Supplementary Information

Regio- and enantioselective remote hydroarylation using a ligand-relay strategy

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1. Supplementary Notes

Solvents were either purified and dried by passage through alumina and Q5 reactant-packed columns on a solvent purification system or bought from the commercial sources and transferred to the glovebox without exposure to air. Other commercial reagents were purchased from Sigma-Aldrich, Acros, Alfa Aesar, TCI, J&K, Energy Chemical, Bide Pharmatech Ltd. and were used as received. Flash chromatography was either performed using glass columns with *SiliaFlash*® P60 (SiliCycle, 230-400 mesh), or on pre-packed *Biotage*® SNAP columns using a Biotage Isolera Automated Flash Chromatography System.

$NiCl_2$·dme: (CAS 29046-78-4) was purchased from Strem Chemical;

4-Phenyl-1-butene: (CAS 768-56-9) was purchased from TCI and stored under nitrogen at –20 °C in glove box;

2,9-Dimethyl-10-phenanthroline: (Neocuproine, CAS 484-11-7) was purchased from Adamas-beta®;

DMMS: (Methyldimethoxysilane, CAS 16881-77-9) was purchased from TCI and stored under nitrogen at –20 °C in glove box;

KF: (*White powder*, CAS 7789-23-3) was purchased from Alfa Aesar (Stock No. 42216);

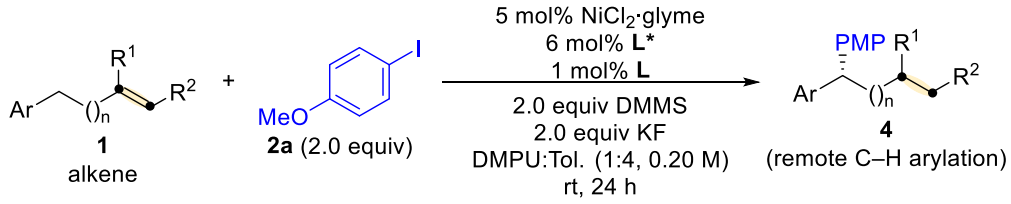
DMPU: [1,3-Dimethyl-3,4,5,6-tetrahydro-2(1*H*)-pyrimidinone, CAS 7226-23-5] was purchased from TCI and stored under nitrogen in glove box;

All compounds (starting materials and products) were characterized by ^{1}H NMR, ^{13}C NMR, IR spectroscopy, melting point (where applicable), and high-resolution mass spectrometry. ^{1}H NMR spectra were recorded on Bruker 500 M MHz spectrometer and are referenced relative to residual $CDCl_3$ proton signals at δ 7.26 ppm. ^{19}F NMR spectra were recorded on a Bruker 500 MHz spectrometer and are referenced to $CFCl_3$ (δ 0.0 ppm). Data for ^{1}H and ^{19}F NMR are reported as follows: chemical shift (δ ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, ap = apparent), integration, and coupling constant (Hz). ^{13}C NMR spectra were recorded on a Bruker 500 MHz spectrometer and are referenced to $CDCl_3$ at δ 77.16 ppm. The ^{13}C NMR spectra were obtained with ^{1}H decoupling. Data for ^{13}C NMR are reported in terms of chemical

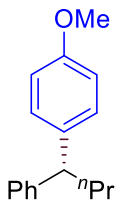
shift and multiplicity where appropriate. IR spectra were obtained on a Bruker Alpha and was reported in terms of frequency of absorption (cm^{-1}). GC analyses were performed on an Agilent 8890 gas chromatograph with an FID detector using a J&W DB-1 column (10 m, 0.1 mm I.D.). High Resolution Mass spectra were obtained on a Bruker Daltonics, Inc. APEXIII 7.0 TESLA FTMS instrument (ESI) or Atmospheric Pressure Chemical Ionization (ESI) mode. High pressure liquid chromatography (HPLC) was performed on Agilent 1260 Series chromatographs using Daicel Chiralcel columns (250 mm). Optical rotations were measured on a S3 Rudolph Research Analytical Autopol VI automatic polarimeter using a 50 mm pathlength cell at 589 nm with $[\alpha]_D$ values reported in degrees; concentration (c) is in g/100 mL. Melting points (m.p.) were obtained on a Mel-Temp capillary melting point apparatus. The powder X-ray diffraction pattern (PXRD) measurements were carried out on a Philips X'pert MPD Pro *X*-ray diffractometer using Cu Kα radiation (λ = 0.15418 nm), and the *X*-ray tube was operated at 40 kV and 40 mA at room temperature. Reactions were monitored by GC analysis and thin-layer chromatography (TLC) carried out on 0.25 mm Jiang you silica gel plates (HSGF254) using UV light as a visualizing agent.

2. Supplementary Methods

2.1. Regio- and Enantioselective C(sp^3)−H Arylation



General procedure (A) for the regio- and enantioselective C(sp^3)−H arylation. In a nitrogen-filled glove box, to an oven-dried 8 mL screw-cap vial equipped with a magnetic stir bar was added $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), KF (23.2 mg, 2.0 equiv), **L** [0.42 mg, 0.2 mL (2.1 mg/ mL in toluene)], anhydrous toluene (0.60 mL) and DMPU (0.20 mL) were added, and the mixture was stirred for 15 min at room temperature, at which time 4-phenyl-1-butene (30 μL, 0.20 mmol), 4-iodoanisole (94.0 mg, 0.40 mmol) and DMMS (49.3 μL, 0.40 mmol) were added to the resulting mixture in this order. The tube was sealed with a teflon-lined screw cap, removed from the glove box and the reaction was stirred at rt (22~26 °C) for up to 24 h (the mixture was stirred at 750 rpm, ensuring that the base was uniformly suspended). After the reaction was complete, the reaction mixture was directly filtered through a short pad of silica gel [EtOAc in petroleum ether (PE)] to give the crude product. Dodecane (20 μL) was added as an internal standard for GC analysis. The product was purified by chromatography on silica gel for each substrate. The yields reported are the average of at least two experiments, unless otherwise indicated. The enantiomeric excesses (% *ee*) were determined by HPLC analysis using chiral stationary phases.



(*R*)-1-Methoxy-4-(1-phenylpropyl)benzene (Figure 3, **3a**)[1,2]. From **4-Iodoanisole** (94.0 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general

procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 84% yield (40.1 mg) with 99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.5 Hz, 2H), 7.28 (d, *J* = 8.2 Hz, 2H), 7.21 (d, *J* = 8.8 Hz, 3H), 6.88 (d, *J* = 8.7 Hz, 2H), 3.92 (t, *J* = 7.8 Hz, 1H), 3.81 (s, 3H), 2.05 (q, *J* = 7.8 Hz, 2H), 1.38 – 1.29 (m, 2H), 0.98 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.8, 137.6, 128.8, 128.4, 127.8, 125.9, 113.8, 55.2, 50.2, 38.1, 21.2, 14.1;

HRMS (ESI) calcd. for $C_{17}H_{21}O$ $[M+H]^+$ *m/z* 241.1587, found 241.1588;

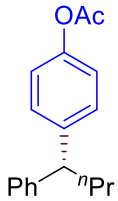
IR (neat, cm^{-1}) 2955, 1609, 1509, 1246, 697;

$[\alpha]_D^{20}$ = –7.6 (*c* = 1.4, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 23.6 min, t_R (major) = 26.5 min.

Note:

From **1-Bromo-4-methoxybenzene** (**2a'**) (74.8 mg, 0.40 mmol), the title compound was prepared following the general procedure **A**, and the crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 67% yield (38.9 mg) with 95% *ee* and >99:1 rr.



(*R*)-4-(1-Phenylbutyl)phenyl acetate (Figure 3, **3b**). From **4-Iodophenyl acetate** (104.8 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.20 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0

μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 90% yield (48.3 mg) with 99:1 rr.

Rf 0.3 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.30 (m, 2H), 7.30 – 7.26 (m, 4H), 7.22 (t, *J* = 7.2 Hz, 1H), 7.04 (d, *J* = 8.3 Hz, 2H), 3.96 (t, *J* = 7.8 Hz, 1H), 2.31 (s, 3H), 2.09 – 2.02 (m, 2H), 1.36 – 1.29 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 169.6, 148.8, 144.9, 142.9, 128.8, 128.5, 127.9, 126.2, 121.3, 50.5, 38.0, 21.2, 21.1, 14.1;

HRMS (ESI) calcd. for $C_{18}H_{20}NaO_2$ $[M+Na]^+$ *m/z* 291.1356, found 291.1354;

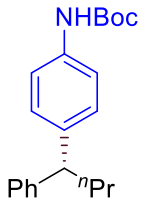
IR (neat, cm^{-1}) 2956, 1758, 1367, 1191, 698;

$[\alpha]_D^{20}$ = –4.2 (*c* = 2.2, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 28.9 min, t_R (major)= 31.6 min.

Note:

From **4-Bromophenyl acetate** (**2b'**) (85.6 mg, 0.40 mmol), the title compound was prepared following the general procedure **A**, and the crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 74% yield (39.5 mg) with 90% *ee* and 99:1 rr.



tert*-Butyl (*R*)-(4-(1-phenylbutyl)phenyl)carbamate** (Figure 3, **3c**). From ***tert*-Butyl (4-iodophenyl)carbamate** (127.7 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.20 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for

24 h at rt. The crude material was purified by flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 73% yield (47.5 mg) with 98:2 rr.

Rf 0.3 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.27 (m, 4H), 7.26 – 7.23 (m, 2H), 7.23 – 7.15 (m, 3H), 6.49 (s, 1H), 3.90 (t, *J* = 7.8 Hz, 1H), 2.03 (q, *J* = 7.7 Hz, 2H), 1.54 (s, 9H), 1.36 – 1.25 (m, 2H), 0.95 (t, *J* = 7.4 Hz, 3H);

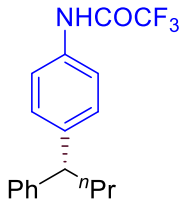
^{13}C NMR (126 MHz, $CDCl_3$) δ 152.9, 145.5, 140.1, 136.3, 128.4, 128.4, 127.8, 125.9, 118.8, 80.4, 50.4, 37.9, 28.4, 21.1, 14.1;

HRMS (ESI) calcd. for $C_{21}H_{27}NNaO_2$ $[M+Na]^+$ *m/z* 348.1934, found 348.1933;

IR (neat, cm^{-1}) 2929, 1699, 1519, 1154, 697;

$[\alpha]_D^{20}$ = –8.2 (*c* = 2.2, $CHCl_3$); 96% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 38.7 min, t_R (major) = 46.6 min.



(*R*)-2,2,2-Trifluoro-*N*-(4-(1-phenylbutyl)phenyl)acetamide (Figure 3, **3d**). From **2,2,2-Trifluoro-*N*-(4-iodophenyl)acetamide** (126.0 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 63% yield (39.4 mg) with 97:3 rr.

Rf 0.3 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.00 (s, 1H), 7.50 (d, *J* = 8.3 Hz, 2H), 7.33 – 7.27 (m, 4H), 7.27 – 7.18 (m, 3H), 3.94 (t, *J* = 7.8 Hz, 1H), 2.11 – 1.99 (m, 2H), 1.36 – 1.25 (m, 3H), 0.96 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 154.8 (q, *J* = 37.2 Hz), 144.8, 143.8, 133.0, 128.8, 128.5, 127.8, 126.2, 120.6, 115.8 (q, *J* = 289.2 Hz), 50.5, 37.8, 21.1, 14.0;

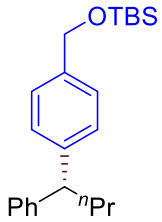
^{19}F NMR (471 MHz, $CDCl_3$) δ –75.7;

HRMS (ESI) calcd. for $C_{18}H_{18}F_3NaO$ $[M+Na]^+$ *m/z* 344.1233, found 344.1234;

IR (neat, cm^{-1}) 2958, 1702, 1151, 697;

$[\alpha]_D^{20}$ = –9.5 (*c* = 1.1, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 18.1 min, t_R (major) = 19.2 min.



(*R*)-*tert*-Butyldimethyl((4-(1-phenylbutyl)benzyl)oxy)silane (Figure 3, **3e**). From ***tert*-Butyl((4-iodobenzyl)oxy)dimethylsilane** (139.2 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.20 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (PE) to provide the title compound as a colorless liquid in 77% yield (54.3 mg) with 98:2 rr.

Rf 0.2 (PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 – 7.24 (m, 8H), 7.20 (t, *J* = 6.8 Hz, 1H), 4.75 (s, 2H), 3.95 (t, *J* = 7.8 Hz, 1H), 2.07 (q, *J* = 7.8 Hz, 2H), 1.35 – 1.31 (m, 2H), 1.01 – 0.95 (m, 12H), 0.14 (s, 6H);

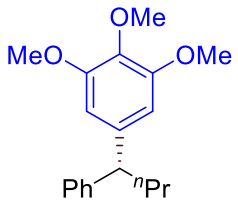
^{13}C NMR (126 MHz, $CDCl_3$) δ 145.5, 144.0, 139.1, 128.4, 127.9, 127.7, 126.2, 125.9, 64.8, 50.8, 38.0, 29.7, 26.0, 21.2, 18.5, 14.1, –5.2;

HRMS (ESI) calcd. for $C_{23}H_{35}OSi$ $[M+H]^+$ *m/z* 355.2452, found 355.2453;

IR (neat, cm^{-1}) 2955, 1252, 1082, 697;

$[\alpha]_D^{20}$ = –4.8 (*c* = 1.8, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL OD-H column, hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 8.2 min, t_R (major) = 9.2 min.



(*R*)-1,2,3-Trimethoxy-5-(1-phenylbutyl)benzene (Figure 3, **3f**). From **5-Iodo-1,2,3-trimethoxybenzene** (117.6 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 71% yield (42.8 mg) with 99:1 rr.

Rf 0.3 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 – 7.26 (m, 4H), 7.21 (t, *J* = 7.0 Hz, 1H), 6.49 (s, 2H), 3.90 – 3.83 (m, 10H), 2.07 – 1.98 (m, 2H), 1.36 – 1.30 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 153.1, 145.1, 141.1, 136.2, 128.4, 127.7, 126.1, 104.8, 60.8, 56.1, 51.4, 38.0, 21.2, 14.1;

HRMS (ESI) calcd. for $C_{19}H_{25}O_3$ $[M+H]^+$ *m/z* 301.1798, found 301.1797;

IR (neat, cm^{-1}) 2930, 1586, 1123, 700;

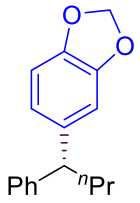
$[\alpha]_D^{20}$= –4.8 (*c* = 1.5, $CHCl_3$); 97% *ee*;

HPLC analysis CHIRALCEL IC column, 5% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (major) = 12.2 min, t_R (minor) = 15.5 min.

Note:

From **5-Bromo-1,2,3-trimethoxybenzene** (**2f'**) (98.8 mg, 0.40 mmol), the title compound was prepared following the general procedure **A**, and the crude material was purified by

flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 55% yield (32.8 mg) with 96% *ee* and 99:1 rr.



(*R*)-5-(1-Phenylbutyl)benzo[*d*][1,3]dioxole (Figure 3, **3g**). From **5-Iodobenzo[*d*][1,3]dioxole** (99.2 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2% EtOAc in PE) to provide the title compound as a colorless liquid in 70% yield (35.5 mg) with 99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.5 Hz, 2H), 7.27 (d, *J* = 6.7 Hz, 2H), 7.21 (t, *J* = 7.2 Hz, 1H), 6.77 (s, 3H), 5.93 (d, *J* = 1.9 Hz, 2H), 3.88 (t, *J* = 7.8 Hz, 1H), 2.07 – 1.96 (m, 2H), 1.40 – 1.26 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H);

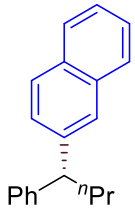
^{13}C NMR (126 MHz, $CDCl_3$) δ 147.7, 145.7, 145.4, 139.4, 128.4, 127.7, 126.1, 120.8, 108.3, 108.1, 100.8, 50.7, 38.0, 21.2, 14.1;

HRMS (ESI) calcd. for $C_{17}H_{19}O_2$ $[M+H]^+$ *m/z* 277.1199, found 277.1197;

IR (neat, cm^{-1}) 2955, 1484, 1243, 1037, 697;

$[\alpha]_D^{20}$ = –8.9 (*c* = 1.7, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 5% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 17.2 min, t_R (major) = 18.8 min.



(*R*)-2-(1-Phenylbutyl)naphthalene (Figure 3, **3h**). From **2-Iodonaphthalene** (101.6 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (PE) to provide the title compound as a colorless liquid in 74% yield (38.3 mg) with 99:1 rr.

Rf 0.5 (PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.85 (dd, *J* = 11.6, 7.7 Hz, 2H), 7.82 – 7.77 (m, 2H), 7.54 – 7.44 (m, 2H), 7.42 (d, *J* = 8.4 Hz, 1H), 7.39 – 7.31 (m, 4H), 7.27 – 7.21 (m, 1H), 4.15 (t, *J* = 7.8 Hz, 1H), 2.28 – 2.13 (m, 2H), 1.45 – 1.36 (m, 2H), 1.03 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 145.3, 142.8, 133.6, 132.2, 128.4, 128.0, 128.0, 127.7, 127.6, 126.9, 126.1, 125.9, 125.9, 125.4, 51.1, 37.7, 21.3, 14.2;

HRMS (ESI) calcd. for $C_{20}H_{20}Na$ $[M+Na]^+$ *m/z* 283.1457, found 283.1459;

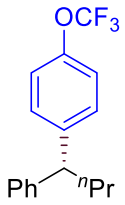
IR (neat, cm^{-1}) 2927, 1598, 742, 697;

$[\alpha]_D^{20}$ = –15.6 (*c* = 1.4, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL OD-H column, hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 25.7 min, t_R (major) = 40.3 min.

Note:

From **2-Bromonaphthalene** (**2h'**) (82.8 mg, 0.40 mmol), the title compound was prepared following the general procedure **A**, and the crude material was purified by flash column chromatography (PE) to provide the title compound as a colorless liquid in 55% yield (28.7 mg) with 95% *ee* and 99:1 rr.



(*R*)-1-(1-Phenylbutyl)-4-(trifluoromethoxy)benzene (Figure 3, **3i**). From **1-Iodo-4-(trifluoromethoxy)benzene** (115.2 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 67% yield (39.4 mg) with 98:2 rr.

Rf 0.2 (3% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 (t, *J* = 7.6 Hz, 2H), 7.30 – 7.25 (m, 4H), 7.23 (t, *J* = 7.2 Hz, 1H), 7.15 (d, *J* = 8.2 Hz, 2H), 3.96 (t, *J* = 7.8 Hz, 1H), 2.10 – 1.99 (m, 2H), 1.32 (q, *J* = 7.5 Hz, 2H), 0.97 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 147.4 (q, *J* = 1.7 Hz), 144.7, 144.1, 129.1, 128.5, 127.8, 126.3, 120.9, 120.5 (q, *J* = 256.6 Hz), 50.5, 37.9, 21.1, 14.0;

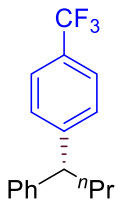
^{19}F NMR (471 MHz, $CDCl_3$) δ –57.9;

HRMS (ESI) calcd. for $C_{17}H_{18}F_3O$ $[M+H]^+$ *m/z* 295.1304, found 295.1306;

IR (neat, cm^{-1}) 1507, 1253, 1156, 697;

$[\alpha]_D^{20}$ = –2.1 (*c* = 1.2, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL OJ-H column, hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 11.9 min, t_R (major) = 13.1 min.



(*R*)-1-(1-Phenylbutyl)-4-(trifluoromethyl)benzene (Figure 3, **3j**). From **1-Iodo-4-(trifluoromethyl)benzene** (108.8 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 67% yield (37.5 mg) with 97:3 rr.

Rf 0.5 (1% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.57 (d, *J* = 8.2 Hz, 2H), 7.40 (d, *J* = 8.1 Hz, 2H), 7.34 (t, *J* = 7.6 Hz, 2H), 7.27 (d, *J* = 6.7 Hz, 2H), 7.24 (t, *J* = 7.2 Hz, 1H), 4.02 (t, *J* = 7.8 Hz, 1H), 2.16 – 2.01 (m, 2H), 1.38 – 1.28 (m, 2H), 0.98 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 149.5, 144.3, 128.6, 128.2, 127.9, 127.8, 126.4, 125.4 (q, *J* = 3.9 Hz), 122.2 (q, *J* = 272.3 Hz), 50.9, 37.7, 21.1, 14.0;

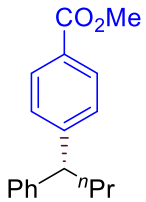
^{19}F NMR (471 MHz, $CDCl_3$) δ –62.3;

HRMS (ESI) calcd. for $C_{17}H_{18}F_3$ $[M+H]^+$ *m/z* 279.1355, found 279.1358;

IR (neat, cm^{-1}) 2960, 1322, 1116, 1017, 698;

$[\alpha]_D^{20}$ = +1.6 (*c* = 1.7, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL OJ-H*2 column, hexane, 0.4 mL/min, 220 nm UV detector, t_R (minor) = 31.5 min, t_R (major) = 34.2 min.



Methyl (*R*)-4-(1-phenylbutyl)benzoate (Figure 3, **3k**). From **Methyl 4-iodobenzoate** (104.8 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU

(0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 80% yield (42.9 mg) with 98:2 rr.

Rf 0.2 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.99 (d, *J* = 8.4 Hz, 2H), 7.37 – 7.28 (m, 4H), 7.26 (d, *J* = 8.1 Hz, 2H), 7.22 (t, *J* = 7.2 Hz, 1H), 4.00 (t, *J* = 7.8 Hz, 1H), 3.92 (s, 3H), 2.13 – 2.00 (m, 2H), 1.34 – 1.28 (m, 2H), 0.96 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 167.1, 150.8, 144.4, 129.8, 128.5, 128.0, 127.9, 127.9, 126.3, 52.0, 51.1, 37.6, 21.1, 14.1;

HRMS (ESI) calcd. for $C_{18}H_{21}O_2$ $[M+H]^+$ *m/z* 269.1536, found 269.1534;

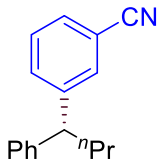
IR (neat, cm^{-1}) 2954, 1718, 1274, 697;

$[\alpha]_D^{20}$ = –5.5 (*c* = 1.5, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL IC column, 1% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 13.2 min, t_R (major) = 15.1 min.

Note:

From **Methyl 4-bromobenzoate** (**2k'**) (86.0 mg, 0.40 mmol), the title compound was prepared following the general procedure **A**, and the crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 50% yield (26.9 mg) with 91% *ee* and 98:2 rr.



(*R*)-3-(1-Phenylbutyl)benzonitrile (Figure 3, **3l**). From **3-Iodobenzonitrile** (91.6 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 71% yield (33.4 mg) with 96:4 rr.

Rf 0.4 (1% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.56 (s, 1H), 7.52 – 7.47 (m, 2H), 7.39 (t, *J* = 7.8 Hz, 1H), 7.35 – 7.31 (m, 2H), 7.23 (d, *J* = 7.7 Hz, 3H), 3.97 (t, *J* = 7.8 Hz, 1H), 2.12 – 1.98 (m, 2H), 1.33 – 1.27 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H);

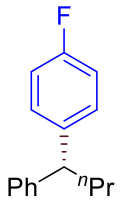
^{13}C NMR (126 MHz, $CDCl_3$) δ 146.9, 143.7, 132.6, 131.5, 129.8, 129.2, 128.7, 127.8, 126.6, 119.1, 112.4, 50.7, 37.6, 21.0, 14.0;

HRMS (ESI) calcd. for $C_{17}H_{18}N$ $[M+H]^+$ *m/z* 236.1434, found 236.1435;

IR (neat, cm^{-1}) 2957, 2228, 1452, 691;

$[\alpha]_D^{20}$ = –7.5 (*c* = 1.1, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 5% ^{i}PrOH in pentane, 0.5 mL/min, 220 nm UV detector, t_R (major) = 25.7 min, t_R (minor) = 28.0 min.



(*R*)-1-Fluoro-4-(1-phenylbutyl)benzene (Figure 3, **3m**). From **1-Fluoro-4-iodobenzene** (88.8 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 74% yield (34.0 mg) with 97:3 rr.

Rf 0.5 (1% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.6 Hz, 2H), 7.27 – 7.20 (m, 5H), 7.00 (t, *J* = 8.7 Hz, 2H), 3.94 (t, *J* = 7.8 Hz, 1H), 2.11 – 1.97 (m, 2H), 1.37 – 1.26 (m, 2H), 0.97 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 161.3 (d, *J* = 243.8 Hz), 145.2, 141.1 (d, *J* = 3.0 Hz), 129.2 (d, *J* = 7.6 Hz), 128.5, 127.8, 126.2, 115.1 (d, *J* = 21.3 Hz), 50.3, 38.1, 21.13, 14.1;

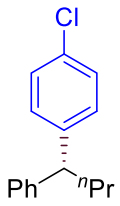
^{19}F NMR (471 MHz, $CDCl_3$) δ –117.5;

HRMS (ESI) calcd. for $C_{17}H_{18}F$ $[M+H]^+$ *m/z* 229.1387, found 229.1390;

IR (neat, cm^{-1}) 2957, 1507, 1222, 697;

$[\alpha]_D^{20}$ = –2.7 (*c* = 1.1, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 5.5 min, t_R (major) = 6.3 min.



(*R*)-1-Chloro-4-(1-phenylbutyl)benzene (Figure 3, **3n**). From **1-Chloro-4-iodobenzene** (95.4 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 74% yield (36.3 mg) with 98:2 rr.

Rf 0.4 (1% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.6 Hz, 2H), 7.28 (d, *J* = 8.5 Hz, 2H), 7.26 – 7.18 (m, 5H), 3.93 (t, *J* = 7.8 Hz, 1H), 2.11 – 1.97 (m, 2H), 1.36 – 1.27 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H);

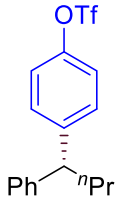
^{13}C NMR (126 MHz, $CDCl_3$) δ 144.8, 143.8, 131.7, 129.2, 128.5, 127.8, 126.2, 50.5, 37.8, 21.1, 14.0;

HRMS (ESI) calcd. for $C_{16}H_{17}ClNa$ $[M+Na]^+$ *m/z* 267.0911, found 267.0909;

IR (neat, cm^{-1}) 2956, 1488, 1091, 1013, 697;

$[\alpha]_D^{20}$ = –6.0 (*c* = 1.4, $CHCl_3$); 91% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 5% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 4.5 min, t_R (major) = 4.9 min.



(*R*)-4-(1-Phenylbutyl)phenyl trifluoromethanesulfonate (Figure 3, **3o**). From **4-Iodophenyl trifluoromethanesulfonate** (140.8 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 68% yield (48.8 mg) with 97:3 rr.

Rf 0.4 (1% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.46 – 7.28 (m, 5H), 7.28 – 7.15 (m, 4H), 3.97 (t, *J* = 7.3 Hz, 1H), 2.25 – 1.98 (m, 2H), 1.39 – 1.26 (m, 2H), 0.96 (t, *J* = 6.9 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 147.8, 146.0, 144.6, 129.6, 127.9, 126.5, 123.4, 121.2, 116.2 (d, *J* = 322.3 Hz), 50.5, 37.9, 21.1, 14.0;

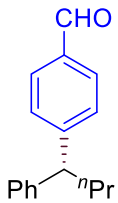
^{19}F NMR (471 MHz, $CDCl_3$) δ –72.9;

HRMS (ESI) calcd. for $C_{17}H_{17}F_3NaO_3S[M+Na]^+$ *m/z* 381.0743, found 381.0740;

IR (neat, cm^{-1}) 2960, 1421, 1207, 1137, 885;

$[\alpha]_D^{20}$ = –1.6 (*c* = 2.3, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 8.3 min, t_R (major) = 9.8 min.



(*R*)-4-(1-Phenylbutyl)benzaldehyde (Figure 3, **3p**). From **4-Iodobenzaldehyde** (93.0 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general

procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 71% yield (34.2 mg) with 97:3 rr.

Rf 0.2 (4% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 9.98 (s, 1H), 7.82 (d, *J* = 8.2 Hz, 2H), 7.44 (d, *J* = 8.1 Hz, 2H), 7.32 (t, *J* = 7.6 Hz, 2H), 7.26 (d, *J* = 6.9 Hz, 2H), 7.22 (t, *J* = 7.2 Hz, 1H), 4.02 (t, *J* = 7.8 Hz, 1H), 2.12 – 2.03 (m, 2H), 1.34 – 1.29 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H);

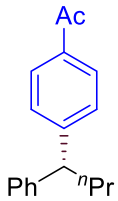
^{13}C NMR (126 MHz, $CDCl_3$) δ 192.0, 152.7, 144.0, 134.6, 130.0, 128.6, 128.6, 127.9, 126.5, 51.3, 37.6, 21.1, 14.0;

HRMS (ESI) calcd. for $C_{17}H_{19}O$ $[M+H]^+$ *m/z* 239.1430, found 239.1431;

IR (neat, cm^{-1}) 2956, 1698, 1603, 698;

$[\alpha]_D^{20}$ = –1.9 (*c* = 1.5, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 10% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 10.4 min, t_R (major) =11.5 min.



(*R*)-1-(4-(1-Phenylbutyl)phenyl)ethan-1-one (Figure 3, **3q**). From **1-(4-Iodophenyl)ethan-1-one** (98.4 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 71% yield (35.8 mg) with 97:3 rr.

Rf 0.2 (3% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.91 (d, *J* = 8.4 Hz, 2H), 7.37 (d, *J* = 8.4 Hz, 2H), 7.34 – 7.30 (m, 2H), 7.26 (d, *J* = 8.5 Hz, 2H), 7.22 (t, *J* = 7.2 Hz, 1H), 4.01 (t, *J* = 7.8 Hz, 1H), 2.59 (s, 3H), 2.12 – 2.04 (m, 2H), 1.35 – 1.29 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H);

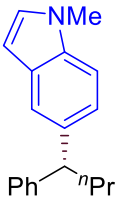
^{13}C NMR (126 MHz, $CDCl_3$) δ 197.8, 151.1, 144.3, 135.2, 128.6, 128.6, 128.1, 127.9, 126.4, 51.1, 37.6, 26.6, 21.1, 14.0;

HRMS (ESI) calcd. for $C_{18}H_{21}O$ $[M+H]^+$ *m/z* 253.1587, found 253.1586;

IR (neat, cm^{-1}) 2957, 1679, 1604, 1266, 699;

$[\alpha]_D^{20}$ = –1.9 (*c* = 1.5, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 10% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 9.0 min, t_R (major) = 9.6 min.



(*R*)-1-Methyl-5-(1-phenylbutyl)-1*H*-indole (Figure 3, **3r**). From **5-Iodo-1-methyl-1*H*-indole** (102.8 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 60% yield (31.5 mg) with 98:2 rr.

Rf 0.2 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 (s, 1H), 7.38 – 7.31 (m, 4H), 7.29 (d, *J* = 8.4 Hz, 1H), 7.21 (t, *J* = 7.1 Hz, 1H), 7.18 (d, *J* = 8.5 Hz, 1H), 7.06 (d, *J* = 3.1 Hz, 1H), 6.50 (d, *J* = 3.1 Hz, 1H), 4.10 (t, *J* = 7.8 Hz, 1H), 3.79 (s, 3H), 2.21 – 2.12 (m, 2H), 1.43 – 1.36 (m, 2H), 1.02 (t, *J* = 7.3 Hz, 3H);

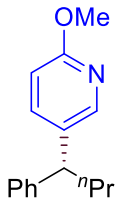
^{13}C NMR (126 MHz, $CDCl_3$) δ 146.6, 136.4, 135.5, 128.9, 128.6, 128.3, 127.9, 125.7, 122.2, 119.6, 109.1, 100.8, 51.1, 38.4, 32.9, 21.4, 14.2;

HRMS (ESI) calcd. for $C_{19}H_{21}NNa$ $[M+Na]^+$ *m/z* 286.1566, found 286.1565;

IR (neat, cm^{-1}) 2926, 1512, 1245, 698;

$[\alpha]_D^{20}$ = –15.7 (*c* = 1.4, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL IC column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (major) = 10.0 min, t_R (minor) = 10.7 min.



(*R*)-2-Methoxy-5-(1-phenylbutyl)pyridine (Figure 3, **3s**). From **5-Iodo-2-methoxypyridine** (94.0 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–4% EtOAc in PE) to provide the title compound as a colorless liquid in 76% yield (36.4 mg) with 97:3 rr.

Rf 0.2 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.09 (s, 1H), 7.44 (dd, *J* = 8.6, 2.5 Hz, 1H), 7.31 (t, *J* = 7.6 Hz, 2H), 7.24 (d, *J* = 6.9 Hz, 2H), 7.20 (t, *J* = 7.2 Hz, 1H), 6.69 (d, *J* = 8.5 Hz, 1H), 3.94 (s, 3H), 3.89 (t, *J* = 7.8 Hz, 1H), 2.07 – 1.96 (m, 2H), 1.34 – 1.29 (m, 2H), 0.95 (t, *J* = 7.4 Hz, 3H);

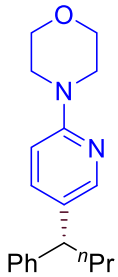
^{13}C NMR (126 MHz, $CDCl_3$) δ 162.7, 145.6, 144.7, 138.3, 133.3, 128.5, 127.7, 126.3, 110.7, 53.4, 47.7, 37.7, 21.0, 14.0;

HRMS (ESI) calcd. for $C_{16}H_{20}NO$ $[M+H]^+$ *m/z* 242.1539, found 242.1540;

IR (neat, cm^{-1}) 2955, 1603, 1489, 1026, 697;

$[\alpha]_D^{20}$ = +8.9 (*c* = 1.5, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (major) = 5.2 min, t_R (minor) = 5.9 min.



(*R*)-4-(5-(1-Phenylbutyl)pyridin-2-yl)morpholine (Figure 3, **3t**). From **4-(5-Iodopyridin-2-yl)morpholine** (116.0 mg, 0.40 mmol, 2.0 equiv), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 61% yield (36.2 mg) with 97:3 rr.

Rf 0.4 (15% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.15 (s, 1H), 7.38 (dd, *J* = 2.5, 2.5 Hz, 1H), 7.33 – 7.22 (m, 4H), 7.19 (t, *J* = 7.2 Hz, 1H), 6.60 (d, *J* = 8.7 Hz, 1H), 3.86 – 3.81 (m, 5H), 3.52 – 3.45 (m, 4H), 2.07 – 1.96 (m, 2H), 1.37 – 1.27 (m, 2H), 0.95 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 158.2, 145.1, 137.3, 130.5, 128.5, 127.7, 126.1, 107.0, 66.8, 47.7, 45.8, 37.6, 21.0, 14.0;

HRMS (ESI) calcd. for $C_{19}H_{25}N_2O$ $[M+H]^+$ *m/z* 297.1961, found 297.1962;

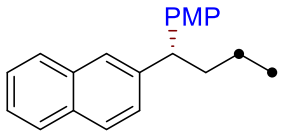
IR (neat, cm^{-1}) 2956, 1602, 1488, 1243, 943, 698;

$[\alpha]_D^{20}$ = –0.5 (*c* = 1.6, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL AD-H column, 2% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (major) = 8.1 min, t_R (minor) = 10.4 min.

Note:

From **4-(5-Bromopyridin-2-yl)morpholine** (**2t'**) (97.2 mg, 0.40 mmol), the title compound was prepared following the general procedure **A**, and the crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 47% yield (38.9 mg) with 95% *ee* and 97:3 rr.



(*S*)-2-(1-(4-Methoxypenyl)butyl)naphthalene (Figure 4, **4b**). From **2-(But-3-en-1-yl)naphthalene** (36.4 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2% EtOAc in PE) to provide the title compound as a colorless liquid in 78% yield (45.2 mg) with 97:3 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.86 (dd, *J* = 11.8, 8.1 Hz, 2H), 7.80 (d, *J* = 8.5 Hz, 1H), 7.77 (s, 1H), 7.54 – 7.46 (m, 2H), 7.40 (d, *J* = 8.5 Hz, 1H), 7.27 (d, *J* = 8.8 Hz, 2H), 6.90 (d, *J* = 8.7 Hz, 2H), 4.11 (t, *J* = 7.8 Hz, 1H), 3.83 (s, 3H), 2.22 – 2.10 (m, 2H), 1.43 – 1.36 (m, 2H), 1.03 (t, *J* = 7.3 Hz, 3H);

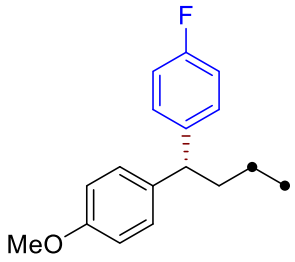
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.9, 143.2, 137.4, 133.6, 132.2, 128.9, 128.1, 127.7, 127.6, 126.9, 125.9, 125.7, 125.3, 113.8, 55.3, 50.3, 37.9, 21.3, 14.2;

HRMS (ESI) calcd. for $C_{21}H_{23}O$ $[M+H]^+$ *m/z* 291.1743, found 291.1745;

IR (neat, cm^{-1}) 2955, 1508, 1245, 1035, 813;

$[\alpha]_D^{20}$ = +7.8 (*c* = 2.1, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 6.5 min, t_R (major) = 7.3 min.



(*R*)-1-Fluoro-4-(1-(4-methoxyphenyl)butyl)benzene (Figure 4, **4c**). From **1-(But-3-en-1-yl)-4-methoxybenzene** (32.4 mg, 0.20 mmol), the title compound was prepared

following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.84 mg, 0.4 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 1-fluoro-4-iodobenzene (88.8 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.40 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2% EtOAc in PE) to provide the title compound as a colorless liquid in 74% yield (38.2 mg) with 98:2 rr.

Rf 0.3 (3% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.20 (dd, *J* = 8.6, 5.5 Hz, 2H), 7.16 (d, *J* = 8.6 Hz, 2H), 6.98 (t, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 3.88 (t, *J* = 7.8 Hz, 1H), 3.81 (s, 3H), 2.03 – 1.95 (m, 2H), 1.32 – 1.27 (m, 2H), 0.95 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 161.2 (d, *J* = 243.8 Hz), 157.9, 137.3, 141.5 (d, *J* = 3.0 Hz), 129.1 (d, *J* = 7.9 Hz), 128.6, 115.1 (d, *J* = 20.9 Hz), 113.8, 55.2, 49.4, 38.2, 21.1, 14.1;

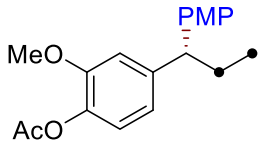
^{19}F NMR (471 MHz, $CDCl_3$) δ –117.7;

HRMS (ESI) calcd. for $C_{17}H_{19}FNaO$ $[M+Na]^+$ *m/z* 281.1312, found 281.1313;

IR (neat, cm^{-1}) 2957, 1505, 1247, 1036, 824;

$[\alpha]_D^{20}$ = +5.3 (*c* = 1.5, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL OJ-H*2 column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 37.6 min, t_R (major) = 41.6 min.



(*S*)-2-Methoxy-4-(1-(4-methoxyphenyl)propyl)phenyl acetate (Figure 4, **4d**). From **4-Allyl-2-methoxyphenyl acetate** (41.2 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt.

The crude material was purified by flash column chromatography (0–8% EtOAc in PE) to provide the title compound as a colorless liquid in 72% yield (45.0 mg) with 99:1 rr.

Rf 0.3 (10% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.18 (d, *J* = 8.7 Hz, 2H), 6.96 (d, *J* = 7.9 Hz, 1H), 6.90 – 6.80 (m, 4H), 3.81 (s, 6H), 3.76 (t, *J* = 7.8 Hz, 1H), 2.32 (s, 3H), 2.05 (p, *J* = 7.4 Hz, 2H), 0.93 (t, *J* = 7.3 Hz, 3H);

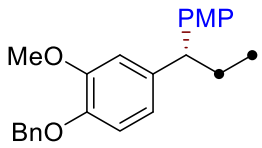
^{13}C NMR (126 MHz, $CDCl_3$) δ 169.2, 157.9, 150.8, 144.6, 137.8, 136.8, 128.8, 122.4, 119.8, 113.8, 112.2, 55.8, 55.2, 52.3, 28.9, 20.7, 12.8;

HRMS (ESI) calcd. for $C_{19}H_{22}NaO_4$ $[M+Na]^+$ *m/z* 337.1410, found 337.1412;

IR (neat, cm^{-1}) 2967, 1762, 1508, 1195, 1033;

$[\alpha]_D^{20}$ = –7.2 (*c* = 1.6, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 5% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 45.3 min, t_R (major) = 49.2 min.



(*S*)-1-(Benzyloxy)-2-methoxy-4-(1-(4-methoxyphenyl)propyl)benzene (Figure 4, **4e**). From **4-Allyl-1-(benzyloxy)-2-methoxybenzene** (50.9 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 72% yield (52.0 mg) with 99:1 rr.

Rf 0.2 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.47 (d, *J* = 7.5 Hz, 2H), 7.39 (t, *J* = 7.5 Hz, 2H), 7.33 (t, *J* = 7.3 Hz, 1H), 7.18 (d, *J* = 8.6 Hz, 2H), 6.89 – 6.83 (m, 3H), 6.79 (s, 1H), 6.75 (d, *J* = 8.2 Hz, 1H), 5.15 (s, 2H), 3.88 (s, 3H), 3.81 (s, 3H), 3.72 (t, *J* = 7.8 Hz, 1H), 2.04 (p, *J* = 7.4 Hz, 2H), 0.93 (t, *J* = 7.3 Hz, 3H);

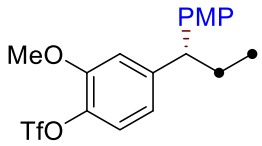
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 149.5, 146.5, 138.9, 137.5, 137.5, 128.7, 128.5, 127.7, 127.3, 119.6, 113.9, 113.7, 111.9, 71.1, 56.0, 55.2, 52.0, 28.9, 12.9;

HRMS (ESI) calcd. for $C_{24}H_{26}NaO_3$ $[M+Na]^+$ *m/z* 385.1774, found 385.1777;

IR (neat, cm^{-1}) 2966, 1508, 1245, 1034, 695;

$[\alpha]_D^{20}$ = +0.9 (*c* = 2.4, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL AD-H column, 10% EtOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 8.5 min, t_R (major) = 9.7 min.



(*S*)-2-Methoxy-4-(1-(4-methoxyphenyl)propyl)phenyl trifluoromethanesulfonate (Figure 4, **4f**). From **4-Allyl-2-methoxyphenyl trifluoromethanesulfonate** (59.3 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2% EtOAc in PE) to provide the title compound as a colorless liquid in 58% yield (47.1 mg) with 96:4 rr.

Rf 0.2 (3% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.15 (dd, *J* = 13.9, 8.4 Hz, 3H), 6.92 – 6.83 (m, 4H), 3.88 (s, 3H), 3.81 (s, 3H), 3.77 (t, *J* = 7.8 Hz, 1H), 2.10 – 2.00 (m, 2H), 0.92 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 158.2, 151.1, 147.4, 136.9, 136.0, 128.8, 122.1, 119.9, 116.2 (q, *J* = 320.4 Hz), 113.9, 112.7, 56.1, 55.2, 52.3, 28.8, 12.7;

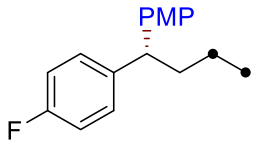
^{19}F NMR (471 MHz, $CDCl_3$) δ –73.9;

HRMS (ESI) calcd. for $C_{18}H_{20}F_3O_5S$ $[M+H]^+$ *m/z* 405.0978, found 405.0978;

IR (neat, cm^{-1}) 2969, 1416, 1202, 878, 612;

$[\alpha]_D^{20}$ = –7.2 (*c* = 2.3, $CHCl_3$); 80% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 10% EtOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 12.4 min, t_R (major) = 14.1 min.



(*S*)-1-Fluoro-4-(1-(4-methoxyphenyl)butyl)benzene (Figure 4, **4g**). From **1-(But-3-en-1-yl)-4-fluorobenzene** (30.1 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 66% yield (33.9 mg) with 97:3 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.20 (dd, *J* = 8.6, 5.5 Hz, 2H), 7.16 (d, *J* = 8.6 Hz, 2H), 6.99 (t, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 3.88 (t, *J* = 7.9 Hz, 1H), 3.81 (s, 3H), 2.05 – 1.94 (m, 2H), 1.33 – 1.26 (m, 2H), 0.96 (t, *J* = 7.4 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 161.2 (d, *J* = 243.5 Hz), 157.9, 141.5 (d, *J* = 3.2 Hz), 137.3, 129.1 (d, *J* = 7.6 Hz), 128.7, 115.1 (d, *J* = 20.9 Hz), 113.8, 55.2, 49.4, 38.2, 21.1, 14.1;

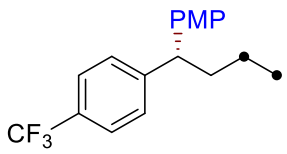
^{19}F NMR (471 MHz, $CDCl_3$) δ –117.7;

HRMS (ESI) calcd. for $C_{17}H_{20}FO$ $[M+H]^+$ *m/z* 259.1493, found 259.1493;

IR (neat, cm^{-1}) 2957, 1506, 1124, 1037, 824;

$[\alpha]_D^{20}$ = –4.3 (*c* = 1.4, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (major) = 35.6 min, t_R (minor) = 40.5 min.



(*R*)-1-Methoxy-4-(1-(4-(trifluoromethyl)phenyl)butyl)benzene (Figure 4, **4h**). From **1-(Prop-1-en-1-yl)-4-(trifluoromethyl)benzene** (40.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 70% yield (43.6 mg) with 97:3 rr.

Rf 0.3 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.55 (d, *J* = 8.2 Hz, 2H), 7.36 (d, *J* = 8.0 Hz, 2H), 7.17 (d, *J* = 8.7 Hz, 2H), 6.87 (d, *J* = 8.7 Hz, 2H), 3.96 (t, *J* = 7.8 Hz, 1H), 3.81 (s, 3H), 2.08 – 1.99 (m, 2H), 1.34 – 1.28 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 158.1, 149.9, 136.4, 128.8, 128.1, 125.3 (q, *J* = 3.6 Hz), 122.2 (q, *J* = 271.7 Hz), 113.9, 55.2, 50.1, 37.8, 21.1, 14.0;

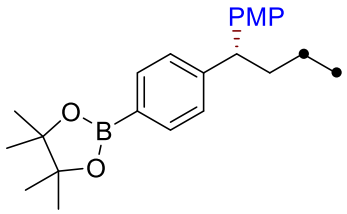
^{19}F NMR (471 MHz, $CDCl_3$) δ –62.3;

HRMS (ESI) calcd. for $C_{18}H_{19}F_3NaO$ $[M+Na]^+$ *m/z* 331.1280, found 331.1283;

IR (neat, cm^{-1}) 2959, 1510, 1323, 1117, 824;

$[\alpha]_D^{20}$ = –8.9 (*c* = 1.5, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL AD-H column, 1% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 8.4 min, t_R (major) = 8.8 min.



(*R*)-2-(4-(1-(4-methoxyphenyl)butyl)phenyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane (Figure 4, **4i**). From **2-(4-(But-3-en-1-yl)phenyl)-4,4,5,5-tetramethyl-1,3,2-dioxaborolane** (51.6 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene

(**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 43% yield (31.4 mg) with 97:3 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.76 (d, *J* = 7.9 Hz, 2H), 7.27 (d, *J* = 7.9 Hz, 2H), 7.17 (d, *J* = 8.6 Hz, 2H), 6.84 (d, *J* = 8.7 Hz, 2H), 3.91 (t, *J* = 7.8 Hz, 1H), 3.81 – 3.77 (m, 3H), 2.08 – 1.98 (m, 2H), 1.35 (s, 12H), 1.32 – 1.26 (m, 2H), 0.94 (t, *J* = 7.4 Hz, 3H);

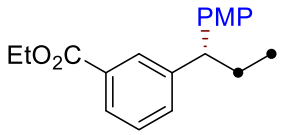
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 149.1, 137.3, 134.9, 128.8, 127.3, 113.7, 83.6, 55.2, 50.4, 37.9, 24.9, 21.1, 14.1;

HRMS (ESI) calcd. for $C_{23}H_{31}BNaO_3$ $[M+Na]^+$ *m/z* 389.2258, found 389.2253;

IR (neat, cm^{-1}) 2975, 1358, 1087, 658;

$[\alpha]_D^{20}$ = –0.3 (*c* = 1.5, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL ID-3 column, 3% EtOH in hexane, 0.4 mL/min, 220 nm UV detector, t_R (minor) = 10.0 min, t_R (major) = 11.1 min.



Ethyl (*S*)-3-(1-(4-methoxyphenyl)propyl)benzoate (Figure 4, **4j**). From **Ethyl 3-allylbenzoate** (38.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 73% yield (43.7 mg) with 96:4 rr.

Rf 0.4 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.88 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.8 Hz, 1H), 7.36 (t, *J* = 7.7 Hz, 1H), 7.18 (d, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 4.39 (q, *J*

= 7.1 Hz, 2H), 3.83 (t, *J* = 7.8 Hz, 1H), 3.79 (s, 3H), 2.15 – 2.05 (m, 2H), 1.42 (t, *J* = 7.2 Hz, 3H), 0.92 (t, *J* = 7.3 Hz, 3H);

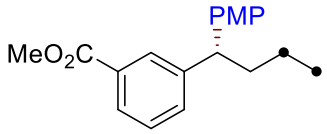
^{13}C NMR (126 MHz, $CDCl_3$) δ 166.8, 157.9, 145.9, 136.7, 132.4, 130.5, 128.9, 128.7, 128.4, 127.2, 113.8, 60.9, 55.2, 52.2, 28.6, 14.3, 12.7;

HRMS (ESI) calcd. for $C_{19}H_{22}NaO_3$ $[M+Na]^+$ *m/z* 321.1461, found 321.1463;

IR (neat, cm^{-1}) 2967, 1714, 1510, 1246, 756;

$[\alpha]_D^{20}$ = –3.2 (*c* = 1.9, $CHCl_3$); 86% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 7.2 min, t_R (major) = 7.8 min.



Methyl (*S*)-3-(1-(4-methoxyphenyl)butyl)benzoate (Figure 4, **4k**). From **Methyl 3-(but-3-en-1-yl)benzoate** (38.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–4% EtOAc in PE) to provide the title compound as a colorless liquid in 68% yield (40.4 mg) with 97:3 rr.

Rf 0.4 (4% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.88 (d, *J* = 7.7 Hz, 1H), 7.44 (d, *J* = 7.7 Hz, 1H), 7.36 (t, *J* = 7.7 Hz, 1H), 7.19 (d, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 3.99 – 3.92 (m, 4H), 3.79 (s, 3H), 2.10 – 2.01 (m, 2H), 1.38 – 1.23 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H);

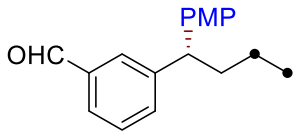
^{13}C NMR (126 MHz, $CDCl_3$) δ 167.2, 158.0, 146.2, 136.8, 132.5, 130.2, 128.8, 128.7, 128.4, 127.3, 113.9, 55.1, 52.0, 50.1, 37.9, 21.1, 14.0;

HRMS (ESI) calcd. for $C_{19}H_{23}O_3$ $[M+H]^+$ *m/z* 299.1642, found 299.1637;

IR (neat, cm^{-1}) 2955, 1719, 1509, 1246, 1035, 750;

$[\alpha]_D^{20}$ = –0.4 (*c* = 2.0, $CHCl_3$); 89% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 7.2 min, t_R (major) = 7.6 min.



(*S*)-3-(1-(4-Methoxyphenyl)butyl)benzaldehyde (Figure 4, **4l**). From **3-(But-3-en-1-yl)benzaldehyde** (32.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 51% yield (27.5 mg) with 96:4 rr.

Rf 0.3 (4% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 10.00 (s, 1H), 7.78 (s, 1H), 7.70 (d, *J* = 7.4 Hz, 1H), 7.52 (d, *J* = 7.6 Hz, 1H), 7.46 (t, *J* = 7.6 Hz, 1H), 7.18 (d, *J* = 8.7 Hz, 2H), 6.86 (d, *J* = 8.7 Hz, 2H), 3.97 (t, *J* = 7.8 Hz, 1H), 3.80 (s, 3H), 2.11 – 2.00 (m, 2H), 1.37 – 1.23 (m, 2H), 0.96 (t, *J* = 7.4 Hz, 3H);

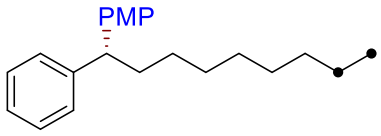
^{13}C NMR (126 MHz, $CDCl_3$) δ 192.6, 158.1, 147.0, 136.6, 136.5, 134.2, 129.1, 128.7, 128.6, 127.9, 113.9, 55.2, 49.9, 37.9, 21.1, 14.0;

HRMS (ESI) calcd. for $C_{18}H_{21}O_2$ $[M+H]^+$ *m/z* 269.1536, found 269.1534;

IR (neat, cm^{-1}) 2957, 1694, 1509, 1245, 1035;

$[\alpha]_D^{20}$ = +3.6 (*c* = 1.0, $CHCl_3$); 86% *ee*;

HPLC analysis CHIRALCEL IG-3 column, 5% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 15.6 min, t_R (major) = 16.3 min.



(*R*)-1-methoxy-4-(1-phenylnonyl)benzene (Figure 4, **4m**). From **Non-8-en-1-ylbenzene** (40.9 mg, 0.20 mmol), the title compound was prepared following the general procedure

A using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 38% yield (23.7 mg) with 96:4 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30 – 7.23 (m, 4H), 7.21 – 7.15 (m, 3H), 6.84 (d, *J* = 8.6 Hz, 2H), 3.86 (t, *J* = 7.7 Hz, 1H), 3.79 (s, 3H), 2.06 – 1.98 (m, 2H), 1.32 – 1.22 (m, 12H), 0.89 (t, *J* = 7.0 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.8, 137.6, 128.7, 128.3, 127.8, 125.9, 113.7, 55.2, 50.5, 35.9, 31.9, 29.7, 29.5, 29.3, 28.1, 22.7, 14.1;

HRMS (ESI) calcd. for $C_{22}H_{30}NaO$ $[M+Na]^+$ *m/z* 333.2189, found 333.2188;

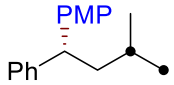
IR (neat, cm^{-1}) 2923, 1510, 1246, 1039, 698;

$[\alpha]_D^{20}$ = –4.0 (*c* = 0.5, $CHCl_3$); 96% *ee*;

HPLC analysis CHIRALCEL OJ-H*2 column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 28.6 min, t_R (major) = 30.5 min.

Note:

Using **L** [0.84 mg, 0.4 mL (2.1 mg/mL in toluene)] and anhydrous toluene (0.40 mL), the title compound was prepared following the general procedure **A**, and the crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 57% yield (35.2 mg) with 93% *ee*.



(*R*)-1-Methoxy-4-(3-methyl-1-phenylbutyl)benzene (Figure 4, **4n**)[2]. From **(3-Methylbut-3-en-1-yl)benzene** (29.4 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt.

The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 41% yield (20.5 mg) with 99:1 rr.

Rf 0.3 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 – 7.25 (m, 4H), 7.19 (d, *J* = 8.6 Hz, 3H), 6.85 (d, *J* = 8.7 Hz, 2H), 4.00 (t, *J* = 8.0 Hz, 1H), 3.80 (s, 3H), 1.96 – 1.89 (m, 2H), 1.52 – 1.43 (m, 1H), 0.95 (d, *J* = 6.7 Hz, 6H);

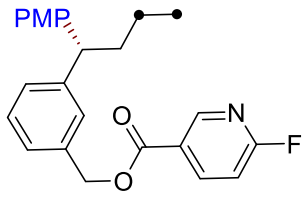
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.8, 137.5, 128.8, 128.4, 127.8, 125.9, 113.8, 55.2, 48.0, 45.2, 25.5, 22.7, 22.6;

HRMS (ESI) calcd. for $C_{18}H_{22}NaO$ $[M+Na]^+$ *m/z* 277.1563, found 277.1564;

IR (neat, cm^{-1}) 2954, 1509, 1246, 1038, 697;

$[\alpha]_D^{20}$ = –7.5 (*c* = 1.0, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (major) = 10.7 min, t_R (minor) = 11.6 min.



(*S*)-3-(1-(4-Methoxyphenyl)butyl)benzyl 6-fluoronicotinate (Figure 4, **4o**). From **3-(But-3-en-1-yl)benzyl 6-fluoronicotinate** (57.1 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 79% yield (61.9 mg) with 98:2 rr.

Rf 0.5 (20% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.93 (s, 1H), 8.46 – 8.38 (m, 1H), 7.37 – 7.24 (m, 4H), 7.19 (d, *J* = 8.7 Hz, 2H), 7.02 (dd, *J* = 8.5, 2.8 Hz, 1H), 6.86 (d, *J* = 8.7 Hz, 2H), 5.37 (s,

2H), 3.93 (t, *J* = 7.8 Hz, 1H), 3.80 (s, 3H), 2.09 – 1.98 (m, 2H), 1.37 – 1.28 (m, 2H), 0.96 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 165.9 (d, *J* = 245.7 Hz), 164.1, 157.9, 150.5 (d, *J* = 16.3 Hz), 146.5, 142.7 (d, *J* = 9.3 Hz), 137.0, 135.3, 128.8, 128.8, 127.9, 127.8, 125.9, 124.5 (d, *J* = 4.5 Hz), 113.8, 109.6 (d, *J* = 37.5 Hz), 67.1, 55.2, 50.1, 38.1, 21.2, 14.1;

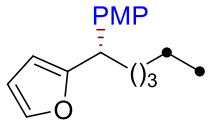
^{19}F NMR (471 MHz, $CDCl_3$) δ –61.1;

HRMS (ESI) calcd. for $C_{24}H_{24}FNNaO_3$ $[M+Na]^+$ *m/z* 416.1632, found 416.1633;

IR (neat, cm^{-1}) 2958, 1721, 1510, 1246, 1109, 775;

$[\alpha]_D^{20}$ = –6.5 (*c* = 2.3, $CHCl_3$); 92% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 10% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (major) = 30.7 min, t_R (minor) = 35.1 min.



(*S*)-2-(1-(4-Methoxyphenyl)hexyl)furan (Figure 4, **4p**). From **2-(Hex-5-en-1-yl)furan** (30.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2% EtOAc in PE) to provide the title compound as a colorless liquid in 42% yield (21.9 mg) with 96:4 rr.

Rf 0.4 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 (s, 1H), 7.17 (d, *J* = 8.7 Hz, 2H), 6.87 (d, *J* = 8.7 Hz, 2H), 6.30 (dd, *J* = 3.2, 1.9 Hz, 1H), 6.05 (d, *J* = 3.1 Hz, 1H), 3.89 (t, *J* = 7.7 Hz, 1H), 3.81 (s, 3H), 2.14 – 2.04 (m, 1H), 1.92 – 1.83 (m, 1H), 1.34 – 1.27 (m, 6H), 0.89 (t, *J* = 6.7 Hz, 3H);

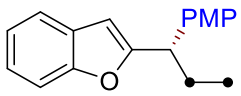
^{13}C NMR (126 MHz, $CDCl_3$) δ 158.7, 158.1, 141.1, 135.1, 128.8, 113.8, 113.7, 109.9, 104.9, 55.2, 44.5, 34.8, 31.7, 27.3, 22.5, 14.1;

HRMS (ESI) calcd. for $C_{17}H_{22}NaO_2$ $[M+Na]^+$ m/z 281.1512, found 281.1511;

IR (neat, cm^{-1}) 2926, 1510, 1244, 1037, 726;

[α]$_D^{20}$ = +35.3 (*c* = 0.9, $CHCl_3$); 90% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 11.7 min, t_R (major) = 13.5 min.



(*S*)-2-(1-(4-Methoxyphenyl)propyl)benzofuran (Figure 4, **4q**). From **2-Allylbenzofuran** (31.6 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–3% EtOAc in PE) to provide the title compound as a colorless liquid in 52% yield (27.9 mg) with 97:3 rr.

Rf 0.4 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.53 (d, *J* = 6.8 Hz, 1H), 7.44 (d, *J* = 7.7 Hz, 1H), 7.27 (d, *J* = 8.6 Hz, 2H), 7.24 – 7.19 (m, 2H), 6.90 (d, *J* = 8.7 Hz, 2H), 6.47 (s, 1H), 3.95 (t, *J* = 7.7 Hz, 1H), 3.83 (s, 3H), 2.33 – 2.24 (m, 1H), 2.06 – 1.96 (m, 1H), 0.99 (t, *J* = 7.4 Hz, 3H);

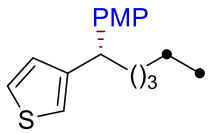
^{13}C NMR (126 MHz, $CDCl_3$) δ 161.7, 158.4, 154.8, 134.3, 129.0, 128.7, 123.3, 122.4, 120.4, 113.9, 110.9, 102.2, 55.3, 46.7, 27.7, 12.4;

HRMS (ESI) calcd. for $C_{18}H_{19}O_2$ $[M+H]^+$ *m/z* 267.1380, found 267.1381;

IR (neat, cm^{-1}) 2966, 1510, 1247, 1037, 740;

[α]$_D^{20}$ = +33.7 (*c* = 1.3, $CHCl_3$); 84% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 16.7 min, t_R (major) = 20.8 min.



(*S*)-3-(1-(4-Methoxyphenyl)hexyl)thiophene (Figure 4, **4r**)[1]. From **3-(Hex-5-en-1-yl)thiophene** (33.3 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 52% yield (28.4 mg) with 98:2 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.25 (dd, *J* = 5.0, 2.9 Hz, 1H), 7.16 (d, *J* = 8.7 Hz, 2H), 6.99 (d, *J* = 2.9 Hz, 1H), 6.93 (d, *J* = 3.6 Hz, 1H), 6.87 (d, *J* = 8.7 Hz, 2H), 3.93 (t, *J* = 7.7 Hz, 1H), 3.82 (s, 3H), 2.12 – 2.01 (m, 1H), 2.01 – 1.91 (m, 1H), 1.35 – 1.27 (m, 6H), 0.90 (t, *J* = 6.7 Hz, 3H);

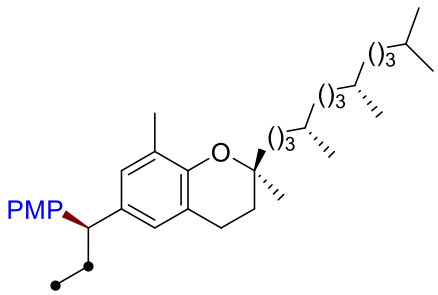
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.9, 146.9, 137.2, 128.7, 127.8, 125.3, 119.7, 113.7, 55.2, 46.1, 36.3, 31.8, 27.6, 22.6, 14.1;

HRMS (ESI) calcd. for $C_{17}H_{22}NaOS$ $[M+Na]^+$ *m/z* 297.1284, found 297.1280;

IR (neat, cm^{-1}) 2925, 1609, 1509, 1243, 1037, 827;

$[\alpha]_D^{20}$ = +44.2 (*c* = 1.1, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 30% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 7.7 min, t_R (major) = 9.5 min.



(*S*)-6-((*S*)-1-(4-Methoxyphenyl)propyl)-2,8-dimethyl-2-((4*S*,8*S*)-4,8,12-trimethyltridecyl)chromane (Figure 4, **4s**). From **(*S*)-6-Allyl-2,8-dimethyl-2-((4*S*,8*S*)-4,8,12-trimethyltridecyl)chromane** (85.3 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L***

(7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 88% yield (94.0 mg) with >99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

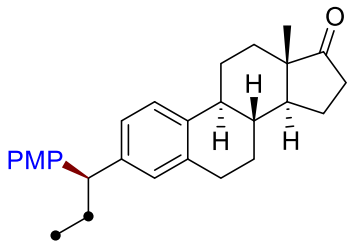
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.18 (d, *J* = 8.6 Hz, 2H), 6.85 (d, *J* = 8.6 Hz, 2H), 6.82 (s, 1H), 6.75 (s, 1H), 3.80 (s, 3H), 3.62 (t, *J* = 7.8 Hz, 1H), 2.76 – 2.68 (m, 2H), 2.14 (s, 3H), 2.05 – 1.96 (m, 2H), 1.81 (dt, *J* = 13.8, 7.0 Hz, 1H), 1.74 (dt, *J* = 13.2, 6.4 Hz, 1H), 1.60 – 1.55 (m, 3H), 1.48 – 1.35 (m, 5H), 1.33 – 1.26 (m, 9H), 1.21 – 1.05 (m, 7H), 0.90 (d, *J* = 6.7 Hz, 9H), 0.88 (d, *J* = 2.6 Hz, 3H), 0.87 (d, *J* = 2.8 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.6, 150.3, 138.2, 135.7, 128.7, 127.7, 125.8, 119.9, 113.6, 75.8, 55.2, 51.7, 40.3, 39.4, 37.5, 37.4, 37.3, 32.8, 32.7, 31.3, 29.1, 28.0, 24.8, 24.5, 24.3, 24.3, 22.8, 22.7, 22.5, 21.0, 19.8, 19.7, 16.2, 13.0;

HRMS (ESI) calcd. for $C_{37}H_{58}NaO_2$ $[M+Na]^+$ *m/z* 557.4329, found 557.4332;

IR (neat, cm^{-1}) 2923, 1510, 1244, 1041, 828;

$[\alpha]_D^{20}$ = +6.5 (*c* = 4.5, $CHCl_3$); >20:1 dr.



(8*R*,9*S*,13*S*,14*S*)-3-((*S*)-1-(4-Methoxyphenyl)propyl)-13-methyl-6,7,8,9,11,12,13,14,15,16-decahydro-17*H*-cyclopenta[*a*]phenanthren-17-one (Figure 4, **4t**). From **(8*R*,9*S*,13*S*,14*S*)-3-Allyl-13-methyl-6,7,8,9,11,12,13,14,15,16-decahydro-17*H*-cyclopenta[*a*]phenanthren-17-one** (58.9 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.17 mg, 0.08 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-phenyl-1-butene (**1a**) (30.0 μL, 0.20 mmol), DMMS (49.3 μL, 0.40 mmol),

anhydrous toluene (0.72 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a white solid in 82% yield (66.3 mg) with >99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.22 (d, *J* = 8.1 Hz, 1H), 7.19 (d, *J* = 8.7 Hz, 2H), 7.05 (d, *J* = 8.1 Hz, 1H), 6.97 (s, 1H), 6.86 (d, *J* = 8.7 Hz, 2H), 3.80 (s, 3H), 3.71 (t, *J* = 7.8 Hz, 1H), 2.94 – 2.87 (m, 2H), 2.53 (dd, *J* = 19.0, 8.7 Hz, 1H), 2.47 – 2.39 (m, 1H), 2.29 (t, *J* = 13.0 Hz, 1H), 2.21 – 2.13 (m, 1H), 2.11 – 2.00 (m, 4H), 1.98 (d, *J* = 11.8 Hz, 1H), 1.69 – 1.58 (m, 2H), 1.58 – 1.39 (m, 4H), 0.97 – 0.87 (m, 6H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 221.1, 157.8, 143.1, 137.4, 137.3, 136.3, 128.8, 128.4, 125.3, 125.1, 113.8, 55.2, 52.0, 50.6, 48.0, 44.3, 38.2, 35.9, 31.6, 29.7, 29.5, 28.8, 26.6, 25.7, 21.6, 13.9, 12.9;

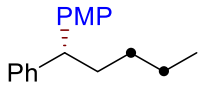
HRMS (ESI) calcd. for $C_{28}H_{34}NaO_2$ $[M+Na]^+$ *m/z* 425.2451, found 425.2451;

IR (neat, cm^{-1}) 3674, 2920, 1734, 1250, 1051;

m.p. 103.8 – 105.3 °C;

$[\alpha]_D^{20}$ = +123.5 (*c* = 2.1, $CHCl_3$); >20:1 dr;

HPLC analysis CHIRALCEL AD-H column, 10% EtOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 8.4 min, t_R (major) = 11.0 min.



(*R*)-1-Methoxy-4-(1-phenylpentyl)benzene (Figure 4, **4u**). From **Pent-3-en-1-ylbenzene** (29.2 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 80% yield (40.8 mg) with >99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.25 (m, 4H), 7.25 – 7.16 (m, 3H), 6.87 (d, *J* = 8.6 Hz, 2H), 3.89 (t, *J* = 7.8 Hz, 1H), 3.81 (s, 3H), 2.10 – 2.02 (m, 2H), 1.43 – 1.35 (m, 2H), 1.32 – 1.26 (m, 2H), 0.92 (t, *J* = 7.3 Hz, 3H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.8, 137.6, 128.8, 128.4, 127.8, 125.9, 113.8, 55.2, 50.5, 35.7, 30.3, 22.8, 14.1;

HRMS (ESI) calcd. for $C_{18}H_{23}O$ $[M+H]^+$ *m/z* 255.1743, found 255.1738;

IR (neat, cm^{-1}) 2927, 1322, 1116, 1017, 698;

$[\alpha]_D^{20}$ = –5.9 (*c* = 1.6, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 20.4 min, t_R (major) = 22.4 min.

(*R*)-1-Methoxy-4-(1-phenylnonyl)benzene (Figure 4, **4v**)[1]. From **Non-3-en-1-ylbenzene** (40.9 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 58% yield (36.2 mg) with >99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31 (t, *J* = 7.5 Hz, 2H), 7.26 (d, *J* = 6.7 Hz, 2H), 7.23 – 7.16 (m, 3H), 6.87 (d, *J* = 8.7 Hz, 2H), 3.88 (t, *J* = 7.8 Hz, 1H), 3.81 (s, 3H), 2.09 – 2.01 (m, 2H), 1.38 – 1.25 (m, 12H), 0.92 (t, *J* = 7.0 Hz, 3H);

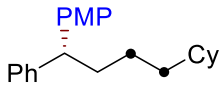
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.8, 137.6, 128.8, 128.4, 127.8, 125.9, 113.7, 55.2, 50.5, 35.9, 31.9, 29.7, 29.5, 29.4, 28.1, 22.7, 14.2;

HRMS (ESI) calcd. for $C_{22}H_{30}NaO$ $[M+Na]^+$ *m/z* 333.2189, found 333.2191;

IR (neat, cm^{-1}) 2923, 1509, 1245, 1038, 697;

$[\alpha]_D^{20}$ = –4.4 (*c* = 0.7, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 28.0 min, t_R (major) = 30.1 min.



(*R*)-1-(4-Cyclohexyl-1-phenylbutyl)-4-methoxybenzene (Figure 4, **4w**). From **(4-Cyclohexylbut-3-en-1-yl)benzene** (42.8 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a white solid in 61% yield (39.5 mg) with >99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 – 7.25 (m, 4H), 7.20 (d, *J* = 8.4 Hz, 3H), 6.87 (d, *J* = 8.4 Hz, 2H), 3.89 (t, *J* = 7.8 Hz, 1H), 3.81 (s, 3H), 2.06 – 1.99 (m, 2H), 1.72 – 1.64 (m, 5H), 1.32 – 1.17 (m, 8H), 0.90 – 0.81 (m, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.8, 137.6, 128.8, 128.4, 127.8, 125.9, 113.8, 113.7, 55.2, 50.6, 37.6, 37.5, 36.2, 33.5, 26.8, 26.5, 25.3;

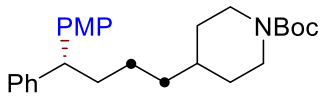
HRMS (ESI) calcd. for $C_{23}H_{31}O$ $[M+H]^+$ *m/z* 323.2369, found 323.2365;

IR (neat, cm^{-1}) 2920, 1509, 1246, 1037, 697;

m.p. 59.1 – 60.0 °C;

$[\alpha]_D^{20}$ = –3.8 (*c* = 1.7, $CHCl_3$); 96% *ee*;

HPLC analysis CHIRALCEL OJ-H*2 column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 30.5 min, t_R (major) = 32.3 min.



***t*ert-Butyl (*R*)-4-(4-(4-methoxyphenyl)-4-phenylbutyl)piperidine-1-carboxylate** (Figure 4, **4x**). From ***tert*-Butyl 4-(4-phenylbut-1-en-1-yl)piperidine-1-carboxylate**

(63.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2% EtOAc in PE) to provide the title compound as a white solid in 75% yield (63.9 mg) with >99:1 rr.

Rf 0.3 (4% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.29 (t, *J* = 7.5 Hz, 2H), 7.24 (d, *J* = 6.7 Hz, 2H), 7.18 (dd, *J* = 10.9, 7.9 Hz, 3H), 6.85 (d, *J* = 8.7 Hz, 2H), 4.06 (s, 2H), 3.86 (t, *J* = 7.8 Hz, 1H), 3.79 (s, 3H), 2.73 – 2.55 (m, 2H), 2.06 – 1.97 (m, 2H), 1.63 – 1.57 (m, 2H), 1.47 (s, 9H), 1.37 – 1.27 (m, 5H), 1.10 – 0.98 (m, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 154.9, 145.6, 137.3, 128.7, 128.4, 127.7, 125.9, 113.8, 79.2, 55.2, 50.5, 44.4, 43.7, 36.5, 36.0, 35.8, 28.5, 25.1;

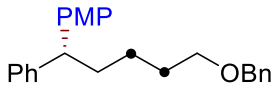
HRMS (ESI) calcd. for $C_{27}H_{37}NNaO_3$ $[M+Na]^+$ *m/z* 446.2666, found 446.2666;

IR (neat, cm^{-1}) 3674, 2987, 1681, 1408, 1066;

m.p. 75.1 – 78.6 °C;

$[\alpha]_D^{20}$ = –1.7 (*c* = 2.5, $CHCl_3$); 96% *ee*;

HPLC analysis CHIRALCEL IC column, 5% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 20.8 min, t_R (major) = 22.4 min.



(*R*)-1-(5-(Benzyloxy)-1-phenylpentyl)-4-methoxybenzene (Figure 4, **4y**). From **(*E*)-(5-(Benzyloxy)pent-3-en-1-yl)benzene** (50.4 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–2%

EtOAc in PE) to provide the title compound as a colorless liquid in 37% yield (26.6 mg) with >99:1 rr.

Rf 0.4 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.39 – 7.32 (m, 5H), 7.29 (d, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 7.0 Hz, 2H), 7.19 (dd, *J* = 11.0, 7.9 Hz, 3H), 6.85 (d, *J* = 8.7 Hz, 2H), 4.50 (s, 2H), 3.88 (t, *J* = 7.8 Hz, 1H), 3.80 (s, 3H), 3.47 (t, *J* = 6.6 Hz, 2H), 2.11 – 2.02 (m, 2H), 1.74 – 1.64 (m, 2H), 1.43 – 1.33 (m, 2H);

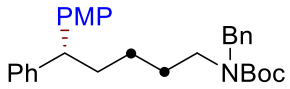
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 145.6, 138.6, 137.3, 128.8, 128.4, 128.4, 127.8, 127.7, 127.5, 125.9, 113.8, 72.9, 70.3, 55.2, 50.5, 35.7, 29.7, 24.7;

HRMS (ESI) calcd. for $C_{25}H_{29}O_2$ $[M+H]^+$ *m/z* 361.2162, found 361.2160;

IR (neat, cm^{-1}) 2931, 1509, 1245, 1036, 696;

$[\alpha]_D^{20}$ = –12.3 (*c* = 0.7, $CHCl_3$); 93% *ee*;

HPLC analysis CHIRALCEL IG*2 column, 1% ^{i}PrOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (minor) = 42.2 min, t_R (major) = 43.8 min.



tert*-Butyl (*R*)-benzyl(5-(4-methoxyphenyl)-5-phenylpentyl)carbamate** (Figure 4, **4z**). From ***tert*-Butyl (*E*)-benzyl(5-phenylpent-2-en-1-yl)carbamate** (70.2 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in 51% yield (47.3 mg) with >99:1 rr.

Rf 0.2 (5% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 (t, *J* = 7.3 Hz, 2H), 7.32 – 7.27 (m, 3H), 7.25 – 7.22 (m, 3H), 7.20 (d, *J* = 7.3 Hz, 1H), 7.17 (d, *J* = 8.6 Hz, 2H), 6.86 (d, *J* = 8.5 Hz, 2H), 4.43 (d, *J* = 25.0 Hz, 2H), 3.84 (t, *J* = 7.8 Hz, 1H), 3.80 (d, *J* = 1.6 Hz, 3H), 3.17 (d, *J* = 45.9 Hz, 2H), 2.07 – 1.99 (m, 2H), 1.63 – 1.39 (m, 12H), 1.24 (s, 2H);

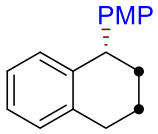
^{13}C NMR (126 MHz, $CDCl_3$) δ 157.9, 156.1, 155.6, 145.5, 138.8, 137.2, 128.7, 128.5, 128.4, 127.7, 127.1, 126.0, 113.8, 79.6, 55.2, 50.5, 49.8, 46.7&46.4 (*due to rotamer*), 35.6, 28.5, 28.2&27.9 (*due to rotamer*), 25.4;

HRMS (ESI) calcd. for $C_{30}H_{37}NNaO_3$ $[M+Na]^+$ *m/z* 482.2666, found 482.2668;

IR (neat, cm^{-1}) 2972, 1687, 1510, 1244, 698;

$[\alpha]_D^{20}$ = –2.9 (*c* = 2.3, $CHCl_3$); 93% *ee*;

HPLC analysis CHIRALCEL OD-H column, 10% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (minor) = 7.7 min, t_R (major) = 8.5 min.



(*S*)-1-(4-Methoxyphenyl)-1,2,3,4-tetrahydronaphthalene (Figure 4, **4a'**)[1]. From **1,4-Dihydronaphthalene** (26.0 mg, 0.20 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), **L** [0.42 mg, 0.2 mL (2.1 mg/mL in toluene)], KF (23.2 mg, 2.0 equiv), 4-iodoanisole (94.0 mg, 0.40 mmol, 2.0 equiv), DMMS (49.3 μL, 0.40 mmol), anhydrous toluene (0.60 mL) and DMPU (0.20 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 62% yield (29.7 mg) with >99:1 rr.

Rf 0.2 (2% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.16 (d, *J* = 6.7 Hz, 2H), 7.06 (d, *J* = 8.7 Hz, 3H), 6.88 (dd, *J* = 11.8, 8.4 Hz, 3H), 4.11 (t, *J* = 6.7 Hz, 1H), 3.83 (s, 3H), 3.00 – 2.83 (m, 2H), 2.22 – 2.13 (m, 1H), 1.96 – 1.85 (m, 2H), 1.83 – 1.75 (m, 1H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 139.8, 139.7, 137.6, 130.2, 129.7, 128.9, 125.8, 125.6, 113.6, 55.3, 44.8, 33.4, 29.8, 21.0;

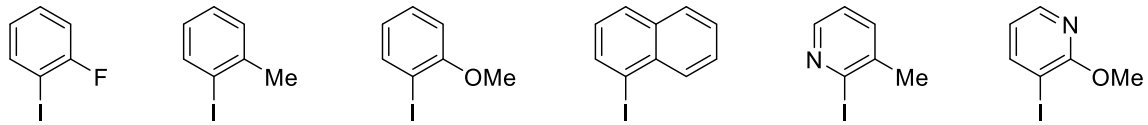
HRMS (ESI) calcd. for $C_{17}H_{18}NaO$ $[M+Na]^+$ *m/z* 261.1250, found 261.1252;

IR (neat, cm^{-1}) 3674, 2987, 1510, 1243, 1066, 740;

$[\alpha]_D^{20}$ = +23.8 (*c* = 0.5, $CHCl_3$); 90% *ee*;

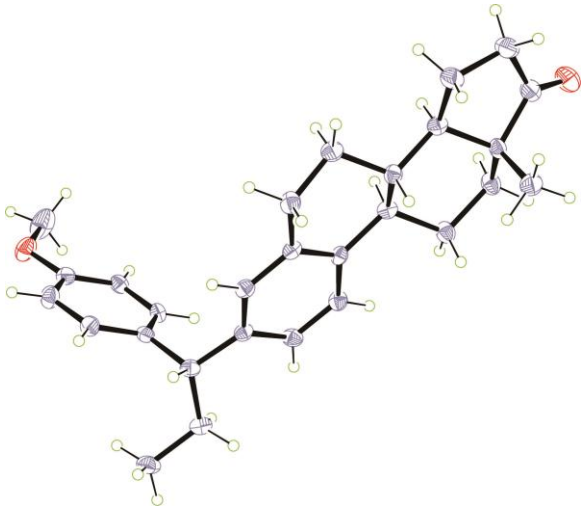
HPLC analysis CHIRALCEL OJ-H column, 1% EtOH in hexane, 0.5 mL/min, 220 nm UV detector, t_R (major) = 23.5 min, t_R (minor) = 27.1 min.

2.2. Suboptimal Substrate



16% yield | 12% yield | <1% yield | <5% yield | NR | <1% yield

2.3. Crystal Data and Structure Refinement for 4t

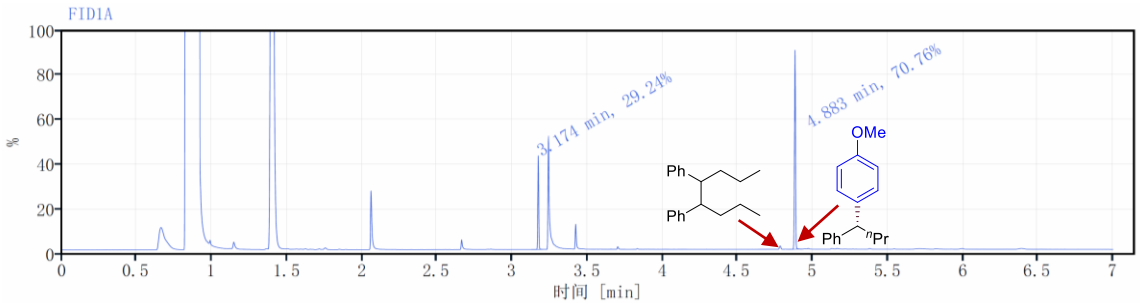


Supplementary Fig. 1. Crystal data and structure refinement for **4t**

Identification code	**4t**_a
Empirical formula	$C_{28}H_{34}O_2$
Formula weight	402.55
Temperature/K	193
Crystal system	monoclinic
Space group	P21
a/Å	6.8064(14)
b/Å	7.3932(12)
c/Å	22.709(5)
α/°	90
β/°	98.375(8)

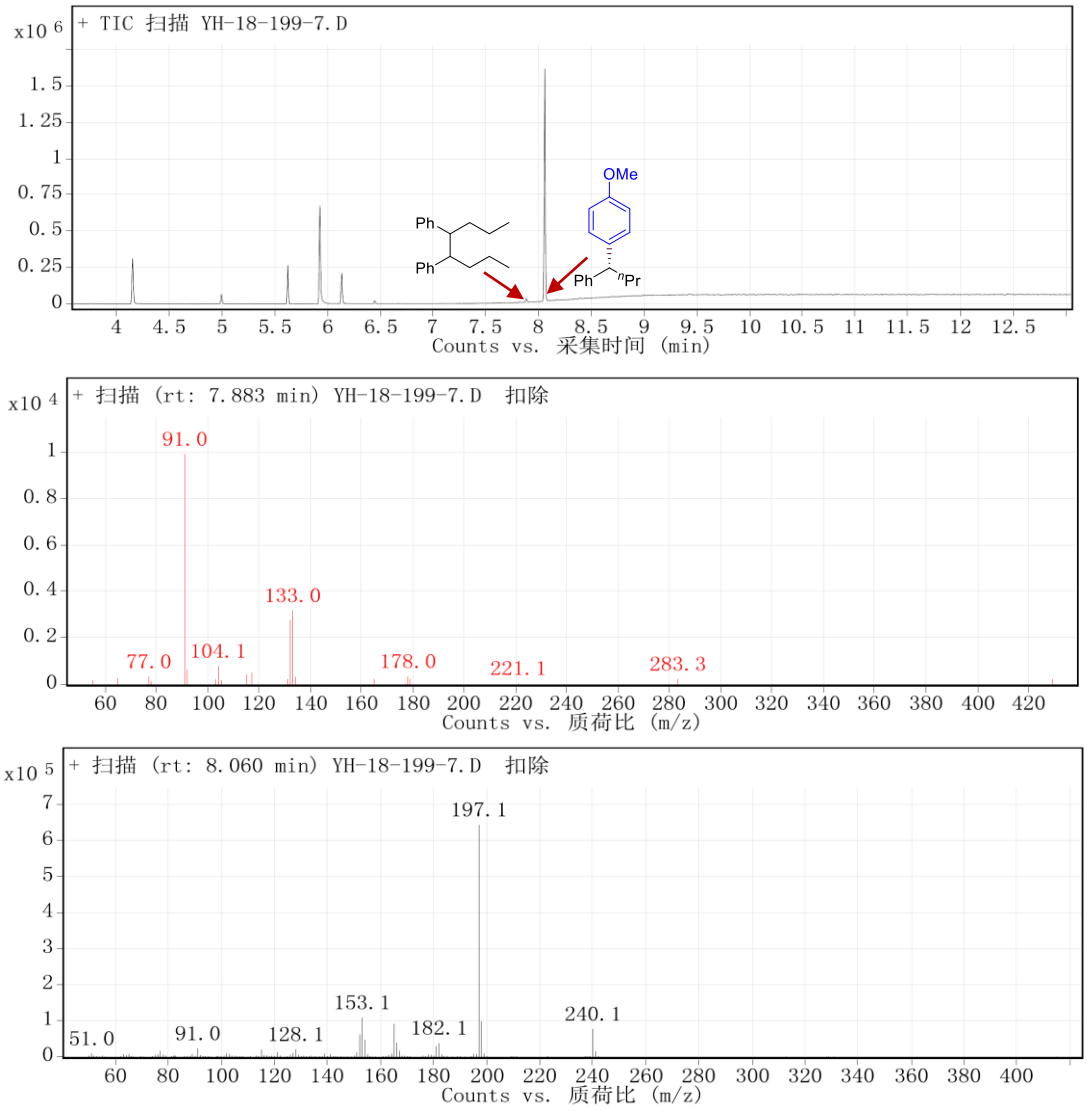
γ/°	90
Volume/Å3	1130.6(4)
Z	2
ρcalcg/cm3	1.183
μ/mm-1	0.072
F(000)	436.0
Crystal size/mm3	0.18 × 0.14 × 0.12
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	5.802 to 53.82
Index ranges	-8 ≤ h ≤ 8, -9 ≤ k ≤ 9, -23 ≤ l ≤ 28
Reflections collected	9271
Independent reflections	4542 [Rint = 0.0492, Rsigma = 0.0682]
Data/restraints/parameters	4542/1/274
Goodness-of-fit on F2	1.072
Final R indexes [I>=2σ (I)]	R1 = 0.0584, wR2 = 0.1245
Final R indexes [all data]	R1 = 0.0809, wR2 = 0.1480
Largest diff. peak/hole / e Å-3	0.26/-0.30
Flack parameter	-0.3(10)

2.4. GC Trace and GC-MS Analysis of 3a



RetTime (min)	Signal	Width(min)	Area	Height	Area%
3.174	FID1A	0.083	11.0	25.7	29.24
4.883	FID1A	0.093	26.6	54.9	70.76
		Total FID1A	37.6		

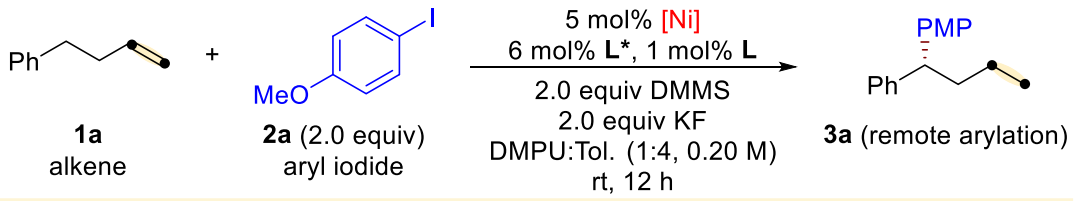
Supplementary Fig. 2. GC Trace of **3a**



Supplementary Fig. 3. GC-MS Analysis of **3a**

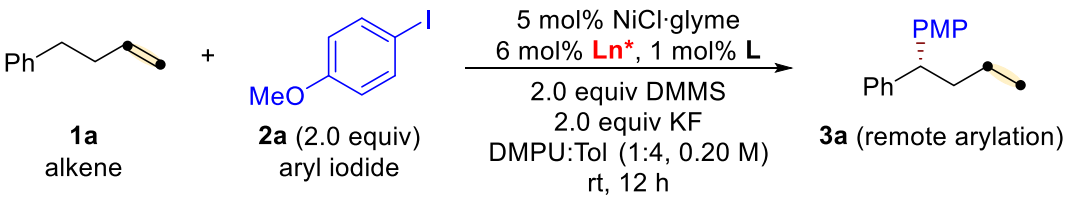
2.5. Detailed Condition Optimization

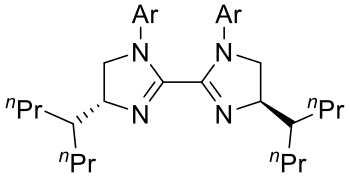
Supplementary Table 1. Nickel salts screening for enantioselective C(sp^3)–H arylation



entry	[Ni]	yield of **3a** (%)[a]	rr[b]	ee[c]
1	***$NiCl_2$·glyme***	***90 (84)***	***99:1***	***95***
2	$NiCl_2$	47	97:3	95
3	$NiBr_2$	76	98:2	94
4	NiI_2	80	99:1	94
5	$NiBr_2$·glyme	82	98:2	95
6	$Ni(COD)_2$	85	99:1	94

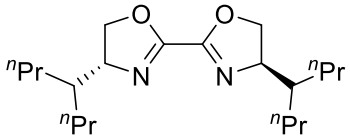
Supplementary Table 2. Chiral ligand screening for enantioselective C(sp^3)–H arylation



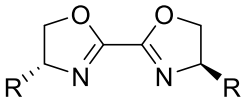


L: Ar = 3-^{t}Bu-C_6H_4, 90% yield, 95% ee*

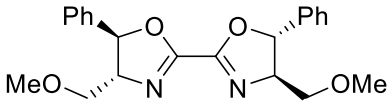
L1*: Ar = Ph, 91% yield, 91% ee



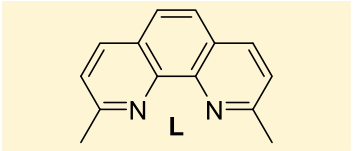
L2*: 70% yield, 80% ee



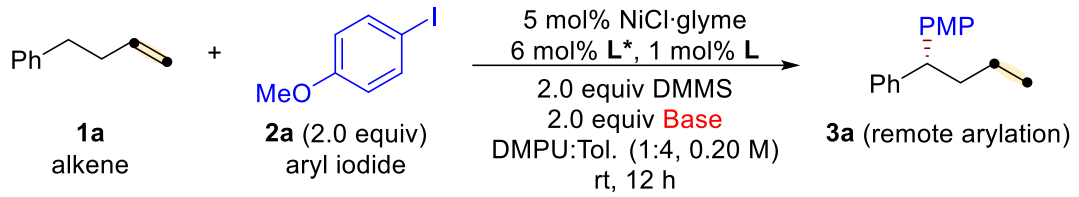
L3*: R = ^{i}Pr, 46% yield, 55% ee
L4*: R = Ph, 39% yield, 4% ee
L5*: R = ^{t}Bu, 48% yield, 16% ee
L6*: R = Bn, 60% yield, 64% ee



L7*: 68% yield, 66% ee

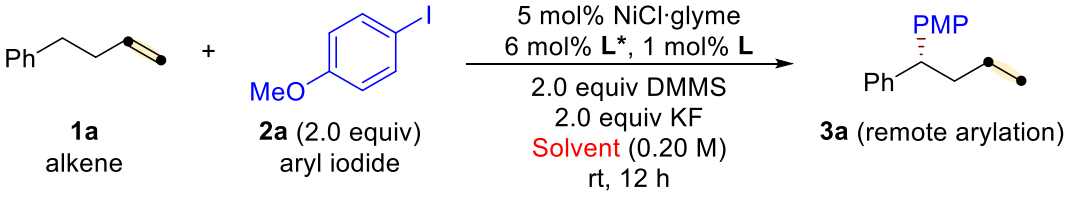


Supplementary Table 3. Base screening for enantioselective C(sp^3)–H arylation



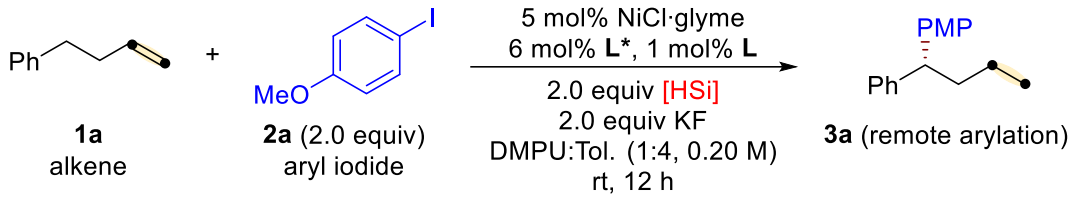
entry	Base	yield of **3a** (%)[a]	rr[b]	ee[c]
1	***KF***	***90 (84)***	***99:1***	***95***
2	CsF	42	95:5	91
3	NaF	trace	-	-
4	K_3PO_4	19	89:11	-
5	$K_3PO_4·H_2O$	79	99:1	93
6	LiOMe	24	85:15	-

Supplementary Table 4. Solvent screening for enantioselective C(sp^3)–H arylation



entry	Solvent	yield of **3a** (%)[a]	rr[b]	ee[c]
1	***DMPU:Tol (1:4)***	***90 (84)***	***99:1***	***95***
2	DMPU:Tol (1:1)	80	95:5	95
3	DMPU:Tol (1:9)	61	99:1	96
4	DMPU	44	94:6	93
5	Tol	3	-	-
6	DMAc	53	96:4	82

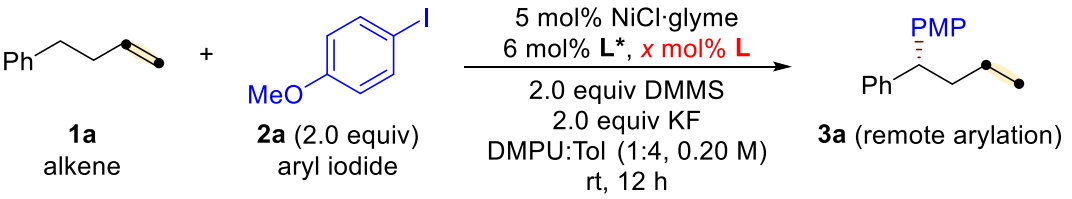
Supplementary Table 5. Silane screening for enantioselective C(sp^3)–H arylation



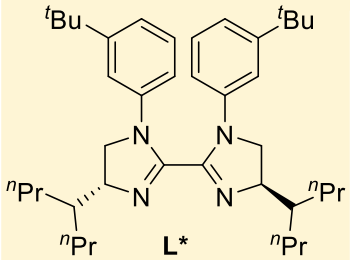
1a alkene | **2a** (2.0 equiv) aryl iodide | **3a** (remote arylation)

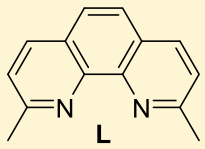
entry	[HSi]	yield of **3a** (%)[a]	rr[b]	ee[c]
1	***$(MeO)_2MeSiH$***	***90 (84)***	***99:1***	***95***
2	$(EtO)_2MeSiH$	93	95:5	95
3	$(EtO)_3SiH$	64	97:3	95
4	$(MeO)_3SiH$	72	97:3	95
5	PMHS	70	98:2	95

Supplementary Table 6. ligand ratio screening for enantioselective C(sp^3)–H arylation



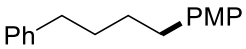
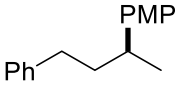
1a alkene | **2a** (2.0 equiv) aryl iodide | **3a** (remote arylation)

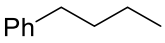
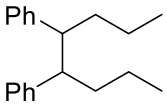




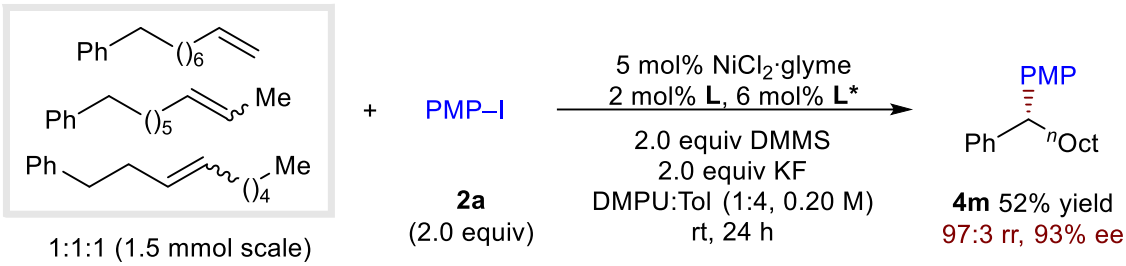
L (*x* mol%)	yield (%)[a]	ee (%)[b]	rr[c]
0	52[d]	95	68:32
0.5	84	95	97:3
1	***90***	***95***	***99:1***
2	90	93	99:1
3	88	85	99:1
4	85	68	99:1
5	77	54	99:1
6	60	50	99:1

a.Yields were determined by gas chromatography (GC) analysis using *n*-dodecane as the internal standard, the yield within parentheses is the isolated yield and is an average of two runs (0.20 mmol scale). b. Enantioselectivities were determined by chiral HPLC analysis. c. Regioselectivities (rr) were determined by GC and GC-MS analysis. d.

*Without **L***: the other regioisomers were  (24% yield) and 

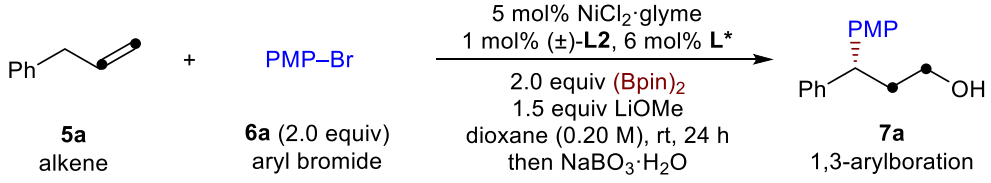
(1% yield), the byproducts were  (19% yield) and  (2% yield).

2.6. Regioconvergent Experiment

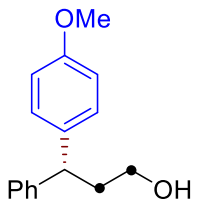


(*R*)-1-methoxy-4-(1-phenylnonyl)benzene (Figure 5, **4m**). From **Non-8-en-1-ylbenzene** (101.2 mg, 0.50 mmol), **Non-7-en-1-ylbenzene** (101.2 mg, 0.50 mmol) and **Non-3-en-1-ylbenzene** (101.2 mg, 0.50 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (16.5 mg, 5.0 mol%), **L*** (57.0 mg, 6.0 mol%), **L** (6.2 mg, 5.0 mol%), KF (174.0 mg, 2.0 equiv), 4-iodoanisole (705.0 mg, 3.0 mmol, 2.0 equiv), DMMS (370.0 μL, 3.0 mmol), anhydrous toluene (6.0 mL) and DMPU (1.5 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–1% EtOAc in PE) to provide the title compound as a colorless liquid in 52% yield (242.7 mg) with 97:3 rr and 93% *ee*.

2.7. Application of Multiligand-Relay Catalysis in 1,3-Arylboration Reaction



General procedure (B) for the regio- and enantioselective 1,3-arylboration reaction. In a nitrogen-filled glove box, to an oven-dried 8 mL screw-cap vial equipped with a magnetic stir bar was added $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), and anhydrous dioxane (1.0 mL) were added, and the mixture was stirred for 15 min at room temperature, at which time allylbenzene (26.5 μL, 0.20 mmol), 4-bromoanisole (50.0 μL, 0.40 mmol) and $(Bpin)_2$ (101.6 mg, 0.40 mmol) were added to the resulting mixture in this order. The tube was sealed with a teflon-lined screw cap, removed from the glove box and the reaction was stirred at rt (22~26 °C) for up to 24 h (the mixture was stirred at 750 rpm, ensuring that the base was uniformly suspended). After the reaction was complete, the reaction mixture was directly filtered through a short pad of silica gel [EtOAc in Petroleum ether (PE)] to give the crude product. Dodecane (20 μL) was added as an internal standard for GC analysis. The crude product was then oxidized to the corresponding alcohol with $NaBO_3$·H_2O and purified by chromatography on silica gel for each substrate. The yields reported are the average of at least two experiments, unless otherwise indicated. The enantiomeric excesses (% *ee*) were determined by HPLC analysis using chiral stationary phases.



(*R*)-3-(4-Methoxyphenyl)-3-phenylpropan-1-ol (Figure 5, **7a**). From **4-Bromoanisole** (50.0 μL, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–10% EtOAc in PE) to provide the title compound as a colorless liquid in 61% yield (29.5 mg) with 95:5 rr.

Rf 0.3 (10% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.25 (m, 4H), 7.25 – 7.17 (m, 3H), 6.86 (d, *J* = 8.7 Hz, 2H), 4.12 (t, *J* = 7.9 Hz, 1H), 3.80 (s, 3H), 3.63 (t, *J* = 6.4 Hz, 2H), 2.37 – 2.28 (m, 2H);

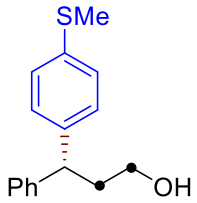
^{13}C NMR (126 MHz, $CDCl_3$) δ 158.0, 144.9, 136.6, 128.8, 128.6, 127.8, 126.2, 113.9, 61.2, 55.3, 46.5, 38.4;

HRMS (ESI) calcd. for $C_{16}H_{19}O_2$ $[M+H]^+$ *m/z* 243.1380, found 243.1378;

IR (neat, cm^{-1}) 3348(br), 2969, 1583, 1245, 1028, 698;

$[\alpha]_D^{20}$ = –6.8 (*c* = 1.0, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (major) = 38.4 min, t_R (minor) = 42.8 min.



(*R*)-3-(4-(Methylthio)phenyl)-3-phenylpropan-1-ol (Figure 5, **7b**). From **(4-Bromophenyl)(methyl)sulfane** (81.2 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–10% EtOAc in PE) to provide the title compound as a colorless liquid in 50% yield (25.9 mg) with 96:4 rr.

Rf 0.3 (10% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 – 7.29 (m, 2H), 7.28 – 7.25 (m, 2H), 7.24 – 7.18 (m, 5H), 4.13 (t, *J* = 7.9 Hz, 1H), 3.63 (t, *J* = 6.4 Hz, 2H), 2.47 (s, 3H), 2.32 (q, *J* = 7.5 Hz, 2H);

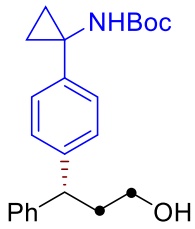
^{13}C NMR (126 MHz, $CDCl_3$) δ 144.4, 141.6, 136.0, 128.6, 128.4, 127.8, 127.1, 126.4, 61.0, 46.8, 38.1, 16.1;

HRMS (ESI) calcd. for $C_{16}H_{18}NaOS$ $[M+Na]^+$ *m/z* 281.0971, found 281.0973;

IR (neat, cm^{-1}) 3344(br), 2920, 1491, 1049, 698;

[α]$_D^{20}$ = –5.4 (*c* = 1.0, $CHCl_3$); 96% *ee*;

HPLC analysis CHIRALCEL AD-H column, 5% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 23.8 min, t_R (major) = 26.3 min.



tert*-Butyl (*R*)-(1-(4-(3-hydroxy-1-phenylpropyl)phenyl)cyclopropyl)carbamate** (Figure 5, **7c**). From ***tert*-Butyl (1-(4-bromophenyl)cyclopropyl)carbamate** (124.9 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–10% EtOAc in PE) to provide the title compound as a colorless liquid in 41% yield (30.1 mg) with 95:5 rr.

Rf 0.4 (15% EtOAc in PE), UV;

^{1}H NMR (500 MHz, CD_3OD) δ 7.29 – 7.24 (m, 4H), 7.21 (d, *J* = 7.7 Hz, 2H), 7.18 – 7.08 (m, 3H), 4.10 (t, *J* = 7.9 Hz, 1H), 3.49 (t, *J* = 6.6 Hz, 2H), 2.27 (q, *J* = 7.0 Hz, 2H), 1.45 (s, 9H), 1.21 – 1.12 (m, 4H);

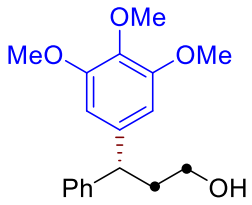
^{13}C NMR (126 MHz, CD_3OD) δ 157.1, 144.9, 142.3, 141.5, 128.0, 127.5, 127.4, 125.7, 124.4, 78.8, 59.7, 46.6, 37.9, 33.9, 27.4, 17.6;

HRMS (ESI) calcd. for $C_{23}H_{29}NNaO_3$ $[M+Na]^+$ *m/z* 390.2040, found 390.2039;

IR (neat, cm^{-1}) 3348(br), 2973, 1690, 1392, 1066, 699;

[α]$_D^{20}$ = –7.2 (*c* = 1.0, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OD-H column, 25% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (major) = 15.3 min, t_R (minor) = 26.9 min.



(*R*)-3-Phenyl-3-(3,4,5-trimethoxyphenyl)propan-1-ol (Figure 5, **7d**). From **5-Bromo-1,2,3-trimethoxybenzene** (98.8 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–20% EtOAc in PE) to provide the title compound as a colorless liquid in 55% yield (33.4 mg) with 92:8 rr.

Rf 0.2 (20% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.28 (m, 4H), 7.22 (t, *J* = 7.0 Hz, 1H), 6.49 (s, 2H), 4.09 (t, *J* = 7.9 Hz, 1H), 3.84 (s, 6H), 3.83 (s, 3H), 3.64 (t, *J* = 6.4 Hz, 2H), 2.36 – 2.28 (m, 2H);

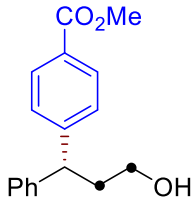
^{13}C NMR (126 MHz, $CDCl_3$) δ 153.2, 144.3, 140.3, 136.4, 128.6, 127.7, 126.4, 104.9, 61.0, 60.8, 56.1, 47.6, 38.4;

HRMS (ESI) calcd. for $C_{18}H_{22}NaO_4$ $[M+Na]^+$ *m/z* 325.1410, found 325.1409;

IR (neat, cm^{-1}) 3346(br), 2969, 1588, 1122, 702;

$[\alpha]_D^{20}$ = –0.4 (*c* = 1.2, $CHCl_3$); 96% *ee*;

HPLC analysis CHIRALCEL OD-H column, 10% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 13.8 min, t_R (major) = 16.9 min.



Methyl (*R*)-4-(3-hydroxy-1-phenylpropyl)benzoate (Figure 5, **7e**). From **Methyl 4-bromobenzoate** (86.0 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-

L2 (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–15% EtOAc in PE) to provide the title compound as a colorless liquid in 53% yield (28.8 mg) with 90:10 rr.

Rf 0.3 (20% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.98 (d, *J* = 8.4 Hz, 2H), 7.35 (d, *J* = 8.3 Hz, 2H), 7.33 – 7.29 (m, 2H), 7.26 (d, *J* = 6.9 Hz, 2H), 7.23 (d, *J* = 7.2 Hz, 1H), 4.24 (t, *J* = 7.9 Hz, 1H), 3.91 (s, 3H), 3.62 (t, *J* = 6.4 Hz, 2H), 2.41 – 2.30 (m, 2H);

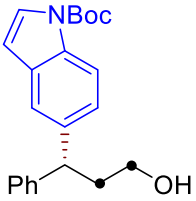
^{13}C NMR (126 MHz, $CDCl_3$) δ 167.0, 149.9, 143.6, 129.9, 128.7, 128.2, 127.9, 127.9, 126.6, 60.7, 52.1, 47.2, 37.9;

HRMS (ESI) calcd. for $C_{17}H_{18}NaO_3$ $[M+Na]^+$ *m/z* 293.1148, found 293.1147;

IR (neat, cm^{-1}) 3348(br), 2952, 1717, 1276, 698;

$[\alpha]_D^{20}$ = –4.0 (*c* = 1.0, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL OD-H column, 20% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 9.0 min, t_R (major) = 12.9 min.



tert*-Butyl (*R*)-5-(3-hydroxy-1-phenylpropyl)-1*H*-indole-1-carboxylate** (Figure 5, **7f**). From ***tert*-Butyl 5-bromo-1*H*-indole-1-carboxylate** (118.5 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–10% EtOAc in PE) to provide the title compound as a colorless liquid in 66% yield (46.3 mg) with 95:5 rr.

Rf 0.3 (10% EtOAc in PE), UV;

^{1}H NMR (500 MHz, CD_3OD) δ 8.01 (d, *J* = 8.6 Hz, 1H), 7.56 (d, *J* = 3.7 Hz, 1H), 7.48 (s, 1H), 7.30 (d, *J* = 6.7 Hz, 2H), 7.27 (d, *J* = 7.4 Hz, 2H), 7.21 (dd, *J* = 8.6, 1.8 Hz, 1H), 7.14 (t, *J* = 7.2 Hz, 1H), 6.55 (d, *J* = 3.7 Hz, 1H), 4.22 (t, *J* = 7.9 Hz, 1H), 3.51 (t, *J* = 6.6 Hz, 2H), 2.33 (q, *J* = 7.3, 6.7 Hz, 2H), 1.65 (s, 9H);

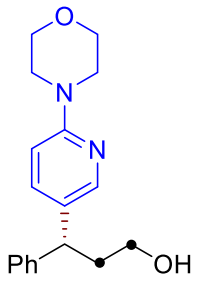
^{13}C NMR (126 MHz, CD_3OD) δ 149.7, 145.3, 139.4, 133.7, 130.8, 128.0, 127.6, 125.7, 125.6, 124.2, 119.5, 114.5, 107.1, 83.4, 59.8, 46.9, 38.3, 26.9;

HRMS (ESI) calcd. for $C_{22}H_{25}NNaO_3$ $[M+Na]^+$ *m/z* 374.1727, found 374.1729;

IR (neat, cm^{-1}) 3348(br), 2974, 1729, 1467, 1371, 1160, 699;

$[\alpha]_D^{20}$ = –9.2 (*c* = 1.0, $CHCl_3$); 95% *ee*;

HPLC analysis CHIRALCEL AD-H column, 30% ^{i}PrOH in hexane, 0.8 mL/min, 220 nm UV detector, t_R (major) = 6.3 min, t_R (minor) = 16.6 min.



(*R*)-3-(6-Morpholinopyridin-3-yl)-3-phenylpropan-1-ol (Figure 5, **7g**). From **4-(5-Bromopyridin-2-yl)morpholine** (97.2 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–30% EtOAc in PE) to provide the title compound as a colorless liquid in 47% yield (28.2 mg) with 91:9 rr.

Rf 0.2 (30% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.16 (d, *J* = 2.5 Hz, 1H), 7.40 (dd, *J* = 8.7, 2.5 Hz, 1H), 7.29 (d, *J* = 7.8 Hz, 2H), 7.25 (d, *J* = 7.1 Hz, 2H), 7.20 (t, *J* = 7.2 Hz, 1H), 6.61 (d, *J* = 8.8 Hz, 1H), 4.08 (t, *J* = 7.9 Hz, 1H), 3.82 (t, *J* = 4.9 Hz, 4H), 3.62 (t, *J* = 6.4 Hz, 2H), 3.48 (t, 4H), 2.34 – 2.24 (m, 2H);

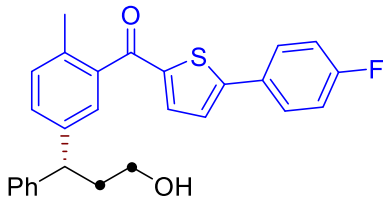
^{13}C NMR (126 MHz, $CDCl_3$) δ 158.1, 146.5, 144.1, 137.6, 129.8, 128.6, 127.7, 126.4, 107.2, 66.7, 60.7, 45.8, 43.9;

HRMS (ESI) calcd. for $C_{18}H_{22}N_2NaO_2$ $[M+Na]^+$ *m/z* 321.1573, found 321.1568;

IR (neat, cm^{-1}) 3348(br), 2968, 1603, 1490, 1243, 699;

$[\alpha]_D^{20}$ = –1.6 (*c* = 1.0, $CHCl_3$); 93% *ee*;

HPLC analysis CHIRALCEL AD-H column, 20% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (major) = 12.2 min, t_R (minor) = 14.6 min.



(*R*)-(5-(4-Fluorophenyl)thiophen-2-yl)(5-(3-hydroxy-1-phenylpropyl)-2-methylphenyl)methanone (Figure 5, **7h**). From **(5-Bromo-2-methylphenyl)(5-(4-fluorophenyl)thiophen-2-yl)methanone** (150.1 mg, 0.40 mmol), the title compound was prepared following the general procedure **B** using $NiCl_2$·glyme (2.2 mg, 5.0 mol%), **L*** (7.2 mg, 6.0 mol%), (±)-**L2** (0.50 mg, 1.0 mol%), LiOMe (11.4 mg, 1.5 equiv), allylbenzene (26.5 μL, 0.20 mmol), $(Bpin)_2$ (101.6 mg, 0.40 mmol) and anhydrous dioxane (1.0 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–20% EtOAc in PE) to provide the title compound as a colorless liquid in 44% yield (38.1 mg) with 92:8 rr.

Rf 0.4 (20% EtOAc in PE), UV;

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 (dd, *J* = 8.8, 5.2 Hz, 2H), 7.39 (d, *J* = 1.9 Hz, 1H), 7.31 (t, *J* = 7.3 Hz, 3H), 7.27 (d, *J* = 6.3 Hz, 3H), 7.25 – 7.20 (m, 3H), 7.14 (t, *J* = 8.6 Hz, 2H), 4.20 (t, *J* = 7.9 Hz, 1H), 3.64 (t, *J* = 6.4 Hz, 2H), 2.37 (s, 3H), 2.33 (q, *J* = 6.4 Hz, 2H);

^{13}C NMR (126 MHz, $CDCl_3$) δ 190.2, 163.3 (d, *J* = 250.2 Hz), 152.7, 144.2, 143.5, 141.7, 138.2, 136.5, 134.5, 131.4, 129.9, 129.6 (d, *J* = 3.5 Hz), 128.6, 128.2 (d, *J* = 8.5 Hz), 127.8, 127.7, 126.5, 124.0, 116.3 (d, *J* = 22.0 Hz), 60.9, 46.7, 37.9, 19.3;

^{19}F NMR (471 MHz, $CDCl_3$) δ –111.6;

HRMS (ESI) calcd. for $C_{27}H_{23}FNaO_2S$ $[M+Na]^+$ *m/z* 453.1295, found 453.1292;

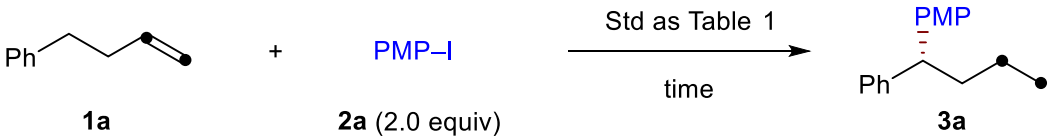
IR (neat, cm^{-1}) 3348(br), 2971, 1630, 1437, 1055, 698;

$[\alpha]_D^{20}$ = +24.4 (*c* = 1.5, $CHCl_3$); 94% *ee*;

HPLC analysis CHIRALCEL AD-H column, 20% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (major) = 18.7 min, t_R (minor) = 22.9 min.

