Supporting Information

Organocatalytic Enantio- and Diastereoselective Synthesis of 1,2-Dihydronaphthalenes from Isobenzopyrylium Ions

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Table of Contents

I. General Information **S-2**

II. Preparation of the Acetal Substrates **S-3**

III. CPA-Catalyzed Dihydronaphthalene Formation **S-18**

IV. Derivatizations **S-46**

V. Determination of the Absolute Stereochemistry **S-50**

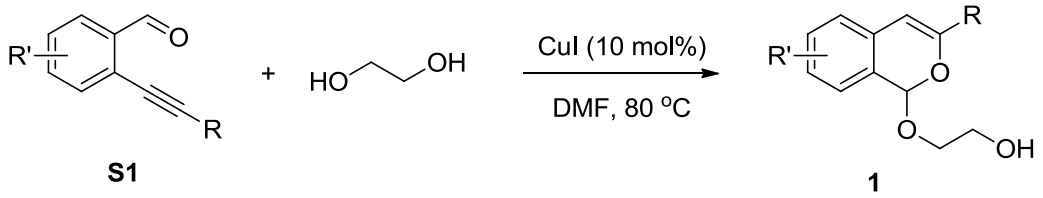
NMR Spectra

I. General Information

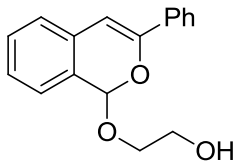
All air or moisture sensitive reactions were conducted in oven-dried glassware under nitrogen atmosphere using dry solvents. Flash column chromatography was performed over silica gel (230-400 mesh) purchased from Qingdao Puke Co., China. Anhydrous dichloromethane and tetrahydrofuran were purified by Innovative® solvent purification system. Anhydrous chloroform, toluene, diethyl ether, acetonitrile, 1,2-dichloroethane, and hexane were purchased from Sigma-Aldrich® and used as received. ^{1}H and ^{13}C NMR spectra were collected on a Bruker AV 400 MHz NMR spectrometer using residue solvent peaks as an internal standard (^{1}H NMR: $CDCl_3$ at 7.26 ppm, acetone-d_6 at 2.05 ppm, ^{13}C NMR: $CDCl_3$ at 77.16 ppm, acetone-d_6 at 206.26 ppm). Mass spectra were collected on an Agilent GC/MS 5975C system, or a MALDI Micro MX mass spectrometer, or an API QSTAR XL System.

II. Preparation of the Acetal Substrates

General Procedure A.



To an oven-dried 4-mL vial was added the aldehyde (1.0 mmol), DMF (0.5 mL), ethane glycol (0.5 mL), and CuI (19.0 mg, 10 mol%). The reaction mixture was stirred at 80 °C, and the reaction progress was monitored by thin layer chromatography. Upon completion (~18 h), water (3 mL) was added. The mixture was extracted with ethyl acetate (3×5 mL). The combined organic layers were washed with water (10 mL) and then brine (10 mL), dried with $NaSO_4$, filtered, and concentrated. The residue was purified by silica gel (pre-treated with Et_3N) flash chromatography to afford the acetal (eluent for all the cases: ethyl acetate/hexanes = 1:2).[1]



1ad

2-((3-Phenyl-1H-isochromen-1-yl)oxy)ethanol (1ad) was prepared according to the General Procedure A.

^{1}**H NMR** (400 MHz, acetone-d_6) δ 7.90 – 7.88 (m, 2H), 7.46 – 7.42 (m, 2H), 7.39 – 7.36 (m, 3H), 7.29 – 7.27 (m, 2H), 6.79 (s, 1H), 6.40 (s, 1H), 4.03 – 3.98 (m, 1H),

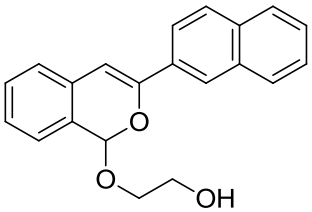
1. Patil, N. T.; Yamamoto, Y. *J. Org. Chem.* **2004**, *69*, 5139.

3.96 – 3.90 (m, 1H), 3.75 (br s, 1H), 3.67 (br s, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 150.1, 135.5, 131.3, 130.0, 129.5, 129.3, 128.5, 127.3, 127.0, 125.6, 125.1, 101.1, 99.7, 70.3, 61.9.

IR (thin film) 3400, 2931, 1613, 1500, 1263 cm^{-1}.

HRMS (CI) Calcd for $C_{17}H_{16}O_3$ (M^+): 268.1099, Found: 268.1100.



1b

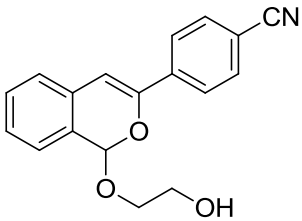
2-((3-(Naphthalen-1-yl)-1H-isochromen-1-yl)oxy)ethanol (1b) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 8.40 (d, J = 8.0 Hz, 1H), 7.97 (d, J = 8.0 Hz, 2H), 7.69 (d, J = 7.2 Hz, 1H), 7.59 – 7.53 (m, 3H), 7.43 – 7.39 (m, 2H), 7.34 – 7.26 (m, 2H), 6.45 (s, 1H), 6.37 (s, 1H), 4.08 – 4.03 (m, 1H), 3.94 – 3.85 (m, 1H), 3.75 (br s, 1H), 3.74 (br s, 2H).

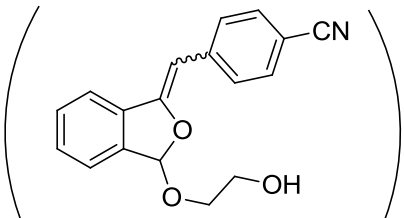
^{13}C NMR (100 MHz, acetone-d_6) δ 152.1, 134.8, 134.7, 132.3, 131.2, 130.2, 130.1, 129.1, 128.1, 127.8, 127.5, 127.2(2C), 126.9, 126.8, 126.1, 124.9, 105.8, 100.4, 71.0, 62.1.

IR (thin film) 3409, 3052, 2930, 1642, 1491 cm^{-1}.

HRMS (CI) Calcd for $C_{21}H_{18}O_3$ (M^+): 318.1256, Found: 318.1263.



1c



1c'

4-(1-(2-Hydroxyethoxy)-1H-isochromen-3-yl)benzonitrile (1c) was prepared according to the General Procedure A (86% purity, contaminated with **1c'**).

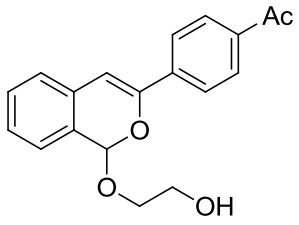
Due to difficulty in purification, the material was used for the standard reaction since **1c′** could not produce the dihydronathalene proudct based on another separate experiment with pure **1c′**.

^{1}H NMR (400 MHz, acetone-d_6) δ 8.05 – 8.03 (m, 2H), 7.81 – 7.79 (m, 2H), 7.42 – 7.39 (m, 2H), 7.35 – 7.29 (m, 2H), 6.99 (s, 1H), 6.43 (s, 1H), 4.00 – 3.91 (m, 2H), 3.78 (br, 1H), 3.67 – 3.65 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 148.3, 139.9, 133.3, 133.0, 130.3, 128.4, 127.2, 126.3, 125.8, 121.4, 119.4, 112.6, 104.4, 99.9, 70.7, 62.0.

IR (thin film) 3404, 2953, 2250, 1743, 1639 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{15}NO_3$ (M^+): 293.1052, Found: 293.1050.



1d

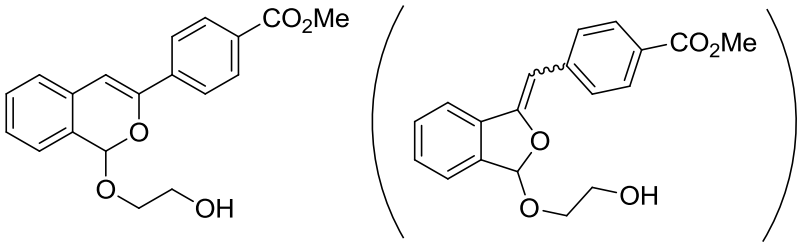
1-(4-(1-(2-Hydroxyethoxy)-1H-isochromen-3-yl)phenyl)ethanone (1d) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, CD_2Cl_2) δ 8.02 (d, J = 8.0 Hz, 2H), 7.93 (d, J = 8.0 Hz, 2H), 7.45 – 7.42 (m, 1H), 7.37 – 7.36 (m, 2H), 7.31 (d, J = 8.0 Hz, 1H), 6.80 (s, 1H), 6.35 (s, 1H), 4.09 – 4.04 (m, 1H), 3.94 – 3.89 (m, 1H), 3.70 (br, 2H), 2.63 (s, 3H), 2.27 (br s, 1H).

^{13}C NMR (100 MHz, CD_2Cl_2) δ 197.3, 148.2, 138.5, 136.9, 129.8, 129.6, 128.5, 127.4(2C), 126.0, 124.9, 124.7, 102.6, 98.9, 69.5, 61.6, 26.5.

IR (thin film) 3408, 2924, 1674, 1599, 1269 cm^{-1}.

HRMS (CI) Calcd for $C_{19}H_{18}O_4$ (M^+): 310.1205, Found: 310.1190.



1e **1e'**

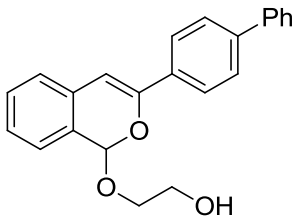
Methyl 4-(1-(2-hydroxyethoxy)-1H-isochromen-3-yl)benzoate (1e) was prepared according to the General Procedure A. (91% purity, contaminated **1e′**). Due to difficulty in purification, the material was used for the standard reaction since **1e′** could not produce the dihydronathalene proudct based on another separate experiment with pure **1e′**.

^{1}**H NMR** (400 MHz, acetone-d_6) δ 8.06 – 8.04 (m, 2H), 8.00 – 7.98 (m, 2H), 7.40 – 7.38 (m, 2H), 7.33 – 7.30 (m, 2H), 6.96 (s, 1H), 6.43 (s, 1H), 4.00 – 3.94 (m, 2H), 3.89 (s, 3H), 3.78 (br s, 1H), 3.71 – 3.64 (m, 2H).

^{13}**C NMR** (100 MHz, acetone-d_6) δ 166.8, 148.9, 139.7, 130.9, 130.8, 130.4, 130.1, 128.8, 127.9, 127.0, 125.51, 125.46, 103.4, 99.7, 70.5, 61.9, 53.3.

IR (thin film) 3410, 2949, 2875, 1718, 1279 cm^{-1}.

HRMS (CI) Calcd for $C_{19}H_{18}O_5$ (M^+): 326.1154, Found: 326.1151.



1f

2-((3-([1,1'-Biphenyl]-4-yl)-1H-isochromen-1-yl)oxy)ethanol (1f) was prepared according to the General Procedure A.

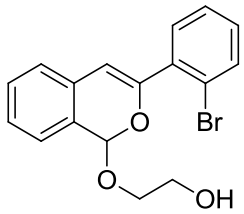
^{1}**H NMR** (400 MHz, acetone-d_6) δ 7.99 – 7.97 (m, 2H), 7.75 – 7.72 (m, 4H), 7.50 – 7.46 (m, 2H), 7.41 – 7.36 (m, 3H), 7.31 – 7.27 (m, 2H), 6.86 (s, 1H), 6.42 (s, 1H), 4.06 – 4.00 (m, 1H), 3.97 – 3.93 (m, 1H), 3.74 – 3.64 (m, 3H).

^{13}**C NMR** (100 MHz, acetone-d_6) δ 150.0, 142.1, 141.2, 134.7, 131.5, 130.1, 129.9,

128.7, 128.5, 127.9, 127.7, 127.4, 127.1, 126.3, 125.3, 101.4, 99.9, 70.5, 62.0.

IR (thin film) 3414, 2927, 1628, 1486, 1405 cm^{-1}.

HRMS (CI) Calcd for $C_{23}H_{20}O_3$ (M^+): 344.1412, Found: 344.1412.



1g

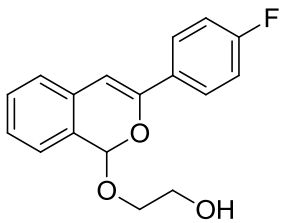
2-((3-(2-Bromophenyl)-1H-isochromen-1-yl)oxy)ethanol (1g) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.72 – 7.70 (m, 1H), 7.66 – 7.64 (m, 1H), 7.48 – 7.44 (m, 1H), 7.40 – 7.37 (m, 2H), 7.35 – 7.26 (m, 2H), 7.25 – 7.24 (m, 1H), 6.38 – 6.37 (m, 2H), 4.06 – 4.01 (m, 1H), 3.93 – 3.87 (m, 1H), 3.81 – 3.78 (m, 1H), 3.73 – 3.70 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 150.6, 137.4, 134.3, 132.0, 131.2, 130.8, 130.0, 128.4, 128.2, 127.7, 127.0, 125.0, 122.3, 106.1, 100.2, 70.9, 62.0.

IR (thin film) 3404, 2953, 1735, 1632, 1491 cm^{-1}.

HRMS (CI) Calcd for $C_{17}H_{15}BrO_3$ (M^+): 346.0205, Found: 346.0210.



1h

2-((3-(4-Fluorophenyl)-1H-isochromen-1-yl)oxy)ethanol (1h) was prepared according to the General Procedure A.

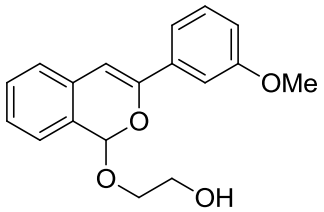
^{1}H NMR (400 MHz, acetone-d_6) δ 7.94 – 7.90 (m, 2H), 7.40 – 7.36 (m, 2H), 7.29 – 7.26 (m, 2H), 7.23 – 7.18 (m, 2H), 6.75 (s, 1H), 6.40 (s, 1H), 4.02 – 3.97 (m, 1H),

3.96 – 3.90 (m, 1H), 3.77 (br s, 1H), 3.68 (br s, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 165.0 (d, J = 245.2 Hz), 149.2, 131.9 (d, J = 3.0 Hz), 131.2, 130.0, 128.4, 127.8(d, J = 8.4 Hz), 127.3 (d, J = 26.3 Hz), 125.1, 116.2, 116.0, 100.9 (d, J = 1.8 Hz), 99.8, 70.4, 61.9.

IR (thin film) 3374, 2931, 1613, 1500, 1263 cm^{-1}.

HRMS (CI) Calcd for $C_{17}H_{15}FO_3$ (M^+): 286.1005, Found: 286.0998.



1i

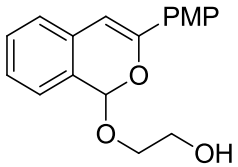
2-((3-(3-Methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (1i) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.48 – 7.44 (m, 2H), 7.40 – 7.33 (m, 3H), 7.29 – 7.26 (m, 2H), 6.97 – 6.94 (m, 1H), 6.81 (s, 1H), 6.39 (s, 1H), 4.04 – 3.99 (m, 1H), 3.96 – 3.91 (m, 1H), 3.85 (s, 3H), 3.79 (br s, 1H), 3.68 (br s, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 160.7, 149.8, 136.8, 131.2, 130.3, 129.9, 128.4, 127.2, 126.9, 125.0, 117.9, 114.9, 111.0, 101.3, 99.6, 70.3, 61.8, 55.4.

IR (thin film) 3411, 2934, 1637, 1510, 1290 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{18}O_4$ (M^+): 298.1205, Found: 298.1217.



1j

2-((3-(4-Methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (1j) was prepared according to the General Procedure A.

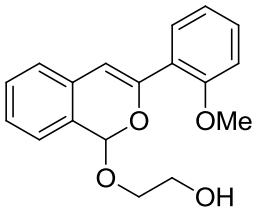
^{1}H NMR (400 MHz, acetone-d_6) δ 7.82 (d, J = 8.4 Hz, 2H), 7.37 – 7.33 (m, 2H),

7.24 – 7.23 (m, 2H), 7.00 (d, J = 8.4 Hz, 2H), 6.64 (s, 1H), 6.36 (s, 1H), 4.01 – 3.89 (m, 2H), 3.84 (s, 3H), 3.69 – 3.62 (m, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 161.1, 150.1, 131.6, 129.8, 128.1, 127.8, 127.0, 126.8, 126.7, 124.7, 114.6, 99.6, 99.3, 70.1, 61.8, 55.5.

IR (thin film) 3409, 2933, 1632, 1510, 1251 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{18}O_4$ (M^+): 298.1205, Found: 298.1198.



1k

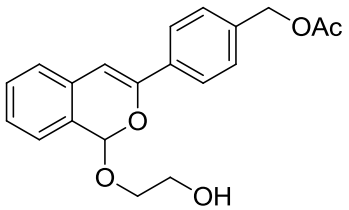
2-((3-(2-Methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (1k) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.93 (dd, J_1 = 6.0 Hz, J_2 = 8.0 Hz, 1H), 7.39 – 7.32 (m, 3H), 7.28 – 7.24 (m, 2H), 7.10 – 7.02 (m, 3H), 6.34 (s, 1H), 4.01 – 3.97 (m, 1H), 3.94 – 3.88 (m, 4H), 3.75 – 3.72 (m, 1H), 3.69 – 3.64 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 158.4, 147.1, 131.7, 130.4, 129.8, 128.6, 128.5, 127.1, 126.8, 125.3, 124.0, 121.2, 112.3, 106.5, 99.4, 70.3, 61.9, 55.8.

IR (thin film) 3415, 2935, 1623, 1491, 1252 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{18}NO_3$ (M^+): 293.1052, Found: 293.1057.



1l

4-(1-(2-Hydroxyethoxy)-1H-isochromen-3-yl)benzyl acetate (1l) was prepared according to the General Procedure A.

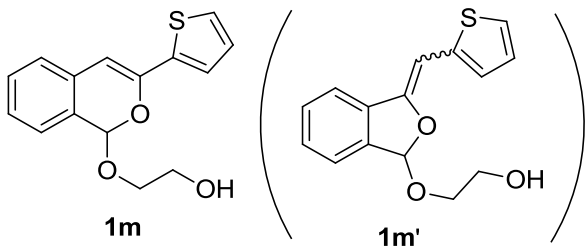
^{1}H NMR (400 MHz, acetone-d_6) δ 7.91 (d, J = 8.0 Hz, 2H), 7.48 (d, J = 8.0 Hz,

2H), 7.40 (d, J = 6.4 Hz, 2H), 7.30 – 7.28 (m, 2H), 6.82 (s, 1H), 6.42 (s, 1H), 5.15 (s, 2H), 4.03 – 4.01 (m, 1H), 3.97 – 3.93 (m, 1H), 3.81 (s, 1H), 3.69 (s, 2H), 2.09 (s, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 170.7, 149.5, 137.8, 135.0, 131.0, 129.8, 128.9, 128.3, 127.2, 126.8, 125.5, 125.0, 101.2, 99.5, 70.1, 65.9, 61.7, 20.6.

IR (thin film) 3434, 2933, 1735, 1632, 1490 cm^{-1}.

HRMS (CI) Calcd for $C_{20}H_{20}O_5$ (M^+): 340.1311, Found: 340.1306.



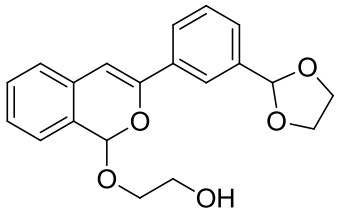
2-((3-(Thiophen-2-yl)-1H-isochromen-1-yl)oxy)ethanol (1m) was prepared according to the General Procedure A. (86% purity, contaminated with **1m'**). Due to difficulty in purification, the material was used for the standard reaction since **1m'** could not produce the dihydronathalene proudct based on another separate experiment with pure **1m'**.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.54 – 7.53 (m, 1H), 7.49 (d, J = 4.4 Hz, 1H), 7.39 – 7.35 (m, 2H), 7.28 – 7.24 (m, 2H), 7.12 – 7.11 (m, 1H), 6.63 (s, 1H), 6.34 (s, 1H), 4.06 – 4.00 (m, 1H), 3.94 – 3.89 (m, 1H), 3.80 (br s, 1H), 3.70 – 3.68 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 146.0, 139.6, 130.8, 129.9, 128.5, 128.3, 127.0, 126.9, 126.7, 124.9, 124.8, 100.1, 99.7, 70.1, 61.7.

IR (thin film) 3404, 2932, 2874, 1631, 1489 cm^{-1}.

HRMS (CI) Calcd for $C_{15}H_{14}O_3S$ (M^+): 274.0664, Found: 274.0658.



1n

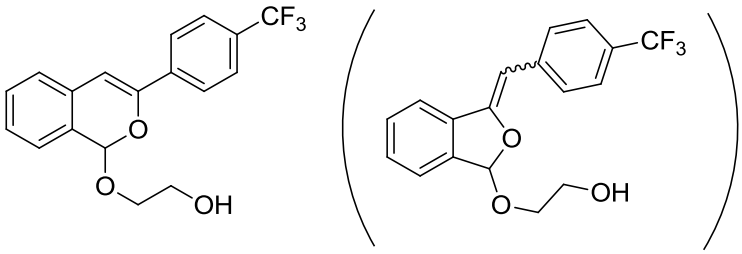
2-((3-(3-(1,3-Dioxolan-2-yl)phenyl)-1H-isochromen-1-yl)oxy)ethanol (1n) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.98 (s, 1H), 7.88 (d, J = 7.2 Hz, 1H), 7.50 – 7.44 (m, 2H), 7.40 – 7.37 (m, 2H), 7.31 – 7.26 (m, 2H), 6.83 (s, 1H), 6.41 (s, 1H), 5.81 (s, 1H), 4.13 – 4.10 (m, 2H), 4.03 – 3.91 (m, 4H), 3.74 – 3.65 (m, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 149.9, 140.0, 135.5, 131.3, 130.0, 129.3, 128.6, 127.8, 127.4, 127.0, 126.2, 125.2, 123.9, 104.1, 101.4, 99.8, 70.4, 65.94, 65.92, 61.9.

IR (thin film) 3428, 2930, 2886, 1633, 1490 cm^{-1}.

HRMS (CI) Calcd for $C_{20}H_{20}O_5$ (M^+): 340.1311, Found: 340.1323.



1o **1o'**

2-((3-(4-(Trifluoromethyl)phenyl)-1H-isochromen-1-yl)oxy)ethanol (1o) was prepared according to the General Procedure A. Due to difficulty in purification, the material was used for the standard reaction since **1o'** could not produce the dihydronathalene proudct based on another separate experiment with pure **1o'**.

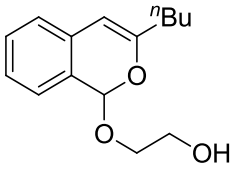
^{1}H NMR (400 MHz, acetone-d_6) δ 8.10 (d, J = 8.0 Hz, 2H), 7.78 (d, J = 8.0 Hz, 2H), 7.43 – 7.39 (m, 2H), 7.34 – 7.31 (m, 2H), 6.98 (s, 1H), 6.44 (s, 1H), 4.02 – 3.91 (m, 2H), 3.77 – 3.74 (m, 1H), 3.68 – 3.63 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 148.6, 139.4, 130.9, 130.2, 128.9, 128.1, 127.1

(q, J = 244.2 Hz), 126.4 (q, J = 3.7 Hz), 126.1(3C), 125.6, 103.5, 99.8, 70.6, 61.9.

IR (thin film) 3390, 2956, 1689, 1632, 1490 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{15}F_3O_3$ (M^+): 336.0973, Found: 336.0972.



1p

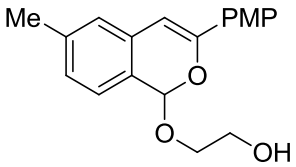
2-((3-Butyl-1H-isochromen-1-yl)oxy)ethanol (1p) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.29 – 7.25 (m, 2H), 7.20 – 7.16 (m, 1H), 7.07 (d, J = 7.2 Hz, 1H), 6.16 (s, 1H), 5.83 (s, 1H), 3.91 – 3.87 (m, 1H), 3.19 – 3.77 (m, 1H), 3.67 (br s, 3H), 2.32 – 2.27 (m, 2H), 1.62 – 1.56 (m, 2H), 1.43 – 1.35 (m, 2H), 0.93 (t, J = 7.2 Hz, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 155.0, 131.7, 129.8, 127.8, 127.1, 126.5, 124.0, 101.0, 99.6, 70.2, 62.0, 34.2, 30.0, 22.8, 14.2.

IR (thin film) 3410, 2955, 2931, 1656, 1491 cm^{-1}.

HRMS (CI-) Calcd for $C_{15}H_{19}O_3$ ($M-H^+$): 247.1334, Found: 247.1343.



1q

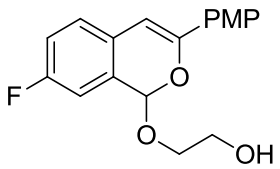
2-((3-(4-Methoxyphenyl)-6-methyl-1H-isochromen-1-yl)oxy)ethanol (1q) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.81 (d, J = 8.8 Hz, 2H), 7.23 (d, J = 8.0 Hz, 1H), 7.06 – 7.03 (m, 2H), 6.99 (d, J = 8.8 Hz, 2H), 6.57 (s, 1H), 6.33 (s, 1H), 4.01 – 3.96 (m, 1H), 3.92 – 3.87 (m, 1H), 3.82 (s, 3H), 3.74 – 3.71 (m, 1H), 3.68 – 3.63 (m, 2H), 2.06 (s, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 161.1, 150.1, 139.4, 131.6, 128.0, 127.5, 127.0, 126.8, 125.6, 125.1, 114.6, 99.7, 99.3, 70.0, 61.8, 55.5, 21.3.

IR (thin film) 3412, 2932, 1633, 1606, 1511 cm^{-1}.

HRMS (CI) Calcd for $C_{19}H_{20}O_4$ (M^+): 312.1362, Found: 312.1348.



1r

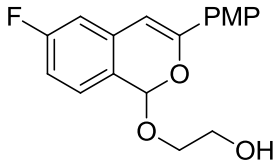
2-((7-Fluoro-3-(4-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (1r) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.80 (d, J = 9.2 Hz, 2H), 7.29 – 7.25 (m, 1H), 7.19 – 7.11 (m, 2H), 7.00 – 6.97 (m, 2H), 6.64 (s, 1H), 6.37 (s, 1H), 4.01 – 3.95 (m, 1H), 3.94 – 3.90 (m, 1H), 3.83 (s, 3H), 3.80 – 3.77 (m, 1H), 3.70 – 3.64 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 161.1 (d, J = 241.5 Hz), 161.3, 49.7 (d, J = 2.4 Hz), 130.0 (d, J = 7.3 Hz), 128.2 (d, J = 2.8 Hz), 127.8, 127.1, 126.7 (d, J = 7.8 Hz), 116.9 (d, J = 21.9 Hz), 114.7, 113.7 (d, J = 22.7 Hz), 99.1 (d, J = 2.4 Hz), 98.6, 70.5, 61.9, 55.6.

IR (thin film) 3411, 2934, 1637, 1510, 1290 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{17}FO_4$ (M^+): 316.1111, Found: 316.1118.



1s

2-((6-Fluoro-3-(4-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (1s) was prepared according to the General Procedure A.

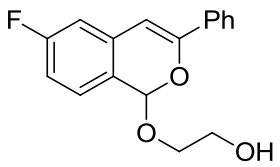
^{1}H NMR (400 MHz, acetone-d_6) δ 7.83 – 7.80 (m, 2H), 7.41 – 7.37 (m, 1H), 7.02 – 6.96 (m, 4H), 6.65 (s, 1H), 6.39 (s, 1H), 4.00 – 3.96 (m, 1H), 3.94 – 3.92 (m, 1H),

3.84 (s, 3H), 3.76 (br s, 1H), 3.66 (br s, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 165.3 (d, J = 242.4 Hz), 161.5, 151.3, 134.3 (d, J = 9.2 Hz), 129.1 (d, J = 9.1 Hz), 127.6, 127.4, 124.4 (d, J = 2.5 Hz), 114.8, 113.4 (d, J = 32.5 Hz), 110.8 (d, J = 22.5 Hz), 99.3, 98.7 (d, J = 2.5 Hz), 70.3, 61.9, 55.6.

IR (thin film) 3411, 2934, 1637, 1510, 1290 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{17}FO_4$ (M^+): 316.1111, Found: 316.1114.



1t

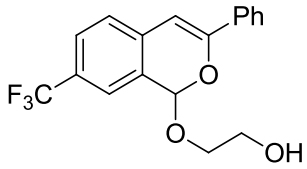
2-((6-Fluoro-3-phenyl-1H-isochromen-1-yl)oxy)ethanol (1t) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.90 – 7.87 (m, 2H), 7.47 – 7.38 (m, 4H), 7.06 – 7.00 (m, 2H), 6.80 (s, 1H), 6.43 (s, 1H), 4.02 – 3.91 (m, 2H), 3.75 (br s, 1H), 3.67 – 3.64 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 165.3 (d, J = 242.7 Hz), 151.3, 135.2, 133.8 (d, J = 9.2 Hz), 130.0, 129.4, 129.2 (d, J = 9.0 Hz), 125.9, 124.7 (d, J = 2.8 Hz), 113.9 (d, J = 12.5 Hz), 111.1 (d, J = 22.5 Hz), 100.4 (d, J = 2.6 Hz), 99.4, 70.5, 61.9.

IR (thin film) 3383, 2927, 2873, 1616, 1494 cm^{-1}.

HRMS (CI) Calcd for $C_{17}H_{15}FO_3$ (M^+): 286.1005, Found: 286.1009.



1u

2-((3-Phenyl-7-(trifluoromethyl)-1H-isochromen-1-yl)oxy)ethanol (1u) was prepared according to the General Procedure A.

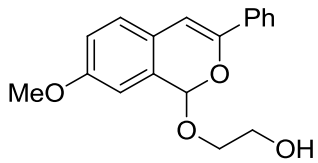
^{1}H NMR (400 MHz, CD_2Cl_2) δ 7.89 (d, J = 8.0 Hz, 2H), 7.68 (d, J = 8.0 Hz, 1H),

7.63 (s, 1H), 7.52 – 7.46 (m, 3H), 7.39 (d, *J* = 8.0 Hz, 1H), 6.72 (s, 1H), 6.38 (s, 1H), 4.14 – 4.09 (m, 1H), 3.97 – 3.92 (m, 1H), 3.73 (s, 2H), 2.02 (s, 1H).

^{13}C NMR (100 MHz, CD_2Cl_2) δ 151.6, 133.9, 133.7, 129.6, 128.6, 128.2 (q, *J* = 32.5 Hz), 127.1, 126.3 (q, *J* = 4.0 Hz), 125.6 (q, *J* = 269.9 Hz), 125.1, 124.7, 123.1 (q, *J* = 3.7 Hz), 99.3, 98.4, 69.7, 61.6.

IR (thin film) 3386, 2935, 2876, 1623, 1320 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{15}F_3O_3$ (M^+): 336.0973, Found: 336.0974.



1v

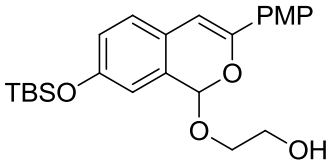
2-((7-Methoxy-3-phenyl-1H-isochromen-1-yl)oxy)ethanol (1v) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-*d*$_6$) δ 7.86 – 7.83 (m, 2H), 7.44 – 7.40 (m, 2H), 7.36 – 7.34 (m, 1H), 7.23 – 7.21 (m, 1H), 6.98 – 6.96 (m, 2H), 6,74 (s, 1H), 6.35 (s, 1H), 4.01 – 3.96 (m, 1H), 3.93 – 3.88 (m, 1H), 3.82 (s, 3H), 3.73 (br s, 1H), 3.67 – 3.64 (m, 2H).

^{13}C NMR (100 MHz, acetone-*d*$_6$) δ 159.7, 148.2, 135.8, 130.1, 129.3, 129.1, 126.6, 125.3, 124.4, 116.1, 122.2, 101.0, 99.8, 70.4, 62.0, 55.8.

IR (thin film) 3374, 2931, 1613, 1500, 1263 cm^{-1}.

HRMS (CI-) Calcd for $C_{18}H_{17}O_4$ ($M-H^+$): 297.1127, Found: 297.1138.



1w

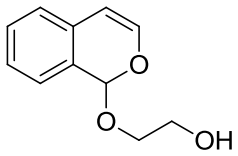
2-((7-((*tert*-Butyldimethylsilyl)oxy)-3-(4-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (1w) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.78 – 7.76 (m, 2H), 7.15 (d, J = 8.0 Hz, 1H), 6.98 – 6.96 (m, 2H), 6.91 – 6.88 (m, 2H), 6.58 (s, 1H), 6.31 (s, 1H), 4.00 – 3.95 (m, 1H), 3.92 – 3.87 (m, 1H), 3.82 (s, 3H), 3.70 – 3.63 (m, 3H), 1.01 (s, 9H), 0.24 (s, 3H), 0.23 (s, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 161.0, 155.0, 148.6, 129.8, 128.3, 126.9, 126.2, 125.5, 121.8, 118.4, 114.7, 99.6, 99.2, 70.2, 62.0, 55.6, 26.1, 18.8, -4.22, -4.25.

IR (thin film) 3980, 2948, 2931, 1680, 1555 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{32}O_5Si$ (M^+): 428.2019, Found: 428.2013.



1x

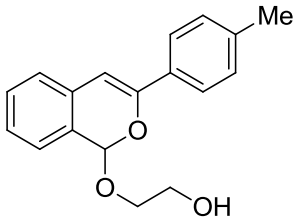
2-((1H-Isochromen-1-yl)oxy)ethanol (1x) was prepared according to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.35 – 7.23 (m, 3H), 7.14 (d, J = 7.6 Hz, 1H), 6.68 (d, J = 2.4 Hz, 1H), 6.17 (s, 1H), 6.01 (d, J = 2.4 Hz, 1H), 3.88 – 3.76 (m, 3H), 3.68 – 3.64 (m, 2H).

^{13}C NMR (100 MHz, acetone-d_6) δ 142.8, 129.9, 129.7, 128.4, 127.1, 127.0, 124.1, 105.0, 98.6, 70.2, 61.7.

IR (thin film) 3405, 2958, 2960, 1680, 1465 cm^{-1}.

MS (LD+) Calcd for $C_9H_7O_1$ (M-$C_2H_5O_2$): 131.1, Found: 131.1.



1y

2-((3-(*p*-Tolyl)-1H-isochromen-1-yl)oxy)ethanol (1y) was prepared according

to the General Procedure A.

^{1}H NMR (400 MHz, acetone-d_6) δ 7.78 (d, J = 8.0 Hz, 2H), 7.39 – 7.35 (m, 2H), 7.25 (d, J = 8.0 Hz, 4H), 6.73 (s, 1H), 6.38 (s, 1H), 4.02 – 3.97 (m, 1H), 3.94 – 3.89 (m, 1H), 3.70 (br s, 1H), 3.67 (br s, 2H), 2.36 (s, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 150.3, 139.5, 132.8, 131.5, 130.0 (2C), 128.4, 127.1, 127.0, 125.6, 125.0, 100.3, 99.7, 70.3, 61.9, 21.3.

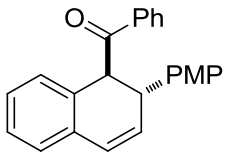
IR (thin film) 3408, 2922, 2871, 1632, 1511 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{18}O_3$ (M^+): 282.1256, Found: 282.1248.

III. CPA-Catalyzed Dihydronaphthalene Formation

General Procedure B.

Under N_2, an oven-dried 4-mL vial charged with the vinyl boronic acid (0.6 mmol), $MgSO_4$ (40 mg), the catalyst **A6** (14.0 mg, 0.02 mmol), and anhydrous DCM (2.0 mL) was cooled to 0 °C. Next, the acetal (0.2 mmol) was added. The reaction mixture was stirred at 0 °C, and the reaction progress was monitored by thin layer chromatography. Upon completion (24-36 h, as specified), the reaction mixture was warmed to room temperature and loaded on silica gel directly for flash chromatography purification to afford the pure product.



3a

((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(phenyl) methanone (3a) was prepared as colorless oil from 2-((3-phenyl-1H-isochromen-1-yl)oxy)ethanol (53.4 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl) boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 9:1) in 97% yield (65.8 mg, >20:1 dr, 91% ee).

$[\alpha]_D^{26}$: −302.0 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 19.5 min (major), 25.4 min (minor).

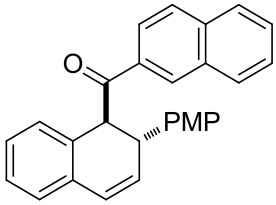
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.90 (m, 2H), 7.57 – 7.54 (m, 1H), 7.46 – 7.42 (m, 2H), 7.23 – 7.13 (m, 4H), 7.10 – 7.08 (m, 1H), 6.8 (m, 1H), 6.77 (dd, J_1 = 2.0 Hz, J_2 = 6.8 Hz, 2H), 6.63 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.96 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.99 (d, J = 7.6 Hz, 1H), 4.17 – 4.13 (m, 1H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 201.3, 158.7, 137.2, 135.1, 133.8, 133.2, 132.0,

130.7, 129.0, 128.8, 128.7, 128.2, 127.9, 127.8, 127.3, 126.7, 114.2, 55.3, 53.8, 43.3.

IR (thin film) 3059, 2835, 1682, 1510, 1247 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{20}O_2$ (M^+): 340.1463, Found: 340.1472.



3b

((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(naphthalen-1-yl) methanone (3b) was prepared as colorless oil from 2-((3-(naphthalen-2-yl)-1H-isochromen-1-yl)oxy)ethanol (63.6 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl) boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 9:1) in 81% yield (67.6 mg, >20:1 dr, 84% ee).

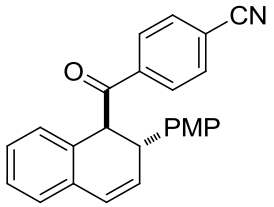
$[\alpha]_D^{26}$: −360.2 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 23.2 min (major), 18.8 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 – 8.07 (m, 1H), 7.92 (d, J = 8.0 Hz, 1H), 7.85 – 7.83 (m, 1H), 7.66 – 6.64 (m, 1H), 7.51 – 7.42 (m, 3H), 7.18 – 7.17 (m, 2H), 7.10 – 7.09 (m, 2H), 7.00 – 6.96 (m, 1H), 6.82 (d, J = 7.6 Hz, 1H), 6.75 – 6.72 (m, 2H), 6.66 (dd, J_1 = 1.2 Hz, J_2 = 9.6 Hz, 1H), 6.05 (dd, J_1 = 4.8Hz, J_2 = 9.6 Hz, 1H), 4.83 (d, J = 5.6 Hz, 1H), 4.29 – 4.27 (m, 1H), 3.72 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 204.6, 158.7, 137.1, 134.5, 133.9, 133.8, 132.0, 130.9, 130.7, 130.5, 129.2, 129.0, 128.3, 127.9, 127.8, 127.7, 127.3, 126.6 (two carbons), 126.2, 125.6, 124.3, 114.2, 58.1, 55.3, 42.2.

IR (thin film) 3032, 2835, 1682, 1510, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{28}H_{22}O_2$ (M^+): 390.1620, Found: 390.1609.



3c

4-((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalene-1-carbonyl) benzonitrile (3c) was prepared as colorless oil from methyl 4-(1-(2-hydroxyethoxy)-1H-isochromen-3-yl)benzonitrile (86% purity, 58.6 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 15:1) in 88% yield (55.6 mg, >20:1 dr, 97% ee).

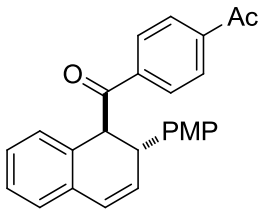
$[\alpha]_D^{26}$: −8.6 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 25.7 min (major), 23.5 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 (d, J = 8.4 Hz, 2H), 7.72 (d, J = 8.4 Hz, 2H), 7.24 – 7.22 (m, 1H), 7.19 – 7.17 (m, 1H), 7.10 – 7.07 (m, 3H), 6.80 – 6.75 (m, 3H), 6.63 (dd, J_1 = 1.6 Hz, J_2 = 9.6 Hz, 1H), 5.98 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.90 (d, J = 7.6 Hz, 1H), 4.12 – 4.09 (m, 1H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.3, 158.7, 140.4, 134.3, 133.6, 132.5 (2C), 130.9, 130.5, 128.9(2C), 128.1, 127.9, 127.2, 126.8, 117.9, 116.2, 114.2, 55.2, 54.5, 43.1.

IR (thin film) 3032, 2836, 1687, 1510, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{19}NO_2$ (M^+): 365.1416, Found: 365.1423.



3d

1-(4-((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalene-1-carbonyl) phenyl)ethanone (3d) was prepared as colorless oil from methyl

1-(4-(1-(2-hydroxyethoxy)-1H-isochromen-3-yl)phenyl)ethanone (62.0 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 8:1) in 87% yield (66.2 mg, >20:1 dr, 96% ee).

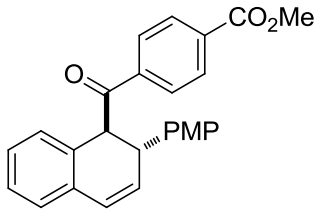
$[\alpha]_D^{26}$: −347.0 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 27.6 min (major), 21.8 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.00 – 7.98 (m, 2H), 7.94 – 7.92 (m, 2H), 7.25 – 7.17 (m, 2H), 7.13 – 7.06 (m, 3H), 6.83 (d, J = 7.6 Hz, 1H), 6.77 – 6.75 (m, 2H), 6.61 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.97 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.96 (d, J = 7.6 Hz, 1H), 4.15 – 4.12 (m, 1H), 3.74 (s, 3H), 2.63 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 201.1, 197.5, 158.8, 140.7, 140.2, 134.7, 133.8, 131.5, 130.7, 129.0, 128.8, 128.7, 128.2, 127.99, 127.95, 127.3, 126.8, 114.3, 55.3, 54.5, 43.3, 27.0.

IR (thin film) 3031, 2835, 1684, 1510, 1260 cm^{-1}.

HRMS (CI) Calcd for $C_{26}H_{22}O_3$ (M^+): 382.1569, Found: 382.1575.



3e

Methyl 4-((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalene-1-carbonyl) benzoate (3e) was prepared as colorless oil from methyl 4-(1-(2-hydroxyethoxy)-1H-isochromen-3-yl)benzoate (91% purity, 65.2 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 9:1) in 91% yield (65.2 mg, >20:1 dr, 90% ee).

$[\alpha]_D^{26}$: −324.9 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel

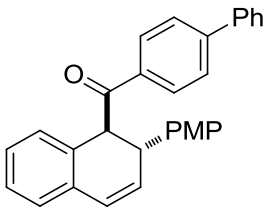
CHIRALPAK IC column; 15% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 18.7 min (major), 22.2 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 (d, J = 8.0 Hz, 2H), 7.92 (d, 8.0 Hz, 2H), 7.25 – 7.17 (m, 2H), 7.12 – 7.06 (m, 3H), 6.83 (d, J = 7.6 Hz, 1H), 6.77 (d, J = 8.4 Hz, 2H), 6.63 (d, J = 9.6 Hz, 1H), 5,97 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 4.95 (d, J = 7.2 Hz, 1H), 4,13 – 4.11 (m, 1H), 3.94 (s, 3H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 201.1, 166.3, 158.8, 140.7, 134.7, 133.9, 133.8, 131.4, 130.6, 130.0, 129.0, 128.5, 128.2, 128.0, 127.9, 127.3, 126.8, 114.2, 55.3, 54.4, 52.6, 43.1.

IR (thin film) 2952, 2837, 1710, 1676, 1508 cm^{-1}.

HRMS (CI) Calcd for $C_{26}H_{22}O_4$ (M^+): 398.1518, Found: 398.1516.



3f

[1,1'-Biphenyl]-4-yl((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)methanone (3f) was prepared as colorless oil from methyl 2-((3-([1,1'-biphenyl]-4-yl)-1H-isochromen-1-yl)oxy)ethanol (68.8 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 8:1) in 93% yield (77.4 mg, >20:1 dr, 94% ee).

$[\alpha]_D^{26}$: −383.2 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 19.4 min (major), 17.6 min (minor).

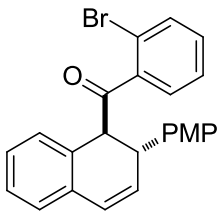
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.00 (d, J = 8.4 Hz, 2H), 7.68 (d, J = 8.4 Hz, 2H), 7.64 – 7.62 (m, 2H), 7.49 – 7.46 (m, 2H), 7.42 – 7.39 (m, 1H), 7.24 – 7.15 (m, 4H), 7.12 – 7.08 (m, 1H), 6.90 (d, J = 7.6 Hz, 1H), 7.80 – 6.78 (m, 2H), 6.63 (dd, J_1 = 1.6

Hz, J_2 = 9.6 Hz, 1H), 5.99 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 5.02 (d, J = 8.0 Hz, 1H), 4,21 – 4.17 (m, 1H), 3.75 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.8, 158.7, 145.9, 139.9, 135.9, 135.2, 133.8, 132.1, 130.8, 129.3, 129.09, 129.06, 128.4, 128.1, 127.9, 127.8, 127.5, 127.4, 127.3, 126.7, 114.2, 55.3, 53.8, 43.4.

IR (thin film) 3030, 1974, 1678, 1510, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{30}H_{24}O_2$ (M^+): 416.1776, Found: 416.1768.



3g

(2-Bromophenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl) methanone (3g) was prepared as colorless oil from methyl 2-((3-(2-bromophenyl)-1H-isochromen-1-yl)oxy)ethanol (69.4 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 9:1) in 81% yield (67.8 mg, >20:1 dr, 90% ee).

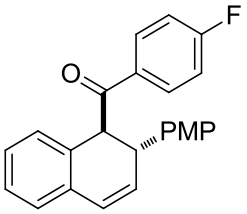
$[\alpha]_D^{26}$: −399.3 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 13.4 min (major), 15.2 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 – 7.52 (m, 1H), 7.22 – 7.17 (m, 3H), 7.13 (d, J = 6.4 Hz, 1H), 7.08 – 7.06 (m, 2H), 6.99 – 6.95 (m, 1H), 6.91 – 6.89 (m, 1H), 6.77 – 6.72 (m, 3H), 6.64 – 6.62 (m, 1H), 6.12 (dd, J_1 = 5.6 Hz, J_2 = 9.6 Hz, 1H), 4.55 (d, J = 2.4 Hz, 1H), 4.30 (d, J = 4.4 Hz, 1H), 3.73 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 203.1, 158.7, 141.3, 134.0, 133.6, 133.1, 131.0, 130.5, 130.4, 128.88, 128.85, 128.4, 128.2, 127.5, 127.0, 126.9, 126.6, 118.6, 114.2, 58.4, 55.3, 40.3.

IR (thin film) 3031, 2835, 1701, 1509, 1249 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{19}BrO_2$ (M^+): 418.0568, Found: 418.0577.



3h

(4-Fluorophenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl) methanone (3h) was prepared as colorless oil from methyl 2-((3-(4-fluorophenyl)-1H-isochromen-1-yl)oxy)ethanol (57.2 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 15:1) in 88% yield (62.8 mg, >20:1 dr, 96% ee).

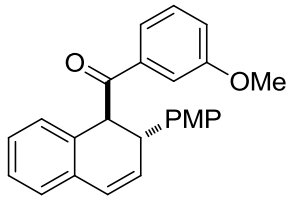
$[\alpha]_D^{26}$: −472.9 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 14.7 min (major), 12.1 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.94 – 7.90 (m, 2H), 7.25 – 7.17 (m, 2H), 7.14 – 7.07 (m, 5H), 6.84 – 6.82 (m, 1H), 6.79 – 6.76 (m, 2H), 6.62 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.97 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.95 (d, J = 8.4 Hz, 1H), 4.14 – 4.11 (m, 1H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 199.9, 167.1 (d, J = 232.8 Hz), 158.7, 135.0, 133.8, 133.7, 131.9, 131.4 (d, J = 9.3 Hz), 130.9, 129.0, 128.0, 127.9 (d, J = 5.2 Hz), 127.3, 126.8, 116.1, 115.9, 114.2, 55.4, 53.9, 43.5.

IR (thin film) 3032, 2836, 1682, 1596, 1510 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{20}FO_2$ ($M+H^+$): 359.1447, Found: 359.1454.



3i

(3-Methoxyphenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)methanone (3i) was prepared as colorless oil from methyl 2-((3-(3-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (59.6 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 9:1) in 82% yield (60.6 mg, >20:1 dr, 95% ee).

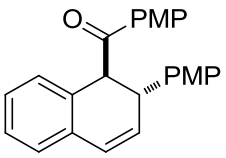
$[\alpha]_D^{26}$: −407.1 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 12.9 min (major), 11.0 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 (d, J = 8.0 Hz, 1H), 7.43 – 7.42 (m, 1H), 7.35 (t, J = 8.0 Hz, 1H), 7.24 – 7.13 (m, 4H), 7.09 – 7.07 (m, 2H), 6.87 (d, J = 8.0 Hz, 1H), 6.79 – 6.76 (m, 2H), 6.63 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.97 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 4.97 (d, J = 7.6 Hz, 1H), 4.17 – 4.13 (m, 1H), 3.82 (s, 3H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 201.1, 160.0, 158.7, 138.6, 135.1, 133.8, 132.0, 130.7, 129.8, 129.0, 128.2, 127.9, 127.8, 127.3, 126.7, 121.2, 119.8, 114.2, 112.9, 55.5, 55.3, 53.9, 43.3.

IR (thin film) 3032, 2836, 1682, 1596, 1510 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_3$ (M^+): 370.1569, Found: 370.1561.



3j

(4-Methoxyphenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-

yl)methanone (3j) was prepared as colorless oil from 2-((3-(4-methoxyphenyl)- 1H-isochromen-1-yl)oxy)ethanol (65.0 mg, 0.2 mmol) and (*E*)-(4-methoxy styryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 4:1) in 96% yield (71.1 mg, >20:1 dr, 94% ee).

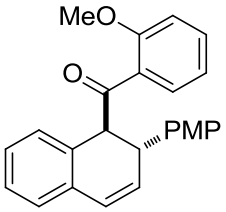
$[\alpha]_D^{26}$: −260.4 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 16.2 min (major), 12.8 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.90 (m, 2H), 7.23 – 7.13 (m, 4H), 7.10 – 7.06 (m, 1H), 6.92 – 6.90 (m, 2H), 6.86 – 6.84 (m, 1H), 6.63 – 6.60 (m, 2H), 6.62 (dd, J_1 = 1.6 Hz, J_2 = 9.6 Hz, 1H), 5.96 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4,96 (d, *J* = 8.0 Hz, 1H), 4.17 – 4.14 (m, 1H), 3.86 (s, 3H), 3.74 (m, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 199.8, 163.7, 158.6, 135.4, 133.8, 132.5, 131.1, 130.2(2C), 129.0, 127.9, 127.8, 127.6, 127.2, 126.6, 114.1, 114.0, 55.6, 55.3, 53.3, 43.5.

IR (thin film) 3032, 2835, 1682, 1510, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_3$ (M^+): 370.1569, Found: 370.1566.



3k

(2-Methoxyphenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)methanone (3k) was prepared as colorless oil from methyl 2-((3-(2-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (59.6 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 9:1) in 84% yield (62.2 mg, >20:1 dr, 90% ee).

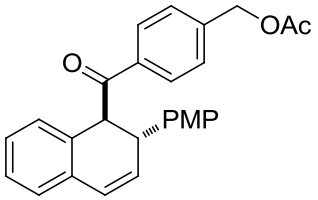
$[\alpha]_D^{26}$: −452.3 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 20.4 min (major), 17.6 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.42 – 7.38 (m, 1H), 7.29 – 7.26 (m, 1H), 7.21 – 7.17 (m, 1H), 7.14 – 7.12 (m, 1H), 7.09 – 7.02 (m, 3H), 6.94 – 6.87 (m, 3H), 6.77 – 6.74 (m, 2H), 6,58 (d, J = 9.6 Hz, 1H), 6.00 (dd, J_1 = 5.6 Hz, J_2 = 9.6 Hz, 1H), 4.88 (d, J = 4.0 Hz, 1H), 4.14 (t, J = 4.0 Hz, 1H), 3.81 (s, 3H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 203.5, 158.5, 157.2, 134.9, 133.8, 132.7, 131.4, 130.3, 130.1, 129.5, 129.0, 128.9, 127.6, 127.5, 127.2, 126.4, 120.9, 113.9, 111.2, 58.0, 55.6, 55.3, 41.6.

IR (thin film) 3029, 2936, 2836, 1678, 1509 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_3$ (M^+): 370.1569, Found: 370.1565.



3l

4-((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalene-1-carbonyl)benzyl acetate (3l) was prepared as colorless oil from 4-(1-(2-hydroxyethoxy)-1H-isochromen-3-yl)benzyl acetate (68.0 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 3:1) in 90% yield (74.2 mg, >20:1 dr, 97% ee).

$[\alpha]_D^{26}$: −404.7 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 25.6 min (major), 21.8 min (minor).

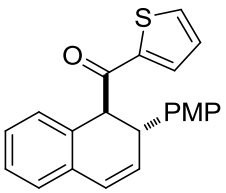
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 (d, J = 7.6 Hz, 2H), 7.42 (d, J = 7.6 Hz, 2H), 7.24 – 7.17 (m, 2H), 7.14 (d, J = 7.2 Hz, 2H), 7.08 (t, J = 7.2 Hz, 1H), 6.84 (d, J = 7.2 Hz, 1H), 6.77 (d, J = 7.2 Hz, 2H), 6.63 (d, J = 9.6 Hz, 1H), 5.95 (dd, J_1 = 2.4 Hz,

J_2 = 9.6 Hz, 1H), 5.15 (s, 2H), 4.98 (d, J = 8.0 Hz, 1H), 4.14 (s, 1H), 3.74 (s, 3H), 2.14 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.8, 170.8, 158.7, 141.3, 136.9, 135.0, 133.8, 131.9, 130.8, 129.0(2C), 128.13, 128.07, 127.9, 127.8, 127.3, 126.7, 114.2, 65.5, 55.3, 53.9, 43.3, 21.1.

IR (thin film) 3031, 2836, 1701, 1596, 1505 cm^{-1}.

HRMS (CI) Calcd for $C_{27}H_{24}O_4$ (M^+): 412.1675, Found: 412.1680.



3m

((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(thiophen-2-yl)methanone (3m) was prepared as colorless oil from 2-((3-(thiophen-2-yl)-1H-isochromen-1-yl)oxy)ethanol (86% purity, 54.8 mg, 0.2 mmol,) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 9:1) in 87% yield (51.6 mg, >20:1 dr, 94% ee).

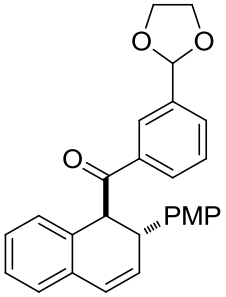
$[\alpha]_D^{26}$: −309.9 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 26.8 min (major), 32.3 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 – 7.62 (m, 2H), 7.26 – 7.21 (m, 1H), 7.18 – 7.15 (m, 3H), 7.12 – 7.08 (m, 2H), 6.92 (d, J = 7.2 Hz, 1H), 6.78 (d, J = 7.6 Hz, 2H), 6.64 d, J = 9.6 Hz, 1H), 5.99 (d, J = 10.0 Hz, 1H), 4.80 (d, J = 8.4 Hz, 1H), 4.19 (d, J = 6.0 Hz, 1H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 194.0, 158.7, 144.7, 135.0, 134.6, 133.7, 132.5, 131.8, 130.8, 129.1, 128.4, 128.0, 127.91, 127.88, 127.4, 126.7, 114.2, 55.8, 55.3, 43.8.

IR (thin film) 3031, 2970, 2835, 1657, 1510 cm^{-1}.

HRMS (CI) Calcd for $C_{22}H_{18}O_2S$ (M^+): 346.1028, Found: 346.1027.



3n

(3-(1,3-Dioxolan-2-yl)phenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)methanone (3n) was prepared as colorless oil from methyl 2-((3-(3-(1,3-dioxolan-2-yl)phenyl)-1H-isochromen-1-yl)oxy)ethanol (68.0 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 3:1) in 72% yield (59.4 mg, >20:1 dr, 92% ee).

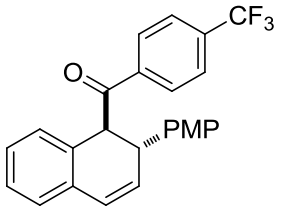
$[\alpha]_D^{26}$: −258.4 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 30% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 18.5 min (major), 11.0 min (minor).

^{1}H NMR (400 MHz, CD_2Cl_2) δ 8.04 (s, 1H), 7.92 (d, J = 7.6 Hz, 1H), 7.69 (d, J = 7.6 Hz, 1H), 7.51 – 7.48 (m, 1H), 7.27 – 7.19 (m, 2H), 7.15 – 7.08 (m, 3H), 6.87 (d, J = 7.6 Hz, 1H), 6.78 (d, J = 7.6 Hz, 2H), 6.65 (d, J = 9.6 Hz, 1H), 5.94 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 5.82 (s, 1H), 4.98 (d, J = 6.0 Hz, 1H), 4.12 – 4.03 (m, 5H), 3.23 (s, 3H).

^{13}C NMR (100 MHz, CD_2Cl_2) δ 200.6, 159.1, 139.5, 137.3, 135.0, 134.4, 132.1, 131.6, 130.5, 129.6, 129.2, 128.7, 128.0, 127.5, 127.1, 126.9, 114.3, 103.4, 65.9 (2C), 55.5, 54.1, 43.2.

