Electronic Supplementary Material (ESI) for ChemComm.

Supporting Information

Pd(II)-Catalyzed hydroarylations/hydroalkenylations of terminal alkynes: regioselective synthesis of allylic, homoallylic and 1,3-diene systems

Jivan Shinde, Sundaram Suresh, Veerababurao Kavala, and Ching-Fa Yao*

Department of Chemistry, National Taiwan Normal University, 88, Sec. 4, Ting-Zhou Road, Taipei-11677, Taiwan R.O.C.

* E-mail: cheyaocf@ntnu.edu.tw

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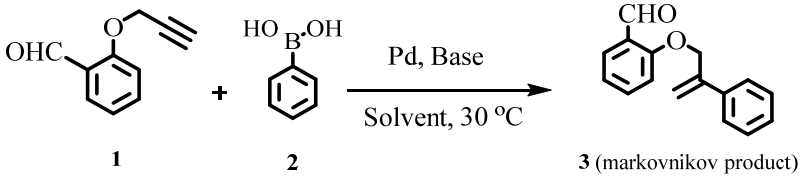
I. General Remarks:

Unless otherwise stated, all reagents were purchased from commercial suppliers and were used directly without any further purification. All solvents were dried according to known methods and distilled prior to use. All reactions were conducted under a nitrogen atmosphere on a dual-manifold Schlenk line unless otherwise mentioned and in oven-dried glassware. All reactions that require anhydrous conditions were conducted under an argon atmosphere. For reactions that required heating, an oil bath was used as the heat source. (Flash column chromatography was performed on 63-200 mesh silica gel using n-hexane (distilled) and ethyl acetate as eluents. ^{1}H and ^{13}C NMR spectra were recorded on a Bruker Ascend spectrometer at 400 and 100 MHz, respectively. Chemical shifts are reported in parts per million (ppm) on the δ scale by using $CDCl_3$, as an internal standard. Multiplicities were indicated by using abbreviations s=singlet; d=doublet; t=triplet; q=quartet; and m=multiplet. Coupling constants are expressed in Hertz (Hz). High-Resolution Mass Spectra (HRMS) were recorded in JEOL JMS-700 M Station and ESI-TOF mode. The melting points (mp) were obtained on an Electro-Thermal FARGO MP-2D capillary melting point apparatus. The X-ray diffraction measurements were carried out at 200 K on either a Bruker D8 Venture or a Bruker KAPPA APEX II CCD area detector system equipped with a graphite monochromator and a Mo-Kα fine-focus sealed tube (k = 0.71073 Å).

II. Table 1. Optimization of the Reaction Conditions.



1 **2** **3** (markovnikov product)

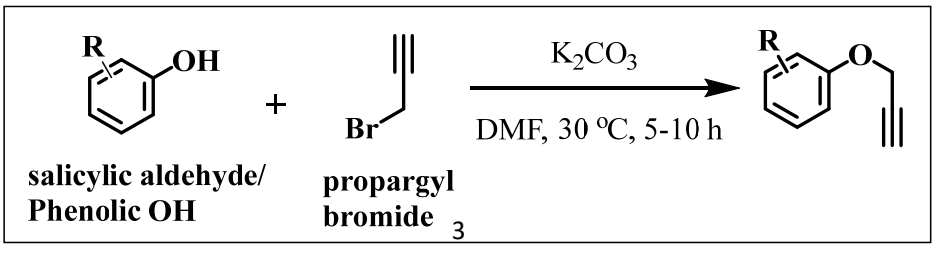
Entry[a]	Cat. (3 mol%)	Base (equiv.)	Solvent 2 mL	T(°C) /*t* (h)	Yield (%)[b]
01	-	KOAc	DCM	30/2.5	ND
02	$PdCl_2(PPh_3)_2$	KOAc	DCM	30/2.5	66
03	$PdCl_2(PPh_3)_2$	KOAc	DMSO	30/2.5	ND
04	$PdCl_2(PPh_3)_2$	KOAc	DMF	30/2.5	ND
05	$PdCl_2(PPh_3)_2$	KOAc	THF	30/2.5	14
06	$PdCl_2(PPh_3)_2$	KOAc	ACN	30/2.5	ND
07	$PdCl_2(PPh_3)_2$	KOAc	$CHCl_3$	30/2.5	58
08	**$PdCl_2(PPh_3)_2$**	**KOAc**	**DCE**	**30/2.5**	**98**
09[c]	$PdCl_2(PPh_3)_2$	KOAc	DCE	30/2.5	54
10	$PdCl_2(PPh_3)_2$	NaOAc	DCE	30/4.5	65
11	$PdCl_2(PPh_3)_2$	K_2CO_3	DCE	30/2.5	ND
12	$PdCl_2(PPh_3)_2$	K_3PO_4	DCE	30/2.5	ND
13	$PdCl_2$	KOAc	DCE	30/2.5	06
14	$Pd(OAc)_2$	KOAc	DCE	30/2.5	ND

[a] **1** (0.4 mmol), **2** (0.6 mmol), catalyst (3 mol%), KOAc (0.8 mmol), solvent (2 mL) at 30 °C for 2.5 h. [b] Yields were calculated from the crude reaction mixtures by ^1H NMR using CH_2Br_2 as the internal standard. [c] 1 mol% of catalyst was used. The biphenyl compound was formed only in traces. ND-not detected.

III. Experimental Procedures

Synthesis of starting materials: -

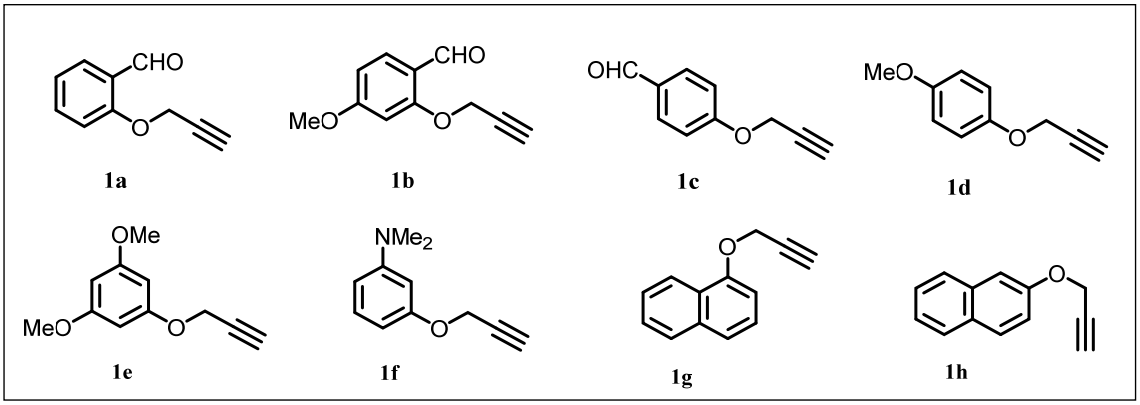
a) General procedure for the synthesis of propargyl aryl ethers [1]



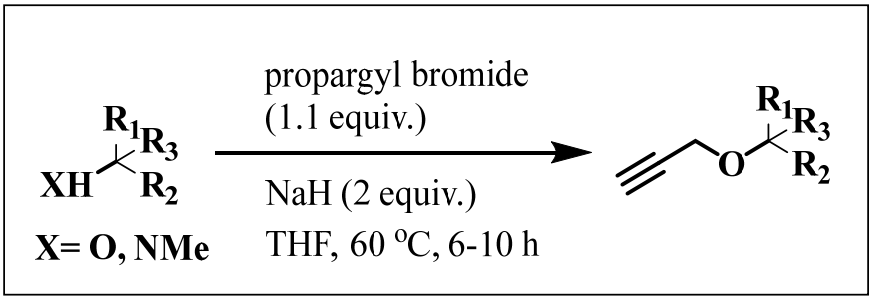
salicylic aldehyde/ Phenolic OH **propargyl bromide**

A 50 mL round bottom flask was charged with salicylic aldehyde (1220 mg, 10 mmol) in DMF (25 mL) then K_2CO_3 (2760 mg, 20 mmol) was added. Then, a propargyl bromide (1309 mg, 11 mmol) was added dropwise at 0 ^{O}C over 5 min. After completion of the addition, the reaction mixture was stirred at 30 ^{O}C for 5 h and quenched with crushed ice. The reaction mixture was extracted with EtOAc (30 mL × 3) and the organic phase was dried over anhydrous $MgSO_4$. The solvent was then removed under reduced pressure and the crude product was purified by flash chromatography with the eluent hexane-ethyl acetate.

List of Isolated molecules-



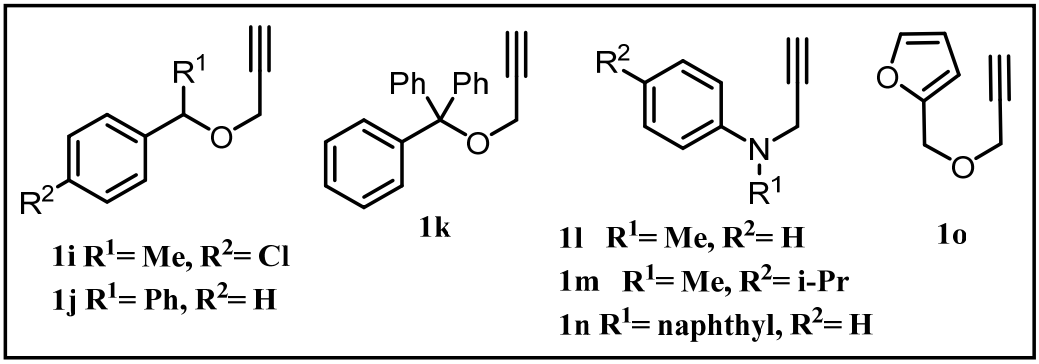
b) General procedure for propargyl aryl ethers/amine synthesis[2]



In a dried 50 mL flask containing alcohol/amine (3 mmol) in THF (25 mL), NaH (0.144 g, 6 mmol) was added. Then a solution of propargyl bromide (0.392 g, 3.3 mmol) in THF (5 mL) was added dropwise over 10 minutes. The reaction mixture was stirred at 60 ^{O}C for 6-10h, after completion of the reaction, NH_4Cl solution was added and the reaction mixture was dissolved

in ethyl acetate further organic layer was separated and dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure, and the crude residue was subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure terminal alkynes.

List of Isolated molecules-



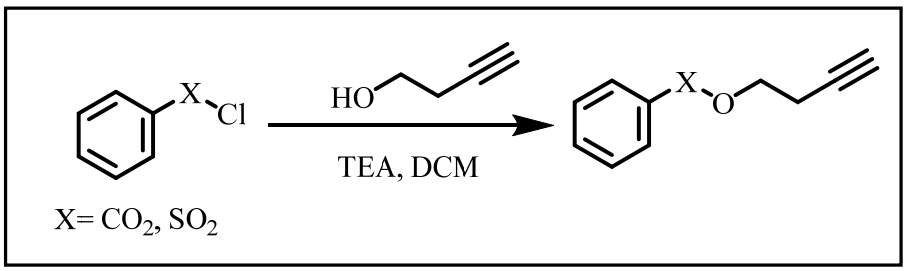
1i R^1= Me, R^2= Cl
1j R^1= Ph, R^2= H

1k

1l R^1= Me, R^2= H
1m R^1= Me, R^2= i-Pr
1n R^1= naphthyl, R^2= H

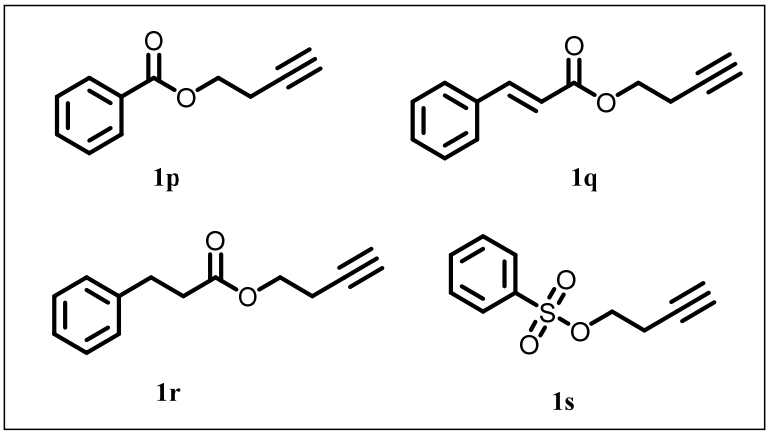
1o

c) General procedure for But-3-yn-1-yl benzoate synthesis[3]

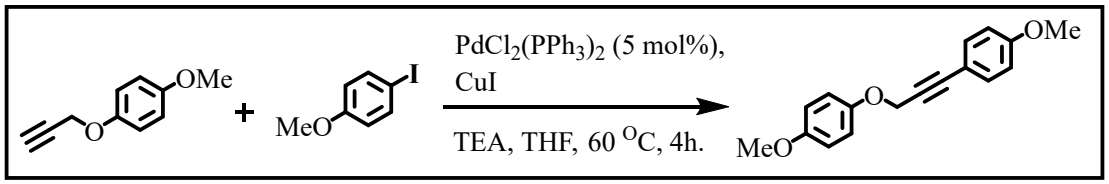


In a dried 50 mL flask containing but-3-yn-1-ol (0.77 g, 5.5 mmol) in DCM (25 mL) at 0 ^{O}C, TEA (2 mL, 15 mmol) was added. Then a solution of benzoyl chloride/sulfonyl chloride (5 mmol) was added. The reaction mixture was stirred at room temperature for 6 hours, after completion of the reaction crushed ice was added and the reaction mixture was washed by DCM. The organic layer was separated by a separatory funnel and further dried over anhydrous $MgSO_4$. The solvent was removed under reduced pressure, and the crude residue was subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure but-3-yn-1-yl benzoate.

List of Isolated molecules-

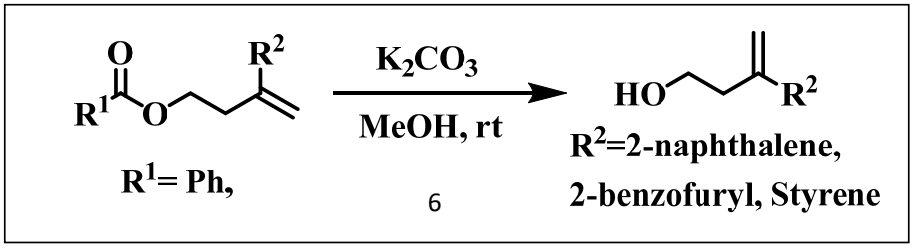


d) Synthesis of 1-methoxy-4-(3-(4-methoxyphenoxy)prop-1-yn-1-yl)benzene [4]



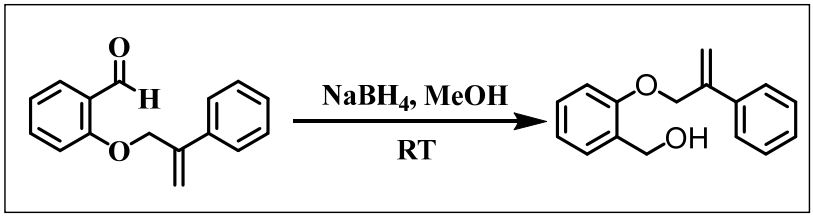
To a 50 mL round bottom flask was added 1-methoxy-4-(prop-2-yn-1-yloxy)benzene (0.648 g, 4 mmol,) and 1-iodo-4-methoxybenzene (1.1 g, 4.8 mmol). Later Triethyl amine (0.808 g, 8 mmol) and THF solvent (30 mL) were added to system then reaction mixture degassed by using nitrogen gas. Then CuI (0.038 g, 0.2 mmol). and $PdCl_2(PPh_3)_2$ (0.140 g 5 mol%) were added. The resulting mixture was heated for 4 h at 60 ^{O}C. After completion of the reaction, the reaction mixture extracted with ethyl acetate-water system, and the organic layer was separated and evaporated under reduced pressure. The crude residue was then subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure internal alkyne compound.

e) Synthesis of homoallylic alcohol



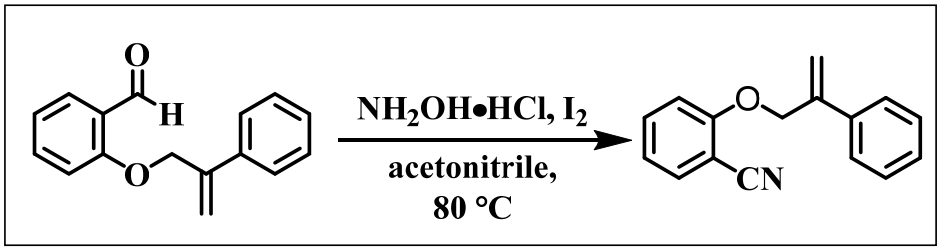
To a 25 mL round bottom flask was added 3-(naphthalen-2-yl)but-3-en-1-yl benzoate (0.060 g, 0.2 mmol,), K_2CO_3 (0.055 g, 0.4 mmol,) and MeOH 5 mL. The resulting mixture was stirred at room temperature. After completion of the reaction, the reaction mixture was evaporated on a rotatory evaporator and then extracted with ethyl acetate-water system, and the organic layer was separated and evaporated under reduced pressure. The crude residue was then subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure homoallylic alcohol.

f) Synthesis of (2-((2-Phenylallyl)oxy)phenyl)methanol



To a 25 mL round bottom flask **3a** (0.095 g, 0.4 mmol) and 2 mL MeOH were added. Next, $NaBH_4$ (0.030 g, 0.8 mmol) was added, and the resulting solution was stirred at room temperature for 1 h. The reaction mixture was quenched with ammonium chloride solution, and the organic layer was separated and evaporated under reduced pressure. The crude product was subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure target compound.

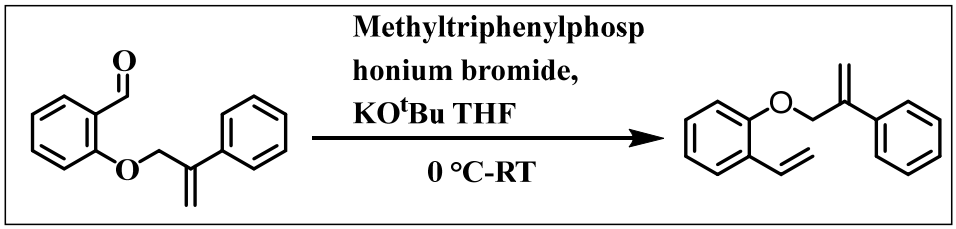
g) Synthesis of 2-((2-Phenylallyl)oxy)benzonitrile



To a 25 mL round bottom flask **3a** (0.095 g, 0.4 mmol), and 5 mL acetonitrile were added. Next, $NH_2OH.HCl$ (0.083 g, 1.2 mmol) and Iodine (0.030 g, 0.12 mmol) were added, and the

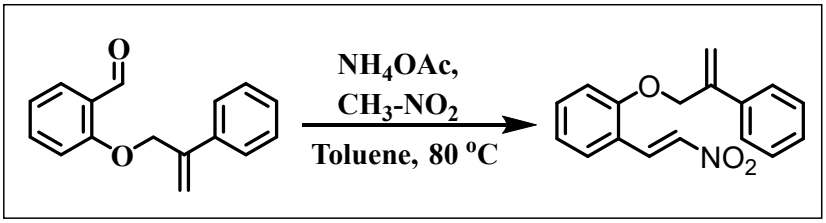
resulting solution was refluxed for 6 h. The resulting reaction mixture was quenched with cold water, and the organic layer was separated and evaporated under reduced pressure. The crude product was subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure target compound.

h) Synthesis of 1-((2-Phenylallyl)oxy)-2-vinylbenzene



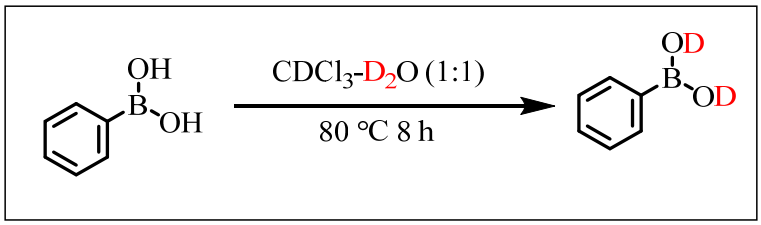
To a 25 mL round bottom flask Methyltriphenylphosphonium bromide (0.171 g, 0.48 mmol) and dry THF 5 mL were added under an inert atmosphere further Potassium tert-butoxide (0.089 g, 0.8 mmol) was added and reaction mixture was allowed to stir 1 h. Next, **3a** (0.095 g, 0.4 mmol) was added, and the resulting mixture was stirred at room temperature for 6 h. The reaction mixture was quenched with crushed ice, and the organic layer was separated and evaporated under reduced pressure. The crude product was subjected to flash column chromatography on silica gel (100 % hexane) to obtain the pure product.

i) Synthesis of (*E*)-1-(2-Nitrovinyl)-2-((2-phenylallyl)oxy)benzene



To a 25 mL round bottom flask **3a** (0.095 g, 0.4 mmol) and toluene 5 mL were added. Then NH_4OAc (0.062 g, 0.8 mmol) and nitromethane (0.037 g, 0.6 mmol) were added, and the reaction mixture was refluxed for 4 h. Next, the resulting mixture was quenched with water, and the organic layer was separated and evaporated under reduced pressure. The crude product was subjected to flash column chromatography on silica gel (eluent hexane-ethyl acetate) to obtain the pure product.

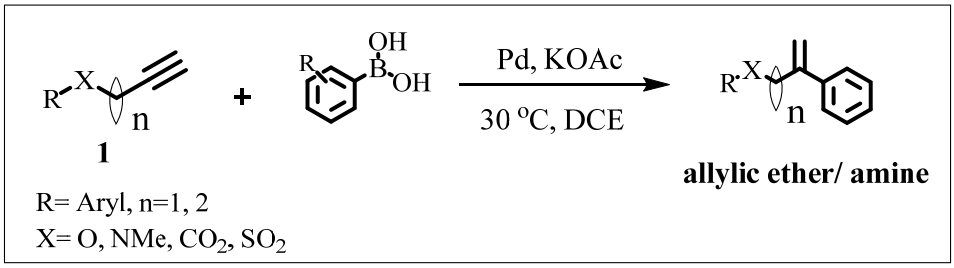
j) Synthesis of deuterated Phenylboronic acid[5]



To a 25 mL round bottom flask was added Phenyl boronic Acid (0.610 g, 5.0 mmol,) and $CDCl_3$-D_2O (1:1) 3 mL. Then resulting solution was refluxed at 80 ^{O}C for 8 h in an oil bath. The reaction mixture was cooled and deuterated phenyl boronic acid was obtained. After filtration, the white solid was dried by using a high vacuum for 5 h. Deuterated phenylboronic acid (0.390 g, 63%, >85% D) was obtained. ^{1}H NMR (400 MHz, DMSO-d6) δ 7.90 – 7.78 (m, 2H), 7.42 – 7.30 (m, 3H), 8.02 (s, 0.30).

General Procedures-

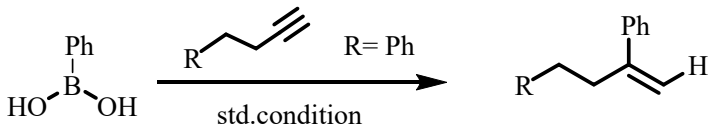
[A] Palladium (II)-Catalyzed regioselective hydroarylation of terminal alkyne:



A 10 mL round bottom flask fitted with a septum containing alkyne substrate **1** (0.4 mmol), phenylboronic acid **2a** (0.073 g, 0.6 mmol) and KOAc (0.078 g, 0.8 mmol, 2 equiv), finally the catalyst $PdCl_2(PPh_3)_2$ (0.0084 g, 3 mol %) was added. Then DCE (2.0 mL) solvent was added to the system and the reaction mixture was stirred at 30 ^{O}C for 2-5 h. At the end of the reaction, the reaction mixture was filtered on a celite pad with CH_2Cl_2 (10 mL) solvent. The crude products were purified by silica gel column chromatography using n-hexane/ EtOAc as eluent to afford the desired product.

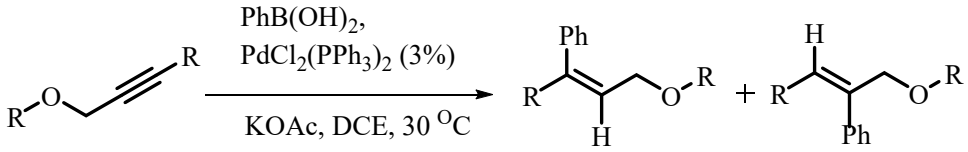
IV Control Experiments:

a) without heteroatom



2 (**4.5 h. 72 %**)

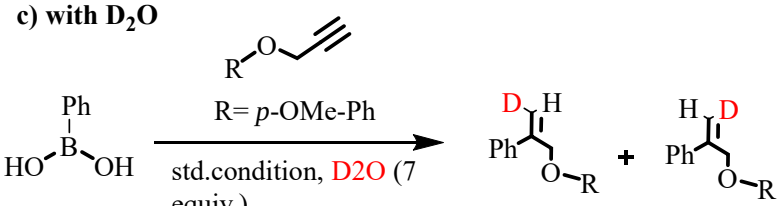
b) with internal alkyne



R= *p*-OMePh

Major (4:1) Minor

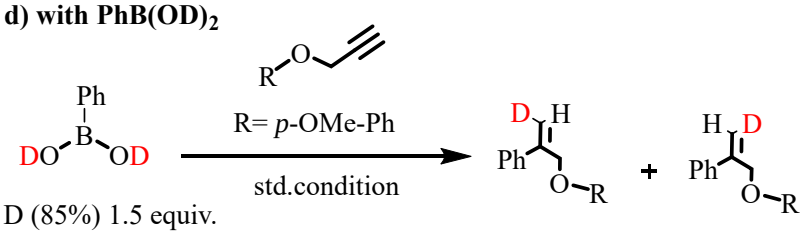
c) with D_2O



2

(E:Z = 2:1)

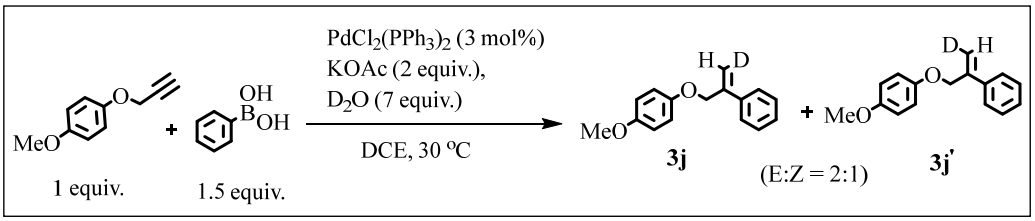
d) with $PhB(OD)_2$



D (85%) 1.5 equiv.

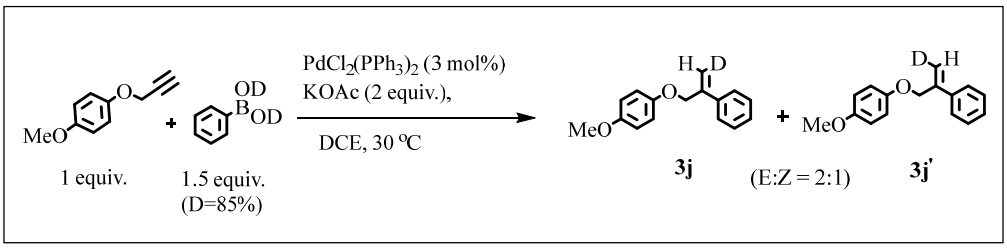
(E:Z = 2:1)

a) Studies with D_2O-[6]



A 10 mL round bottom flask fitted with a septum containing 1-methoxy-4-(prop-2-yn-1-yloxy)benzene (0.065 g, 0.4 mmol), phenylboronic acid **2** (0.073 g, 0.6 mmol), KOAc (0.078 g, 0.8 mmol, 2 equiv) and D_2O (7 equiv., 2.8 mmol) finally catalyst $PdCl_2(PPh_3)_2$ (0.0084, 3 mol %) was added, then DCE (2.0 mL) solvent was added to the system, and the reaction mixture was stirred at 30 ^{O}C for 1.5 h. At the end of the reaction, the reaction mixture was filtered on a celite pad with CH_2Cl_2 (10 mL) solvent. The crude products were purified by silica gel column chromatography using n-hexane/ EtOAc as eluent to afford desired products **3j** and **3j^{I} (**E:Z= 2:1**)**.

b) Studies with $PhB(OD)_2$-[6]



A 10 mL round bottom flask fitted with a septum containing 1-methoxy-4-(prop-2-yn-1-yloxy)benzene (0.065 g, 0.4 mmol), phenylboronic acid-*d*2 (D=85%) (0.087 g, 0.6 mmol) and KOAc (0.078 g, 0.8 mmol, 2 equiv), finally catalyst $PdCl_2(PPh_3)_2$ (3 mol %) was added to the system then DCE (2.0 mL) solvent was added and the reaction mixture was stirred at 30 ^{O}C for 1.5 h. At the end of the reaction, the reaction mixture was filtered on a celite pad with CH_2Cl_2 (10 mL) solvent. The crude products were purified by silica gel column chromatography using n-hexane/ EtOAc as eluent to afford desired products **3j** and **3j^{I} (**E:Z= 2:1**)**.

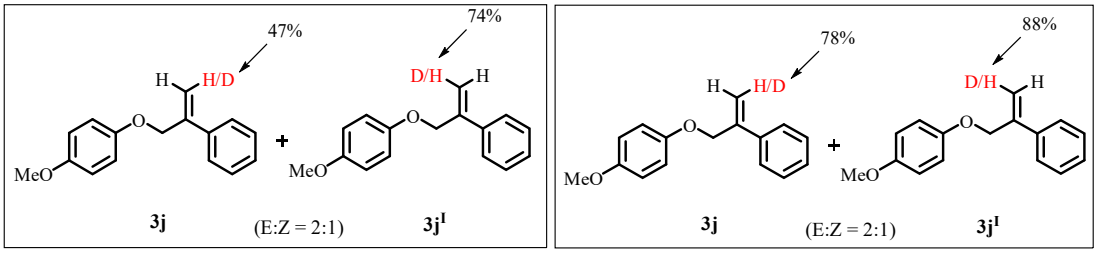
Deuteration % calculation-[7]

The equation below was used to determine the % of deuterium incorporation in allylic ether.

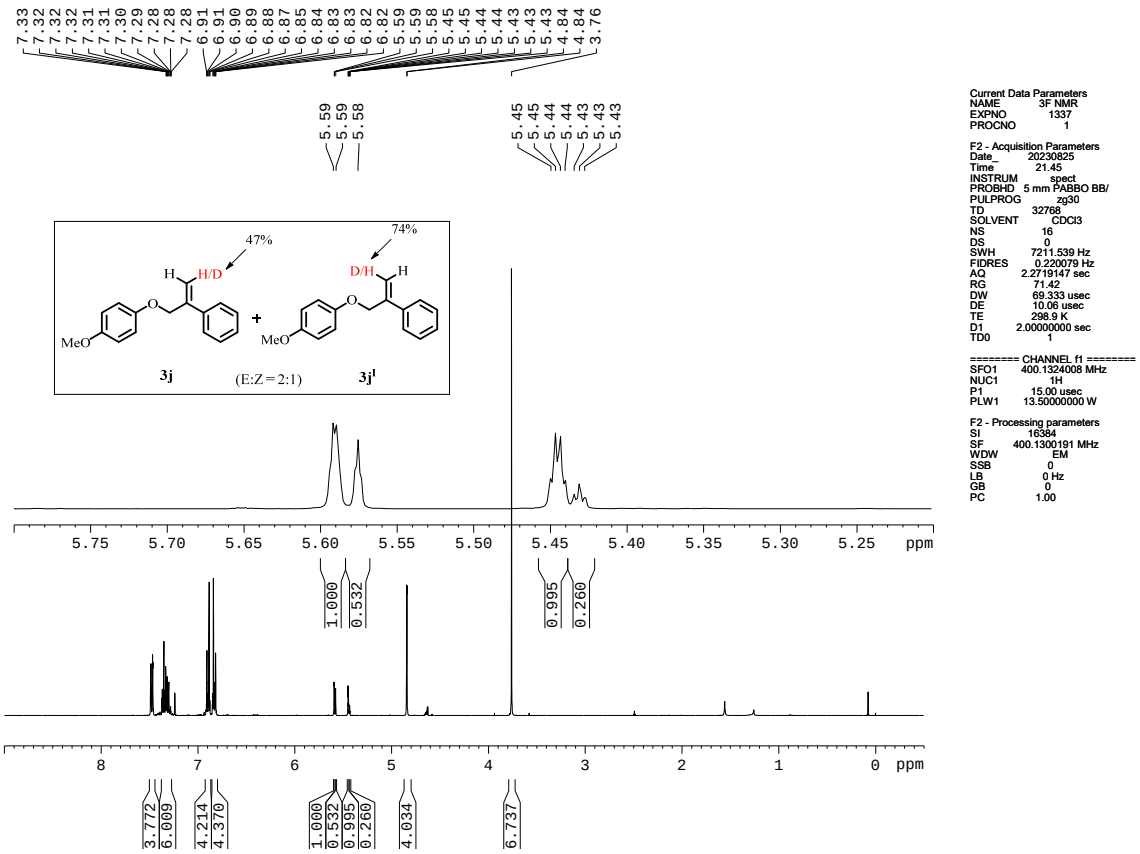
$$\% \text{ deuteration} = 100 - \left[\left(\frac{\text{residual integral}}{\text{no. labelling sites}} \right) \text{X } 100 \right]$$

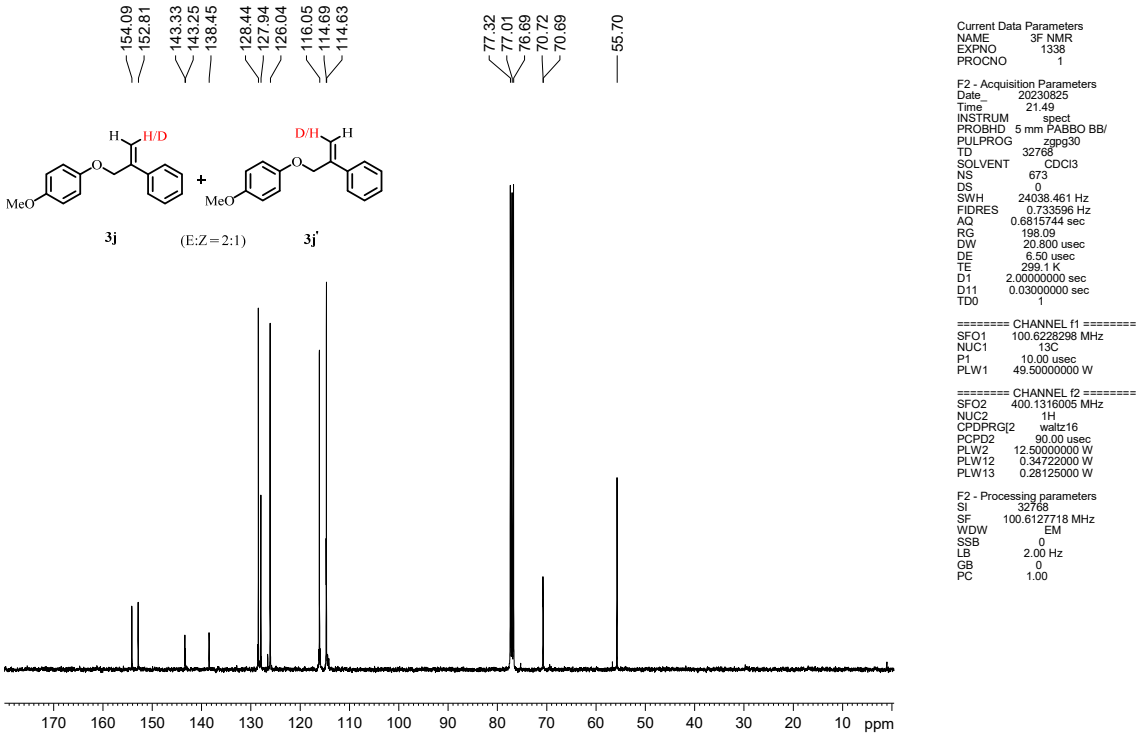
This experiment concluded boronic acid has more percentage of proton donor than water.