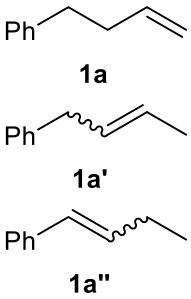
2.8. Tracing Experiment

Supplementary Table 7. Tracing experiment for the enantioselective C(sp^3)−H arylation



1a **2a** (2.0 equiv) **3a**

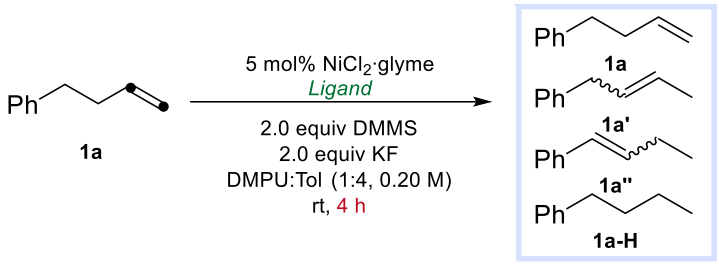
Entry	Reaction time	GC yield **3a** [%][a]	**1a**:**1a'**:**1a"**[b]
1	1 h	6	71:19:10
2	2 h	10	35:42:23
3	4 h	46	0:55:45
4	6 h	78	0:36: 64
5	12 h	92	trace



[a]Yields were determined by GC using dodecane as the internal standard. [b]The ratio of **1a**, **1a**' and **1a**" was determined by GC and GC-MS analysis.

2.9. Olefin Isomerization in the Absence of Aryl Iodide

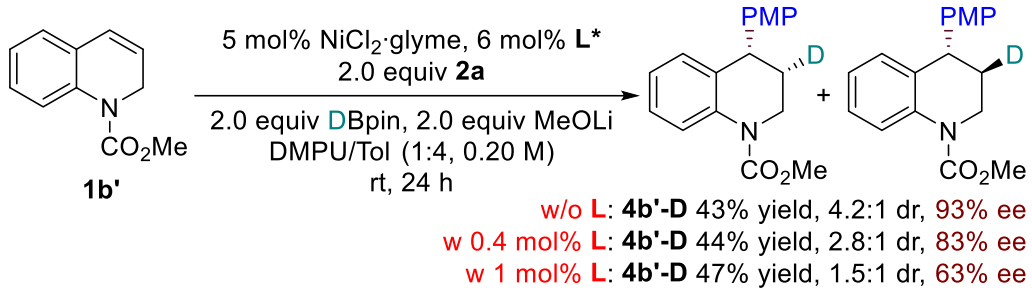
Supplementary Table 8. Olefin isomerization in the absence of aryl iodide for the enantioselective C(sp^3)−H arylation



isomer[a]	1 mol% L	6 mol% L*	1 mol% L and 6 mol% L*
Ph	12.4%	83.6%	59.6%
Ph	33.6%	3.1%	9.3%
Ph	23.4%	6.6%	14.3%
Ph	30.6%	6.7%	16.7%

[a]The ratio of **1a**, **1a**', **1a**" and **1a-H** was determined by GC and GC-MS analysis.

2.10. NiD Experiment



Methyl (*3S,4S*)-4-(4-methoxyphenyl)-3,4-dihydroquinoline-1(*2H*)-carboxylate-3-*d* (Figure 6, **4b'-D**). From **Methyl quinoline-1(*2H*)-carboxylate** (18.9 mg, 0.1 mmol), the title compound was prepared following the general procedure **A** using $NiCl_2$·glyme (1.1 mg, 5.0 mol%), **L*** (3.6 mg, 6.0 mol%), LiOMe (7.6 mg, 2.0 equiv), 4-iodoanisole (**2a**) (47.0 mg, 0.20 mmol, 2.0 equiv), DBpin (29 μL, 0.20 mmol), anhydrous toluene (0.40 mL) and DMPU (0.10 mL). The reaction mixture was stirred for 24 h at rt. The crude material was purified by flash column chromatography (0–5% EtOAc in PE) to provide the title compound as a colorless liquid in ***43% yield (13.4 mg) (w/o L)***, ***44% yield (13.6 mg) (w 0.4 mol% L)***, ***47% yield (14.5 mg) (w 1 mol% L)***.

***w/o L*:**

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.78 (d, *J* = 8.4 Hz, 1H), 7.25 – 7.19 (m, 1H), 7.06 (d, *J* = 8.7 Hz, 2H), 7.01 – 6.96 (m, 1H), 6.87 (d, *J* = 8.6 Hz, 3H), 4.09 (d, *J* = 6.0 Hz, 1H), 3.91 – 3.79 (m, 7H), 3.78 – 3.73 (m, 1H), [2.30 – 2.23 (m, 0.84H) & 2.08 – 2.01 (m, 0.20H), *due to dr*];

$[\alpha]_D^{20}$ = +33.7 (*c* = 2.0, $CHCl_3$); 93% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 13.9 min, t_R (major) = 21.5 min.

***w 0.4 mol% L*:**

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.78 (d, *J* = 8.4 Hz, 1H), 7.25 – 7.19 (m, 1H), 7.06 (d, *J* = 8.7 Hz, 2H), 7.01 – 6.96 (m, 1H), 6.87 (d, *J* = 8.6 Hz, 3H), 4.09 (d, *J* = 6.0 Hz, 1H), 3.91 – 3.79 (m, 7H), 3.78 – 3.73 (m, 1H), [2.30 – 2.23 (m, 0.72H) & 2.08 – 2.01 (m, 0.26H), *due to dr*];

$[\alpha]_D^{20}$ = +21.1 (*c* = 2.0, $CHCl_3$); 83% *ee*;

HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 13.8 min, t_R (major) = 21.3 min.

***w 1 mol% L*:**

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.78 (d, *J* = 8.4 Hz, 1H), 7.25 – 7.19 (m, 1H), 7.06 (d, *J* = 8.7 Hz, 2H), 7.01 – 6.96 (m, 1H), 6.87 (d, *J* = 8.6 Hz, 3H), 4.09 (d, *J* = 6.0 Hz, 1H), 3.91 – 3.79 (m, 7H), 3.78 – 3.73 (m, 1H), [2.30 – 2.23 (m, 0.61H) & 2.08 – 2.01 (m, 0.41H), *due to dr*];

$[\alpha]_D^{20}$ = +9.9 (*c* = 2.0, $CHCl_3$); 63% *ee*;

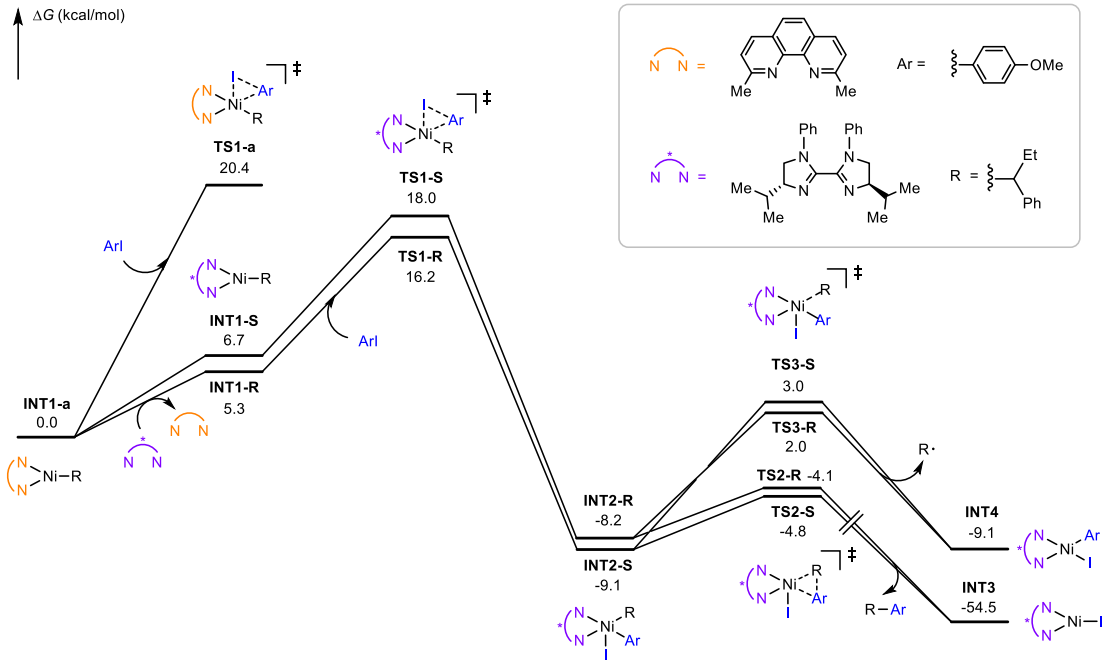
HPLC analysis CHIRALCEL OJ-H column, 20% ^{i}PrOH in hexane, 1.0 mL/min, 220 nm UV detector, t_R (minor) = 13.9 min, t_R (major) = 21.5 min.

2.11. Computational Study

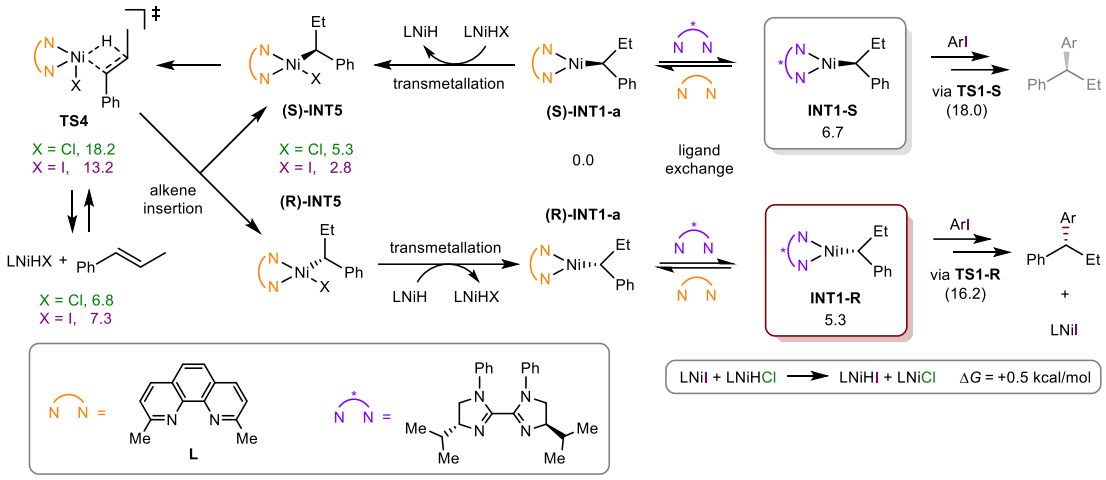
Computational details

All calculations were performed with Gaussian 09 program[3]. Geometry optimizations were performed using (U)B3LYP functionals[4,5], and LANL2DZ pseudo-potential[6,7] was set for Ni and I atoms and 6-31G(d) basis set for all the other atoms. After optimization, frequency calculations were subsequently performed to confirm that all stationary points had correct number of imaginary frequencies (zero for minima and one for transition

states) and to provide thermodynamic corrections at 298 K, 1 atm. For all transition states, Intrinsic Reaction Coordinate (IRC)[8] were calculated to confirm that they indeed connected between correct minima. Single-point energies of optimized structures were calculated using (U)M06 functionals[9] with SDD[10,11] for Ni and I atoms and 6-311+G(d,p) for all the other atoms. SMD solvation model[12] was used in single-point energy calculations to consider solvent effect, while dichloromethane (ε = 8.93) was set as implicit solvent to fit the polarity of the mixed solvent in experiments (DMPU [ε = 36.12][13]: toluene [ε = 2.37] = 1:4). The final Gibbs free energy was calculated as the sum of Gibbs free energy correction (from frequency calculation) and the single point energy in solution. For each species, extensive conformational search was done and the reported value is from the conformer with the lowest Gibbs free energy. See supplementary data 1 for detailed energies and atom coordinates for all computed species.

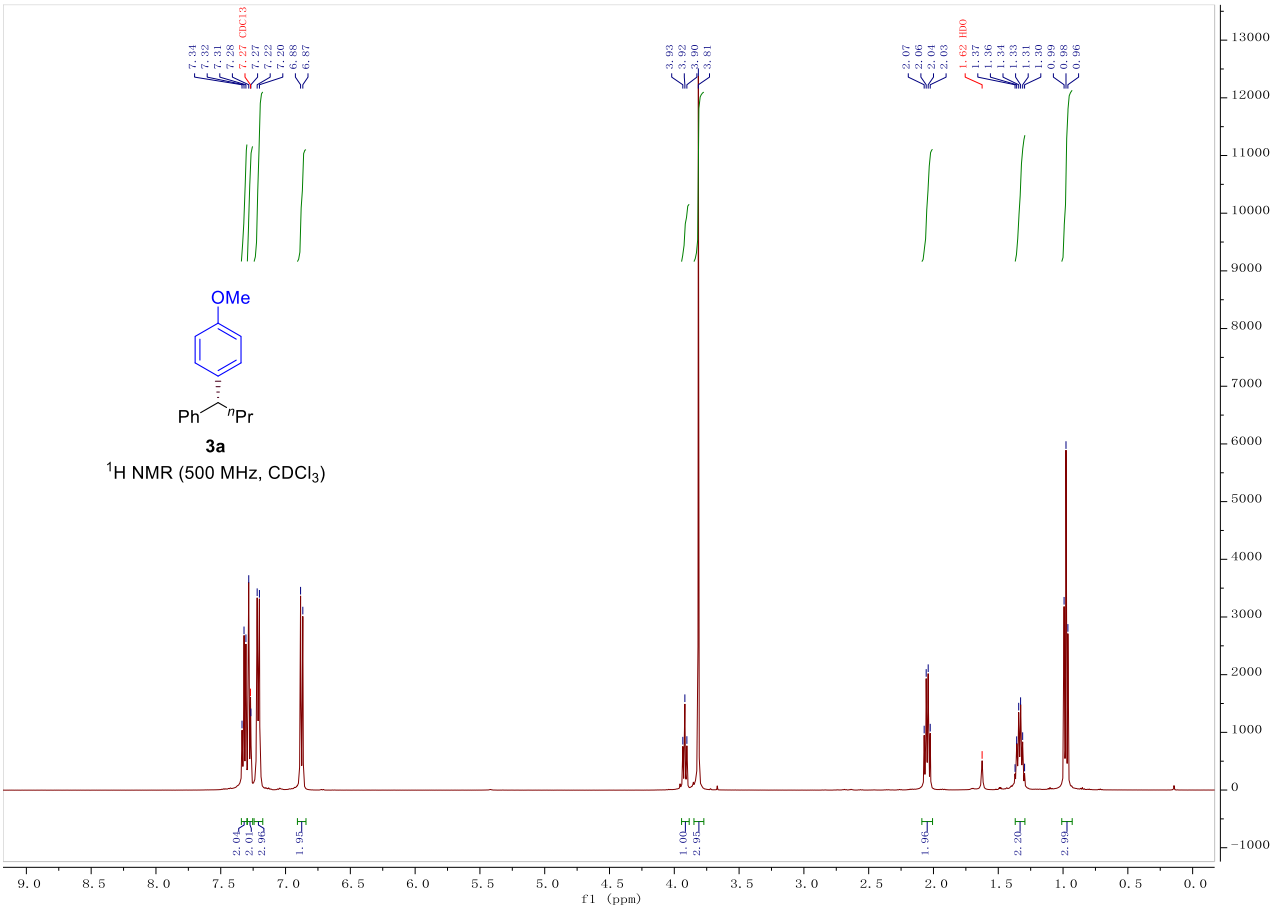


Supplementary Fig 4. Potential energy surface of multi-ligand enabled asymmetric arylation. Computed at SMD(DCM)-(U)M06/6-311+G(d,p)[SDD for Ni and I]//(U)B3LYP/6-31G(d)[LANL2DZ for Ni and I]. Values are relative Gibbs free energies in kcal/mol.

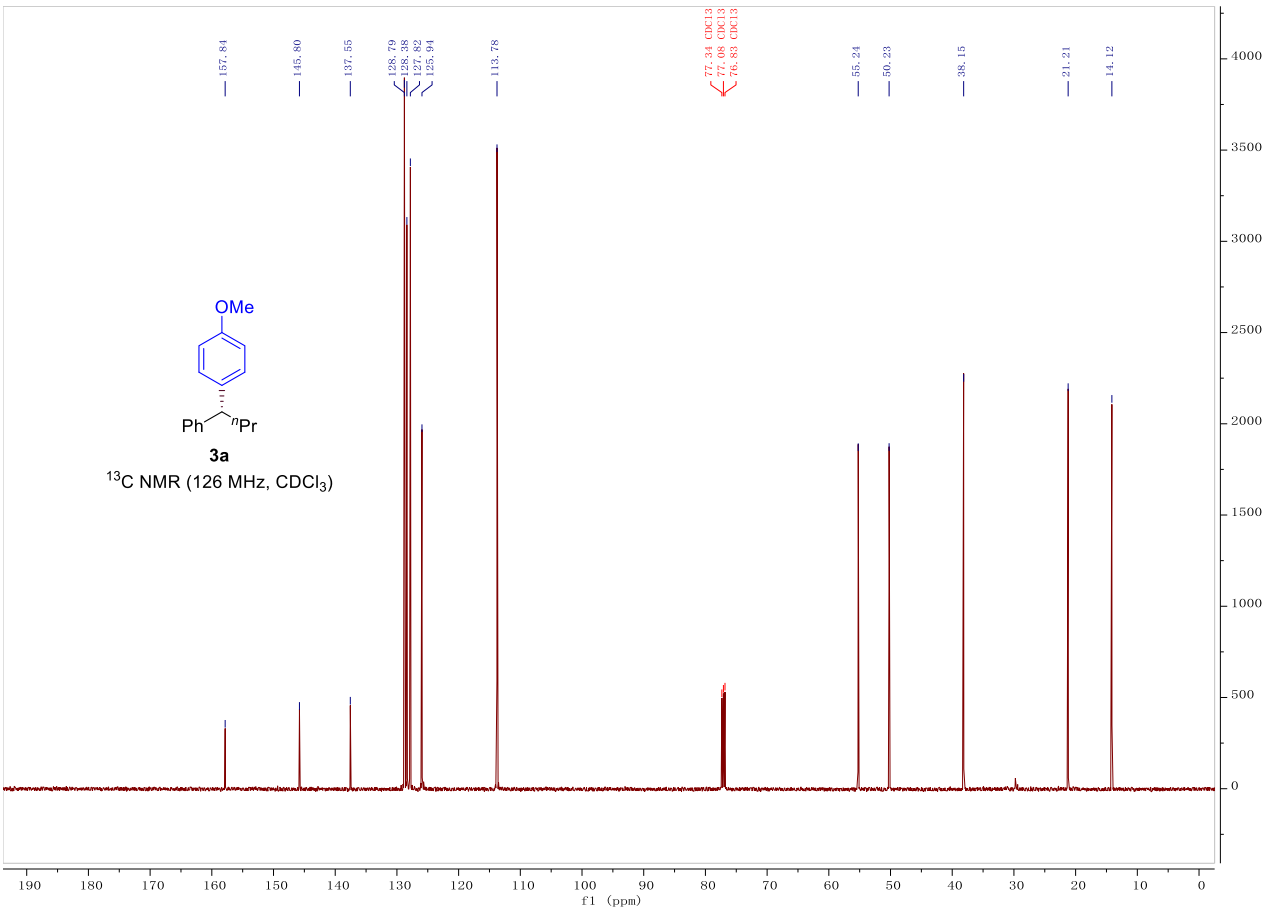


Supplementary Fig 5. Conversion of **INT1-S** to **INT1-R** via a reversible ligand exchange, transmetallation and alkene insertion process. Computed at SMD(DCM)-(U)M06/6-311+G(d,p)[SDD for Ni and I]//(U)B3LYP/6-31G(d)[LANL2DZ for Ni and I]. Values are relative Gibbs free energies in kcal/mol. When X = Cl (from $NiCl_2$), the interconversion needs an activation free energy of 18.2 kcal/mol, which is very close to that of the undesired oxidative addition via **TS1-S** (18.0 kcal/mol). However, as the reaction proceeds, LNiI generates, which can undergo the exchange reaction with LNiHCl to give LNiHI. This process is approximately neutral in energy (+0.5 kcal/mol). When X = I, the barrier for the interconversion is lowered to 13.2 kcal/mol, ensuring a fast conversion of **INT1-S** to **INT1-R**.

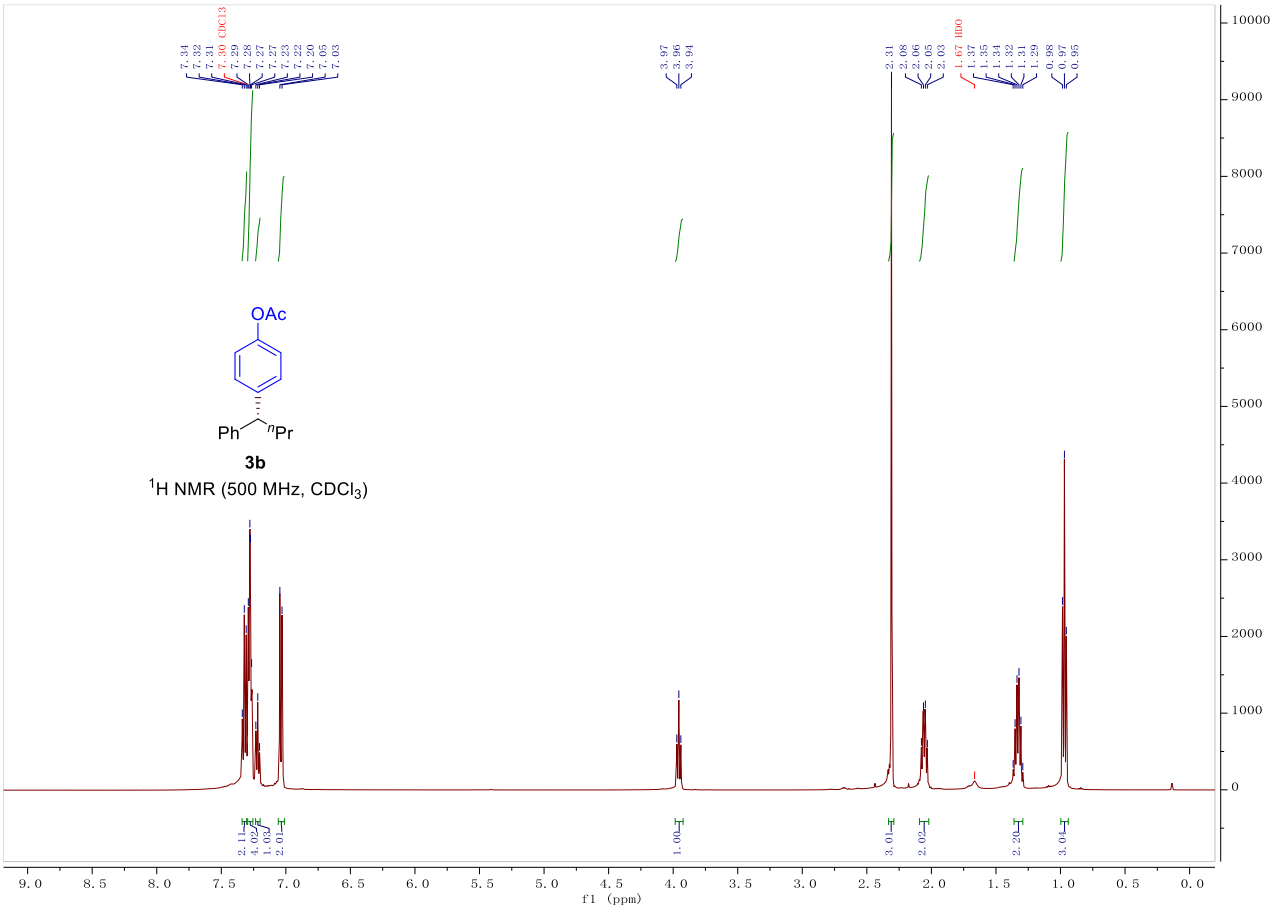
2.12. Spectroscopic Data (NMR Spectrum)



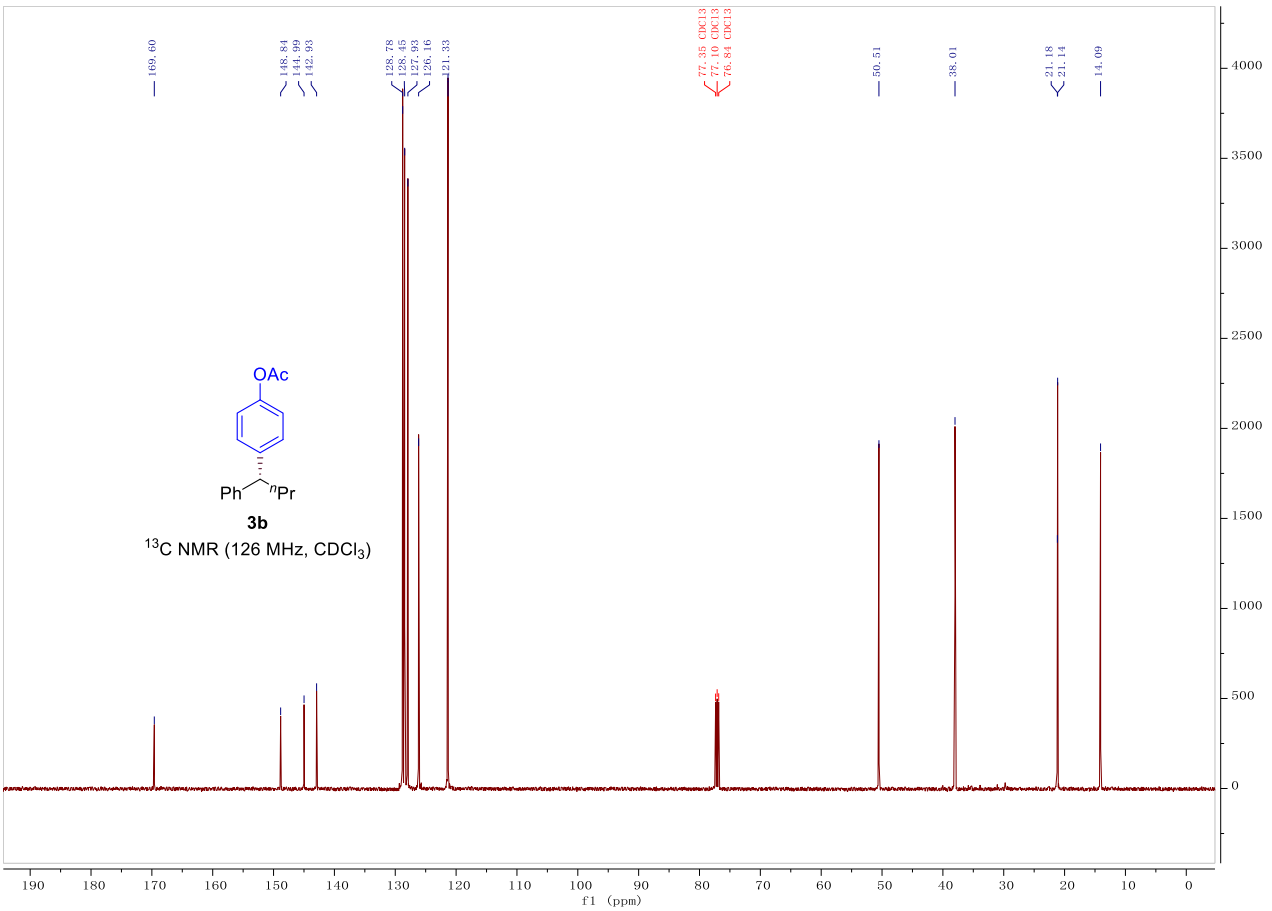
Supplementary Fig. 6. ^{1}H NMR of compound **3a**



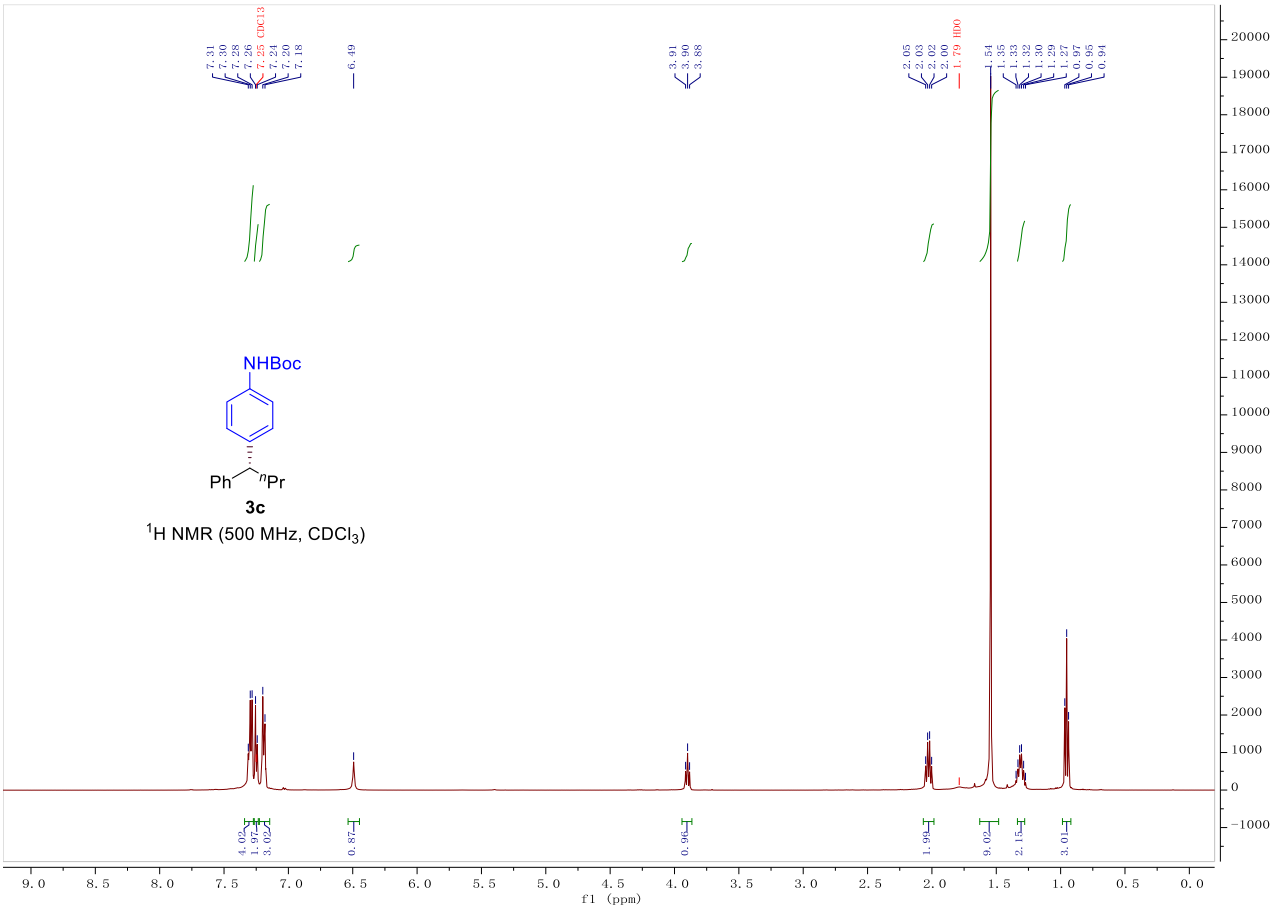
Supplementary Fig. 7. ^{13}C NMR of compound **3a**



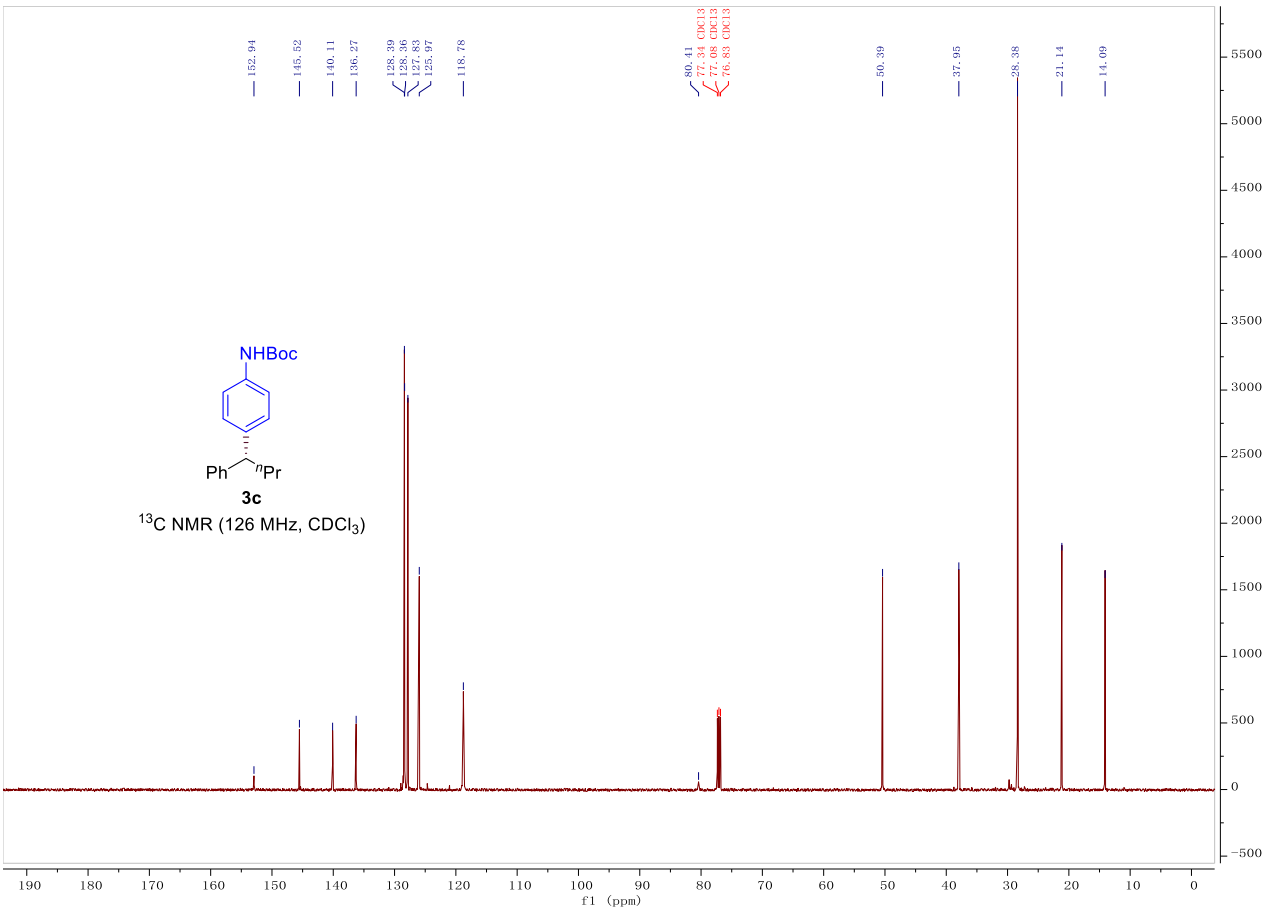
Supplementary Fig. 8. ^{1}H NMR of compound **3b**



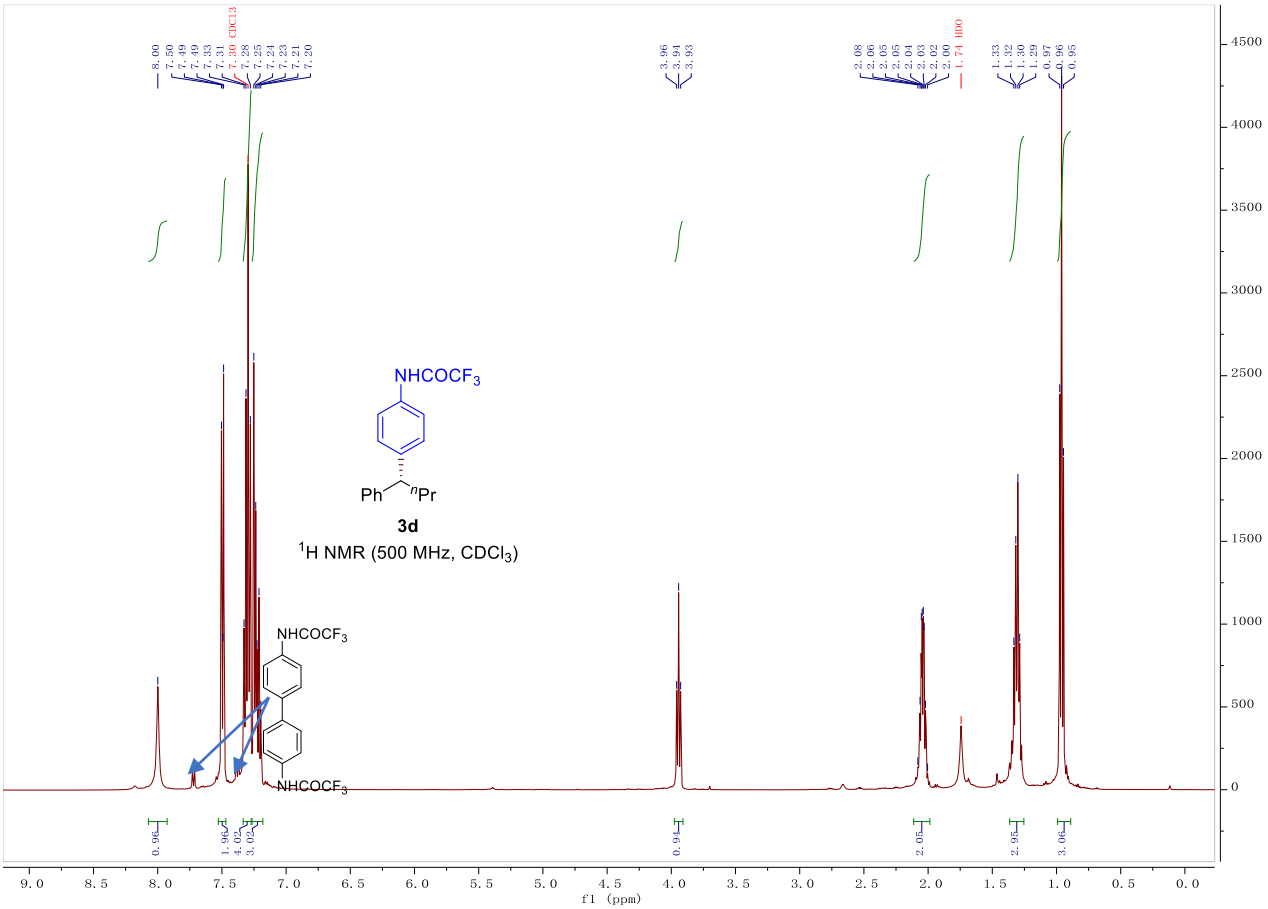
Supplementary Fig. 9. ^{13}C NMR of compound **3b**



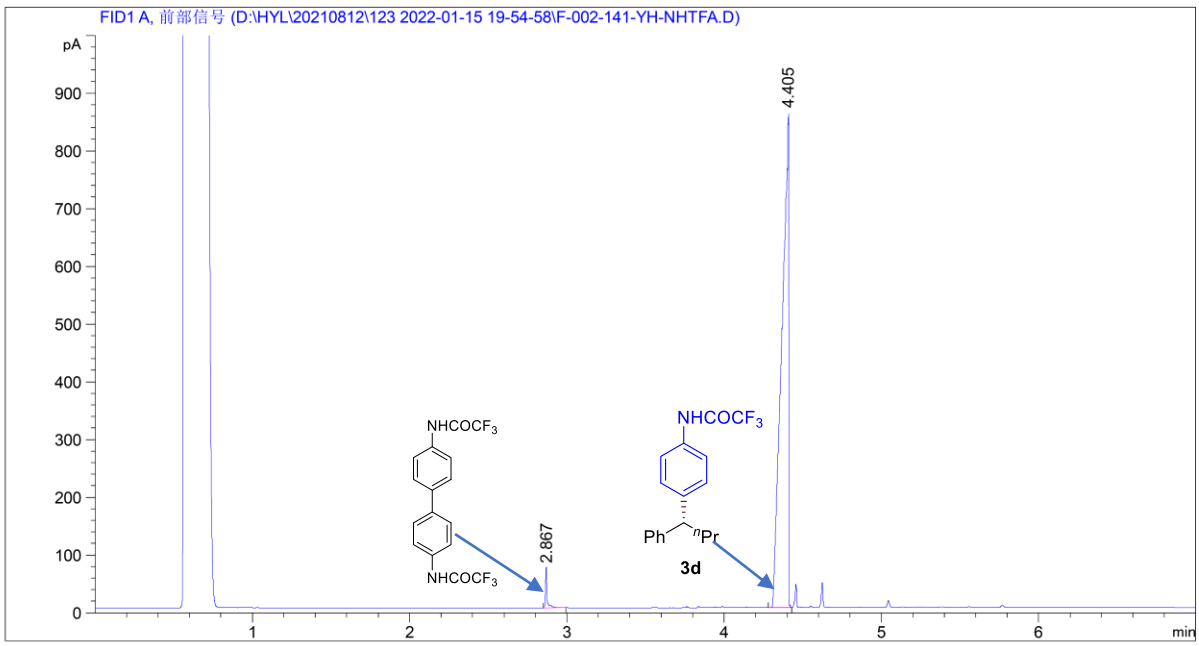
Supplementary Fig. 10. ^{1}H NMR of compound **3c**



Supplementary Fig. 11. ^{13}C NMR of compound **3c**

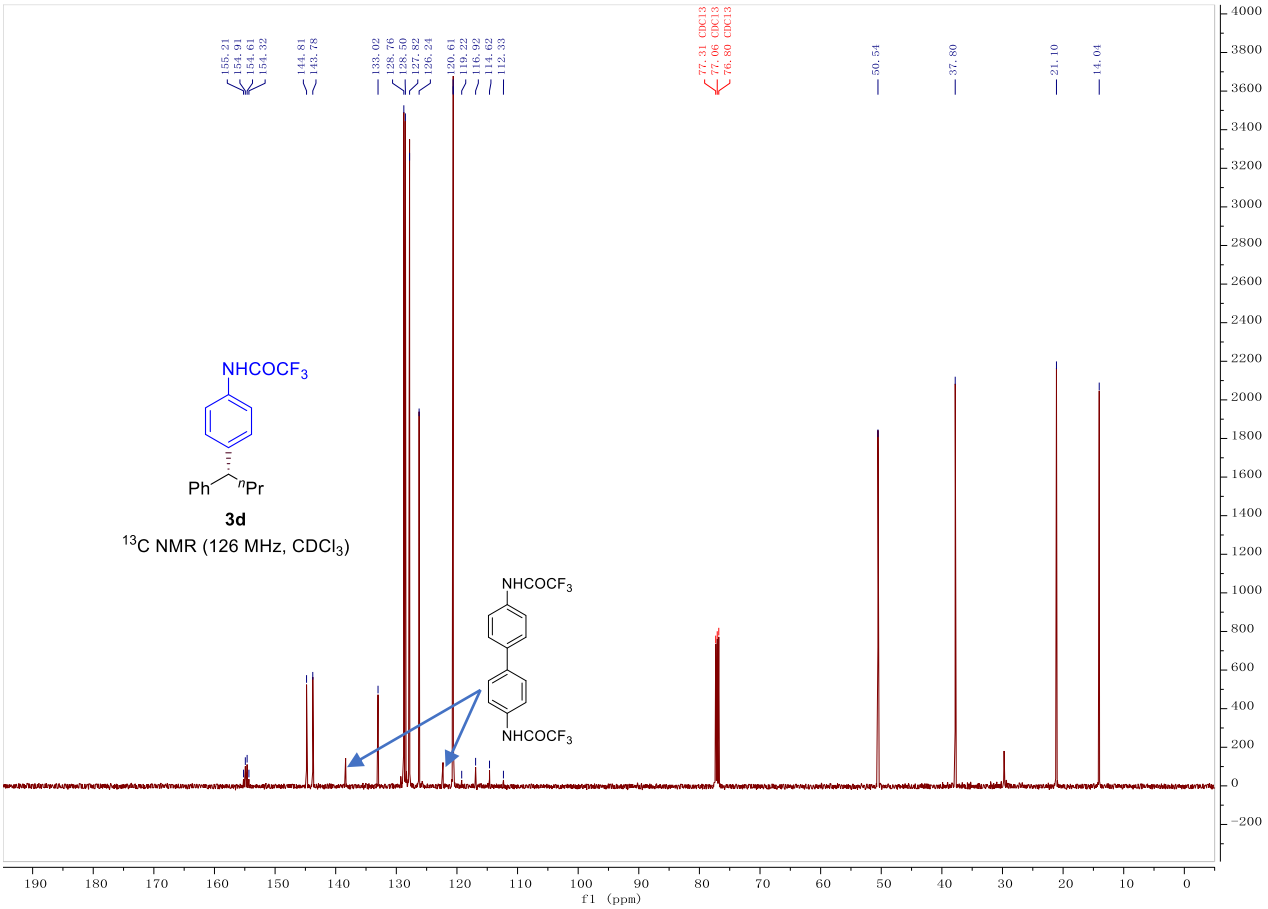


Supplementary Fig. 12. ^{1}H NMR of compound **3d**

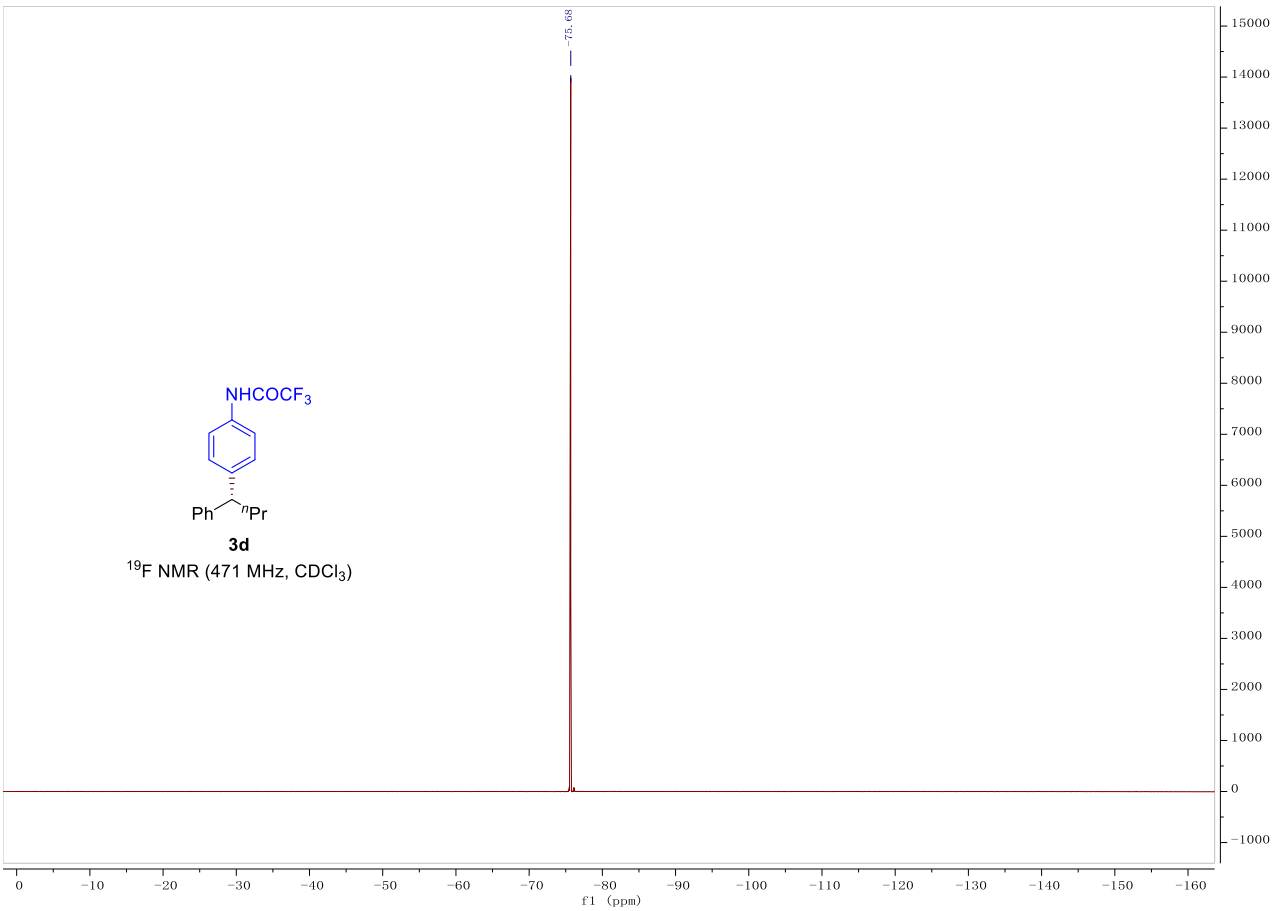


Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	2.867	BB	0.0115	49.50231	69.88297	1.85979
2	4.405	BV	0.0379	2612.21851	857.58795	98.14021

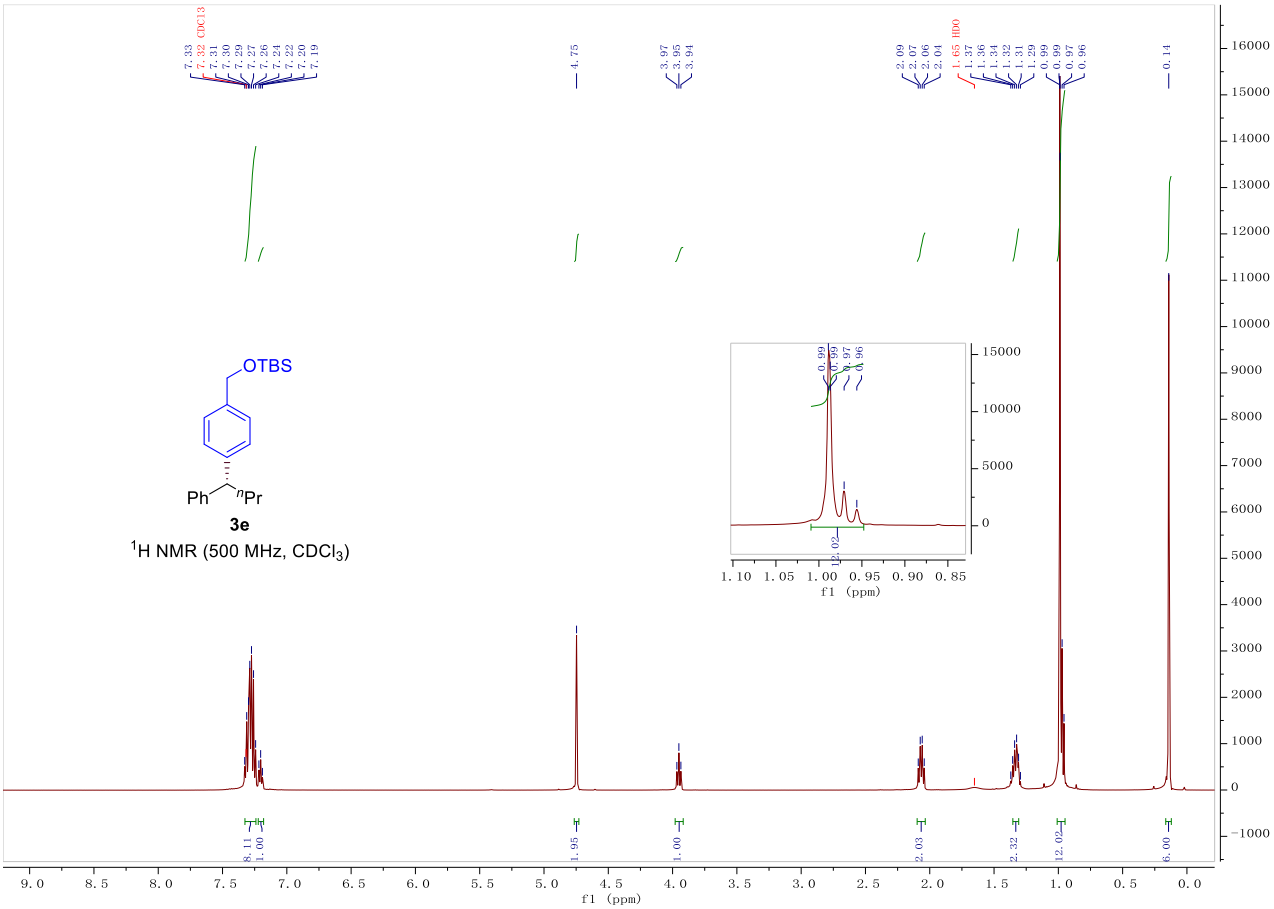
Supplementary Fig. 13. GC trace of compound **3d**



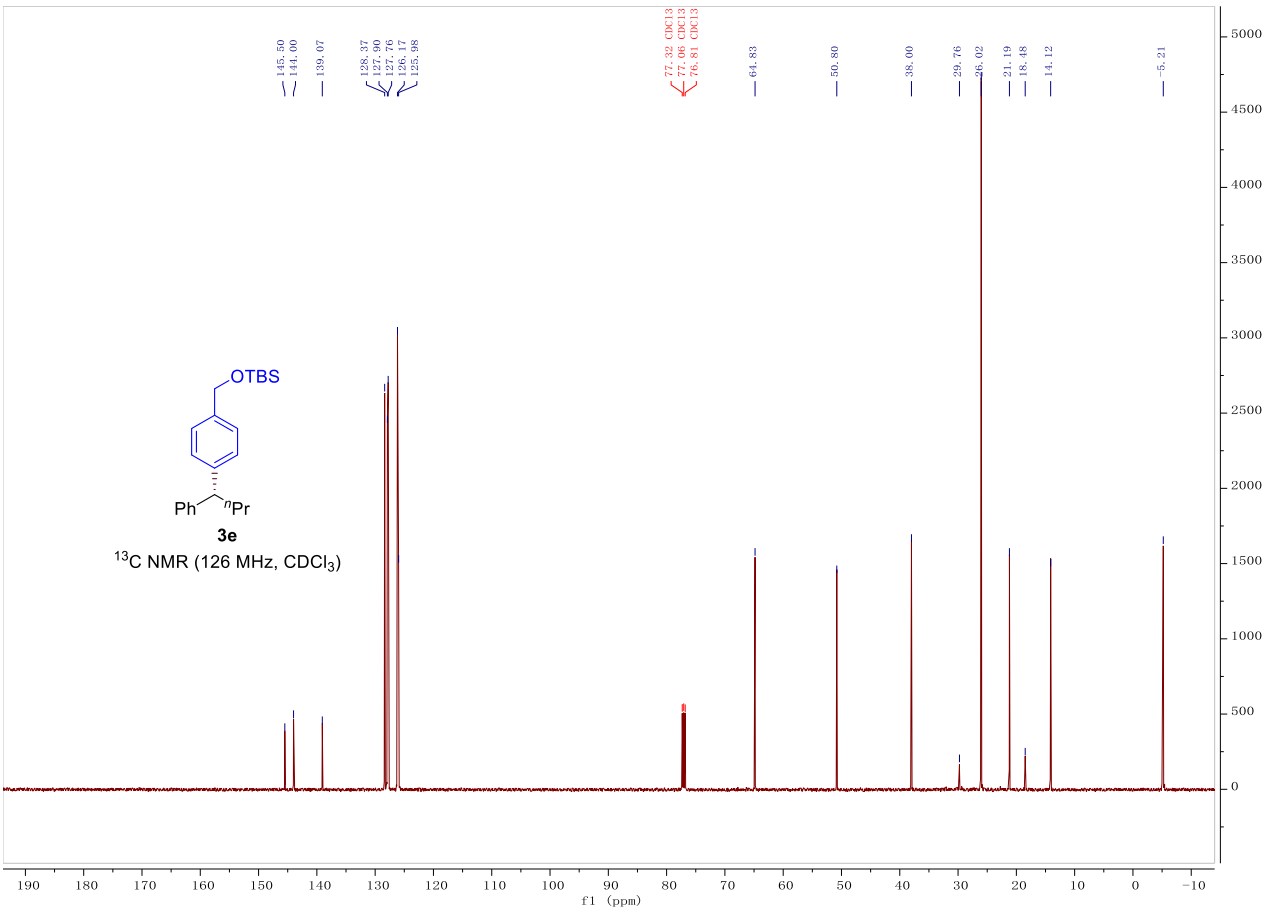
Supplementary Fig. 14. ^{3}C NMR of compound **3d**



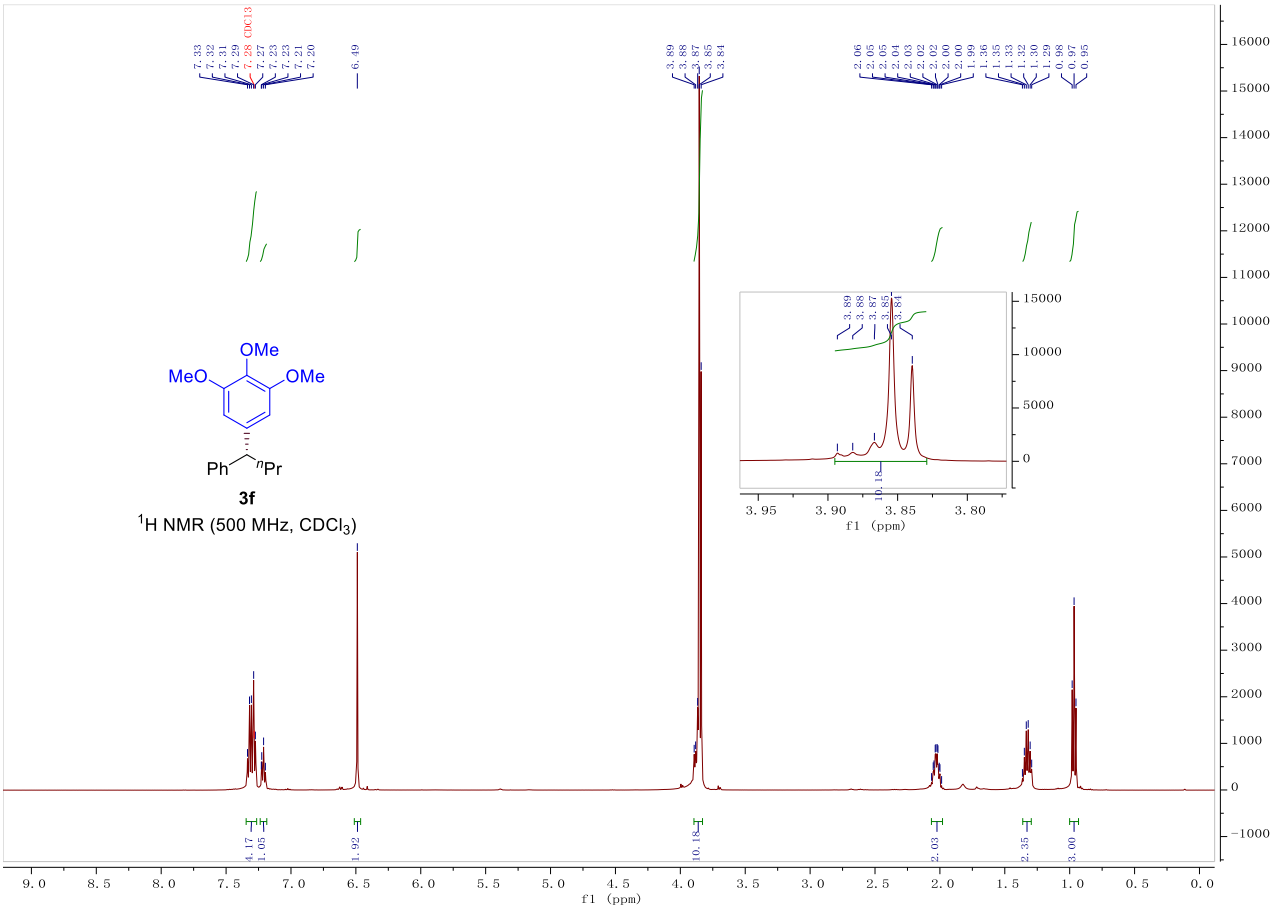
Supplementary Fig. 15. ^{19}F NMR of compound **3d**



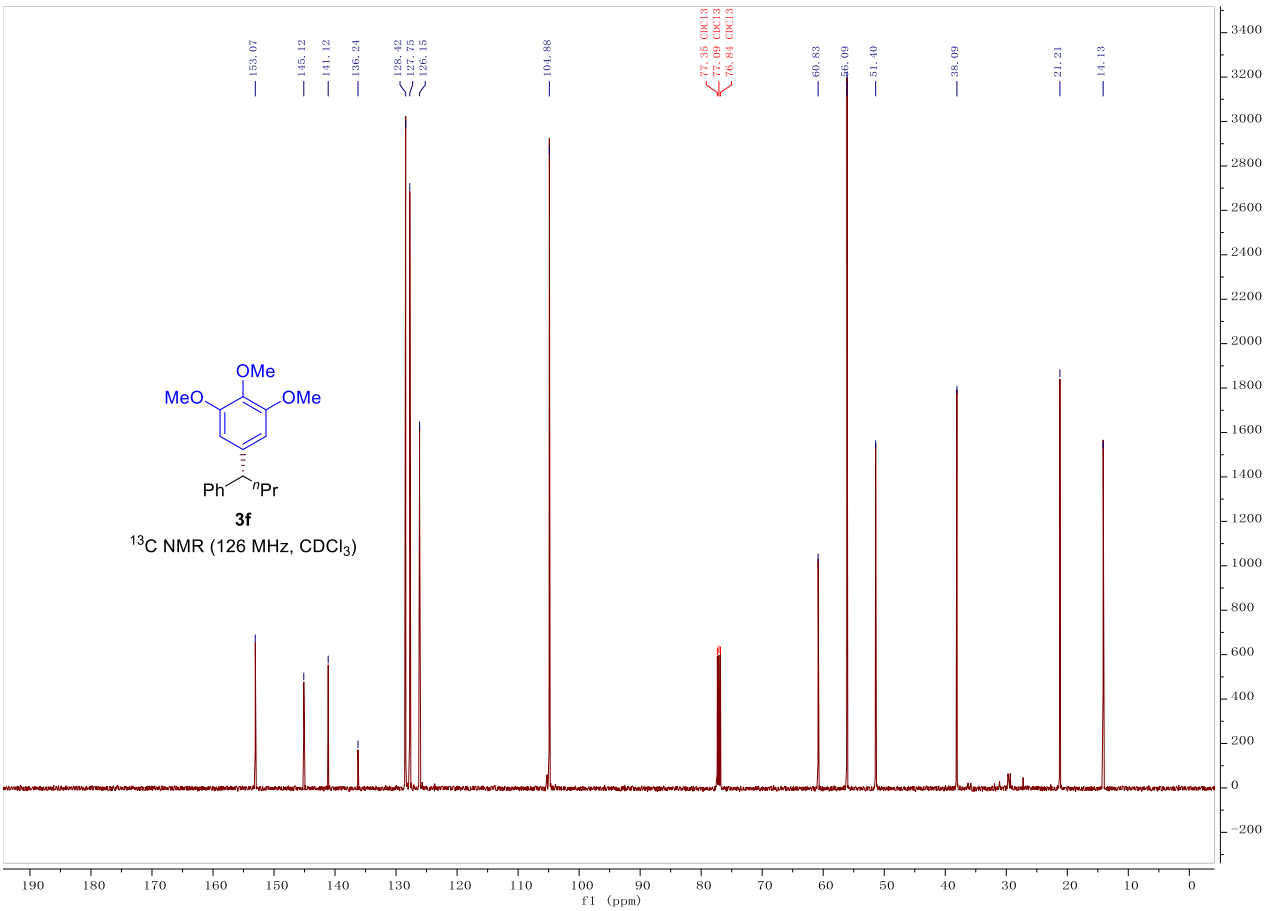
Supplementary Fig. 16. ^{1}H NMR of compound **3e**



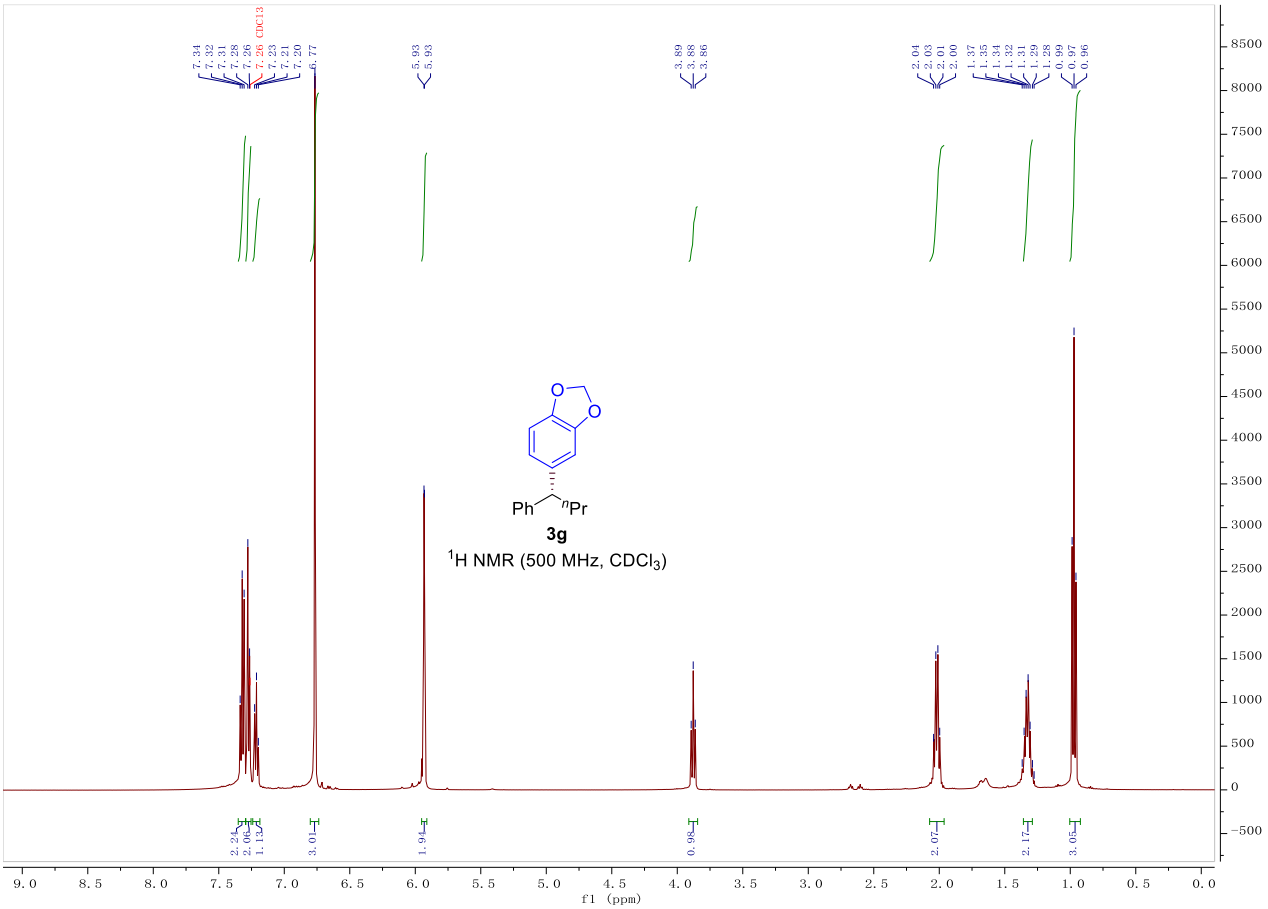
Supplementary Fig. 17. ^{13}C NMR of compound **3e**



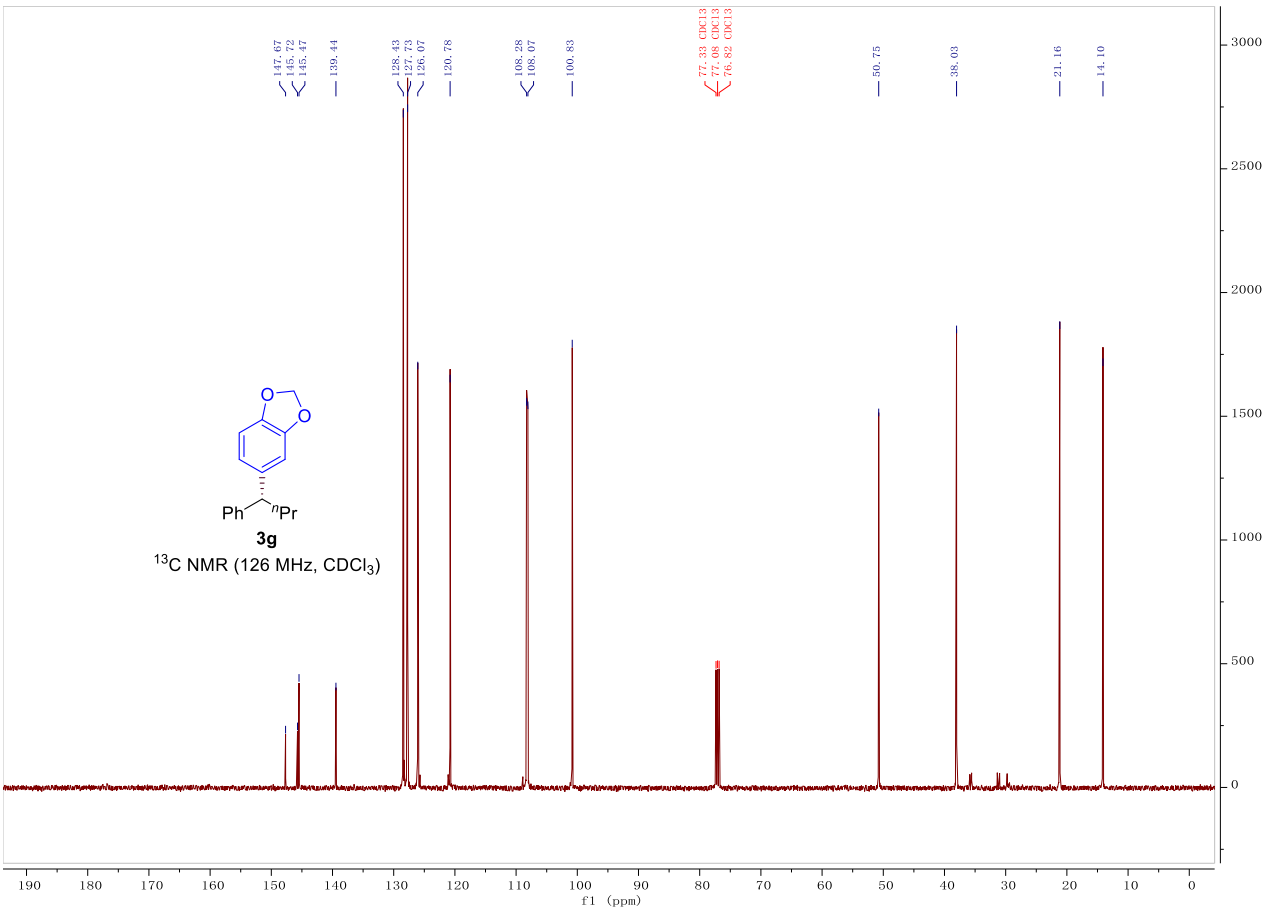
Supplementary Fig. 18. ^{1}H NMR of compound **3f**



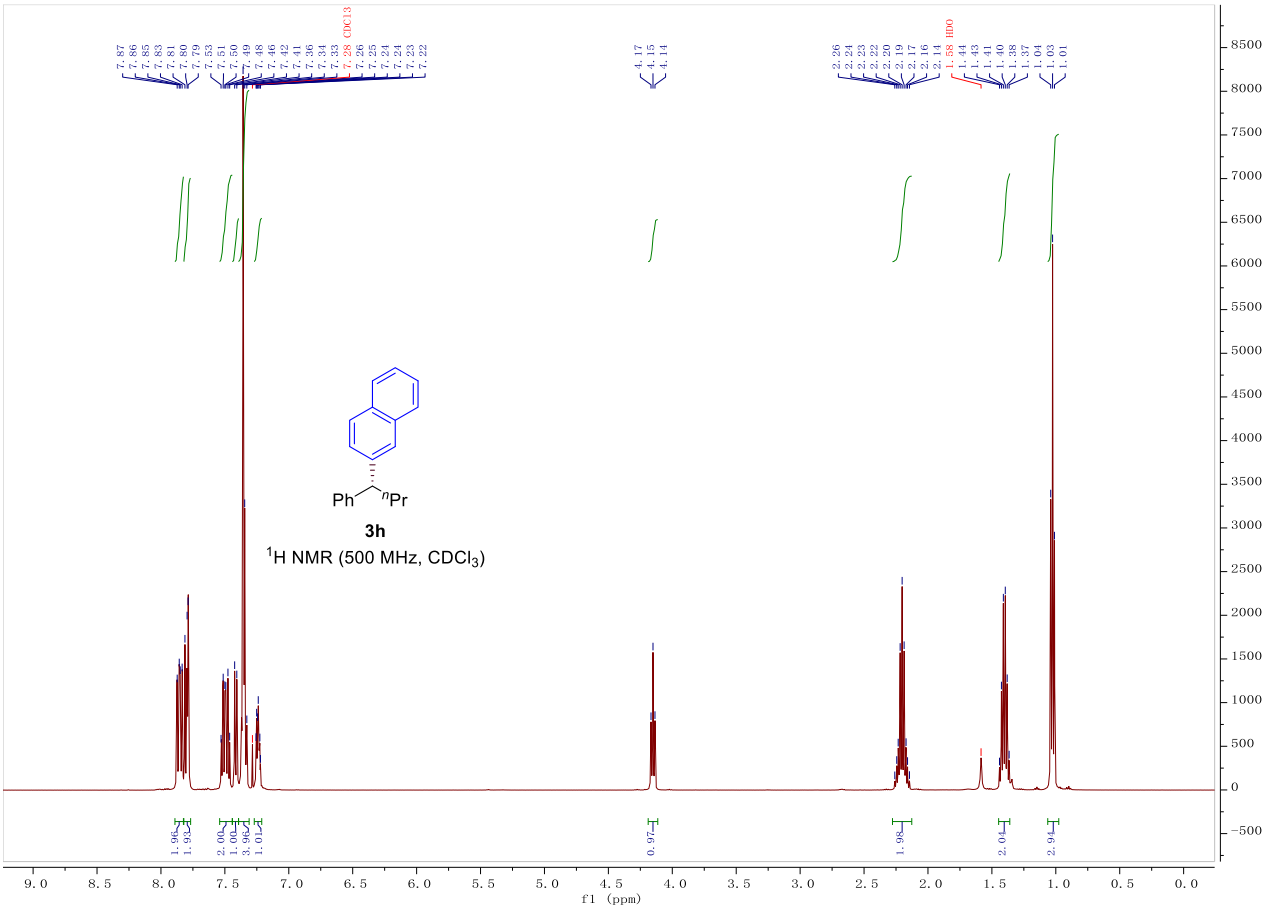
Supplementary Fig. 19. ^{13}C NMR of compound **3f**



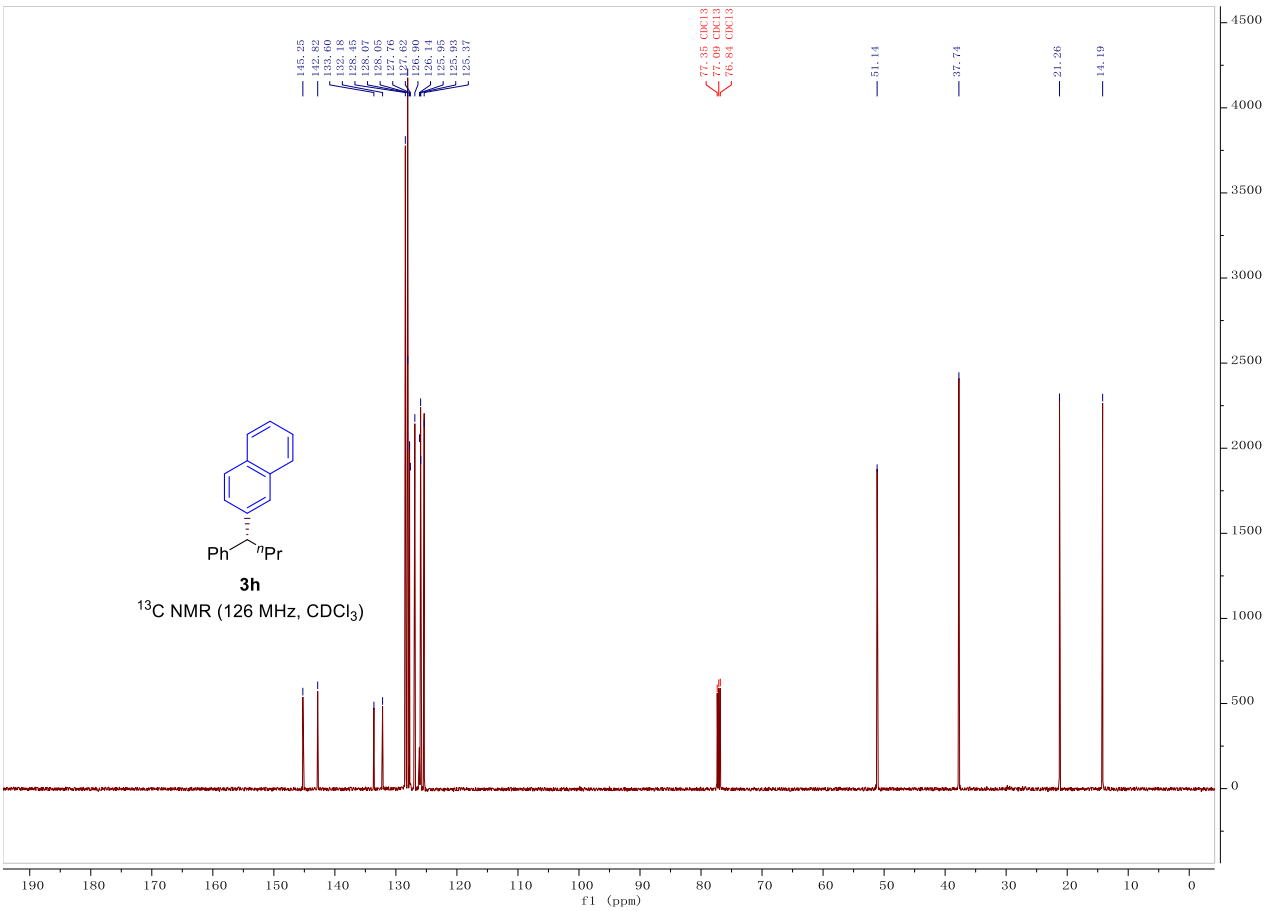
Supplementary Fig. 20. ^{1}H NMR of compound **3g**



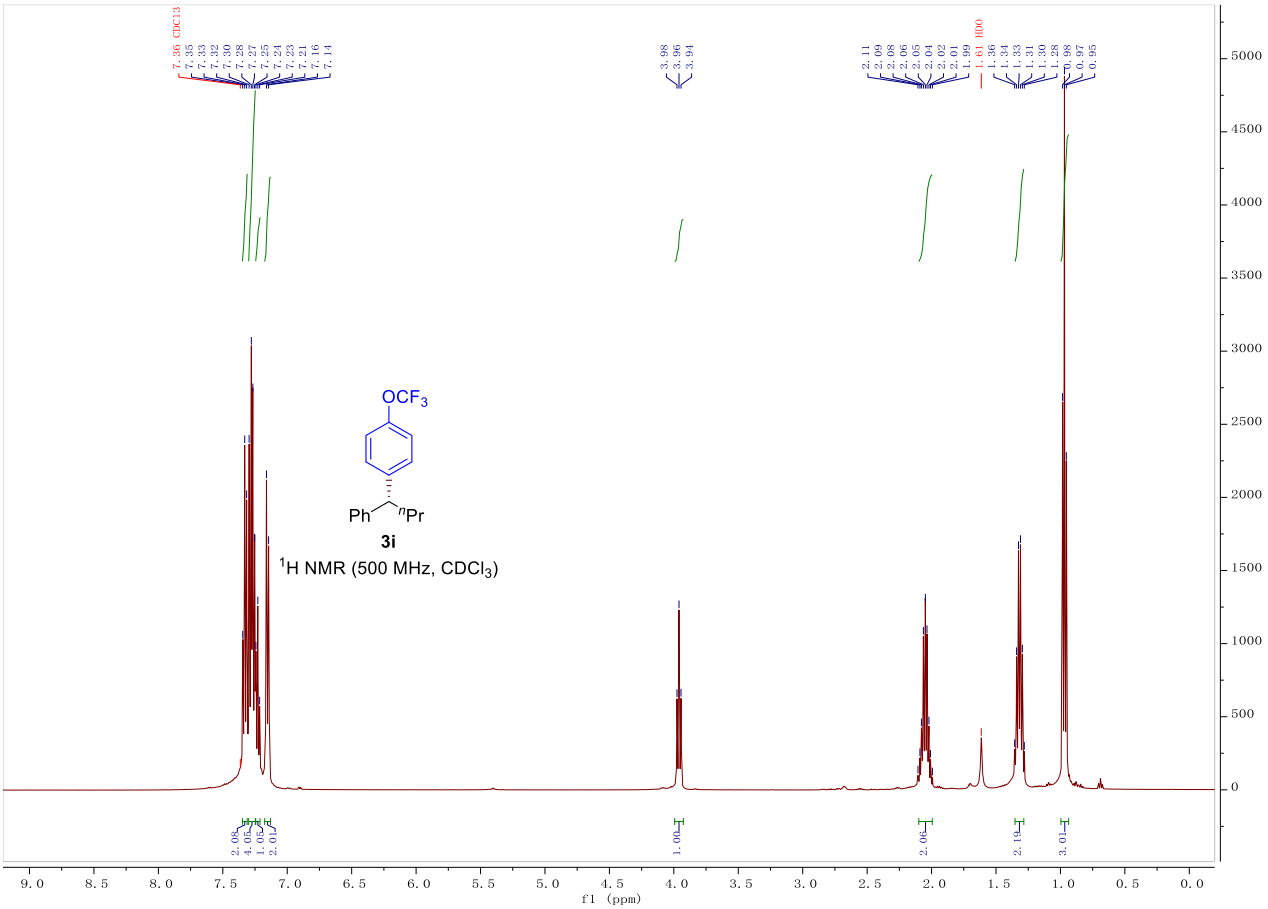
Supplementary Fig. 21. ^{13}C NMR of compound **3g**



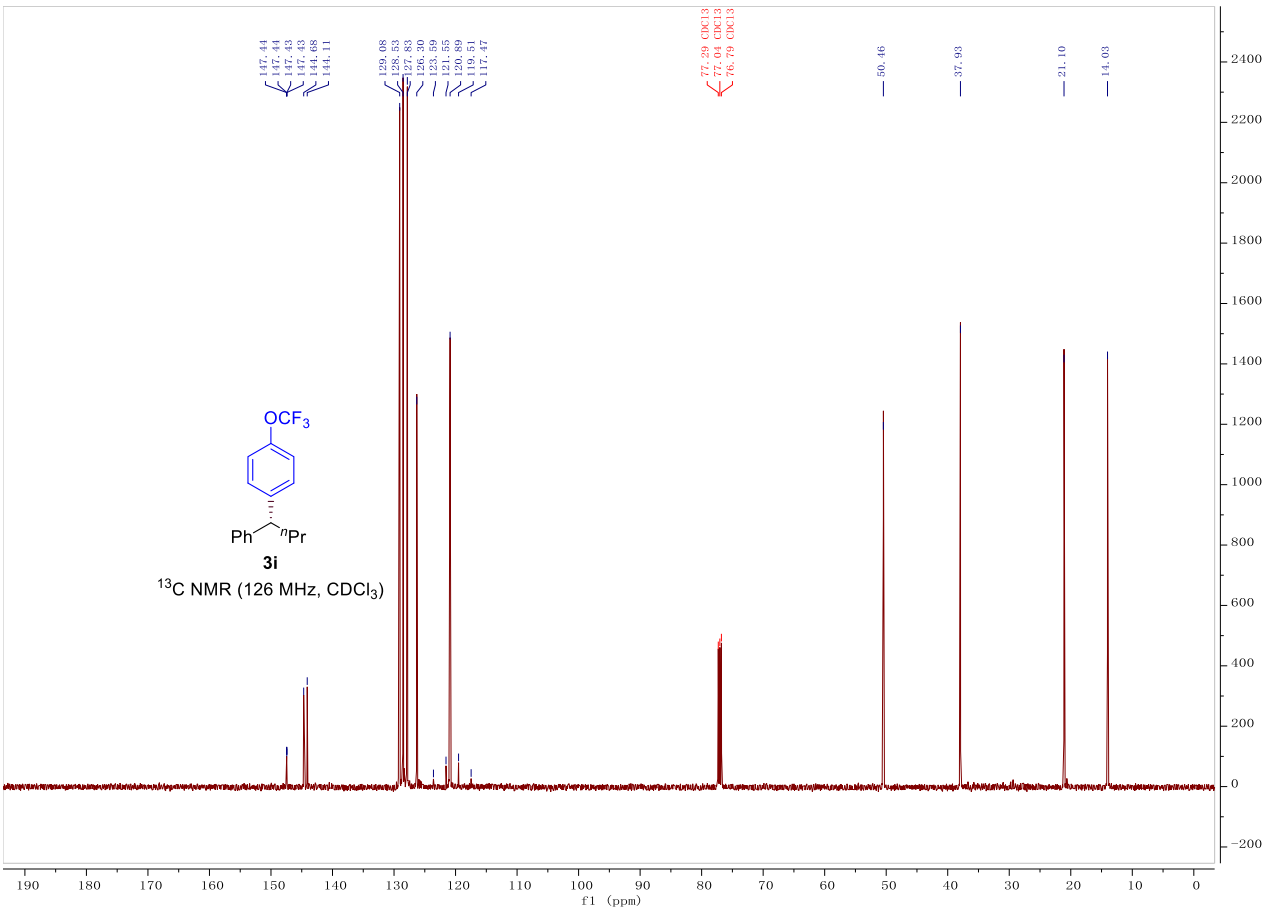
Supplementary Fig. 22. ^{1}H NMR of compound **3h**



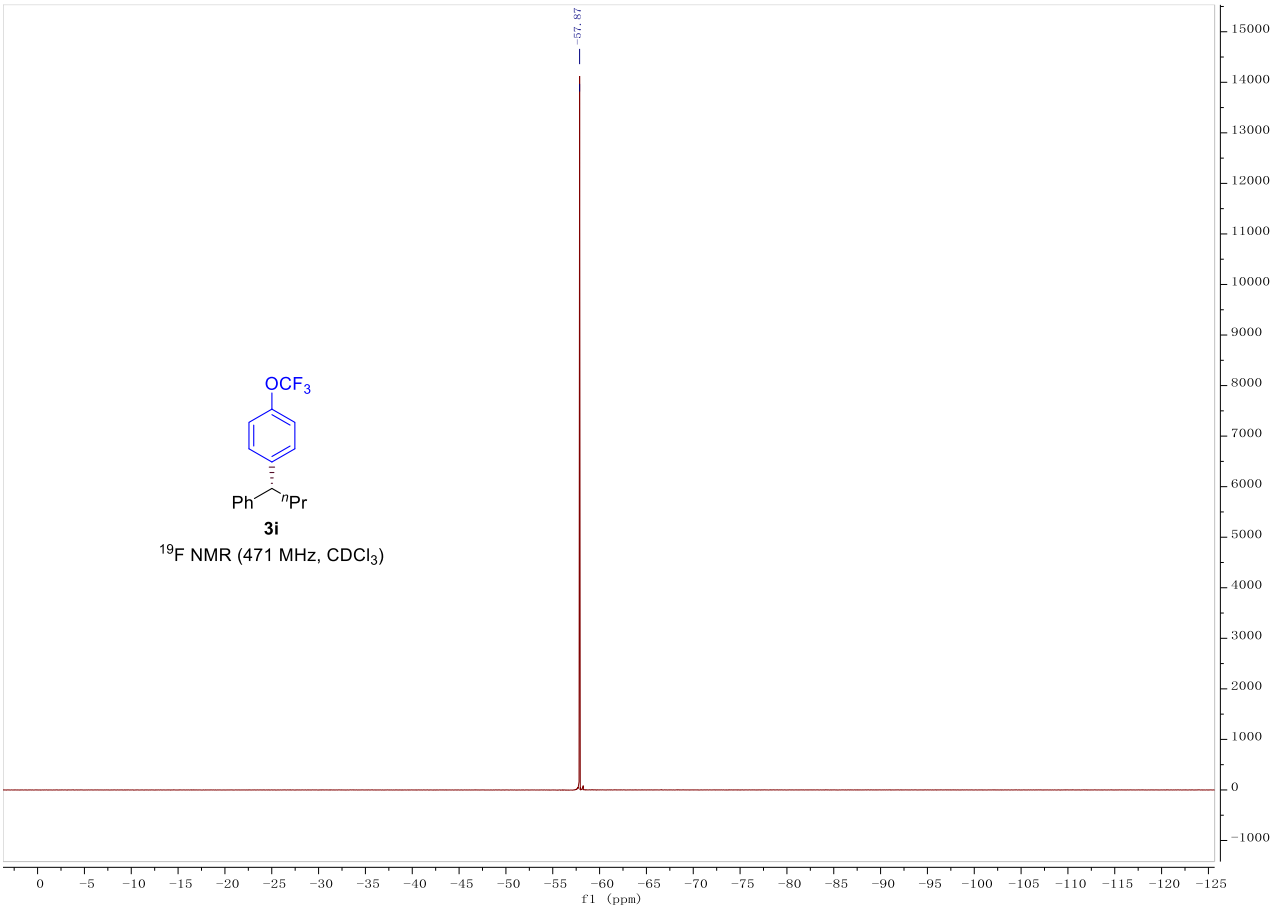
Supplementary Fig. 23. ^{13}C NMR of compound **3h**



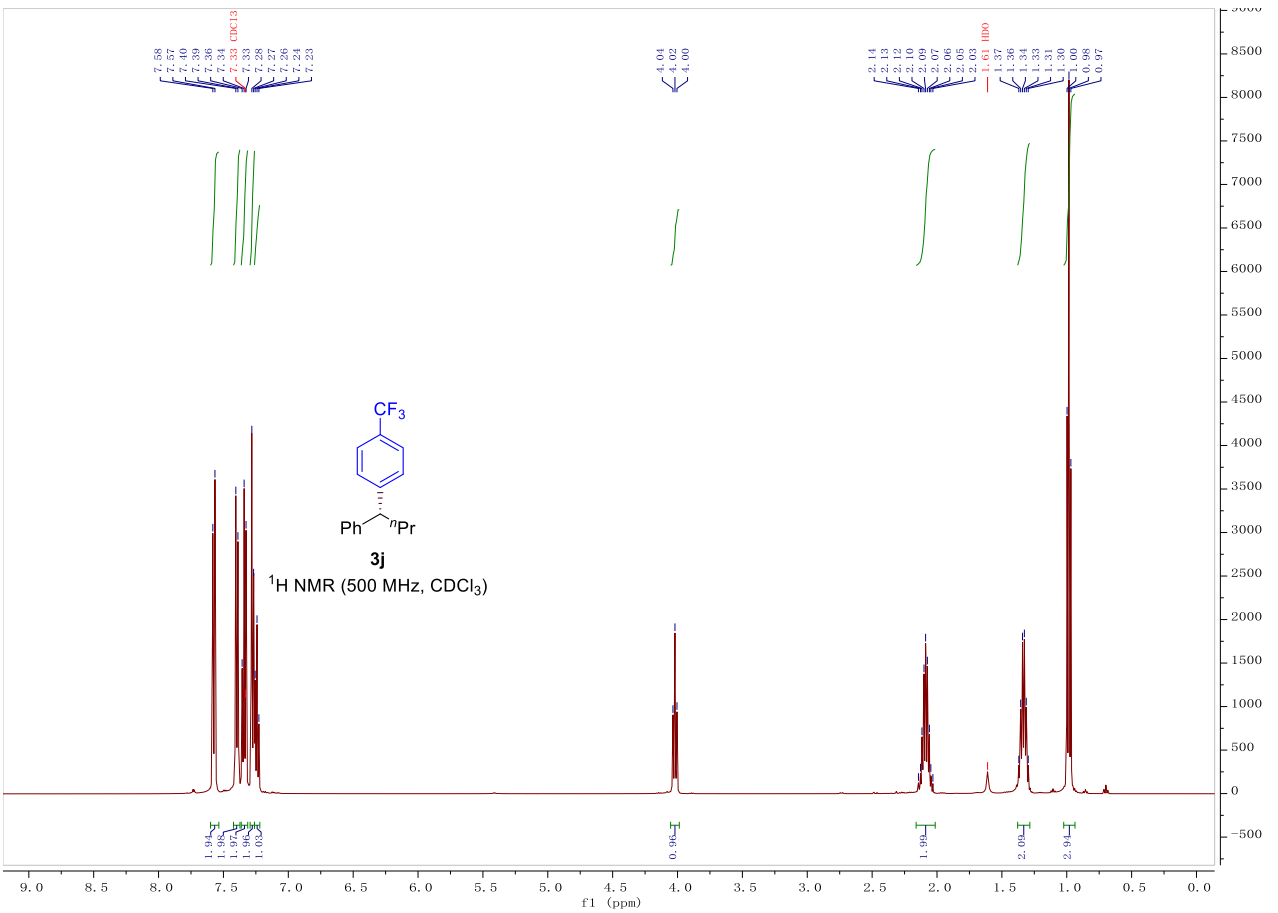
Supplementary Fig. 24. ^{1}H NMR of compound **3i**



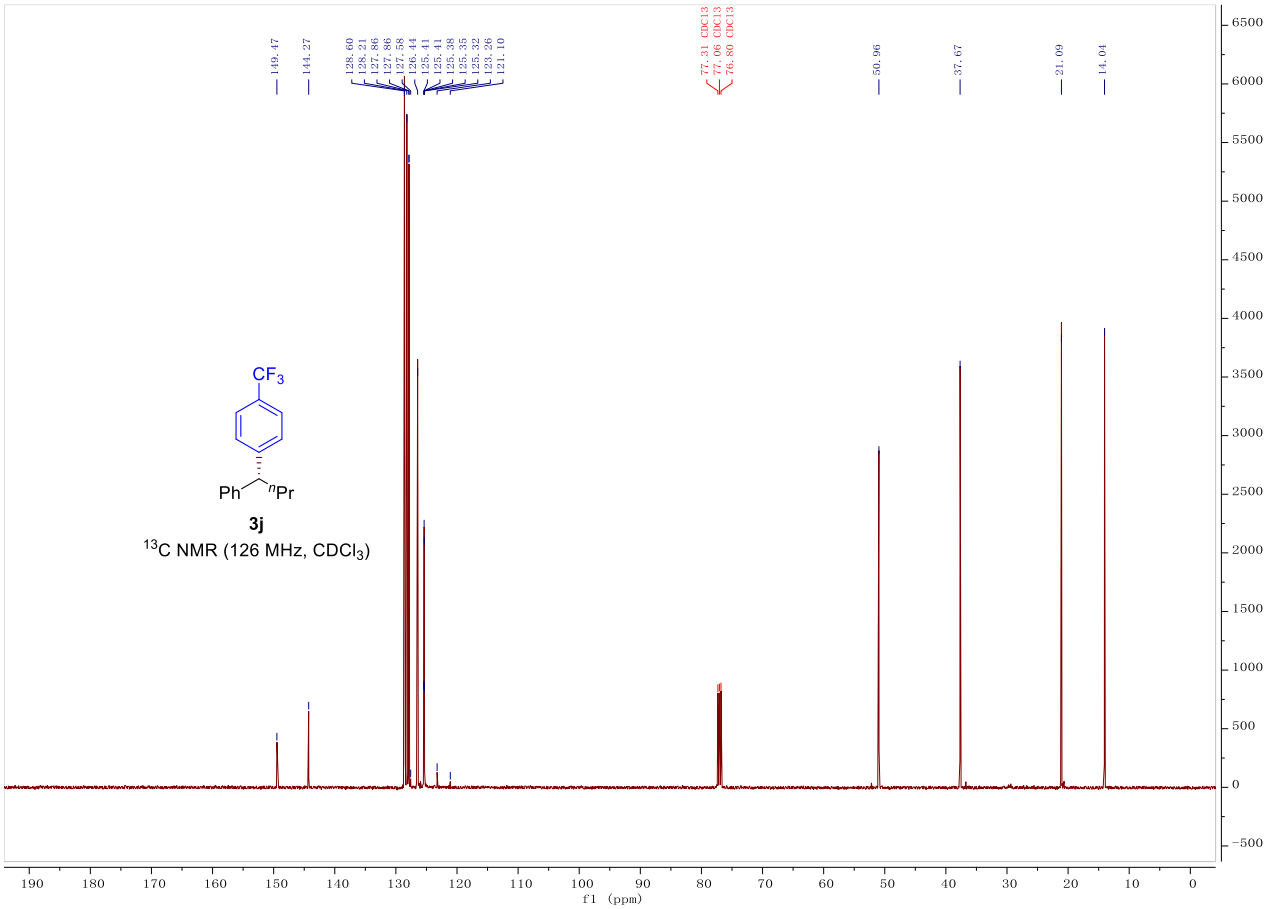
Supplementary Fig. 25. ^{13}C NMR of compound **3i**



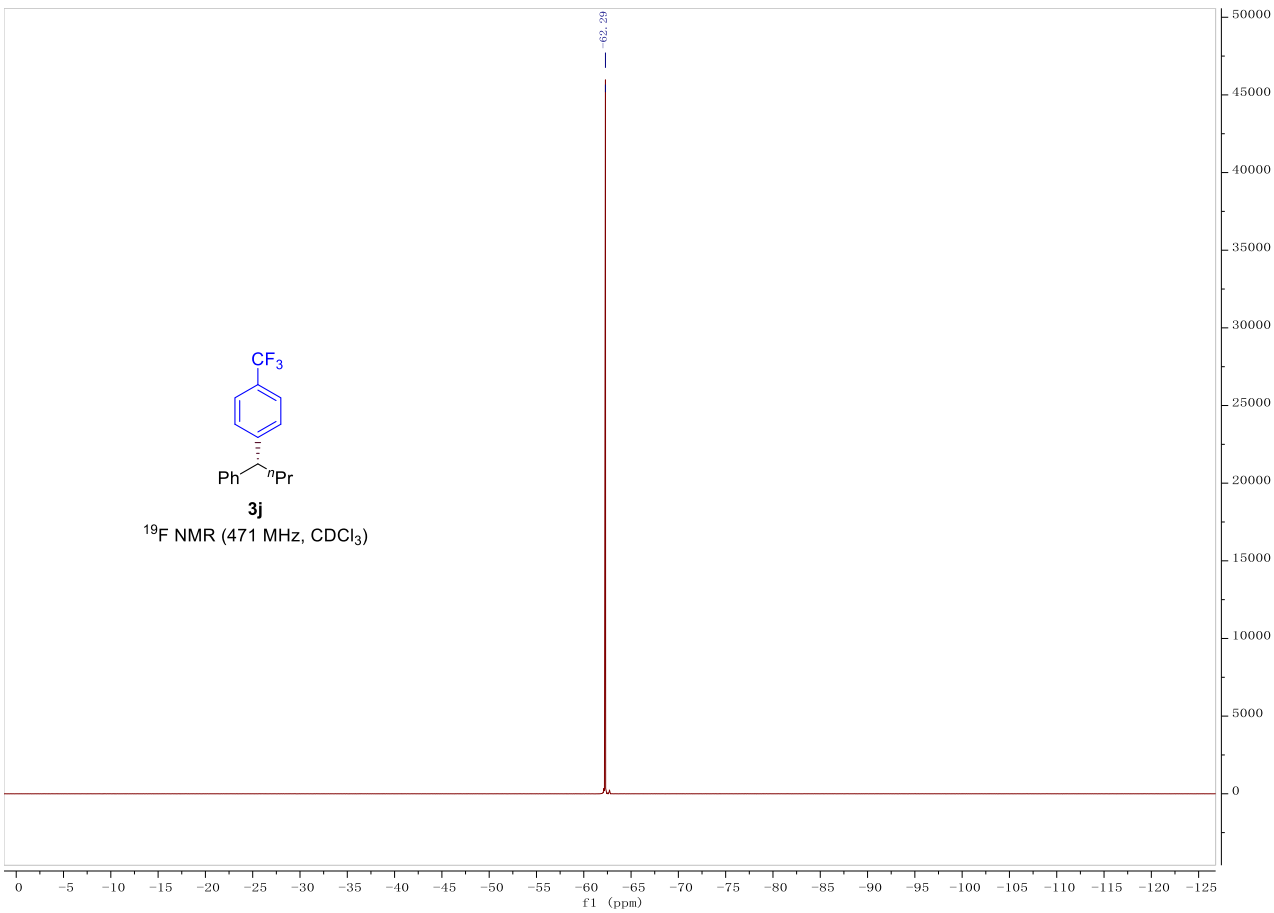
Supplementary Fig. 26. ^{19}F NMR of compound **3i**



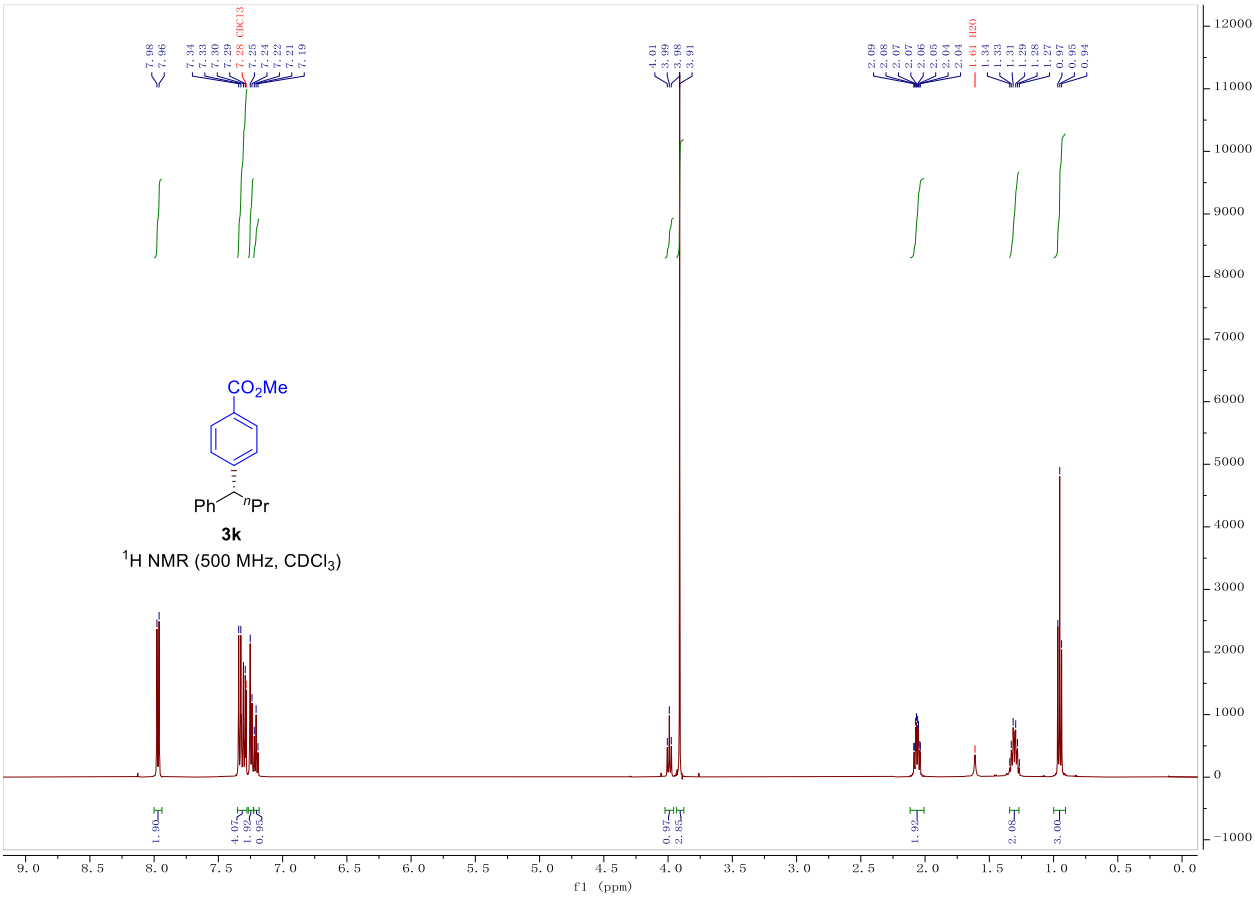
Supplementary Fig. 27. ^{1}H NMR of compound **3j**



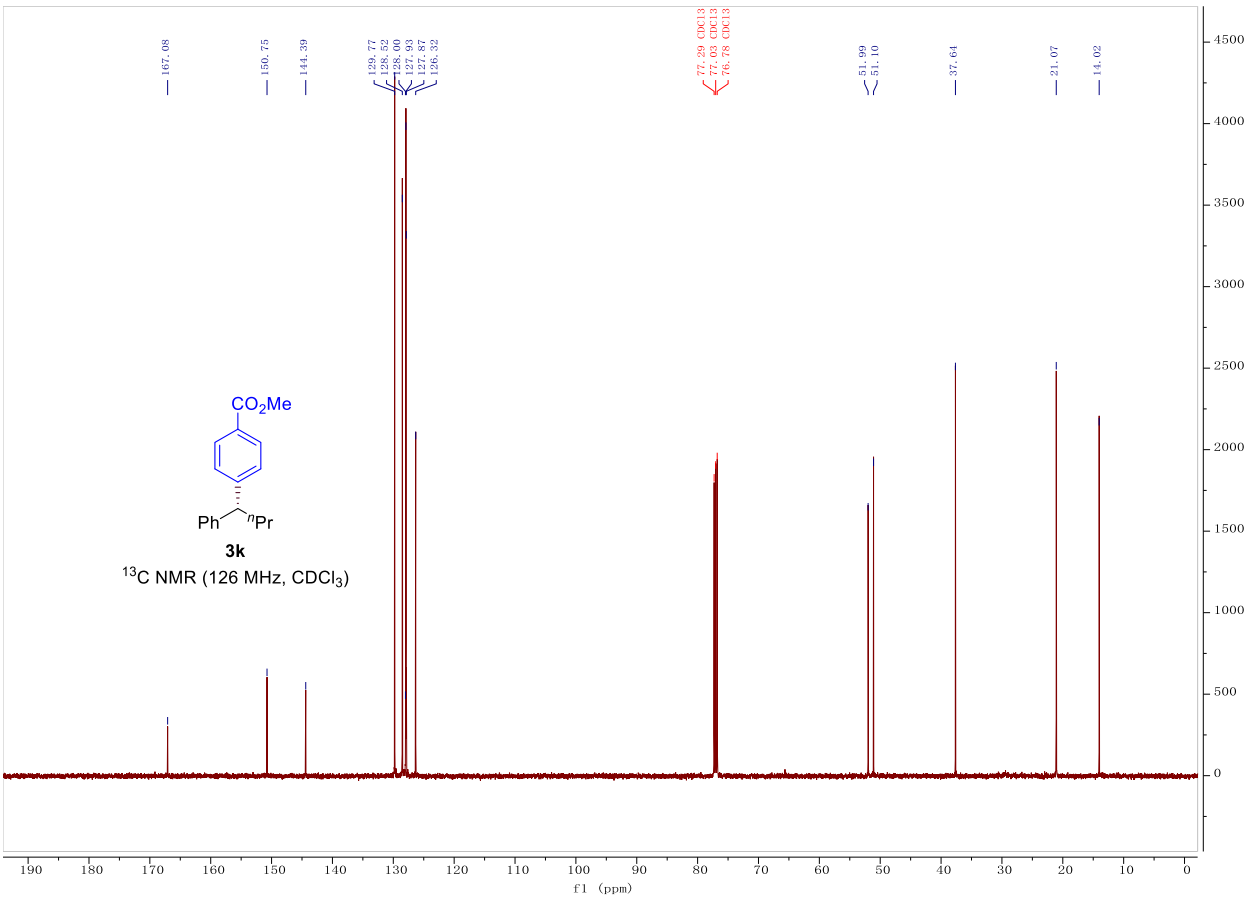
Supplementary Fig. 28. ^{13}C NMR of compound **3j**



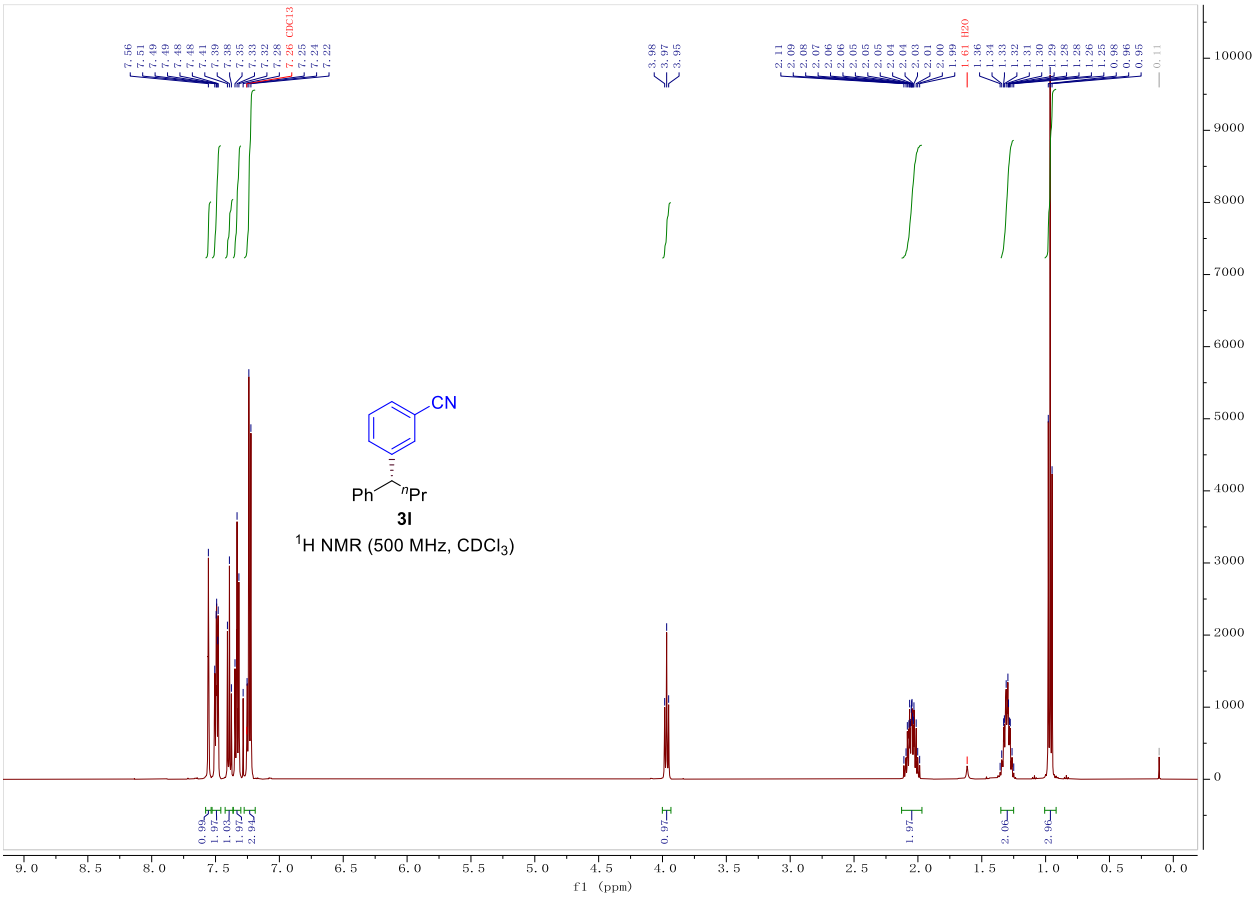
Supplementary Fig. 29. ^{19}F NMR of compound **3j**



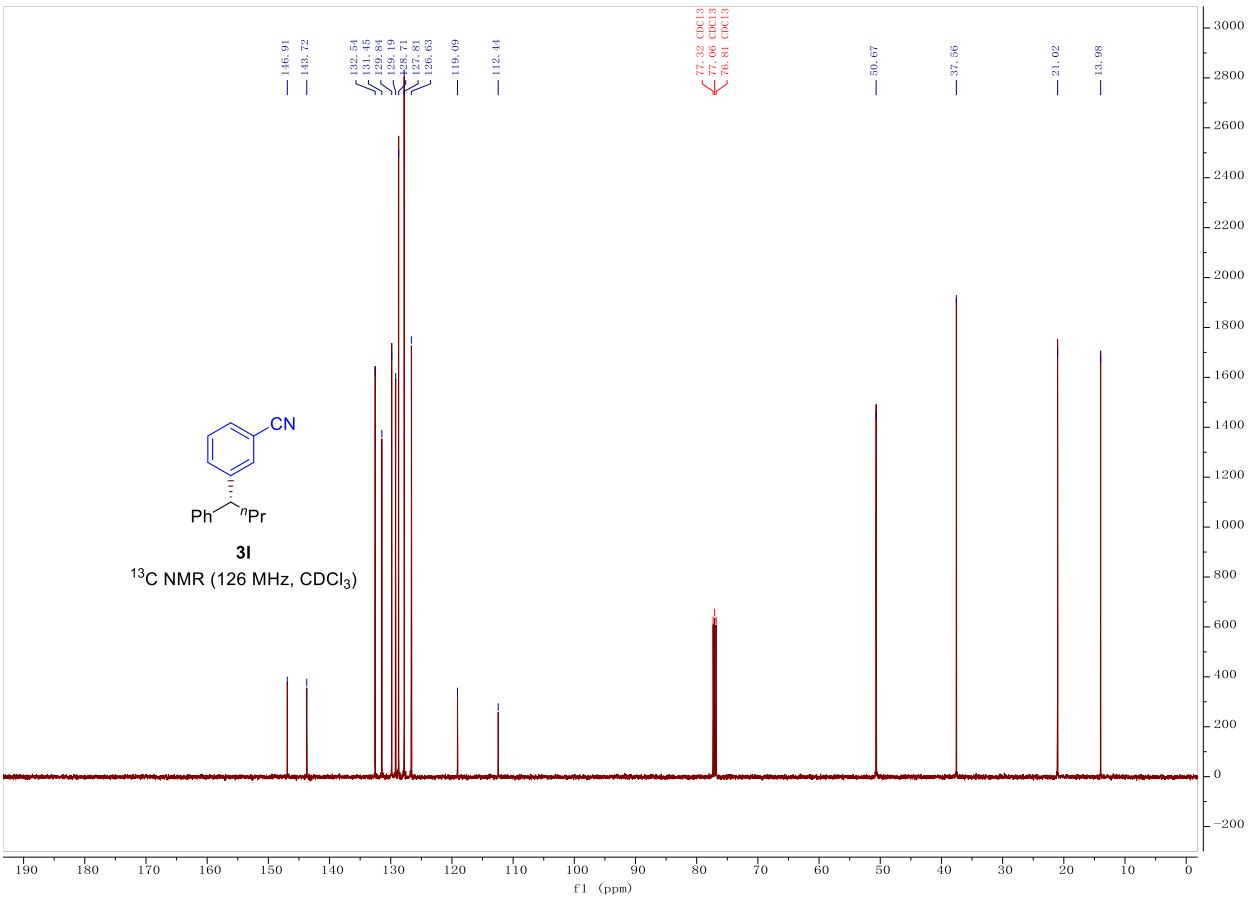
Supplementary Fig. 30. ^{1}H NMR of compound **3k**