IR (thin film) 3031, 2892, 1683, 1510, 1247 cm^{-1}.

HRMS (CI) Calcd for $C_{27}H_{24}O_4$ (M^+): 412.1675, Found: 412.1674.



3o

((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(4-(trifluoromethyl)phenyl)methanone (3o) was prepared as colorless oil from methyl 2-((3-(4-(trifluoromethyl)phenyl)-1H-isochromen-1-yl)oxy)ethanol (67.2 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 15:1) in 92% yield (60.6 mg, >20:1 dr, 94% ee).

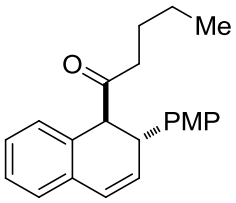
$[\alpha]_D^{26}$: −490.1 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 11.2 min (major), 8.1 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (d, J = 8.0 Hz, 2H), 7.70 (d, J = 8.0 Hz, 2H), 7.24 – 7.22 (m, 1H), 7.20 – 7.18 (m, 1H), 7.13 – 7.07 (m, 3H), 6.83 (d, J = 7.2 Hz, 1H), 6.79 – 6.75 (m, 2H), 6.64 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.98 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.95 (d, 8.0 Hz, 1H), 4.15 – 4.13 (m, 1H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.6, 158.8, 140.1, 134.6, 134.2, 133.7, 131.3, 129.00, 128.97, 128.1 (q, J = 257.5 Hz), 128.06, 128.0, 127.3, 126.9, 125.9 (q, J = 3.7 Hz), 125.0, 122.3, 114.3, 55.3, 54.5, 43.3.

IR (thin film) 3033, 2906, 1688, 1487, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{19}F_3O_2$ (M^+): 408.1337, Found: 408.1328.



3p

1-((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)pentan-1-one

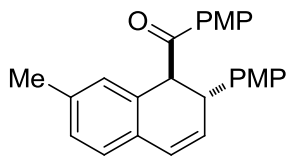
(3p) was prepared as colorless oil from 2-((3-butyl-1H-isochromen-1-yl)oxy)ethanol (49.6 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, with catalyst **D**, eluent: hexanes/ether = 9:1) in 80% yield (51.2 mg, >20:1 dr, 84% ee).

$[\alpha]_D^{26}$: −266.7 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 11.1 min (major), 9.6 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30 – 7.26 (m, 1H), 7.22 – 7.16 (m, 2H), 7.09 – 7.06 (m, 3H), 6.80 – 6.77 (m, 2H), 6.62 (d, J = 9.6Hz, 1H), 6.07 (dd, J_1 = 5.2Hz, J_2 = 9.6Hz, 1H), 4.15 (t, J = 4.4 Hz, 1H), 3.83 (d, J = 3.6Hz, 1H), 3.76 (s, 3H), 2.37 – 2.33 (m, 2H), 1.47 – 1.43 (m, 2H), 1.22 – 1.17 (m, 2H), 0.85 – 0.81 (m, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 210.6, 158.6, 134.0, 133.6, 131.1, 131.0, 129.5, 128.8, 128.0, 127.8, 127.0, 126.6, 114.1, 59.7, 55.3, 41.3, 40.8, 25.8, 22.3, 13.9.

The product is a known compound. The characterization data match the literature data.[2]



3q

(4-Methoxyphenyl)((1*S*,2*R*)-2-(4-methoxyphenyl)-7-methyl-1,2-dihydronaphthalen-1-yl)methanone (3q) was prepared as colorless oil from methyl 2-((3-(4-methoxyphenyl)-6-methyl-1H-isochromen-1-yl)oxy)ethanol (62.4 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 9:1) in 89% yield (68.4 mg, >20:1 dr, 93% ee).

$[\alpha]_D^{26}$: −418.8 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel

2. Asao, N.; Kasahara, T.; Yamamoto, Y. *Angew. Chem., Int. Ed.* **2003**, 42, 3504.

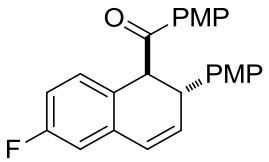
CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 13.3 min (major), 11.1 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.93 – 7.90 (m, 2H), 7.15 – 7.12 (m, 2H), 7.08 (d, J = 7.6 Hz, 1H), 7.03 (d, J = 7.6 Hz, 1H), 6.93 – 6.90 (m, 2H), 6.78 – 6.75 (m, 2H), 6.66 (s, 1H), 6.60 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.88 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.92 (d, J = 8.4 Hz, 1H), 4.12 – 4.09 (m, 1H), 3.86 (s, 3H), 3.74 (s, 3H), 2.02 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.0, 163.6, 158.6, 137.6, 135.5, 132.4, 131.2, 131.1, 130.2, 129.8, 129.0, 128.8, 128.2, 127.1, 126.5, 114.1, 114.0, 55.6, 55.3, 53.4, 43.7, 21.5.

IR (thin film) 3031, 2904, 1682, 1596, 1247 cm^{-1}.

HRMS (CI) Calcd for $C_{26}H_{24}O_3$ (M^+): 384.1725, Found: 384.1732.



3r

((1*S*,2*R*)-6-Fluoro-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(4-methoxyphenyl)methanone (3r) was prepared as colorless oil from methyl 2-((7-fluoro-3-(4-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (63.2 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 15:1) in 76% yield (59.0 mg, >20:1 dr, 97% ee).

$[\alpha]_D^{26}$: −320.1 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 17.3 min (major), 13.6 min (minor).

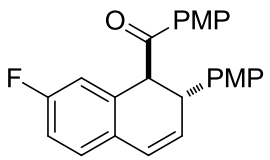
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.90 (m, 2H), 7.13 – 7.11 (m, 2H), 6.94 – 6.87 (m, 3H), 6.80 – 6.76 (m, 4H), 6.55 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 6.00 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 4.90 (d, J = 8.4 Hz, 1H), 4.13 – 4.10 (m, 1H), 3,87 (s,

3H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 199.4, 163.8, 163.5 (d, J = 243.6 Hz), 158.7, 135.8 (d, J = 7.9 Hz), 134.8, 132.2, 131.1, 129.8, 129.5 (d, J = 8.3 Hz), 129.0, 127.8(d, J = 3.3 Hz), 126.5, 114.2, 114.1, 114.0, 113.5 (d, J = 21.9 Hz), 55.6, 55.3, 52.6, 43.5.

IR (thin film) 3029, 2836, 1701, 1596, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{21}FO_3$ (M^+): 388.1475, Found: 388.1478.



3s

((1*S*,2*R*)-7-Fluoro-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(4-methoxyphenyl)methanone (3s) was prepared as colorless oil from methyl 2-((6-fluoro-3-(4-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (63.2 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 8:1) in 92% yield (71.2 mg, >20:1 dr, 96% ee).

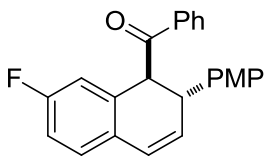
$[\alpha]_D^{26}$: −437.3 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 10% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 22.3 min (major), 12.3 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 (m, 2H), 7.15 – 7.12 (m, 3H), 6.93 – 6.90 (m, 3H), 6.78 – 6.76 (m, 2H), 6.60 – 6.57 (m, 2H), 5.92 (dd, J_1 = 4.0 Hz, J_2 = 10.0 Hz, 1H), 4.92 (d, J = 7.6 Hz, 1H), 4.12 – 4.10 (m, 1H), 3.87 (s, 3H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 198.9, 163.9, 163.4 (d, J = 245.1 Hz), 158.7, 135.0, 134.7 (d, J = 7.3 Hz), 131.1, 130.2 (d, J = 2.9 Hz), 130.0 (d, J = 2.5 Hz), 129.8, 129.0, 127.9 (d, J = 8.1 Hz), 126.2, 115.6 (d, J = 22.6 Hz), 114.3 (d, J = 21.1 Hz), 114.2, 114.13, 55.6, 55.3, 53.3, 43.1.

IR (thin film) 3033, 2986, 1672, 1600, 1510 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{21}FO_3$ (M^+): 388.1475, Found: 388.1470.



3t

((1*S*,2*R*)-7-Fluoro-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(phenyl) methanone (3t) was prepared as colorless oil from 2-((6-fluoro-3-phenyl-1H-isochromen-1-yl)oxy)ethanol (57.3 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl) boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 9:1) in 88% yield (63.2 mg, >20:1 dr, 91% ee).

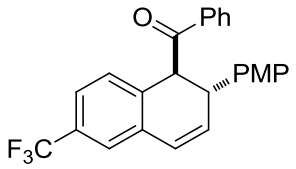
$[\alpha]_D^{26}$: −363.9 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 12.3 min (major), 15.6 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.89 (m, 2H), 7.59 – 7.55 (m, 1H), 7.48 – 7.44 (m, 2H), 7.17 – 7.11 (m, 3H), 6.94 – 6.90 (m, 1H), 6.79 – 6.77 (m, 2H), 6.62 – 6.59 (m, 2H), 5.92 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 4.94 (d, *J* = 7.2 Hz, 1H), 4.12 – 4.09 (m, 1H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.4, 163.4 (d, *J* = 245.2 Hz), 158.8, 136.8, 134.6, 134.1 (d, *J* = 7.3 Hz), 133.4, 130.2 (d, *J* = 3.1 Hz), 129.7 (d, *J* = 2.2 Hz), 129.0, 128.9, 128.7, 128.0 (d, *J* = 8.1 Hz), 126.3, 115.6 (d, *J* = 22.5 Hz), 114.5, 114.3, 55.5, 53.7, 42.9.

IR (thin film) 3034, 2932, 1683, 1500, 1247 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{19}FO_2$ (M^+): 358.1369, Found: 358.1374.



3u

((1*S*,2*R*)-2-(4-Methoxyphenyl)-6-(trifluoromethyl)-1,2-dihydronaphthalen-1-yl)(phenyl)methanone (3u) was prepared as colorless oil from

2-((3-phenyl-7-(trifluoromethyl)-1H-isochromen-1-yl)oxy)ethanol (67.3 mg, 0.2 mmol) and (*E*)-(4-methoxy styryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 4:1) in 53% yield (43.2 mg, >20:1 dr, 90% ee).

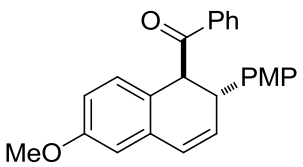
$[\alpha]_D^{26}$: −347.8 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 8.4 min (major), 9.3 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.90 (m, 2H), 7.47 – 7.46 (m, 1H), 7.35 – 7.34 (m, 3H), 7.12 (d, *J* = 7.6 Hz, 1H), 7.11 – 7.09 (m, 2H), 6.99 (d, *J* = 8.0 Hz, 1H), 6.68 – 6.78 (m, 2H) 6.65 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 6.05 (dd, J_1 = 4.4 Hz, J_2 = 8.8 Hz, 1H), 5.02 (d, *J* = 6.8 Hz, 1H), 4.16 – 4.12 (m, 1H), 3.75 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.0, 158.9, 136.6, 135.7, 134.6, 134.2, 133.5, 132.0, 130.3 (q, *J* = 32.5 Hz), 129.0, 128.9, 128.74, 128.68 (q, *J* = 231.3 Hz), 128.2, 126.4, 124.5 (q, *J* = 4.1 Hz), 123.2(q, *J* = 3.7 Hz), 114.4, 55.4, 53.5, 43.0.

IR (thin film) 3033, 2986, 1672, 1600, 1510 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{19}F_3O_2$ (M^+): 408.1337, Found: 408.1333.



3v

((1*S*,2*R*)-6-Methoxy-2-(4-methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(phenyl)methanone (3v) was prepared as colorless oil from methyl 2-((7-methoxy-3-phenyl-1H-isochromen-1-yl)oxy)ethanol (65.0 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 8:1) in 82% yield (73.2 mg, >20:1 dr, 68% ee).

$[\alpha]_D^{26}$: −452.3 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention

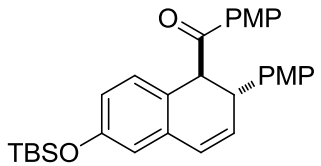
times: 20.4 min (major), 16.4 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.90 (m, 2H), 7.57 – 7.53 (m, 1H), 7.46 – 7.42 (m, 2H), 7.13 (d, J = 8.4 Hz, 2H), 6.78 – 6.75 (m, 4H), 6.64 – 6.57 (m, 2H), 5.98 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 4.88 (d, J = 6.8 Hz, 1H), 4.12 – 4.09 (m, 1H), 3.79 (s, 3H), 3.74 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 201.2, 159.2, 158.7, 137.1, 135.01, 134.97, 133.1, 131.2, 129.2, 129.0, 128.8, 128.7, 127.3, 123.8, 114.2, 112.8, 112.5, 55.4, 55.3, 53.1, 43.3.

IR (thin film) 3031, 2921, 2835, 1678, 1605 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_3$ (M^+): 370.1569, Found: 370.1579.



3w

((1*S*,2*R*)-6-((*tert*-Butyldimethylsilyl)oxy)-2-(4-methoxyphenyl)-1,2-dihydron aphthalen-1-yl)(4-methoxyphenyl)methanone (3w) was prepared as colorless oil from 2-((7-((tert-butyldimethylsilyl)oxy)-3-(4-methoxyphenyl)-1H-isochromen-1-yl)oxy)ethanol (85.8 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl) boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (36 h, eluent: hexanes/ether = 4:1) in 72% yield (72.1 mg, >20:1 dr, 77% ee).

$[\alpha]_D^{26}$: −387.4 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 11.6 min (major), 9.1 min (minor).

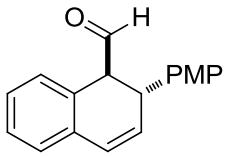
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 – 7.88 (m, 2H), 7.14 (d, J = 8.8 Hz, 2H), 6.91 – 6.89 (m, 2H), 6.76 (d, J = 8.8 Hz, 2H), 6.70 – 6.66 (m, 2H), 6.55 – 6.51 (m, 2H), 5.96 (dd, J_1 = 3.6 Hz, J_2 = 9.6 Hz, 1H), 4.88 (d, J = 8.8, Hz, 1H), 4.15 – 4.11 (m, 1H), 3.85 (s, 3H), 3.74 (s, 3H), 0.98 (s, 9H), 0.192 (s, 3H), 0.189 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.2, 163.6, 158.6, 155.0, 135.5, 134.9, 131.6,

131.1, 130.4, 129.1, 128.8, 127.2, 125.3, 118.9, 118.4, 114.1, 114.0, 55.6, 55.3, 52.7, 43.7, 25.8, 18.3, -4.2.

IR (thin film) 3020, 2921, 2835, 1720, 1595 cm^{-1}.

HRMS (CI) Calcd for $C_{31}H_{37}O_4Si$ ($M+H^+$): 501.2461, Found: 501.2469.



3x

(1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalene-1-carbaldehyde (3x) was prepared as colorless oil from 2-((1H-isochromen-1-yl)oxy)ethanol (38.4 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl) boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 9:1) in 78% yield (41.2 mg, >20:1 dr, 50% ee).

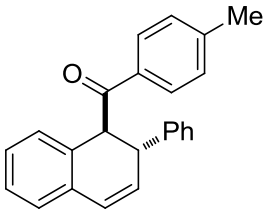
$[\alpha]_D^{26}$: −153.6 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 9.6 min (major), 10.0min (minor).

^{1}H NMR (400 MHz, acetone-d_6) δ 9.62 (s, 1H), 7.32 – 7.23 (m, 4H), 7.10 – 7.08(m, 2H), 6.79 – 6.77 (m, 2H), 6.65 (d, J = 9.6 Hz, 1H), 6.05 (dd, J_1 = 6.0 Hz, J_2 = 10.0 Hz, 1H), 4.23 (d, J = 5.6 Hz, 1H), 3.78 (s, 1H), 3.71 (s, 3H).

^{13}C NMR (100 MHz, acetone-d_6) δ 199.8, 159.7, 134.7, 134.4, 131.0, 130.6, 129.49, 129.46, 129.1, 129.0, 127.7, 127.6, 114.9, 60.0, 55.5, 39.0.

IR (thin film) 3033, 2830, 1678, 1560, 1248cm^{-1}.

MS (LD+) Calcd for $C_{18}H_{15}O_2$ ($M-H^+$): 263.1, Found: 263.2.



4a

((1*S*,2*R*)-2-Phenyl-1,2-dihydronaphthalen-1-yl)(*p*-tolyl)methanone (4a) was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-styrylboronic acid (88.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 15:1) in 87% yield (56.4 mg, >20:1 dr, 92% ee).

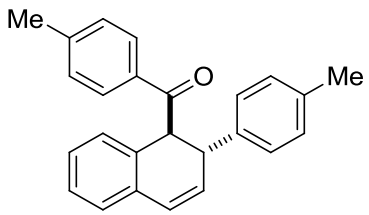
$[\alpha]_D^{26}$: −511.4 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 11.3 min (major), 7.9 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, J = 7.2 Hz, 2H), 7.27 – 7.20 (m, 9H), 7.13 – 7.09 (m, 1H), 6.90 (d, J = 7.2 Hz, 1H), 6.68 (d, J = 9.6 Hz, 1H), 6.02 (dd, J_1 = 3.2 Hz, J_2 = 9.6 Hz, 1H), 5.05 (d, J = 8.0 Hz, 1H), 4.25 – 4.22 (m, 1H), 2.43 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.8, 144.1, 143.2, 134.7, 133.8, 132.2, 130.5, 129.5, 128.9, 128.8(2C), 128.1, 127.9, 127.7, 127.4, 127.1, 126.7, 53.3, 44.2, 21.8.

IR (thin film) 3060, 2974, 1700, 1571, 1407 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{20}O$ (M^+): 324.1514, Found: 324.1528.



4b

***p*-Tolyl((1*S*,2*R*)-2-(*p*-tolyl)-1,2-dihydronaphthalen-1-yl)methanone (4b)** was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(4-methylstyryl)boronic acid (97.2 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 15:1) in 92%

yield (62.4 mg, >20:1 dr, 97% ee).

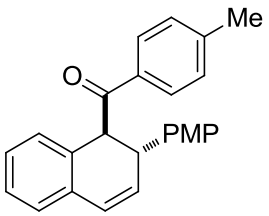
$[\alpha]_D^{26}$: −333.1 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK IC column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 13.3 min (major), 20.0 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (d, J = 7.6 Hz, 2H), 7.28 – 7.19 (m, 4H), 7.15 – 7.06 (m, 5H), 6.88 (d, J = 7.6 Hz, 1H), 6.66 (d, J = 9.6 Hz, 1H), 6.00 (dd, J_1 = 2.4 Hz, J_2 = 9.6 Hz, 1H), 5.02 (d, J = 7.6 Hz, 1H), 4.19 (s, 1H), 2.43 (s, 3H), 2.30 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.7, 144.0, 140.2, 136.7, 134.6, 133.8, 132.2, 130.7, 129.53, 129.49, 128.9, 128.1, 127.9, 127.8, 127.7, 127.3, 126.7, 53.3, 43.7, 21.8, 21.1.

IR (thin film) 3027, 2920, 1678, 1605, 1181 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O$ (M^+): 338.1671, Found: 338.1664.



4c

((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(*p*-tolyl) methanone (4c) was prepared as colorless oil from methyl 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl) boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 15:1) in 93% yield (65.6 mg, >20:1 dr, 94% ee).

$[\alpha]_D^{26}$: −382.5 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 14.2 min (major), 10.0 min (minor).

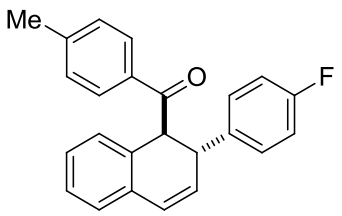
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, J = 8.0 Hz, 2H), 7.28 – 7.16 (m, 6H), 7.10

(t, J = 7.2 Hz, 1H), 6.88 (d, J = 7.6 Hz, 1H), 6.80 (d, J = 8.4 Hz, 2H), 6.65 (d, J = 10.0 Hz, 1H), 6.00 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 5.00 (d, J = 8.0 Hz, 1H), 4.18 (t, J = 4.0 Hz, 1H), 3.77 (s, 3H), 2.43 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.8, 158.6, 144.1, 135.2, 134.7, 133.8, 132.2, 130.9, 129.5, 129.0, 128.9, 128.1, 127.8, 127.7, 127.2, 126.6, 114.1, 55.3, 53.5, 43.3, 21.7.

IR (thin film) 3030, 2931, 1678, 1606, 1510 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_2$ (M^+): 354.1620, Found: 354.1631.



4d

((1*S*,2*R*)-2-(4-Fluorophenyl)-1,2-dihydronaphthalen-1-yl)(*p*-tolyl)methanone (4d) was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl) oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(4-fluorostyryl)boronic acid (99.6 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 20:1) in 85% yield (57.8 mg, >20:1 dr, 95% ee).

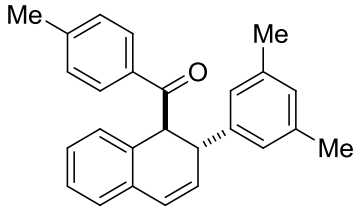
$[\alpha]_D^{26}$: −495.2 (c = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 13.0 min (major), 8.5 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (d, J = 8.4 Hz, 2H), 7.25 – 7.17 (m, 6H), 7.10 - 7.06 (m, 1H), 6.93 – 6.89 (m, 2H), 6.85 (d, J = 7.2 Hz, 1H), 6.65 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.96 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 4.98 (d, J = 8.8 Hz, 1H), 4.23 – 4.20 (m, 1H), 2.40 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.8, 163.1 (d, J = 243.5 Hz), 144.3, 138.9 (d, J = 3.4 Hz), 134.8, 133.6, 132.2, 130.5, 129.7 (d, J = 7.8 Hz), 129.6, 128.8, 127.9 (d, J = 3.6 Hz), 127.8, 127.6, 126.7, 115.6, 115.5, 53.5, 43.5, 21.8.

IR (thin film) 3033, 2921, 1677, 1605, 1508 cm^{-1}.

HRMS (CI) Calcd for $C_{24}H_{19}FO$ (M^+): 342.1420, Found: 342.1432.



4e

((1*S*,2*R*)-2-(3,5-Dimethylphenyl)-1,2-dihydronaphthalen-1-yl)(*p*-tolyl)methanone (4e) was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(3,5-dimethylstyryl) boronic acid (105.6 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 20:1) in 84% yield (59.2 mg, >20:1 dr, 93% ee).

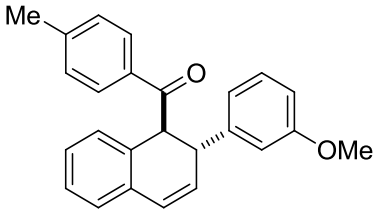
$[\alpha]_D^{26}$: −443.1 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 7.5 min (major), 5.8 min (minor).

^{1}H NMR (400 MHz, CD_2Cl_2) δ 7.86 (d, J = 8.0 Hz, 2H), 7.27 – 7.18 (m, 4H), 7.10 (t, J = 7.2 Hz, 1H), 6.89 – 6.86 (m, 4H), 6.65 (d, J = 9.6 Hz, 1H), 6.00 (dd, J_1 = 3.6 Hz, J_2 = 9.6 Hz, 1H), 5.05 (d, J = 8.0 Hz, 1H), 4.16 – 4.15 (m, 1H), 2.43 (s, 3H), 2.25 (s, 6H).

^{13}C NMR (100 MHz, CD_2Cl_2) δ 201.0, 144.0, 143.2, 138.2, 134.8, 133.7, 132.3, 130.8, 129.5, 128.9, 128.7, 128.0, 127.8, 127.6, 127.1, 126.7, 125.8, 53.1, 44.0, 21.8, 21.4.

IR (thin film) 3029, 2836, 1701, 1596, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{26}H_{25}O$ ($M+H^+$): 353.1905, Found: 353.1909.



4f

((1*S*,2*R*)-2-(3-Methoxyphenyl)-1,2-dihydronaphthalen-1-yl)(*p*-tolyl) methanone (4f) was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(3-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 20:1) in 76% yield (53.6 mg, >20:1 dr, 85% ee).

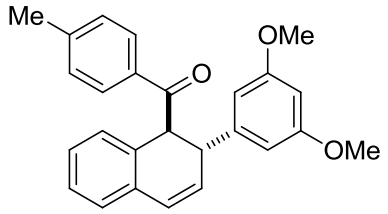
$[\alpha]_D^{26}$: −288.8 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 12.7 min (major), 9.2 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, J = 8.0 Hz, 2H), 7.25 – 7.14 (m, 5H), 7.11 – 7.08 (m, 1H), 6.87 – 6.82 (m, 2H), 6.79 – 6.78 (m, 1H), 6.74 – 6.71 (m, 1H), 6.65 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 5.98 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 5.03 (d, J = 7.6 Hz, 1H), 4.20 – 4.16 (m, 1H), 3.71 (s, 3H), 2.41(s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.7, 159.8, 144.8, 144.1, 134.7, 133.7, 132.2, 130.3, 129.8, 129.5, 128.9, 128.1, 127.9, 127.7, 127.4, 126.7, 120.4, 113.8, 112.4, 55.2, 53.1, 44.1, 21.8.

IR (thin film) 3031, 2921, 2835, 1678, 1605 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_2$ (M^+): 354.1620, Found: 354.1608.



4g

((1*S*,2*R*)-2-(3,5-Dimethoxyphenyl)-1,2-dihydronaphthalen-1-yl)(*p*-tolyl) methanone (4g) was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(3,5-dimethoxystyryl)boronic acid (124.8 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 3:1) in 73% yield (56.4 mg, >20:1 dr, 83% ee).

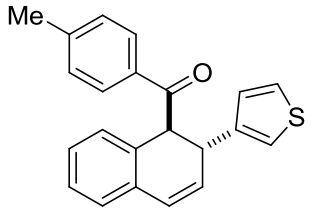
$[\alpha]_D^{26}$: −240.8 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 5% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 16.0 min (major), 12.4 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, J = 8.4 Hz, 2H), 7.25 – 7.15 (m, 4H), 7.09 – 7.05 (m, 1H), 6.87 (d, J = 7.6 Hz, 1H), 6.63 (dd, J_1 = 2.0 Hz, J_2 = 9.6 Hz, 1H), 6.38 (d, J = 2.4 Hz, 2H), 6.28 (t, J = 2.0 Hz, 1H), 5.98 (dd, J_1 = 4.0 Hz, J_2 = 9.6 Hz, 1H), 5.02 (d, J = 8.0 Hz, 1H), 4.15 – 4.12 (m, 1H), 3.68 (s, 6H), 2.40 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.7, 160.9, 145.6, 144.1, 134.7, 133.6, 132.3, 130.2, 129.5, 128.9, 128.0, 127.9, 127.7, 127.5, 126.7, 106.1, 98.9, 55.3, 53.0, 44.3, 21.8.

IR (thin film) 2956, 2836, 1678, 1605, 1450 cm^{-1}.

HRMS (CI) Calcd for $C_{26}H_{25}O_3$ ($M+H^+$): 385.1803, Found: 385.1802.



4h

((1*S*,2*R*)-2-(Thiophen-3-yl)-1,2-dihydronaphthalen-1-yl)(*p*-tolyl)methanone (4h) was prepared as colorless oil from 2-((3-(*p*-tolyl)-1H-isochromen-1-yl)oxy)ethanol (56.4 mg, 0.2 mmol) and (*E*)-(2-(thiophen-3-yl)vinyl)boronic acid (92.4 mg, 0.6 mmol) according to the General Procedure B (24 h, eluent: hexanes/ether = 20:1) in 84% yield (55.2 mg, >20:1 dr, 80% ee).

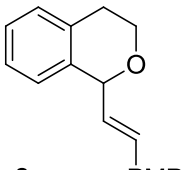
$[\alpha]_D^{26}$: −337.7 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 17.9 min (major), 10.2 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 8.0 Hz, 2H), 7.24 – 7.15 (m, 5H), 7.10 – 7.06 (m, 1H), 7.01 – 7.00 (m, 1H), 6.94 (dd, J_1 = 1.2 Hz, J_2 = 4.8 Hz, 1H), 6.92 (d, *J* = 16 Hz, 1H), 6.61 (dd, J_1 = 1.6 Hz, J_2 = 9.6 Hz, 1H), 6.00 (dd, J_1 = 4.4 Hz, J_2 = 9.6 Hz, 1H), 4.98 (d, *J* = 8.0 Hz, 1H), 4.34 – 4.30 (m, 1H), 2.41 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.7, 144.2, 143.3, 134.7, 133.7, 132.3, 130.1, 129.6, 128.8, 128.1, 127.9, 127.8, 127.3, 127.2, 126.7, 126.2, 121.5, 52.8, 39.3, 21.8.

IR (thin film) 3032, 2835, 1682, 1510, 1248 cm^{-1}.

HRMS (CI) Calcd for $C_{22}H_{19}OS$ ($M+H^+$): 331.1156, Found: 331.1147.



8

(*E*)-1-(4-Methoxystyryl)isochroman (8) was prepared as colorless oil from 1-methoxyisochroman (32.8 mg, 0.2 mmol) and (*E*)-(4-methoxystyryl)boronic acid (106.8 mg, 0.6 mmol) according to the General Procedure B (72 h, eluent: hexanes/ether = 9:1) in 63% yield (28.4 mg, 0% ee).

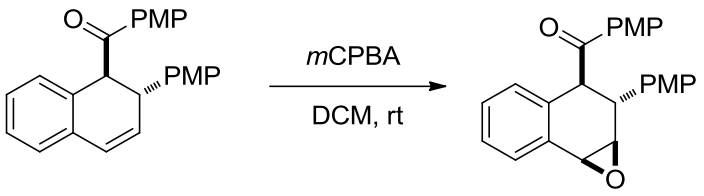
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.38 (d, J = 8.4 Hz, 2H), 7.21 – 7.14 (m, 3H), 7.12 – 7.10 (m, 1H), 6.87 – 6.85 (m, 2H), 6.69 (d, J = 8.0 Hz, 1H), 6.23 – 6.17 (m ,1H), 5.33 – 5.31 (m, 1H), 4.25 – 4.20 (m, 1H), 3.95 – 3.89 (m, 1H), 3.81 (s, 3H), 3.08 – 3.00 (m, 1H), 2.82 – 2.76 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 159.6, 136.8, 133.7, 133.6, 129.4, 129.0, 128.1, 127.2, 126.8, 126.4, 126.2, 114.1, 78.1, 63.5, 55.4, 28.9.

IR (thin film) 3027, 2902, 1666, 1460, 1280 cm^{-1}.

HRMS (CI) Calcd for $C_{18}H_{18}O_2$ (M^+): 226.1307, Found: 226.1306.

IV. Derivatizations



3j **9**

(4-Methoxyphenyl)((1a*R*,2*R*,3*S*,7b*S*)-2-(4-methoxyphenyl)-1a,2,3,7b-tetrahydronaphtho[1,2-b]oxiren-3-yl)methanone (9). A 4-mL oven-dried vial was charged with alkene **3j** (23.0 mg, 62 μmol), *m*CPBA (12.0 mg, 85% purity, 68 μmol), and DCM (1.0 mL). The mixture was stirred at room temperature under N_2 overnight and concentrated. The residue was purified by silica gel flash column chromatography to give the epoxide **9** (20.6 mg, 86% yield, >20:1 dr, 94% ee).

$[\alpha]_D^{26}$: −3.9 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 20% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 18.0 min (major), 15.6 min (minor).

^{1}H NMR (400 MHz, CD_2Cl_2) δ 7.81 – 7.78 (m, 2H), 7.55 – 7.53 (m, 1H), 7.32 – 7.28 (m, 3H), 7.20 – 7.16 (m, 1H), 6.87 – 6.84 (m, 2H), 6.80 – 6.76 (m, 3H), 4.99 (d, *J* = 11.6 Hz, 1H), 4.03 (d, *J* = 4.4 Hz, 1H), 3.82 (s, 3H), 3.77 (d, *J* = 4.4 Hz, 1H), 3.71 (s, 3H), 3.63 (d, *J* = 11.6 Hz, 1H).

^{13}C NMR (100 MHz, CD_2Cl_2) δ 200.6, 164.2, 159.1, 137.5, 133.7, 133.2, 132.2, 131.1(2C), 130.2, 130.0, 128.9, 127.6, 127.2, 114.3, 114.2, 59.3, 55.9, 55.5, 53.7, 42.6.

IR (thin film) 3002, 2971, 1723, 1597, 1512 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{22}O_4$ (M^+): 386.1518, Found: 386.1511.

***p*-Tolyl((1a*R*,2*R*,3*S*,7b*S*)-2-(*p*-tolyl)-1-tosyl-1a,2,3,7b-tetrahydro-1H-naphtho [1,2-b]azirin-3-yl)methanone (10).** A 4-mL oven-dried vial was charged with alkene **4b** (25.0 mg, 73 μmol), chloramine-T trihydrate (18.5 mg, 81 μmol) and MeCN (0.5 mL). Next, trimethylphenylammonium tribromide (2.6 mg, 7 μmol) was added. The mixture was stirred at room temperature under nitrogen overnight and filtered through a pad of celite. The filtrate was concentrated and subjected to silica gel flash column chromatography to give pure **10** (32.4 mg, 87% yield, >20:1 dr, >99% ee).

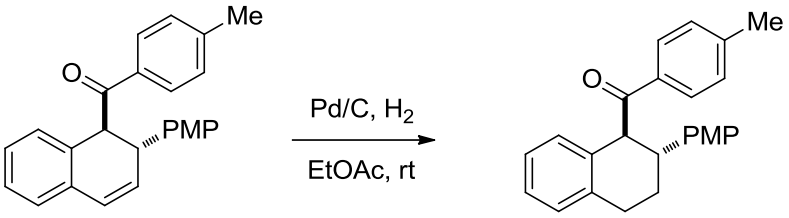
$[\alpha]_D^{26}$: −33.6 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK OD-H column; 30% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 9.3 min (major), 3.2 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (d, *J* = 8.4 Hz, 2H), 7.48 – 7.44 (m, 3H), 7.32 – 7.29 (m, 2H), 7.27 – 7.25 (m, 2H), 7.19 – 7.17 (m, 2H), 7.04 (d, *J* = 8.0 Hz, 2H), 6.98 – 6.96 (m, 1H), 6.88 (d, *J* = 8.0 Hz, 2H), 4.36 (s, 1H), 4.25 (s, 1H), 3.96 (d, *J* = 6.8 Hz, 1H), 3.58 (dd, J_1 = 2.0 Hz, J_2 = 6.8 Hz, 1H), 2.42 (s, 3H), 2.40 (s, 3H), 2.28 (s, 3H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 200.4, 144.3, 142.6, 137.5, 137.4, 135.6, 134.7, 132.5, 131.8, 131.0, 129.8, 129.7 (2C), 129.6, 129.2, 128.4, 127.8, 127.7, 127.6, 55.6, 45.1, 41.5, 39.5, 21.8, 21.7, 21.1.

IR (thin film) cm^{-1}. 3442, 2923, 2854, 1685, 1604

HRMS (CI) Calcd for $C_{32}H_{30}NO_3S$ ($M+H^+$): 508.1946, Found: 508.1938.



4c **11**

((1*S*,2*R*)-2-(4-Methoxyphenyl)-1,2,3,4-tetrahydronaphthalen-1-yl)(*p*-tolyl) methanone (11). A 25-mL oven-dried flask was charged with alkene **4c** (36.0 mg, 0.1 mmol), Pd/C (10 wt%, 5.0 mg), and ethyl acetate (5.0 mL). The flask was evaluated and refilled with H_2 (balloon). The mixture was stirred at room temperature overnight and filtered through a pad of celite, which was washed with ethyl acetate (3×10 mL). The filtrate was concentrated, and the residue purified by silica gel flash column chromatography to afford the pure product **11** (33.2 mg, 92% yield, >20:1 dr, 92% ee).

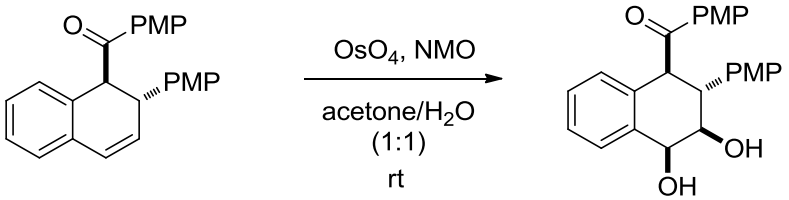
$[\alpha]_D^{26}$: −76.6 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK OD-H column; 3% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 11.2 min (major), 15.8 min (minor).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (d, *J* = 8.4 Hz, 2H), 7.20 – 7.15 (m, 4H), 7.09 – 7.03 (m, 3H), 6.89 (d, *J* = 7.6 Hz, 1H), 6.72 – 6.74 (m, 2H), 4.94 (d, *J* = 8.8 Hz, 1H), 3.73 (s, 3H), 3.51 – 3.45 (m, 1H), 3.07 – 3.04 (m, 1H), 2.92 – 2.87 (m, 1H), 2.37 (s, 3H), 2.18 – 2.14 (m, 1H), 2.08 – 2.02 (m, 1H).

^{13}C NMR (100 MHz, $CDCl_3$) δ 202.8, 158.3, 143.7, 137.1, 136.4, 135.7, 135.4, 129.5, 129.4, 129.0, 128.6, 128.4, 126.7, 126.3, 114.0, 55.3, 54.8, 43.8, 29.8, 29.3, 21.7.

IR (thin film) 3027, 2920, 1678, 1605, 1181 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{24}O_2$ (M^+): 356.1776, Found: 356.1778.



3j **12**

((1*S*,2*R*,3*R*,4*S*)-3,4-Dihydroxy-2-(4-methoxyphenyl)-1,2,3,4-tetrahydronaphthalen-1-yl)(4-methoxyphenyl)methanone (12). A 4-mL oven-dried vial was charged with alkene **3j** (20.5 mg, 55 μmol), NMO (16.1 mg, 0.137 mmol), acetone (0.3 mL), and water (0.2 mL). Next, OsO_4 (0.36 mg, 0.18 mL solution, 0.2 wt% in water, 3 μmol) was added. The mixture was stirred at room temperature under N_2 overnight and then filtered through a pad of celite. The filtrate was concentrated to give the crude product. ^{1}H NMR analysis of the crude product indicated that the diastereomeric ratio was 3.1:1. The crude mixture was subjected to flash column chromatography to give the pure **12** (16.7 mg, 75% yield, 94% ee).

$[\alpha]_D^{26}$: −273.3 (*c* = 1.0, $CHCl_3$). HPLC analysis of the product: Daicel CHIRALPAK AS-H column; 30% *i*-PrOH in hexanes; 1.0 mL/min; retention times: 29.5 min (major), 23.2 min (minor).

Major isomer:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78 (d, *J* = 6.8 Hz, 2H), 7.56 (d, *J* = 6.8 Hz, 1H), 7.33 – 7.30 (m, 1H), 7.23 – 7.21 (m, 1H), 7.13 (d, *J* = 8.8 Hz, 2H), 6.95 (d, *J* = 7.6 Hz, 1H), 6.86 – 6.81 (m, 4H), 4.91 (d, *J* = 7.2 Hz, 1H), 4.74 (s, 1H), 4.16 (br s, 1H), 3.84 (s, 1H), 3.76 (s, 1H), 3.73 – 3.68 (m, 1H).

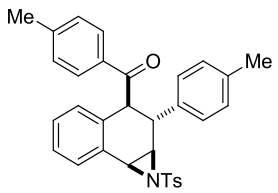
^{13}C NMR (100 MHz, $CDCl_3$) δ 200.8, 164.0, 159.0, 134.5, 132.2, 131.9, 130.9(2C), 129.4, 129.2, 128.0(2C), 127.8, 114.6, 114.1, 73.3, 70.2, 55.6, 55.4, 54.7, 45.4.

IR (thin film) 3415, 2935, 1623, 1491, 1252 cm^{-1}.

HRMS (CI) Calcd for $C_{25}H_{25}O_5$ ($M+H^+$): 405.1702, Found: 405.1698.

V. Determination of the Absolute Stereochemistry

The absolute configuration of **10** was determined by X-ray diffraction. The data have been deposited at the Cambridge Crystallographic Data Center (CCDC 1021235). The stereochemistry of the other products was assigned by analogy.



10

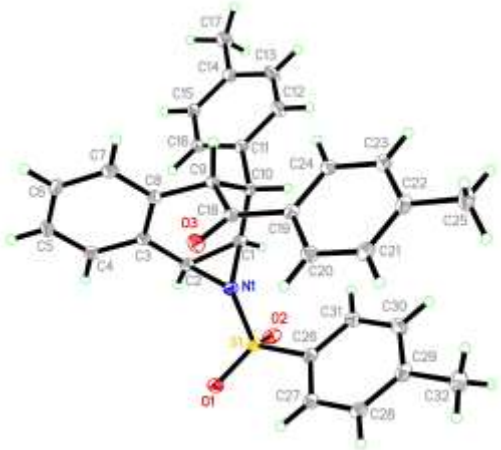


Table 1. Crystal data and structure refinement for **10**.

Identification code	qian11cult	
Empirical formula	C32 H29 N O3 S	
Formula weight	507.62	
Temperature	99.9(2) K	
Wavelength	1.5418 Å	
Crystal system	Orthorhombic	
Space group	P2(1)2(1)2(1)	
Unit cell dimensions	a = 8.33405(8) Å	α= 90°
	b = 11.10306(9) Å	β= 90°
	c = 27.9805(3) Å	γ = 90°
Volume	2589.13(4) $Å^3$	
Z	4	
Density (calculated)	1.302 Mg/m^3	
Absorption coefficient	1.383 mm^{-1}	
F(000)	1072	
Crystal size	0.20 x 0.18 x 0.08 mm^3	
Theta range for data collection	4.28 to 67.42°	
Index ranges	-8<=h<=9, -13<=k<=13, -33<=l<=22	
Reflections collected	10798	
Independent reflections	4579 [R(int) = 0.0135]	
Completeness to theta = 66.50°	99.02 %	
Absorption correction	Semi-empirical from equivalents	

Max. and min. transmission	1.00000 and 0.28303
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	4579 / 0 / 337
Goodness-of-fit on F^2	1.002
Final R indices [I>2sigma(I)]	R1 = 0.0240, wR2 = 0.0599
R indices (all data)	R1 = 0.0246, wR2 = 0.0604
Absolute structure parameter	0.006(10)
Largest diff. peak and hole	0.187 and -0.241 e.$Å^{-3}$

Table 2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters ($Å^2$x 10^3) for qian11CuLT. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
S(1)	517(1)	3419(1)	3477(1)	16(1)
O(1)	-271(1)	2283(1)	3541(1)	22(1)
O(2)	-217(1)	4469(1)	3684(1)	22(1)
O(3)	5459(1)	1623(1)	3325(1)	20(1)
N(1)	2405(1)	3258(1)	3666(1)	15(1)
C(1)	3079(2)	4285(1)	3944(1)	15(1)
C(2)	2575(2)	3178(1)	4203(1)	16(1)
C(3)	3815(2)	2328(1)	4375(1)	16(1)
C(4)	3408(2)	1460(1)	4714(1)	19(1)
C(5)	4556(2)	650(1)	4877(1)	22(1)
C(6)	6120(2)	737(1)	4710(1)	20(1)
C(7)	6541(2)	1630(1)	4385(1)	18(1)
C(8)	5395(2)	2431(1)	4211(1)	14(1)
C(9)	5827(2)	3340(1)	3827(1)	14(1)
C(10)	4847(2)	4528(1)	3872(1)	14(1)
C(11)	5421(2)	5318(1)	4283(1)	15(1)
C(12)	6258(2)	6384(1)	4197(1)	21(1)
C(13)	6710(2)	7136(1)	4569(1)	25(1)
C(14)	6346(2)	6858(1)	5043(1)	19(1)
C(15)	5528(2)	5786(1)	5130(1)	16(1)
C(16)	5076(2)	5034(1)	4758(1)	16(1)
C(17)	6811(2)	7685(1)	5448(1)	28(1)
C(18)	5701(2)	2701(1)	3337(1)	15(1)
C(19)	6003(2)	3353(1)	2878(1)	16(1)
C(20)	5524(2)	2775(1)	2457(1)	21(1)
C(21)	5893(2)	3259(1)	2015(1)	22(1)
C(22)	6763(2)	4328(1)	1973(1)	20(1)
C(23)	7216(2)	4912(1)	2394(1)	18(1)

C(24)	6843(2)	4436(1)	2841(1)	16(1)
C(25)	7241(2)	4811(1)	1491(1)	26(1)
C(26)	878(2)	3667(1)	2866(1)	17(1)
C(27)	397(2)	2809(1)	2538(1)	18(1)
C(28)	715(2)	3003(1)	2057(1)	21(1)
C(29)	1511(2)	4036(1)	1904(1)	21(1)
C(30)	1989(2)	4887(1)	2247(1)	22(1)
C(31)	1667(2)	4710(1)	2725(1)	20(1)
C(32)	1855(2)	4262(2)	1385(1)	29(1)

Table 3. Bond lengths [Å] and angles [°] for qian11CuLT.

S(1)-O(1)	1.4339(10)
S(1)-O(2)	1.4390(10)
S(1)-N(1)	1.6701(11)
S(1)-C(26)	1.7556(14)
O(3)-C(18)	1.2151(16)
N(1)-C(1)	1.4893(17)
N(1)-C(2)	1.5098(17)
C(1)-C(2)	1.4866(19)
C(1)-C(10)	1.5118(19)
C(2)-C(3)	1.4798(19)
C(3)-C(4)	1.3942(19)
C(3)-C(8)	1.3985(19)
C(4)-C(5)	1.391(2)
C(5)-C(6)	1.389(2)
C(6)-C(7)	1.391(2)
C(7)-C(8)	1.3925(19)
C(8)-C(9)	1.5182(17)
C(9)-C(10)	1.5555(17)
C(9)-C(18)	1.5472(17)
C(10)-C(11)	1.5227(18)
C(11)-C(12)	1.3956(18)
C(11)-C(16)	1.3958(19)
C(12)-C(13)	1.387(2)
C(13)-C(14)	1.394(2)
C(14)-C(15)	1.3929(18)
C(14)-C(17)	1.5089(19)
C(15)-C(16)	1.3864(19)
C(18)-C(19)	1.4952(19)
C(19)-C(20)	1.4000(19)
C(19)-C(24)	1.3952(19)

C(20)-C(21)	1.383(2)
C(21)-C(22)	1.396(2)
C(22)-C(23)	1.396(2)
C(22)-C(25)	1.505(2)
C(23)-C(24)	1.391(2)
C(26)-C(27)	1.3817(19)
C(26)-C(31)	1.389(2)
C(27)-C(28)	1.390(2)
C(28)-C(29)	1.391(2)
C(29)-C(30)	1.404(2)
C(29)-C(32)	1.501(2)
C(30)-C(31)	1.379(2)
O(1)-S(1)-O(2)	117.86(6)
O(1)-S(1)-N(1)	107.27(6)
O(1)-S(1)-C(26)	109.79(6)
O(2)-S(1)-N(1)	111.02(6)
O(2)-S(1)-C(26)	109.82(6)
N(1)-S(1)-C(26)	99.49(6)
C(1)-N(1)-S(1)	116.04(9)
C(1)-N(1)-C(2)	59.42(8)
C(2)-N(1)-S(1)	114.28(8)
N(1)-C(1)-C(10)	115.80(11)
C(2)-C(1)-N(1)	60.97(8)
C(2)-C(1)-C(10)	119.14(12)
C(1)-C(2)-N(1)	59.60(8)
C(3)-C(2)-N(1)	115.25(11)
C(3)-C(2)-C(1)	119.26(12)
C(4)-C(3)-C(2)	119.49(12)
C(4)-C(3)-C(8)	120.54(13)
C(8)-C(3)-C(2)	119.92(12)
C(5)-C(4)-C(3)	120.22(13)
C(6)-C(5)-C(4)	119.34(13)
C(5)-C(6)-C(7)	120.48(13)
C(6)-C(7)-C(8)	120.68(13)
C(3)-C(8)-C(9)	120.60(12)
C(7)-C(8)-C(3)	118.67(12)
C(7)-C(8)-C(9)	120.60(12)
C(8)-C(9)-C(10)	112.43(10)
C(8)-C(9)-C(18)	107.83(10)
C(18)-C(9)-C(10)	115.19(10)
C(1)-C(10)-C(9)	111.79(10)
C(1)-C(10)-C(11)	107.99(11)
C(11)-C(10)-C(9)	112.66(10)
C(12)-C(11)-C(10)	121.02(12)

C(12)-C(11)-C(16)	117.30(12)
C(16)-C(11)-C(10)	121.62(11)
C(13)-C(12)-C(11)	121.09(13)
C(12)-C(13)-C(14)	121.45(13)
C(13)-C(14)-C(17)	121.53(13)
C(15)-C(14)-C(13)	117.57(13)
C(15)-C(14)-C(17)	120.90(13)
C(16)-C(15)-C(14)	121.01(12)
C(15)-C(16)-C(11)	121.57(12)
O(3)-C(18)-C(9)	119.22(12)
O(3)-C(18)-C(19)	118.75(12)
C(19)-C(18)-C(9)	121.83(11)
C(20)-C(19)-C(18)	116.90(12)
C(24)-C(19)-C(18)	124.49(12)
C(24)-C(19)-C(20)	118.36(13)
C(21)-C(20)-C(19)	120.70(13)
C(20)-C(21)-C(22)	121.41(13)
C(21)-C(22)-C(23)	117.67(13)
C(21)-C(22)-C(25)	121.05(13)
C(23)-C(22)-C(25)	121.25(13)
C(24)-C(23)-C(22)	121.37(13)
C(23)-C(24)-C(19)	120.47(13)
C(27)-C(26)-S(1)	119.21(11)
C(27)-C(26)-C(31)	121.58(13)
C(31)-C(26)-S(1)	119.20(11)
C(26)-C(27)-C(28)	118.76(13)
C(27)-C(28)-C(29)	121.06(13)
C(28)-C(29)-C(30)	118.71(13)
C(28)-C(29)-C(32)	121.71(14)
C(30)-C(29)-C(32)	119.58(14)
C(31)-C(30)-C(29)	120.77(14)
C(30)-C(31)-C(26)	119.12(13)

Symmetry transformations used to generate equivalent atoms:

Table 4. Anisotropic displacement parameters ($Å^2 x\ 10^3$)for qian11CuLT. The anisotropic displacement factor exponent takes the form: $-2\pi^2[\ h^2 a^{*2} U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}\ ]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
S(1)	11(1)	22(1)	14(1)	-1(1)	0(1)	-1(1)
O(1)	16(1)	29(1)	20(1)	4(1)	0(1)	-7(1)
O(2)	14(1)	32(1)	21(1)	-5(1)	0(1)	4(1)

O(3)	25(1)	16(1)	20(1)	-2(1)	4(1)	-1(1)
N(1)	14(1)	18(1)	13(1)	-1(1)	-1(1)	-1(1)
C(1)	15(1)	16(1)	13(1)	-3(1)	0(1)	0(1)
C(2)	15(1)	20(1)	12(1)	-2(1)	1(1)	-2(1)
C(3)	17(1)	17(1)	12(1)	-2(1)	-2(1)	-2(1)
C(4)	20(1)	22(1)	16(1)	-1(1)	0(1)	-5(1)
C(5)	31(1)	20(1)	16(1)	4(1)	-3(1)	-6(1)
C(6)	25(1)	16(1)	19(1)	0(1)	-7(1)	1(1)
C(7)	18(1)	18(1)	18(1)	-4(1)	-2(1)	1(1)
C(8)	17(1)	14(1)	12(1)	-3(1)	-1(1)	0(1)
C(9)	11(1)	16(1)	16(1)	-2(1)	1(1)	0(1)
C(10)	13(1)	14(1)	14(1)	1(1)	1(1)	1(1)
C(11)	13(1)	14(1)	17(1)	-2(1)	0(1)	2(1)
C(12)	27(1)	19(1)	18(1)	0(1)	3(1)	-5(1)
C(13)	32(1)	21(1)	23(1)	-1(1)	2(1)	-12(1)
C(14)	21(1)	18(1)	20(1)	-1(1)	-2(1)	-2(1)
C(15)	17(1)	18(1)	15(1)	0(1)	0(1)	2(1)
C(16)	14(1)	14(1)	18(1)	-1(1)	1(1)	-1(1)
C(17)	38(1)	24(1)	21(1)	-4(1)	-2(1)	-10(1)
C(18)	10(1)	17(1)	18(1)	-1(1)	1(1)	1(1)
C(19)	15(1)	17(1)	16(1)	-1(1)	1(1)	3(1)
C(20)	22(1)	21(1)	20(1)	-2(1)	-1(1)	-3(1)
C(21)	25(1)	25(1)	16(1)	-2(1)	-2(1)	2(1)
C(22)	18(1)	22(1)	19(1)	2(1)	2(1)	7(1)
C(23)	17(1)	17(1)	22(1)	2(1)	2(1)	2(1)
C(24)	14(1)	17(1)	19(1)	-2(1)	1(1)	3(1)
C(25)	28(1)	29(1)	20(1)	5(1)	4(1)	7(1)
C(26)	14(1)	20(1)	16(1)	1(1)	0(1)	4(1)
C(27)	17(1)	17(1)	20(1)	0(1)	-1(1)	1(1)
C(28)	23(1)	22(1)	19(1)	-4(1)	-3(1)	2(1)
C(29)	19(1)	25(1)	18(1)	1(1)	1(1)	6(1)
C(30)	21(1)	19(1)	25(1)	3(1)	2(1)	-1(1)
C(31)	19(1)	20(1)	20(1)	-2(1)	-1(1)	-2(1)
C(32)	34(1)	32(1)	21(1)	2(1)	4(1)	4(1)

Table 5. Hydrogen coordinates ($x10^4$) and isotropic displacement parameters ($Å^2 x\ 10^3$) for qian11CuLT.

	x	y	z	U(eq)
H(1)	2372	5006	3981	18

H(2)	1565	3231	4394	19
H(4)	2342	1422	4834	23
H(5)	4273	43	5101	27
H(6)	6908	182	4818	24
H(7)	7622	1696	4280	22
H(9)	6981	3555	3875	17
H(10)	4978	4992	3569	17
H(12)	6523	6599	3878	26
H(13)	7280	7856	4500	30
H(15)	5277	5566	5450	20
H(16)	4519	4309	4828	19
H(17A)	6071	8370	5458	41
H(17B)	7907	7977	5397	41
H(17C)	6757	7243	5751	41
H(20)	4938	2042	2475	25
H(21)	5547	2855	1734	26
H(23)	7792	5649	2375	22
H(24)	7162	4852	3122	20
H(25A)	7574	5654	1523	38
H(25B)	6325	4760	1272	38
H(25C)	8134	4335	1364	38
H(27)	-141	2100	2640	22
H(28)	384	2422	1828	26
H(30)	2539	5594	2148	26
H(31)	1981	5293	2955	24
H(32A)	1431	3595	1194	44
H(32B)	3017	4323	1337	44
H(32C)	1342	5016	1286	44

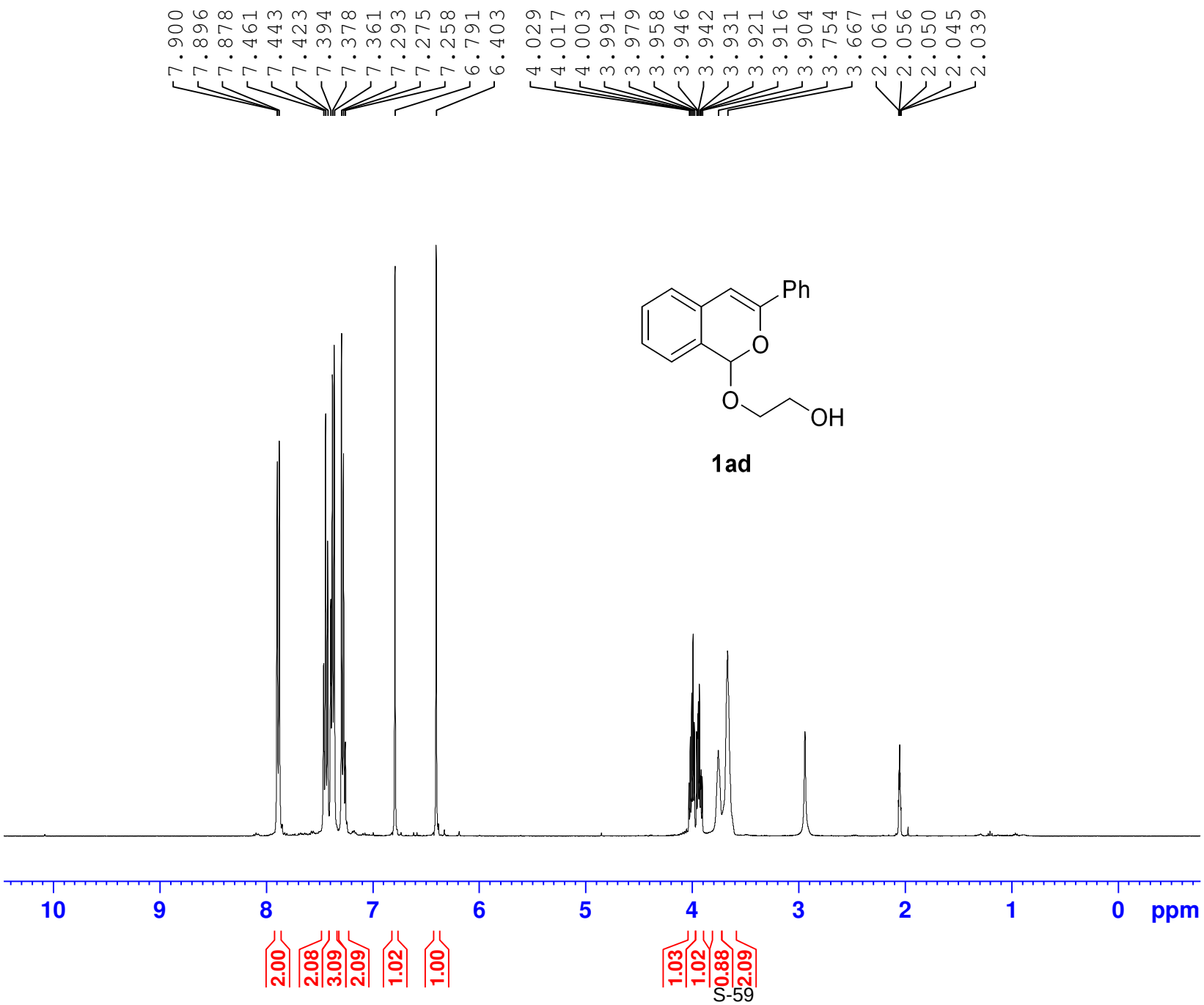
Table 6. Torsion angles [°] for qian11CuLT.

