Synthesis of Unsymmetrical 2,4-Diaryl Substituted and 3-Bromo-2-(4-bromoalkoxy)-Derived Pyranocoumarins

Velu Saravanan,[a] Pin-Hui Lin,[b] and Ding-Yah Yang*[a,b]

[a]Department of Chemistry, Tunghai University
[b]Graduate Program for Biomedical and Materials Science, Tunghai University
No. 1727, Sec. 4, Taiwan Boulevard, Xitun District, Taichung 407224, Taiwan
*Corresponding author; Email: yang@thu.edu.tw

Supporting Information

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Instrumentation

Melting points were determined on a Mel-Temp melting point apparatus in open capillaries and are uncorrected. Infrared (IR) spectra were recorded using 1725XFT-IR spectrophotometer. High resolution mass spectra (HRMS) were obtained on a Thermo Fisher Scientific Finnigan MAT95XL spectrometer using magnetic sector analyzer. ^{1}H NMR (400 MHz) and ^{13}C NMR (100) spectra were recorded on a Bruker 400 spectrometer. Chemical shifts were reported in parts per million on the scale relative to an internal standard (tetramethylsilane, or appropriate solvent peaks) with coupling constants given in hertz. ^{1}H NMR multiplicity data are denoted by s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet). Analytical thin-layer chromatography (TLC) was carried out on Merck silica gel 60G-254 plates (25 mm) and developed with the solvents mentioned. Visualization was accomplished by using portable UV light, ninhydrin spray, or iodine chamber. Flash chromatography was performed in columns of various diameters with Merck silica gel (230–400 mesh ASTM 9385 kieselgel 60H) by elution with the solvent systems. Solvents, unless otherwise specified, were reagent grade and distilled once prior to use. All new compounds exhibited satisfactory spectroscopic and analytical data.

X-ray crystallographic data of compound **1k** (CCDC-2376165)

Single crystal of **1k** was obtained by slow evaporation from a mixture of dichloromethane and n-hexane at 25 ℃. Single-crystal X-ray data were collected at 150 K on a Bruker APEX-II CCD diffractometer using graphite-monochromated Mo KR radiation (λ = 0.71073A°). The crystal structures were solved by using SHELXS-97 and the structures were refined using SHELXL-97 2014. All non-hydrogen atoms were refined anisotropically. Hydrogen atoms were fixed at geometrically calculated positions and were refined using riding model.

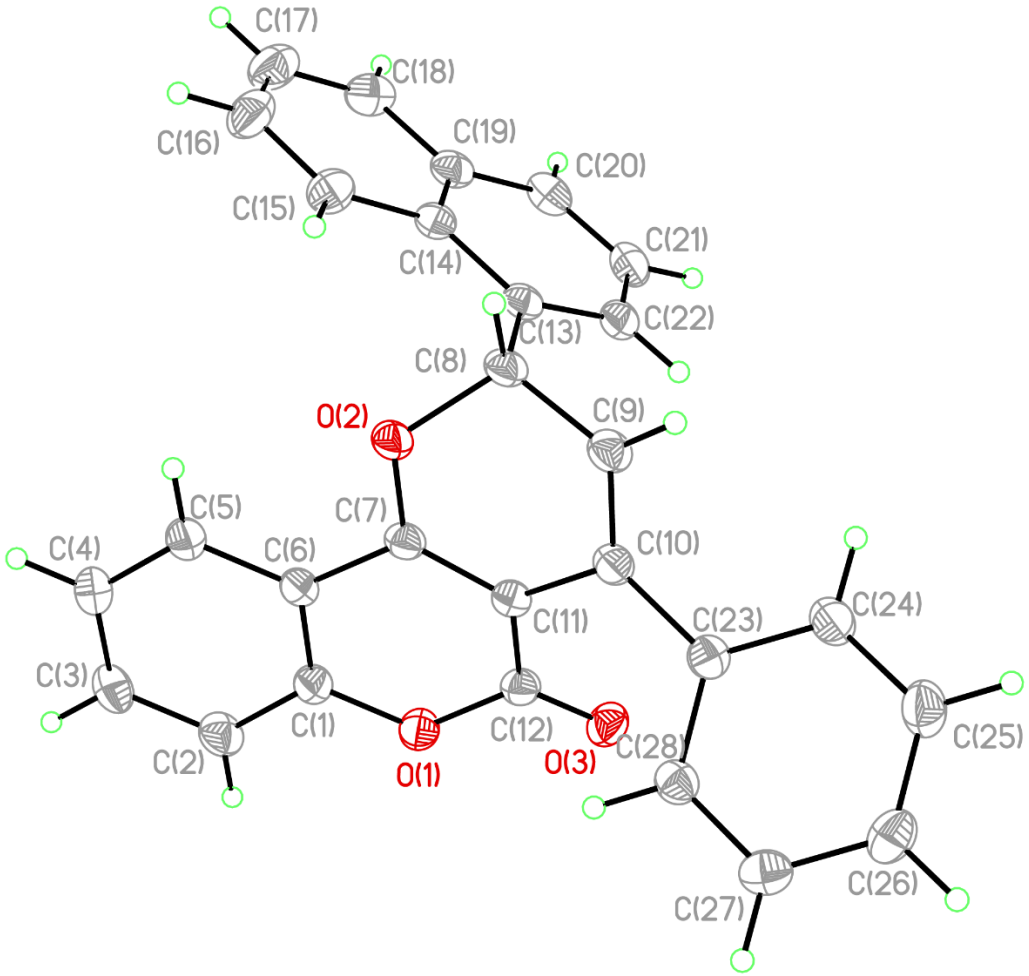


Figure S1. ORTEP diagram of compound **1k**. The ellipsoid contour probability levels: 50%

Table S1. Crystal data and structure refinement of compound **1k**

Identification code	VS214	
Empirical formula	C28 H18 O3	
Formula weight	402.42	
Temperature	150(2) K	
Wavelength	0.71073 Å	
Crystal system	Triclinic	
Space group	P-1	
Unit cell dimensions	a = 9.8884(5) Å	α= 100.494(2)°.
	b = 10.0147(5) Å	β= 105.227(2)°.
	c = 12.1140(7) Å	γ = 115.046(2)°.
Volume	987.89(9) $Å^3$	
Z	2	
Density (calculated)	1.353 Mg/m^3	
Absorption coefficient	0.087 mm^{-1}	
F(000)	420	
Crystal size	0.320 x 0.250 x 0.170 mm^3	
Theta range for data collection	3.137 to 27.895°.	
Index ranges	-12<=h<=12, -13<=k<=13, -15<=l<=15	
Reflections collected	19093	
Independent reflections	4693 [R(int) = 0.0282]	
Completeness to theta = 25.242°	99.5 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7456 and 0.6959	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	4693 / 0 / 280	
Goodness-of-fit on F^2	1.037	
Final R indices [I>2sigma(I)]	R1 = 0.0492, wR2 = 0.1311	
R indices (all data)	R1 = 0.0563, wR2 = 0.1377	
Extinction coefficient	n/a	
Largest diff. peak and hole	1.252 and -0.231 $e.Å^{-3}$	

X-ray crystallographic data of compound **5a** (CCDC-2361150)

Single crystal of **5a** was obtained by slow evaporation from a mixture of dichloromethane and *n*-hexane at 25 ℃. Single-crystal X-ray data were collected at 150 K on a Bruker APEX-II CCD diffractometer using graphite-monochromated Mo KR radiation (λ = 0.71073A°). The crystal structures were solved by using SHELXS-97 and the structures were refined using SHELXL-97 2014. All non-hydrogen atoms were refined anisotropically. Hydrogen atoms were fixed at geometrically calculated positions and were refined using riding model.

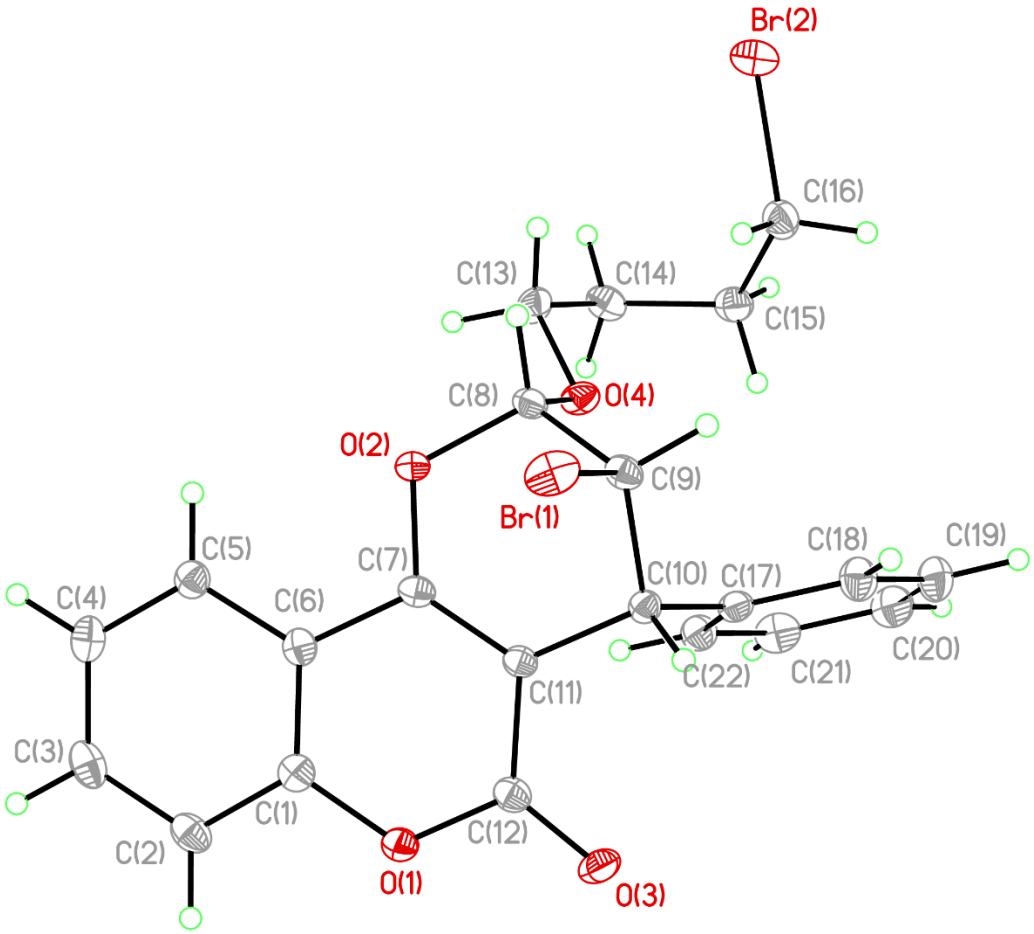
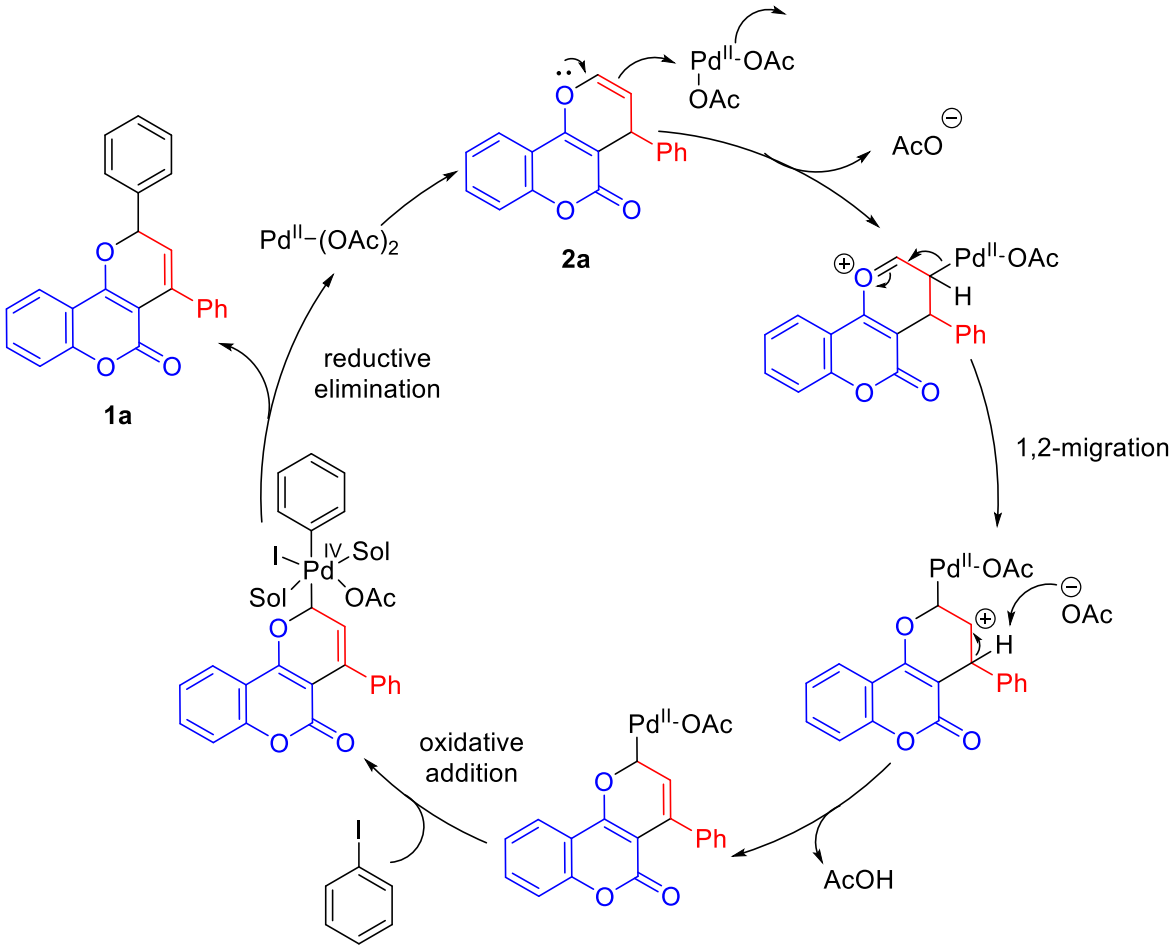


Figure S2. ORTEP diagram of compound **5a**. The ellipsoid contour probability levels: 50%

Table S2. Crystal data and structure refinement of compound **5a**.

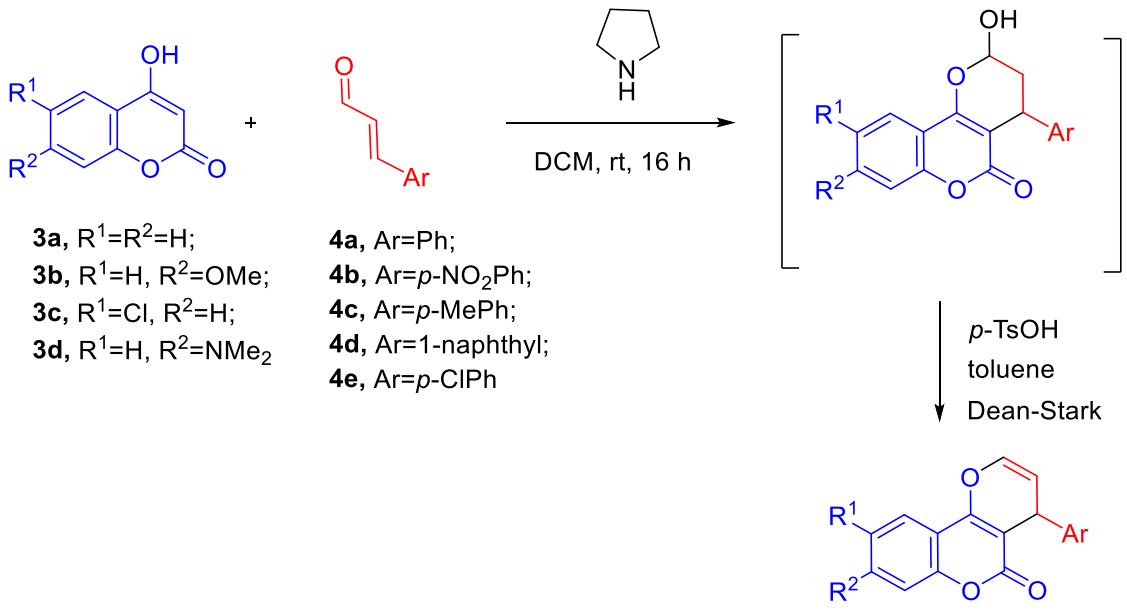
Identification code	JNS099	
Empirical formula	C22 H20 Br2 O4	
Formula weight	508.20	
Temperature	150(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	$P2_1/n$	
Unit cell dimensions	a = 8.8245(4) Å	a= 90°.
	b = 20.8267(8) Å	b= 101.108(2)°.
	c = 10.7464(5) Å	g = 90°.
Volume	1938.03(15) $Å^3$	
Z	4	
Density (calculated)	1.742 Mg/m^3	
Absorption coefficient	4.210 mm^{-1}	
F(000)	1016	
Crystal size	0.350 x 0.300 x 0.150 mm^3	
Theta range for data collection	2.910 to 27.889°.	
Index ranges	-11<=h<=11, -27<=k<=27, -14<=l<=14	
Reflections collected	43618	
Independent reflections	4618 [R(int) = 0.0598]	
Completeness to theta = 25.242°	99.8 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7456 and 0.5528	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	4618 / 0 / 253	
Goodness-of-fit on F^2	1.030	
Final R indices [I>2sigma(I)]	R1 = 0.0248, wR2 = 0.0650	
R indices (all data)	R1 = 0.0348, wR2 = 0.0693	
Extinction coefficient	n/a	
Largest diff. peak and hole	0.372 and -0.694 $e.Å^{-3}$	

Proposed mechanism for Heck coupling reaction



Scheme S1. Proposed mechanism for formation of **1a** from **2a**.

Synthesis of 4-aryl-2*H*,5*H*-pyrano[3,2-*c*]chromen-5-ones **2a**–**i**.



3a, R^1=R^2=H;
3b, R^1=H, R^2=OMe;
3c, R^1=Cl, R^2=H;
3d, R^1=H, R^2=NMe_2

4a, Ar=Ph;
4b, Ar=*p*-NO_2Ph;
4c, Ar=*p*-MePh;
4d, Ar=1-naphthyl;
4e, Ar=*p*-ClPh

2a, R^1=H, R^2=H, Ar=Ph, 66%;
2b, R^1=H, R^2=OMe, Ar=Ph, 76%;
2c, R^1=Cl, R^2=H, Ar=Ph, 68%;
2d, R^1=H, R^2=NMe_2, Ar=Ph, 51%;
2e, R^1=H, R^2=H, Ar=*p*-ClPh, 73%;
2f, R^1=H, R^2=H, Ar=*p*-MePh, 62%;
2g, R^1=H, R^2=H, Ar=1-naphthyl, 59%;
2h, R^1=H, R^2=H, Ar=*p*-NO_2Ph, 58%;
2i, R^1=Cl, R^2=H, Ar=*p*-MePh, 66%

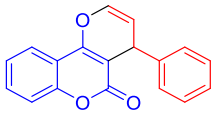
Scheme S2. Synthesis of 4-aryl-2*H*,5*H*-pyrano[3,2-*c*]chromen-5-ones **2a**–**i**.

General procedure for preparation of compounds **2a**–**i**.

To a solution of α,β-unsaturated aldehyde **4** (2.2 mmol, 1.1 equiv.) and pyrrolidine (0.2 equiv.) in methylene chloride (10 mL) was added 4-hydroxycoumarin **3** (2.0 mmol, 1.0 equiv.) at 0 °C. The reaction mixture was warmed to room temperature. The mixture was then stirred at that temperature for 3–24 h. After consumption of the 4-hydroxycoumarin (monitored by TLC), the mixture was concentrated *in vacuum*. The residue was then redissolved in toluene and was added *p*-TsOH (2.4 mmol, 1.2 equiv.). The resulting mixture was then refluxed under a Dean-Stark trap for overnight. After completion of the reaction (monitored by TLC), the reaction mixture was cooled to room temperature, and the solvent was concentrated under reduced pressure. The residue was then diluted with ethyl acetate (20 mL), washed with water and brine. The organic layer was then dried over anhydrous $MgSO_4$ and concentrated under reduced pressure to provide the crude product, which was further purified by column chromatography to obtain the desired compound **2**.

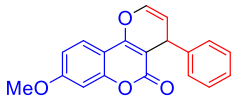
Characterization data of prepared compounds

2a



White solid; 364 mg; yield 66%; R_f = 0.62 (20% EtOAc/hexanes); mp 146–148 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.83 (d, J = 8.0 Hz, 1H), 7.54 (td, J = 8.4, 1.6 Hz, 1H), 7.39 (d, J = 7.2 Hz, 2H), 7.35–7.28 (m, 4H), 7.22 (t, J = 7.2 Hz, 1H), 6.79 (d, J = 6.0 Hz, 1H), 5.35 (dd, J = 6.0, 4.4 Hz, 1H), 4.54 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 155.6, 152.5, 143.5, 138.0, 131.9, 128.5 (2C), 128.3 (2C), 127.1, 124.0, 122.7, 116.6, 114.3, 108.8, 103.7, 35.3; IR ν_{max} (KBr) 3027, 1721, 1623, 1395, 1229, 1011, 752, 699 cm^{-1}.

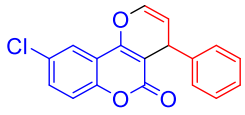
2b



White solid; 465 mg; yield 76%; R_f = 0.45 (20% EtOAc/hexanes); mp 140–142 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.71 (d, J = 8.8 Hz, 1H), 7.38 (d, J = 7.2 Hz, 2H), 7.31 (t, J = 7.2 Hz, 2H), 7.22 (tt, J = 7.2, 1.6 Hz, 1H), 6.88 (dd, J = 8.8, 2.4 Hz, 1H), 6.78 (d, J = 2.4 Hz, 1H), 6.75 (dd, J = 6.0, 0.8 Hz, 1H), 5.33 (dd, J = 6.0, 4.4 Hz, 1H), 4.50 (d, J = 4.4 Hz, 1H), 3.86 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.8, 161.8, 156.0, 154.3, 143.7, 137.9, 128.4 (2C), 128.3 (2C), 127.0, 123.7, 112.3, 108.9, 107.4, 100.9, 100.4, 55.7, 35.1; IR ν_{max} (KBr) 3026, 1719, 1618, 1399, 1233, 1157, 1031, 752,

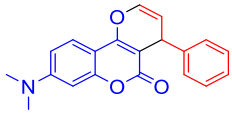
698 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{19}H_{14}O_4$, 306.0892; found, 306.0887.

2c



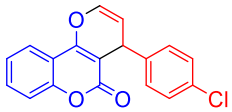
White solid; 422 mg; yield 68%; R_f = 0.61 (20% EtOAc/hexanes); mp 144–146 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.80 (d, J = 2.4 Hz, 1H), 7.47 (dd, J = 8.8, 2.4 Hz, 1H), 7.38–7.35 (m, 2H), 7.34–7.30 (m, 2H), 7.25–7.21 (m, 2H), 6.79 (d, J = 6.0 Hz, 1H), 5.36 (dd, J = 6.0, 4.8 Hz, 1H), 4.53 (d, J = 4.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.8, 154.5, 150.9, 143.1, 138.0, 131.9, 129.6, 128.5 (2C), 128.4 (2C), 127.3, 122.3, 118.1, 115.4, 108.8, 104.5, 35.2; IR ν_{max} (KBr) 3028, 1723, 1622, 1486, 1228, 1012, 838, 753, 700 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{18}H_{11}ClO_3$, 310.0397; found, 310.0389.

2d



Light pink solid; 325 mg; yield 51%; R_f = 0.41 (20% EtOAc/hexanes); mp 194–196 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.60 (d, J = 8.8 Hz, 1H), 7.37 (dd, J = 7.2, 1.2 Hz, 2H), 7.30 (t, J = 7.2 Hz, 2H), 7.20 (t, J = 7.2, 1.2 Hz, 1H), 6.72 (dd, J = 6.0, 0.8 Hz, 1H), 6.64 (dd, J = 8.8, 2.4 Hz, 1H), 6.47 (d, J = 2.4 Hz, 1H), 5.30 (dd, J = 6.0, 4.4 Hz, 1H), 4.47 (d, J = 4.4 Hz, 1H), 3.04 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.4, 156.6, 154.6, 152.9, 144.3, 137.9, 128.3 (2C), 128.2 (2C), 126.8, 123.3, 108.9, 108.8, 102.9, 98.6, 97.7, 40.1 (2C), 35.1; IR ν_{max} (KBr) 2919, 1712, 1620, 1527, 1403, 1231, 1169, 1020, 752, 698 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{20}H_{17}NO_3$, 319.1208; found, 319.1202.

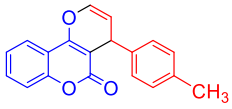
2e



White solid; 453 mg; yield 73%; R_f = 0.61 (20% EtOAc/hexanes); mp 168–170 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.82 (dd, J = 8.4, 1.6 Hz, 1H), 7.55 (td, J = 8.4, 1.6 Hz, 1H), 7.35–7.33 (m, 1H), 7.33–7.28 (m, 4H), 7.28–7.25 (m, 1H), 6.80 (d, J = 6.0 Hz, 1H), 5.32 (t, J = 6.0, 4.4 Hz, 1H), 4.52 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 155.7, 152.5, 142.0, 138.3, 132.9, 132.1, 129.8 (2C), 128.6 (2C), 124.1, 122.7, 116.7, 114.1, 108.4, 103.3, 34.7; IR ν_{max} (KBr) 2923, 1723, 1621, 1492, 1392, 1229,

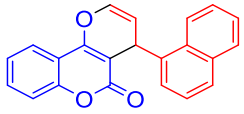
1044, 1011, 845, 756 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{18}H_{11}ClO_3$, 310.0397; found, 310.0399.

2f



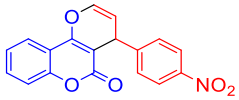
White solid; 360 mg; yield 62%; R_f = 0.64 (20% EtOAc/hexanes); mp 142–144 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.82 (d, J = 8.0 Hz, 1H), 7.53 (t, J = 8.0, 1.2 Hz, 1H), 7.34–7.24 (m, 4H), 7.12 (d, J = 8.0 Hz, 2H), 6.77 (d, J = 6.0 Hz, 1H), 5.34 (dd, J = 6.0, 4.4 Hz, 1H), 4.50 (d, J = 4.4 Hz, 1H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.5, 155.5, 152.5, 140.7, 137.9, 136.8, 131.8, 129.2 (2C), 128.2 (2C), 124.0, 122.6, 116.6, 114.3, 109.0, 103.8, 34.8, 21.0; IR ν_{max} (KBr) 2922, 1722, 1622, 1393, 1228, 1207, 1112, 1042, 1010, 758 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{19}H_{14}O_3$, 290.0943; found, 290.0945.

2g



White solid; 385 mg; yield 59%; R_f = 0.57 (20% EtOAc/hexanes); mp 164–166 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.32 (d, J = 8.4 Hz, 1H), 7.89 (d, J = 8.0 Hz, 2H), 7.75 (d, J = 8.0 Hz, 1H), 7.63–7.55 (m, 2H), 7.52 (t, J = 7.2 Hz, 1H), 7.43–7.33 (m, 3H), 7.30 (d, J = 7.2 Hz, 1H), 6.69 (dd, J = 5.6, 0.8 Hz, 1H), 5.48 (dd, J = 5.6, 4.4 Hz, 1H), 5.39 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 156.8, 152.6, 140.2, 137.6, 133.9, 132.0, 130.7, 128.9, 127.6, 126.4, 125.71 (2C), 125.67, 124.1, 122.8, 122.7, 116.8, 114.2, 108.9, 103.0, 30.7; IR ν_{max} (KBr) 2923, 1722, 1621, 1397, 1229, 1040, 1010, 769, 757 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{22}H_{14}O_3$, 326.0943; found, 326.0648.

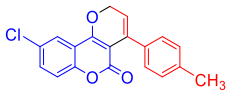
2h



White solid; 372 mg; yield 58%; R_f = 0.38 (20% EtOAc/hexanes); mp 196–198 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.16 (d, J = 8.8 Hz, 2H), 7.84 (dd, J = 8.0, 1.2 Hz, 1H), 7.56 (d, J = 8.4 Hz, 2H), 7.58 (td, J = 7.2, 1.2 Hz, 1H), 7.31 (d, J = 8.8 Hz, 1H), 7.35 (t, J = 8.0, 0.4 Hz, 1H), 6.85 (dd, J = 6.0, 0.8 Hz, 1H), 5.32 (dd, J = 6.0, 4.4 Hz, 1H), 4.67 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.3, 156.1, 152.6, 150.5, 147.0, 138.9, 132.5, 129.4 (2C), 124.3, 123.8 (2C), 122.8, 116.8, 113.9, 107.5, 102.4, 35.3; IR ν_{max}

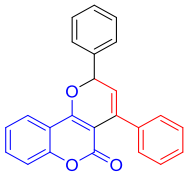
(KBr) 3077, 1720, 1621, 1518, 1395, 1347, 1231, 1013, 833, 752 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{18}H_{11}NO_5$, 321.0637; found, 321.0641.

2i



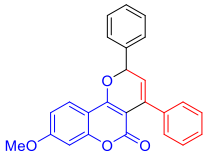
White solid; 428 mg; yield 66%; R_f = 0.67 (20% EtOAc/hexanes); mp 154–156 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.79 (d, J = 2.4 Hz, 1H), 7.47 (dd, J = 8.8, 2.4 Hz, 1H), 7.25 (d, J = 8.0 Hz, 2H), 7.23 (d, J = 8.8 Hz, 1H), 7.13 (d, J = 8.0 Hz, 2H), 6.77 (d, J = 6.0 Hz, 1H), 5.34 (dd, J = 6.0, 4.4 Hz, 1H), 4.48 (d, J = 4.4 Hz, 1H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 154.4, 150.8, 140.3, 137.9, 137.0, 131.8, 129.6, 129.2 (2C), 128.2 (2C), 122.3, 118.1, 115.4, 109.0, 104.7, 34.8, 21.0; IR ν_{max} (KBr) 2921, 1723, 1622, 1421, 1385, 1227, 1204, 1010, 819 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{19}H_{13}ClO_3$, 324.0553; found, 324.0557.

1a



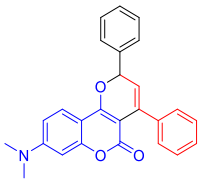
Pale yellow solid; 33 mg; yield 68%; R_f = 0.63 (30% EtOAc/hexanes); mp 158–160 °C (Lit.[1] 158–160 °C); ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.86 (dd, J = 8.0, 1.2 Hz, 1H), 7.59–7.51 (m, 3H), 7.46–7.38 (m, 3H), 7.38–7.33 (m, 5H), 7.30 (d, J = 8.4 Hz, 1H), 7.29–7.24 (m, 1H), 6.15 (d, J = 4.4 Hz, 1H), 5.77 (d, J = 4.4 Hz, 1H).

1b



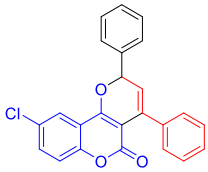
Light brown solid; 32 mg; yield 61%; R_f = 0.65 (20% EtOAc/hexanes); mp 126–128 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.75 (d, J = 8.8 Hz, 1H), 7.56 (d, J = 8.0 Hz, 2H), 7.45–7.38 (m, 3H), 7.37–7.32 (m, 5H), 6.83 (dd, J = 8.8, 2.4 Hz, 1H), 6.78 (d, J = 2.4 Hz, 1H), 6.10 (d, J = 4.0 Hz, 1H), 5.71 (d, J = 4.0 Hz, 1H), 3.86 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.6, 161.9, 159.0, 155.5, 138.4, 138.0, 135.3, 129.1, 128.8 (2C), 127.8 (2C), 127.7, 127.4 (3C), 124.4, 119.2, 112.5, 108.3, 100.3 (2C), 78.7, 55.7; IR ν_{max} (KBr) 2925, 1724, 1617, 1405, 1285, 1160, 1028, 755, 699 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{25}H_{18}O_4$, 382.1205; found, 382.1198.

1c



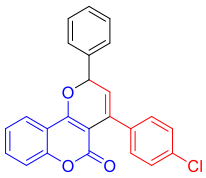
Pink solid; 41 mg; yield 76%; R_f = 0.39 (20% EtOAc/hexanes); mp 128–130 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.65 (d, J = 8.8 Hz, 1H), 7.56 (dd, J = 8.0, 1.6 Hz, 2H), 7.44–7.31 (m, 8H), 6.59 (dd, J = 8.8, 2.4 Hz, 1H), 6.47 (d, J = 2.4 Hz, 1H), 6.04 (d, J = 4.0 Hz, 1H), 5.64 (d, J = 4.0 Hz, 1H), 3.06 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.6, 159.6, 155.9, 153.5, 138.9, 138.4, 135.7, 128.9, 128.7 (2C), 127.7 (2C), 127.5, 127.42 (2C), 127.38 (2C), 124.2, 118.1, 108.7, 103.8, 98.2, 97.5, 78.4, 40.1 (2C); IR ν_{max} (KBr) 2924, 1711, 1618, 1578, 1513, 1408, 1175, 755, 698 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{26}H_{21}NO_3$, 395.1521; found, 395.1530.

1d



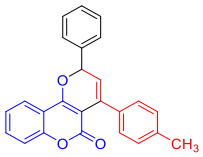
Pale yellow solid; 33 mg; yield 62%; R_f = 0.58 (20% EtOAc/hexanes); mp 198–200 °C (Lit.[2] 203–205 °C); ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.81 (d, J = 2.4 Hz, 1H), 7.58–7.56 (m, 2H), 7.48 (dd, J = 8.8, 2.4 Hz, 1H), 7.46–7.41 (m, 3H), 7.39–7.35 (m, 3H), 7.35–7.31 (m, 2H), 7.25 (d, J = 9.2 Hz, 1H), 6.16 (d, J = 4.0 Hz, 1H), 5.79 (d, J = 4.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.1, 158.1, 151.9, 137.8, 137.5, 134.9, 132.5, 129.5 (3C), 129.0 (2C), 128.0, 127.9, 127.6 (2C), 127.4 (2C), 122.7, 120.7, 118.1, 116.3, 103.3, 79.0; IR ν_{max} (KBr) 3029, 1729, 1630, 1552, 1484, 1393, 1118, 996, 755, 698 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{24}H_{15}ClO_3$, 386.0710; found, 386.0720.

1e



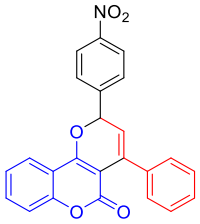
Pale yellow solid; 39 mg; yield 73%; R_f = 0.57 (20% EtOAc/hexanes); mp 190–192 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.86 (dd, J = 8.0, 1.2 Hz, 1H), 7.58–7.52 (m, 3H), 7.46–7.39 (m, 3H), 7.33 (d, J = 8.4 Hz, 2H), 7.31–7.24 (m, 4H), 6.14 (d, J = 4.4 Hz, 1H), 5.75 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.5, 158.6, 153.5, 138.0, 136.3, 134.1, 133.7, 132.8, 129.3, 128.9 (2C), 128.8 (2C), 128.1 (2C), 127.4 (2C), 124.0, 123.3, 120.5, 116.6, 115.0, 102.3, 78.7; IR ν_{max} (KBr) 2920, 1723, 1629, 1609, 1552, 1491, 1405, 990, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{24}H_{15}ClO_3$, 386.0710; found, 386.0712.

1f



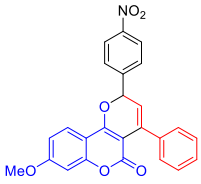
White solid; 36 mg; yield 72%; R_f = 0.59 (20% EtOAc/hexanes); mp 142–144 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.85 (dd, J = 7.6, 1.2 Hz, 1H), 7.68–7.51 (m, 3H), 7.45–7.38 (m, 3H), 7.33–7.22 (m, 4H), 7.18 (d, J = 8.0 Hz, 2H), 6.13 (d, J = 4.4 Hz, 1H), 5.75 (d, J = 4.4 Hz, 1H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.3, 158.7, 153.5, 138.2, 137.6, 135.1, 134.9, 132.5, 129.2, 128.8 (2C), 128.7 (2C), 127.5 (2C), 127.2 (2C), 123.9, 123.2, 119.7, 116.6, 115.2, 102.9, 78.7, 21.3; IR ν_{max} (KBr) 2922, 1727, 1628, 1609, 1552, 1491, 1397, 1107, 988, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{25}H_{18}O_3$, 366.1256; found, 366.1246.

1g



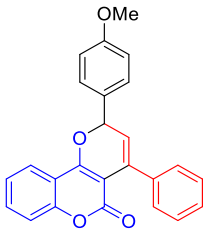
Brown solid; 30 mg; yield 54%; R_f = 0.66 (30% EtOAc/hexanes); mp 192–194 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.29 (d, J = 8.8 Hz, 2H), 7.87 (dd, J = 8.0, 1.2 Hz, 1H), 7.74 (d, J = 8.4 Hz, 2H), 7.59 (td, J = 8.4, 1.6 Hz, 1H), 7.40–7.35 (m, 3H), 7.35–7.29 (m, 4H), 6.24 (d, J = 4.4 Hz, 1H), 5.75 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.0, 158.2, 153.6, 148.2, 145.1, 137.3, 136.1, 133.0, 128.1, 127.94 (2C), 127.89 (2C), 127.3 (2C), 124.14 ,124.07 (2C), 123.0, 118.8, 116.7, 114.7, 103.0, 77.2; IR ν_{max} (KBr) 2920, 1725, 1632, 1523, 1348, 754, 699 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{24}H_{15}NO_5$, 397.0950; found, 397.0959.

1h



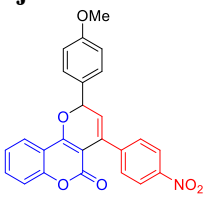
Brown solid; 31 mg; yield 53%; R_f = 0.33 (20% EtOAc/hexanes); mp 174–176 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.28 (d, J = 8.4 Hz, 2H), 7.76 (d, J = 8.8 Hz, 1H), 7.73 (d, J = 8.4 Hz, 2H), 7.38–7.30 (m, 5H), 6.87 (dd, J = 8.8, 2.4 Hz, 1H), 6.80 (d, J = 2.4 Hz, 1H), 6.19 (d, J = 4.4 Hz, 1H), 5.68 (d, J = 4.4 Hz, 1H), 3.88 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.9, 161.6, 158.7, 155.6, 148.2, 145.4, 137.4, 136.3, 128.1, 127.93 (2C), 127.88 (2C), 127.3 (2C), 124.2, 124.1 (2C), 117.7, 112.8, 107.9, 100.5, 100.4, 77.1, 55.8; IR ν_{max} (KBr) 3365, 1727, 1615, 1529, 1402, 1161, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{25}H_{17}NO_6$, 427.1056; found, 427.1050.

1i



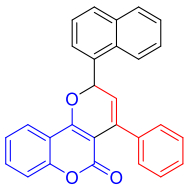
Pale yellow solid; 27 mg; yield 52%; R_f = 0.29 (30% EtOAc/hexanes); mp 122–124 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.83 (dd, J = 8.0, 1.2 Hz, 1H), 7.55–7.48 (m, 3H), 7.40–7.32 (m, 5H), 7.29 (d, J = 8.4 Hz, 1H), 7.23 (d, J = 7.6 Hz, 1H), 6.93 (d, J = 8.8 Hz, 2H), 6.10 (d, J = 4.4 Hz, 1H), 5.76 (d, J = 4.4 Hz, 1H), 3.82 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.2, 160.4, 158.8, 153.5, 137.9, 135.1, 132.5, 129.9, 129.4 (2C), 127.9, 127.8 (2C), 127.4 (2C), 123.8, 123.3, 120.2, 116.5, 115.3, 114.2 (2C), 102.6, 78.5, 55.3; IR ν_{max} (KBr) 2925, 1737, 1614, 1585, 1483, 1457, 1364, 1033 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{25}H_{18}O_4$, 382.1205; found, 382.1199.

1j



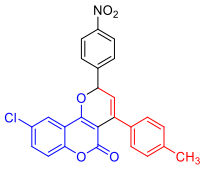
Brown solid; 43 mg; yield 73%; R_f = 0.33 (30% EtOAc/hexanes); mp 156–158 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.22 (d, J = 8.8 Hz, 2H), 7.84 (d, J = 7.6 Hz, 1H), 7.56 (t, J = 7.6 Hz, 1H), 7.48 (d, J = 8.4 Hz, 4H), 7.33–7.24 (m, 2H), 6.95 (d, J = 8.4 Hz, 2H), 6.16 (d, J = 4.4 Hz, 1H), 5.82 (d, J = 4.0 Hz, 1H), 3.82(s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.7, 160.6, 158.8, 153.5, 147.3, 144.9, 133.4, 133.0, 129.4, 129.3 (2C), 128.4 (2C), 124.2, 123.4, 123.2 (2C), 122.0, 116.7, 115.0, 114.4 (2C), 101.6, 78.5, 55.3; IR ν_{max} (KBr) 3441, 1717, 1609, 1515, 1345, 1252, 1175, 1033, 755 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{25}H_{17}NO_6$, 427.1056; found, 427.1046.

1k



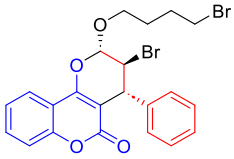
White solid; 35 mg; yield 63%; R_f = 0.53 (20% EtOAc/hexanes); mp 184–186 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.38 (d, J = 8.4 Hz, 1H), 7.92 (t, J = 9.2 Hz, 2H), 7.81 (d, J = 7.2 Hz, 1H), 7.75 (dd, J = 7.6, 1.2 Hz, 1H), 7.64 (t, J = 7.2 Hz, 1H), 7.57 (t, J = 7.2 Hz, 1H), 7.53–7.47 (m, 2H), 7.43–7.35 (m, 5H), 7.28 (d, J = 8.4 Hz, 1H), 7.18 (t, J = 7.2 Hz, 1H), 6.90 (d, J = 4.4 Hz, 1H), 5.87 (d, J = 4.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.6, 158.7, 153.5, 137.8, 135.8, 134.2, 132.5, 132.4, 131.0, 130.1, 129.1 (2C), 127.91 (2C), 127.88, 127.4, 126.8, 126.4, 126.0, 125.1, 123.8, 123.5, 123.3, 119.8, 116.5, 115.2, 102.9, 76.1; IR ν_{max} (KBr) 3016, 1727, 1629, 1609, 1553, 1491, 1400, 1107, 753, 699 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{28}H_{18}O_3$, 402.1256; found, 402.1250.

1l



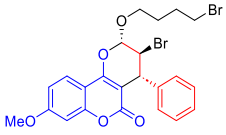
White solid; 37 mg; yield 61%; R_f = 0.49 (20% EtOAc/hexanes); mp 182–184 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.31 (d, J = 8.8 Hz, 2H), 7.80 (d, J = 2.4 Hz, 1H), 7.73 (d, J = 8.8 Hz, 2H), 7.52 (dd, J = 8.8, 2.4 Hz, 1H), 7.27 (d, J = 8.8 Hz, 1H), 7.2 (dd, J = 8.4, 6.0 Hz, 4H), 6.23 (d, J = 4.4 Hz, 1H), 5.74 (d, J = 4.4 Hz, 1H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.8, 157.7, 151.9, 148.4, 144.8, 138.2, 135.8, 134.0, 132.9, 129.7, 128.8 (2C), 128.1 (2C), 127.2 (2C), 124.2 (2C), 122.5, 118.8, 118.2, 115.9, 103.8, 77.5, 21.3; IR ν_{max} (KBr) 2921, 1730, 1630, 1551, 1522, 1348, 1118, 998, 820, 755 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{25}H_{16}ClNO_5$, 445.0717; found, 445.0715.

5a



White solid; 44 mg; yield 63%; R_f = 0.58 (20% EtOAc/hexanes); mp 118–120 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.91 (dd, J = 7.6, 1.2 Hz, 1H), 7.61 (td, J = 8.8, 1.2 Hz, 1H), 7.40 (d, J = 8.8 Hz, 1H), 7.36 (td, J = 8.8, 0.8 Hz, 1H), 7.29–7.18 (m, 5H), 5.52 (d, J = 2.4 Hz, 1H), 4.58 (t, J = 2.4 Hz, 1H), 4.52 (d, J = 2.4 Hz, 1H), 3.90–3.85 (m, 1H), 3.56–3.50 (m, 1H), 3.17 (t, J = 6.0 Hz, 2H), 1.60–1.40 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 157.2, 152.9, 139.6, 132.2, 128.2, 127.8 (2C), 127.1 (2C), 124.1, 122.7, 116.8, 115.0, 101.0 (2C), 69.2, 47.3, 44.0, 33.1, 28.8, 27.8; IR ν_{max} (KBr) 2930, 1719, 1634, 1611, 1493, 1400, 1126, 1079, 953, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{22}H_{20}Br_2O_4$, 505.9728; found, 505.9722.

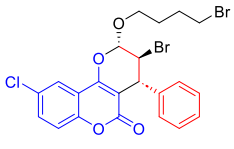
5b



White solid; 48 mg; yield 65%; R_f = 0.41 (20% EtOAc/hexanes); mp 130–132 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.80 (d, J = 8.8 Hz, 1H), 7.30–7.17 (m, 5H), 6.92 (dd, J = 8.8, 2.4 Hz, 1H), 6.87 (d, J = 2.4 Hz, 1H), 5.48 (d, J = 2.4 Hz, 1H), 4.56 (t, J = 2.4 Hz, 1H), 4.48 (d, J = 1.6 Hz, 1H), 3.89 (s, 3H), 3.87–3.80 (m, 1H), 3.56–3.45 (m, 1H), 3.17 (t, J = 5.6 Hz, 2H), 1.60–1.40 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.1, 161.8, 157.6, 154.6, 139.8, 128.1 (2C), 127.7 (2C), 126.9, 123.7, 112.3, 108.1, 100.8, 100.5, 97.8, 69.1, 55.7, 47.6, 43.9, 33.1, 28.7, 27.8; IR ν_{max} (KBr) 2925, 1721, 1635,

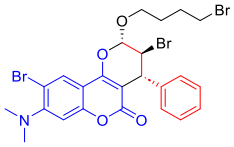
1574, 1484, 1097, 952, 756 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{23}H_{22}Br_2O_5$, 535.9834; found, 535.9843.

5c



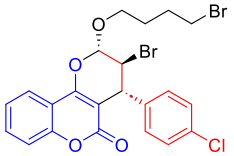
White solid; 58 mg; yield 78%; R_f = 0.58 (20% EtOAc/hexanes); mp 154–156 °C; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.88 (d, J = 2.4 Hz, 1H), 7.55 (dd, J = 8.8, 2.4 Hz, 1H), 7.34 (d, J = 8.8 Hz, 1H), 7.30–7.18 (m, 5H), 5.53 (d, J = 2.0 Hz, 1H), 4.59 (t, J = 2.4 Hz, 1H), 4.51 (d, J = 2.0 Hz, 1H), 3.91–3.85 (m, 1H), 3.57–3.49 (m, 1H), 3.21–3.10 (m, 2H), 1.55–1.43 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 156.2, 151.3, 139.2, 132.2, 129.7, 128.3 (2C), 127.7 (2C), 127.2, 122.3, 118.3, 116.1, 101.6, 101.1, 69.4, 46.9, 43.9, 33.1, 28.8, 27.8; IR ν_{max} (KBr) 3434, 1720, 1636, 1574, 1483, 1097, 952, 755, 719 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{22}H_{19}Br_2ClO_4$, 539.9339; found, 539.9332.

