Supporting Information

Nickel-Catalyzed Asymmetric Reductive Aryl-Allylation of Unactivated Alkenes

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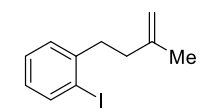
I. General Information

^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded on a Bruker Advance 400M NMR spectrometers at ambient temperature in $CDCl_3$ at 400, 101 and 376 MHz, respectively. ^{19}F NMR were reported as ^{19}F exp. comp. pulse decoupling ($F^{19}CPD$) unless otherwise noted. The chemical shifts are given in ppm relative to tetramethylsilane [^{1}H: δ =($SiMe_4$) = 0.00 ppm] as an internal standard or relative to the resonance of the solvent [^{1}H: δ ($CDCl_3$) = 7.26, ^{13}C: δ ($CDCl_3$) = 77.16 ppm]. Multiplicities were given as: s (singlet); d (doublet); t (triplet); q (quartet); dd (doublet of doublets); dt (doublet of triplets); m (multiplets), etc. Coupling constants are reported as *J* values in Hz. High resolution mass spectral analysis (HRMS) was performed on Waters XEVO G2 Q-TOF. Flash chromatography was performed using 300-400 mesh silica gel with the indicated solvent system.

All Ni-salts were purchased from Adamas-beta, Sigma-Aldrich, Alfa Aesar, TCI, and were used as received. All solvents were purchased from Adamas-beta China and used as received. Other commercial reagents were purchased from Sigma-Aldrich, Alfa Aesar, TCI, Strem, Acros and Energy Chemical, and were used as received.

Reactions were monitored through thin layer chromatography [Merck 60 F254 precoated silica gel plate (0.2 mm thickness)]. Subsequent to elution, spots were visualized using UV radiation (254 nm) on Spectroline Model ZF-7 254 nm. Other visualization methods include staining with a basic solution of potassium permanganate or acidic solution of ceric ammonium molybdate, followed by heating.

II. Preparation of Substrates



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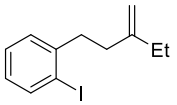

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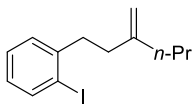

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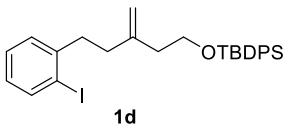

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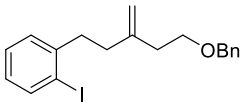

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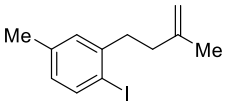

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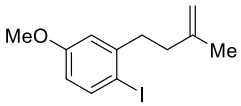

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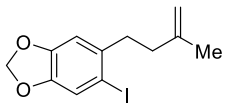

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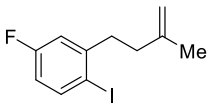

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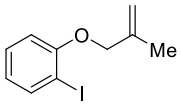

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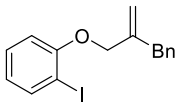

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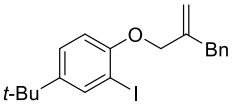

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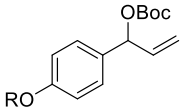

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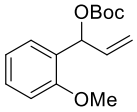

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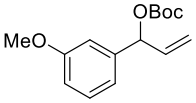

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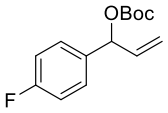

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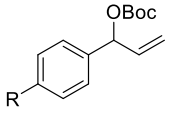

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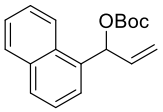

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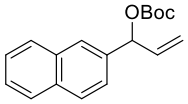

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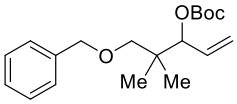

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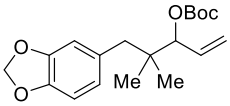

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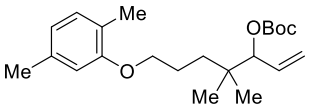

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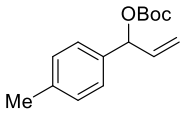

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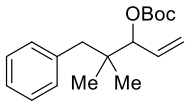

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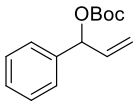

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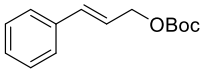

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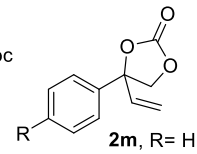

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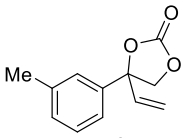

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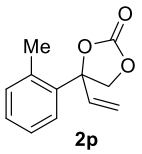

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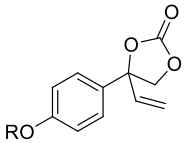

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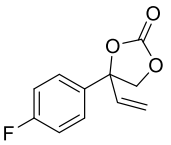

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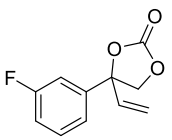

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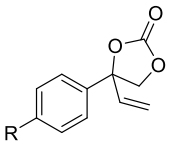

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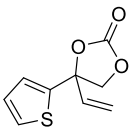

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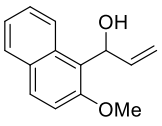

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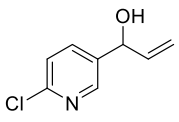

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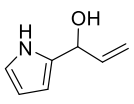

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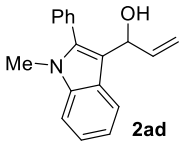

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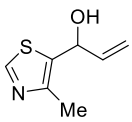

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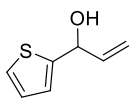
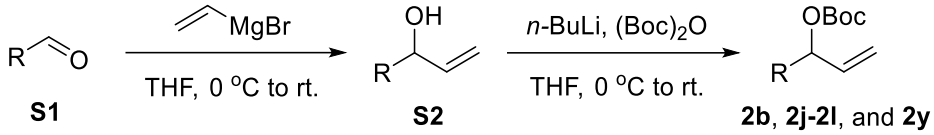


2af

The unactivated alkenes **1a-1i**[1] and **1j-1l**[2], the allylic carbonates **2a**[3], **2c-2g**[3], **2i**[3], **2x**[3],

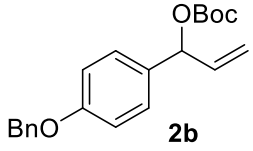
2h[4], **2z**[5], and **2m-2w**[6], the allylic alcohols **2aa-2ab**[7], **2ad**[7], and **2af**[7] are known compounds in the literature.

Procedure for Preparation of the Allylic Carbonates 2b, 2j-2l, and 2y.



Step 1: Allylic carbonates was synthesized according to the reported method[4].Vinyl magnesium bromide (6 mL, 6 mmol, 1.2 equiv, 1 M in THF) was added to a solution of the corresponding aldehydes **S1** (5 mmol, 1.0 equiv) in THF at 0 °C. After 15 min, the reaction was allowed to warm to RT and stirred for additional 3 h. The reaction mixture was quenched by addition of saturated aqueous solution of NH_4Cl and extracted with Et_2O. The combined organic phases were washed with brine, dried over $MgSO_4$, filtered and evaporated in vacuo. The mixture was passed through a short silica gel pad to remove the polar compounds to get the crude material **S2**. **Step 2**: To a flame-dried round-bottomed flask with stir bar was added allylic alcohols **S2 (**1 equiv) and dry THF. The solution was cooled to −78 °C and *n*-butyllithium (1 equiv, 2.5 M in hexane) was added, dropwise. The solution was stirred for 30 minutes at −78 °C, before $(Boc)_2O$ (1.5 equiv) in 4 mL THF was added. The reaction was allowed to warm to room temperature and stirred overnight. The reaction mixture was diluted with 10 mL of diethyl ether and 7 mL of water, and stirred for 15 minutes. The organic layer was separated and the aqueous layer was extracted with diethyl ether (3 x 15 mL). The combined organic phases were washed with brine, dried over $MgSO_4$, filtered and concentrated in vacuo. The crude reaction mixture was purified by flash column chromatography to afford the allylic carbonates.

1-(4-(Benzyloxy)phenyl)allyl tert-butyl carbonate (**2b**)



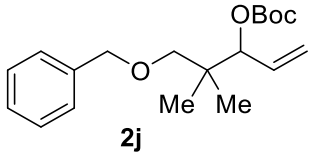
The title compound **2b** was isolated as a colorless oil (1.15 g, 68% over two steps) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).

^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.44-7.37 (m, 4H), 7.36-7.29 (m, 3H), 6.92 (d, *J*= 8.7 Hz, 2H), 6.68-6.50 (m, 1H), 6.16 (dt, *J*= 15.8, 6.6 Hz, 1H), 5.06 (s, 2H), 4.75-4.60 (m, 1H), 1.50 (s, 9H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 158.8, 153.4, 136.8, 134.3, 129.2, 128.6 (2C), 128.1, 127.9 (2C), 127.5, 120.7 (2C), 114.9 (2C), 82.2, 70.0, 67.8, 27.8 (3C) ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{24}O_4Na$ 363.1567; Found 363.1566.

5-(Benzyloxy)-4,4-dimethylpent-1-en-3-yl tert-butyl carbonate (**2j**)



2j

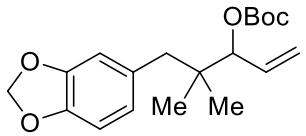
The title compound **2j** was isolated as a colorless oil (0.83 g, 52% over two steps) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.35-7.24 (m, 5H), 5.90-5.73 (m, 1H), 5.33-5.18 (m, 2H), 5.14-5.08 (m, 1H), 4.55-4.40 (m, 2H), 3.27 (d, *J*= 8.9 Hz, 1H), 3.20 (d, *J*= 8.8 Hz, 1H), 1.47 (s, 9H), 0.98 (s, 3H), 0.93 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 153.2, 138.7, 133.3, 128.3 (2C), 127.4 (3C), 118.4, 81.7, 81.5, 76.5, 73.3, 38.6, 27.9 (3C), 21.1, 20.7 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{19}H_{28}O_4Na$ 343.1880 ; Found 343.1881.

5-(Benzo[d][1,3]dioxol-5-yl)-4,4-dimethylpent-1-en-3-yl tert-butyl carbonate (**2k**)



2k

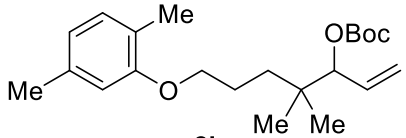
The title compound **2k** was isolated as a colorless oil (0.83 g, 52% over two steps) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).

^{1}H NMR (500 MHz, Chloroform-*d*) δ= 6.71 (d, *J*= 7.9 Hz, 1H), 6.62 (s, 1H), 6.56 (d, *J*= 7.9 Hz, 1H), 5.92 (s, 2H), 5.88-5.82 (m, 1H), 5.30-5.22 (m, 2H), 4.73 (d, *J*= 7.0 Hz, 1H), 2.61 (d, *J*= 13.3 Hz, 1H), 2.46 (d, *J*= 13.3 Hz, 1H), 1.50 (s, 9H), 0.91 (s, 3H), 0.85 (s, 3H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 153.2, 147.1, 145.9, 133.3, 131.7, 123.6, 118.9, 111.1, 107.7, 100.8, 83.9, 81.9, 44.0, 38.1, 27.9 (3C), 23.2, 22.5 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{19}H_{26}O_5Na$ 357.1678; Found 357.1682.

tert-Butyl (7-(2,5-dimethylphenoxy)-4,4-dimethylhept-1-en-3-yl) carbonate (**2l**)

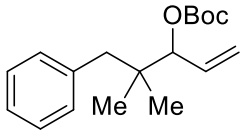


2l

The title compound **2l** was isolated as a colorless oil (1.10 g, 61% over two steps) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 6.99 (d, *J*= 7.4 Hz, 1H), 6.65 (d, *J*= 7.5 Hz, 1H), 6.61 (s, 1H), 5.94-5.78 (m, 1H), 5.36-5.13 (m, 2H), 4.85 (d, *J*= 5.9 Hz, 1H), 3.96-3.84 (m, 2H), 2.30 (s, 3H), 2.17 (s, 3H), 1.85-1.71 (m, 2H), 1.52-1.44 (m, 2H), 1.47 (s, 9H), 0.96 (s, 3H), 0.94 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 157.0, 153.4, 136.4, 133.3, 130.3, 123.6, 120.6, 118.6, 111.9, 84.0, 81.7, 68.4, 36.7, 35.0, 27.9 (3C), 23.9, 23.0, 22.9, 21.4, 15.8 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{34}O_4Na$ 385.2349; Found 385.2356.

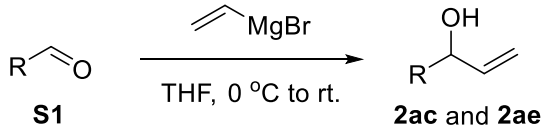
tert-Butyl (4,4-dimethyl-5-phenylpent-1-en-3-yl) carbonate (**2y**)



2y

The title compound **2y** was isolated as a colorless oil (0.93 g, 64% over two steps) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.28-7.20 (m, 3H), 7.15-7.11 (m, 2H), 5.94-5.84 (m, 1H), 5.31-5.25 (m, 2H), 4.77 (d, *J*= 7.1 Hz, 1H), 2.69 (d, *J*= 13.1 Hz, 1H), 2.55 (d, *J*= 13.0 Hz, 1H), 1.50 (s, 9H), 0.92 (s, 3H), 0.85 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 153.2, 138.1, 133.3, 130.8 (2C), 127.8 (2C), 126.1, 118.9, 84.0, 81.8, 44.2, 38.1, 27.9 (3C), 23.1, 22.5 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{18}H_{26}O_3Na$ 313.1774; Found 313.1770.

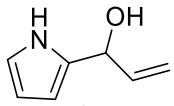
Procedure for Preparation of the Allylic Alcohols 2ac and 2ae[4]



S1 **2ac** and **2ae**

Vinyl magnesium bromide (6 mL, 6 mmol, 1.2 equiv, 1 M in THF) was added to a solution of the corresponding aldehydes **S1** (5 mmol, 1.0 equiv) in THF at 0 °C. After 15 min, the reaction was allowed to warm to RT and stirred for additional 3 h. The reaction mixture was quenched by addition of saturated aqueous solution of NH_4Cl and extracted with Et_2O. The combined organic phases were washed with brine, dried over $MgSO_4$, and removed in vacuum. The residue was purified by column chromatography (petroleum ether/ethyl acetate) to provide the allylic alcohols.

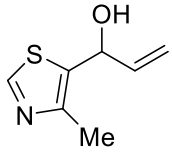
1-(1H-Pyrrol-2-yl)prop-2-en-1-ol (**2ac**)



2ac

The title compound **2ac** was isolated as a colorless oil (0.22 g, 35%) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (2:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 8.41 (s, 1H), 6.81-6.71 (m, 1H), 6.20-6.11 (m, 1H), 6.12-6.03 (m, 2H), 5.39 (dt, *J*= 17.0, 1.4 Hz, 1H), 5.29-5.21 (m, 2H), 2.19-2.11 (brs, 1H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 138.3, 132.4, 118.2, 115.6, 108.4, 106.1, 68.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for C_7H_9NONa 146.0582; Found 146.0588.

1-(4-Methylthiazol-5-yl)prop-2-en-1-ol (**2ae**)

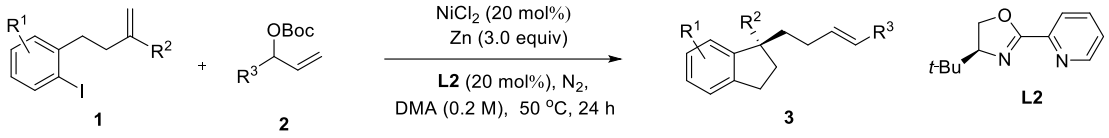


2ae

The title compound **2ae** was isolated as a colorless oil (0.61 g, 79%) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (3:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 8.59 (s, 1H), 6.13-6.01 (m, 1H), 5.49 (d, *J*= 5.7 Hz, 1H), 5.36 (d, *J*= 18.6 Hz, 1H), 5.22 (d, *J*= 10.2 Hz, 1H), 3.56-3.38 (brs, 1H), 2.40 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 151.1, 148.8, 138.9, 134.2, 115.8, 68.4, 15.2 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_7H_{10}NOS$ 156.0483; Found 156.0481.

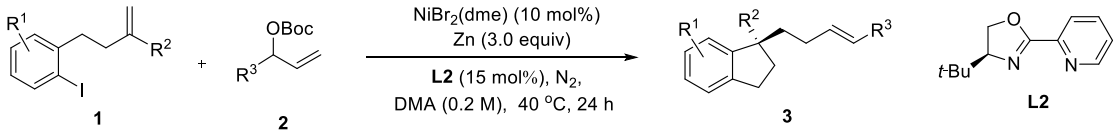
III. Procedures for the Nickel-Catalyzed Asymmetric Reductive Aryl-Allylation

Standard Procedure A for Synthesis of 3aa-3ad and 3fa.



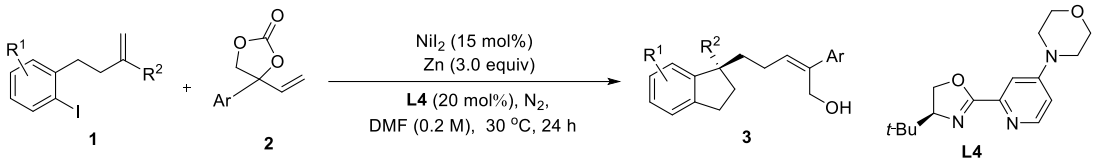
$NiCl_2$ (5.2 mg, 0.04 mmol, 20 mol %), Zn (39 mg, 0.6 mmol, 3 equiv) and ligand **L2** (8.2 mg, 0.04 mmol, 20 mol %) were placed in a Schlenk tube equipped with a stir bar. Subsequently, the Schlenk tube was evacuated and filled with nitrogen (three cycles). To these solids, 1.0 mL dry DMA, unactivated alkenes **1** (0.2 mmol, 1.0 equiv) and allylic carbonates **2** (0.3 mmol, 1.5 equiv) were added successively under nitrogen atmosphere. The reaction mixture was stirred at 50 °C for 24 hours, before it was quenched by addition of water. The aqueous phase was extracted with ethyl acetate (3×20 mL), and the combined organic phases were washed with brine, dried over Na_2SO_4, filtered and concentrated in vacuo. The crude materials were then purified through column chromatography on silica gel (petroleum ether/ethyl acetate) to give the products **3**.

Standard Procedure B for Synthesis of 3ae-3al, 3bk, 3ck, 3fx, 3gy and 3ik.



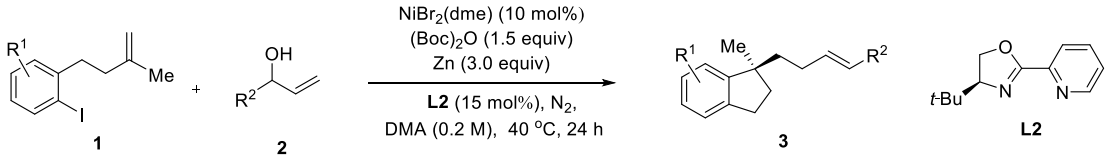
$NiBr_2$(dme) (6.2 mg, 0.02 mmol, 10 mol %), Zn (39 mg, 0.6 mmol, 3 equiv) and ligand **L2** (6.1 mg, 0.03 mmol, 15 mol %) were placed in a Schlenk tube equipped with a stir bar. Then the Schlenk tube was evacuated and filled with nitrogen (three cycles). To these solids, 1.0 mL dry DMA, unactivated alkenes **1** (0.2 mmol, 1.0 equiv) and allylic carbonates **2** (0.3 mmol, 1.5 equiv) were added successively under nitrogen atmosphere. The reaction mixture was stirred at 40 °C for 24 hours, before it was quenched by addition of water. The aqueous phase was extracted with ethyl acetate (3×20 mL), and the combined organic phases were washed with brine, dried over Na_2SO_4, filtered and concentrated in vacuo. The crude materials were purified through column chromatography on silica gel (petroleum ether/ethyl acetate) to give the products **3**.

Standard Procedure C for Synthesis of 3am-3aw, 3bm-3jm, 3jn-3jo and 3km-3lm.



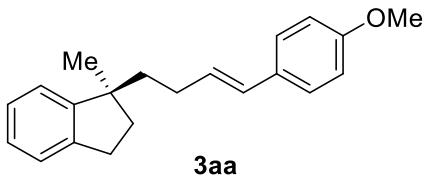
NiI_2 (9.4 mg, 0.03 mmol, 15 mol %), Zn (39 mg, 0.6 mmol, 3 equiv) and ligand (11.6 mg, 0.04 mmol, 20 mol %) were placed in a Schlenk tube equipped with a stir bar. Then the Schlenk tube was evacuated and filled with nitrogen (three cycles). To these solids, 1.0 mL dry DMF, unactivated alkenes **1** (0.3 mmol, 1.5 equiv) and vinyl ethylene carbonates **2** (0.2 mmol, 1.0 equiv) were added successively under nitrogen atmosphere. The reaction mixture was stirred at 30 °C for 24 hours,[a] before it was quenched by addition of water. The aqueous phase was extracted with ethyl acetate (3×20 mL), and the combined organic phases were washed with brine, dried over Na_2SO_4, filtered and concentrated in vacuo. The crude materials were purified through column chromatography on silica gel (petroleum ether/ethyl acetate) to give the **3** as products.
[a] 48 h for **3km**.

Standard Procedure D for Synthesis of 3aaa-3aae and 3gaf.



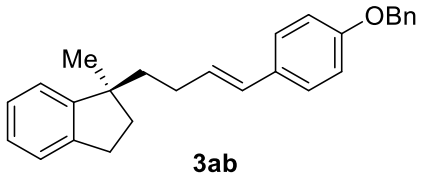
$NiBr_2$(dme) (6.2 mg, 0.02 mmol, 10 mol %), $(Boc)_2O$ (65.4 mg, 0.3 mmol, 1.5 equiv), Zn (39 mg, 0.6 mmol, 3 equiv) and ligand **L2** (6.1 mg, 0.03 mmol, 15 mol %) were placed in a Schlenk tube equipped with a stir bar. Then the Schlenk tube was evacuated and filled with nitrogen (three cycles). To these solids, 1.0 mL dry DMA and unactivated alkenes **1** (0.2 mmol, 1.0 equiv) and the allyl alcohols **2** (0.3 mmol, 1.5 equiv) were added successively under nitrogen atmosphere. The reaction mixture was stirred at 40 °C for 24 hours, before it was quenched by addition of water. The aqueous phase was extracted with ethyl acetate (3×20 mL), and the combined organic phases were washed with brine, dried over Na_2SO_4, filtered and concentrated in vacuo. The crude products were purified through column chromatography on silica gel (petroleum ether/ethyl acetate) to give the products **3**.

(S,E)-1-(4-(4-Methoxyphenyl)but-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3aa**)



Following the Standard Procedure A, the title compound **3aa** was isolated as a colorless oil (43 mg, 74%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
Following the Standard Procedure D, the title compound **3aa** was isolated as a colorless oil (34 mg, 58%, 93% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.25-7.18 (m, 4H), 7.17-7.13 (m, 2H), 6.81 (d, *J*= 8.7 Hz, 2H), 6.29 (d, *J*= 15.8 Hz, 1H), 6.03 (dt, *J*= 15.8, 6.7 Hz, 1H), 3.78 (s, 3H), 2.94-2.86 (m, 2H), 2.22-2.03 (m, 3H), 1.87 (dt, *J*= 12.6, 7.8 Hz, 1H), 1.81-1.66 (m, 2H), 1.28 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 158.6, 151.2, 143.2, 130.7, 129.1, 128.8, 126.9 (2C), 126.3, 126.2, 124.6, 122.7, 113.9 (2C), 55.3, 47.3, 41.1, 38.6, 30.3, 28.7, 26.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{24}ONa$ 315.1719; Found 315.1722.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.5 mL/min): t_R = 10.0 (major), 11.4 (minor).

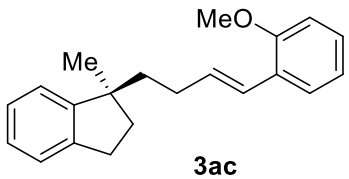
(S,E)-1-(4-(4-(Benzyloxy)phenyl)but-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3ab**)



3ab

The title compound **3ab** was isolated as a colorless oil (38 mg, 51%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.45-7.32 (m, 5H), 7.25-7.12 (m, 6H), 6.89 (d, *J*= 8.7 Hz, 2H), 6.29 (d, *J*= 15.8 Hz, 1H), 6.04 (dt, *J*= 15.8, 6.8 Hz, 1H), 5.05 (s, 2H), 2.94-2.86 (m, 2H), 2.22-2.16 (m, 1H), 2.12-2.03 (m, 2H), 1.87 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.81-1.71 (m, 1H), 1.71-1.64 (m, 1H), 1.28 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 157.8, 151.2, 143.2, 137.1, 131.0, 129.2, 128.8, 128.6 (2C), 127.9, 127.5 (2C), 126.9 (2C), 126.3, 126.2, 124.6, 122.7, 114.9 (2C), 70.0, 47.3, 41.1, 38.6, 30.3, 28.7, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{27}H_{29}O$ 369.2213; Found 369.2210.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 96/4, flow rate = 0.4 mL/min): t_R= 20.3 (minor), 21.0 (major).

(S,E)-1-(4-(2-Methoxyphenyl)but-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3ac**)

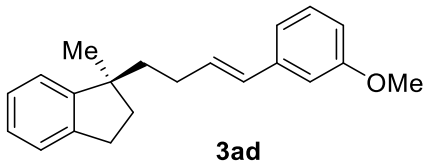


3ac

The title compound **3ac** was isolated as a colorless oil (36 mg, 61%, 90% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.36 (dd, *J*= 7.6, 1.7 Hz, 1H), 7.24-7.09 (m, 5H), 6.93-6.79 (m, 2H), 6.67 (d, *J*= 15.9 Hz, 1H), 6.17 (dt, *J*= 15.9, 6.8 Hz, 1H), 3.82 (s, 3H), 2.94-2.86 (m, 2H), 2.26-2.19 (m, 1H), 2.17-2.05 (m, 2H), 1.87 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.81-1.68 (m, 2H), 1.28 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 156.2, 151.3, 143.2, 131.9, 127.8, 126.9, 126.4, 126.3, 126.2, 124.5, 124.0, 122.7, 120.6, 110.8, 55.4, 47.4, 41.0, 38.7, 30.3, 29.2, 26.8 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{21}H_{25}O$ 293.1900; Found 293.1888.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 98/2, flow rate = 0.4 mL/min): t_R= 12.7 (minor), 13.3 (major).

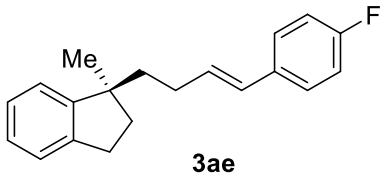
(S,E)-1-(4-(3-Methoxyphenyl)but-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3ad**)



3ad

The title compound **3ad** was isolated as a colorless oil (33 mg, 56%, 93% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.23-7.12 (m, 5H), 6.92-6.81 (m, 2H), 6.77-6.69 (m, 1H), 6.32 (d, *J*= 15.9 Hz, 1H), 6.18 (dt, *J*= 15.8, 6.6 Hz, 1H), 3.79 (s, 3H), 2.94-2.86 (m, 2H), 2.25-2.04 (m, 3H), 1.87 (dt, *J* = 12.7, 7.6 Hz, 1H), 1.77 – 1.67 (m, 2H), 1.29 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 159.8, 151.1, 143.2, 139.4, 131.6, 129.42, 129.37, 126.3, 126.2, 124.6, 122.7, 118.6, 112.4, 111.2, 55.2, 47.3, 40.9, 38.6, 30.3, 28.7, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{21}H_{25}O$ 293.1900; Found 293.1183.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.4 mL/min): t_R= 43.5 (minor), 44.8 (major).

(S,E)-1-(4-(4-Fluorophenyl)but-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3ae**)

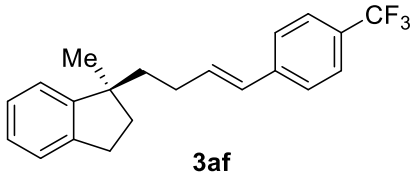


3ae

The title compound **3ae** was isolated as a colorless oil (24 mg, 42%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.27-7.23 (m, 2H), 7.20-7.12 (m, 4H), 6.95 (t, *J*= 8.7 Hz, 2H), 6.30 (d, *J*= 16.0 Hz, 1H), 6.09 (dt, *J*= 15.8, 6.8 Hz, 1H), 2.94-2.86 (m, 2H), 2.25-2.18 (m, 1H), 2.14-2.08 (m, 2H), 1.87 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.80-1.74 (m, 1H), 1.70-1.66 (m, 1H), 1.28 (s, 3H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 161.9 (d, *J*= 245.4 Hz), 151.1, 143.2, 134.0 (d, *J*= 3.6 Hz), 130.9 (d, *J*= 1.8 Hz), 128.3, 127.3 (d, *J*= 8.2 Hz, 2C), 126.3 (d, *J*= 17.5 Hz, 2C), 124.6, 122.7, 115.4, 115.2, 47.3, 40.9, 38.6, 30.3, 28.7, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{20}H_{22}F$ 281.1700; Found 281.1697.
^{19}F NMR (471 MHz, Chloroform-*d*) δ= –116.74 (s, 1F) ppm.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.4 mL/min): t_R= 11.2 (minor), 12.3 (major).

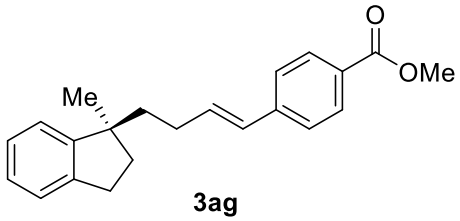
(S,E)-1-Methyl-1-(4-(4-(trifluoromethyl)phenyl)but-3-en-1-yl)-2,3-dihydro-1H-indene (**3af**)



3af

The title compound **3af** was isolated as a colorless oil (24 mg, 37%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.51 (d, *J*= 8.2 Hz, 2H), 7.37 (d, *J*= 8.1 Hz, 2H), 7.23-7.10 (m, 4H), 6.37 (d, *J*= 15.9 Hz, 1H), 6.28 (dt, *J*= 15.8, 6.4 Hz, 1H), 2.94-2.87 (m, 2H), 2.26-2.04 (m, 3H), 1.88 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.81-1.69 (m, 2H), 1.29 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 150.9, 143.2, 141.3, 134.1, 128.8 (q, *J*= 32.5 Hz), 128.3, 126.4, 126.3, 125.9 (2C), 124.3 (q, *J*= 272.7 Hz), 125.4 (q, *J*= 3.8 Hz, 2C), 124.6, 122.7, 47.3, 40.7, 38.6, 30.3, 28.8, 26.9 ppm.
^{19}F NMR (376 MHz, Chloroform-*d*) δ= –62.35 (s, 3F) ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{21}H_{22}F_3$ 331.1668; Found 331.1683.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.4 mL/min): t_R= 9.4 (minor), 11.1 (major).

Methyl (S,E)-4-(4-(1-methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)benzoate (**3ag**)

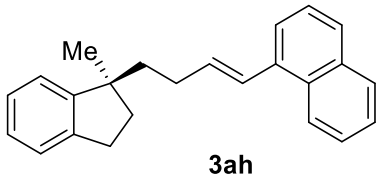


3ag

The title compound **3ag** was isolated as a colorless oil (33 mg, 51%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (10:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.94 (d, *J*= 8.3 Hz, 2H), 7.34 (d, *J*= 8.3 Hz, 2H), 7.22-7.09 (m, 4H), 6.38 (d, *J*= 15.9 Hz, 1H), 6.32 (dt, *J*= 15.9, 6.4 Hz, 1H), 3.89 (s, 3H), 2.93-2.87 (m, 2H), 2.27-2.20 (m, 1H), 2.14-2.04 (m, 2H), 1.88 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.81-1.69 (m, 2H), 1.29 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 167.0, 150.9, 143.2, 142.4, 134.3, 129.9 (2C), 128.8, 128.3, 126.4, 126.3, 125.7 (2C), 124.6, 122.7, 52.0, 47.3, 40.7, 38.6, 30.3, 28.9, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{22}H_{25}O_2$ 321.1849; Found 321.1853.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 14.3 (major), 15.1 (minor).

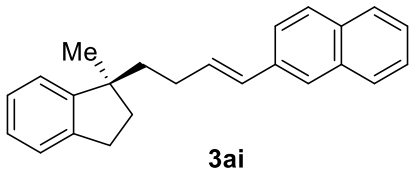
(S,E)-1-(4-(1-Methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)naphthalene (**3ah**)



3ah

The title compound **3ah** was isolated as a colorless oil (35 mg, 56%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 8.09 (d, *J*= 9.3 Hz, 1H), 7.81 (dd, *J*= 7.8, 1.9 Hz, 1H), 7.72 (d, *J*= 8.1 Hz, 1H), 7.52-7.40 (m, 4H), 7.23-7.15 (m, 4H), 7.07 (d, *J*= 15.5 Hz, 1H), 6.19 (dt, *J*= 15.5, 6.7 Hz, 1H), 2.93-2.84 (m, 2H), 2.36-2.21 (m, 2H), 2.14-2.06 (m, 1H), 1.99-1.75 (m, 3H), 1.32 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 151.2, 143.3, 135.7, 134.6, 133.6, 131.1, 128.5, 127.2, 126.6, 126.4, 126.3, 125.8, 125.7, 125.6, 124.6, 123.9, 123.5, 122.8, 47.4, 41.0, 38.7, 30.4, 29.2, 26.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{24}H_{24}Na$ 335.1770; Found 335.1783.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 70/30, flow rate = 0.7 mL/min): t_R= 9.4 (major), 11.3 (minor).

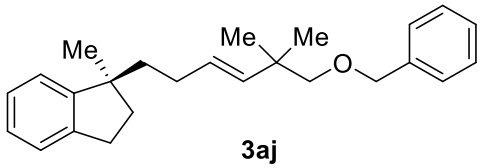
(S,E)-2-(4-(1-Methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)naphthalene (**3ai**)



3ai

The title compound **3ai** was isolated as a colorless oil (34 mg, 54%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.79-7.71 (m, 3H), 7.62 (s, 1H), 7.52 (dd, *J*= 8.5, 1.8 Hz, 1H), 7.45-7.36 (m, 2H), 7.22-7.13 (m, 4H), 6.50 (d, *J*= 15.8 Hz, 1H), 6.30 (dt, *J*= 15.8, 6.7 Hz, 1H), 2.94-2.86 (m, 2H), 2.27-2.06 (m, 3H), 1.93-1.72 (m, 3H), 1.30 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 151.1, 143.3, 135.4, 133.7, 132.7, 131.8, 129.6, 128.1, 127.8, 127.6, 126.4, 126.3, 126.1, 125.5, 125.3, 124.6, 123.6, 122.7, 47.4, 40.9, 38.7, 30.4, 28.9, 26.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{24}H_{24}Na$ 335.1770; Found 335.1783.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 12.1 (major), 16.1 (minor).

(S,E)-1-(6-(Benzyloxy)-5,5-dimethylhex-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3aj**)



3aj

The title compound **3aj** was isolated as a colorless oil (36 mg, 51%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).

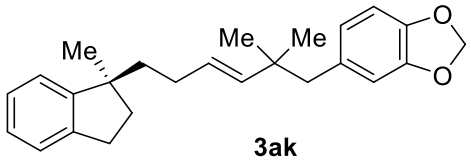
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.35-7.24 (m, 5H), 7.20-7.08 (m, 4H), 5.43 (d, *J*= 15.7 Hz, 1H), 5.35 (dt, *J*= 15.7, 5.9 Hz, 1H), 4.50 (s, 2H), 3.13 (s, 2H), 2.91-2.84 (m, 2H), 2.09-1.97 (m, 2H), 1.97-1.79 (m, 2H), 1.70-1.62 (m, 1H), 1.60-1.54 (m, 1H), 1.25 (s, 3H), 0.98 (s, 6H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 151.4, 143.2, 138.9, 137.3, 128.2 (2C), 127.5, 127.33 (2C), 127.30, 126.2, 126.1, 124.5, 122.7, 79.6, 73.2, 47.3, 41.3, 38.6, 37.2, 30.3, 28.4, 26.8, 24.8 (2C) ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{25}H_{32}ONa$ 371.2345; Found 371.2340.

HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 70/30, flow rate = 0.7 mL/min): t_R= 5.5 (minor), 9.9 (major).

(S,E)-5-(2,2-Dimethyl-6-(1-methyl-2,3-dihydro-1H-inden-1-yl)hex-3-en-1-yl)benzo[d][1,3]dioxole (**3ak**)



3ak

Following the Standard Procedure B, The title compound **3ak** was isolated as a colorless oil (45 mg, 62%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).

Following the Standard Procedure D, the title compound **3ak** was isolated as a colorless oil (37 mg, 51%, 94% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).

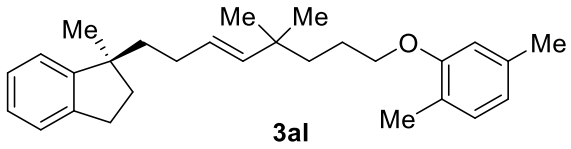
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.20-7.10 (m, 4H), 6.69 (s, 1H), 6.57 (s, 1H), 6.51 (dd, *J*= 7.9, 1.7 Hz, 1H), 5.91-5.87 (m, 2H), 5.37 (dt, *J*= 15.5, 1.4 Hz, 1H), 5.16 (dt, *J*= 15.7, 6.6 Hz, 1H), 2.91-2.85 (m, 2H), 2.43 (s, 2H), 2.06-1.98 (m, 2H), 1.92-1.81 (m, 2H), 1.66-1.60 (m, 1H), 1.58-1.52 (m, 1H), 1.24 (s, 3H), 0.92 (s, 6H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 151.4, 146.7, 145.6, 143.2, 139.4, 132.9, 126.7, 126.2, 126.1, 124.5, 123.4, 122.7, 111.1, 107.4, 100.6, 49.3, 47.3, 41.5, 38.5, 36.8, 30.3, 28.4, 27.1 (2C), 26.8 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{25}H_{30}O_2Na$ 385.2143; Found 385.2147.

HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 70/30, flow rate = 0.7 mL/min): t_R= 6.1 (minor), 8.8 (major).

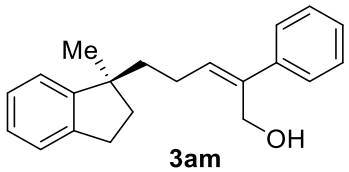
(S,E)-1-(8-(2,5-Dimethylphenoxy)-5,5-dimethyloct-3-en-1-yl)-1-methyl-2,3-dihydro-1H-indene (**3al**)



3al

The title compound **3al** was isolated as a colorless oil (45 mg, 58%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.22-7.07 (m, 4H), 6.99 (d, *J*= 7.5 Hz, 1H), 6.64 (d, *J*= 7.2 Hz, 1H), 6.60 (s, 1H), 5.34 (d, *J*= 15.6 Hz, 1H), 5.28 (dt, *J*= 15.6, 5.7 Hz, 1H), 3.87 (t, *J*= 6.5 Hz, 2H), 2.91-2.85 (m, 2H), 2.30 (s, 3H), 2.17 (s, 3H), 2.06-1.90 (m, 3H), 1.88-1.80 (m, 1H), 1.70-1.53 (m, 4H), 1.42-1.36 (m, 2H), 1.25 (s, 3H), 0.96 (s, 6H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 157.1, 151.4, 143.2, 139.5, 136.4, 130.2, 126.6, 126.2, 126.1, 124.5, 123.6, 122.7, 120.5, 111.9, 68.5, 47.3, 41.6, 39.3, 38.6, 35.4, 30.3, 28.4, 27.5, 27.4, 26.8, 24.9, 21.5, 15.8 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{28}H_{39}O$ 391.2995; Found 391.2994.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 96/4, flow rate = 0.4 mL/min): t_R= 9.5 (minor), 10.9 (major).

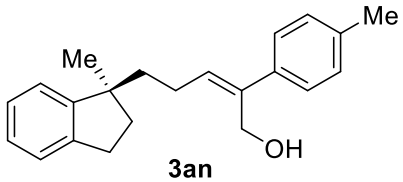
(S,Z)-5-(1-Methyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3am**)



3am

The title compound **3am** was isolated as a colorless oil (47 mg, 81%, 98% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.42-7.35 (m, 2H), 7.35-7.27 (m, 2H), 7.27-7.19 (m, 2H), 7.23-7.14 (m, 2H), 7.17-7.11 (m, 1H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.49 (s, 2H), 2.94-2.87 (m, 2H), 2.32-2.16 (m, 2H), 2.11-2.05 (m, 1H), 1.93-1.86 (m, 1H), 1.79-1.64 (m, 2H), 1.45-1.37 (brs, 1H), 1.29 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 150.9, 143.2, 140.9, 138.5, 132.7, 128.5 (2C), 127.1, 126.5, 126.32, 126.29 (2C), 124.7, 122.6, 59.7, 47.5, 41.5, 38.5, 30.3, 27.0, 24.3 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{24}ONa$ 315.1725; Found 315.1730.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 17.9 (minor), 20.1 (major).

S,Z)-5-(1-Methyl-2,3-dihydro-1H-inden-1-yl)-2-(p-tolyl)pent-2-en-1-ol (**3an**)



3an

The title compound **3an** was isolated as a colorless oil (50 mg, 82%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).

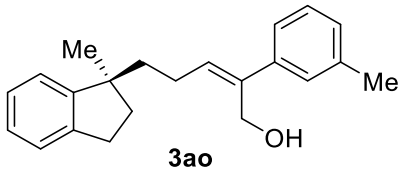
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.28 (d, *J*= 8.2 Hz, 2H), 7.22-7.15 (m, 3H), 7.14-7.10 (m, 3H), 5.80 (t, *J*= 7.5 Hz, 1H), 4.48 (s, 2H), 2.94-2.85 (m, 2H), 2.33 (s, 3H), 2.30-2.24 (m, 1H), 2.19-2.04 (m, 2H), 1.88 (dt, *J*= 12.5, 7.6 Hz, 1H), 1.81-1.71 (m, 1H), 1.71-1.61 (m, 1H), 1.29 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 150.9, 143.2, 138.3, 137.9, 136.8, 131.8, 129.2 (2C), 126.4, 126.3, 126.1 (2C), 124.6, 122.6, 59.7, 47.4, 41.5, 38.5, 30.3, 26.9, 24.2, 21.1 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}ONa$ 329.1876; Found 329.1879.

HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 15.8 (minor), 17.1 (major).

(S,Z)-5-(1-Methyl-2,3-dihydro-1H-inden-1-yl)-2-(m-tolyl)pent-2-en-1-ol (**3ao**)



3ao

The title compound **3ao** was isolated as a colorless oil (46 mg, 76%, 94% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).

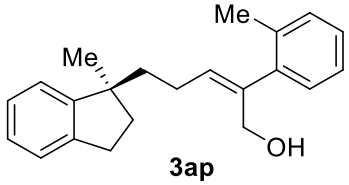
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.22-7.10 (m, 7H), 7.08-7.04 (m, 1H), 5.81 (t, *J*= 7.5 Hz, 1H), 4.48 (s, 2H), 2.94-2.86 (m, 2H), 2.34 (s, 3H), 2.30-2.22 (m, 1H), 2.19-2.14 (m, 1H), 2.08 (dt, *J*= 12.5, 7.0 Hz, 1H), 1.88 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.81-1.71 (m, 1H), 1.71-1.64 (m, 1H), 1.29 (s, 3H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 150.9, 143.2, 140.8, 138.6, 138.1, 132.5, 128.4, 127.9, 127.1, 126.5, 126.3, 124.7, 123.4, 122.6, 59.8, 47.4, 41.5, 38.5, 30.4, 26.9, 24.2, 21.6 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}ONa$ 329.1876; Found 329.1882.

HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 15.0 (minor), 16.0 (major).

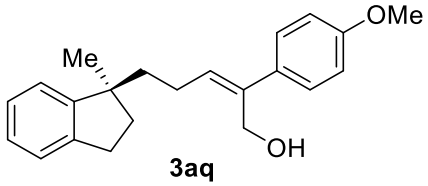
(S,Z)-5-(1-Methyl-2,3-dihydro-1H-inden-1-yl)-2-(o-tolyl)pent-2-en-1-ol (**3ap**)



3ap

The title compound **3ap** was isolated as a colorless oil (29 mg, 47%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.23-7.05 (m, 8H), 5.42 (t, *J*= 7.5 Hz, 1H), 4.36 (s, 2H), 2.95-2.88 (m, 2H), 2.26 (s, 3H), 2.18-2.04 (m, 3H), 1.89 (dt, *J*= 12.7, 7.7 Hz, 1H), 1.79-1.62 (m, 2H), 1.29 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 150.9, 143.2, 141.2, 139.1, 135.9, 132.9, 130.2, 129.3, 127.1, 126.4, 126.3, 125.6, 124.6, 122.6, 61.1, 47.4, 41.4, 38.5, 30.3, 26.9, 23.8, 20.0 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}ONa$ 329.1876; Found 329.1881.
HPLC-Data: (Chiralpak AD-H column, λ = 254 nm, hexane/isopropanol = 96/4, flow rate = 0.5 mL/min): t_R= 19.6 (major), 20.8 (minor).

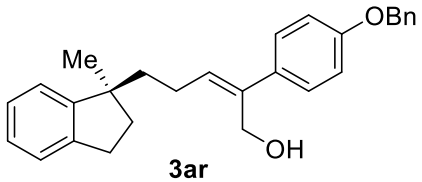
(S,Z)-2-(4-Methoxyphenyl)-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-1-ol (**3aq**)



3aq

The title compound **3aq** was isolated as a colorless oil (46 mg, 71%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (4:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.33 (d, *J*= 8.8 Hz, 2H), 7.24-7.10 (m, 4H), 6.86 (d, *J*= 8.8 Hz, 2H), 5.76 (t, *J*= 7.5 Hz, 1H), 4.47 (s, 2H), 3.80 (s, 3H), 2.95-2.86 (m, 2H), 2.30-2.23 (m, 1H), 2.19-2.13 (m, 1H), 2.11-2.06 (m, 1H), 1.88 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.81-1.71 (m, 1H), 1.70-1.65 (m, 1H), 1.29 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 158.8, 150.9, 143.2, 137.8, 133.2, 131.1, 127.4 (2C), 126.4, 126.3, 124.6, 122.6, 113.9 (2C), 59.7, 55.3, 47.4, 41.6, 38.5, 30.3, 26.9, 24.2 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}O_2Na$ 345.1825; Found 345.1827.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.6 mL/min): t_R= 26.2 (major), 29.4 (minor).

(S,Z)-2-(4-(Benzyloxy)phenyl)-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-1-ol (**3ar**)



3ar

The title compound **3ar** was isolated as a colorless oil (57 mg, 72%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (4:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.44-7.35 (m, 4H), 7.34-7.30 (m, 3H), 7.22-7.11 (m, 4H), 6.92 (d, *J*= 8.7 Hz, 2H), 5.75 (t, *J*= 7.5 Hz, 1H), 5.05 (s, 2H), 4.46 (s, 2H),

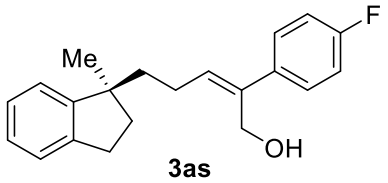
2.94-2.88 (m, 2H), 2.29-2.03 (m, 3H), 1.88 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.80-1.64 (m, 2H), 1.29 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 158.1, 150.9, 143.2, 137.8, 137.0, 133.5, 131.2, 128.6 (2C), 128.0, 127.5 (2C), 127.4 (2C), 126.5, 126.3, 124.7, 122.7, 114.9 (2C), 70.1, 59.7, 47.4, 41.6, 38.5, 30.4, 27.0, 24.2 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{28}H_{30}O_2Na$ 421.2138; Found 421.2146.

HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 90/10, flow rate = 0.5 mL/min): t_R= 24.6 (major), 27.6 (minor).

(S,Z)-2-(4-Fluorophenyl)-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-1-ol (**3as**)



3as

The title compound **3as** was isolated as a colorless oil (46 mg, 74%, 98% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.39-7.31 (m, 2H), 7.24-7.09 (m, 4H), 7.04-6.95 (m, 2H), 5.78 (t, *J*= 7.5 Hz, 1H), 4.46 (s, 2H), 2.95-2.85 (m, 2H), 2.31-2.12 (m, 2H), 2.14-2.02 (m, 1H), 1.92-1.84 (m, 1H), 1.81-1.64 (m, 2H), 1.47-1.37 (brs, 1H), 1.29 (s, 3H) ppm.

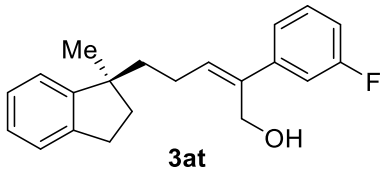
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 162.1 (d, *J*= 246.1 Hz), 150.8, 143.2, 137.5, 137.0, 132.7, 127.9 (d, *J*= 7.5 Hz, 2C), 126.5, 126.3, 124.7, 122.6, 115.3 (d, *J*= 21.2 Hz, 2C), 59.8, 47.4, 41.5, 38.5, 30.3, 27.0, 24.2 ppm.

^{19}F NMR (376 MHz, Chloroform-d) δ= –115.81 (s, 1F) ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{23}FONa$ 333.1625; Found 333.1610.

HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 15.3 (minor), 16.3 (major).

(S,Z)-2-(3-Fluorophenyl)-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-1-ol (**3at**)



3at

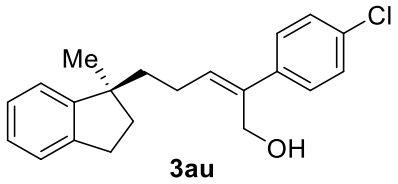
The title compound **3at** was isolated as a colorless oil (43 mg, 69%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).

^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.30-7.26 (m, 1H), 7.22-7.09 (m, 6H), 6.97-6.90 (m, 1H), 5.87 (t, *J*= 7.5 Hz, 1H), 4.47 (s, 2H), 2.95-2.87 (m, 2H), 2.32-2.23 (m, 1H), 2.21-2.14 (m, 1H), 2.08 (dt, *J*= 12.6, 7.0 Hz, 1H), 1.89 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.82-1.72 (m, 1H), 1.73-1.63 (m, 1H), 1.29 (s, 3H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 163.0 (d, *J*= 244.7 Hz), 150.7, 143.3 (d, *J*= 7.5 Hz), 143.2, 137.5, 133.8, 129.8 (d, *J*= 8.4 Hz), 126.5, 126.3, 124.7, 122.6, 121.8 (d,

J= 2.8 Hz), 113.8 (d, *J*= 21.2 Hz), 113.2 (d, *J*= 21.8 Hz), 59.6, 47.4, 41.4, 38.5, 30.3, 27.0, 24.3 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{23}FONa$ 333.1625; Found 333.1615.
HPLC-Data: (Chiralpak AD-H column, λ = 254 nm, hexane/isopropanol = 96/4, flow rate = 0.5 mL/min): t_R= 32.4 (major), 34.5 (minor).

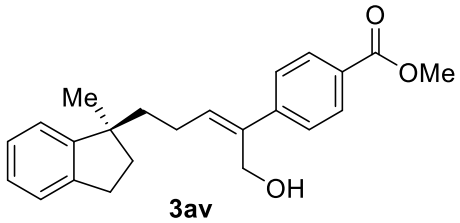
(S,Z)-2-(4-Chlorophenyl)-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-1-ol (**3au**)



3au

The title compound **3au** was isolated as a colorless oil (42 mg, 65%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.32 (d, *J*= 8.6 Hz, 2H), 7.27 (d, *J*= 8.7 Hz, 2H), 7.22-7.11 (m, 4H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.46 (s, 2H), 2.94-2.86 (m, 2H), 2.32-2.23 (m, 1H), 2.20-2.14 (m, 1H), 2.08 (dt, *J*= 12.6, 7.0 Hz, 1H), 1.89 (dt, *J*= 12.7, 7.6 Hz, 1H), 1.81-1.72 (m, 1H), 1.72-1.65 (m, 1H), 1.29 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 150.8, 143.2, 139.4, 137.4, 133.3, 132.8, 128.6 (2C), 127.6 (2C), 126.5, 126.3, 124.7, 122.6, 59.6, 47.4, 41.4, 38.5, 30.3, 27.0, 24.3 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{23}ClONa$ 349.1330; Found 349.1321.
HPLC-Data: (Chiralpak AD-H column, λ = 254 nm, hexane/isopropanol = 93/7, flow rate = 0.5 mL/min): t_R= 29.2 (major), 32.4 (minor).

Methyl (S,Z)-4-(1-Hydroxy-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-2-yl)benzoate (**3av**)

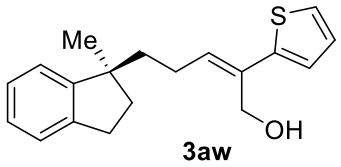


3av

The title compound **3av** was isolated as a colorless oil (38 mg, 54%, 98% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (3:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.97 (d, *J*= 8.4 Hz, 2H), 7.46 (d, *J*= 8.5 Hz, 2H), 7.24-7.11 (m, 4H), 5.96 (t, *J*= 7.5 Hz, 1H), 4.51 (s, 2H), 3.90 (s, 3H), 2.96-2.88 (m, 2H), 2.35-2.27 (m, 1H), 2.24-2.17 (m, 1H), 2.08 (dt, *J*= 12.6, 7.0 Hz, 1H), 1.90 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.83-1.73 (m, 1H), 1.75-1.66 (m, 1H), 1.30 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 166.9, 150.7, 145.6, 143.2, 137.8, 134.8, 129.8 (2C), 128.6, 126.5, 126.3, 126.1 (2C), 124.7, 122.6, 59.5, 52.0, 47.4, 41.3, 38.5, 30.3, 27.0, 24.4 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{23}H_{26}O_3Na$ 373.1774; Found 373.1772.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 88/12, flow

rate = 0.5 mL/min): t_R= 20.3 (major), 23.9 (minor).

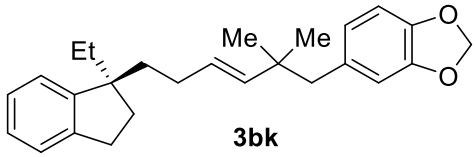
(S,E)-5-(1-Methyl-2,3-dihydro-1H-inden-1-yl)-2-(thiophen-2-yl)pent-2-en-1-ol (**3aw**)



3aw

The title compound **3aw** was isolated as a colorless oil (35 mg, 58%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.29-7.23 (m, 2H), 7.24-7.10 (m, 5H), 5.96 (t, *J*= 7.6 Hz, 1H), 4.45 (s, 2H), 2.94-2.85 (m, 2H), 2.32-2.22 (m, 1H), 2.21-2.13 (m, 1H), 2.08 (dt, *J*= 12.6, 7.0 Hz, 1H), 1.88 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.81-1.70 (m, 1H), 1.71-1.61 (m, 1H), 1.29 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 150.8, 143.2, 141.9, 133.4, 131.4, 126.5, 126.3, 125.7, 125.6, 124.7, 122.6, 119.8, 59.8, 47.4, 41.5, 38.5, 30.3, 26.9, 23.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{19}H_{22}OSNa$ 321.1284; Found 321.1284.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 26.2 (minor), 30.4 (major).

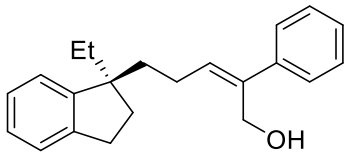
(S,E)-5-(6-(1-Ethyl-2,3-dihydro-1H-inden-1-yl)-2,2-dimethylhex-3-en-1-yl)benzo[d][1,3]dioxole (**3bk**)



3bk

The title compound **3bk** was isolated as a colorless oil (48 mg, 64%, 91% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.21-7.13 (m, 3H), 7.08-7.04 (m, 1H), 6.68 (d, *J*= 7.9 Hz, 1H), 6.57 (d, *J*= 1.7 Hz, 1H), 6.51 (dd, *J*= 7.9, 1.7 Hz, 1H), 5.91-5.87 (m, 2H), 5.35 (d, *J*= 15.6 Hz, 1H), 5.14 (dt, *J*= 15.6, 6.6 Hz, 1H), 2.90-2.84 (m, 2H), 2.43 (s, 2H), 1.99-1.90 (m, 3H), 1.88-1.76 (m, 1H), 1.71-1.63 (m, 2H), 1.59-1.52 (m, 2H), 0.92 (s, 6H), 0.79 (t, *J*= 7.4 Hz, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 149.6, 146.7, 145.6, 143.9, 139.4, 132.9, 126.8, 126.2, 125.8, 124.5, 123.5, 123.4, 111.1, 107.4, 100.7, 51.1, 49.3, 39.1, 36.8, 35.9, 31.8, 30.6, 27.9, 27.1 (2C), 8.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{26}H_{33}O_2$ 377.2475; Found 377.2474.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 85/15, flow rate = 0.7 mL/min): t_R= 5.9 (minor), 7.3 (major).

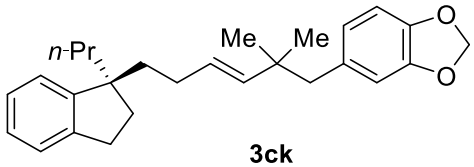
(S,Z)-5-(1-Ethyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3bm**)



3bm

The title compound **3bm** was isolated as a colorless oil (47 mg, 76%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.39 (d, *J*= 7.4 Hz, 2H), 7.31 (t, *J*= 7.6 Hz, 2H), 7.27-7.13 (m, 4H), 7.12-7.06 (m, 1H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.47 (s, 2H), 2.95-2.88 (m, 2H), 2.27-2.17 (m, 1H), 2.16-2.06 (m, 1H), 1.99 (t, *J*= 7.5 Hz, 2H), 1.85-1.66 (m, 3H), 1.66-1.57 (m, 1H), 0.81 (t, *J*= 7.4 Hz, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 149.1, 143.9, 140.9, 138.4, 132.8, 128.5 (2C), 127.1, 126.5, 126.3 (2C), 126.0, 124.6, 123.5, 59.7, 51.3, 39.2, 35.7, 32.0, 30.6, 23.8, 8.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}ONa$ 329.1876; Found 329.1886.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 98/2, flow rate = 0.5 mL/min): t_R= 12.8 (minor), 13.4 (major).

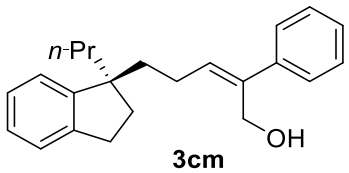
(S,E)-5-(2,2-Dimethyl-6-(1-propyl-2,3-dihydro-1H-inden-1-yl)hex-3-en-1-yl)benzo[d][1,3]dioxole (**3ck**)



3ck

The title compound **3ck** was isolated as a colorless oil (59 mg, 76%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.20-7.10 (m, 3H), 7.11-7.04 (m, 1H), 6.68 (d, *J*= 8.0 Hz, 1H), 6.57 (d, *J*= 1.6 Hz, 1H), 6.51 (dd, *J*= 7.9, 1.6 Hz, 1H), 5.92-5.83 (m, 2H), 5.35 (d, *J*= 15.6 Hz, 1H), 5.14 (dt, *J*= 15.6, 6.6 Hz, 1H), 2.90-2.85 (m, 2H), 2.43 (s, 2H), 1.93 (t, *J*= 7.4 Hz, 2H), 1.89-1.75 (m, 1H), 1.69-1.59 (m, 2H), 1.58-1.41 (m, 3H), 1.34-1.14 (m, 2H), 0.92 (s, 6H), 0.86 (t, *J*= 7.3 Hz, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 149.9, 146.7, 145.6, 143.8, 139.3, 132.9, 126.8, 126.2, 125.8, 124.4, 123.5, 123.4, 111.1, 107.4, 100.6, 50.9, 49.3, 42.1, 39.6, 36.8, 36.4, 30.6, 27.9, 27.0 (2C), 17.7, 14.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{27}H_{35}O_2$ 391.2632; Found 391.2631.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 96/4, flow rate = 0.4 mL/min): t_R= 10.8 (minor), 13.0 (major).

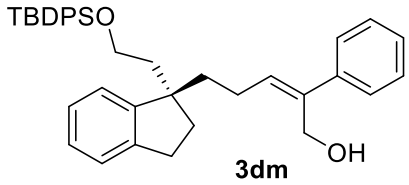
(S,Z)-2-Phenyl-5-(1-propyl-2,3-dihydro-1H-inden-1-yl)pent-2-en-1-ol (**3cm**)



3cm

The title compound **3cm** was isolated as a colorless oil (49 mg, 76%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.41-7.37 (m, 2H), 7.35-7.29 (m, 2H), 7.26-7.23 (m, 1H), 7.22-7.15 (m, 3H), 7.13-7.06 (m, 1H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.47 (s, 2H), 2.92-2.86 (m, 2H), 2.27-2.09 (m, 2H), 2.00 (t, *J*= 7.5 Hz, 2H), 1.86-1.74 (m, 1H), 1.72-1.62 (m, 2H), 1.59-1.46 (m, 1H), 1.35-1.26 (m, 1H), 1.21-1.13 (m, 1H), 0.87 (t, *J*= 7.2 Hz, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 149.4, 143.8, 140.8, 138.4, 132.8, 128.5 (2C), 127.1, 126.4, 126.3 (2C), 126.0, 124.6, 123.4, 59.7, 51.1, 42.3, 39.6, 36.2, 30.7, 23.8, 17.8, 14.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{23}H_{28}ONa$ 343.2032; Found 343.2042.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 94/6, flow rate = 0.5 mL/min): t_R= 14.3 (minor), 15.1 (major).

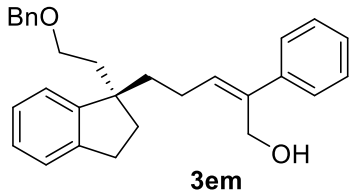
(S,Z)-5-(1-(2-((tert-Butyldiphenylsilyl)oxy)ethyl)-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3dm**)



3dm

The title compound **3dm** was isolated as a colorless oil (69 mg, 62%, 94% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.67-7.58 (m, 4H), 7.44-7.26 (m, 10H), 7.24-7.20 (m, 1H), 7.20-7.08 (m, 3H), 7.01-6.94 (m, 1H), 5.75 (t, *J*= 7.5 Hz, 1H), 4.41 (s, 2H), 3.73-3.60 (m, 2H), 2.90-2.80 (m, 2H), 3.03-2.77 (m, 6H), 2.18-1.86 (m, 1H), 1.79-1.58 (m, 1H), 1.02 (s, 9H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 148.7, 143.6, 140.8, 138.4, 135.6 (4C), 133.9 (2C), 132.6, 129.6 (2C), 128.5 (2C), 127.6 (4C), 127.0, 126.6, 126.2 (2C), 126.1, 124.7, 123.3, 61.2, 59.7, 49.8, 41.6, 39.9, 36.4, 30.5, 26.9 (3C), 23.7, 19.1 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{38}H_{44}O_2SiNa$ 583.3003; Found 583.3013.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 86/14, flow rate = 0.7 mL/min): t_R= 6.9 (minor), 7.4 (major).

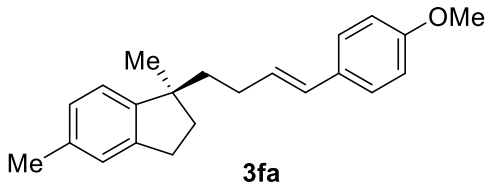
(S,Z)-5-(1-(2-Benzyloxy)ethyl)-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3em**)



3em

The title compound **3em** was isolated as a colorless oil (42 mg, 51%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (4:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.42-7.34 (m, 2H), 7.35-7.25 (m, 7H), 7.26-7.17 (m, 2H), 7.20-7.13 (m, 2H), 7.13-7.05 (m, 1H), 5.80 (t, *J*= 7.5 Hz, 1H), 4.44 (s, 2H), 4.43 (s, 2H), 3.53-3.41 (m, 2H), 2.93-2.86 (m, 2H), 2.29-2.15 (m, 2H), 2.11-1.97 (m, 4H), 1.90-1.77 (m, 1H), 1.74-1.65 (m, 1H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 148.7, 143.6, 140.9, 138.6, 138.4, 132.5, 128.5 (2C), 128.4 (2C), 127.7 (2C), 127.5, 127.0, 126.7, 126.23 (2C), 126.15, 124.7, 123.4, 73.1, 67.6, 59.7, 49.9, 39.9, 38.5, 36.7, 30.5, 23.8 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{29}H_{32}O_2Na$ 435.2295; Found 435.2305.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 86/14, flow rate = 0.5 mL/min): t_R= 19.9 (major), 25.3 (minor).

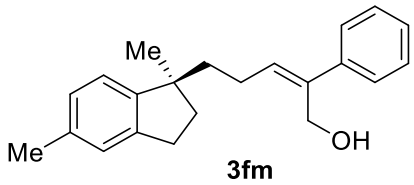
(S,E)-1-(4-(4-Methoxyphenyl)but-3-en-1-yl)-1,5-dimethyl-2,3-dihydro-1H-indene (**3fa**)



3fa

The title compound **3fa** was isolated as a colorless oil (47 mg, 77%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.22 (d, *J*= 8.7 Hz, 2H), 7.03-6.96 (m, 3H), 6.81 (d, *J*= 8.7 Hz, 2H), 6.28 (d, *J*= 15.9 Hz, 1H), 6.03 (dt, *J*= 15.8, 6.8 Hz, 1H), 3.78 (s, 3H), 2.90-2.84 (m, 2H), 2.32 (s, 3H), 2.19-2.03 (m, 3H), 1.85 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.78-1.64 (m, 2H), 1.26 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 158.6, 148.4, 143.5, 135.9, 130.8, 129.2, 128.8, 127.0, 126.9 (2C), 125.3, 122.5, 113.9 (2C), 55.3, 46.9, 41.1, 38.9, 30.2, 28.7, 26.9, 21.3 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{22}H_{27}O$ 307.2056; Found 307.2039.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 98/2, flow rate = 0.5 mL/min): t_R= 9.1 (major), 10.1 (minor).

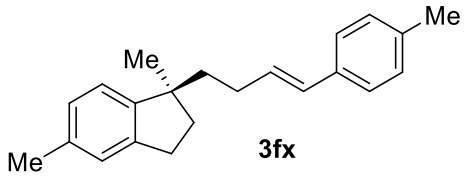
(S,Z)-5-(1,5-Dimethyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3fm**)



3fm

The title compound **3fm** was isolated as a colorless oil (51 mg, 83%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.38 (d, *J*= 7.1 Hz, 2H), 7.31 (t, *J*= 7.5 Hz, 2H), 7.28-7.21 (m, 1H), 7.05-6.98 (m, 3H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.50 (s, 2H), 2.90-2.85 (m, 2H), 2.32 (s, 3H), 2.27-2.04 (m, 3H), 1.87 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.79-1.63 (m, 2H), 1.27 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 147.9, 143.4, 140.9, 138.4, 136.1, 132.8, 128.5 (2C), 127.11, 127.05, 126.3 (2C), 125.4, 122.4, 59.7, 47.1, 41.5, 38.7, 30.2, 27.1, 24.3, 21.3 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}ONa$ 329.1876; Found 329.1880.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 80/20, flow rate = 1.0 mL/min): t_R= 7.2 (major), 16.0 (minor).

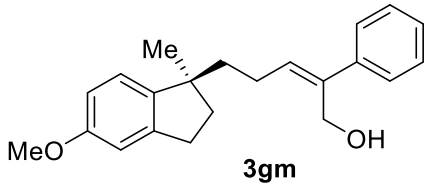
(S,E)-1,5-Dimethyl-1-(4-(p-tolyl)but-3-en-1-yl)-2,3-dihydro-1H-indene (**3fx**)



3fx

The title compound **3fx** was isolated as a colorless oil (41 mg, 71%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (30:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.19 (d, *J*= 8.1 Hz, 2H), 7.07 (d, *J*= 7.9 Hz, 2H), 7.04-6.99 (m, 3H), 6.31 (d, *J*= 15.9 Hz, 1H), 6.12 (dt, *J*= 15.8, 6.7 Hz, 1H), 2.91-2.86 (m, 2H), 2.32 (s, 3H), 2.31 (s, 3H), 2.20-2.02 (m, 3H), 1.86 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.77-1.64 (m, 2H), 1.26 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 148.3, 143.5, 136.5, 135.9, 135.1, 130.3, 129.2 (2C), 129.2, 127.0, 125.8 (2C), 125.3, 122.5, 46.9, 41.0, 38.9, 30.2, 28.8, 26.9, 21.3, 21.2 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{22}H_{27}$ 291.2107; Found 291.2092.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 99/1, flow rate = 0.2 mL/min): t_R= 22.0 (minor), 23.3 (major).

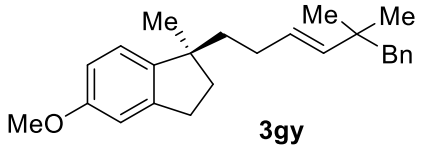
(S,Z)-5-(5-Methoxy-1-methyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3gm**)



3gm

The title compound **3gm** was isolated as a colorless oil (51 mg, 79%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.45-7.37 (m, 2H), 7.34-7.28 (m, 2H), 7.28-7.19 (m, 1H), 7.02 (d, *J*= 8.1 Hz, 1H), 6.78-6.70 (m, 2H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.50 (s, 2H), 3.78 (s, 3H), 2.91-2.87 (m, 2H), 2.30-2.15 (m, 2H), 2.08 (dt, *J*= 12.6, 7.0 Hz, 1H), 1.89 (dt, *J*= 12.7, 7.6 Hz, 1H), 1.79-1.70 (m, 1H), 1.67-1.61 (m, 1H), 1.27 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 158.8, 144.7, 143.1, 140.9, 138.4, 132.8, 128.5 (2C), 127.1, 126.3 (2C), 123.1, 112.2, 109.9, 59.7, 55.4, 46.7, 41.7, 38.9, 30.5, 27.2, 24.3 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{26}O_2Na$ 345.1825; Found 345.1826.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 86/14, flow rate = 0.5 mL/min): t_R= 12.1 (minor), 16.9 (major).

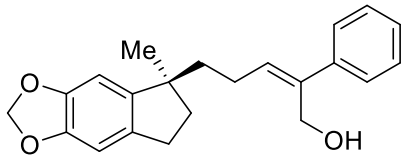
(S,E)-1-(5,5-Dimethyl-6-phenylhex-3-en-1-yl)-5-methoxy-1-methyl-2,3-dihydro-1H-indene (**3gy**)



3gy

The title compound **3gy** was isolated as a colorless oil (43 mg, 62%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.24-7.17 (m, 3H), 7.09-7.05 (m, 2H), 6.99 (d, *J*= 8.1 Hz, 1H), 6.76-6.71 (m, 2H), 5.40 (d, *J*= 15.6 Hz, 1H), 5.16 (dt, *J*= 15.6, 6.6 Hz, 1H), 3.78 (s, 3H), 2.90-2.86 (m, 2H), 2.51 (s, 2H), 2.05-1.96 (m, 2H), 1.91-1.81 (m, 2H), 1.61-1.46 (m, 2H), 1.22 (s, 3H), 0.93 (s, 6H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 158.6, 144.7, 143.6, 139.5, 139.1, 130.7 (2C), 127.4 (2C), 126.6, 125.8, 123.2, 112.1, 109.8, 55.4, 49.6, 46.6, 41.7, 38.9, 36.7, 30.5, 28.4, 27.1 (3C) ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{25}H_{33}O$ 349.2526; Found 349.2523.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 70/30, flow rate = 0.7 mL/min): t_R= 6.3 (minor), 8.6 (major).

(S,Z)-5-(5-Methyl-6,7-dihydro-5H-indeno[5,6-d][1,3]dioxol-5-yl)-2-phenylpent-2-en-1-ol (**3hm**)



3hm

The title compound **3hm** was isolated as a colorless oil (47 mg, 70%, 94% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).

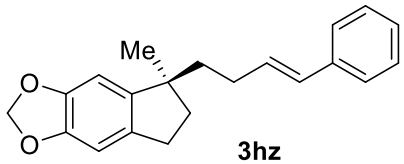
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.44-7.38 (m, 2H), 7.36-7.29 (m, 3H), 6.66 (s, 1H), 6.59 (s, 1H), 5.90 (s, 2H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.52 (s, 2H), 2.86-2.80 (m, 2H), 2.32-2.23 (m, 1H), 2.20-2.05 (m, 2H), 1.89 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.73-1.59 (m, 2H), 1.24 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 146.49, 146.47, 143.8, 140.8, 138.5, 135.7, 132.7, 128.5 (2C), 127.1, 126.3 (2C), 105.1, 103.3, 100.9, 59.7, 47.2, 41.7, 38.9, 30.3, 27.3, 24.2 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{22}H_{24}O_3Na$ 359.1618; Found 359.1622.

HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 90/10, flow rate = 0.5 mL/min): t_R= 18.2 (minor), 19.2 (major).

(S,E)-5-Methyl-5-(4-phenylbut-3-en-1-yl)-6,7-dihydro-5H-indeno[5,6-d][1,3]dioxole (**3hz**)



3hz

Starting from **2z**, the title compound **3hz** was isolated as a colorless oil (40 mg, 66%, 93% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).

Starting from **2z'**, The title compound **3hz** was isolated as a colorless oil (36 mg, 59%, 94% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).

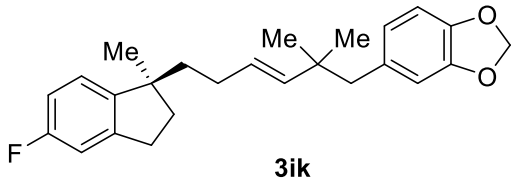
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.34-7.24 (m, 4H), 7.19-7.15 (m, 1H), 6.66 (s, 1H), 6.60 (s, 1H), 6.34 (d, *J*= 16.0 Hz, 1H), 6.17 (dt, *J*= 15.8, 6.7 Hz, 1H), 5.90 (s, 2H), 2.85-2.76 (m, 2H), 2.23-2.16 (m, 1H), 2.12-2.05 (m, 2H), 1.88 (dt, *J*= 12.7, 7.7 Hz, 1H), 1.77-1.63 (m, 2H), 1.24 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 146.42, 146.38, 144.1, 137.9, 135.7, 131.2, 129.5, 128.5 (2C), 126.8, 125.9 (2C), 105.0, 103.4, 100.9, 47.2, 41.2, 39.0, 30.3, 28.7, 27.2 ppm.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{21}H_{23}O_2$ 307.1693; Found 307.1698.

HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.5 mL/min): t_R= 11.8 (minor), 12.2 (major).

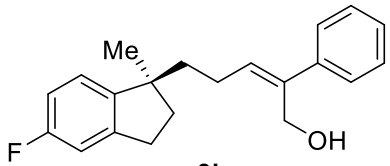
(S,E)-5-(6-(5-Fluoro-1-methyl-2,3-dihydro-1H-inden-1-yl)-2,2-dimethylhex-3-en-1-yl)benzo[d][1,3]dioxole (**3ik**)



3ik

The title compound **3ik** was isolated as a colorless oil (31 mg, 41%, 95% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.01 (dd, *J*= 8.0, 5.3 Hz, 1H), 6.90-6.80 (m, 2H), 6.68 (d, *J*= 7.9 Hz, 1H), 6.56 (d, *J*= 1.7 Hz, 1H), 6.51 (dd, *J*= 7.9, 1.7 Hz, 1H), 5.89 (s, 2H), 5.37 (d, *J*= 15.6 Hz, 1H), 5.15 (dt, *J*= 15.5, 6.6 Hz, 1H), 2.90-2.80 (m, 2H), 2.43 (s, 2H), 2.10-1.92 (m, 2H), 1.92-1.79 (m, 2H), 1.64-1.46 (m, 2H), 1.22 (s, 3H), 0.92 (s, 6H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 161.9 (d, *J*= 242.2 Hz), 146.9 (d, *J*= 2.4 Hz), 146.7, 145.6, 145.3 (d, *J*= 7.8 Hz), 139.5, 132.9, 126.5, 123.5, 123.4, 112.9 (d, *J*= 22.2 Hz), 111.3 (d, *J*= 21.6 Hz), 111.1, 107.4, 100.7, 49.2, 46.7, 41.6, 38.8, 36.8, 30.3 (d, *J* = 2.1 Hz), 28.4, 27.03 (2C), 27.0 ppm.
^{19}F NMR (376 MHz, Chloroform-*d*) δ= –117.96 (s, 1F) ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{25}H_{30}FO_2$ 381.2224; Found 381.2225.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 96/4, flow rate = 0.4 mL/min): t_R= 13.6 (minor), 17.6 (major).

(S,Z)-5-(5-Fluoro-1-methyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol (**3im**)

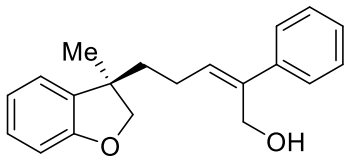


3im

The title compound **3im** was isolated as a colorless oil (39 mg, 63%, 92% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.42-7.37 (m, 2H), 7.34-7.29 (m, 2H), 7.27-7.22 (m, 1H), 7.04 (dd, *J*= 8.1, 5.2 Hz, 1H), 6.92-6.81 (m, 2H), 5.83 (t, *J*= 7.5 Hz, 1H), 4.51 (s, 2H), 2.92-2.86 (m, 2H), 2.30-2.23 (m, 1H), 2.20-2.07 (m, 2H), 1.91 (dt, *J*= 12.7, 7.6 Hz, 1H), 1.81-1.68 (m, 1H), 1.71-1.58 (m, 1H), 1.27 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 162.1 (d, *J*= 242.5 Hz), 146.3 (d, *J*= 2.5 Hz), 145.3 (d, *J*= 7.9 Hz), 140.8, 138.6, 132.5, 128.5 (2C), 127.1, 126.3 (2C), 123.4 (d, *J*= 8.9 Hz), 113.1 (d, *J*= 22.4 Hz), 111.5 (d, *J*= 21.6 Hz), 59.7, 46.8, 41.6, 38.8, 30.3 (d, *J*= 2.2 Hz), 27.1, 24.2 ppm.
^{19}F NMR (376 MHz, Chloroform-d) δ= –117.57 (s, 1F) ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{23}FONa$ 333.1631; Found 333.1615.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate

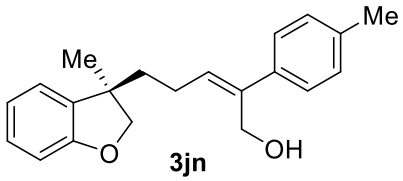
= 0.5 mL/min): t_R= 18.7 (minor), 22.8 (major).

(R,Z)-5-(3-Methyl-2,3-dihydrobenzofuran-3-yl)-2-phenylpent-2-en-1-ol (**3jm**)



3jm

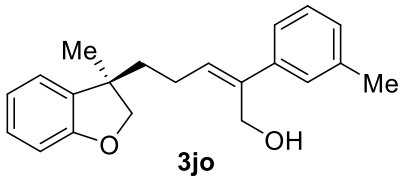
The title compound **3jm** was isolated as a colorless oil (36 mg, 61%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.40-7.36 (m, 2H), 7.34-7.29 (m, 2H), 7.27-7.23 (m, 1H), 7.18-7.07 (m, 2H), 6.90 (td, *J*= 7.4, 1.1 Hz, 1H), 6.80 (d, *J*= 8.0 Hz, 1H), 5.78 (t, *J*= 7.5 Hz, 1H), 4.47 (s, 2H), 4.44 (d, *J*= 8.8 Hz, 1H), 4.19 (d, *J*= 8.8 Hz, 1H), 2.35-2.27 (m, 1H), 2.15-2.05 (m, 1H), 1.84-1.73 (m, 2H), 1.39 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 159.6, 140.8, 138.9, 134.5, 131.8, 128.5 (2C), 128.3, 127.2, 126.3 (2C), 122.8, 120.7, 109.7, 82.2, 59.7, 45.3, 41.0, 25.8, 23.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{20}H_{22}O_2Na$ 317.1512; Found 317.1511.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 90/10, flow rate = 0.5 mL/min): t_R= 16.6 (minor), 20.3 (major).
(R,Z)-5-(3-Methyl-2,3-dihydrobenzofuran-3-yl)-2-(p-tolyl)pent-2-en-1-ol (**3jn**)



3jn

The title compound **3jn** was isolated as a colorless oil (37 mg, 60%, 98% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (4:1).
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.27 (t, *J*= 6.9 Hz, 2H), 7.17-7.08 (m, 4H), 6.90 (t, *J*= 7.4 Hz, 1H), 6.80 (d, *J*= 8.0 Hz, 1H), 5.75 (t, *J*= 7.5 Hz, 1H), 4.45 (s, 2H), 4.43 (d, *J*= 8.7 Hz, 1H), 4.19 (d, *J*= 8.7 Hz, 1H), 2.33 (s, 3H), 2.33-2.24 (m, 1H), 2.13-2.02 (m, 1H), 1.81-1.73 (m, 2H), 1.39 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 159.6, 138.8, 137.8, 136.9, 134.5, 130.9, 129.2 (2C), 128.3, 126.2 (2C), 122.8, 120.7, 109.7, 82.2, 59.7, 45.3, 41.1, 25.8, 23.9, 21.1 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{24}O_2Na$ 331.1669; Found 331.1673.
HPLC-Data: (Chiralpak AD-H column, λ = 254 nm, hexane/isopropanol = 20/80, flow rate = 0.2 mL/min): t_R= 34.2 (minor), 35.5 (major).

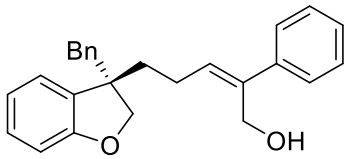
(R,Z)-5-(3-Methyl-2,3-dihydrobenzofuran-3-yl)-2-(m-tolyl)pent-2-en-1-ol (**3jo**)



3jo

The title compound **3jo** was isolated as a colorless oil (41 mg, 67%, 98% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (4:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.23-7.10 (m, 5H), 7.08-7.04 (m, 1H), 6.90 (td, *J*= 7.4, 1.0 Hz, 1H), 6.80 (d, *J*= 7.9 Hz, 1H), 5.76 (t, *J*= 7.5 Hz, 1H), 4.46 (s, 2H), 4.44 (d, *J*= 8.7 Hz, 1H), 4.19 (d, *J*= 8.8 Hz, 1H), 2.34 (s, 3H), 2.34-2.24 (m, 1H), 2.14-2.06 (m, 1H), 1.82-1.73 (m, 2H), 1.39 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 159.6, 140.7, 139.1, 138.1, 134.5, 131.5, 128.4, 128.3, 127.9, 127.1, 123.4, 122.8, 120.7, 109.7, 82.2, 59.7, 45.3, 41.0, 25.8, 23.9, 21.5 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{24}O_2Na$ 331.1669; Found 331.1671.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 60/40, flow rate = 0.7 mL/min): t_R= 10.5 (major), 17.6 (minor).

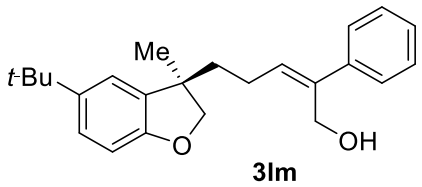
(S,Z)-5-(3-Benzyl-2,3-dihydrobenzofuran-3-yl)-2-phenylpent-2-en-1-ol (**3km**)



3km

The title compound **3km** was isolated as a colorless oil (35 mg, 46%, 87% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (4:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.40-7.36 (m, 2H), 7.33-7.29 (m, 2H), 7.24-7.21 (m, 4H), 7.15 (td, *J*= 7.7, 1.4 Hz, 1H), 7.03-6.96 (m, 3H), 6.90 (t, *J*= 7.4 Hz, 1H), 6.76 (d, *J*= 8.1 Hz, 1H), 5.77 (t, *J*= 7.5 Hz, 1H), 4.50 (d, *J*= 9.0 Hz, 1H), 4.43 (s, 2H), 4.31 (d, *J*= 9.0 Hz, 1H), 3.04 (d, *J*= 13.5 Hz, 1H), 2.98 (d, *J*= 13.5 Hz, 1H), 2.35-2.26 (m, 1H), 2.15-2.05 (m, 1H), 1.90-1.80 (m, 2H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 160.1, 140.7, 138.9, 137.1, 132.3, 131.6, 130.3 (2C), 128.53, 128.5 (2C), 128.1 (2C), 127.2, 126.6, 126.3 (2C), 123.8, 120.4, 109.7, 79.5, 59.7, 49.9, 45.5, 38.1, 23.8 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{26}H_{26}O_2Na$ 393.1825; Found 393.1827.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 86/14, flow rate = 0.7 mL/min): t_R= 12.7 (minor), 15.0 (major).

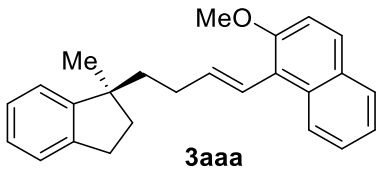
(R,Z)-5-(5-(tert-Butyl)-3-methyl-2,3-dihydrobenzofuran-3-yl)-2-phenylpent-2-en-1-ol (**3lm**)



3lm

The title compound **3lm** was isolated as a colorless oil (46 mg, 65%, 98% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.41-7.34 (m, 2H), 7.35-7.27 (m, 2H), 7.27-7.19 (m, 1H), 7.17-7.10 (m, 2H), 6.72 (d, *J*= 8.3 Hz, 1H), 5.78 (t, *J*= 7.5 Hz, 1H), 4.47 (s, 2H), 4.43 (d, *J*= 8.7 Hz, 1H), 4.18 (d, *J*= 8.7 Hz, 1H), 2.35-2.27 (m, 1H), 2.17-2.10 (m, 1H), 1.82-1.73 (m, 2H), 1.40 (s, 3H), 1.30 (s, 9H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 157.3, 143.8, 140.8, 138.9, 134.1, 131.8, 128.5 (2C), 127.1, 126.3 (2C), 125.0, 119.5, 108.8, 82.4, 59.6, 45.5, 41.1, 34.4, 31.8 (3C), 25.7, 24.0 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{24}H_{30}O_2Na$ 373.2138; Found 373.2141.
HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 86/14, flow rate = 0.7 mL/min): t_R= 10.3 (minor), 12.6 (major).

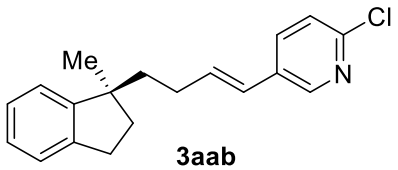
(S,E)-2-Methoxy-1-(4-(1-methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)naphthalene (**3aaa**)



3aaa

The title compound **3aaa** was isolated as a colorless oil (38 mg, 55%, 92% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 8.13 (d, *J*= 8.7 Hz, 1H), 7.77-7.69 (m, 2H), 7.46-7.37 (m, 1H), 7.33-7.29 (m, 1H), 7.24-7.17 (m, 5H), 6.70 (d, *J*= 16.2 Hz, 1H), 6.15 (dt, *J*= 16.0, 6.7 Hz, 1H), 3.91 (s, 3H), 2.99-2.89 (m, 2H), 2.40-2.24 (m, 2H), 2.16-2.10 (m, 1H), 1.95-1.78 (m, 3H), 1.34 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 154.0, 151.3, 143.3, 137.7, 132.6, 129.3, 128.2, 128.1, 126.4, 126.23, 126.17, 124.6, 124.5, 123.4, 122.8, 122.3, 121.3, 113.3, 56.5, 47.4, 41.1, 38.8, 30.4, 29.8, 26.9 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{25}H_{26}ONa$ 365.1881; Found 365.1866.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.5 mL/min): t_R= 10.1 (minor), 10.5 (major).

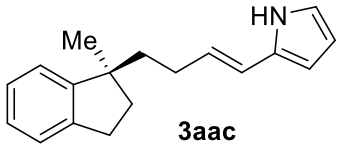
(S,E)-2-Chloro-5-(4-(1-methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)pyridine (**3aab**)



3aab

The title compound **3aab** was isolated as a colorless oil (29 mg, 49%, 70% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 8.26 (d, *J*= 2.5 Hz, 1H), 7.57 (dd, *J*= 8.3, 2.5 Hz, 1H), 7.23-7.10 (m, 5H), 6.29 (d, *J*= 16.1 Hz, 1H), 6.27-6.18 (m, 1H), 2.95-2.86 (m, 2H), 2.28-2.18 (m, 1H), 2.17-2.11 (m, 1H), 2.09-2.03 (m, 1H), 1.88 (dt, *J*= 12.7, 7.7 Hz, 1H), 1.80-1.68 (m, 2H), 1.29 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 150.8, 149.2, 147.5, 143.2, 135.1, 134.6, 132.4, 126.5, 126.3, 124.7, 124.6, 123.9, 122.7, 47.3, 40.6, 38.6, 30.3, 28.9, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{19}H_{21}ClN$ 293.1363; Found 293.1360.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 23.5 (major), 26.7 (minor).

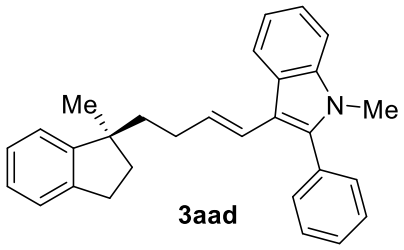
(S,E)-2-(4-(1-Methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)-1H-pyrrole (**3aac**)



3aac

The title compound **3aac** was isolated as a colorless oil (26 mg, 52%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (3:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 8.08 (s, 1H), 7.22-7.03 (m, 4H), 6.72-6.66 (m, 1H), 6.21 (d, *J*= 16.0 Hz, 1H), 6.17-6.12 (m, 1H), 6.08 (s, 1H), 5.72 (dt, *J*= 16.1, 6.8 Hz, 1H), 2.95-2.85 (m, 2H), 2.18-2.03 (m, 3H), 1.86 (dt, *J*= 12.6, 7.6 Hz, 1H), 1.75-1.64 (m, 2H), 1.27 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 151.2, 143.2, 130.9, 126.3, 126.2, 126.1, 124.6, 122.7, 120.2, 117.7, 109.3, 106.7, 47.3, 41.2, 38.6, 30.3, 28.5, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{18}H_{22}N$ 252.1752; Found 252.1751.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 18.9 (minor), 19.6 (major).

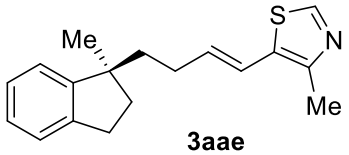
(S,E)-1-Methyl-3-(4-(1-methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)-2-phenyl-1H-indole (**3aad**)



3aad

The title compound **3aad** was isolated as a colorless oil (50 mg, 64%, 97% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (10:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.92 (d, *J*= 7.9 Hz, 1H), 7.52-7.43 (m, 3H), 7.41-7.37 (m, 2H), 7.34 (d, *J*= 8.1 Hz, 1H), 7.28 (dd, *J*= 7.0, 1.2 Hz, 1H), 7.21-7.12 (m, 5H), 6.33 (d, *J*= 16.0 Hz, 1H), 6.16 (dt, *J*= 16.0, 6.8 Hz, 1H), 3.58 (s, 3H), 2.90-2.84 (m, 2H), 2.15-2.03 (m, 3H), 1.89-1.82 (m, 1H), 1.79-1.73 (m, 1H), 1.70-1.64 (m, 1H), 1.26 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 151.4, 143.2, 138.8, 137.7, 131.7, 131.1 (2C), 128.8, 128.4 (2C), 128.2, 126.23, 126.16, 125.8, 124.5, 122.8, 122.6, 122.1, 120.5, 120.1, 111.9, 109.5, 47.4, 41.7, 38.7, 30.9, 30.3, 29.8, 26.9 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{30}N$ 392.2378; Found 392.2380.
HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.5 mL/min): t_R= 9.6 (minor), 10.1 (major).

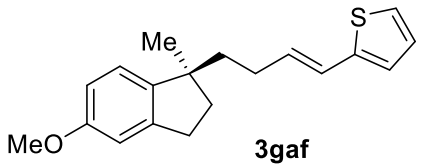
(S,E)-4-Methyl-5-(4-(1-methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)thiazole (**3aae**)



3aae

The title compound **3aae** was isolated as a colorless oil (35 mg, 61%, 93% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (5:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 8.45 (s, 1H), 7.24-7.09 (m, 4H), 6.42 (d, *J*= 15.5 Hz, 1H), 5.93 (dt, *J*= 15.5, 6.9 Hz, 1H), 2.95-2.86 (m, 2H), 2.41 (s, 3H), 2.23-2.17 (m, 1H), 2.12-2.03 (m, 1H), 1.88 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.77-1.67 (m, 3H), 1.29 (s, 3H) ppm.
^{13}C NMR (126 MHz, Chloroform-*d*) δ= 150.9, 148.7, 148.5, 143.2, 134.5, 130.7, 126.4, 126.3, 124.6, 122.7, 119.4, 47.3, 40.8, 38.6, 30.3, 28.9, 26.9, 15.2 ppm.
HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{18}H_{21}NSNa$ 306.1292; Found 306.1299.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 90/10, flow rate = 0.5 mL/min): t_R= 10.6 (minor), 11.6 (major).

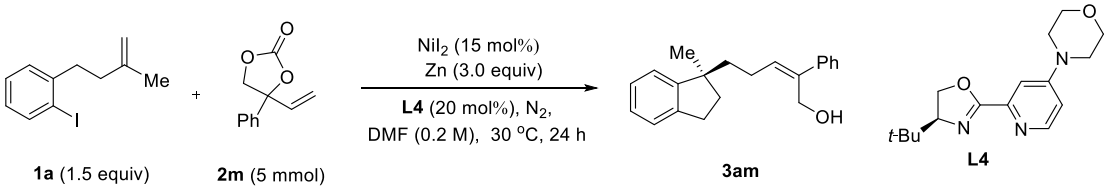
(S,E)-2-(4-(5-Methoxy-1-methyl-2,3-dihydro-1H-inden-1-yl)but-1-en-1-yl)thiophene (**3gaf**)



3gaf

The title compound **3gaf** was isolated as a colorless oil (32 mg, 54%, 96% *ee*) through flash chromatography on silica gel eluting with petroleum ether/ethyl acetate (20:1).
^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.09-7.05 (m, 1H), 7.01 (d, *J*= 8.1 Hz, 1H), 6.91 (dd, *J*= 5.1, 3.5 Hz, 1H), 6.82 (d, *J*= 3.5 Hz, 1H), 6.76-6.72 (m, 2H), 6.47 (d, *J*= 15.7 Hz, 1H), 6.03 (dt, *J*= 15.7, 6.8 Hz, 1H), 3.78 (s, 3H), 2.90-2.84 (m, 2H), 2.16-2.04 (m, 3H), 1.92-1.83 (m, 1H), 1.76-1.64 (m, 2H), 1.25 (s, 3H) ppm.
^{13}C NMR (101 MHz, Chloroform-*d*) δ= 158.7, 144.7, 143.2, 143.2, 131.3, 127.2, 124.1, 123.2, 123.0, 122.7, 112.1, 109.8, 55.4, 46.6, 40.9, 39.0, 30.5, 28.7, 27.1 ppm.
HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{19}H_{23}OS$ 299.1464; Found 299.1467.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 97/3, flow rate = 0.5 mL/min): t_R= 9.4 (minor), 10.4 (major).

Procedure for Synthesis of 3am on a 5-mmol Scale.

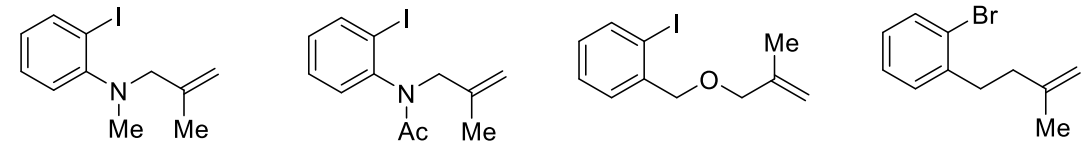


1a (1.5 equiv) **2m** (5 mmol) **3am** **L4**

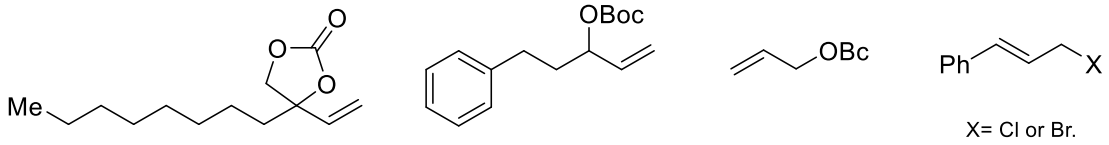
NiI_2 (234 mg, 0.75 mmol, 15 mol %), Zn (975 mg, 15 mmol, 3 equiv) and ligand **L4** (289 mg, 1.0 mmol, 20 mol %) were placed in a Schlenk tube equipped with a stir bar. Then the Schlenk tube was evacuated and filled with nitrogen (three cycles). To these solids, 25 mL dry DMF, the aryl iodide-tethered alkene **1a** (2.04 g, 7.5 mmol, 1.5 equiv) and the allyl ethylene carbonate **2m** (0.95 g, 5 mmol, 1.0 equiv) were added successively under nitrogen atmosphere. The reaction mixture was stirred at 30 °C for 24 hours, before it was quenched by addition of water. The aqueous phase was extracted with ethyl acetate (3×30 mL), and the combined organic phases were washed with brine, dried over Na_2SO_4, filtered and concentrated in vacuo. The crude materials were purified through column chromatography on silica gel (petroleum ether/ethyl acetate=5:1) to give compound **3am** (1.17 g, 80%, 97% *ee*) as a colorless oil.

Unsuccessful Substrates

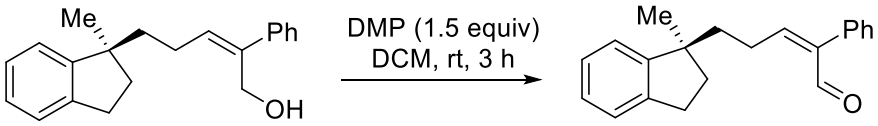
Unsuccessful Tethered Alkenes:



Unsuccessful Allyl Species:



IV. Derivatizations of the Aryl-Allylation Products



3am, 97% *ee* **4**, 75%, 96% *ee*

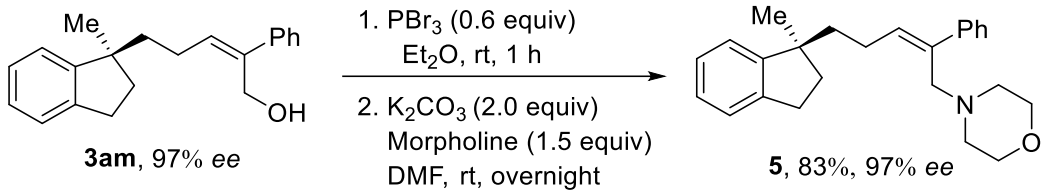
To a stirred suspension of Dess-Martin periodinane (127 mg, 0.3 mmol, 1.5 equiv) in DCM (0.2 M, 1.0 mL) was added a solution of the alcohol **3am** (58 mg, 0.2 mmol, 1.0 equiv). After stirring for 3 h at room temperature, the mixture was quenched with brine. The organic layer was separated and the aqueous layer was extracted with DCM. The combined organic layers were dried over anhydrous Na_2SO_4, filtered, and concentrated under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate=20:1) to give *(S,Z)-5-(1-methyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-ol* (**4**) (44 mg, 75%, 96% *ee*) as a colorless oil**.**

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 10.20 (s, 1H), 7.35-7.29 (m, 3H), 7.26-7.14 (m, 6H), 6.72 (t, *J*= 8.2 Hz, 1H), 2.99-2.90 (m, 2H), 2.74-2.59 (m, 2H), 2.10 (dt, *J*= 12.7, 6.9 Hz, 1H), 1.96-1.76 (m, 3H), 1.33 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 190.2, 151.8, 150.2, 143.2, 139.9, 136.6, 128.3 (2C), 128.2 (2C), 127.8, 126.7, 126.4, 124.8, 122.6, 47.5, 41.2, 38.5, 30.3, 27.0, 23.6 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{22}ONa$ 313.1563; Found 313.1564.

HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 98/2, flow rate = 0.4 mL/min): t_R= 19.5 (major), 20.7 (min).



3am, 97% *ee* **5**, 83%, 97% *ee*

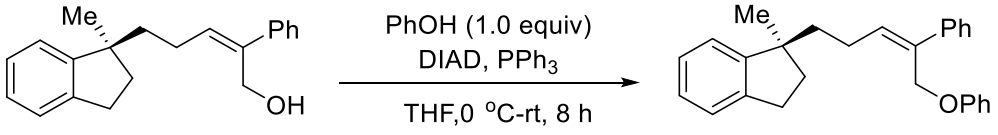
To a stirred suspension of compound **3am** (58 mg, 0.2 mmol, 1.0 equiv) in Et_2O (0.2 M, 1.0 mL) was added a solution of the PBr_3 (32 mg, 0.12 mmol, 0.6 equiv) at 0 °C. After stirring for 1 h at room temperature, the mixture was quenched with saturated aqueous solution of NaCl. The organic layer was separated and the aqueous layer was extracted with Et_2O. The combined organic layers were dried over anhydrous Na_2SO_4, filtered, and concentrated under reduced pressure. The resultant crude product was used in the next step without further purification. To a stirred suspension of K_2CO_3 (55 mg, 0.4 mmol, 2.0 equiv) and morpholine (26 mg, 0.3 mmol, 1.5 equiv) in DMF (0.2 M, 1.0 mL) was added the solution of the crude allyl bromide. After stirring overnight at room temperature, the mixture was quenched with brine. The organic layer was separated and the aqueous layer was extracted with ethyl acetate. The combined organic layers were dried over anhydrous Na_2SO_4, filtered, and concentrated under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate = 2:1) to give *(S,Z)-4-(5-(1-methyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-yl)morpholine* (**5**) (60 mg, 95%, 97% *ee*) as a colorless oil.

^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.44 (d, *J*= 8.6 Hz, 2H), 7.30-7.23 (m, 2H), 7.23-7.11 (m, 5H), 5.88 (t, *J*= 7.4 Hz, 1), 3.65-3.55 (m, 4H), 3.28 (s, 2H), 2.96-2.85 (m, 2H), 2.41-2.33 (m, 4H), 2.28-2.20 (m, 1H), 2.18-2.13 (m, 1H), 2.08 (dt, *J*= 13.4, 6.9 Hz, 1H), 1.89 (dt, *J*= 12.6, 7.7 Hz, 1H), 1.73 (td, *J*= 12.7, 12.2, 5.2 Hz, 1H), 1.64 (td, *J*= 12.8, 4.9 Hz, 1H), 1.30 (s, 3H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 150.9, 143.20, 143.17, 135.0, 133.8, 128.0 (2C), 126.6, 126.43, 126.38 (2C), 126.3, 124.6, 122.7, 67.1 (2C), 57.1, 53.4 (2C), 47.4, 41.2, 38.6, 30.4, 26.9, 24.5 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{25}H_{31}NONa$ 384.2303; Found 384.2306.

HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 98/2, flow rate = 0.4 mL/min): t_R= 15.3 (minor), 15.8 (major).



3am, 97% *ee* **6,** 76%, 97% *ee*

To a stirred solution of PPh_3 (53 mg, 0.2 mmol, 1.0 equiv), phenol (21 mg, 0.22 mmol, 1.1 equiv) and compound **3am** (58 mg, 0.2 mmol, 1.0 equiv) in THF (0.2 M, 1.0 mL) was added a solution of the DIAD (diisopropyl azodicarboxylate) (41 mg, 0.2 mmol, 1.0 equiv) at 0 °C. After stirring for 8 h at room temperature, the mixture was quenched with brine. The organic layer was separated and the aqueous layer was extracted with ethyl acetate. The combined organic layers were dried over anhydrous Na_2SO_4, filtered, and concentrated under reduced pressure. The residue was purified by column

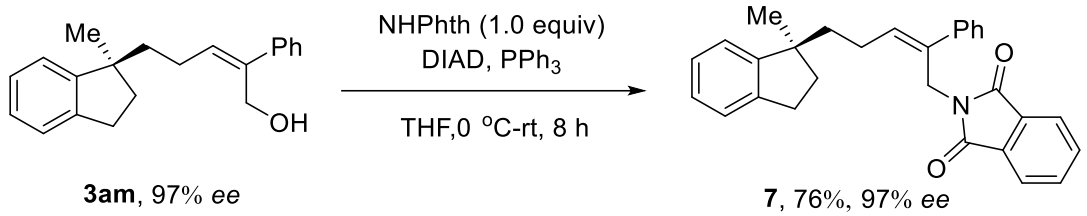
chromatography on silica gel (petroleum ether/ethyl acetate=20:1) to give *(S,Z)-1-methyl-1-(5-phenoxy-4-phenylpent-3-en-1-yl)-2,3-dihydro-1H-indene* (**6**) (56 mg, 76%, 97% *ee*) as a colorless oil.

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.32 (d, *J*= 8.1 Hz, 2H), 7.27-7.17 (m, 4H), 7.19-7.07 (m, 2H), 7.08-6.98 (m, 3H), 6.90 (t, *J*= 7.4 Hz, 1H), 6.85 (d, *J*= 8.8 Hz, 2H), 6.00 (t, *J*= 7.5 Hz, 1H), 4.70 (s, 2H), 2.85-2.75 (m, 2H), 2.26-2.19 (m, 1H), 2.15-2.07 (m, 1H), 1.97 (dt, *J*= 12.7, 7.0 Hz, 1H), 1.83-1.75 (m, 1H), 1.74-1.59 (m, 2H), 1.18 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 157.8, 149.8, 142.1, 140.2, 134.1, 133.6, 128.4 (2C), 127.2 (2C), 125.9, 125.3, 125.2, 124.9 (2C), 123.5, 121.6, 119.9, 113.9 (2C), 64.2, 46.3, 40.1, 37.4, 29.2, 25.9, 23.5 ppm.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{27}H_{29}O$ 369.2213; Found 369.2205.

HPLC-Data: (Chiralcel OJ-H column, λ = 254 nm, hexane/isopropanol = 85/15, flow rate = 0.7 mL/min): t_R= 11.0 (major), 15.2 (minor).



3am, 97% *ee* **7**, 76%, 97% *ee*

To a stirred solution of PPh_3 (53 mg, 0.2 mmol, 1.0 equiv), phthalimide (21 mg, 0.22 mmol, 1.1 equiv) and compound **3am** (58 mg, 0.2 mmol, 1.0 equiv) in THF (0.2 M, 1.0 mL) was added a solution of DIAD (Diisopropyl Azodicarboxylate) (41 mg, 0.2 mmol, 1.0 equiv) at 0 °C. After stirring for 8 h at room temperature, the mixture was quenched with brine. The organic layer was separated and the aqueous layer was extracted with ethyl acetate. The combined organic layers were dried over anhydrous Na_2SO_4, filtered, and concentrated under reduced pressure. The residue was purified by column chromatography on silica gel (petroleum ether/ethyl acetate=3:1) to give *(S,Z)-2-(5-(1-methyl-2,3-dihydro-1H-inden-1-yl)-2-phenylpent-2-en-1-yl)isoindoline-1,3-dione* (**7**) (44 mg, 80%, 97% *ee*) as a colorless oil.

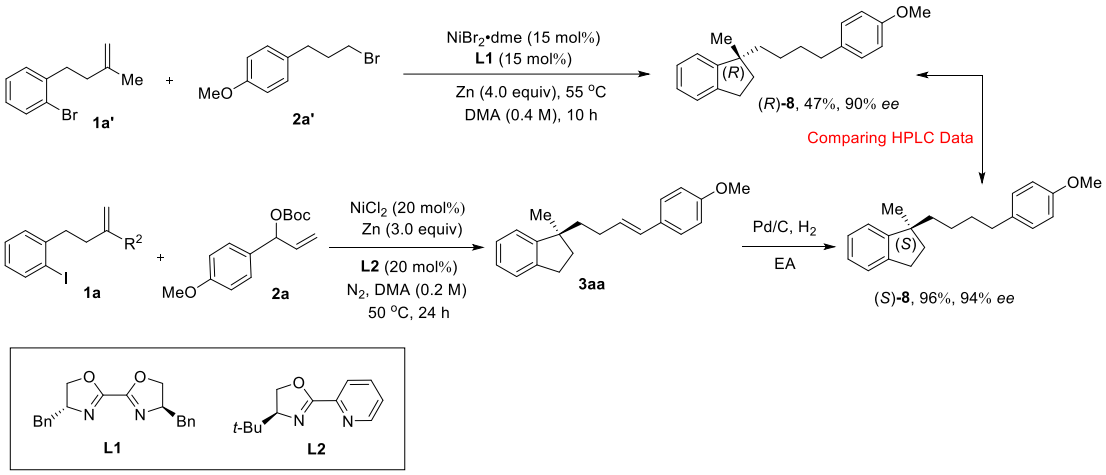
^{1}H NMR (500 MHz, Chloroform-*d*) δ= 7.71 (dd, *J*= 5.5, 3.1 Hz, 2H), 7.61 (dd, *J*= 5.5, 3.0 Hz, 2H), 7.35-7.31 (m, 2H), 7.24-7.12 (m, 7H), 5.80 (t, *J*= 7.3 Hz, 1H), 4.70 (s, 2H), 2.99-2.90 (m, 2H), 2.52-2.43 (m, 1H), 2.39-2.32 (m, 1H), 2.19-2.10 (m, 1H), 1.96-1.90 (m, 1H), 1.88-1.82 (m, 1H), 1.82-1.72 (m, 1H), 1.33 (s, 3H) ppm.

^{13}C NMR (126 MHz, Chloroform-*d*) δ= 168.0 (2C), 151.2, 143.3, 140.3, 134.21, 134.15, 133.8 (2C), 131.9, 128.1 (2C), 127.1, 126.9 (2C), 126.4, 126.3, 124.6 (2C), 123.1 (2C), 122.7, 47.4, 40.9, 38.5, 36.7, 30.4, 26.9, 24.5 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{29}H_{27}NO_2Na$ 444.1934; Found 444.1937.

HPLC-Data: (Chiralpak IB column, λ = 254 nm, hexane/isopropanol = 90/10, flow rate = 0.5 mL/min): t_R= 12.2 (minor), 12.7 (major).

V. Determination of the Absolute Configuration of the Aryl-Allylation Products



The aryl-allylation product **3aa** was hydrogenated to compound **8**. It is known in the literature that the compound **8** with *R*-configuration can be synthesized through Ni-catalyzed asymmetric aryl-alkylation.[8] The absolute configuration of compound **3aa** prepared using our method was determined to be *S* through comparison of the HPLC data (Page 222-223) with these reported in the literature. The absolute stereochemistry of the other aryl-allylation products was assigned assuming a common reaction pathway.

Procedure for Hydrogenation of Compound 3aa

A flask is charged with compound **3aa** (58 mg, 0.2 mmol, 1.0 equiv), ethyl acetate (3.0 mL) and Pd/C (5.0 mg, 5%) with a H_2 ballon. The reaction mixture was stirred for 6 h at room temperature. Then the reaction mixture was diluted with ethyl acetate, filtered, dried over Na_2SO_4, filtered, and concentrated in vacuo. The residue was purified through column chromatography on silica gel (petroleum ether/ethyl acetate=20:1) to afford *(S)-1-(4-(4-methoxyphenyl)butyl)-1-methyl-2,3-dihydro-1H-indene* ((*S*)-**8**) (56 mg, 96%, 94% *ee*) as a colorless oil.

^{1}H NMR (400 MHz, Chloroform-*d*) δ= 7.13-6.95 (m, 6H), 6.72 (d, *J*= 8.6 Hz, 2H), 3.69 (s, 3H), 2.85-2.75 (m, 2H), 2.49-2.33 (m, 2H), 1.92 (dt, *J*= 12.5, 7.0 Hz, 1H), 1.73 (dt, *J*= 12.5, 7.6 Hz, 1H), 1.56-1.42 (m, 4H), 1.33-1.23 (m, 2H), 1.15 (s, 3H) ppm.

^{13}C NMR (101 MHz, Chloroform-*d*) δ= 156.5, 150.6, 142.1, 133.9, 128.1 (2C), 125.12, 125.06, 123.4, 121.6, 112.6 (2C), 54.2, 46.3, 40.2, 37.5, 33.9, 31.5, 29.2, 25.7, 23.6 ppm.

HRMS (ESI) m/z: $[M+Na]^+$ Calcd for $C_{21}H_{26}ONa$ 295.2062; Found 295.2052.

HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 9.0 (major), 9.9 (minor).

Procedure for Preparation of Compound 8 through Ni-Catalyzed Aryl-Alkylation

A sealed test tube charged with $NiBr_2$(dme) (9.3 mg, 0.03 mmol, 15mol%), ligand **L1** (9.6 mg, 0.03 mmol, 15 mol%), Zn-powder (52 mg, 0.8 mmol, 4.0 equiv) and a stir bar was evacuated and filled with nitrogen (three cycles) before adding DMA (0.5 mL) under nitrogen atmosphere. Then the reaction mixture was stirred at 40 °C for 15 minutes. Next, the aryl bromide-tethered alkene **1a'** (44.8 mg, 0.2mmol, 1.0 equiv) and 1-(3-bromopropyl)-4-methoxybenzene (**2a'**) (91.2 mg, 0.4 mmol, 2.0 equiv) were added, and the resulting mixture was stirred at 40 °C for 10 hours. The mixture was then filtered through a pad of Celite and concentrated under reduced pressure. The residue was purified through column chromatography on silica gel (petroleum ether/ethyl acetate=20:1) to afford *(R)-1-(4-(4-methoxyphenyl)butyl)-1-methyl-2,3-dihydro-1H-indene* ((*R*)-**8**) (31 mg, 47%, 90% *ee*) as a colorless oil.
HPLC-Data: (Chiral MD column, λ = 254 nm, hexane/isopropanol = 95/5, flow rate = 0.5 mL/min): t_R= 9.0 (minor), 9.9 (major)

VI. Determination of the E/Z-Configuration of the Aryl-Allylation Products

The ^3J coupling constants between the two alkene hydrogens of the aryl-allylation products **3aa-al**, **3bk**, **3ck**, **3fa**, **3fx**, **3gy**, **3hz** and **3ik** range from 15.5 to 16.0 Hz, which are typical for *E*-alkenes.
Furthermore, the NOESY spectrum of **3ma** (Page 82-83) indicates that the trisubstituted alkene is Z-configured. Therefore, the geometry of all the other aryl-allylation products **3am-av**, **3bm-lm**, **3jn** and **3jo** and derived from vinyl ethylene carbonates is assigned to be *Z* assuming a common reaction pathway (Exception: **3aw** is *E*-configured).