S(1)-N(1)-C(1)-C(2)	104.05(10)
S(1)-N(1)-C(1)-C(10)	-145.45(10)
S(1)-N(1)-C(2)-C(1)	-107.04(10)
S(1)-N(1)-C(2)-C(3)	142.49(10)
S(1)-C(26)-C(27)-C(28)	-178.80(11)
S(1)-C(26)-C(31)-C(30)	178.22(11)
O(1)-S(1)-N(1)-C(1)	-139.29(9)
O(1)-S(1)-N(1)-C(2)	-72.91(10)
O(1)-S(1)-C(26)-C(27)	0.20(13)
O(1)-S(1)-C(26)-C(31)	-178.59(10)
O(2)-S(1)-N(1)-C(1)	-9.22(11)

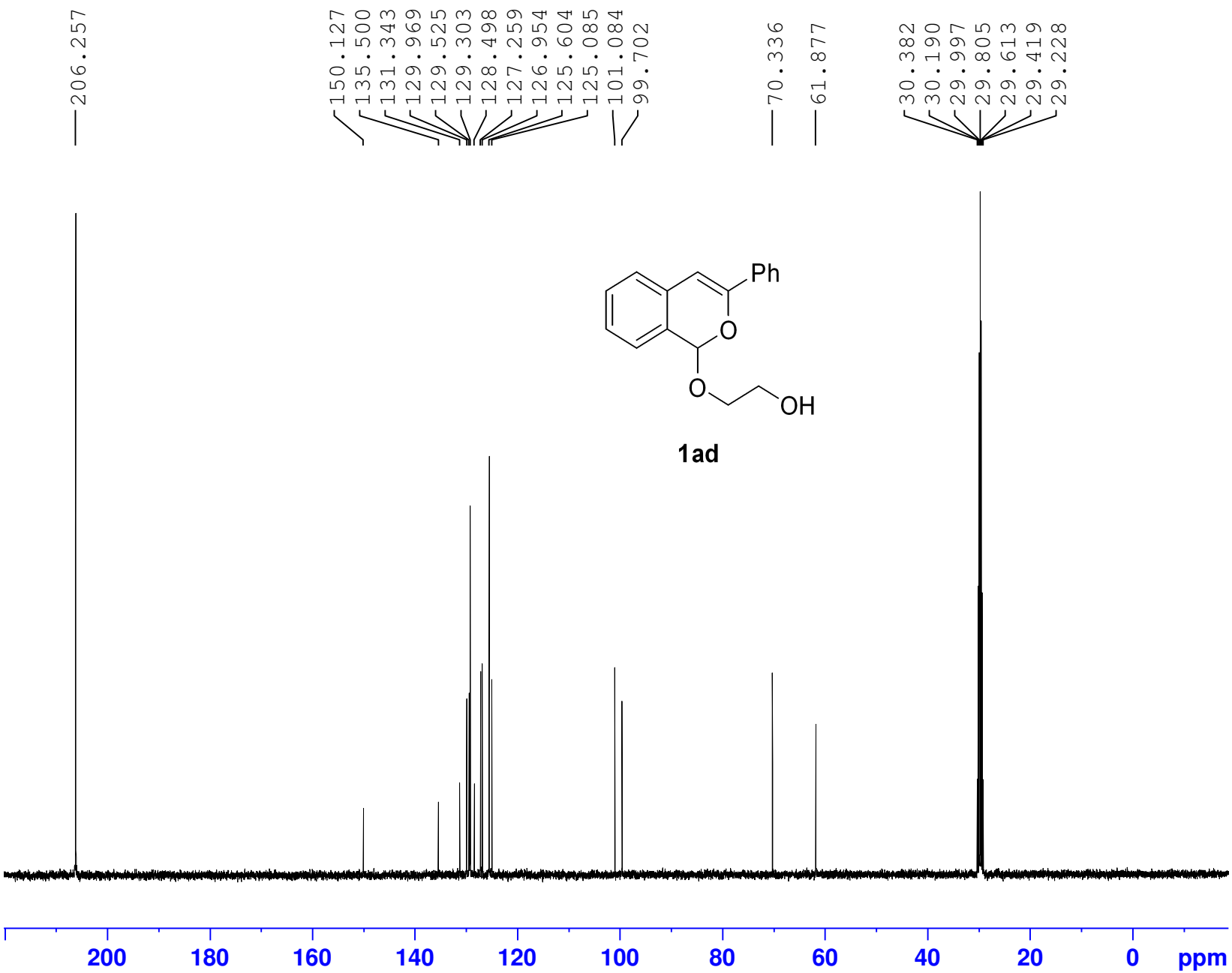
O(2)-S(1)-N(1)-C(2)	57.16(10)
O(2)-S(1)-C(26)-C(27)	-130.93(11)
O(2)-S(1)-C(26)-C(31)	50.28(12)
O(3)-C(18)-C(19)-C(20)	18.62(19)
O(3)-C(18)-C(19)-C(24)	-155.60(13)
N(1)-S(1)-C(26)-C(27)	112.53(11)
N(1)-S(1)-C(26)-C(31)	-66.26(12)
N(1)-C(1)-C(2)-C(3)	103.78(13)
N(1)-C(1)-C(10)-C(9)	-38.41(15)
N(1)-C(1)-C(10)-C(11)	-162.90(11)
N(1)-C(2)-C(3)-C(4)	-127.96(13)
N(1)-C(2)-C(3)-C(8)	54.62(16)
C(1)-N(1)-C(2)-C(3)	-110.48(13)
C(1)-C(2)-C(3)-C(4)	164.20(12)
C(1)-C(2)-C(3)-C(8)	-13.23(18)
C(1)-C(10)-C(11)-C(12)	-128.06(13)
C(1)-C(10)-C(11)-C(16)	49.24(16)
C(2)-N(1)-C(1)-C(10)	110.50(13)
C(2)-C(1)-C(10)-C(9)	31.25(16)
C(2)-C(1)-C(10)-C(11)	-93.23(13)
C(2)-C(3)-C(4)-C(5)	179.63(12)
C(2)-C(3)-C(8)-C(7)	178.98(11)
C(2)-C(3)-C(8)-C(9)	-5.13(18)
C(3)-C(4)-C(5)-C(6)	1.9(2)
C(3)-C(8)-C(9)-C(10)	35.76(16)
C(3)-C(8)-C(9)-C(18)	-92.30(14)
C(4)-C(3)-C(8)-C(7)	1.59(19)
C(4)-C(3)-C(8)-C(9)	177.47(12)
C(4)-C(5)-C(6)-C(7)	0.5(2)
C(5)-C(6)-C(7)-C(8)	-1.9(2)
C(6)-C(7)-C(8)-C(3)	0.84(19)
C(6)-C(7)-C(8)-C(9)	-175.05(12)
C(7)-C(8)-C(9)-C(10)	-148.44(12)
C(7)-C(8)-C(9)-C(18)	83.50(14)
C(8)-C(3)-C(4)-C(5)	-3.0(2)
C(8)-C(9)-C(10)-C(1)	-47.03(15)
C(8)-C(9)-C(10)-C(11)	74.80(14)
C(8)-C(9)-C(18)-O(3)	-6.97(17)
C(8)-C(9)-C(18)-C(19)	178.16(11)
C(9)-C(10)-C(11)-C(12)	107.98(14)
C(9)-C(10)-C(11)-C(16)	-74.71(15)
C(9)-C(18)-C(19)-C(20)	-166.49(12)
C(9)-C(18)-C(19)-C(24)	19.29(19)
C(10)-C(1)-C(2)-N(1)	-105.11(13)

C(10)-C(1)-C(2)-C(3)	-1.33(18)
C(10)-C(9)-C(18)-O(3)	-133.43(13)
C(10)-C(9)-C(18)-C(19)	51.70(16)
C(10)-C(11)-C(12)-C(13)	176.69(14)
C(10)-C(11)-C(16)-C(15)	-176.67(12)
C(11)-C(12)-C(13)-C(14)	-0.1(2)
C(12)-C(11)-C(16)-C(15)	0.73(19)
C(12)-C(13)-C(14)-C(15)	0.9(2)
C(12)-C(13)-C(14)-C(17)	-178.92(15)
C(13)-C(14)-C(15)-C(16)	-0.9(2)
C(14)-C(15)-C(16)-C(11)	0.1(2)
C(16)-C(11)-C(12)-C(13)	-0.7(2)
C(17)-C(14)-C(15)-C(16)	178.92(13)
C(18)-C(9)-C(10)-C(1)	77.04(14)
C(18)-C(9)-C(10)-C(11)	-161.13(11)
C(18)-C(19)-C(20)-C(21)	-173.79(13)
C(18)-C(19)-C(24)-C(23)	172.97(12)
C(19)-C(20)-C(21)-C(22)	0.6(2)
C(20)-C(19)-C(24)-C(23)	-1.18(19)
C(20)-C(21)-C(22)-C(23)	-1.6(2)
C(20)-C(21)-C(22)-C(25)	176.50(14)
C(21)-C(22)-C(23)-C(24)	1.2(2)
C(22)-C(23)-C(24)-C(19)	0.2(2)
C(24)-C(19)-C(20)-C(21)	0.8(2)
C(25)-C(22)-C(23)-C(24)	-176.88(12)
C(26)-S(1)-N(1)-C(1)	106.41(10)
C(26)-S(1)-N(1)-C(2)	172.79(9)
C(26)-C(27)-C(28)-C(29)	0.4(2)
C(27)-C(26)-C(31)-C(30)	-0.5(2)
C(27)-C(28)-C(29)-C(30)	-0.2(2)
C(27)-C(28)-C(29)-C(32)	-179.62(14)
C(28)-C(29)-C(30)-C(31)	-0.4(2)
C(29)-C(30)-C(31)-C(26)	0.8(2)
C(31)-C(26)-C(27)-C(28)	0.0(2)
C(32)-C(29)-C(30)-C(31)	179.04(14)

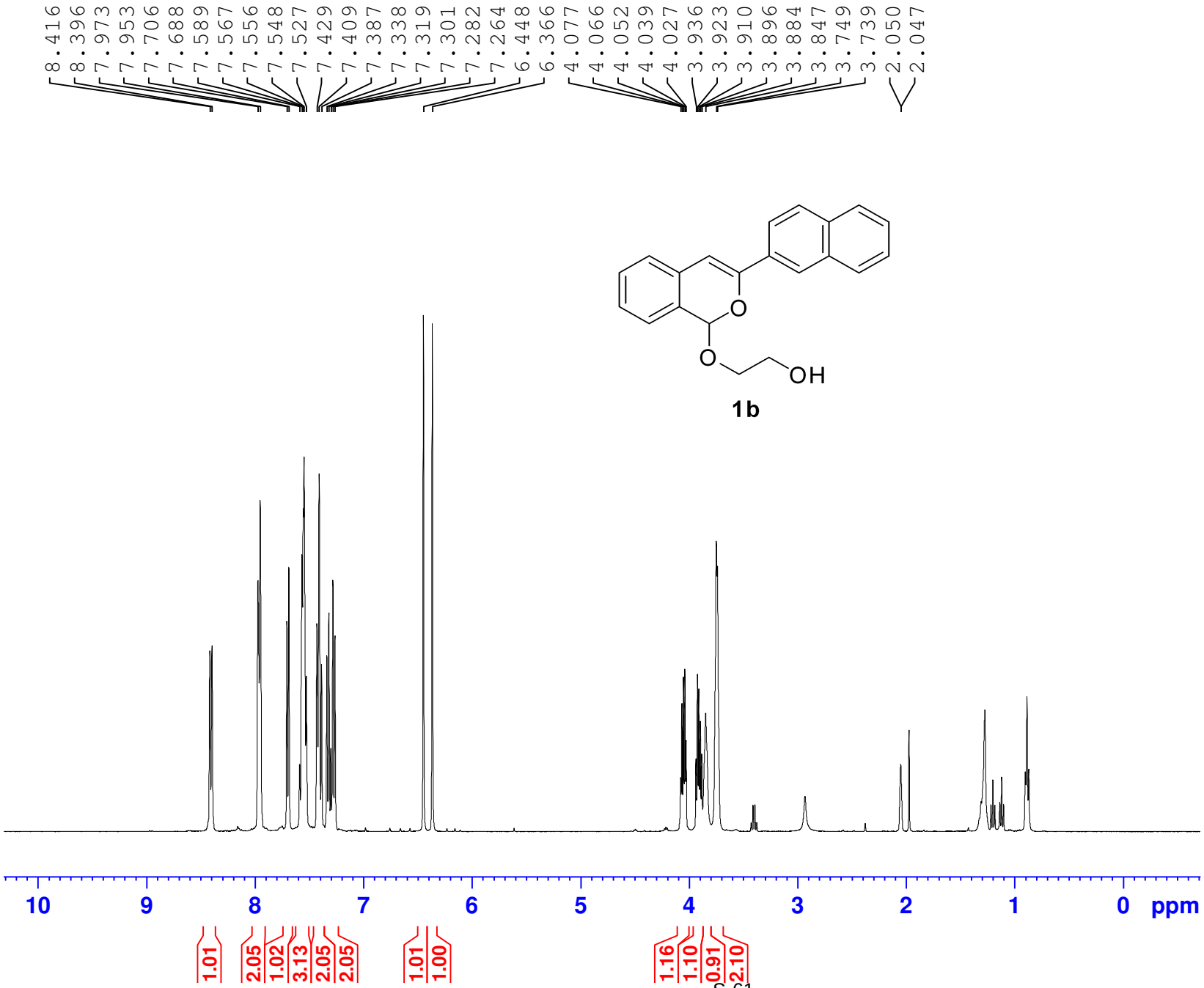
Symmetry transformations used to generate equivalent atoms:



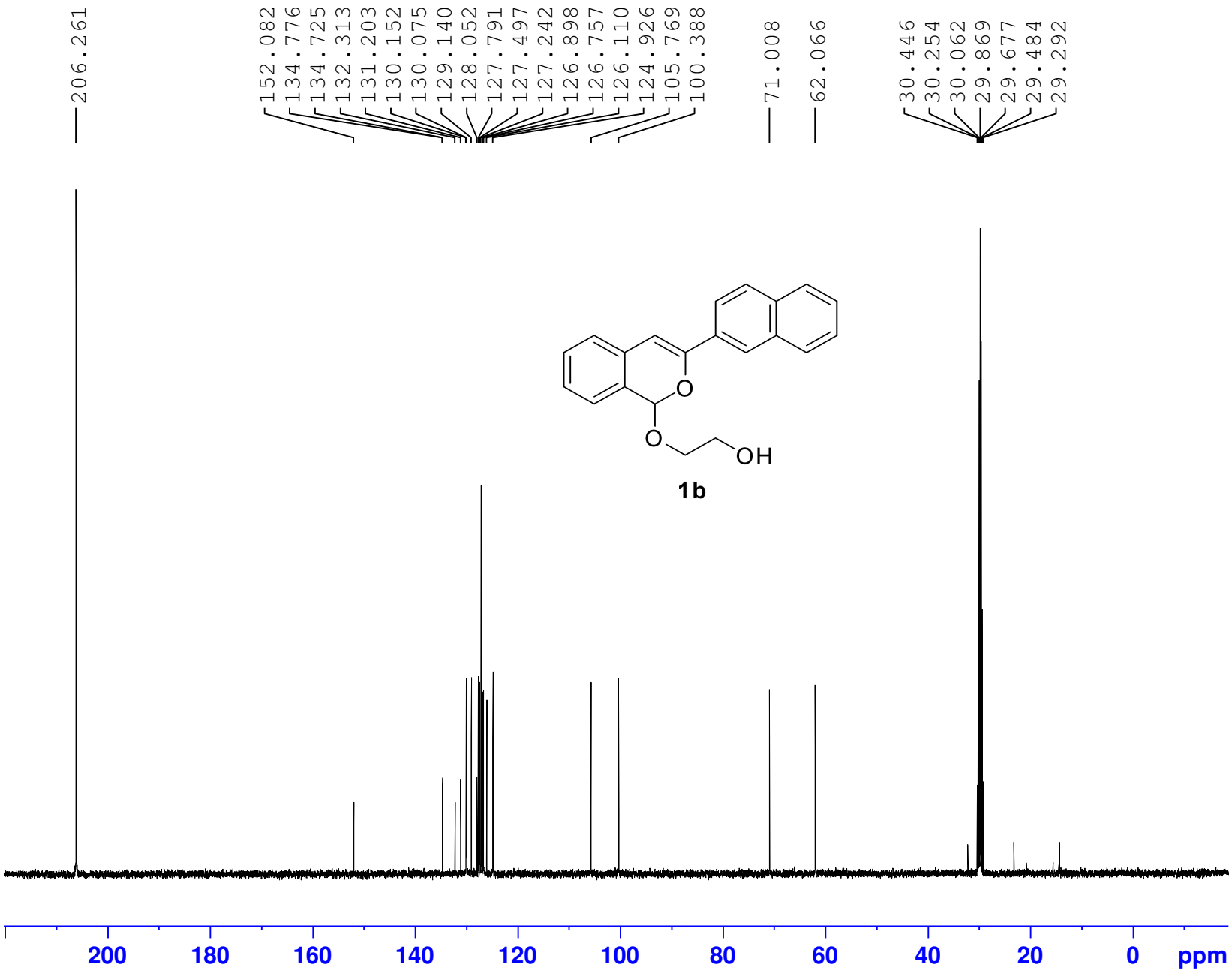

```
Current Data Parameters
NAME              qh-0156
EXPNO                   1
PROCNO                  1

F2 - Acquisition Parameters
Date_            20130911
Time                 9.39
INSTRUM             spect
PROBHD    5 mm DUL 13C-1
PULPROG              zg30
TD                  65536
SOLVENT           Acetone
NS                      1
DS                      0
SWH              8012.820 Hz
FIDRES           0.122266 Hz
AQ             4.0894465 sec
RG                  27.78
DW                 62.400 usec
DE                  6.50 usec
TE                 297.1 K
D1             1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1          400.1324710 MHz
NUC1                    1H
P1                  14.30 usec
PLW1           9.10000038 W

F2 - Processing parameters
SI                  65536
SF            400.1300068 MHz
WDW                    EM
SSB       0
LB                   0.30 Hz
GB        0
PC                   1.00
```




```
Current Data Parameters
NAME                qh-0156
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20130911
Time                    9.41
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                        36
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                     6.50 usec
TE                    297.4 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6126899 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```




```
Current Data Parameters
NAME          qh-7084-2
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140220
Time              20.26
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT         Acetone
NS                    3
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG               39.46
DW               62.400 usec
DE                6.50 usec
TE               296.0 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                 1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300069 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



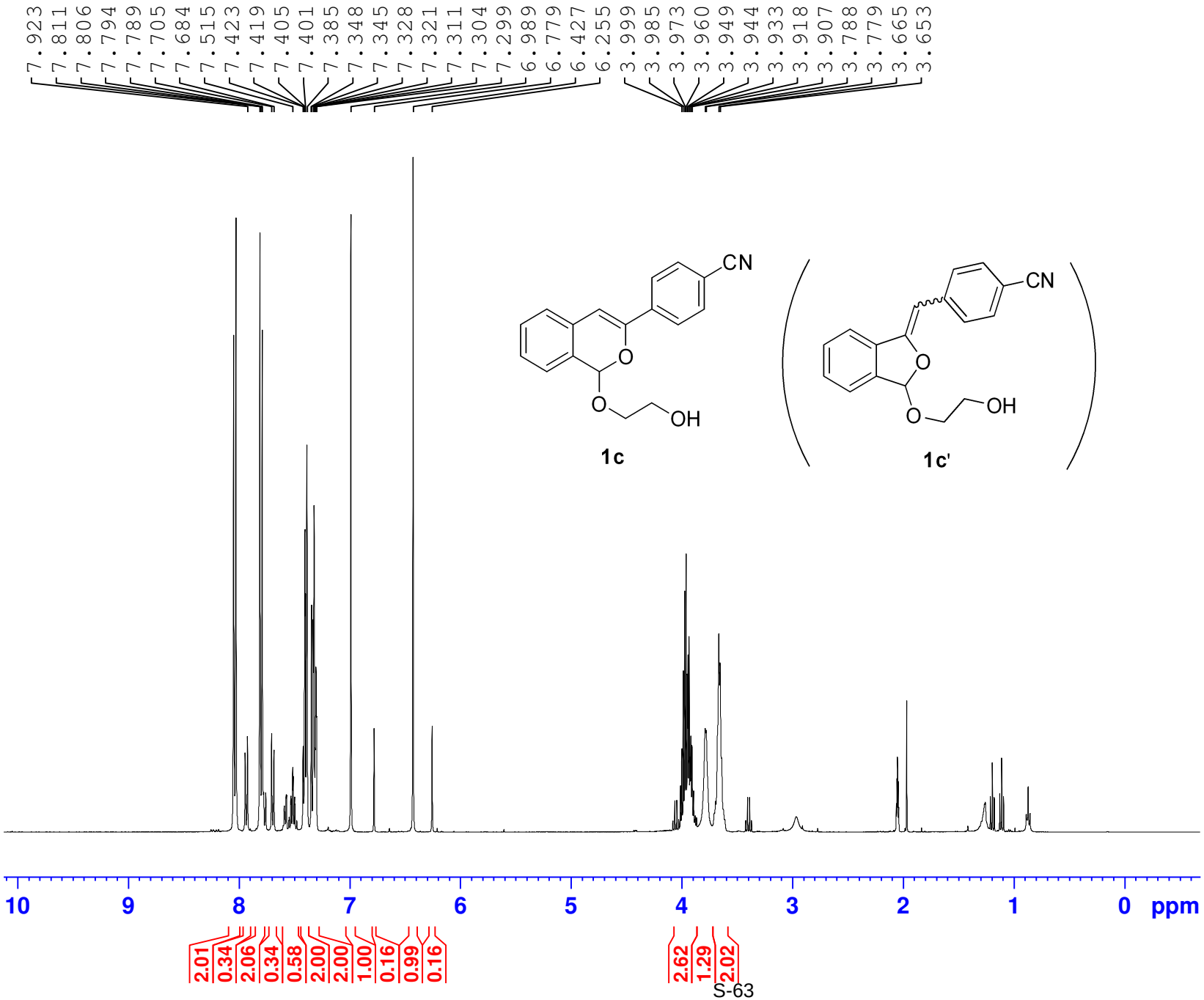
Current Data Parameters
NAME qh-7084-2
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20140220
Time 20.30
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT Acetone
NS 58
DS 2
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631488 sec
RG 196.92
DW 20.800 usec
DE 6.50 usec
TE 296.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 9.60 usec
PLW1 31.98900032 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 9.10000038 W
PLW12 0.24608000 W
PLW13 0.19933000 W

F2 - Processing parameters
SI 32768
SF 100.6126835 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

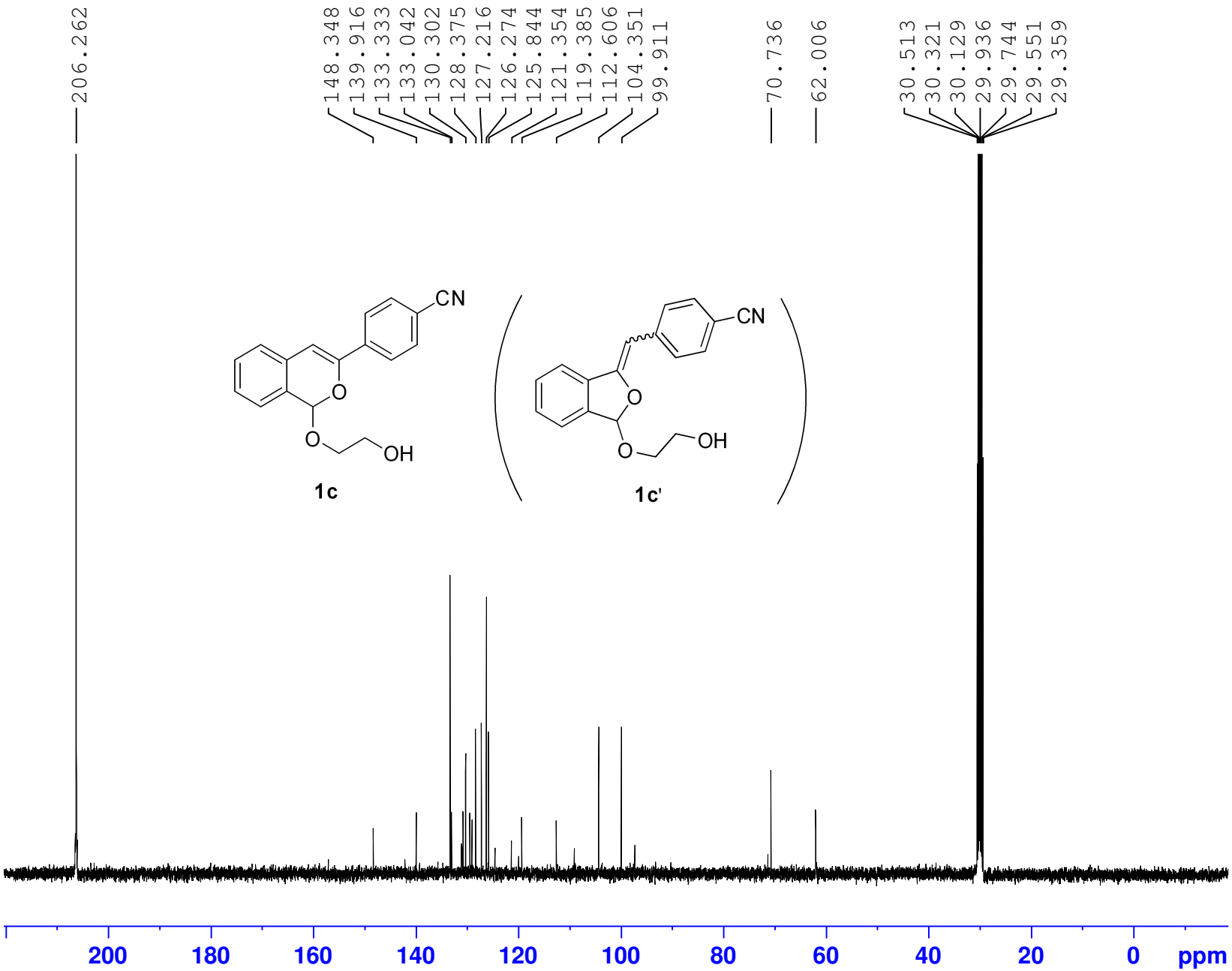


Current Data Parameters
NAME qh-7081-1
EXPNO 1
PROCNO 1

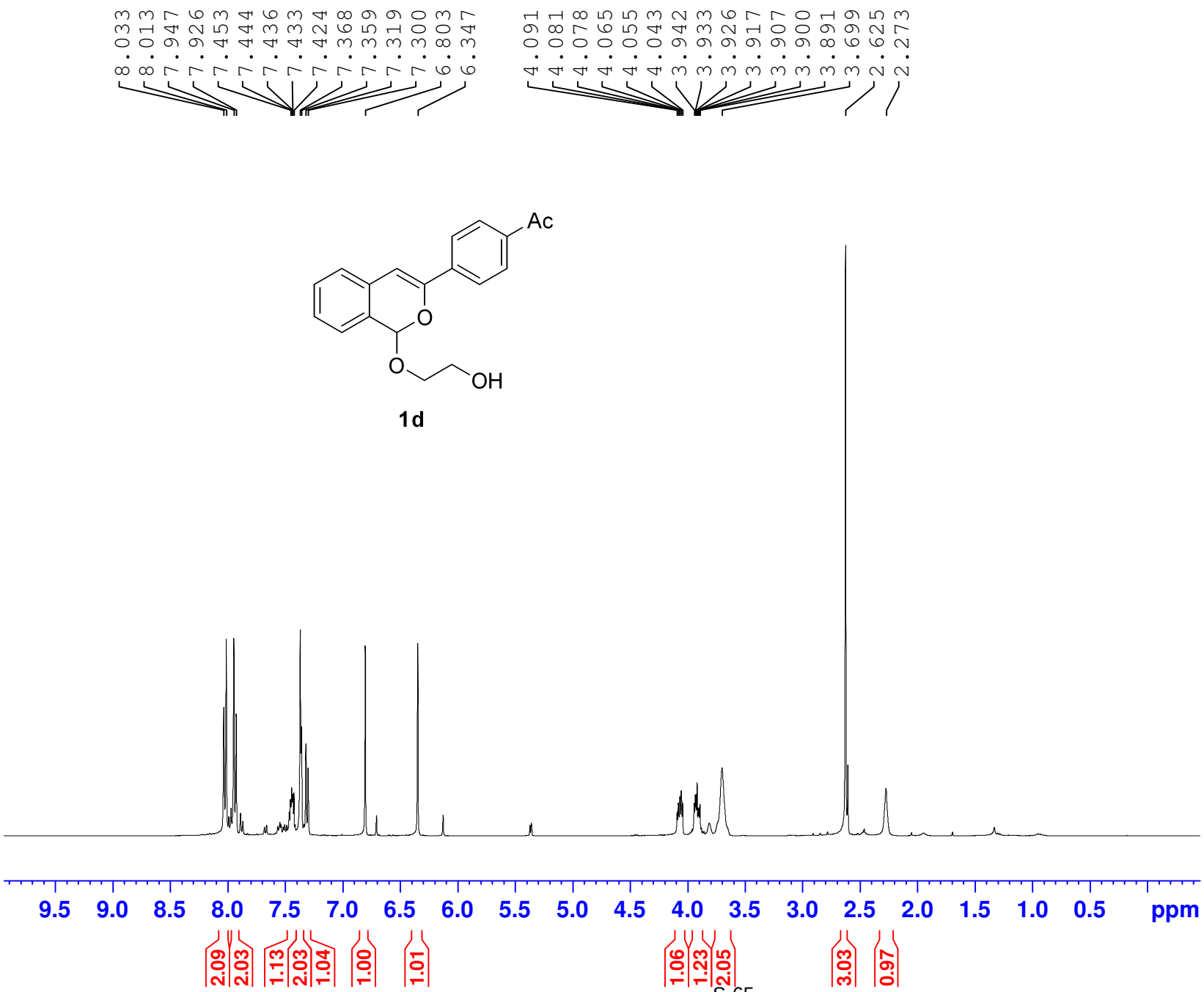
F2 - Acquisition Parameters
Date_ 20140219
Time 14.13
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT Acetone
NS 2
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 34.77
DW 62.400 usec
DE 6.50 usec
TE 295.8 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

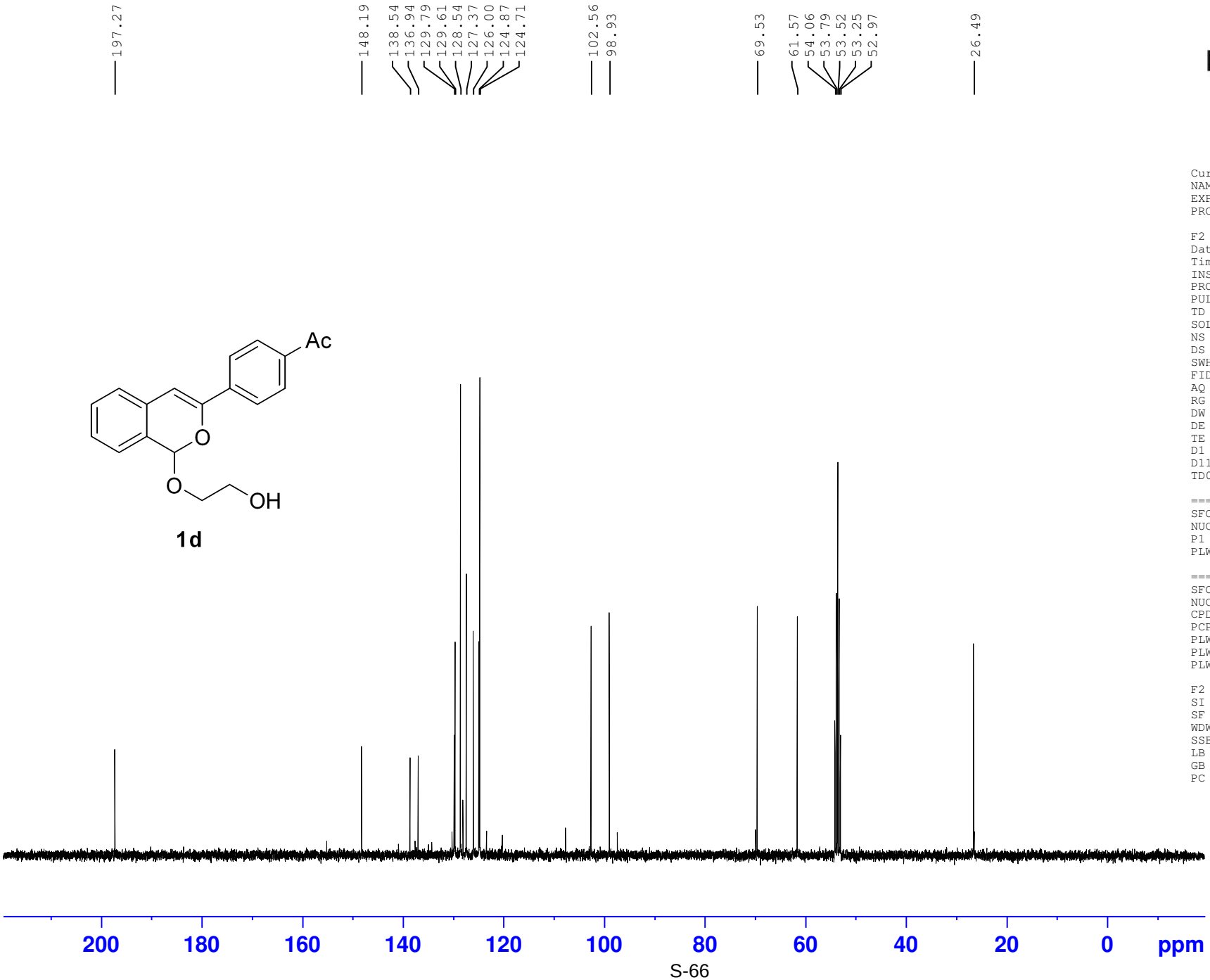
F2 - Processing parameters
SI 65536
SF 400.1300068 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



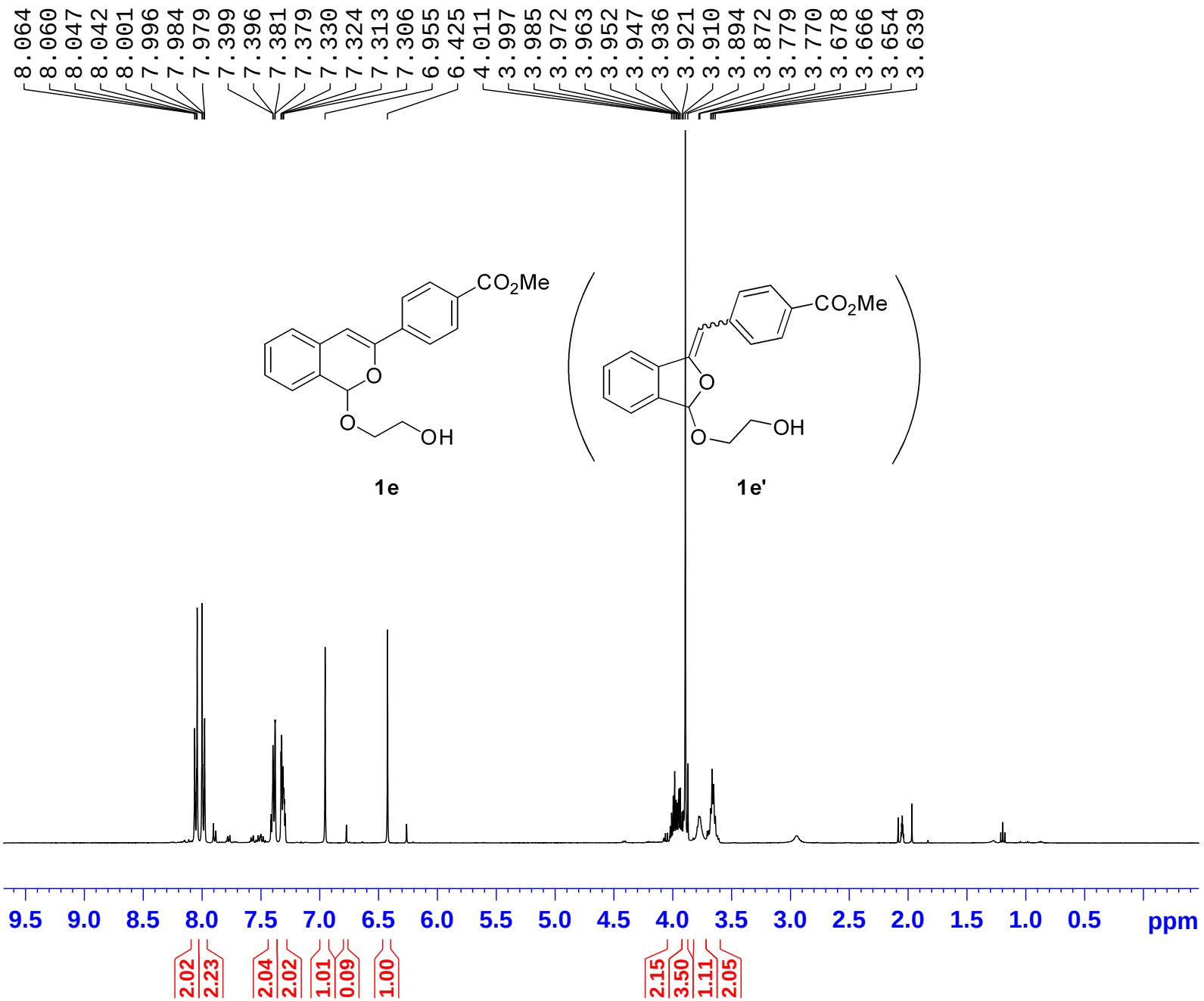

```
Current Data Parameters
NAME                 qh-7081
EXPNO                      3
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140825
Time                   13.16
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                       288
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
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             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2              waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6126702 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



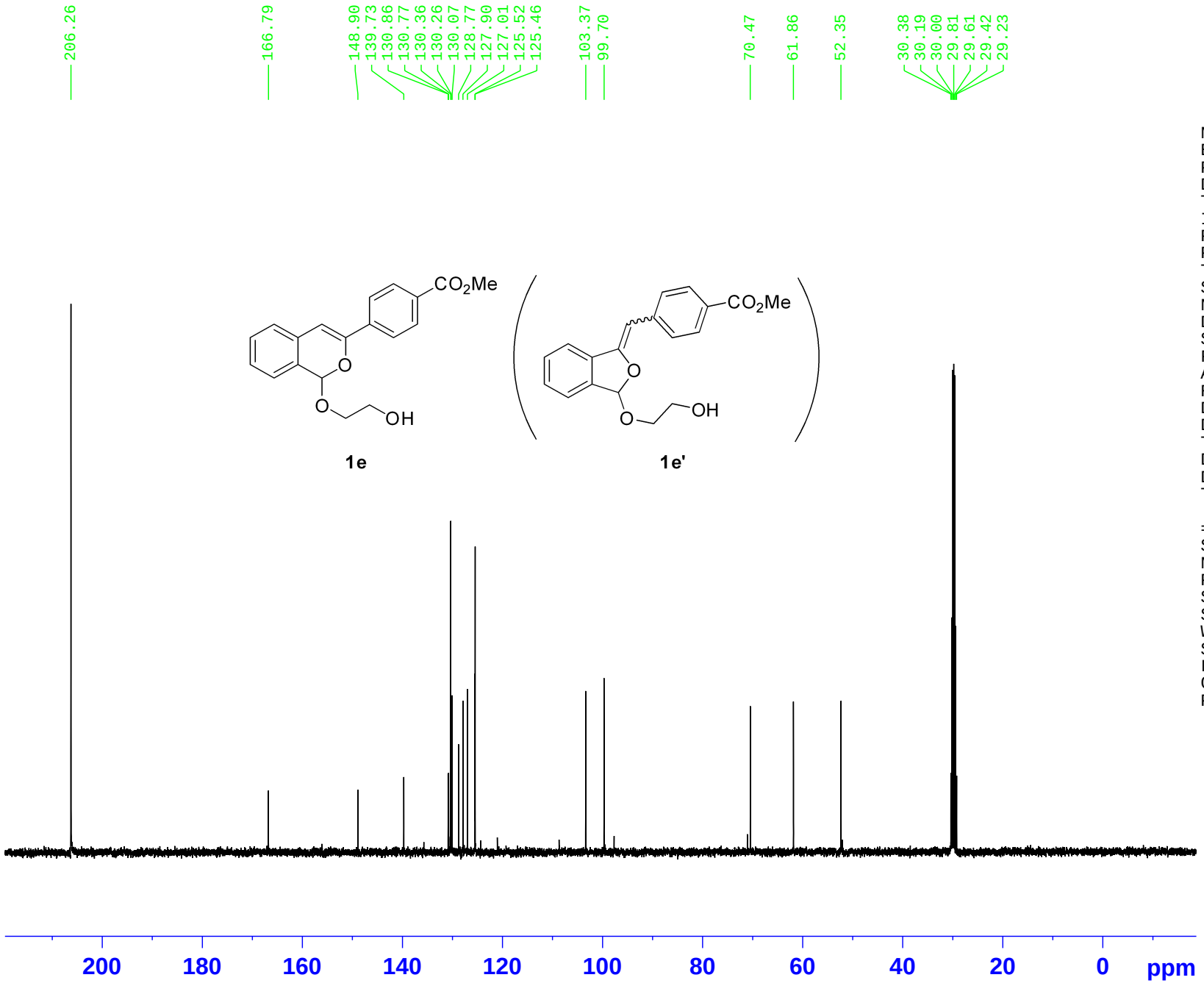

```
Current Data Parameters
NAME          qh-7081-2
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140219
Time              14.23
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT          CD2Cl2
NS                    2
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG                22.47
DW               62.400 usec
DE                6.50 usec
TE               296.2 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300000 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



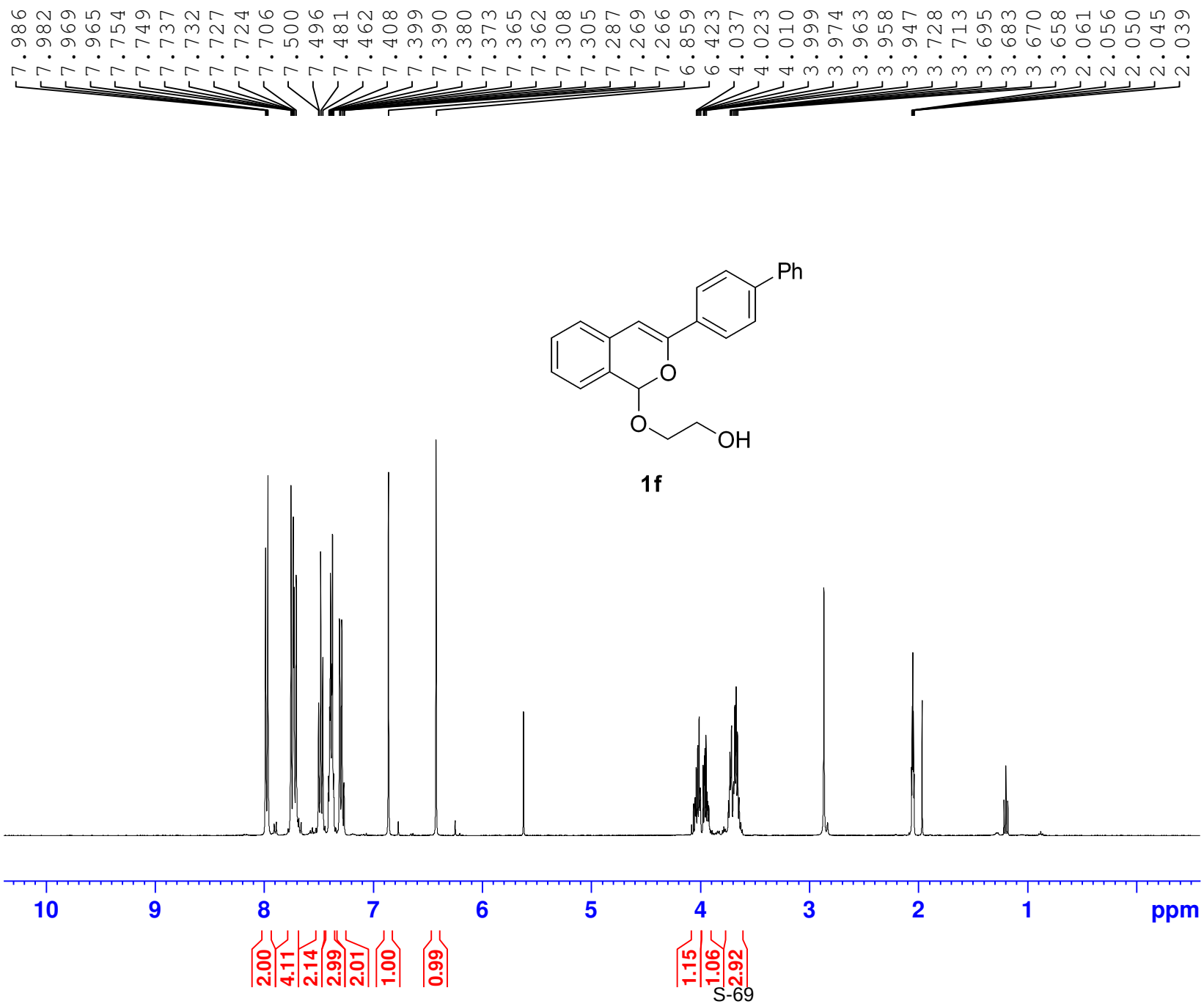

```
Current Data Parameters
NAME          qh-7081-2
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140219
Time              14.26
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT          CD2Cl2
NS                    36
DS                     2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
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        100.6228298 MHz
NUC1                 13C
P1                  9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2         9.10000038 W
PLW12        0.24608000 W
PLW13        0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6127690 MHz
WDW                  EM
SSB      0
LB                 1.00 Hz
GB       0
PC                 1.40
```



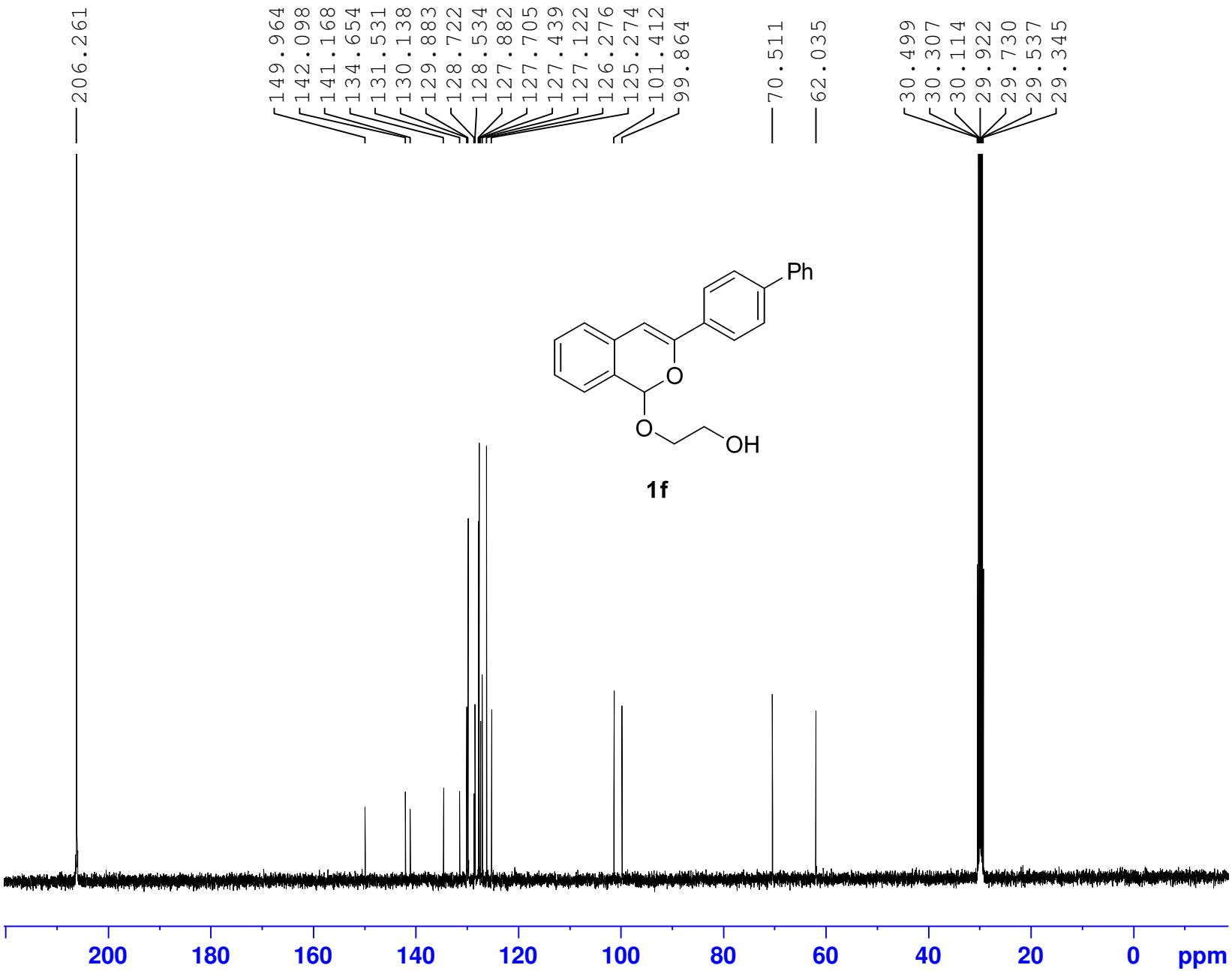

```
NAME              qh-7132
EXPNO                   1
PROCNO                  1
Date_            20140310
Time               12.32
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG             zg30
TD                 65536
SOLVENT          Acetone
NS                      2
DS                      0
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ            4.0894966 sec
RG                 22.47
DW                62.400 usec
DE                 6.50 usec
TE                296.1 K
D1           1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                  1H
P1                14.30 usec
SI                65536
SF           400.1300067 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```



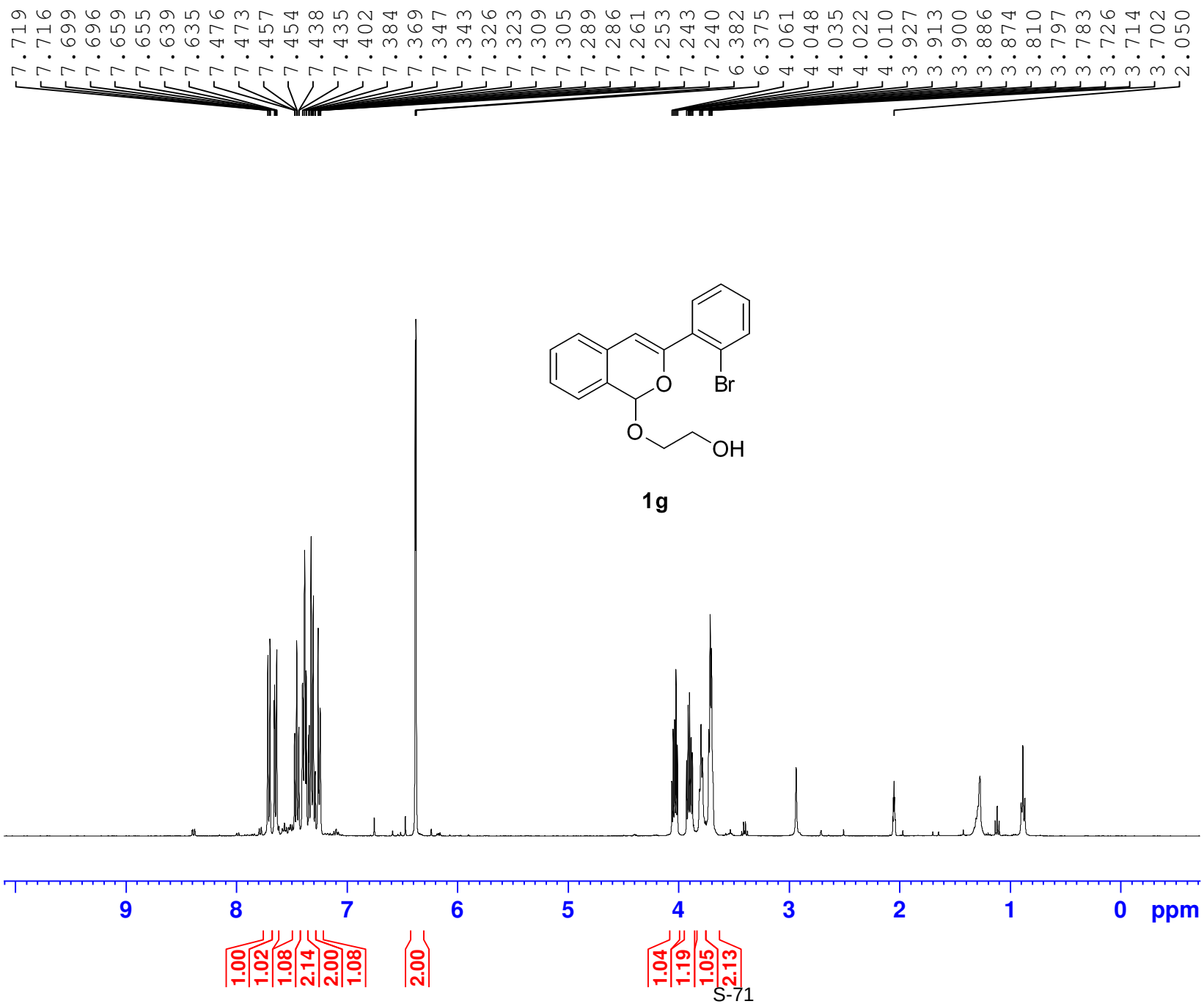

```
NAME            qh-7132
EXPNO                 2
PROCNO                1
Date_          20140310
Time              12.33
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT         Acetone
NS                   22
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.6 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                  9.60 usec
SI                 32768
SF          100.6126900 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```




```
Current Data Parameters
NAME          qh-7081-3
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140219
Time              16.28
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT         Acetone
NS                    4
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG                82.92
DW               62.400 usec
DE                6.50 usec
TE               295.5 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1                14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300068 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```