5d



White solid; 51 mg; yield 58%; R_f = 0.60 (20% EtOAc/hexanes); mp 118–120 °C; ^1H NMR ($CDCl_3$, 400 MHz) δ 8.03 (s, 1H), 7.28–7.17 (m, 5H), 6.98 (s, 1H), 5.49 (d, J = 2.0 Hz, 1H), 4.57 (t, J = 2.4 Hz, 1H), 4.48 (d, J = 1.6 Hz, 1H), 3.90–3.84 (m, 1H), 3.55–3.48 (m, 1H), 3.19–3.14 (m, 2H), 2.92 (s, 6H), 1.54–1.45 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.6, 156.6, 155.5, 153.2, 139.7, 128.3 (2C), 127.8 (2C), 127.7, 127.1, 112.7, 110.0, 107.7, 101.0, 98.9, 69.3, 47.3, 43.9, 43.8 (2C), 33.3, 28.9, 27.9; IR ν_{max} (KBr) 2923, 1718, 1626, 1608, 1396, 1135, 1081, 954, 754 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{24}H_{24}Br_3NO_4$, 636.9255; found, 636.9255.

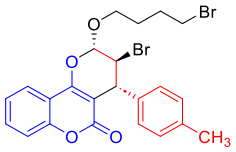
5e



White solid; 57 mg; yield 76%; R_f = 0.56 (20% EtOAc/hexanes); mp 112–114 °C; ^1H NMR ($CDCl_3$, 400 MHz) δ 7.92 (d, J = 8.8 Hz, 1H), 7.62 (td, J = 8.4, 1.2 Hz, 1H), 7.40 (d, J = 8.4 Hz, 1H), 7.37 (t, J = 7.6 Hz, 1H), 7.25 (d, J = 8.8 Hz, 2H), 7.16 (d, J = 8.4 Hz, 2H), 5.52 (d, J = 2.4 Hz, 1H), 4.51 (t, J = 2.4 Hz, 1H), 4.48 (s, 1H), 3.93–3.83 (m, 1H), 3.60–3.51 (m, 1H), 3.25–3.17 (m, 2H), 1.58–1.46 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 157.4, 152.9, 138.2, 132.8, 132.4, 129.2 (2C), 128.4 (2C), 124.2,

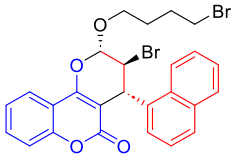
122.7, 116.9, 114.8, 100.9, 100.3, 69.4, 46.8, 43.5, 33.0, 28.9, 27.9; IR ν_{max} (KBr) 2922, 1717, 1634, 1491, 1412, 1126, 1091, 1078, 955, 759 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{22}H_{19}Br_2ClO_4$, 539.9339; found, 539.9334.

5f



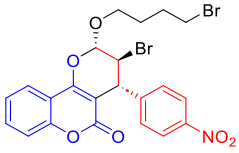
White solid; 56 mg; yield 78%; R_f = 0.60 (20% EtOAc/hexanes); mp 136–138 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.91 (d, J = 6.8 Hz, 1H), 7.60 (td, J = 8.4, 1.2 Hz, 1H), 7.39 (d, J = 8.8 Hz, 1H), 7.36 (t, J = 8.8 Hz, 1H), 7.08 (q, J = 8.0 Hz, 4H), 5.51 (d, J = 2.4 Hz, 1H), 4.55 (d, J = 2.4 Hz, 1H), 4.48 (s, 1H), 3.92–3.84 (m, 1H), 3.59–3.49 (m, 1H), 3.22–3.12 (m, 2H), 2.30 (s, 3H), 3.92–3.84 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 157.1, 152.9, 136.7, 136.6, 132.2, 129.0 (2C), 127.7 (2C), 124.1, 122.7, 116.8, 115.0, 100.99, 101.0, 69.3, 47.6, 43.8, 33.1, 28.9, 27.9, 21.1; IR ν_{max} (KBr) 3429, 1717, 1639, 1611, 1398, 1327, 1126, 1078, 955, 759 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{23}H_{22}Br_2O_4$, 519.9885; found, 519.9878.

5g



White solid; 47 mg; yield 61%; R_f = 0.54 (20% EtOAc/hexanes); mp 158–160 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.14 (d, J = 8.8 Hz, 1H), 7.98 (dd, J = 8.0, 1.2 Hz, 1H), 7.92 (d, J = 8.0 Hz, 1H), 7.76 (d, J = 8.0 Hz, 1H), 7.68–7.61 (m, 2H), 7.54 (t, J = 7.6 Hz, 1H), 7.43 (d, J = 8.8 Hz, 1H), 7.40 (t, J = 8.0 Hz, 1H), 7.29 (t, J = 8.0 Hz, 1H), 7.19 (d, J = 7.2 Hz, 1H), 5.56 (s, 1H), 5.20 (s, 1H), 4.73 (s, 1H), 3.86–3.78 (m, 1H), 3.48–3.38 (m, 1H), 3.10 (t, J = 6.0 Hz, 2H), 1.48–1.34 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.5, 157.5, 153.0, 134.6, 134.2, 132.3, 130.9, 129.5, 128.1, 126.8, 125.5, 124.9 (2C), 124.2, 122.7, 122.4, 116.9, 115.1, 100.7, 100.4, 69.2, 45.1, 40.5, 33.0, 28.8, 27.8; IR ν_{max} (KBr) 3419, 1717, 1635, 1611, 1399, 1126, 1077, 955, 754 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{26}H_{22}Br_2O_4$, 555.9885; found, 555.9892.

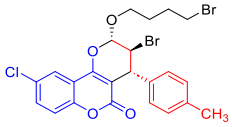
5h



White solid; 58 mg; yield 77%; R_f = 0.36 (20% EtOAc/hexanes); mp 158–160 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 8.15 (d, J = 8.8 Hz, 2H), 7.93 (dd, J = 8.0, 1.2 Hz, 1H), 7.65 (td, J = 8.4, 1.2 Hz, 1H), 7.37–7.44 (m, 4H), 5.55

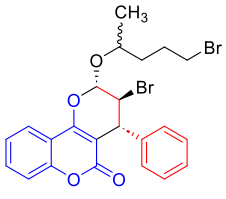
(d, J = 2.4 Hz, 1H), 4.57 (d, J = 2.4 Hz, 1H), 4.53 (t, J = 2.4 Hz, 1H), 3.92–3.84 (m, 1H), 3.62–3.54 (m, 1H), 3.18 (t, J = 6.0 Hz, 2H), 1.56–1.43 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.3, 157.8, 152.9, 147.2, 146.9, 132.7, 128.8 (2C), 124.4, 123.5 (2C), 122.8, 116.9, 114.6, 100.6, 99.4, 69.6, 45.7, 43.8, 32.7, 28.8, 27.8; IR ν_{max} (KBr) 2922, 1713, 1634, 1609, 1519, 1399, 1347, 1126, 1078, 953, 754 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{22}H_{19}Br_2NO_6$, 550.9579; found, 550.9573.

5i



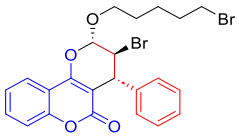
White solid; 59 mg; yield 77%; R_f = 0.62 (20% EtOAc/hexanes); mp 122–124 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.88 (d, J = 2.4 Hz, 1H), 7.54 (dd, J = 8.8, 2.4 Hz, 1H), 7.33 (d, J = 9.2 Hz, 1H), 7.08 (s, 4H), 5.52 (d, J = 2.4 Hz, 1H), 4.55 (t, J = 2.4 Hz, 1H), 4.47 (d, J = 2.4 Hz, 1H), 3.94–3.85 (m, 1H), 3.50–3.58 (m, 1H), 3.11–3.22 (m, 2H), 2.30 (s, 3H), 1.60–1.48 (m, 4H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 156.1, 151.3, 136.8, 136.3, 132.2, 129.7, 129.0 (2C), 127.7 (2C), 122.3, 118.4, 116.2, 101.9, 101.2, 69.5, 47.2, 43.8, 33.0, 29.0, 28.0, 21.1; IR ν_{max} (KBr) 2922, 1721, 1635, 1486, 1422, 1097, 1073, 954, 914, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{23}H_{21}Br_2ClO_4$, 553.9495; found, 553.9490.

5j



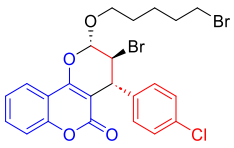
White solid; 51 mg; yield 71% (two inseparable isomers); R_f = 0.58 (20% EtOAc/hexanes); mp 122–124 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) (peaks overlapped for both isomers) δ 7.92 (d, J = 8.0 Hz, 1H), 7.60 (d, J = 8.0 Hz, 1H), 7.39 (d, J = 8.4 Hz, 1H), 7.36 (t, J = 7.6 Hz, 1H), 7.30–7.19 (m, 5H), 5.52 (d, J = 2.4 Hz, 1H), 4.59 (t, J = 2.4 Hz, 1H), 4.52 (d, J = 2.4 Hz, 1H), 3.93–3.81 (m, 2H), 3.59–3.48 (m, 1H), 1.65–1.31 (m, 7H); ^{13}C NMR (100 MHz, $CDCl_3$) isomer one δ 161.4, 157.2, 152.9, 139.7, 139.6, 132.2, 128.3, 128.2, 127.8, 127.1, 127.0, 124.1, 122.7, 116.8, 115.0, 100.9, 69.5, 51.2, 47.2, 44.0, 37.1, 27.8, 26.4; isomer two δ 161.4, 157.2, 152.9, 139.7, 139.6, 132.2, 128.3, 128.2, 127.8, 127.1, 127.0, 124.1, 122.7, 116.8, 115.0, 101.0, 100.7, 69.6, 50.9, 47.3, 44.1, 27.5, 26.3; IR ν_{max} (KBr) 2925, 1719, 1634, 1611, 1399, 1126, 1083, 953, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{23}H_{22}Br_2O_4$, 519.9885; found, 519.9886.

5k



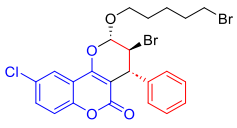
White solid; 52 mg; yield 72%; R_f = 0.60 (20% EtOAc/hexanes); mp 122–124 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.92 (dd, J = 8.0, 1.2 Hz, 1H), 7.61 (td, J = 8.4, 1.2 Hz, 1H), 7.39 (d, J = 8.4 Hz, 1H), 7.37 (t, J = 8.0 Hz, 1H), 7.29–7.17 (m, 5H), 5.52 (d, J = 2.8 Hz, 1H), 4.58 (t, J = 2.8 Hz, 1H), 4.52 (d, J = 2.4 Hz, 1H), 3.90–3.80 (m, 1H), 3.55–3.45 (m, 1H), 3.23 (t, J = 6.8 Hz, 2H), 1.70–1.00 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.5, 157.3, 152.9, 139.6, 132.2, 128.2 (2C), 127.9 (2C), 127.0, 124.1, 122.7, 116.8, 115.0, 101.0, 100.7, 69.9, 47.4, 44.1, 33.4, 32.1, 28.3, 24.4; IR ν_{max} (KBr) 3445, 1718, 1634, 1611, 1492, 1400, 1082, 758, 697 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{23}H_{22}Br_2O_4$, 519.9885; found, 519.9877.

5l



White solid; 53 mg; yield 69%; R_f = 0.58 (20% EtOAc/hexanes); mp 116–118 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.92 (d, J = 8.0 Hz, 1H), 7.61 (td, J = 8.4, 1.2 Hz, 1H), 7.40 (d, J = 8.4 Hz, 1H), 7.37 (t, J = 7.6 Hz, 1H), 7.24 (d, J = 8.4 Hz, 2H), 7.17 (d, J = 8.4 Hz, 2H), 5.52 (d, J = 2.4 Hz, 1H), 4.51 (t, J = 2.4 Hz, 1H), 4.47 (s, 1H), 3.90–3.79 (m, 1H), 3.59–3.47 (m, 1H), 3.34–3.19 (m, 2H), 1.68 (quintet, J = 7.2 Hz, 2H), 1.43–1.33 (m, 2H), 1.26–1.07 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 157.4, 153.0, 138.3, 132.8, 132.4, 129.4 (2C), 128.3 (2C), 124.2, 122.8, 116.9, 114.9, 100.9, 100.3, 70.2, 46.8, 43.5, 33.4, 32.2, 28.5, 24.5; IR ν_{max} (KBr) 3448, 1714, 1634, 1611, 1491, 1327, 1083, 760 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{23}H_{21}Br_2ClO_4$, 553.9495; found, 553.9492.

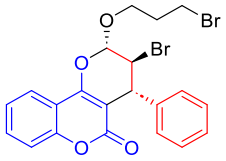
5m



White solid; 56 mg; yield 73%; R_f = 0.58 (20% EtOAc/hexanes); mp 120–122 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.88 (d, J = 2.8 Hz, 1H), 7.55 (dd, J = 8.8, 2.4 Hz, 1H), 7.34 (d, J = 8.8 Hz, 1H), 7.29–7.18 (m, 5H), 5.53 (d, J = 2.0 Hz, 1H), 4.58 (t, J = 2.4 Hz, 1H), 4.51 (s, 1H), 3.89–3.81 (m, 1H), 3.55–3.47 (m, 1H), 3.29–3.19 (m, 2H), 1.70–1.61 (m, 2H), 1.40–1.29 (m, 2H), 1.23–1.03 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 156.2, 151.3, 139.3, 132.2, 129.7, 128.2 (2C), 127.9 (2C), 127.1, 122.3, 118.3,

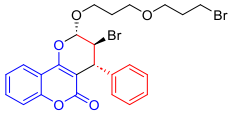
116.2, 101.7, 101.2, 70.1, 47.0, 44.1, 33.4, 32.2, 28.4, 24.4; IR ν_{max} (KBr) 2938, 1721, 1636, 1574, 1483, 1422, 1097, 1071, 952, 755 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{23}H_{21}Br_2ClO_4$, 553.9495; found, 553.9498.

5n



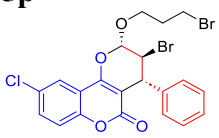
White solid; 26 mg; yield 38%; R_f = 0.56 (20% EtOAc/hexanes); mp 204–206 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.94 (dd, J = 8.0, 1.2 Hz, 1H), 7.61 (td, J = 8.4, 1.2 Hz, 1H), 7.40 (d, J = 8.8 Hz, 1H), 7.36 (t, J = 7.2, 0.8 Hz, 1H), 7.30–7.20 (m, 5H), 5.55 (d, J = 2.4 Hz, 1H), 4.60 (t, J = 2.4 Hz, 1H), 4.53 (d, J = 2.4 Hz, 1H), 4.02–3.96 (m, 1H), 3.68–3.62 (m, 1H), 3.05–2.98 (m, 1H), 2.95–2.88 (m, 1H), 1.82 (quintet, J = 6.0 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.5, 157.3, 153.0, 139.7, 132.3, 128.3 (2C), 127.8 (2C), 127.2, 124.2, 122.8, 116.9, 115.0, 101.0, 100.7, 67.3, 47.2, 43.9, 31.9, 29.7; IR ν_{max} (KBr) 3445, 1718, 1634, 1399, 1089, 1041, 758, 699 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{21}H_{18}Br_2O_4$, 491.9572; found, 491.9581.

5o



White viscous liquid; 28 mg; yield 37%; R_f = 0.53 (20% EtOAc/hexanes); ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.60 (t, J = 8.4, 1.2 Hz, 1H), 7.39 (d, J = 7.6 Hz, 1H), 7.36 (t, J = 7.6 Hz, 2H), 7.29–7.18 (m, 5H), 5.53 (d, J = 2.4 Hz, 1H), 4.58 (t, J = 2.4 Hz, 1H), 4.52 (d, J = 2.4 Hz, 1H), 3.95–3.89 (m, 1H), 3.64–3.56 (m, 1H), 3.40 (t, J = 6.4 Hz, 2H), 3.35 (t, J = 6.4 Hz, 2H), 3.18–3.01 (m, 2H), 1.97 (quintet, J = 6.0 Hz, 2H), 1.64–1.51 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.5, 157.3, 152.9, 139.7, 132.2, 128.2 (2C), 127.9 (2C), 127.0, 124.1, 122.8, 116.8, 115.0, 101.0, 100.8, 67.9, 67.0, 66.6, 47.4, 44.1, 32.5, 30.5, 29.4; IR ν_{max} (KBr) 2923, 1719, 1639, 1611, 1493, 1399, 1127, 1090, 955, 759 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{24}H_{24}Br_2O_5$, 549.9990; found, 549.9995.

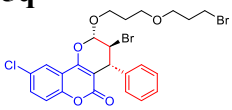
5p



White solid; 32 mg; yield 44%; R_f = 0.57 (20% EtOAc/hexanes); mp 208–210 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.91 (d, J = 2.4 Hz, 1H), 7.55 (dd, J = 8.8, 2.4 Hz, 1H), 7.34 (d, J = 9.2 Hz, 1H), 7.30–7.17 (m, 5H), 5.55 (d, J = 1.6 Hz, 1H), 4.60 (t, J = 2.0 Hz, 1H), 4.52 (s, 1H), 4.02–4.00 (m, 1H),

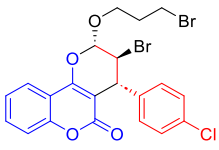
3.68–3.61 (m, 1H), 3.02–2.95 (m, 1H), 2.93–2.86 (m, 1H), 1.85–1.78 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 156.2, 151.3, 139.2, 132.3, 129.7, 128.3 (2C), 127.7 (2C), 127.2, 122.4, 118.3, 116.3, 101.5, 101.0, 67.4, 46.7, 43.8, 31.8, 29.6; IR ν_{max} (KBr) 2920, 1720, 1636, 1483, 1096, 1071, 954, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{21}H_{17}Br_2ClO_4$, 525.9182; found, 525.9190.

5q



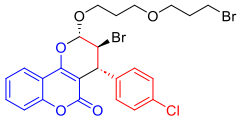
White viscous liquid; 27 mg; yield 33%; R_f = 0.54 (20% EtOAc/hexanes); ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.89 (d, J = 2.4 Hz, 1H), 7.55 (dd, J = 8.8, 2.4 Hz, 1H), 7.33 (d, J = 8.8 Hz, 1H), 7.29–7.18 (m, 5H), 5.54 (d, J = 2.4 Hz, 1H), 4.58 (t, J = 2.4 Hz, 1H), 4.51 (d, J = 1.6 Hz, 1H), 3.98–3.88 (m, 1H), 3.65–3.56 (m, 1H), 3.42 (t, J = 6.4 Hz, 2H), 3.36 (t, J = 6.4 Hz, 2H), 3.17–3.09 (m, 1H), 3.08–3.00 (m, 1H), 1.99 (quintet, J = 6.0 Hz, 2H), 1.62–1.56 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 160.9, 156.3, 151.3, 139.3, 132.2, 129.7, 128.3 (2C), 127.9 (2C), 127.2, 122.4, 118.3, 116.2, 101.6, 101.2, 67.9, 67.2, 66.5, 47.0, 44.1, 32.5, 30.6, 29.4; IR ν_{max} (KBr) 2921, 1723, 1635, 1485, 1422, 1305, 1117, 1011, 953, 756 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{24}H_{23}Br_2ClO_5$, 583.9601; found, 583.9594.

5r



White solid; 26 mg; yield 36%; R_f = 0.57 (20% EtOAc/hexanes); mp 168–170 °C; ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.94 (d, J = 8.0 Hz, 1H), 7.62 (t, J = 7.6 Hz, 1H), 7.40 (d, J = 8.4 Hz, 1H), 7.37 (t, J = 7.6 Hz, 1H), 7.25 (d, J = 8.4 Hz, 2H), 7.17 (d, J = 8.4 Hz, 2H), 5.55 (d, J = 2.4 Hz, 1H), 4.52 (d, J = 2.4 Hz, 1H), 4.48 (s, 1H), 4.06–3.94 (m, 1H), 3.75–3.64 (m, 1H), 3.14–3.05 (m, 1H), 3.04–2.95 (m, 1H), 1.86 (quintet, J = 6.0 Hz, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 157.4, 152.9, 138.2, 132.9, 132.5, 129.2 (2C), 128.4 (2C), 124.3, 122.8, 116.9, 114.8, 100.9, 100.2, 67.5, 46.6, 43.4, 31.8, 29.5; IR ν_{max} (KBr) 2921, 1714, 1636, 1610, 1491, 1412, 1126, 1091, 1075, 921, 759 cm^{-1}; HRMS (EI) m/z [M$^+$] calcd for $C_{21}H_{17}Br_2ClO_4$, 525.9182; found, 525.9193.

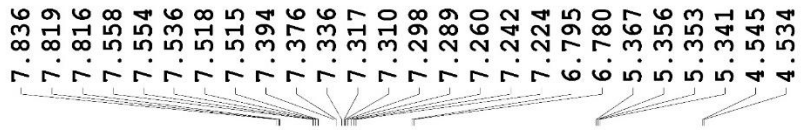
5s



White viscous liquid; 27 mg; yield 34%; R_f = 0.54 (20% EtOAc/hexanes); ^{1}H NMR ($CDCl_3$, 400 MHz) δ 7.93 (d, J = 7.6 Hz, 1H), 7.61 (td, J = 8.0, 0.8 Hz, 1H), 7.40 (d, J = 7.6 Hz, 1H), 7.37 (t, J = 7.2 Hz, 1H), 7.26–7.21 (m, 2H), 7.20–7.15 (m, 2H), 5.54 (d, J = 2.4 Hz, 1H), 4.51 (t, J = 2.4 Hz, 1H), 4.47 (s, 1H), 3.97–3.86 (m, 1H), 3.68–3.56 (m, 1H), 3.44–3.34 (m, 4H), 3.20–3.12 (m, 1H), 3.12–3.03 (m, 1H), 1.99 (quintet, J = 6.4 Hz, 2H), 1.67–1.53 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.4, 157.5, 153.0, 138.3, 132.8, 132.4, 129.4 (2C), 128.4 (2C), 124.2, 122.8, 116.9, 114.9, 100.9, 100.3, 68.0, 67.2, 66.6, 46.8, 43.6, 32.6, 30.5, 29.5; IR ν_{max} (KBr) 2870, 1719, 1634, 1491, 1122, 1074, 955, 760 cm^{-1}; HRMS (EI) m/z [M^+] calcd for $C_{24}H_{23}Br_2ClO_5$, 583.9601; found, 583.9597.

References

1. Y. Chen, Y. Wang, R. Zhong and J. Li, *J. Org. Chem.* 2020, **85**, 10638–10647.
2. D. Cheng, L. Wu, H. Lv, X. Xu and J. Yan, *J. Org. Chem.*, 2017, **82**, 1610–1617.

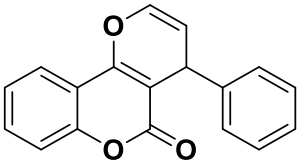


DYY-JNS-093

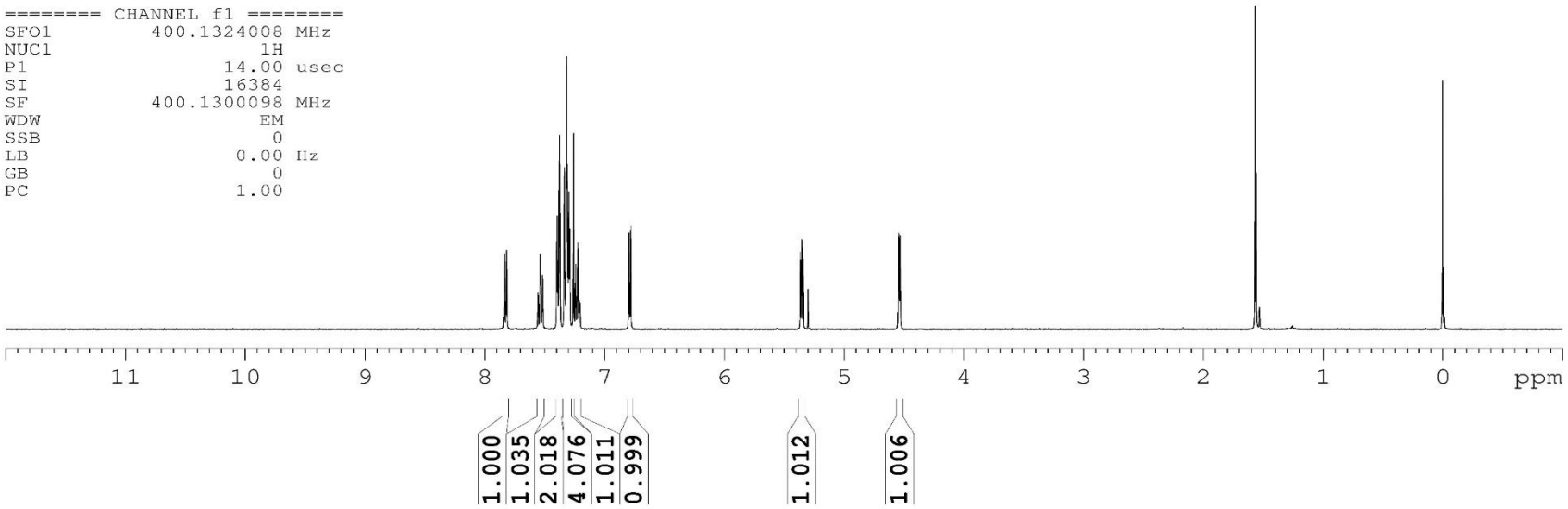
NAME	DYY-JNS-093
EXPNO	1
PROCNO	1
Date_	20231226
Time	13.06
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	294.2 K
D1	2.00000000 sec
TD0	1

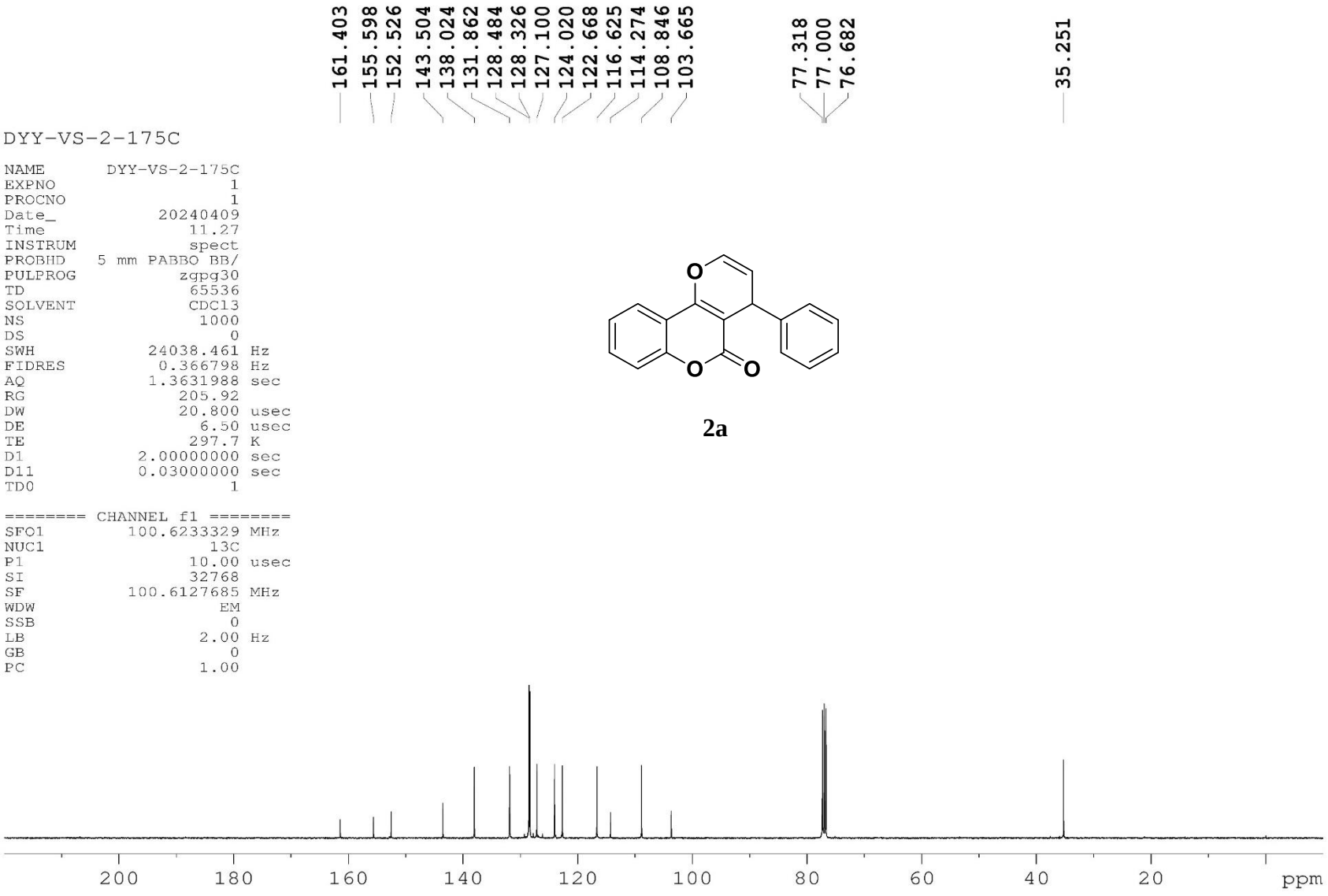
======== CHANNEL f1 ========

SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300098 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

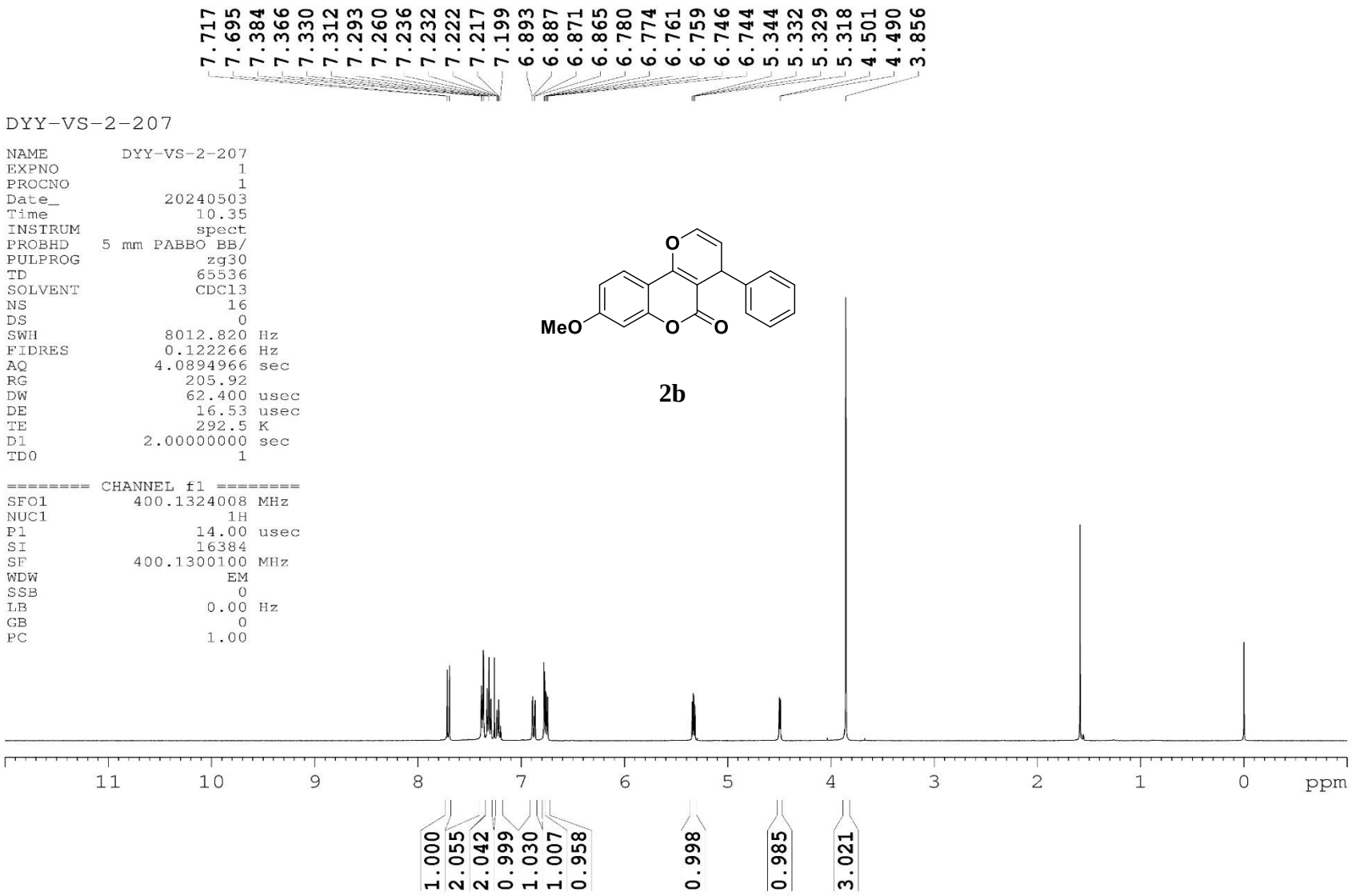


2a

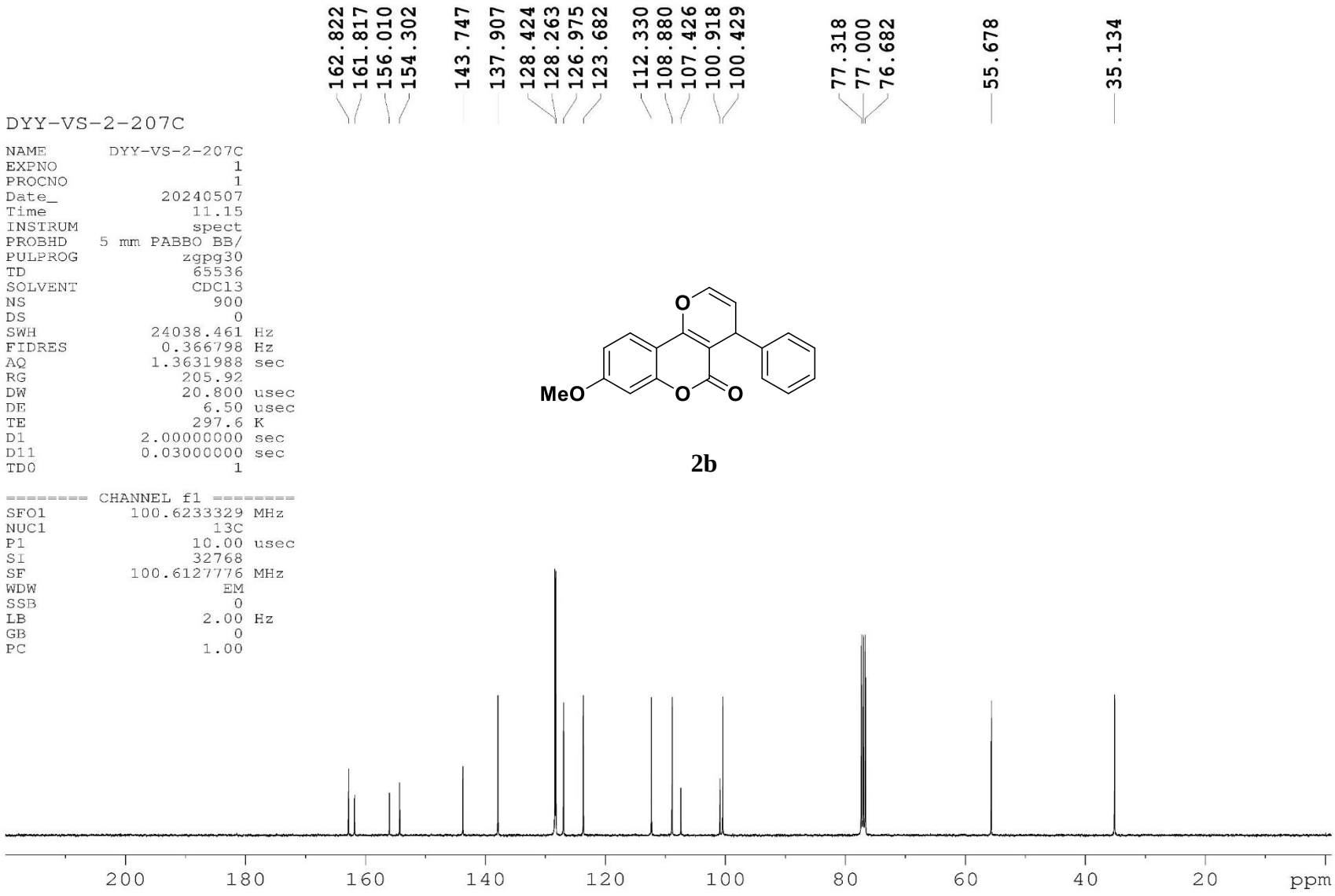



161.403
155.598
152.526
143.504
138.024
131.862
128.484
128.326
127.100
124.020
122.668
116.625
114.274
108.846
103.665
77.318
77.000
76.682
35.251
DYY-VS-2-175C
NAME DYY-VS-2-175C
EXPNO 1
PROCNO 1
Date_ 20240409
Time 11.27
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1000
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 297.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

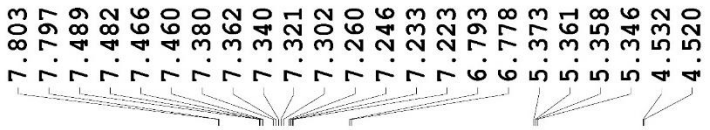
2a


7.717
7.695
7.384
7.366
7.330
7.312
7.293
7.260
7.236
7.232
7.222
7.217
7.199
6.893
6.887
6.871
6.865
6.780
6.774
6.761
6.759
6.746
6.744
5.344
5.332
5.329
5.318
4.501
4.490
3.856
DYY-VS-2-207
NAME DYY-VS-2-207
EXPNO 1
PROCNO 1
Date_ 20240503
Time 10.35
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 292.5 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
MeO
O
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
2.055
2.042
0.999
1.030
1.007
0.958
0.998
0.985
3.021

2b

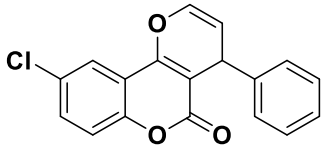

162.822
161.817
156.010
154.302
143.747
137.907
128.424
128.263
126.975
123.682
112.330
108.880
107.426
100.918
100.429
77.318
77.000
76.682
55.678
35.134
DYY-VS-2-207C
NAME DYY-VS-2-207C
EXPNO 1
PROCNO 1
Date_ 20240507
Time 11.15
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 900
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 297.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127776 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
MeO
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

2b

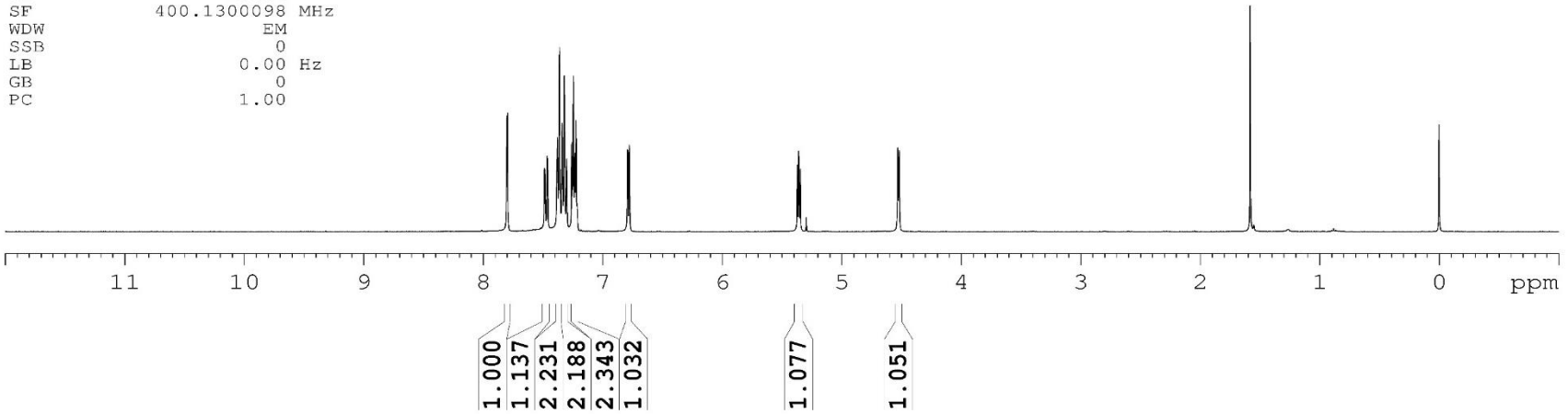


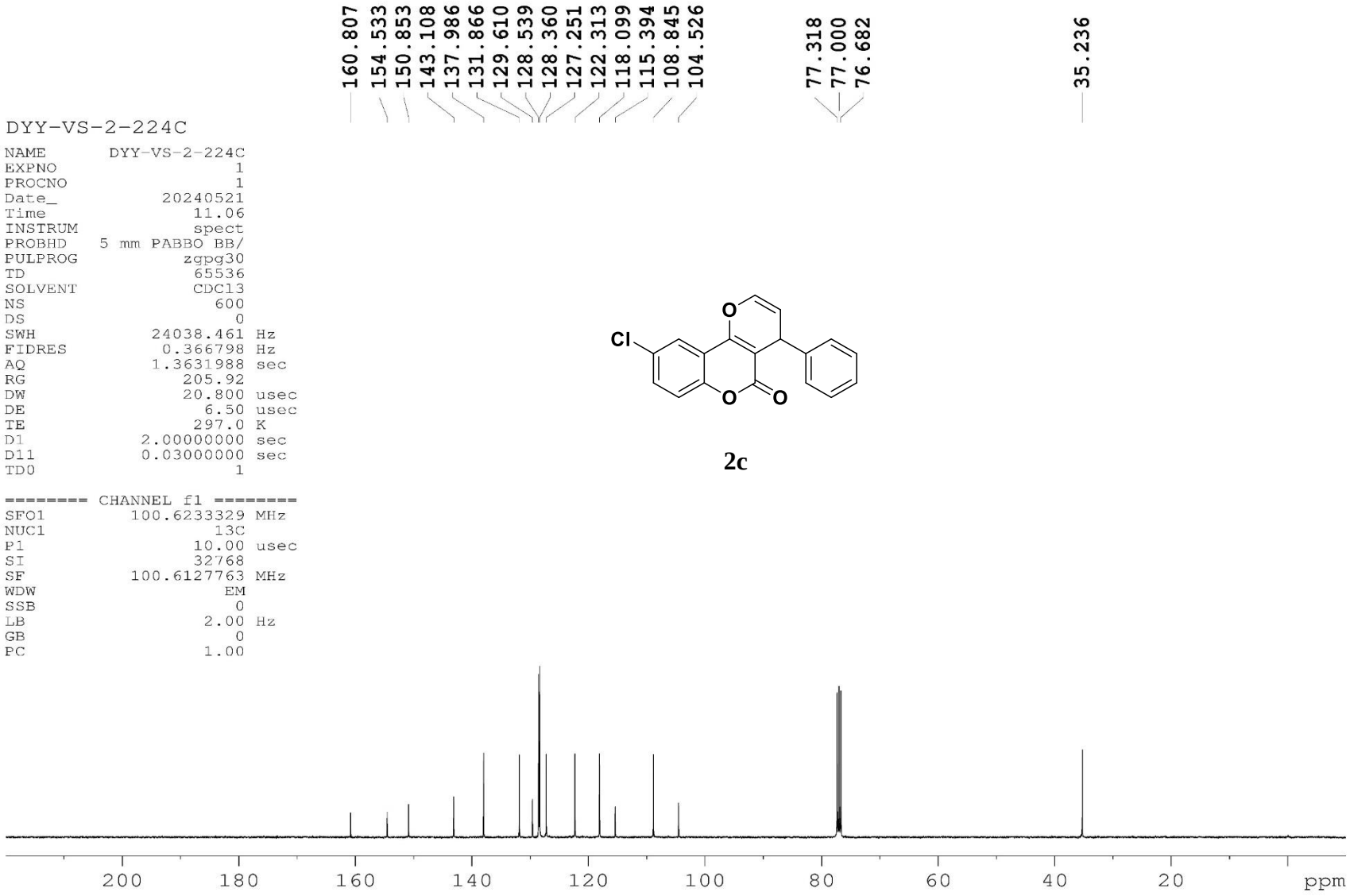
DYY-VS-2-224

NAME	DYY-VS-2-224
EXPNO	1
PROCNO	1
Date_	20240521
Time	10.19
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	294.8 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300098 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