VII. References

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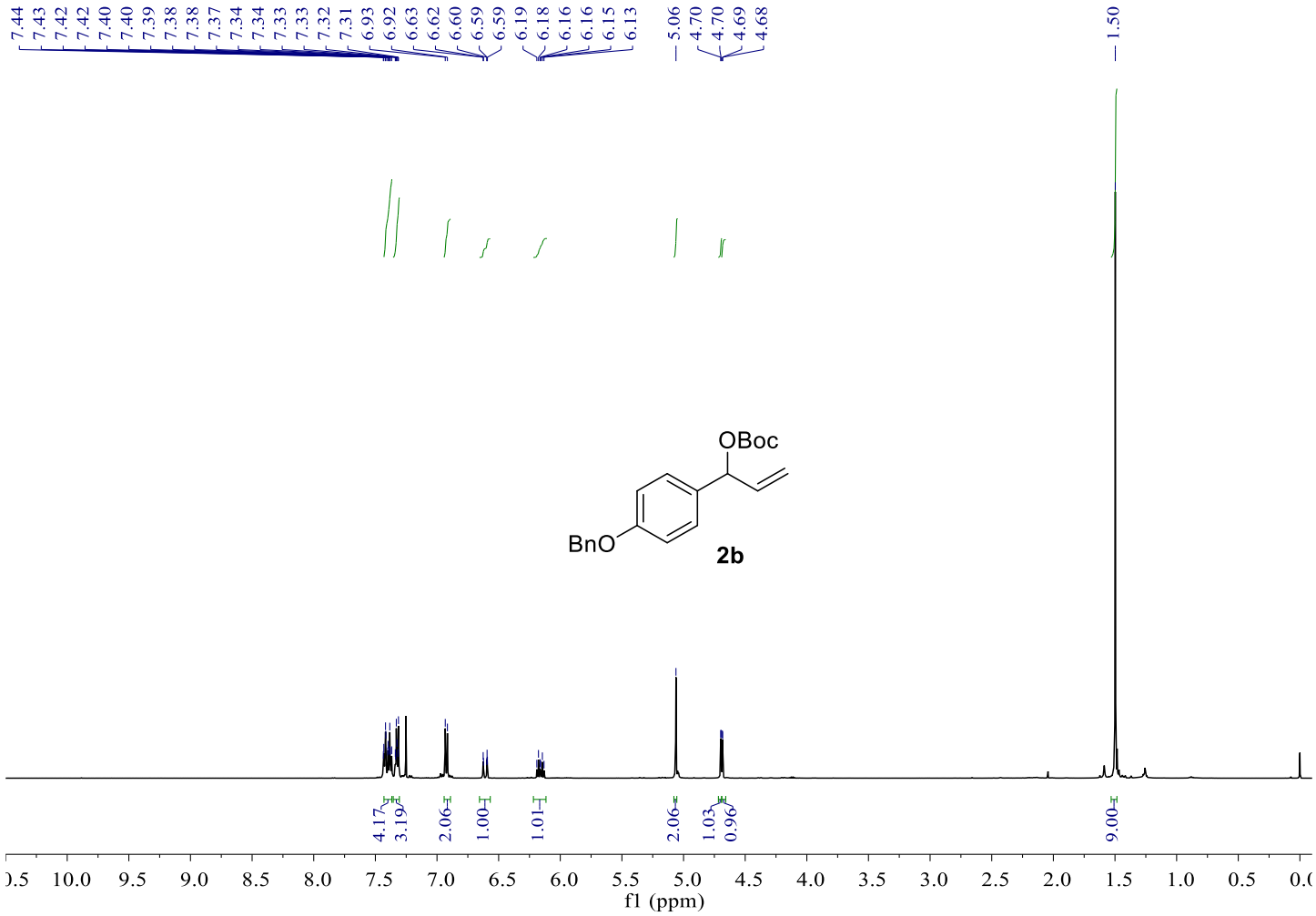
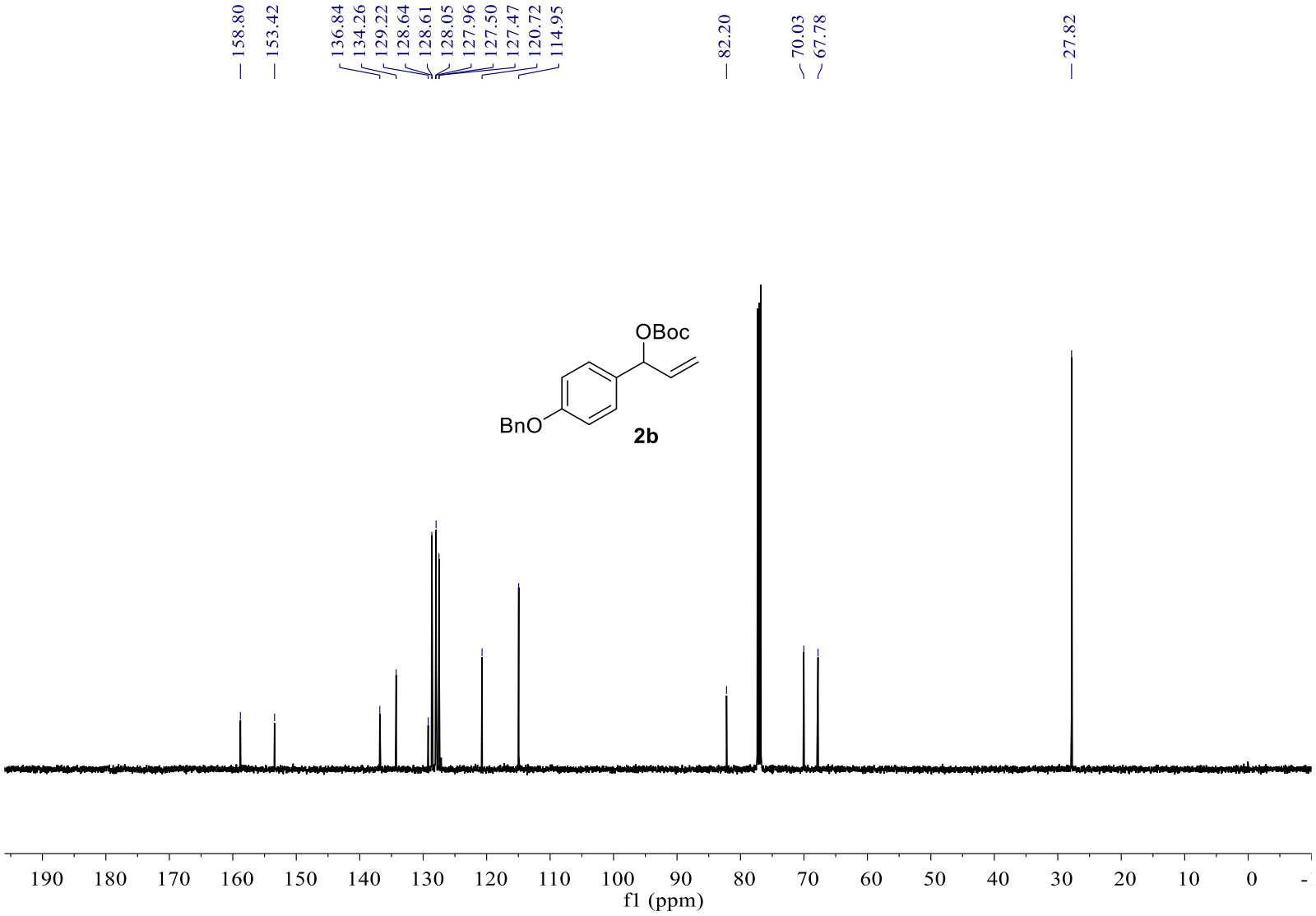
8. Jin, Y.; Wang, C. Nickel-Catalyzed Asymmetric Reductive Arylalkylation of Unactivated Alkenes. *Angew.Chem. Int.Ed*. **2019**, *58*, 6722–6726.

VIII. NMR Spectra

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70.03
67.78
27.82
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BnO
2b
190
180
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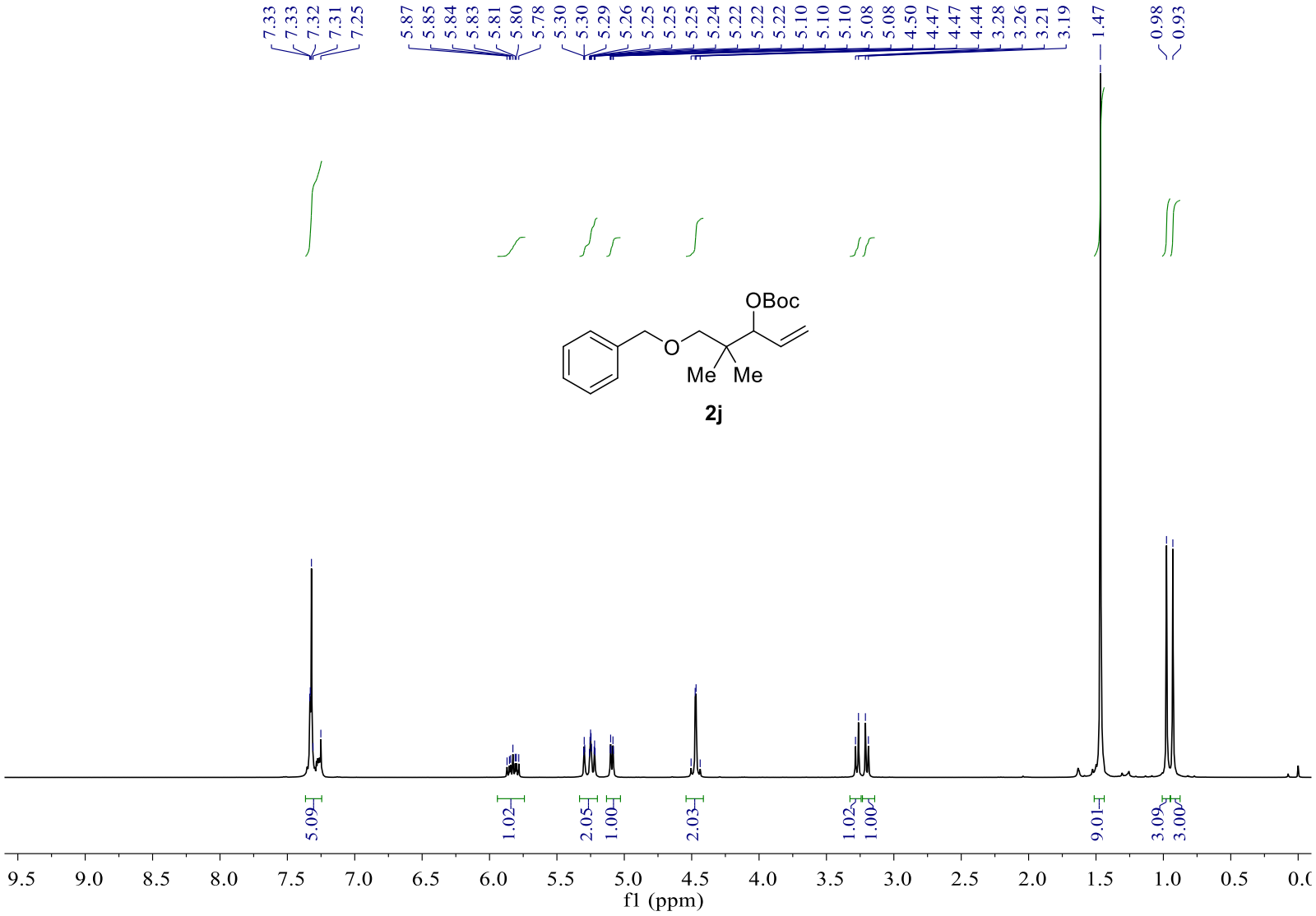
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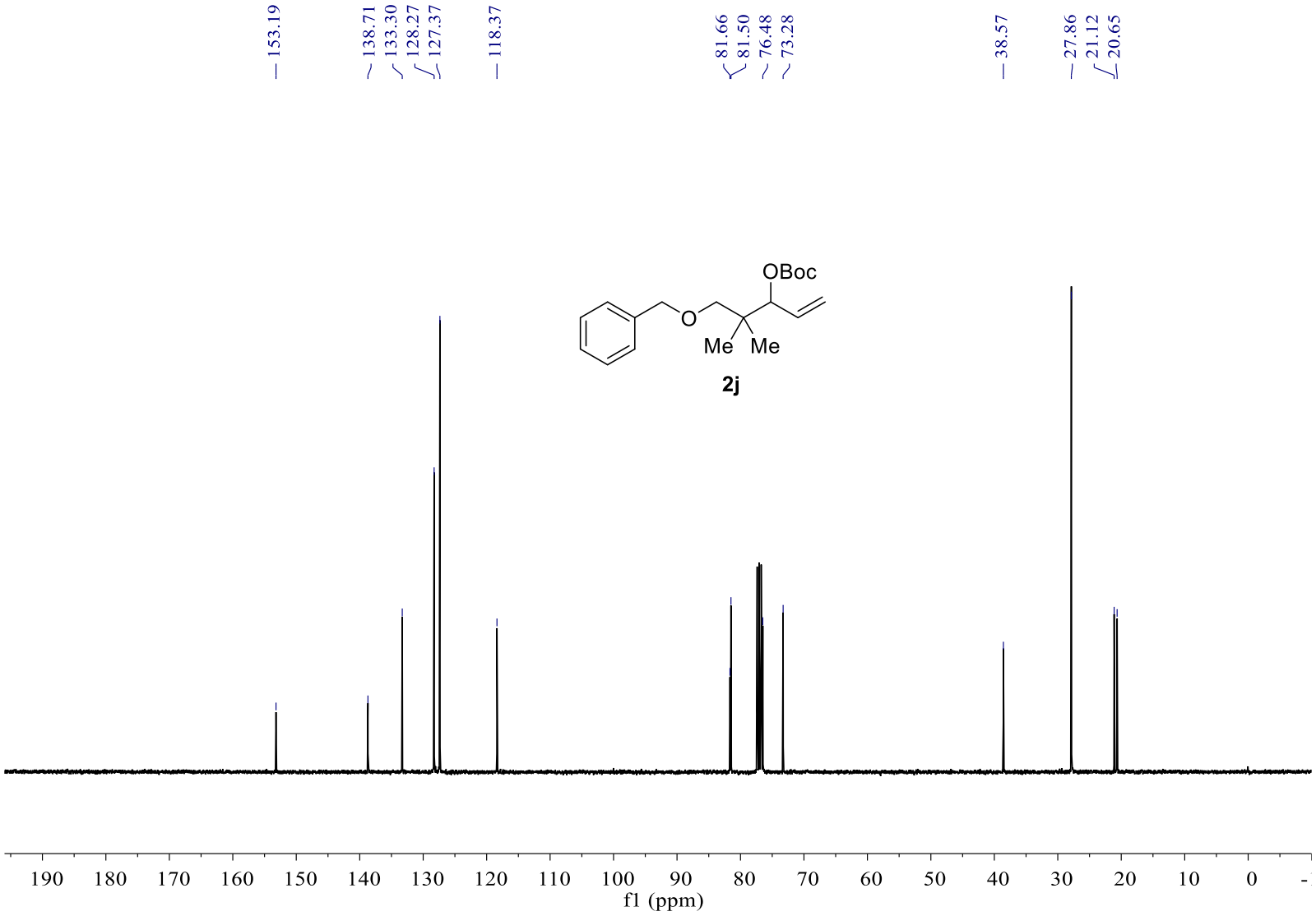
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2j
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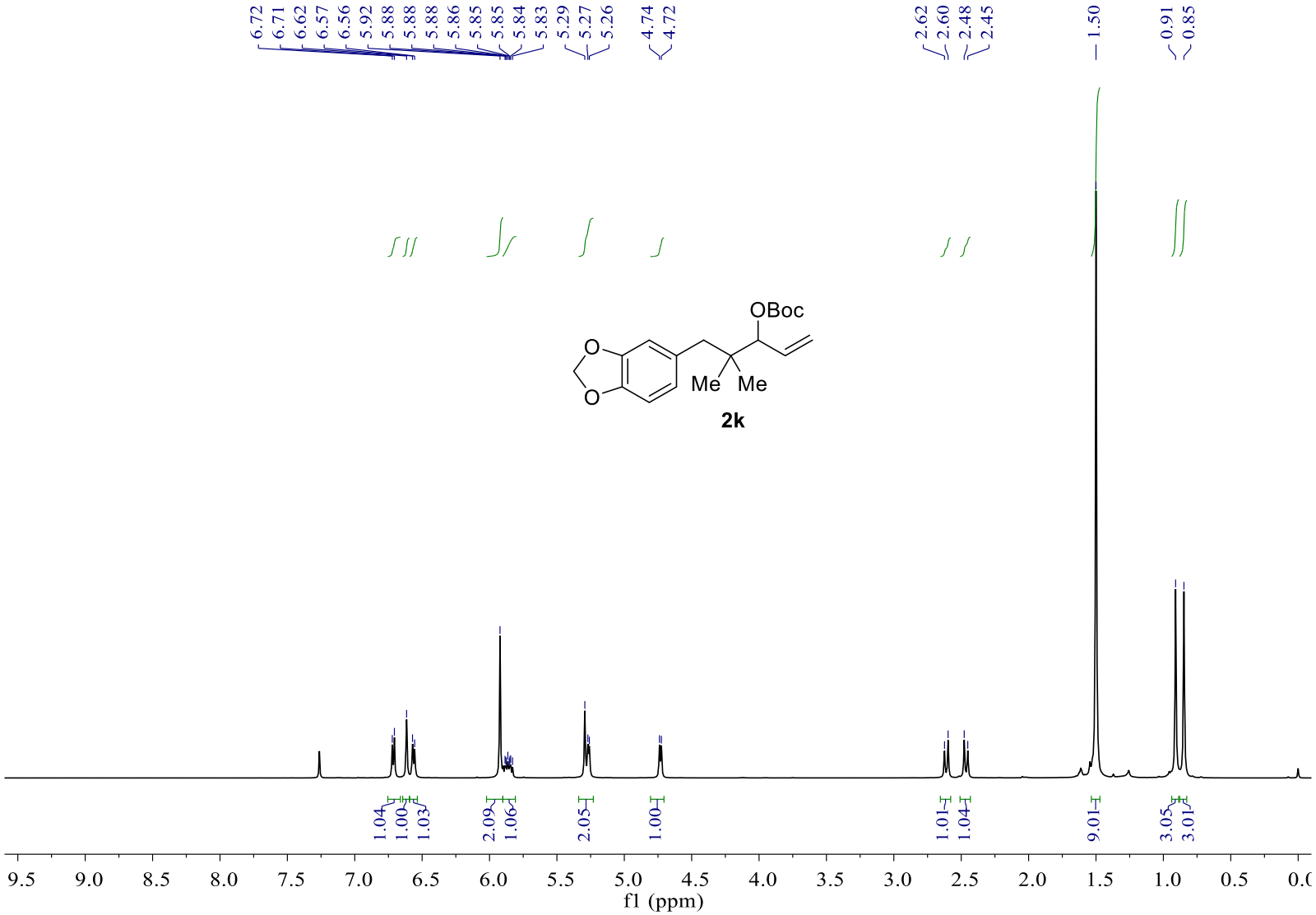
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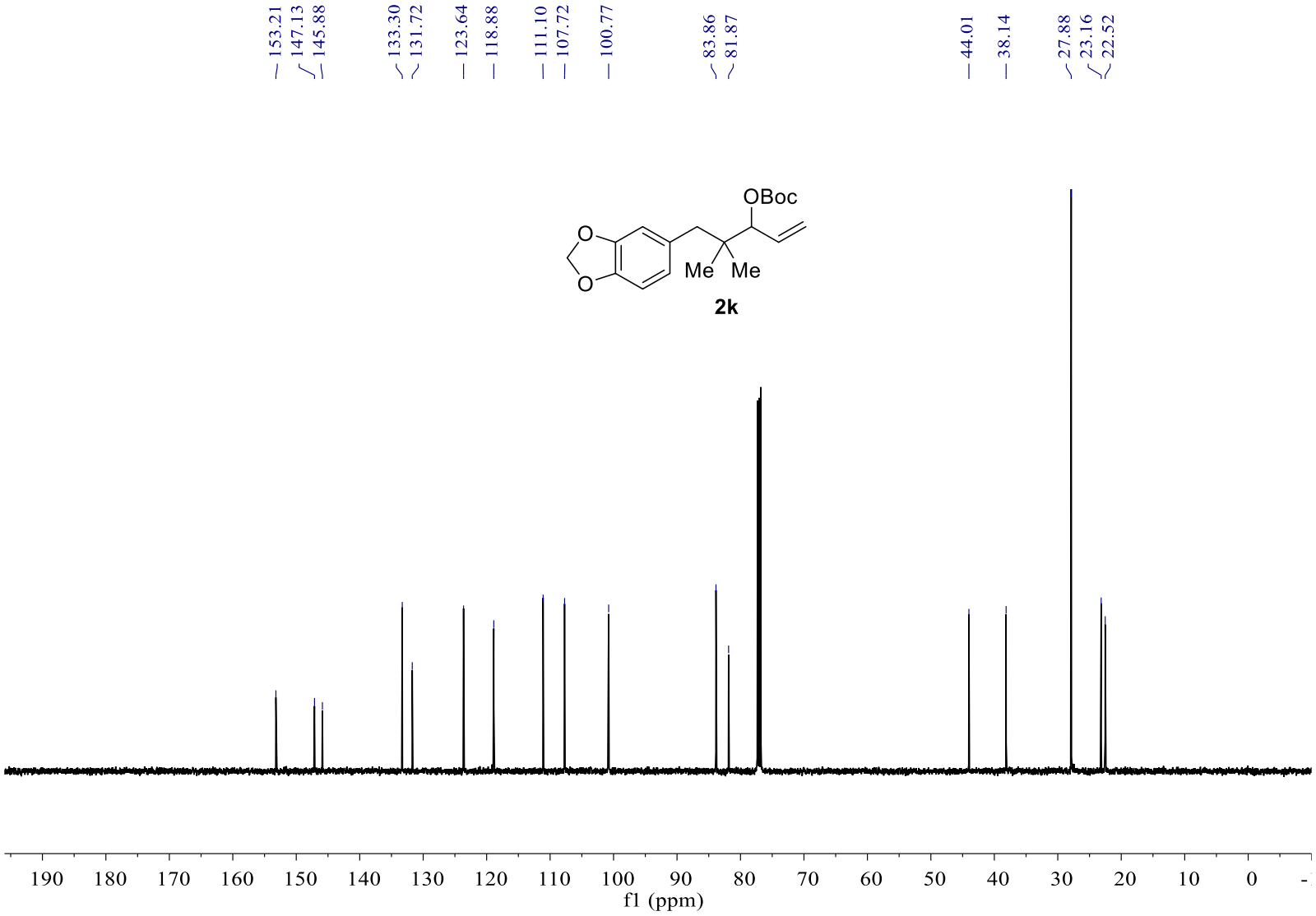
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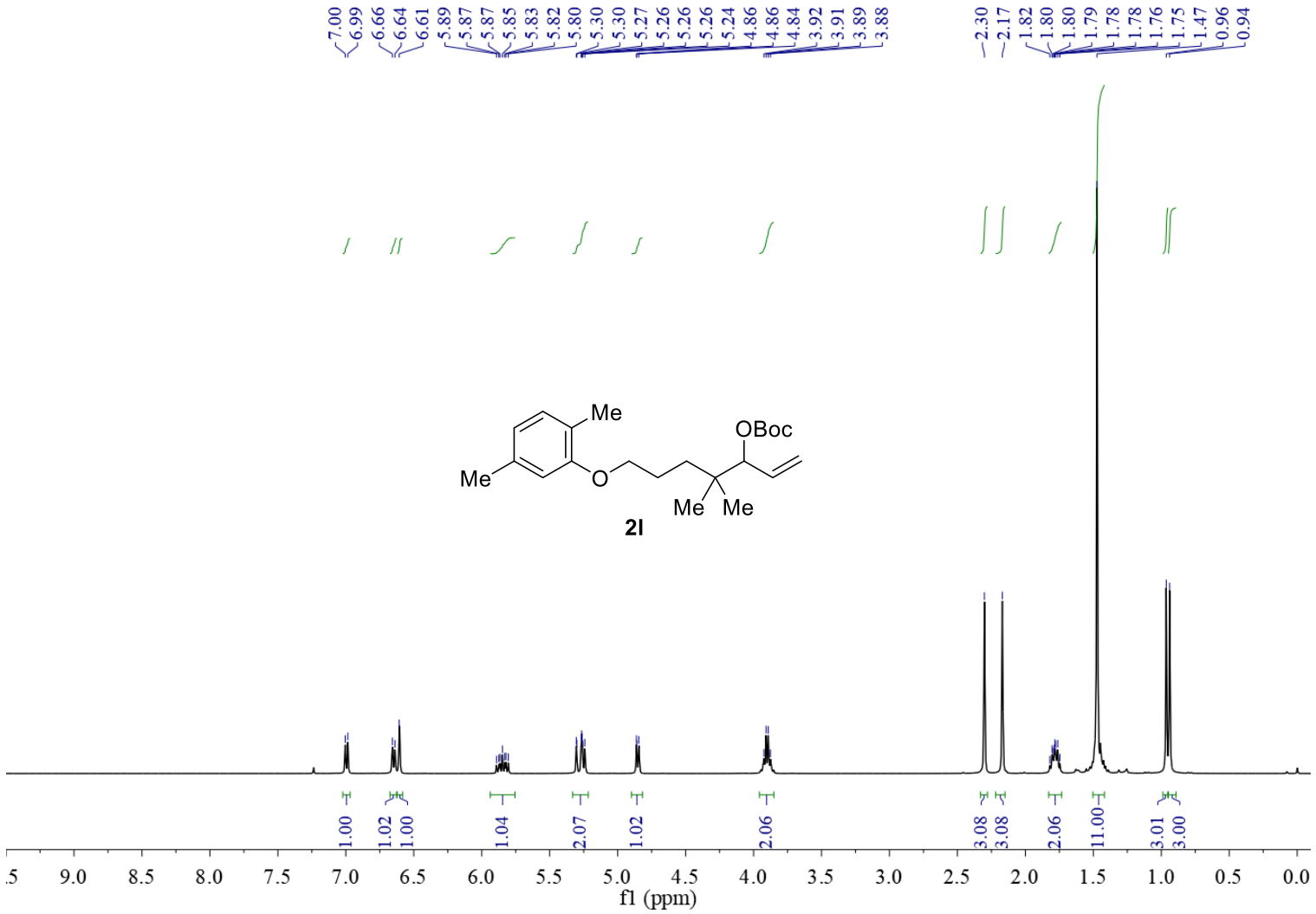
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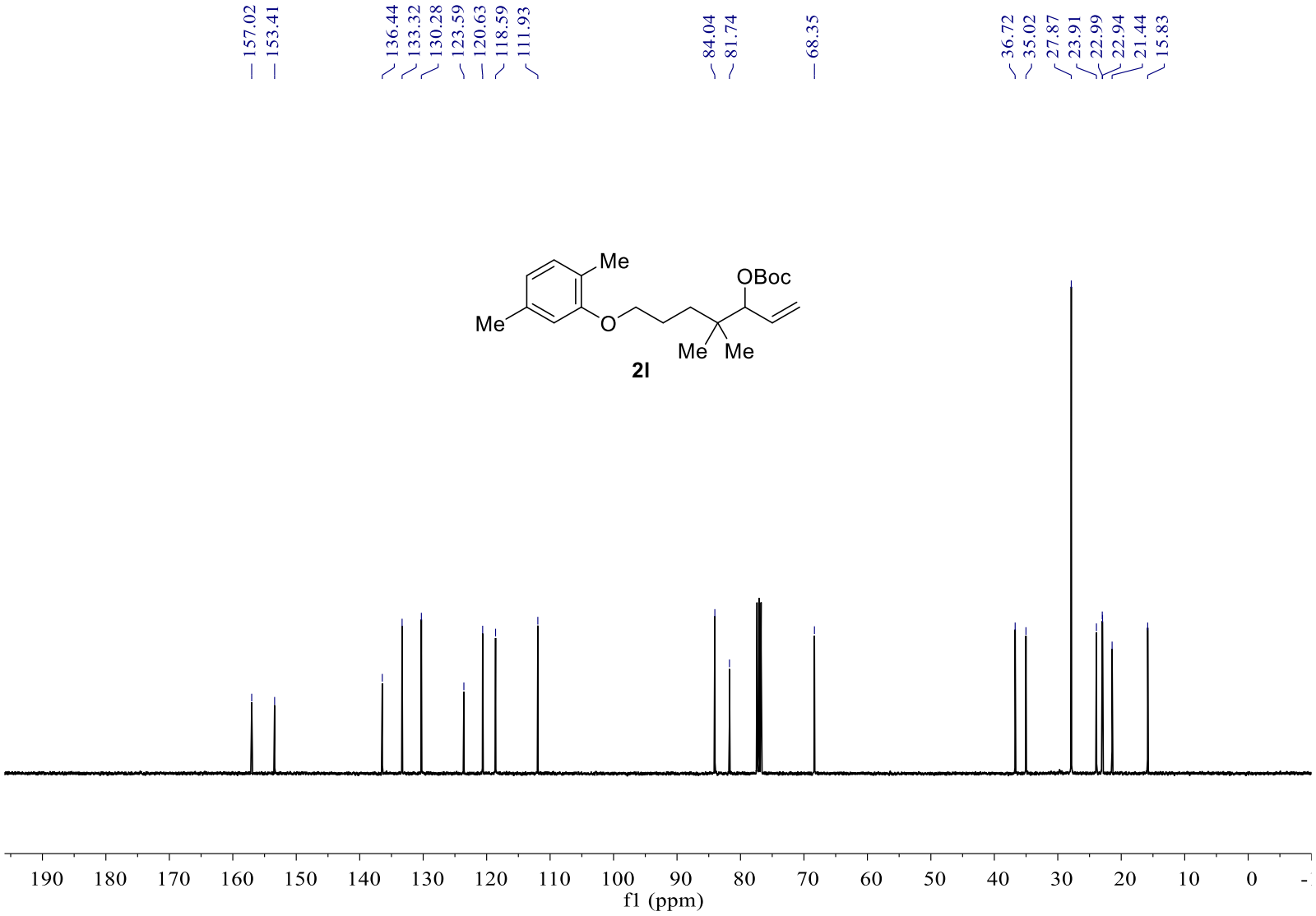
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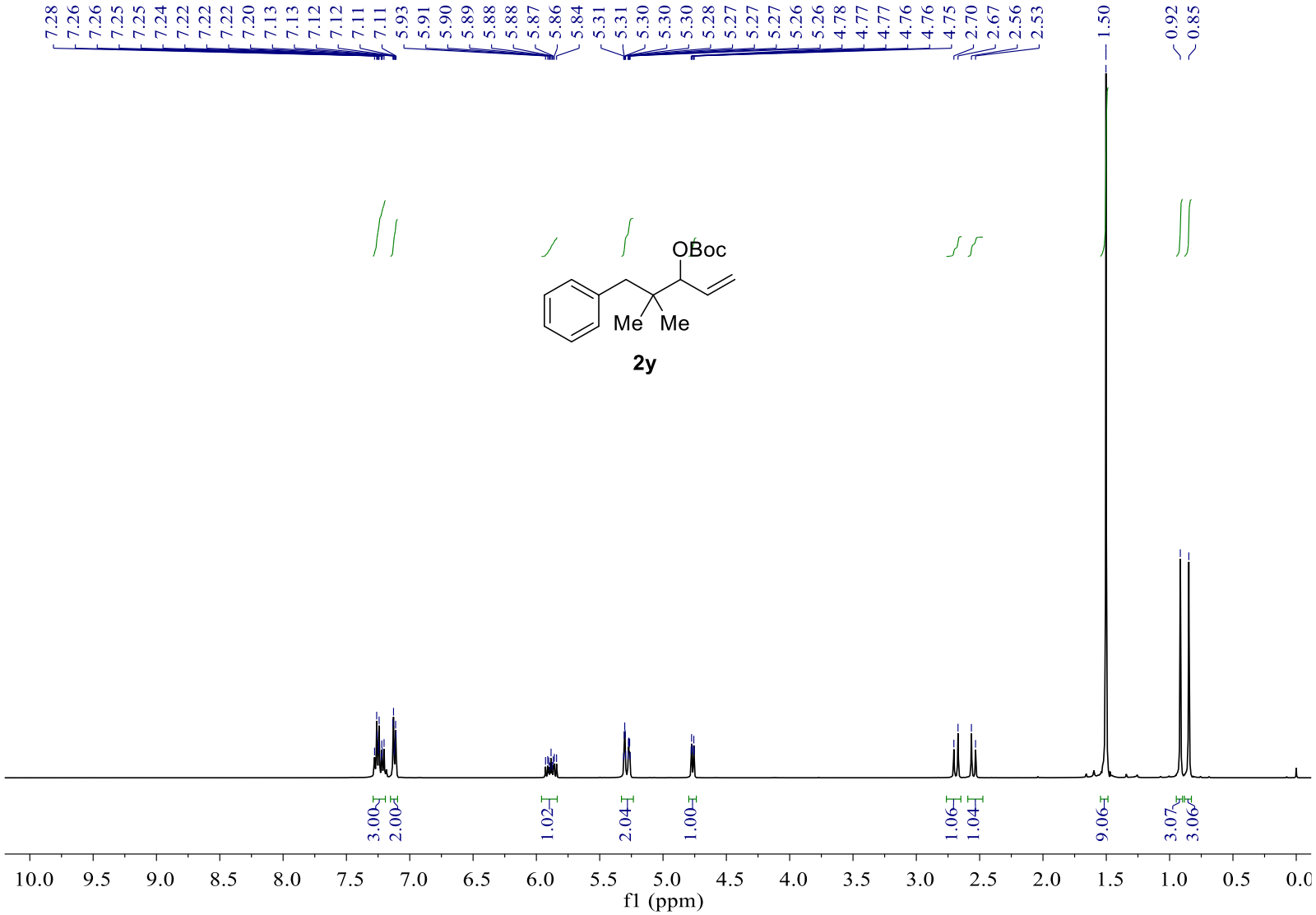
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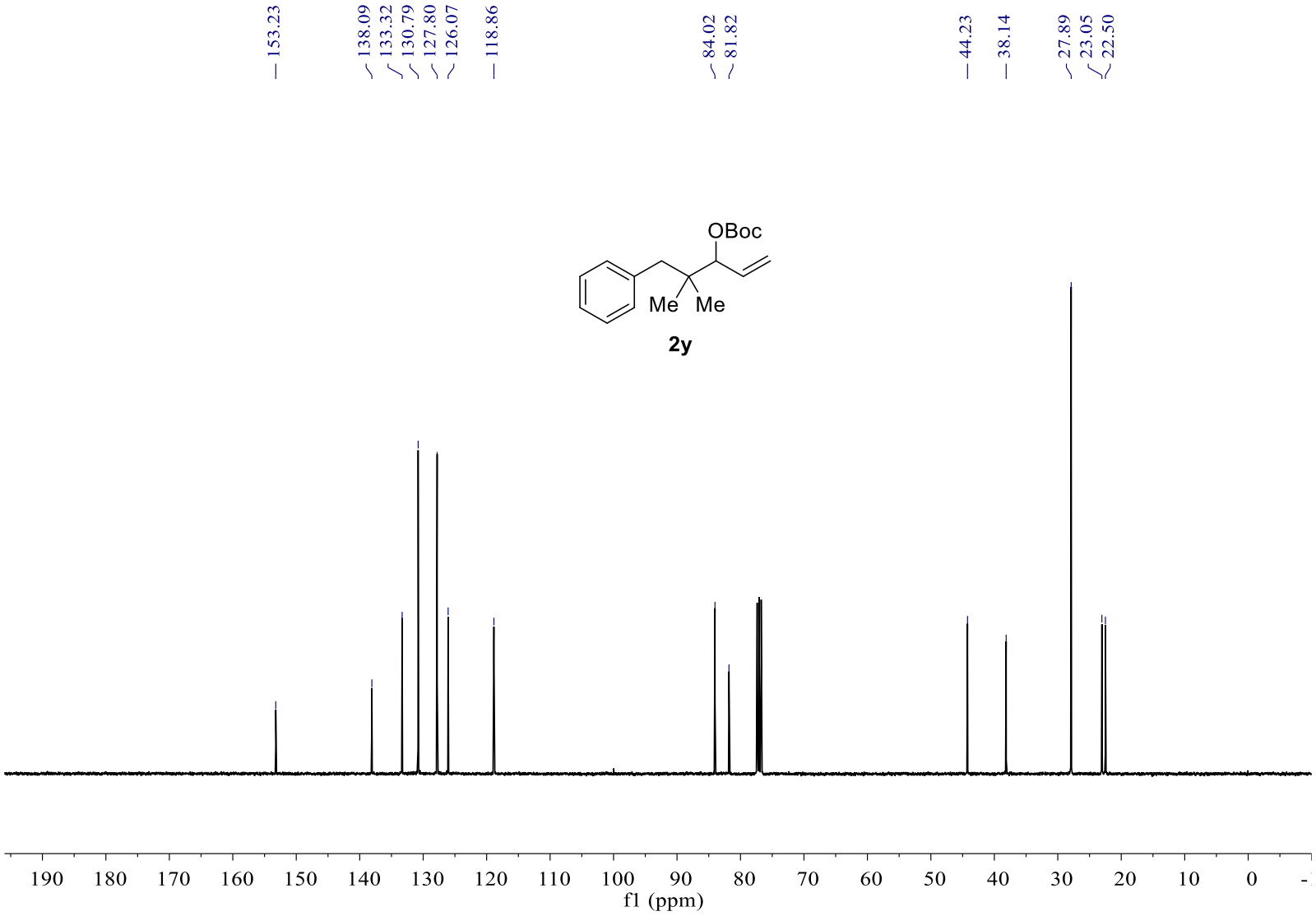
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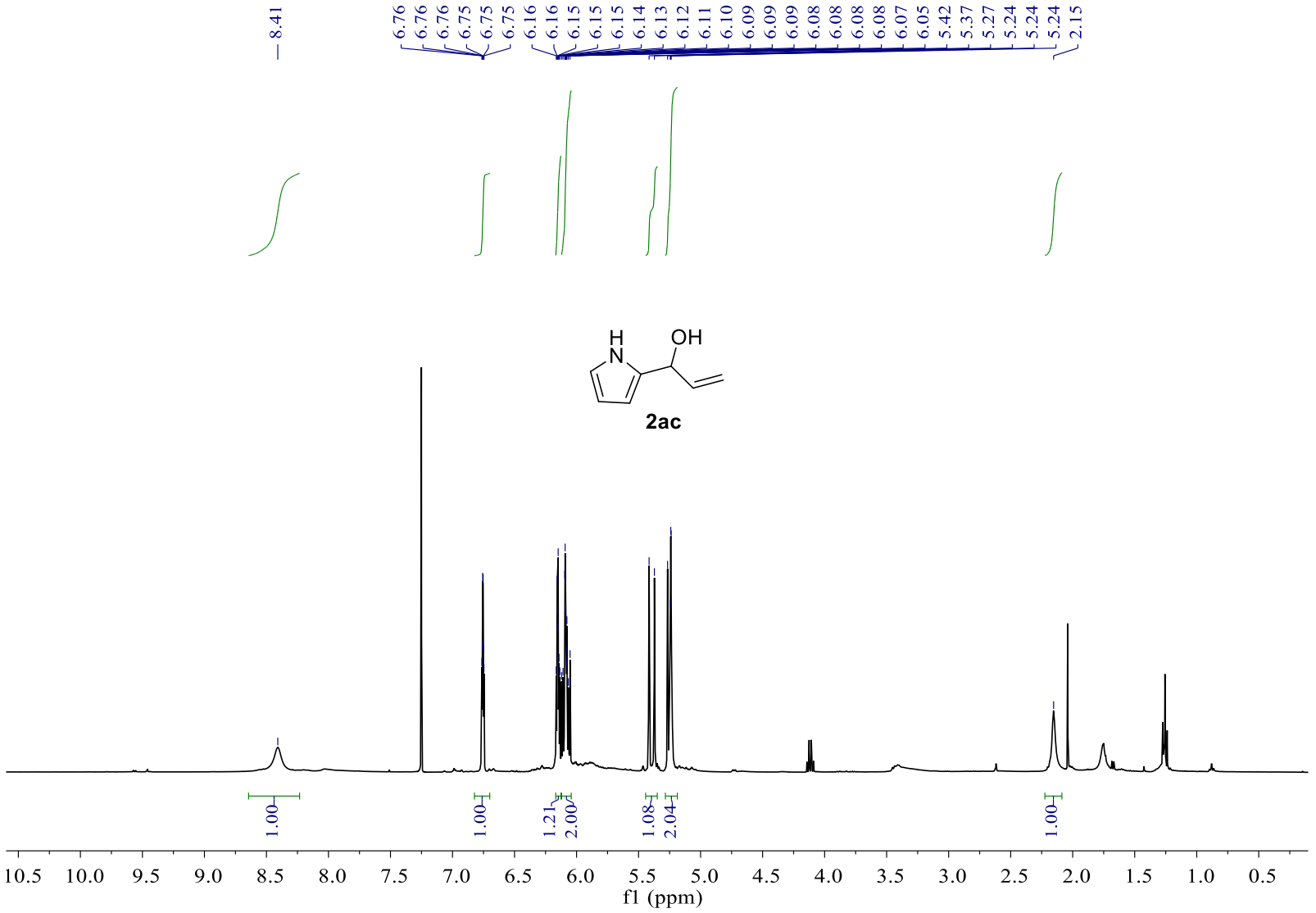
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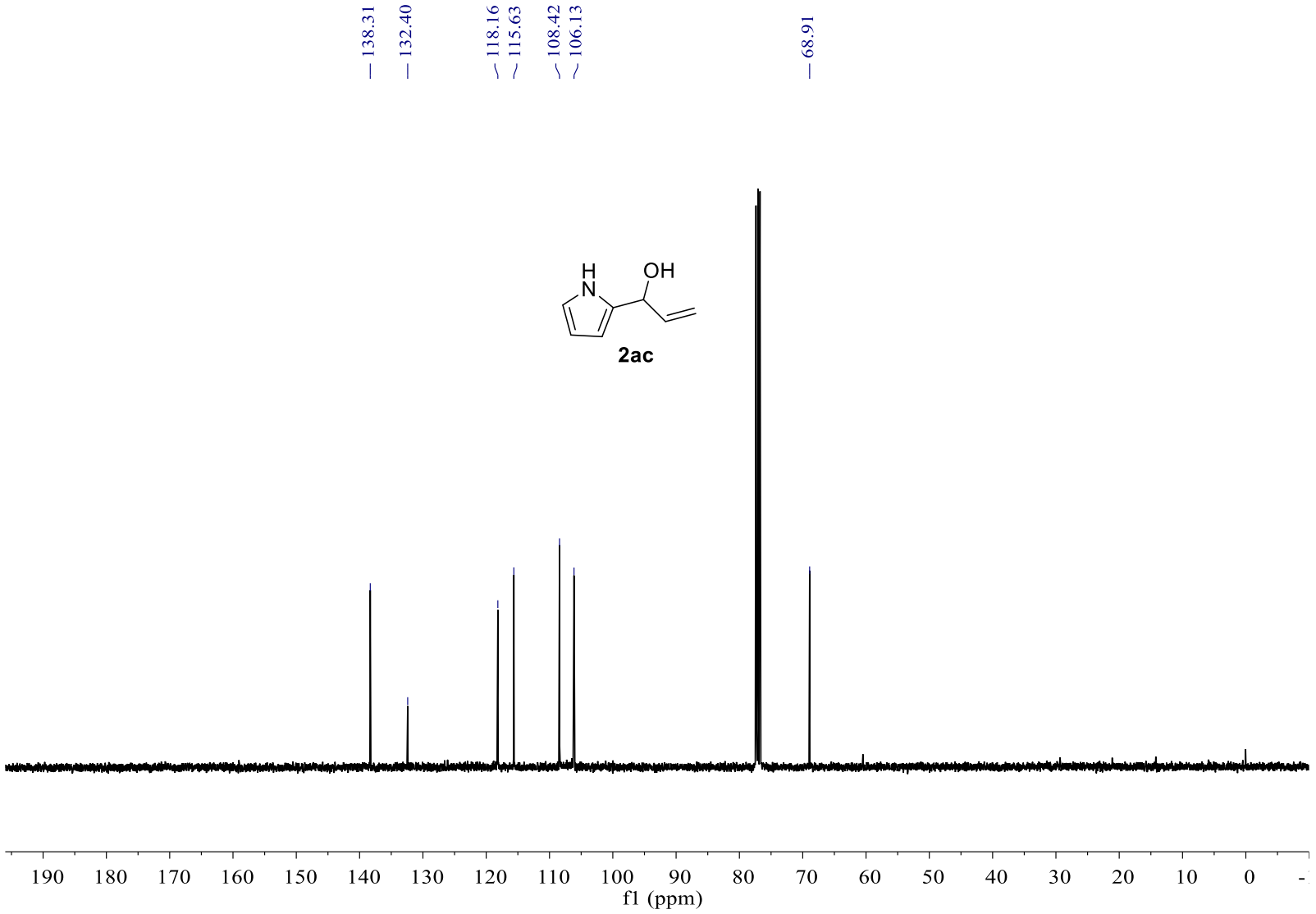
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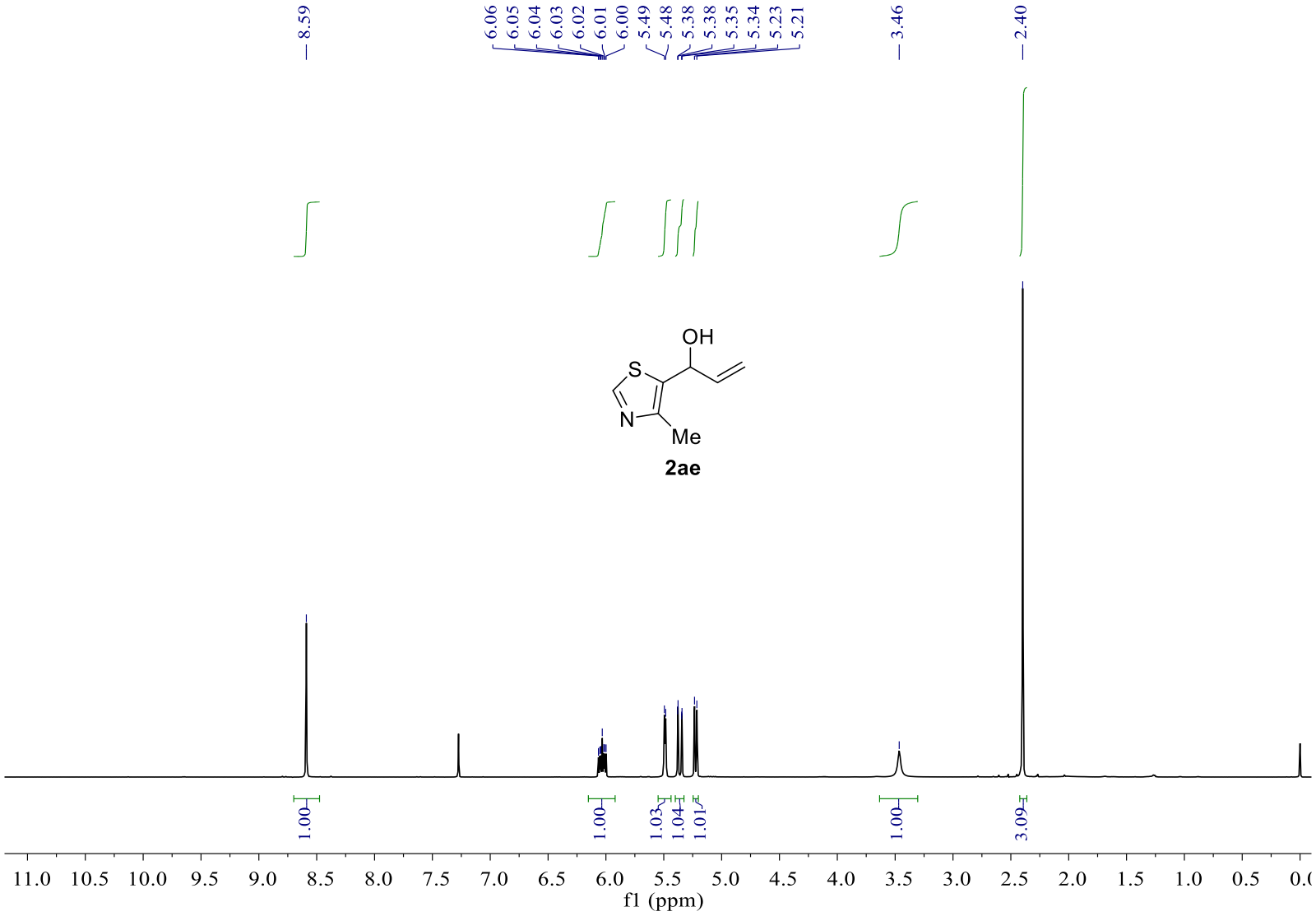
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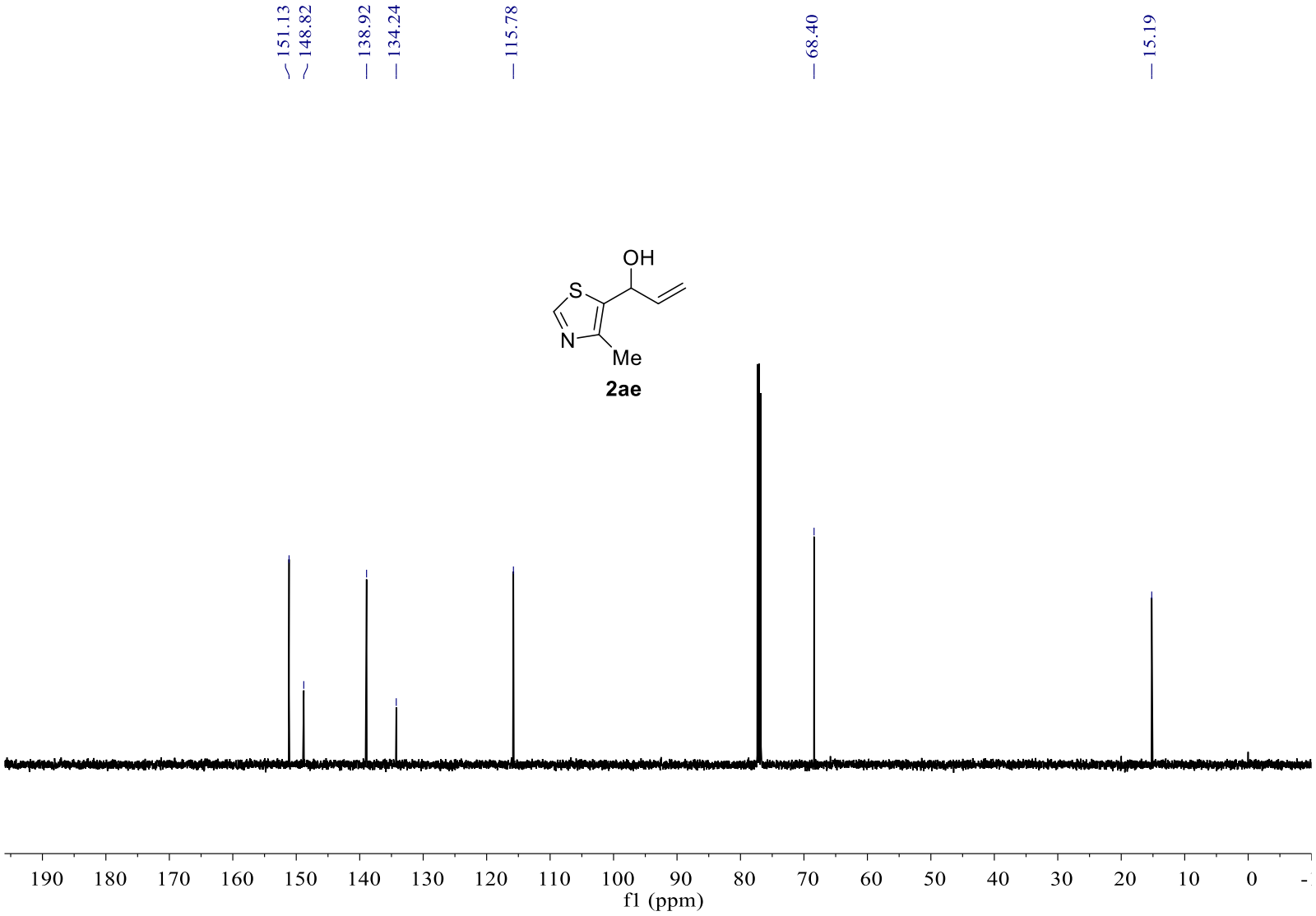
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Me
2ae
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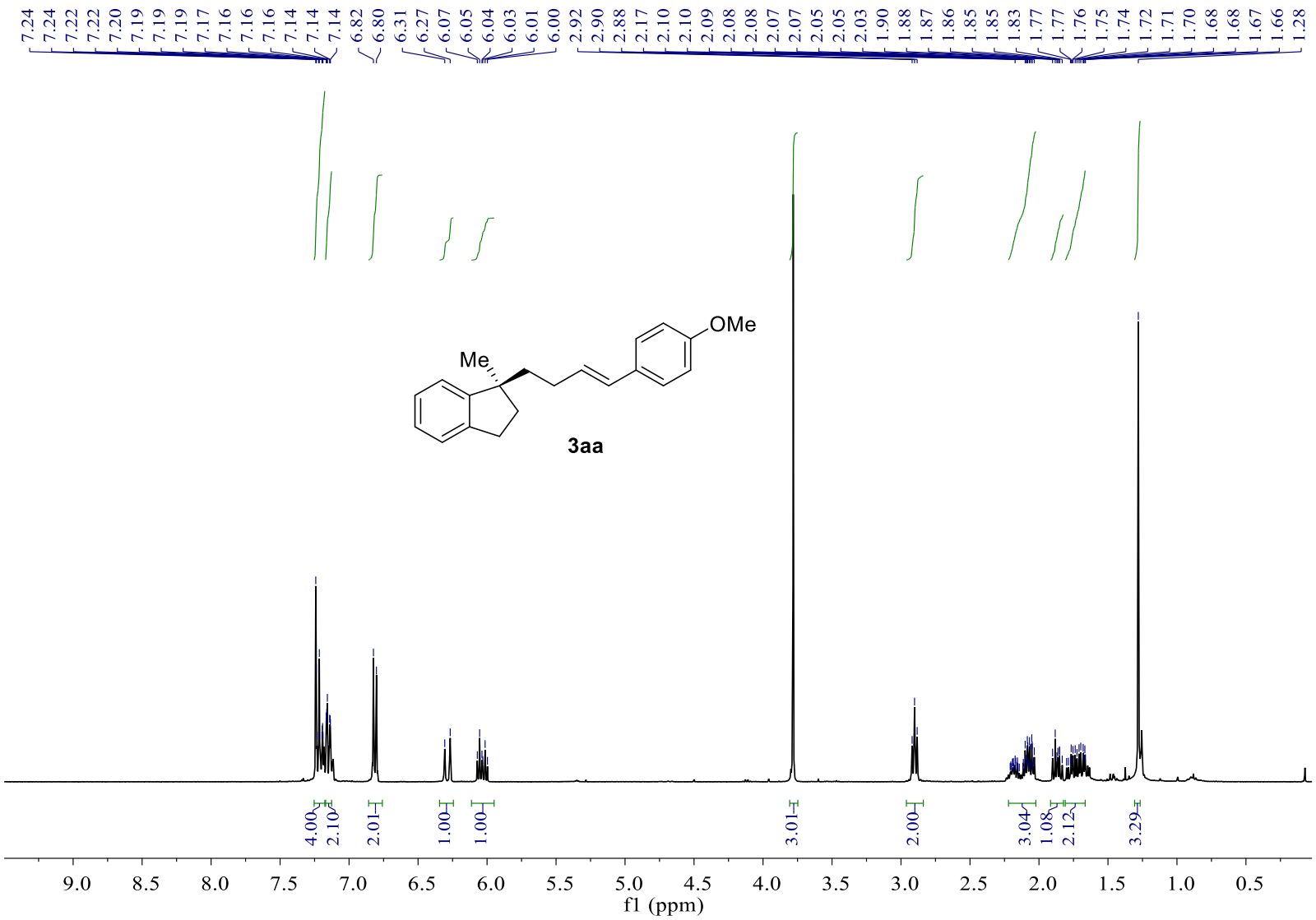
f1 (ppm)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OMe
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3aa
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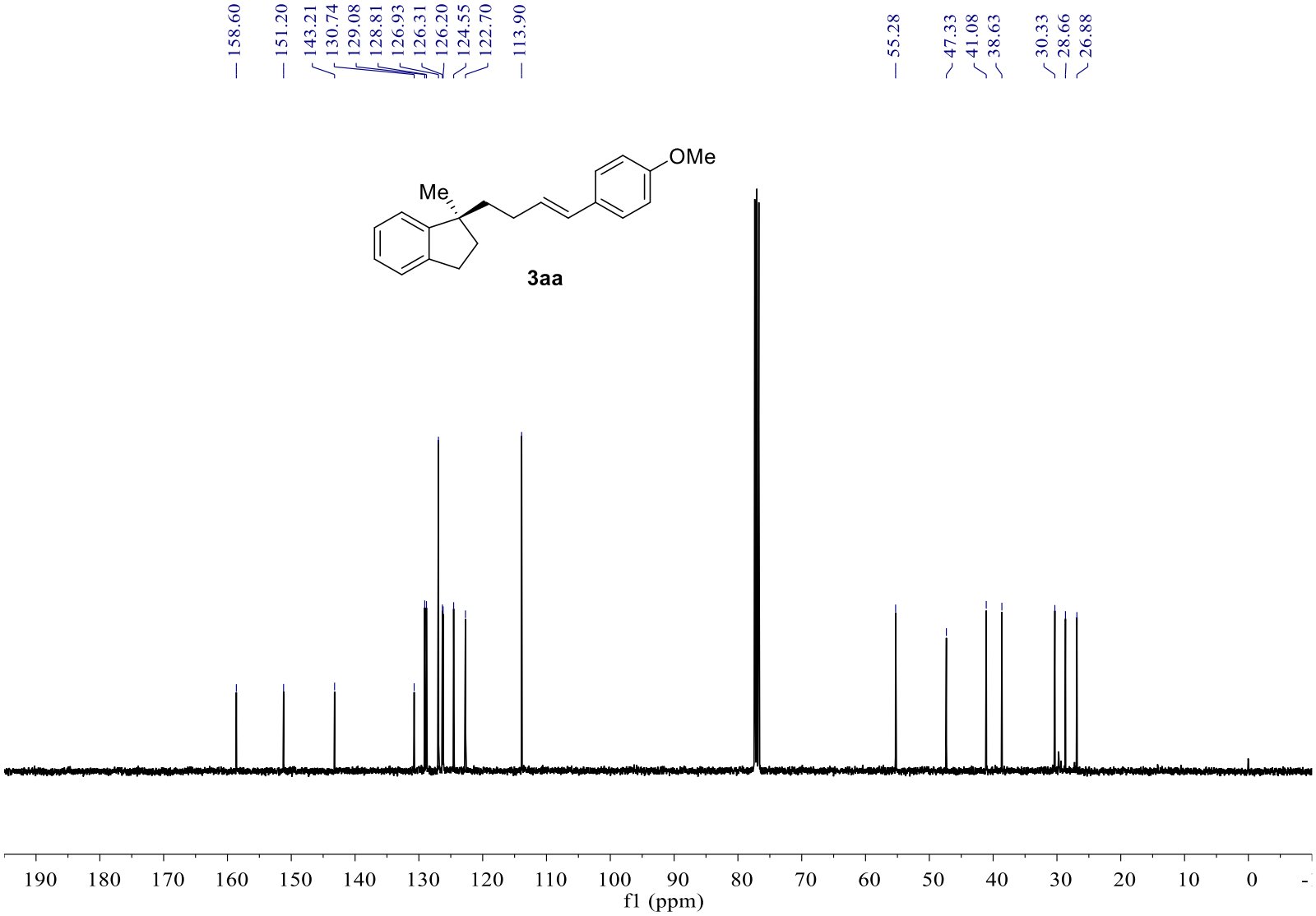
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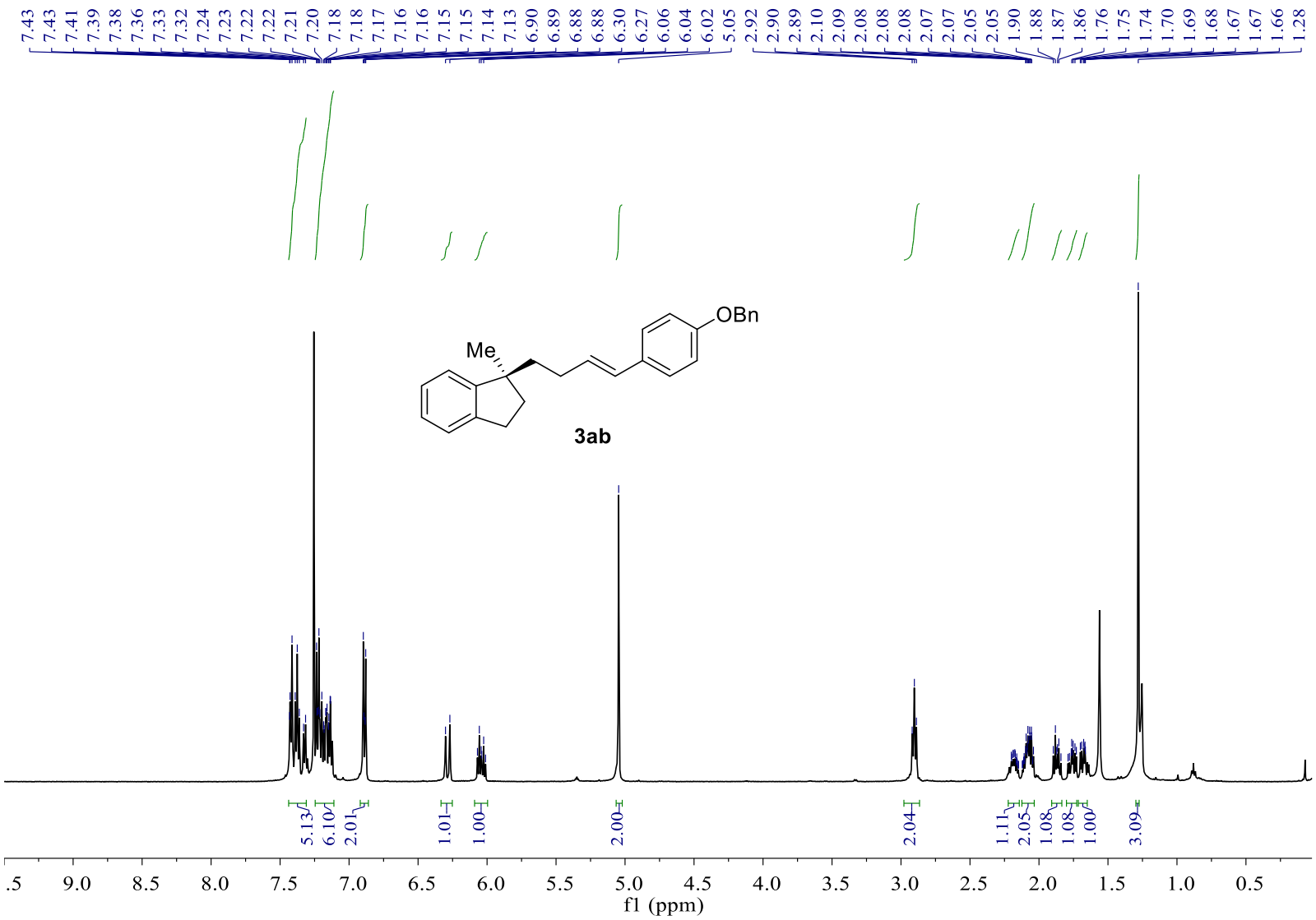
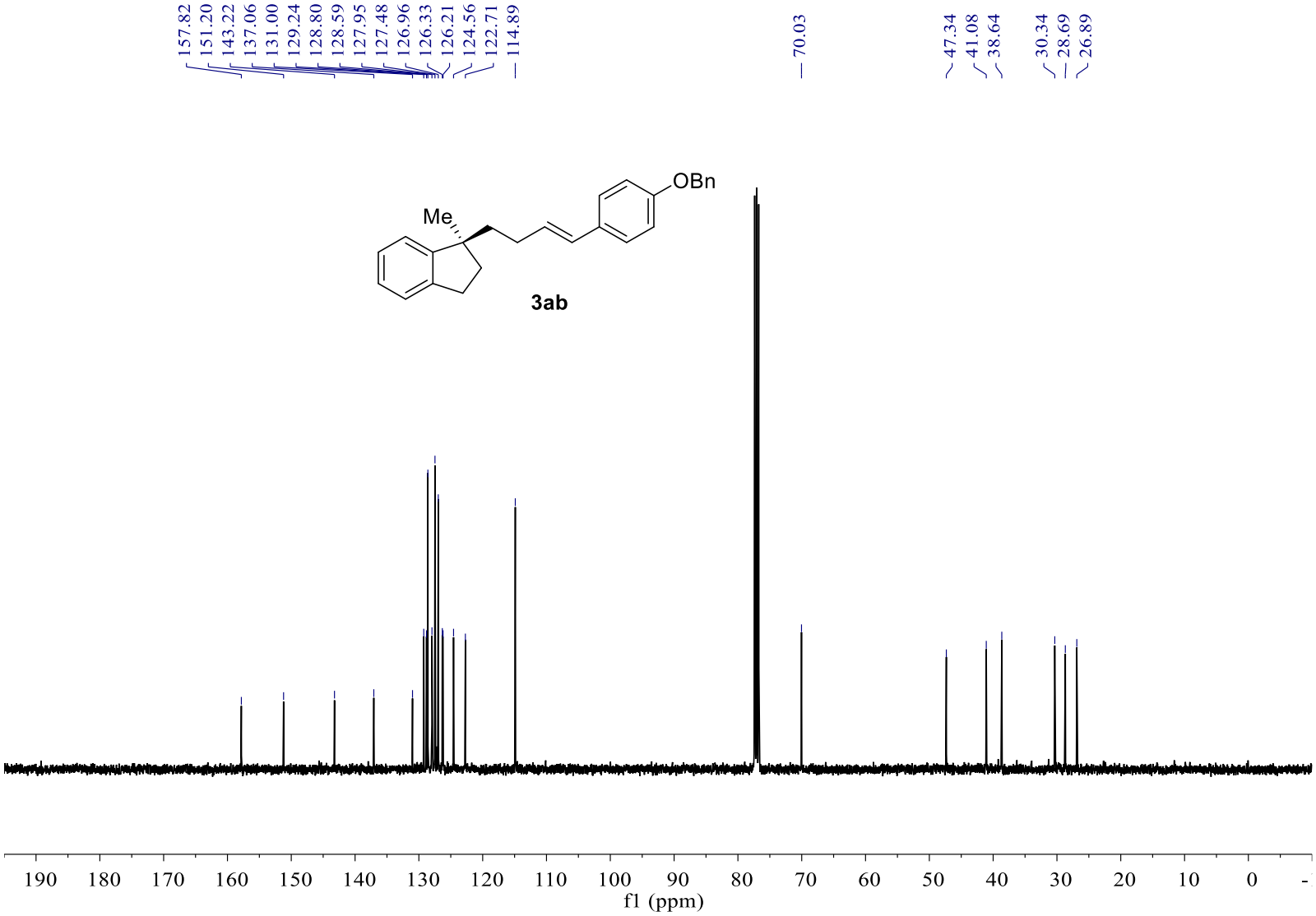
128.81
126.93
126.31
126.20
124.55
122.70
113.90
55.28
47.33
41.08
38.63
30.33
28.66
26.88
OMe
Me
3aa
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.43 7.43 7.41 7.39 7.38 7.36 7.33 7.32 7.24 7.23 7.22 7.22 7.21 7.20 7.18 7.18 7.17 7.16 7.16 7.15 7.15 7.14 7.13 6.90 6.89 6.88 6.88 6.30 6.27 6.06 6.04 6.02 5.05
2.92 2.90 2.89 2.10 2.09 2.08 2.08 2.08 2.07 2.07 2.05 2.05 1.90 1.88 1.87 1.86 1.76 1.75 1.74 1.70 1.69 1.68 1.67 1.67 1.66 1.28
OBn
Me
3ab
5.13 6.10 2.01 1.01 1.00 2.00 2.04 1.11 2.05 1.08 1.08 1.00 3.09
.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
f1 (ppm)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143.22
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129.24
128.80
128.59
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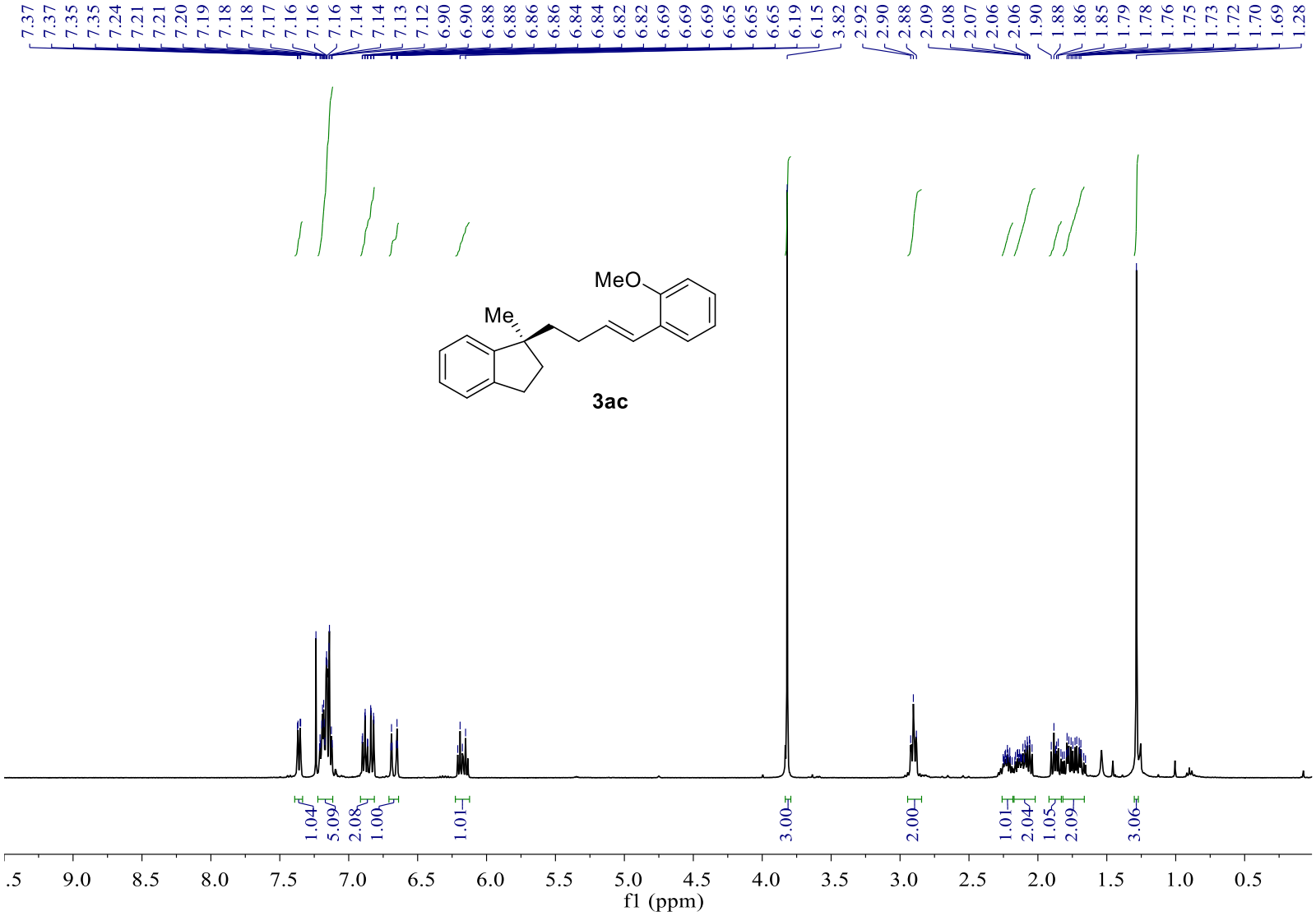
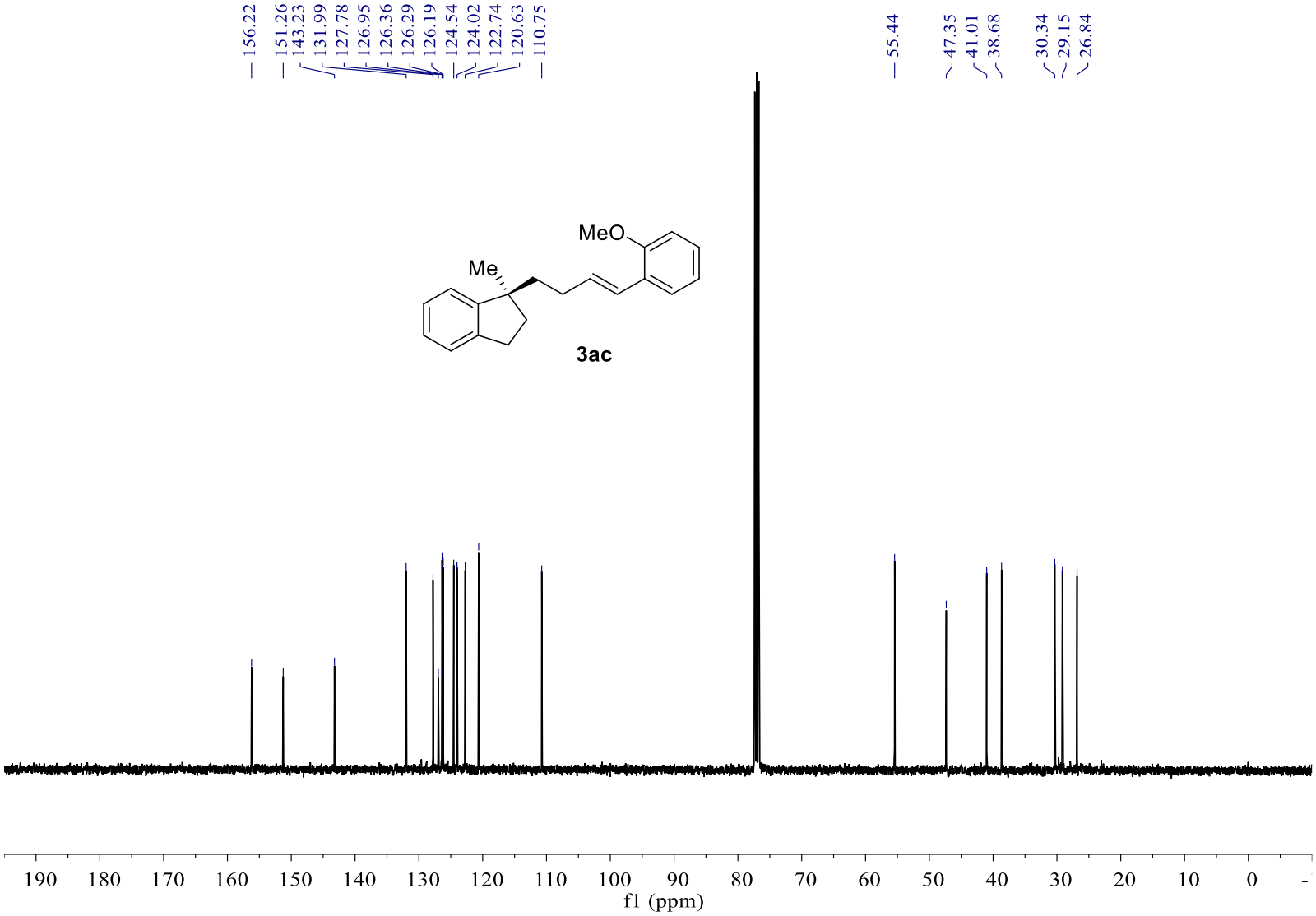
127.48
126.96
126.33
126.21
124.56
122.71
114.89
70.03
47.34
41.08
38.64
30.34
28.69
26.89
OBn
Me
3ab
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.37 7.37 7.35 7.35 7.24 7.21 7.21 7.20 7.19 7.18 7.18 7.17 7.16 7.16 7.16 7.14 7.14 7.13 7.12 6.90 6.90 6.88 6.88 6.86 6.86 6.84 6.84 6.82 6.82 6.69 6.69 6.69 6.65 6.65 6.65 6.19 6.15 3.82 2.92 2.90 2.88 2.09 2.08 2.07 2.06 2.06 1.90 1.88 1.86 1.85 1.79 1.78 1.76 1.75 1.73 1.72 1.70 1.69 1.28
MeO
Me
3ac
1.04 5.09 2.08 1.00 1.01 3.00 2.00 1.01 2.04 1.05 2.09 3.06
.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
f1 (ppm)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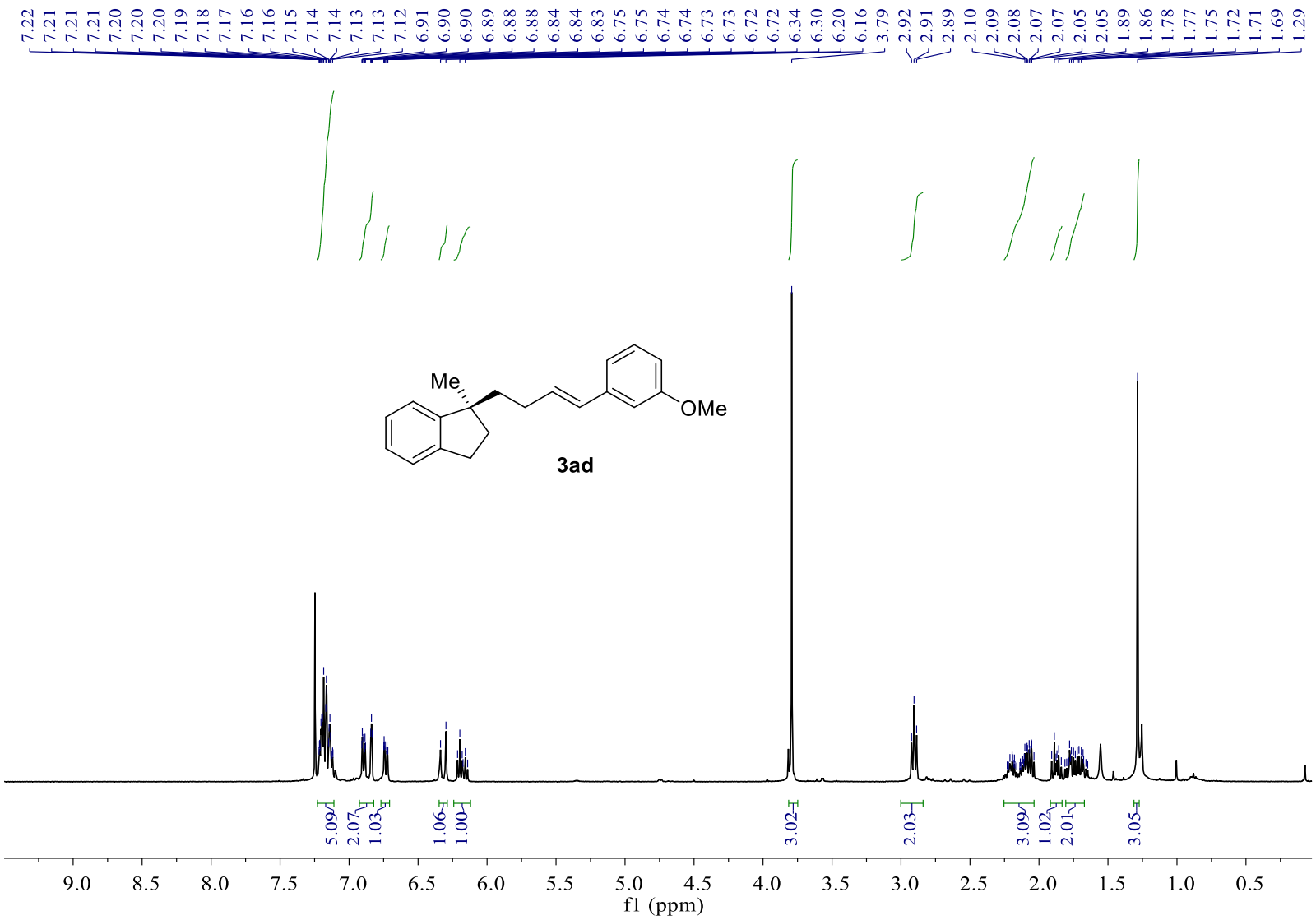
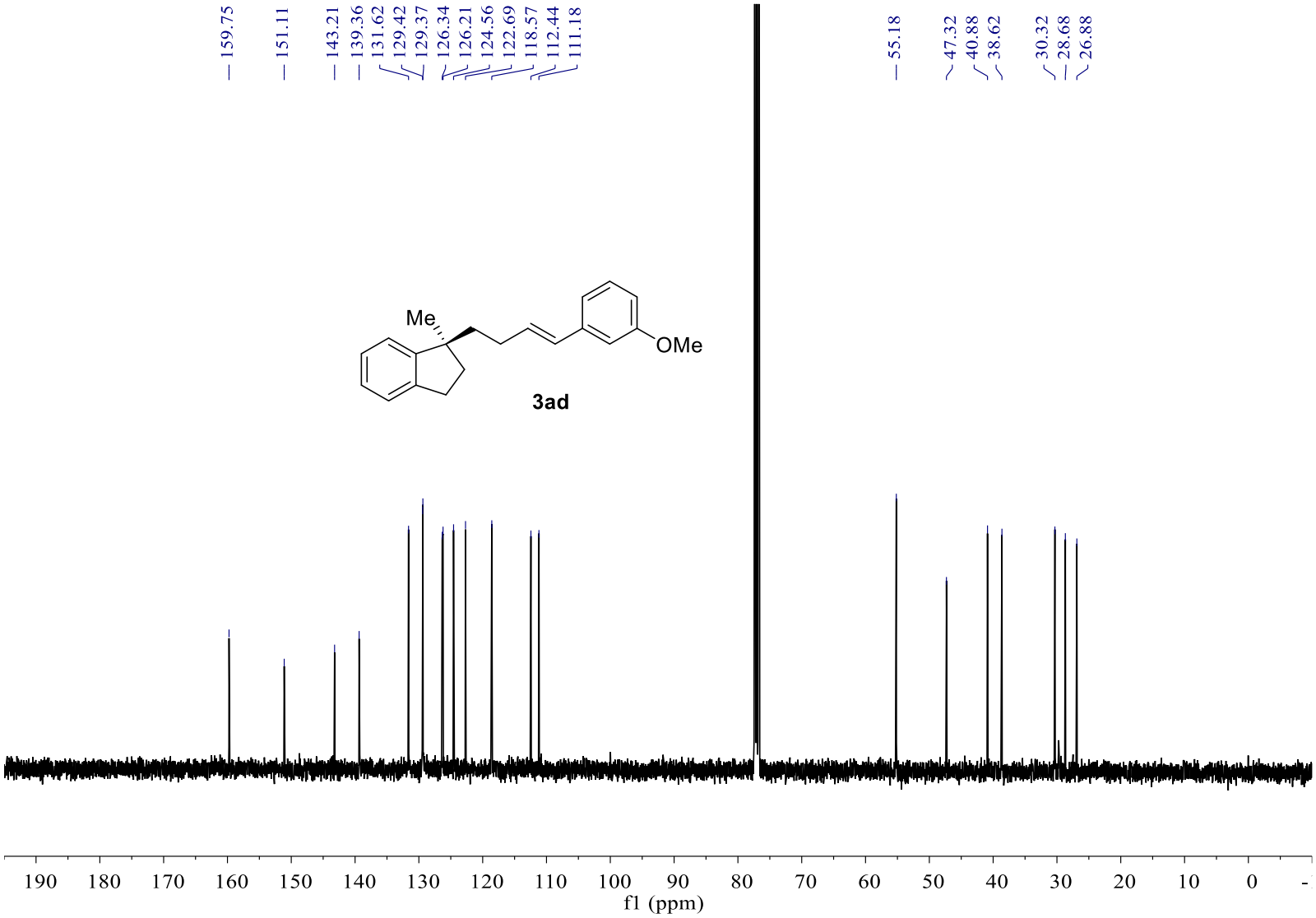
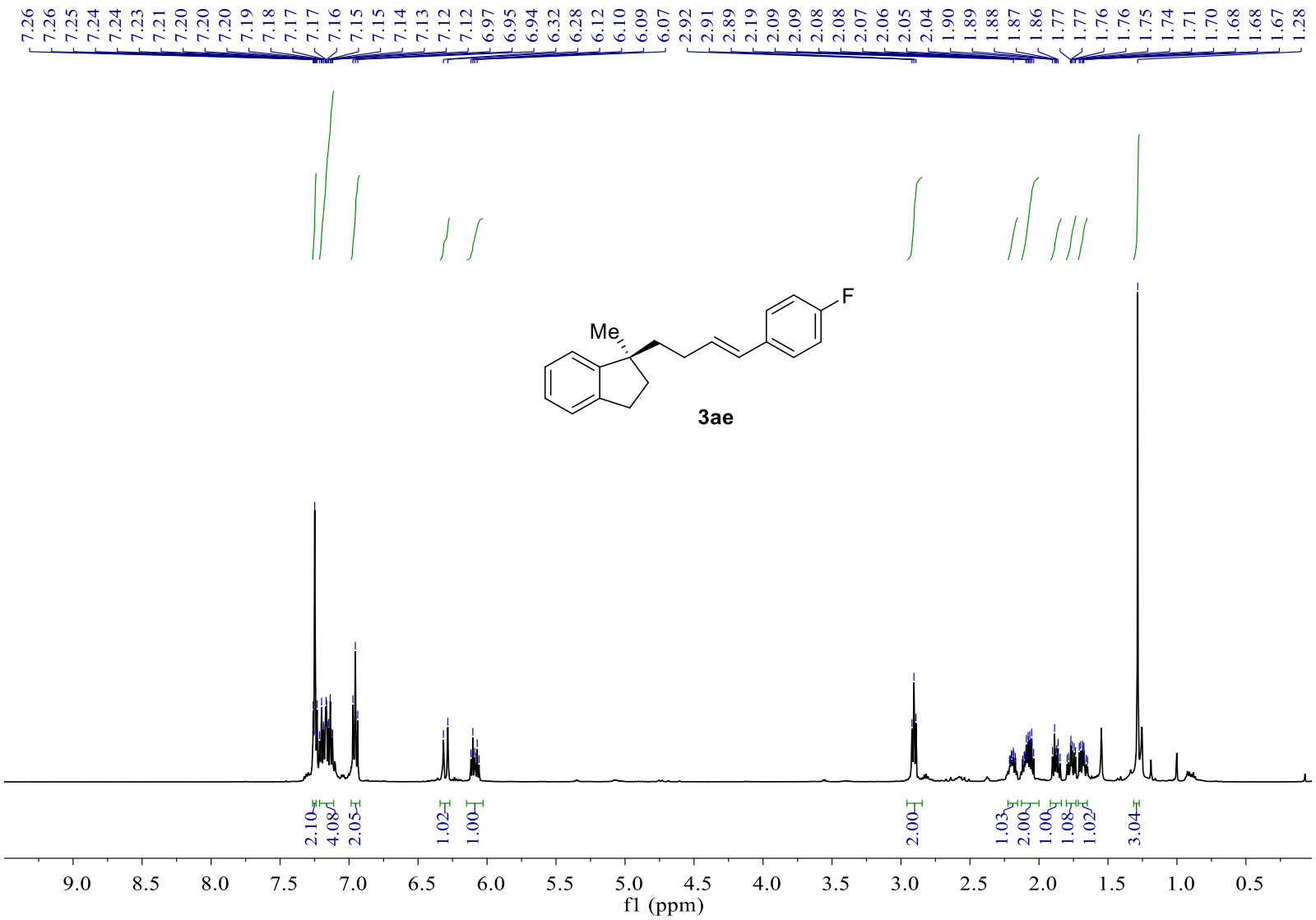
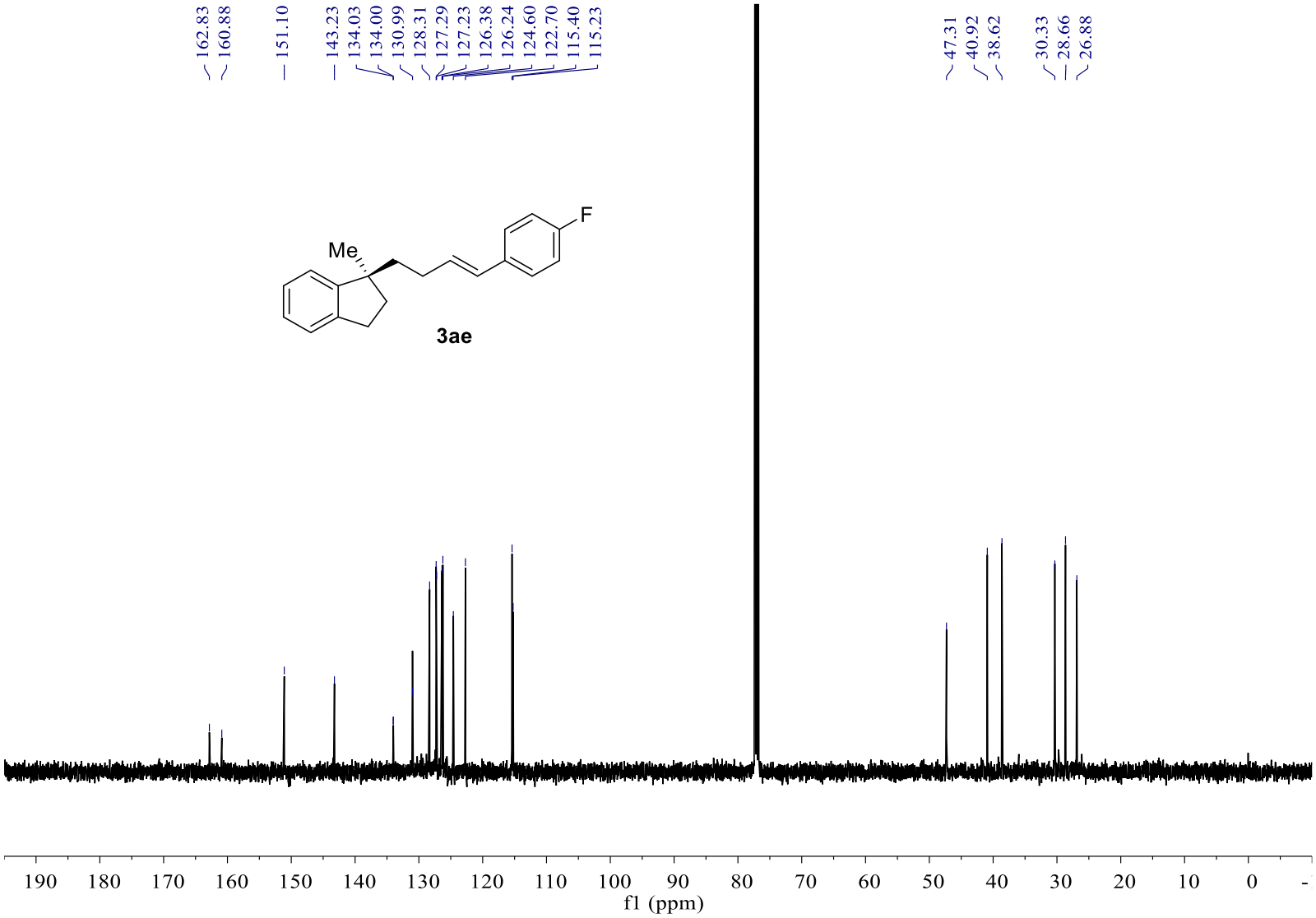
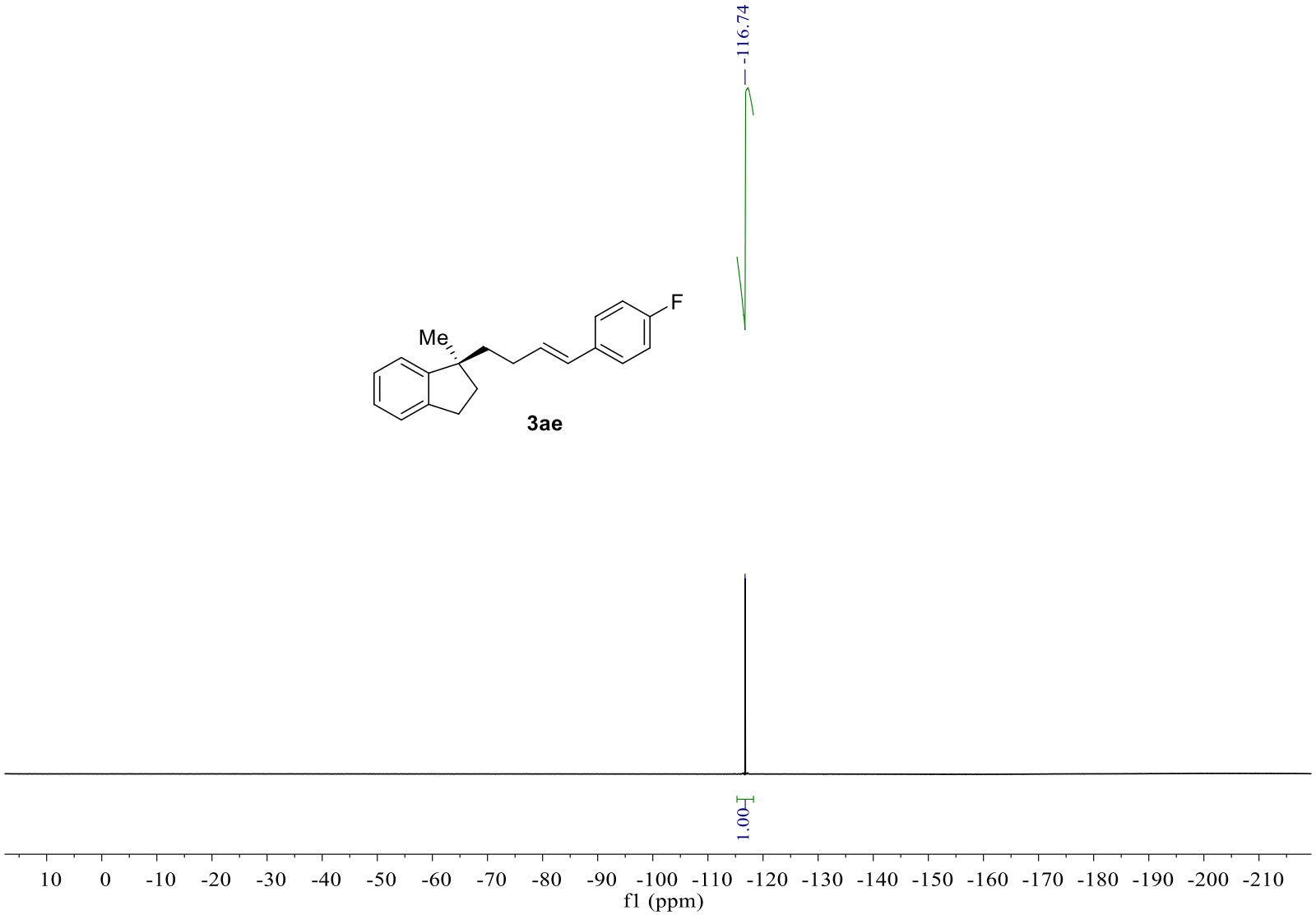
151.26
143.23
131.99
127.78
126.95
126.36
126.29
126.19
124.54
124.02
122.74
120.63
110.75
55.44
47.35
41.01
38.68
30.34
29.15
26.84
MeO
Me
3ac
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

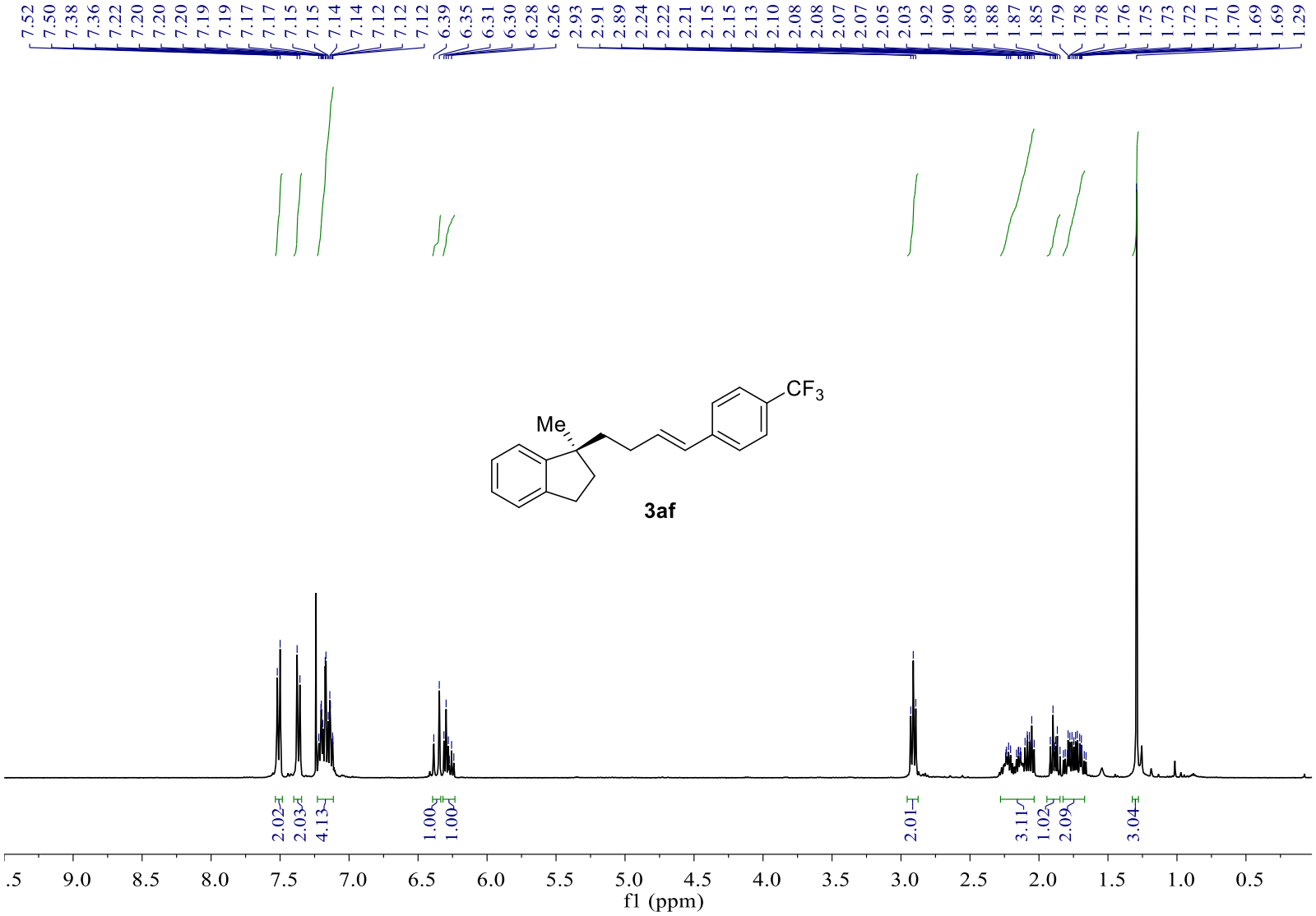

7.22 7.21 7.21 7.21 7.20 7.20 7.20 7.19 7.18 7.17 7.16 7.16 7.15 7.14 7.14 7.13 7.13 7.12 6.91 6.90 6.90 6.89 6.88 6.88 6.84 6.84 6.83 6.75 6.75 6.74 6.74 6.73 6.73 6.72 6.72 6.34 6.30 6.20 6.16 3.79 2.92 2.91 2.89 2.10 2.09 2.08 2.07 2.07 2.05 2.05 1.89 1.86 1.78 1.77 1.75 1.72 1.71 1.69 1.29
Me
OMe
3ad
5.09 2.07 1.03 1.06 1.00 3.02 2.03 3.09 1.02 2.01 3.05
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
f1 (ppm)

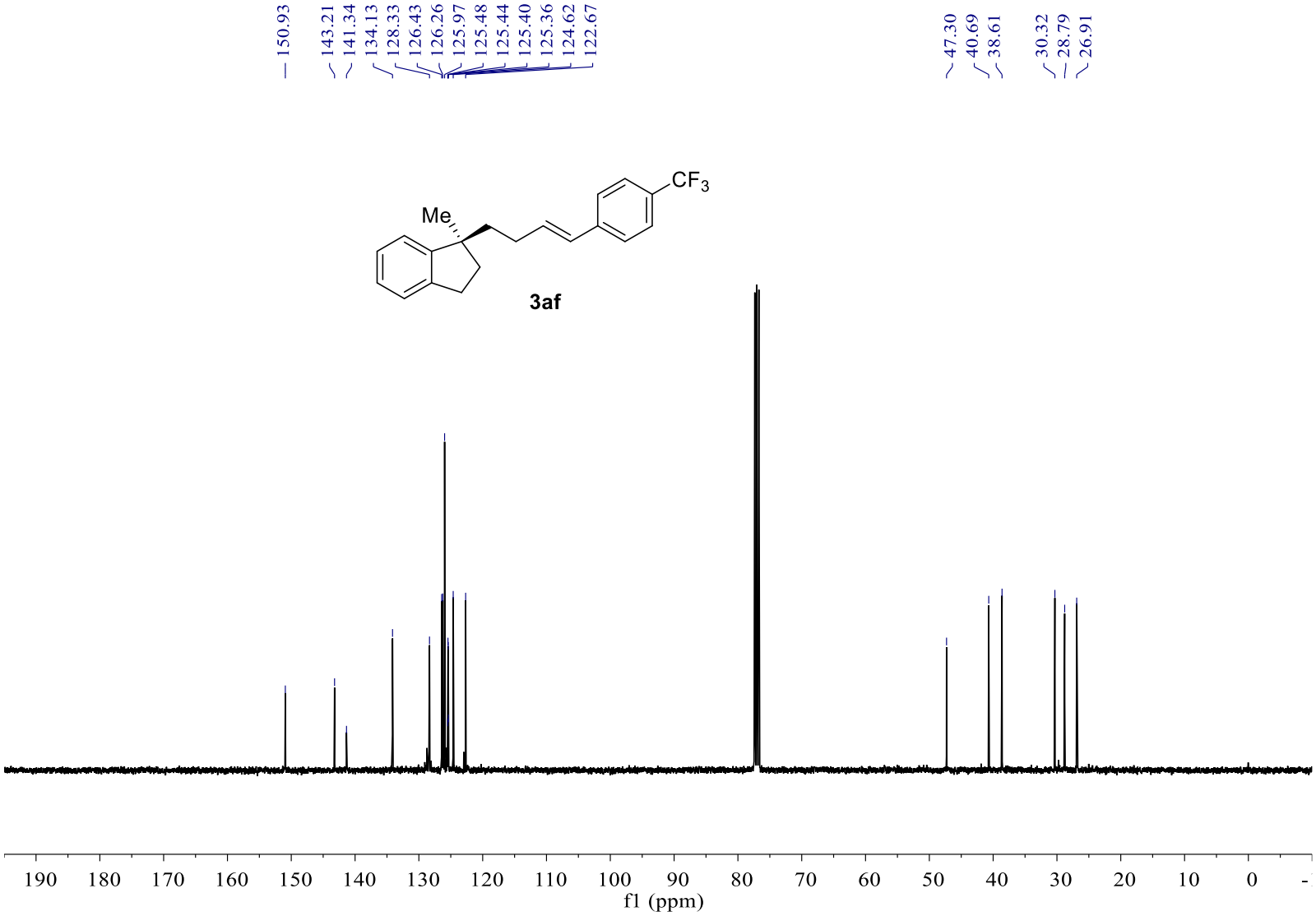

159.75
151.11
143.21
139.36
131.62
129.42
129.37
126.34
126.21
124.56
122.69
118.57
112.44
111.18
55.18
47.32
40.88
38.62
30.32
28.68
26.88
Me
OMe
3ad
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.26 7.26 7.25 7.24 7.24 7.23 7.21 7.20 7.20 7.20 7.19 7.18 7.17 7.17 7.16 7.15 7.15 7.14 7.13 7.12 7.12 6.97 6.95 6.94 6.32 6.28 6.12 6.10 6.09 6.07
2.92 2.91 2.89 2.19 2.09 2.09 2.08 2.08 2.07 2.06 2.05 2.04 1.90 1.89 1.88 1.87 1.86 1.77 1.77 1.76 1.76 1.75 1.74 1.71 1.70 1.68 1.68 1.67 1.28
Me
F
3ae
2.10 4.08 2.05 1.02 1.00 2.00 1.03 2.00 1.00 1.08 1.02 3.04
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
f1 (ppm)


162.83
160.88
151.10
143.23
134.03
134.00
130.99
128.31
127.29
127.23
126.38
126.24
124.60
122.70
115.40
115.23
47.31
40.92
38.62
30.33
28.66
26.88
Me
F
3ae
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


-116.74
Me
F
3ae
1.00
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)


7.52 7.50 7.38 7.36 7.22 7.20 7.20 7.20 7.19 7.19 7.17 7.17 7.15 7.15 7.14 7.14 7.12 7.12 7.12 6.39 6.35 6.31 6.30 6.28 6.26 2.93 2.91 2.89 2.24 2.22 2.21 2.15 2.15 2.13 2.10 2.08 2.08 2.07 2.07 2.05 2.03 1.92 1.90 1.89 1.88 1.87 1.85 1.79 1.78 1.78 1.76 1.75 1.73 1.72 1.71 1.70 1.69 1.69 1.29
Me
CF3
3af
2.02 2.03 4.13 1.00 1.00 2.01 3.11 1.02 2.09 3.04
.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
f1 (ppm)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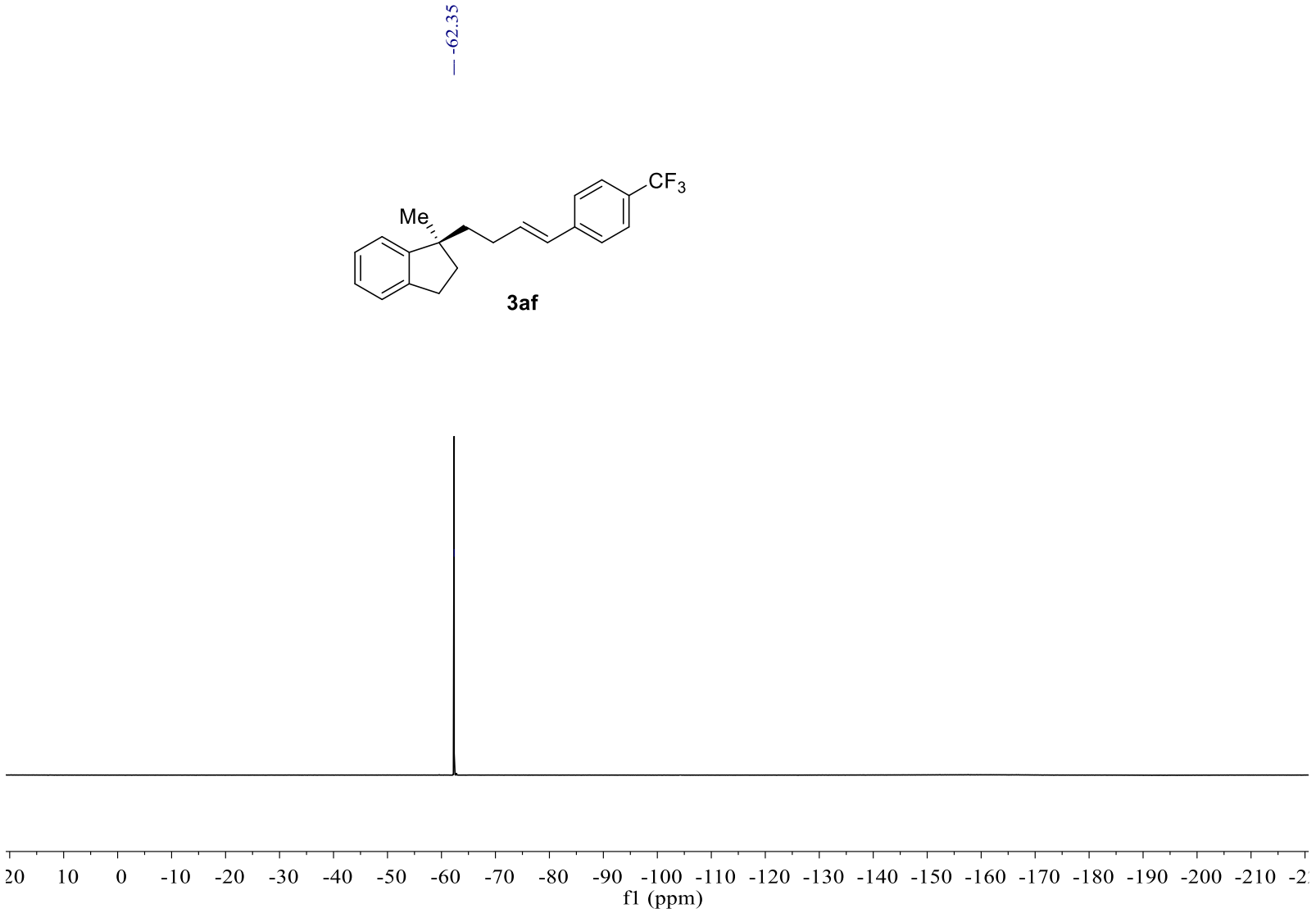
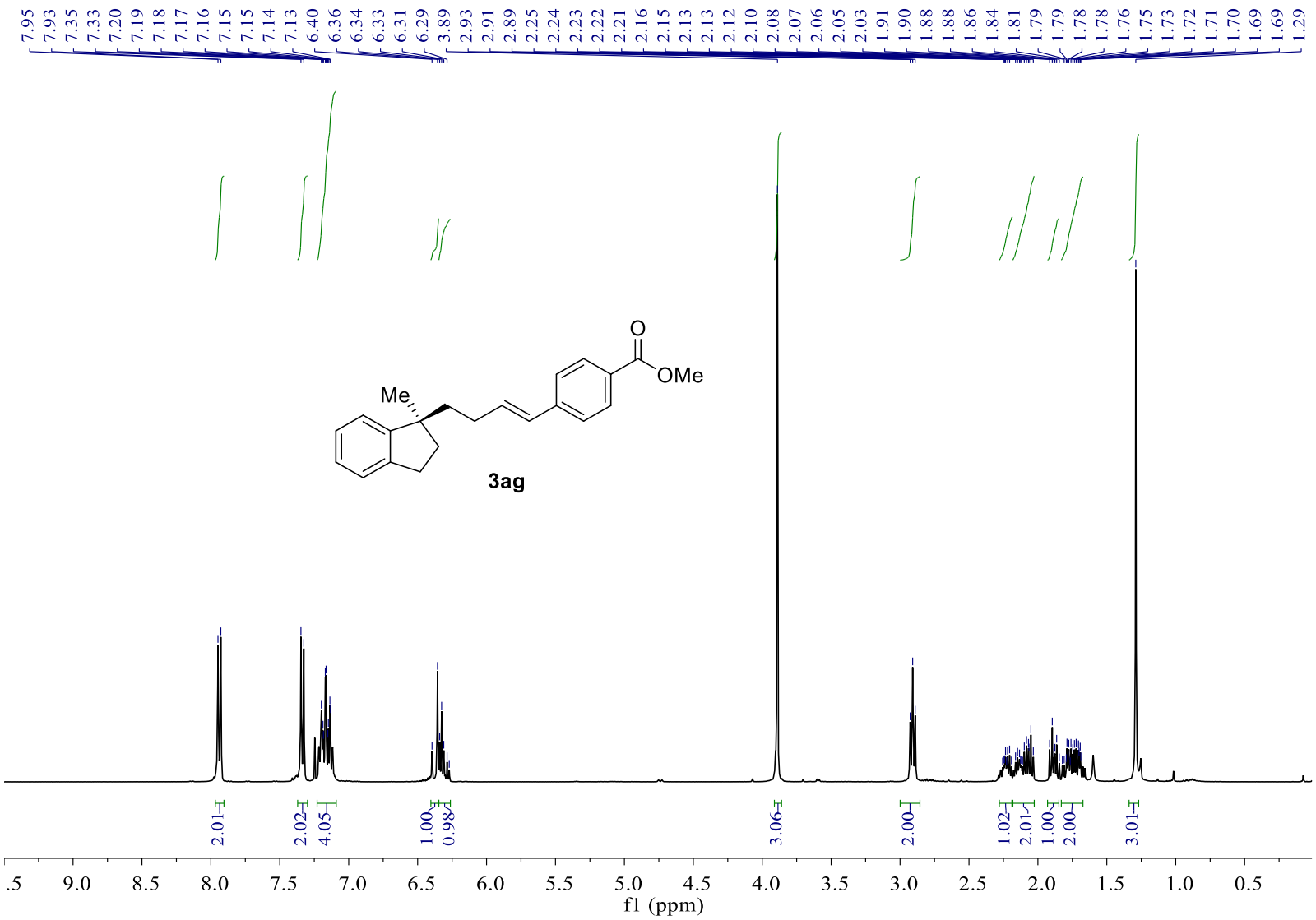
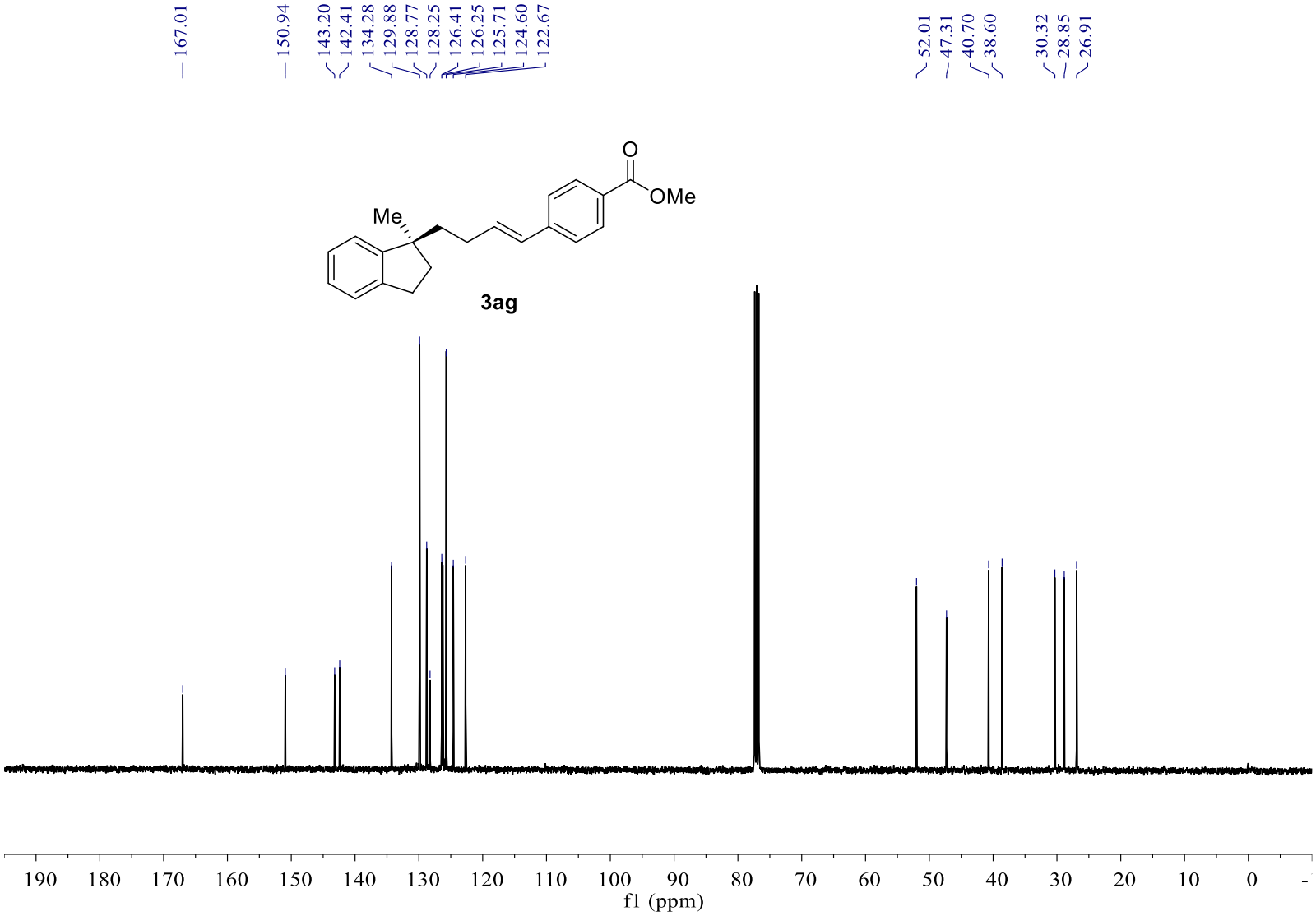
126.43
126.26
125.97
125.48
125.44
125.40
125.36
124.62
122.67
47.30
40.69
38.61
30.32
28.79
26.91
CF3
Me
3af
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