```
Current Data Parameters
NAME          qh-7081-3
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140219
Time              16.34
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT         Acetone
NS                  168
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.3 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                 9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2         9.10000038 W
PLW12        0.24608000 W
PLW13        0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6126730 MHz
WDW                  EM
SSB      0
LB                1.00 Hz
GB       0
PC                1.40
```

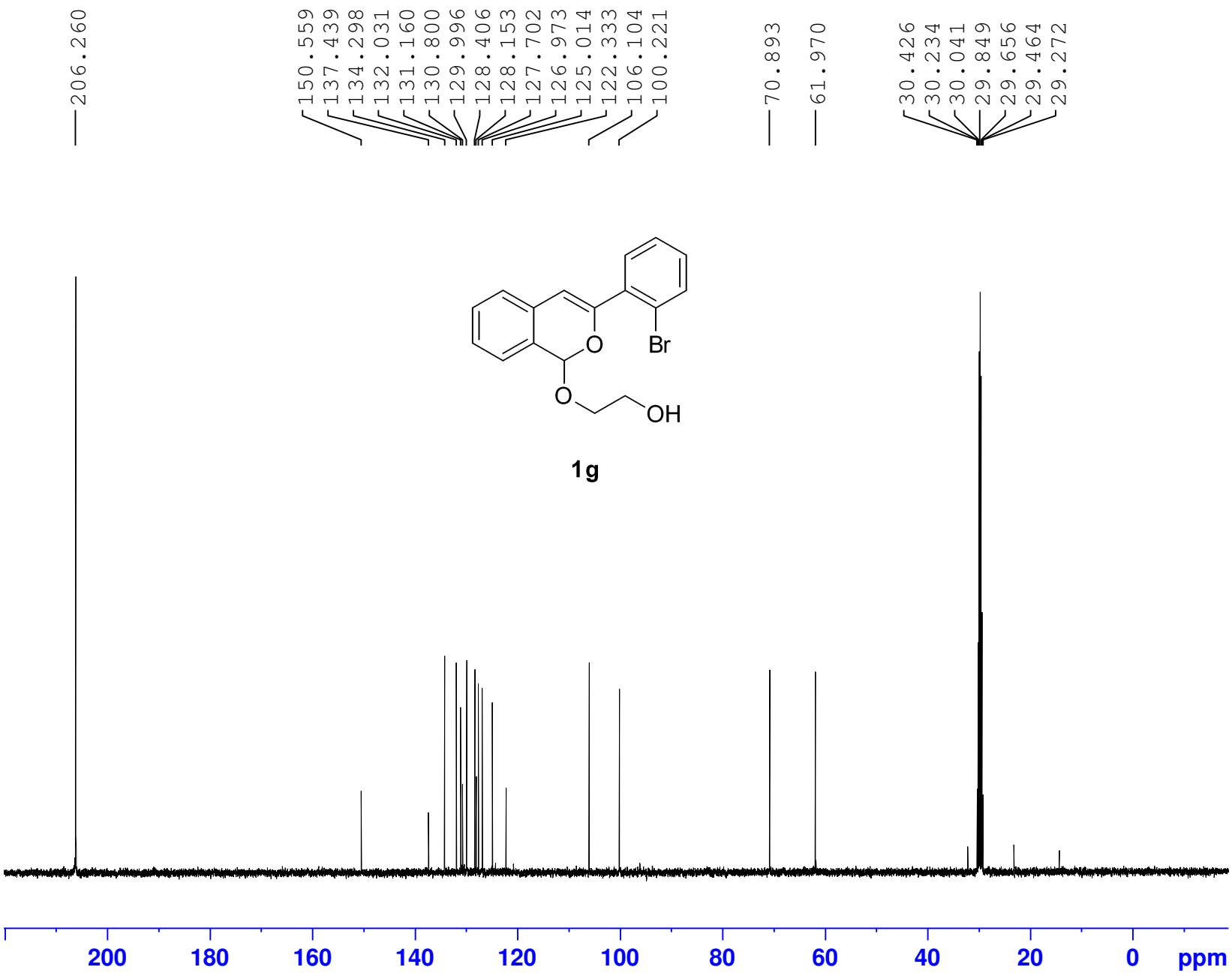


Current Data Parameters
NAME qh-7162
EXPNO 3
PROCNO 1

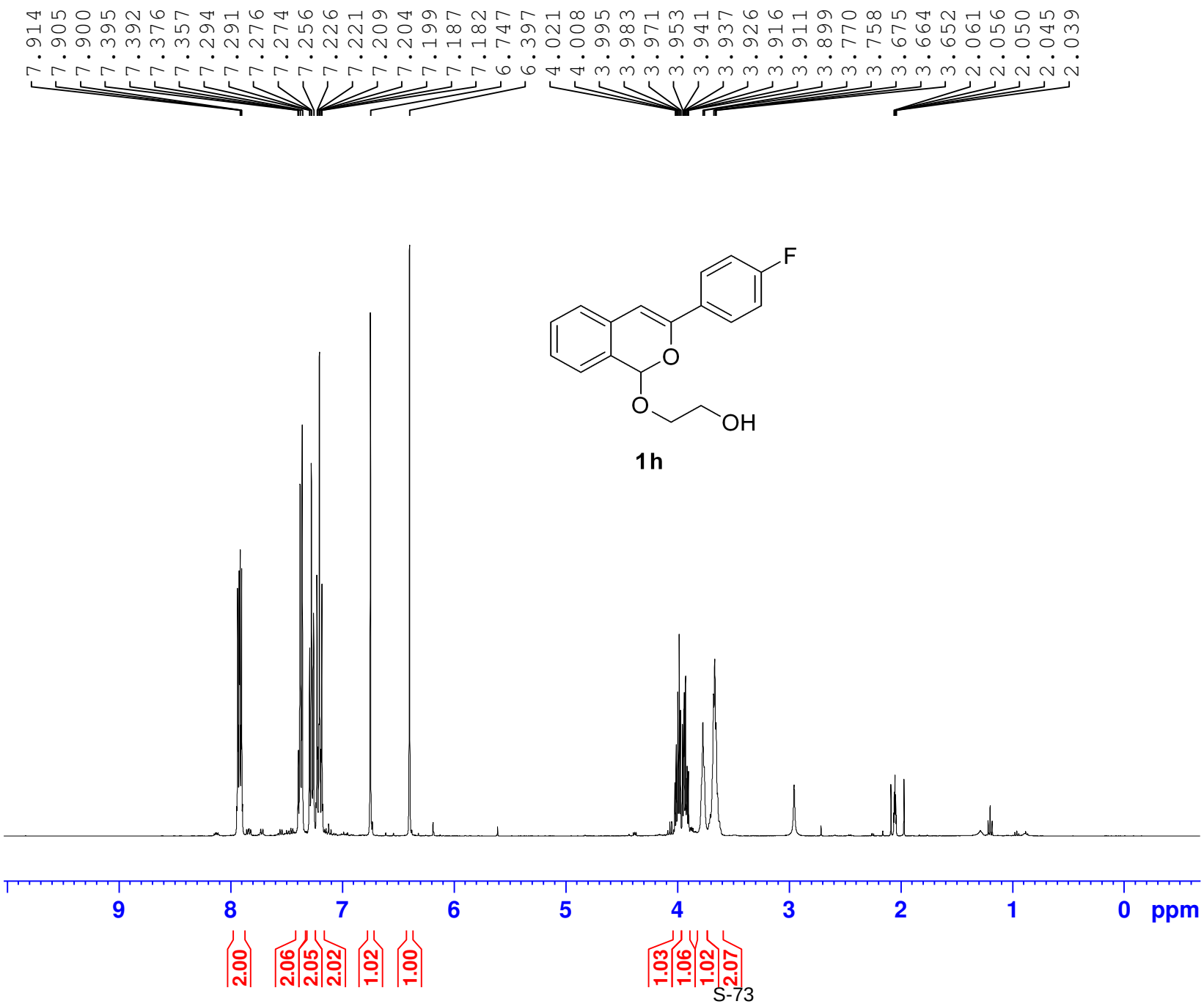
F2 - Acquisition Parameters
Date_ 20140317
Time 14.33
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT Acetone
NS 2
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 25.32
DW 62.400 usec
DE 6.50 usec
TE 295.7 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

F2 - Processing parameters
SI 65536
SF 400.1300068 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00




```
Current Data Parameters
NAME                qh-7162
EXPNO                     4
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140317
Time                  14.35
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT             Acetone
NS                       31
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6126882 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

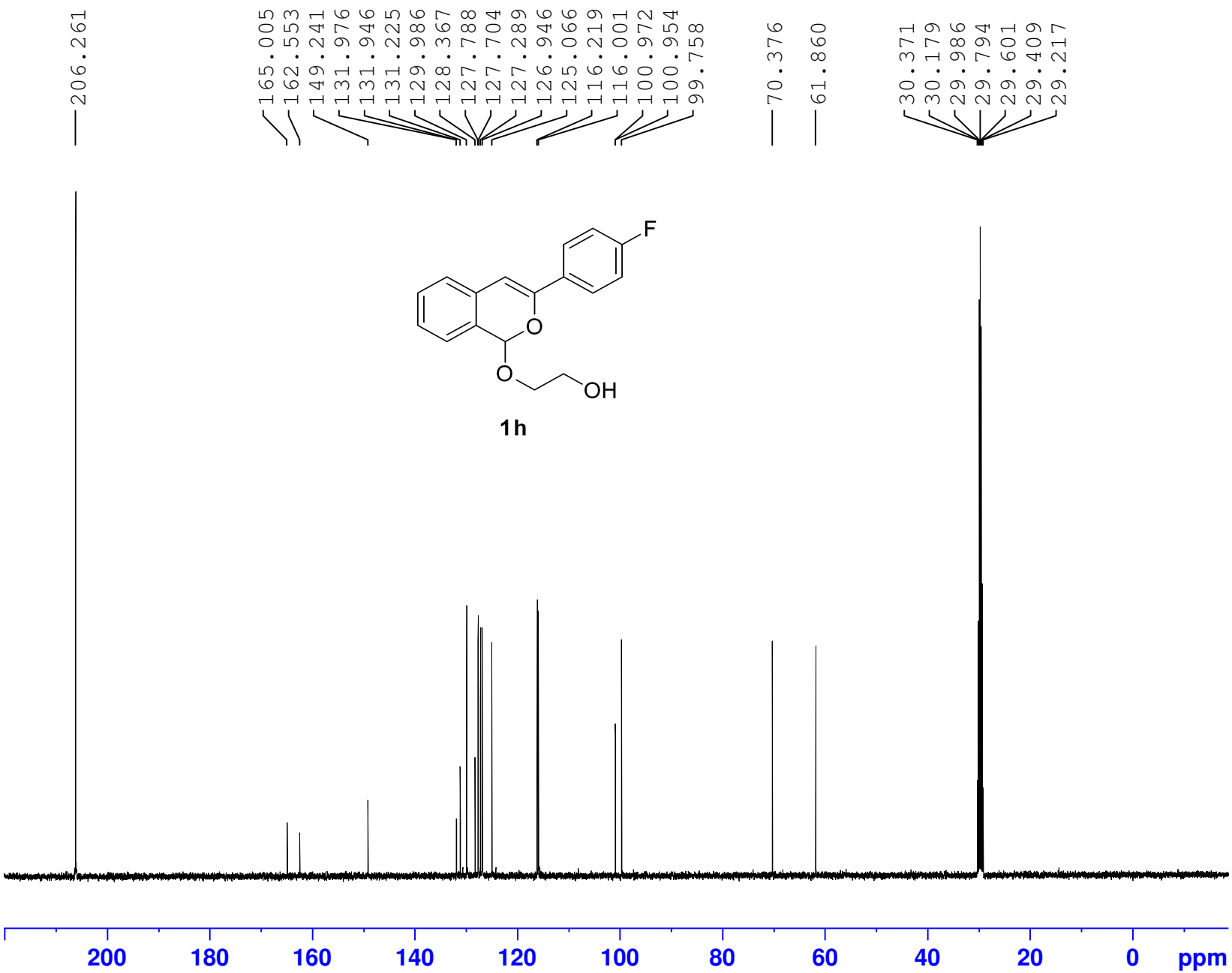


Current Data Parameters
NAME qh-7145
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20140313
Time 13.06
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT Acetone
NS 2
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 39.46
DW 62.400 usec
DE 6.50 usec
TE 295.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

F2 - Processing parameters
SI 65536
SF 400.1300068 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



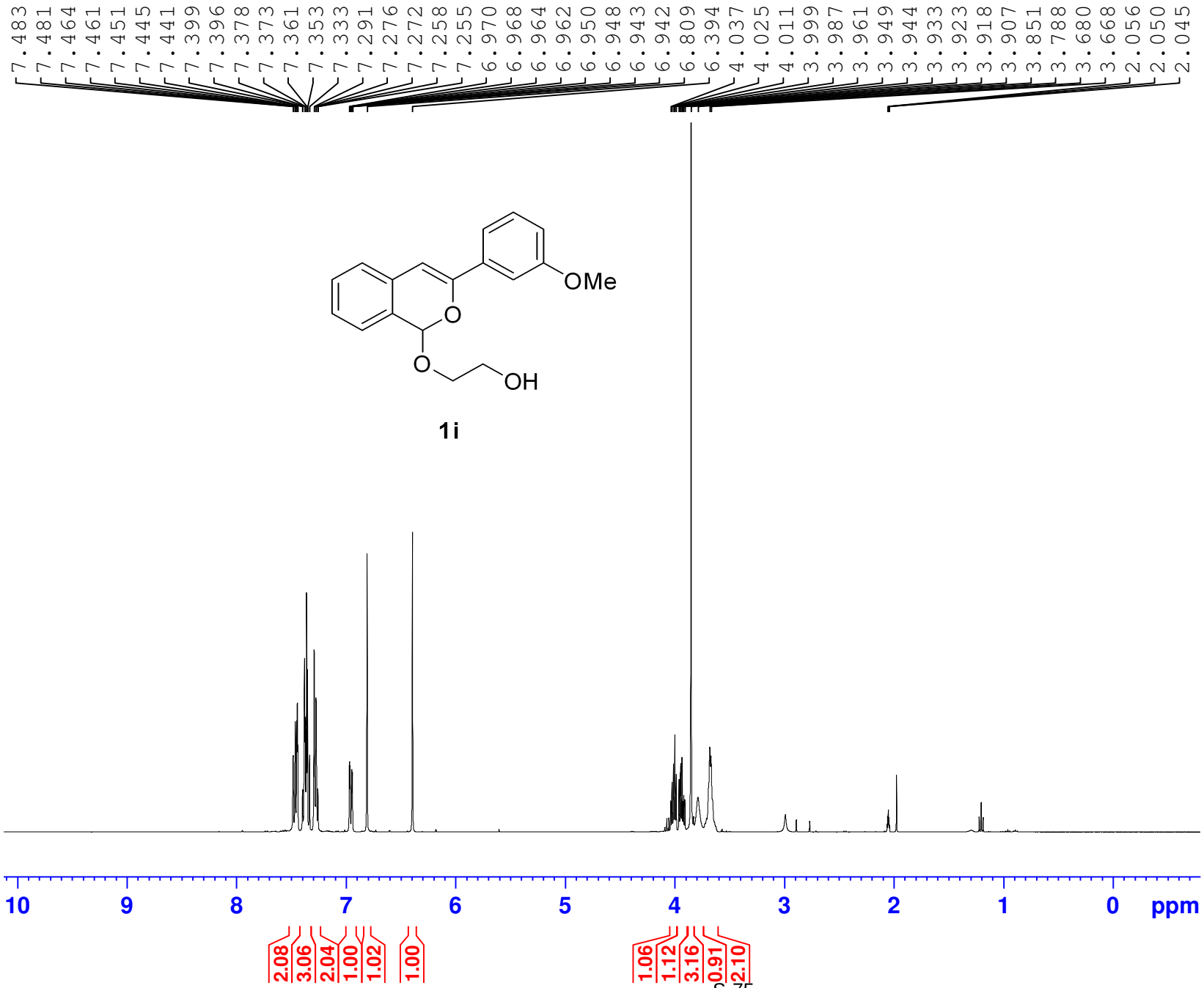
Current Data Parameters
NAME qh-7145
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20140313
Time 13.09
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT Acetone
NS 70
DS 2
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631488 sec
RG 196.92
DW 20.800 usec
DE 6.50 usec
TE 296.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

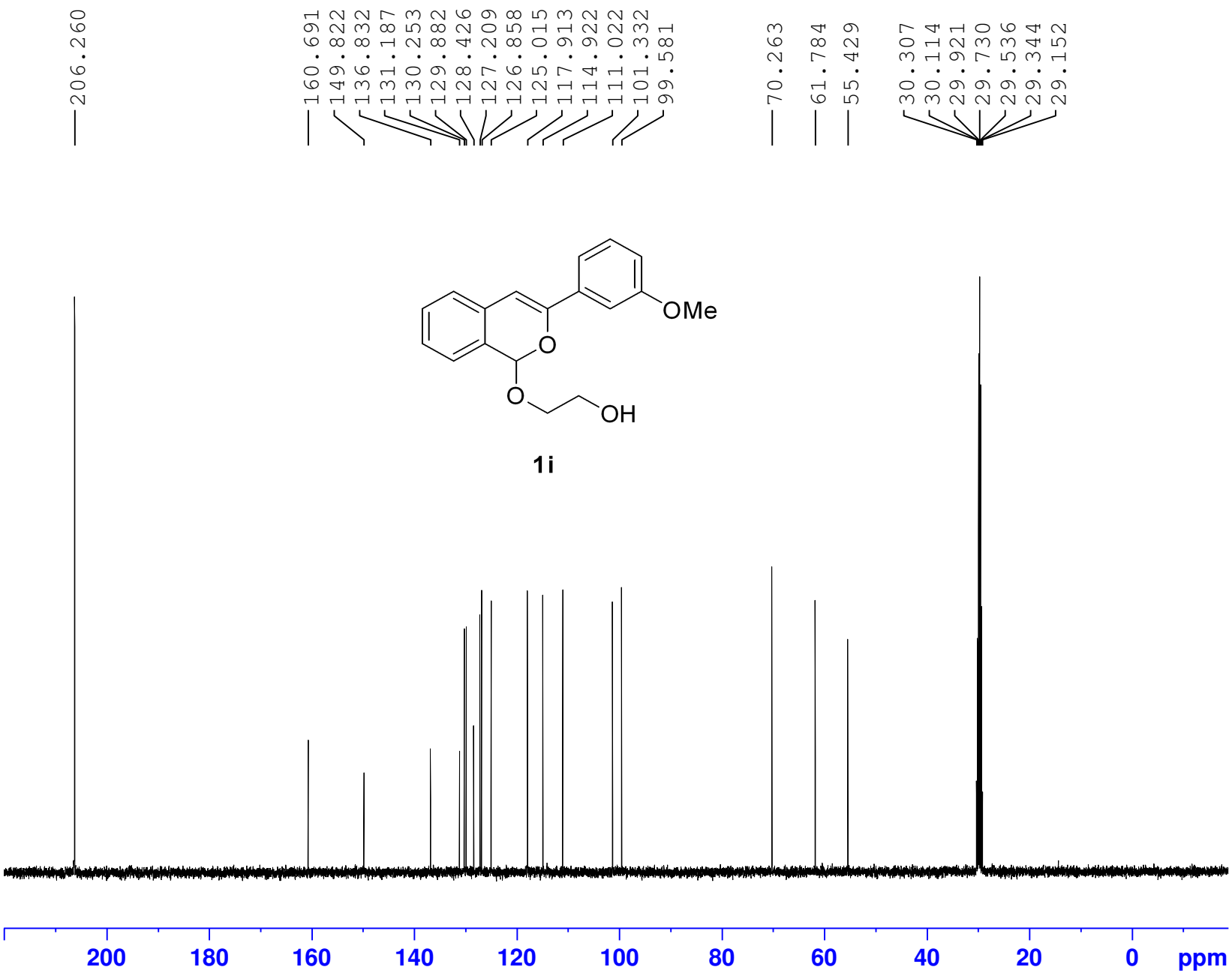
======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 9.60 usec
PLW1 31.98900032 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 9.10000038 W
PLW12 0.24608000 W
PLW13 0.19933000 W

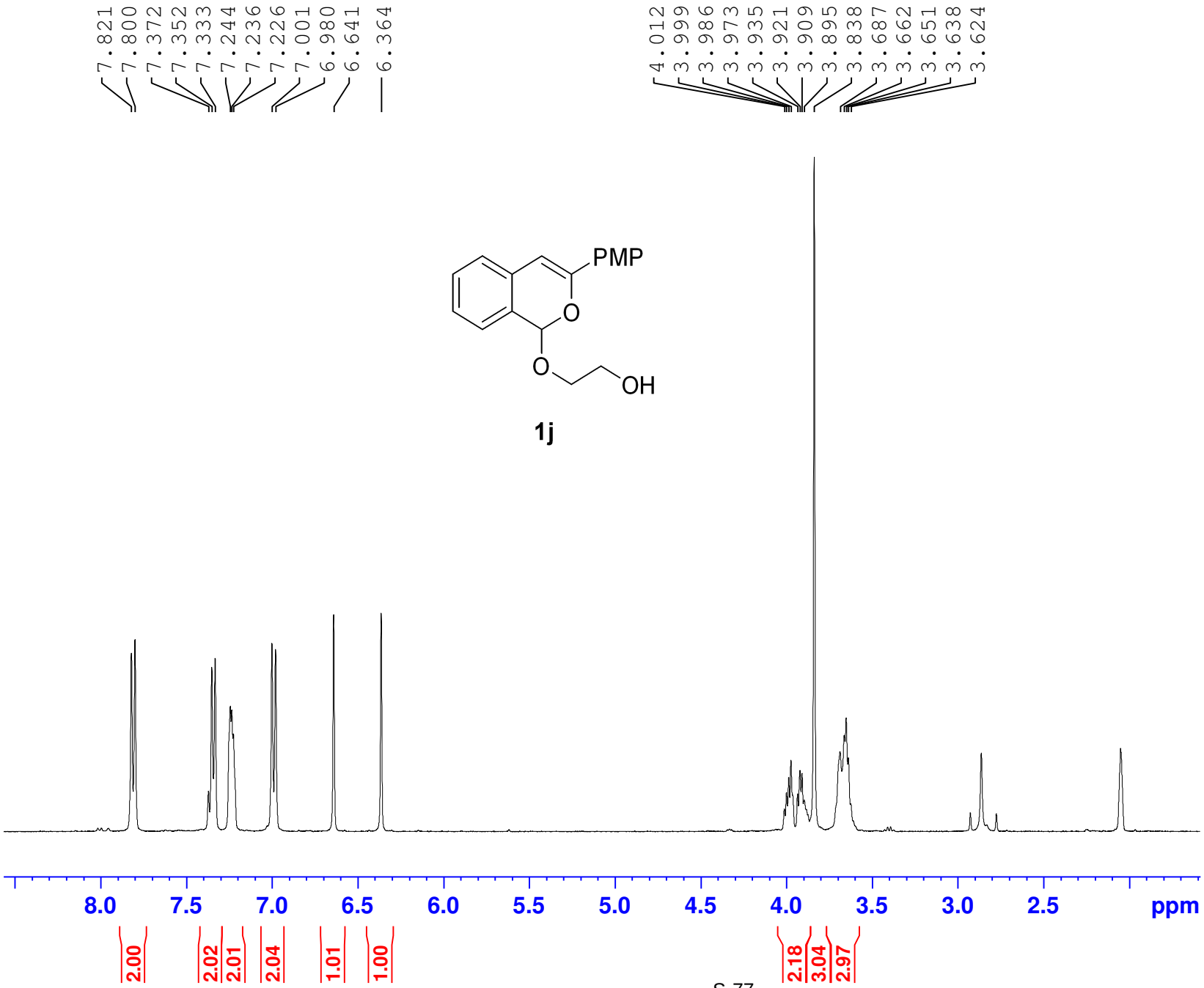
F2 - Processing parameters
SI 32768
SF 100.6126908 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



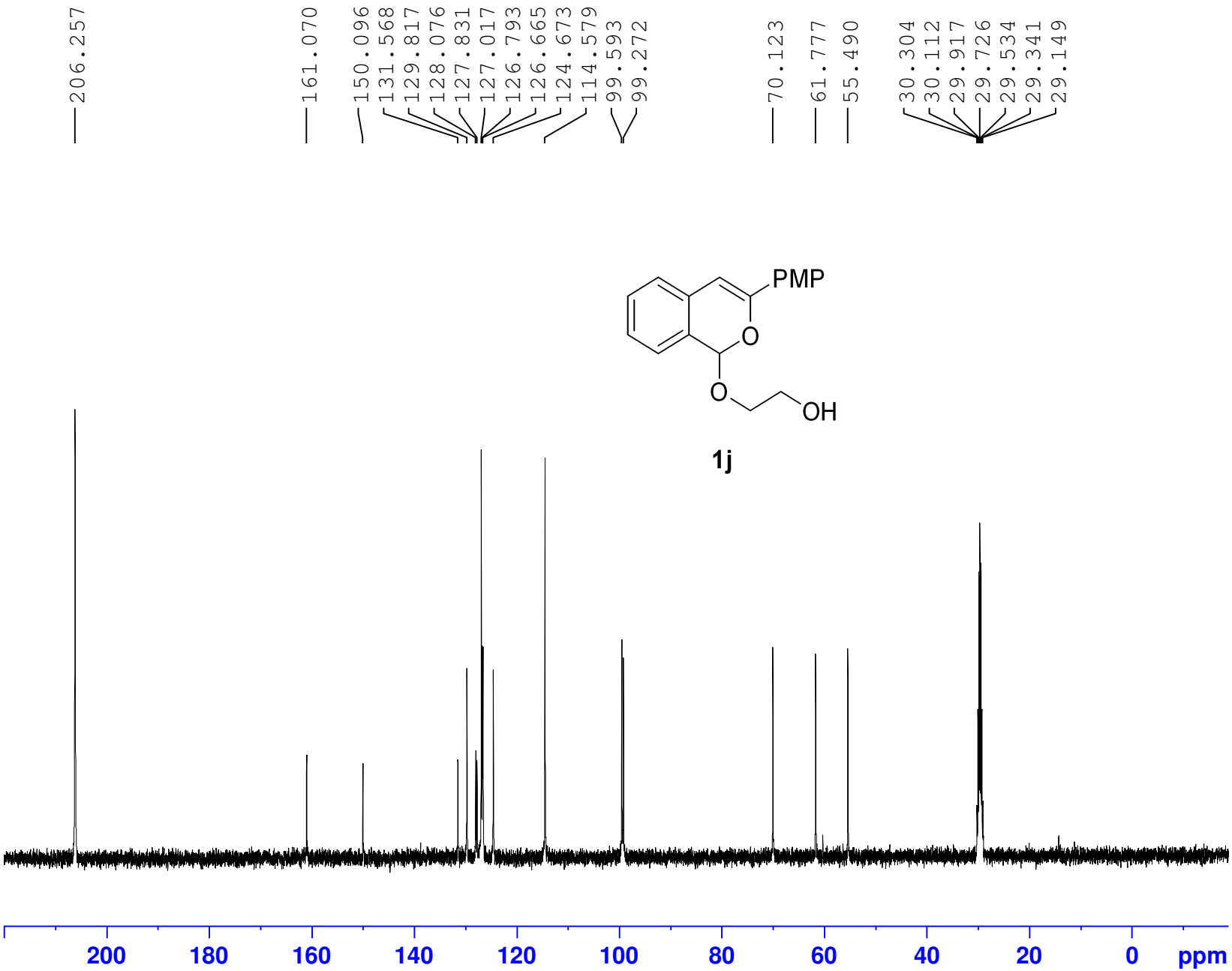

```
Current Data Parameters
NAME                 qh-7152
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140314
Time                   13.41
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT              Acetone
NS                         4
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                      19.7
DW                    62.400 usec
DE                     6.50 usec
TE                    295.6 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300067 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```




```
Current Data Parameters
NAME                qh-7152
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140314
Time                  13.42
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT             Acetone
NS                       18
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.1 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                     13C
P1                      9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                      1H
CPDPRG[2            waltz16
PCPD2                  90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                     32768
SF              100.6127017 MHz
WDW                       EM
SSB         0
LB                      1.00 Hz
GB          0
PC                      1.40
```




```
Current Data Parameters
NAME          qh-7084-1
EXPNO                 3
PROCNO                1

F2 - Acquisition Parameters
Date_          20140220
Time              20.24
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT         Acetone
NS                    1
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG                70.97
DW               62.400 usec
DE                6.50 usec
TE               296.0 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300070 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



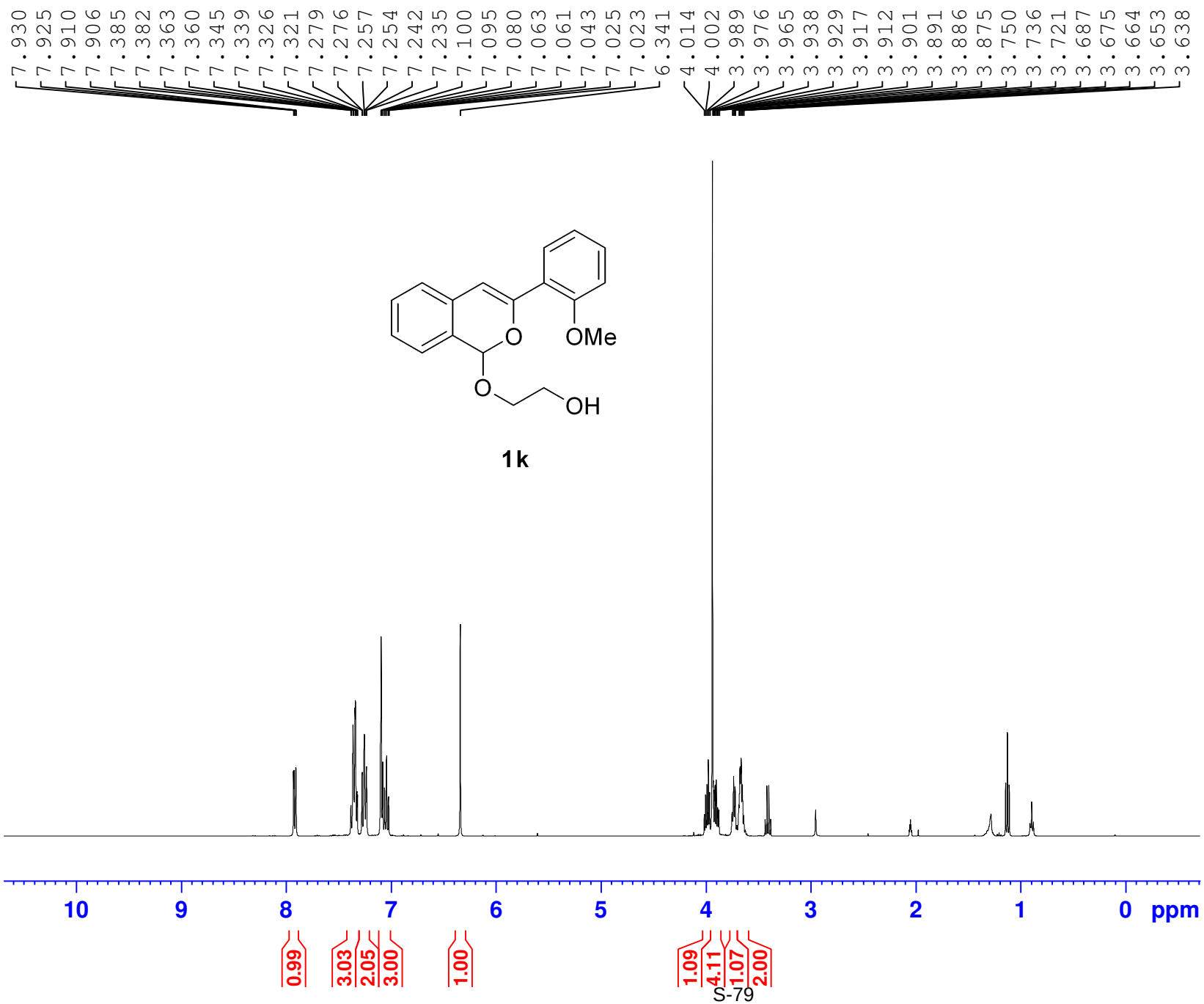
Current Data Parameters
NAME qh-7084-1
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20140220
Time 16.52
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zgpg30
TD 65536
SOLVENT Acetone
NS 50
DS 2
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631488 sec
RG 196.92
DW 20.800 usec
DE 6.50 usec
TE 295.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

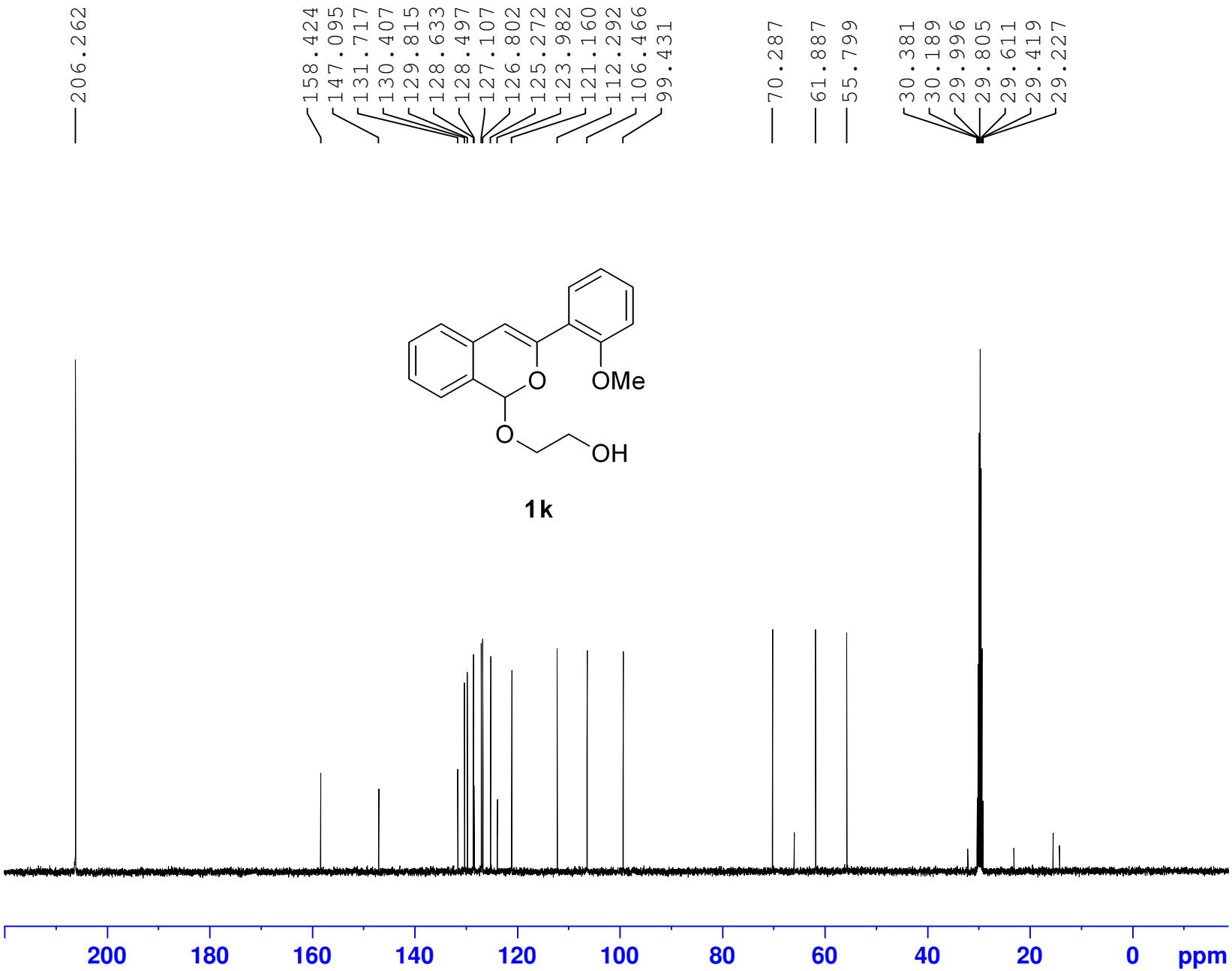
======== CHANNEL f1 ========
SFO1 100.6228298 MHz
NUC1 13C
P1 9.60 usec
PLW1 31.98900032 W

======== CHANNEL f2 ========
SFO2 400.1316005 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 9.10000038 W
PLW12 0.24608000 W
PLW13 0.19933000 W

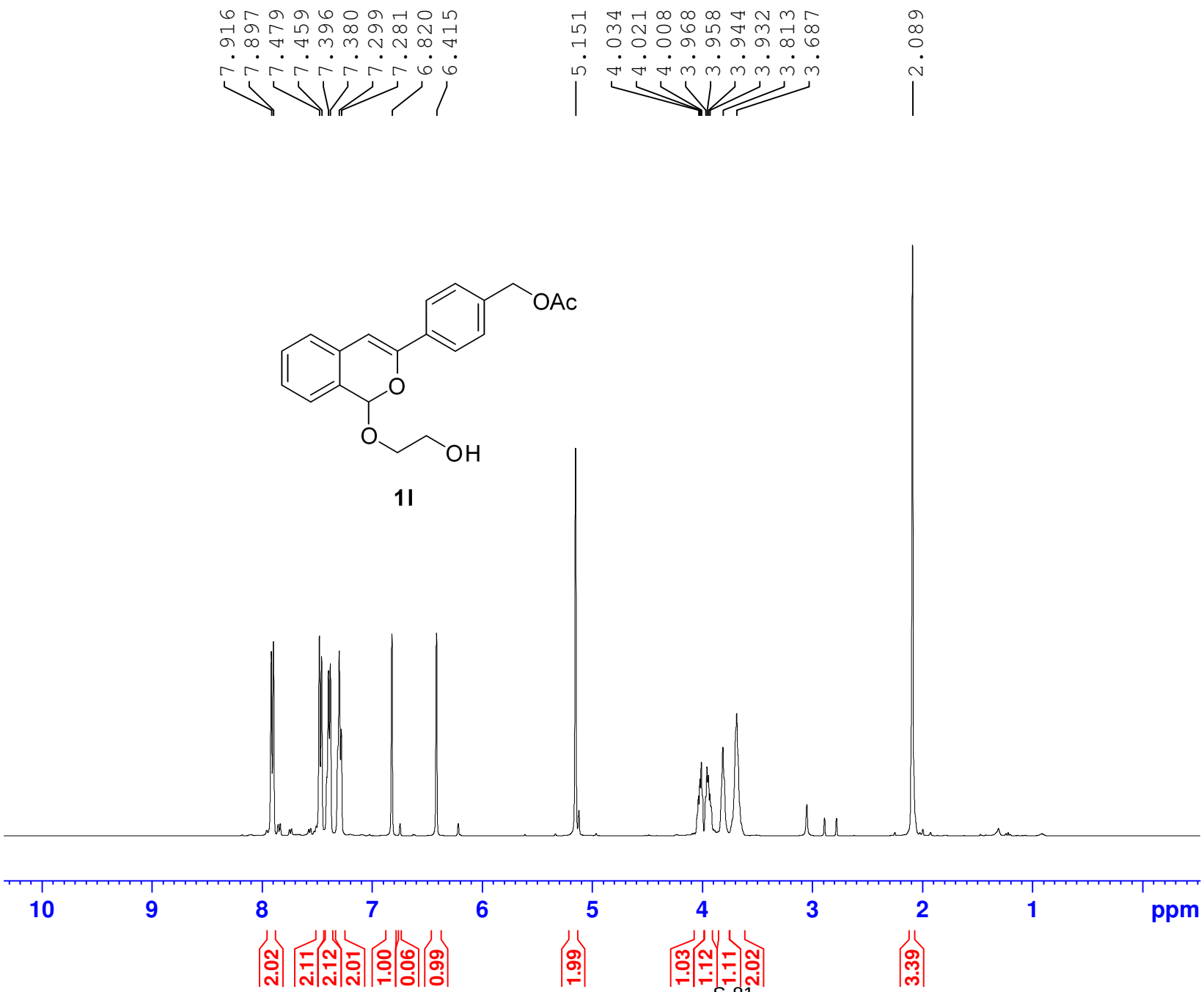
F2 - Processing parameters
SI 32768
SF 100.6127037 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40




```
Current Data Parameters
NAME                 qh-7173
EXPNO                      3
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140319
Time                   13.57
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT              Acetone
NS                         3
DS                         2
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                      19.7
DW                    62.400 usec
DE                     6.50 usec
TE                    296.0 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300068 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```




```
Current Data Parameters
NAME                qh-7173
EXPNO                     4
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140319
Time                  13.59
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT            Acetone
NS                       30
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6126928 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

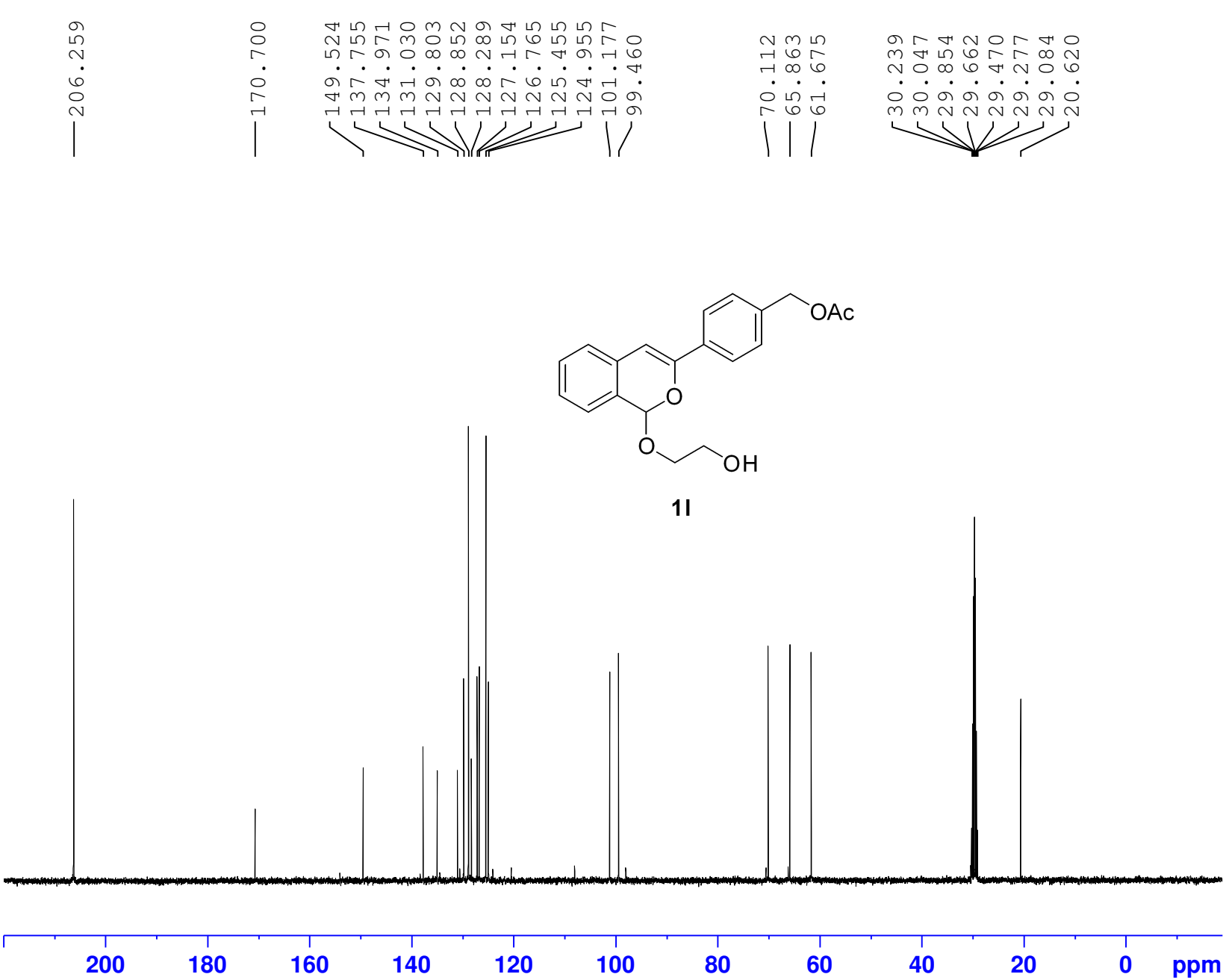


Current Data Parameters
NAME qh-7183
EXPNO 1
PROCNO 1

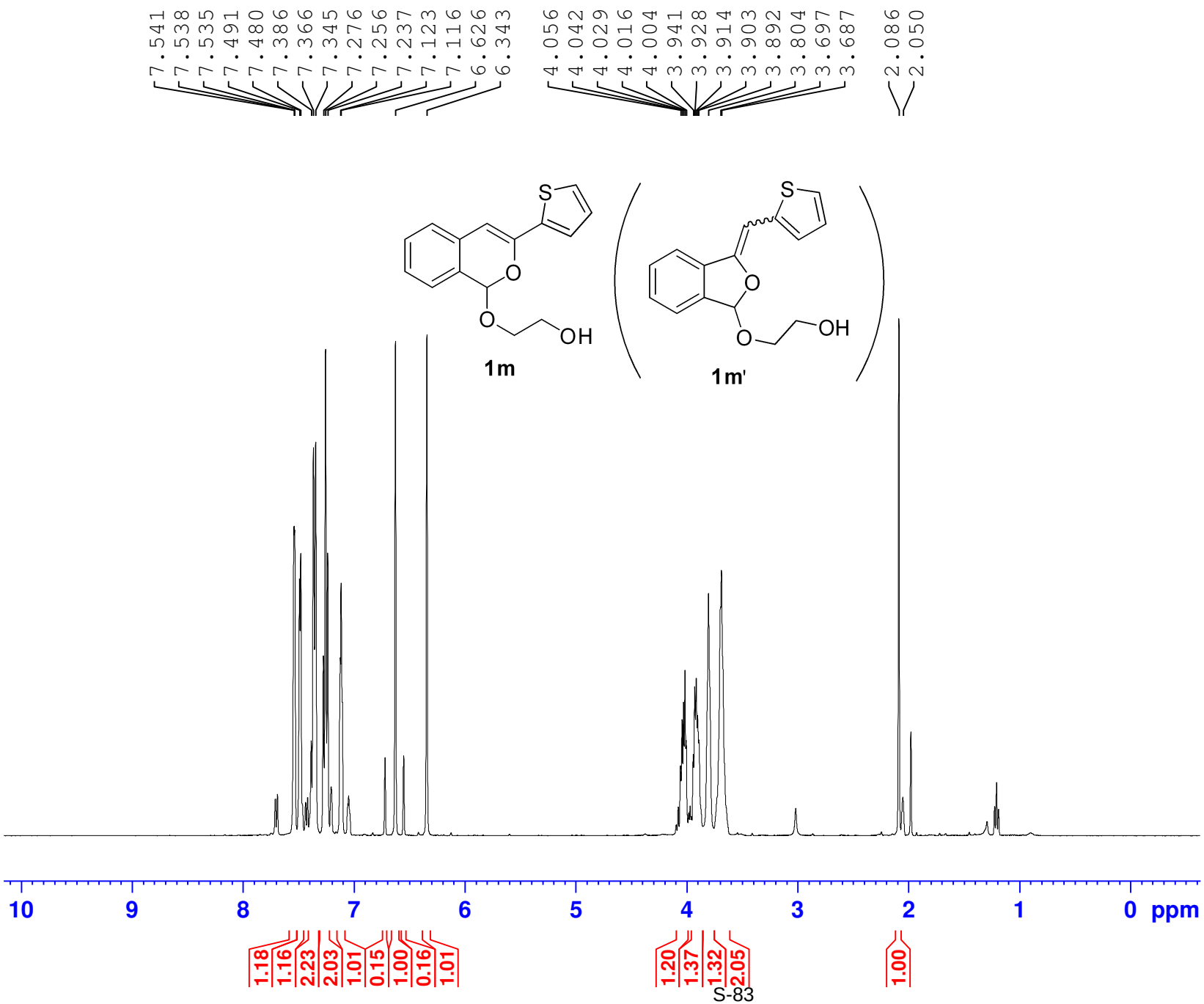
F2 - Acquisition Parameters
Date_ 20140322
Time 12.39
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT Acetone
NS 5
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 14.29
DW 62.400 usec
DE 6.50 usec
TE 296.5 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

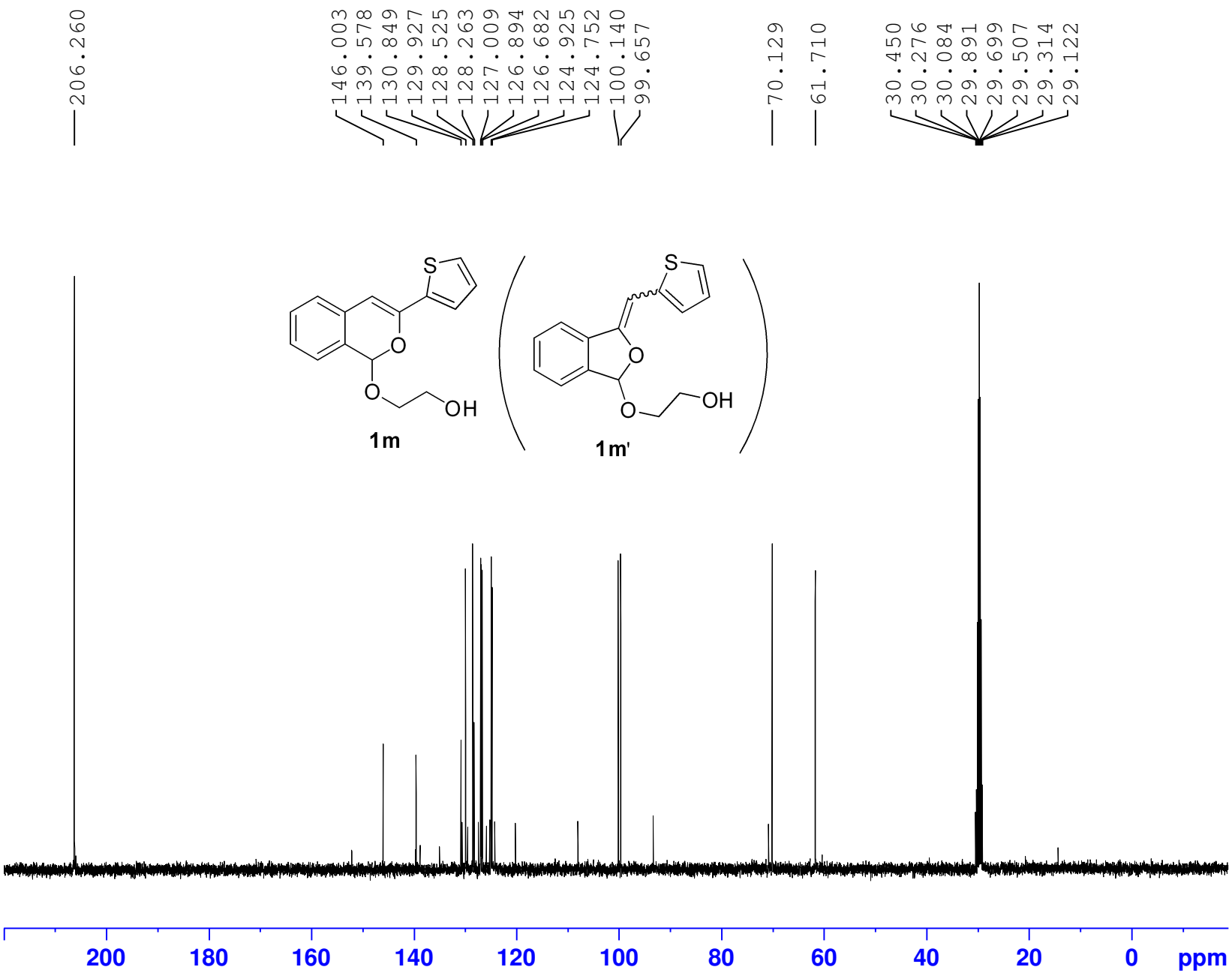
F2 - Processing parameters
SI 65536
SF 400.1300000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



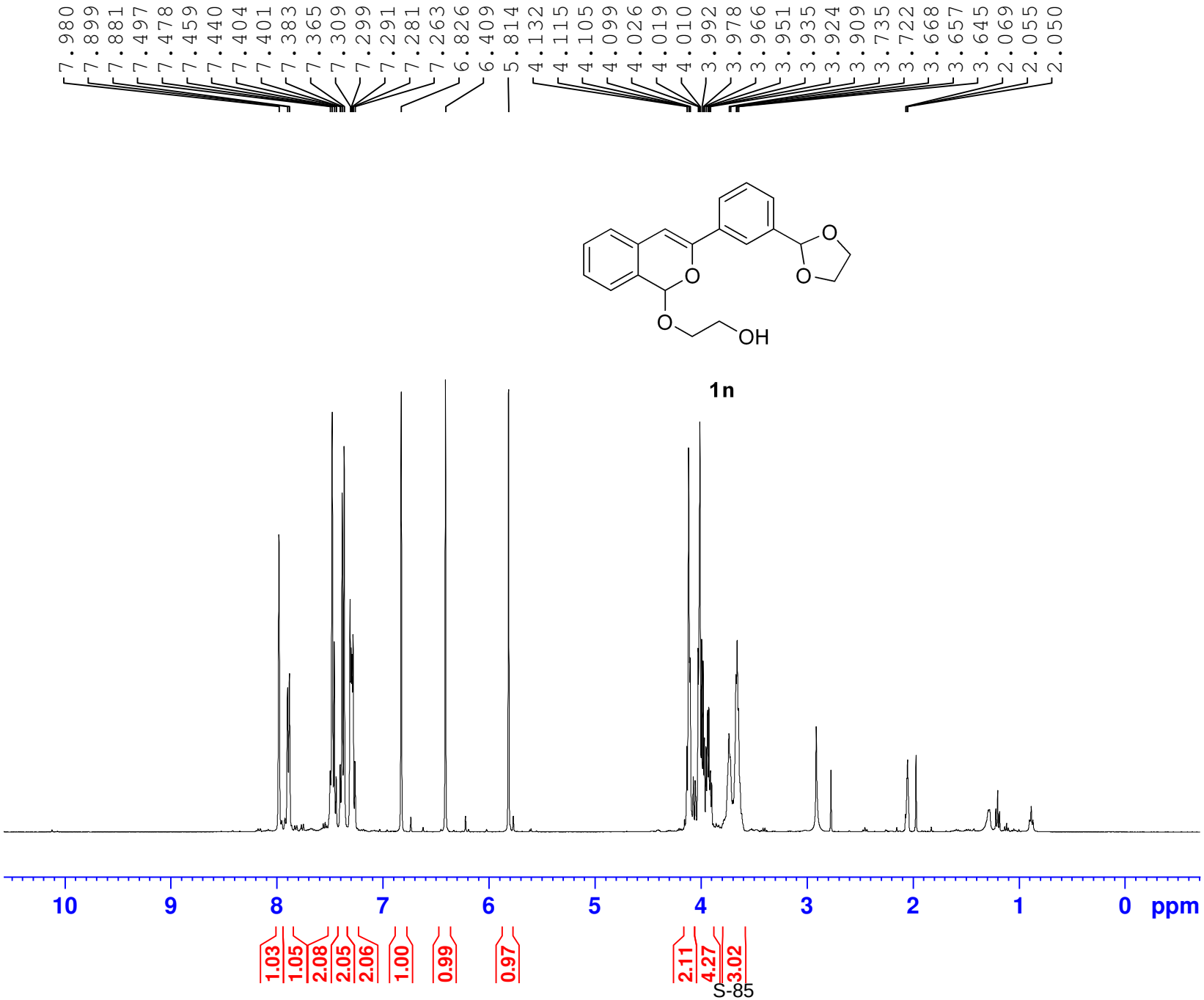

```
Current Data Parameters
NAME                qh-7183
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140322
Time                  12.41
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT            Acetone
NS                       29
DS                        2
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631488 sec
RG                  196.92
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            100.6228298 MHz
NUC1                    13C
P1                    9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127139 MHz
WDW                      EM
SSB         0
LB                    1.00 Hz
GB          0
PC                    1.40
```




```
Current Data Parameters
NAME                qh-7184
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140322
Time                   12.32
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT              Acetone
NS                        1
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    17.38
DW                   62.400 usec
DE                    6.50 usec
TE                   296.5 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300059 MHz
WDW                       EM
SSB         0
LB                     0.30 Hz
GB          0
PC                     1.00
```




```
Current Data Parameters
NAME                 qh-7184
EXPNO                      2
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140322
Time                   12.33
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                        14
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     296.7 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                      13C
P1                       9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2              waltz16
PCPD2                   90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                      32768
SF               100.6127086 MHz
WDW                        EM
SSB          0
LB                       1.00 Hz
GB           0
PC                       1.40
```