Studies with D_2O and $PhB(OD)_2$



c) Studies with D_2O-





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PROCNO 1

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D11 0.03000000 sec
TD0 1

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PLW1 49.50000000 W

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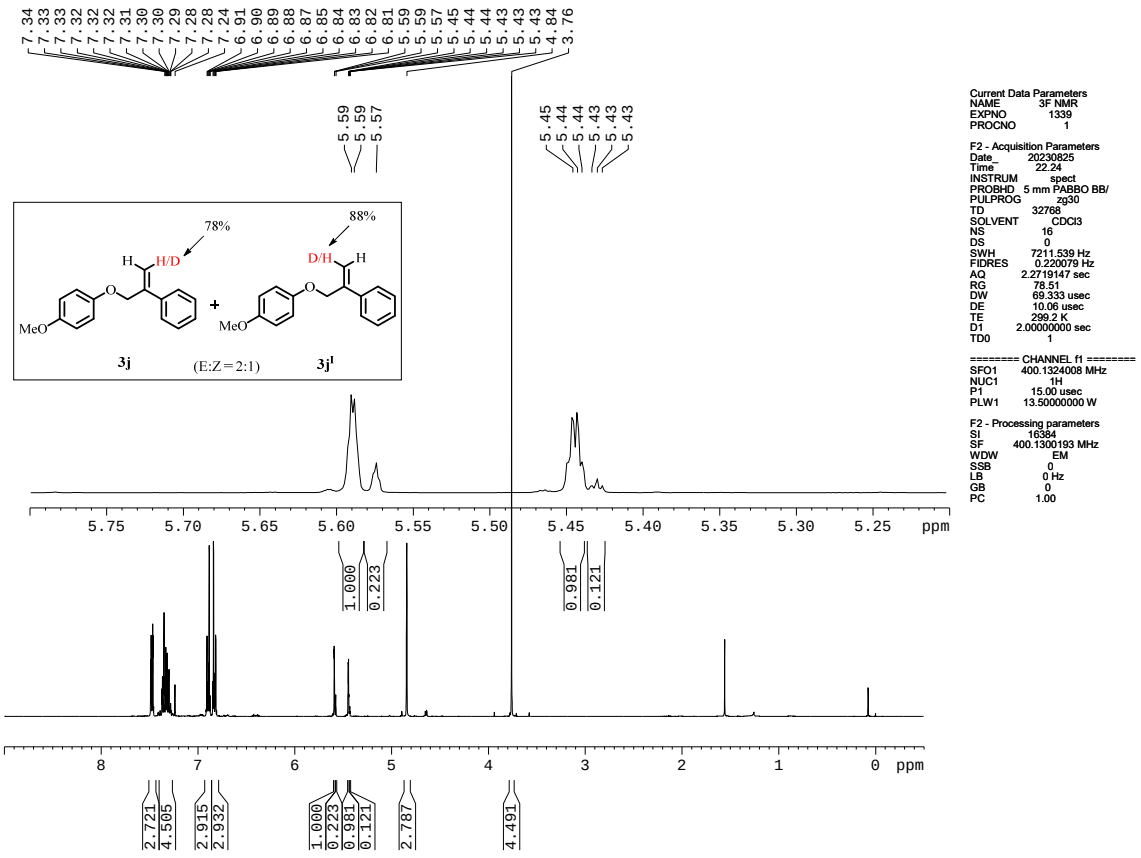
d) Studies with $PhB(OD)_2$-



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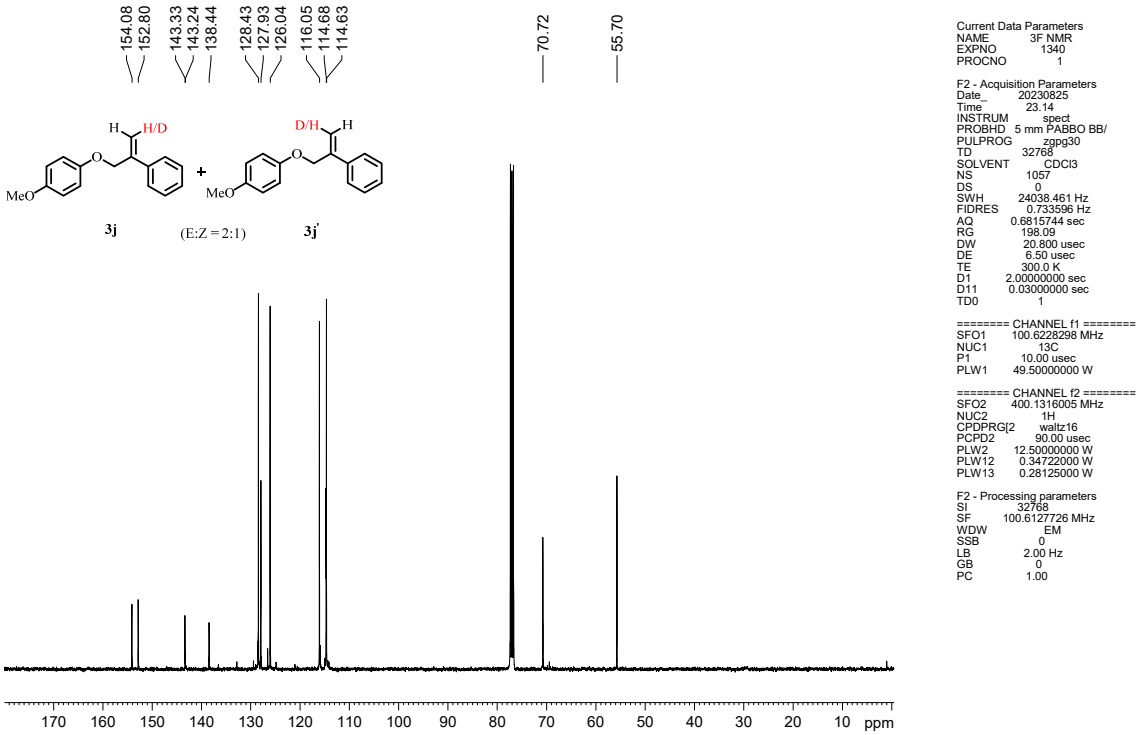
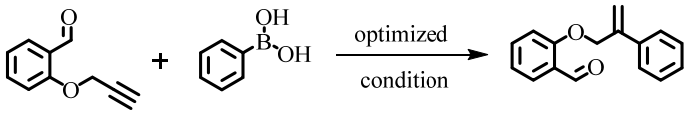


Gram scale synthesis.

Optimized reaction conditions were applied for large scale and successfully achieved good to moderate yields.

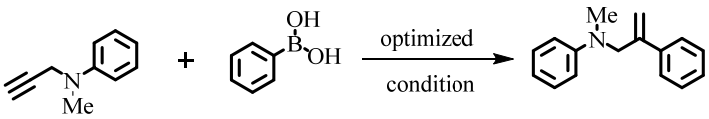
a) 10 mmol scale synthesis of allylic ether-



10 mmol

3a, 3h, 79%, 1.88 g

b) 5 mmol scale synthesis of allylic amine-

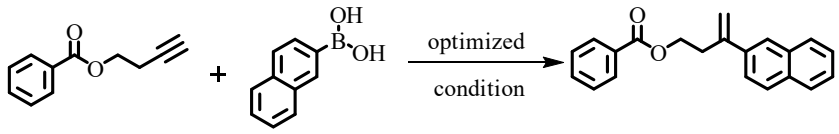


5 mmol

4a, 2h, 84%, 0.937 g

Scale-up on 1 mmol.

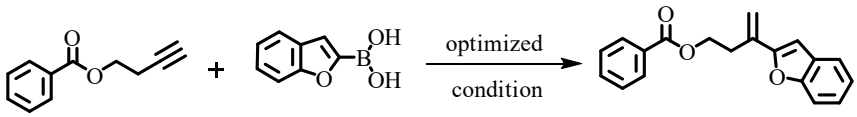
a) 1 mmol scale synthesis of allylic benzoate-



1 mmol

5b, 2h, 70%, 0.211 g

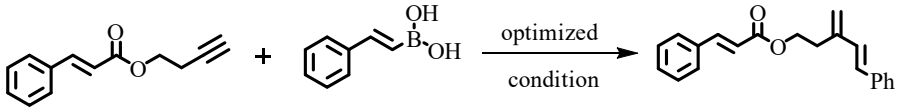
b) 1 mmol scale synthesis of allylic benzoate-



1 mmol

5c, 3h, 52%, 0.152 g

c) 1 mmol scale synthesis of diene derivative-



1 mmol

6g, 2h, 52%, 0.158 g

V. Single crystal X-ray Analytical Data

The Single crystals of isolated compounds **3a** and **6f** were obtained by slow evaporation of dichloromethane: hexane (1:2) solution at room temperature. X-ray reflections were collected using Mo Kα X-radiation (λ = 0.71073 Å) on the single crystals at 200 K using a Bruker Kappa APEX-II diffractometer. All the crystal structures were solved and refined using SHELX-97.

- Crystal data and structure refinement for **3a** [CCDC number 2290697]. (ellipsoid counter 30% probability)

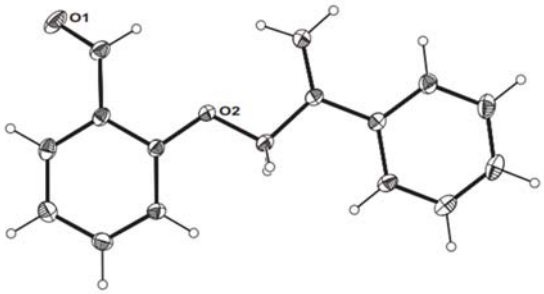


Table 1. Crystal data and structure refinement for d24491.

Identification code	d24491	
Empirical formula	C16 H14 O2	
Formula weight	238.27	
Temperature	200(2) K	
Wavelength	0.71073 Å	
Crystal system	Orthorhombic	
Space group	P n a 21	
Unit cell dimensions	a = 16.5657(15) Å	α= 90°.
	b = 5.4295(4) Å	β= 90°.
	c = 14.0697(11) Å	γ = 90°.
Volume	1265.48(18) $Å^3$	
Z	4	
Density (calculated)	1.251 Mg/m^3	
Absorption coefficient	0.081 mm^{-1}	
F(000)	504	
Crystal size	0.72 x 0.06 x 0.02 mm^3	
Theta range for data collection	2.46 to 25.26°.	
Index ranges	-19<=h<=19, -6<=k<=5, -16<=l<=13	
Reflections collected	6361	
Independent reflections	1825 [R(int) = 0.1282]	
Completeness to theta = 25.26°	99.0 %	
Absorption correction	multi-scan	
Max. and min. transmission	0.9984 and 0.9437	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	1825 / 1 / 164	
Goodness-of-fit on F^2	1.028	
Final R indices [I>2sigma(I)]	R1 = 0.0528, wR2 = 0.1200	
R indices (all data)	R1 = 0.0701, wR2 = 0.1313	
Absolute structure parameter	-4(2)	
Extinction coefficient	0.034(8)	
Largest diff. peak and hole	0.171 and -0.155 $e.Å^{-3}$	

- Crystal data and structure refinement for **6f** [CCDC number 2290696]. (ellipsoid counter 30% probability)

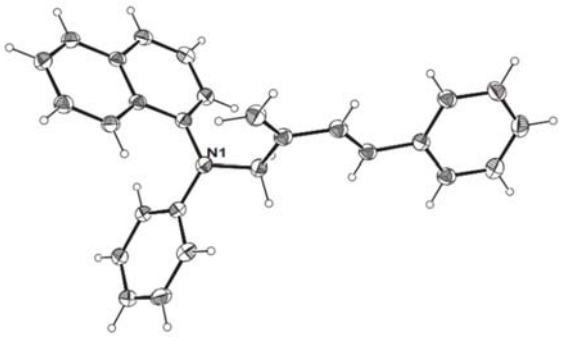
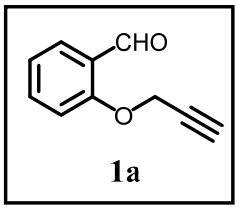


Table 1. Crystal data and structure refinement for d24673.

Identification code	d24673	
Empirical formula	C27 H23 N O0	
Formula weight	361.46	
Temperature	200(2) K	
Wavelength	1.54178 Å	
Crystal system	Monoclinic	
Space group	P 21/n	
Unit cell dimensions	a = 9.4988(2) Å	α= 90°.
	b = 11.9651(3) Å	β= 97.1390(10)°.
	c = 17.3667(4) Å	γ = 90°.
Volume	1958.49(8) $Å^3$	
Z	4	
Density (calculated)	1.226 Mg/m^3	
Absorption coefficient	0.534 mm^{-1}	
F(000)	768	
Crystal size	0.57 x 0.40 x 0.13 mm^3	
Theta range for data collection	5.98 to 66.74°.	
Index ranges	-11<=h<=11, -14<=k<=14, -20<=l<=20	
Reflections collected	14764	
Independent reflections	3440 [R(int) = 0.0476]	
Completeness to theta = 66.74°	98.7 %	
Absorption correction	None	
Max. and min. transmission	0.9338 and 0.7505	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	3440 / 0 / 253	
Goodness-of-fit on F^2	1.041	
Final R indices [I>2sigma(I)]	R1 = 0.0492, wR2 = 0.1273	
R indices (all data)	R1 = 0.0548, wR2 = 0.1342	
Largest diff. peak and hole	0.181 and -0.187 $e.Å^{-3}$	

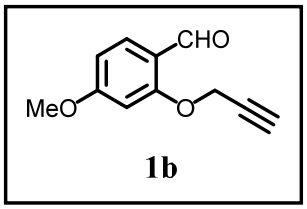
VI. Spectral Data

2-(Prop-2-yn-1-yloxy)benzaldehyde (1a):[1a]



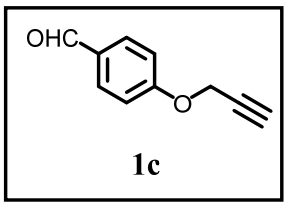
Eluent: n-hexane/ ethyl acetate (93/7); White solid; Yield: 1.21 g (76%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 10.49 (s, 1H), 7.87-7.85 (m, 1H), 7.59-7.55 (m, 1H), 7.13-7.07 (m, 2H), 4.83 (d, *J* = 4 Hz, 2H), 2.57 (t, *J* = 2 Hz, 1H).

4-Methoxy-2-(prop-2-yn-1-yloxy)benzaldehyde (1b):[1b]



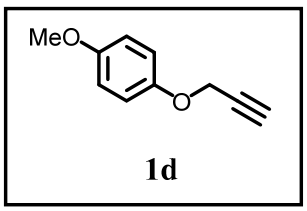
Eluent: n-hexane/ ethyl acetate (93/7); White solid; Yield: 1.36 g (72%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 10.30 (s, 1H), 7.84 (d, *J* = 8 Hz, 1H), 6.59 (d, *J* = 4 Hz, 2H), 4.80 (d, *J* = 2 Hz, 2H), 3.88 (s, 3H), 2.58 (t, *J* = 2 Hz, 1H).

4-(Prop-2-yn-1-yloxy)benzaldehyde (1c):[1c]



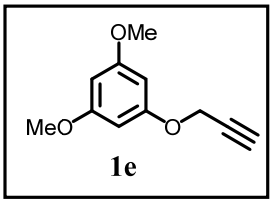
Eluent: n-hexane/ ethyl acetate (93/7); White solid; Yield: 1.02 g (64%);. **^{1}H NMR** (400 MHz, $CDCl_3$): δ 9.90 (s, 1H), 7.86 (d, *J* = 8 Hz, 2H), 7.09 (d, *J* = 8 Hz, 2H), 4.78 (d, *J* = 2.4 Hz, 2H), 2.57 (t, *J* = 4 Hz 1H).

1-Methoxy-4-(prop-2-yn-1-yloxy)benzene (1d):[1d]



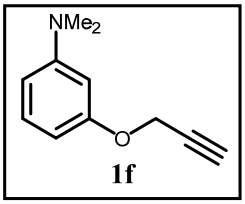
Eluent: n-hexane/ ethyl acetate (90/5); Yellow liquid; Yield: 1.36 g (84%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.93-6.90 (m, 2H), 6.86-6.83 (m, 2H), 4.63 (d, *J* = 2 Hz, 2H), 3.77 (s, 3H), 2.50 (t, *J* = 2 Hz 1H).

1,3-Dimethoxy-5-(prop-2-yn-1-yloxy)benzene (1e):[1e]



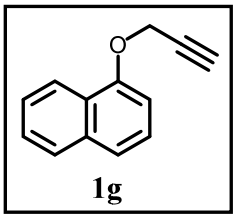
Eluent: n-hexane/ ethyl acetate (94/6); Gray solid; Yield: 1.11 g (58%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 6.15 (d, *J* = 8 Hz, 2H), 6.12 (d, *J* = 4 Hz, 1H), 4.64 (q, *J* = 1 Hz 2H), 3.76 (d, *J* = 1 Hz 6H), 2.52 (q, *J* = 4 Hz 1H).

N,N-Dimethyl-3-(prop-2-yn-1-yloxy)aniline (1f):[1e]



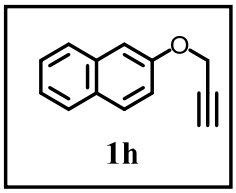
Eluent: n-hexane/ ethyl acetate (95/5); White solid; Yield: 1.15 g (66%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.17-7.13 (m, 1H), 6.40-6.28 (m, 3H), 4.67 (d, *J* = 2 Hz, 2H), 2.93 (s, 6H), 2.50 (t, *J* = 2 Hz 1H).

1-(Prop-2-yn-1-yloxy)naphthalene (1g):[1c]



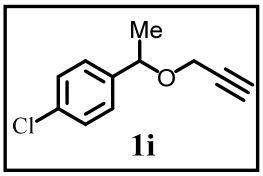
Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 1.41 g (78%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 8.26 (t, *J* = 8 Hz, 1H), 7.80-7.78 (m, 1H), 7.50-7.45 (m, 3H), 7.37 (t, *J* = 8 Hz, 1H), 6.93 (d, *J* = 8 Hz, 1H), 4.88 (d, *J* = 2 Hz, 2H), 2.54 (t, *J* = 2 Hz 1H).

2-(Prop-2-yn-1-yloxy)naphthalene (1h):[1f]



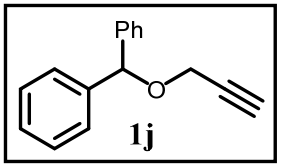
Eluent: n-hexane/ ethyl acetate (97/3); Gray solid; Yield: 1.25 g (69%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.78-7.74 (m, 3H), 7.46-7.42 (m, 1H), 7.37-7.33 (m, 1H), 7.23 (d, *J* = 4 Hz, 1H), 7.20-7.17 (m, 1H), 4.80 (d, *J* = 4 Hz, 2H), 2.55 (t, *J* = 2 Hz 1H).

1-Chloro-4-(1-(prop-2-yn-1-yloxy)ethyl)benzene (1i):



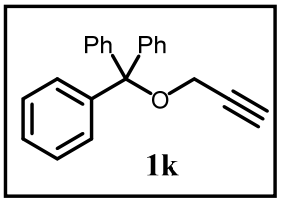
Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 0.5 g (86%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.33-7.30 (m, 2H), 7.28-7.25 (m, 2H), 4.64 (q, *J* = 4 Hz, 1H), 4.07 (dd, *J* = 12 Hz, 4 Hz, 1H), 3.86 (dd, *J* = 12 Hz, 4 Hz, 1H), 2.40 (t, *J* = 4 Hz 1H), 1.44 (d, *J* = 4 Hz, 3H), **^{13}C NMR** (100 MHz, $CDCl_3$): δ 141.0, 133.4, 128.7, 127.8, 79.7, 75.9, 74.2, 55.5, 23.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{11}H_{11}ClO$ 194.0498, found 194.0487.

((Prop-2-yn-1-yloxy)methylene)dibenzene (1j):[2a]



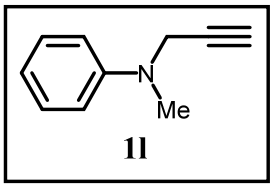
Eluent: n-hexane/ ethyl acetate (95/5); Yellow solid; Yield: 0.47 g (71%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.34-7.25 (m, 10H), 5.66 (s, 1H), 4.15 (s, 2H), 2.44 (s, 1H).

((Prop-2-yn-1-yloxy)methanetriyl)tribenzene (1k):[2b]



Eluent: n-hexane/ ethyl acetate (95/5); White solid; Yield: 0.46 g (52%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.47-7.44 (m, 5H), 7.33-7.28 (m, 5H), 7.26-7.22 (m, 5H), 3.74 (d, *J* = 2 Hz, 2H), 2.38 (t, *J* = 2 Hz 1H).

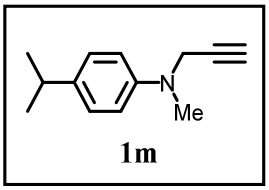
N-methyl-N-(prop-2-yn-1-yl)aniline (1l):[2c]



1l

Eluent: n-hexane/ ethyl acetate (97/3); brownish liquid; Yield: 1.7 g (81%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.28-7.24 (m, 2H), 6.87-6.79 (m, 3H), 4.04 (d, *J* = 2 Hz, 2H), 2.97 (s, 3H), 2.16 (t, *J* = 2 Hz, 1H).

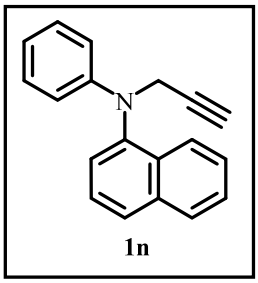
4-Isopropyl-*N*-methyl-*N*-(prop-2-yn-1-yl)aniline (1m):



1m

Eluent: n-hexane/ ethyl acetate (96/4); colorless liquid; Yield: 0.35 g (64%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.13 (d, *J* = 8 Hz, 2H), 6.82 (d, *J* = 8 Hz, 2H), 4.02 (d, *J* = 1 Hz, 2H), 2.94 (s, 3H), 2.87-2.80 (m, 1H), 2.17 (t, *J* = 2 Hz, 1H), 1.22 (d, *J* = 8 Hz, 6 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 147.0, 139.0, 127.0, 114.7, 79.3, 72.1, 42.8, 38.8, 33.1, 24.1; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{13}H_{17}N$ 187.1361, found 187.1357.

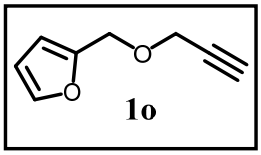
***N*-Phenyl-N-(prop-2-yn-1-yl)naphthalen-1-amine (1n):**



1n

Eluent: n-hexane/ ethyl acetate (95/5); Brown liquid; Yield: 0.59 g (77%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.95 (d, *J* = 12 Hz, 1H), 7.90 (d, *J* = 12 Hz, 1H), 7.81 (d, *J* = 8 Hz, 1H), 7.53-7.41 (m, 4H), 7.20-7.15 (m, 2H), 6.78 (d, *J* = 8 Hz, 1H), 6.72 (d, *J* = 8 Hz, 2H), 4.45 (d, *J* = 2 Hz, 2H), 2.27 (t, *J* = 2 Hz, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 148.29, 143.63, 135.02, 131.31, 128.88, 128.40, 127.17, 126.51, 126.33, 126.28, 125.99, 123.53, 118321, 114.49, 80.11, 72.49, 41.77 ; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{19}H_{15}N$ 257.1204, found 257.1202.

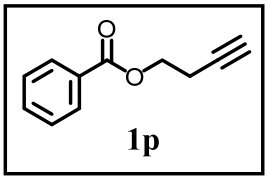
2-((Prop-2-yn-1-yloxy)methyl)furan (1o):[2d]



1o

Eluent: n-hexane/ ethyl acetate (96/4); brownish liquid; Yield: 0.27 g (68%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.42 (s, 1H), 6.38-6.34 (m, 2H), 4.56 (s, 2H); 4.16 (d, *J* = 2 Hz, 2H), 2.46 (t, *J* = 2 Hz, 1H).

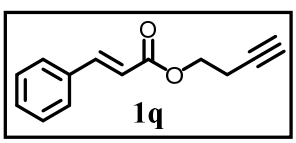
But-3-yn-1-yl benzoate (1p):[1f]



1p

Eluent: n-hexane/ ethyl acetate (98/2); colorless liquid; Yield: 0.72 g (83%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 8.06 (d, *J* = 4 Hz, 2H), 7.57 (t, *J* = 8 Hz, 1H), 7.44 (d, *J* = 8 Hz, 2H), 4.43 (t, *J* = 8 Hz, 2H), 2.69-2.65 (m, 2H), 2.04-2.02 (m, 1H).

But-3-yn-1-yl cinnamate (1q):

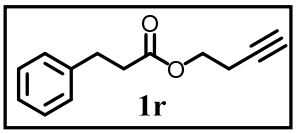


1q

Eluent: n-hexane/ ethyl acetate (96/4); colorless liquid; Yield: 0.68 g (62%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.71(d, *J* = 16 Hz, 1H), 7.54-7.51 (m, 2H), 7.39-7.37 (m, 3H), 6.45 (d, *J* = 16 Hz, 1H), 4.32

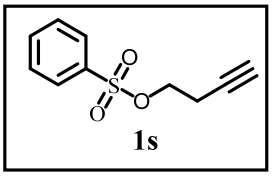
(t, *J* = 4 Hz, 2H), 2.63-2.59 (m, 2H), 2.03 (t, *J* = 4 Hz, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.6, 145.2, 134.3, 130.3, 128.86, 128.09, 117.6, 80.1, 69.9, 62.1, 19.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{13}H_{12}O_2$ 200.0837, found 200.0838.

But-3-yn-1-yl 3-phenylpropanoate (1r):[3]



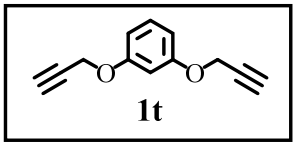
Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 0.59 g (59%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.31-7.25 (m, 2H), 7.21-7.17 (m, 3H), 4.18 (t, *J* = 8 Hz, 2H), 2.96 (t, *J* = 8 Hz, 2H), 2.67-2.64 (m, 2H), 2.51-2.47 (m, 2H), 1.98 (t, *J* = 4 Hz, 1H).

But-3-yn-1-yl benzenesulfonate (1s):



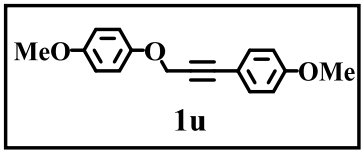
Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 0.81g (78%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.95-7.92 (m, 2H), 7.69-7.65 (m, 1H), 7.59-7.55 (m, 2H), 4.14 (t, *J* = 8 Hz, 1H), 2.59-2.55 (m, 2H), 1.96 (t, *J* = 4 Hz, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 135.8, 133.8, 129.2, 127.8, 78.2, 70.7, 67.5, 19.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{10}H_{10}O_3S$ 210.0350, found 210.0346.

1,3-Bis(prop-2-yn-1-yloxy)benzene (1t):[8]



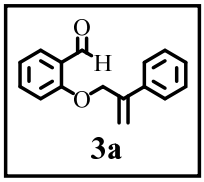
Eluent: n-hexane/ ethyl acetate (95/5); colorless liquid; Yield: 0.56 g (61%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.23-7.19 (m, 1H), 7.63-7.61 (m, 3H), 4.67(d, *J* = 1 Hz, 4H), 2.52 (t, *J* = 4 Hz, 2H).

1-methoxy-4-(3-(4-methoxyphenoxy)prop-1-yn-1-yl)benzene (1u):[4]



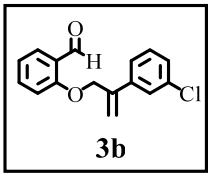
Eluent: n-hexane/ ethyl acetate (97/3); White solid; Yield: 0.73 g (69%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.35-7.39 (m, 2H), 6.95-6.99 (m, 2H), 6.80-6.87 (m, 4H), 4.84 (s, 2H), 3.80 (s, 3H), 3.77 (s, 3H).

2-((2-Phenylallyl)oxy)benzaldehyde (3a):[9]



Eluent: n-hexane/ ethyl acetate (97/3); White solid; Yield: 90.4 mg (95%); M.p.:55 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 10.38 (s, 1H), 7.83 (dd, *J* = 8.2 Hz, 2 Hz, 1H), 7.57-7.52 (m, 1H), 7.45-7.44 (m, 2H), 7.39-7.32 (m, 3H), 7.07-7.02 (m, 2H), 5.63 (s, 1H), 5.49 (s, 1H), 5.03 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ189.7, 160.8, 142.6, 137.9, 135.8, 128.6, 128.4, 128.2, 126.0, 125.3, 121.1, 115.2, 113.1, 70.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{14}O_2$ 238.0993, found 238.0992.

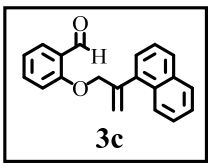
2-((2-(3-Chlorophenyl)allyl)oxy)benzaldehyde (3b):



3b

Eluent: n-hexane/ ethyl acetate (97/3); White solid; Yield: 82.6 mg (76%); M.p.:58 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 10.40 (s, 1H), 7.83 (dd, *J* = 8 Hz, 2 Hz, 1H), 7.57-7.53 (m, 1H), 7.44-7.43 (m, 1H), 7.34-7.29 (m, 3H), 7.06 (t, *J* = 12 Hz, 2H), 5.64 (s, 1H), 5.53 (s, 1H), 4.99 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 189.5, 160.6, 141.5, 139.8, 135.8, 134.6, 129.8, 128.5, 128.3, 126.2, 125.3, 124.2, 121.2, 116.5, 113.0, 70.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{13}ClO_2$ 272.0604, found 272.0612.

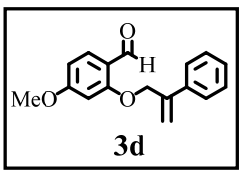
2-((2-(Naphthalen-1-yl)allyl)oxy)benzaldehyde (3c):



3c

Eluent: n-hexane/ ethyl acetate (97/3); White solid; Yield: 110 mg (96%); M.p.:125 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 10.40 (s, 1H), 8.06-8.02 (m, 1H), 7.89-7.85 (m, 1H), 7.84-7.80 (m, 2H), 7.52-7.46 (m, 4H), 7.37 (d, *J* = 8 Hz, 1H), 7.03-6.97 (m, 2H), 5.86 (s, 1H), 5.42 (s, 1H), 4.94 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 189.6, 160.7, 142.8, 137.2, 135.7, 133.6, 131.3, 128.4, 128.1, 126.2, 125.9, 125.8, 125.1, 125.1, 120.9, 117.8, 112.7, 71.5; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{20}H_{16}O_2$ 288.1150, found 288.1142.

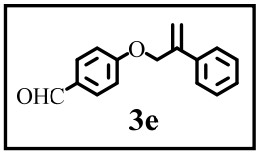
4-Methoxy-2-((2-phenylallyl)oxy)benzaldehyde (3d):[10]



3d

Eluent: n-hexane/ ethyl acetate (95/5); White solid; Yield: 84.6 mg (79%); M.p.:81 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 10.22 (s, 1H), 7.81 (d, *J* = 8Hz, 1H), 7.46-7.43 (m, 2H), 7.38-7.29 (m, 3H), 6.5 (dd, *J* = 8 Hz, 2H), 6.52 (d, *J* = 4 Hz, 1H), 5.63 (s, 1H), 5.49 (s, 1H), 4.99 (s, 1H), 3.86 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 188.1, 166.0, 162.5, 142.4, 137.9, 130.4, 128.5, 128.2, 126.0, 119.4, 115.2, 106.2, 99.2, 70.2, 55.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{16}O_3$ 268.1099, found 268.1109.

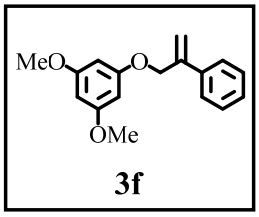
4-((2-Phenylallyl)oxy)benzaldehyde (3e):



3e

Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 49.5 mg (52%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 9.89 (s, 1H) 7.84 (d, *J* = 8 Hz, 2H), 7.46 (d, *J* = 8 Hz, 2H), 7.39-7.33 (m, 3H), 7.06 (d, *J* = 8 Hz, 2H), 5.64 (s, 1H), 5.46 (s, 1H), 4.99 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 190.7, 163.5, 142.2, 137.9, 131.9, 130.2, 128.5, 128.2, 126.0, 115.3, 115.1, 70.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{14}O_2$ 238.0993, found 238.0991.

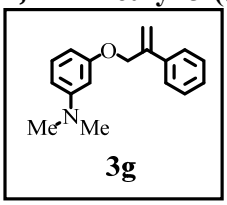
1,3-Dimethoxy-5-((2-phenylallyl)oxy)benzene (3f):



3f

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 84.2 mg (78%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.47 (d, *J* = 8 Hz, 2H), 7.35-7.30 (m, 3H), 6.15-6.10 (m, 3H), 5.61 (s, 1H), 5.46 (s, 1H), 4.85 (s, 2H), 3.76 (s, 6H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ161.5, 160.5, 142.9, 138.3, 128.0, 126.0, 115.0, 93.8, 93.3, 69.9, 55.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{18}O_3$ 270.1255, found 270.1248.

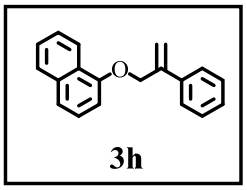
***N,N*-Dimethyl-3-((2-phenylallyl)oxy)aniline (3g):**



3g

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid;; Yield: 76.9 mg (76%); M.p.:88 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.47 (d, *J* = 8 Hz, 2H), 7.36-7.27 (m, 3H), 7.14 (t, *J* = 8 Hz, 1H), 6.38-6.28 (m, 3H), 5.60 (s, 1H), 5.47 (s, 1H), 4.88 (s, 2H), 2.92 (s, 6H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 159.8, 152.0, 143.3, 138.5, 129.7, 128.4, 127.9, 126.0, 114.8, 106.0, 102.3, 100.2, 69.8, 40.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{19}NO$ 253.1466, found 253.1453.

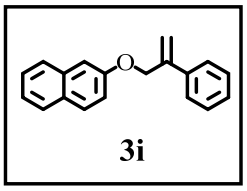
1-((2-Phenylallyl)oxy)naphthalene (3h):[11]



3h

Eluent: n-hexane/ ethyl acetate (96/4); colorless liquid; Yield: 70.7 mg (68%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 8.23 (d, *J* = 8 Hz, 1H), 7.79 (d, *J* = 8 Hz, 1H), 7.53 (d, *J* = 8 Hz, 2H), 7.49-7.40 (m, 4H), 6.89 (d, *J* = 8 Hz, 1H), 5.66 (s, 1H), 5.59 (s, 1H), 5.06 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 154.3, 143.0, 138.4, 134.5, 128.4, 128.0, 127.4, 126.4, 126.0, 125.7, 125.2, 122.1, 120.5, 114.7, 105.1, 70.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{19}H_{16}O$ 260.1201, found 260.1197.

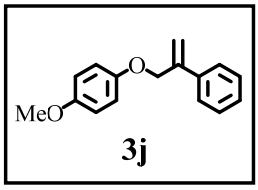
2-((2-Phenylallyl)oxy)naphthalene (3i):



3i

Eluent: n-hexane/ ethyl acetate (96/4); colorless liquid;; Yield: 56 mg (54%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.76-7.70 (m, 3H), 7.51-7.41 (m, 3H), 7.37-7.31 (m, 4H), 7.21 (s, 2H), 5.64 (s, 1H), 5.52 (s, 1H), 5.00 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 156.5, 142.9, 138.3, 134.4, 129.4, 129.1, 128.5, 128.0, 127.6, 126.7, 126.3, 126.0, 123.7, 119.0, 114.9, 107.3, 69.8; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{19}H_{16}O$ 260.1201, found 260.1197.

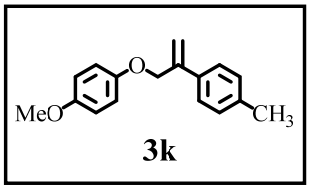
1-Methoxy-4-((2-phenylallyl)oxy)benzene (3j):[12]



3j

Eluent: n-hexane/ ethyl acetate (90/5); White solid; Yield: 72 mg (75%); M.p.:50 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.48-7.46 (m, 2H), 7.37-7.29 (m, 3H), 6.90-6.87 (m, 2H), 6.84-6.81 (m, 2H), 5.58 (s, 1H), 5.44 (d, *J* = 1.2 Hz, 1H), 4.48 (s, 2H), 3.75 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 154.0, 152.8, 143.3, 138.4, 128.4, 127.9, 126.0, 116.0, 114.75, 114.64, 70.72, 55.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{16}O_2$ 240.1150, found 240.1152.

1-Methoxy-4-((2-(p-tolyl)allyl)oxy)benzene (3k):

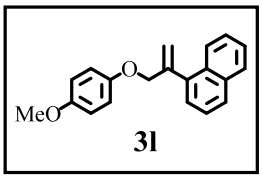


3k

Eluent: n-hexane/ ethyl acetate (90/5); White solid; Yield: 59 mg (58%); M.p.:61 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.37 (d, *J* = 8 Hz, 2H), 7.16 (d, *J* = 8 Hz, 2H), 6.90-6.87 (m, 2H), 6.84-6.81 (m, 2H), 5.56 (s, 1H), 5.39 (s, 1H), 4.82 (s, 2H), 3.76 (s, 3H), 2.35 (s, 3H), **^{13}C NMR** (100 MHz, $CDCl_3$): δ154.0, 152.8, 143.0, 137.7,

135.4, 129.1, 125.8, 116.0, 114.5, 113.8, 70.7, 55.6, 21.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{18}O_2$ 254.1306, found 254.1316.

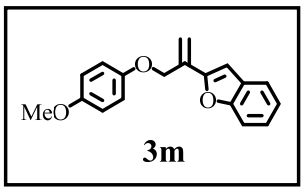
1-(3-(4-Methoxyphenoxy)prop-1-en-2-yl)naphthalene (3l):



3l

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 112.5 mg (97%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 8.07-8.05 (m, 1H), 7.87-7.79 (m, 2H), 7.49-7.43 (m, 3H), 7.36 (d, *J* = 8 Hz, 1H), 6.89-6.80 (m, 4H), 5.83 (s, 1H), 5.35 (s, 1H), 4.76 (s, 2H), 3.75 (s, 3H), **^{13}C NMR** (100 MHz, $CDCl_3$): δ 154.0, 152.8, 147.7, 137.9, 133.7, 131.5, 128.3, 127.9, 126.1, 125.8, 125.8, 125.4, 125.2, 116.7, 115.8, 114.6, 71.7, 55.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{20}H_{18}O_2$ 290.1306, found 290.1316.

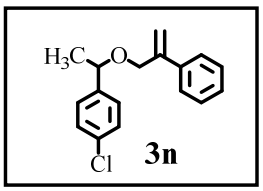
2-(3-(4-Methoxyphenoxy)prop-1-en-2-yl)benzofuran (3m):



3m

Eluent: n-hexane/ ethyl acetate (96/4); White solid; Yield: 65 mg (58%); M.p.:57 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.53 (d, *J* = 8 Hz, 1H), 7.46 (d, *J* = 8 Hz, 1H), 7.30-7.26 (m, 2H), 7.22-7.18 (m, 1H), 6.94-6.91 (m, 2H), 6.86-6.83 (m, 2H), 6.77 (s, 1H), 6.03 (s, 1H), 5.54 (s, 1H), 4.48 (s, 2H), 3.77 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 154.6, 154.2, 153.9, 152.6, 133.5, 128.7, 124.7, 122.8, 121.1, 116.0, 115.2, 114.7, 111.0, 103.5, 69.1, 55.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{18}H_{16}O_3$ 280.1099, found 280.1116.

