 1H), 6.65 (m, 1H), 6.60 (s, 1H), 6.02 (m, 2H), 4.79 (m, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.0, 147.8, 146.7, 143.2, 136.5, 135.3, 134.9, 131.7, 129.2, 128.9, 128.9, 128.6, 128.5, 127.6, 126.0 (q, J = 281.1 Hz), 120.7, 119.8, 102.2, 101.8, 101.5, 50.7 (q, J = 28.4 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.41(s, 3F); **IR (neat):** ν_{max} = 2995, 1670, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{18}F_3O_2$ $[M+H]^+$: 407.1182, found: 407.1185.

(*E*)-6-Fluoro-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-*1H*-indene (3ma)



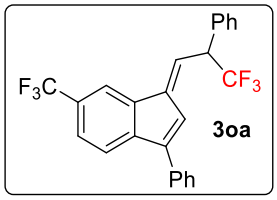
Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynyl-5-fluorophenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate **1m** (126.0 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3ma** as a yellow colour oil, yield 75% (85.50 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.65 (d, 1H), 7.59 (m, 2H), 7.49 (m, 4H), 7.42 (m, 4H), 7.29 (m, 2H), 6.79 (m, 1H), 6.72 (s, 1H), 4.70 (p, J = 9.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 162.3 (d, J = 244.4 Hz), 147.6, 142.6, 137.5, 137.5, 134.9, 134.6, 129.1, 128.9, 128.8, 128.7, 128.5, 127.5, 125.8 (q, J = 280.5 Hz), 121.9, 121.4 (d, J = 8.6 Hz), 120.9 (d, J = 3.4 Hz), 114.5 (d, J = 22.8 Hz), 107.8 (d, J = 24.2 Hz), 50.6 (q, J = 28.7 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) δ –68.54 (s, 3F), –116.49 (s, F); **IR (neat):** ν_{max} = 2955, 1680, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{17}F_4$ $[M+H]^+$: 381.1244, found: 381.1246.

(*E*)-6-Chloro-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-*1H*-indene (3na)



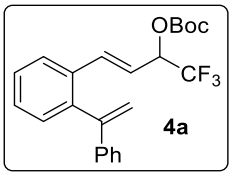
Following general procedure **E**, *(E)-tert*-butyl (4-(5-chloro-2-ethynylphenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-yl) carbonate **1n** (130.8 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3na** as a yellow colour oil, yield 78% (92.66 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.62 (m, 2H), 7.49 (m, 10H), 6.98 (m, *J* = 9.1, 8.4, 2.4 Hz, 1H), 6.76 (dd, *J* = 9.8, 0.8 Hz, 1H), 6.69 (s, 1H), 4.70 (p, *J* = 9.0 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ* 147.7, 142.6, 140.3, 139.2, 134.8, 134.6, 132.3, 129.3, 128.9, 128.9, 128.9, 128.7, 128.3, 128.0, 127.7, 122.4, 121.6, 121.4, 120.5, 50.7 (q, *J* = 28.3 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) *δ* –71.99 (s, 3F); **IR (neat)**: ν_{max} = 2950, 1660, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{17}ClF_3$ $[M+H]^+$: 397.0945, found: 397.0947.

(*E*)-3-Phenyl-1-(3,3,3-Trifluoro-2-phenylpropylidene)-6-(trifluoromethyl)-*1H*-indene (3oa)



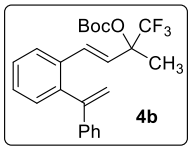
Following general procedure **E**, *(E)-tert*-butyl (4-(2-ethynyl-5-(trifluoromethyl)phenyl)-1,1,1 -trifluoro-2-phenylbut-3-en-2-yl)carbonate **1o** (141.0 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **3oa** as a yellow colour oil, yield 65% (83.85 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) *δ* 7.91 (s, 1H), 7.63 (m, 3H), 7.48 (m, 4H), 7.36 (m, 5H), 6.90 (m, 2H), 4.82 (m, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) *δ* 147.5, 144.7, 142.4, 137.8, 134.5, 129.5, 129.3, 129.0, 128.8, 128.4, 127.7, 126.7 (q, *J* = 277.8 Hz), 126.1, 125.9 (q, *J* = 280.0 Hz), 125.3, 123.5, 123.3, 120.7, 116.9, 116.8, 50.8 (q, *J* = 28.5 Hz); **^{19}F NMR** (376 MHz, $CDCl_3$) *δ* –63.00 (s, 3F), –78.19 (s, 3F); **IR (neat):** ν_{max} = 2905, 1670, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{25}H_{17}F_6$ $[M+H]^+$: 431.1213, found: 431.1215.

(*E*)-*Tert*-butyl (1,1,1-trifluoro-4-(2-(1-phenylvinyl)phenyl)but-3-en-2-yl) carbonate (4a)



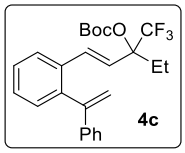
Following general procedure **E**, *(E)-t*ert-butyl (4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-yl) carbonate **1p** (97.80 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **4a** as a white colour oil, yield 82% (99.38 mg); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 7.61 (m, 1H), 7.34 (m, 2H), 7.29 (m, 6H), 6.91 (d, *J* = 15.9 Hz, 1H), 5.99 (dd, *J* = 15.9, 7.9 Hz, 1H), 5.85 (d, *J* = 0.9 Hz, 1H), 5.44 (m, 1H), 5.19 (d, *J* = 0.9 Hz, 1H), 1.46 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 151.7, 147.8, 141.6, 140.7, 137.8, 134.0, 130.6, 128.8, 128.5, 127.9, 126.9, 126.2, 125.9 (q, *J* = 280.4 Hz), 118.1, 116.9, 83.9, 74.7, 29.8, 27.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –78.93; **IR (KBr):** ν_{max} = 1745, 1642, 1446 cm^{-1}**; HRMS (ESI):** m/z calcd for $C_{18}H_{14}F_3$ $[M–OBoc]^–$: 287.1048, found: 287.1038.

(*E*)-*Tert*-butyl (1,1,1-trifluoro-2-methyl-4-(2-(1-phenylvinyl)phenyl)but-3-en-2-yl) carbonate (4b)



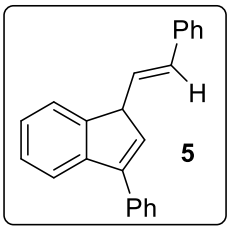
Following general procedure **E**, *(E)-t*ert-butyl (4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-yl) carbonate **1q** (72 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **4b** as a white colour oil, yield 79% (99.06 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.42 (m, 1H), 7.40 (m, 1H), 7.35 (m, 3H), 7.30 (m, 2H), 7.28 (m, *J* = 2.2 Hz, 4H), 6.77 (m, 1H), 6.25 (d, *J* = 16.3 Hz, 1H), 1.92 (s, 3H), 1.47 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 150.2, 147.9, 141.2, 140.9, 134.6, 132.9, 130.4, 129.1, 128.4, 128.2, 127.8, 127.8, 126.9, 125.9, 124.5, 124.2 (q, *J* = 281.7 Hz), 116.8, 83.7, 27.7, 24.8; **^{19}F NMR** (377 MHz, $CDCl_3$) δ –63.30; **IR (KBr):** ν_{max} = 1766, 1645, 1455 cm^{-1}**; HRMS (ESI):** m/z calcd for $C_{19}H_{16}F_3$ $[M–OBoc]^–$: 301.1204, found: 301.1259.

(*E*)-*Tert*-butyl (1-(2-(1-phenylvinyl) phenyl)-3-(trifluoromethyl) pent-1-en-3-yl) carbonate (4c)



Following general procedure **E**, *(E)-t*ert-butyl (4-(2-ethynylphenyl)-1,1,1-trifluorobut-3-en-2-yl) carbonate **1r** (76 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **4c** as a white colour oil, yield 78% (101.08 mg); **^{1}H NMR** (300 MHz, $CDCl_3$) δ 7.56 (dd, J = 8.4, 6.6 Hz, 1H), 7.36 (m, 8H), 6.78 (d, J = 16.4 Hz, 1H), 6.06 (dd, J = 21.7, 10.4 Hz, 1H), 5.83 (d, J = 1.1 Hz, 1H), 5.20 (d, J = 1.1 Hz, 1H), 2.29 (m, 2H), 1.43 (s, 9H), 0.88 (m, 3H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 150.3, 148.0, 141.3, 141.0, 134.8, 133.1, 130.5, 128.5, 128.3, 127.9, 127.9, 127.0, 126.1, 124.6, 124.3 (q, J = 285.5 Hz), 116.9, 83.6, 77.4, 27.8, 24.9, 7.5; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –76.53; **IR (KBr):** ν_{max} = 1756, 1665, 1485 cm^{-1}**; HRMS (ESI):** m/z calcd for $C_{20}H_{18}F_3$ $[M–OBoc]^-$: 315.1361, found: 315.1359.

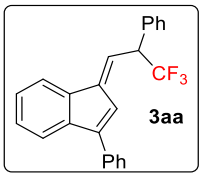
(*E*)-3-Phenyl-1-styryl-1H-indene (5)



Following general procedure **E**, *(E)-t*ert-butyl (3-(2-ethynylphenyl)-1-phenylallyl) carbonate **1s** (100.2 mg, 0.30 mmol), phenylboronic acid **2a** (43.9 mg, 0.36 mmol), $Pd(PPh_3)_4$ (17.3 mg, 5 mol%) and (0.34 µL, 20 mol%) acetic acid in 3 mL of 1,4-dioxane were taken to furnish compound **5** as a white colour oil, yield 73% (64.38 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.50 (d, J = 7.3 Hz, 1H), 7.39 (m, 5H), 7.32 (m, 4H), 7.23 (m, 1H), 7.20 (m, 4H), 6.81 (d, J = 15.7 Hz, 1H), 5.95 (dd, J = 15.7, 9.2 Hz, 1H), 4.76 (d, J = 9.1 Hz, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 145.6, 144.6, 140.4, 137.4, 135.7, 133.3, 129.6, 129.5, 128.8, 128.6, 128.1, 127.6, 127.4, 126.9, 126.4, 125.7, 124.4, 120.6, 55.9; **IR (KBr):** ν_{max} = 1766, 1645, 1455 cm^{-1}**; HRMS (ESI):** m/z calcd for $C_{23}H_{17}$ $[M–H]^-$: 293.1330, found: 293.1753.

7. Gram scale reaction

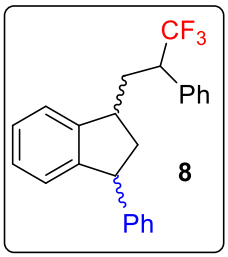
(*E*)-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene (3aa)



To a stirred solution of (*E*)-*tert*-butyl (4-(2-ethynyl phenyl)-1,1,1-trifluoro-2-phenyl but-3-en-2-yl) carbonate **1a** (1g, 2.48 mmol) in 10 mL of 1,4-dioxane was added phenylboronic acid **2a** (364 mg, 2.98 mmol) at room temperature. Then $Pd(PPh_3)_4$ (143 mg, 0.124 mmol, 5 mol%) and 20 mol% acetic acid were added to the reaction mixture, and stirring continued at 90 °C (oil bath temperature) for 10 –12 h. The reaction progress was monitored by TLC. After completion of the reaction, the mixture was diluted with water and extracted with ethyl acetate (3 X 15 mL). The combined organic layers were dried over sodium sulfate and concentrated on rotary evaporation. The obtained crude product was purified using flash column chromatography (using 9.5:0.5 hexane/ethyl acetate as eluent) to obtain the pure product (*E*)-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene **3aa**, in 78% yield (700.25 mg) as a yellow oil.

8. Synthetic utility of CF_3-benzofulvene (3aa)

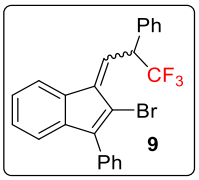
8.1 General procedure for the synthesis of 1-phenyl-3-(3,3,3-trifluoro-2-phenylpropyl)-2,3-dihydro-1*H*-indene (8)



To a the stirred solution of (*E)*-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene **3aa** (108.6, 0.30 mmol, 1.0 equiv) in 5 mL of methanol, was suspended palladium carbon (catalytic amount) and hydrogen gas was connected through a balloon. The reaction mixture was stirred vigorously at room temperature for 1h under N_2 atmosphere, completion of the reaction was monitored by TLC. The reaction mixture was diluted with the water, then extracted with ethyl acetate (3 × 30 mL). The combined organic layers were finally washed with brine solution, dried over anhydrous Na_2SO_4, and then the solvent was removed under reduced pressure. The crude product **8** was further purified by column chromatography, pure compound **8** was obtained as a white colour oil; yield 70% (76.86 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.30 (m, J = 3.1, 2.6 Hz, 5H), 7.27 (m, 10H), 7.18 (m, 7H), 7.09 (m, 4H), 6.79 (t, J = 6.6 Hz, 2H), 4.04 (m, 1.9H, major + minor,), 3.53 (m, 1H, major), 3.35 (m, 0.93H, minor), 2.76 (m, 2H, major), 2.62 (m, 0.96H, minor), 2.40 (m, 1H, major), 2.04 (m, 1H, minor), 1.61 (m, 1.96H, minor), 1.50 (m, 2H, major); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 146.8, 146.7, 146.7, 146.4, 144.6, 144.5, 135.7, 134.1, 129.3, 129.1, 128.9, 128.8, 128.7, 128.6, 128.5, 128.5, 128.4, 127.1, 126.8, 126.7, 126.6, 126.2 (q, J = 282.3 Hz), 125.1, 125.1 (q, J = 275.4 Hz).124.9, 123.1,

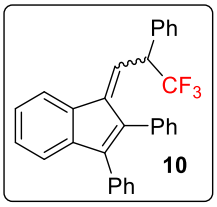
122.7, 50.5, 50.5, 49.4 (q, J = 26.3 Hz), 48.4 (q, J = 26.7 Hz), 44.95, 43.8, 42.1, 40.1, 35.1, 33.4, 29.8, 22.8, 14.3; **^{19}F NMR** (377 MHz, $CDCl_3$) δ –69.05 (s, 3F), –70.06 (s, 3F); **IR (neat):** ν_{max} = 2974, 2926, 1760, 1489 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{20}F_3$ [M-H]: 366.1572, found: 366.1575.

8.2 General procedure for the synthesis of 2-bromo-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-6-(trifluoromethyl)-1*H*-indene (9)



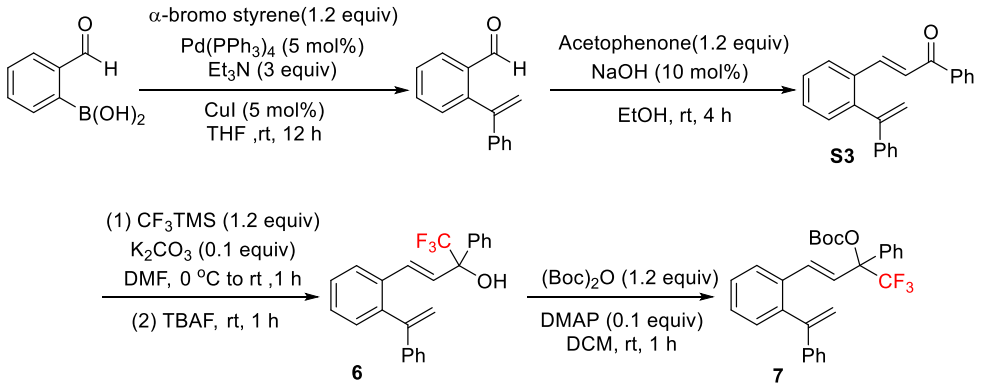
To a stirred solution of (*E*) -3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene **3aa** (108 mg, 0.30 mmol, 1.0 equiv) in anhydrous carbon tetrachloride (5 mL) was added *N*-bromosuccinimide (53 mg, 0.30 mmol, 1 equiv) portion wise, the reaction mixture was stirred vigorously at room temperature for 1h under N_2 atmosphere. completion of the reaction was monitored by TLC. The reaction mixture was diluted with the water, then extracted with ethyl acetate (3 × 30 mL). The combined organic layers were finally washed with brine solution, dried over anhydrous Na_2SO_4, and then the solvent was removed under reduced pressure. The crude was further purified by column chromatography to obtain the brominated product **9** as yellow colour oil; yield 72% (95.04 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.65 (m, J = 5.9, 2.5 Hz, 1H), 7.59 (m, 9H), 7.45 (m, 6H), 7.27 (m, 5H), 7.01 (d, J = 10.9 Hz, 1H, major), 6.94 (d, J = 9.8 Hz, 0.48H, minor), 6.12 (m, J = 17.8, 8.9 Hz, 1H, major), 5.13 (p, J = 8.7 Hz, 0.48H, minor); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 148.1 (major), 143.5 (minor), 143.3 (major), 141.3 (minor), 140.7 (major), 138.8 (minor), 136.8 (major), 134.8 (minor), 134.1 (major), 133.3 (minor), 133.1 (major), 133.0 (minor), 129.5, 129.3, 129.1, 128.8, 128.7, 128.7, 128.6, 128.5, 128.4, 128.1, 128.1, 126.2, 126.1, 126.1 (d, J = 280.7 Hz, major), 125.9 (d, J = 280.5 Hz, minor), 124.3, 124.3, 123.3, 120.5, 120.1, 119.8, 118.9, 112.5, 49.4 (q, J = 28.1 Hz, minor), 46.2 (q, J = 28.2 Hz, major); **^{19}F NMR** (377 MHz, $CDCl_3$) δ –68.76 (s, 3F), –69.56 (s, 3F); **IR (neat):** ν_{max} = 2974, 2926, 1760, 1489 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{15}BrF_3$ $[M–H]^-$: 439.0315, found: 439.0317.

8.3 General procedure for the synthesis of 2,3-diphenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-6-(trifluoromethyl)-1*H*-indene (10)



To a stirred solution of 2-bromo-3-phenyl-1-(3,3,3-trifluoro-2-phenylpropylidene)-1*H*-indene **9** (103.2 mg, 0.24 mmol, 1 equiv) in 3 mL of toluene was added phenylboronic acid (35 mg, 0.28 mmol, 1.2 equiv) at room temperature. Then, $Pd(PPh_3)_4$ (13 mg, 0.01 mol, 0.05 equiv) and sodium carbonate (50 mg , 0.48 mmol, 2 equiv) was added to the reaction mixture and stirred at 100 °C (oil bath temperature) for 10 –12 h. The reaction progress was monitored by TLC. After completion of the reaction, the mixture was diluted with water and extracted with ethyl acetate (3 X 15 mL). The combined organic layers were dried over sodium sulphate and concentrated on rotary evaporation. The obtained crude product was purified using flash column chromatography (using 9.5:0.5 hexane/ethyl acetate as a elunet) to get the pure product **10** as a yellow colour oil; yield 75% (98.55 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.77 (m, 1H), 7.46 (m, 5H), 7.30 (m, 3H), 7.26 (m, 4H), 7.22 (m, 4H), 6.96 (m, 3H), 4.33 (m, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 145.7, 142.9, 141.8, 137.4, 136.7, 135.9, 134.6, 134.0, 130.7, 129.3, 129.1, 128.7, 128.5, 128.3, 128.2, 127.8, 127.7, 126.1, 125.8 (q, J = 280.7 Hz), 122.9, 122.9, 120.5, 119.2, 47.2 (q, J = 28.0 Hz); **^{19}F NMR** (377 MHz, $CDCl_3$) δ –68.89 (s, 3F); **IR (neat):** ν_{max} = 2974, 2926, 1760, cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{30}H_{20}F_3$ $[M–H]^-$: 437.1520, found: 437.1521.

9) General procedure for the synthesis of (*E*)-*tert*-butyl (1,1,1-trifluoro-2-phenyl-4-(2-(1-phenylvinyl)phenyl)but-3-en-2-yl) carbonate (7) (General procedure F)

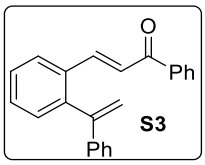


To a solution of (2-formylphenyl) boronic acid (1.5 g, 10 mmol) and α-bromo styrene (2.1 g, 12 mmol) in Et_3N (50 mL) at room temperature were added $Pd(PPh_3)_4$ (0.577 g, 0.5 mmol) and CuI (0.035 g, 1.89 mmol) under argon. The reaction mixture was stirred at room temperature

for 12 h, then filtered through a short pad of silica gel and washed with ethyl acetate. After the removal of solvent, the crude residue was purified by flash chromatography on silica gel (petroleum ether/ ethyl acetate = 100:1, v/v) to afford the desired product 2-(1-phenylvinyl)benzaldehyde (1.9 g, 95% yield).

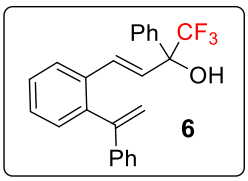
To a solution of 2-(1-phenylvinyl)benzaldehyde (1.04 g, 5 mmol) and acetophenone (0.60 g, 5 mmol) in MeOH (25 mL) at room temperature was added 10% NaOH aqueous solution (1.5 mL, 11.0 mmol). The reaction mixture was stirred at room temperature for 3 h, then the solution was quenched with water and extracted with EtOAc (20 mL). The organic layer was separated and the aqueous layer was extracted with EtOAc (3x 10 mL). The combined organic layer was washed with brine, dried over $MgSO_4$ and concentrated under reduced pressure. The residue was purified by flash chromatography on silica gel (petroleum ether/ethyl acetate = 100:1 to 30:1, v/v) to afford **S3** (1.3 g, 85%).

(*E*)-1-Phenyl-3-(2-(1-phenylvinyl)phenyl)prop-2-en-1-one (S3)



Following general procedure **F,** 2-(1-phenylvinyl)benzaldehyde (104 mg, 0.50 mmol), acetophenone (60 mg, 0.50 mmol), aqueous NaOH solution (10%), were taken in 10 mL of methanol to obtain the compound **S3** as a red colour oil, yield 72% (102 mg); **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.82 (m, 4H), 7.44 (m, 5H), 7.30 (m, 7H), 5.89 (d, J = 3.2 Hz, 1H), 5.21 (d, J = 3.2 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 191.5, 147.6, 143.9, 143.4, 140.6, 138.2, 133.8, 132.5, 130.9, 130.2, 129.1, 128.6, 128.6, 128.1, 126.9, 126.8, 126.2, 123.9, 117.2; **HRMS (ESI):** m/z calcd for $C_{23}H_{19}O$ $[M+H]^+$: 311.1430, found: 311.1426.

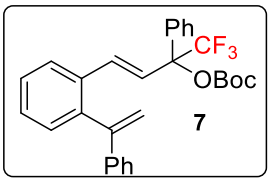
(*E*)-1,1,1-Trifluoro-2-phenyl-4-(2-(1-phenylvinyl)phenyl)but-3-en-2-ol (6)



Following general procedure **A,** (*E)*-1-Phenyl-3-(2-(1-phenylvinyl)phenyl)prop-2-en-1-one (**S3**) (93 mg, 0.30 mmol), $TMSCF_3$ (0.5 mL, 0.36 mmol), and K_2CO_3 (41 mg, 0.30 mmol) were taken in 3 mL of DMF. After that TBAF was added to obtain the compound **6** as a reddish colour oil, yield 69% (78.66 mg); **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.46 (m, 1H), 7.34 (m, 2H), 7.29 (m, 3H), 7.24 (m, 4H), 7.19 (m, 3H), 7.12 (m, 2H), 6.68 (m, 1H), 6.36 (d, J = 16.1 Hz,

1H), 5.67 (d, J = 1.7 Hz, 1H), 5.15 (d, J = 3.6, 1.2 Hz, 1H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 148.6, 141.3, 141.2, 137.3, 134.6, 133.2, 130.7, 128.7, 128.5, 128.5, 128.3, 128.2, 127.9, 127.6, 127.2, 126.9, 126.3, 125.0 (q, J = 286.1 Hz), 116.6, 77.2 (q, J = 29.0 Hz); **^{19}F NMR (376 MHz, $CDCl_3$)** δ –76.39 (s, 3F); **IR (neat):** ν_{max} = 3285, 2925, 1492 cm^{-1} ; **HRMS (ESI):** m/z calcd for $C_{24}H_{18}F_3O$ $[M–H]^-$: 379.1374, found: 379.1375.

(*E*)-*Tert*-butyl(1,1,1-trifluoro-2-phenyl-4-(2-(1-phenylvinyl)phenyl)but-3-en-2-yl) carbonate (7)



Following general procedure **A**, (*E*)-4-(2-ethynyl-5-(trifluoromethyl)phenyl)-1,1,1-trifluoro-2-phenylbut-3-en-2-ol **6** (114 mg, 0.30 mmol), $(Boc)_2O$ (0.08 mL, 0.36 mmol), and DMAP (36.6 mg, 0.30 mmol) were taken in 3 mL of DCM to obtain the compound **7** as a white solid, yield 78% (112.32 mg), mp: 65 – 66 °C; **^{1}H NMR** (400 MHz, $CDCl_3$) δ 7.57 (m, 1H), 7.28 (m, 7H), 7.16 (m, J = 6.9, 3.3 Hz, 6H), 6.95 (m, 1H), 6.59 (d, J = 16.5 Hz, 1H), 5.75 (d, J = 1.1 Hz, 1H), 5.12 (d, J = 1.1 Hz, 1H), 1.27 (s, 9H); **^{13}C NMR** (101 MHz, $CDCl_3$) δ 149.9, 147.9, 141.6, 140.8, 135.3, 134.9, 134.7, 130.6, 129.0, 128.5, 128.5, 128.3, 128.0, 127.9, 127.1, 127.0, 126.1, 123.4 (d, J = 285.0 Hz), 122.8, 116.8, 83.5 (d, J = 29.2 Hz), 83.4, 27.7; **^{19}F NMR** (376 MHz, $CDCl_3$) δ –83.87 (s, 3F); **IR (KBr):** ν_{max} = 2974, 2926, 1760, 1489 cm^{-1}; **HRMS (ESI):** m/z calcd for $C_{24}H_{18}F_3$ $[M–OBoc]^-$: 363.1355, found: 363.1354.

10. Reference

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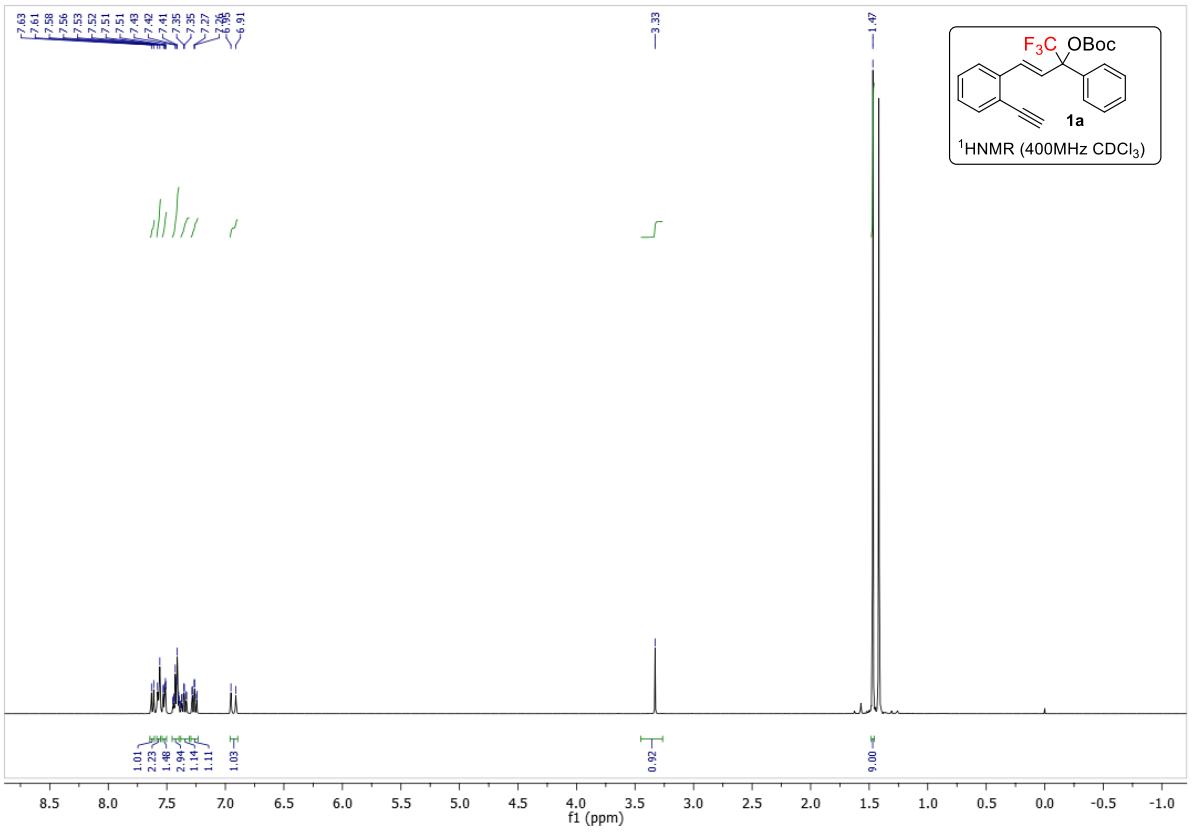
2. (a) Zhou, M.; Zhang, J.; Zhang, XG.; Zhang, X. Ni-catalyzed defluorination for the synthesis of gem-difluoro-1, 3-dienes and their [4+ 2] cycloaddition reaction. *Organic letters.* **2019**, 21, 671-4. (b) Ortega, A.; Manzano.;R, Uria, U.; Carrillo, L.; Reyes, E.; Tejero, T.; Merino, P.; Vicario, J.L.; Catalytic Enantioselective Cloke–Wilson Rearrangement. *Angewandte Chemie*.

2018, 130, 8357-61. (c) Priyanka, C.; Subbarao.; Punna, N. Palladium-catalyzed ortho-vinylation of *β*-naphthols with α-trifluoromethyl allyl carbonates: one-pot access to naphtho [2, 1-*b*] furans. *Organic & Biomolecular Chemistry*. **2021**, 19, 8241-5