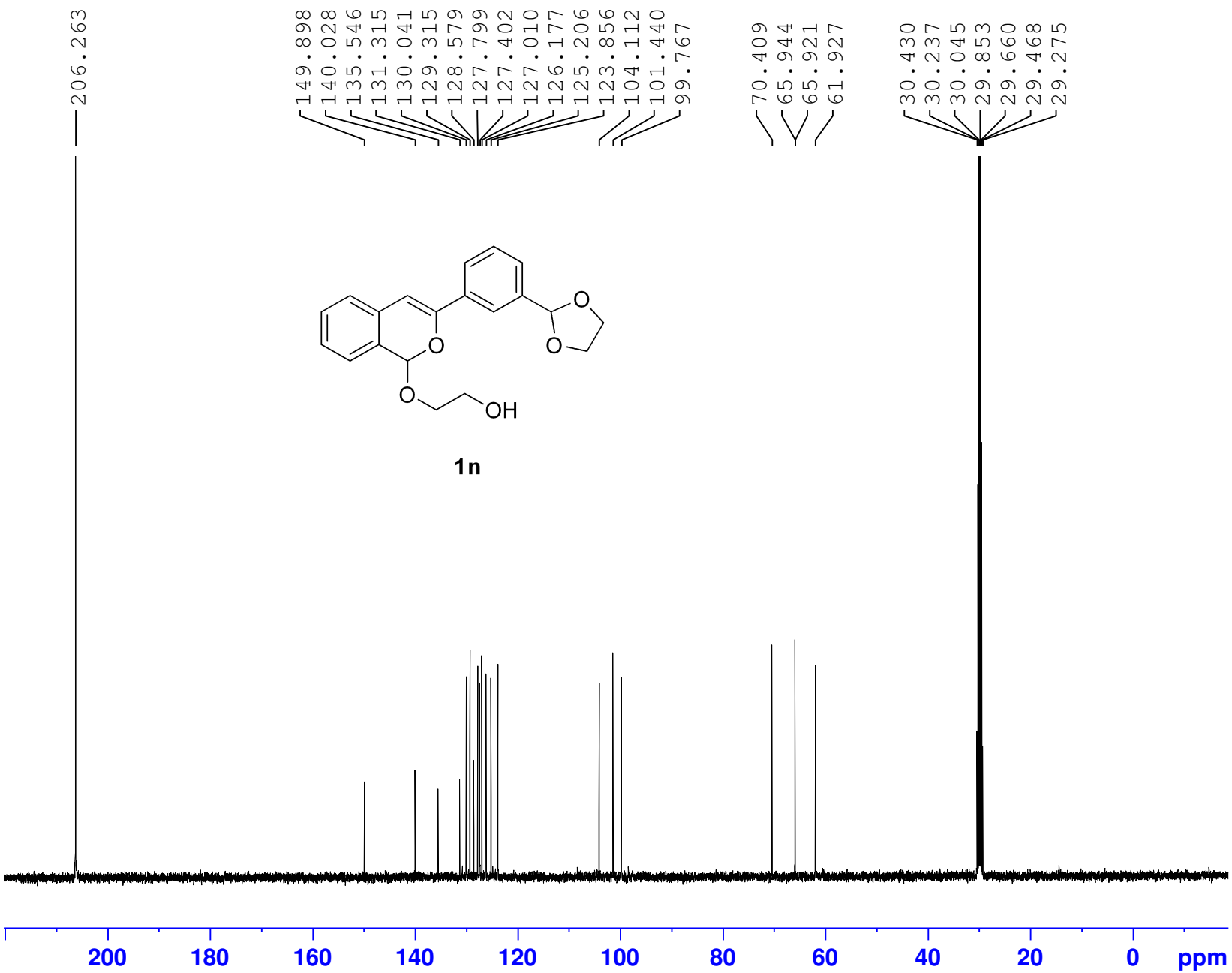


Current Data Parameters
NAME qh-7082-3
EXPNO 1
PROCNO 1

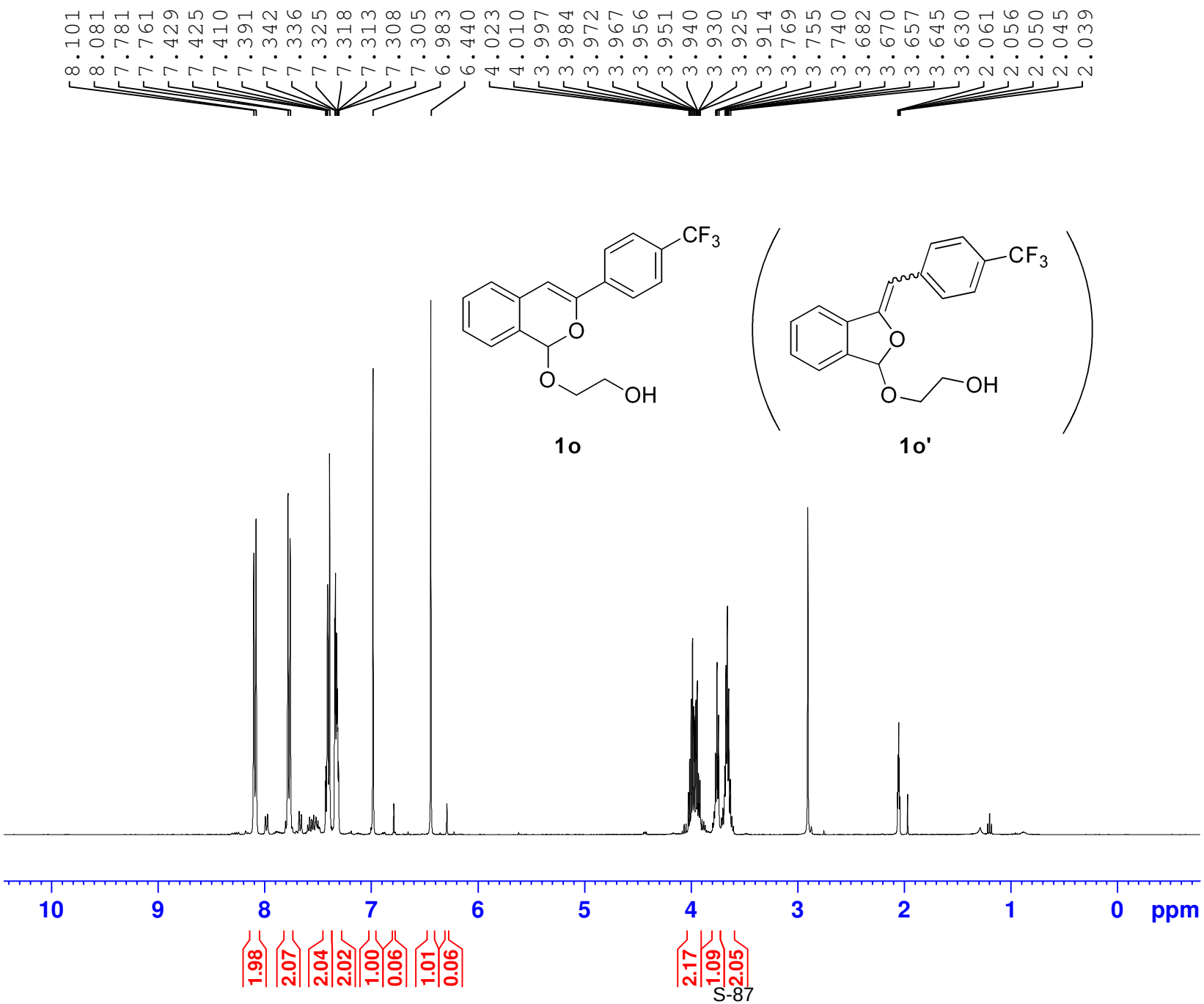
F2 - Acquisition Parameters
Date_ 20140219
Time 19.02
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT Acetone
NS 16
DS 2
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 27.78
DW 62.400 usec
DE 6.50 usec
TE 295.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

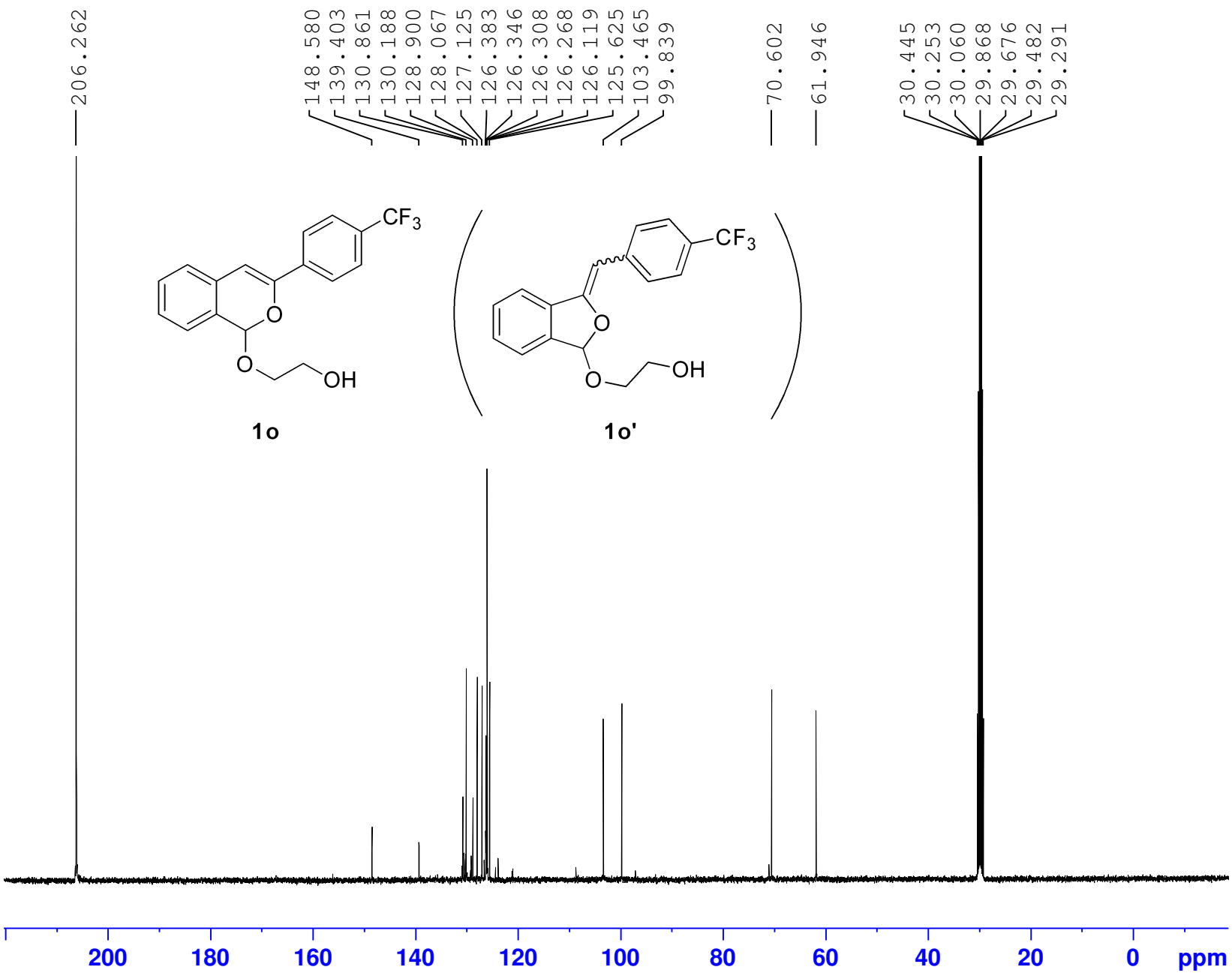
F2 - Processing parameters
SI 65536
SF 400.1300068 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



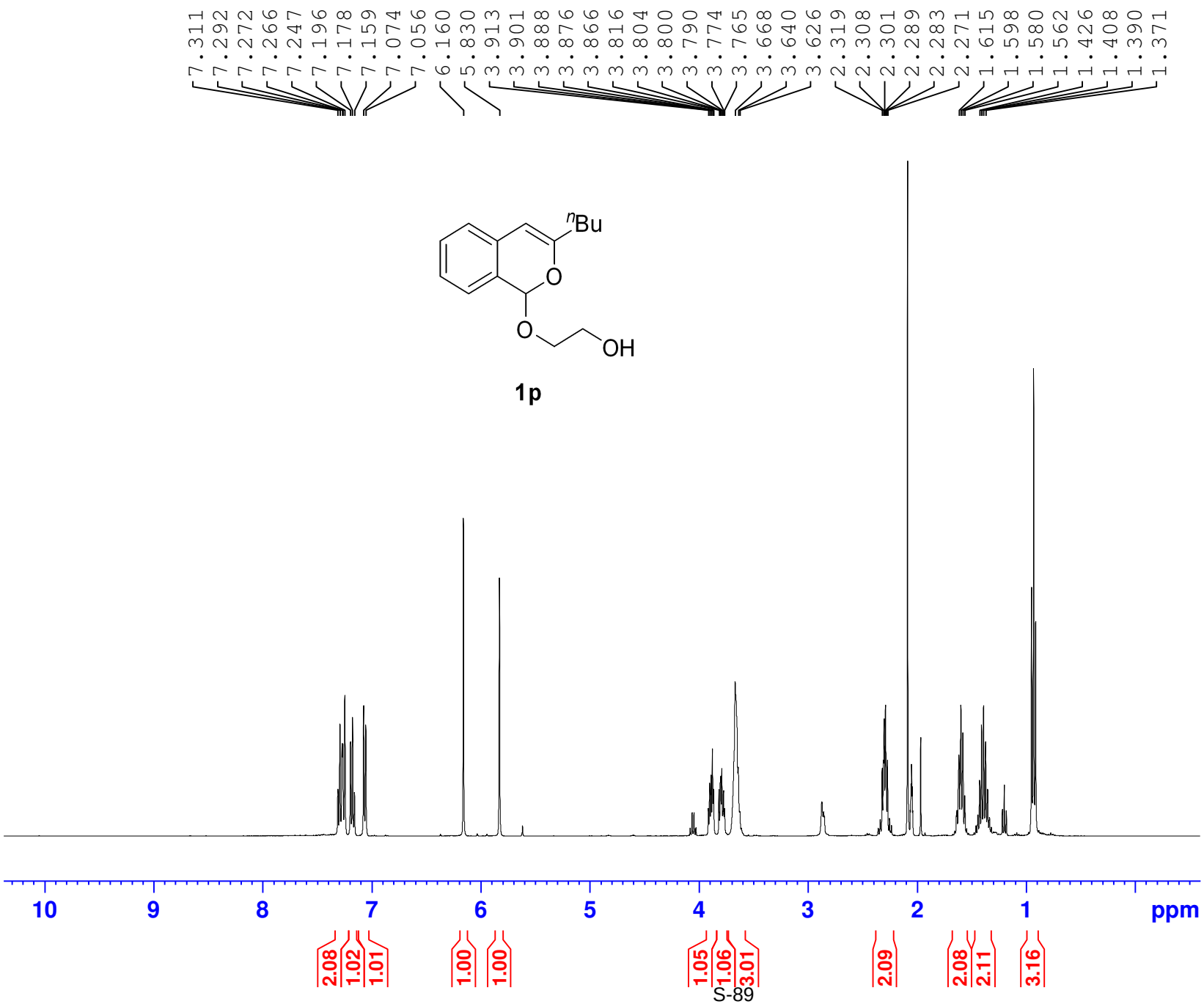

```
Current Data Parameters
NAME          qh-7082-3
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140219
Time              19.06
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT         Acetone
NS                   71
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.6 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                 9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2         9.10000038 W
PLW12        0.24608000 W
PLW13        0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6126841 MHz
WDW                  EM
SSB      0
LB                1.00 Hz
GB       0
PC                1.40
```



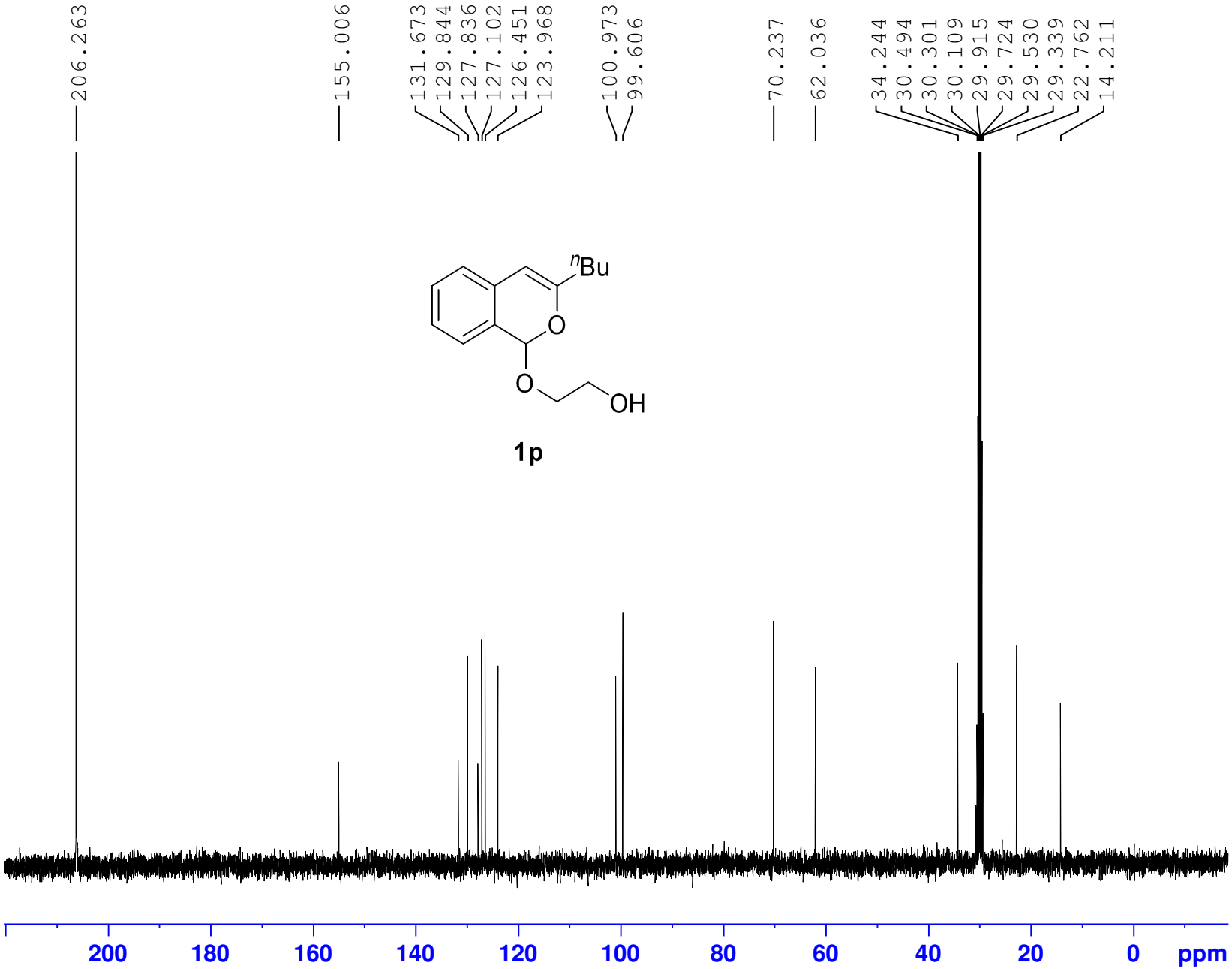

```
Current Data Parameters
NAME                qh-7149
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140314
Time                   10.45
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT              Acetone
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     54.81
DW                    62.400 usec
DE                     6.50 usec
TE                    295.7 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300068 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



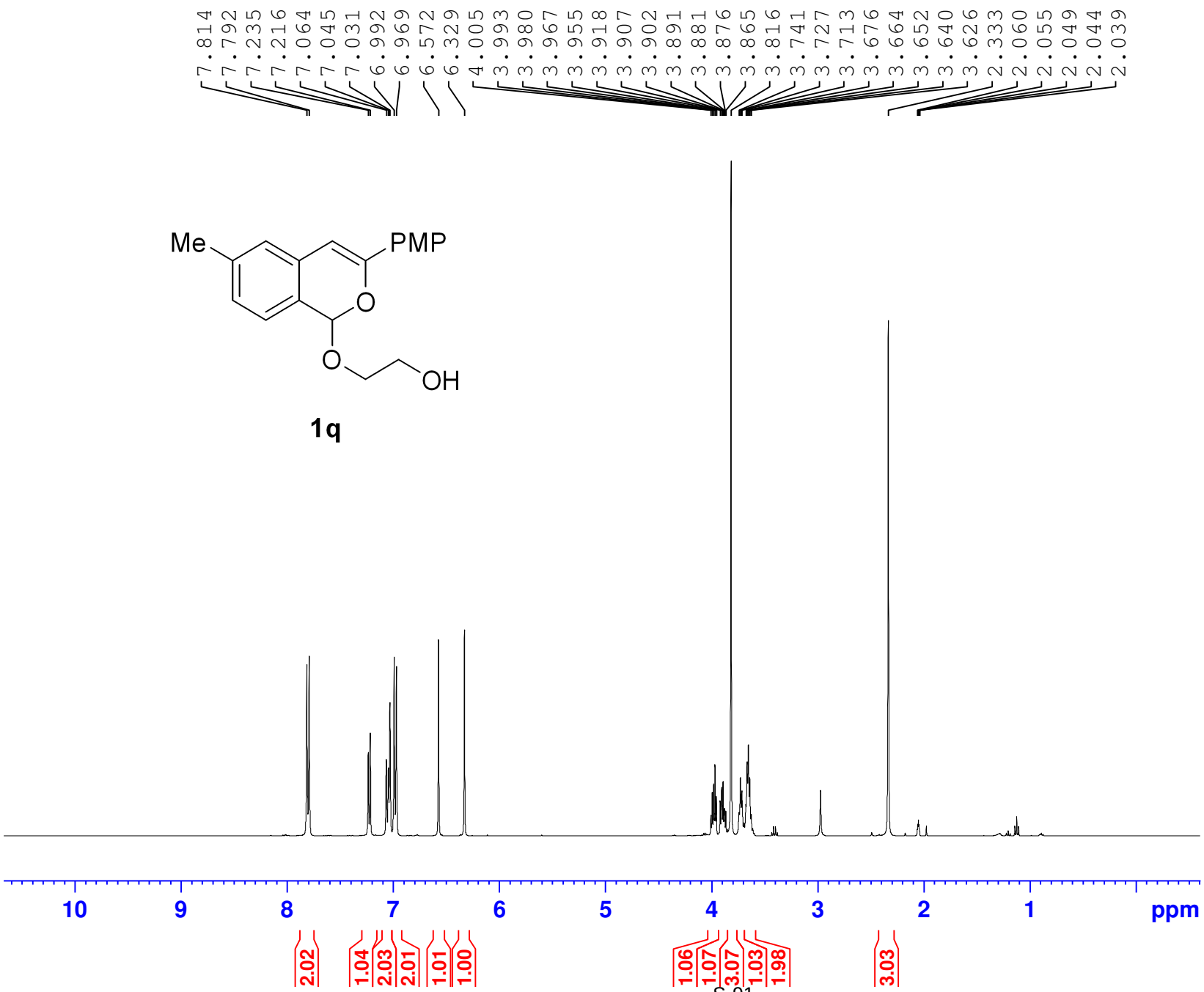

```
Current Data Parameters
NAME                qh-7149
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140314
Time                   10.51
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                       200
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
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             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2              waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6126784 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



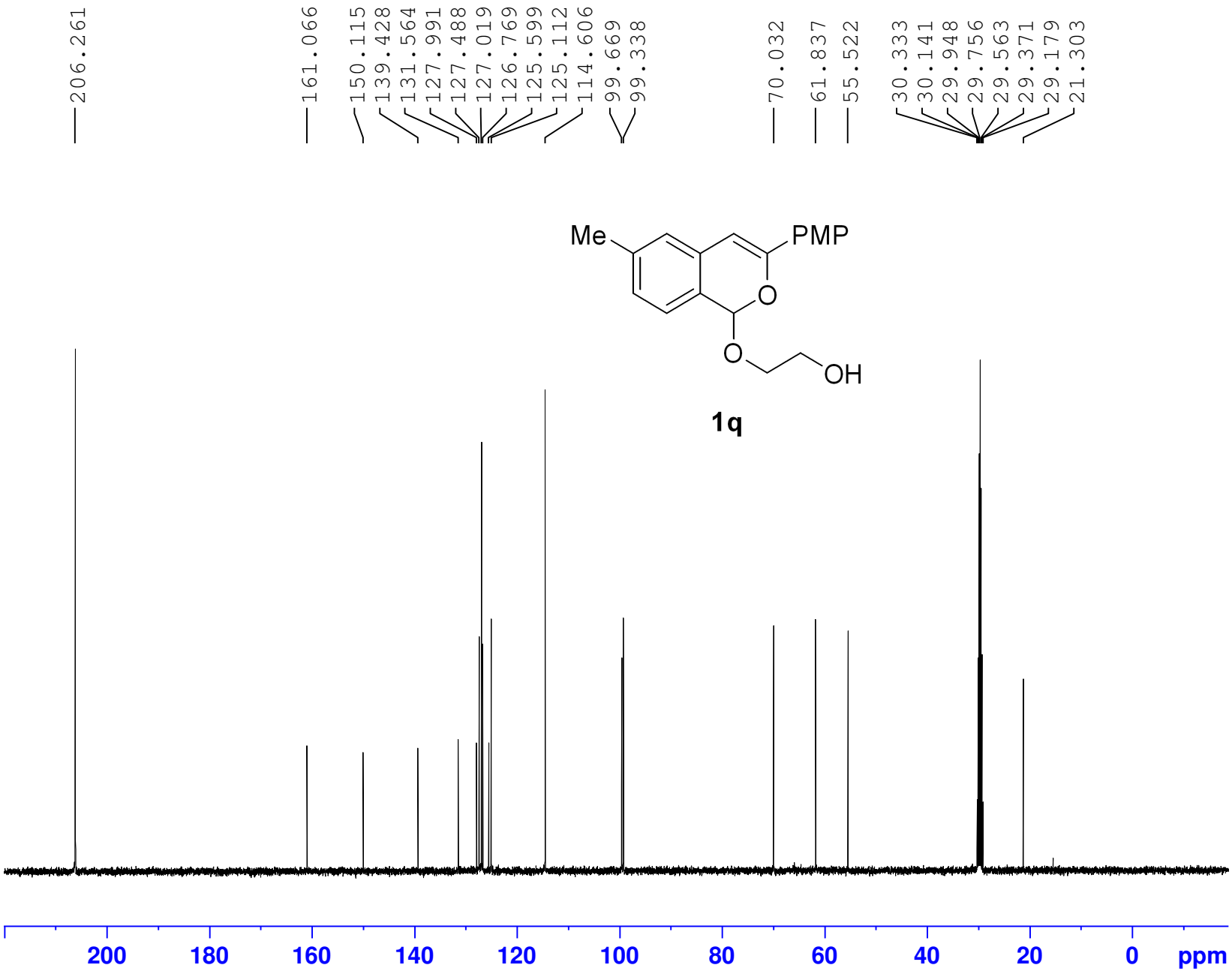

```
Current Data Parameters
NAME                qh-8006
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140329
Time                  15.37
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT            Acetone
NS                        3
DS                        0
SWH               8012.820 Hz
FIDRES            0.122266 Hz
AQ               4.0894465 sec
RG                    31.55
DW                   62.400 usec
DE                    6.50 usec
TE                   295.8 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                     1H
P1                   14.30 usec
PLW1            9.10000038 W

F2 - Processing parameters
SI                    65536
SF             400.1300067 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```



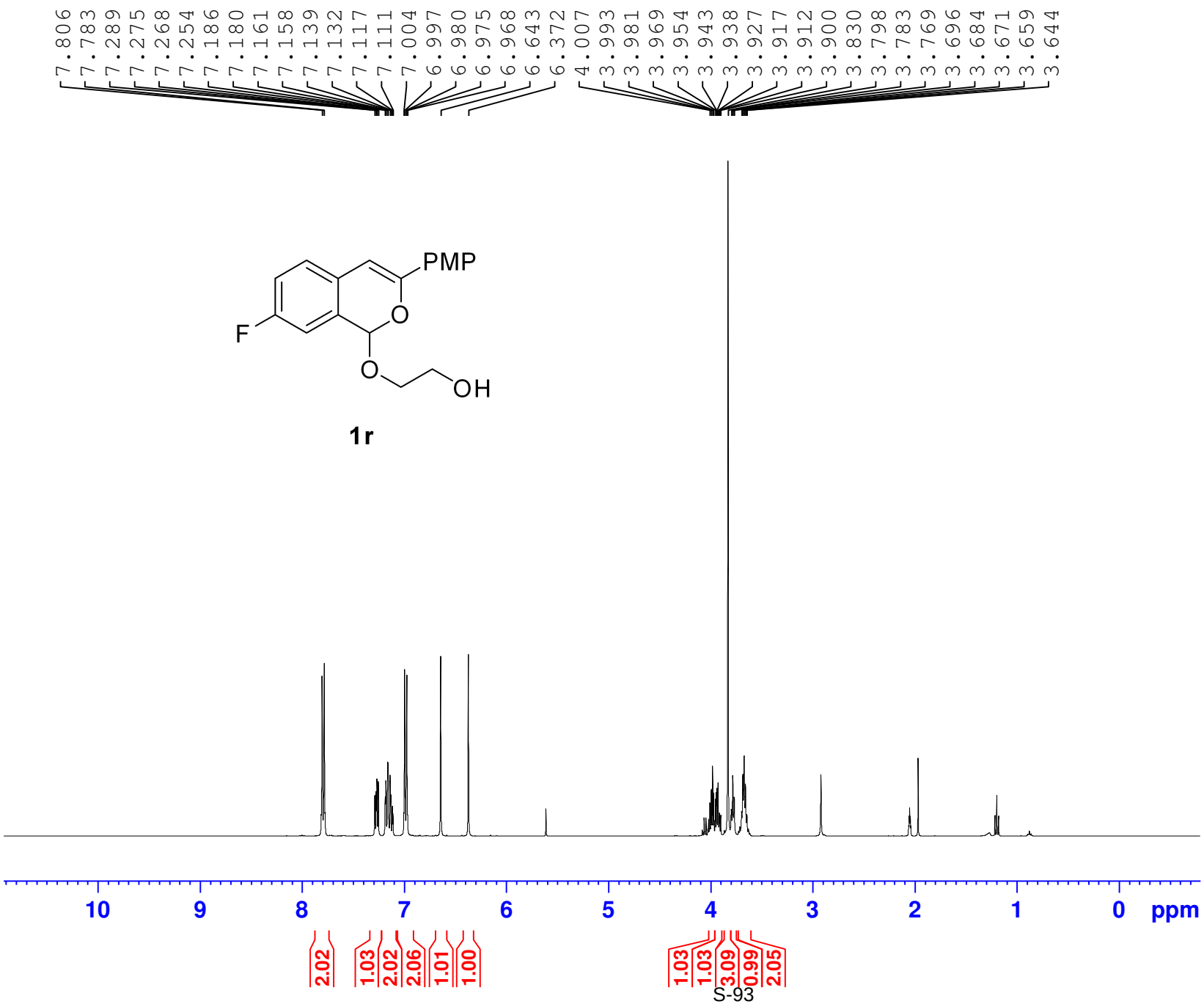

```
Current Data Parameters
NAME                qh-8006
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140329
Time                  15.38
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT            Acetone
NS                       20
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.2 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6126744 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



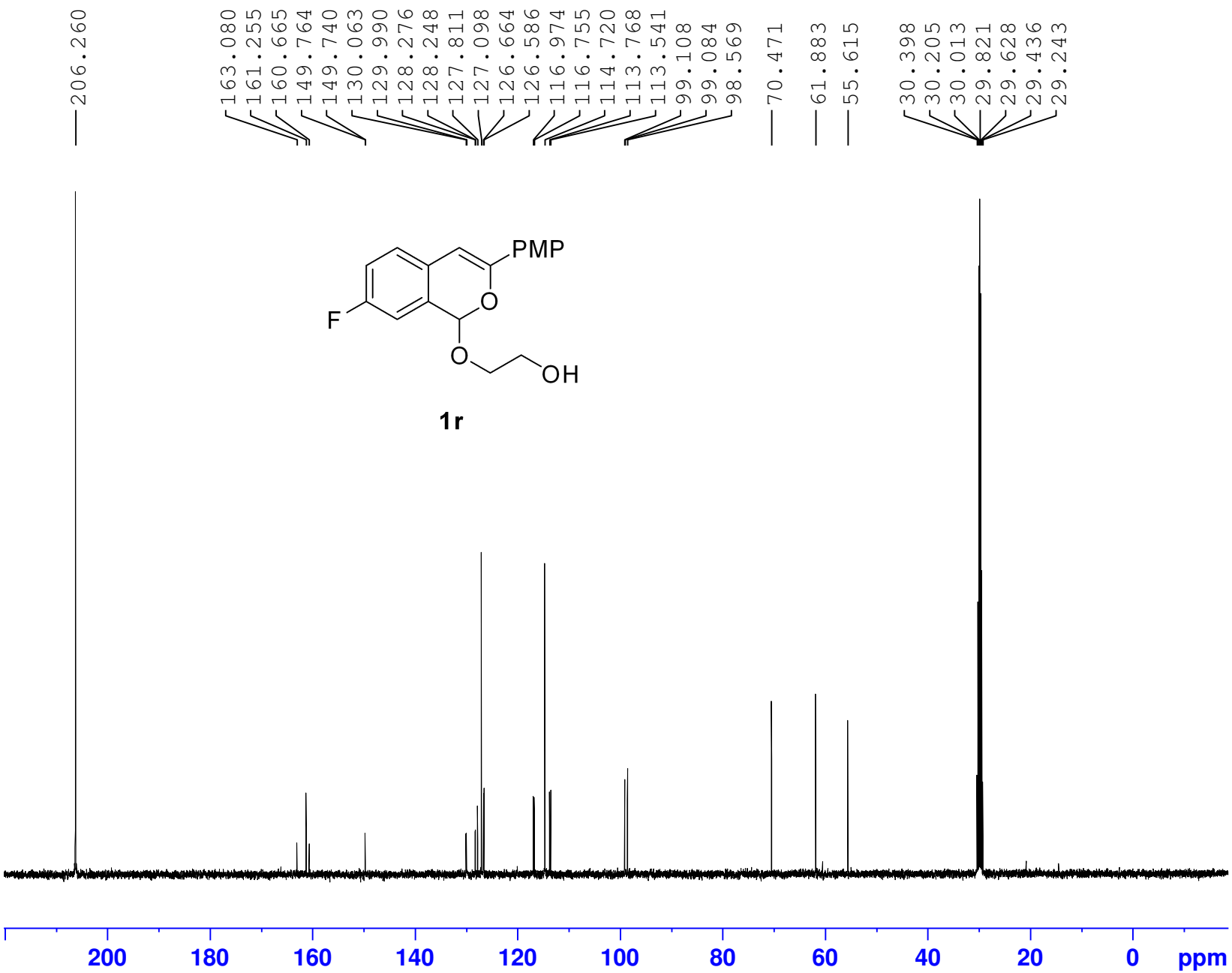

```
Current Data Parameters
NAME                qh-7167
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140319
Time                  13.11
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT            Acetone
NS                        2
DS                        0
SWH               8012.820 Hz
FIDRES            0.122266 Hz
AQ               4.0894465 sec
RG                    17.38
DW                   62.400 usec
DE                    6.50 usec
TE                   296.2 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                    1H
P1                   14.30 usec
PLW1            9.10000038 W

F2 - Processing parameters
SI                    65536
SF             400.1300070 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```



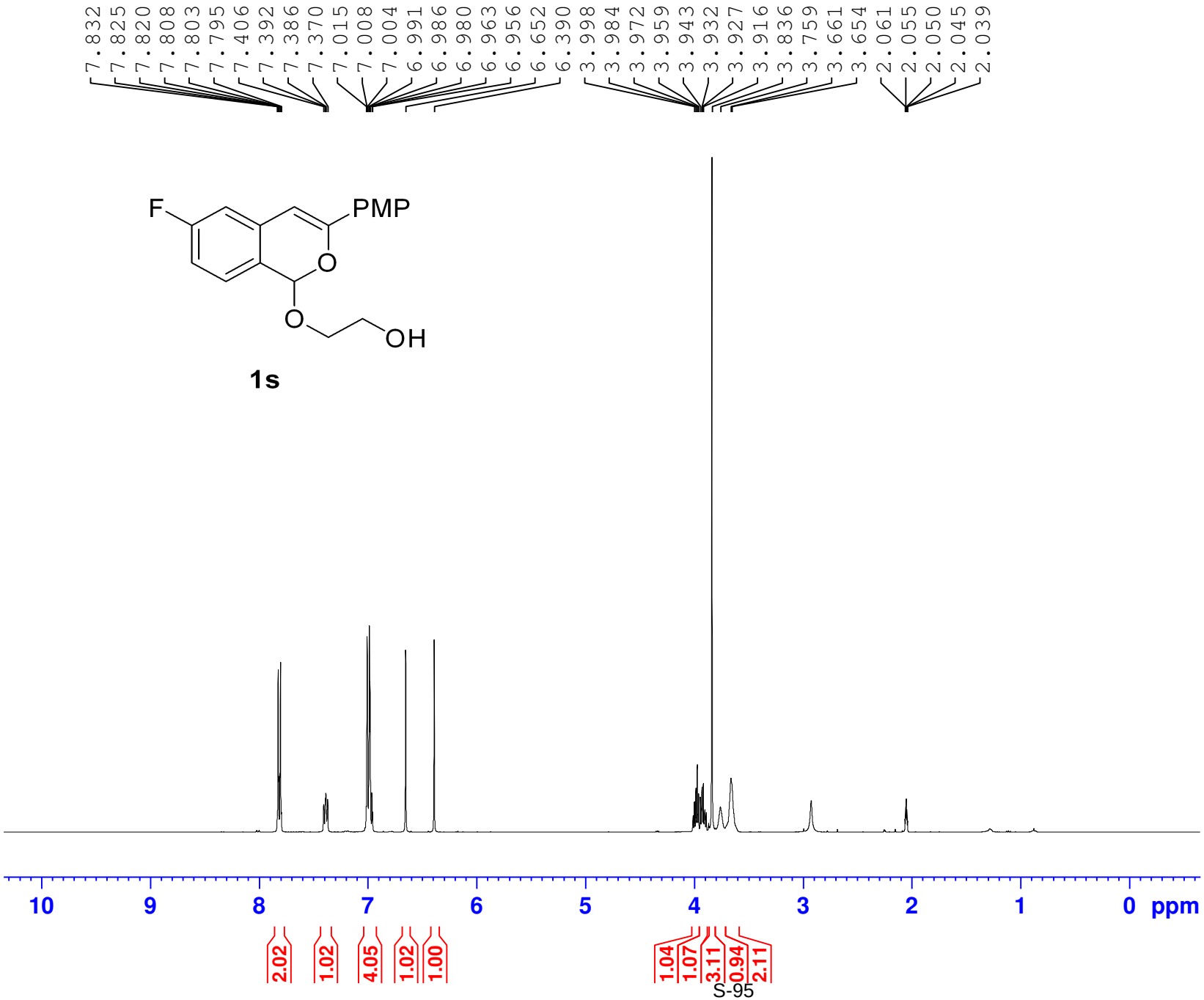

```
Current Data Parameters
NAME                 qh-7167
EXPNO                      2
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140319
Time                   13.13
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                        35
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     296.6 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2              waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6126977 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



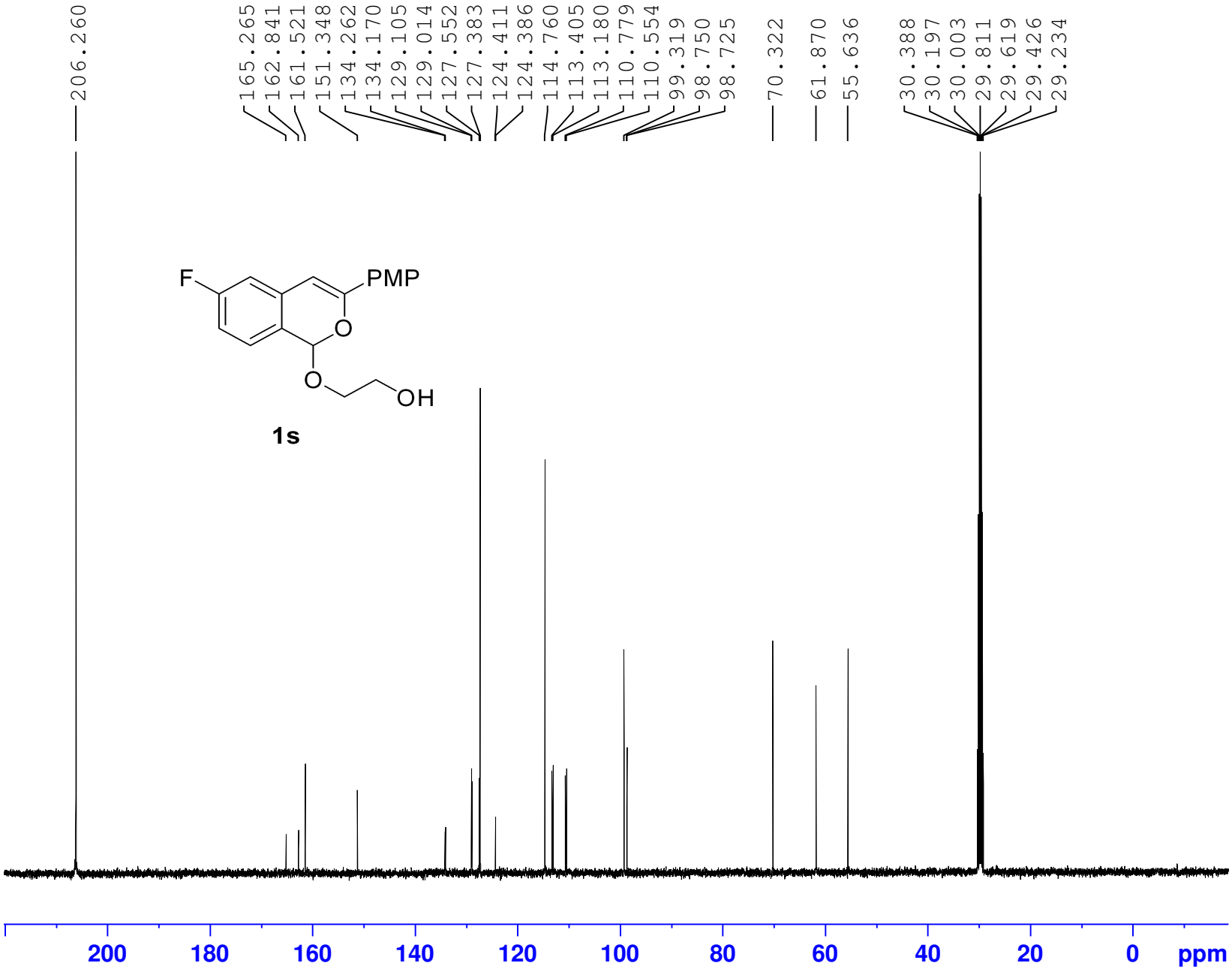

```
Current Data Parameters
NAME                qh-7166
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140319
Time                   13.07
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT             Acetone
NS                        1
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    27.78
DW                   62.400 usec
DE                    6.50 usec
TE                   296.0 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300069 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



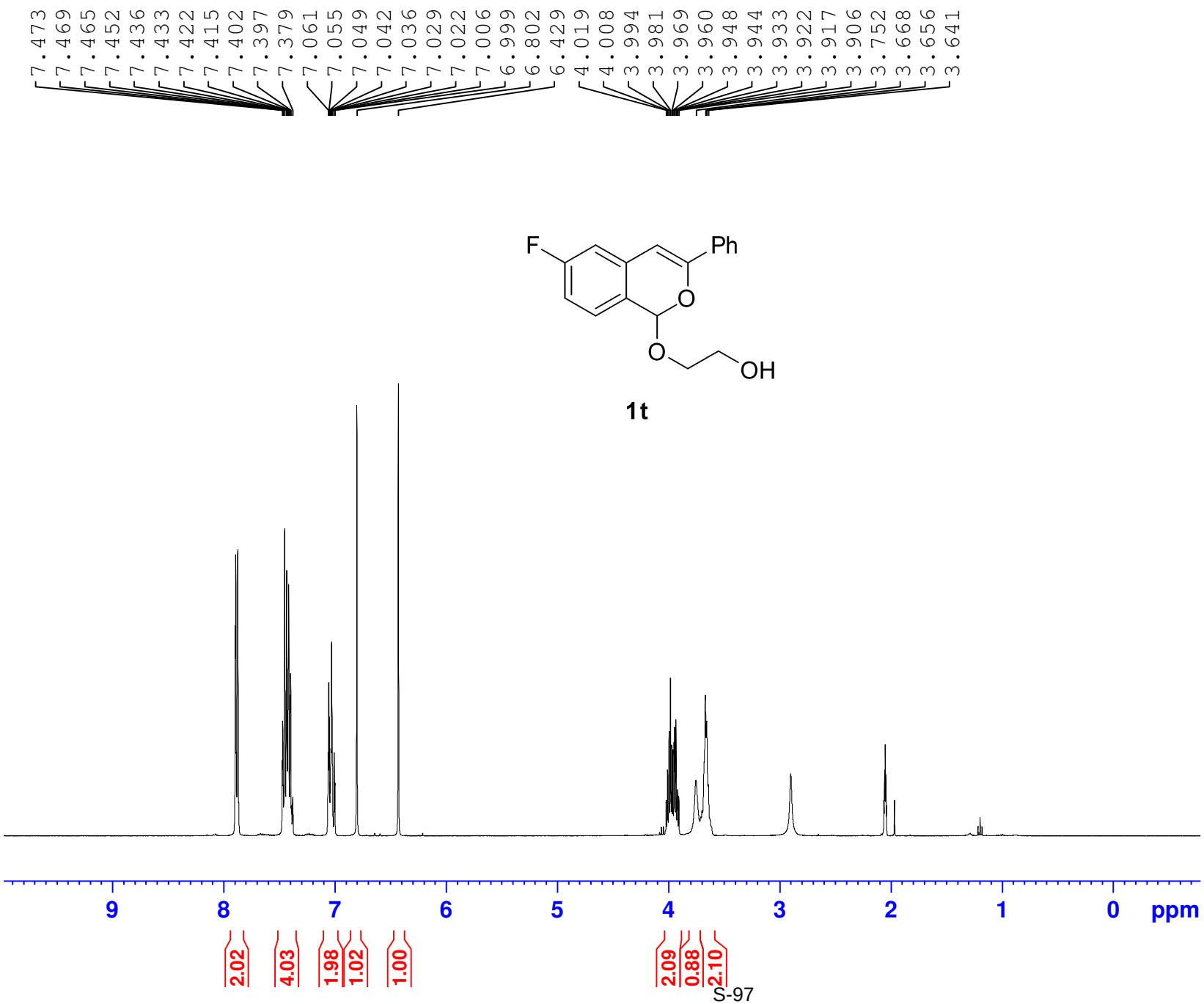

```
Current Data Parameters
NAME                 qh-7166
EXPNO                      2
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140319
Time                   13.09
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                        35
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
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             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2              waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6126859 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



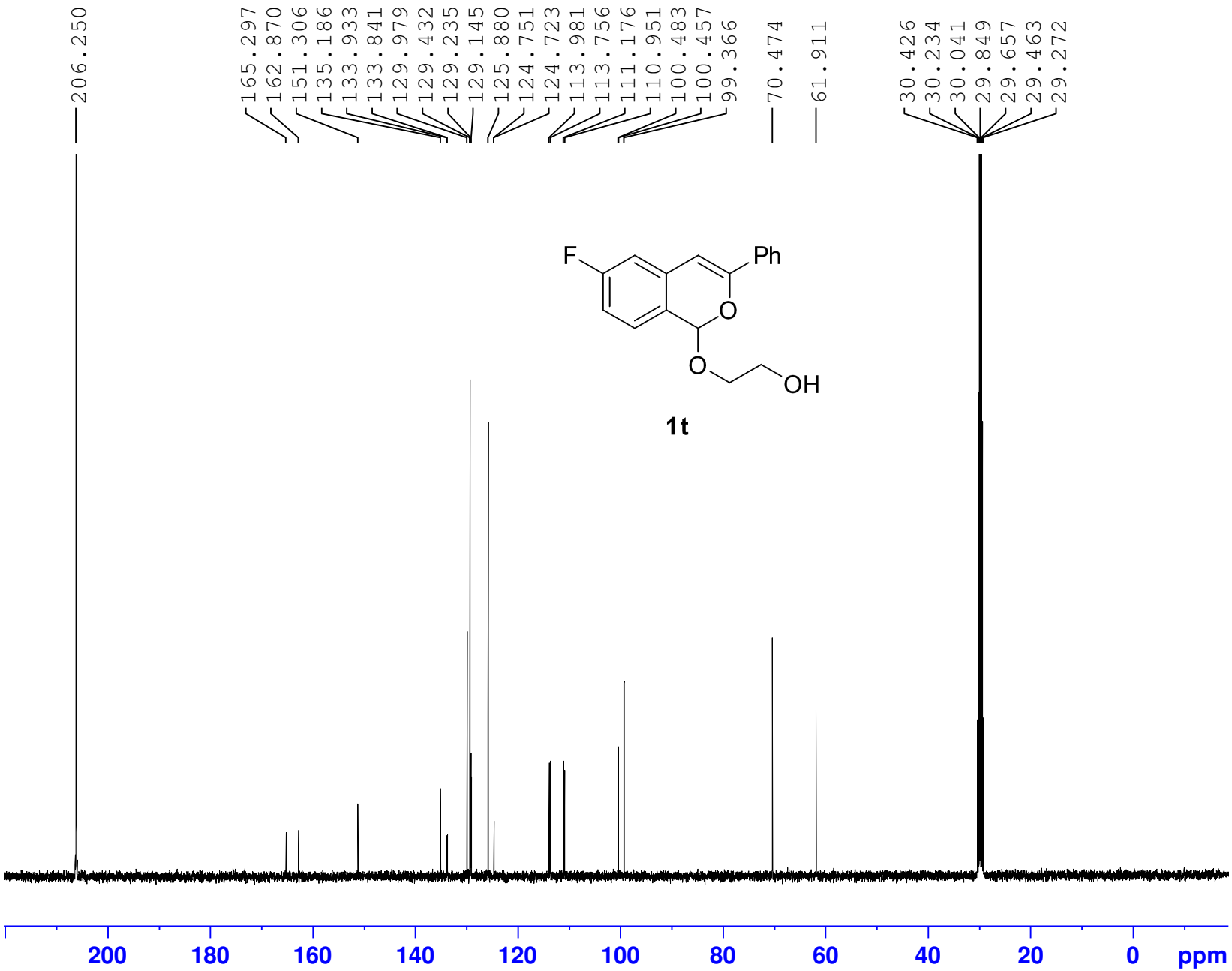

```
Current Data Parameters
NAME                 qh-7121
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140305
Time                   19.35
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT              Acetone
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     31.55
DW                    62.400 usec
DE                     6.50 usec
TE                     295.8 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300068 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



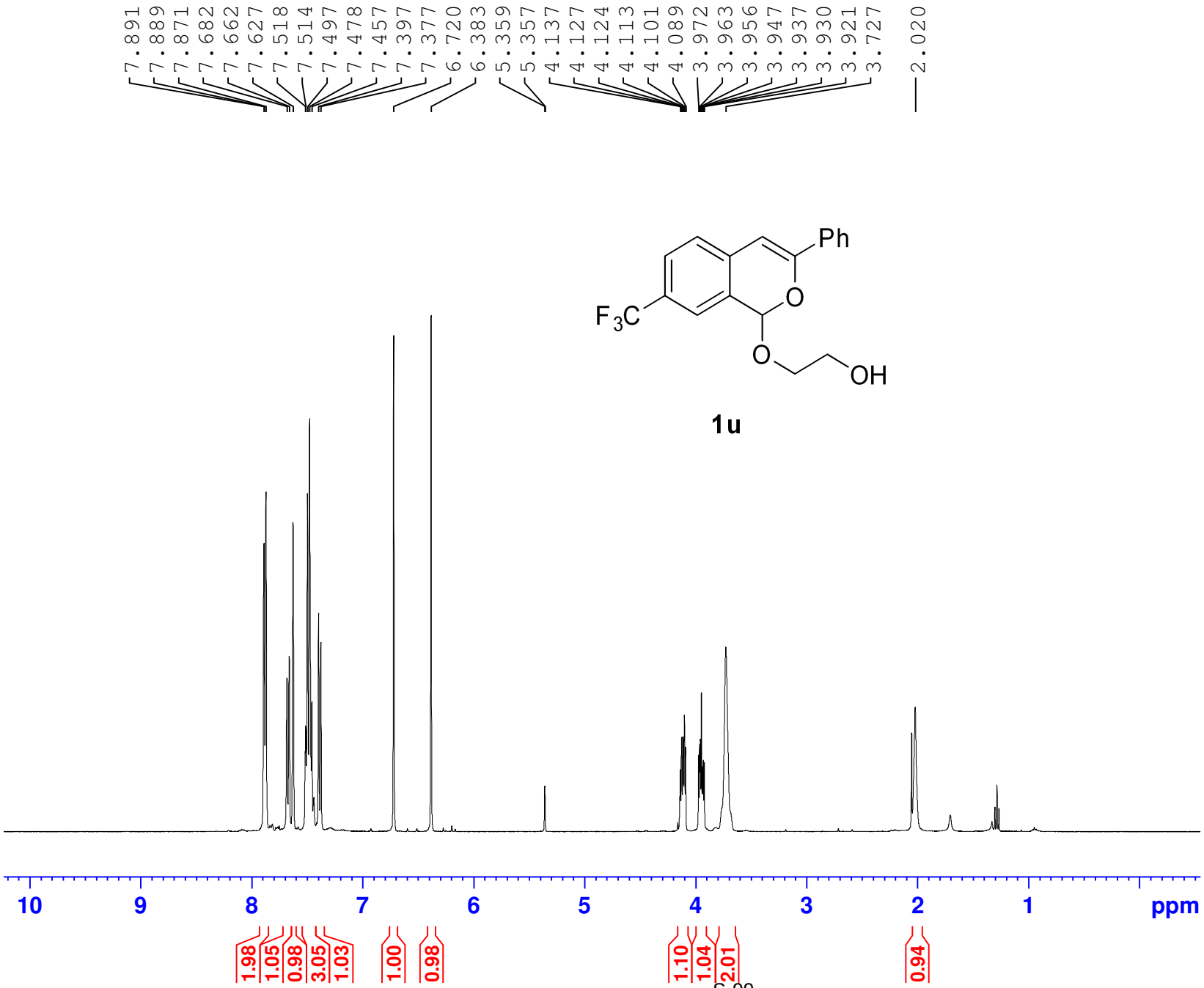

```
Current Data Parameters
NAME                qh-7121
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140305
Time                   19.38
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT              Acetone
NS                        80
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     296.4 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2              waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6126863 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



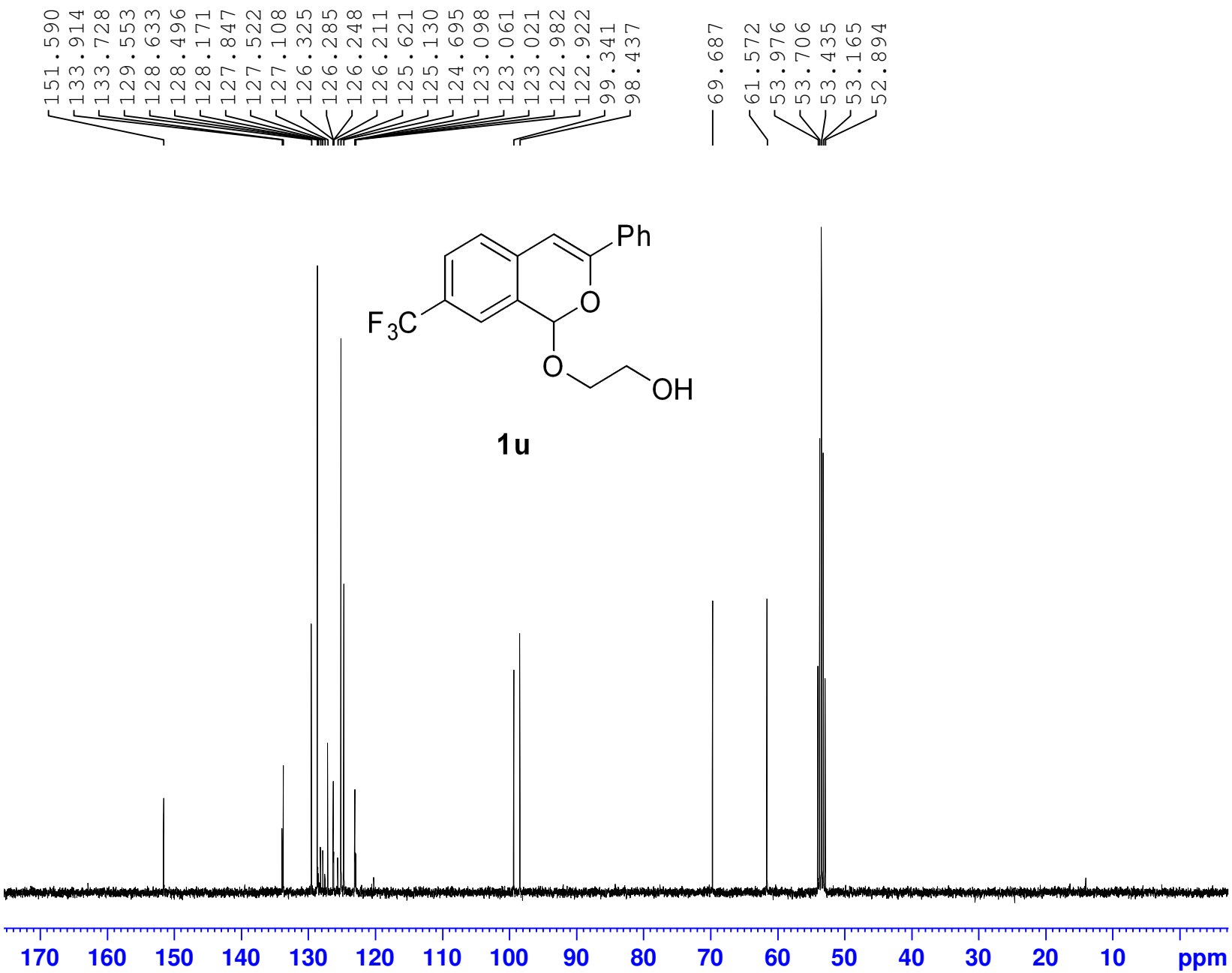

```
Current Data Parameters
NAME                qh-7118
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140304
Time                   14.43
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT             Acetone
NS                         3
DS                         2
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     62.93
DW                    62.400 usec
DE                     6.50 usec
TE                    296.6 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300067 MHz
WDW                       EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```



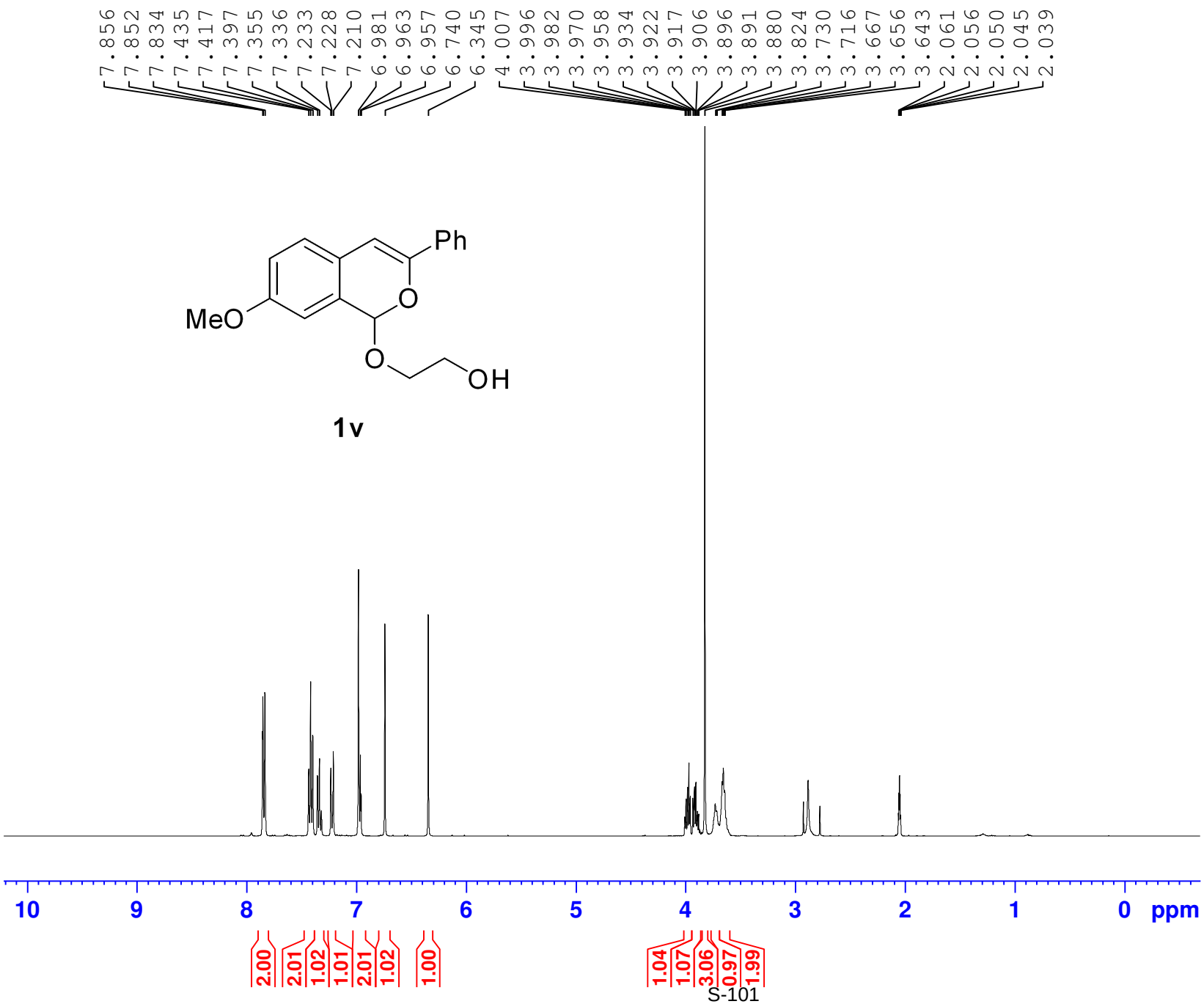