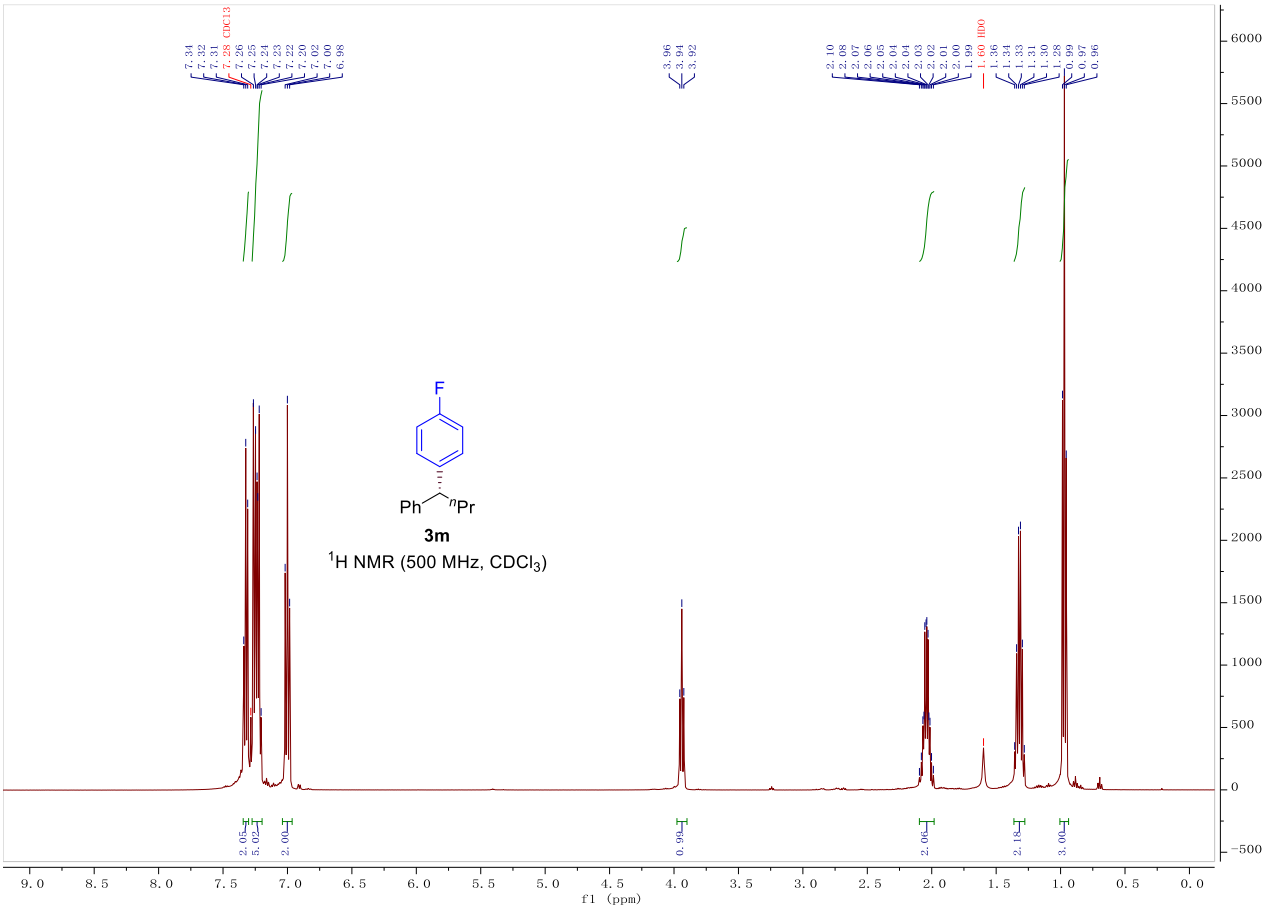
Supplementary Fig. 31. ^{13}C NMR of compound **3k**



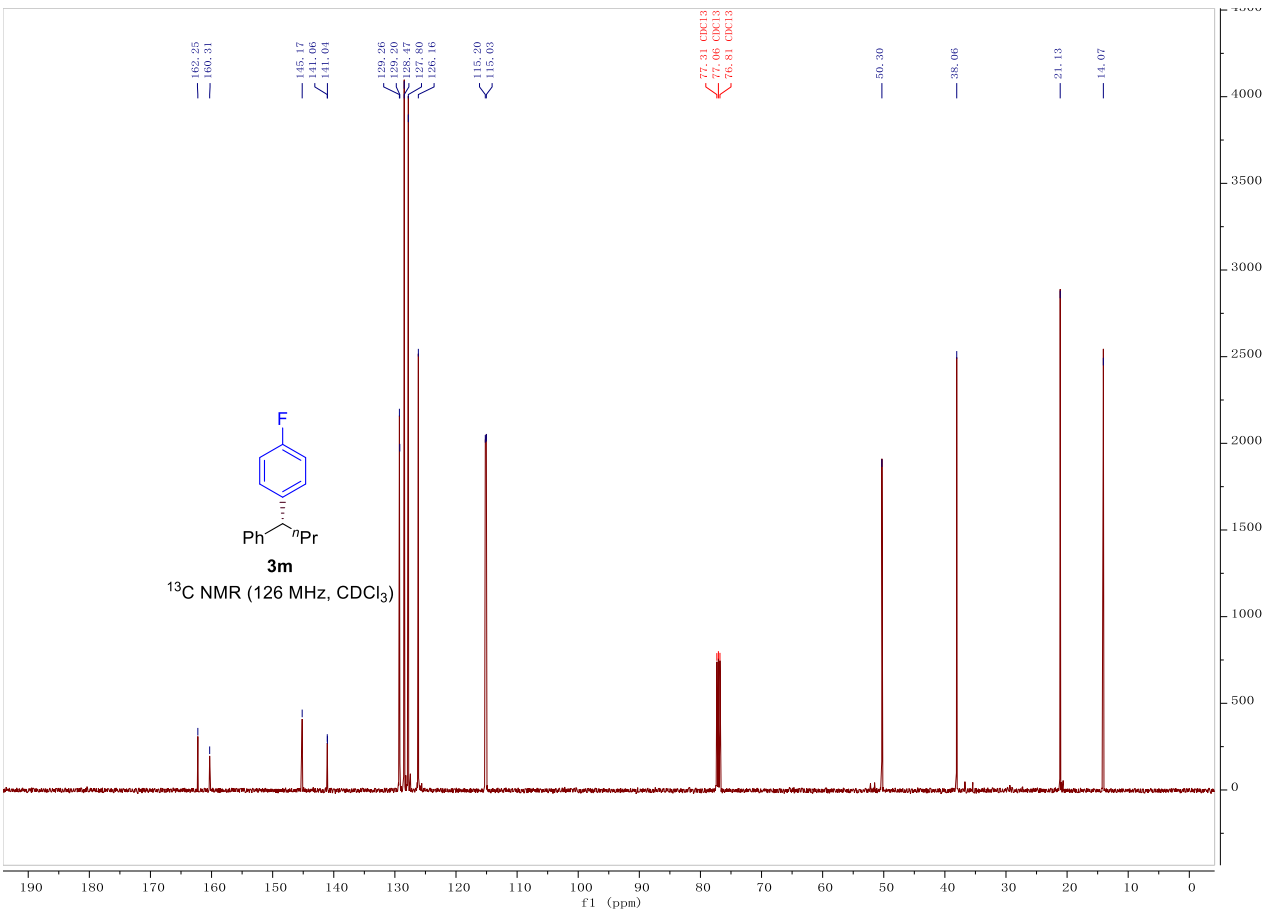
Supplementary Fig. 32. ^{1}H NMR of compound **3l**



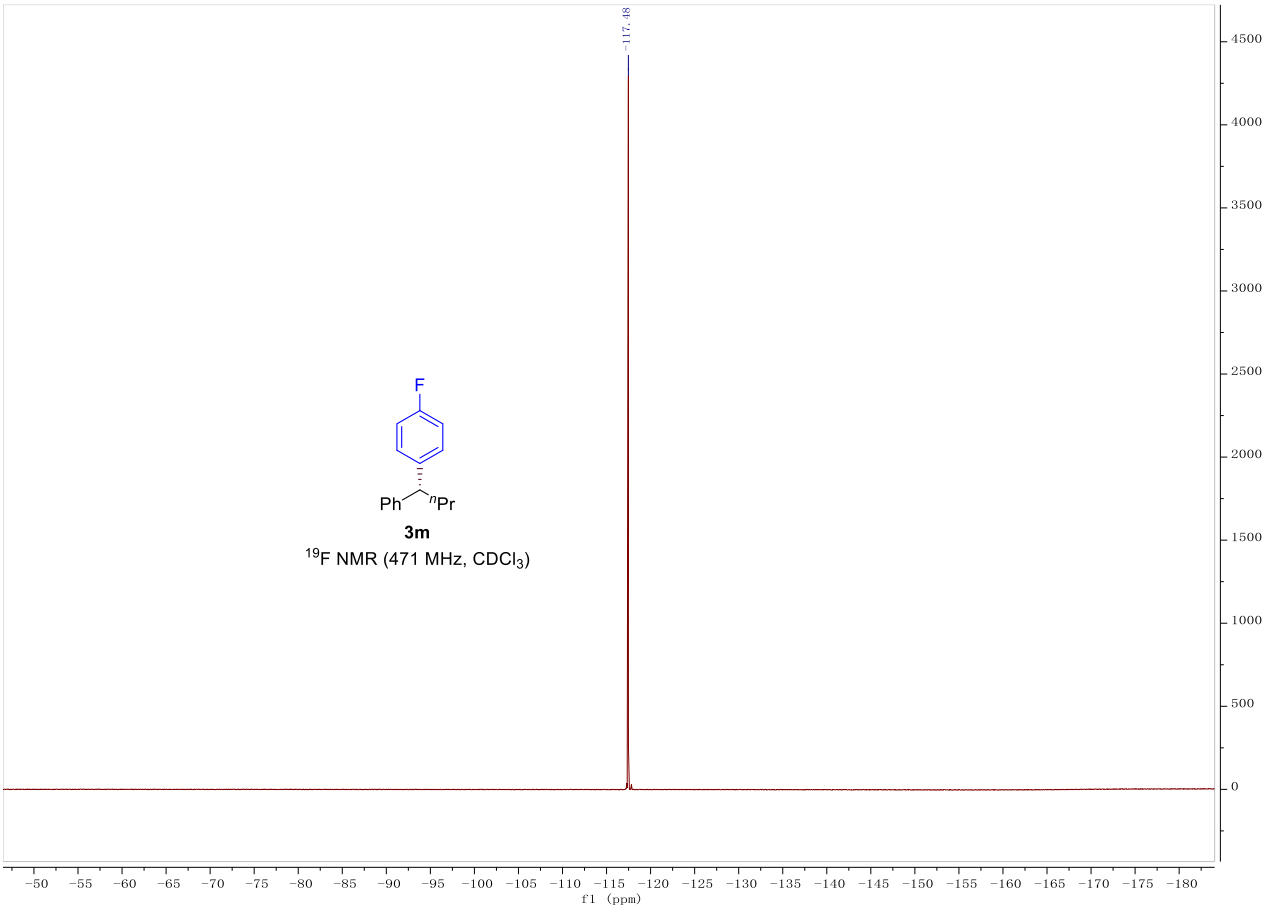
Supplementary Fig. 33. ^{13}C NMR of compound **3l**



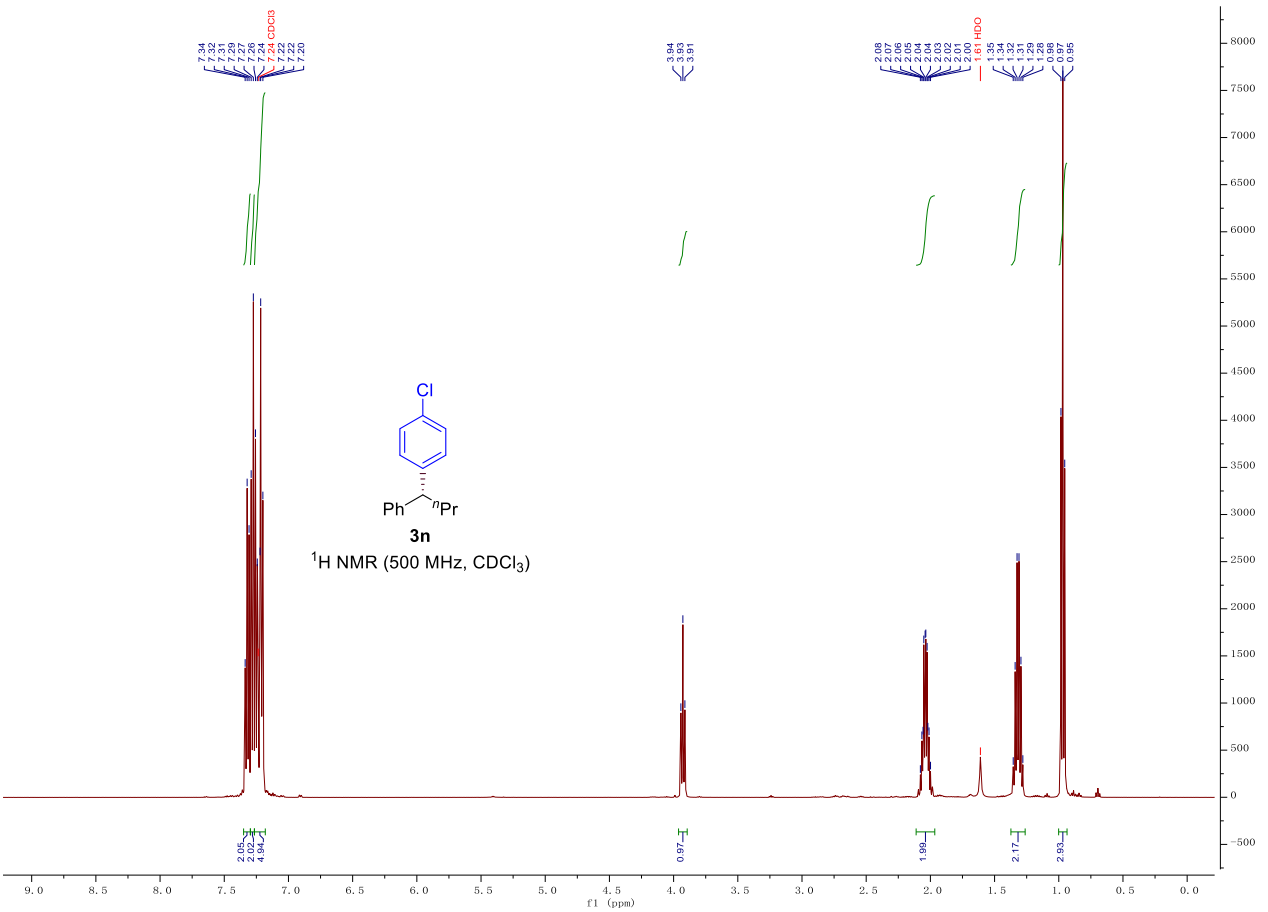
Supplementary Fig. 34. ^{1}H NMR of compound **3m**



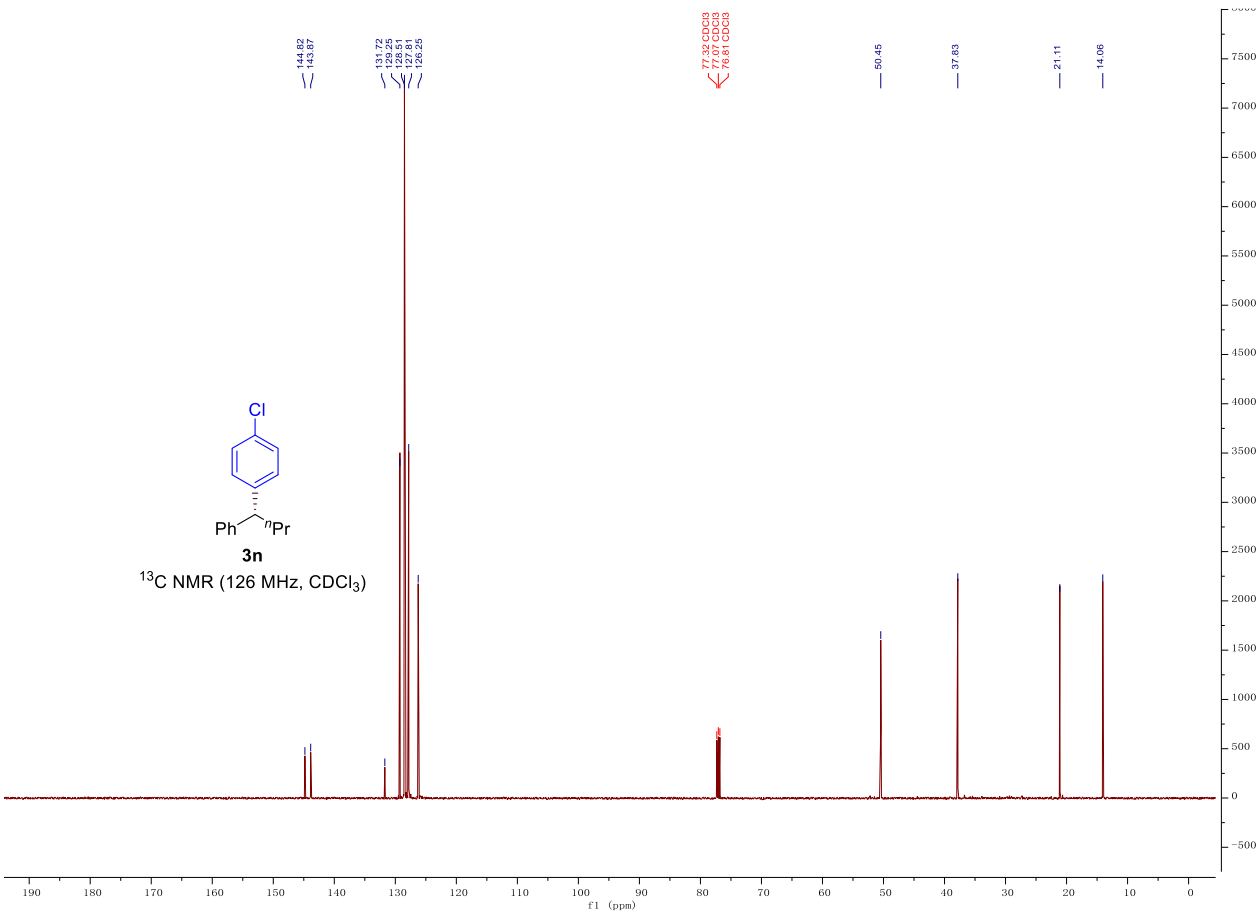
Supplementary Fig. 35. ^{13}C NMR of compound **3m**



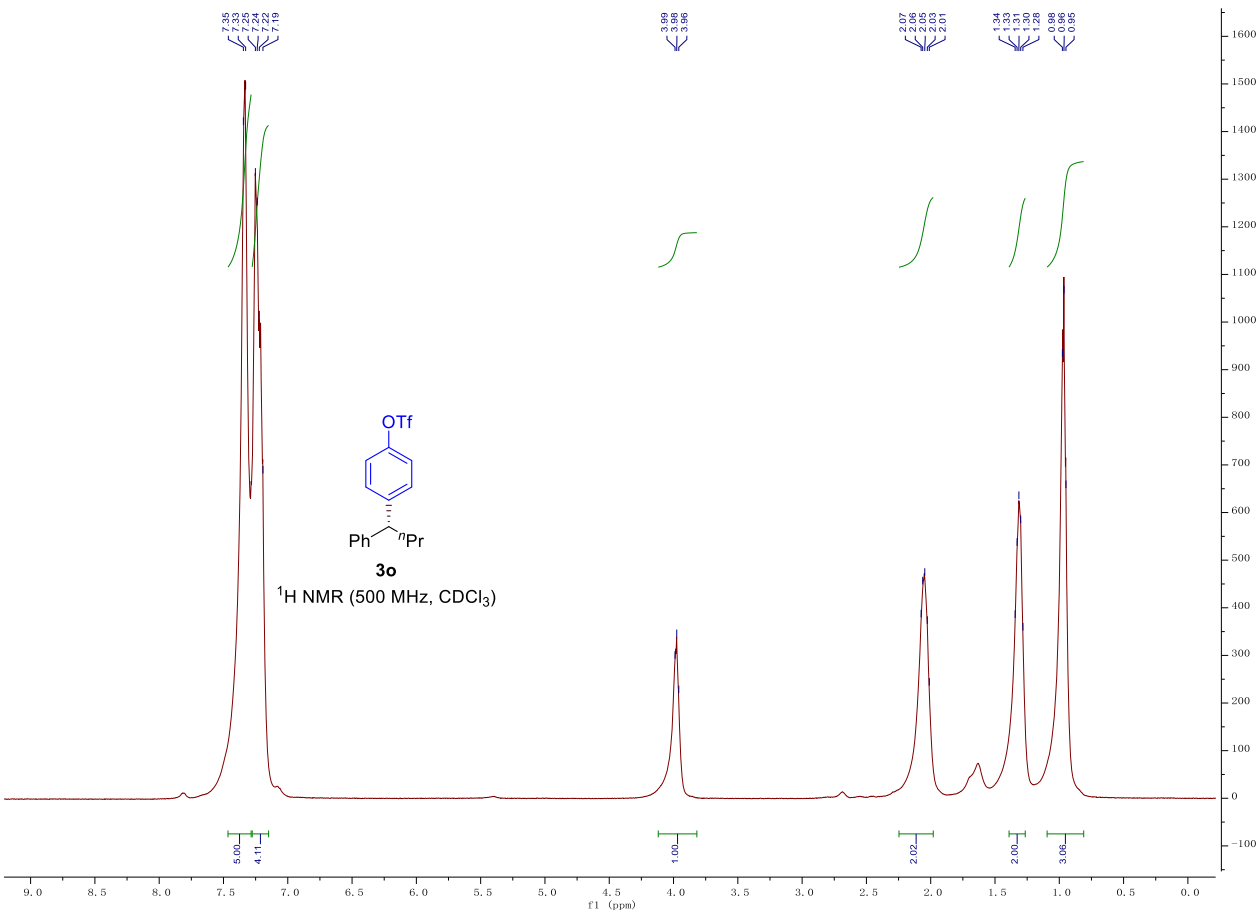
Supplementary Fig. 36. ^{19}F NMR of compound **3m**



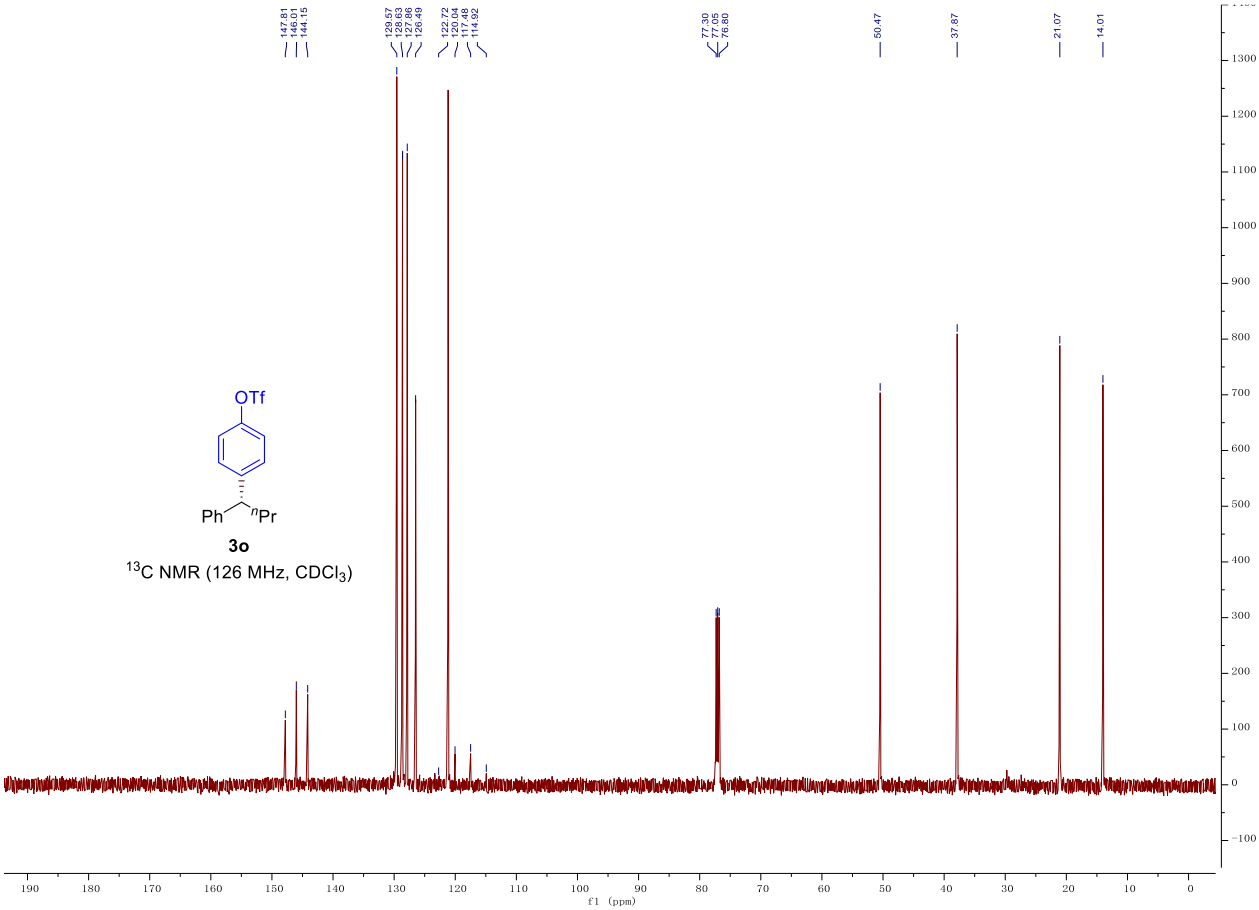
Supplementary Fig. 37. ^{1}H NMR of compound **3n**



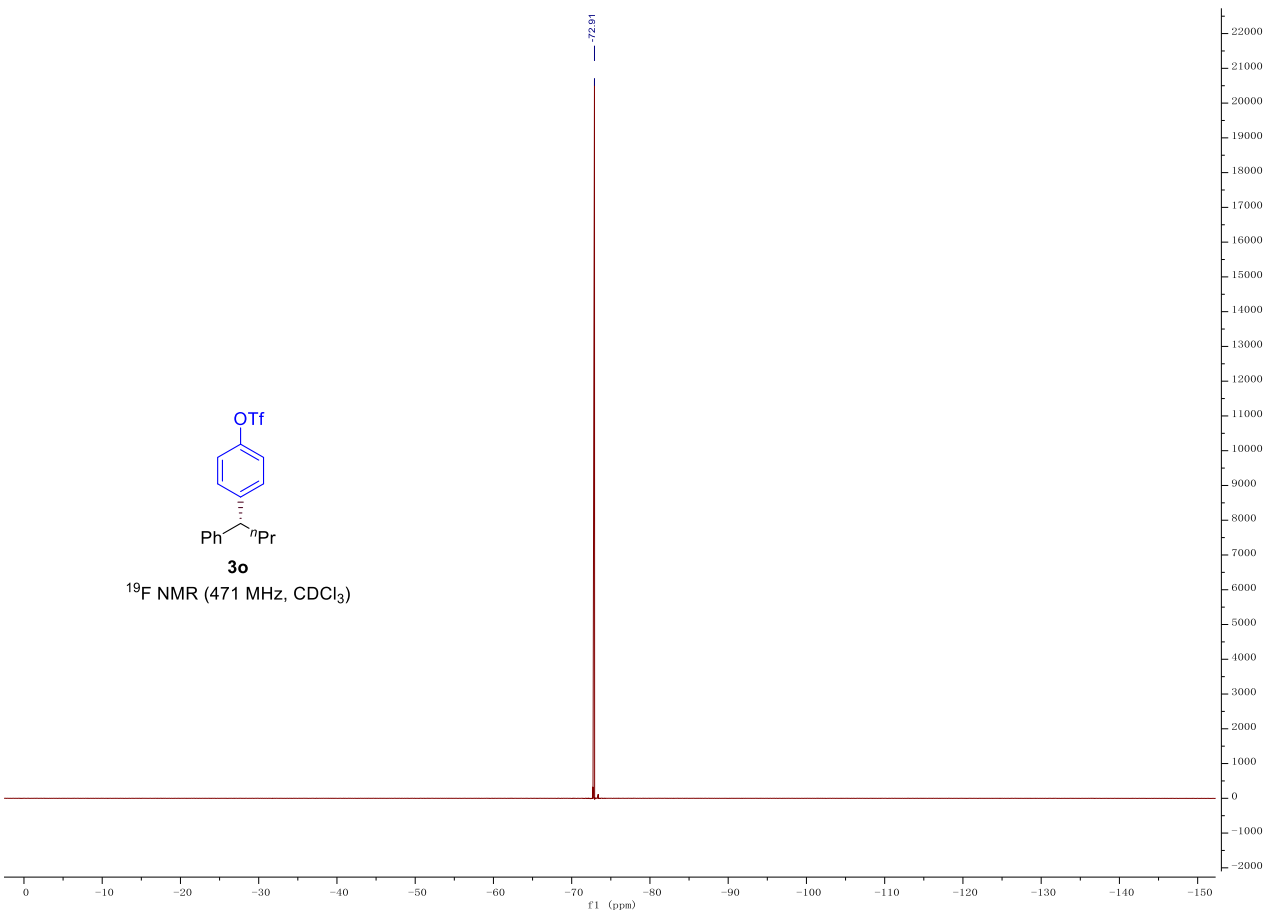
Supplementary Fig. 38. ^{13}C NMR of compound **3n**



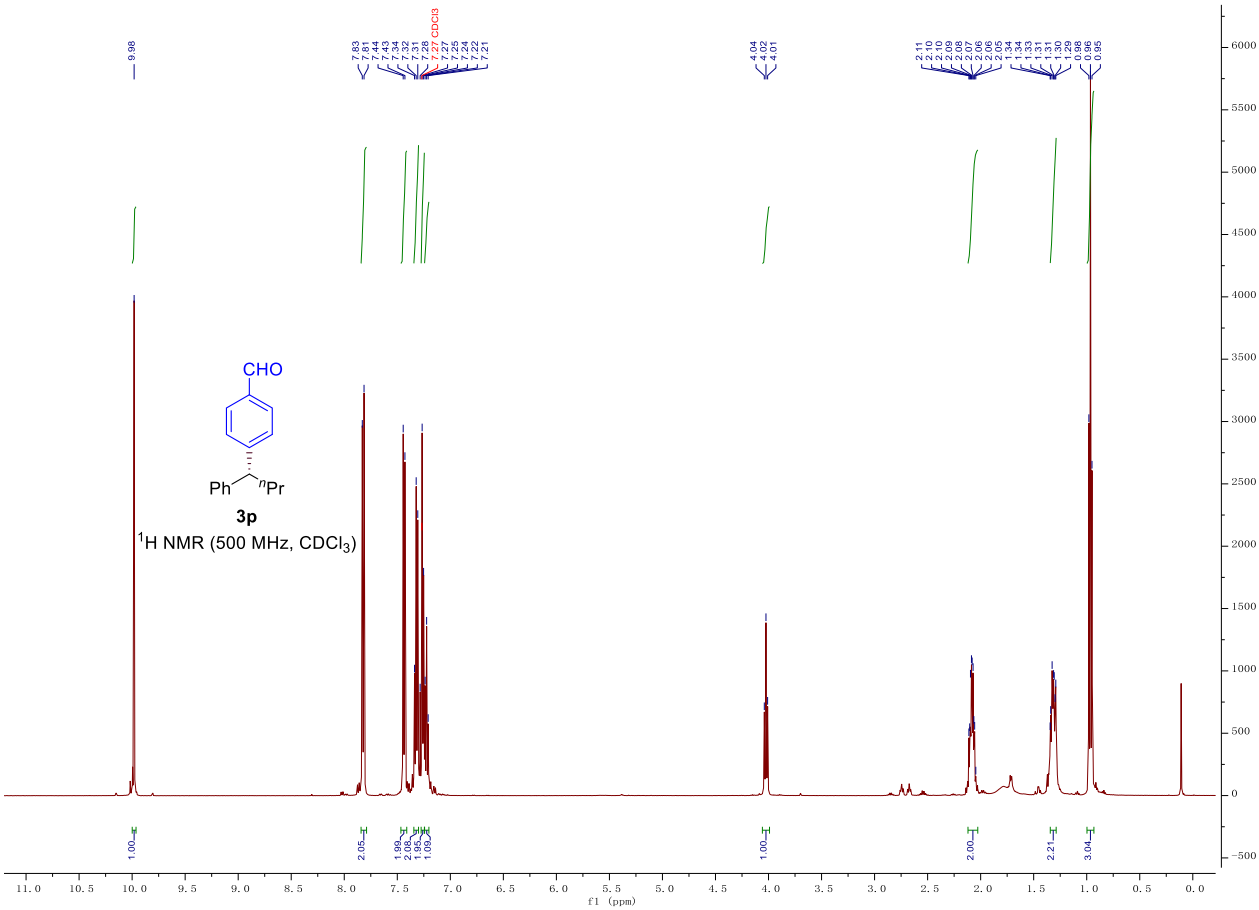
Supplementary Fig. 39. ^{1}H NMR of compound **3o**



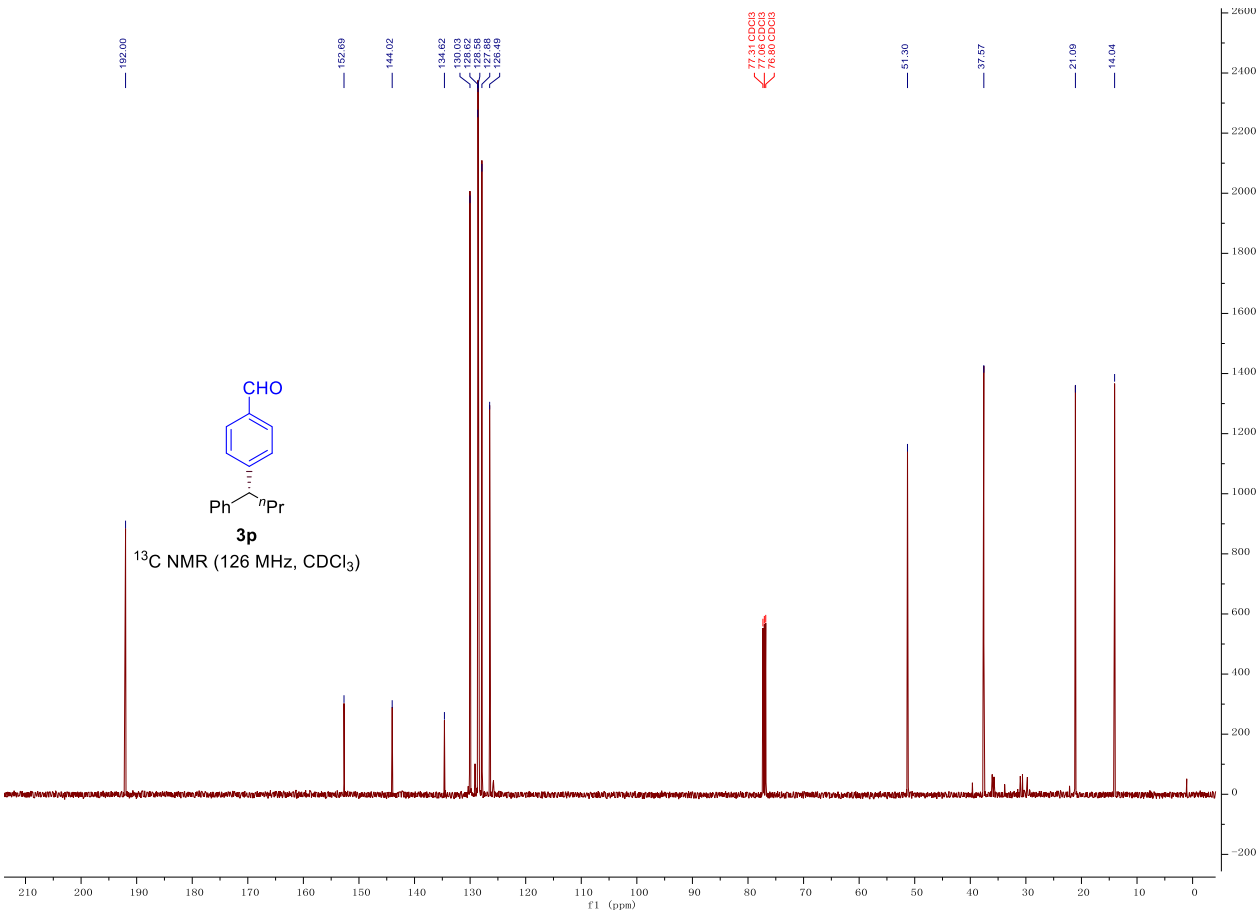
Supplementary Fig. 40. ^{13}C NMR of compound **3o**



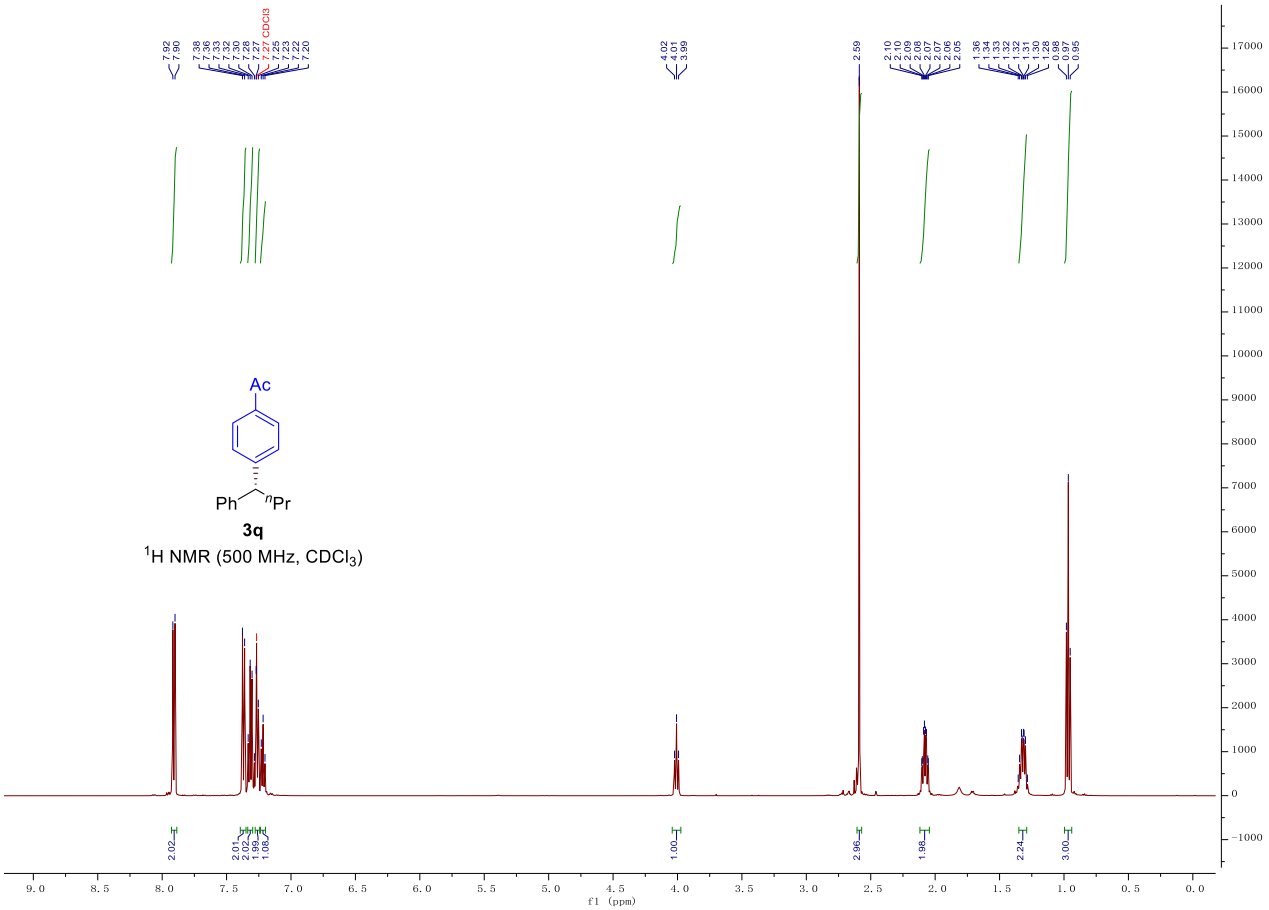
Supplementary Fig. 41. ^{19}F NMR of compound **3o**



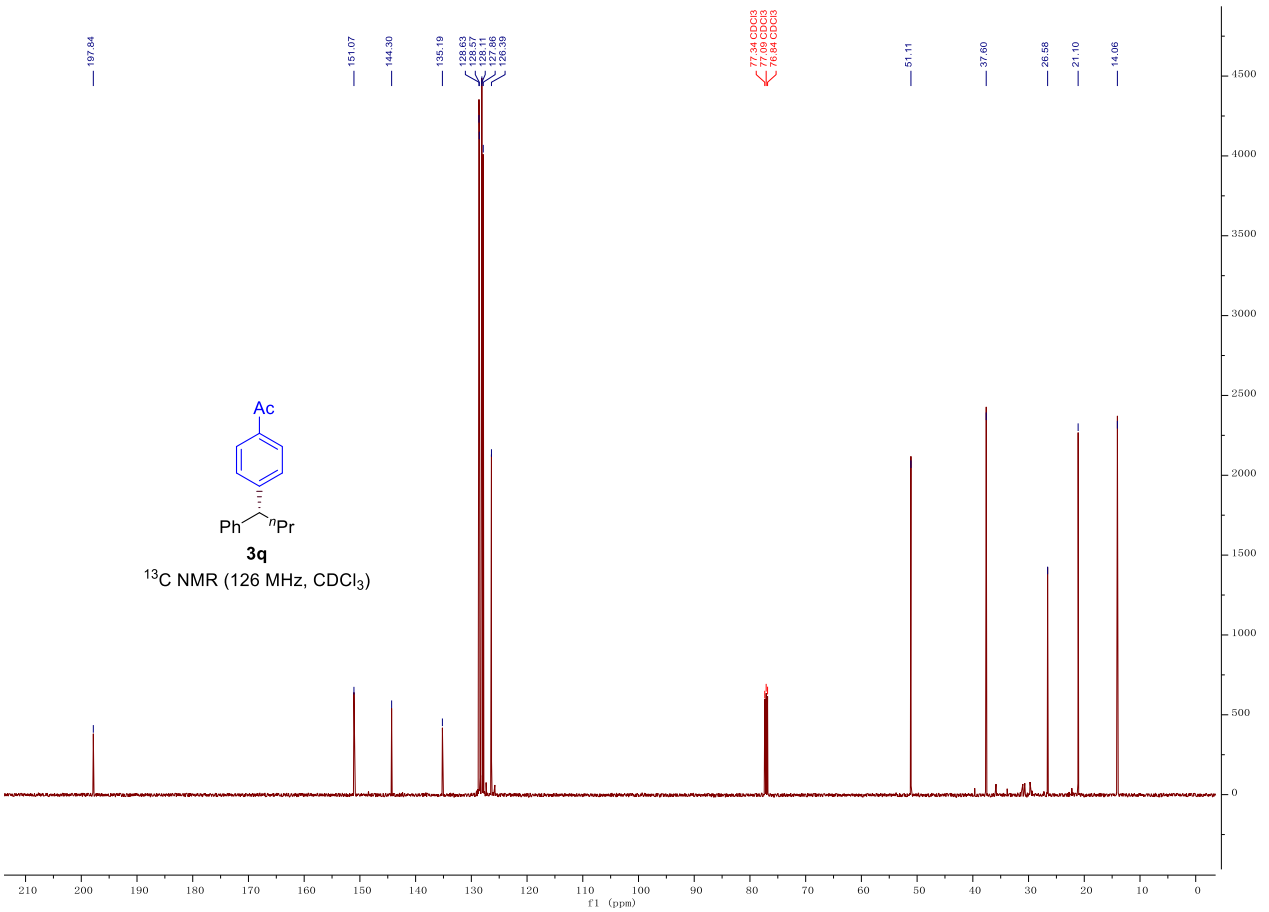
Supplementary Fig. 42. ^{1}H NMR of compound **3p**



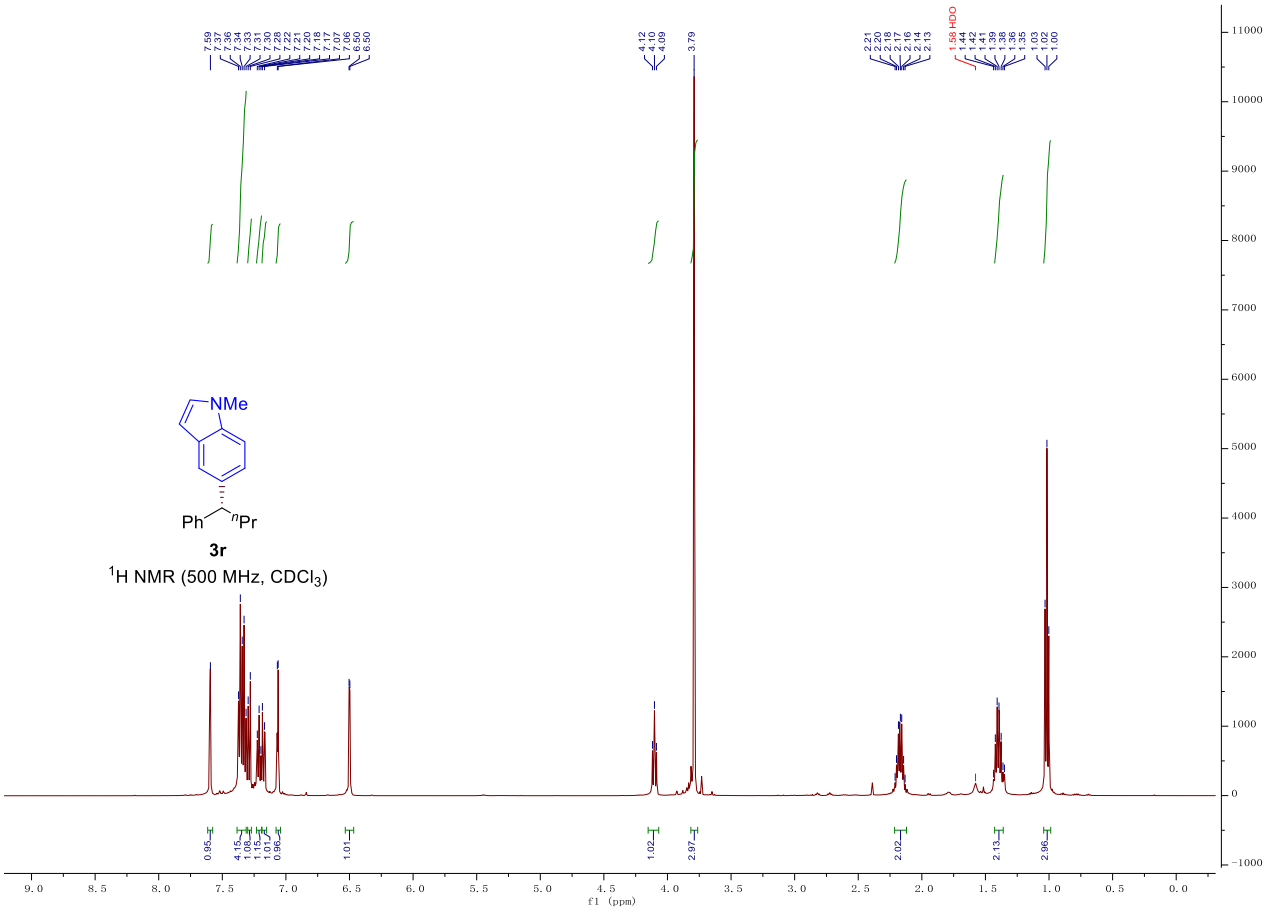
Supplementary Fig. 43. ^{13}C NMR of compound **3p**



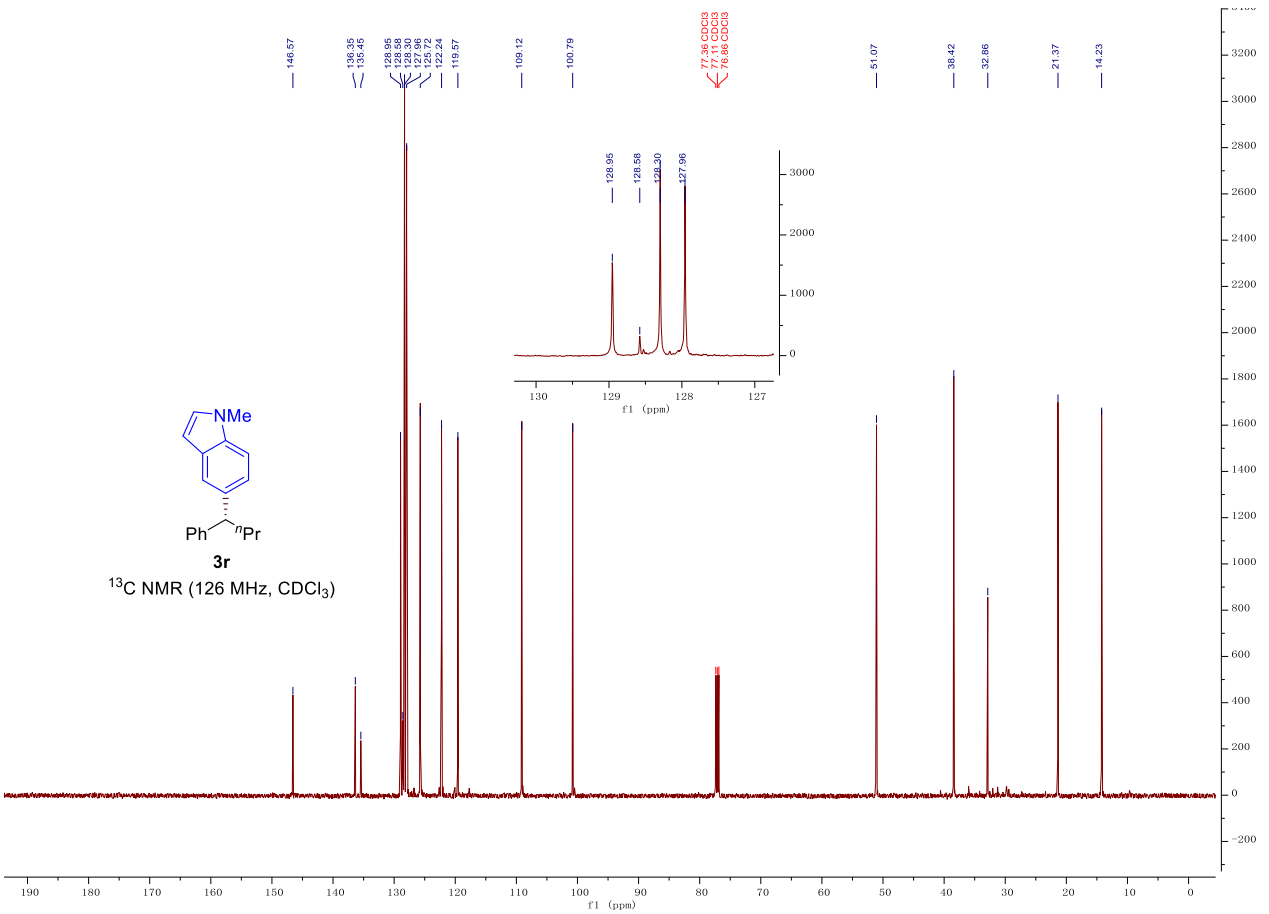
Supplementary Fig. 44. ^{1}H NMR of compound **3q**



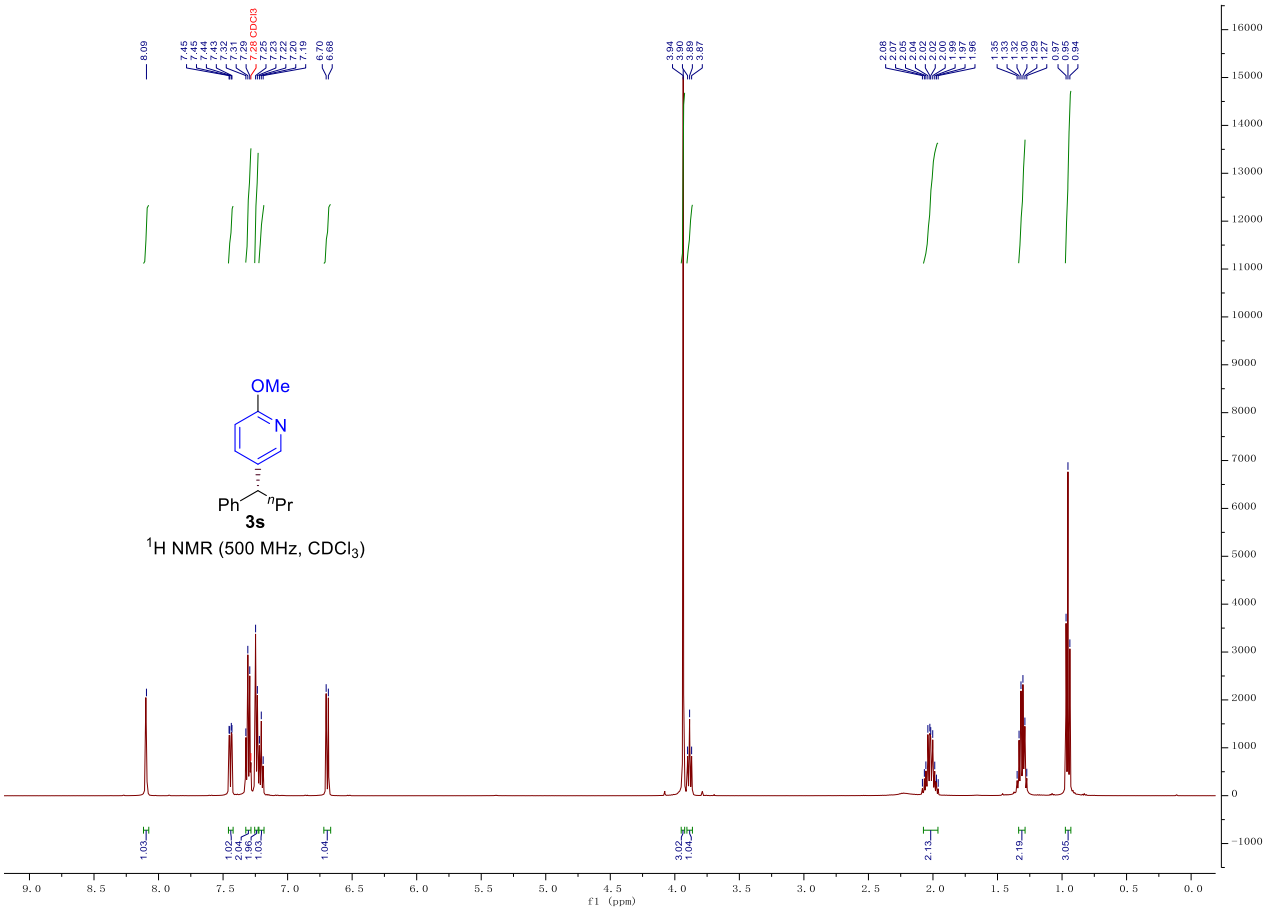
Supplementary Fig. 45. ^{13}C NMR of compound **3q**



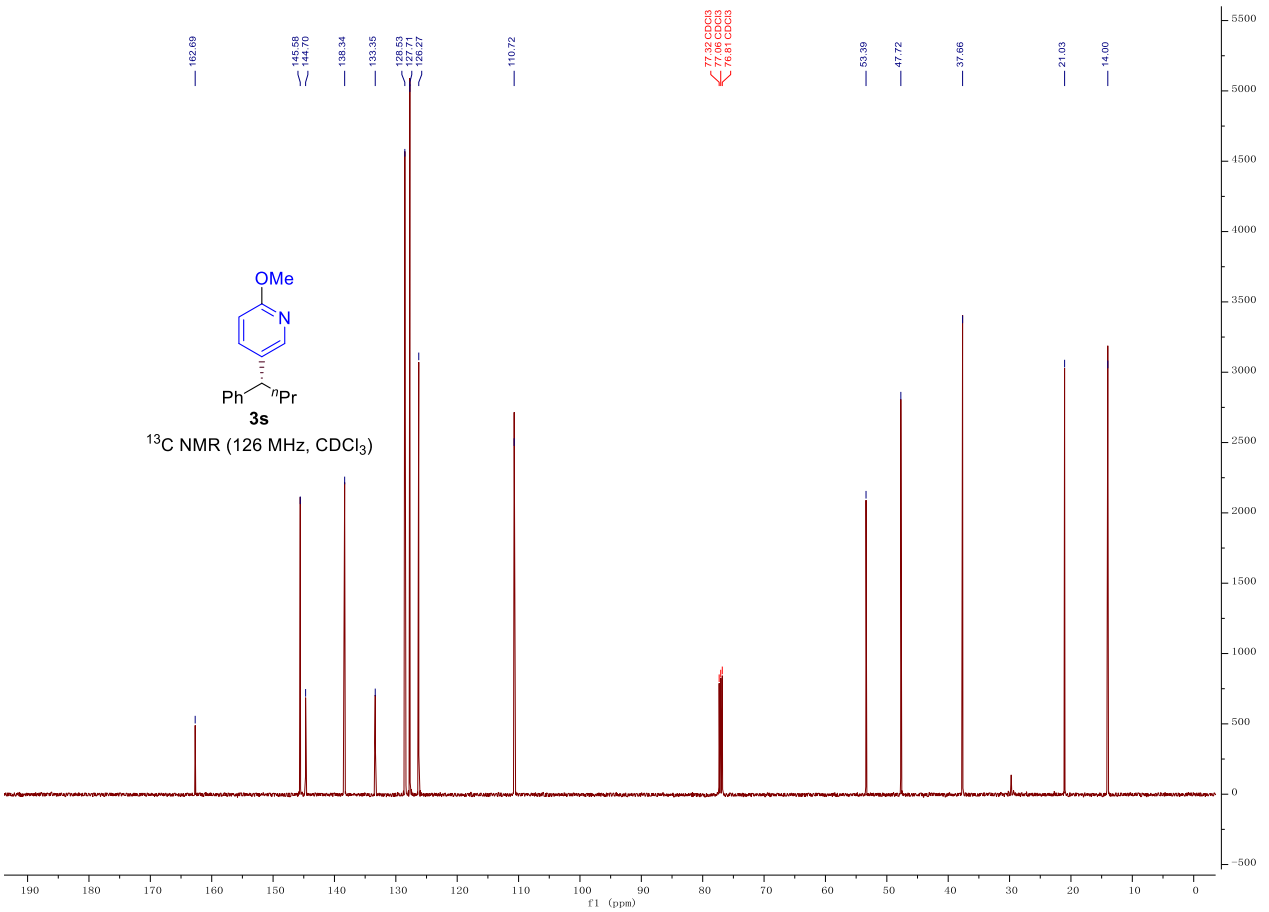
Supplementary Fig. 46. ^{1}H NMR of compound **3r**



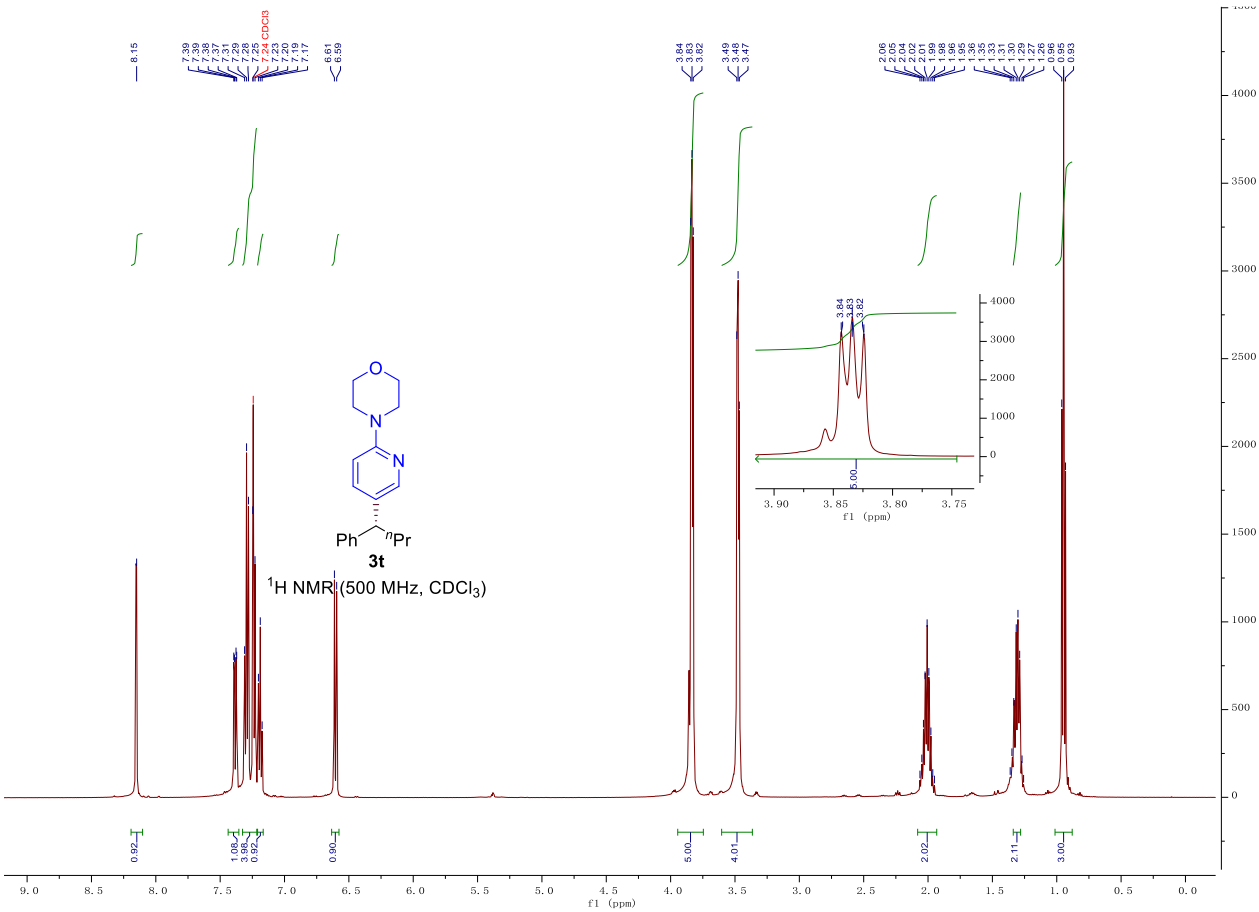
Supplementary Fig. 47. ^{13}C NMR of compound **3r**



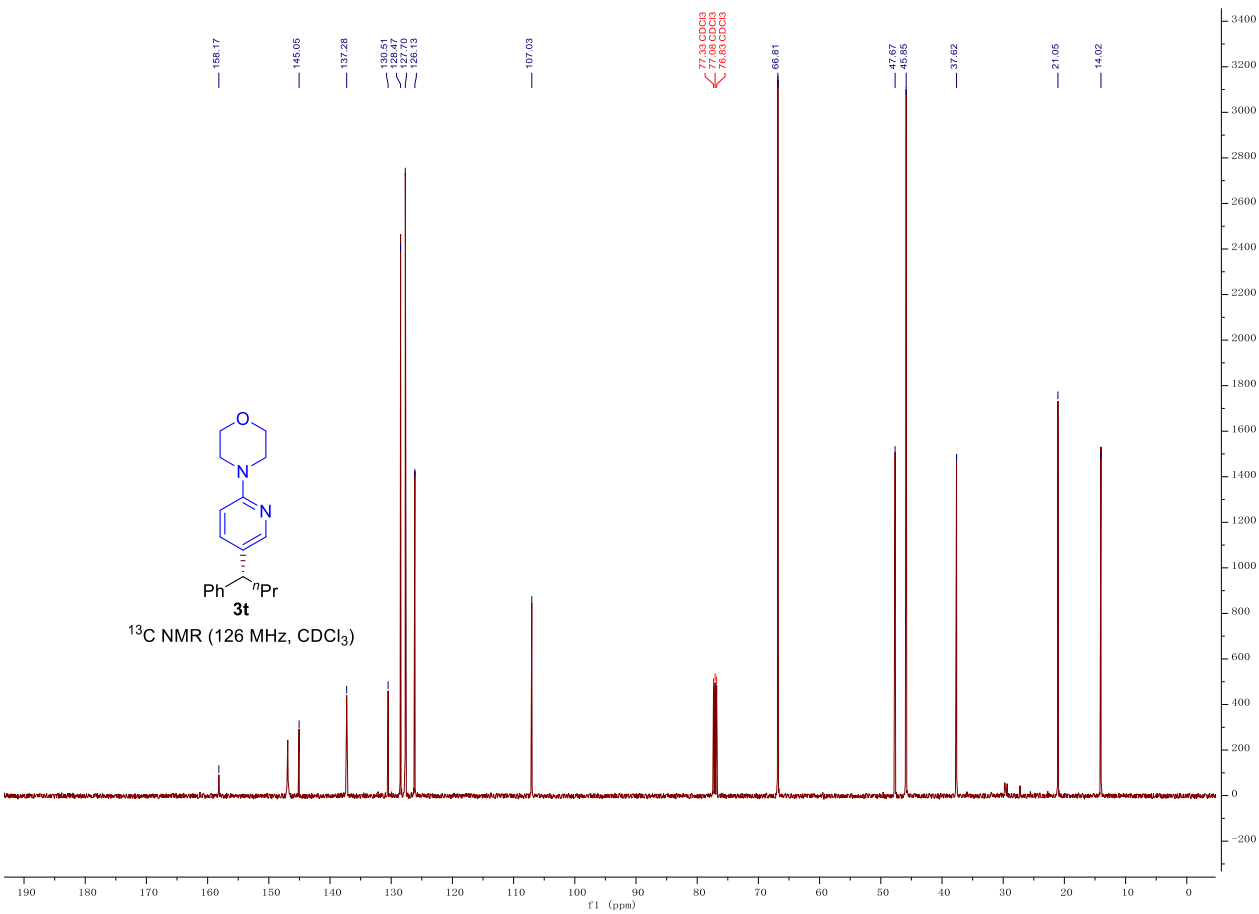
Supplementary Fig. 48. ^{1}H NMR of compound **3s**



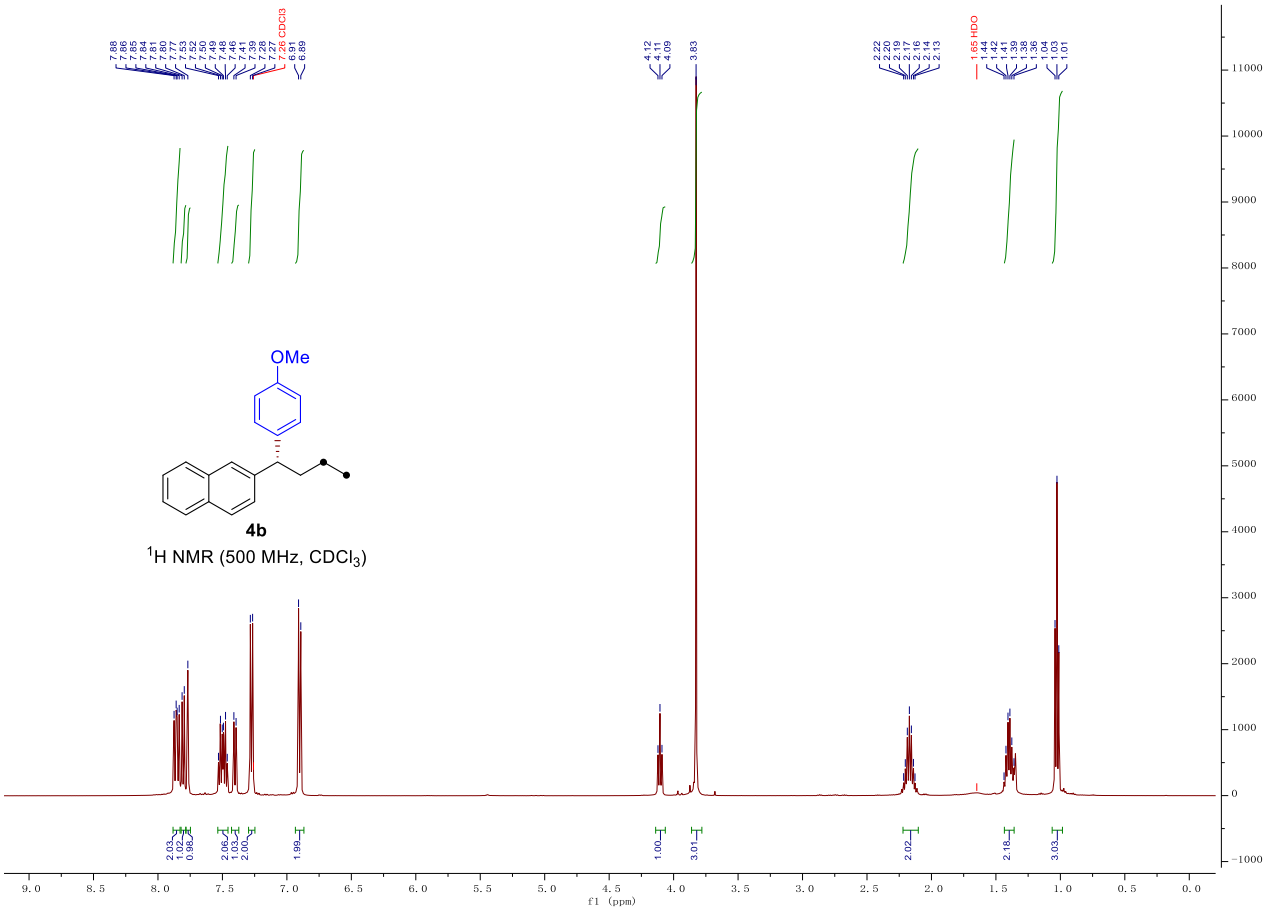
Supplementary Fig. 49. ^{13}C NMR of compound **3s**



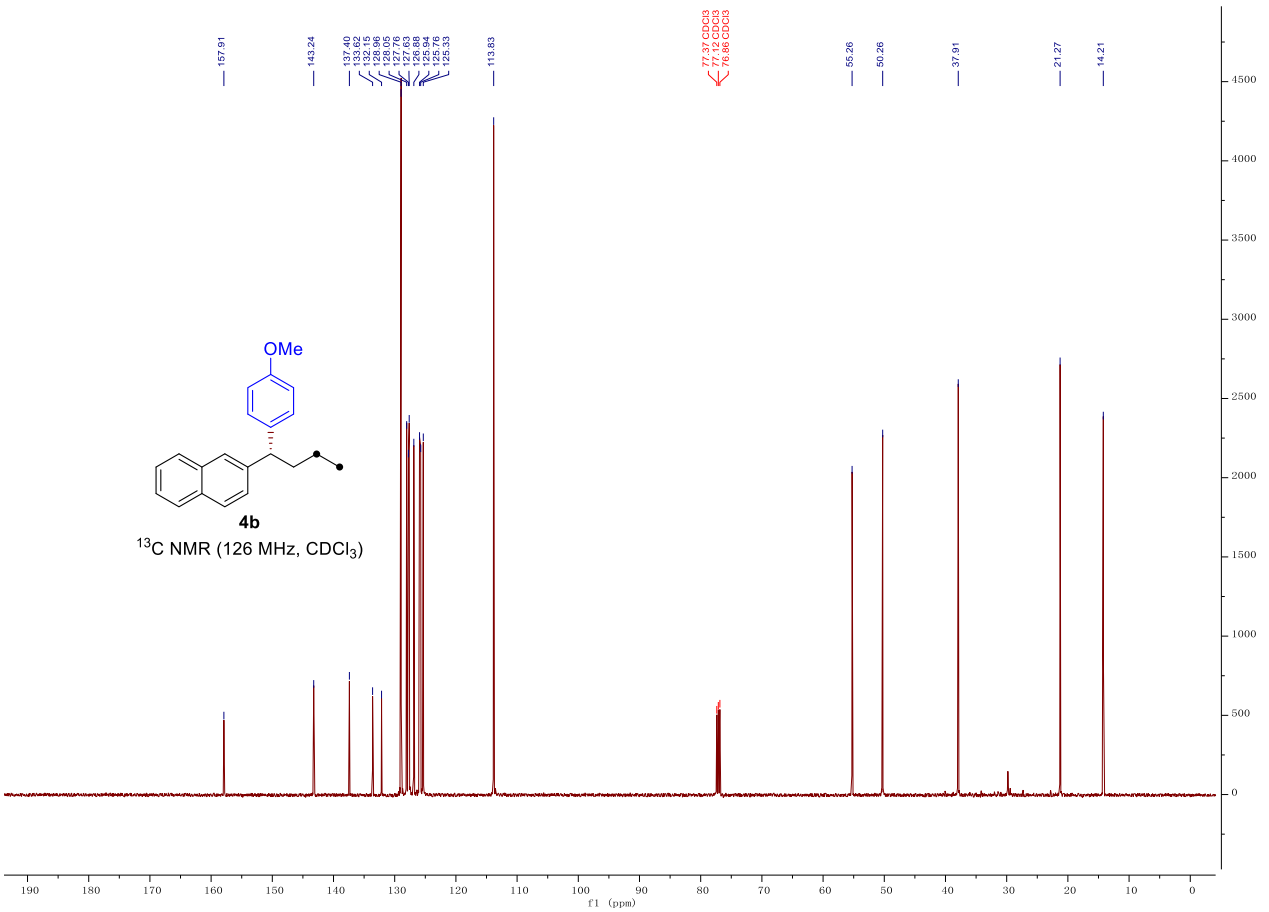
Supplementary Fig. 50. ^{1}H NMR of compound **3t**



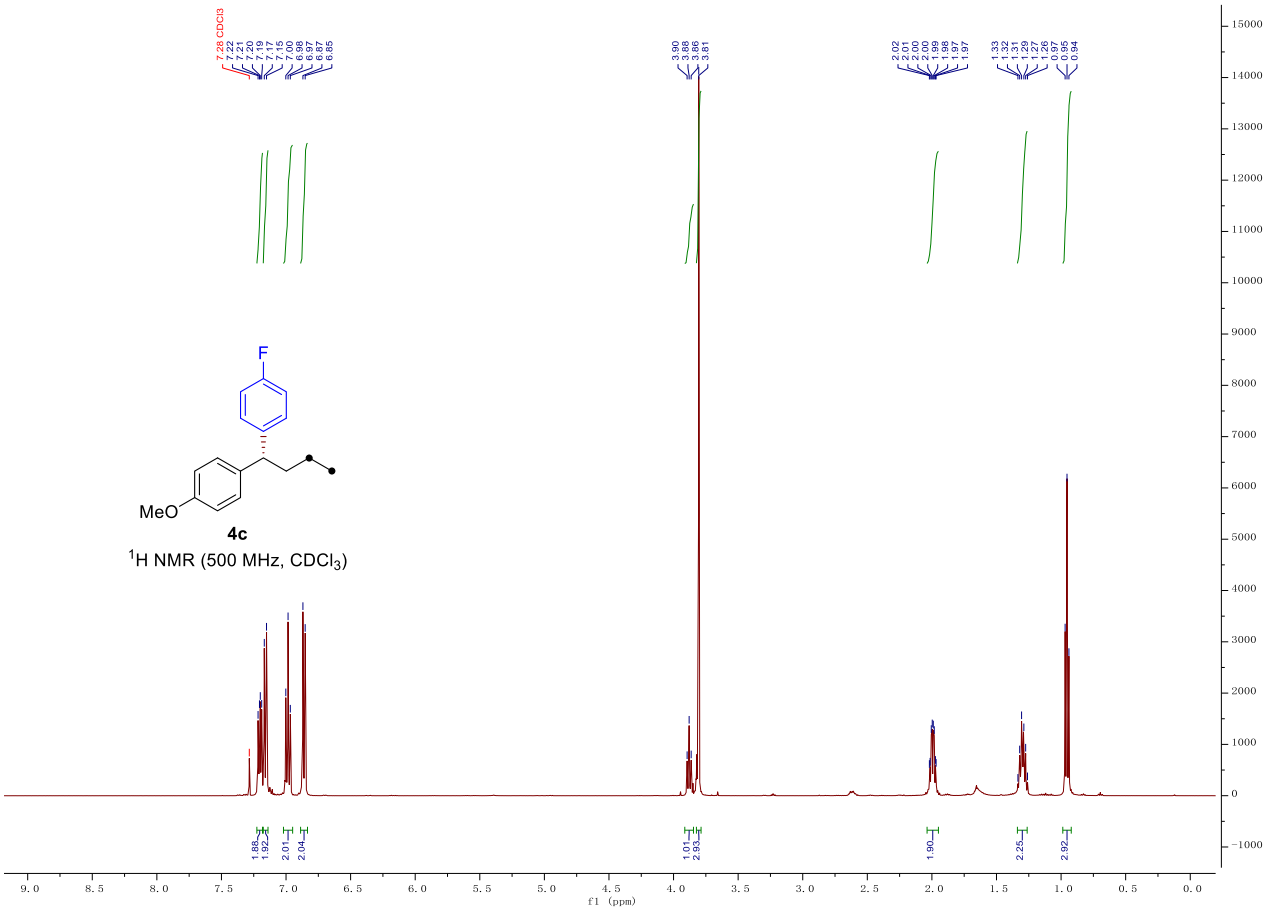
Supplementary Fig. 51. ^{13}C NMR of compound **3t**



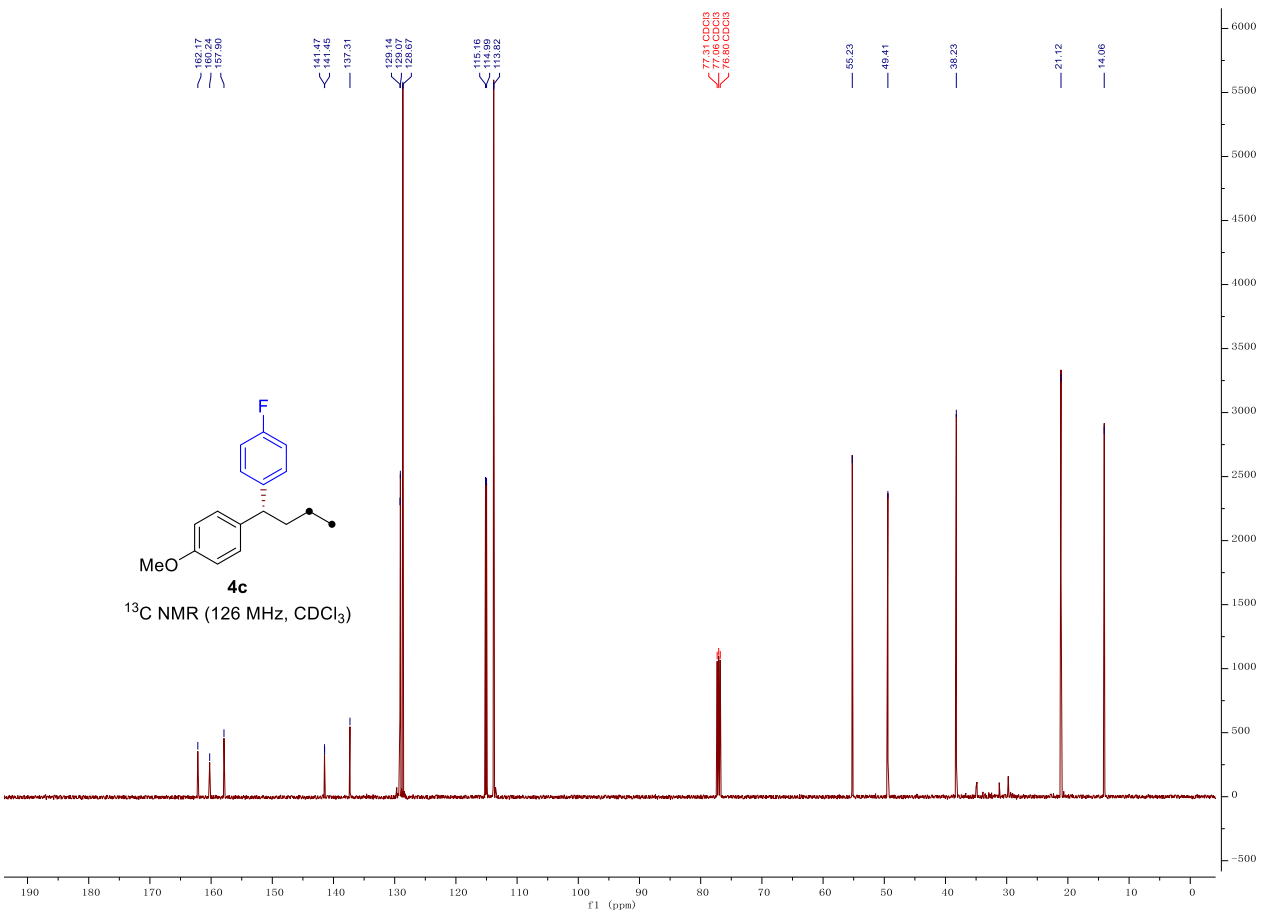
Supplementary Fig. 52. ^{1}H NMR of compound **4b**



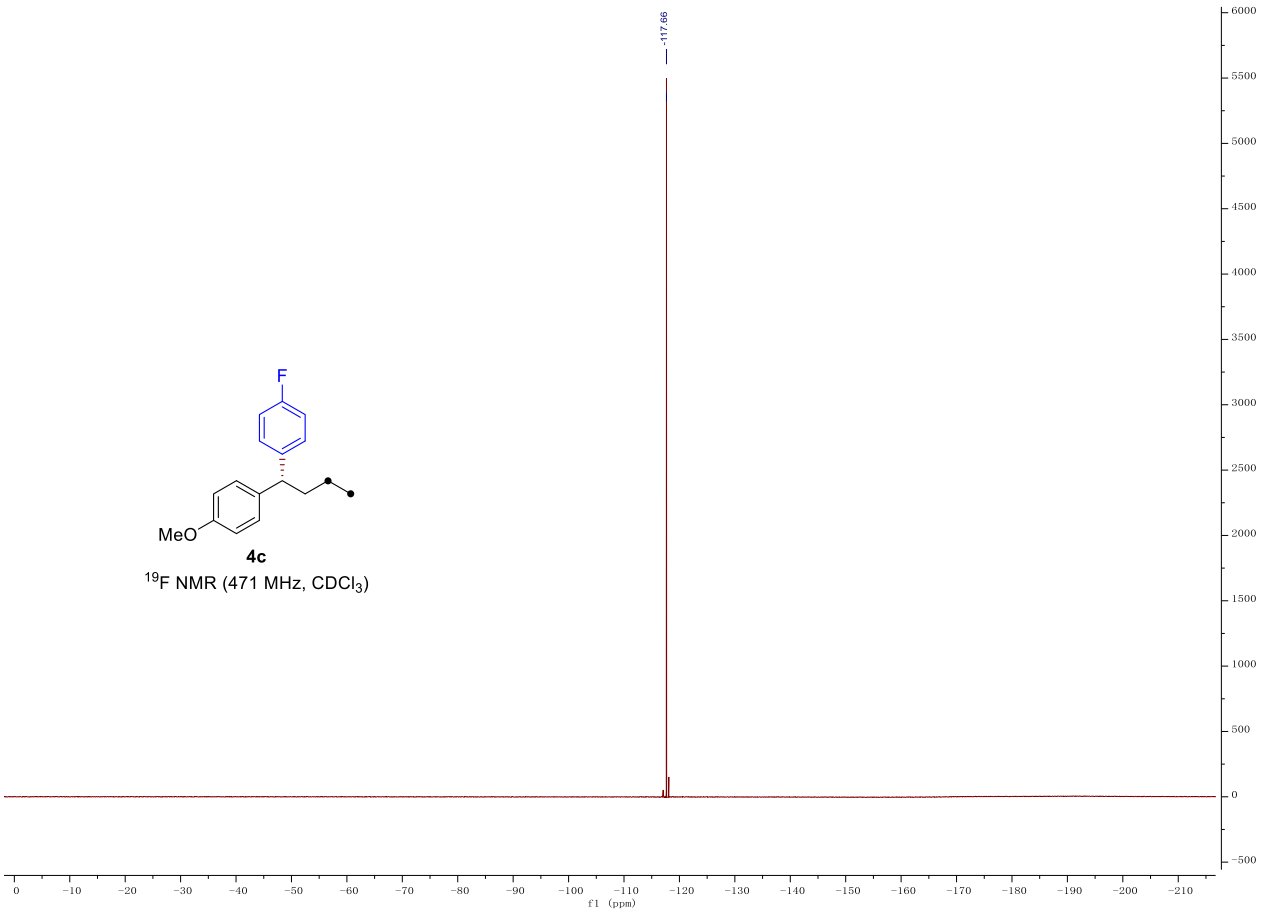
Supplementary Fig. 53. ^{13}C NMR of compound **4b**



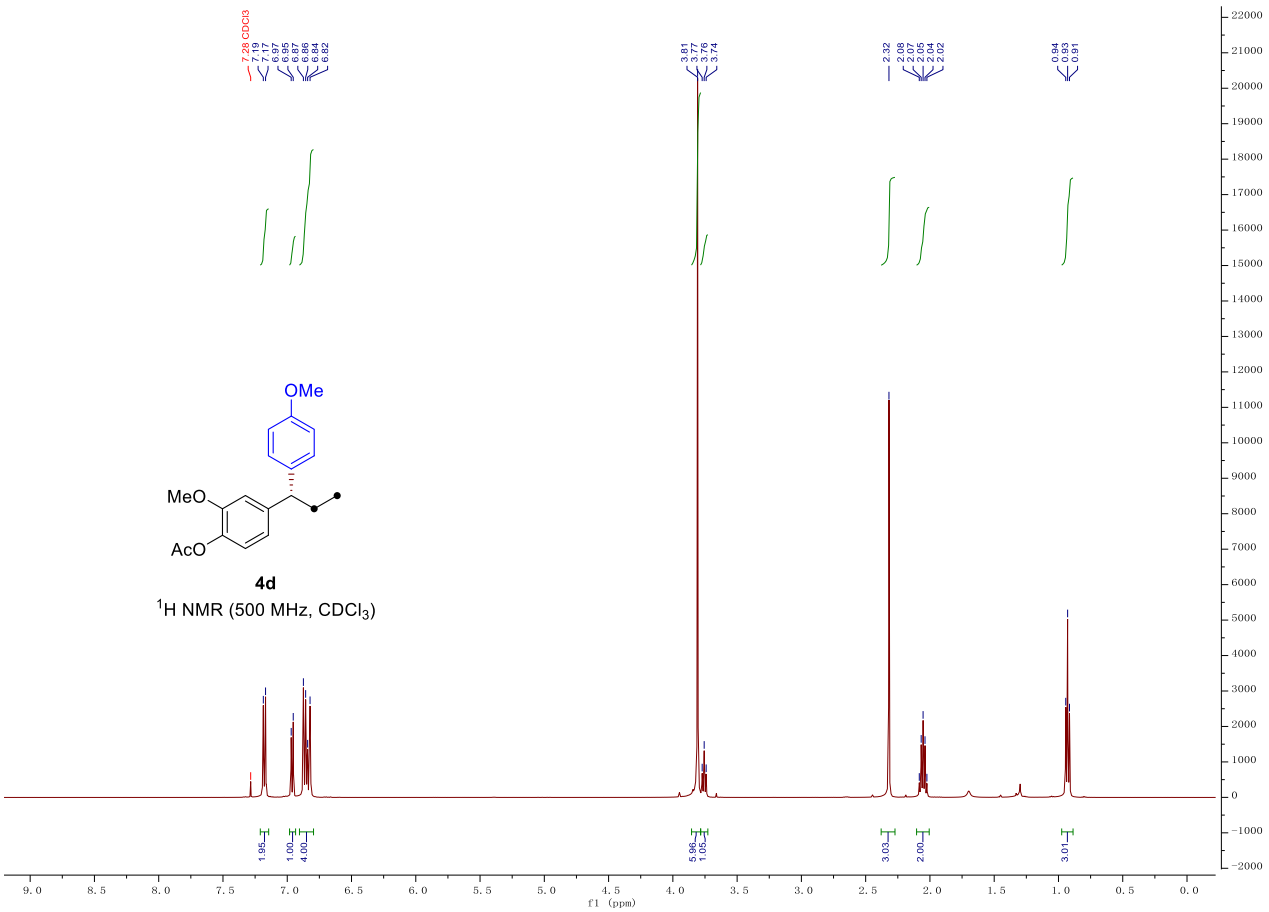
Supplementary Fig. 54. ^{1}H NMR of compound **4c**



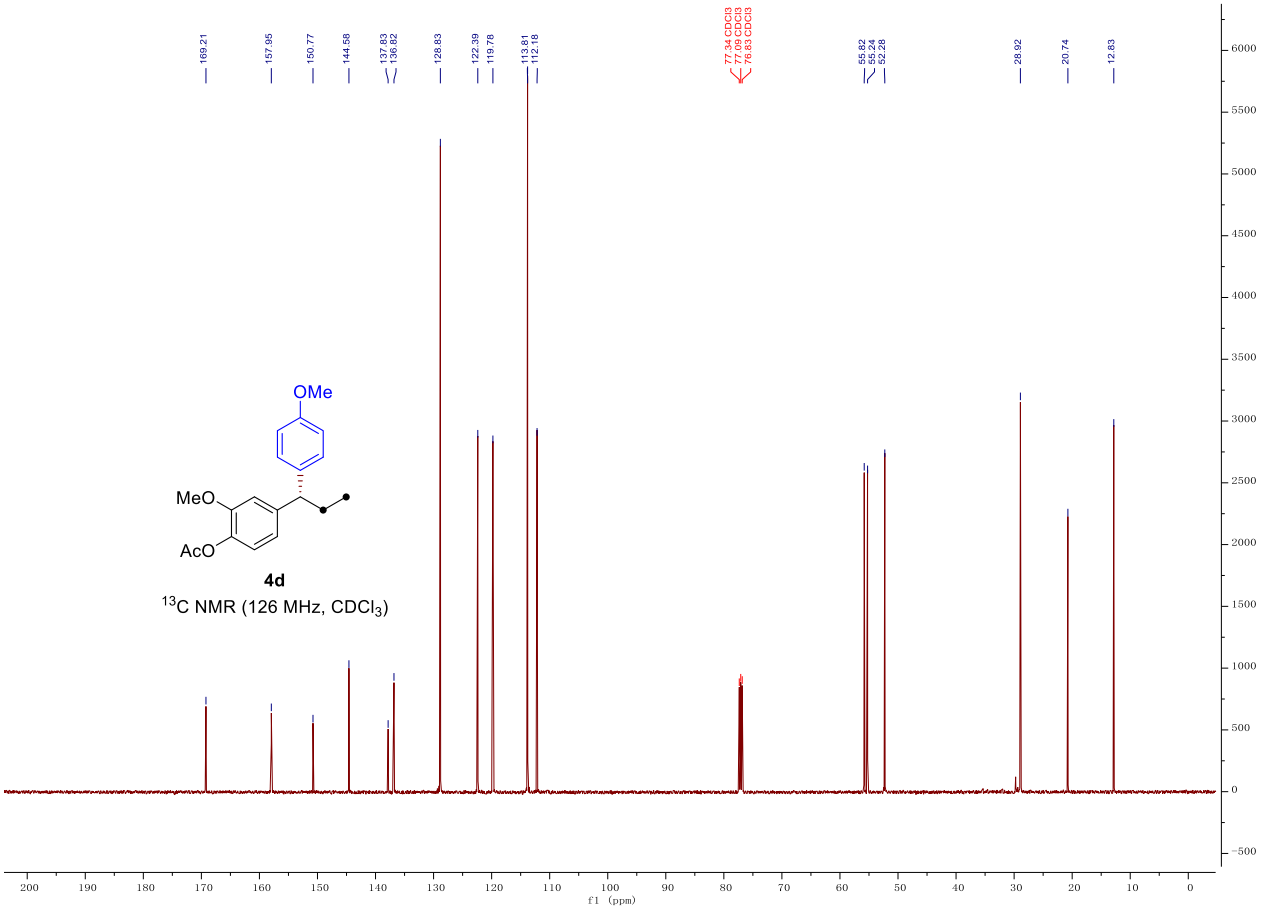
Supplementary Fig. 55. ^{13}C NMR of compound **4c**



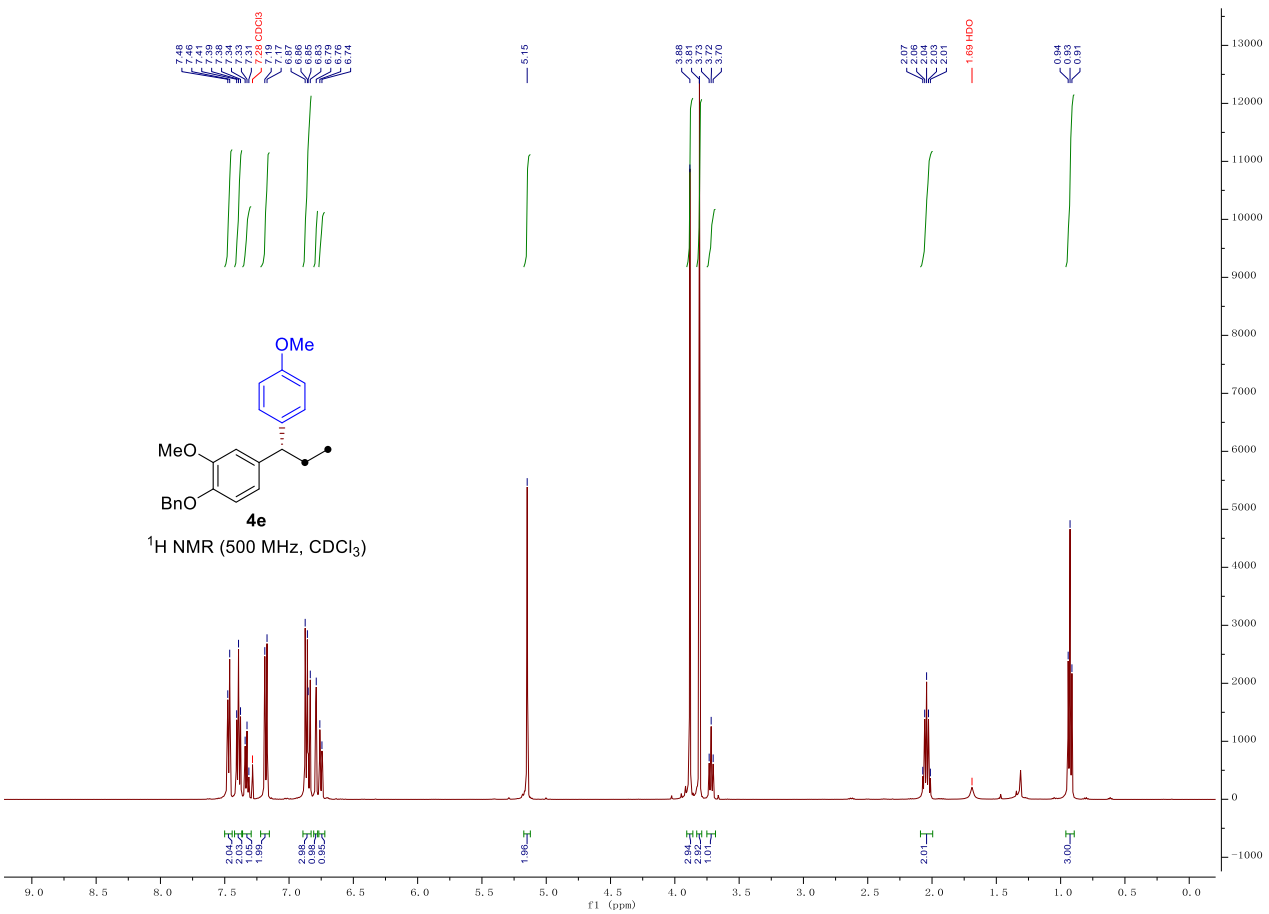
Supplementary Fig. 56. ^{19}F NMR of compound **4c**



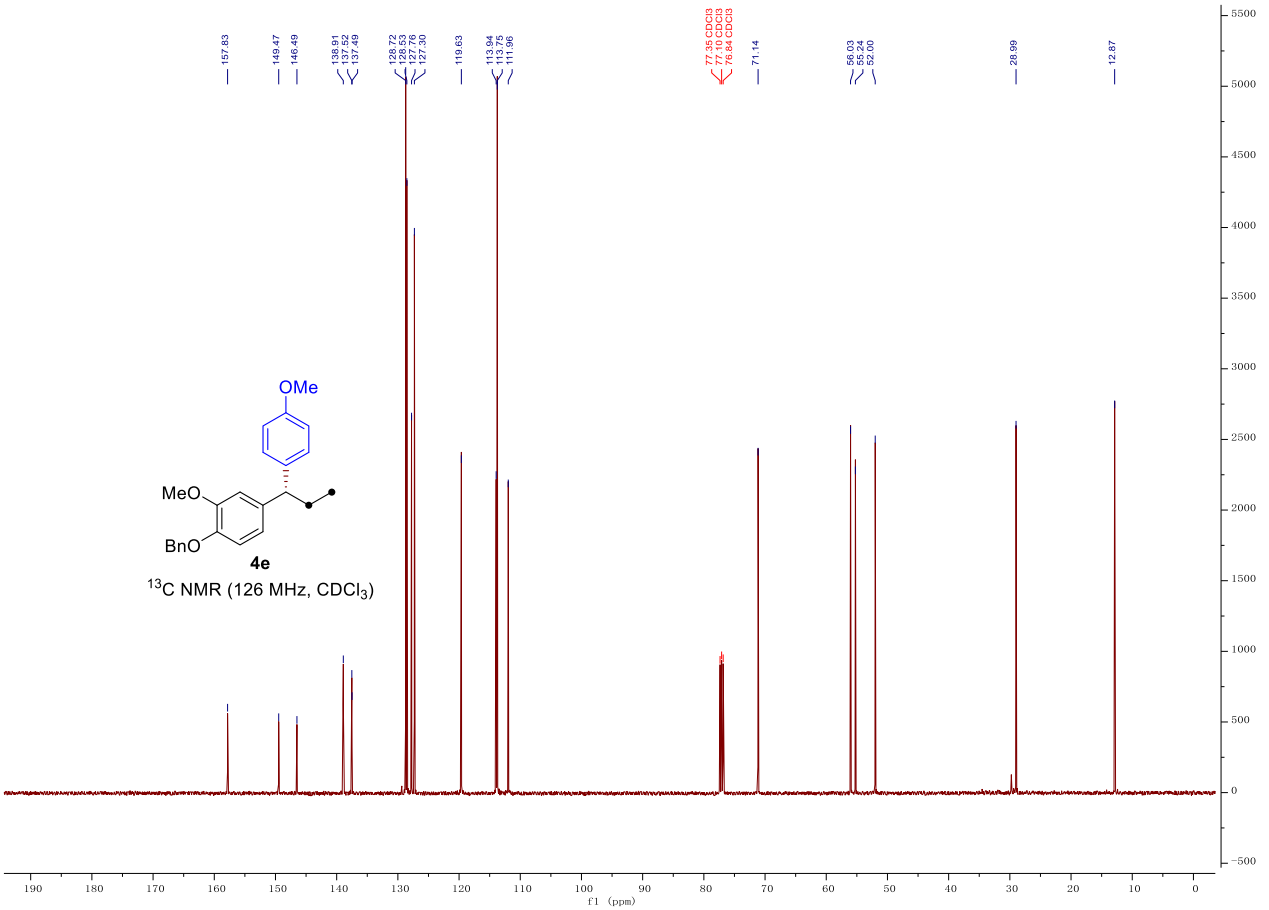
Supplementary Fig. 57. ^{1}H NMR of compound **4d**



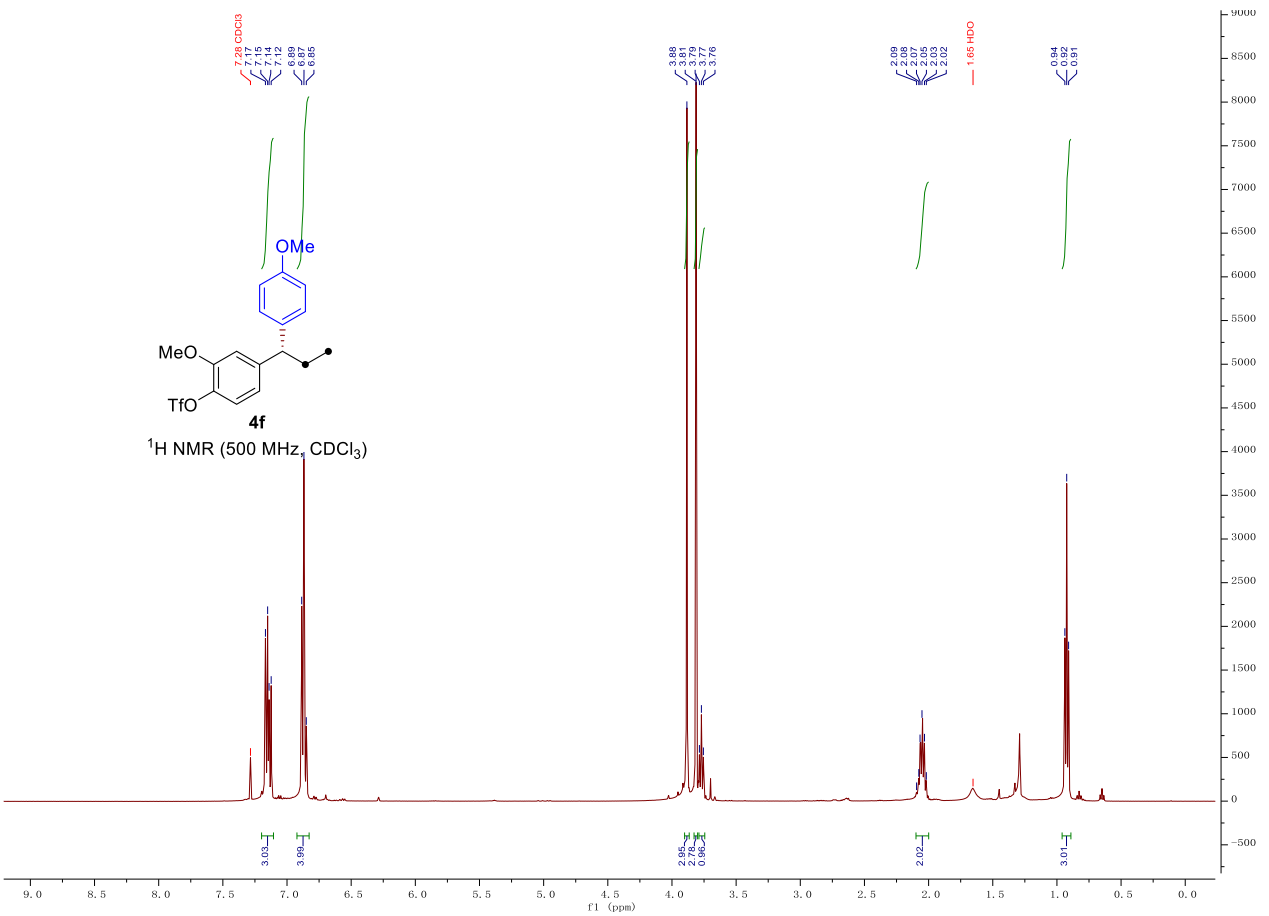
Supplementary Fig. 58. ^{13}C NMR of compound **4d**



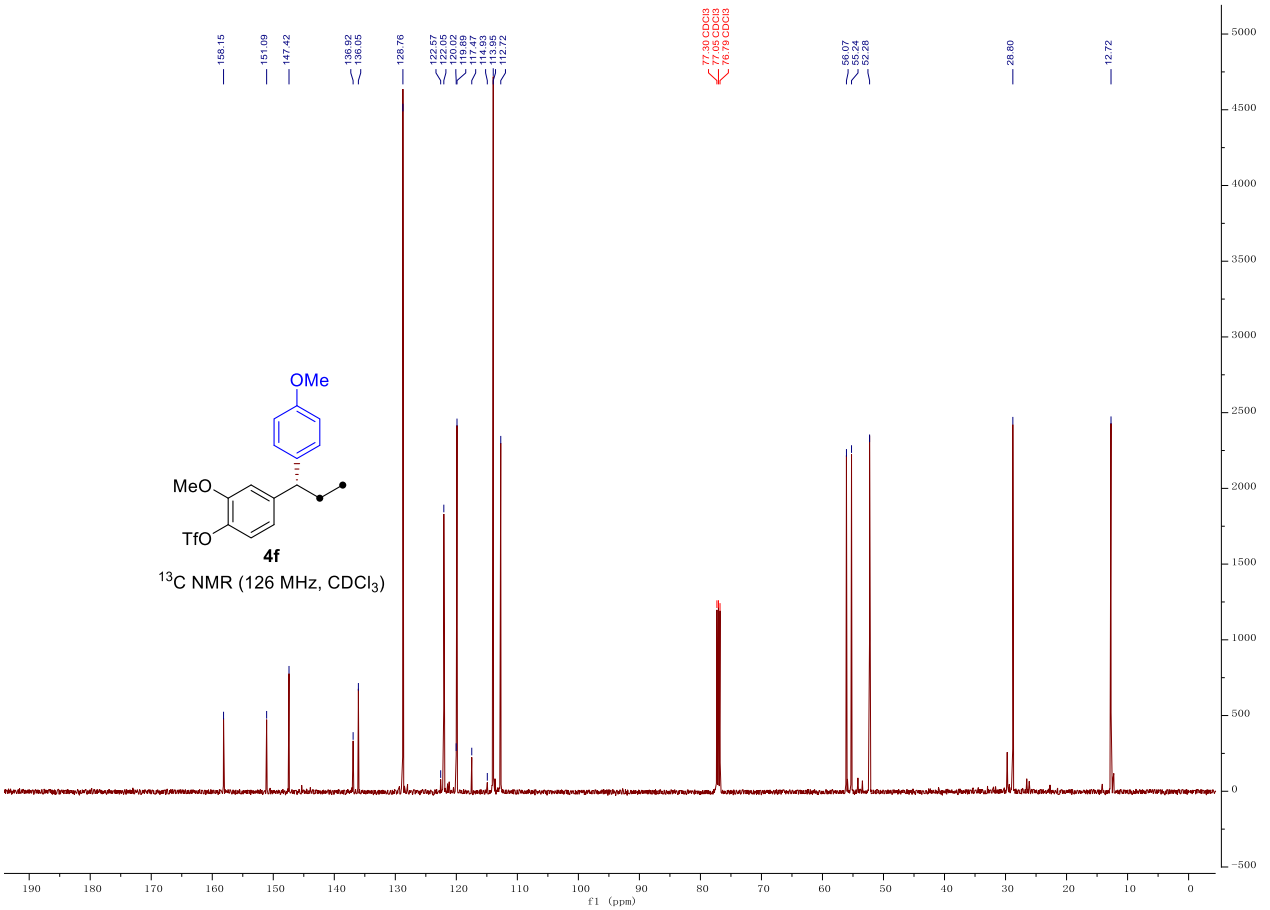
Supplementary Fig. 59. ^{1}H NMR of compound **4e**



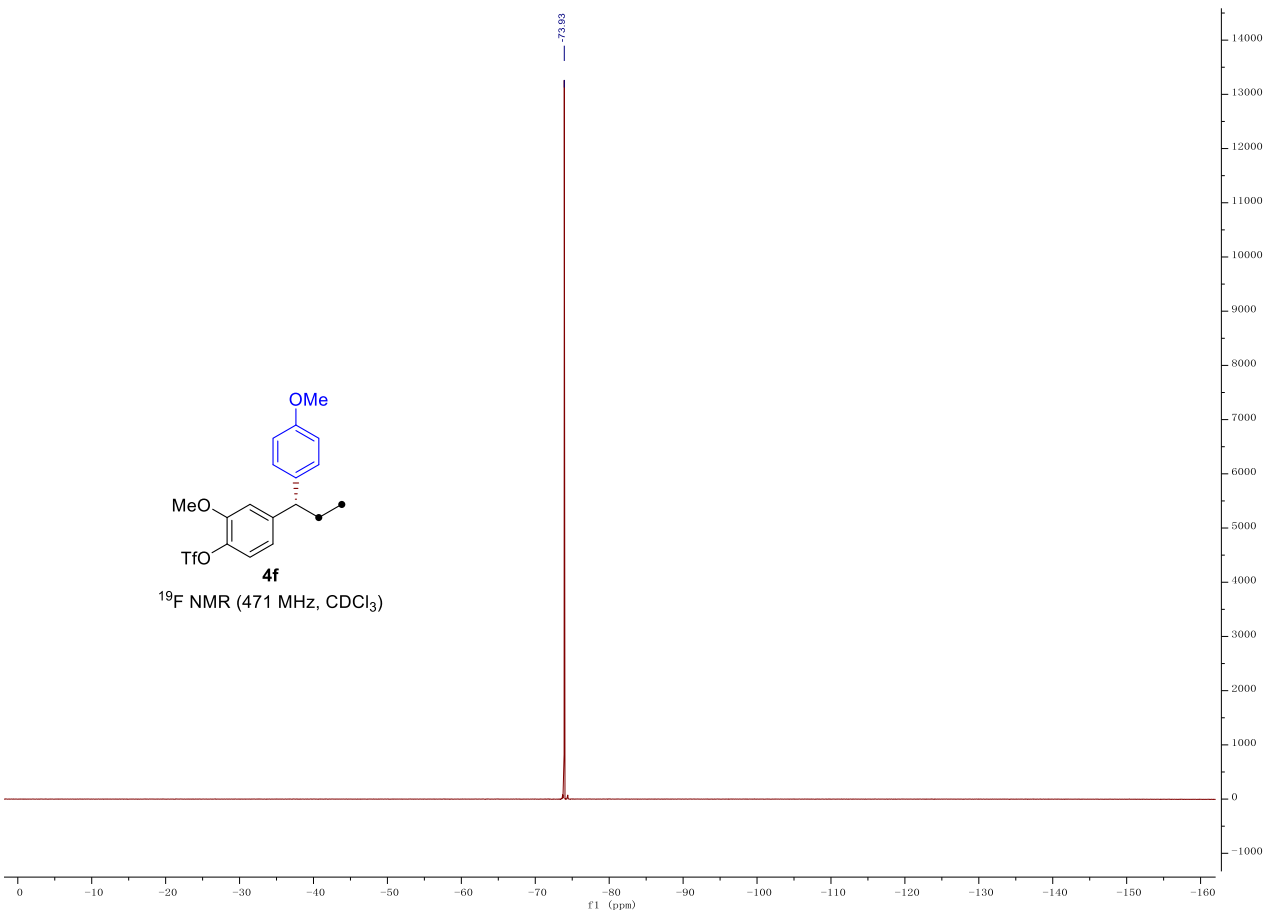
Supplementary Fig. 60. ^{13}C NMR of compound **4e**



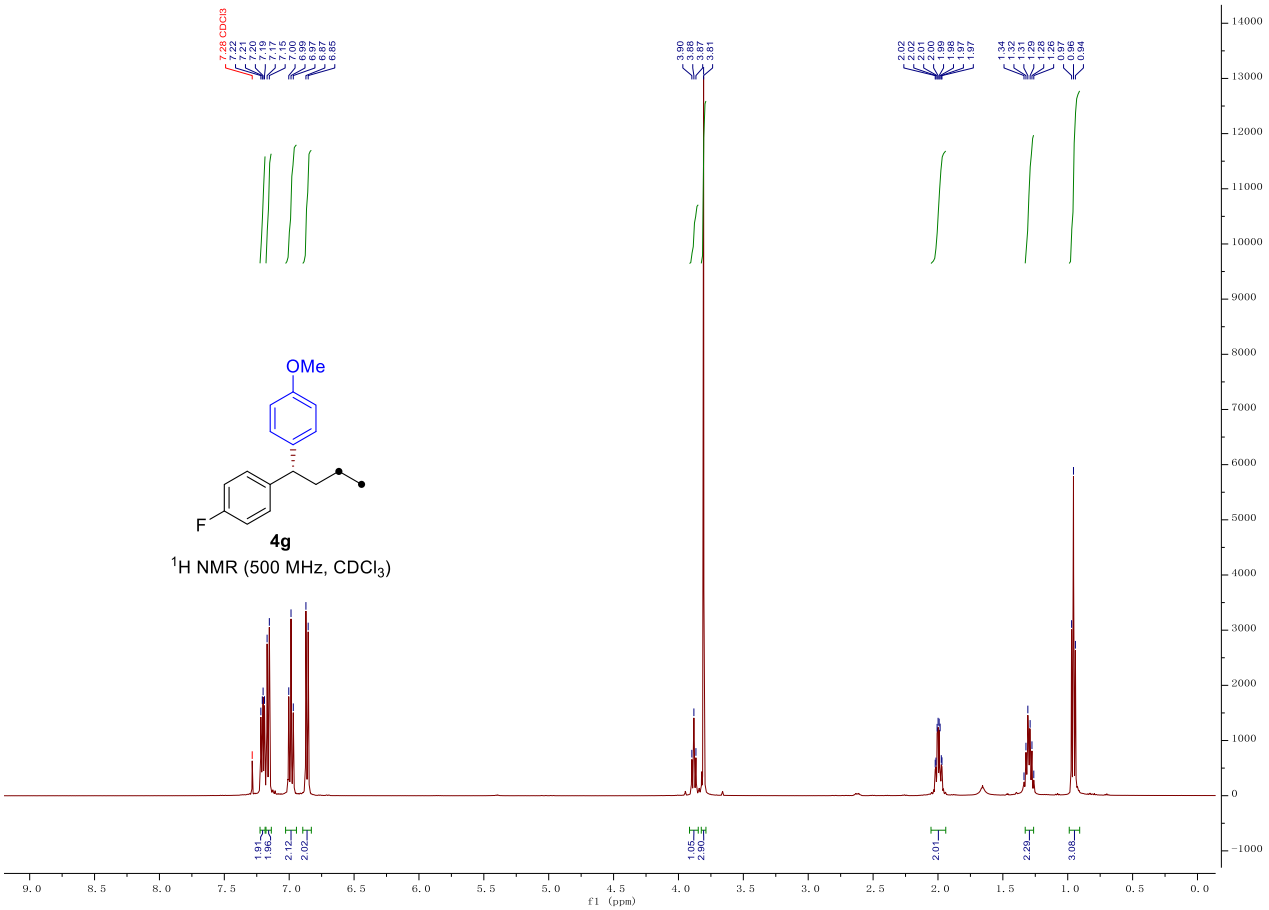
Supplementary Fig. 61. ^{1}H NMR of compound **4f**