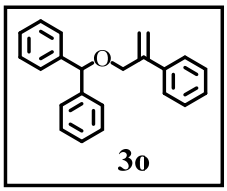
1-Chloro-4-(1-((2-phenylallyl)oxy)ethyl)benzene (3n):



3n

Eluent: n-hexane/ ethyl acetate (98/2); colorless liquid;; Yield: 99 mg (91%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.41-7.39 (m, 2H), 7.32-7.24 (m, 7H), 5.50 (s, 1H), 5.31 (s, 1H), 4.50 (q, *J* = 6.4 Hz, 1H), 4.28 (d, *J* = 12 Hz, 1H), 4.11 (d, *J* = 12 Hz, 1H), 1.40 (d, *J* = 6.4 Hz, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ144.4, 142.1, 138.8, 133.0, 128.5, 128.2, 127.6, 126.0, 114.0, 76.4, 70.2, 23.9; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{17}ClO$ 272.0967, found 272.0961.

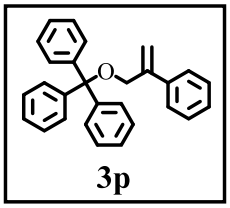
(((2-Phenylallyl)oxy)methylene)dibenzene (3o):



3o

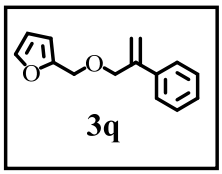
Eluent: n-hexane/ ethyl acetate (95/5); colorless liquid; Yield: 94.8 mg (79%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.45-7.43 (m, 2H), 7.33-7.26 (m, 11H), 7.24-7.20 (m, 3H), 5.54 (s, 1H), 5.48 (s, 1H), 5.38 (s, 1H), 4.37 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 144.3, 142.1, 139.0, 128.4, 128.3, 127.7, 127.5, 127.2, 126.2, 114.2, 82.5, 70.5; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{22}H_{20}O$ 300.1514, found 300.1507.

(((2-Phenylallyl)oxy)methanetriyl)tribenzene (3p):[13]



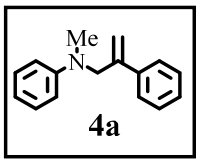
Eluent: n-hexane/ ethyl acetate (90/5); White solid; Yield: 63 mg (42%); M.p.:102 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.50-7.47 (m, 5H), 7.31-7.20 (m, 15H), 5.66 (s, 1H), 5.53 (s, 1H), 3.96 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 145.0, 144.1, 139.3, 128.6, 128.2, 127.8, 127.5, 127.0, 126.0, 112.5, 87.1, 65.5; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{28}H_{24}O$ 376.1827, found 376.1813.

2-(((2-Phenylallyl)oxy)methyl)furan (3q):



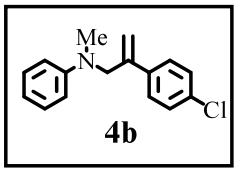
Eluent: n-hexane/ ethyl acetate (94/6); brownish liquid; Yield: 24 mg (28%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.46-7.45 (m, 1H), 7.44-7.43 (m, 1H), 7.41-7.40 (m, 1H), 7.34-7.25 (m, 3H), 6.34-6.33 (m, 1H), 6.30 (d, *J* = 4 Hz, 1H), 5.55 (s, 1H), 5.35 (d, *J* = 2 Hz, 1H), 4.50 (s, 2H), 4.39 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ151.7, 143.8, 142.7, 138.6, 128.3, 127.7, 126.0, 114.7, 110.2, 109.3, 71.6, 63.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{14}H_{14}O_2$ 214.0993, found 214.0990.

***N*-Methyl-*N*-(2-phenylallyl)aniline (4a):**



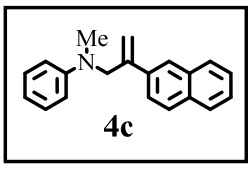
Eluent: n-hexane/ ethyl acetate (97/3); Yellow solid; Yield: 87 mg (98%); M.p.:57 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.44-7.42 (m, 2H), 7.36-7.27 (m, 3H), 7.23-7.19 (m, 2H), 6.72-6.68 (m, 3H), 5.41 (s, 1H), 5.09 (s, 1H), 4.27 (s, 2H), 3.00 (s, 3H), **^{13}C NMR** (100 MHz, $CDCl_3$): δ 149.4, 142.9, 139.7, 129.1, 128.4, 127.8, 126.0, 116.3, 112.4, 112.0, 56.7, 38.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{17}N$ 223.1361, found 223.1356.

***N*-(2-(4-Chlorophenyl)allyl)-*N*-methylaniline (4b):**



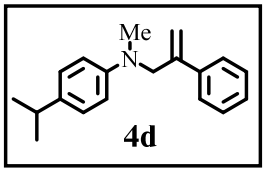
Eluent: n-hexane/ ethyl acetate (96/4); colorless liquid; Yield: 59.6 mg (58%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.37-7.29 (m, 4H), 7.24-7.20 (m, 2H), 6.73-6.69 (m, 3H), 5.41 (s, 1H), 5.13 (s, 1H), 4.23 (s, 2H), 2.99 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 149.3, 142.1, 136.0, 133.6, 129.1, 128.5, 127.3, 116.5, 113.2, 112.1, 56.6, 38.2; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{16}ClN$ 257.0971, found 257.0966.

***N*-Methyl-*N*-(2-(naphthalen-2-yl)allyl)aniline (4c):**



Eluent: n-hexane/ ethyl acetate (95/5); Yellow solid; Yield: 98 mg (90%); M.p.:67 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.83-7.80 (m, 4H), 7.63-7.60 (m, 1H), 7.49-7.44 (m, 2H), 7.25-7.21 (m, 2H), 6.76-6.69 (m, 3H), 5.57 (s, 1H), 5.21 (s, 1H), 4.40 (s, 2H), 3.05 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 149.4, 142.6, 136.8, 133.3, 132.9, 129.0, 128.1, 127.9, 127.5, 126.2, 125.9, 124.4, 116.3, 112.9, 112.0, 56.7, 38.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{20}H_{19}N$ 273.1517, found 273.1506.

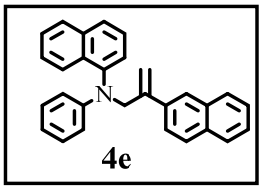
4-Isopropyl-*N*-methyl-*N*-(2-phenylallyl)aniline (4d):



4d

Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 71 mg (67%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.44 (d, *J* = 8 Hz, 2H), 7.37-7.25 (m, 3H), 7.11-7.07 (m, 2H), 6.68 (d, *J* = 8 Hz, 2H), 5.43 (s, 1H), 5.15 (s, 1H), 4.24 (s, 2H), 2.98 (s, 3H), 2.85-2.78 (m, 1H), 1.21(d, *J* = 8 Hz, 6H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 147.7, 143.2, 139.7, 128.3, 127.7, 126.94, 126.03, 112.60, 112.21, 57.1, 38.3, 33.0, 24.2; **HRMS (ESI)** m/z calcd. For $[M+H]^+$ $C_{19}H_{24}N$ 266.1903, found 266.1913.

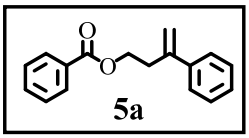
***N*-(2-(naphthalen-2-yl)allyl)-*N*-phenylnaphthalen-1-amine (4e):**



4e

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 108 mg (70%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.89 (d, *J* = 8 Hz, 1H), 7.80-7.72 (m, 6H), 7.55-7.53 (m, 1H), 7.48-7.42 (m, 5H), 7.36-7.32 (m, 1H), 7.14-7.10 (m, 2H), 6.72 (t, *J* = 8Hz, 1H), 6.62 (d, *J* = 8Hz, 2H), 5.66 (s, 2H), 4.89 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 149.3, 143.9, 143.2, 136.8, 135.3, 133.2, 132.9, 131.2, 128.8, 128.5, 128.1, 127.9, 127.5, 127.0, 126.4, 126.3, 126.2, 126.1, 126.0, 125.9, 124.7, 124.6, 123.9, 117.5, 114.0, 113.9, 57.1; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{29}H_{23}N$ 385.1830, found 385.1825.

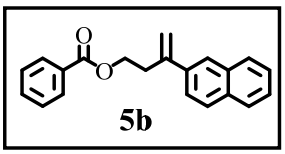
3-Phenylbut-3-en-1-yl benzoate (5a):



5a

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 82.6 mg (82%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.97-7.95 (m, 2H), 7.56-7.51 (m, 1H), 7.46-7.39 (m, 4H), 7.36-7.26 (m, 3H), 5.40 (d, *J* = 1 Hz, 1H), 5.20 (q, *J* = 1 Hz, 1H), 4.43 (t, *J* = 6.8 Hz, 2H), 3.00 (m, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.5, 144.5, 140.6, 132.8, 130.3, 129.5, 128.4, 128.3, 127.6, 126.1, 114.5, 63.7, 43.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{16}O_2$ 252.1150, found 252.1145.

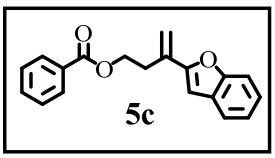
3-(Naphthalen-2-yl)but-3-en-1-yl benzoate (5b):



5b

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 92 mg (76%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.93 (d, *J* = 8 Hz, 2H), 7.88 (s, 1H), 7.84-7.79 (m, 3H), 7.60 (dd, *J* = 12 Hz, 4 Hz 1H), 7.52-7.42 (m, 3H), 7.35 (t, *J* = 8 Hz, 2H), 5.55 (s, 1H), 5.30 (s, 1H), 4.48 (t, *J* = 8 Hz, 2H), 3.09 (t, *J* = 8 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.4, 144.4, 137.8, 133.3, 132.87, 132.81, 130.2, 129.5, 128.23, 128.18, 128.03, 127.5, 126.2, 125.9, 124.7, 124.4, 115.0, 63.8, 34.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{21}H_{18}O_2$ 302.1306, found 302.1322.

3-(Benzofuran-2-yl)but-3-en-1-yl benzoate (5c):

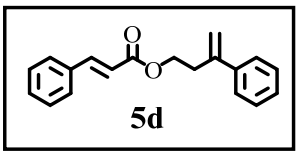


5c

Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 70 mg (60%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 8.01 (t, *J* = 8 Hz, 2H), 7.56-7.52 (m, 2H), 7.45-7.39 (m, 3H), 7.29-7.24 (m, 1H), 7.21-7.17 (m, 1H), 6.79 (s, 1H), 5.94 (s, 1H), 5.32 (s, 1H), 4.57 (t, *J* = 8 Hz, 2H), 2.93 (q, *J* = 8 Hz, 8 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.5, 155.7, 154.8, 133.5, 132.9,

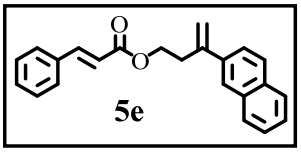
130.2, 129.6, 128.87, 128.37, 124.7, 122.8, 121.0, 114.8, 111.0, 103.1, 63.7, 32.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{19}H_{16}O_3$ 292.1099, found 292.1114.

3-Phenylbut-3-en-1-yl cinnamate (5d):



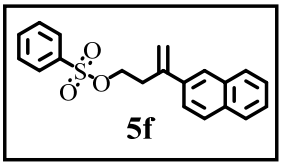
Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 71 mg (64%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.62 (d, *J* = 16 Hz, 1H), 7.51-7.48 (m, 2H), 7.45-7.42 (m, 2H), 7.38-7.35 (m, 3H), 7.34-7.24 (m, 3H), 6.39 (d, *J* = 16 Hz, 1H), 5.39 (d, *J* = 4 Hz, 1H), 5.17 (d, *J* = 1 Hz, 1H), 4.32 (t, *J* = 8Hz, 2H), 2.94 -2.90 (m, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.8, 144.72, 144.45, 140.5, 134.4, 130.2, 128.84, 128.40, 128.05, 127.6, 126.0, 118.0, 114.3, 63.3, 34.5; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{19}H_{18}O_2$ 278.1306, found 278.1316.

3-(Naphthalen-2-yl)but-3-en-1-yl cinnamate (5e):



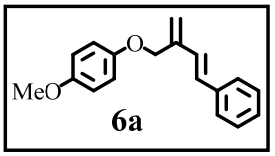
Eluent: n-hexane/ ethyl acetate (90/5); White solid; Yield: 101 mg (77%); M.p.:78 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.87 (s, 1H), 7.84-7.79 (m, 3H), 7.61-7.55 (m, 2H), 7.48-7.41 (m, 4H), 7.36-7.33 (m, 3H), 6.37 (d, *J* = 16 Hz, 1H), 5.55 (s, 1H), 5.28 (s, 1H), 4.40-4.37 (m, 2H), 3.03 (t, *J* = 8 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.8, 144.7, 144.3, 137.7, 134.3, 133.3, 132.8, 130.2, 128.81, 128.20, 128.03, 127.5, 126.2. 125.9, 124.76, 124.43, 118.0, 114.9, 63.5, 34.5; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{23}H_{20}O_2$ 328.1463, found 328.1456.

3-(Naphthalen-2-yl)but-3-en-1-yl benzenesulfonate (5f):



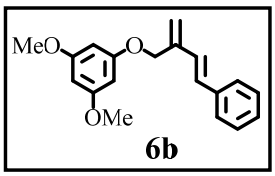
Eluent: n-hexane/ ethyl acetate (90/5); colorless liquid; Yield: 115 mg (85%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.81-7.73 (m, 5H), 6.67 (d, *J* = 1.2 Hz, 1H), 7.55-7.51 (m, 1H), 7.49-7.39 (m, 5H), 5.48 (s, 1H), 5.18 (d, *J* = 1 Hz, 1H), 4.17 (t, *J* = 8 Hz, 2H), 3.00-2.97 (m, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 142.5, 136.8, 135.9, 133.53, 133.19, 132.8, 129.0, 128.10, 128.05, 127.69, 127.46, 126.25, 126.06, 124.66, 124.12, 115.8, 68.8, 34.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{20}H_{18}O_3S$ 338.0976, found 338.0962.

(*E*)-1-Methoxy-4-((2-methylene-4-phenylbut-3-en-1-yl)oxy)benzene (6a):



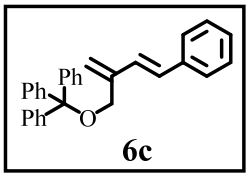
Eluent: n-hexane/ ethyl acetate (90/3); White solid; Yield: 89 mg (84%); M.p.:85 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.43-7.41 (m, 2H), 7.33-7.29 (m, 2H), 7.25-7.21 (m, 2H), 6.93-6.89 (m, 2H), 6.87-6.82 (m, 3H), 6.67 (d, *J* = 16 Hz, 1H), 5.41(s, 1H), 5.36 (s, 1H), 4.75 (s, 2H), 3.76 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ154.0, 152.7, 141.2, 137.0, 129.1, 128.5, 128.1, 127.7, 126.4, 118.1, 115.9, 114.6, 68.9, 55.6; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{18}H_{18}O_2$ 266.1298, found 266.1306.

(*E*)-1,3-Dimethoxy-5-((2-methylene-4-phenylbut-3-en-1-yl)oxy)benzene (6b):



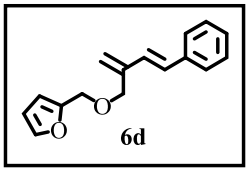
Eluent: n-hexane/ ethyl acetate (97/3); White solid; Yield: 107.7 mg (91%); M.p.:70 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.43-7.41 (m, 2H), 7.34-7.30 (m, 2H), 7.24-7.21 (m, 1H), 6.85 (d, *J* = 16 Hz, 1H), 6.65 (d, *J* = 16 Hz, 1H), 6.17 (d, *J* = 2 Hz, 2H), 6.11 (t, *J* = 4 Hz, 1H), 5.42 (s, 1H), 5.39 (s, 1H), 4.75 (s, 2H), 3.77 (s, 6H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 161.5, 160.5, 140.9, 137.0, 129.2, 128.6, 128.1, 127.7, 126.5, 118.3, 93.8, 93.2, 96.2, 55.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{19}H_{20}O_3$ 296.1412, found 296.1401.

(*E*)-(((4-Phenylbuta-1,3-dien-2-yl)oxy)methanetriyl)tribenzene (6c):



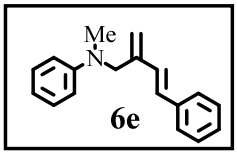
Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid;; Yield: 101.3 mg (63%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.52-7.46 (m, 5H), 7.34-7.19 (m, 15H), 6.76 (d, *J* = 16 Hz, 1H), 6.28 (d, *J* = 16 Hz, 1H), 5.62 (d, *J* = 1.6 Hz, 1H), 5.34 (s, 1H), 3.87 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 144.1, 142.9, 137.2, 128.83, 128.70, 128.54, 128.37, 127.87, 127.48, 127.06, 126.3, 116.4, 87.0, 63.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{30}H_{26}O$ 402.1983, found 402.1977.

(*E*)-2-(((2-Methylene-4-phenylbut-3-en-1-yl)oxy)methyl)furan (6d):



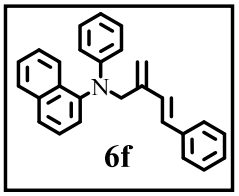
Eluent: n-hexane/ ethyl acetate (97/3); Yellowish liquid; Yield: 87.3 mg (91%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.43-7.39 (m, 3H), 7.33-7.29 (m, 2H), 7.25-7.20 (m, 1H), 6.79 (d, *J* = 16 Hz, 1H), 6.67 (d, *J* = 16 Hz, 1H), 6.36-6.34 (m, 2H), 5.32 (s, 2H), 4.50 (s, 2H), 4.29 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 151.8, 142.82, 142.01, 137.2, 129.3, 128.58, 128.37, 127.6, 126.5, 118.2, 110.3, 109.4, 70.0, 63.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{16}O_2$ 240.1150, found 240.1136.

(*E*)-*N*-Methyl-*N*-(2-methylene-4-phenylbut-3-en-1-yl)aniline (6e):



Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 81.6 mg (82%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.42-7.40 (m, 2H), 7.34-7.30 (m, 2H), 7.25-7.20 (m, 3H), 6.90 (d, *J* = 16 Hz, 1H), 6.71-6.69 (m, 3H), 5.59 (d, *J* = 16 Hz, 1H), 5.24 (s, 1H), 5.09 (s, 1H), 4.19 (s, 2H), 3.02 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 149.5, 140.4, 137.1, 129.3, 129.1, 128.6, 128.1, 127.6, 126.4, 116.2, 116.2, 111.9, 54.4, 38.3; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{18}H_{19}N$ 249.1517, found 249.1520.

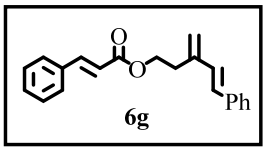
(*E*)-*N*-(2-Methylene-4-phenylbut-3-en-1-yl)-*N*-phenylnaphthalen-1-amine (6f):



Eluent: n-hexane/ ethyl acetate (97/3); Brown solid; Yield: 131.4 mg (91%); M.p.:142 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.91 (d, *J* = 8 Hz, 1H), 7.86 (d, *J* = 8 Hz, 1H), 7.80 (dd, *J* = 8 Hz, 4 Hz 1H), 7.52-7.47 (m, 3H), 7.44-7.40 (m, 1H), 7.38-7.36 (m, 3H), 7.31-7.21 (m, 2H), 7.23-7.19 (m, 2H), 7.14-7.09 (m, 2H), 6.89 (d, *J* = 16 Hz, 1H), 6.73-6.69 (m, 1H),

6.58-6.54 (m, 3H), 5.57 (s, 1H), 5.38 (s, 1H), 4.67 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 149.3, 144.0, 140.6, 137.0, 135.3, 131.1, 129.2, 128.7, 128.6, 128.5, 128.0, 127.5, 126.9, 126.36, 126.32, 126.29, 126.25, 126.0, 123.9, 117.4, 117.1, 113.9, 54.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{27}H_{23}N$ 361.1830, found 361.1822.

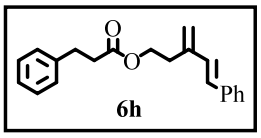
(*E*)-3-Methylene-5-phenylpent-4-en-1-yl cinnamate (6g):



6g

Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 76 mg (63%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.69 (d, *J* = 16 Hz, 1H), 7.48-7.21 (m, 10H), 6.83 (d, *J* = 16 Hz, 1H), 6.67 (d, *J* = 16 Hz, 1H), 6.44 (d, *J* = 16 Hz, 1H), 5.26 (s, 1H), 5.16 (s, 1H), 4.41 (t, *J* = 8 Hz, 2H), 2.76 (t, *J* = 8 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 166.9, 144.9, 142.1, 137.1, 134.4, 130.47, 130.28, 128.88, 128.71, 128.66, 128.10, 127.6, 126.5, 118.12, 118.05, 63.4, 31.4; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{21}H_{20}O_2$ 304.1463, found 304.1454.

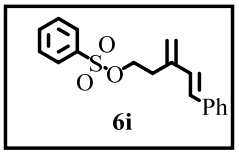
(*E*)-3-Methylene-5-phenylpent-4-en-1-yl 3-phenylpropanoate (6h):



6h

Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid;; Yield: 111.3 mg (91%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.48-7.46 (m, 2H), 7.39-7.22 (m, 8H), 6.85 (d, *J* = 16 Hz, 1H), 6.66 (d, *J* = 16 Hz, 1H), 5.26 (s, 1H), 5.13 (s, 1H), 4.32 (t, *J* = 8 Hz, 2H), 3.0 (t, *J* = 8 Hz, 2H), 2.71-2.26 (m, 4H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 172.8, 142.0, 140.5, 137.1, 130.4, 128.66, 128.62, 128.51, 128.32, 127.6, 126.53, 126.27, 117.9, 63.2, 35.9, 31.3, 31.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{21}H_{22}O_2$ 306.1620, found 306.1607.

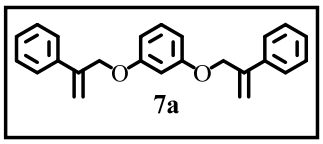
(*E*)-3-Methylene-5-phenylpent-4-en-1-yl benzenesulfonate (6i):



6i

Eluent: n-hexane/ ethyl acetate (97/3); colorless liquid; Yield: 103 mg (82%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.92-7.89 (m, 2H), 7.64-7.60 (m, 1H), 7.54-7.50 (m, 2H), 7.37-7.29 (m, 4H), 7.25-7.21 (m, 1H), 6.68 (d, *J* = 16 Hz, 1H), 6.45 (d, *J* = 16 Hz, 1H), 5.19 (s, 1H), 5.05 (s, 1H), 4.23 (t, *J* = 8 Hz, 2H), 2.73-2.70 (m, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 140.4, 136.80, 136.23, 133.7, 129.78, 129.21, 128.6, 127.89, 127.80, 126.5, 118.7, 69.0, 31.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{18}H_{18}O_3S$ 314.0976, found 314.0968.

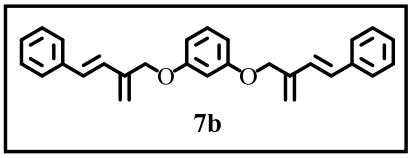
1,3-Bis((2-phenylallyl)oxy)benzene (7a):



7a

Eluent: n-hexane/ ethyl acetate (98/2); colorless liquid; Yield: 76 mg (56%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.47 (d, *J* = 8 Hz, 4H), 7.39-7.28 (m, 6H), 7.21-7.17 (m, 1H), 6.59 (d, *J* = 8 Hz, 3H), 5.60 (s, 2H), 5.46 (s, 2H), 4.86 (s, 4H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 159.8, 143.0, 138.3, 129.8, 128.48, 128.00, 126.05, 114.8, 107.5, 102.4, 69.9; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{24}H_{22}O_2$ 342.1619, found 342.1614.

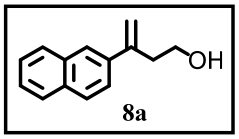
1,3-Bis(((*E*)-2-methylene-4-phenylbut-3-en-1-yl)oxy)benzene (7b):



7b

Eluent: n-hexane/ ethyl acetate (98/2); White solid; Yield: 56.7 mg (36%); M.p.:92 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.43-7.41 (m, 4H), 7.33-7.29 (m, 4H), 7.25-7.19 (m, 3H), 6.85 (d, *J* = 16 Hz, 2H), 6.68-6.60 (m, 5H), 5.44 (s, 2H), 5.39 (s, 2H), 4.79 (s, 4H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 159.9, 141.0, 137.0, 129.9, 129.2, 128.63, 128.15, 127.7, 126.5, 118.2, 107.5, 102.4, 68.2; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{28}H_{26}O_2$ 394.1932, found 394.1928.

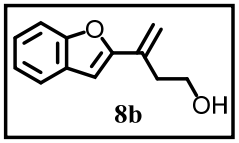
3-(Naphthalen-2-yl)but-3-en-1-ol (8a):[14]



8a

Eluent: n-hexane/ ethyl acetate (90/10); White solid; Yield: 36.4 mg (92%); M.p.:51 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.83-7.79 (m, 4H), 7.57 (dd, *J* = 4 Hz, 4 Hz, 1H), 7.49-7.43 (m, 2H), 5.55 (d, *J* = 1.2 Hz, 1H), 5.26 (d, *J* = 1.2 Hz, 1H), 3.77 (t, *J* = 8 Hz, 2H), 2.92-2.88 (m, 2H), 1.50 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 144.6, 137.6, 133.3, 132.9, 128.16, 128.03, 127.5, 126.25, 126.0, 124.83, 124.46, 115.0, 61.1, 38.6; **HRMS (ESI)** m/z calcd. For $[M+H]^+$ $C_{14}H_{15}O$ 199.1117, found 199.1125.

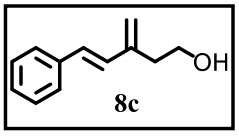
3-(Benzofuran-2-yl)but-3-en-1-ol (8b):[15]



8b

Eluent: n-hexane/ ethyl acetate (90/10); colorless liquid; Yield: 35.7 mg (95%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.52 (d, *J* = 4 Hz, 1H), 7.45-7.43 (m, 1H), 7.29-7.25 (m, 1H), 7.21-7.17 (m, 1H), 6.69 (s, 1H), 5.93 (d, *J* = 1 Hz, 1H), 5.27 (d, *J* = 1 Hz, 1H), 3.37 (q, *J* = 1 Hz, 1H), 2.76-2.72 (m, 2H), 1.54 (t, *J* = 8 Hz, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 155.7, 154.7, 133.9, 128.7, 124.7, 122.8, 121.0, 114.7, 110.9, 103.0, 61.4, 36.5; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{12}H_{12}O_2$ 188.0837, found 188.0847.

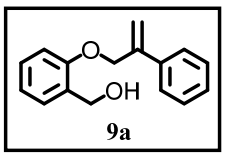
(*E*)-3-Methylene-5-phenylpent-4-en-1-ol (8c):[16]



8c

Eluent: n-hexane/ ethyl acetate (90/10); White solid; Yield: 32.3 mg (93%); M.p.:54 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.43-7.41 (m, 2H), 7.34-7.30 (m, 2H), 7.25-7.21 (m, 1H), 6.81 (d, *J* = 16 Hz, 1H), 6.61 (d, *J* = 16 Hz, 1H), 5.26 (s, 1H), 5.14 (s, 1H), 3.82 (t, *J* = 8 Hz, 2H), 6.65-6.62 (m, 2H), 1.50 (s, 1H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 142.4, 137.0, 130.3, 128.75, 128.64, 127.6, 126.4, 118.1, 61.2, 35.4; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{12}H_{14}O$ 174.1044, found 174.1025.

(2-((2-Phenylallyl)oxy)phenyl)methanol (9a):

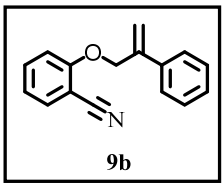


9a

Eluent: n-hexane/ ethyl acetate (93/7); colorless liquid; Yield: 86 mg (90%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.45 (d, *J* = 8 Hz, 2H), 7.38-7.25 (m, 5H), 6.96-6.93 (m, 2H), 5.60 (s, 1H), 5.45 (s, 1H), 4.96 (s, 2H), 4.57 (d, *J* = 8 Hz, 2H), 2.08 (q, *J* = 1.2 Hz, 1); **^{13}C NMR** (100 MHz, $CDCl_3$): δ

156.3, 143.1, 138.1, 129.5, 128.89, 128.86, 128.58, 128.17, 126.0, 121.0, 114.9, 111.4, 69.8, 62.0; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{16}O_2$ 240.1150, found 240.1136.

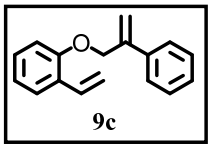
2-((2-Phenylallyl)oxy)benzonitrile (9b):



9b

Eluent: n-hexane (94/6); colorless liquid; Yield: 63 mg (67%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.56-7.44 (m, 4H), 7.39-7.30 (m, 3H), 7.02-6.98 (m, 2H), 5.61 (d, *J* = 1 Hz, 1H), 5.54 (s, 1H), 5.00 (t, *J* = 4 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 160.1, 147.7, 137.8, 134.1, 133.7, 128.52, 128.16, 125.9, 121.0, 116.2, 114.8, 112.8, 102.3, 70.1; **HRMS (EI)** m/z calcd. For $[M+H]^+$ $C_{16}H_{14}NO$ 236.1069, found 236.1072.

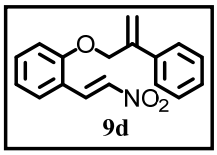
1-((2-Phenylallyl)oxy)-2-vinylbenzene (9c):



9c

Eluent: n-hexane (100%); colorless liquid; Yield: 78 mg (83%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.50-7.45 (m, 3H), 7.37-7.28 (m, 3H), 7.24-7.20 (m, 1H), 7.05-6.92 (m, 3H), 5.69 (dd, *J* = 8 Hz, 1.6 Hz, 1H), 5.60 (d, *J* = 1 Hz, 1H), 5.47 (q, *J* = 4 Hz, 1H), 5.20 (dd, *J* = 1 Hz, 4 Hz, 1H), 4.91 (s, 1H), **^{13}C NMR** (100 MHz, $CDCl_3$): δ 155.6, 143.1, 138.4, 131.5, 128.69, 128.41, 127.92, 127.20, 126.48, 126.02, 120.9, 114.53, 114.39, 112.4, 70.1; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{16}O$ 236.1201, found 236.1206.

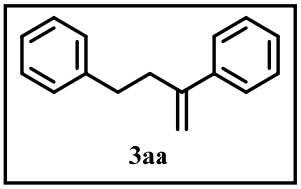
(*E*)-1-(2-Nitrovinyl)-2-((2-phenylallyl)oxy)benzene (9d):



9d

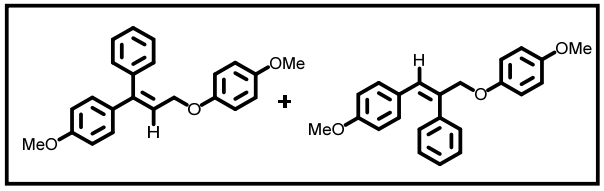
Eluent: n-hexane/ethyl acetate (95/5); colorless liquid; Yield: 86 mg (77%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 8.01 (d, *J* = 12 Hz, 1H), 7.62 (d, *J* = 12 Hz, 1H), 7.46-7.32 (m, 7H), 7.02 (t, *J* = 8 Hz, 1H), 5.62 (s, 1H), 7.02 (d, *J* = 1 Hz, 1H), 5.05 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 158.4, 142.7, 138.5, 137.9, 135.1, 133.2, 132.6, 128.71, 128.39, 126.1, 121.4, 119.7, 115.8, 112.8, 70.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{17}H_{15}NO_3$ 281.1051, found 281.1042.

But-3-ene-1,3-diyldibenzene (3aa):[17]


3aa

Eluent: n-hexane/ethyl acetate (97/3); colorless liquid; Yield: 60 mg (72%); **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.44-7.41 (m, 2H), 7.36-7.31 (m, 2H), 7.29-7.23 (m, 3H), 7.20-7.16 (m, 3H), 5.29 (d, *J* = 1.2 Hz, 1H), 5.06 (d, *J* = 1.2 Hz, 1H), 2.83-2.74 (m, 4H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 147.8, 141.9, 141.1, 128.4, 128.36, 128.31, 127.4, 126.1, 125.8, 112.6, 37.2, 34.7; **HRMS (EI)** m/z calcd. For $[M]^+$ $C_{16}H_{16}$ 208.1252, found 208.1238.

(*E*)-1-methoxy-4-(3-(4-methoxyphenoxy)-1-phenylprop-1-en-1-yl)benzene (3bb) and (*E*)-1-methoxy-4-(3-(4-methoxyphenoxy)-2-phenylprop-1-en-1-yl)benzene (3bb').



The products **3bb** and **3bb'** were isolated in a 4:1 ratio of inseparable mixture using eluent: *n*-hexane/ethyl acetate (96/4); White solid; Yield: 88 mg (64%); M.p.:85 °C; **^{1}H NMR** (400 MHz, $CDCl_3$): δ 7.58 (d, *J* = 4 Hz, 0.51H), 7.35 (t, *J* = 8 Hz, 1H), 7.29-7.23 (m, 5.2H), 7.13 (t, *J* = 8 Hz, 2.3H), 6.90 (d, *J* = 8 Hz, 2.8H), 6.86-6.82 (m, 0.87H), 6.78 (s, 4H), 6.24 (t, *J* = 4 Hz, 1H), 4.88 (s, 0.5H), 4.55 (d, *J* = 4 Hz, 2H), 3.82 (s, 3.0H), 3.79 (s, 0.88H), 3.77 (s, 0.82H), 3.74 (s, 3.0H);**^{13}C NMR** (100 MHz, $CDCl_3$): 159.1, 154.0, 153.8, 152.7, 145.1, 142.0, 141.2, 134.7, 132.9, 131.2, 130.9, 130.3, 129.3, 128.4, 128.0, 127.7, 127.6, 127.2, 126.1, 123.7, 115.8, 115.7, 114.6, 114.5, 113.8, 113.6, 66.8, 66.7, 55.6, 55.2. **HRMS (MALDI)** m/z calcd. For $[M+H]^+$ $C_{23}H_{22}O_3$ 347.1642, found 347.1646.

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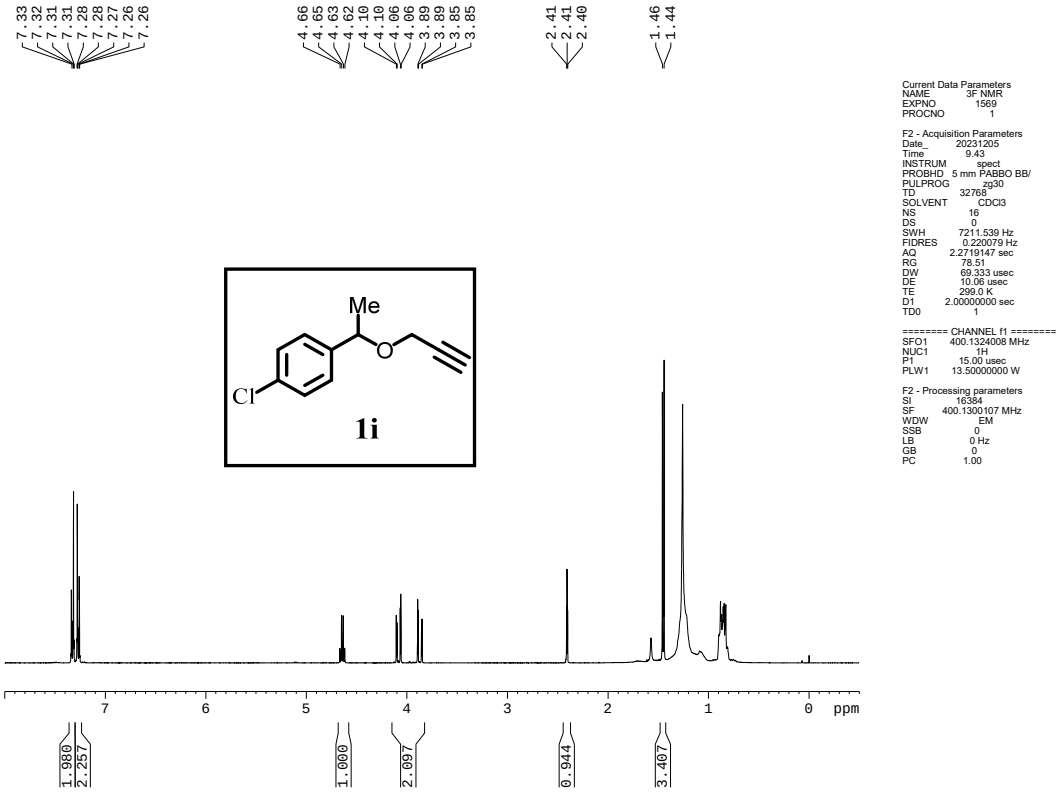
VIII. Spectra Copies

^{1}H and ^{13}C NMR spectra of compound 1i.