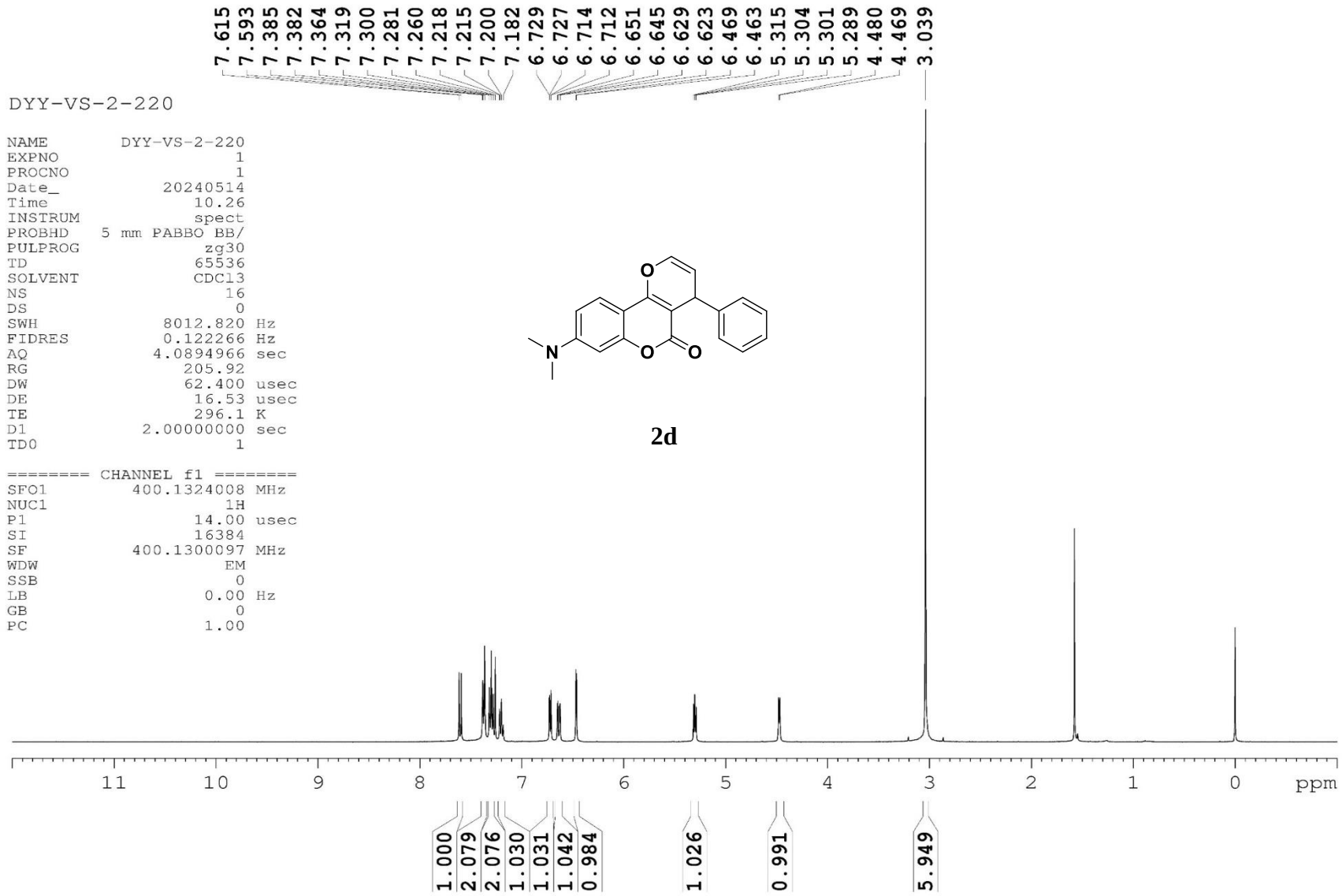


2c

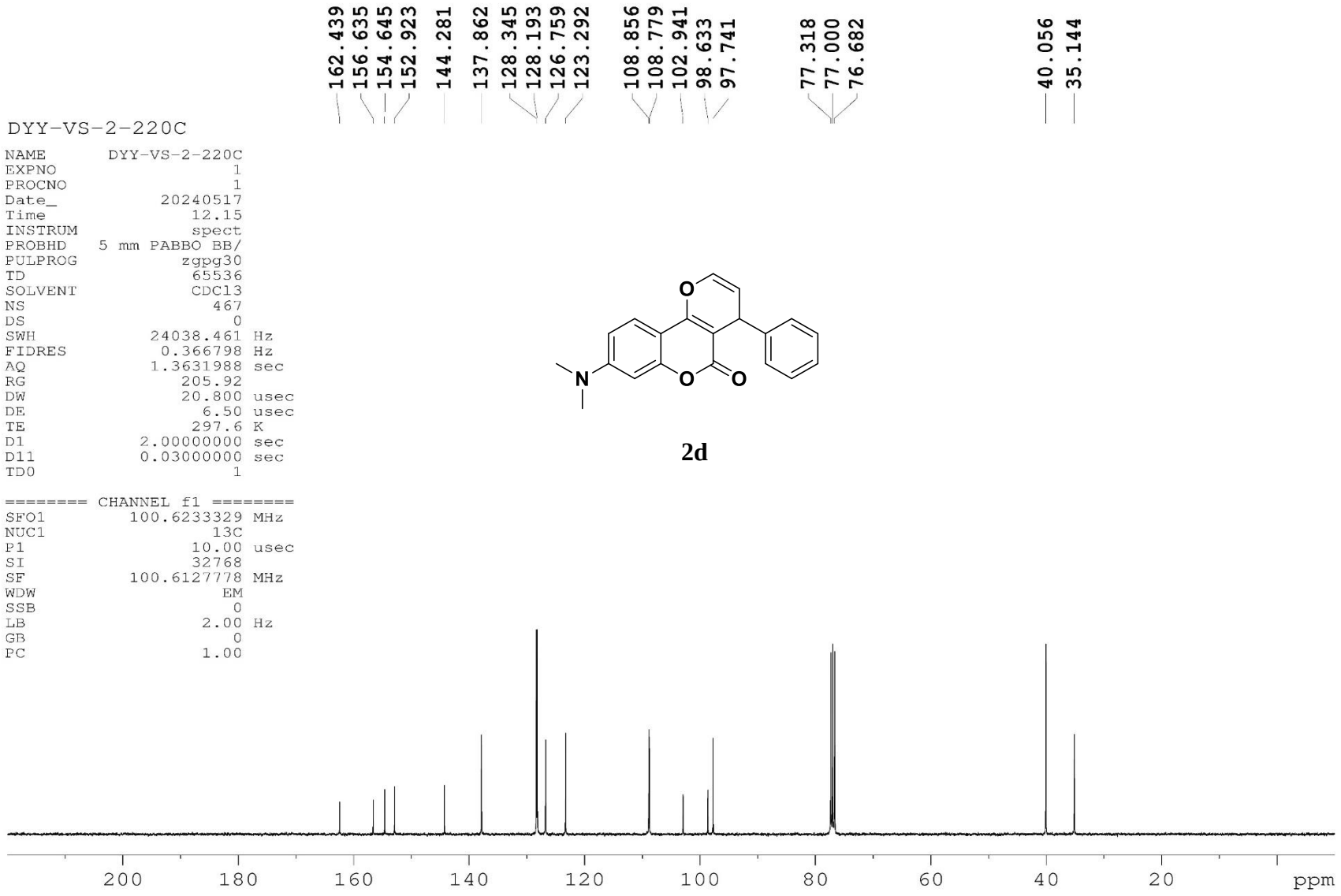



160.807
154.533
150.853
143.108
137.986
131.866
129.610
128.539
128.360
127.251
122.313
118.099
115.394
108.845
104.526
77.318
77.000
76.682
35.236
DYY-VS-2-224C
NAME DYY-VS-2-224C
EXPNO 1
PROCNO 1
Date_ 20240521
Time 11.06
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 600
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 297.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127763 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Cl
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

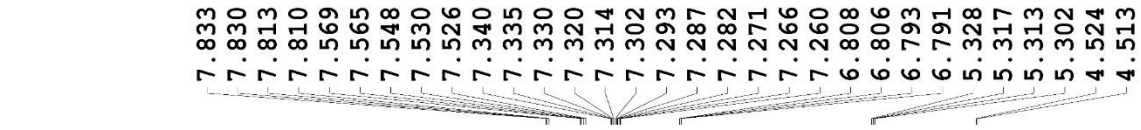
2c


7.615
7.593
7.385
7.382
7.364
7.319
7.300
7.281
7.260
7.218
7.215
7.200
7.182
6.729
6.727
6.714
6.712
6.651
6.645
6.629
6.623
6.469
6.463
5.315
5.304
5.301
5.289
4.480
4.469
3.039
DYY-VS-2-220
NAME DYY-VS-2-220
EXPNO 1
PROCNO 1
Date_ 20240514
Time 10.26
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 296.1 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300097 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
O
N
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
2.079
2.076
1.030
1.031
1.042
0.984
1.026
0.991
5.949

2d


162.439
156.635
154.645
152.923
144.281
137.862
128.345
128.193
126.759
123.292
108.856
108.779
102.941
98.633
97.741
77.318
77.000
76.682
40.056
35.144
DYY-VS-2-220C
NAME DYY-VS-2-220C
EXPNO 1
PROCNO 1
Date_ 20240517
Time 12.15
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 467
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 297.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127778 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
N
O
O
200
180
160
140
120
100
80
60
40
20
ppm

2d

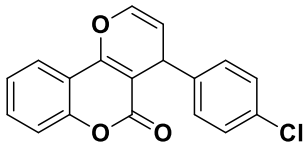


DYY-VS-3-252

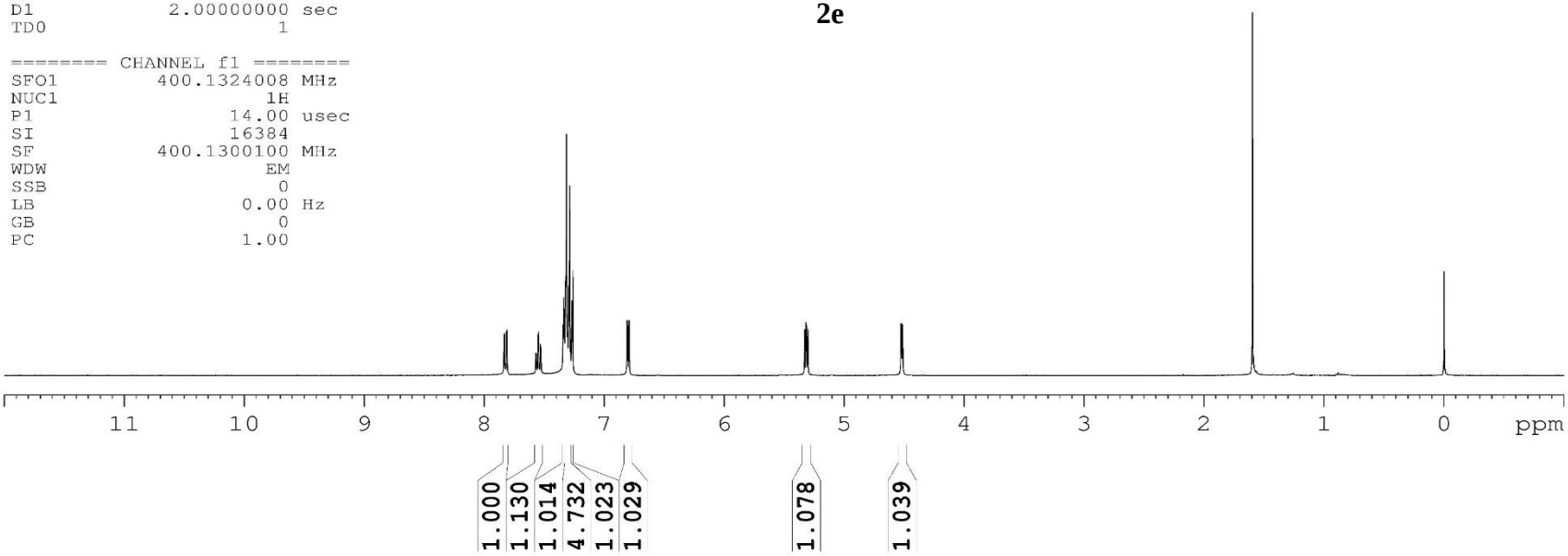
NAME	DYY-VS-3-252
EXPNO	1
PROCNO	1
Date_	20240628
Time	10.15
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	291.3 K
D1	2.00000000 sec
TD0	1

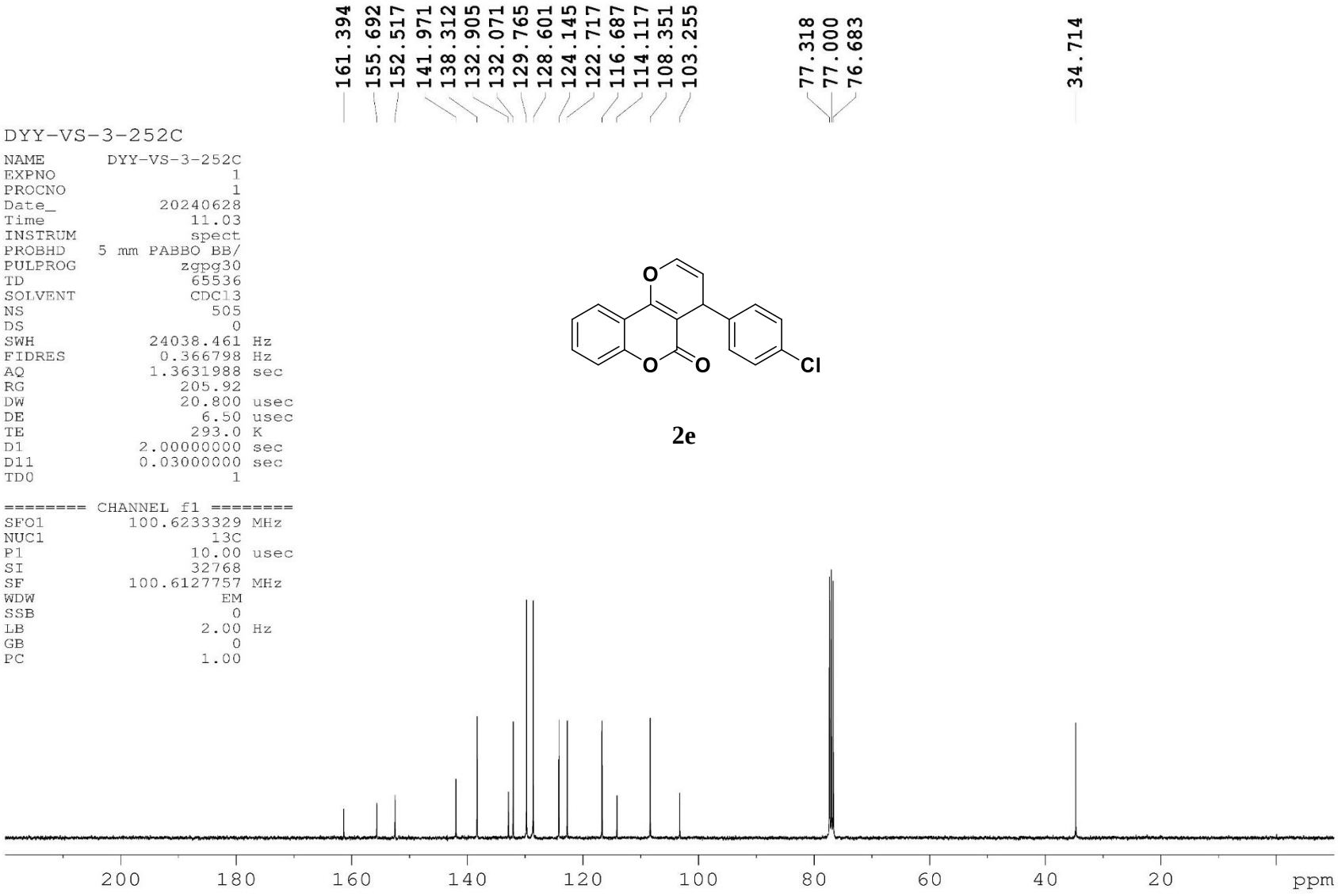
======== CHANNEL f1 ========

SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

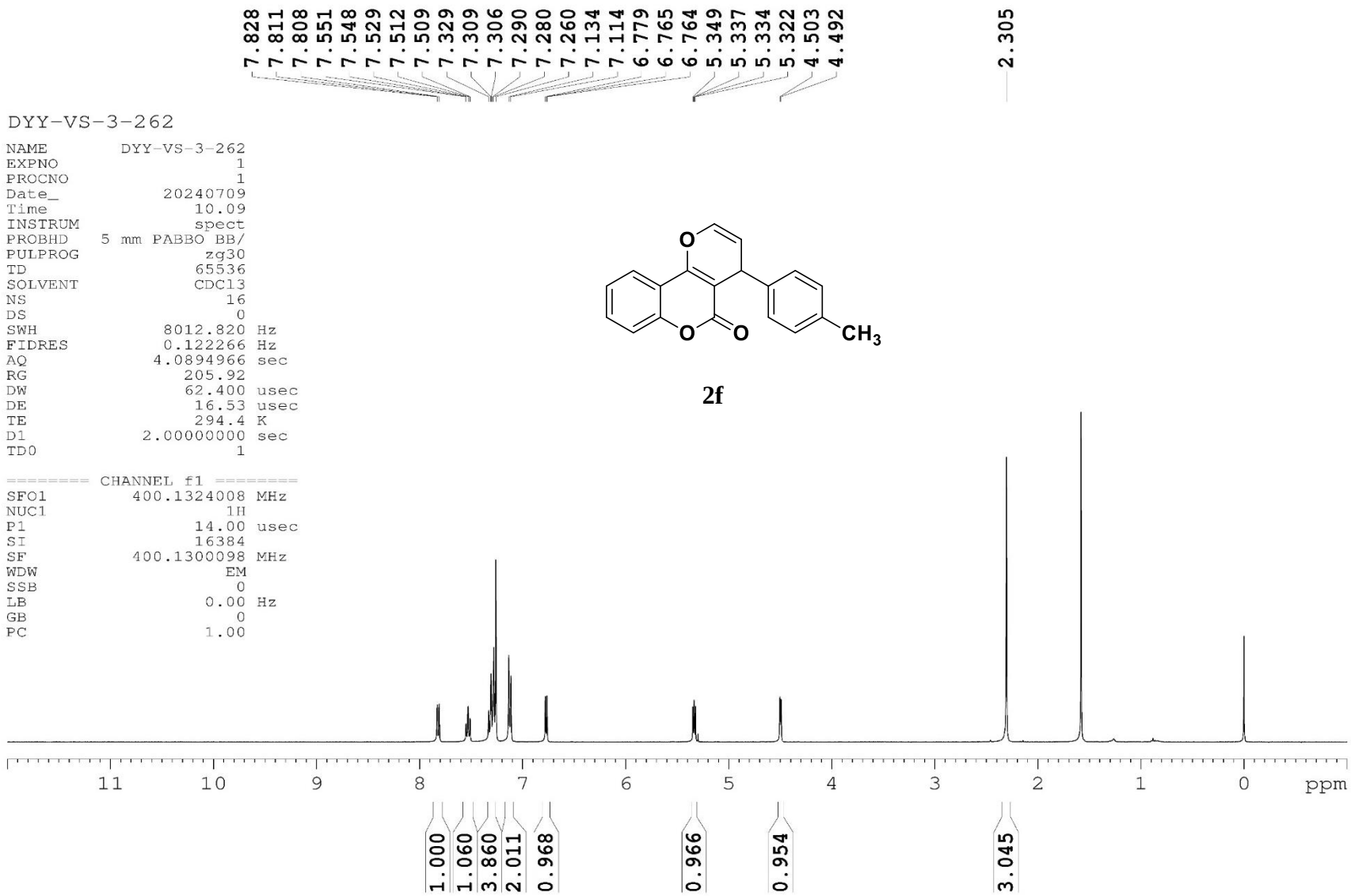


2e

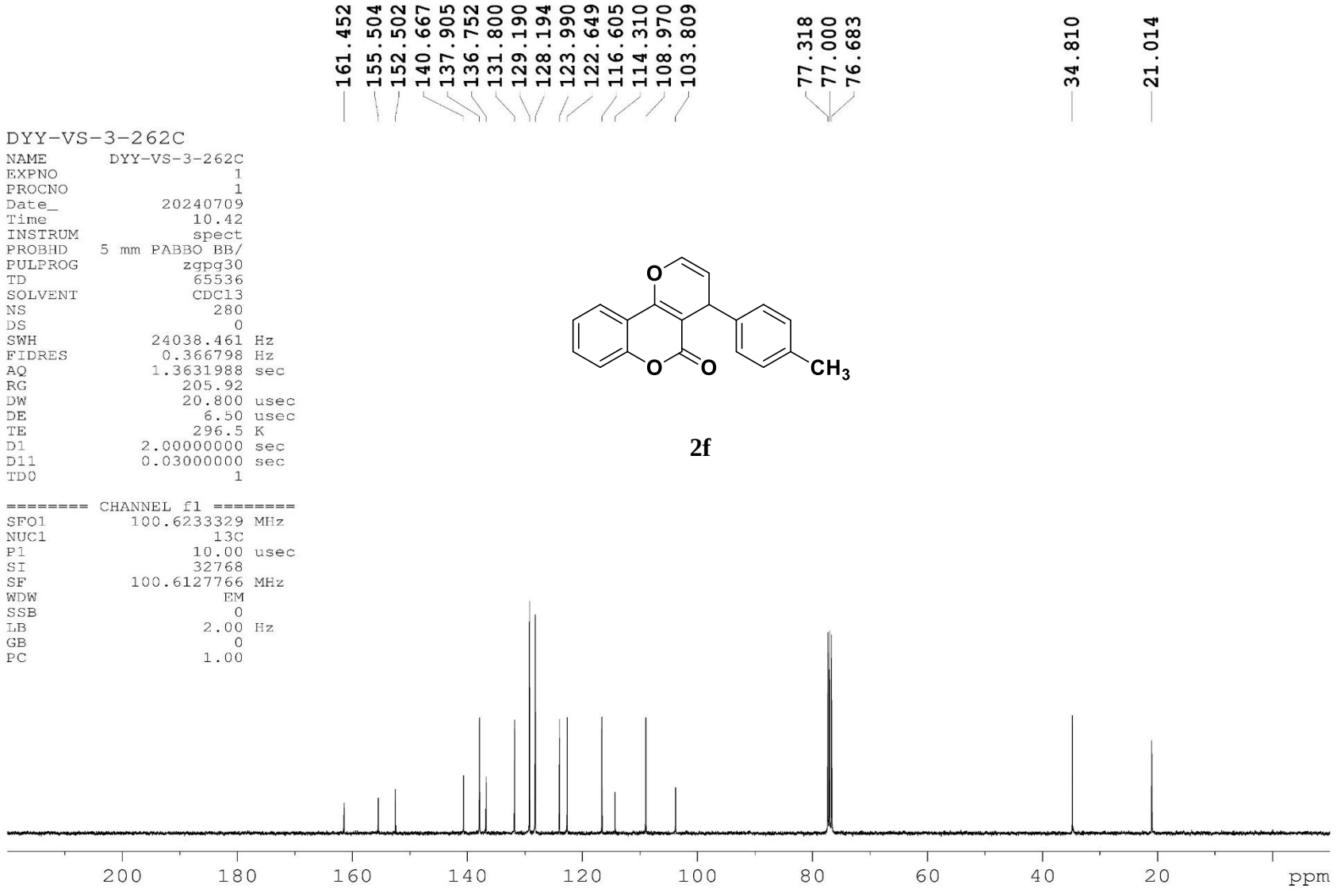



161.394
155.692
152.517
141.971
138.312
132.905
132.071
129.765
128.601
124.145
122.717
116.687
114.117
108.351
103.255
77.318
77.000
76.683
34.714
DYY-VS-3-252C
NAME DYY-VS-3-252C
EXPNO 1
PROCNO 1
Date_ 20240628
Time 11.03
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 505
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127757 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
O
Cl
200
180
160
140
120
100
80
60
40
20
ppm

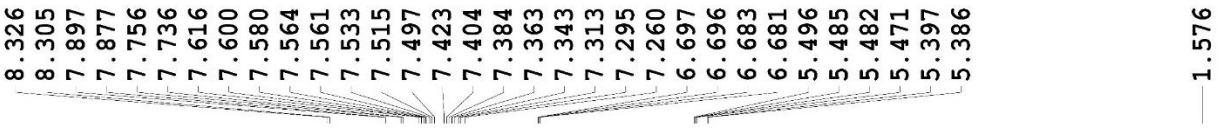
2e


7.828
7.811
7.808
7.551
7.548
7.529
7.512
7.509
7.329
7.309
7.306
7.290
7.280
7.260
7.134
7.114
6.779
6.765
6.764
5.349
5.337
5.334
5.322
4.503
4.492
2.305
DYY-VS-3-262
NAME DYY-VS-3-262
EXPNO 1
PROCNO 1
Date_ 20240709
Time 10.09
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 294.4 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
O
O
O
CH3
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.060
3.860
2.011
0.968
0.966
0.954
3.045

2f


161.452
155.504
152.502
140.667
137.905
136.752
131.800
129.190
128.194
123.990
122.649
116.605
114.310
108.970
103.809
77.318
77.000
76.683
34.810
21.014
DYY-VS-3-262C
NAME DYY-VS-3-262C
EXPNO 1
PROCNO 1
Date_ 20240709
Time 10.42
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 280
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
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 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127766 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
O
CH3
200
180
160
140
120
100
80
60
40
20
ppm

2f

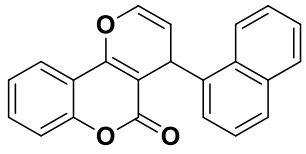


DYY-VS-3-240-1

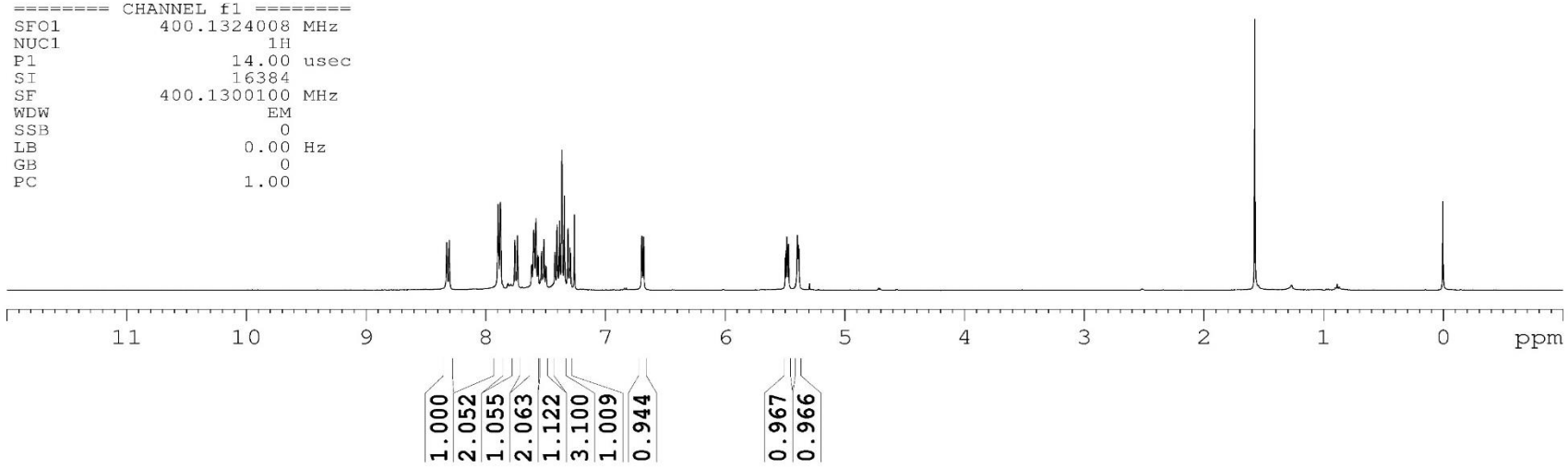
NAME	DYY-VS-3-240-1
EXPNO	1
PROCNO	1
Date_	20240625
Time	10.17
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	293.5 K
D1	2.00000000 sec
TD0	1

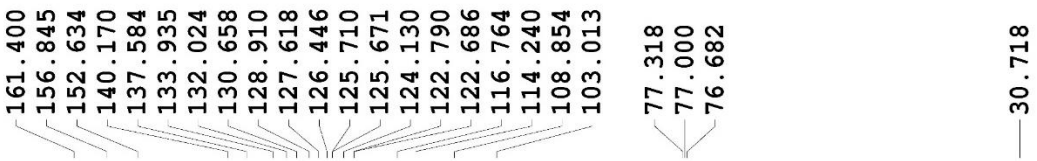
======== CHANNEL f1 ========

SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



2g



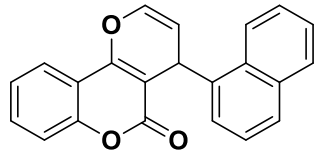


DYY-VS-3-240C

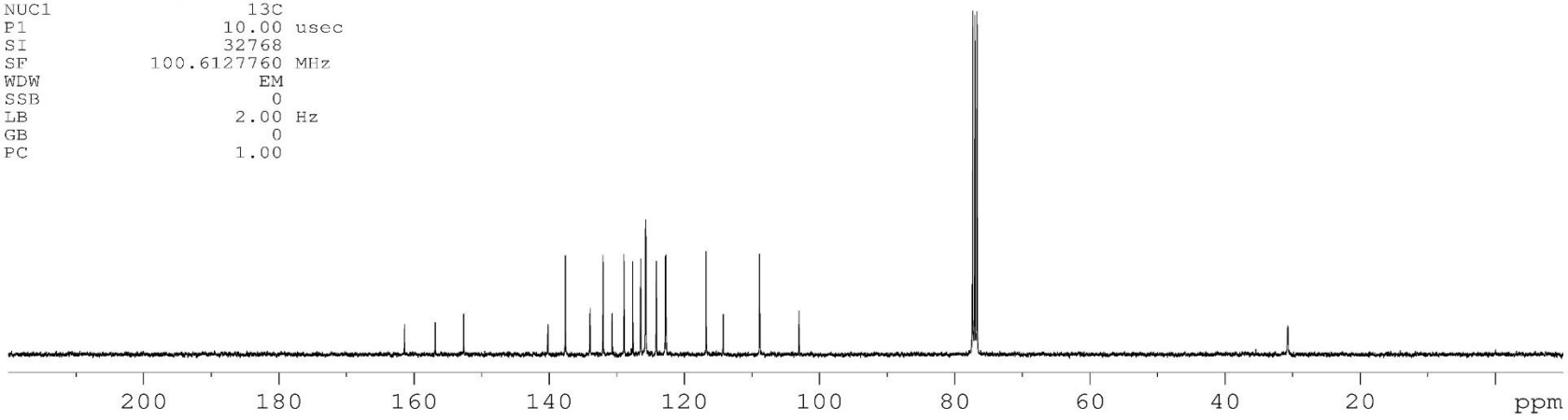
NAME	DYY-VS-3-240C
EXPNO	1
PROCNO	1
Date_	20240625
Time	11.03
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	395
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	293.8 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

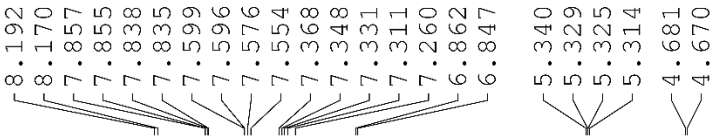
======== CHANNEL f1 ========

SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127760 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



2g



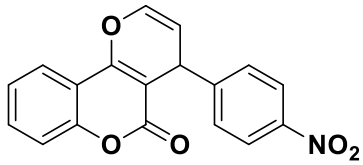


DYY-VS-2-189-0903

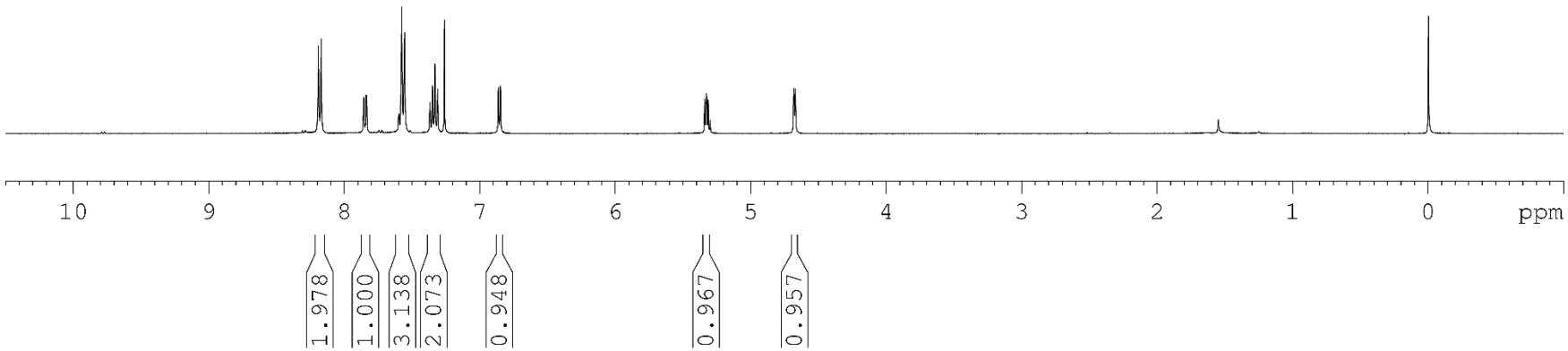
NAME	DYY-VS-2-189-0903
EXPNO	1
PROCNO	1
Date_	20240903
Time	12.47
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	292.5 K
D1	2.00000000 sec
TD0	1

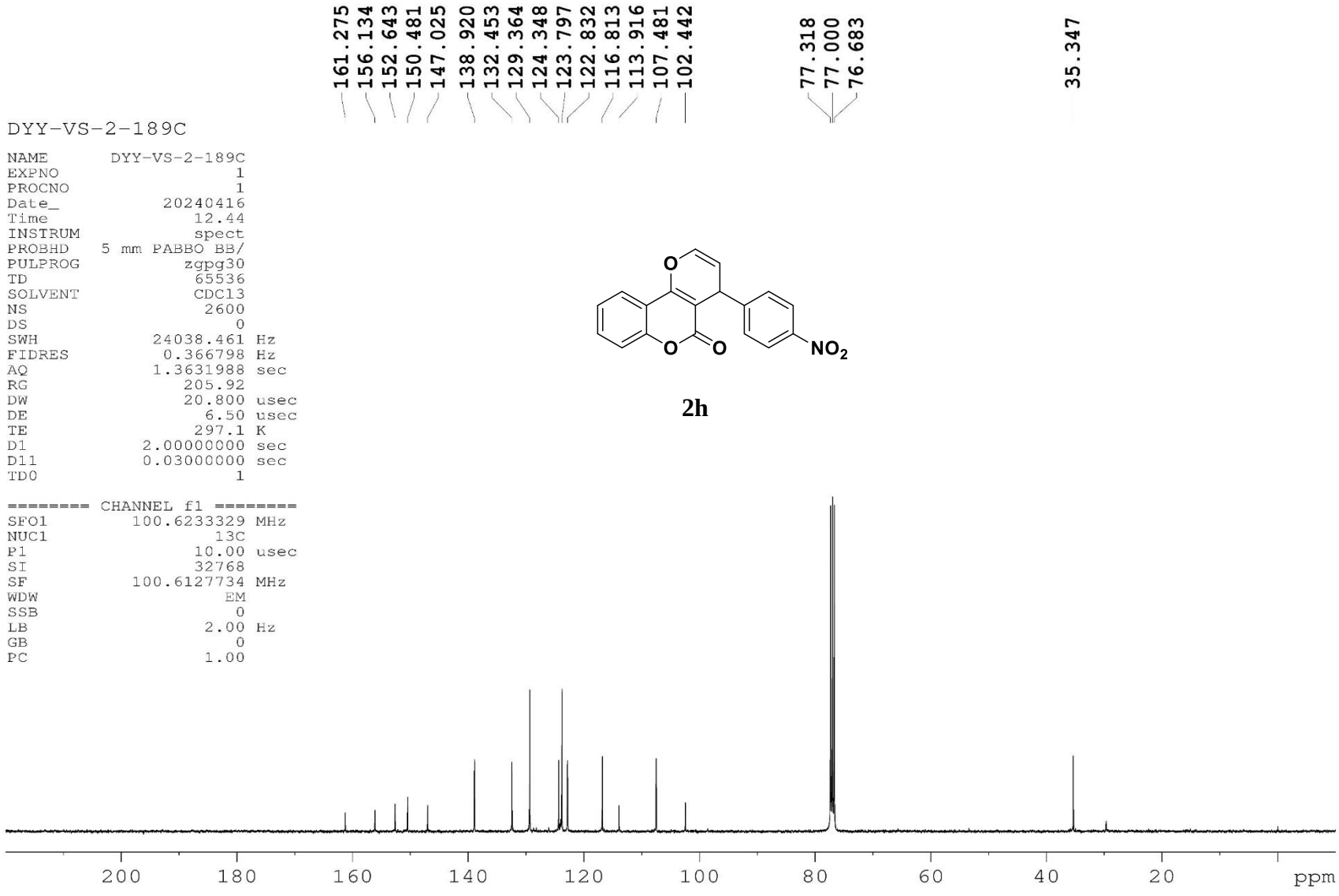
======== CHANNEL f1 ========

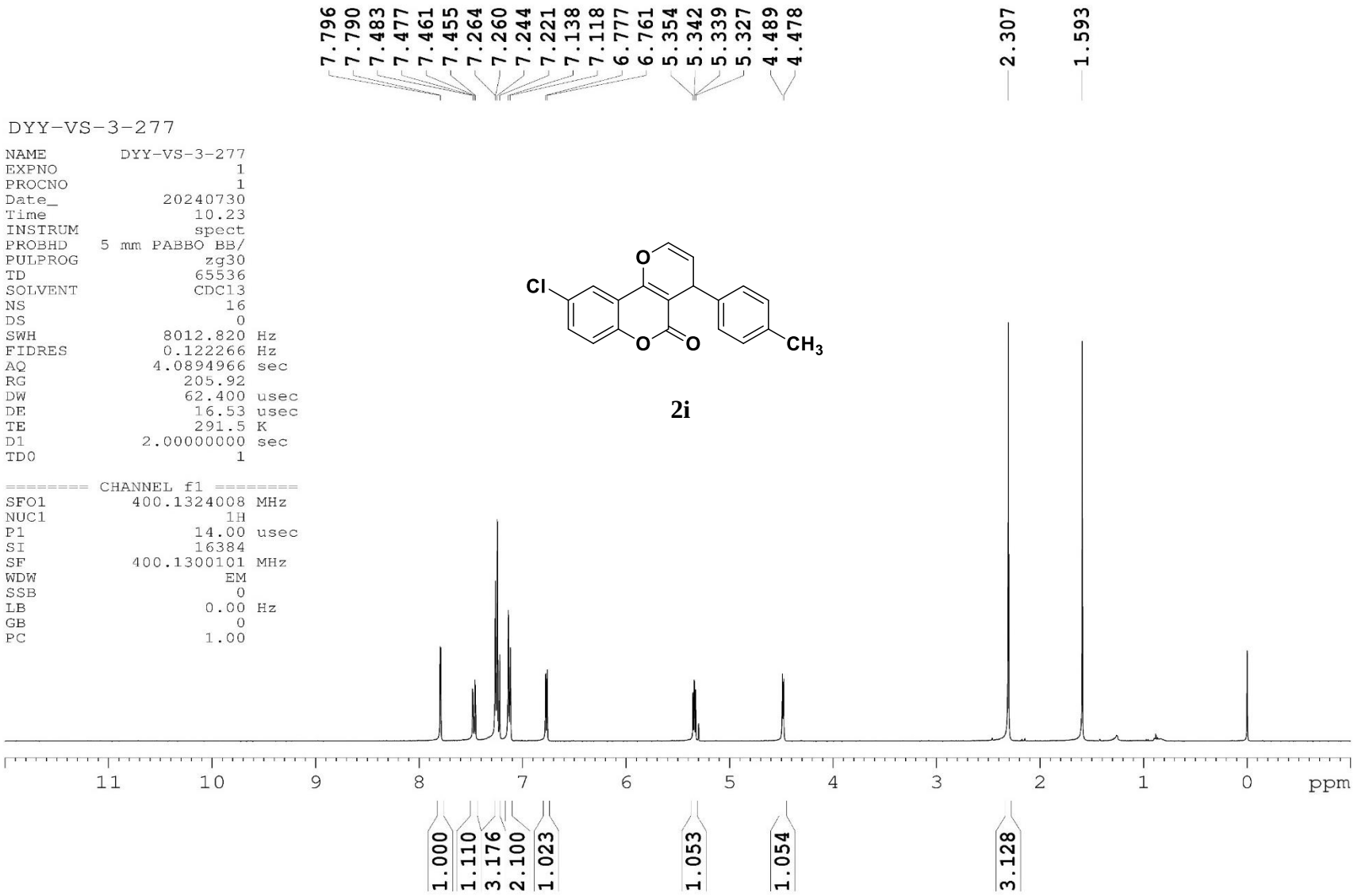
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300101 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

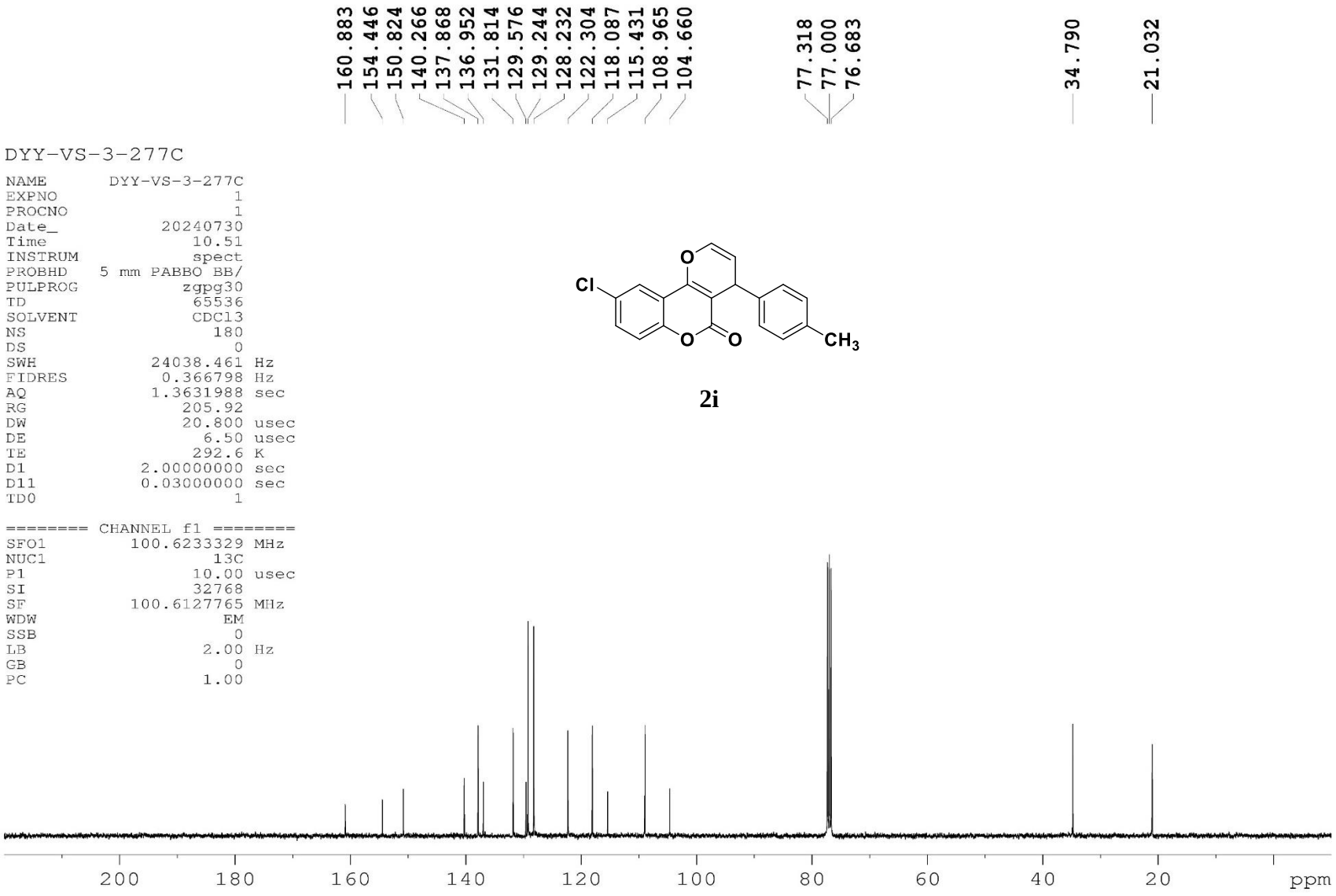


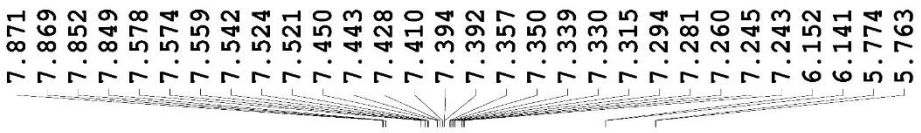
2h




161.275
156.134
152.643
150.481
147.025
138.920
132.453
129.364
124.348
123.797
122.832
116.813
113.916
107.481
102.442
77.318
77.000
76.683
35.347
DYY-VS-2-189C
NAME DYY-VS-2-189C
EXPNO 1
PROCNO 1
Date_ 20240416
Time 12.44
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 2600
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 297.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127734 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
O
NO2
2h
200
180
160
140
120
100
80
60
40
20
ppm

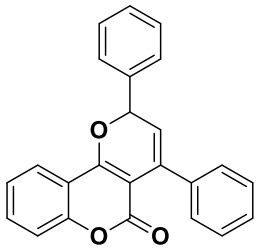

7.796
7.790
7.483
7.477
7.461
7.455
7.264
7.260
7.244
7.221
7.138
7.118
6.777
6.761
5.354
5.342
5.339
5.327
4.489
4.478
2.307
1.593
DYY-VS-3-277
NAME DYY-VS-3-277
EXPNO 1
PROCNO 1
Date_ 20240730
Time 10.23
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.5 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300101 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Cl
O
O
O
CH3
2i
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.110
3.176
2.100
1.023
1.053
1.054
3.128


160.883
154.446
150.824
140.266
137.868
136.952
131.814
129.576
129.244
128.232
122.304
118.087
115.431
108.965
104.660
77.318
77.000
76.683
34.790
21.032
DYY-VS-3-277C
NAME DYY-VS-3-277C
EXPNO 1
PROCNO 1
Date_ 20240730
Time 10.51
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 180
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127765 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Cl
O
O
O
CH3
2i
200
180
160
140
120
100
80
60
40
20
ppm