```
Current Data Parameters
NAME                qh-7118
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140304
Time                  14.48
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT            Acetone
NS                       91
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    297.2 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6126811 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



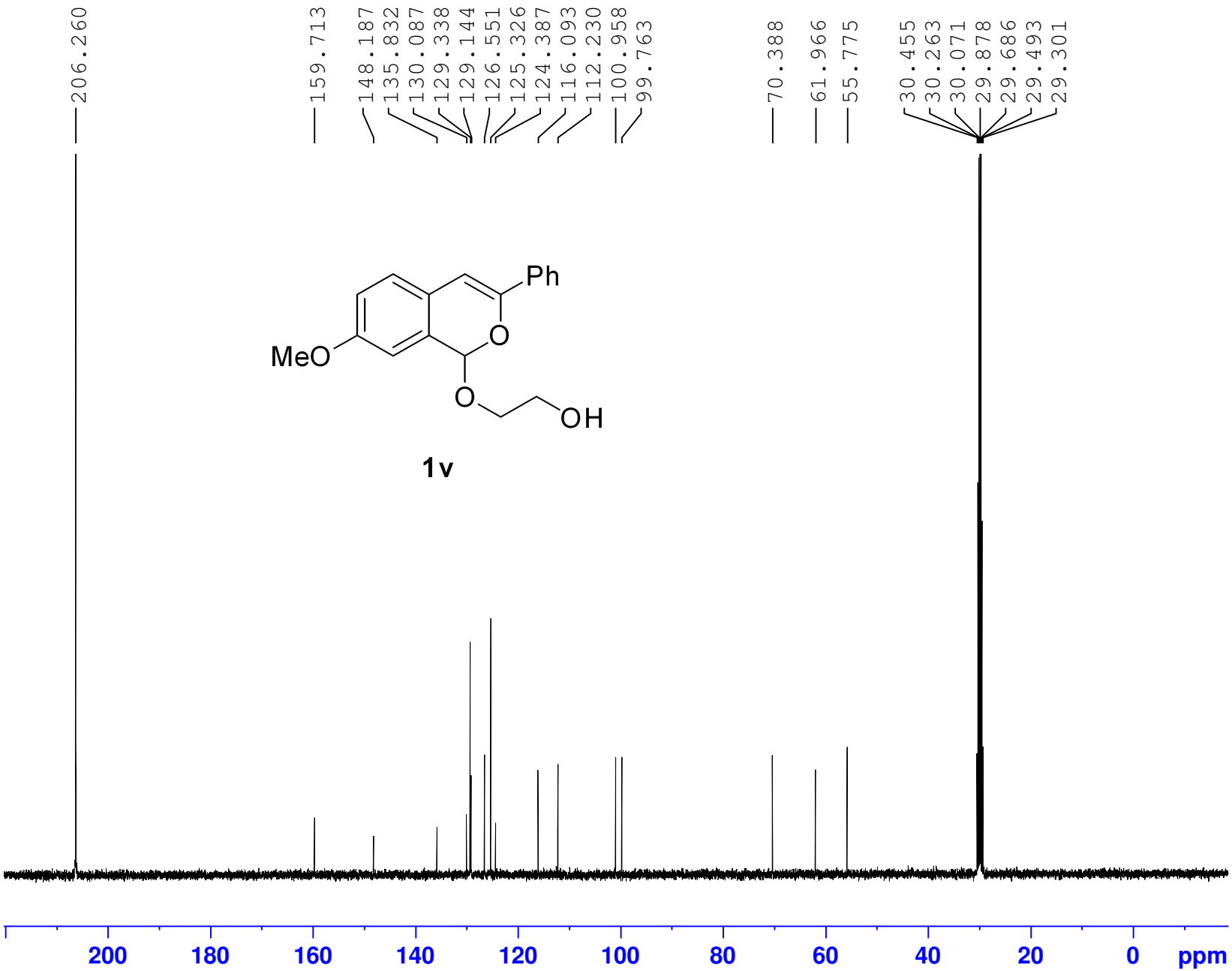

```
Current Data Parameters
NAME                qh-7088
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140221
Time                   14.04
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT               CD2Cl2
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     31.55
DW                    62.400 usec
DE                     6.50 usec
TE                     297.0 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300000 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



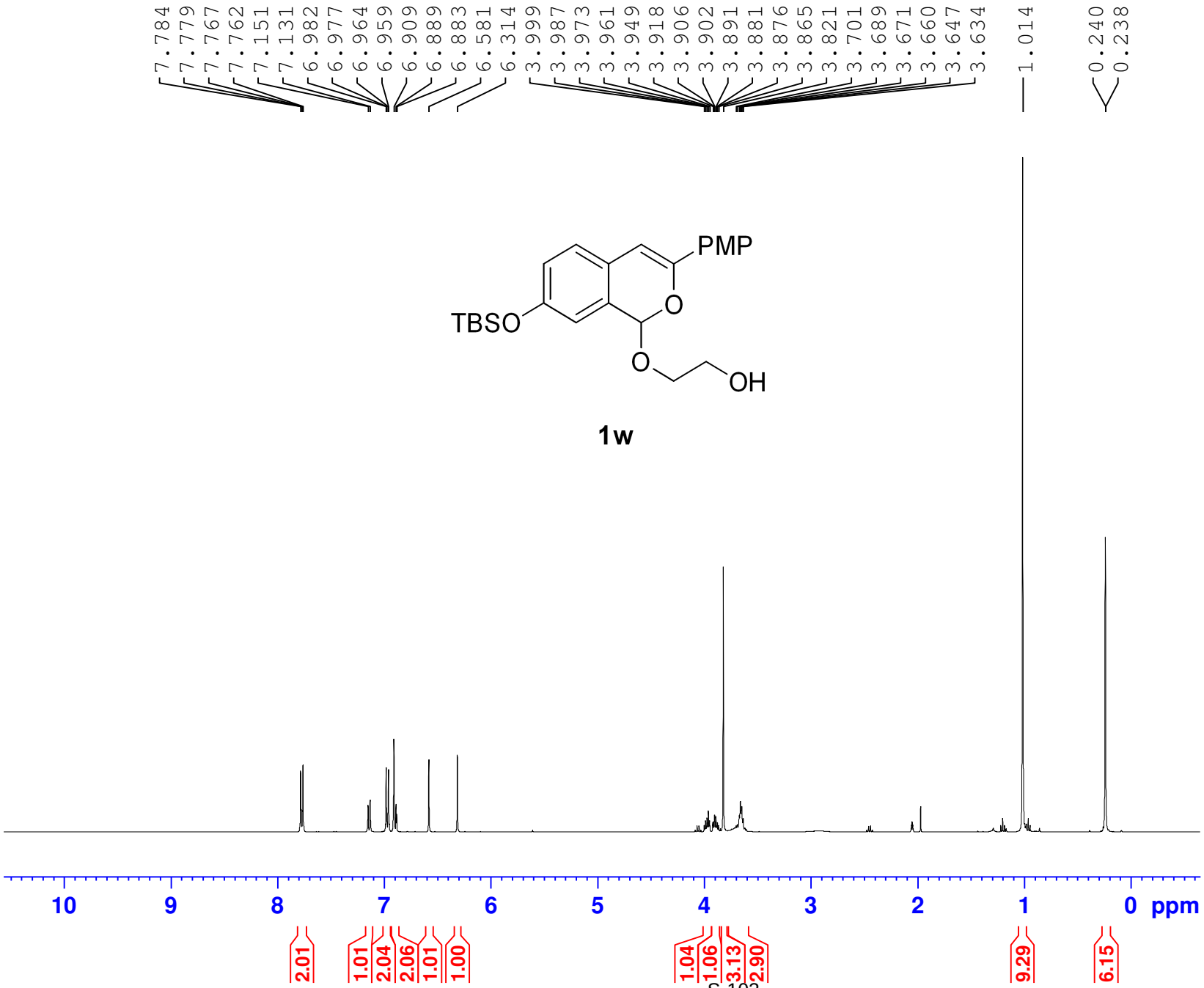

```
Current Data Parameters
NAME                qh-7088
EXPNO                     3
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140221
Time                  14.06
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT             CD2Cl2
NS                      100
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    297.4 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127690 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



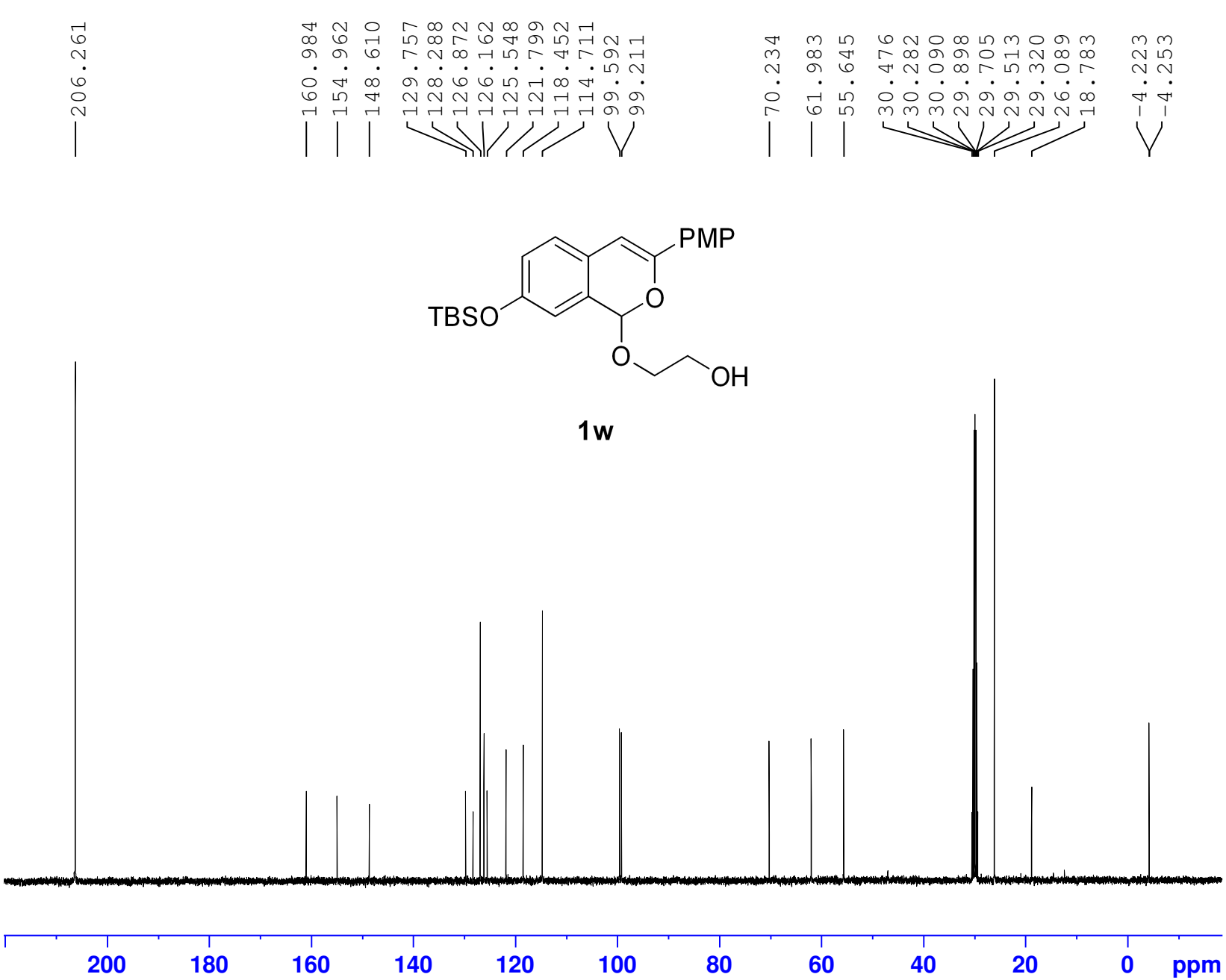

```
Current Data Parameters
NAME            qh-7109
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140302
Time              15.36
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT         Acetone
NS                    3
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ           4.0894465 sec
RG               70.97
DW               62.400 usec
DE                6.50 usec
TE               295.7 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                 1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300068 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



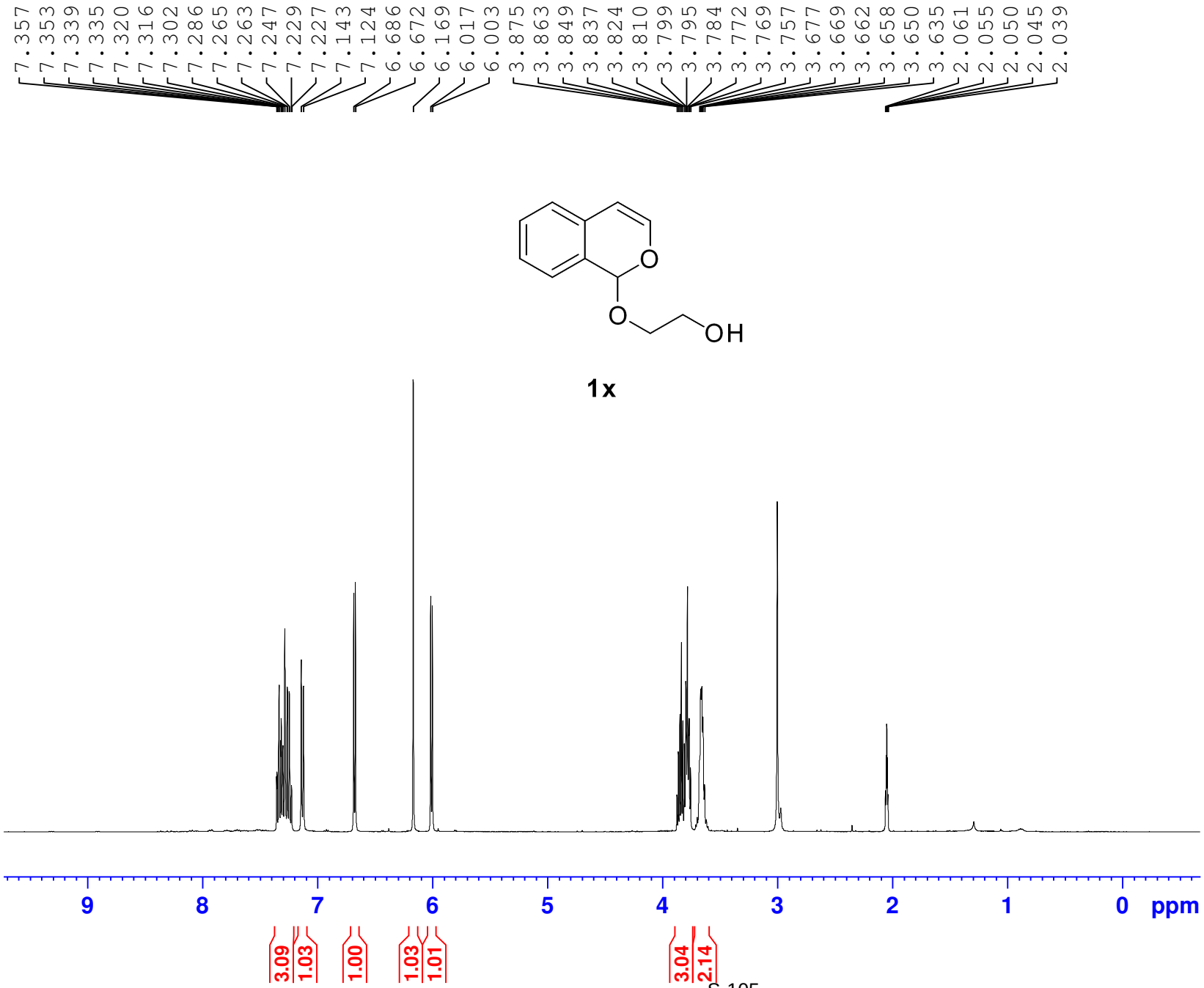

```
Current Data Parameters
NAME                qh-7109
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140302
Time                  15.38
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT             Acetone
NS                       50
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6126783 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



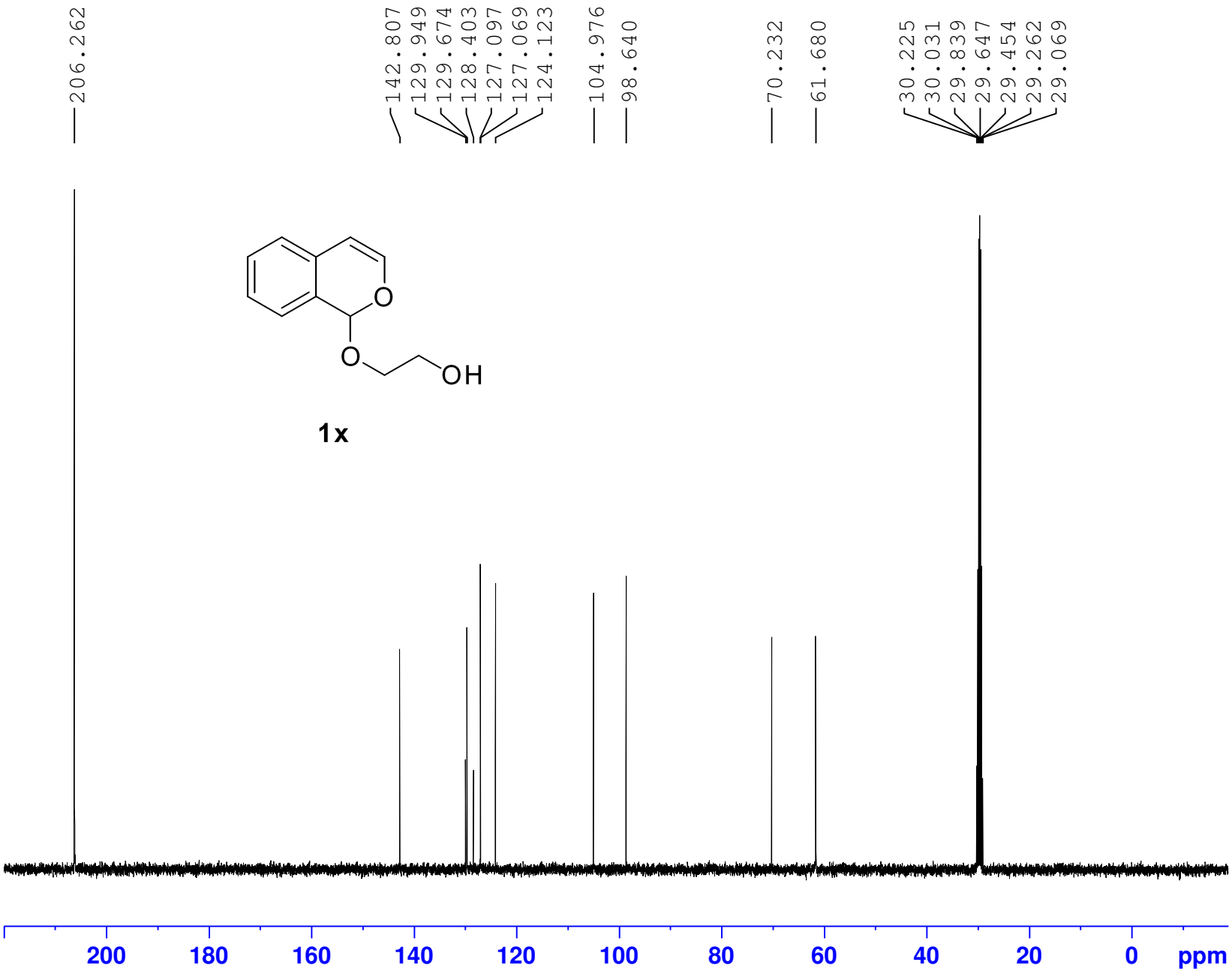

```
Current Data Parameters
NAME                qh-8015
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140402
Time                  18.51
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT            Acetone
NS                        1
DS                        0
SWH               8012.820 Hz
FIDRES            0.122266 Hz
AQ               4.0894465 sec
RG                    17.38
DW                   62.400 usec
DE                    6.50 usec
TE                   295.6 K
D1              1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           400.1324710 MHz
NUC1                    1H
P1                   14.30 usec
PLW1            9.10000038 W

F2 - Processing parameters
SI                    65536
SF             400.1300069 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```



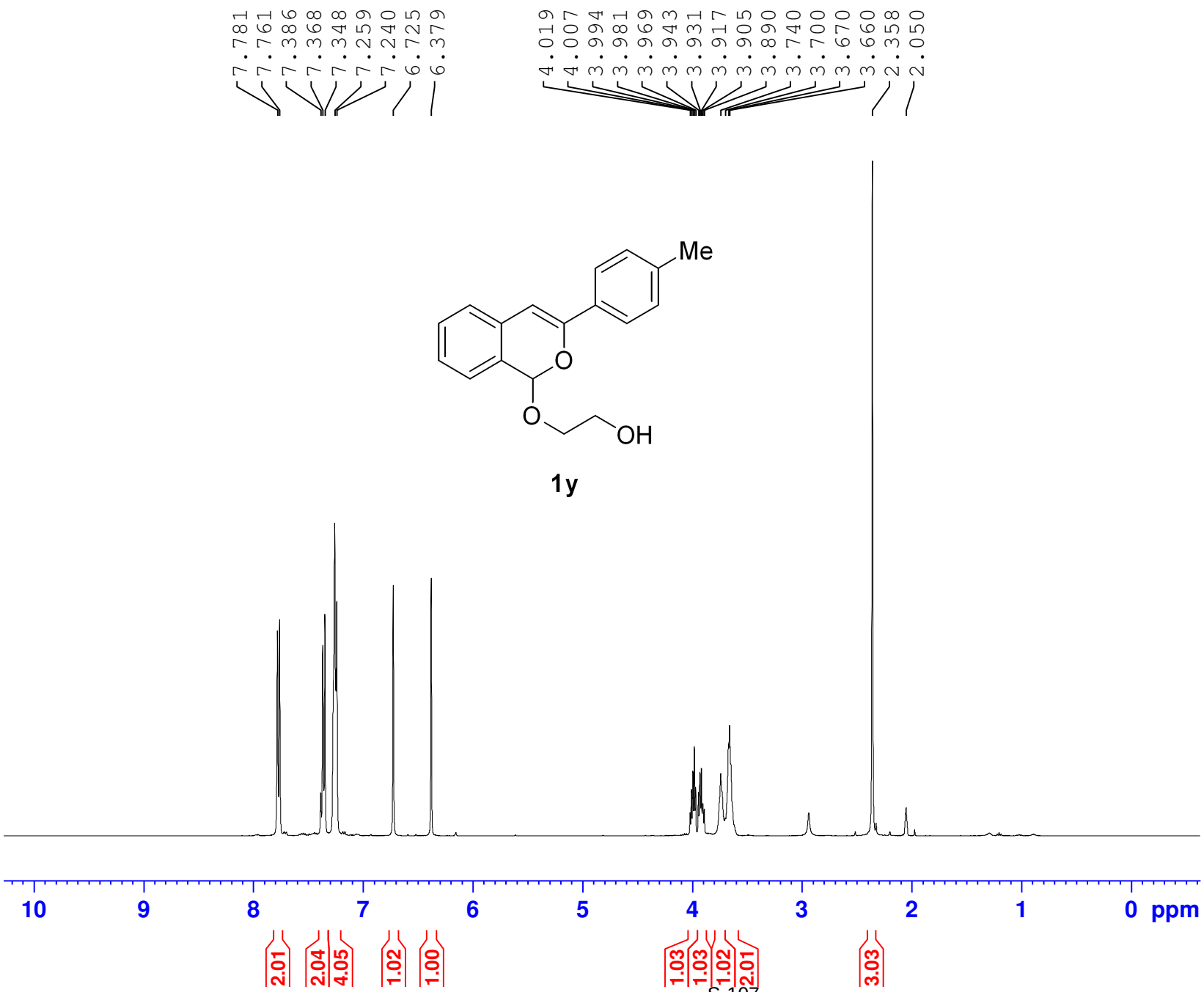

```
Current Data Parameters
NAME                qh-8015
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140402
Time                  18.53
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT            Acetone
NS                       33
DS                        2
SWH              24038.461 Hz
FIDRES            0.366798 Hz
AQ               1.3631488 sec
RG                  196.92
DW                  20.800 usec
DE                    6.50 usec
TE                   296.2 K
D1              2.00000000 sec
D11             0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1           100.6228298 MHz
NUC1                    13C
P1                    9.60 usec
PLW1           31.98900032 W

======== CHANNEL f2 ========
SFO2           400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                90.00 usec
PLW2            9.10000038 W
PLW12           0.24608000 W
PLW13           0.19933000 W

F2 - Processing parameters
SI                    32768
SF             100.6126816 MHz
WDW                      EM
SSB        0
LB                    1.00 Hz
GB         0
PC                    1.40
```



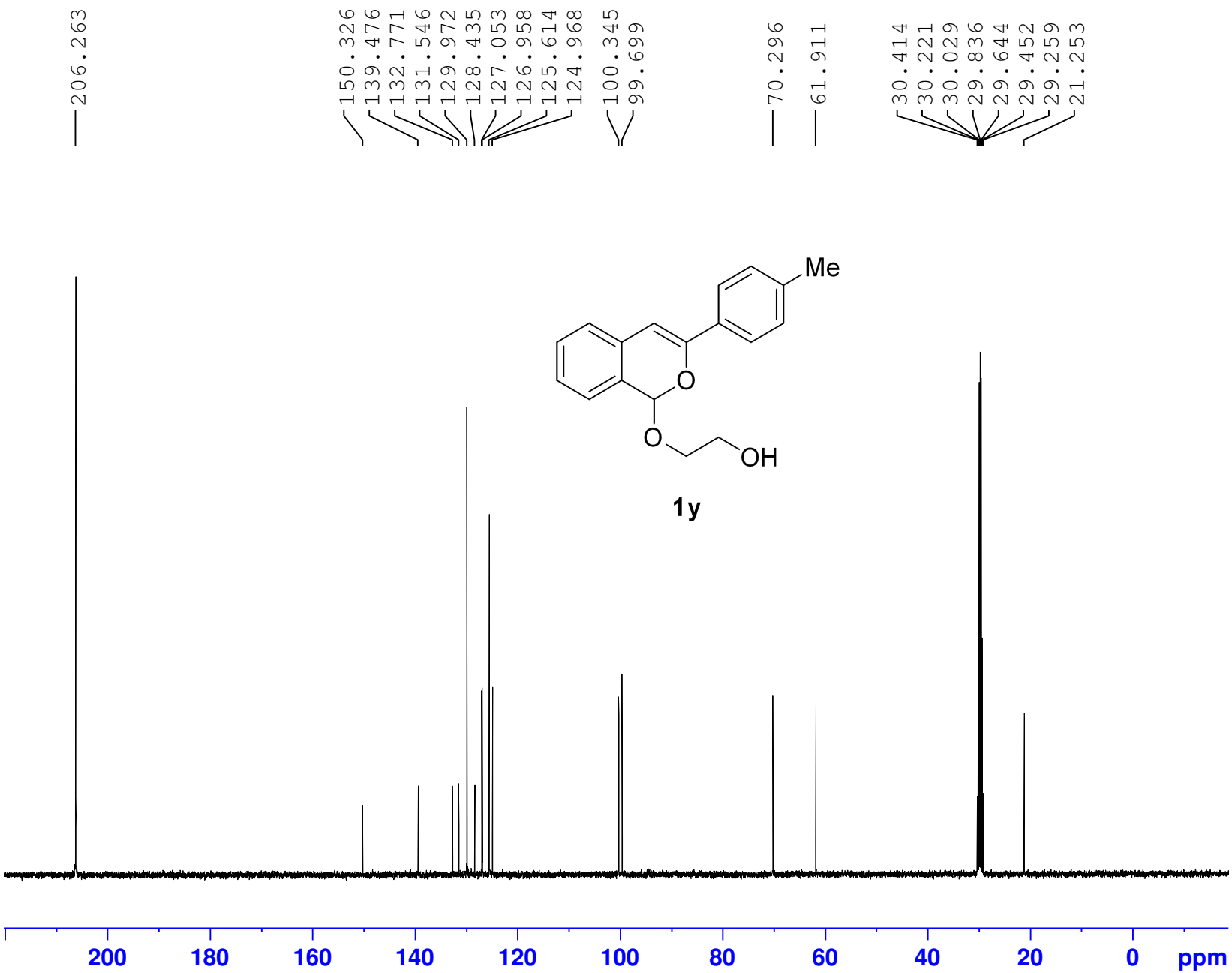

```
Current Data Parameters
NAME            qh-11036
EXPNO                  1
PROCNO                 1

F2 - Acquisition Parameters
Date_           20141117
Time               13.31
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG             zg30
TD                 65536
SOLVENT          Acetone
NS                     2
DS                     0
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ            4.0894465 sec
RG                 25.32
DW                62.400 usec
DE                 6.50 usec
TE                 296.1 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                  1H
P1                 14.30 usec
PLW1          9.10000038 W

F2 - Processing parameters
SI                 65536
SF           400.1300068 MHz
WDW                   EM
SSB       0
LB                  0.30 Hz
GB        0
PC                  1.00
```



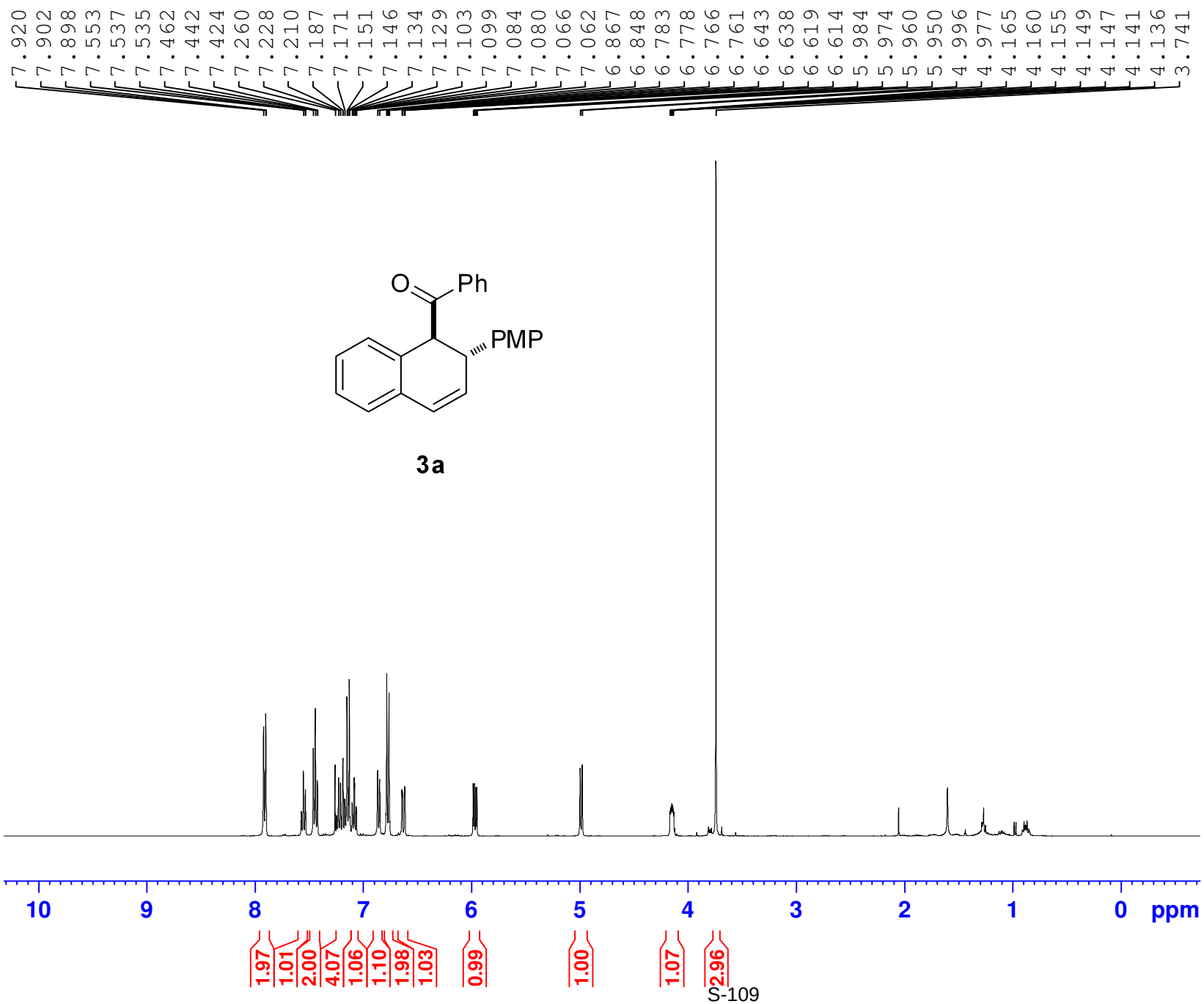

```
Current Data Parameters
NAME            qh-11036
EXPNO                  2
PROCNO                 1

F2 - Acquisition Parameters
Date_           20141117
Time               13.32
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT          Acetone
NS                    18
DS                     2
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                196.92
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         100.6228298 MHz
NUC1                  13C
P1                  9.60 usec
PLW1         31.98900032 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                   1H
CPDPRG[2         waltz16
PCPD2              90.00 usec
PLW2          9.10000038 W
PLW12         0.24608000 W
PLW13         0.19933000 W

F2 - Processing parameters
SI                 32768
SF           100.6127069 MHz
WDW                   EM
SSB       0
LB                  1.00 Hz
GB        0
PC                  1.40
```



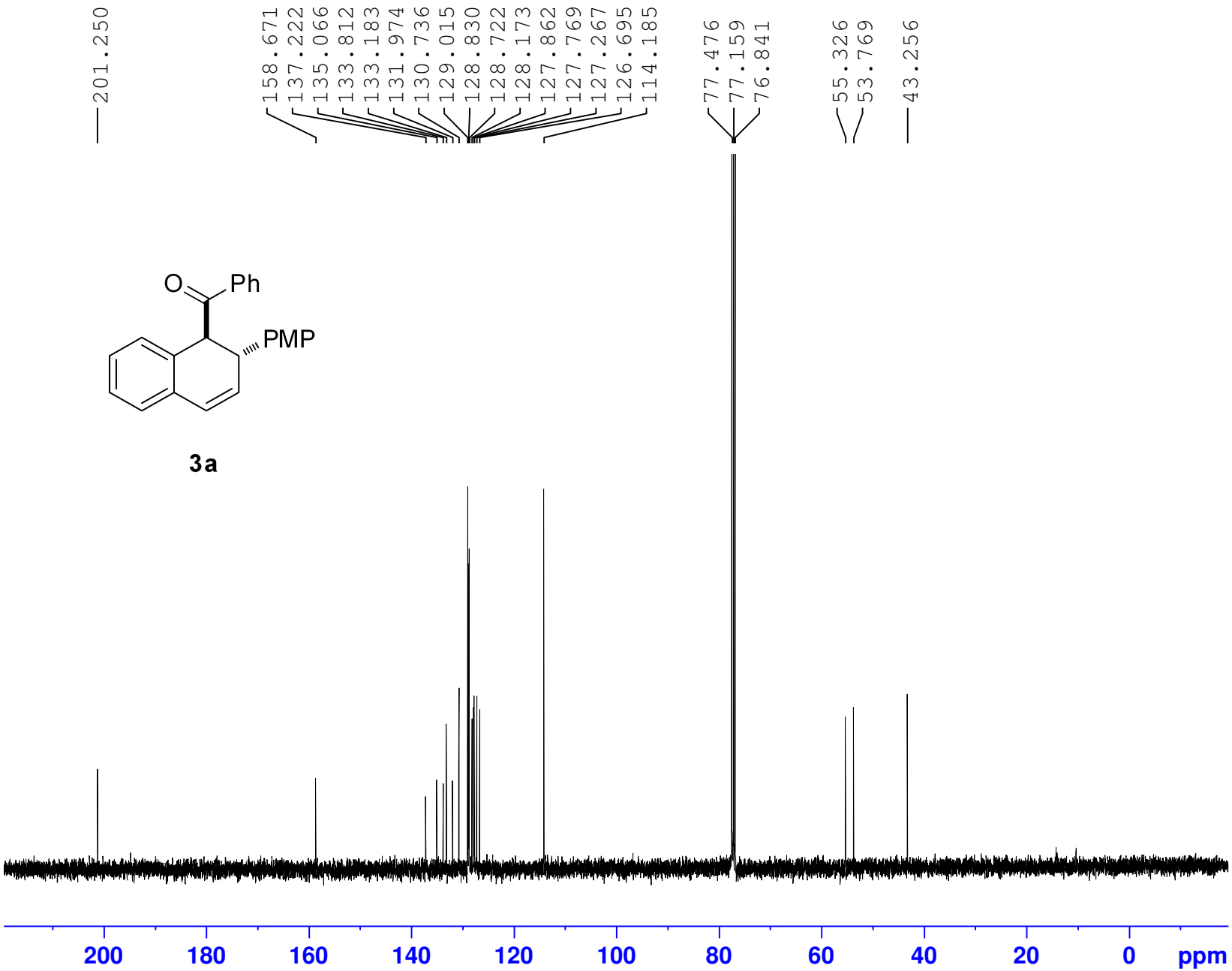

```
Current Data Parameters
NAME                 qh-7091
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140222
Time                   11.12
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT              Acetone
NS                         1
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     25.32
DW                    62.400 usec
DE                     6.50 usec
TE                     295.9 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300063 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



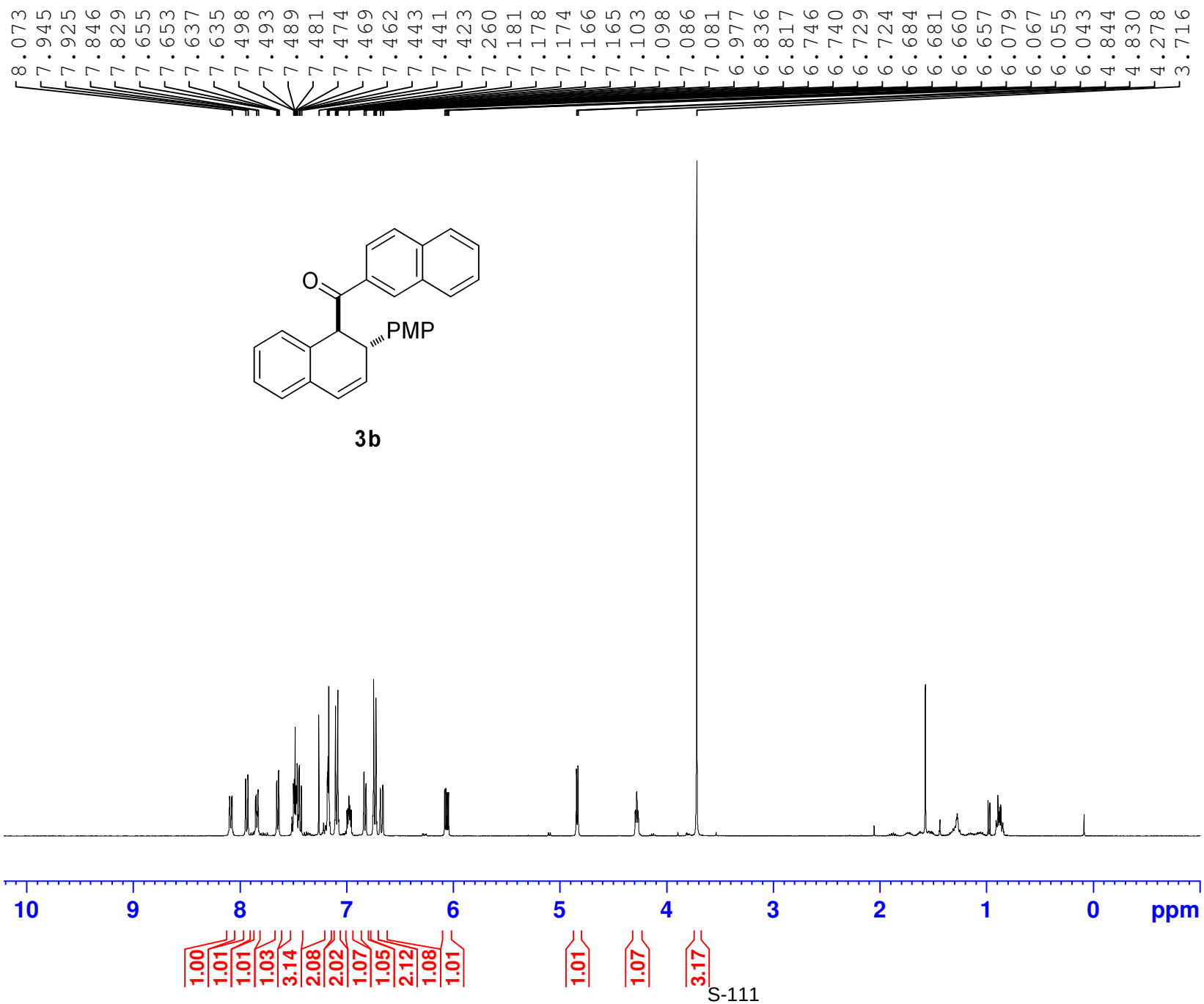

```
Current Data Parameters
NAME                qh-7091
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140222
Time                  11.16
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT             Acetone
NS                       59
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.6 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6126870 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



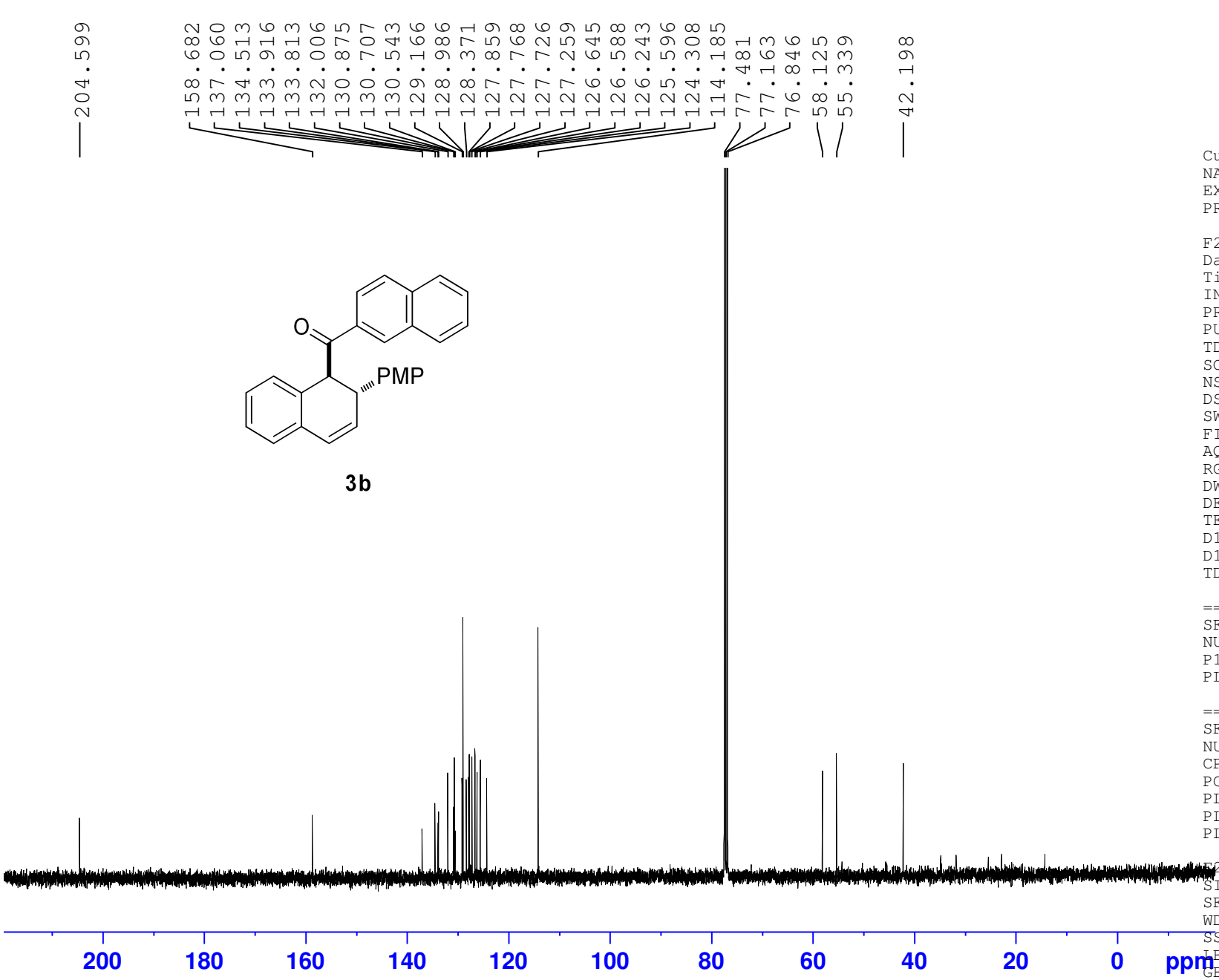

```
Current Data Parameters
NAME                qh-0095
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20130816
Time                  13.39
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        3
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    82.92
DW                   62.400 usec
DE                    6.50 usec
TE                   296.0 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                   14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                    65536
SF              400.1300096 MHz
WDW                       EM
SSB        0
LB                    0.30 Hz
GB         0
PC                    1.00
```



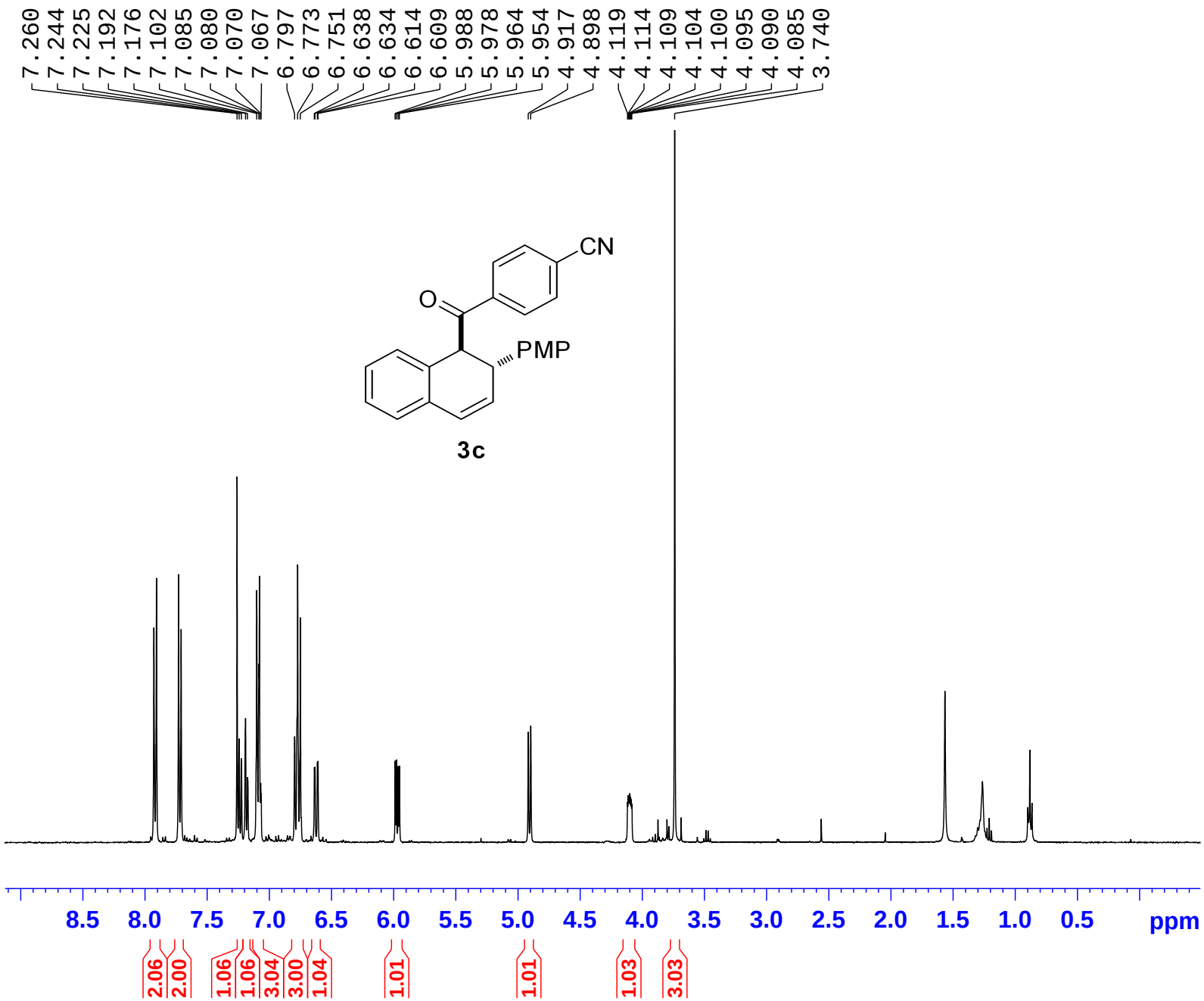

```
Current Data Parameters
NAME                qh-0095
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20130816
Time                  13.43
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      100
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.4 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127583 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



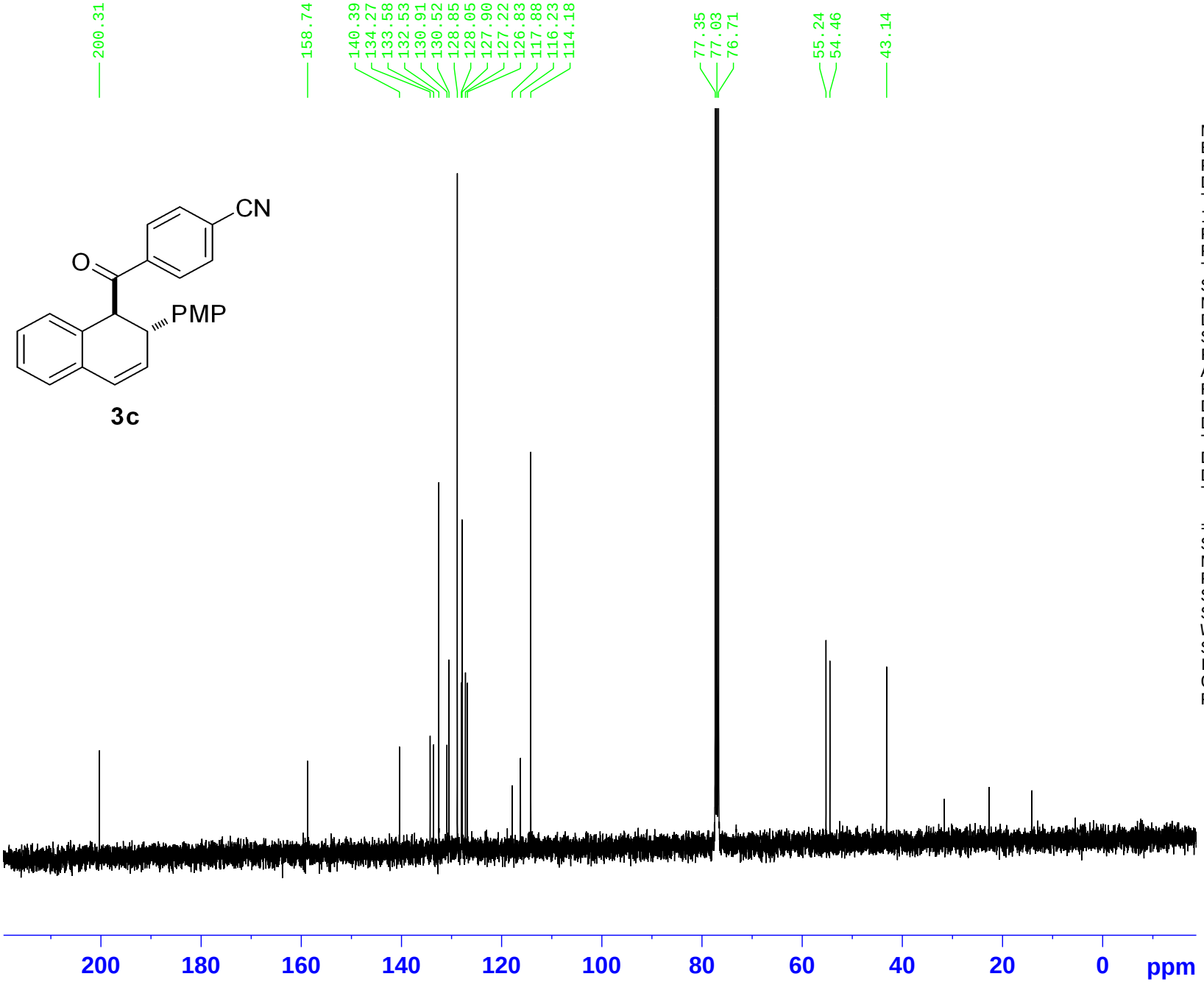

```
Current Data Parameters
NAME                 qh-0154
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20130909
Time                   20.06
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         3
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                    103.52
DW                    62.400 usec
DE                      6.50 usec
TE                     295.7 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300097 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



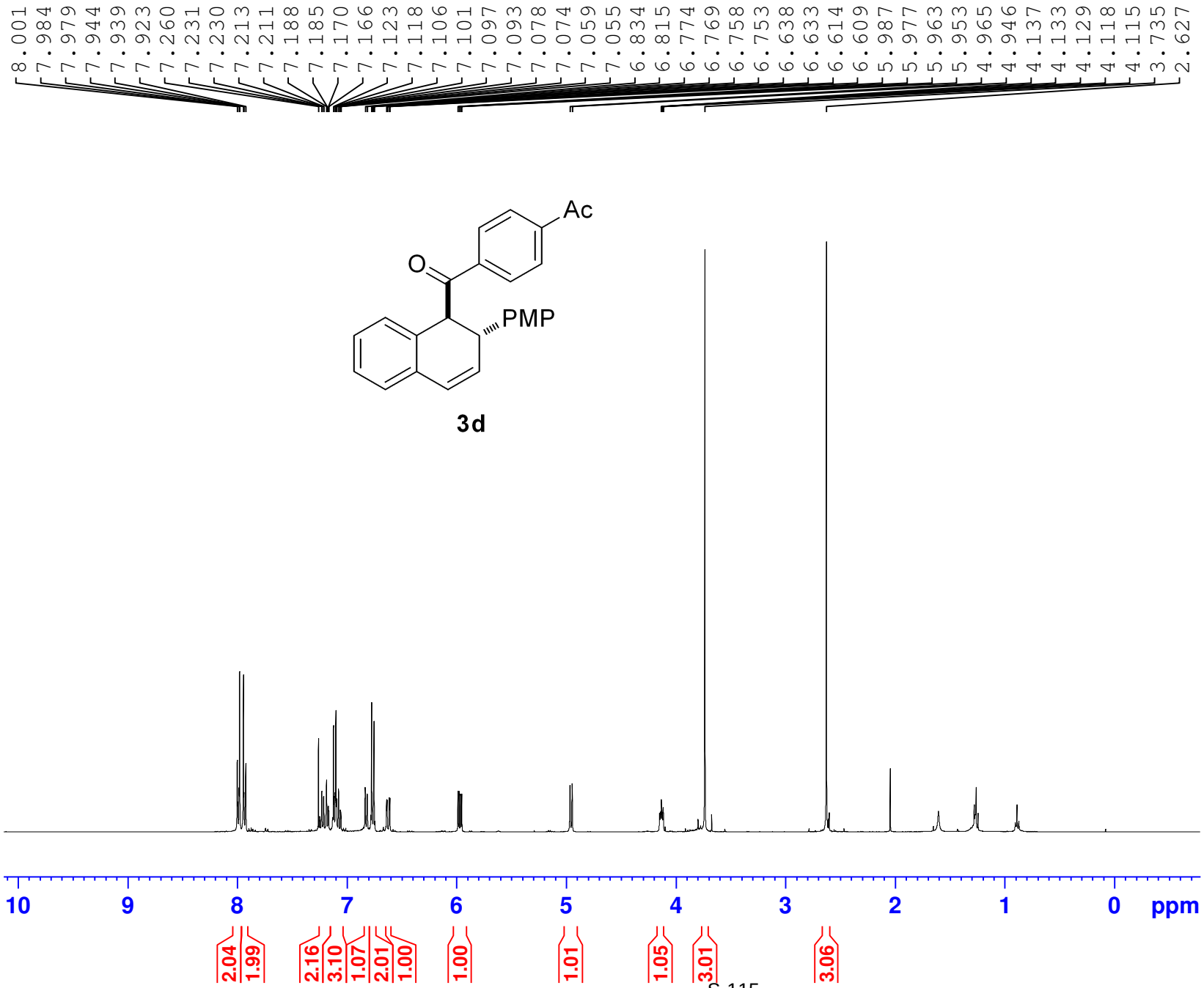