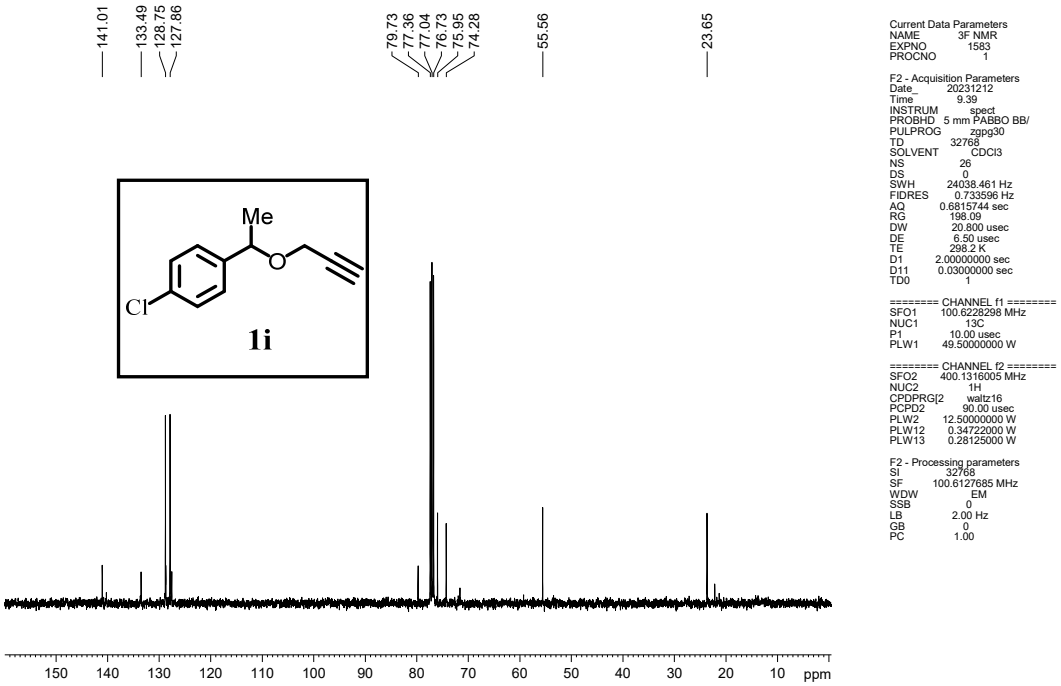


Current Data Parameters
NAME 3F NMR
EXPNO 1569
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231205
Time 9.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 78.51
DW 69.333 usec
DE 10.06 usec
TE 299.0 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300107 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1583
PROCNO 1

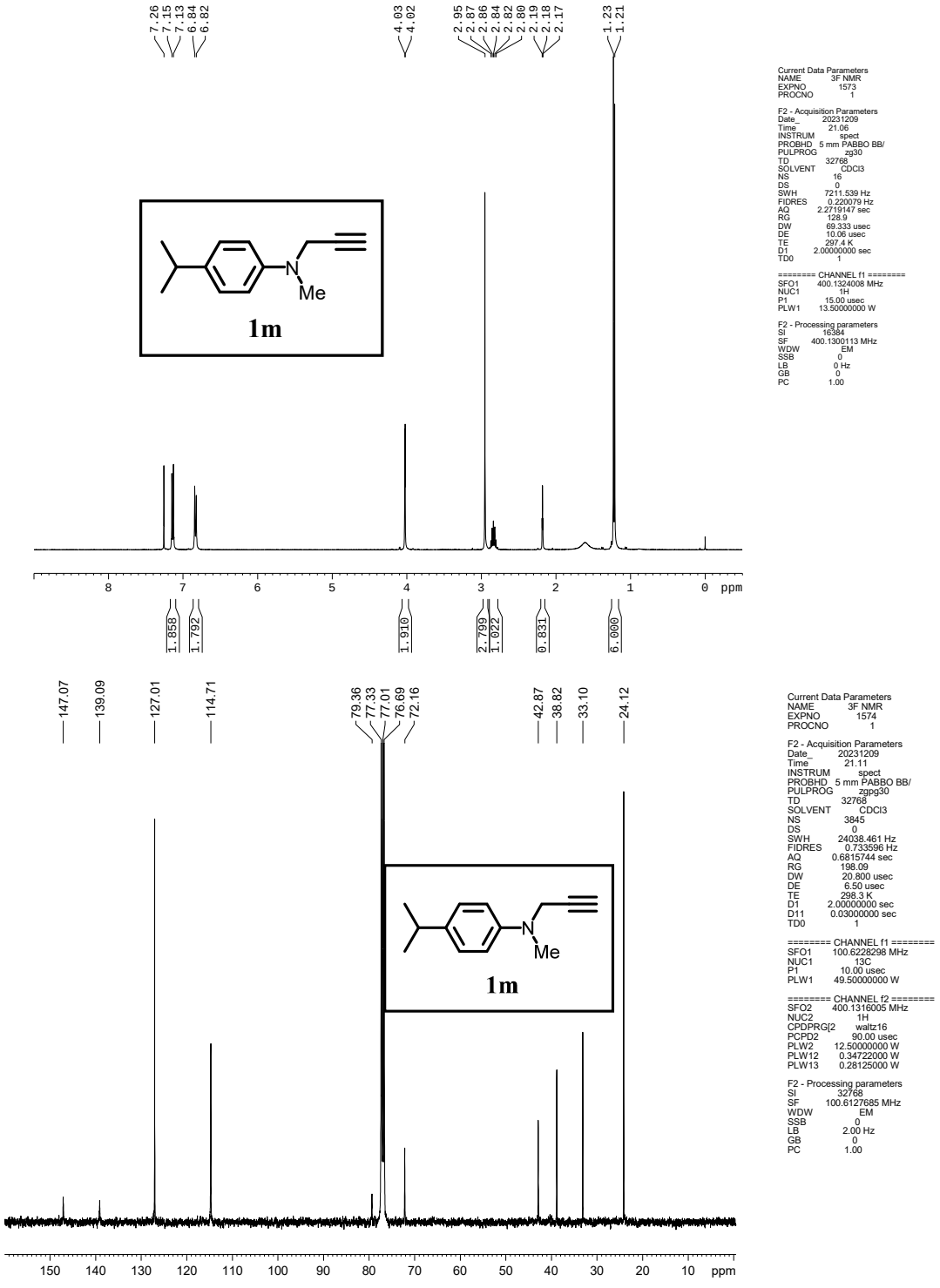
F2 - Acquisition Parameters
Date_ 20231212
Time 9.39
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 26
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 1m.



Current Data Parameters
NAME 3F NMR
EXPNO 1573
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231209
Time 21.06
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 128.9
DW 69.333 usec
DE 10.06 usec
TE 297.4 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300113 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1574
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231209
Time 21.11
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 3845
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 1n.

Current Data Parameters
NAME 3F NMR
EXPNO 1328
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230818
Time 15.29
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 298.7 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300205 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1329
PROCNO 1

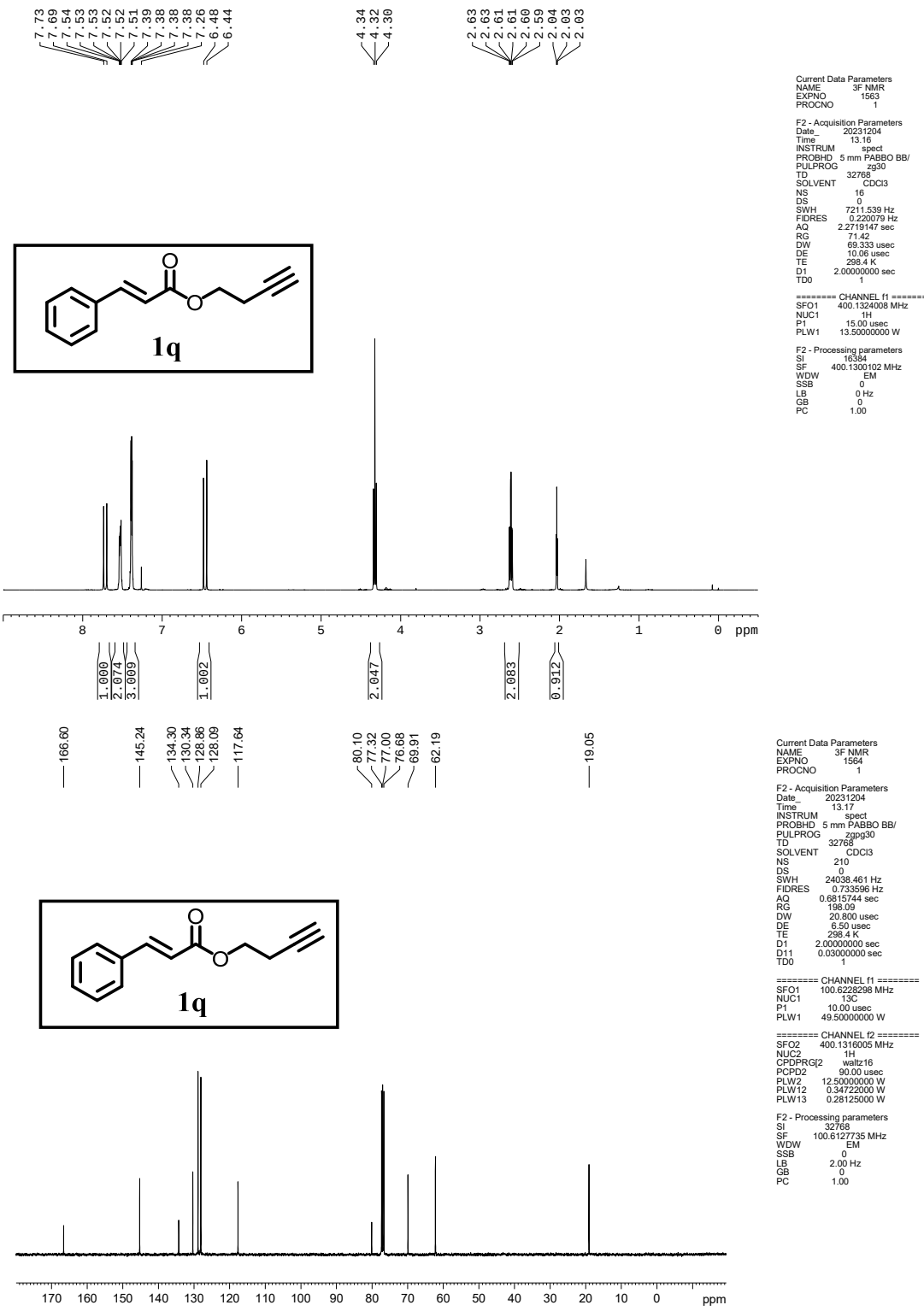
F2 - Acquisition Parameters
Date_ 20230818
Time 15.31
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 116
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

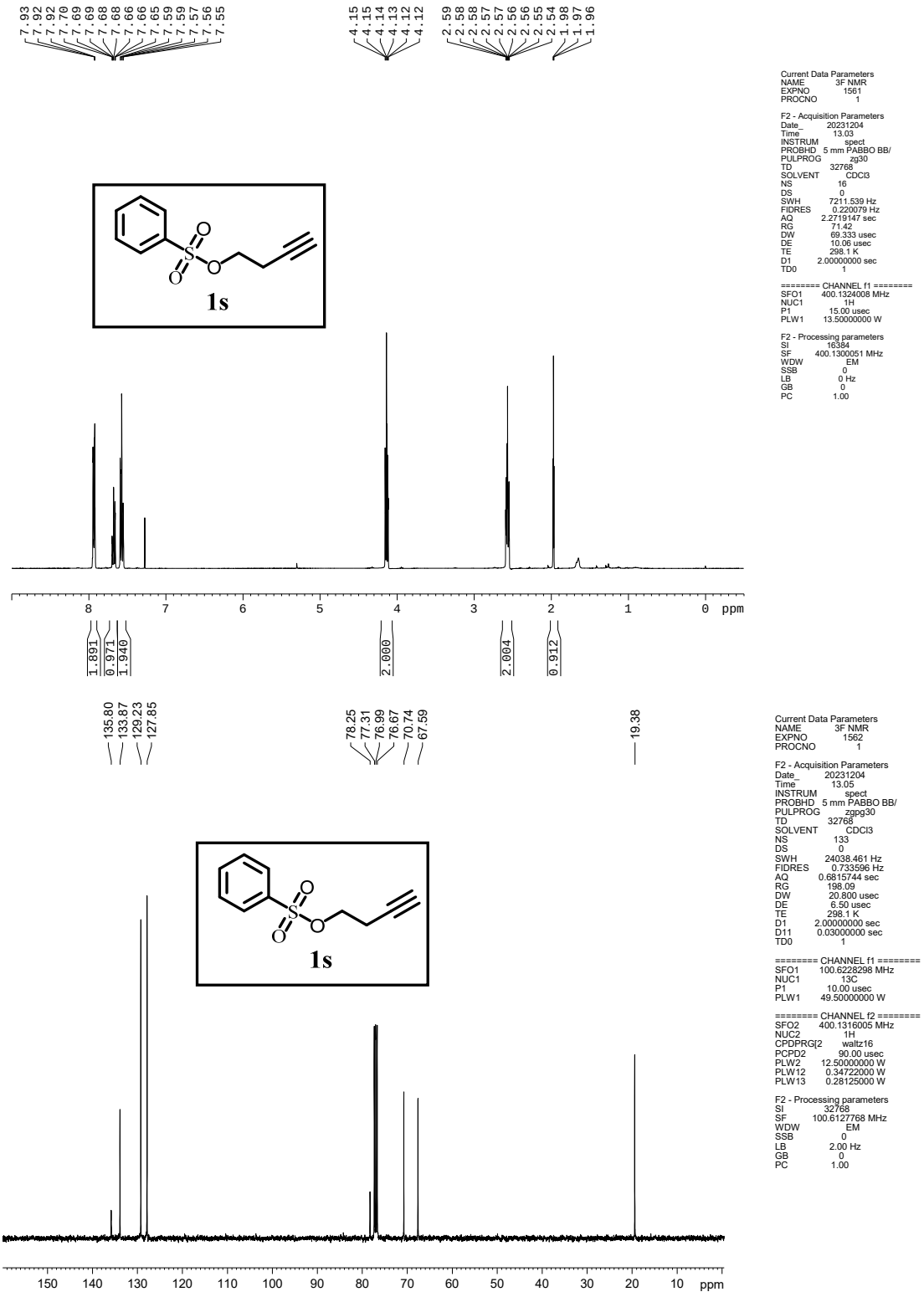
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127757 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 1q.



^{1}H and ^{13}C NMR spectra of compound 1s.



Current Data Parameters
NAME 3F NMR
EXPNO 1561
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231204
Time 13.03
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 71.42
DW 69.333 usec
DE 10.06 usec
TE 298.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300051 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1562
PROCNO 1

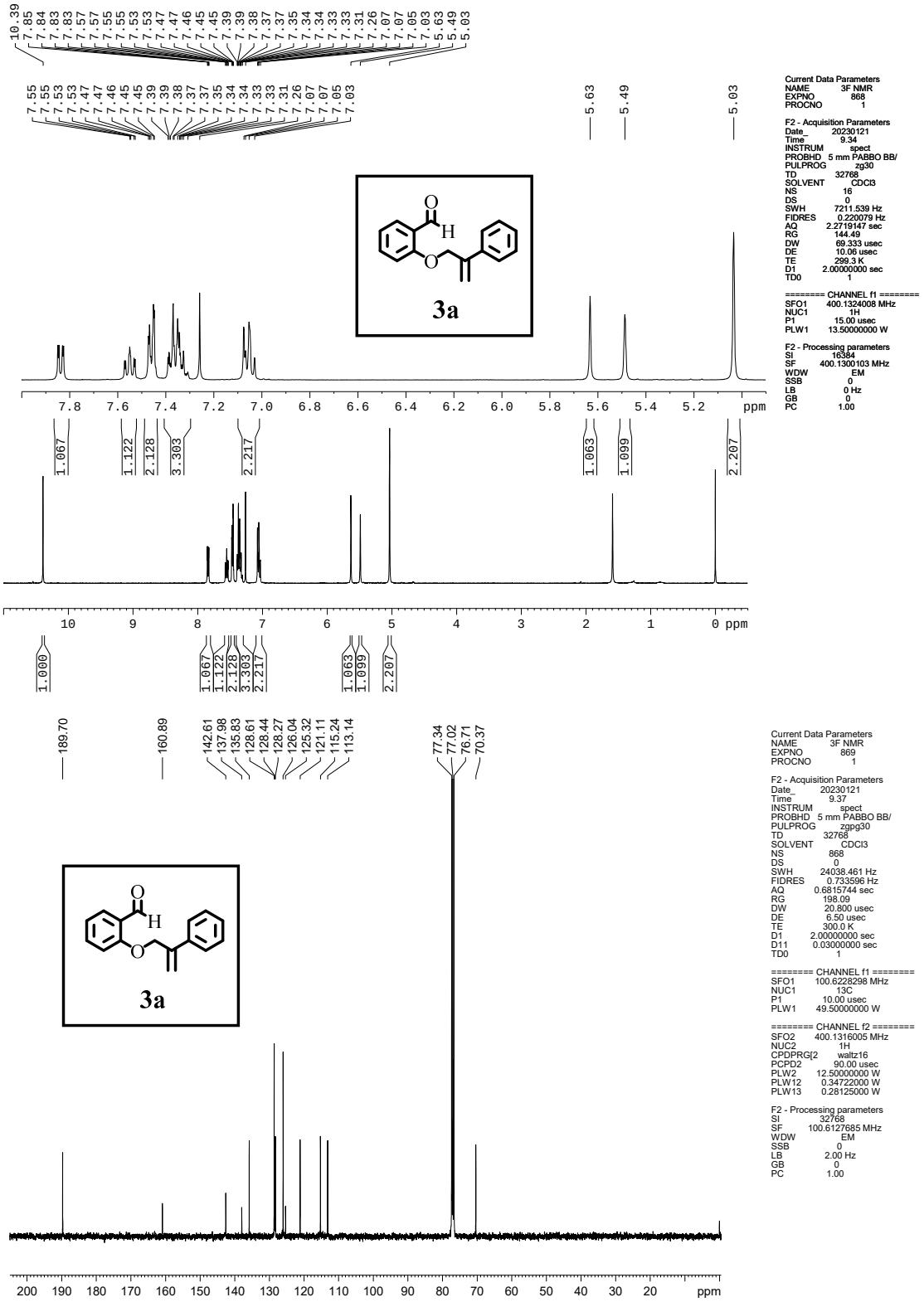
F2 - Acquisition Parameters
Date_ 20231204
Time 13.05
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 133
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

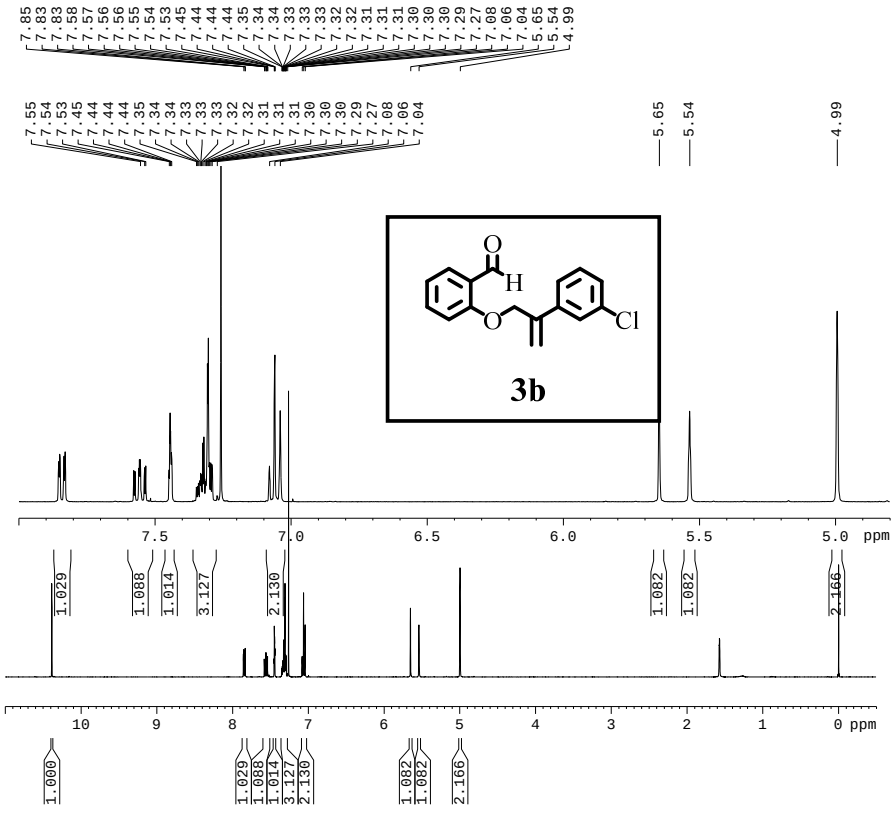
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127768 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3a.



^{1}H and ^{13}C NMR spectra of compound 3b

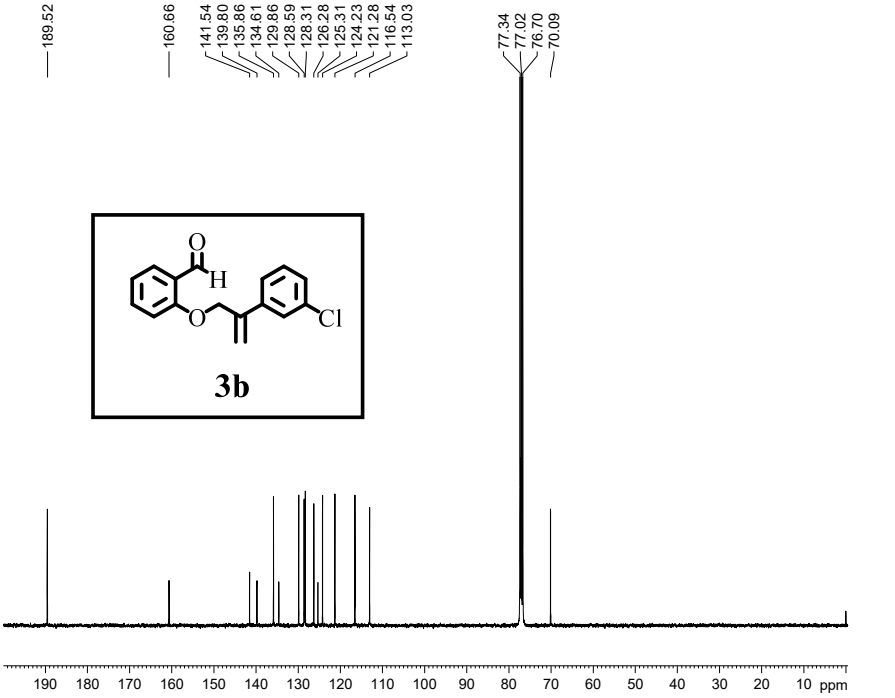


Current Data Parameters
NAME 3F NMR
EXPNO 953
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230310
Time 16.56
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 158.74
DW 69.333 usec
DE 10.06 usec
TE 298.9 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300107 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 954
PROCNO 1

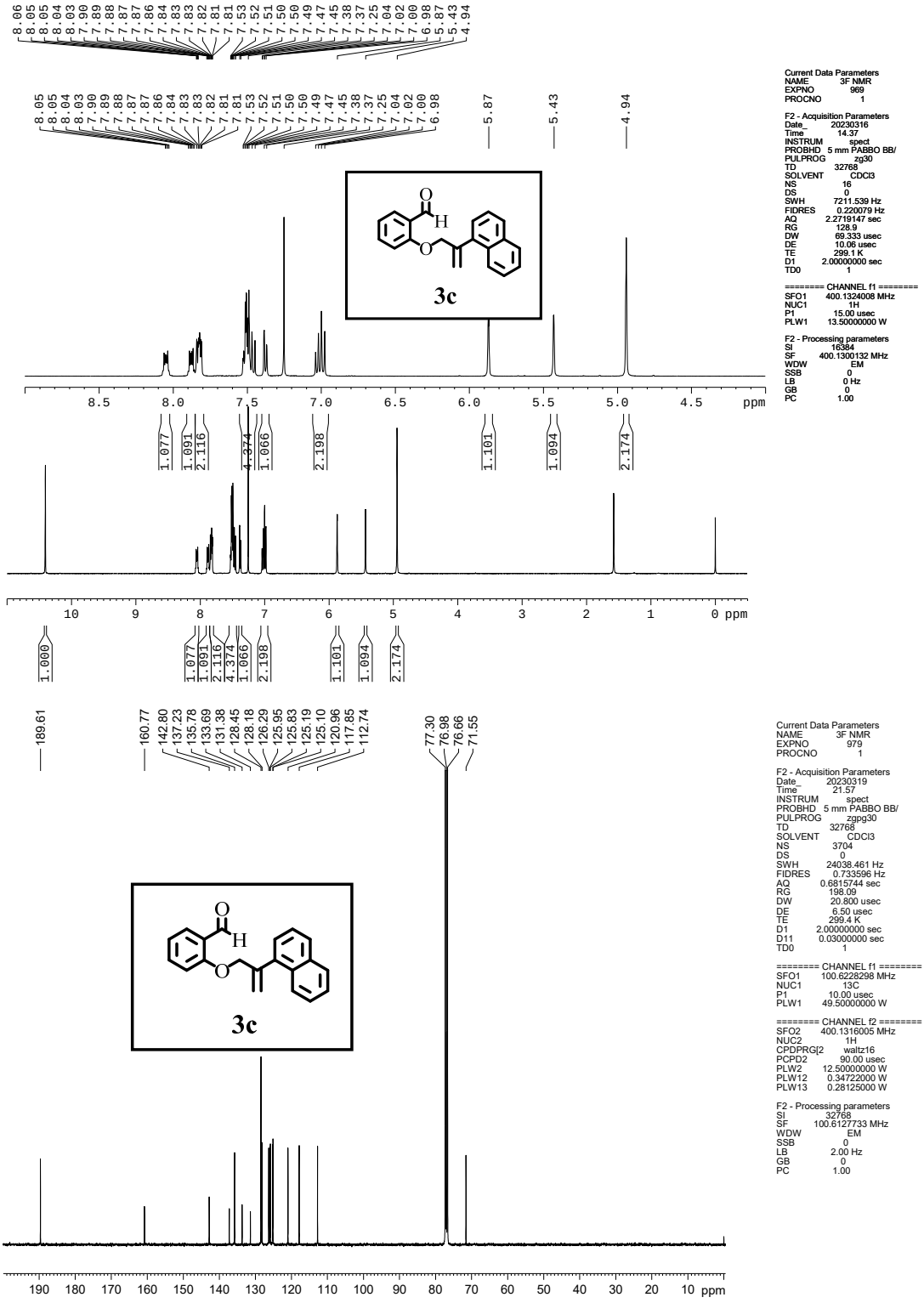
F2 - Acquisition Parameters
Date_ 20230312
Time 21.41
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 5987
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

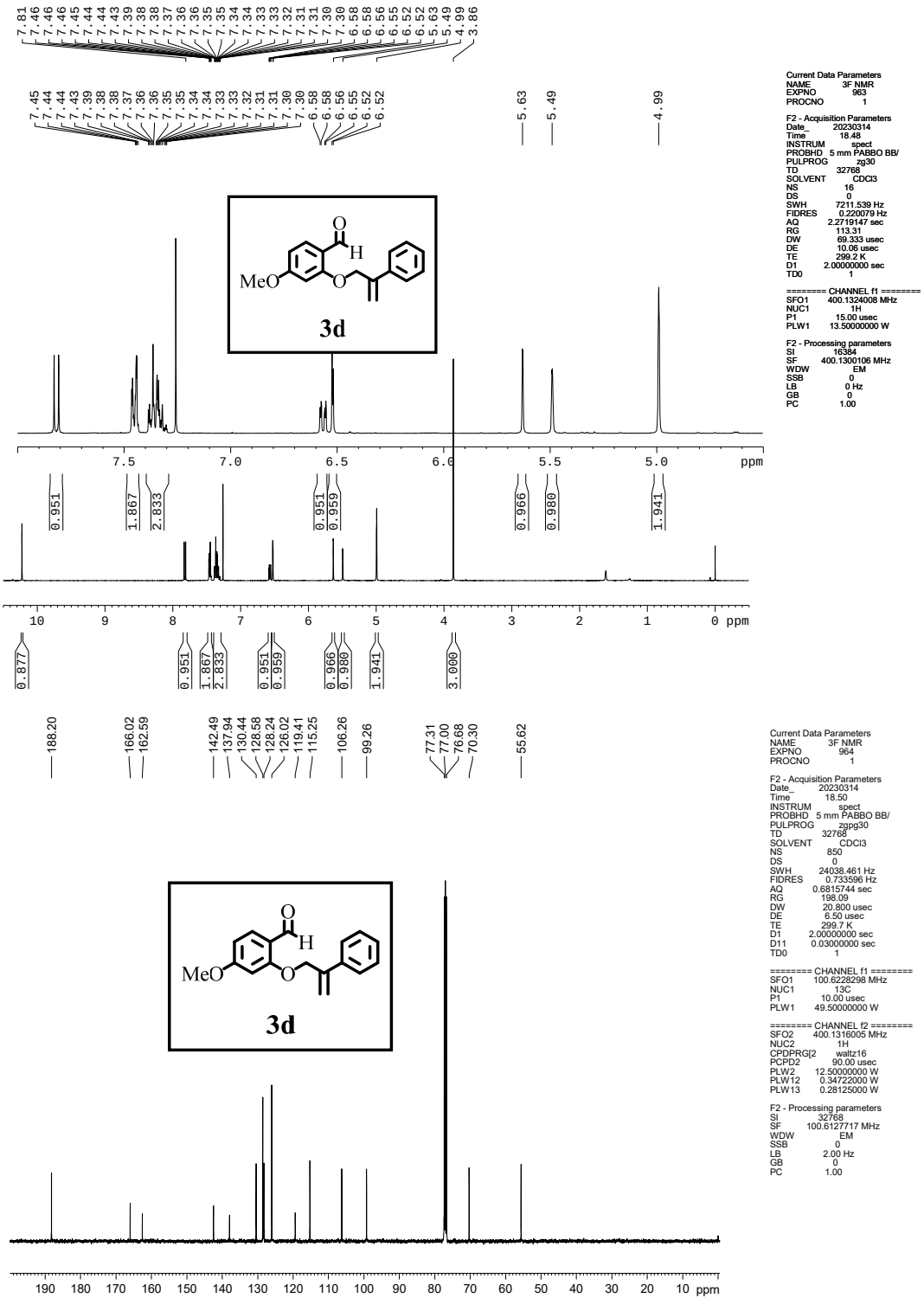
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3c



^{1}H and ^{13}C NMR spectra of compound 3d



Current Data Parameters
NAME 3F NMR
EXPNO 963
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230314
Time 18.48
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 113.31
DW 69.333 usec
DE 10.06 usec
TE 299.2 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300106 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 964
PROCNO 1

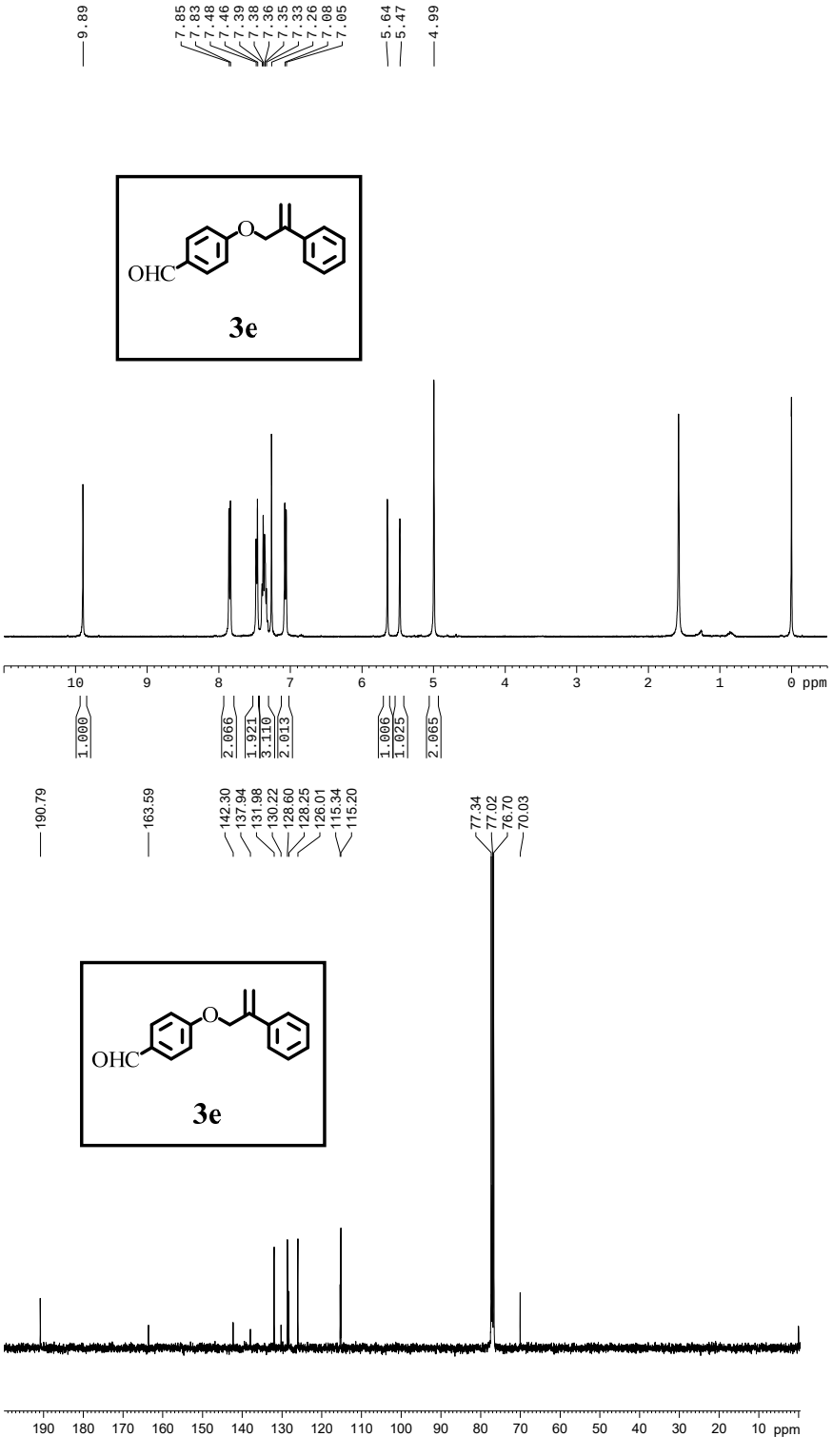
F2 - Acquisition Parameters
Date_ 20230314
Time 18.50
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 850
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127717 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3e.



Current Data Parameters
NAME 3F NMR
EXPNO 874
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230124
Time 7.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 198.09
DW 69.333 usec
DE 10.06 usec
TE 299.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300102 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 875
PROCNO 1

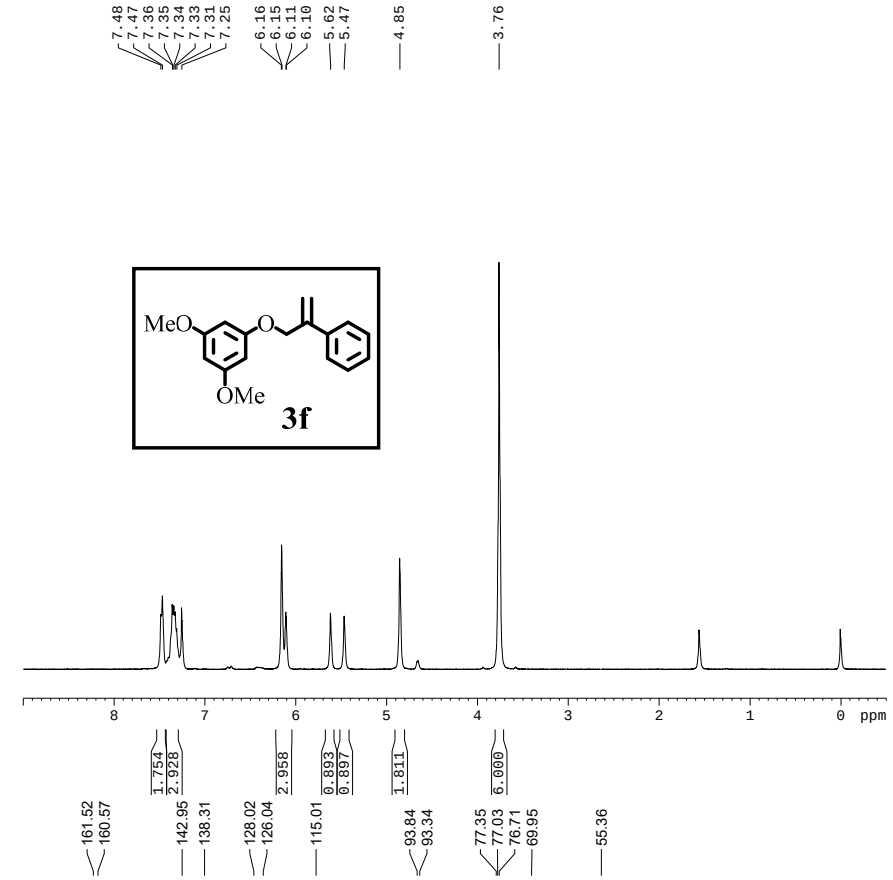
F2 - Acquisition Parameters
Date_ 20230124
Time 8.01
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 802
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3f.