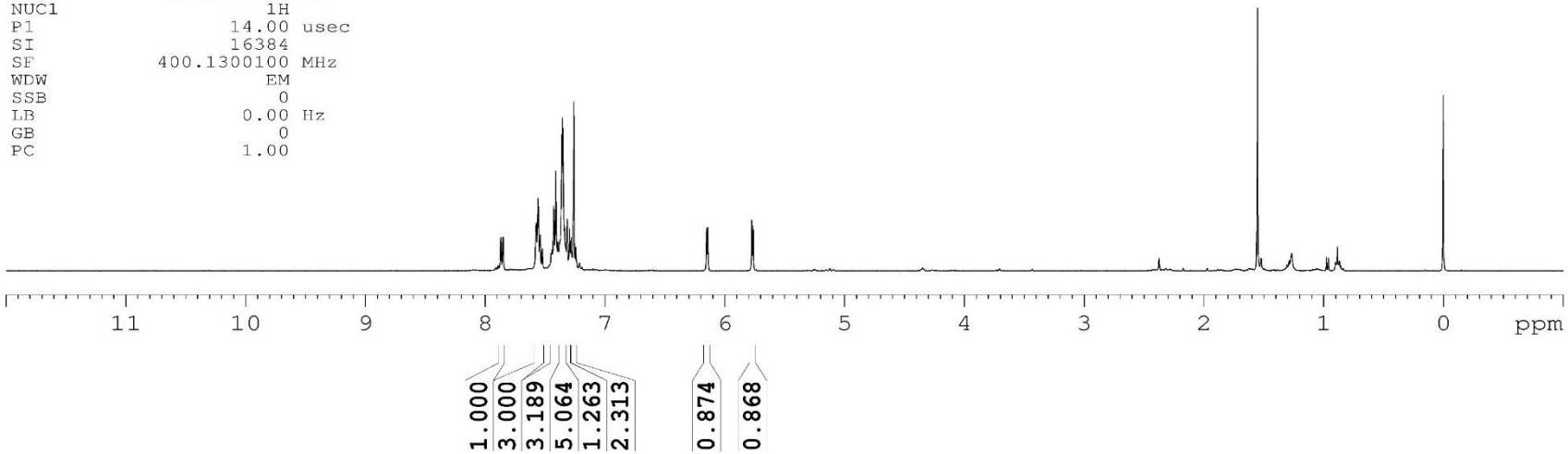


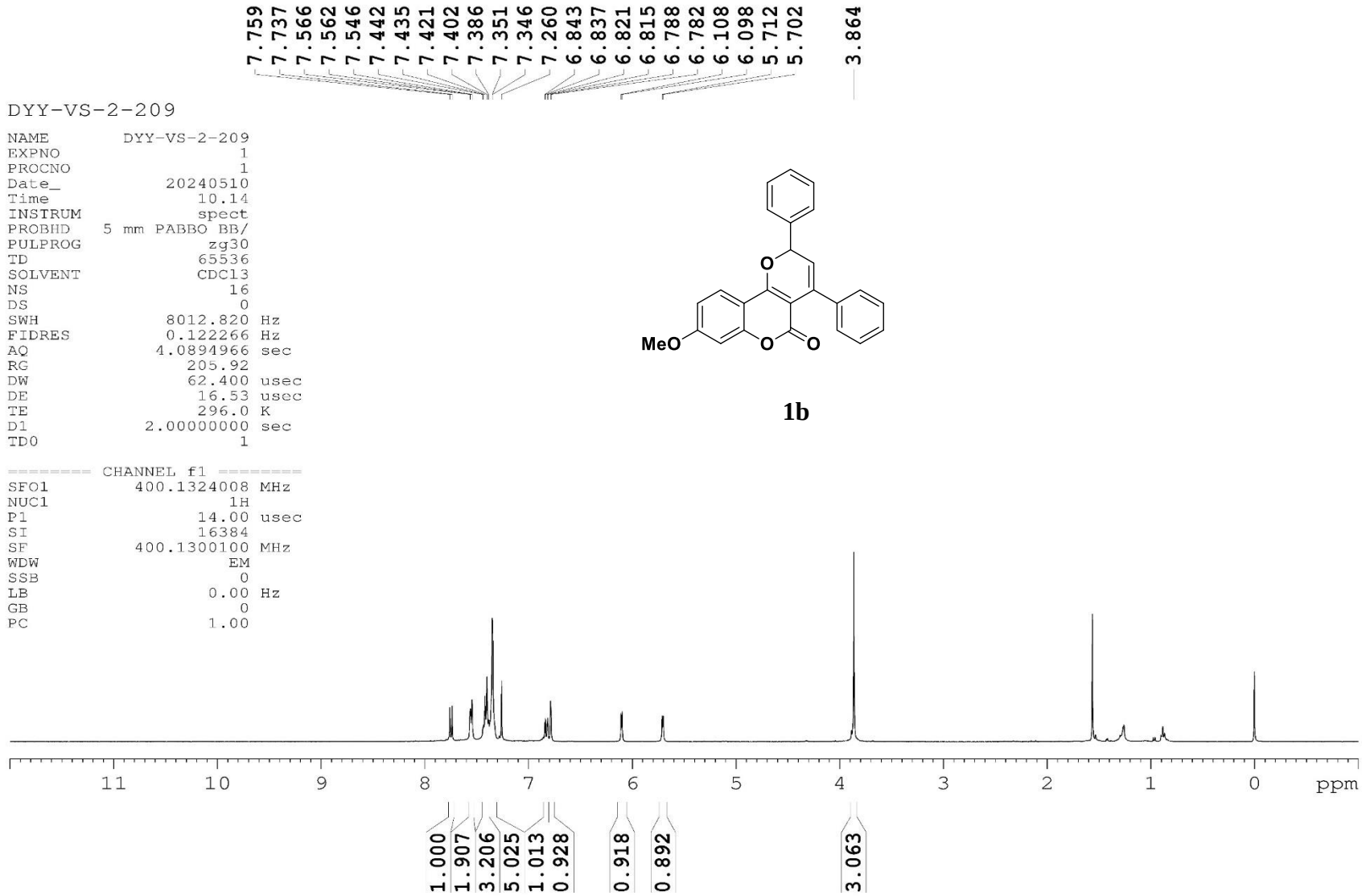
DYY-JNS-105

NAME	DYY-JNS-105
EXPNO	1
PROCNO	1
Date_	20240112
Time	10.29
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	296.7 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

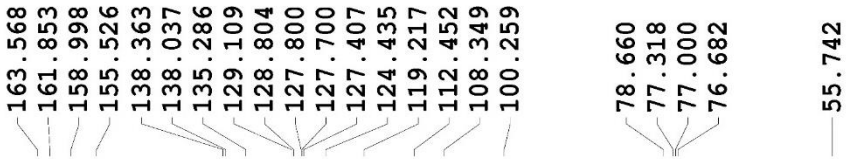


1a



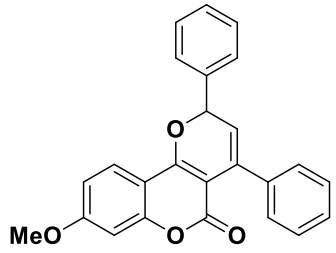

7.759
7.737
7.566
7.562
7.546
7.442
7.435
7.421
7.402
7.386
7.351
7.346
7.260
6.843
6.837
6.821
6.815
6.788
6.782
6.108
6.098
5.712
5.702
3.864
DYY-VS-2-209
NAME DYY-VS-2-209
EXPNO 1
PROCNO 1
Date_ 20240510
Time 10.14
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 296.0 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
MeO
O
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.907
3.206
5.025
1.013
0.928
0.918
0.892
3.063

1b

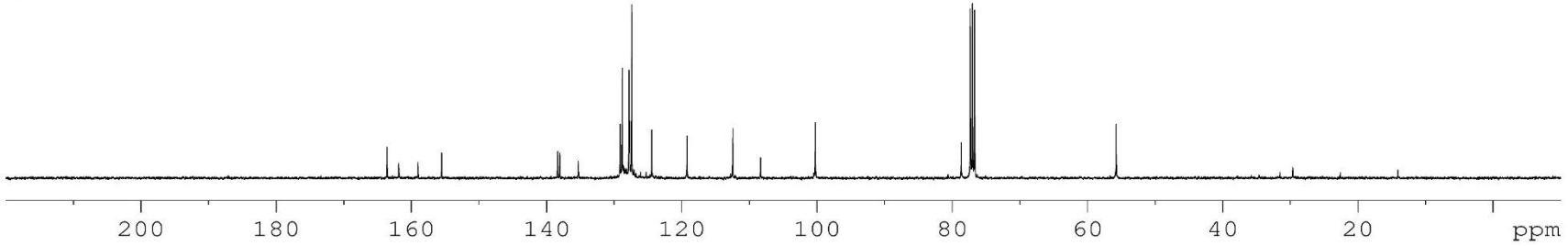


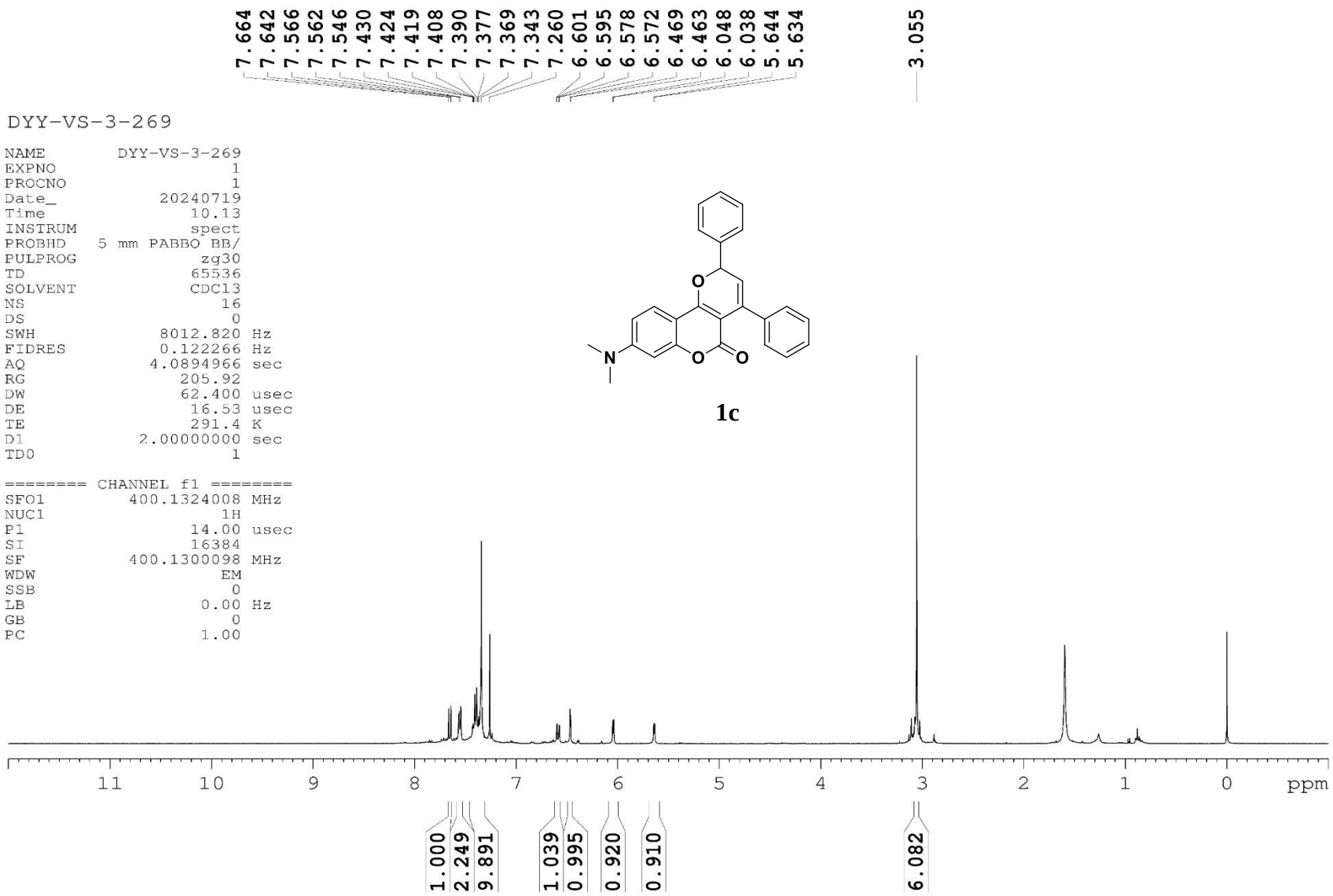
DYY-VS-2-209C

NAME	DYY-VS-2-209C
EXPNO	1
PROCNO	1
Date_	20240517
Time	11.07
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	600
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	297.5 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127772 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00

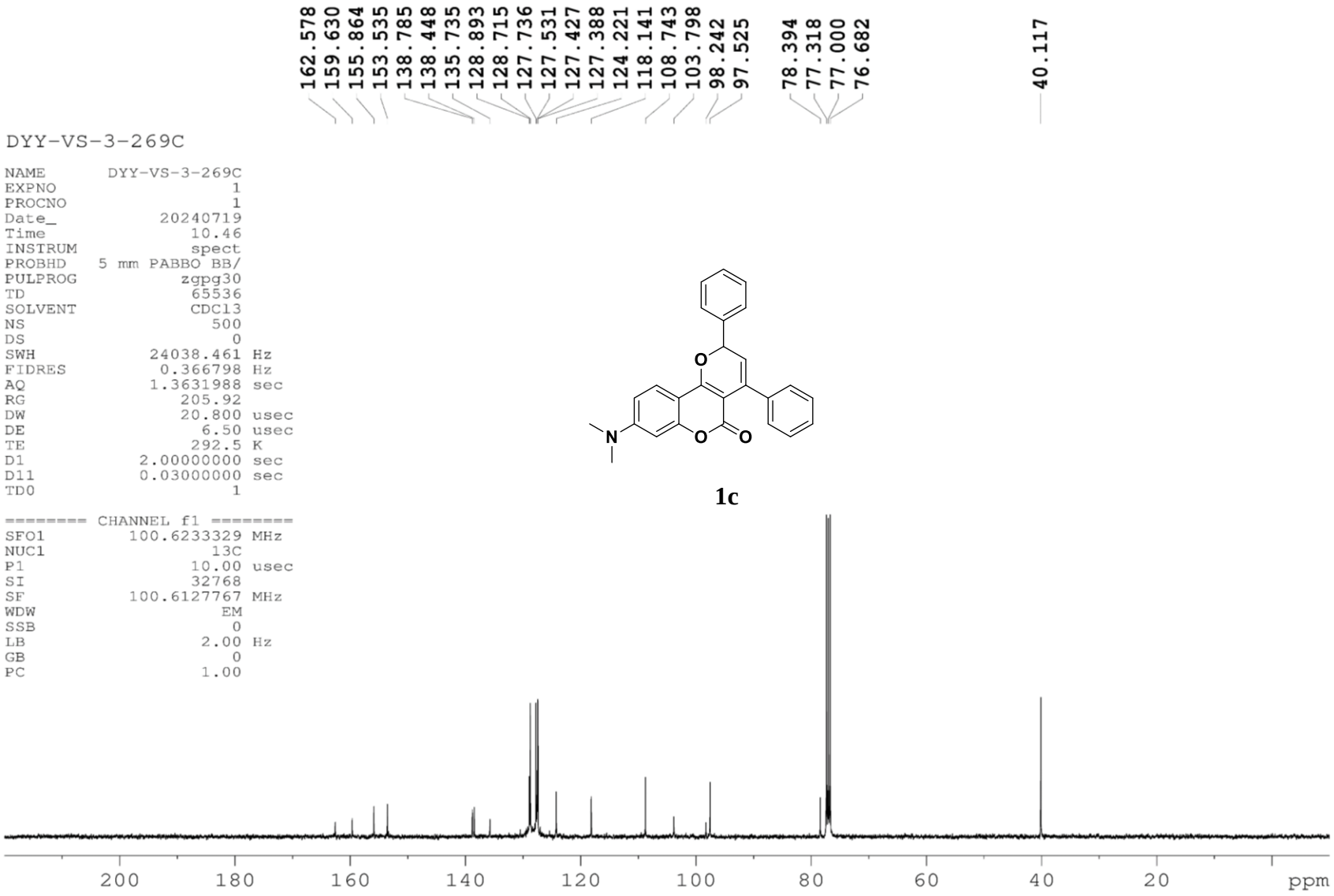


1b

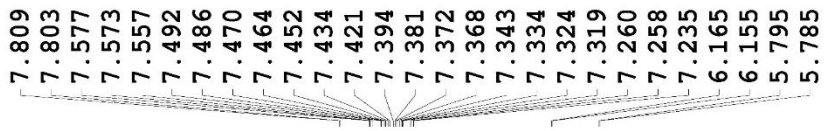



7.664
7.642
7.566
7.562
7.546
7.430
7.424
7.419
7.408
7.390
7.377
7.369
7.343
7.260
6.601
6.595
6.578
6.572
6.469
6.463
6.048
6.038
5.644
5.634
3.055
DYY-VS-3-269
NAME DYY-VS-3-269
EXPNO 1
PROCNO 1
Date_ 20240719
Time 10.13
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.4 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
N
O
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
2.249
9.891
1.039
0.995
0.920
0.910
6.082

1c


162.578
159.630
155.864
153.535
138.785
138.448
135.735
128.893
128.715
127.736
127.531
127.427
127.388
124.221
118.141
108.743
103.798
98.242
97.525
78.394
77.318
77.000
76.682
40.117
DYY-VS-3-269C
NAME DYY-VS-3-269C
EXPNO 1
PROCNO 1
Date_ 20240719
Time 10.46
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 500
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127767 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
N
O
O
200
180
160
140
120
100
80
60
40
20
ppm

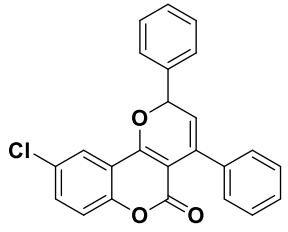
1c



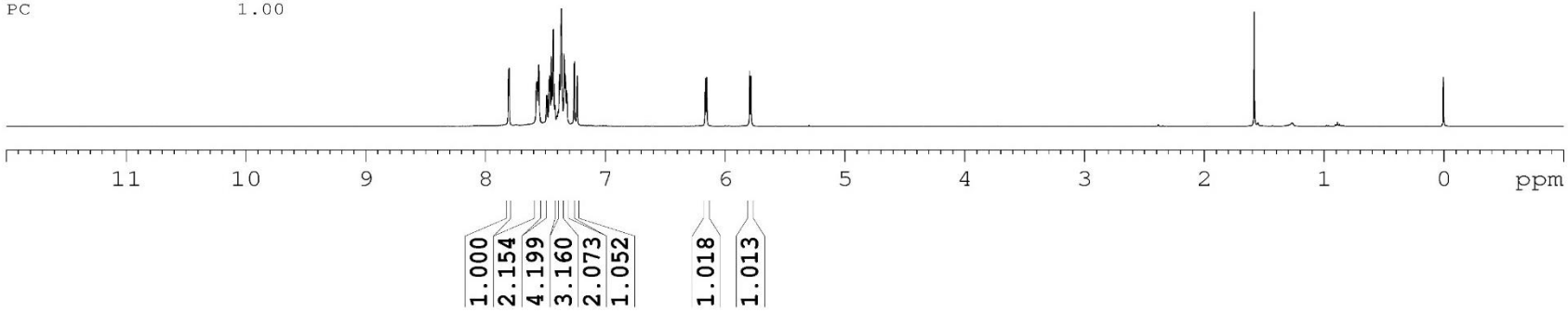
DYY-VS-2-227-1

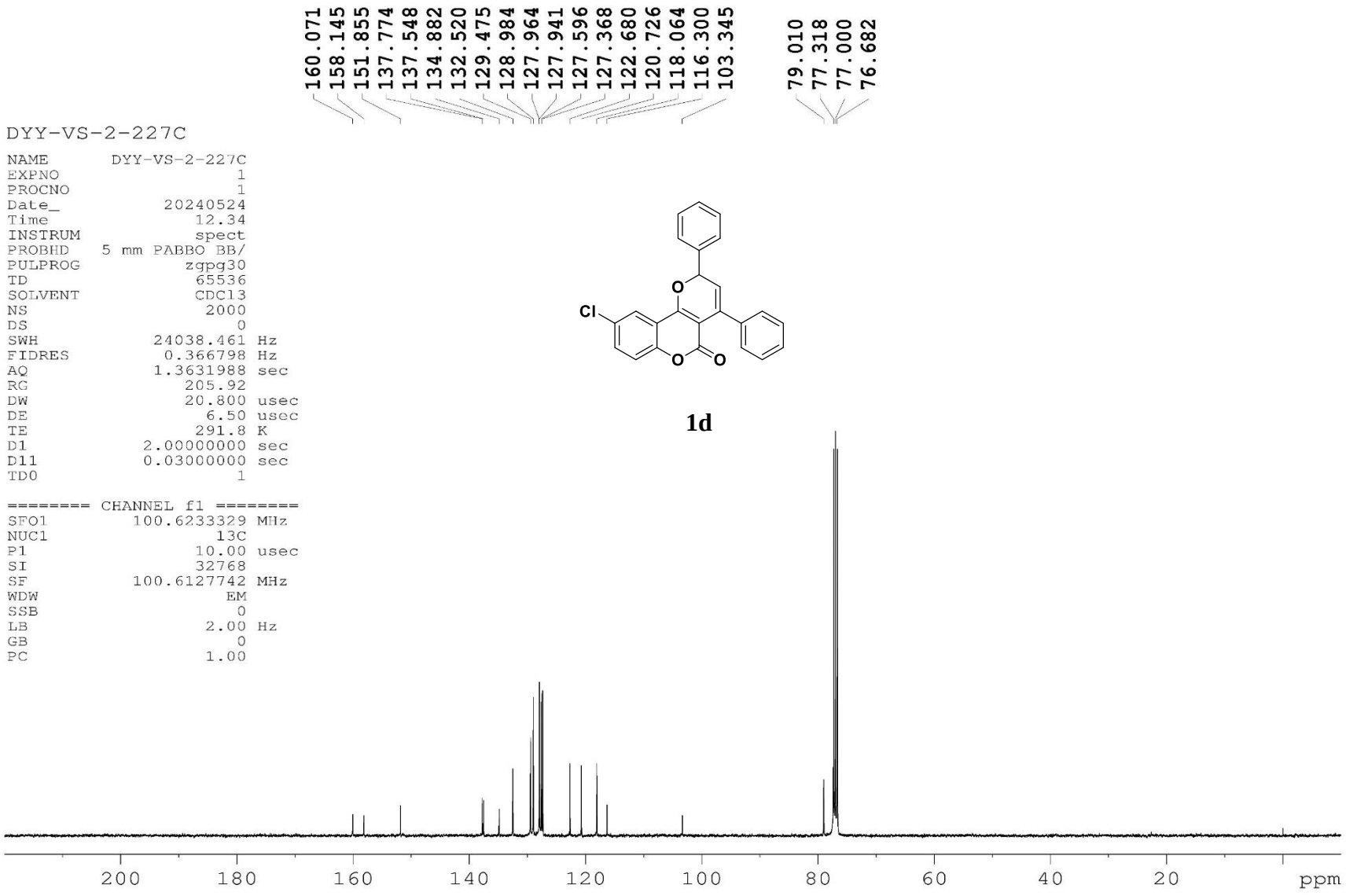
```
NAME      DYY-VS-2-227-1
EXPNO                 2
PROCNO                1
Date_          20240524
Time              12.37
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                   16
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894966 sec
RG               205.92
DW               62.400 usec
DE               16.53 usec
TE               290.7 K
D1            2.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324008 MHz
NUC1                1H
P1                14.00 usec
SI                16384
SF          400.1300094 MHz
WDW                 EM
SSB                  0
LB                0.00 Hz
GB                   0
PC                1.00
```

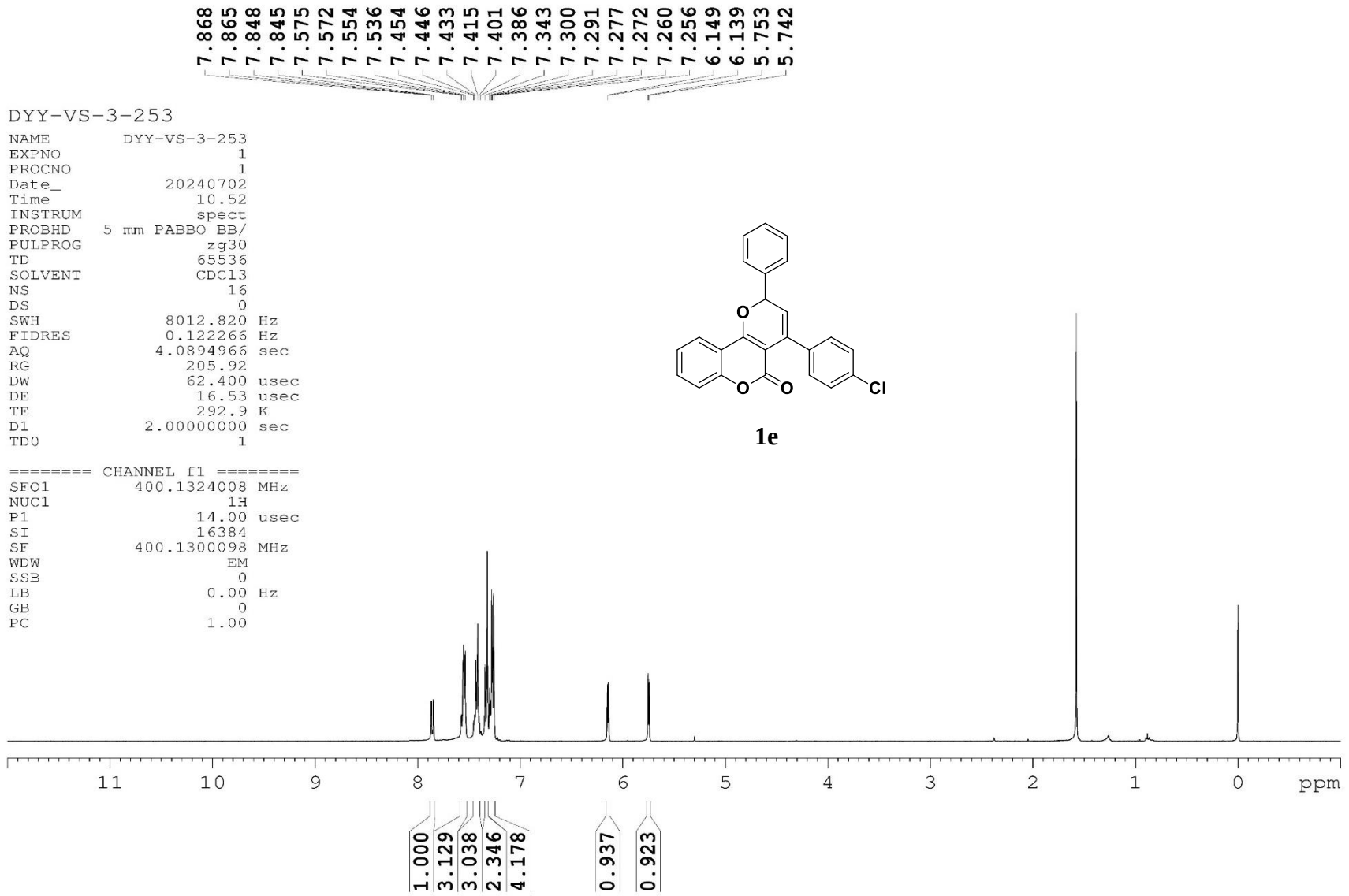


1d

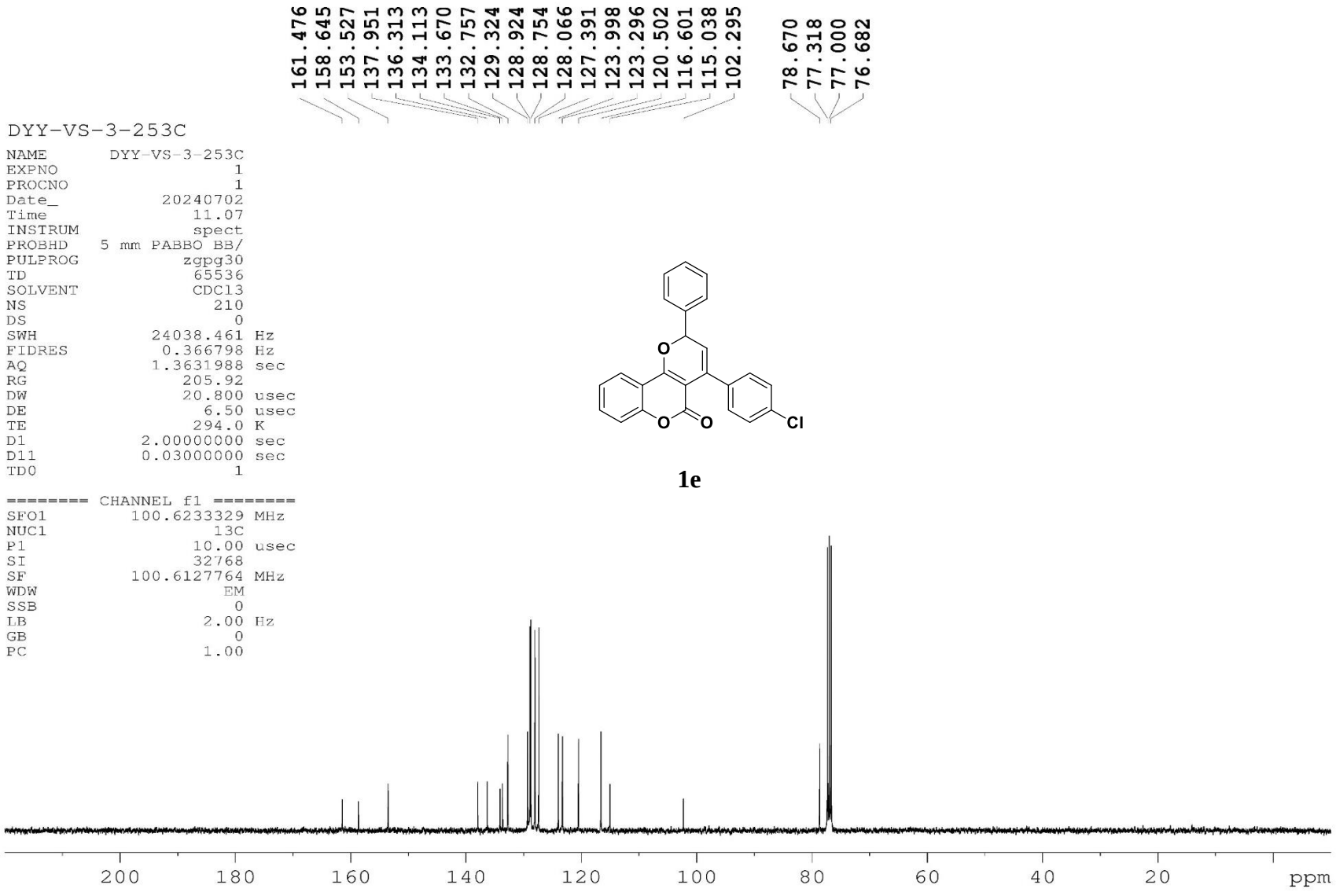



160.071
158.145
151.855
137.774
137.548
134.882
132.520
129.475
128.984
127.964
127.941
127.596
127.368
122.680
120.726
118.064
116.300
103.345
79.010
77.318
77.000
76.682
DYY-VS-2-227C
NAME DYY-VS-2-227C
EXPNO 1
PROCNO 1
Date_ 20240524
Time 12.34
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 2000
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 291.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127742 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Cl
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

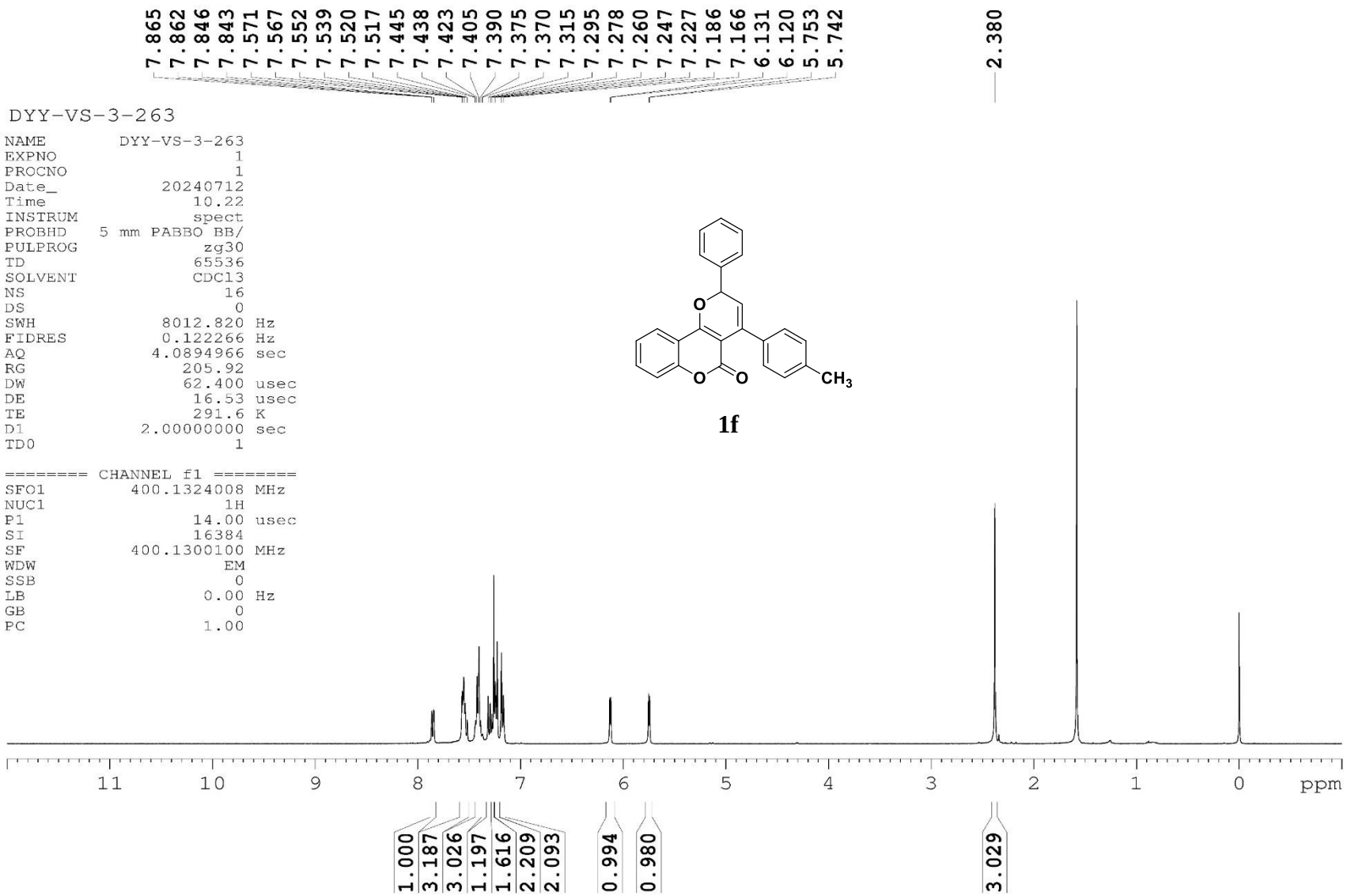
1d

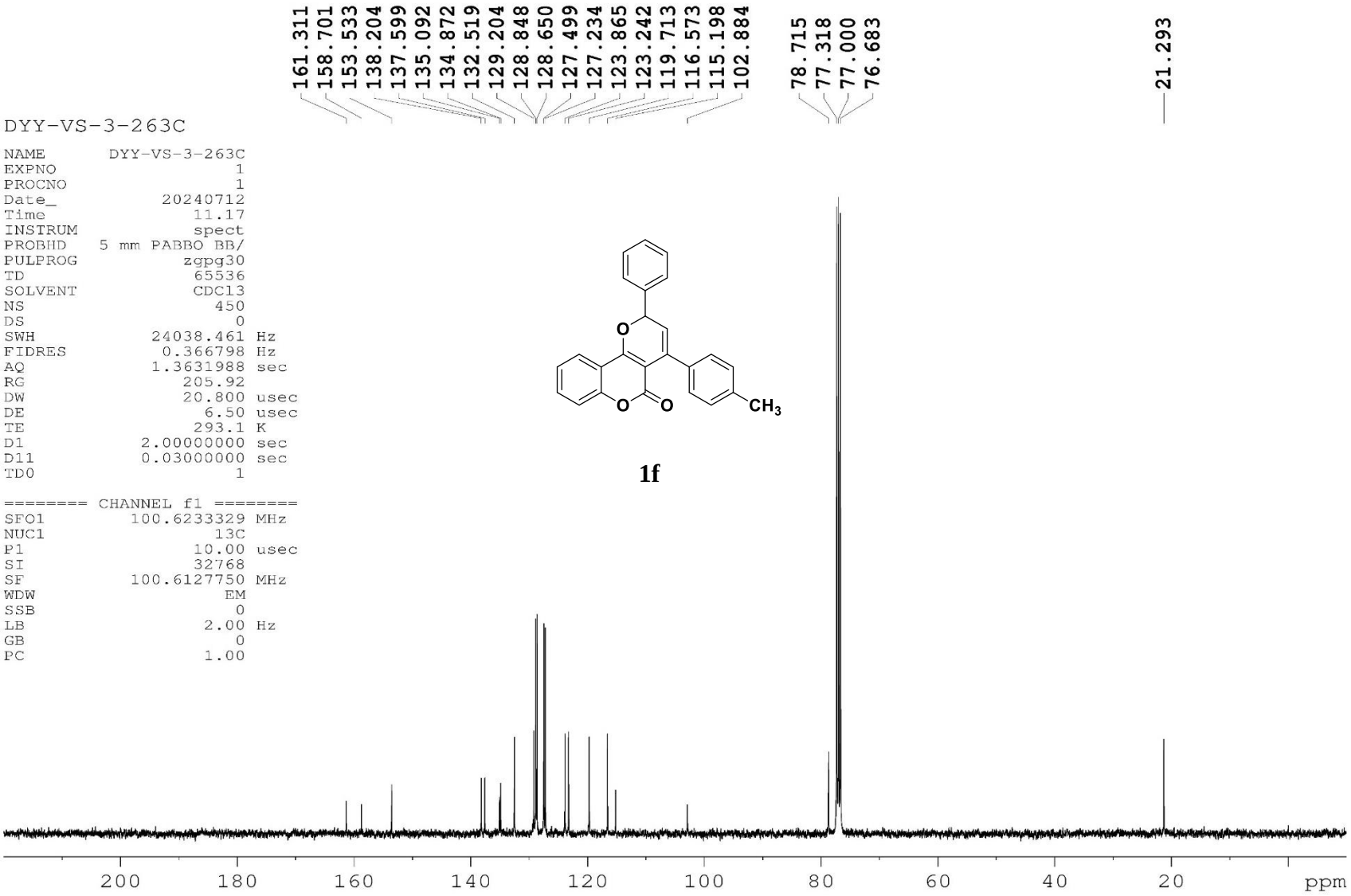

7.868
7.865
7.848
7.845
7.575
7.572
7.554
7.536
7.454
7.446
7.433
7.415
7.401
7.386
7.343
7.300
7.291
7.277
7.272
7.260
7.256
6.149
6.139
5.753
5.742
DYY-VS-3-253
NAME DYY-VS-3-253
EXPNO 1
PROCNO 1
Date_ 20240702
Time 10.52
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 292.9 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
O
O
O
Cl
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
3.129
3.038
2.346
4.178
0.937
0.923

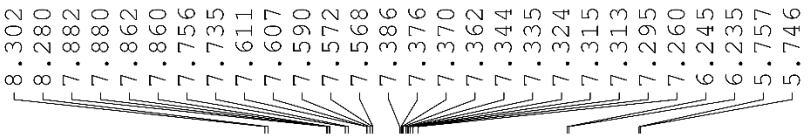
1e


161.476
158.645
153.527
137.951
136.313
134.113
133.670
132.757
129.324
128.924
128.754
128.066
127.391
123.998
123.296
120.502
116.601
115.038
102.295
78.670
77.318
77.000
76.682
DYY-VS-3-253C
NAME DYY-VS-3-253C
EXPNO 1
PROCNO 1
Date_ 20240702
Time 11.07
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 210
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 294.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127764 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
O
Cl
200
180
160
140
120
100
80
60
40
20
ppm

1e

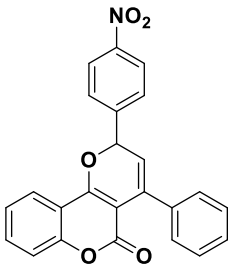

7.865
7.862
7.846
7.843
7.571
7.567
7.552
7.539
7.520
7.517
7.445
7.438
7.423
7.405
7.390
7.375
7.370
7.315
7.295
7.278
7.260
7.247
7.227
7.186
7.166
6.131
6.120
5.753
5.742
2.380
DYY-VS-3-263
NAME DYY-VS-3-263
EXPNO 1
PROCNO 1
Date_ 20240712
Time 10.22
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.6 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
O
O
O
CH3
1f
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
3.187
3.026
1.197
1.616
2.209
2.093
0.994
0.980
3.029


161.311
158.701
153.533
138.204
137.599
135.092
134.872
132.519
129.204
128.848
128.650
127.499
127.234
123.865
123.242
119.713
116.573
115.198
102.884
78.715
77.318
77.000
76.683
21.293
DYY-VS-3-263C
NAME DYY-VS-3-263C
EXPNO 1
PROCNO 1
Date_ 20240712
Time 11.17
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 450
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127750 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
O
CH3
1f
200
180
160
140
120
100
80
60
40
20
ppm

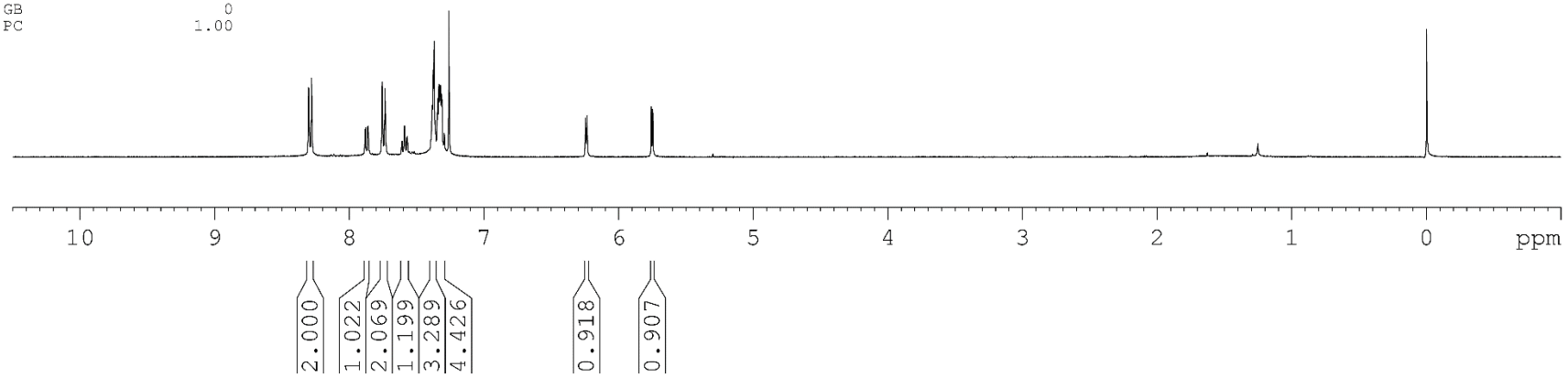


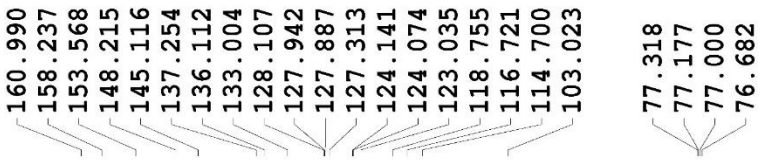
DYY-JNS-146-1-0903

NAME	DYY-JNS-146-1-0903
EXPNO	1
PROCNO	1
Date_	20240903
Time	13.01
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	292.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300101 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



1g



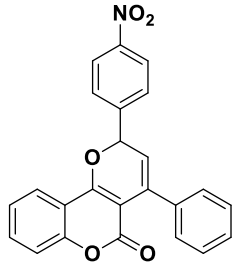


DYY-JNS-146C

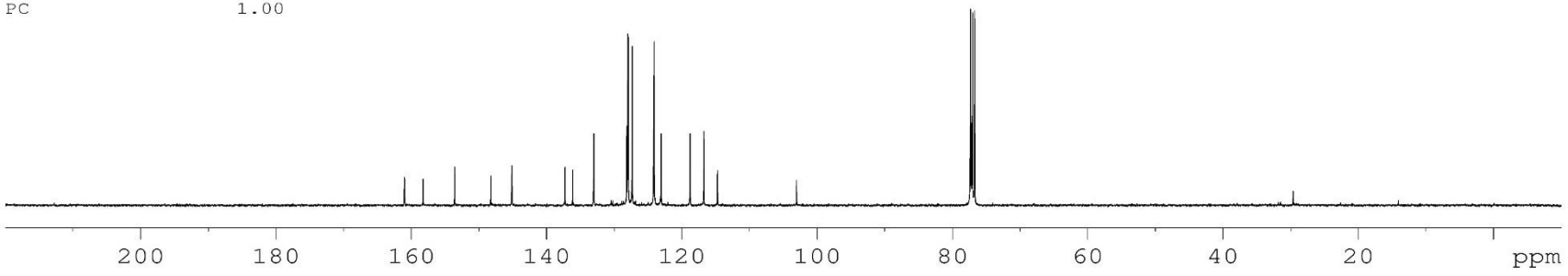
NAME	DYY-JNS-146C
EXPNO	1
PROCNO	1
Date_	20240322
Time	12.15
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	800
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	297.8 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

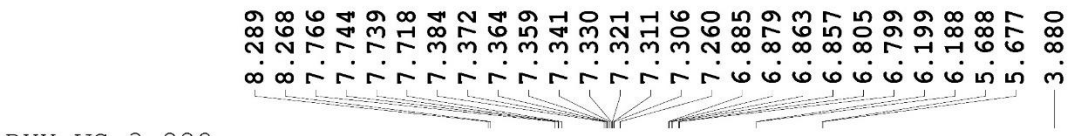
======== CHANNEL f1 ========

SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127783 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



1g



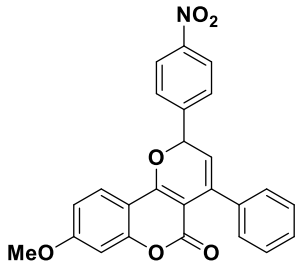


DYY-VS-3-228

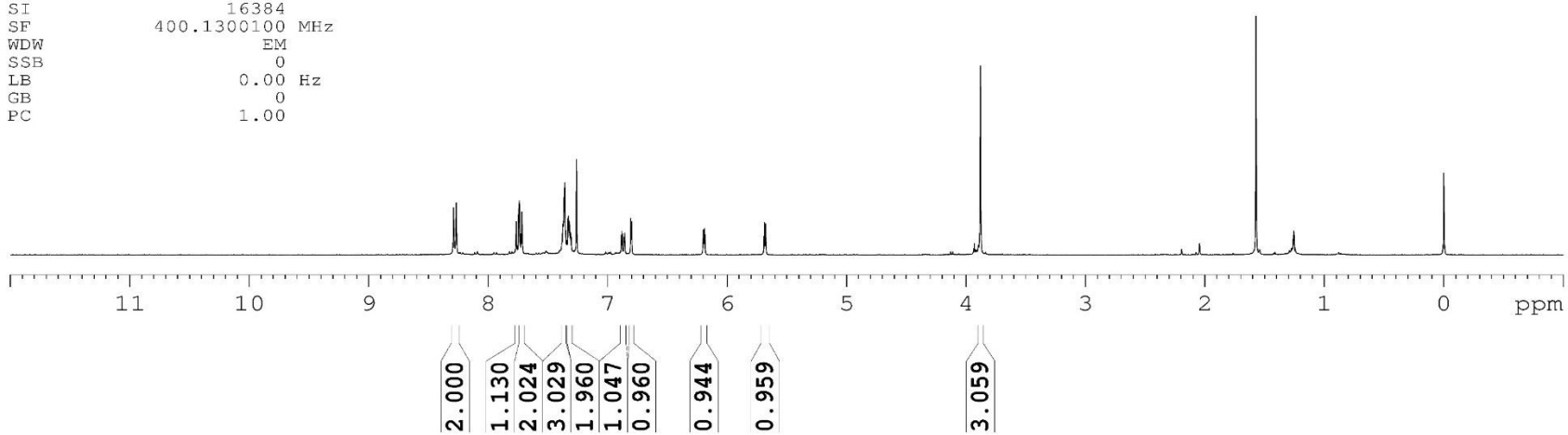
NAME	DYY-VS-3-228
EXPNO	1
PROCNO	1
Date_	20240528
Time	10.17
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	296.2 K
D1	2.00000000 sec
TD0	1