-62.35
Me
CF3
3af
20 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)


7.95 7.93 7.35 7.33 7.20 7.19 7.18 7.17 7.16 7.15 7.15 7.14 7.13 6.40 6.36 6.34 6.33 6.31 6.29 3.89 2.93 2.91 2.89 2.25 2.24 2.23 2.22 2.21 2.16 2.15 2.13 2.13 2.12 2.10 2.08 2.07 2.06 2.05 2.03 1.91 1.90 1.88 1.88 1.86 1.84 1.81 1.79 1.79 1.78 1.78 1.76 1.75 1.73 1.72 1.71 1.70 1.69 1.69 1.29
O
OMe
Me
3ag
2.01 2.02 4.05 1.00 0.98 3.06 2.00 1.02 2.01 1.00 2.00 3.01
.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
f1 (ppm)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150.94
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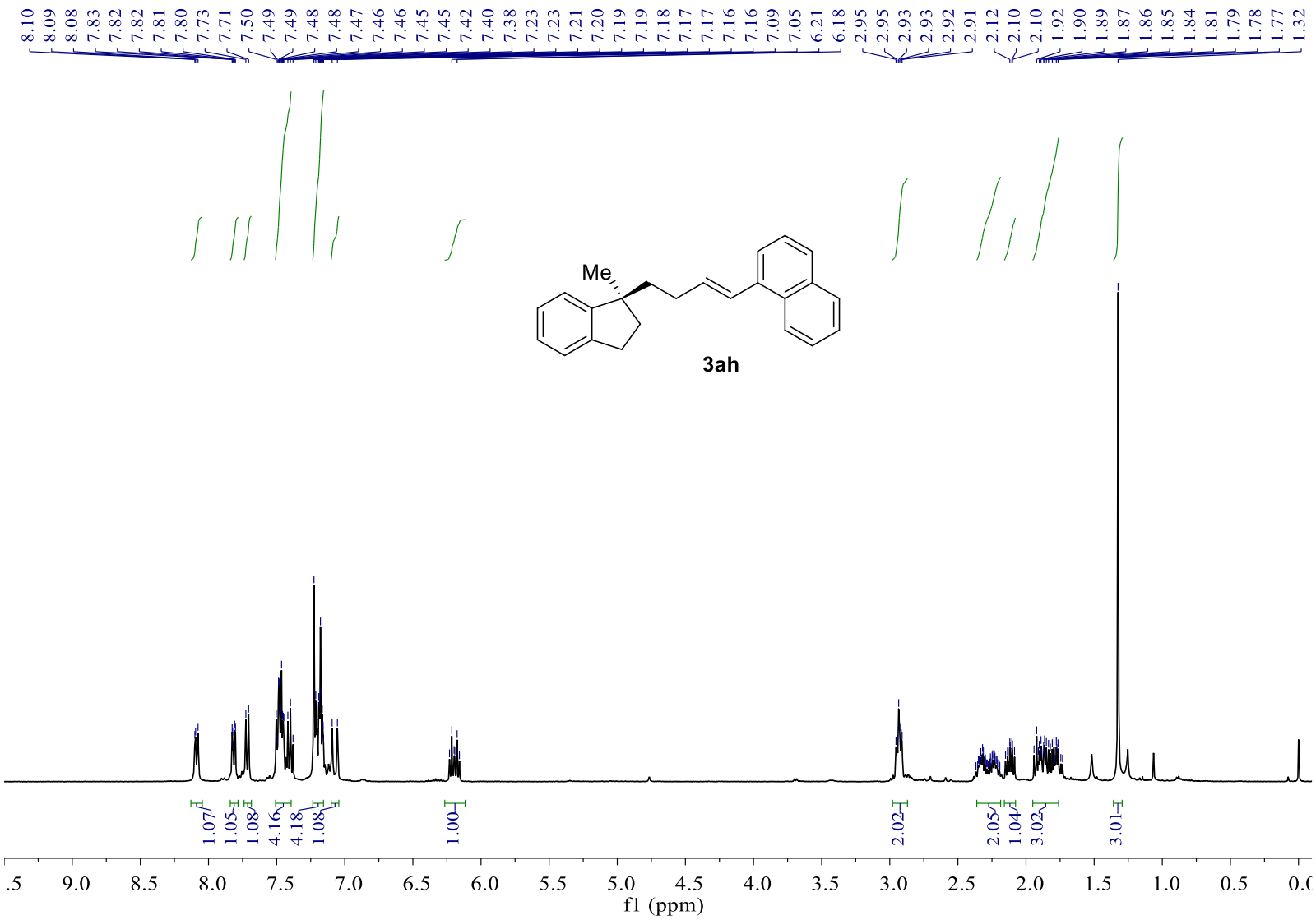
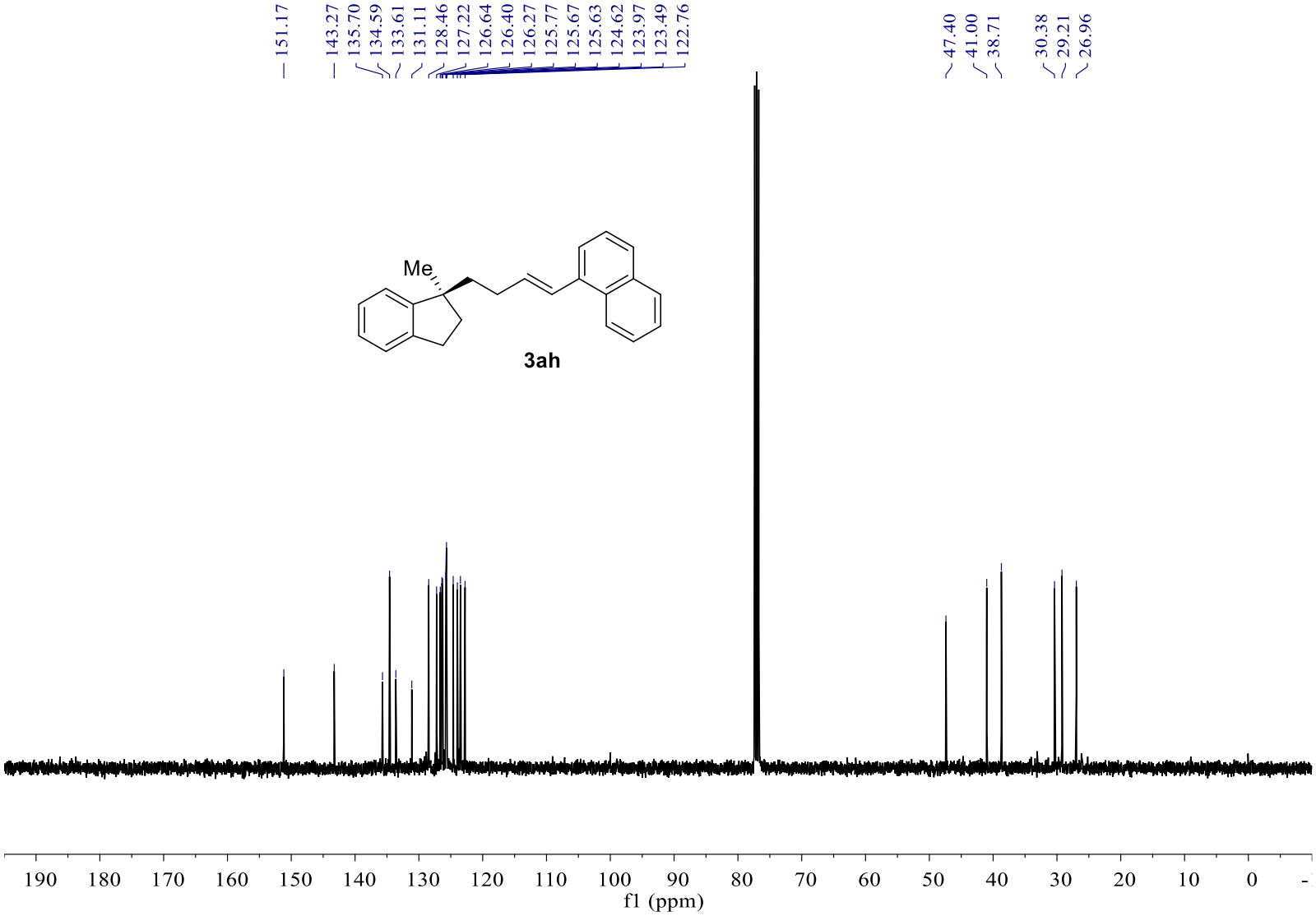
142.41
134.28
129.88
128.77
128.25
126.41
126.25
125.71
124.60
122.67
52.01
47.31
40.70
38.60
30.32
28.85
26.91
O
OMe
Me
3ag
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.10 8.09 8.08 7.83 7.82 7.82 7.81 7.80 7.73 7.71 7.50 7.49 7.49 7.48 7.48 7.47 7.46 7.46 7.45 7.45 7.42 7.40 7.38 7.23 7.23 7.21 7.20 7.19 7.19 7.18 7.17 7.17 7.16 7.16 7.09 7.05 6.21 6.18 2.95 2.95 2.93 2.93 2.92 2.91 2.12 2.10 2.10 1.92 1.90 1.89 1.87 1.86 1.85 1.84 1.81 1.79 1.78 1.77 1.32
Me
3ah
1.07 1.05 1.08 4.16 4.18 1.08 1.00 2.02 2.05 1.04 3.02 3.01
f1 (ppm)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135.70
134.59
133.61
131.11
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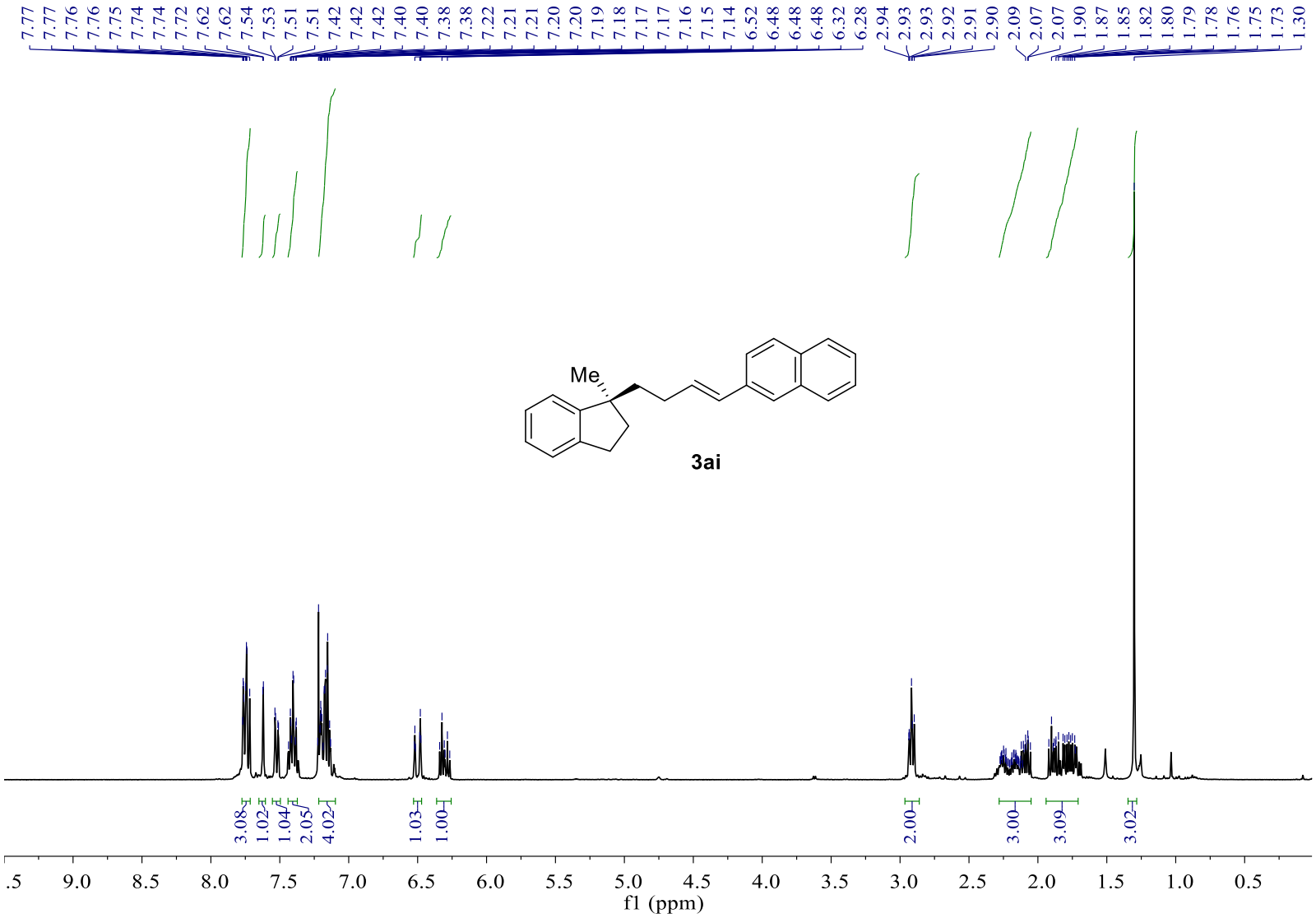
127.22
126.64
126.40
126.27
125.77
125.67
125.63
124.62
123.97
123.49
122.76
47.40
41.00
38.71
30.38
29.21
26.96
Me
3ah
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)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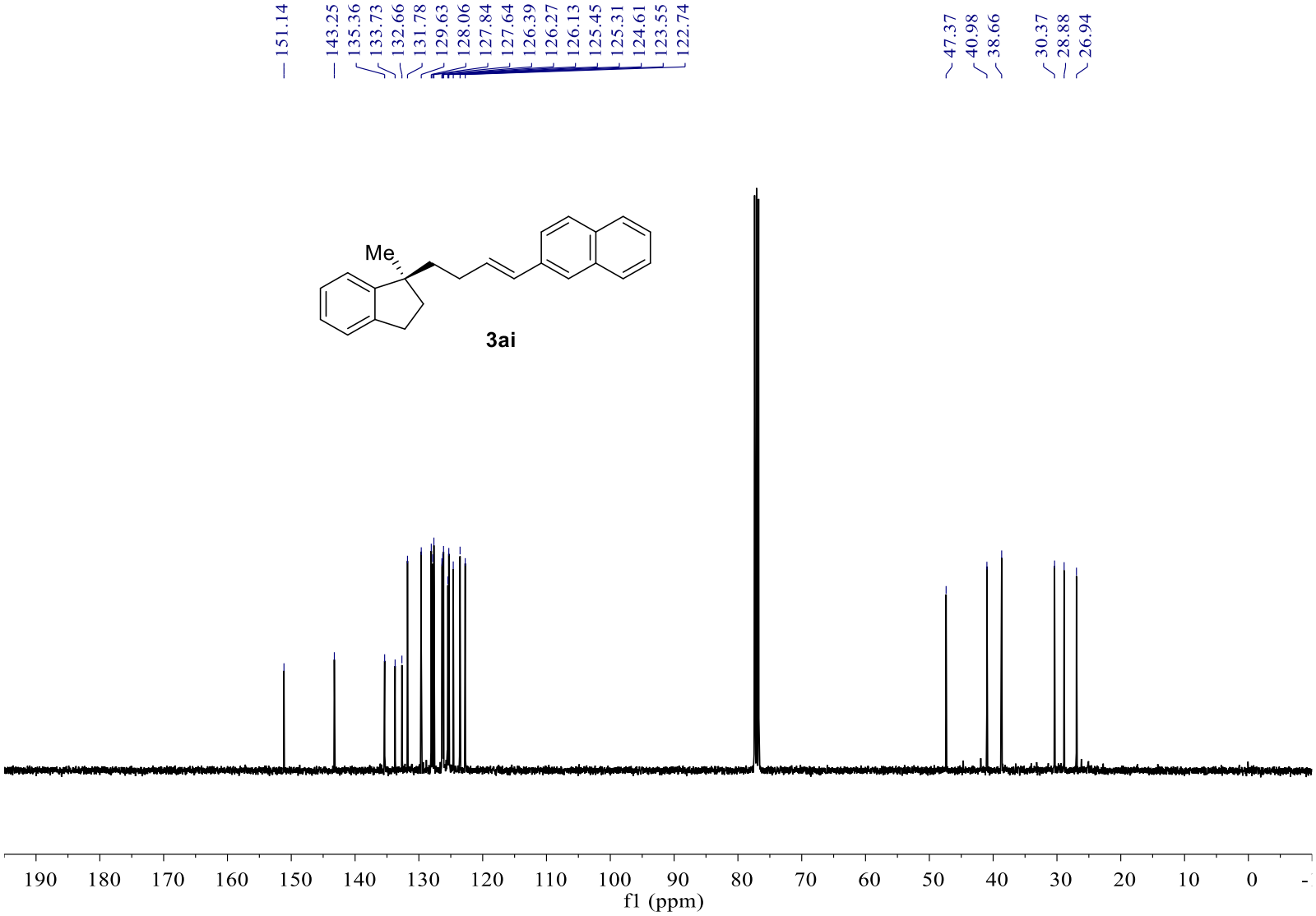
2.94 2.93 2.93 2.92 2.91 2.90 2.09 2.07 2.07 1.90 1.87 1.85 1.82 1.80 1.79 1.78 1.76 1.75 1.73 1.30
Me
3ai
3.08 1.02 1.04 2.05 4.02 1.03 1.00 2.00 3.00 3.09 3.02
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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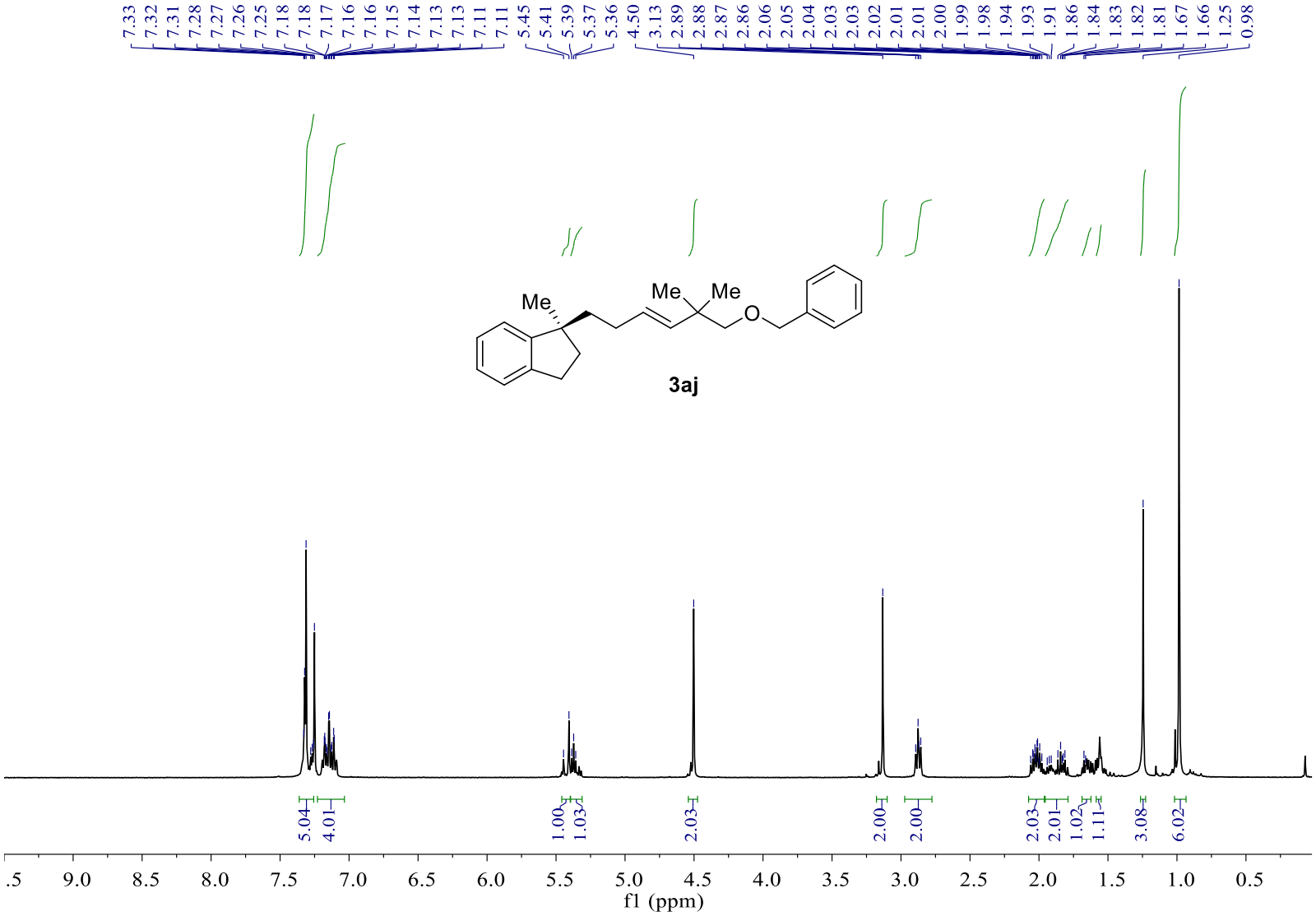
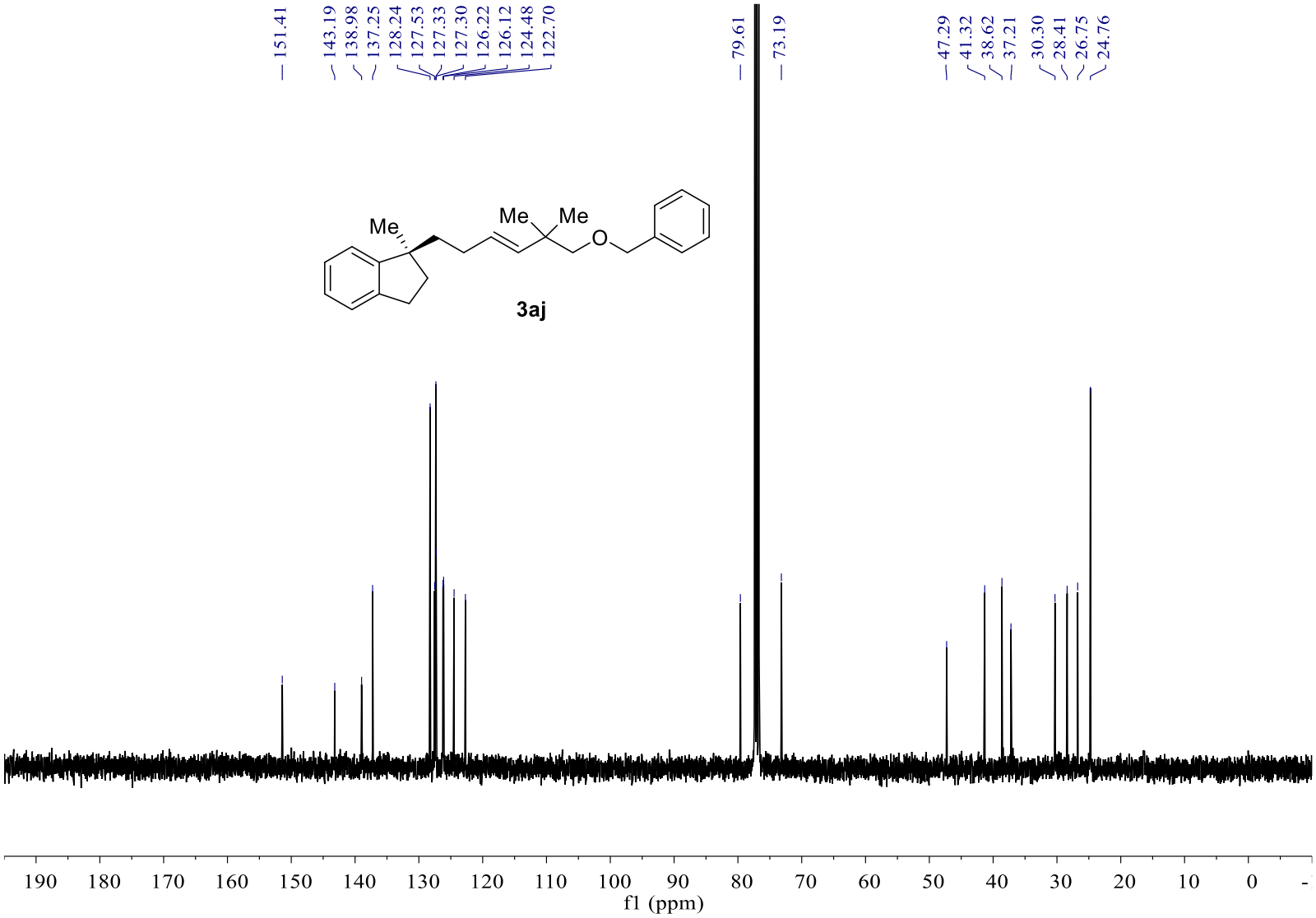
143.25
135.36
133.73
132.66
131.78
129.63
128.06
127.84
127.64
126.39
126.27
126.13
125.45
125.31
124.61
123.55
122.74
47.37
40.98
38.66
30.37
28.88
26.94
Me
3ai
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.33 7.32 7.31 7.28 7.27 7.26 7.25 7.18 7.18 7.17 7.16 7.16 7.15 7.14 7.13 7.13 7.11 7.11
5.45 5.41 5.39 5.37 5.36
4.50 3.13 2.89 2.88 2.87 2.86 2.06 2.05 2.04 2.03 2.03 2.02 2.01 2.01 2.00 1.99 1.98 1.94 1.93 1.91 1.86 1.84 1.83 1.82 1.81 1.67 1.66 1.25 0.98
Me
Me
Me
O
3aj
5.04 4.01 1.00 1.03 2.03 2.00 2.00 2.03 2.01 1.02 1.11 3.08 6.02
f1 (ppm)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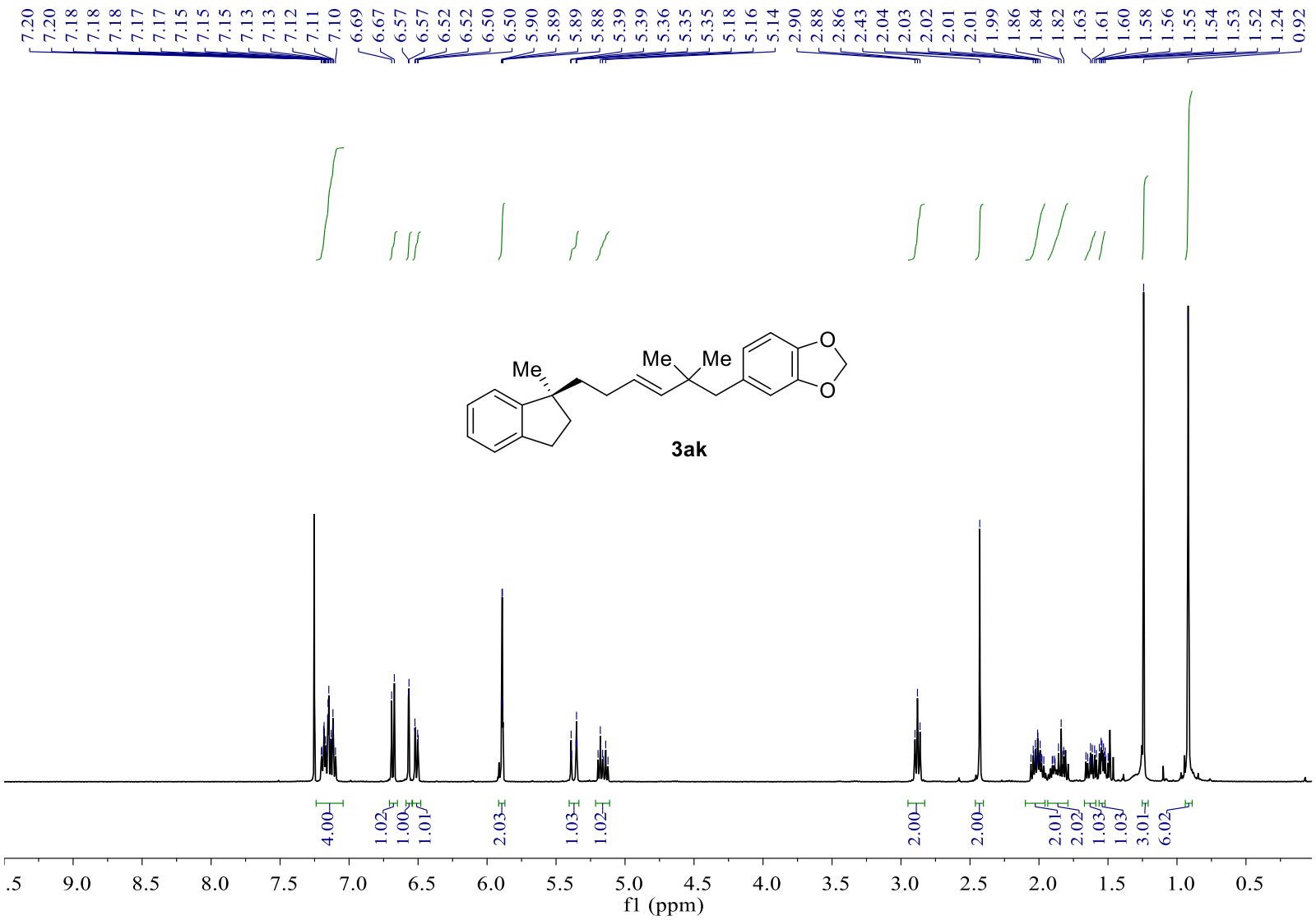
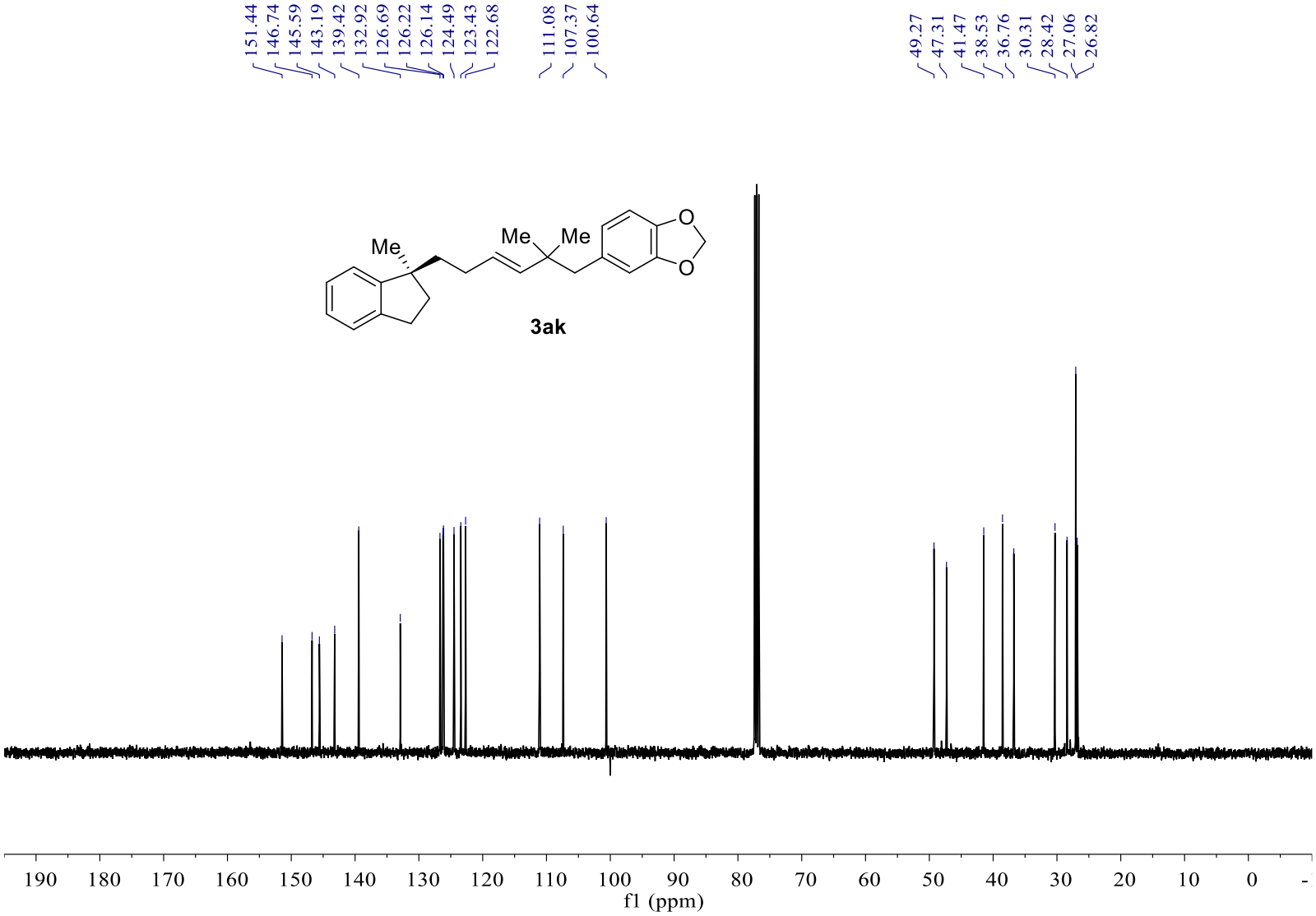
128.24
127.53
127.33
127.30
126.22
126.12
124.48
122.70
79.61
73.19
47.29
41.32
38.62
37.21
30.30
28.41
26.75
24.76
Me
Me
Me
O
3aj
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.20 7.20 7.18 7.18 7.18 7.17 7.17 7.15 7.15 7.15 7.13 7.13 7.12 7.11 7.10 6.69 6.67 6.57 6.57 6.52 6.52 6.50 6.50 5.90 5.89 5.89 5.88 5.39 5.39 5.36 5.35 5.35 5.18 5.16 5.14 2.90 2.88 2.86 2.43 2.04 2.03 2.02 2.01 2.01 1.99 1.86 1.84 1.82 1.63 1.61 1.60 1.58 1.56 1.55 1.54 1.53 1.52 1.24 0.92
Me
Me
Me
O
O
4.00 1.02 1.00 1.01 2.03 1.03 1.02 2.00 2.00 2.01 2.02 1.03 3.01 6.02
f1 (ppm)

3ak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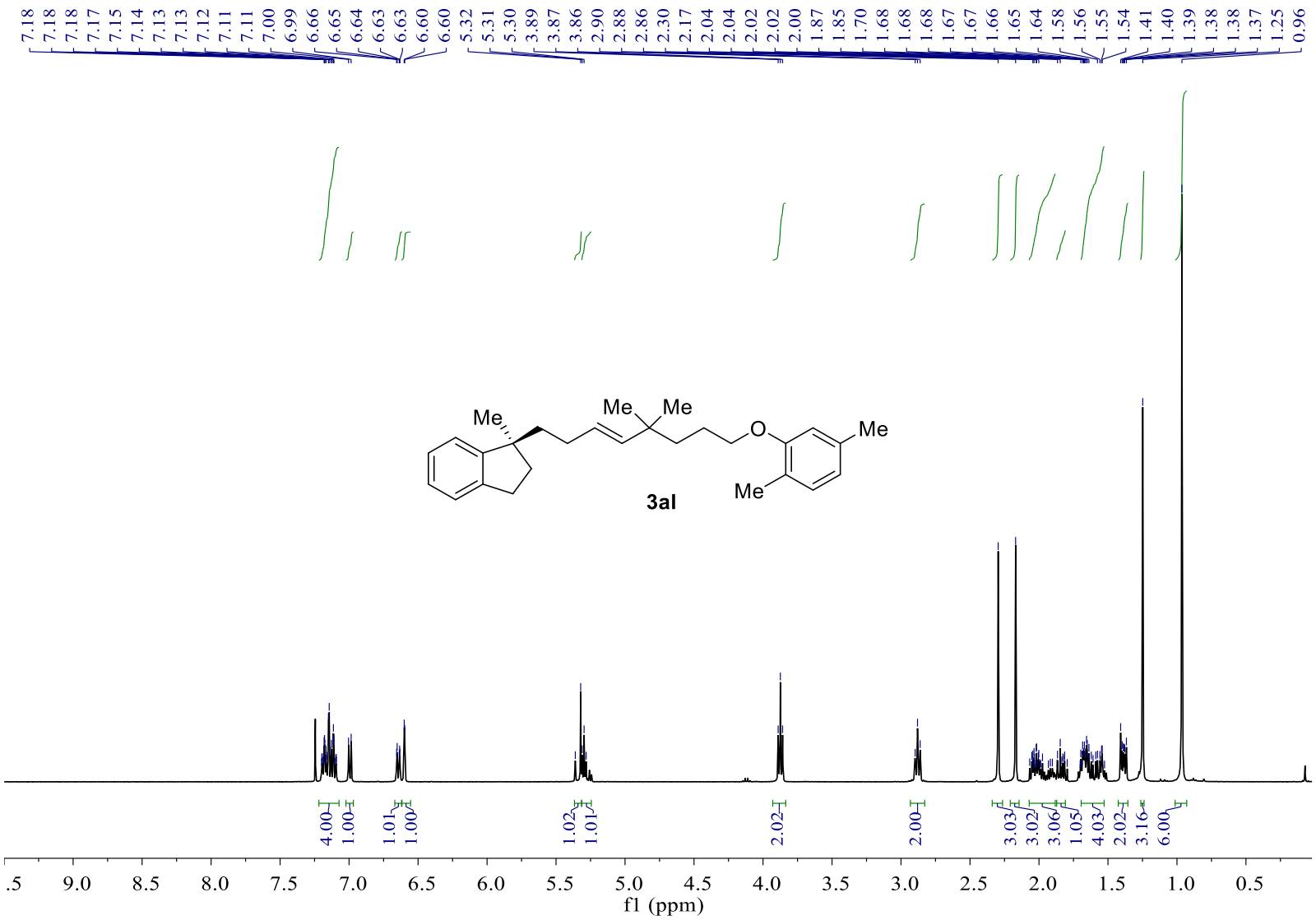
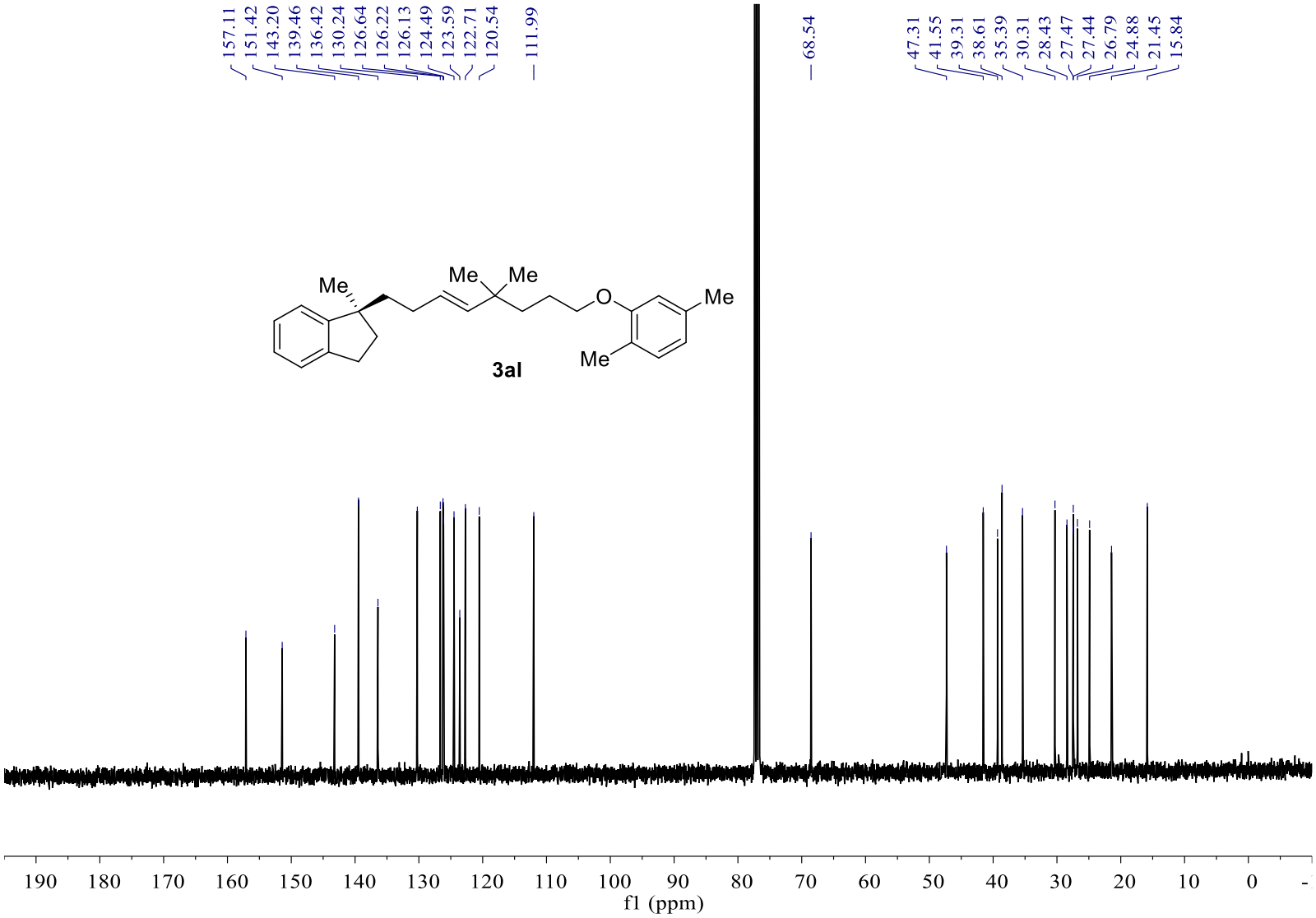
143.19
139.42
132.92
126.69
126.22
126.14
124.49
123.43
122.68
111.08
107.37
100.64
49.27
47.31
41.47
38.53
36.76
30.31
28.42
27.06
26.82
Me
Me
Me
O
O
3ak
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.18 7.18 7.18 7.17 7.15 7.14 7.13 7.13 7.12 7.11 7.11 7.00 6.99 6.66 6.65 6.64 6.63 6.63 6.60 6.60
5.32 5.31 5.30 3.89 3.87 3.86 2.90 2.88 2.86 2.30 2.17 2.04 2.04 2.02 2.02 2.00 1.87 1.85 1.70 1.68 1.68 1.68 1.67 1.67 1.66 1.65 1.64 1.58 1.56 1.55 1.54 1.41 1.40 1.39 1.38 1.38 1.37 1.25 0.96
Me
Me
Me
O
Me
Me
3aI
4.00 1.00 1.01 1.00 1.02 1.01 2.02 2.00 3.03 3.02 3.06 1.05 4.03 2.02 3.16 6.00
.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
f1 (ppm)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143.20
139.46
136.42
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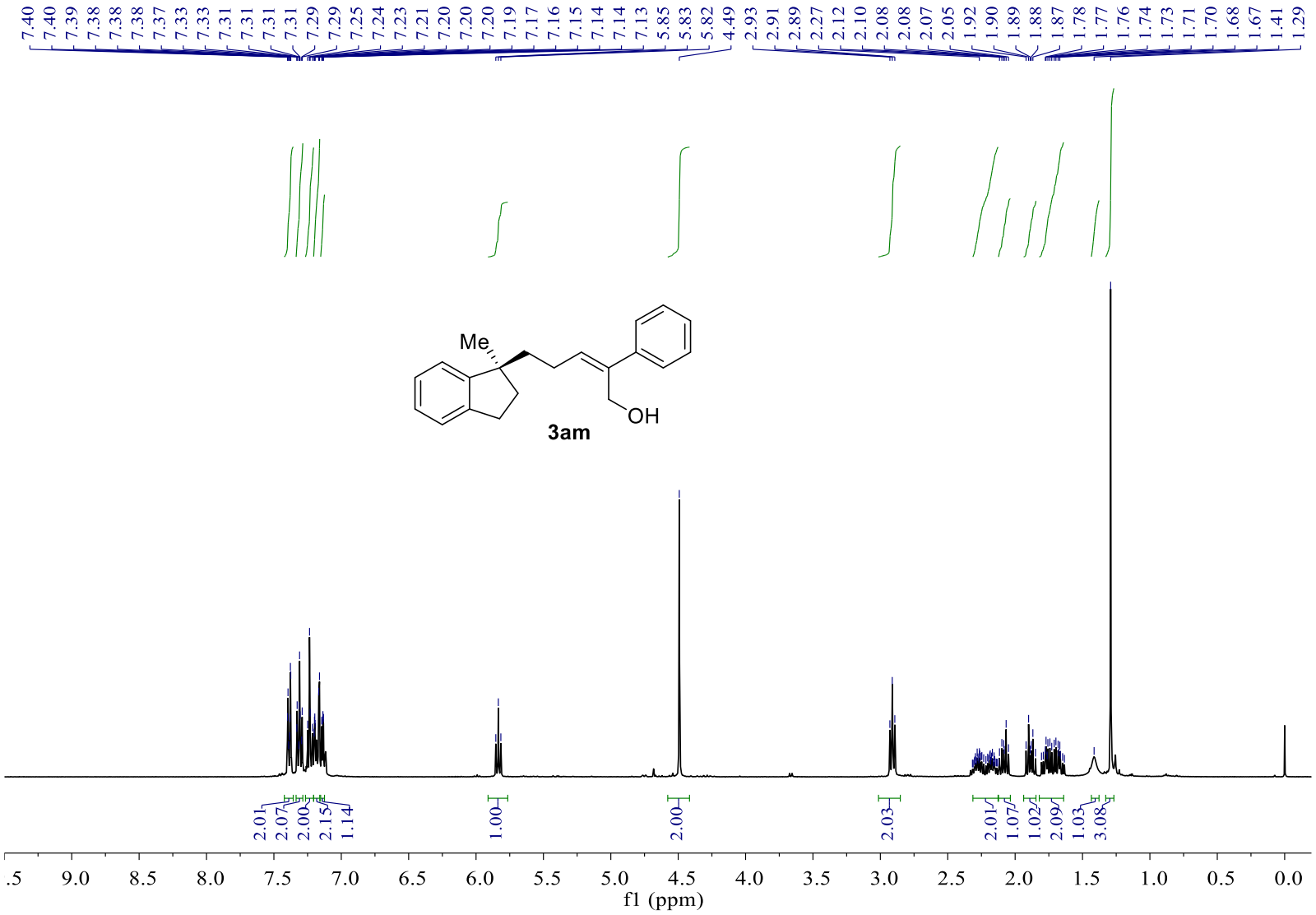
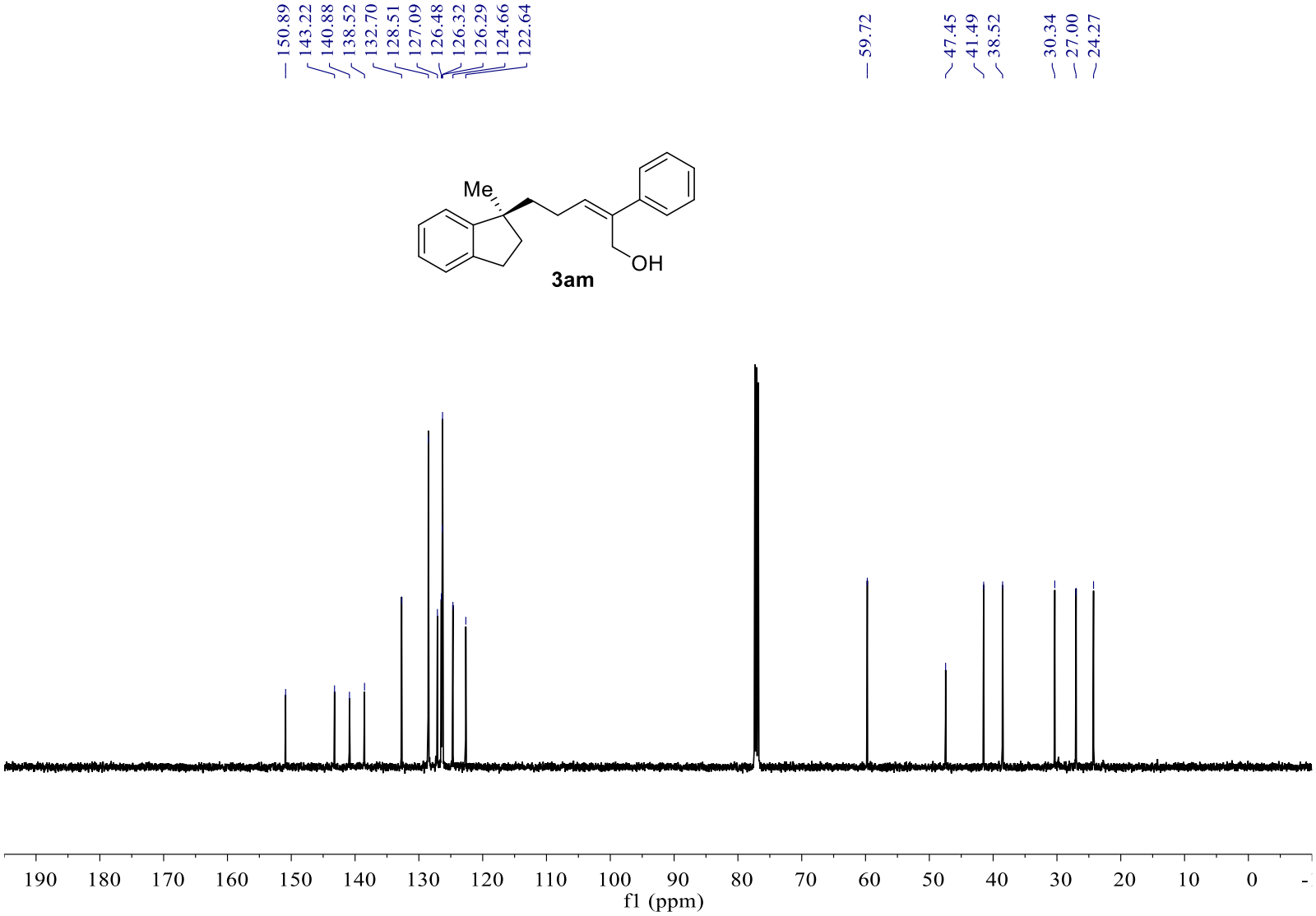
126.64
126.22
126.13
124.49
123.59
122.71
120.54
111.99
68.54
47.31
41.55
39.31
38.61
35.39
30.31
28.43
27.47
27.44
26.79
24.88
21.45
15.84
Me
Me
Me
O
Me
Me
3al
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.40 7.40 7.39 7.38 7.38 7.38 7.37 7.33 7.33 7.31 7.31 7.31 7.31 7.29 7.29 7.25 7.24 7.23 7.21 7.20 7.20 7.20 7.19 7.17 7.16 7.15 7.14 7.14 7.13 5.85 5.83 5.82 4.49 2.93 2.91 2.89 2.27 2.12 2.10 2.08 2.08 2.07 2.05 1.92 1.90 1.89 1.88 1.87 1.78 1.77 1.76 1.74 1.73 1.71 1.70 1.68 1.67 1.41 1.29
Me
OH
3am
2.01 2.07 2.00 2.15 1.14 1.00 2.00 2.03 2.01 1.07 1.02 2.09 1.03 3.08
.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
f1 (ppm)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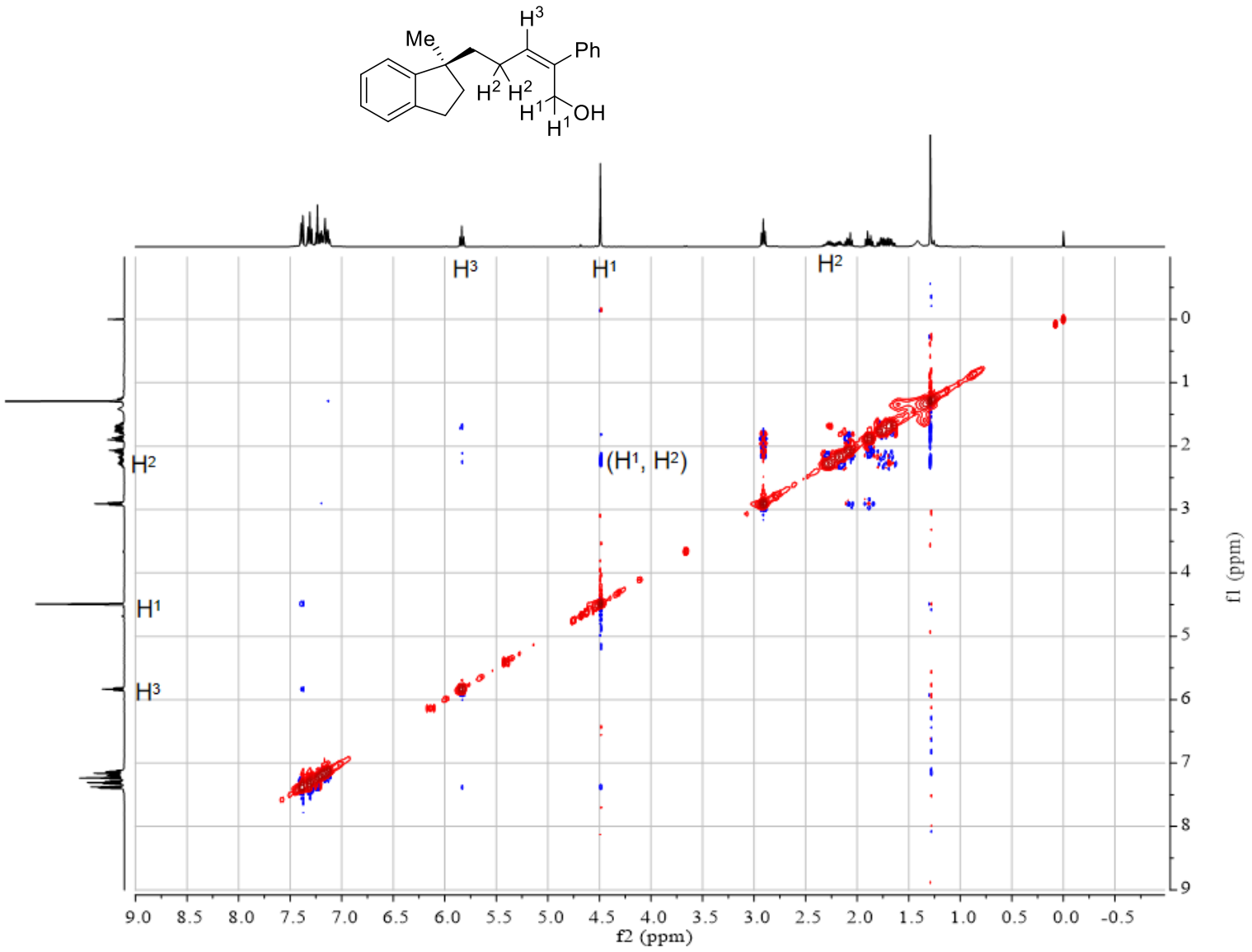
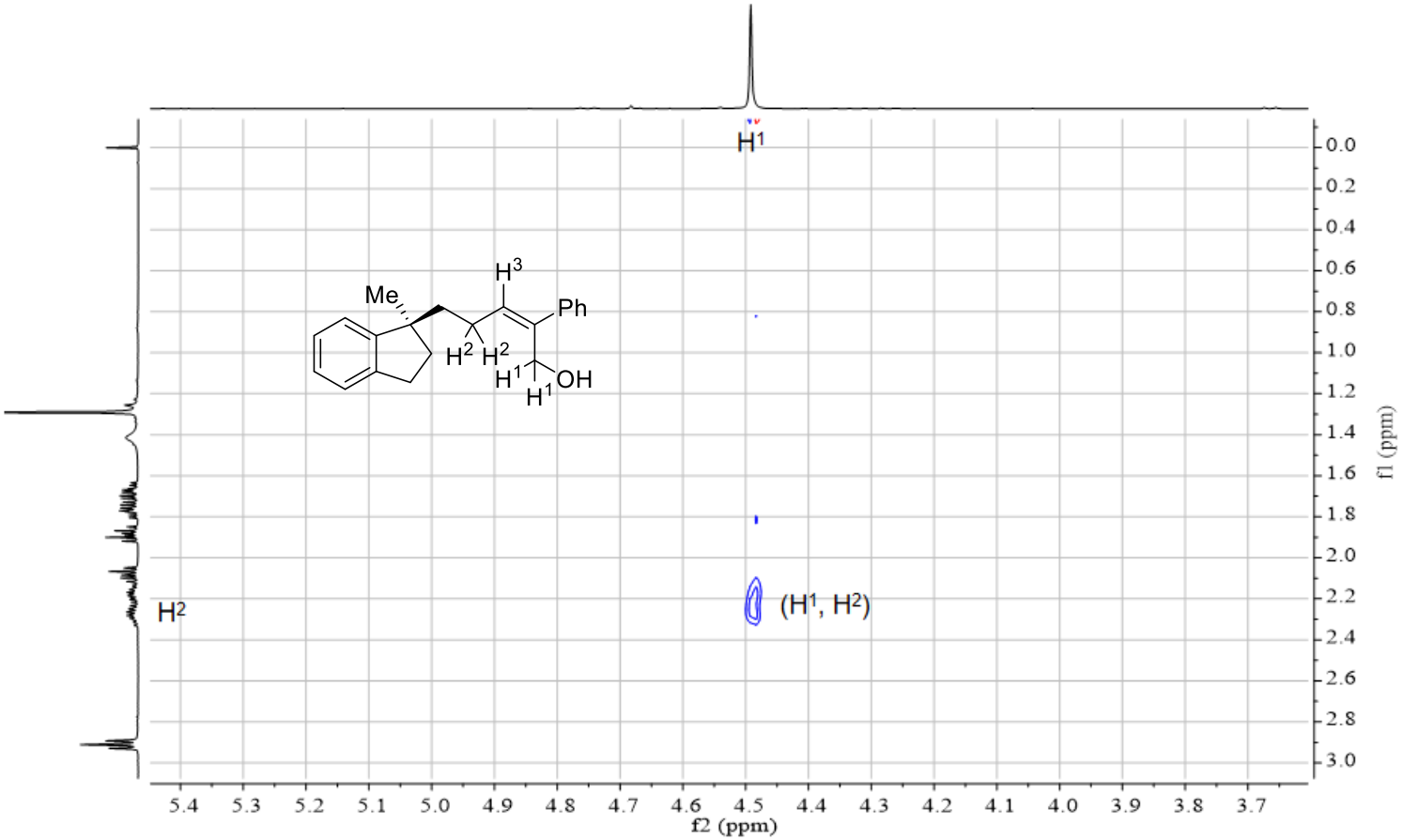
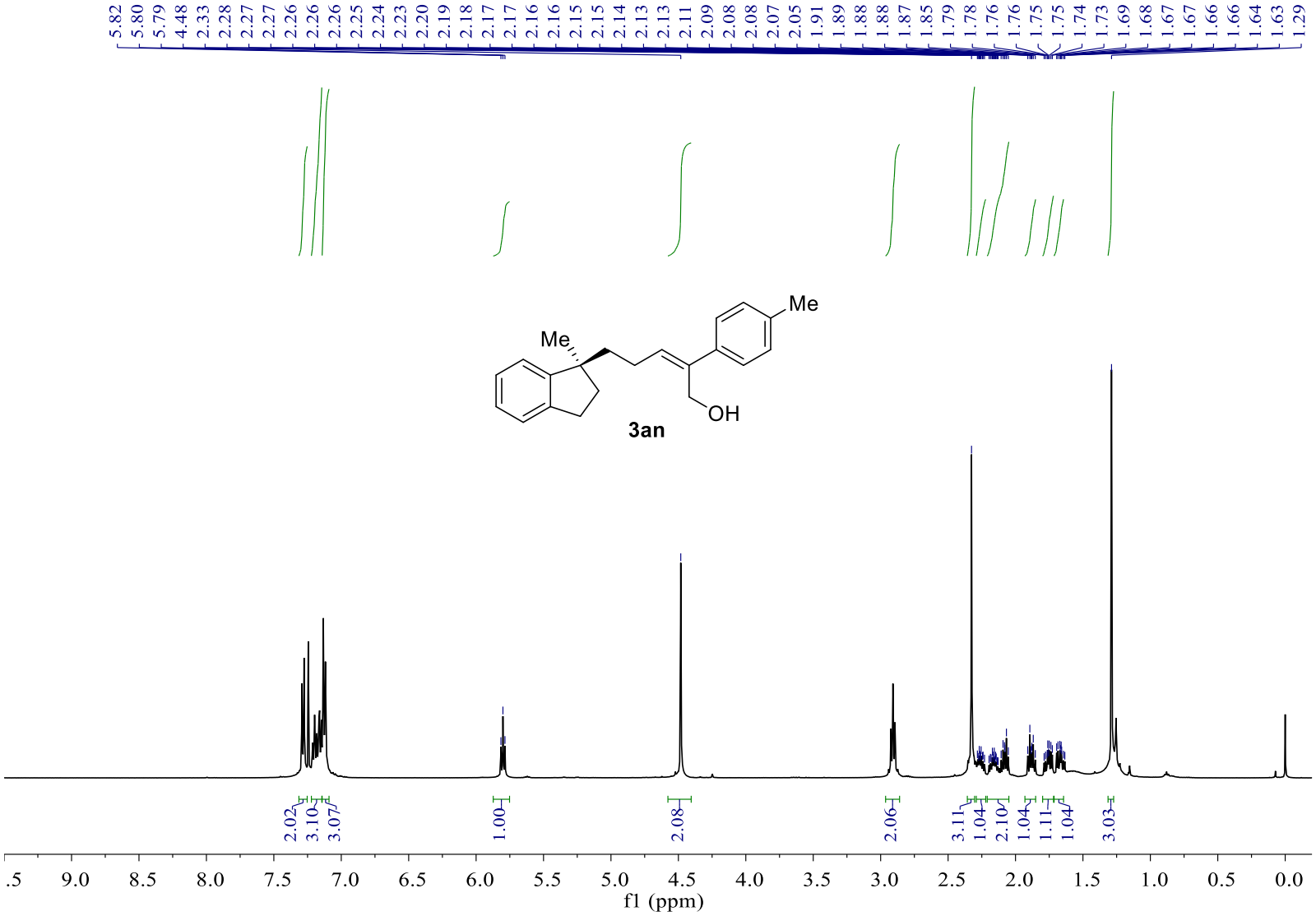
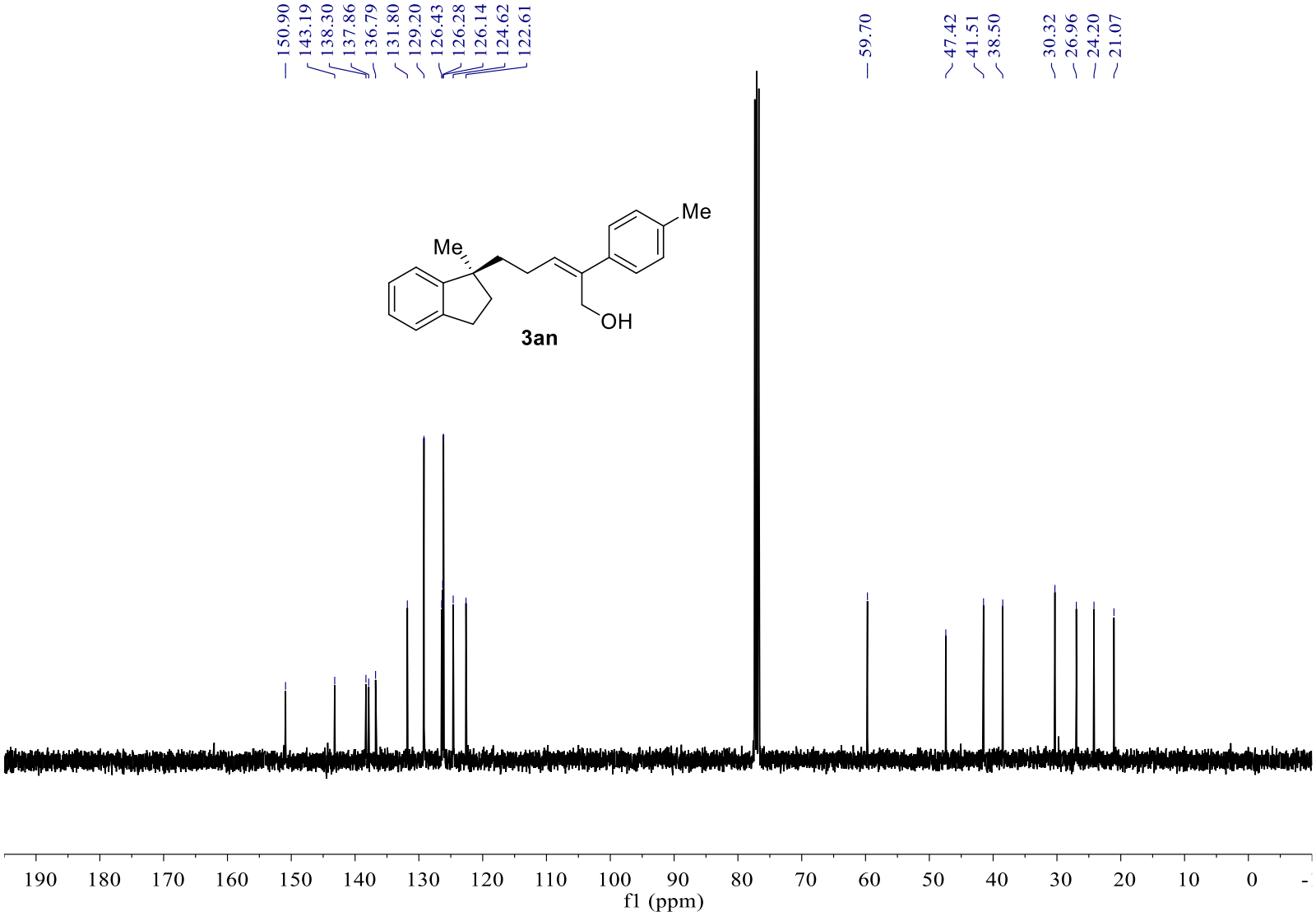
128.51
127.09
126.48
126.32
126.29
124.66
122.64
59.72
47.45
41.49
38.52
30.34
27.00
24.27
Me
OH
3am
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

NOESY


Me
H3
Ph
H2 H2
H1
H1
OH
H3
H1
H2
H2
(H1, H2)
H1
H3
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
f2 (ppm)
0 1 2 3 4 5 6 7 8 9
f1 (ppm)


H1
H2
(H1, H2)
Me
H3
Ph
H2 H2
H1
H1
OH
f2 (ppm)
f1 (ppm)
5.4 5.3 5.2 5.1 5.0 4.9 4.8 4.7 4.6 4.5 4.4 4.3 4.2 4.1 4.0 3.9 3.8 3.7
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0


5.82 5.80 5.79 4.48 2.33 2.28 2.27 2.27 2.26 2.26 2.26 2.25 2.24 2.23 2.20 2.19 2.18 2.17 2.17 2.16 2.16 2.15 2.15 2.14 2.13 2.13 2.11 2.09 2.08 2.08 2.07 2.05 1.91 1.89 1.88 1.88 1.87 1.85 1.79 1.78 1.76 1.76 1.75 1.75 1.74 1.73 1.69 1.68 1.67 1.67 1.66 1.66 1.64 1.63 1.29
Me
Me
OH
3an
2.02 3.10 3.07 1.00 2.08 2.06 3.11 1.04 2.10 1.04 1.11 1.04 3.03
.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
f1 (ppm)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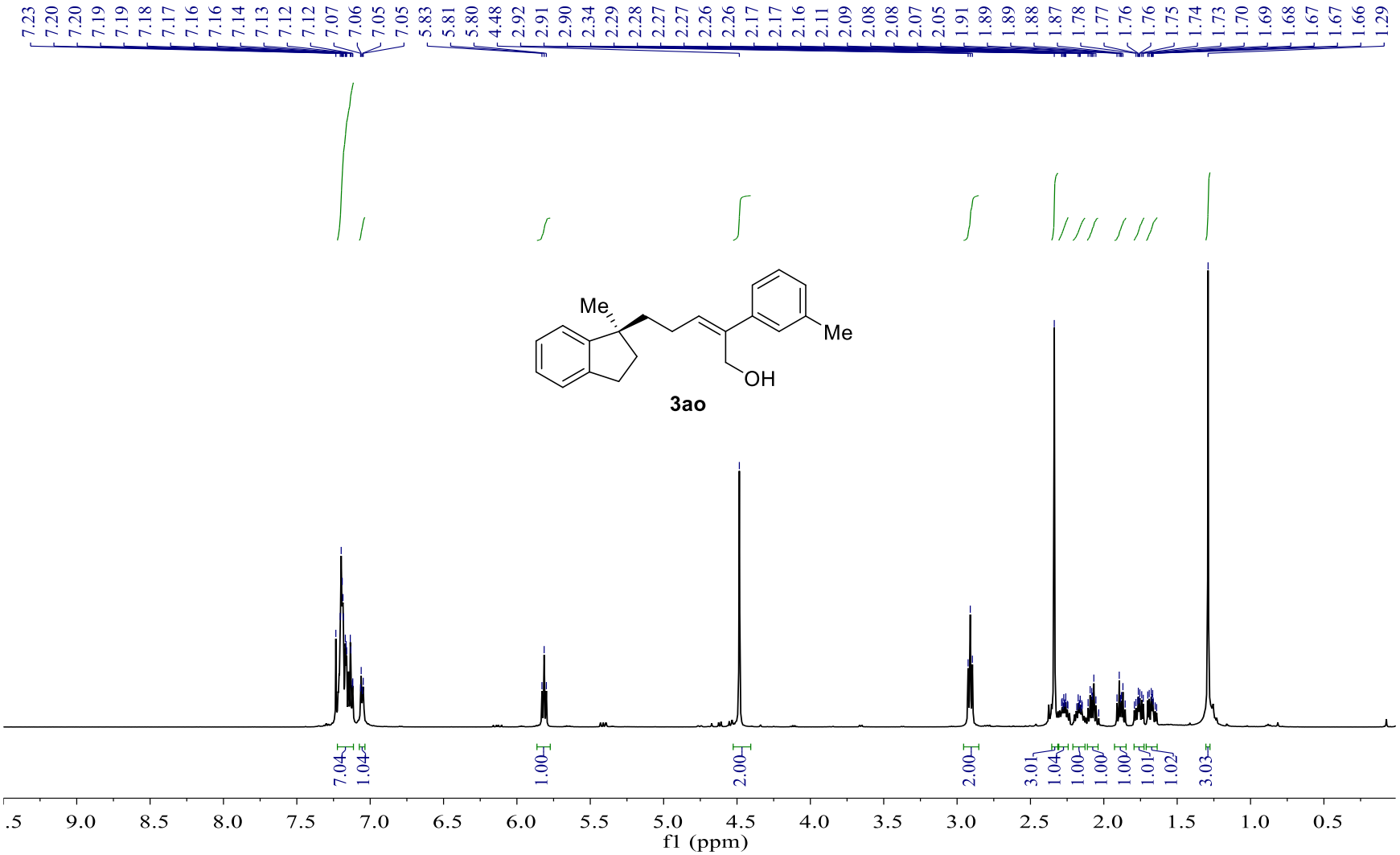
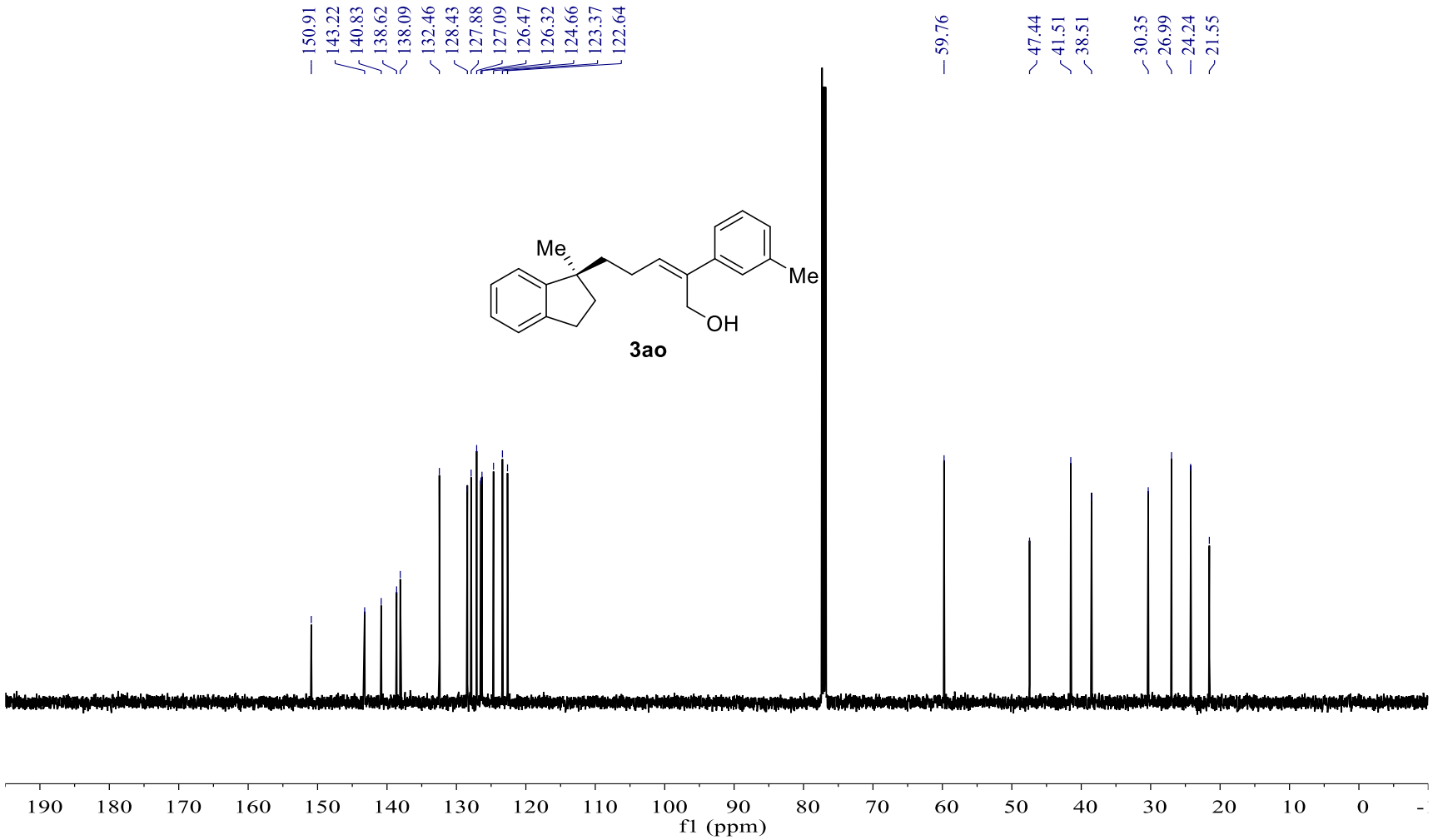
143.19
138.30
137.86
136.79
131.80
129.20
126.43
126.28
126.14
124.62
122.61
59.70
47.42
41.51
38.50
30.32
26.96
24.20
21.07
Me
Me
OH
3an
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.23
7.20
7.20
7.19
7.19
7.18
7.17
7.16
7.16
7.14
7.13
7.12
7.12
7.07
7.06
7.05
7.05
5.83
5.81
5.80
4.48
2.92
2.91
2.90
2.34
2.29
2.28
2.27
2.27
2.26
2.26
2.17
2.17
2.16
2.11
2.09
2.08
2.08
2.07
2.05
1.91
1.89
1.89
1.88
1.87
1.78
1.77
1.76
1.76
1.75
1.74
1.73
1.70
1.69
1.68
1.67
1.67
1.66
1.29
Me
Me
OH
3ao
7.04
1.04
1.00
2.00
2.00
3.01
1.04
1.00
1.00
1.00
1.01
1.02
3.03
.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
f1 (ppm)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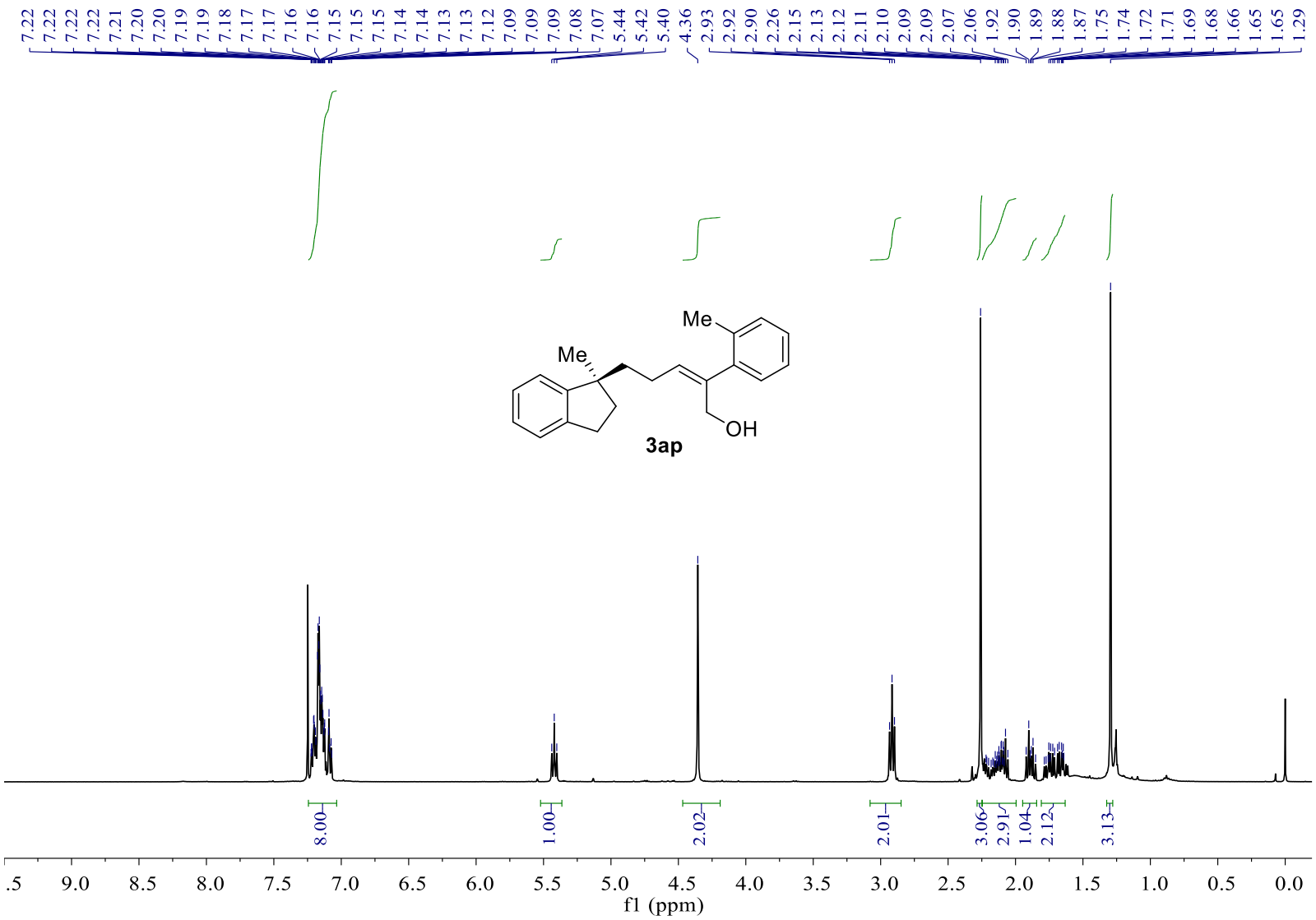
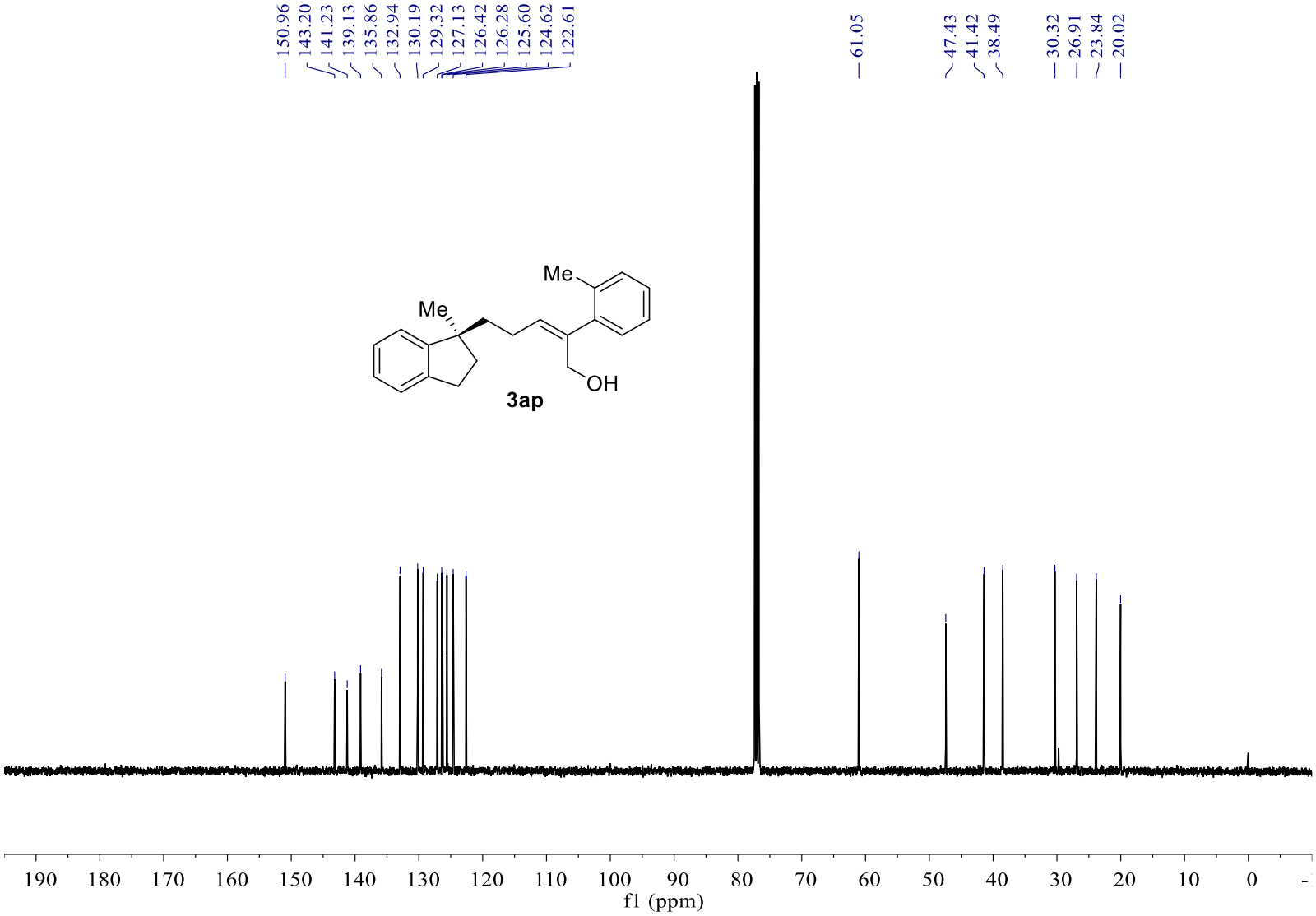
143.22
140.83
138.62
138.09
132.46
128.43
127.88
127.09
126.47
126.32
124.66
123.37
122.64
59.76
47.44
41.51
38.51
30.35
26.99
24.24
21.55
Me
Me
OH
3ao
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.22 7.22 7.22 7.22 7.21 7.20 7.20 7.19 7.19 7.18 7.17 7.17 7.16 7.16 7.15 7.15 7.15 7.14 7.14 7.13 7.13 7.12 7.09 7.09 7.09 7.08 7.07 5.44 5.42 5.40 4.36 2.93 2.92 2.90 2.26 2.15 2.13 2.12 2.11 2.10 2.09 2.09 2.07 2.06 1.92 1.90 1.89 1.88 1.87 1.75 1.74 1.72 1.71 1.69 1.68 1.66 1.65 1.65 1.29
Me
Me
OH
3ap
8.00
1.00
2.02
2.01
3.06
2.91
1.04
2.12
3.13
.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
f1 (ppm)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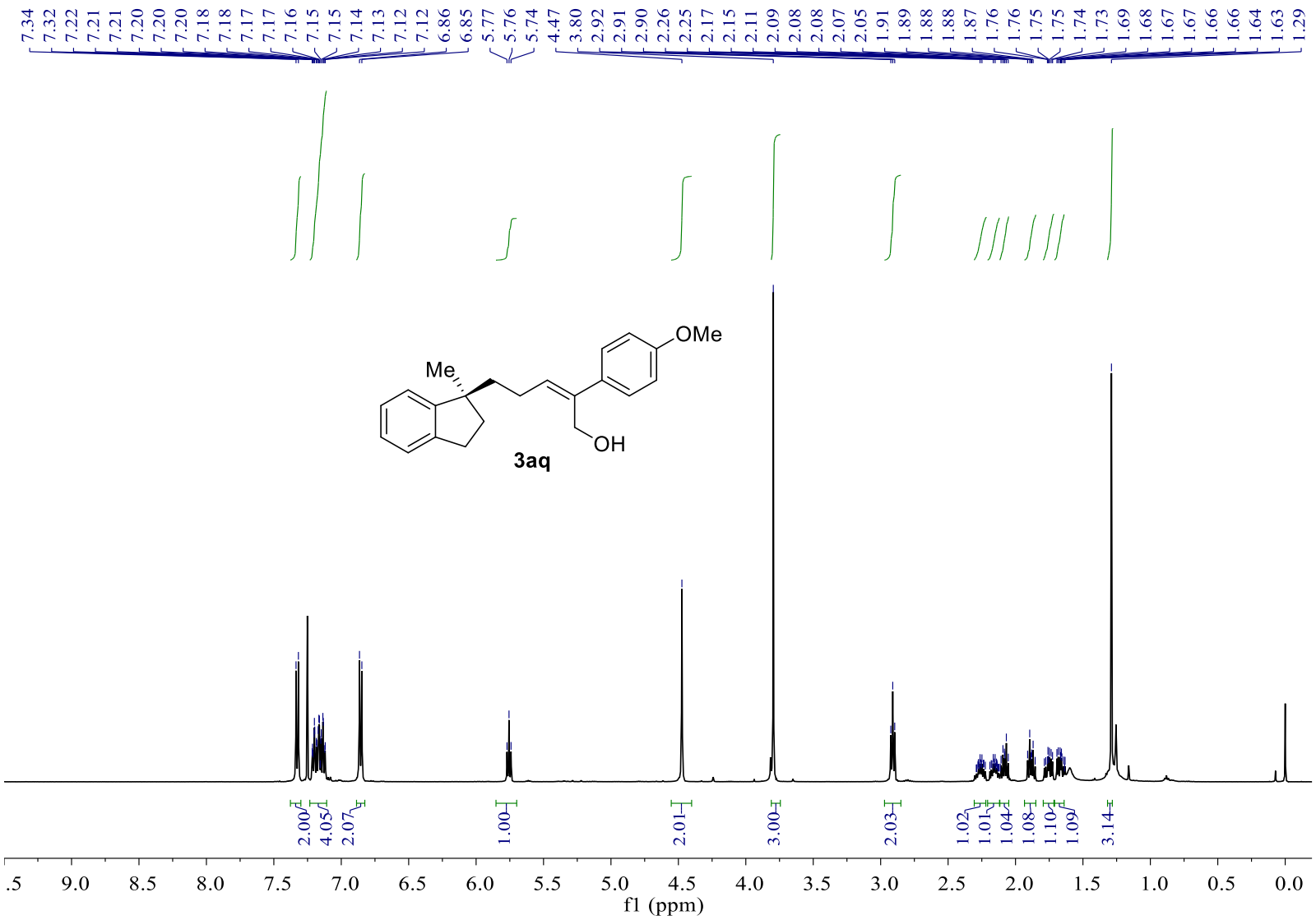
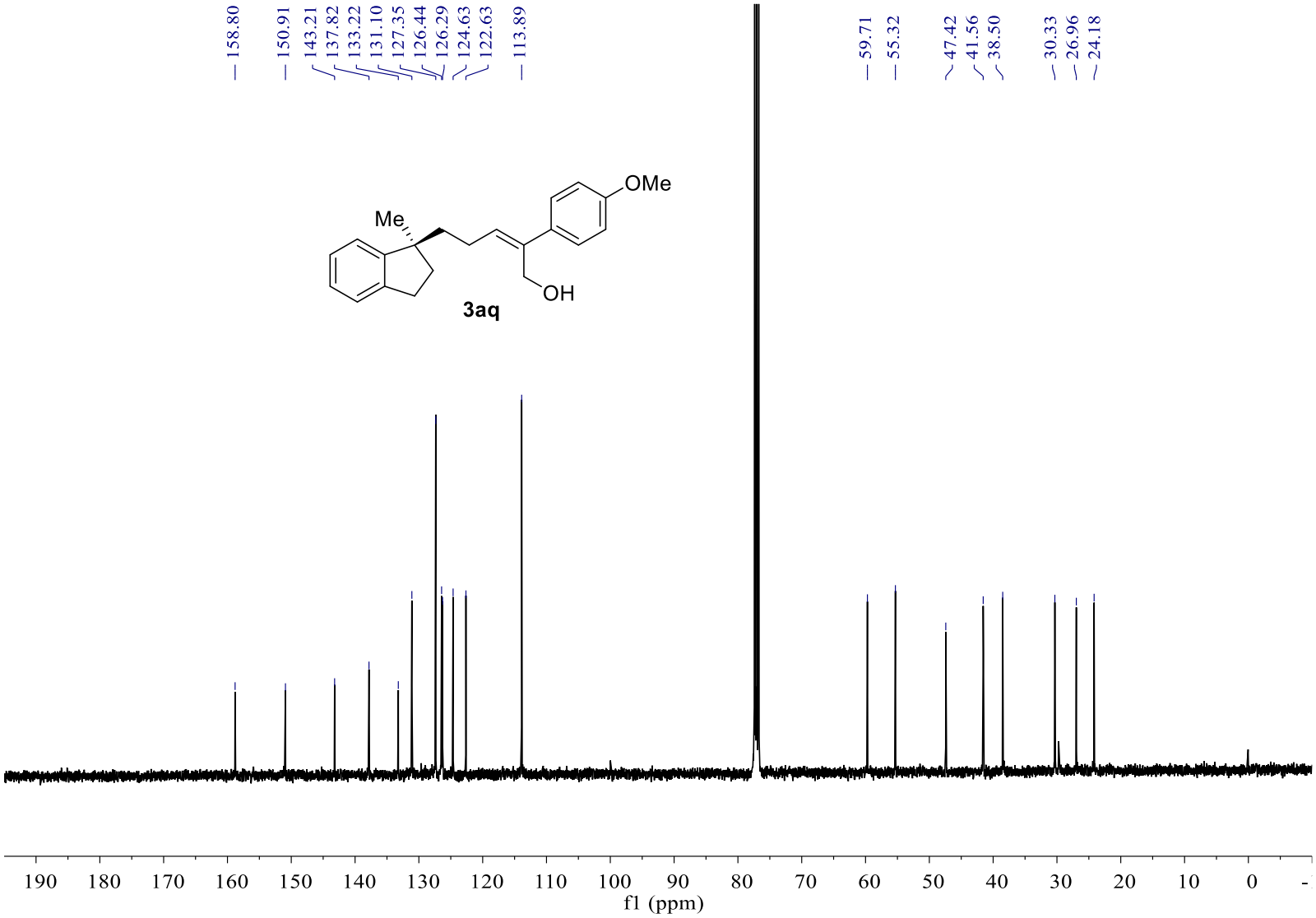
129.32
127.13
126.42
126.28
125.60
124.62
122.61
61.05
47.43
41.42
38.49
30.32
26.91
23.84
20.02
Me
Me
OH
3ap
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.34 7.32 7.22 7.21 7.21 7.20 7.20 7.20 7.18 7.18 7.17 7.17 7.16 7.15 7.15 7.14 7.13 7.12 7.12 6.86 6.85 5.77 5.76 5.74 4.47 3.80 2.92 2.91 2.90 2.26 2.25 2.17 2.15 2.11 2.09 2.08 2.08 2.07 2.05 1.91 1.89 1.88 1.88 1.87 1.76 1.76 1.75 1.75 1.74 1.73 1.69 1.68 1.67 1.67 1.66 1.66 1.64 1.63 1.29
OMe
Me
OH
3aq
2.00 4.05 2.07 1.00 2.01 3.00 2.03 1.02 1.01 1.04 1.08 1.10 1.09 3.14
.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
f1 (ppm)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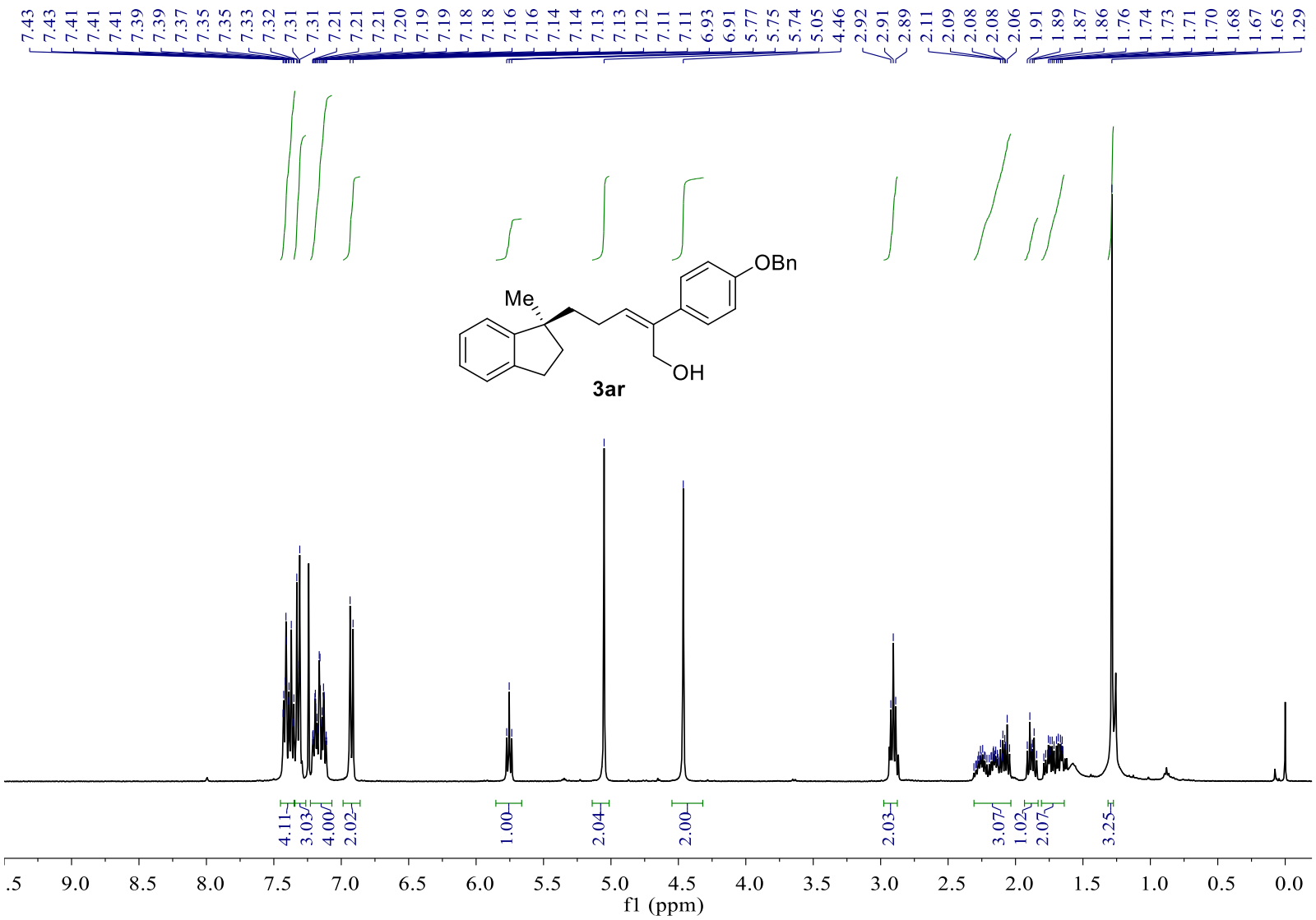
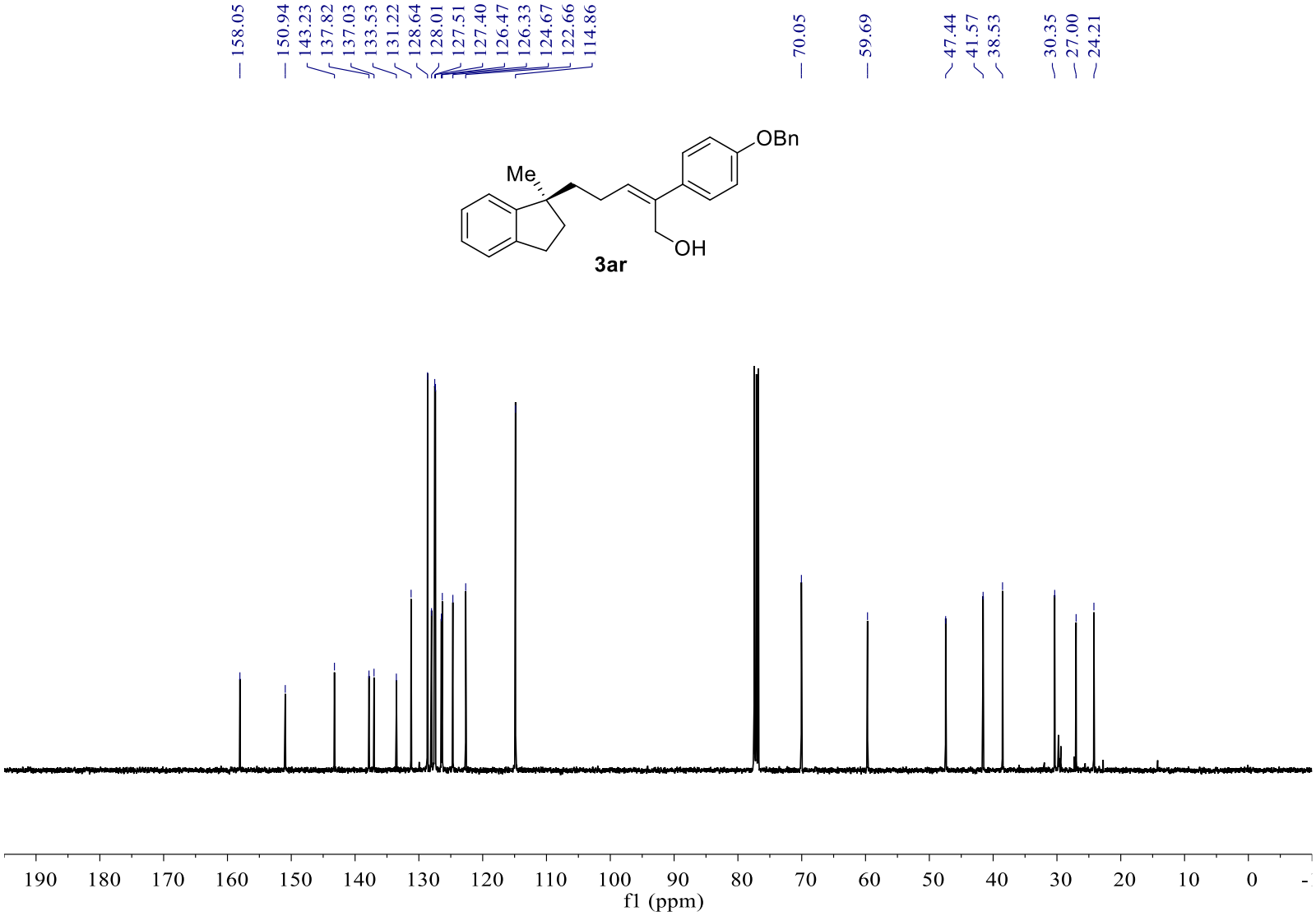
131.10
127.35
126.44
126.29
124.63
122.63
113.89
59.71
55.32
47.42
41.56
38.50
30.33
26.96
24.18
OMe
Me
OH
3aq
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.43 7.43 7.41 7.41 7.41 7.39 7.39 7.37 7.35 7.35 7.33 7.32 7.31 7.31 7.21 7.21 7.21 7.20 7.19 7.19 7.18 7.18 7.16 7.16 7.14 7.14 7.13 7.13 7.12 7.11 7.11 6.93 6.91 5.77 5.75 5.74 5.05 4.46 2.92 2.91 2.89 2.11 2.09 2.08 2.08 2.06 1.91 1.89 1.87 1.86 1.76 1.74 1.73 1.71 1.70 1.68 1.67 1.65 1.29
OBn
Me
OH
3ar
4.11 3.03 4.00 2.02 1.00 2.04 2.00 2.03 3.07 1.02 2.07 3.25
.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
f1 (ppm)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150.94
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137.03
133.53
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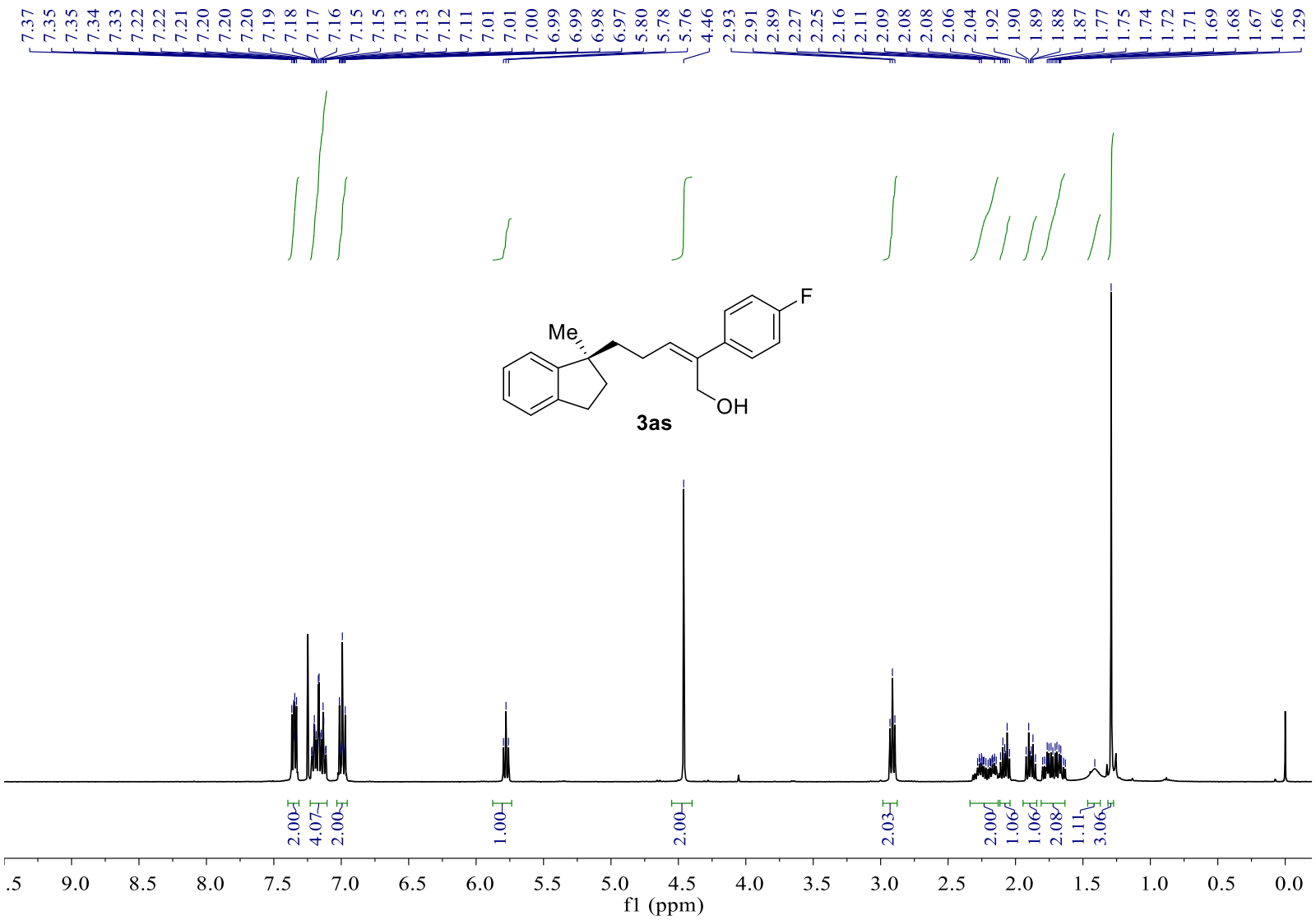
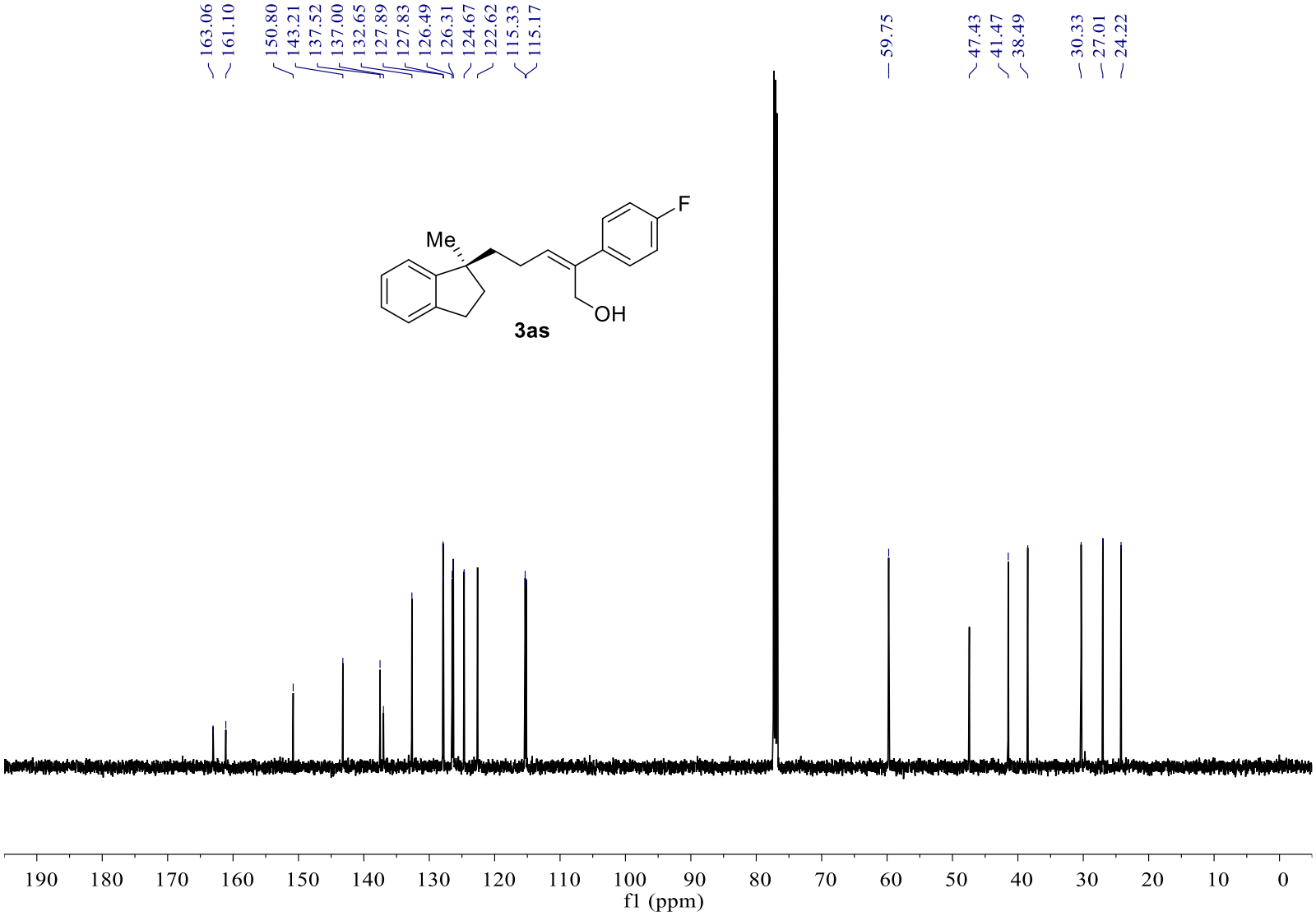
128.64
128.01
127.51
127.40
126.47
126.33
124.67
122.66
114.86
70.05
59.69
47.44
41.57
38.53
30.35
27.00
24.21
OBn
Me
OH
3ar
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.37 7.35 7.35 7.34 7.33 7.22 7.22 7.21 7.20 7.20 7.20 7.19 7.18 7.17 7.16 7.15 7.15 7.13 7.13 7.12 7.11 7.01 7.01 7.00 6.99 6.99 6.98 6.97 5.80 5.78 5.76 4.46 2.93 2.91 2.89 2.27 2.25 2.16 2.11 2.09 2.08 2.08 2.06 2.04 1.92 1.90 1.89 1.88 1.87 1.77 1.75 1.74 1.72 1.71 1.69 1.68 1.67 1.66 1.29
Me
F
OH
3as
2.00 4.07 2.00 1.00 2.00 2.03 2.00 1.06 1.06 2.08 1.11 3.06
.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
f1 (ppm)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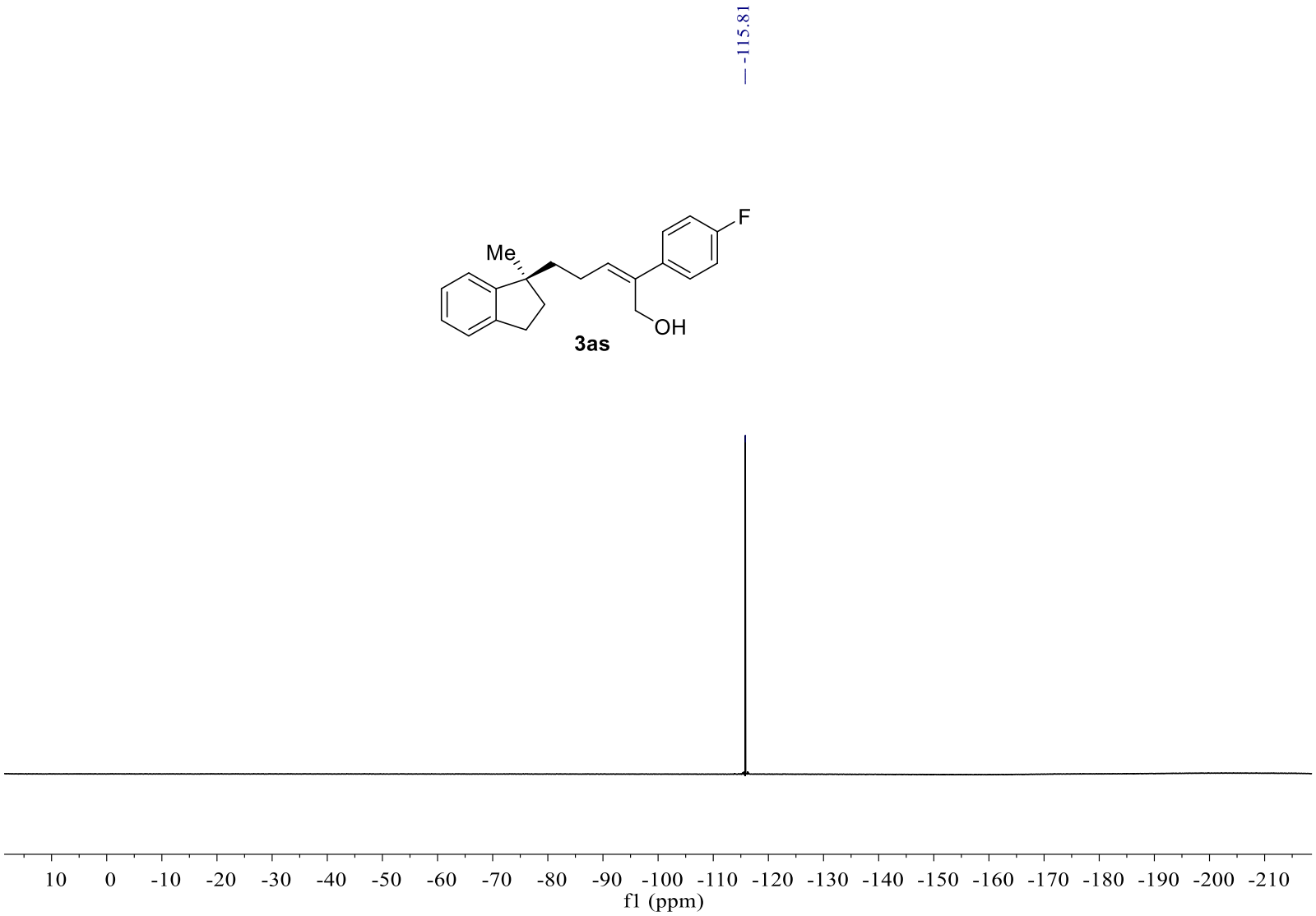
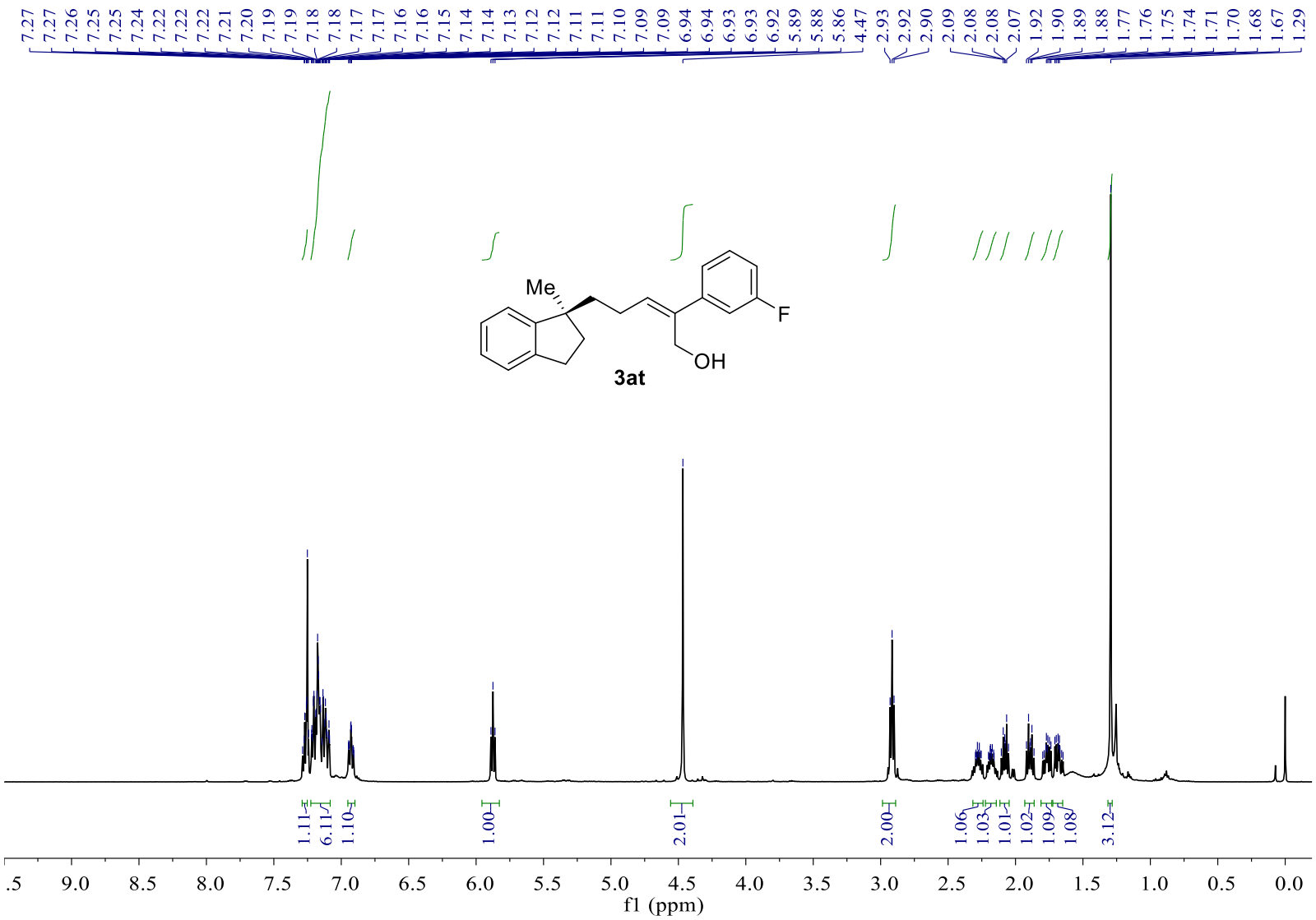
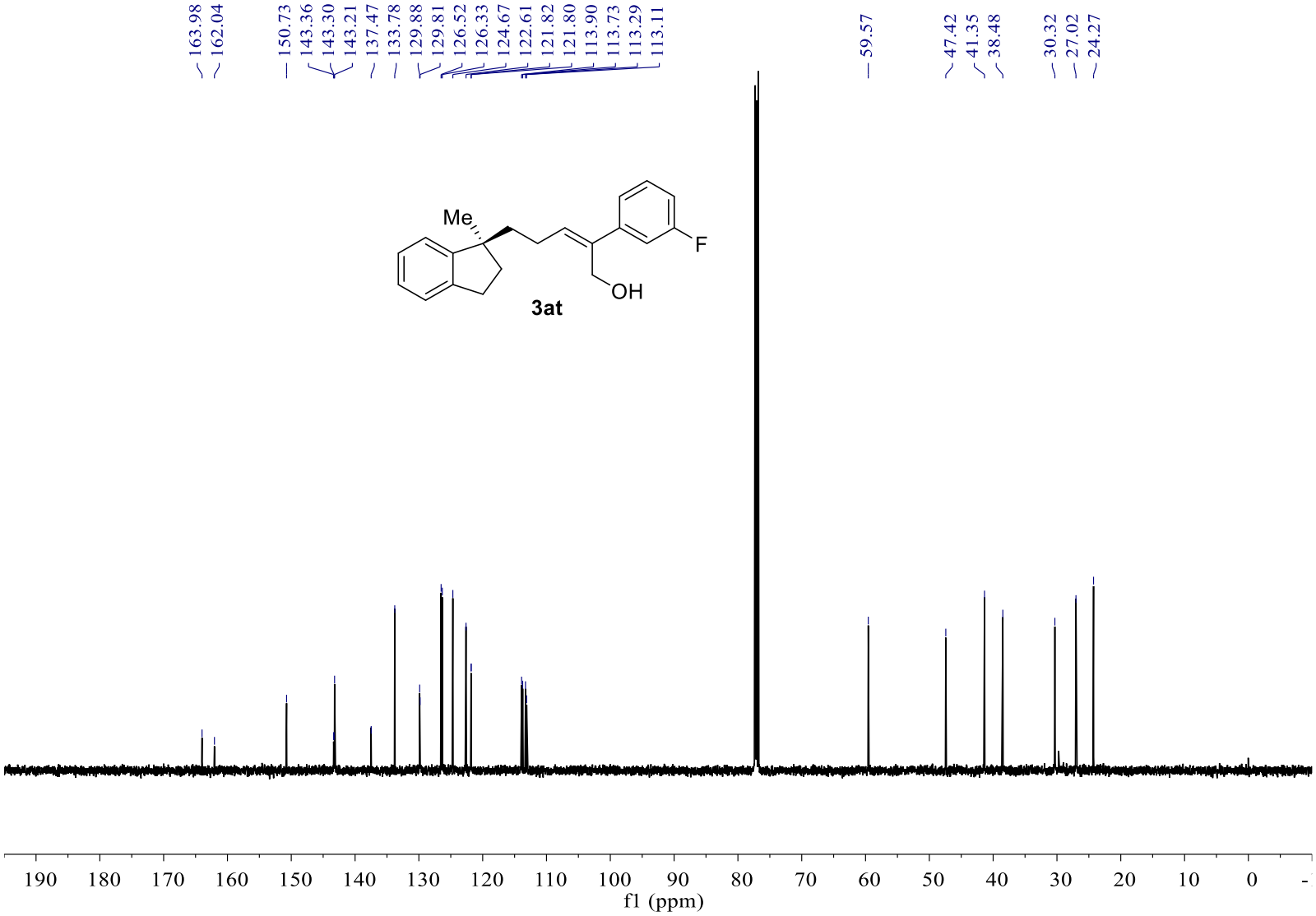
161.10
150.80
143.21
137.52
137.00
132.65
127.89
127.83
126.49
126.31
124.67
122.62
115.33
115.17
59.75
47.43
41.47
38.49
30.33
27.01
24.22
Me
F
OH
3as
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