11. ^{1}H NMR ,^{13}C NMR and ^{19}F NMR spectral copies of compounds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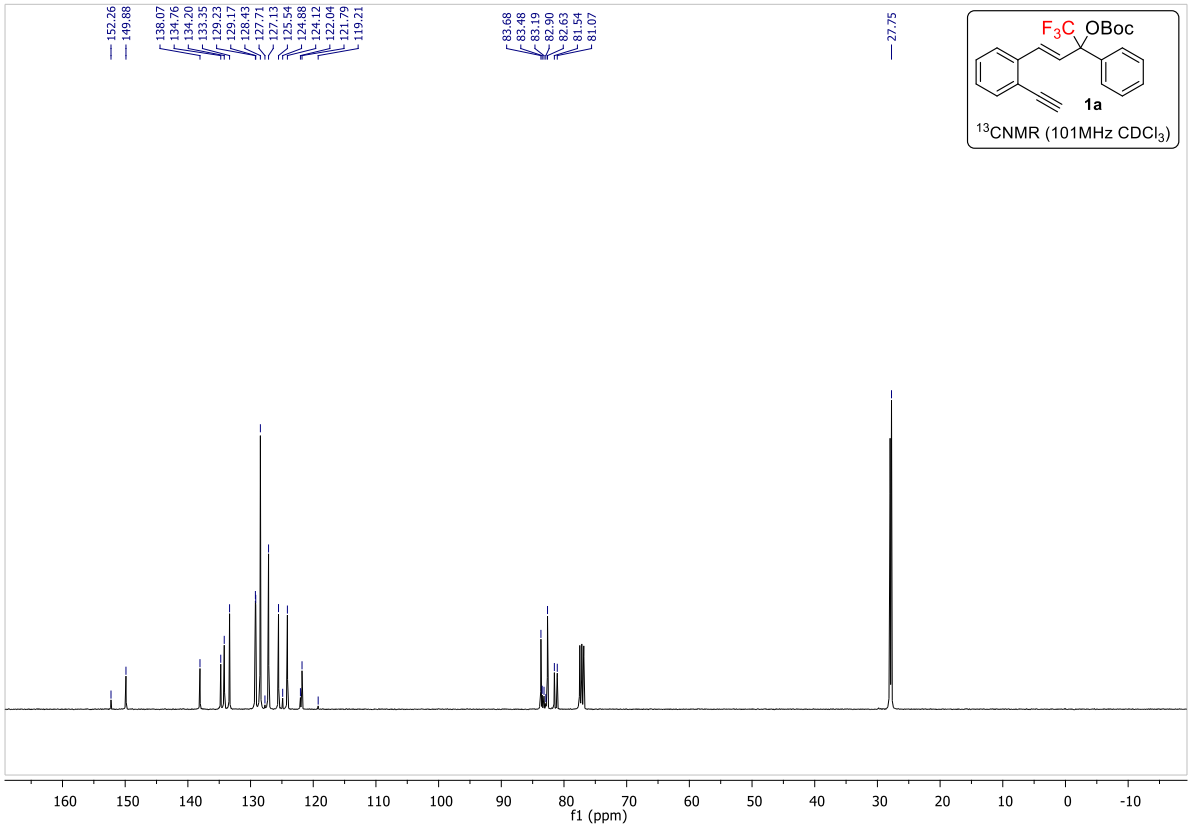
f1 (ppm)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1a
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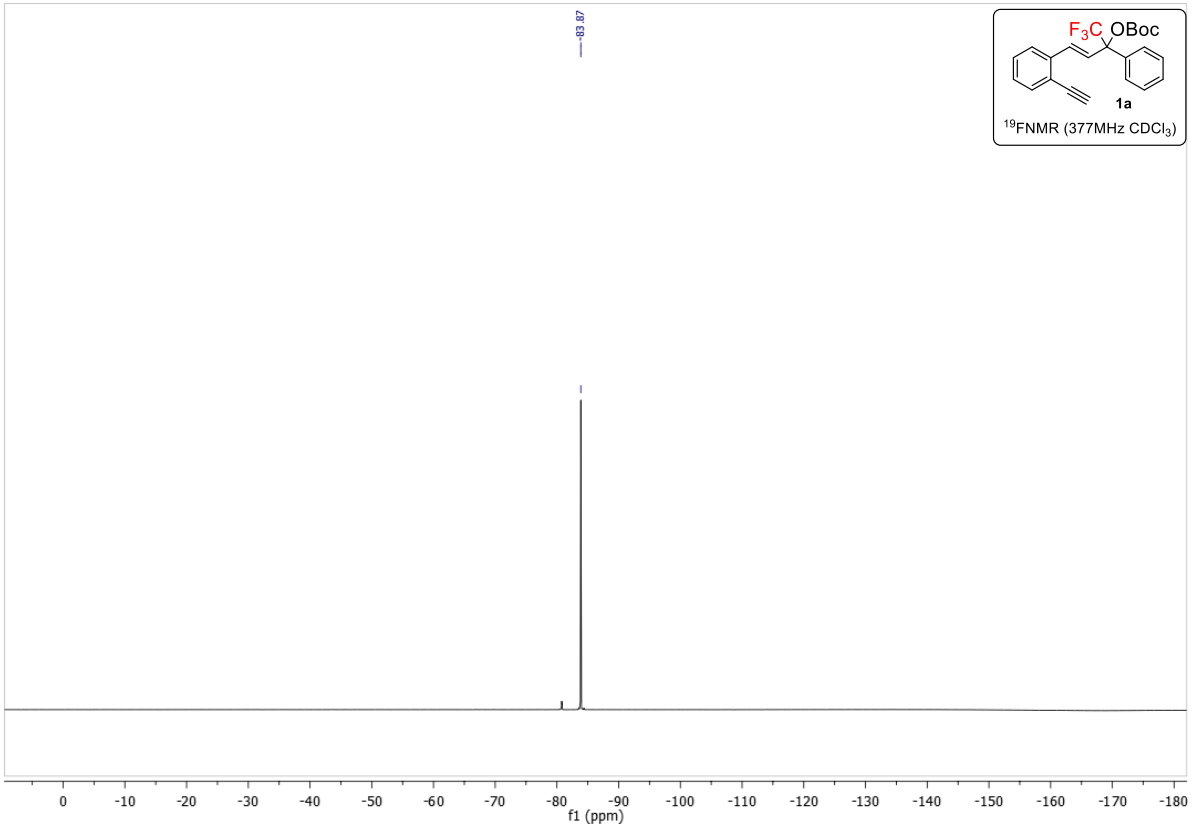
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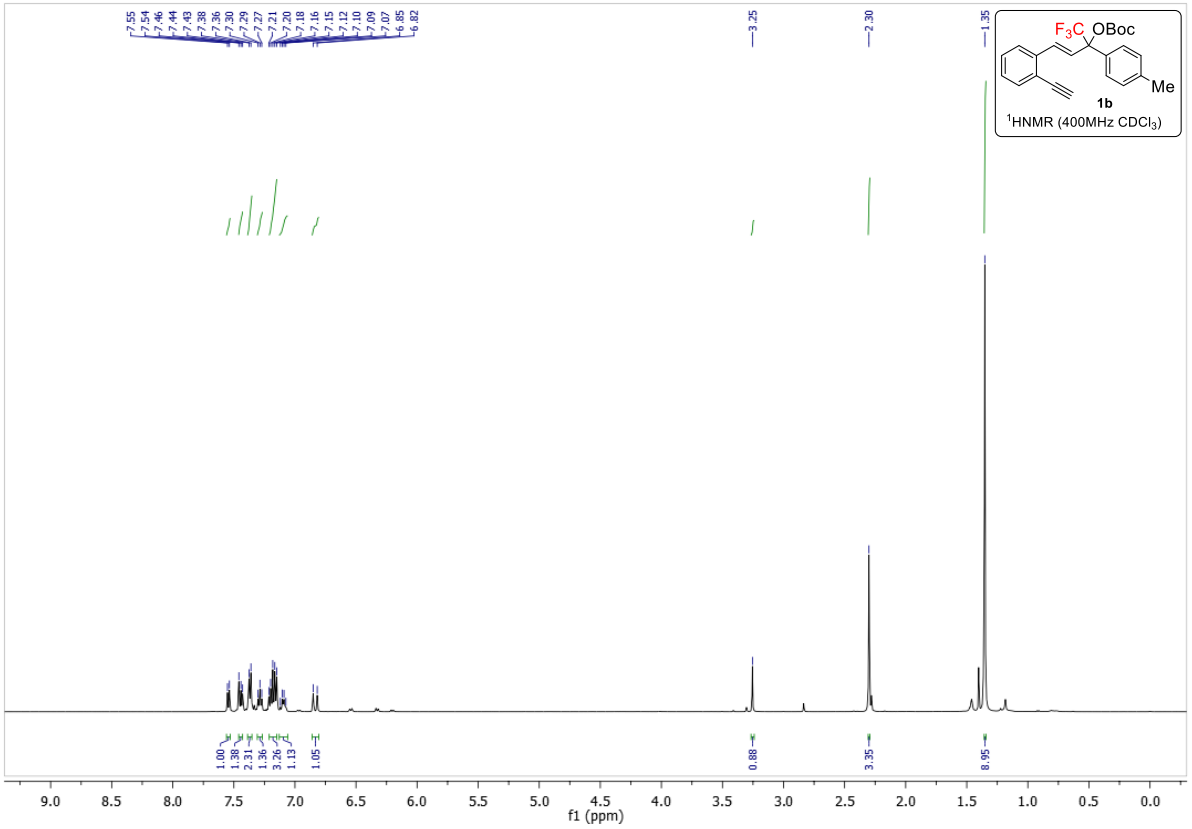
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7.30
7.29
7.27
7.21
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7.18
7.16
7.15
7.12
7.10
7.09
7.07
6.85
6.82
3.25
2.30
1.35
F3C OBoc
Me
1b
1HNMR (400MHz CDCl3)
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2.31
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3.26
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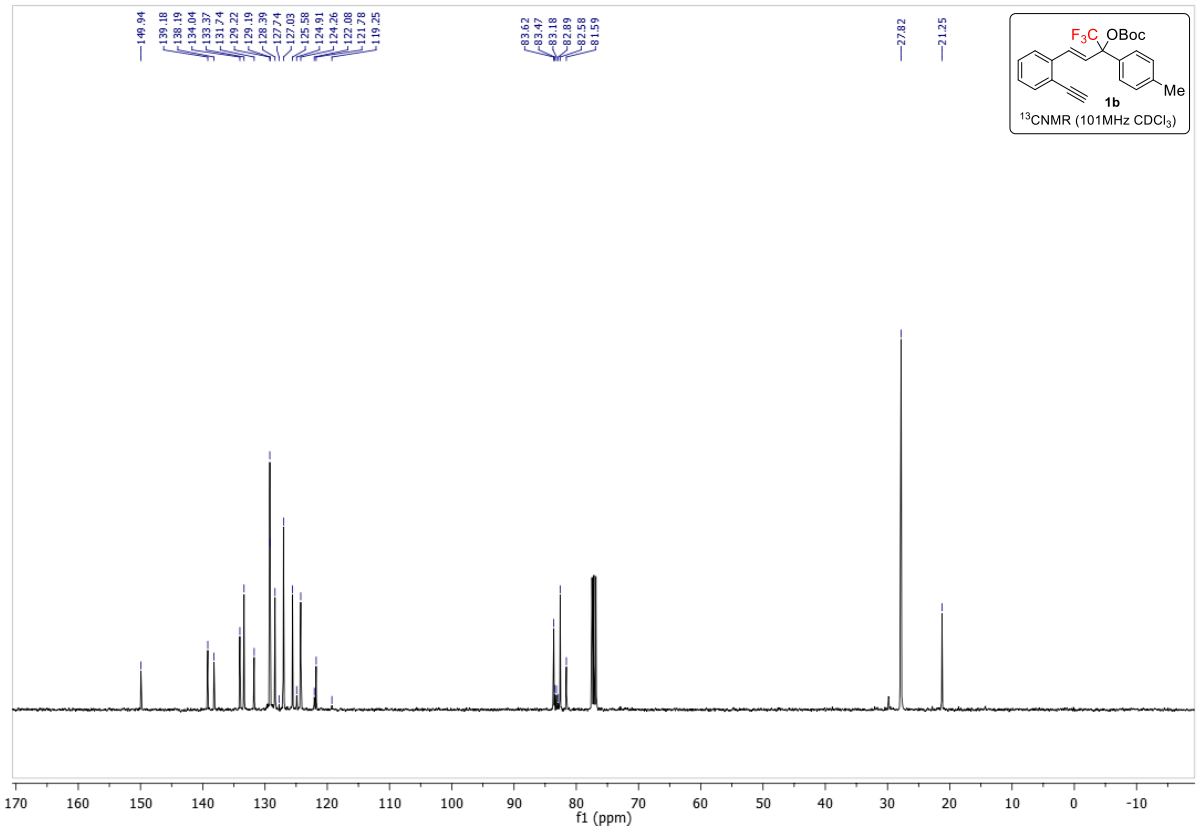
0.88
3.35
8.95
f1 (ppm)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124.26
122.08
121.78
119.25
83.62
83.47
83.18
82.89
82.58
81.59
27.82
21.25
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Me
1b
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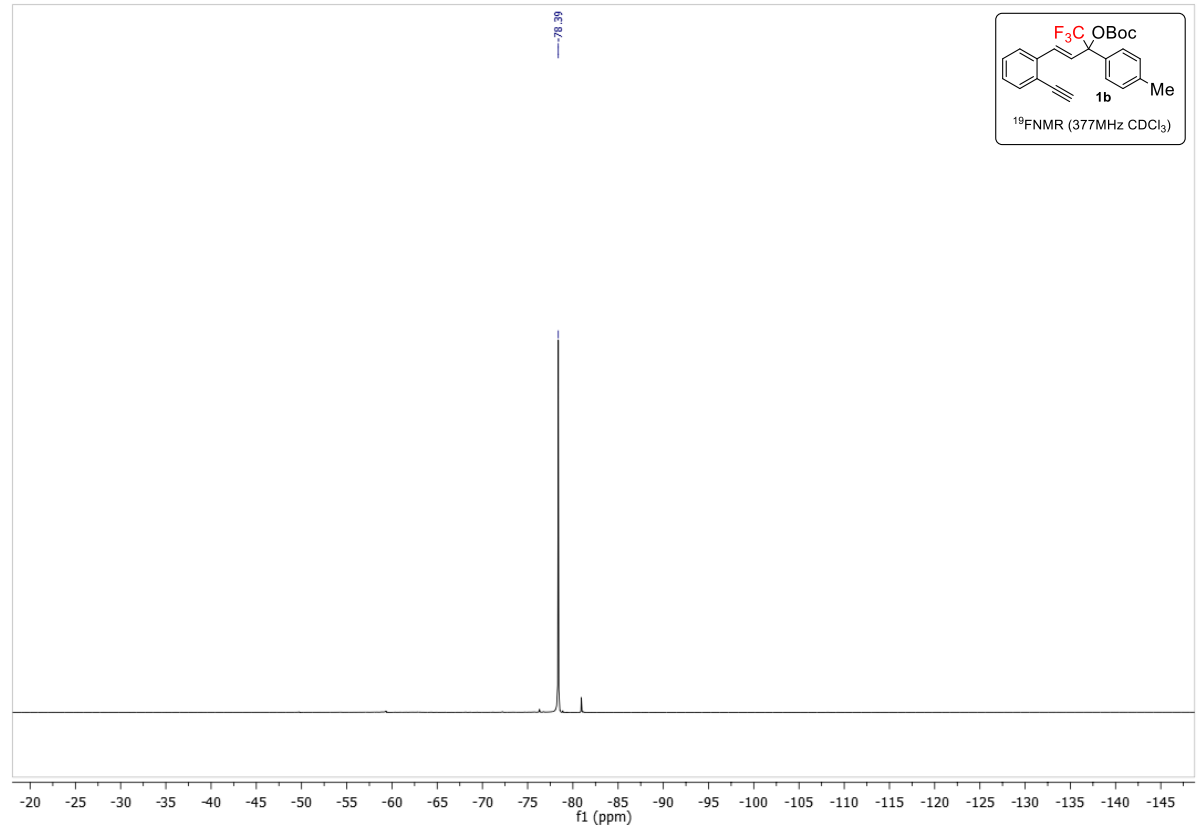
f1 (ppm)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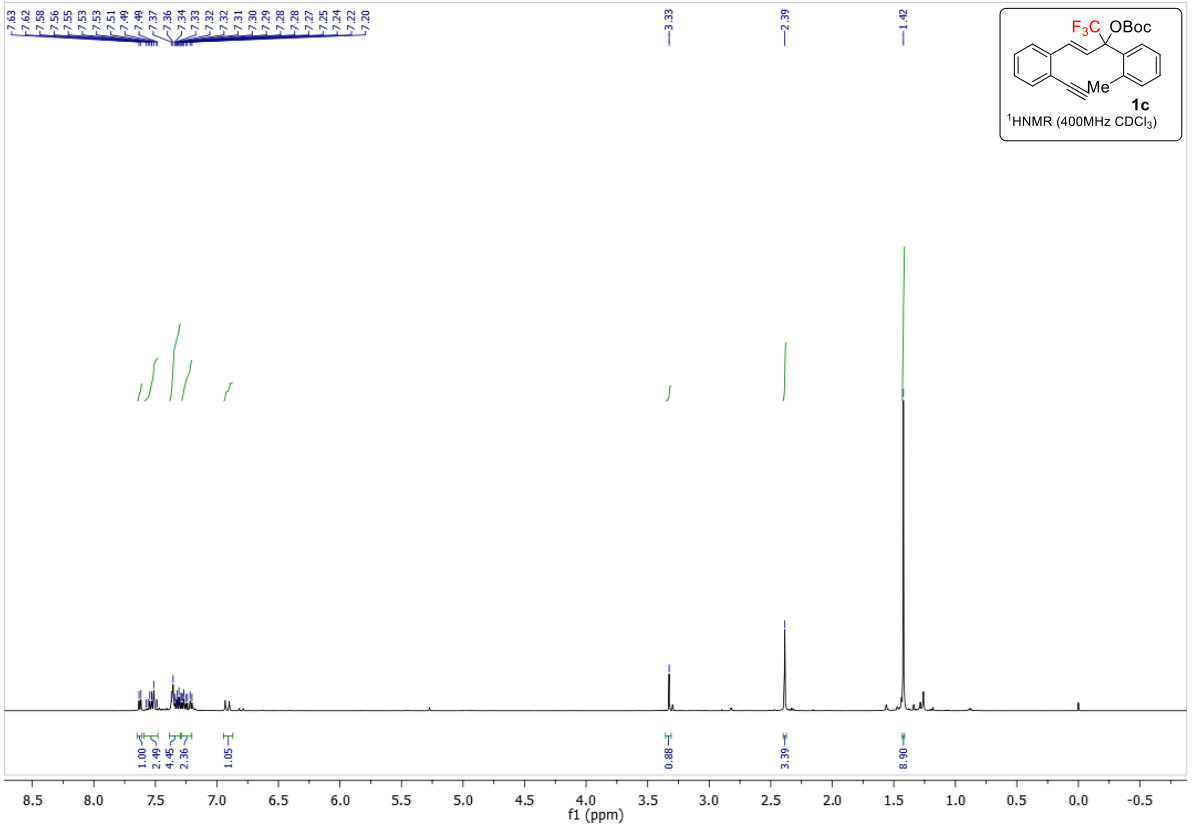
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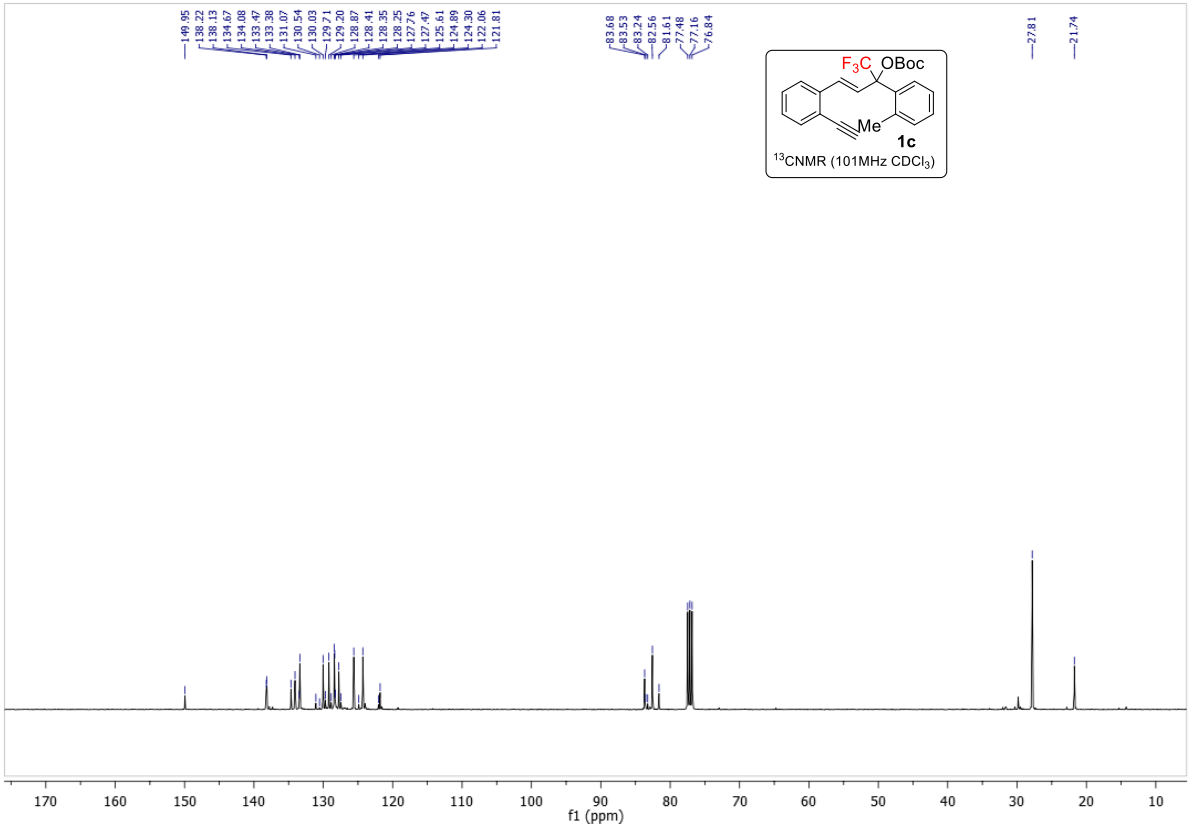
f1 (ppm)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Me
1c
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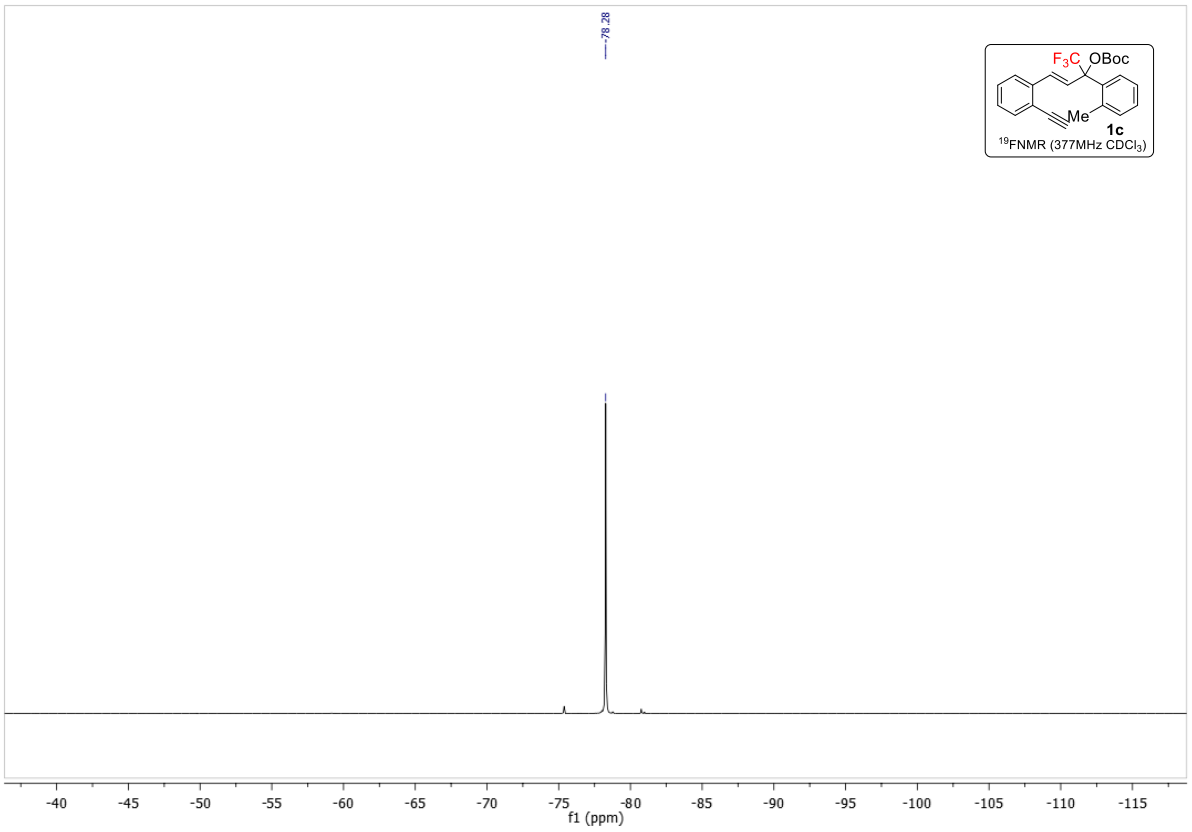
f1 (ppm)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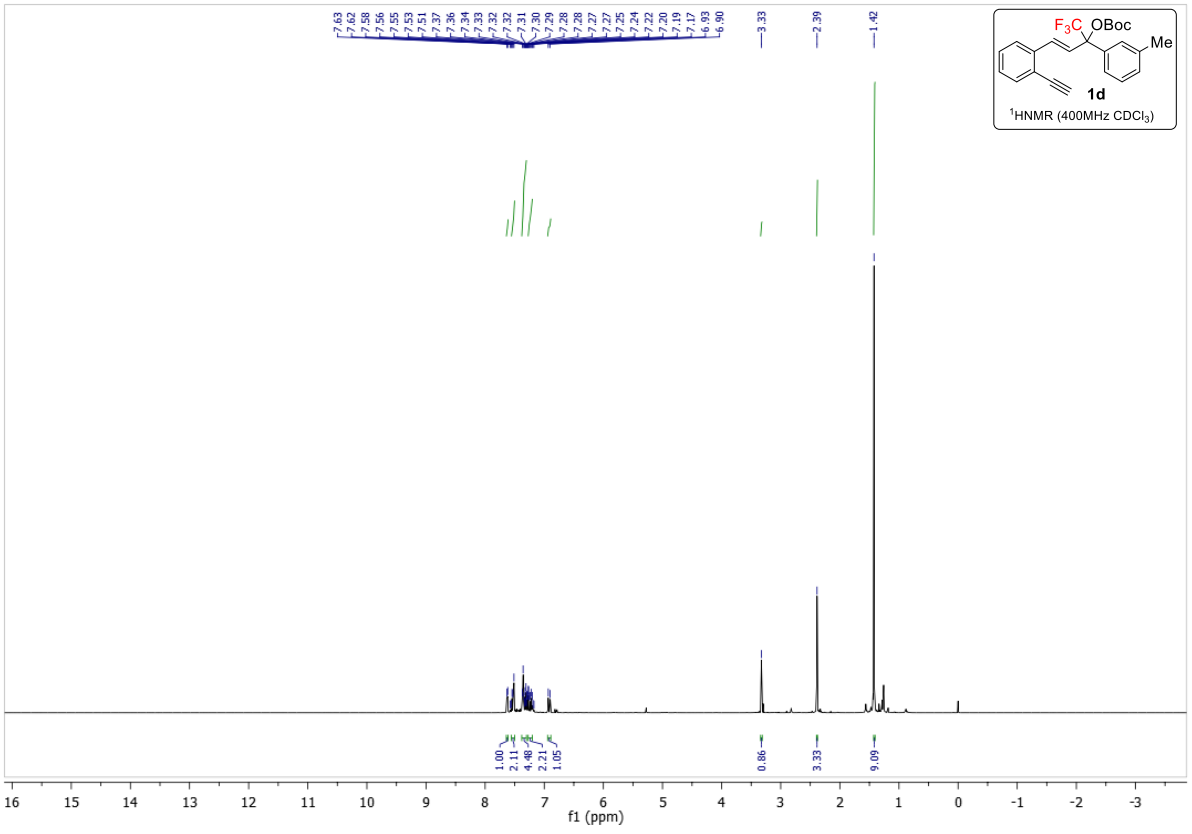
f1 (ppm)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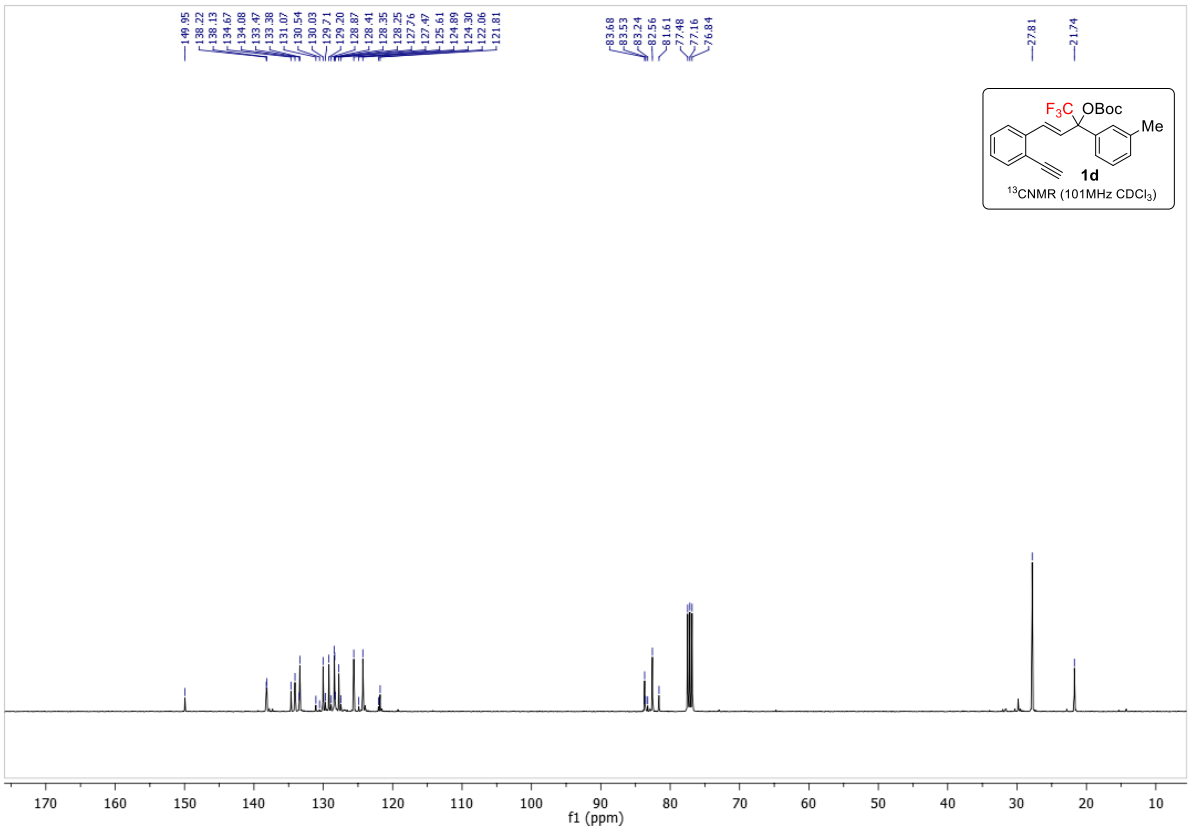
3.33
2.39
1.42
F3C OBoc
Me
1d
1HNMR (400MHz CDCl3)
1.00 2.11 4.48 2.21 1.05
0.86
3.33
9.09
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3
f1 (ppm)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128.25
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127.47
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124.89
124.30
122.06
121.81
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83.53
83.24
82.56
81.61
77.48
77.16
76.84
27.81
21.74
F3C
OBoc
Me
1d
13CNMR (101MHz CDCl3)
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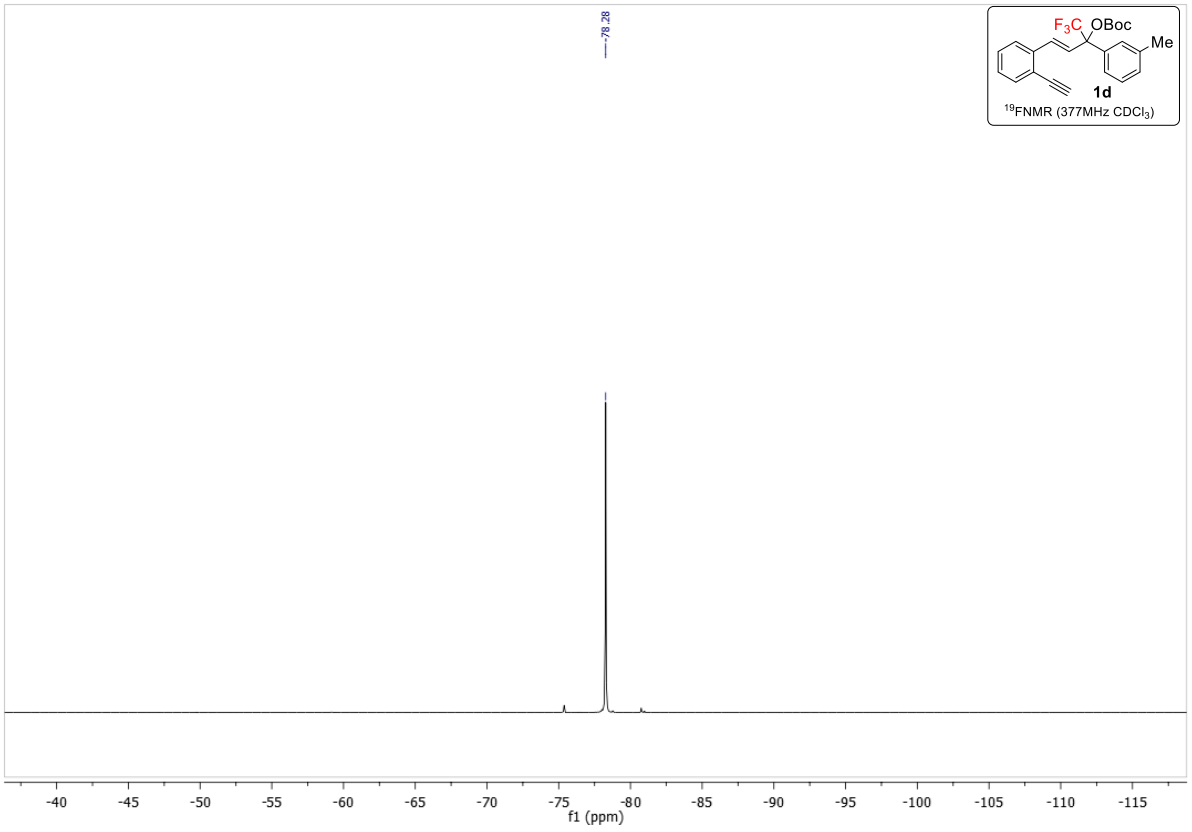
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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F3C
OBoc
Me
1d
19FNMR (377MHz CDCl3)
-40
-45
-50
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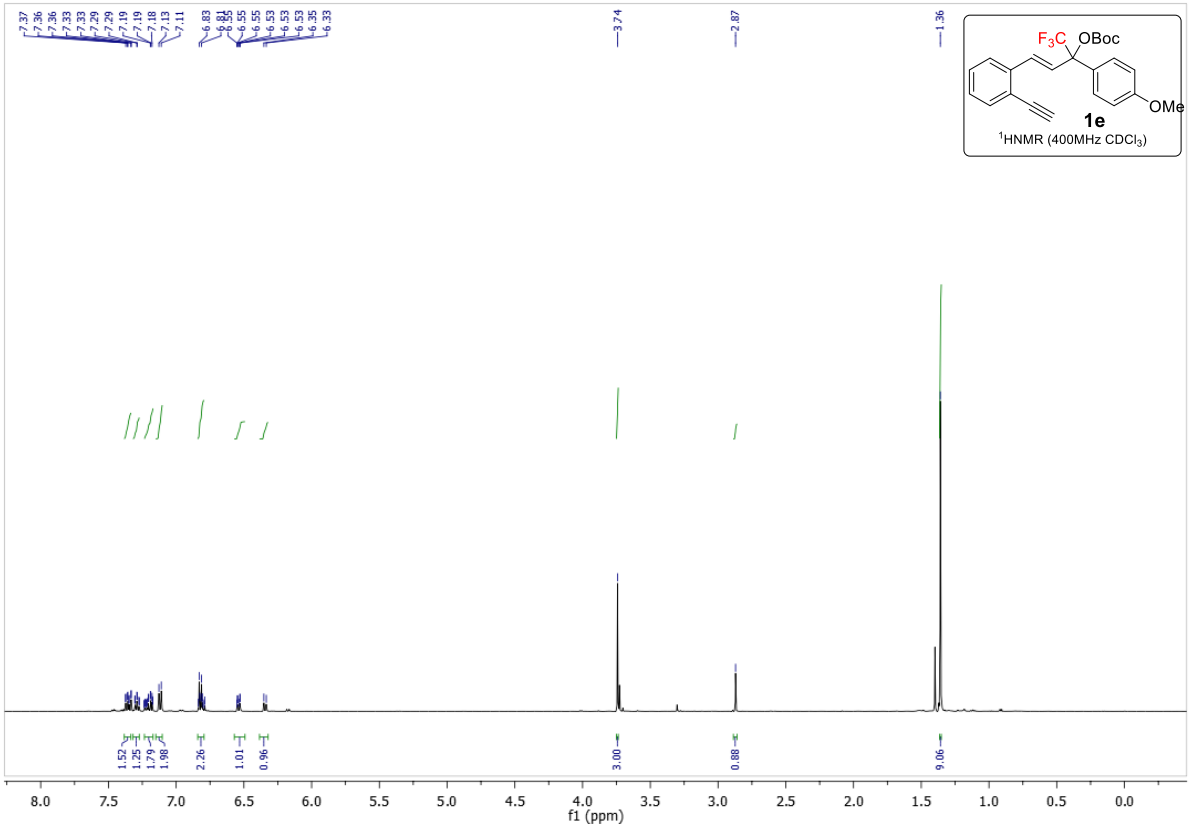
-95
-100
-105
-110
-115
f1 (ppm)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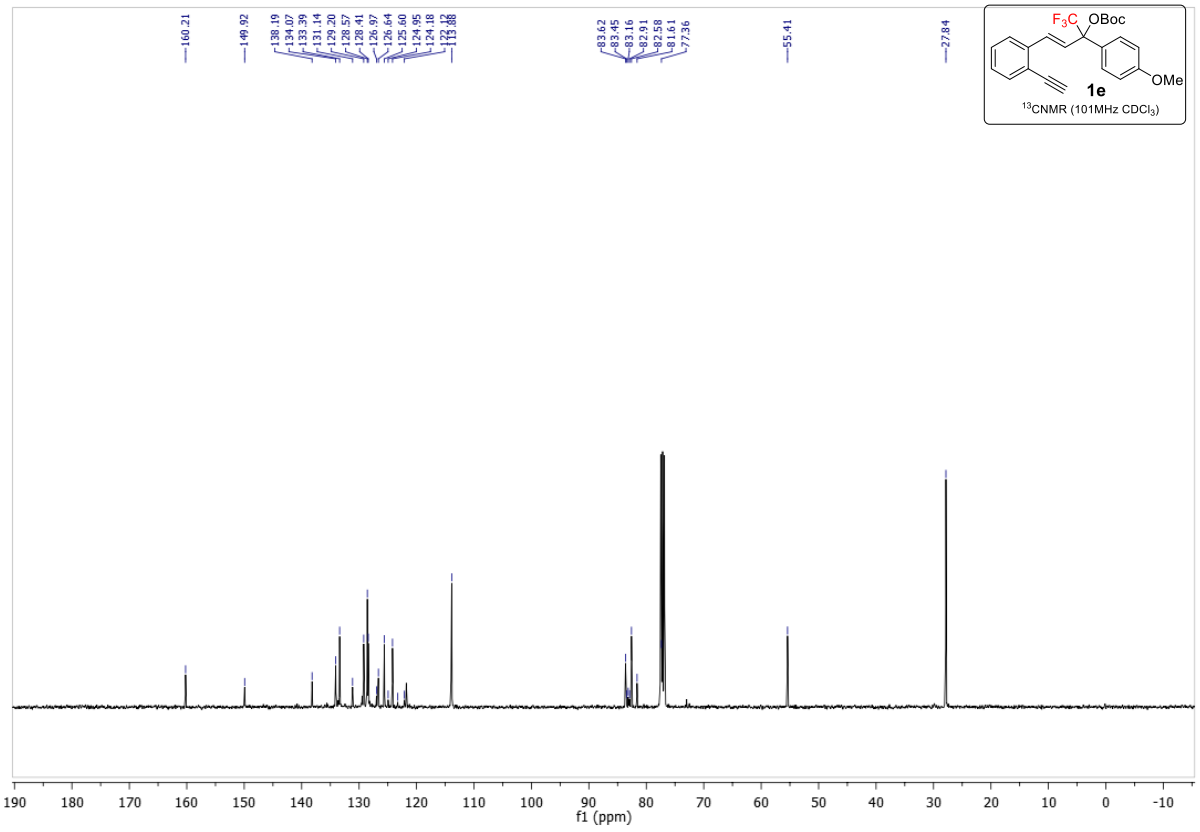
OBoc
OMe
1e
1HNMR (400MHz CDCl3)
f1 (ppm)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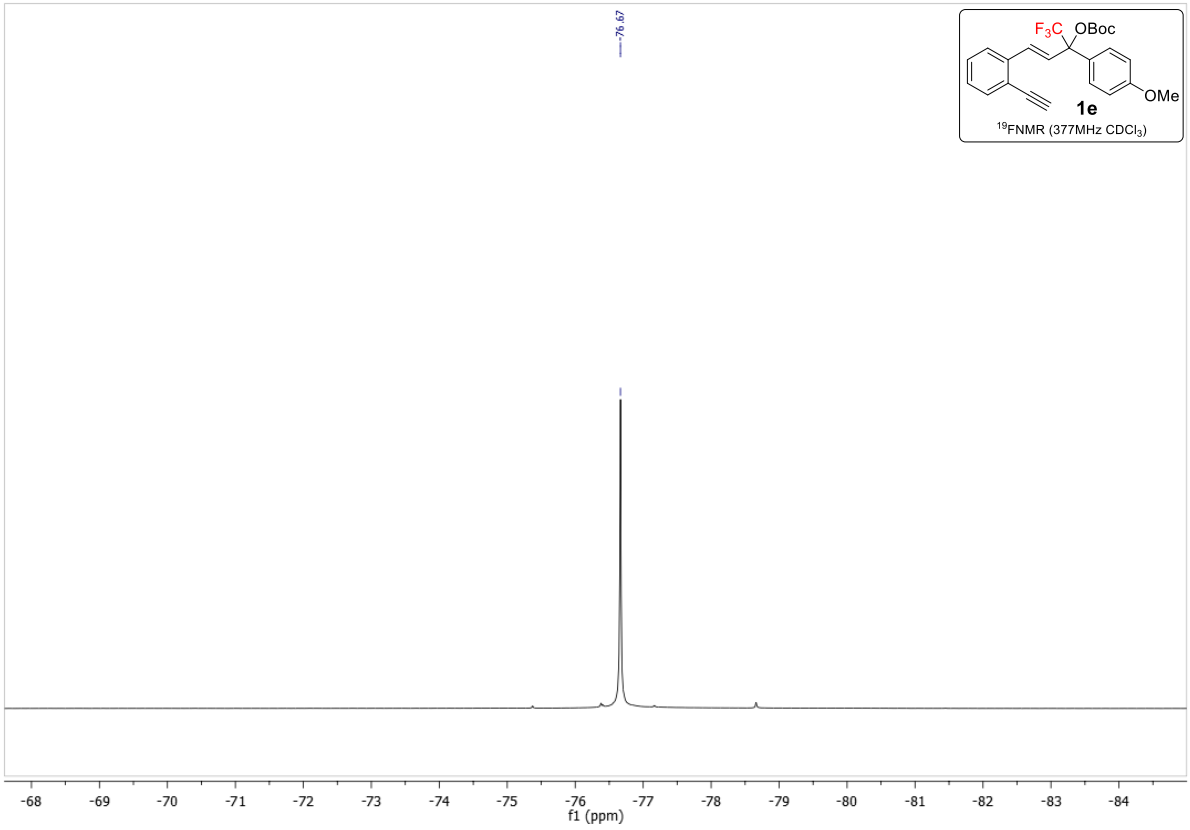
OBoc
OMe
1e
13CNMR (101MHz CDCl3)
f1 (ppm)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OMe
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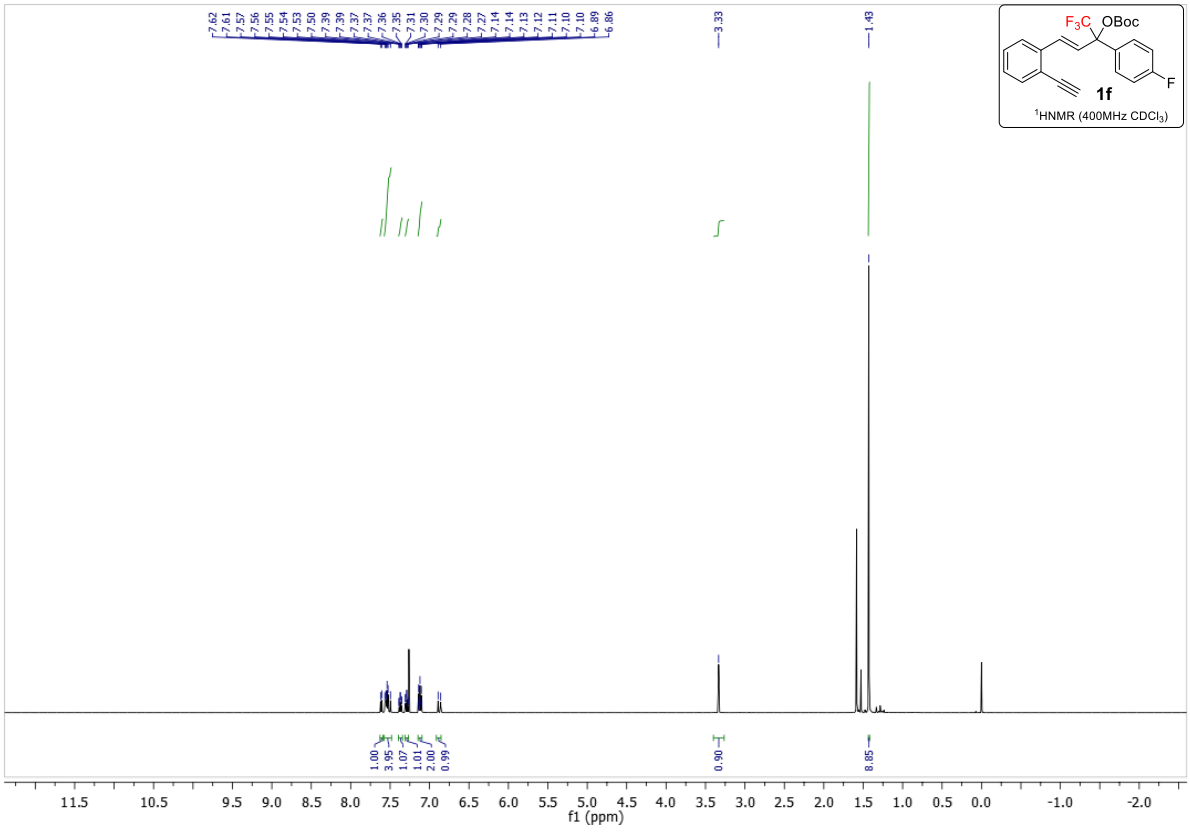
f1 (ppm)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3.33
1.43
F3C OBoc
F
1f
1HNMR (400MHz CDCl3)
1.00 3.95 1.07 1.01 2.00 0.99
0.90
8.85
11.5 10.5 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -1.0 -2.0
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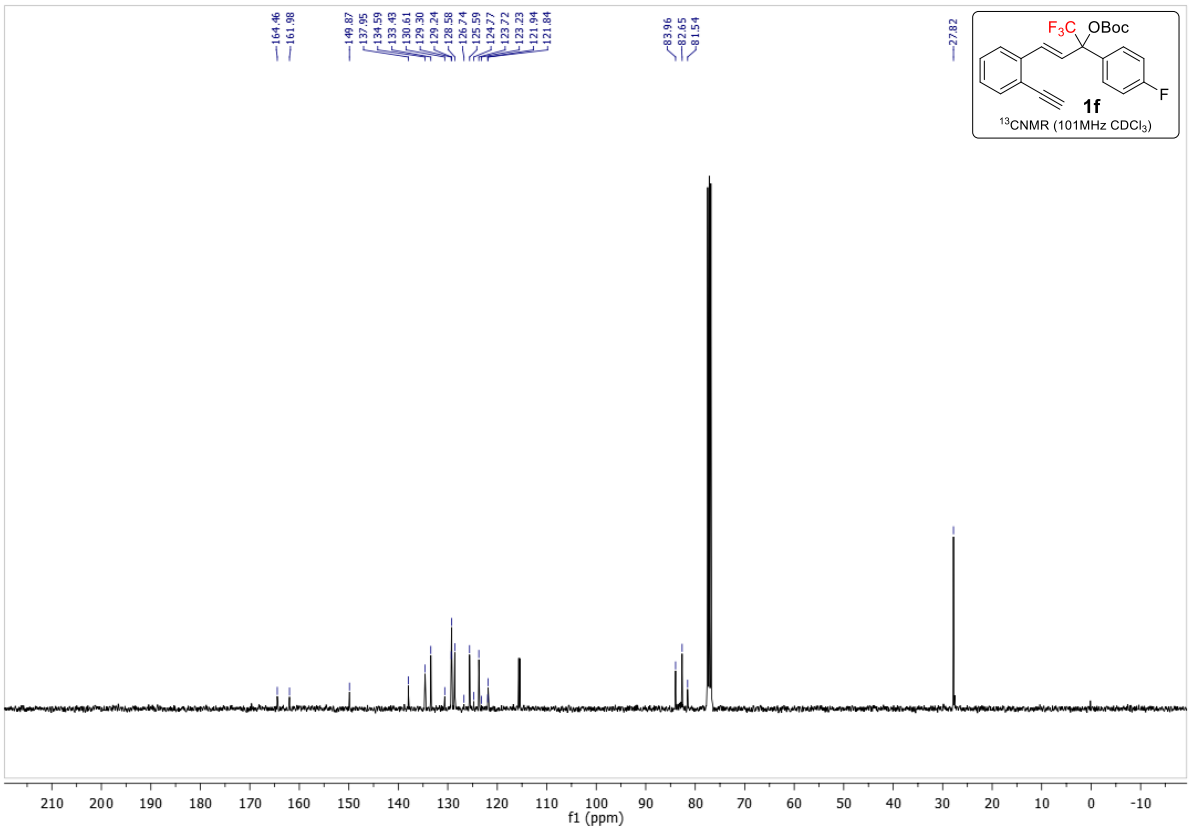
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123.72
123.23
121.94
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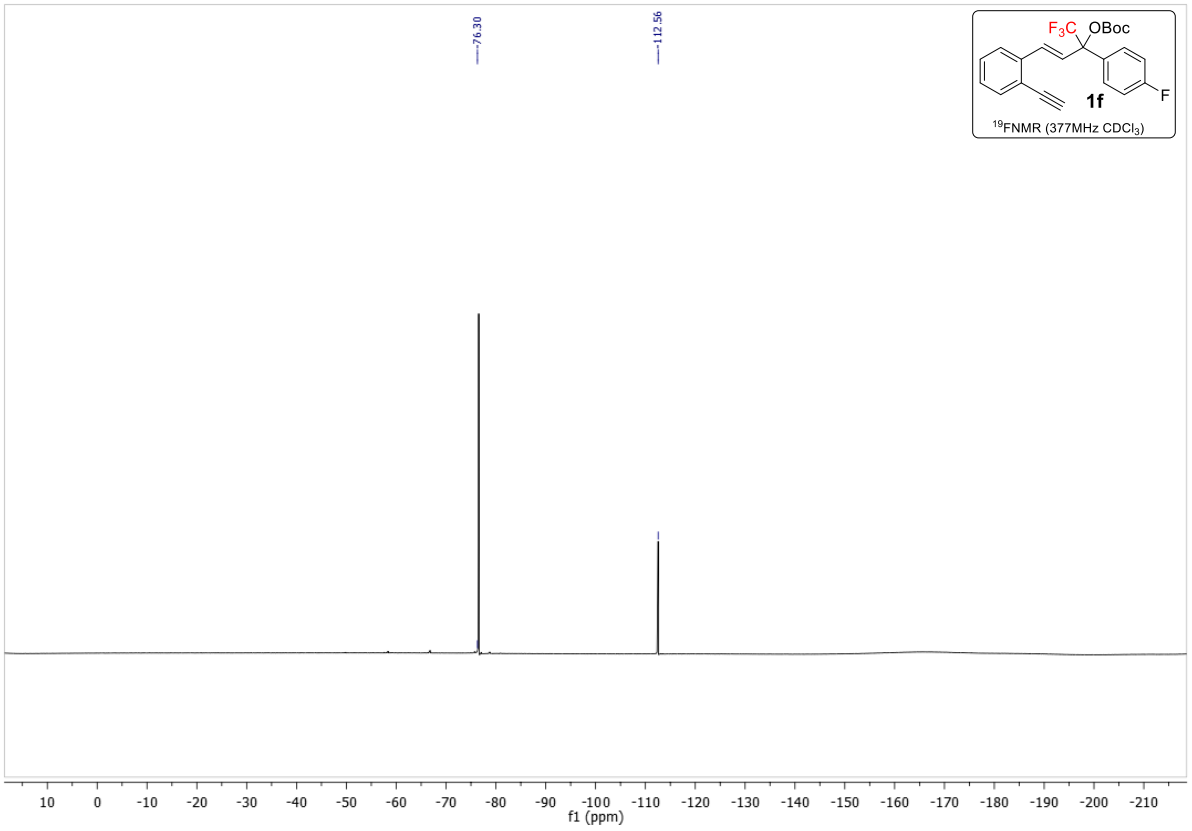
82.65
81.54
27.82
F3C OBoc
F
1f
13CNMR (101MHz CDCl3)
f1 (ppm)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112.56
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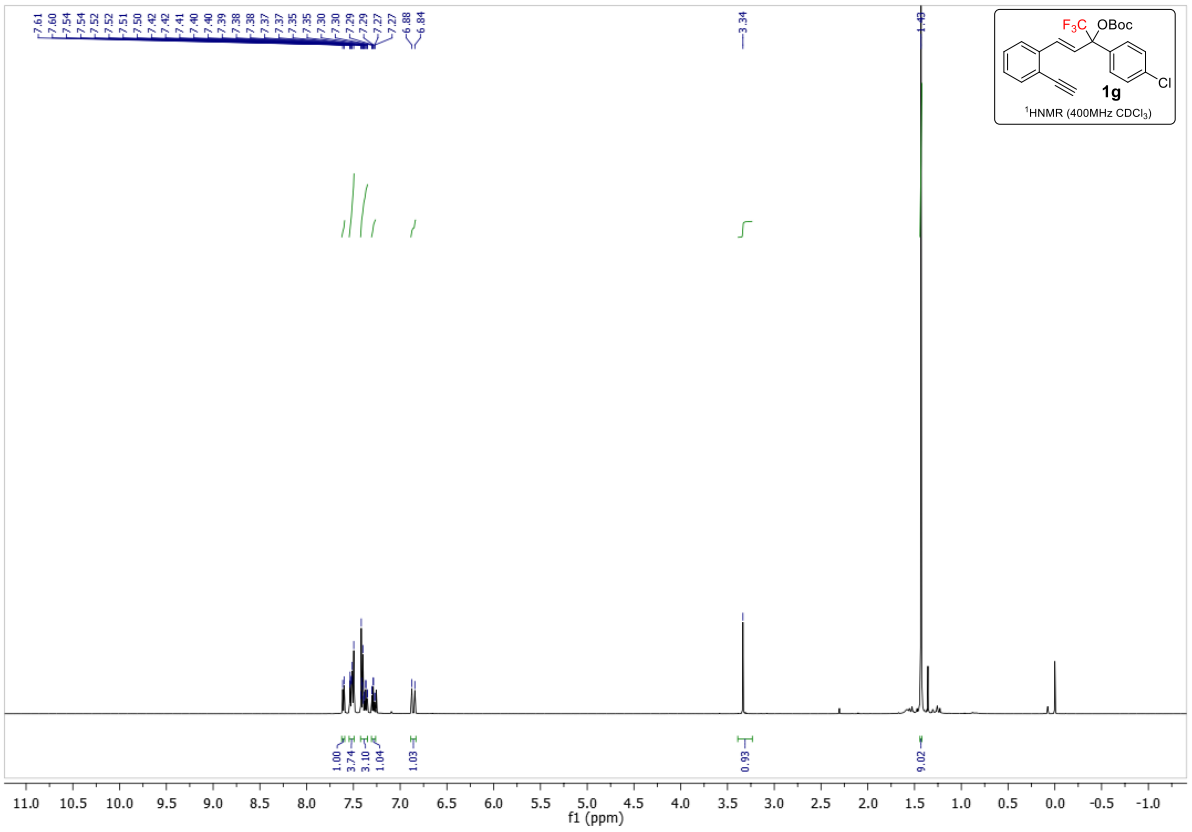
F
1f
19FNMR (377MHz CDCl3)
f1 (ppm)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Cl
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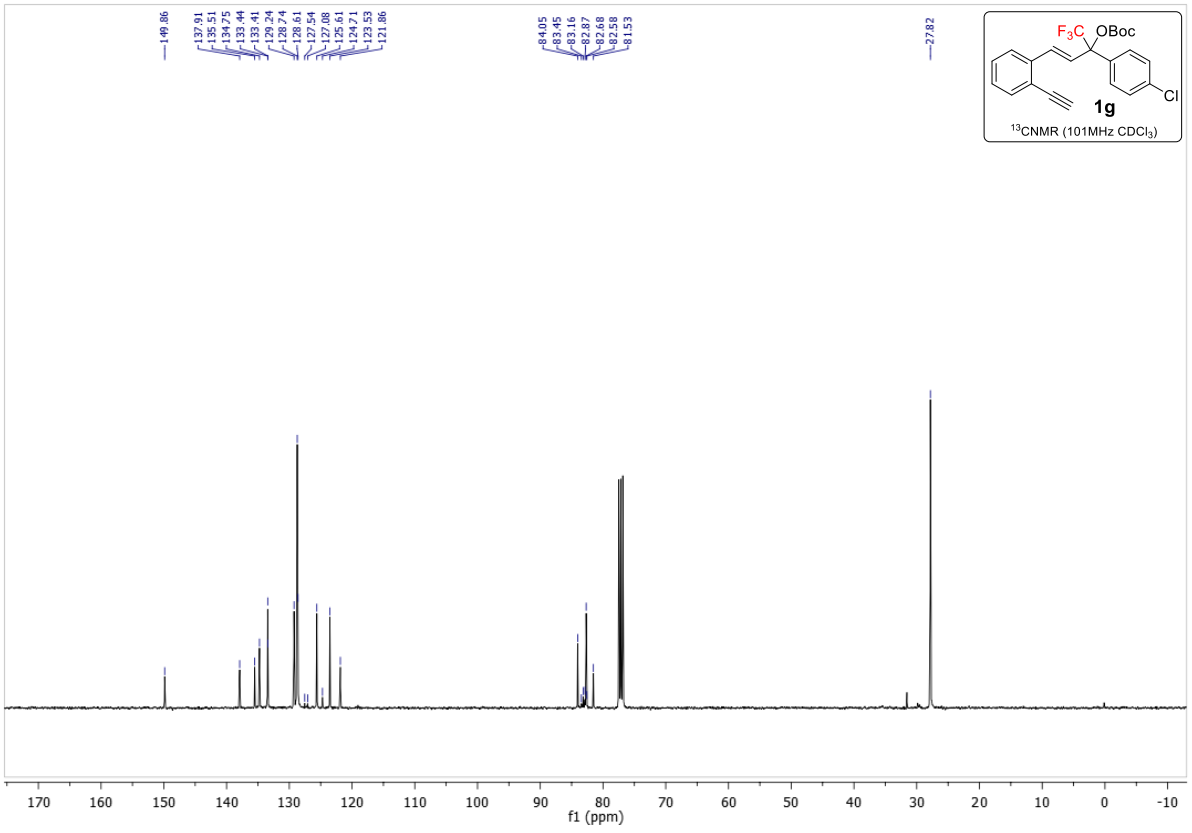
f1 (ppm)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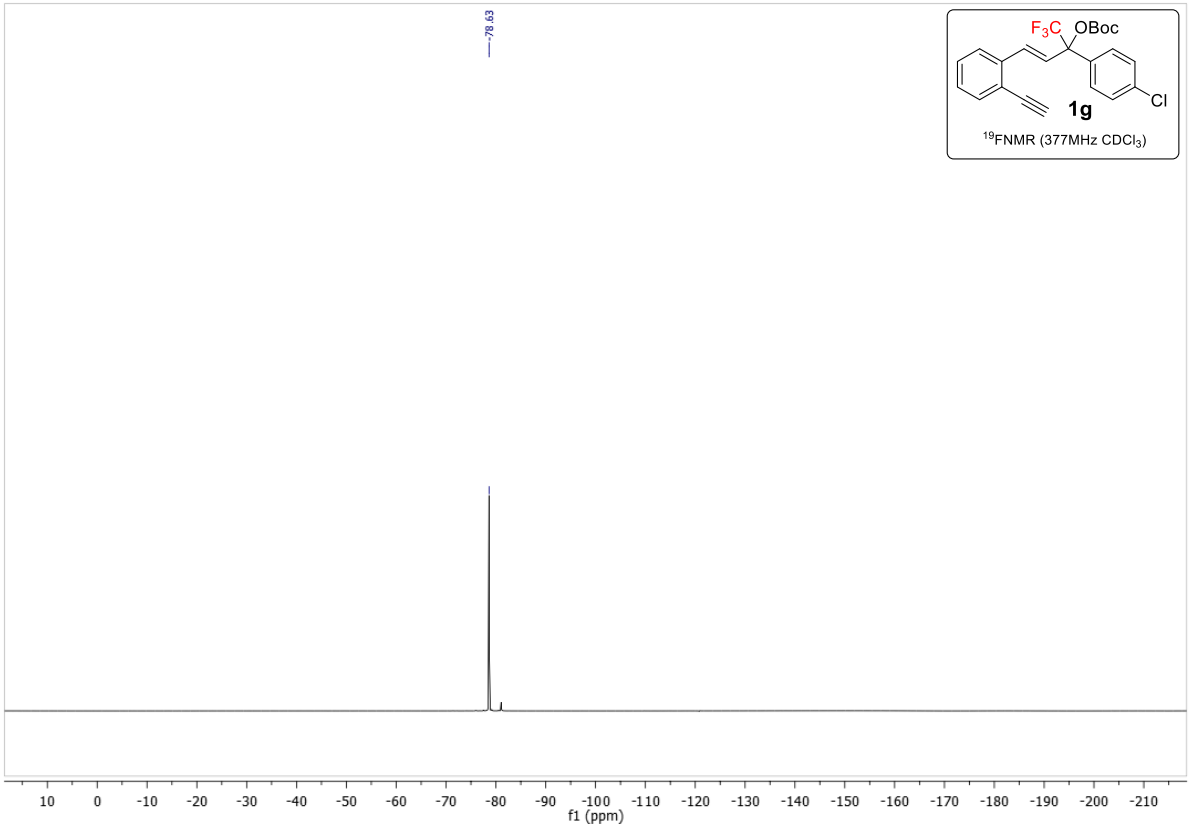
Cl
1g
13CNMR (101MHz CDCl3)
f1 (ppm)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F3C OBoc
Cl
1g
19FNMR (377MHz CDCl3)
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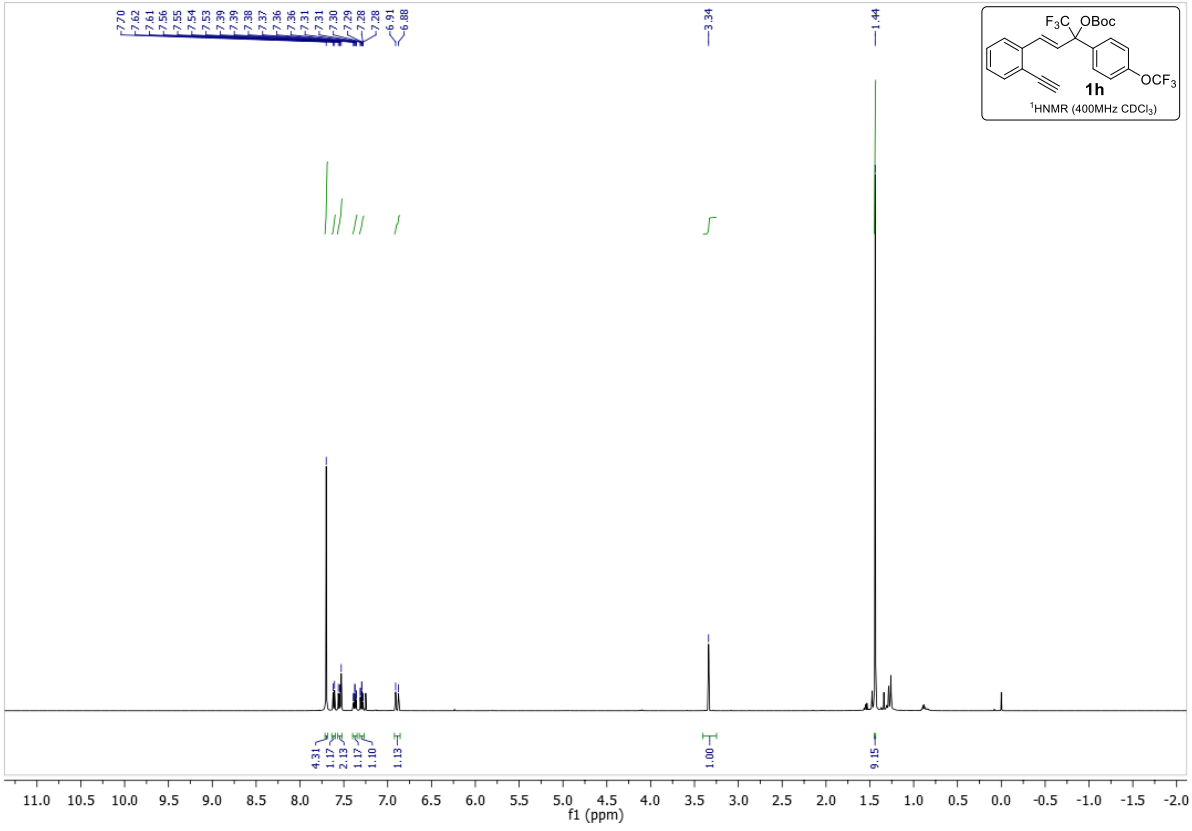
f1 (ppm)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7.31
7.31
7.30
7.29
7.29
7.28
6.91
6.88
3.34
1.44
F3C OBoc
OCF3
1h
1HNMR (400MHz CDCl3)
4.31
1.17
2.13
1.17
1.10
1.13
1.00
9.15
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5 -2.0
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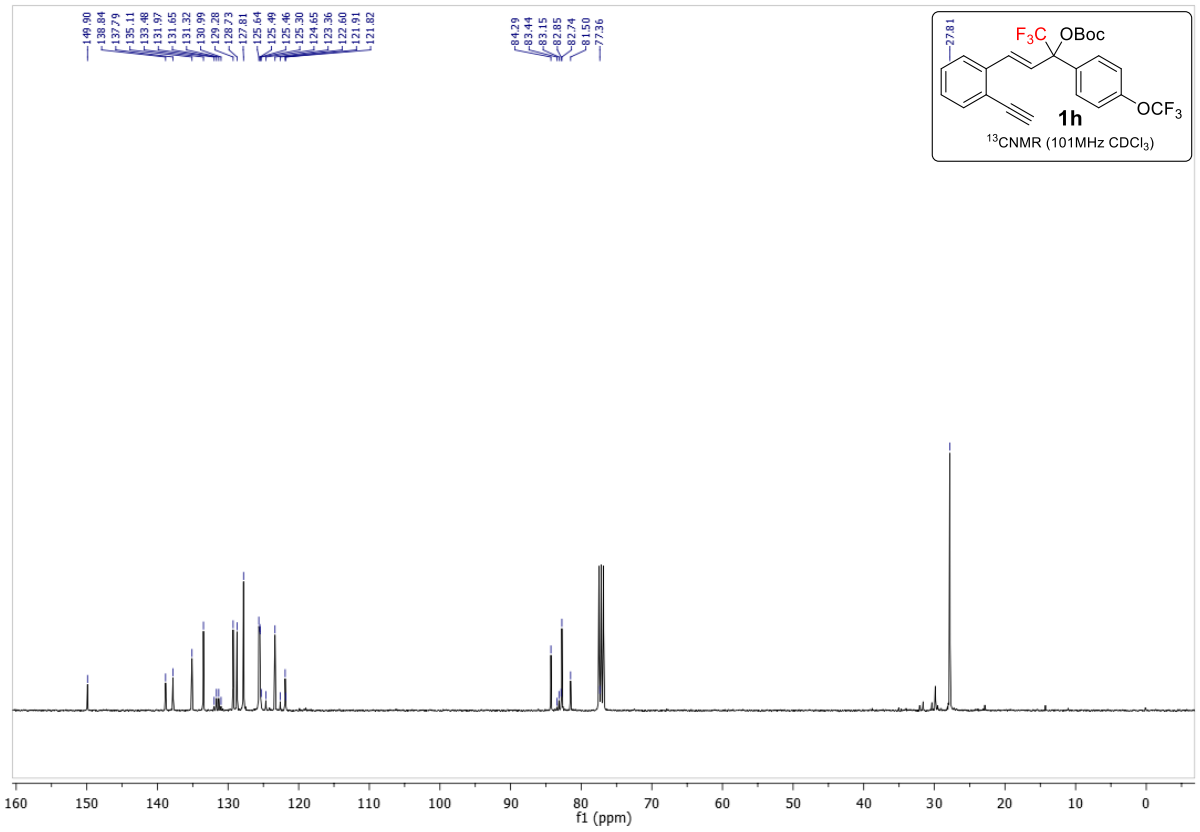
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121.82
84.29
83.44
83.15
82.85
82.74
81.50
77.36
27.81
F3C
OBoc
OCF3
1h
13CNMR (101MHz CDCl3)
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130
120
110
100
90
80
70
60
50
40
30
20
10
0
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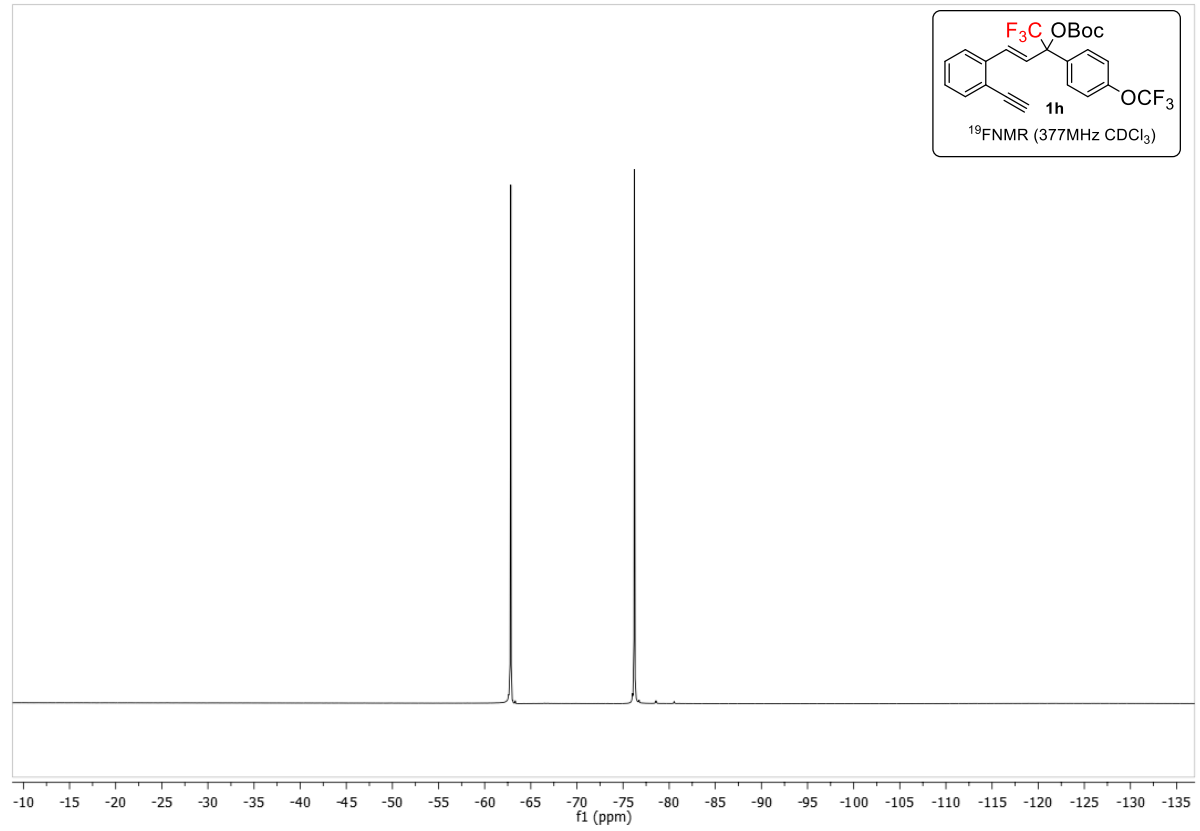
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OCF3
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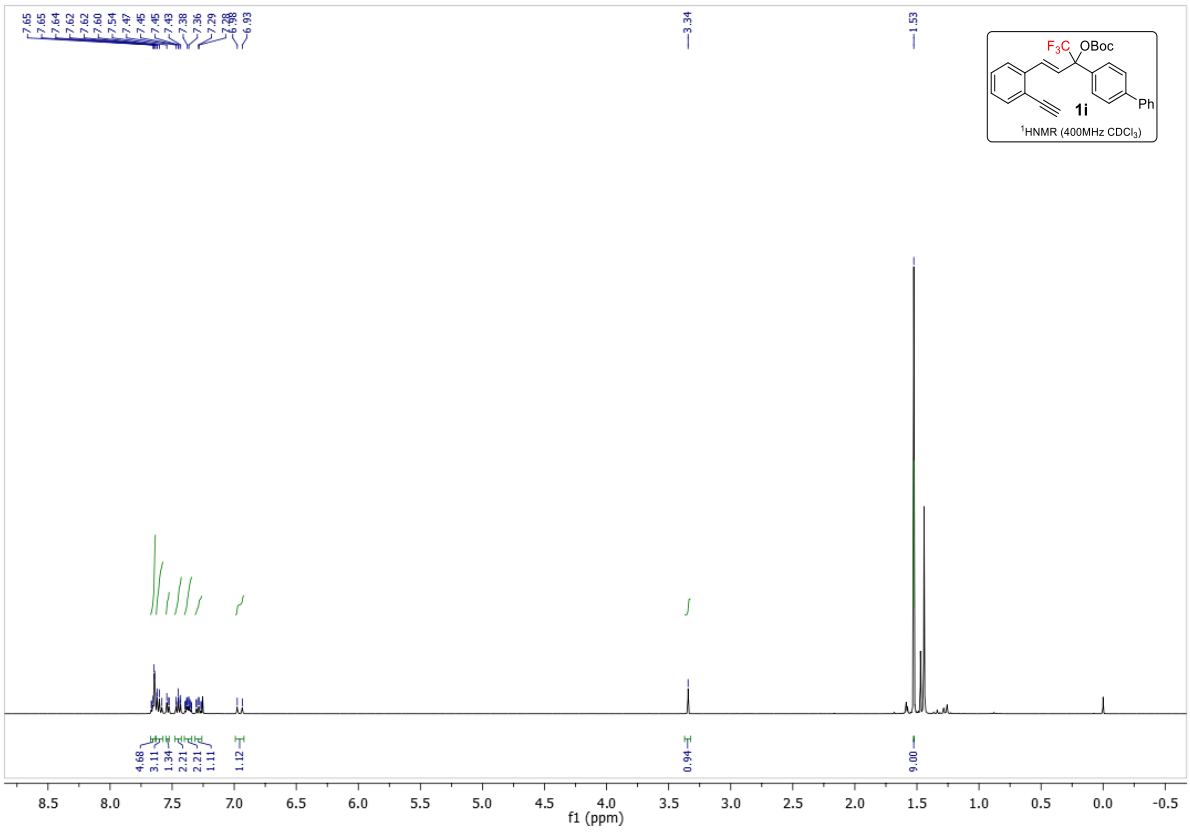
-135
f1 (ppm)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Ph
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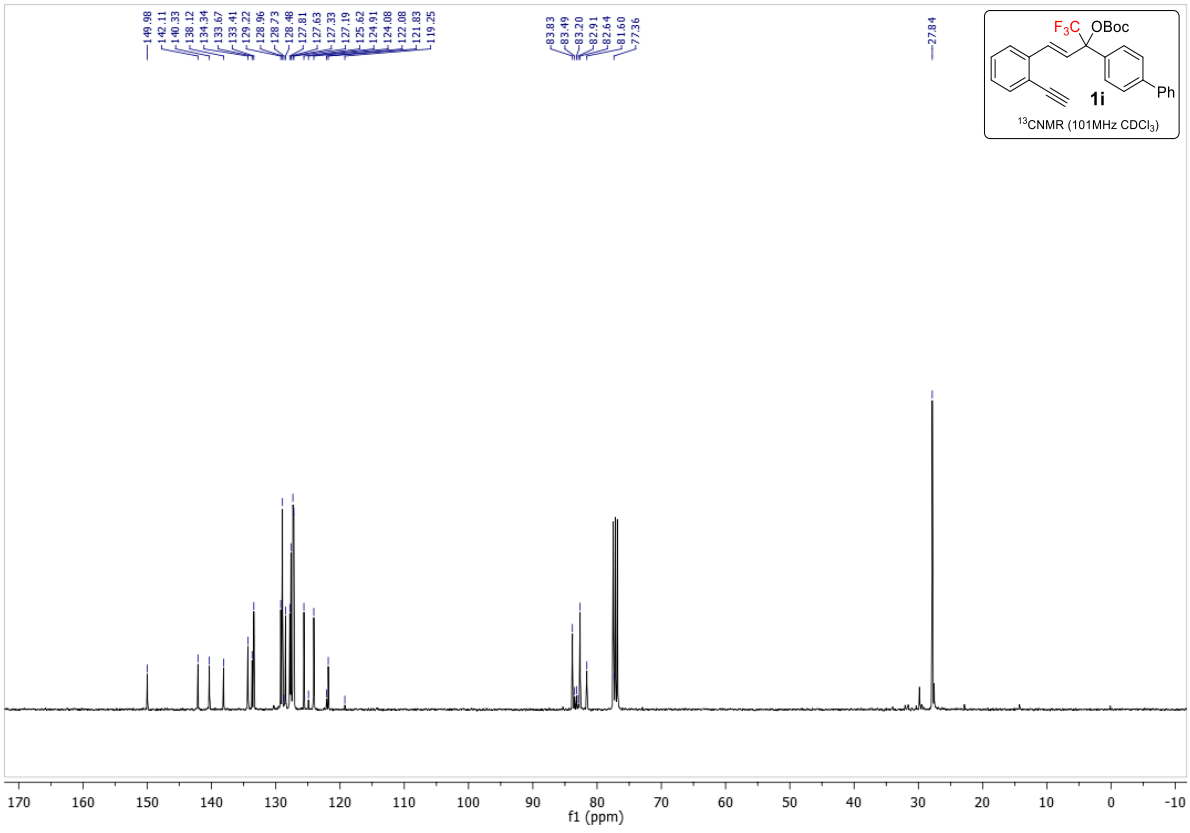
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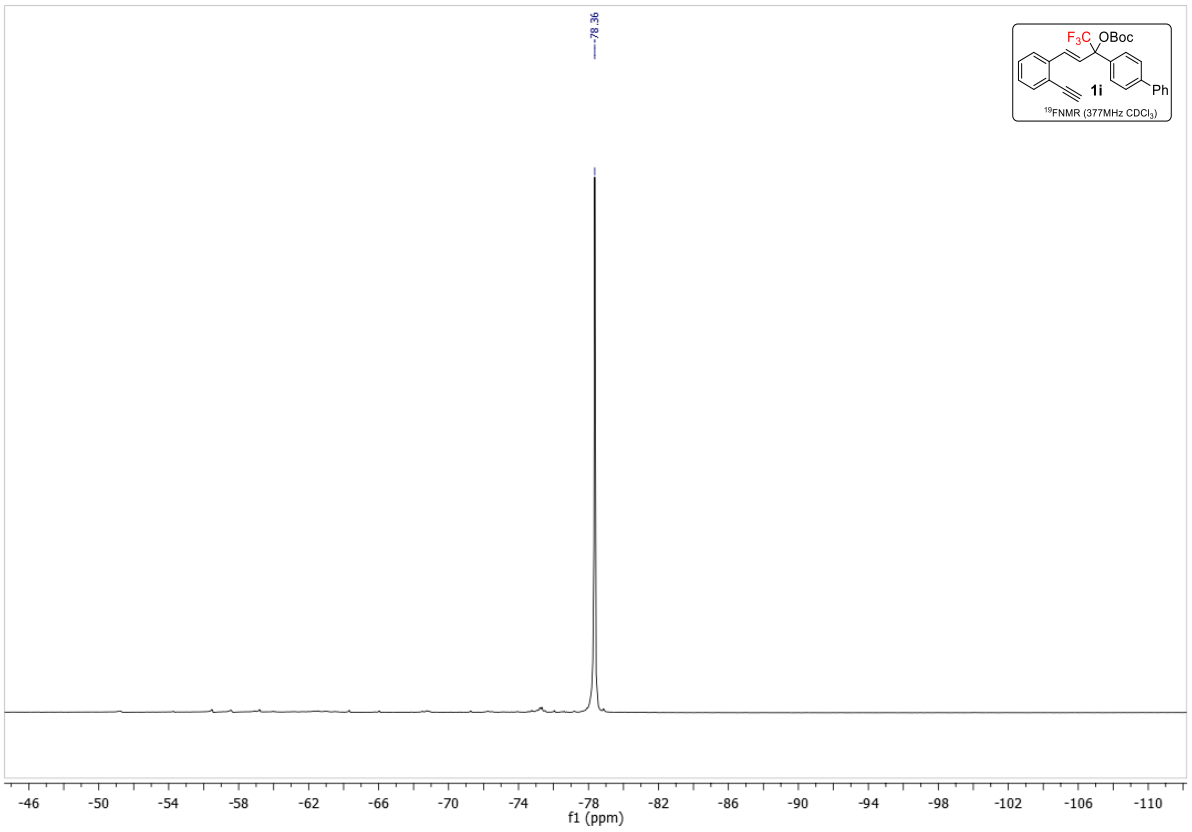
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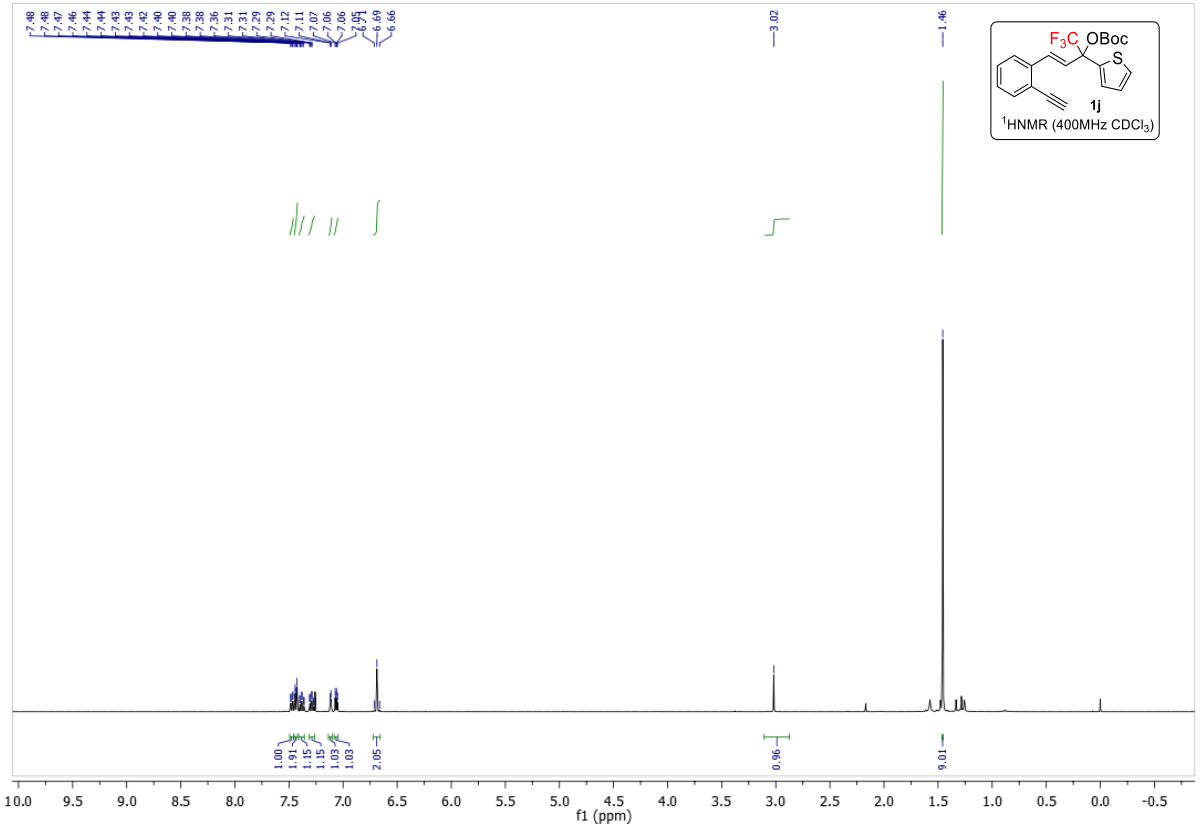
f1 (ppm)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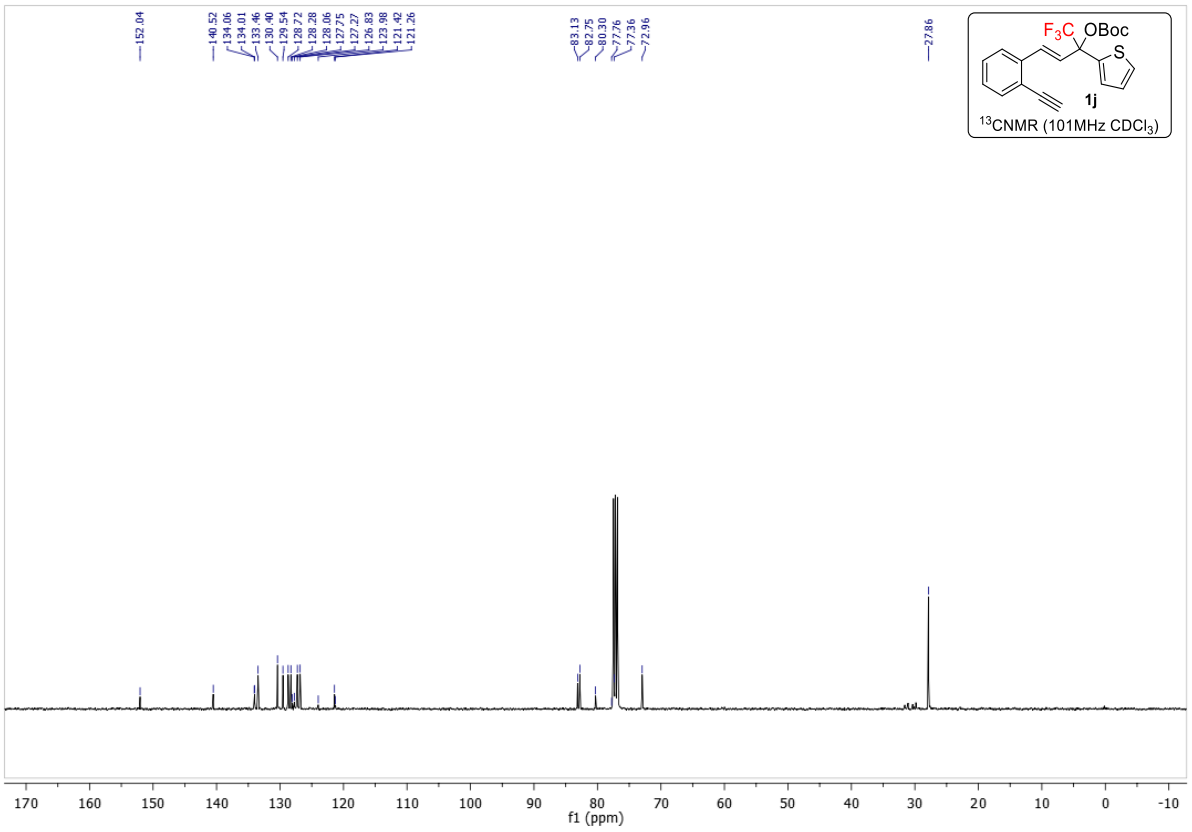
3.02
1.46
F3C OBoc
S
1j
1HNMR (400MHz CDCl3)
1.00 1.91 1.15 1.15 1.03 1.03 2.05 0.96 9.01
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)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121.42
121.26
83.13
82.75
80.30
77.76
77.36
72.96
27.86
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S
1j
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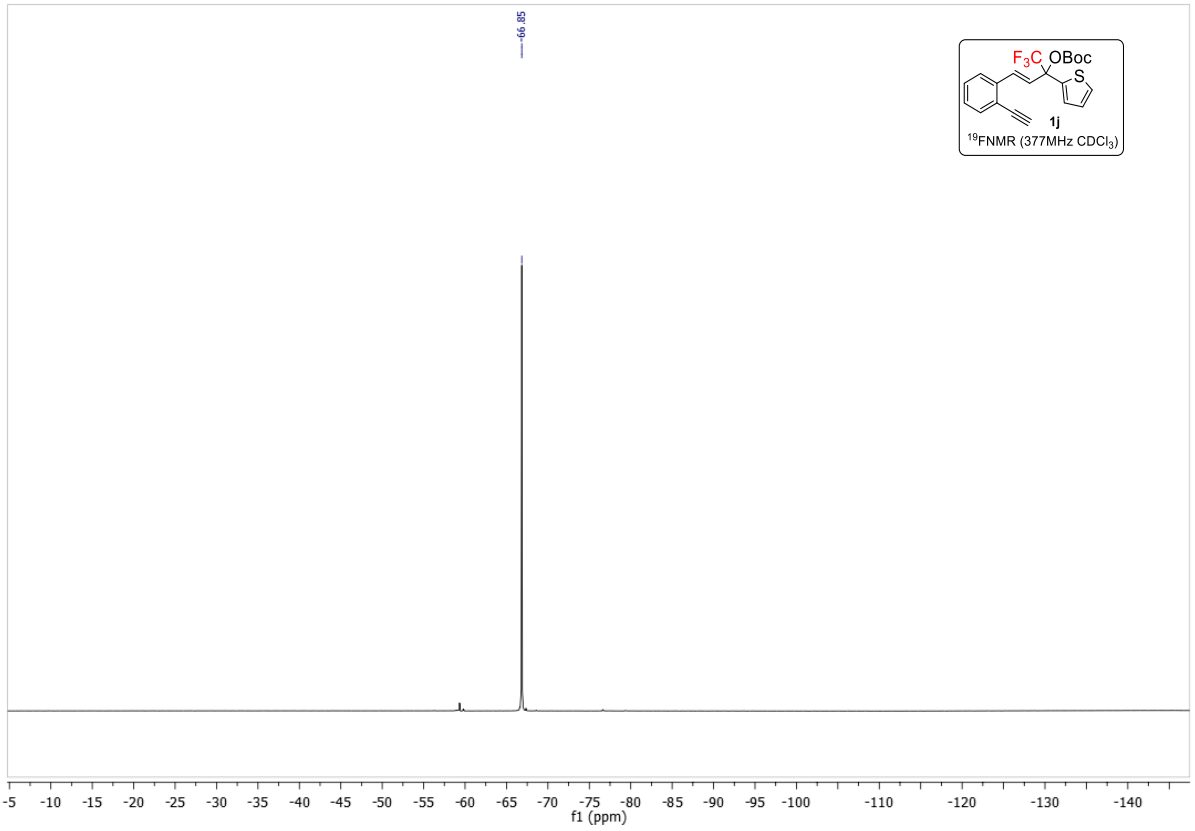
f1 (ppm)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S
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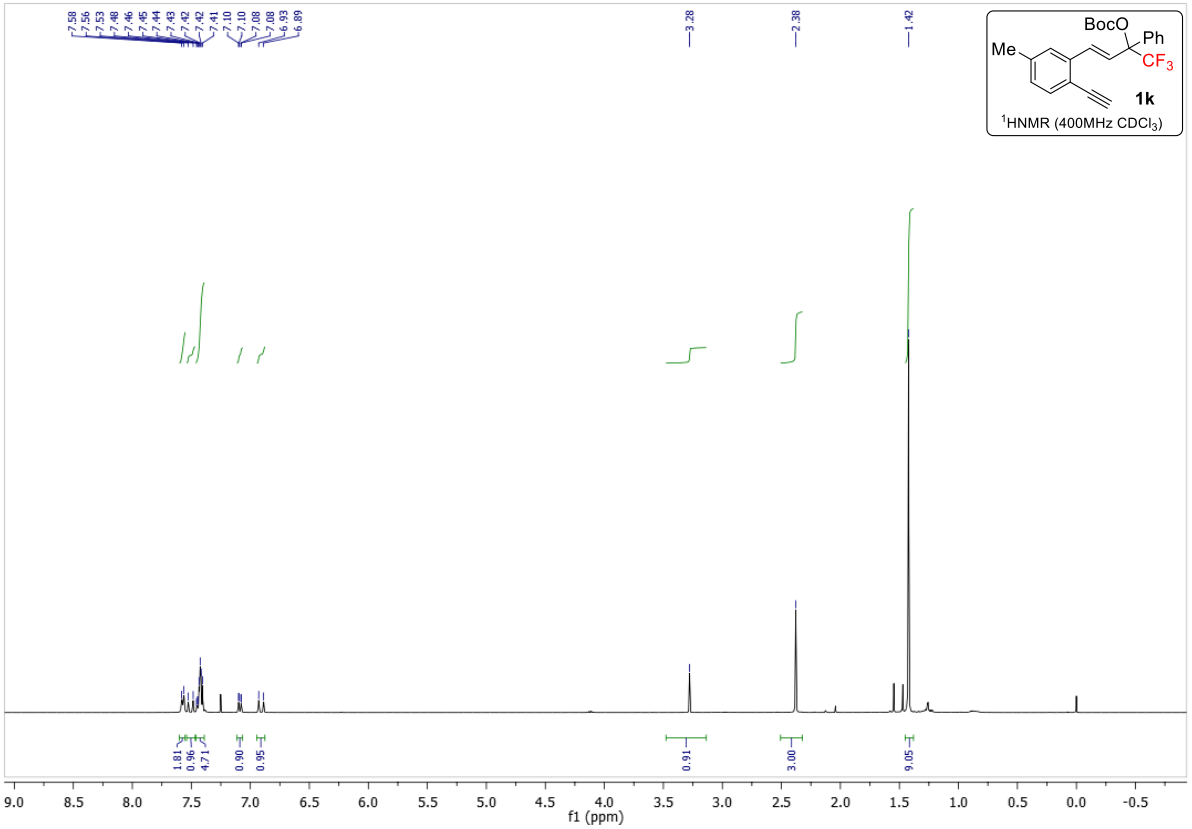
f1 (ppm)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7.08
7.08
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3.28
2.38
1.42
BocO
Ph
Me
CF3
1k
1HNMR (400MHz CDCl3)
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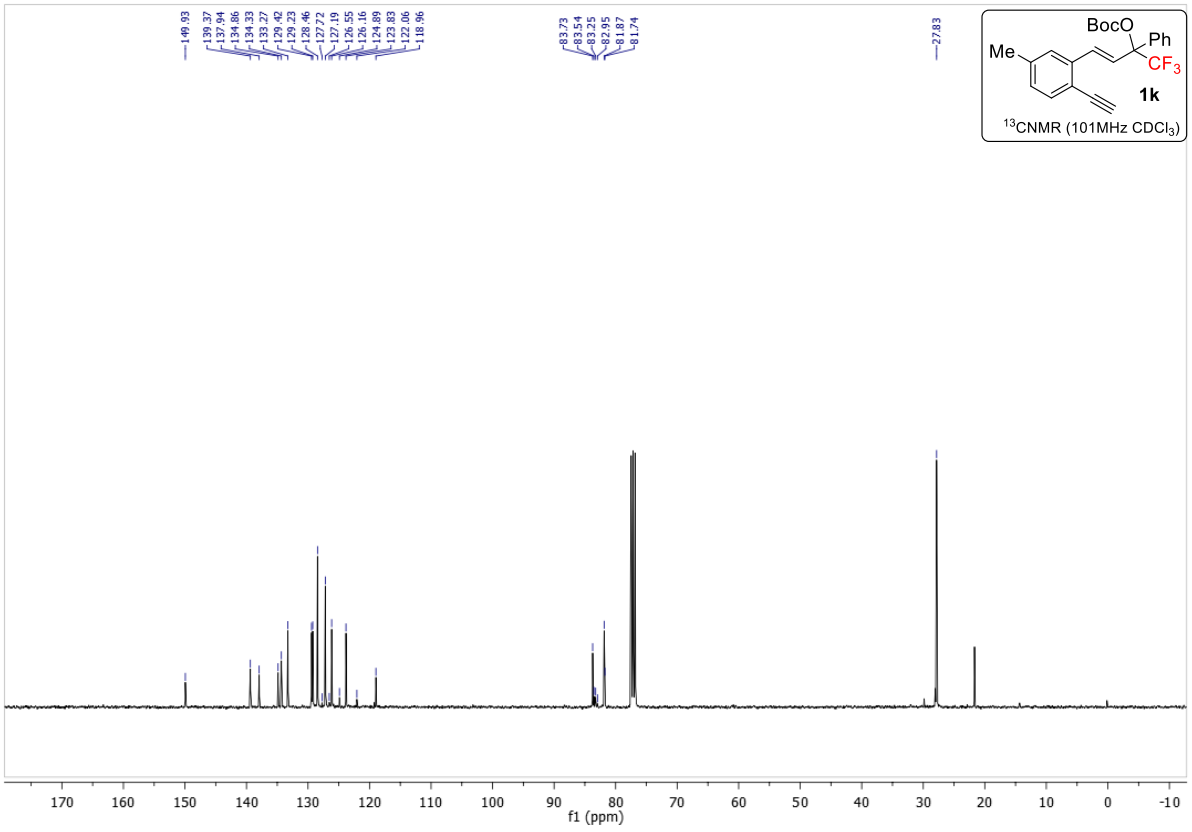
0.96
4.71
0.90
0.95
0.91
3.00
9.05
f1 (ppm)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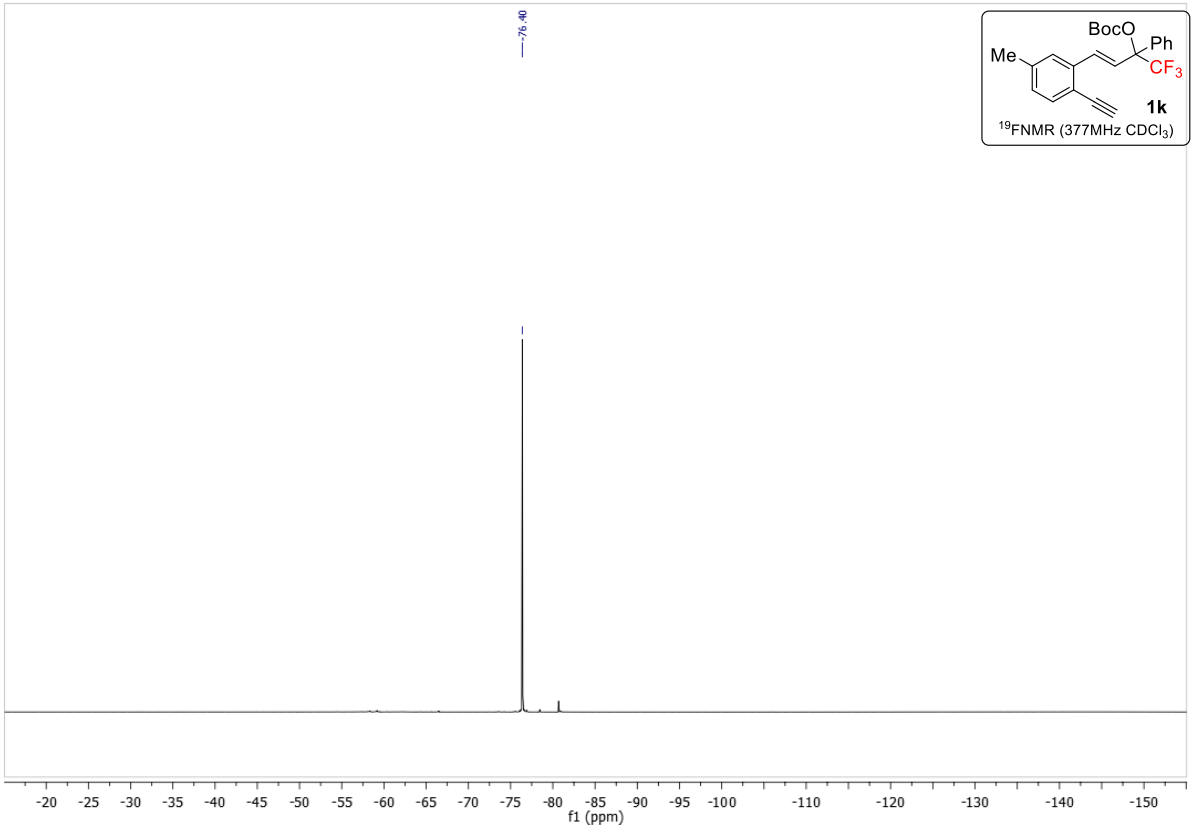
137.94
134.86
134.33
133.27
129.42
129.23
128.46
127.72
127.19
126.55
126.16
124.89
123.83
122.06
118.96
83.73
83.54
83.25
82.95
81.87
81.74
27.83
BocO
Ph
Me
CF3
1k
13CNMR (101MHz CDCl3)
f1 (ppm)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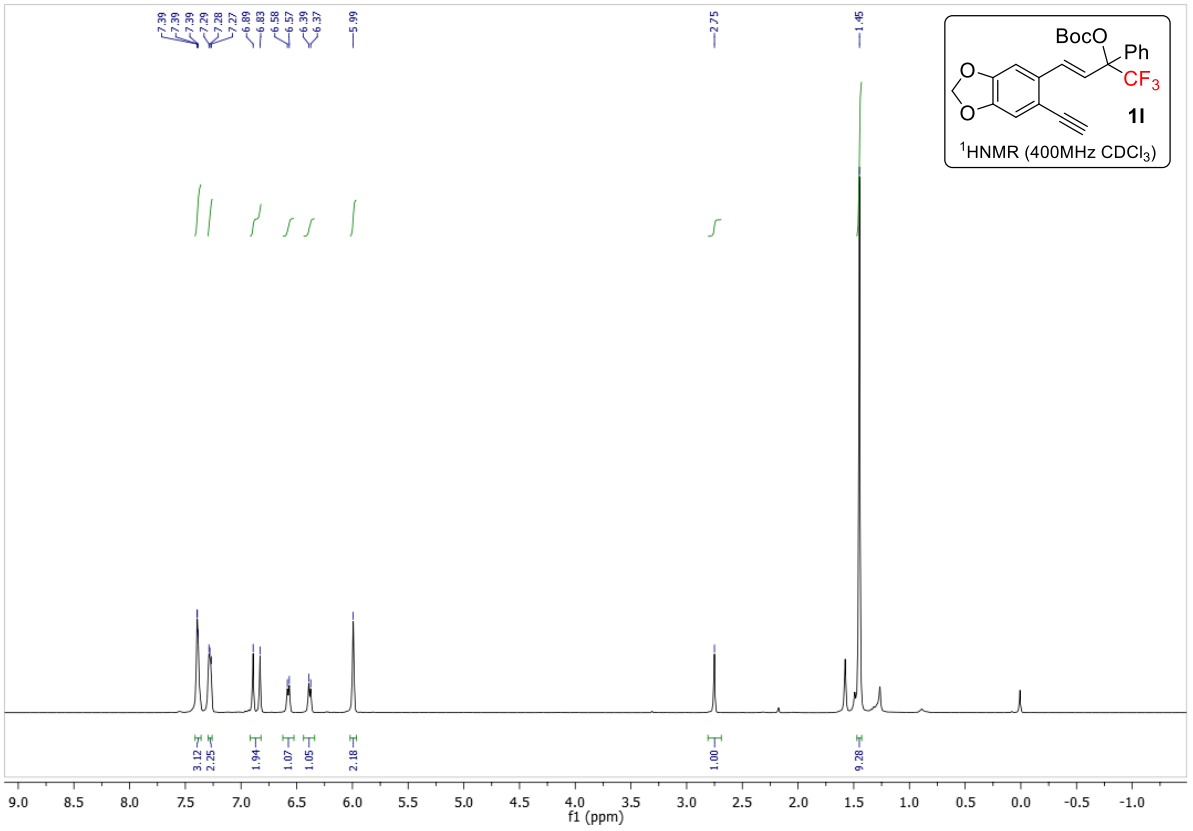
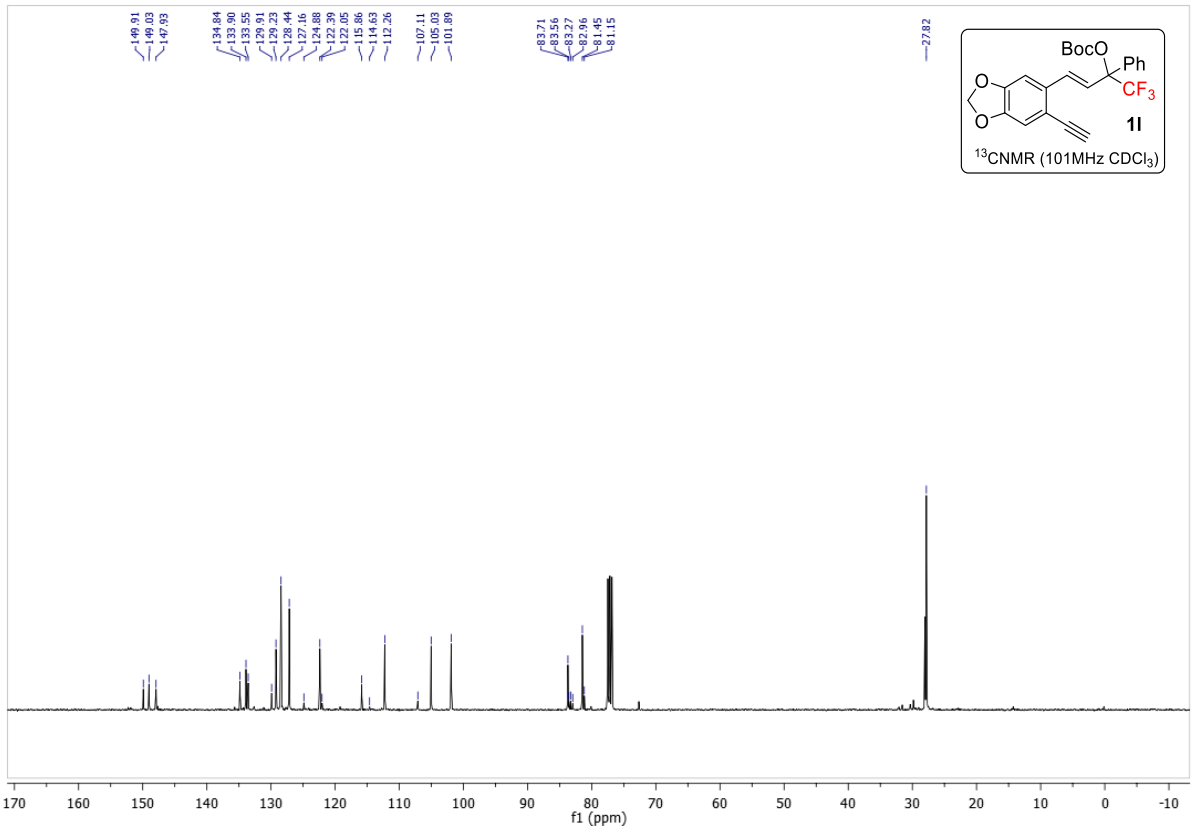
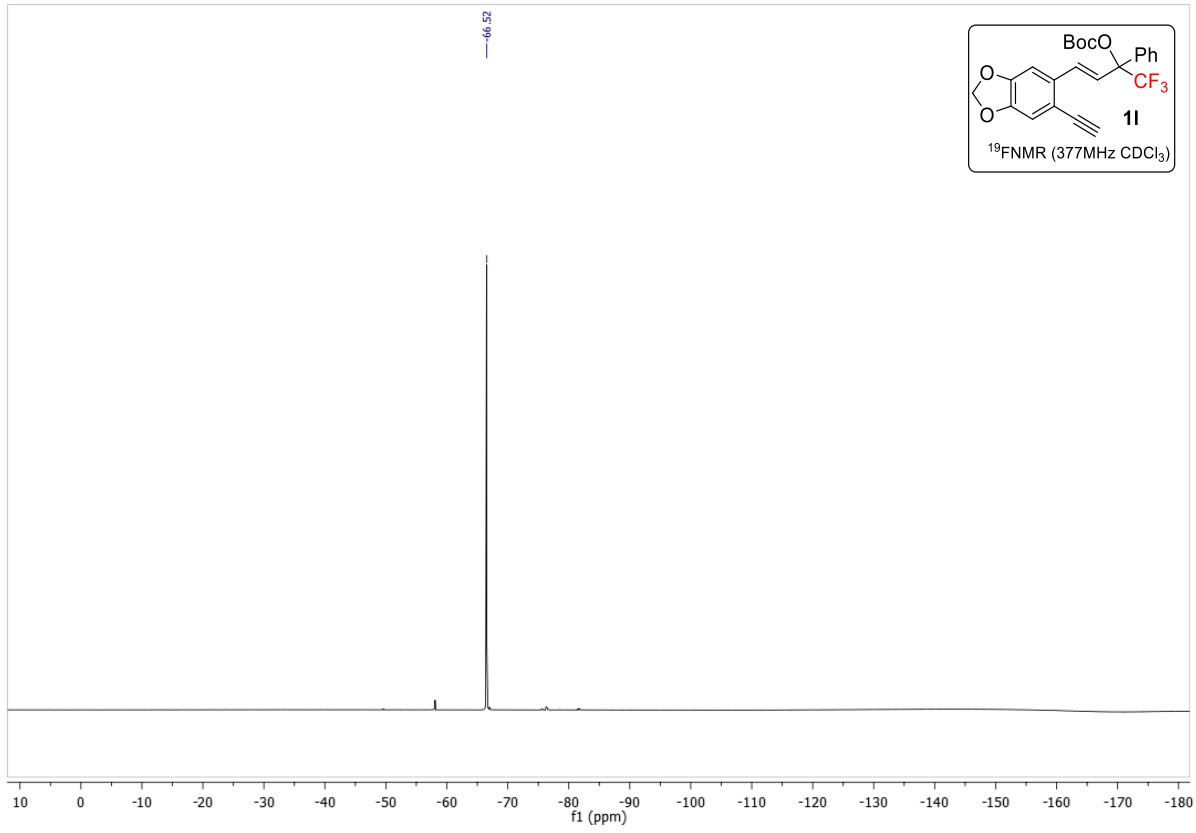
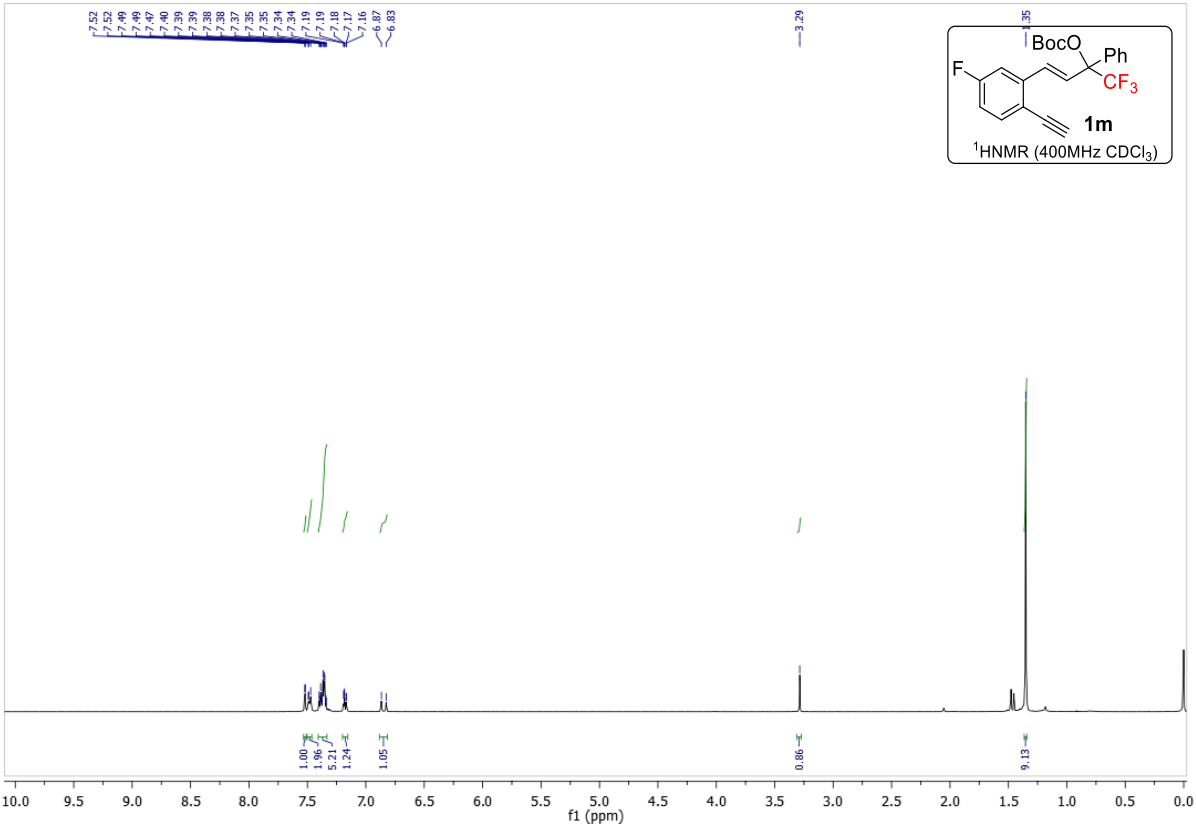
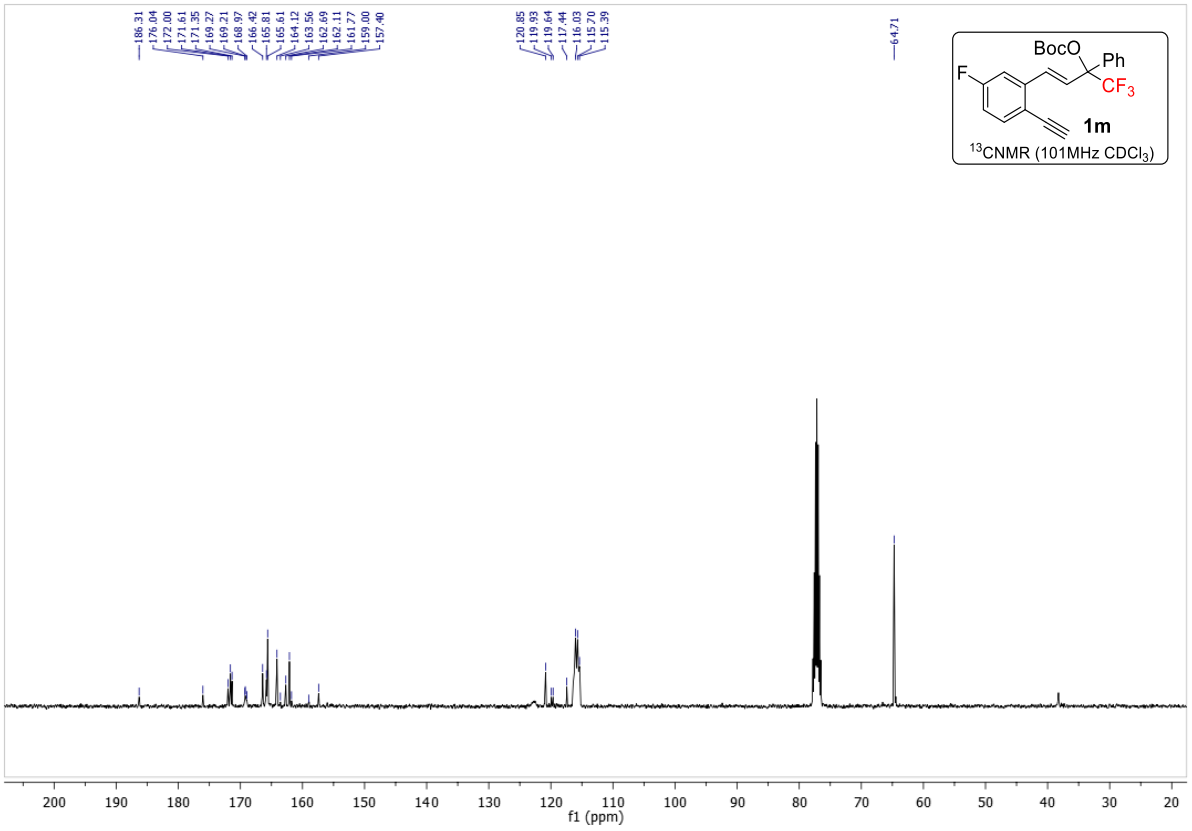
Ph
Me
CF3
1k
19FNMR (377MHz CDCl3)
f1 (ppm)