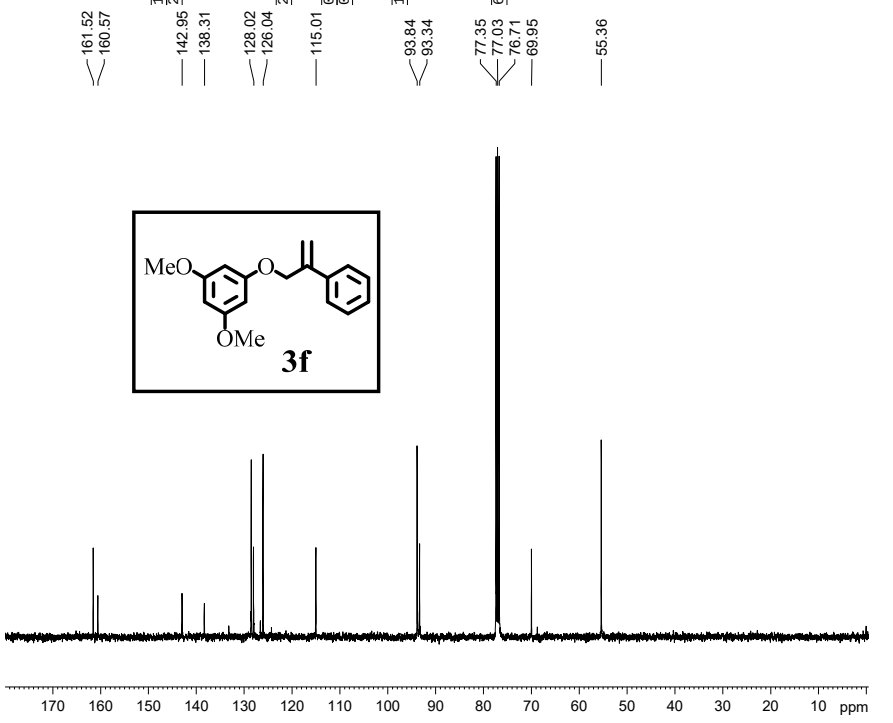


Current Data Parameters
NAME 3F NMR
EXPNO 1045
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230421
Time 3.14
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 113.31
DW 69.333 usec
DE 10.06 usec
TE 298.2 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300136 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1046
PROCNO 1

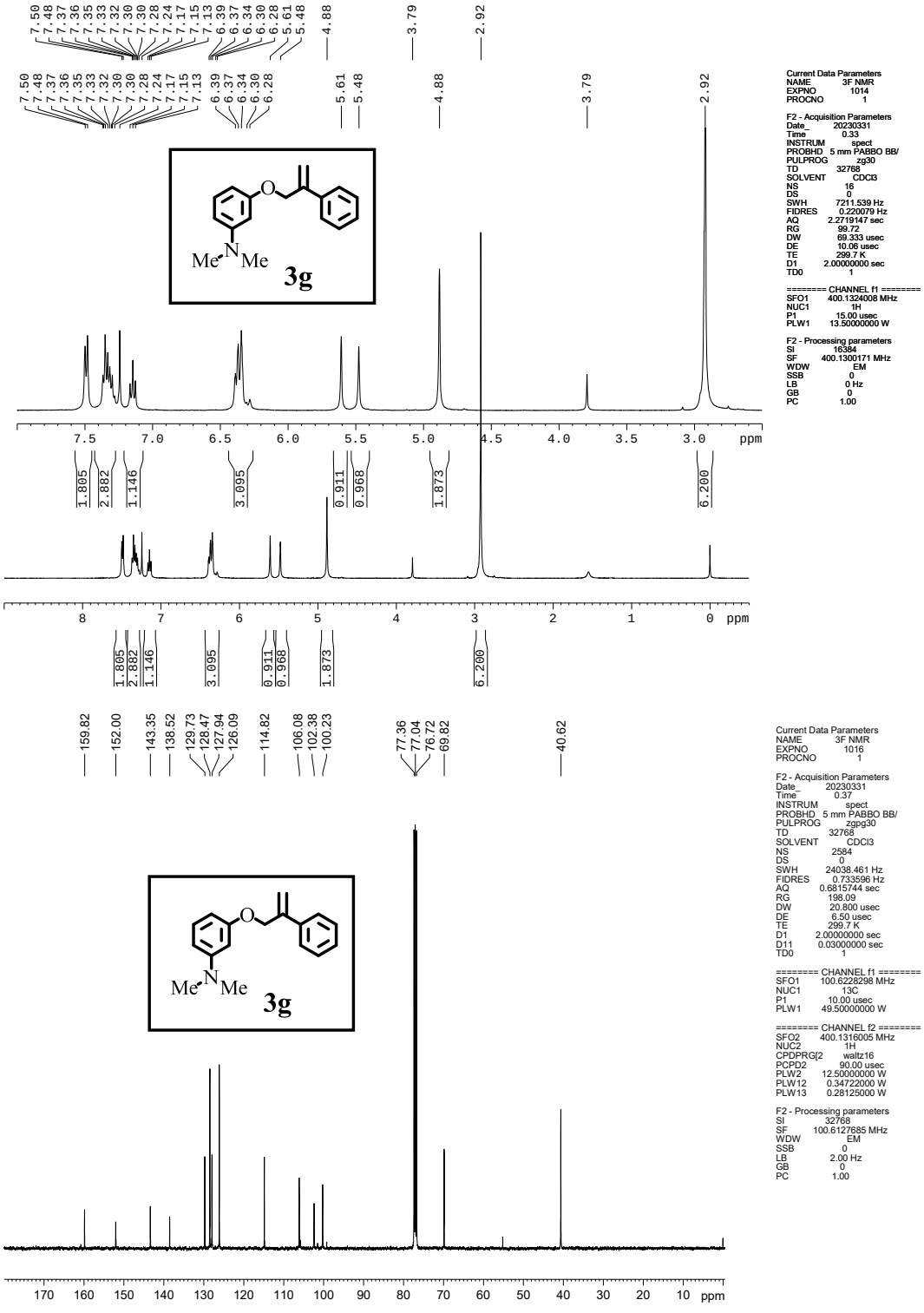
F2 - Acquisition Parameters
Date_ 20230421
Time 3.17
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 575
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3g.



Current Data Parameters
NAME 3F NMR
EXPNO 1014
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230331
Time 0.33
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 99.72
DW 69.333 usec
DE 10.06 usec
TE 299.7 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300171 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1016
PROCNO 1

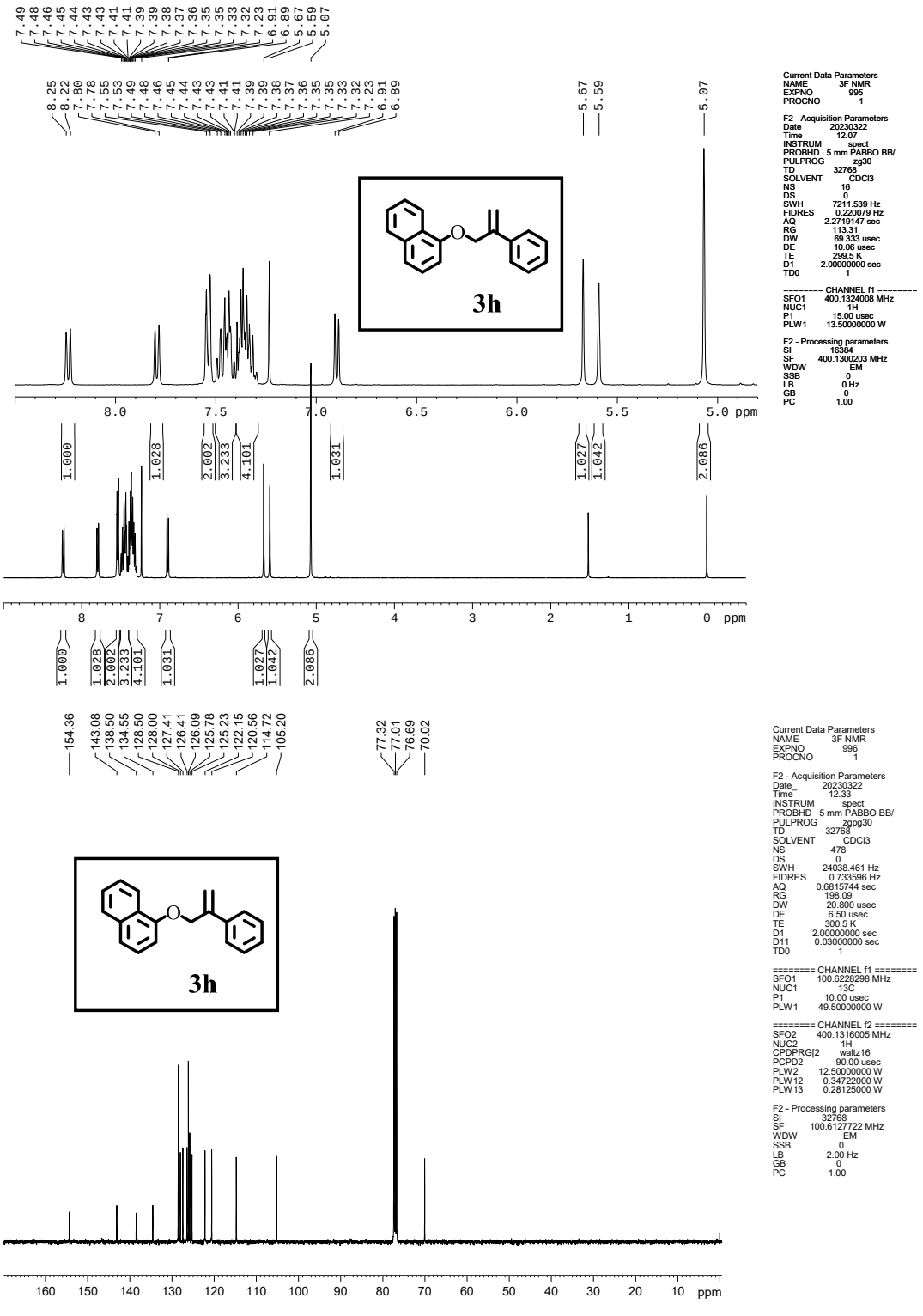
F2 - Acquisition Parameters
Date_ 20230331
Time 0.37
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 2584
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3h.



Current Data Parameters
NAME 3F NMR
EXPNO 995
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230322
Time 12.07
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 113.31
DW 69.333 usec
DE 10.06 usec
TE 299.5 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300203 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 996
PROCNO 1

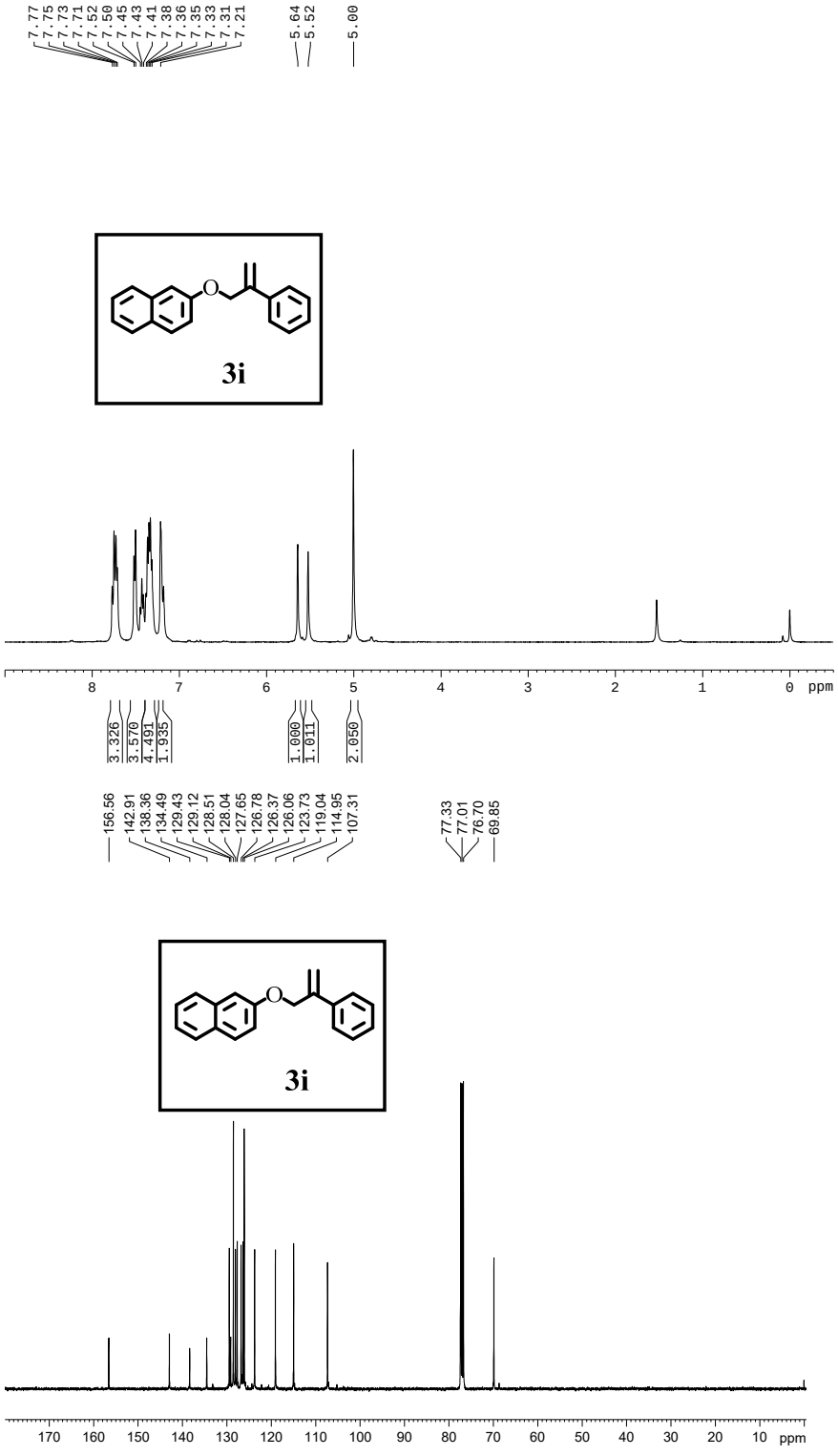
F2 - Acquisition Parameters
Date_ 20230322
Time 12.33
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 478
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 300.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

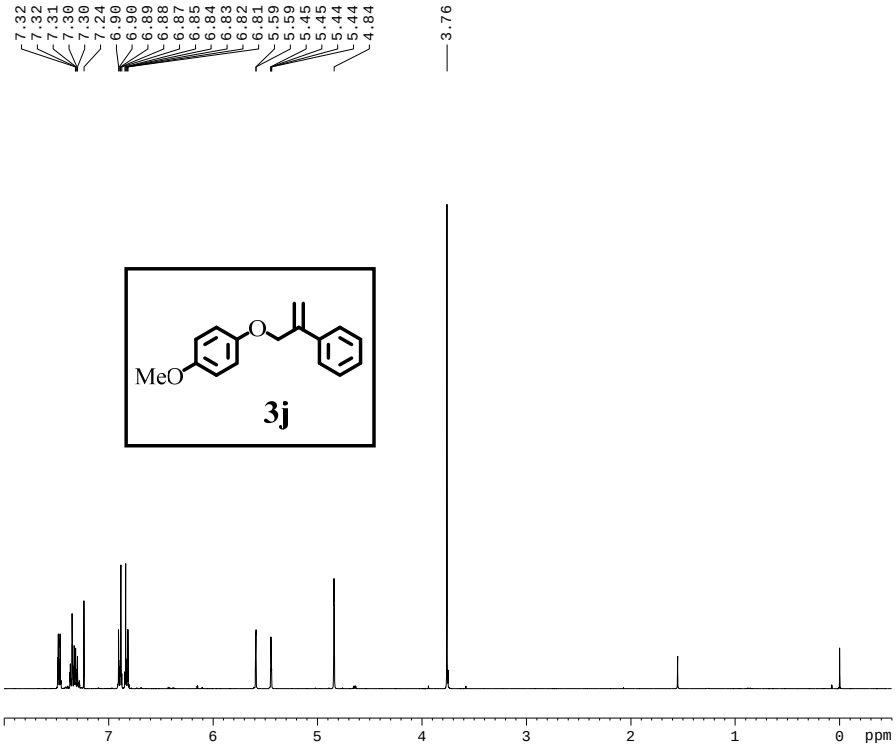
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127722 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3i.



^{1}H and ^{13}C NMR spectra of compound 3j.

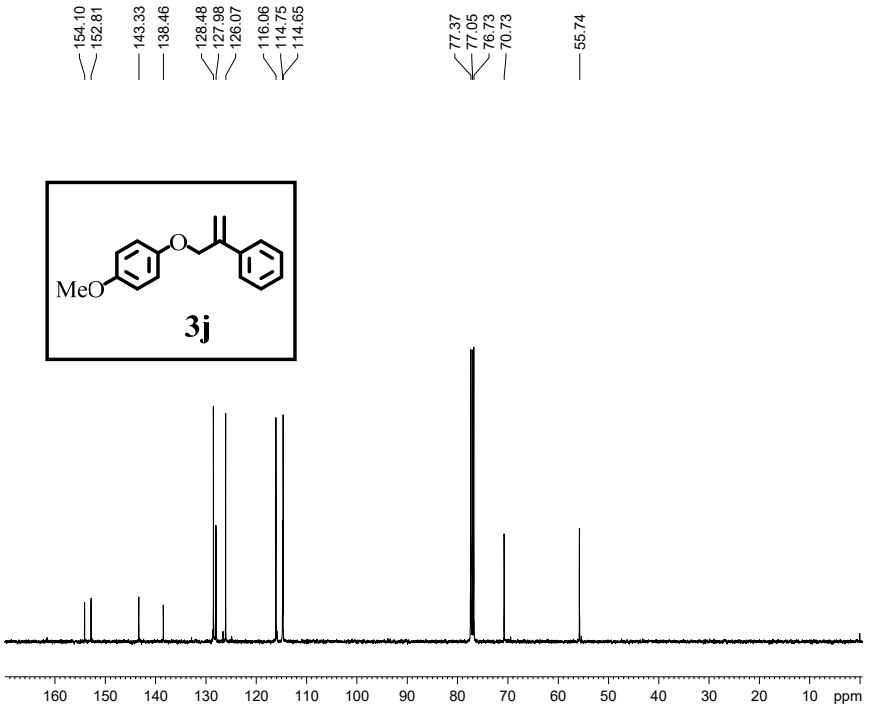


Current Data Parameters
NAME 3F NMR
EXPNO 1043
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230421
Time 2.47
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 71.42
DW 69.333 usec
DE 10.06 usec
TE 298.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300193 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1044
PROCNO 1

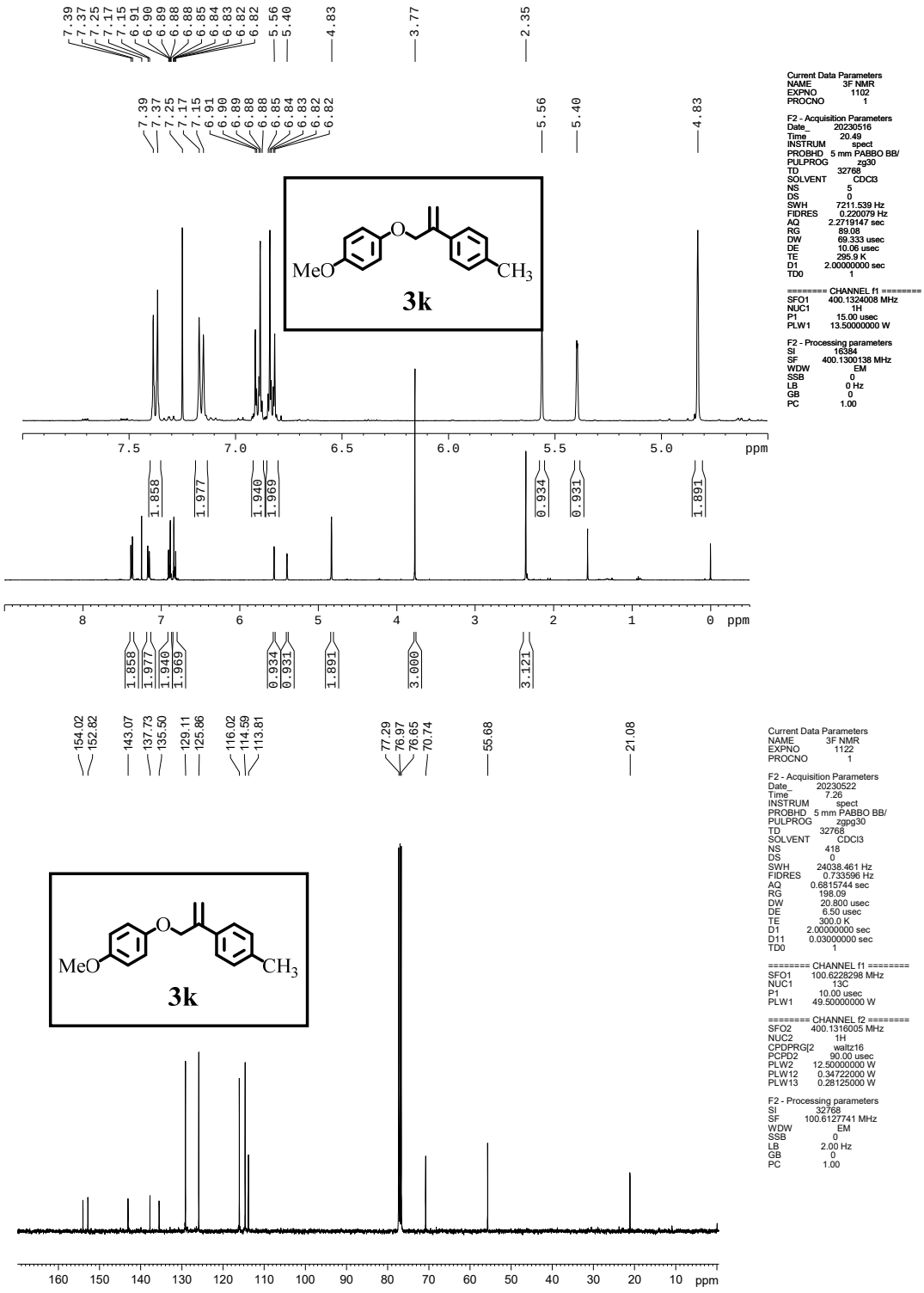
F2 - Acquisition Parameters
Date_ 20230421
Time 2.50
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 438
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3k.



Current Data Parameters
NAME 3F NMR
EXPNO 1102
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230516
Time 20.49
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 5
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 295.9 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300138 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1122
PROCNO 1

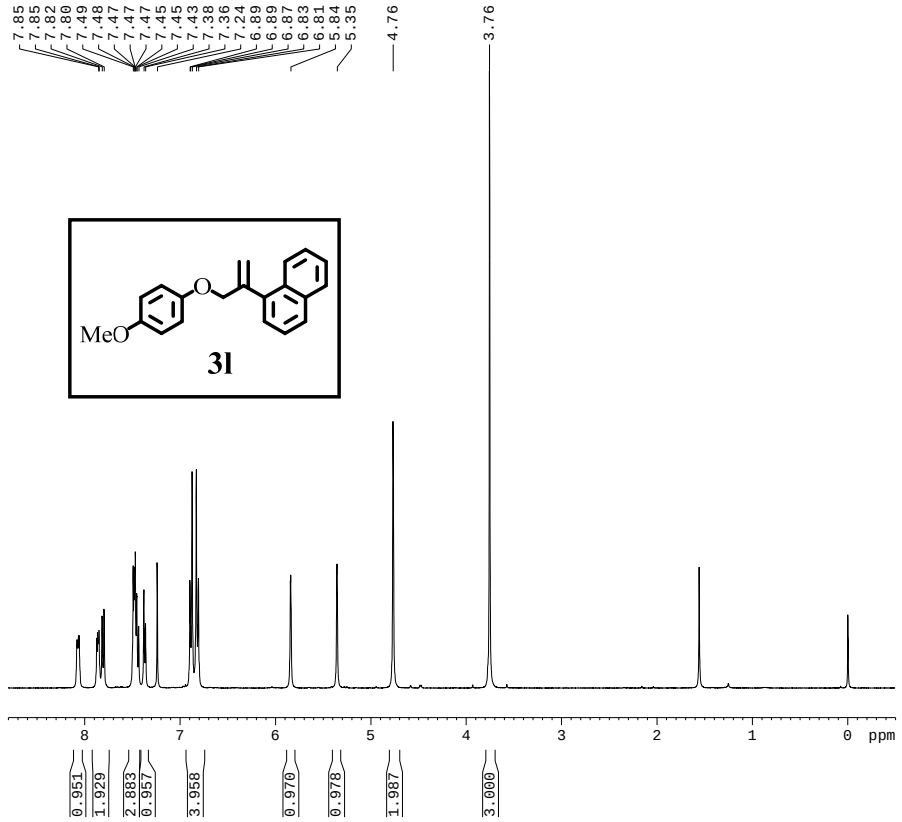
F2 - Acquisition Parameters
Date_ 20230522
Time 7.26
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 418
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 300.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127741 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3l.

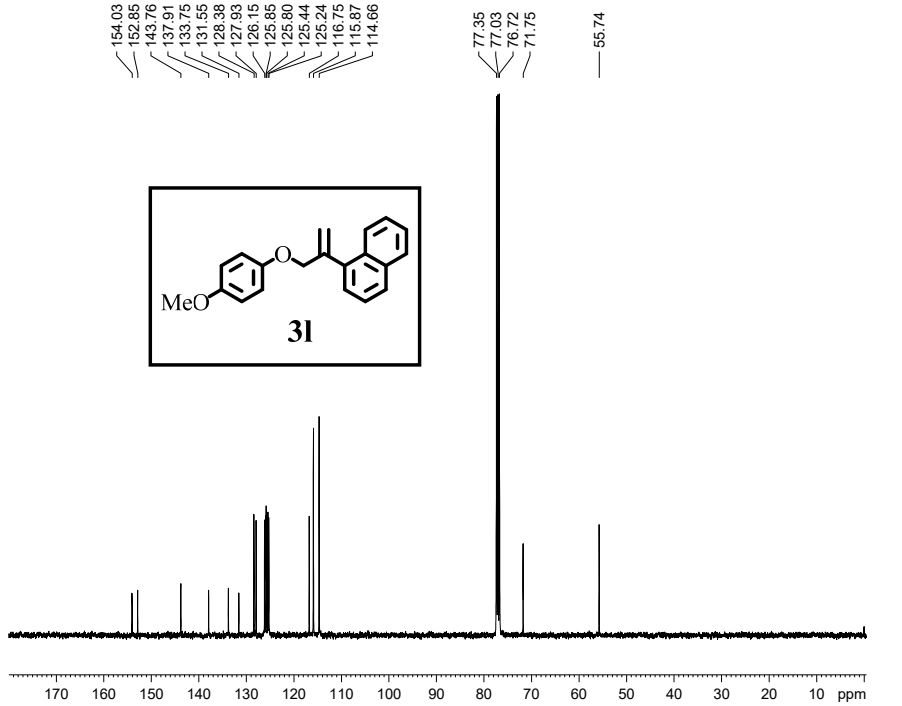


Current Data Parameters
NAME 3F NMR
EXPNO 1106
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230517
Time 20.49
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 296.5 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300189 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1107
PROCNO 1

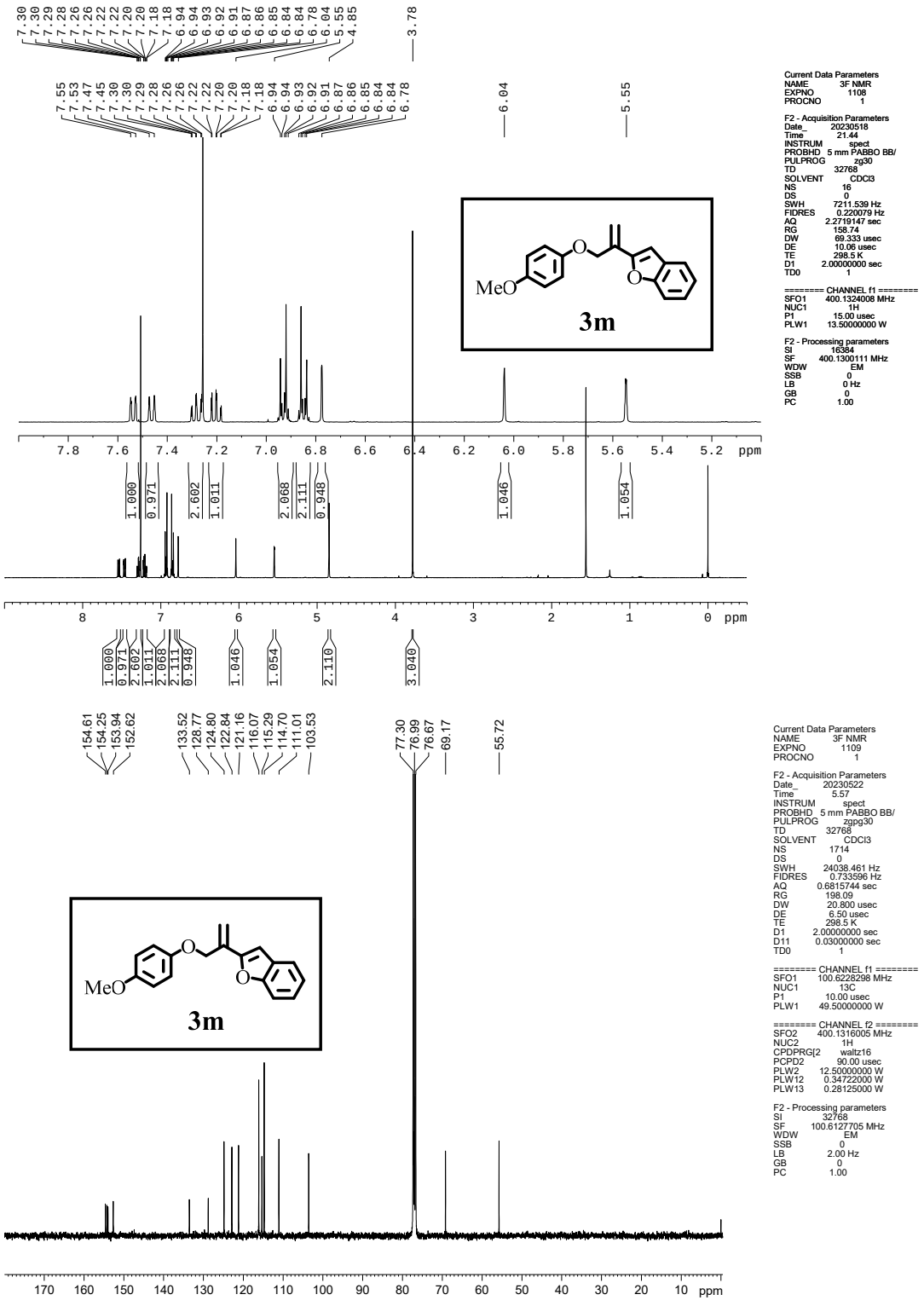
F2 - Acquisition Parameters
Date_ 20230517
Time 20.51
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 651
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 296.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3m.



Current Data Parameters
NAME 3F NMR
EXPNO 1108
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230518
Time 21.44
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 158.74
DW 69.333 usec
DE 10.06 usec
TE 298.5 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300111 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1109
PROCNO 1

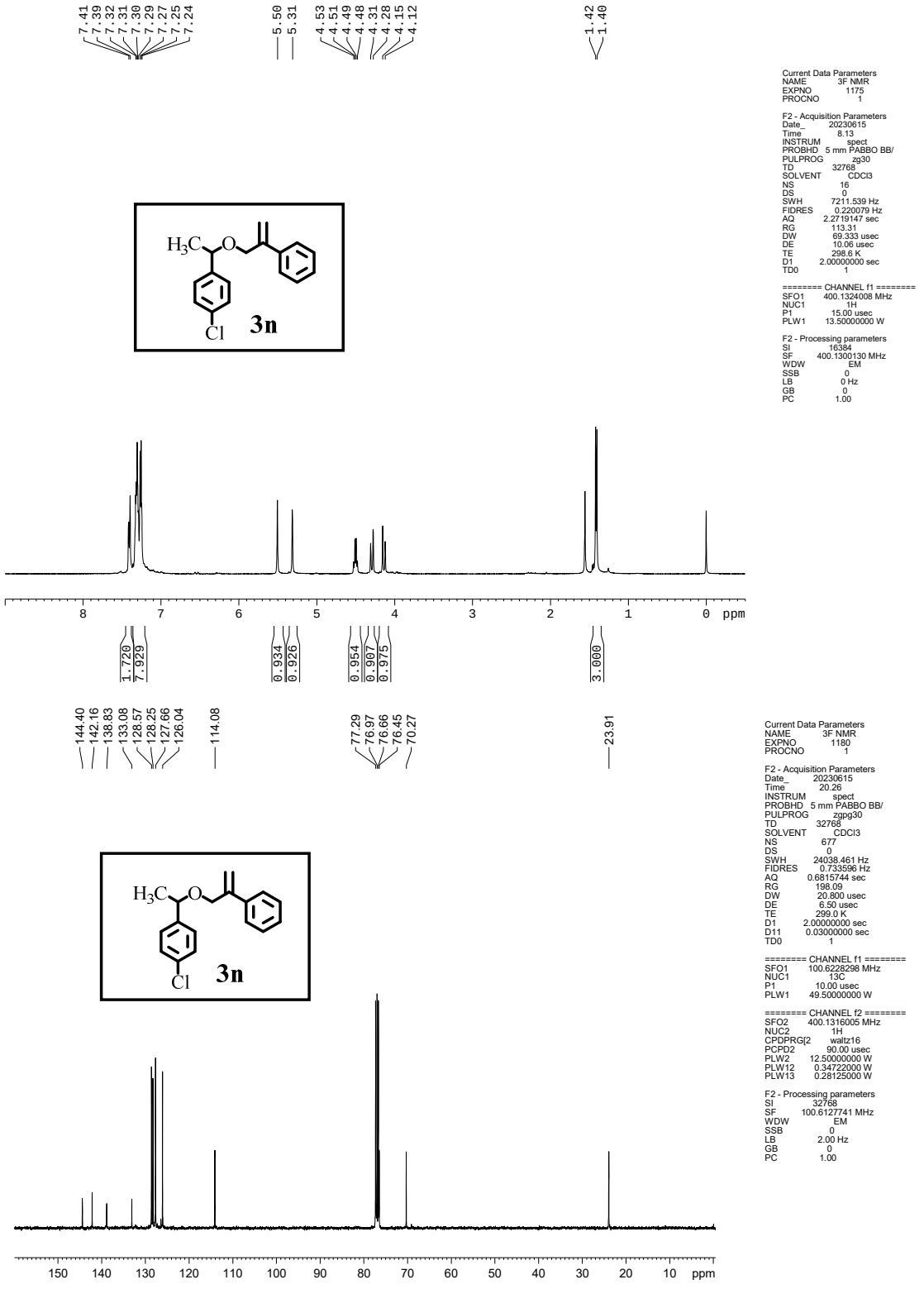
F2 - Acquisition Parameters
Date_ 20230522
Time 5.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1714
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

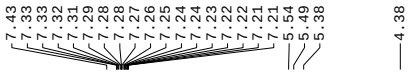
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

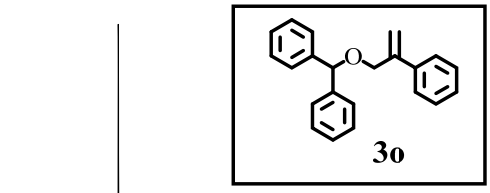
F2 - Processing parameters
SI 32768
SF 100.6127705 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3n.



^{1}H and ^{13}C NMR spectra of compound 3o.



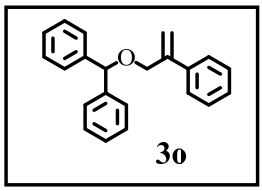


Current Data Parameters
NAME 3F NMR
EXPNO 1171
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230614
Time 7.10
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 298.8 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300222 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



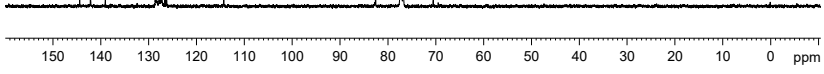
Current Data Parameters
NAME 3F NMR
EXPNO 1172
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230615
Time 19.54
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 461
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 300.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

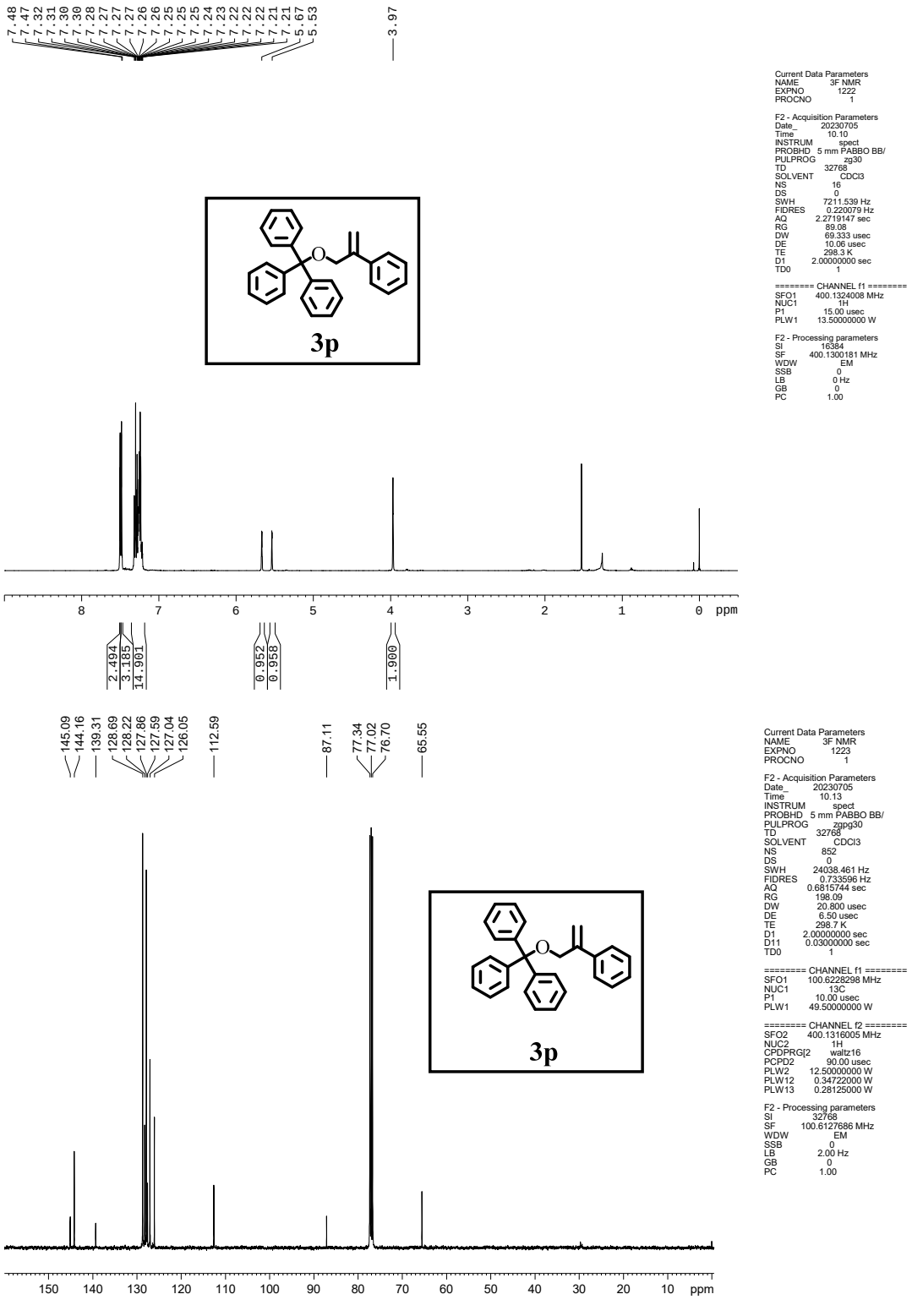
======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

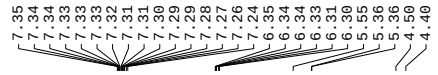
F2 - Processing parameters
SI 32768
SF 100.6127644 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

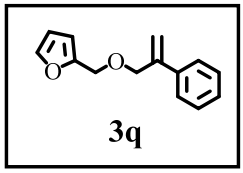


^{1}H and ^{13}C NMR spectra of compound 3p.