-115.81
F
Me
OH
3as
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)


7.27 7.27 7.26 7.25 7.25 7.24 7.22 7.22 7.22 7.21 7.20 7.19 7.19 7.18 7.18 7.17 7.17 7.16 7.16 7.15 7.14 7.14 7.13 7.12 7.12 7.11 7.11 7.10 7.09 7.09 6.94 6.94 6.93 6.93 6.92 5.89 5.88 5.86 4.47 2.93 2.92 2.90 2.09 2.08 2.08 2.07 1.92 1.90 1.89 1.88 1.77 1.76 1.75 1.74 1.71 1.70 1.68 1.67 1.29
Me
F
OH
3at
1.11 6.11 1.10 1.00 2.01 2.00 1.06 1.03 1.01 1.02 1.09 1.08 3.12
.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
f1 (ppm)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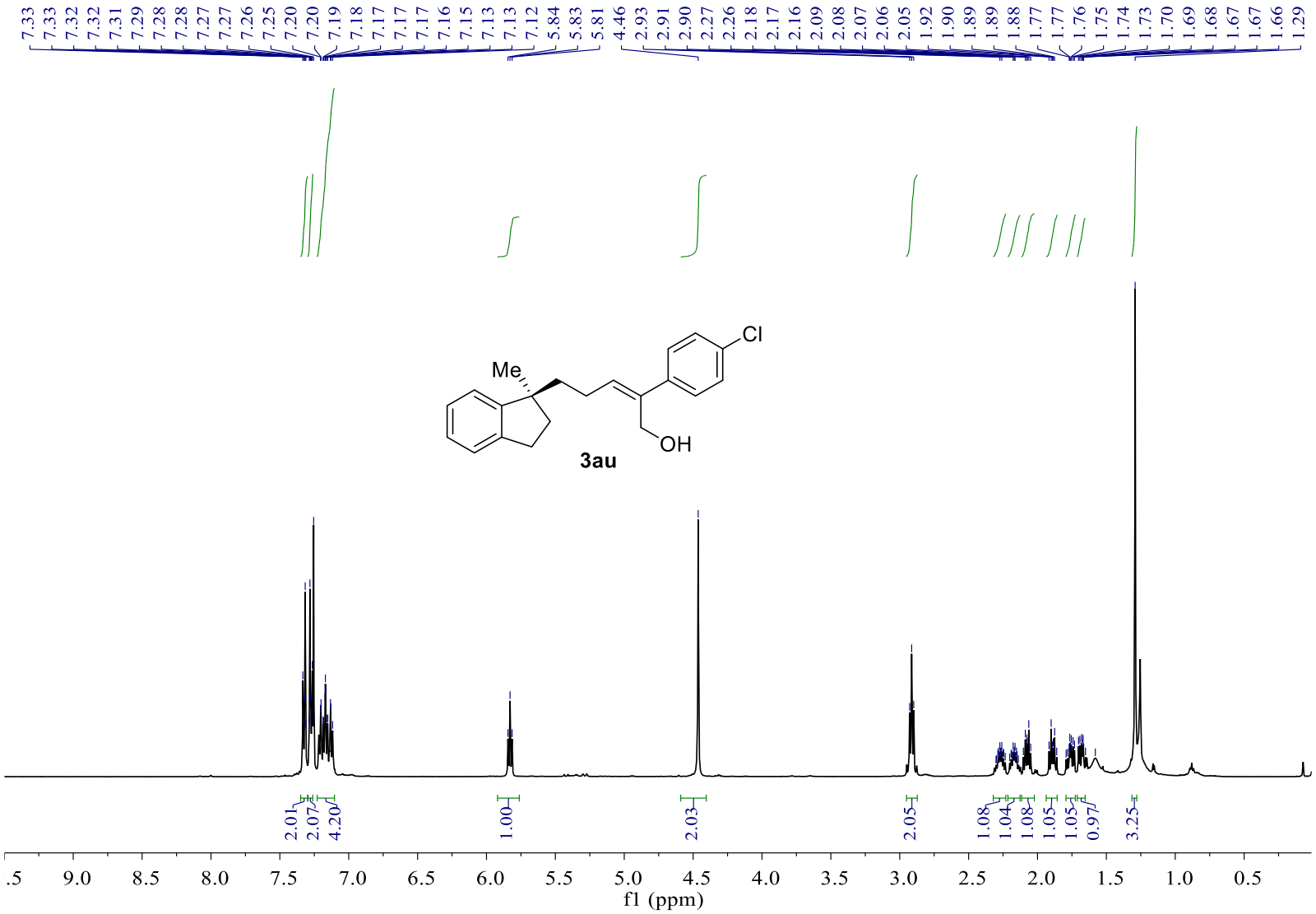
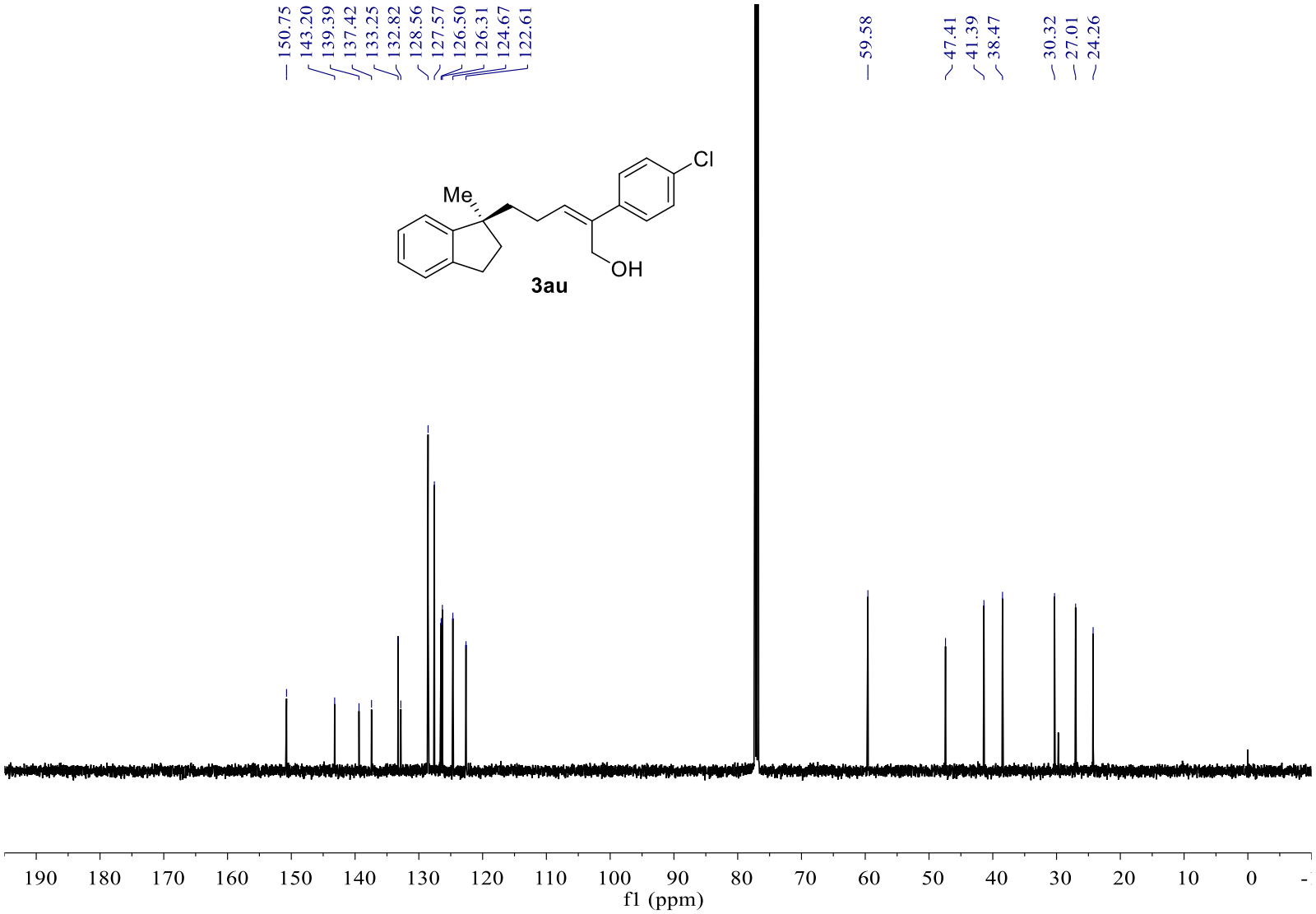
133.78
129.88
129.81
126.52
126.33
124.67
122.61
121.82
121.80
113.90
113.73
113.29
113.11
59.57
47.42
41.35
38.48
30.32
27.02
24.27
Me
F
OH
3at
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)


7.33 7.33 7.32 7.32 7.31 7.29 7.28 7.28 7.27 7.27 7.26 7.25 7.20 7.20 7.19 7.18 7.17 7.17 7.17 7.16 7.15 7.13 7.13 7.12 5.84 5.83 5.81 4.46 2.93 2.91 2.90 2.27 2.26 2.18 2.17 2.16 2.09 2.08 2.07 2.06 2.05 1.92 1.90 1.89 1.89 1.88 1.77 1.77 1.76 1.75 1.74 1.73 1.70 1.69 1.68 1.67 1.67 1.66 1.29
Me
Cl
OH
3au
2.01 2.07 4.20 1.00 2.03 2.05 1.08 1.04 1.08 1.05 1.05 0.97 3.25
f1 (ppm)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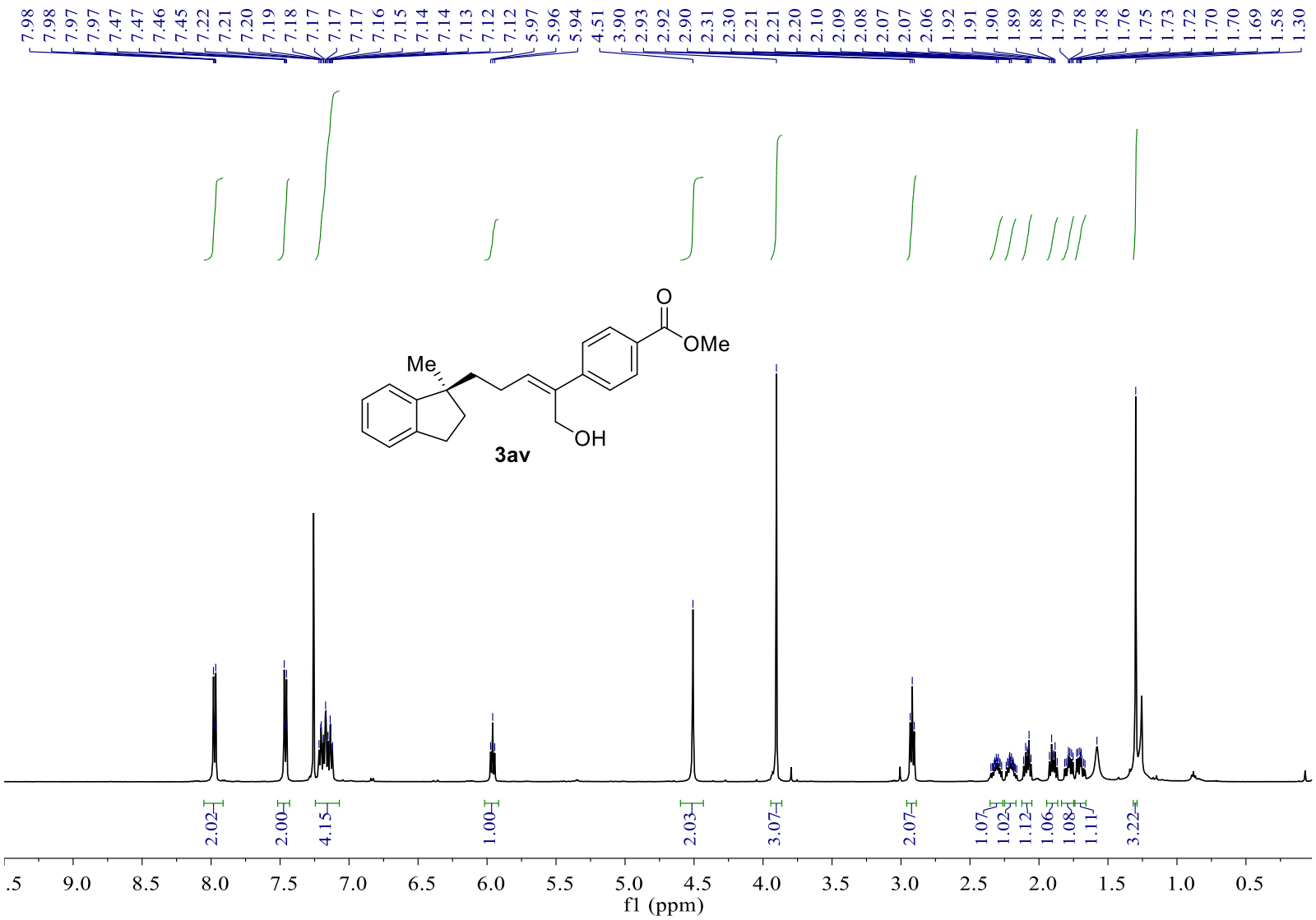
143.20
139.39
137.42
133.25
132.82
128.56
127.57
126.50
126.31
124.67
122.61
59.58
47.41
41.39
38.47
30.32
27.01
24.26
Cl
Me
OH
3au
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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4.51 3.90 2.93 2.92 2.90 2.31 2.30 2.21 2.21 2.20 2.10 2.09 2.08 2.07 2.07 2.06 1.92 1.91 1.90 1.89 1.88 1.79 1.78 1.78 1.76 1.75 1.73 1.72 1.70 1.70 1.69 1.58 1.30
O
OMe
Me
OH
3av
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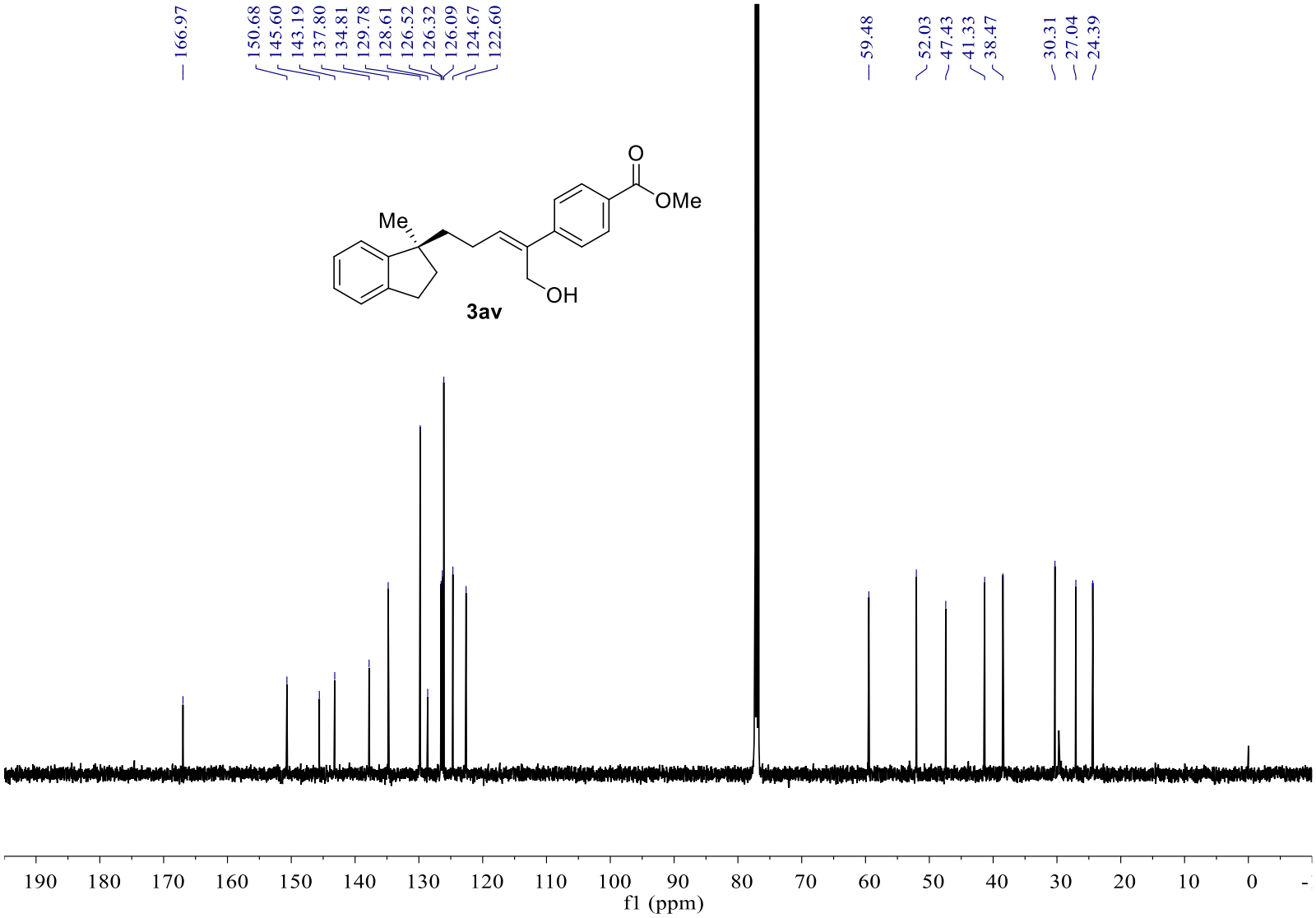
f1 (ppm)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128.61
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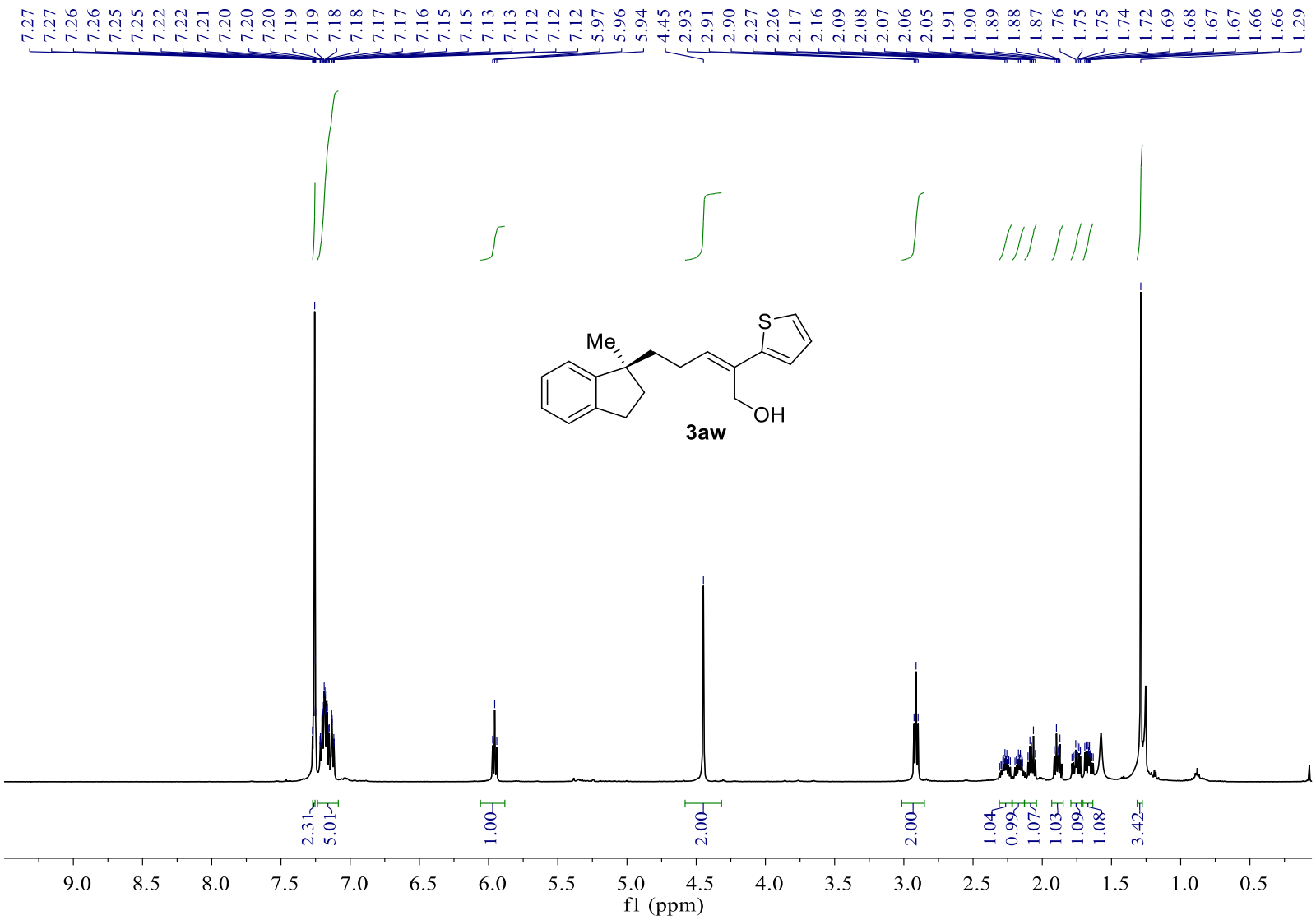
126.32
126.09
124.67
122.60
59.48
52.03
47.43
41.33
38.47
30.31
27.04
24.39
O
OMe
Me
OH
3av
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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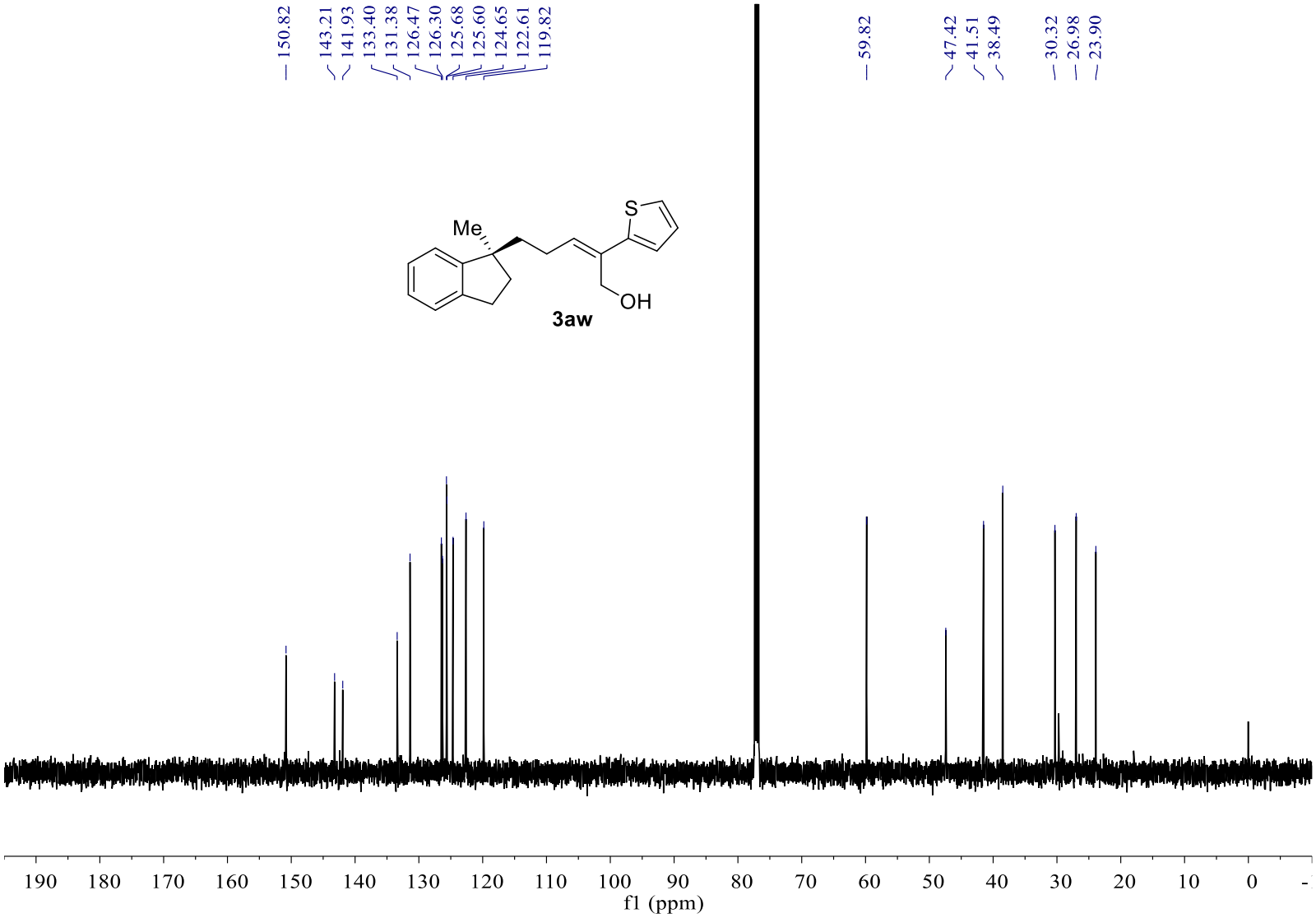
4.45 2.93 2.91 2.90 2.27 2.26 2.17 2.16 2.09 2.08 2.07 2.06 2.05 1.91 1.90 1.89 1.88 1.87 1.76 1.75 1.75 1.74 1.72 1.69 1.68 1.67 1.67 1.66 1.66 1.29
Me
S
OH
3aw
2.31
5.01
1.00
2.00
2.00
1.04
0.99
1.07
1.03
1.09
1.08
3.42
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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125.68
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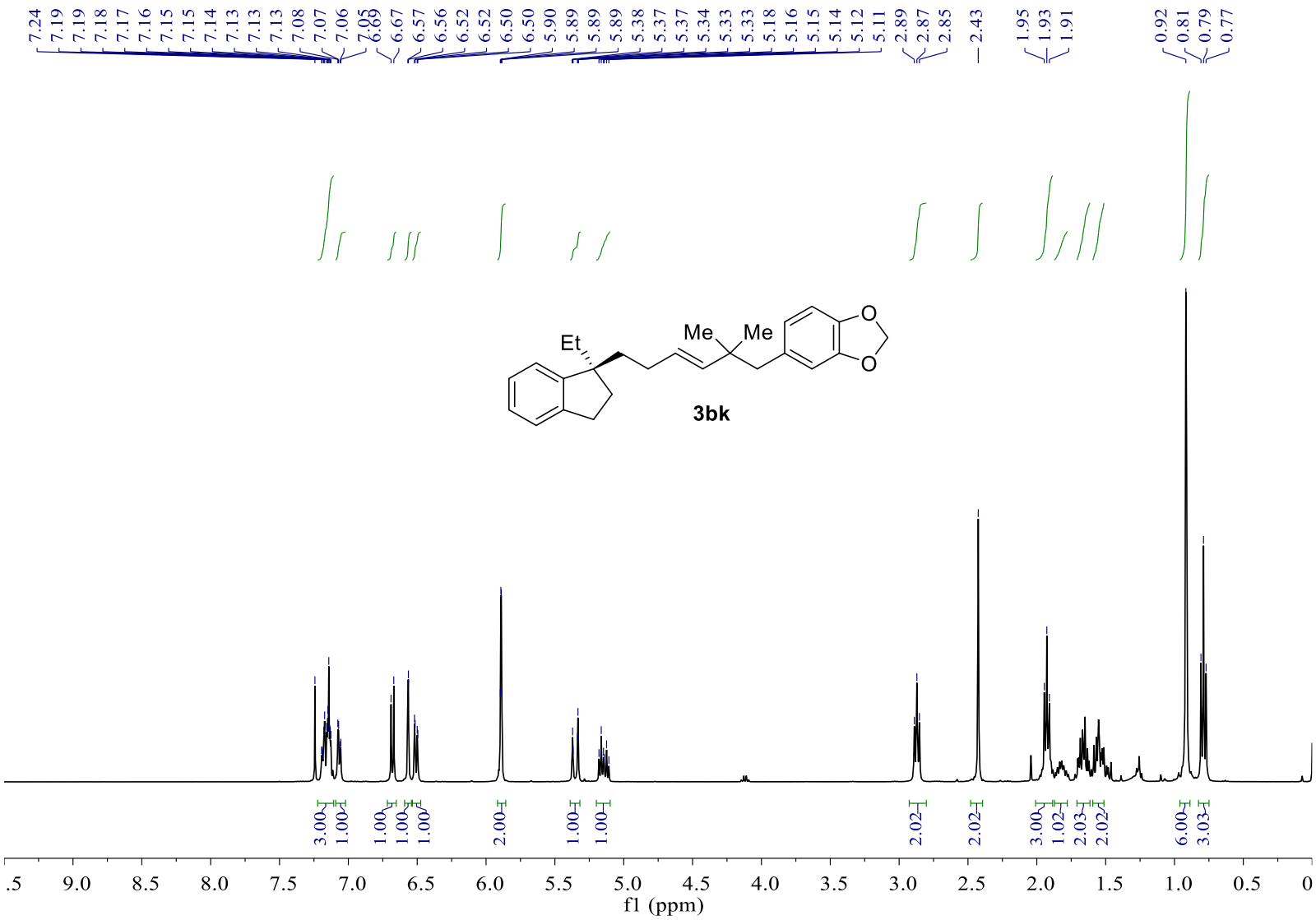
124.65
122.61
119.82
59.82
47.42
41.51
38.49
30.32
26.98
23.90
Me
S
OH
3aw
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)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7.19
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7.07
7.06
7.05
6.69
6.67
6.57
6.56
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6.50
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5.89
5.89
5.89
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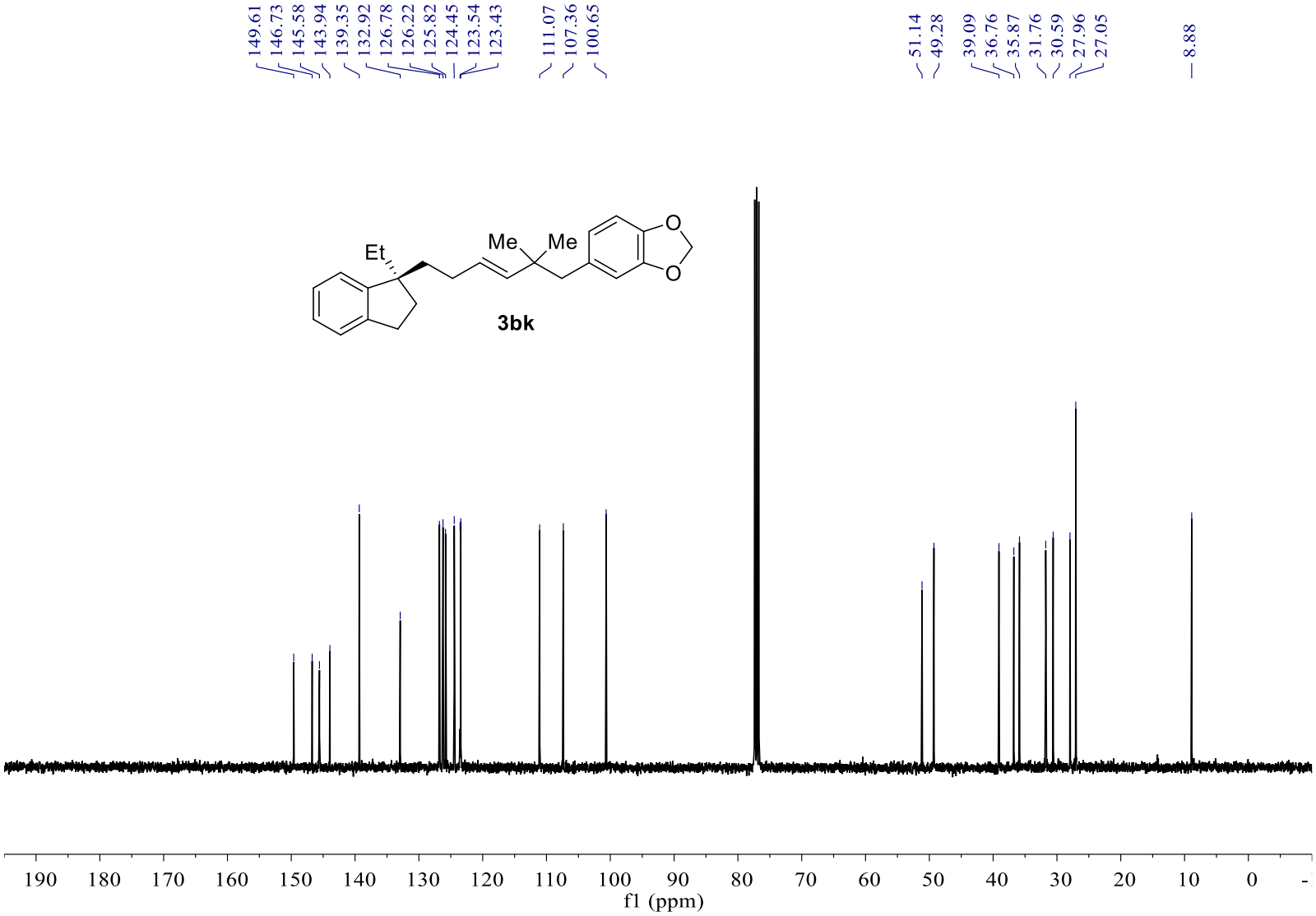
5.37
5.37
5.34
5.33
5.33
5.18
5.16
5.15
5.14
5.12
5.11
2.89
2.87
2.85
2.43
1.95
1.93
1.91
0.92
0.81
0.79
0.77
Et
Me
Me
O
O
3bk
3.00
1.00
1.00
1.00
1.00
2.00
1.00
1.00
2.02
2.02
3.00
1.02
2.03
2.02
6.00
3.03
f1 (ppm)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132.92
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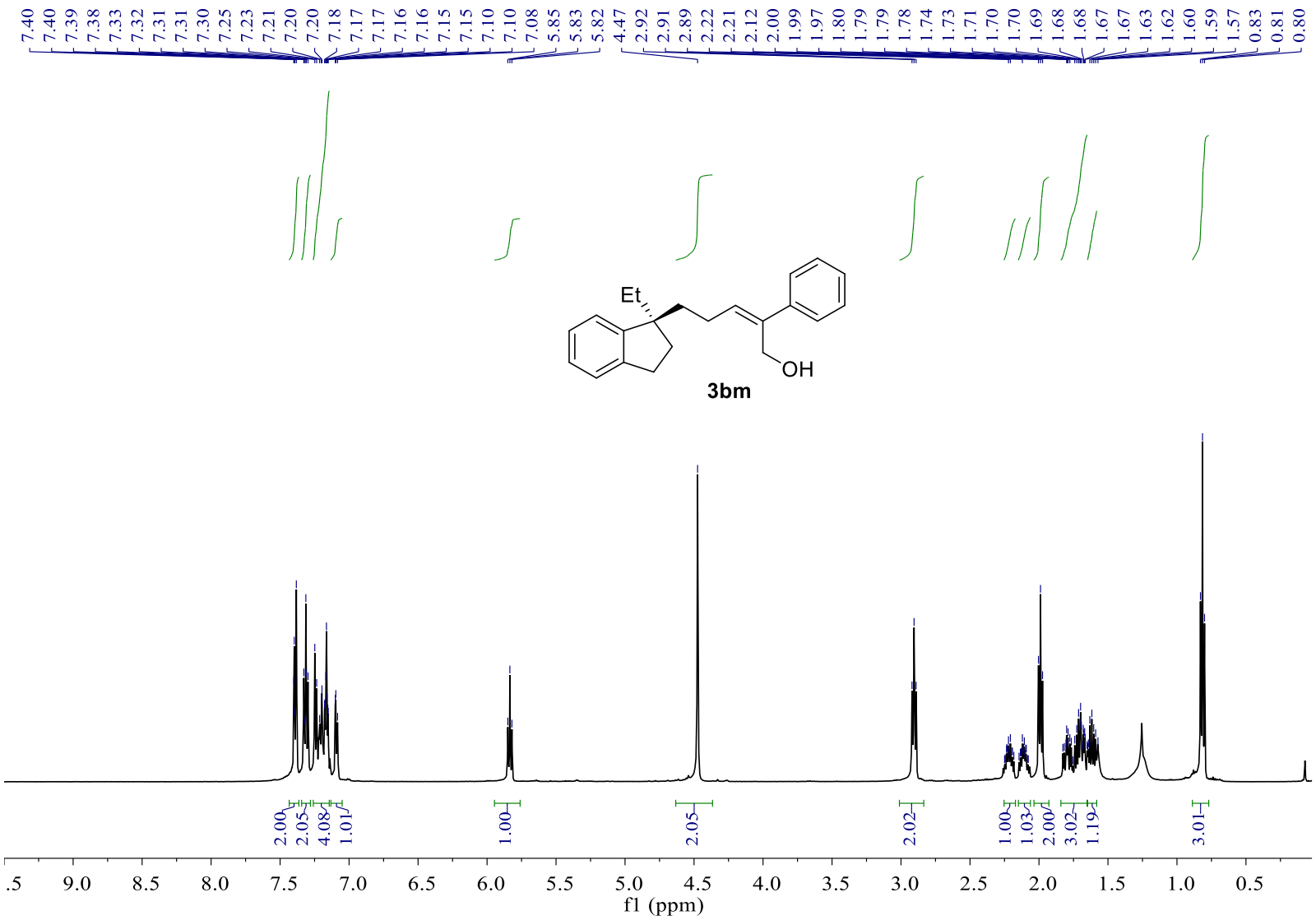
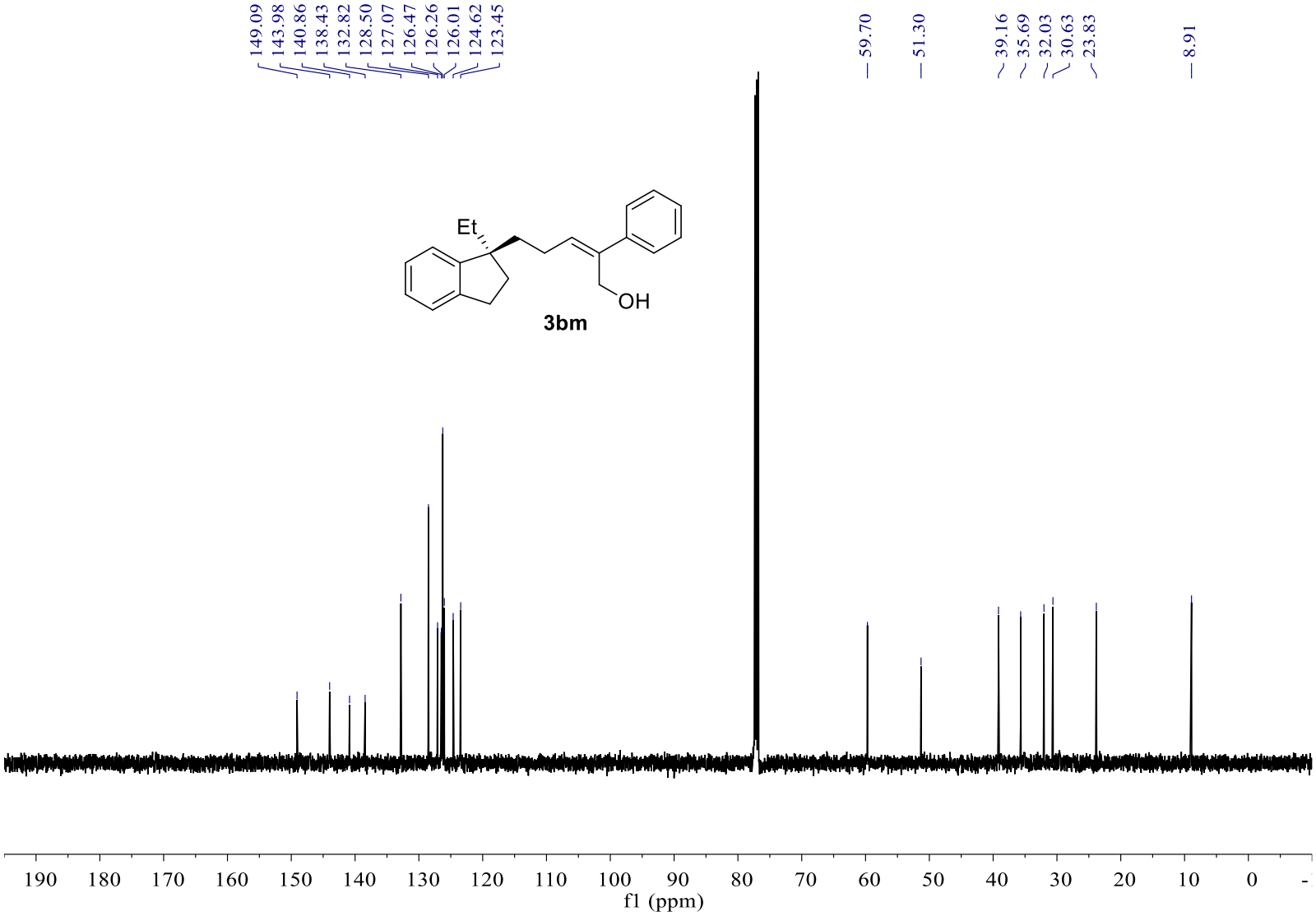
126.22
125.82
124.45
123.54
123.43
111.07
107.36
100.65
51.14
49.28
39.09
36.76
35.87
31.76
30.59
27.96
27.05
8.88
Et
Me
Me
O
O
3bk
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.40 7.40 7.39 7.38 7.33 7.32 7.31 7.31 7.30 7.25 7.23 7.21 7.20 7.20 7.18 7.17 7.17 7.16 7.16 7.15 7.15 7.10 7.10 7.08 5.85 5.83 5.82 4.47 2.92 2.91 2.89 2.22 2.21 2.12 2.00 1.99 1.97 1.80 1.79 1.79 1.78 1.74 1.73 1.71 1.70 1.70 1.69 1.68 1.68 1.67 1.67 1.63 1.62 1.60 1.59 1.57 0.83 0.81 0.80
Et
OH
3bm
2.00 2.05 4.08 1.01 1.00 2.05 2.02 1.00 1.03 2.00 3.02 1.19 3.01
f1 (ppm)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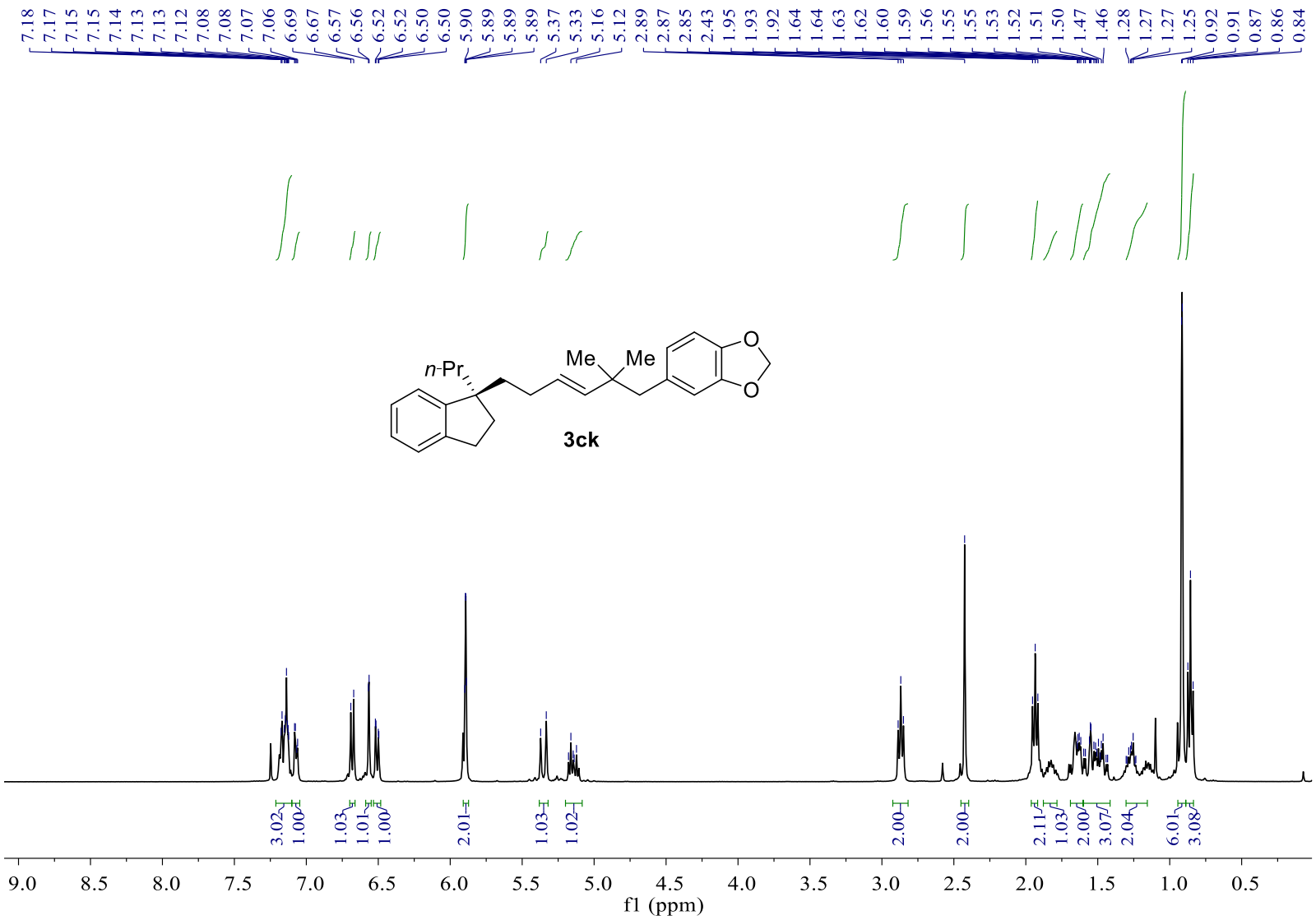
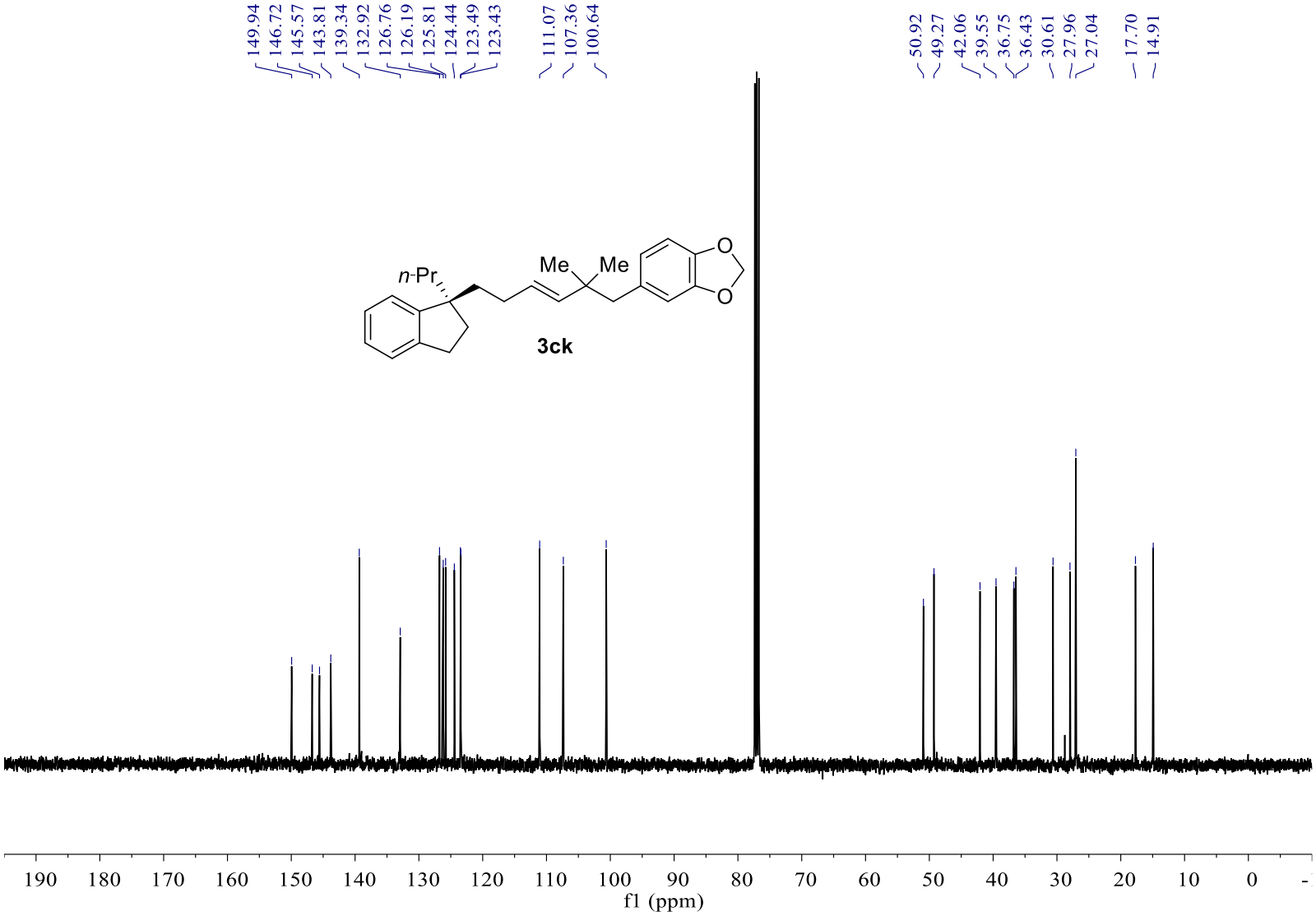
140.86
138.43
132.82
128.50
127.07
126.47
126.26
126.01
124.62
123.45
59.70
51.30
39.16
35.69
32.03
30.63
23.83
8.91
Et
OH
3bm
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)


7.18 7.17 7.15 7.15 7.14 7.13 7.13 7.12 7.08 7.08 7.07 7.06 6.69 6.67 6.57 6.56 6.52 6.52 6.50 6.50 5.90 5.89 5.89 5.89 5.37 5.33 5.16 5.12 2.89 2.87 2.85 2.43 1.95 1.93 1.92 1.64 1.64 1.63 1.62 1.60 1.59 1.56 1.55 1.55 1.53 1.52 1.51 1.50 1.47 1.46 1.28 1.27 1.27 1.25 0.92 0.91 0.87 0.86 0.84
n-Pr
Me
Me
O
O
3ck
3.02 1.00 1.03 1.01 1.00 2.01 1.03 1.02 2.00 2.00 2.11 1.03 2.00 3.07 2.04 6.01 3.08
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
f1 (ppm)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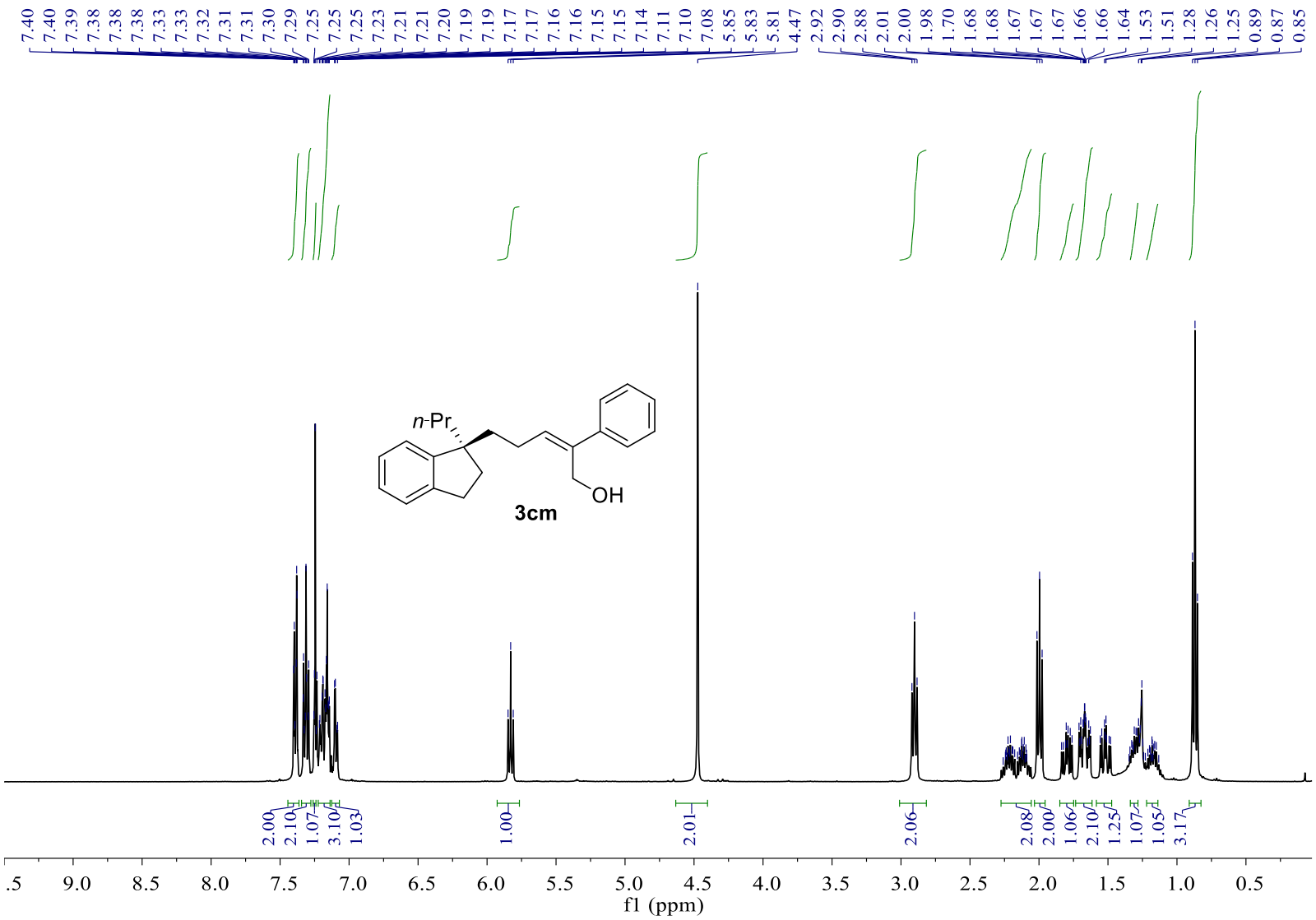
126.19
125.81
124.44
123.49
123.43
111.07
107.36
100.64
50.92
49.27
42.06
39.55
36.75
36.43
30.61
27.96
27.04
17.70
14.91
n-Pr
Me
Me
O
O
3ck
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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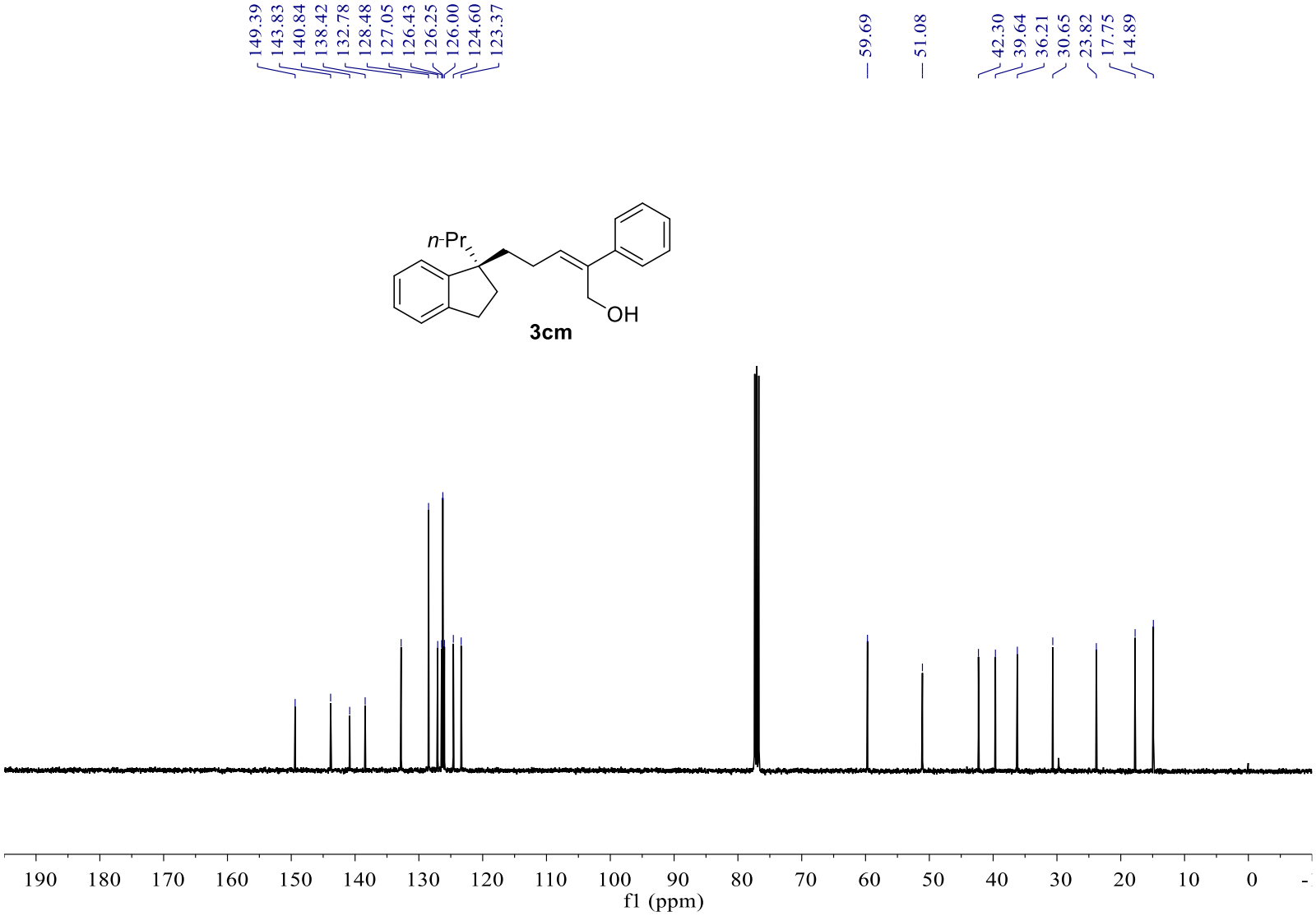
n-Pr
OH
3cm
2.00 2.10 1.07 3.10 1.03 1.00 2.01 2.06 2.08 2.00 1.06 2.10 1.25 1.07 1.05 3.17
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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132.78
128.48
127.05
126.43
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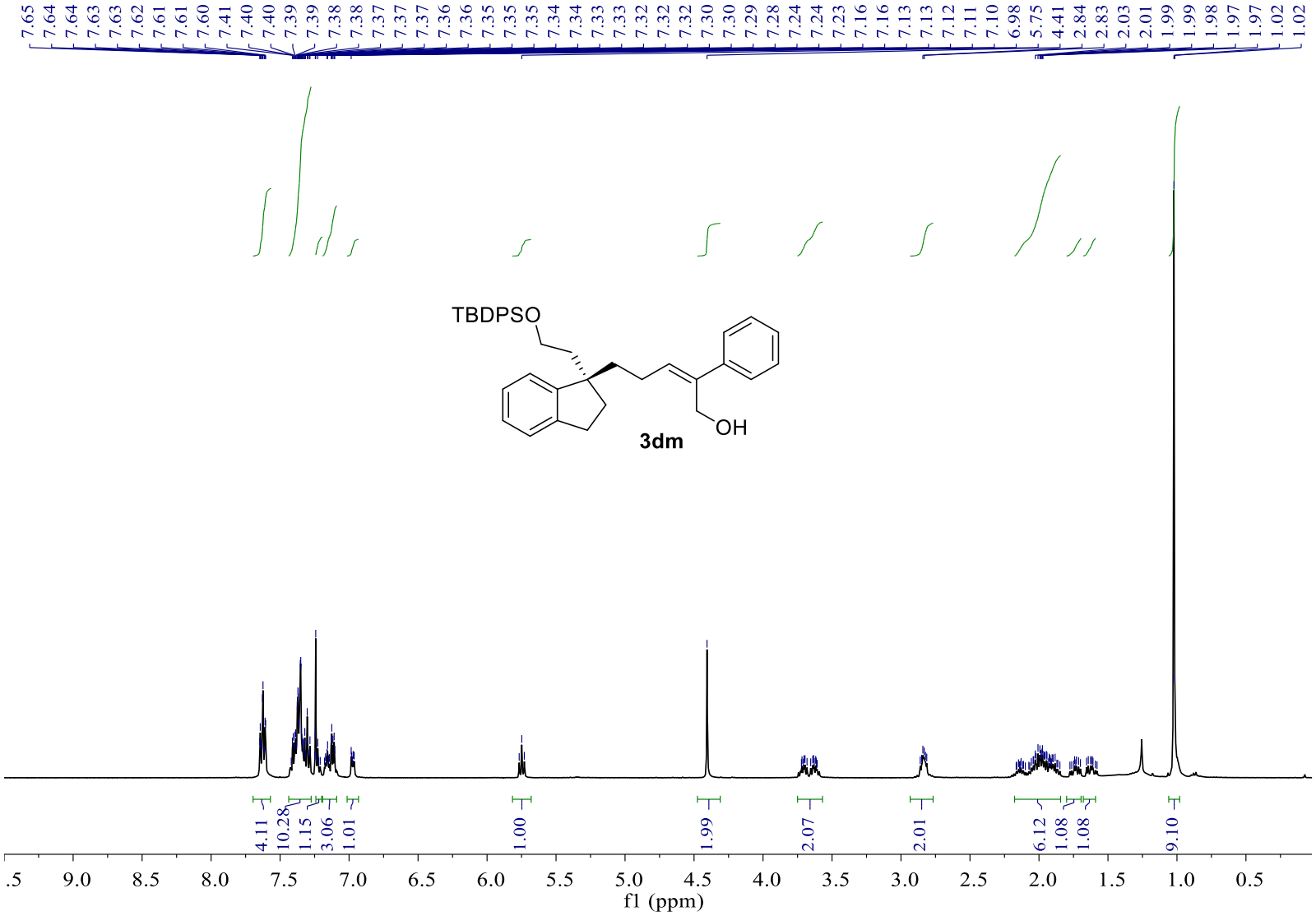
126.00
124.60
123.37
59.69
51.08
42.30
39.64
36.21
30.65
23.82
17.75
14.89
n-Pr
OH
3cm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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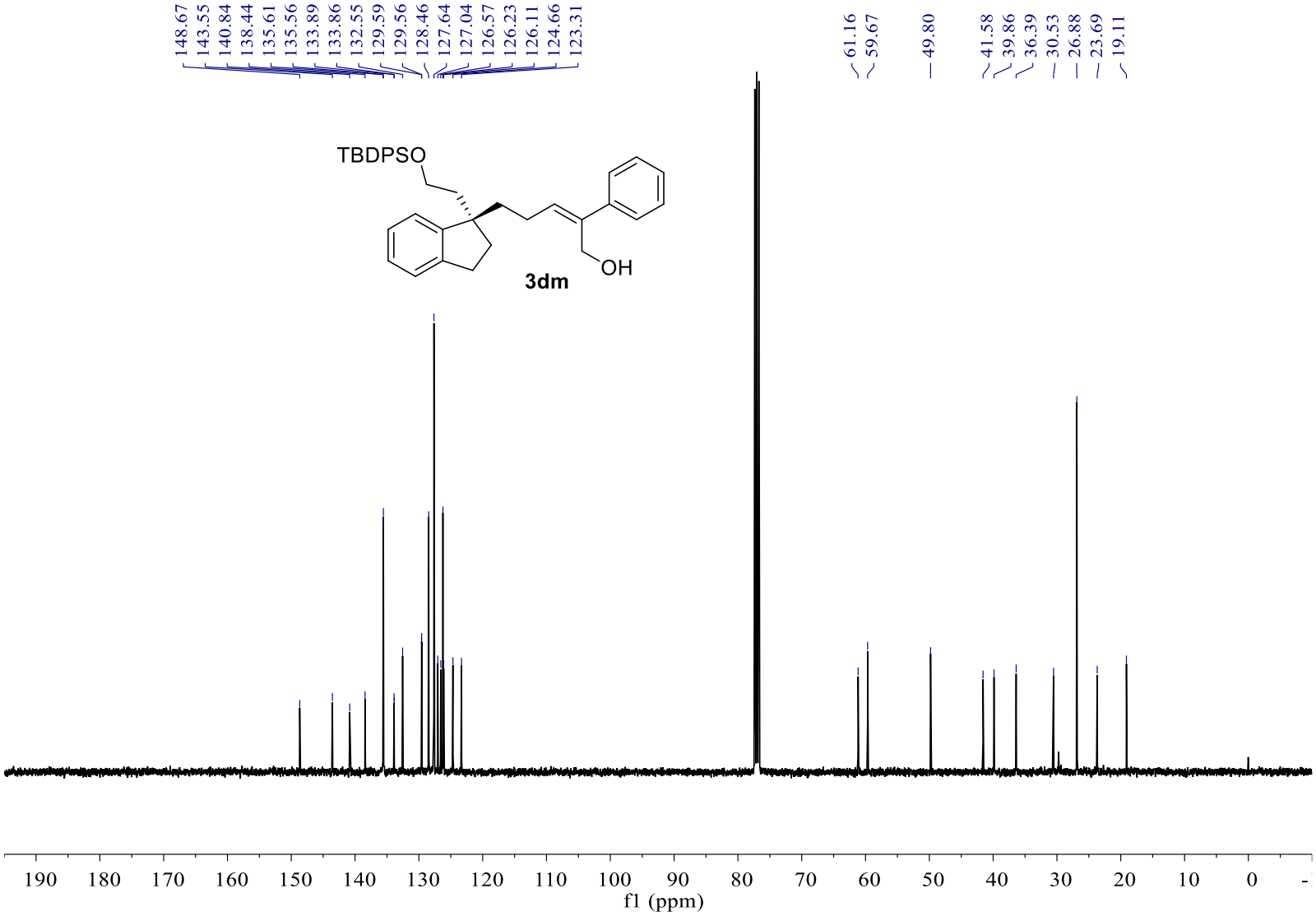
TBDPSO
OH
3dm
4.11 10.28 1.15 3.06 1.01 1.00 1.99 2.07 2.01 6.12 1.08 1.08 9.10
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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133.86
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127.64
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126.57
126.23
126.11
124.66
123.31
61.16
59.67
49.80
41.58
39.86
36.39
30.53
26.88
23.69
19.11
TBDPSO
OH
3dm
190
180
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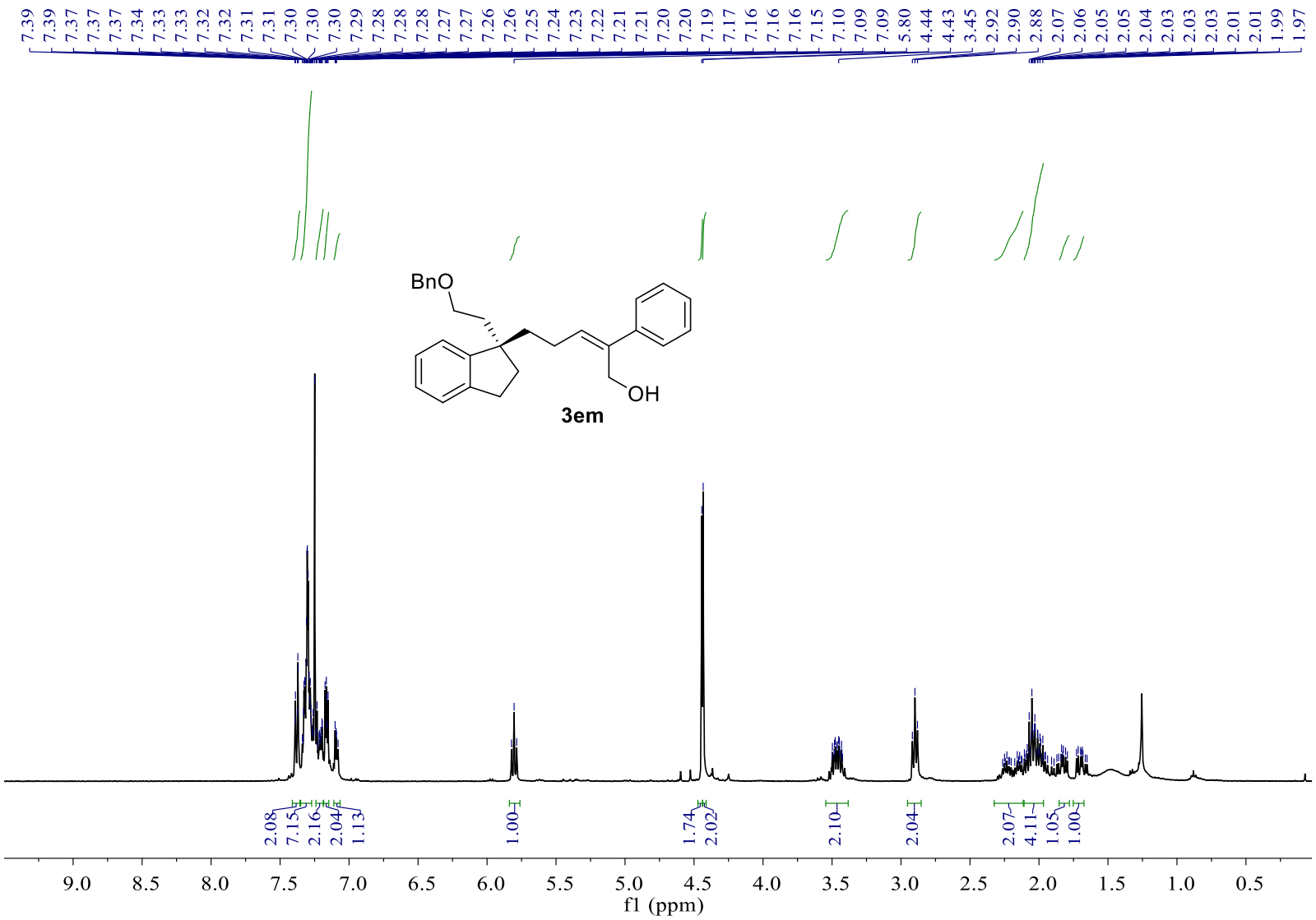
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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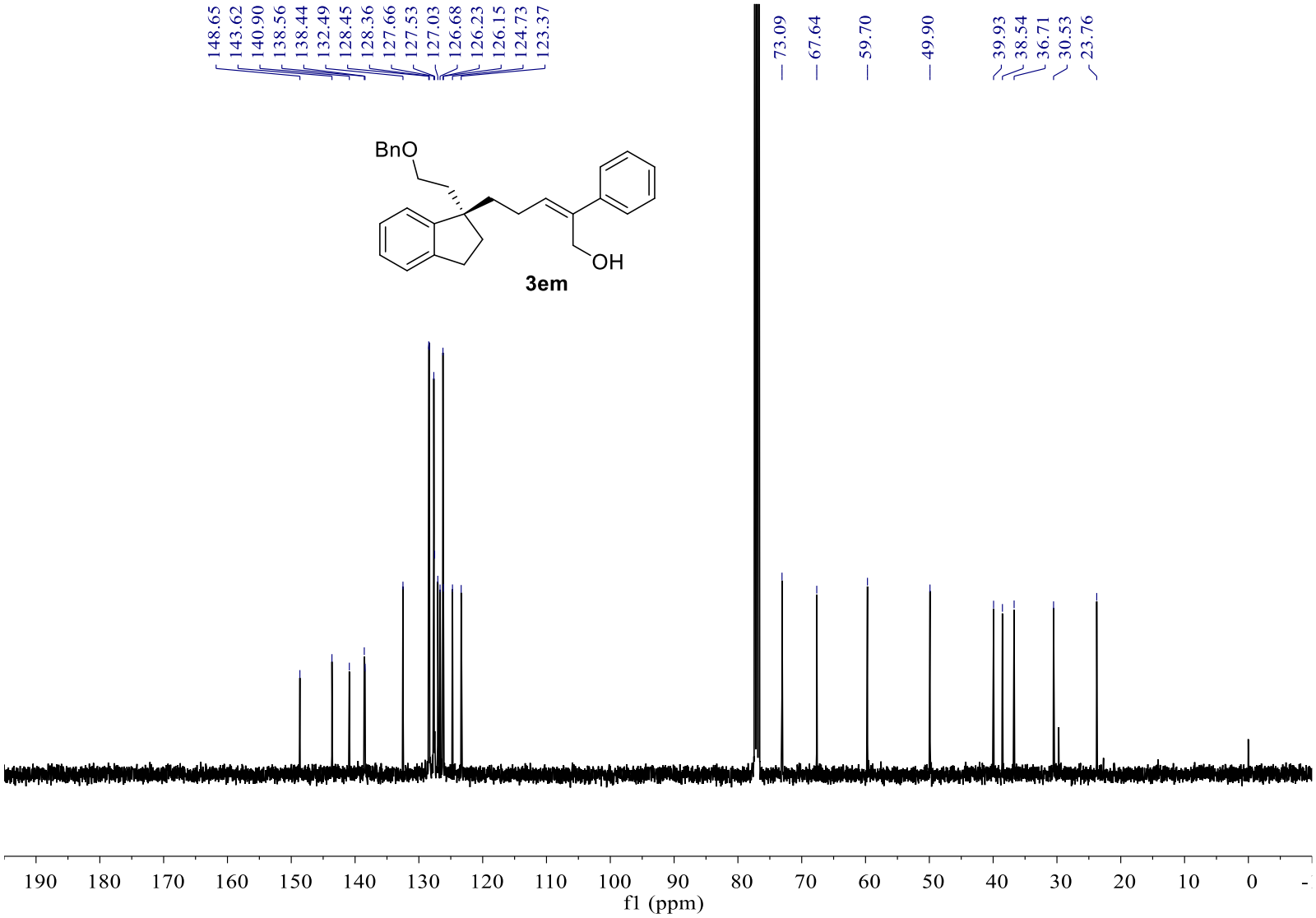
BnO
OH
3em
2.08 7.15 2.16 2.04 1.13 1.00 1.74 2.02 2.10 2.04 2.07 4.11 1.05 1.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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128.36
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127.53
127.03
126.68
126.23
126.15
124.73
123.37
73.09
67.64
59.70
49.90
39.93
38.54
36.71
30.53
23.76
BnO
OH
3em
190
180
170
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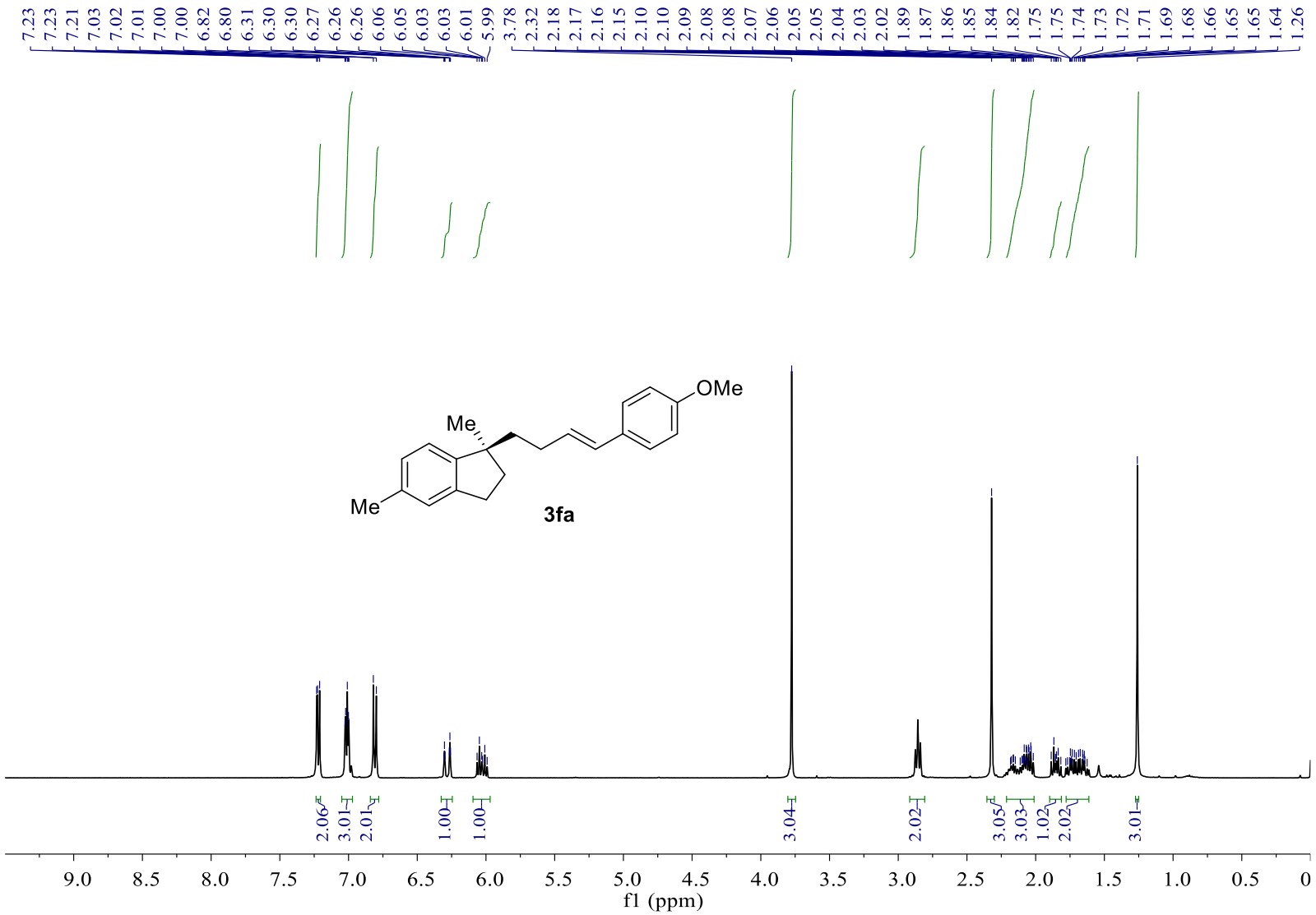
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.00
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6.30
6.30
6.27
6.26
6.26
6.06
6.05
6.03
6.03
6.01
5.99
3.78
2.32
2.18
2.17
2.16
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2.06
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1.74
1.73
1.72
1.71
1.69
1.68
1.66
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1.65
1.64
1.26
OMe
Me
Me
3fa
2.06
3.01
2.01
1.00
1.00
3.04
2.02
3.05
3.03
1.02
2.02
3.01
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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4.0
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3.0
2.5
2.0
1.5
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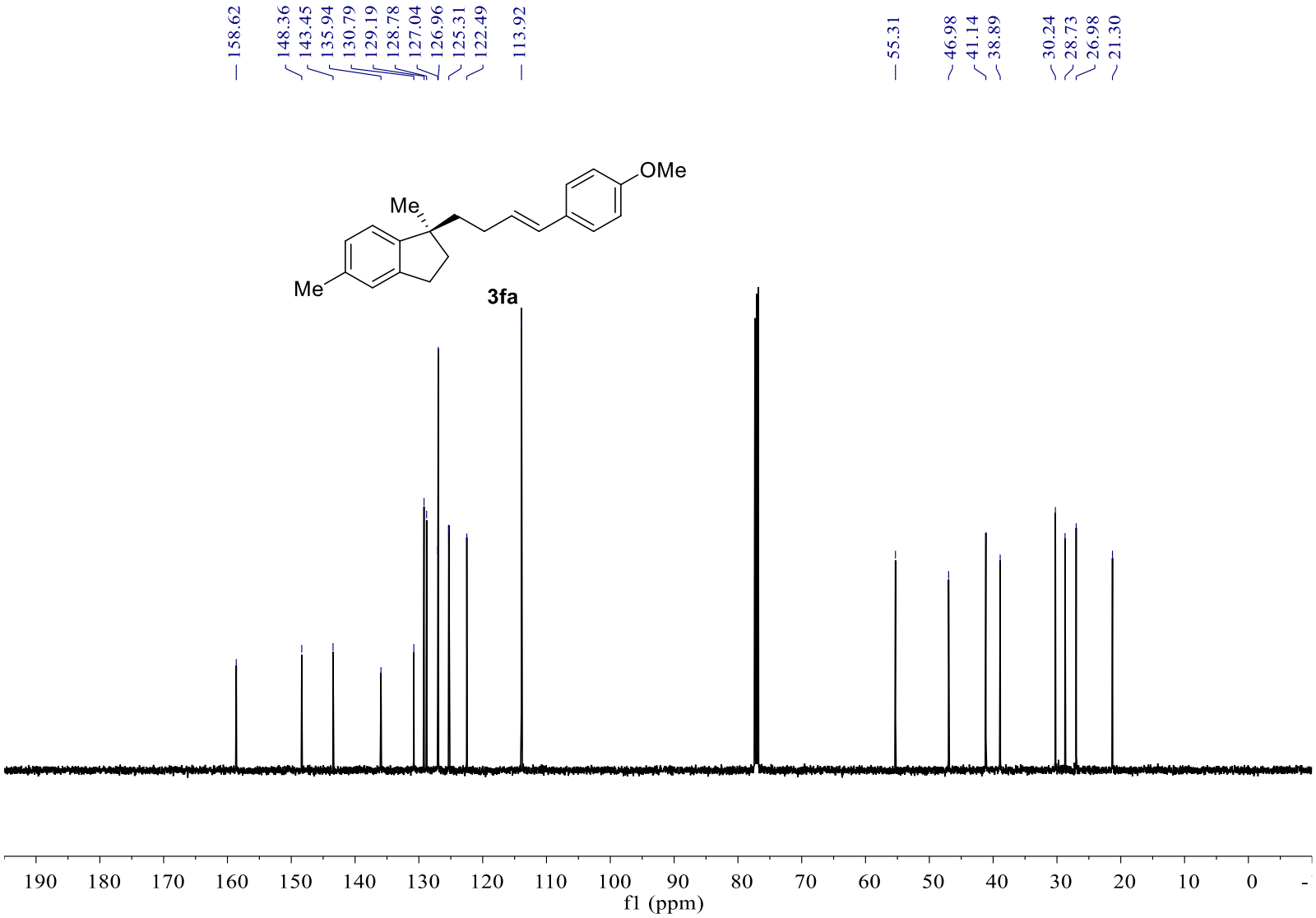
0
f1 (ppm)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127.04
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125.31
122.49
113.92
55.31
46.98
41.14
38.89
30.24
28.73
26.98
21.30
OMe
Me
Me
3fa
190
180
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130
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110
100
90
80
70
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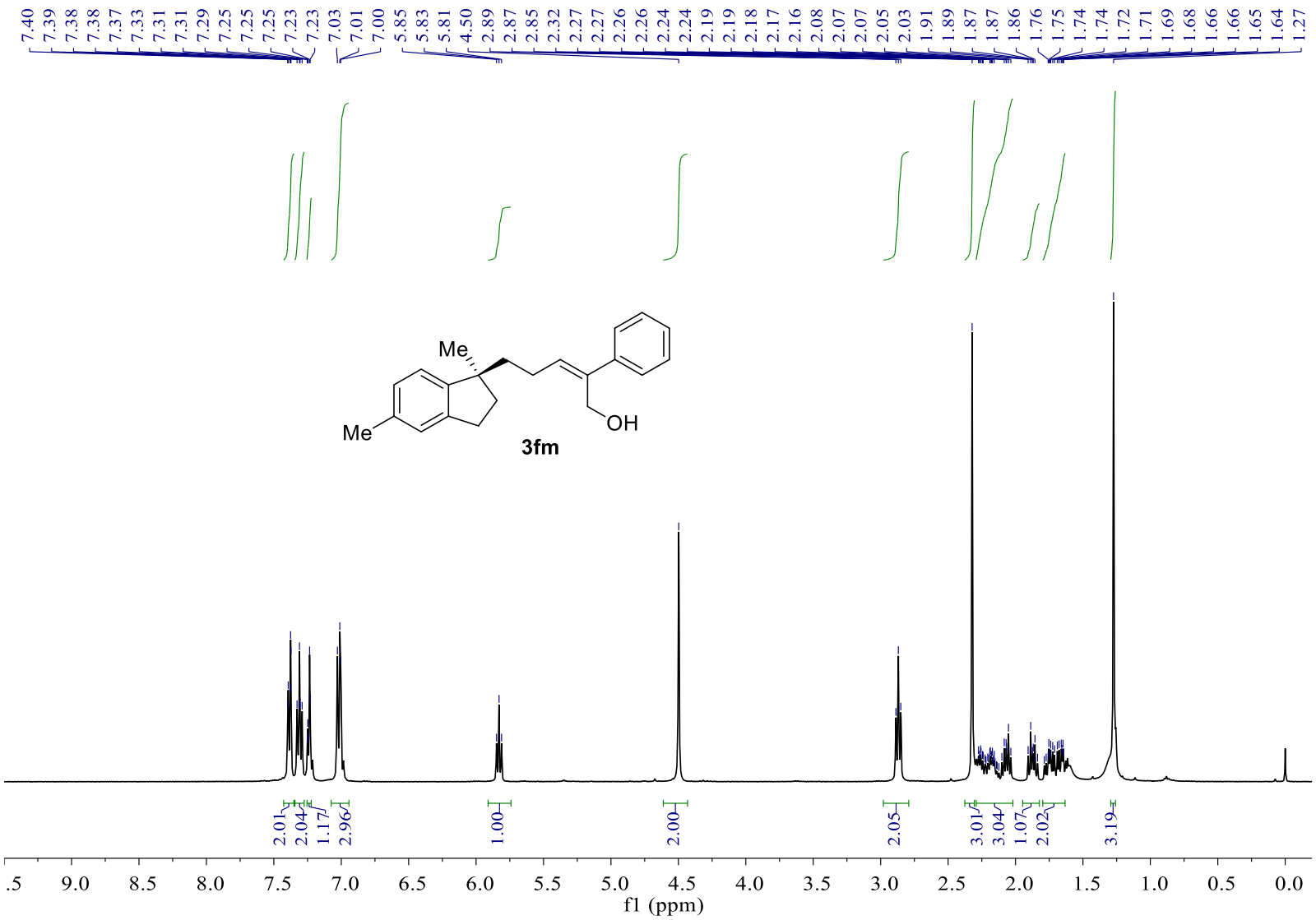
50
40
30
20
10
0
f1 (ppm)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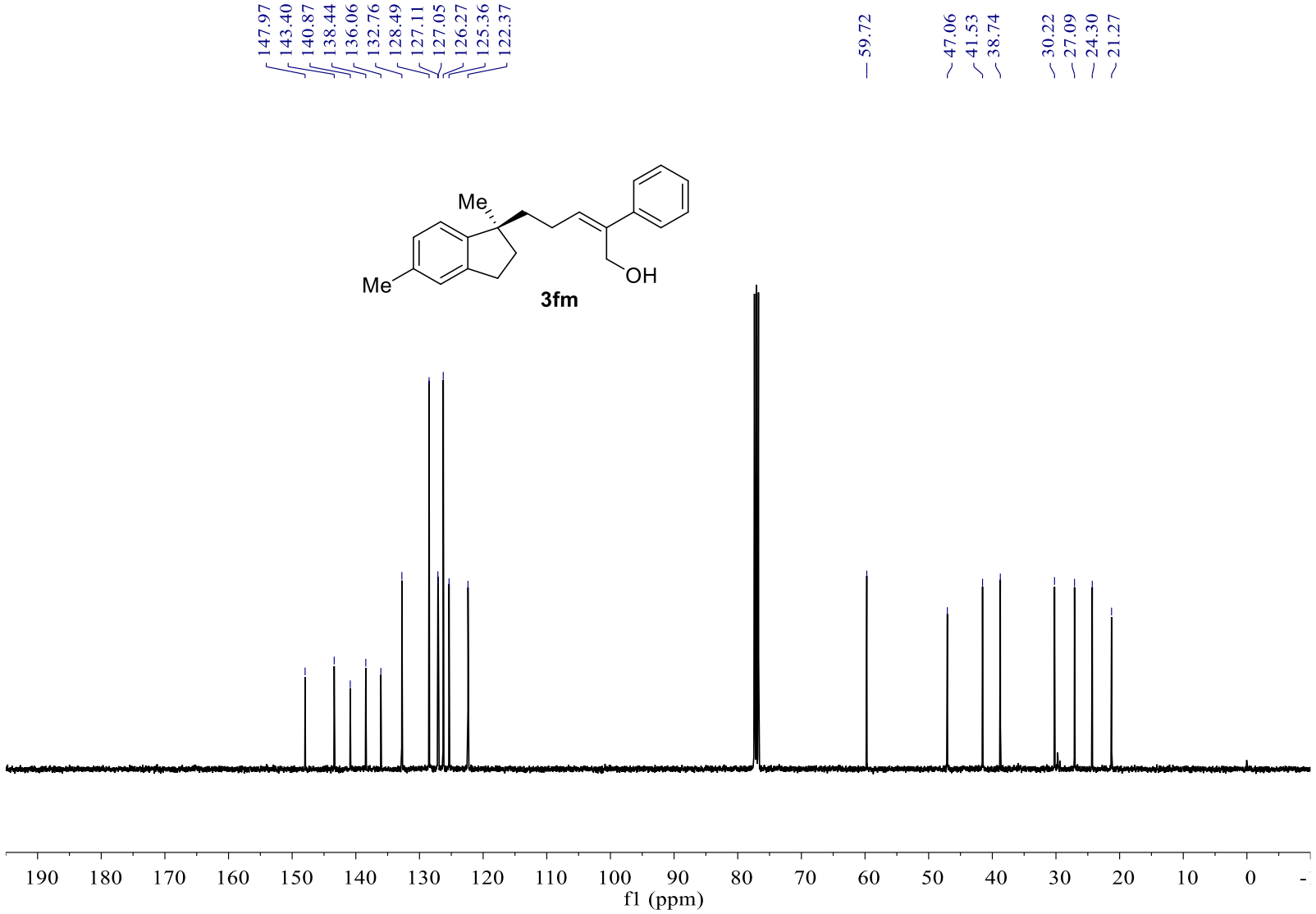
Me
Me
OH
3fm
2.01 2.04 1.17 2.96 1.00 2.00 2.05 3.01 3.04 1.07 2.02 3.19
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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140.87
138.44
136.06
132.76
128.49
127.11
127.05
126.27
125.36
122.37
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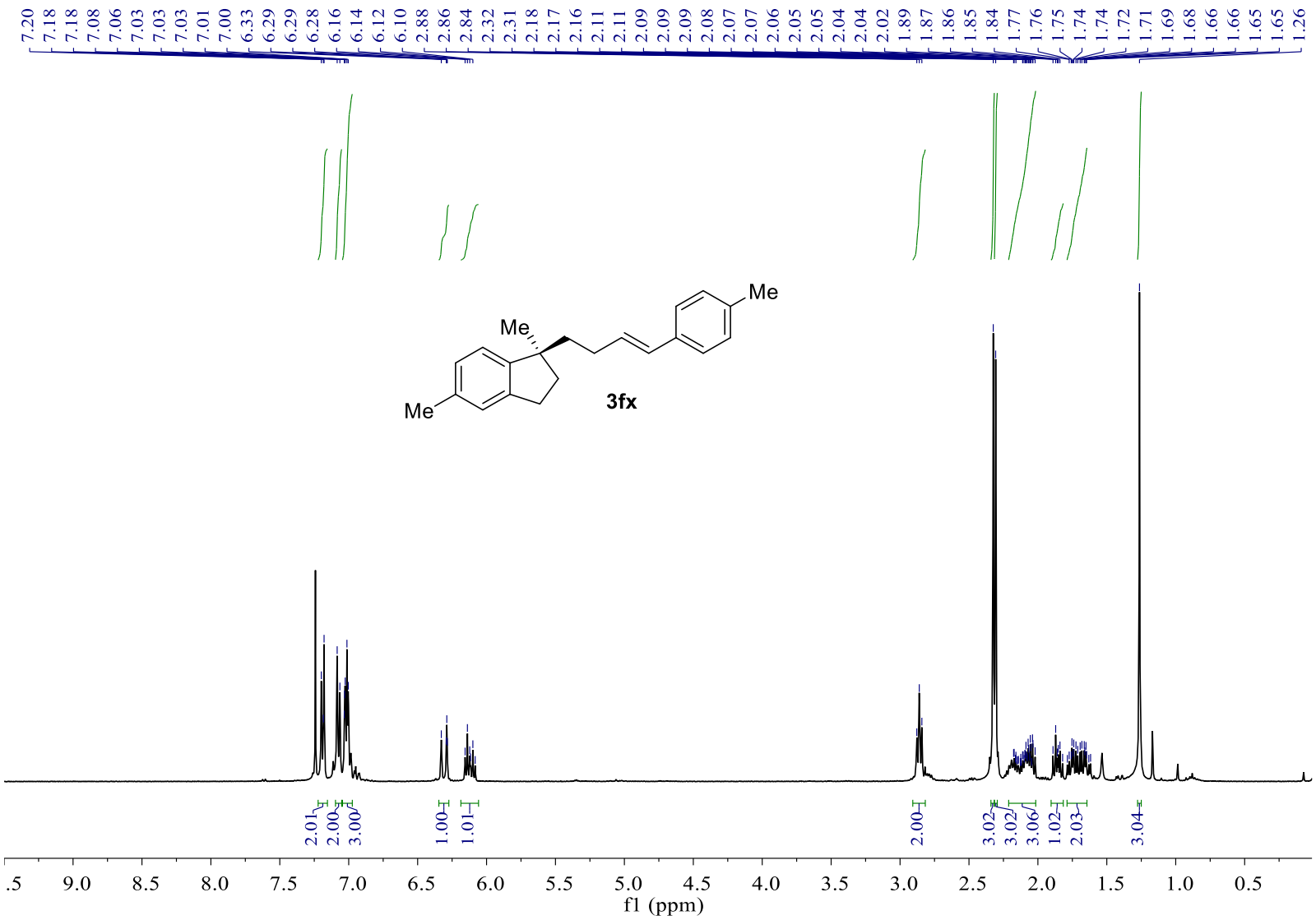
47.06
41.53
38.74
30.22
27.09
24.30
21.27
Me
Me
OH
3fm
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)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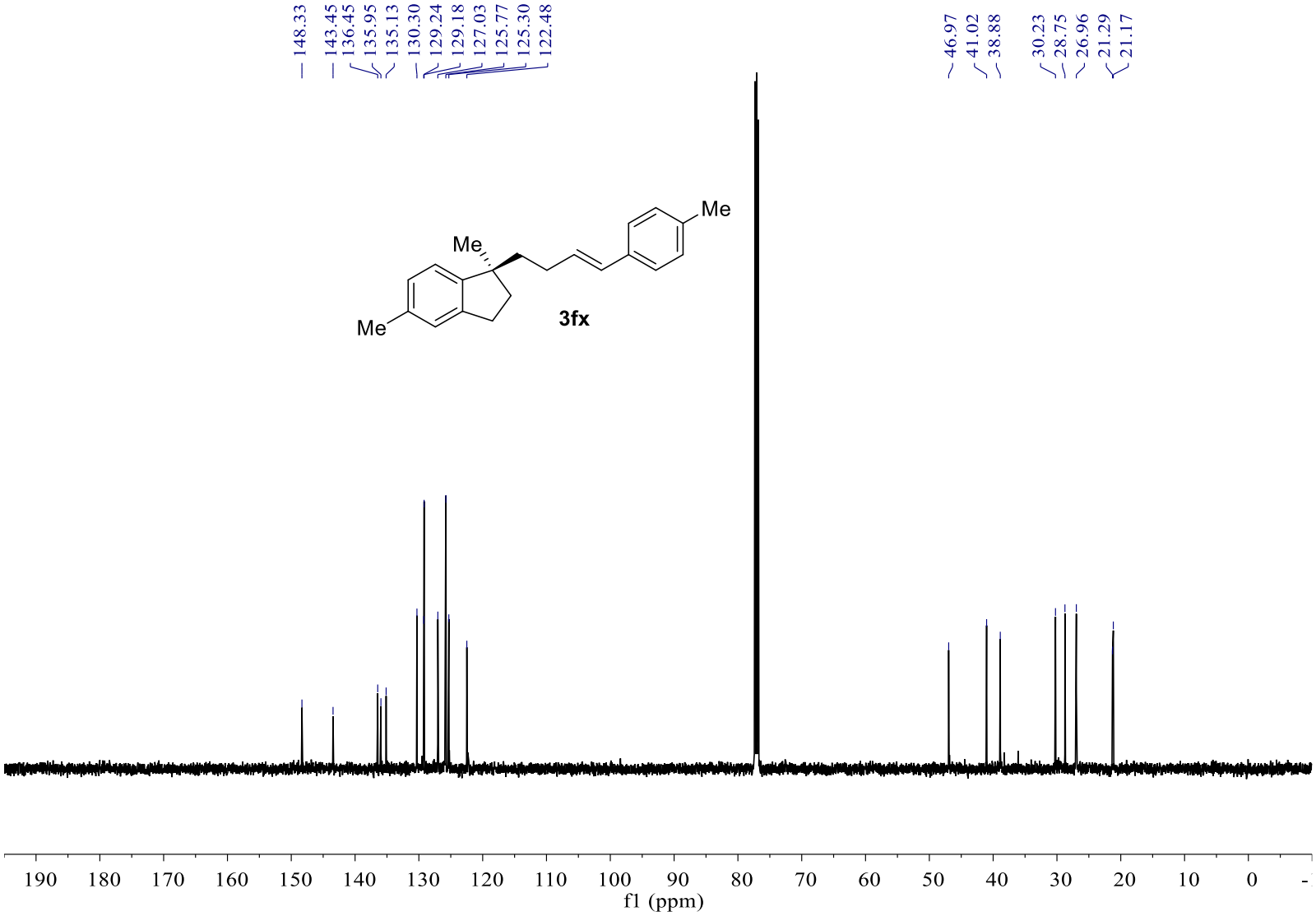
Me
Me
Me
3fx
2.01 2.00 3.00 1.00 1.01 2.00 3.02 3.02 3.06 1.02 2.03 3.04
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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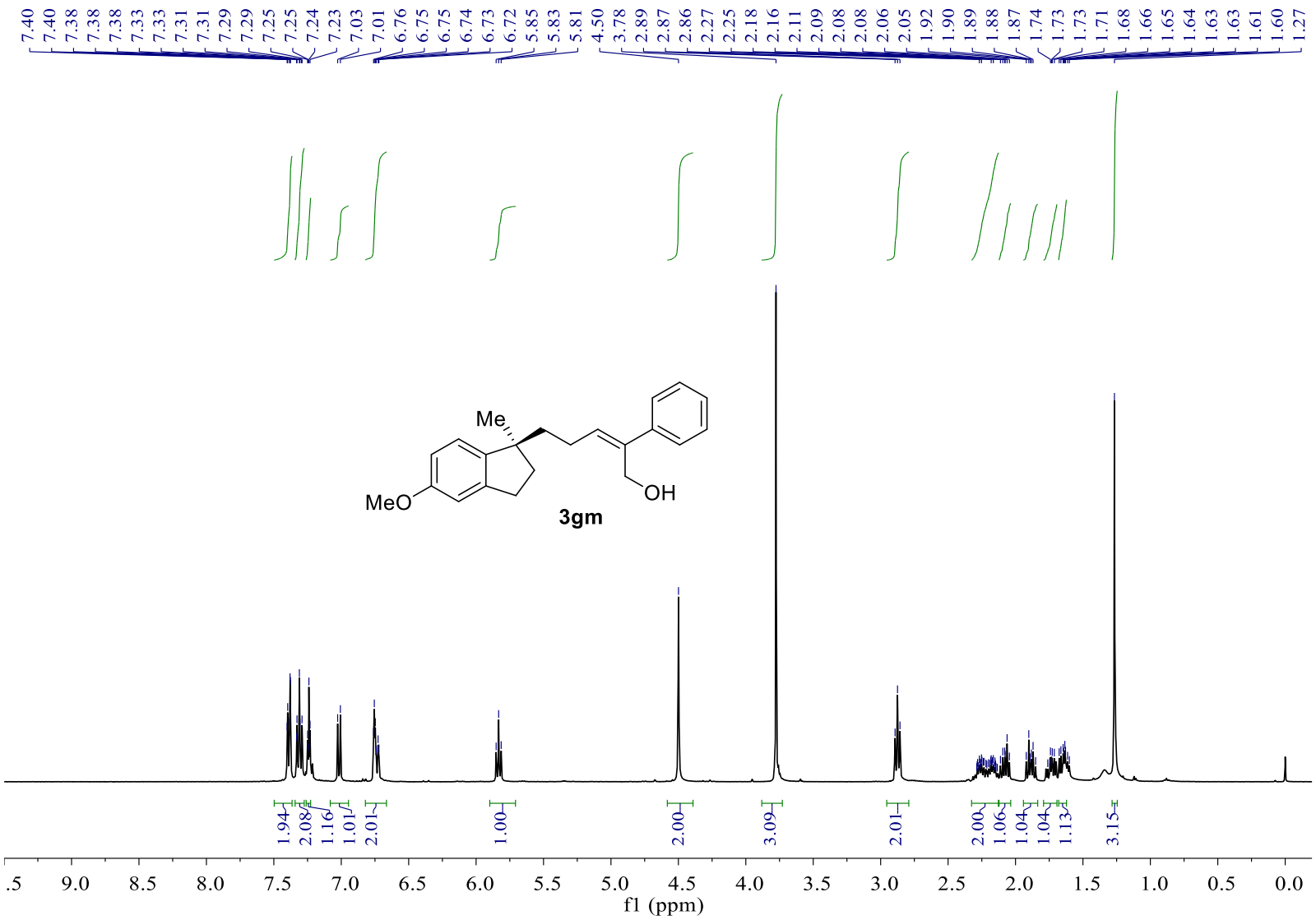
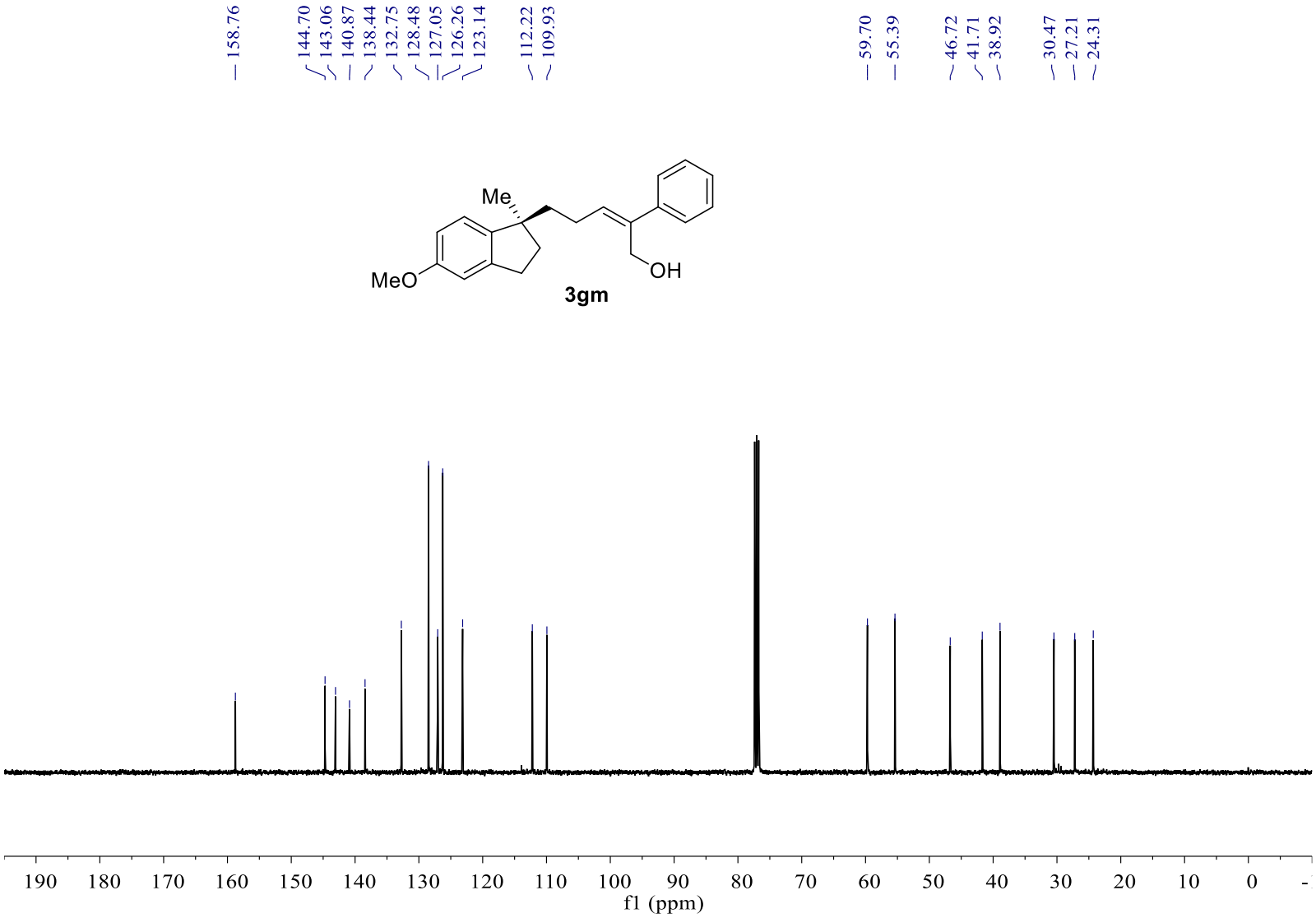
143.45
136.45
135.95
135.13
130.30
129.24
129.18
127.03
125.77
125.30
122.48
46.97
41.02
38.88
30.23
28.75
26.96
21.29
21.17
Me
Me
Me
3fx
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.40 7.40 7.38 7.38 7.38 7.33 7.33 7.31 7.31 7.29 7.29 7.25 7.25 7.24 7.23 7.03 7.01 6.76 6.75 6.75 6.74 6.73 6.72 5.85 5.83 5.81 4.50 3.78 2.89 2.87 2.86 2.27 2.25 2.18 2.16 2.11 2.09 2.08 2.08 2.06 2.05 1.92 1.90 1.89 1.88 1.87 1.74 1.73 1.73 1.71 1.68 1.66 1.65 1.64 1.63 1.63 1.61 1.60 1.27
Me
MeO
OH
3gm
1.94 2.08 1.16 1.01 2.01 1.00 2.00 3.09 2.01 2.00 1.06 1.04 1.04 1.13 3.15
.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
f1 (ppm)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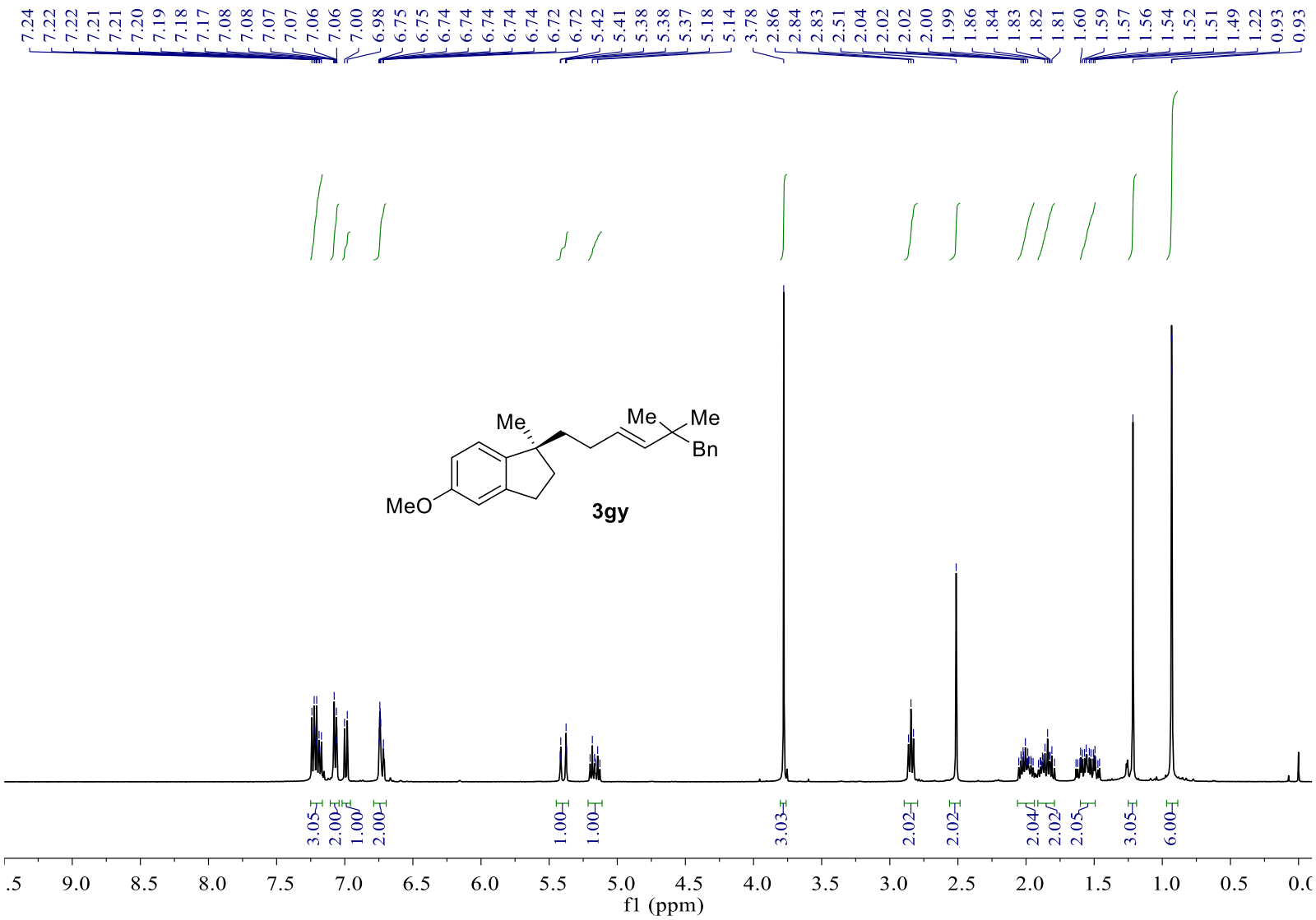
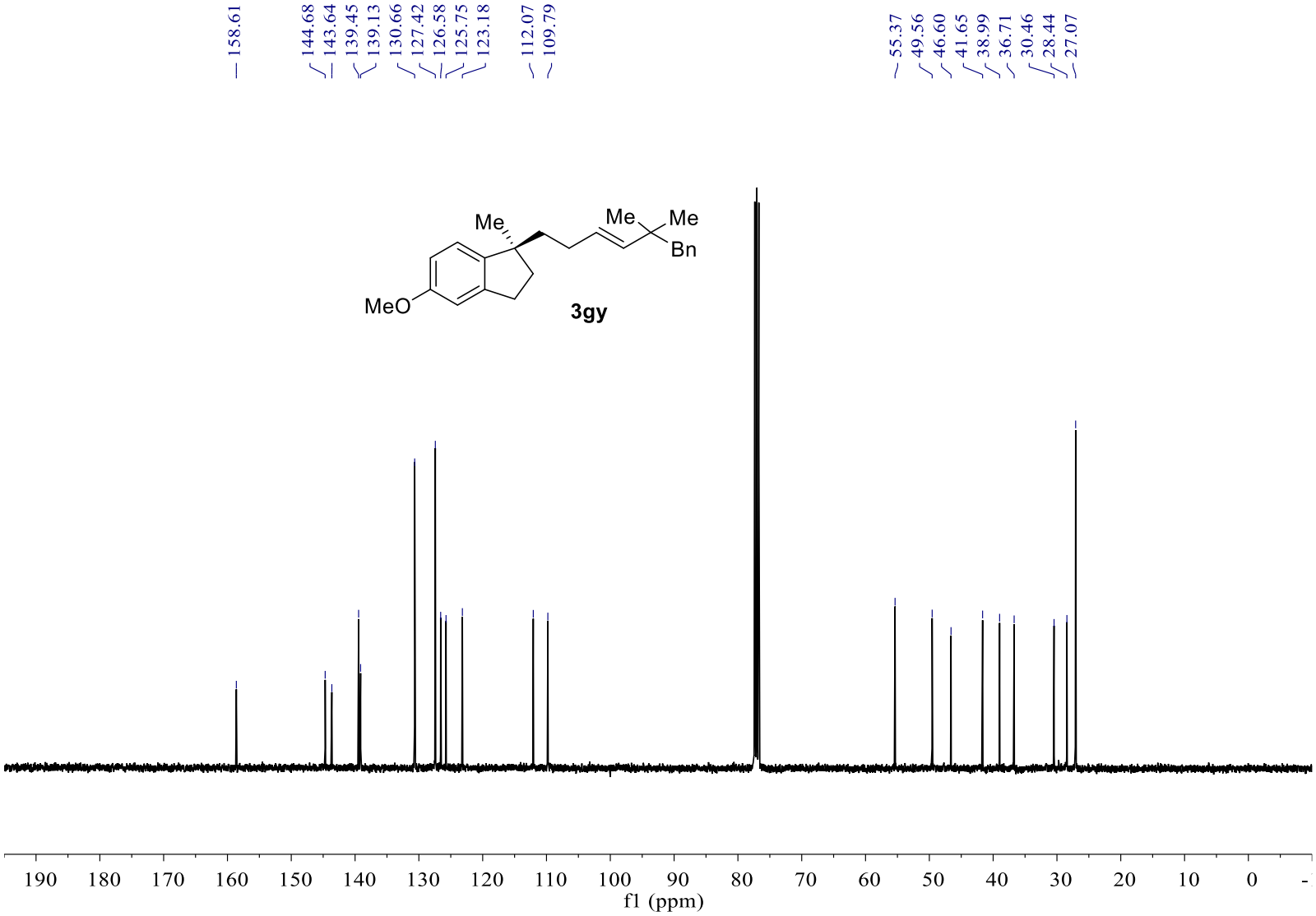
127.05
126.26
123.14
112.22
109.93
59.70
55.39
46.72
41.71
38.92
30.47
27.21
24.31
Me
MeO
OH
3gm
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.24 7.22 7.22 7.21 7.21 7.20 7.19 7.18 7.17 7.08 7.08 7.07 7.07 7.06 7.06 7.00 6.98 6.75 6.75 6.74 6.74 6.74 6.74 6.74 6.72 6.72 5.42 5.41 5.38 5.38 5.37 5.18 5.14 3.78 2.86 2.84 2.83 2.51 2.04 2.02 2.02 2.00 1.99 1.86 1.84 1.83 1.82 1.81 1.60 1.59 1.57 1.56 1.54 1.52 1.51 1.49 1.22 0.93 0.93
Me
Me
Me
Bn
MeO
3gy
3.05 2.00 1.00 2.00 1.00 1.00 3.03 2.02 2.02 2.04 2.02 2.05 3.05 6.00
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
f1 (ppm)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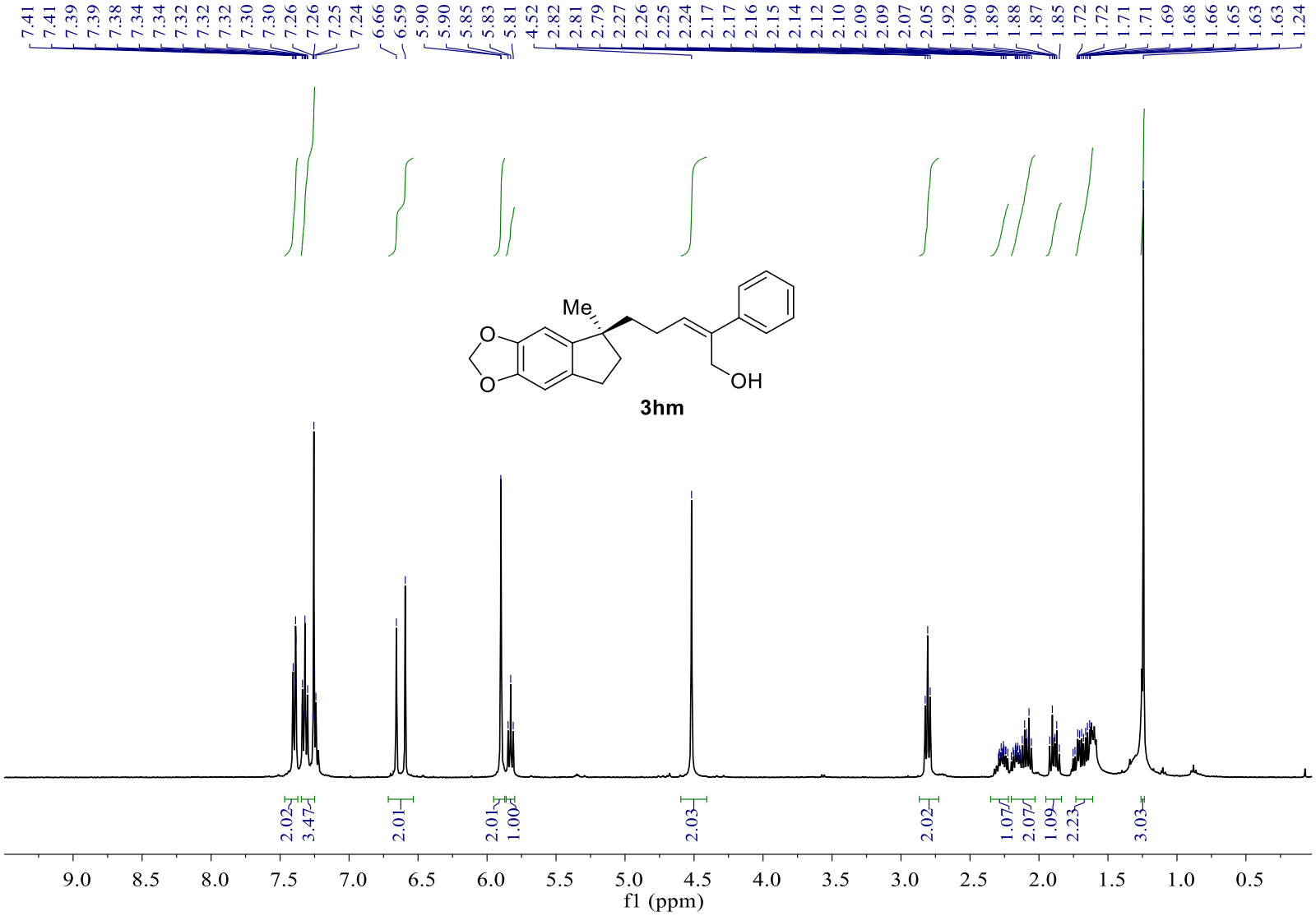
130.66
127.42
126.58
125.75
123.18
112.07
109.79
55.37
49.56
46.60
41.65
38.99
36.71
30.46
28.44
27.07
Me
Me
Me
Bn
MeO
3gy
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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7.32
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7.30
7.30
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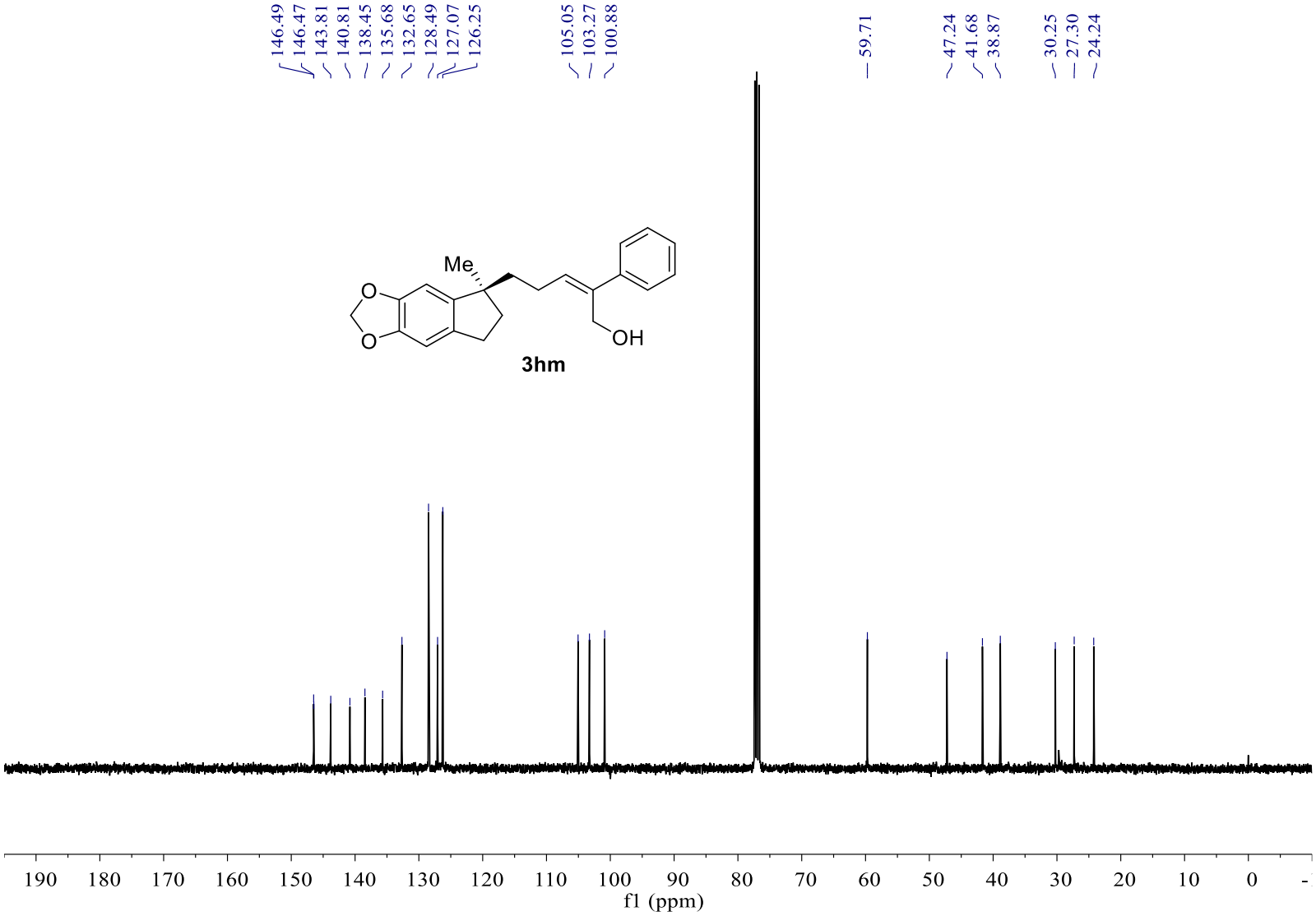
7.26
7.25
7.24
6.66
6.59
5.90
5.90
5.85
5.83
5.81
4.52
2.82
2.81
2.79
2.27
2.26
2.25
2.24
2.17
2.17
2.16
2.15
2.14
2.12
2.10
2.09
2.09
2.07
2.05
1.92
1.90
1.89
1.88
1.87
1.85
1.72
1.72
1.71
1.71
1.69
1.68
1.66
1.65
1.63
1.63
1.24
Me
O
O
OH
3hm
2.02
3.47
2.01
2.01
1.00
2.03
2.02
1.07
2.07
1.09
2.23
3.03
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
f1 (ppm)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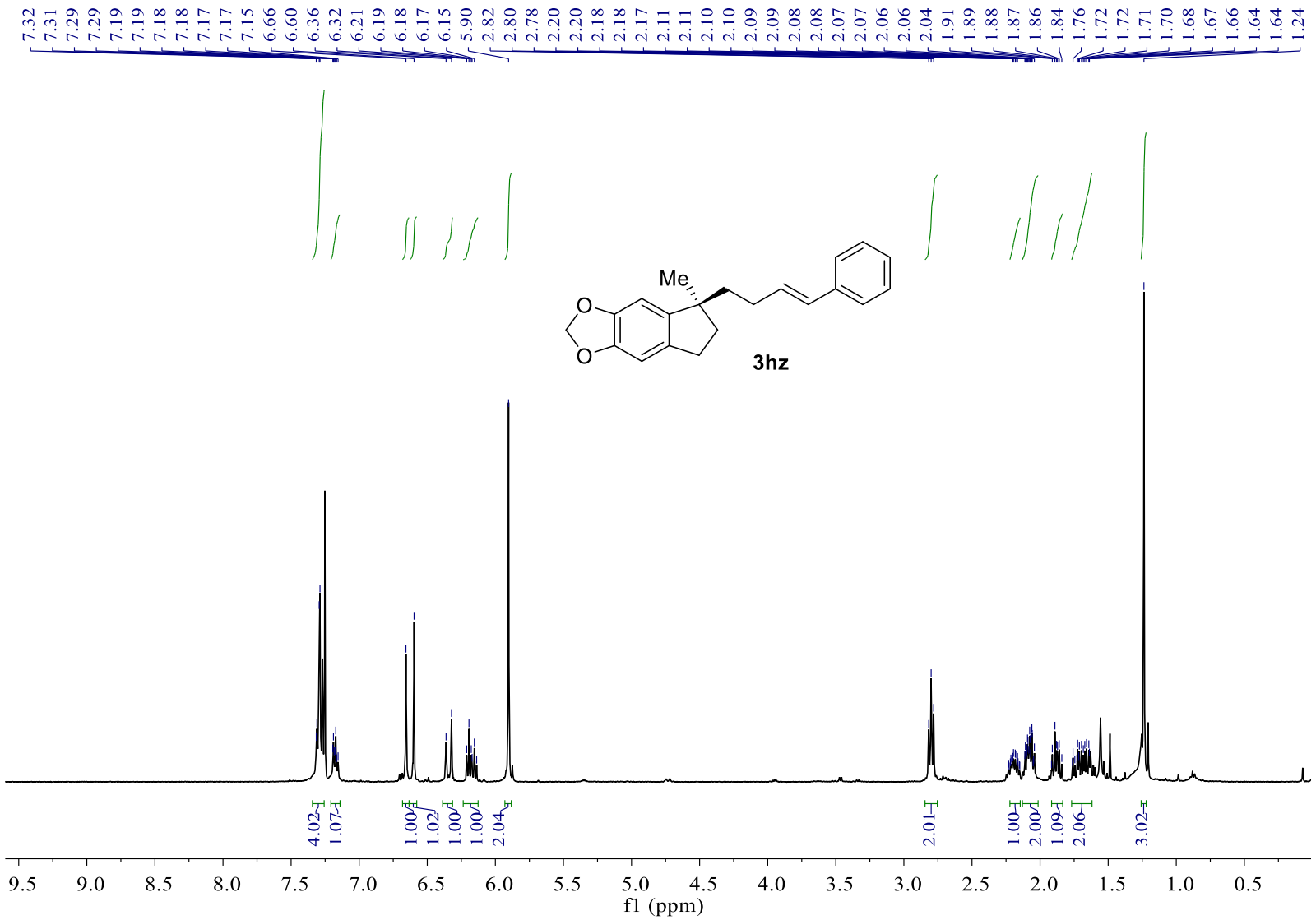
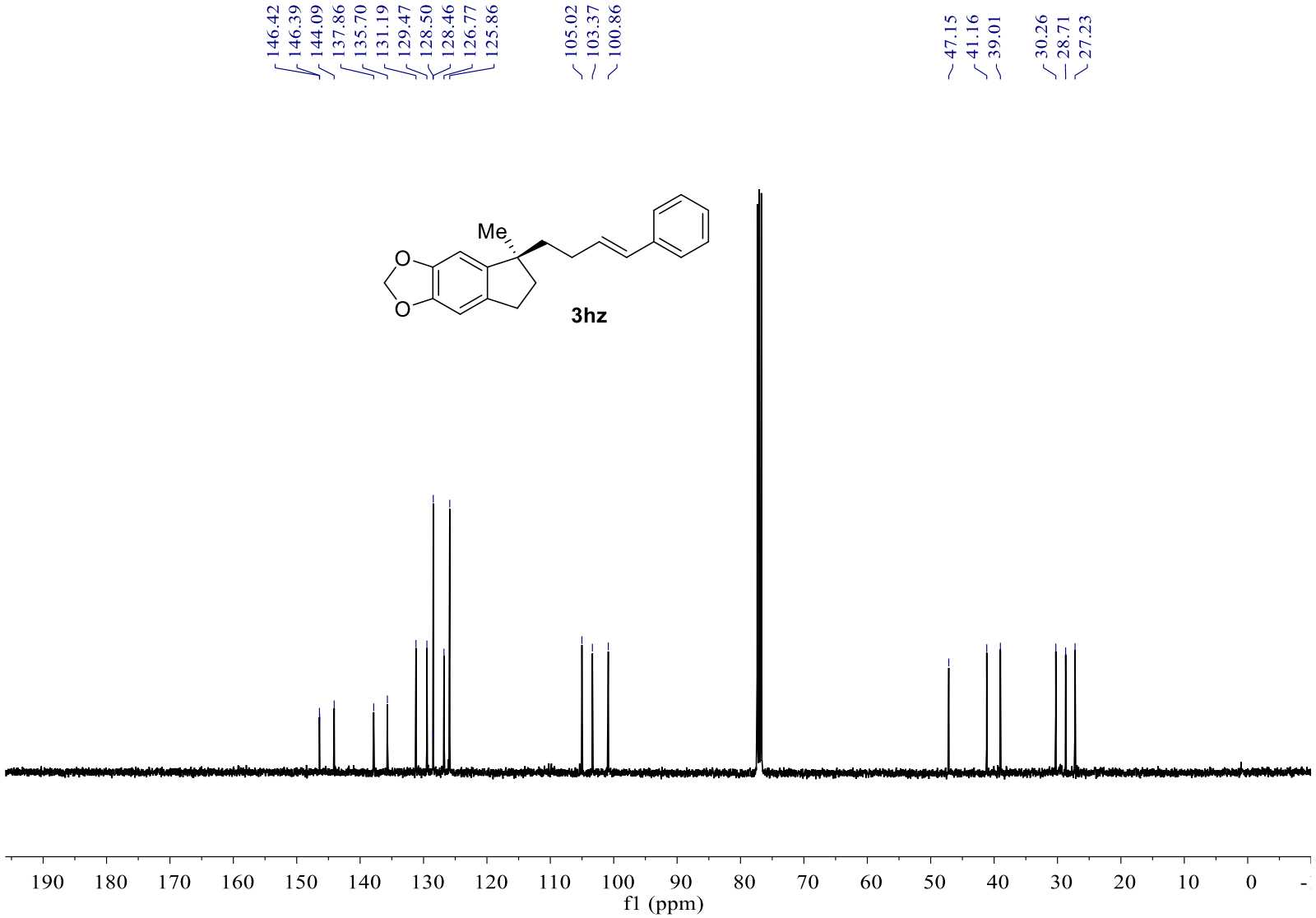
143.81
140.81
138.45
135.68
132.65
128.49
127.07
126.25
105.05
103.27
100.88
59.71
47.24
41.68
38.87
30.25
27.30
24.24
Me
O
O
OH
3hm
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.32 7.31 7.29 7.29 7.19 7.19 7.18 7.18 7.17 7.17 7.15 6.66 6.60 6.36 6.32 6.21 6.19 6.18 6.17 6.15 5.90 2.82 2.80 2.78 2.20 2.20 2.18 2.18 2.17 2.11 2.11 2.10 2.10 2.09 2.09 2.08 2.08 2.07 2.07 2.06 2.06 2.04 1.91 1.89 1.88 1.87 1.86 1.84 1.76 1.72 1.72 1.71 1.70 1.68 1.67 1.66 1.64 1.64 1.24
Me
O
O
3hz
4.02 1.07 1.00 1.02 1.00 1.00 2.04 2.01 1.00 2.00 1.09 2.06 3.02
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
f1 (ppm)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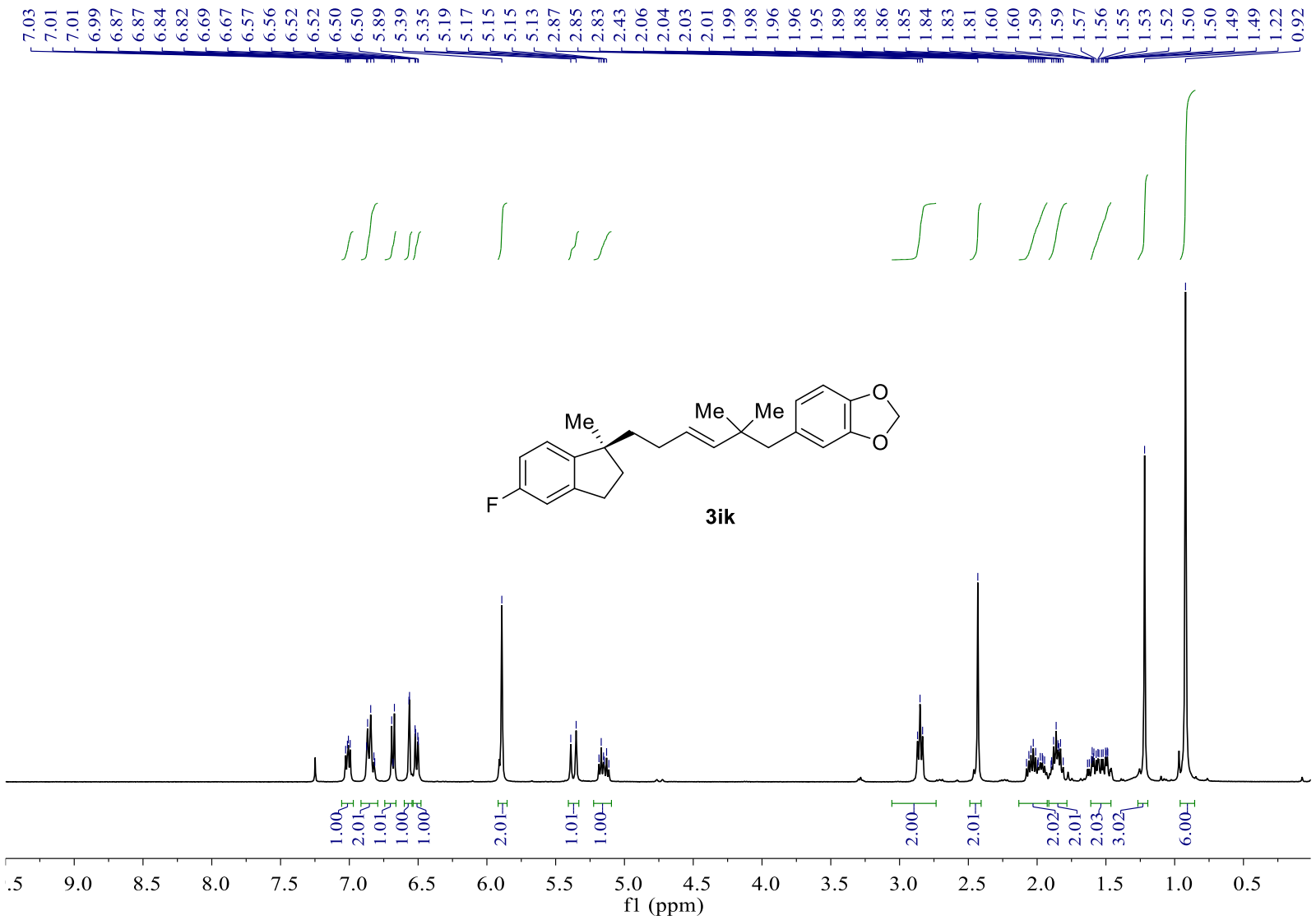
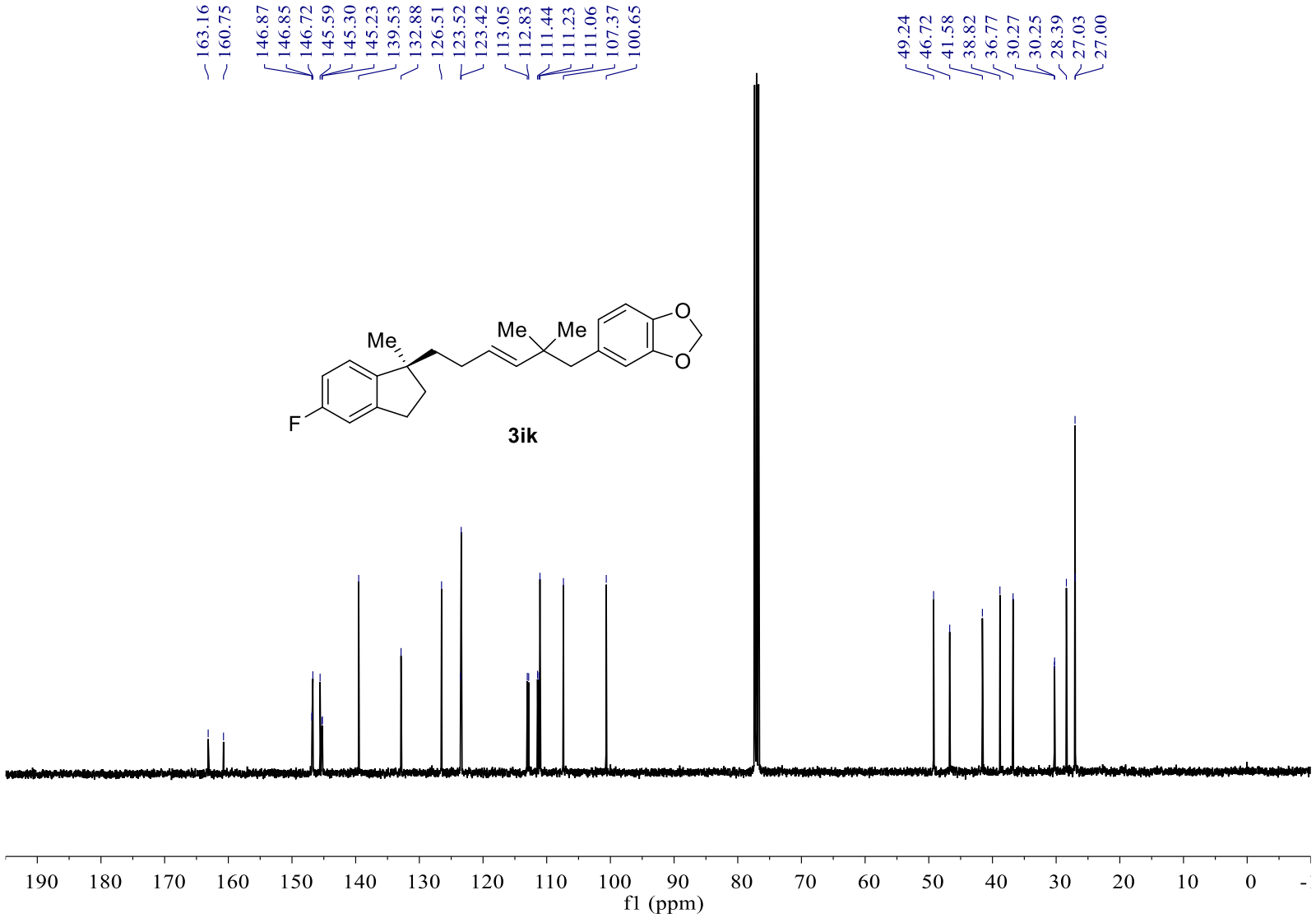
144.09
137.86
135.70
131.19
129.47
128.50
128.46
126.77
125.86
105.02
103.37
100.86
47.15
41.16
39.01
30.26
28.71
27.23
Me
O
O
3hz
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.03 7.01 7.01 6.99 6.87 6.87 6.84 6.82 6.69 6.67 6.57 6.56 6.52 6.52 6.50 6.50 5.89 5.39 5.35 5.19 5.17 5.15 5.15 5.13 2.87 2.85 2.83 2.43 2.06 2.04 2.03 2.01 1.99 1.98 1.96 1.96 1.95 1.89 1.88 1.86 1.85 1.84 1.83 1.81 1.60 1.60 1.59 1.59 1.57 1.56 1.55 1.53 1.52 1.50 1.50 1.49 1.49 1.22 0.92
Me
Me
Me
O
O
F
3ik
1.00 2.01 1.01 1.00 1.00 2.01 1.01 1.00 2.00 2.01 2.02 2.01 2.03 3.02 6.00
f1 (ppm)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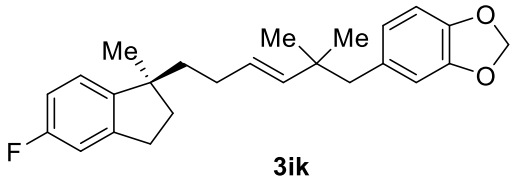
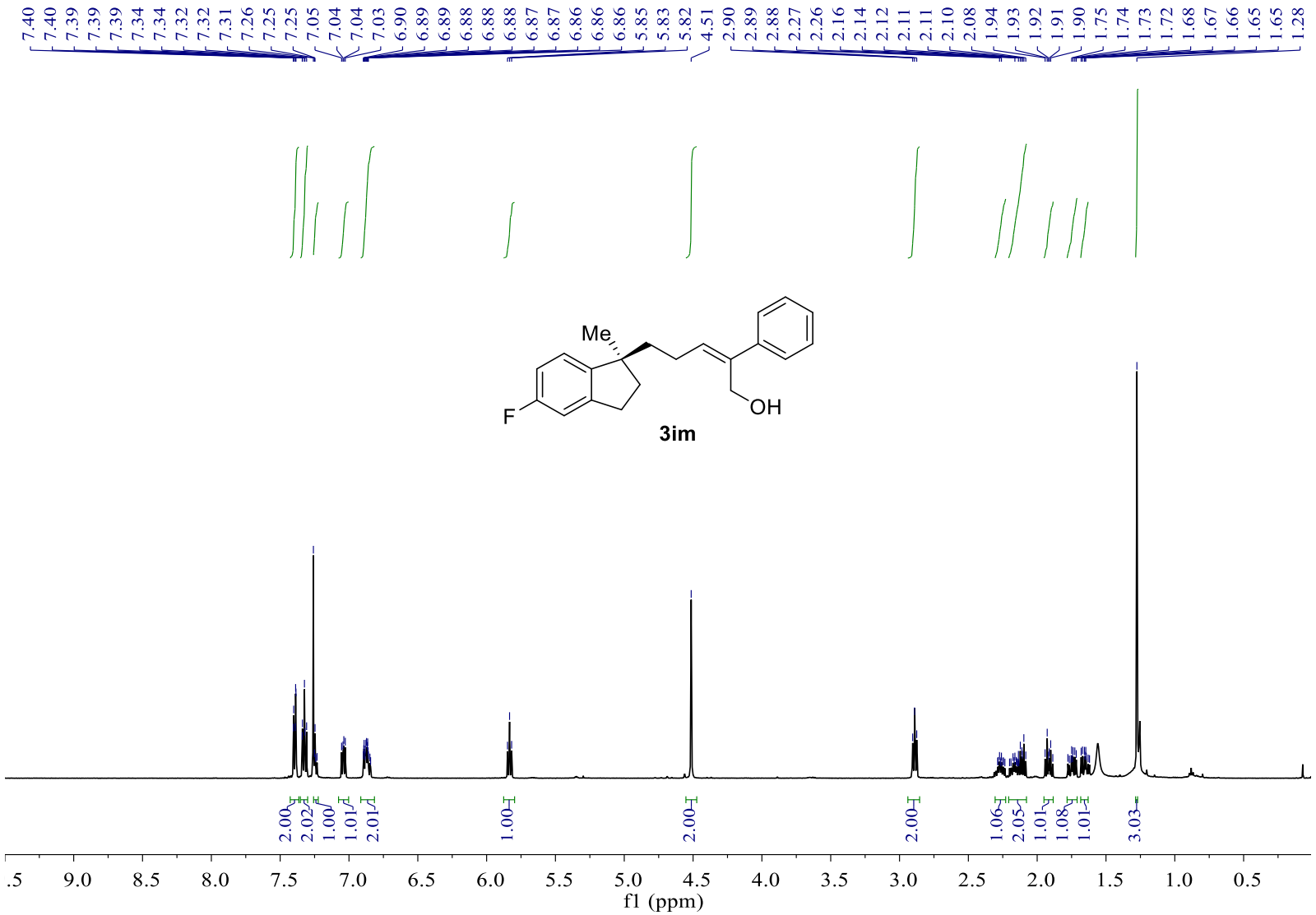
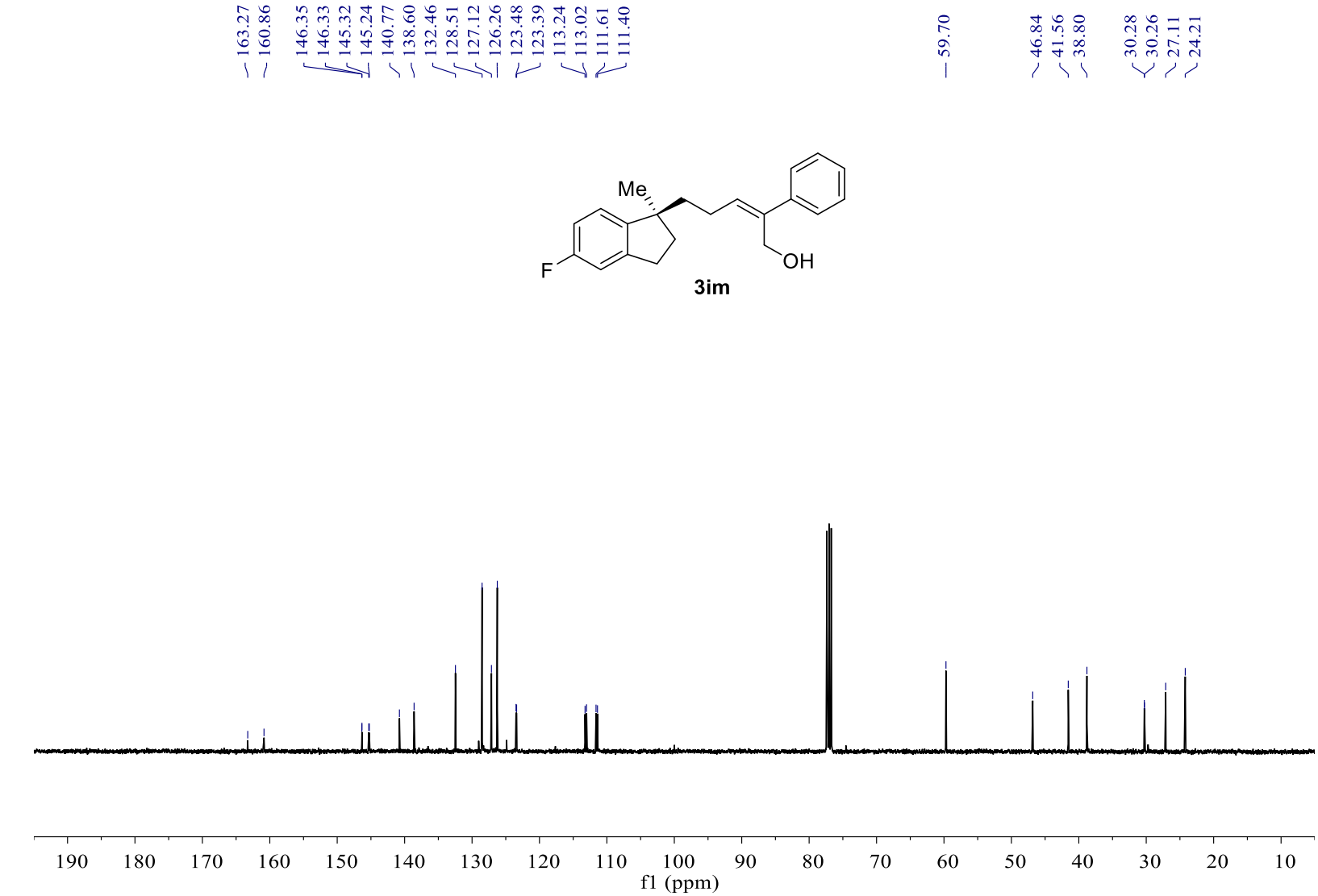
146.72
145.59
145.30
145.23
139.53
132.88
126.51
123.52
123.42
113.05
112.83
111.44
111.23
111.06
107.37
100.65
49.24
46.72
41.58
38.82
36.77
30.27
30.25
28.39
27.03
27.00
Me
Me
Me
O
O
F
3ik
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