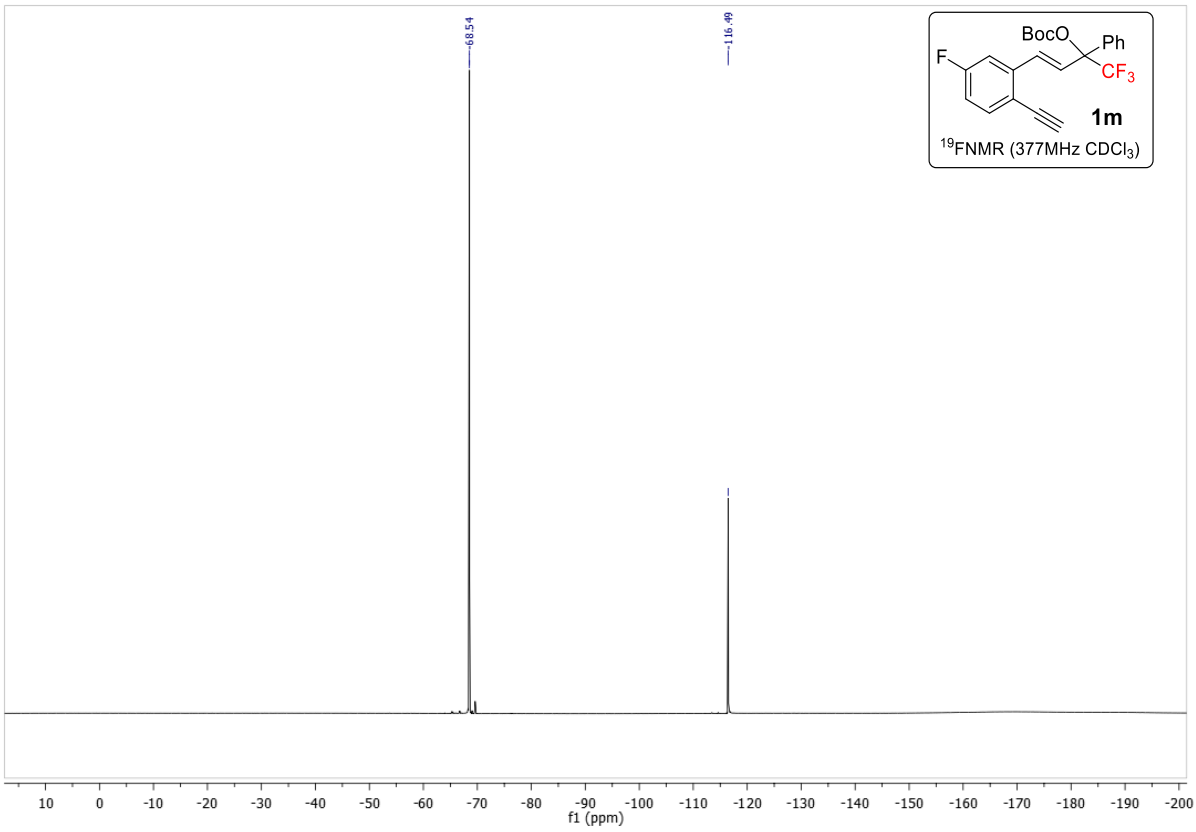

7.39
7.39
7.39
7.29
7.28
7.27
6.89
6.83
6.58
6.57
6.39
6.37
5.99
2.75
1.45
BocO
Ph
CF3
1l
1HNMR (400MHz CDCl3)
3.12
2.25
1.94
1.07
1.05
2.18
1.00
9.28
f1 (ppm)


149.91
149.03
147.93
134.84
133.90
133.55
129.91
129.23
128.44
127.16
124.88
122.39
122.05
115.86
114.63
112.26
107.11
105.03
101.89
83.71
83.56
83.27
82.96
81.45
81.15
27.82
BocO
Ph
CF3
1l
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


-66.52
BocO
Ph
CF3
1l
19FNMR (377MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180
f1 (ppm)


BocO
Ph
F
CF3
1m
1HNMR (400MHz CDCl3)
f1 (ppm)


BocO
Ph
F
CF3
1m
13CNMR (101MHz CDCl3)
f1 (ppm)


-68.54
-116.49
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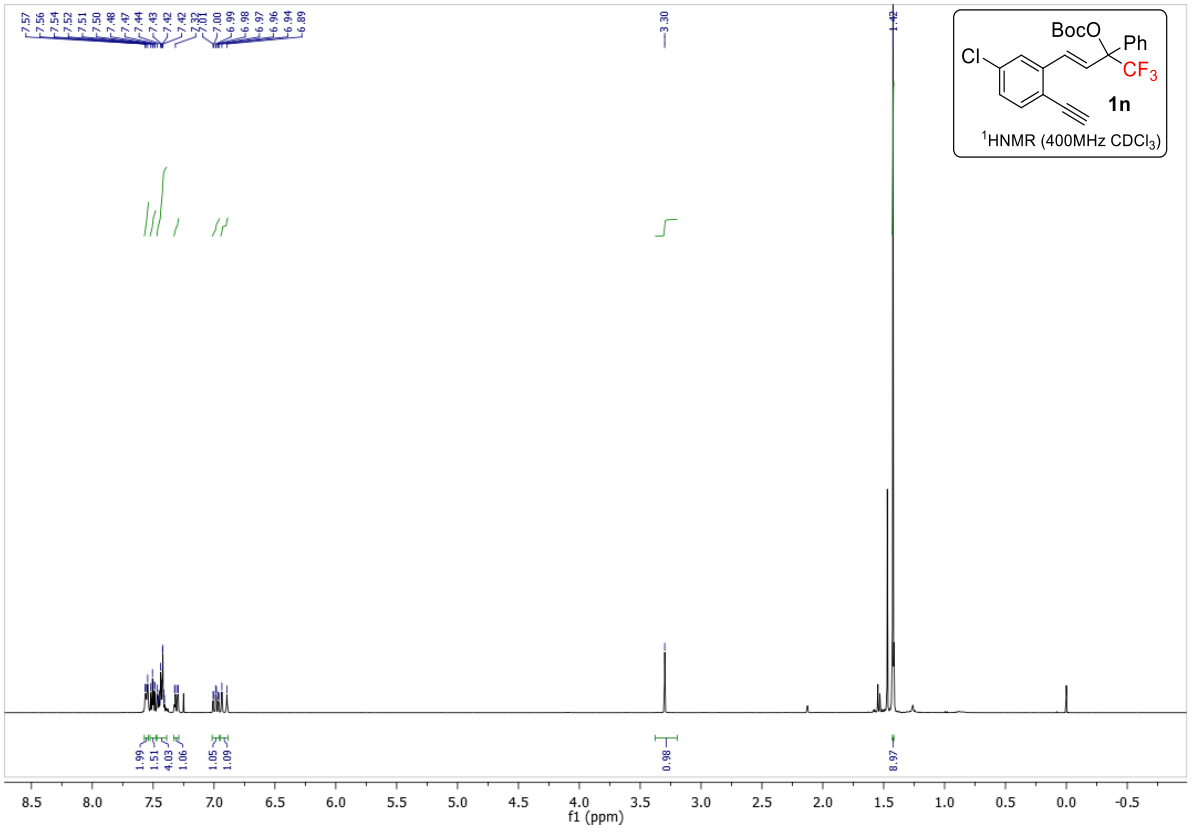
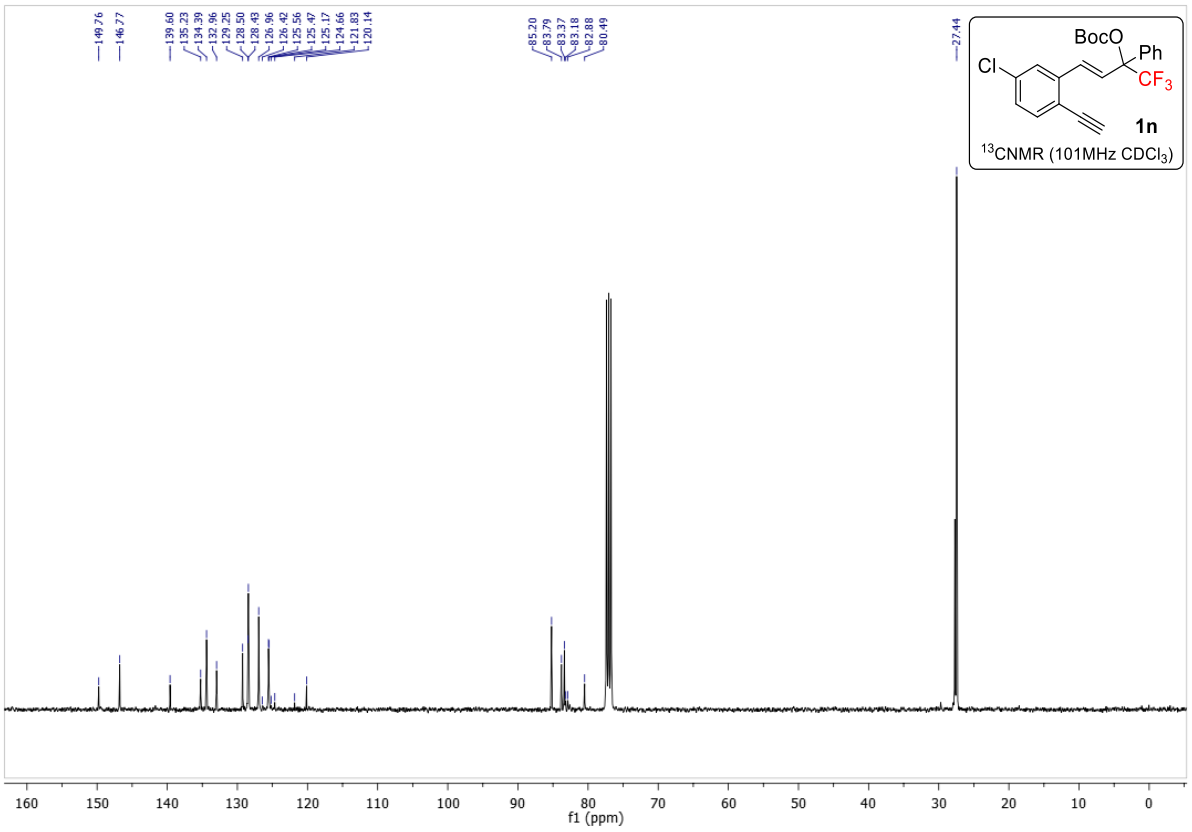
Ph
F
CF3
1m
19FNMR (377MHz CDCl3)
f1 (ppm)


7.57
7.56
7.54
7.52
7.51
7.50
7.48
7.47
7.44
7.43
7.42
7.42
7.01
7.00
6.99
6.98
6.97
6.96
6.94
6.89
3.30
1.42
BocO
Ph
Cl
CF3
1n
1HNMR (400MHz CDCl3)
1.99
1.51
4.03
1.06
1.05
1.09
0.98
8.97
f1 (ppm)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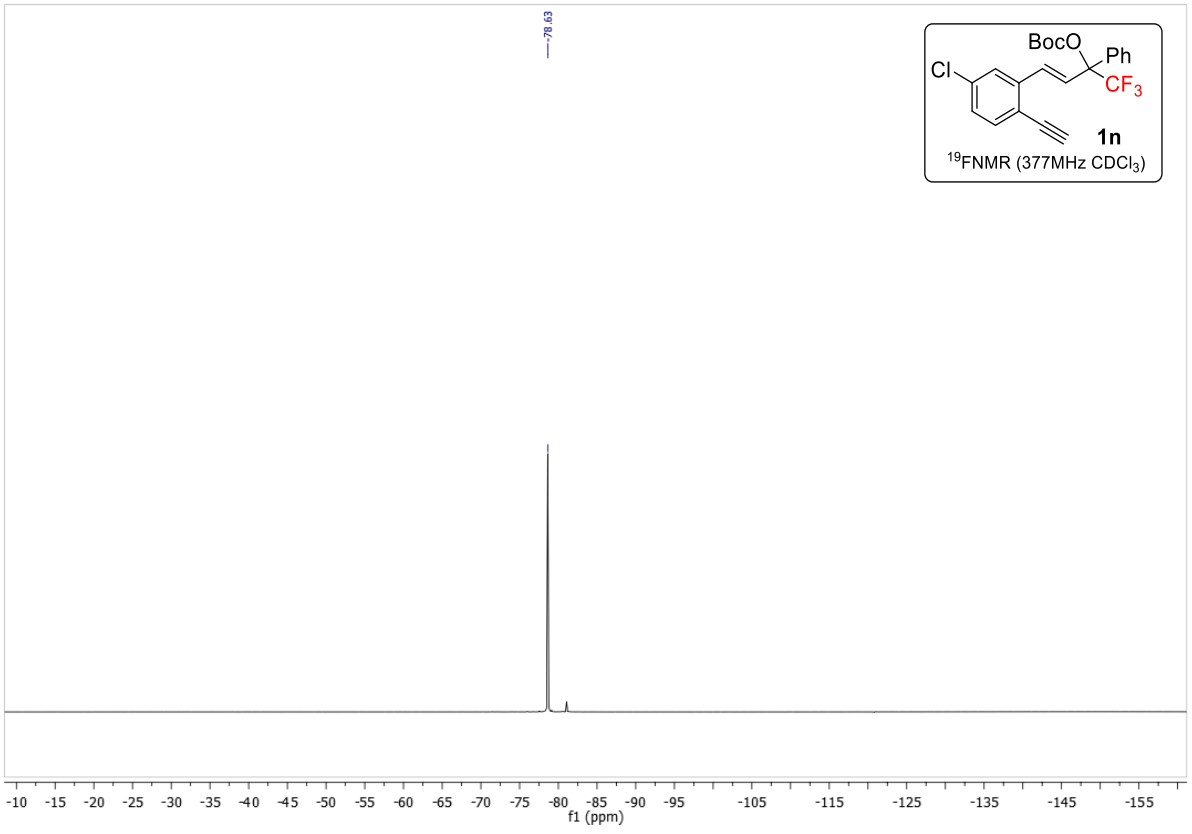
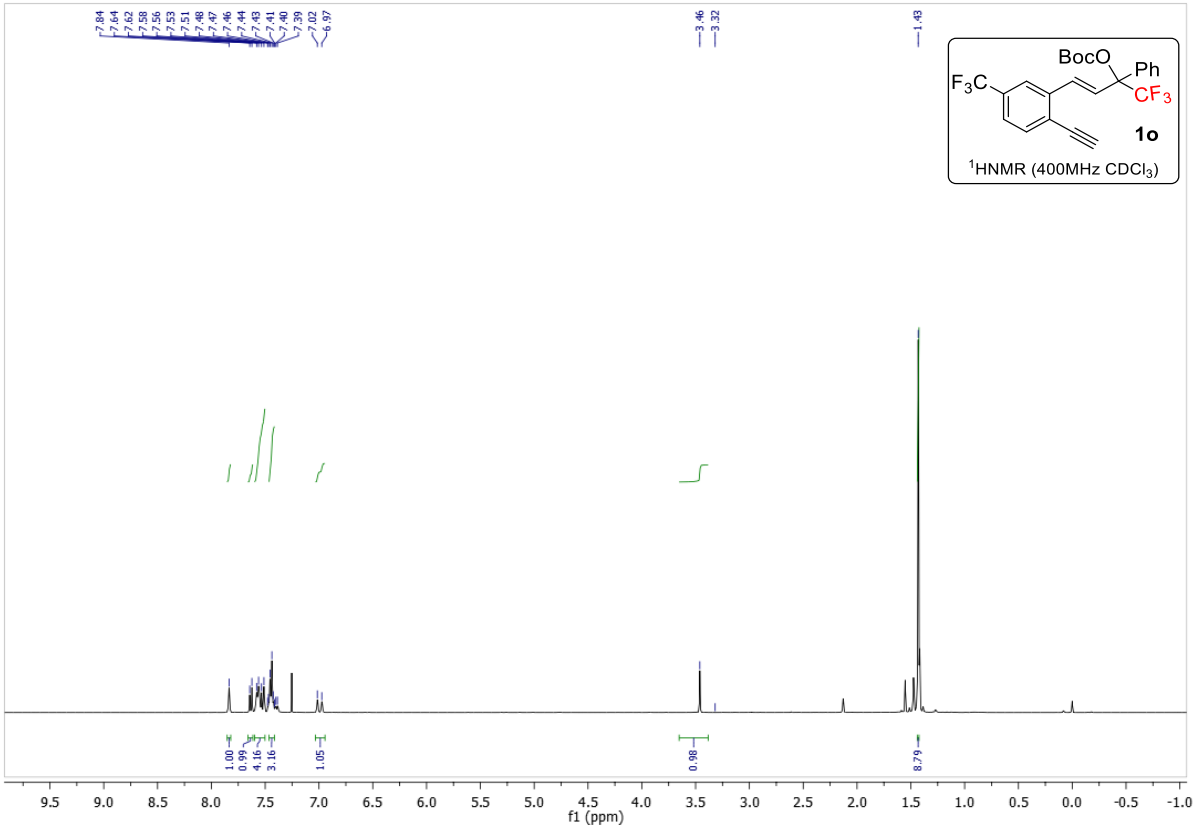
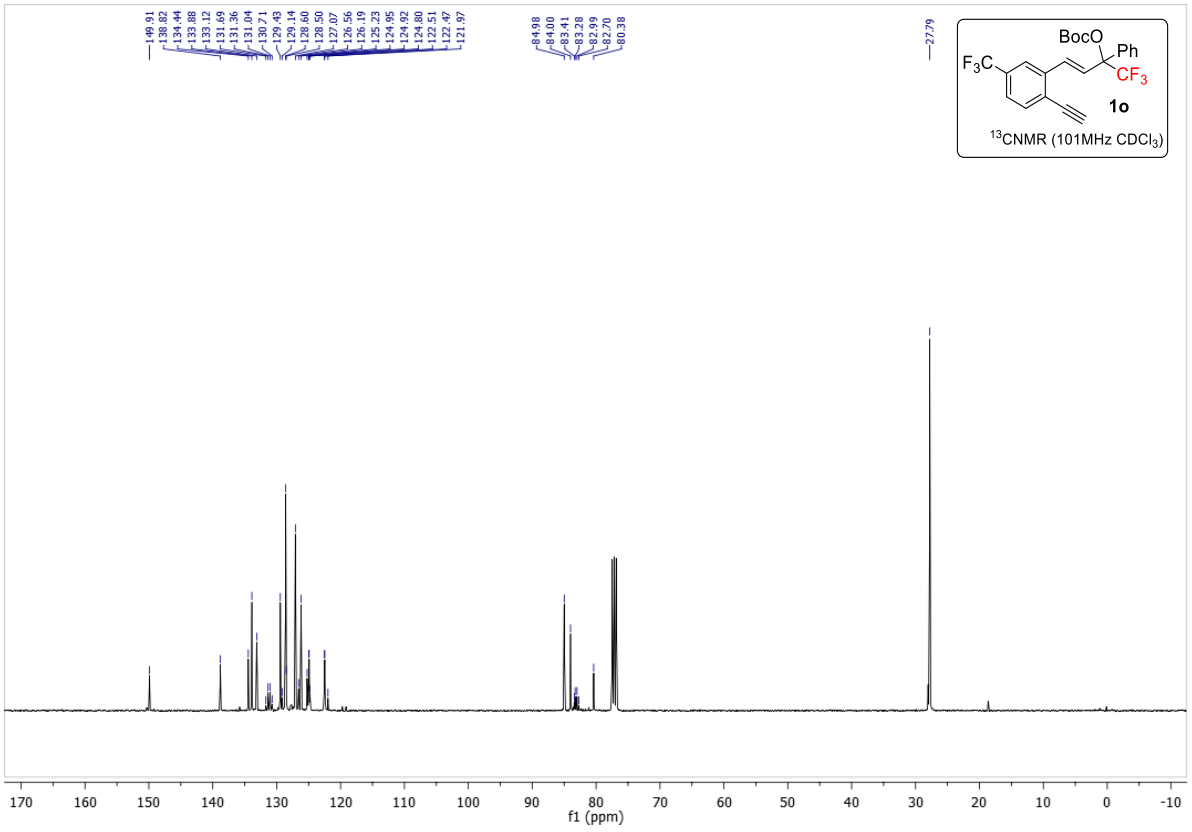
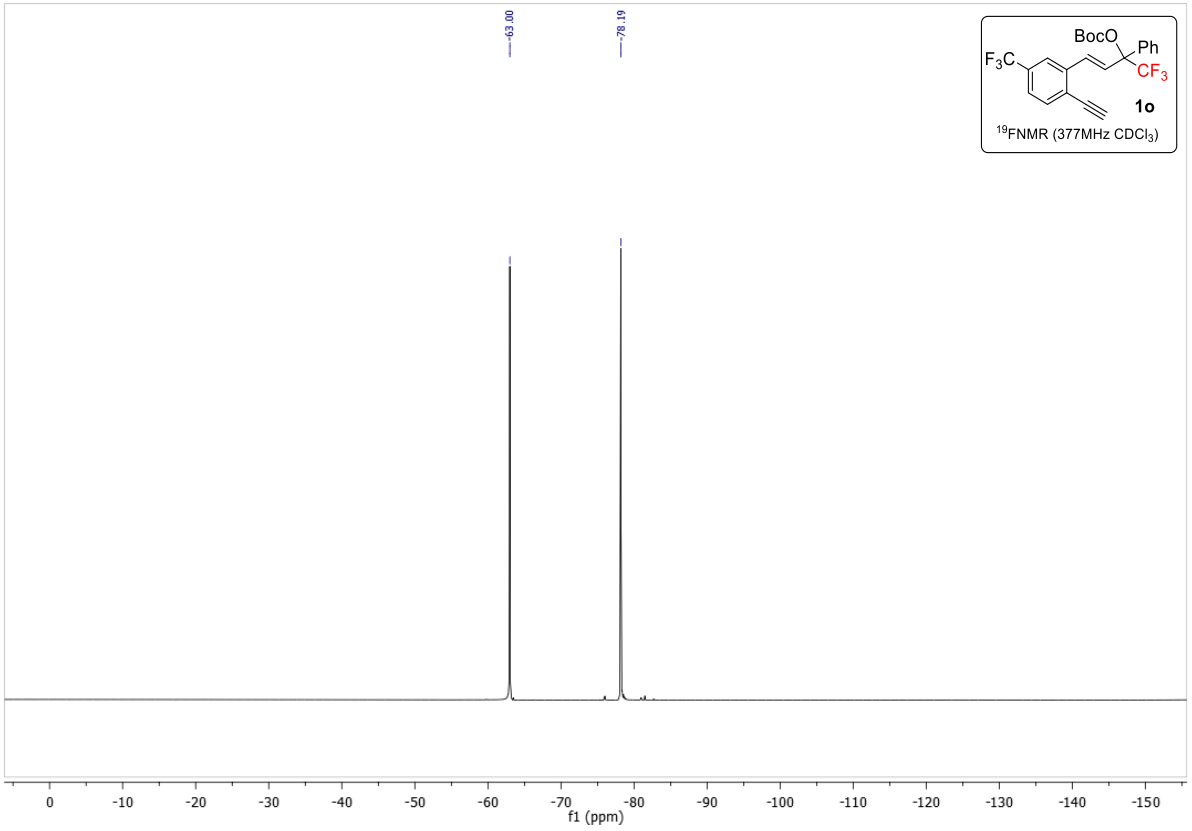
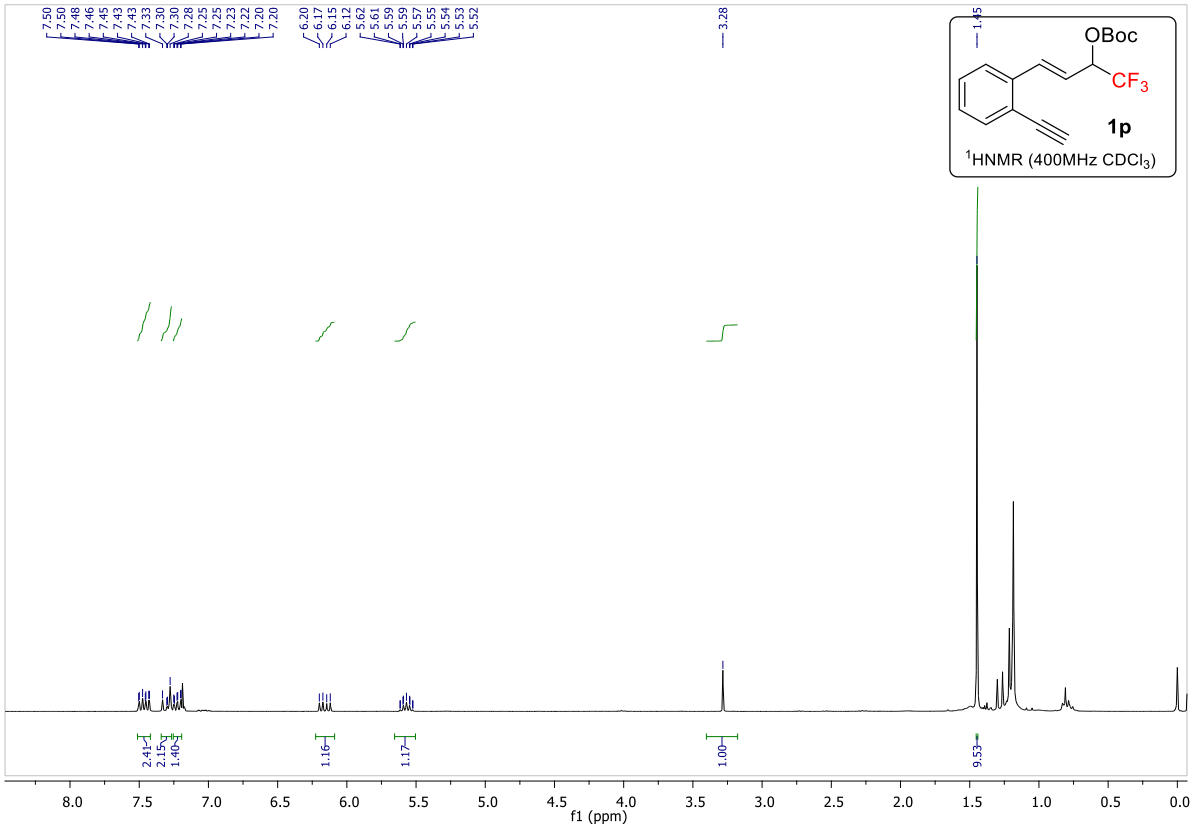
146.77
139.60
135.23
134.39
132.96
129.25
128.50
128.43
126.96
126.42
125.56
125.47
125.17
124.66
121.83
120.14
85.20
83.79
83.37
83.18
82.88
80.49
27.44
BocO
Ph
Cl
CF3
1n
13CNMR (101MHz CDCl3)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

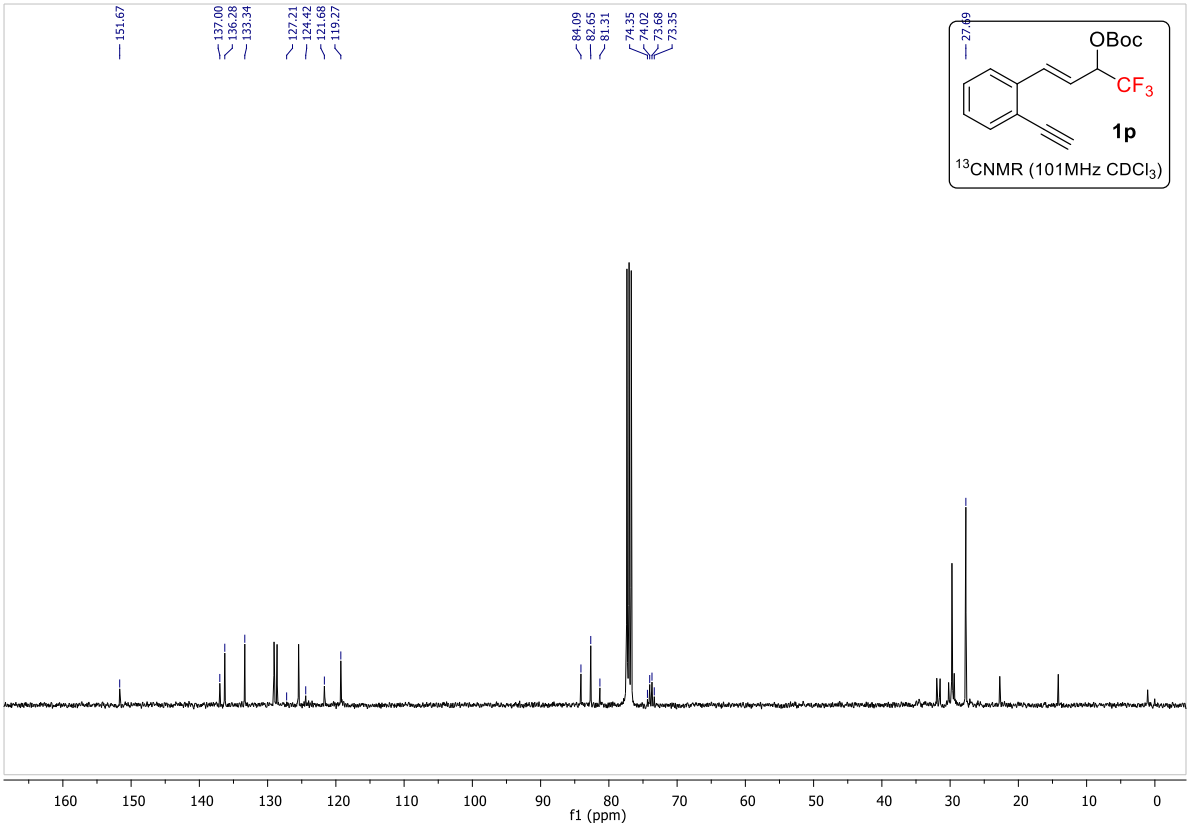

78.63
BocO
Ph
Cl
CF3
1n
19FNMR (377MHz CDCl3)
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
-75
-80
-85
-90
-95
-105
-115
-125
-135
-145
-155
f1 (ppm)

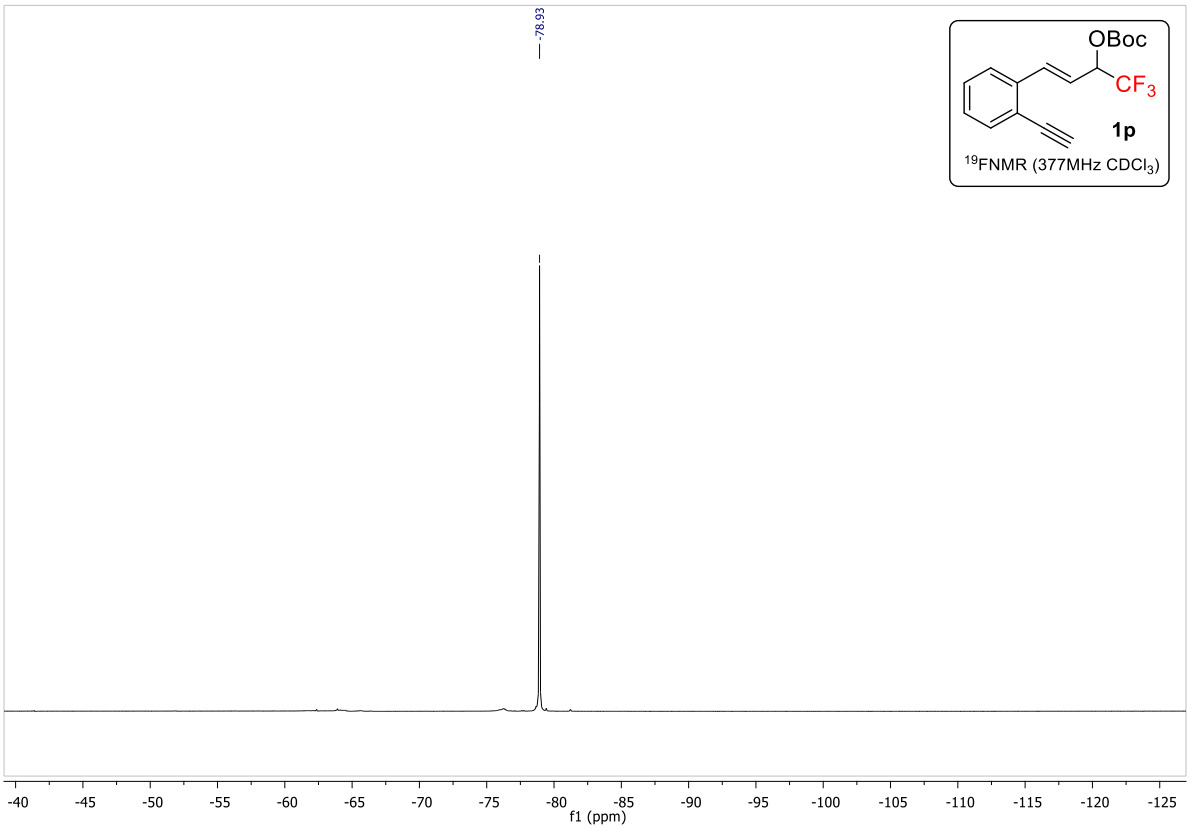

7.84
7.64
7.62
7.58
7.56
7.53
7.51
7.48
7.47
7.46
7.44
7.43
7.41
7.40
7.39
7.02
6.97
3.46
3.32
1.43
BocO
Ph
F3C
CF3
1o
1HNMR (400MHz CDCl3)
1.00
0.99
4.16
3.16
1.05
0.98
8.79
f1 (ppm)

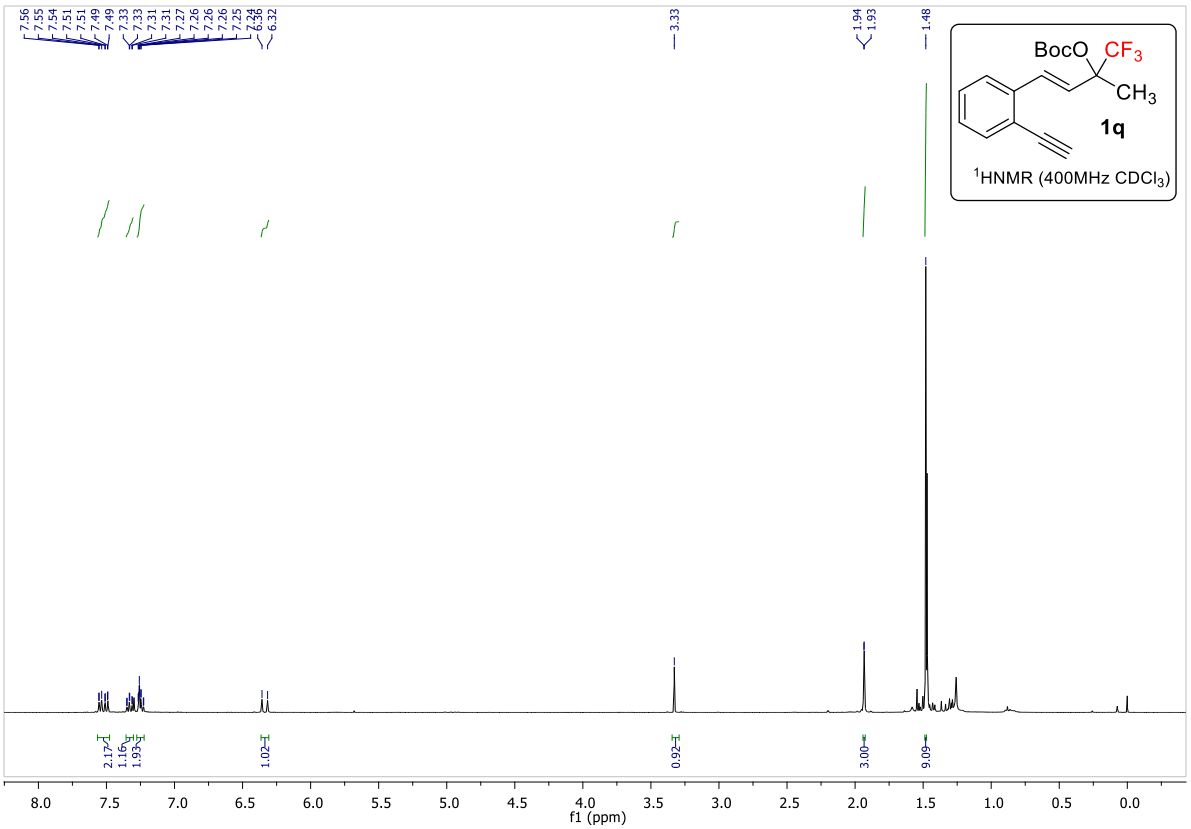

149.91
138.82
134.44
133.88
133.12
131.69
131.36
131.04
130.71
129.48
129.14
128.60
128.50
127.07
126.56
126.19
125.23
124.95
124.92
124.80
122.51
122.47
121.97
84.98
84.00
83.41
83.28
82.99
82.70
80.38
27.79
BocO
Ph
F3C
CF3
1o
13CNMR (101MHz CDCl3)
f1 (ppm)

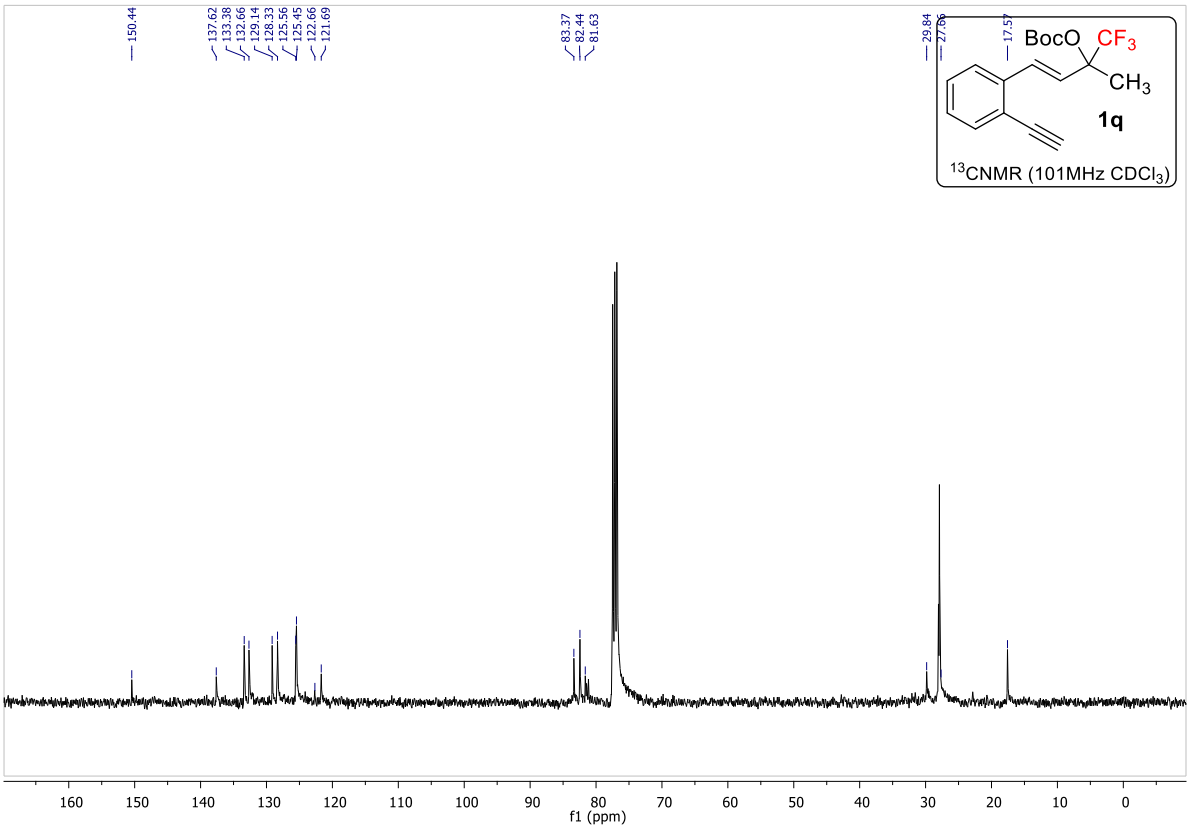

-63.00
-78.19
BocO
Ph
F3C
CF3
1o
19FNMR (377MHz CDCl3)
f1 (ppm)

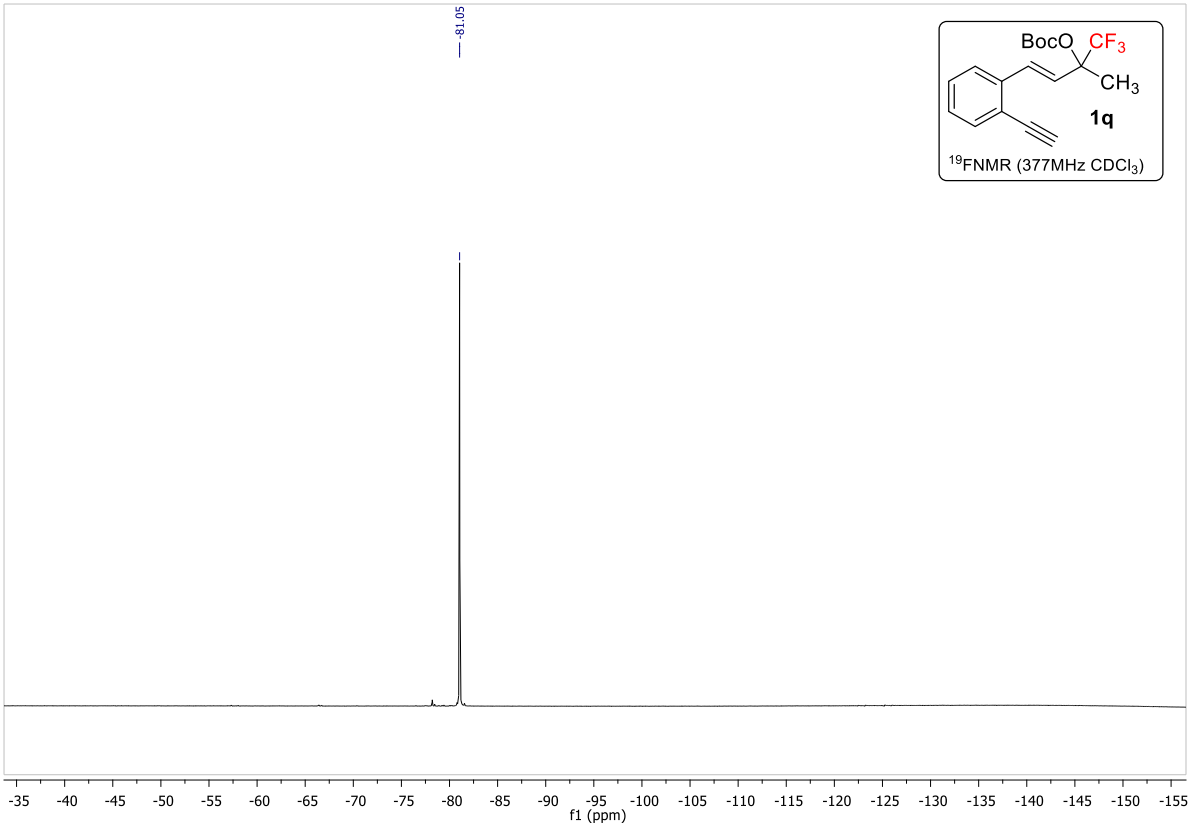

3.28
1.45
OBoc
CF3
1p
1HNMR (400MHz CDCl3)
2.41
2.15
1.40
1.16
1.17
1.00
9.53
f1 (ppm)

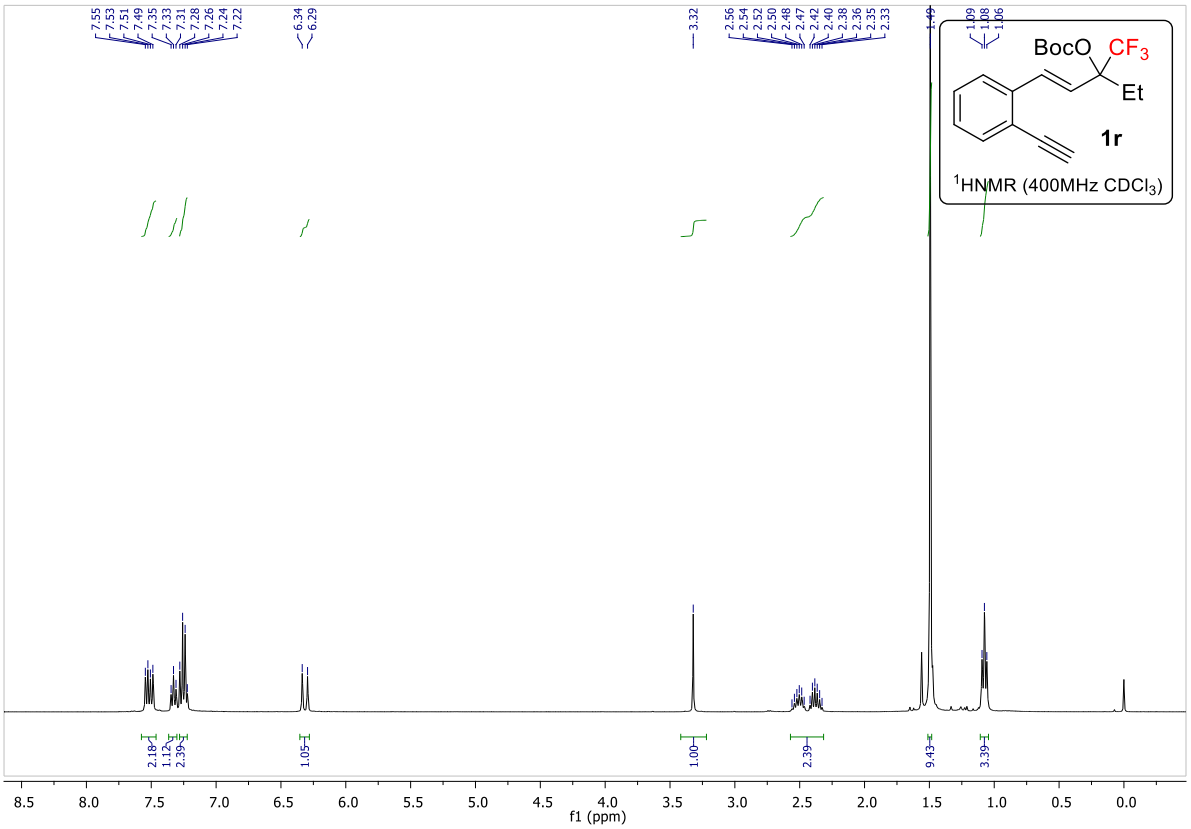

151.67
137.00
136.28
133.34
127.21
124.42
121.68
119.27
84.09
82.65
81.31
74.35
74.02
73.68
73.35
27.69
OBoc
CF3
1p
13CNMR (101MHz CDCl3)
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

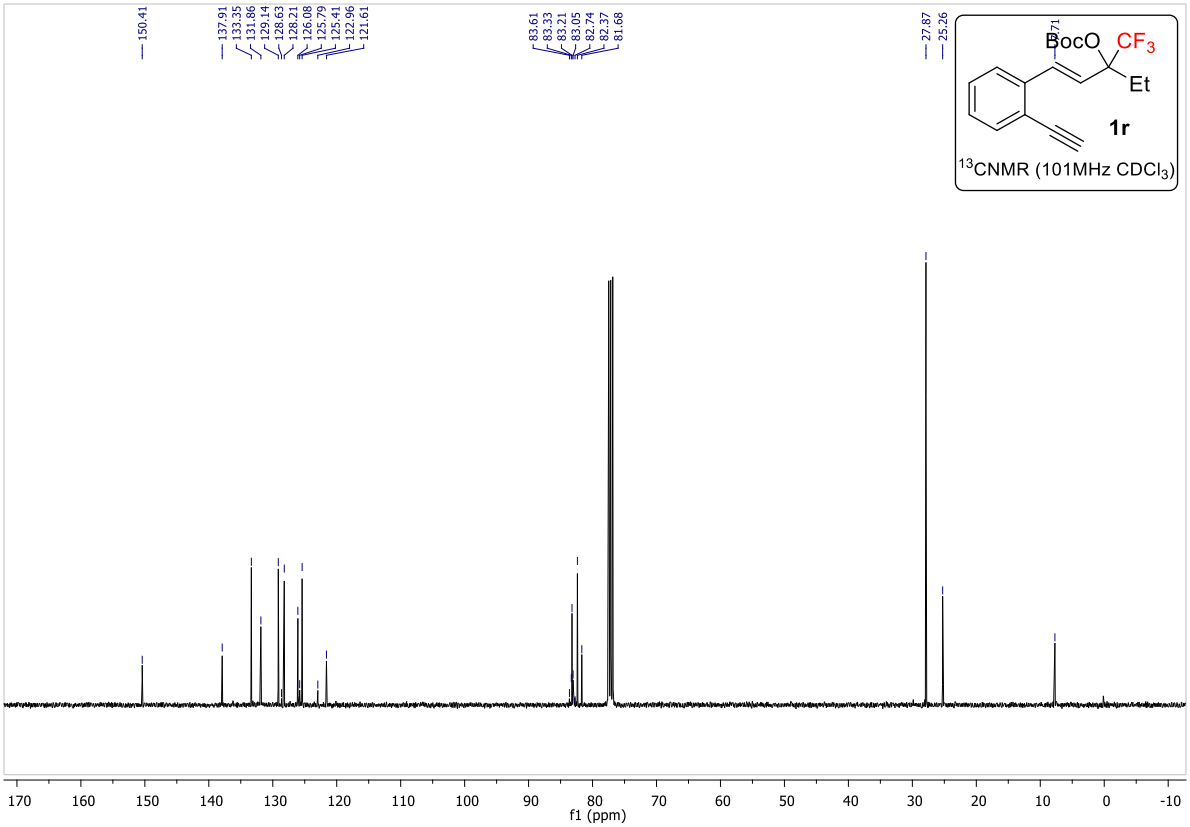

-78.93
OBoc
CF3
1p
19FNMR (377MHz CDCl3)
-40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125
f1 (ppm)

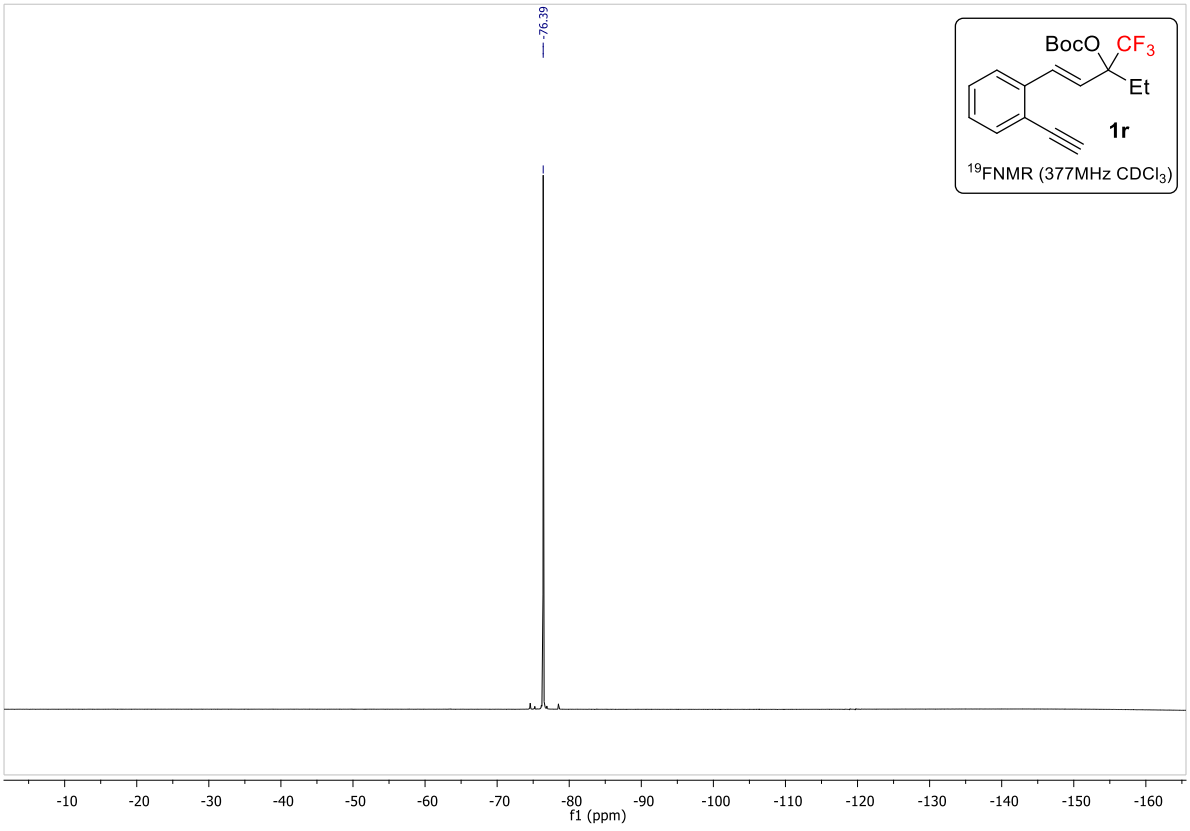

BocO CF3
CH3
1q
1HNMR (400MHz CDCl3)
f1 (ppm)