```
Current Data Parameters
NAME                qh-0154
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20130909
Time                   20.11
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       219
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     296.4 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                     13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                      1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6127568 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



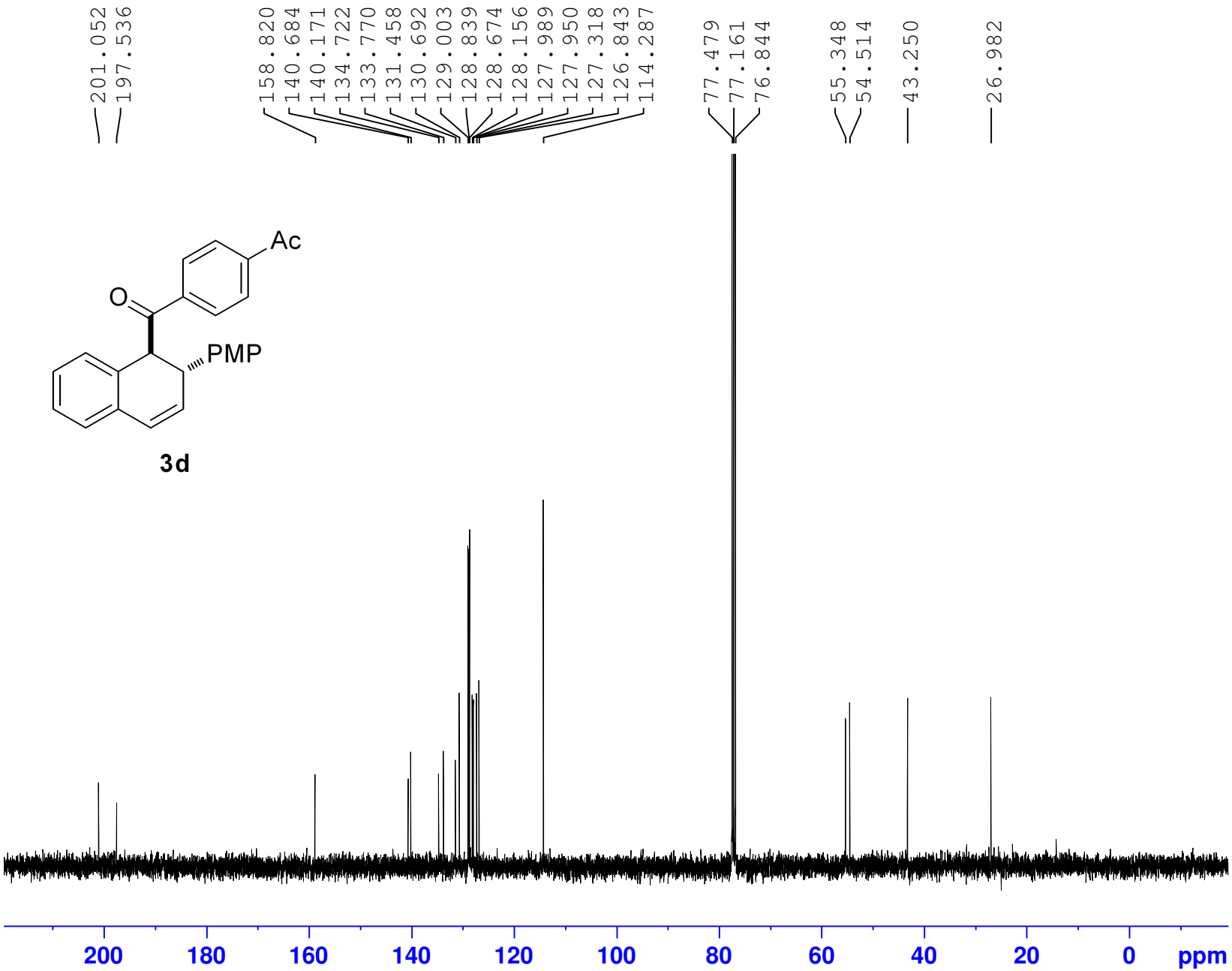

```
NAME          qh-7112-2b
EXPNO                  1
PROCNO                 1
Date_           20140306
Time               11.09
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                     4
DS                     0
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894966 sec
RG                187.77
DW                62.400 usec
DE                  6.50 usec
TE                 296.2 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                  1H
P1                14.30 usec
SI                65536
SF           400.1300096 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```



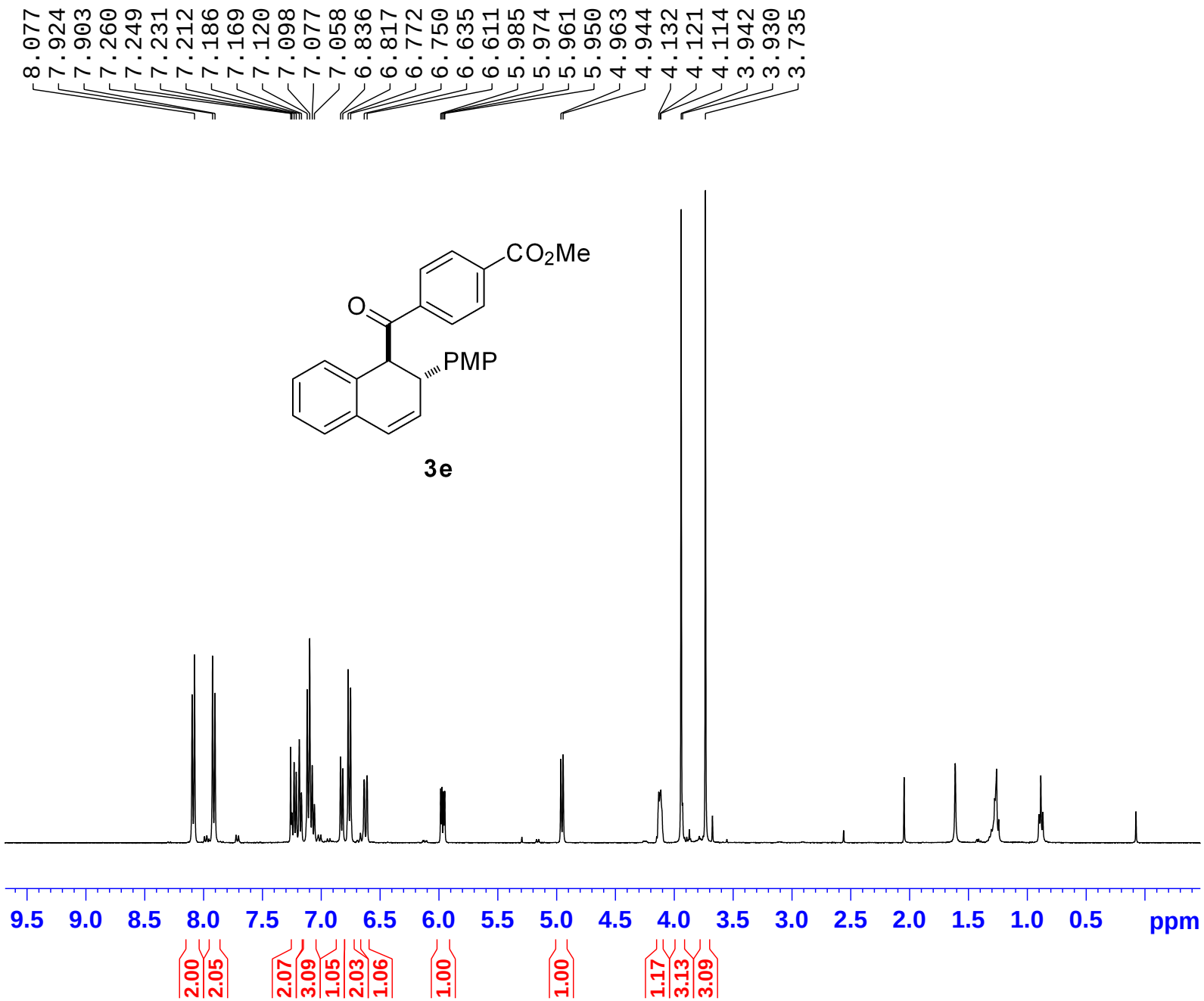

```
NAME          qh-7122-2b
EXPNO                  3
PROCNO                 1
Date_           20140306
Time               13.21
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  700
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG               196.92
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        100.6228298 MHz
NUC1                13C
P1                 9.60 usec
SI                32768
SF          100.6127690 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```



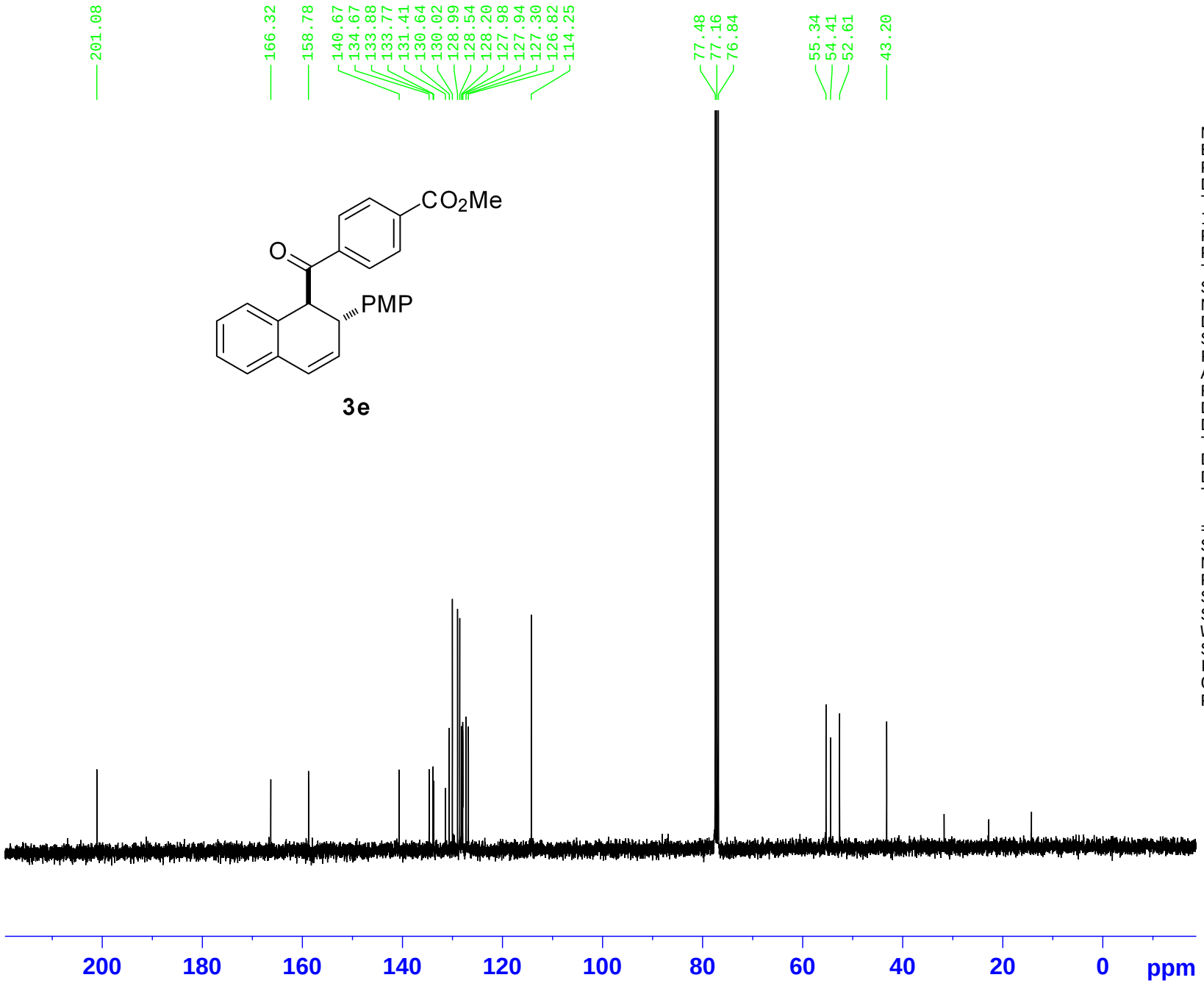

```
Current Data Parameters
NAME          qh-7120-2
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140304
Time              19.50
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                    3
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG                88.84
DW               62.400 usec
DE                6.50 usec
TE               302.3 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300093 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



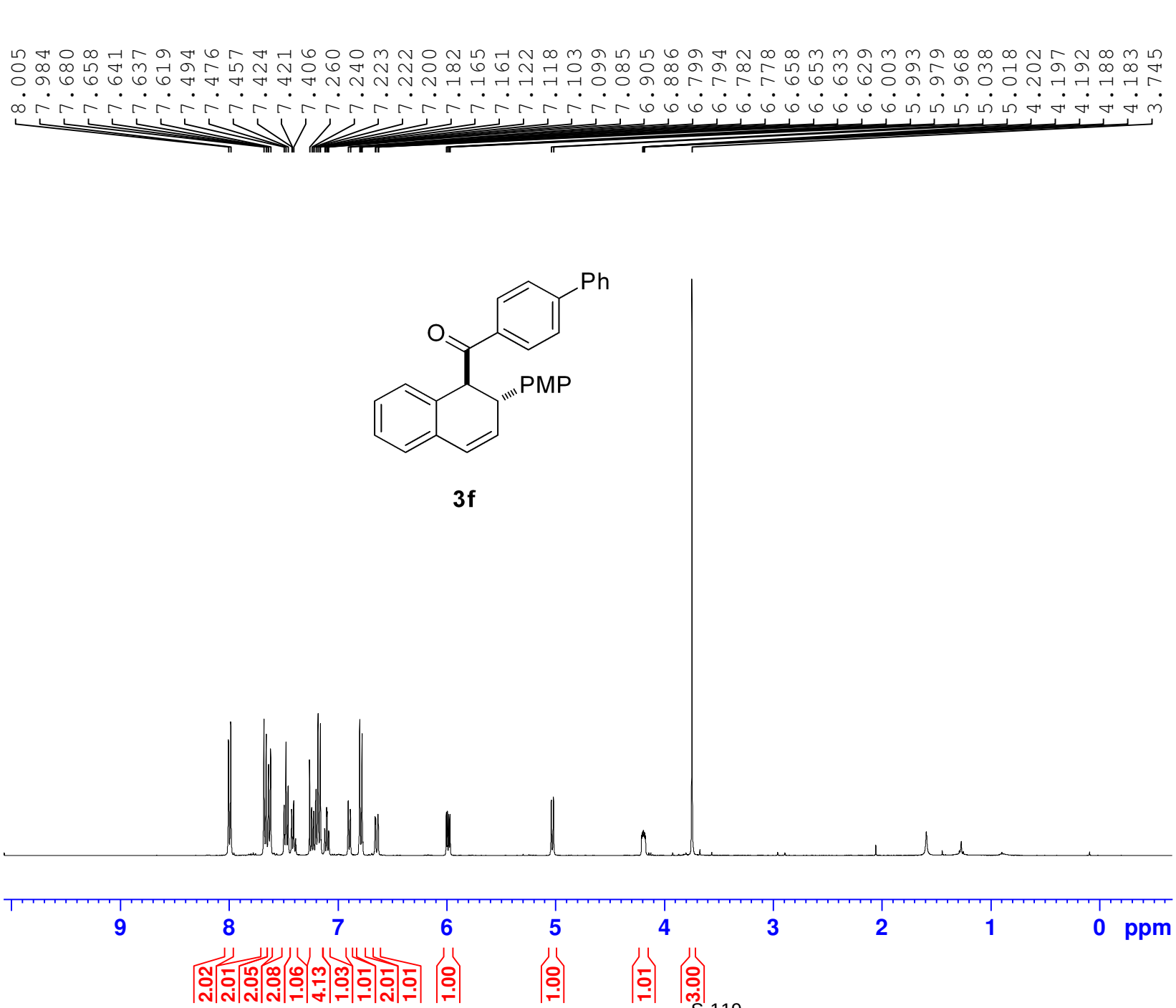

```
Current Data Parameters
NAME          qh-7120-2
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140304
Time              19.55
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  128
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                301.9 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                 9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2          9.10000038 W
PLW12         0.24608000 W
PLW13         0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6127553 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```



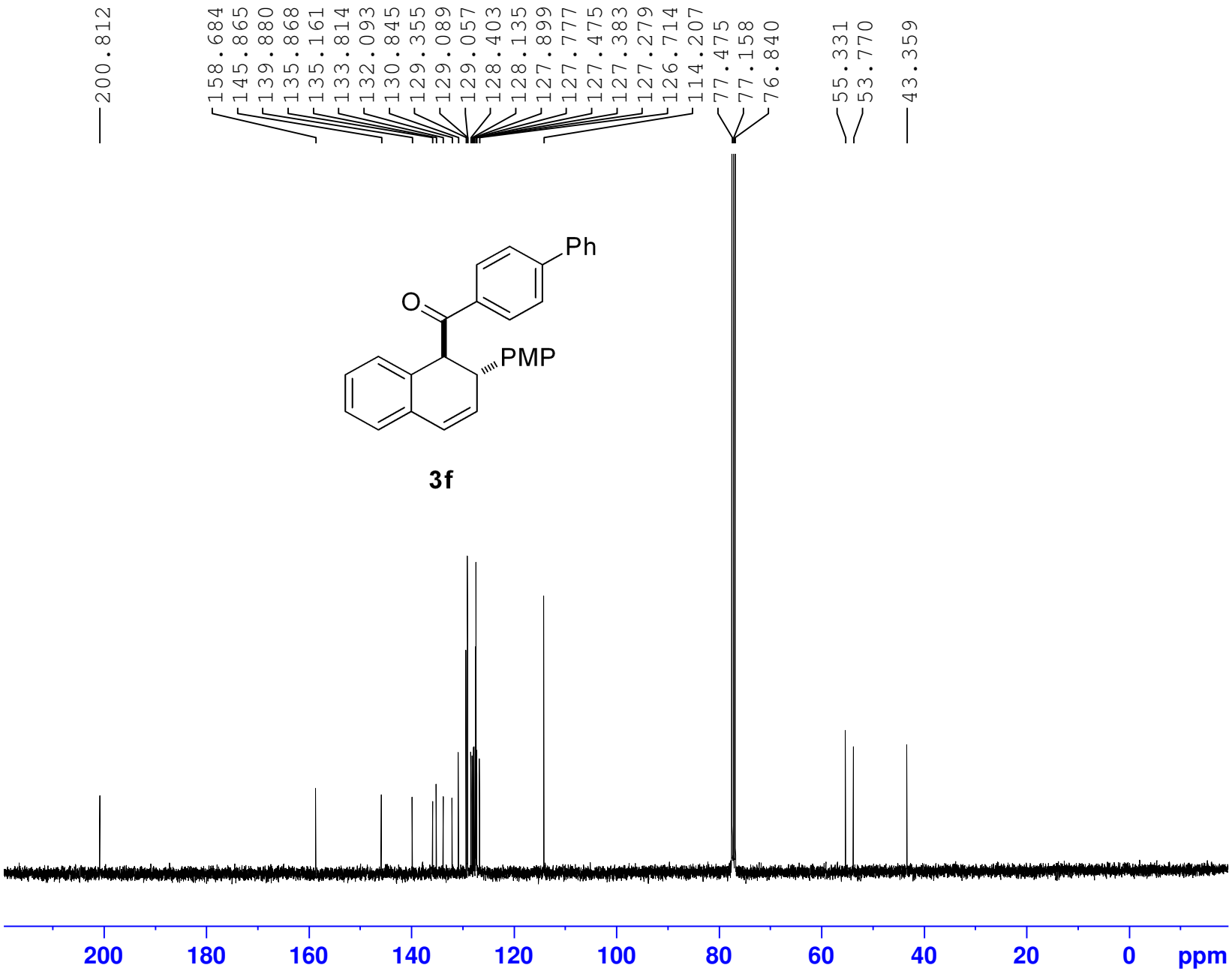

```
NAME            qh-7139-2
EXPNO                   1
PROCNO                  1
Date_            20140311
Time                12.47
INSTRUM             spect
PROBHD    5 mm DUL 13C-1
PULPROG              zg30
TD                  65536
SOLVENT             CDCl3
NS                      2
DS                      0
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894966 sec
RG                  88.84
DW                 62.400 usec
DE                  6.50 usec
TE                 295.8 K
D1            1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                  1H
P1                 14.30 usec
SI                 65536
SF           400.1300094 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```



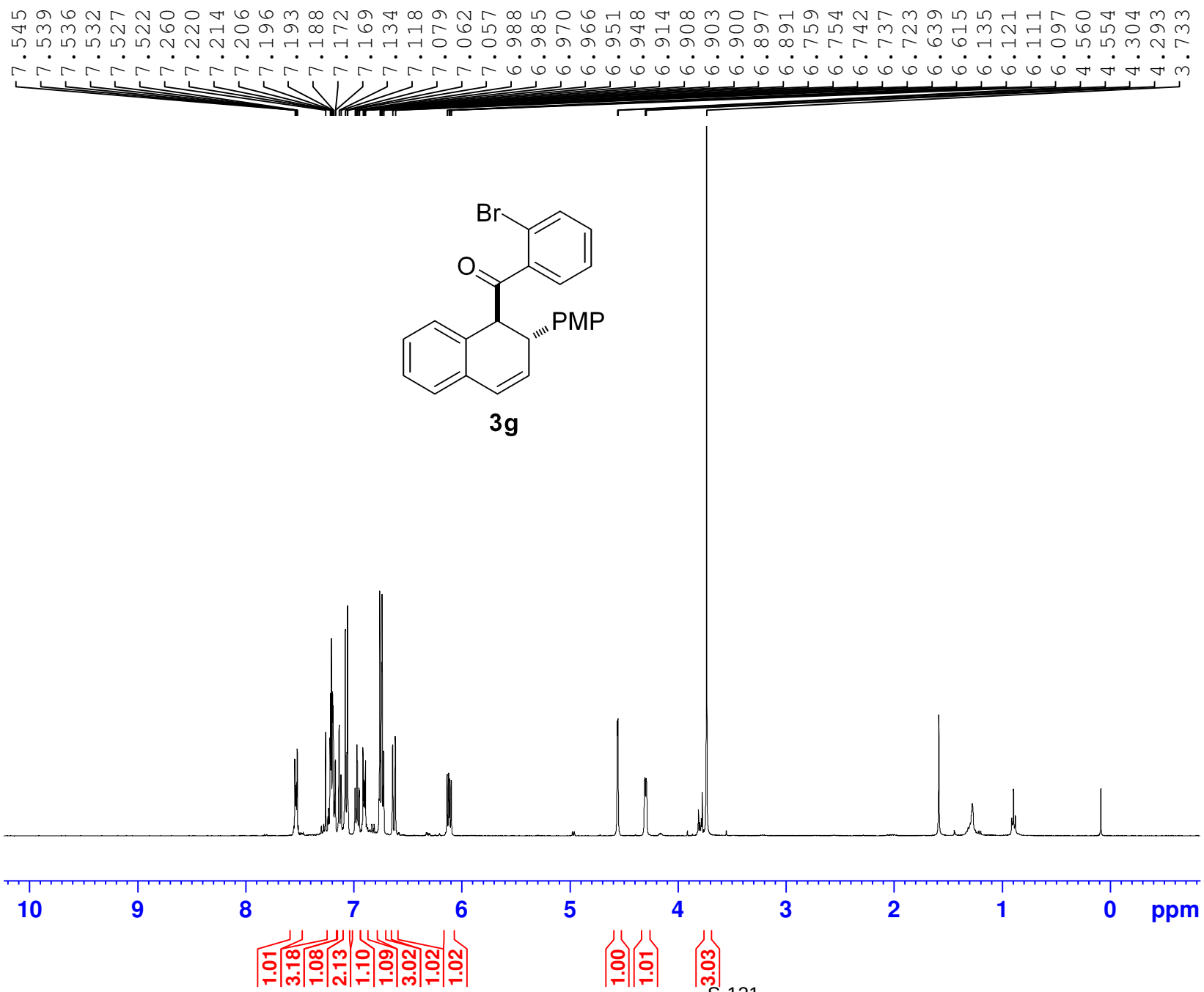

```
NAME          qh-7139-2
EXPNO                 2
PROCNO                1
Date_          20140311
Time              12.49
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  208
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.4 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                  9.60 usec
SI                 32768
SF          100.6127569 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```



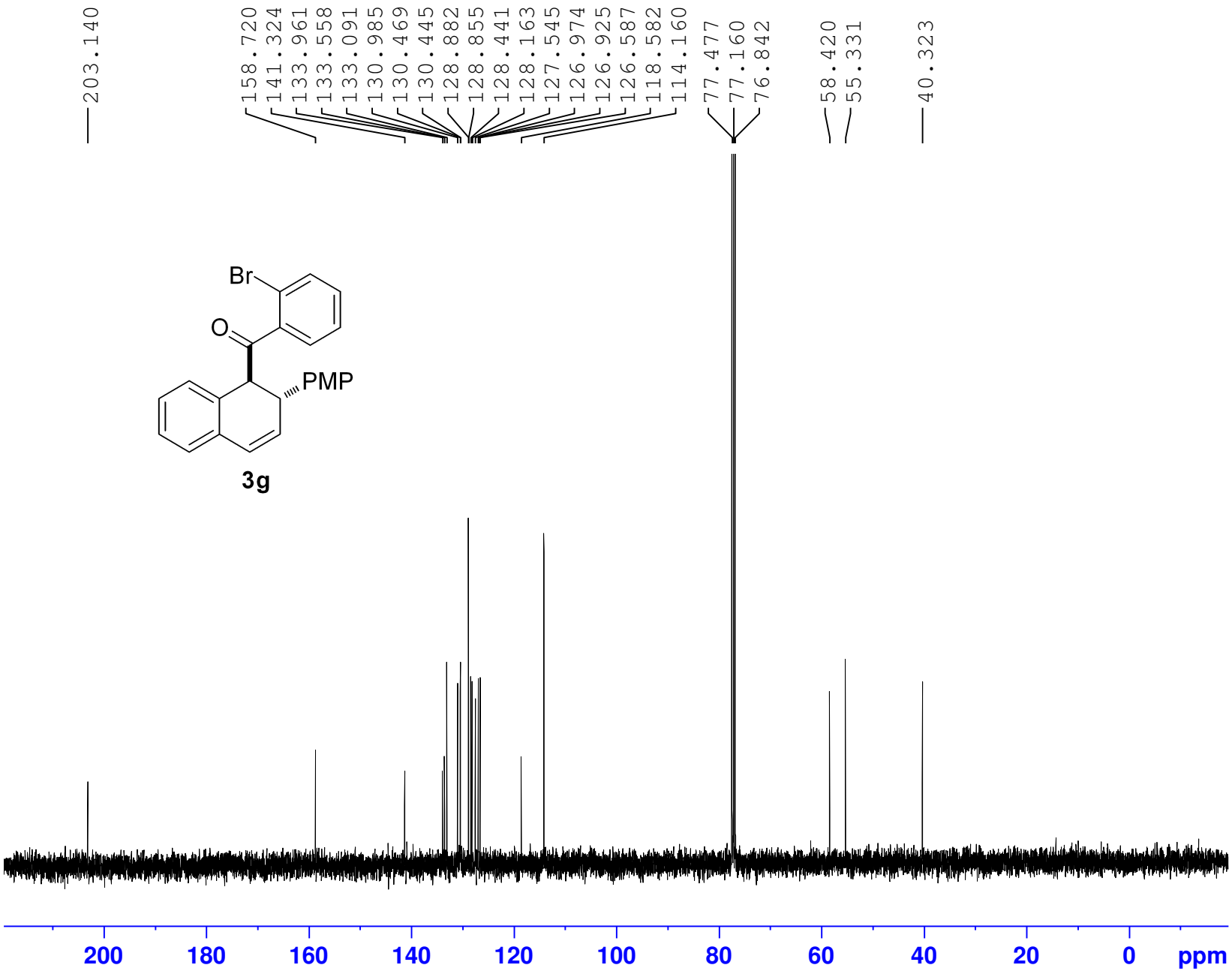

```
Current Data Parameters
NAME                qh-7113
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140303
Time                   13.07
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         3
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     88.84
DW                    62.400 usec
DE                     6.50 usec
TE                     295.7 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300095 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



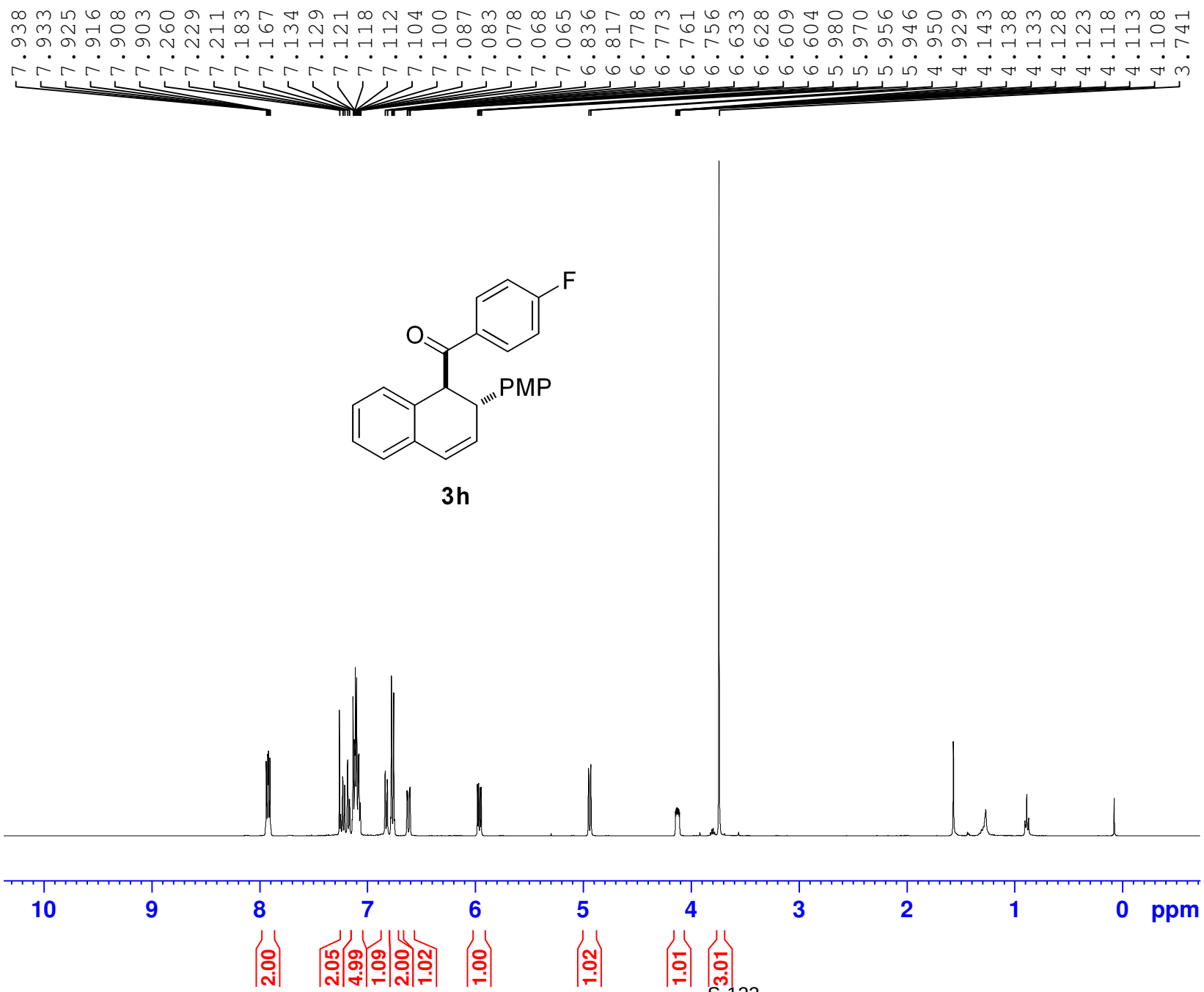

```
Current Data Parameters
NAME                qh-7113
EXPNO                     3
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140303
Time                   13.11
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       239
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     296.4 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6127583 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



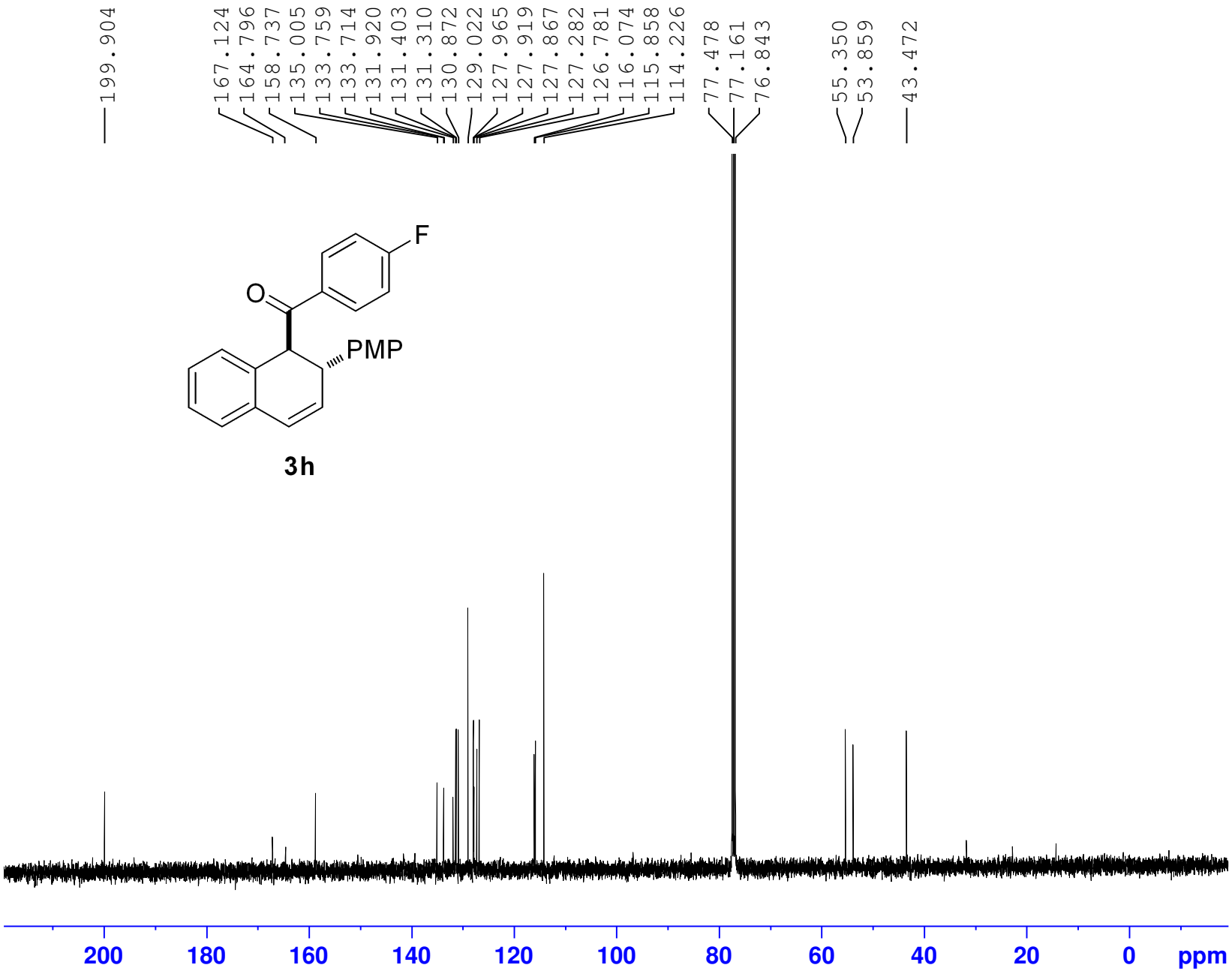

```
Current Data Parameters
NAME          qh-7163-2
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140317
Time              22.31
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                    2
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG                82.92
DW               62.400 usec
DE                6.50 usec
TE               296.7 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300096 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



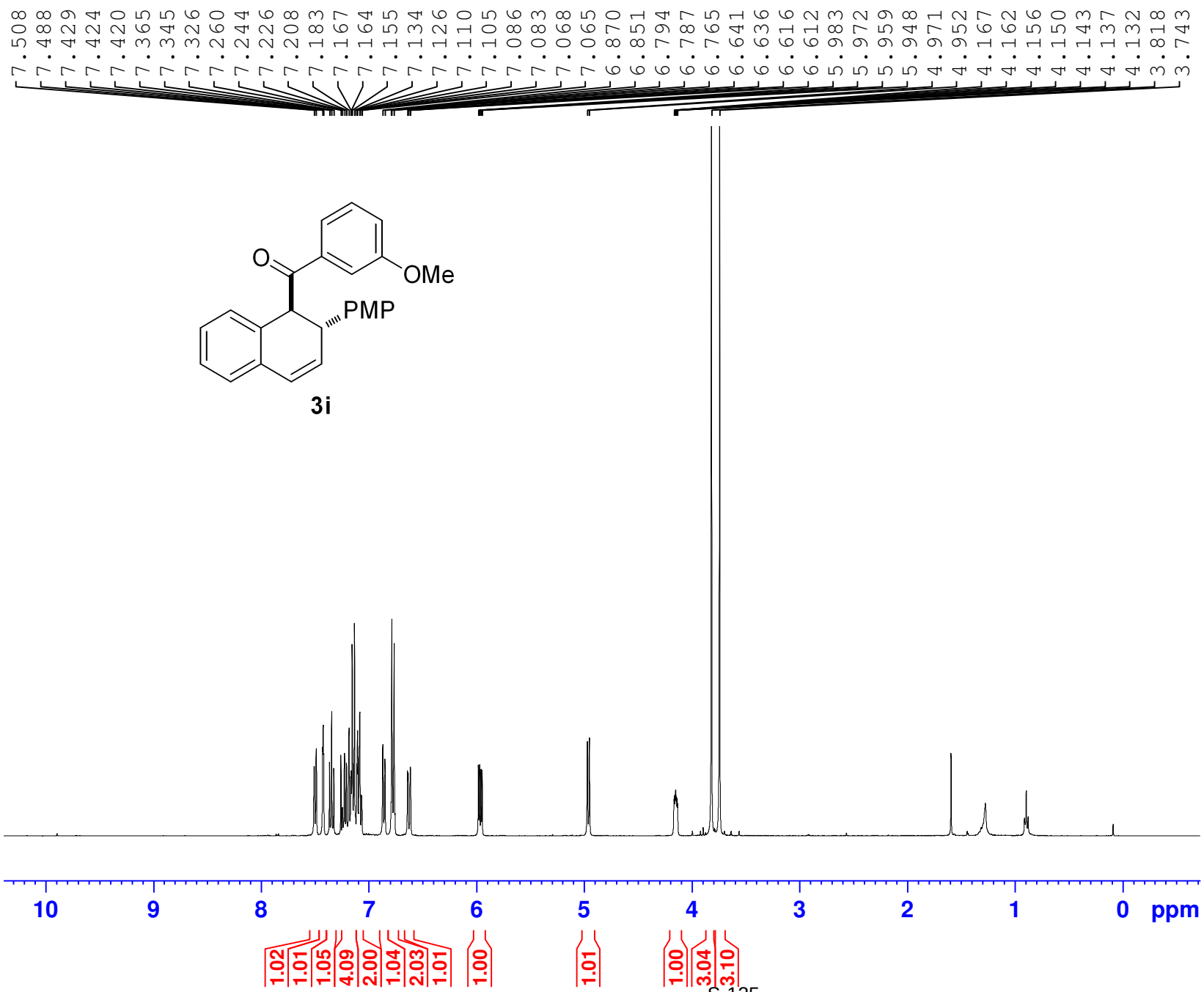

```
Current Data Parameters
NAME          qh-7163-2
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140317
Time              22.33
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   60
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                297.3 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                 9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2          9.10000038 W
PLW12         0.24608000 W
PLW13         0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6127582 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```




```
Current Data Parameters
NAME                 qh-7150
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140313
Time                   21.18
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                        15
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                    126.97
DW                    62.400 usec
DE                     6.50 usec
TE                    296.7 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             400.1324710 MHz
NUC1                       1H
P1                    14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF               400.1300096 MHz
WDW                        EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```




```
Current Data Parameters
NAME                qh-7150
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140313
Time                  21.22
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      293
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    297.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127557 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

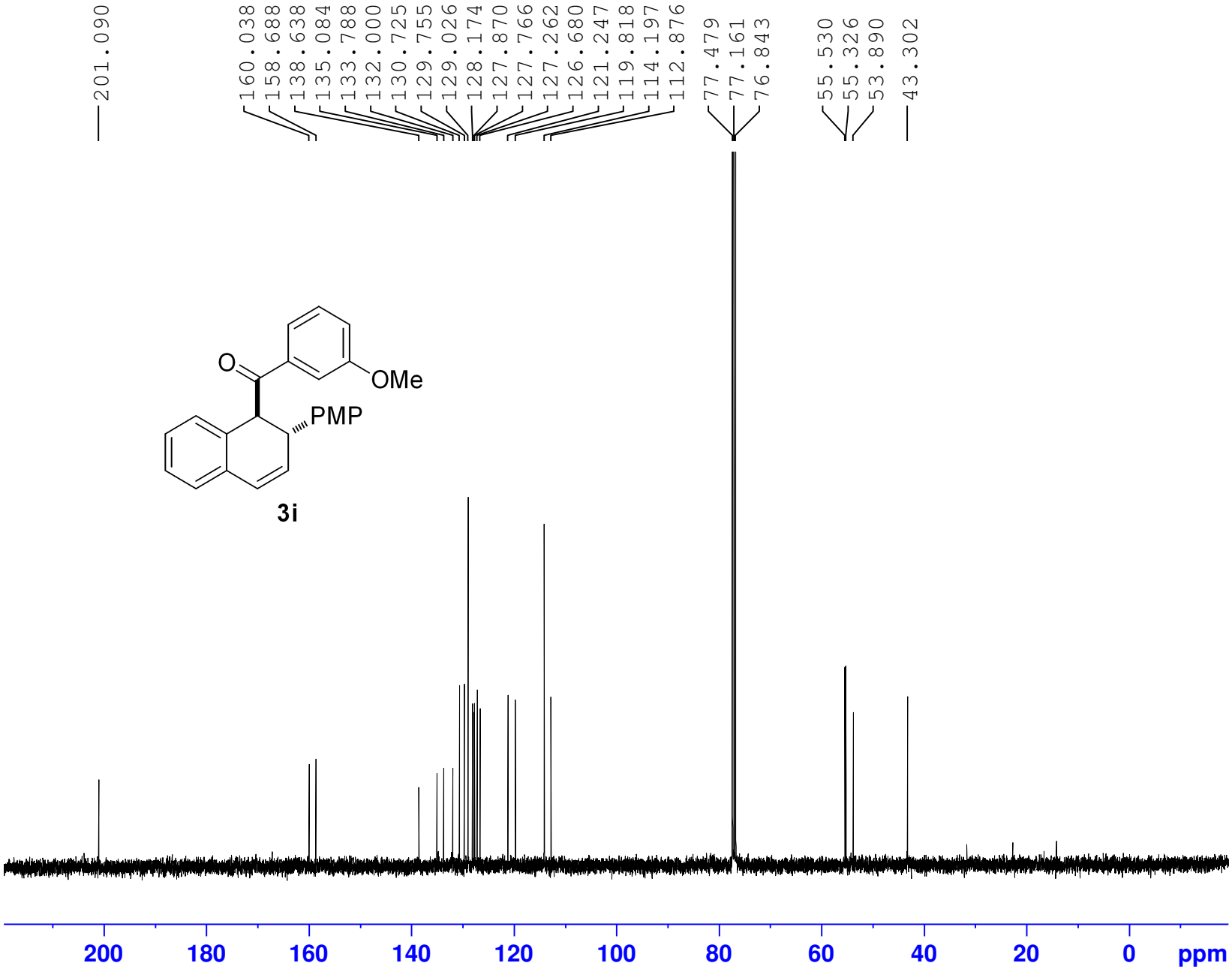


Current Data Parameters
NAME qh-7155
EXPNO 1
PROCNO 1

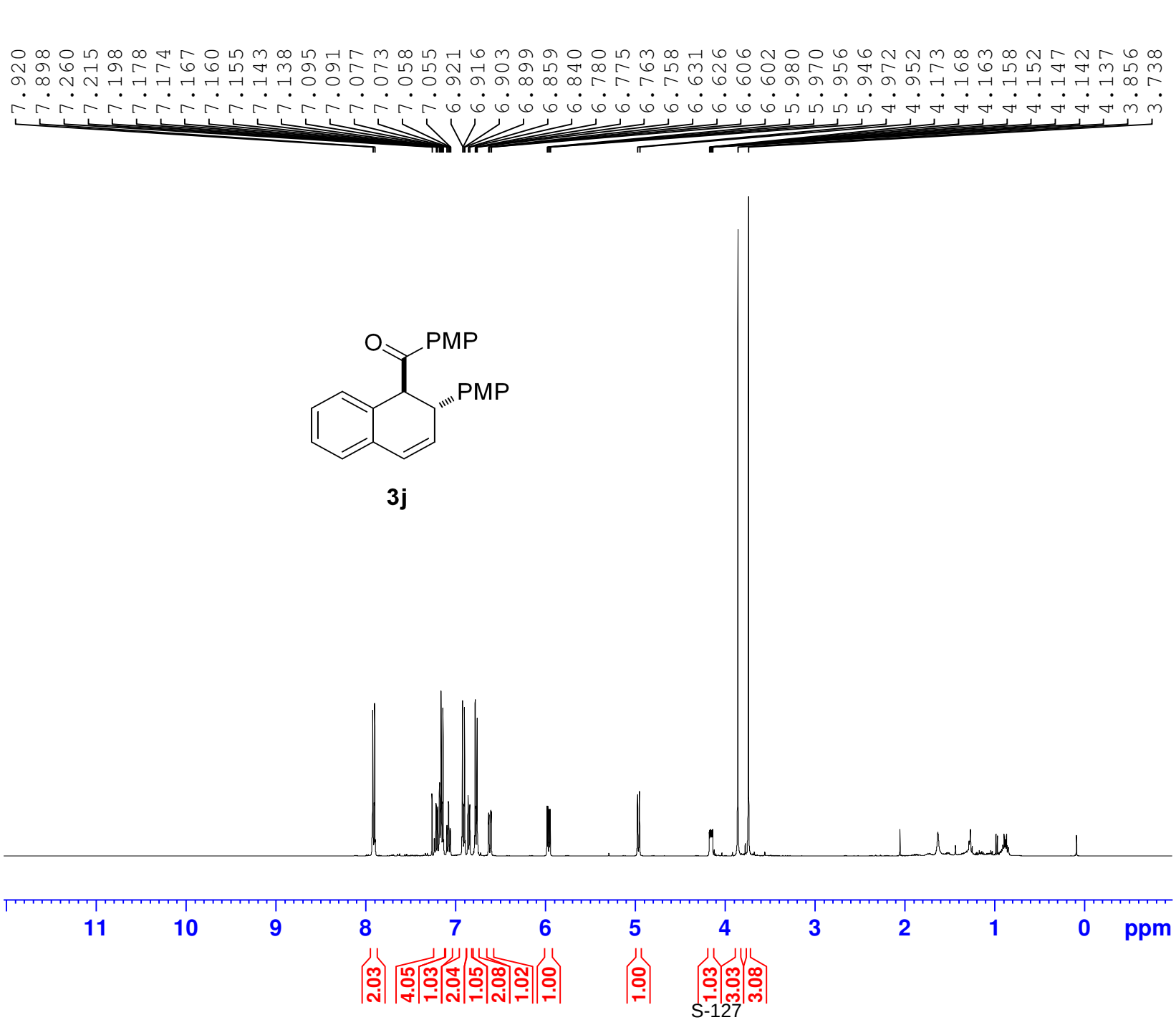
F2 - Acquisition Parameters
Date_ 20140314
Time 22.20
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 2
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 70.97
DW 62.400 usec
DE 6.50 usec
TE 296.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

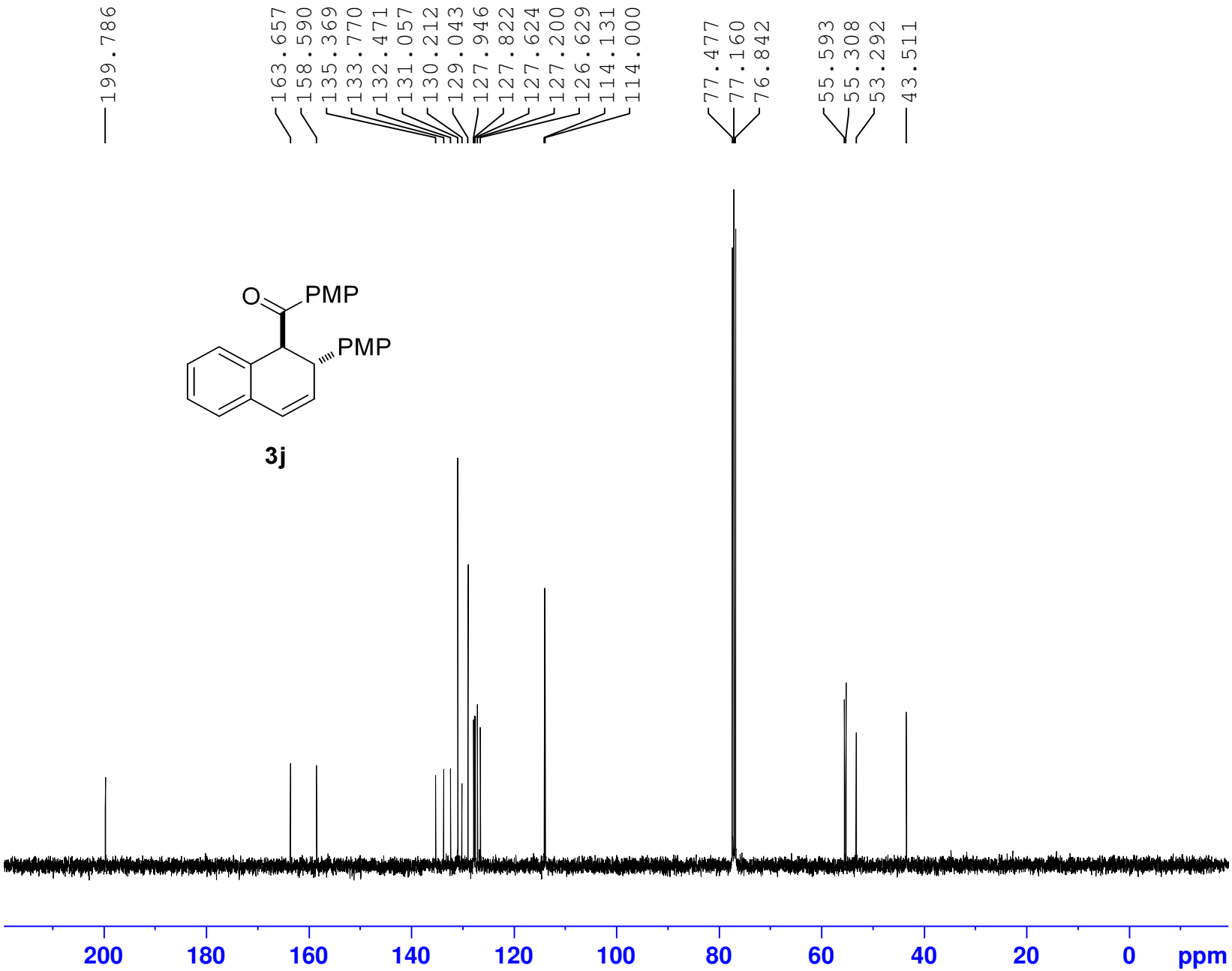
F2 - Processing parameters
SI 65536
SF 400.1300095 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



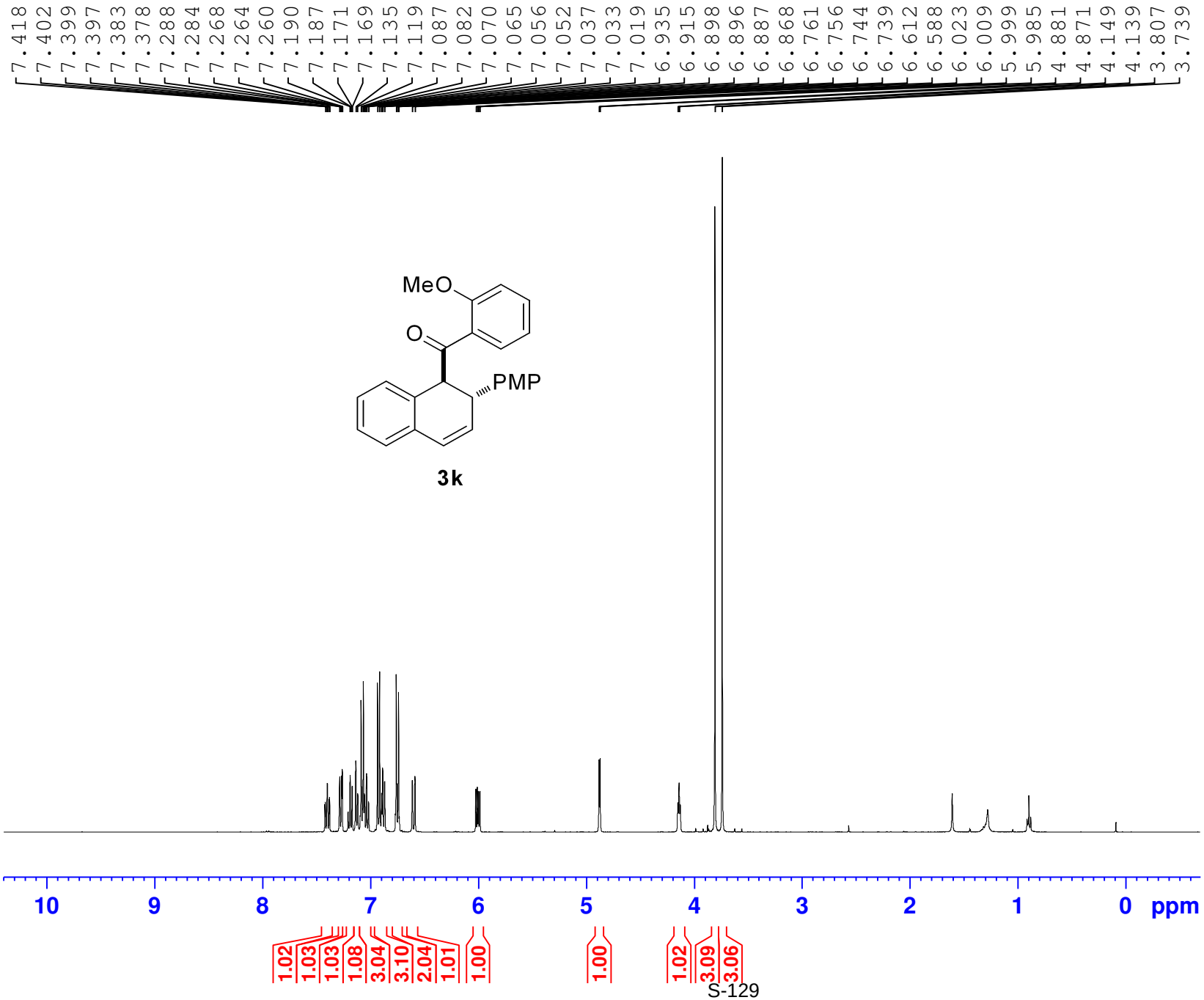

```
Current Data Parameters
NAME                qh-7155
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140314
Time                  22.27
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      118
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127579 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



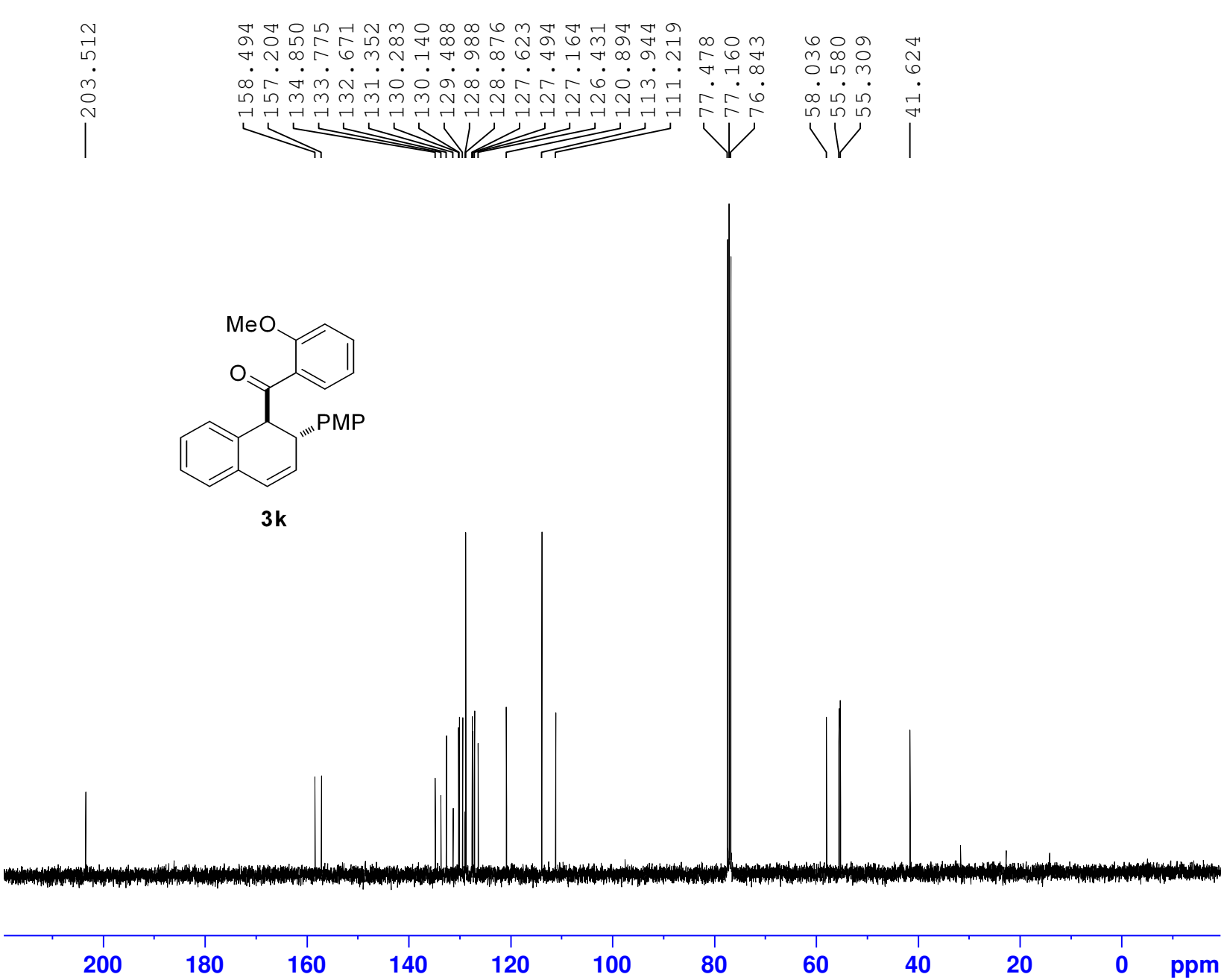