Me
Me
Me
O
O
F

3ik

-117.96
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)


7.40 7.40 7.39 7.39 7.39 7.34 7.34 7.32 7.32 7.31 7.26 7.25 7.25 7.05 7.04 7.04 7.03 6.90 6.89 6.89 6.88 6.88 6.88 6.87 6.87 6.86 6.86 6.86 5.85 5.83 5.82 4.51 2.90 2.89 2.88 2.27 2.26 2.16 2.14 2.12 2.11 2.11 2.10 2.08 1.94 1.93 1.92 1.91 1.90 1.75 1.74 1.73 1.72 1.68 1.67 1.66 1.65 1.65 1.28
Me
F
OH
3im
2.00 2.02 1.00 1.01 2.01 1.00 2.00 2.00 1.06 2.05 1.01 1.08 1.01 3.03
.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
f1 (ppm)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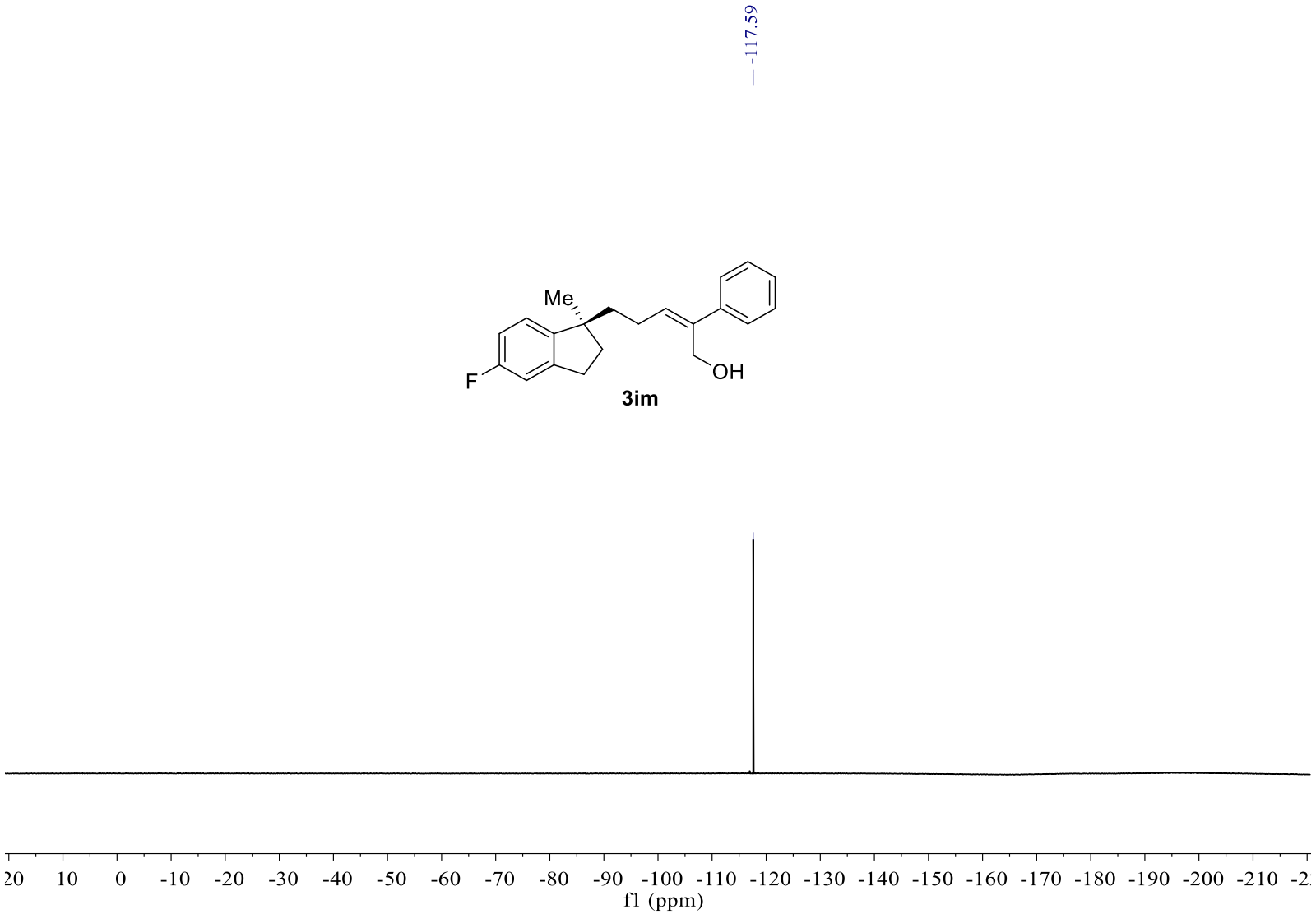
127.12
126.26
123.48
123.39
113.24
113.02
111.61
111.40
59.70
46.84
41.56
38.80
30.28
30.26
27.11
24.21
Me
F
OH
3im
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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Me
F
OH
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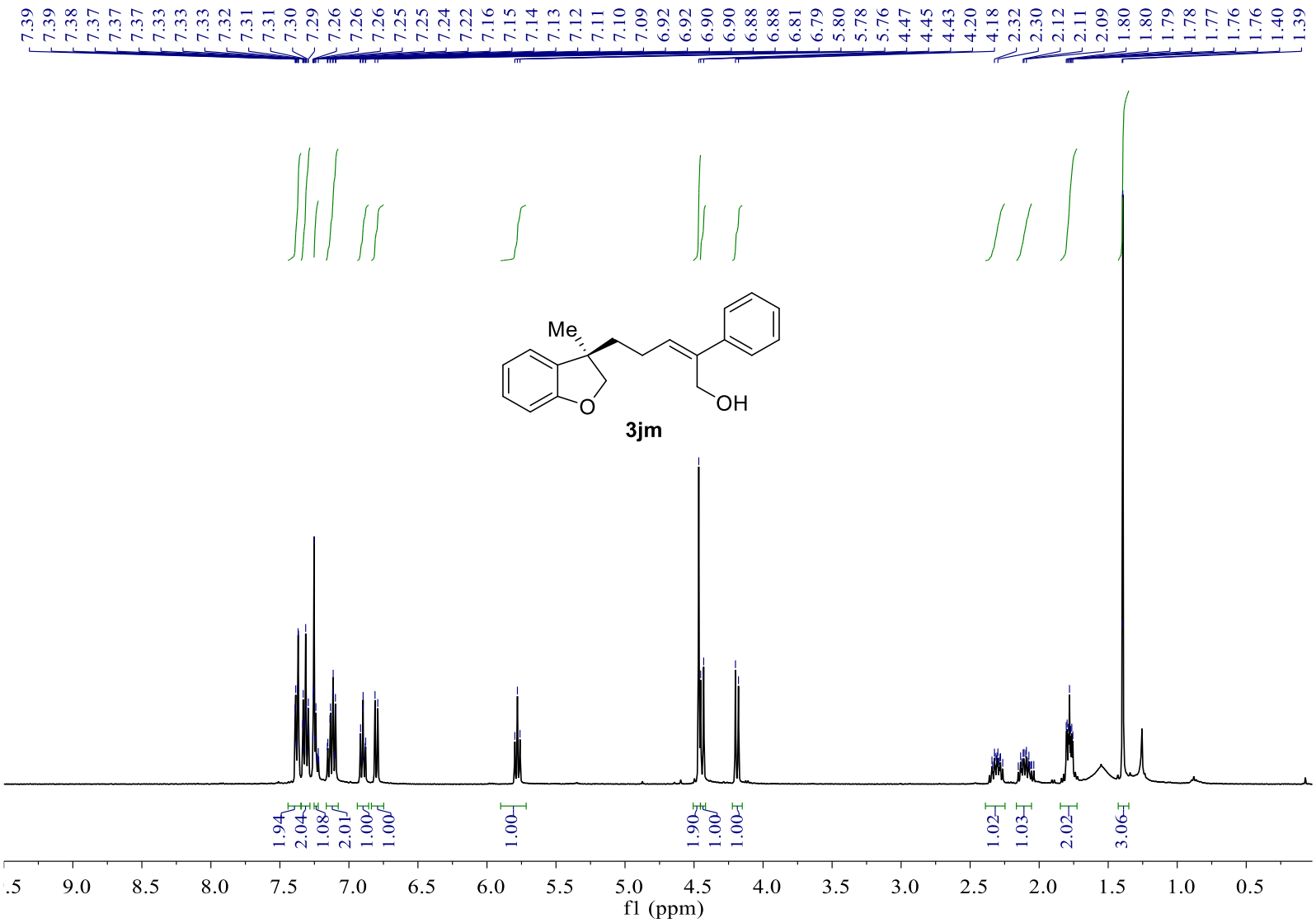
f1 (ppm)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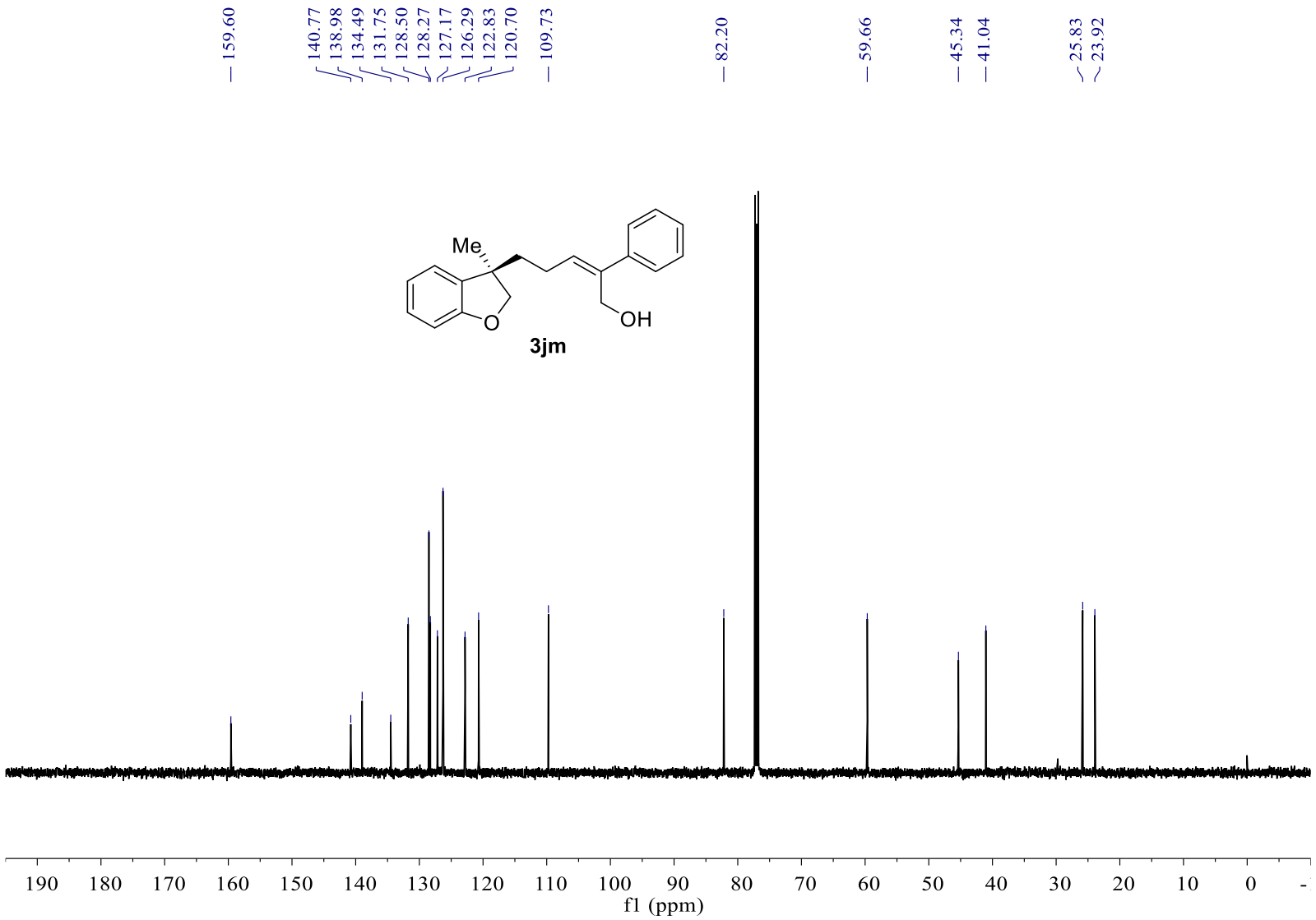
Me
O
OH
3jm
1.94 2.04 1.08 2.01 1.00 1.00 1.00 1.90 1.00 1.00 1.02 1.03 2.02 3.06
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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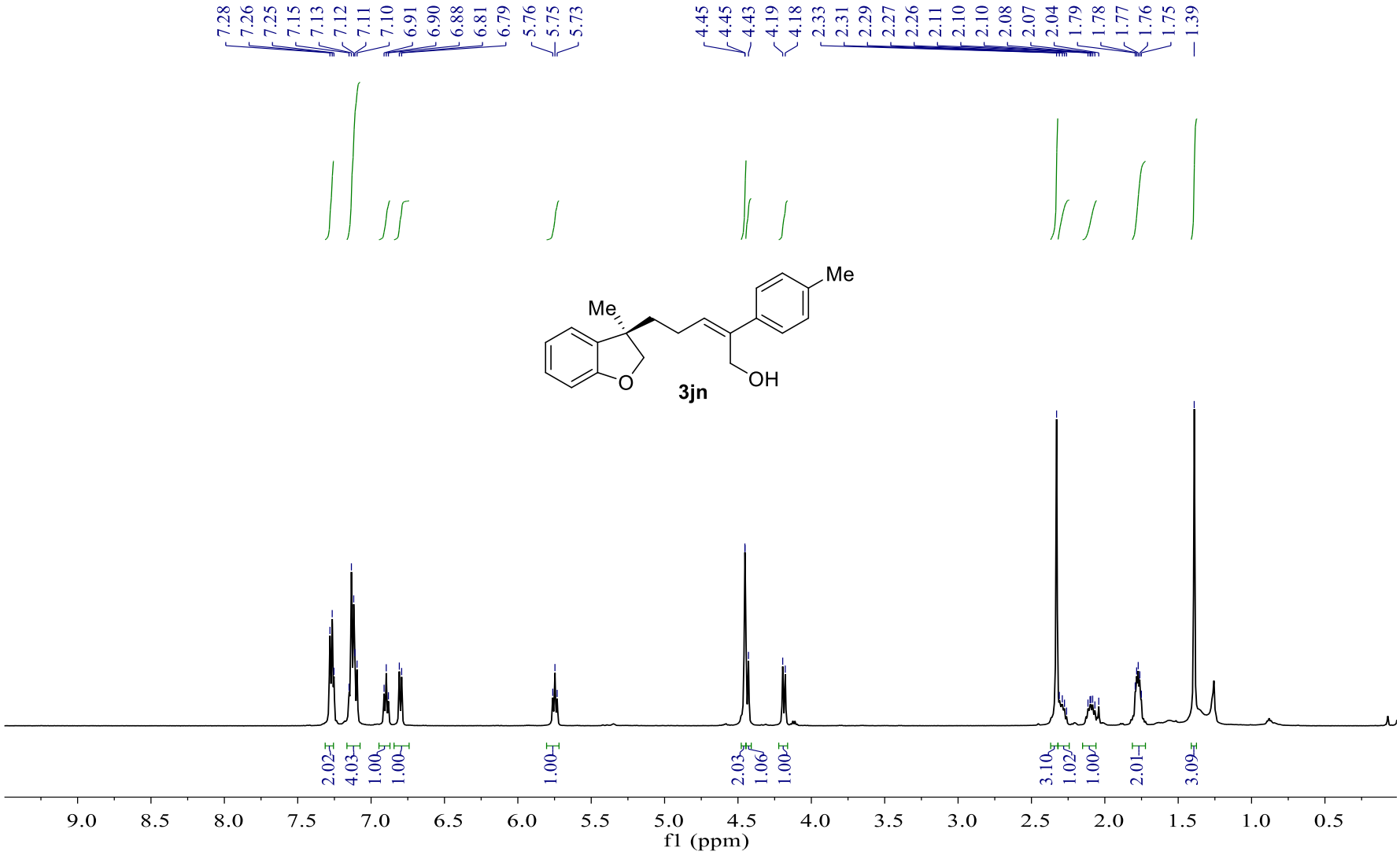
122.83
120.70
109.73
82.20
59.66
45.34
41.04
25.83
23.92
Me
O
OH
3jm
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)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6.91
6.90
6.88
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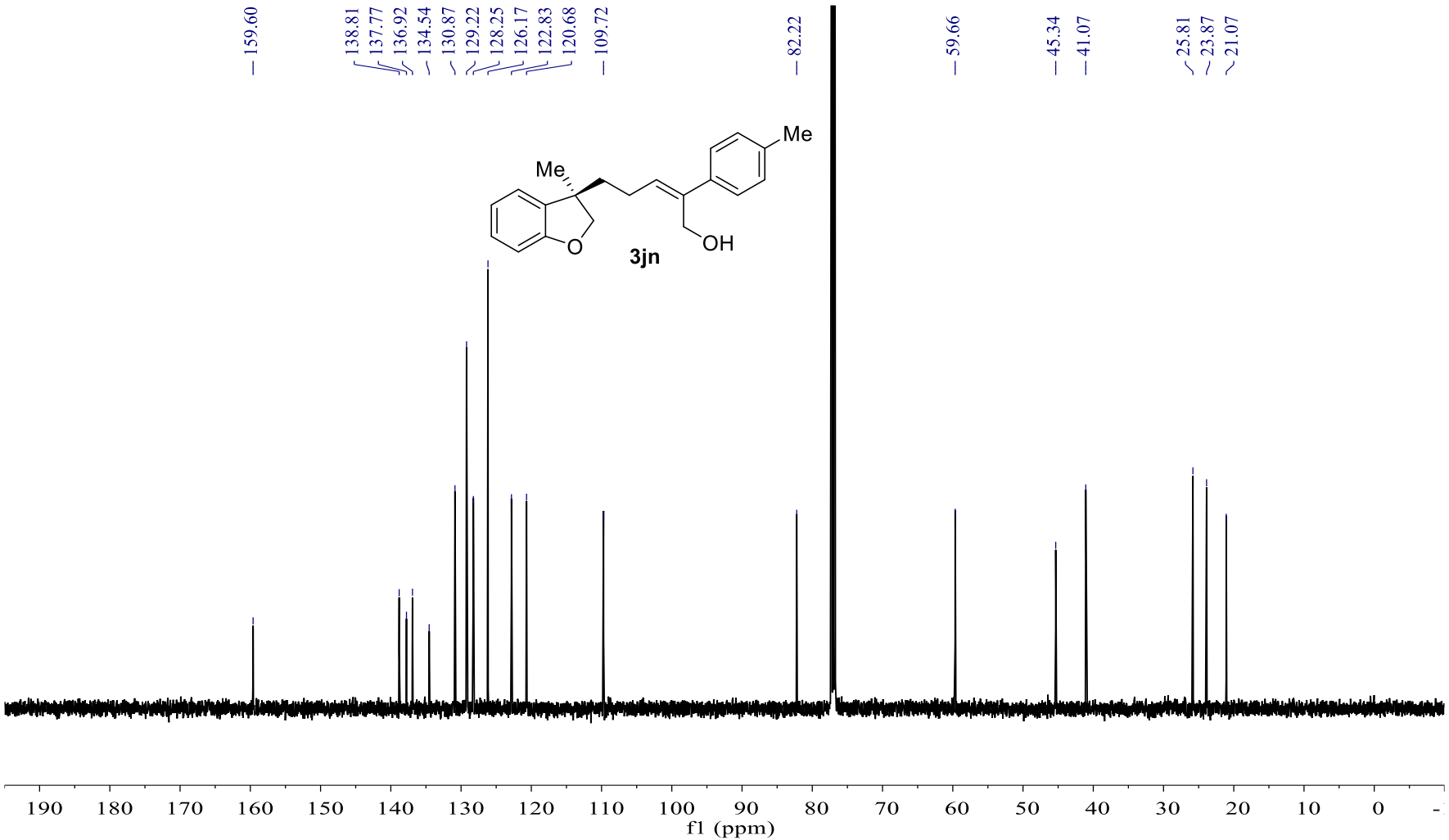
5.76
5.75
5.73
4.45
4.45
4.43
4.19
4.18
2.33
2.31
2.29
2.27
2.26
2.11
2.10
2.10
2.08
2.07
2.04
1.79
1.78
1.77
1.76
1.75
1.39
Me
Me
O
OH
3jn
2.02
4.03
1.00
1.00
1.00
2.03
1.06
1.00
3.10
1.02
1.00
2.01
3.09
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)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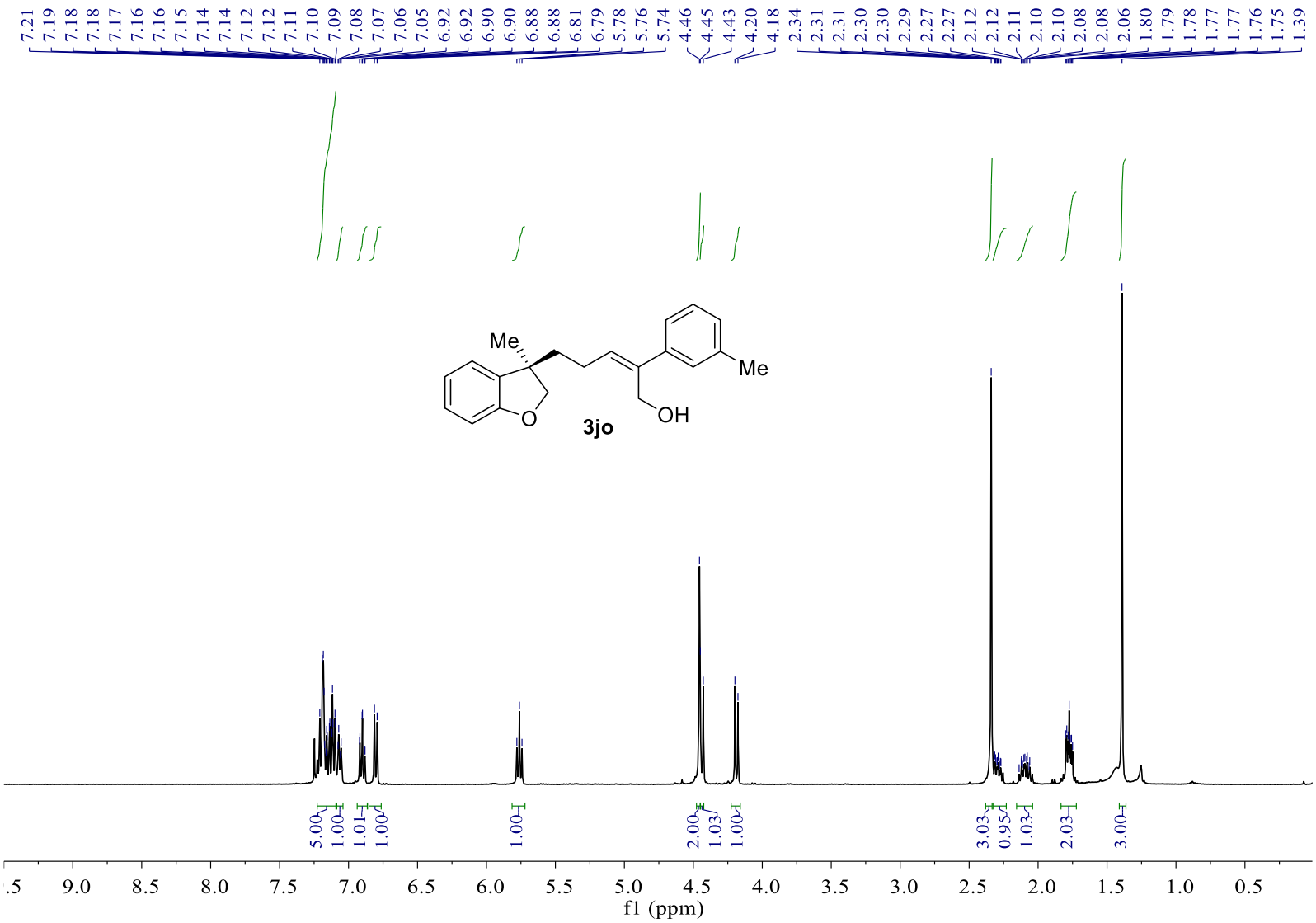
128.25
126.17
122.83
120.68
109.72
82.22
59.66
45.34
41.07
25.81
23.87
21.07
Me
Me
O
OH
3jn
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.21 7.19 7.18 7.18 7.17 7.16 7.16 7.15 7.14 7.14 7.12 7.12 7.11 7.10 7.09 7.08 7.07 7.06 7.05 6.92 6.92 6.90 6.90 6.88 6.88 6.81 6.79 5.78 5.76 5.74
4.46 4.45 4.43 4.20 4.18
2.34 2.31 2.31 2.30 2.30 2.29 2.27 2.27 2.12 2.12 2.11 2.10 2.10 2.08 2.08 2.06 1.80 1.79 1.78 1.77 1.77 1.76 1.75 1.39
Me
Me
O
OH
3jo
5.00 1.00 1.01 1.00 1.00 2.00 1.03 1.00 3.03 0.95 1.03 2.03 3.00
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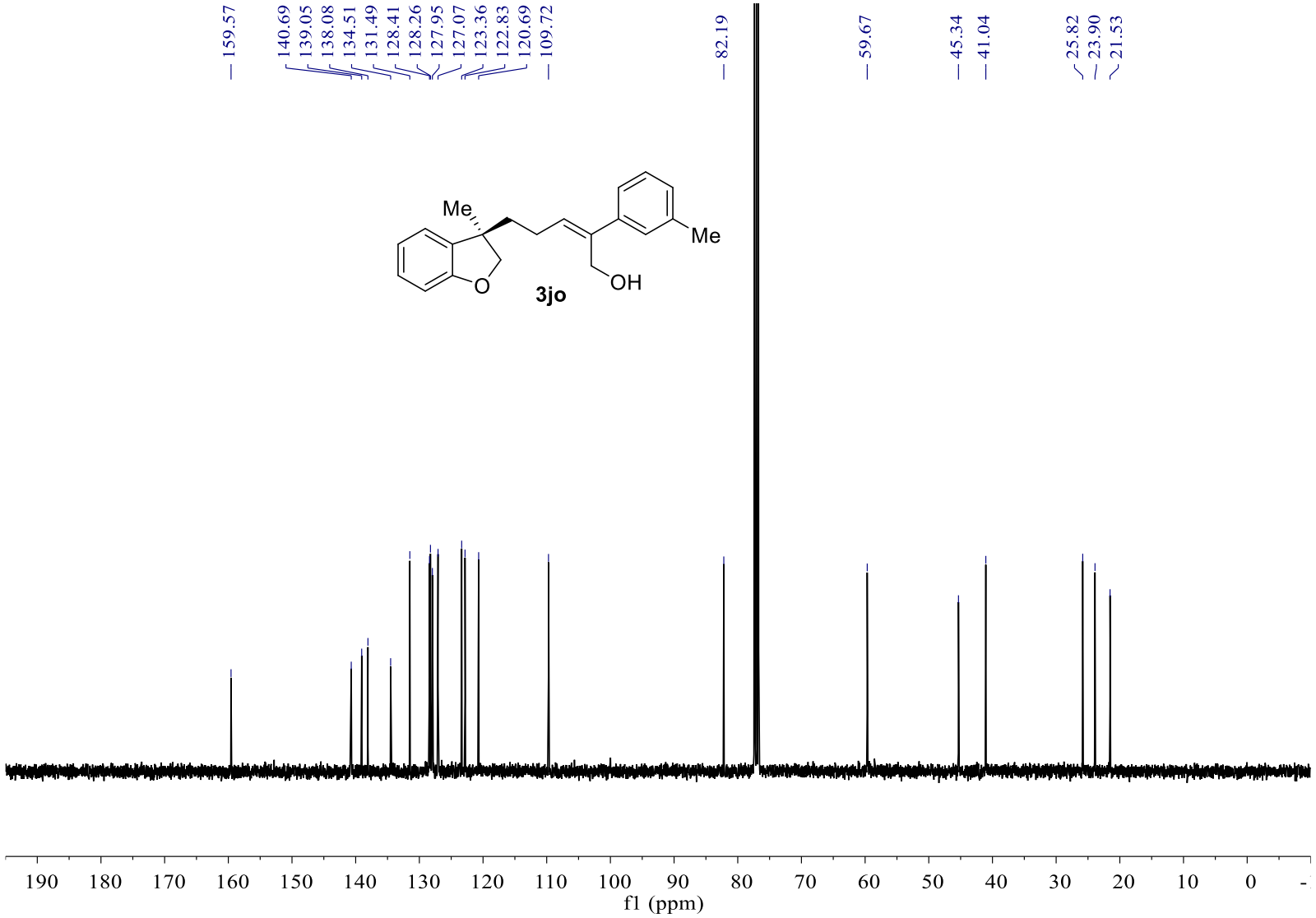
f1 (ppm)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123.36
122.83
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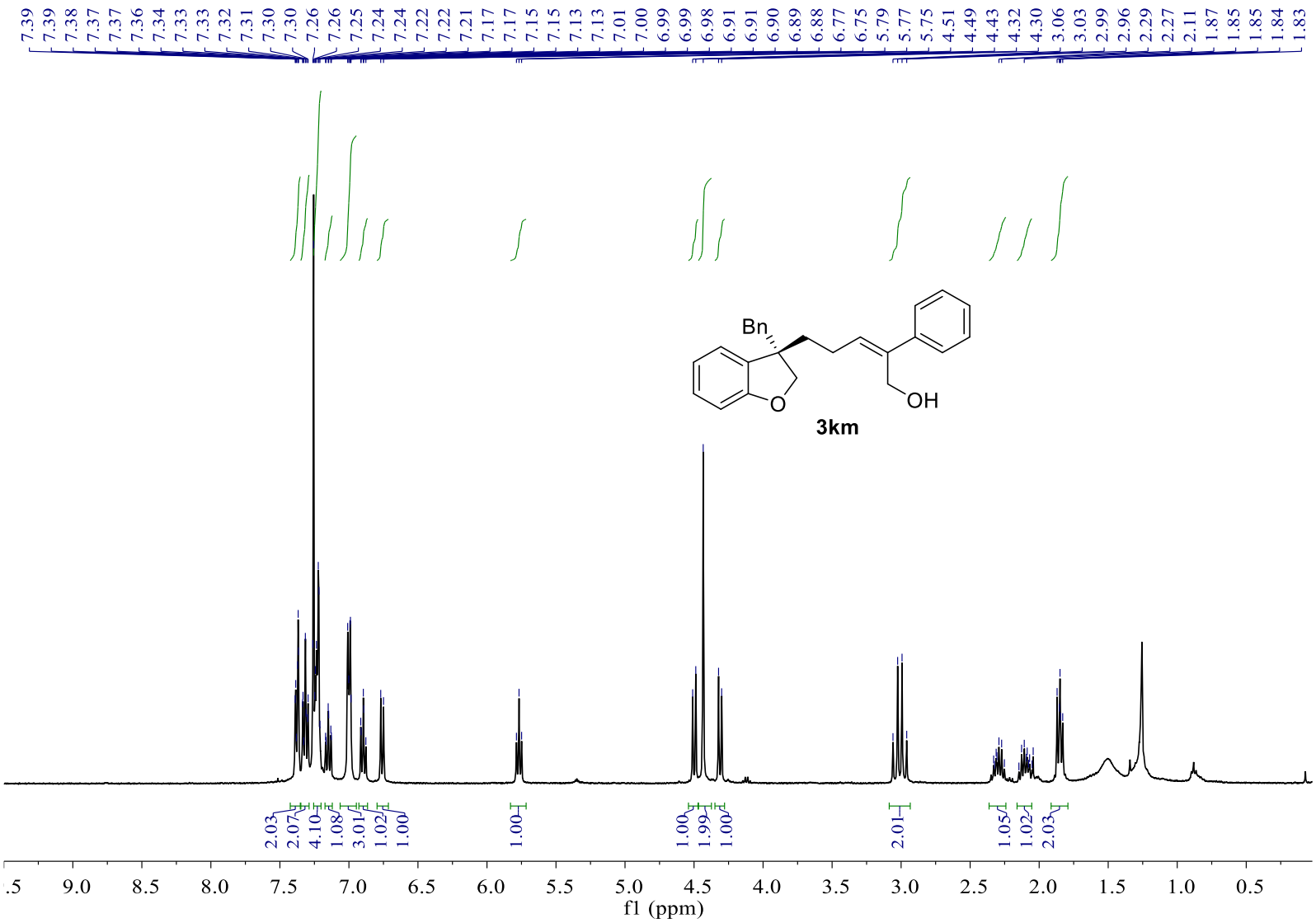
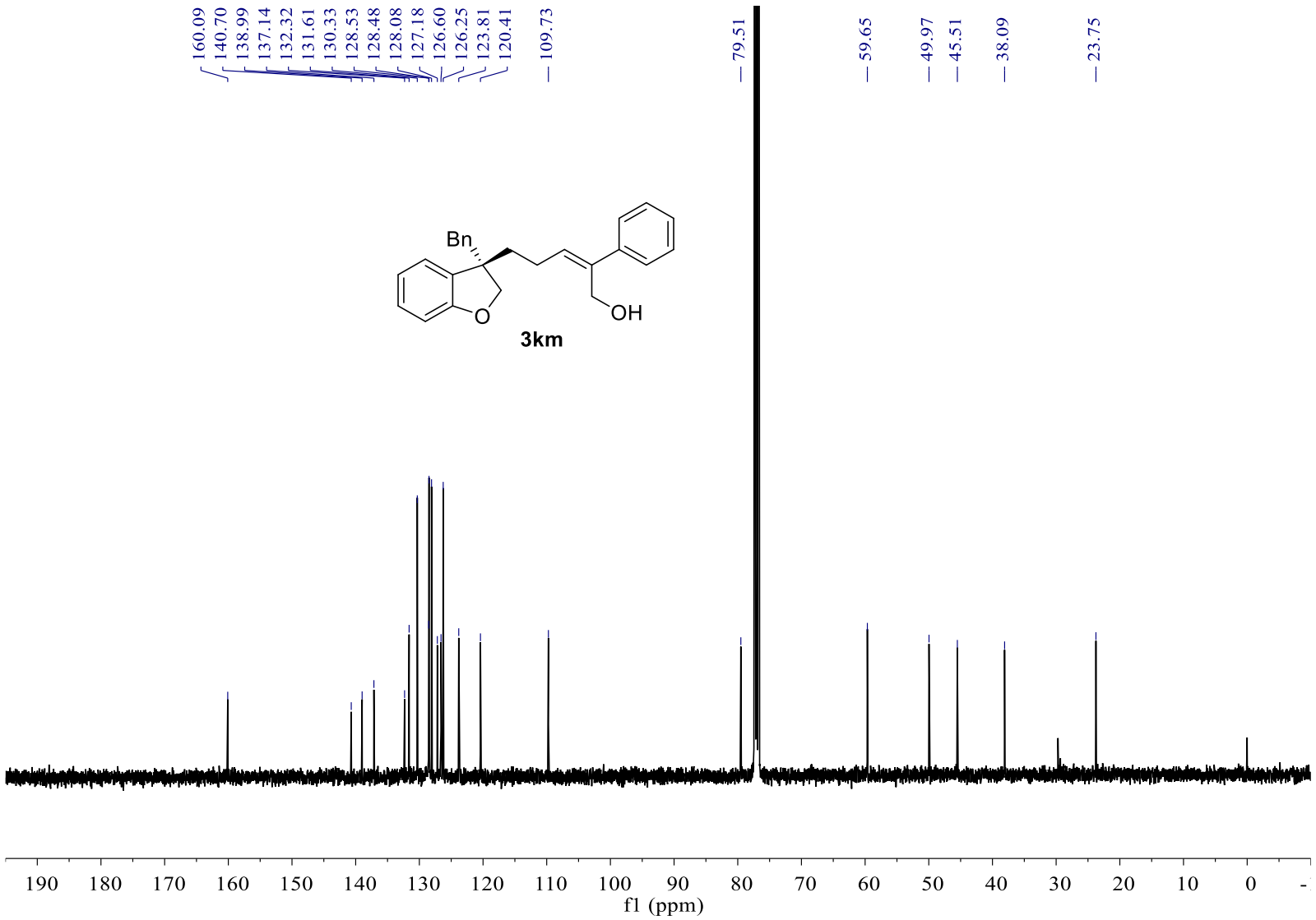
109.72
82.19
59.67
45.34
41.04
25.82
23.90
21.53
Me
Me
O
OH
3jo
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)


7.39 7.39 7.38 7.37 7.37 7.36 7.34 7.33 7.33 7.32 7.31 7.30 7.30 7.26 7.26 7.25 7.24 7.24 7.22 7.22 7.21 7.17 7.17 7.15 7.15 7.13 7.13 7.01 7.00 6.99 6.99 6.98 6.91 6.91 6.90 6.89 6.88 6.77 6.75 5.79 5.77 5.75 4.51 4.49 4.43 4.32 4.30 3.06 3.03 2.99 2.96 2.29 2.27 2.11 1.87 1.85 1.85 1.84 1.83
Bn
O
OH
3km
2.03 2.07 4.10 1.08 3.01 1.02 1.00 1.00 1.00 1.99 1.00 2.01 1.05 1.02 2.03
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
f1 (ppm)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127.18
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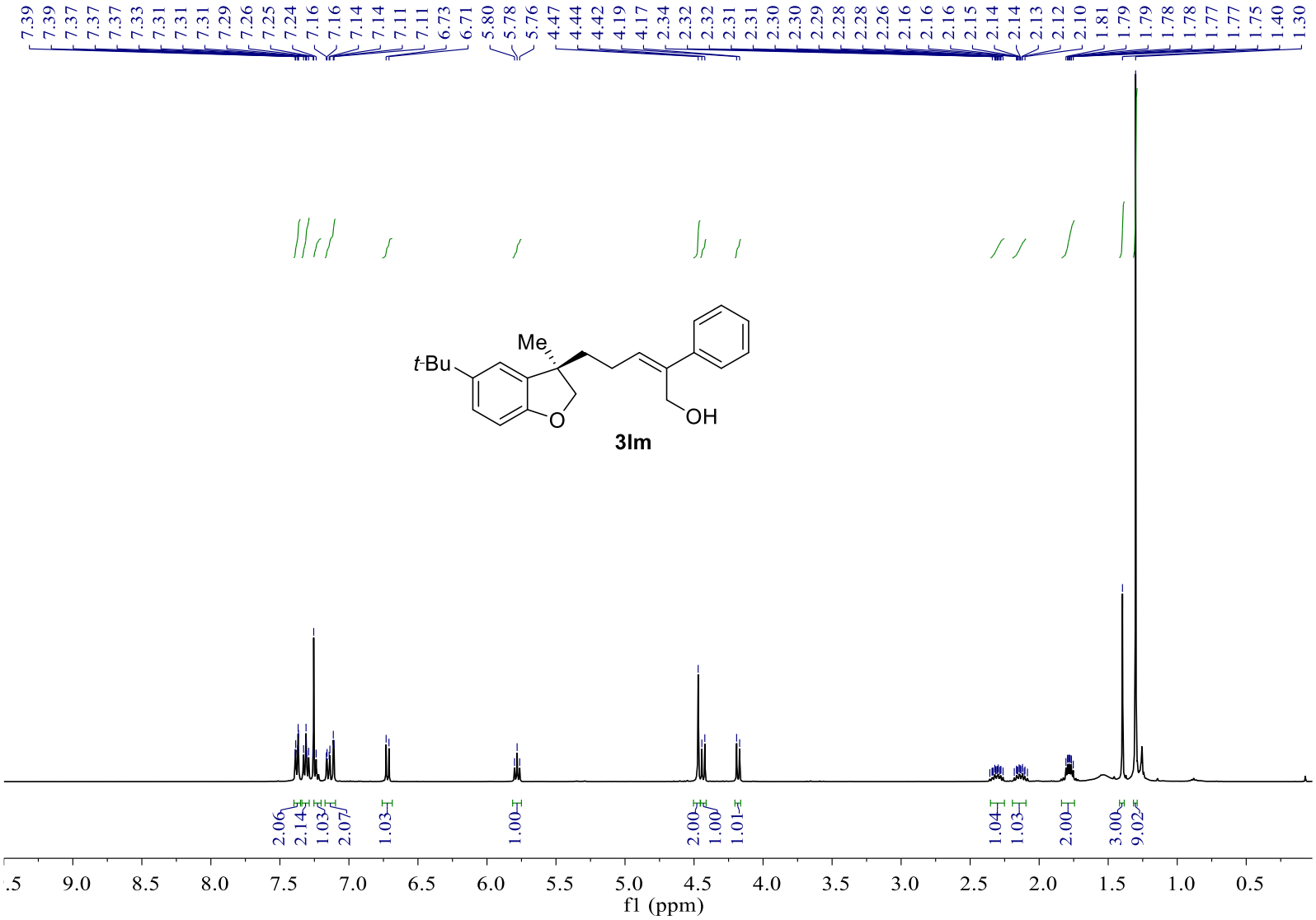
123.81
120.41
109.73
79.51
59.65
49.97
45.51
38.09
23.75
Bn
O
OH
3km
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-
f1 (ppm)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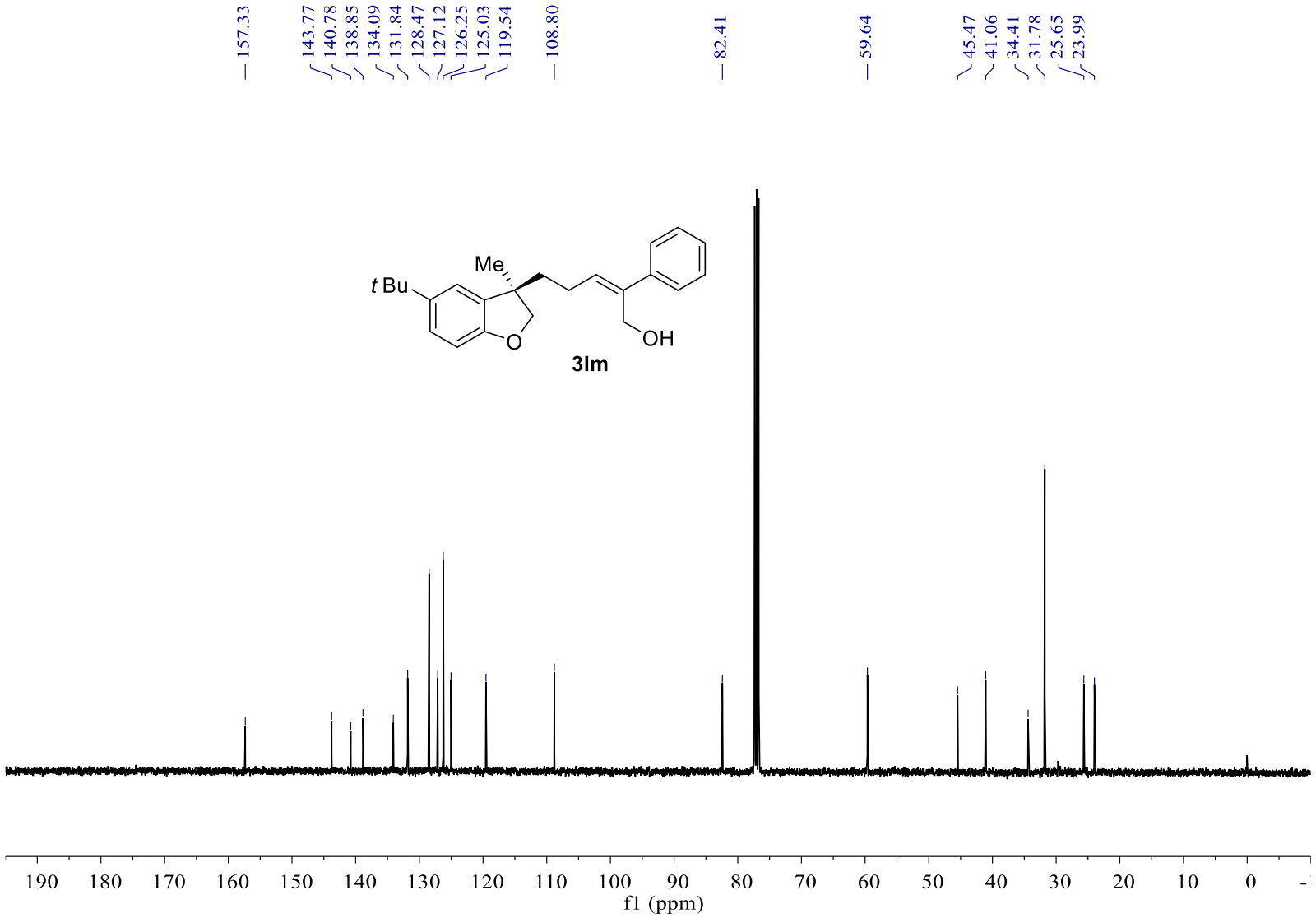
Me
t-Bu
O
OH
3lm
2.06 2.14 1.03 2.07 1.03 1.00 2.00 1.00 1.01 1.04 1.03 2.00 3.00 9.02
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5
f1 (ppm)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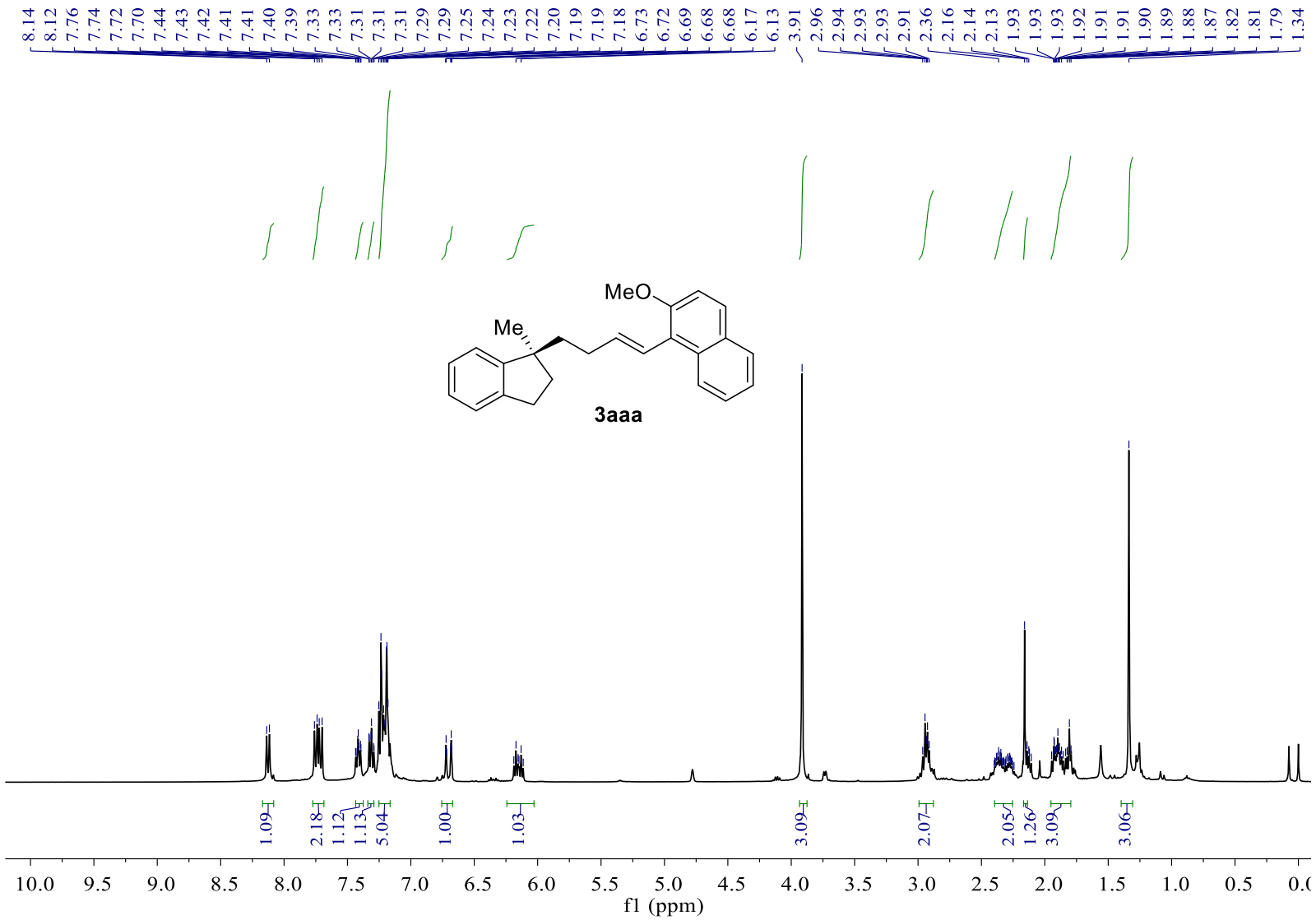
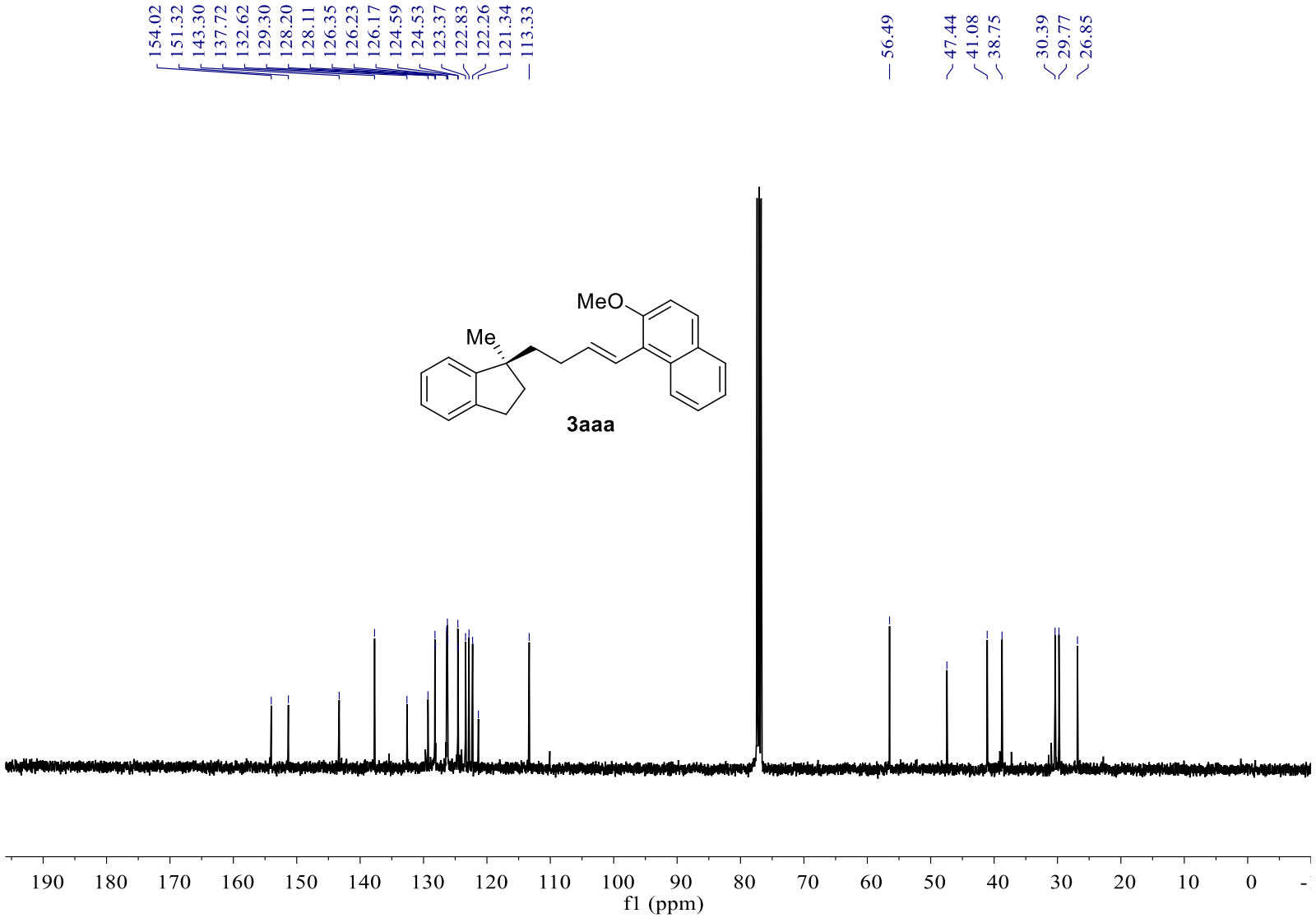
131.84
128.47
127.12
126.25
125.03
119.54
108.80
82.41
59.64
45.47
41.06
34.41
31.78
25.65
23.99
Me
t-Bu
O
OH
3lm
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)


8.14 8.12 7.76 7.74 7.72 7.70 7.44 7.43 7.42 7.41 7.41 7.40 7.39 7.33 7.33 7.31 7.31 7.31 7.29 7.29 7.25 7.24 7.23 7.22 7.20 7.19 7.19 7.18 6.73 6.72 6.69 6.68 6.68 6.17 6.13 3.91 2.96 2.94 2.93 2.93 2.91 2.36 2.16 2.14 2.13 1.93 1.93 1.93 1.92 1.91 1.91 1.90 1.89 1.88 1.87 1.82 1.81 1.79 1.34
MeO
Me
3aaa
1.09 2.18 1.12 1.13 5.04 1.00 1.03 3.09 2.07 2.05 1.26 3.09 3.06
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
f1 (ppm)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128.20
128.11
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126.23
126.17
124.59
124.53
123.37
122.83
122.26
121.34
113.33
56.49
47.44
41.08
38.75
30.39
29.77
26.85
MeO
Me
3aaa
190
180
170
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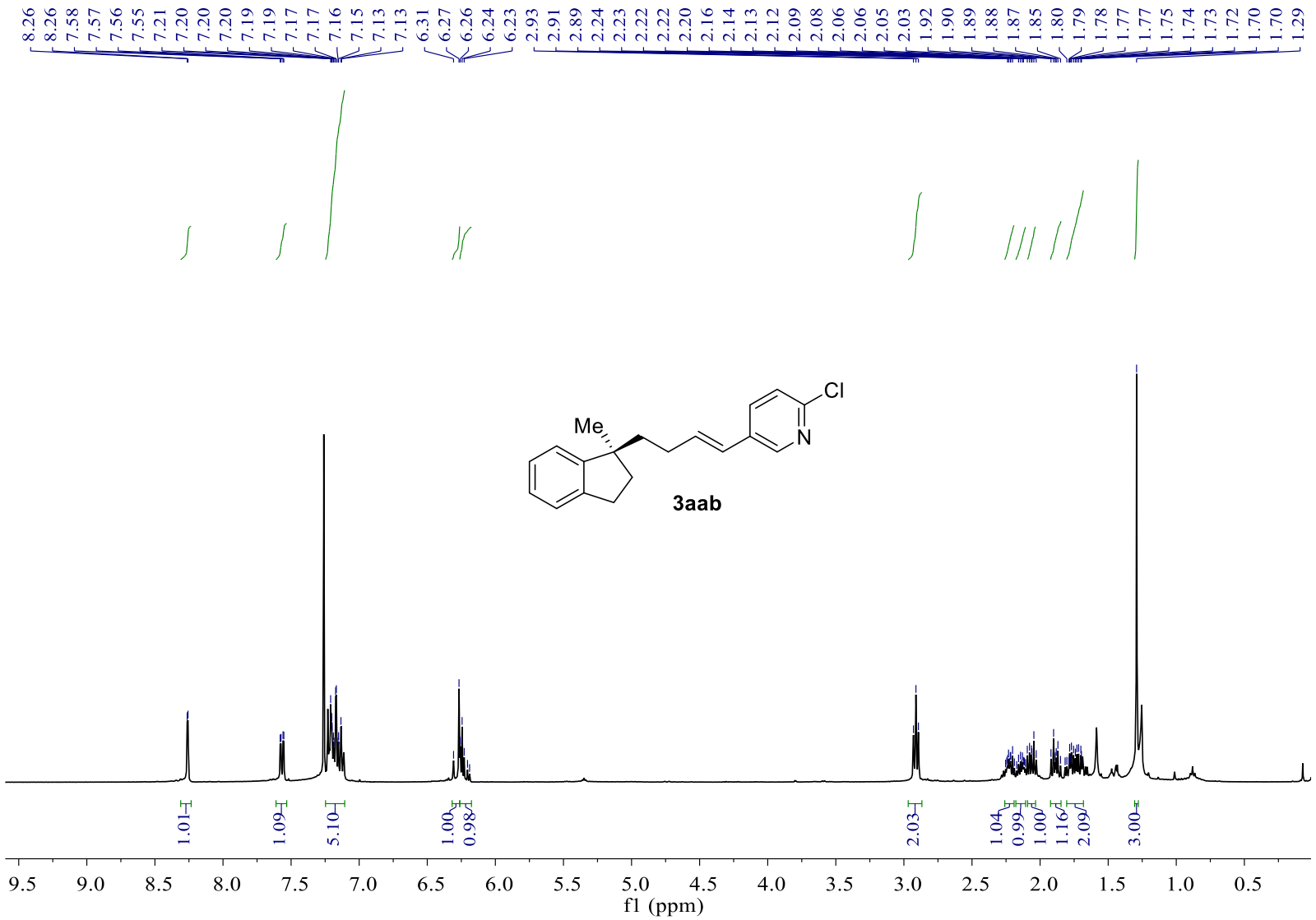
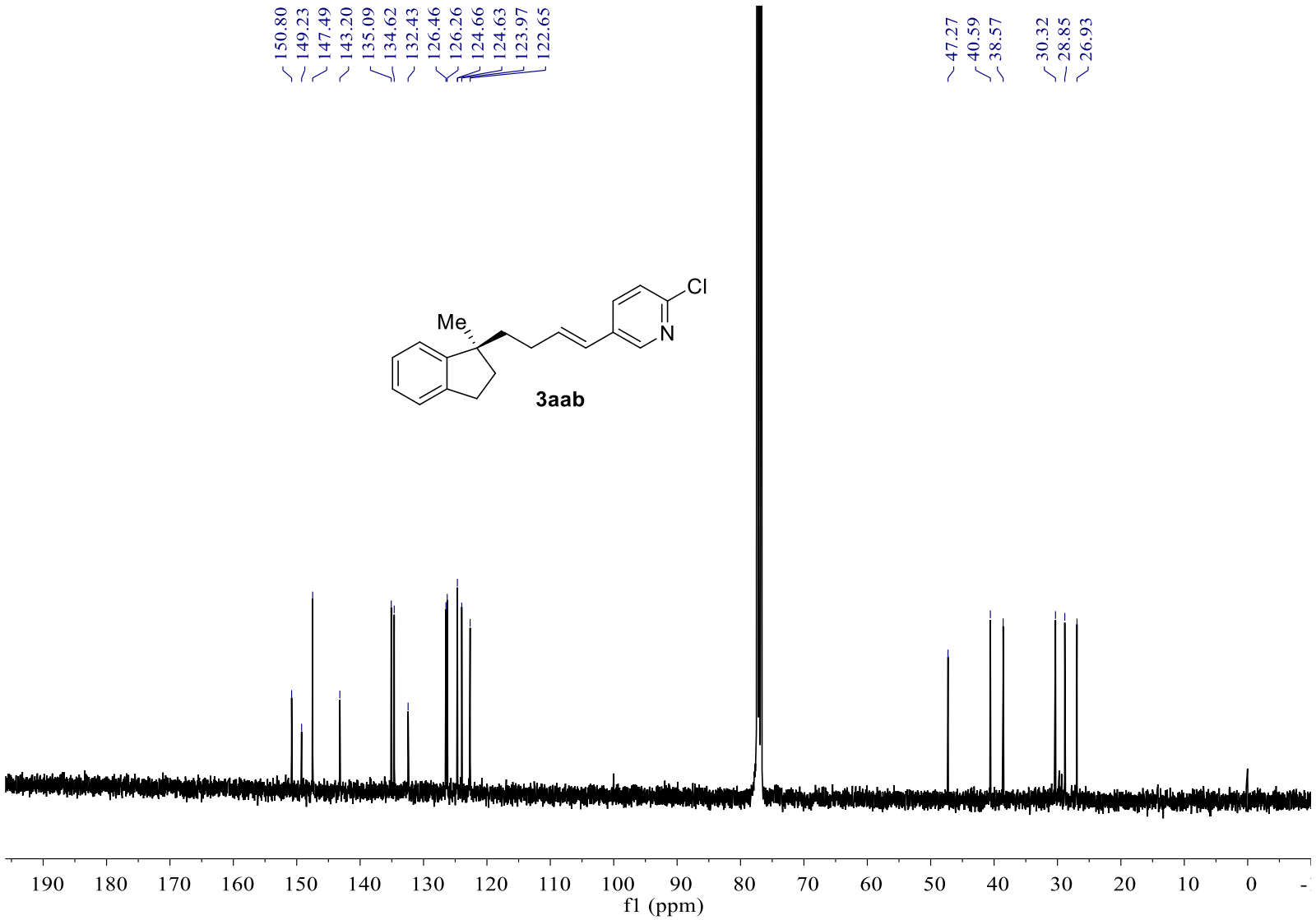
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.26 8.26 7.58 7.57 7.56 7.55 7.21 7.20 7.20 7.20 7.19 7.19 7.17 7.17 7.16 7.15 7.13 7.13 6.31 6.27 6.26 6.24 6.23 2.93 2.91 2.89 2.24 2.23 2.22 2.22 2.20 2.16 2.14 2.13 2.12 2.09 2.08 2.06 2.06 2.05 2.03 1.92 1.90 1.89 1.88 1.87 1.85 1.80 1.79 1.78 1.77 1.77 1.75 1.74 1.73 1.72 1.70 1.70 1.29
Me
Cl
N
3aab
1.01 1.09 5.10 1.00 0.98 2.03 1.04 0.99 1.00 1.16 2.09 3.00
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
f1 (ppm)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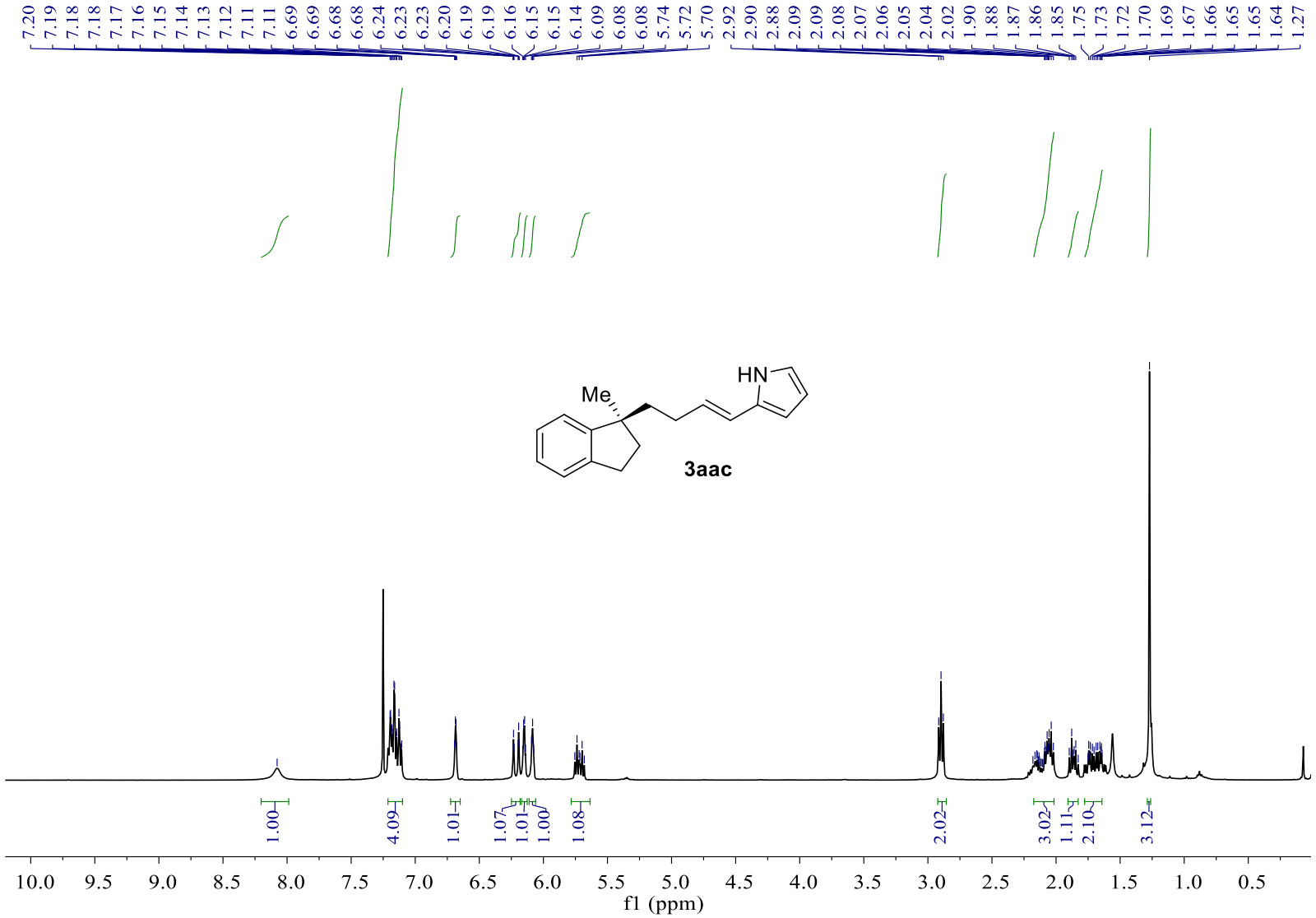
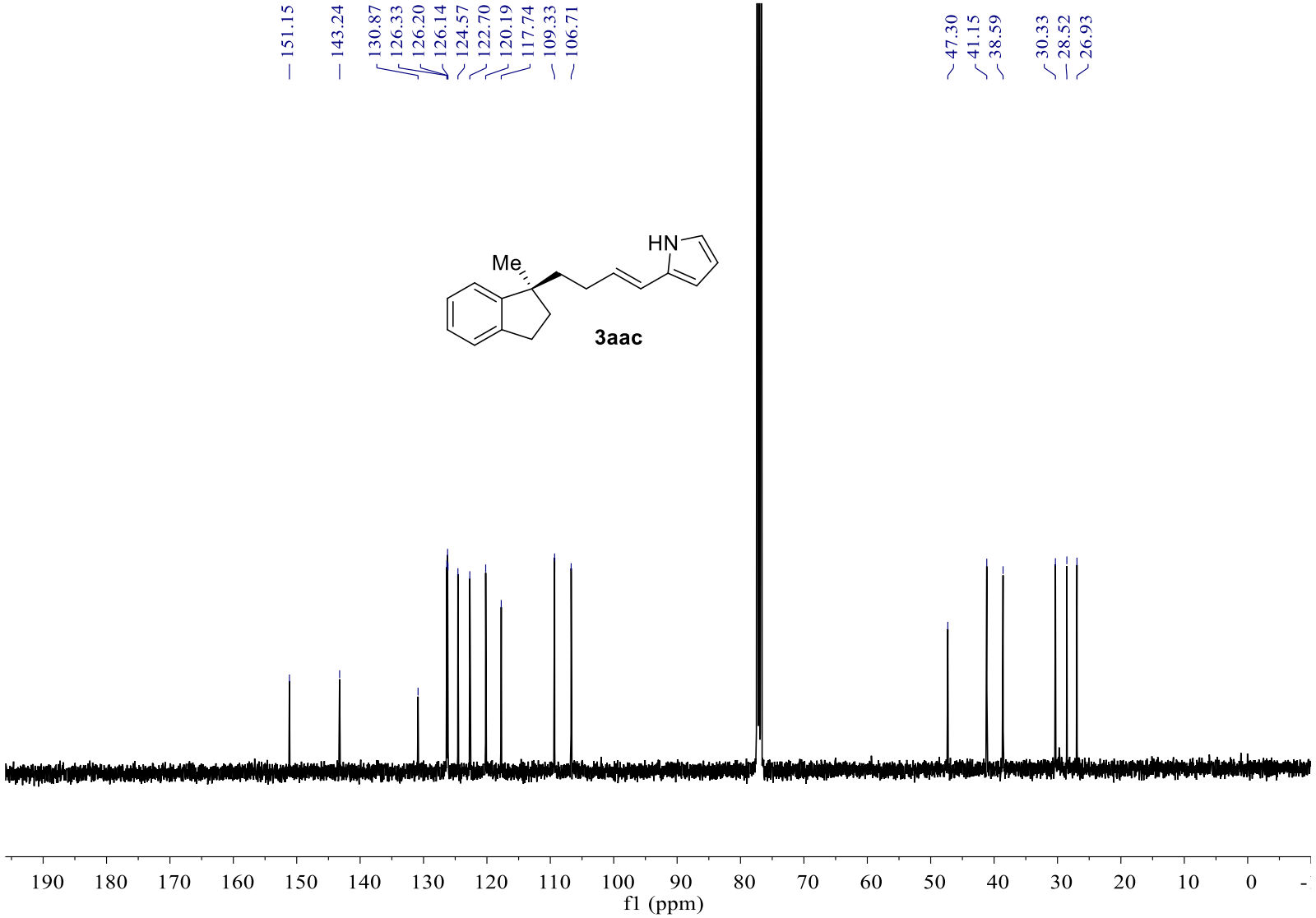
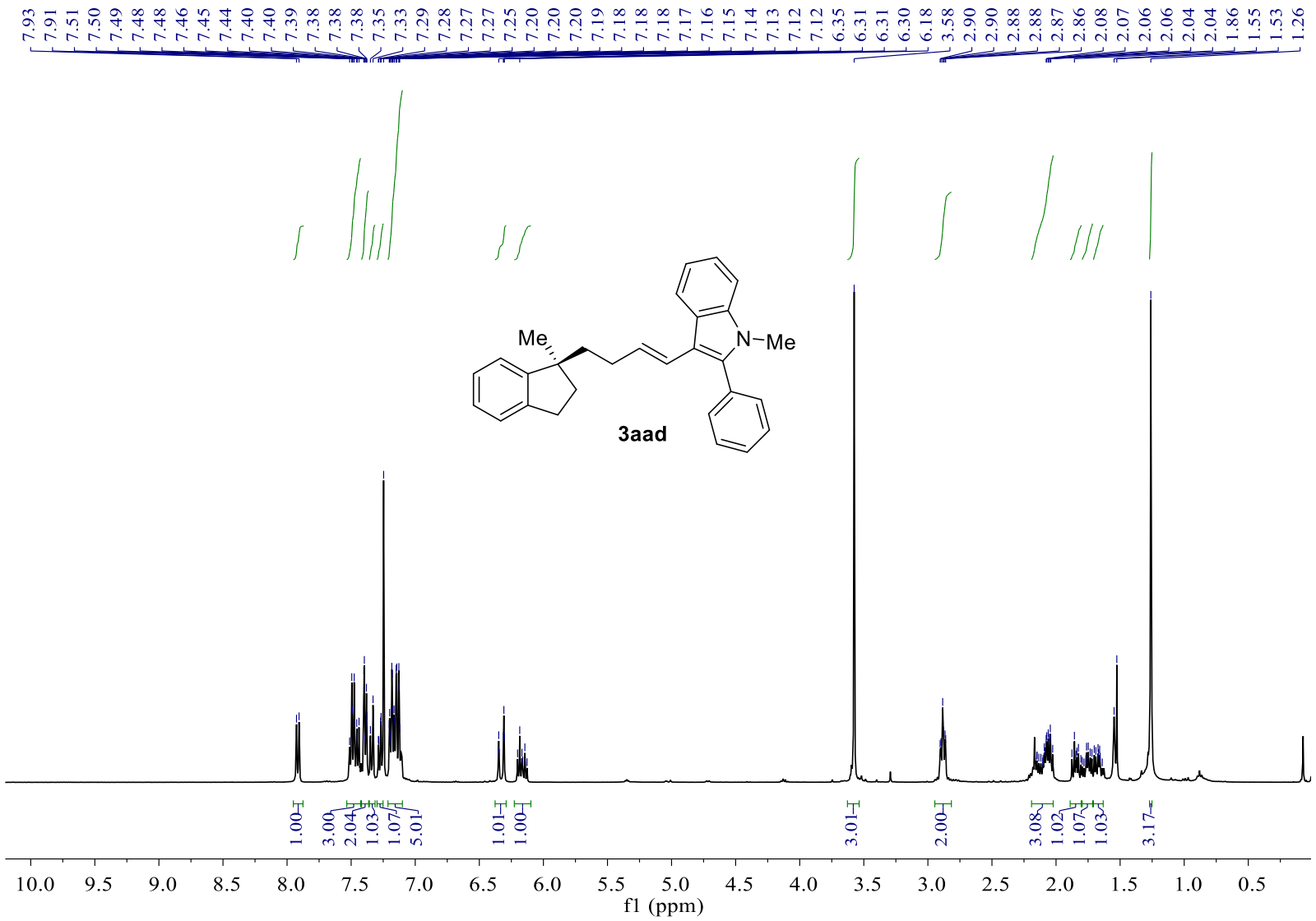
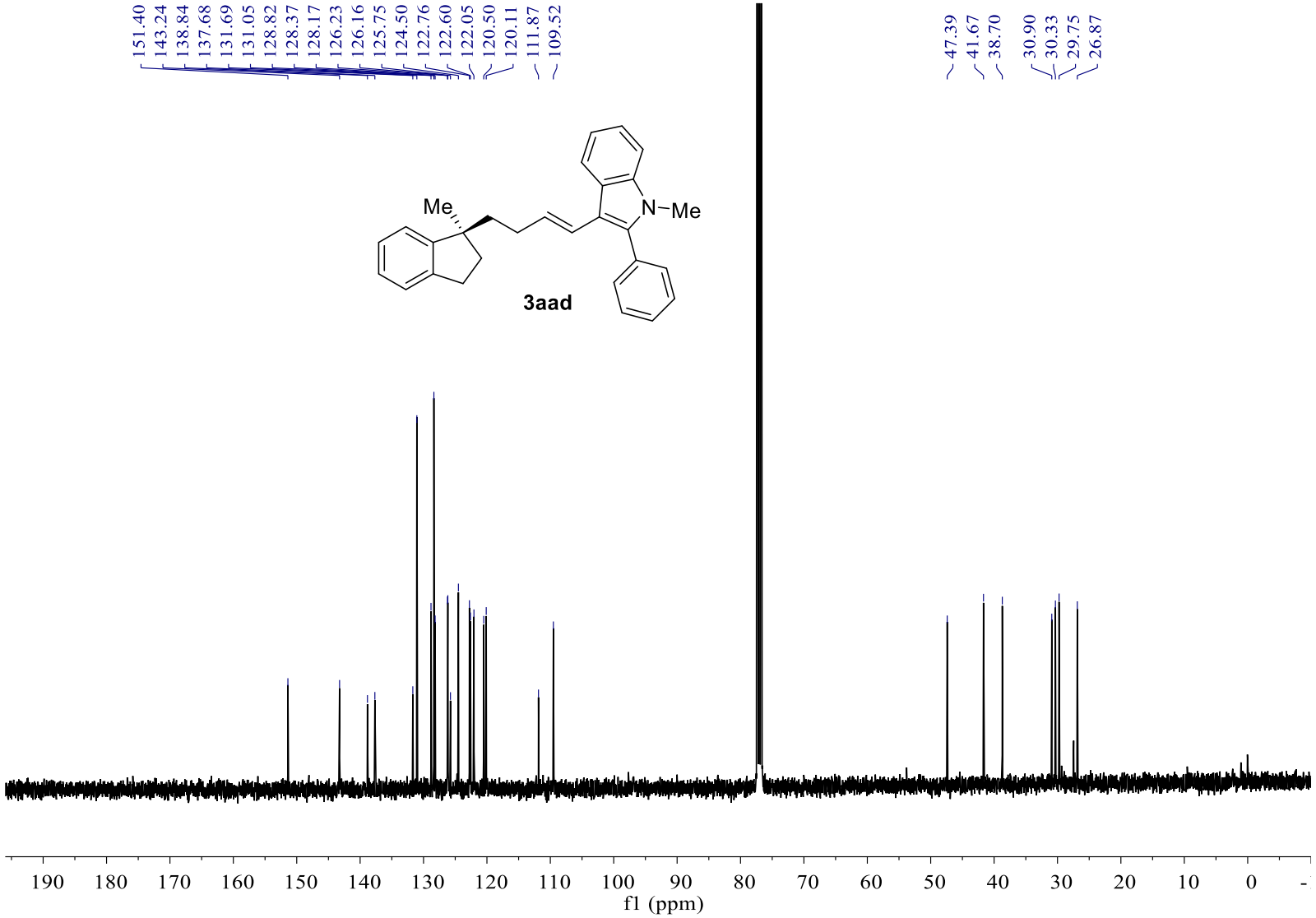
126.46
126.26
124.66
124.63
123.97
122.65
47.27
40.59
38.57
30.32
28.85
26.93
Cl
N
Me
3aab
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.20 7.19 7.18 7.18 7.17 7.16 7.15 7.14 7.13 7.12 7.11 7.11 6.69 6.69 6.68 6.68 6.24 6.23 6.23 6.20 6.19 6.19 6.16 6.15 6.15 6.14 6.09 6.08 6.08 5.74 5.72 5.70
2.92 2.90 2.88 2.09 2.09 2.08 2.07 2.06 2.05 2.04 2.02 1.90 1.88 1.87 1.86 1.85 1.75 1.73 1.72 1.70 1.69 1.67 1.66 1.65 1.65 1.64 1.27
Me
HN
3aac
1.00 4.09 1.01 1.07 1.01 1.00 1.08 2.02 3.02 1.11 2.10 3.12
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
f1 (ppm)