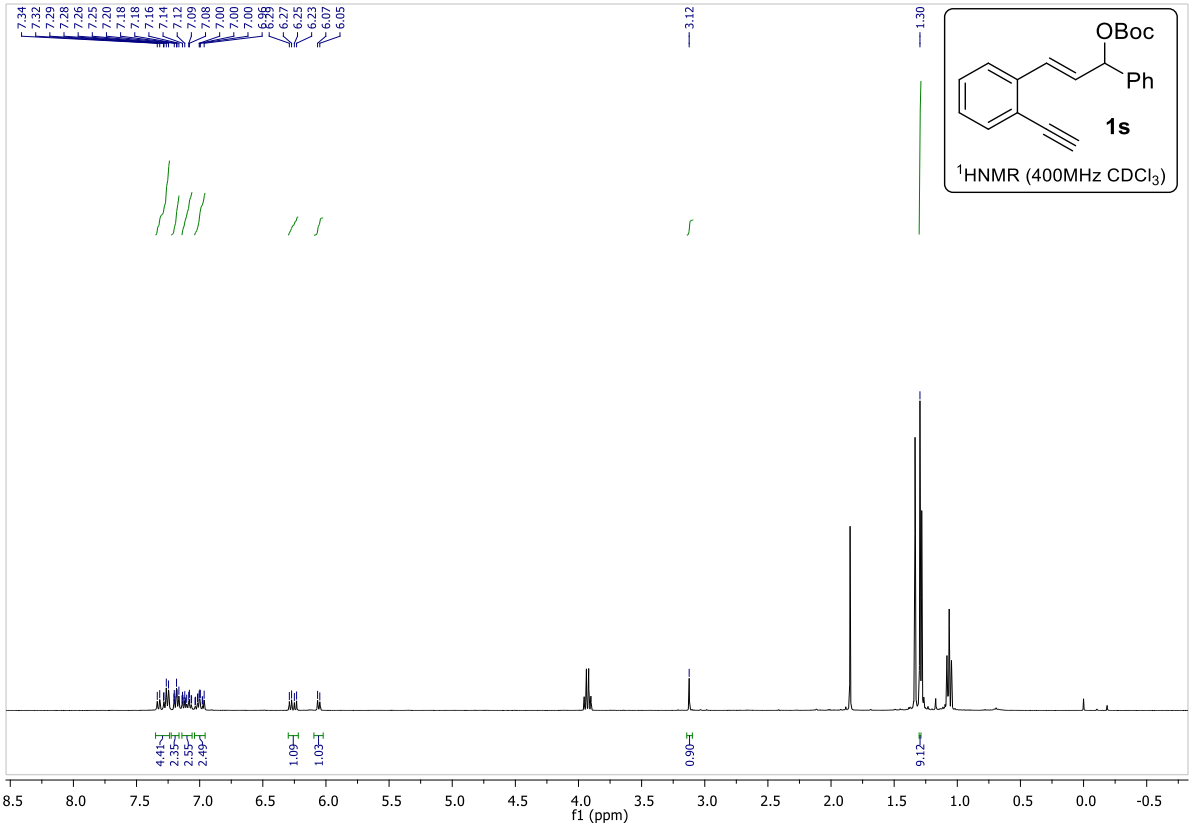

BocO CF3
CH3
1q
13CNMR (101MHz CDCl3)
f1 (ppm)

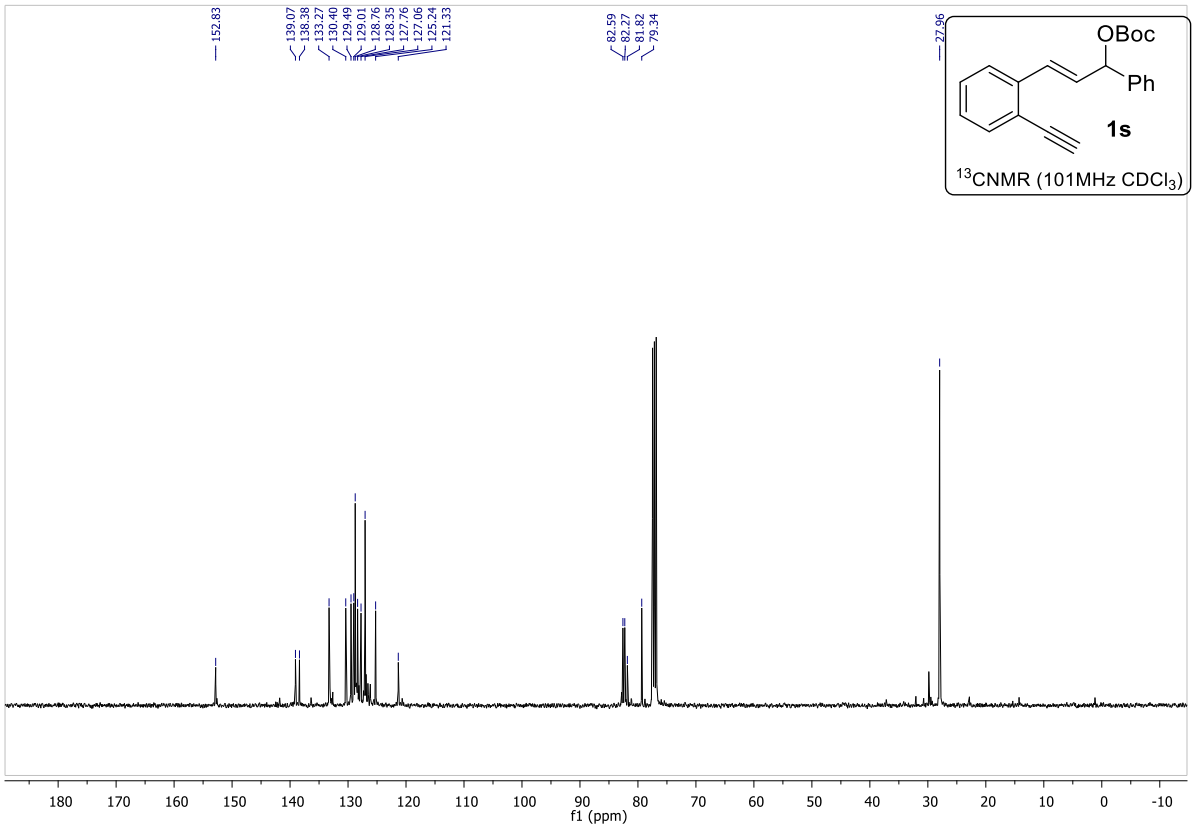

-81.05
BocO CF3
CH3
1q
19FNMR (377MHz CDCl3)
f1 (ppm)

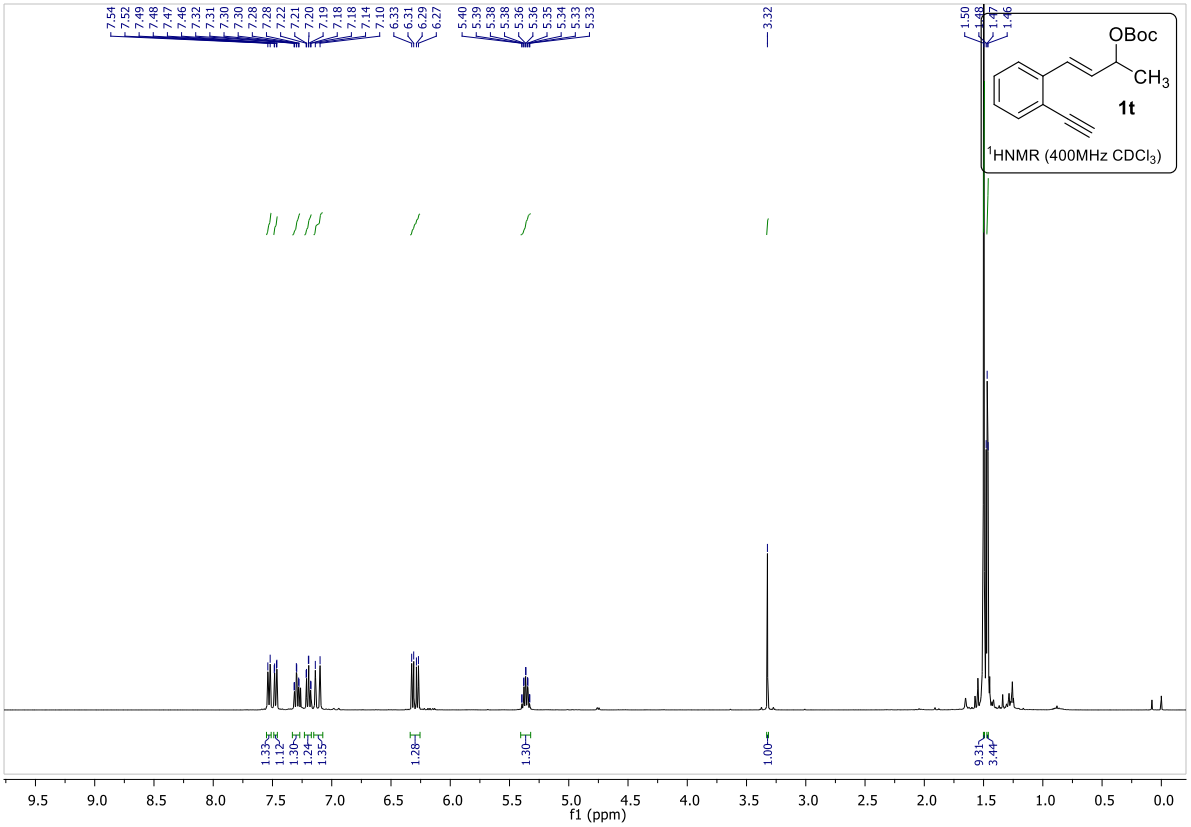

7.55
7.53
7.51
7.49
7.35
7.33
7.31
7.28
7.26
7.24
7.22
6.34
6.29
3.32
2.56
2.54
2.52
2.50
2.48
2.47
2.42
2.40
2.38
2.36
2.35
2.33
1.49
1.09
1.08
1.06
BocO CF3
Et
1r
1HNMR (400MHz CDCl3)
2.18
1.12
2.39
1.05
1.00
2.39
9.43
3.39
f1 (ppm)

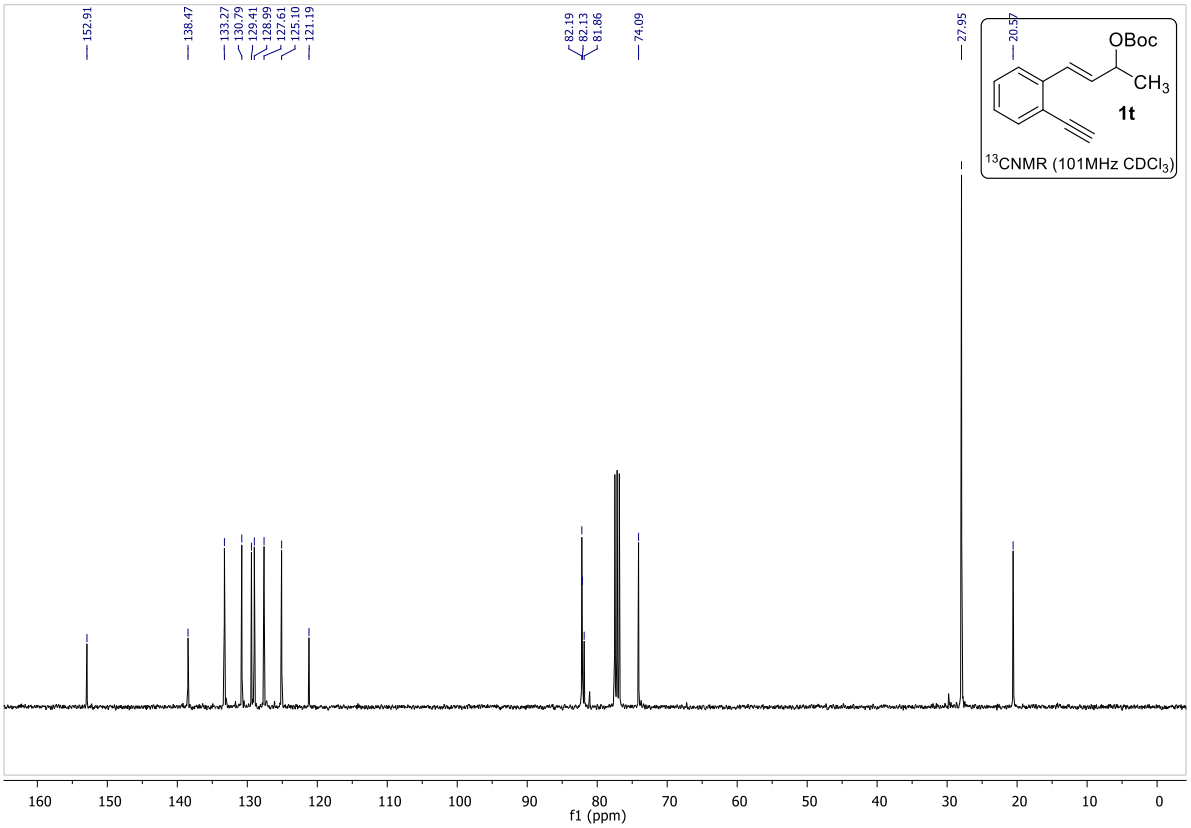

150.41
137.91
133.35
131.86
129.14
128.63
128.21
126.08
125.79
125.41
122.96
121.61
83.61
83.33
83.21
83.05
82.74
82.37
81.68
27.87
25.26
BocO
CF3
Et
1r
13CNMR (101MHz CDCl3)
f1 (ppm)

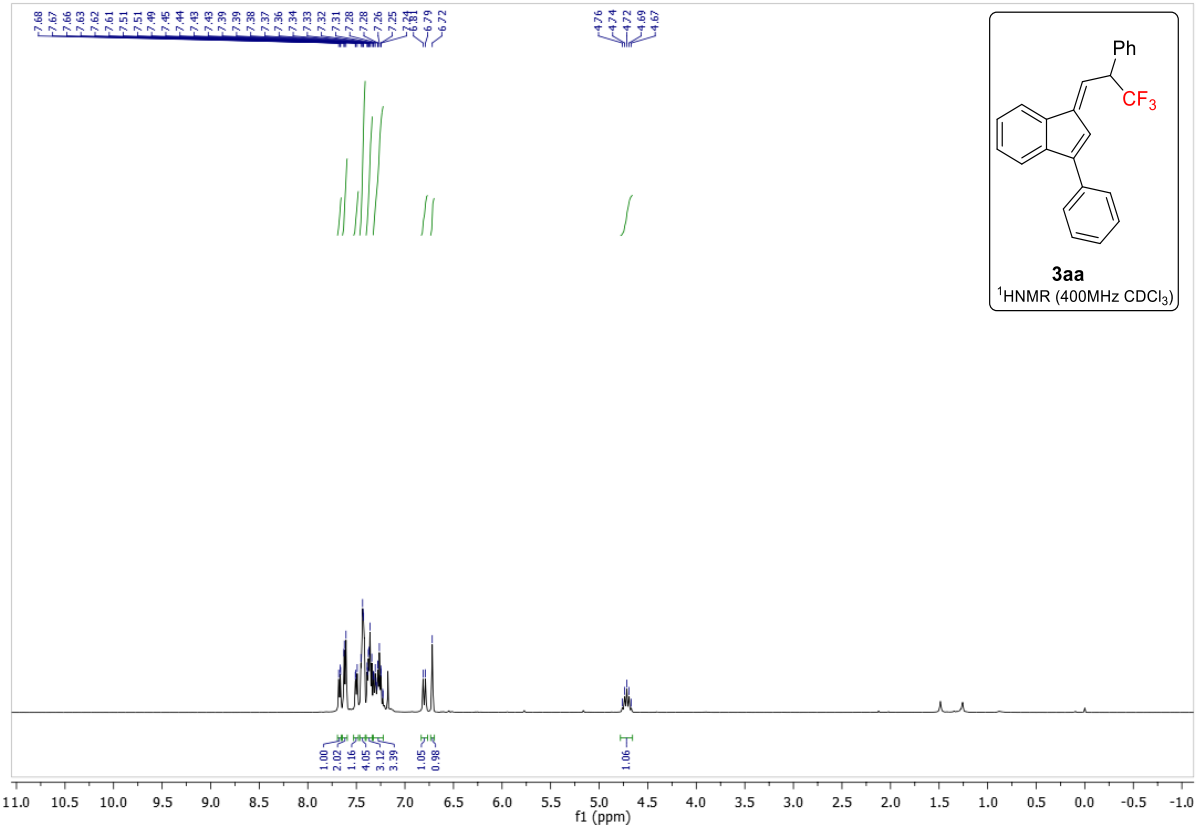

-76.39
BocO
CF3
Et
1r
19FNMR (377MHz CDCl3)
f1 (ppm)

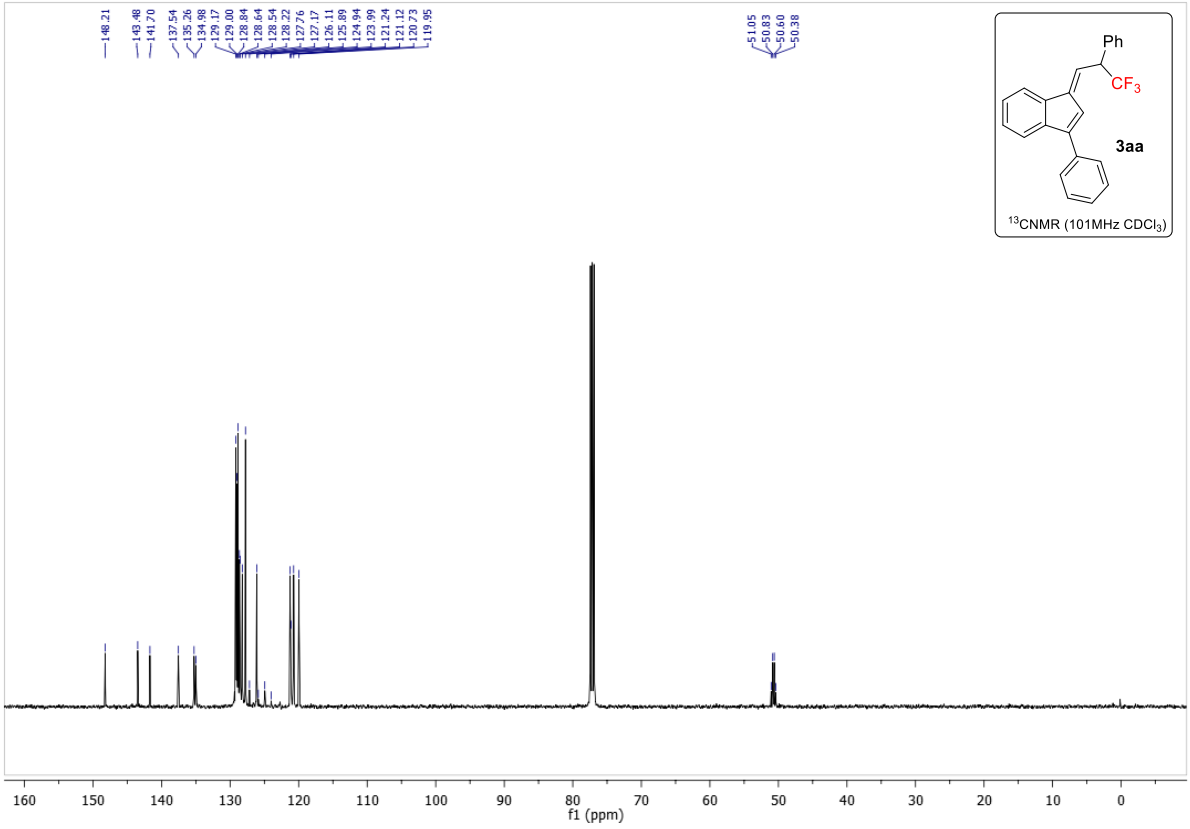

OBoc
Ph
1s
^{1}HNMR (400MHz $CDCl_3$)
f1 (ppm)

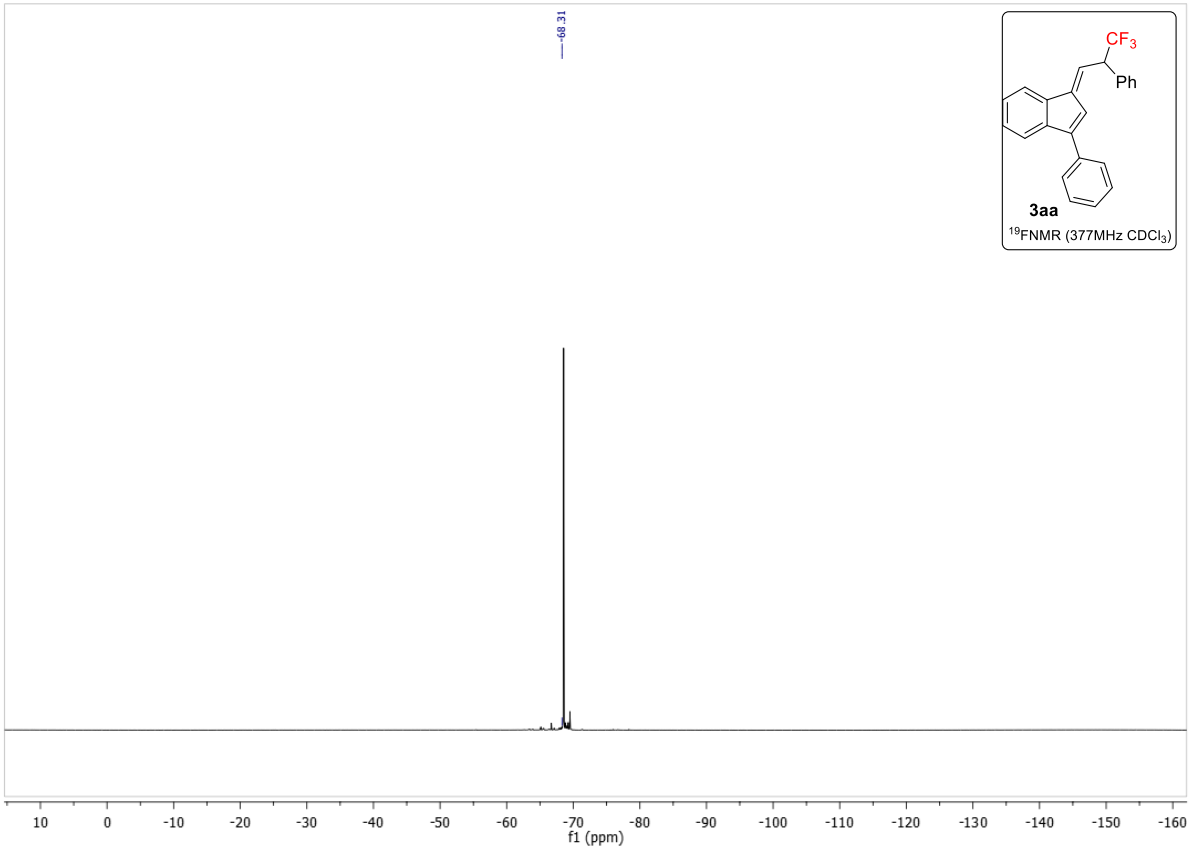

OBoc
Ph
1s
^{13}CNMR (101MHz $CDCl_3$)
f1 (ppm)

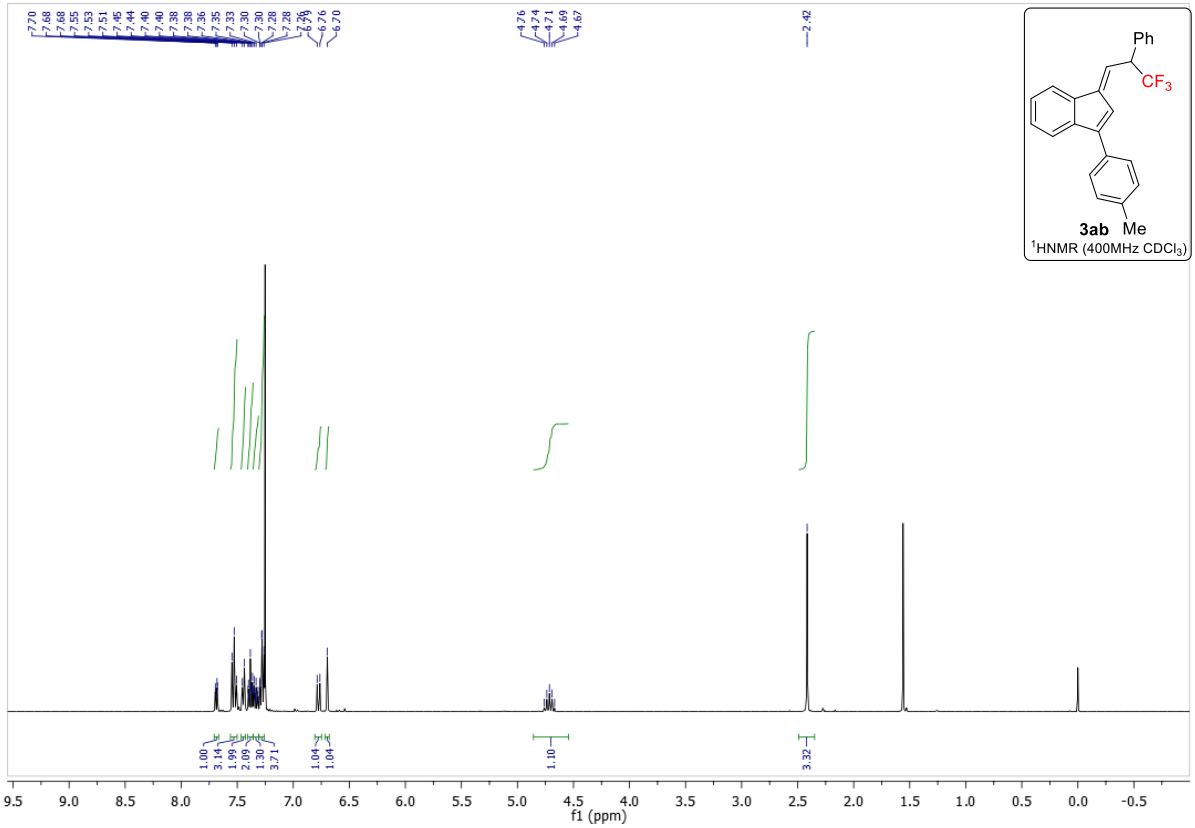

OBoc
CH3
1t
1HNMR (400MHz CDCl3)
f1 (ppm)


OBoc
CH3
1t
13CNMR (101MHz CDCl3)
f1 (ppm)


Ph
CF3
3aa
1HNMR (400MHz CDCl3)
f1 (ppm)


Ph
CF3
3aa
13CNMR (101MHz CDCl3)
f1 (ppm)


-68.31
CF3
Ph
3aa
19FNMR (377MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160
f1 (ppm)


7.70
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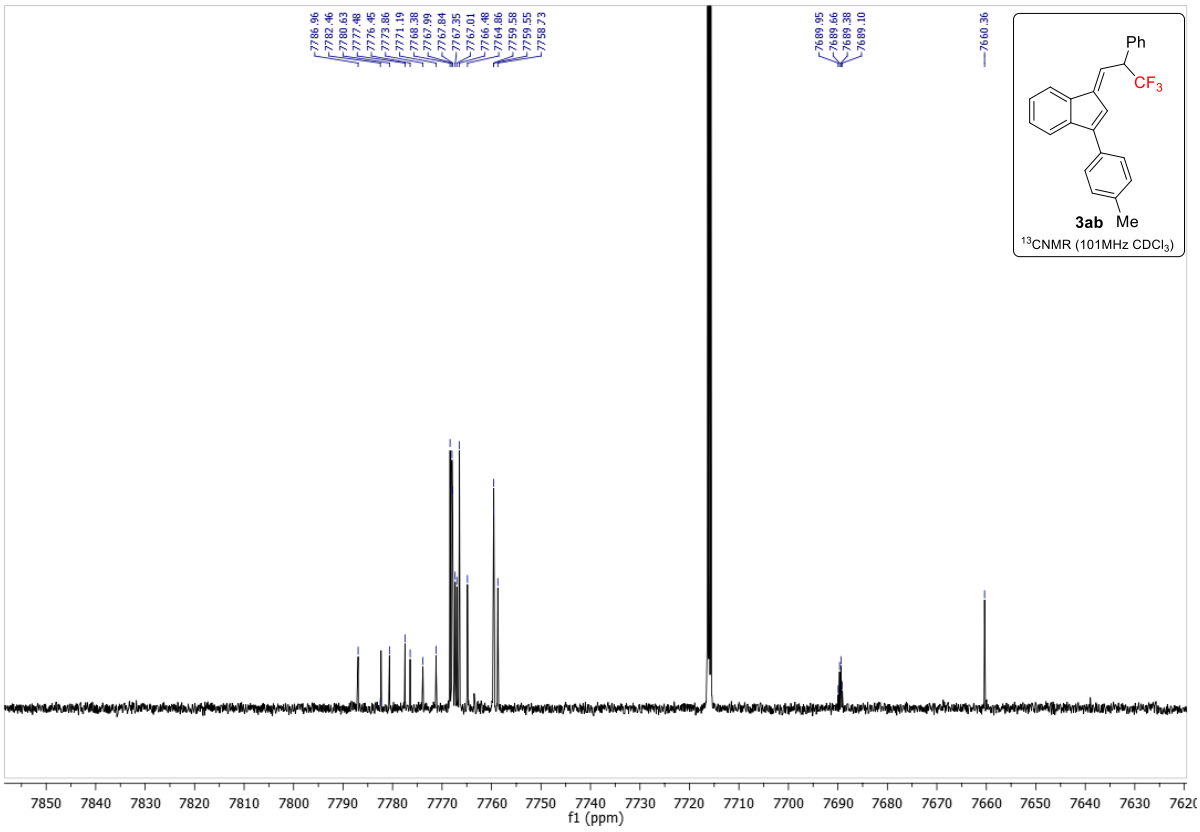
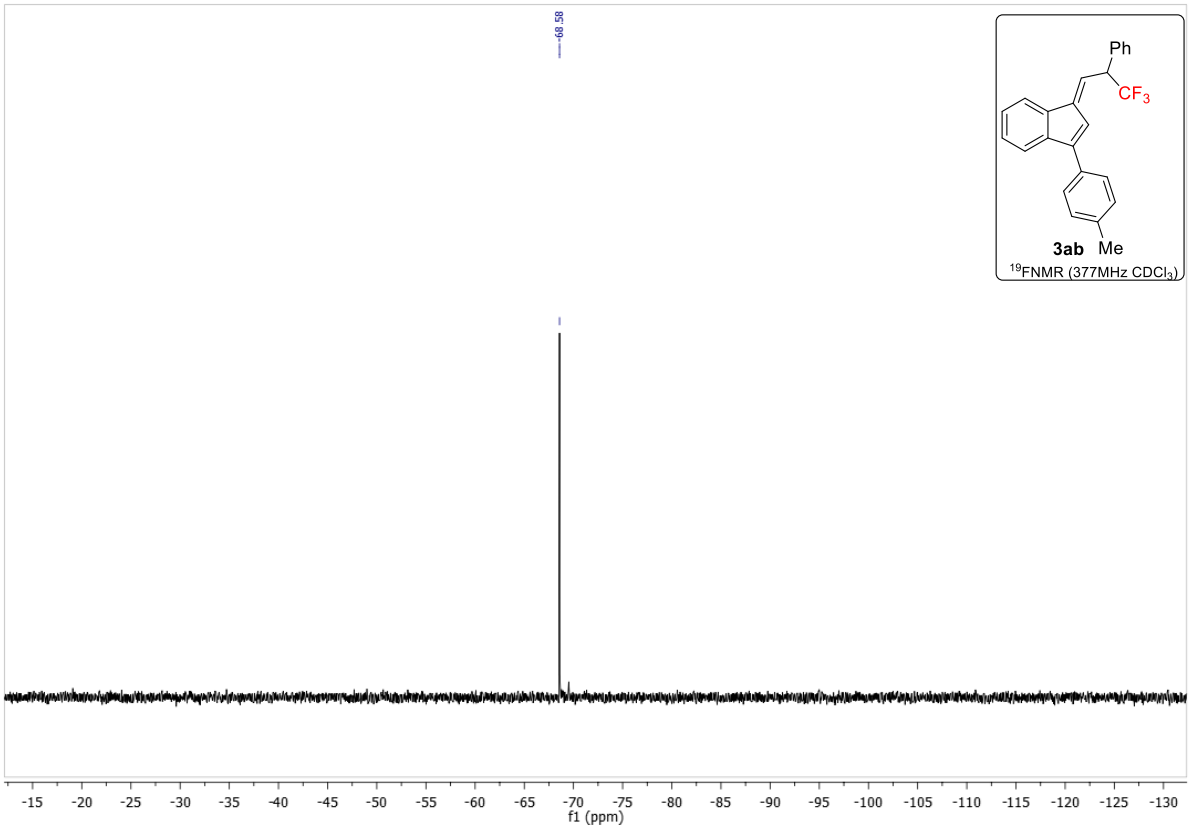
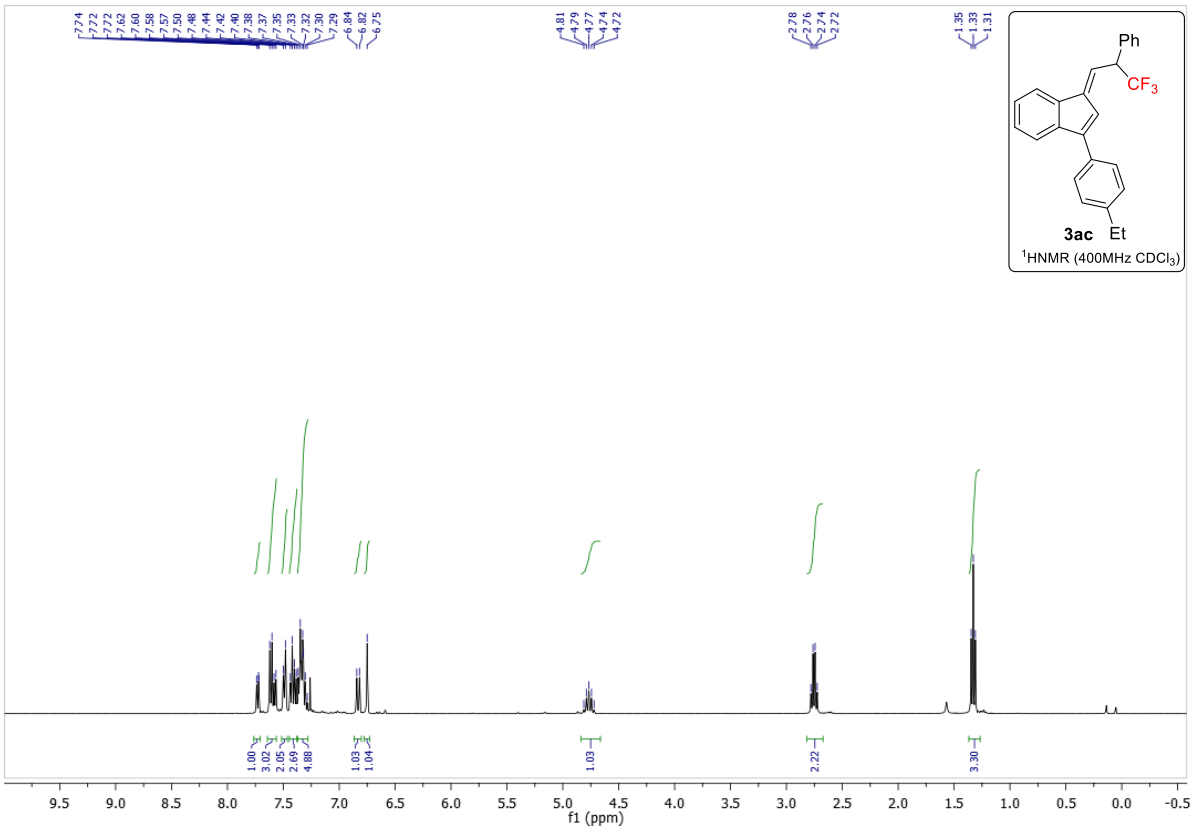
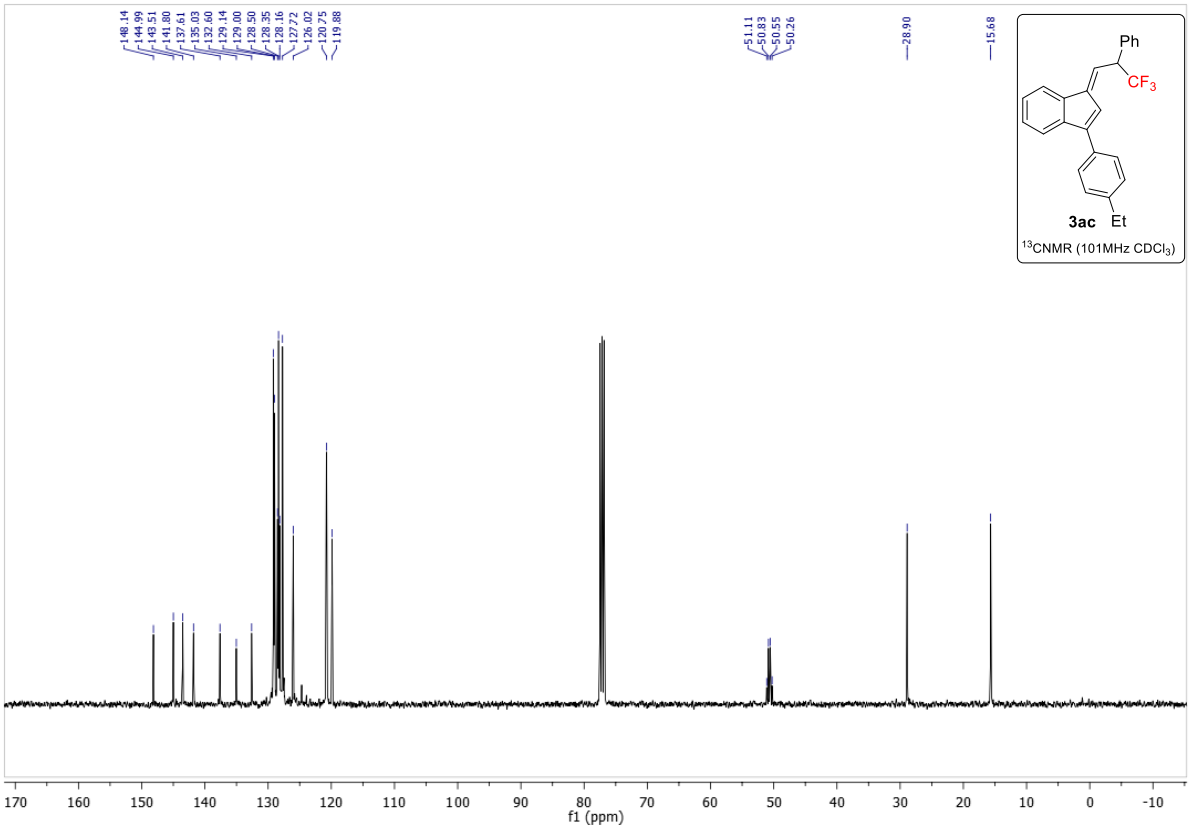
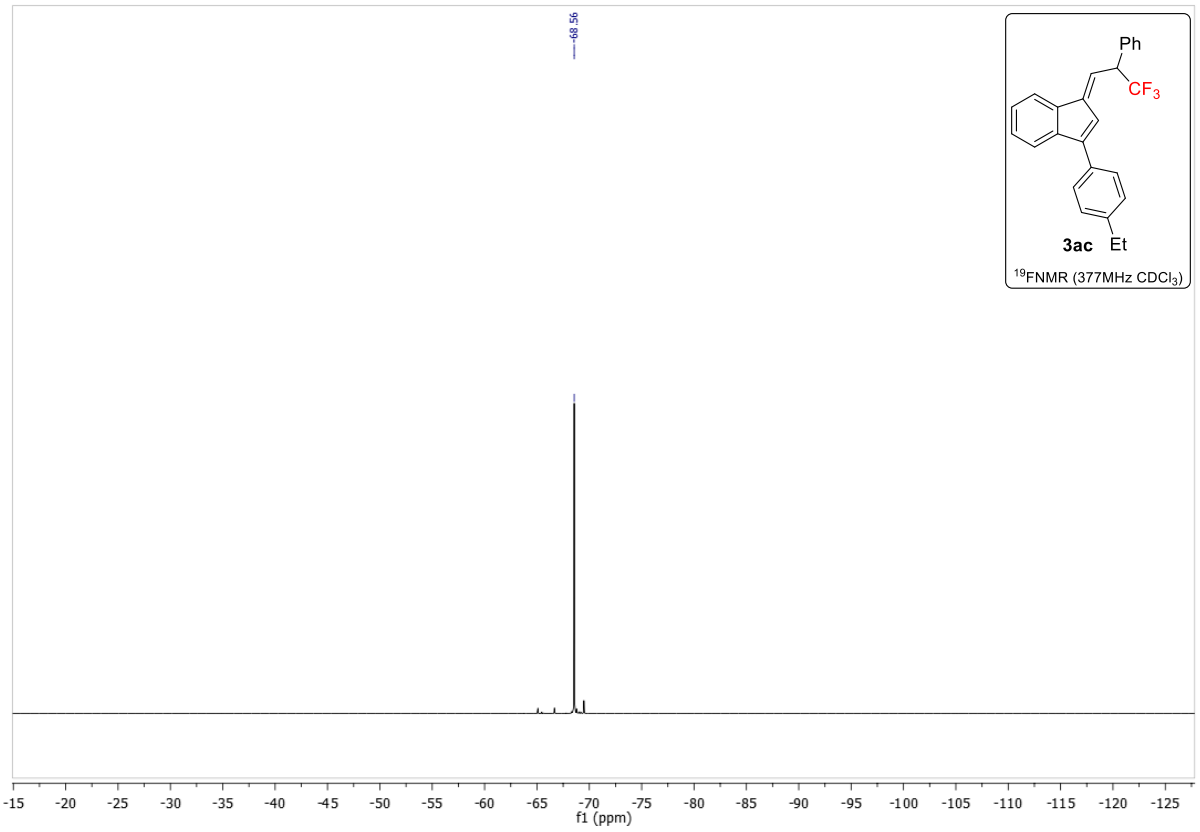
7.68
7.55
7.53
7.51
7.45
7.44
7.40
7.40
7.38
7.38
7.36
7.35
7.33
7.30
7.30
7.28
6.76
6.70
4.76
4.74
4.71
4.69
4.67
2.42
Ph
CF3
3ab Me
1HNMR (400MHz CDCl3)
1.00
3.14
1.99
2.09
1.30
3.71
1.04
1.04
1.10
3.32
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

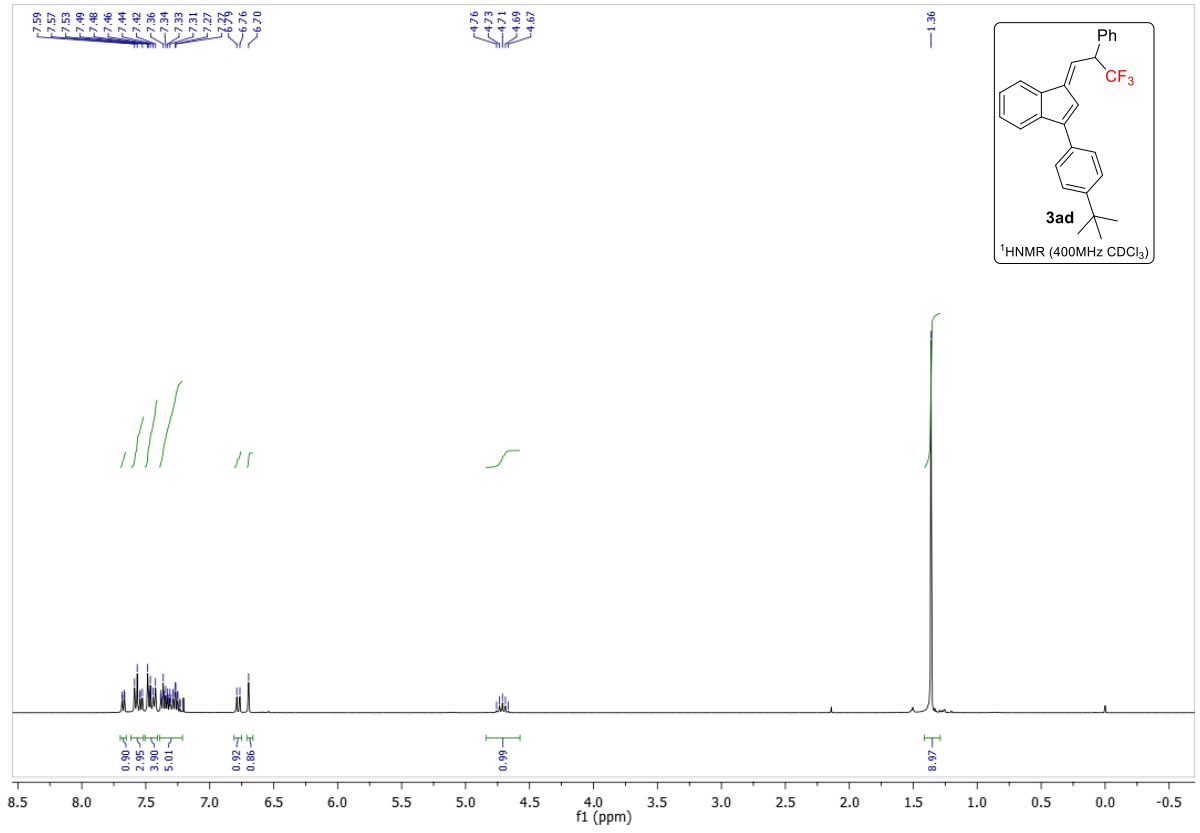

7786.96
7782.46
7780.63
7777.48
7776.45
7773.86
7771.19
7768.38
7767.99
7767.84
7767.35
7767.01
7766.48
7764.86
7759.58
7759.55
7758.73
7689.95
7689.66
7689.38
7689.10
7660.36
Ph
CF3
3ab Me
13CNMR (101MHz CDCl3)
7850 7840 7830 7820 7810 7800 7790 7780 7770 7760 7750 7740 7730 7720 7710 7700 7690 7680 7670 7660 7650 7640 7630
f1 (ppm)

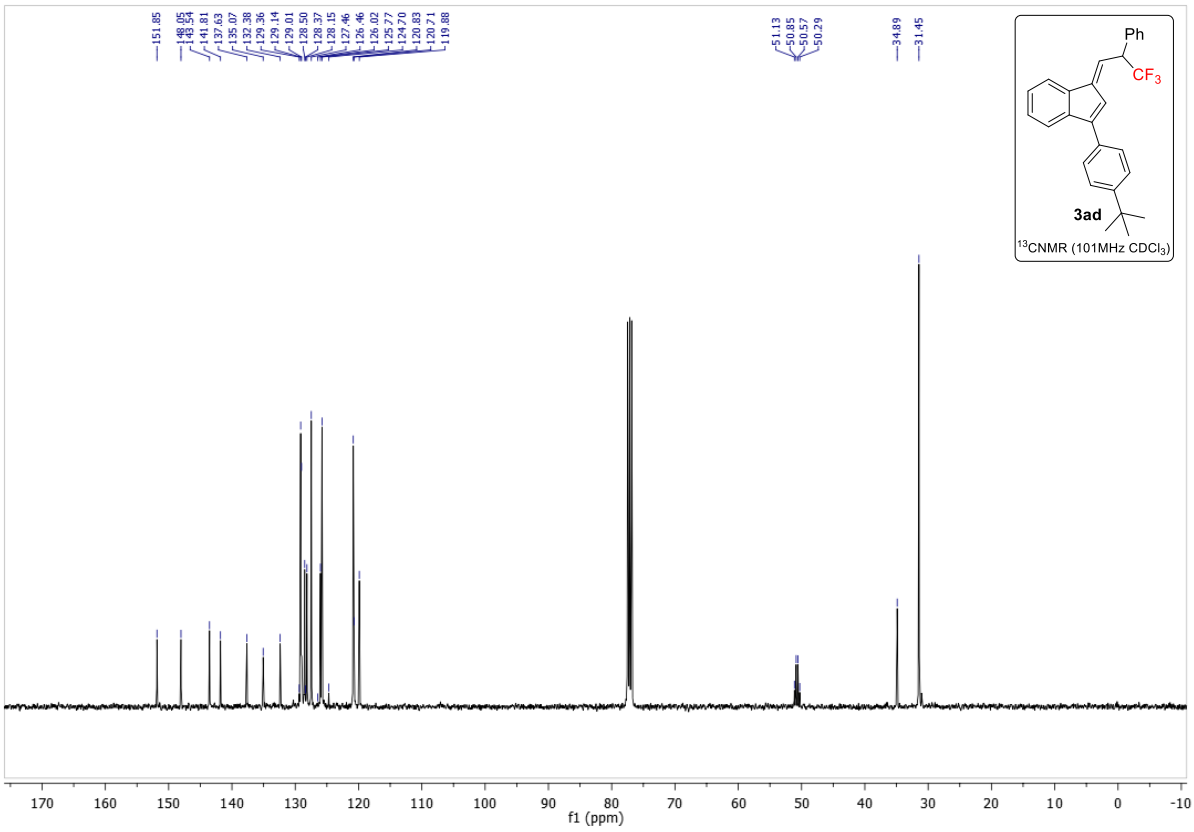

-68.58
Ph
CF3
3ab Me
19FNMR (377MHz CDCl3)
-15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130
f1 (ppm)

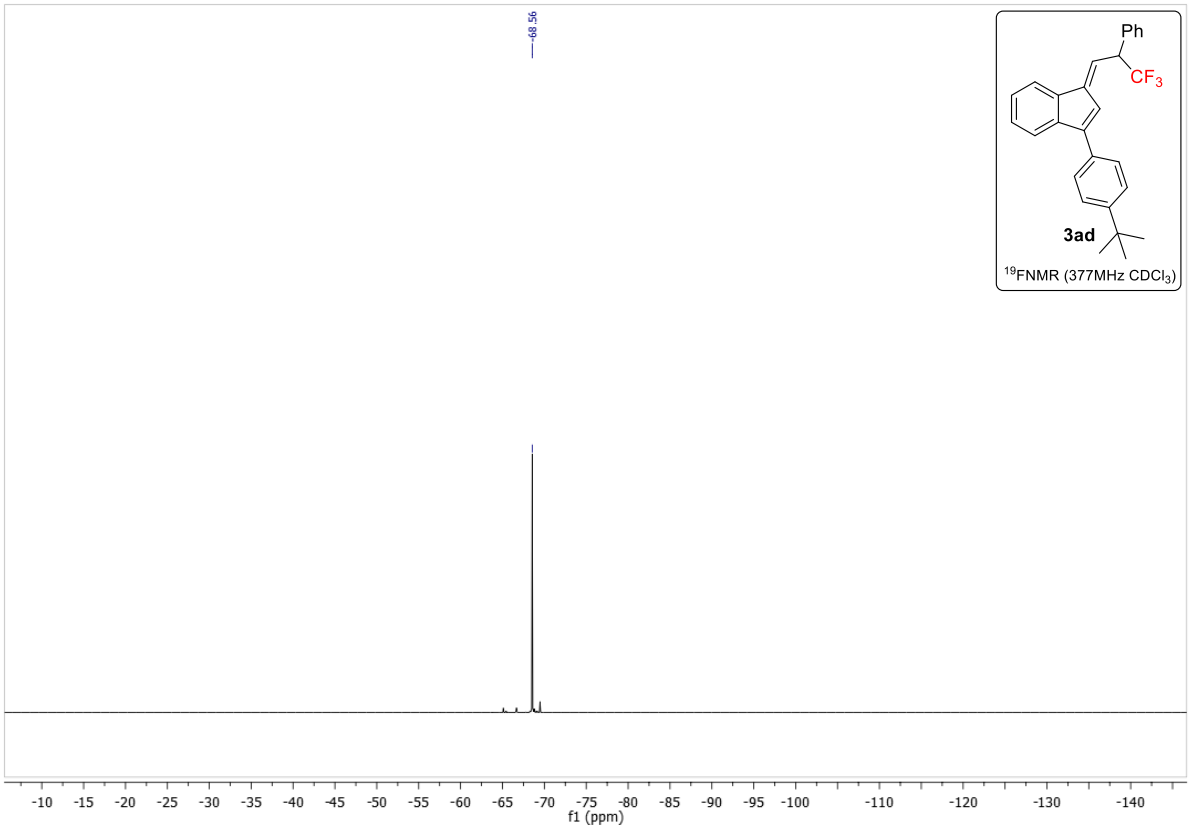

Ph
CF3
3ac Et
1HNMR (400MHz CDCl3)
f1 (ppm)

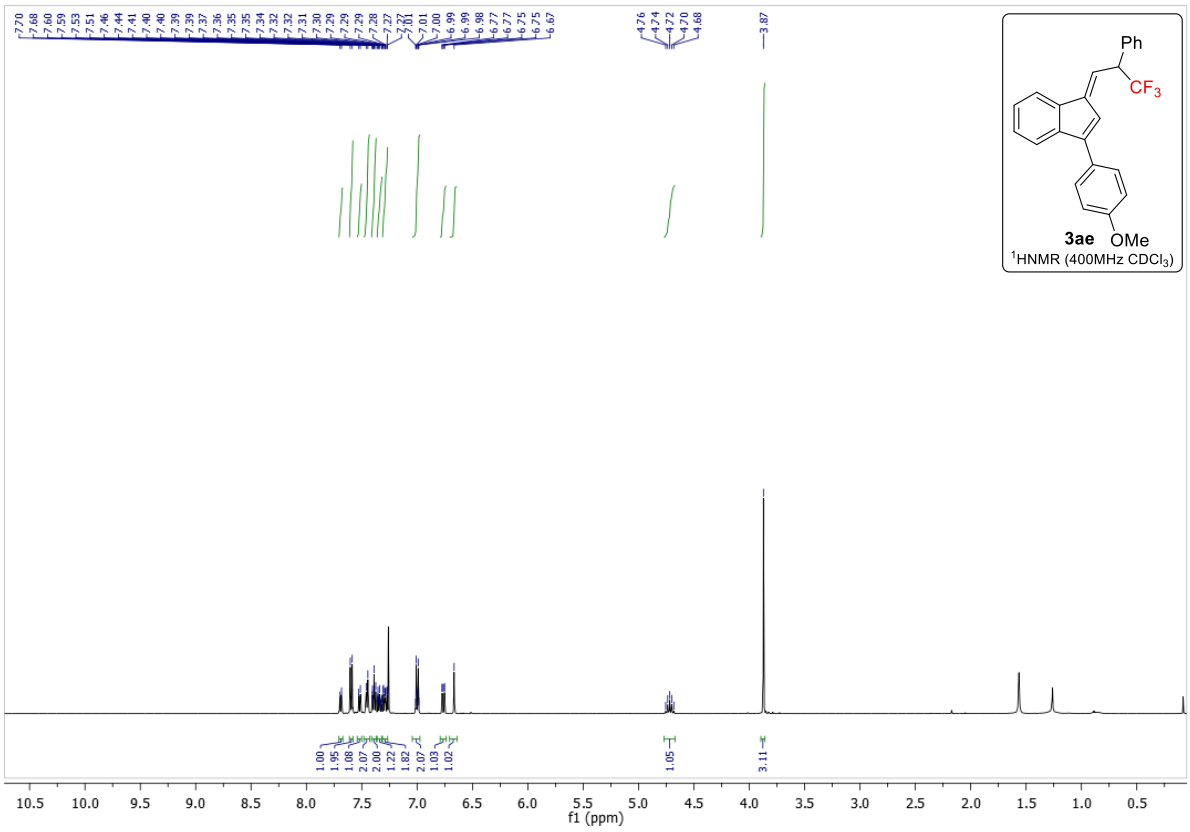

Ph
CF3
3ac Et
13CNMR (101MHz CDCl3)
f1 (ppm)

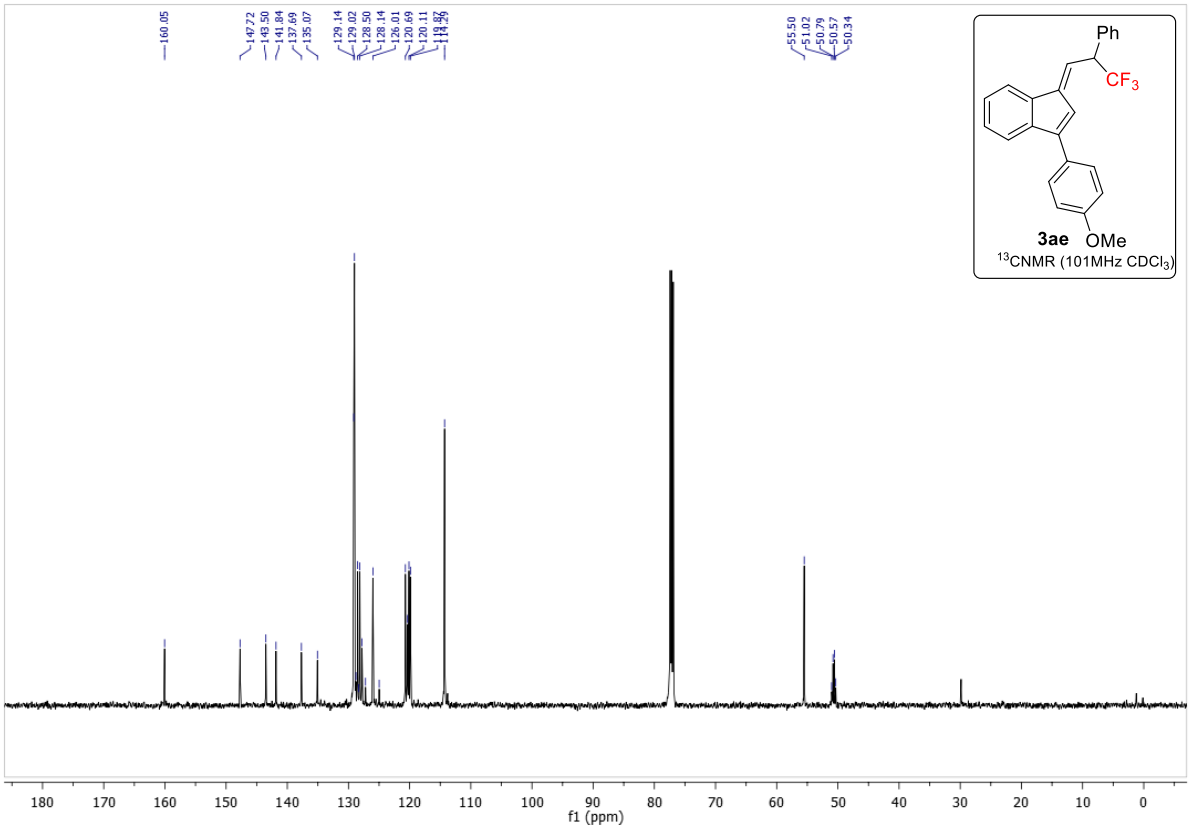

-68.56
Ph
CF3
3ac Et
19FNMR (377MHz CDCl3)
f1 (ppm)

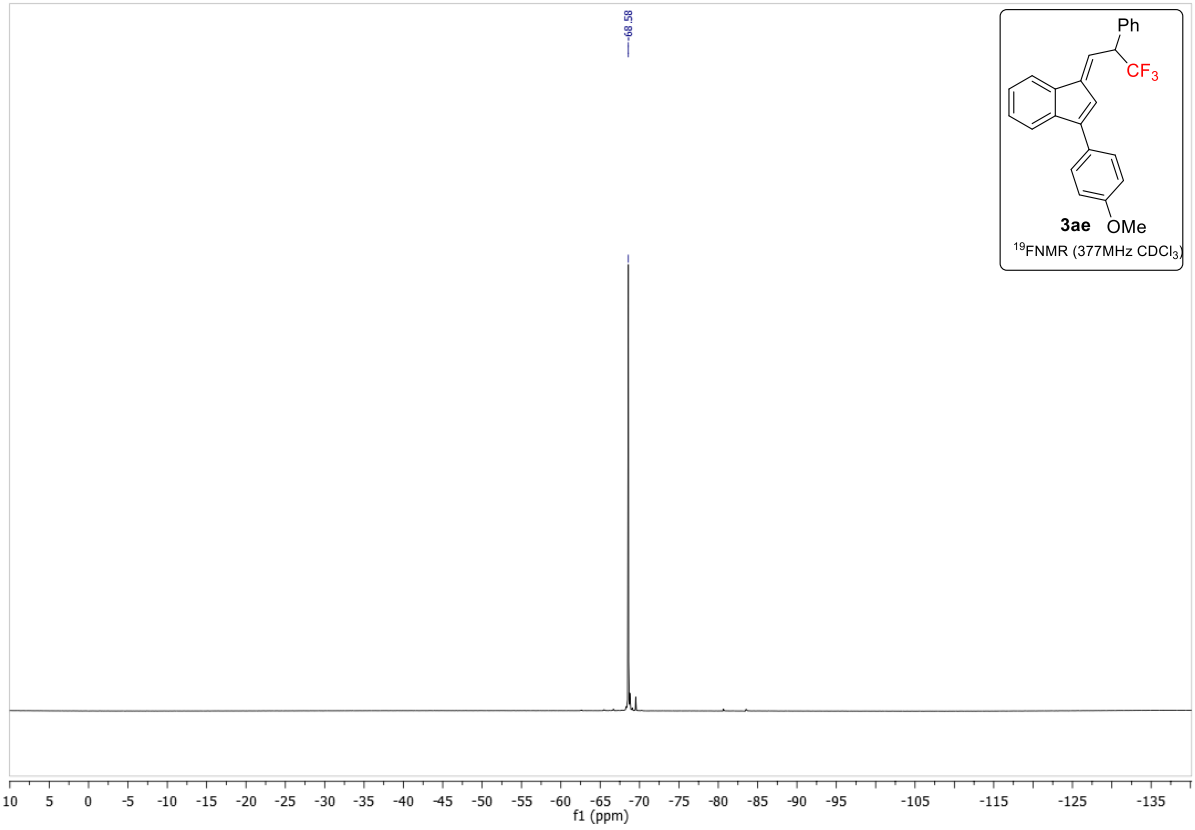

7.59
7.57
7.53
7.49
7.48
7.46
7.44
7.42
7.36
7.34
7.33
7.31
7.27
6.76
6.70
4.76
4.73
4.71
4.69
4.67
1.36
Ph
CF3
3ad
1HNMR (400MHz CDCl3)
0.90
2.95
3.90
5.01
0.92
0.86
0.99
8.97
f1 (ppm)

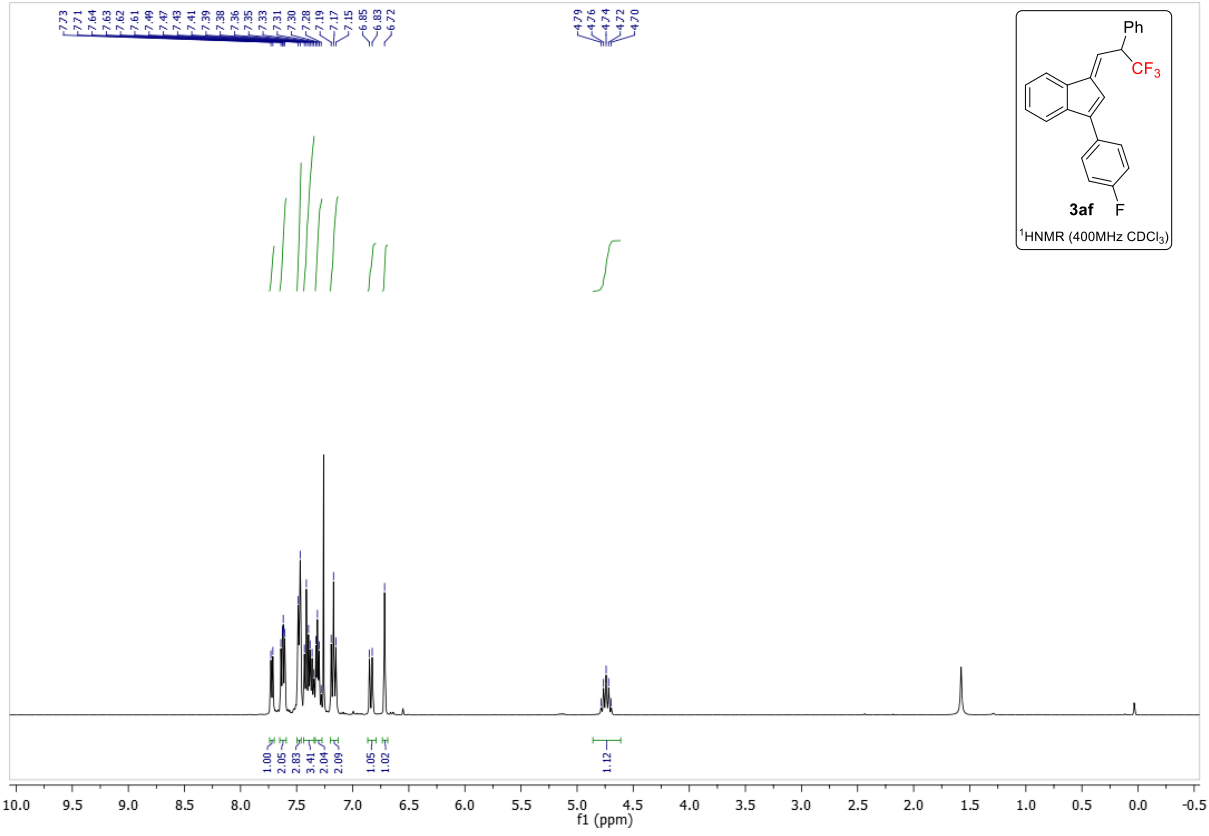

151.85
148.05
145.54
141.81
137.63
135.07
132.38
129.36
129.14
129.01
128.50
128.37
128.15
127.46
126.46
126.02
125.77
124.70
120.83
120.71
119.88
51.13
50.85
50.57
50.29
34.89
31.45
Ph
CF3
3ad
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