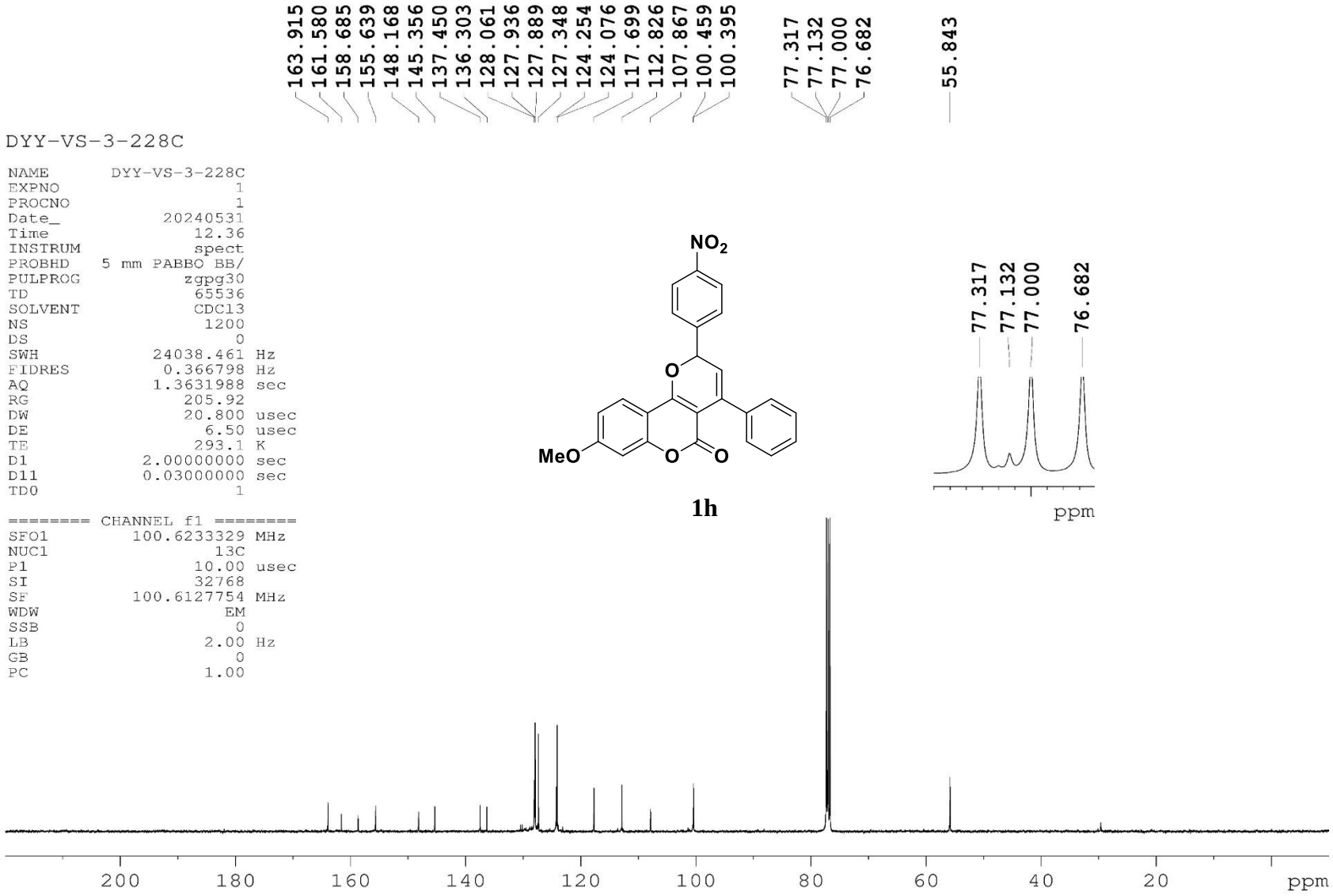
======== CHANNEL f1 ========

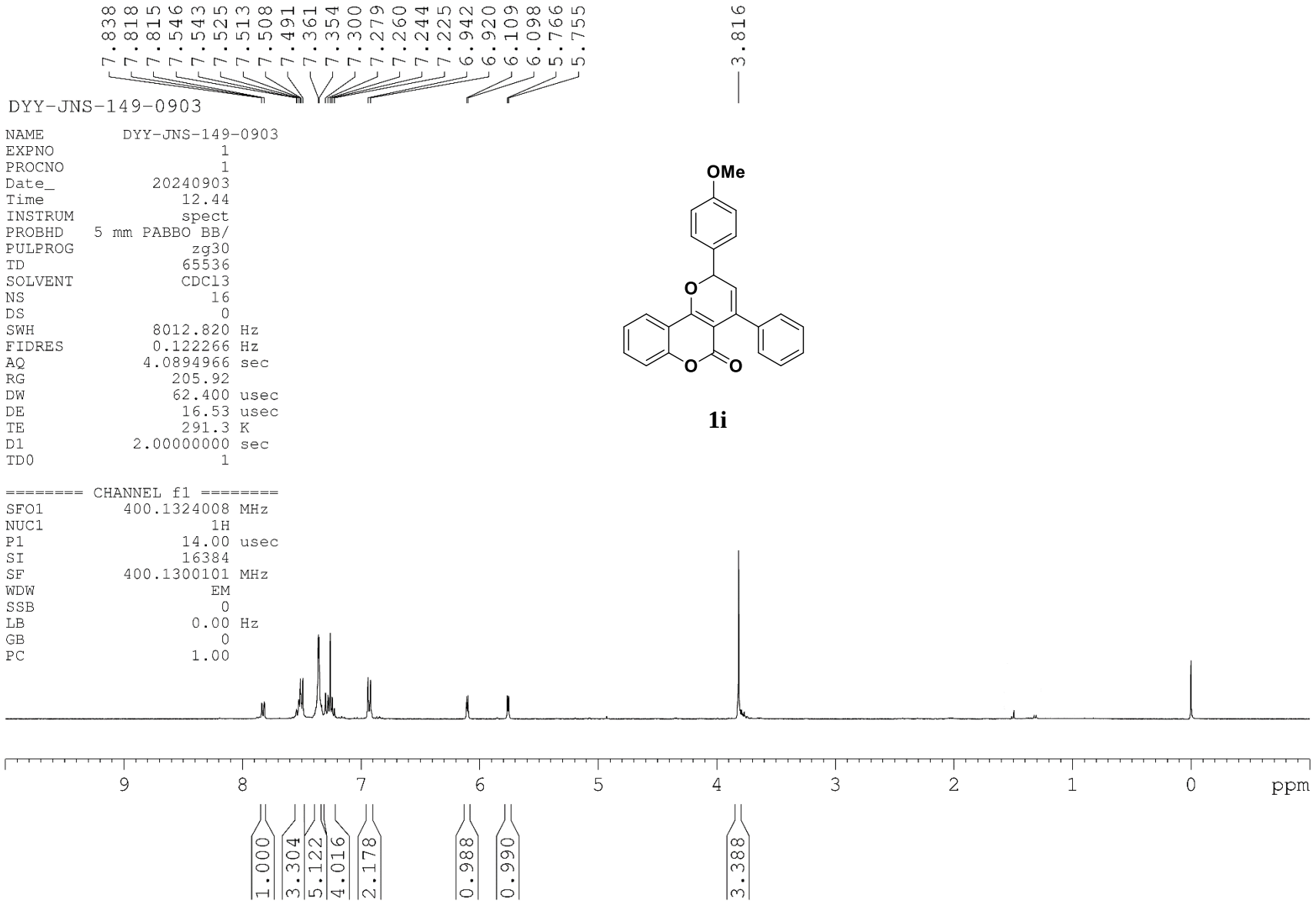
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



1h




163.915
161.580
158.685
155.639
148.168
145.356
137.450
136.303
128.061
127.936
127.889
127.348
124.254
124.076
117.699
112.826
107.867
100.459
100.395
77.317
77.132
77.000
76.682
55.843
DYY-VS-3-228C
NAME DYY-VS-3-228C
EXPNO 1
PROCNO 1
Date_ 20240531
Time 12.36
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1200
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127754 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
NO2
O
MeO
O
O
1h
77.317
77.132
77.000
76.682
ppm
200
180
160
140
120
100
80
60
40
20
ppm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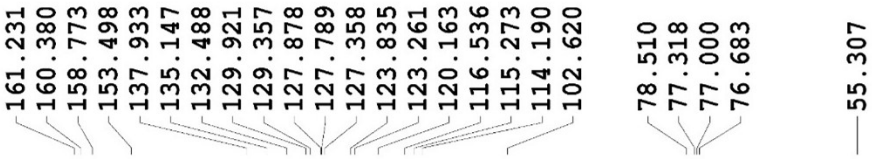
7.818
7.815
7.546
7.543
7.525
7.513
7.508
7.491
7.361
7.354
7.300
7.279
7.260
7.244
7.225
6.942
6.920
6.109
6.098
5.766
5.755
3.816
DYY-JNS-149-0903
NAME DYY-JNS-149-0903
EXPNO 1
PROCNO 1
Date_ 20240903
Time 12.44
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.3 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300101 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
OMe
O
O
O
9
8
7
6
5
4
3
2
1
0
ppm
1.000
3.304
5.122
4.016
2.178
0.988
0.990
3.388

1i

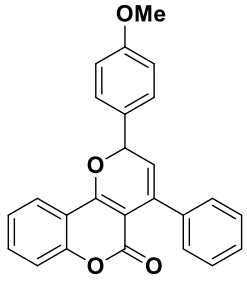


DYY-JNS-149C

NAME	DYY-JNS-149C
EXPNO	1
PROCNO	1
Date_	20240326
Time	11.17
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	32768
SOLVENT	CDCl3
NS	1500
DS	0
SWH	24038.461 Hz
FIDRES	0.733596 Hz
AQ	0.6816244 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	292.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

======== CHANNEL f1 ========

SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127757 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



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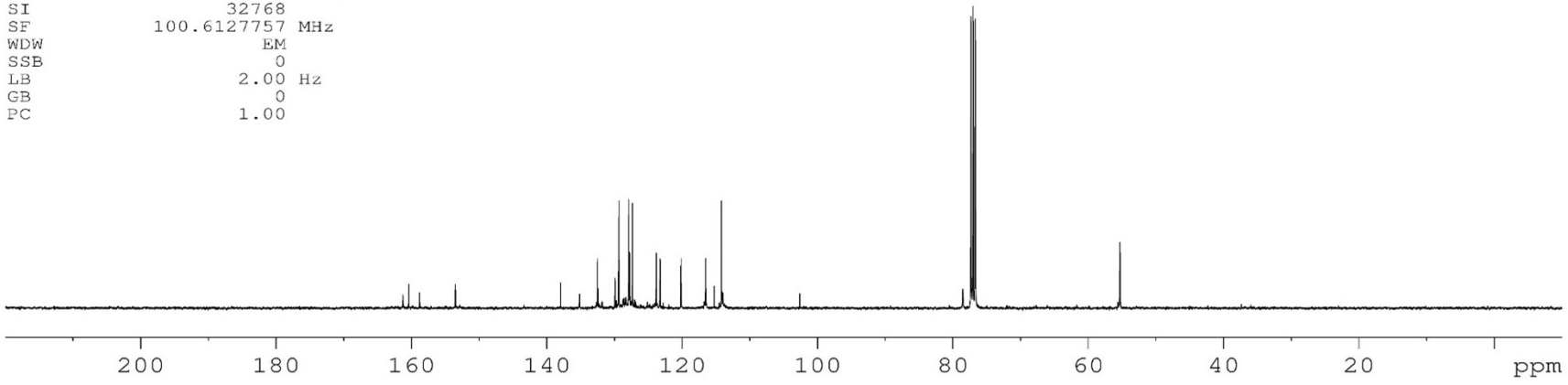
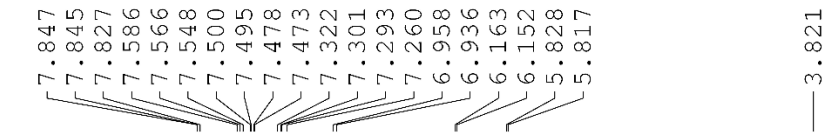
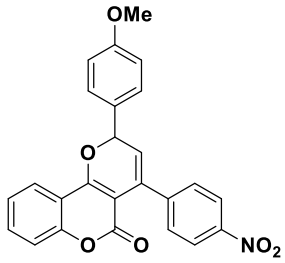




DYY-VS-3-237-0903

```
NAME      DYY-VS-3-237-0903
EXPNO                    1
PROCNO                   1
Date_             20240903
Time                 13.19
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG               zg30
TD                   65536
SOLVENT              CDCl3
NS                      16
DS                       0
SWH               8012.820 Hz
FIDRES            0.122266 Hz
AQ                4.0894966 sec
RG                   205.92
DW                   62.400 usec
DE                   16.53 usec
TE                   291.6 K
D1               2.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           400.1324008 MHz
NUC1                   1H
P1                   14.00 usec
SI                   16384
SF             400.1300100 MHz
WDW                    EM
SSB                     0
LB                   0.00 Hz
GB                      0
PC                   1.00
```



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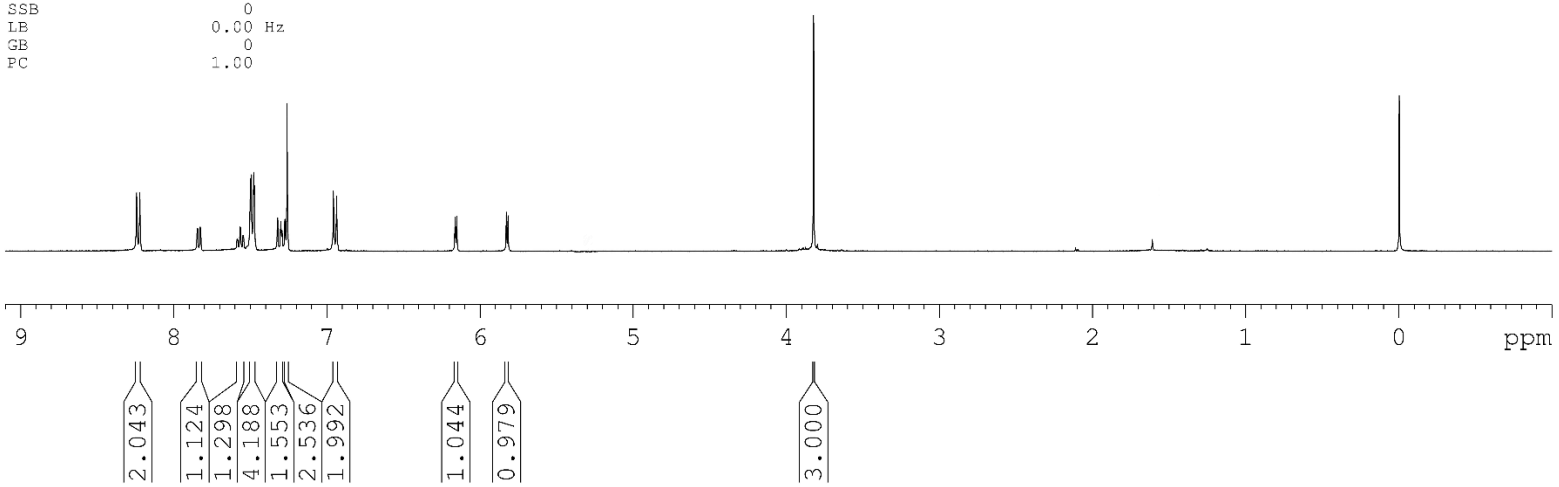
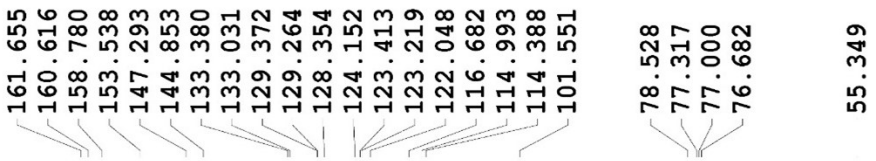
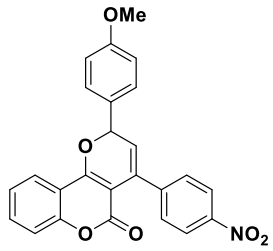


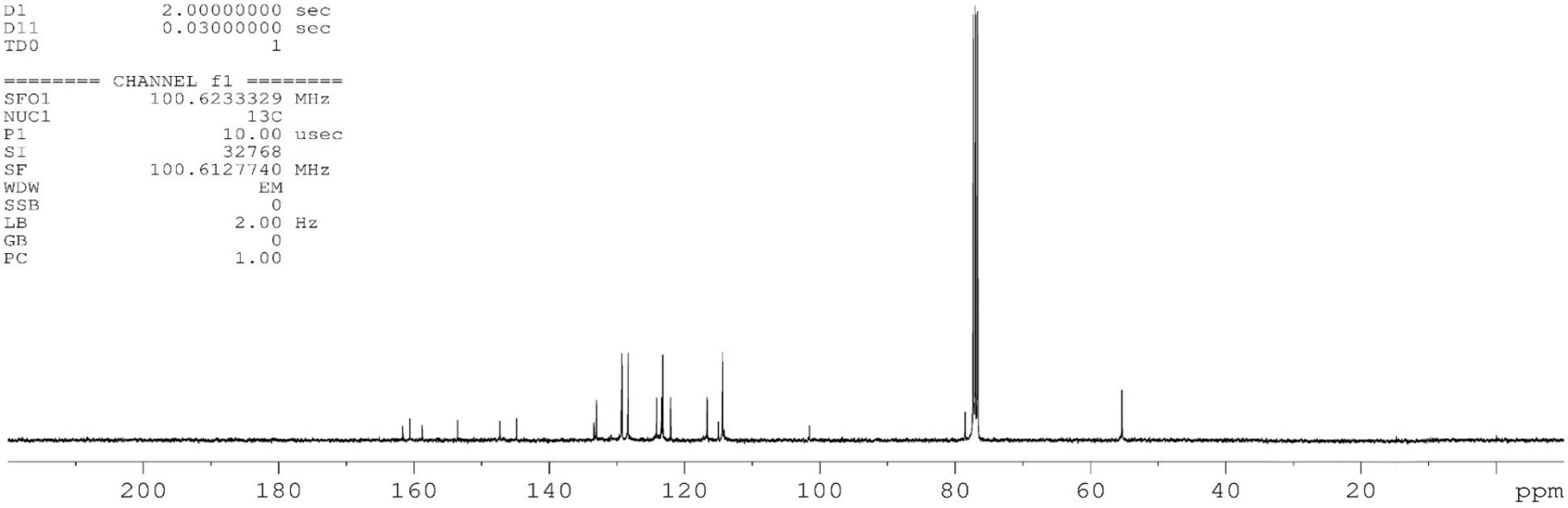


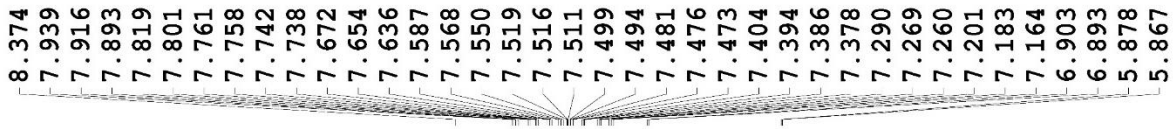
DYY-VS-3-237C

NAME	DYY-VS-3-237C
EXPNO	1
PROCNO	1
Date_	20240614
Time	12.36
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	1200
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	293.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127740 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



1j



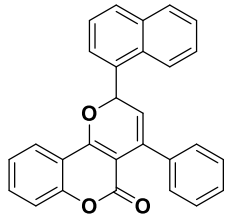


DYY-VS-2-214

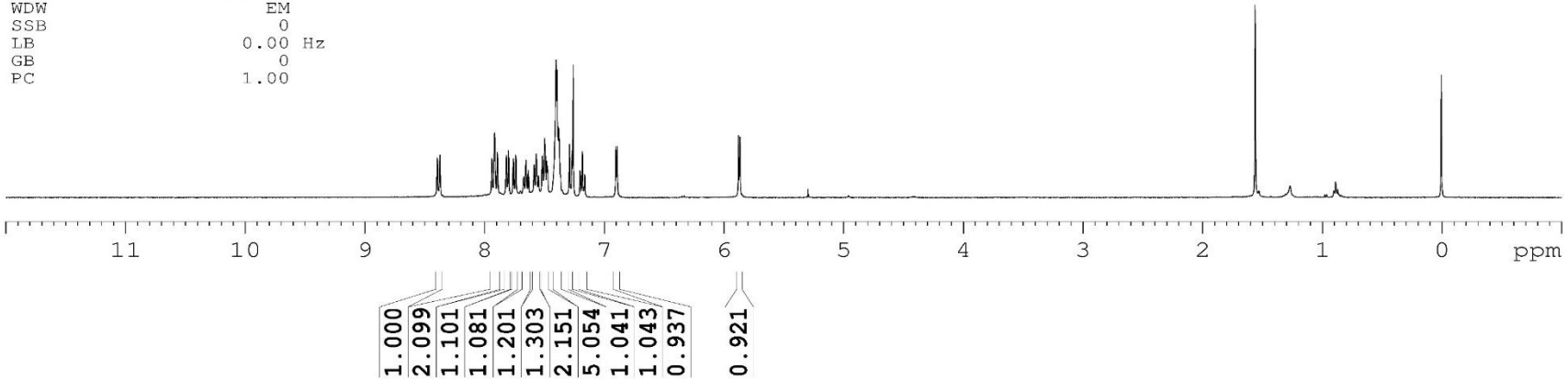
NAME	DYY-VS-2-214
EXPNO	1
PROCNO	1
Date_	20240514
Time	10.19
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	296.3 K
D1	2.00000000 sec
TD0	1

======== CHANNEL f1 ========

SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



1k

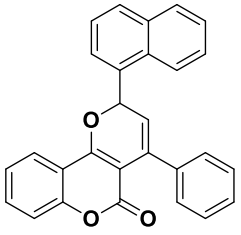


DYY-VS-2-214C

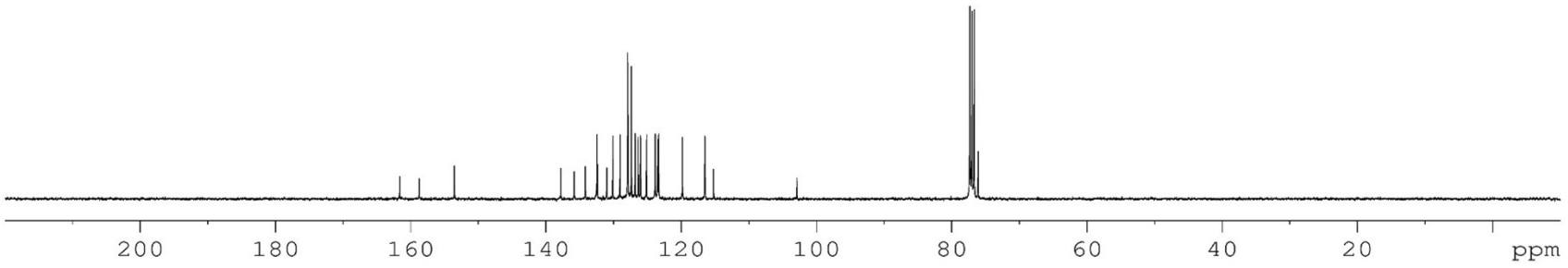
NAME	DYY-VS-2-214C
EXPNO	1
PROCNO	1
Date_	20240517
Time	11.45
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	600
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	297.6 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

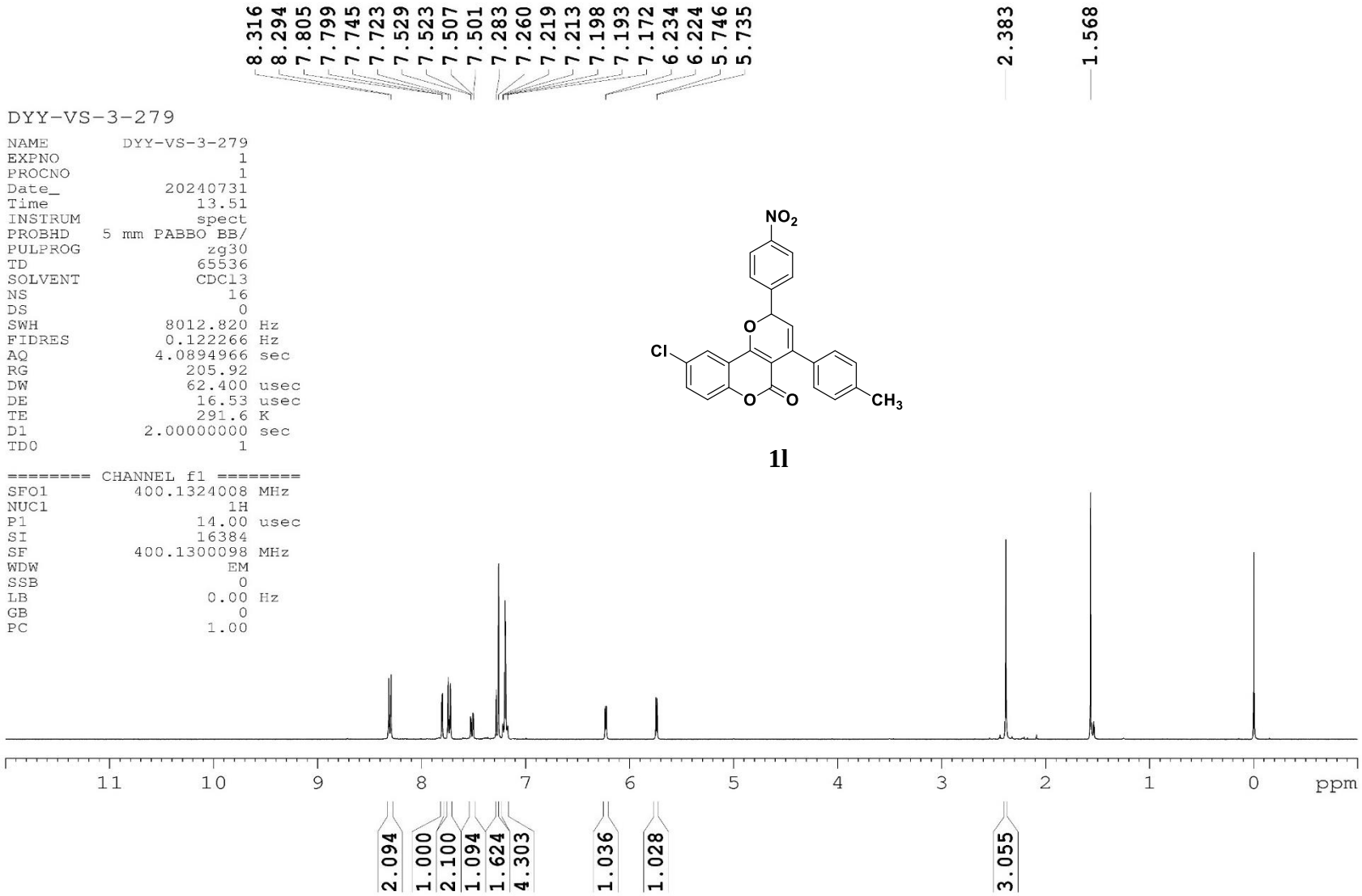
======== CHANNEL f1 ========

SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127775 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



1k

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7.805
7.799
7.745
7.723
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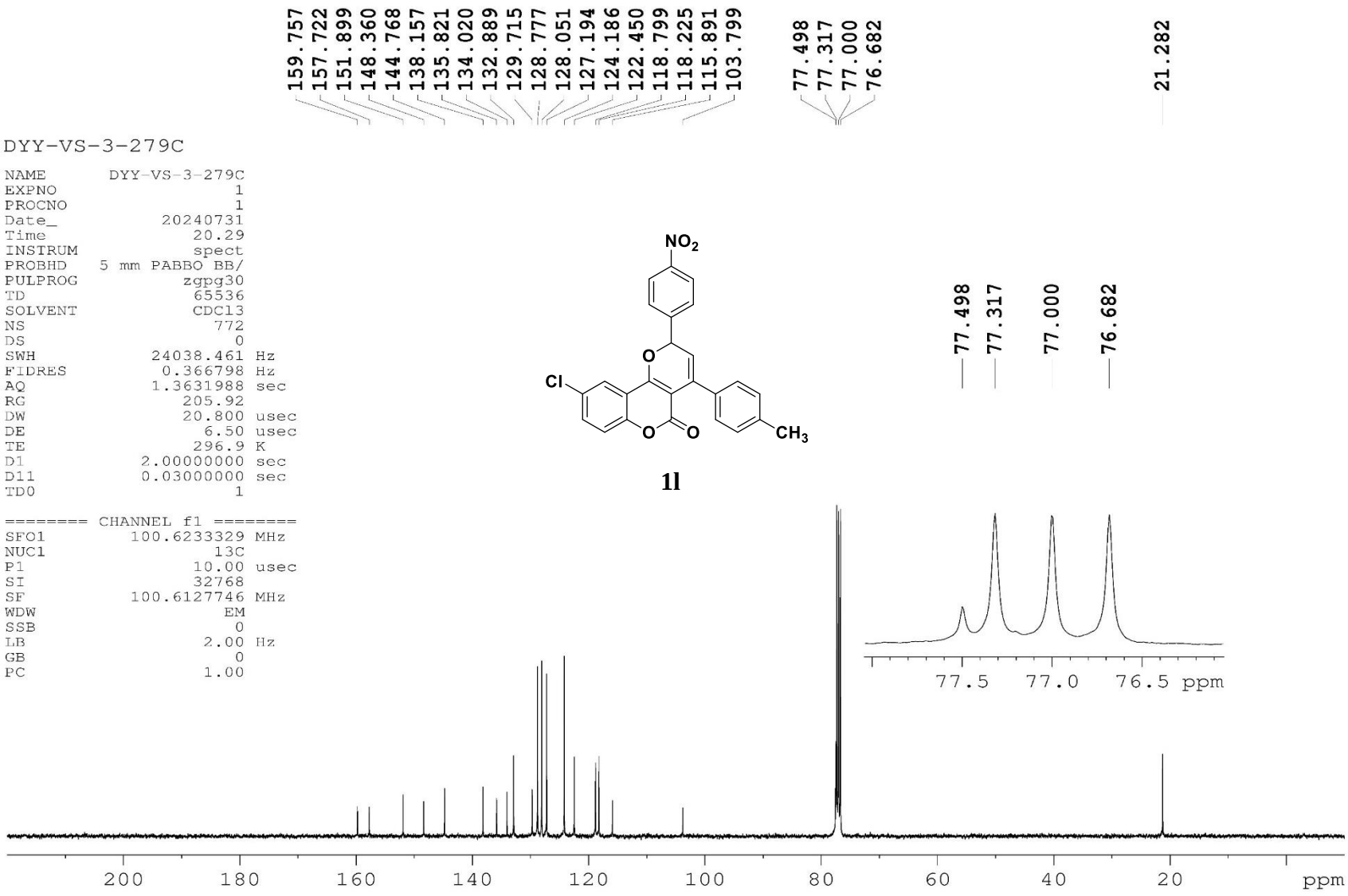
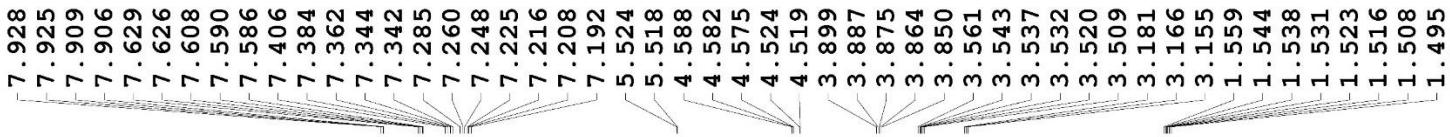
7.523
7.507
7.501
7.283
7.260
7.219
7.213
7.198
7.193
7.172
6.234
6.224
5.746
5.735
2.383
1.568
DYY-VS-3-279
NAME DYY-VS-3-279
EXPNO 1
PROCNO 1
Date_ 20240731
Time 13.51
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.6 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
NO2
O
Cl
O
O
CH3
11
10
9
8
7
6
5
4
3
2
1
0
ppm
2.094
1.000
2.100
1.094
1.624
4.303
1.036
1.028
3.055

1l

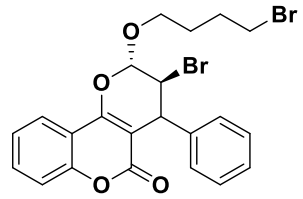

159.757
157.722
151.899
148.360
144.768
138.157
135.821
134.020
132.889
129.715
128.777
128.051
127.194
124.186
122.450
118.799
118.225
115.891
103.799
77.498
77.317
77.000
76.682
21.282
DYY-VS-3-279C
NAME DYY-VS-3-279C
EXPNO 1
PROCNO 1
Date_ 20240731
Time 20.29
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 772
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
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 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127746 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
NO2
Cl
O
O
O
CH3
77.498
77.317
77.000
76.682
77.5
77.0
76.5 ppm
200
180
160
140
120
100
80
60
40
20
ppm

1l

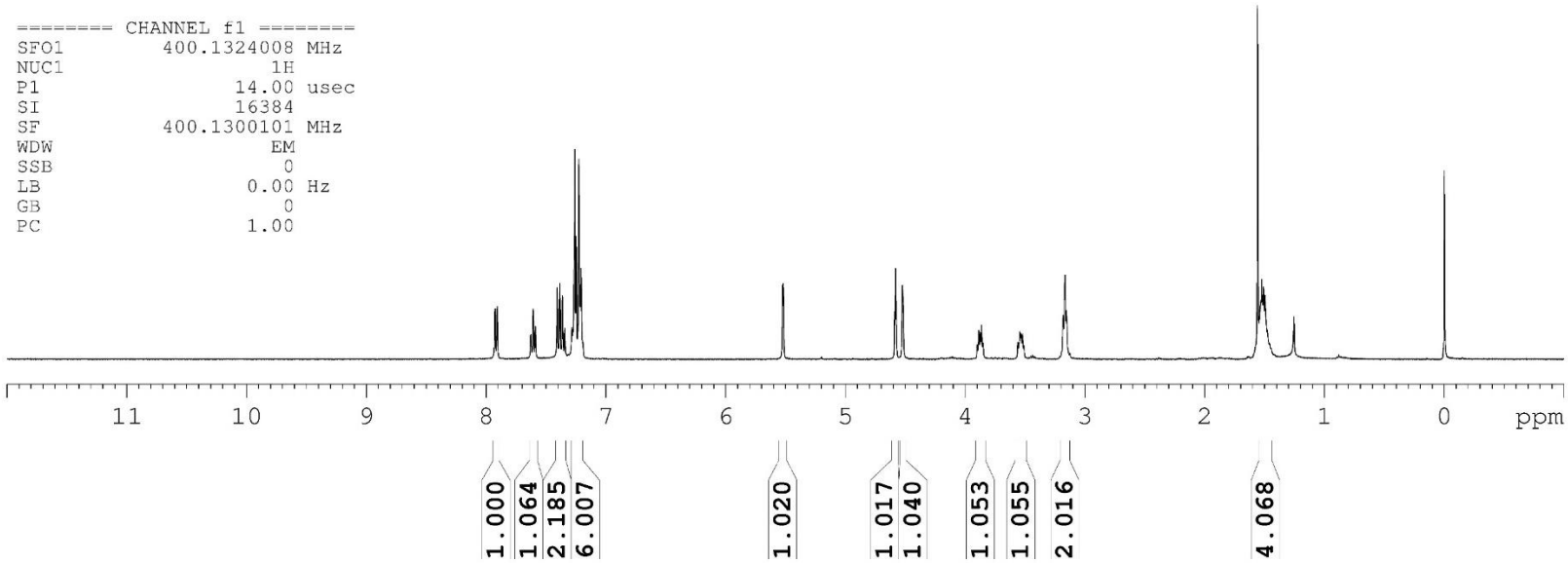


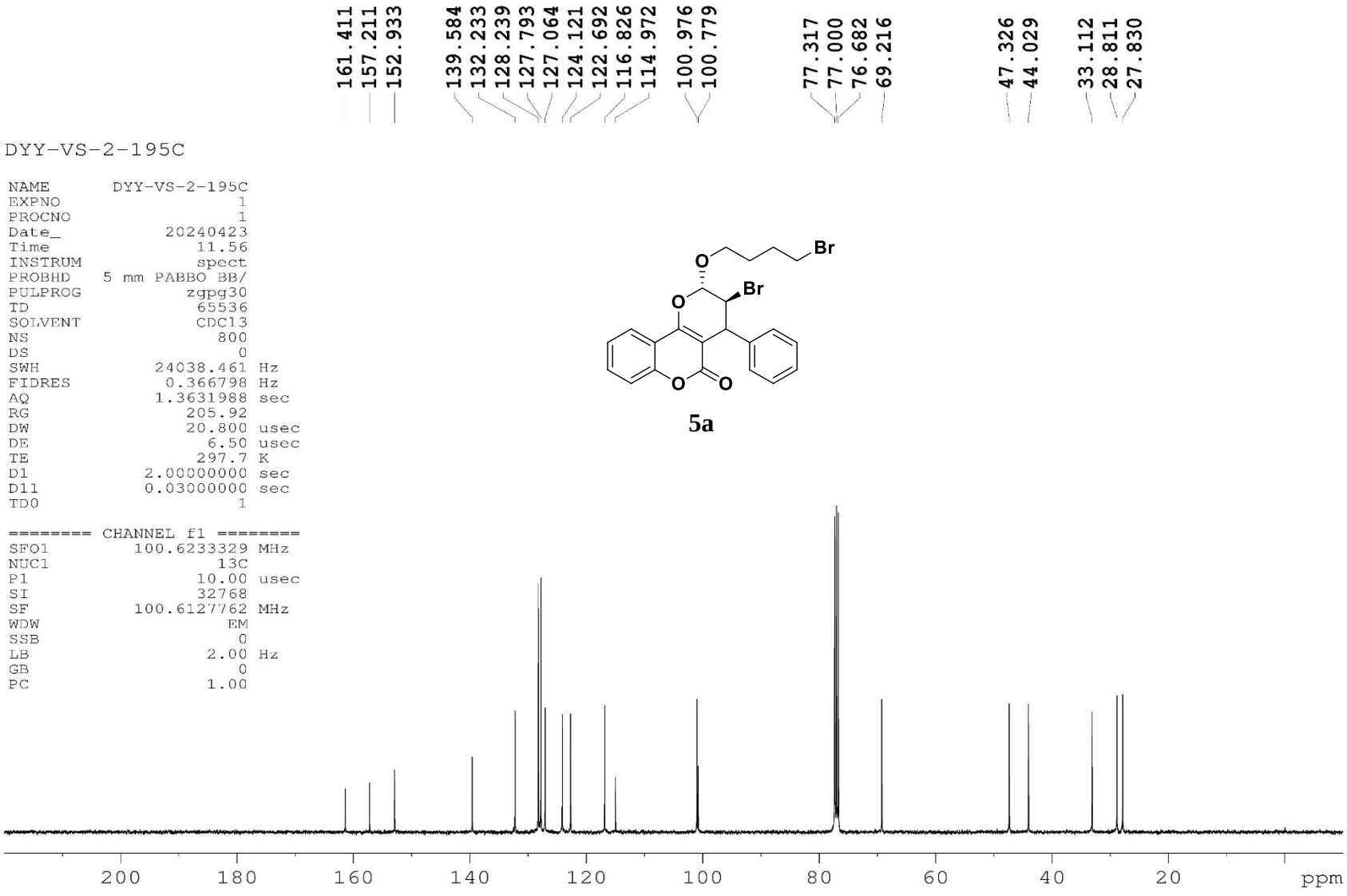
DYY-VS-2-195-1

NAME	DYY-VS-2-195-1
EXPNO	1
PROCNO	1
Date_	20240423
Time	10.51
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	296.0 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300101 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

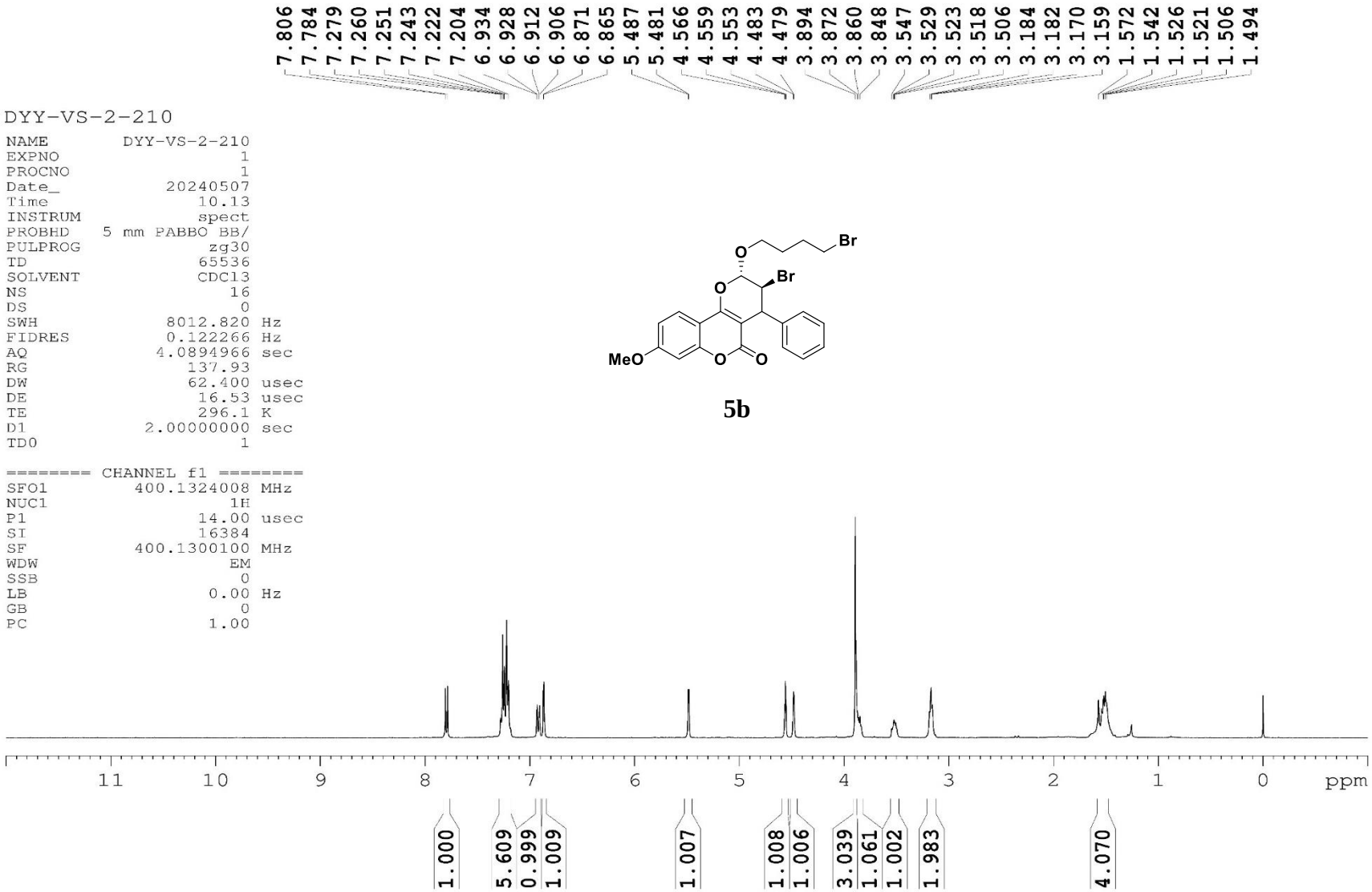


5a

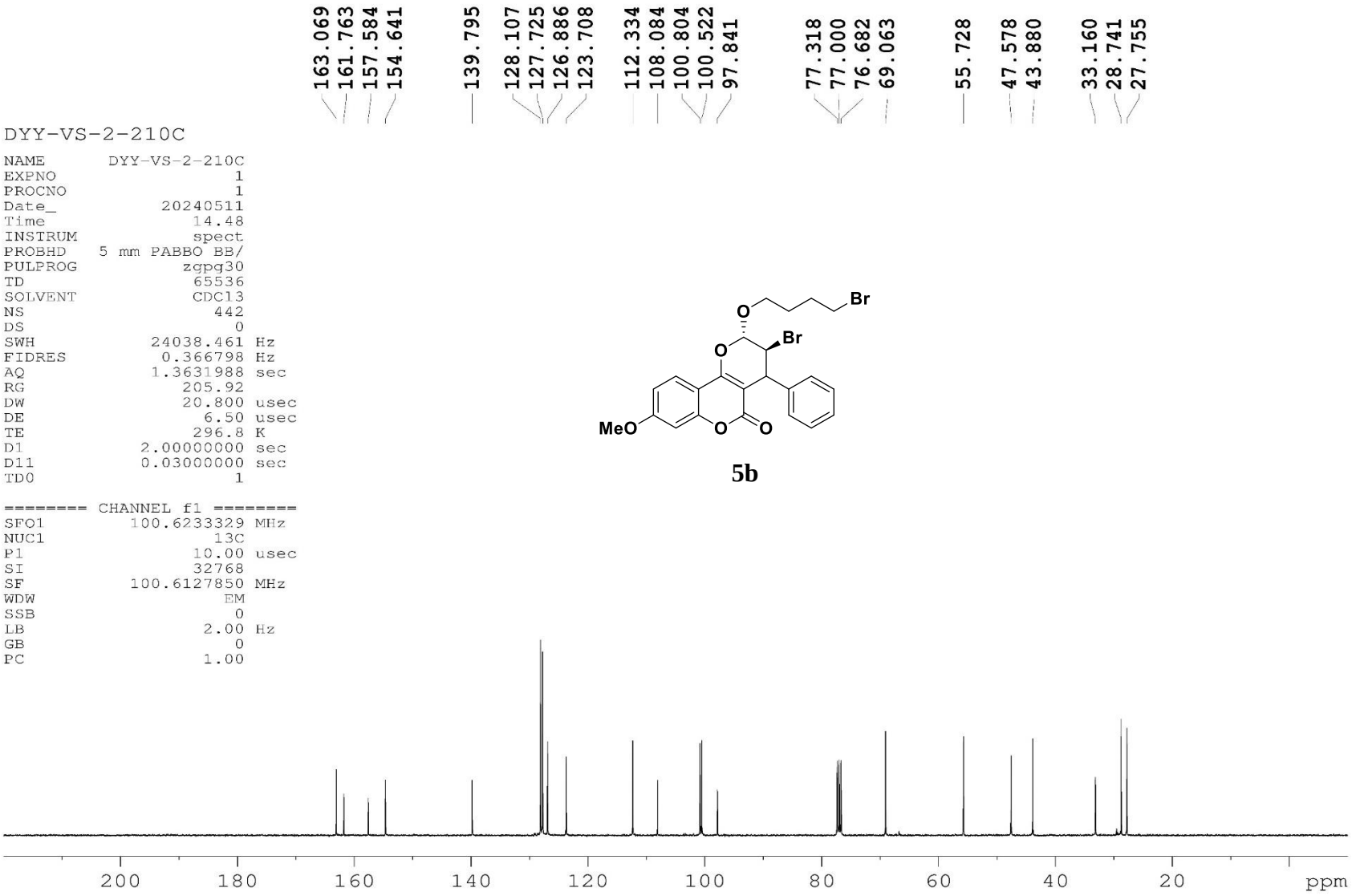



161.411
157.211
152.933
139.584
132.233
128.239
127.793
127.064
124.121
122.692
116.826
114.972
100.976
100.779
77.317
77.000
76.682
69.216
47.326
44.029
33.112
28.811
27.830
DYY-VS-2-195C
NAME DYY-VS-2-195C
EXPNO 1
PROCNO 1
Date_ 20240423
Time 11.56
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 800
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 297.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127762 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