151.15
143.24
130.87
126.33
126.20
126.14
124.57
122.70
120.19
117.74
109.33
106.71
47.30
41.15
38.59
30.33
28.52
26.93
HN
Me
3aac
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.93 7.91 7.51 7.50 7.49 7.48 7.48 7.46 7.45 7.44 7.40 7.40 7.39 7.38 7.38 7.38 7.35 7.33 7.29 7.28 7.27 7.27 7.25 7.20 7.20 7.20 7.19 7.18 7.18 7.18 7.17 7.16 7.15 7.14 7.13 7.12 7.12 6.35 6.31 6.31 6.30 6.18 3.58 2.90 2.90 2.88 2.88 2.87 2.86 2.08 2.07 2.06 2.06 2.04 2.04 1.86 1.55 1.53 1.26
Me
N–Me
3aad
1.00 3.00 2.04 1.03 1.07 5.01 1.01 1.00 3.01 2.00 3.08 1.02 1.07 1.03 3.17
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
f1 (ppm)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137.68
131.69
131.05
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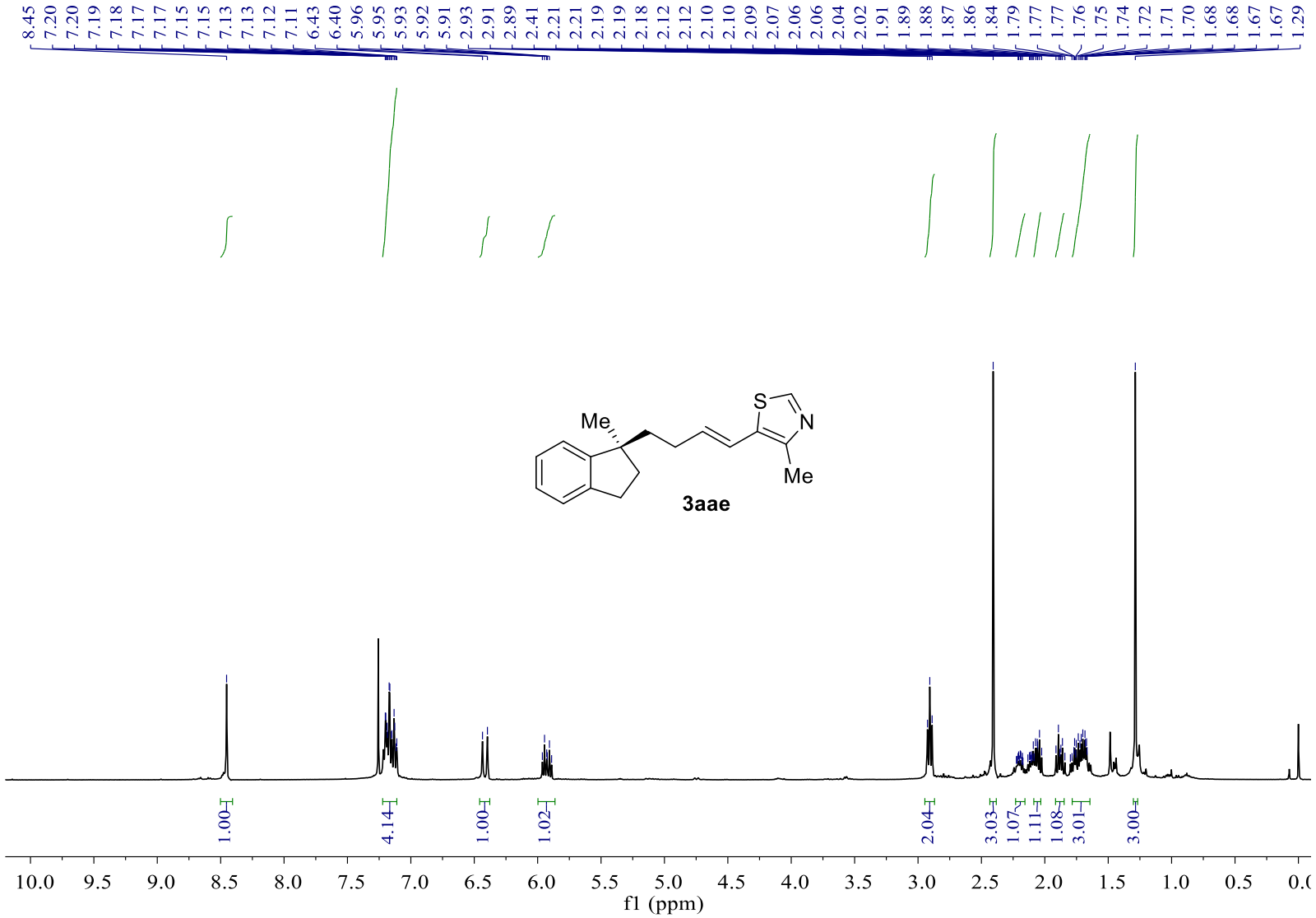
128.37
128.17
126.23
126.16
125.75
124.50
122.76
122.60
122.05
120.50
120.11
111.87
109.52
47.39
41.67
38.70
30.90
30.33
29.75
26.87
Me
N–Me
3aad
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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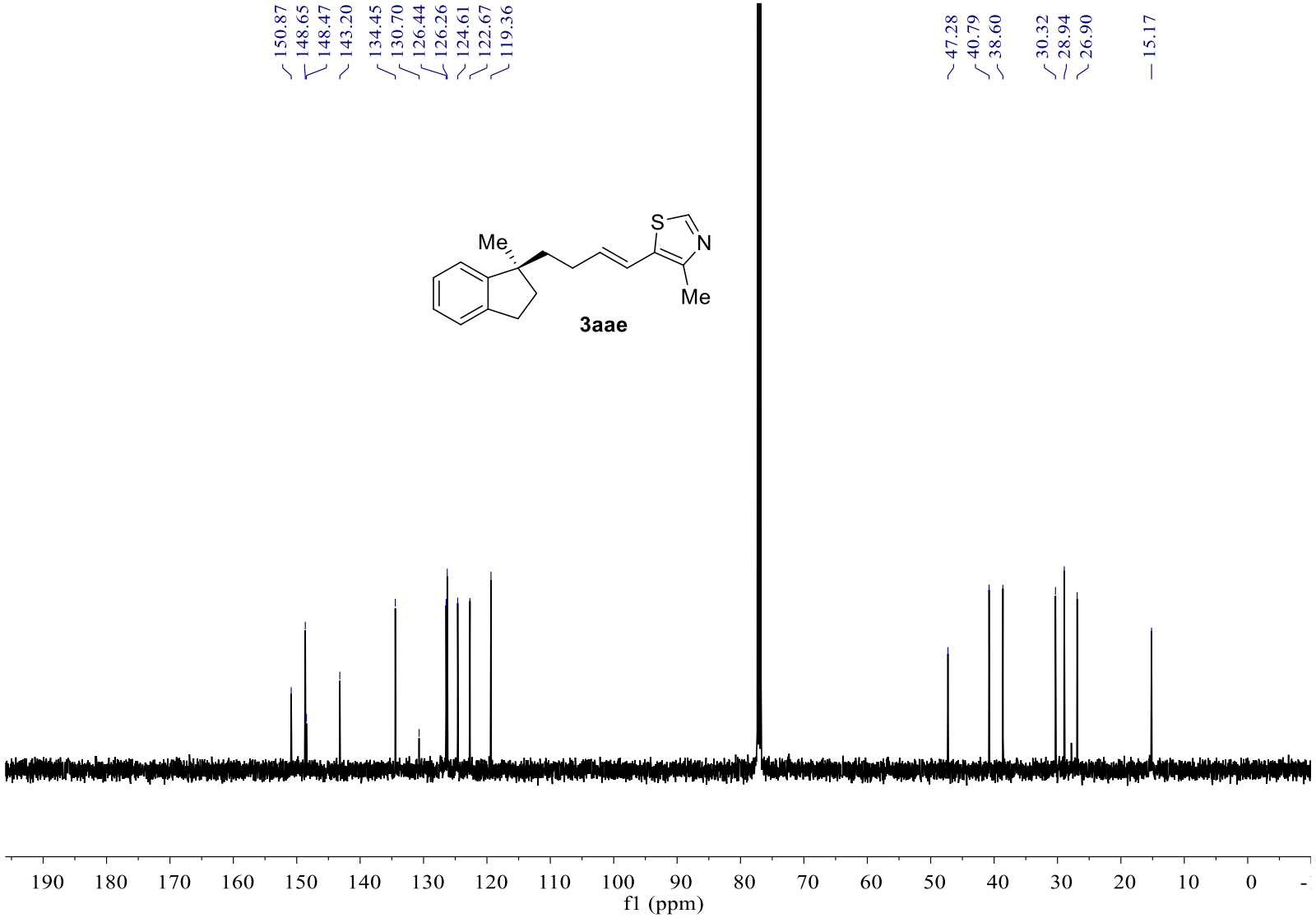
7.20
7.19
7.18
7.17
7.17
7.15
7.15
7.13
7.13
7.12
7.11
6.43
6.40
5.96
5.95
5.93
5.92
5.91
2.93
2.91
2.89
2.41
2.21
2.21
2.19
2.19
2.18
2.12
2.12
2.10
2.10
2.09
2.07
2.06
2.06
2.04
2.02
1.91
1.89
1.88
1.87
1.86
1.84
1.79
1.77
1.77
1.76
1.75
1.74
1.72
1.71
1.70
1.68
1.68
1.67
1.67
1.29
Me
S
N
Me
3aae
1.00
4.14
1.00
1.02
2.04
3.03
1.07
1.11
1.08
3.01
3.00
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
f1 (ppm)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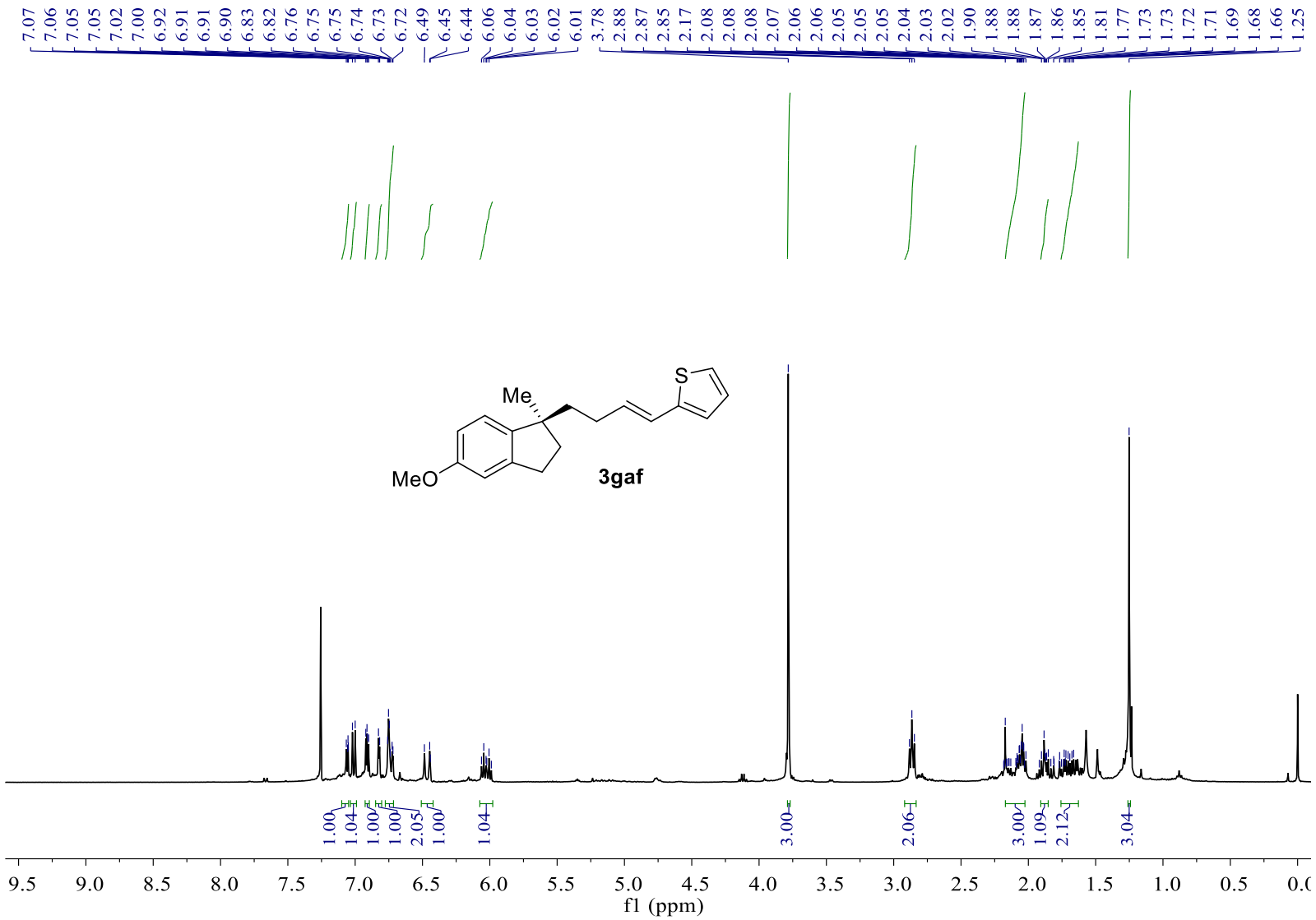
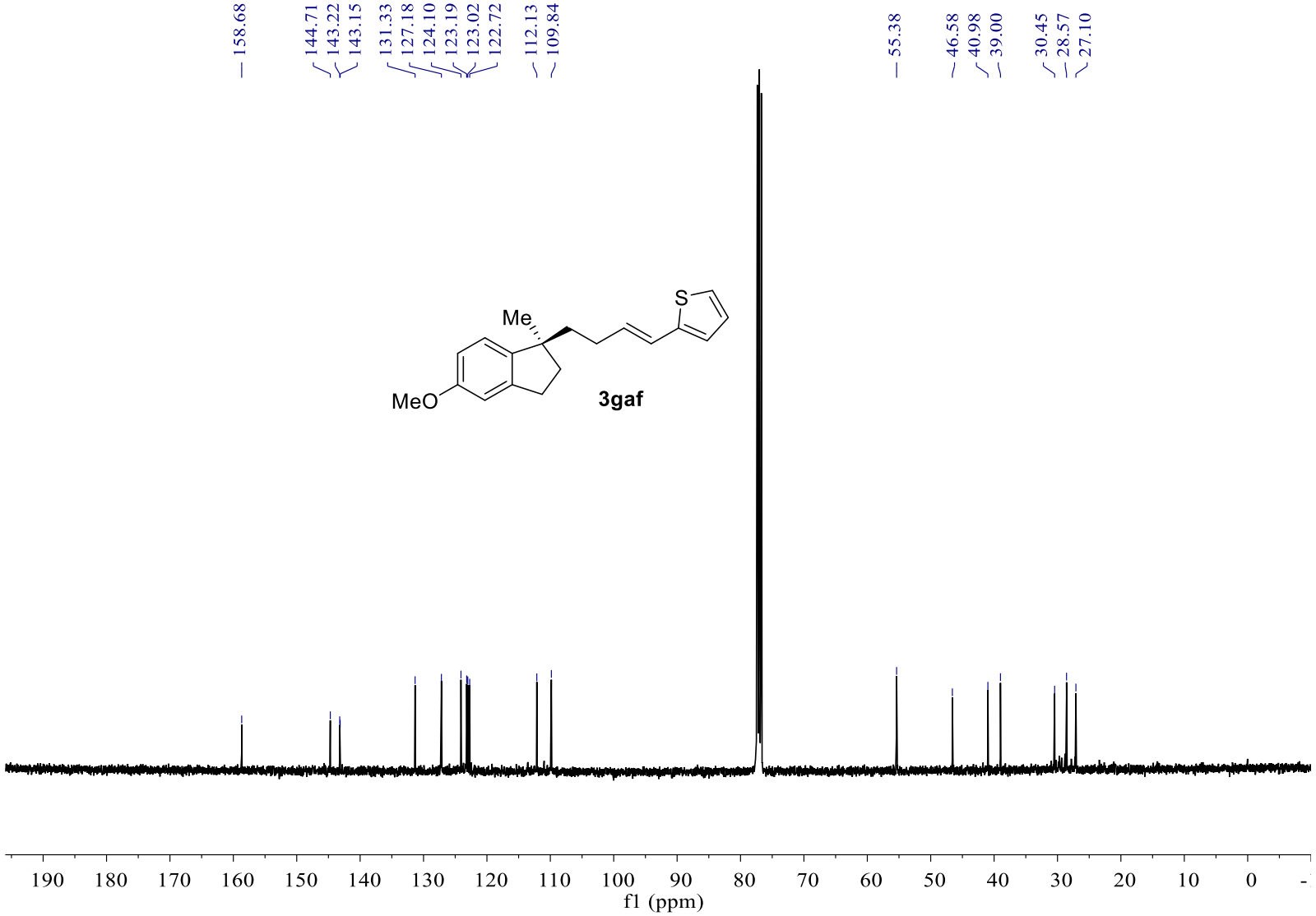
126.26
124.61
122.67
119.36
47.28
40.79
38.60
30.32
28.94
26.90
15.17
Me
S
N
Me
3aae
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.07 7.06 7.05 7.05 7.02 7.00 6.92 6.91 6.91 6.90 6.83 6.82 6.76 6.75 6.75 6.74 6.73 6.72 6.49 6.45 6.44 6.06 6.04 6.03 6.02 6.01 3.78 2.88 2.87 2.85 2.17 2.08 2.08 2.08 2.07 2.06 2.06 2.05 2.05 2.05 2.04 2.03 2.02 1.90 1.88 1.88 1.87 1.86 1.85 1.81 1.77 1.73 1.73 1.72 1.71 1.69 1.68 1.66 1.25
Me
S
MeO
3gaf
1.00 1.04 1.00 1.00 2.05 1.00 1.04 3.00 2.06 3.00 1.09 2.12 3.04
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
f1 (ppm)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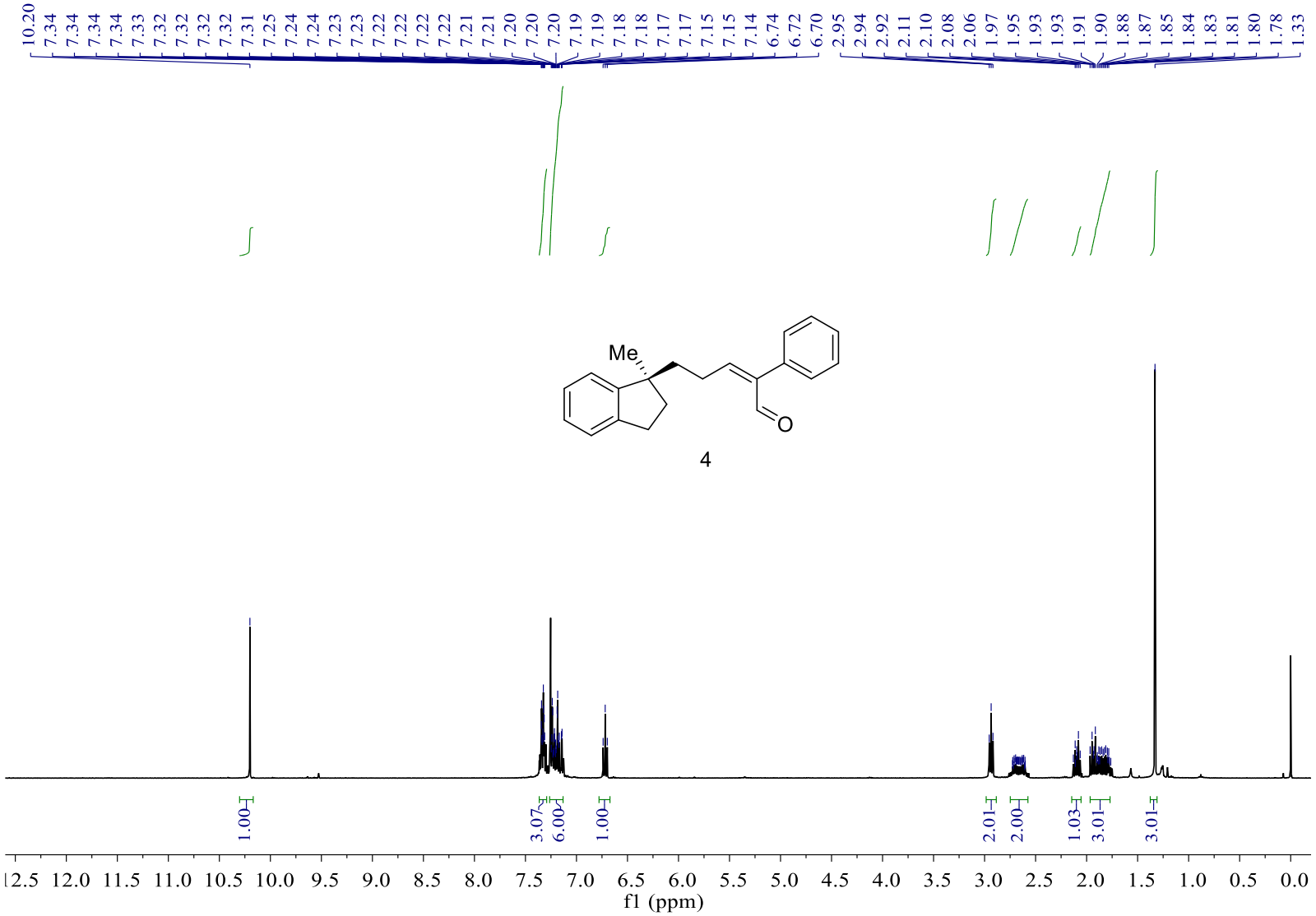
123.19
123.02
122.72
112.13
109.84
55.38
46.58
40.98
39.00
30.45
28.57
27.10
Me
S
MeO
3gaf
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)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7.32
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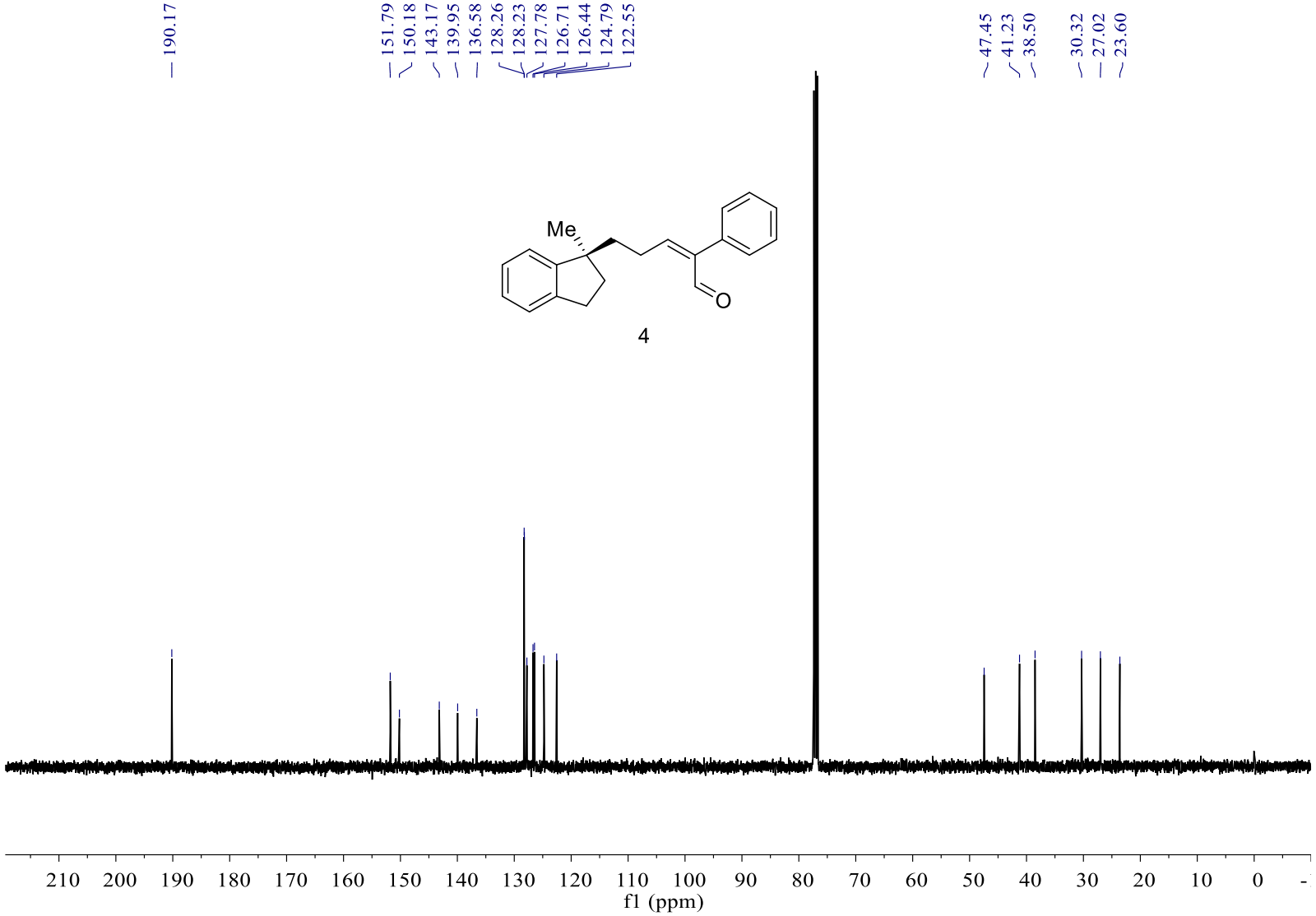
7.32
7.31
7.25
7.24
7.24
7.23
7.23
7.22
7.22
7.22
7.22
7.21
7.21
7.20
7.20
7.20
7.19
7.19
7.18
7.18
7.17
7.17
7.15
7.15
7.14
6.74
6.72
6.70
2.95
2.94
2.92
2.11
2.10
2.08
2.06
1.97
1.95
1.93
1.93
1.91
1.90
1.88
1.87
1.85
1.84
1.83
1.81
1.80
1.78
1.33
Me
O
4
1.00
3.07
6.00
1.00
2.01
2.00
1.03
3.01
3.01
12.5 12.0 11.5 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
f1 (ppm)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139.95
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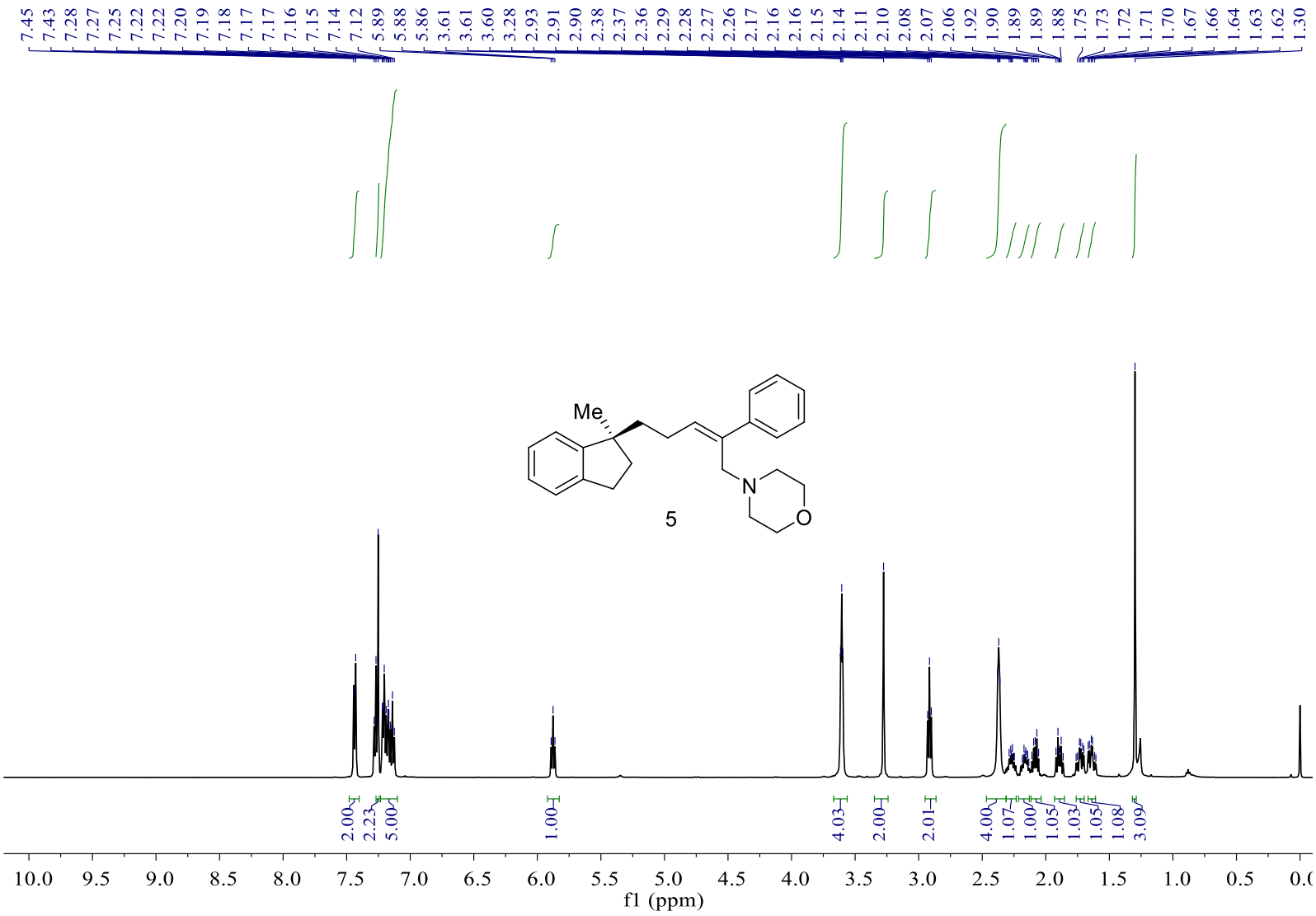
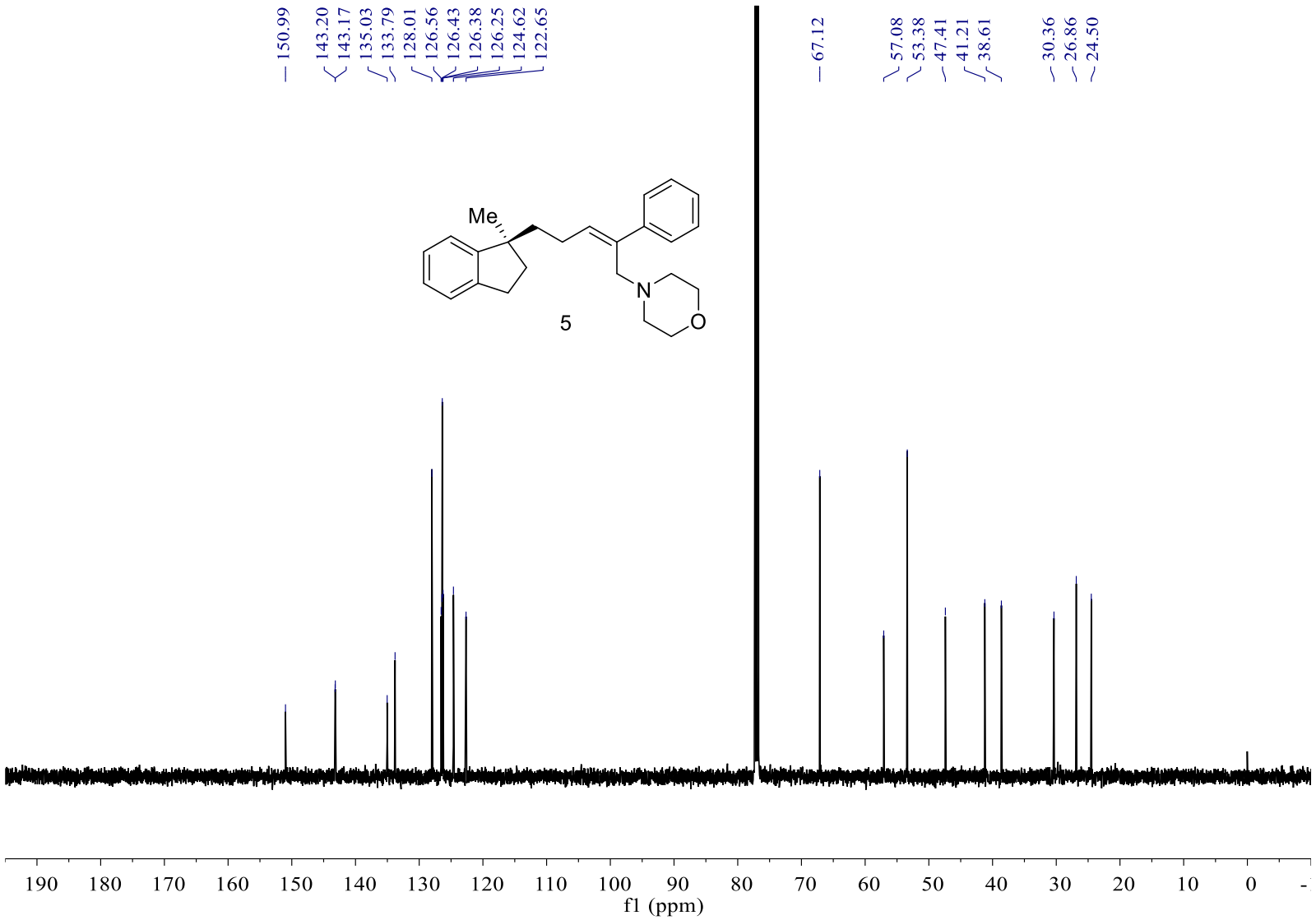
128.26
128.23
127.78
126.71
126.44
124.79
122.55
47.45
41.23
38.50
30.32
27.02
23.60
Me
O
4
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -
f1 (ppm)


7.45 7.43 7.28 7.27 7.25 7.22 7.22 7.20 7.19 7.18 7.17 7.17 7.16 7.15 7.14 7.12 5.89 5.88 5.86 3.61 3.61 3.60 3.28 2.93 2.91 2.90 2.38 2.37 2.36 2.29 2.28 2.27 2.26 2.17 2.16 2.16 2.15 2.14 2.11 2.10 2.08 2.07 2.06 1.92 1.90 1.89 1.89 1.88 1.75 1.73 1.72 1.71 1.70 1.67 1.66 1.64 1.63 1.62 1.30
Me
N
O
5
2.00 2.23 5.00 1.00 4.03 2.00 2.01 4.00 1.07 1.00 1.05 1.03 1.05 1.08 3.09
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
f1 (ppm)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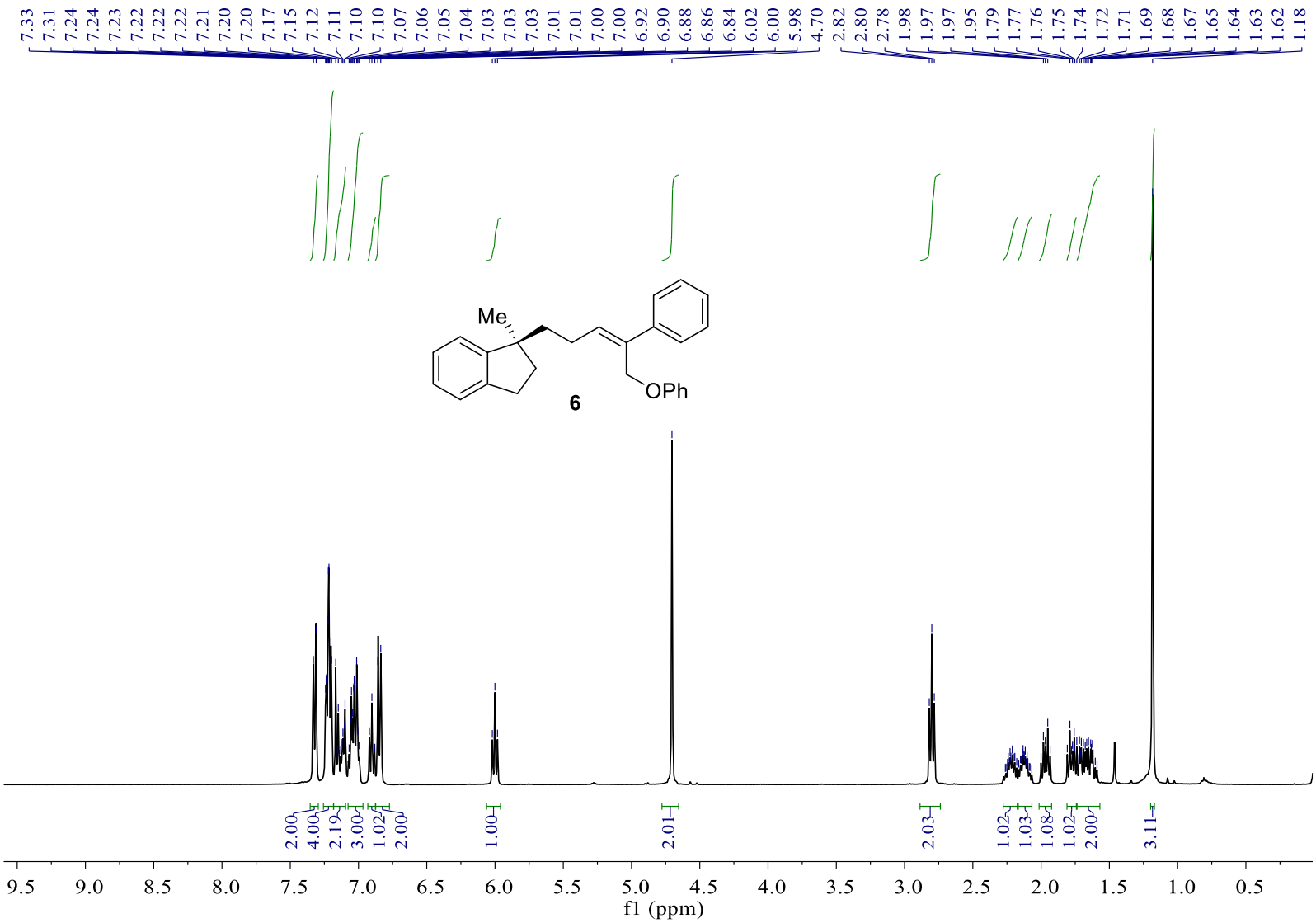
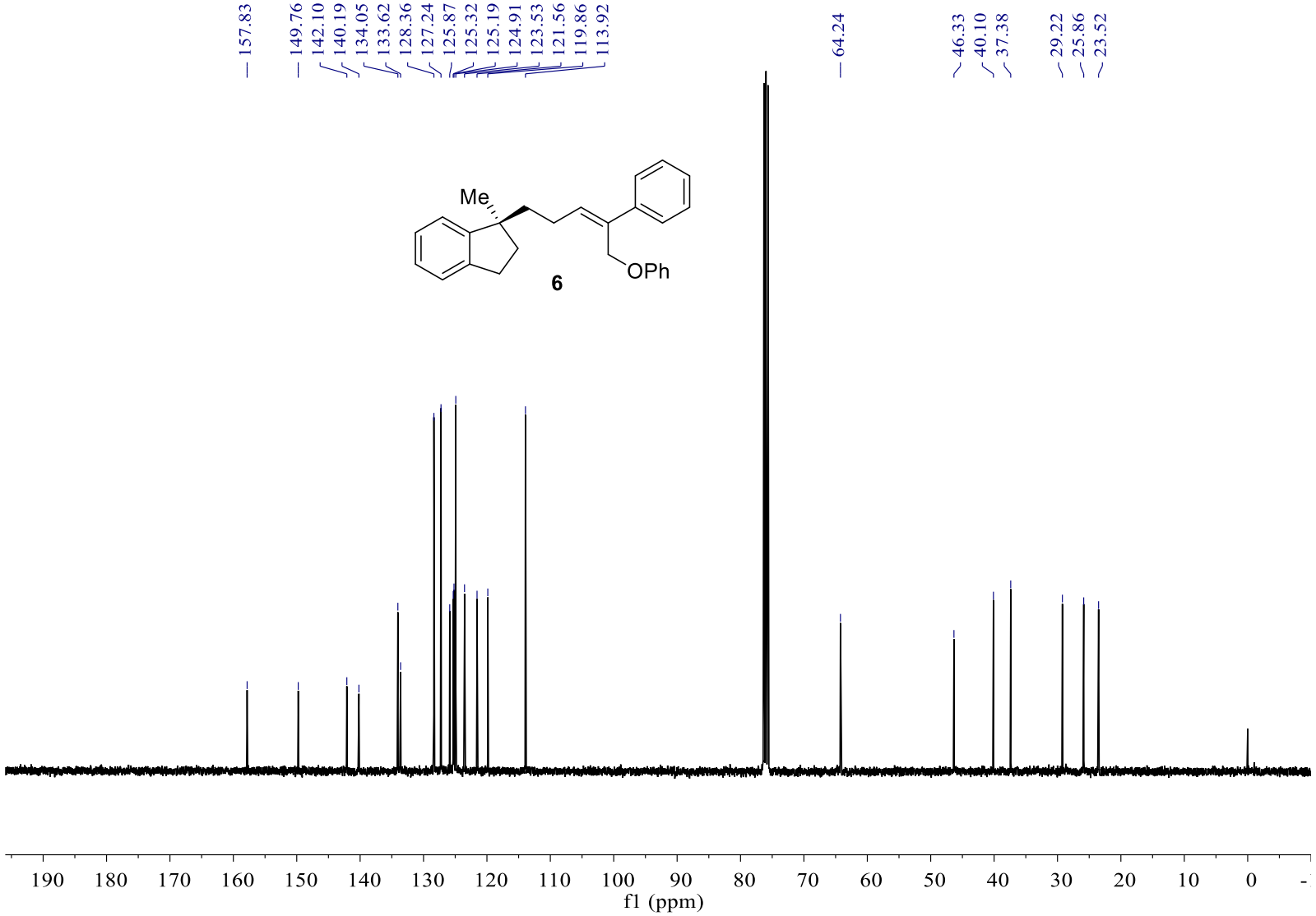
126.25
124.62
122.65
67.12
57.08
53.38
47.41
41.21
38.61
30.36
26.86
24.50
Me
N
O
5
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.33 7.31 7.24 7.24 7.23 7.22 7.22 7.22 7.21 7.20 7.20 7.17 7.15 7.12 7.11 7.10 7.10 7.07 7.06 7.05 7.04 7.03 7.03 7.03 7.01 7.01 7.00 7.00 6.92 6.90 6.88 6.86 6.84 6.02 6.00 5.98 4.70
2.82 2.80 2.78 1.98 1.97 1.97 1.95 1.79 1.77 1.76 1.75 1.74 1.72 1.71 1.69 1.68 1.67 1.65 1.64 1.63 1.62 1.18
Me
OPh
6
2.00 4.00 2.19 3.00 1.02 2.00 1.00 2.01 2.03 1.02 1.03 1.08 1.02 2.00 3.11
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
f1 (ppm)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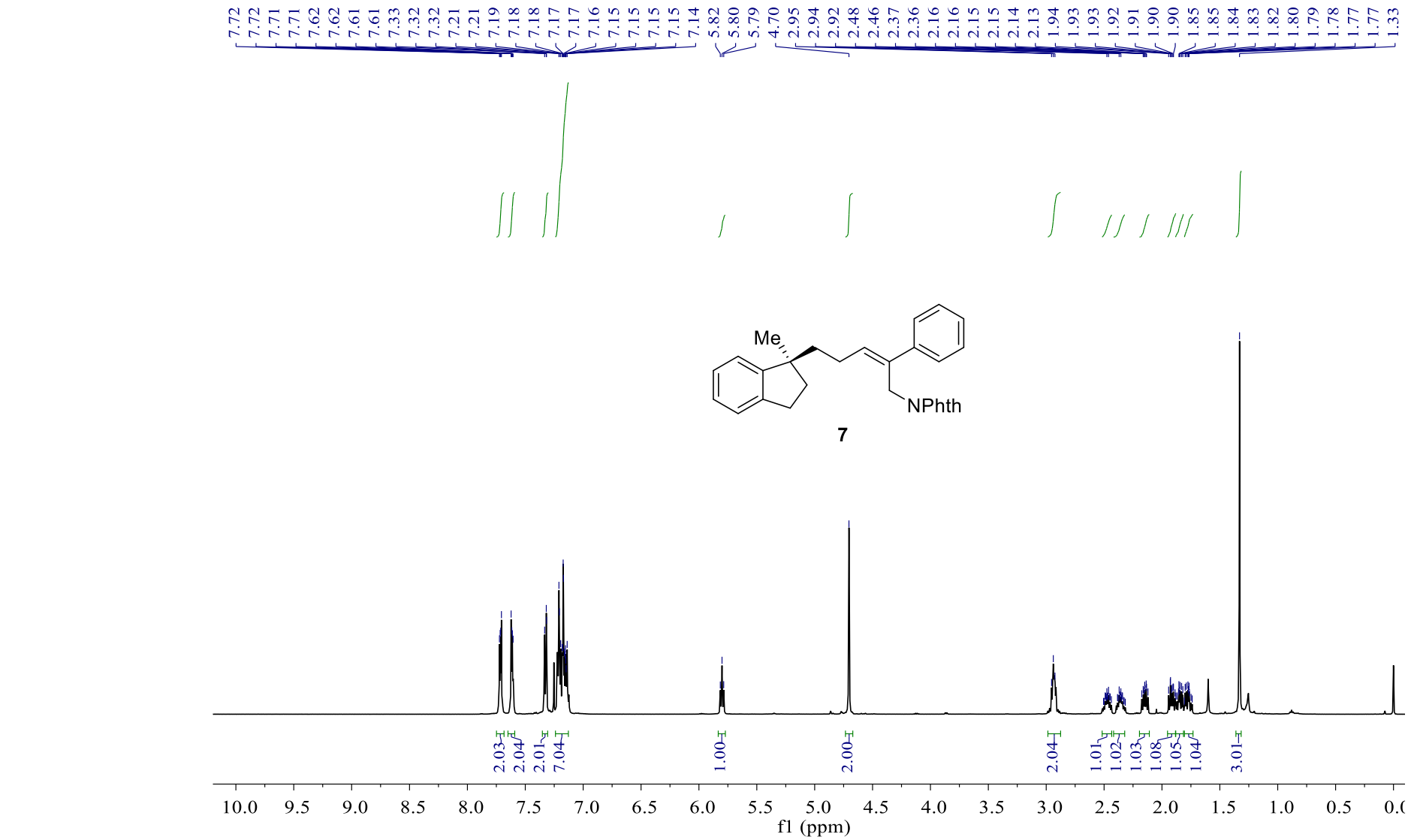
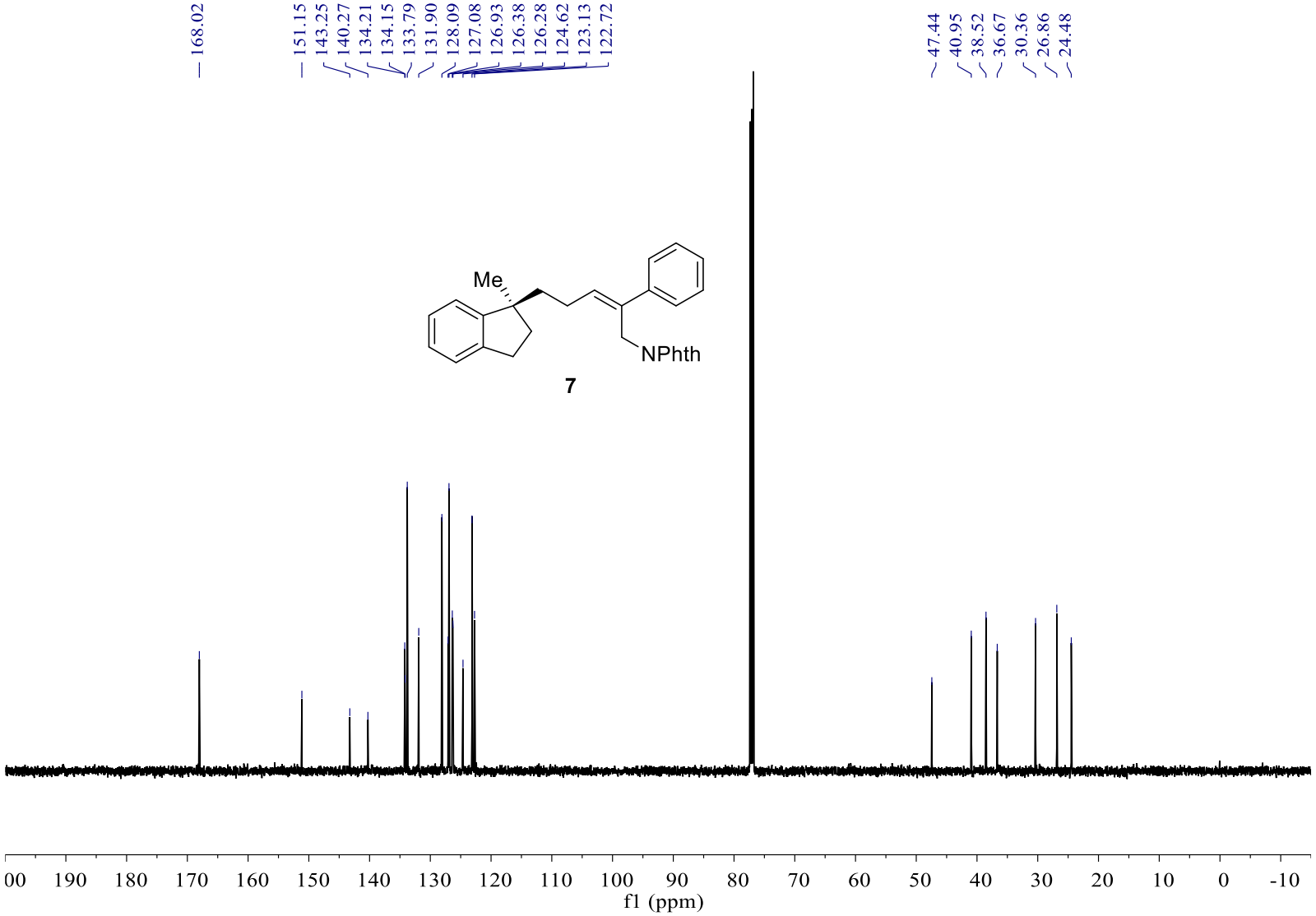
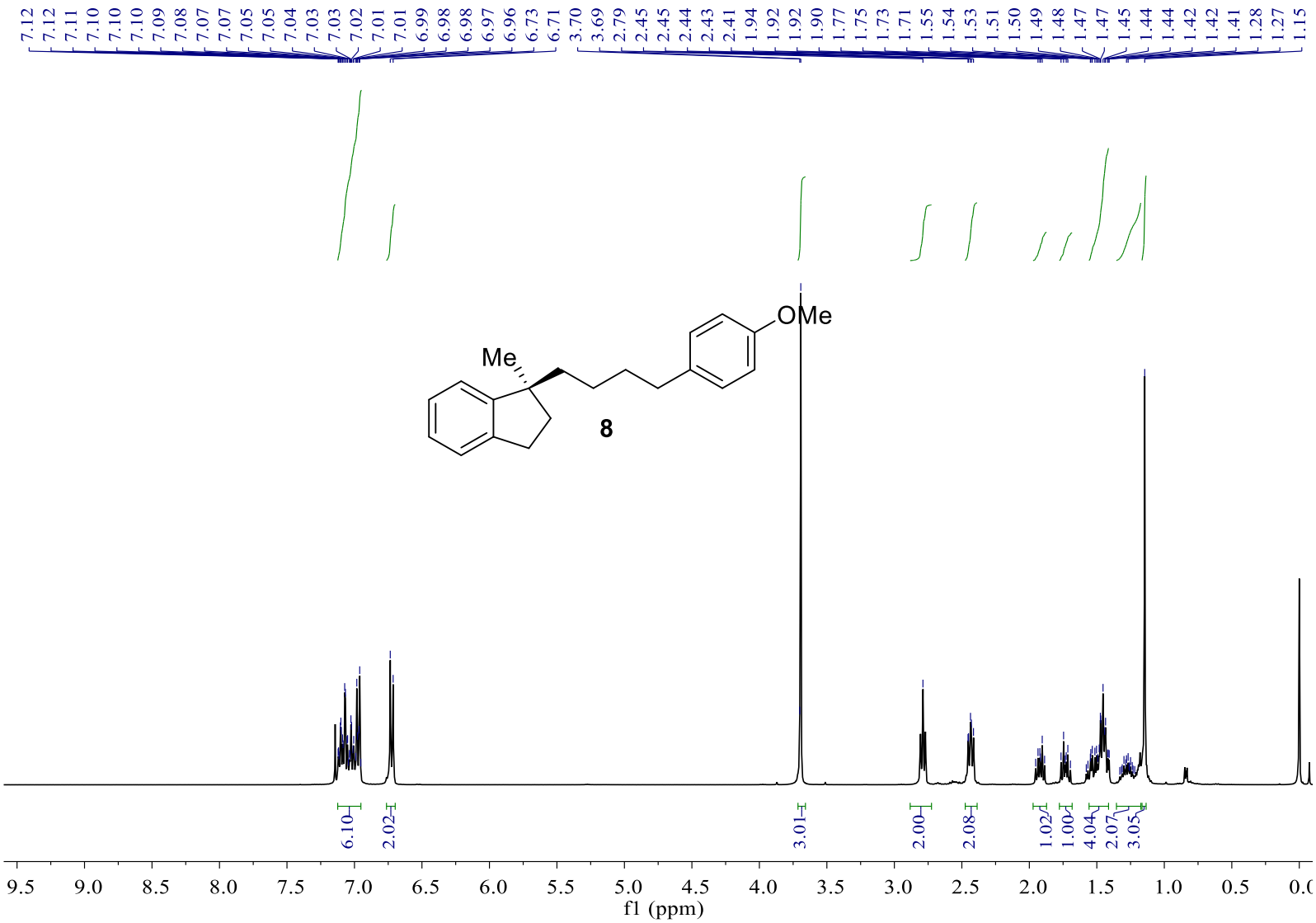
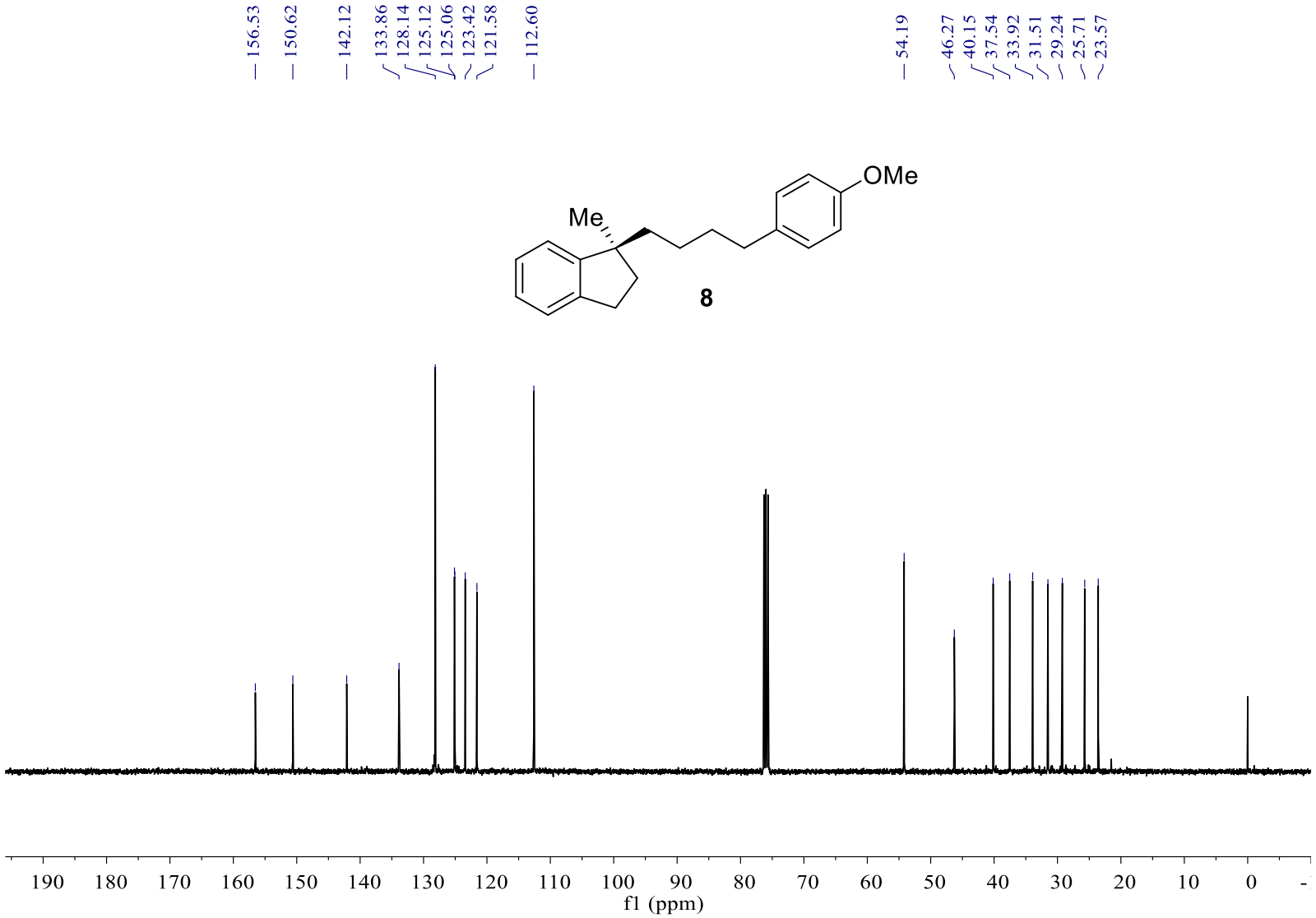
127.24
125.87
125.32
125.19
124.91
123.53
121.56
119.86
113.92
64.24
46.33
40.10
37.38
29.22
25.86
23.52
Me
OPh
6
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

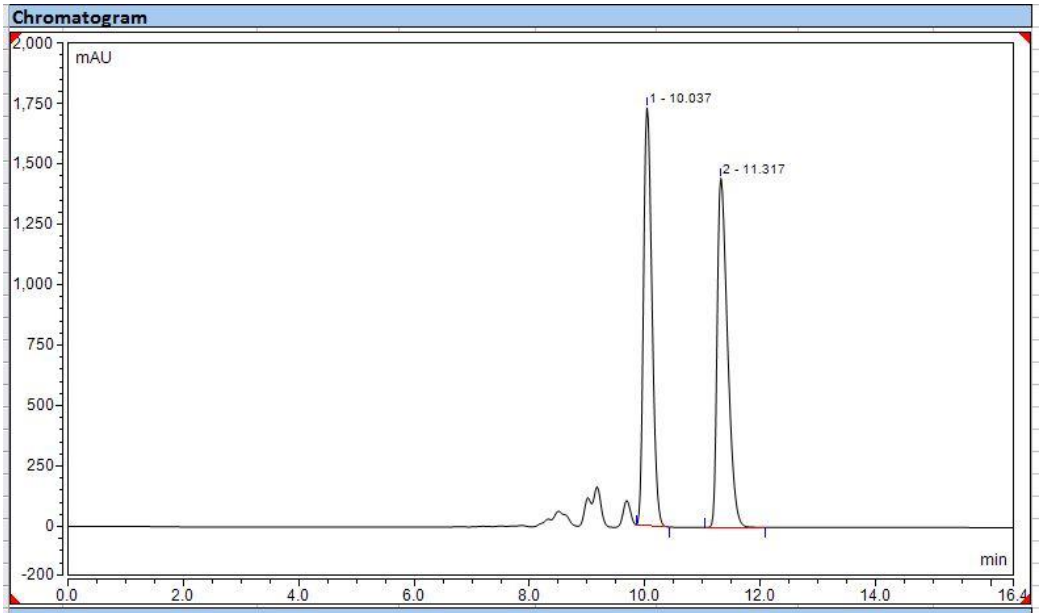

7.72 7.72 7.71 7.71 7.62 7.62 7.61 7.61 7.33 7.32 7.32 7.21 7.21 7.19 7.18 7.18 7.17 7.17 7.16 7.15 7.15 7.15 7.15 7.14 5.82 5.80 5.79 4.70 2.95 2.94 2.92 2.48 2.46 2.37 2.36 2.16 2.16 2.15 2.15 2.14 2.13 1.94 1.93 1.93 1.92 1.91 1.90 1.90 1.85 1.85 1.84 1.83 1.82 1.80 1.79 1.78 1.77 1.77 1.33
Me
NPhth
7
2.03 2.04 2.01 7.04 1.00 2.00 2.04 1.01 1.02 1.03 1.08 1.05 1.04 3.01
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
f1 (ppm)


168.02
151.15
143.25
140.27
134.21
134.15
133.79
131.90
128.09
127.08
126.93
126.38
126.28
124.62
123.13
122.72
47.44
40.95
38.52
36.67
30.36
26.86
24.48
Me
NPhth
7
00 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


7.12 7.12 7.11 7.10 7.10 7.10 7.09 7.08 7.07 7.07 7.05 7.05 7.04 7.03 7.03 7.02 7.01 7.01 6.99 6.98 6.98 6.97 6.96 6.73 6.71
3.70 3.69 2.79 2.45 2.45 2.44 2.43 2.41 1.94 1.92 1.92 1.90 1.77 1.75 1.73 1.71 1.55 1.54 1.53 1.51 1.50 1.49 1.48 1.47 1.47 1.45 1.44 1.44 1.42 1.42 1.41 1.28 1.27 1.15
OMe
Me
8
6.10
2.02
3.01
2.00
2.08
1.02
1.00
4.04
2.07
3.05
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
f1 (ppm)

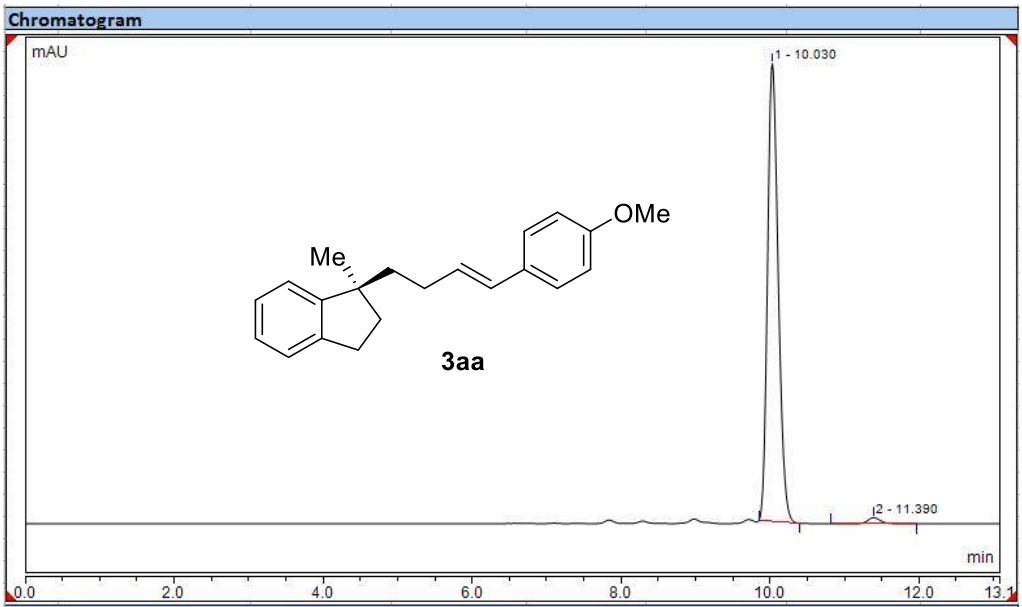

156.53
150.62
142.12
133.86
128.14
125.12
125.06
123.42
121.58
112.60
54.19
46.27
40.15
37.54
33.92
31.51
29.24
25.71
23.57
OMe
Me
8
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

XI. HPLC Chromatograms



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.037	292.581	1729.103	49.34	54.48	n.a.
2		11.317	300.413	1444.619	50.66	45.52	n.a.
Total:			**592.994**	**3173.722**	**100.00**	**100.00**	

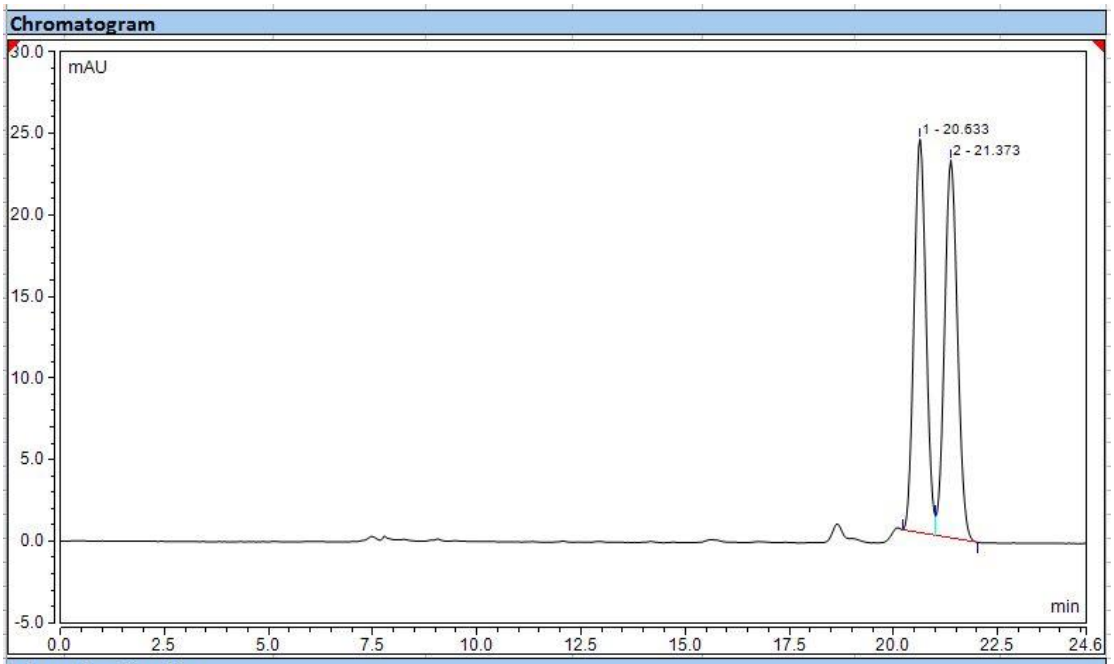


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.030	155.687	941.470	98.40	98.68	n.a.
2		11.390	2.529	12.589	1.60	1.32	n.a.
Total:			**158.216**	**954.059**	**100.00**	**100.00**	

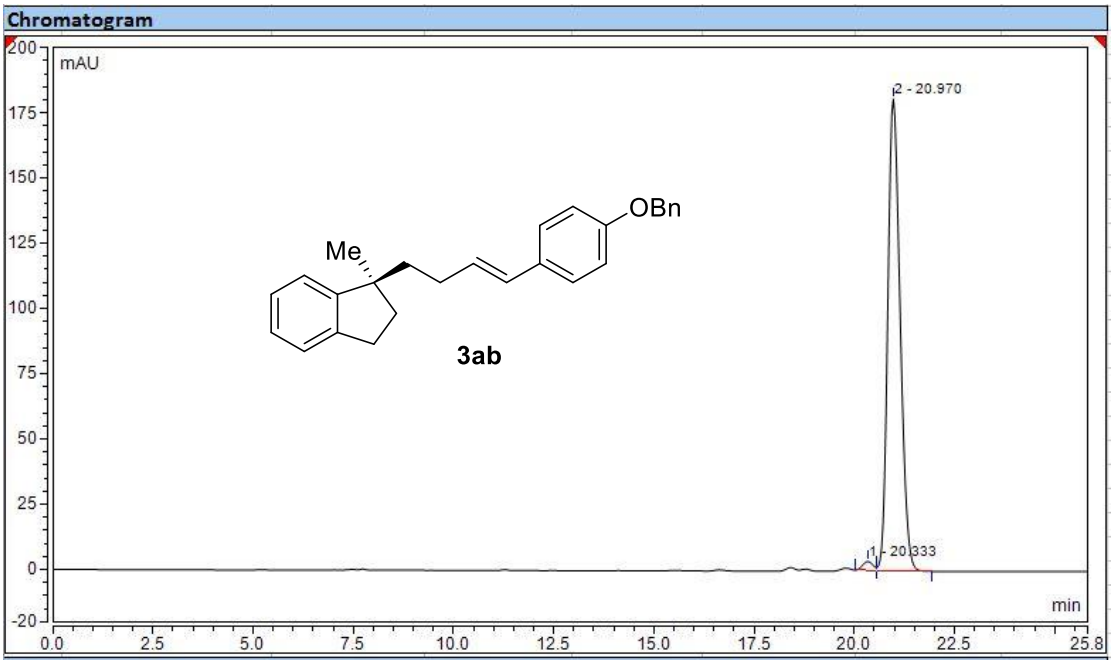
HPLC (Chiralpak IB): t_R= 10.0 (major), 11.4 (minor)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		20.633	8.032	24.128	49.10	51.03	n.a.
2		21.373	8.328	23.156	50.90	48.97	n.a.
Total:			**16.360**	**47.284**	**100.00**	**100.00**	

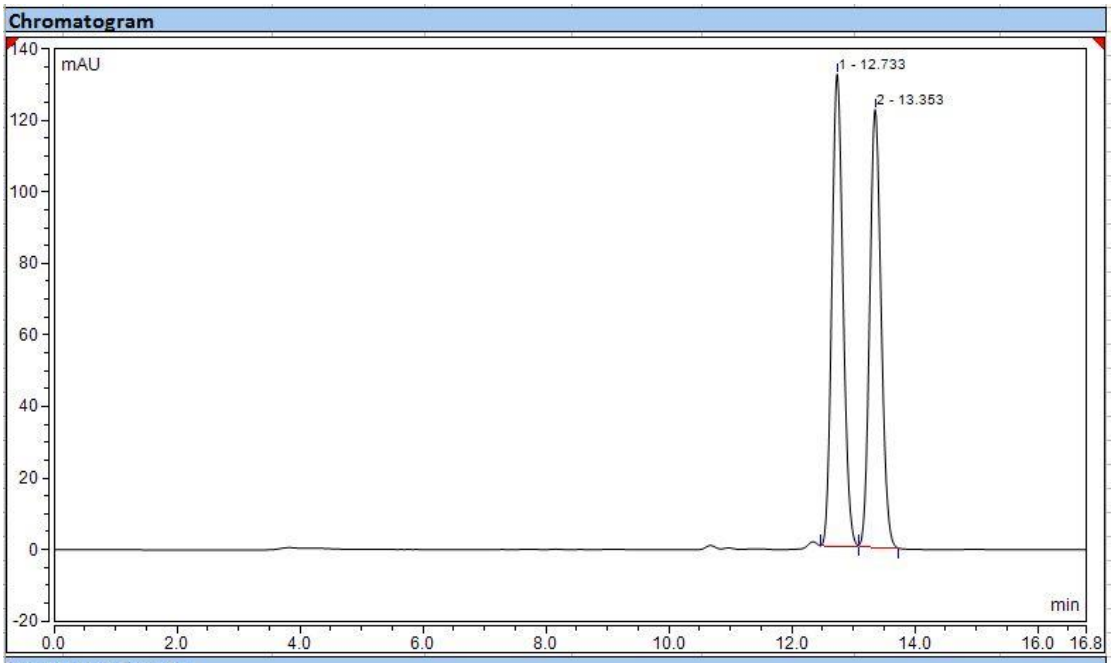


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		20.333	0.986	3.393	1.51	1.84	n.a.
2		20.970	64.353	180.945	98.49	98.16	n.a.
Total:			**65.339**	**184.338**	**100.00**	**100.00**	

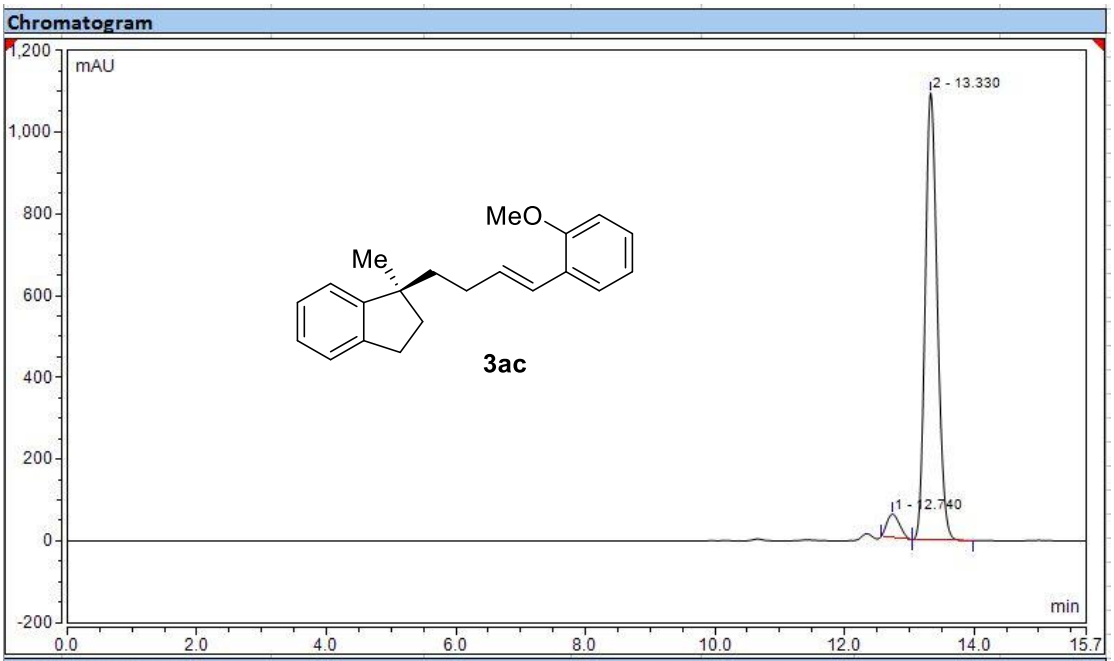
HPLC (Chiral MD): t_R= 20.3 (minor), 21.0 (major)

Condition: 96:4 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.733	27.770	132.038	51.37	51.88	n.a.
2		13.353	26.285	122.484	48.63	48.12	n.a.
Total:			**54.055**	**254.522**	**100.00**	**100.00**	

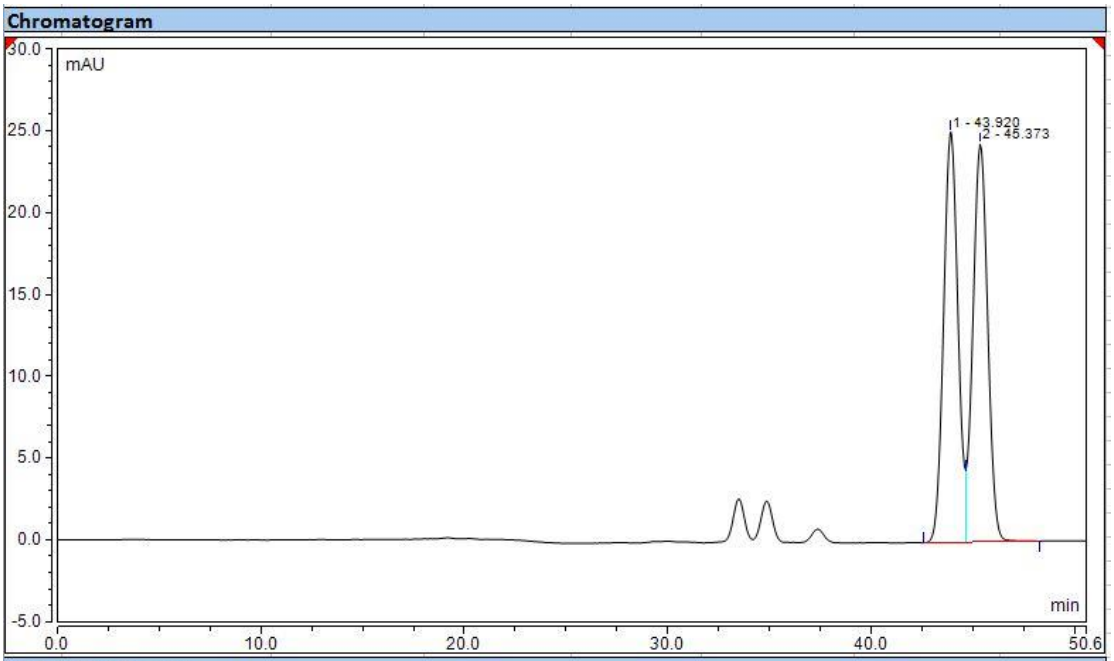


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.740	12.885	56.574	5.17	4.92	n.a.
2		13.330	236.462	1093.421	94.83	95.08	n.a.
Total:			**249.347**	**1149.995**	**100.00**	**100.00**	

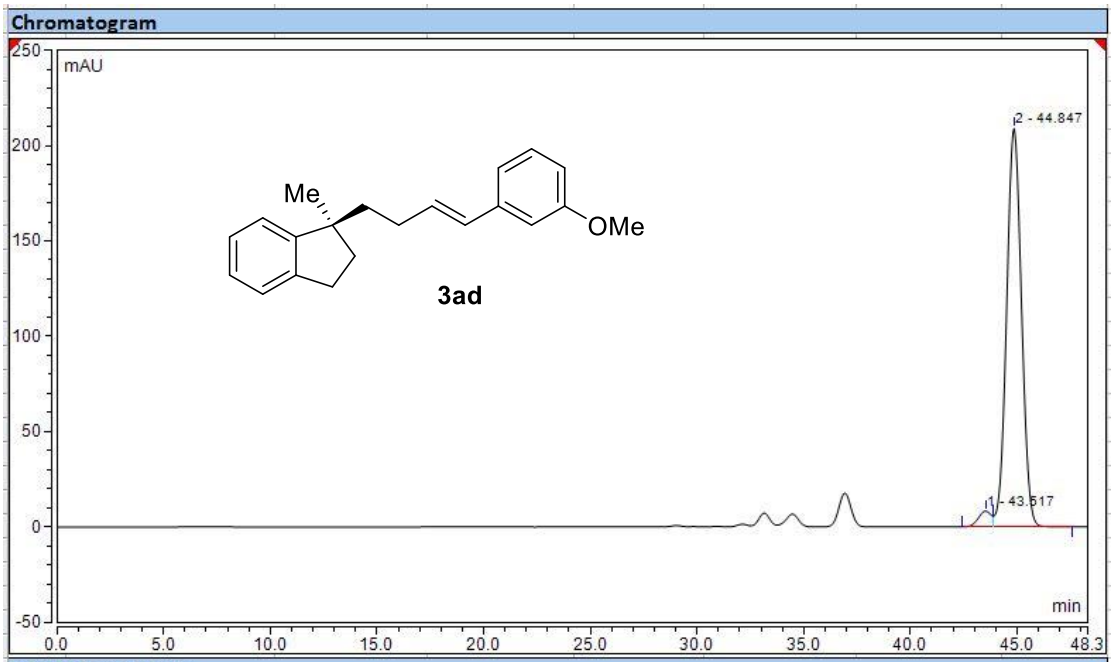
HPLC (Chiralpak IB): t_R= 12.7 (minor), 13.3 (major)

Condition: 98:2 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		43.920	20.372	25.096	49.77	50.77	n.a.
2		45.373	20.563	24.336	50.23	49.23	n.a.
Total:			**40.934**	**49.432**	**100.00**	**100.00**	

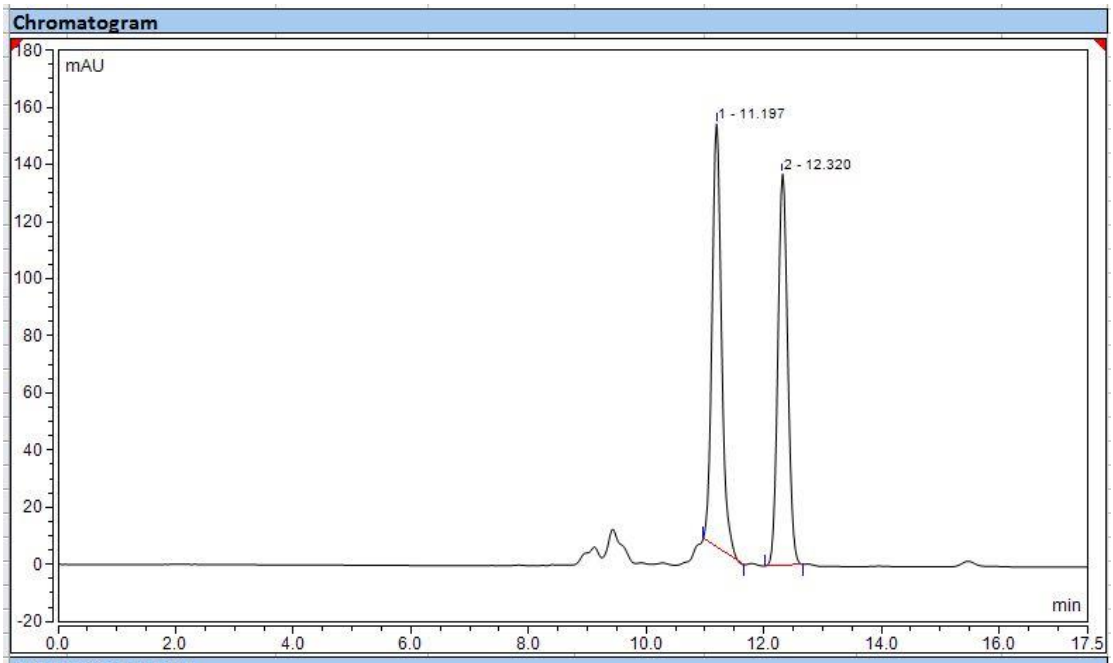


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		43.517	5.802	8.268	3.32	3.81	n.a.
2		44.847	168.756	208.948	96.68	96.19	n.a.
Total:			**174.558**	**217.216**	**100.00**	**100.00**	

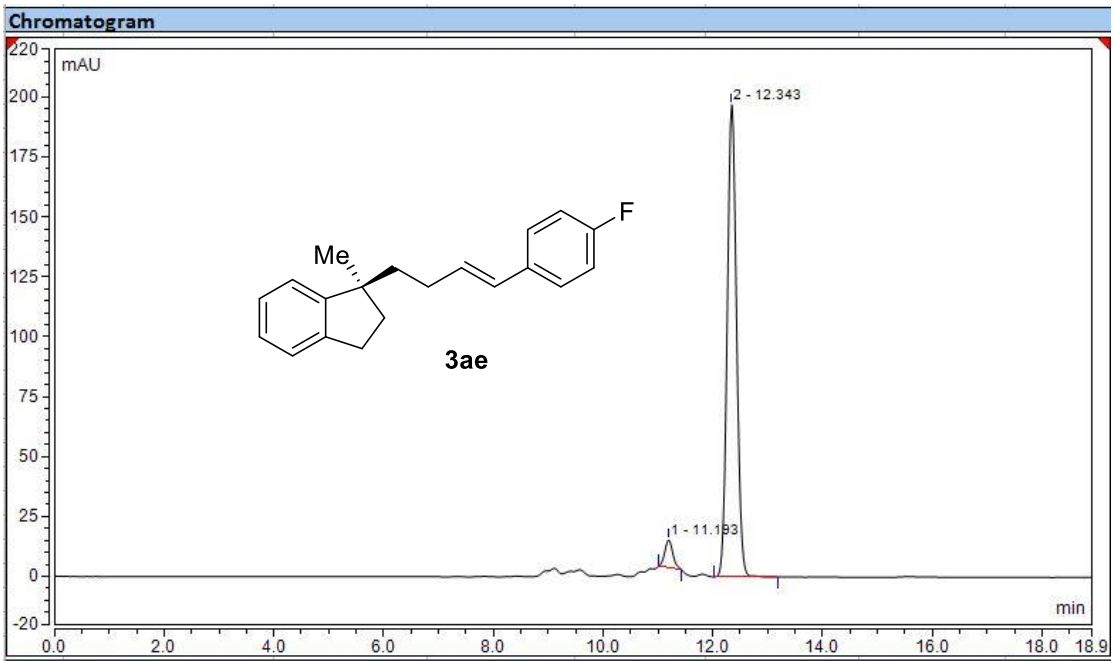
HPLC (Chiral MD): t_R= 43.5 (minor), 44.8 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		11.197	27.456	148.045	50.88	51.95	n.a.
2		12.320	26.511	136.935	49.12	48.05	n.a.
Total:			**53.968**	**284.980**	**100.00**	**100.00**	

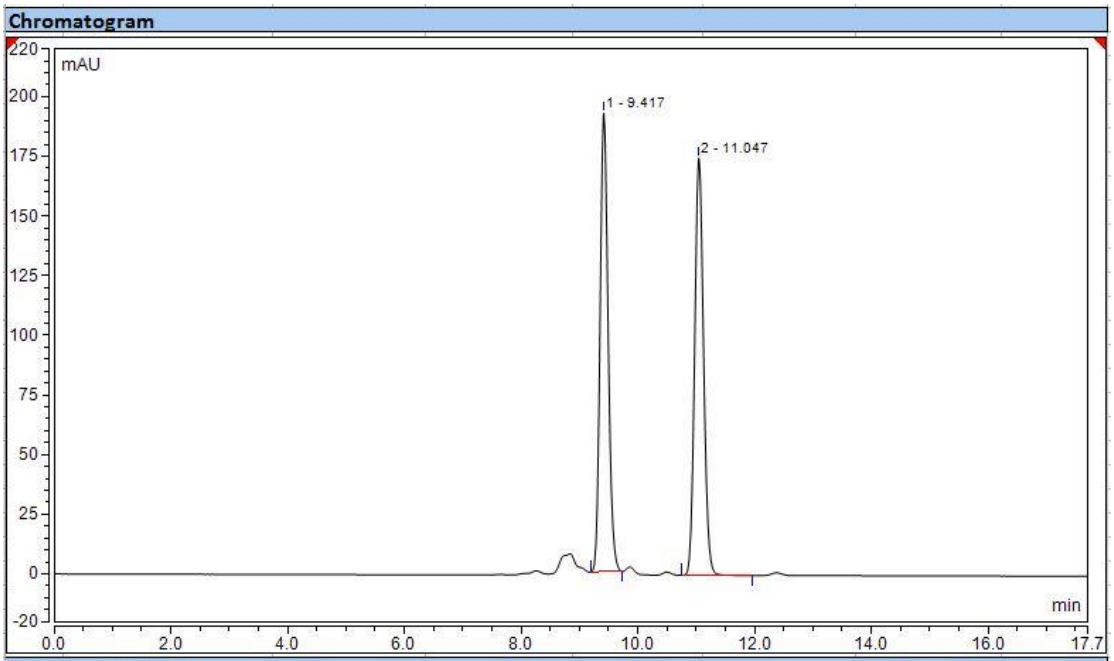


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		11.193	1.958	11.542	4.83	5.53	n.a.
2		12.343	38.549	197.049	95.17	94.47	n.a.
Total:			**40.506**	**208.591**	**100.00**	**100.00**	

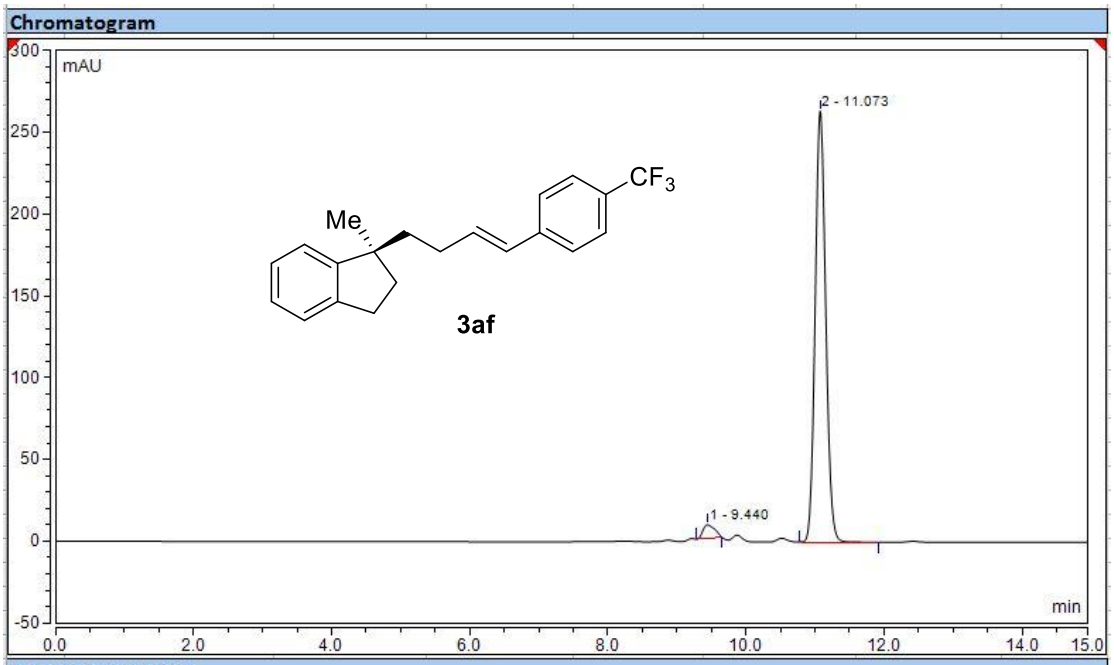
HPLC (Chiral MD): t_R= 11.2 (minor), 12.3 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.417	30.586	192.261	49.85	52.36	n.a.
2		11.047	30.769	174.953	50.15	47.64	n.a.
Total:			**61.354**	**367.213**	**100.00**	**100.00**	

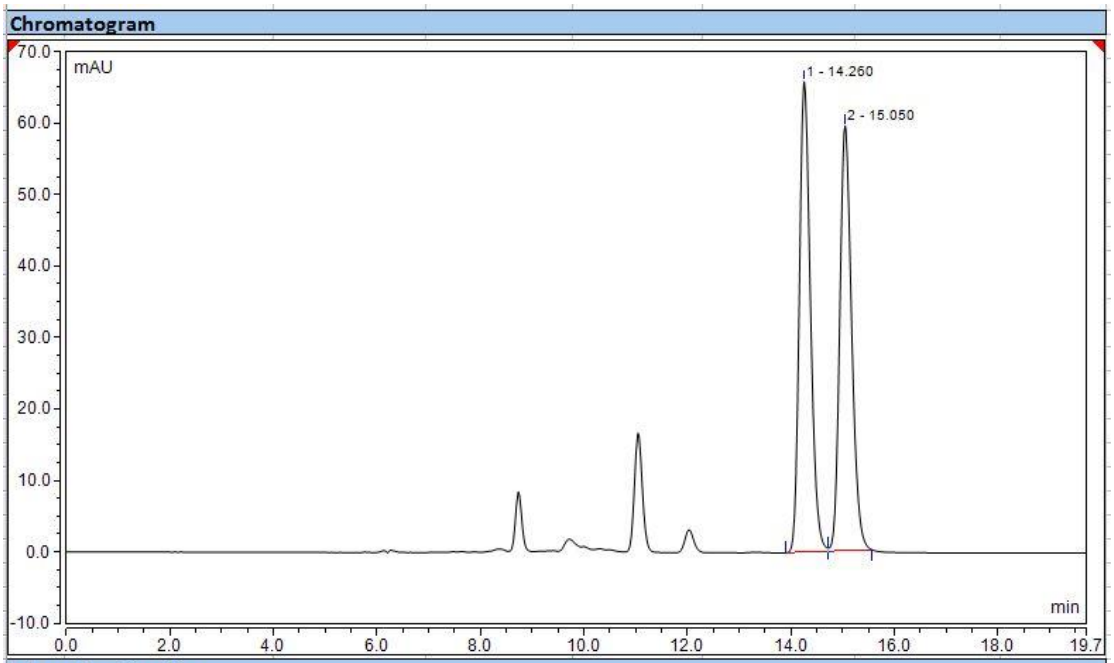


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.440	1.650	8.463	3.43	3.11	n.a.
2		11.073	46.507	263.531	96.57	96.89	n.a.
Total:			**48.157**	**271.994**	**100.00**	**100.00**	

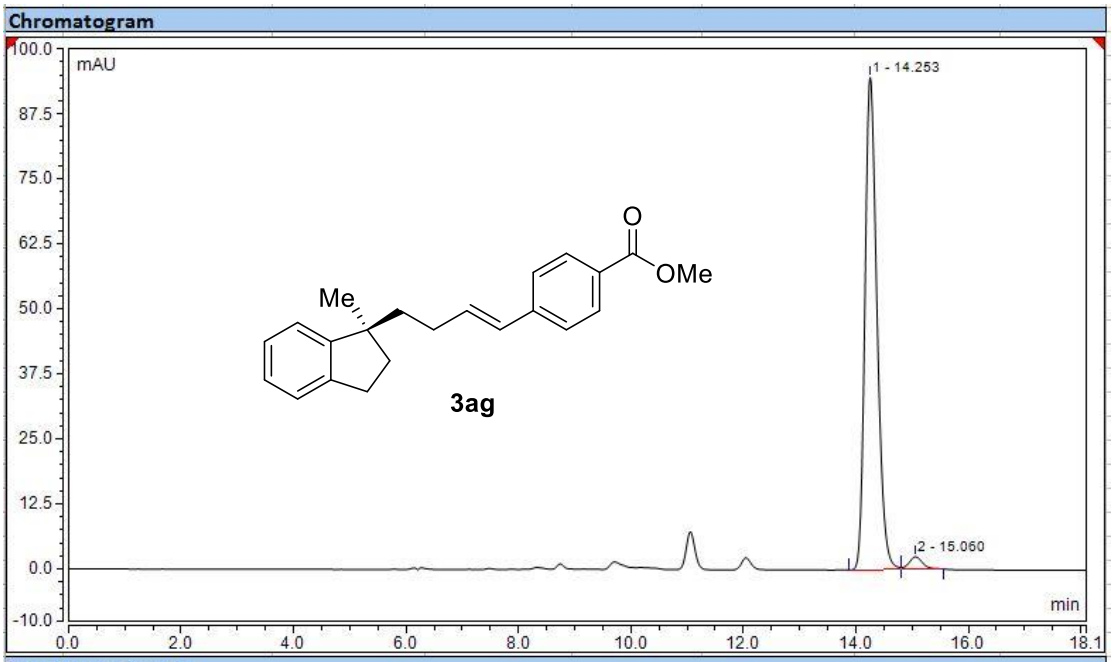
HPLC (Chiralpak IB): t_R= 9.4 (minor), 11.1 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		14.260	16.301	65.846	50.91	52.55	n.a.
2		15.050	15.719	59.452	49.09	47.45	n.a.
Total:			**32.020**	**125.297**	**100.00**	**100.00**	

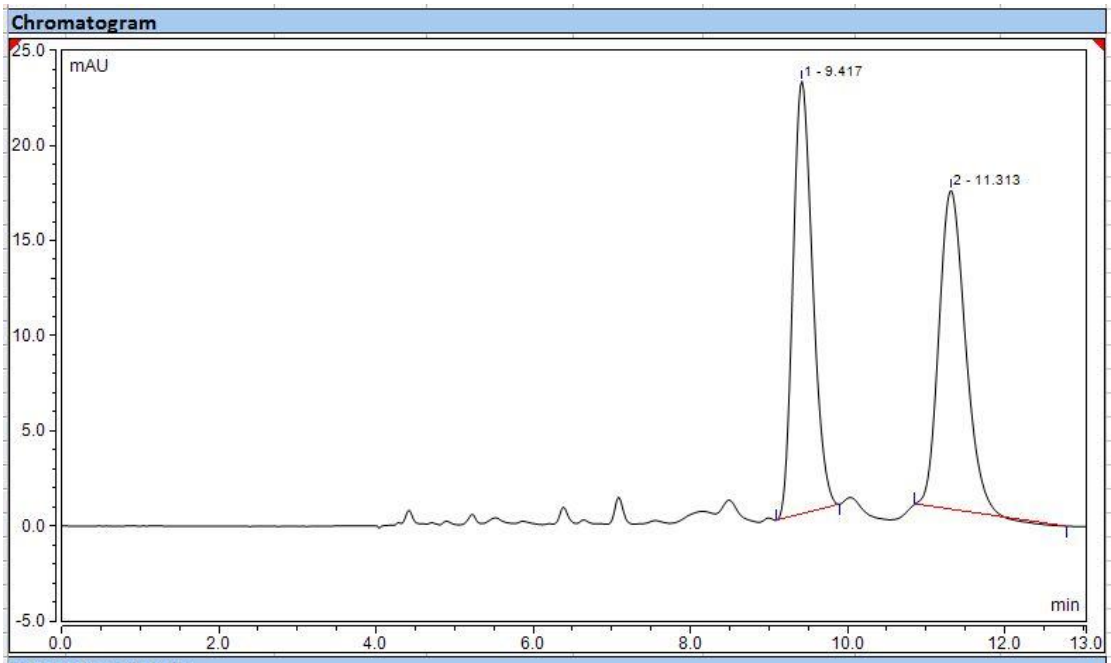


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		14.253	23.512	94.714	97.17	97.50	n.a.
2		15.060	0.685	2.427	2.83	2.50	n.a.
Total:			**24.196**	**97.141**	**100.00**	**100.00**	

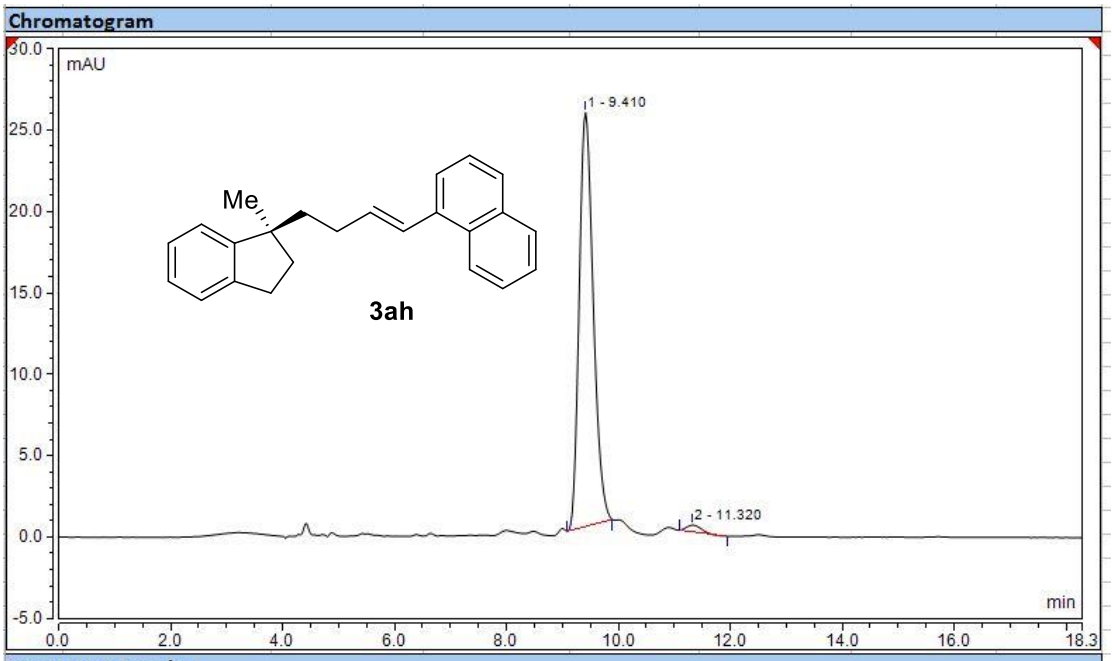
HPLC (Chiralpak IB): t_R= 14.3 (major), 15.1 (minor)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.417	6.573	22.740	50.31	57.58	n.a.
2		11.313	6.491	16.751	49.69	42.42	n.a.
Total:			**13.064**	**39.491**	**100.00**	**100.00**	

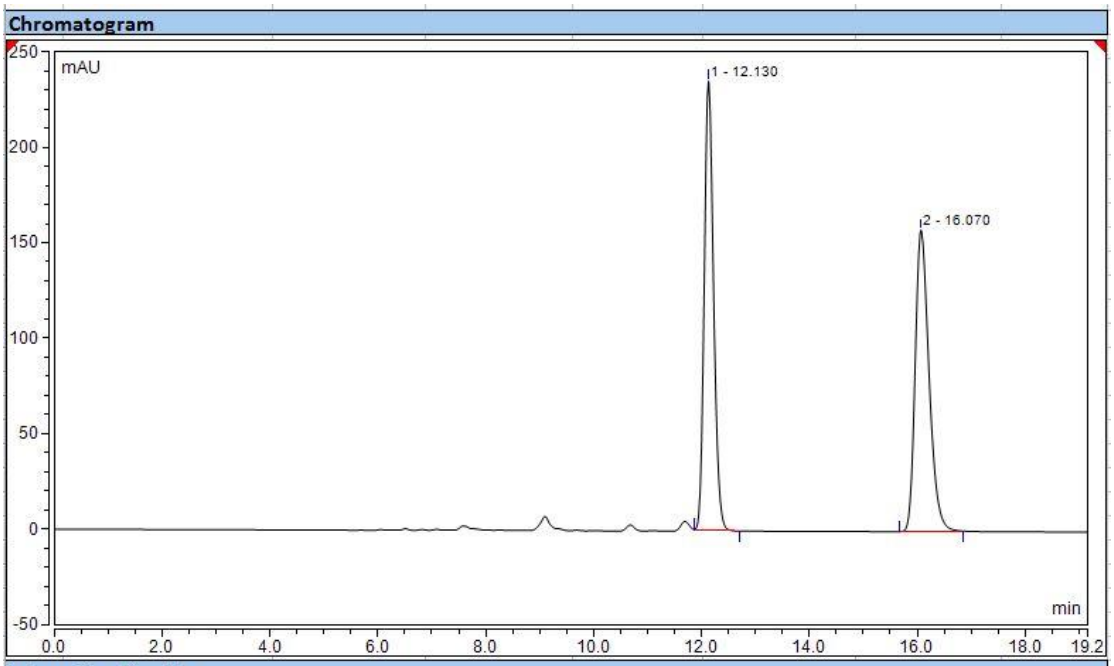


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.410	7.390	25.455	98.38	98.38	n.a.
2		11.320	0.122	0.419	1.62	1.62	n.a.
Total:			**7.512**	**25.874**	**100.00**	**100.00**	

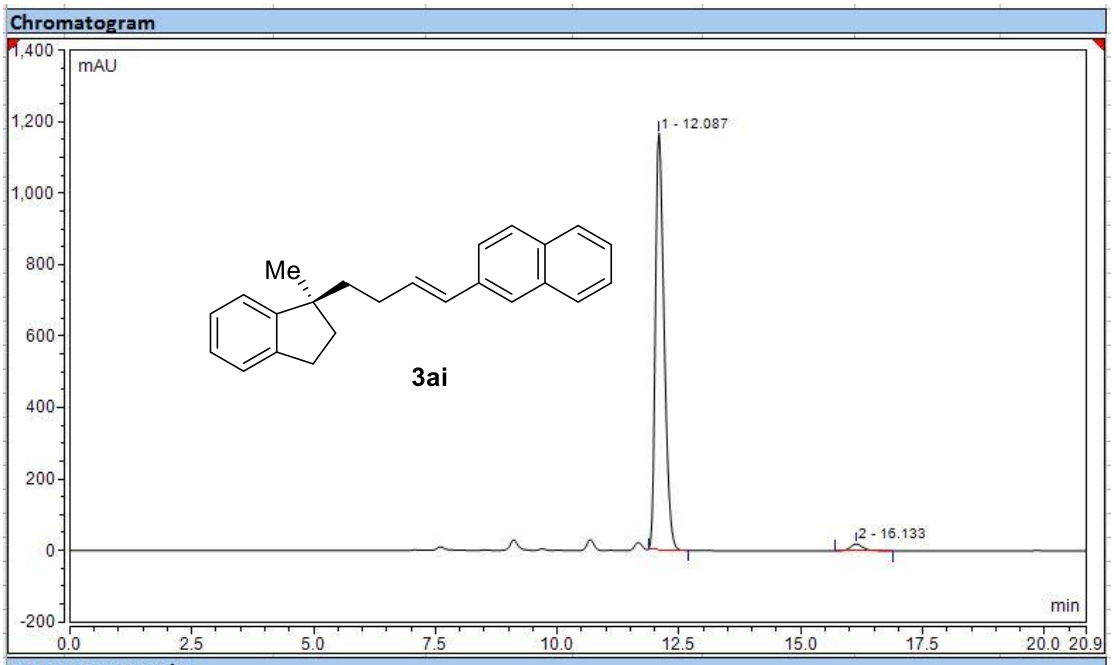
HPLC (Chiralcel OJ-H): t_R= 9.4 (major), 11.3 (minor)

Condition: 70:30 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.130	47.022	235.108	50.12	59.82	n.a.
2		16.070	46.791	157.915	49.88	40.18	n.a.
Total:			**93.813**	**393.023**	**100.00**	**100.00**	

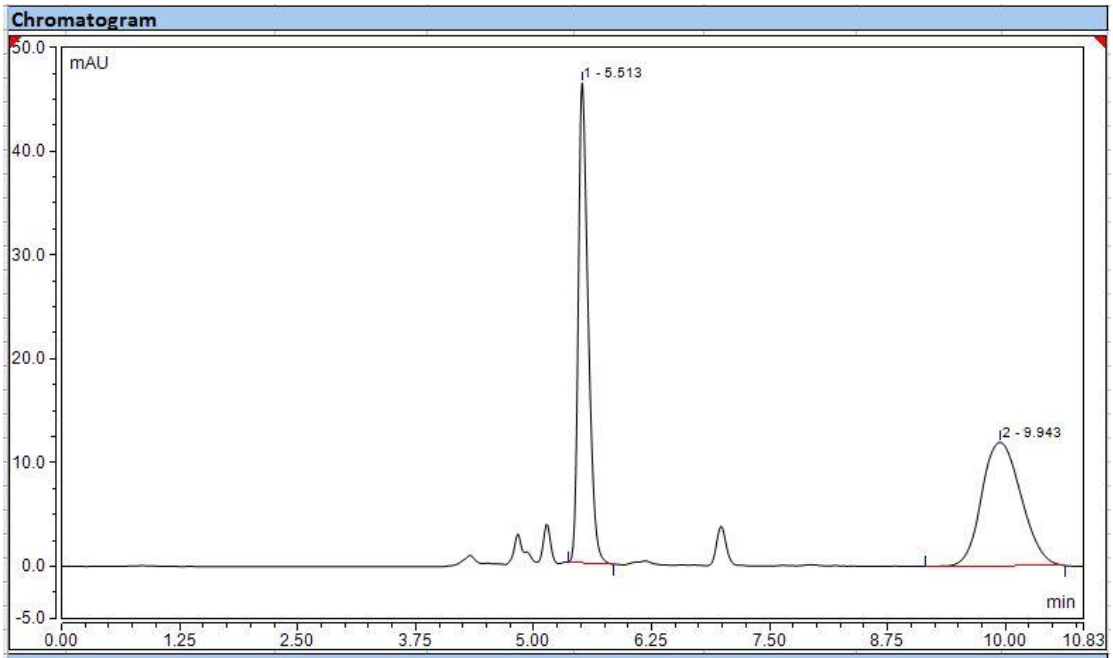


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.087	241.913	1166.138	97.72	98.38	n.a.
2		16.133	5.633	19.157	2.28	1.62	n.a.
Total:			**247.546**	**1185.295**	**100.00**	**100.00**	

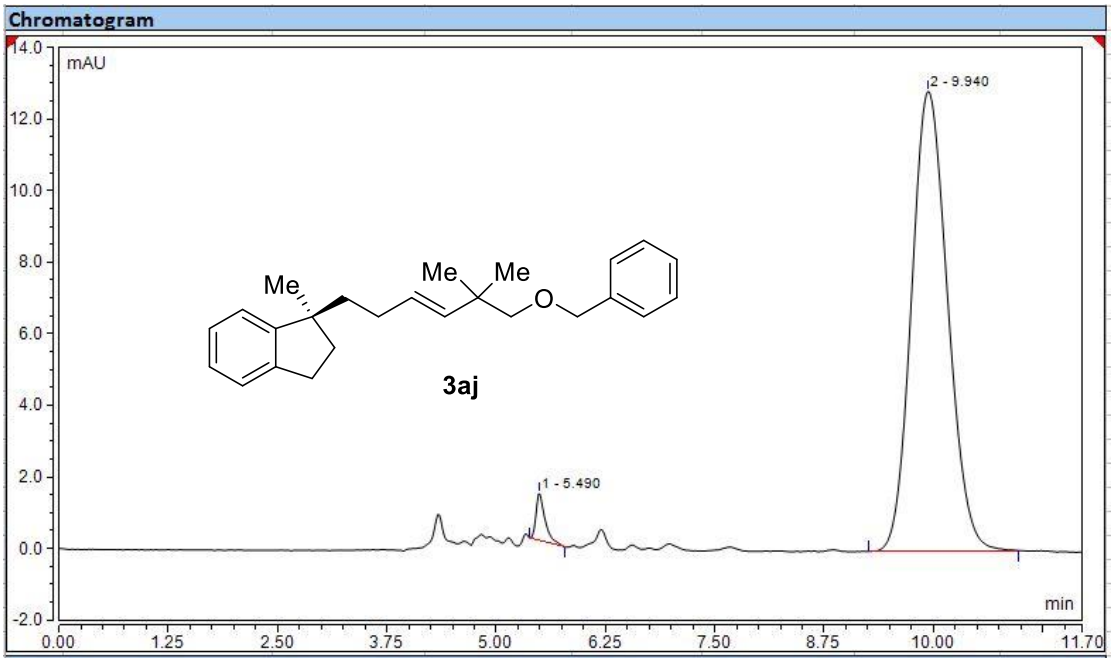
HPLC (Chiralpak IB): t_R= 12.1 (major), 16.1 (minor)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.513	5.594	46.253	49.24	79.53	n.a.
2		9.943	5.768	11.904	50.76	20.47	n.a.
Total:			**11.362**	**58.157**	**100.00**	**100.00**	

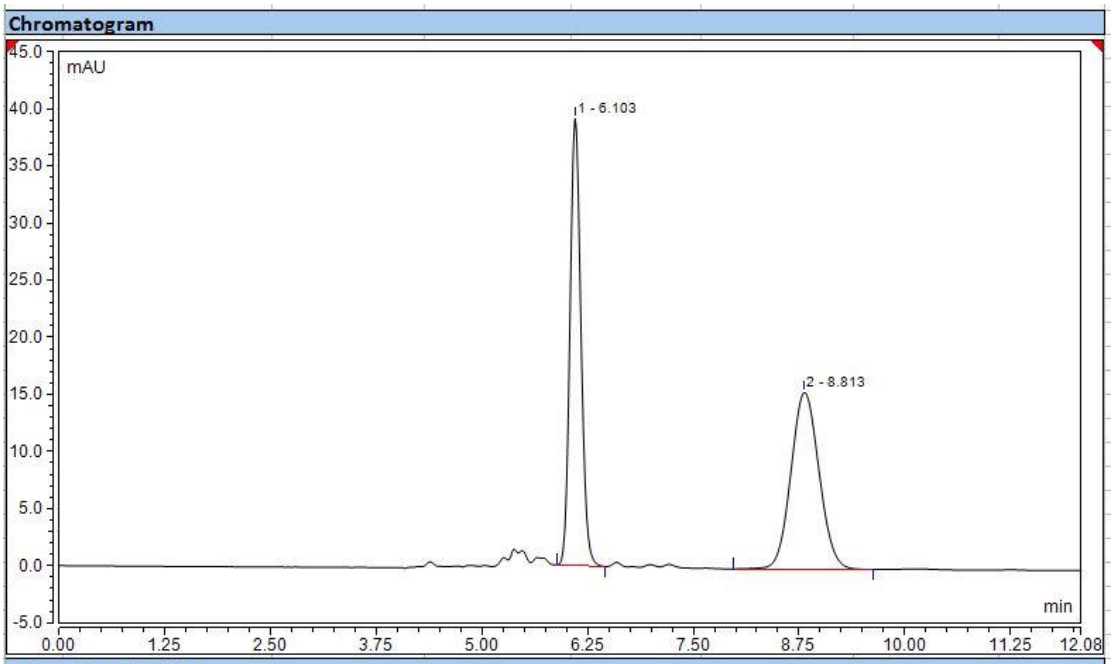


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.490	0.160	1.329	2.53	9.37	n.a.
2		9.940	6.153	12.856	97.47	90.63	n.a.
Total:			**6.313**	**14.185**	**100.00**	**100.00**	