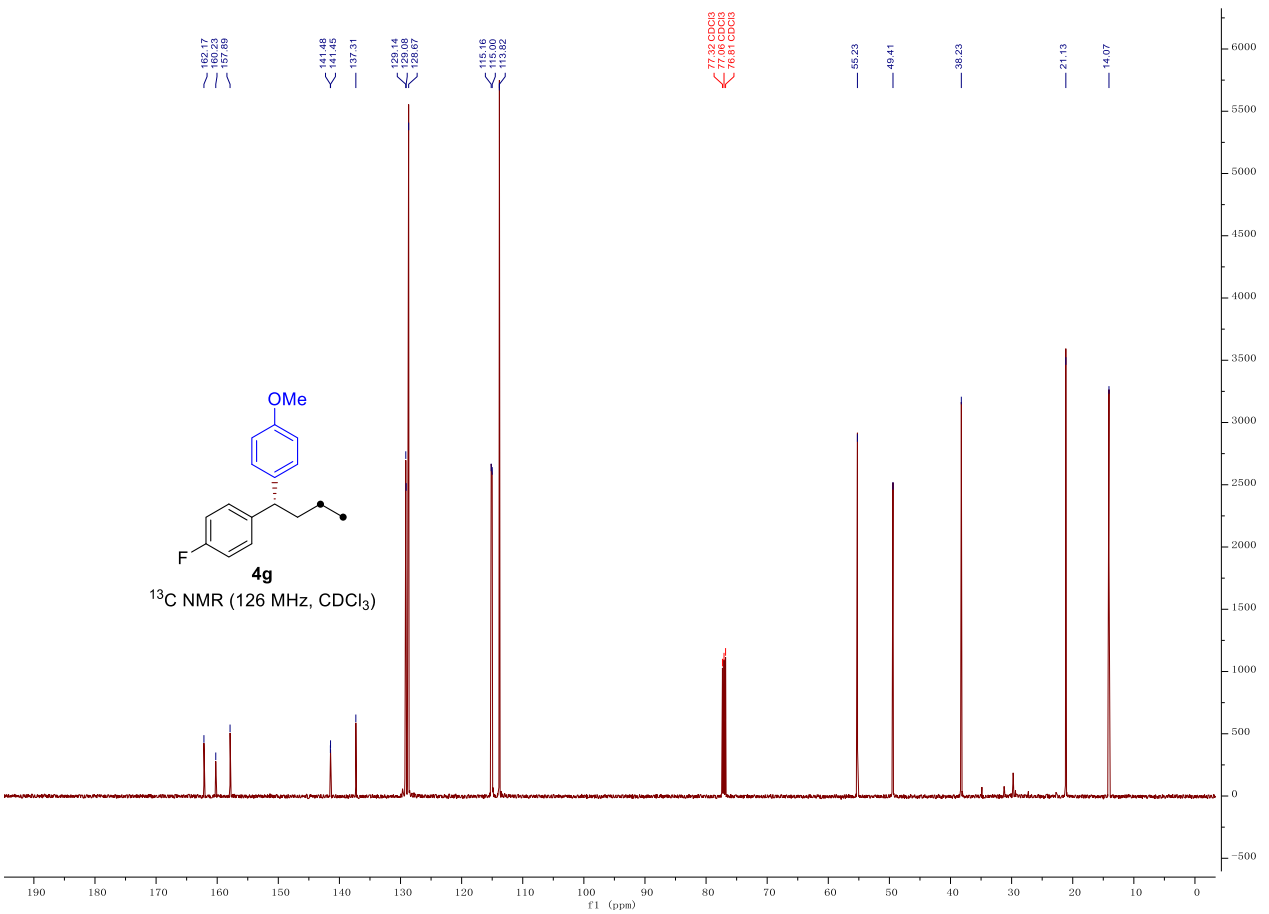
Supplementary Fig. 62. ^{13}C NMR of compound **4f**



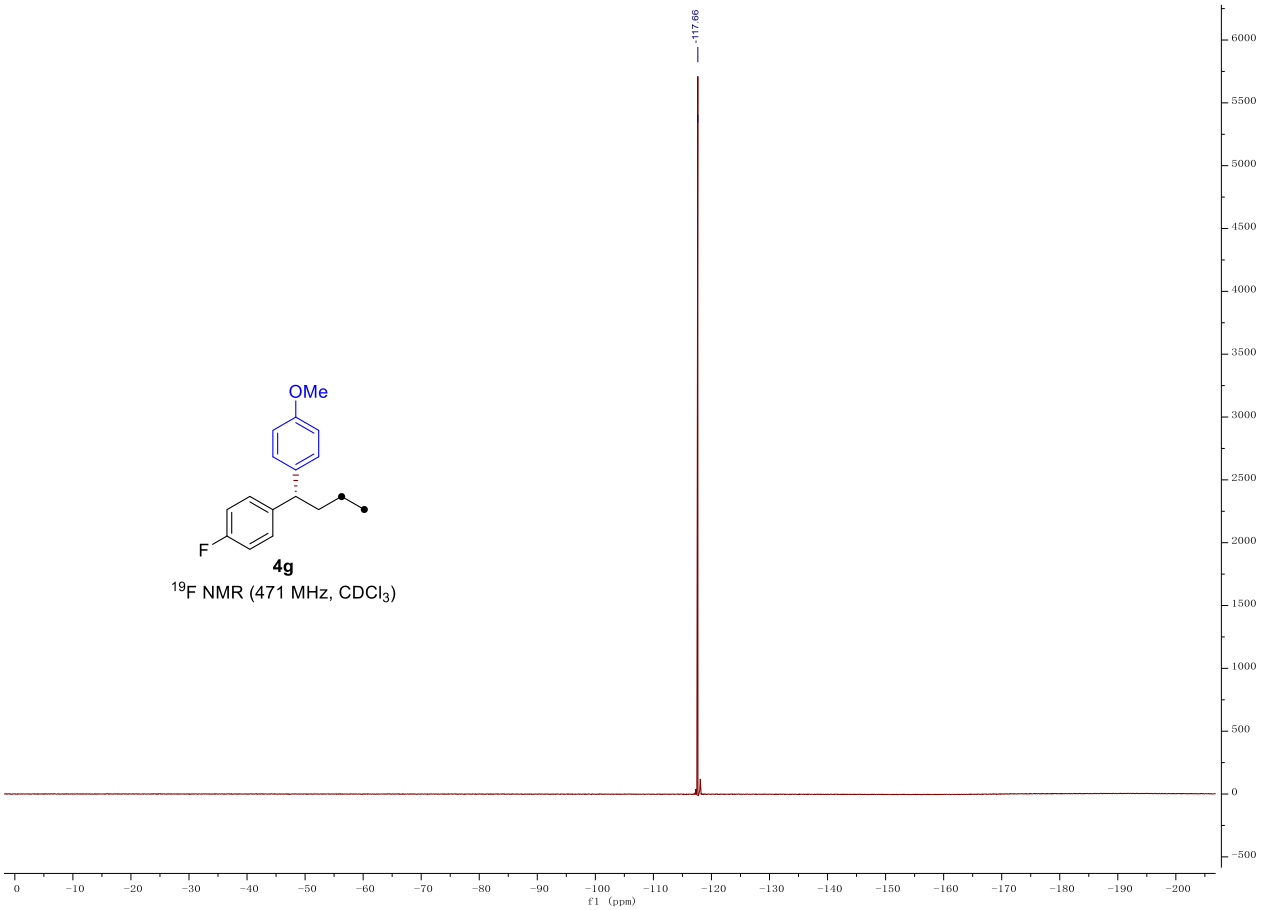
Supplementary Fig. 63. ^{19}F NMR of compound **4f**



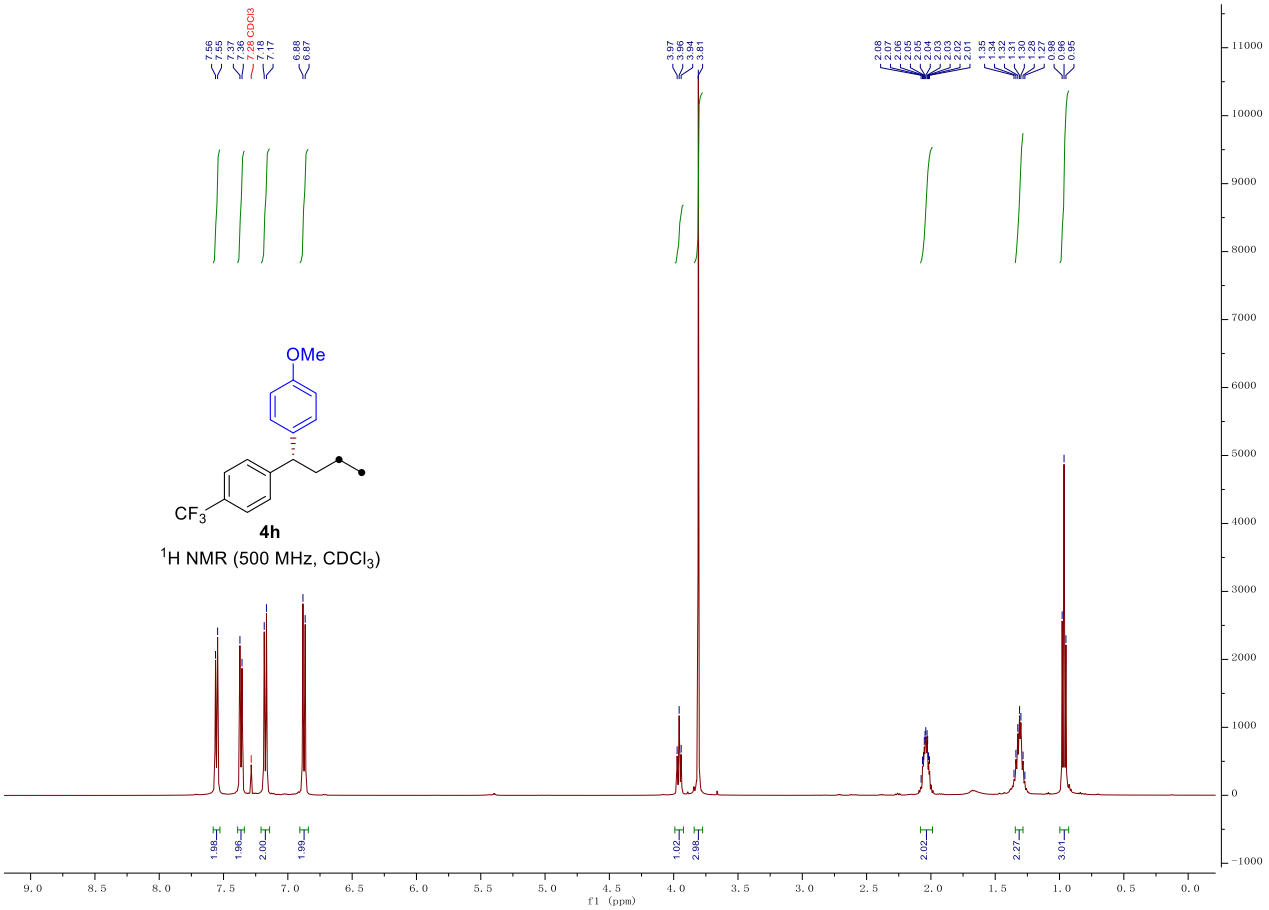
Supplementary Fig. 64. ^{1}H NMR of compound **4g**



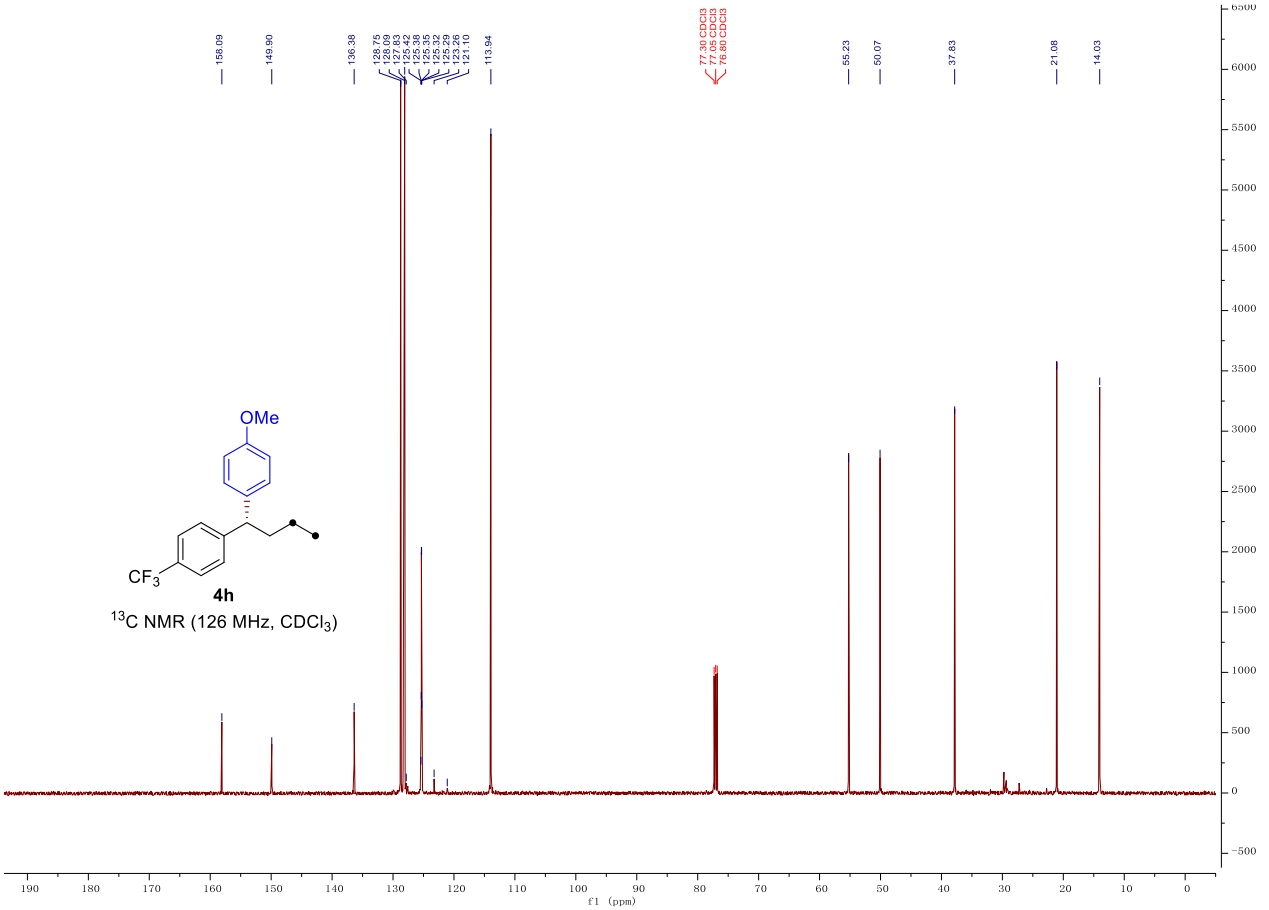
Supplementary Fig. 65. ^{13}C NMR of compound **4g**



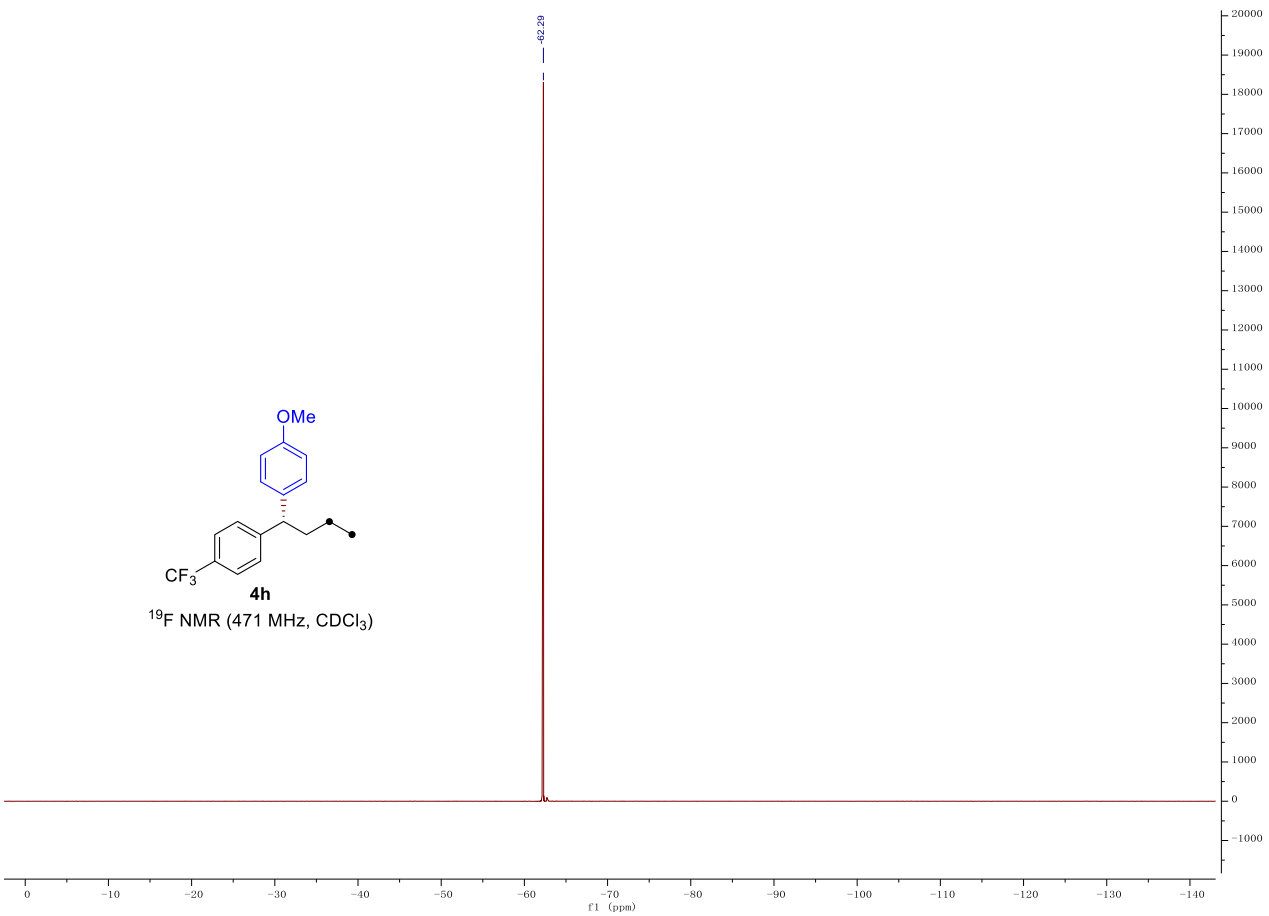
Supplementary Fig. 66. ^{19}F NMR of compound **4g**



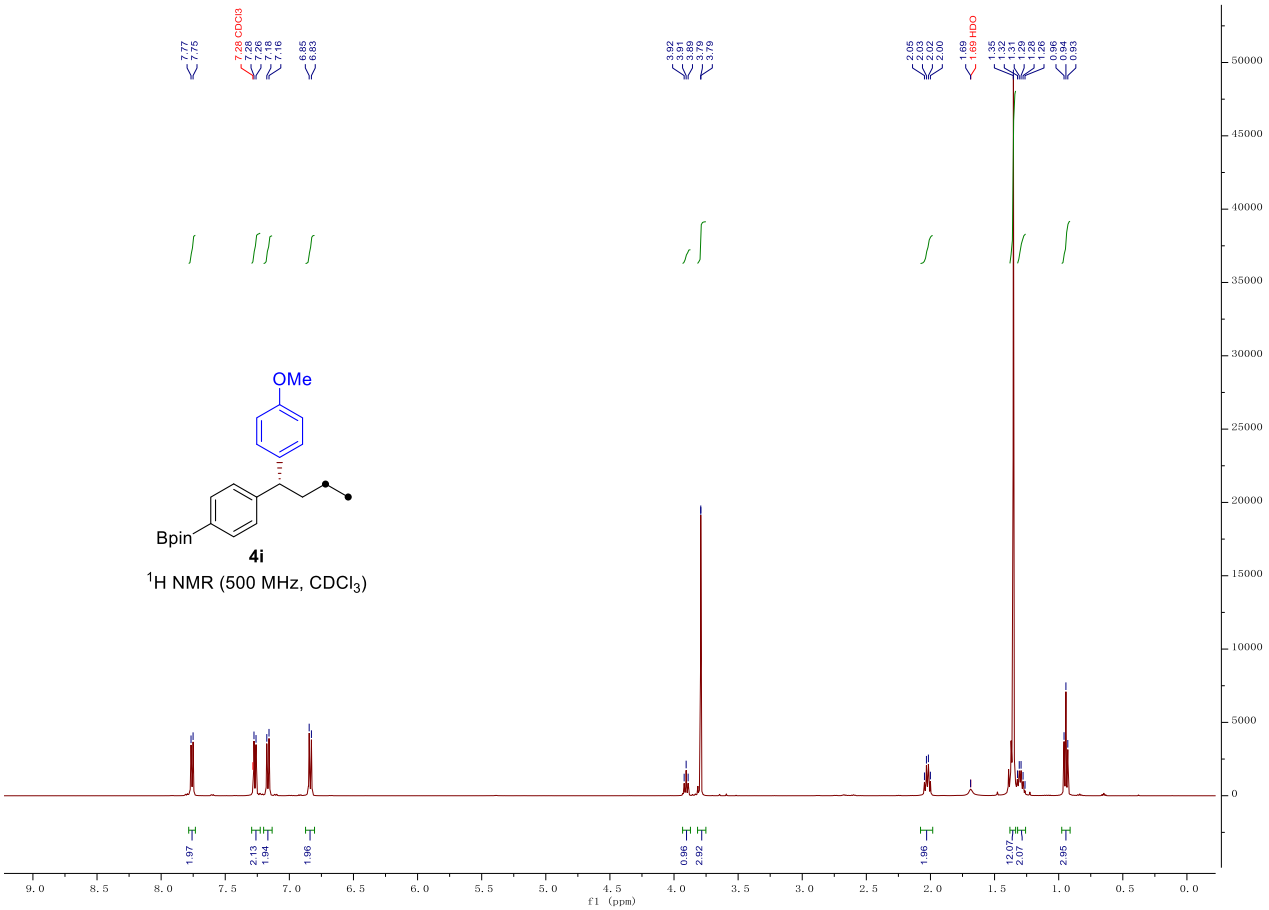
Supplementary Fig. 67. ^{1}H NMR of compound **4h**



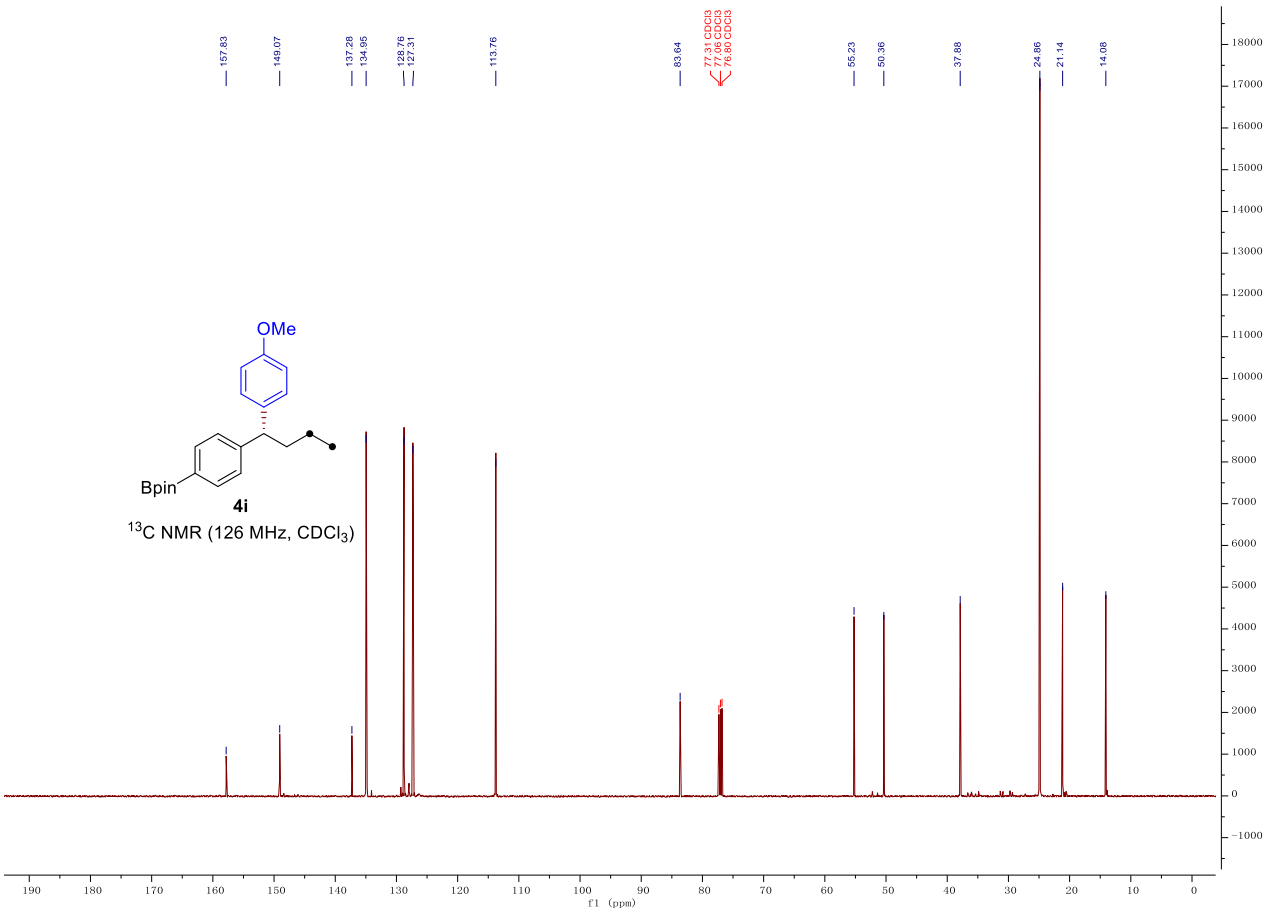
Supplementary Fig. 68. ^{13}C NMR of compound **4h**



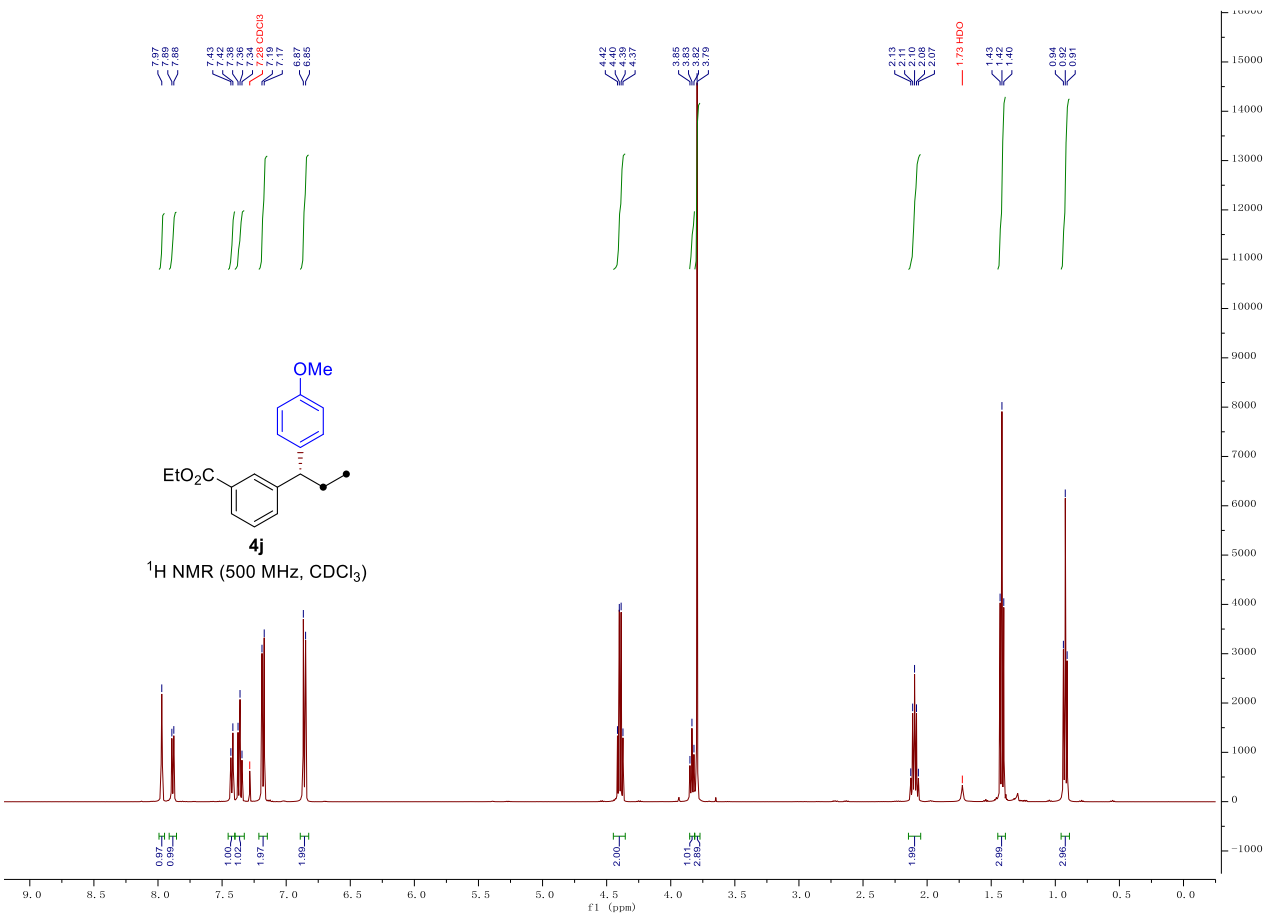
Supplementary Fig. 69. ^{19}F NMR of compound **4h**



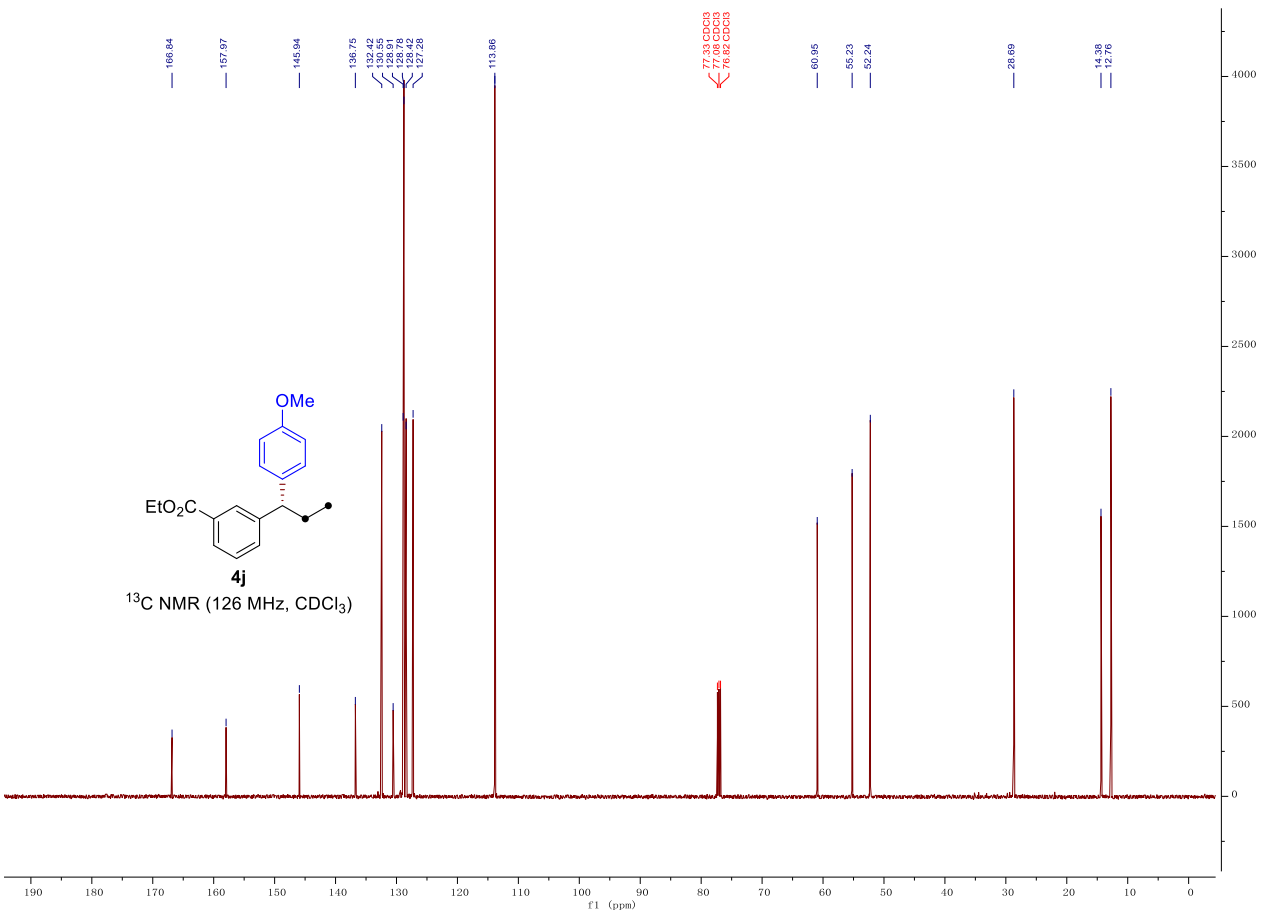
Supplementary Fig. 70. ^{1}H NMR of compound **4i**



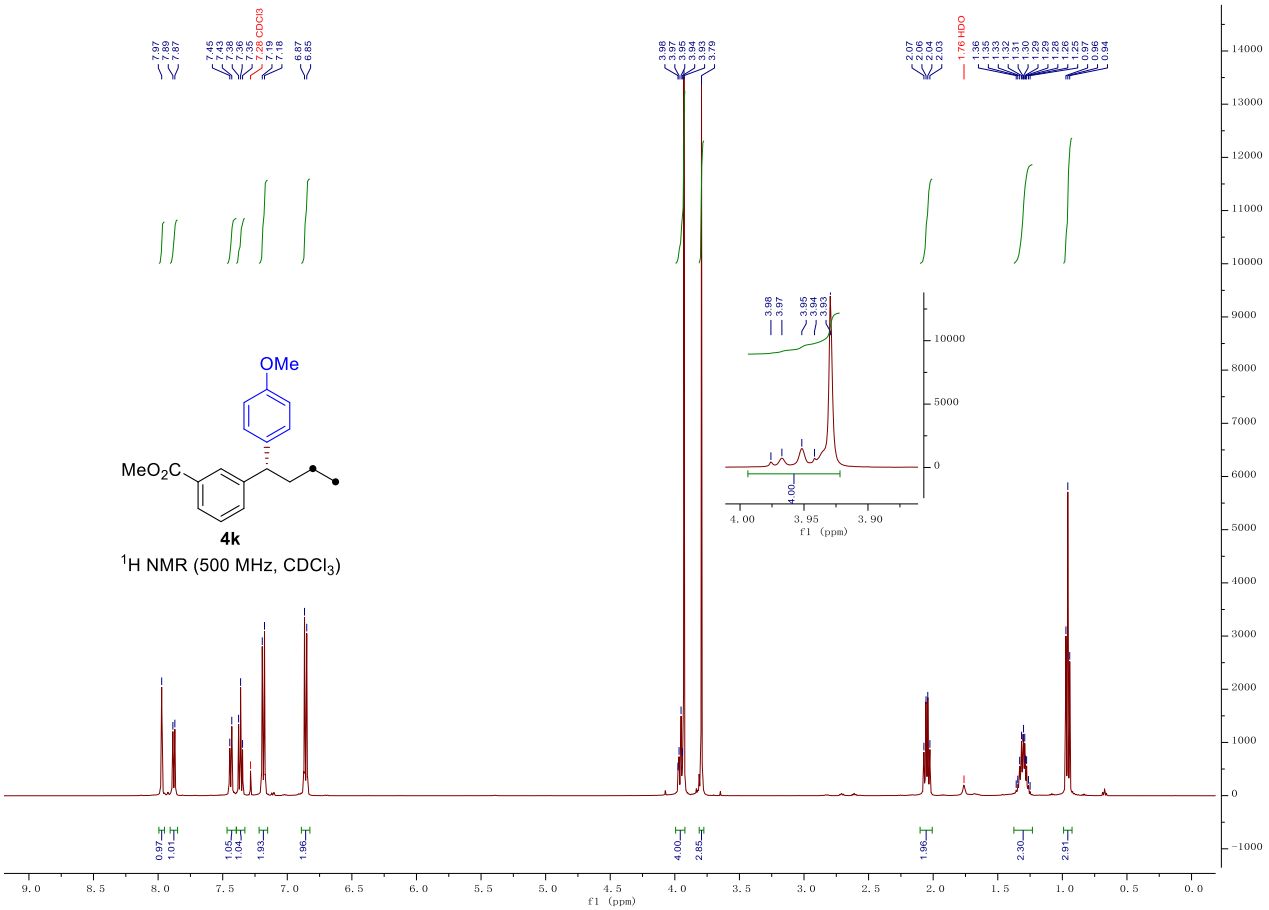
Supplementary Fig. 71. ^{13}C NMR of compound **4i**



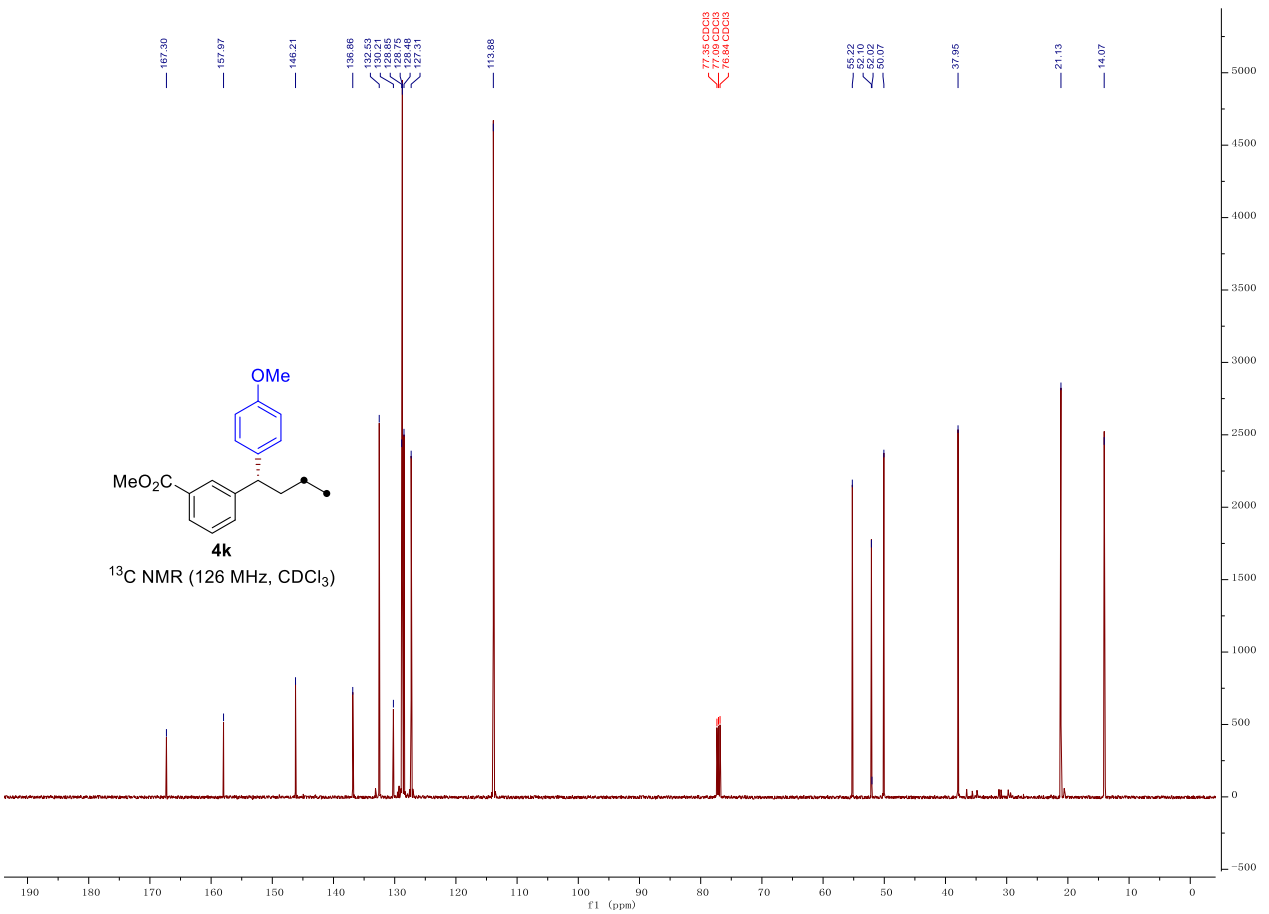
Supplementary Fig. 72. ^{1}H NMR of compound **4j**



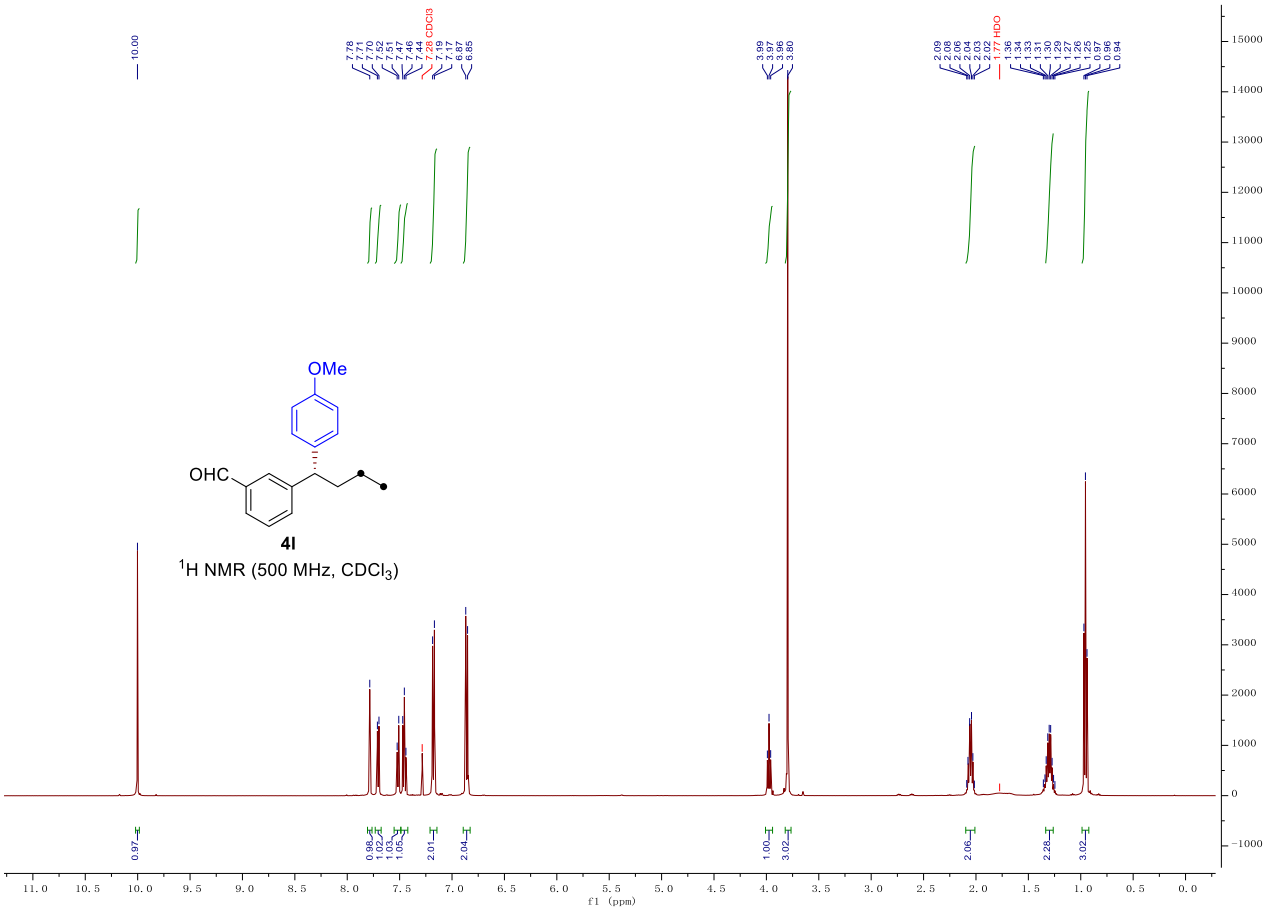
Supplementary Fig. 73. ^{13}C NMR of compound **4j**



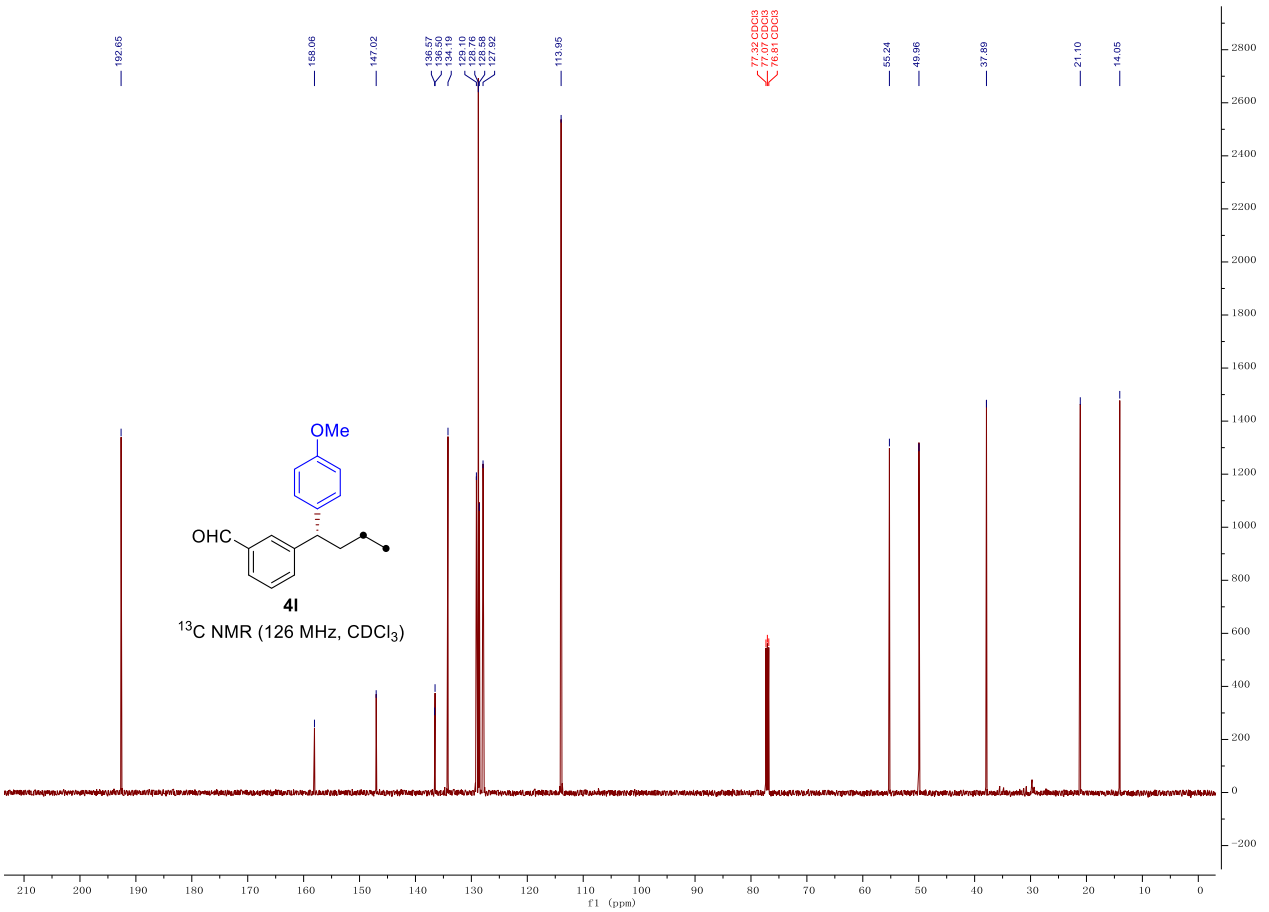
Supplementary Fig. 74. ^{1}H NMR of compound **4k**



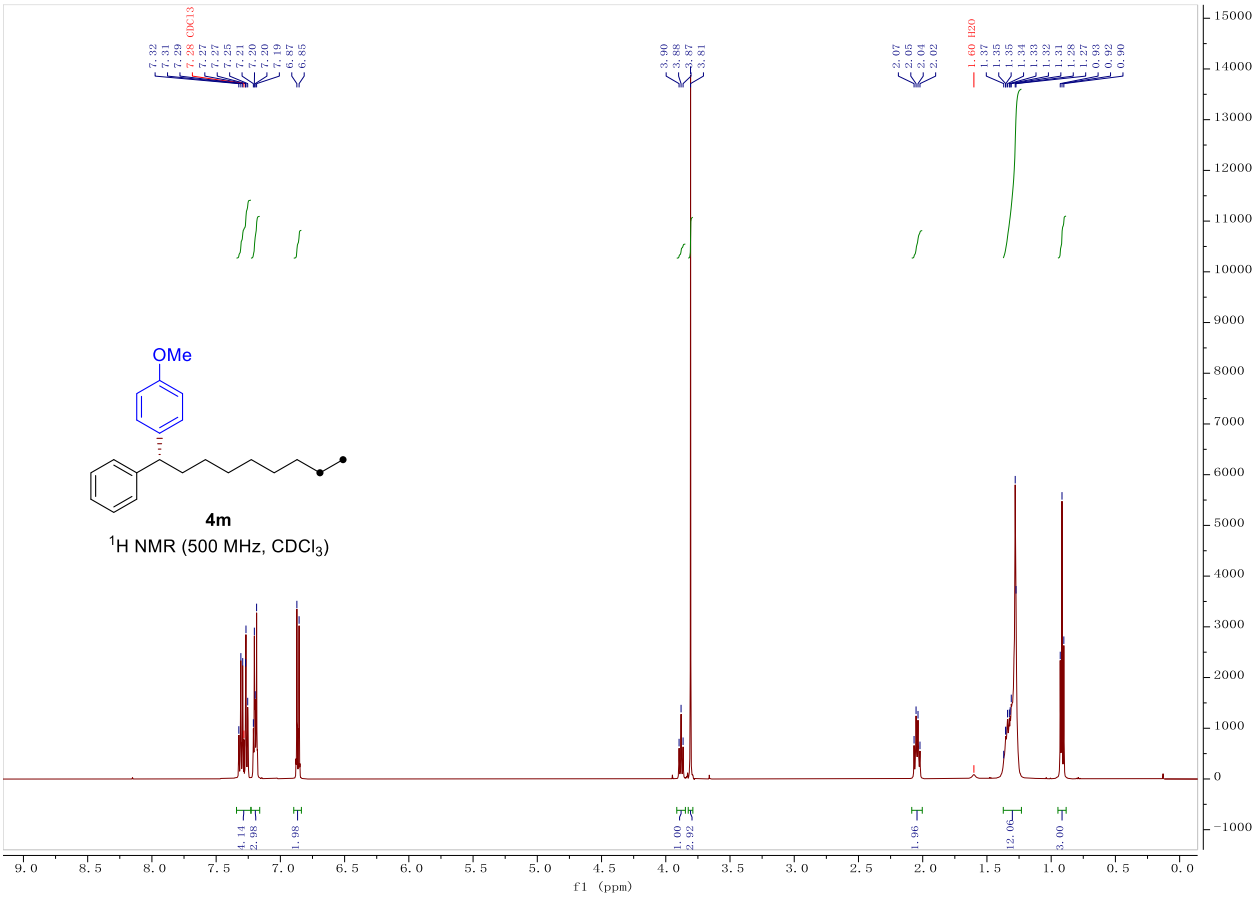
Supplementary Fig. 75. ^{13}C NMR of compound **4k**



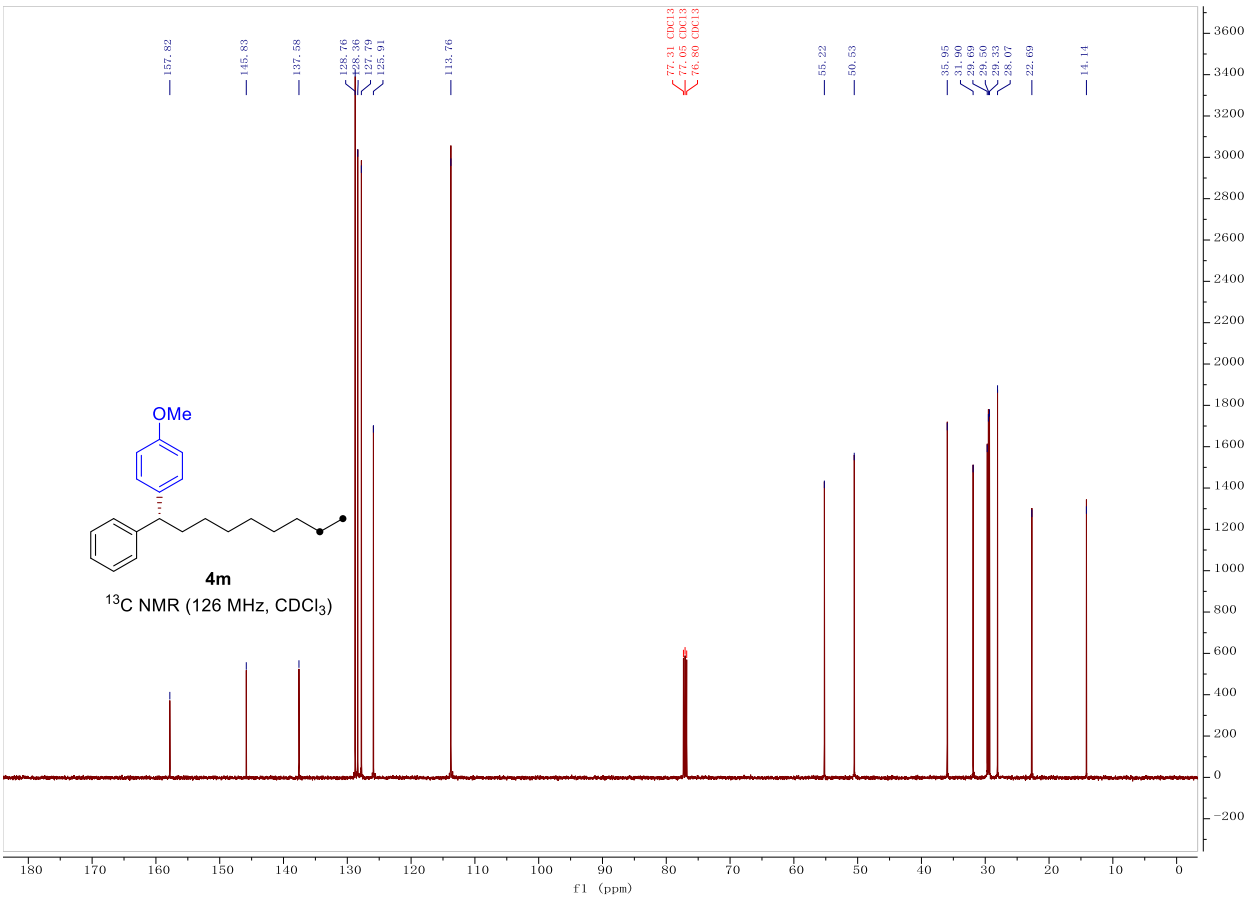
Supplementary Fig. 76. ^{1}H NMR of compound **4l**



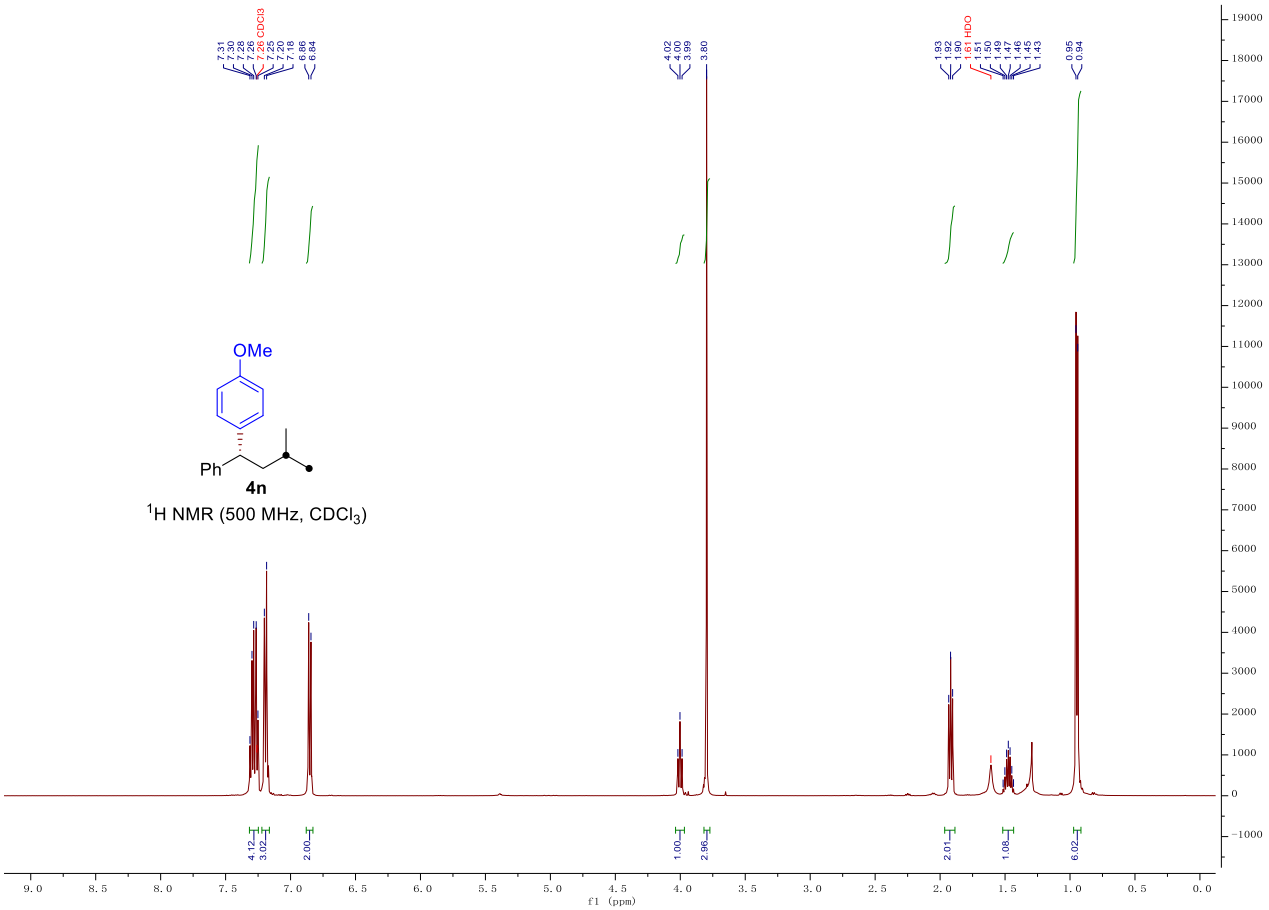
Supplementary Fig. 77. ^{13}C NMR of compound **4l**



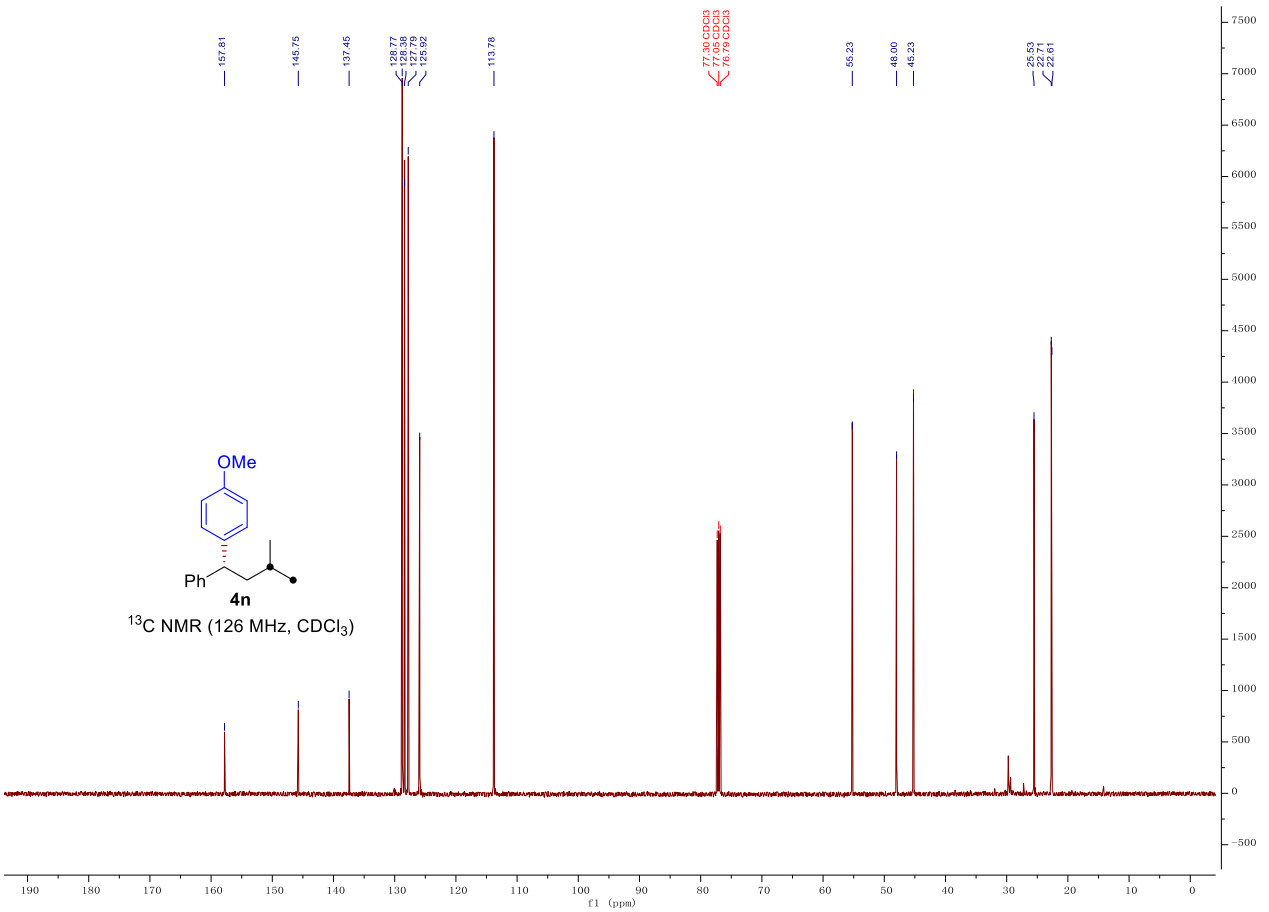
Supplementary Fig. 78. ^{1}H NMR of compound **4m**



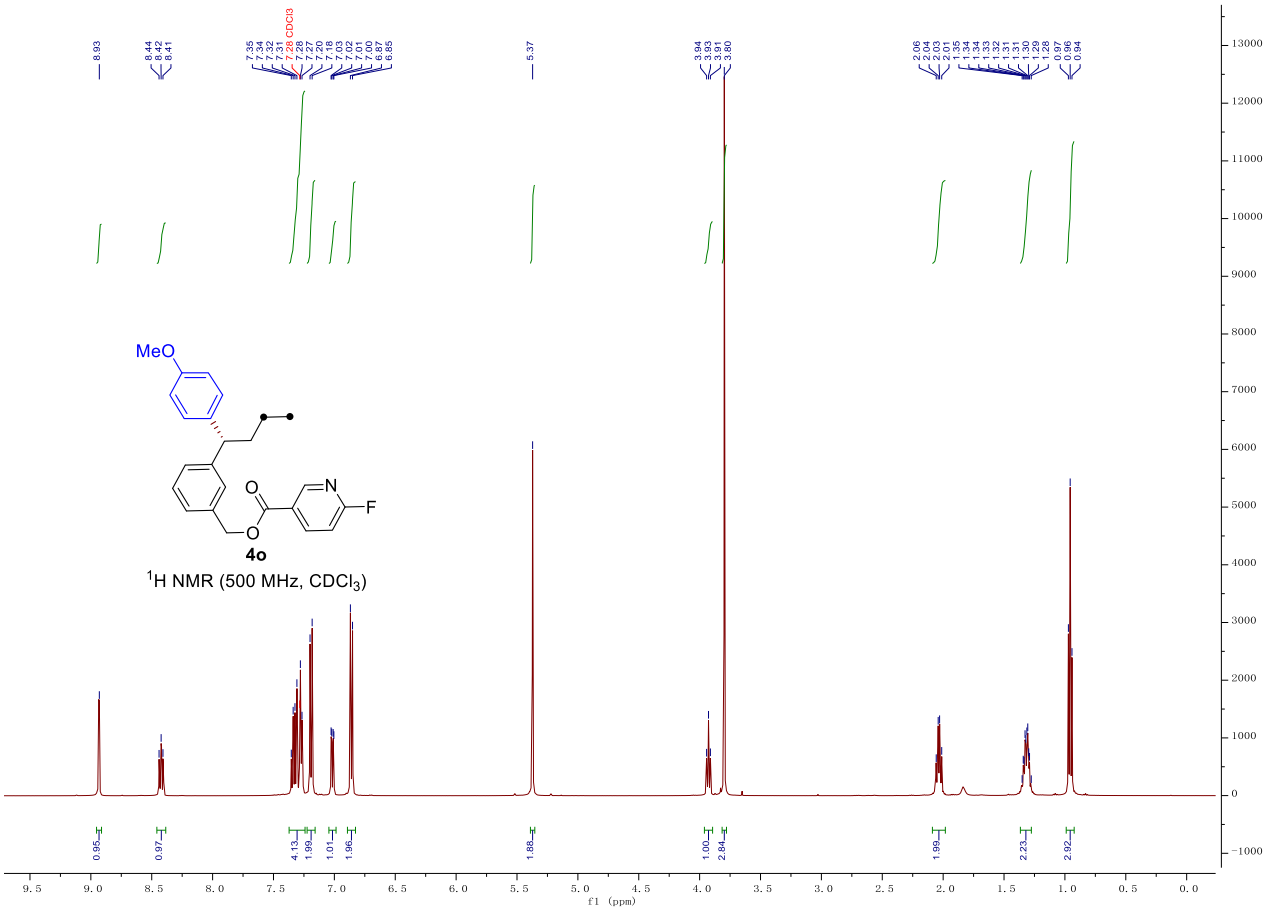
Supplementary Fig. 79. ^{13}C NMR of compound **4m**



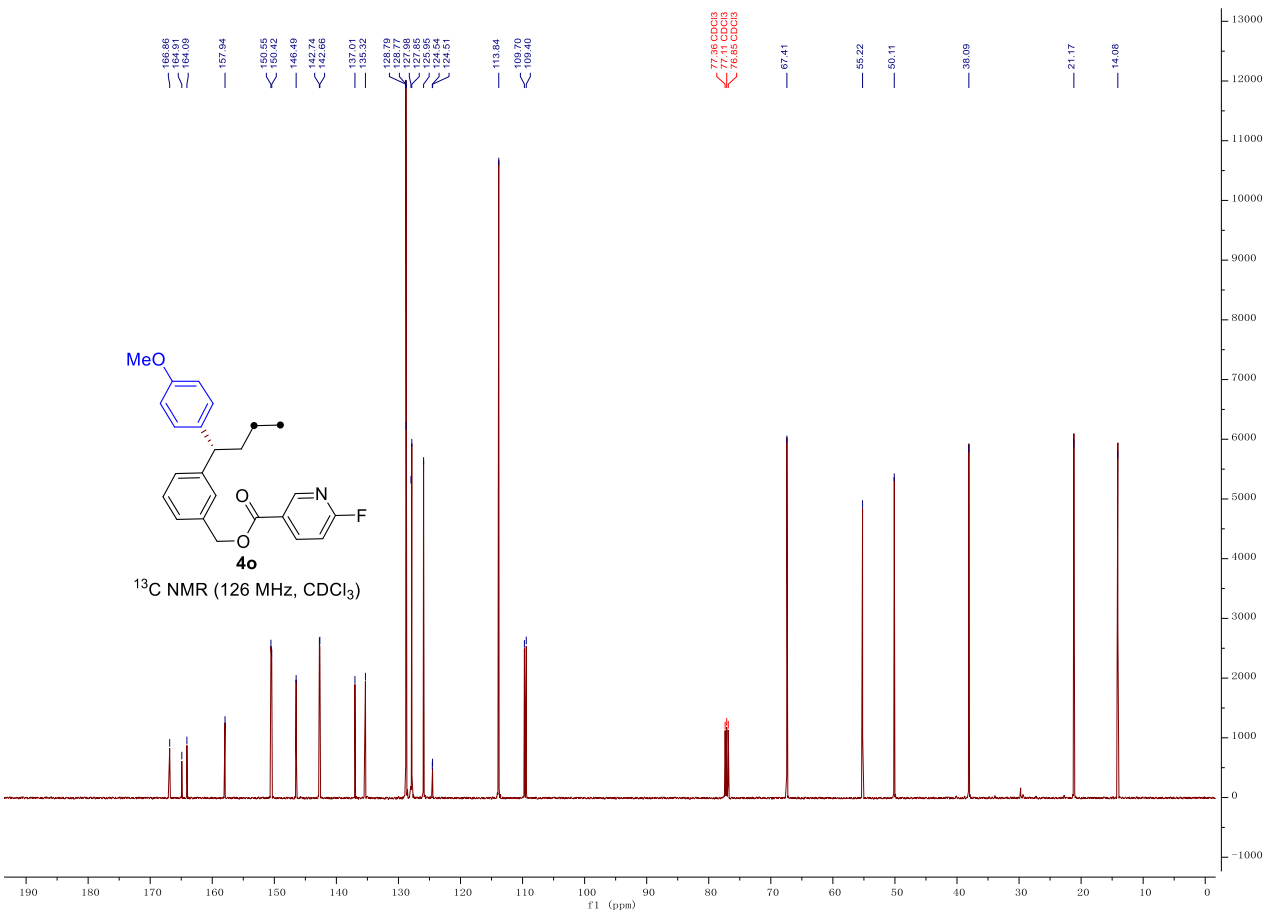
Supplementary Fig. 80. ^{1}H NMR of compound **4n**



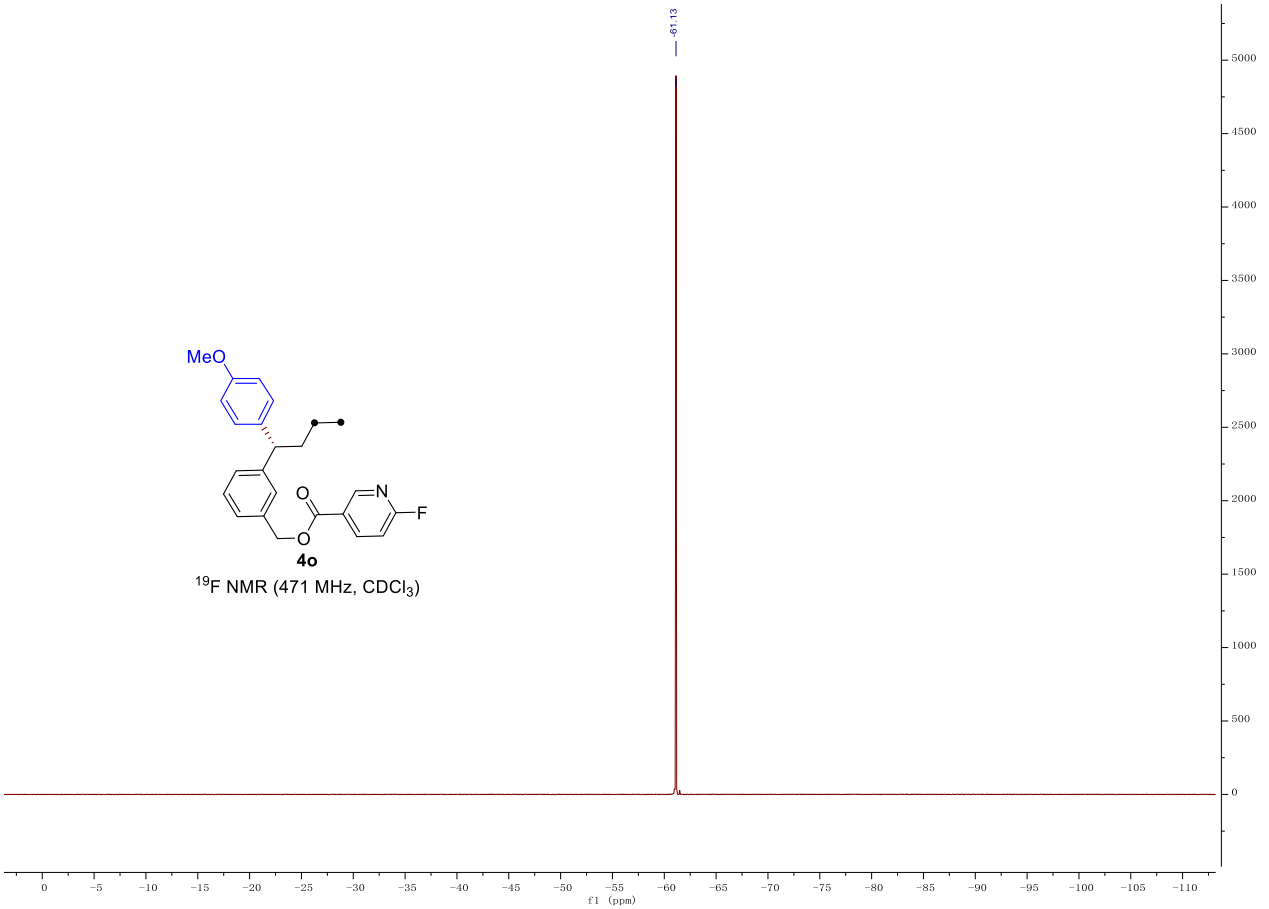
Supplementary Fig. 81. ^{13}C NMR of compound **4n**



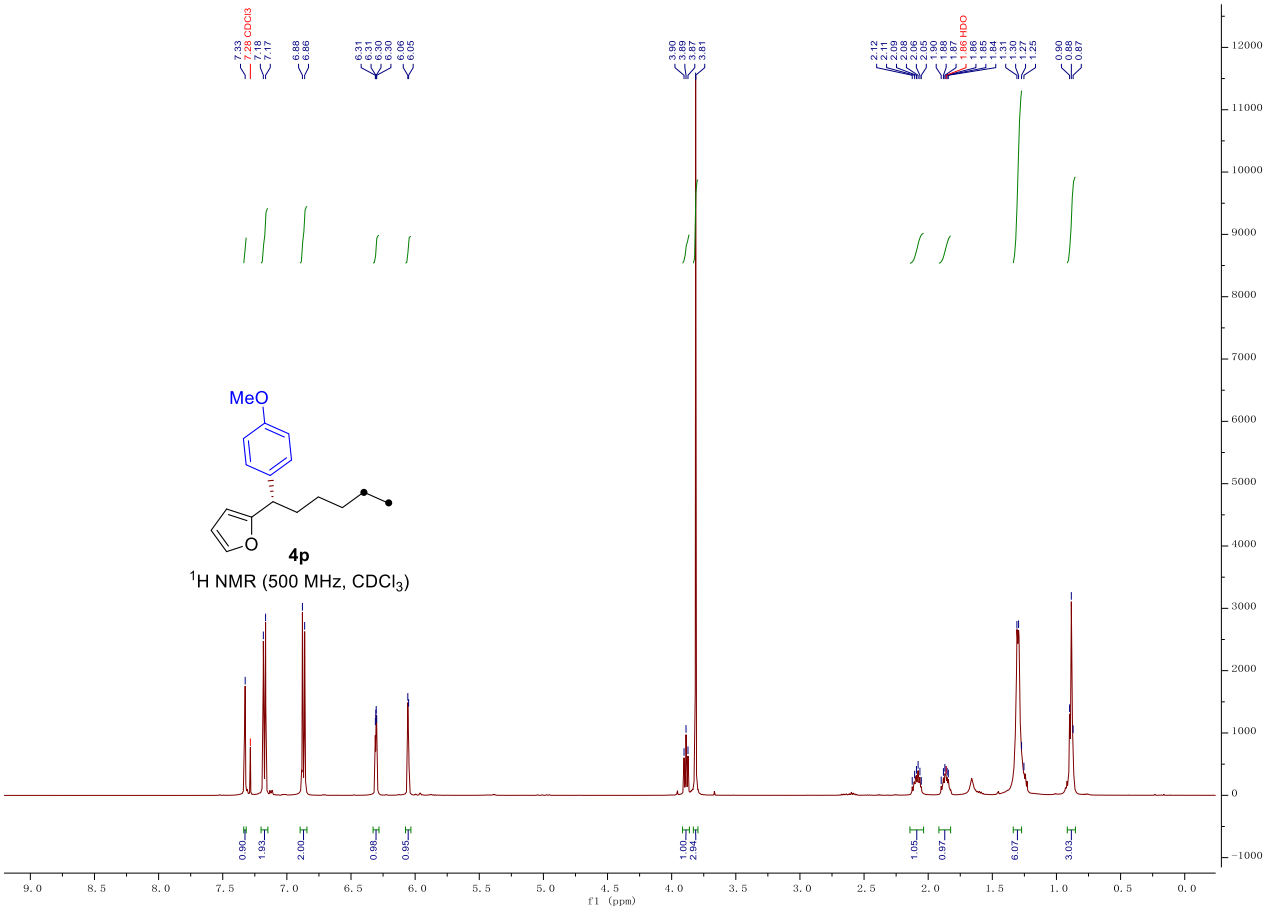
Supplementary Fig. 82. ^{1}H NMR of compound **4o**



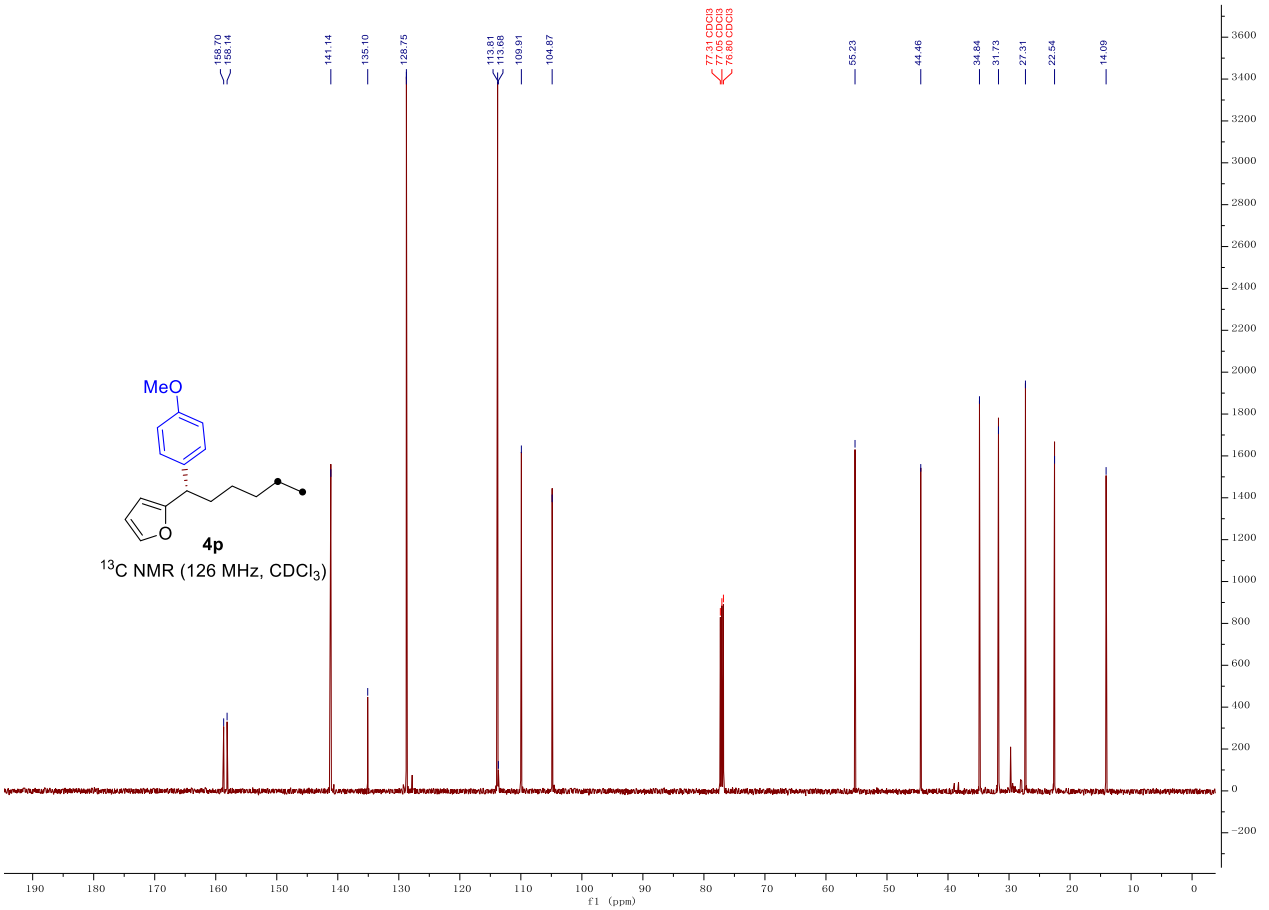
Supplementary Fig. 83. ^{13}C NMR of compound **4o**



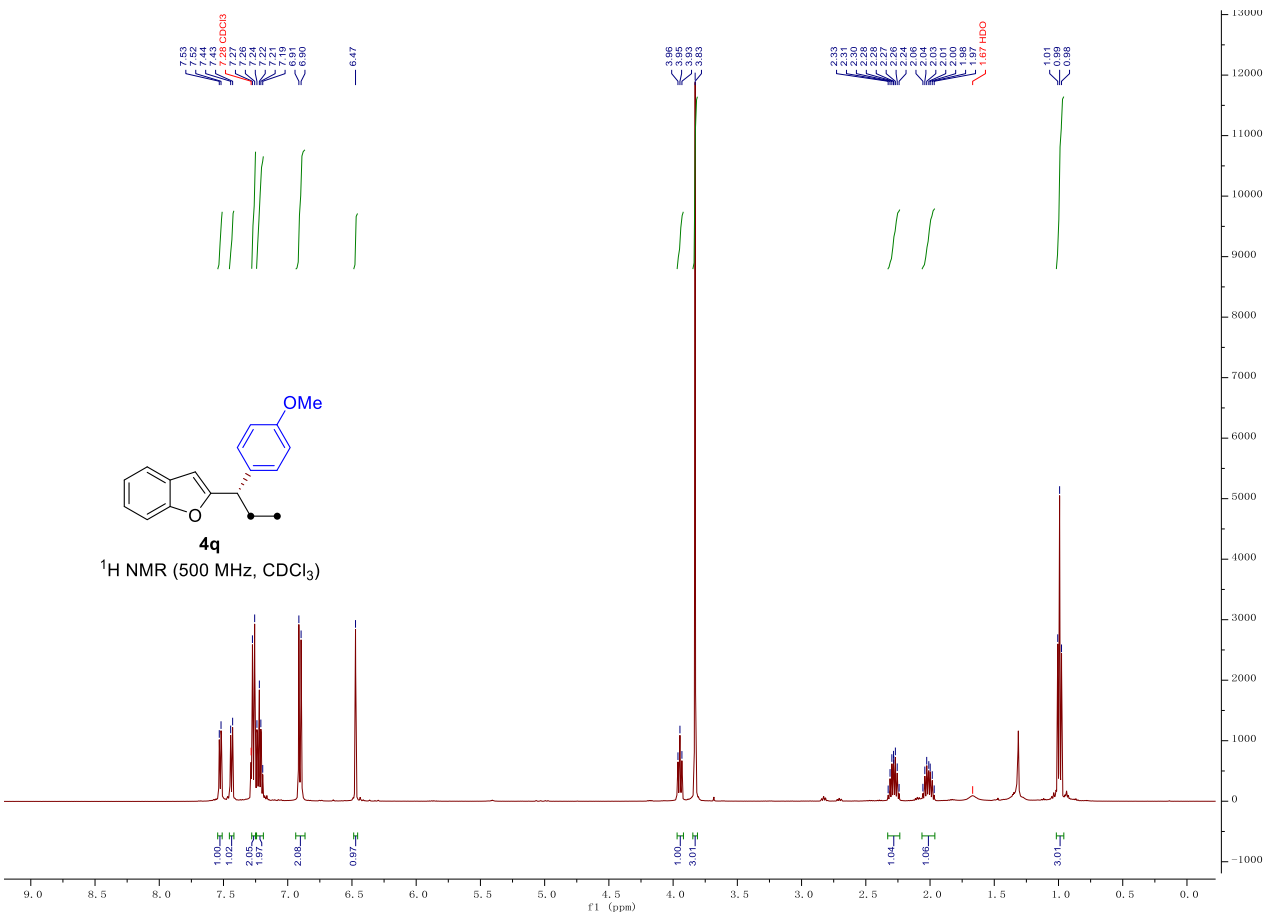
Supplementary Fig. 84. ^{19}F NMR of compound **4o**



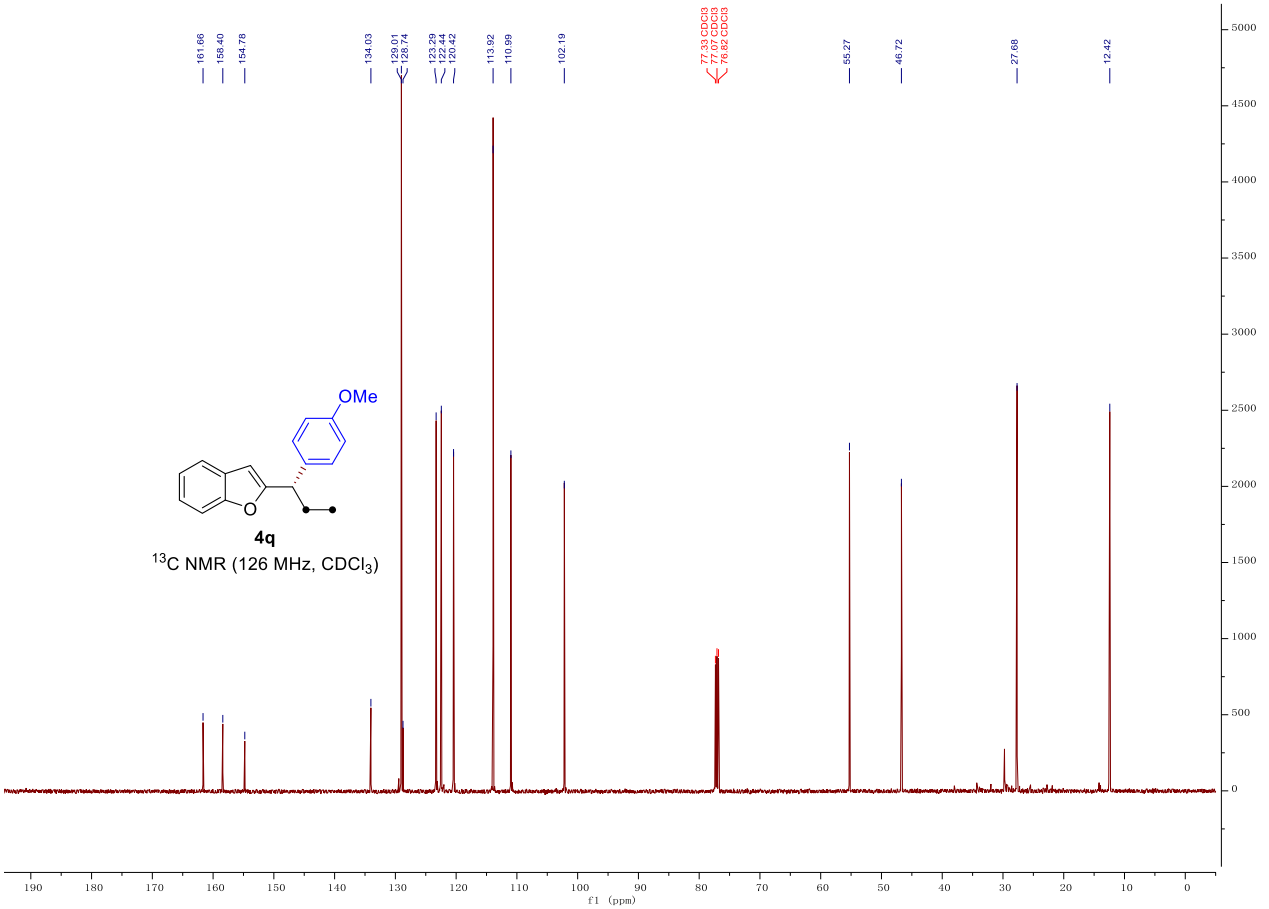
Supplementary Fig. 85. ^{1}H NMR of compound **4p**



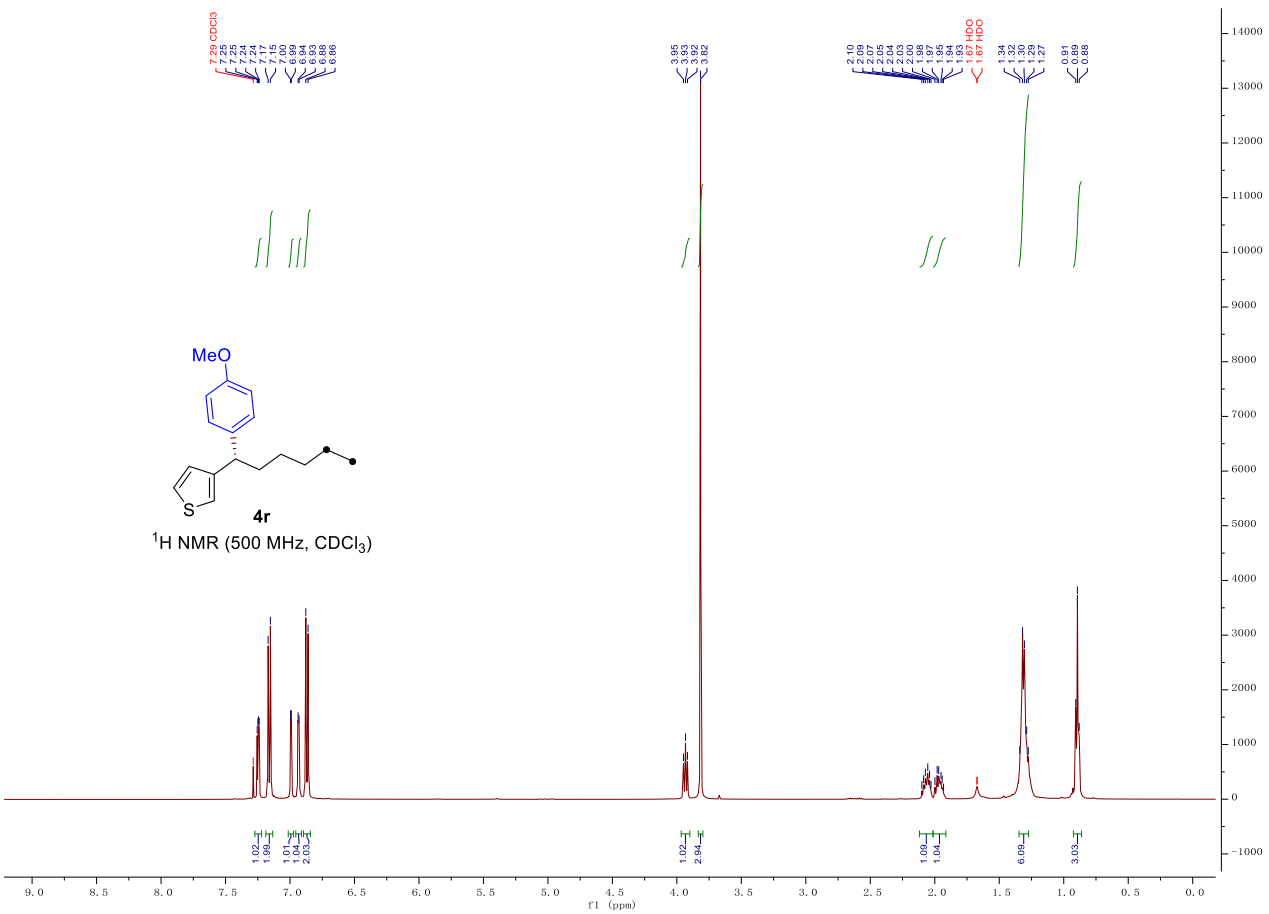
Supplementary Fig. 86. ^{13}C NMR of compound **4p**



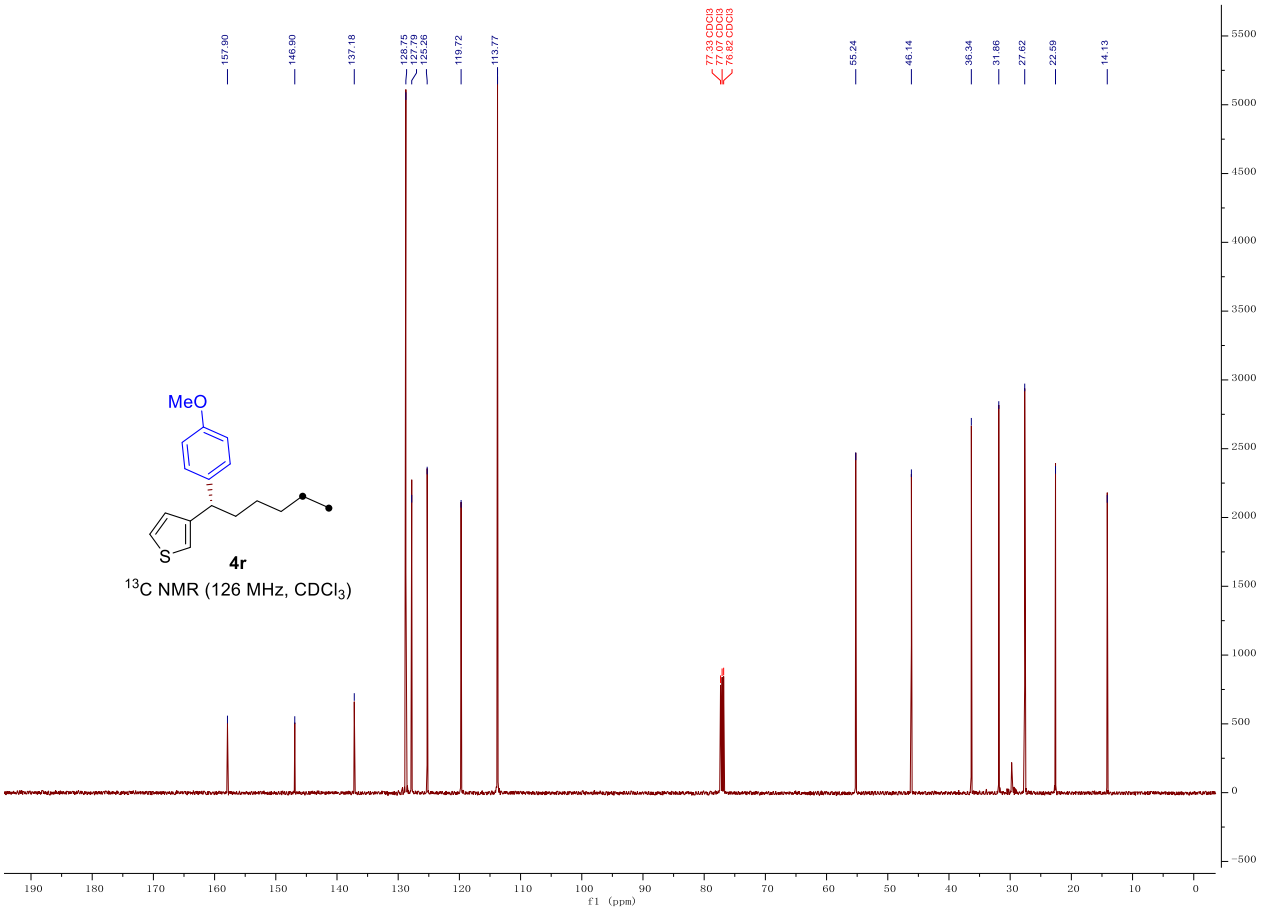
Supplementary Fig. 87. ^{1}H NMR of compound **4q**



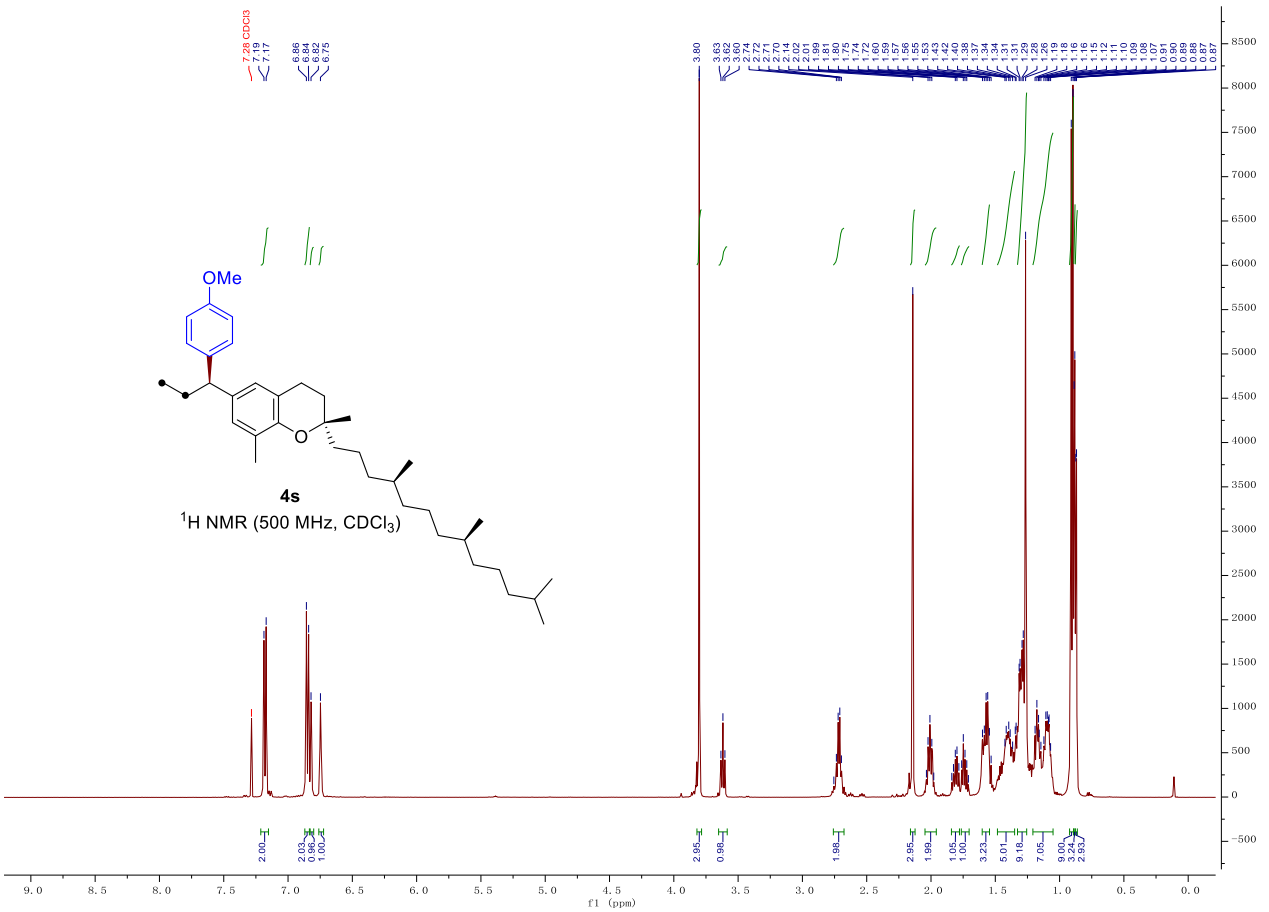
Supplementary Fig. 88. ^{13}C NMR of compound **4q**



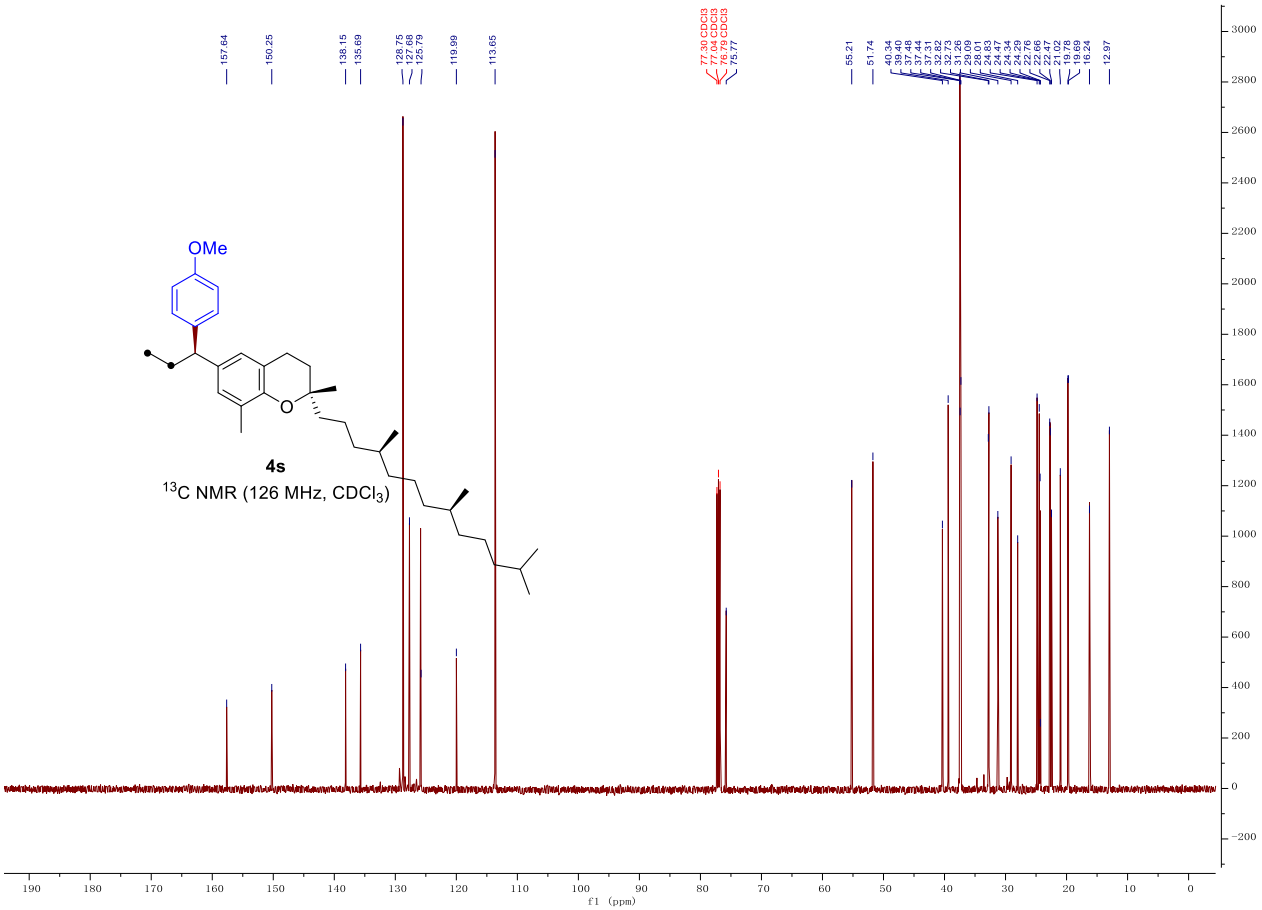
Supplementary Fig. 89. ^{1}H NMR of compound **4r**



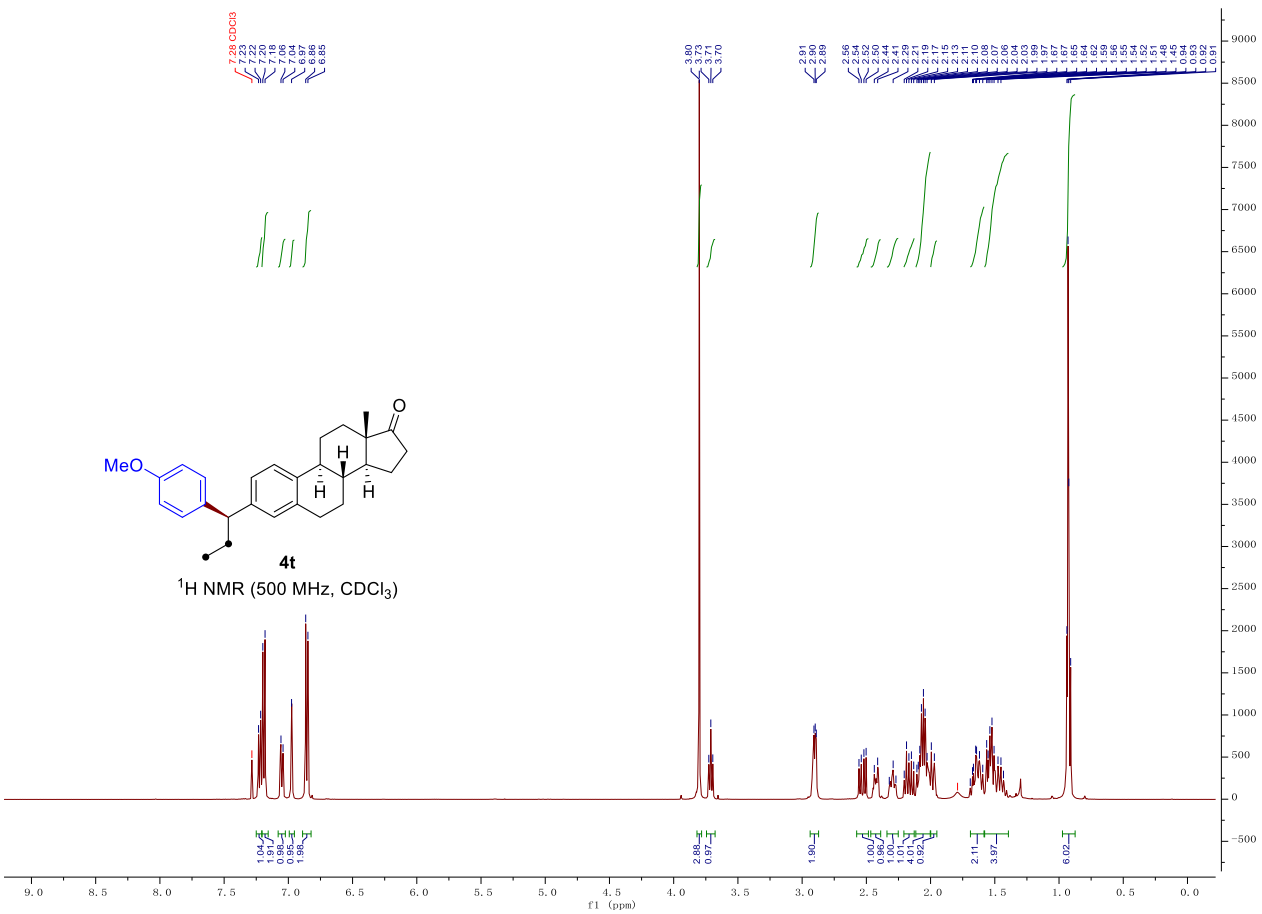
Supplementary Fig. 90. ^{13}C NMR of compound **4r**



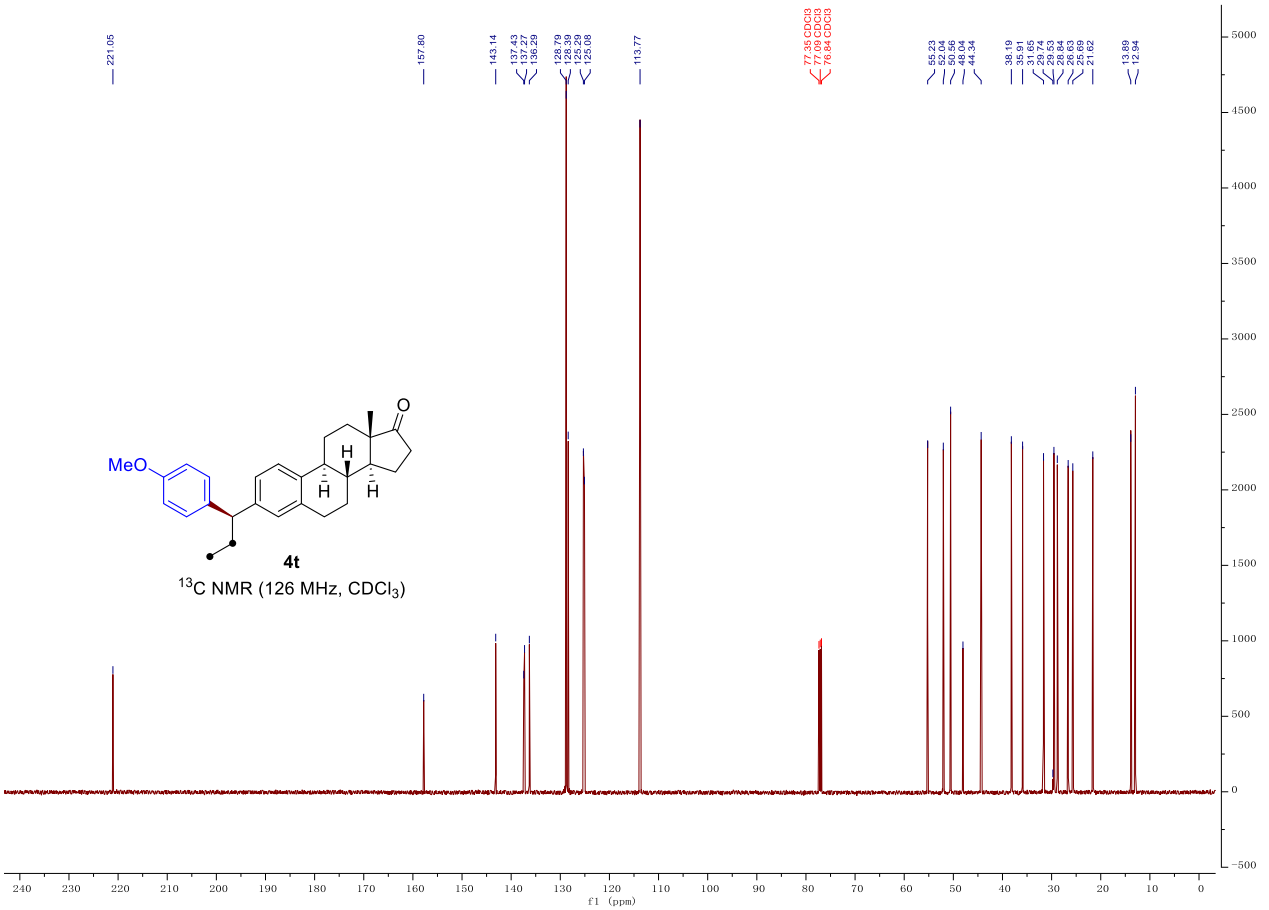
Supplementary Fig. 91. ^{1}H NMR of compound **4s**