^{1}H and ^{13}C NMR spectra of compound 3q.



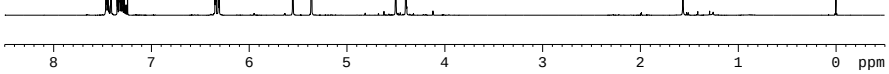


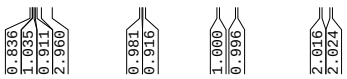
Current Data Parameters
NAME 3F NMR
EXPNO 1037
PROCNO 1

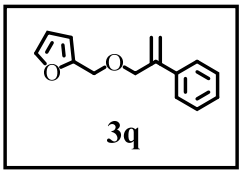
F2 - Acquisition Parameters
Date_ 20230418
Time 7.31
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 78.51
DW 69.333 usec
DE 10.06 usec
TE 298.7 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300173 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00







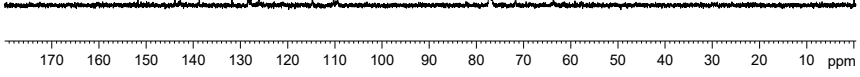
Current Data Parameters
NAME 3F NMR
EXPNO 1038
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230418
Time 7.32
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 353
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

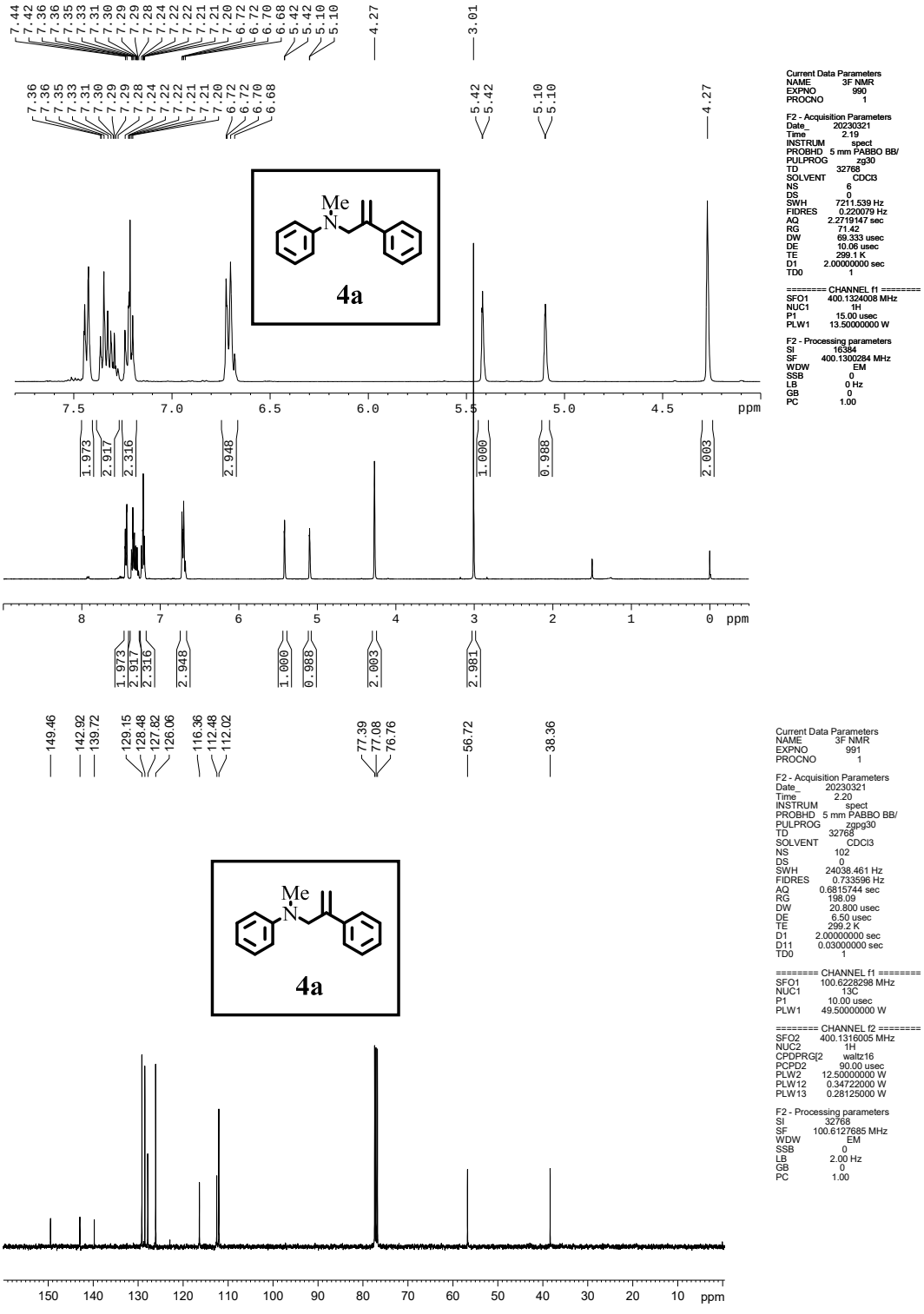
======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127748 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00



^{1}H and ^{13}C NMR spectra of compound 4a.



Current Data Parameters
NAME 3F NMR
EXPNO 990
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230321
Time 2.19
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 6
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 71.42
DW 69.333 usec
DE 10.06 usec
TE 299.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300284 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 991
PROCNO 1

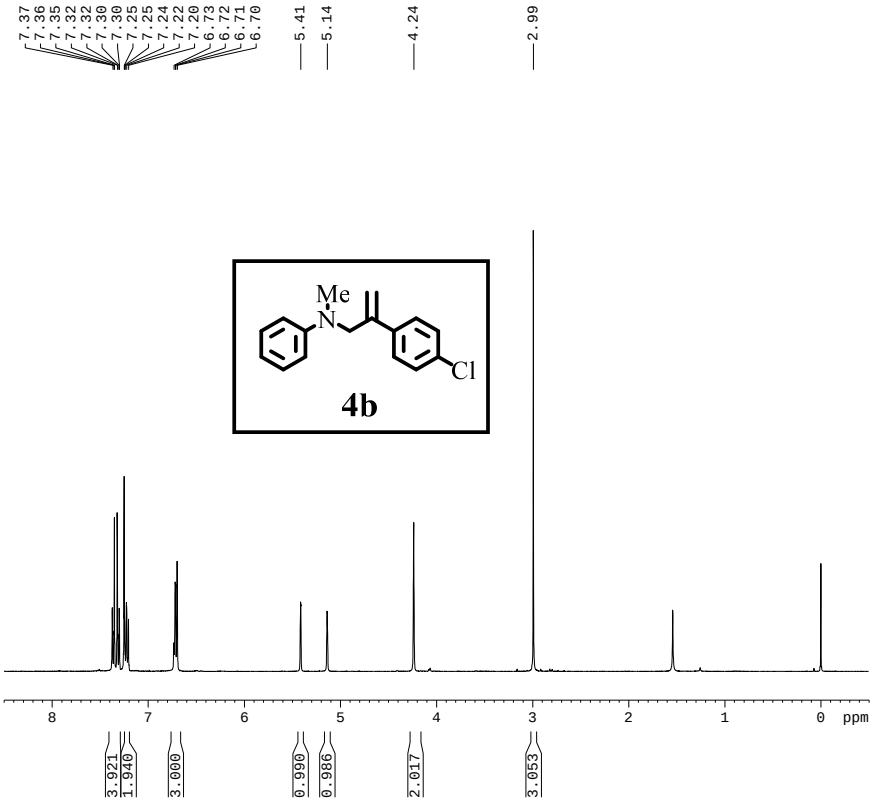
F2 - Acquisition Parameters
Date_ 20230321
Time 2.20
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 102
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 4b.

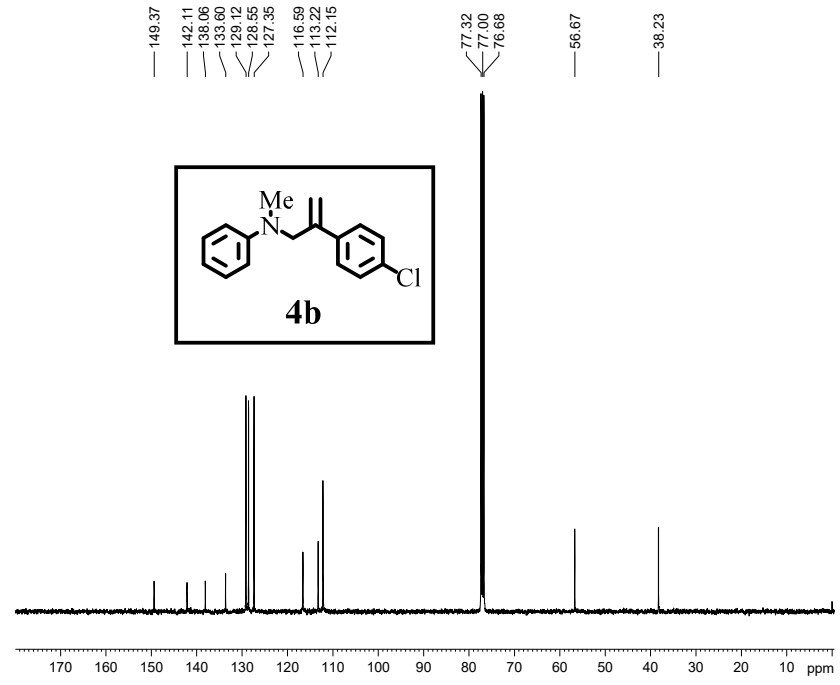


Current Data Parameters
NAME 3F NMR
EXPNO 1153
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230607
Time 21.42
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 113.31
DW 69.333 usec
DE 10.06 usec
TE 298.7 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300139 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1154
PROCNO 1

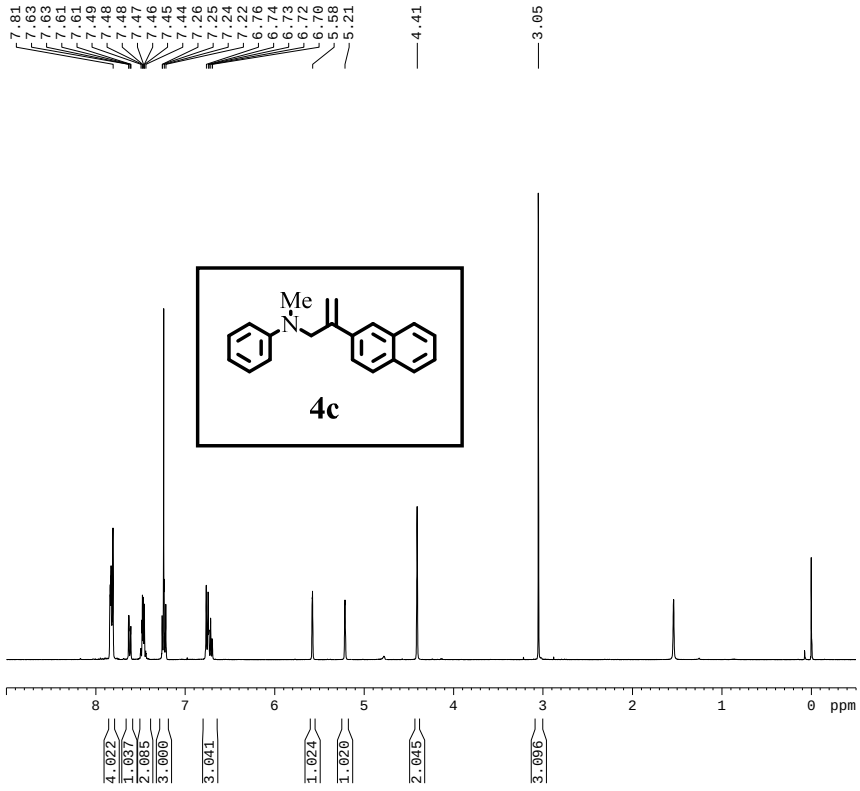
F2 - Acquisition Parameters
Date_ 20230608
Time 21.12
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 866
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127710 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 4c.

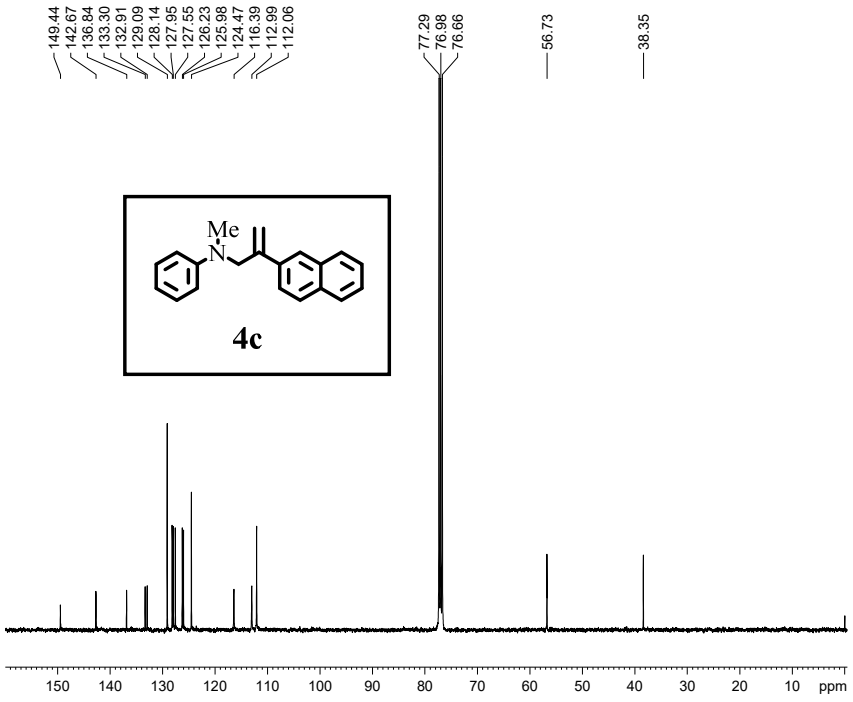


Current Data Parameters
NAME 3F NMR
EXPNO 1165
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230611
Time_ 5.41
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 113.31
DW 69.333 usec
DE 10.06 usec
TE 298.6 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300175 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1166
PROCNO 1

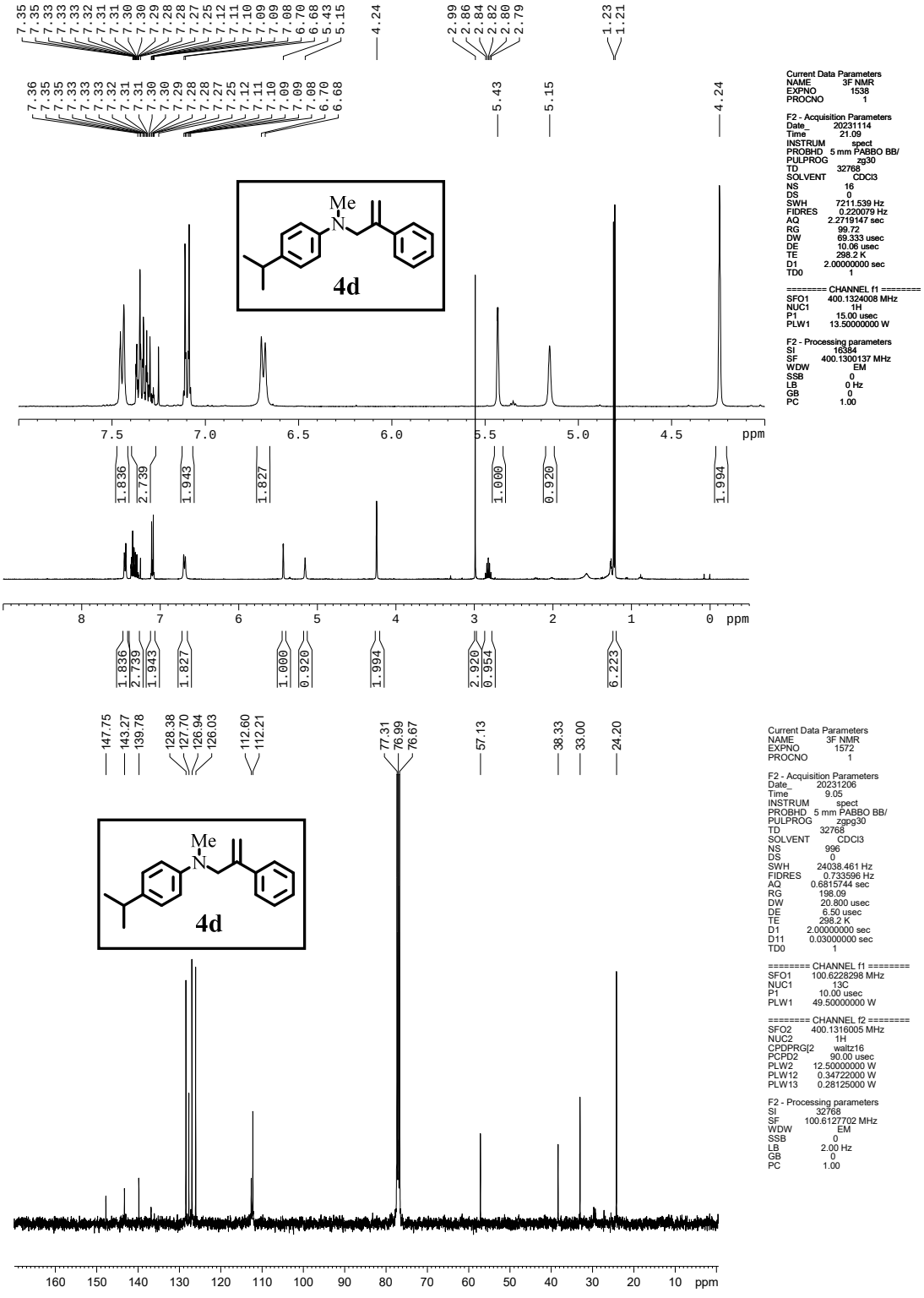
F2 - Acquisition Parameters
Date_ 20230611
Time_ 5.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1330
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

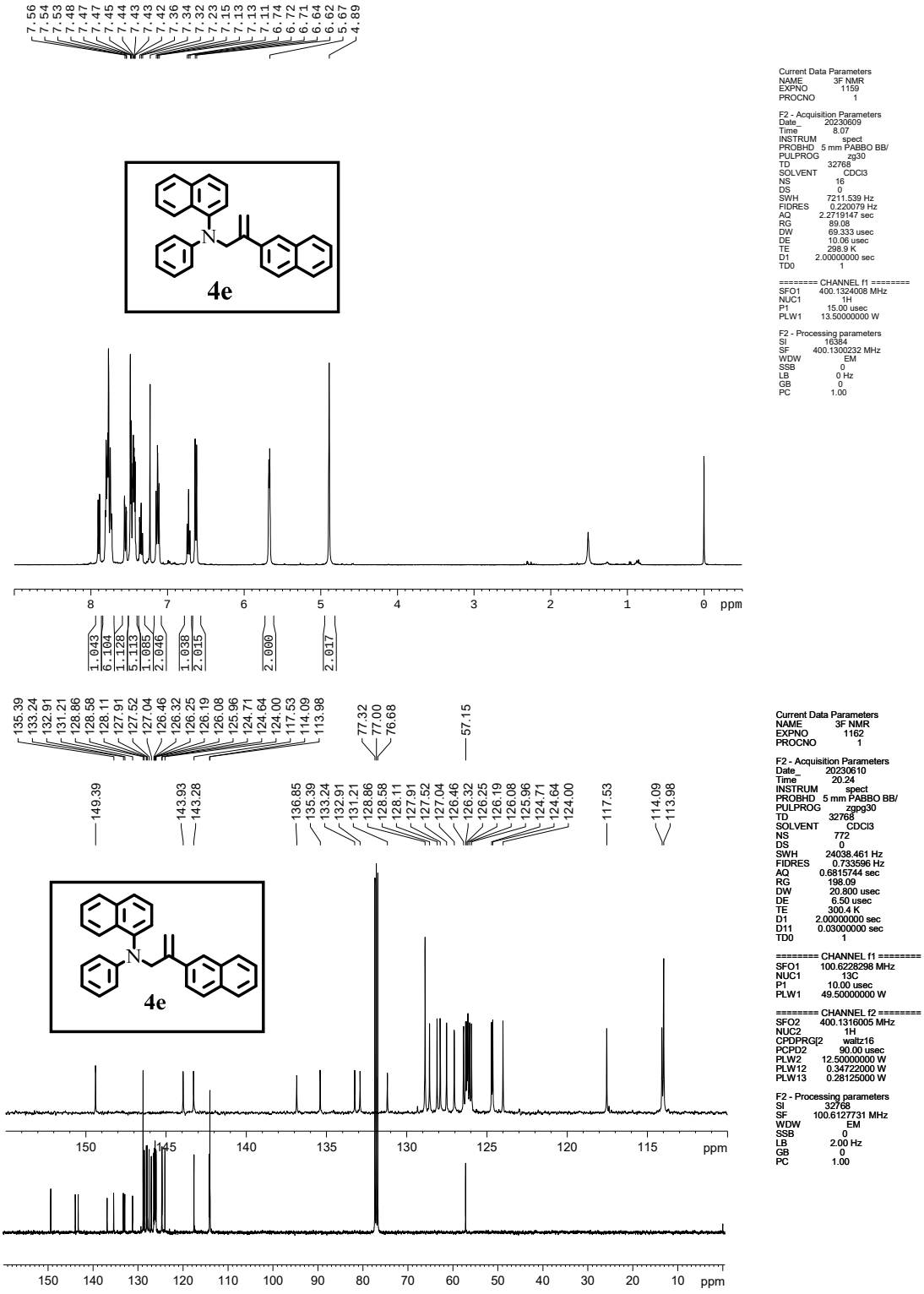
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127734 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

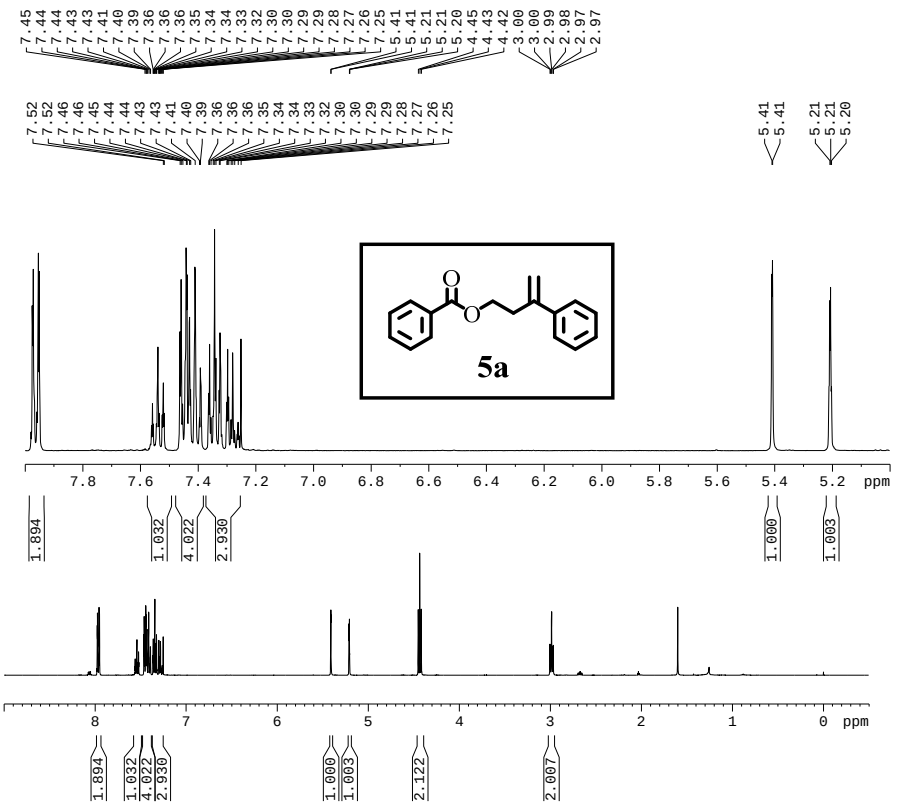
^{1}H and ^{13}C NMR spectra of compound 4d.



^{1}H and ^{13}C NMR spectra of compound 4e.



^{1}H and ^{13}C NMR spectra of compound 5a.

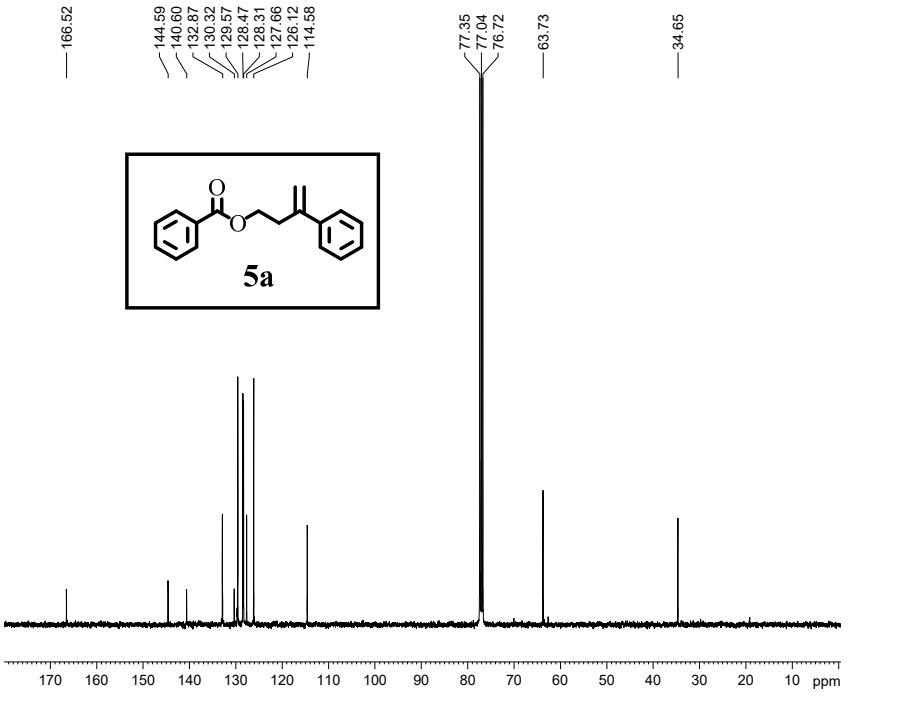


Current Data Parameters
NAME 3F NMR
EXPNO 1450
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231005
Time 22.24
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 38
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 99.72
DW 69.333 usec
DE 10.06 usec
TE 296.4 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300132 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1451
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231005
Time 22.26
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 455
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 296.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 5b.

Current Data Parameters
NAME 3F NMR
EXPNO 1461
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231007
Time 20.45
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 78.51
DW 69.333 usec
DE 10.06 usec
TE 294.3 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300163 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1462
PROCNO 1

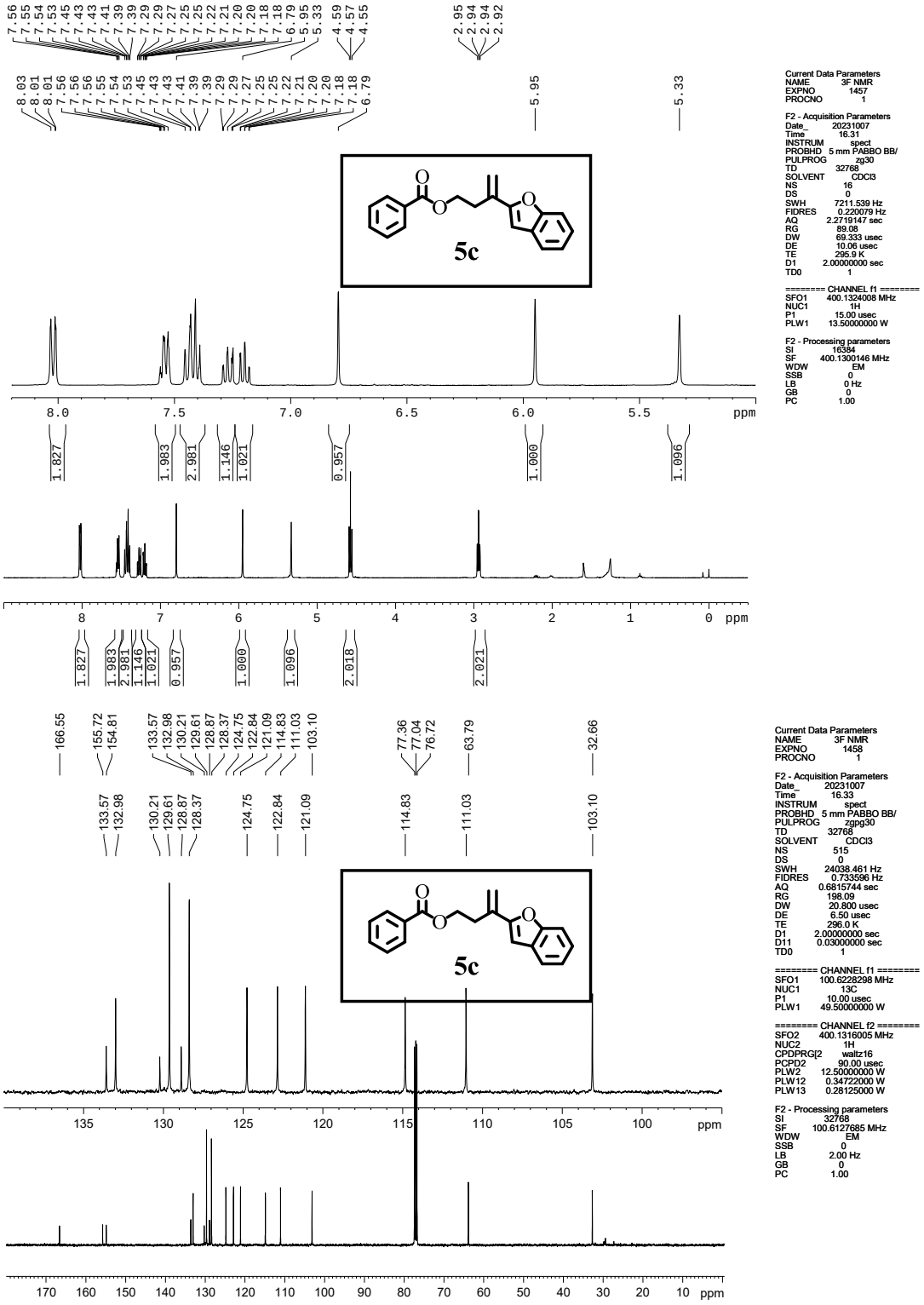
F2 - Acquisition Parameters
Date_ 20231007
Time 20.48
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 412
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 294.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

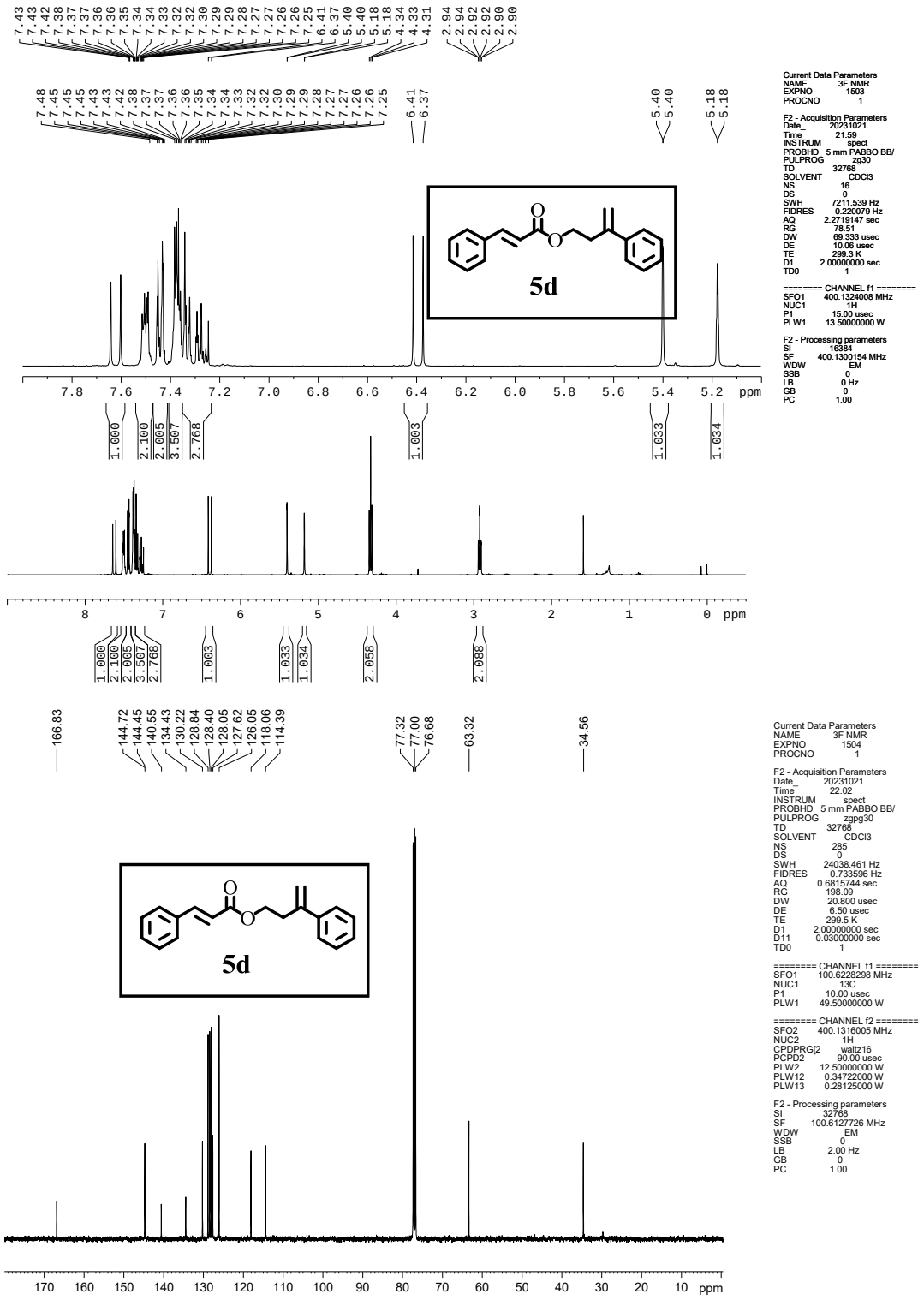
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127735 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

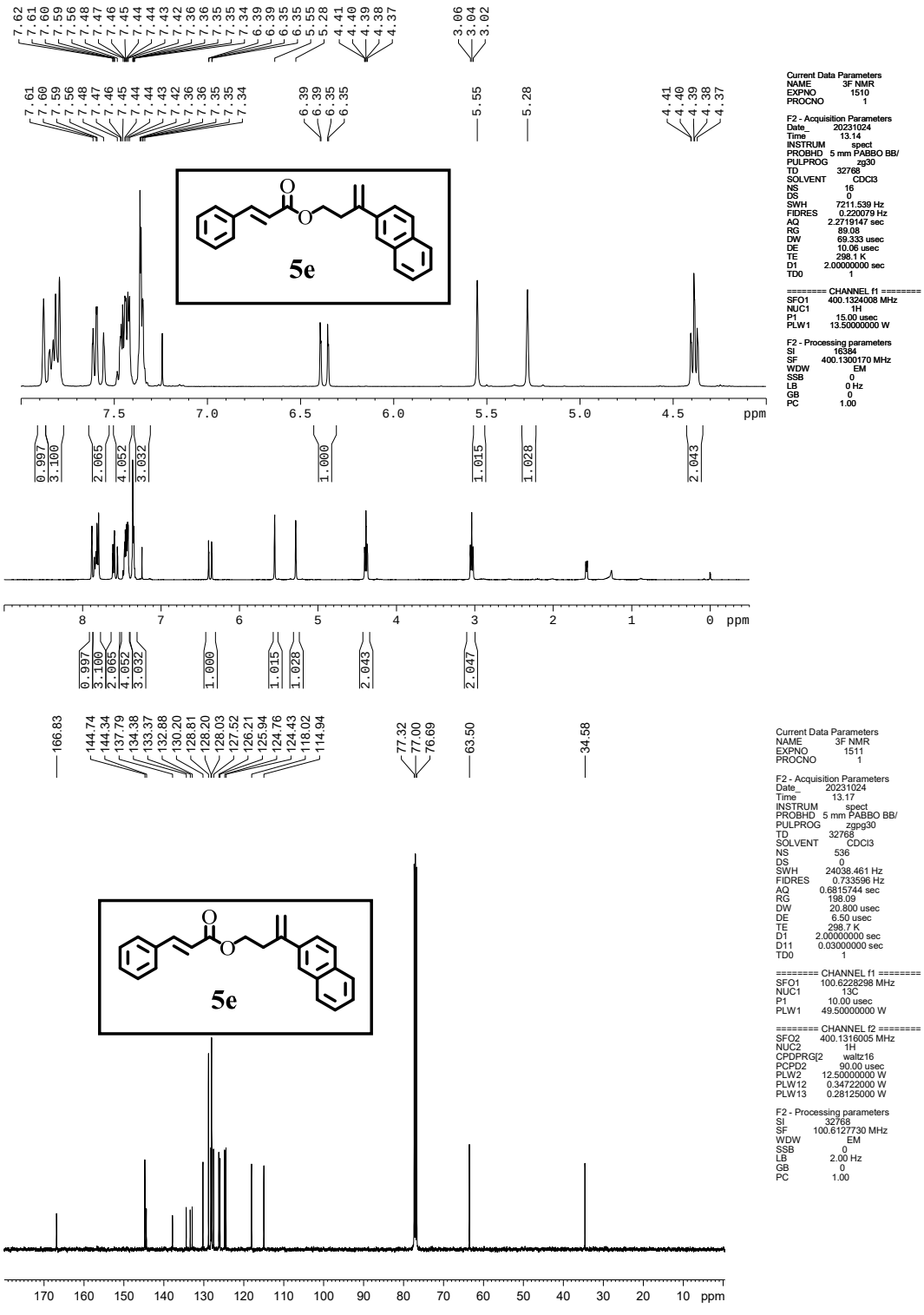
^{1}H and ^{13}C NMR spectra of compound 5c.