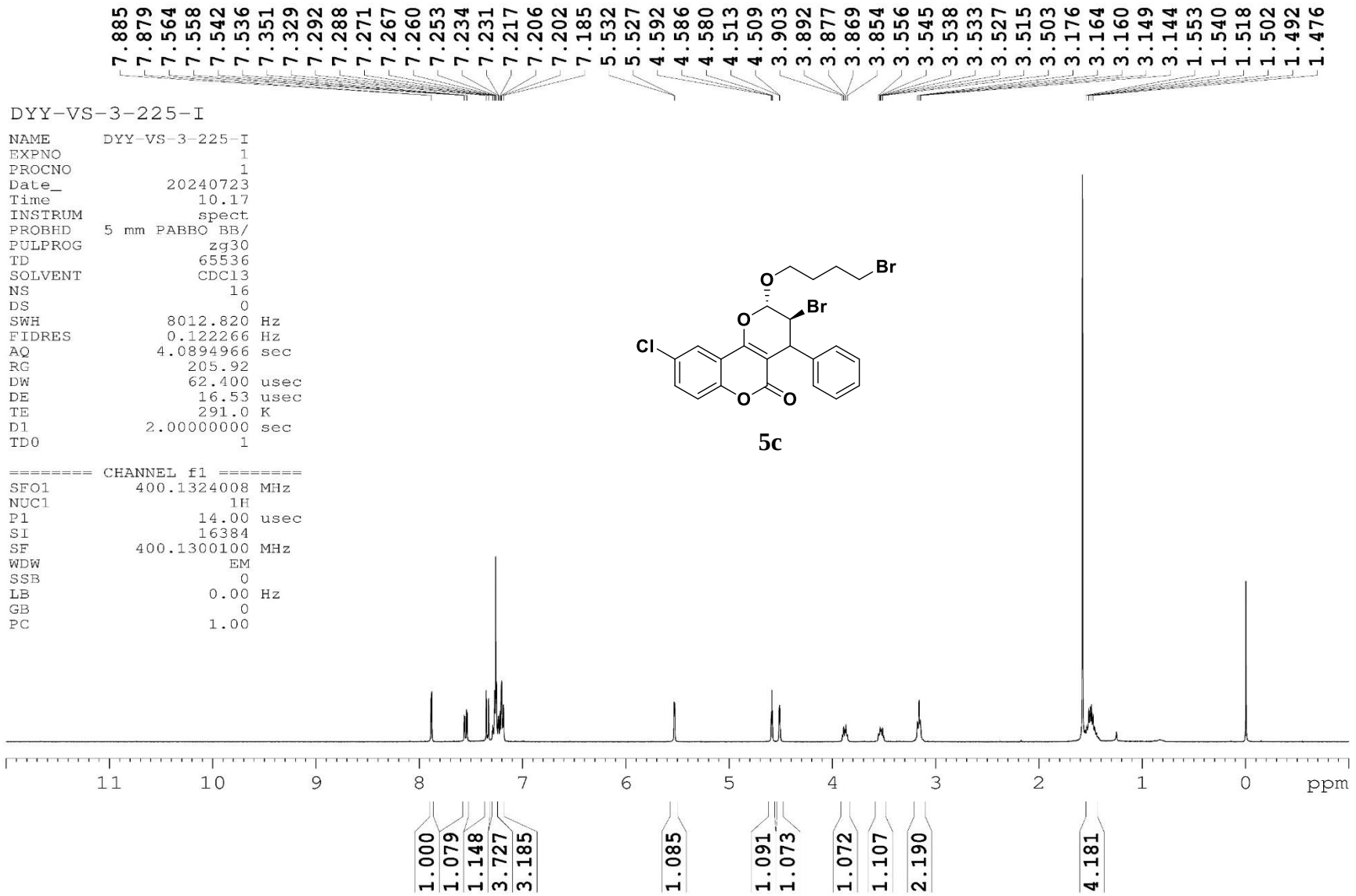
5a


7.806
7.784
7.279
7.260
7.251
7.243
7.222
7.204
6.934
6.928
6.912
6.906
6.871
6.865
5.487
5.481
4.566
4.559
4.553
4.483
4.479
3.894
3.872
3.860
3.848
3.547
3.529
3.523
3.518
3.506
3.184
3.182
3.170
3.159
1.572
1.542
1.526
1.521
1.506
1.494
DYY-VS-2-210
NAME DYY-VS-2-210
EXPNO 1
PROCNO 1
Date_ 20240507
Time 10.13
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 137.93
DW 62.400 usec
DE 16.53 usec
TE 296.1 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
MeO
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
5.609
0.999
1.009
1.007
1.008
1.006
3.039
1.061
1.002
1.983
4.070

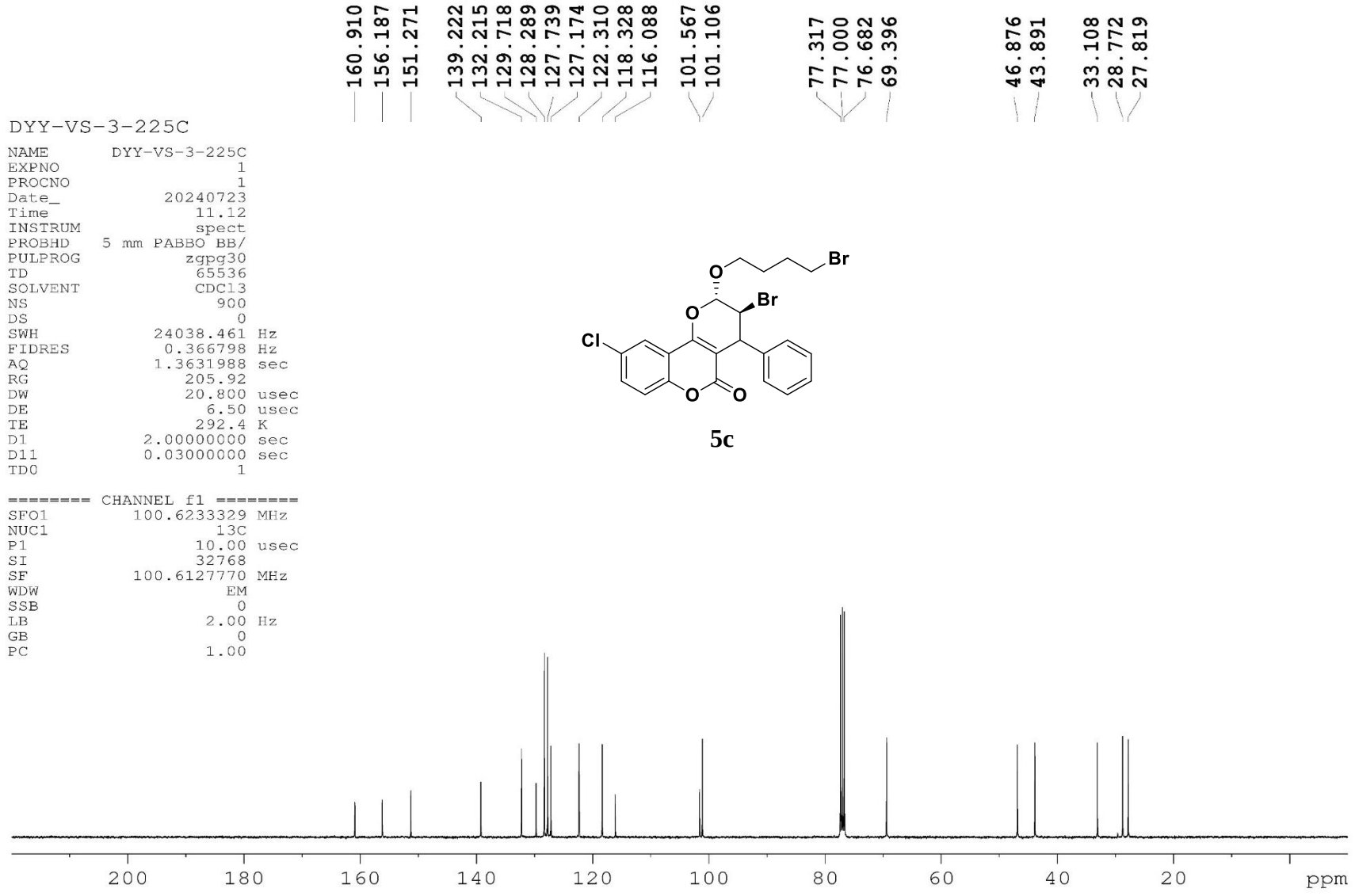
5b


163.069
161.763
157.584
154.641
139.795
128.107
127.725
126.886
123.708
112.334
108.084
100.804
100.522
97.841
77.318
77.000
76.682
69.063
55.728
47.578
43.880
33.160
28.741
27.755
DYY-VS-2-210C
NAME DYY-VS-2-210C
EXPNO 1
PROCNO 1
Date_ 20240511
Time 14.48
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 442
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 296.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127850 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
MeO
O
O
200
180
160
140
120
100
80
60
40
20
ppm

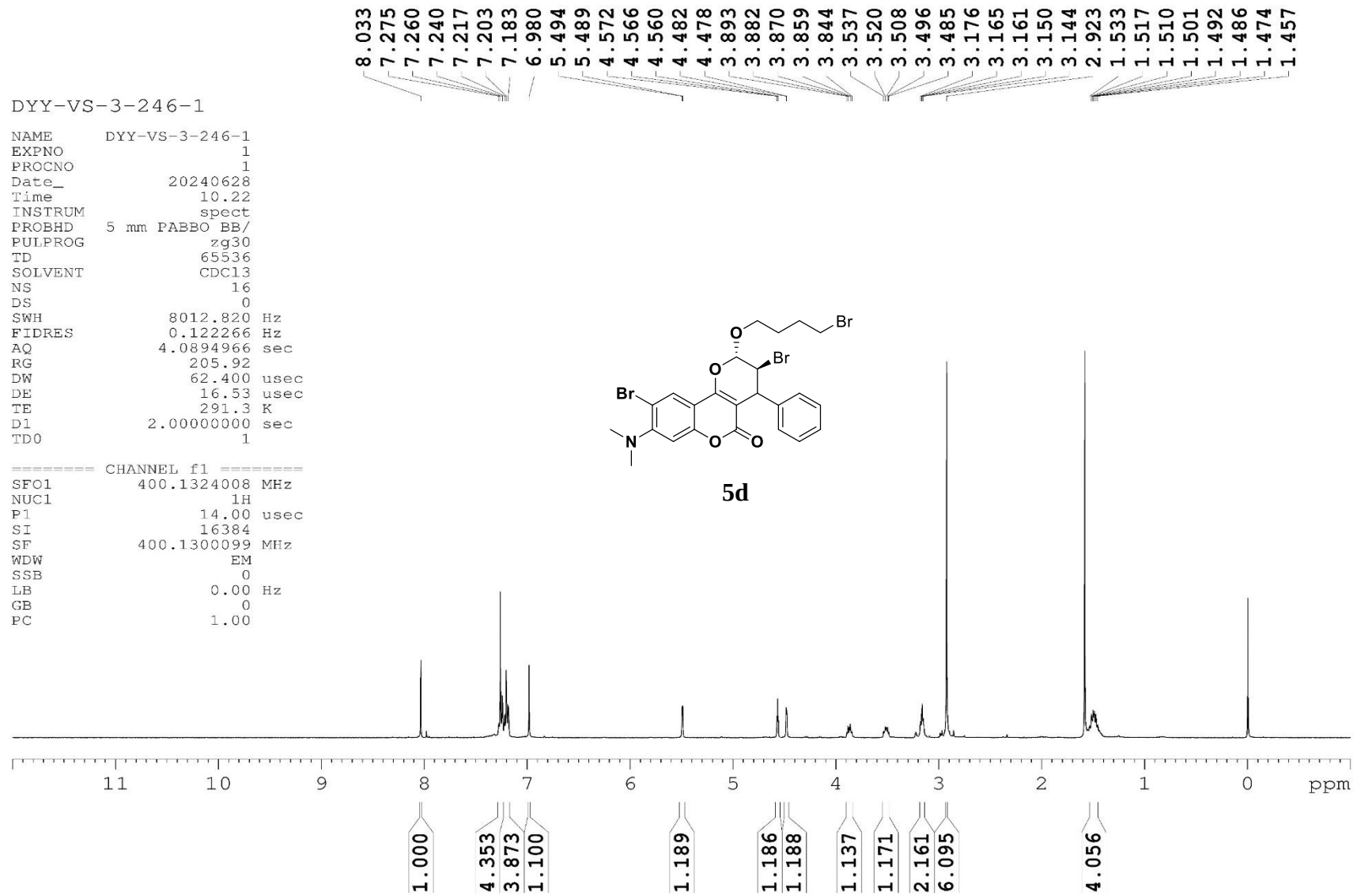
5b

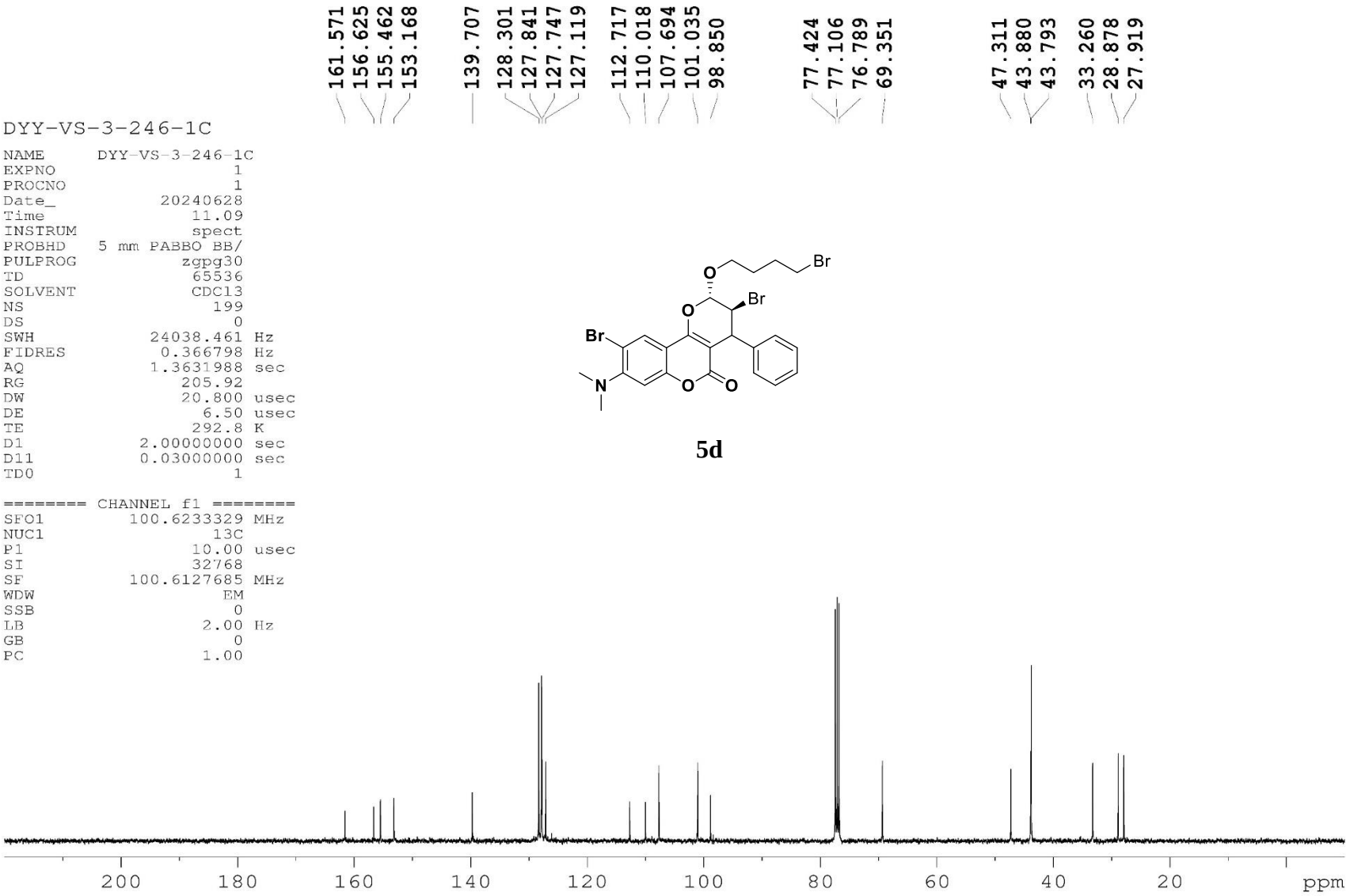

7.885
7.879
7.564
7.558
7.542
7.536
7.351
7.329
7.292
7.288
7.271
7.267
7.260
7.253
7.234
7.231
7.217
7.206
7.202
7.185
5.532
5.527
4.592
4.586
4.580
4.513
4.509
3.903
3.892
3.877
3.869
3.854
3.556
3.545
3.538
3.533
3.527
3.515
3.503
3.176
3.164
3.160
3.149
3.144
1.553
1.540
1.518
1.502
1.492
1.476
DYY-VS-3-225-I
NAME DYY-VS-3-225-I
EXPNO 1
PROCNO 1
Date_ 20240723
Time 10.17
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.0 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
Cl
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.079
1.148
3.727
3.185
1.085
1.091
1.073
1.072
1.107
2.190
4.181

5c

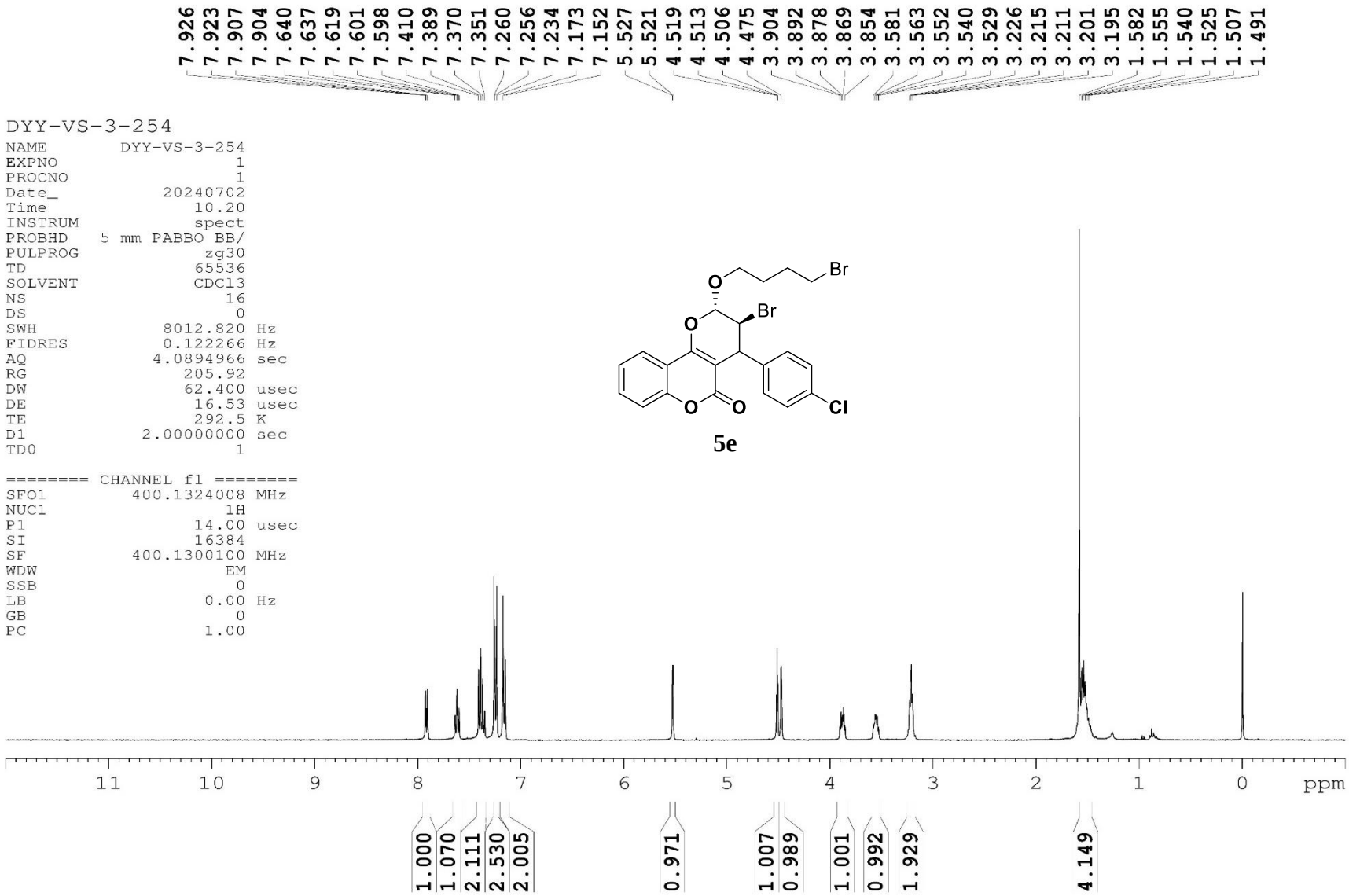

160.910
156.187
151.271
139.222
132.215
129.718
128.289
127.739
127.174
122.310
118.328
116.088
101.567
101.106
77.317
77.000
76.682
69.396
46.876
43.891
33.108
28.772
27.819
DYY-VS-3-225C
NAME DYY-VS-3-225C
EXPNO 1
PROCNO 1
Date_ 20240723
Time 11.12
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 900
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127770 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
Br
O
Br
Cl
O
O
200
180
160
140
120
100
80
60
40
20
ppm

5c

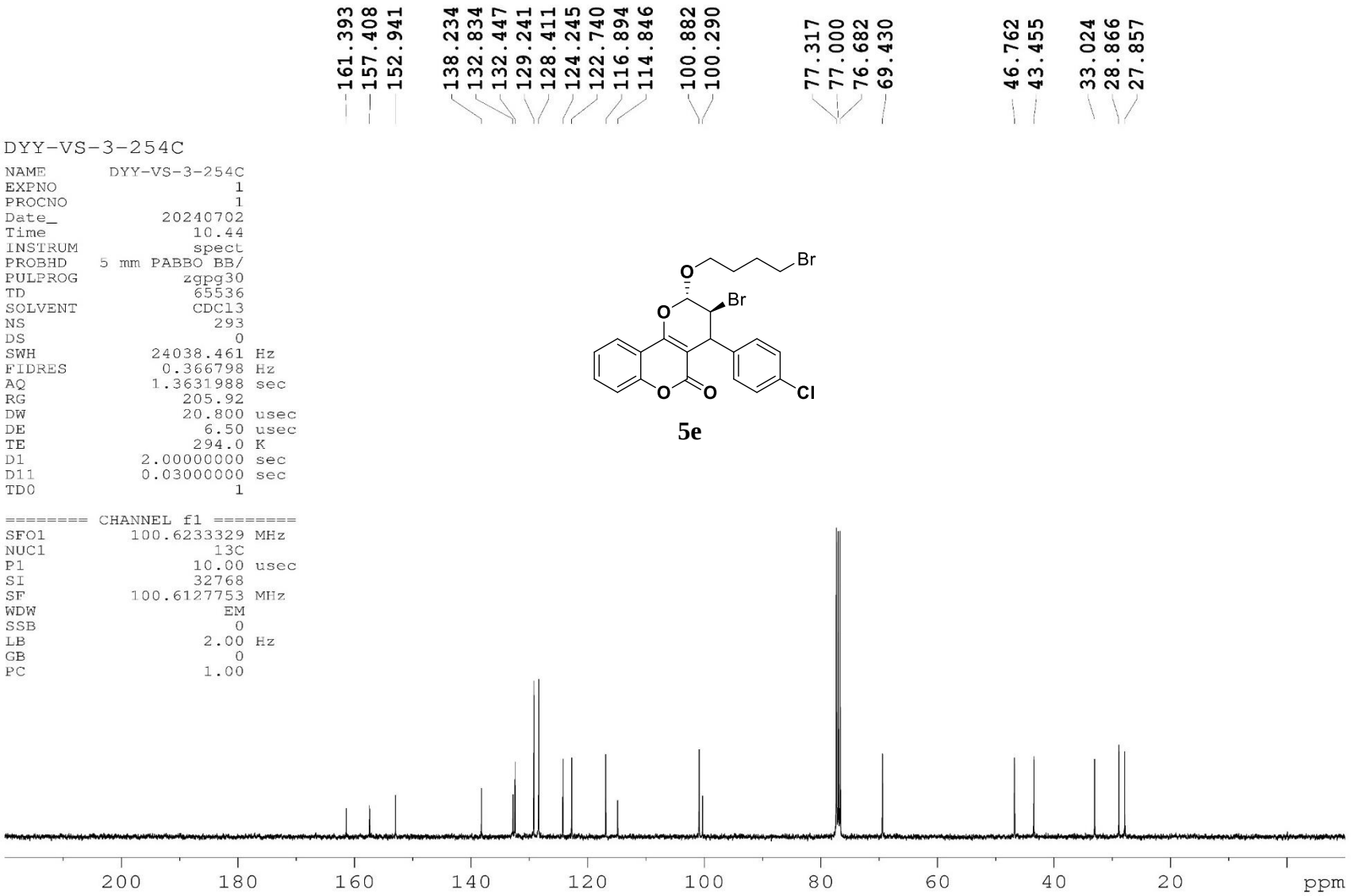

8.033
7.275
7.260
7.240
7.217
7.203
7.183
6.980
5.494
5.489
4.572
4.566
4.560
4.482
4.478
3.893
3.882
3.870
3.859
3.844
3.537
3.520
3.508
3.496
3.485
3.176
3.165
3.161
3.150
3.144
2.923
1.533
1.517
1.510
1.501
1.492
1.486
1.474
1.457
DYY-VS-3-246-1
NAME DYY-VS-3-246-1
EXPNO 1
PROCNO 1
Date_ 20240628
Time 10.22
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.3 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300099 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
Br
N
O
O
5d
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
4.353
3.873
1.100
1.189
1.186
1.188
1.137
1.171
2.161
6.095
4.056

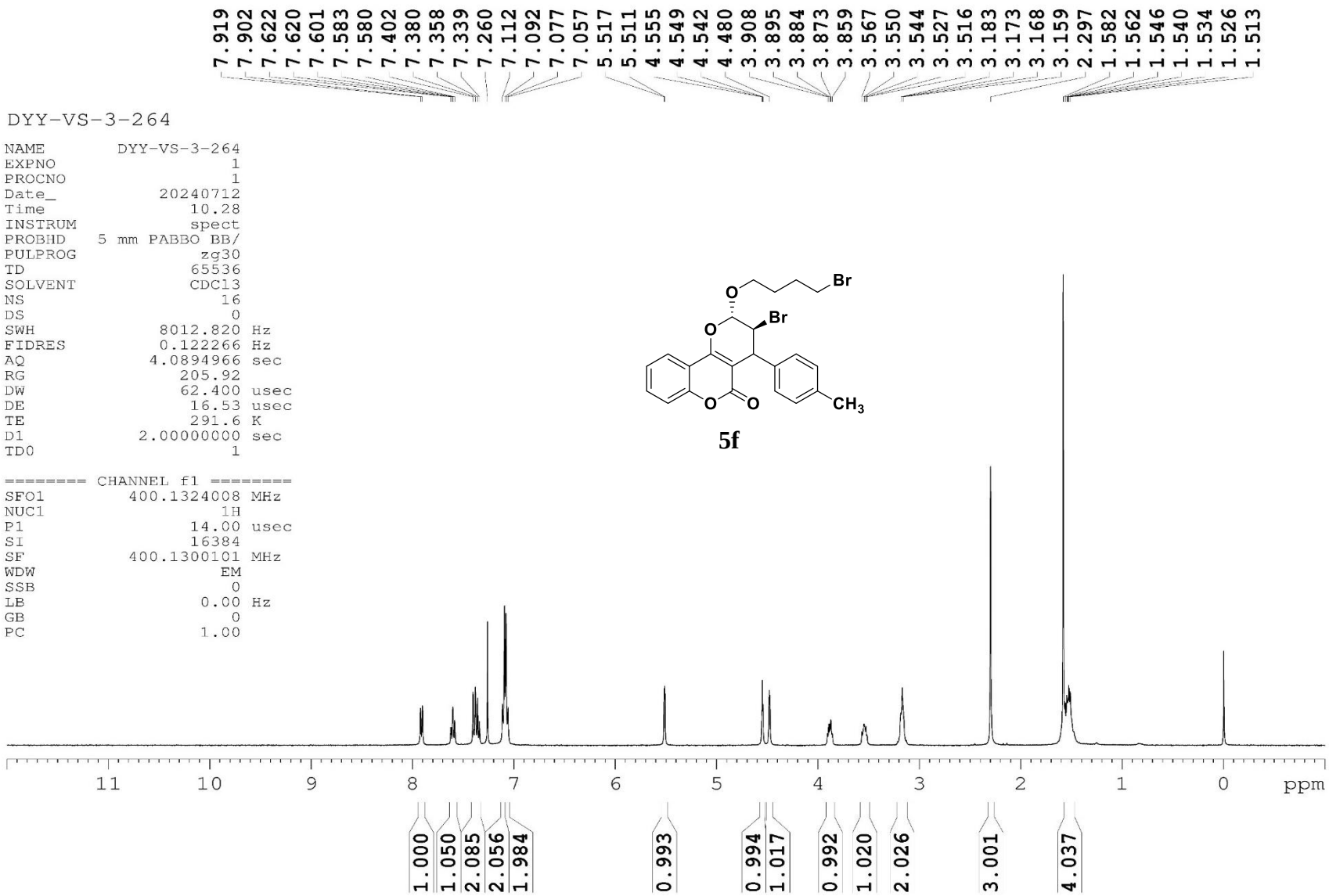

161.571
156.625
155.462
153.168
139.707
128.301
127.841
127.747
127.119
112.717
110.018
107.694
101.035
98.850
77.424
77.106
76.789
69.351
47.311
43.880
43.793
33.260
28.878
27.919
DYY-VS-3-246-1C
NAME DYY-VS-3-246-1C
EXPNO 1
PROCNO 1
Date_ 20240628
Time 11.09
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 199
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
Br
N
O
O
200
180
160
140
120
100
80
60
40
20
ppm

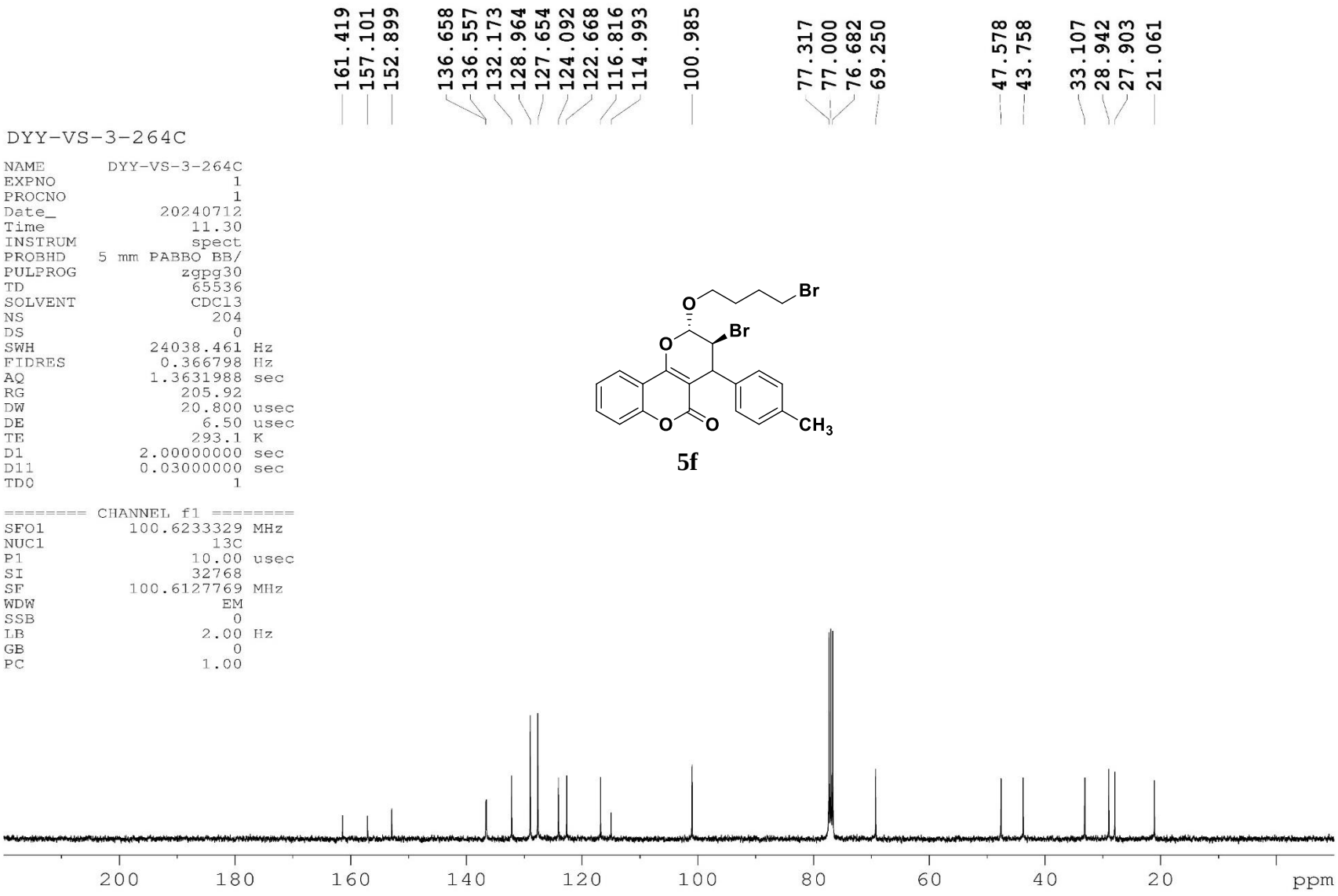
5d


7.926
7.923
7.907
7.904
7.640
7.637
7.619
7.601
7.598
7.410
7.389
7.370
7.351
7.260
7.256
7.234
7.173
7.152
5.527
5.521
4.519
4.513
4.506
4.475
3.904
3.892
3.878
3.869
3.854
3.581
3.563
3.552
3.540
3.529
3.226
3.215
3.211
3.201
3.195
1.582
1.555
1.540
1.525
1.507
1.491
DYY-VS-3-254
NAME DYY-VS-3-254
EXPNO 1
PROCNO 1
Date_ 20240702
Time 10.20
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 292.5 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
Cl
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.070
2.111
2.530
2.005
0.971
1.007
0.989
1.001
0.992
1.929
4.149

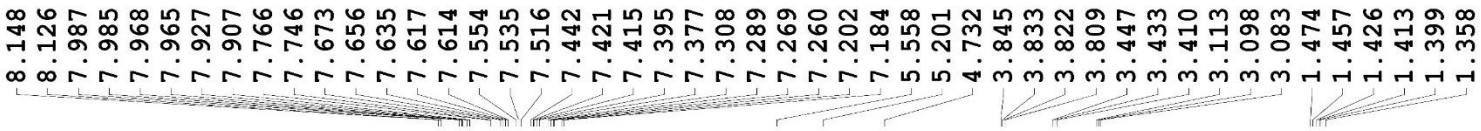
5e


161.393
157.408
152.941
138.234
132.834
132.447
129.241
128.411
124.245
122.740
116.894
114.846
100.882
100.290
77.317
77.000
76.682
69.430
46.762
43.455
33.024
28.866
27.857
DYY-VS-3-254C
NAME DYY-VS-3-254C
EXPNO 1
PROCNO 1
Date_ 20240702
Time 10.44
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 293
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 294.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127753 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
Cl
5e
200
180
160
140
120
100
80
60
40
20
ppm


7.919
7.902
7.622
7.620
7.601
7.583
7.580
7.402
7.380
7.358
7.339
7.260
7.112
7.092
7.077
7.057
5.517
5.511
4.555
4.549
4.542
4.480
3.908
3.895
3.884
3.873
3.859
3.567
3.550
3.544
3.527
3.516
3.183
3.173
3.168
3.159
2.297
1.582
1.562
1.546
1.540
1.534
1.526
1.513
DYY-VS-3-264
NAME DYY-VS-3-264
EXPNO 1
PROCNO 1
Date_ 20240712
Time 10.28
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.6 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300101 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
CH3
5f
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.050
2.085
2.056
1.984
0.993
0.994
1.017
0.992
1.020
2.026
3.001
4.037


161.419
157.101
152.899
136.658
136.557
132.173
128.964
127.654
124.092
122.668
116.816
114.993
100.985
77.317
77.000
76.682
69.250
47.578
43.758
33.107
28.942
27.903
21.061
DYY-VS-3-264C
NAME DYY-VS-3-264C
EXPNO 1
PROCNO 1
Date_ 20240712
Time 11.30
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 204
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127769 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
CH3
200
180
160
140
120
100
80
60
40
20
ppm

5f

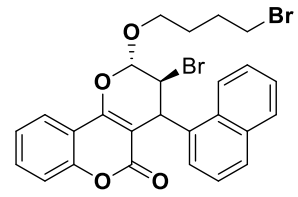


DYY-VS-3-243

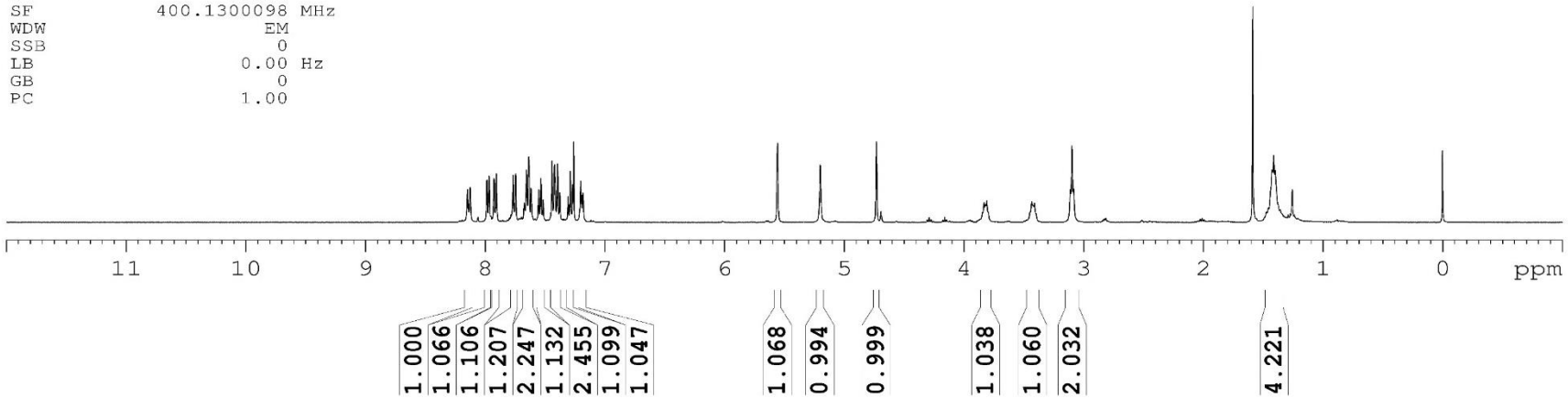
NAME	DYY-VS-3-243
EXPNO	1
PROCNO	1
Date_	20240618
Time	10.11
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	163.06
DW	62.400 usec
DE	16.53 usec
TE	291.8 K
D1	2.00000000 sec
TD0	1

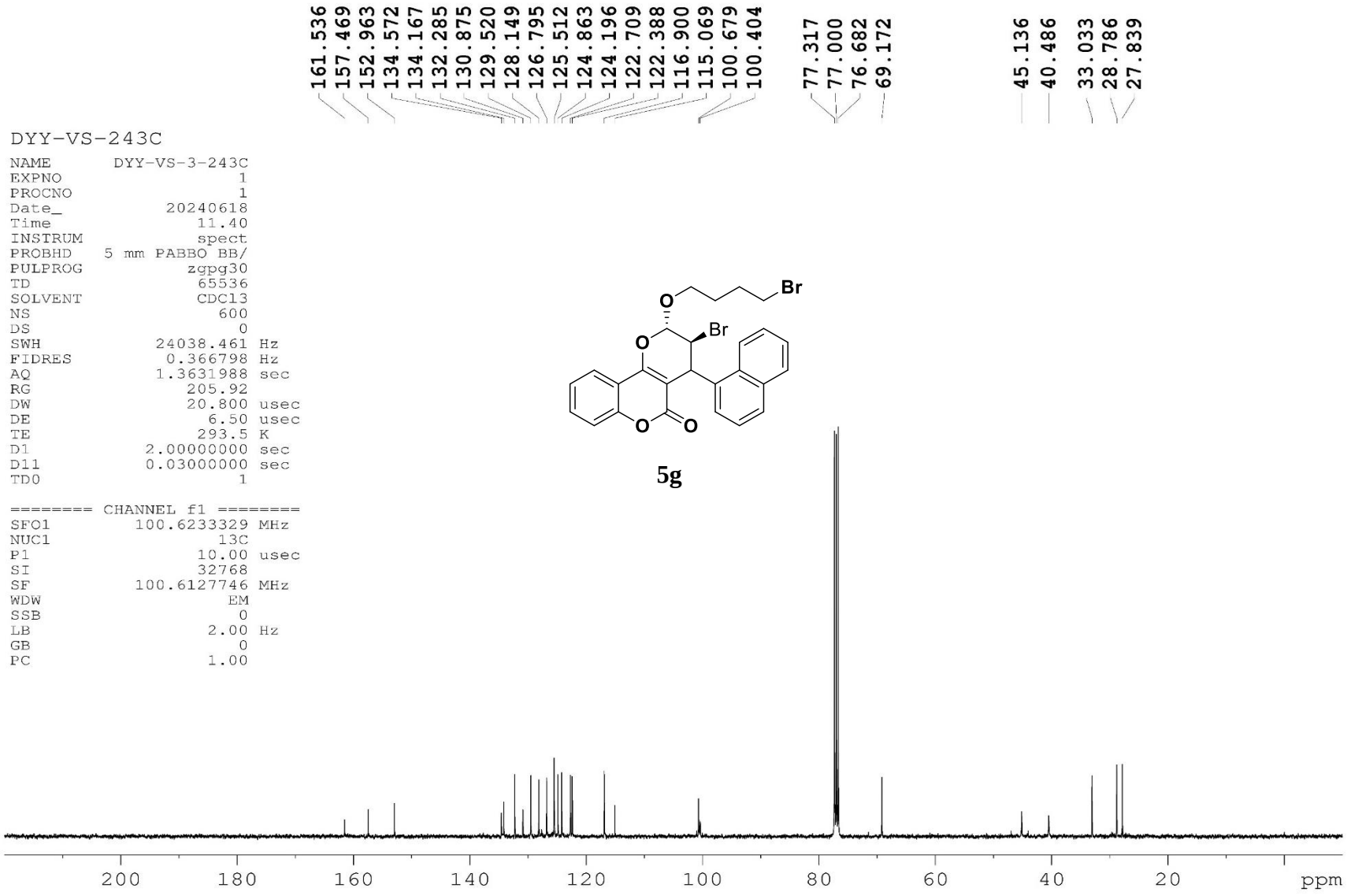
======== CHANNEL f1 ========

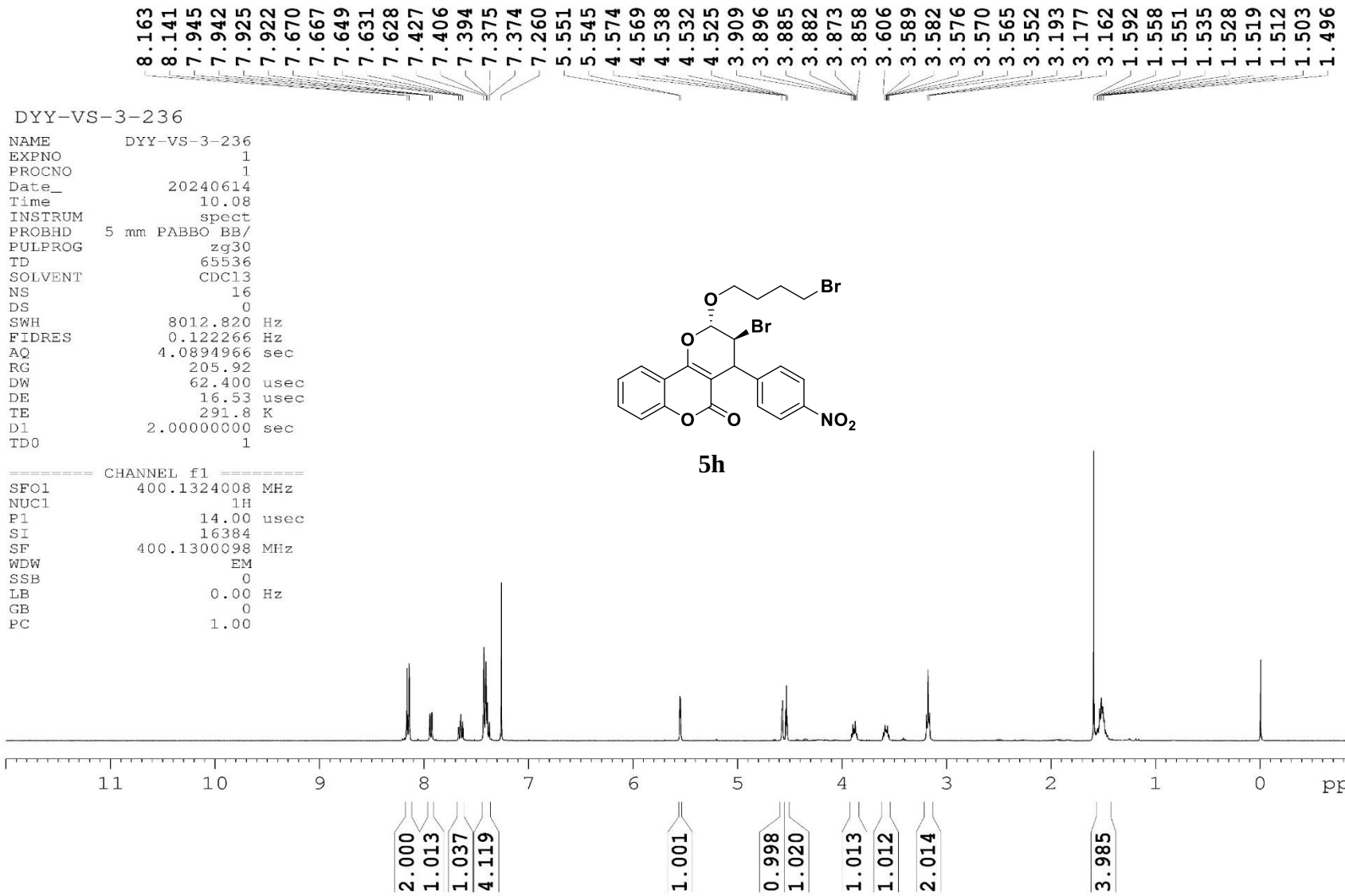
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300098 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