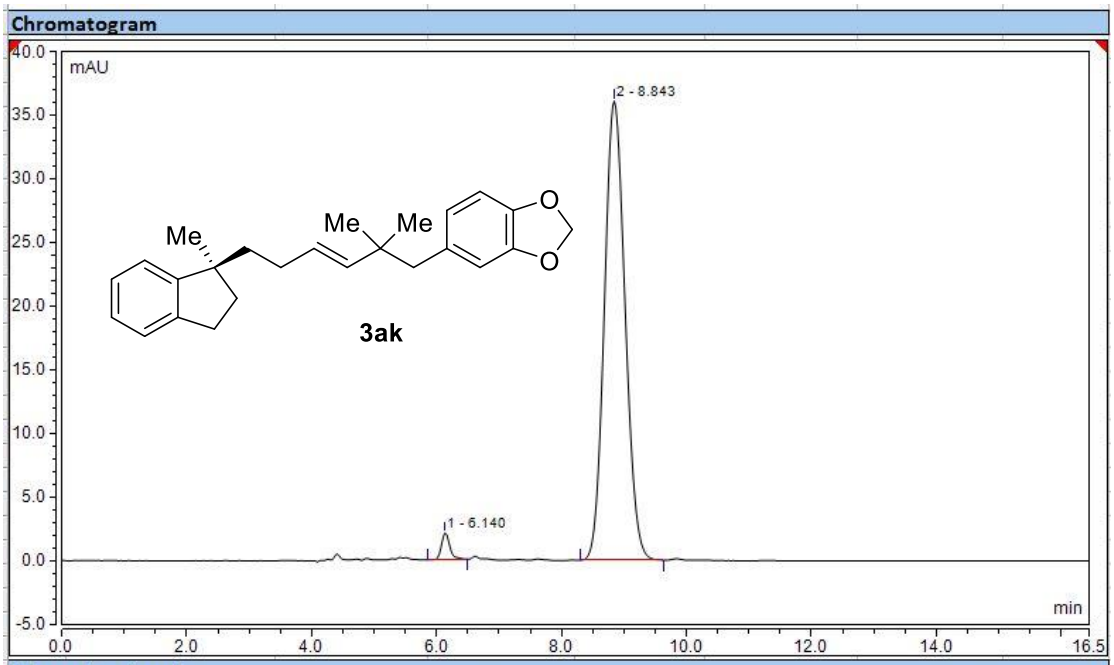
HPLC (Chiralcel OJ-H): t_R= 5.5 (minor), 9.9 (major)

Condition: 70:30 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.103	5.842	39.137	49.42	71.65	n.a.
2		8.813	5.980	15.482	50.58	28.35	n.a.
Total:			**11.822**	**54.620**	**100.00**	**100.00**	

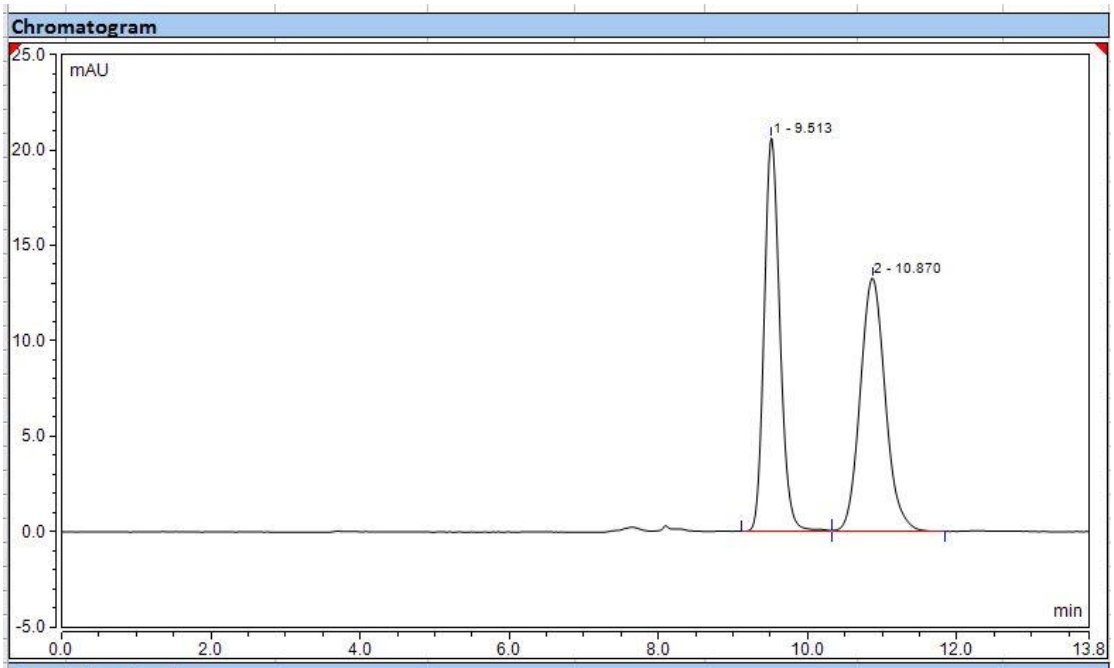


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.140	0.323	2.101	2.28	5.50	n.a.
2		8.843	13.837	36.095	97.72	94.50	n.a.
Total:			**14.160**	**38.195**	**100.00**	**100.00**	

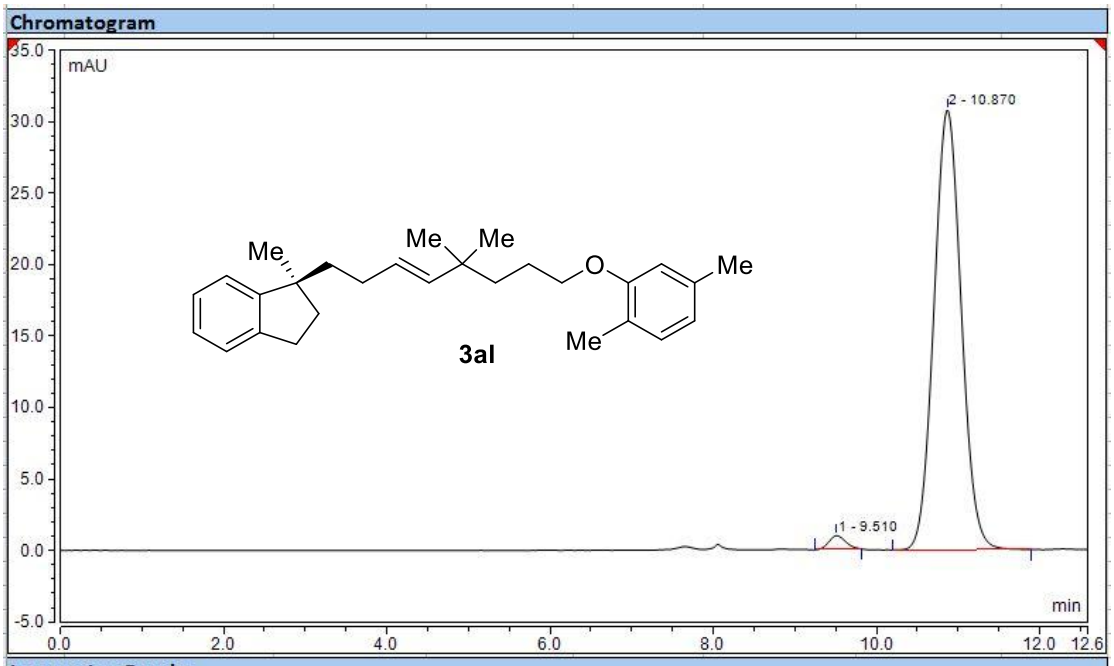
HPLC (Chiralcel OJ-H): t_R= 6.1 (minor), 8.8 (major)

Condition: 70:30 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.513	5.033	20.615	49.33	60.82	n.a.
2		10.870	5.170	13.280	50.67	39.18	n.a.
Total:			**10.203**	**33.895**	**100.00**	**100.00**	

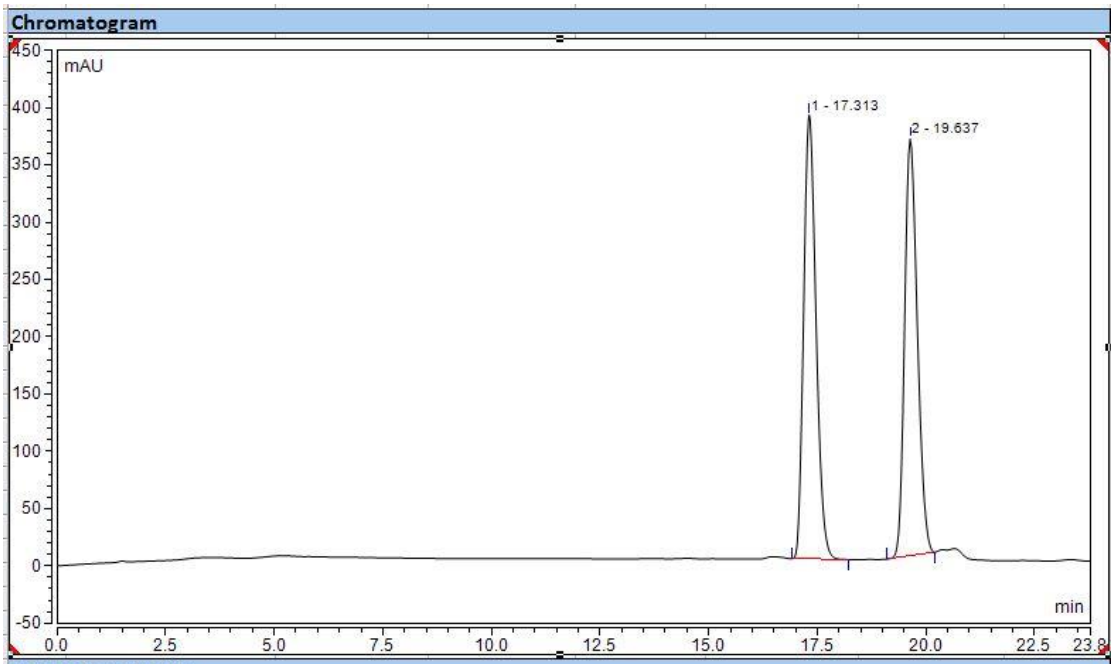


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.510	0.230	0.961	1.89	3.03	n.a.
2		10.870	11.938	30.785	98.11	96.97	n.a.
Total:			**12.167**	**31.745**	**100.00**	**100.00**	

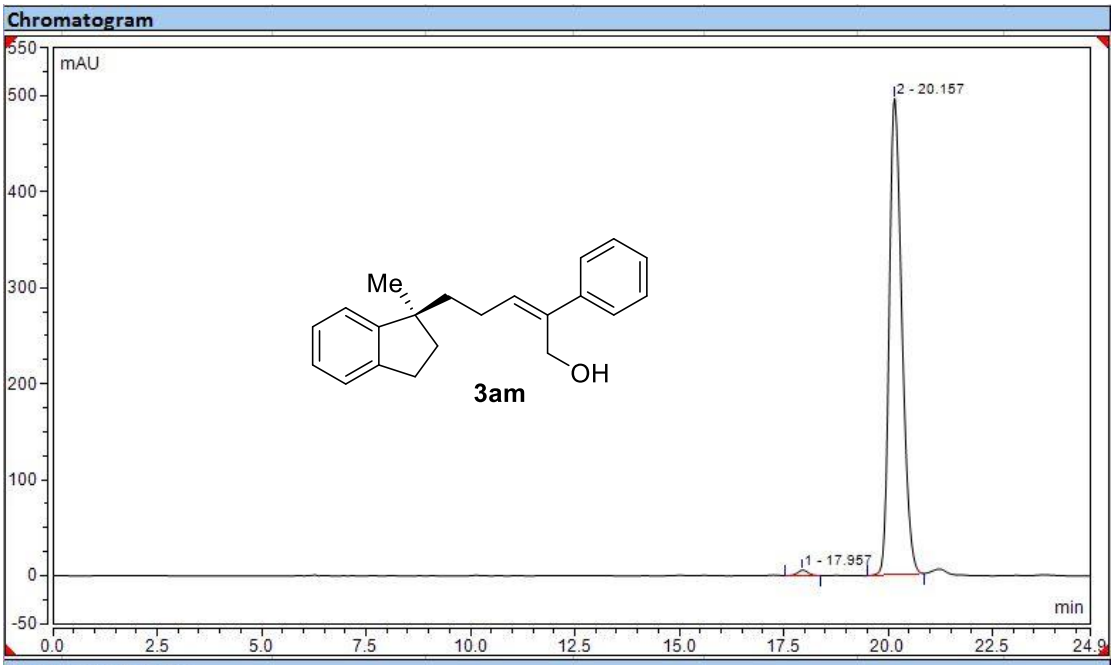
HPLC (Chiralcel OJ-H): t_R= 9.5 (minor), 10.9 (major)

Condition: 96:4 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		17.313	127.533	387.650	50.80	51.57	n.a.
2		19.637	123.502	364.082	49.20	48.43	n.a.
Total:			**251.035**	**751.733**	**100.00**	**100.00**	

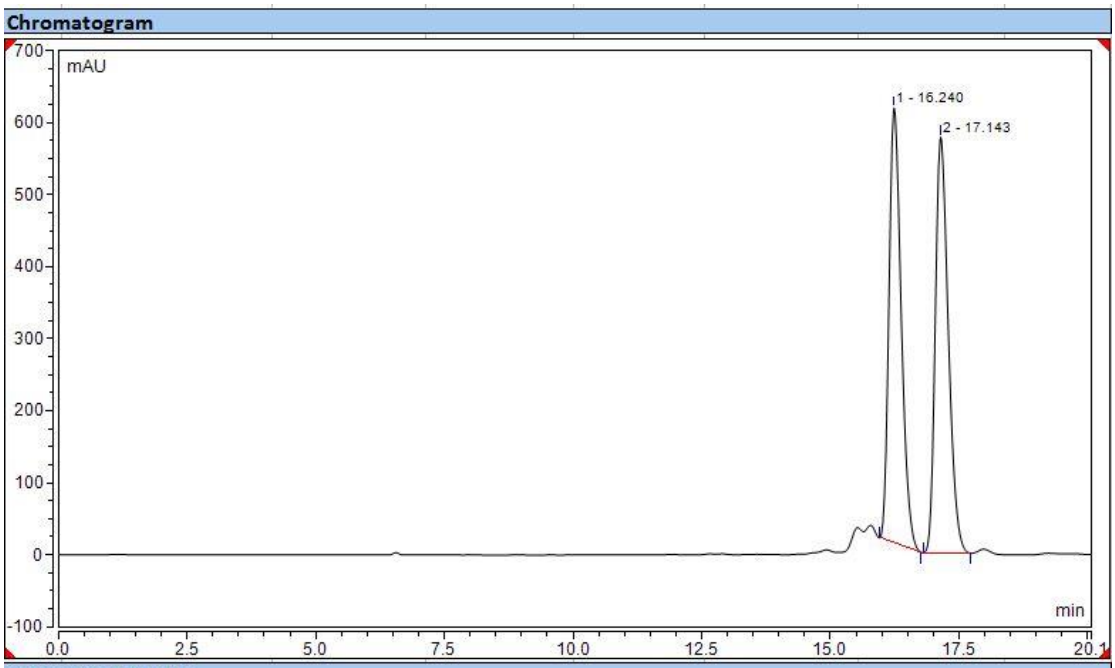


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		17.957	1.652	5.709	0.94	1.14	n.a.
2		20.157	174.222	496.044	99.06	98.86	n.a.
Total:			**175.874**	**501.753**	**100.00**	**100.00**	

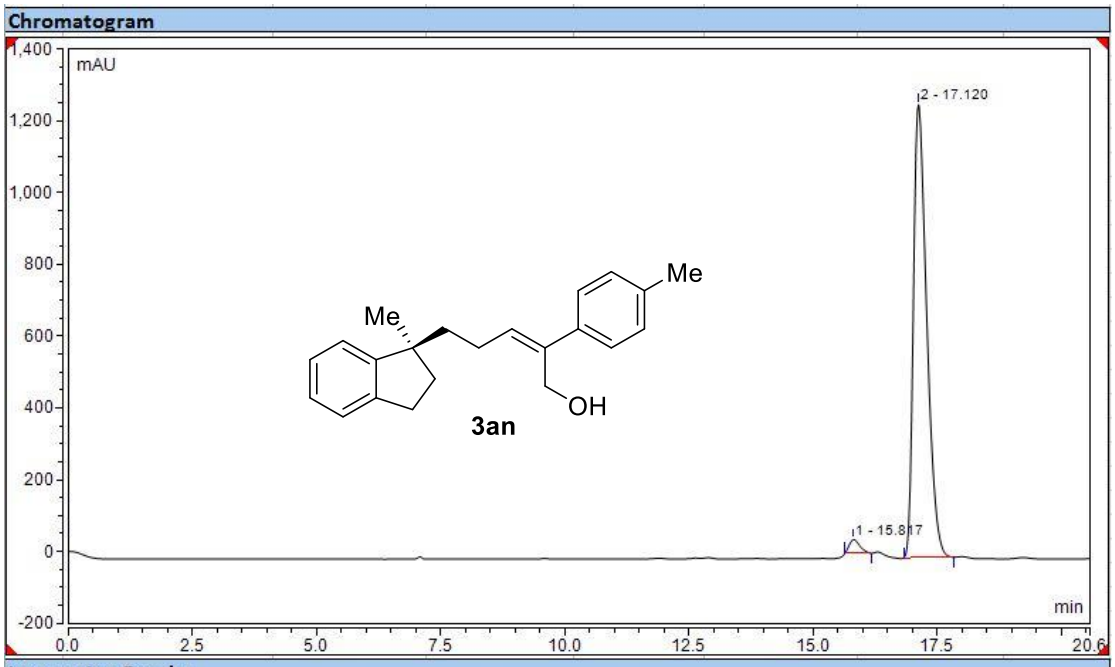
HPLC (Chiralpak IB): t_R= 17.9 (minor), 20.1 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		16.240	165.390	603.580	49.45	51.11	n.a.
2		17.143	169.038	577.384	50.55	48.89	n.a.
Total:			**334.428**	**1180.964**	**100.00**	**100.00**	

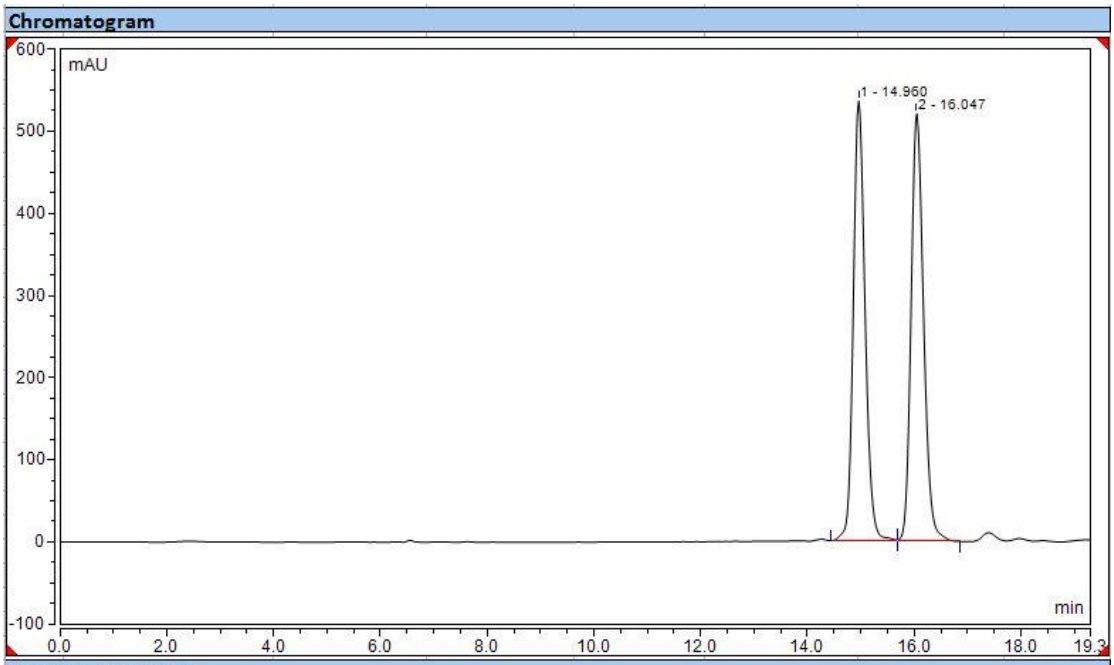


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		15.817	9.426	38.450	2.35	2.96	n.a.
2		17.120	391.313	1262.259	97.65	97.04	n.a.
Total:			**400.739**	**1300.709**	**100.00**	**100.00**	

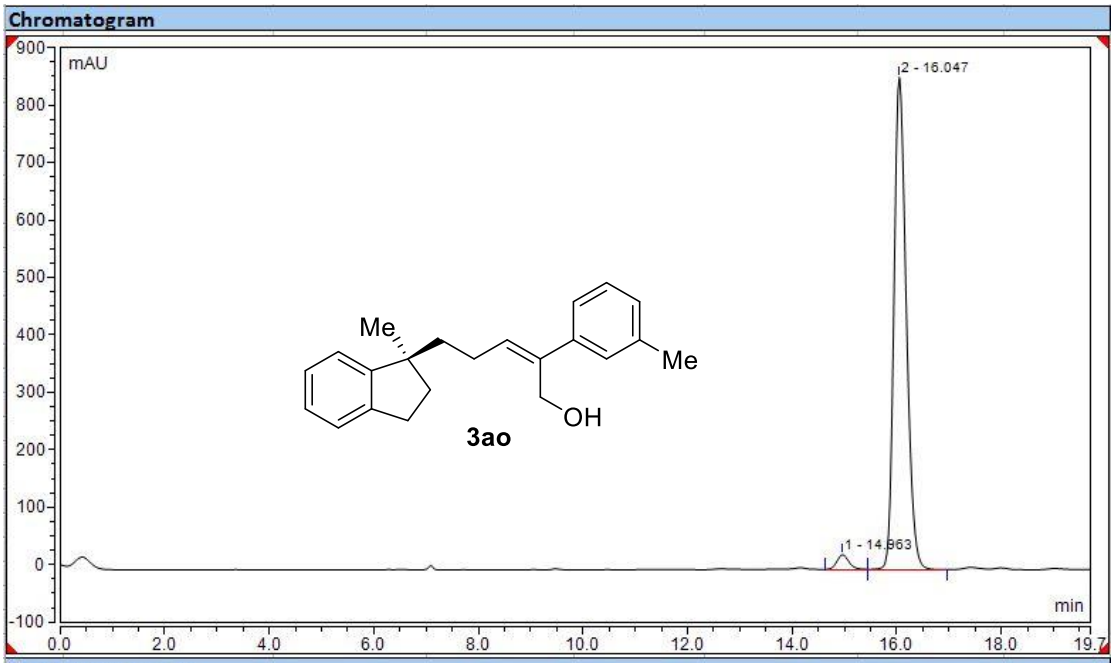
HPLC (Chiralpak IB): t_R= 15.8 (minor), 17.1 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		14.960	136.775	535.351	49.29	50.71	n.a.
2		16.047	140.702	520.344	50.71	49.29	n.a.
Total:			277.477	1055.695	100.00	100.00	

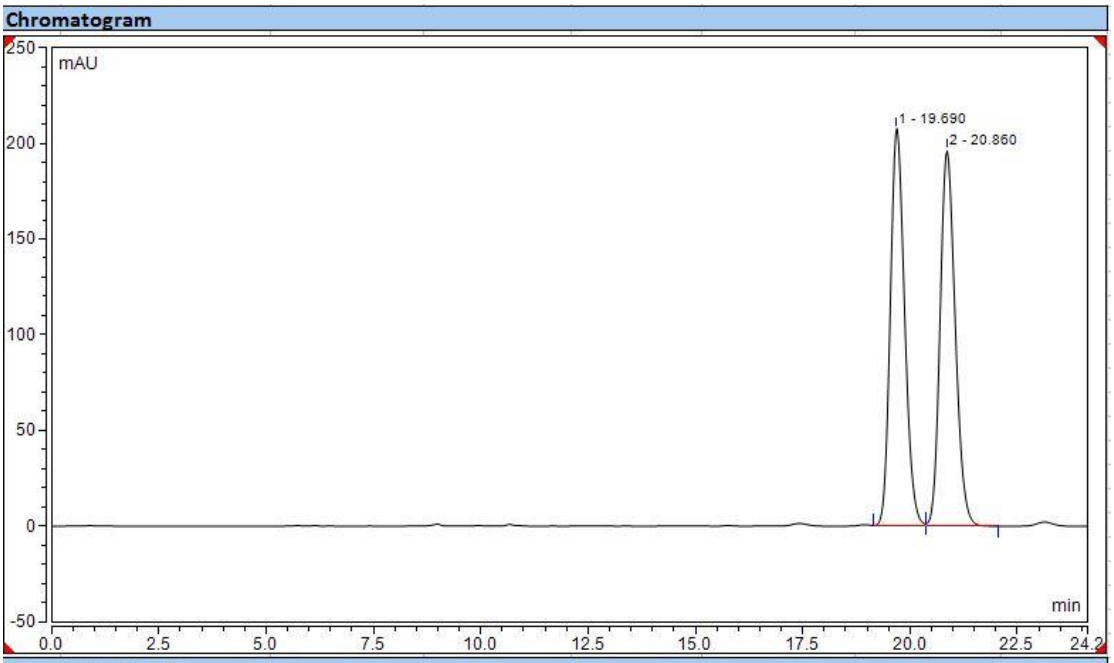


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		14.963	6.809	25.667	2.83	2.91	n.a.
2		16.047	234.016	856.884	97.17	97.09	n.a.
Total:			240.824	882.551	100.00	100.00	

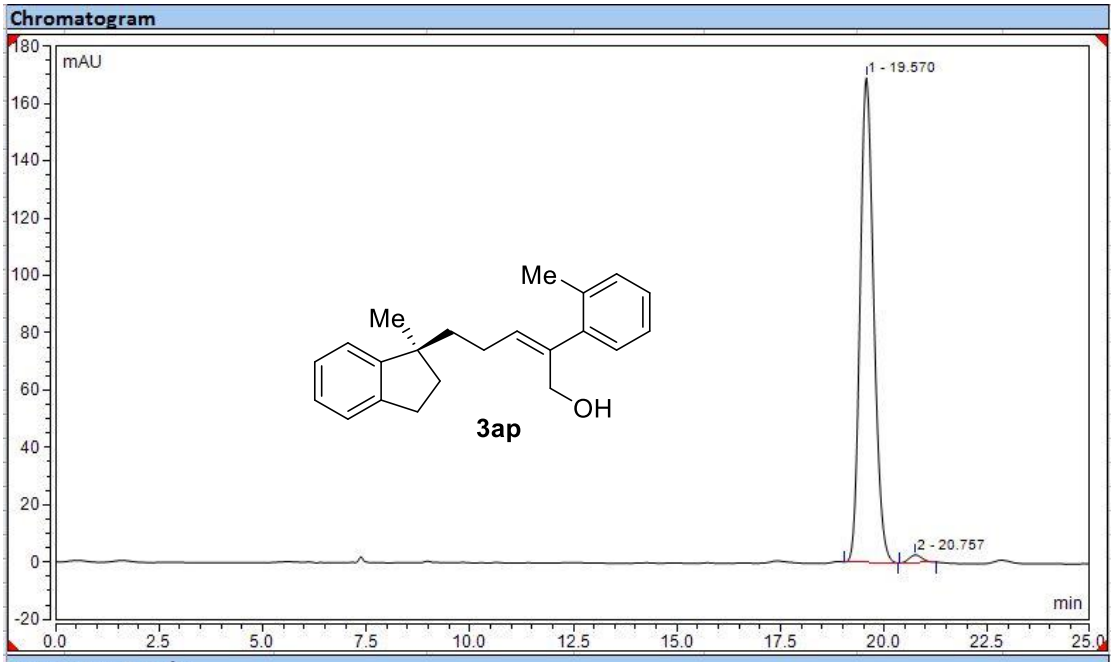
HPLC (Chiralpak IB): t_R= 15.0 (minor), 16.0 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		19.690	79.997	207.603	49.96	51.40	n.a.
2		20.860	80.112	196.266	50.04	48.60	n.a.
Total:			**160.109**	**403.869**	**100.00**	**100.00**	

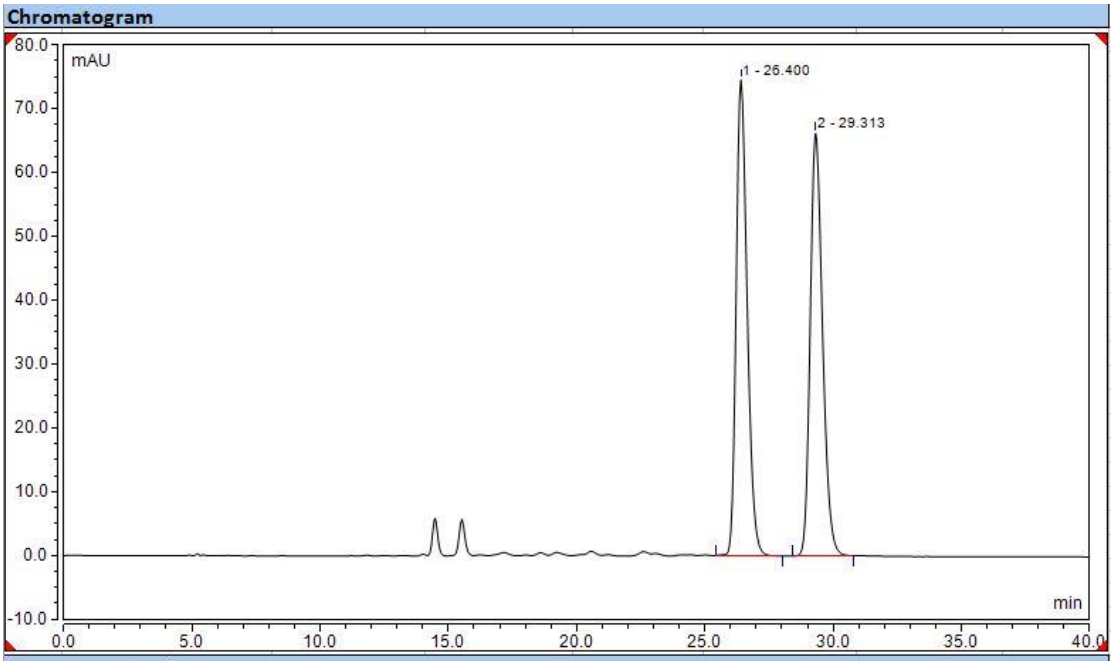


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		19.570	64.467	169.138	98.49	98.42	n.a.
2		20.757	0.987	2.717	1.51	1.58	n.a.
Total:			**65.454**	**171.854**	**100.00**	**100.00**	

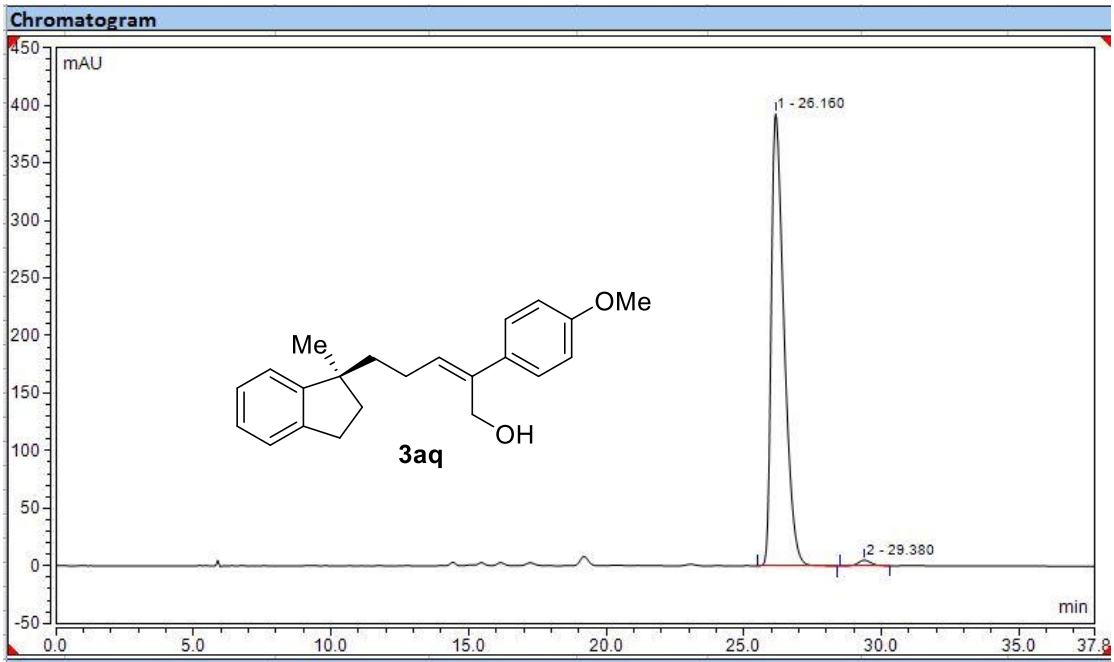
HPLC (Chiralpak AD-H): t_R= 19.6 (major), 20.8 (minor)

Condition: 96:4 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		26.400	37.023	74.582	50.09	52.97	n.a.
2		29.313	36.889	66.210	49.91	47.03	n.a.
Total:			**73.912**	**140.792**	**100.00**	**100.00**	

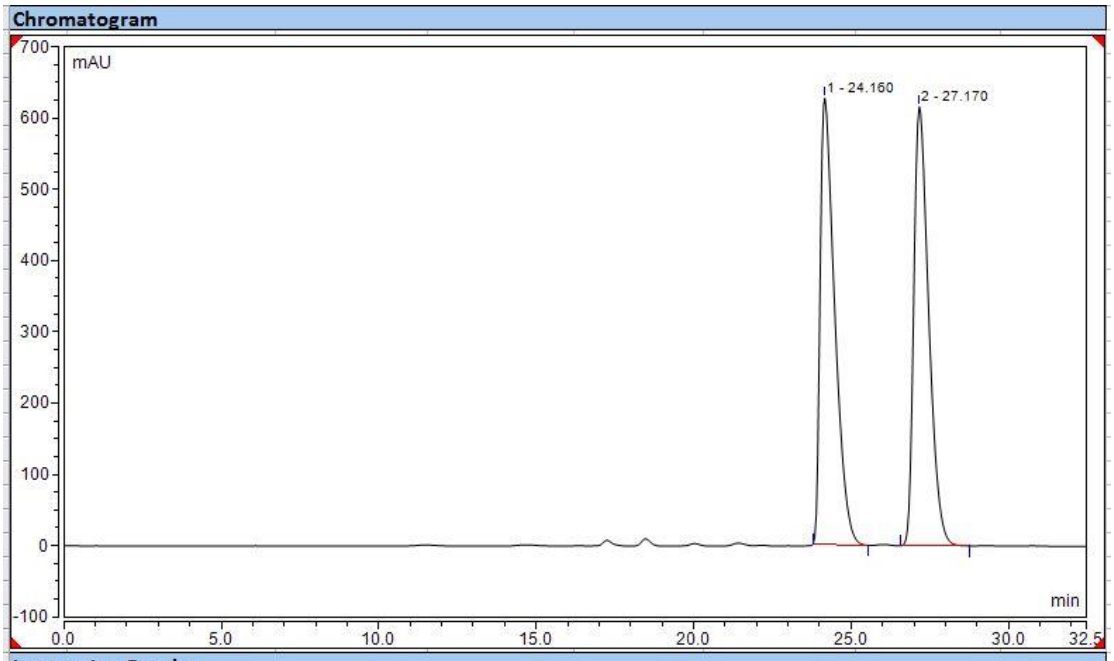


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		26.160	211.174	392.821	98.70	98.73	n.a.
2		29.380	2.787	5.072	1.30	1.27	n.a.
Total:			**213.962**	**397.894**	**100.00**	**100.00**	

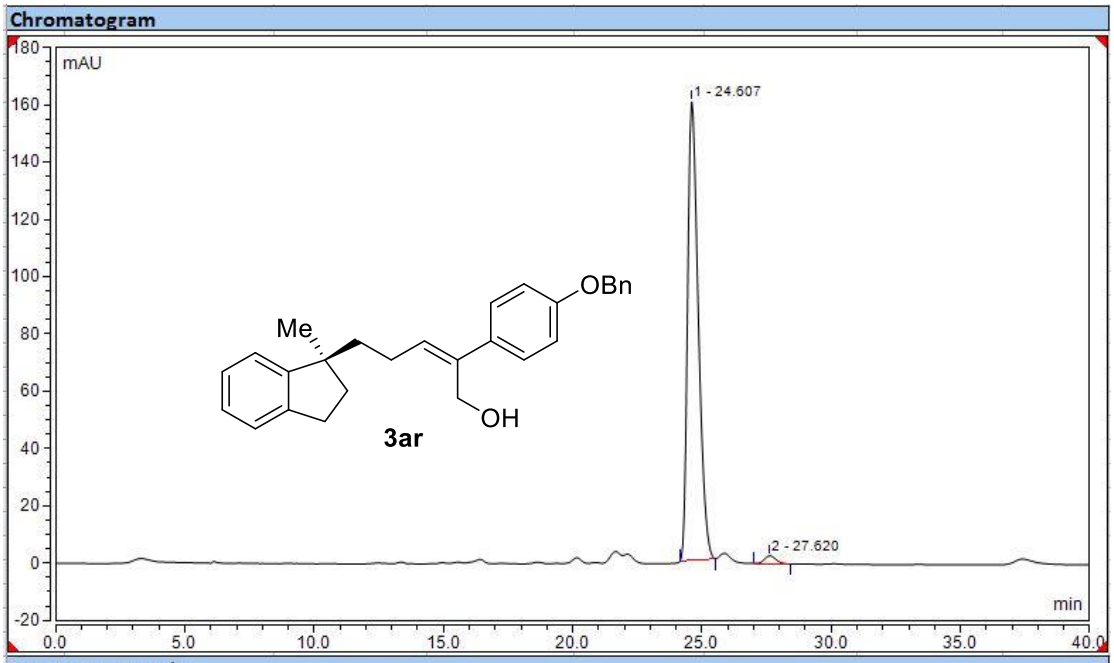
HPLC (Chiralpak IB): t_R= 26.2 (major), 29.4 (minor)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.6 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		24.160	336.616	626.735	49.84	50.42	n.a.
2		27.170	338.839	616.297	50.16	49.58	n.a.
Total:			**675.455**	**1243.032**	**100.00**	**100.00**	

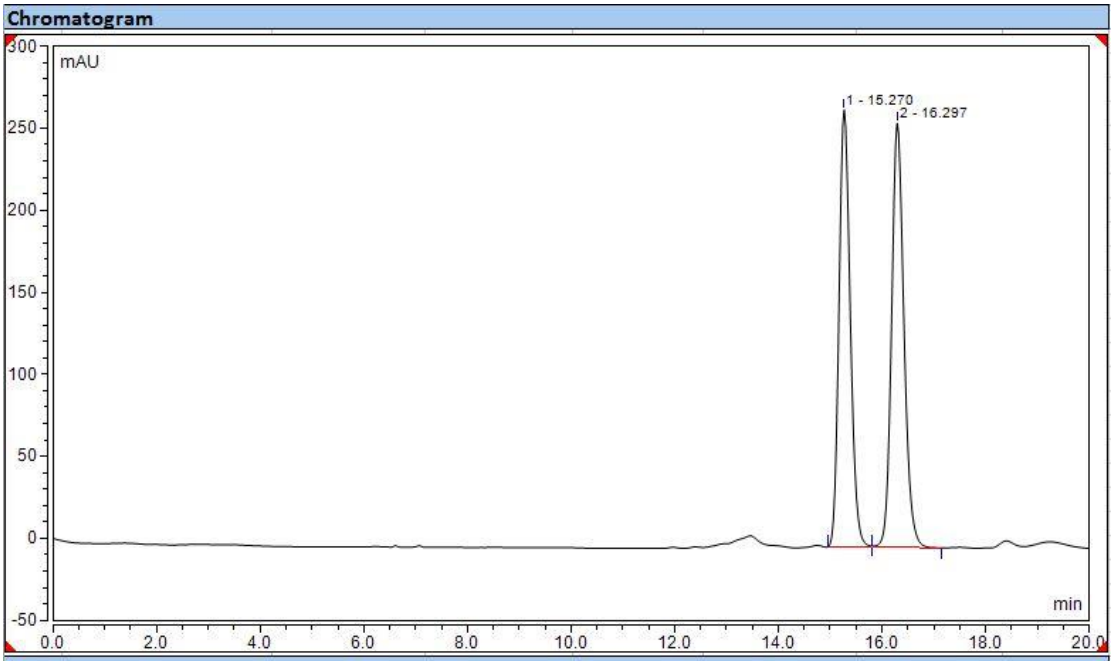


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		24.607	76.607	160.107	98.17	98.29	n.a.
2		27.620	1.425	2.793	1.83	1.71	n.a.
Total:			**78.032**	**162.899**	**100.00**	**100.00**	

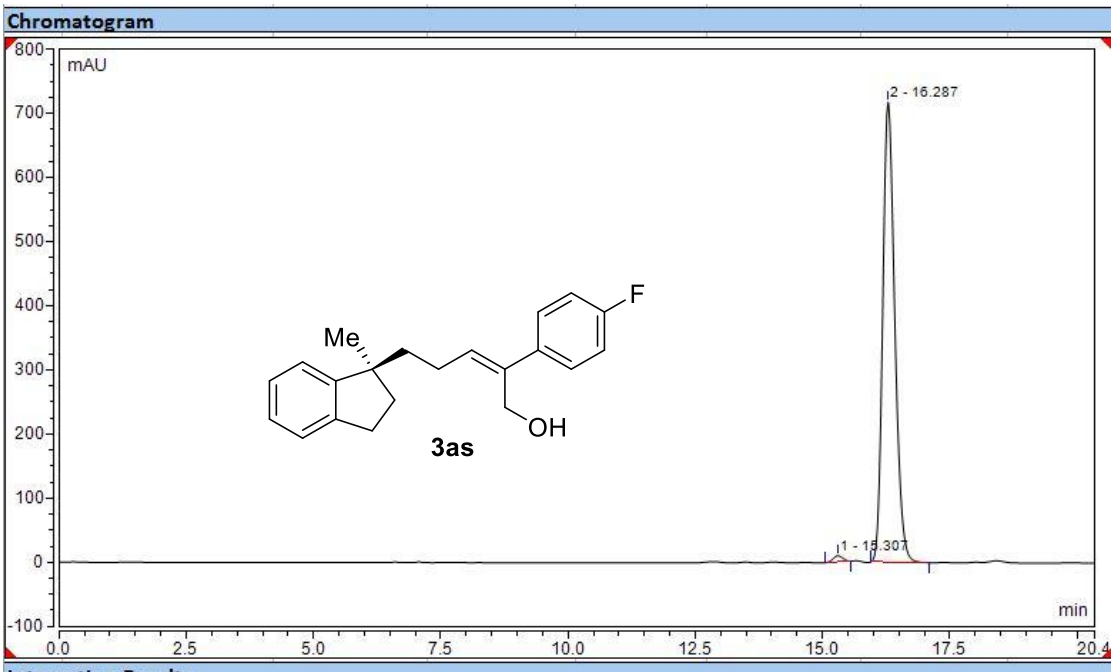
HPLC (Chiralpak IB): t_R= 24.6 (major), 27.6 (minor)

Condition: 90:10 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		15.270	66.869	266.382	48.27	50.74	n.a.
2		16.297	71.673	258.651	51.73	49.26	n.a.
Total:			**138.542**	**525.032**	**100.00**	**100.00**	

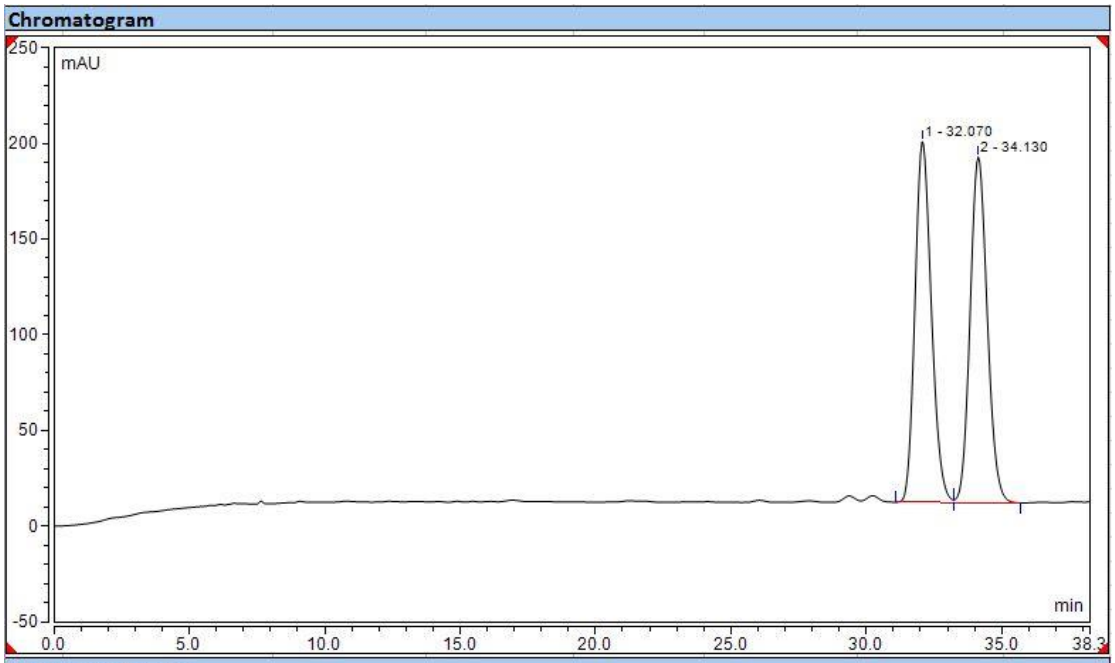


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		15.307	2.110	9.739	1.07	1.34	n.a.
2		16.287	195.671	717.250	98.93	98.66	n.a.
Total:			**197.781**	**726.989**	**100.00**	**100.00**	

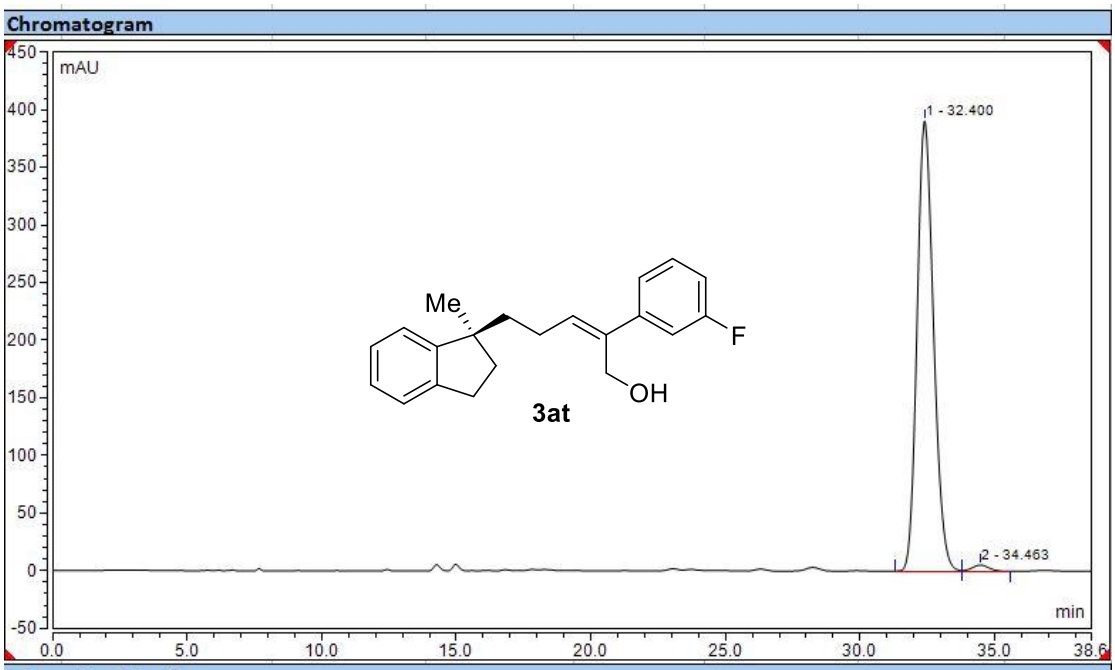
HPLC (Chiralpak IB): t_R= 15.3 (minor), 16.3 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		32.070	132.224	188.408	49.97	51.04	n.a.
2		34.130	132.374	180.702	50.03	48.96	n.a.
Total:			**264.598**	**369.110**	**100.00**	**100.00**	

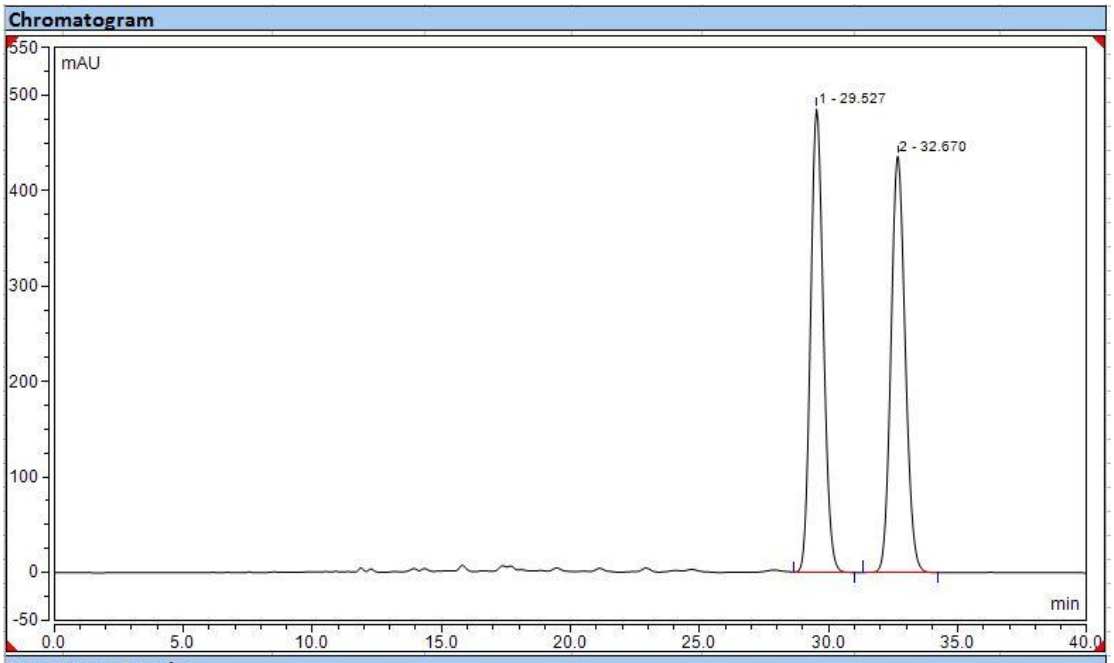


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		32.400	277.266	390.541	98.62	98.64	n.a.
2		34.463	3.874	5.376	1.38	1.36	n.a.
Total:			**281.140**	**395.917**	**100.00**	**100.00**	

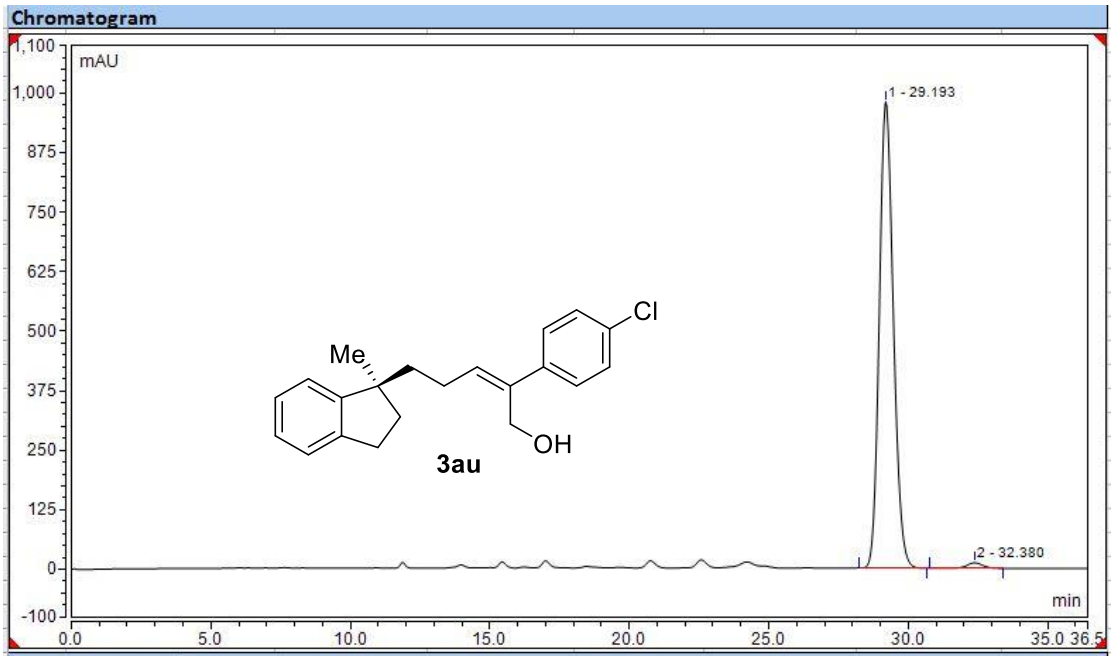
HPLC (Chiralpak AD-H): t_R= 32.4 (major), 34.5 (minor)

Condition: 96:4 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		29.527	278.084	485.571	49.91	52.66	n.a.
2		32.670	279.101	436.435	50.09	47.34	n.a.
Total:			**557.184**	**922.006**	**100.00**	**100.00**	

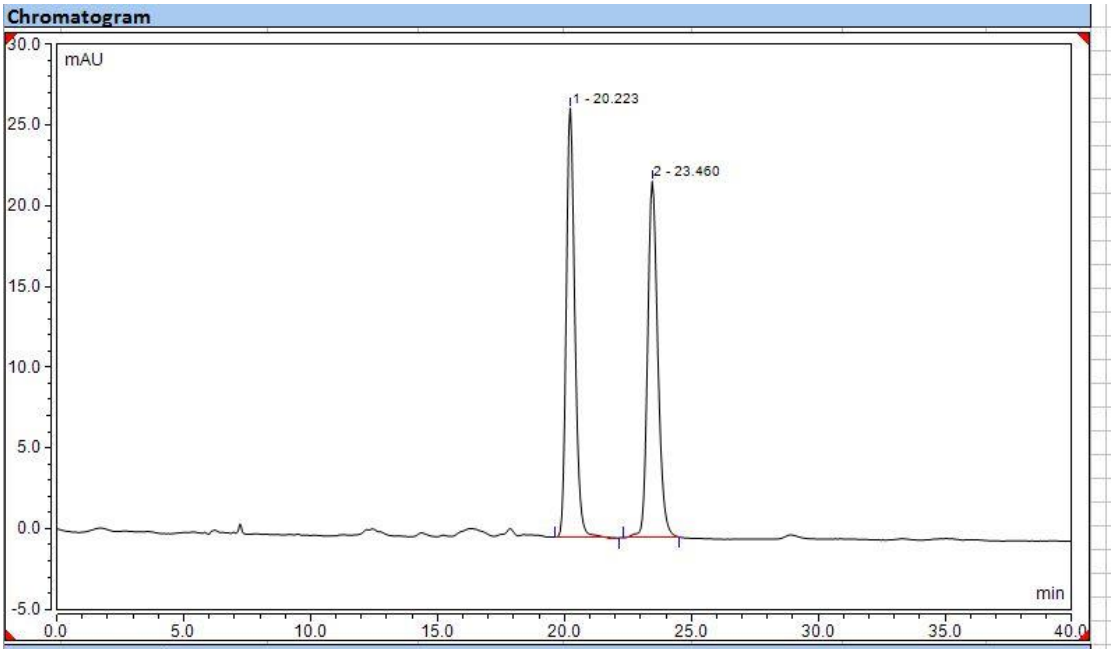


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		29.193	572.007	979.436	98.64	98.83	n.a.
2		32.380	7.898	11.620	1.36	1.17	n.a.
Total:			**579.905**	**991.055**	**100.00**	**100.00**	

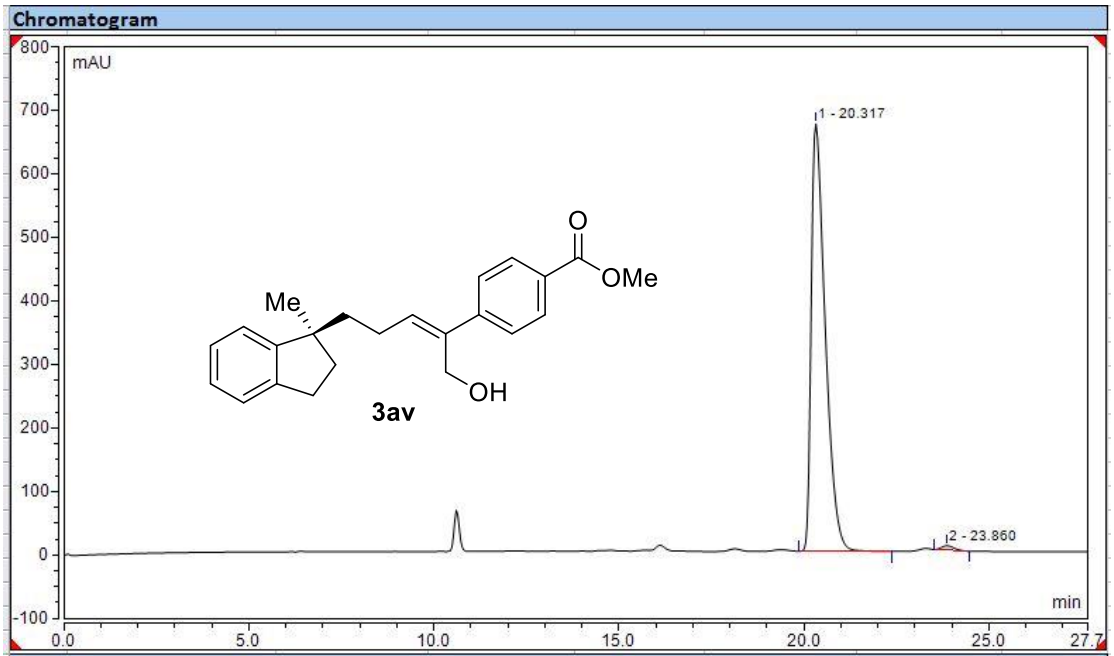
HPLC (Chiralpak AD-H): t_R= 29.2 (major), 32.4 (minor)

Condition: 93:7 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		20.223	10.404	26.572	50.19	54.62	n.a.
2		23.460	10.327	22.076	49.81	45.38	n.a.
Total:			**20.731**	**48.648**	**100.00**	**100.00**	

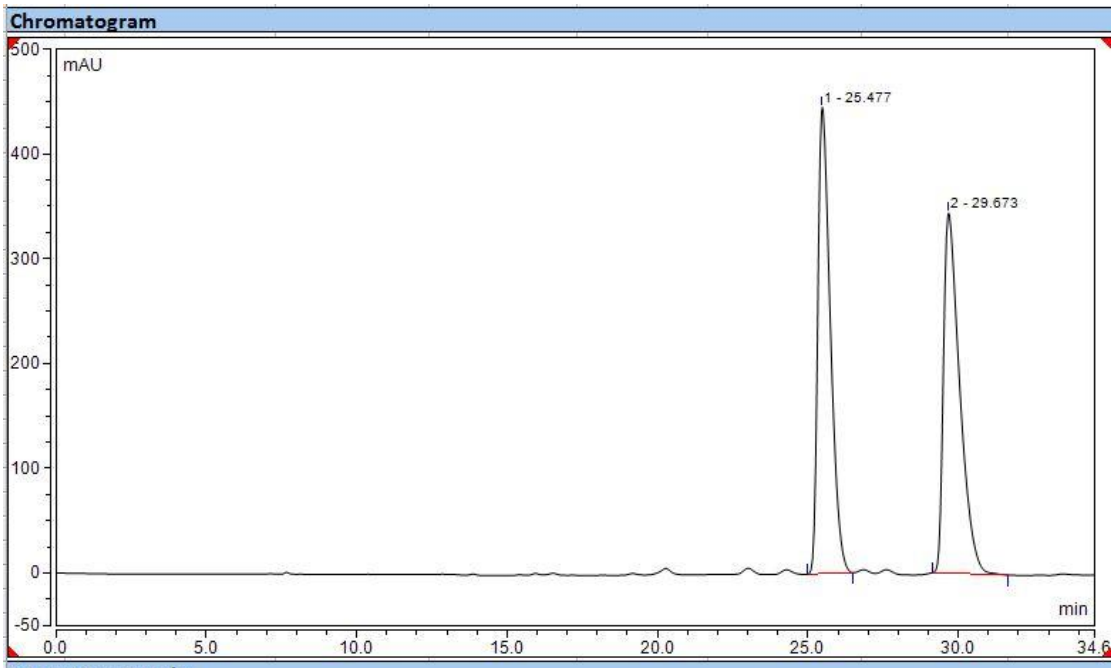


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		20.317	295.481	673.345	99.10	98.98	n.a.
2		23.860	2.694	6.944	0.90	1.02	n.a.
Total:			**298.175**	**680.290**	**100.00**	**100.00**	

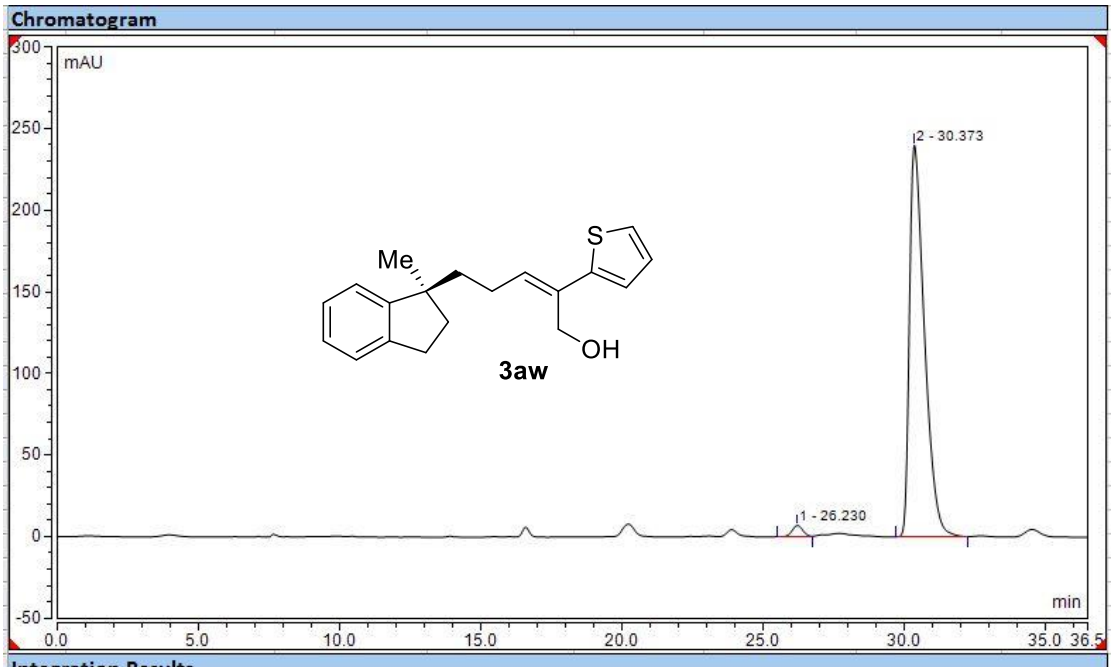
HPLC (Chiralpak IB): t_R= 20.3 (major), 23.9 (minor)

Condition: 88:12 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		25.477	214.999	445.365	49.97	56.43	n.a.
2		29.673	215.222	343.850	50.03	43.57	n.a.
Total:			**430.222**	**789.215**	**100.00**	**100.00**	

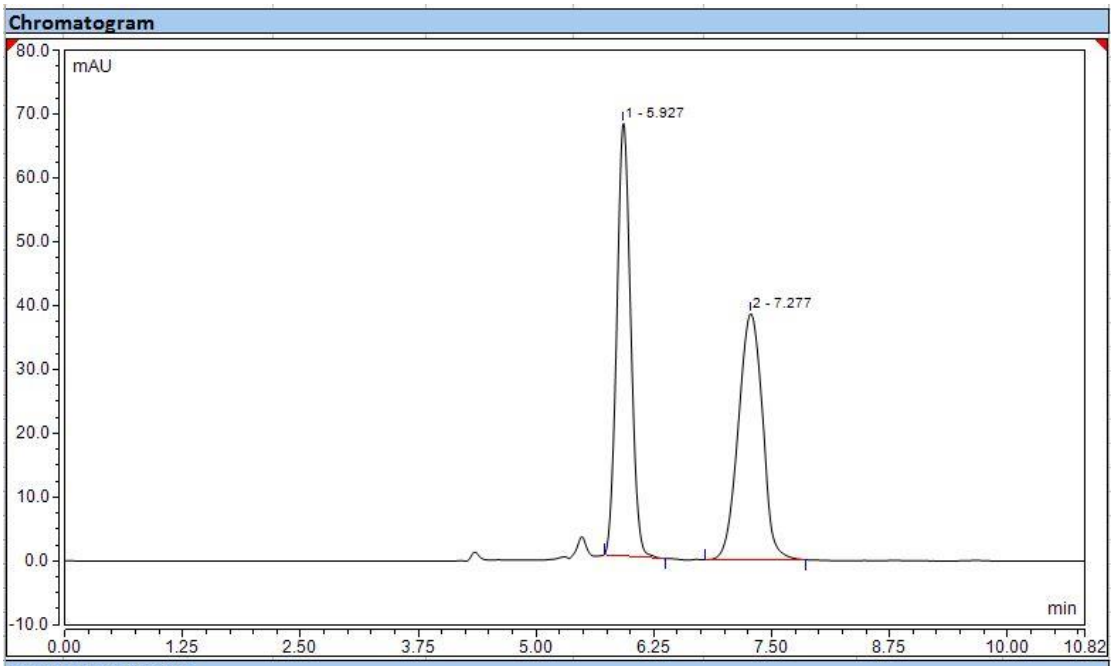


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		26.230	2.915	6.769	1.94	2.74	n.a.
2		30.373	147.398	240.020	98.06	97.26	n.a.
Total:			**150.313**	**246.789**	**100.00**	**100.00**	

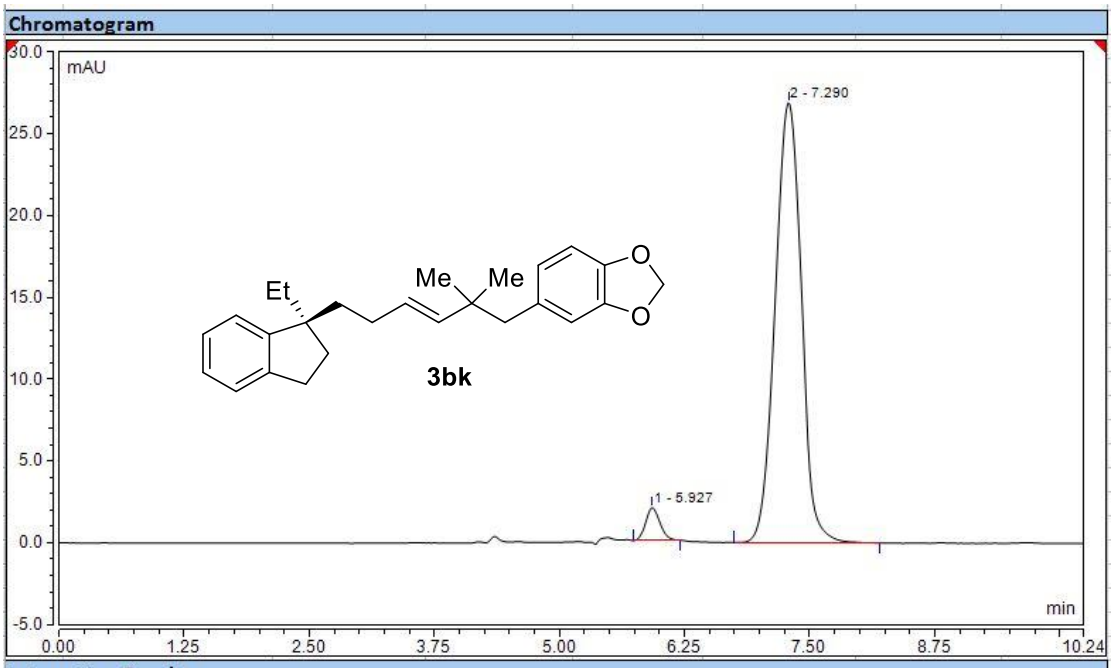
HPLC (Chiralpak IB): t_R= 26.2 (minor), 30.4 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.927	11.577	67.838	50.23	63.74	n.a.
2		7.277	11.472	38.583	49.77	36.26	n.a.
Total:			**23.049**	**106.420**	**100.00**	**100.00**	

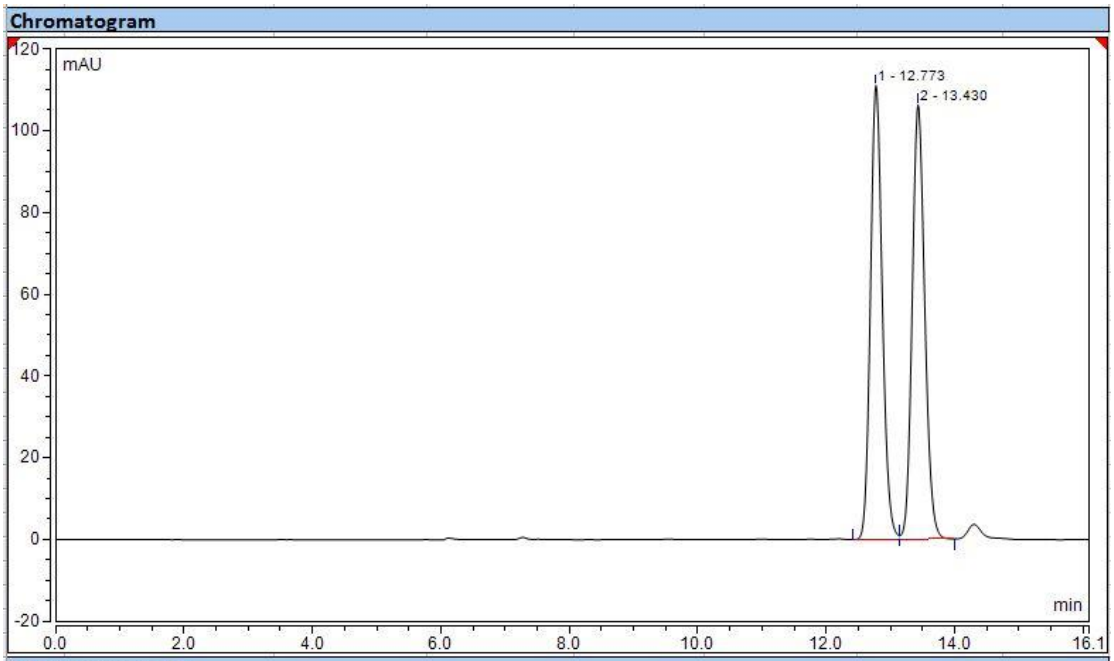


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		5.927	0.330	2.008	3.89	6.94	n.a.
2		7.290	8.164	26.904	96.11	93.06	n.a.
Total:			**8.495**	**28.912**	**100.00**	**100.00**	

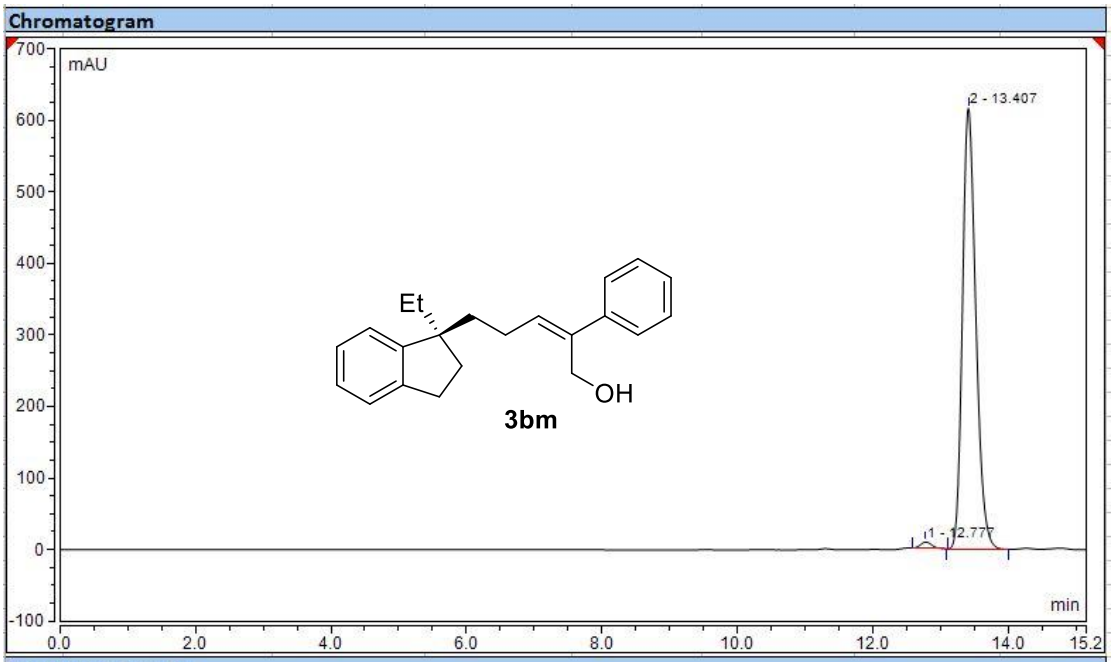
HPLC (Chiralcel OJ-H): t_R= 5.9 (minor), 7.3 (major)

Condition: 85:15 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.773	23.693	111.072	49.70	51.12	n.a.
2		13.430	23.975	106.189	50.30	48.88	n.a.
Total:			**47.668**	**217.261**	**100.00**	**100.00**	

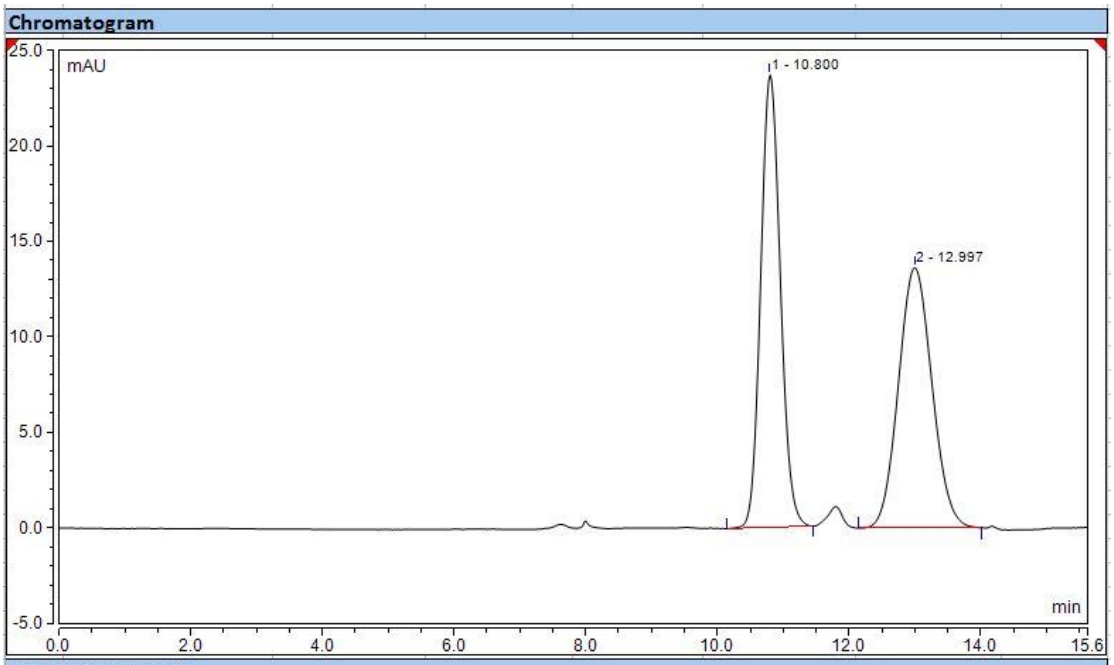


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.777	1.671	8.807	1.17	1.41	n.a.
2		13.407	140.775	616.291	98.83	98.59	n.a.
Total:			**142.446**	**625.098**	**100.00**	**100.00**	

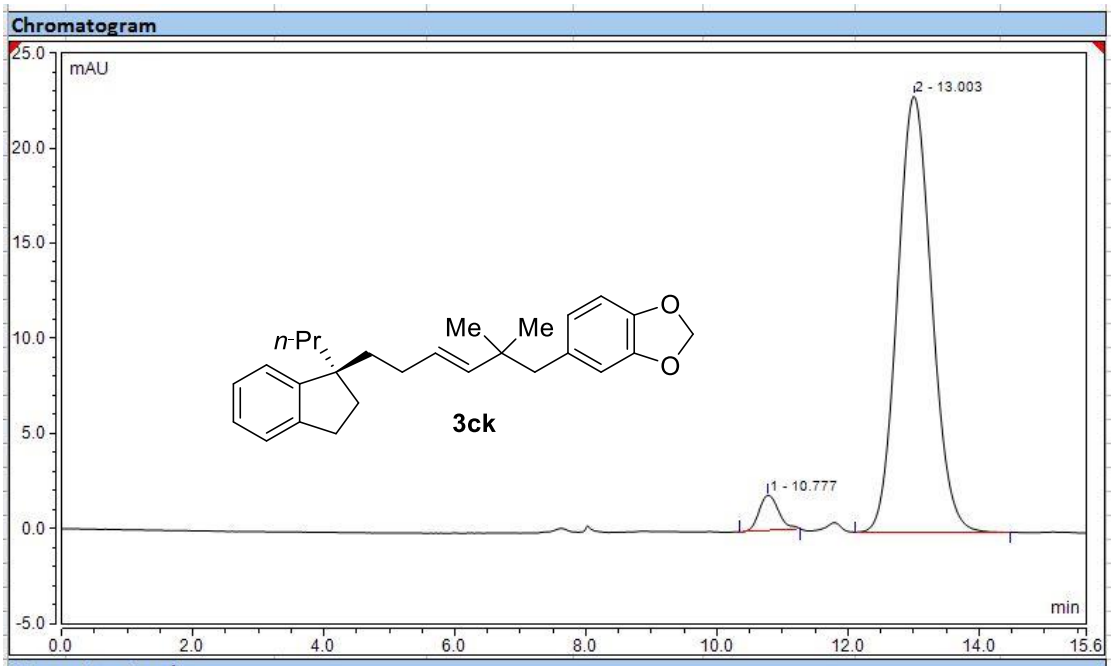
HPLC (Chiralpak IB): t_R= 12.8 (minor), 13.4 (major)

Condition: 98:2 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.800	8.194	23.700	50.48	63.48	n.a.
2		12.997	8.038	13.633	49.52	36.52	n.a.
Total:			**16.232**	**37.333**	**100.00**	**100.00**	

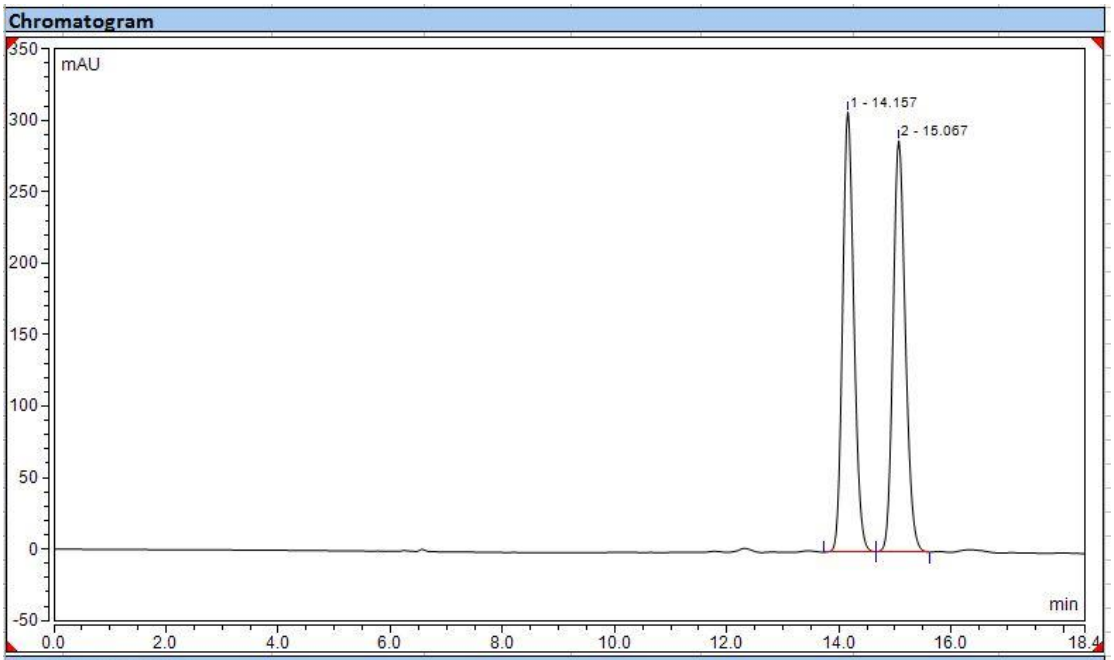


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.777	0.637	1.850	4.40	7.47	n.a.
2		13.003	13.840	22.919	95.60	92.53	n.a.
Total:			**14.477**	**24.768**	**100.00**	**100.00**	

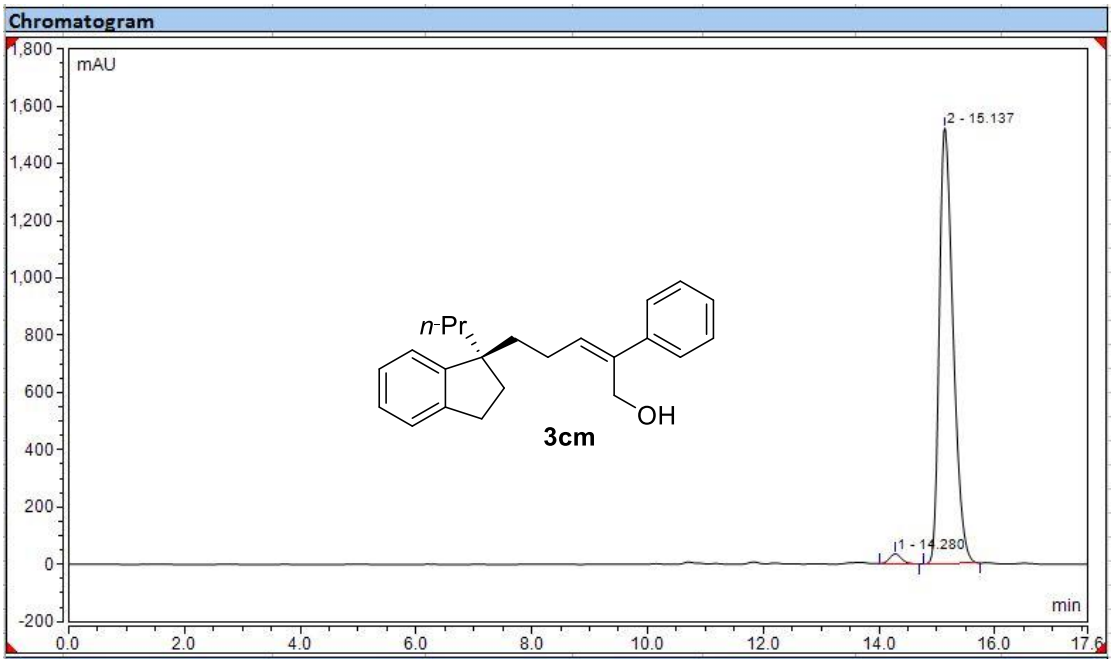
HPLC (Chiralcel OJ-H): t_R= 10.8 (minor), 13.0 (major)

Condition: 96:4 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		14.157	72.267	307.773	49.61	51.68	n.a.
2		15.067	73.415	287.742	50.39	48.32	n.a.
Total:			**145.682**	**595.515**	**100.00**	**100.00**	

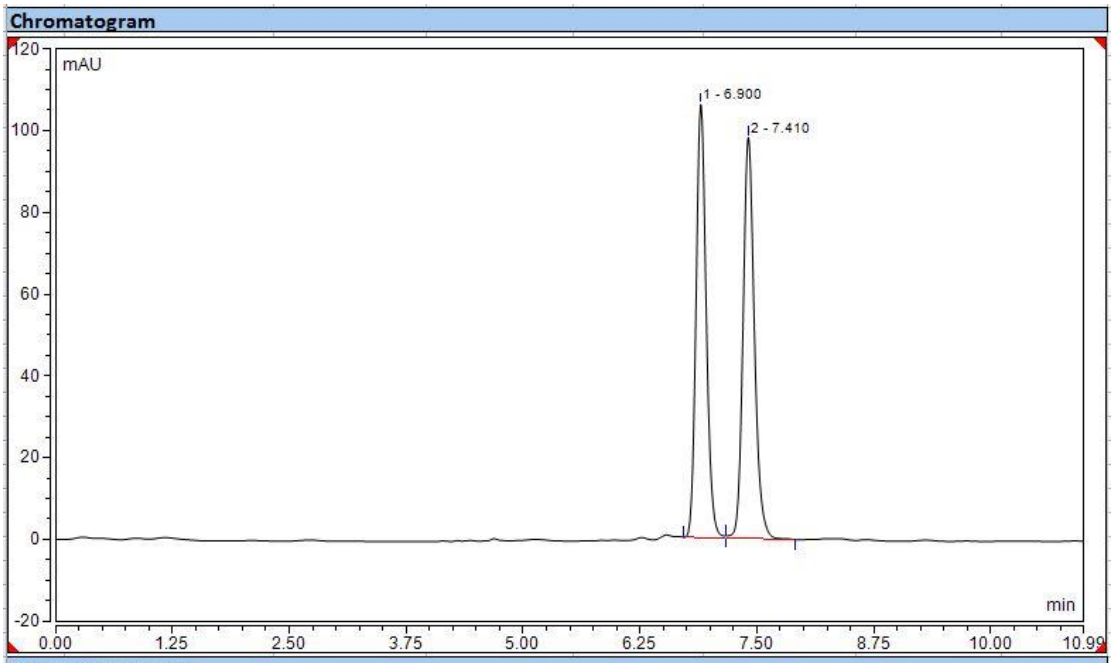


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		14.280	8.263	34.575	1.92	2.22	n.a.
2		15.137	421.333	1521.553	98.08	97.78	n.a.
Total:			**429.596**	**1556.128**	**100.00**	**100.00**	

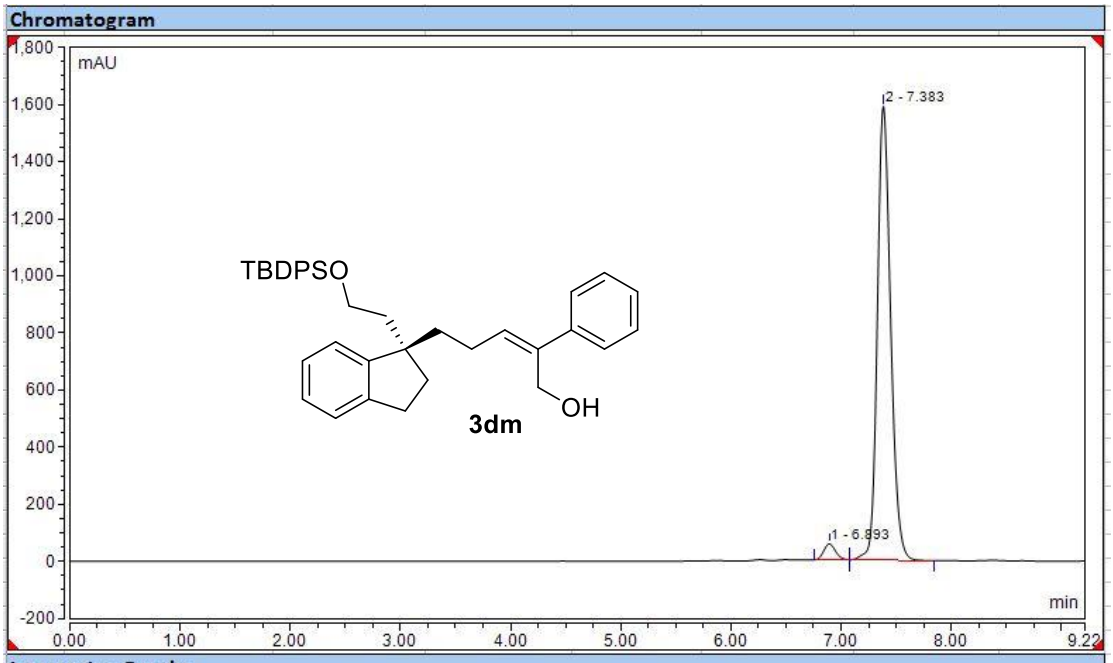
HPLC (Chiralpak IB): t_R= 14.3 (minor), 15.1 (major)

Condition: 94:6 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.900	13.287	105.967	49.05	51.92	n.a.
2		7.410	13.801	98.128	50.95	48.08	n.a.
Total:			**27.088**	**204.095**	**100.00**	**100.00**	

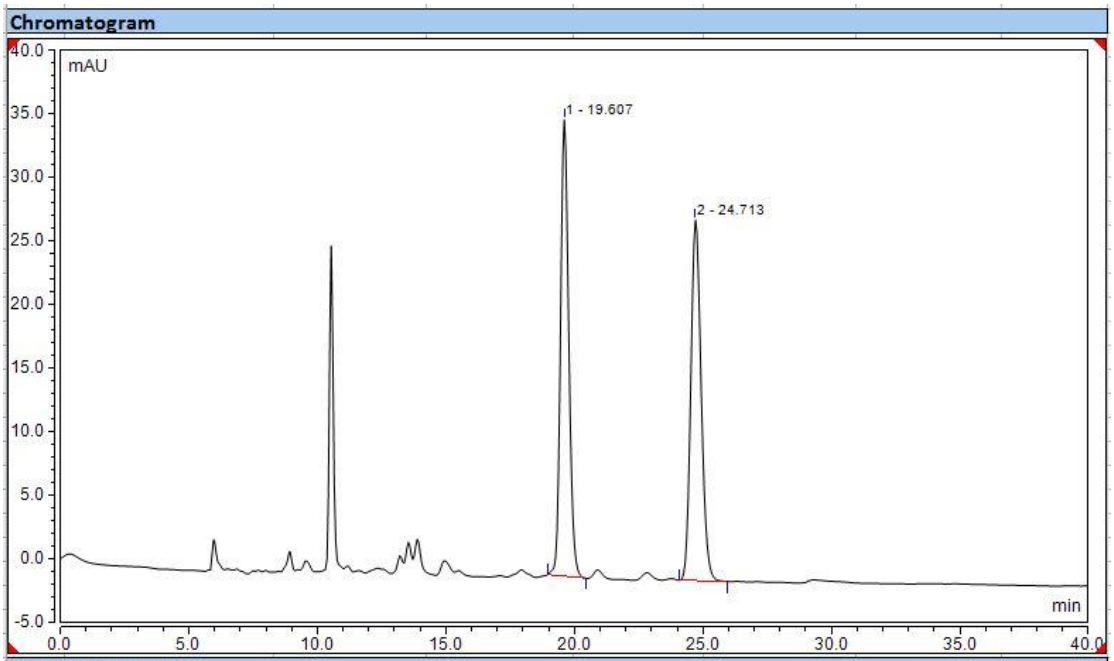


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.893	7.063	56.571	3.07	3.44	n.a.
2		7.383	222.896	1589.619	96.93	96.56	n.a.
Total:			**229.959**	**1646.190**	**100.00**	**100.00**	

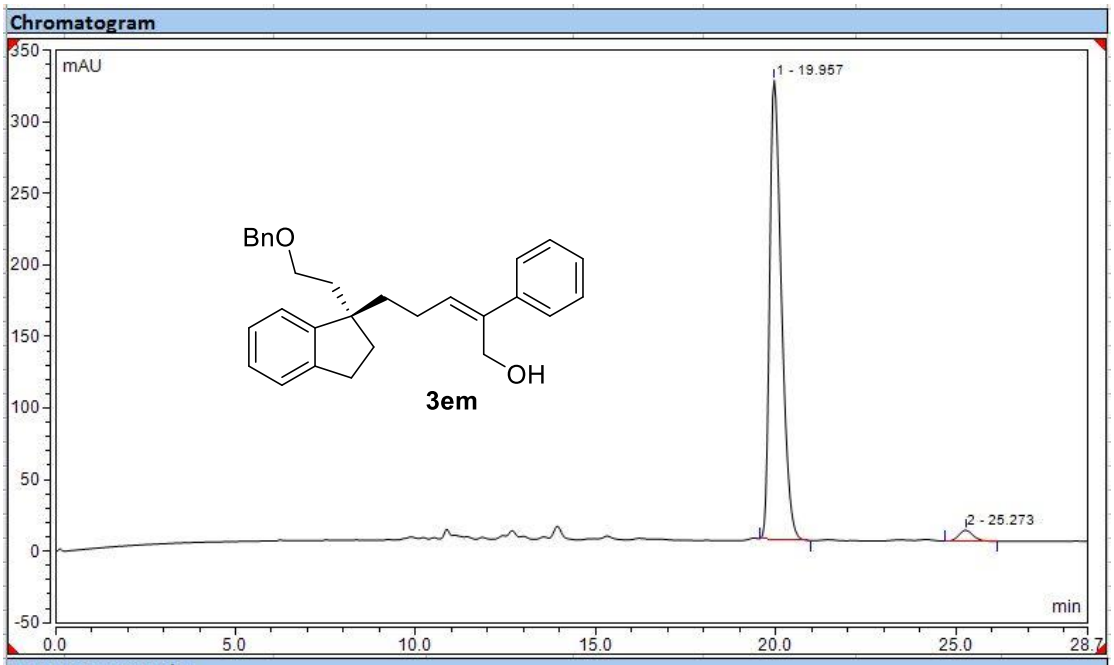
HPLC (Chiralpak IB): t_R= 6.9 (minor), 7.4 (major)

Condition: 86:14 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		19.607	13.298	35.933	50.15	55.86	n.a.
2		24.713	13.217	28.399	49.85	44.14	n.a.
Total:			**26.515**	**64.332**	**100.00**	**100.00**	

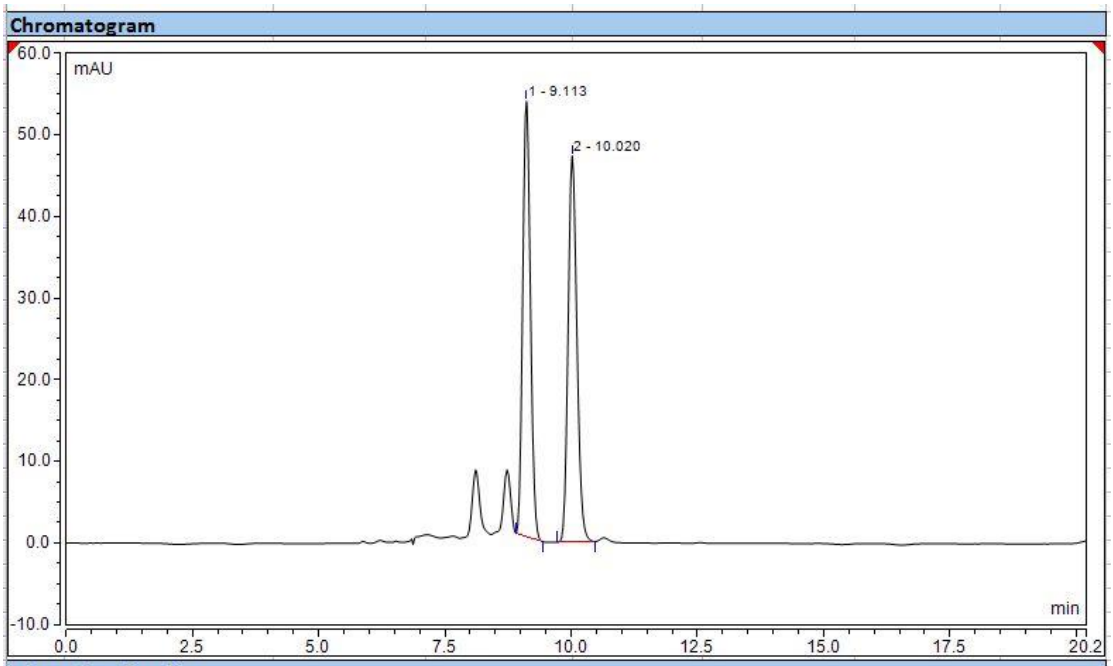


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		19.957	121.604	320.951	97.19	97.67	n.a.
2		25.273	3.510	7.646	2.81	2.33	n.a.
Total:			**125.114**	**328.597**	**100.00**	**100.00**	

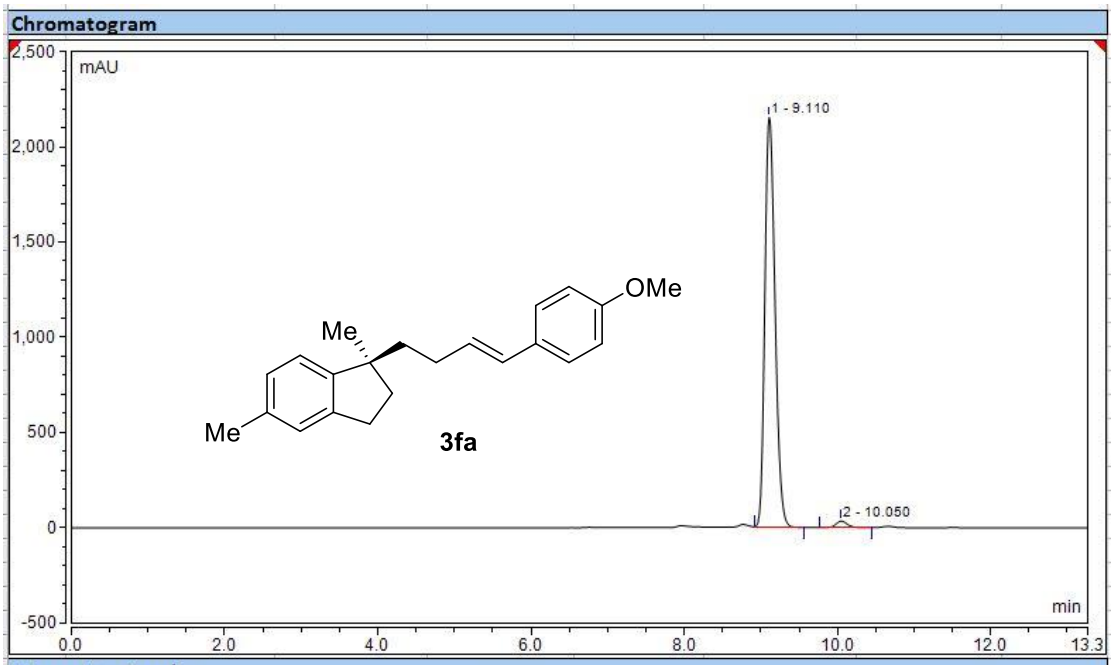
HPLC (Chiralpak IB): t_R= 19.9 (major), 25.3 (minor)

Condition: 86:14 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.113	9.425	53.333	49.78	53.00	n.a.
2		10.020	9.510	47.294	50.22	47.00	n.a.
Total:			**18.935**	**100.627**	**100.00**	**100.00**	

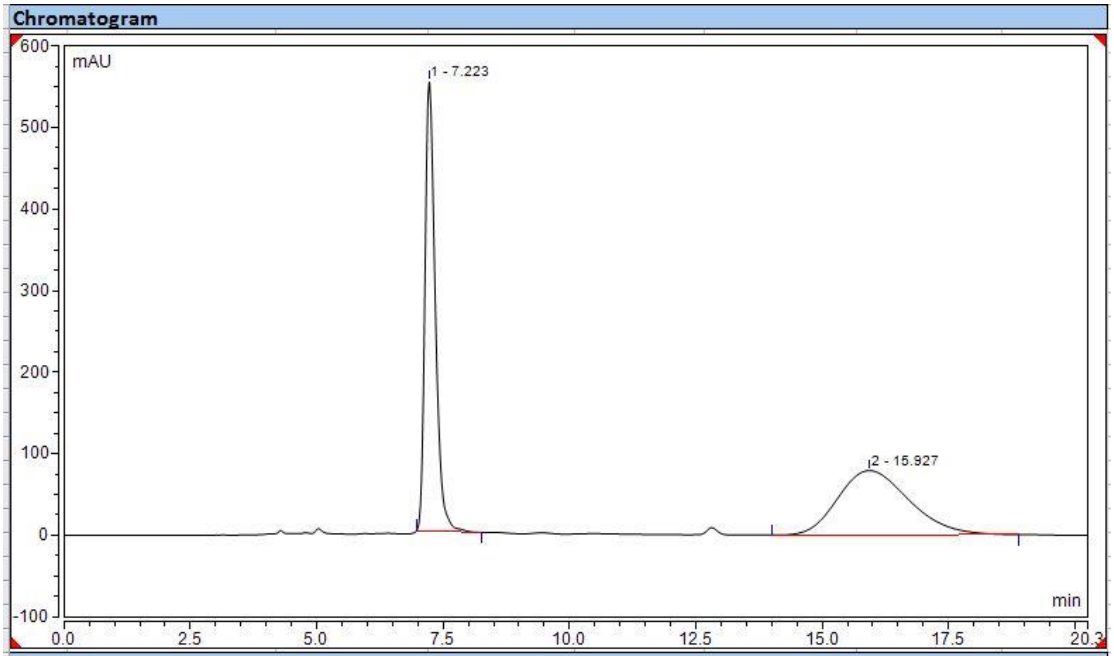


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.110	330.609	2151.318	98.23	98.43	n.a.
2		10.050	5.971	34.416	1.77	1.57	n.a.
Total:			**336.580**	**2185.733**	**100.00**	**100.00**	

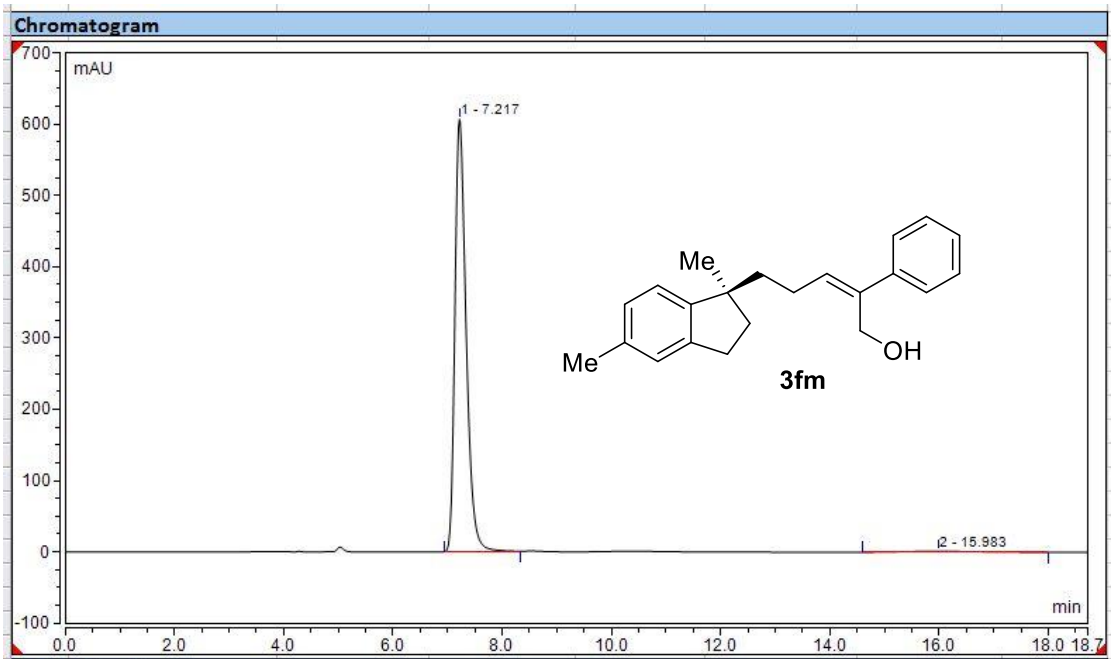
HPLC (Chiralpak IB): t_R= 9.1 (major), 10.1 (minor)

Condition: 98:2 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		7.223	130.472	550.984	50.24	87.46	n.a.
2		15.927	129.244	78.966	49.76	12.54	n.a.
Total:			**259.717**	**629.951**	**100.00**	**100.00**	

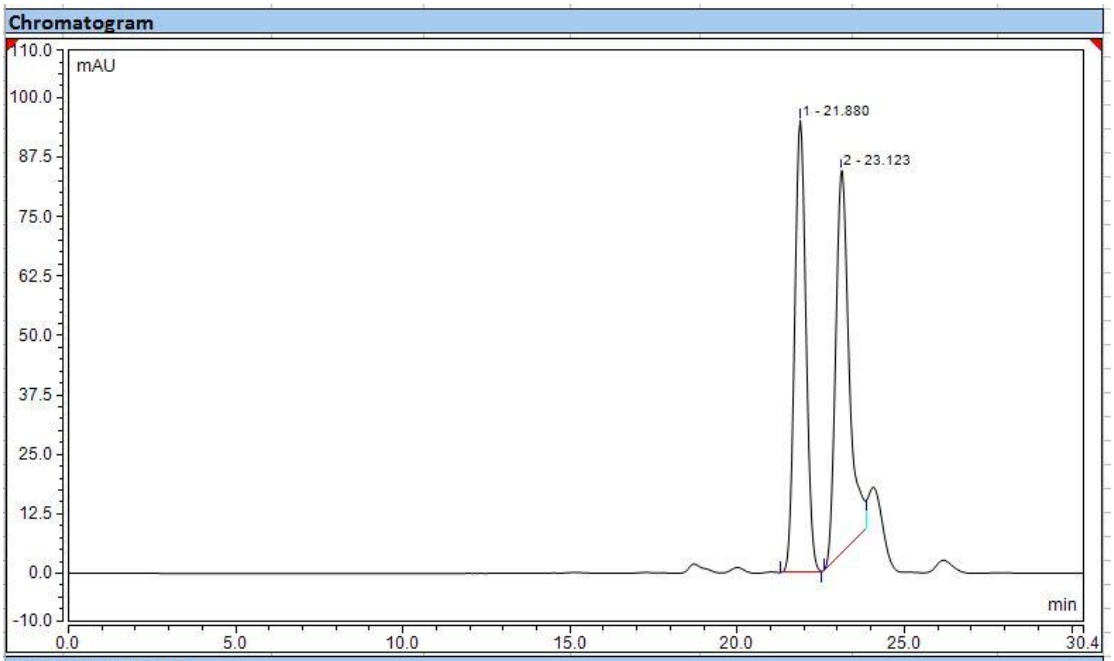


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		7.217	143.994	606.861	98.53	99.76	n.a.
2		15.983	2.143	1.440	1.47	0.24	n.a.
Total:			**146.137**	**608.301**	**100.00**	**100.00**	

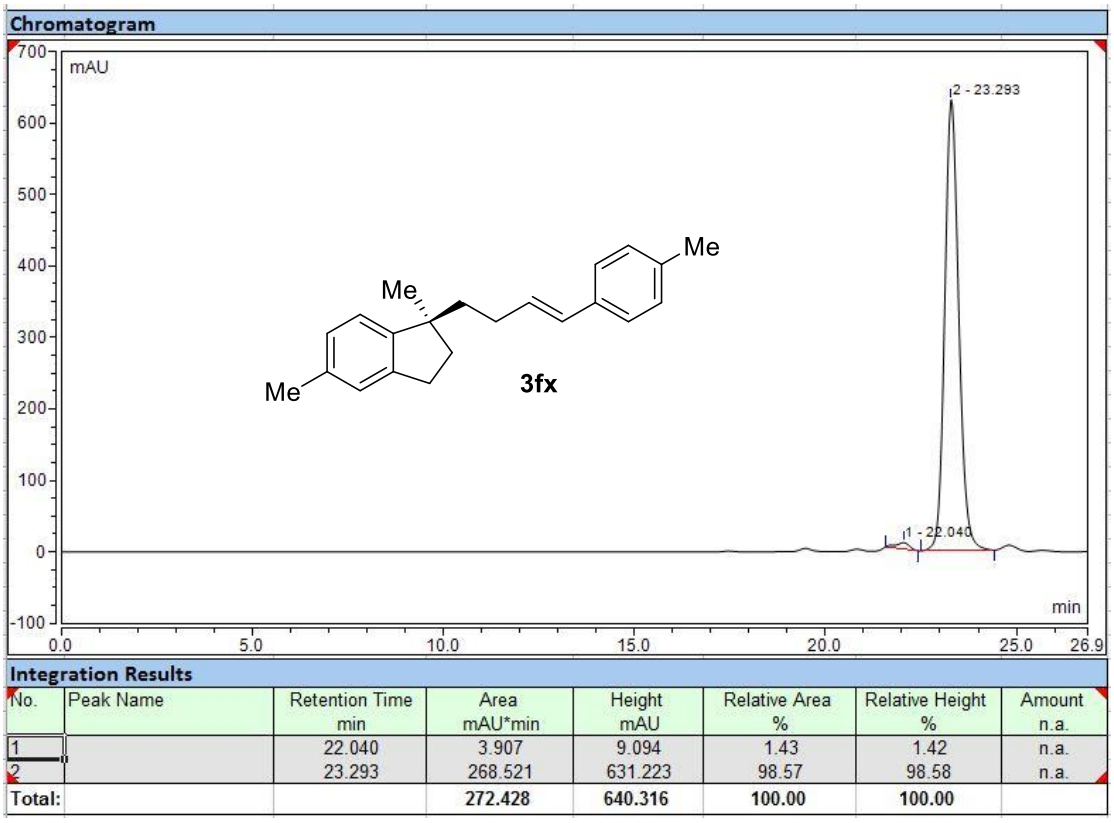
HPLC (Chiralcel OJ-H): t_R= 7.2 (major), 16.0 (minor)

Condition: 80:20 n-Hexane:i-PrOH, flow rate 1.0 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		21.880	37.167	95.009	49.76	54.15	n.a.
2		23.123	37.522	80.447	50.24	45.85	n.a.
Total:			**74.689**	**175.456**	**100.00**	**100.00**	

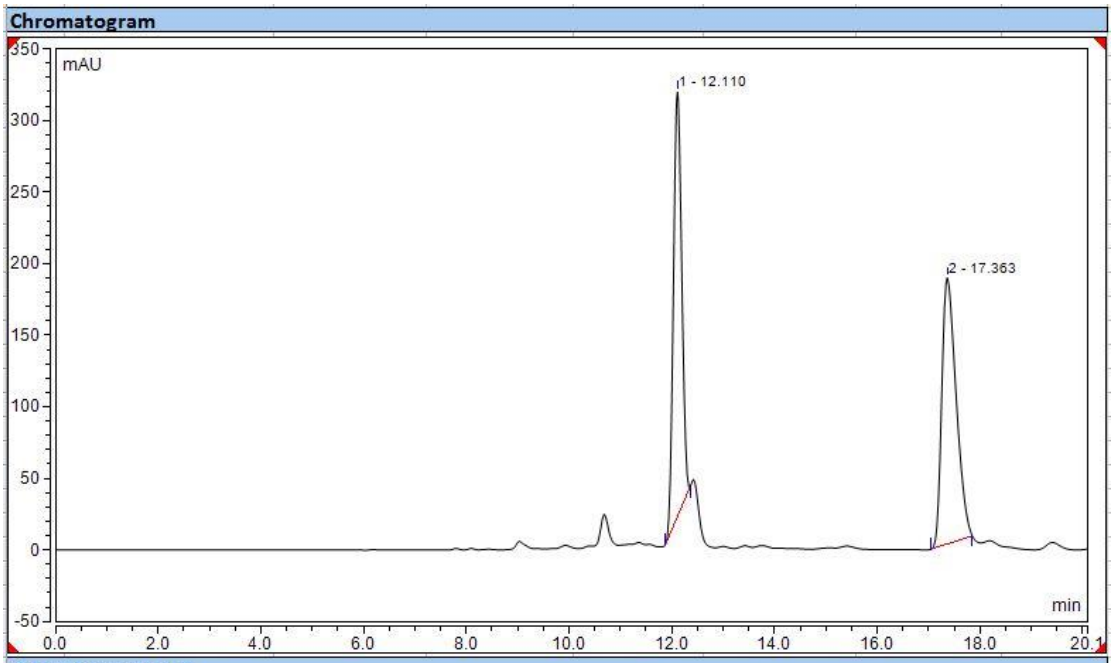


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		22.040	3.907	9.094	1.43	1.42	n.a.
2		23.293	268.521	631.223	98.57	98.58	n.a.
Total:			**272.428**	**640.316**	**100.00**	**100.00**	