^{1}H and ^{13}C NMR spectra of compound 5d.



^{1}H and ^{13}C NMR spectra of compound 5e.



Current Data Parameters
NAME 3F NMR
EXPNO 1510
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231024
Time 13.14
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 298.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300170 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1511
PROCNO 1

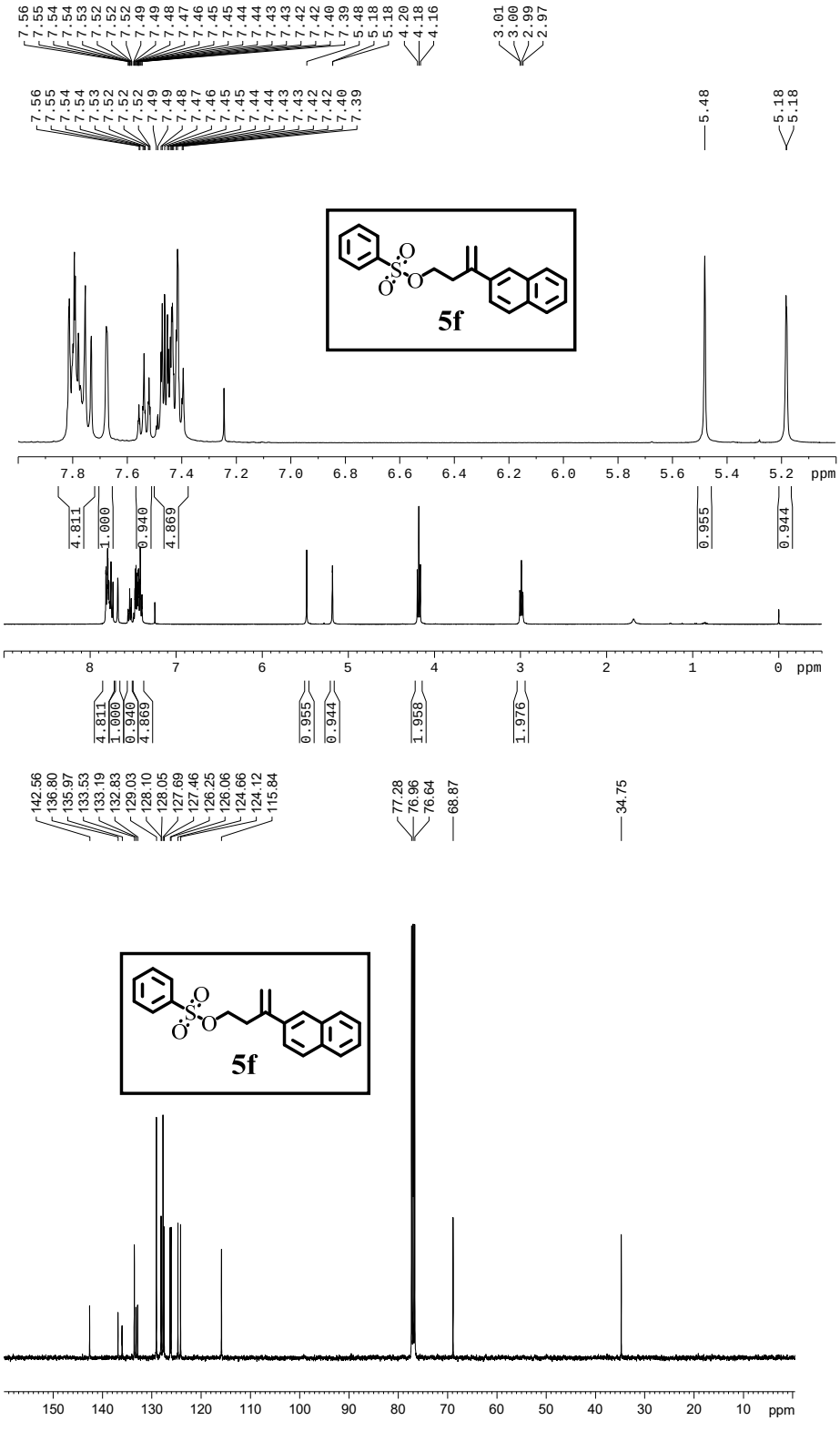
F2 - Acquisition Parameters
Date_ 20231024
Time 13.17
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 536
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127730 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 5f.



Current Data Parameters
NAME 3F NMR
EXPNO 1472
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231011
Time 13.05
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 297.7 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300159 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1473
PROCNO 1

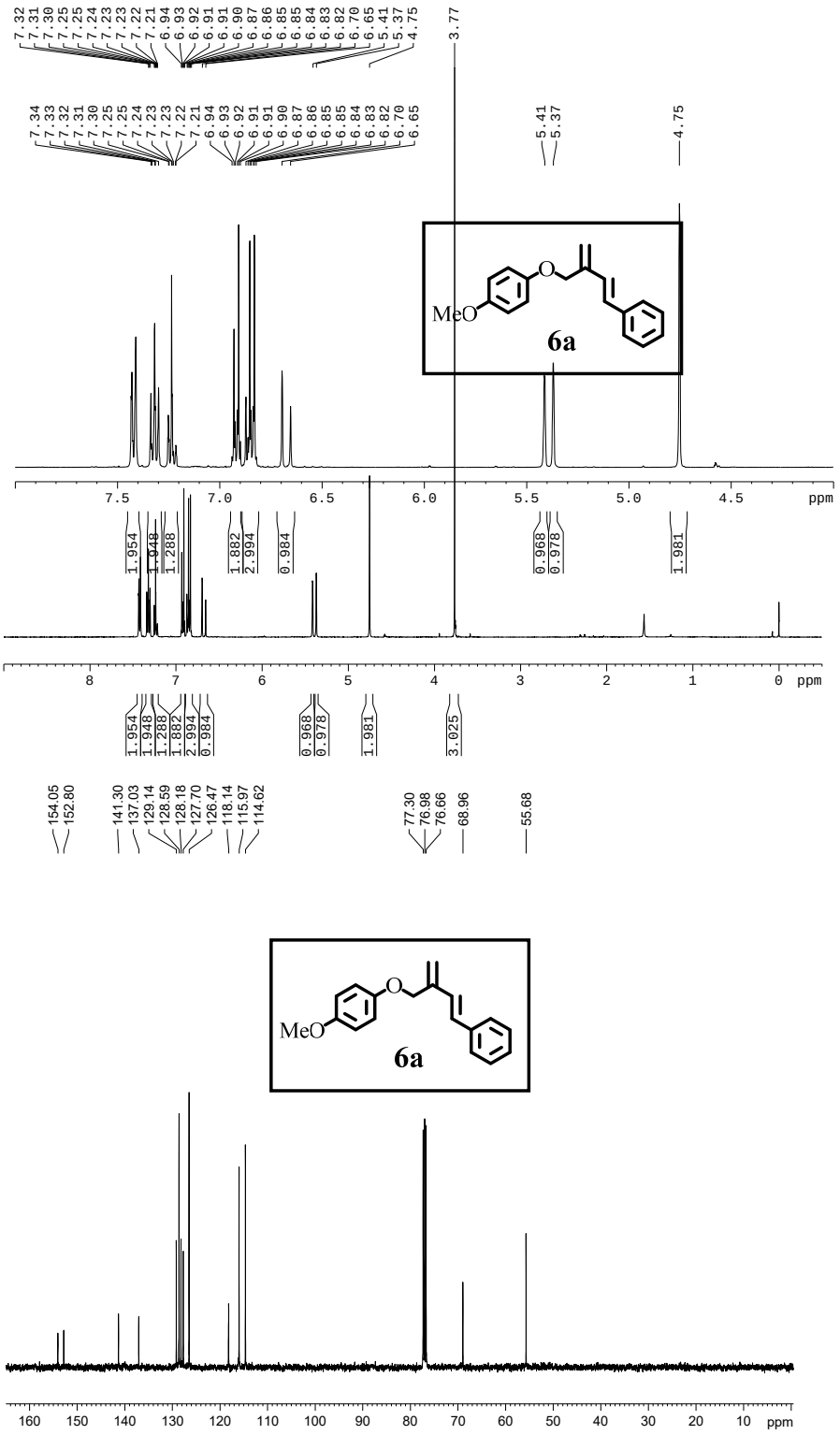
F2 - Acquisition Parameters
Date_ 20231011
Time 13.11
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 533
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127778 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 6a.



^{1}H and ^{13}C NMR spectra of compound 6b.

Current Data Parameters
NAME 3F NMR
EXPNO 1119
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230522
Time 6.51
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 113.31
DW 69.333 usec
DE 10.06 usec
TE 299.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300129 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1120
PROCNO 1

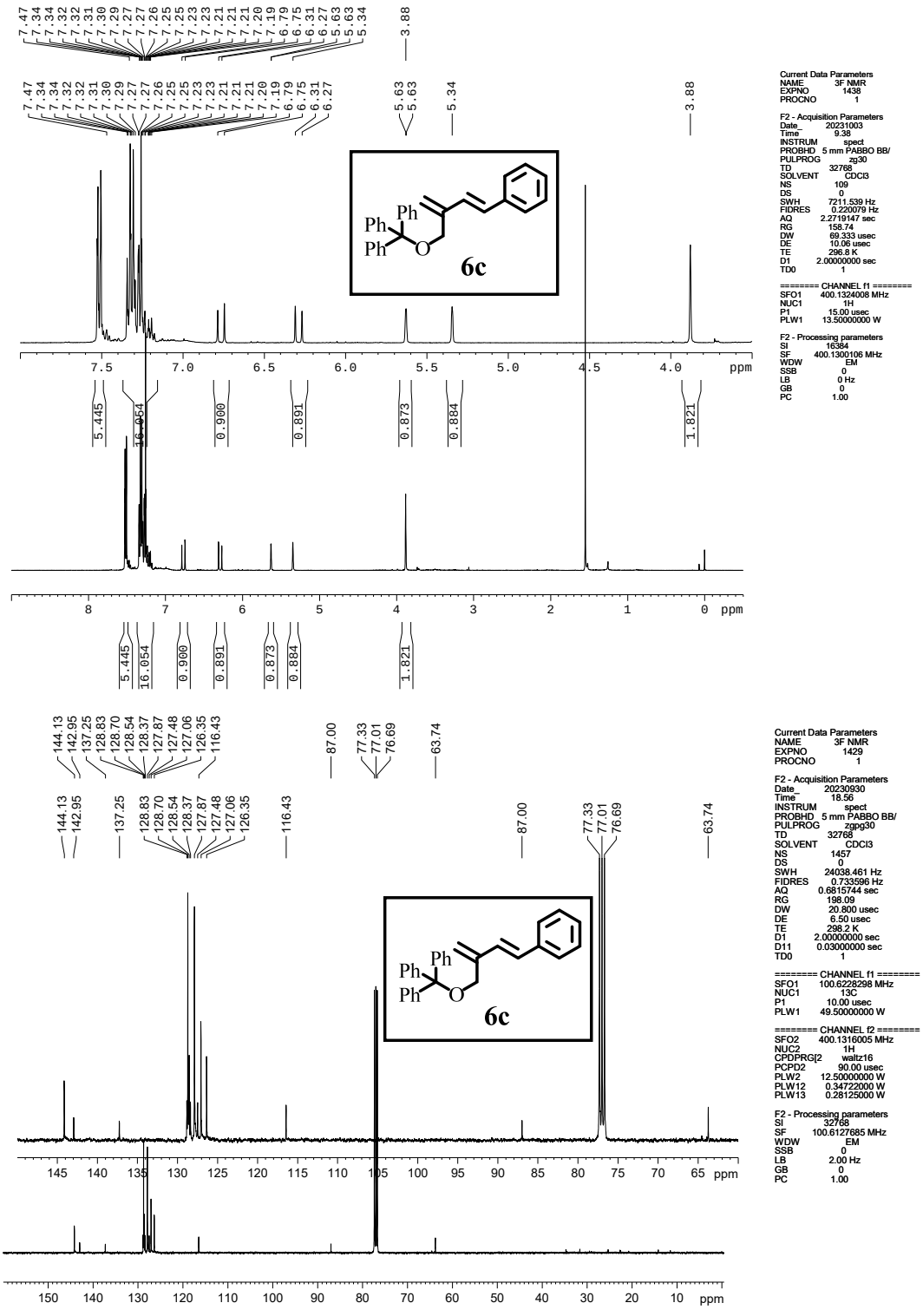
F2 - Acquisition Parameters
Date_ 20230522
Time 6.53
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 515
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127720 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 6c.



Current Data Parameters
NAME 3F NMR
EXPNO 1438
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231003
Time 9.38
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 109
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 158.74
DW 69.333 usec
DE 10.06 usec
TE 296.8 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300106 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1429
PROCNO 1

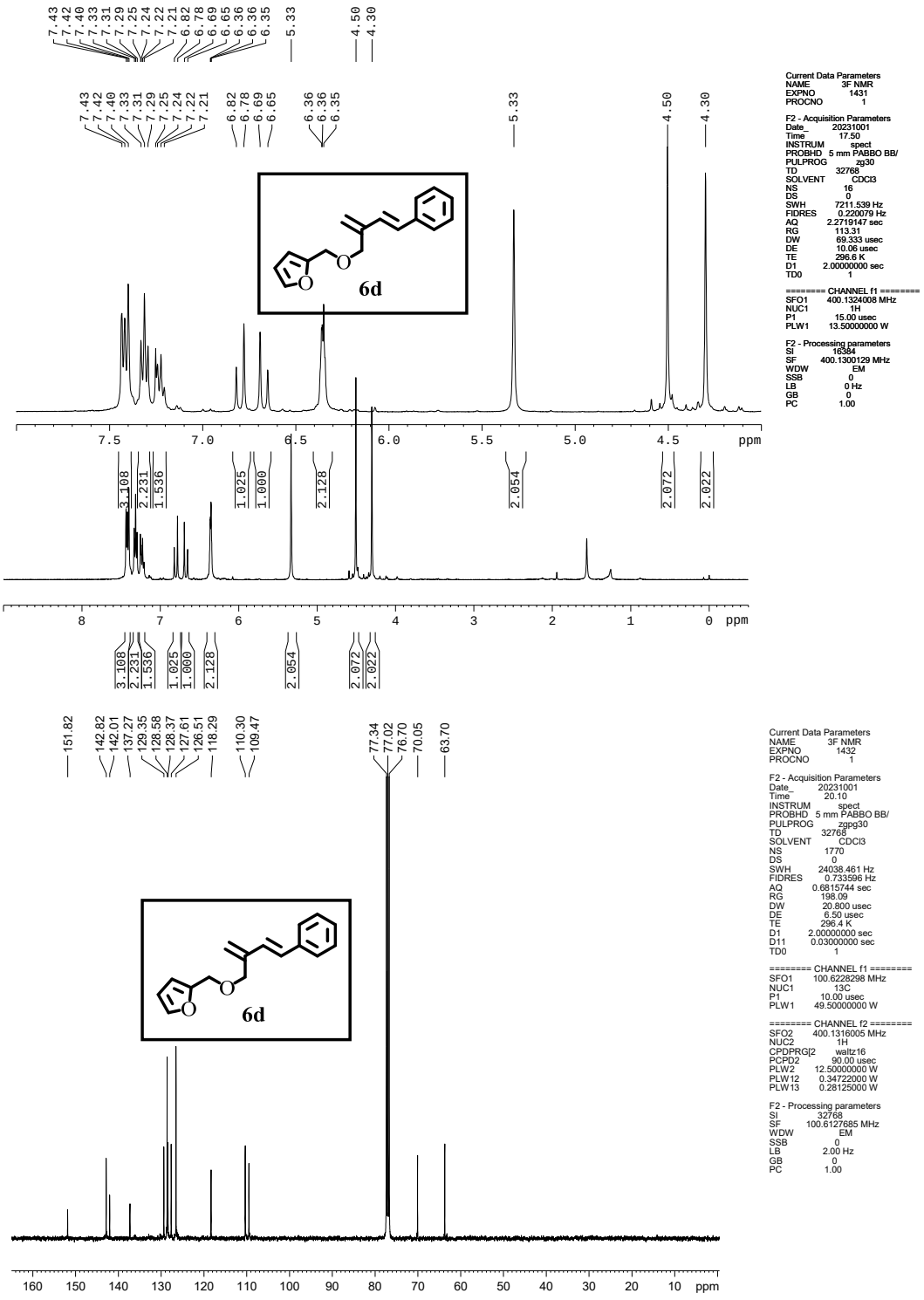
F2 - Acquisition Parameters
Date_ 20230930
Time 18.56
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1457
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

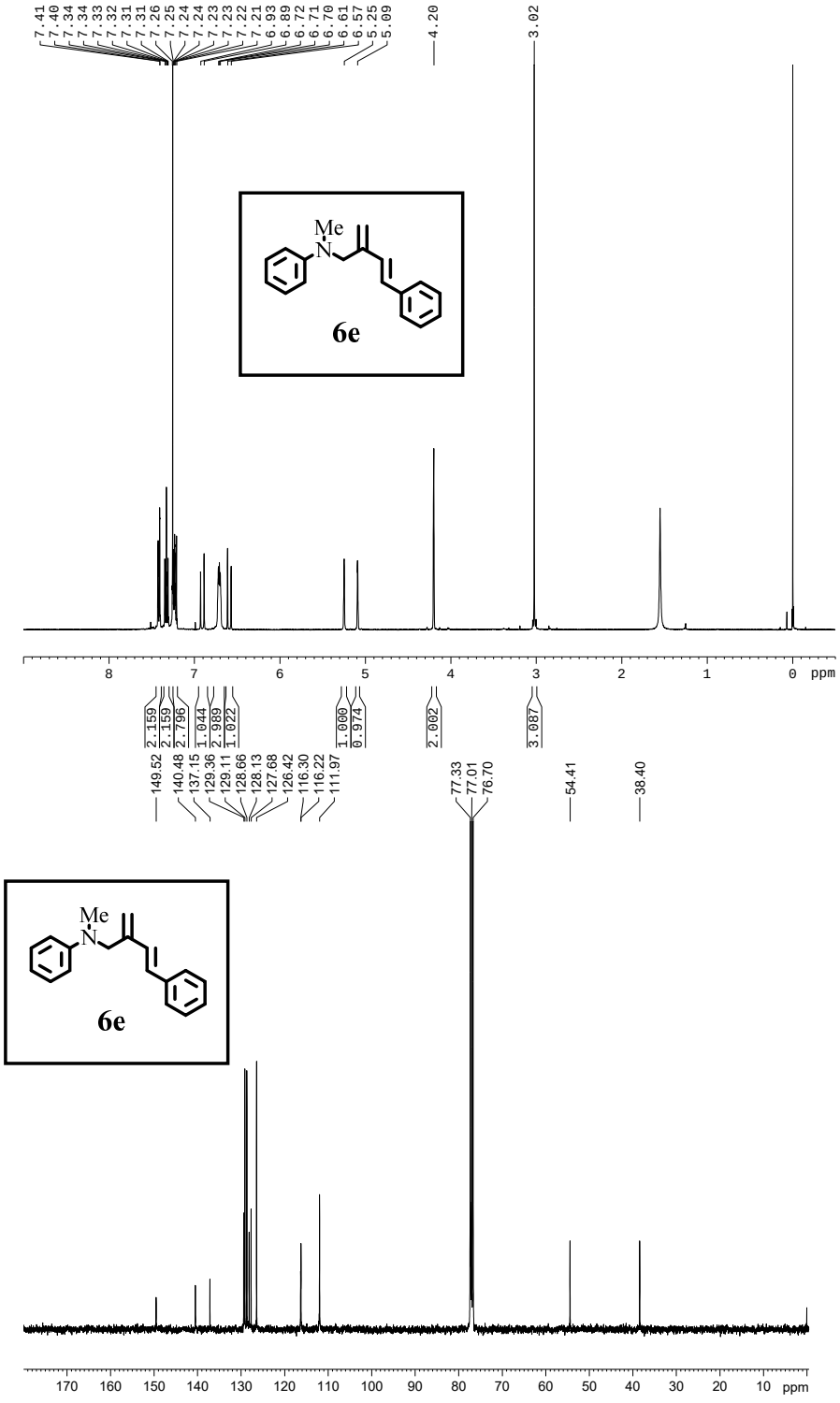
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 6d.



^{1}H and ^{13}C NMR spectra of compound 6e.



Current Data Parameters
NAME 3F NMR
EXPNO 1182
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230616
Time 21.22
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 177.16
DW 69.333 usec
DE 10.06 usec
TE 299.2 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300127 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1183
PROCNO 1

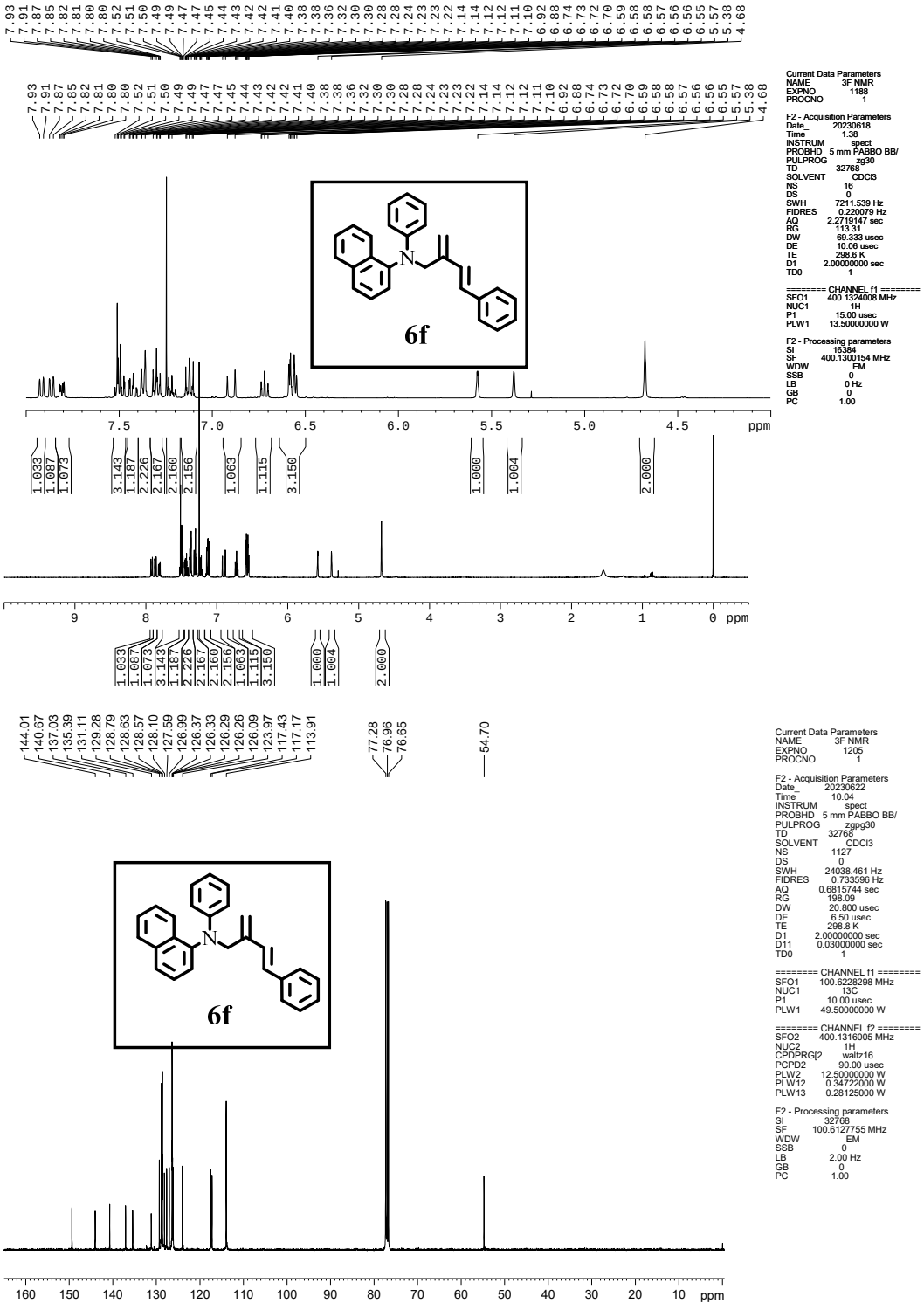
F2 - Acquisition Parameters
Date_ 20230617
Time 22.06
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1081
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

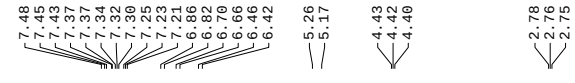
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

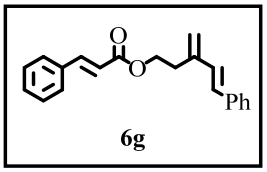
F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 6f.



^{1}H and ^{13}C NMR spectra of compound 6g.





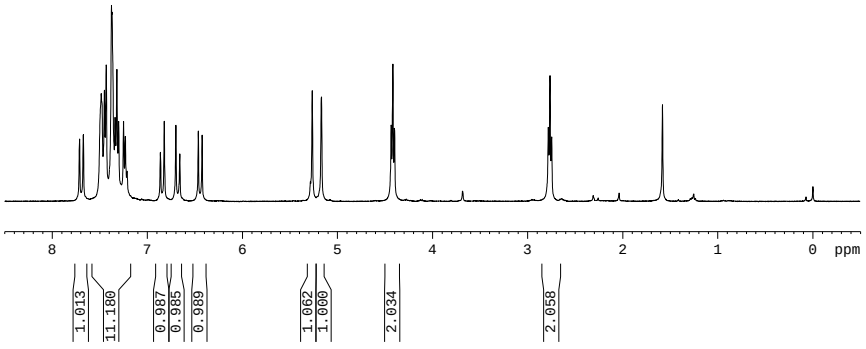
6g

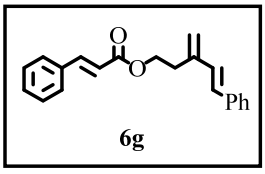
Current Data Parameters
NAME 3F NMR
EXPNO 1529
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231029
Time 17.09
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 99.72
DW 69.333 usec
DE 10.06 usec
TE 299.2 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300149 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00





6g

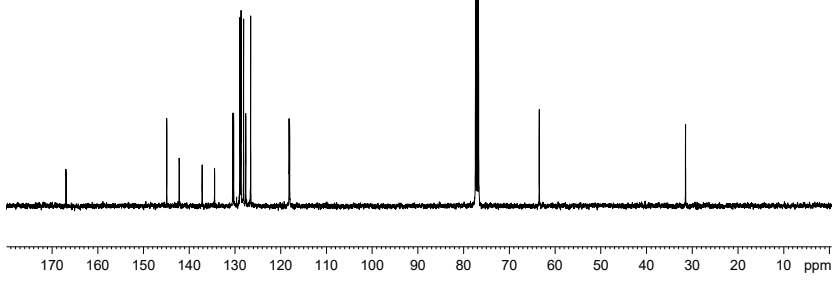
Current Data Parameters
NAME 3F NMR
EXPNO 1530
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231029
Time 17.11
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 566
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

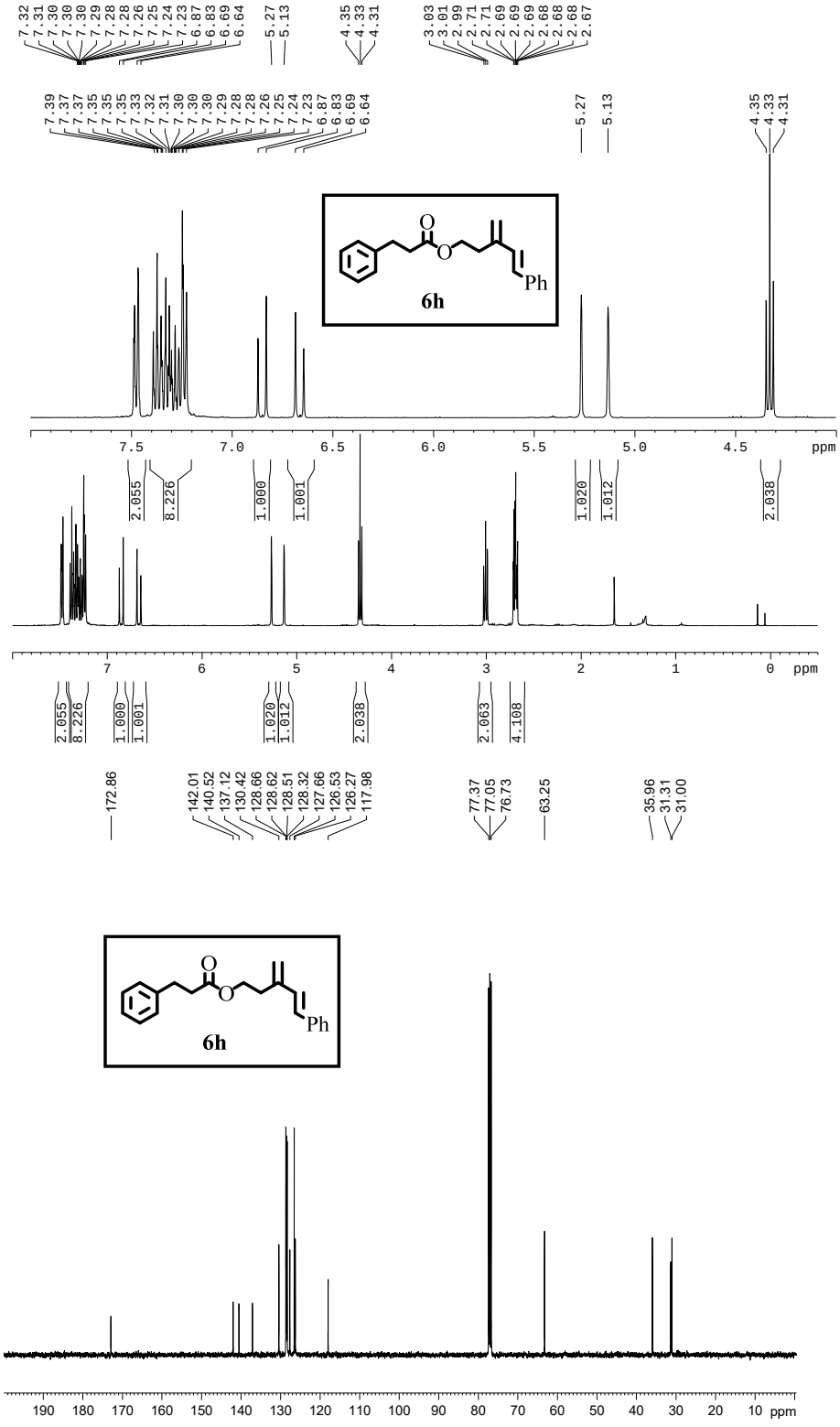
======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00



^{1}H and ^{13}C NMR spectra of compound 6h.



Current Data Parameters
NAME 3F NMR
EXPNO 1519
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231026
Time 22.24
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 51.8
DW 69.333 usec
DE 10.06 usec
TE 298.9 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300000 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1518
PROCNO 1

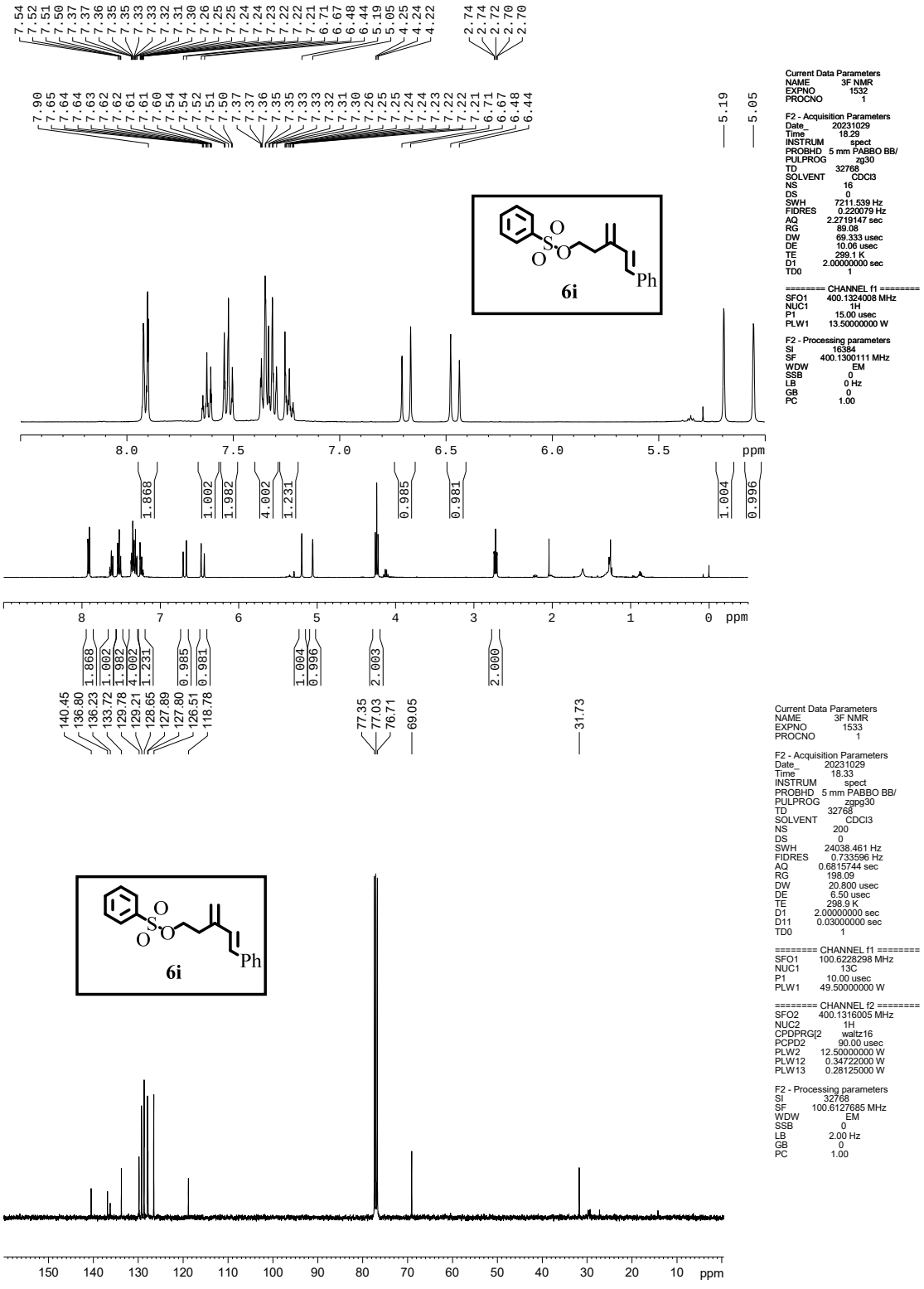
F2 - Acquisition Parameters
Date_ 20231026
Time 22.09
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 253
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 6i.



Current Data Parameters
NAME 3F NMR
EXPNO 1532
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231029
Time 18.29
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.27191470 sec
RG 89.08
DW 69.333 usec
DE 10.06 usec
TE 299.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300111 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1533
PROCNO 1

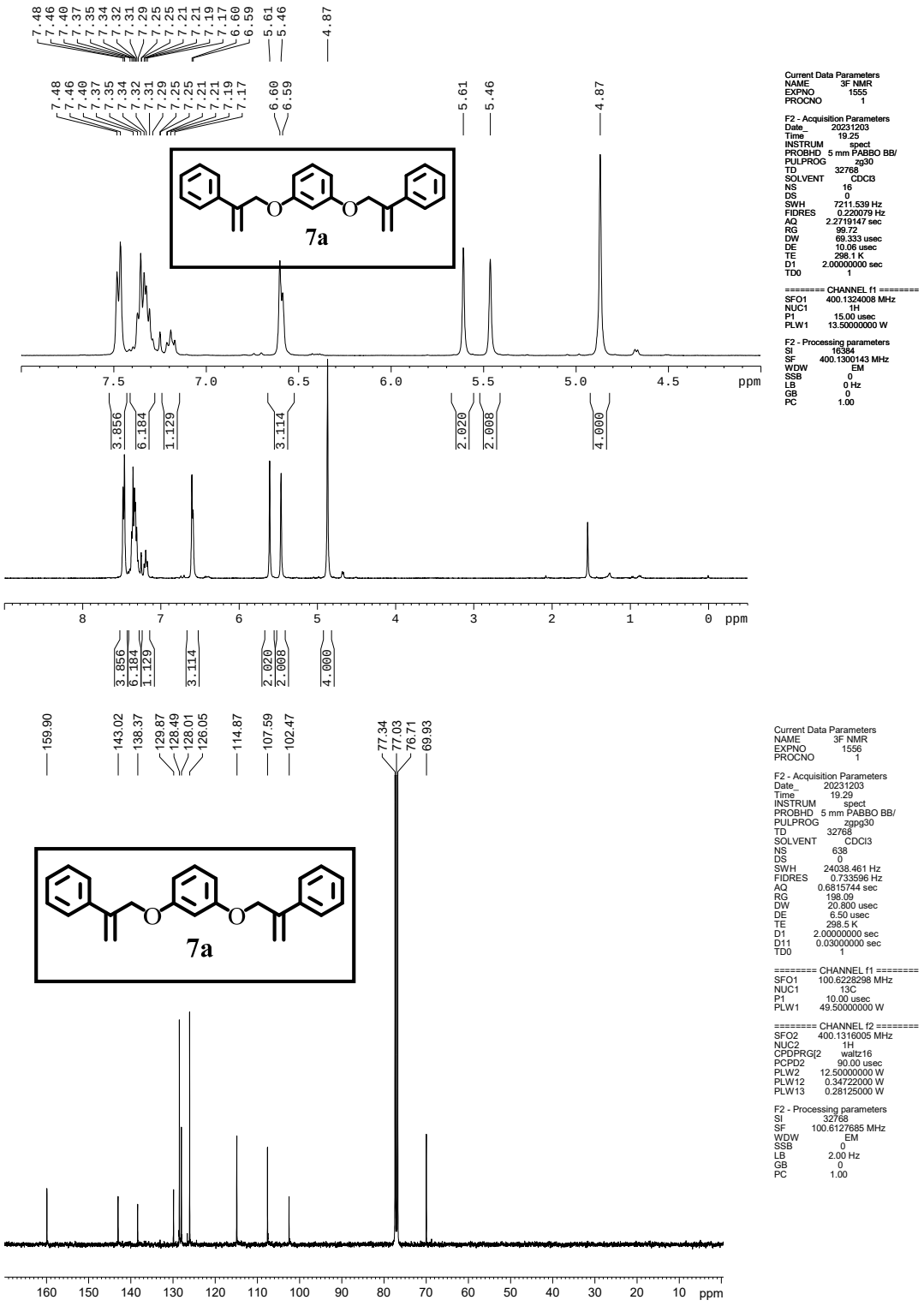
F2 - Acquisition Parameters
Date_ 20231029
Time 18.33
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 200
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 7a.