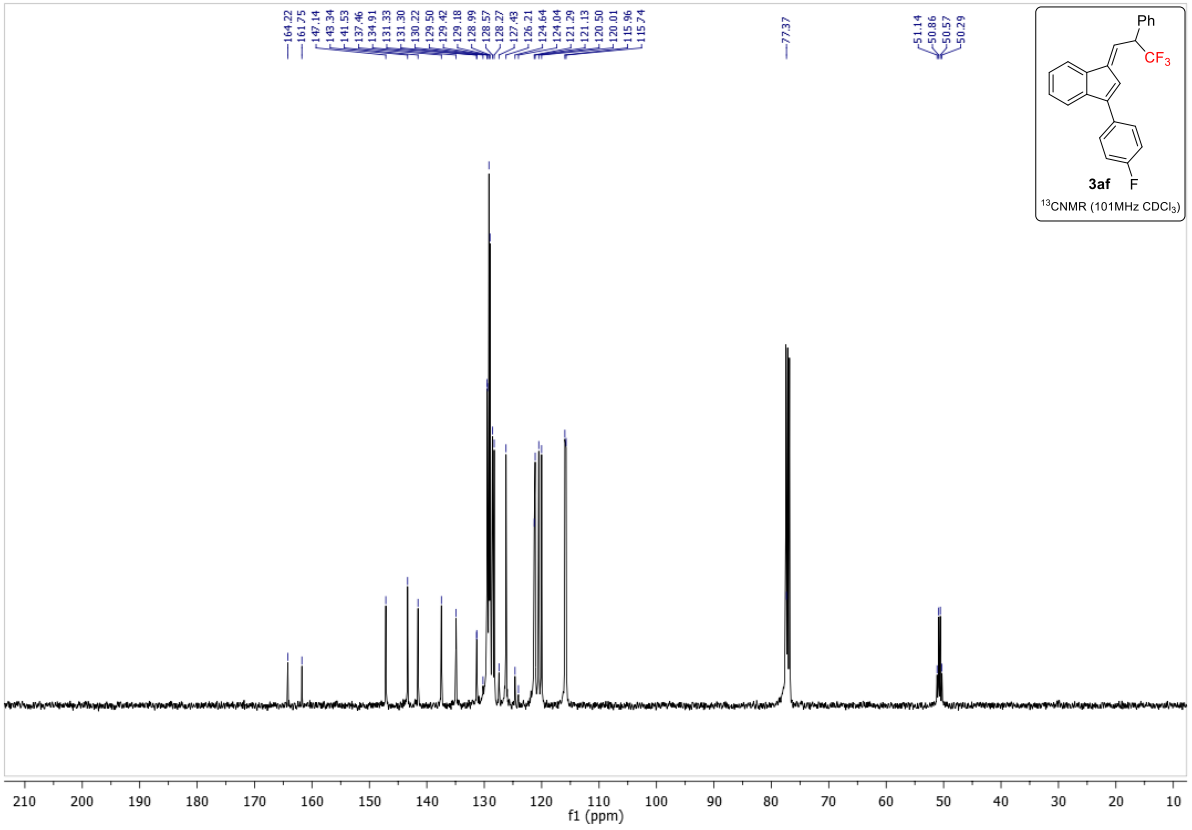

-68.56
Ph
CF3
3ad
19FNMR (377MHz CDCl3)
-10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -110 -120 -130 -140
f1 (ppm)

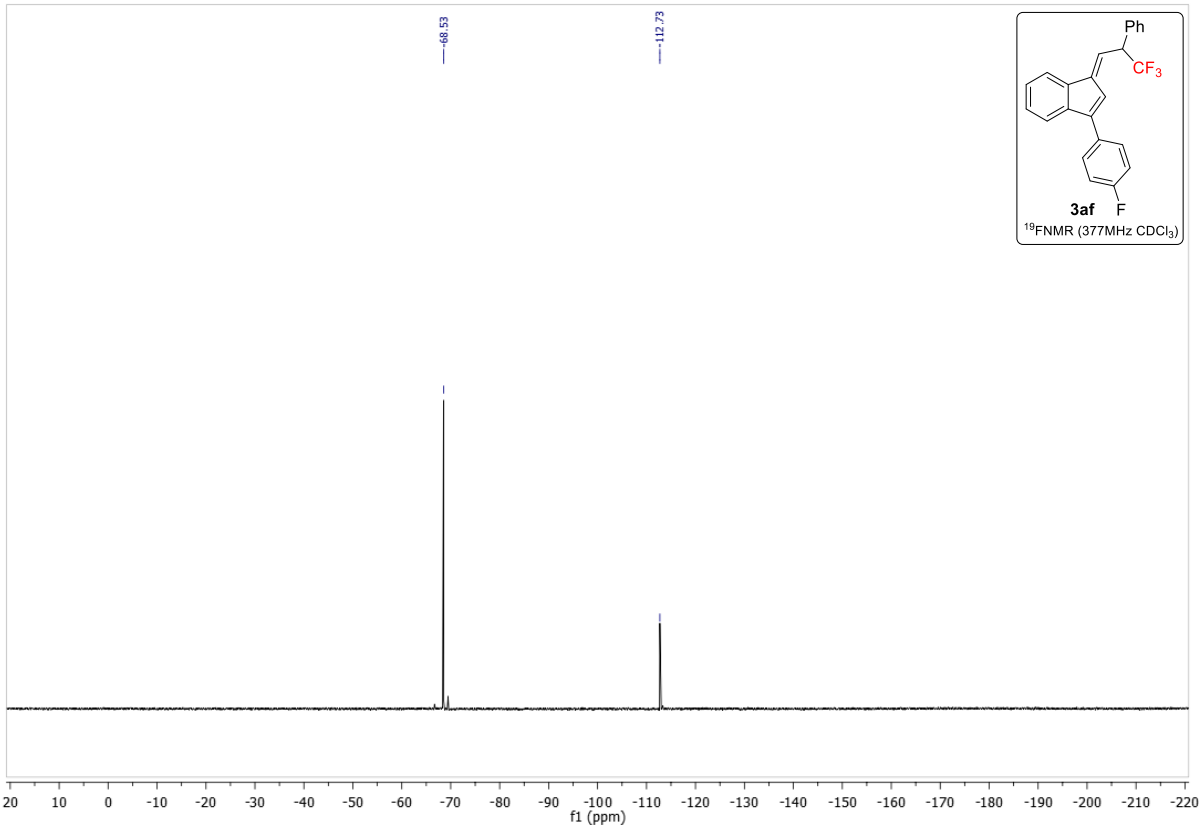

Ph
CF3
3ae OMe
1HNMR (400MHz CDCl3)
f1 (ppm)

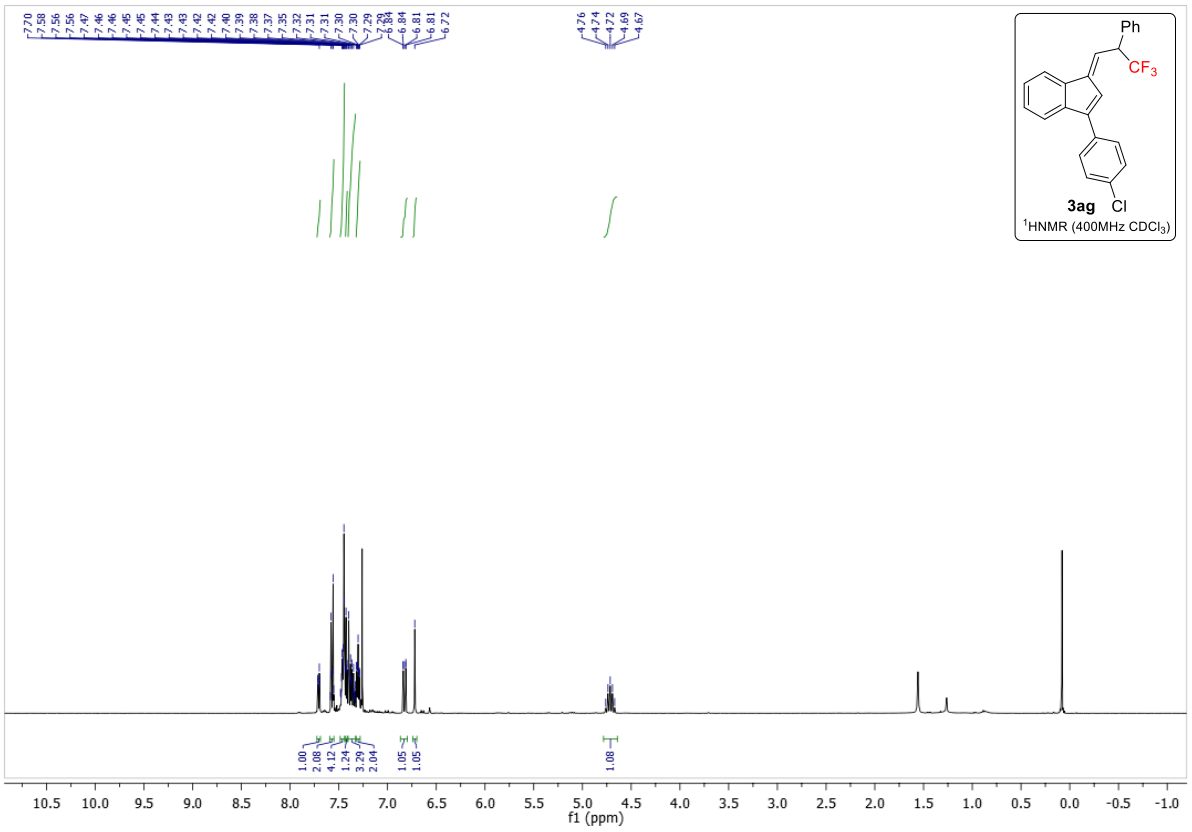

Ph
CF3
3ae OMe
13CNMR (101MHz CDCl3)
f1 (ppm)

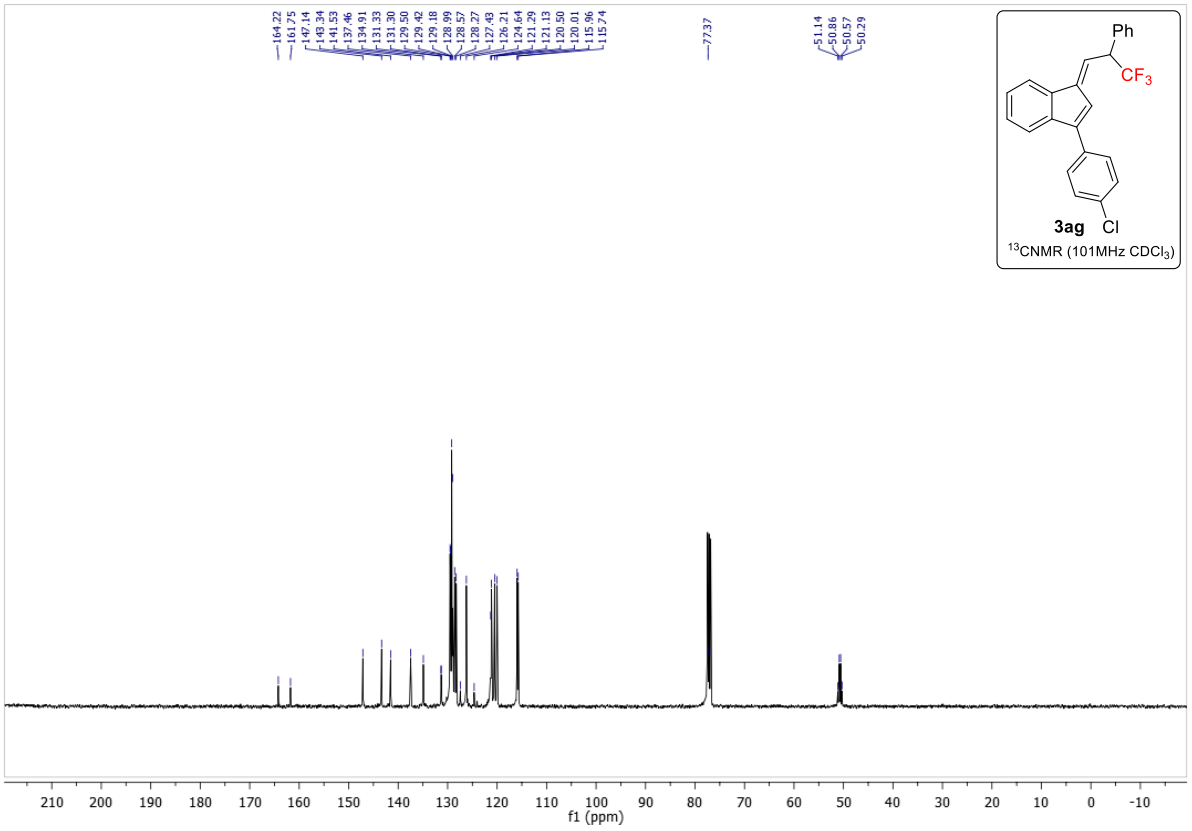

-68.58
Ph
CF3
OMe
3ae
19FNMR (377MHz CDCl3)
f1 (ppm)

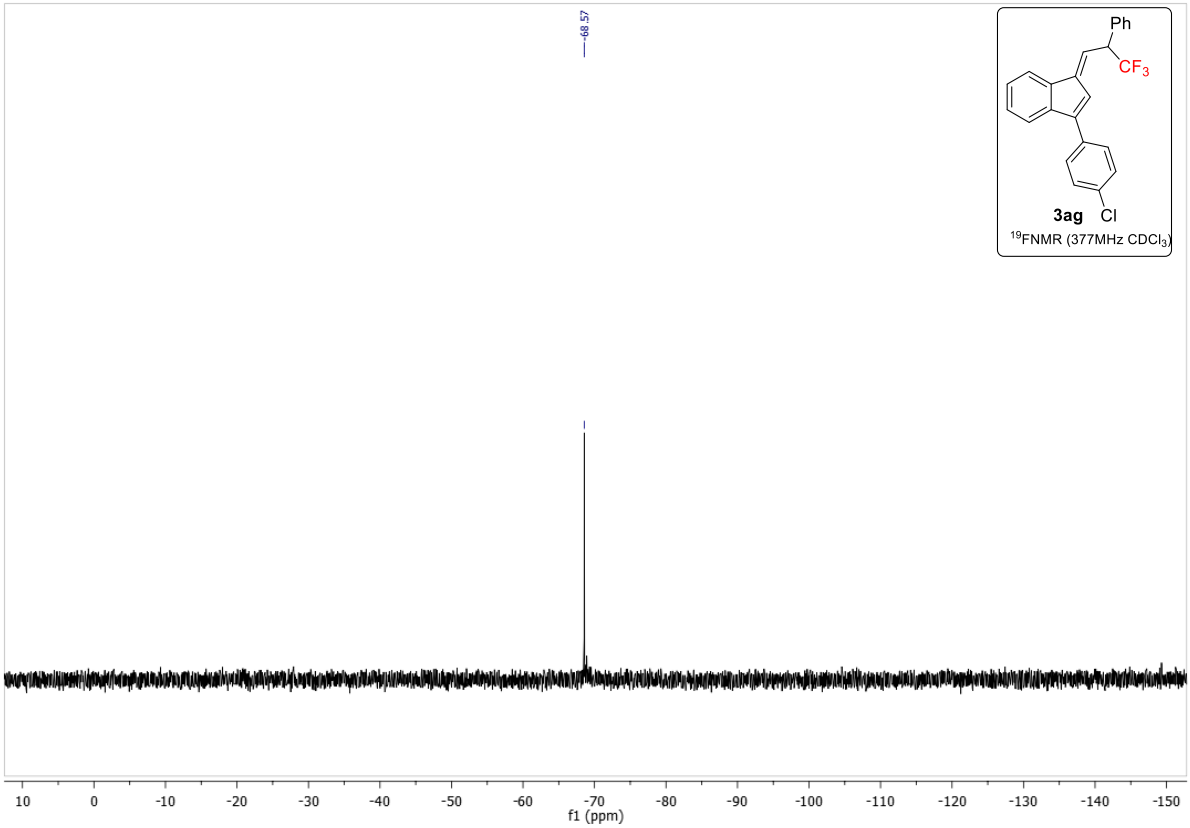

7.73
7.71
7.64
7.63
7.62
7.61
7.49
7.47
7.43
7.41
7.39
7.38
7.36
7.35
7.33
7.31
7.30
7.28
7.19
7.17
7.15
6.85
6.83
6.72
4.79
4.76
4.74
4.72
4.70
Ph
CF3
F
3af
1HNMR (400MHz CDCl3)
1.00
2.05
2.83
3.41
2.04
2.09
1.05
1.02
1.12
f1 (ppm)

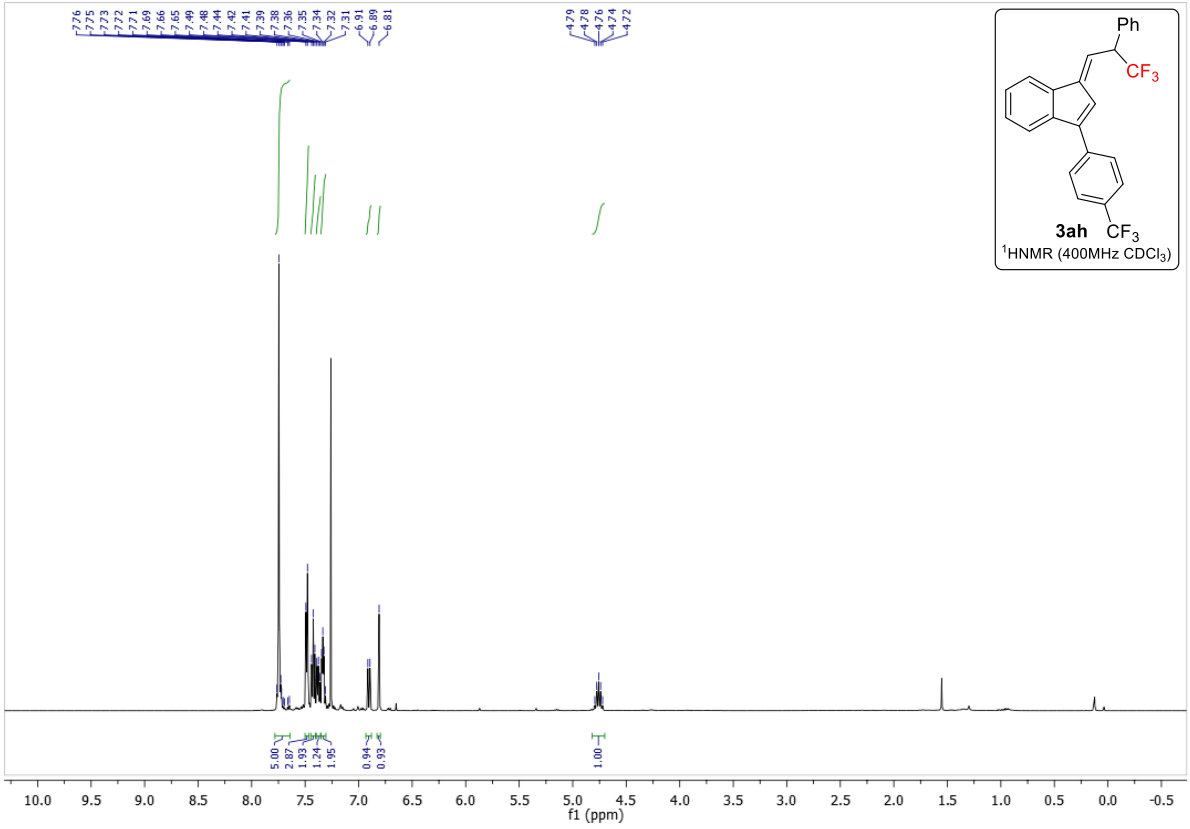

164.22
161.75
147.14
143.34
141.53
137.46
134.91
131.33
131.30
130.22
129.50
129.42
129.18
128.99
128.57
128.27
127.43
126.21
124.64
124.04
121.29
121.13
120.50
120.01
115.96
115.74
77.37
51.14
50.86
50.57
50.29
Ph
CF3
3af F
13CNMR (101MHz CDCl3)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

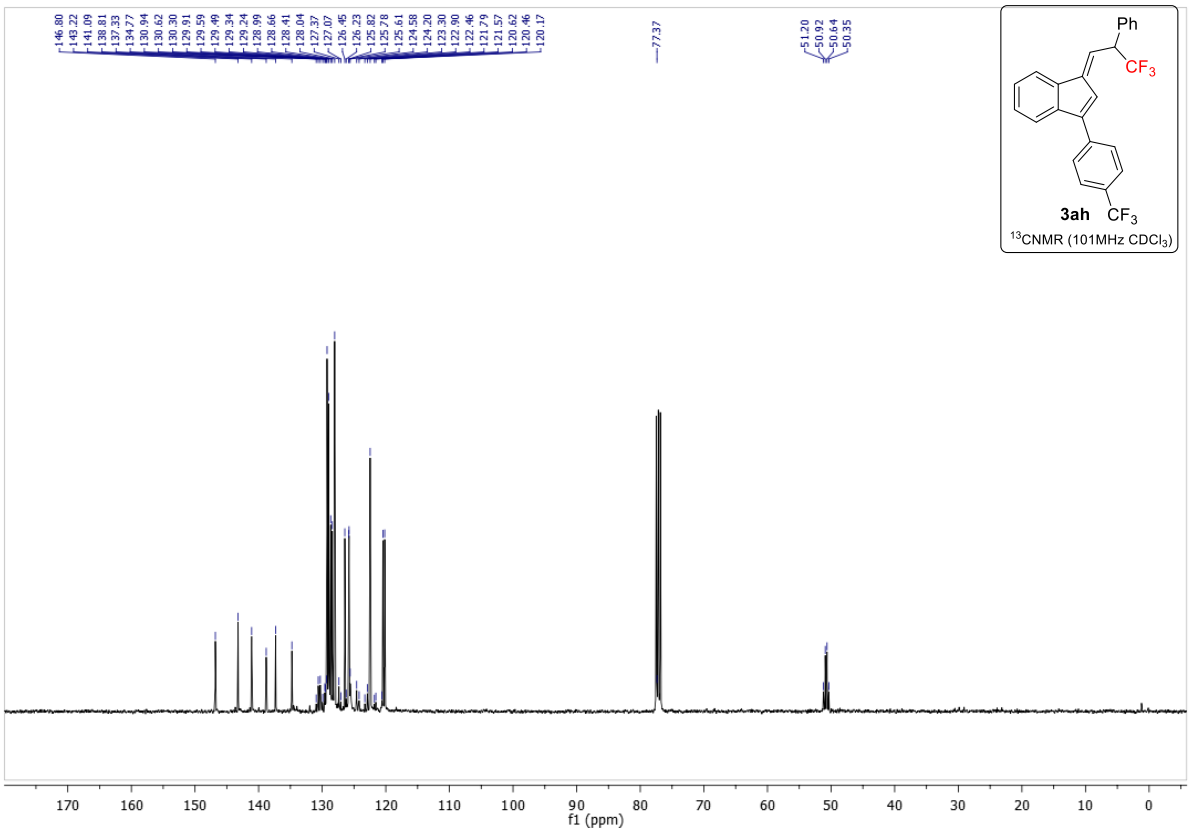

-68.53
-112.73
Ph
CF3
3af F
19FNMR (377MHz CDCl3)
20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

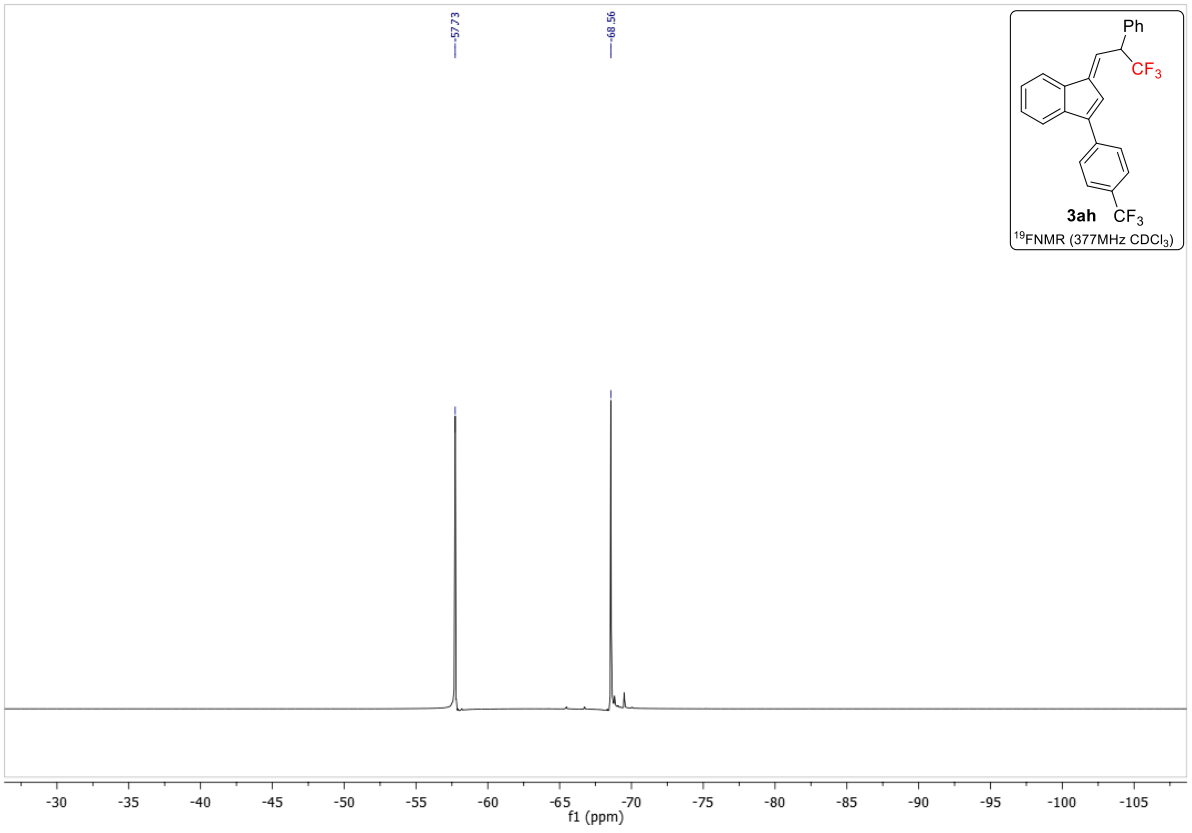

Ph
CF3
3ag Cl
1HNMR (400MHz CDCl3)
f1 (ppm)

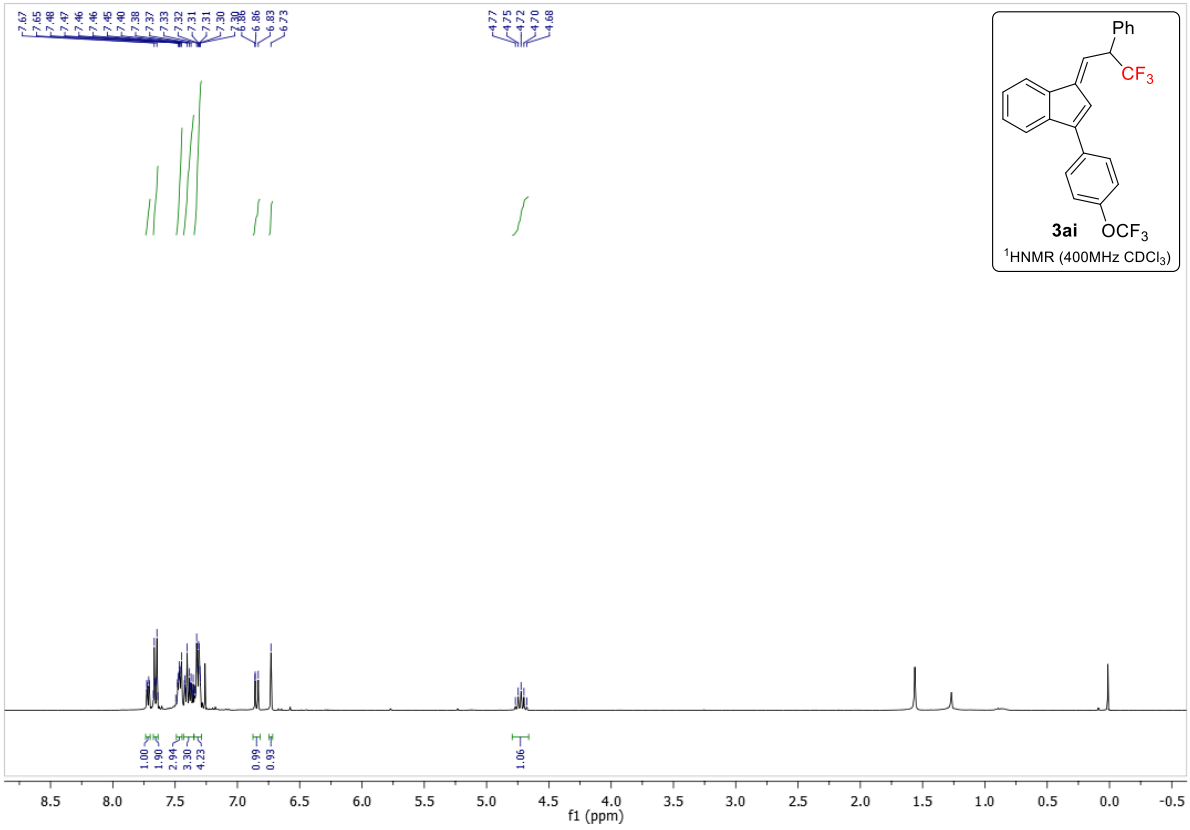

Ph
CF3
3ag Cl
13CNMR (101MHz CDCl3)
f1 (ppm)

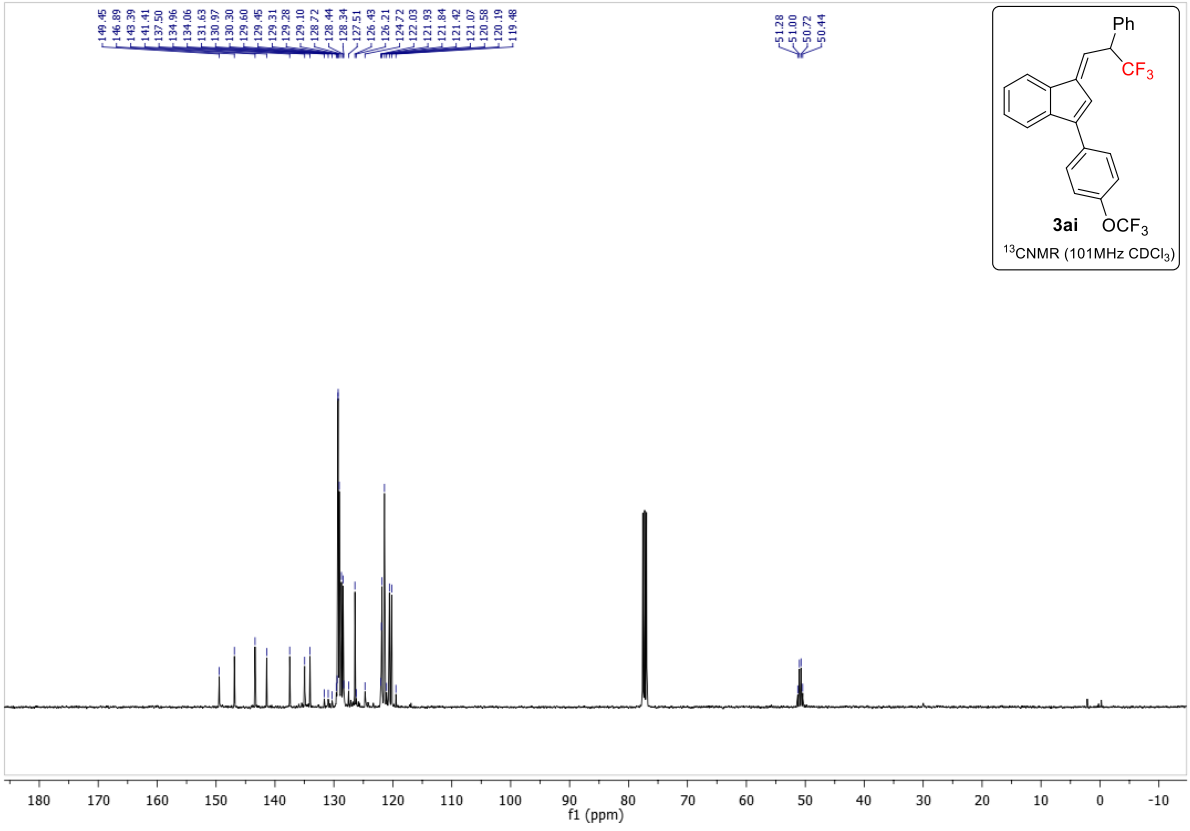

-68.57
Ph
CF3
3ag Cl
19FNMR (377MHz CDCl3)
f1 (ppm)

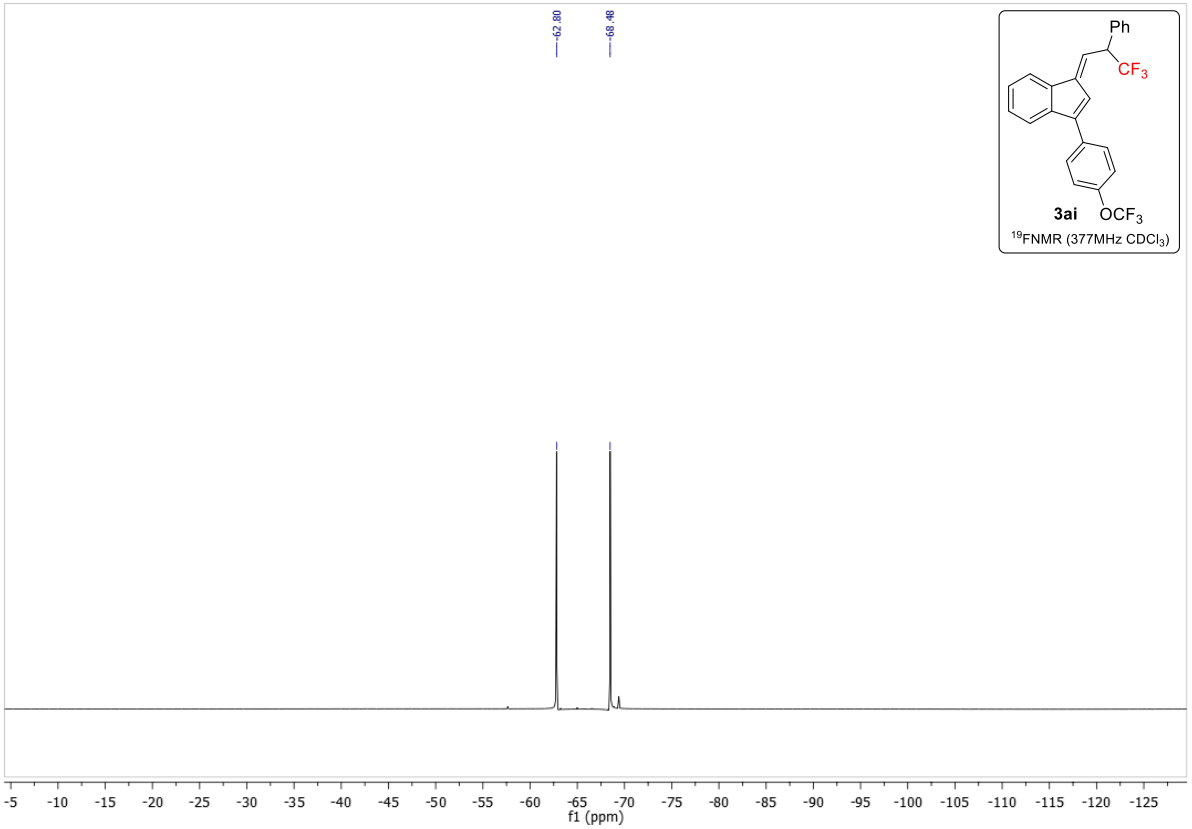

7.76
7.75
7.73
7.72
7.71
7.69
7.66
7.65
7.49
7.48
7.44
7.42
7.41
7.39
7.38
7.36
7.35
7.34
7.32
7.31
6.91
6.89
6.81
4.79
4.78
4.76
4.74
4.72
Ph
CF3
3ah CF3
1HNMR (400MHz CDCl3)
5.00
2.87
1.93
1.24
1.95
0.94
0.93
1.00
f1 (ppm)

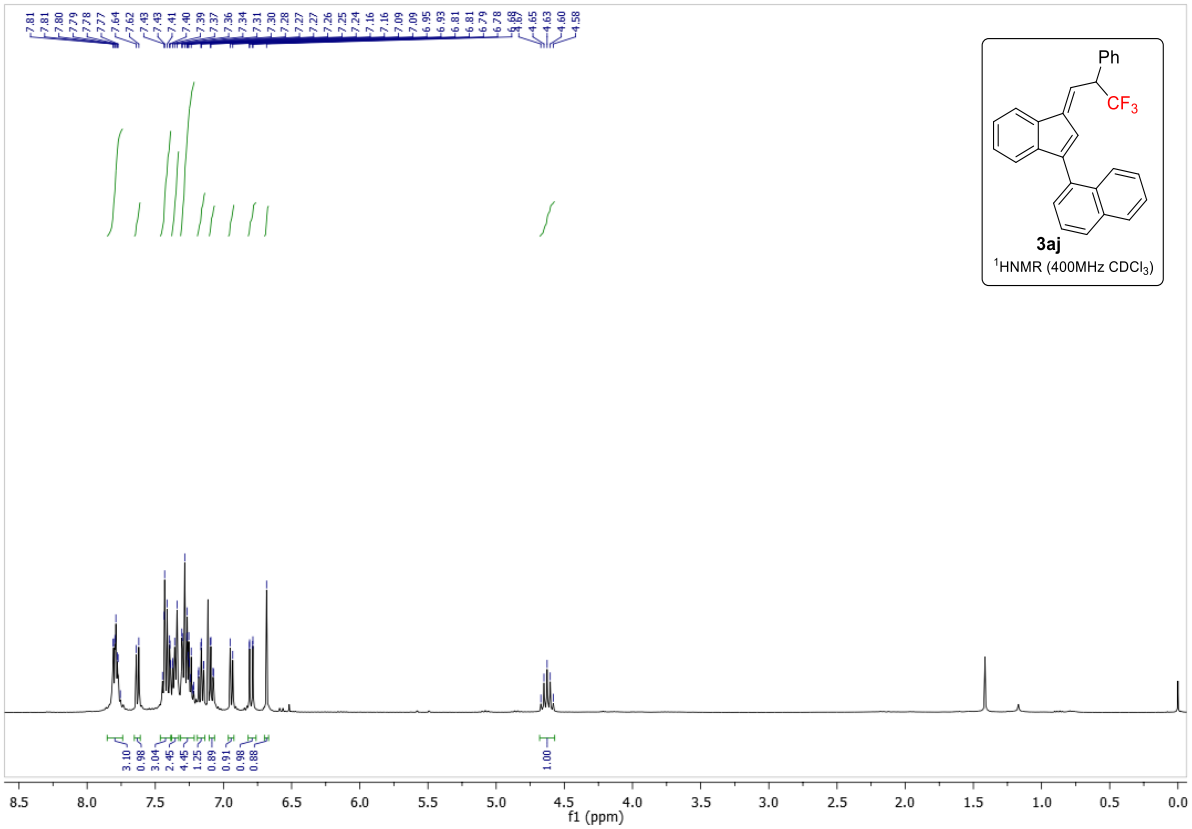

146.80
143.22
141.09
138.81
137.33
134.77
130.94
130.62
130.30
129.91
129.59
129.49
129.34
129.24
128.99
128.66
128.41
128.04
127.37
127.07
126.45
126.23
125.82
125.78
125.61
124.58
124.20
123.30
122.90
122.46
121.79
121.57
120.62
120.46
120.17
77.37
51.20
50.92
50.64
50.35
Ph
CF3
3ah CF3
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

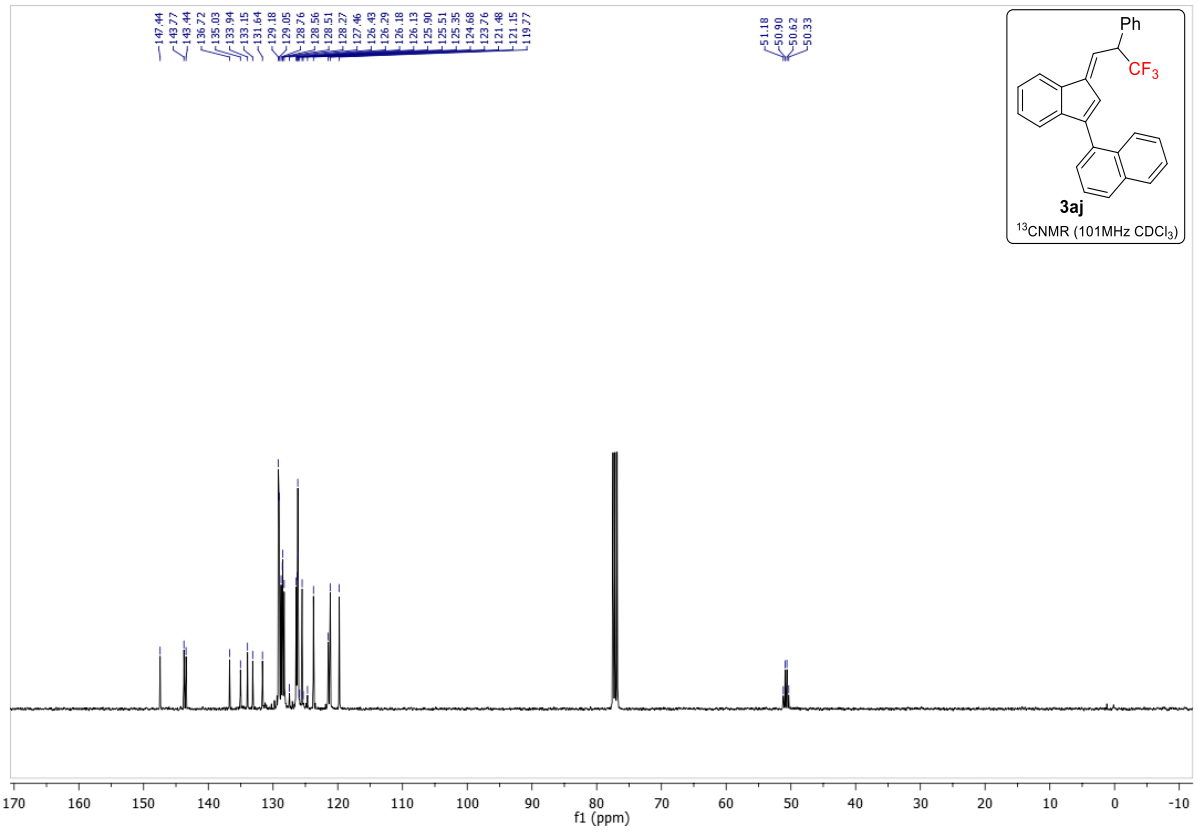

-57.73
-68.56
Ph
CF3
3ah CF3
19FNMR (377MHz CDCl3)
-30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105
f1 (ppm)

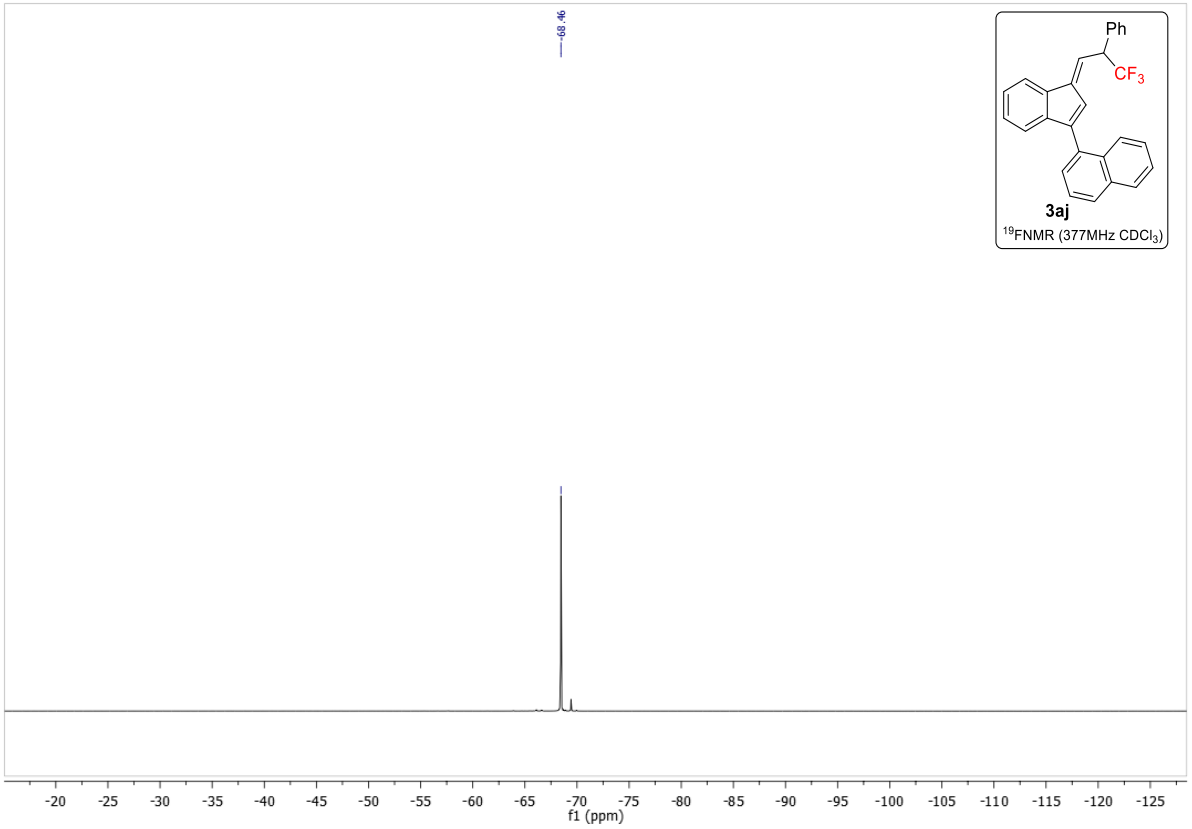

Ph
CF3
3ai
OCF3
1HNMR (400MHz CDCl3)
f1 (ppm)

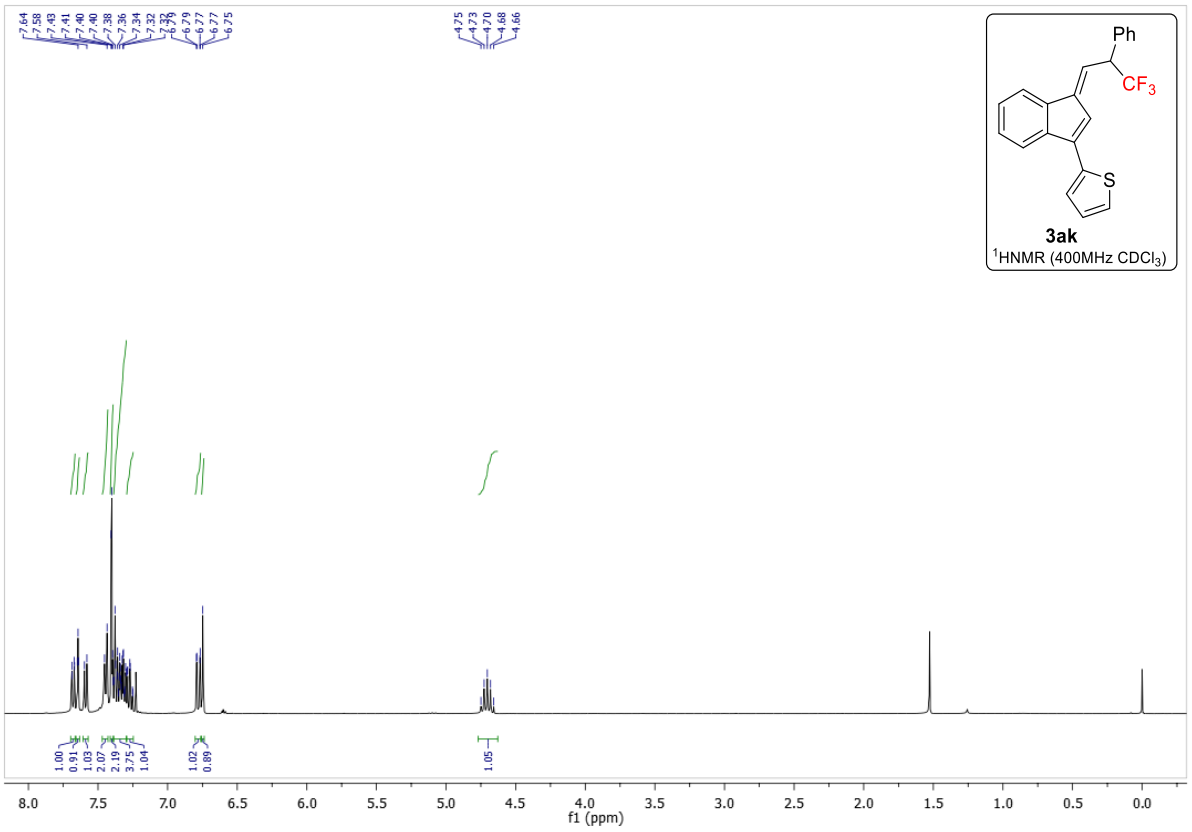

Ph
CF3
3ai
OCF3
13CNMR (101MHz CDCl3)
f1 (ppm)

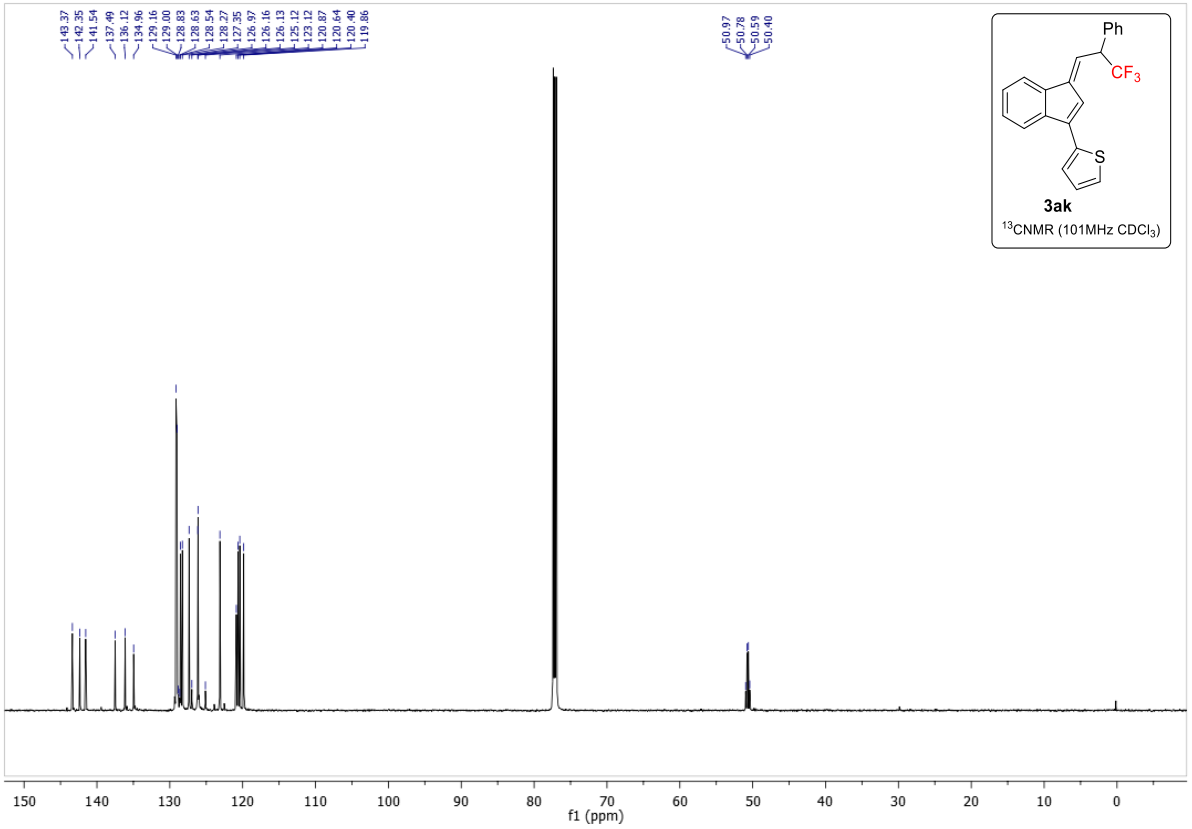

-62.80
-68.48
Ph
CF3
3ai
OCF3
19FNMR (377MHz CDCl3)
f1 (ppm)

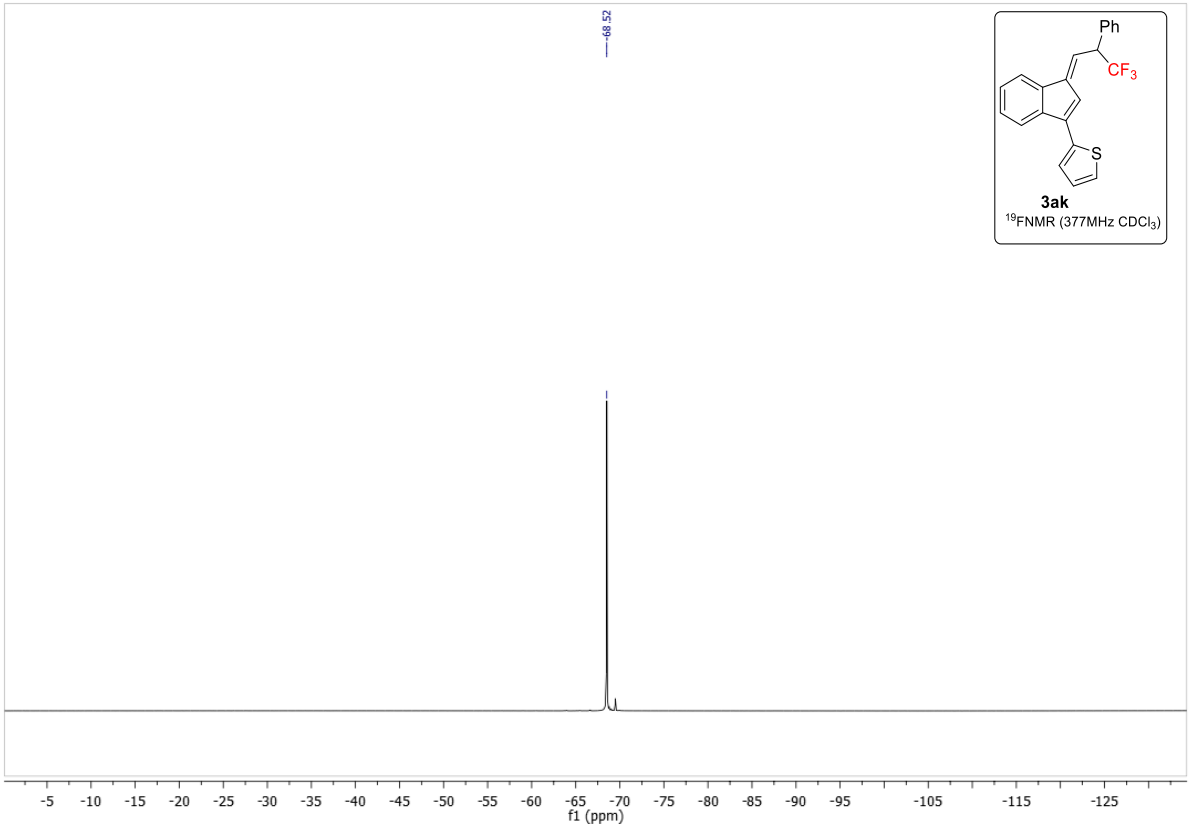

Ph
CF3
3aj
1HNMR (400MHz CDCl3)
f1 (ppm)

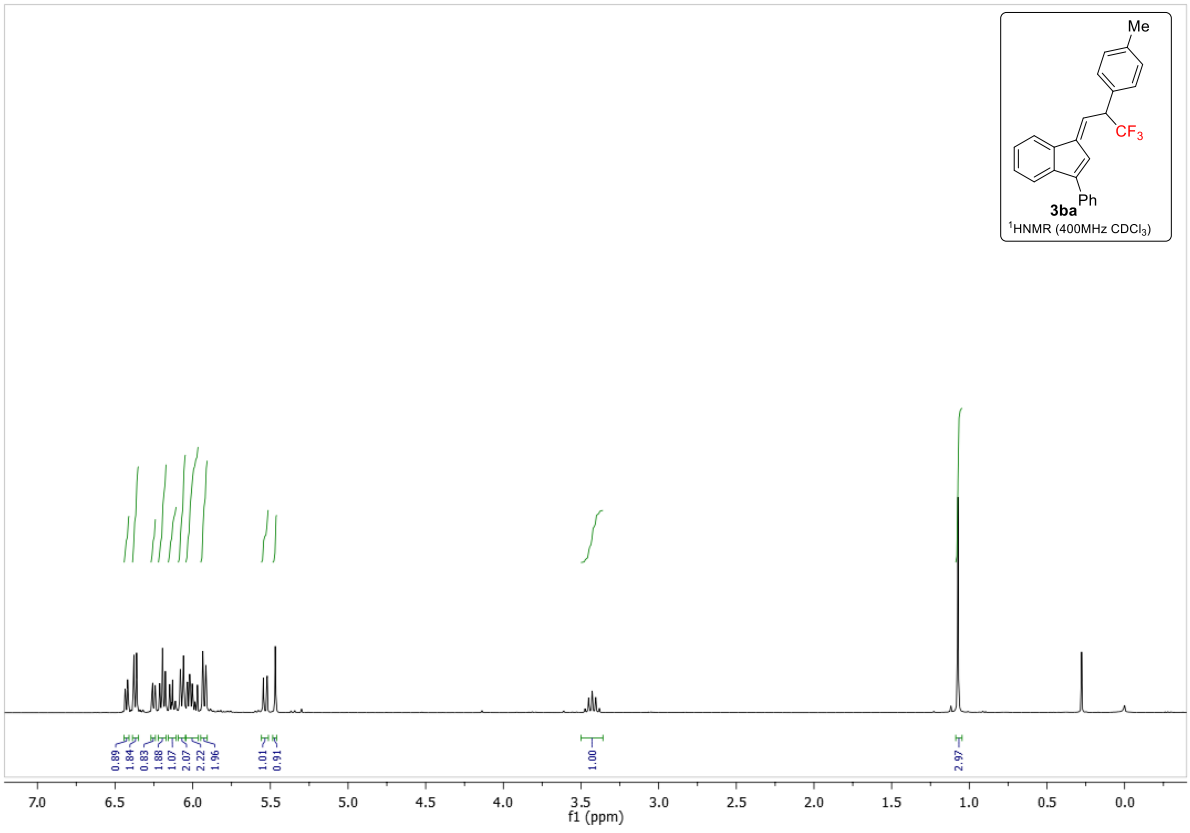

147.44
143.77
143.44
136.72
135.03
133.94
133.15
131.64
129.18
129.05
128.76
128.56
128.51
128.27
127.46
126.43
126.29
126.18
126.13
125.90
125.51
125.35
124.68
123.76
121.48
121.15
119.77
51.18
50.90
50.62
50.33
Ph
CF3
3aj
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

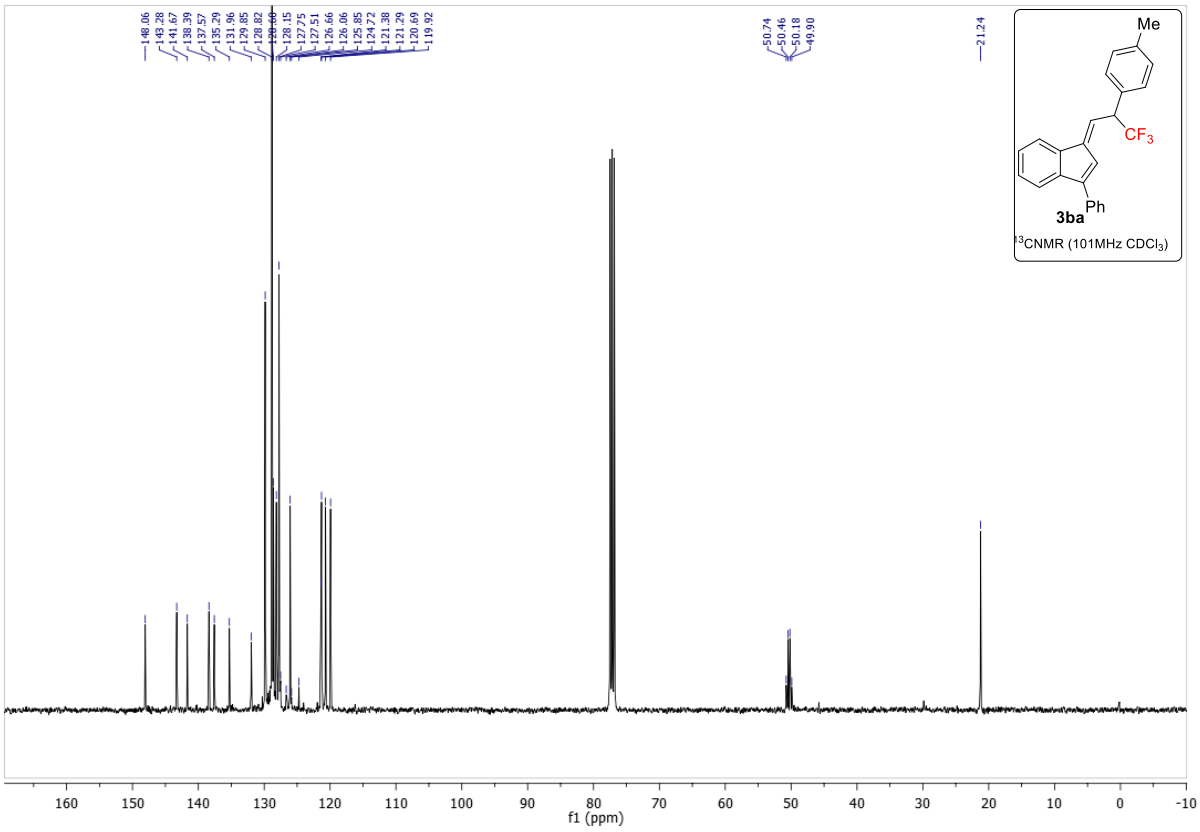

-68.46
Ph
CF3
3aj
19FNMR (377MHz CDCl3)
-20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125
f1 (ppm)

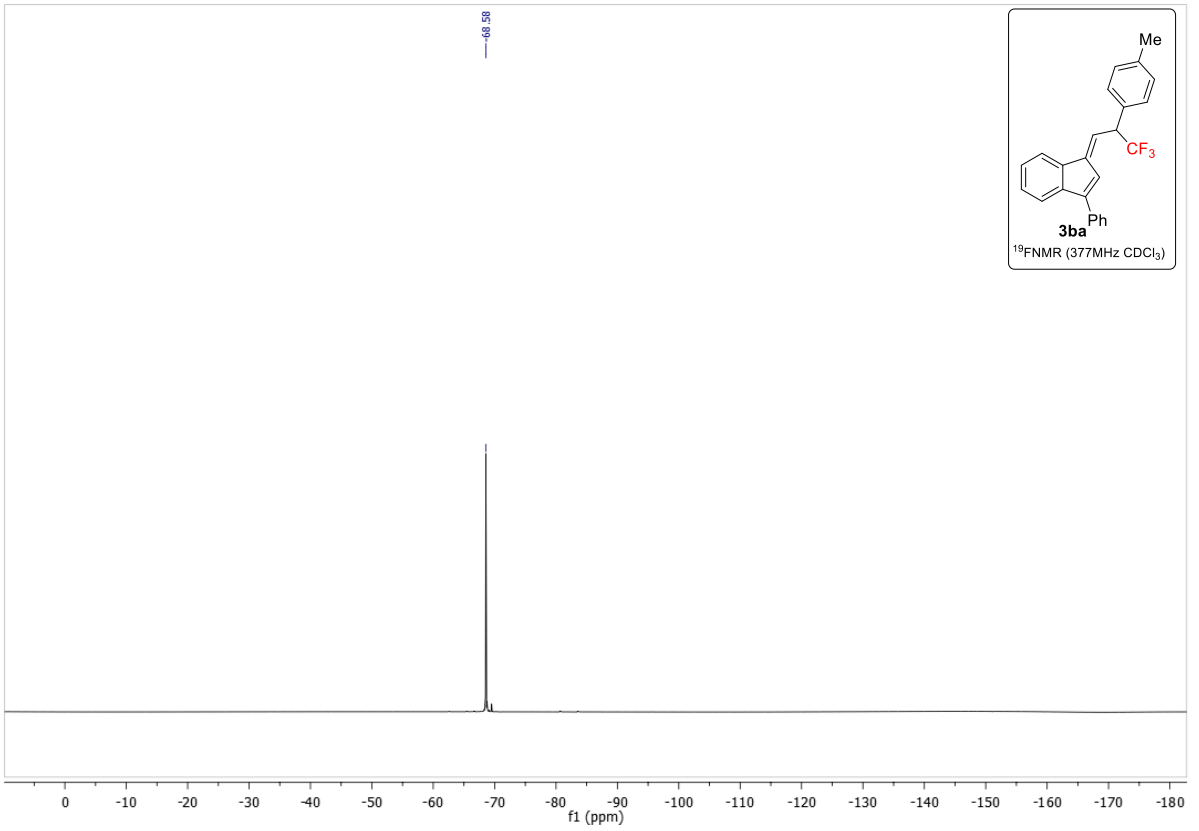

Ph
CF3
S
3ak
1HNMR (400MHz CDCl3)
f1 (ppm)

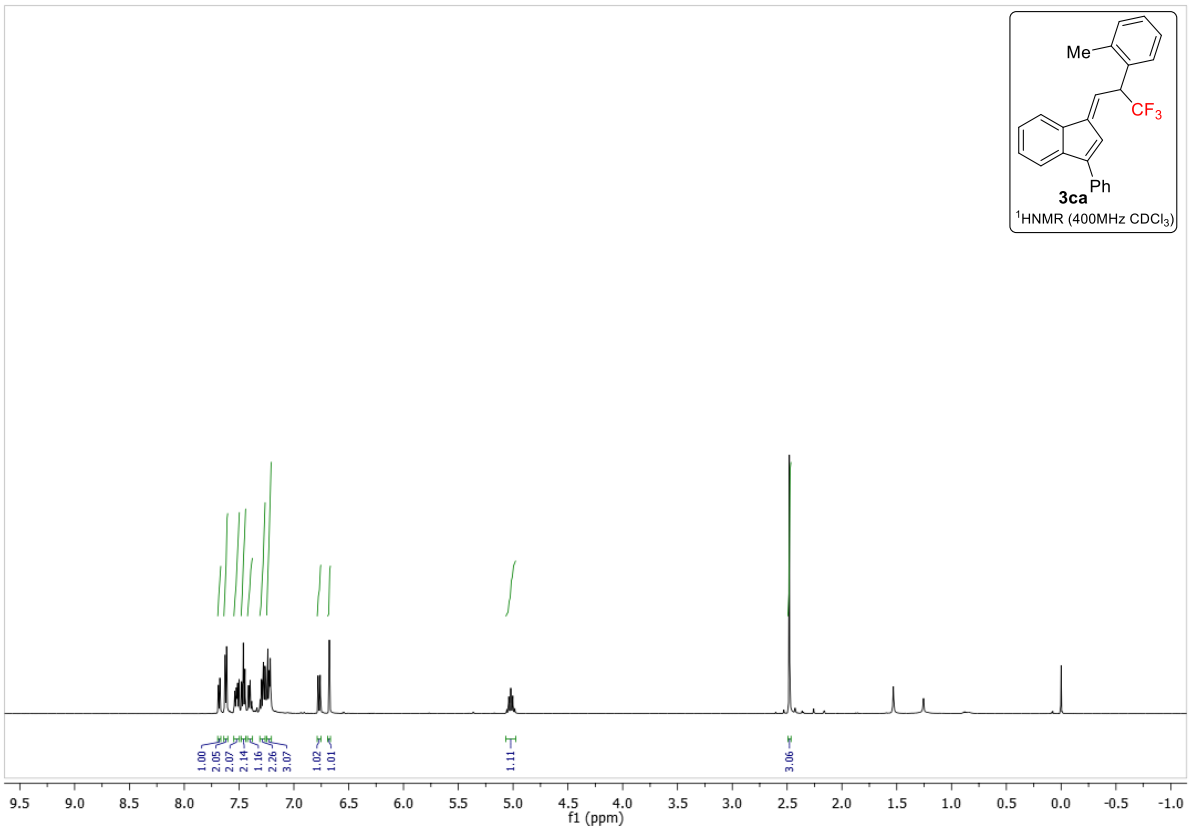

Ph
CF3
S
3ak
13CNMR (101MHz CDCl3)
f1 (ppm)