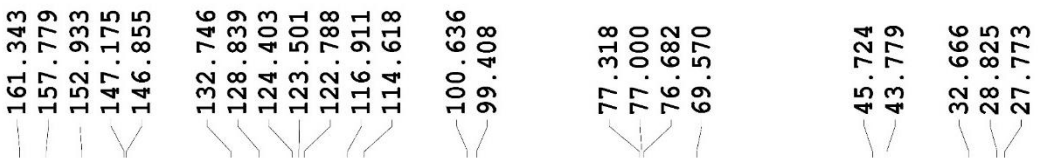
5g




161.536
157.469
152.963
134.572
134.167
132.285
130.875
129.520
128.149
126.795
125.512
124.863
124.196
122.709
122.388
116.900
115.069
100.679
100.404
77.317
77.000
76.682
69.172
45.136
40.486
33.033
28.786
27.839
DYY-VS-243C
NAME DYY-VS-3-243C
EXPNO 1
PROCNO 1
Date_ 20240618
Time 11.40
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 600
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127746 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
5g
200
180
160
140
120
100
80
60
40
20
ppm

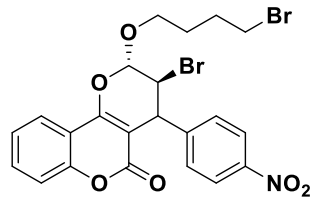

8.163
8.141
7.945
7.942
7.925
7.922
7.670
7.667
7.649
7.631
7.628
7.427
7.406
7.394
7.375
7.374
7.260
5.551
5.545
4.574
4.569
4.538
4.532
4.525
3.909
3.896
3.885
3.882
3.873
3.858
3.606
3.589
3.582
3.576
3.570
3.565
3.552
3.193
3.177
3.162
1.592
1.558
1.551
1.535
1.528
1.519
1.512
1.503
1.496
DYY-VS-3-236
NAME DYY-VS-3-236
EXPNO 1
PROCNO 1
Date_ 20240614
Time 10.08
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.8 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
O
O
NO2
11
10
9
8
7
6
5
4
3
2
1
0
ppm
2.000
1.013
1.037
4.119
1.001
0.998
1.020
1.013
1.012
2.014
3.985

5h

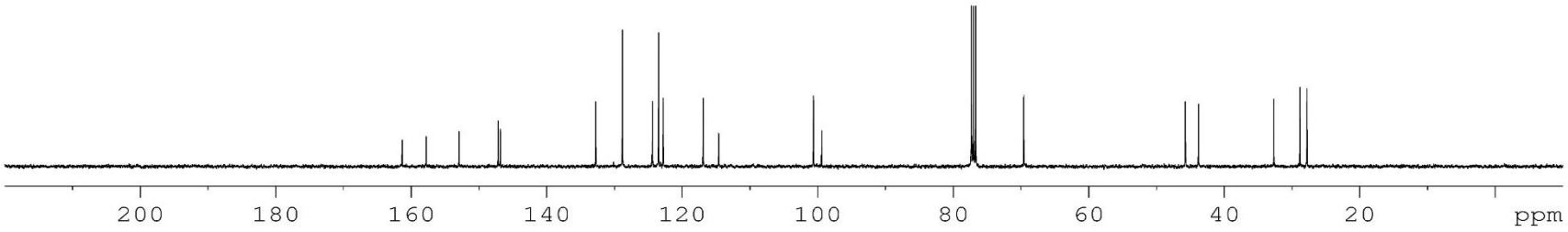


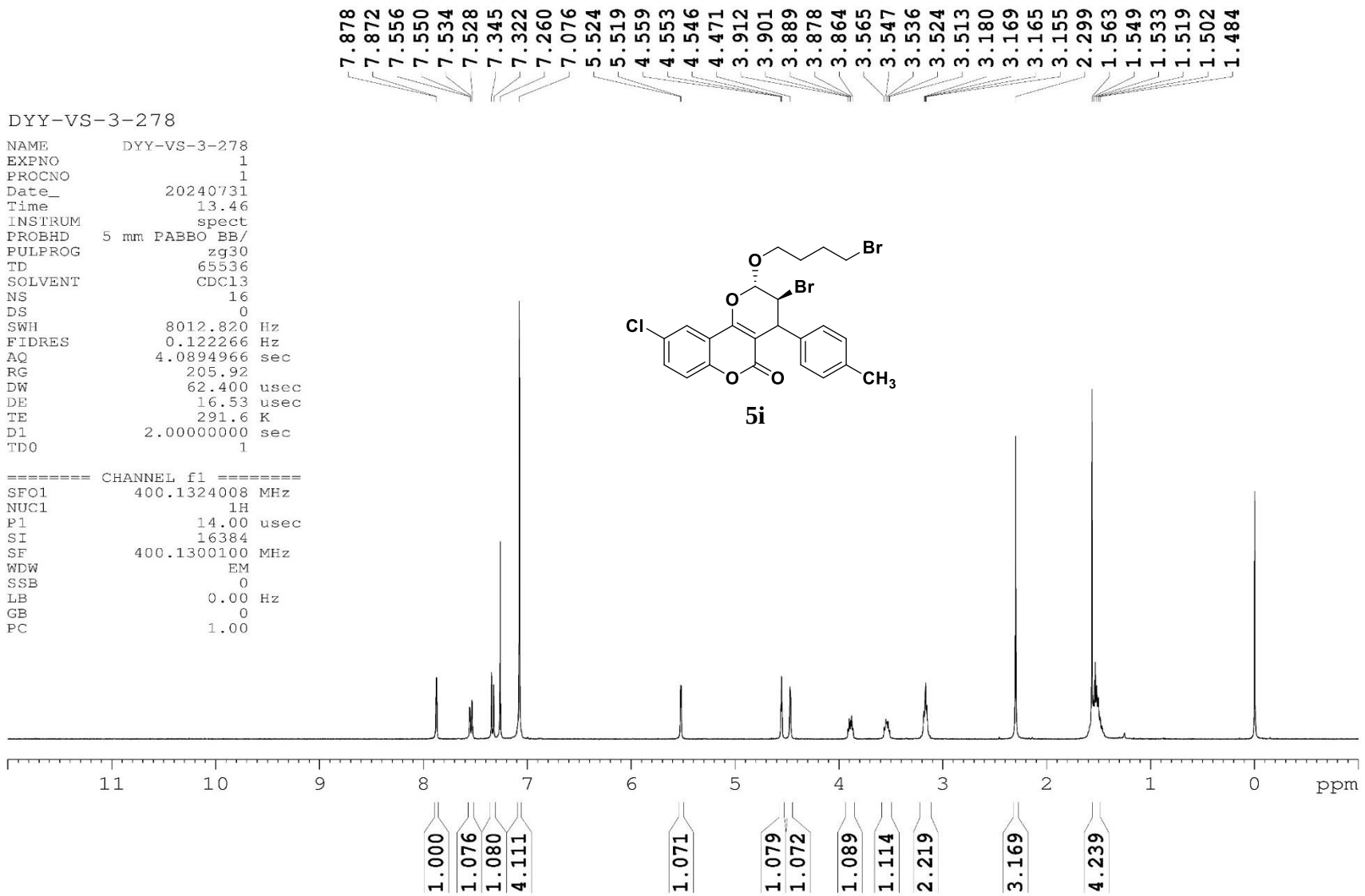
DYY-VS-3-236C

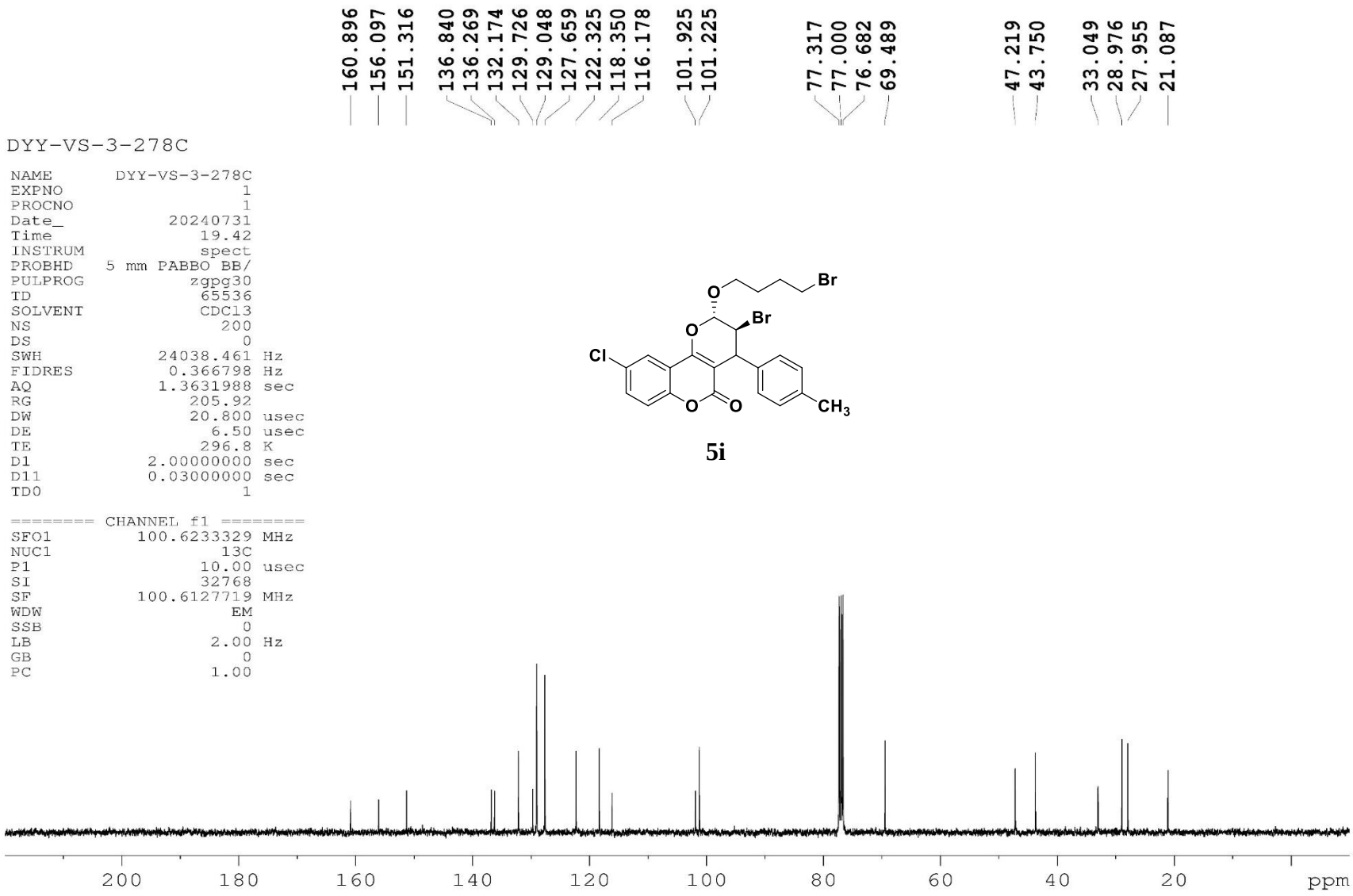
NAME	DYY-VS-3-236C
EXPNO	1
PROCNO	1
Date_	20240614
Time	11.17
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	135
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	292.3 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127803 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



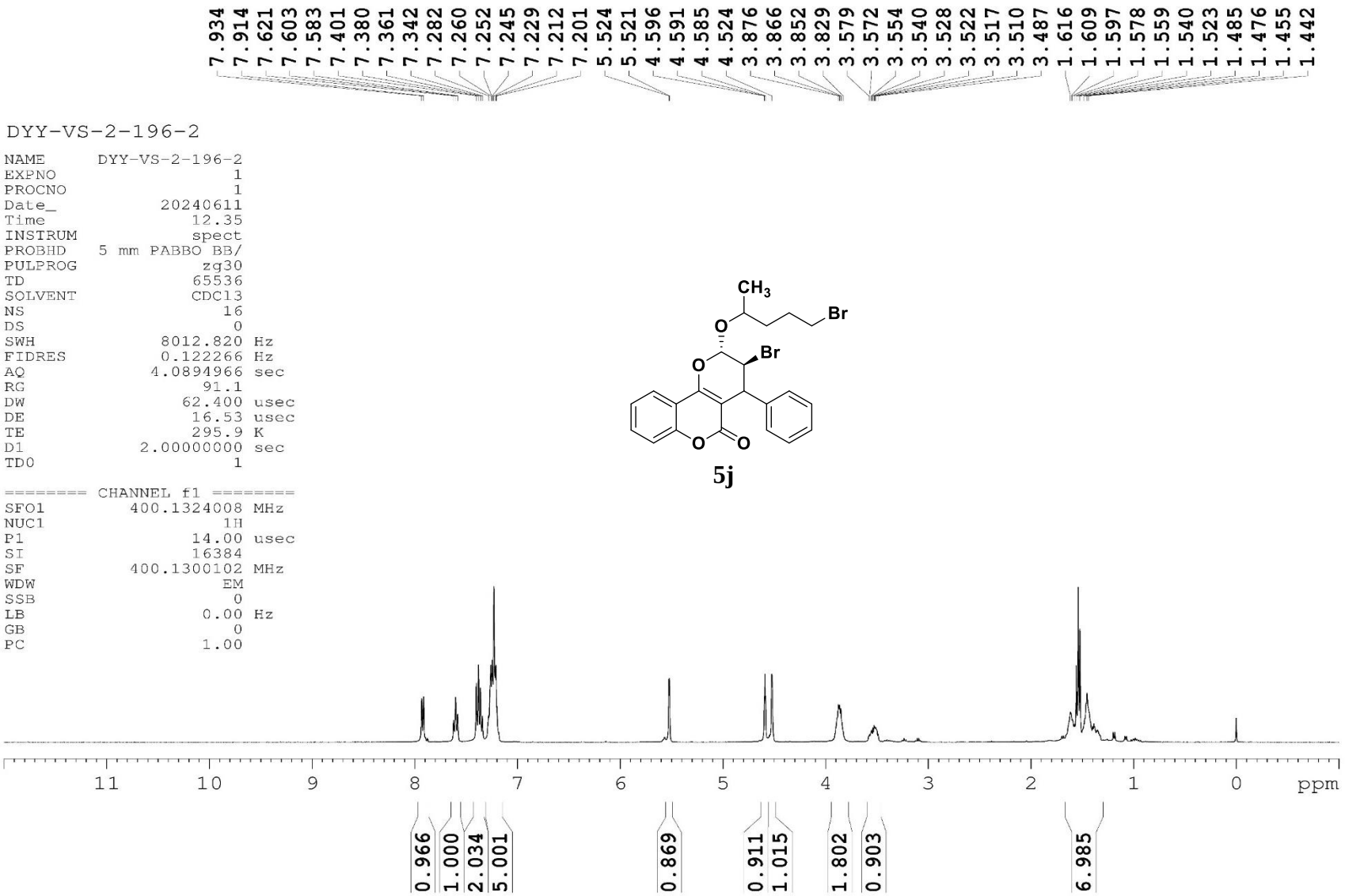
5h




7.878
7.872
7.556
7.550
7.534
7.528
7.345
7.322
7.260
7.076
5.524
5.519
4.559
4.553
4.546
4.471
3.912
3.901
3.889
3.878
3.864
3.565
3.547
3.536
3.524
3.513
3.180
3.169
3.165
3.155
2.299
1.563
1.549
1.533
1.519
1.502
1.484
DYY-VS-3-278
NAME DYY-VS-3-278
EXPNO 1
PROCNO 1
Date_ 20240731
Time 13.46
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.6 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300100 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
O
Br
O
Cl
O
O
CH3
5i
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.076
1.080
4.111
1.071
1.079
1.072
1.089
1.114
2.219
3.169
4.239


160.896
156.097
151.316
136.840
136.269
132.174
129.726
129.048
127.659
122.325
118.350
116.178
101.925
101.225
77.317
77.000
76.682
69.489
47.219
43.750
33.049
28.976
27.955
21.087
DYY-VS-3-278C
NAME DYY-VS-3-278C
EXPNO 1
PROCNO 1
Date_ 20240731
Time 19.42
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 200
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 296.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127719 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
O
Br
O
Cl
O
O
CH3
200
180
160
140
120
100
80
60
40
20
ppm

5i


7.934
7.914
7.621
7.603
7.583
7.401
7.380
7.361
7.342
7.282
7.260
7.252
7.245
7.229
7.212
7.201
5.524
5.521
4.596
4.591
4.585
4.524
3.876
3.866
3.852
3.829
3.579
3.572
3.554
3.540
3.528
3.522
3.517
3.510
3.487
1.616
1.609
1.597
1.578
1.559
1.540
1.523
1.485
1.476
1.455
1.442
DYY-VS-2-196-2
NAME DYY-VS-2-196-2
EXPNO 1
PROCNO 1
Date_ 20240611
Time 12.35
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 91.1
DW 62.400 usec
DE 16.53 usec
TE 295.9 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300102 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
CH3
O
Br
O
Br
O
O
11
10
9
8
7
6
5
4
3
2
1
0
ppm
0.966
1.000
2.034
5.001
0.869
0.911
1.015
1.802
0.903
6.985

5j

161.447
157.235
152.926
139.659
139.593
132.233
128.298
128.195
127.837
127.079
127.013
124.121
122.714
116.821
114.990
101.042
100.926
100.730

77.317
77.000
76.682
69.562
69.452

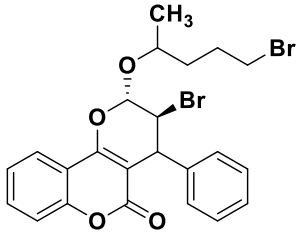
51.192
50.925
47.349
47.234
44.051
43.982
37.070
27.841
27.521
26.375
26.316

DYY-VS-2-196C

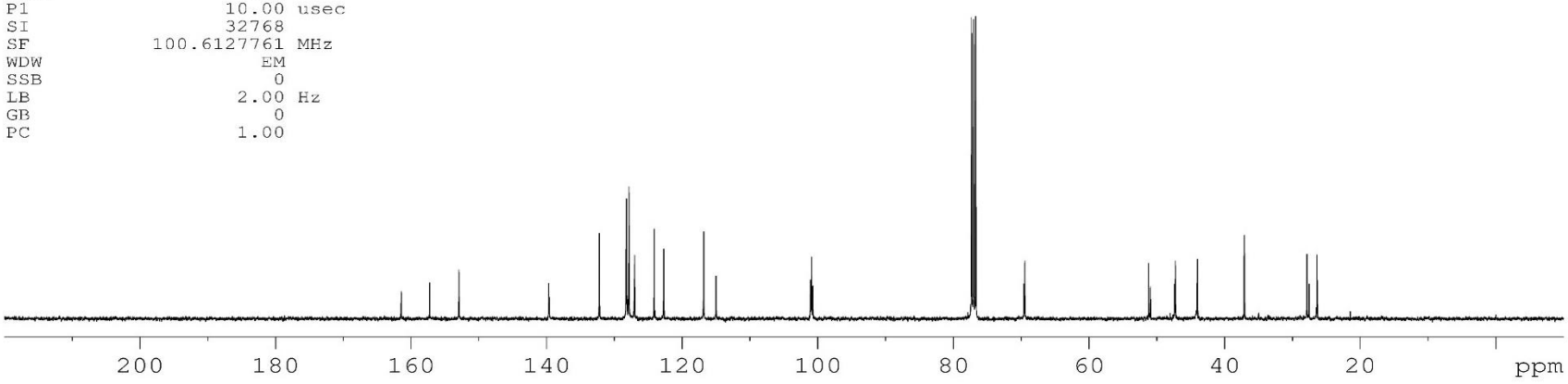
NAME	DYY-VS-2-196C
EXPNO	1
PROCNO	1
Date_	20240611
Time	12.32
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	500
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	296.9 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1

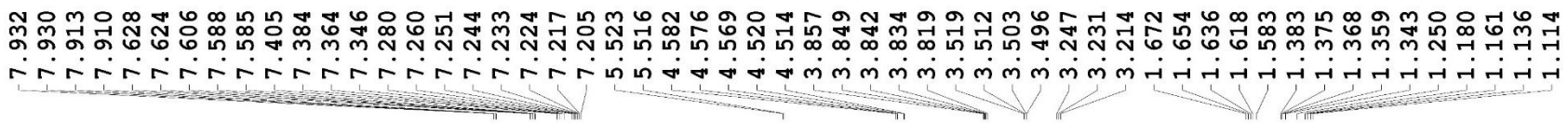
======== CHANNEL f1 ========

SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127761 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00



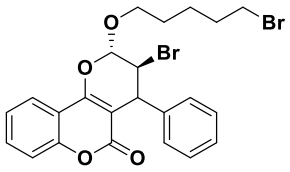
5j



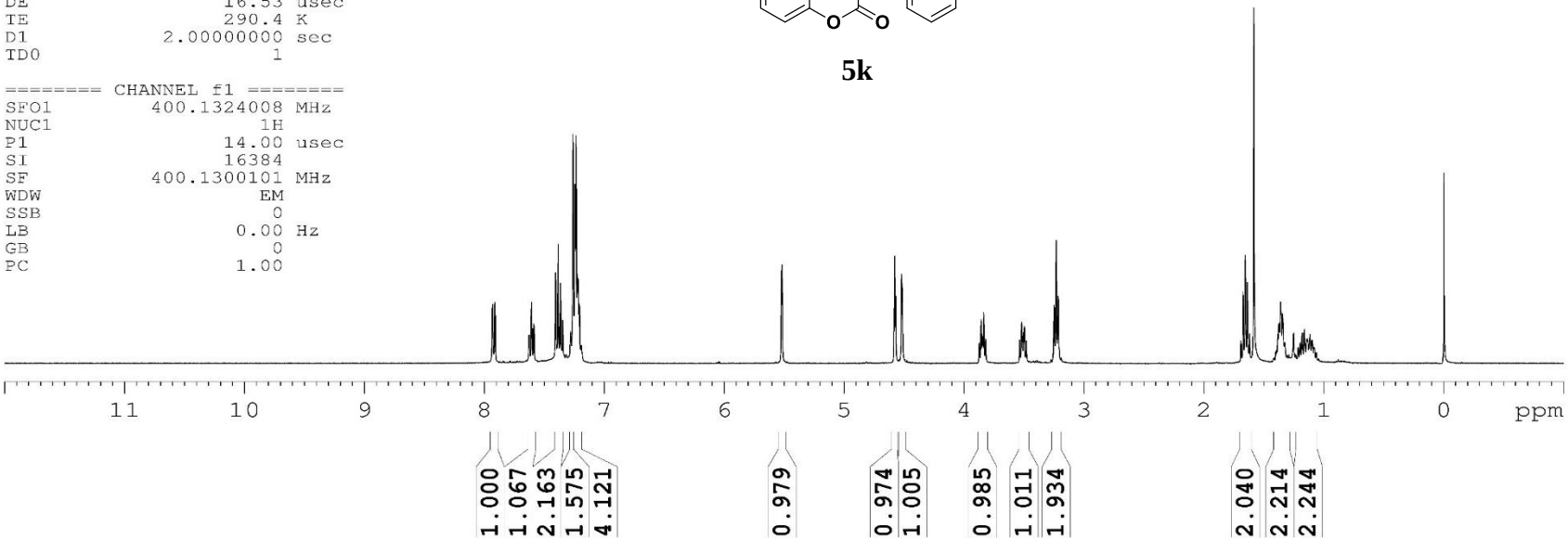


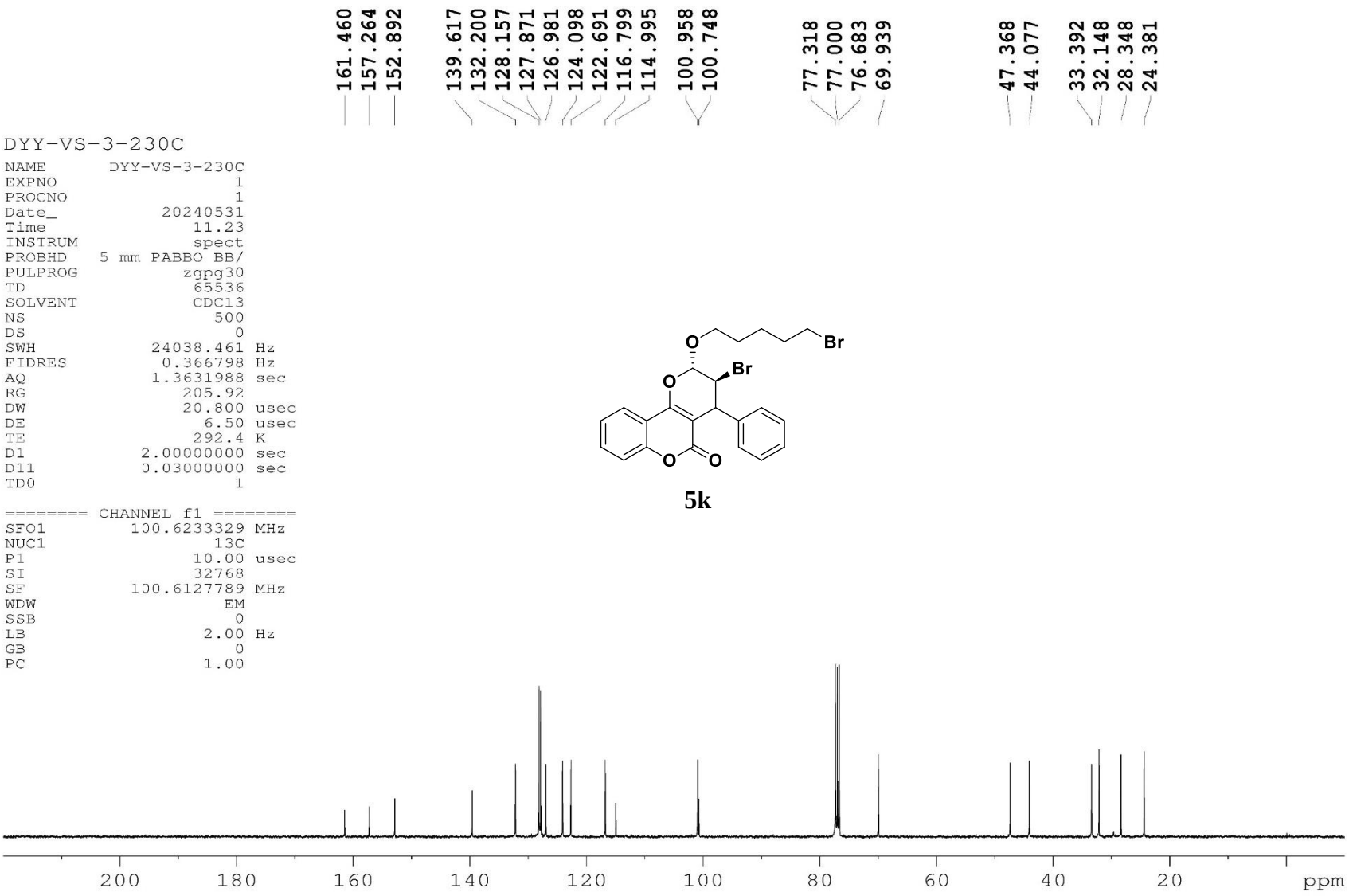
DYY-VS-3-230

NAME	DYY-VS-3-230
EXPNO	1
PROCNO	1
Date_	20240531
Time	10.19
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	290.4 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300101 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

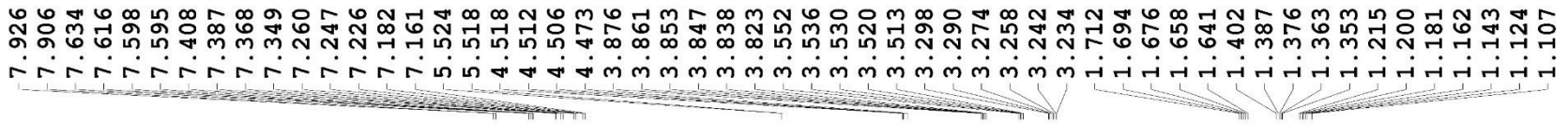


5k



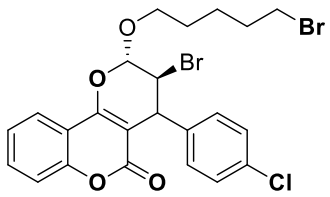

161.460
157.264
152.892
139.617
132.200
128.157
127.871
126.981
124.098
122.691
116.799
114.995
100.958
100.748
77.318
77.000
76.683
69.939
47.368
44.077
33.392
32.148
28.348
24.381
DYY-VS-3-230C
NAME DYY-VS-3-230C
EXPNO 1
PROCNO 1
Date_ 20240531
Time 11.23
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 500
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127789 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
Br
Br
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

5k

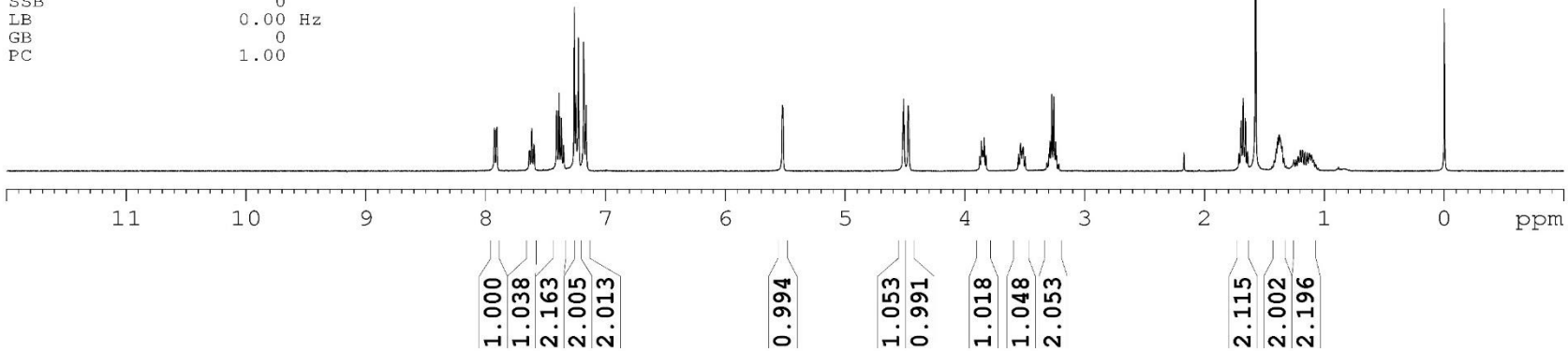


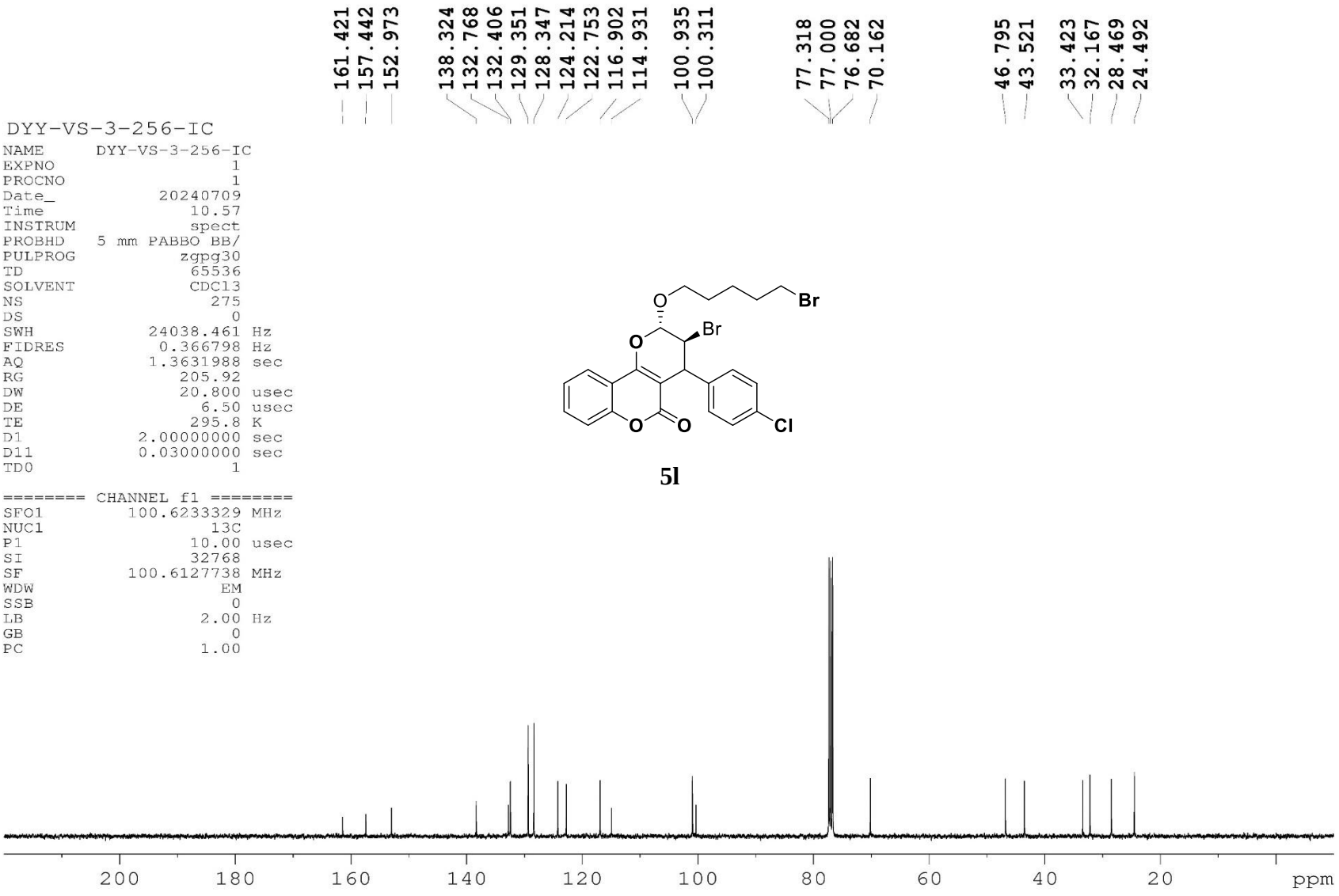
DYY-VS-3-256-I

NAME	DYY-VS-3-256-I
EXPNO	1
PROCNO	1
Date_	20240709
Time	10.20
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	294.7 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300100 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

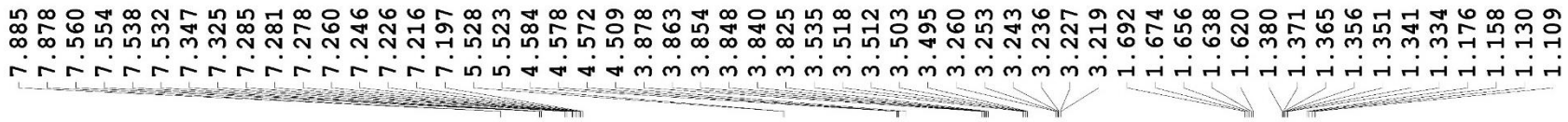


5l



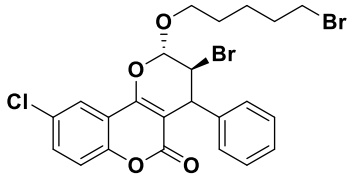

161.421
157.442
152.973
138.324
132.768
132.406
129.351
128.347
124.214
122.753
116.902
114.931
100.935
100.311
77.318
77.000
76.682
70.162
46.795
43.521
33.423
32.167
28.469
24.492
DYY-VS-3-256-IC
NAME DYY-VS-3-256-IC
EXPNO 1
PROCNO 1
Date_ 20240709
Time 10.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 275
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 295.8 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127738 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
Br
Br
O
O
O
O
Cl
200
180
160
140
120
100
80
60
40
20
ppm

5l

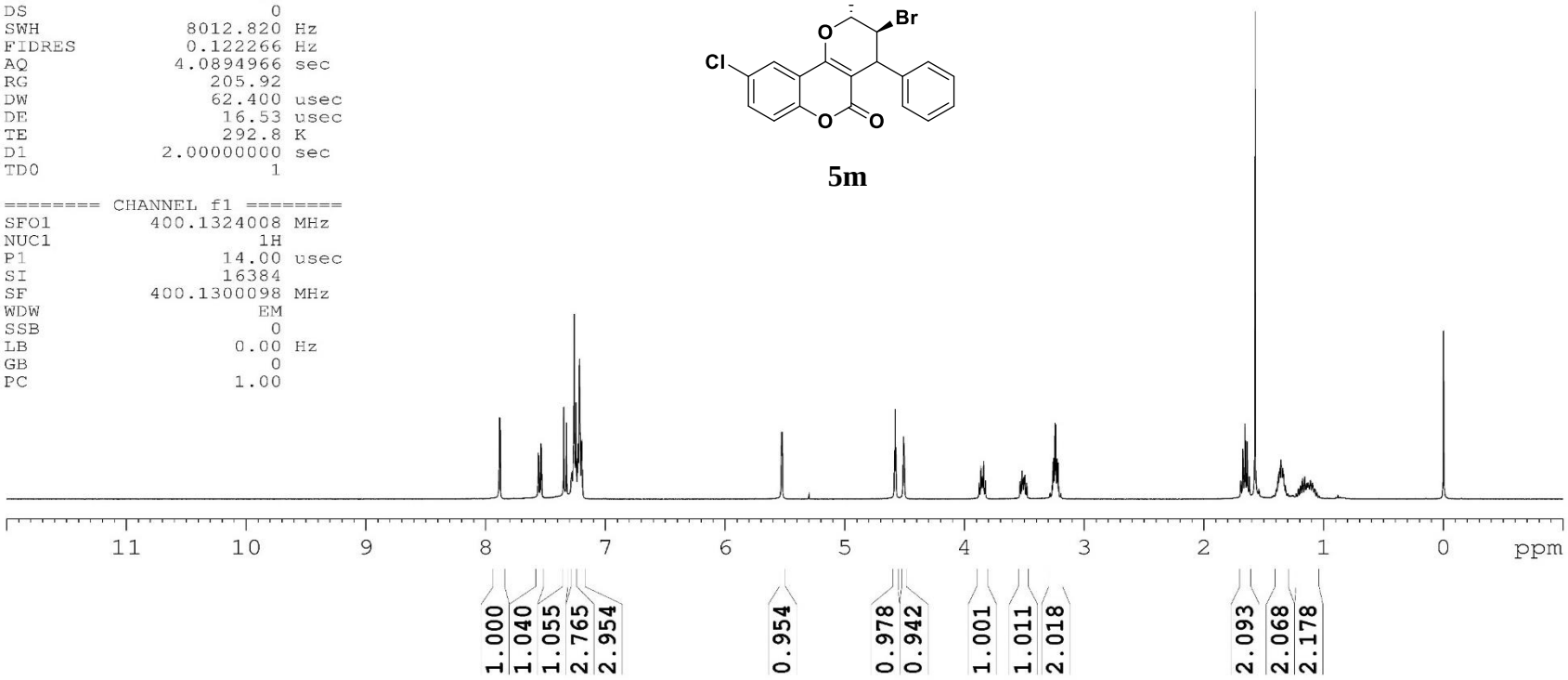


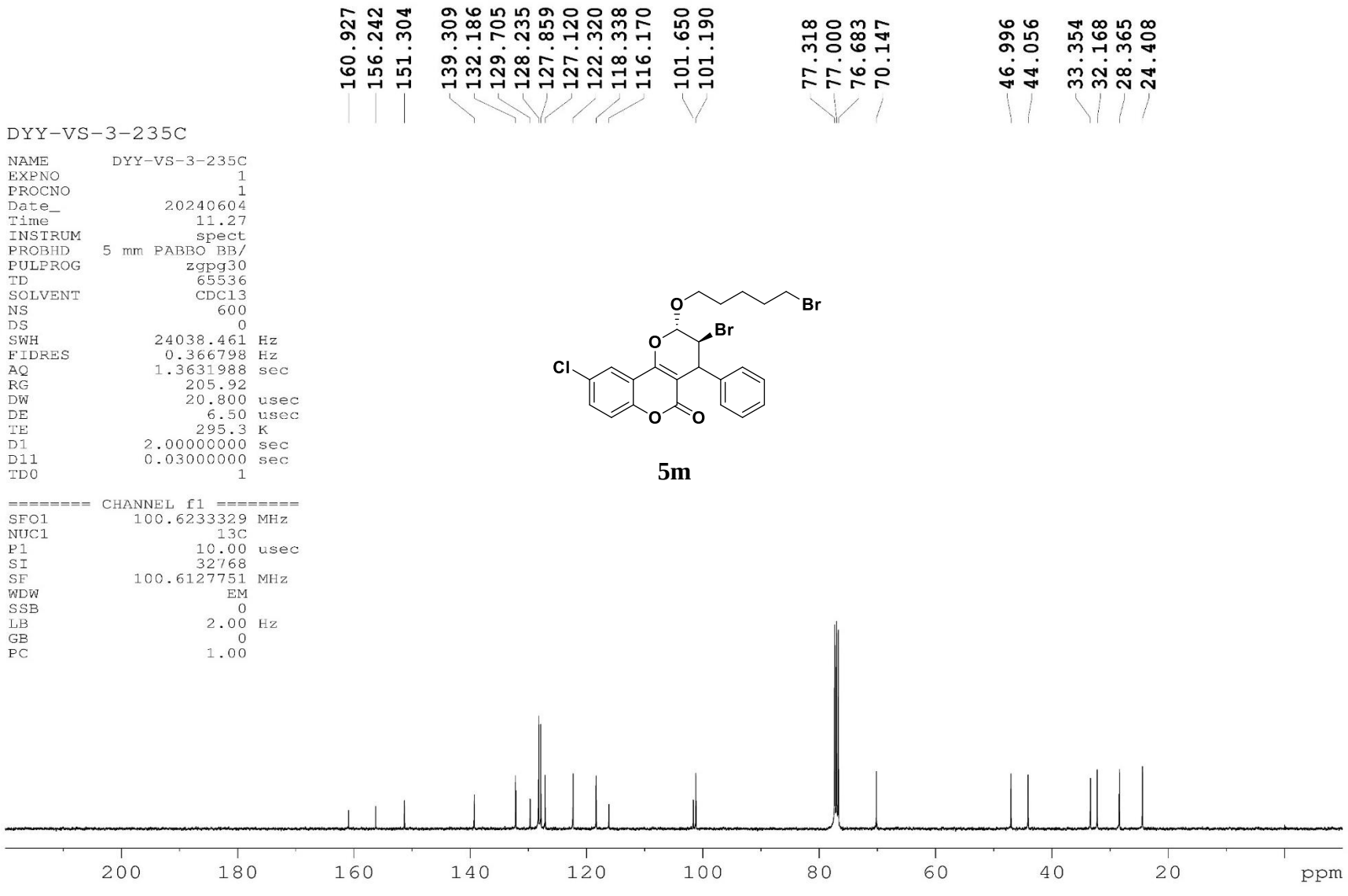
DYY-VS-3-235

NAME	DYY-VS-3-235
EXPNO	1
PROCNO	1
Date_	20240604
Time	10.30
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	205.92
DW	62.400 usec
DE	16.53 usec
TE	292.8 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300098 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