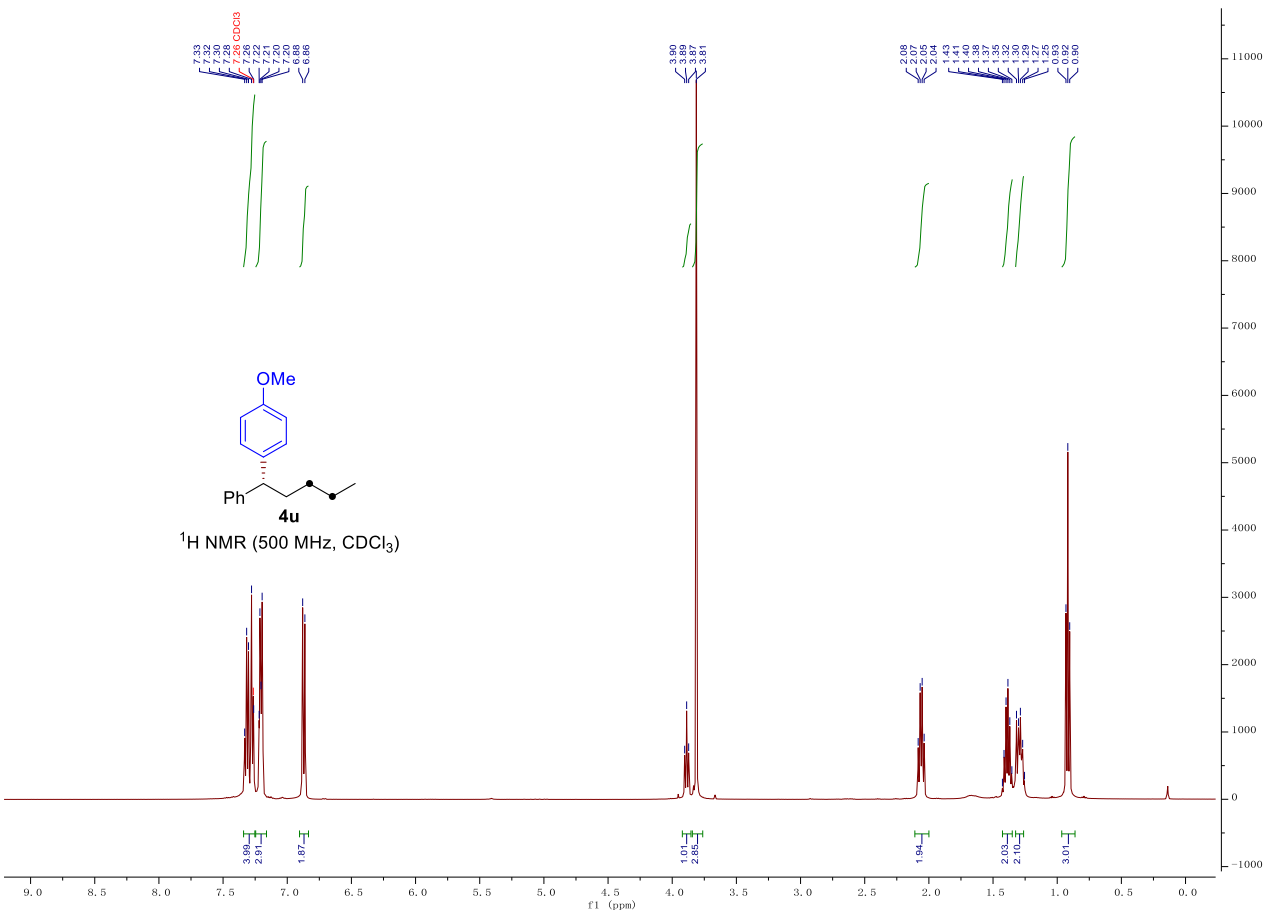
Supplementary Fig. 92. ^{13}C NMR of compound **4s**



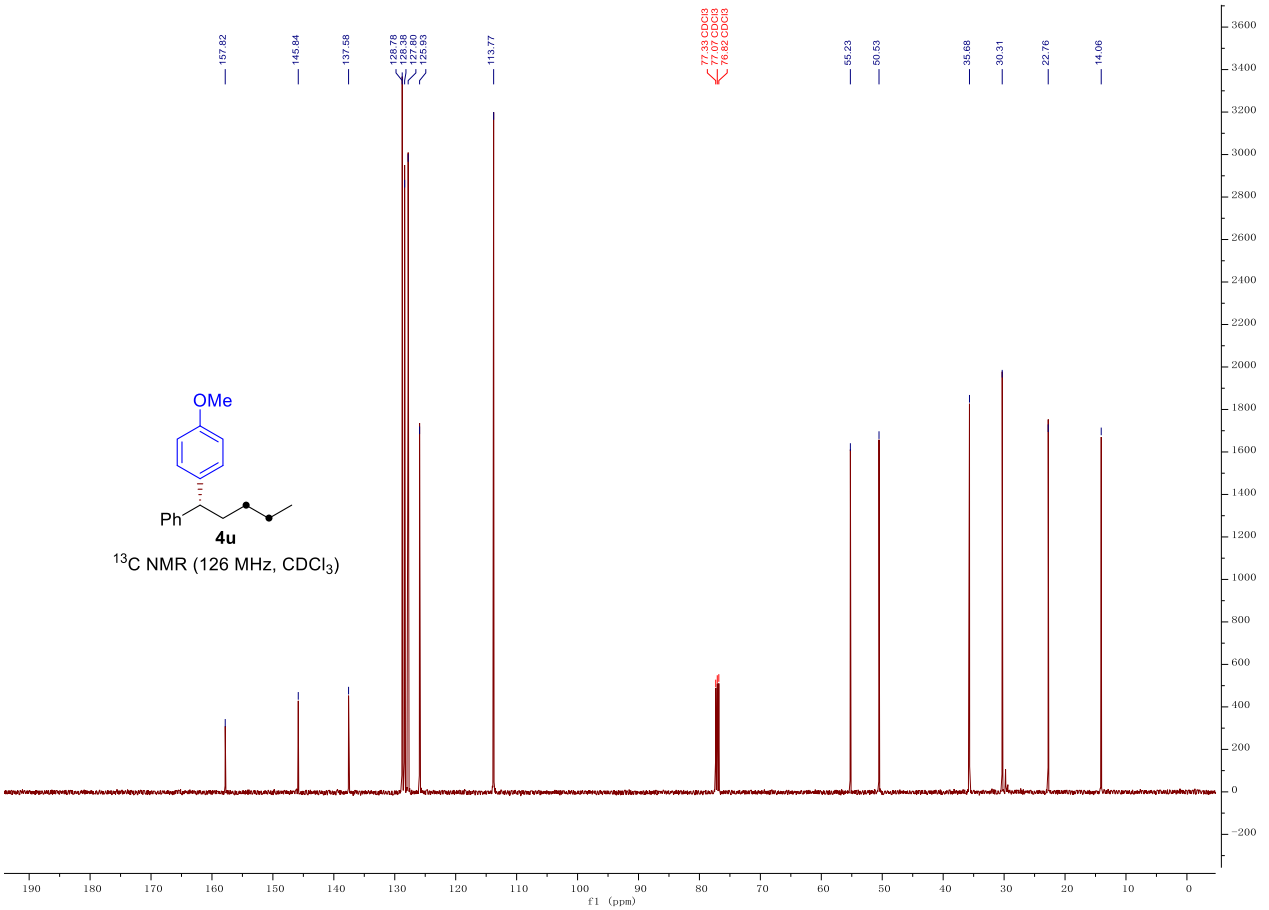
Supplementary Fig. 93. ^{1}H NMR of compound **4t**



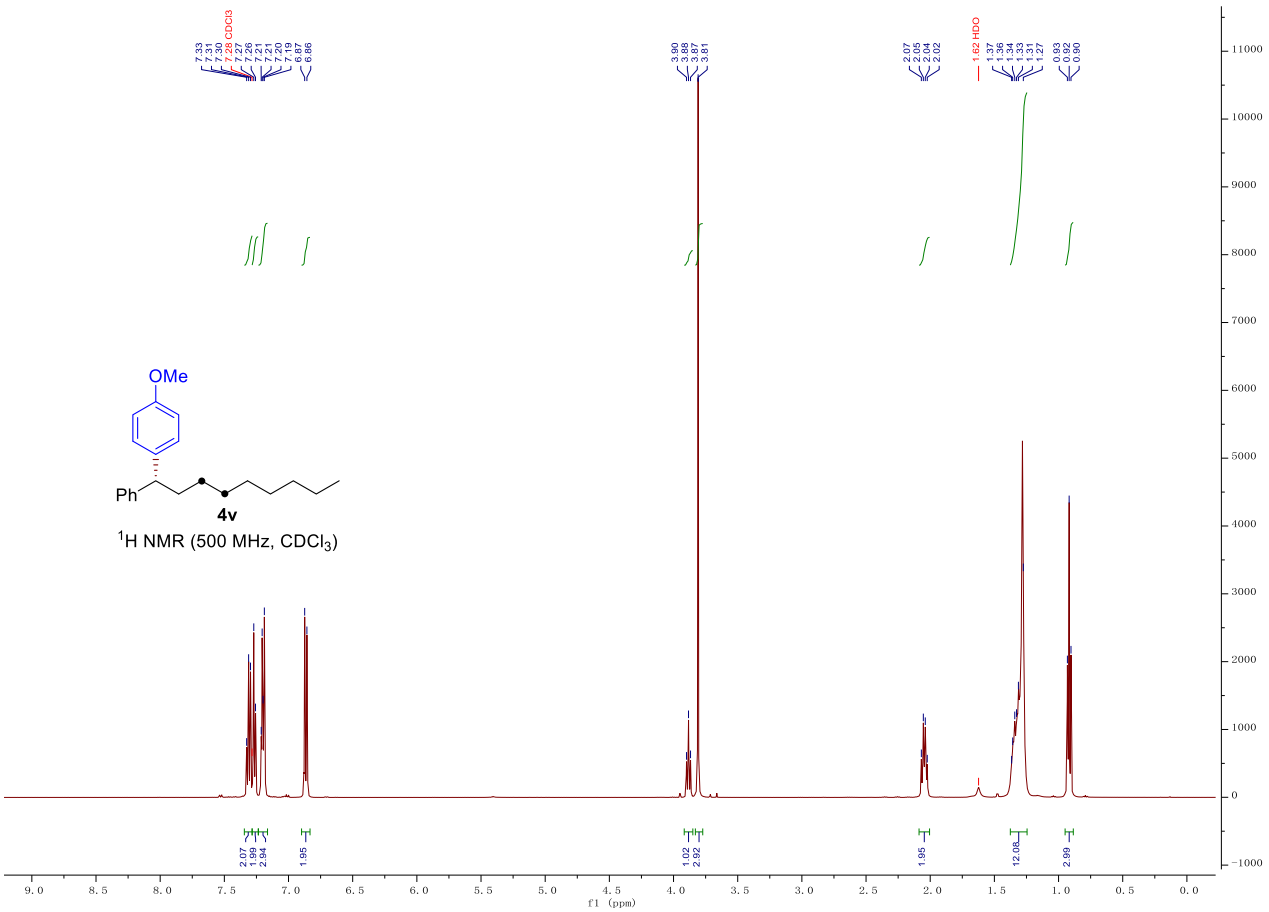
Supplementary Fig. 94. ^{13}C NMR of compound **4t**



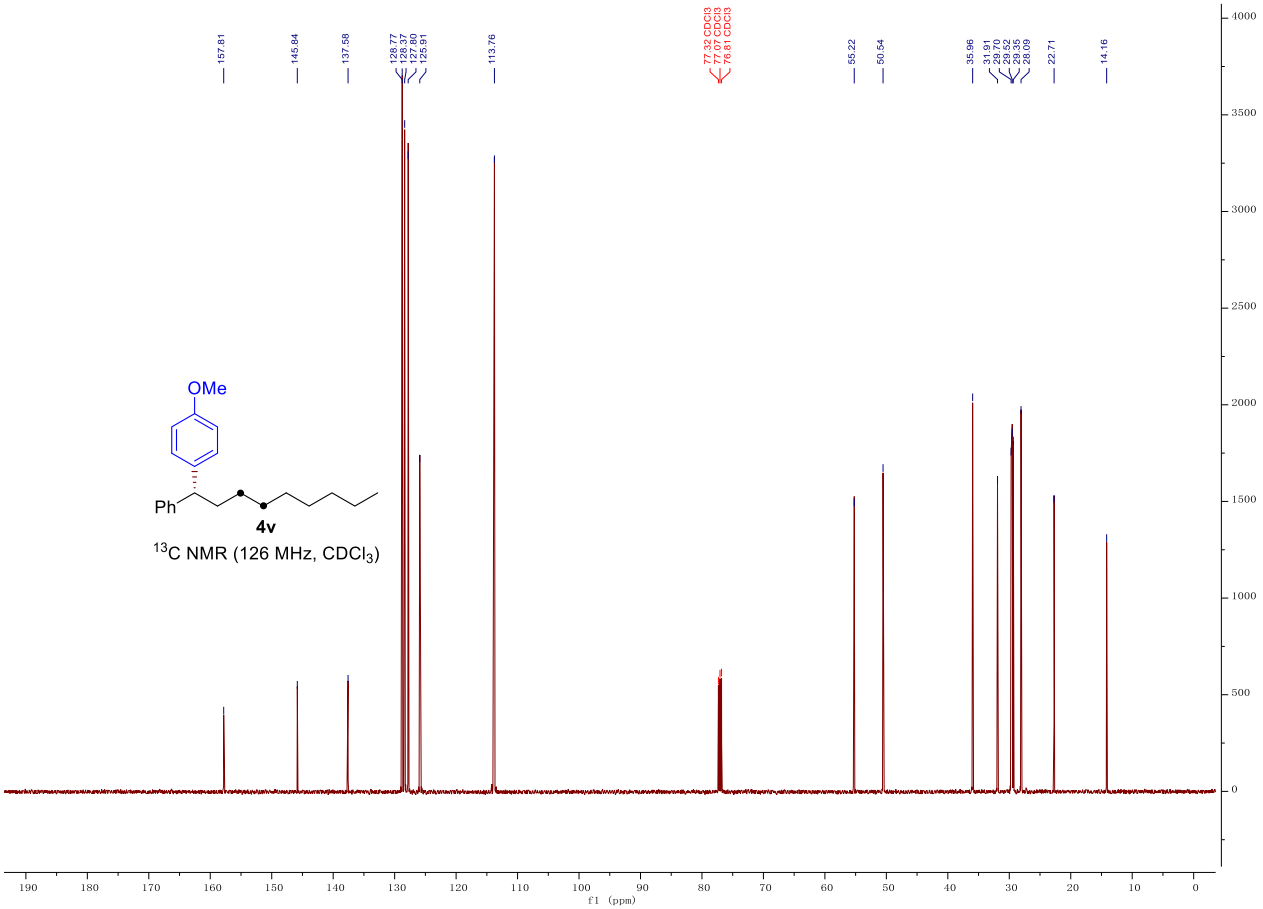
Supplementary Fig. 95. ^{1}H NMR of compound **4u**



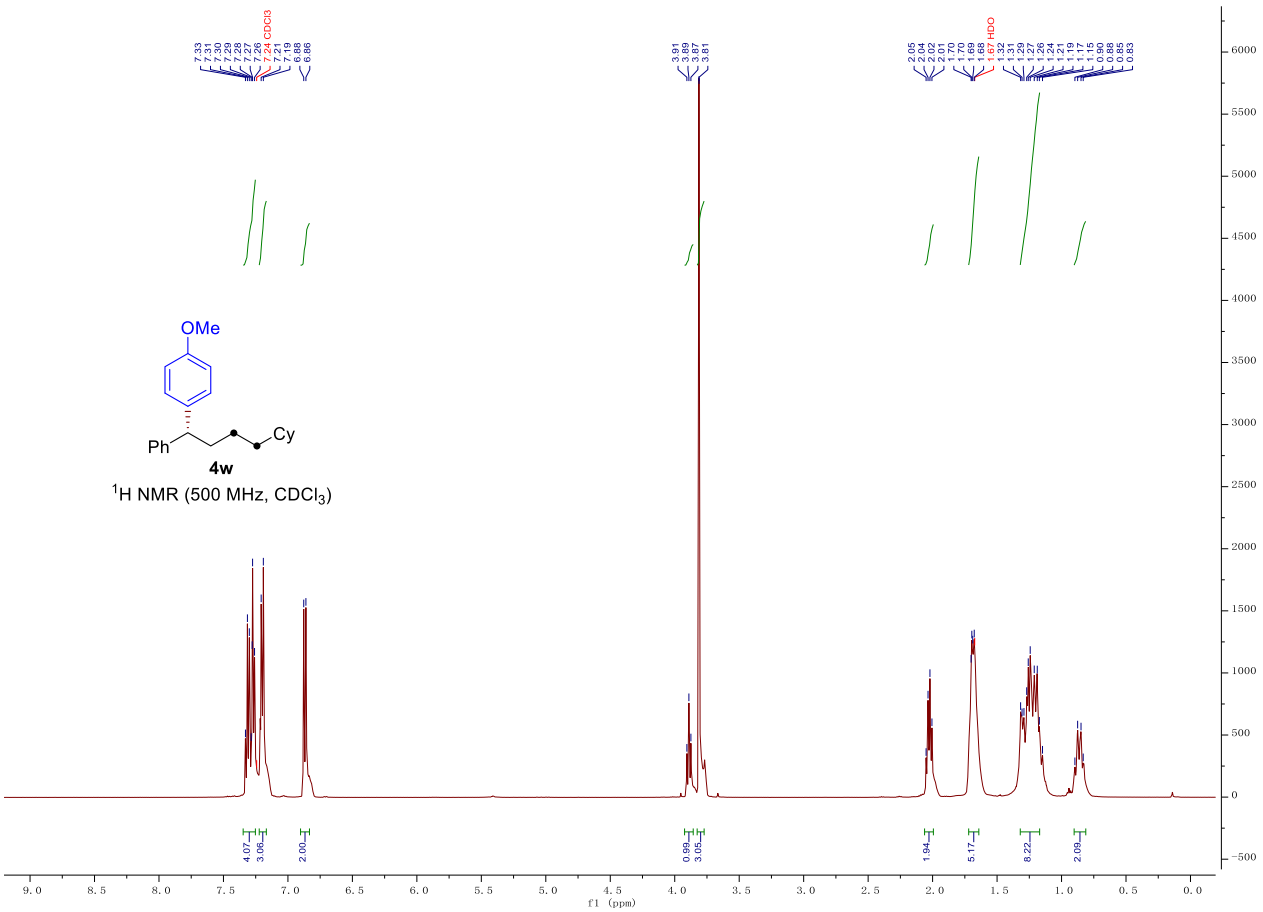
Supplementary Fig. 96. ^{13}C NMR of compound **4u**



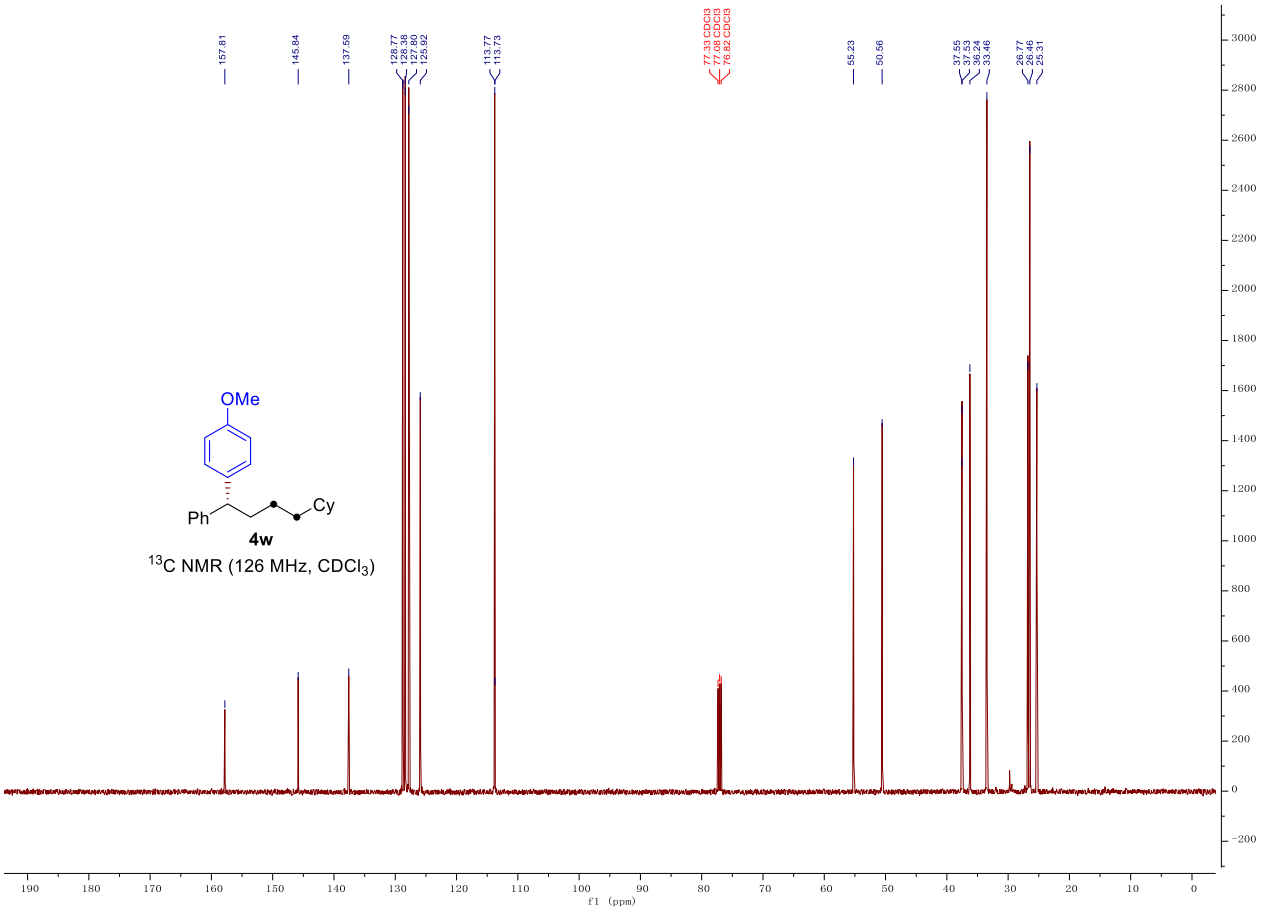
Supplementary Fig. 97. ^{1}H NMR of compound **4v**



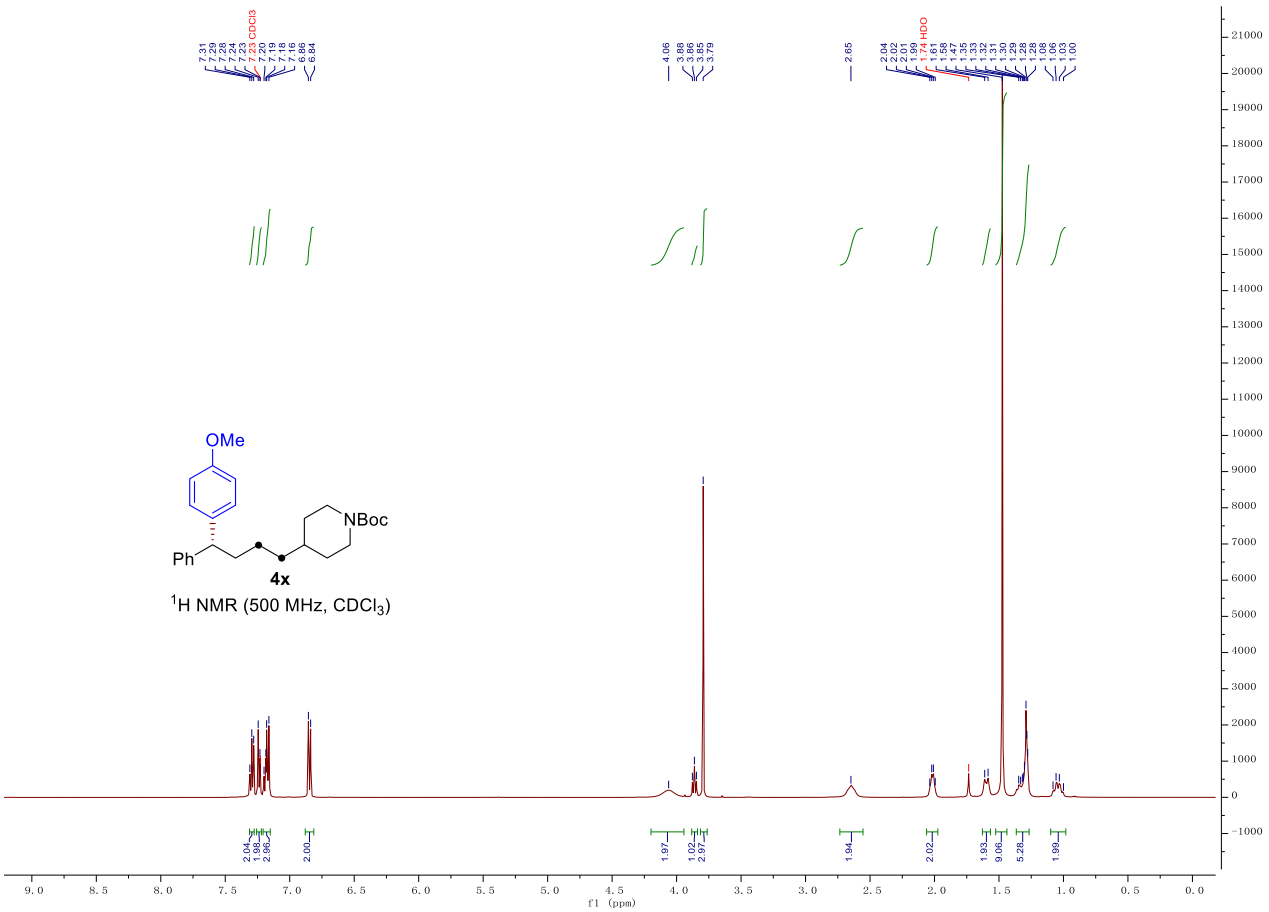
Supplementary Fig. 98. ^{13}C NMR of compound **4v**



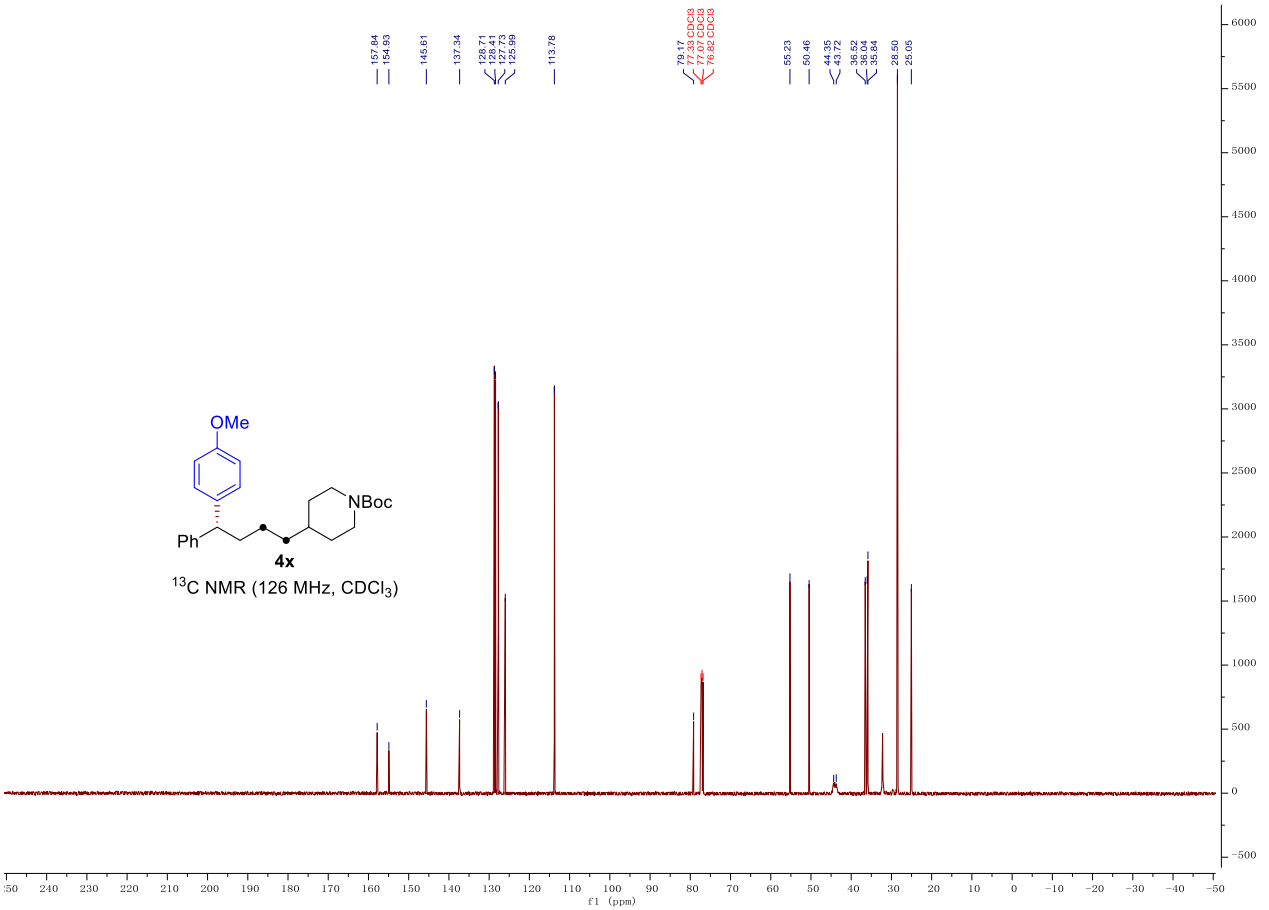
Supplementary Fig. 99. ^{1}H NMR of compound **4w**



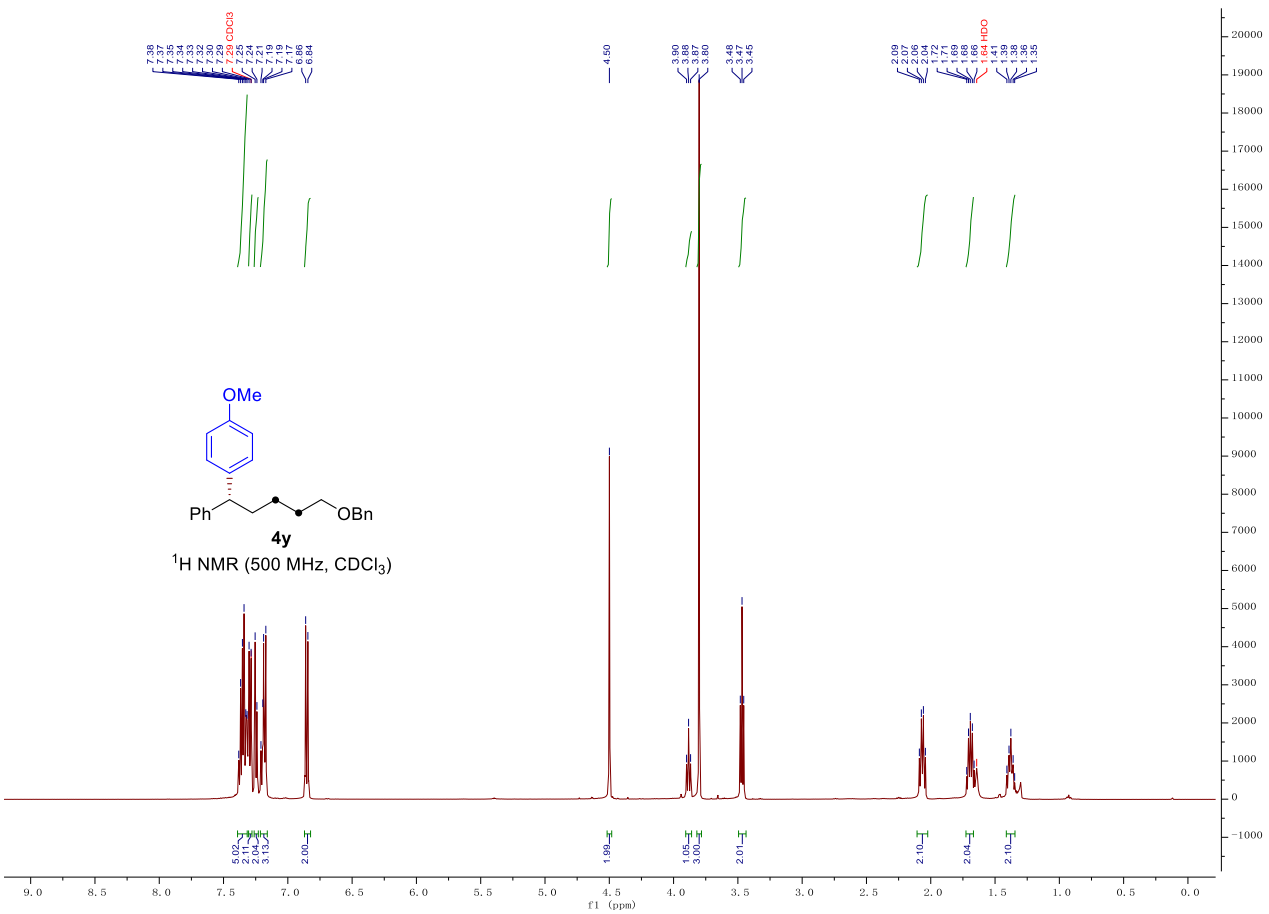
Supplementary Fig. 100. ^{13}C NMR of compound **4w**



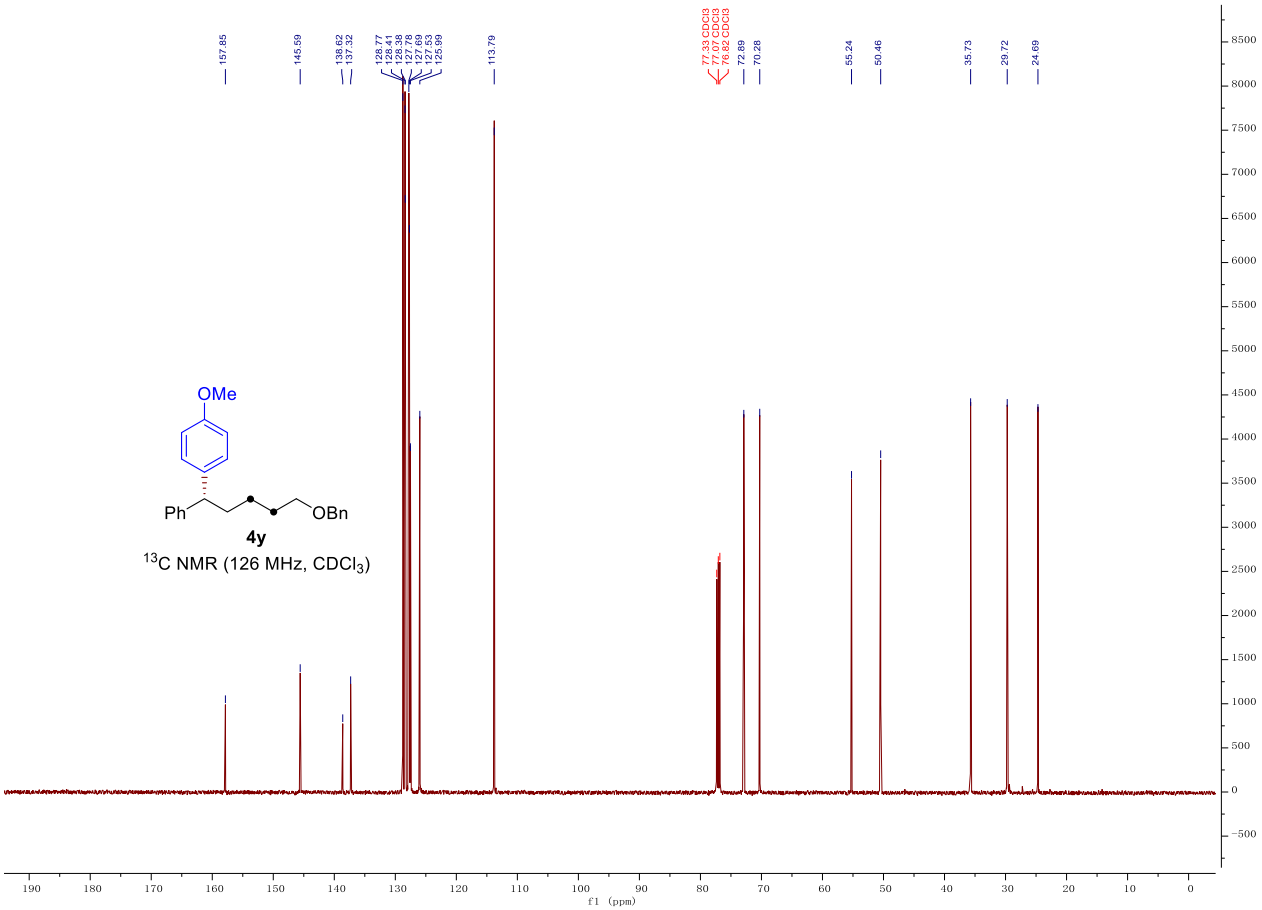
Supplementary Fig. 101. ^{1}H NMR of compound **4x**



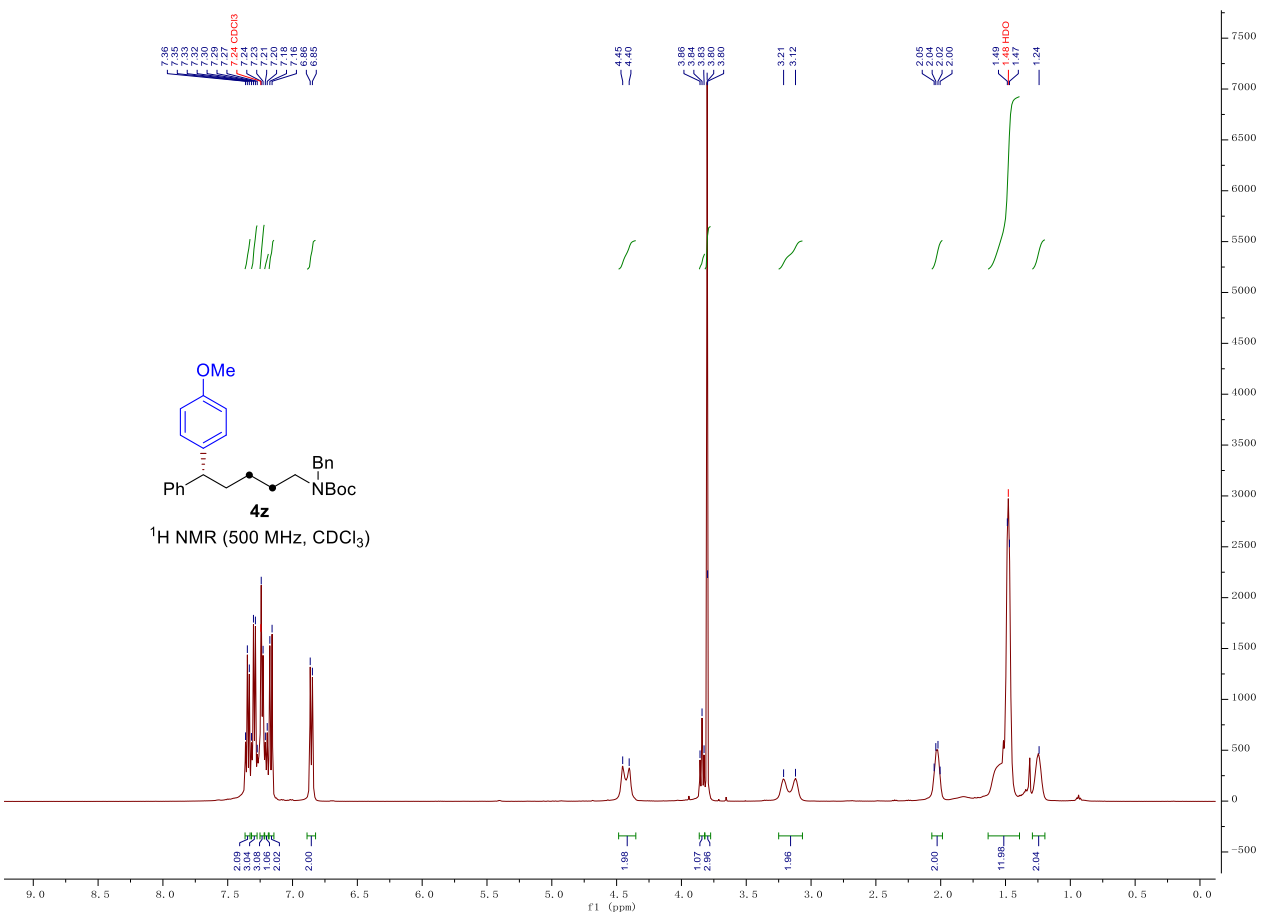
Supplementary Fig. 102. ^{13}C NMR of compound **4x**



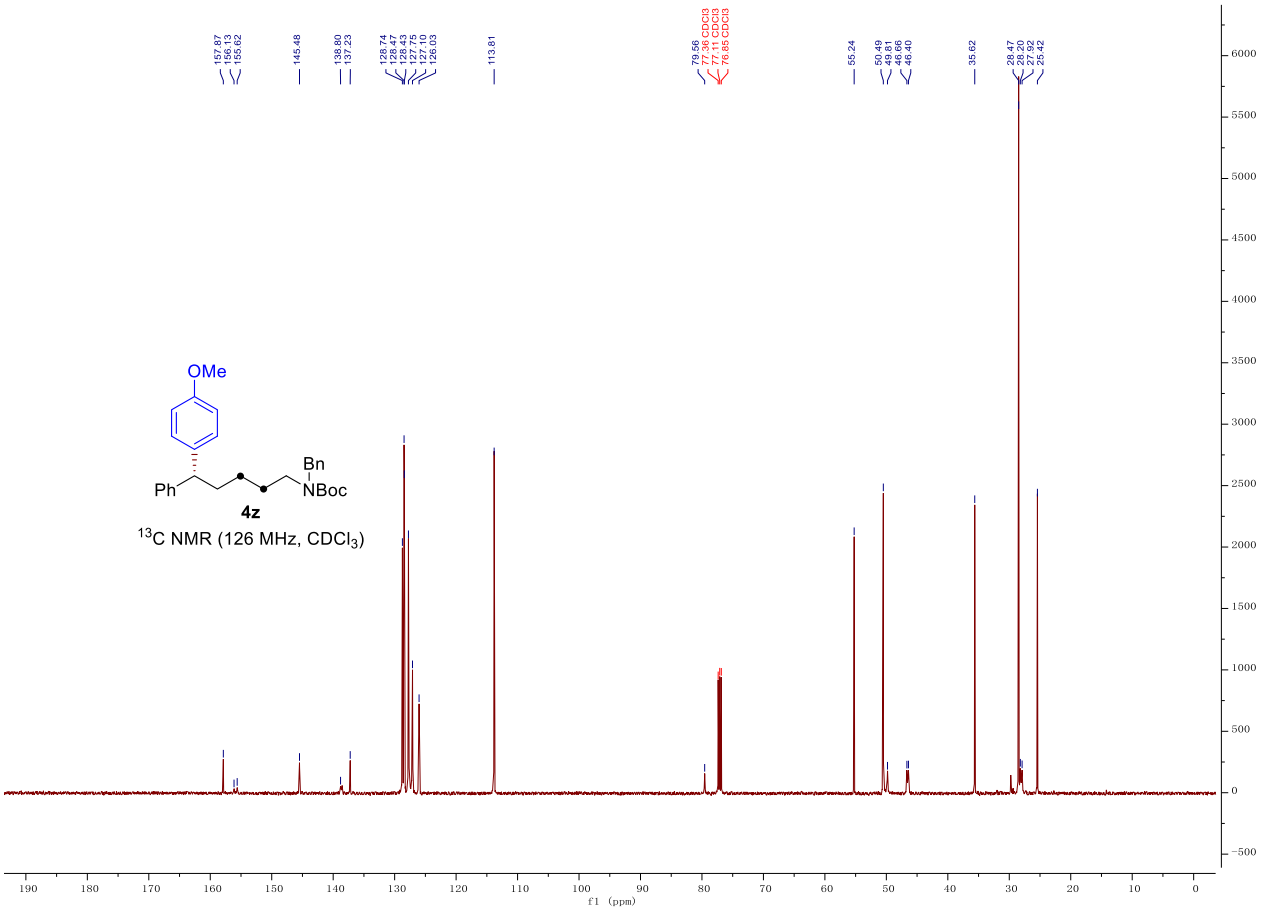
Supplementary Fig. 103. ^{1}H NMR of compound **4y**



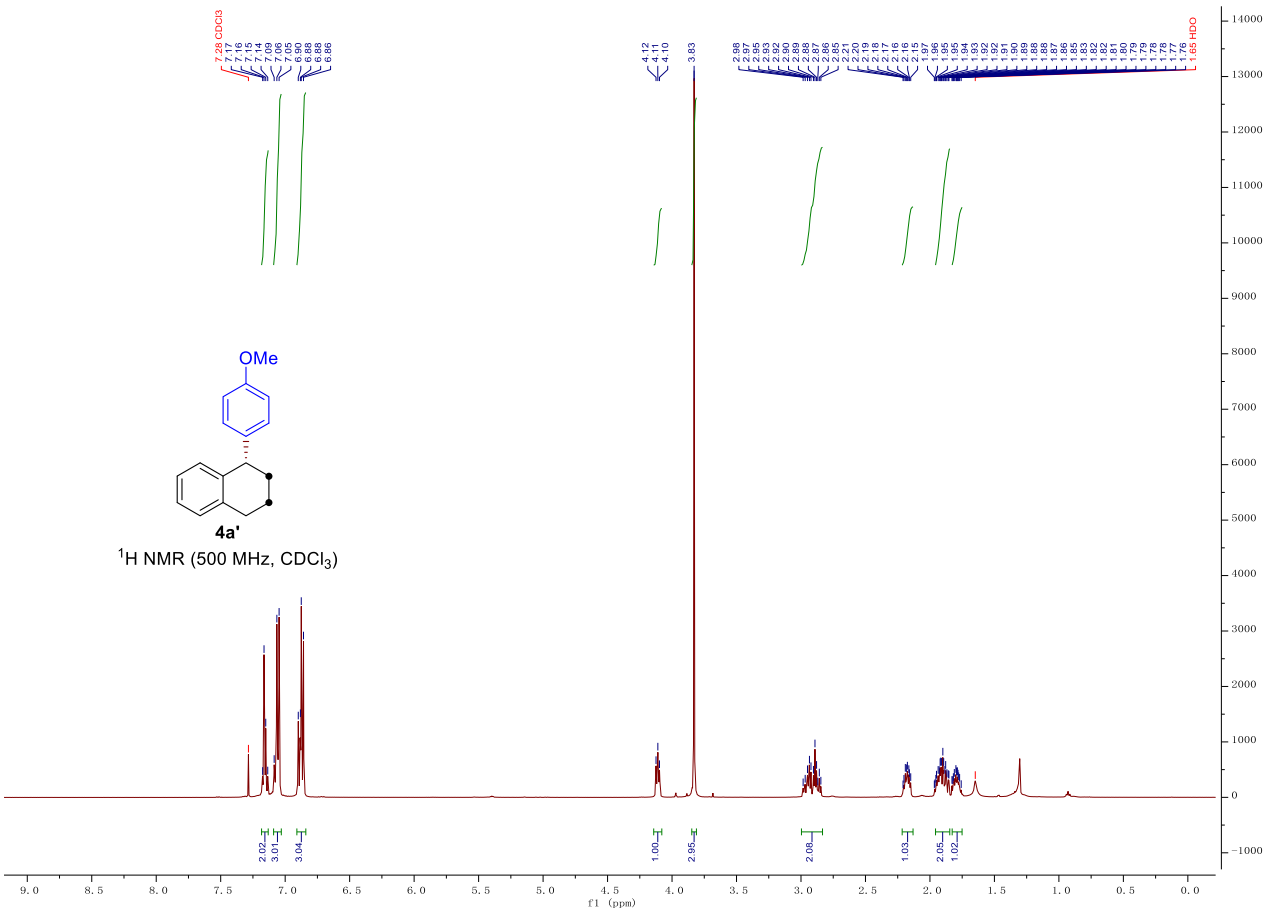
Supplementary Fig. 104. ^{13}C NMR of compound **4y**



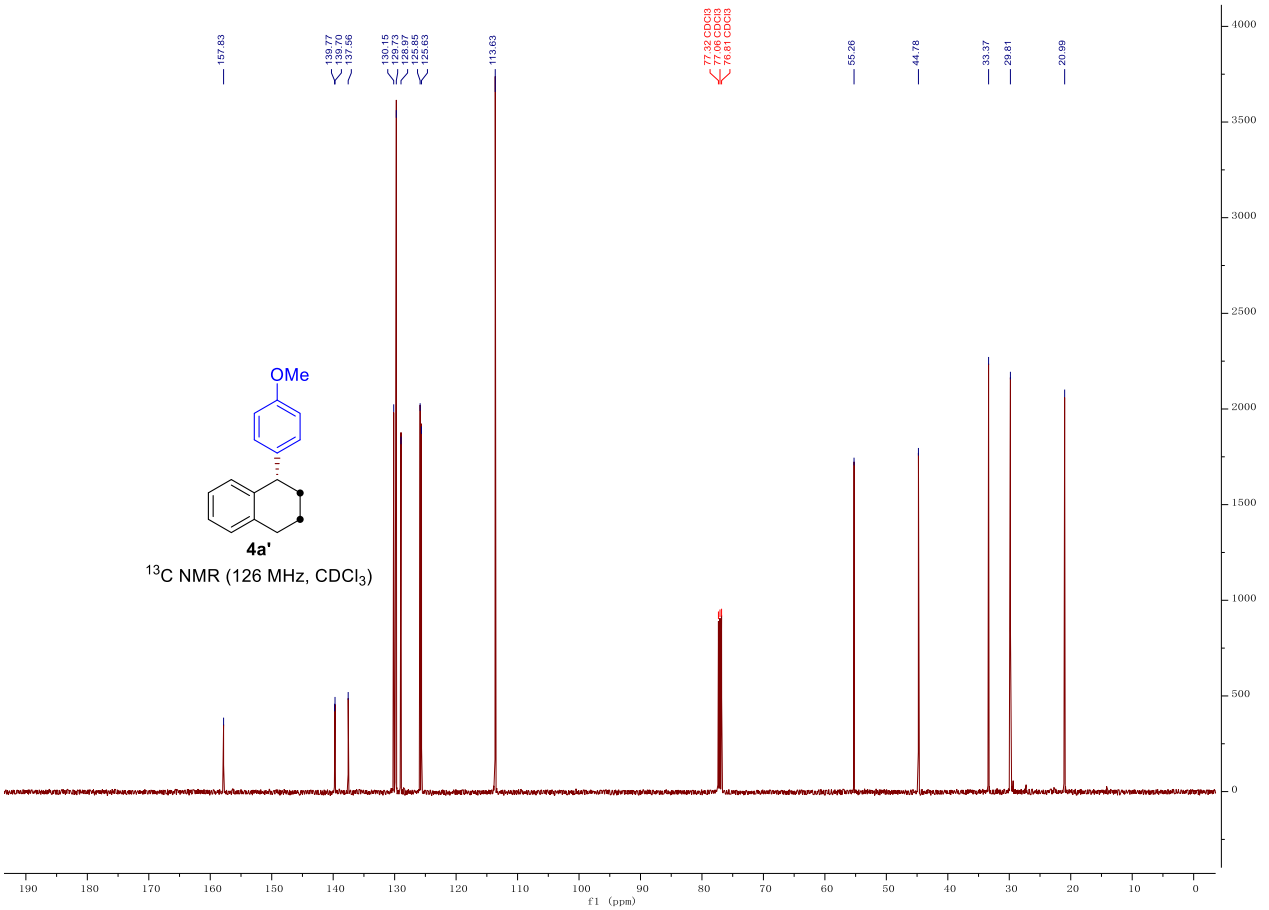
Supplementary Fig. 105. ^{1}H NMR of compound **4z**



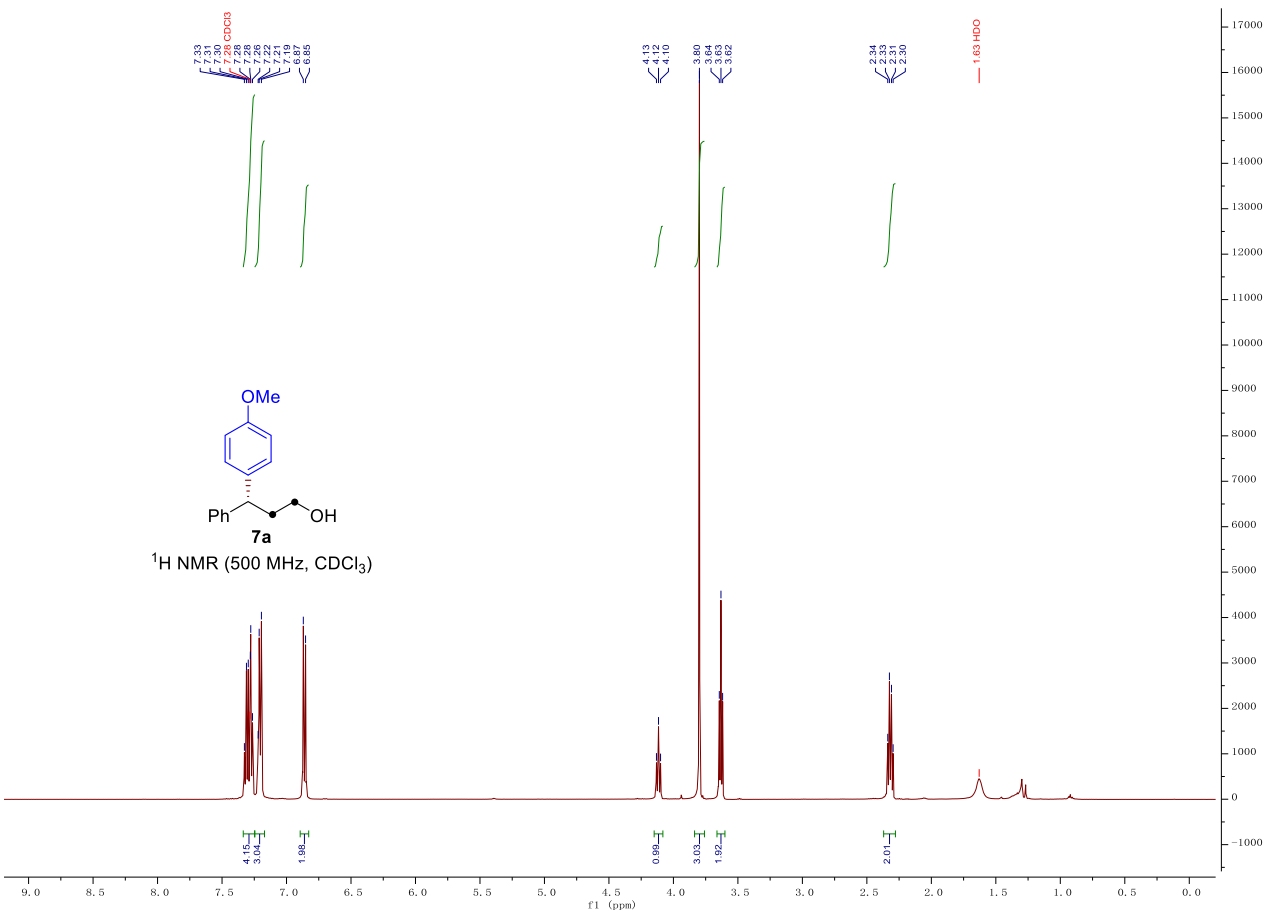
Supplementary Fig. 106. ^{13}C NMR of compound **4z**



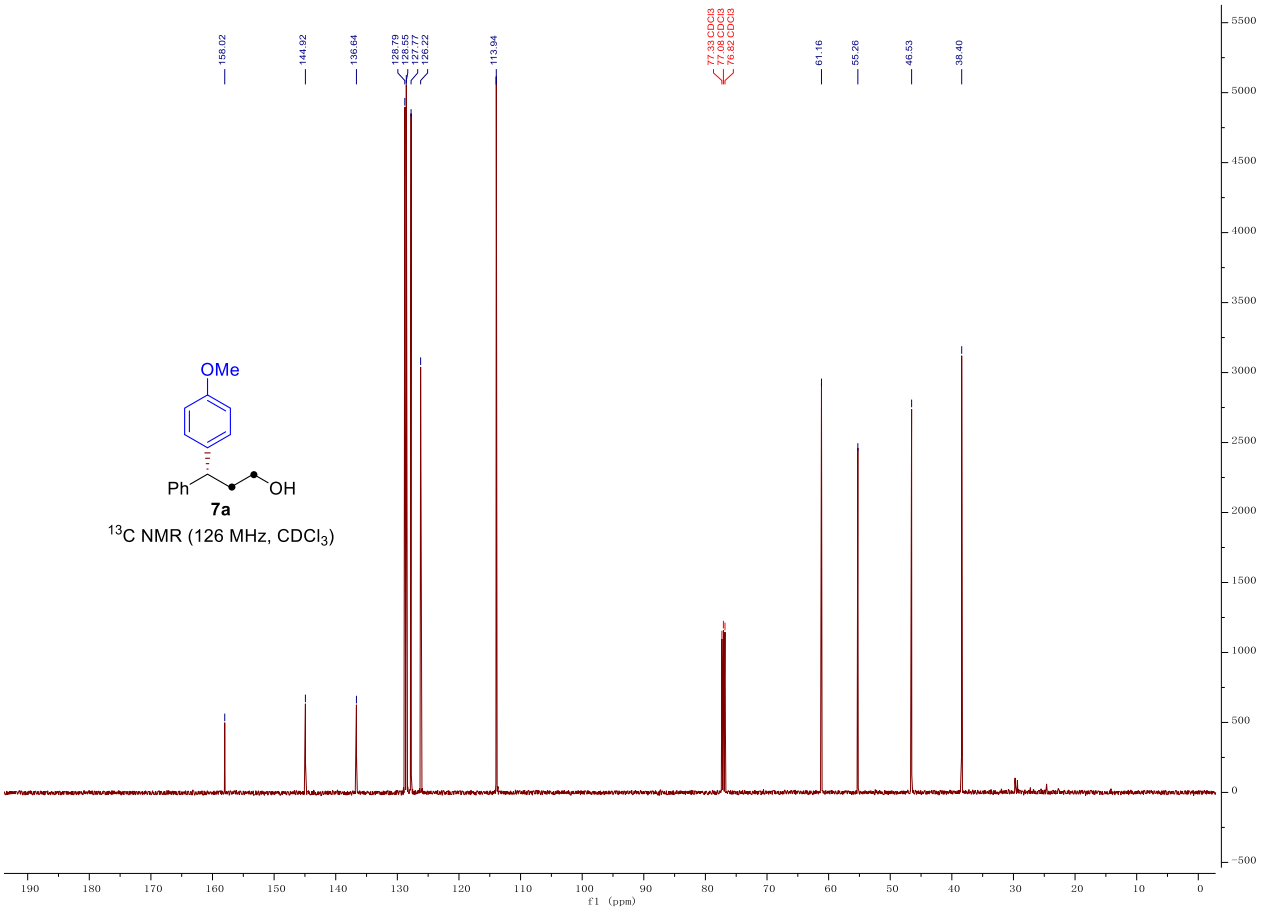
Supplementary Fig. 107. ^{1}H NMR of compound **4a'**



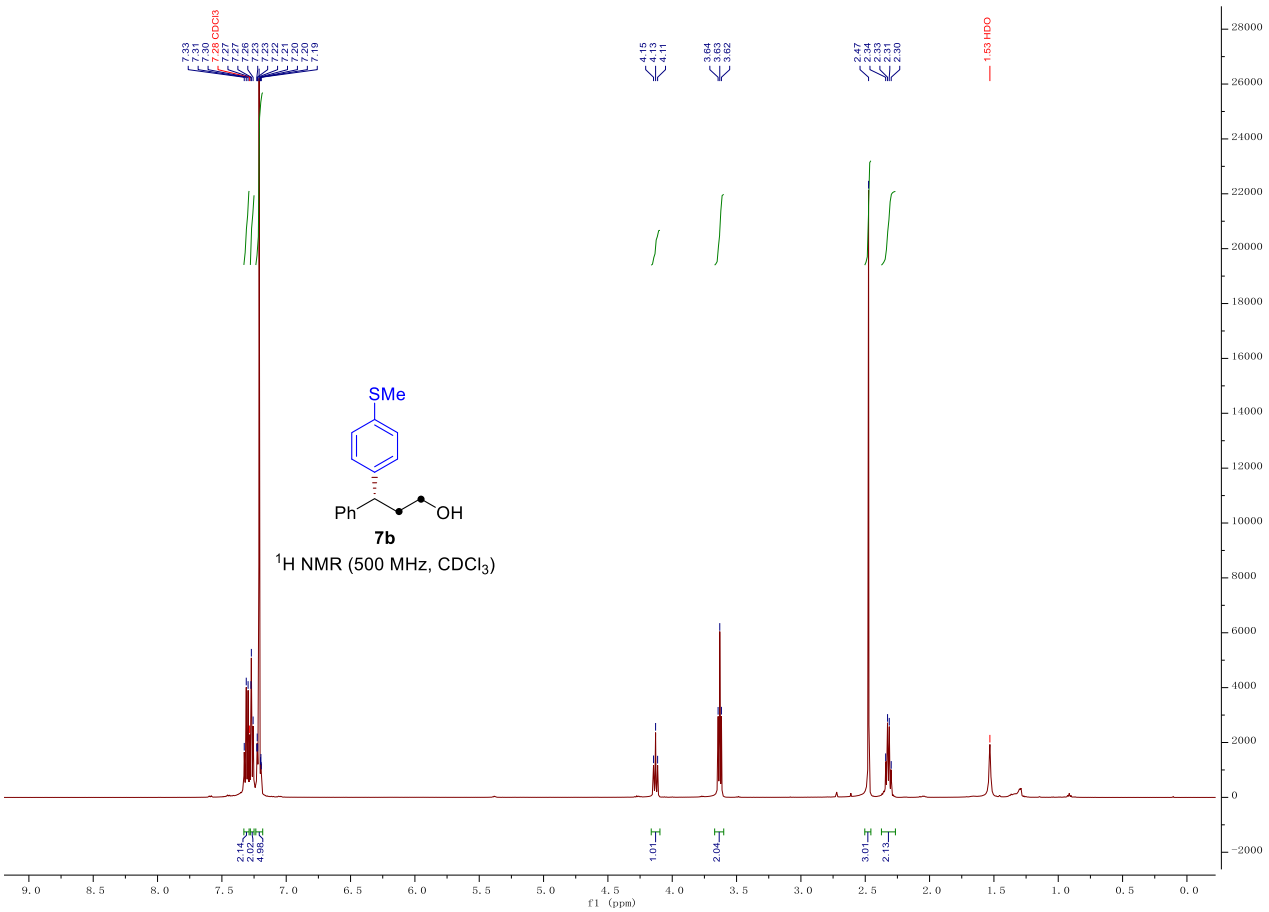
Supplementary Fig. 108. ^{13}C NMR of compound **4a'**



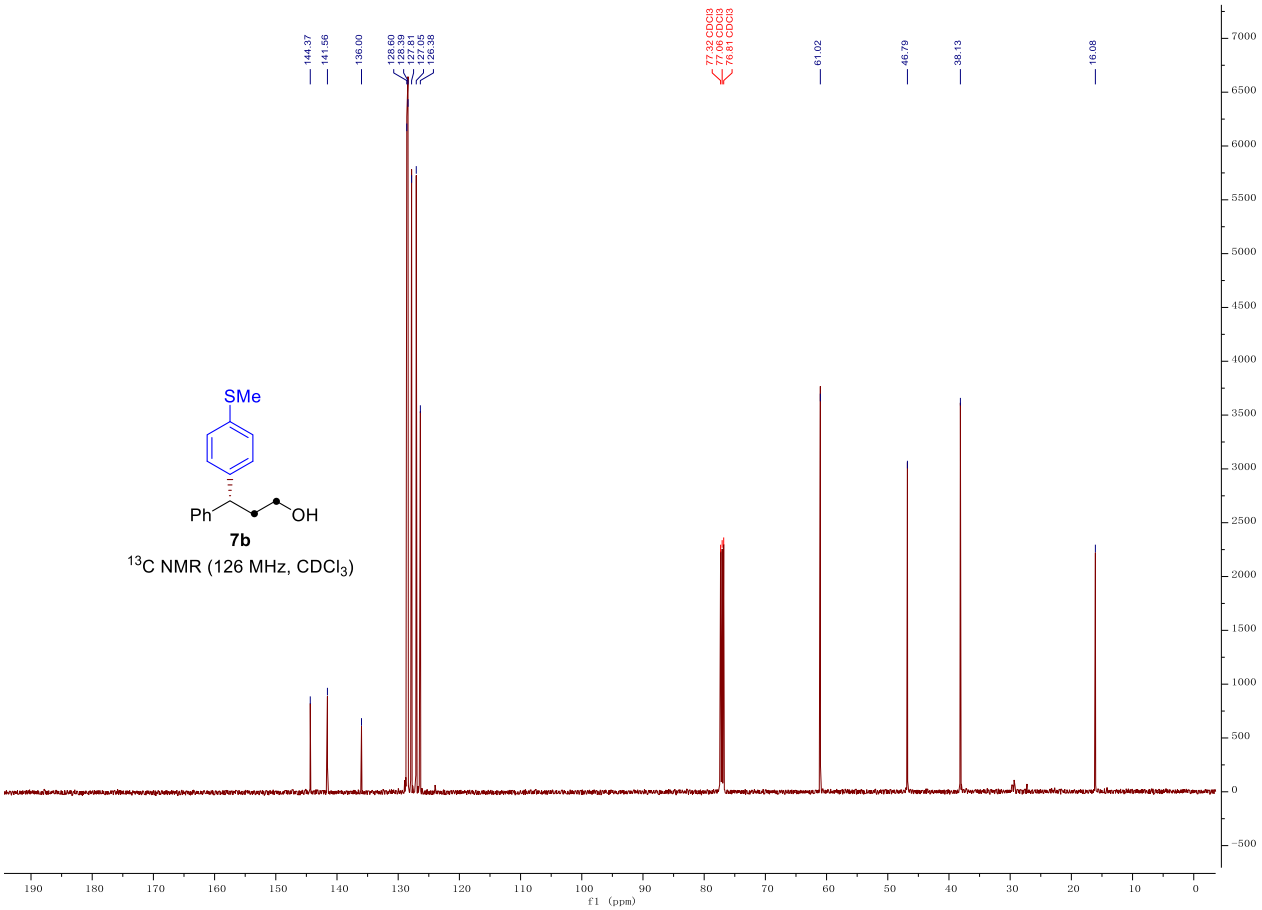
Supplementary Fig. 109. ^{1}H NMR of compound **7a**



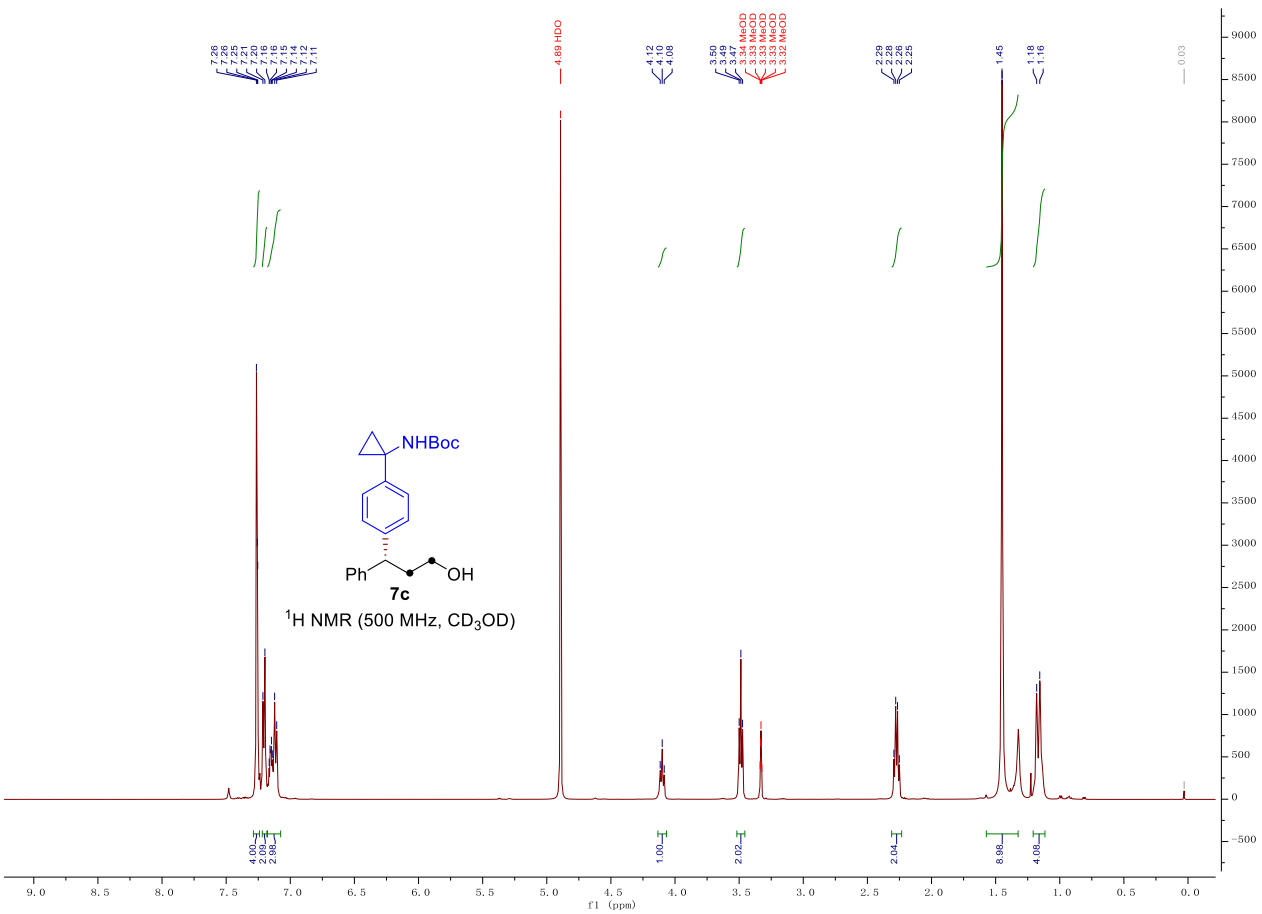
Supplementary Fig. 110. ^{13}C NMR of compound **7a**



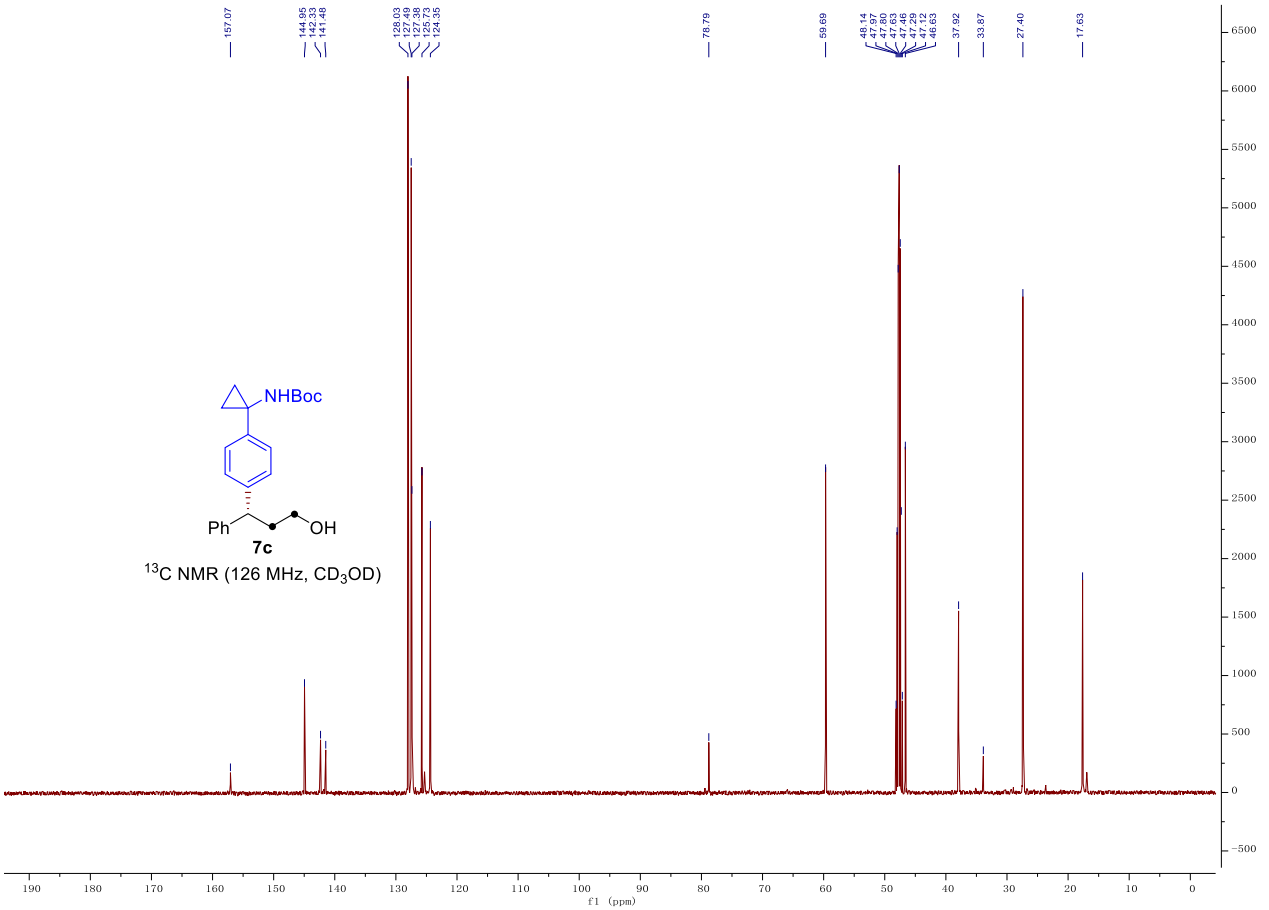
Supplementary Fig. 111. ^{1}H NMR of compound **7b**



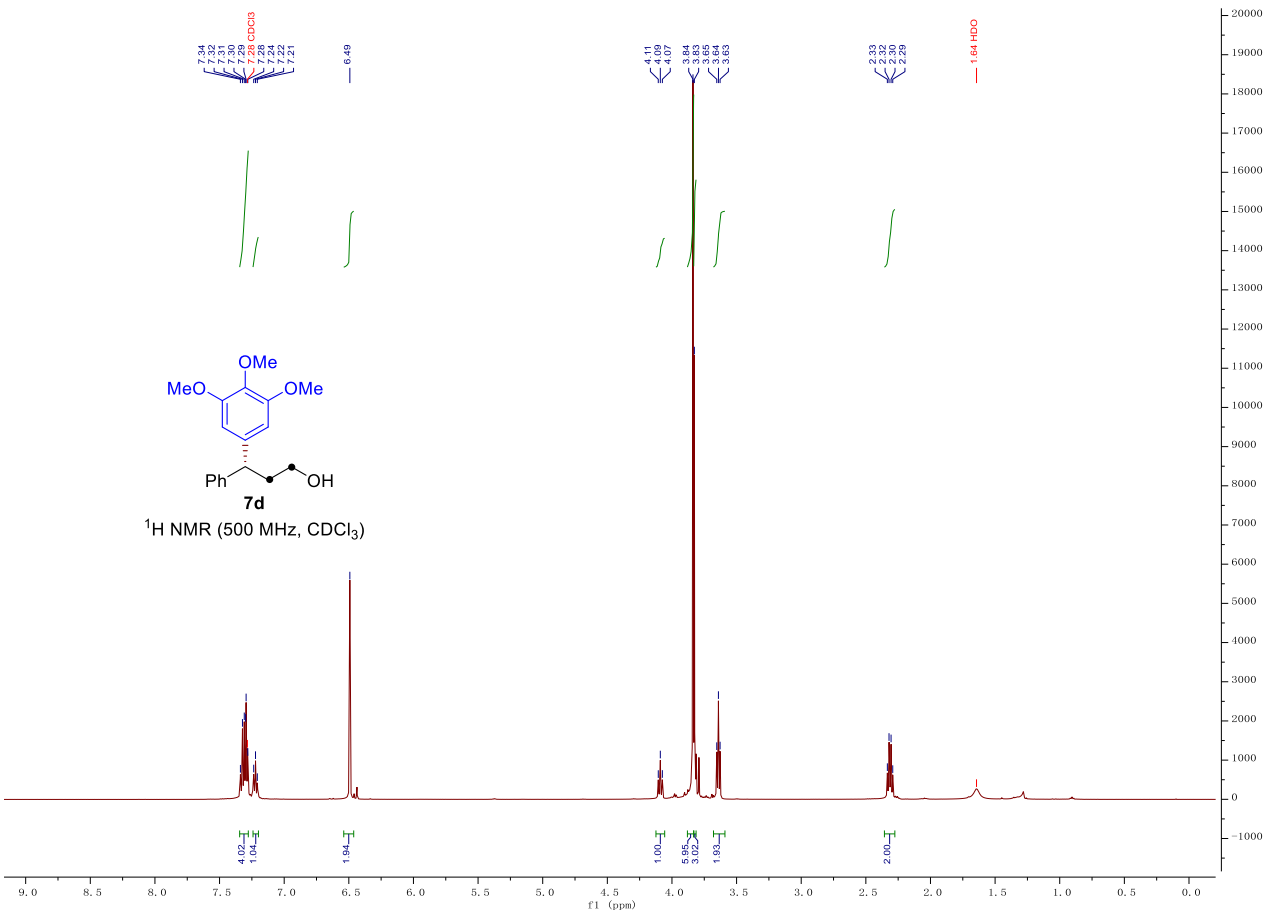
Supplementary Fig. 112. ^{13}C NMR of compound **7b**



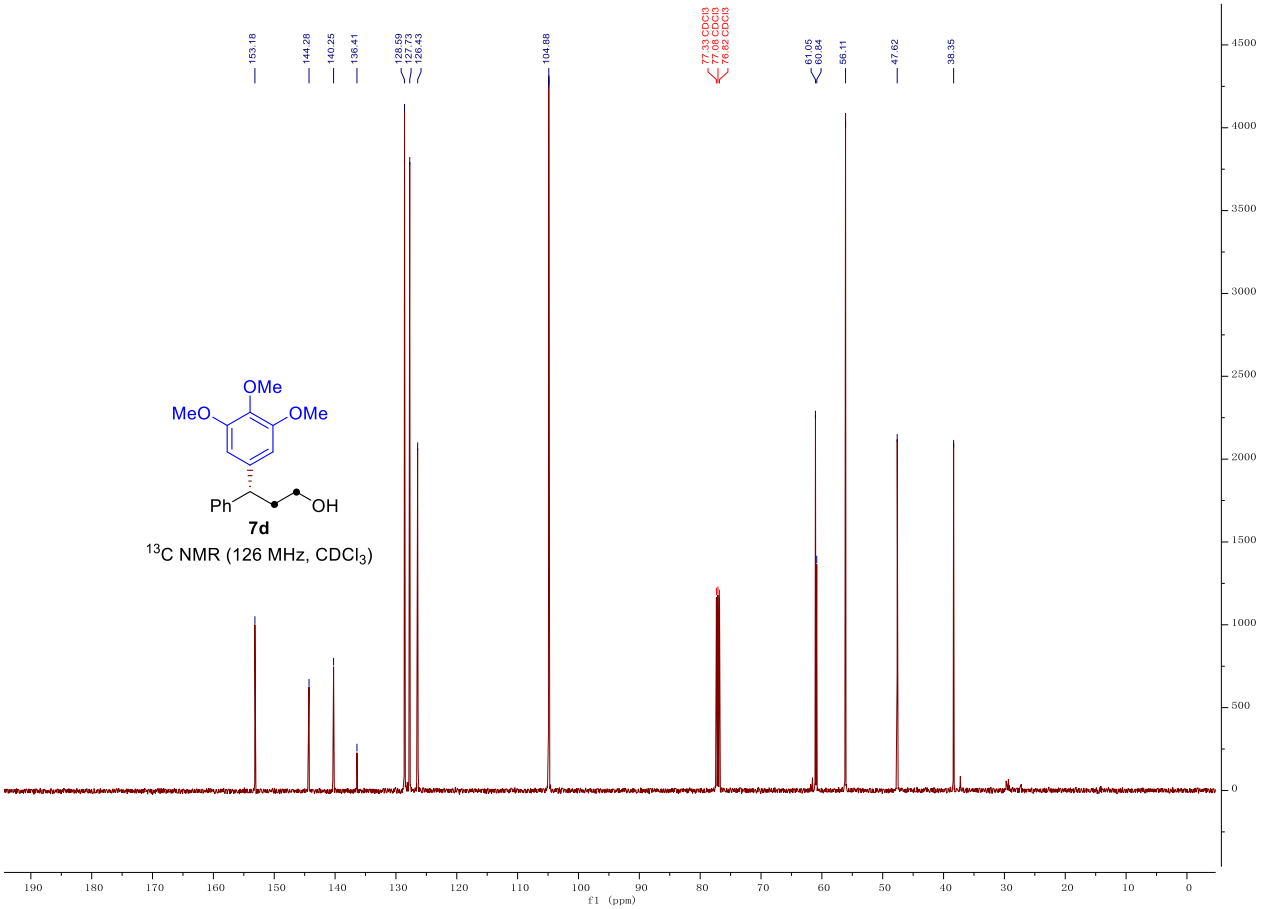
Supplementary Fig. 113. ^{1}H NMR of compound **7c**



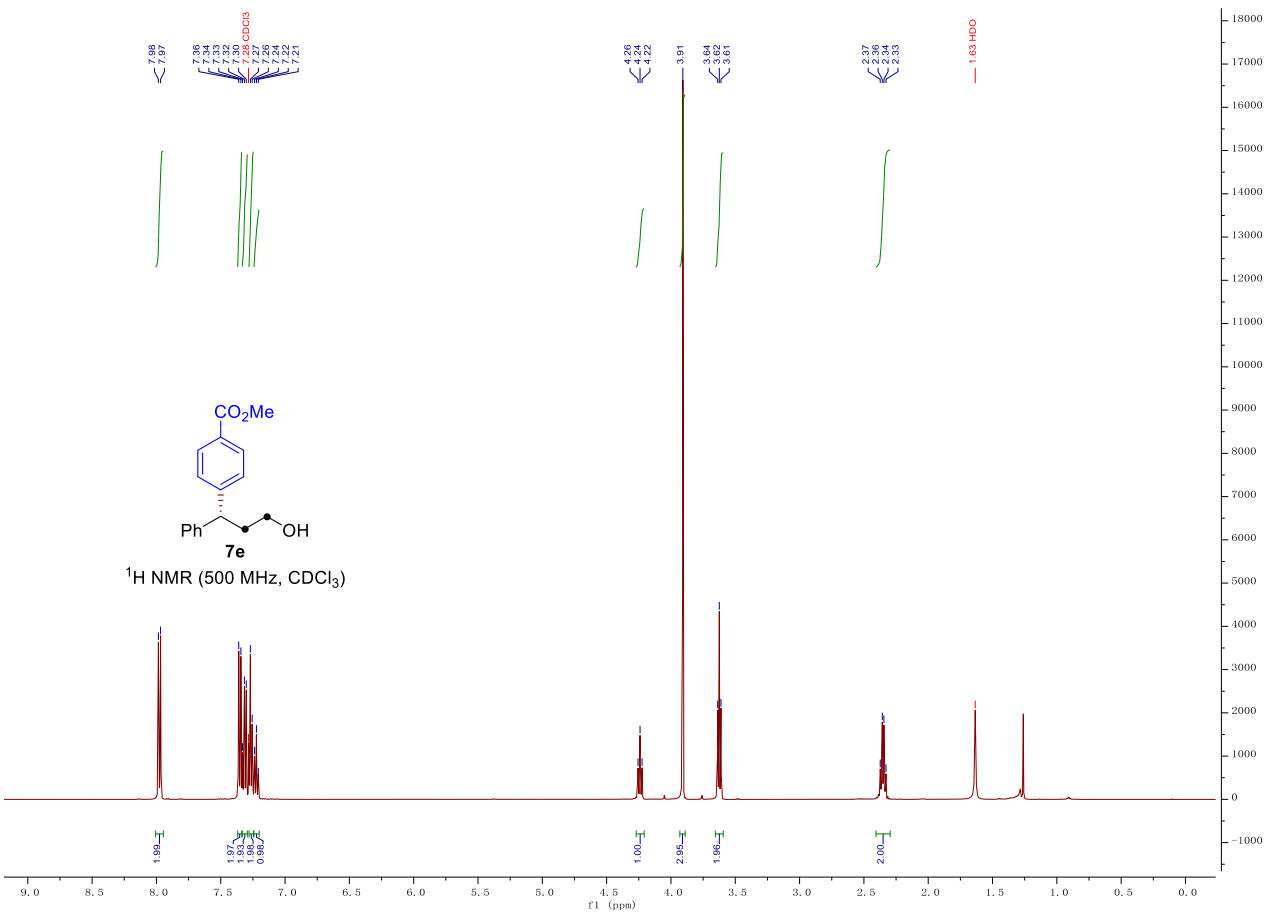
Supplementary Fig. 114. ^{13}C NMR of compound **7c**



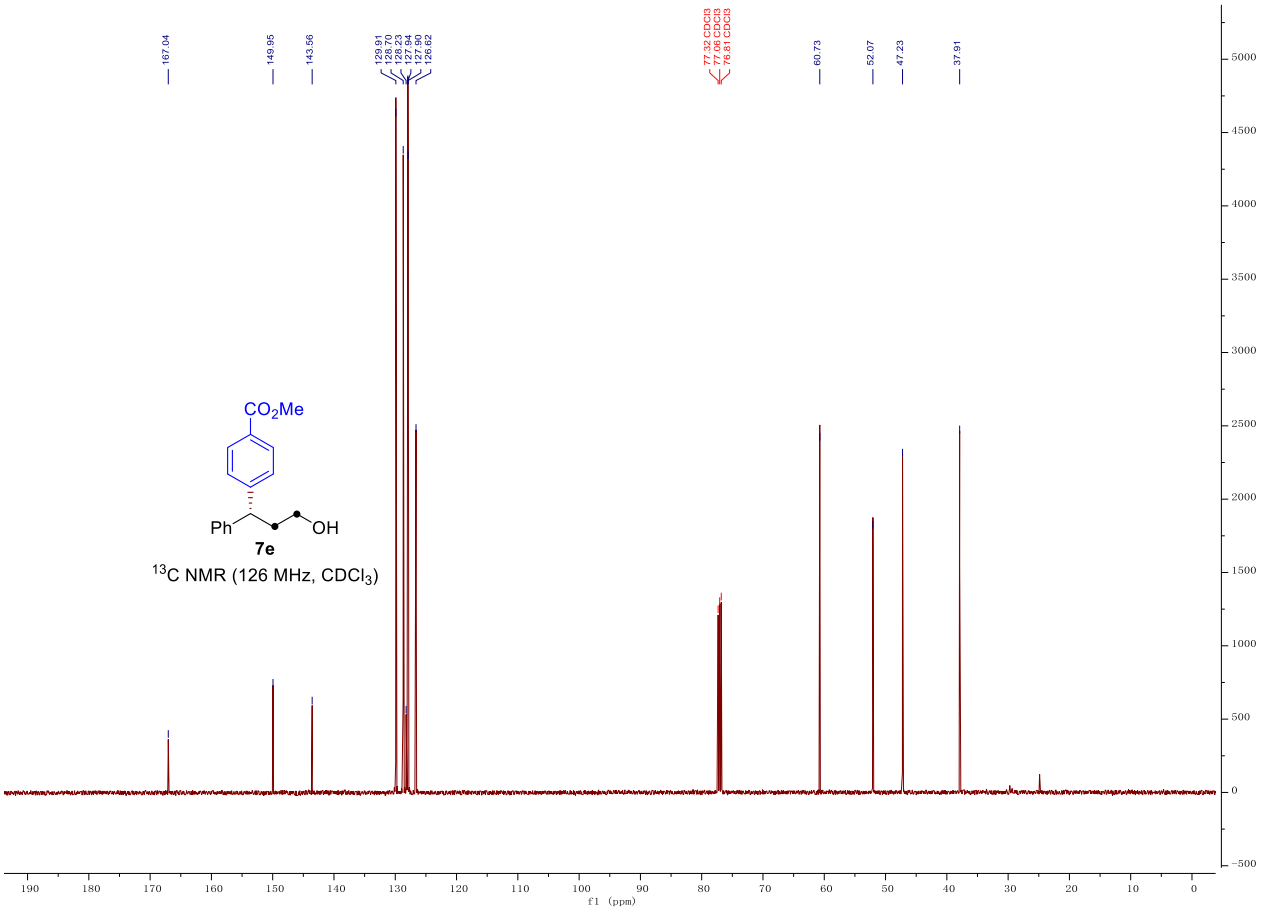
Supplementary Fig. 115. ^{1}H NMR of compound **7d**



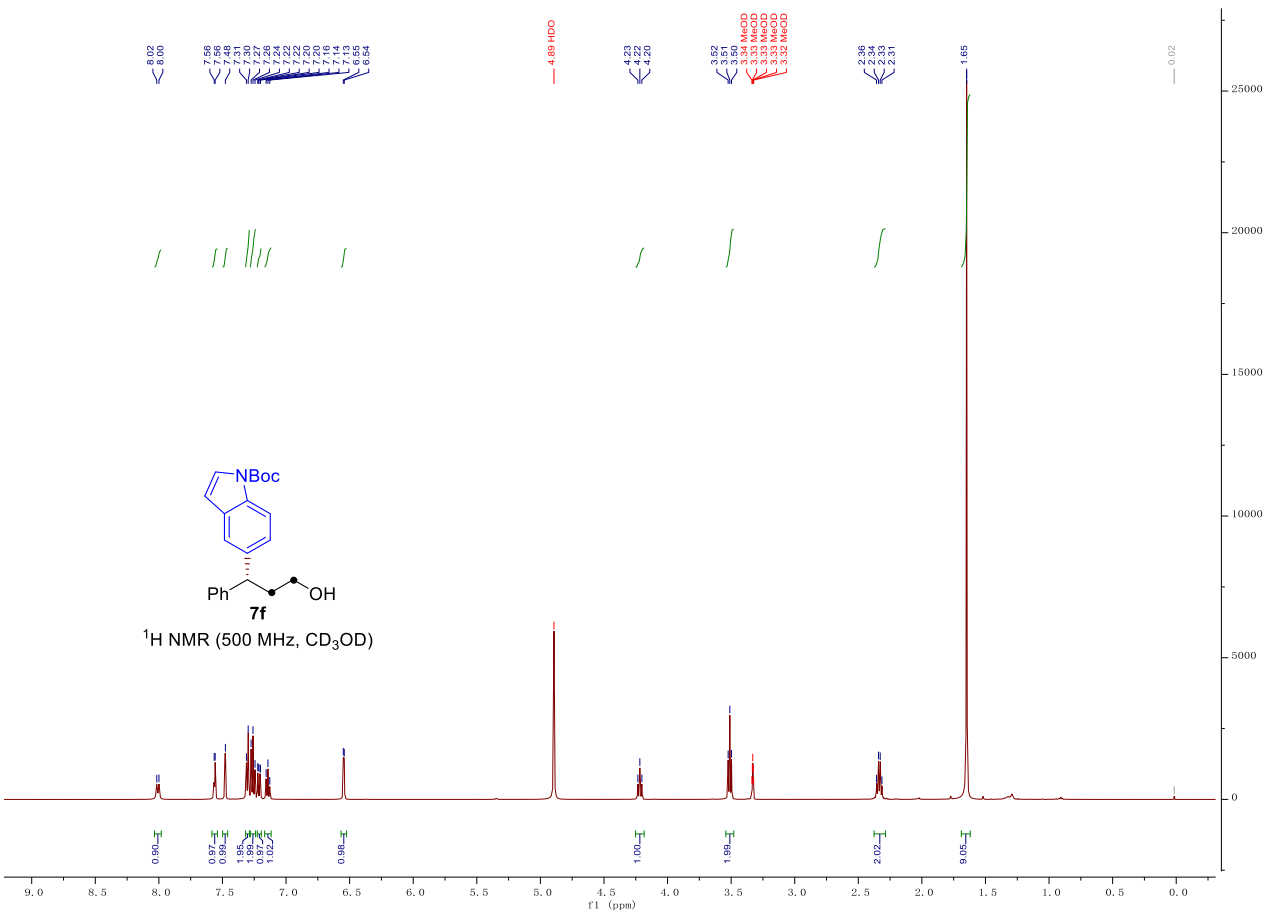
Supplementary Fig. 116. ^{13}C NMR of compound **7d**



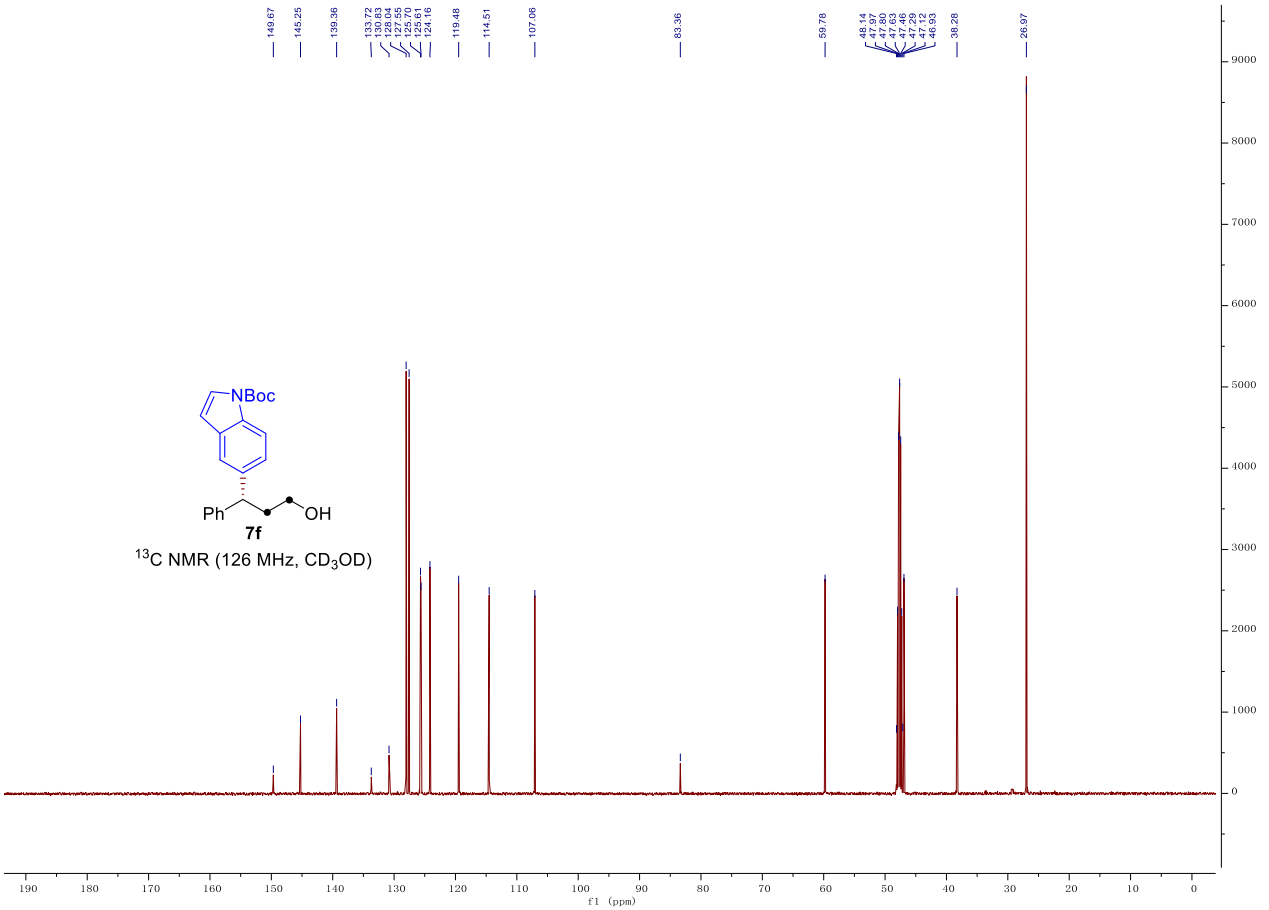
Supplementary Fig. 117. ^{1}H NMR of compound **7e**



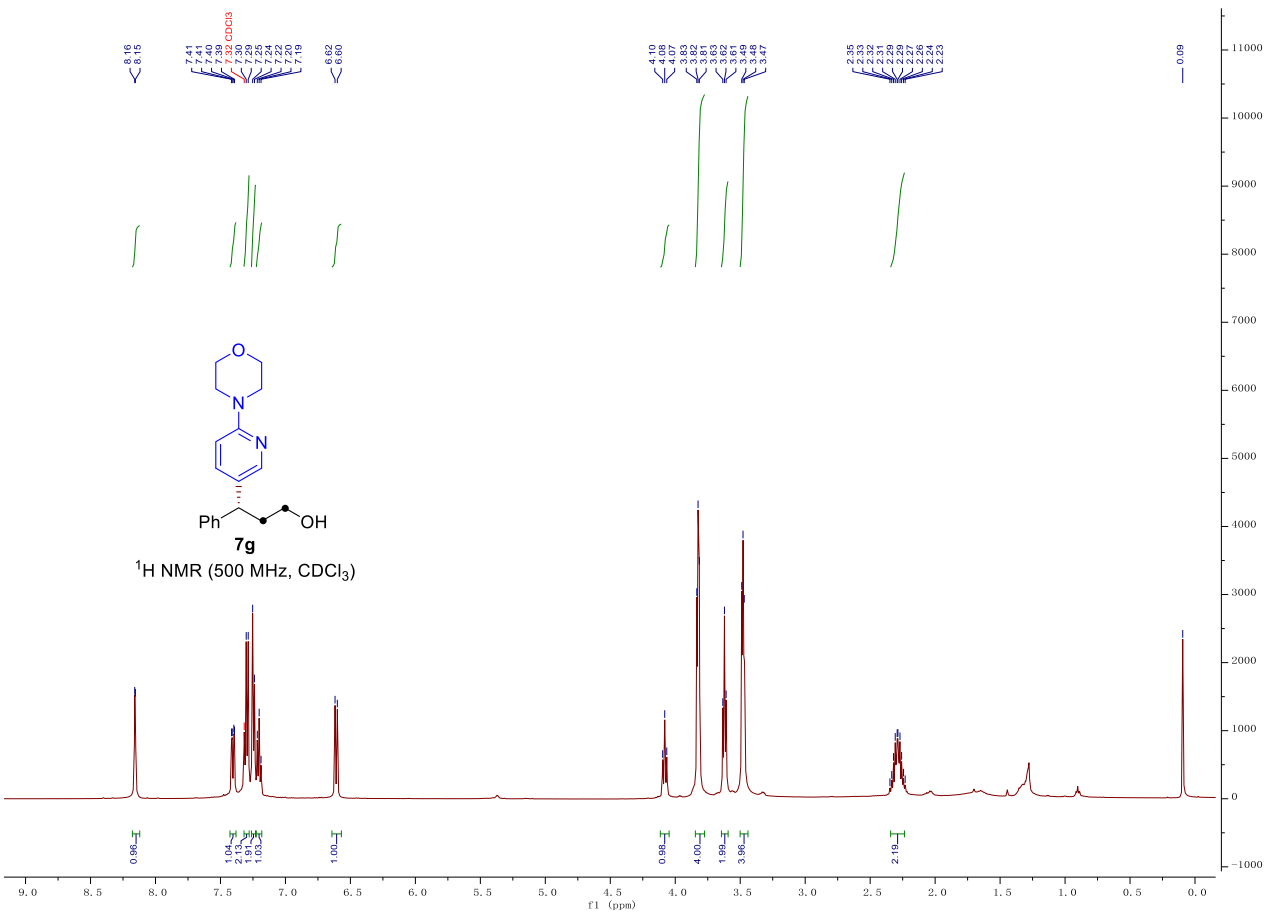
Supplementary Fig. 118. ^{13}C NMR of compound **7e**



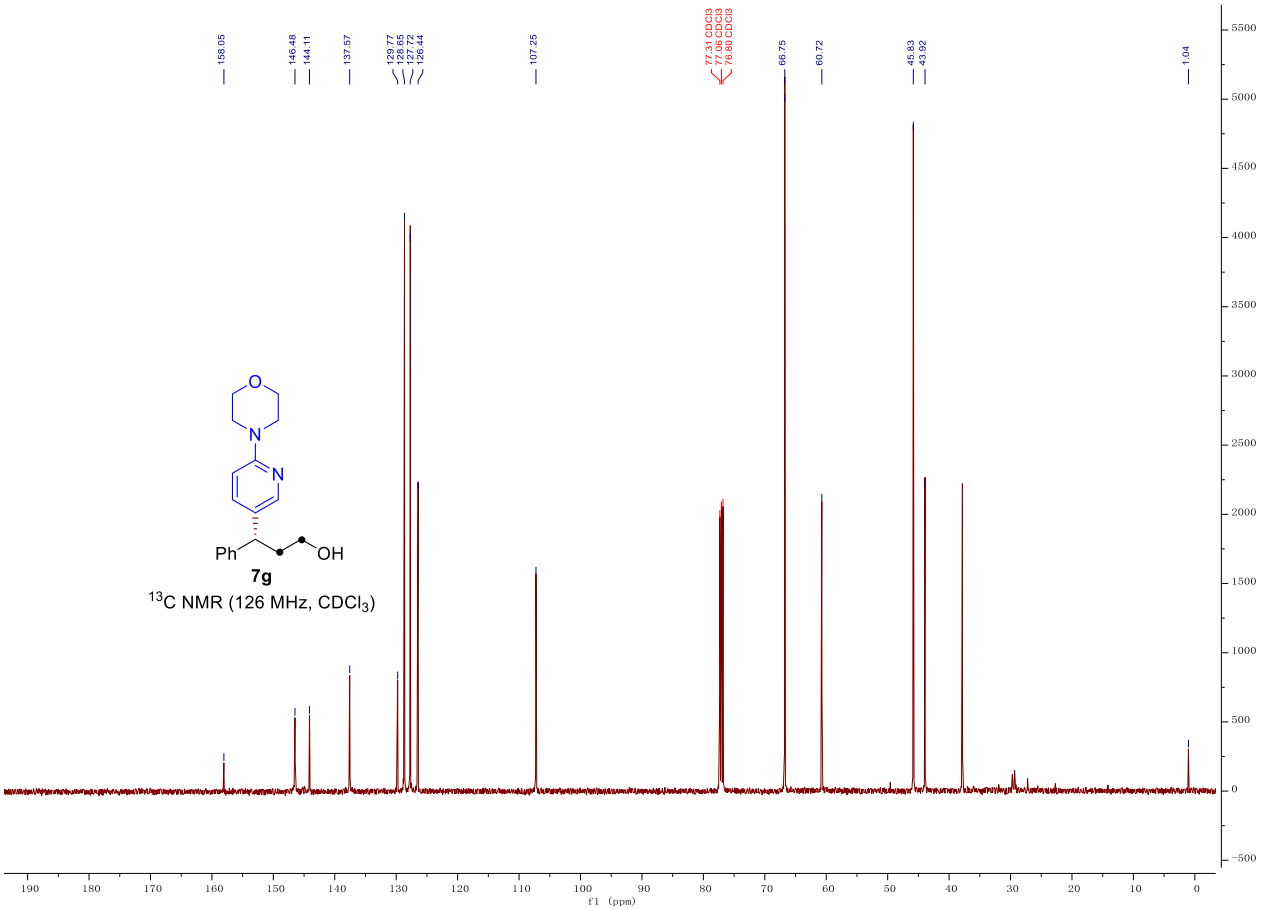
Supplementary Fig. 119. ^{1}H NMR of compound **7f**



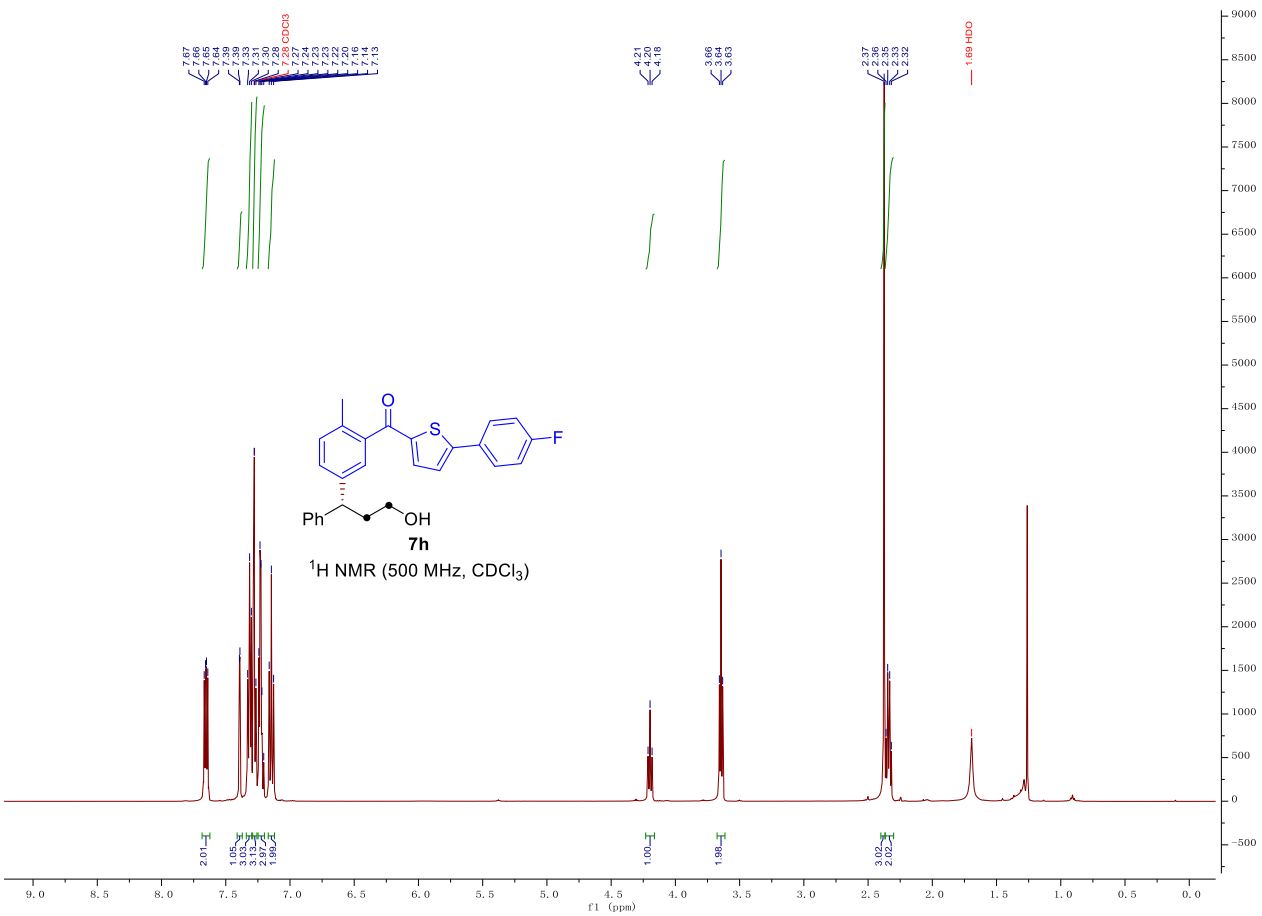
Supplementary Fig. 120. ^{13}C NMR of compound **7f**



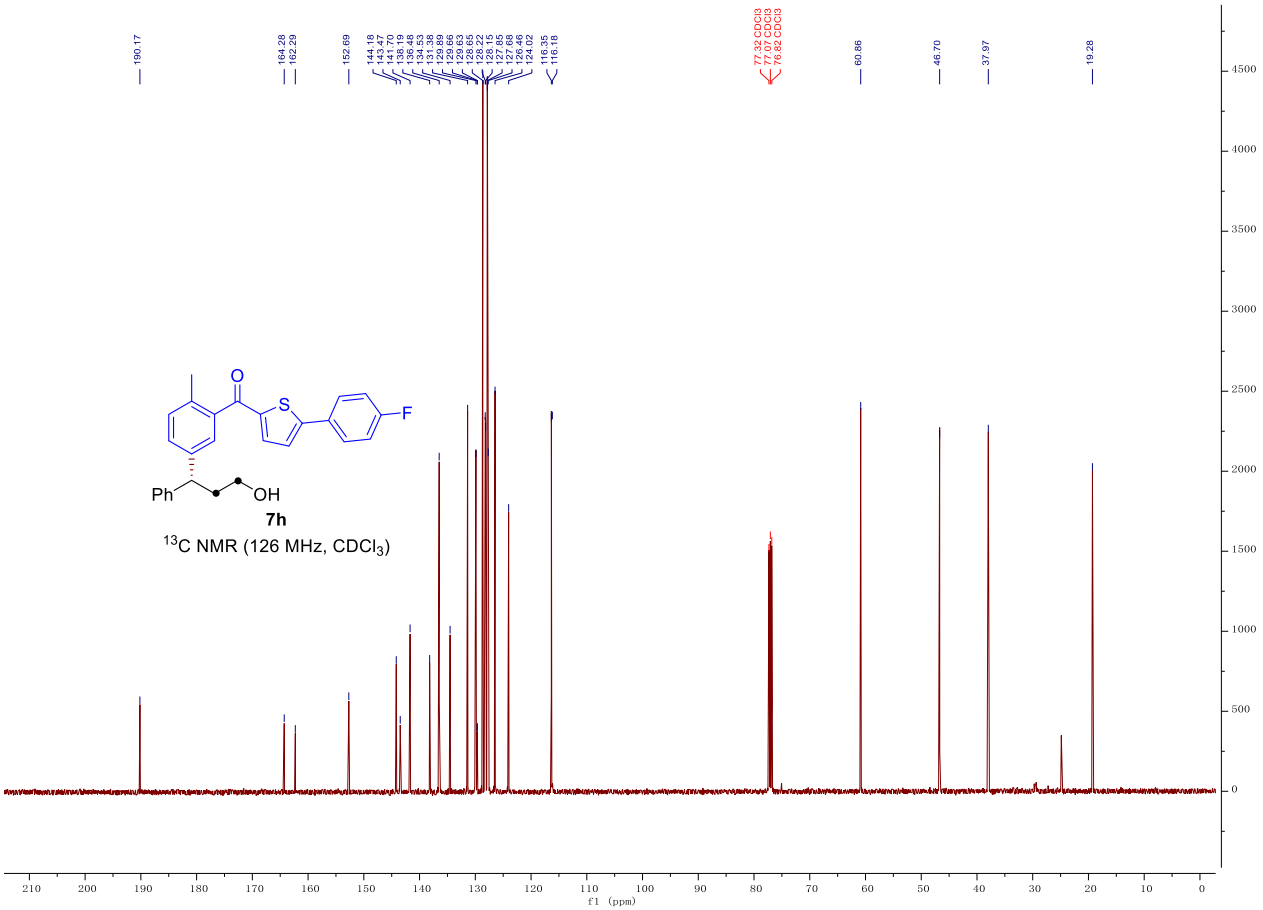
Supplementary Fig. 121. ^{1}H NMR of compound **7g**



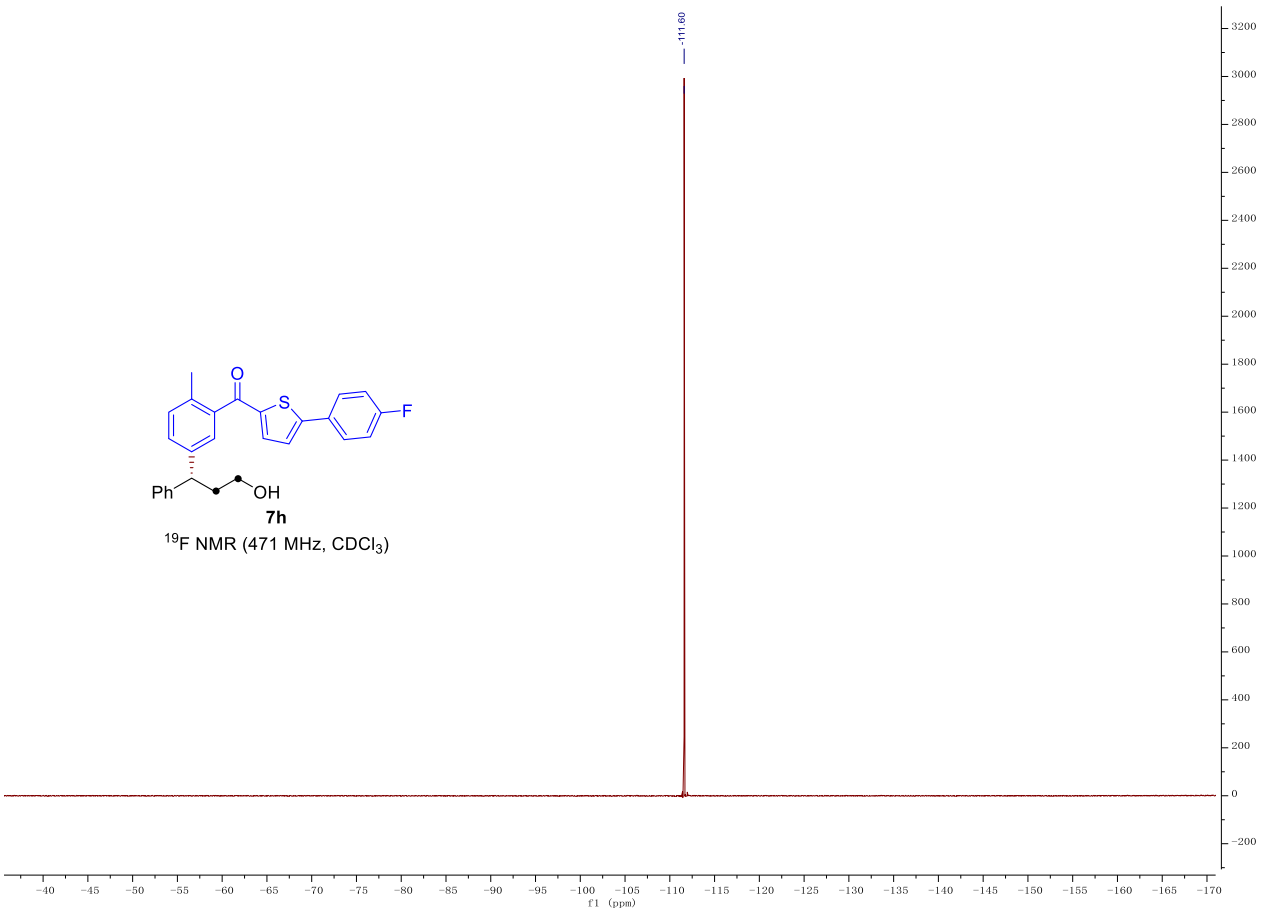
Supplementary Fig. 122. ^{13}C NMR of compound **7g**