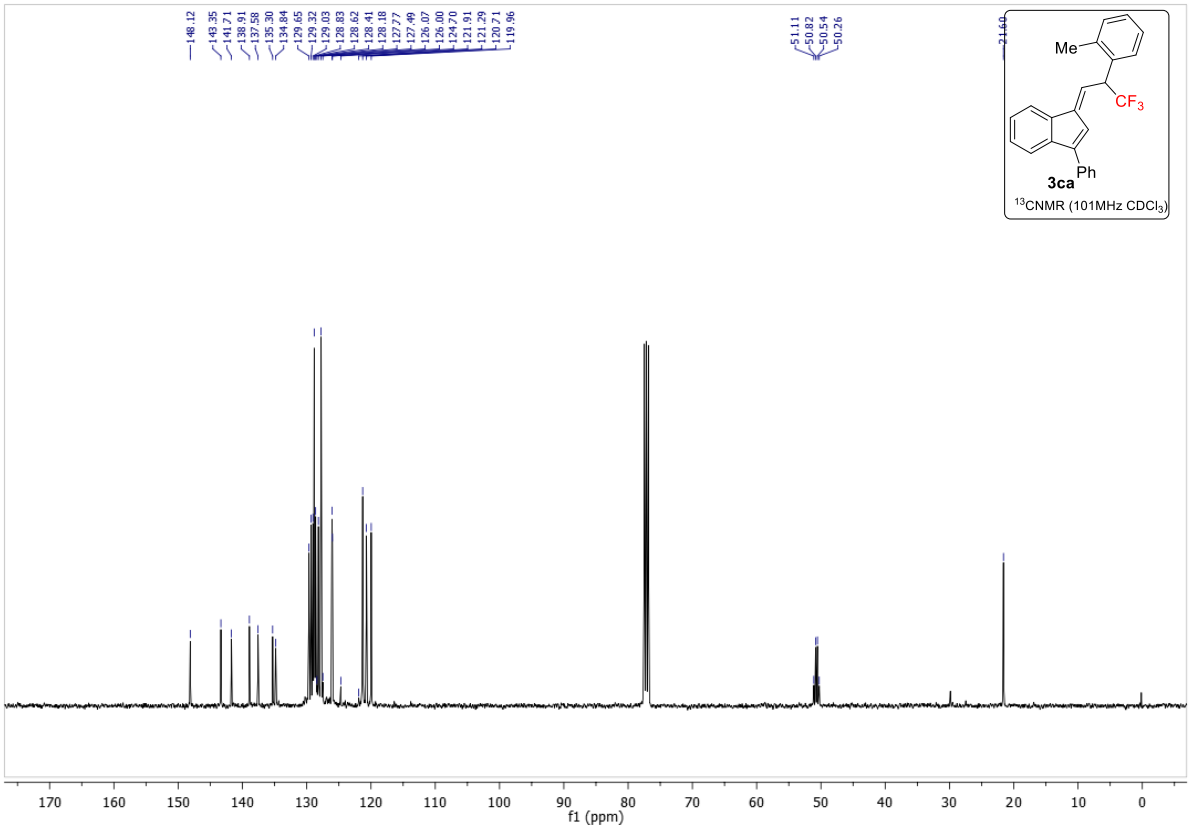

-68.52
Ph
CF3
S
3ak
19FNMR (377MHz CDCl3)
-5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -105 -115 -125
f1 (ppm)


Me
CF3
Ph
3ba
1HNMR (400MHz CDCl3)
0.89 1.84 0.83 1.88 1.07 2.07 2.22 1.96 1.01 0.91 1.00 2.97
7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


148.06
143.28
141.67
138.39
137.57
135.29
131.96
129.85
128.82
128.68
128.15
127.75
127.51
126.66
126.06
125.85
124.72
121.38
121.29
120.69
119.92
50.74
50.46
50.18
49.90
21.24
Me
CF3
Ph
3ba
13CNMR (101MHz CDCl3)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)


-68.58
Me
CF3
Ph
3ba
19FNMR (377MHz CDCl3)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
-170
-180
f1 (ppm)


Me
CF3
Ph
3ca
1HNMR (400MHz CDCl3)
1.00
2.05
2.07
2.14
1.16
2.26
3.07
1.02
1.01
1.11
3.06
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)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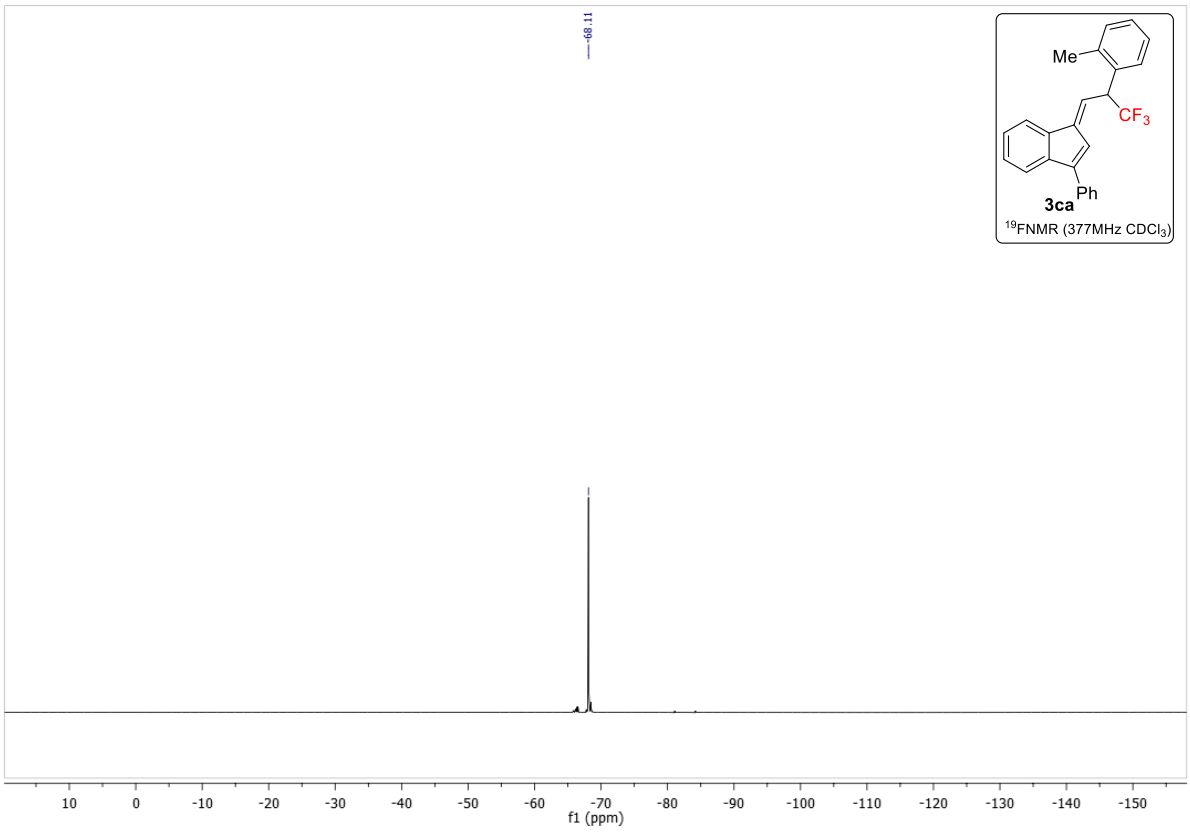
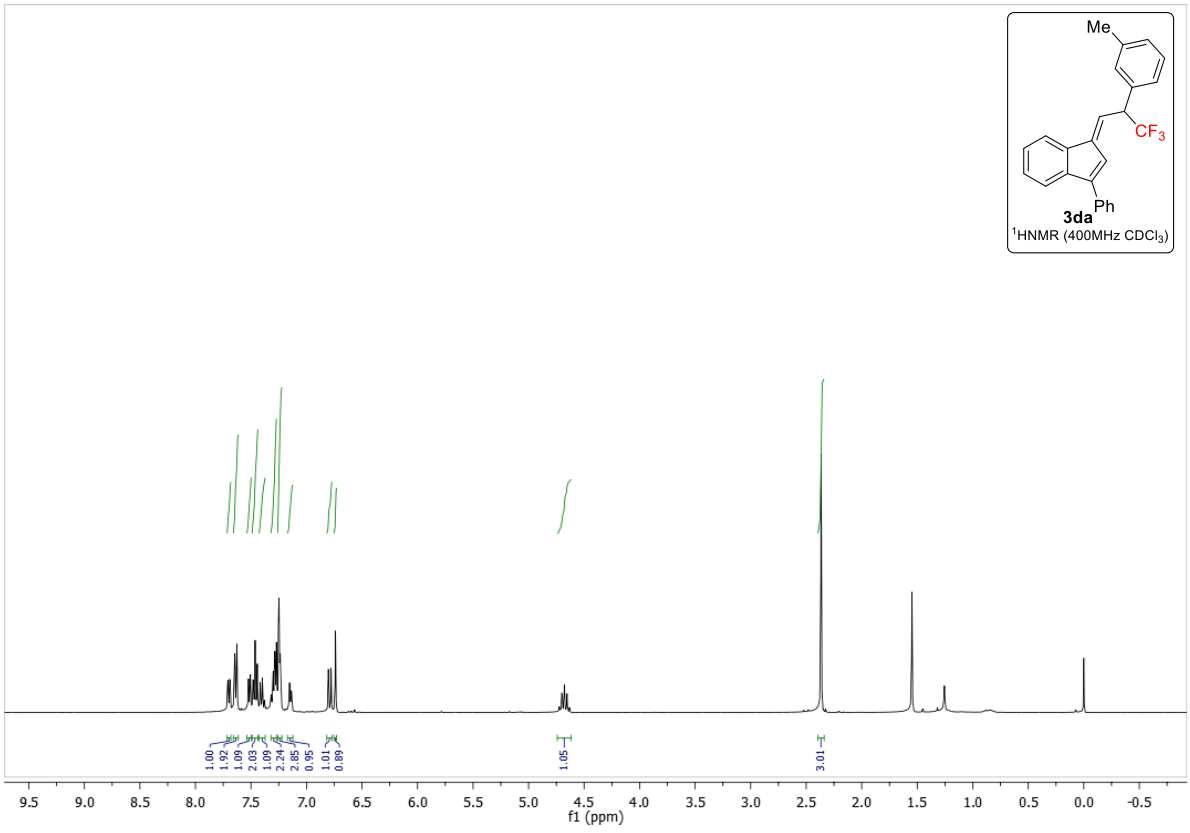
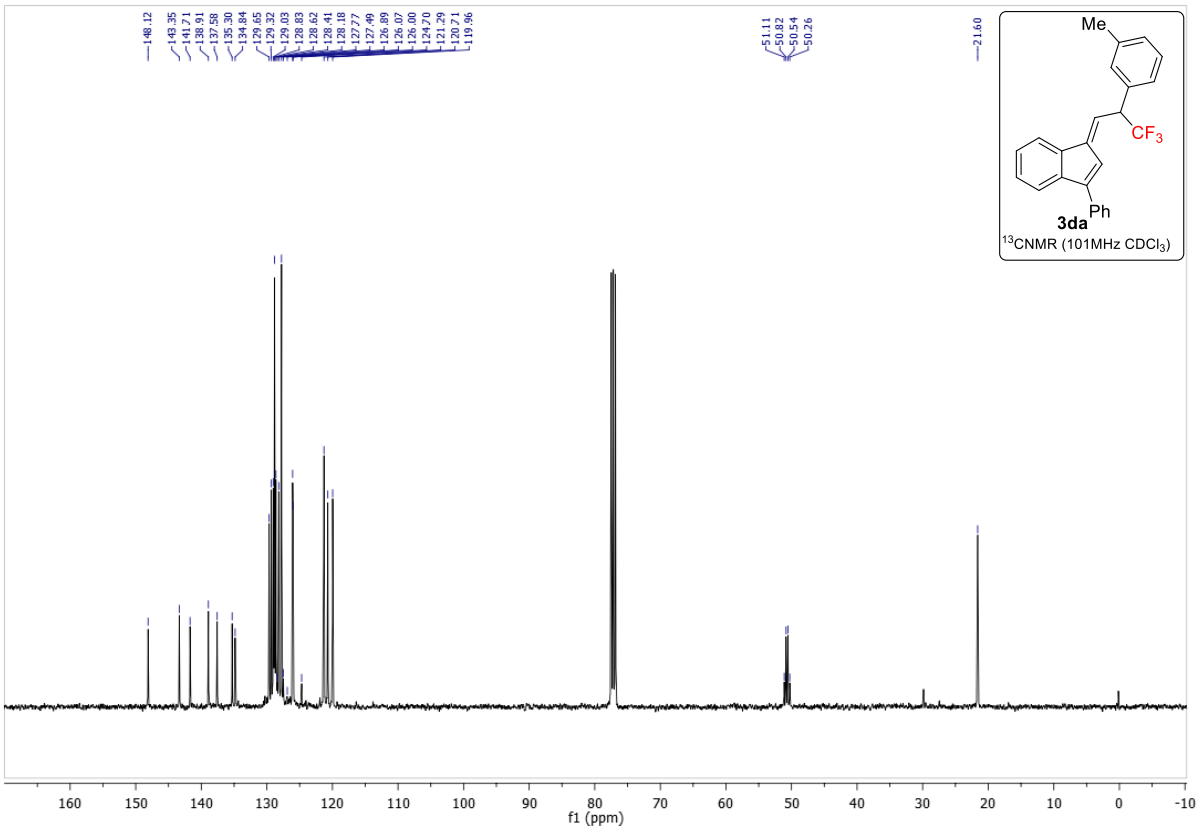
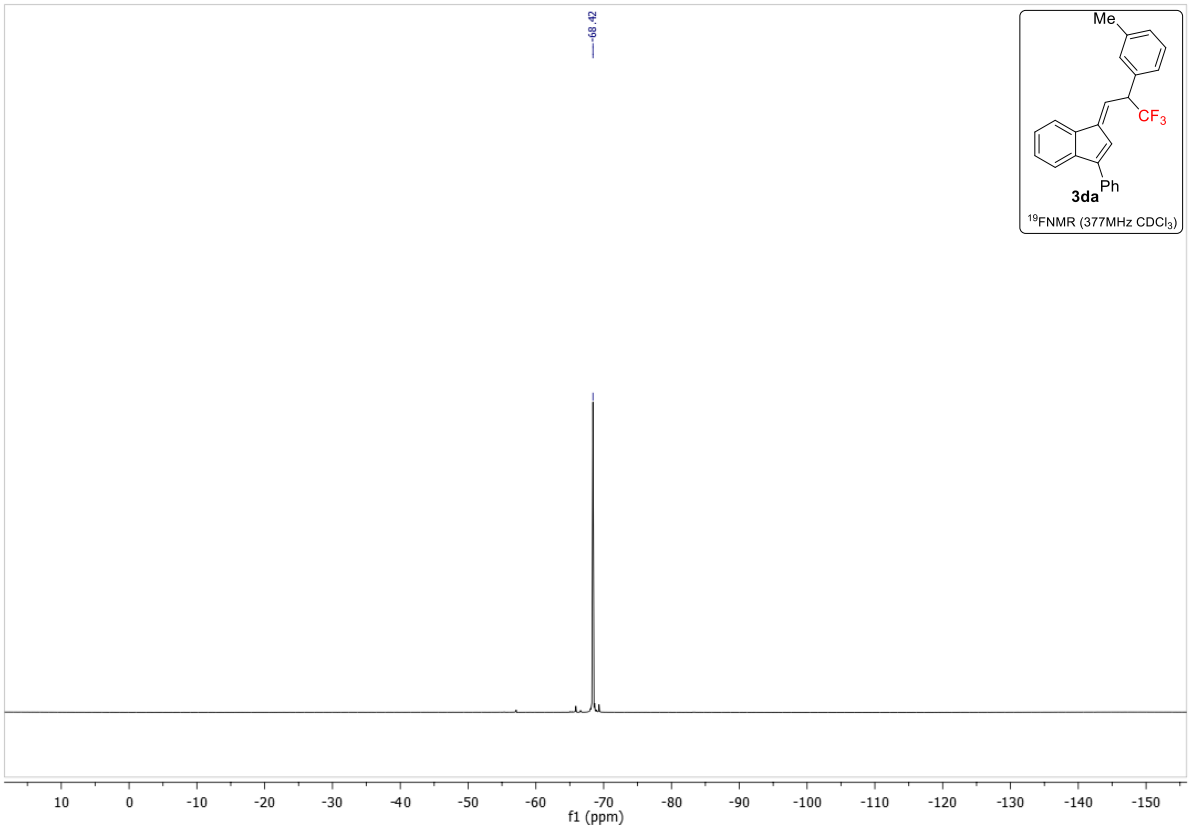
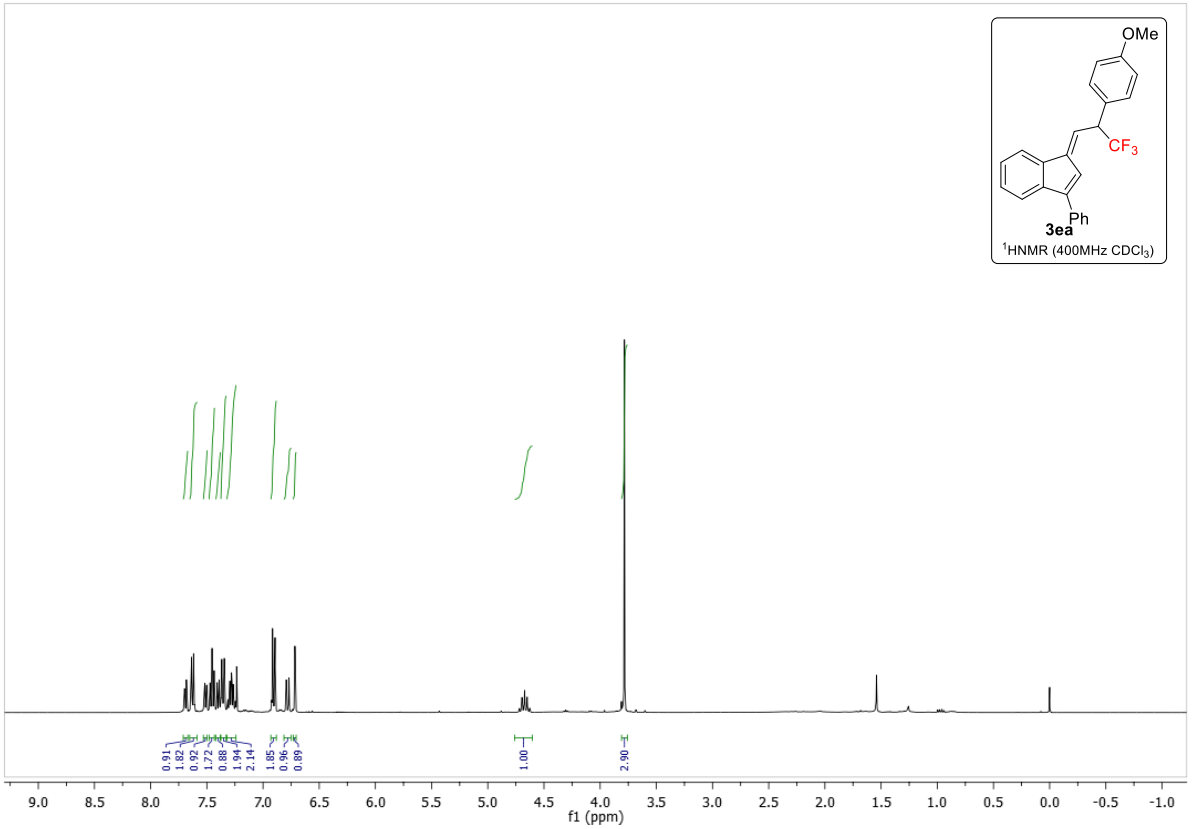
143.35
141.71
138.91
137.58
135.30
134.84
129.65
129.32
129.03
128.83
128.62
128.41
128.18
127.77
127.49
126.07
126.00
124.70
121.91
121.29
120.71
119.96
51.11
50.82
50.54
50.26
21.60
Me
CF3
Ph
3ca
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

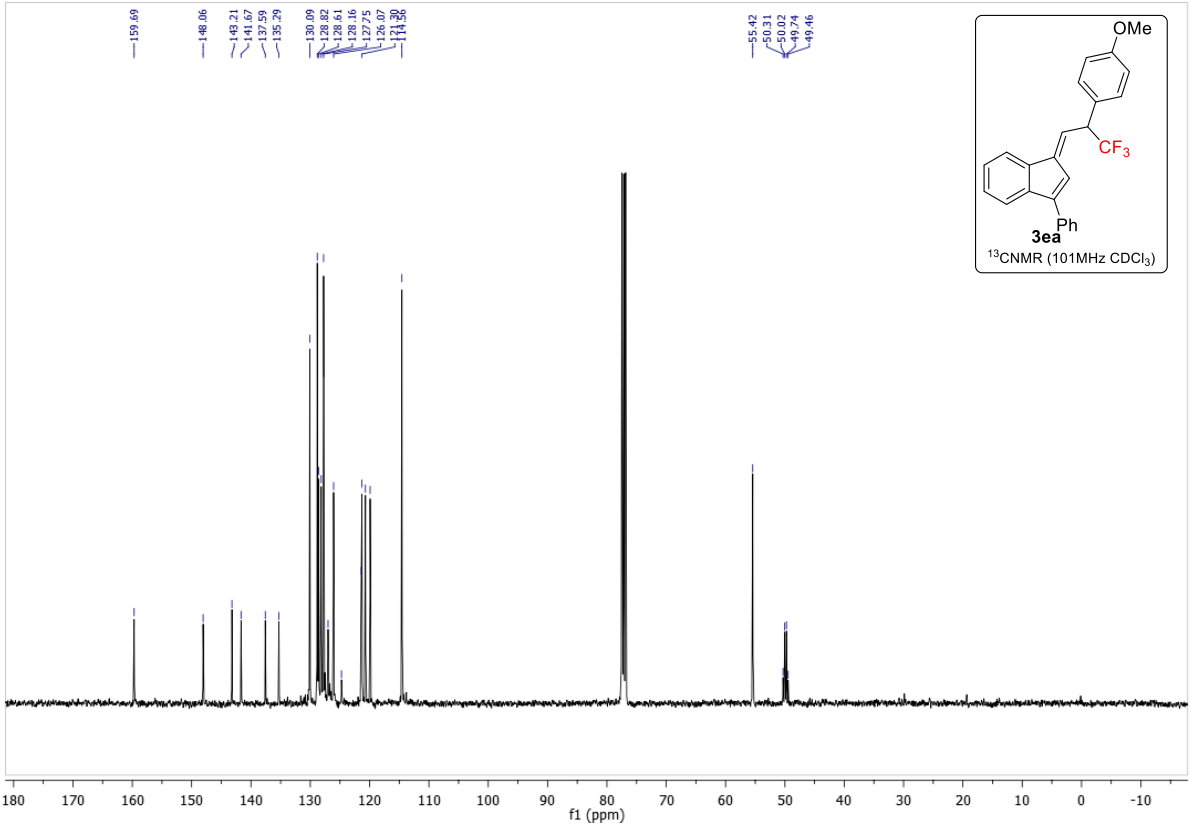

-68.11
Me
CF3
Ph
3ca
19FNMR (377MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150
f1 (ppm)

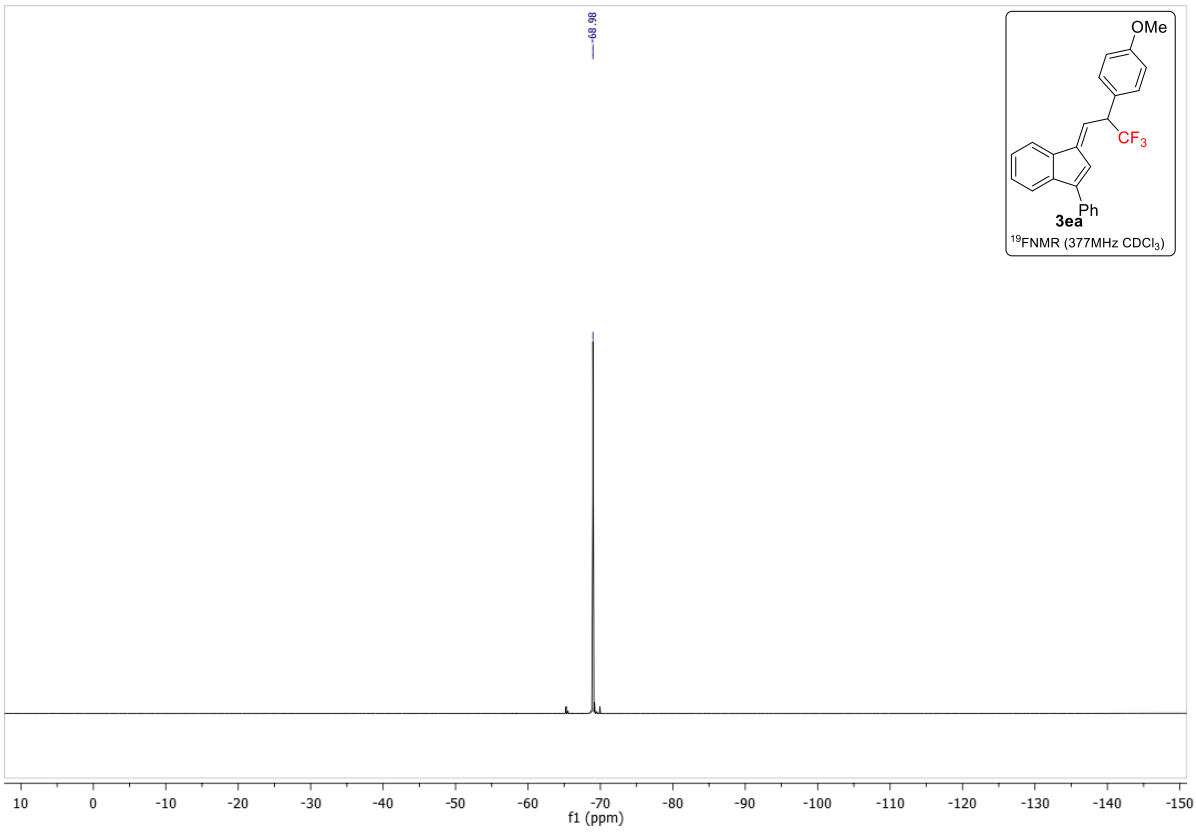

Me
CF3
Ph
3da
1HNMR (400MHz CDCl3)
1.00 1.92 1.09 2.03 1.09 2.24 2.85 0.95 1.01 0.89
1.05
3.01
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

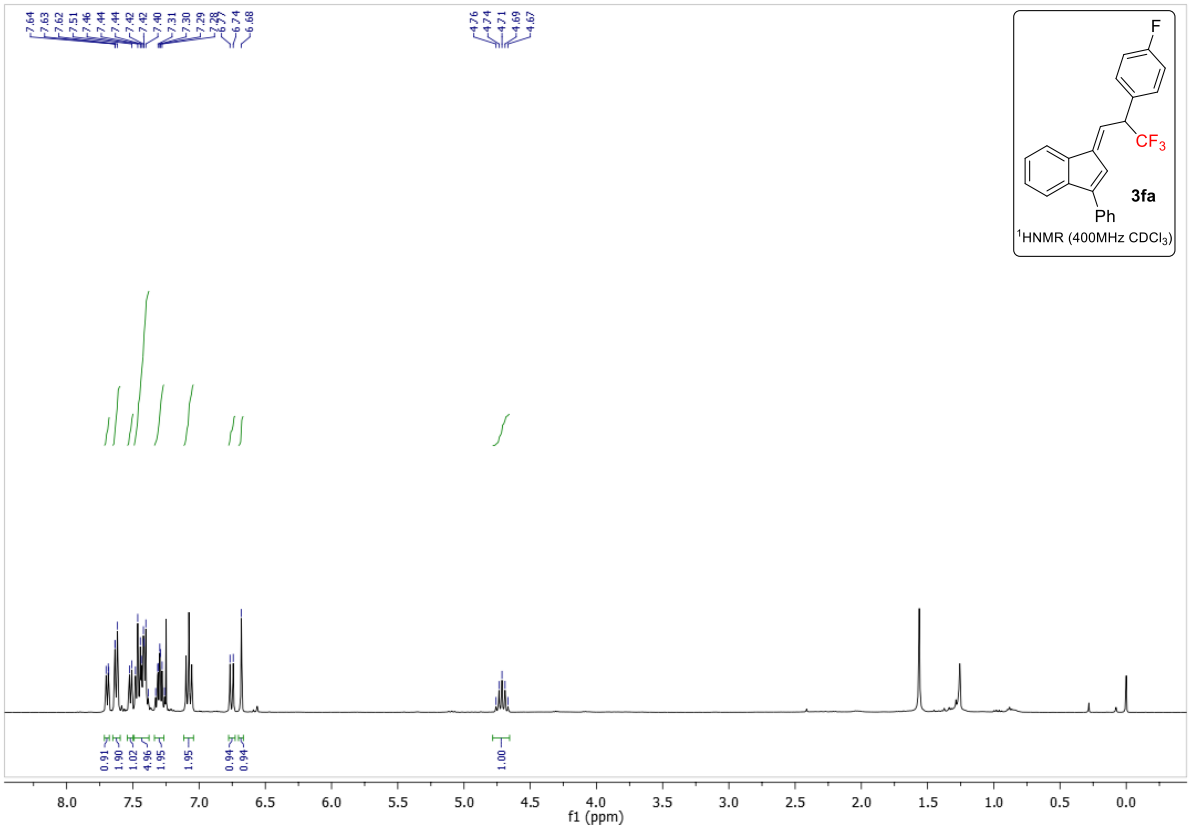

148.12
143.35
141.71
138.91
137.58
135.30
134.84
129.65
129.32
129.03
128.83
128.62
128.41
128.18
127.77
127.49
126.89
126.07
126.00
124.70
121.29
120.71
119.96
51.11
50.82
50.54
50.26
21.60
Me
CF3
Ph
3da
13CNMR (101MHz CDCl3)
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

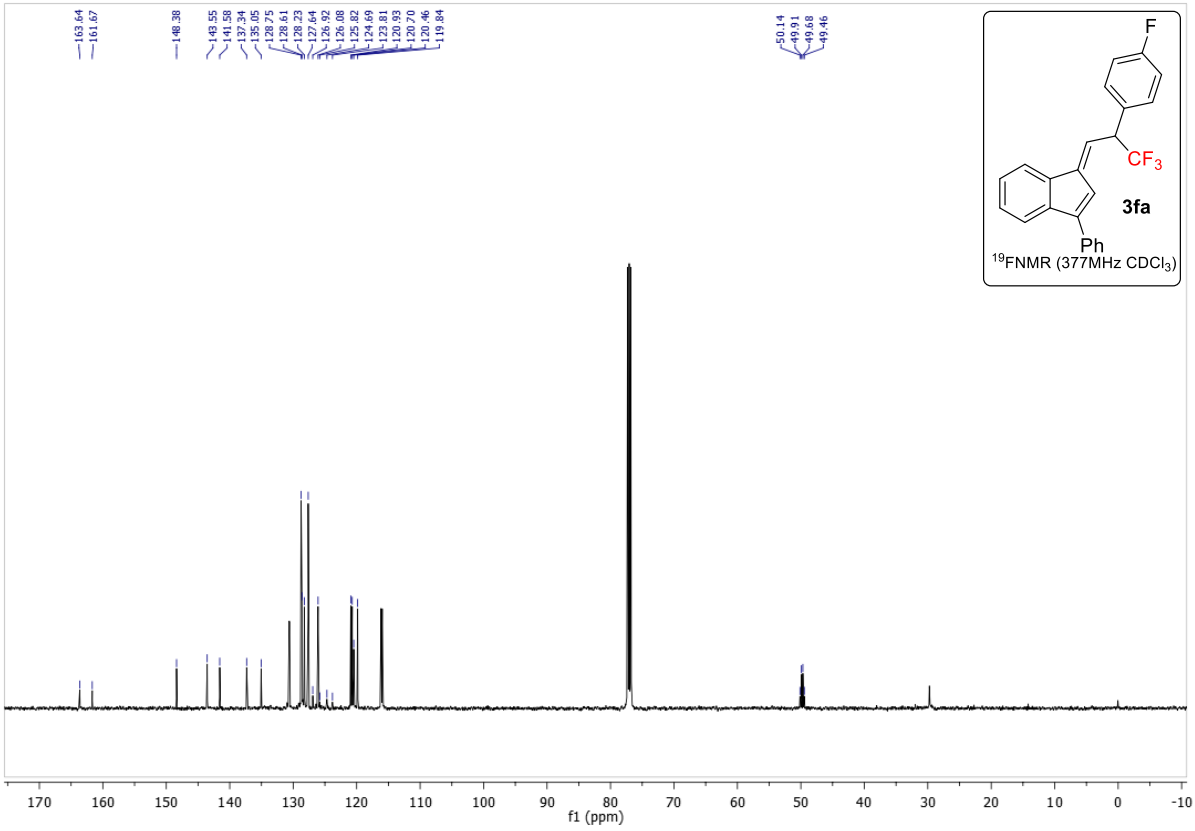

-68.42
Me
CF3
Ph
3da
19FNMR (377MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150
f1 (ppm)

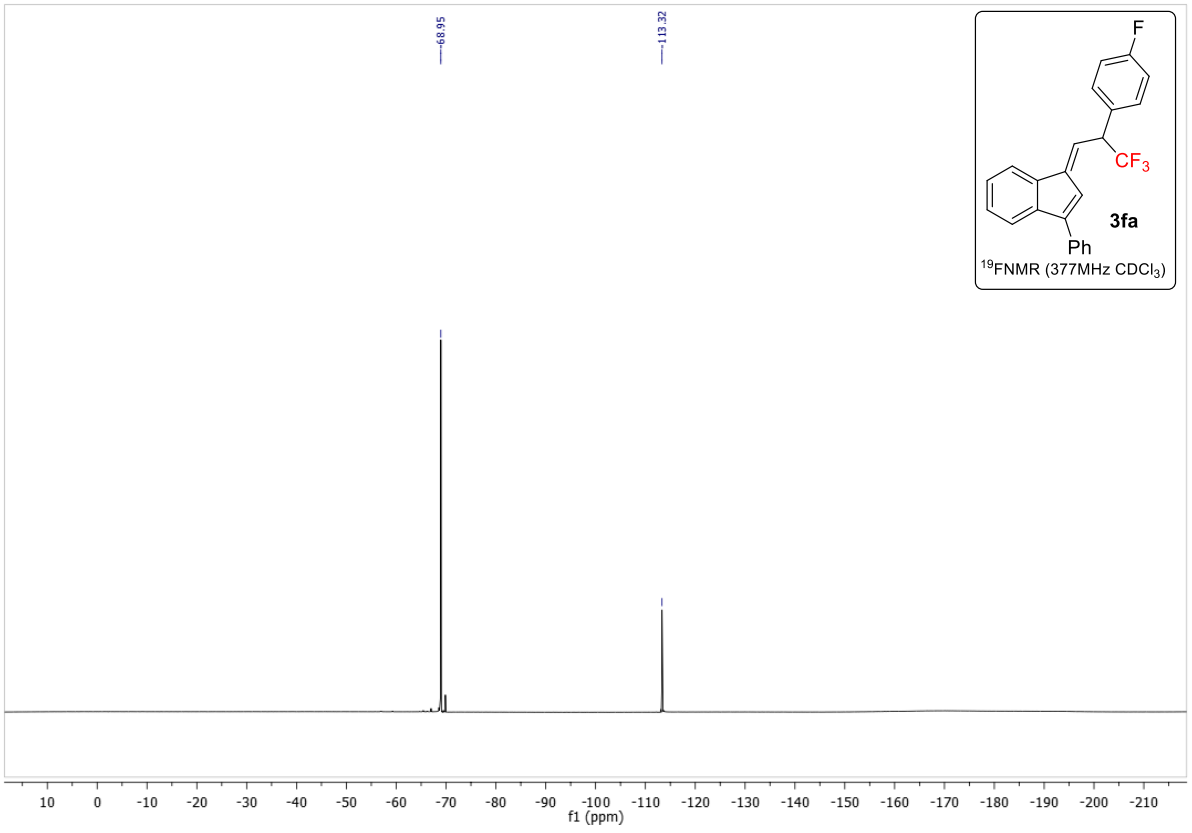

OMe
CF3
Ph
3ea
1HNMR (400MHz CDCl3)
0.91
1.82
0.92
1.72
0.88
1.94
2.14
1.85
0.96
0.89
1.00
2.90
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)

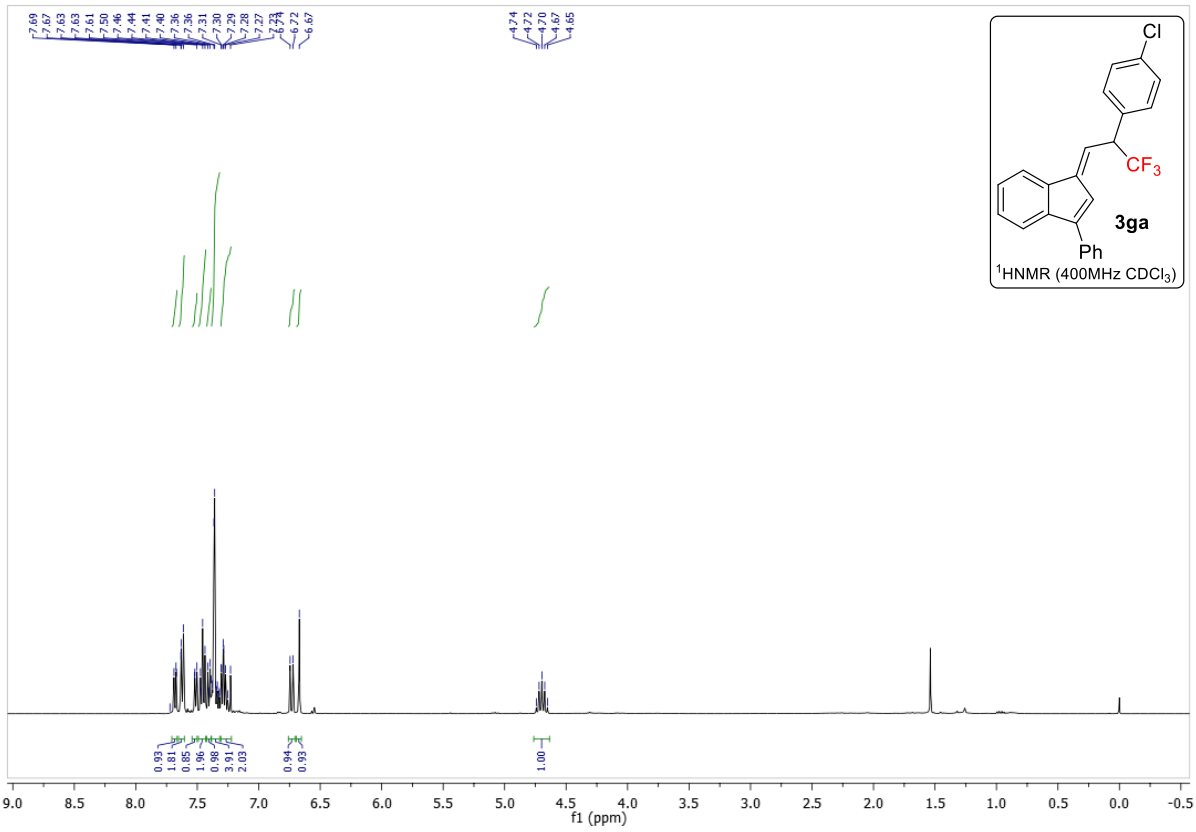

159.69
148.06
143.21
141.67
137.59
135.29
130.09
128.82
128.61
128.16
127.75
126.07
55.42
50.31
50.02
49.74
49.46
OMe
CF3
Ph
3ea
13CNMR (101MHz CDCl3)
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

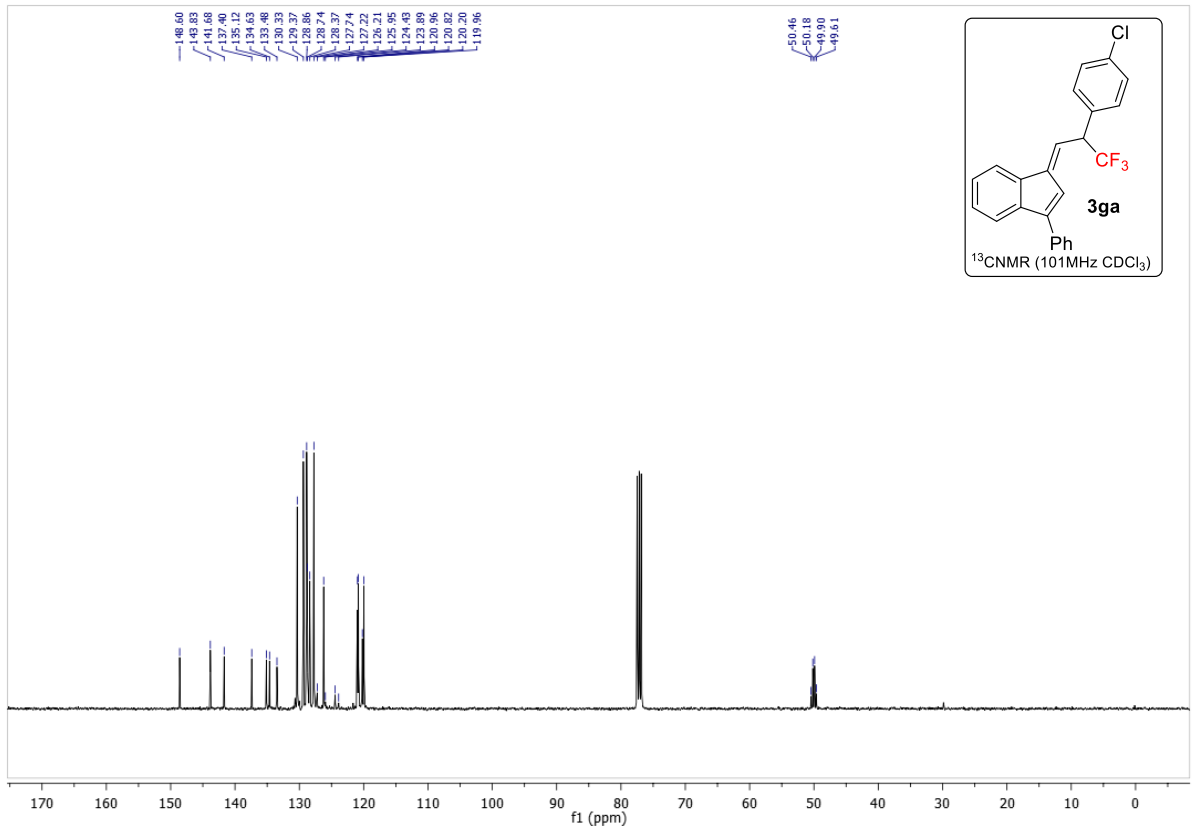

-68.98
OMe
CF3
Ph
3ea
19FNMR (377MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150
f1 (ppm)

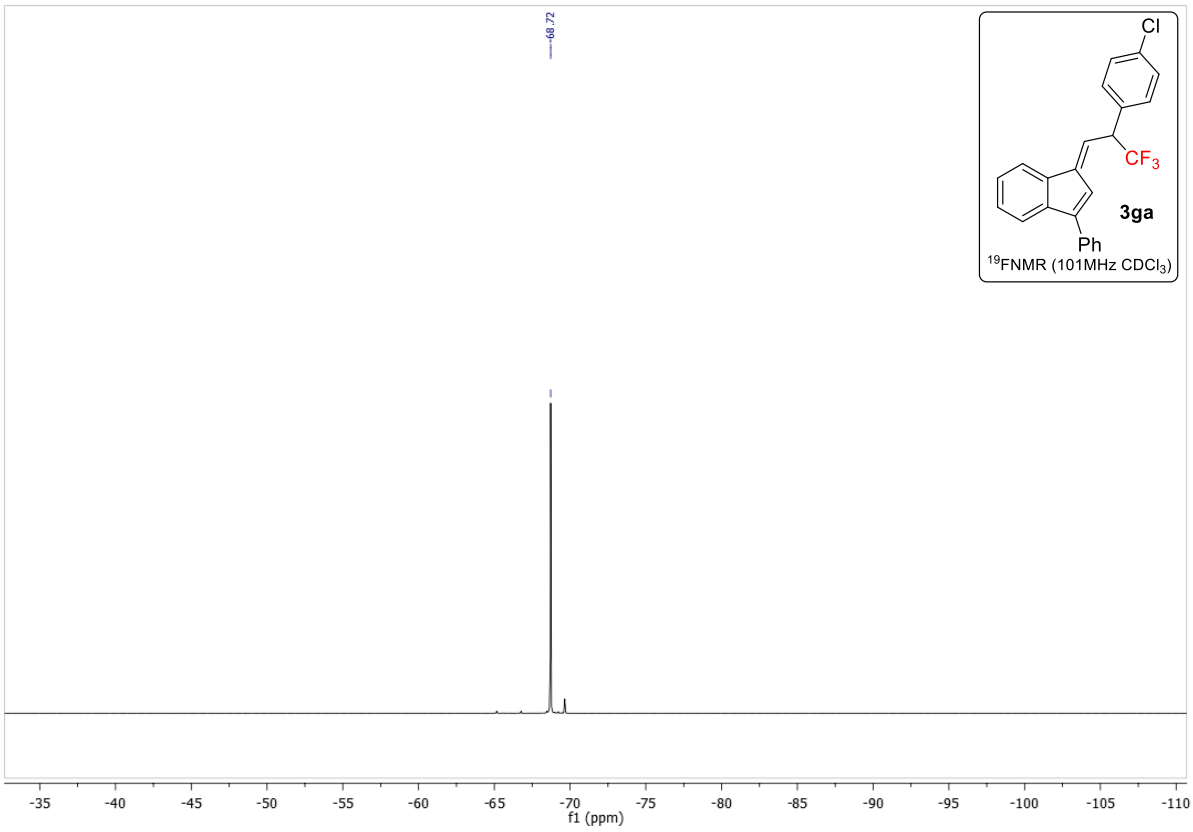

7.64 7.63 7.62 7.51 7.46 7.44 7.44 7.42 7.42 7.40 7.31 7.30 7.29 6.74 6.68
4.76 4.74 4.71 4.69 4.67
F
CF3
3fa
Ph
1HNMR (400MHz CDCl3)
0.91 1.90 1.02 4.96 1.95 1.95 0.94 0.94 1.00
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

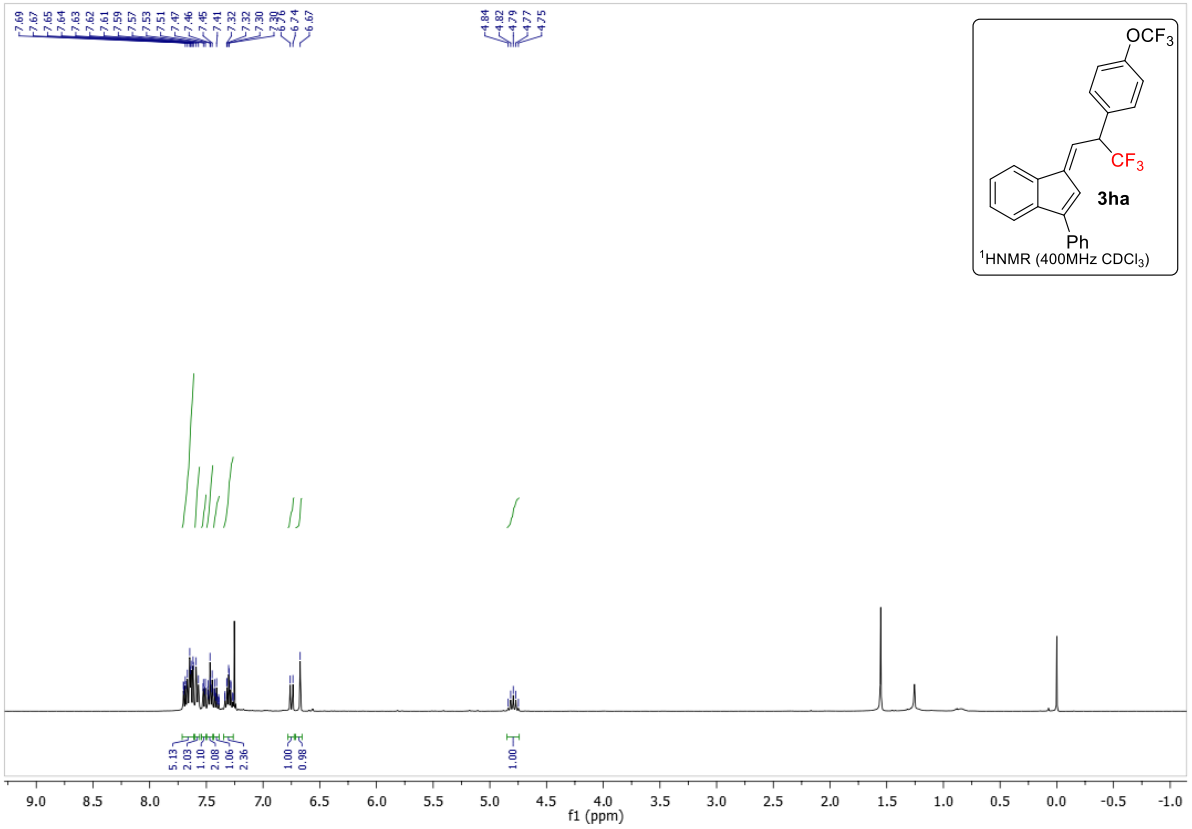

163.64
161.67
148.38
143.55
141.58
137.34
135.05
128.75
128.61
128.23
127.64
126.92
126.08
125.82
124.69
123.81
120.93
120.70
120.46
119.84
50.14
49.91
49.68
49.46
F
CF3
3fa
Ph
19FNMR (377MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

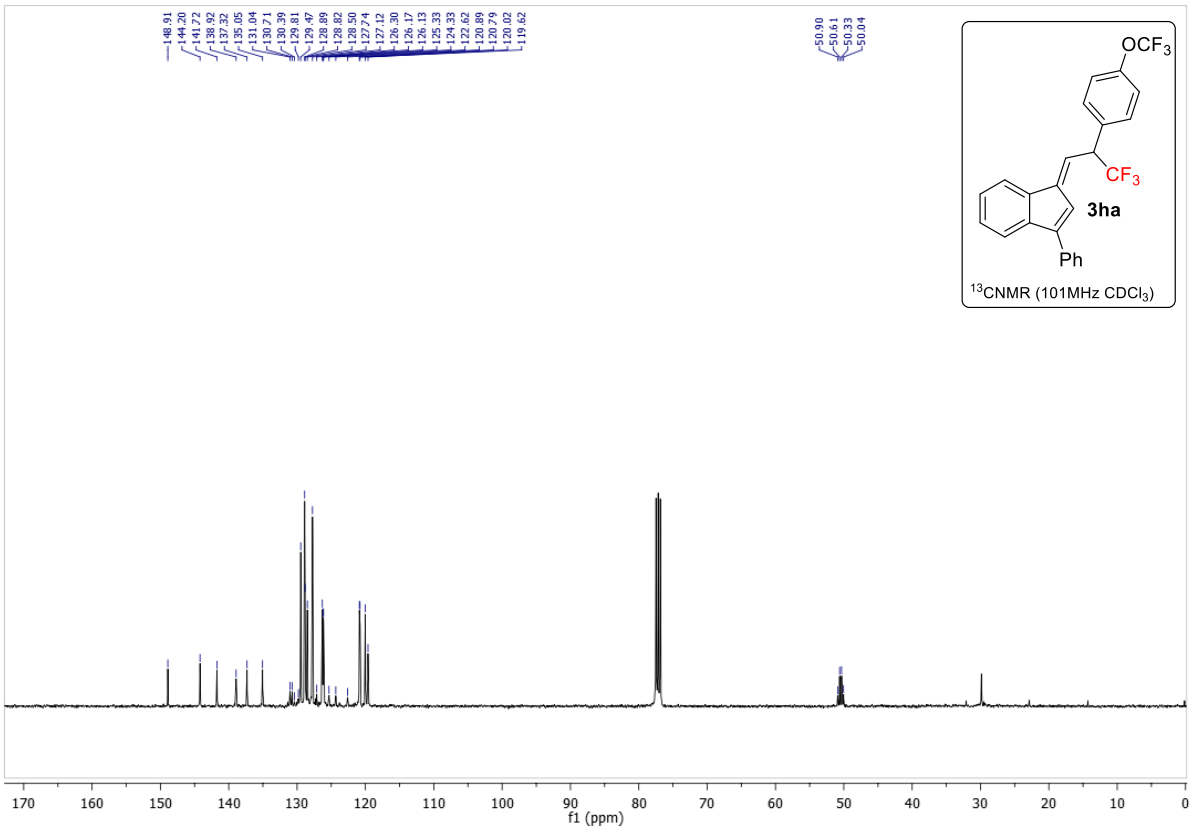

-68.95
-113.32
F
CF3
3fa
Ph
19FNMR (377MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

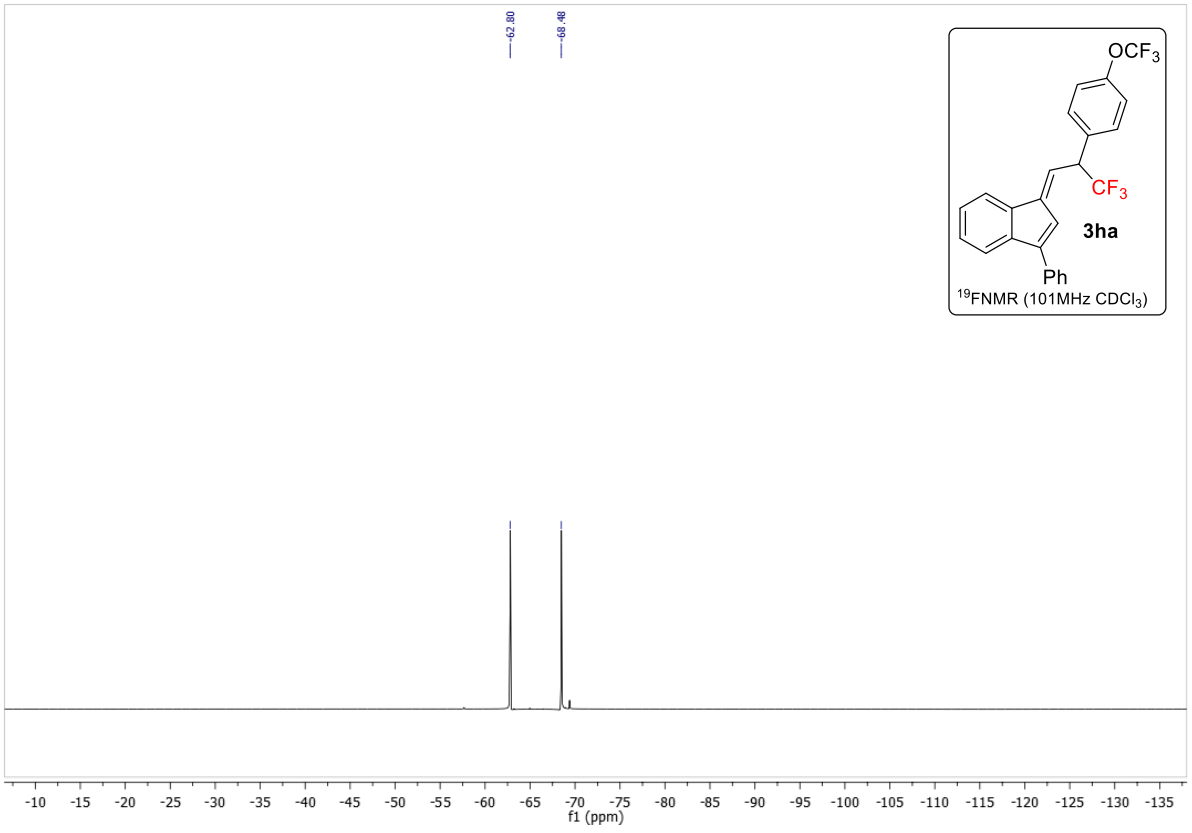

Cl
CF3
3ga
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

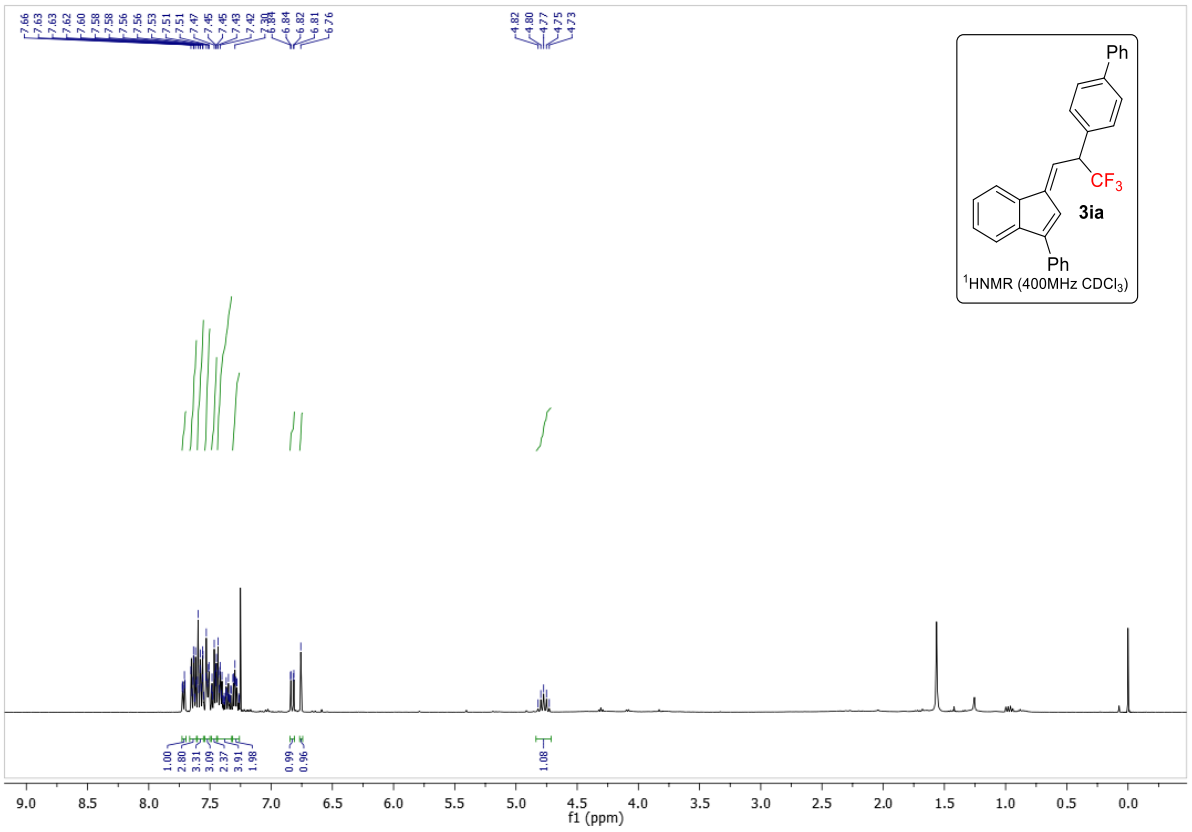

Cl
CF3
3ga
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

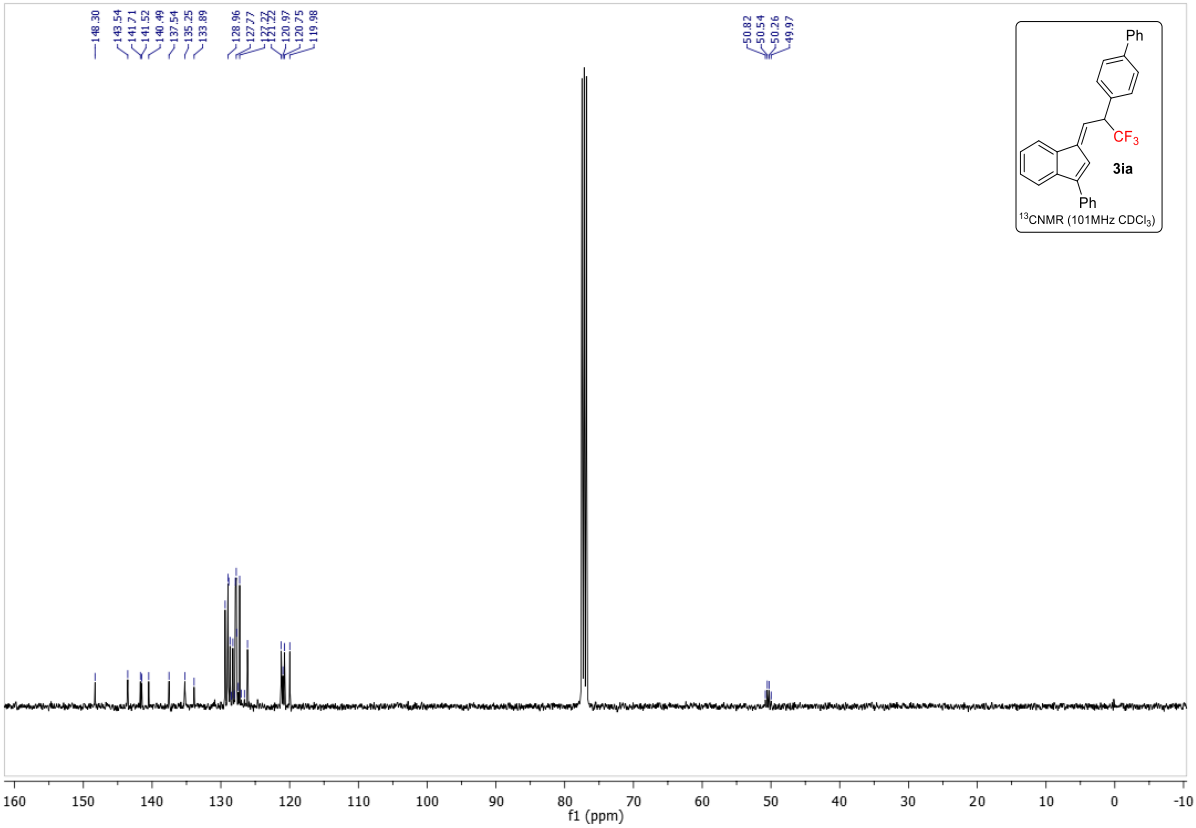

-68.72
Cl
CF3
3ga
Ph
19FNMR (101MHz CDCl3)
-35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110
f1 (ppm)

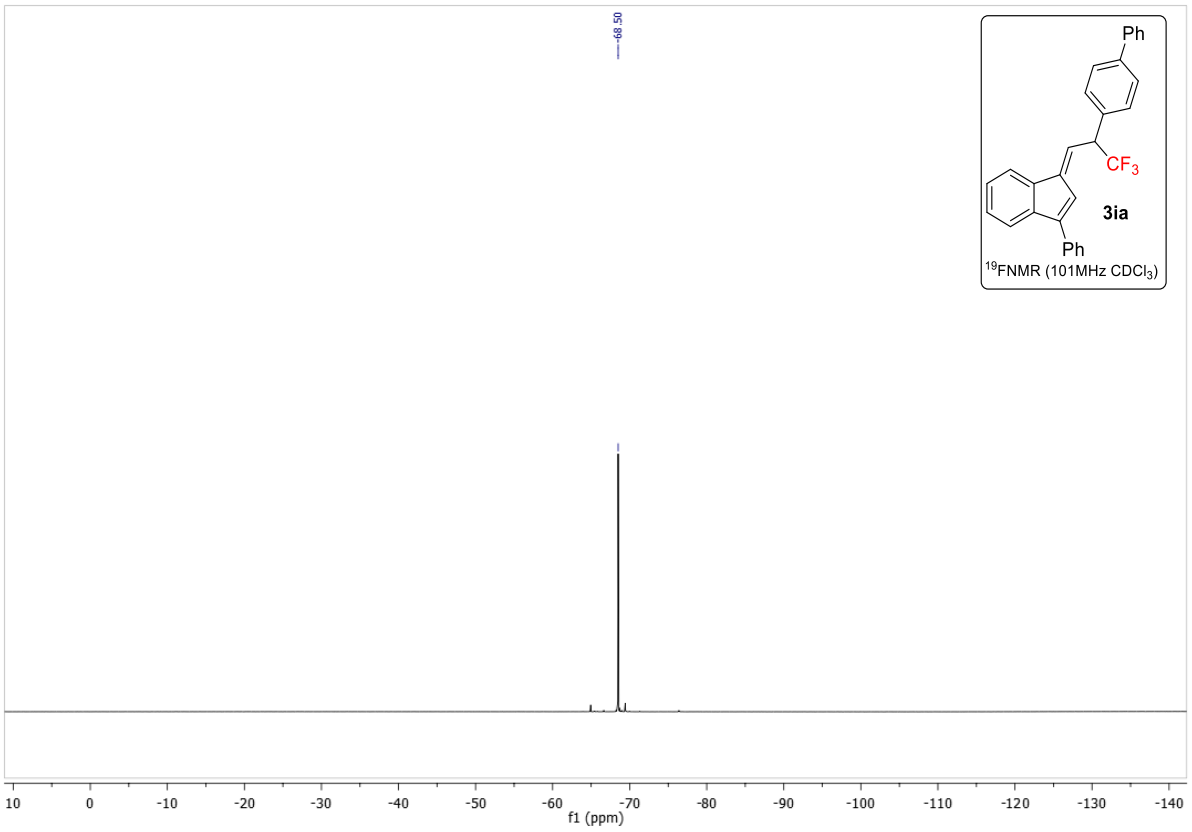

7.69 7.67 7.65 7.64 7.63 7.62 7.61 7.59 7.57 7.53 7.51 7.47 7.46 7.45 7.41 7.32 7.32 7.30 7.30 6.76 6.74 6.67
4.84 4.82 4.79 4.77 4.75
OCF3
CF3
3ha
Ph
1HNMR (400MHz CDCl3)
5.13 2.03 1.10 2.08 1.06 2.36 1.00 0.98 1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0
f1 (ppm)