Current Data Parameters
NAME 3F NMR
EXPNO 1555
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231203
Time 19.25
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 99.72
DW 69.333 usec
DE 10.06 usec
TE 298.1 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300143 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1556
PROCNO 1

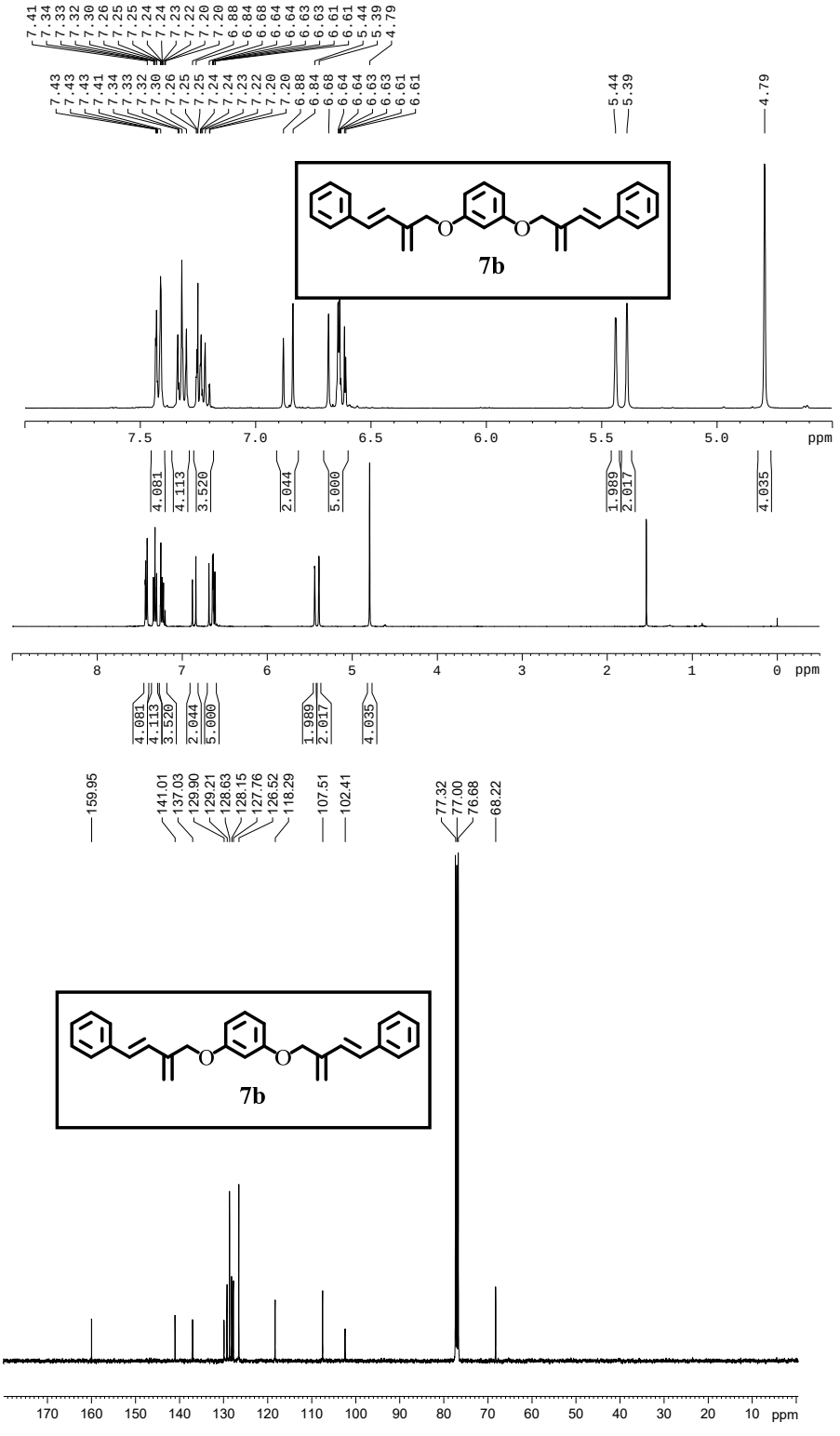
F2 - Acquisition Parameters
Date_ 20231203
Time 19.29
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 638
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 7b.



Current Data Parameters
NAME 3F NMR
EXPNO 1565
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231204
Time 13.31
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 128.9
DW 69.333 usec
DE 10.06 usec
TE 298.6 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300138 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00

Current Data Parameters
NAME 3F NMR
EXPNO 1566
PROCNO 1

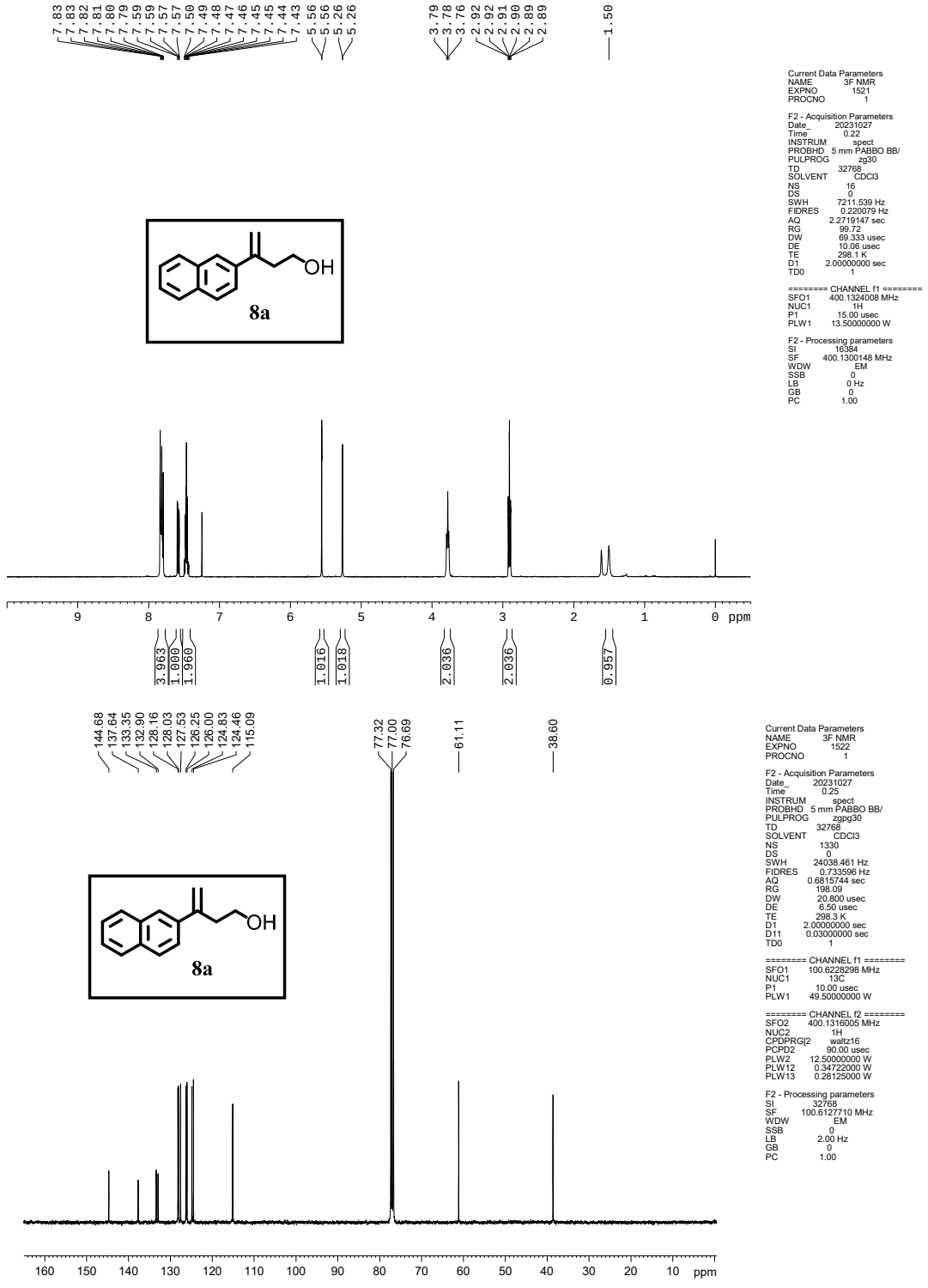
F2 - Acquisition Parameters
Date_ 20231204
Time 13.36
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 663
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 298.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

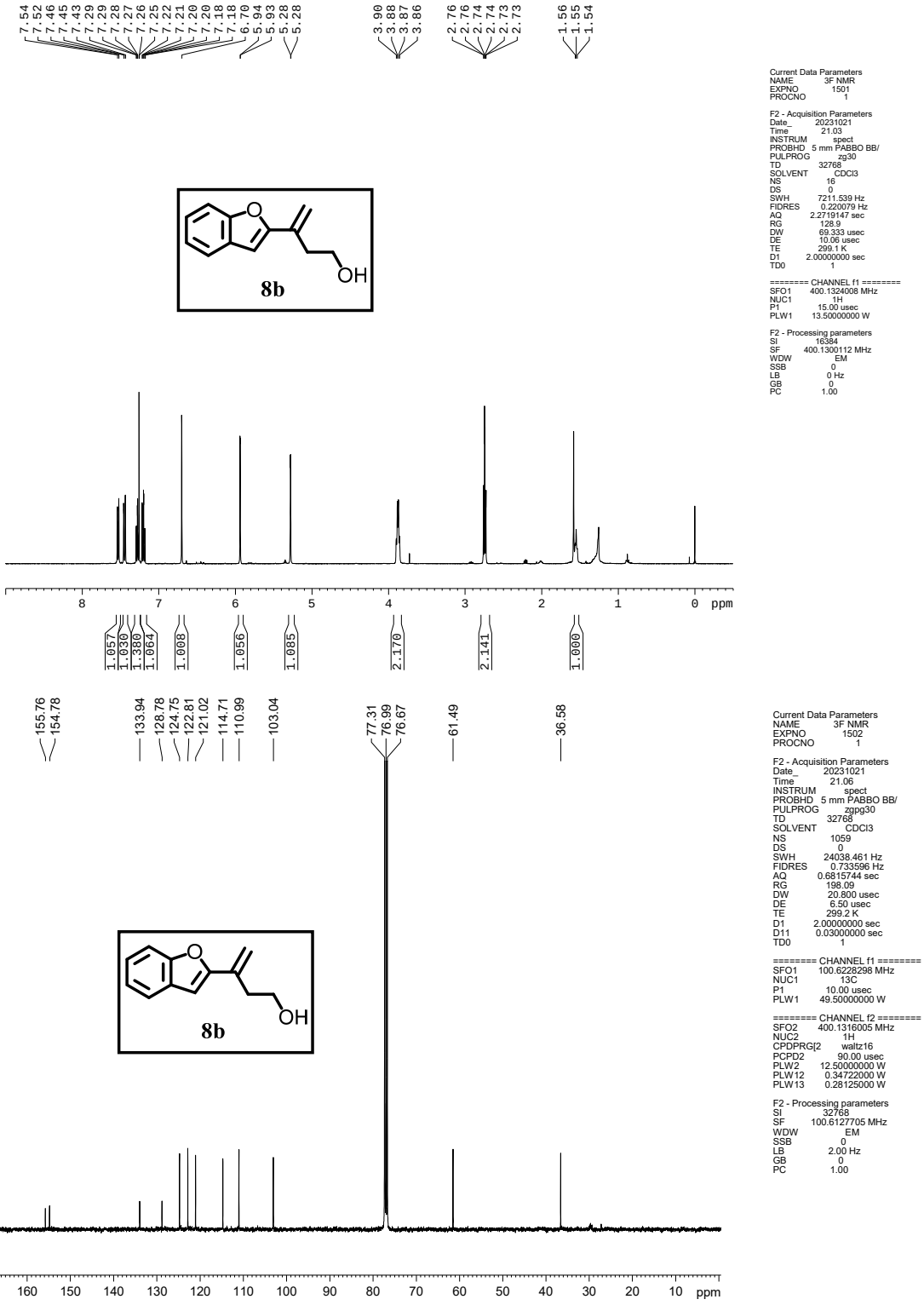
======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127702 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

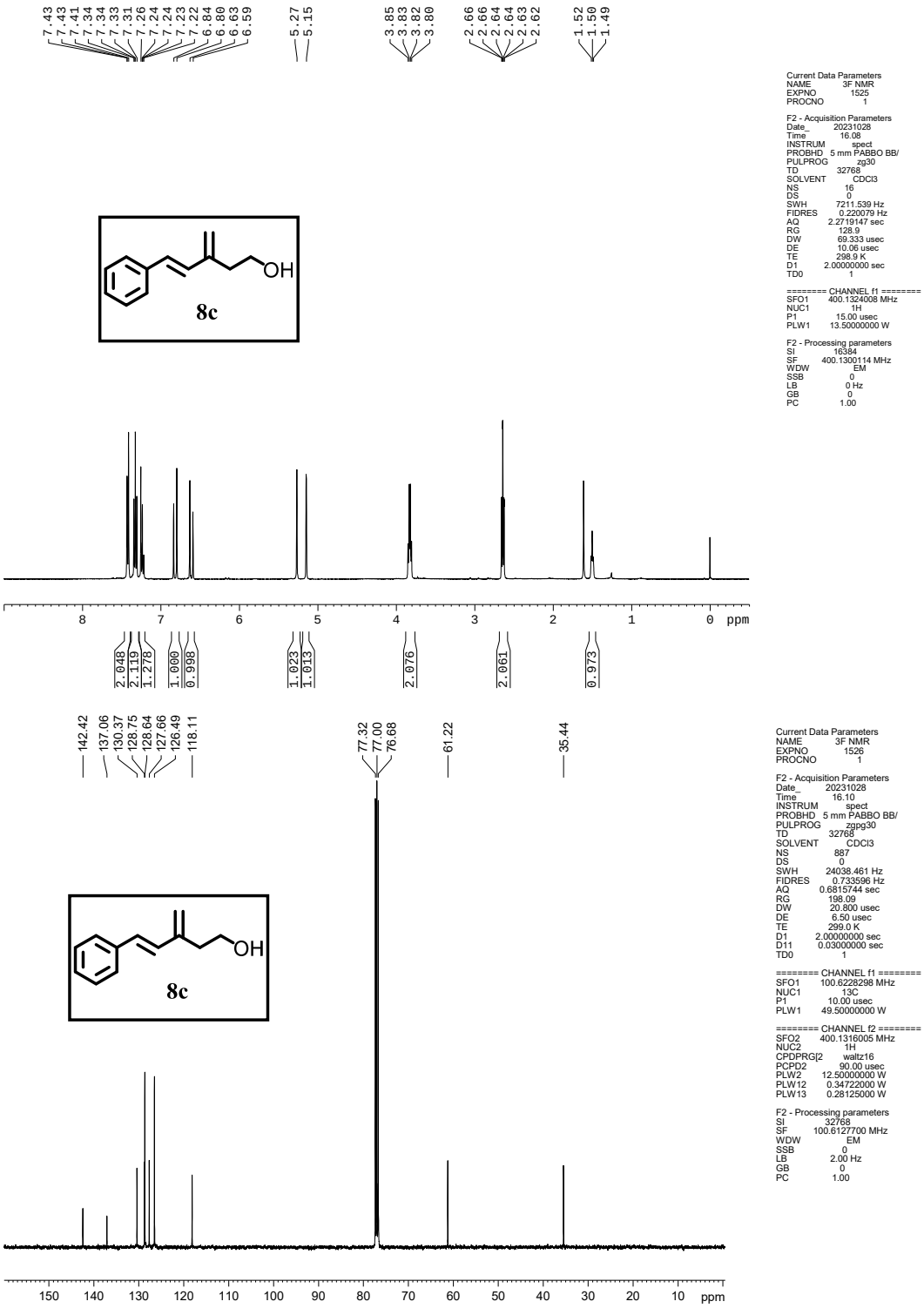
^{1}H and ^{13}C NMR spectra of compound 8a.



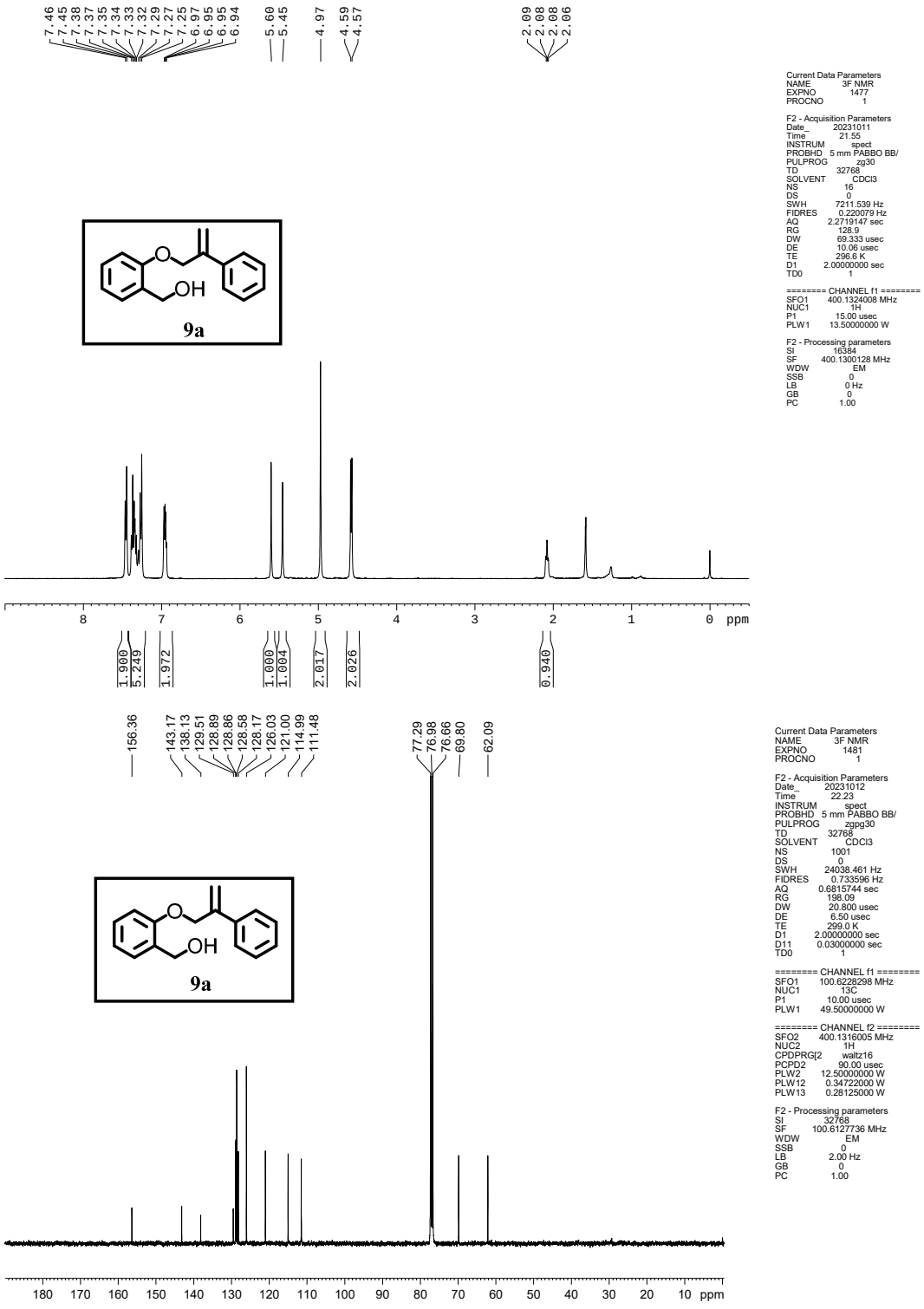
^{1}H and ^{13}C NMR spectra of compound 8b.



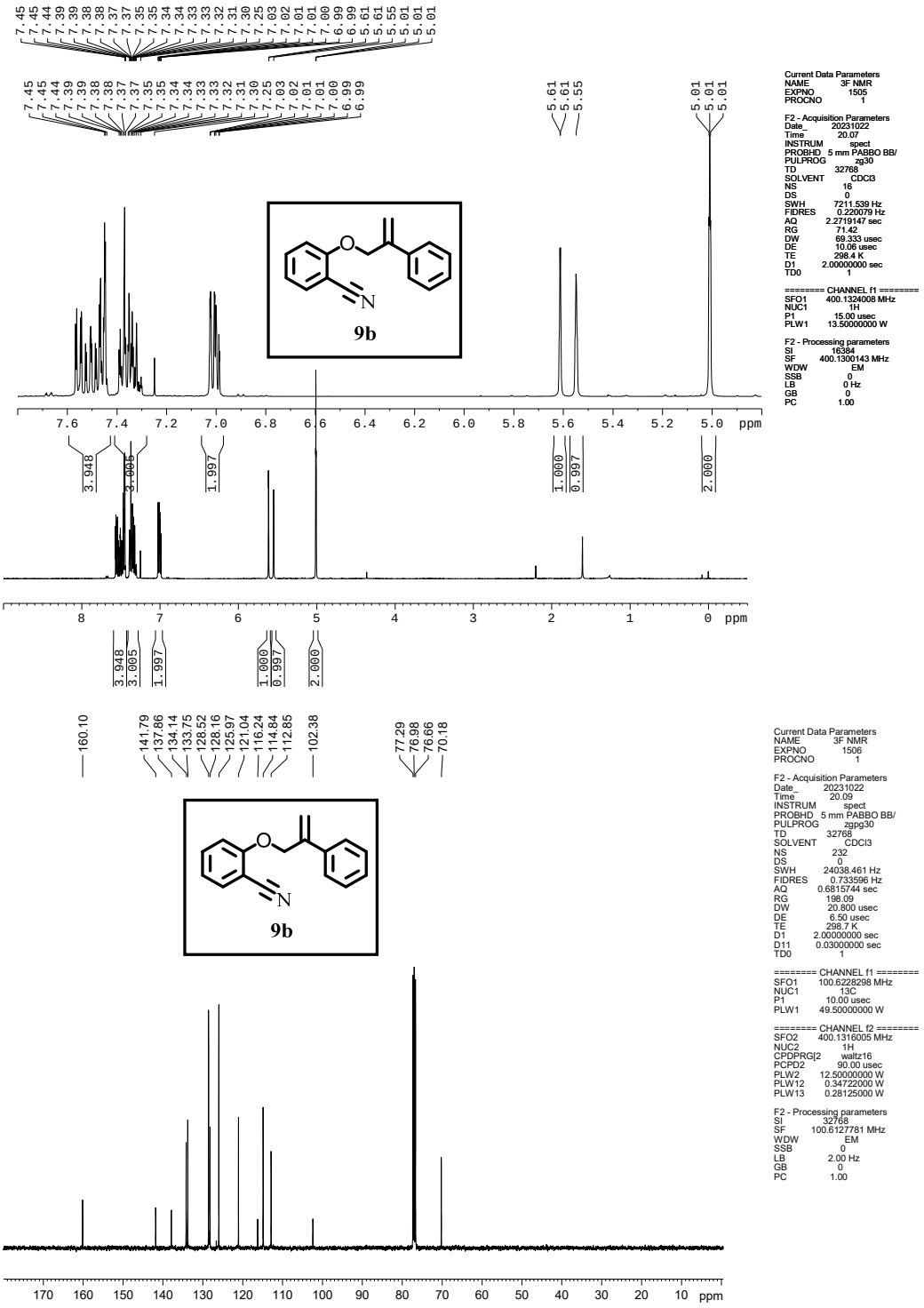
^{1}H and ^{13}C NMR spectra of compound 8c.



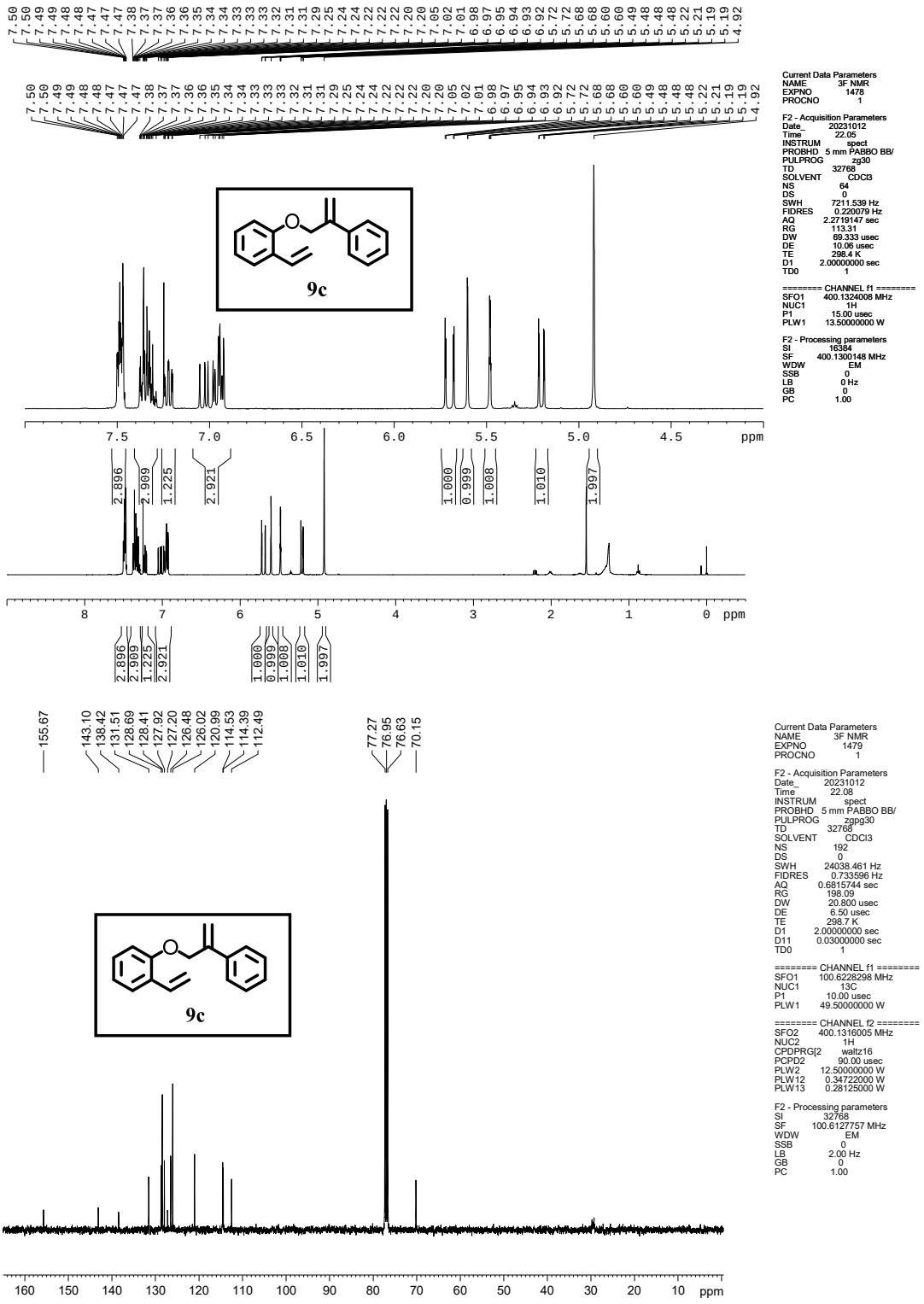
^{1}H and ^{13}C NMR spectra of compound 9a.



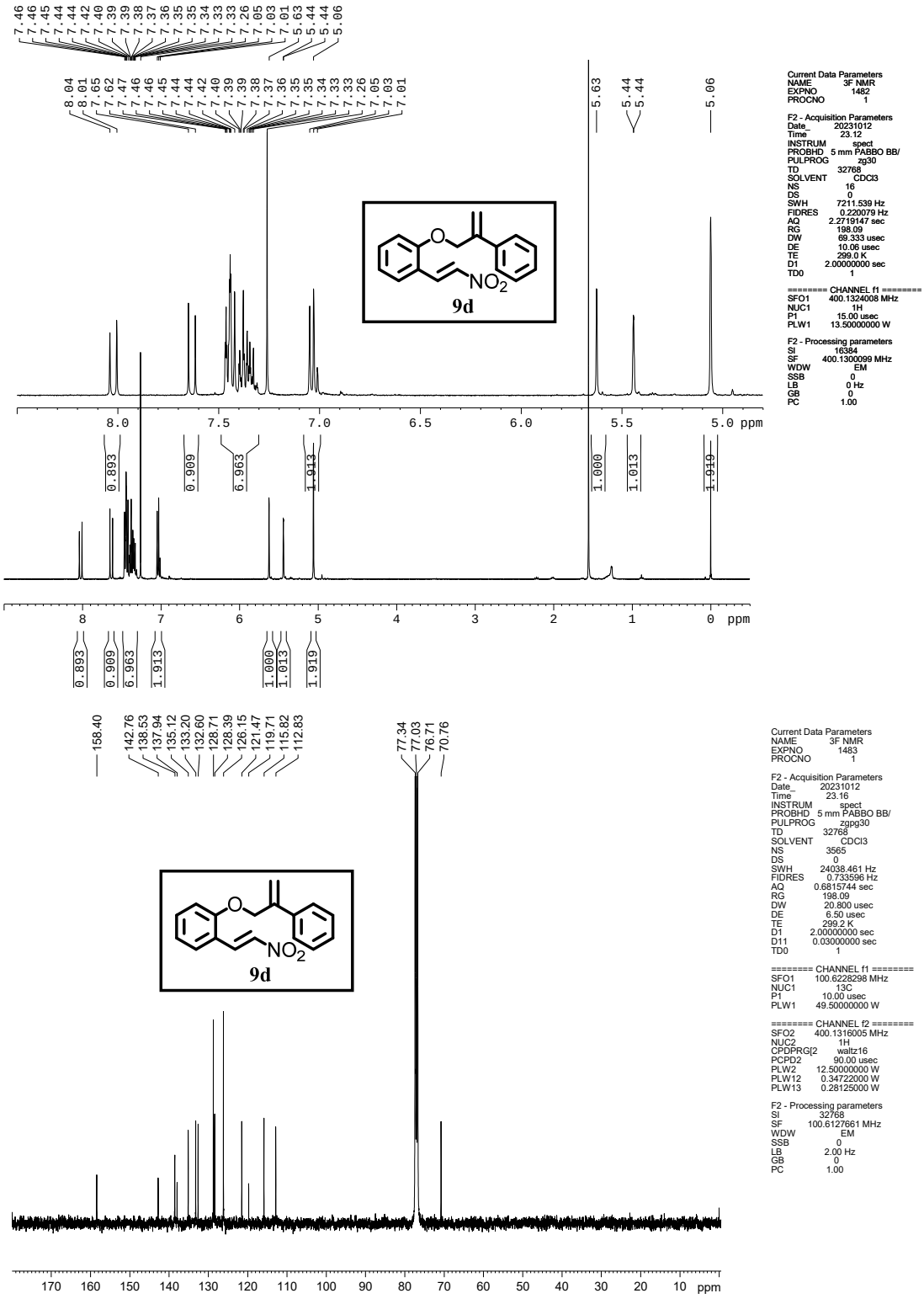
^{1}H and ^{13}C NMR spectra of compound 9b.



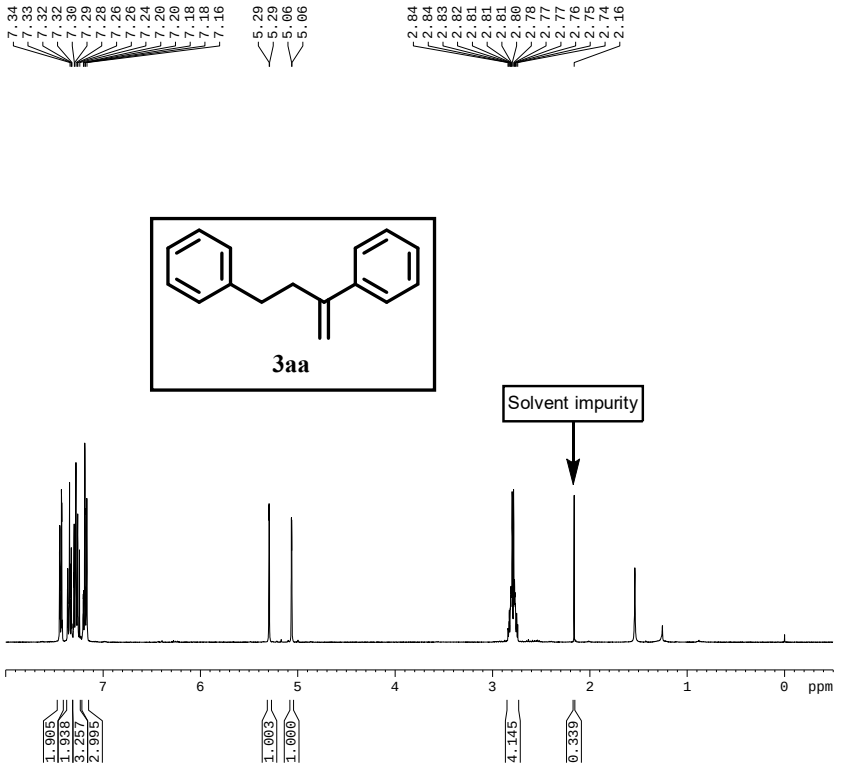
^{1}H and ^{13}C NMR spectra of compound 9c.



^{1}H and ^{13}C NMR spectra of compound 9d.



^{1}H and ^{13}C NMR spectra of compound 3aa.

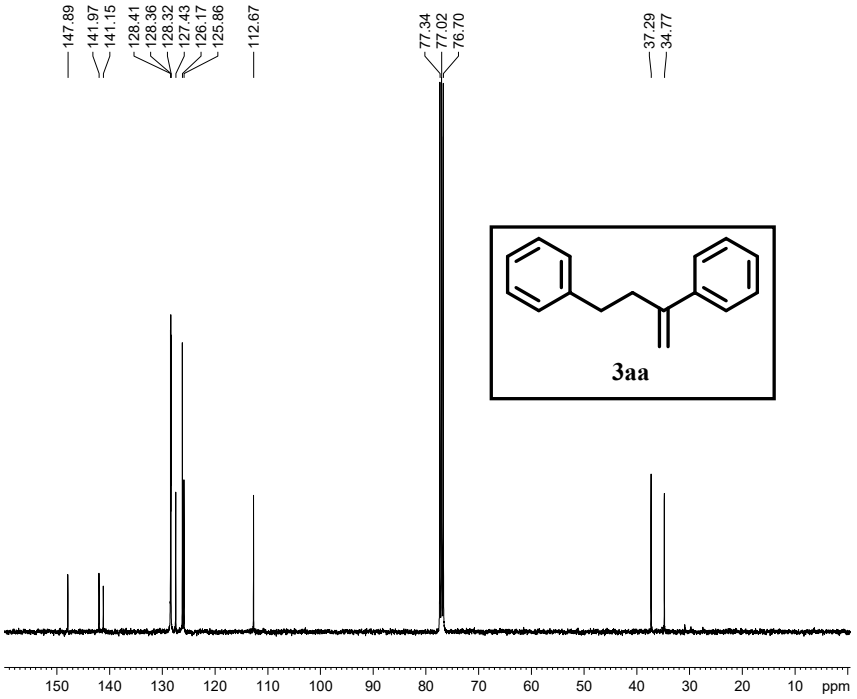


Current Data Parameters
NAME 3F NMR
EXPNO 1404
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230923
Time 20.45
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 0
SWH 7211.539 Hz
FIDRES 0.220079 Hz
AQ 2.2719147 sec
RG 99.72
DW 69.333 usec
DE 10.06 usec
TE 298.5 K
D1 2.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 15.00 usec
PLW1 13.50000000 W

F2 - Processing parameters
SI 16384
SF 400.1300178 MHz
WDW EM
SSB 0
LB 0 Hz
GB 0
PC 1.00



Current Data Parameters
NAME 3F NMR
EXPNO 1405
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230923
Time 20.48
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 821
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 198.09
DW 20.800 usec
DE 6.50 usec
TE 299.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 10.00 usec
PLW1 49.50000000 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.50000000 W
PLW12 0.34722000 W
PLW13 0.28125000 W

F2 - Processing parameters
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00

^{1}H and ^{13}C NMR spectra of compound 3bb and 3bb' (4:1)