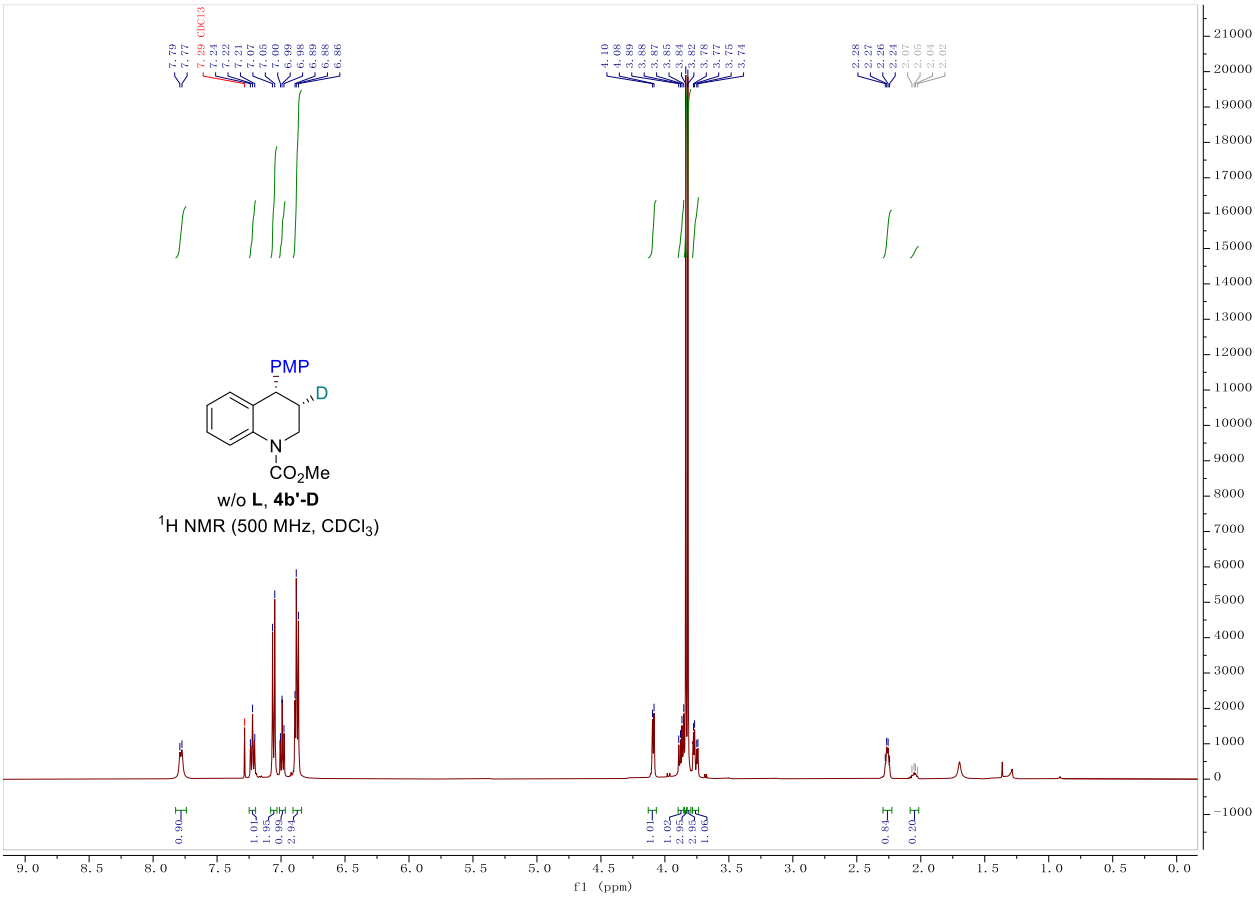
Supplementary Fig. 123. ^{1}H NMR of compound **7h**



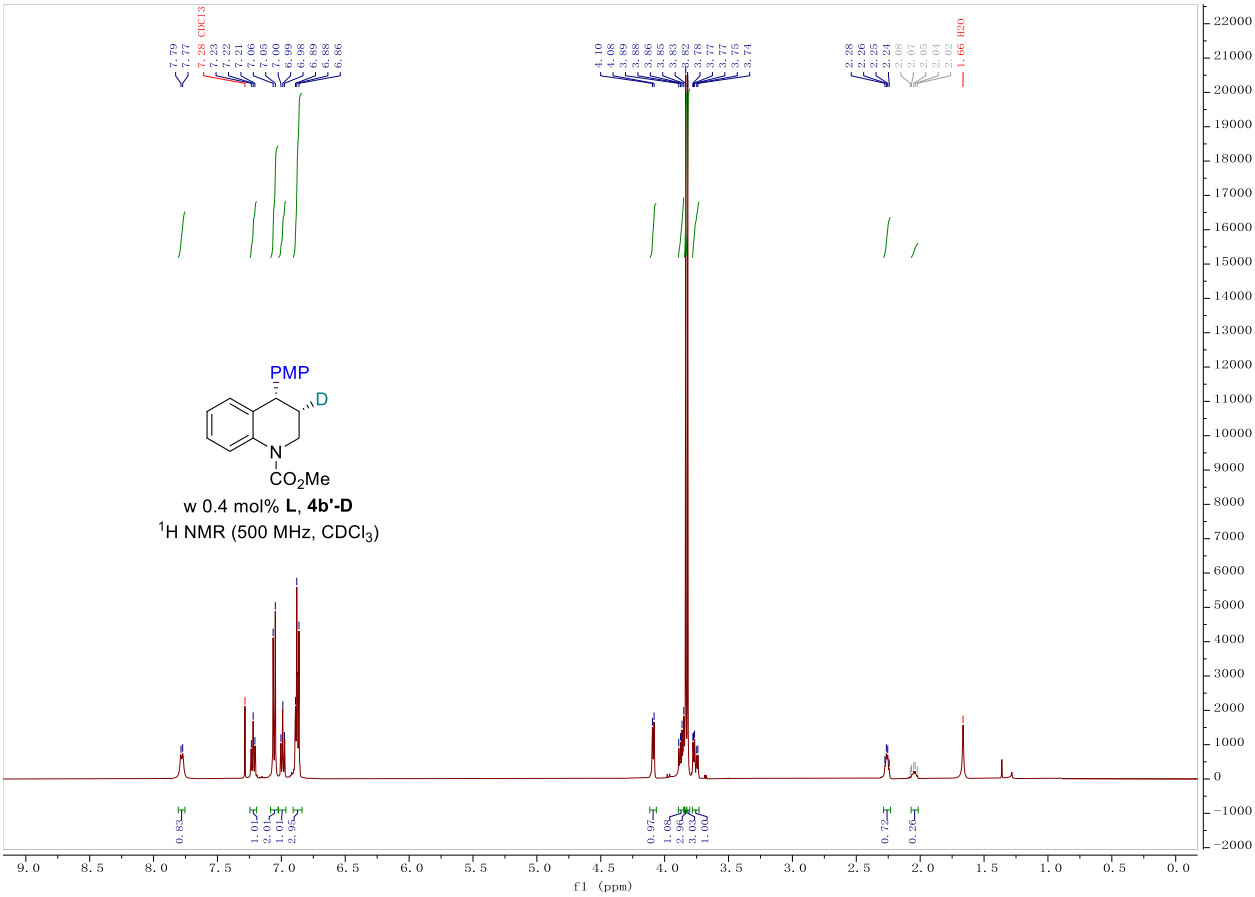
Supplementary Fig. 124. ^{13}C NMR of compound **7h**



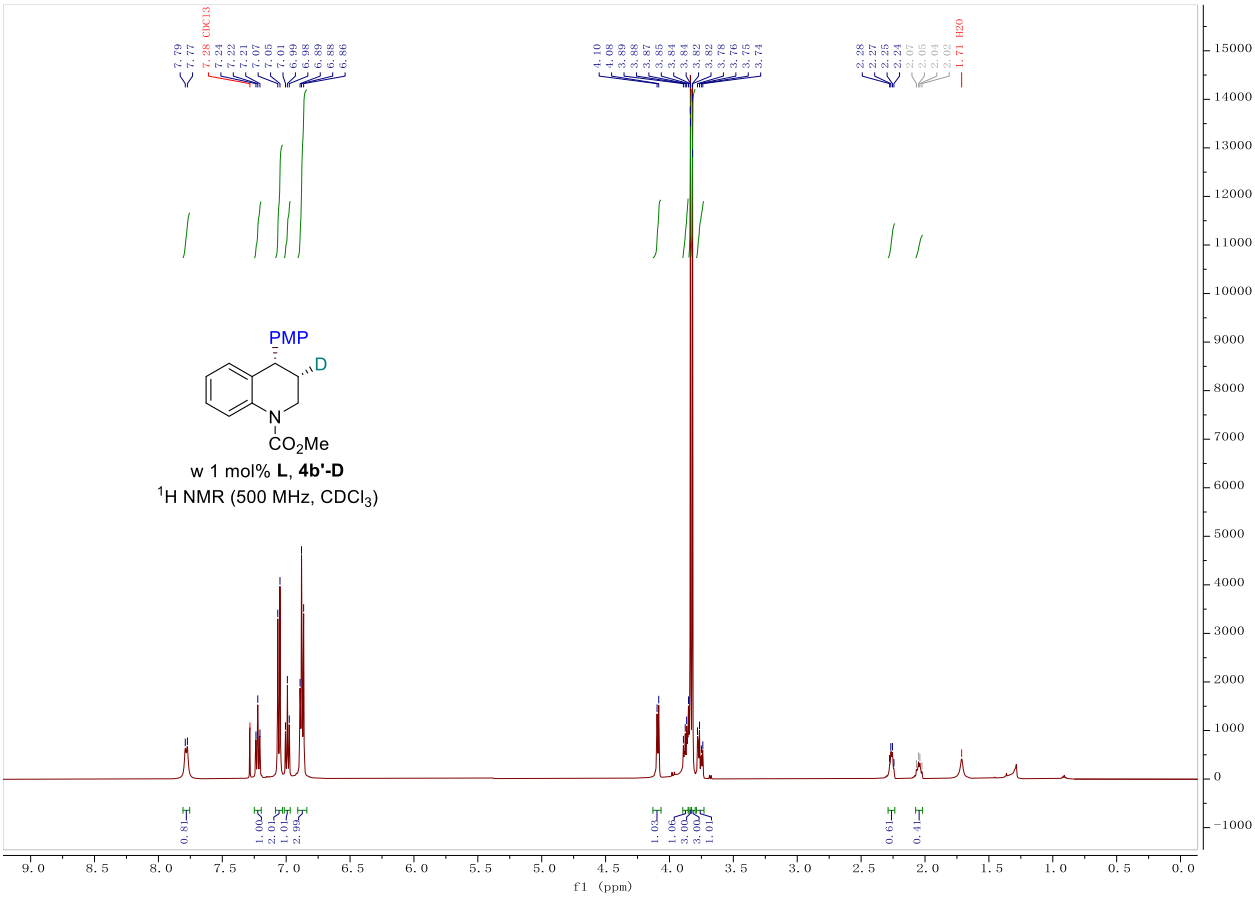
Supplementary Fig. 125. ^{19}F NMR of compound **7h**



Supplementary Fig. 126. ^{1}H NMR of compound **4b'-D** (w/o **L**)



Supplementary Fig. 127. ^{1}H NMR of compound **4b'-D** (w 0.4 mol% **L**)

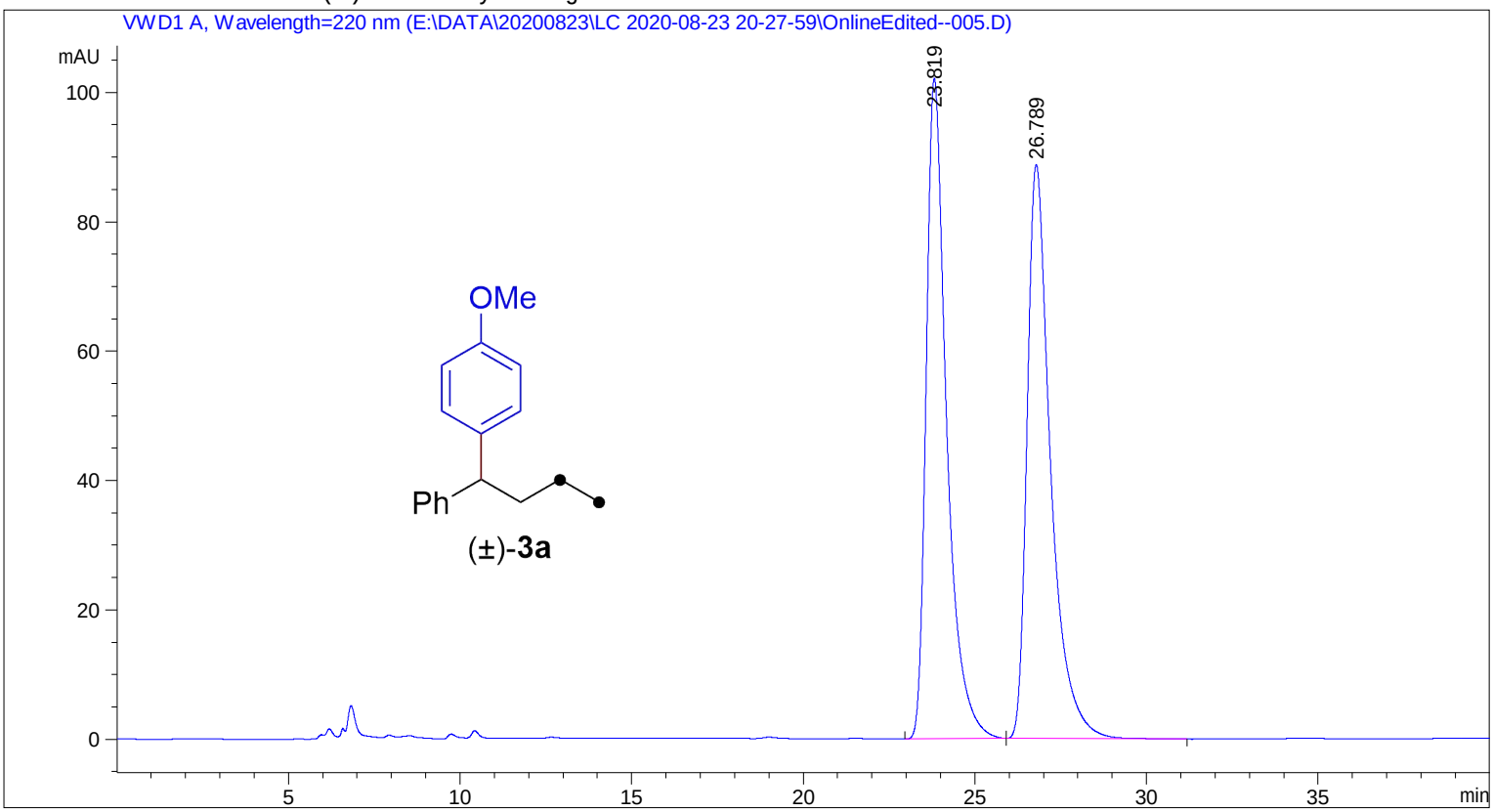


Supplementary Fig. 128. ^{1}H NMR of compound **4b'-D** (w 1 mol% **L**)

2.13. Spectroscopic Data (HPLC Trace)

Data File E:\DATA\20200823\LC 2020-08-23 20-27-59\OnlineEdited--005.D
Sample Name: YH-17-99-RAC

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   5
Acq. Instrument : HPLC1260                         Location :   P1-B1
Injection Date  : 8/23/2020 10:42:48 PM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Method          : E:\DATA\20200823\LC 2020-08-23 20-27-59\1EtOH_40_5_1.M (Sequence Method)
Last changed    : 8/23/2020 9:45:14 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.819 BB    0.6182 4220.85645  102.11806  49.9447
   2  26.789 BB    0.7080 4230.19873   88.77055  50.0553

Totals :                  8451.05518  190.88861


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200823\LC 2020-08-23 20-27-59\OnlineEdited--006.D
Sample Name: YH-17-99-EE

```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   6
Acq. Instrument : HPLC1260                       Location :   P1-B2
Injection Date  : 8/23/2020 11:23:33 PM               Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Method          : E:\DATA\20200823\LC 2020-08-23 20-27-59\1EtOH_40_5_1.M (Sequence Method)
Last changed    : 8/23/2020 9:45:14 PM by SYSTEM
Additional Info : Peak(s) manually integrated
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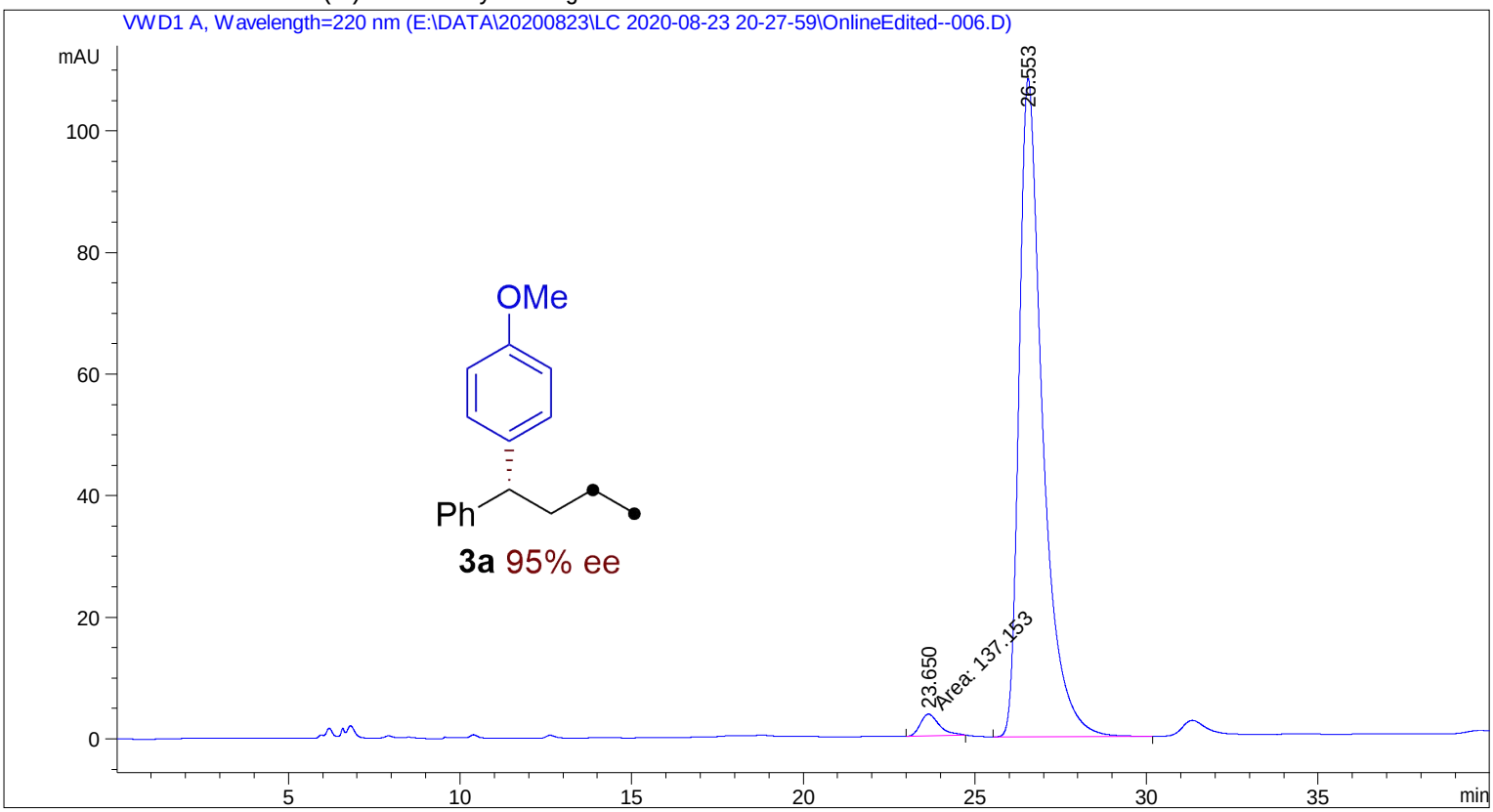


```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.650 MM    0.6355  137.15309    3.59698   2.5840
   2  26.553 BB    0.7092 5170.54736  108.26321  97.4160

Totals :                  5307.70045  111.86019


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200829\LC 2020-08-30 17-08-41\OnlineEdited--010.D
Sample Name: YH-17-114-RAC

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  10
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 8/30/2020 11:52:20 PM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200829\LC 2020-08-30 17-08-41\1IPA_40_8_1.M
Last changed    : 8/30/2020 10:59:52 PM by SYSTEM
Analysis Method : E:\DATA\20200829\LC 2020-08-30 17-08-41\1IPA_40_8_1.M (Sequence Method)
Last changed    : 8/31/2020 8:29:58 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
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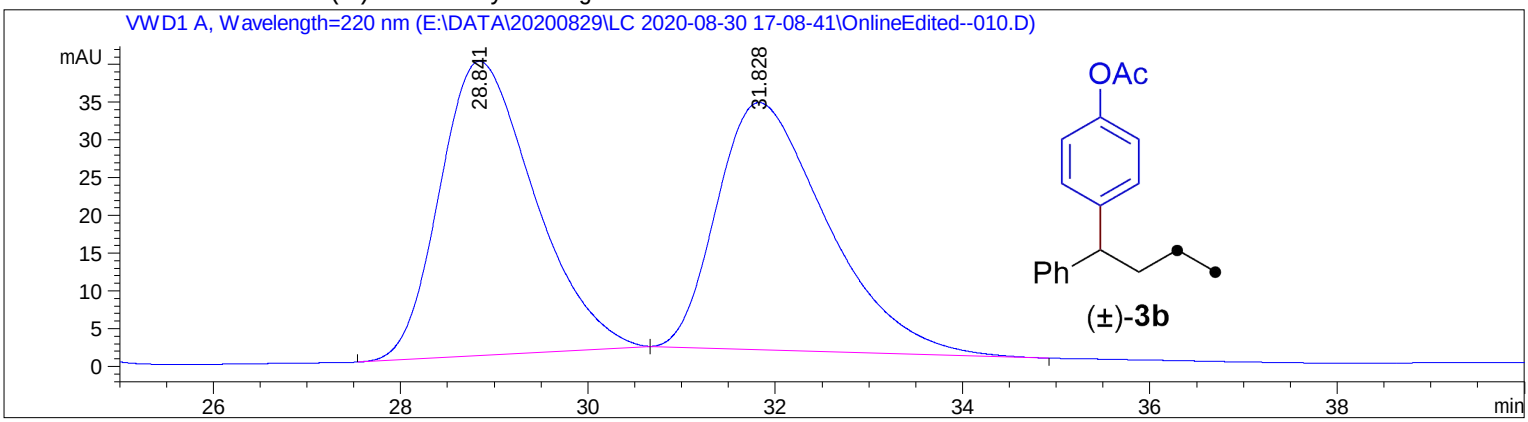


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==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.841 BB    1.0787 2737.25195   39.00799  50.5082
   2  31.828 BB    1.2281 2682.16821   32.72819  49.4918

Totals :                  5419.42017   71.73618


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                          *** End of Report ***
```

Data File E:\DATA\20200829\LC 2020-08-30 17-08-41\OnlineEdited--011.D
Sample Name: YH-17-114-EE

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  11
Acq. Instrument : HPLC1260                          Location :   P1-A4
Injection Date  : 8/31/2020 12:33:04 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200829\LC 2020-08-30 17-08-41\1IPA_40_8_1.M
Last changed    : 8/30/2020 10:59:52 PM by SYSTEM
Analysis Method : E:\DATA\20200829\LC 2020-08-30 17-08-41\1IPA_40_8_1.M (Sequence Method)
Last changed    : 8/31/2020 8:29:58 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
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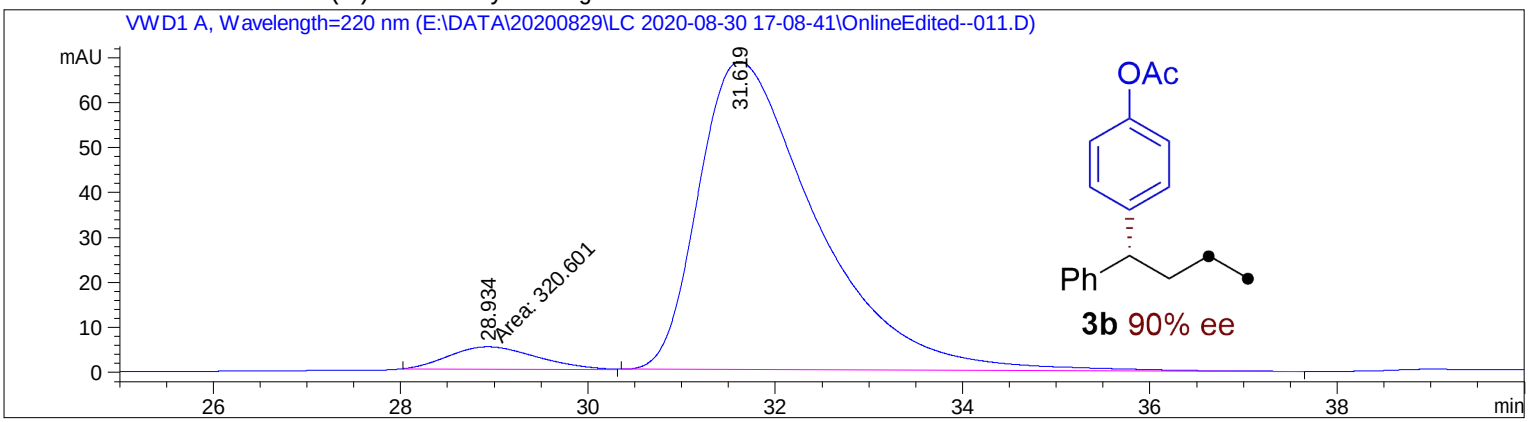


```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.934 MM    1.0810  320.60114    4.94317   5.0726
   2  31.619 BB    1.3067 5999.65186   68.51117  94.9274

Totals :                  6320.25299   73.45434


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                        *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-01 08-57-38\OnlineEdited--006.D
Sample Name: YH-17-115-RAC

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   6
Acq. Instrument : HPLC1260                         Location :   P1-B1
Injection Date  : 9/1/2020 11:33:42 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-01 08-57-38\1IPA_80_8_1.M
Last changed    : 9/1/2020 9:51:26 AM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-01 08-57-38\1IPA_80_8_1.M (Sequence Method)
Last changed    : 9/1/2020 2:27:42 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
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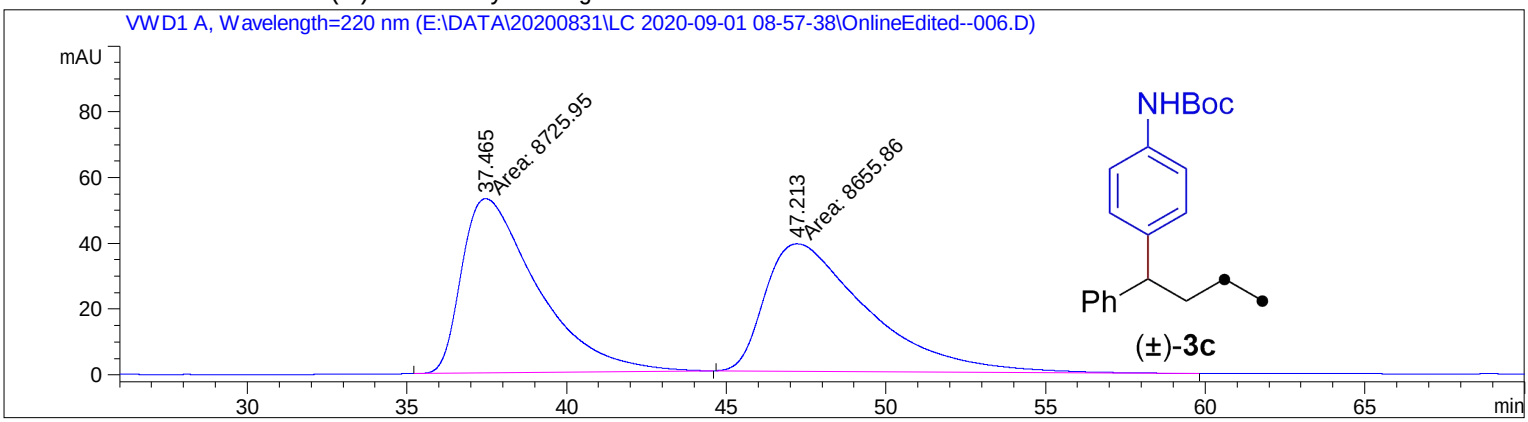


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==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  37.465 MM    2.7428 8725.95410   53.02317  50.2016
   2  47.213 MM    3.7236 8655.86230   38.74373  49.7984

Totals :                  1.73818e4    91.76690


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                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-01 08-57-38\OnlineEdited--007.D
Sample Name: YH-17-115-EE

```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   7
Acq. Instrument : HPLC1260                       Location :   P1-B2
Injection Date  : 9/1/2020 12:54:30 PM               Inj :   1
                                               Inj Volume : 3.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-01 08-57-38\1IPA_80_8_1.M
Last changed    : 9/1/2020 9:51:26 AM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-01 08-57-38\1IPA_80_8_1.M (Sequence Method)
Last changed    : 9/1/2020 2:27:42 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
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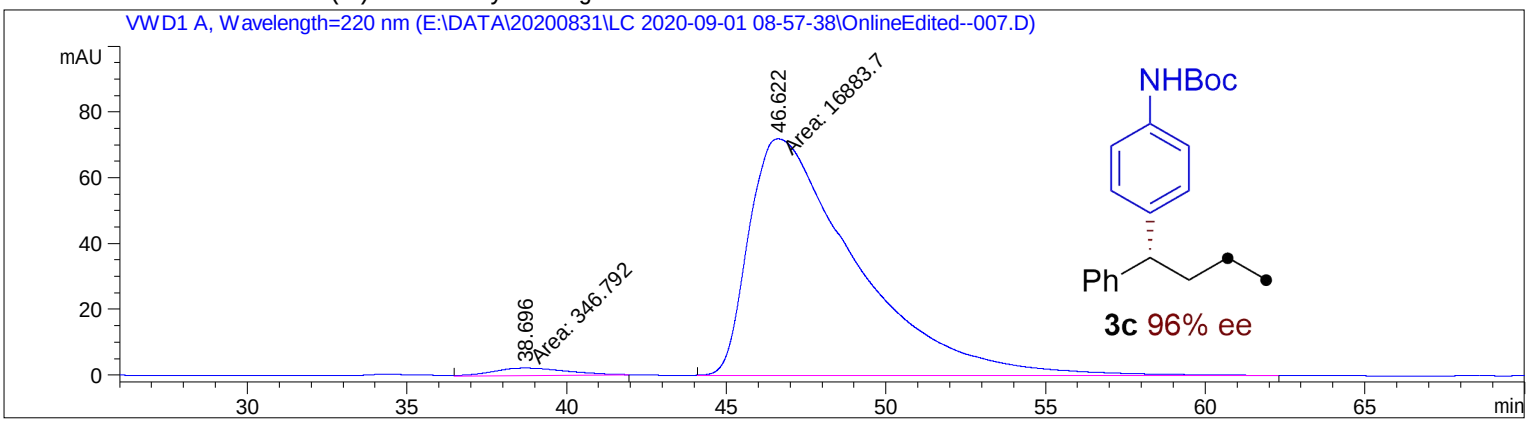


```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  38.696 MM    1.8465  346.79208    2.20724   2.0127
   2  46.622 MM    3.9112 1.68837e4    71.94666  97.9873

Totals :                  1.72305e4    74.15389


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-01 08-57-38\OnlineEdited--017.D
Sample Name: YH-17-117-RAC

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  17
Acq. Instrument : HPLC1260                         Location :   P1-B7
Injection Date  : 9/1/2020 4:52:28 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-01 08-57-38\5IPA_30_5_1.M
Last changed    : 9/1/2020 4:57:29 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200831\LC 2020-09-01 08-57-38\5IPA_30_5_1.M (Sequence Method)
Last changed    : 9/1/2020 6:08:47 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
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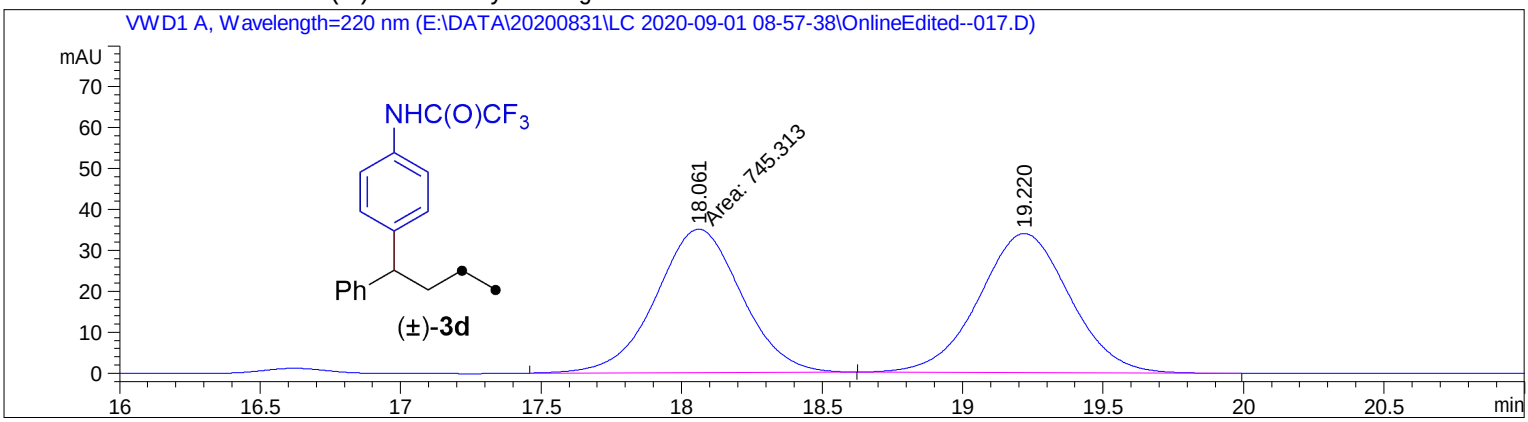
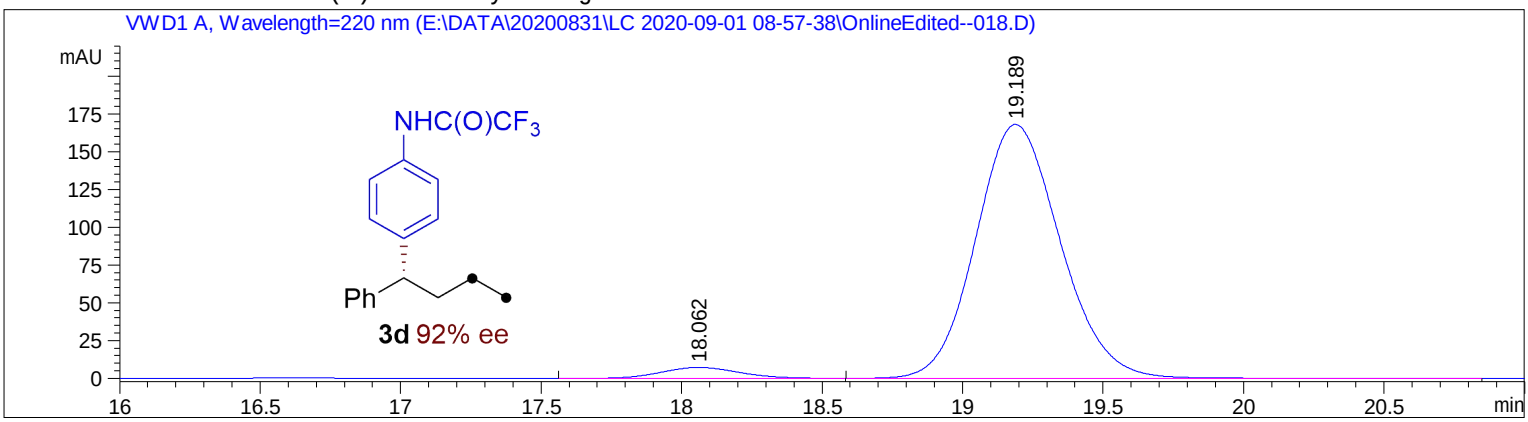



```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.061 FM    0.3541  745.31293   35.08218  49.2961
   2  19.220 BB    0.3470  766.59802   34.00572  50.7039

Totals :                  1511.91095   69.08790


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-01 08-57-38\OnlineEdited--018.D
Sample Name: YH-17-117-EE

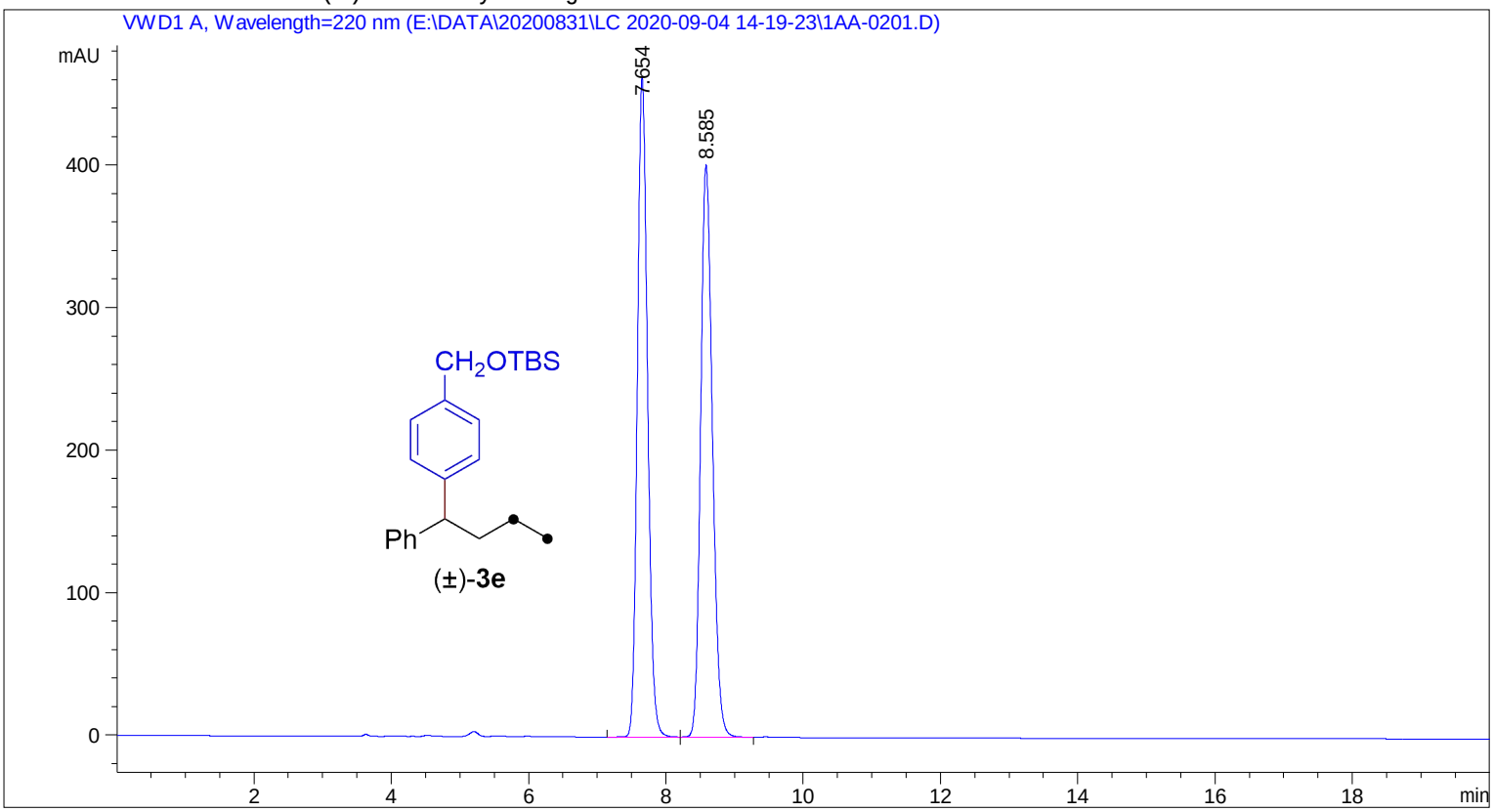
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  18
Acq. Instrument : HPLC1260                         Location :   P1-B2
Injection Date  : 9/1/2020 5:33:15 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-01 08-57-38\5IPA_30_5_1.M
Last changed    : 9/1/2020 6:07:00 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200831\LC 2020-09-01 08-57-38\5IPA_30_5_1.M (Sequence Method)
Last changed    : 9/1/2020 6:09:32 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.062 BB    0.3017  141.60934    7.25616   3.8666
   2  19.189 BB    0.3244 3520.74316  168.05702  96.1334

Totals :                  3662.35251  175.31318


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-04 14-19-23\1AA-0201.D
Sample Name: YH-17-119-RAC

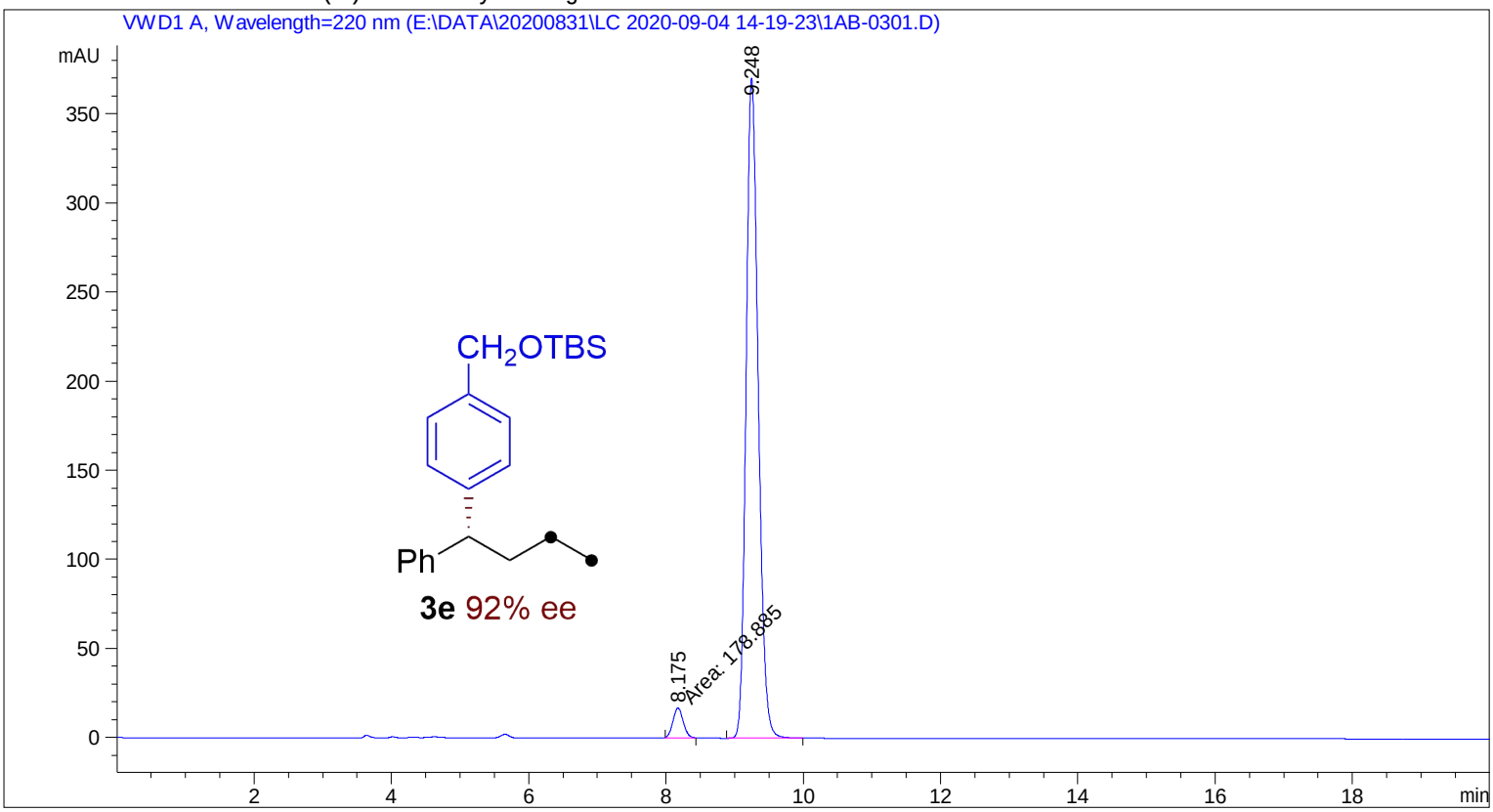
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :   2
Acq. Instrument : HPLC1260                       Location :   P1-A1
Injection Date  : 9/4/2020 2:42:22 PM                 Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-04 14-19-23\0IPA_25_8_3.M
Last changed    : 9/4/2020 2:27:06 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-04 14-19-23\0IPA_25_8_3.M (Sequence Method)
Last changed    : 9/4/2020 2:41:43 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                      Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.654 BB    0.1607 4785.52490  462.56711  49.9838
   2   8.585 BB    0.1852 4788.62549  401.44867  50.0162

Totals :                  9574.15039  864.01578


==================================================================
```

Data File E:\DATA\20200831\LC 2020-09-04 14-19-23\1AB-0301.D
Sample Name: YH-17-119-EE

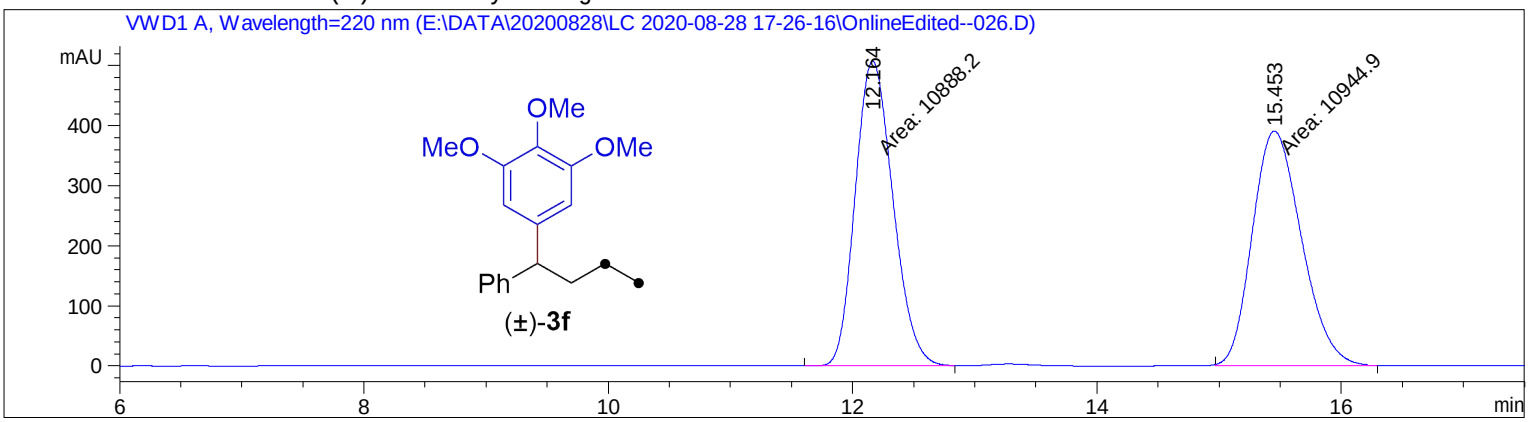
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   3
Acq. Instrument : HPLC1260                          Location :   P1-A2
Injection Date  : 9/4/2020 3:03:07 PM                    Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-04 14-19-23\0IPA_25_8_3.M
Last changed    : 9/4/2020 2:27:06 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-04 14-19-23\0IPA_25_8_3.M (Sequence Method)
Last changed    : 9/4/2020 2:41:43 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.175 FM    0.1756  178.88454   16.97795   3.7939
   2   9.248 BB    0.1889 4536.12598  370.32483  96.2061

Totals :                   4715.01051  387.30278


==========================================================================
```

Data File E:\DATA\20200828\LC 2020-08-28 17-26-16\OnlineEdited--026.D
Sample Name: YH-17-108-RAC

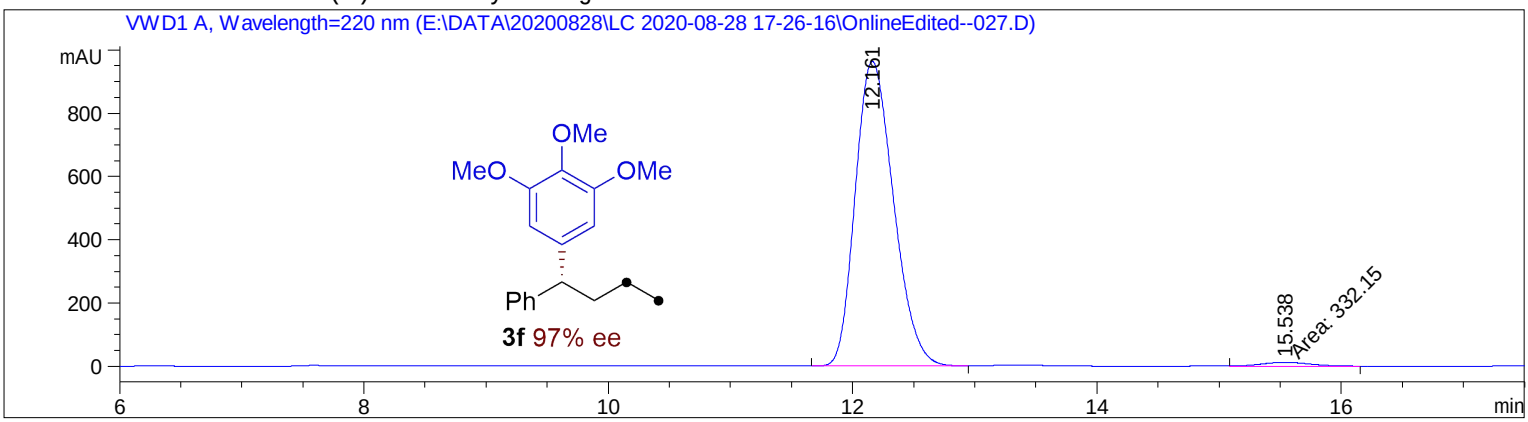
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  26
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 8/29/2020 7:41:50 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200828\LC 2020-08-28 17-26-16\5IPA_35_10_1.M
Last changed    : 8/29/2020 7:59:24 AM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200828\LC 2020-08-28 17-26-16\5IPA_35_10_1.M (Sequence Method)
Last changed    : 8/29/2020 8:51:39 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.164 MF    0.3575 1.08882e4   507.60840  49.8701
   2  15.453 MF    0.4665 1.09449e4   391.03992  50.1299

Totals :                  2.18330e4   898.64832


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200828\LC 2020-08-28 17-26-16\OnlineEdited--027.D
Sample Name: YH-17-108-EE

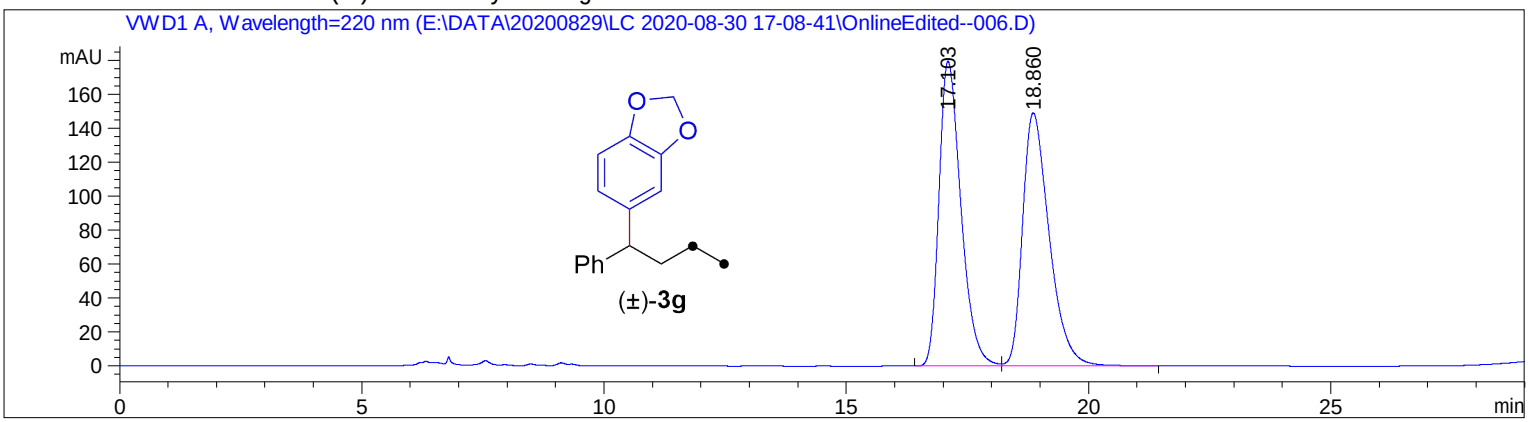
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  27
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 8/29/2020 8:12:36 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200828\LC 2020-08-28 17-26-16\5IPA_35_10_1.M
Last changed    : 8/29/2020 7:59:24 AM by SYSTEM
Analysis Method : E:\DATA\20200828\LC 2020-08-28 17-26-16\5IPA_35_10_1.M (Sequence Method)
Last changed    : 8/29/2020 8:51:39 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.161 BB    0.3418 2.09569e4   963.44781  98.4398
   2  15.538 MF    0.4604  332.14978   12.02373   1.5602

Totals :                  2.12890e4   975.47155


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200829\LC 2020-08-30 17-08-41\OnlineEdited--006.D
Sample Name: YH-17-116-RAC

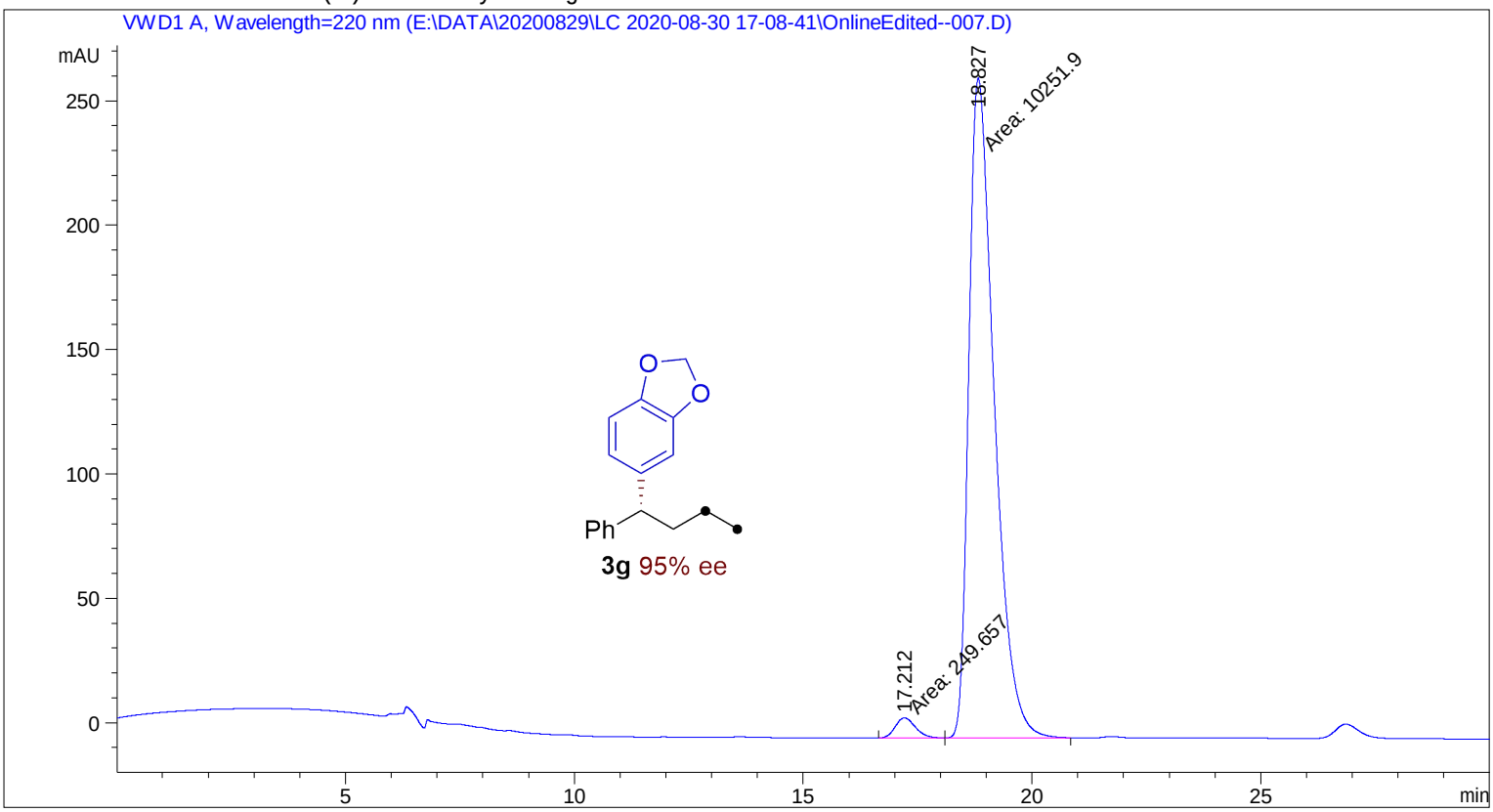
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   6
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 8/30/2020 9:34:17 PM                 Inj :   2
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200829\LC 2020-08-30 17-08-41\5IPA_30_5_1.M
Last changed    : 8/30/2020 8:45:42 PM by SYSTEM
Analysis Method : E:\DATA\20200829\LC 2020-08-30 17-08-41\5IPA_30_5_1.M (Sequence Method)
Last changed    : 8/30/2020 10:35:01 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.103 BV    0.4842 5670.10205  179.65312  49.8935
   2  18.860 VB    0.5823 5694.31055  149.19333  50.1065

Totals :                  1.13644e4   328.84645


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200829\LC 2020-08-30 17-08-41\OnlineEdited--007.D
Sample Name: YH-17-116-EE

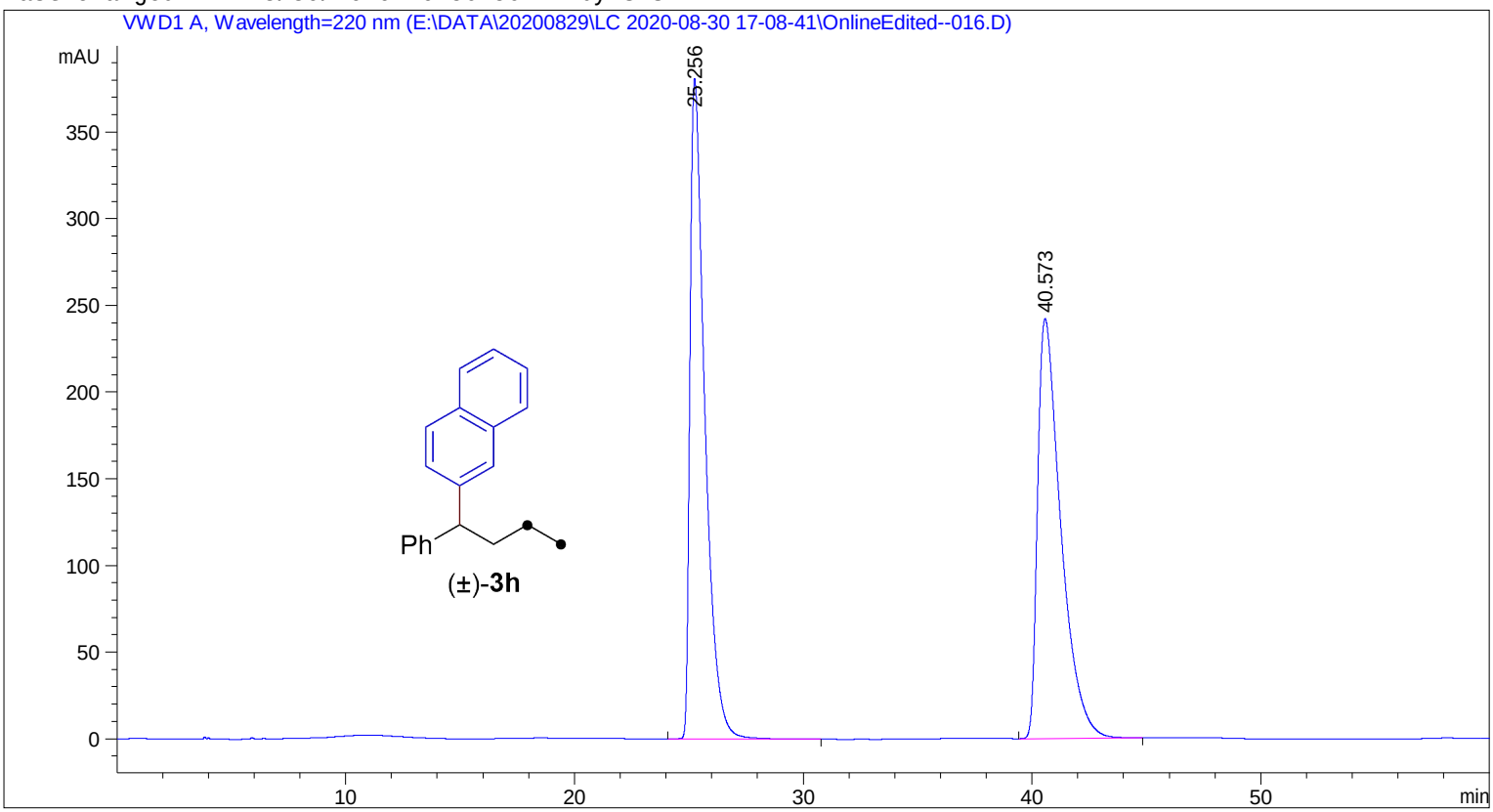
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   7
Acq. Instrument : HPLC1260                          Location :   P1-A2
Injection Date  : 8/30/2020 10:05:03 PM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200829\LC 2020-08-30 17-08-41\5IPA_30_5_1.M
Last changed    : 8/30/2020 8:45:42 PM by SYSTEM
Analysis Method : E:\DATA\20200829\LC 2020-08-30 17-08-41\5IPA_30_5_1.M (Sequence Method)
Last changed    : 8/30/2020 9:02:51 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  17.212 FM    0.5118  249.65678    8.12981   2.3773
   2  18.827 MF    0.6441 1.02519e4   265.28772  97.6227

Totals :                  1.05016e4   273.41753


==========================================================================
```

Data File E:\DATA\20200829\LC 2020-08-30 17-08-41\OnlineEdited--016.D
Sample Name: YH-17-112-RAC

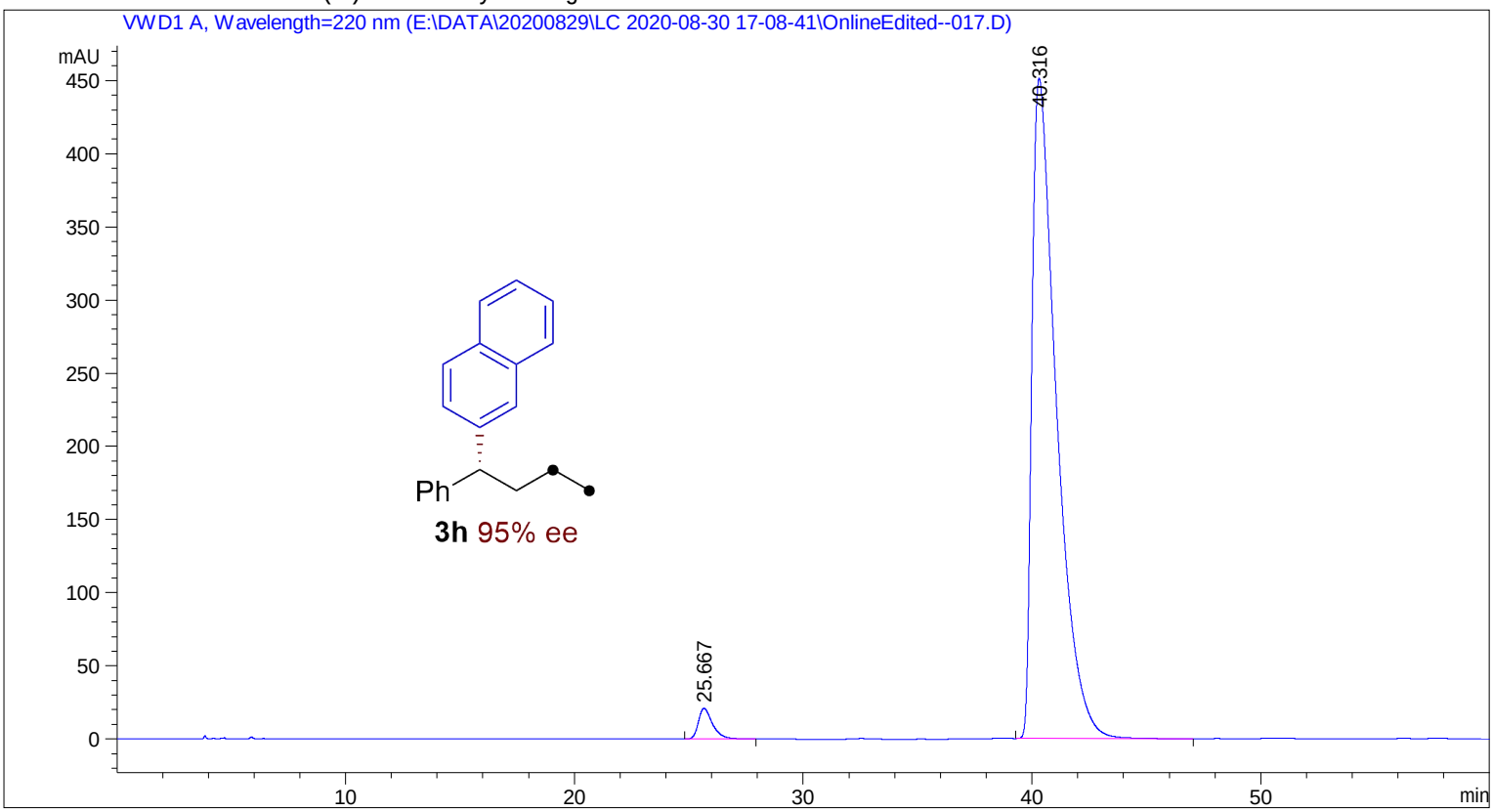
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  16
Acq. Instrument : HPLC1260                       Location :   P1-A1
Injection Date  : 8/31/2020 5:17:01 AM                Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Method          : E:\DATA\20200829\LC 2020-08-30 17-08-41\0IPA_60_8_2.M (Sequence Method)
Last changed    : 8/30/2020 10:56:56 PM by SYSTEM
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.256 BB    0.6736 1.71626e4   380.94769  50.1021
   2  40.573 BB    1.0553 1.70926e4   242.22771  49.8979

Totals :                  3.42552e4   623.17540


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200829\LC 2020-08-30 17-08-41\OnlineEdited--017.D
Sample Name: YH-17-112-EE

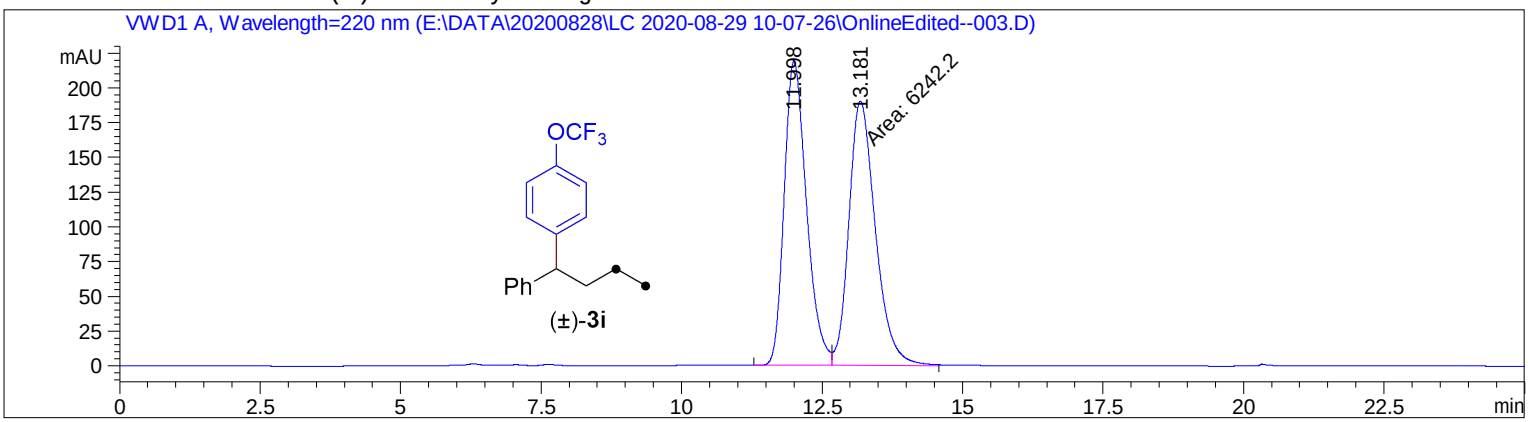
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  17
Acq. Instrument : HPLC1260                          Location :   P1-A2
Injection Date  : 8/31/2020 6:17:47 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Method          : E:\DATA\20200829\LC 2020-08-30 17-08-41\0IPA_60_8_2.M (Sequence Method)
Last changed    : 8/30/2020 10:56:56 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.667 BB    0.6395  893.69812   20.95575   2.5802
   2  40.316 BB    1.1145 3.37432e4   451.20450  97.4198

Totals :                  3.46369e4   472.16025


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200828\LC 2020-08-29 10-07-26\OnlineEdited--003.D
Sample Name: YH-17-109-RAC

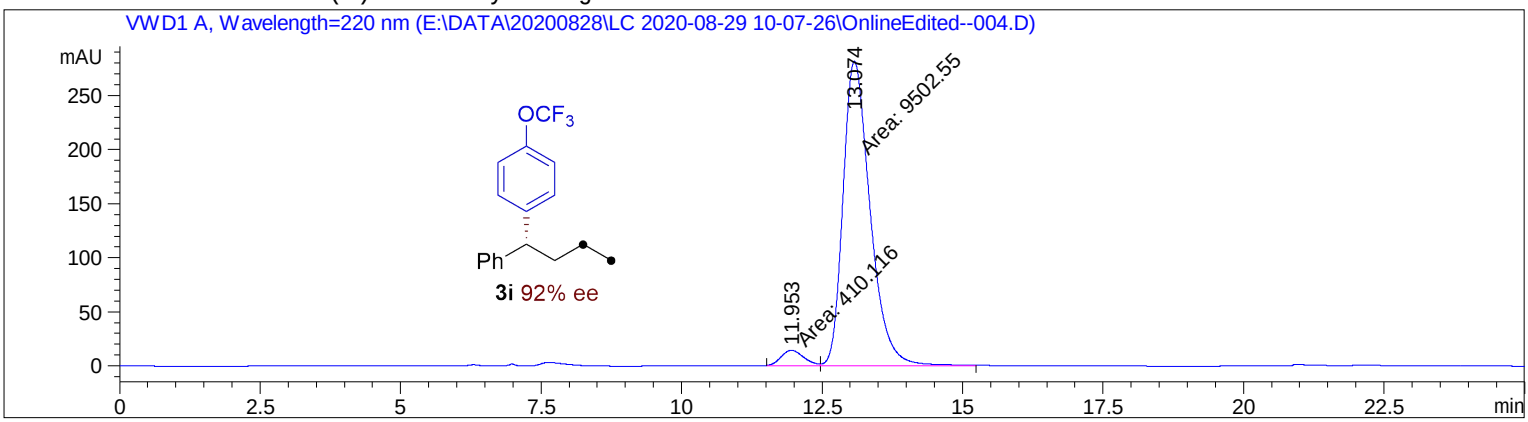
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   3
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 8/29/2020 11:36:05 AM                Inj :   2
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200828\LC 2020-08-29 10-07-26\1EtOH_35_5_1.M
Last changed    : 8/29/2020 11:01:44 AM by SYSTEM
Analysis Method : E:\DATA\20200828\LC 2020-08-29 10-07-26\1EtOH_35_5_1.M (Sequence Method)
Last changed    : 8/29/2020 4:38:45 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.998 BV    0.4249 6057.66504  218.84766  49.2499
   2  13.181 MF    0.5470 6242.19678  190.17905  50.7501

Totals :                  1.22999e4   409.02670


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200828\LC 2020-08-29 10-07-26\OnlineEdited--004.D
Sample Name: YH-17-109-EE

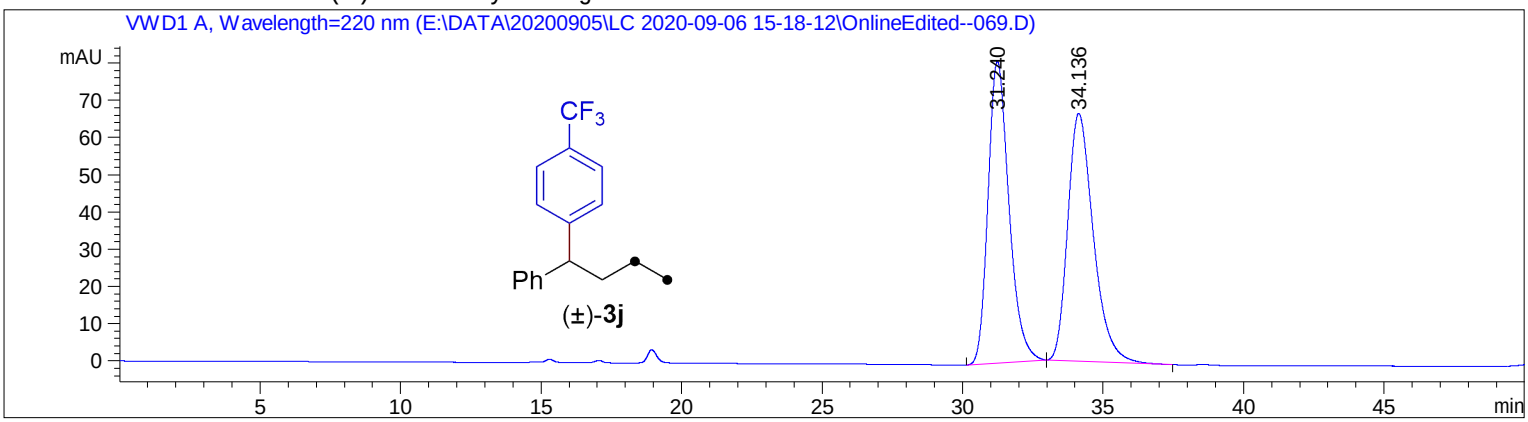
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   4
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 8/29/2020 12:26:53 PM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200828\LC 2020-08-29 10-07-26\1EtOH_35_5_1.M
Last changed    : 8/29/2020 11:01:44 AM by SYSTEM
Analysis Method : E:\DATA\20200828\LC 2020-08-29 10-07-26\1EtOH_35_5_1.M (Sequence Method)
Last changed    : 8/29/2020 4:38:45 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.953 FM    0.4739  410.11621   14.42195   4.1373
   2  13.074 MF    0.5618 9502.54980  281.88467  95.8627

Totals :                  9912.66602  296.30663


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--069.D
Sample Name: YH-17-126-RAC

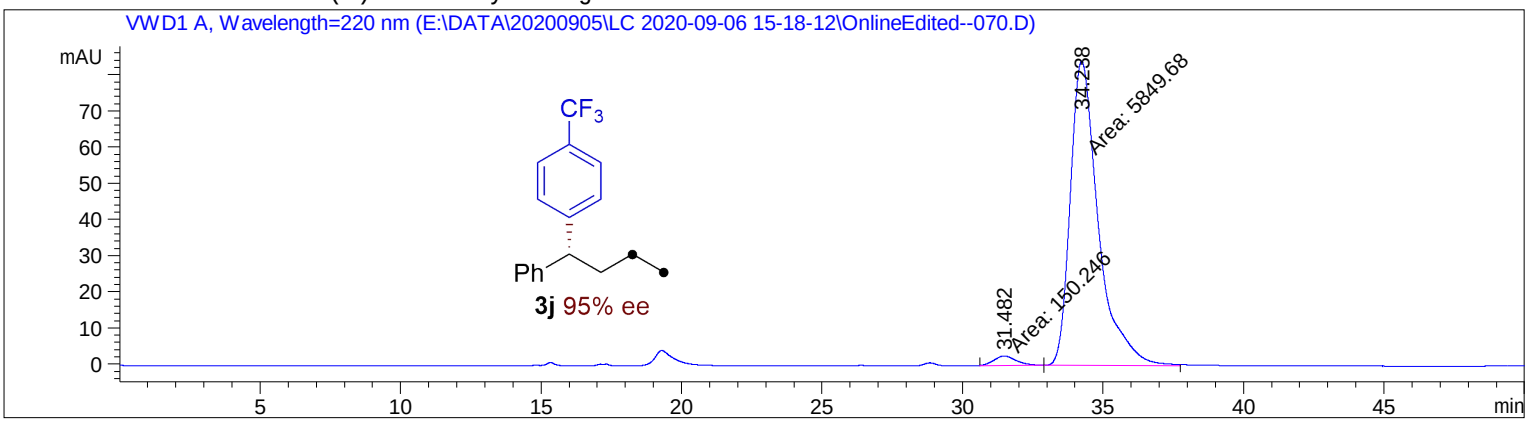
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  69
Acq. Instrument : HPLC1260                         Location :   P1-A7
Injection Date  : 9/8/2020 5:49:33 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\0IPA_50_4_3.M
Last changed    : 9/7/2020 9:42:12 AM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\0IPA_50_4_3.M (Sequence Method)
Last changed    : 9/8/2020 11:31:07 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1  31.240 BB    0.7946 4194.71387   81.07690  49.9003
   2  34.136 BB    0.9644 4211.47217   66.53973  50.0997

Totals :                  8406.18604  147.61663


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--070.D
Sample Name: YH-17-126-EE

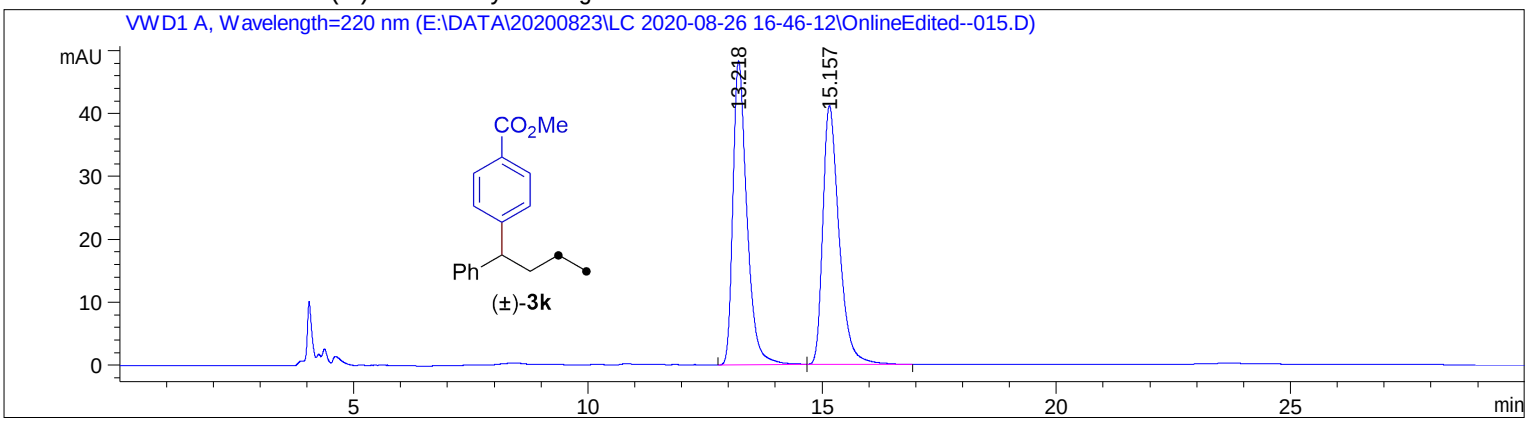
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  70
Acq. Instrument : HPLC1260                         Location :   P1-A8
Injection Date  : 9/8/2020 6:40:17 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\0IPA_50_4_3.M
Last changed    : 9/7/2020 9:42:12 AM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\0IPA_50_4_3.M (Sequence Method)
Last changed    : 9/8/2020 11:31:07 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  31.482 FM    0.9381  150.24557    2.66936   2.5041
   2  34.238 MF    1.1592 5849.67920   84.10281  97.4959

Totals :                  5999.92477   86.77216


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\OnlineEdited--015.D
Sample Name: YH-17-102-RAC

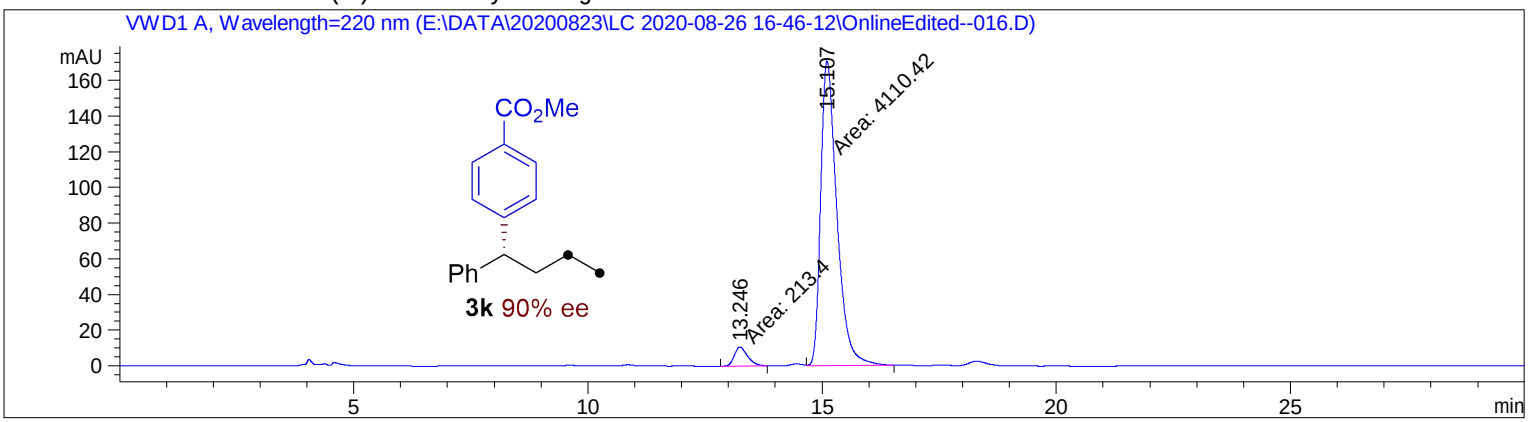
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  15
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 8/26/2020 10:26:09 PM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200823\LC 2020-08-26 16-46-12\1IPA_40_8_1.M
Last changed    : 8/26/2020 10:49:00 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200823\LC 2020-08-26 16-46-12\1IPA_40_8_1.M (Sequence Method)
Last changed    : 8/27/2020 10:35:59 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.218 BB    0.3101  997.52032   48.26073  50.0790
   2  15.157 BB    0.3641  994.37354   41.12718  49.9210

Totals :                  1991.89386   89.38791


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\OnlineEdited--016.D
Sample Name: YH-17-102-EE

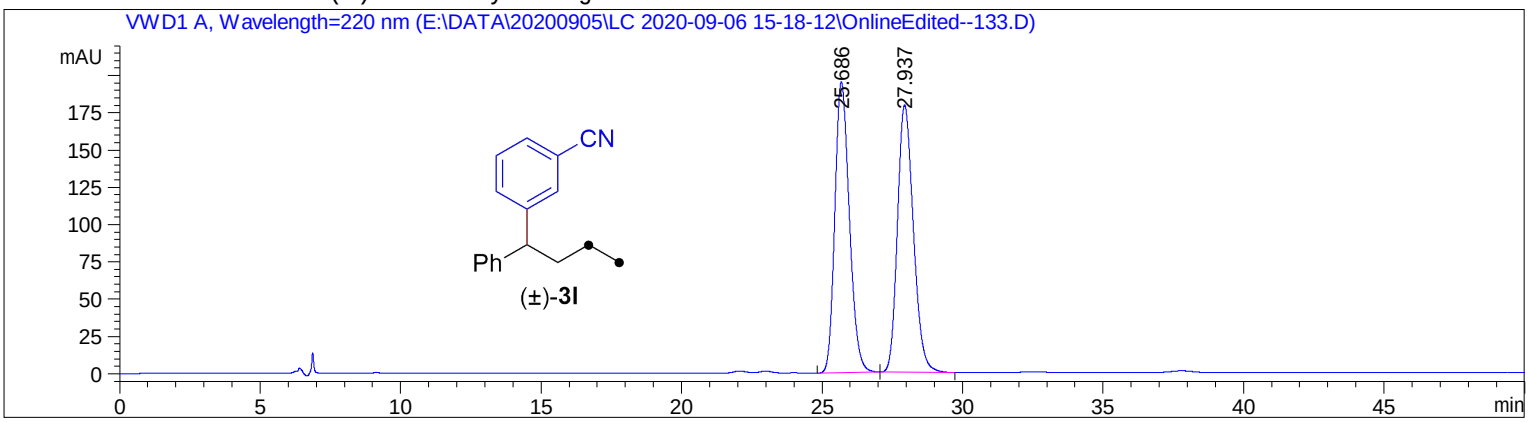
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  16
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 8/26/2020 10:56:55 PM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200823\LC 2020-08-26 16-46-12\1IPA_40_8_1.M
Last changed    : 8/26/2020 10:49:00 PM by SYSTEM
Analysis Method : E:\DATA\20200823\LC 2020-08-26 16-46-12\1IPA_40_8_1.M (Sequence Method)
Last changed    : 8/27/2020 10:35:59 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.246 MF    0.3319  213.40047   10.71743   4.9355
   2  15.107 FM    0.4015 4110.41992  170.60970  95.0645

Totals :                  4323.82039  181.32712


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--133.D
Sample Name: YH-17-121-RAC

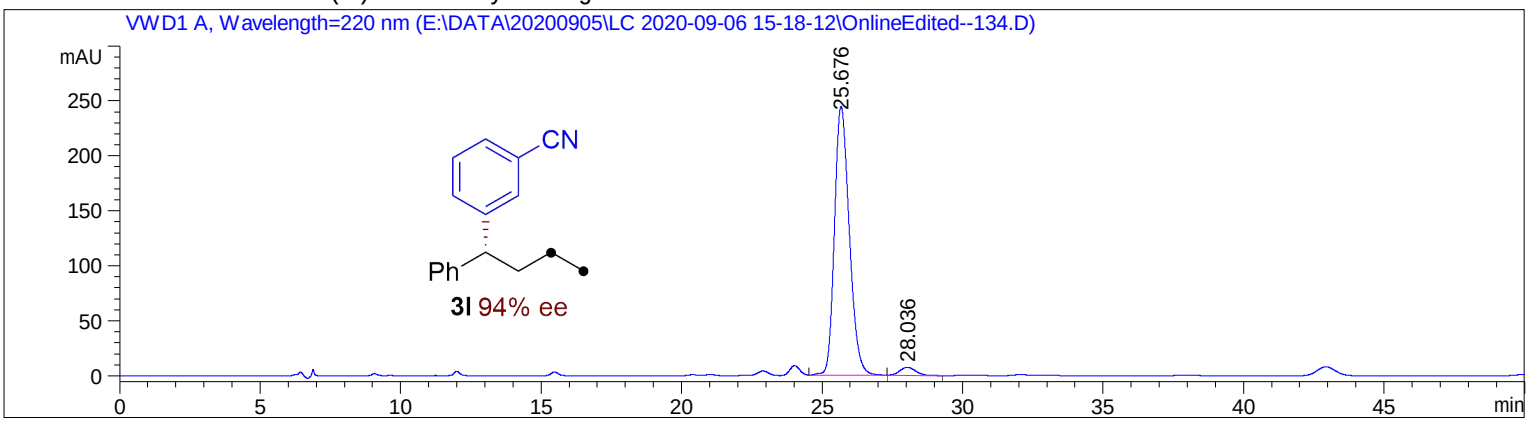
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 133
Acq. Instrument : HPLC1260                         Location :   P1-B1
Injection Date  : 9/9/2020 10:12:47 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA IN PENTANE_40_5_4.M
Last changed    : 9/9/2020 10:12:24 AM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA IN PENTANE_40_5_4.M (Sequence
                  Method)
Last changed    : 11/25/2021 5:03:12 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.686 BB    0.5548 7002.60303  195.05595  49.7788
   2  27.937 BB    0.6088 7064.82617  179.27194  50.2212

Totals :                  1.40674e4   374.32790


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--134.D
Sample Name: YH-17-121-EE

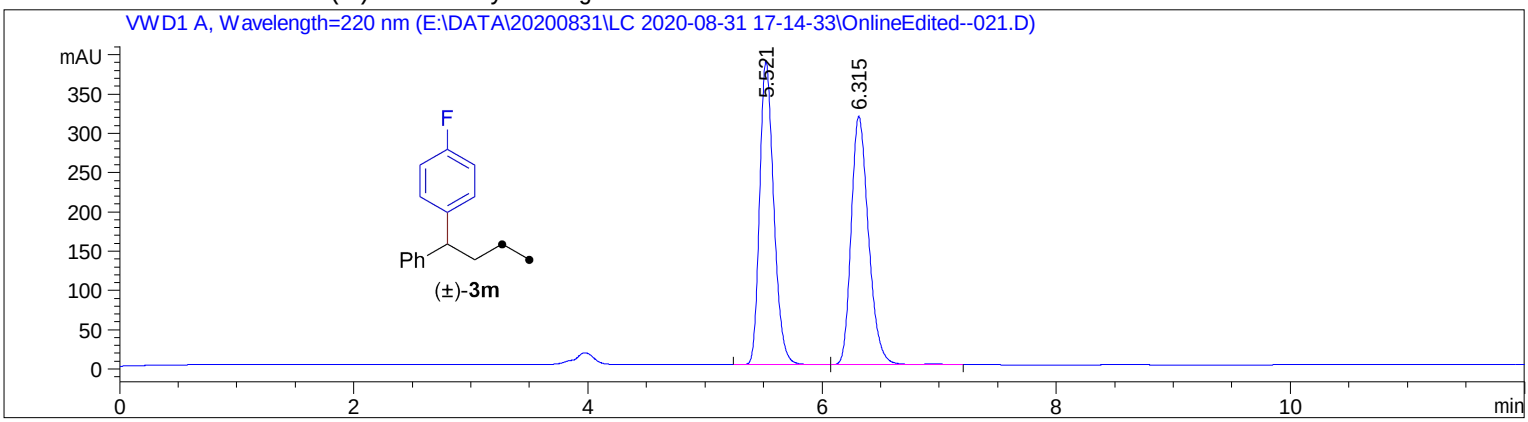
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 134
Acq. Instrument : HPLC1260                         Location :   P1-B2
Injection Date  : 9/9/2020 11:03:32 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA IN PENTANE_40_5_4.M
Last changed    : 9/9/2020 10:12:24 AM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA IN PENTANE_40_5_4.M (Sequence
                  Method)
Last changed    : 11/25/2021 5:03:48 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  25.676 VB    0.5684 8981.67285  244.61131  96.9631
   2  28.036 BB    0.5930  281.30905    7.29287   3.0369

Totals :                  9262.98190  251.90418


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-08-31 17-14-33\OnlineEdited--021.D
Sample Name: YH-17-118-RAC

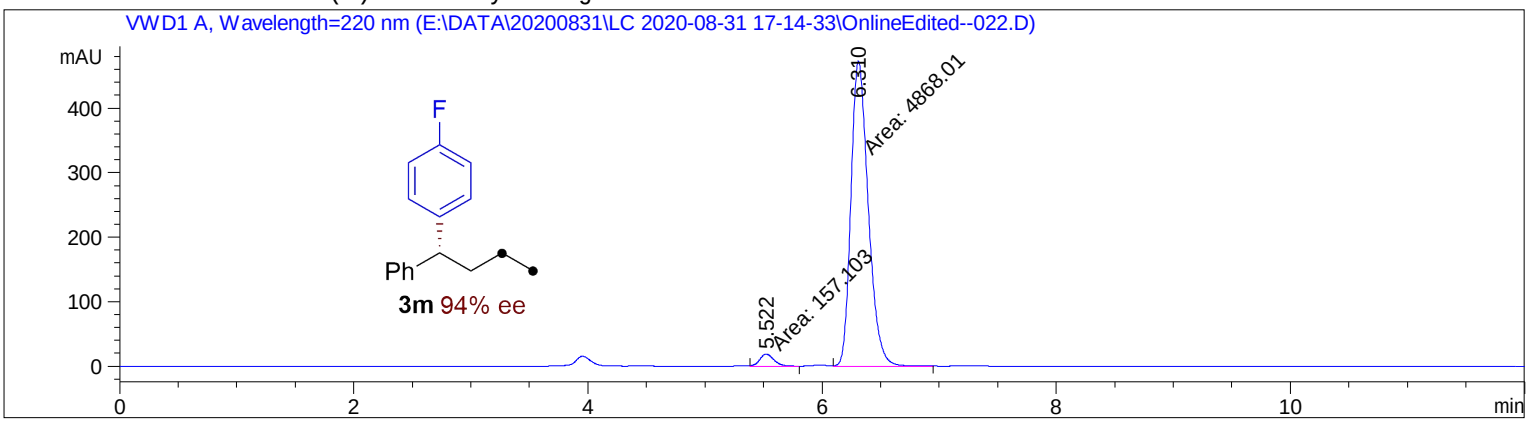
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  21
Acq. Instrument : HPLC1260                         Location :   P1-B3
Injection Date  : 9/1/2020 4:47:15 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-08-31 17-14-33\20IPA_20_0.8_1.M
Last changed    : 8/31/2020 10:07:17 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-08-31 17-14-33\20IPA_20_0.8_1.M (Sequence Method)
Last changed    : 9/1/2020 8:54:30 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   5.521 BB    0.1286 3231.76294  386.16724  49.8112
   2   6.315 BV R  0.1582 3256.26318  316.06775  50.1888

Totals :                  6488.02612  702.23499


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-08-31 17-14-33\OnlineEdited--022.D
Sample Name: YH-17-118-EE

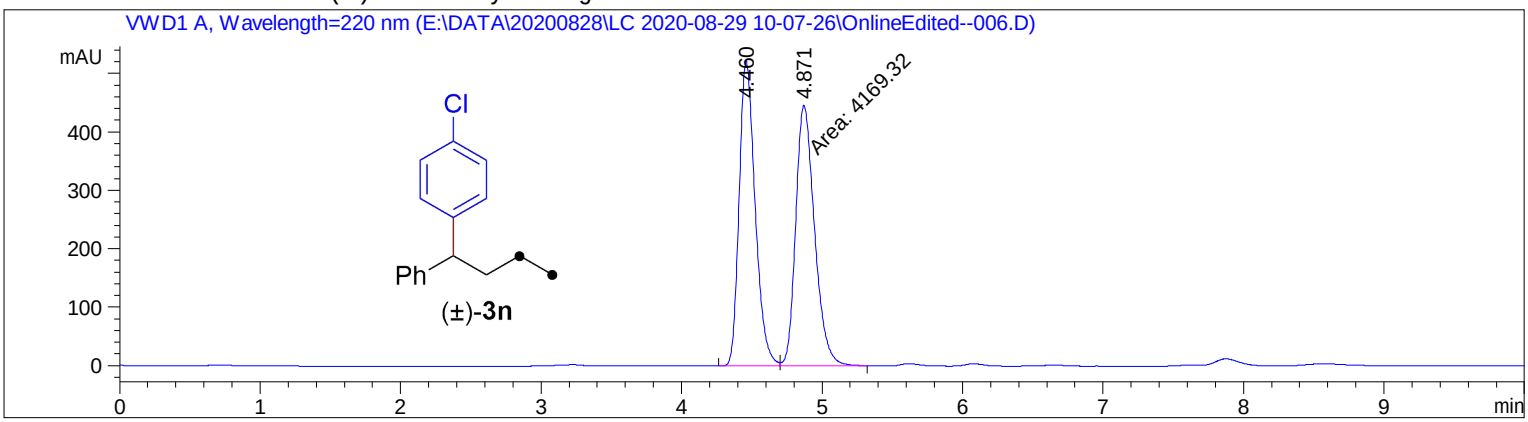
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  22
Acq. Instrument : HPLC1260                         Location :   P1-B4
Injection Date  : 9/1/2020 5:08:01 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-08-31 17-14-33\20IPA_20_0.8_1.M
Last changed    : 8/31/2020 10:07:17 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-08-31 17-14-33\20IPA_20_0.8_1.M (Sequence Method)
Last changed    : 9/1/2020 8:54:30 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   5.522 FM    0.1391  157.10300   18.82444   3.1264
   2   6.310 MF    0.1716 4868.01270  472.90283  96.8736

Totals :                   5025.11569  491.72727


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200828\LC 2020-08-29 10-07-26\OnlineEdited--006.D
Sample Name: YH-17-111-RAC

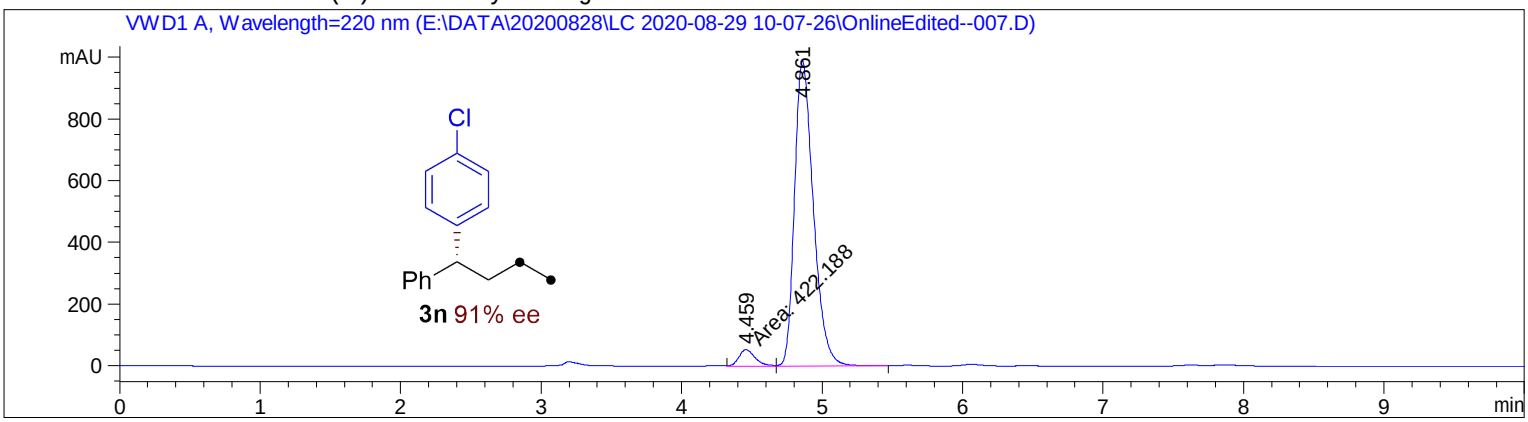
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   6
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 8/29/2020 1:38:25 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200828\LC 2020-08-29 10-07-26\5IPA_20_10_1.M
Last changed    : 8/29/2020 10:48:42 AM by SYSTEM
Analysis Method : E:\DATA\20200828\LC 2020-08-29 10-07-26\5IPA_20_10_1.M (Sequence Method)
Last changed    : 8/29/2020 3:25:50 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.460 BV    0.1215 4133.57275  521.56091  49.7847
   2   4.871 MF    0.1557 4169.31836  446.18970  50.2153

Totals :                  8302.89111  967.75061


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200828\LC 2020-08-29 10-07-26\OnlineEdited--007.D
Sample Name: YH-17-111-EE

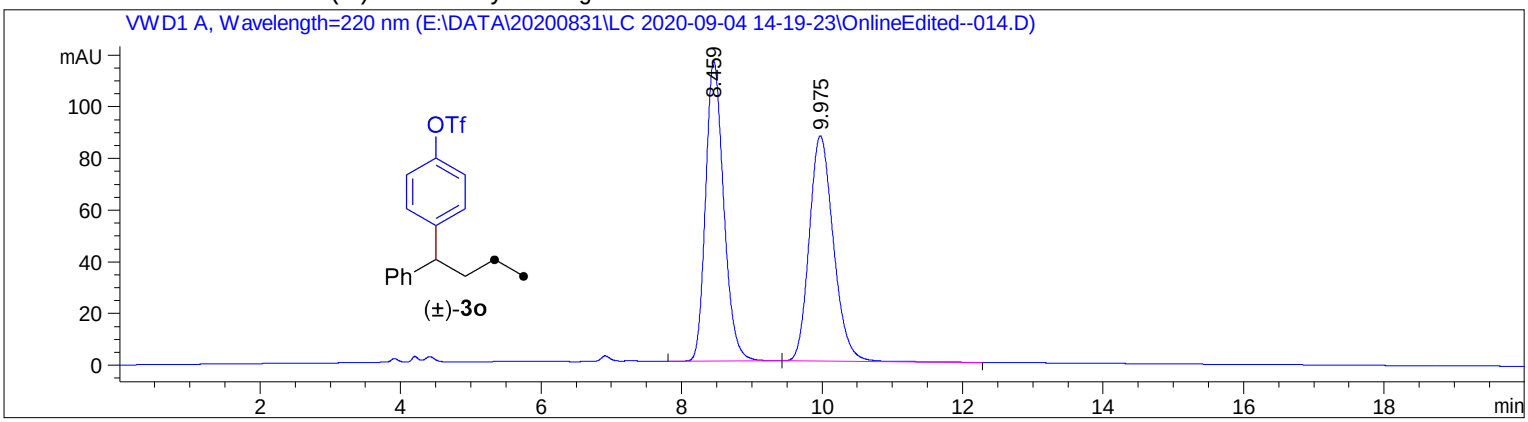
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   7
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 8/29/2020 1:59:10 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200828\LC 2020-08-29 10-07-26\5IPA_20_10_1.M
Last changed    : 8/29/2020 2:14:17 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200828\LC 2020-08-29 10-07-26\5IPA_20_10_1.M (Sequence Method)
Last changed    : 8/29/2020 3:26:45 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   4.459 FM    0.1327  422.18765   53.02592   4.3768
   2   4.861 VB    0.1428 9223.73828  988.79614  95.6232

Totals :                  9645.92593 1041.82207


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-04 14-19-23\OnlineEdited--014.D
Sample Name: YH-17-125-RAC

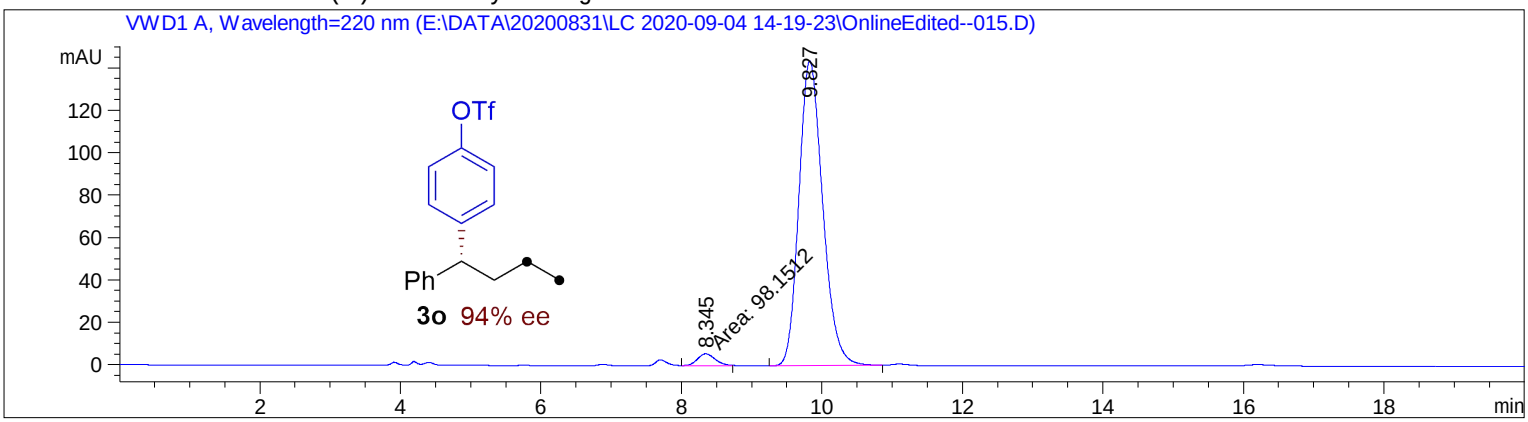
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  14
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/4/2020 6:46:37 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-04 14-19-23\1IPA_20_8_3.M
Last changed    : 9/4/2020 6:17:46 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-04 14-19-23\1IPA_20_8_3.M (Sequence Method)
Last changed    : 9/4/2020 7:31:13 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.459 BB    0.2765 2082.61841  115.99145  49.9658
   2   9.975 BB    0.3689 2085.46729   87.23469  50.0342

Totals :                  4168.08569  203.22614


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-04 14-19-23\OnlineEdited--015.D
Sample Name: YH-17-125-EE

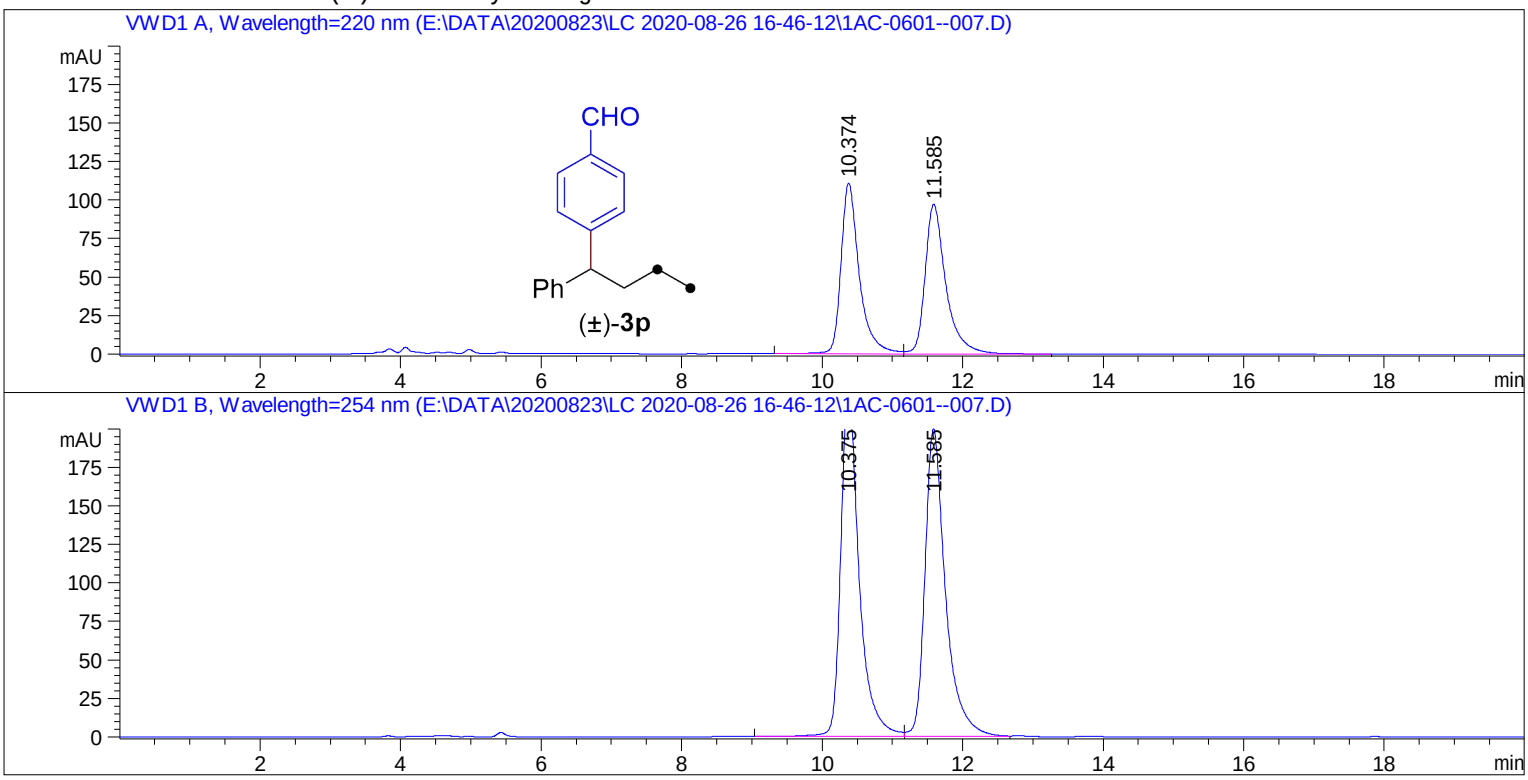
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  15
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/4/2020 7:07:23 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-04 14-19-23\1IPA_20_8_3.M
Last changed    : 9/4/2020 6:17:46 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-04 14-19-23\1IPA_20_8_3.M (Sequence Method)
Last changed    : 9/4/2020 7:31:13 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.345 MF    0.2935   98.15123    5.57303   2.8188
   2   9.827 BB    0.3639 3383.88989  143.63464  97.1812

Totals :                  3482.04112  149.20767


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\1AC-0601--007.D
Sample Name: YH-17-103-EE

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   7
Acq. Instrument : HPLC1260                          Location :   P1-A3
Injection Date  : 8/26/2020 7:22:51 PM                  Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200823\LC 2020-08-26 16-46-12\10EtOH_25_8_1.M
Last changed    : 8/26/2020 7:41:02 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200823\LC 2020-08-26 16-46-12\10EtOH_25_8_1.M (Sequence Method)
Last changed    : 8/26/2020 8:10:22 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.374 BV    0.2695 2007.94751  110.75328  50.1692
   2  11.585 VB    0.3057 1994.40405   97.07459  49.8308

Totals :                  4002.35156  207.82787
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\1AC-0601--007.D
Sample Name: YH-17-103-EE

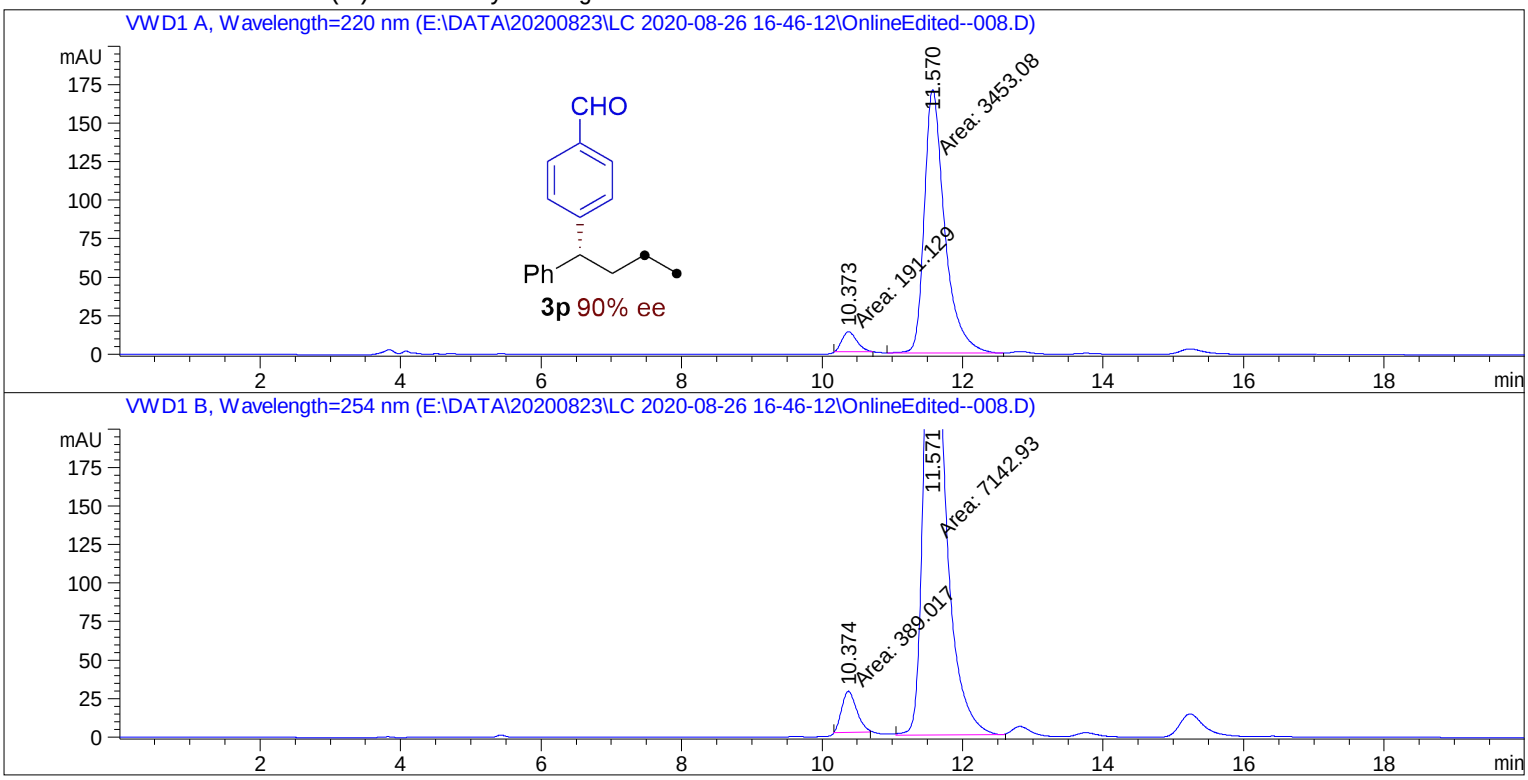
Signal 2: VWD1 B, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.375	BV	0.2672	4089.62842	228.06958	50.3680
2	11.585	VB	0.3019	4029.86670	199.26624	49.6320
Totals :				8119.49512	427.33582	

*** End of Report ***

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\OnlineEdited--008.D
Sample Name: YH-17-103-EE-EE

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   8
Acq. Instrument : HPLC1260                          Location :   P1-A4
Injection Date  : 8/26/2020 7:43:38 PM                  Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200823\LC 2020-08-26 16-46-12\10EtOH_25_8_1.M
Last changed    : 8/26/2020 7:41:02 PM by SYSTEM
Analysis Method : E:\DATA\20200823\LC 2020-08-26 16-46-12\10EtOH_25_8_1.M (Sequence Method)
Last changed    : 8/26/2020 8:10:22 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.373 MM    0.2455  191.12875   12.97701   5.2447
   2  11.570 MM    0.3368 3453.07617  170.87949  94.7553

Totals :                  3644.20493  183.85650
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\OnlineEdited--008.D
Sample Name: YH-17-103-EE-EE