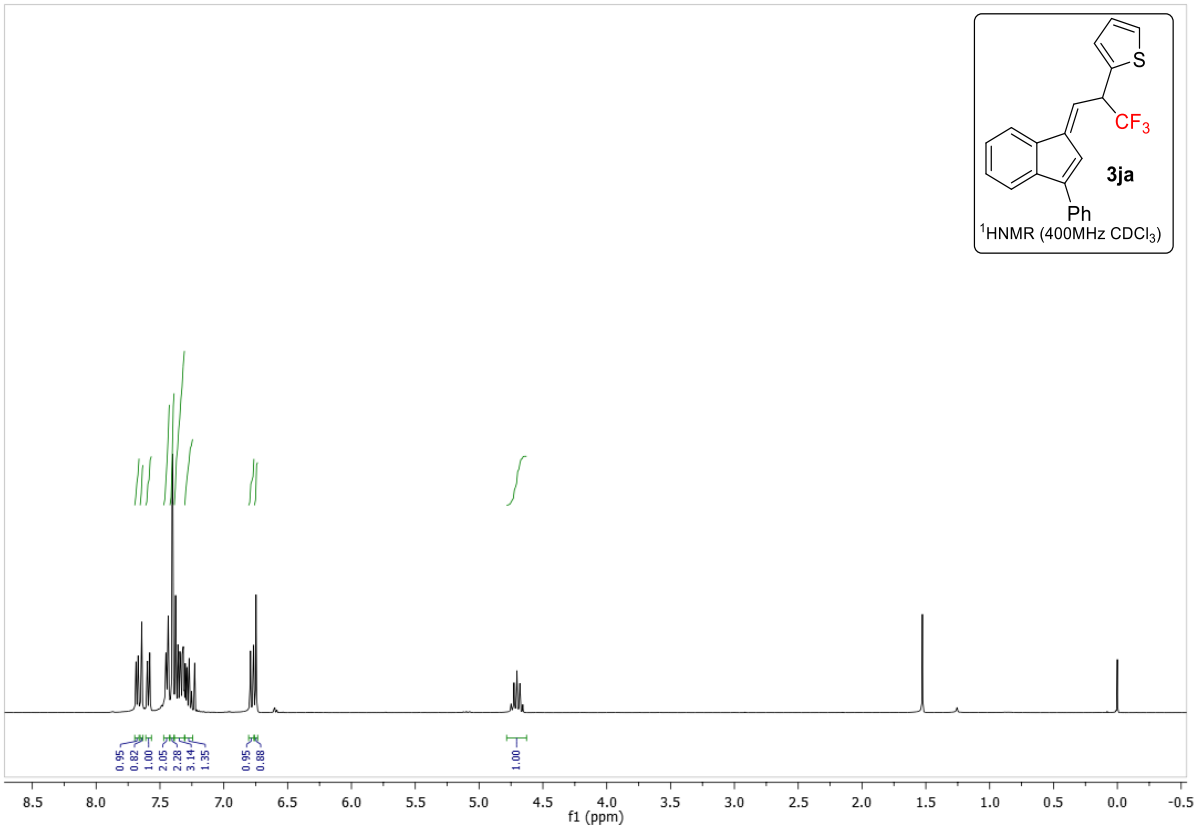

148.91
144.20
141.72
138.92
137.32
135.05
131.04
130.71
130.39
129.81
129.47
128.89
128.82
128.50
127.74
127.12
126.30
126.17
126.13
125.33
124.33
122.62
120.89
120.79
120.02
119.62
50.90
50.61
50.33
50.04
OCF3
CF3
3ha
Ph
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

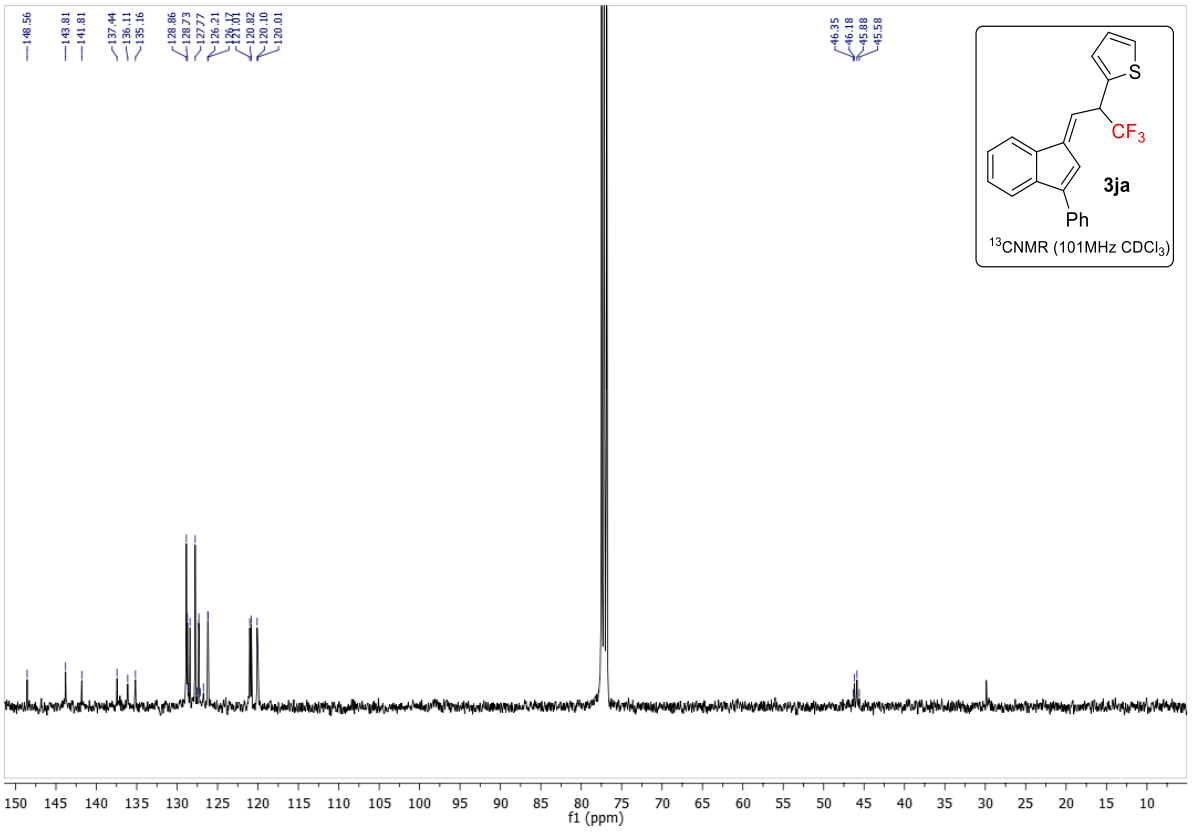

-62.80
-68.48
OCF3
CF3
3ha
Ph
19FNMR (101MHz CDCl3)
-10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135
f1 (ppm)

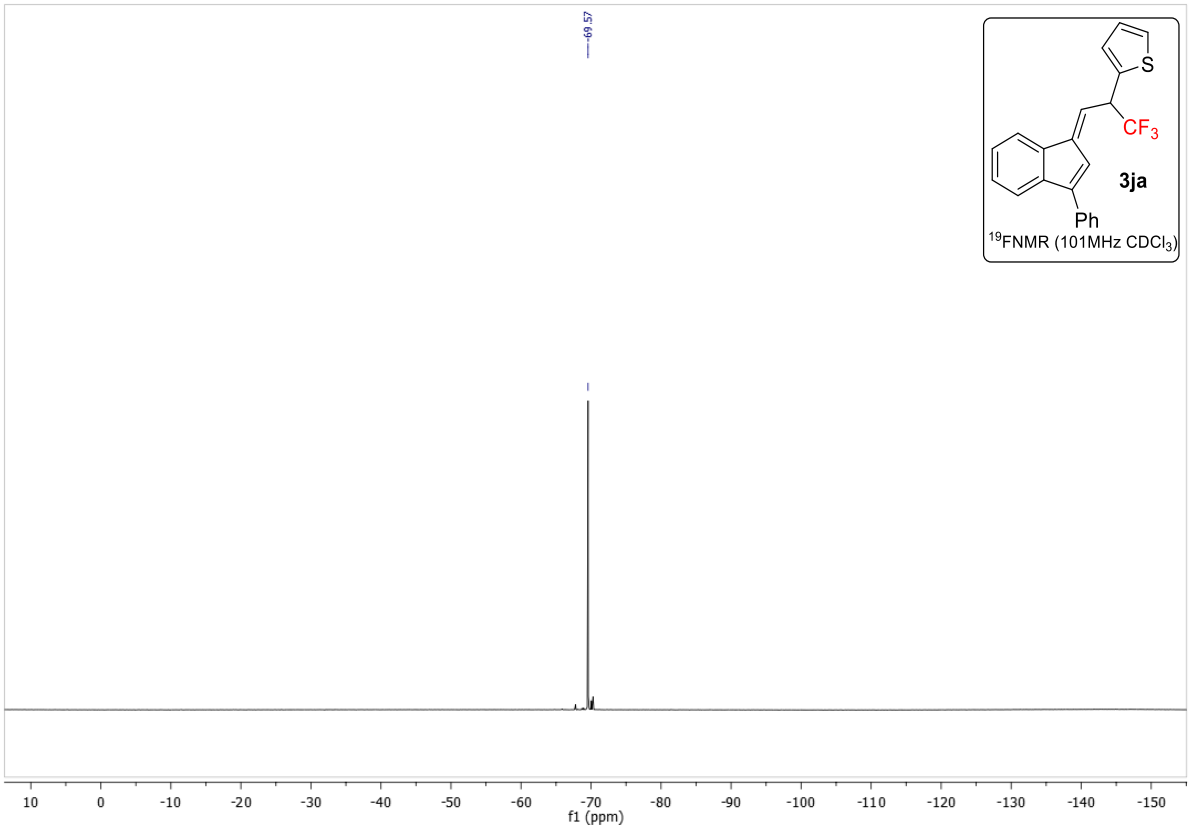

Ph
CF3
3ia
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

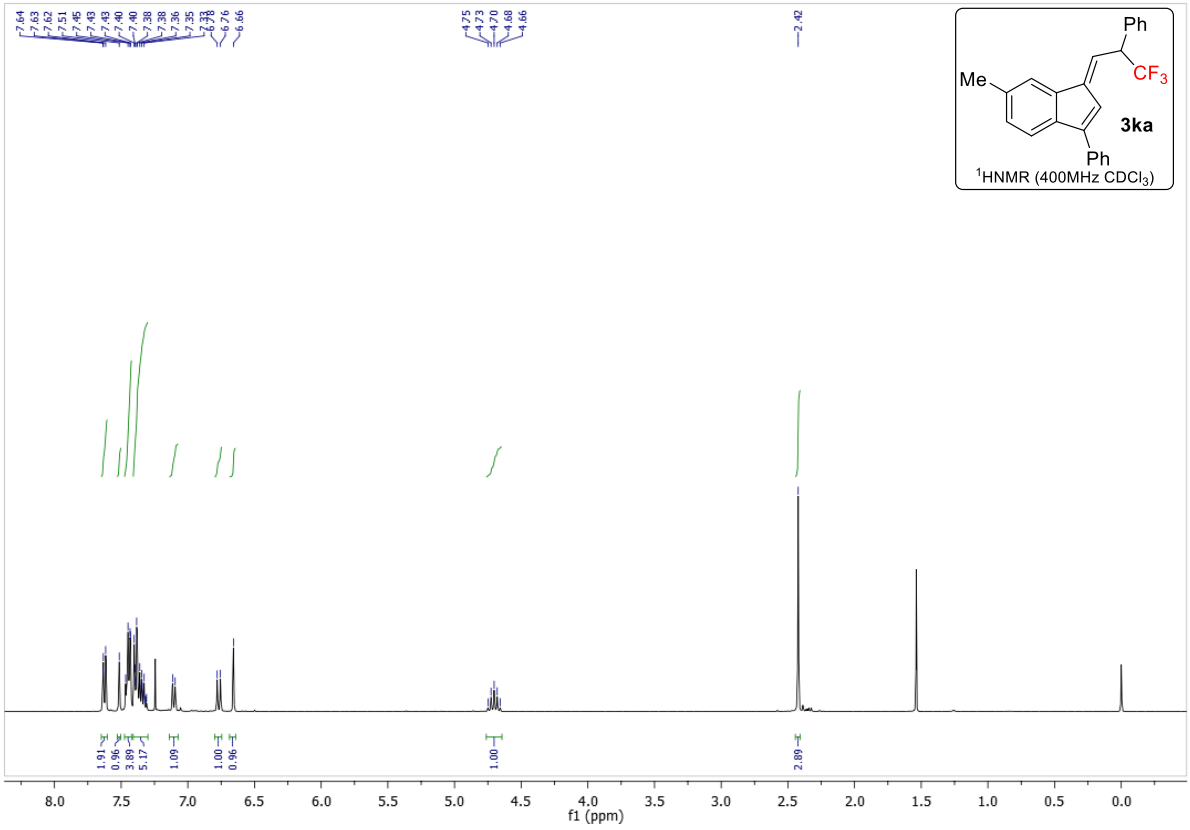

Ph
CF3
3ia
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

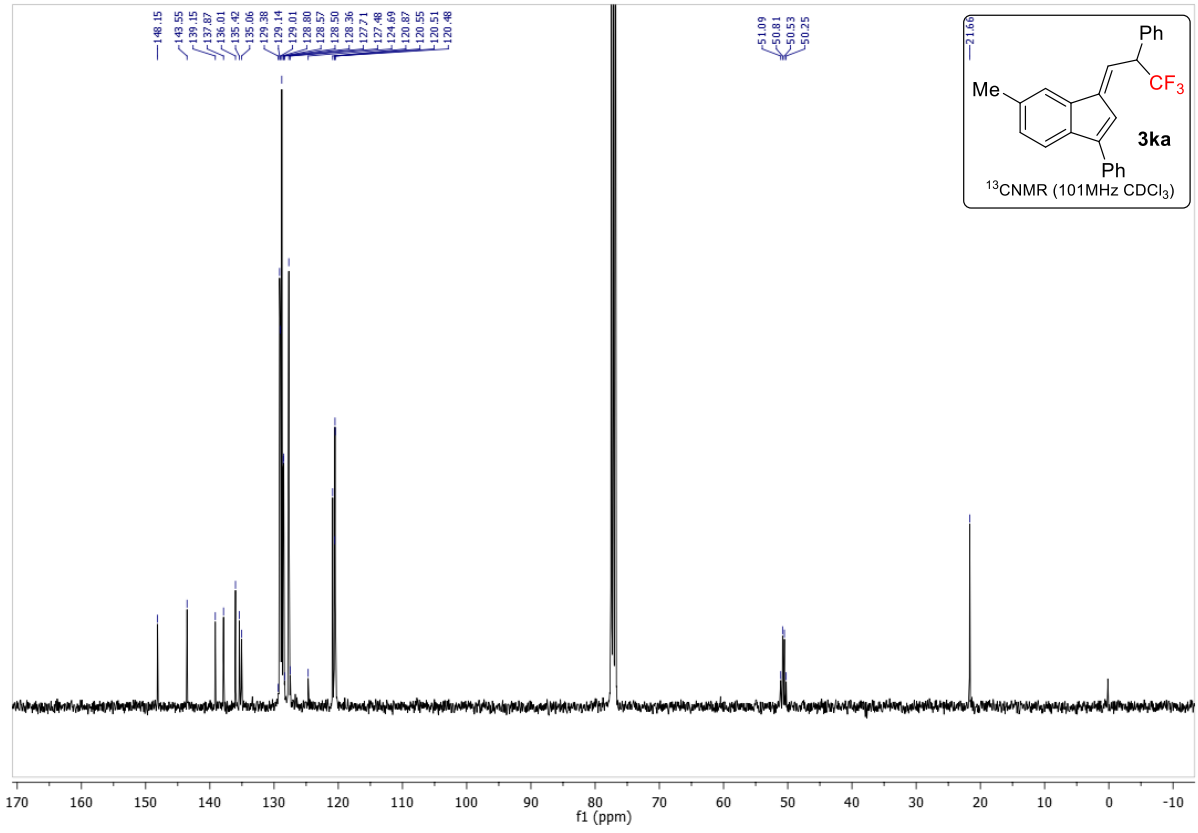

-68.50
Ph
CF3
3ia
Ph
19FNMR (101MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140
f1 (ppm)

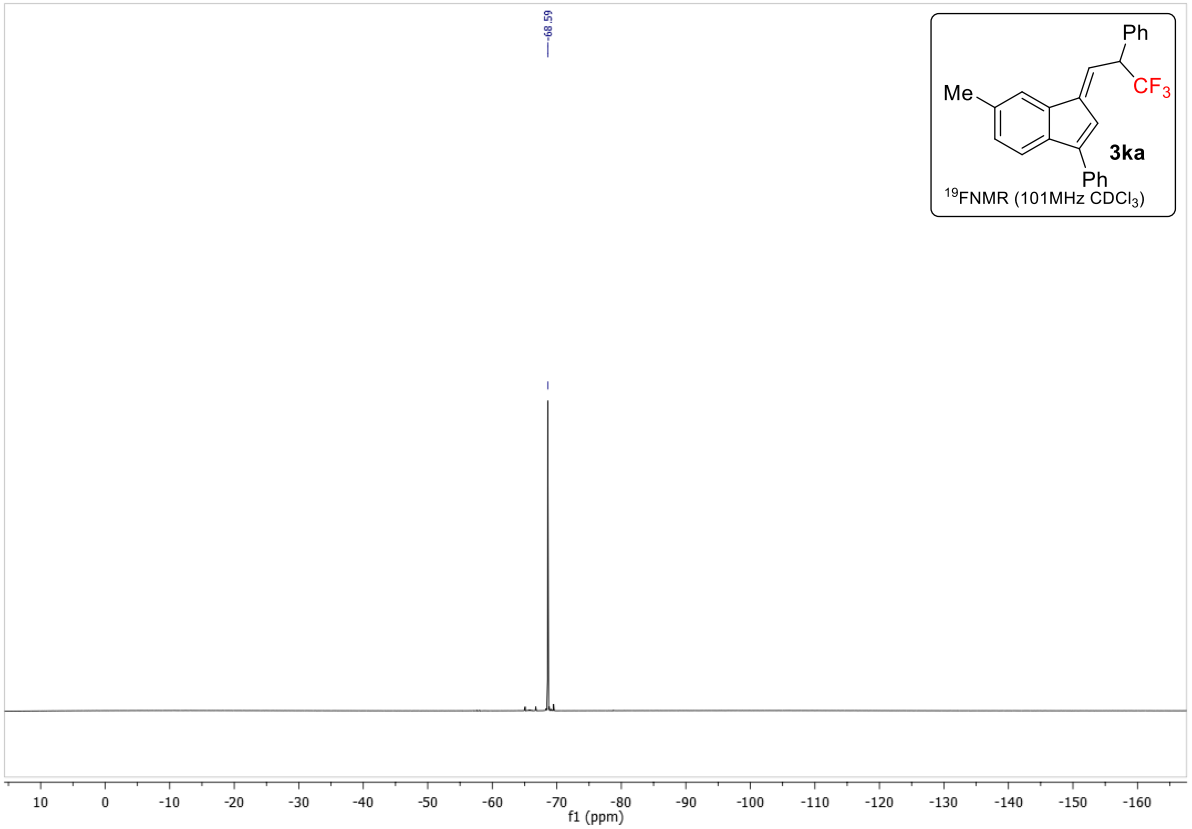

S
CF3
3ja
Ph
1HNMR (400MHz CDCl3)
0.95 0.82 1.00 2.05 2.28 3.14 1.35 0.95 0.88 1.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

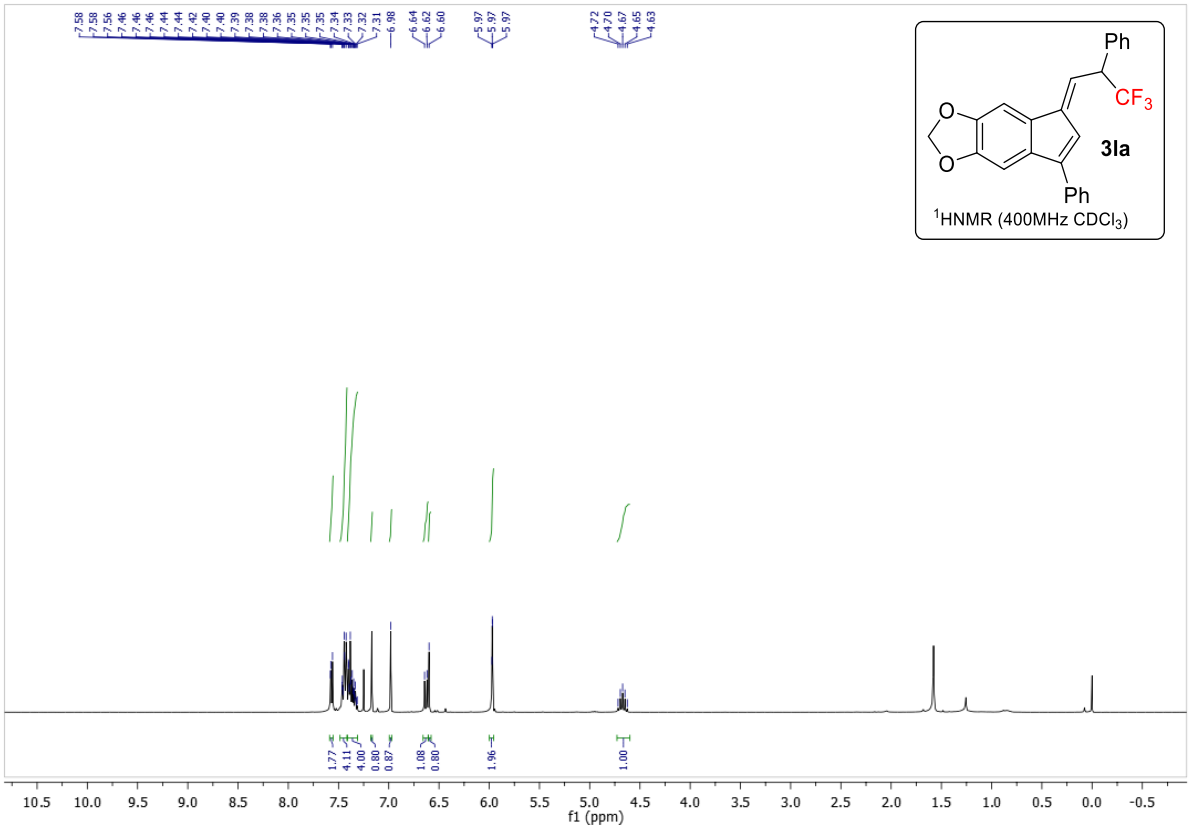

148.56
143.81
141.81
137.44
136.11
135.16
128.86
128.73
127.77
126.21
121.01
120.82
120.10
120.01
46.35
46.18
45.88
45.58
S
CF3
3ja
Ph
13CNMR (101MHz CDCl3)
150 145 140 135 130 125 120 115 110 105 100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
f1 (ppm)

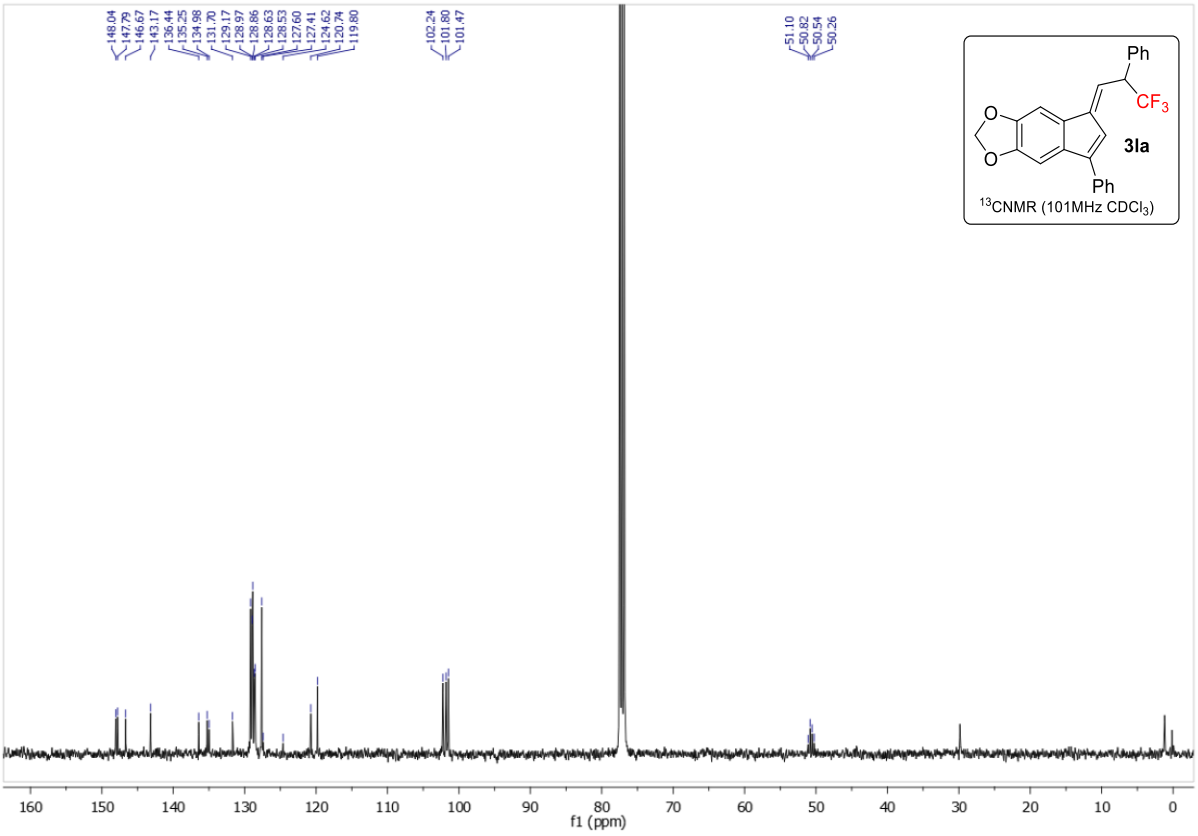

-69.57
S
CF3
3ja
Ph
19FNMR (101MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150
f1 (ppm)

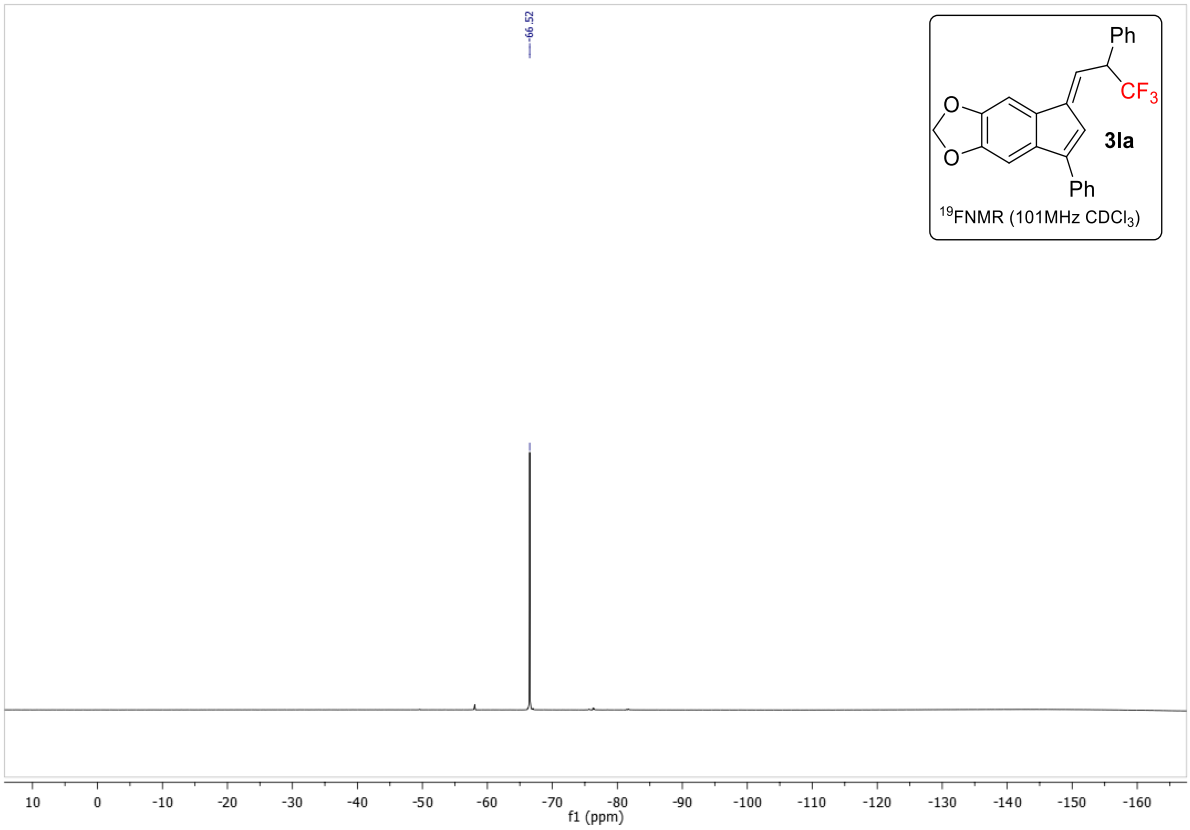

Ph
CF3
Me
3ka
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

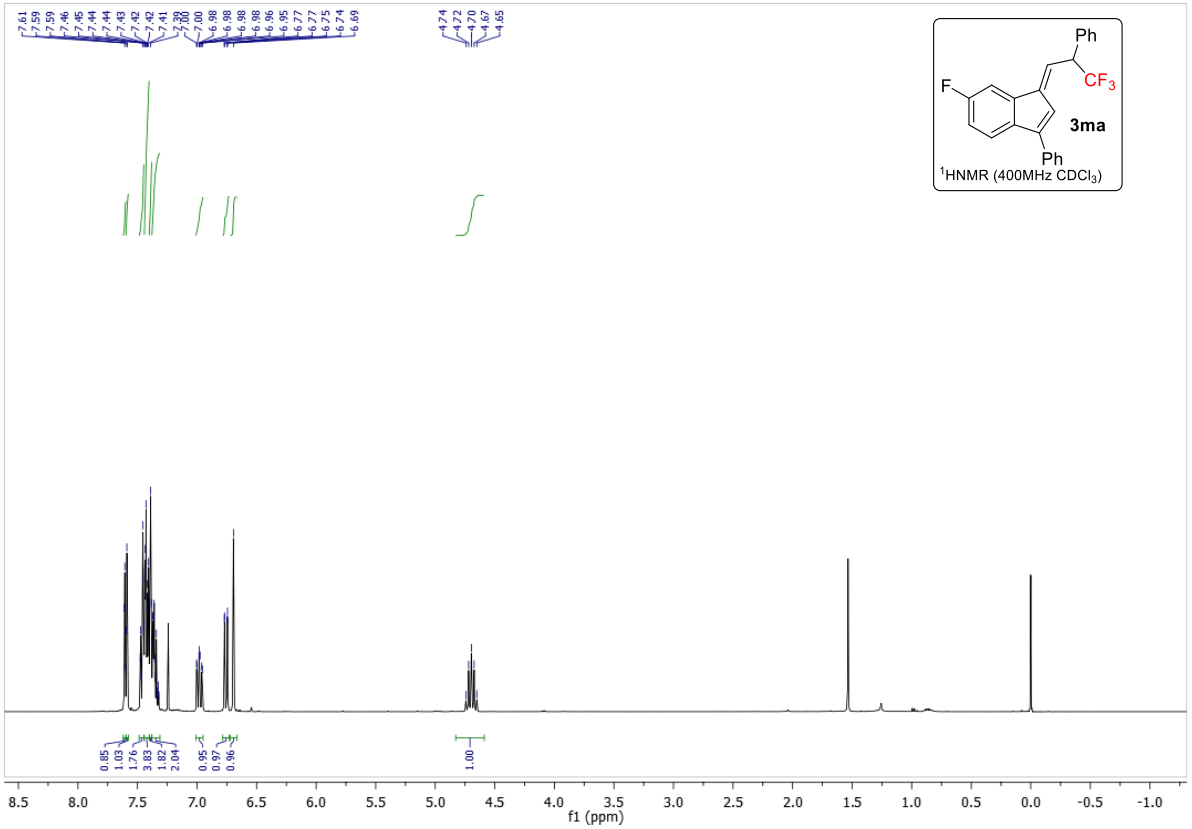

Ph
CF3
Me
3ka
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

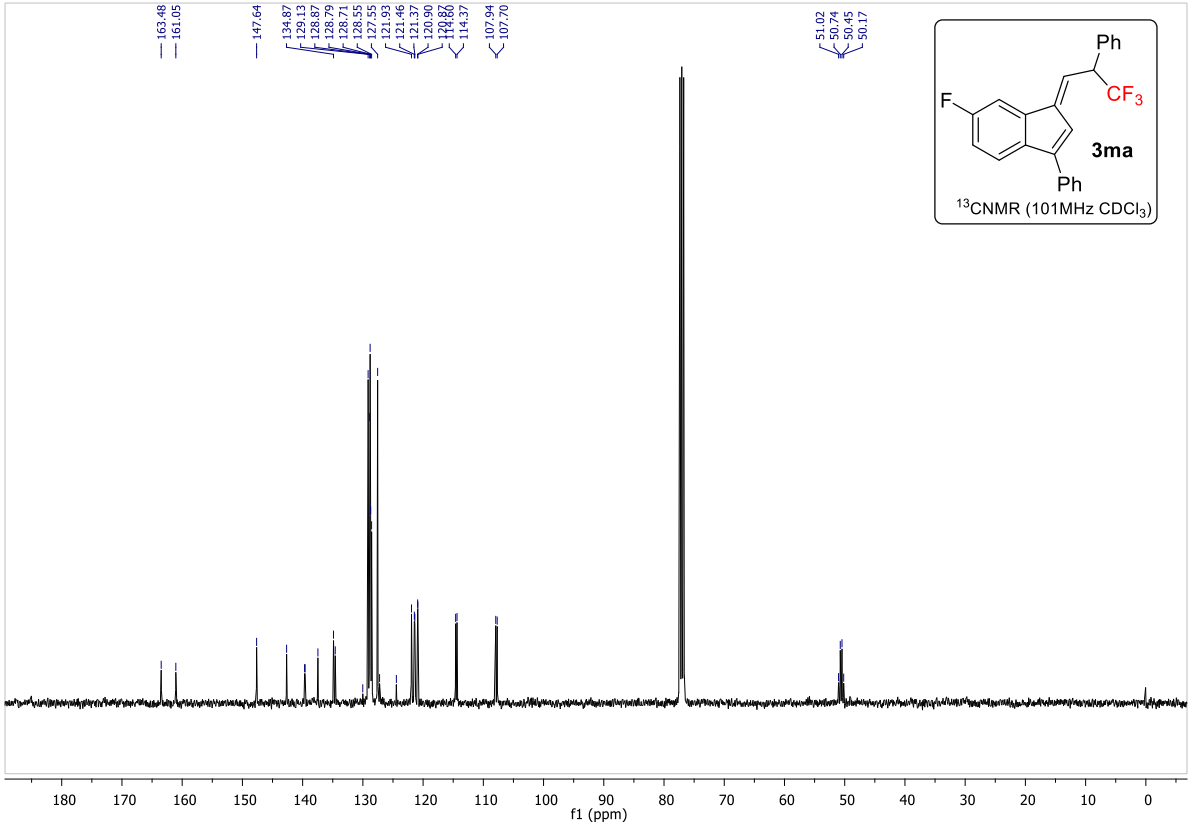

-68.59
Ph
CF3
Me
3ka
Ph
19FNMR (101MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160
f1 (ppm)

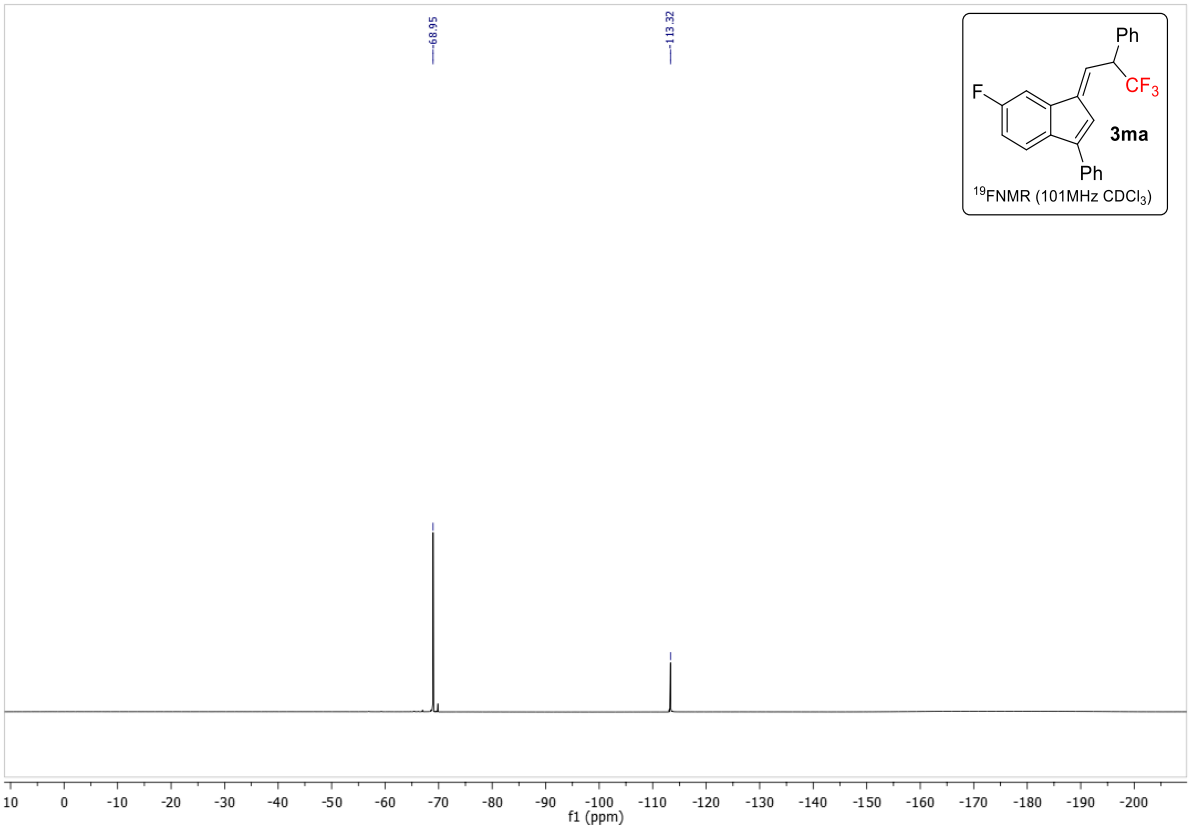

7.58 7.58 7.56 7.46 7.46 7.46 7.44 7.44 7.42 7.40 7.40 7.39 7.38 7.38 7.36 7.35 7.35 7.35 7.34 7.33 7.32 7.31 6.98 6.64 6.62 6.60 5.97 5.97 5.97 4.72 4.70 4.67 4.65 4.63
Ph
CF3
O
O
3la
Ph
1HNMR (400MHz CDCl3)
1.77 4.11 4.00 0.80 0.87 1.08 0.80 1.96 1.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

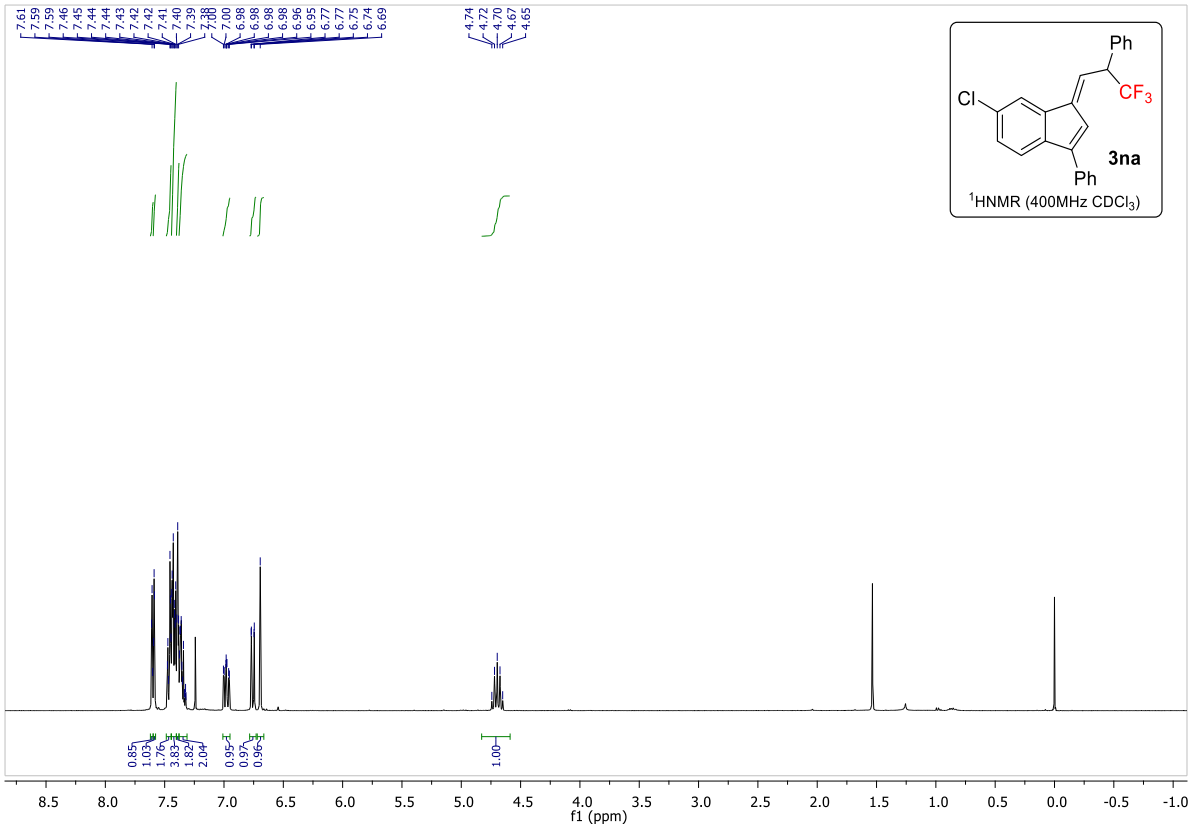

148.04
147.79
146.67
143.17
136.44
135.25
134.98
131.70
129.17
128.97
128.86
128.63
128.53
127.60
127.41
124.62
120.74
119.80
102.24
101.80
101.47
51.10
50.82
50.54
50.26
Ph
CF3
O
O
3la
Ph
13CNMR (101MHz CDCl3)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

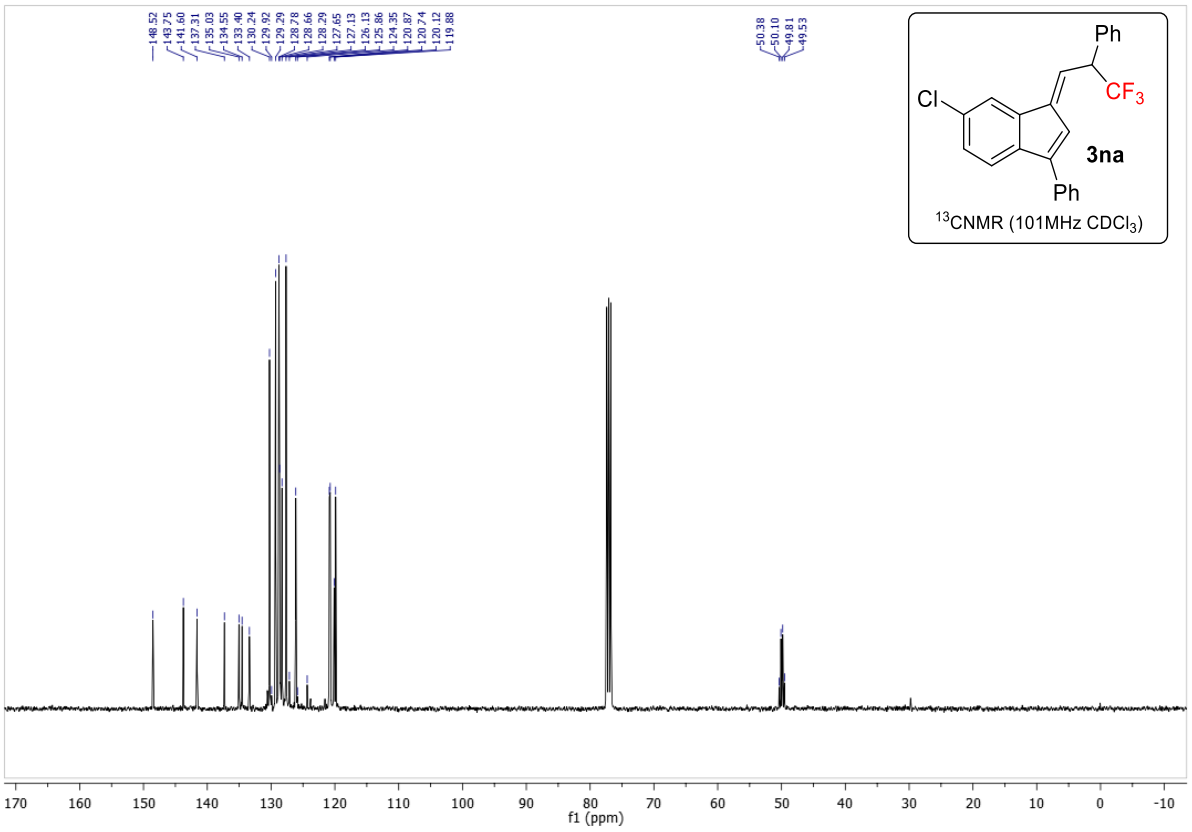

-66.52
Ph
CF3
O
O
3la
Ph
19FNMR (101MHz CDCl3)
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
f1 (ppm)

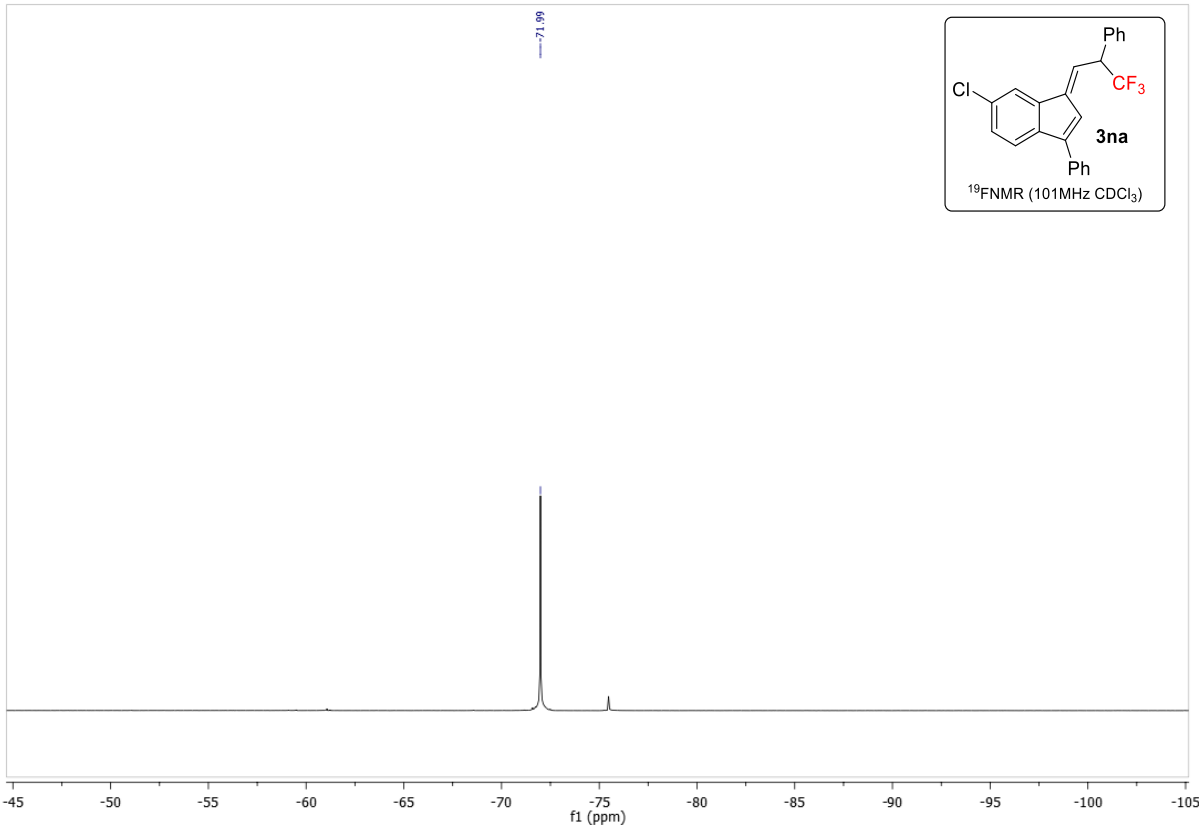

Ph
CF3
F
3ma
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

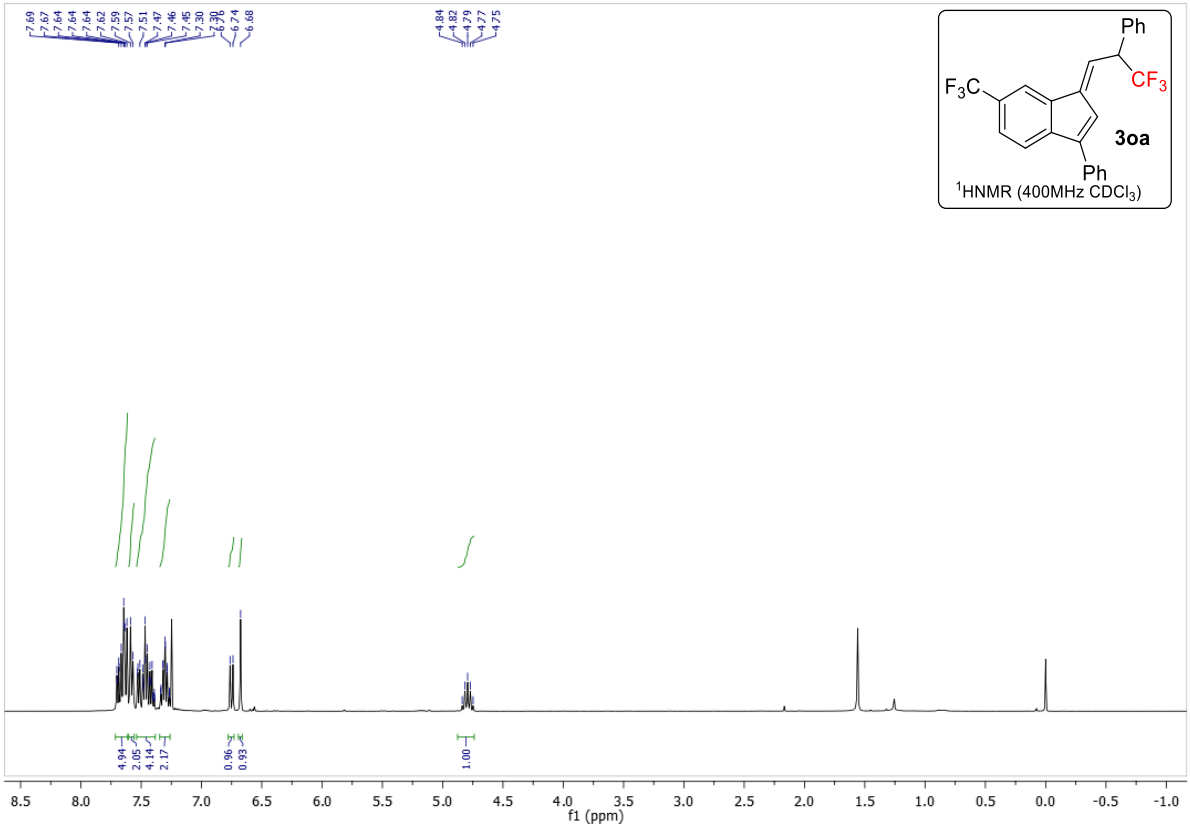

Ph
CF3
F
3ma
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

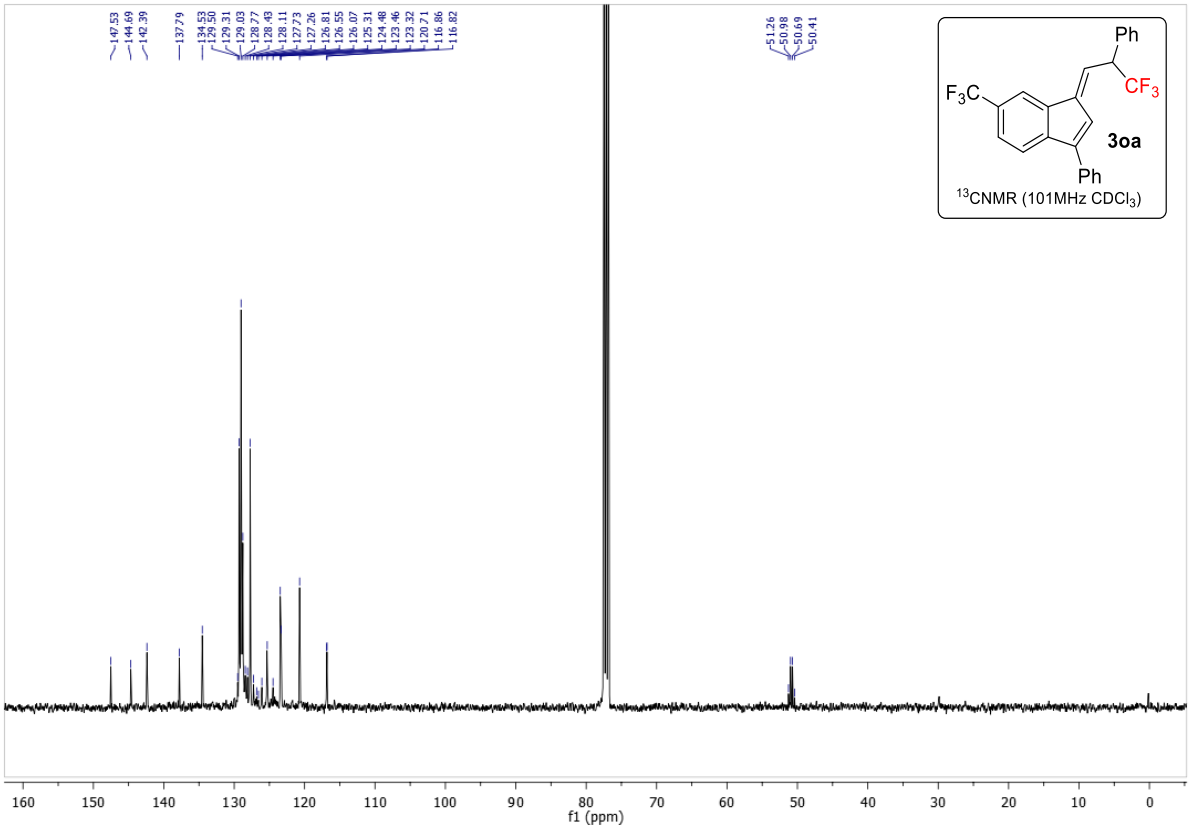

-68.95
-113.32
Ph
CF3
F
3ma
Ph
19FNMR (101MHz CDCl3)
f1 (ppm)

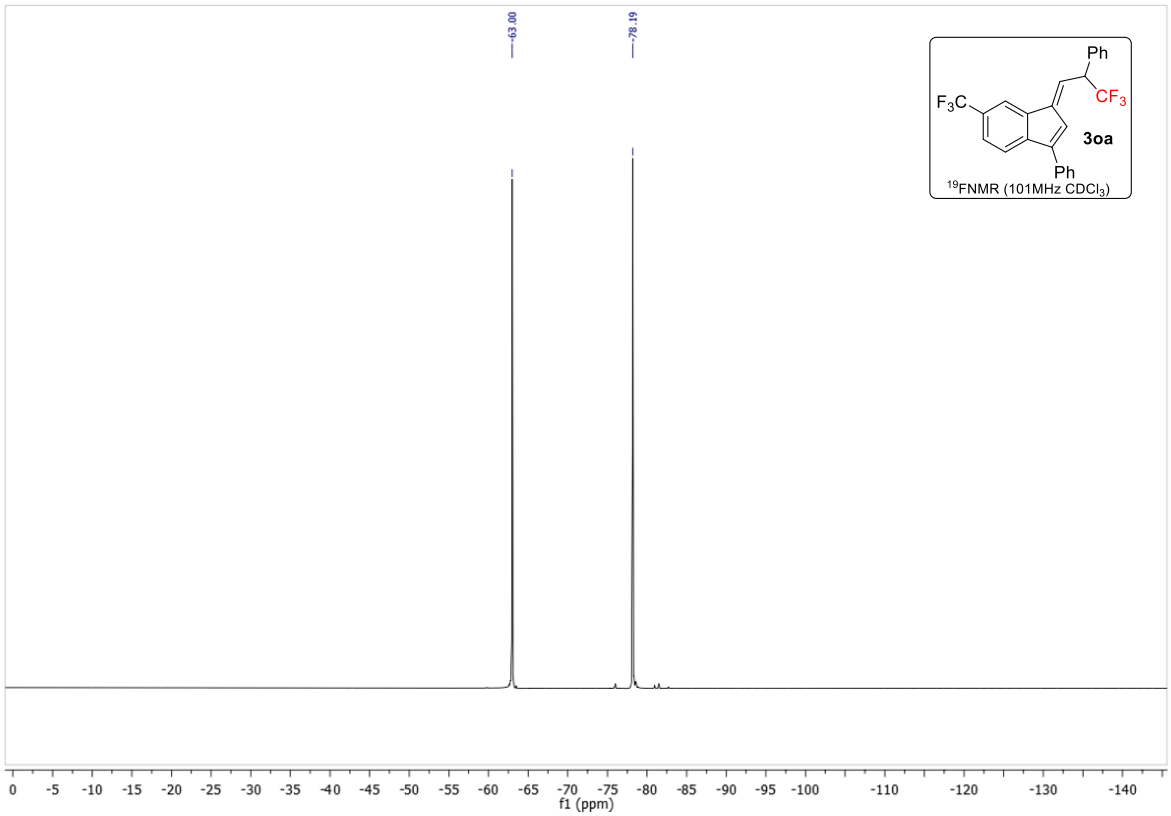

Ph
CF3
Cl
3na
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

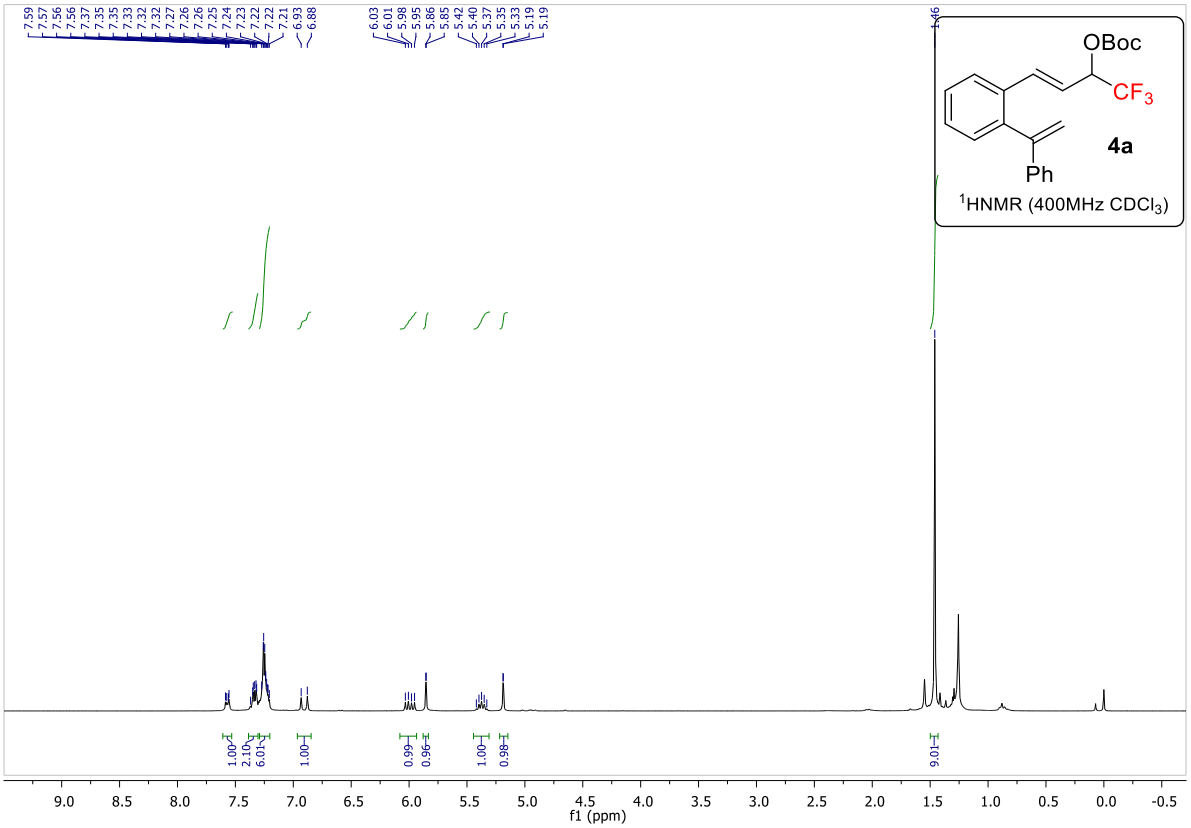

148.52
143.75
141.60
137.31
135.03
134.55
133.40
130.24
129.92
129.29
128.78
128.66
128.29
127.65
127.13
126.13
125.86
124.35
120.87
120.74
120.12
119.88
50.38
50.10
49.81
49.53
Ph
CF3
Cl
3na
Ph
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

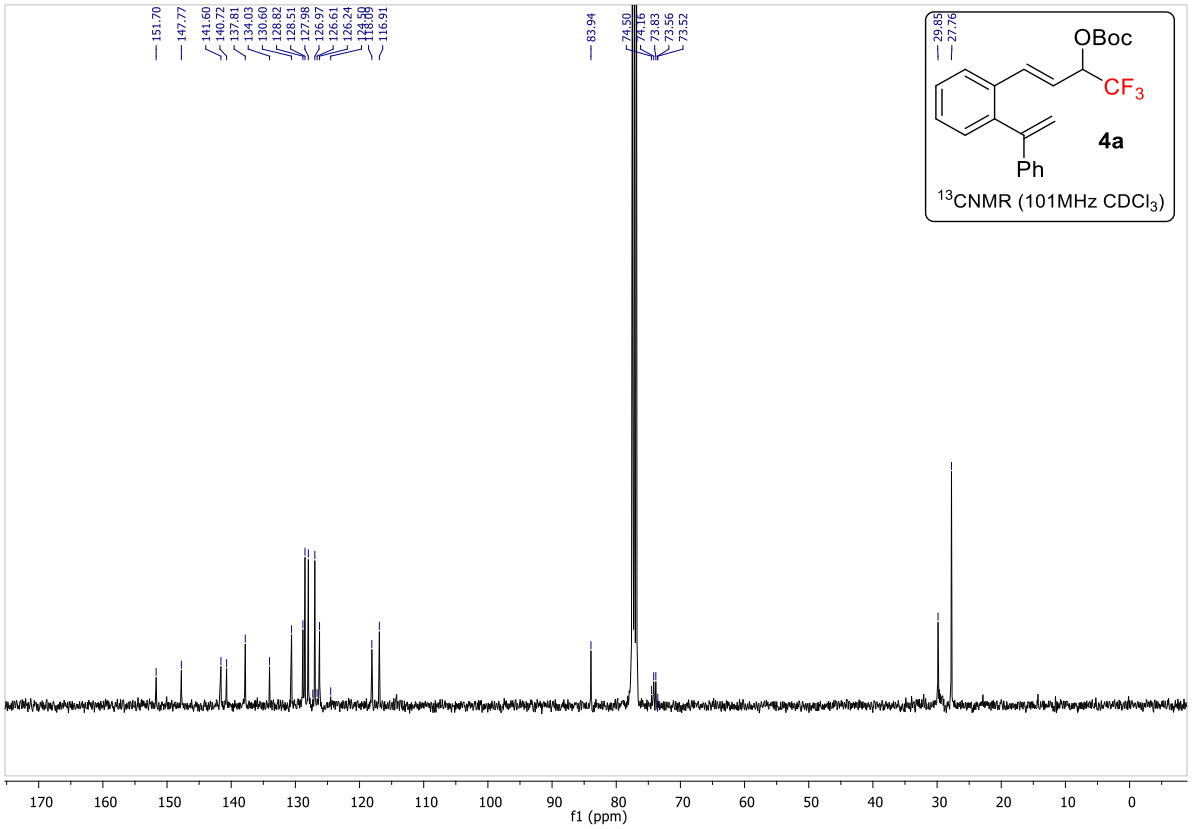

-71.99
Ph
CF3
Cl
3na
Ph
19FNMR (101MHz CDCl3)
-45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105
f1 (ppm)