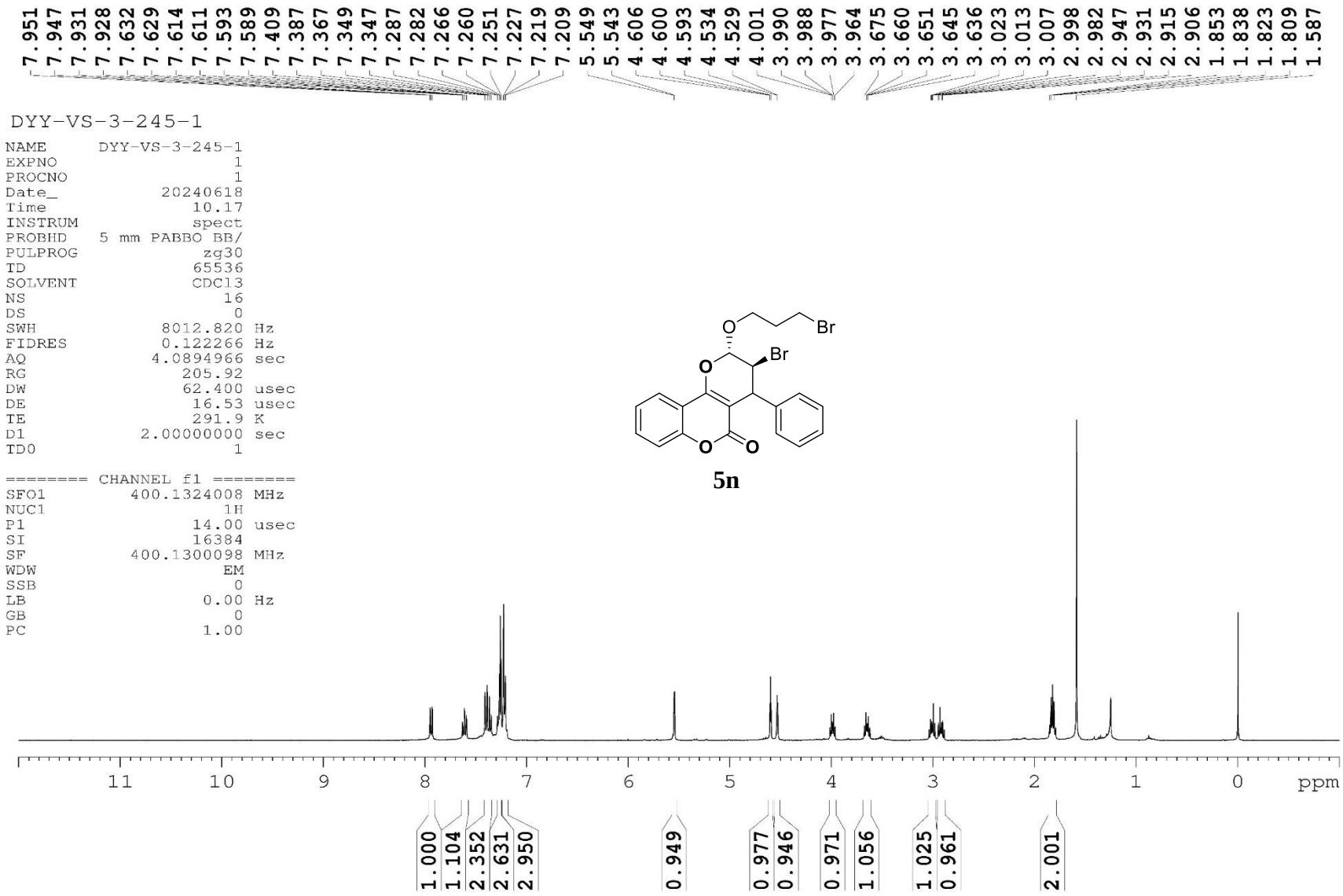


5m

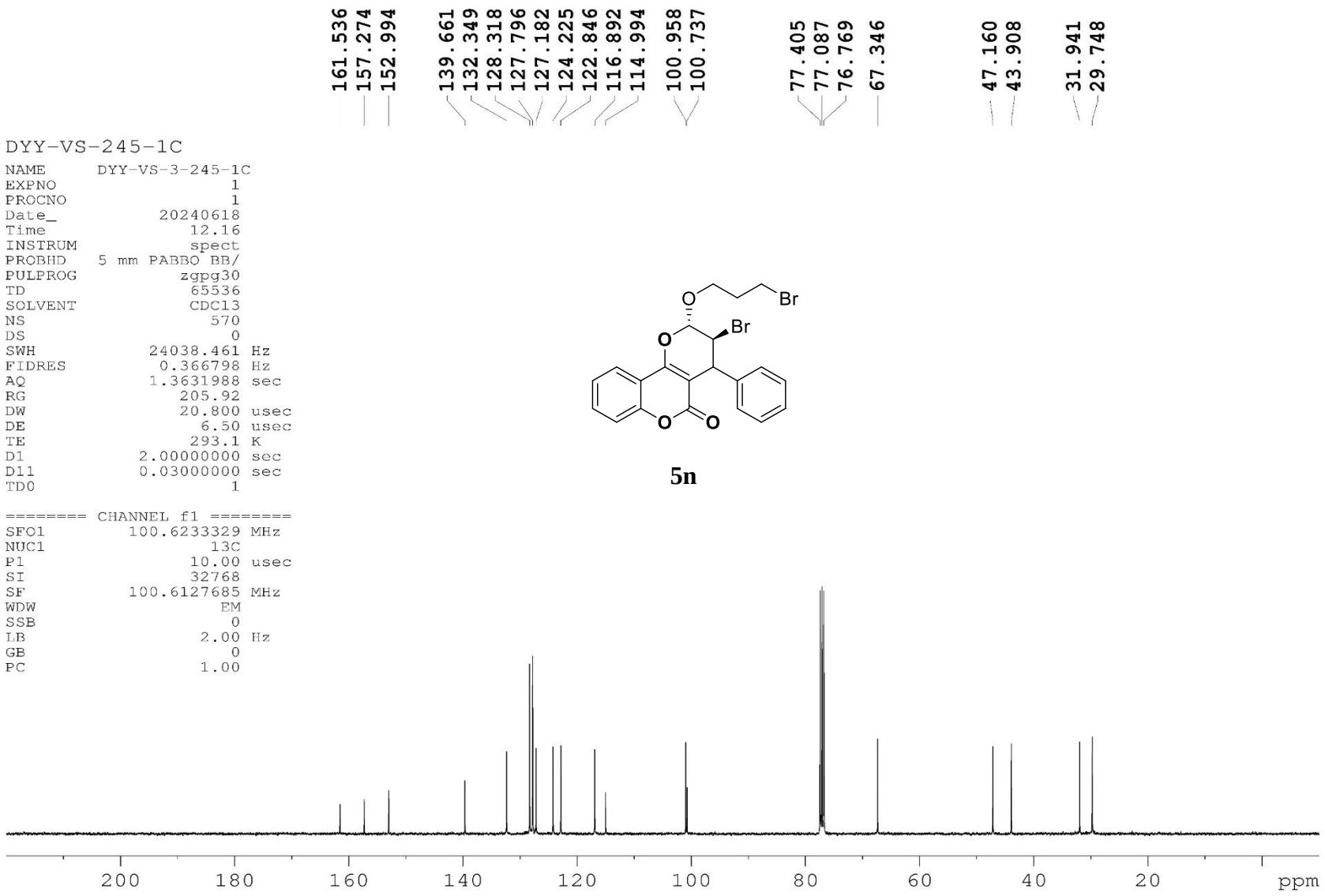



160.927
156.242
151.304
139.309
132.186
129.705
128.235
127.859
127.120
122.320
118.338
116.170
101.650
101.190
77.318
77.000
76.683
70.147
46.996
44.056
33.354
32.168
28.365
24.408
DYY-VS-3-235C
NAME DYY-VS-3-235C
EXPNO 1
PROCNO 1
Date_ 20240604
Time 11.27
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 600
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 295.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127751 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
Br
Br
O
Cl
O
O
200
180
160
140
120
100
80
60
40
20
ppm

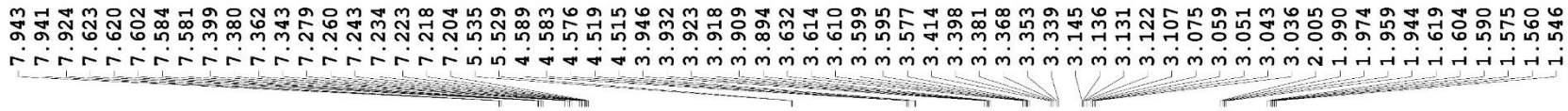
5m


7.951 7.947 7.931 7.928 7.632 7.629 7.614 7.611 7.593 7.589 7.409 7.387 7.367 7.349 7.347 7.287 7.282 7.266 7.260 7.251 7.227 7.219 7.209 5.549 5.543 4.606 4.600 4.593 4.534 4.529 4.001 3.990 3.988 3.977 3.964 3.675 3.660 3.651 3.645 3.636 3.023 3.013 3.007 2.998 2.982 2.947 2.931 2.915 2.906 1.853 1.838 1.823 1.809 1.587
DYY-VS-3-245-1
NAME DYY-VS-3-245-1
EXPNO 1
PROCNO 1
Date_ 20240618
Time 10.17
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 291.9 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
Br
Br
O
O
O
O
11 10 9 8 7 6 5 4 3 2 1 0 ppm
1.000 1.104 2.352 2.631 2.950 0.949 0.977 0.946 0.971 1.056 1.025 0.961 2.001

5n


161.536
157.274
152.994
139.661
132.349
128.318
127.796
127.182
124.225
122.846
116.892
114.994
100.958
100.737
77.405
77.087
76.769
67.346
47.160
43.908
31.941
29.748
DYY-VS-245-1C
NAME DYY-VS-3-245-1C
EXPNO 1
PROCNO 1
Date_ 20240618
Time 12.16
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 570
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127685 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
Br
Br
O
O
O
200
180
160
140
120
100
80
60
40
20
ppm

5n

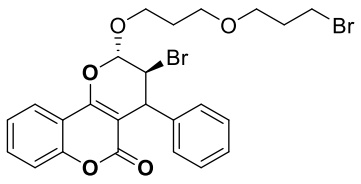


DYY-VS-3-245B

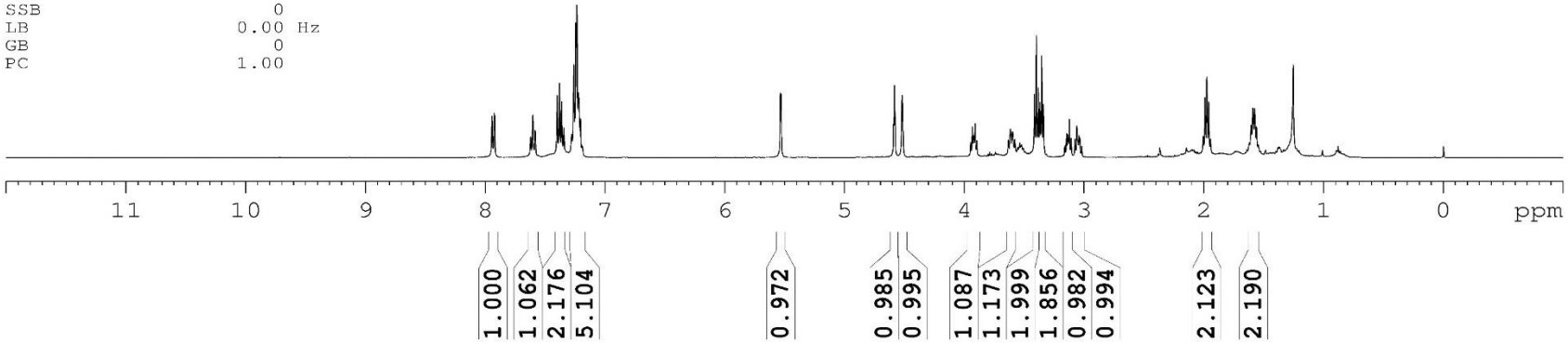
NAME	DYY-VS-3-245B
EXPNO	1
PROCNO	1
Date_	20240719
Time	11.13
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	55.28
DW	62.400 usec
DE	16.53 usec
TE	291.5 K
D1	2.00000000 sec
TD0	1

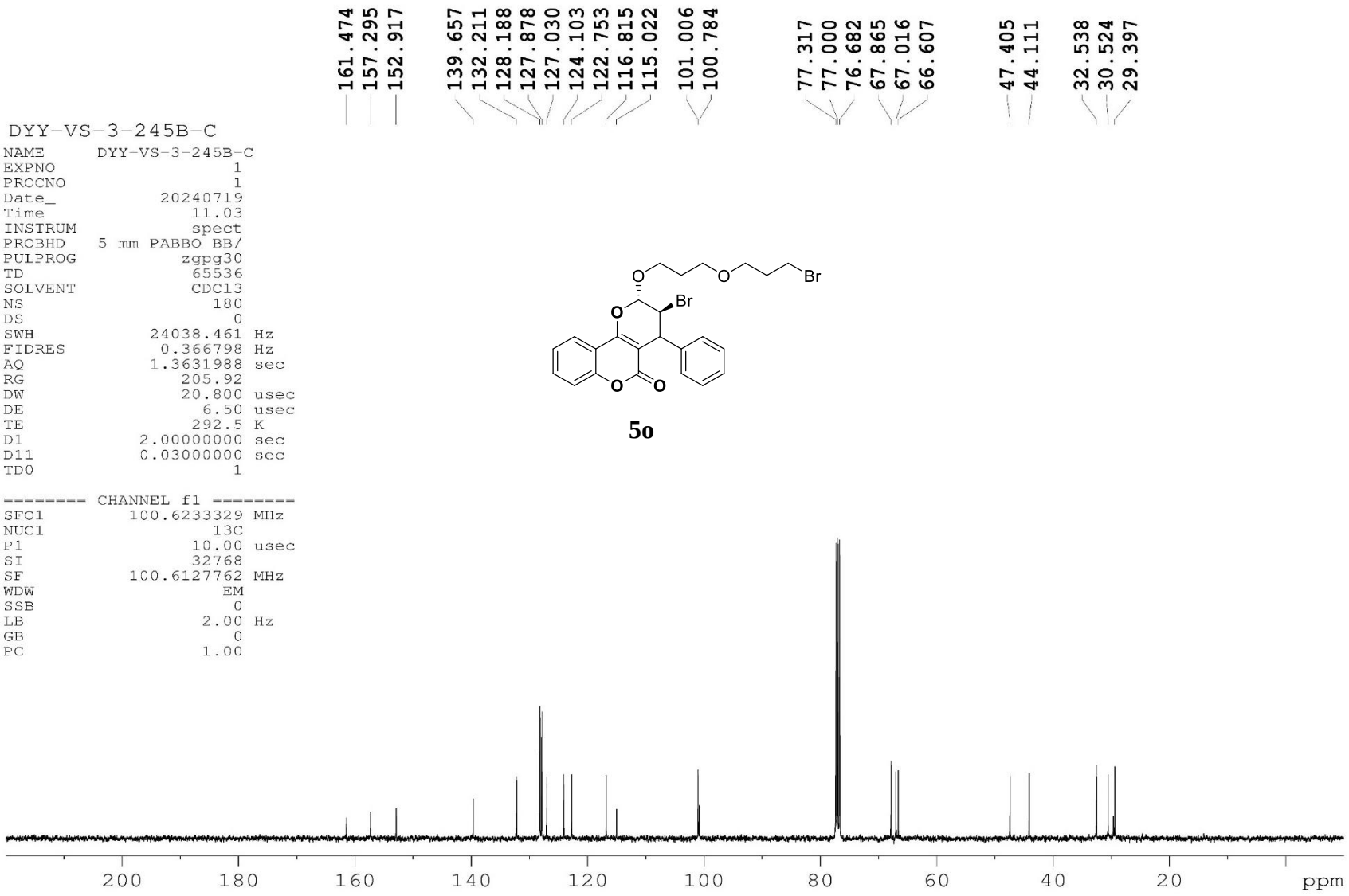
======== CHANNEL f1 ========

SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300099 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

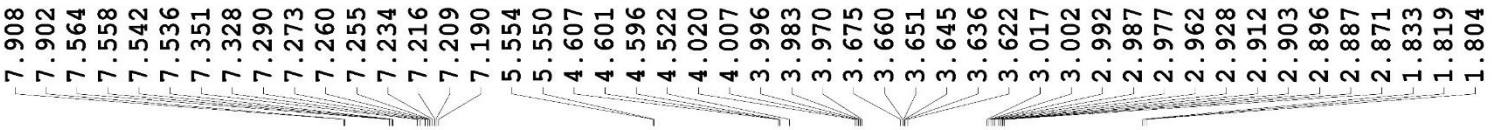


5o



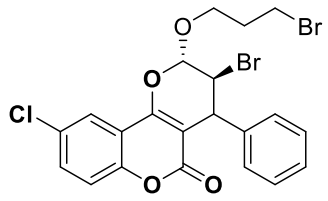

161.474
157.295
152.917
139.657
132.211
128.188
127.878
127.030
124.103
122.753
116.815
115.022
101.006
100.784
77.317
77.000
76.682
67.865
67.016
66.607
47.405
44.111
32.538
30.524
29.397
DYY-VS-3-245B-C
NAME DYY-VS-3-245B-C
EXPNO 1
PROCNO 1
Date_ 20240719
Time 11.03
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 180
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127762 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
Br
O
Br
O
O
200
180
160
140
120
100
80
60
40
20
ppm

5o

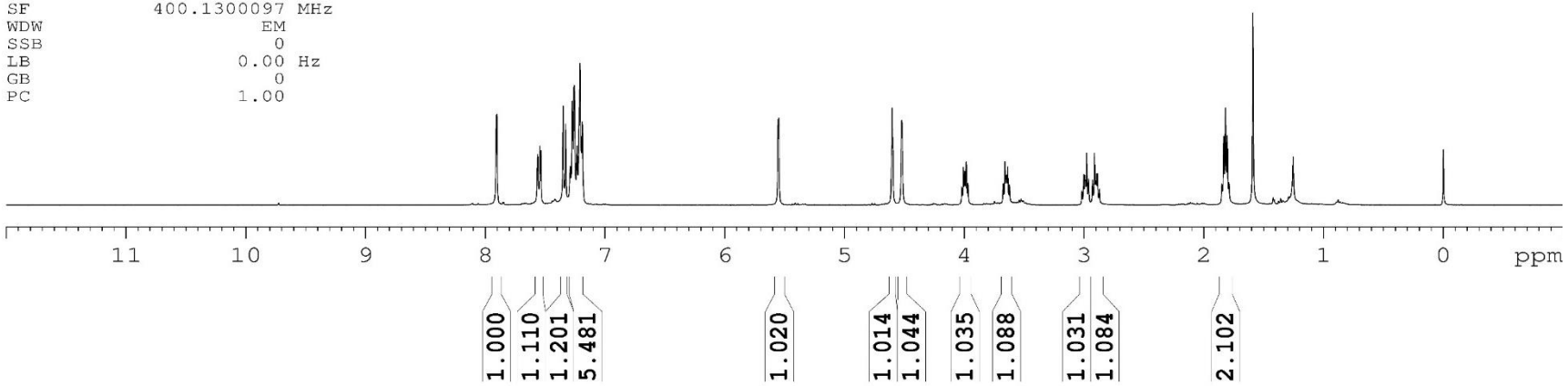


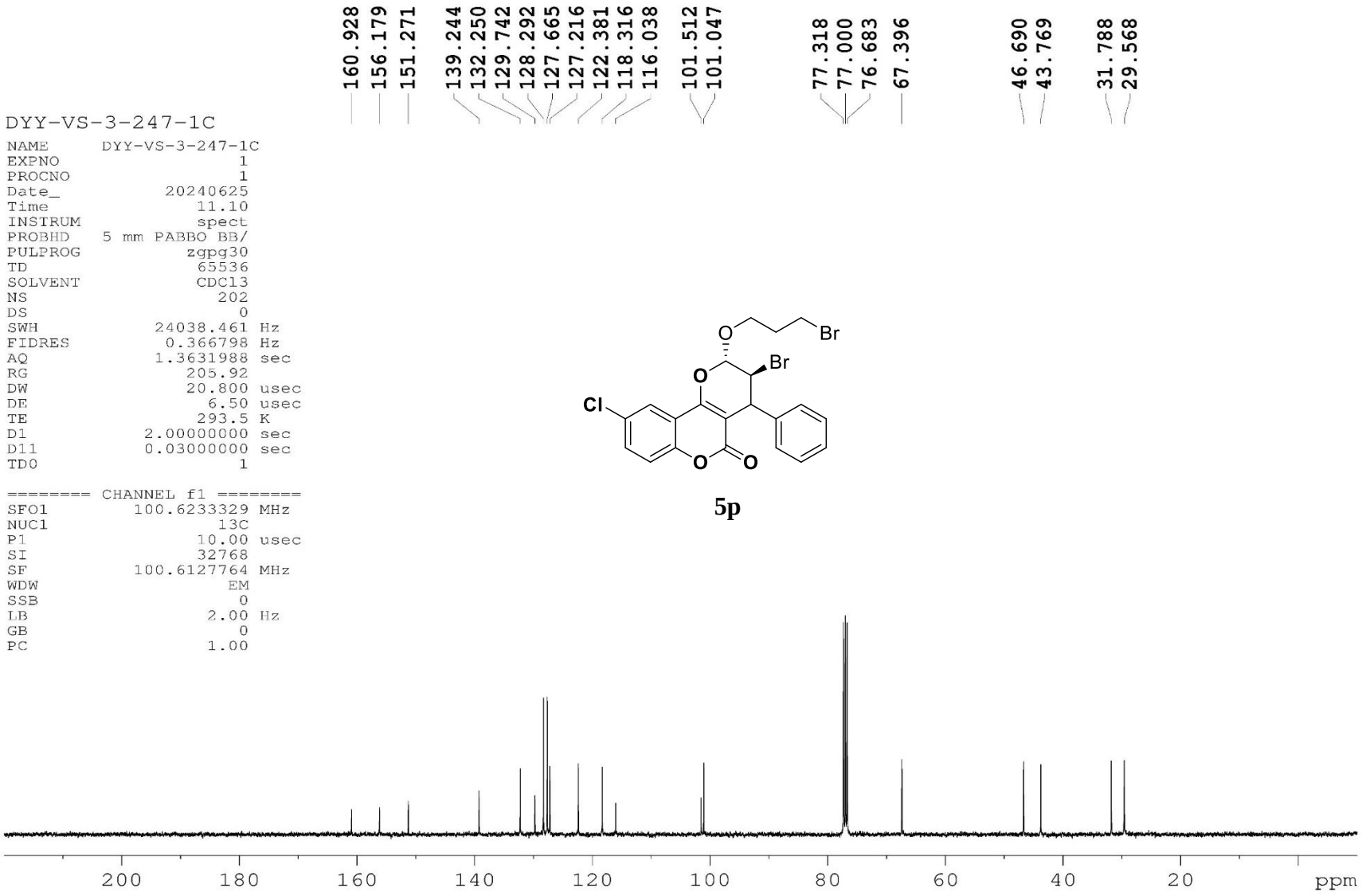
DYY-VS-3-247-1

NAME	DYY-VS-3-247-1
EXPNO	1
PROCNO	1
Date_	20240625
Time	10.24
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	163.06
DW	62.400 usec
DE	16.53 usec
TE	293.1 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300097 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00

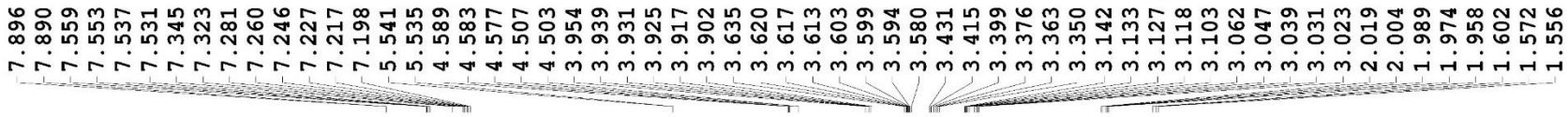


5p




160.928
156.179
151.271
139.244
132.250
129.742
128.292
127.665
127.216
122.381
118.316
116.038
101.512
101.047
77.318
77.000
76.683
67.396
46.690
43.769
31.788
29.568
DYY-VS-3-247-1C
NAME DYY-VS-3-247-1C
EXPNO 1
PROCNO 1
Date_ 20240625
Time 11.10
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 202
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 293.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127764 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
Br
Br
O
Cl
O
O
200
180
160
140
120
100
80
60
40
20
ppm

5p

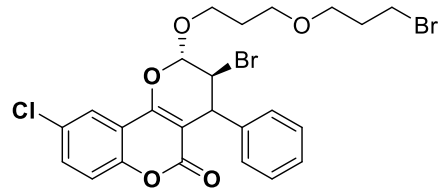


DYY-VS-3-247B

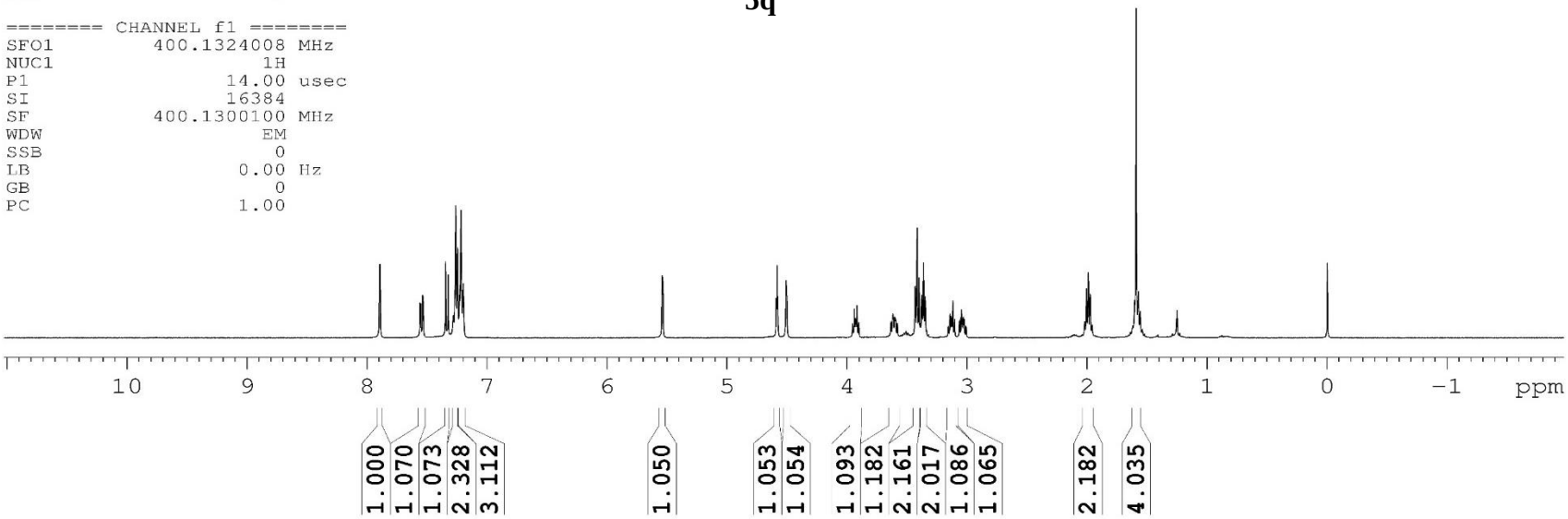
NAME	DYY-VS-3-247B	
EXPNO	1	
PROCNO	1	
Date_	20240716	
Time	10.11	
INSTRUM	spect	
PROBHD	5 mm PABBO BB/	
PULPROG	zg30	
TD	65536	
SOLVENT	CDCl3	
NS	16	
DS	0	
SWH	8012.820	Hz
FIDRES	0.122266	Hz
AQ	4.0894966	sec
RG	181.8	
DW	62.400	usec
DE	16.53	usec
TE	291.2	K
D1	2.00000000	sec
TD0	1	

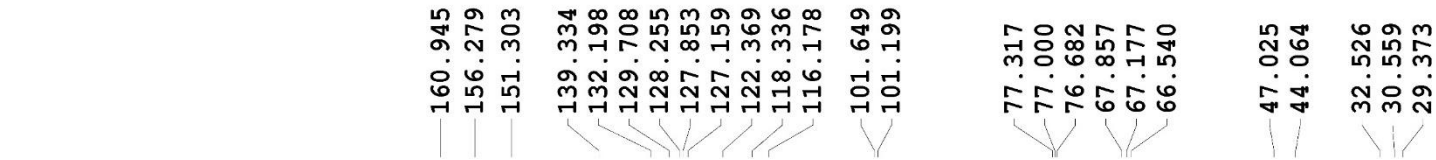
======== CHANNEL f1 ========

SFO1	400.1324008	MHz
NUC1	1H	
P1	14.00	usec
SI	16384	
SF	400.1300100	MHz
WDW	EM	
SSB	0	
LB	0.00	Hz
GB	0	
PC	1.00	



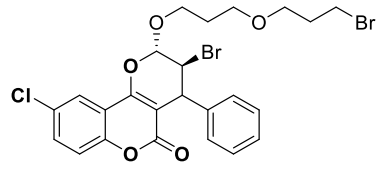
5q



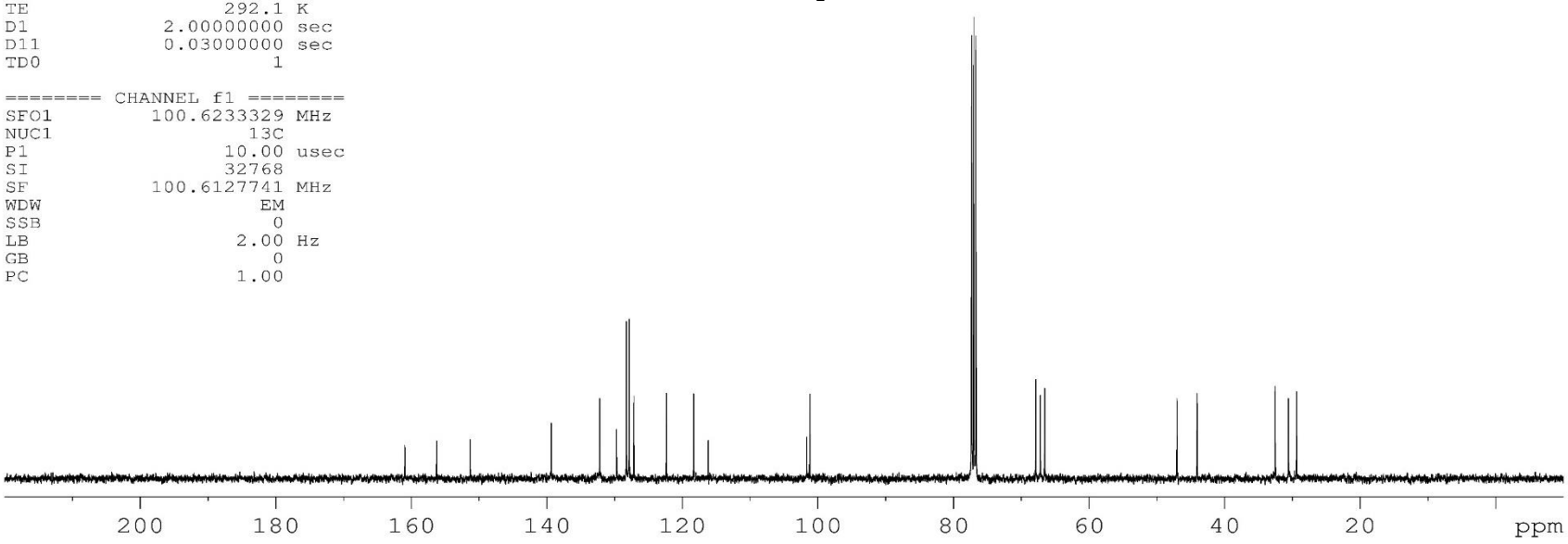


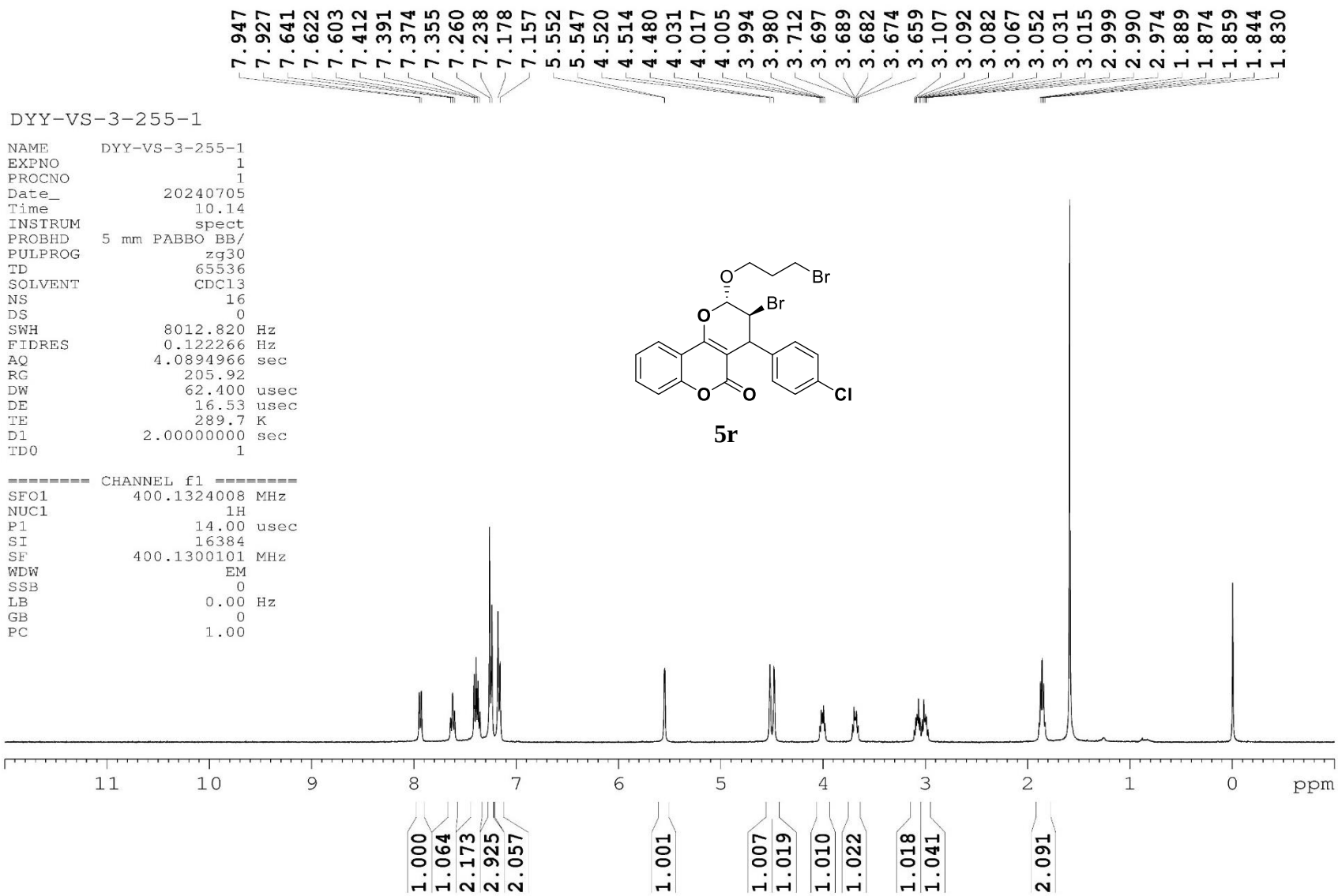
DYY-VS-3-247B-C

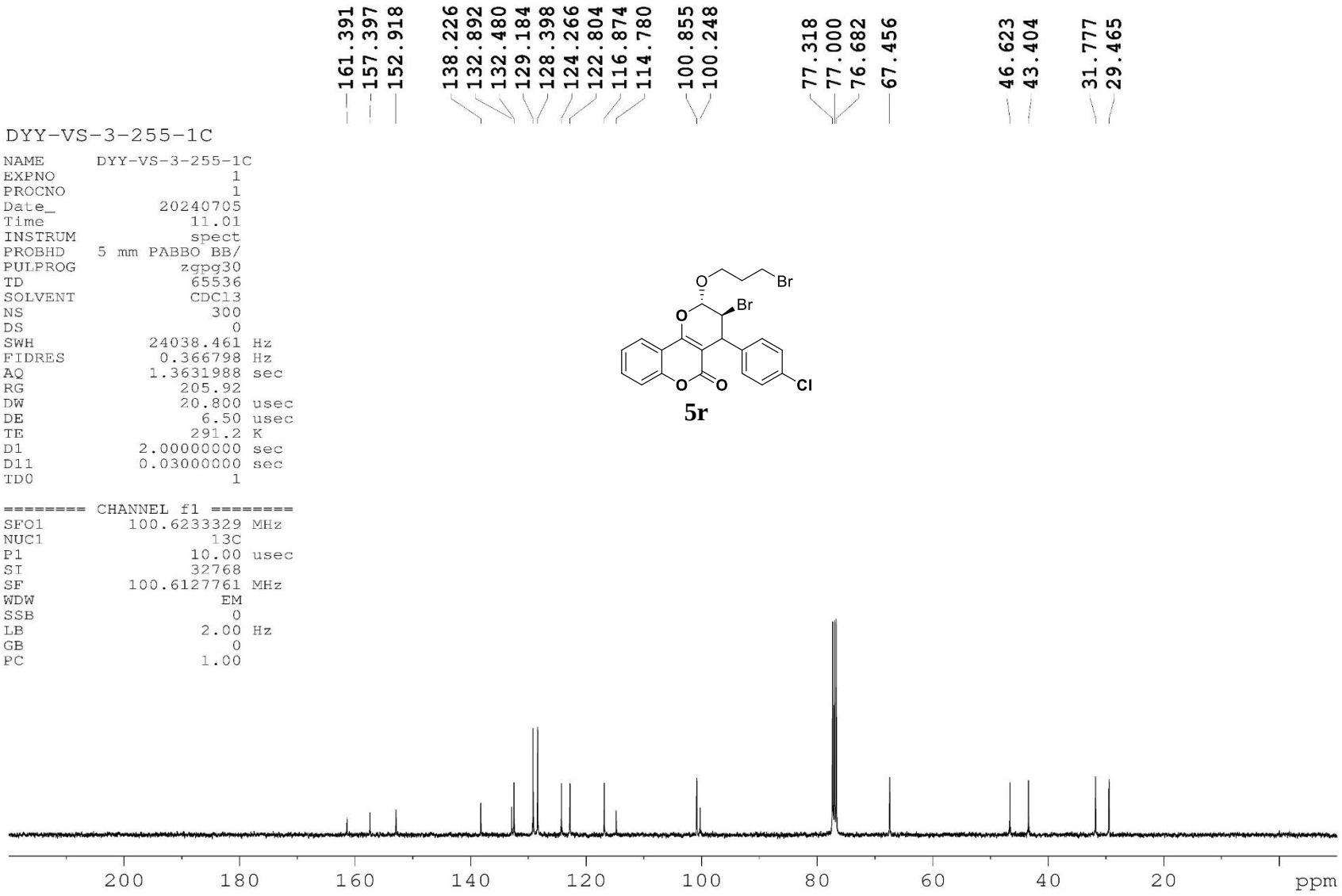
NAME	DYY-VS-3-247B-C
EXPNO	1
PROCNO	1
Date_	20240716
Time	10.54
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zgpg30
TD	65536
SOLVENT	CDCl3
NS	180
DS	0
SWH	24038.461 Hz
FIDRES	0.366798 Hz
AQ	1.3631988 sec
RG	205.92
DW	20.800 usec
DE	6.50 usec
TE	292.1 K
D1	2.00000000 sec
D11	0.03000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	100.6233329 MHz
NUC1	13C
P1	10.00 usec
SI	32768
SF	100.6127741 MHz
WDW	EM
SSB	0
LB	2.00 Hz
GB	0
PC	1.00

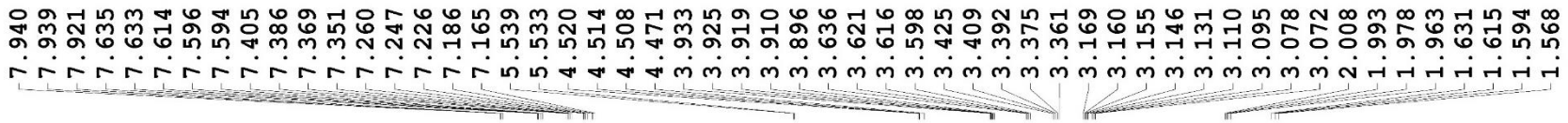


5q



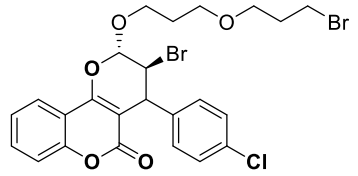

7.947
7.927
7.641
7.622
7.603
7.412
7.391
7.374
7.355
7.260
7.238
7.178
7.157
5.552
5.547
4.520
4.514
4.480
4.031
4.017
4.005
3.994
3.980
3.712
3.697
3.689
3.682
3.674
3.659
3.107
3.092
3.082
3.067
3.052
3.031
3.015
2.999
2.990
2.974
1.889
1.874
1.859
1.844
1.830
DYY-VS-3-255-1
NAME DYY-VS-3-255-1
EXPNO 1
PROCNO 1
Date_ 20240705
Time 10.14
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 205.92
DW 62.400 usec
DE 16.53 usec
TE 289.7 K
D1 2.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1324008 MHz
NUC1 1H
P1 14.00 usec
SI 16384
SF 400.1300101 MHz
WDW EM
SSB 0
LB 0.00 Hz
GB 0
PC 1.00
O
Br
Br
O
O
O
Cl
5r
11
10
9
8
7
6
5
4
3
2
1
0
ppm
1.000
1.064
2.173
2.925
2.057
1.001
1.007
1.019
1.010
1.022
1.018
1.041
2.091


161.391
157.397
152.918
138.226
132.892
132.480
129.184
128.398
124.266
122.804
116.874
114.780
100.855
100.248
77.318
77.000
76.682
67.456
46.623
43.404
31.777
29.465
DYY-VS-3-255-1C
NAME DYY-VS-3-255-1C
EXPNO 1
PROCNO 1
Date_ 20240705
Time 11.01
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 300
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 291.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127761 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
Br
Br
O
O
O
O
Cl
5r
200
180
160
140
120
100
80
60
40
20
ppm

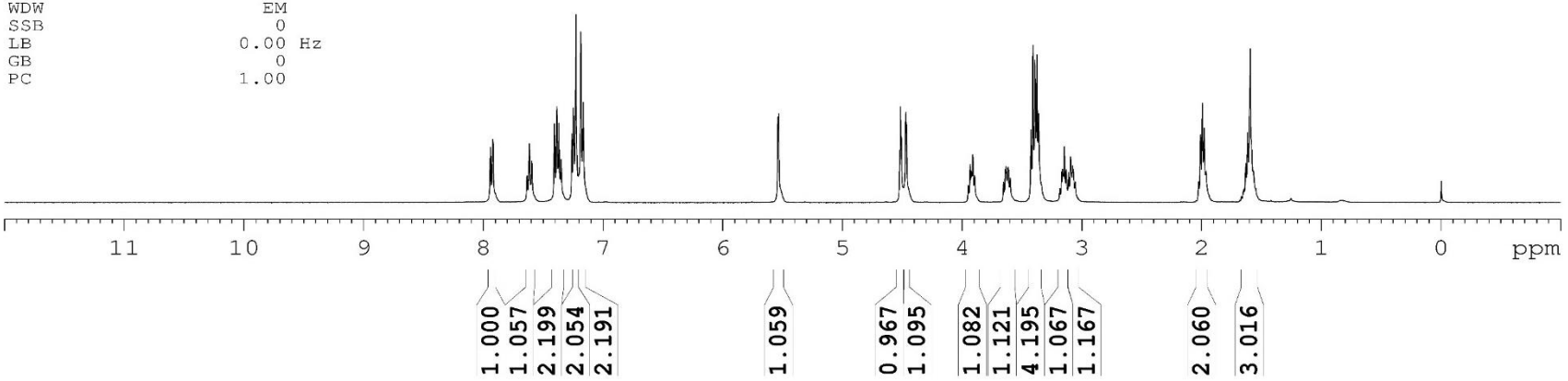


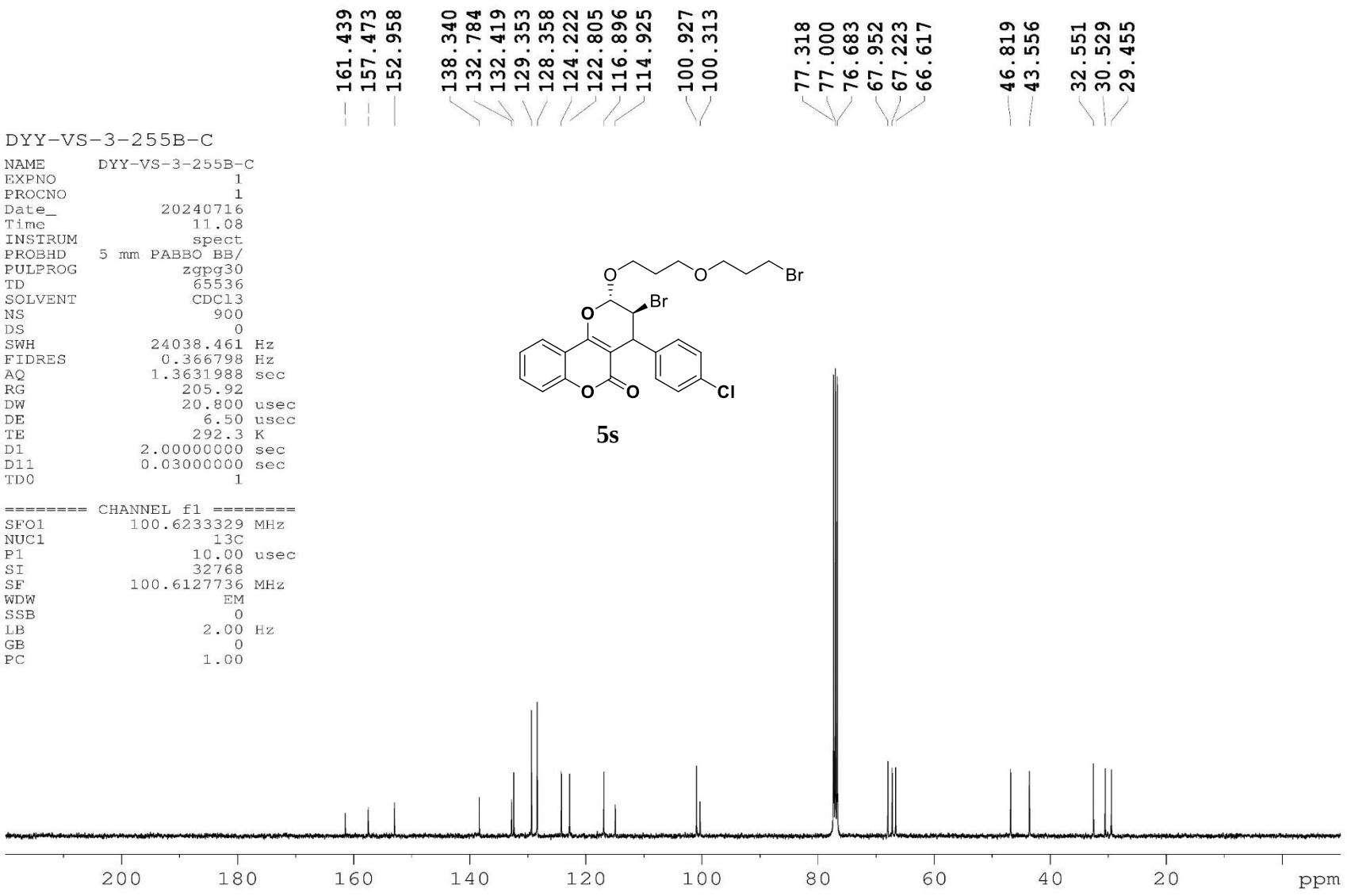
DYY-VS-3-255B-1

NAME	DYY-VS-3-255B-1
EXPNO	1
PROCNO	1
Date_	20240716
Time	11.59
INSTRUM	spect
PROBHD	5 mm PABBO BB/
PULPROG	zg30
TD	65536
SOLVENT	CDCl3
NS	16
DS	0
SWH	8012.820 Hz
FIDRES	0.122266 Hz
AQ	4.0894966 sec
RG	163.06
DW	62.400 usec
DE	16.53 usec
TE	291.4 K
D1	2.00000000 sec
TD0	1
======== CHANNEL f1 ========	
SFO1	400.1324008 MHz
NUC1	1H
P1	14.00 usec
SI	16384
SF	400.1300101 MHz
WDW	EM
SSB	0
LB	0.00 Hz
GB	0
PC	1.00



5s




161.439
157.473
152.958
138.340
132.784
132.419
129.353
128.358
124.222
122.805
116.896
114.925
100.927
100.313
77.318
77.000
76.683
67.952
67.223
66.617
46.819
43.556
32.551
30.529
29.455
DYY-VS-3-255B-C
NAME DYY-VS-3-255B-C
EXPNO 1
PROCNO 1
Date_ 20240716
Time 11.08
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 900
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 205.92
DW 20.800 usec
DE 6.50 usec
TE 292.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6233329 MHz
NUC1 13C
P1 10.00 usec
SI 32768
SF 100.6127736 MHz
WDW EM
SSB 0
LB 2.00 Hz
GB 0
PC 1.00
O
O
Br
Br
O
O
O
Cl
5s
200
180
160
140
120
100
80
60
40
20
ppm