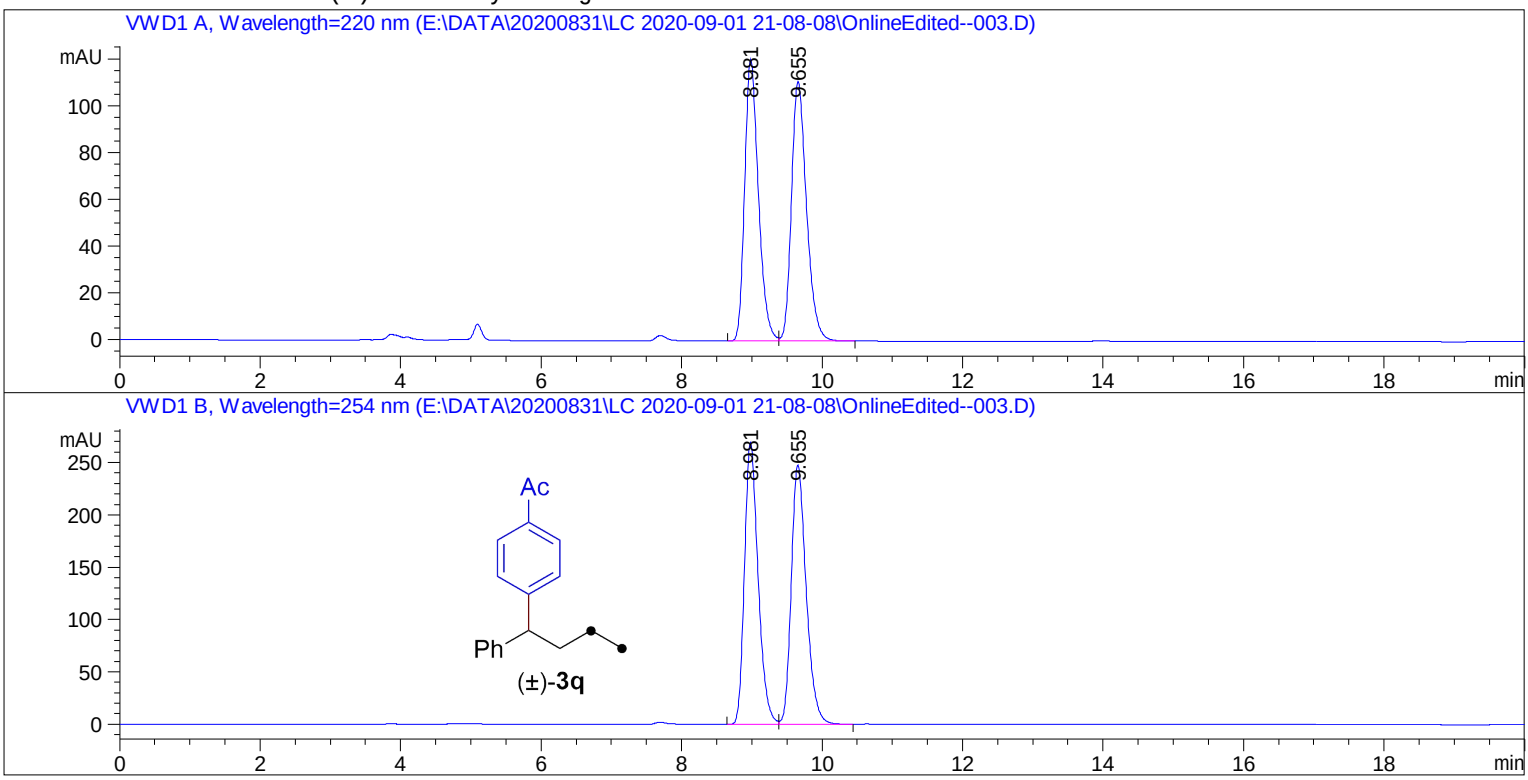
Signal 2: VWD1 B, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.374	MM	0.2447	389.01724	26.49381	5.1649
2	11.571	MM	0.3337	7142.92676	356.73471	94.8351
Totals :				7531.94400	383.22852	

*** End of Report ***

Data File E:\DATA\20200831\LC 2020-09-01 21-08-08\OnlineEdited--003.D
Sample Name: YH-17-123-RAC

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   3
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/1/2020 9:51:22 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-01 21-08-08\10EtOH_25_8_1.M
Last changed    : 9/1/2020 9:22:16 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-01 21-08-08\10EtOH_25_8_1.M (Sequence Method)
Last changed    : 9/1/2020 10:37:13 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.981 BV    0.2086 1632.90027  120.14957  49.8140
   2   9.655 VB    0.2270 1645.09265  110.95697  50.1860

Totals :                  3277.99292  231.10654
```

Data File E:\DATA\20200831\LC 2020-09-01 21-08-08\OnlineEdited--003.D
Sample Name: YH-17-123-RAC

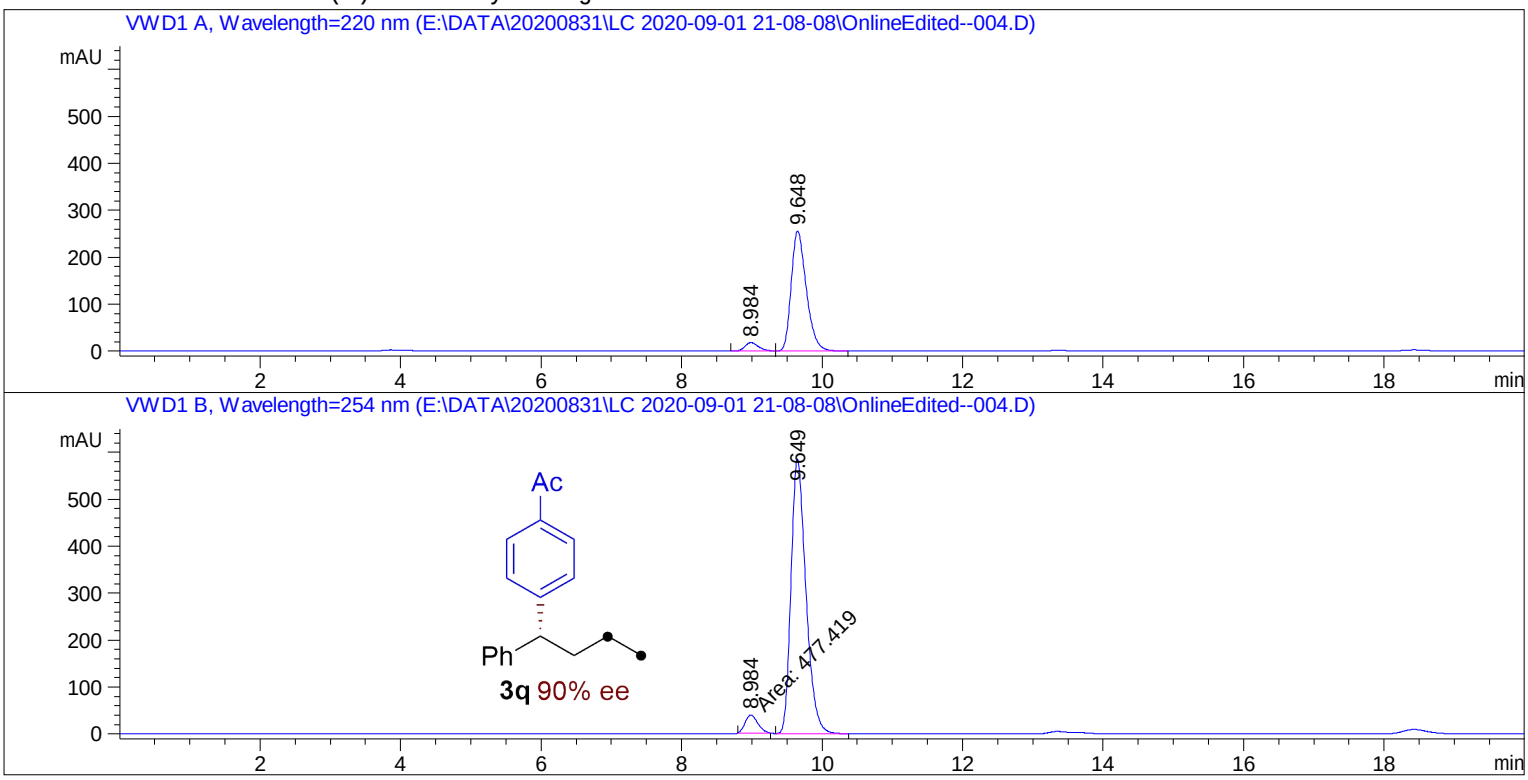
Signal 2: VWD1 B, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.981	BV	0.2077	3637.07153	269.06482	49.8745
2	9.655	VB	0.2260	3655.37085	247.92865	50.1255
Totals :				7292.44238	516.99347	

*** End of Report ***

Data File E:\DATA\20200831\LC 2020-09-01 21-08-08\OnlineEdited--004.D
Sample Name: YH-17-123-EE

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   4
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/1/2020 10:17:09 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.800 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-01 21-08-08\10EtOH_25_8_1.M
Last changed    : 9/1/2020 10:36:44 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200831\LC 2020-09-01 21-08-08\10EtOH_25_8_1.M (Sequence Method)
Last changed    : 9/1/2020 10:40:37 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.984 BV    0.2057  243.22253   18.21900   6.0116
   2   9.648 VB    0.2278 3802.66626  255.24548  93.9884

Totals :                   4045.88879  273.46448
```

Data File E:\DATA\20200831\LC 2020-09-01 21-08-08\OnlineEdited--004.D
Sample Name: YH-17-123-EE

Signal 2: VWD1 B, Wavelength=254 nm

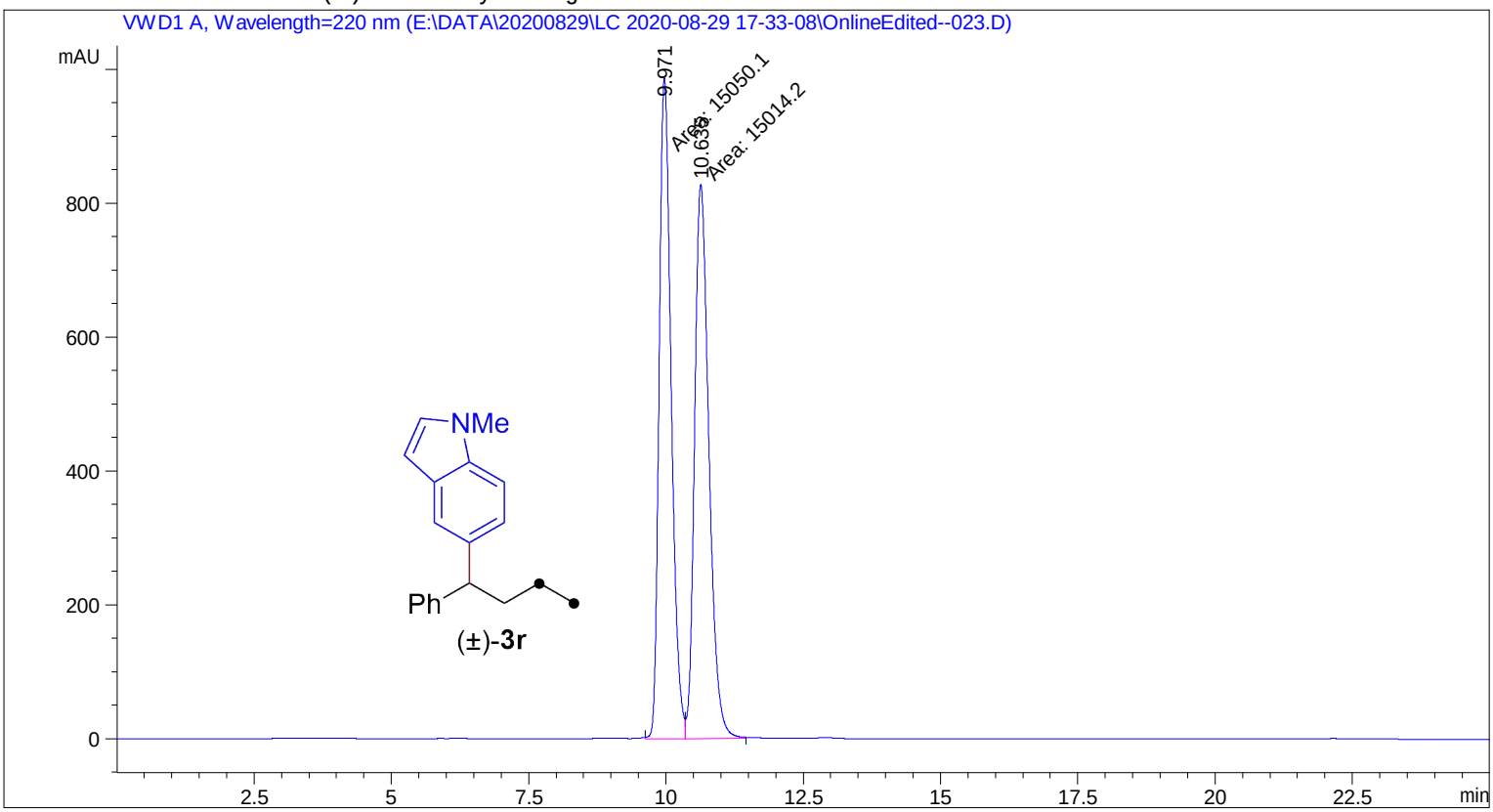
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.984	MM	0.2075	477.41904	38.34625	5.2539
2	9.649	VB	0.2259	8609.58887	584.47095	94.7461
Totals :				9087.00790	622.81720	

==========

*** End of Report ***

Data File E:\DATA\20200829\LC 2020-08-29 17-33-08\OnlineEdited--023.D
Sample Name: YH-17-113-RAC

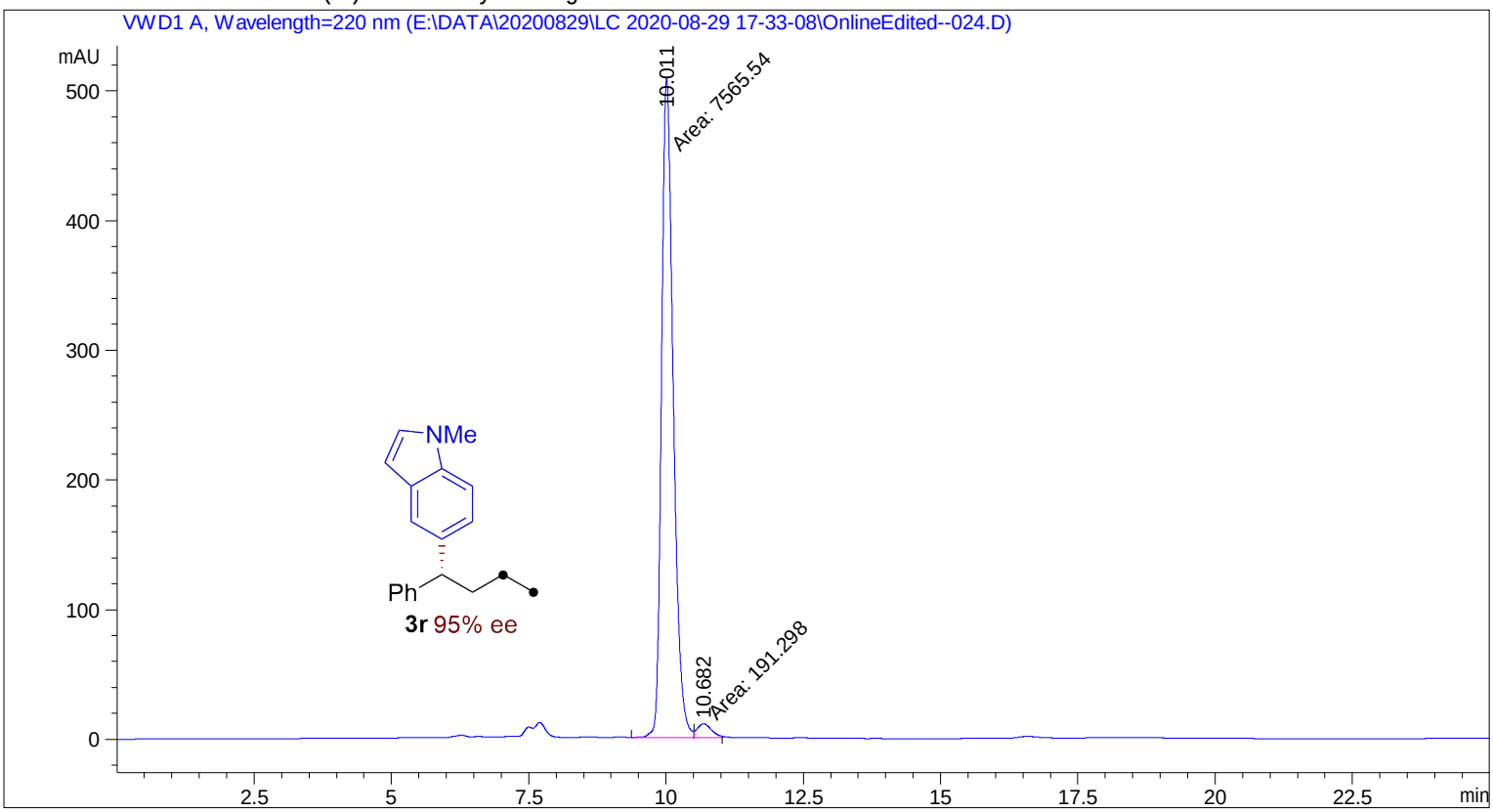
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  23
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 8/30/2020 4:27:17 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.200 µl
Method          : E:\DATA\20200829\LC 2020-08-29 17-33-08\1EtOH_25_5_2.M (Sequence Method)
Last changed    : 8/29/2020 9:51:08 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.971 FM    0.2544 1.50501e4   986.08356  50.0596
   2  10.635 MF    0.3023 1.50142e4   827.73993  49.9404

Totals :                  3.00643e4  1813.82349


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200829\LC 2020-08-29 17-33-08\OnlineEdited--024.D
Sample Name: YH-17-113-EE

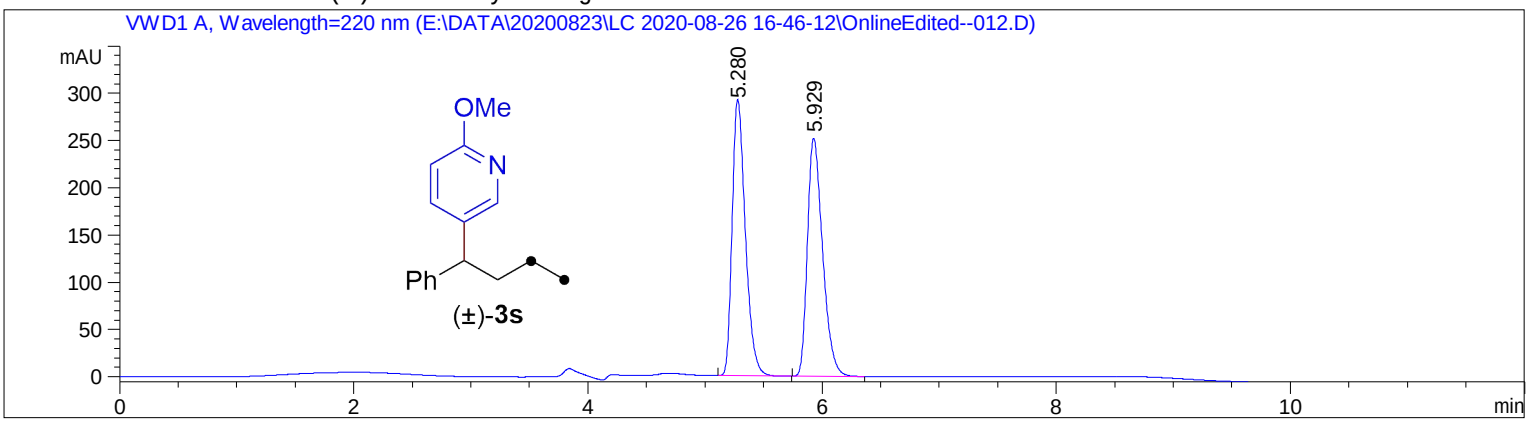
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  24
Acq. Instrument : HPLC1260                       Location :   P1-A4
Injection Date  : 8/30/2020 4:53:01 AM                Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Method          : E:\DATA\20200829\LC 2020-08-29 17-33-08\1EtOH_25_5_2.M (Sequence Method)
Last changed    : 8/29/2020 9:51:08 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.011 MF    0.2481 7565.53662  508.18222  97.5338
   2  10.682 MF    0.2979  191.29788   10.70320   2.4662

Totals :                  7756.83450  518.88542


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\OnlineEdited--012.D
Sample Name: YH-17-104-RAC

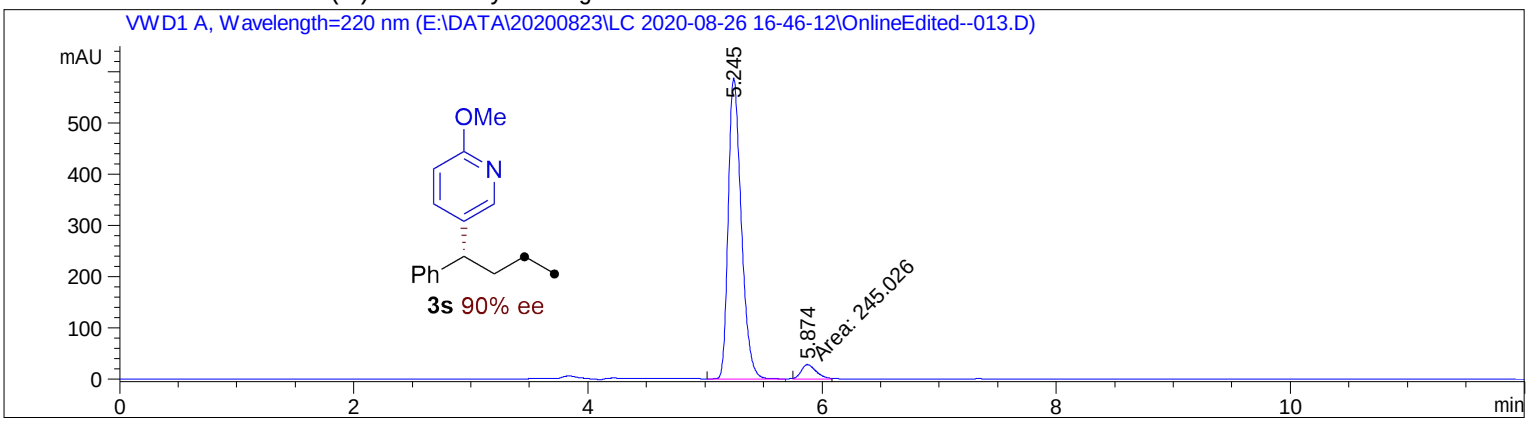
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  12
Acq. Instrument : HPLC1260                         Location :   P1-A5
Injection Date  : 8/26/2020 9:09:08 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200823\LC 2020-08-26 16-46-12\5IPA_20_8_2.M
Last changed    : 8/26/2020 8:31:07 PM by SYSTEM
Analysis Method : E:\DATA\20200823\LC 2020-08-26 16-46-12\5IPA_20_8_2.M (Sequence Method)
Last changed    : 8/26/2020 9:46:16 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   5.280 BB    0.1202 2286.58057  292.43408  50.1367
   2   5.929 BB    0.1383 2274.11108  252.02625  49.8633

Totals :                  4560.69165  544.46033


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200823\LC 2020-08-26 16-46-12\OnlineEdited--013.D
Sample Name: YH-17-104-EE

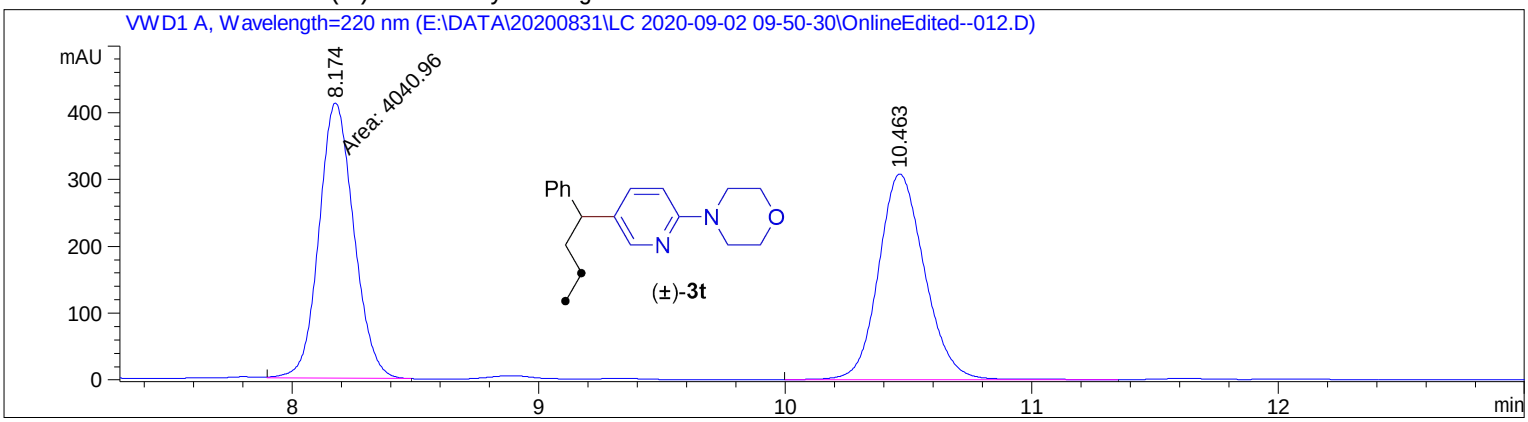
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  13
Acq. Instrument : HPLC1260                       Location :   P1-A6
Injection Date  : 8/26/2020 9:29:52 PM               Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200823\LC 2020-08-26 16-46-12\5IPA_20_8_2.M
Last changed    : 8/26/2020 9:44:35 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200823\LC 2020-08-26 16-46-12\5IPA_20_8_2.M (Sequence Method)
Last changed    : 8/26/2020 9:46:42 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   5.245 BV    0.1190 4532.34863  587.33282  94.8711
   2   5.874 FM    0.1473  245.02647   27.72322   5.1289

Totals :                  4777.37511  615.05604


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-02 09-50-30\OnlineEdited--012.D
Sample Name: YH-17-120-RAC

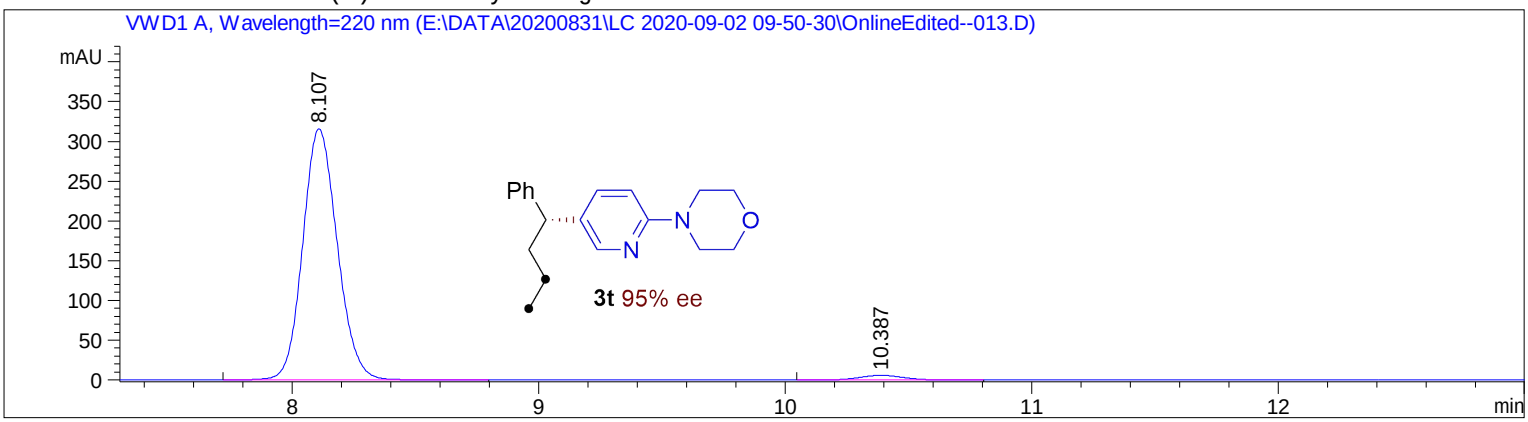
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  12
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/2/2020 5:02:46 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-02 09-50-30\2IPA_45_10_2.M
Last changed    : 9/2/2020 5:16:28 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200831\LC 2020-09-02 09-50-30\2IPA_45_10_2.M (Sequence Method)
Last changed    : 9/2/2020 5:51:52 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.174 MM    0.1635 4040.95679  411.87637  50.4548
   2  10.463 BB    0.1996 3968.10010  307.35077  49.5452

Totals :                  8009.05688  719.22714


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200831\LC 2020-09-02 09-50-30\OnlineEdited--013.D
Sample Name: YH-17-120-EE

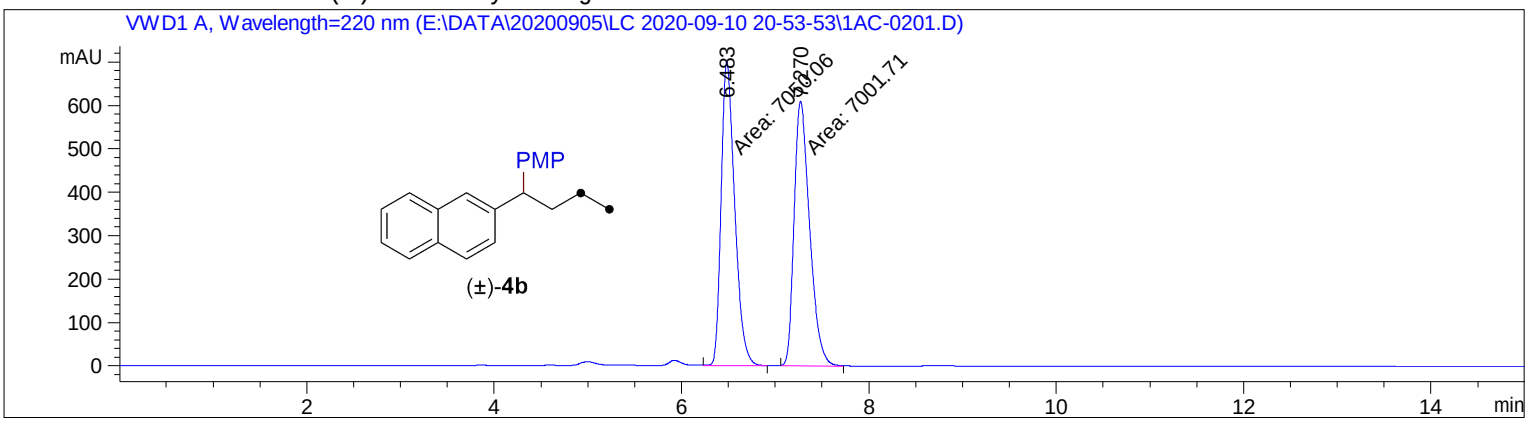
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  13
Acq. Instrument : HPLC1260                         Location :   P1-A5
Injection Date  : 9/2/2020 5:23:33 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200831\LC 2020-09-02 09-50-30\2IPA_45_10_2.M
Last changed    : 9/2/2020 5:16:28 PM by SYSTEM
Analysis Method : E:\DATA\20200831\LC 2020-09-02 09-50-30\2IPA_45_10_2.M (Sequence Method)
Last changed    : 9/2/2020 5:53:00 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.107 BB    0.1505 3073.72876  315.87805  97.6446
   2  10.387 BB    0.1928   74.14445    5.97577   2.3554

Totals :                  3147.87321  321.85382


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-10 20-53-53\1AC-0201.D
Sample Name: YH-17-157-RAC

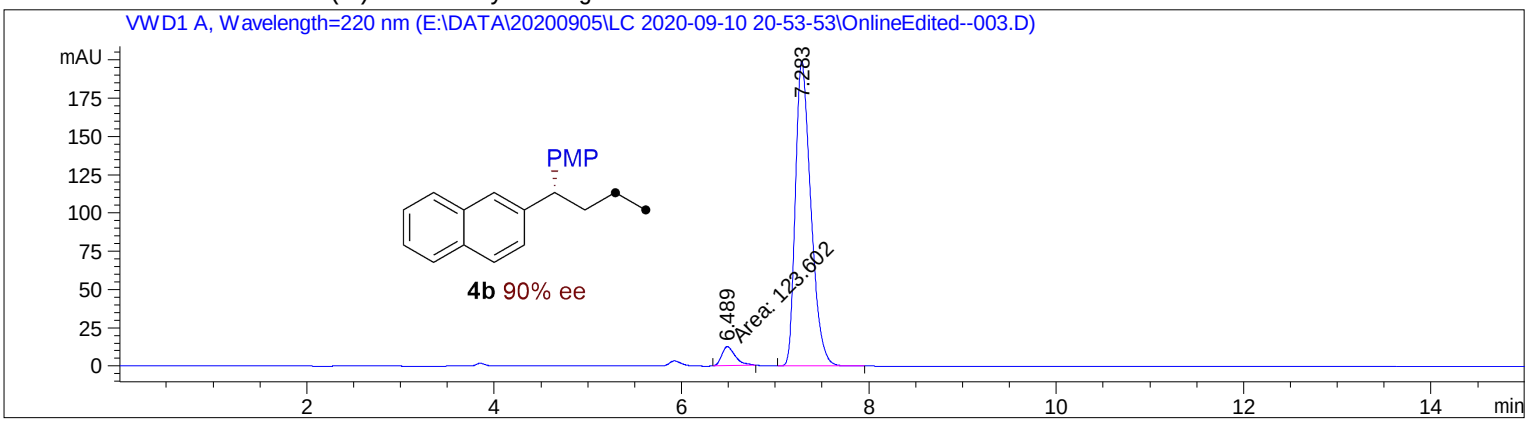
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   2
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/10/2020 9:16:15 PM                 Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.200 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-10 20-53-53\5IPA_20_8_3.M
Last changed    : 9/10/2020 9:28:14 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-10 20-53-53\5IPA_20_8_3.M (Sequence Method)
Last changed    : 9/10/2020 9:48:28 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   6.483 FM    0.1674 7050.06348  701.99628  50.1720
   2   7.270 MM    0.1916 7001.71338  609.16565  49.8280

Totals :                  1.40518e4  1311.16193


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-10 20-53-53\OnlineEdited--003.D
Sample Name: YH-17-157-EE

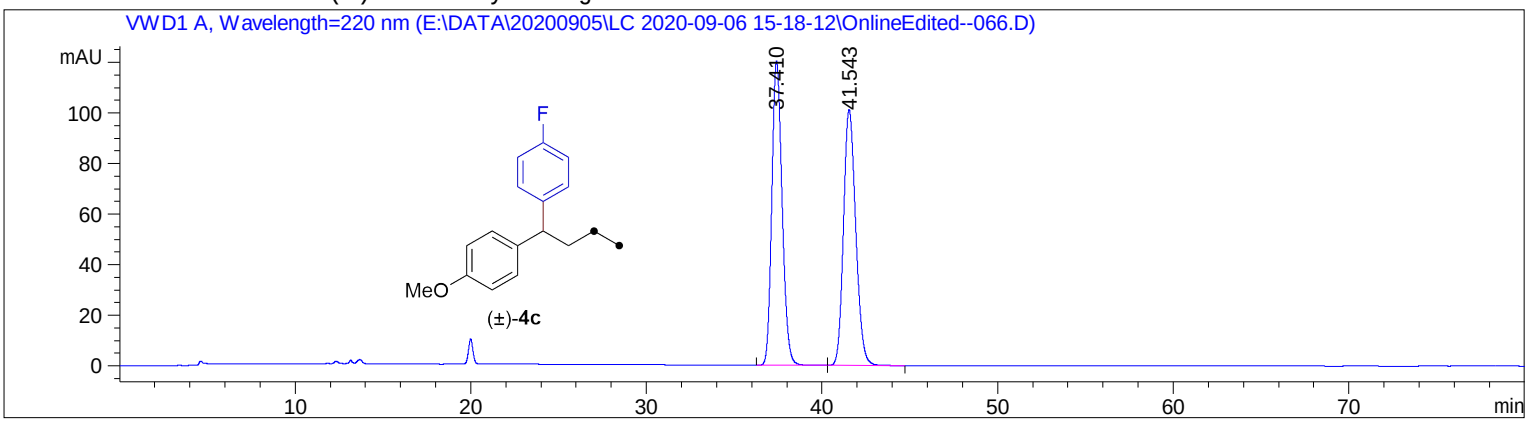
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   3
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/10/2020 9:31:58 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.100 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-10 20-53-53\5IPA_20_8_3.M
Last changed    : 9/10/2020 9:28:14 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-10 20-53-53\5IPA_20_8_3.M (Sequence Method)
Last changed    : 9/10/2020 9:48:28 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   6.489 MM    0.1657  123.60246   12.43593   5.1238
   2   7.283 BB    0.1751 2288.71460  199.18835  94.8762

Totals :                  2412.31705  211.62428


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--066.D
Sample Name: YH-17-131-RAC

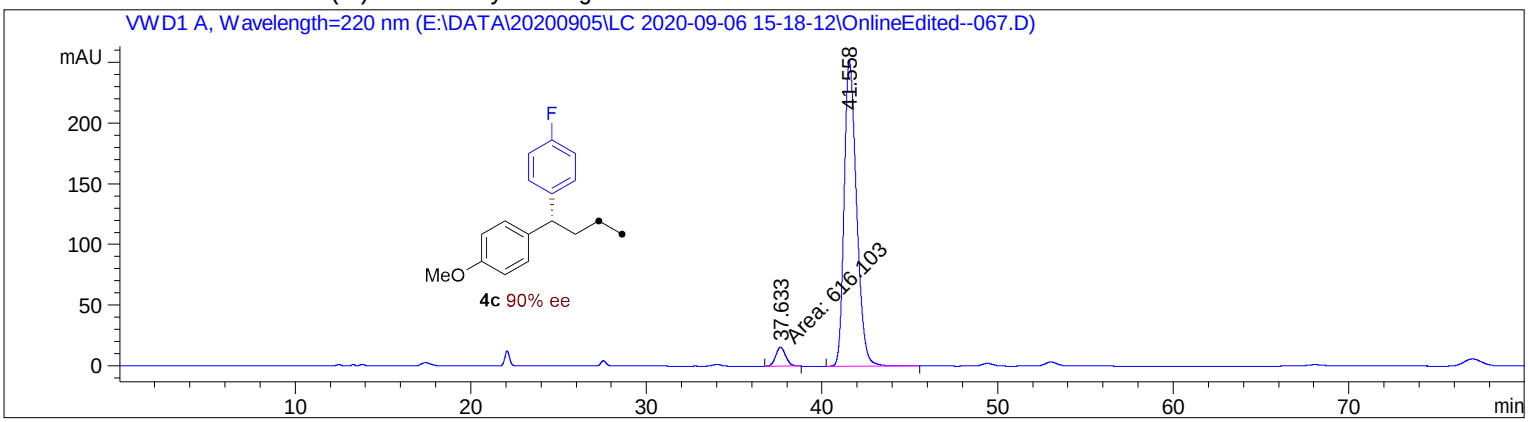
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  66
Acq. Instrument : HPLC1260                         Location :   P1-A5
Injection Date  : 9/8/2020 2:17:15 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M
Last changed    : 9/7/2020 10:38:58 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M (Sequence Method)
Last changed    : 9/8/2020 11:29:32 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  37.410 BB    0.6312 4908.74658  120.27238  50.0023
   2  41.543 BB    0.7496 4908.30127  101.24754  49.9977

Totals :                  9817.04785  221.51991


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--067.D
Sample Name: YH-17-131-EE

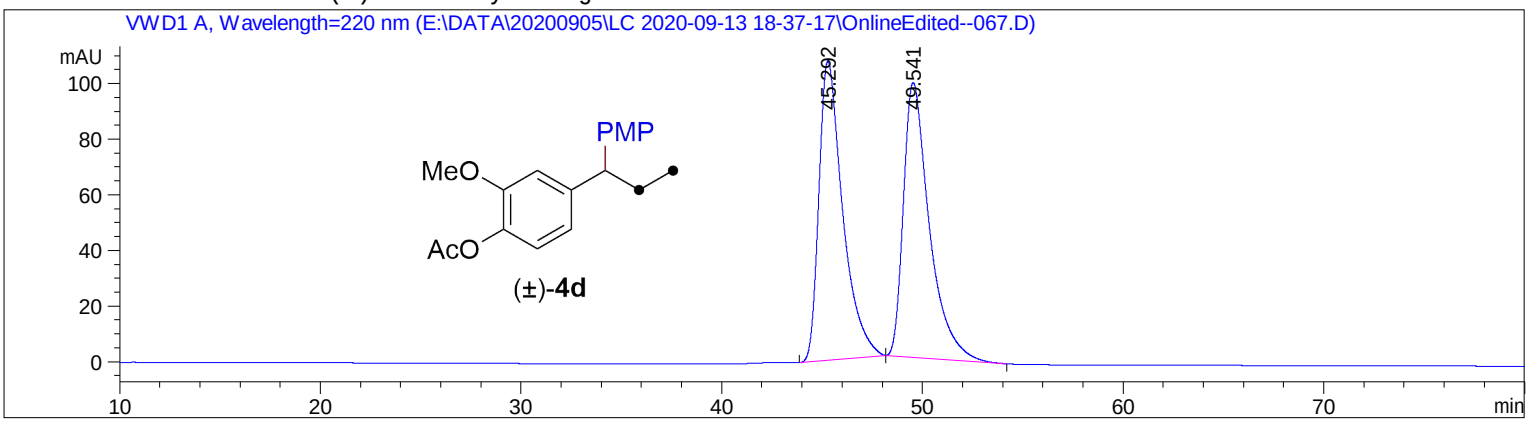
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  67
Acq. Instrument : HPLC1260                         Location :   P1-A6
Injection Date  : 9/8/2020 3:38:00 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M
Last changed    : 9/7/2020 10:38:58 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M (Sequence Method)
Last changed    : 9/8/2020 11:29:32 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  37.633 MF    0.6604  616.10272   15.54854   4.7461
   2  41.558 BB    0.7574 1.23651e4   251.14645  95.2539

Totals :                  1.29812e4   266.69500


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--067.D
Sample Name: YH-17-162-RAC

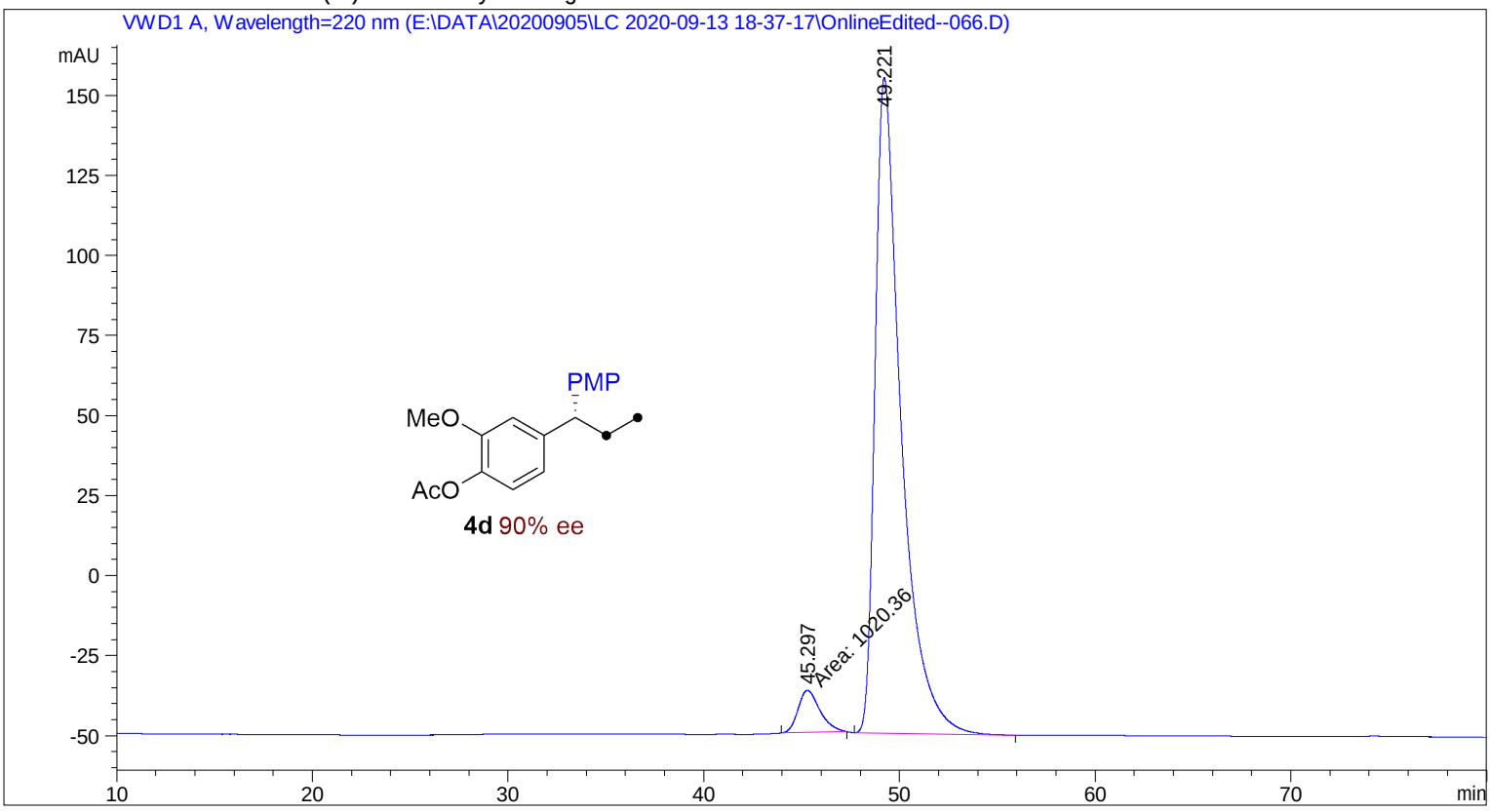
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  67
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/15/2020 12:15:47 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\5EtOH_50_5_1.M
Last changed    : 9/14/2020 11:15:32 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\5EtOH_50_5_1.M (Sequence Method)
Last changed    : 9/15/2020 2:54:21 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  45.292 BB    1.2246 8861.74219  107.51409  49.9567
   2  49.541 BB    1.3363 8877.11035   98.79295  50.0433

Totals :                  1.77389e4   206.30704


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--066.D
Sample Name: YH-17-162-EE

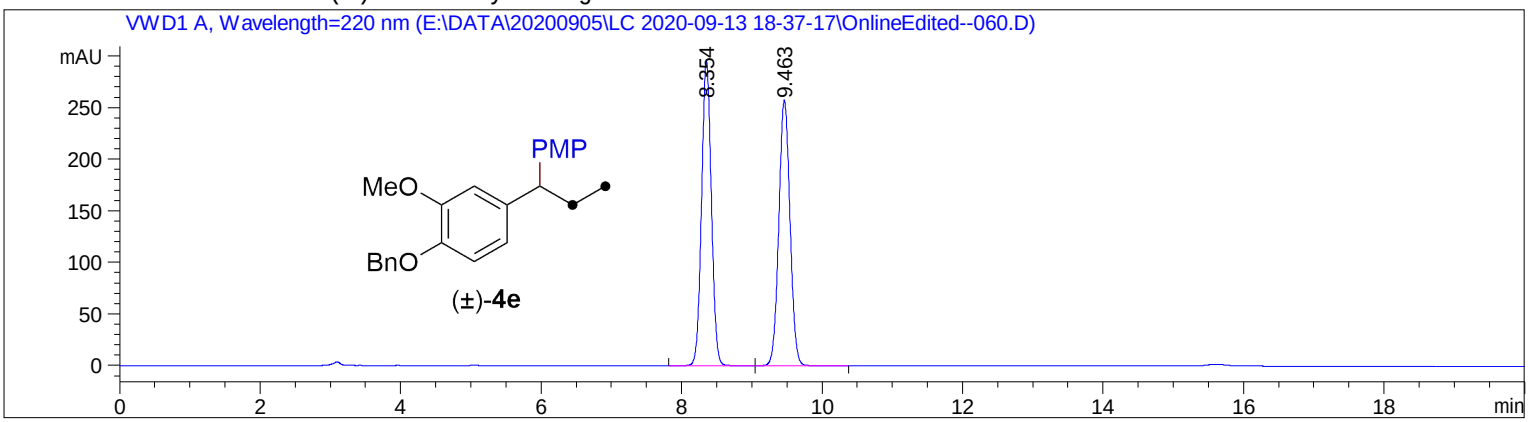
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  66
Acq. Instrument : HPLC1260                         Location :   P1-A5
Injection Date  : 9/14/2020 10:55:01 PM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\5EtOH_50_5_1.M
Last changed    : 9/14/2020 11:15:32 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\5EtOH_50_5_1.M (Sequence Method)
Last changed    : 9/15/2020 2:53:28 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  45.297 MM    1.2879 1020.36469   13.20450   5.1082
   2  49.221 BB    1.3588 1.89546e4   204.78865  94.8918

Totals :                  1.99750e4   217.99315
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--060.D
Sample Name: YH-17-158-AD

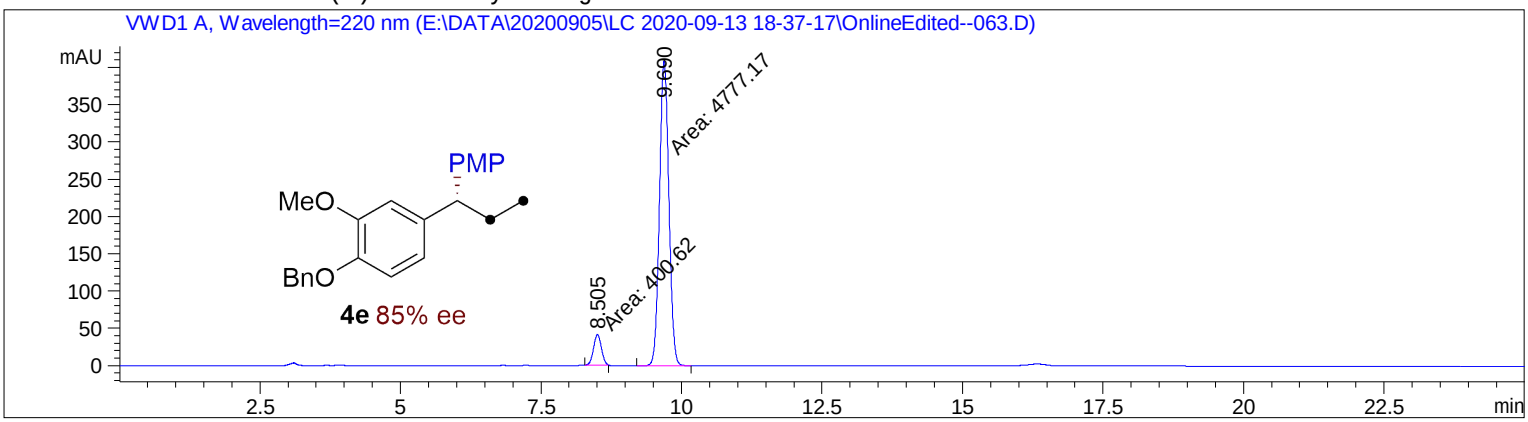
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  60
Acq. Instrument : HPLC1260                         Location :   P1-B3
Injection Date  : 9/14/2020 7:30:26 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M
Last changed    : 9/13/2020 8:50:01 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M (Sequence Method)
Last changed    : 9/14/2020 8:36:44 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.354 BB    0.1500 2859.24878  295.21860  50.0154
   2   9.463 BB    0.1724 2857.48560  257.59555  49.9846

Totals :                  5716.73438  552.81415


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--063.D
Sample Name: YH-17-158-EE

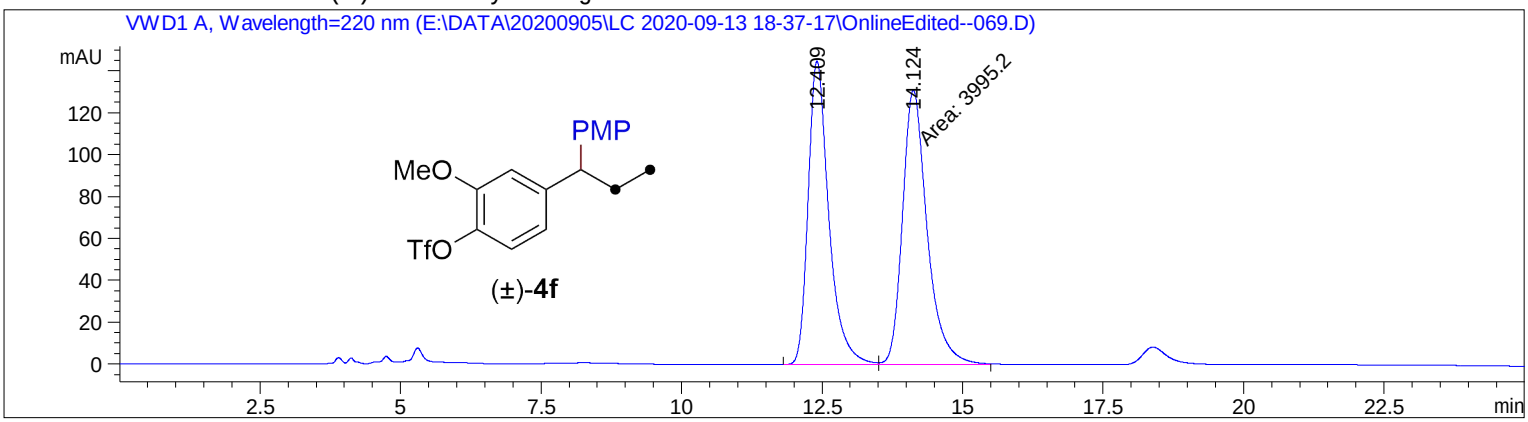
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  63
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/14/2020 8:47:44 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M
Last changed    : 9/13/2020 8:50:01 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M (Sequence Method)
Last changed    : 9/14/2020 9:19:46 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.505 MM    0.1624  400.61996   41.11270   7.7373
   2   9.690 MF    0.1947 4777.16895  408.85339  92.2627

Totals :                  5177.78891  449.96609


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--069.D
Sample Name: YH-17-163-RAC

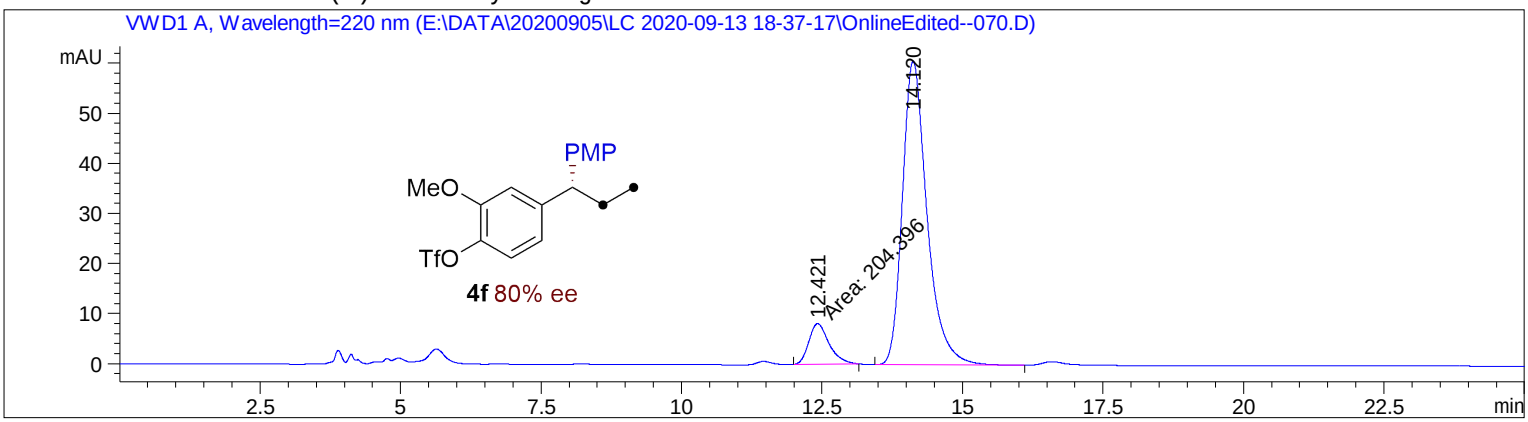
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  69
Acq. Instrument : HPLC1260                         Location :   P1-A6
Injection Date  : 9/15/2020 2:02:19 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10EtOH_25_8_1.M
Last changed    : 9/14/2020 8:28:42 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10EtOH_25_8_1.M (Sequence Method)
Last changed    : 9/15/2020 2:57:52 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.409 BV    0.3871 3712.69434  144.81770  48.1674
   2  14.124 MF    0.5084 3995.20142  130.98309  51.8326

Totals :                  7707.89575  275.80080


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--070.D
Sample Name: YH-17-163-EE

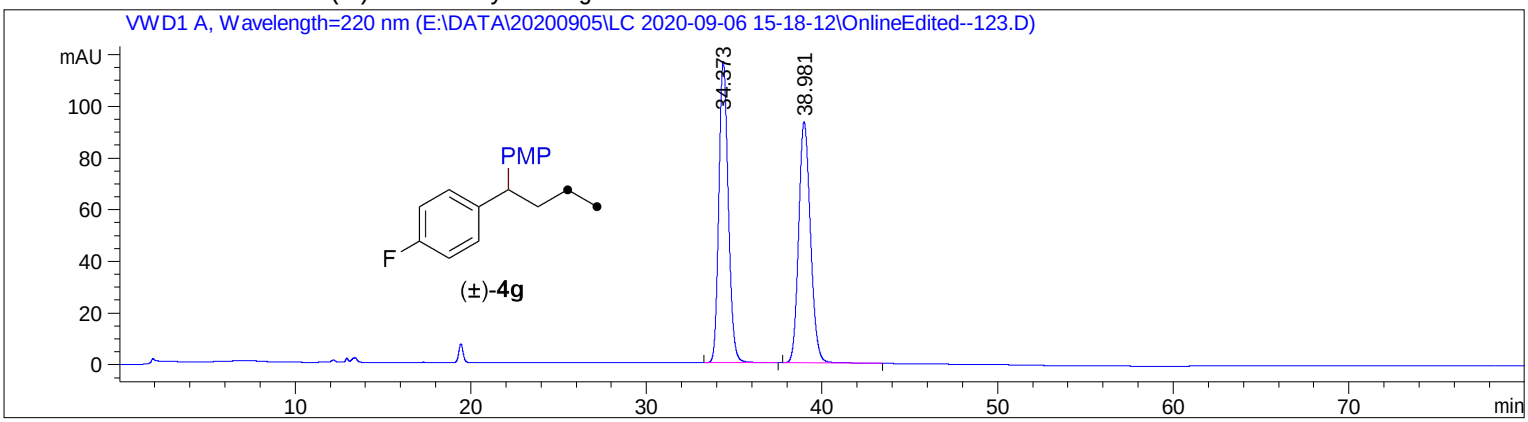
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  70
Acq. Instrument : HPLC1260                         Location :   P1-A7
Injection Date  : 9/15/2020 2:28:04 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10EtOH_25_8_1.M
Last changed    : 9/14/2020 8:28:42 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10EtOH_25_8_1.M (Sequence Method)
Last changed    : 9/15/2020 2:57:52 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.421 MM    0.4185  204.39621    8.14016   9.9366
   2  14.120 BB    0.4624 1852.61621   60.63935  90.0634

Totals :                  2057.01242   68.77951


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--123.D
Sample Name: YH-17-139-RAC

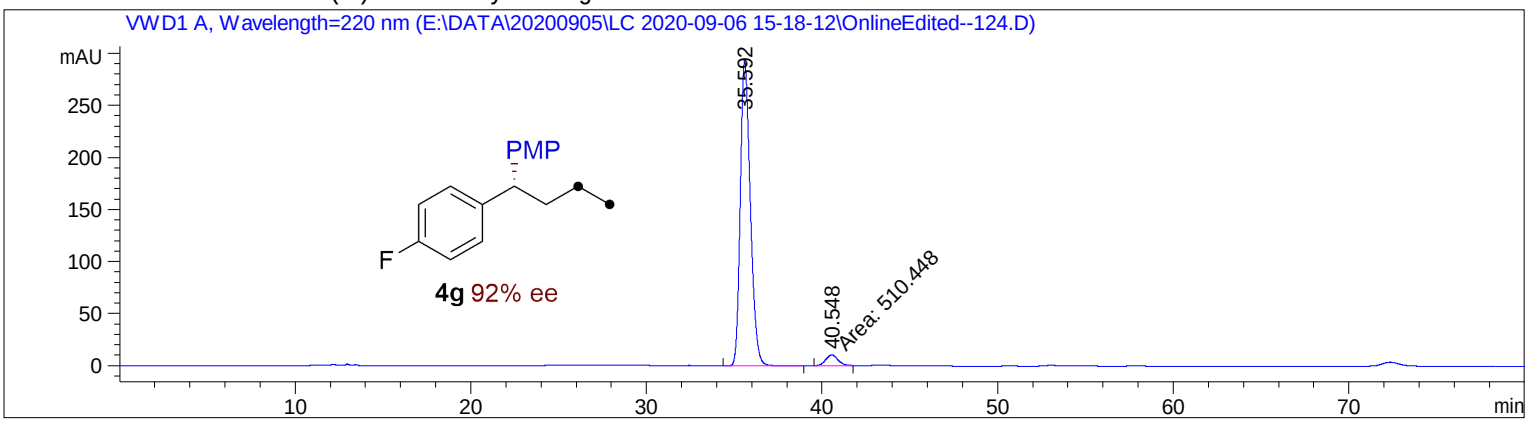
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 123
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/9/2020 3:00:51 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M
Last changed    : 9/7/2020 10:38:58 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M (Sequence Method)
Last changed    : 9/9/2020 9:20:26 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  34.373 BB    0.5767 4356.69092  116.66521  49.9836
   2  38.981 BB    0.7241 4359.55127   93.31073  50.0164

Totals :                  8716.24219  209.97594


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--124.D
Sample Name: YH-17-139-EE

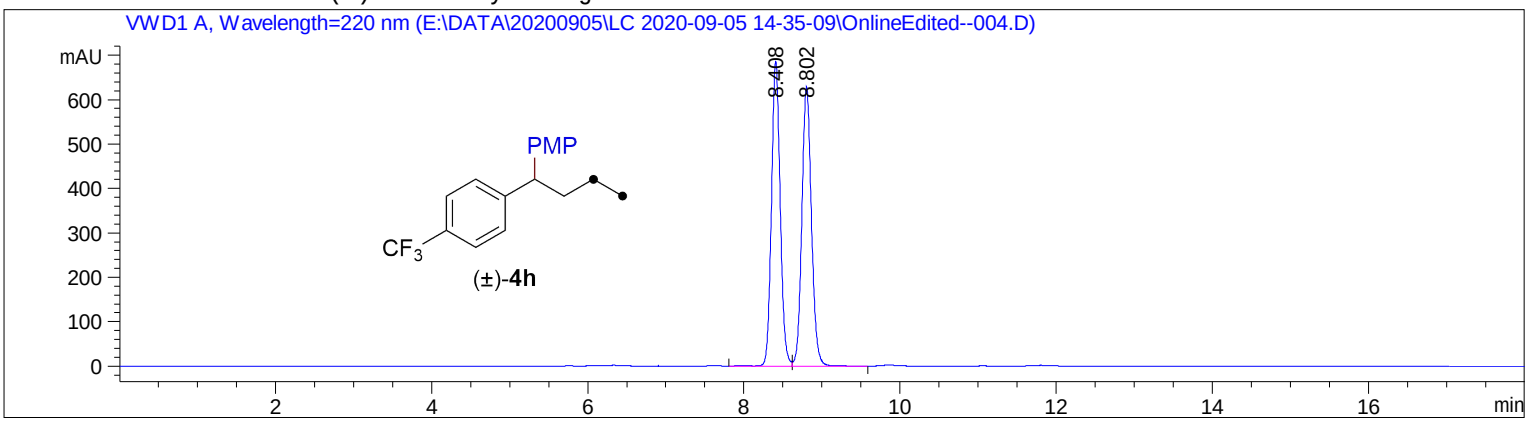
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 124
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/9/2020 4:21:36 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M
Last changed    : 9/7/2020 10:38:58 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_80_5_3.M (Sequence Method)
Last changed    : 9/9/2020 9:20:26 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  35.592 BB    0.6119 1.16652e4   292.72021  95.8076
   2  40.548 MF    0.8214  510.44781   10.35777   4.1924

Totals :                  1.21757e4   303.07798


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-05 14-35-09\OnlineEdited--004.D
Sample Name: YH-17-130-RAC

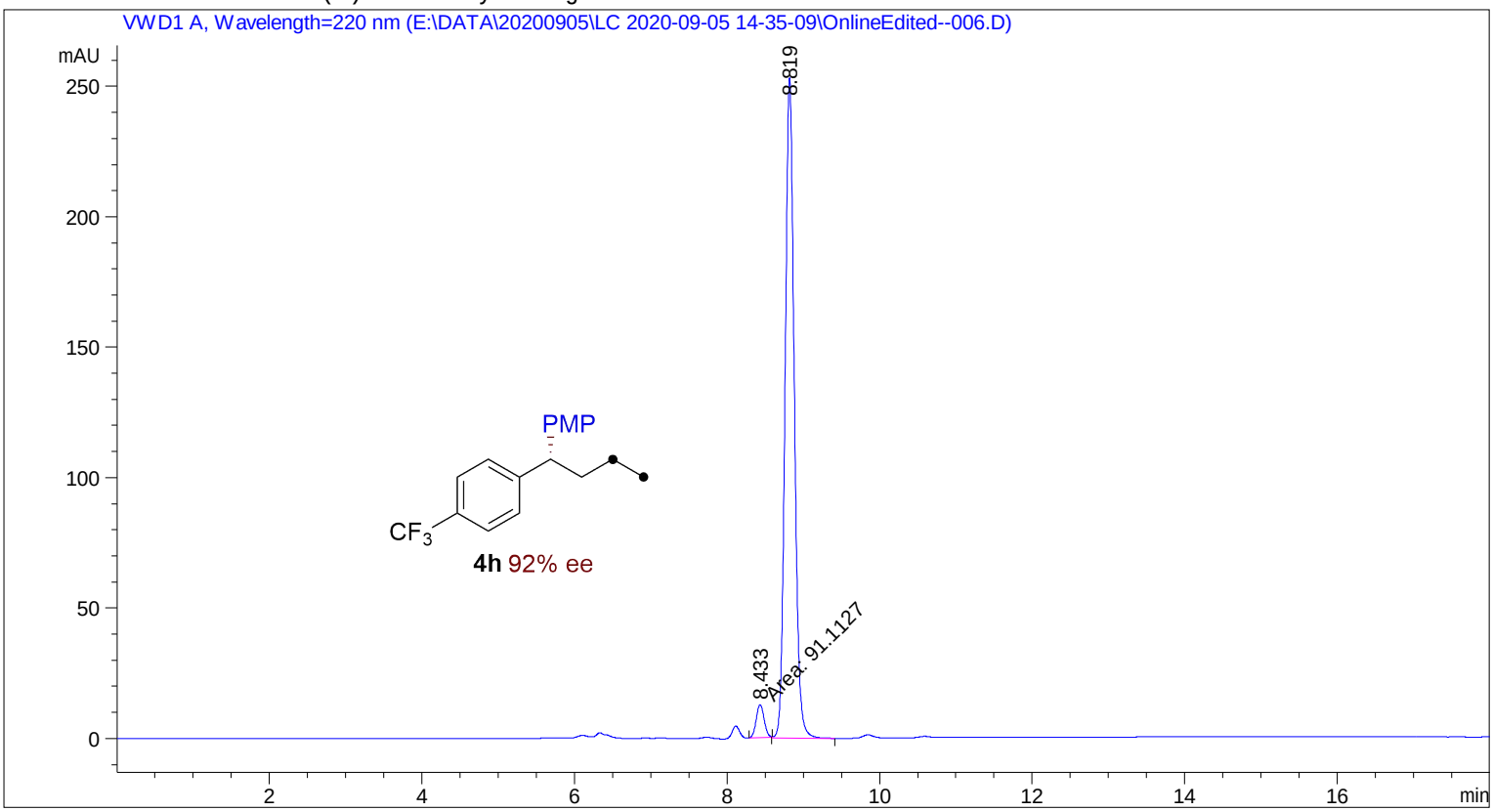
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   4
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/5/2020 3:34:37 PM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-05 14-35-09\1IPA_20_5_2.M
Last changed    : 9/5/2020 3:46:58 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-05 14-35-09\1IPA_20_5_2.M (Sequence Method)
Last changed    : 9/5/2020 4:25:03 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.408 VV R  0.1196 5336.57178  686.96912  49.8828
   2   8.802 VB    0.1314 5361.65088  629.10931  50.1172

Totals :                  1.06982e4  1316.07843


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-05 14-35-09\OnlineEdited--006.D
Sample Name: YH-17-130-EE2

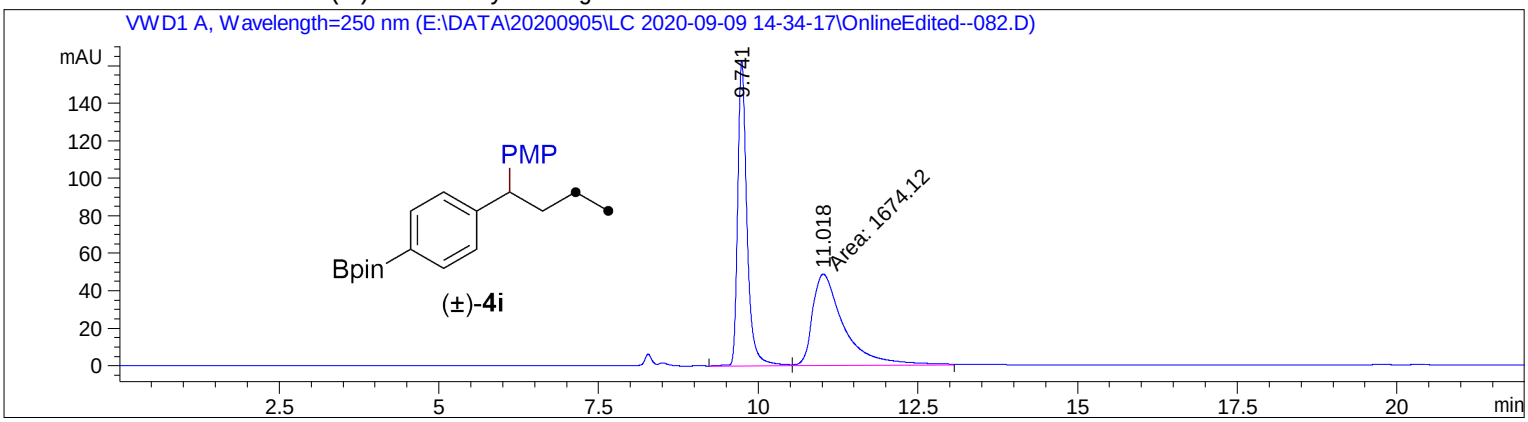
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   6
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/5/2020 4:12:07 PM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.600 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-05 14-35-09\1IPA_20_5_2.M
Last changed    : 9/5/2020 3:46:58 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-05 14-35-09\1IPA_20_5_2.M (Sequence Method)
Last changed    : 9/5/2020 3:52:45 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.433 MM    0.1195   91.11269   12.71069   4.1149
   2   8.819 VB    0.1299 2123.07544  253.10728  95.8851