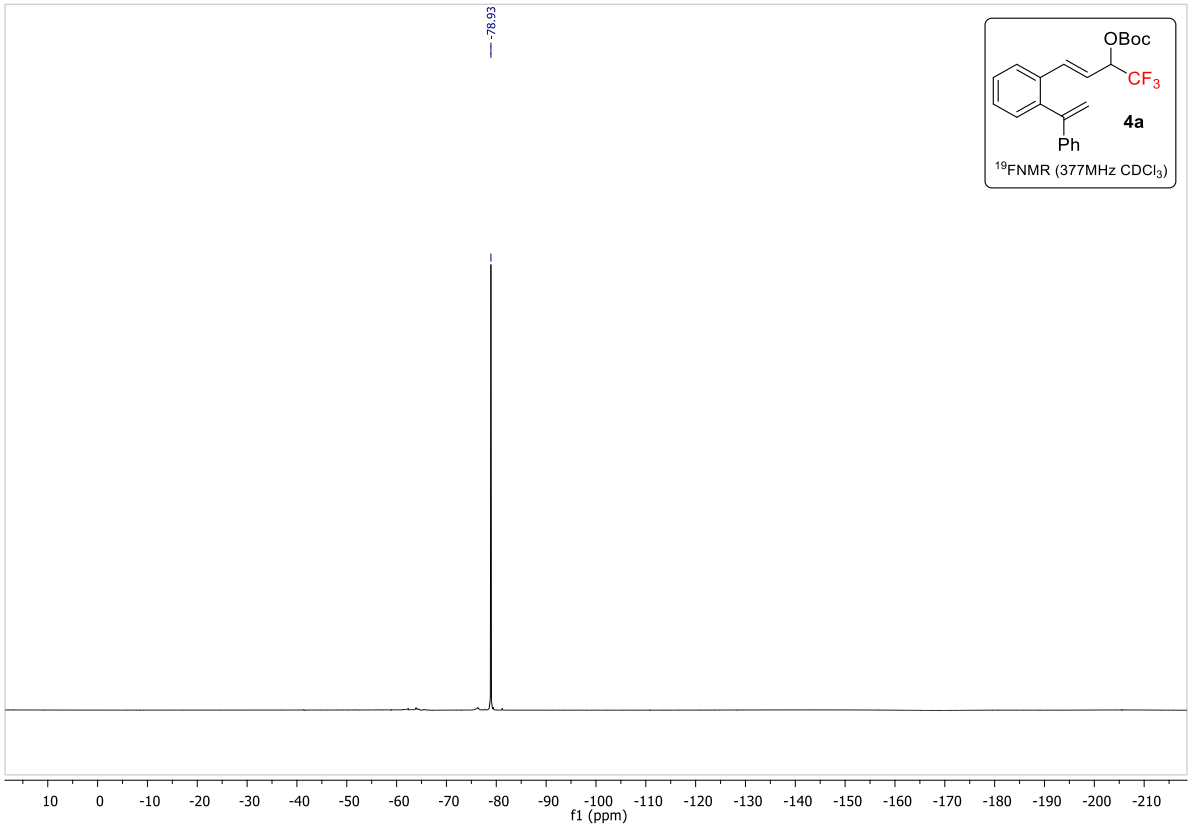

Ph
CF3
F3C
3oa
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

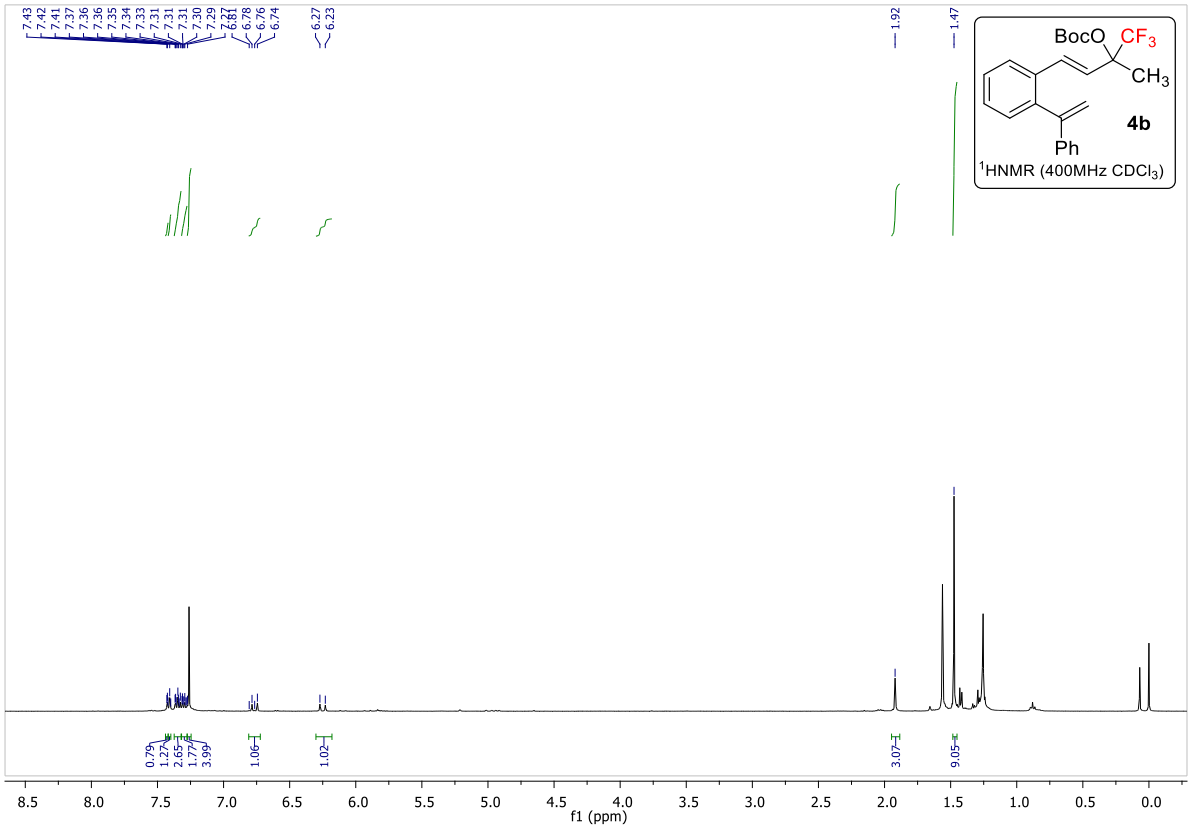

Ph
CF3
F3C
3oa
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

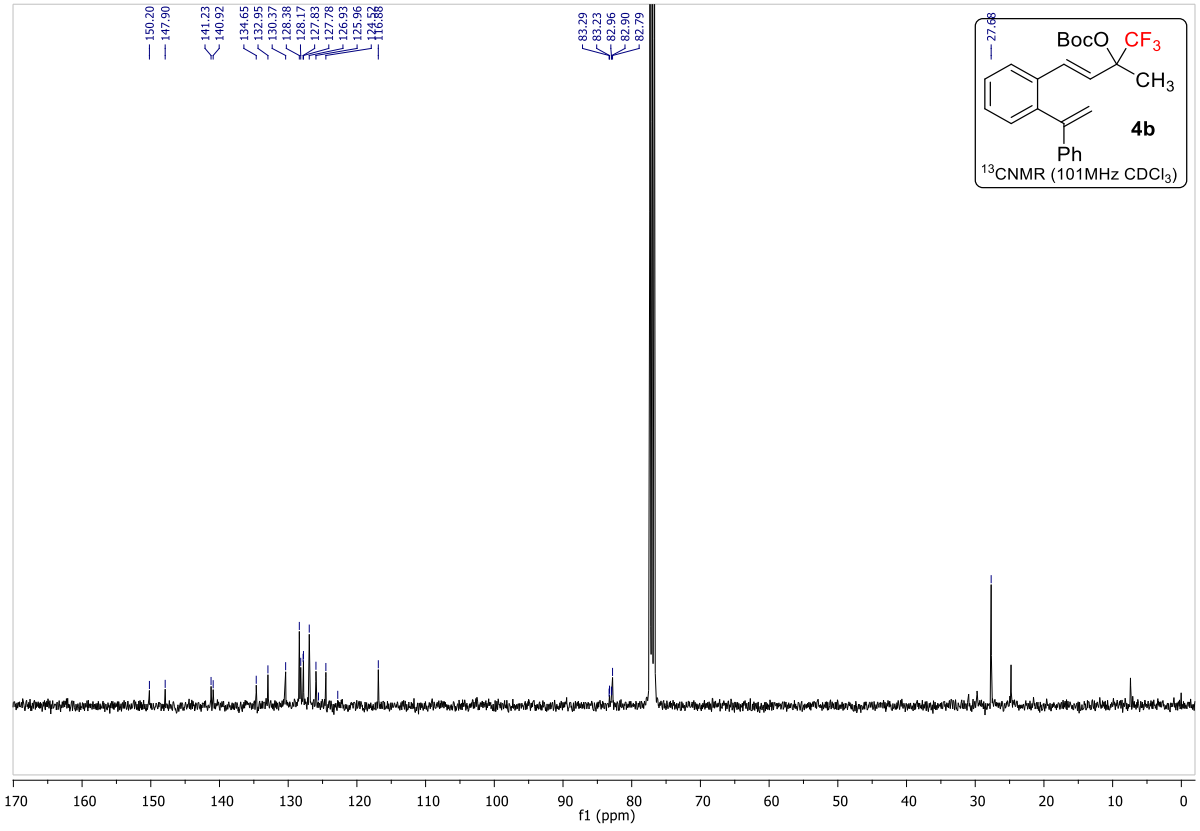

-63.00
-78.19
Ph
CF3
F3C
3oa
Ph
19FNMR (101MHz CDCl3)
f1 (ppm)

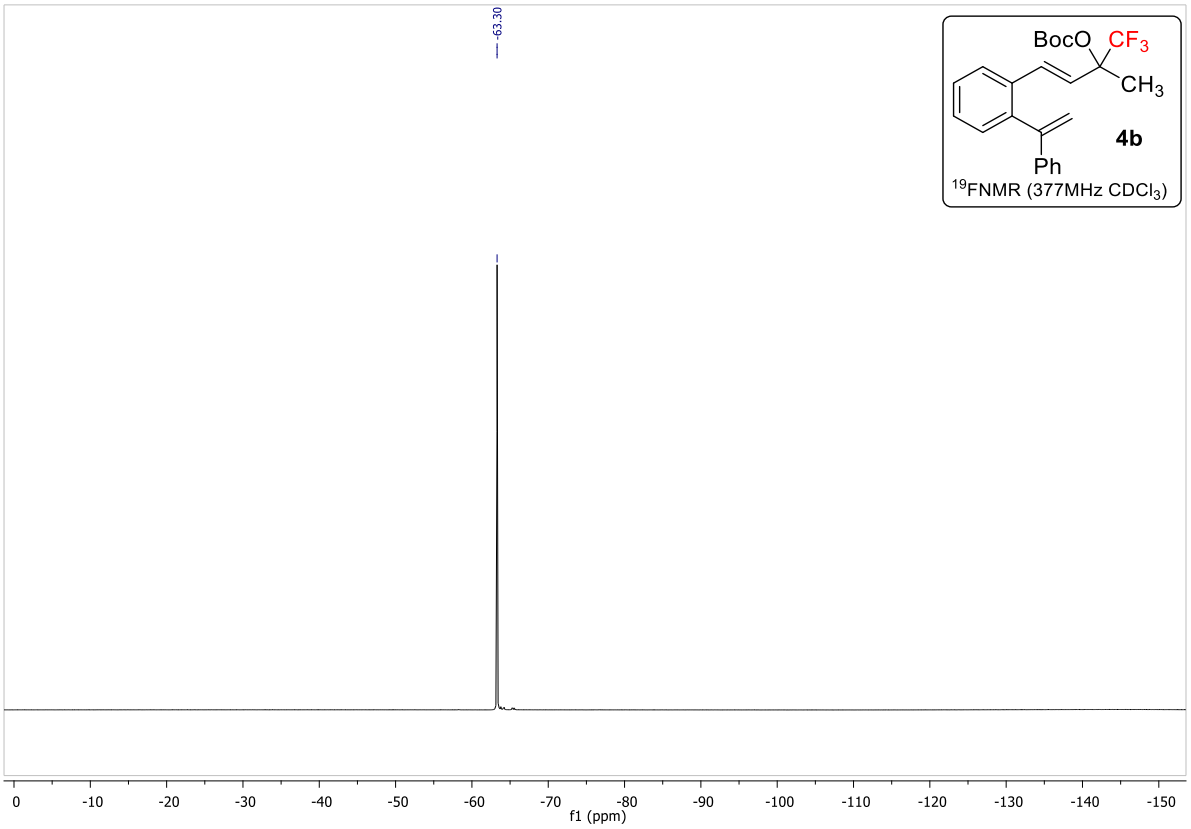

OBoc
CF3
4a
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

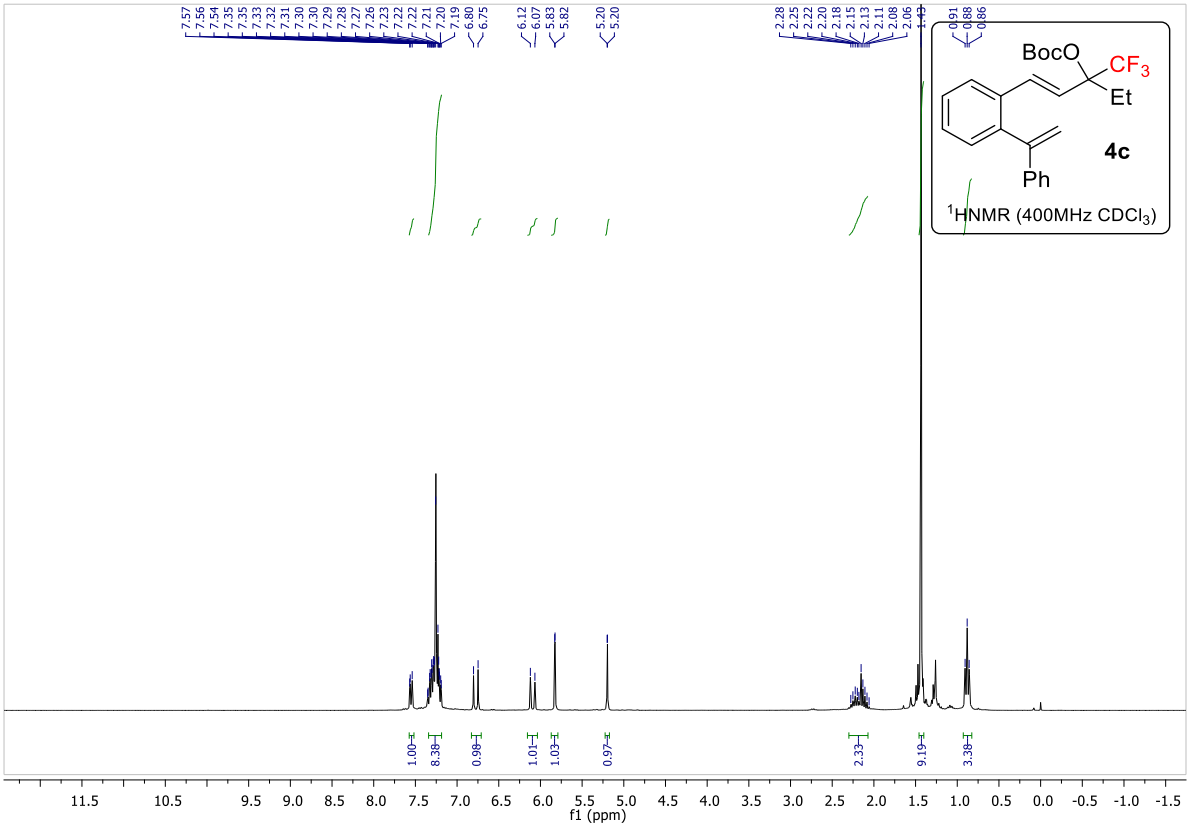

151.70
147.77
141.60
140.72
137.81
134.03
130.60
128.82
128.51
127.98
126.97
126.61
126.24
116.91
83.94
74.50
74.16
73.83
73.56
73.52
29.85
27.76
OBoc
CF3
4a
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

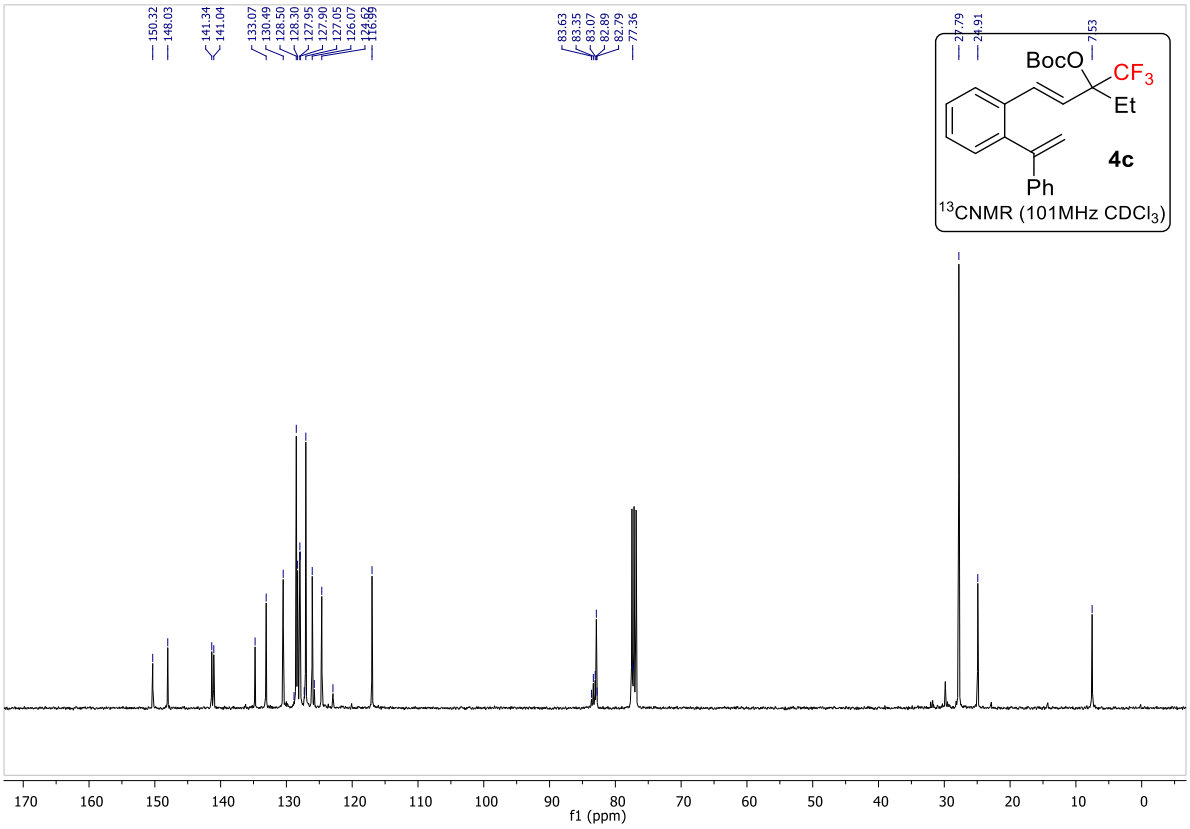

-78.93
OBoc
CF3
4a
Ph
19FNMR (377MHz CDCl3)
f1 (ppm)

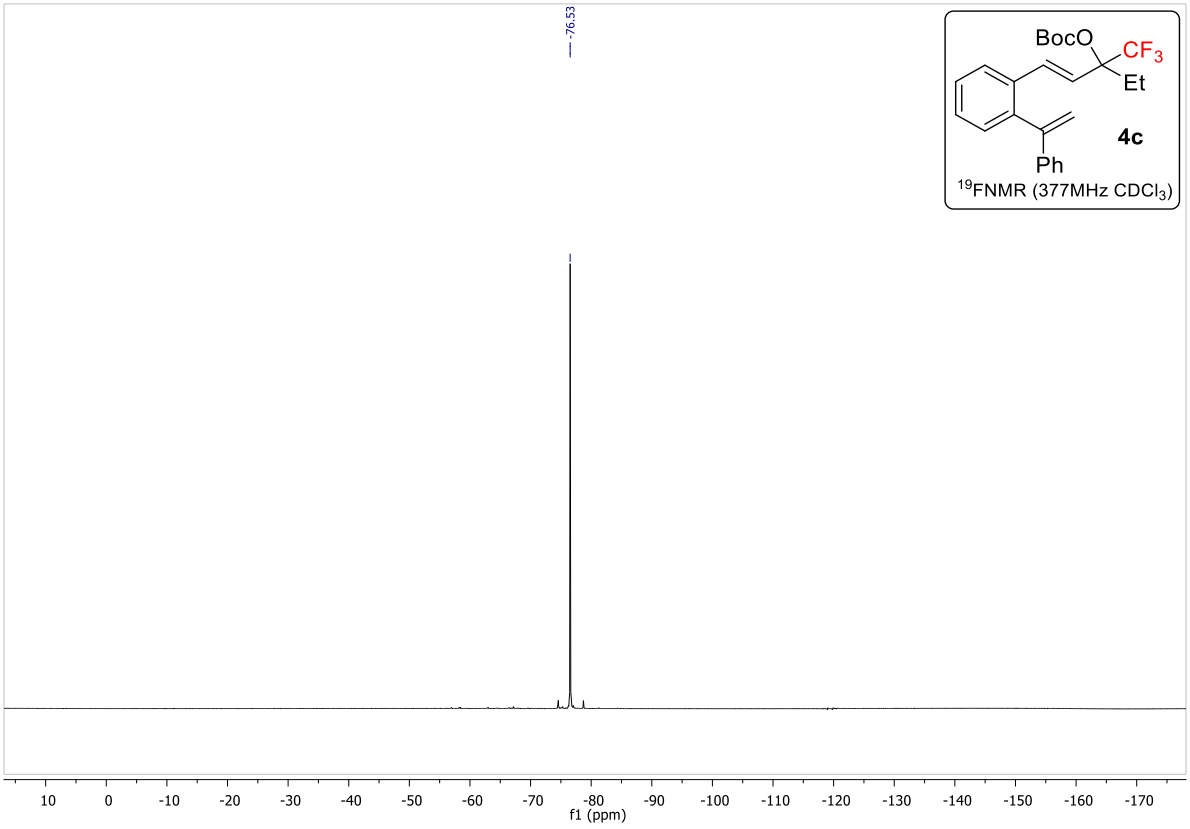

BocO CF3
CH3
4b
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

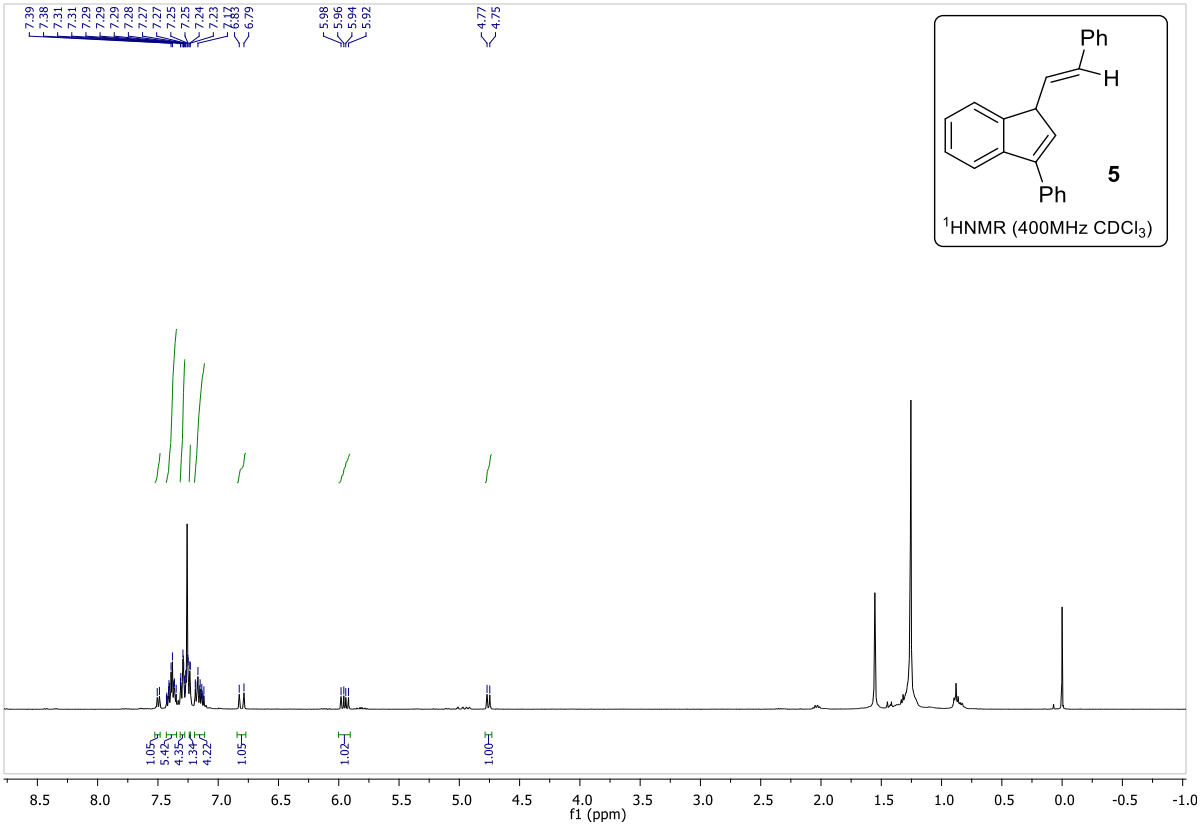

BocO CF3
CH3
4b
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

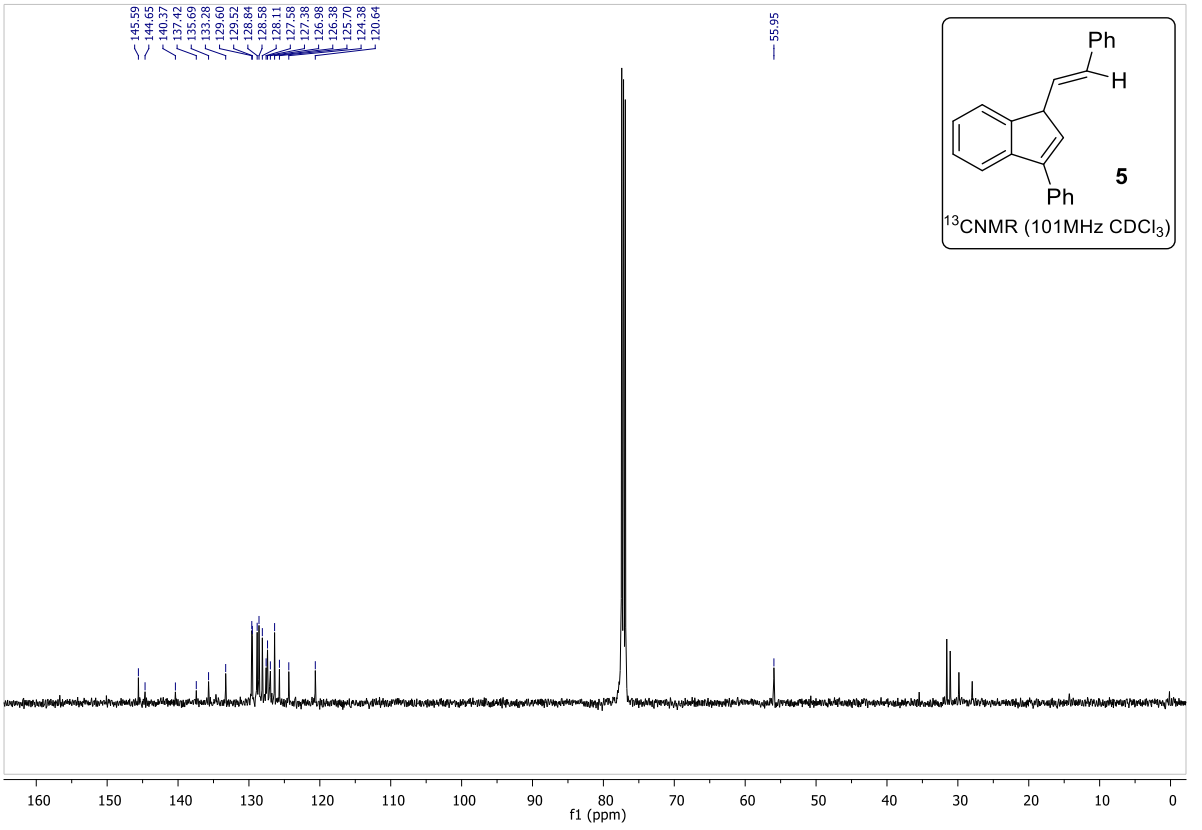

-63.30
BocO
CF3
CH3
4b
Ph
19FNMR (377MHz CDCl3)
f1 (ppm)

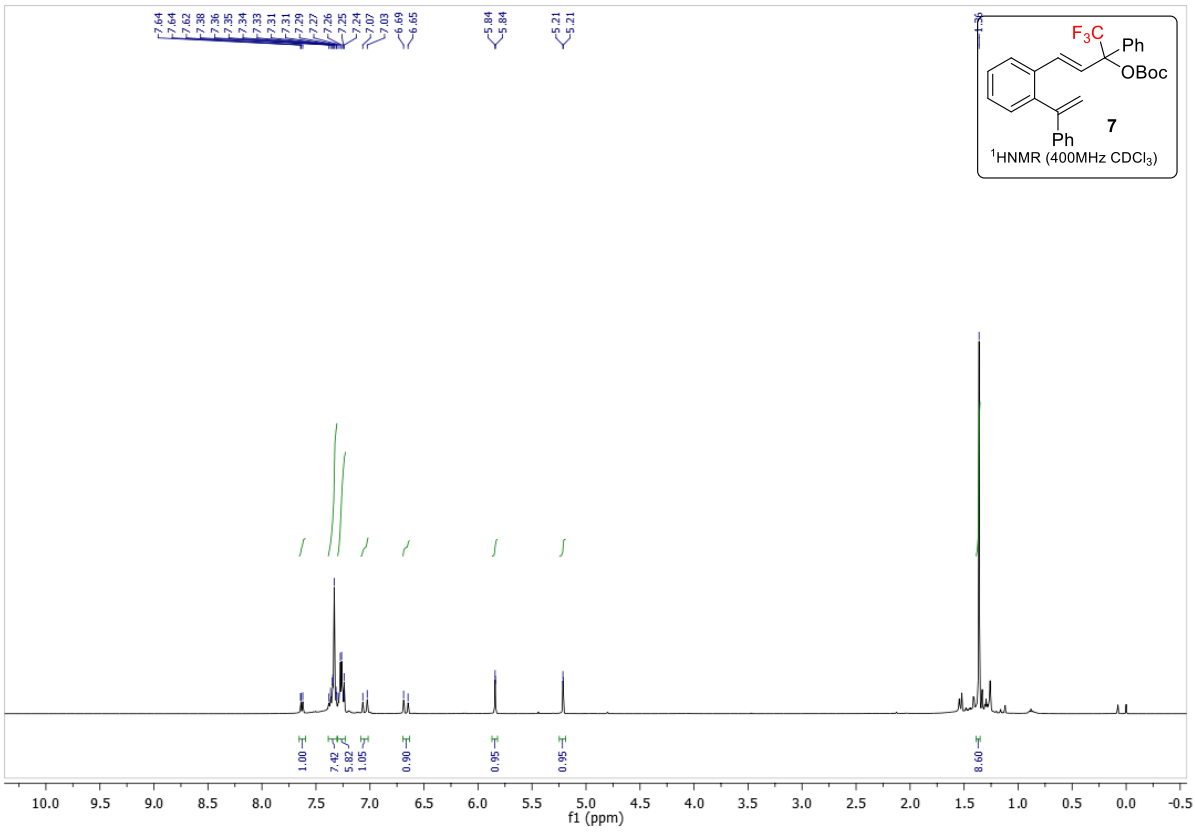

BocO
CF3
Et
4c
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)

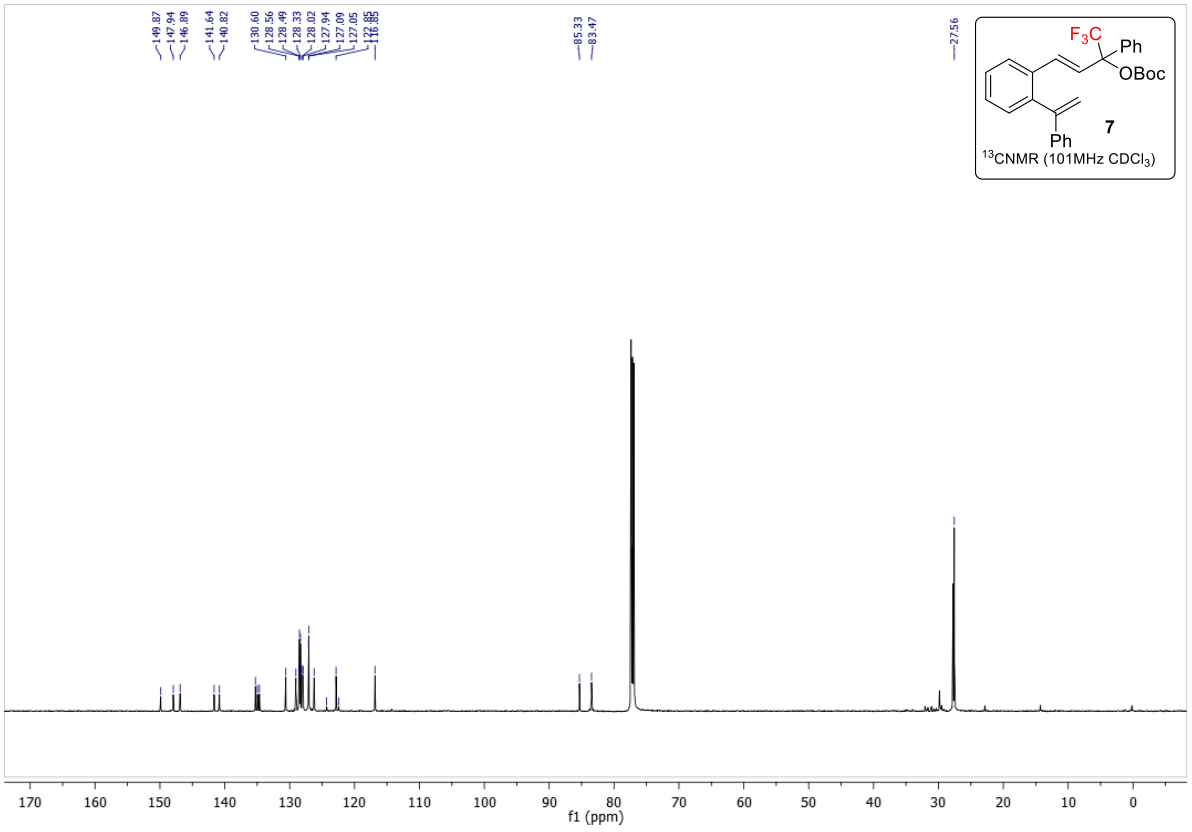

150.32
148.03
141.34
141.04
133.07
130.49
128.50
128.30
127.95
127.90
127.05
126.07
83.63
83.35
83.07
82.89
82.79
77.36
27.79
24.91
7.53
BocO
CF3
Et
4c
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

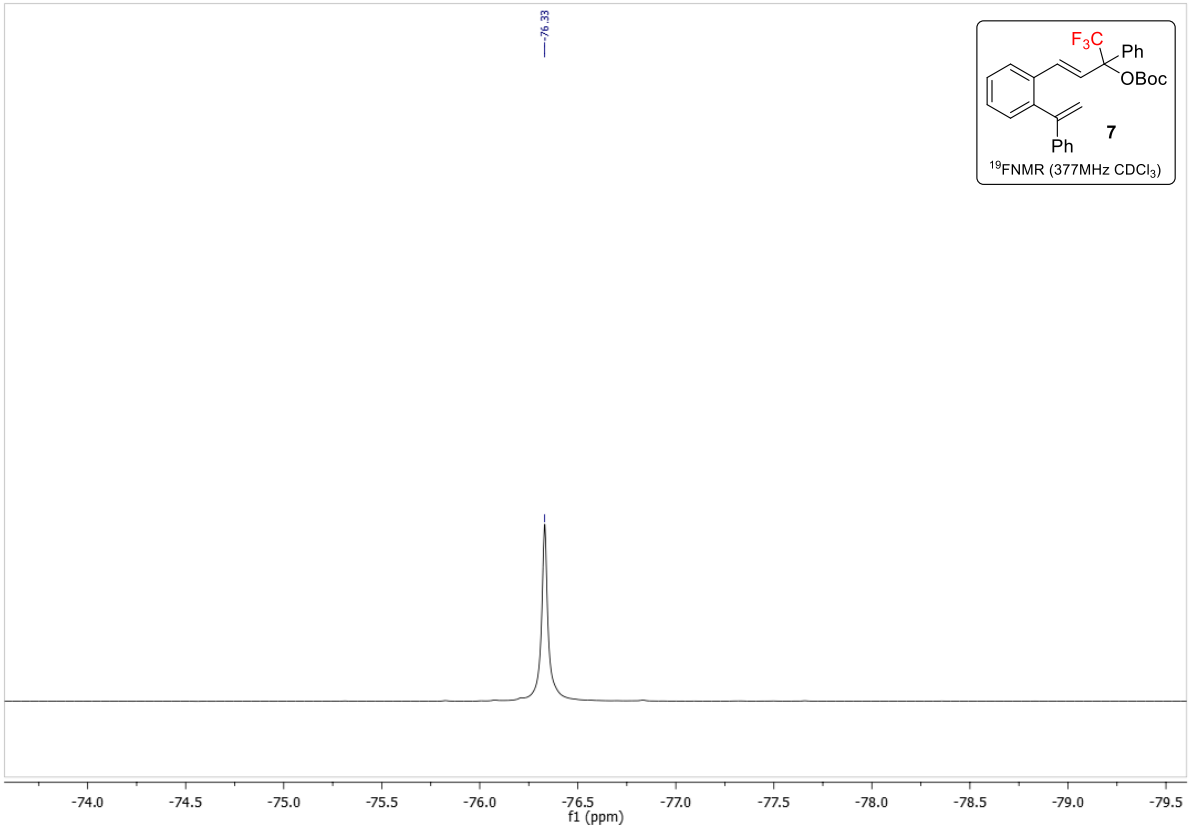

-76.53
BocO
CF3
Et
4c
Ph
19FNMR (377MHz CDCl3)
f1 (ppm)

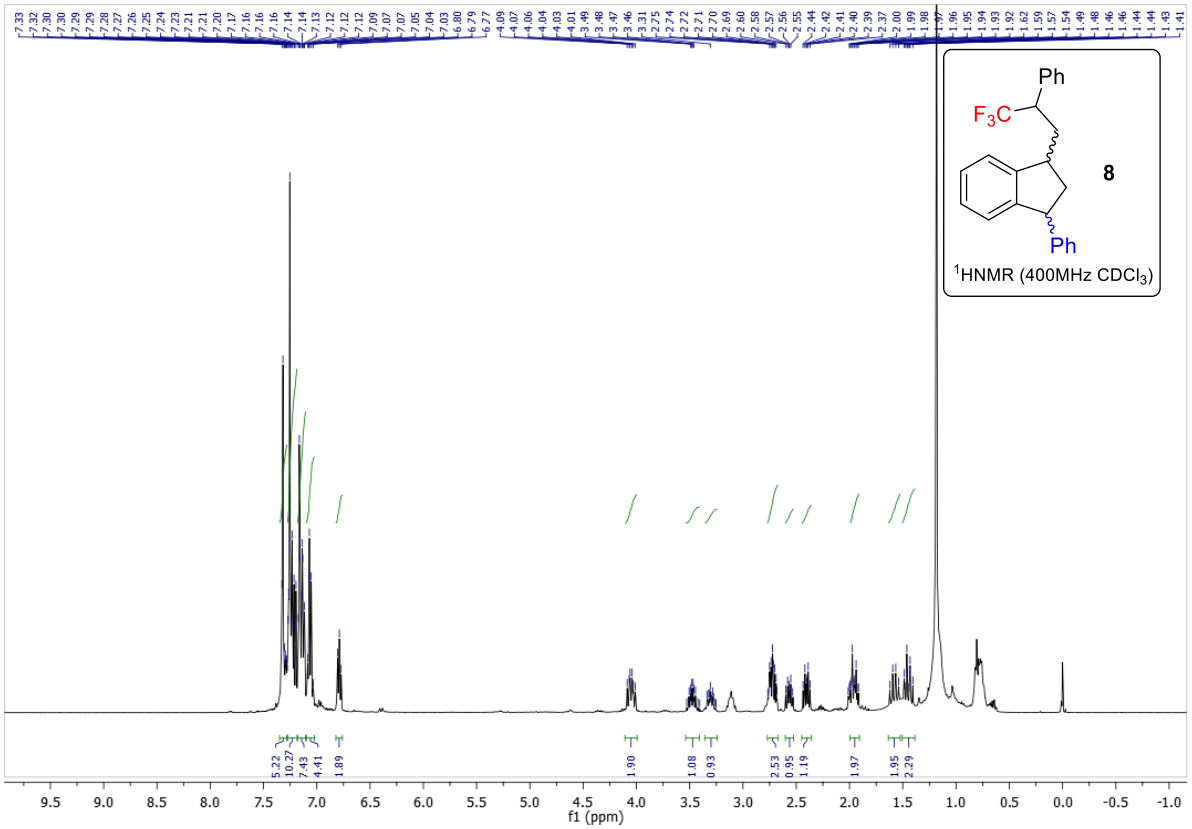

Ph
H
Ph
5
^{1}HNMR (400MHz $CDCl_3$)
f1 (ppm)

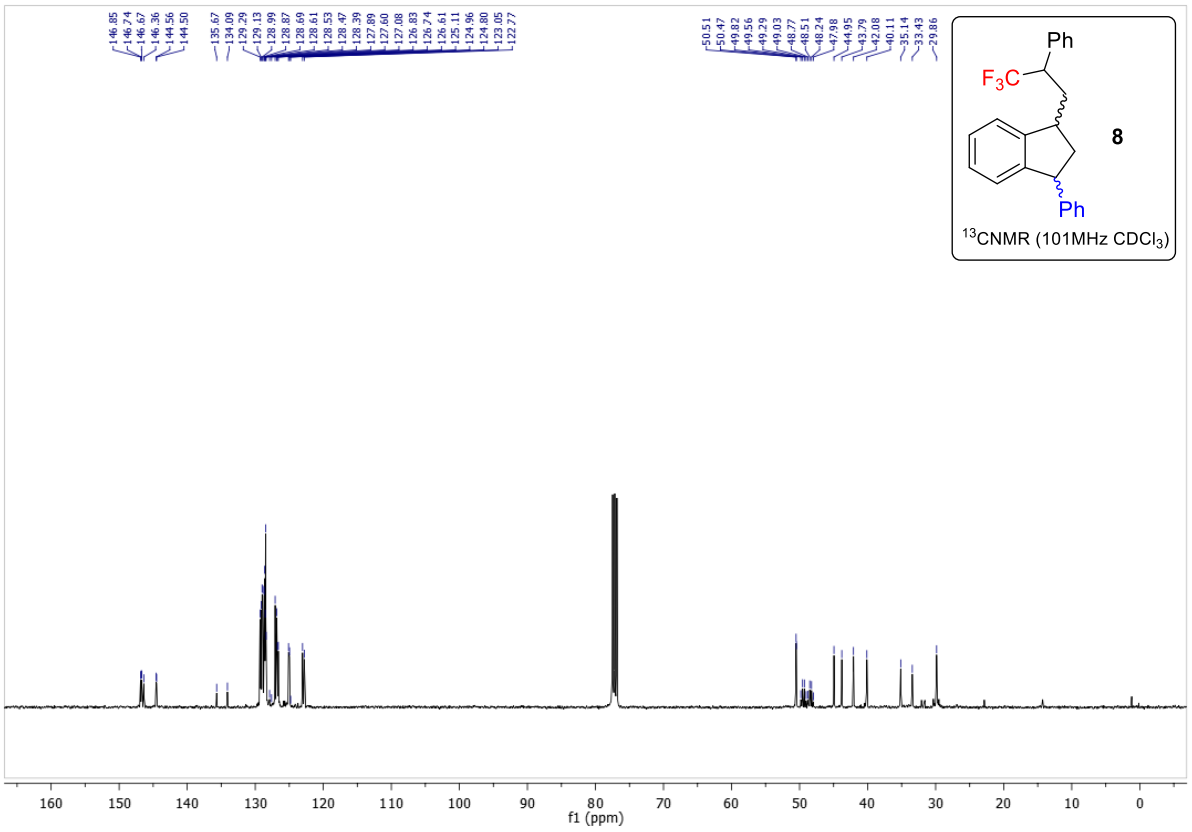

Ph
H
Ph
5
^{13}CNMR (101MHz $CDCl_3$)
f1 (ppm)

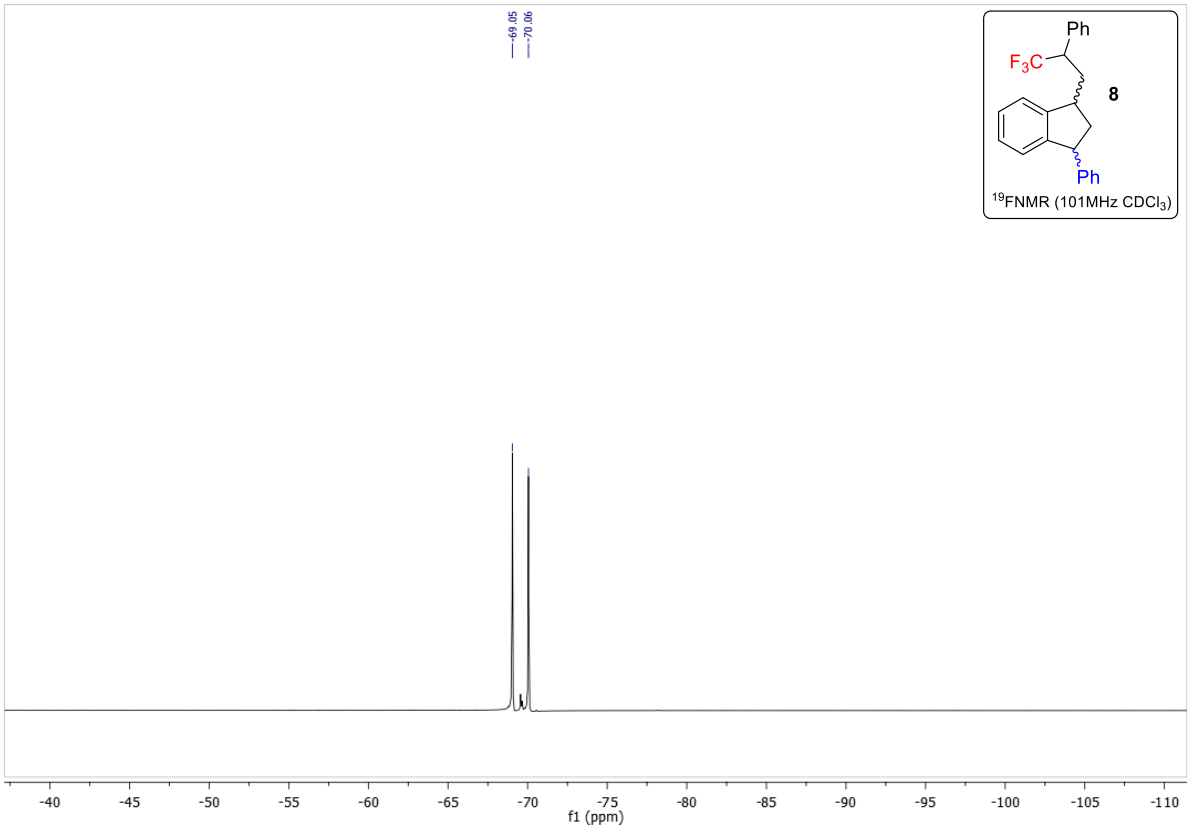

F3C
Ph
OBoc
Ph
7
1HNMR (400MHz CDCl3)
f1 (ppm)

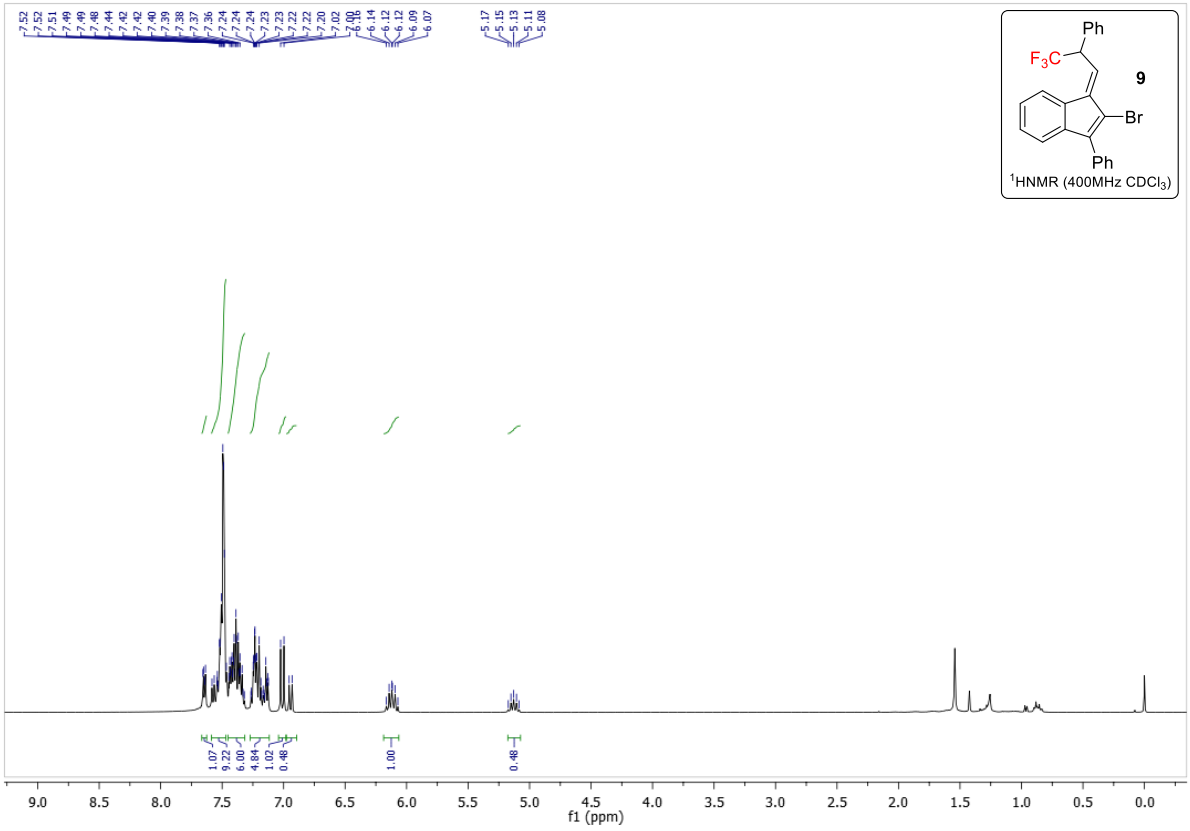

F3C
Ph
OBoc
Ph
7
13CNMR (101MHz CDCl3)
f1 (ppm)

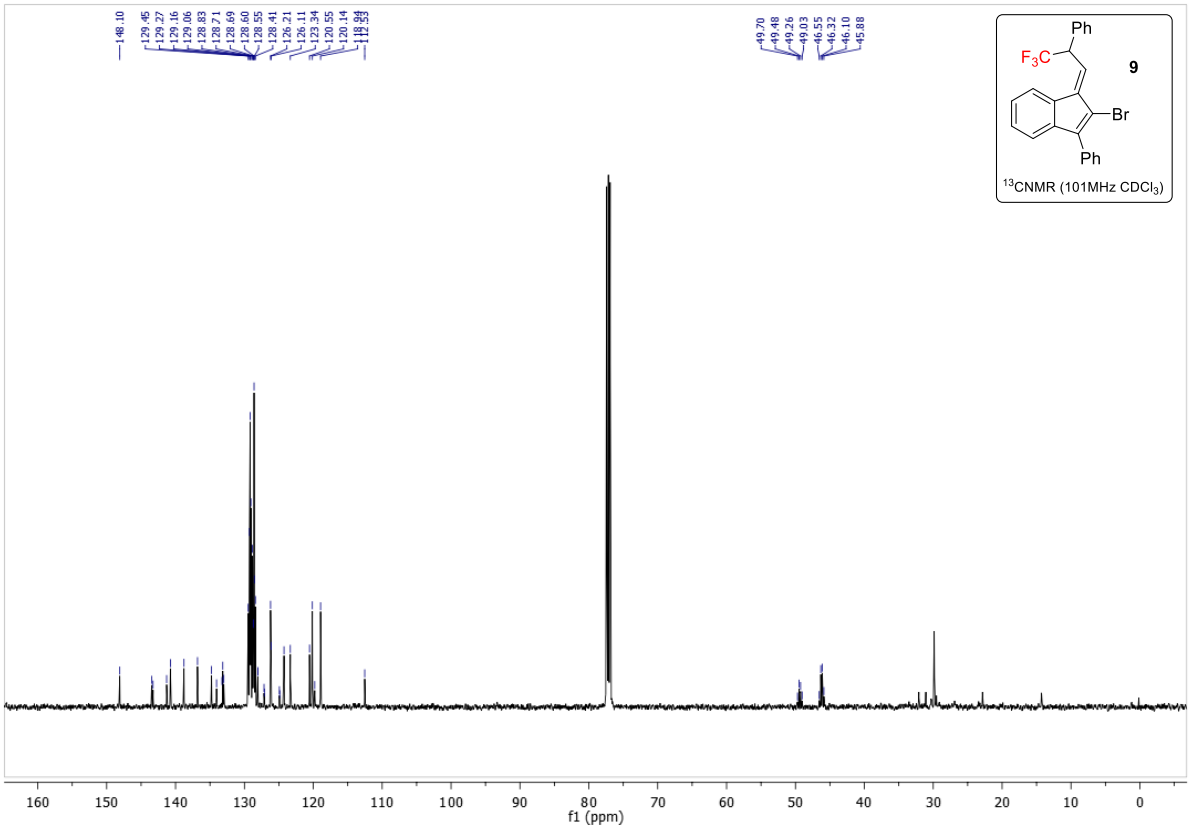

-76.33
F3C
Ph
OBoc
Ph
7
19FNMR (377MHz CDCl3)
-74.0
-74.5
-75.0
-75.5
-76.0
-76.5
-77.0
-77.5
-78.0
-78.5
-79.0
-79.5
f1 (ppm)

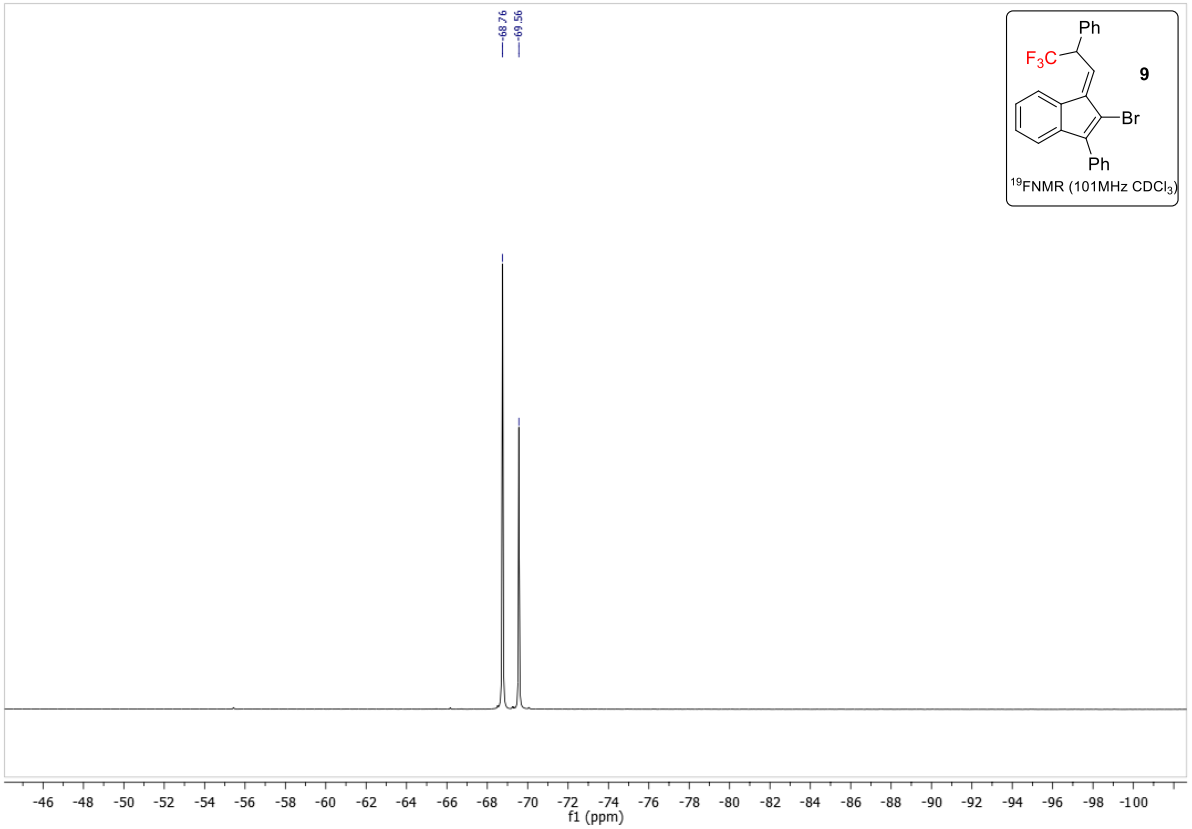

Ph
F3C
8
Ph
1HNMR (400MHz CDCl3)
5.22
10.27
7.43
4.41
1.89
1.90
1.08
0.93
2.53
0.95
1.19
1.97
1.95
2.29
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
f1 (ppm)

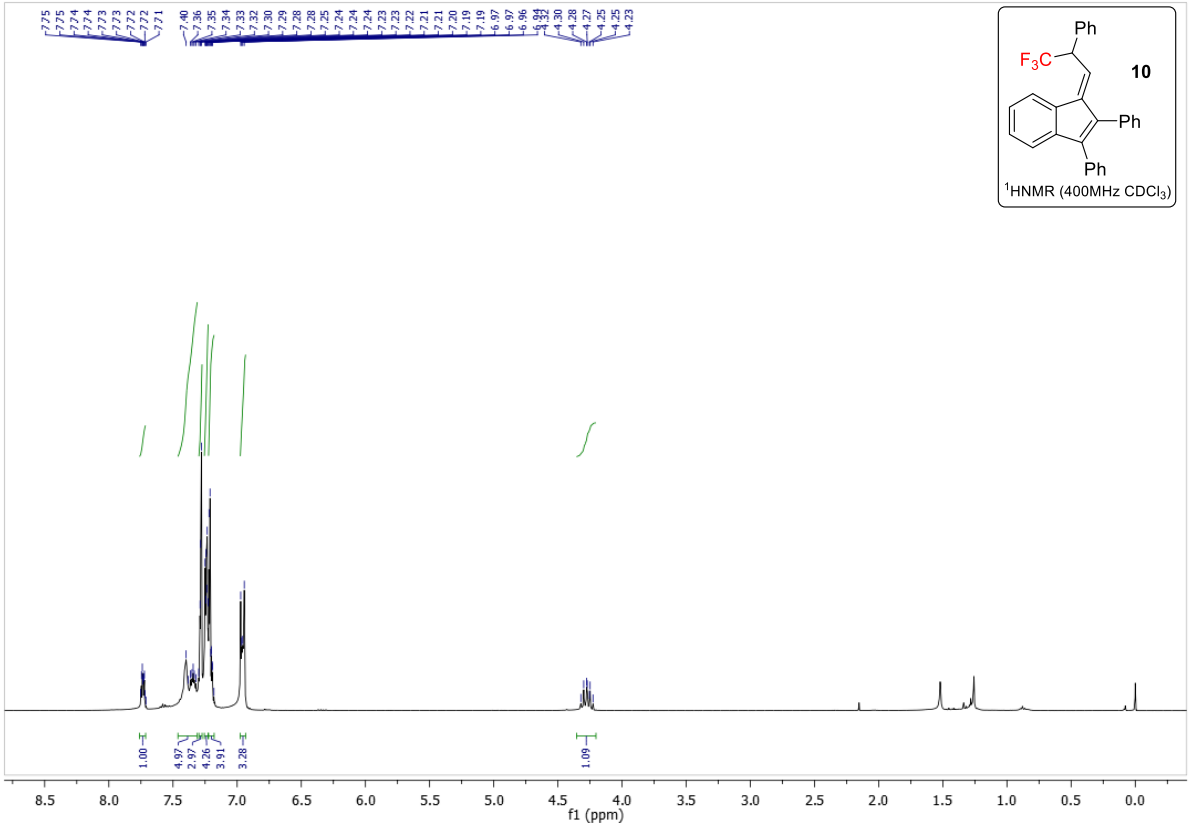

Ph
F3C
8
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)

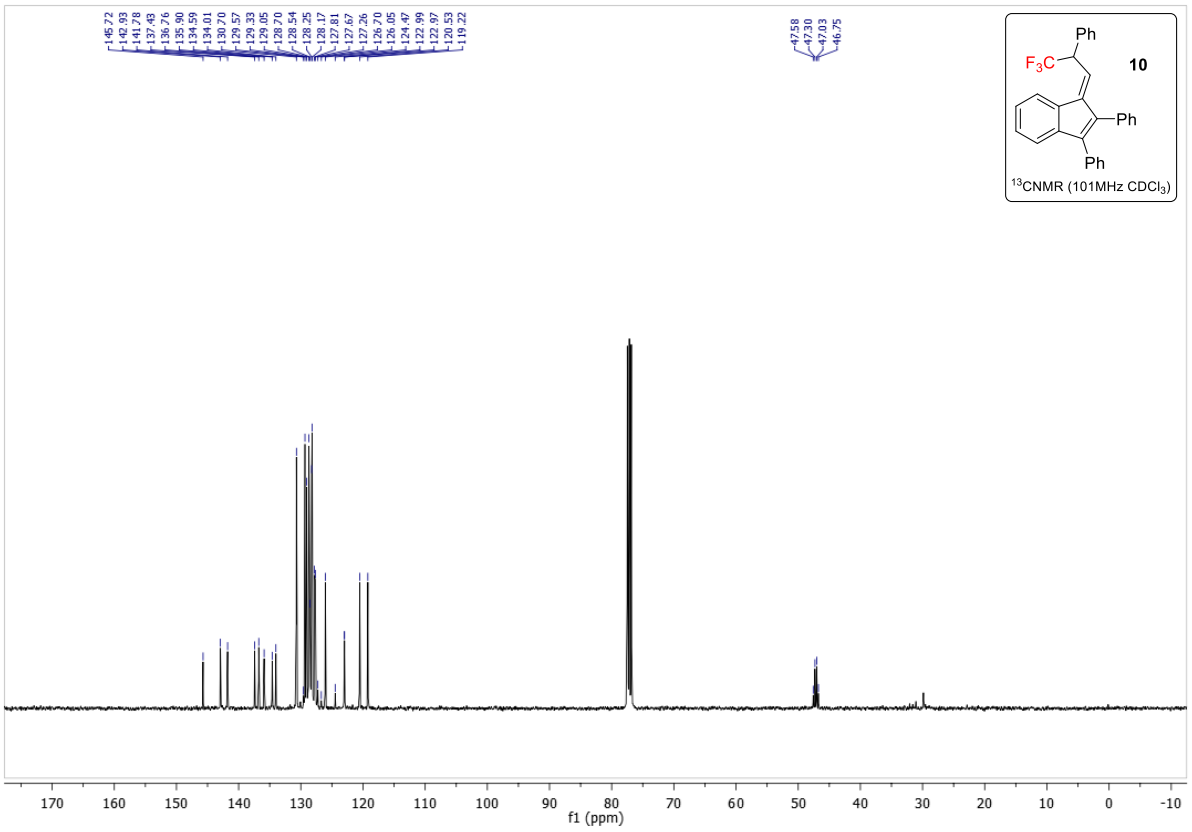

Ph
F3C
8
Ph
19FNMR (101MHz CDCl3)
f1 (ppm)

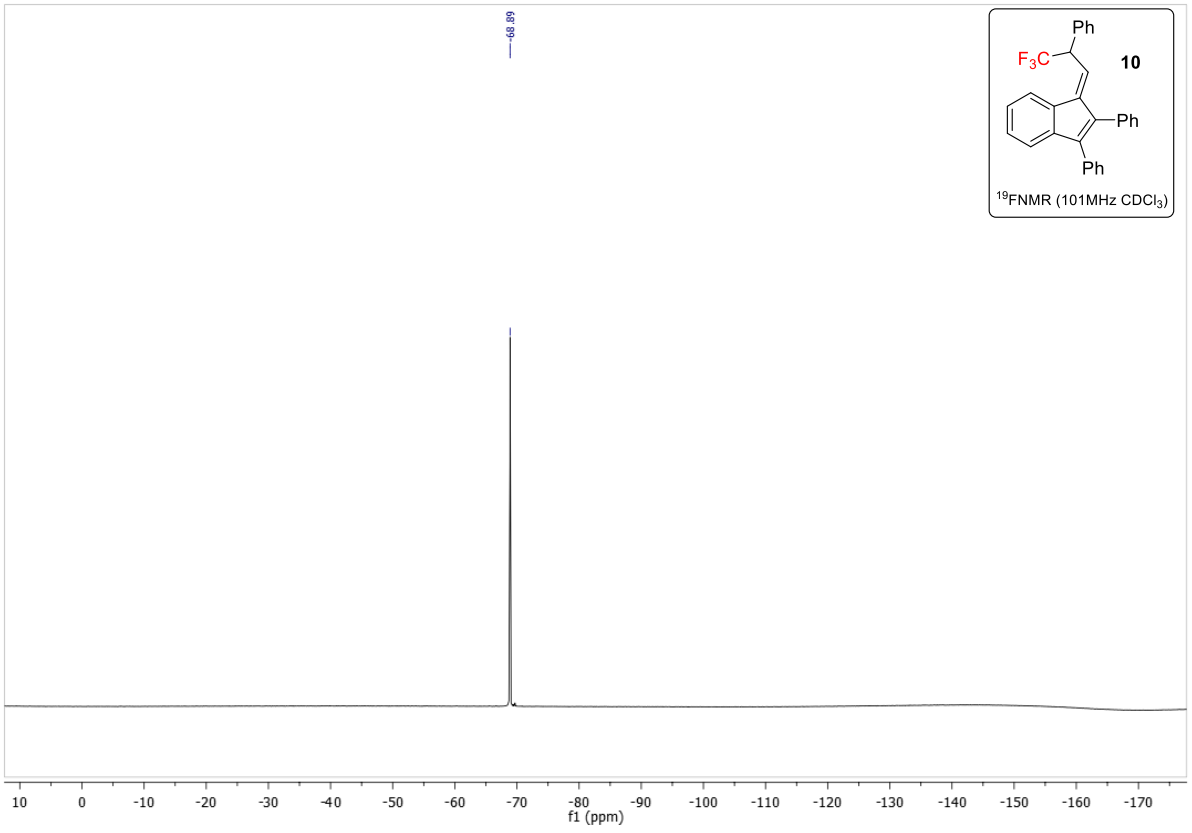

Ph
F3C
9
Br
Ph
1HNMR (400MHz CDCl3)
f1 (ppm)


Ph
F3C
9
Br
Ph
13CNMR (101MHz CDCl3)
f1 (ppm)


-68.76
-69.56
Ph
F3C
9
Br
Ph
19FNMR (101MHz CDCl3)
-46 -48 -50 -52 -54 -56 -58 -60 -62 -64 -66 -68 -70 -72 -74 -76 -78 -80 -82 -84 -86 -88 -90 -92 -94 -96 -98 -100
f1 (ppm)


Ph
F3C
10
Ph
Ph
1HNMR (400MHz CDCl3)
1.00
4.97
2.97
4.26
3.91
3.28
1.09
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


145.72
142.93
141.78
137.43
136.76
135.90
134.59
134.01
130.70
129.57
129.33
129.05
128.70
128.54
128.25
128.17
127.81
127.67
127.26
126.70
126.05
124.47
122.99
122.97
120.53
119.22
47.58
47.30
47.03
46.75
Ph
F3C
10
Ph
Ph
13CNMR (101MHz CDCl3)
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


68.89
Ph
F3C
10
Ph
Ph
19FNMR (101MHz CDCl3)
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170
f1 (ppm)