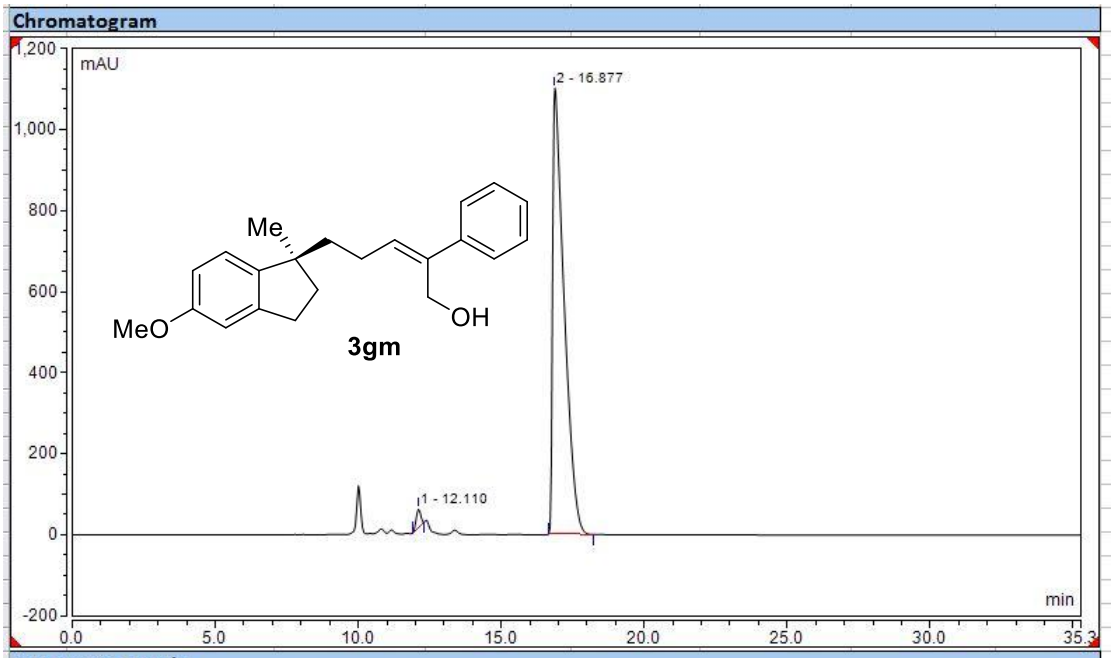
HPLC (Chiral MD): t_R= 22.0 (minor), 23.3 (major)

Condition: 99:1 n-Hexane:i-PrOH, flow rate 0.2 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.110	55.303	296.803	48.00	61.46	n.a.
2		17.363	59.916	186.085	52.00	38.54	n.a.
Total:			**115.220**	**482.888**	**100.00**	**100.00**	

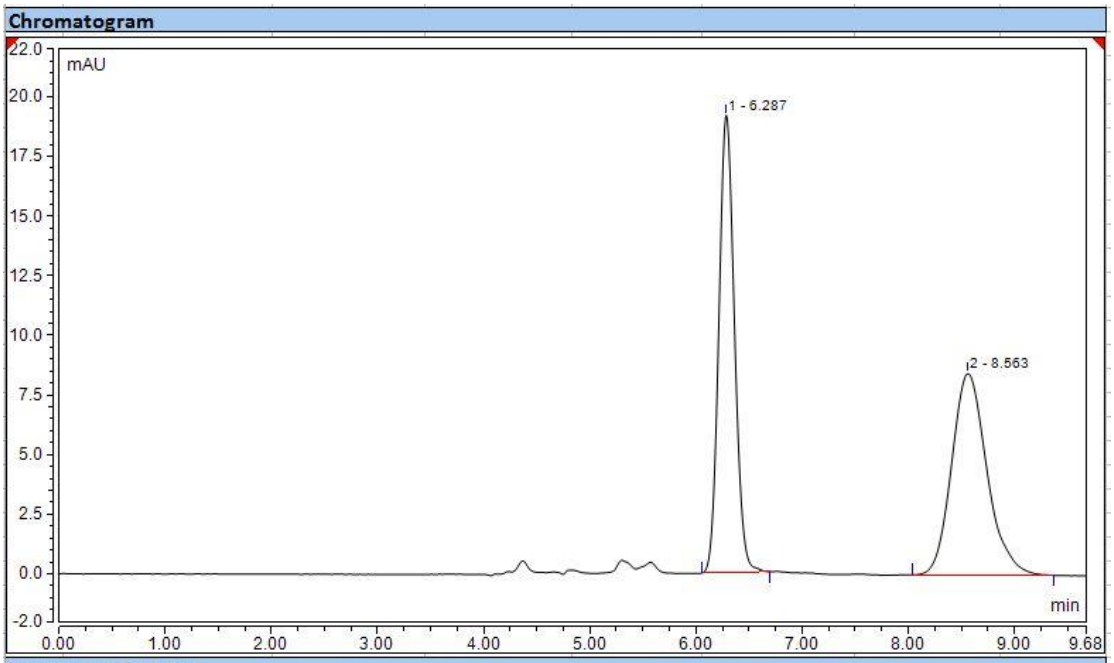


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.110	8.445	45.689	1.63	3.99	n.a.
2		16.877	509.182	1100.569	98.37	96.01	n.a.
Total:			**517.627**	**1146.258**	**100.00**	**100.00**	

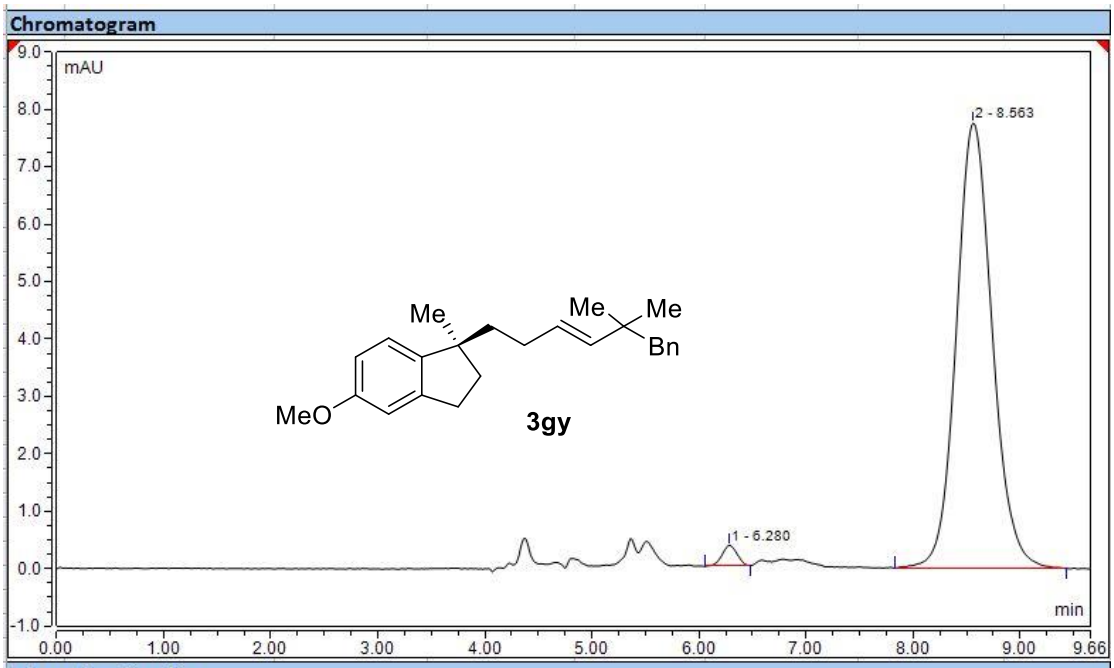
HPLC (Chiralpak IB): t_R= 12.1 (minor), 16.9 (major)

Condition: 86:14 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.287	3.250	19.167	49.94	69.42	n.a.
2		8.563	3.257	8.444	50.06	30.58	n.a.
Total:			**6.508**	**27.612**	**100.00**	**100.00**	

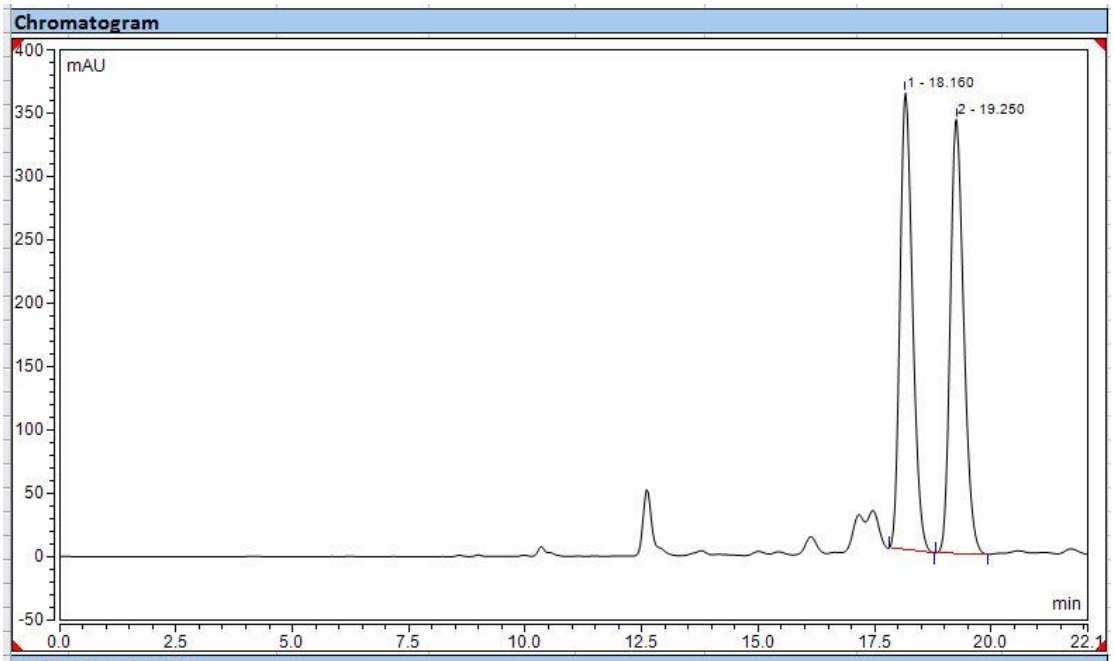


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		6.280	0.059	0.360	1.90	4.44	n.a.
2		8.563	3.019	7.754	98.10	95.56	n.a.
Total:			**3.077**	**8.115**	**100.00**	**100.00**	

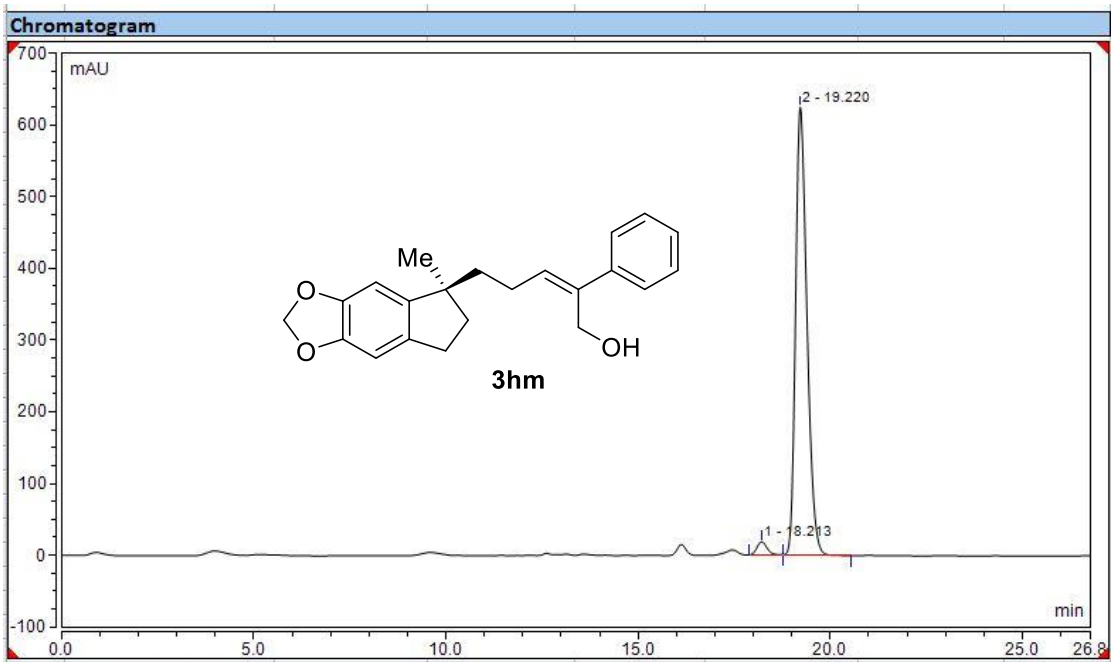
HPLC (Chiralcel OJ-H): t_R= 6.3 (minor), 8.6 (major)

Condition: 70:30 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		18.160	112.802	360.646	49.54	51.25	n.a.
2		19.250	114.877	343.034	50.46	48.75	n.a.
Total:			**227.679**	**703.681**	**100.00**	**100.00**	



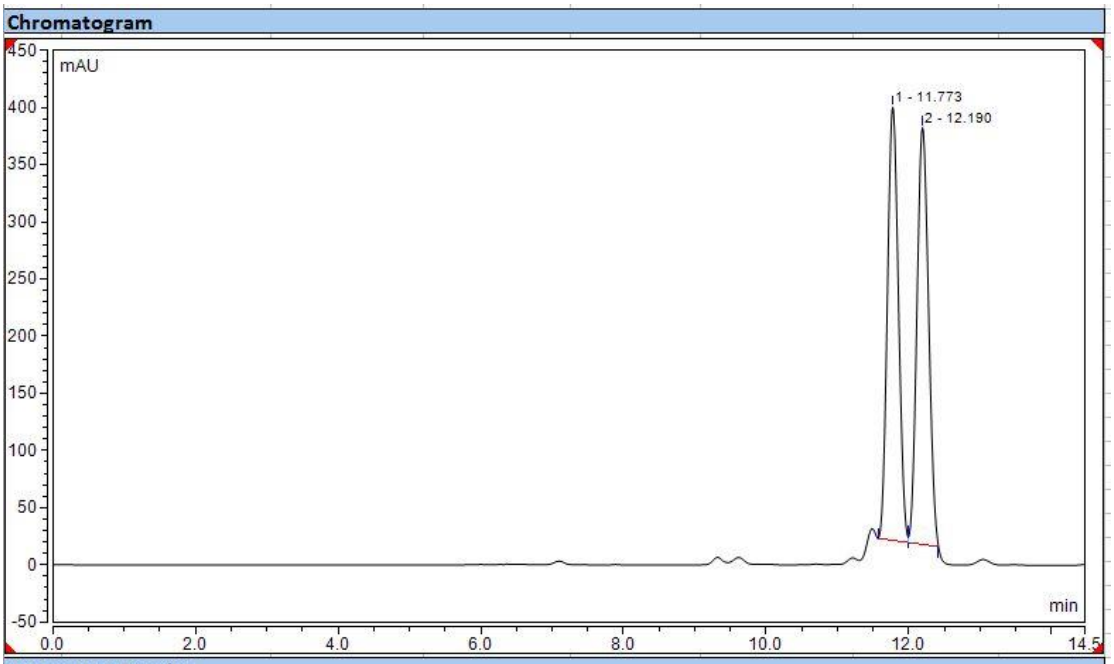
3hm

Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		18.213	5.841	18.664	2.66	2.90	n.a.
2		19.220	214.061	625.096	97.34	97.10	n.a.
Total:			**219.902**	**643.760**	**100.00**	**100.00**	

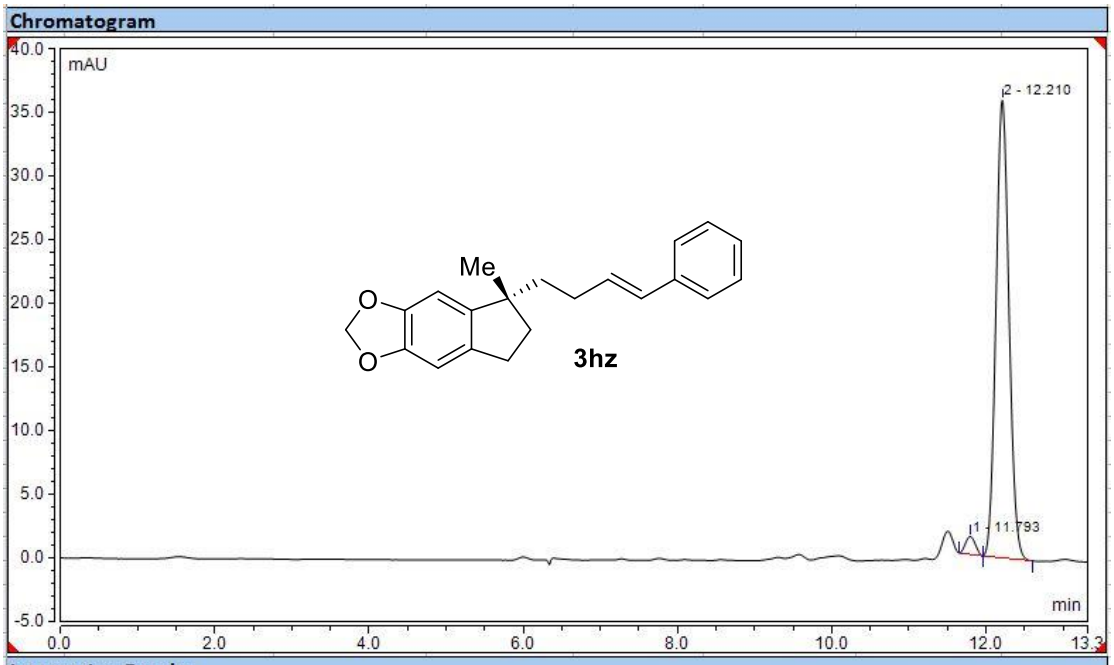
HPLC (Chiralpak IB): t_R= 18.2 (minor), 19.2 (major)

Condition: 90:10 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		11.773	67.393	379.088	49.72	50.97	n.a.
2		12.190	68.165	364.653	50.28	49.03	n.a.
Total:			**135.558**	**743.741**	**100.00**	**100.00**	

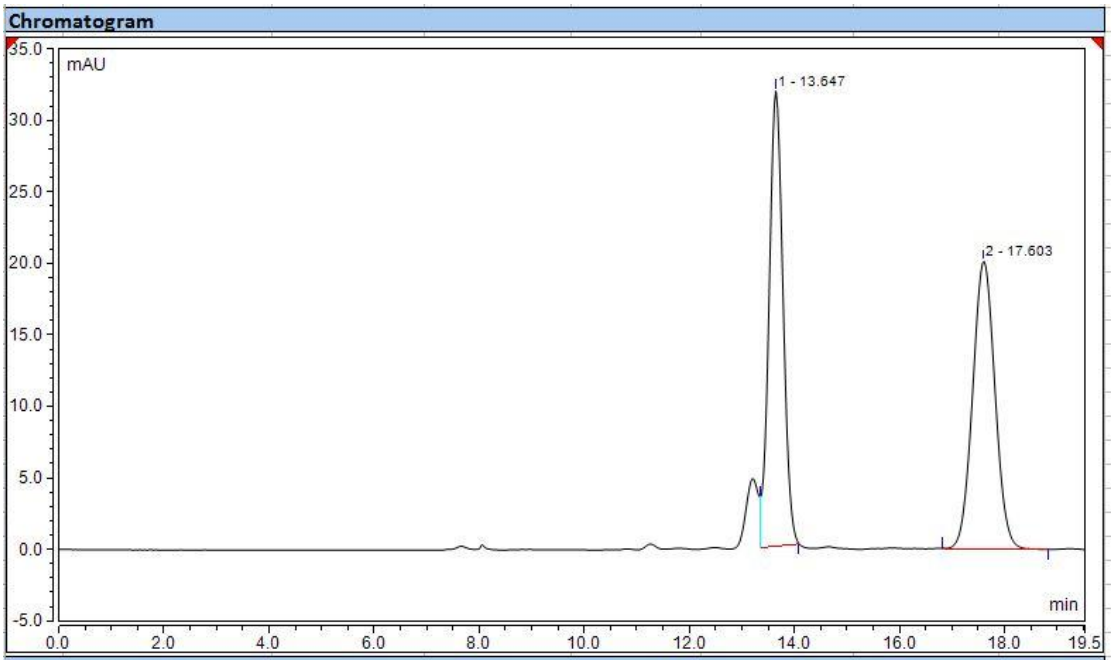


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		11.793	0.208	1.414	2.88	3.78	n.a.
2		12.210	7.031	36.004	97.12	96.22	n.a.
Total:			**7.239**	**37.418**	**100.00**	**100.00**	

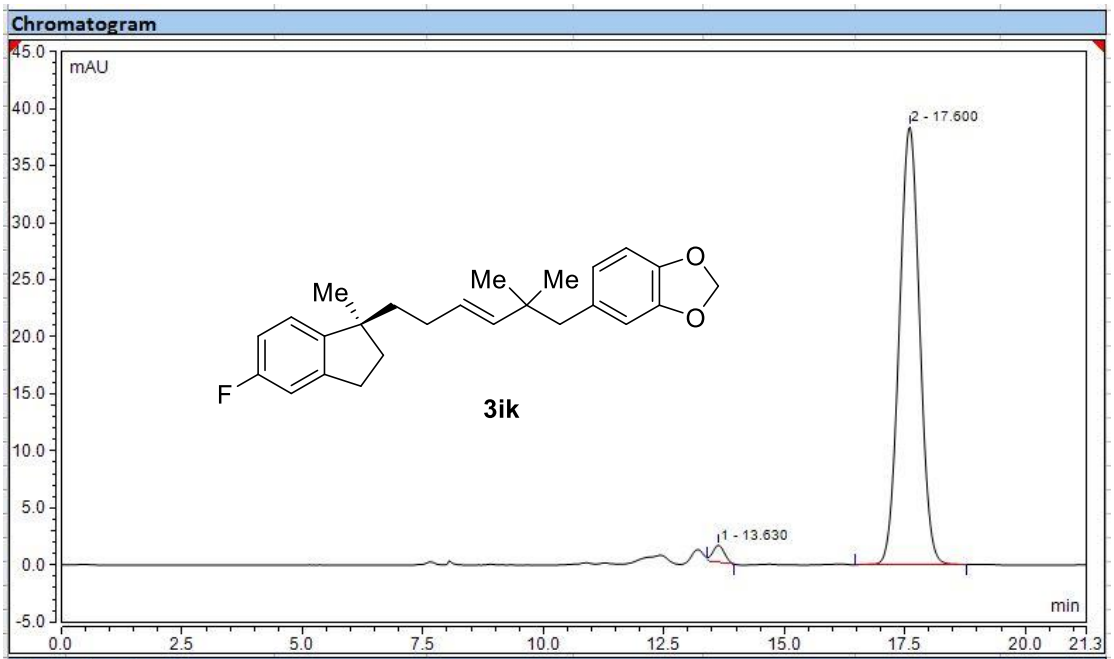
HPLC (Chiral MD): t_R= 11.8 (minor), 12.2 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		13.647	9.759	31.841	49.64	61.26	n.a.
2		17.603	9.901	20.132	50.36	38.74	n.a.
Total:			**19.660**	**51.972**	**100.00**	**100.00**	

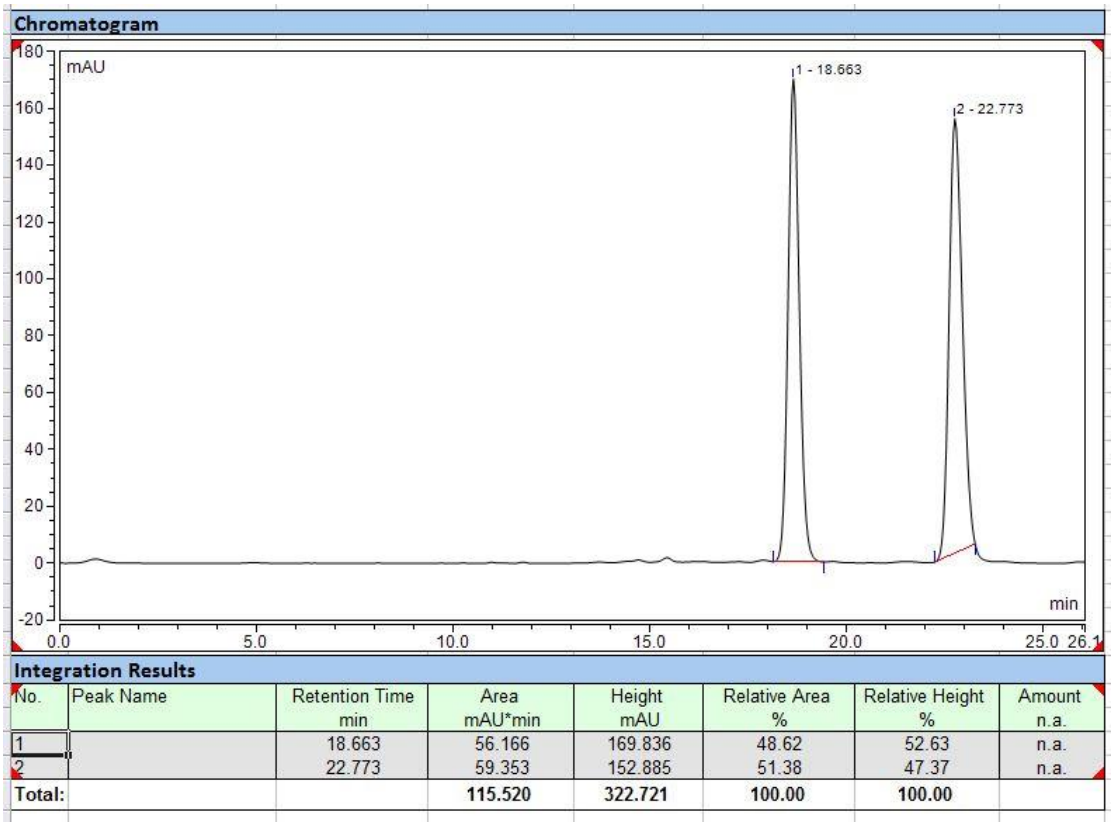


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		13.630	0.419	1.494	2.18	3.74	n.a.
2		17.600	18.776	38.419	97.82	96.26	n.a.
Total:			**19.195**	**39.913**	**100.00**	**100.00**	

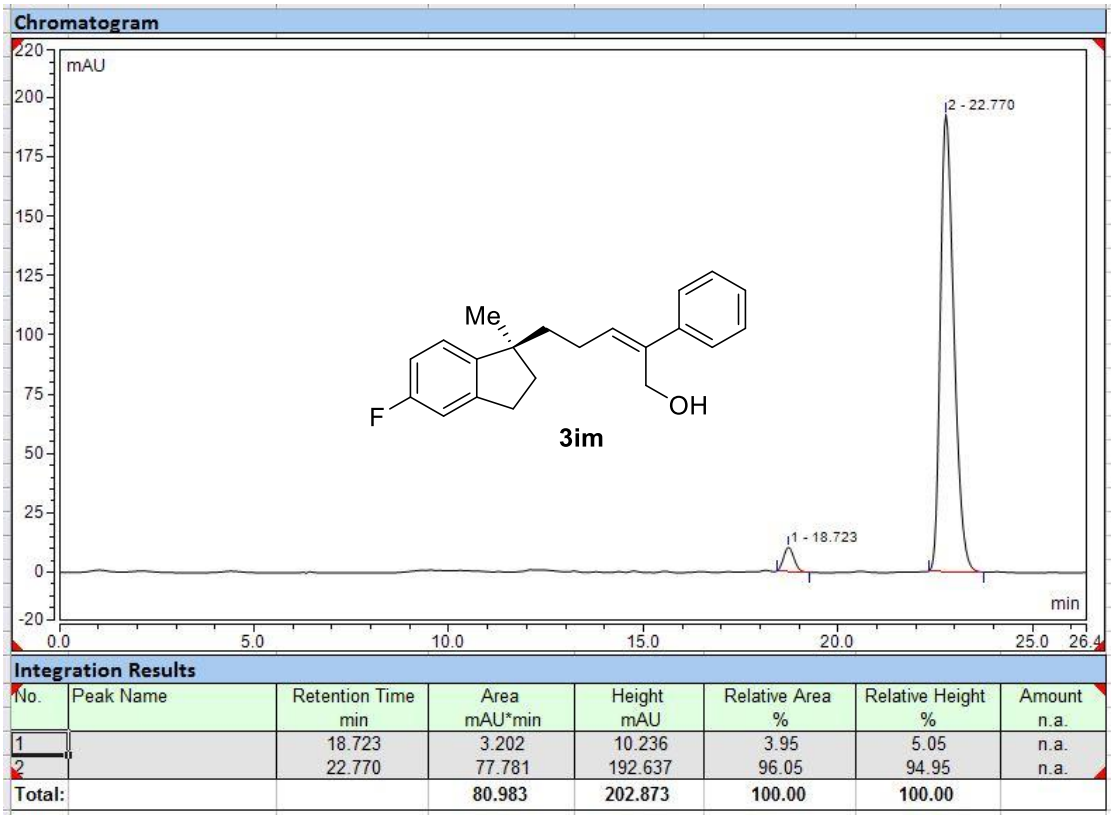
HPLC (Chiralcel OJ-H): t_R= 13.6 (minor), 17.6 (major)

Condition: 96:4 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		18.663	56.166	169.836	48.62	52.63	n.a.
2		22.773	59.353	152.885	51.38	47.37	n.a.
Total:			**115.520**	**322.721**	**100.00**	**100.00**	



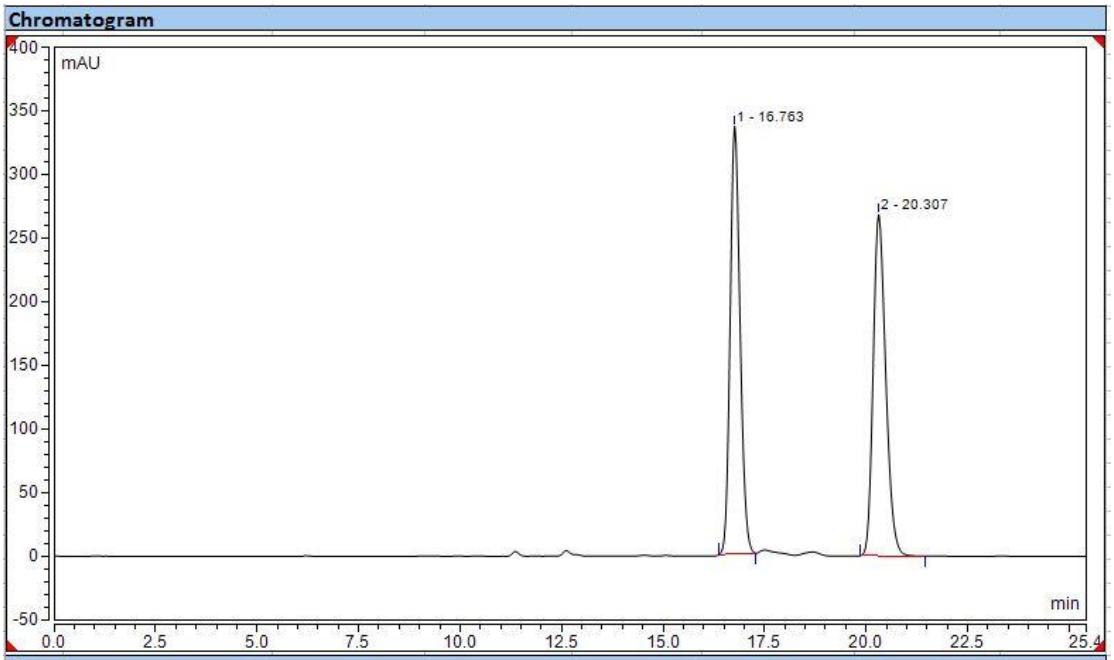
3im

Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		18.723	3.202	10.236	3.95	5.05	n.a.
2		22.770	77.781	192.637	96.05	94.95	n.a.
Total:			**80.983**	**202.873**	**100.00**	**100.00**	

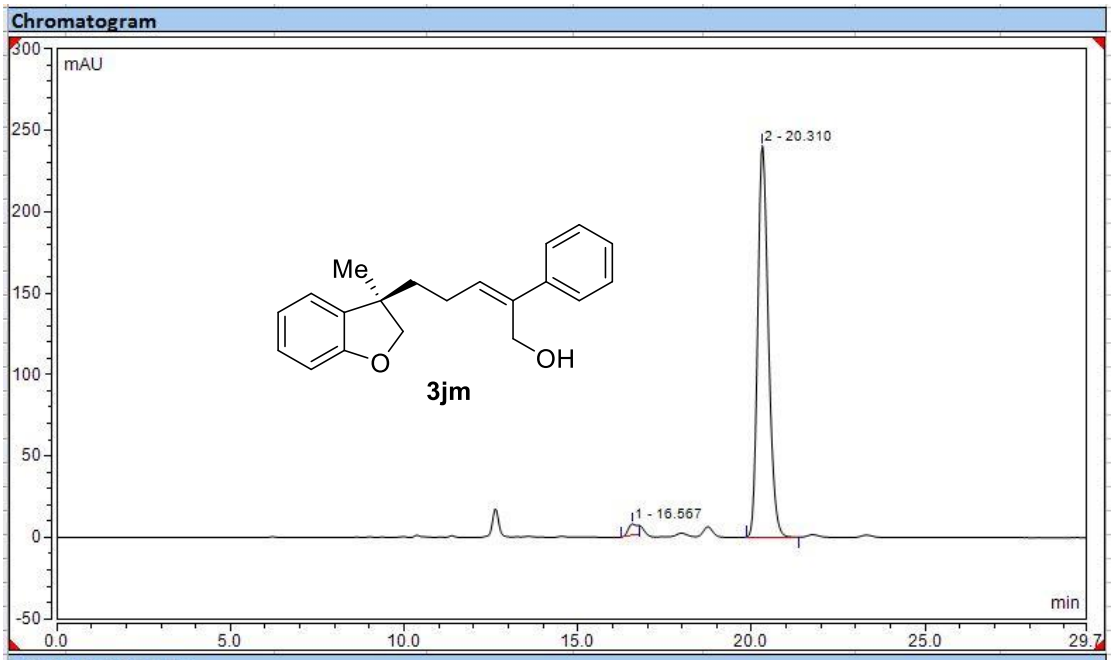
HPLC (Chiralpak IB): t_R= 18.7 (minor), 22.8 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		16.763	95.004	336.273	49.68	55.63	n.a.
2		20.307	96.227	268.186	50.32	44.37	n.a.
Total:			**191.232**	**604.459**	**100.00**	**100.00**	

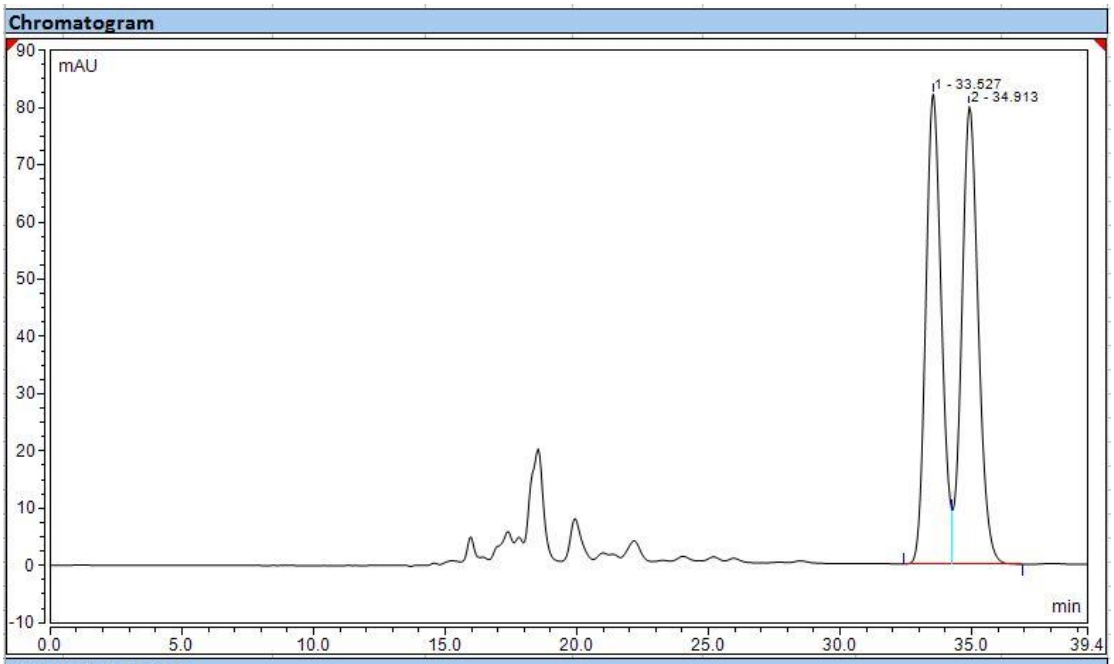


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		16.567	2.193	7.019	2.50	2.84	n.a.
2		20.310	85.581	240.322	97.50	97.16	n.a.
Total:			**87.773**	**247.341**	**100.00**	**100.00**	

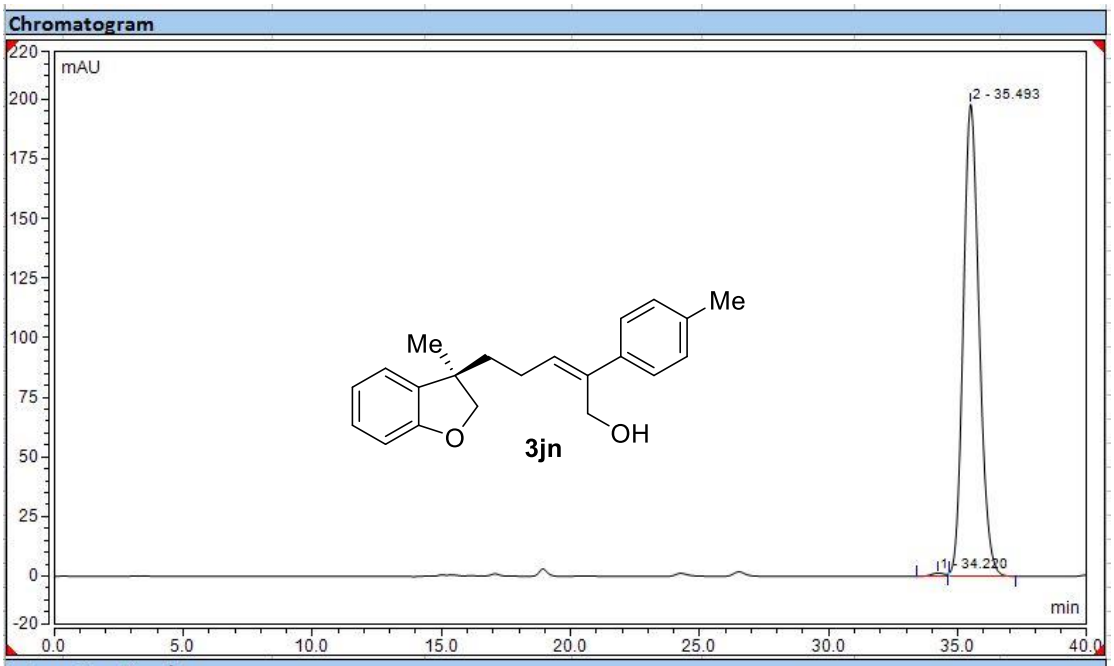
HPLC (Chiralpak IB): t_R= 16.6 (minor), 20.3 (major)

Condition: 90:10 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		33.527	56.327	82.120	49.19	50.66	n.a.
2		34.913	58.190	79.967	50.81	49.34	n.a.
Total:			**114.518**	**162.087**	**100.00**	**100.00**	

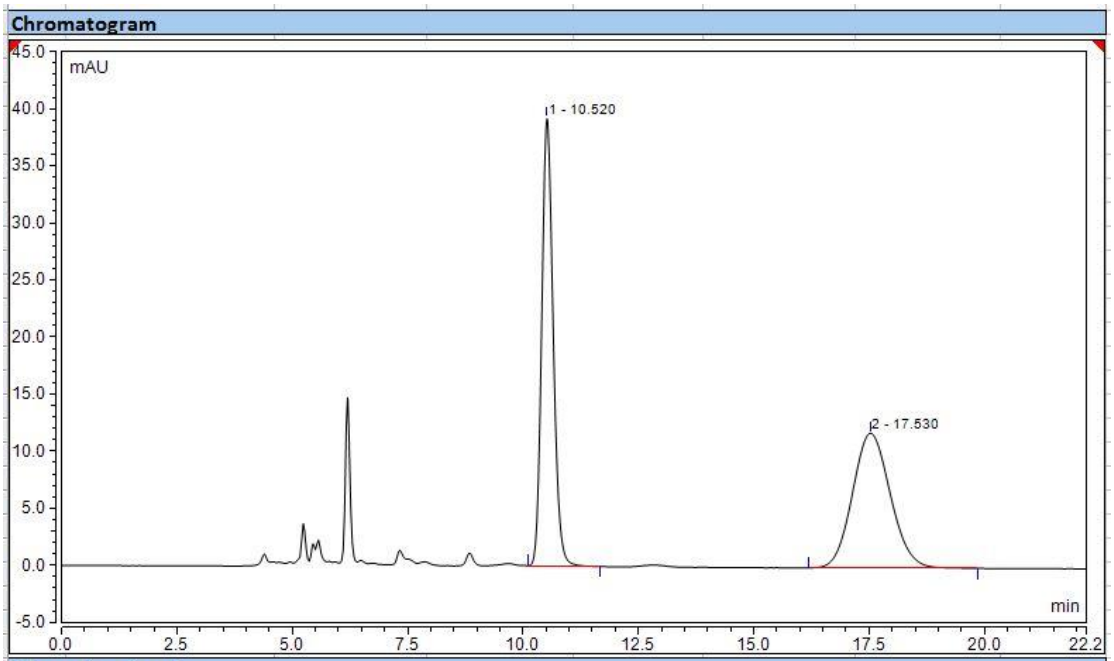


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		34.220	0.883	1.411	0.62	0.71	n.a.
2		35.493	141.302	198.097	99.38	99.29	n.a.
Total:			**142.184**	**199.507**	**100.00**	**100.00**	

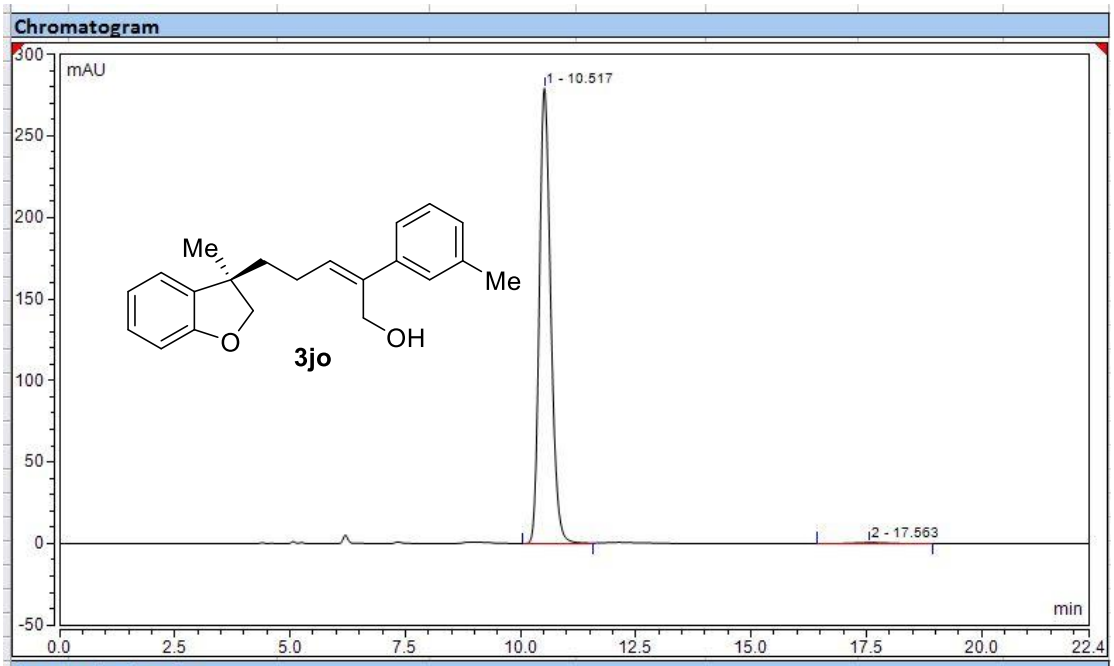
HPLC (Chiralpak AD-H): t_R= 34.2 (minor), 35.5 (major)

Condition: 20:80 n-Hexane:i-PrOH, flow rate 0.2 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.520	11.264	39.202	50.03	76.84	n.a.
2		17.530	11.249	11.814	49.97	23.16	n.a.
Total:			**22.514**	**51.016**	**100.00**	**100.00**	

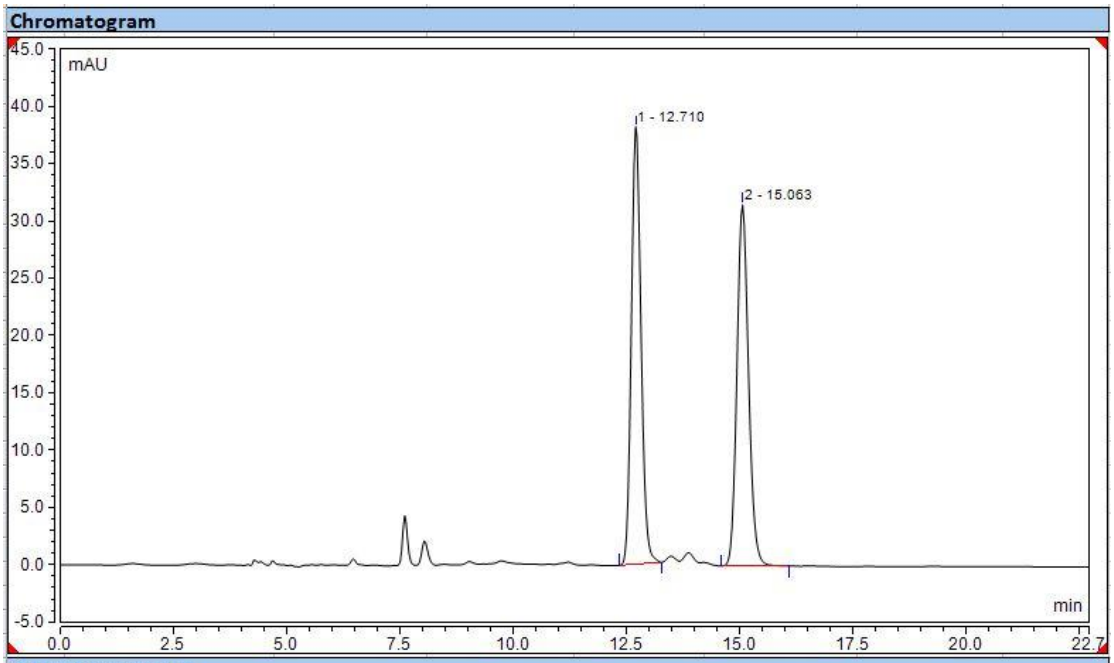


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.517	79.894	279.268	99.25	99.77	n.a.
2		17.563	0.606	0.641	0.75	0.23	n.a.
Total:			**80.500**	**279.909**	**100.00**	**100.00**	

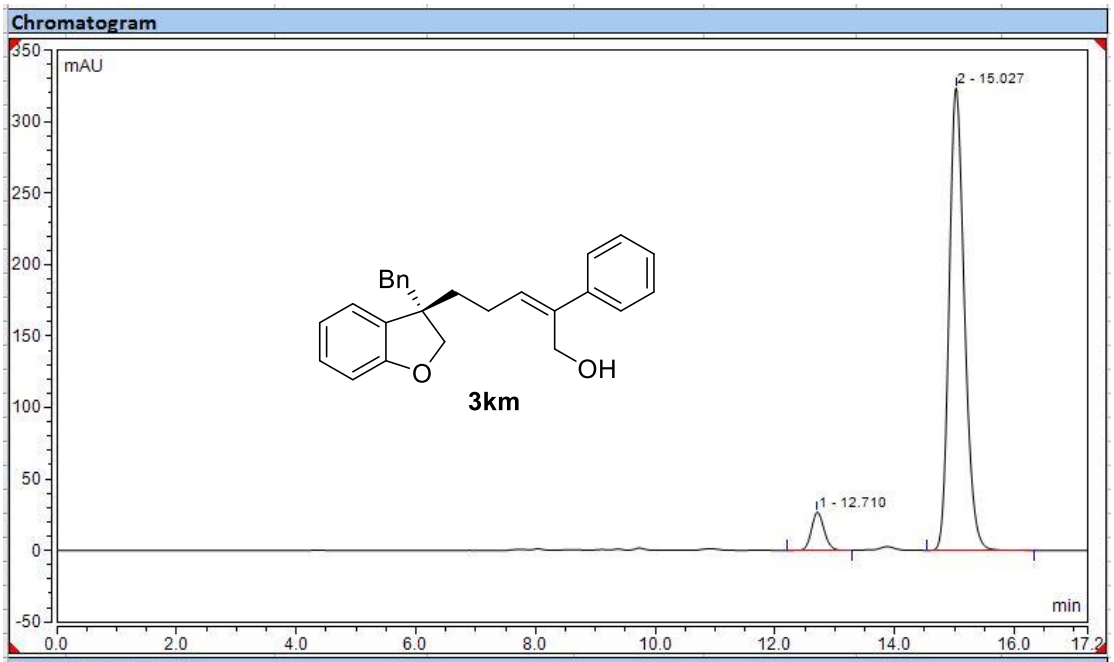
HPLC (Chiralcel OJ-H): t_R= 10.5 (major), 17.6 (minor)

Condition: 60:40 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.710	9.401	38.183	50.04	54.77	n.a.
2		15.063	9.385	31.536	49.96	45.23	n.a.
Total:			**18.786**	**69.718**	**100.00**	**100.00**	

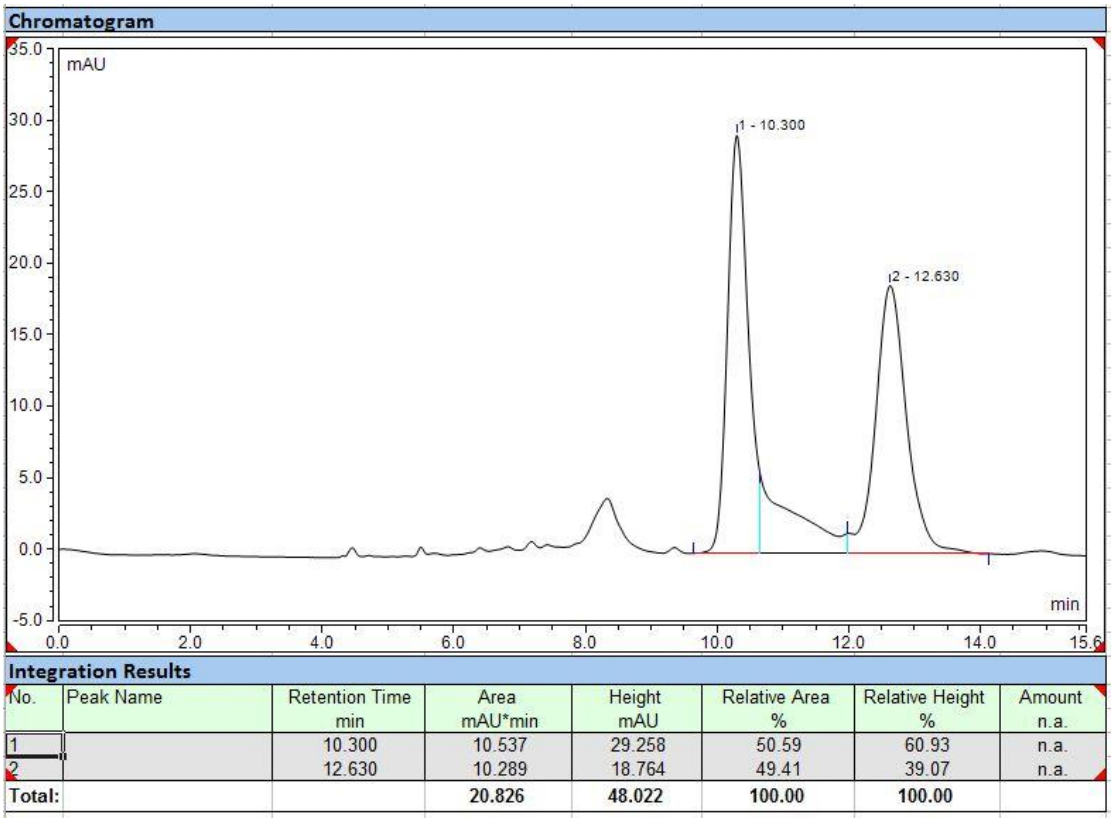


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.710	6.566	26.823	6.41	7.65	n.a.
2		15.027	95.808	323.597	93.59	92.35	n.a.
Total:			**102.374**	**350.420**	**100.00**	**100.00**	

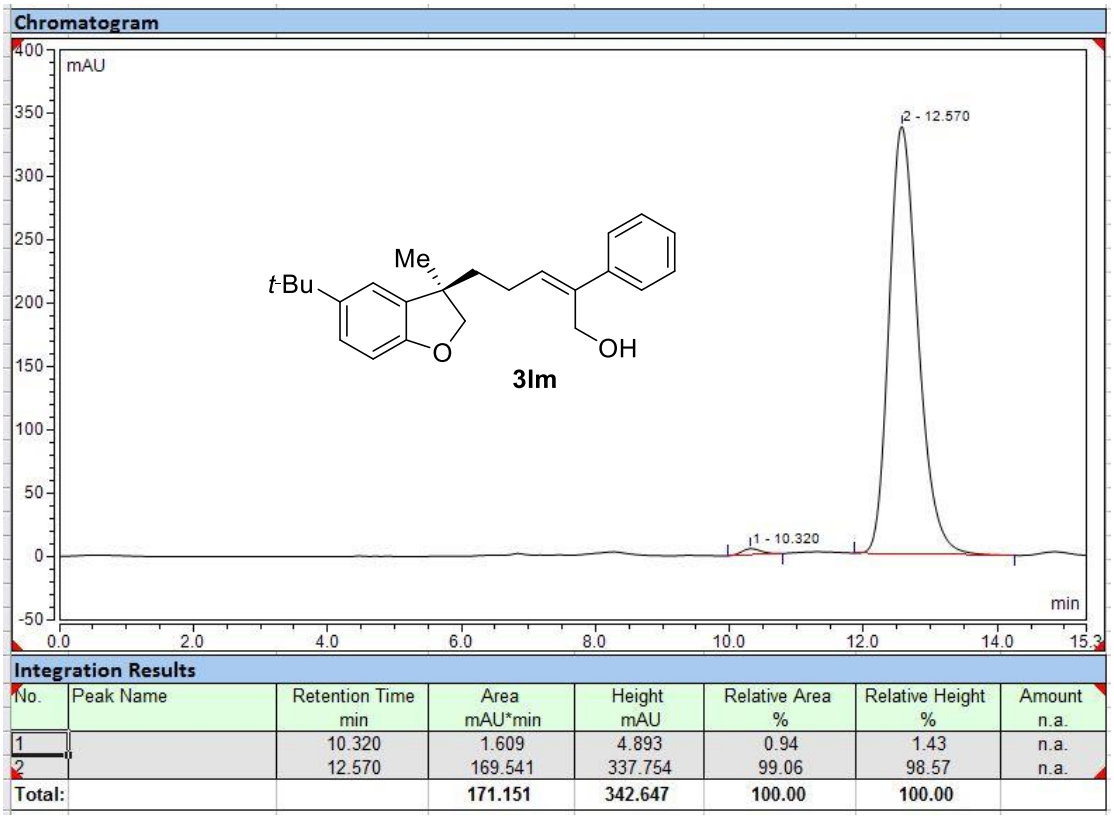
HPLC (Chiralpak IB): t_R= 12.7 (minor), 15.0 (major)

Condition: 86:14 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.300	10.537	29.258	50.59	60.93	n.a.
2		12.630	10.289	18.764	49.41	39.07	n.a.
Total:			**20.826**	**48.022**	**100.00**	**100.00**	



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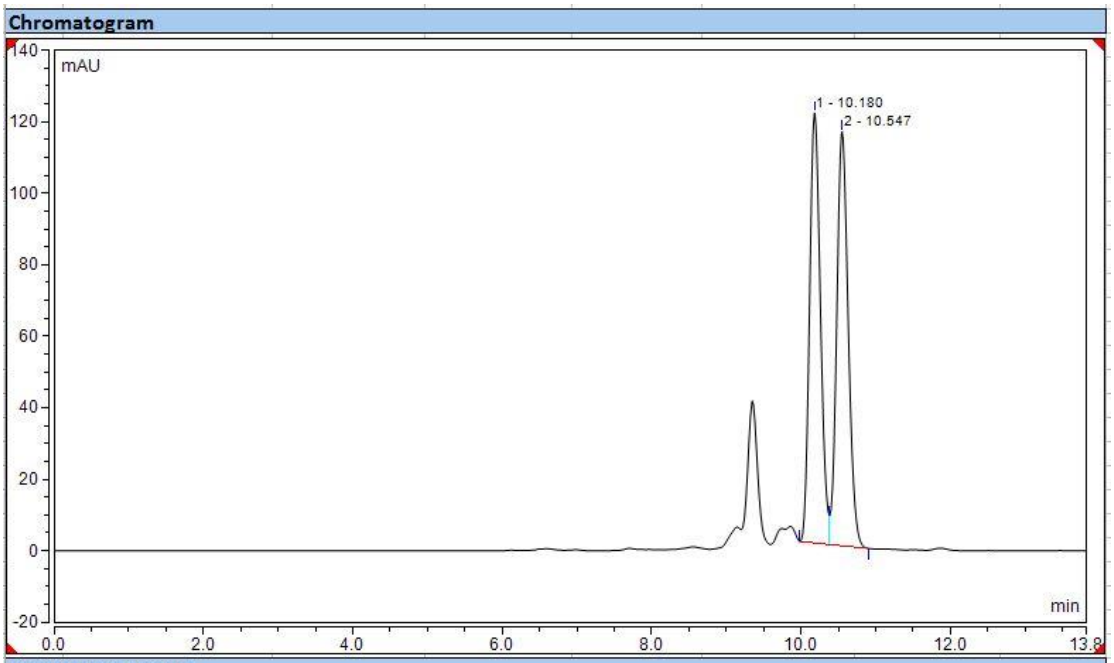
Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.320	1.609	4.893	0.94	1.43	n.a.
2		12.570	169.541	337.754	99.06	98.57	n.a.
Total:			**171.151**	**342.647**	**100.00**	**100.00**	

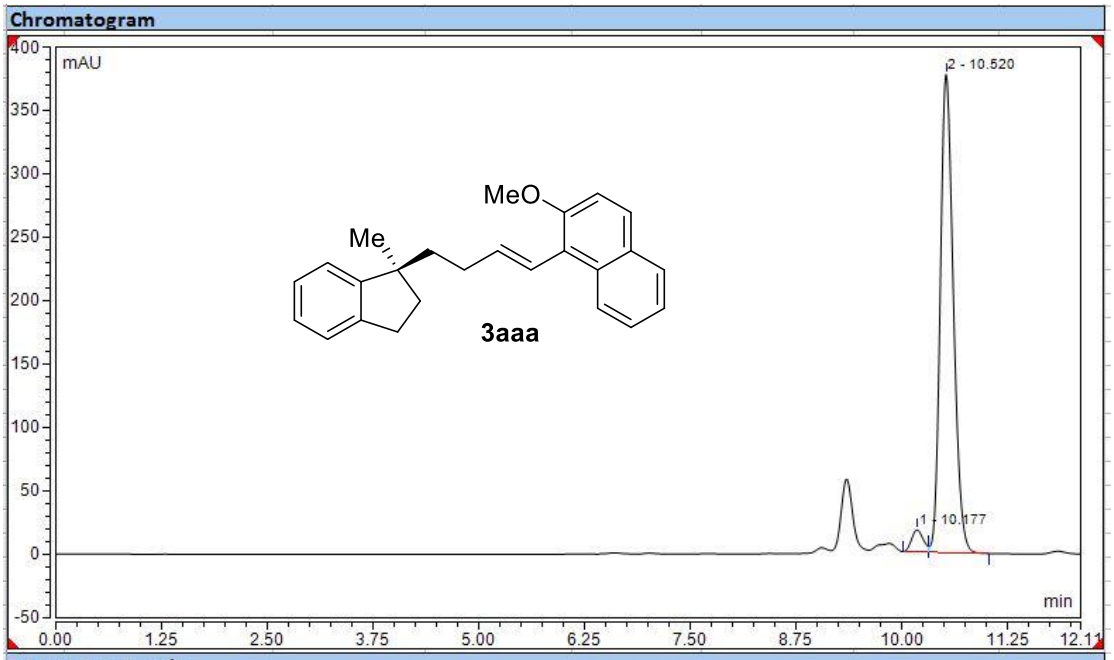
HPLC (Chiralcel OJ-H): t_R= 10.3 (minor), 12.6 (major)

Condition: 86:14 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.180	20.172	120.362	49.47	50.94	n.a.
2		10.547	20.601	115.910	50.53	49.06	n.a.
Total:			**40.773**	**236.272**	**100.00**	**100.00**	

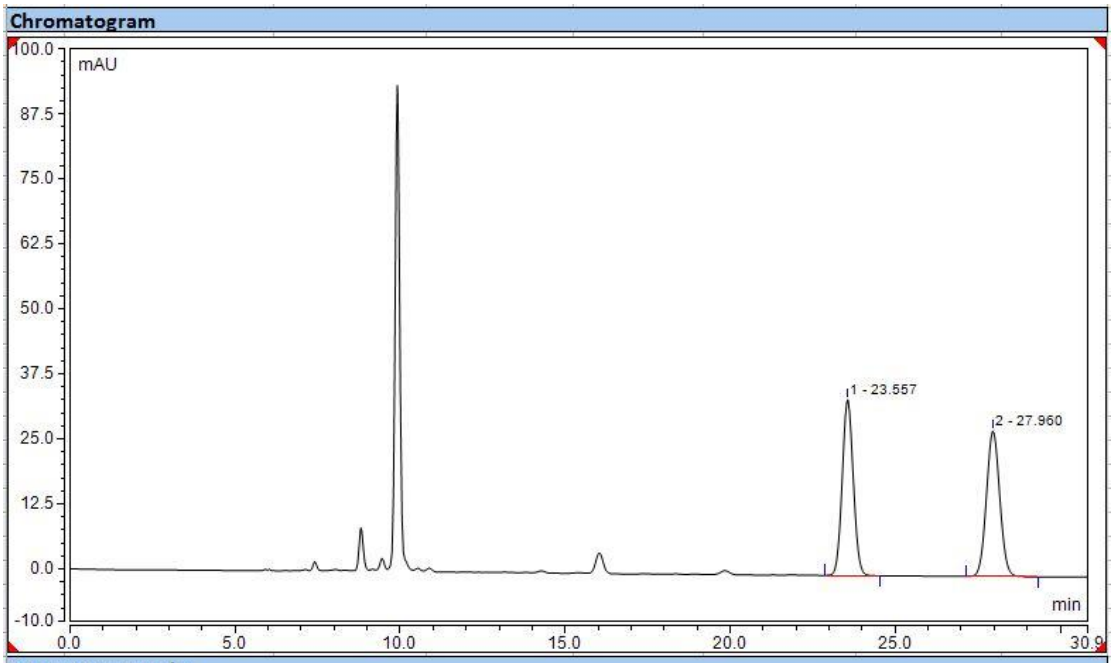


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.177	2.783	17.479	3.96	4.43	n.a.
2		10.520	67.446	377.342	96.04	95.57	n.a.
Total:			**70.228**	**394.821**	**100.00**	**100.00**	

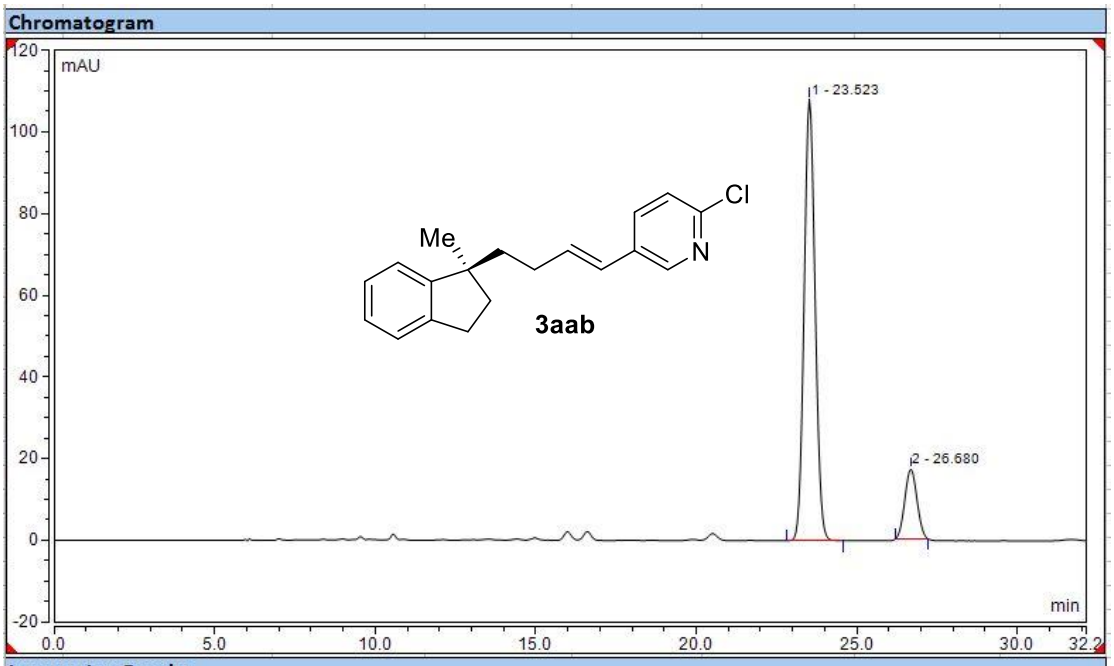
HPLC (Chiralpak IB): t_R= 10.1 (minor), 10.5 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		23.557	13.178	33.827	50.09	54.68	n.a.
2		27.960	13.131	28.040	49.91	45.32	n.a.
Total:			**26.309**	**61.867**	**100.00**	**100.00**	

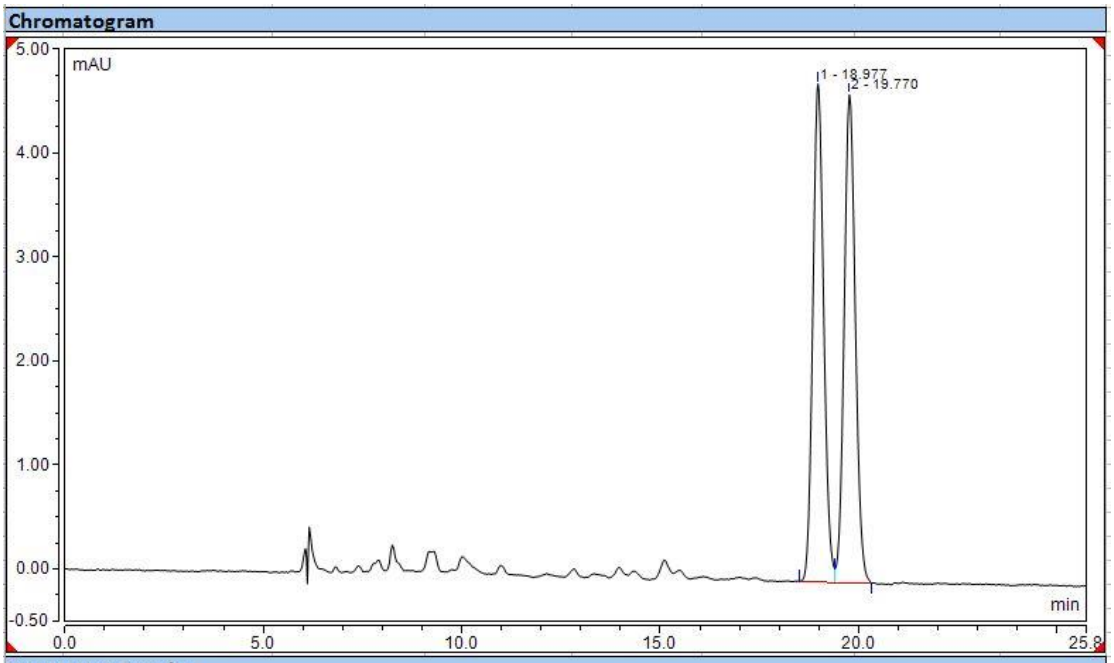


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		23.523	42.789	108.155	85.02	86.32	n.a.
2		26.680	7.539	17.139	14.98	13.68	n.a.
Total:			**50.328**	**125.294**	**100.00**	**100.00**	

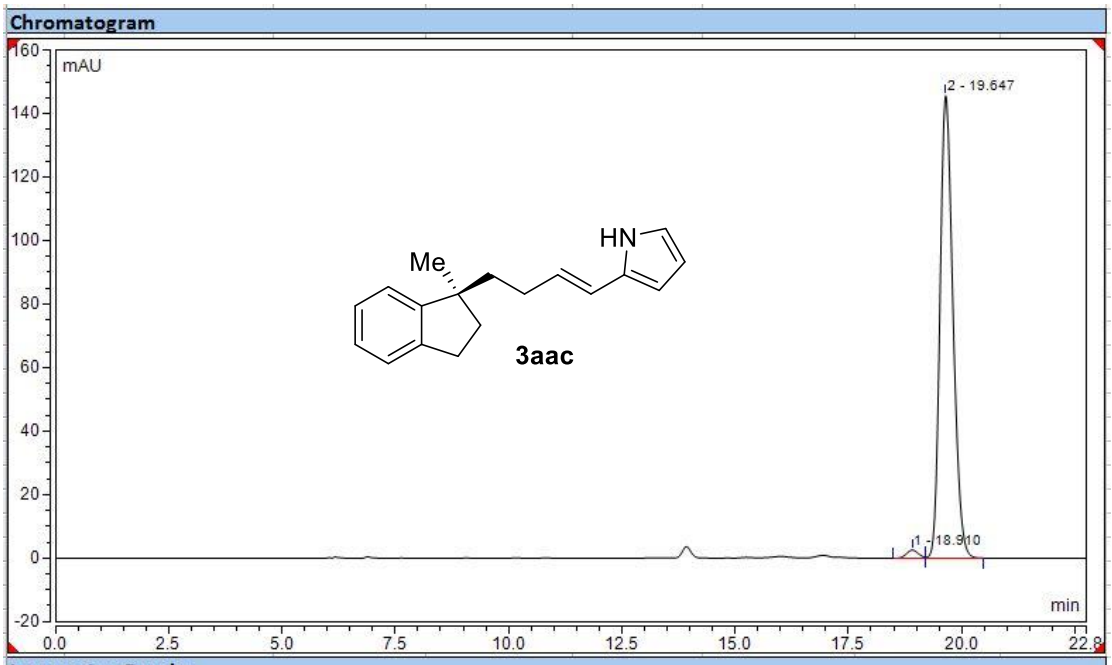
HPLC (Chiral MD): t_R= 23.5 (major), 26.7 (minor)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		18.977	1.514	4.793	49.77	50.51	n.a.
2		19.770	1.528	4.695	50.23	49.49	n.a.
Total:			**3.042**	**9.488**	**100.00**	**100.00**	



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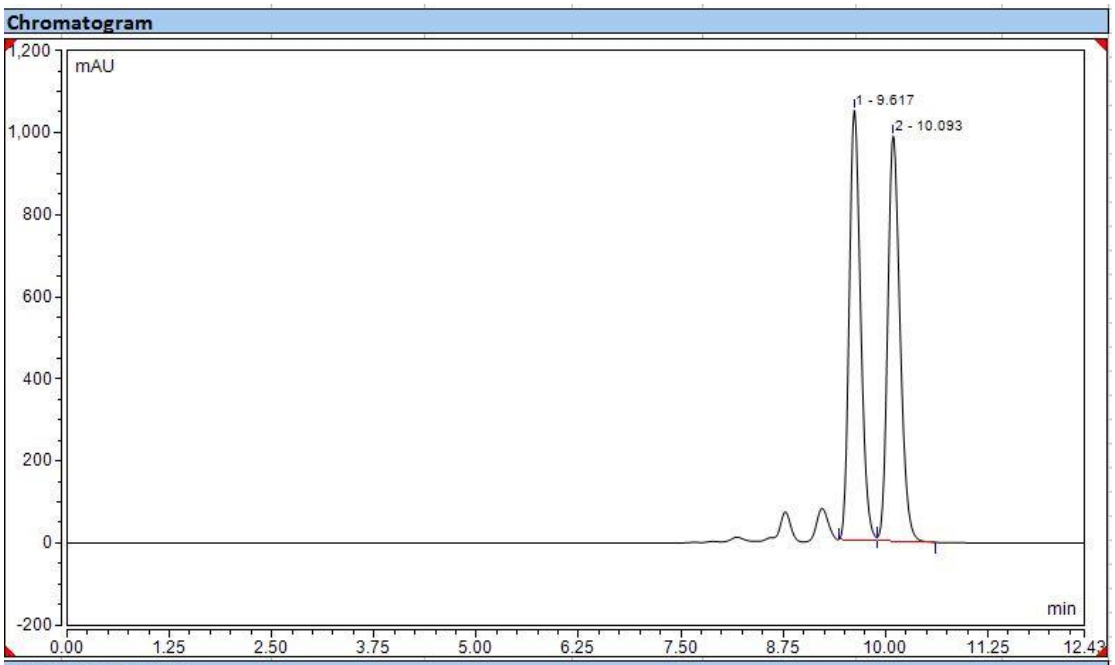
Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		18.910	0.794	2.596	1.61	1.75	n.a.
2		19.647	48.426	145.756	98.39	98.25	n.a.
Total:			**49.221**	**148.352**	**100.00**	**100.00**	

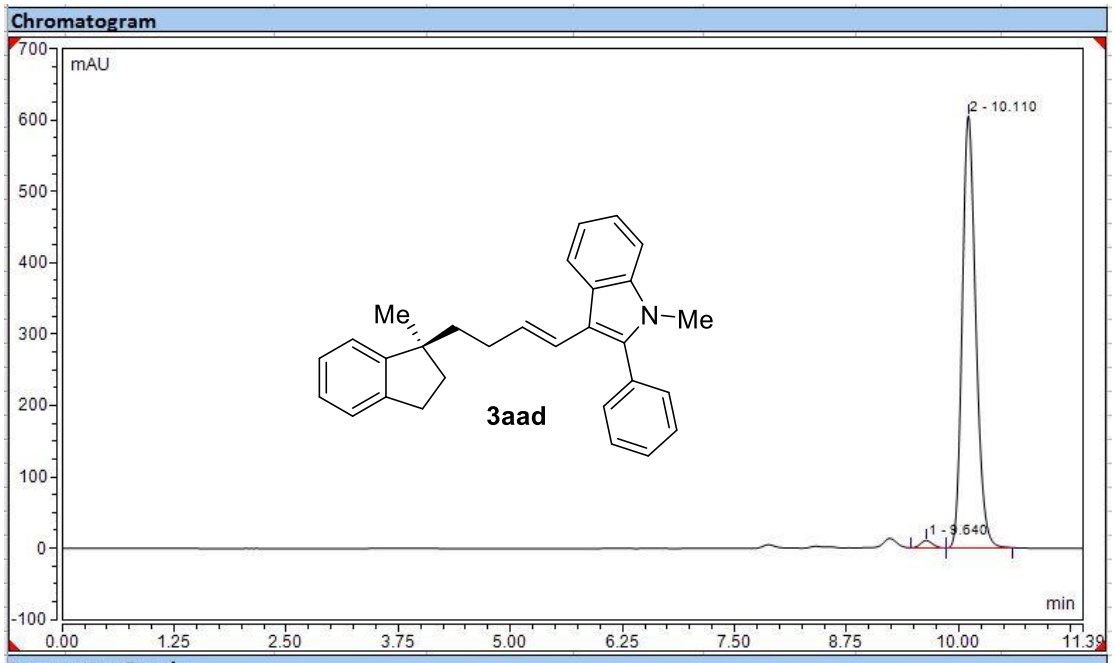
HPLC (Chiralpak IB): t_R= 18.9 (minor), 19.6 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.617	168.342	1046.846	49.48	51.46	n.a.
2		10.093	171.892	987.635	50.52	48.54	n.a.
Total:			**340.234**	**2034.480**	**100.00**	**100.00**	

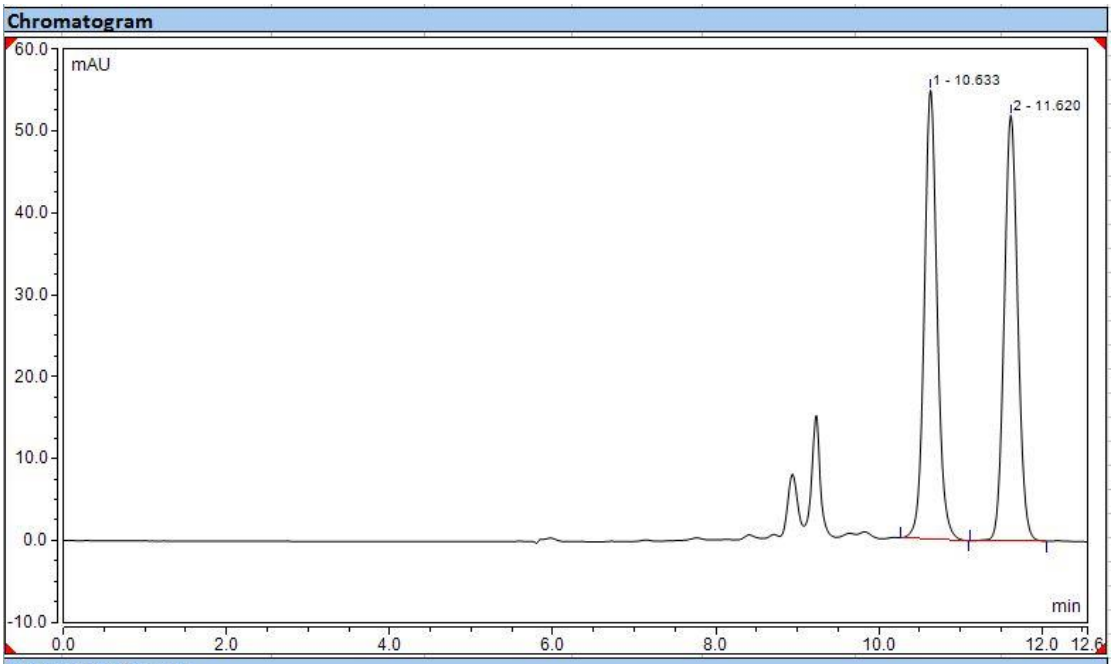


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.640	1.616	10.416	1.50	1.69	n.a.
2		10.110	106.456	605.498	98.50	98.31	n.a.
Total:			**108.072**	**615.914**	**100.00**	**100.00**	

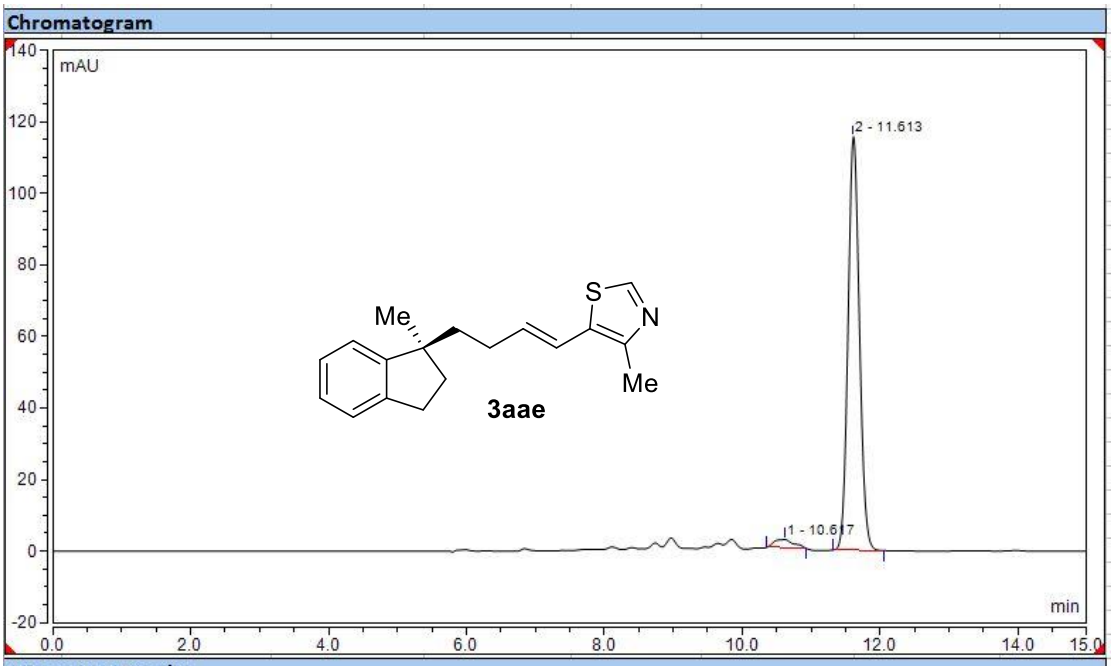
HPLC (Chiralpak IB): t_R= 9.6 (minor), 10.1 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.633	10.014	54.807	50.02	51.34	n.a.
2		11.620	10.005	51.951	49.98	48.66	n.a.
Total:			**20.019**	**106.758**	**100.00**	**100.00**	

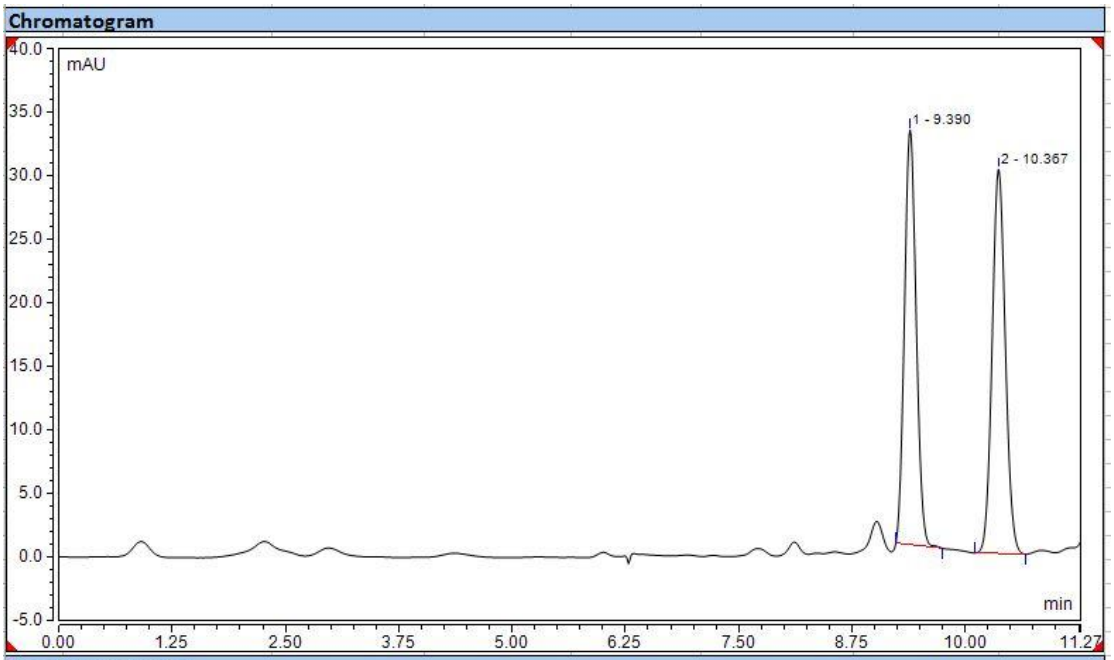


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		10.617	0.737	2.280	3.24	1.93	n.a.
2		11.613	22.006	115.660	96.76	98.07	n.a.
Total:			**22.743**	**117.940**	**100.00**	**100.00**	

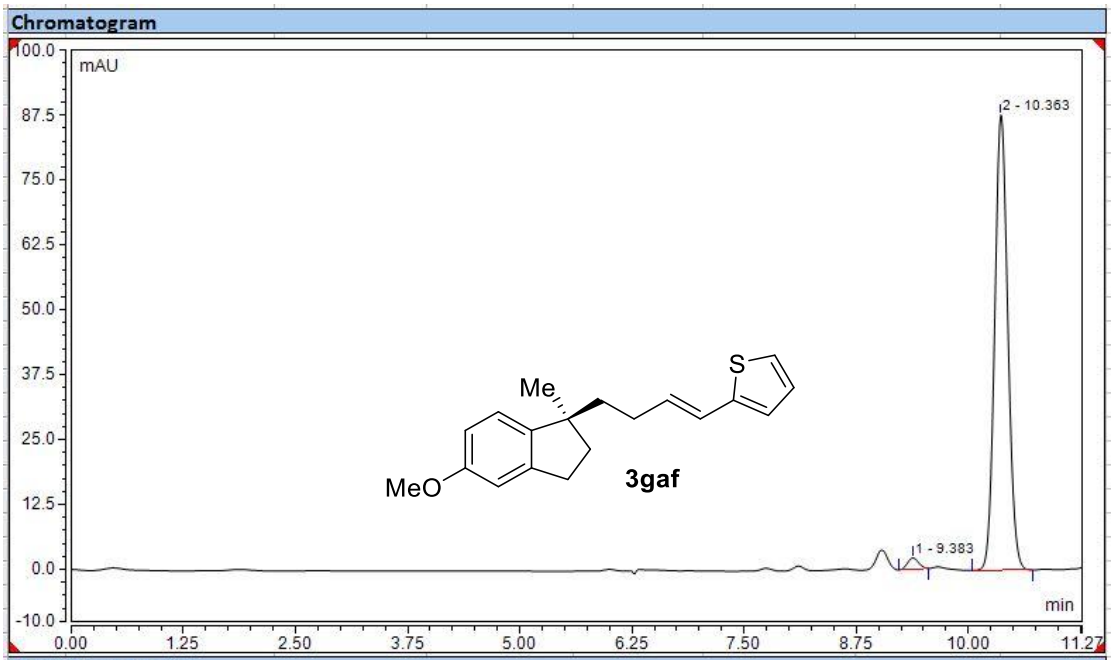
HPLC (Chiral MD): t_R= 10.6 (minor), 11.6 (major)

Condition: 90:10 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.390	4.876	32.673	48.91	51.90	n.a.
2		10.367	5.092	30.280	51.09	48.10	n.a.
Total:			**9.968**	**62.954**	**100.00**	**100.00**	

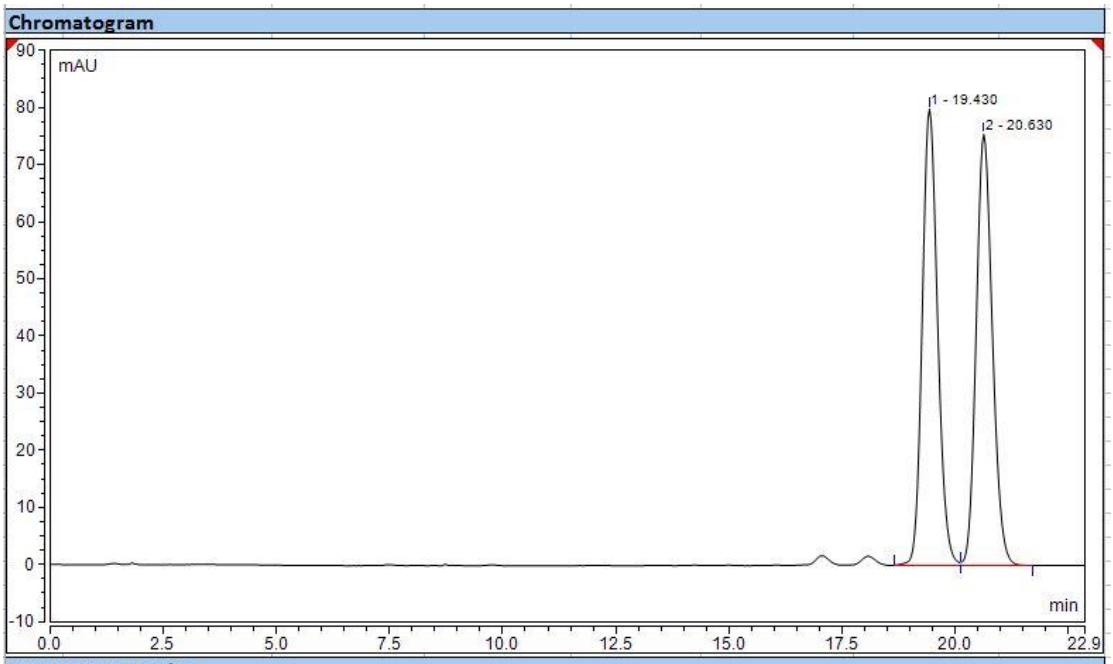


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.383	0.311	2.185	2.04	2.43	n.a.
2		10.363	14.916	87.719	97.96	97.57	n.a.
Total:			**15.227**	**89.904**	**100.00**	**100.00**	

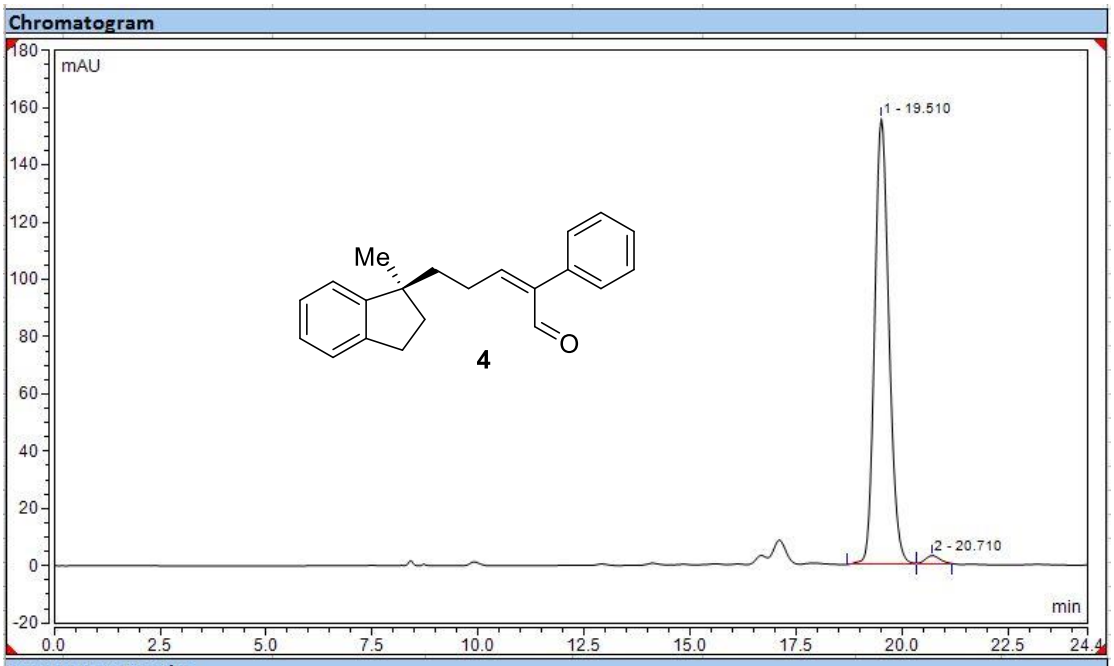
HPLC (Chiral MD): t_R= 9.4 (minor), 10.4 (major)

Condition: 97:3 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		19.430	31.388	79.881	50.11	51.42	n.a.
2		20.630	31.245	75.462	49.89	48.58	n.a.
Total:			**62.633**	**155.344**	**100.00**	**100.00**	

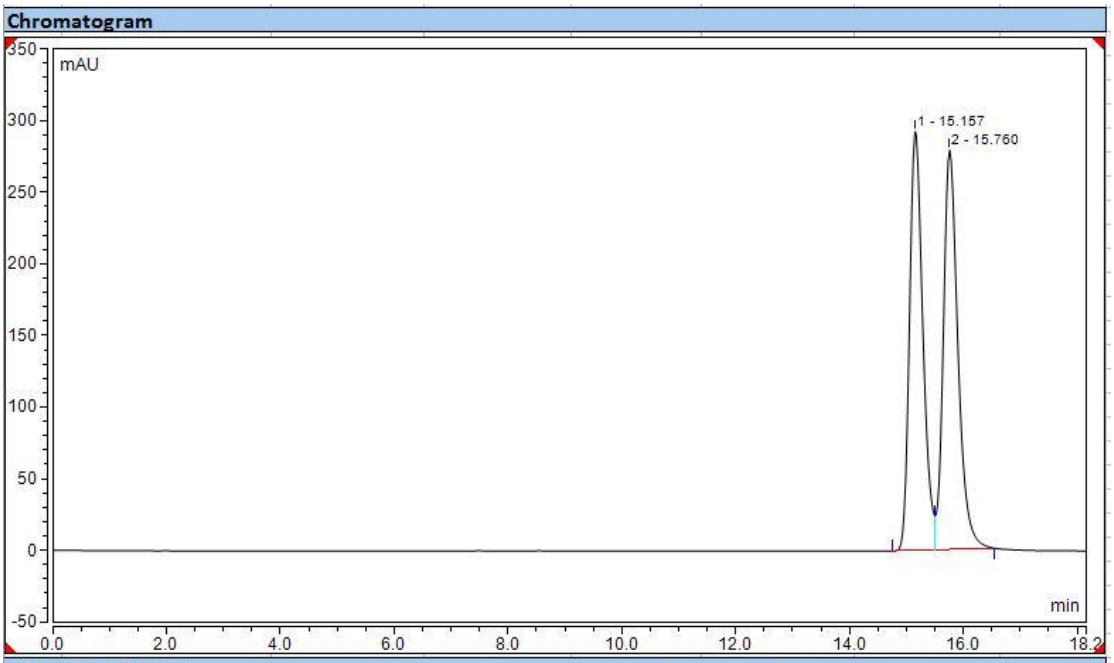


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
n.a.		19.510	60.798	155.644	98.22	98.22	n.a.
n.a.		20.710	1.105	2.819	1.78	1.78	n.a.
Total:			**61.902**	**158.463**	**100.00**	**100.00**	

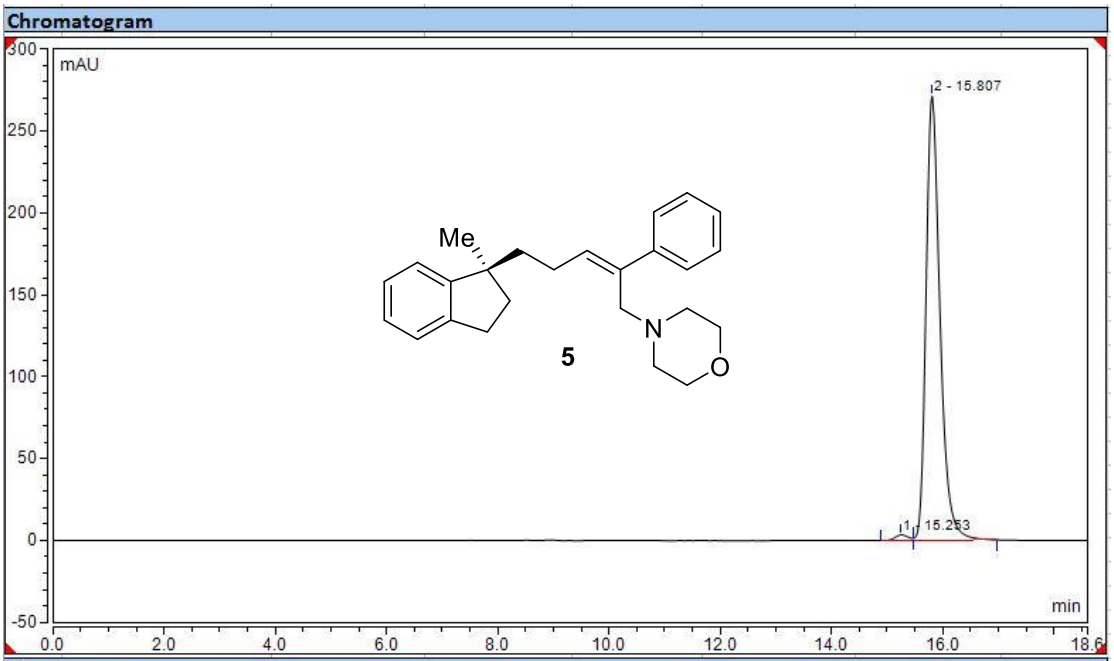
HPLC (Chiral MD): t_R= 19.5 (major), 20.7 (minor)

Condition: 98:2 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		15.157	79.469	292.548	49.01	51.18	n.a.
2		15.760	82.665	279.072	50.99	48.82	n.a.
Total:			**162.134**	**571.620**	**100.00**	**100.00**	



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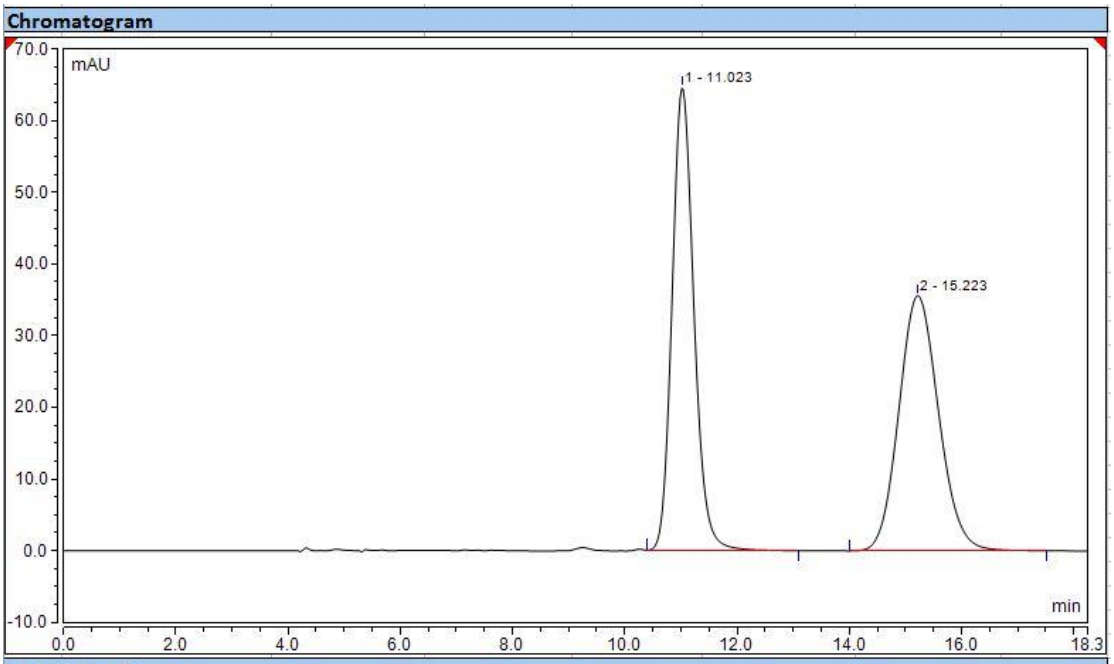
Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		15.253	0.931	3.465	1.16	1.26	n.a.
2		15.807	79.056	271.169	98.84	98.74	n.a.
Total:			**79.986**	**274.635**	**100.00**	**100.00**	

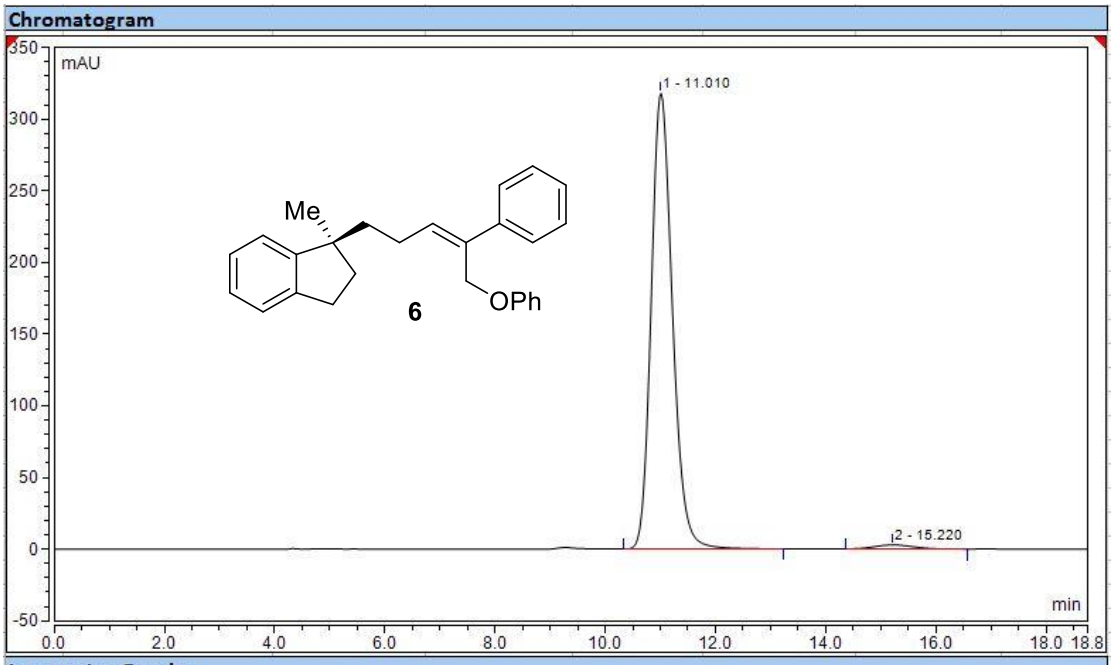
HPLC (Chiral MD): t_R= 15.3 (minor), 15.8 (major)

Condition: 98:2 n-Hexane:i-PrOH, flow rate 0.4 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		11.023	28.988	64.559	49.79	64.44	n.a.
2		15.223	29.235	35.621	50.21	35.56	n.a.
Total:			**58.223**	**100.180**	**100.00**	**100.00**	

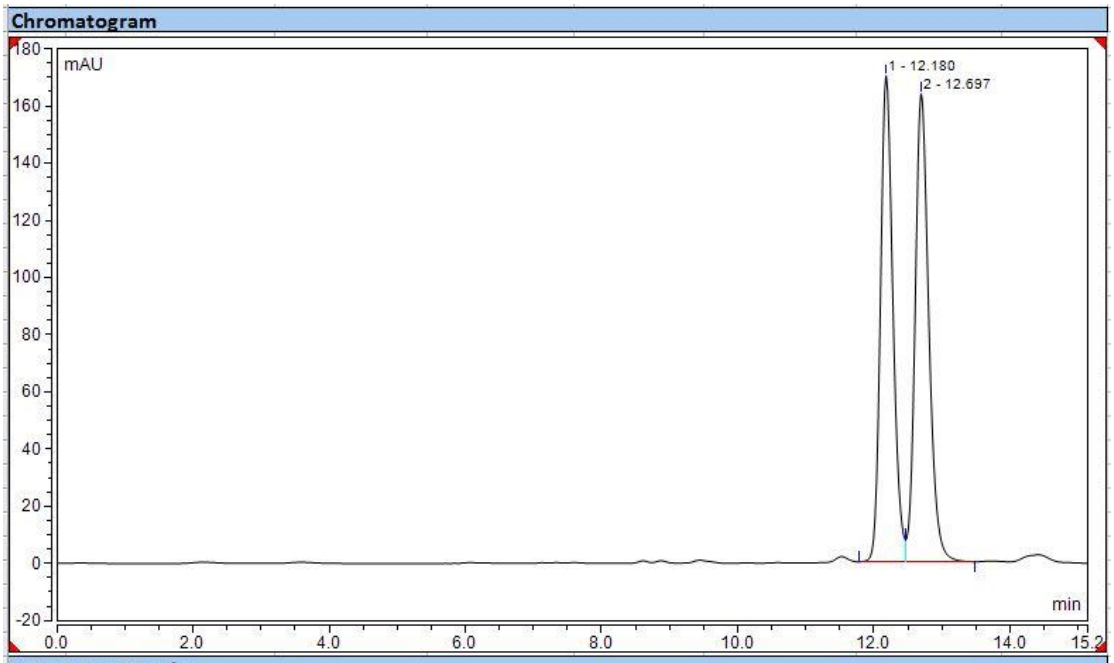


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		11.010	141.641	318.166	98.42	99.12	n.a.
2		15.220	2.268	2.818	1.58	0.88	n.a.
Total:			**143.909**	**320.984**	**100.00**	**100.00**	

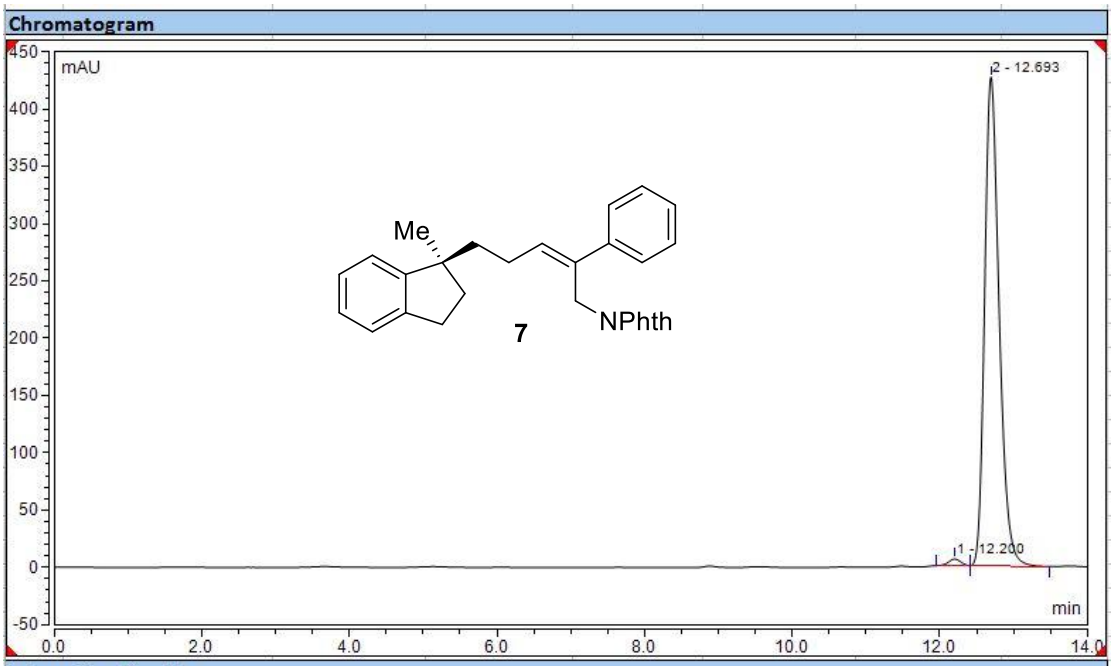
HPLC (Chiralcel OJ-H): t_R= 11.0 (major), 15.2 (minor)

Condition: 85:15 n-Hexane:i-PrOH, flow rate 0.7 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.180	35.983	170.048	48.61	50.95	n.a.
2		12.697	38.034	163.709	51.39	49.05	n.a.
Total:			**74.016**	**333.757**	**100.00**	**100.00**	

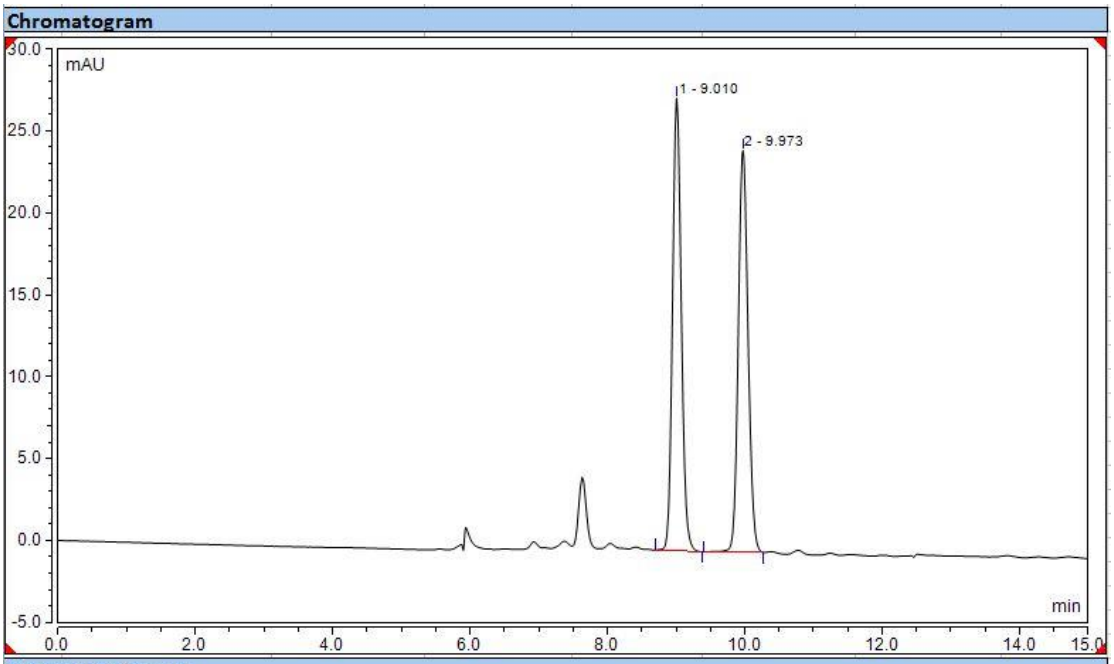


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		12.200	1.126	5.857	1.14	1.35	n.a.
2		12.693	97.414	426.891	98.86	98.65	n.a.
Total:			**98.540**	**432.748**	**100.00**	**100.00**	

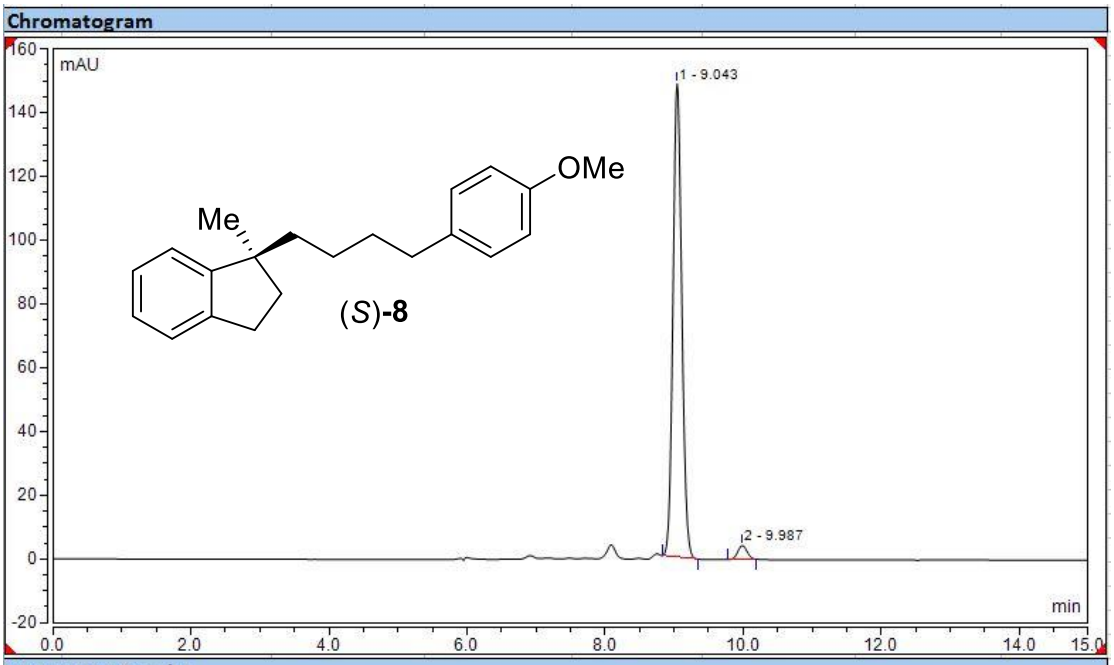
HPLC (Chiralpak IB): t_R= 12.2 (minor), 12.7 (major)

Condition: 90:10 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.010	4.087	27.622	50.33	52.97	n.a.
2		9.973	4.033	24.524	49.67	47.03	n.a.
Total:			**8.121**	**52.146**	**100.00**	**100.00**	

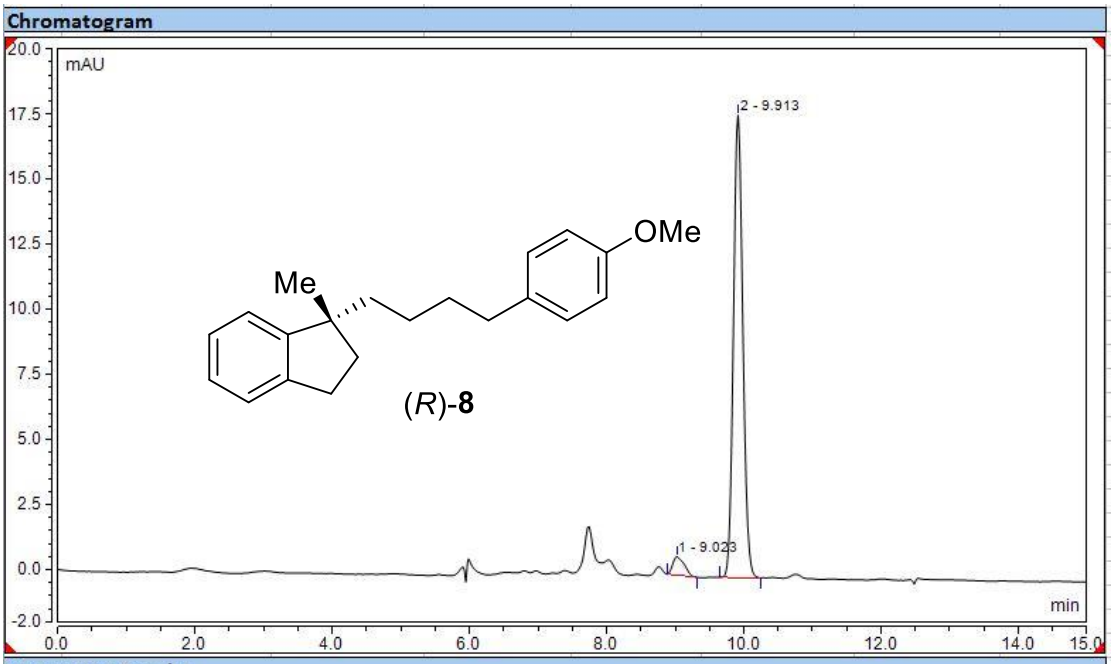


Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.043	21.876	148.460	96.97	97.13	n.a.
2		9.987	0.684	4.394	3.03	2.87	n.a.
Total:			**22.559**	**152.854**	**100.00**	**100.00**	

HPLC (Chiral MD): t_R= 9.0 (major), 9.9 (minor)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.



Integration Results

No.	Peak Name	Retention Time min	Area mAU*min	Height mAU	Relative Area %	Relative Height %	Amount n.a.
1		9.023	0.140	0.717	4.74	3.88	n.a.
2		9.913	2.813	17.765	95.26	96.12	n.a.
Total:			**2.953**	**18.482**	**100.00**	**100.00**	

HPLC (Chiral MD): t_R= 9.0 (minor), 9.9 (major)

Condition: 95:5 n-Hexane:i-PrOH, flow rate 0.5 mL/min, 25°C.