Totals :                  2214.18813  265.81798


==========================================================================
```

Data File E:\DATA\20200905\LC 2020-09-09 14-34-17\OnlineEdited--082.D
Sample Name: YH-17-155-RAC

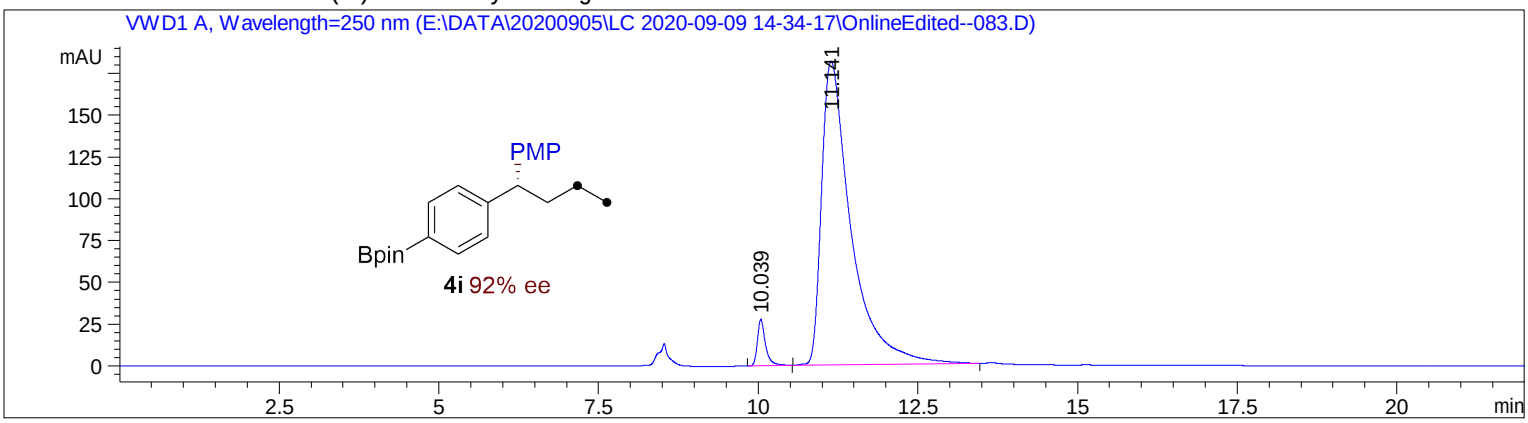
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  82
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/10/2020 7:24:48 PM                  Inj :   4
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-09 14-34-17\1IPA_40_5_4.M
Last changed    : 9/10/2020 7:44:03 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-09 14-34-17\1IPA_40_5_4.M (Sequence Method)
Last changed    : 9/10/2020 8:00:32 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=250 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.741 VV R  0.1516 1637.99194  162.52676  49.4546
   2  11.018 MF    0.5721 1674.11987   48.77103  50.5454

Totals :                  3312.11182  211.29780


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-09 14-34-17\OnlineEdited--083.D
Sample Name: YH-17-155-EE

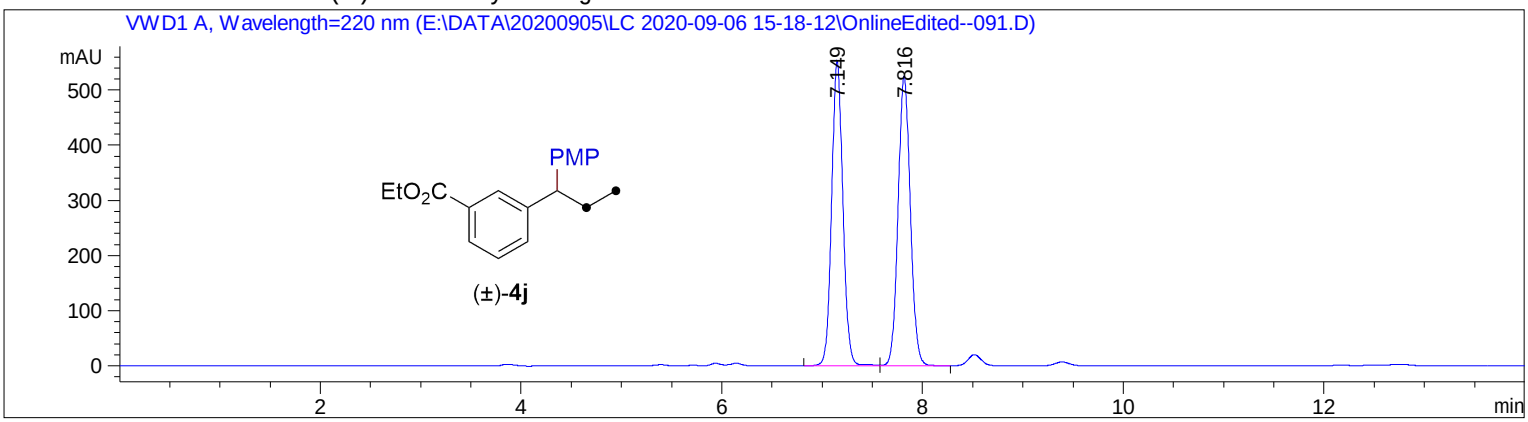
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  83
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/10/2020 7:47:35 PM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-09 14-34-17\1IPA_40_5_4.M
Last changed    : 9/10/2020 7:44:03 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-09 14-34-17\1IPA_40_5_4.M (Sequence Method)
Last changed    : 9/10/2020 8:26:35 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=250 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.039 BB    0.1305  243.71513   27.74428   4.0130
   2  11.141 BB    0.4706 5829.43262  181.53410  95.9870

Totals :                  6073.14775  209.27839


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--091.D
Sample Name: YH-17-133-RAC

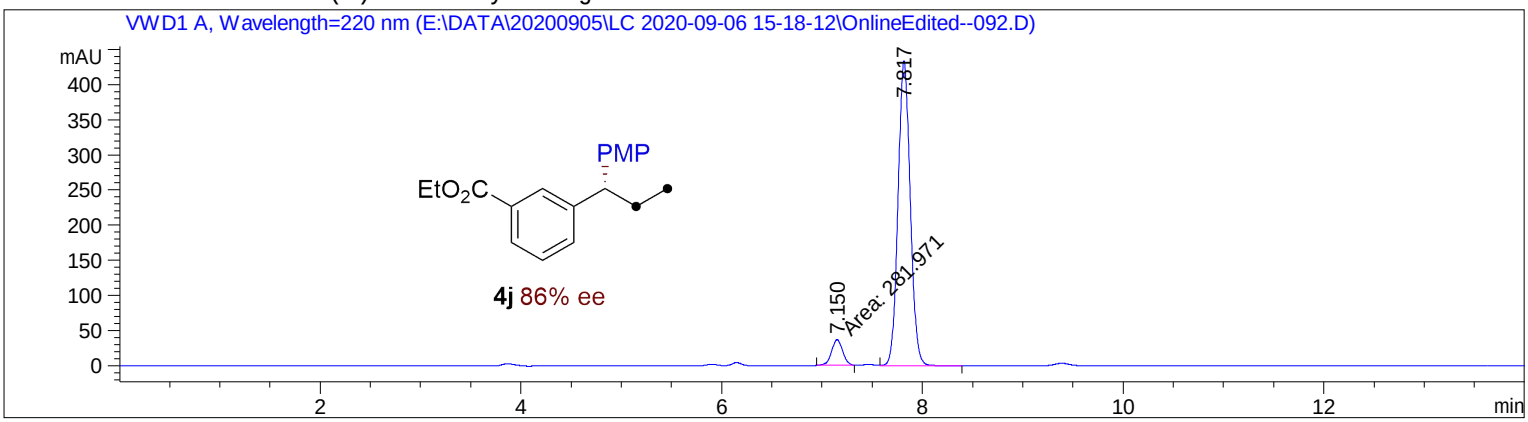
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  91
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/8/2020 2:19:49 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M
Last changed    : 9/8/2020 2:03:49 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M (Sequence Method)
Last changed    : 9/8/2020 3:04:46 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1   7.149 BV R  0.1204 4298.37500  552.23834  49.1222
   2   7.816 VB    0.1310 4451.99170  524.52710  50.8778

Totals :                  8750.36670 1076.76544


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--092.D
Sample Name: YH-17-133-EE

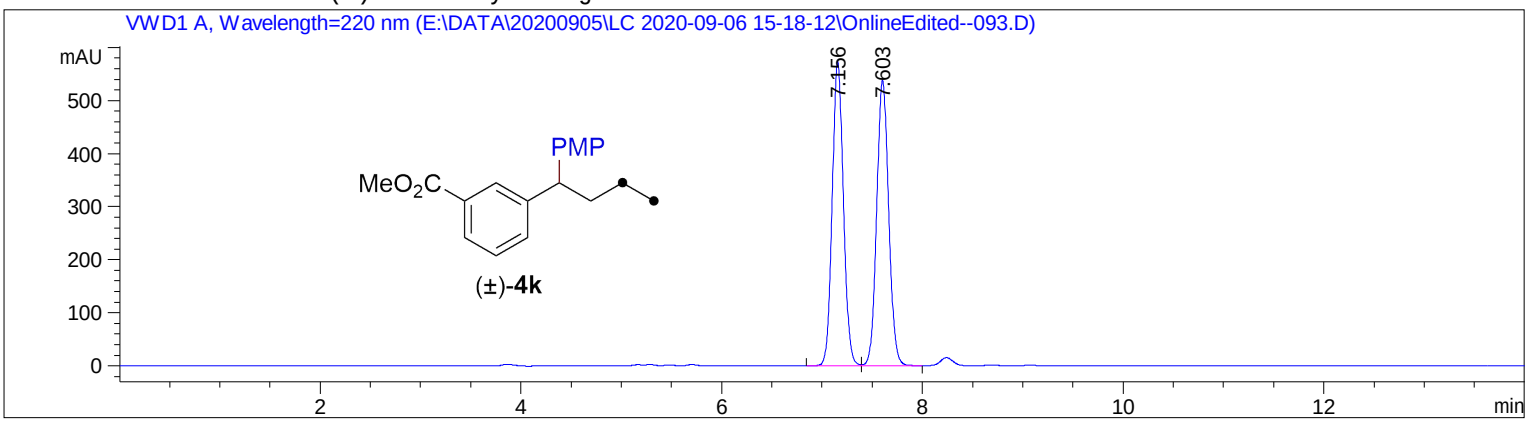
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  92
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/8/2020 2:34:31 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M
Last changed    : 9/8/2020 2:03:49 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M (Sequence Method)
Last changed    : 9/8/2020 3:04:46 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.150 MM    0.1281  281.97110   36.67854   7.1251
   2   7.817 VB    0.1310 3675.43799  433.33679  92.8749

Totals :                  3957.40909  470.01534


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--093.D
Sample Name: YH-17-134-RAC

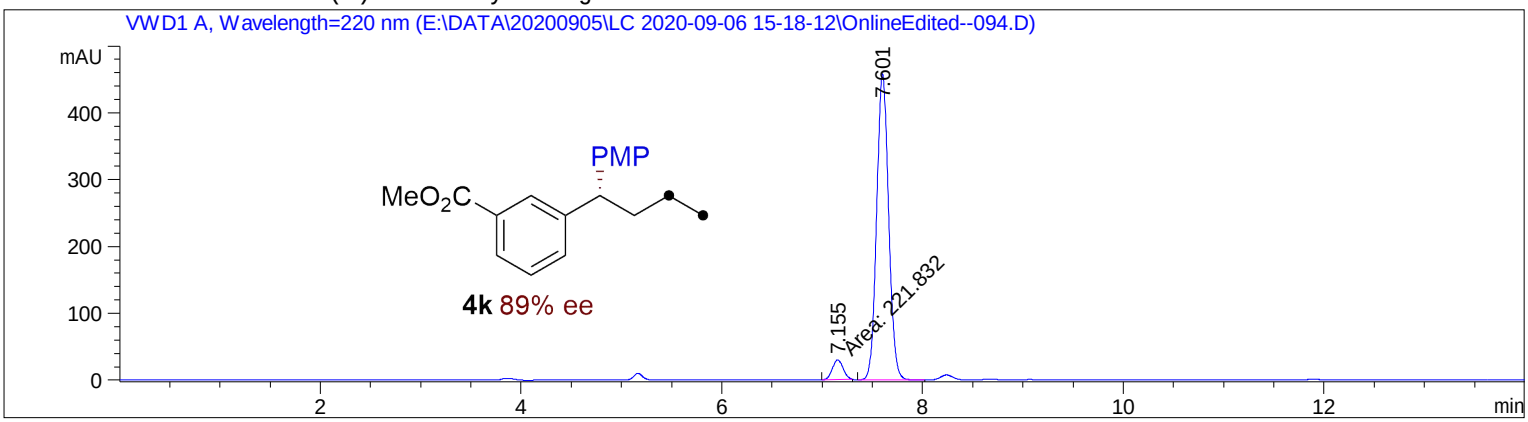
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  93
Acq. Instrument : HPLC1260                         Location :   P1-A5
Injection Date  : 9/8/2020 2:49:14 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M
Last changed    : 9/8/2020 2:03:49 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M (Sequence Method)
Last changed    : 9/8/2020 3:05:48 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.156 BV    0.1194 4448.94434  574.02832  49.9165
   2   7.603 VV    0.1287 4463.82129  538.47260  50.0835

Totals :                  8912.76563 1112.50092


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--094.D
Sample Name: YH-17-134-EE

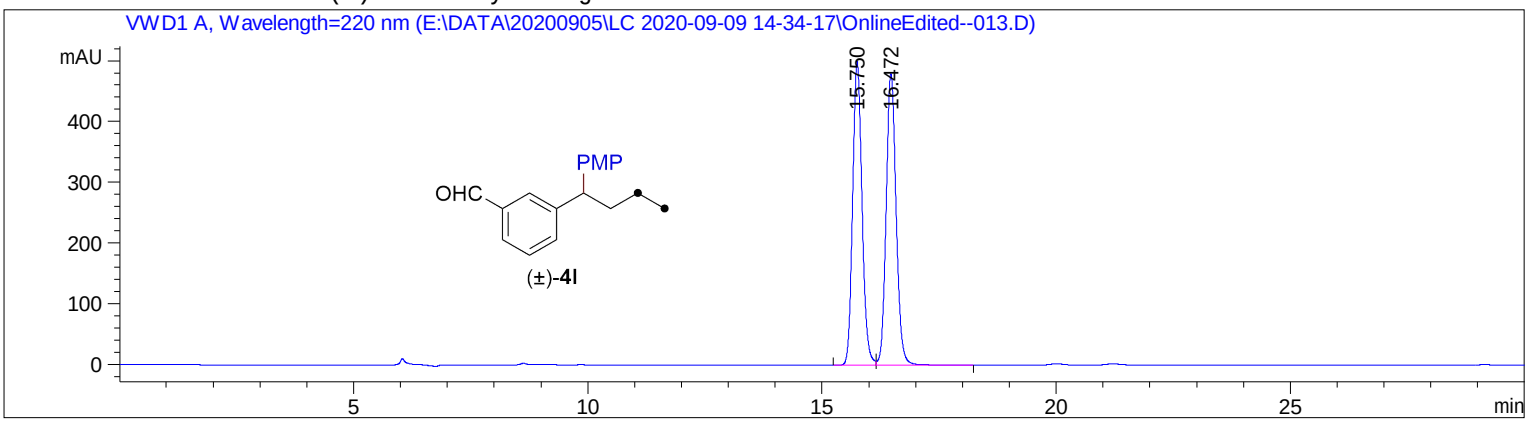
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  94
Acq. Instrument : HPLC1260                         Location :   P1-A6
Injection Date  : 9/8/2020 3:03:57 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.500 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M
Last changed    : 9/8/2020 2:03:49 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\5IPA_25_8_2.M (Sequence Method)
Last changed    : 9/8/2020 3:27:14 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1   7.155 MM    0.1241  221.83202   29.79492   5.5158
   2   7.601 VB    0.1277 3799.90894  458.56464  94.4842

Totals :                  4021.74095  488.35956


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-09 14-34-17\OnlineEdited--013.D
Sample Name: YH-17-141-RAC

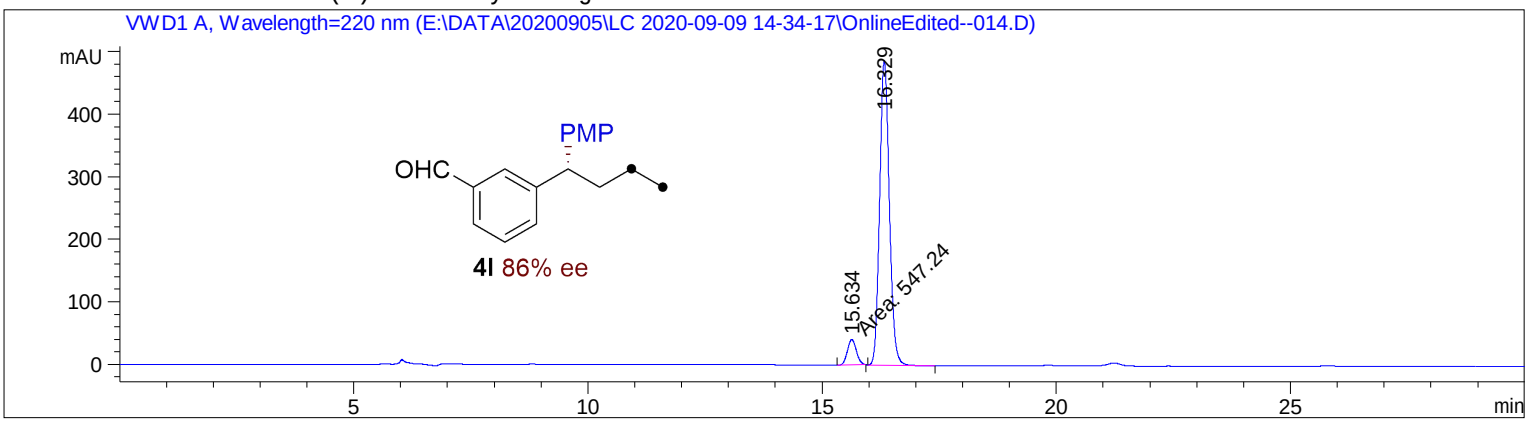
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  13
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/9/2020 6:13:58 PM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-09 14-34-17\5IPA_20_8_3.M
Last changed    : 9/9/2020 6:07:48 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-09 14-34-17\5IPA_20_8_3.M (Sequence Method)
Last changed    : 9/9/2020 7:18:56 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  15.750 BV    0.2154 6964.64014  500.38995  49.5307
   2  16.472 VB    0.2285 7096.62207  479.83856  50.4693

Totals :                  1.40613e4   980.22852


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-09 14-34-17\OnlineEdited--014.D
Sample Name: YH-17-141-EE

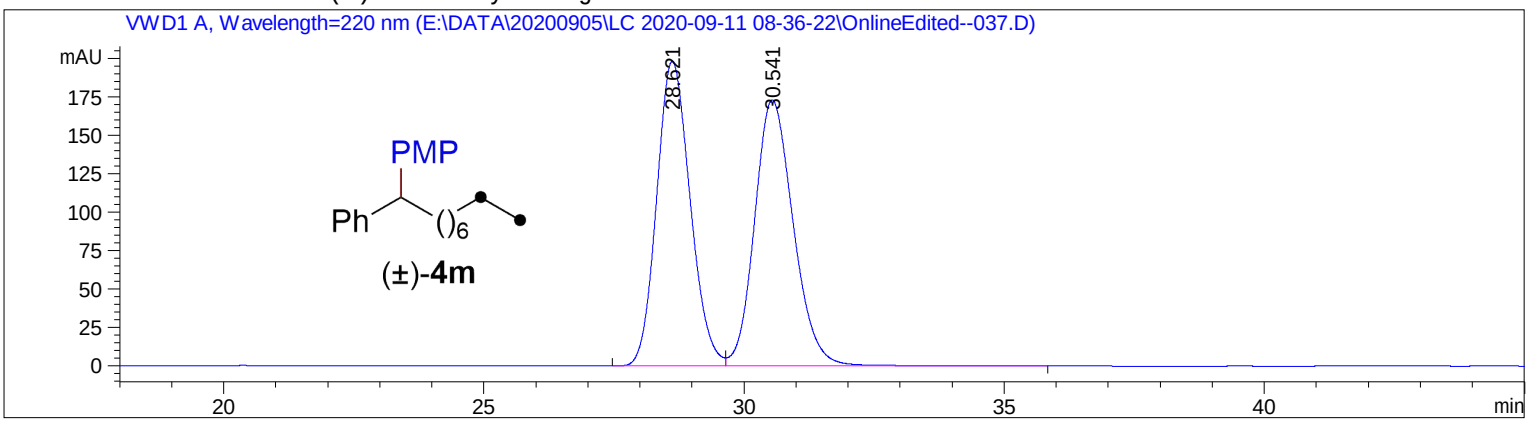
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  14
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/9/2020 6:44:43 PM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-09 14-34-17\5IPA_20_8_3.M
Last changed    : 9/9/2020 6:07:48 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-09 14-34-17\5IPA_20_8_3.M (Sequence Method)
Last changed    : 9/9/2020 7:18:56 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  15.634 MM    0.2229  547.23956   40.90938   7.2131
   2  16.329 VB    0.2238 7039.51855  486.58237  92.7869

Totals :                  7586.75812  527.49175


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--037.D
Sample Name: YH-17-161-RAC

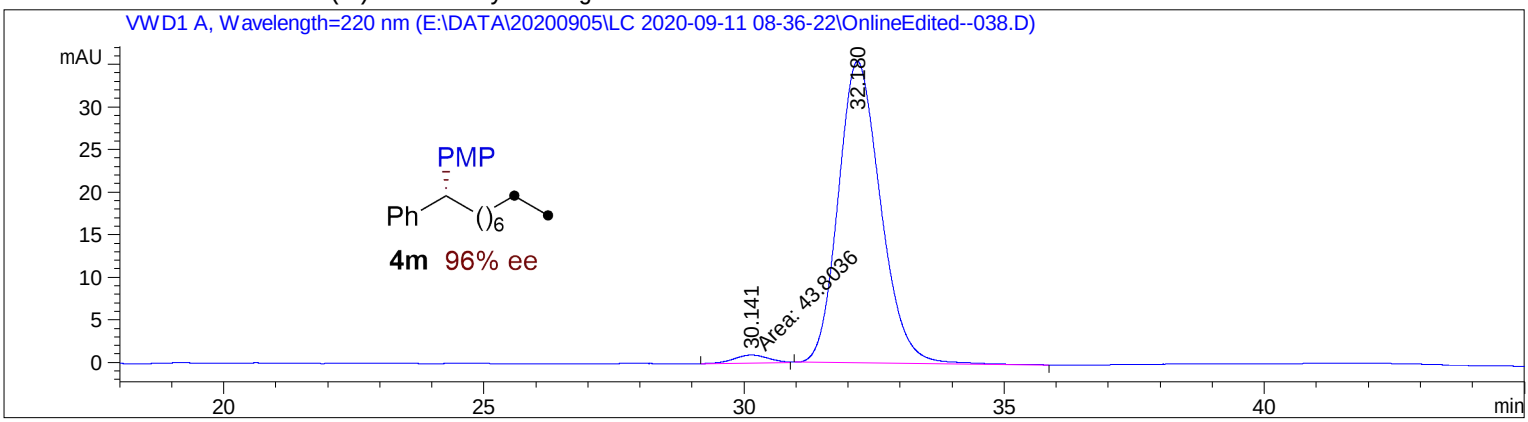
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  37
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/12/2020 3:14:35 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\1ETOH_60_5_3.M
Last changed    : 9/11/2020 8:29:14 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/15/2020 6:39:26 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.621 BV    0.6944 8867.06055  198.40100  49.6974
   2  30.541 VB    0.7973 8975.05762  173.28355  50.3026

Totals :                  1.78421e4   371.68456


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--038.D
Sample Name: YH-17-161-EE1

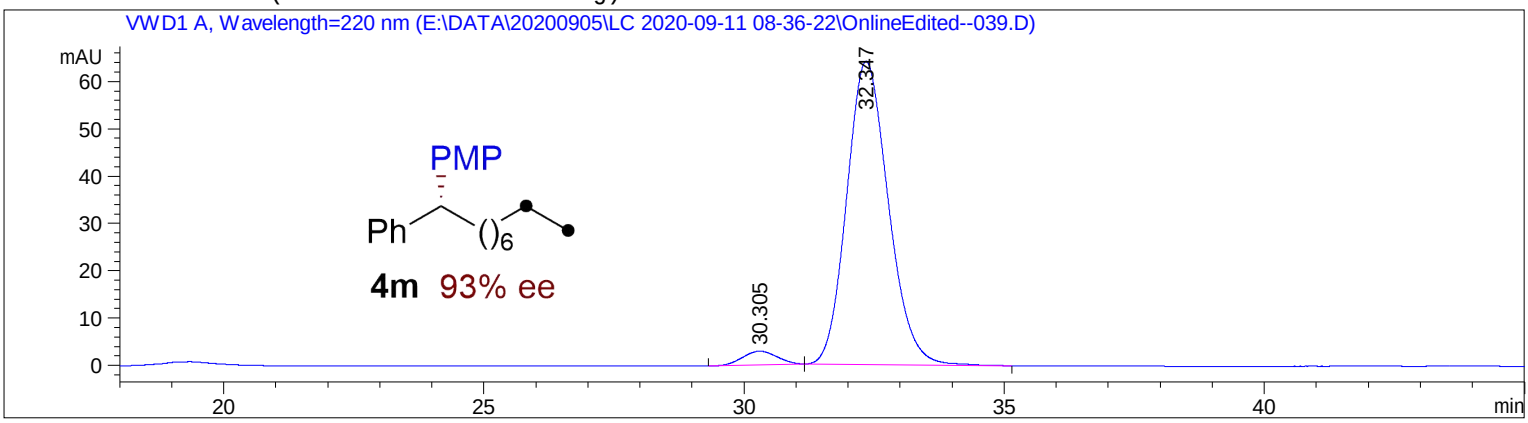
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  38
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/12/2020 4:15:20 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\1ETOH_60_5_3.M
Last changed    : 9/11/2020 8:29:14 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/15/2020 6:39:26 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  30.141 MM    0.7755   43.80361 9.41372e-1   2.1410
   2  32.180 BB    0.8646 2002.12549   35.41506  97.8590

Totals :                  2045.92910   36.35643


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--039.D
Sample Name: YH-17-161-EE2

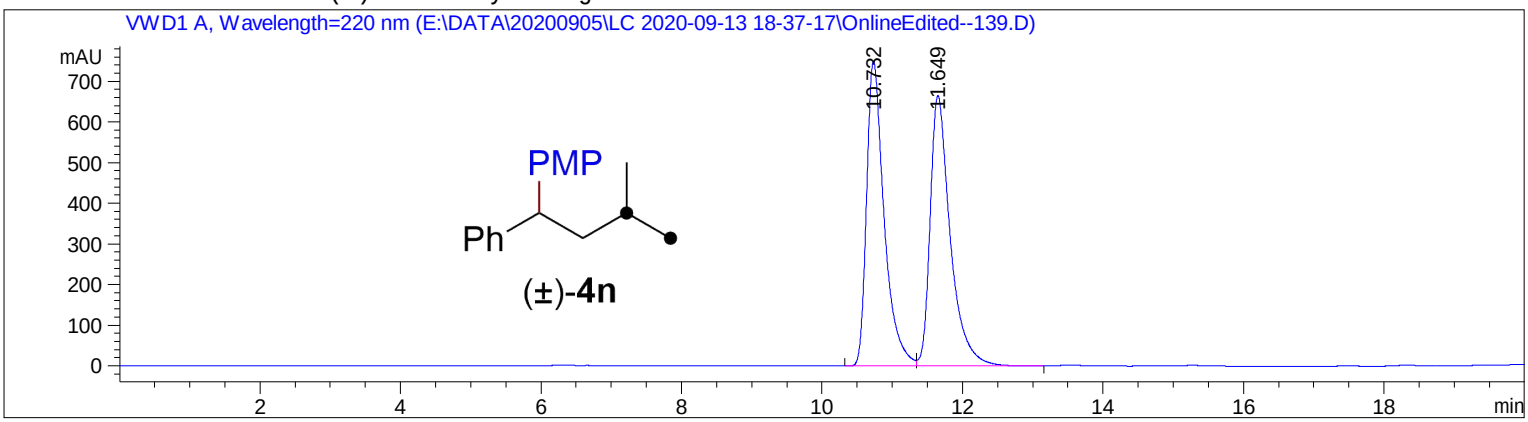
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  39
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/12/2020 5:16:05 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\1ETOH_60_5_3.M
Last changed    : 9/11/2020 8:29:14 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/15/2020 6:39:26 PM by SYSTEM
                  (modified after loading)
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  30.305 BB    0.6861  134.16422    2.91444   3.6283
   2  32.347 BB    0.8588 3563.58740   64.08324  96.3717

Totals :                  3697.75162   66.99769


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--139.D
Sample Name: YH-17-173-RAC

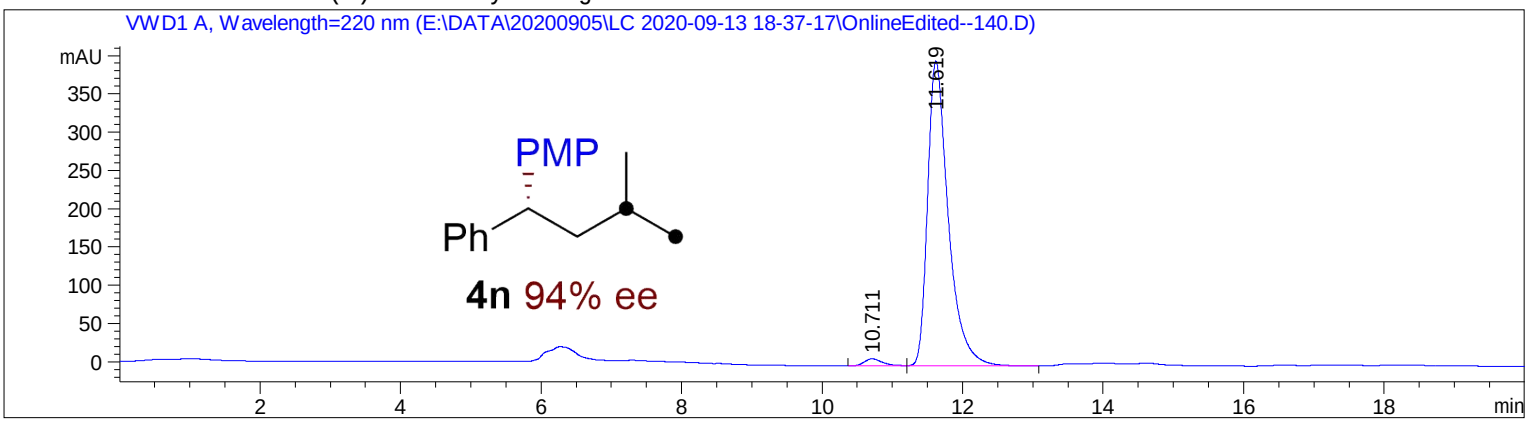
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 139
Acq. Instrument : HPLC1260                         Location :   P1-B1
Injection Date  : 9/16/2020 9:46:23 PM                 Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.200 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\20EtOH_20_5_1.M
Last changed    : 9/16/2020 9:10:36 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\20EtOH_20_5_1.M (Sequence Method)
Last changed    : 9/17/2020 9:24:25 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.732 BV    0.2598 1.30364e4   749.81757  49.6103
   2  11.649 VB    0.2951 1.32412e4   665.68225  50.3897

Totals :                  2.62776e4  1415.49982

==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--140.D
Sample Name: YH-17-173-EE

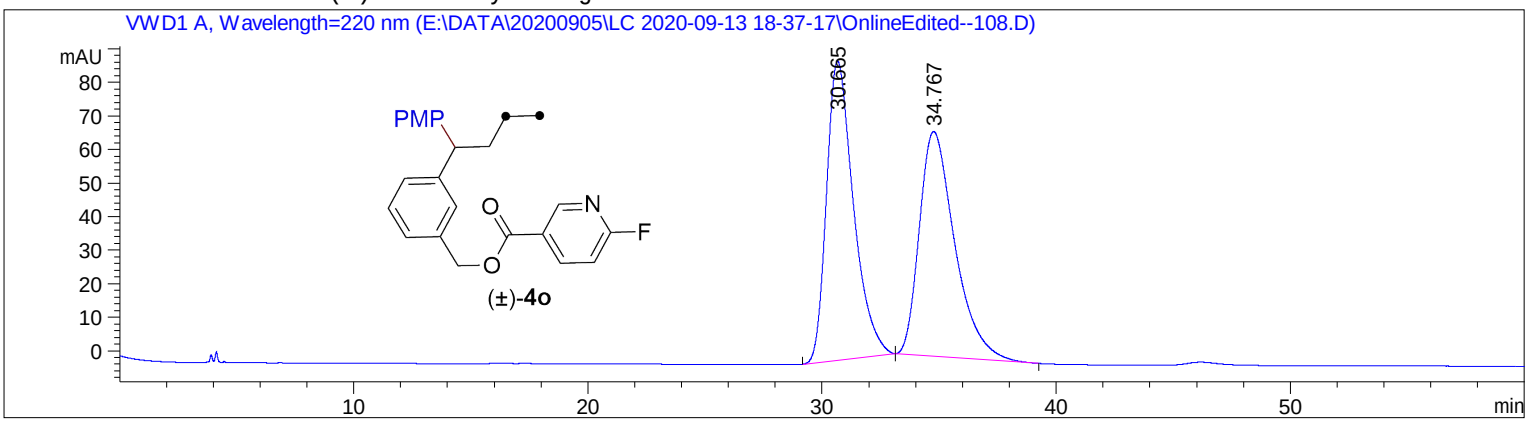
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 140
Acq. Instrument : HPLC1260                         Location :   P1-B2
Injection Date  : 9/16/2020 10:07:12 PM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 8.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\20EtOH_20_5_1.M
Last changed    : 9/16/2020 9:10:36 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\20EtOH_20_5_1.M (Sequence Method)
Last changed    : 9/17/2020 9:24:25 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  10.711 BV    0.2739  165.10509    9.17757   1.9828
   2  11.619 VB    0.3072 8161.65186  398.03119  98.0172

Totals :                  8326.75694  407.20876


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--108.D
Sample Name: YH-17-166-RAC

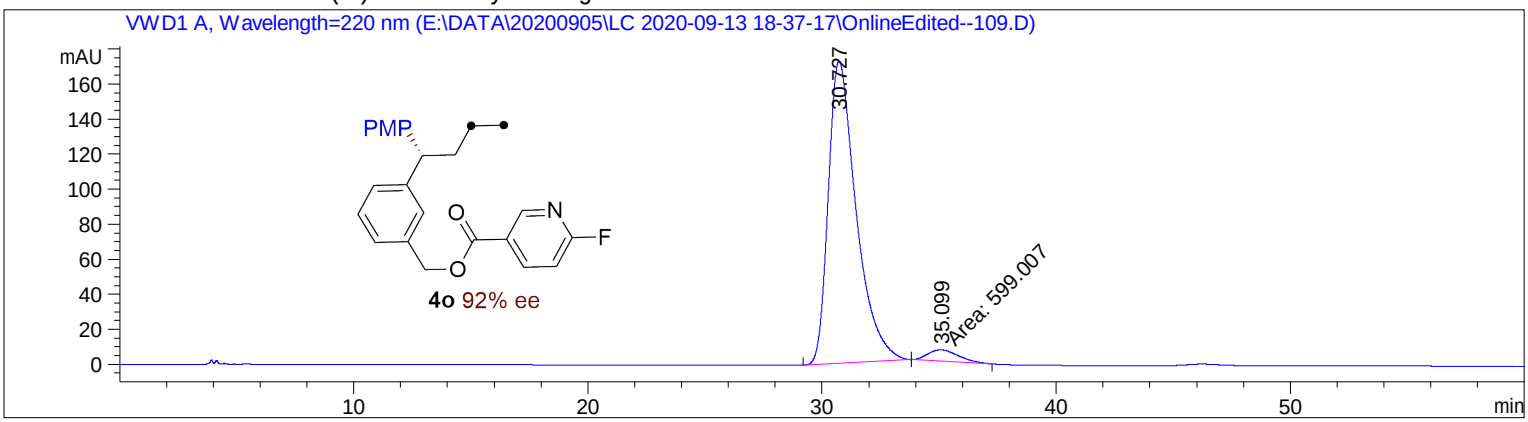
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 108
Acq. Instrument : HPLC1260                         Location :   P1-C1
Injection Date  : 9/16/2020 12:07:31 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10IPA_60_8_1.M
Last changed    : 9/15/2020 3:44:04 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10IPA_60_8_1.M (Sequence Method)
Last changed    : 9/16/2020 9:18:31 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  30.665 BB    1.2106 7133.66357   89.14415  50.2737
   2  34.767 BB    1.5855 7056.00000   67.01034  49.7263

Totals :                  1.41897e4   156.15449


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--109.D
Sample Name: YH-17-166-EE

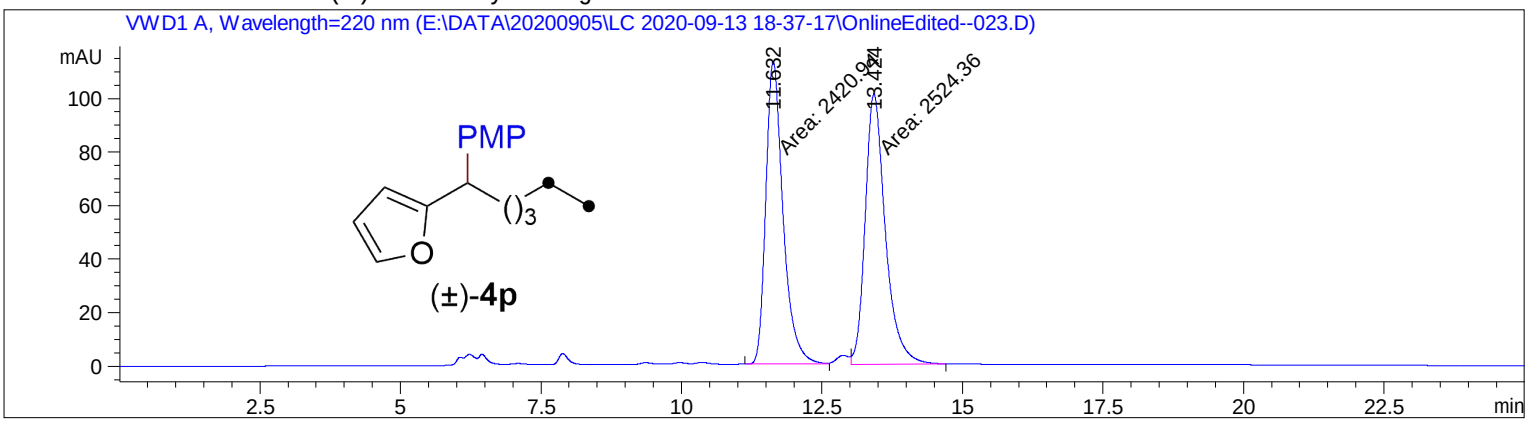
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 109
Acq. Instrument : HPLC1260                         Location :   P1-C2
Injection Date  : 9/16/2020 1:08:16 AM                  Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10IPA_60_8_1.M
Last changed    : 9/15/2020 3:44:04 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10IPA_60_8_1.M (Sequence Method)
Last changed    : 9/16/2020 9:18:31 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  30.727 BB    1.2444 1.42822e4   172.41908  95.9748
   2  35.099 MF    1.5299  599.00665    6.52567   4.0252

Totals :                  1.48812e4   178.94475


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--023.D
Sample Name: YH-17-154-RAC

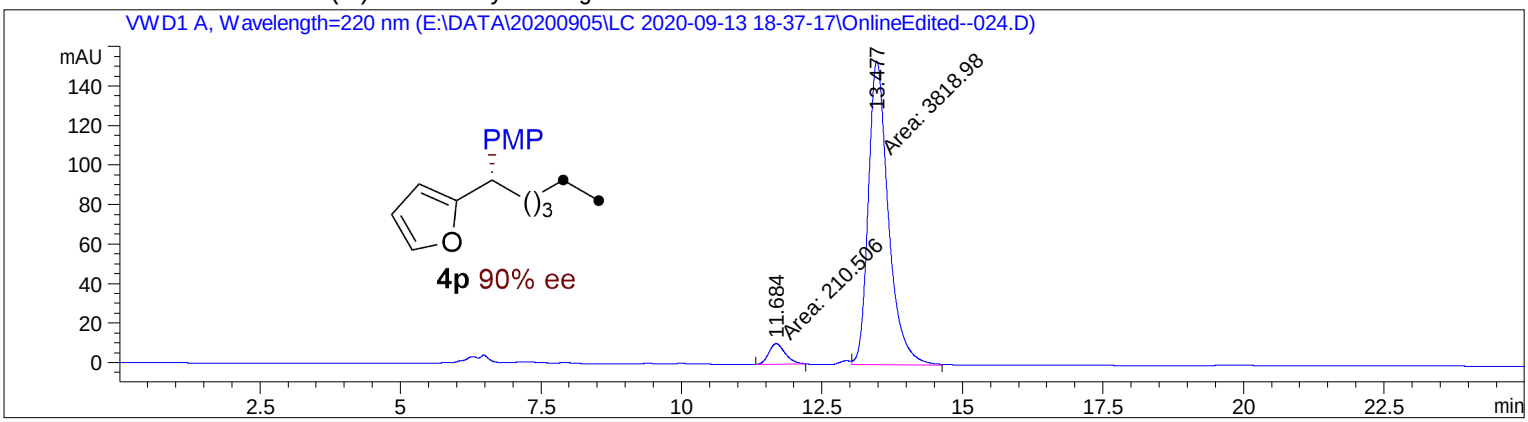
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  23
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/14/2020 3:37:20 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M
Last changed    : 9/13/2020 8:42:18 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M (Sequence Method)
Last changed    : 9/14/2020 8:52:04 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.632 MF    0.3565 2420.94312  113.18167  48.9544
   2  13.424 MM    0.4165 2524.35938  101.00546  51.0456

Totals :                  4945.30249  214.18713


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--024.D
Sample Name: YH-17-154-EE

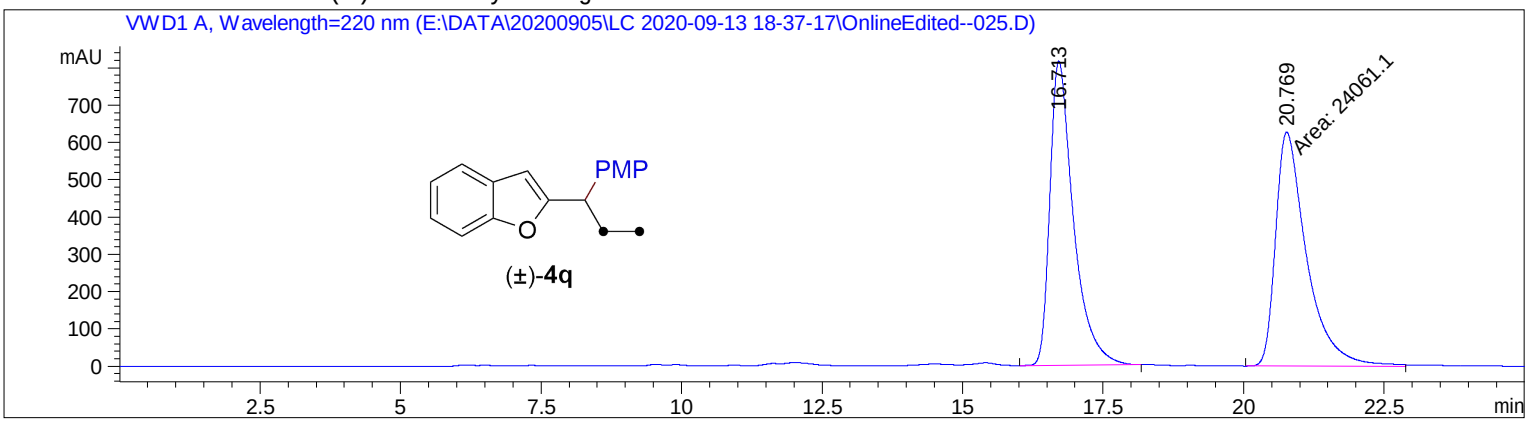
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  24
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/14/2020 4:03:06 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M
Last changed    : 9/13/2020 8:42:18 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M (Sequence Method)
Last changed    : 9/14/2020 8:52:04 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  11.684 MM    0.3366  210.50558   10.42404   5.2241
   2  13.477 MF    0.4143 3818.98242  153.64587  94.7759

Totals :                  4029.48801  164.06991


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--025.D
Sample Name: YH-17-156-RAC

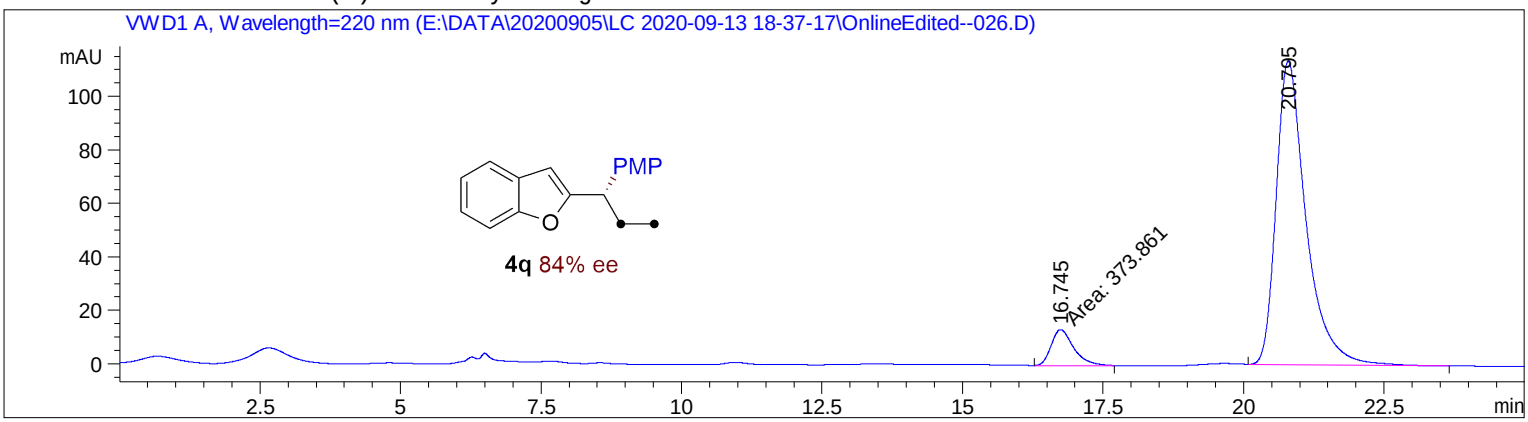
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  25
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/14/2020 4:28:50 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M
Last changed    : 9/13/2020 8:42:18 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M (Sequence Method)
Last changed    : 9/14/2020 8:48:48 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.713 BB    0.4327 2.37441e4   815.48669  49.6684
   2  20.769 MF    0.6390 2.40611e4   627.55438  50.3316

Totals :                  4.78053e4  1443.04108


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--026.D
Sample Name: YH-17-156-EE

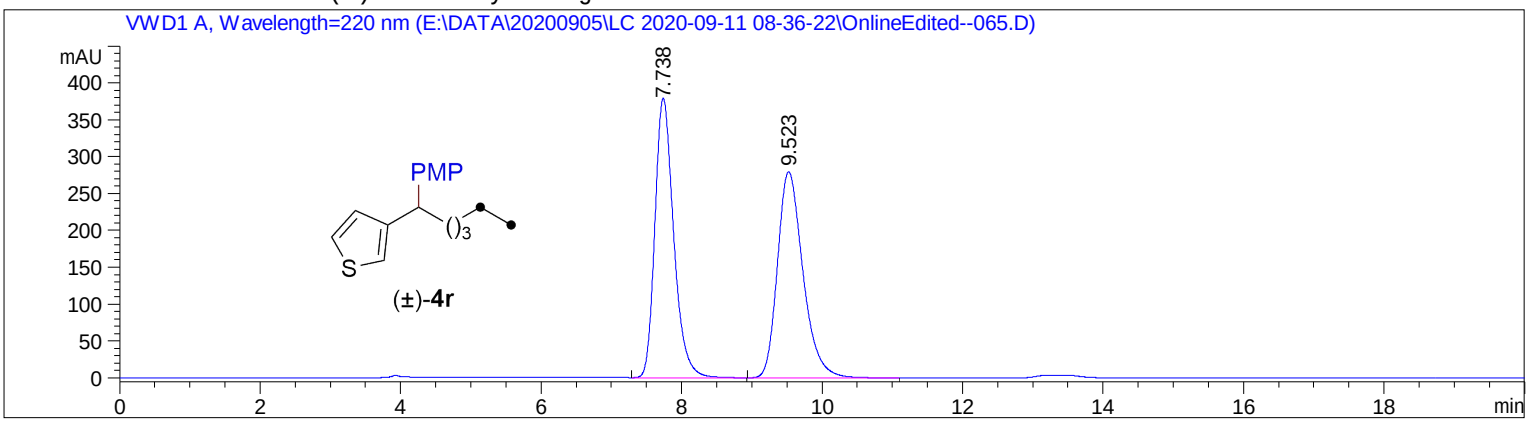
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  26
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/14/2020 4:54:34 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M
Last changed    : 9/13/2020 8:42:18 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\20IPA_25_5_1.M (Sequence Method)
Last changed    : 9/14/2020 8:48:48 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  16.745 MM    0.4636  373.86090   13.43970   8.1749
   2  20.795 BB    0.5548 4199.41406  113.45737  91.8251

Totals :                  4573.27496  126.89708


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--065.D
Sample Name: YH-17-151-RAC

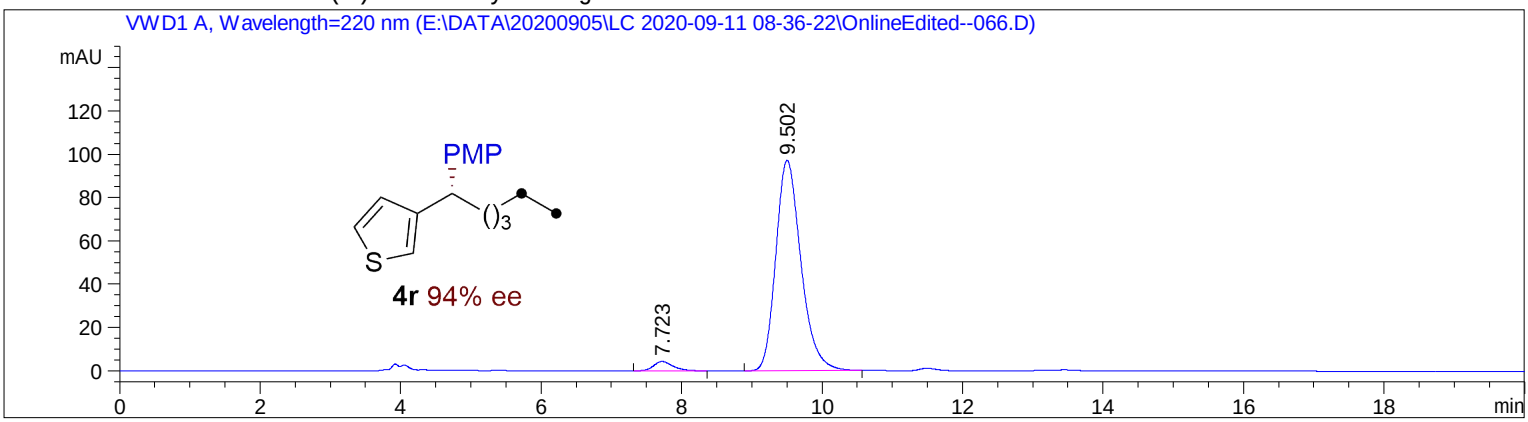
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  65
Acq. Instrument : HPLC1260                         Location :   P1-B7
Injection Date  : 9/12/2020 6:10:32 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.100 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\30IPA_25_8_1.M
Last changed    : 9/11/2020 7:15:37 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\30IPA_25_8_1.M (Sequence Method)
Last changed    : 11/25/2021 4:57:15 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.738 VB    0.2845 7035.99609  379.18643  49.9793
   2   9.523 BB    0.3858 7041.82764  279.59964  50.0207

Totals :                  1.40778e4   658.78607


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--066.D
Sample Name: YH-17-151-EE

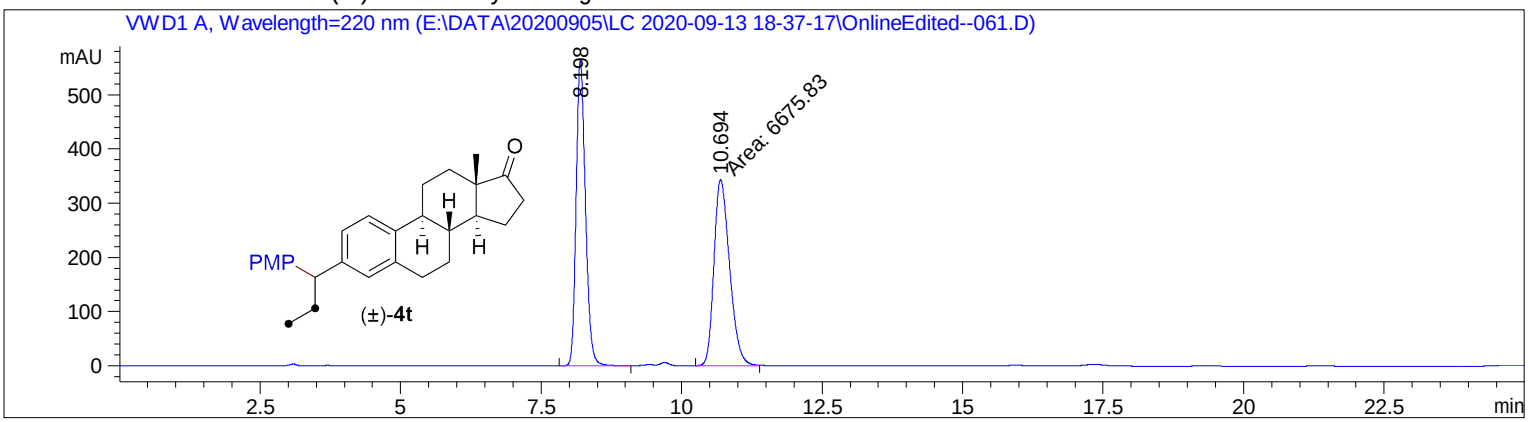
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  66
Acq. Instrument : HPLC1260                         Location :   P1-B8
Injection Date  : 9/12/2020 6:36:16 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\30IPA_25_8_1.M
Last changed    : 9/11/2020 7:15:37 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\30IPA_25_8_1.M (Sequence Method)
Last changed    : 11/25/2021 4:58:08 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                         Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.723 BB    0.2825   79.95707    4.26963   3.2048
   2   9.502 BB    0.3809 2414.99536   97.17395  96.7952

Totals :                  2494.95243  101.44358


==========================================================================
                         *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--061.D
Sample Name: YH-17-159-AD

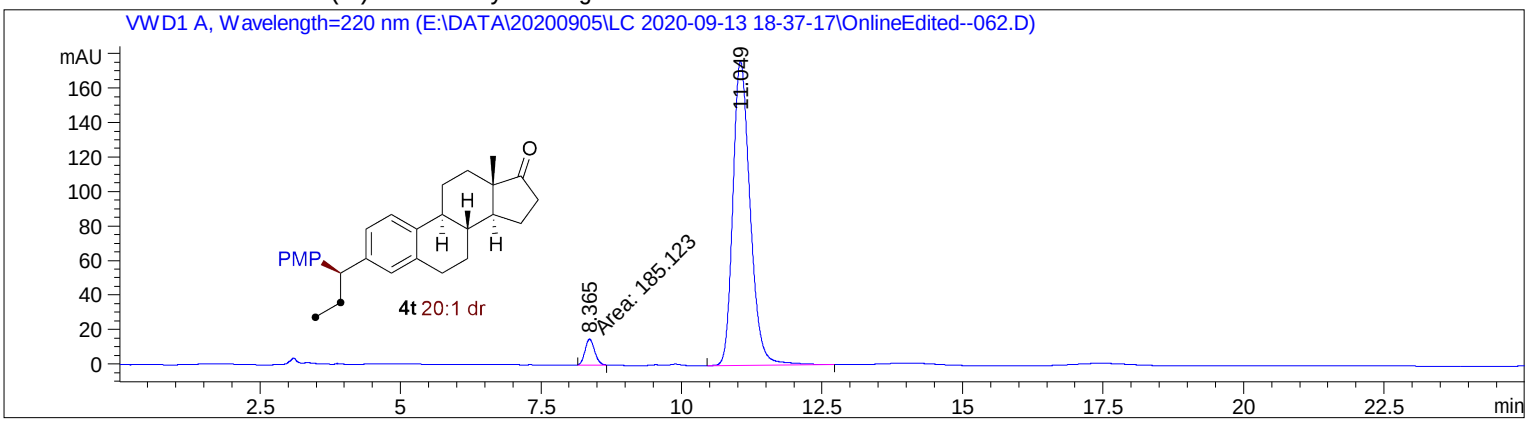
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  61
Acq. Instrument : HPLC1260                       Location :   P1-B4
Injection Date  : 9/14/2020 7:56:12 PM               Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M
Last changed    : 9/13/2020 8:50:01 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M (Sequence Method)
Last changed    : 9/14/2020 8:35:55 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]        %
----|-------|----|-------|----------|----------|--------|
   1   8.198 BB    0.1780 6505.39844  562.11786  49.3535
   2  10.694 FM    0.3238 6675.82568  343.59470  50.6465

Totals :                  1.31812e4   905.71255


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--062.D
Sample Name: YH-17-159-EE

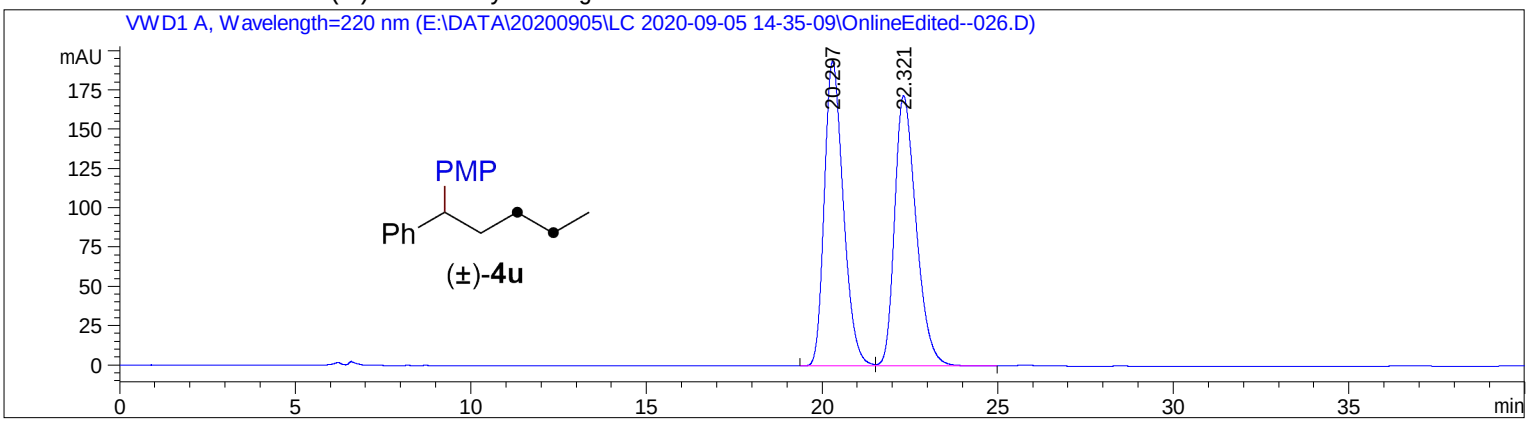
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  62
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/14/2020 8:21:57 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M
Last changed    : 9/13/2020 8:50:01 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\10ETOH_25_10_3.M (Sequence Method)
Last changed    : 9/14/2020 8:49:41 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   8.365 FM    0.2016  185.12340   15.30253   4.6858
   2  11.049 BB    0.3282 3765.57959  176.31880  95.3142

Totals :                  3950.70299  191.62134


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-05 14-35-09\OnlineEdited--026.D
Sample Name: YH-17-127-RAC

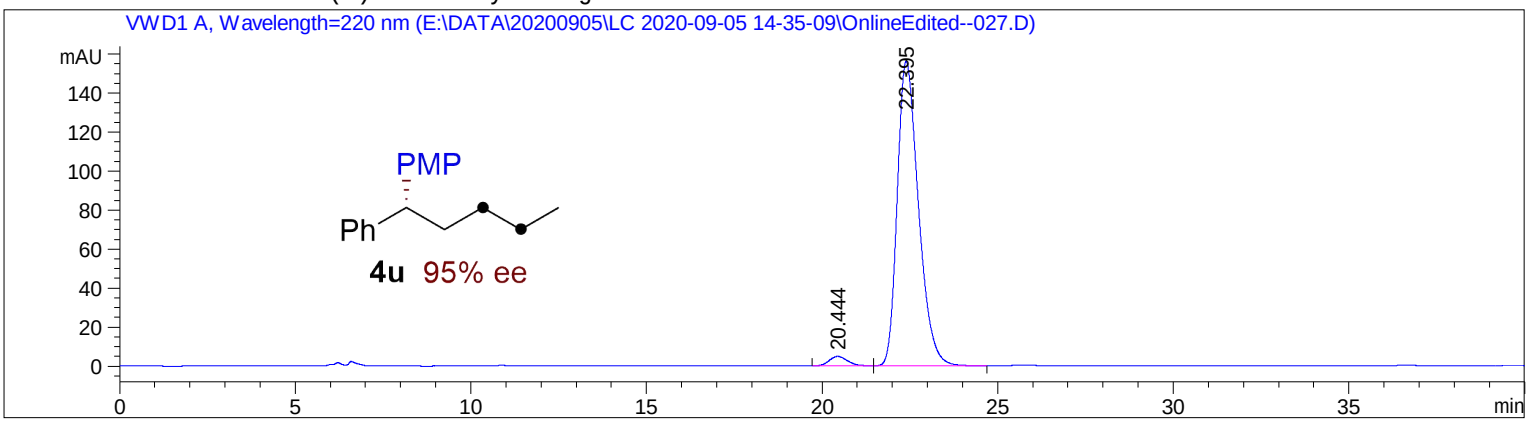
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  26
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/6/2020 12:37:13 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-05 14-35-09\1ETOH_60_5_3.M
Last changed    : 9/5/2020 7:29:37 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-05 14-35-09\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/6/2020 12:19:17 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  20.297 BV    0.5805 7305.88867  193.95717  49.9074
   2  22.321 VB    0.6543 7332.99609  172.01820  50.0926

Totals :                  1.46389e4   365.97537


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-05 14-35-09\OnlineEdited--027.D
Sample Name: YH-17-127-EE

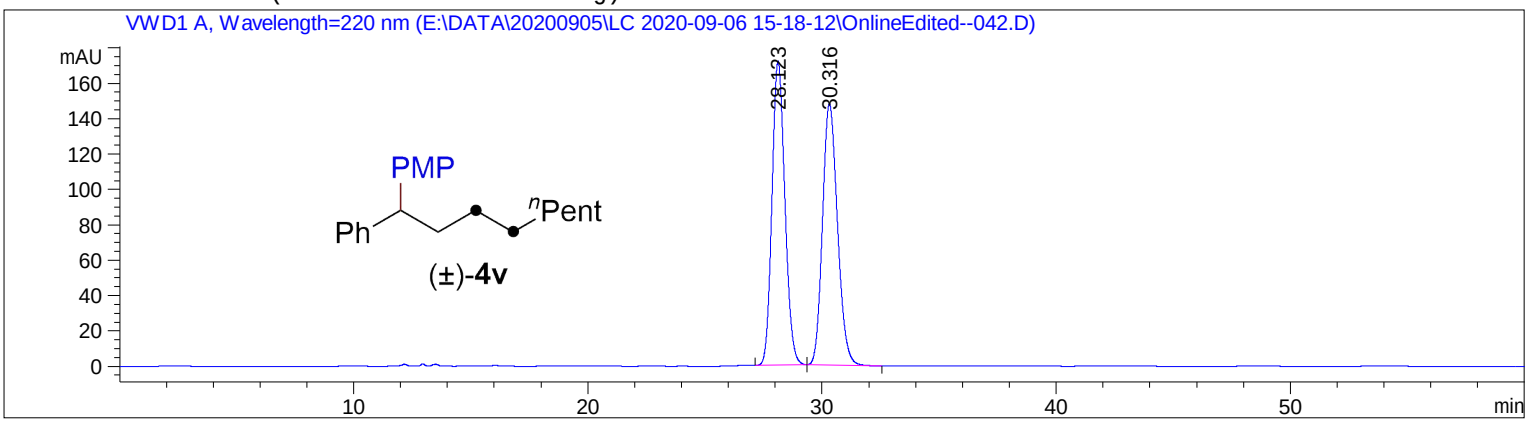
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  27
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/6/2020 1:37:58 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-05 14-35-09\1ETOH_60_5_3.M
Last changed    : 9/5/2020 7:29:37 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-05 14-35-09\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/6/2020 12:19:17 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  20.444 BB    0.5498  174.51820    4.85016   2.5958
   2  22.395 BB    0.6443 6548.65283  156.13647  97.4042

Totals :                  6723.17104  160.98663


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--042.D
Sample Name: YH-17-129-RAC

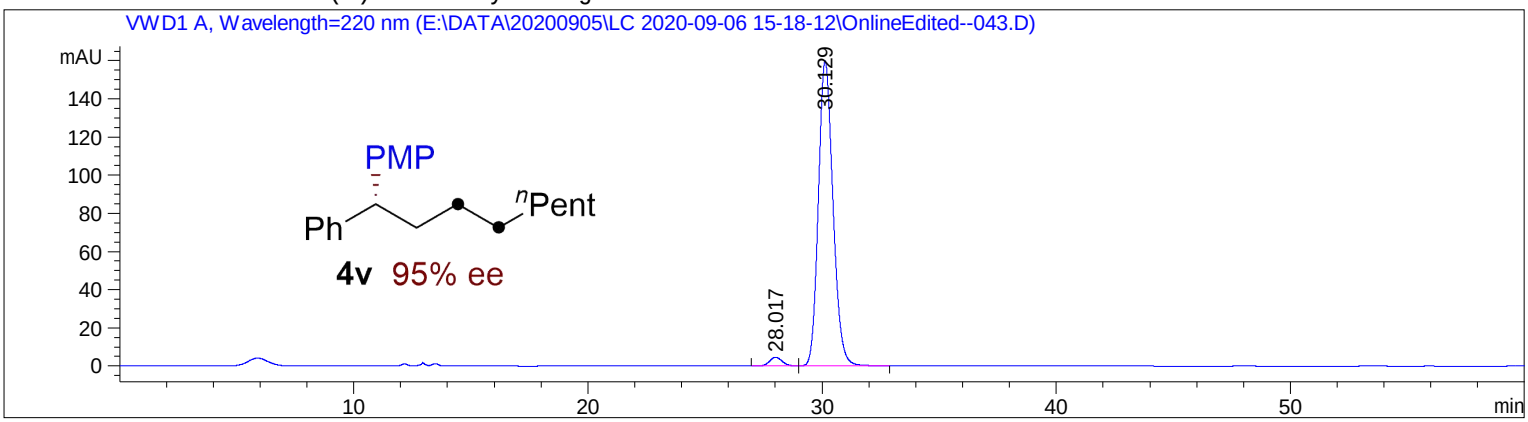
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  42
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 9/7/2020 11:47:35 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M
Last changed    : 9/7/2020 10:03:52 AM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/7/2020 1:51:58 PM by SYSTEM
                  (modified after loading)
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.123 BB    0.5939 6577.11133  171.68488  49.9985
   2  30.316 BB    0.6894 6577.51123  147.74504  50.0015

Totals :                  1.31546e4   319.42992


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--043.D
Sample Name: YH-17-129-EE

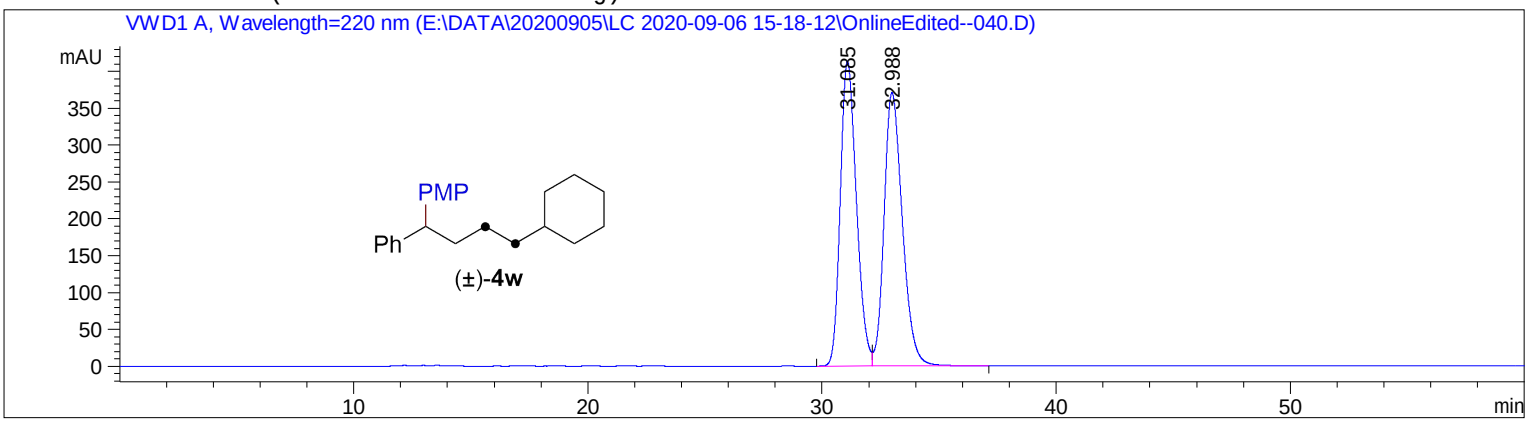
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  43
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 9/7/2020 12:48:19 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M
Last changed    : 9/7/2020 10:03:52 AM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/7/2020 1:51:58 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  28.017 BB    0.5799  171.90323    4.55951   2.4223
   2  30.129 BB    0.6701 6924.69043  159.64058  97.5777

Totals :                  7096.59366  164.20009


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--040.D
Sample Name: YH-17-128-RAC

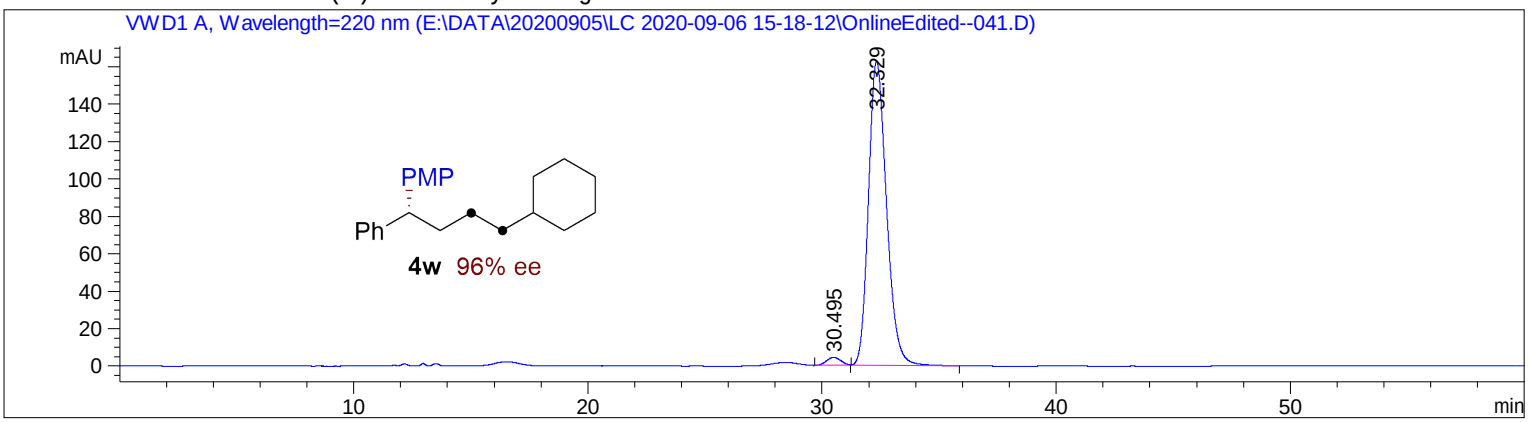
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  40
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 9/7/2020 9:46:04 AM                   Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M
Last changed    : 9/7/2020 10:03:52 AM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/7/2020 1:51:58 PM by SYSTEM
                  (modified after loading)
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  31.085 BV    0.7392 1.97897e4   413.64362  49.5118
   2  32.988 VB    0.8355 2.01799e4   371.04105  50.4882

Totals :                  3.99696e4   784.68466


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-06 15-18-12\OnlineEdited--041.D
Sample Name: YH-17-128-EE

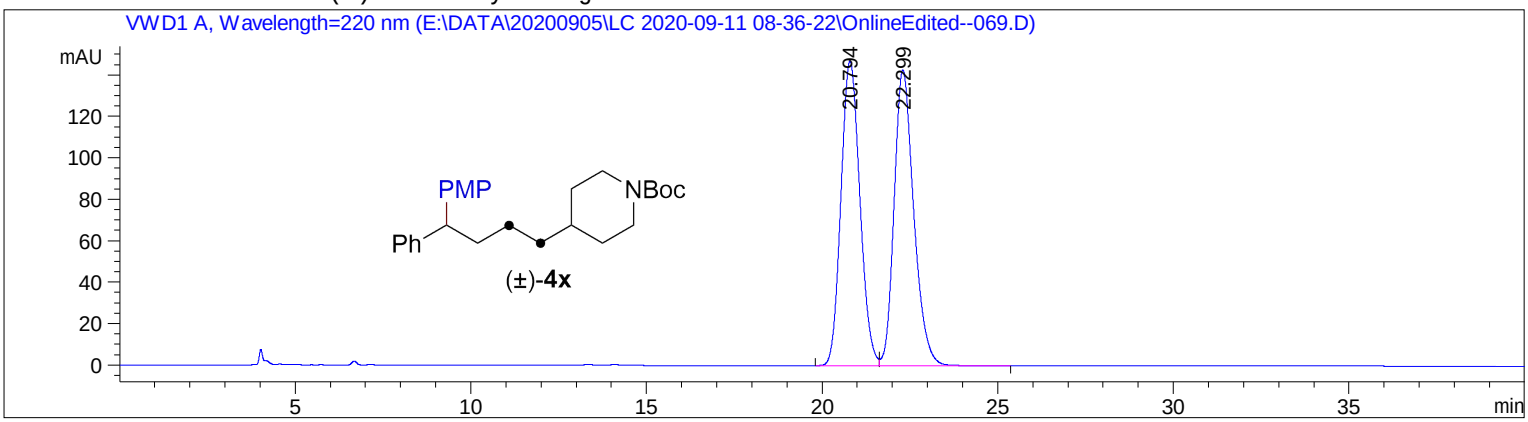
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  41
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 9/7/2020 10:46:50 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M
Last changed    : 9/7/2020 10:03:52 AM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-06 15-18-12\1ETOH_60_5_3.M (Sequence Method)
Last changed    : 9/7/2020 1:51:58 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  30.495 BB    0.6426  172.03056    4.15022   1.9424
   2  32.329 BB    0.8267 8684.74316  162.44980  98.0576

Totals :                  8856.77373  166.60002


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--069.D
Sample Name: YH-17-148-EE

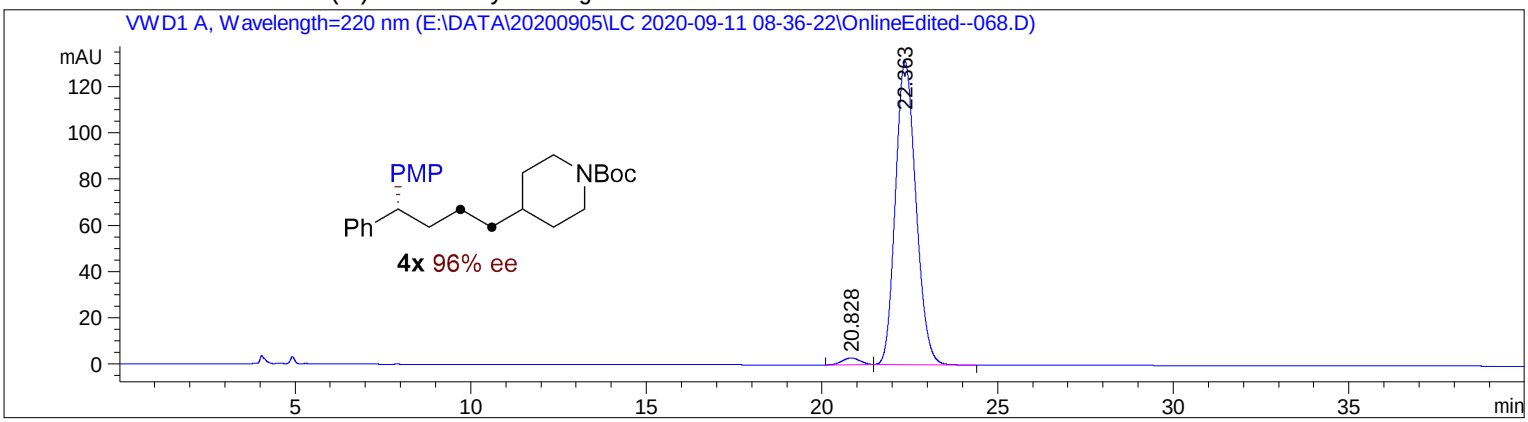
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  69
Acq. Instrument : HPLC1260                         Location :   P1-B4
Injection Date  : 9/12/2020 8:23:31 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\5IPA_40_8_2.M
Last changed    : 9/11/2020 3:58:07 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\5IPA_40_8_2.M (Sequence Method)
Last changed    : 9/12/2020 9:54:34 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  20.794 BV    0.5852 5505.28906  146.92302  49.8768
   2  22.299 VB    0.5918 5532.49512  142.85559  50.1232

Totals :                  1.10378e4   289.77861


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--068.D
Sample Name: YH-17-148-RAC

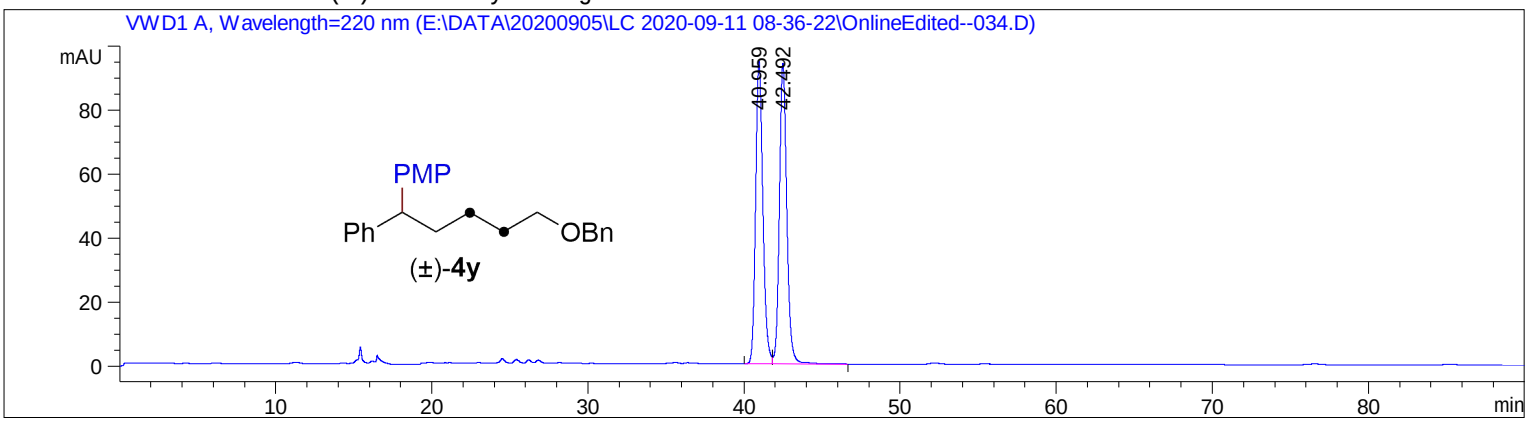
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  68
Acq. Instrument : HPLC1260                         Location :   P1-B3
Injection Date  : 9/12/2020 7:42:47 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\5IPA_40_8_2.M
Last changed    : 9/11/2020 3:58:07 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\5IPA_40_8_2.M (Sequence Method)
Last changed    : 9/12/2020 9:54:34 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  20.828 BB    0.5403  100.21465    2.86358   1.8463
   2  22.363 BB    0.6315 5327.57861  131.53824  98.1537

Totals :                  5427.79326  134.40182


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--034.D
Sample Name: YH-17-147-RAC

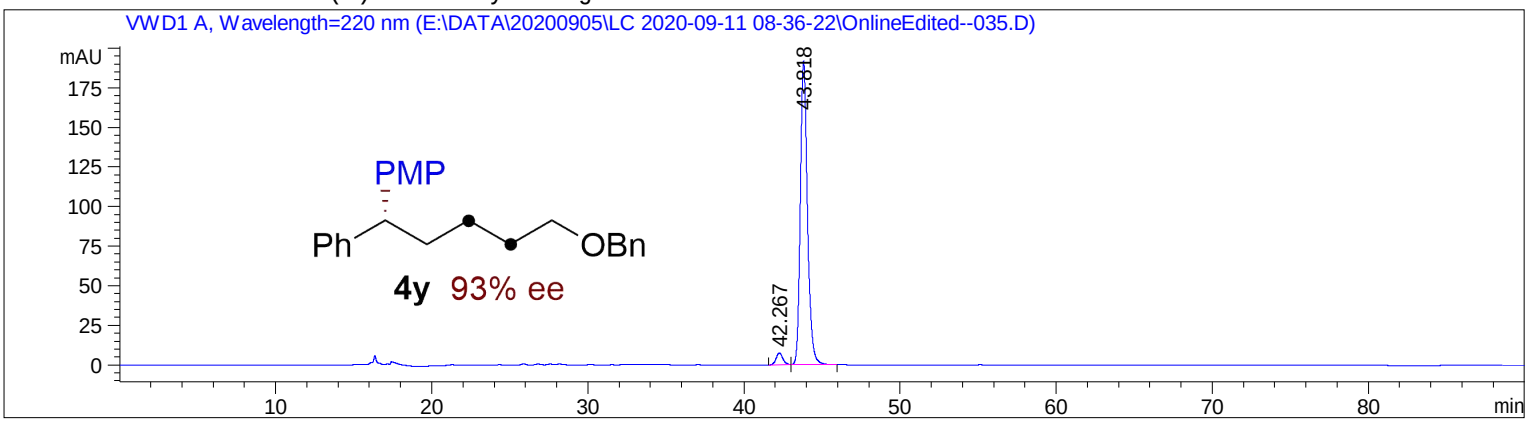
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  34
Acq. Instrument : HPLC1260                         Location :   P1-B1
Injection Date  : 9/11/2020 11:12:14 PM                Inj :   5
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\1IPA_40_5_1.M
Last changed    : 9/11/2020 11:12:05 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\1IPA_40_5_1.M (Sequence Method)
Last changed    : 9/12/2020 9:39:00 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  40.959 BV    0.4954 3048.32300   94.47705  49.6760
   2  42.492 VB    0.5020 3088.08325   93.81505  50.3240

Totals :                  6136.40625  188.29210


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--035.D
Sample Name: YH-17-147-EE

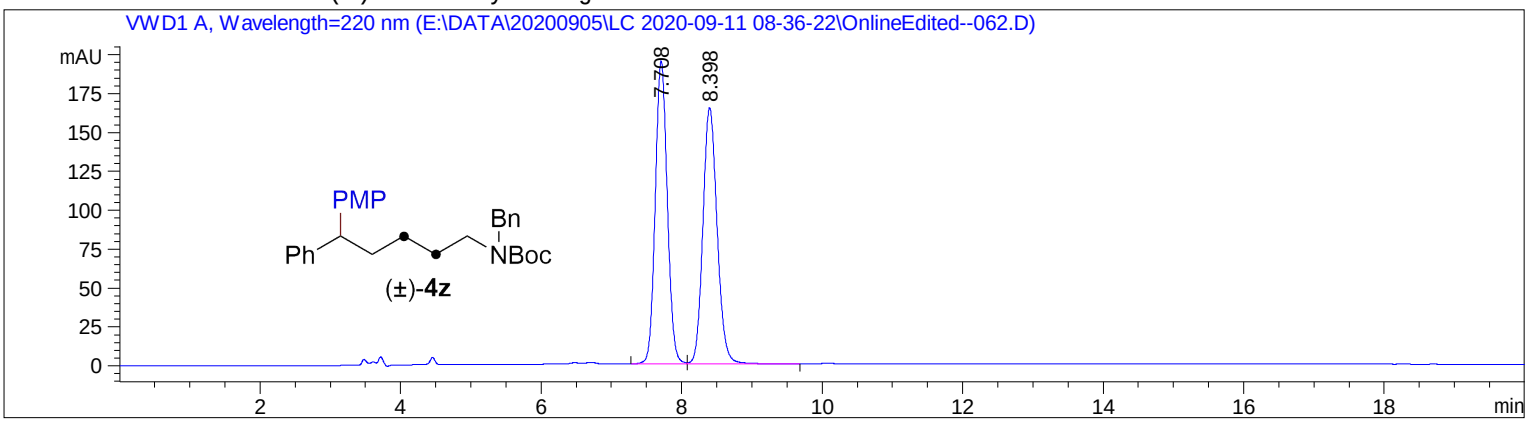
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  35
Acq. Instrument : HPLC1260                         Location :   P1-B2
Injection Date  : 9/12/2020 12:43:00 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\1IPA_40_5_1.M
Last changed    : 9/11/2020 11:12:05 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\1IPA_40_5_1.M (Sequence Method)
Last changed    : 9/12/2020 9:39:00 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  42.267 BB    0.4521  217.21002    7.42821   3.4565
   2  43.818 BB    0.4847 6066.84277  191.43550  96.5435

Totals :                  6284.05280  198.86371


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--062.D
Sample Name: YH-17-150-RAC

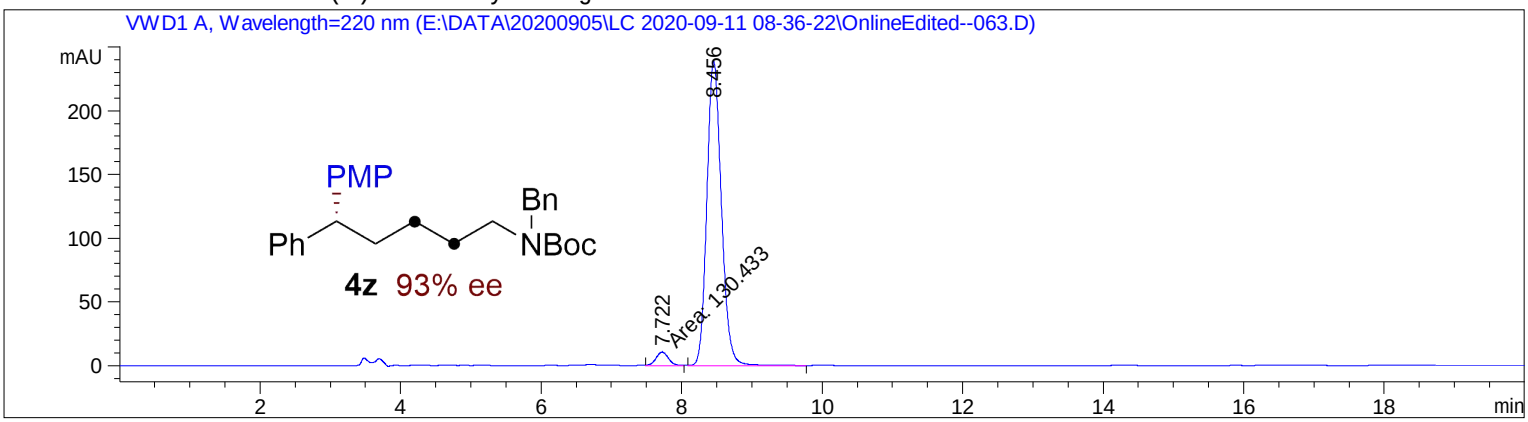
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  62
Acq. Instrument : HPLC1260                         Location :   P1-B5
Injection Date  : 9/12/2020 5:03:14 PM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\10IPA_20_8_4.M
Last changed    : 9/11/2020 8:14:55 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\10IPA_20_8_4.M (Sequence Method)
Last changed    : 9/12/2020 9:52:06 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.708 BV    0.1850 2317.88989  194.59912  50.0108
   2   8.398 VB    0.2180 2316.88647  164.78603  49.9892

Totals :                  4634.77637  359.38515


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-11 08-36-22\OnlineEdited--063.D
Sample Name: YH-17-150-EE

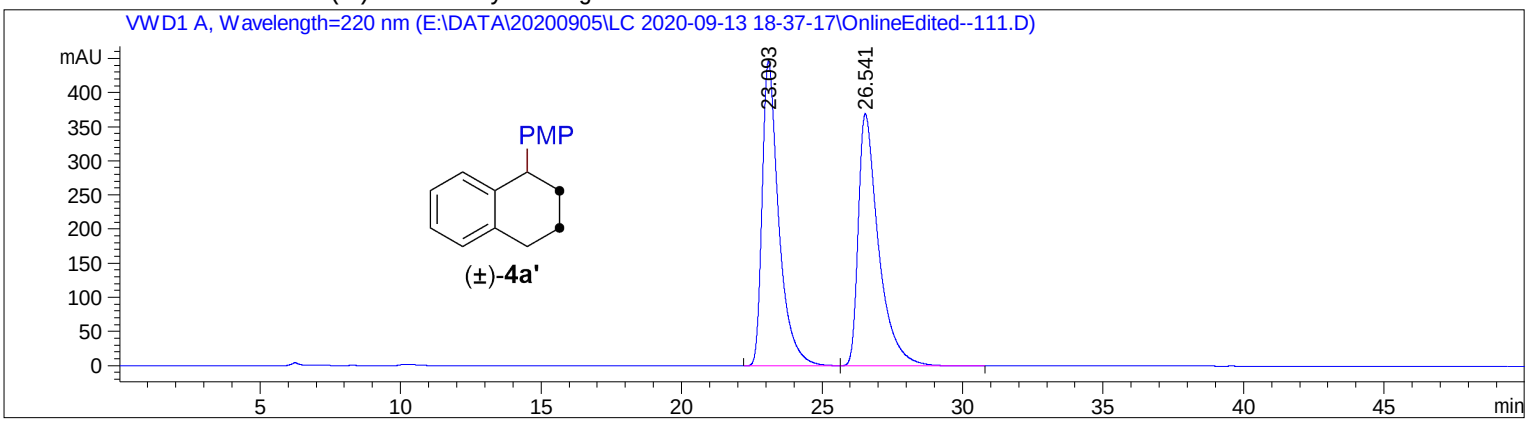
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  63
Acq. Instrument : HPLC1260                         Location :   P1-B6
Injection Date  : 9/12/2020 5:24:00 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-11 08-36-22\10IPA_20_8_4.M
Last changed    : 9/11/2020 8:14:55 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-11 08-36-22\10IPA_20_8_4.M (Sequence Method)
Last changed    : 9/12/2020 9:52:06 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   7.722 FM    0.2043  130.43301   10.64253   3.6710
   2   8.456 VB    0.2212 3422.60986  238.79257  96.3290

Totals :                   3553.04288  249.43510


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--111.D
Sample Name: YH-17-170-RAC

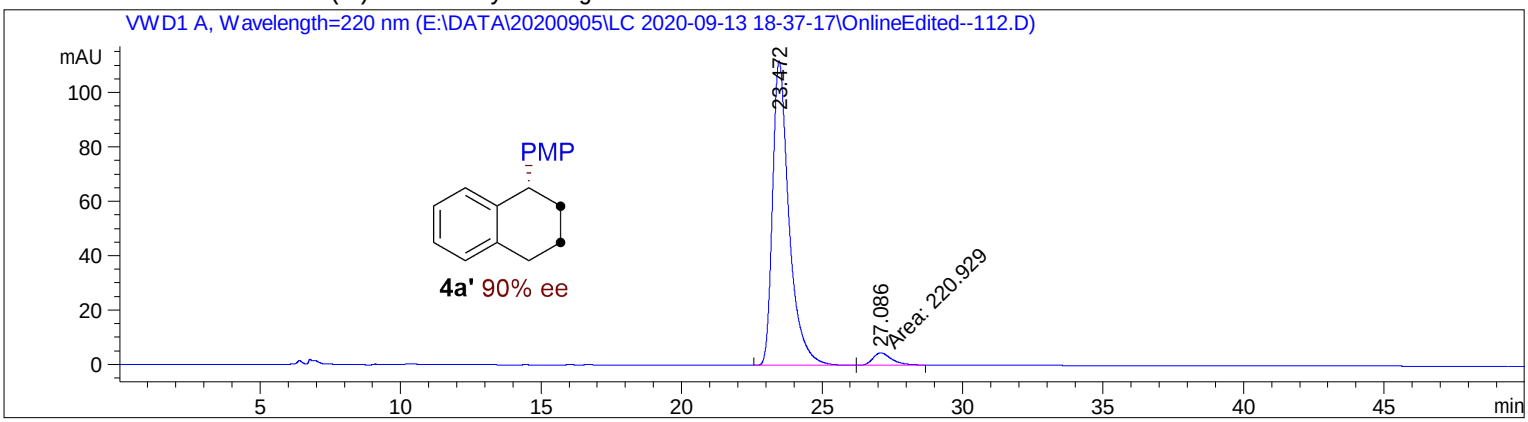
```
==================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 111
Acq. Instrument : HPLC1260                         Location :   P1-C3
Injection Date  : 9/16/2020 2:59:49 AM                  Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 0.100 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\1EtOH_50_5_1.M
Last changed    : 9/15/2020 3:46:59 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\1EtOH_50_5_1.M (Sequence Method)
Last changed    : 9/16/2020 9:20:20 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.093 BB    0.6134 1.83690e4   446.12729  49.8547
   2  26.541 BB    0.7399 1.84760e4   369.18671  50.1453

Totals :                  3.68450e4   815.31400


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20200905\LC 2020-09-13 18-37-17\OnlineEdited--112.D
Sample Name: YH-17-170-EE

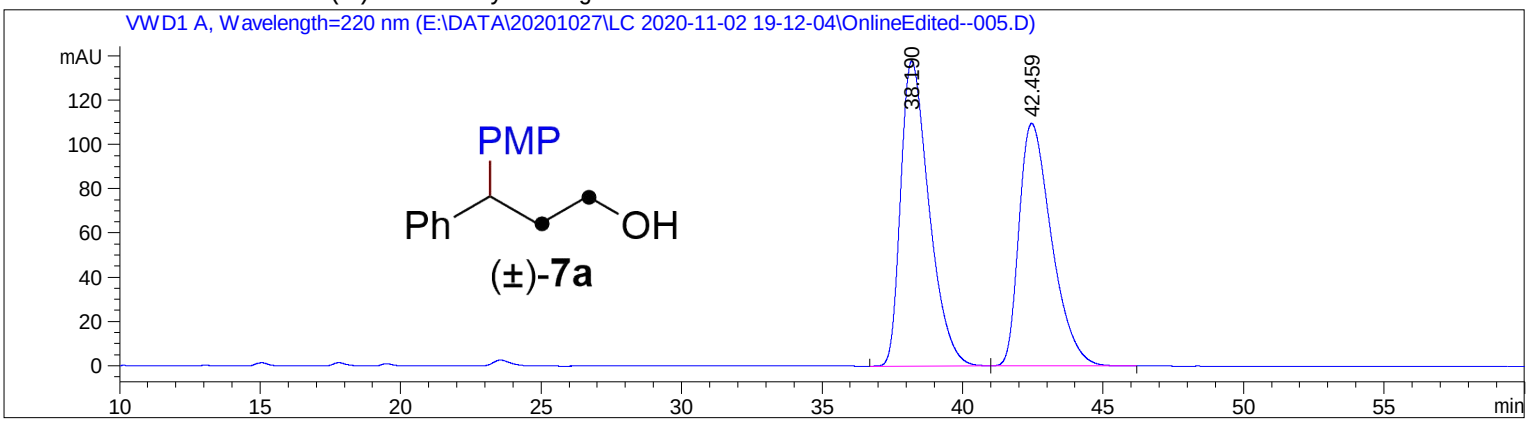
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line : 112
Acq. Instrument : HPLC1260                         Location :   P1-C4
Injection Date  : 9/16/2020 3:50:38 AM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20200905\LC 2020-09-13 18-37-17\1EtOH_50_5_1.M
Last changed    : 9/15/2020 3:46:59 PM by SYSTEM
Analysis Method : E:\DATA\20200905\LC 2020-09-13 18-37-17\1EtOH_50_5_1.M (Sequence Method)
Last changed    : 9/16/2020 9:20:20 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.472 BB    0.6120 4572.08252  111.81881  95.3906
   2  27.086 MF    0.8030  220.92908    4.58552   4.6094

Totals :                  4793.01160  116.40432


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-02 19-12-04\OnlineEdited--005.D
Sample Name: YH-18-81-RAC

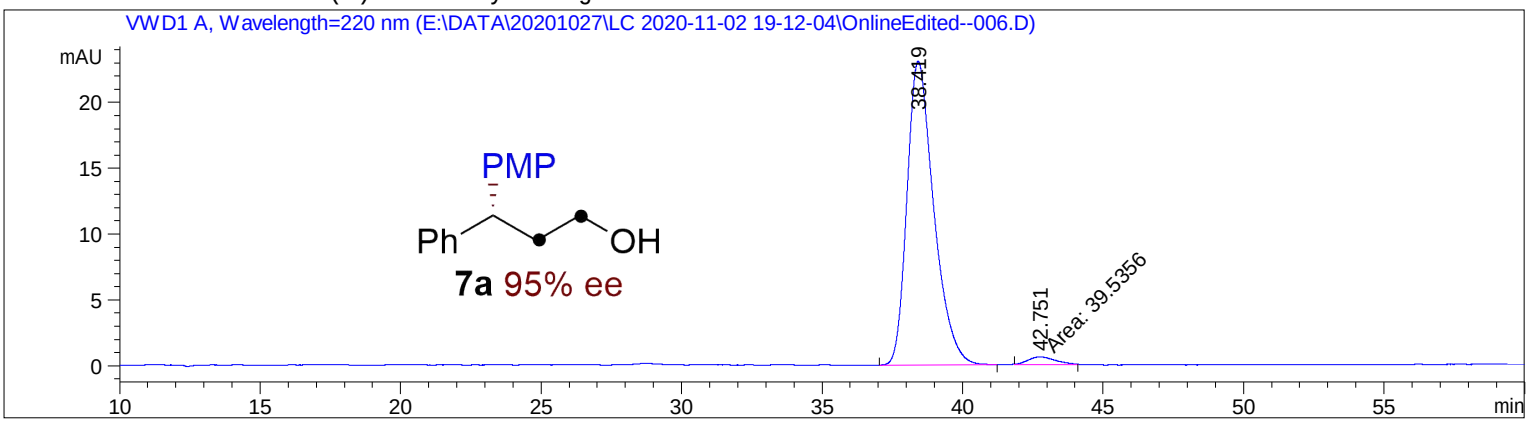
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   5
Acq. Instrument : HPLC1260                         Location :   P1-A1
Injection Date  : 11/2/2020 9:17:03 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-02 19-12-04\5IPA_60_8_3.M
Last changed    : 11/2/2020 8:34:42 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-02 19-12-04\5IPA_60_8_3.M (Sequence Method)
Last changed    : 11/3/2020 8:16:37 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  38.190 BB    1.0737 9665.29883  137.73904  52.2905
   2  42.459 BB    1.2331 8818.56152  109.55659  47.7095

Totals :                  1.84839e4   247.29563


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-02 19-12-04\OnlineEdited--006.D
Sample Name: YH-18-81-EE

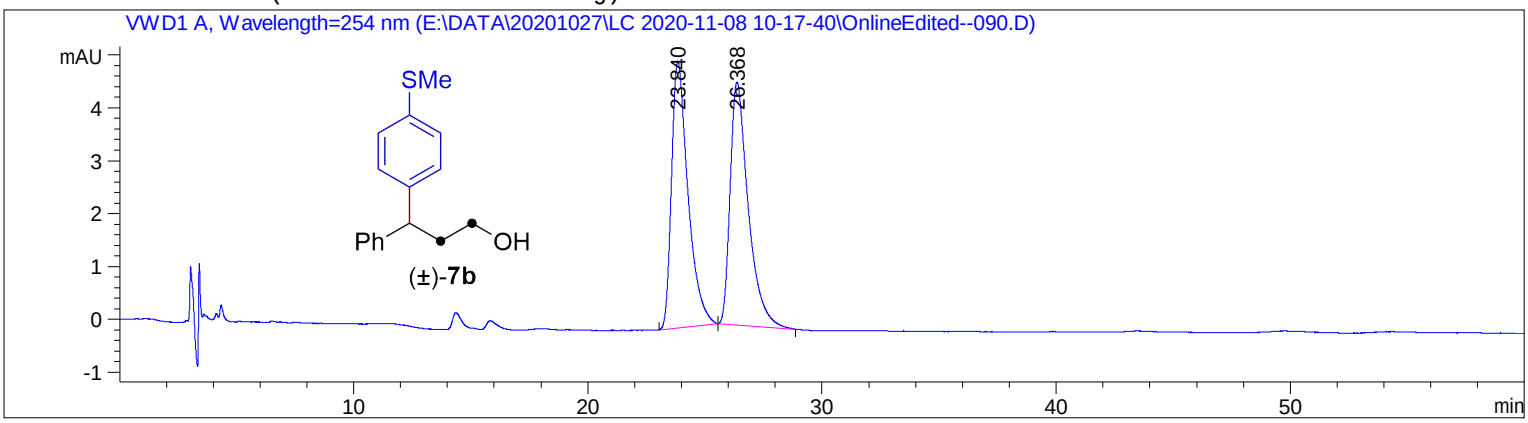
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   6
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 11/2/2020 10:17:51 PM                Inj :   1
                                                 Inj Volume : 3.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-02 19-12-04\5IPA_60_8_3.M
Last changed    : 11/2/2020 8:34:42 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-02 19-12-04\5IPA_60_8_3.M (Sequence Method)
Last changed    : 11/3/2020 8:16:37 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  38.419 BB    0.9930 1529.97595   23.06288  97.4810
   2  42.751 MF    1.1403   39.53560 5.77867e-1   2.5190

Totals :                  1569.51155   23.64074


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-08 10-17-40\OnlineEdited--090.D
Sample Name: YH-18-92-RAC-AD

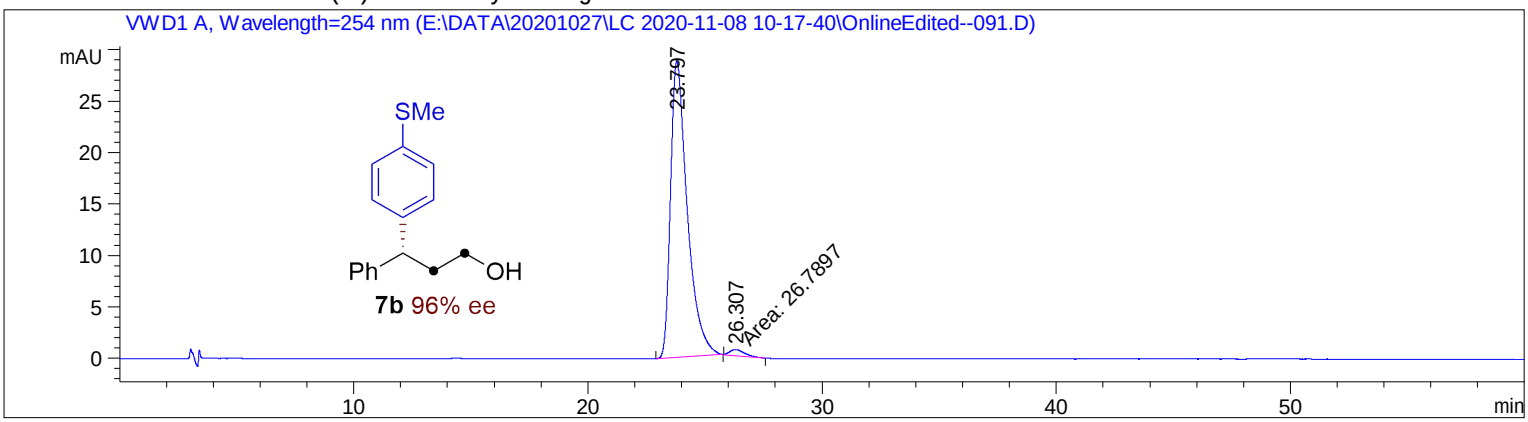
```
==================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  90
Acq. Instrument : HPLC1260                         Location :   P1-D3
Injection Date  : 11/10/2020 5:13:10 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-08 10-17-40\5IPA_60_10_3.M
Last changed    : 11/9/2020 3:42:20 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-08 10-17-40\5IPA_60_10_3.M (Sequence Method)
Last changed    : 11/10/2020 9:02:46 AM by SYSTEM
                  (modified after loading)
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.840 BB    0.6979  246.77345    5.04253  50.0282
   2  26.368 BB    0.7664  246.49480    4.59865  49.9718

Totals :                   493.26825    9.64117


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-08 10-17-40\OnlineEdited--091.D
Sample Name: YH-18-92-EE

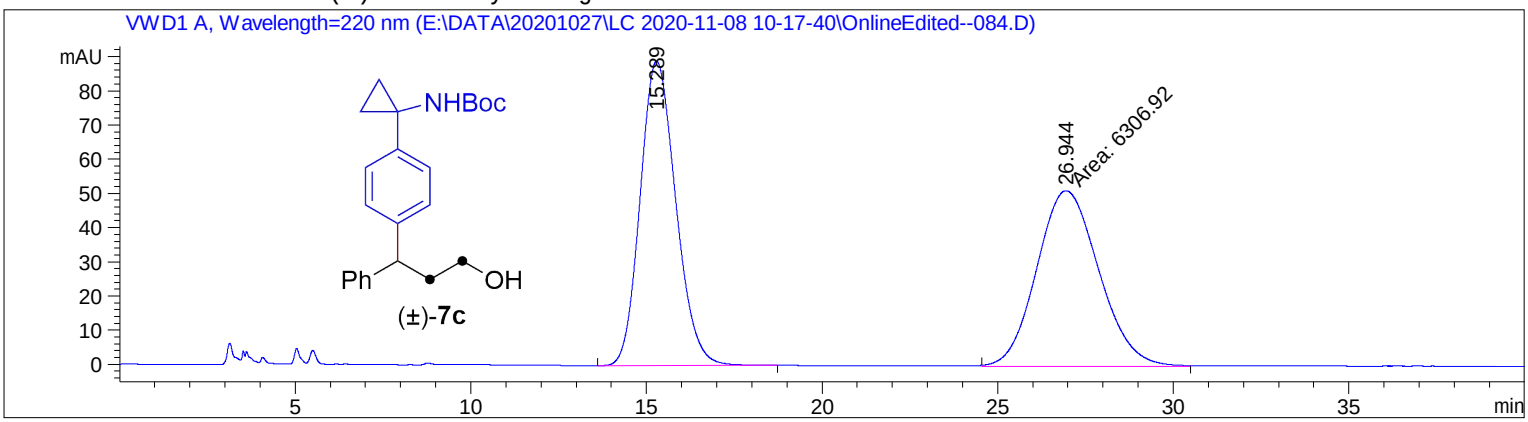
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  91
Acq. Instrument : HPLC1260                         Location :   P1-D4
Injection Date  : 11/10/2020 6:14:00 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-08 10-17-40\5IPA_60_10_3.M
Last changed    : 11/9/2020 3:42:20 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-08 10-17-40\5IPA_60_10_3.M (Sequence Method)
Last changed    : 11/10/2020 9:02:46 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  23.797 BB    0.7363 1428.68213   28.77318  98.1594
   2  26.307 MM    0.7397   26.78973 6.03619e-1   1.8406

Totals :                  1455.47186   29.37680


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-08 10-17-40\OnlineEdited--084.D
Sample Name: YH-18-90-RAC

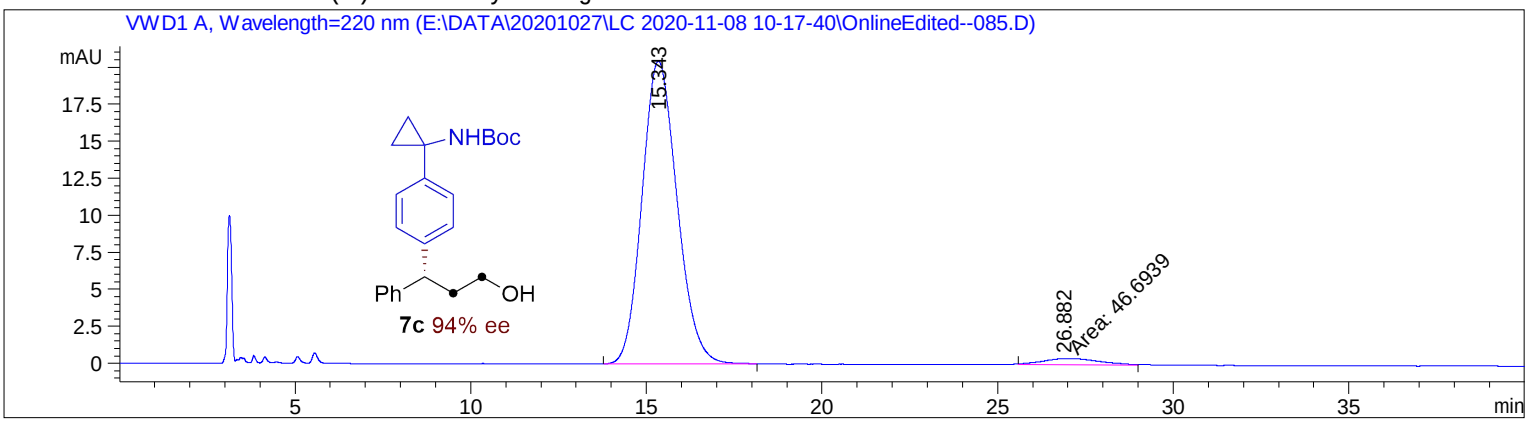
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  84
Acq. Instrument : HPLC1260                         Location :   P1-D1
Injection Date  : 11/10/2020 12:57:55 AM               Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-08 10-17-40\25IPA_40_10_4.M
Last changed    : 11/9/2020 3:38:40 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-08 10-17-40\25IPA_40_10_4.M (Sequence Method)
Last changed    : 11/10/2020 9:00:06 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  15.289 BB    1.0925 6273.77100   88.99331  49.8683
   2  26.944 MM    2.0482 6306.91895   51.32027  50.1317

Totals :                  1.25807e4   140.31358


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-08 10-17-40\OnlineEdited--085.D
Sample Name: YH-18-90-EE

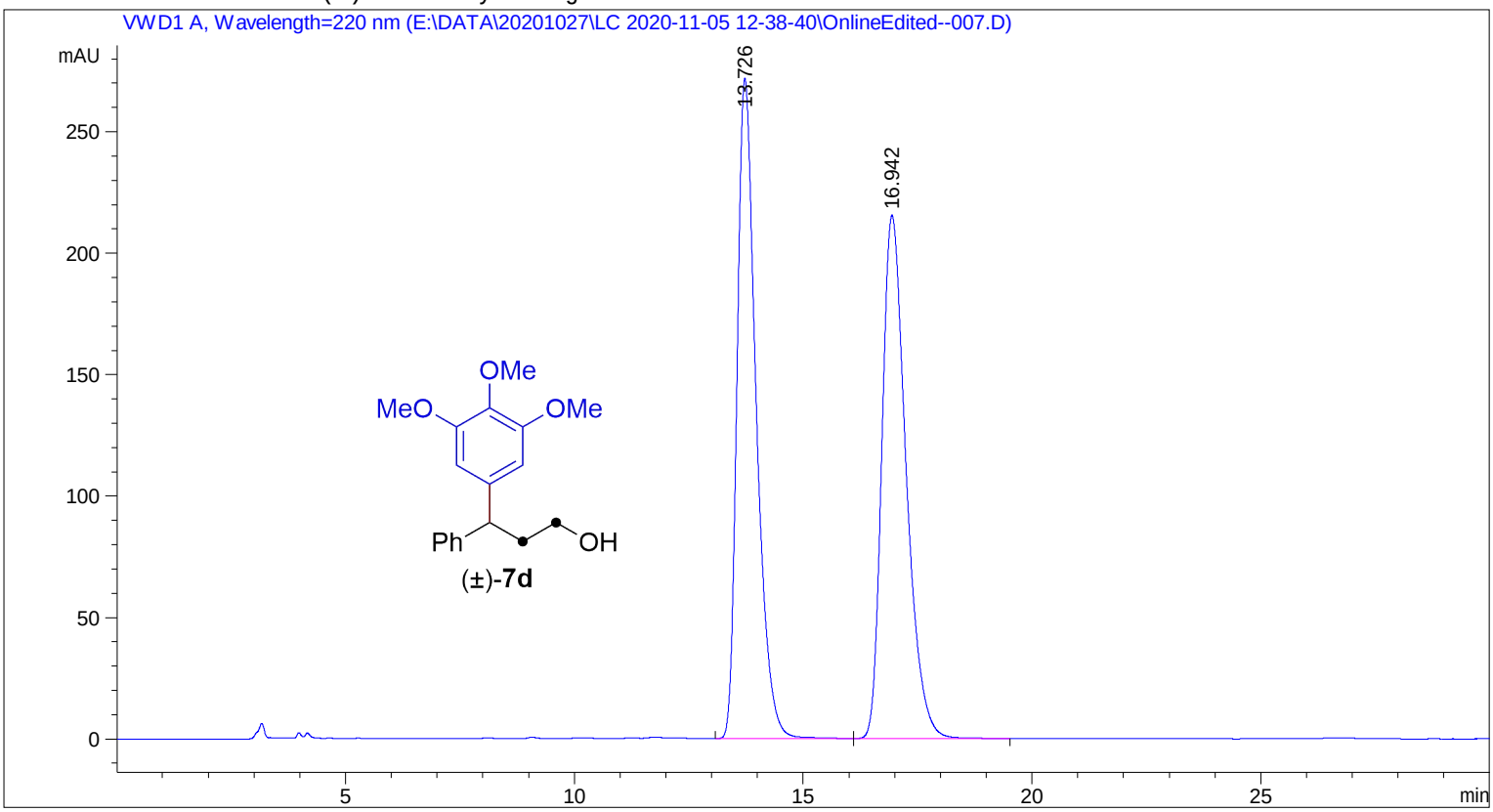
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  85
Acq. Instrument : HPLC1260                         Location :   P1-D2
Injection Date  : 11/10/2020 1:38:46 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-08 10-17-40\25IPA_40_10_4.M
Last changed    : 11/9/2020 3:38:40 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-08 10-17-40\25IPA_40_10_4.M (Sequence Method)
Last changed    : 11/10/2020 9:00:06 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  15.343 BB    1.0508 1418.77441   20.43937  96.8137
   2  26.882 FM    1.8297   46.69392 4.25322e-1   3.1863

Totals :                  1465.46833   20.86470


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-05 12-38-40\OnlineEdited--007.D
Sample Name: YH-18-83-RAC

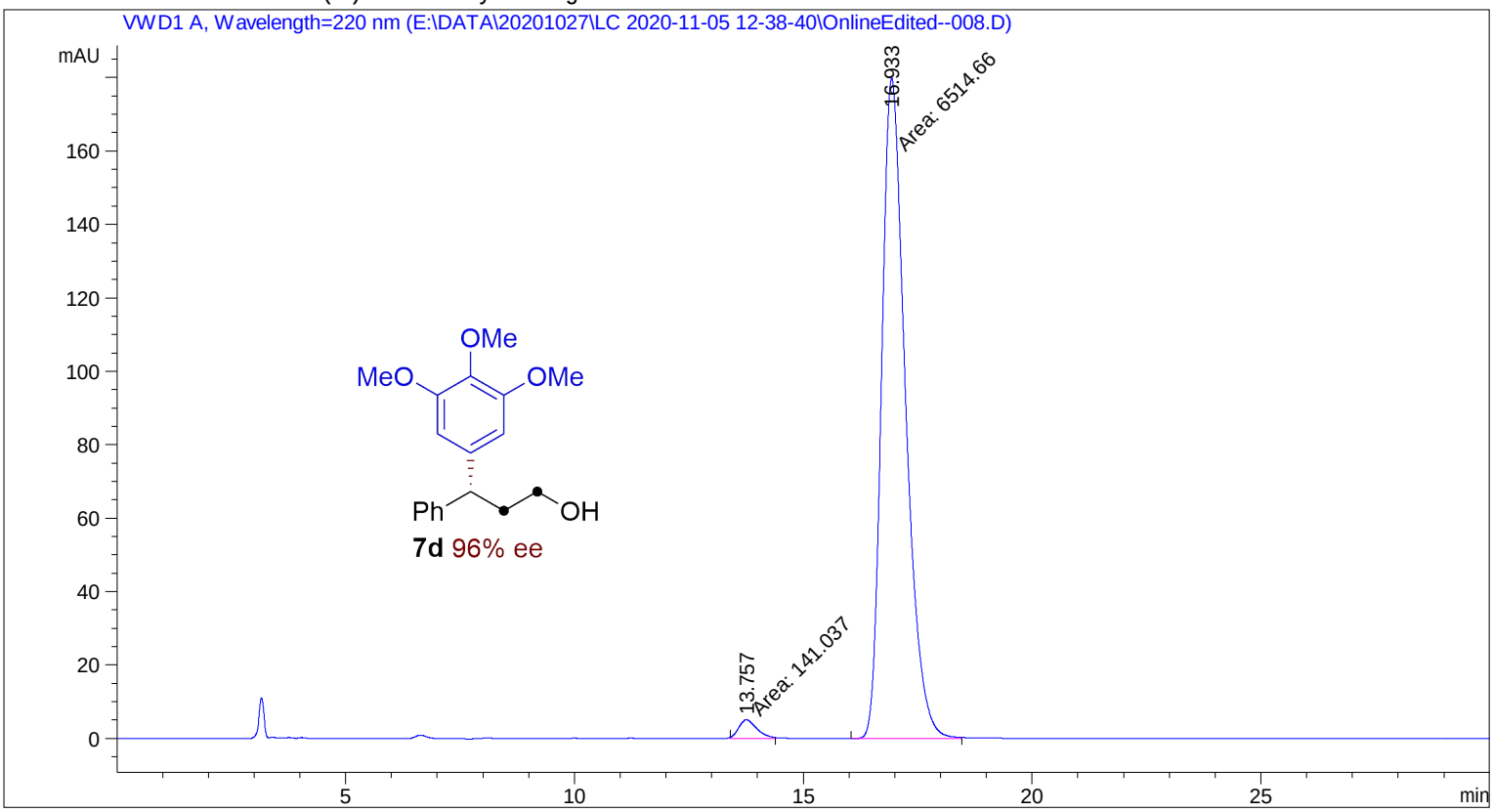
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   7
Acq. Instrument : HPLC1260                         Location :   P1-B1
Injection Date  : 11/5/2020 3:21:53 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-05 12-38-40\10IPA_30_10_1.M
Last changed    : 11/5/2020 1:49:04 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-05 12-38-40\10IPA_30_10_1.M (Sequence Method)
Last changed    : 11/5/2020 2:19:41 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.726 BB    0.4386 7893.44824  271.93649  49.9928
   2  16.942 BB    0.5595 7895.72559  215.45660  50.0072

Totals :                  1.57892e4   487.39310


==========================================================================
```

Data File E:\DATA\20201027\LC 2020-11-05 12-38-40\OnlineEdited--008.D
Sample Name: YH-18-83-EE

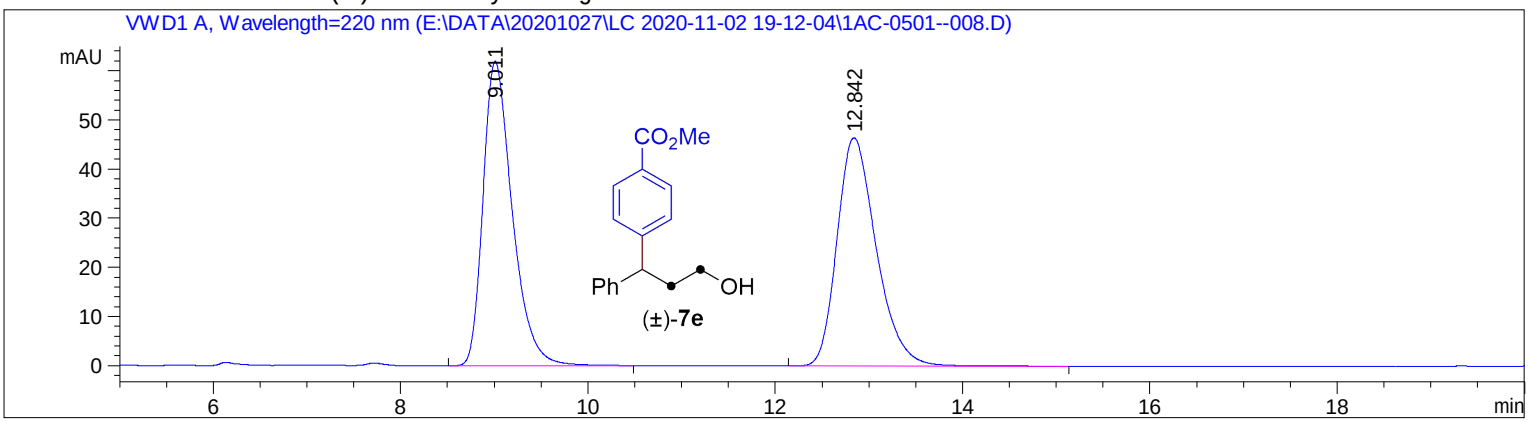
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   8
Acq. Instrument : HPLC1260                         Location :   P1-B2
Injection Date  : 11/5/2020 3:52:38 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-05 12-38-40\10IPA_30_10_1.M
Last changed    : 11/5/2020 1:49:04 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-05 12-38-40\10IPA_30_10_1.M (Sequence Method)
Last changed    : 11/5/2020 2:19:41 PM by SYSTEM
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.757 FM    0.4611  141.03728    5.09765   2.1190
   2  16.933 MF    0.6036 6514.66016  179.87325  97.8810

Totals :                  6655.69743  184.97089


==========================================================================
```

Data File E:\DATA\20201027\LC 2020-11-02 19-12-04\1AC-0501--008.D
Sample Name: YH-18-82-RAC

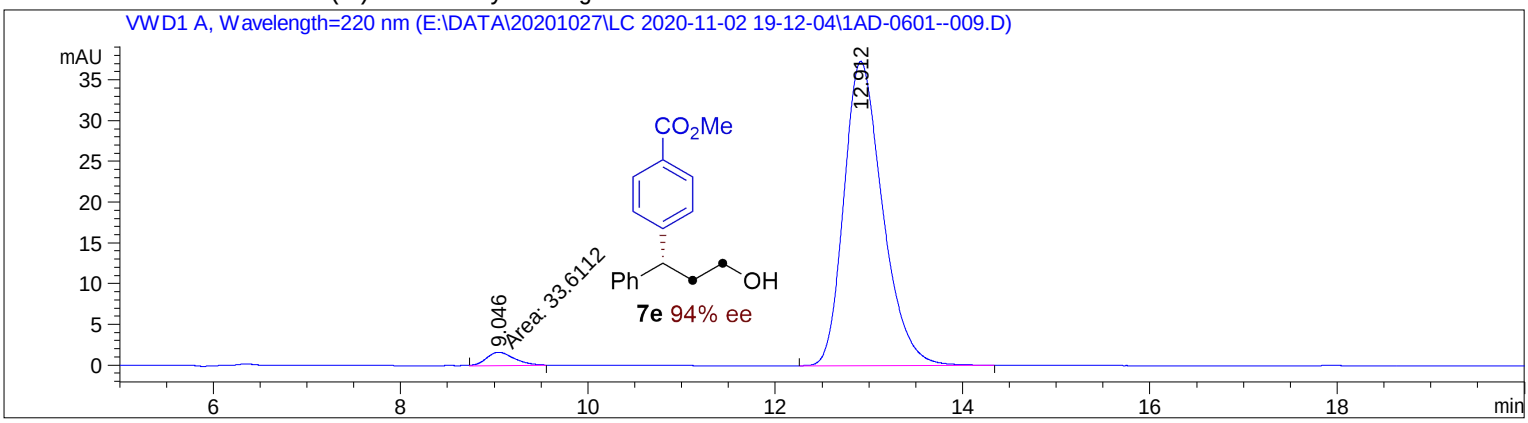
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   8
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 11/2/2020 11:39:29 PM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-02 19-12-04\20IPA_30_10_3.M
Last changed    : 11/2/2020 7:12:04 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-02 19-12-04\20IPA_30_10_3.M (Sequence Method)
Last changed    : 11/3/2020 8:15:39 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.011 BB    0.3291 1344.02332   61.95635  49.8827
   2  12.842 BB    0.4452 1350.34583   46.45029  50.1173

Totals :                  2694.36914  108.40664


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-02 19-12-04\1AD-0601--009.D
Sample Name: YH-18-82-EE

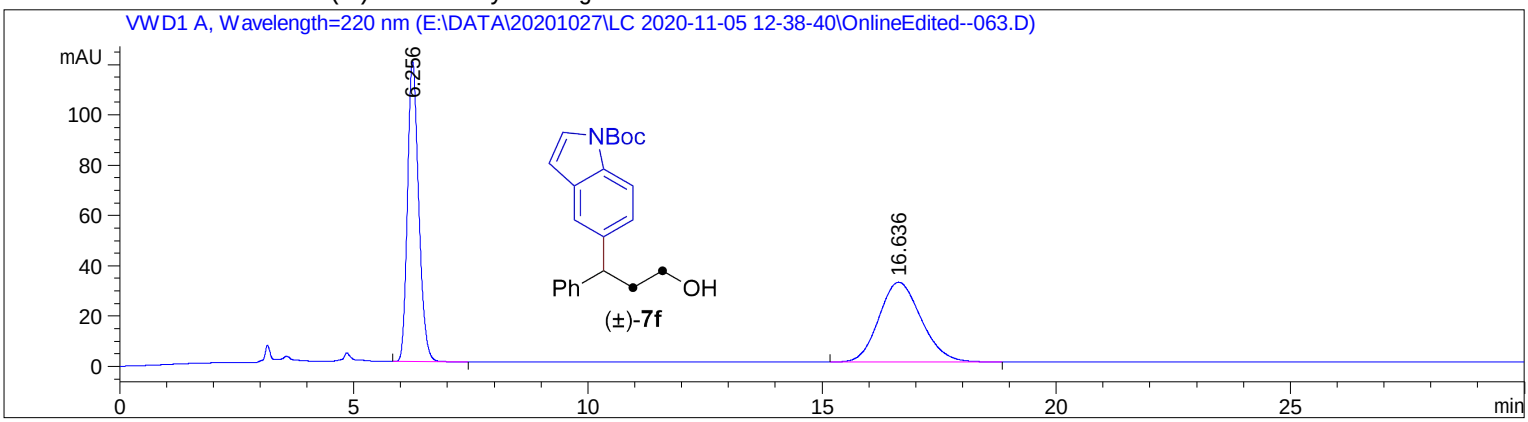
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :   9
Acq. Instrument : HPLC1260                          Location :   P1-A4
Injection Date  : 11/3/2020 12:10:16 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-02 19-12-04\20IPA_30_10_3.M
Last changed    : 11/2/2020 7:12:04 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-02 19-12-04\20IPA_30_10_3.M (Sequence Method)
Last changed    : 11/3/2020 8:15:01 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   9.046 MM    0.3439   33.61117    1.62896   3.0469
   2  12.912 BB    0.4383 1069.49963   37.32675  96.9531

Totals :                  1103.11081   38.95571


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-05 12-38-40\OnlineEdited--063.D
Sample Name: YH-18-89-RAC

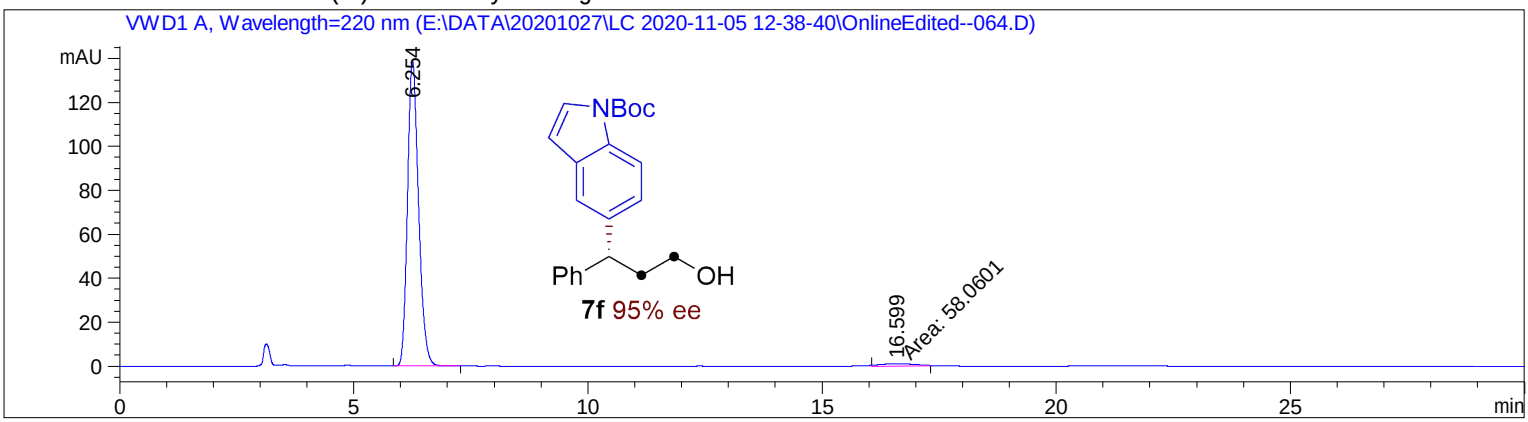
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  63
Acq. Instrument : HPLC1260                         Location :   P1-A3
Injection Date  : 11/6/2020 3:02:15 PM                 Inj :   2
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-05 12-38-40\30IPA_30_0.8_3.M
Last changed    : 11/6/2020 2:57:07 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-05 12-38-40\30IPA_30_0.8_3.M (Sequence Method)
Last changed    : 11/6/2020 7:47:03 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   6.256 BB    0.2551 1986.54639  119.43031  50.0496
   2  16.636 BB    0.9632 1982.60645   31.67539  49.9504

Totals :                  3969.15283  151.10570


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-05 12-38-40\OnlineEdited--064.D
Sample Name: YH-18-89-EE

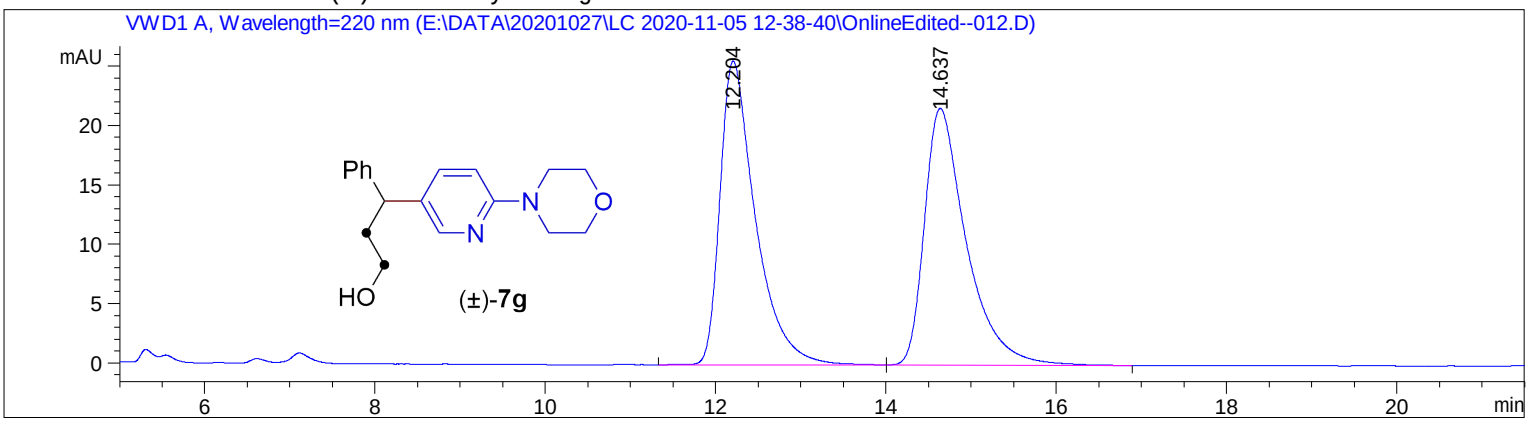
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  64
Acq. Instrument : HPLC1260                         Location :   P1-A4
Injection Date  : 11/6/2020 3:33:01 PM                 Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-05 12-38-40\30IPA_30_0.8_3.M
Last changed    : 11/6/2020 2:57:07 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-05 12-38-40\30IPA_30_0.8_3.M (Sequence Method)
Last changed    : 11/6/2020 7:47:03 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1   6.254 BB    0.2525 2276.00708  138.65160  97.5125
   2  16.599 MF    0.8830   58.06006    1.09585   2.4875

Totals :                  2334.06714  139.74745


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-05 12-38-40\OnlineEdited--012.D
Sample Name: YH-18-85-RAC

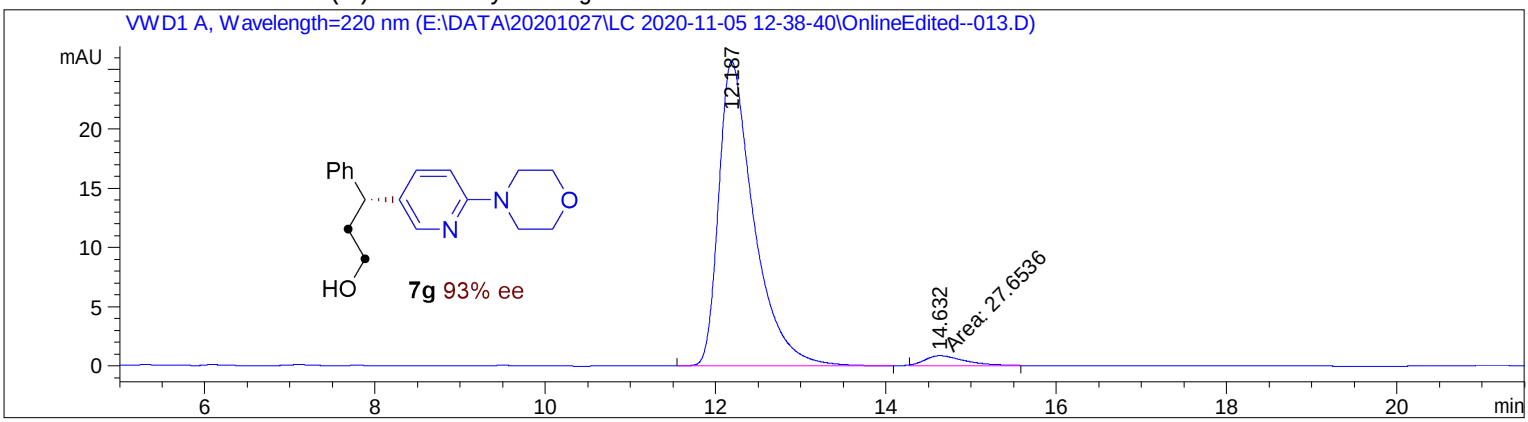
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  12
Acq. Instrument : HPLC1260                       Location :   P1-B3
Injection Date  : 11/5/2020 5:26:51 PM                Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-05 12-38-40\20IPA_60_10_3.M
Last changed    : 11/5/2020 6:11:04 PM by SYSTEM
                  (modified after loading)
Analysis Method : E:\DATA\20201027\LC 2020-11-05 12-38-40\20IPA_60_10_3.M (Sequence Method)
Last changed    : 11/5/2020 7:05:40 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.204 BB    0.4263  739.40247   25.57660  50.0571
   2  14.637 BB    0.5043  737.71674   21.60793  49.9429

Totals :                  1477.11920   47.18453


==================================================================
                        *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-05 12-38-40\OnlineEdited--013.D
Sample Name: YH-18-85-EE

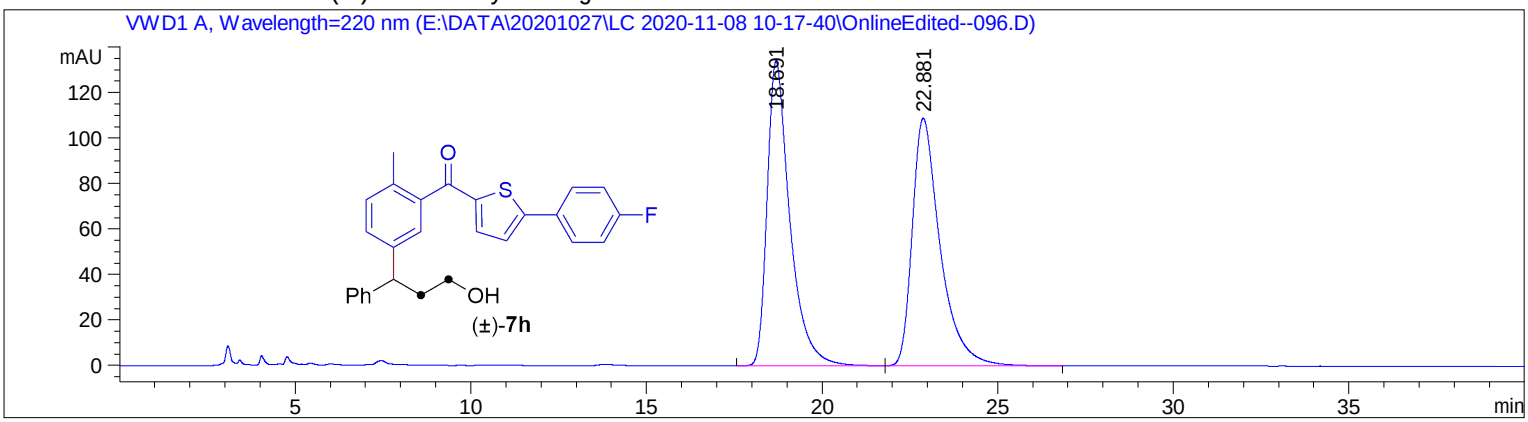
```
==================================================================
Acq. Operator   : SYSTEM                        Seq. Line :  13
Acq. Instrument : HPLC1260                       Location :   P1-B4
Injection Date  : 11/5/2020 6:11:50 PM               Inj :   1
                                                Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-05 12-38-40\20IPA_60_10_3.M
Last changed    : 11/5/2020 6:11:04 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-05 12-38-40\20IPA_60_10_3.M (Sequence Method)
Last changed    : 11/5/2020 7:06:07 PM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==================================================================
                        Area Percent Report
==================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  12.187 BB    0.4210  735.36993   25.69036  96.3758
   2  14.632 FM    0.5482   27.65362 8.40750e-1   3.6242

Totals :                   763.02355   26.53111


==================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-08 10-17-40\OnlineEdited--096.D
Sample Name: YH-18-93-RAC-AD

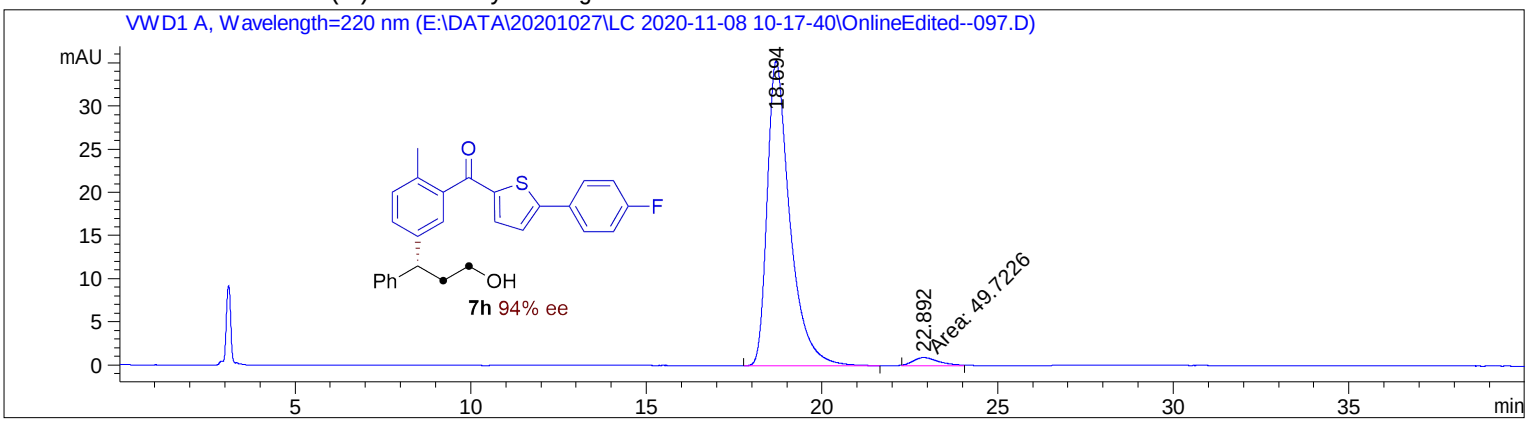
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  96
Acq. Instrument : HPLC1260                         Location :   P1-D5
Injection Date  : 11/10/2020 9:18:26 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-08 10-17-40\20IPA_40_10_3.M
Last changed    : 11/9/2020 3:44:13 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-08 10-17-40\20IPA_40_10_3.M (Sequence Method)
Last changed    : 11/10/2020 10:59:07 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.691 BB    0.6668 6010.69727  133.88478  50.0093
   2  22.881 BB    0.8188 6008.46924  108.88432  49.9907

Totals :                  1.20192e4   242.76910


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-08 10-17-40\OnlineEdited--097.D
Sample Name: YH-18-93-EE

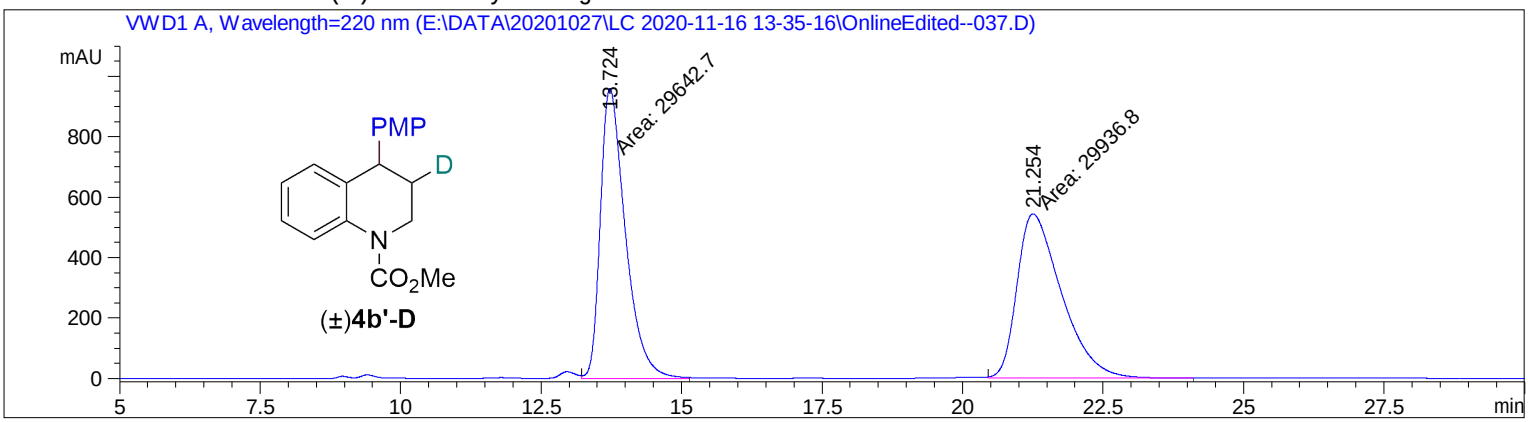
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  97
Acq. Instrument : HPLC1260                         Location :   P1-D6
Injection Date  : 11/10/2020 9:59:13 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 2.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-08 10-17-40\20IPA_40_10_3.M
Last changed    : 11/9/2020 3:44:13 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-08 10-17-40\20IPA_40_10_3.M (Sequence Method)
Last changed    : 11/10/2020 10:59:07 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  18.694 BB    0.6654 1585.69543   35.28029  96.9596
   2  22.892 FM    0.8705   49.72256 9.52012e-1   3.0404

Totals :                  1635.41800   36.23230


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-16 13-35-16\OnlineEdited--037.D
Sample Name: YH-18-101-RAC

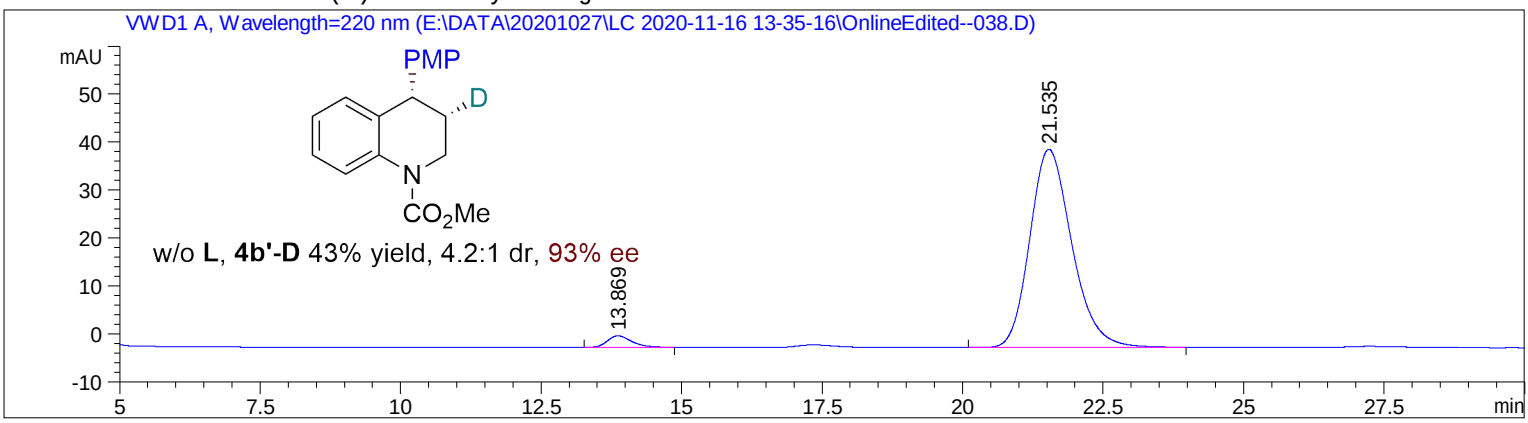
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  37
Acq. Instrument : HPLC1260                         Location :   P1-F1
Injection Date  : 11/17/2020 3:35:54 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 1.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-16 13-35-16\20IPA_50_10_4.M
Last changed    : 11/16/2020 8:05:16 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-16 13-35-16\20IPA_50_10_4.M (Sequence Method)
Last changed    : 1/20/2022 10:11:35 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                        Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.724 MF    0.5154 2.96427e4   958.56610  49.7532
   2  21.254 FM    0.9173 2.99368e4   543.94635  50.2468

Totals :                  5.95795e4  1502.51245


==========================================================================
                        *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-16 13-35-16\OnlineEdited--038.D
Sample Name: YH-18-101-1

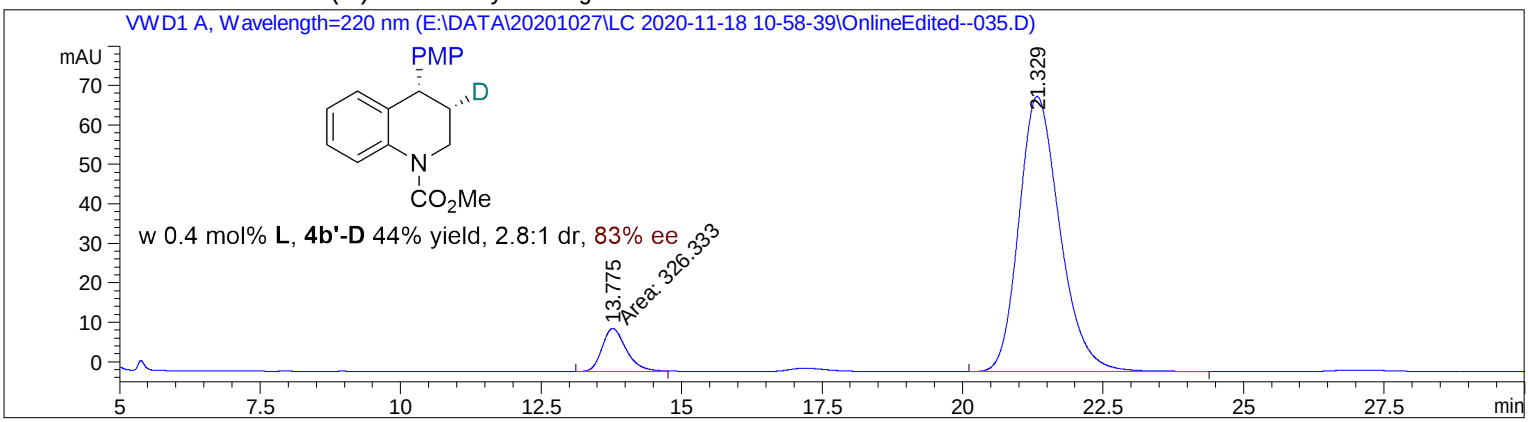
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  38
Acq. Instrument : HPLC1260                         Location :   P1-F2
Injection Date  : 11/17/2020 4:26:42 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-16 13-35-16\20IPA_50_10_4.M
Last changed    : 11/16/2020 8:05:16 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-16 13-35-16\20IPA_50_10_4.M (Sequence Method)
Last changed    : 1/20/2022 10:12:48 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.869 BB    0.4527   72.94081    2.40570   3.2806
   2  21.535 BB    0.7966 2150.43115   41.36130  96.7194

Totals :                  2223.37196   43.76700


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-18 10-58-39\OnlineEdited--035.D
Sample Name: YH-18-101-3-EE

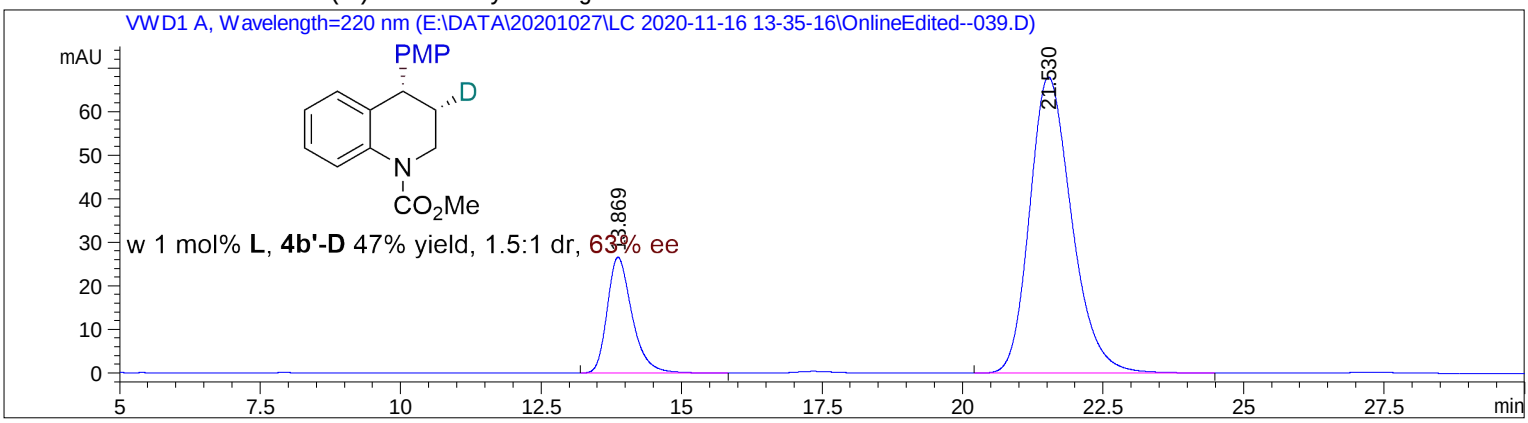
```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  35
Acq. Instrument : HPLC1260                         Location :   P1-A2
Injection Date  : 11/19/2020 2:18:25 AM                Inj :   1
                                                  Inj Volume : 3.000 µl
Different Inj Volume from Sample Entry!  Actual Inj Volume : 5.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-18 10-58-39\20IPA_50_10_3.M
Last changed    : 11/18/2020 8:24:13 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-18 10-58-39\20IPA_50_10_3.M (Sequence Method)
Last changed    : 1/20/2022 10:14:52 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.775 MF    0.4988  326.33282   10.90301   8.4664
   2  21.329 BB    0.7763 3528.12524   69.72406  91.5336

Totals :                  3854.45807   80.62707


==========================================================================
                          *** End of Report ***
```

Data File E:\DATA\20201027\LC 2020-11-16 13-35-16\OnlineEdited--039.D
Sample Name: YH-18-101-2

```
==========================================================================
Acq. Operator   : SYSTEM                          Seq. Line :  39
Acq. Instrument : HPLC1260                         Location :   P1-F3
Injection Date  : 11/17/2020 5:17:32 AM                Inj :   1
                                                 Inj Volume : 3.000 µl
Acq. Method     : E:\DATA\20201027\LC 2020-11-16 13-35-16\20IPA_50_10_4.M
Last changed    : 11/16/2020 8:05:16 PM by SYSTEM
Analysis Method : E:\DATA\20201027\LC 2020-11-16 13-35-16\20IPA_50_10_4.M (Sequence Method)
Last changed    : 1/20/2022 10:13:33 AM by SYSTEM
                  (modified after loading)
Additional Info : Peak(s) manually integrated
```




```
==========================================================================
                          Area Percent Report
==========================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Do not use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=220 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]        [min]   [mAU*s]     [mAU]       %
----|-------|----|-------|----------|----------|--------|
   1  13.869 BB    0.4684  815.76105   26.55793  18.7263
   2  21.530 BB    0.7967 3540.47559   67.96634  81.2737

Totals :                  4356.23663   94.52427


==========================================================================
                          *** End of Report ***
```

3. Supplementary References

1. He, Y., Liu, C., Yu, L. & Zhu, S. Enantio- and regioselective NiH-catalyzed reductive hydroarylation of vinylarenes with aryl iodides. *Angew. Chem. Int. Ed.* **59**, 21530–21534 (2020).

2. Do, H.-Q., Chandrashekar, E. R. R. & Fu, G. C. Nickel/bis(oxazoline)-catalyzed asymmetric negishi arylations of racemic secondary benzylic electrophiles to generate enantioenriched 1,1-diarylalkanes. *J. Am. Chem. Soc.* **135**, 44, 16288–16291 (2013).

3. Frisch, M. J., Trucks, G. W., Schlegel, H. B., Scuseria, G. E., Robb, M. A., Cheeseman, J. R., Scalmani, G., Barone, V., Mennucci, B., Petersson, G. A., Nakatsuji, H., Caricato, M., Li, X., Hratchian, H. P., Izmaylov, A. F., Bloino, J., Zheng, G., Sonnenberg, J. L., Hada, M., Ehara, M., Toyota, K., Fukuda, R., Hasegawa, J., Ishida, M., Nakajima, T., Honda, Y., Kitao, O., Nakai, H., Vreven, T., Montgomery, J. A. Jr., Peralta, J. E., Ogliaro, F., Bearpark, M., Heyd, J. J., Brothers, E., Kudin, K. N., Staroverov, V. N., Keith, T., Kobayashi, R., Normand, J., Raghavachari, K., Rendell, A., Burant, J. C., Iyengar, S. S., Tomasi, J., Cossi, M., Rega, N., Millam, J. M., Klene, M., Knox, J. E., Cross, J. B., Bakken, V., Adamo, C., Jaramillo, J., Gomperts, R., Stratmann, R. E., Yazyev, O., Austin, A. J., Cammi, R., Pomelli, C., Ochterski, J. W., Martin, R. L., Morokuma, K., Zakrzewski, V. G., Voth, G. A., Salvador, P., Dannenberg, J. J., Dapprich, S., Daniels, A. D., Farkas, O., Foresman, J. B., Ortiz, J. V., Cioslowski, J. & Fox, D. J. Gaussian 09, Revision E.01. Gaussian, Inc., Wallingford CT, 2013.

4. Becke, A. D. Density-functional thermochemistry. III. the role of exact exchange. *J. Chem. Phys.* **98**, 5648–5652 (1993).

5. Lee, C., Yang, W. & Parr, R. G. Development of the Colle-Salvetti correlation-energy formula into a functional of the electron density. *Phys. Rev. B* **37**, 785–789 (1988).

6. Hay, P. J. & Wadt, W. R. Ab initio effective core potentials for molecular calculations - potentials for the transition-metal atoms Sc to Hg. *J. Chem. Phys.* **82**, 270–283 (1985).

7. Wadt, W. R. & Hay, P. J. Ab initio effective core potentials for molecular calculations - potentials for main group elements Na to Bi. *J. Chem. Phys.* **82**, 284–298 (1985).

8. Fukui, K. The path of chemical reactions - the IRC approach. *Acc. Chem. Res.* **14**, 363–368 (1981).

9. Zhao, Y. & Truhlar, D. G. The M06 suite of density functionals for main group thermochemistry, thermochemical kinetics, noncovalent interactions, excited states, and transition elements: two new functionals and systematic testing of four M06-class functionals and 12 other functionals. *Theor. Chem. Acc.* **120**, 215–241 (2008).

10. Dolg, M., Wedig, U., Stoll, H. & Preuss, H. Energy-adjusted ab initio pseudopotentials for the 1st-row transition-elements. *J. Chem. Phys.* **86**, 866-872 (1987).

11. Bergner, A., Dolg, M., Kuchle, W., Stoll, H. & Preuss, H. Ab-initio energy-adjusted pseudopotentials for elements of groups 13-17. *Mol. Phys.* **80**, 1431–1441 (1993).

12. Marenich, A. V., Cramer, C. J. & Truhlar, D. G. Universal solvation model based on solute electron density and on a continuum model of the solvent defined by the bulk dielectric constant and atomic surface tensions. *J. Phys. Chem. B* **113**, 6378–6396 (2009).

13. Rosenfarb, J., Huffman, H. L. Jr. & Caruso, J. A. Dielectric constants, viscosities, and related physical properties of several substituted liquid ureas at various temperatures. *J. Chem. Eng. Data* **21**, 150–153 (1976).