```
Current Data Parameters
NAME                qh-0105
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20130901
Time                   15.13
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     70.97
DW                    62.400 usec
DE                     6.50 usec
TE                    295.7 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300096 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



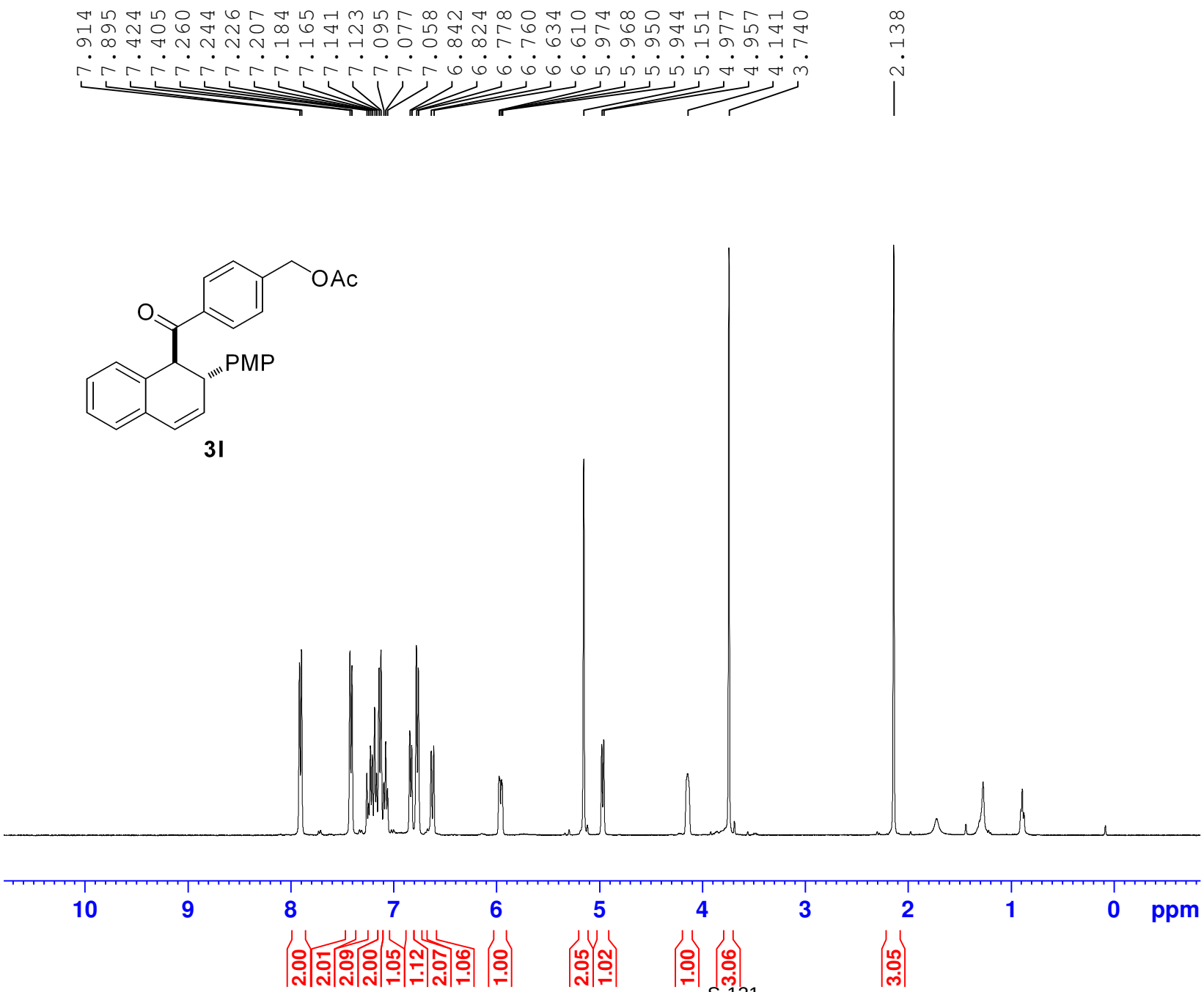

```
Current Data Parameters
NAME                qh-0105
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20130901
Time                  15.19
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      100
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127590 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```




```
Current Data Parameters
NAME                qh-7176
EXPNO                     3
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140320
Time                  13.20
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        1
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    70.97
DW                   62.400 usec
DE                    6.50 usec
TE                   295.7 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                   14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                    65536
SF              400.1300095 MHz
WDW                       EM
SSB        0
LB                    0.30 Hz
GB         0
PC                    1.00
```




```
Current Data Parameters
NAME                qh-7176
EXPNO                     4
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140320
Time                  13.24
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       75
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.4 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127597 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

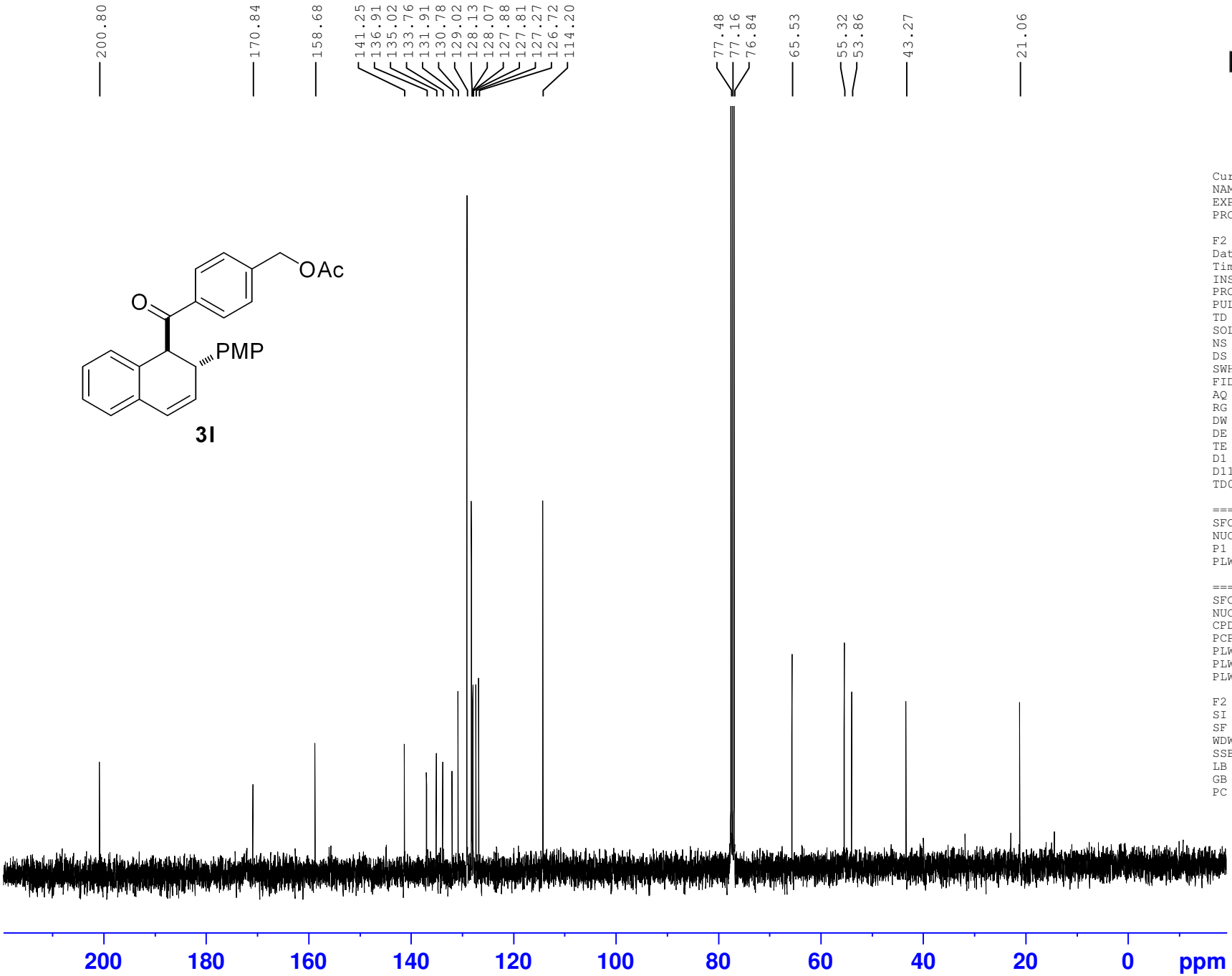


Current Data Parameters
NAME qh-7186
EXPNO 1
PROCNO 1

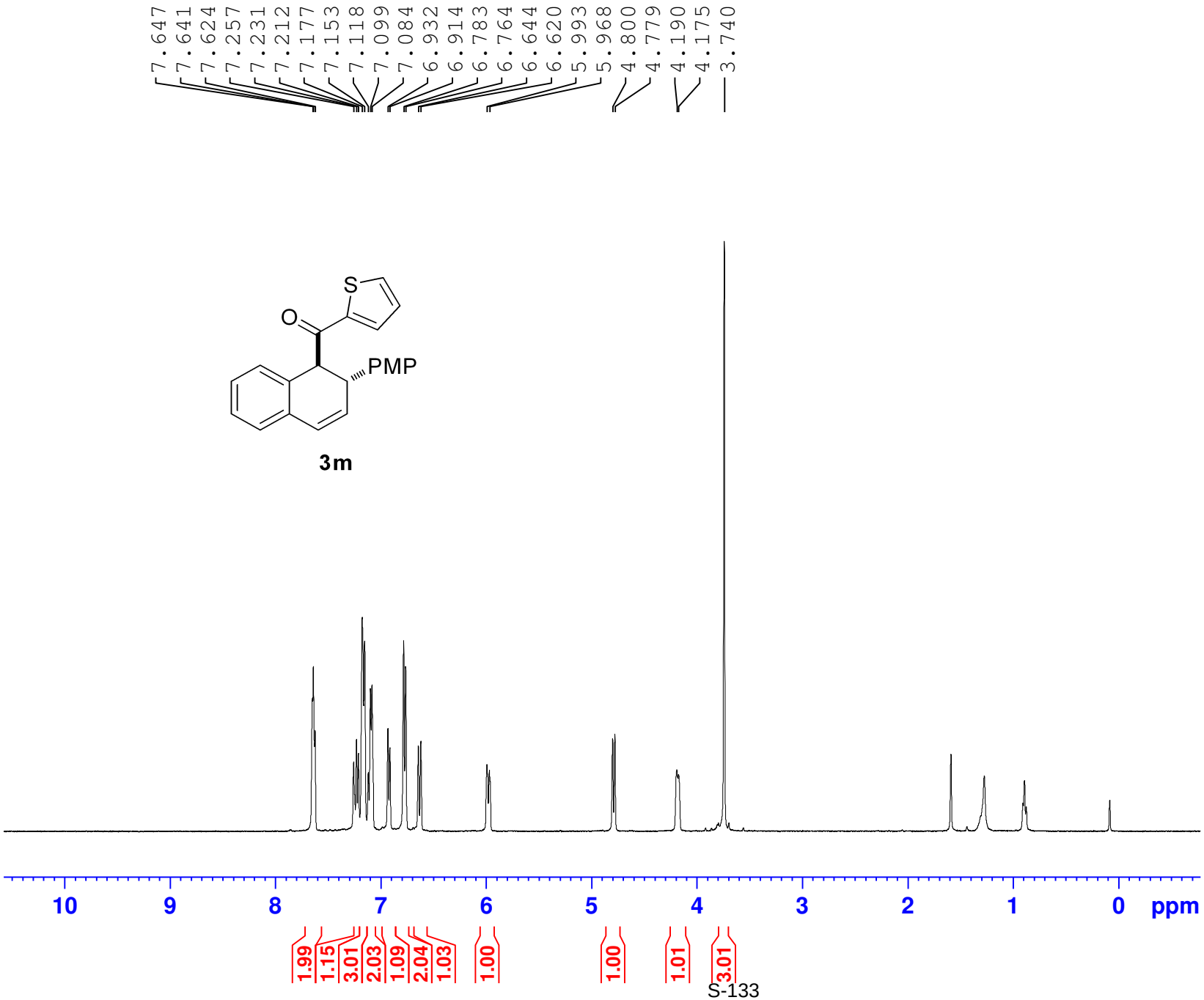
F2 - Acquisition Parameters
Date_ 20140322
Time 17.01
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 2
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 82.92
DW 62.400 usec
DE 6.50 usec
TE 295.7 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

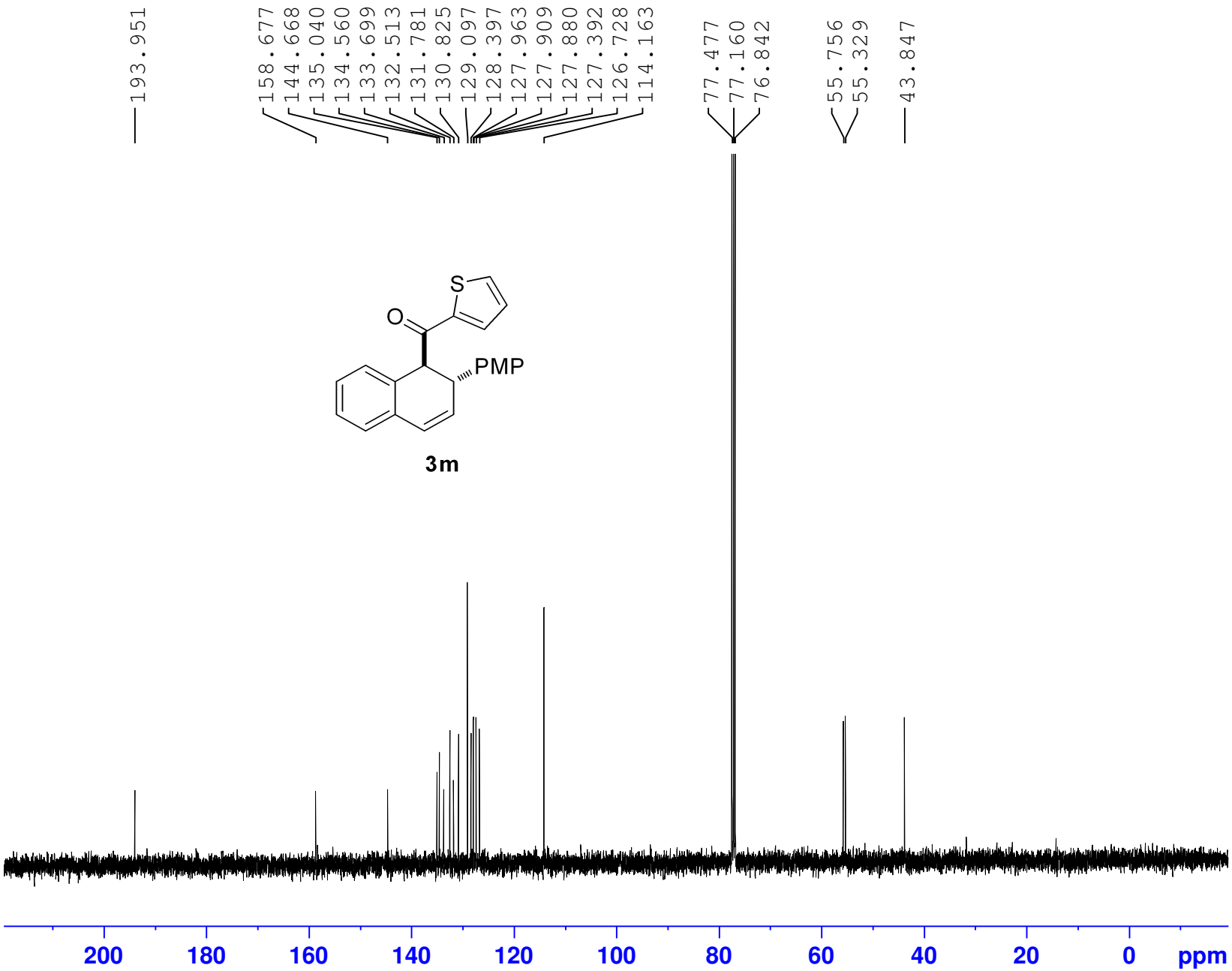
F2 - Processing parameters
SI 65536
SF 400.1300091 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



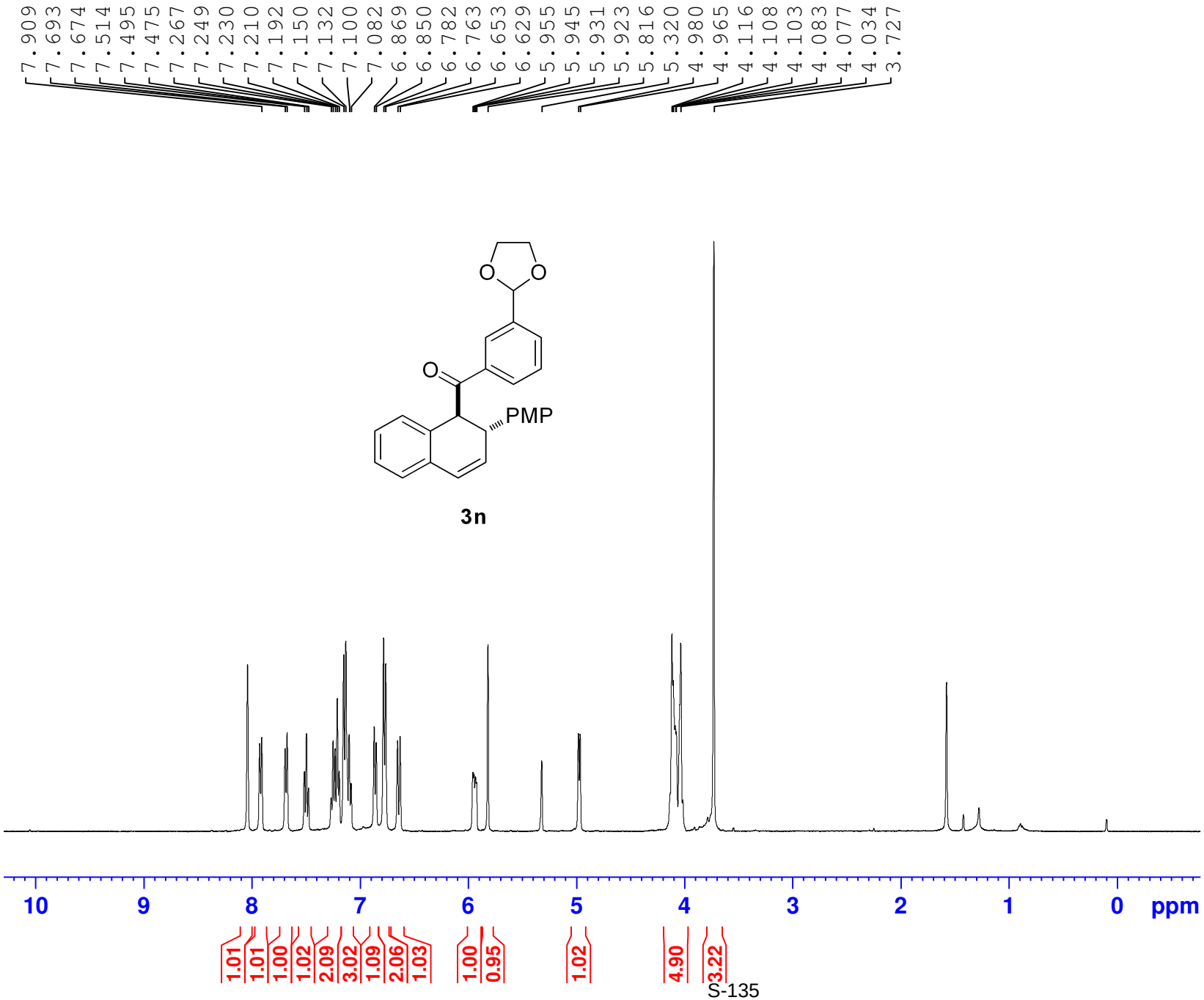

```
Current Data Parameters
NAME            qh-7186
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140322
Time              17.04
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   88
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.4 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                  9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2         9.10000038 W
PLW12        0.24608000 W
PLW13        0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6127582 MHz
WDW                  EM
SSB      0
LB                 1.00 Hz
GB       0
PC                 1.40
```



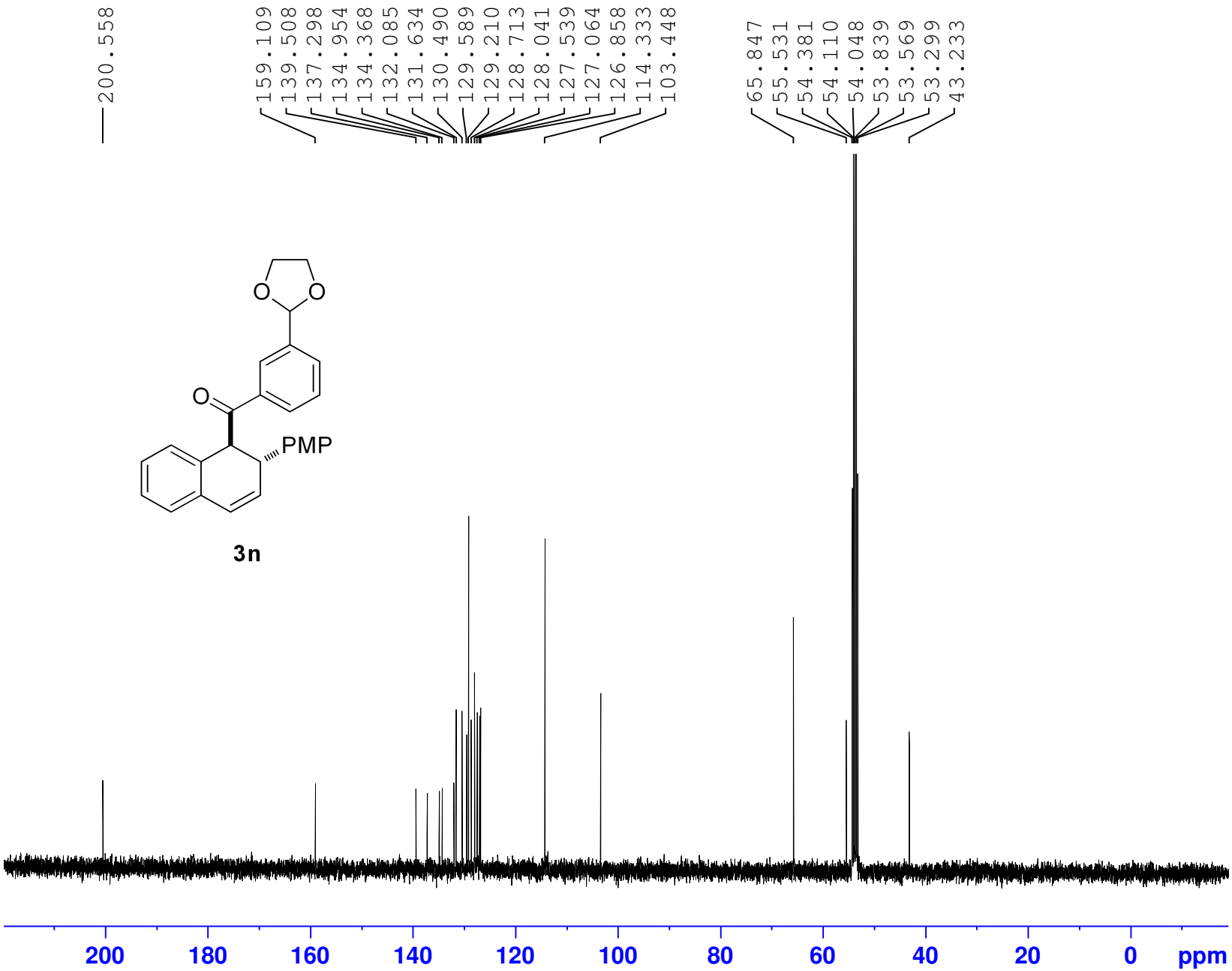

```
Current Data Parameters
NAME                qh-7187
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140322
Time                   15.50
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         1
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     88.84
DW                    62.400 usec
DE                     6.50 usec
TE                    295.9 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300094 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



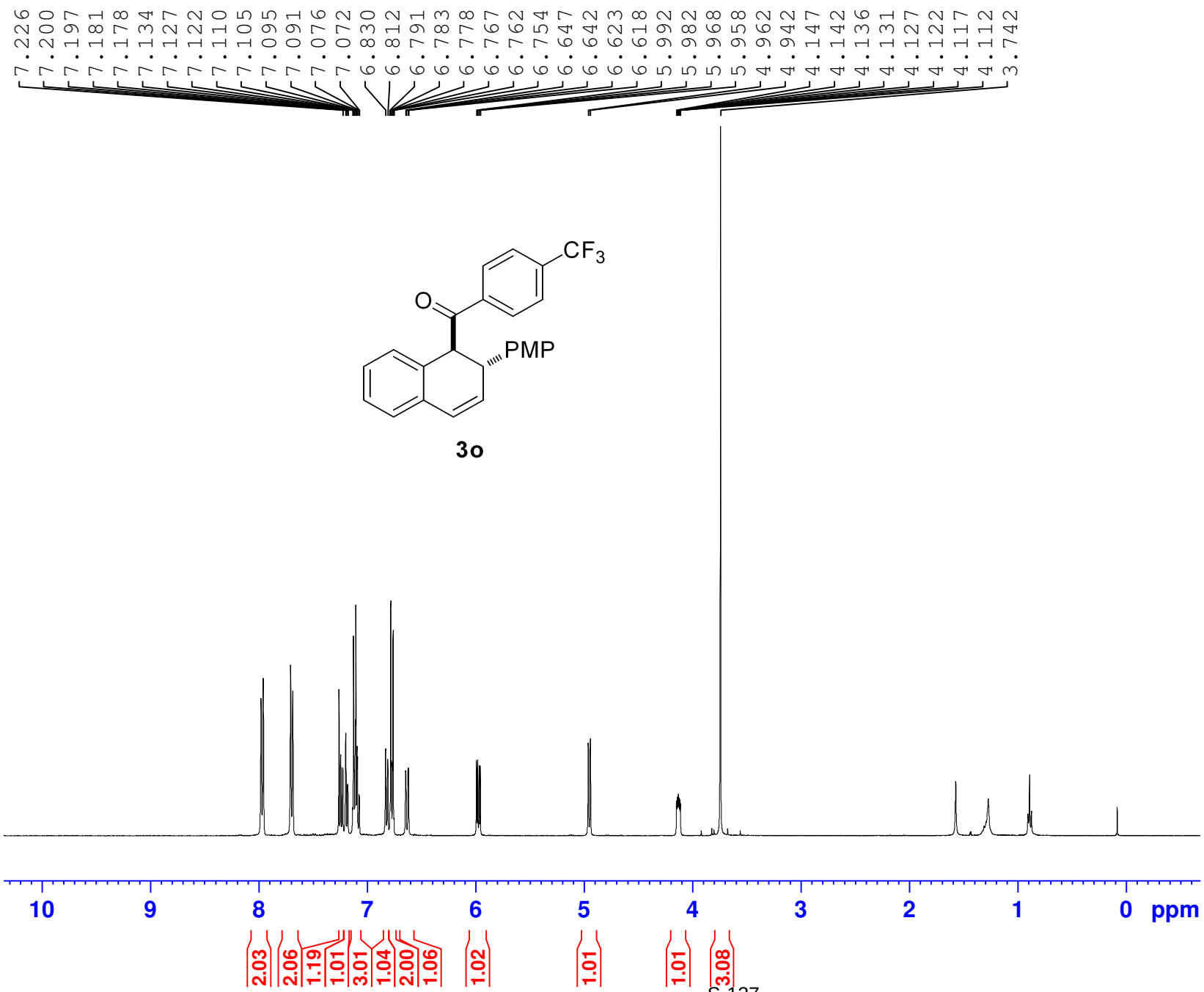

```
Current Data Parameters
NAME                qh-7187
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140322
Time                  15.53
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       81
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127579 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



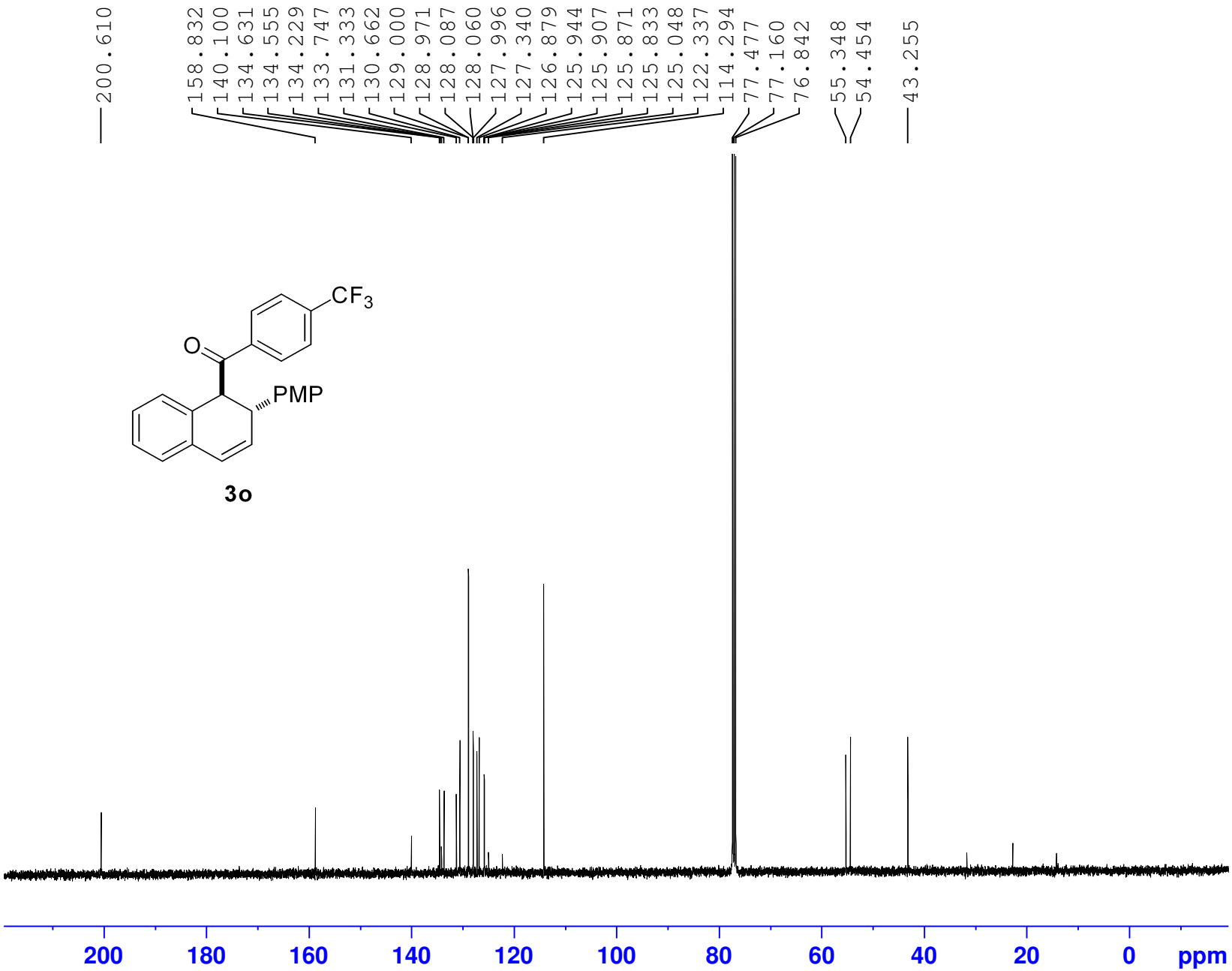

```
Current Data Parameters
NAME                 qh-8001
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140327
Time                   12.49
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT               CD2Cl2
NS                         2
DS                         2
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     88.84
DW                    62.400 usec
DE                     6.50 usec
TE                    295.8 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300149 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



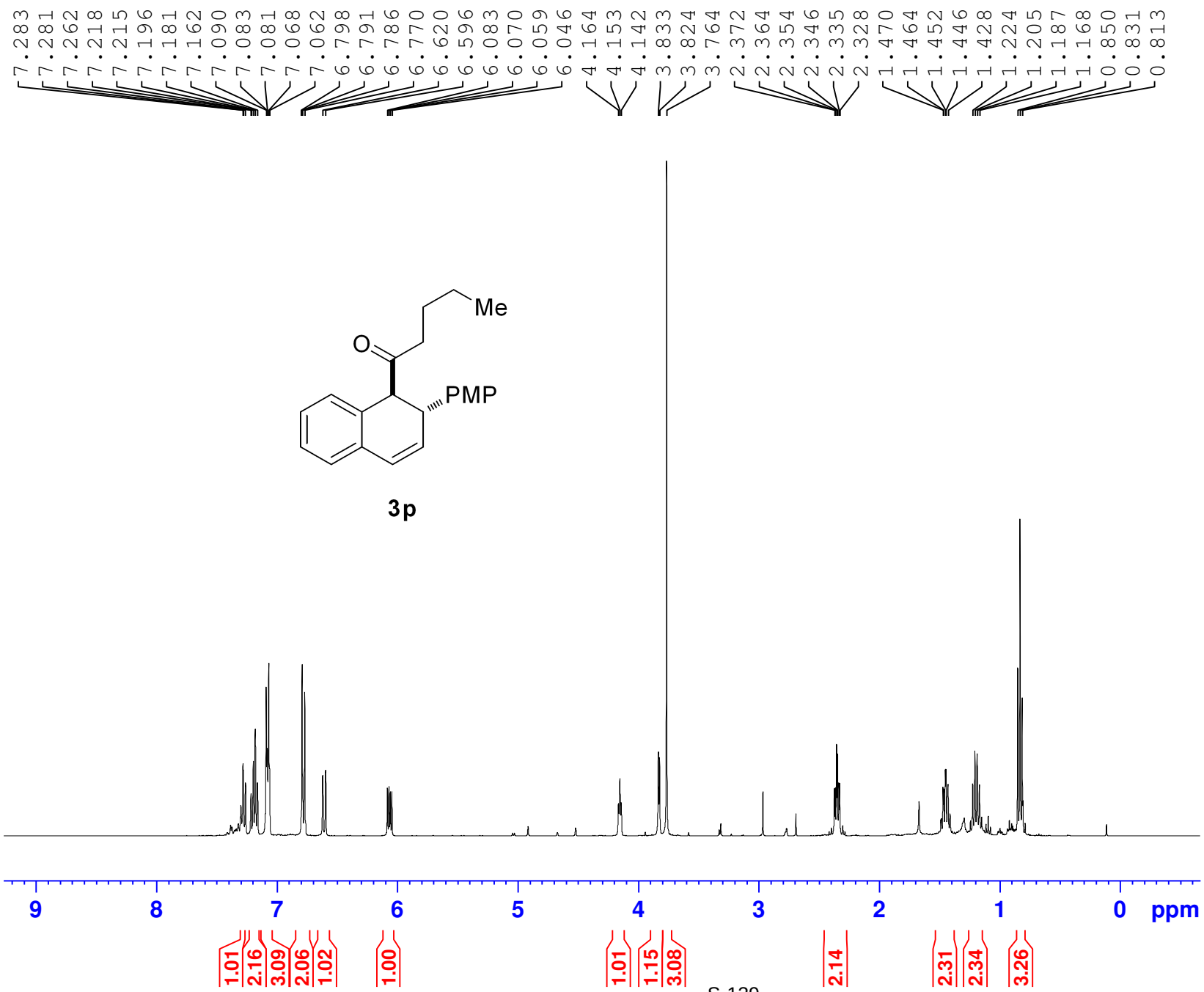

```
Current Data Parameters
NAME                 qh-8001
EXPNO                      2
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140327
Time                   12.55
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT               CD2Cl2
NS                       118
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     296.6 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                      13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6127295 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```



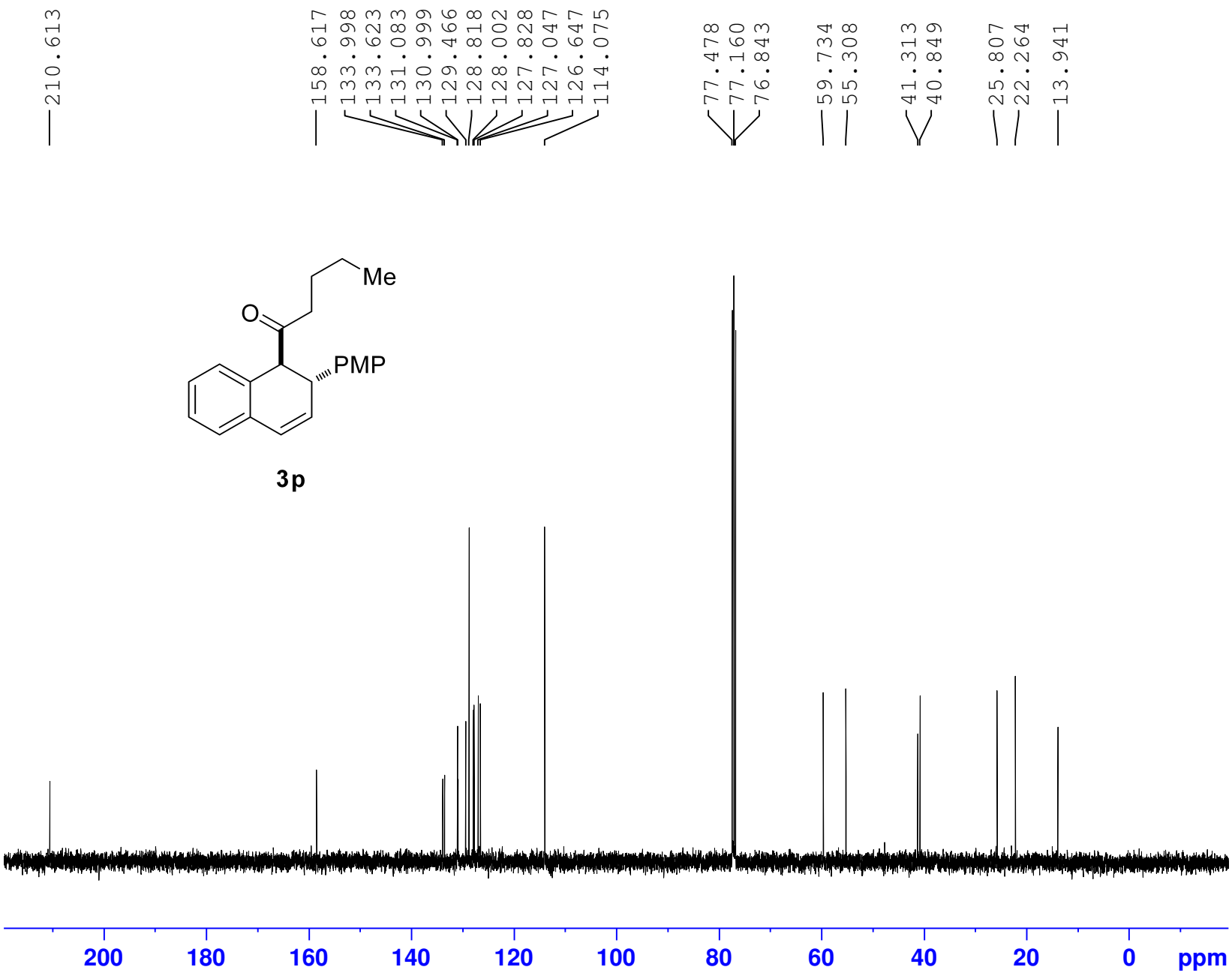

```
Current Data Parameters
NAME                 qh-7154
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140314
Time                   22.29
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                    103.52
DW                    62.400 usec
DE                      6.50 usec
TE                     297.0 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF               400.1300095 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



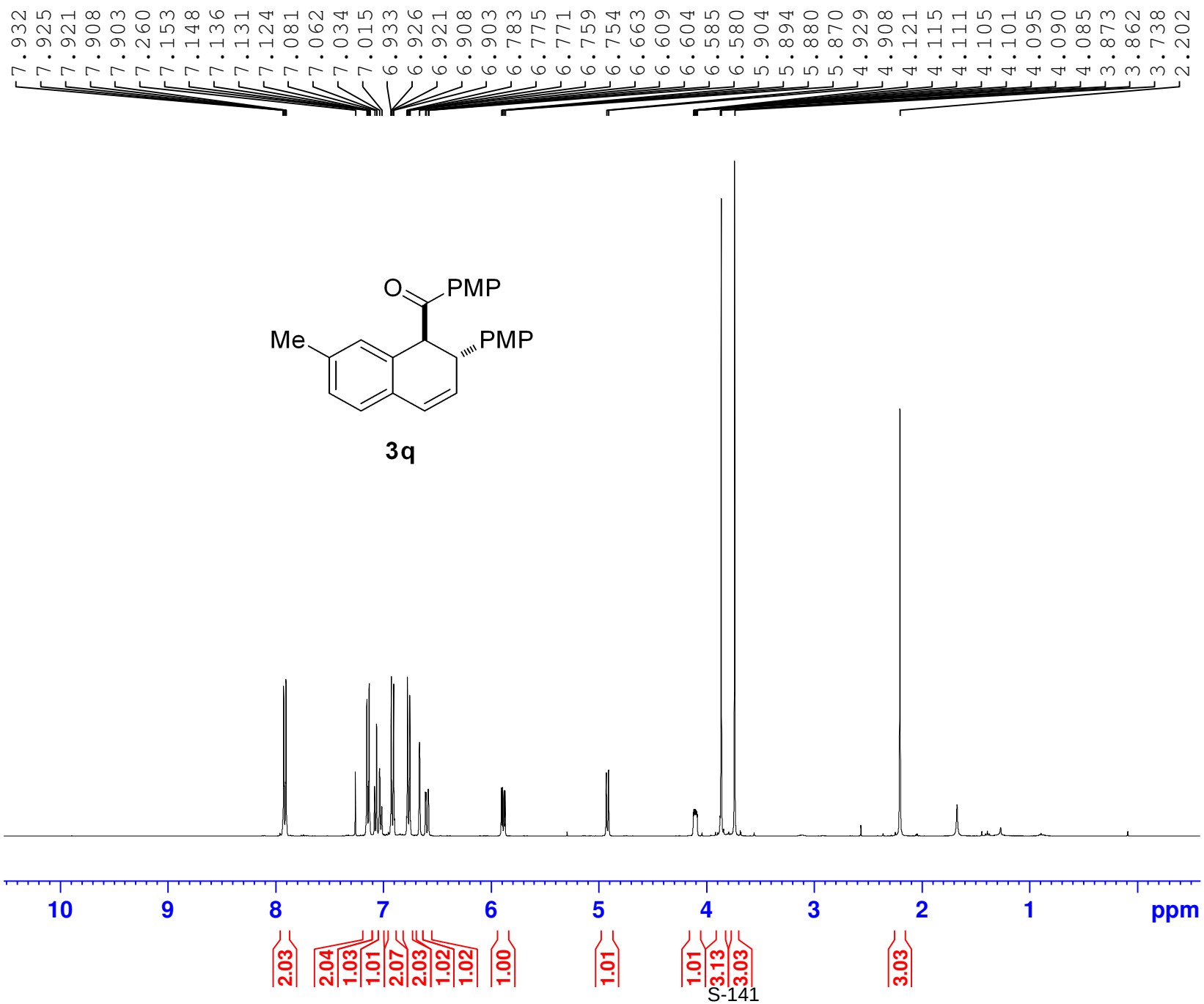

```
Current Data Parameters
NAME                qh-7154
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140314
Time                  22.36
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      413
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127561 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



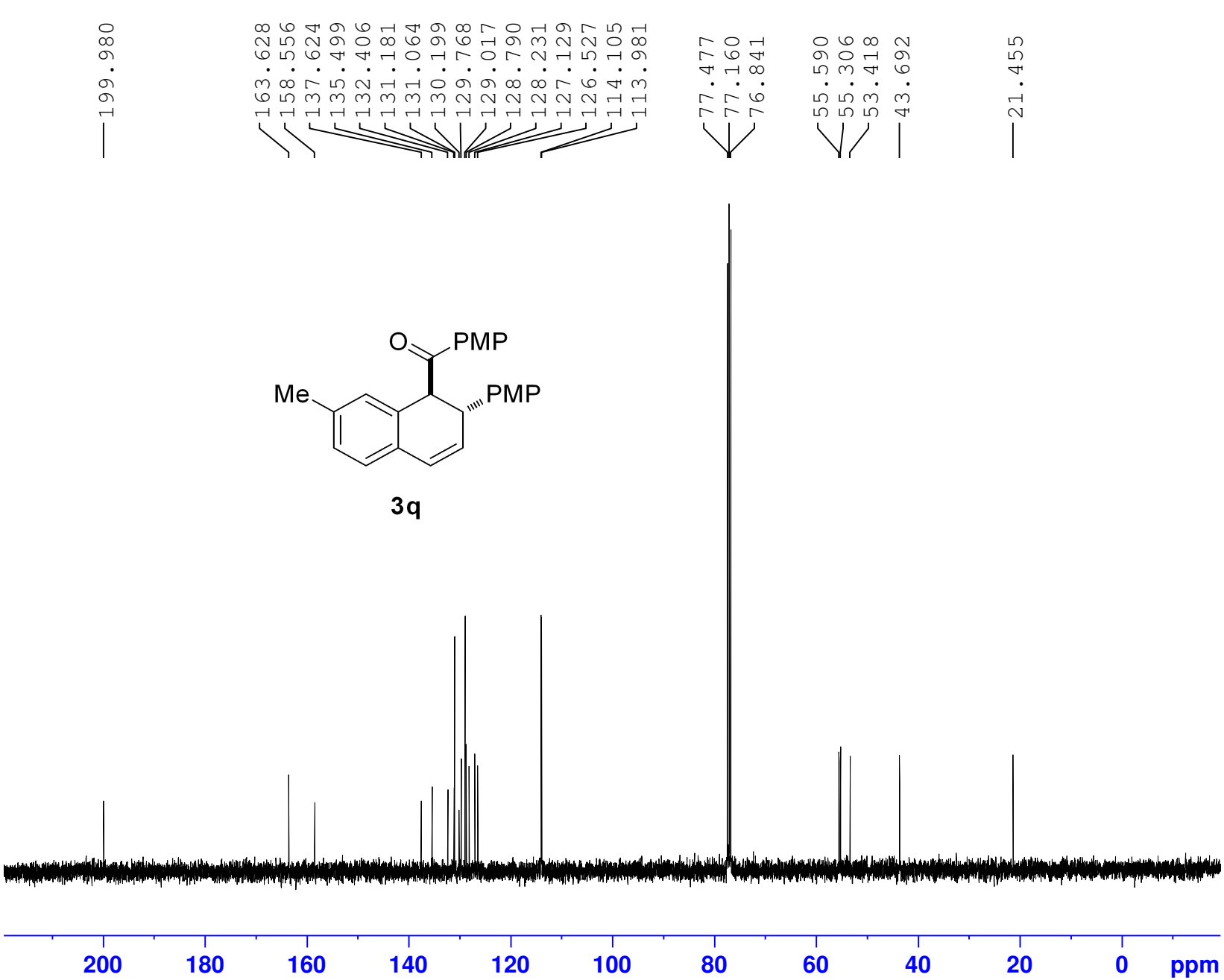

```
Current Data Parameters
NAME                qh-9076
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140825
Time                  16.50
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        3
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    31.55
DW                   62.400 usec
DE                    6.50 usec
TE                   295.7 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                   14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                    65536
SF              400.1300000 MHz
WDW                       EM
SSB         0
LB                    0.30 Hz
GB          0
PC                    1.00
```



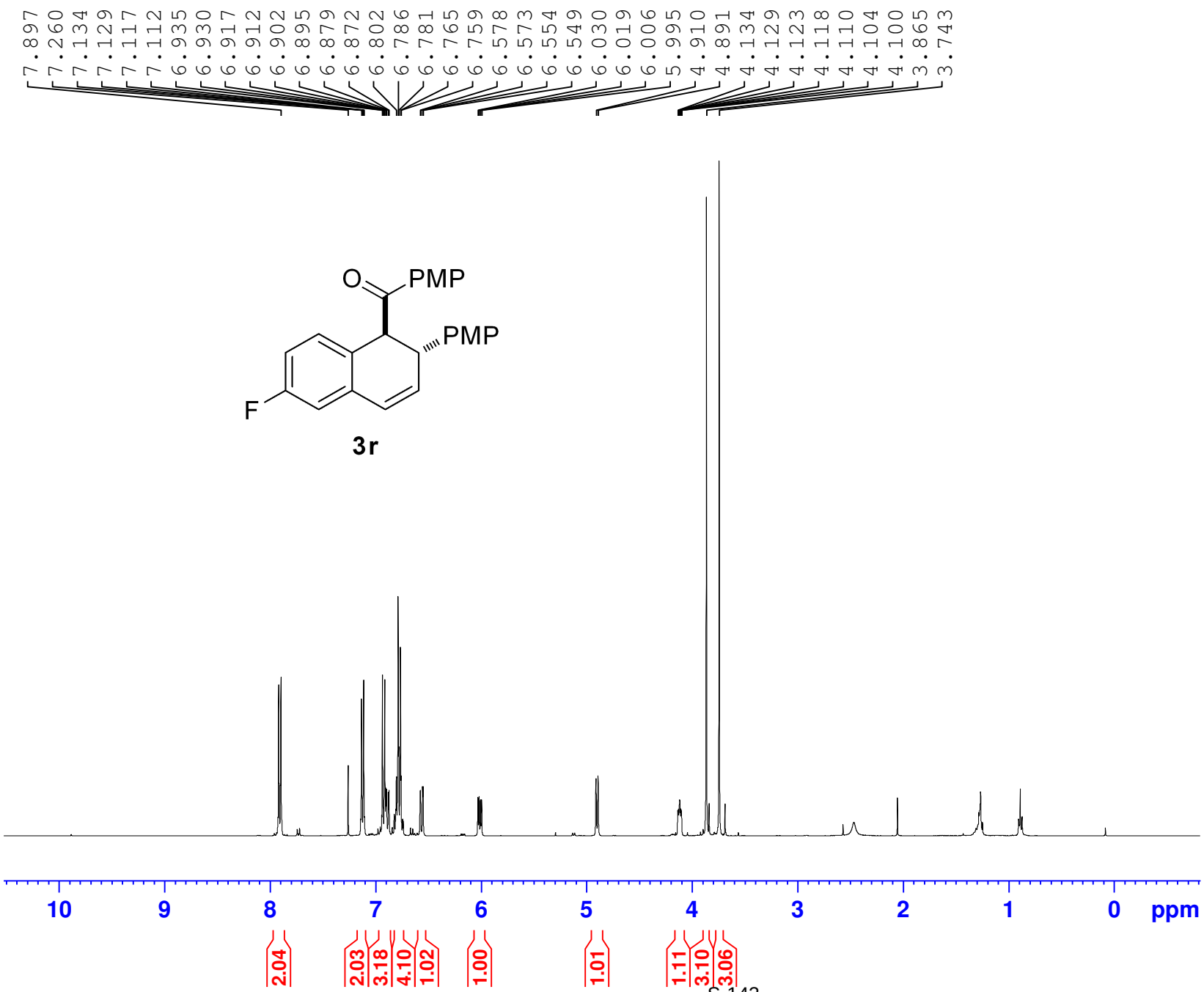

```
Current Data Parameters
NAME                qh-9076
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140825
Time                  16.53
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       40
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127597 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```




```
Current Data Parameters
NAME                 qh-7174
EXPNO                      3
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140319
Time                   20.05
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         4
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     70.97
DW                    62.400 usec
DE                     6.50 usec
TE                    295.7 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300095 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```




```
Current Data Parameters
NAME                qh-7174
EXPNO                     4
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140319
Time                  20.07
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       50
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127590 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

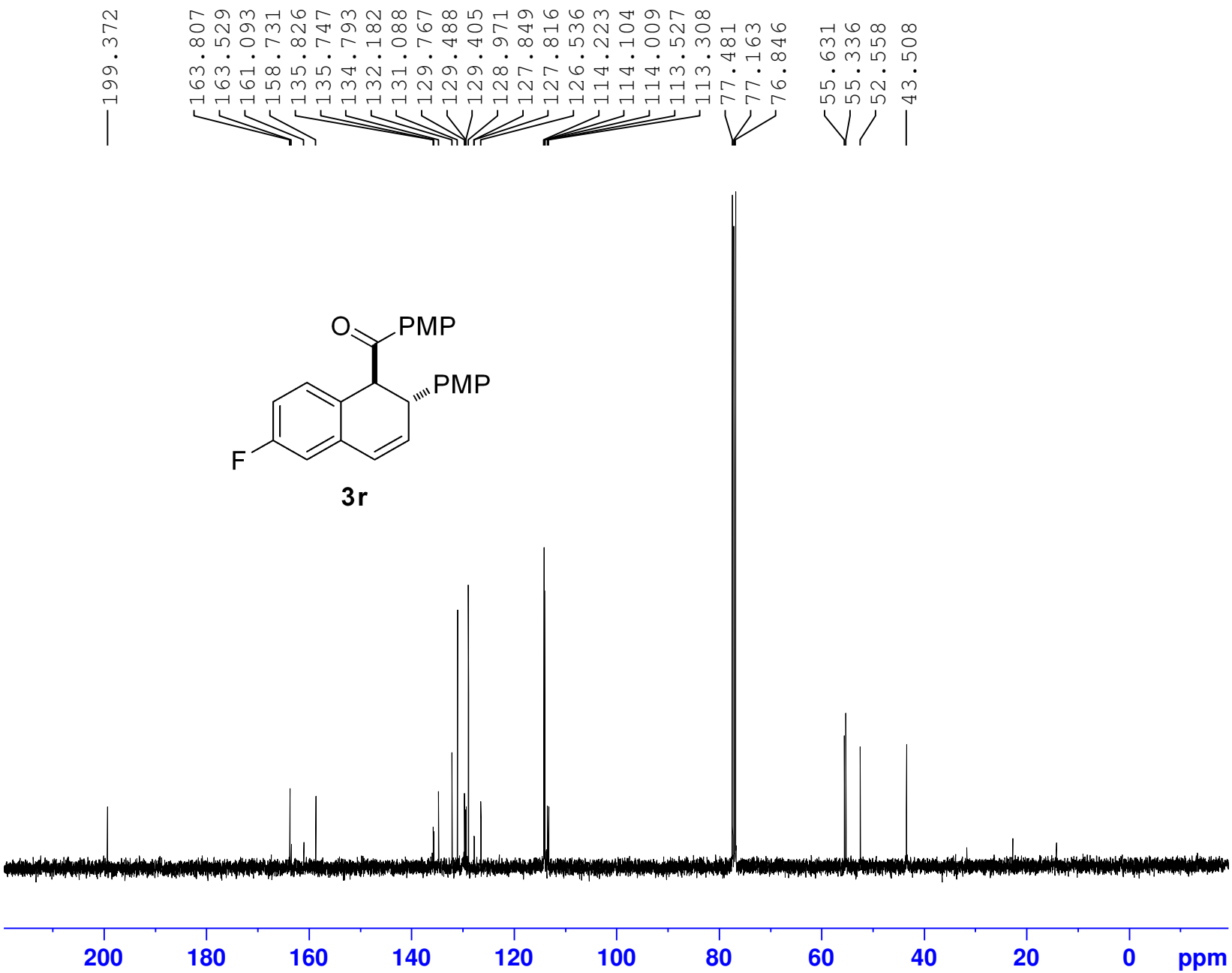


Current Data Parameters
NAME qh-7175
EXPNO 1
PROCNO 1

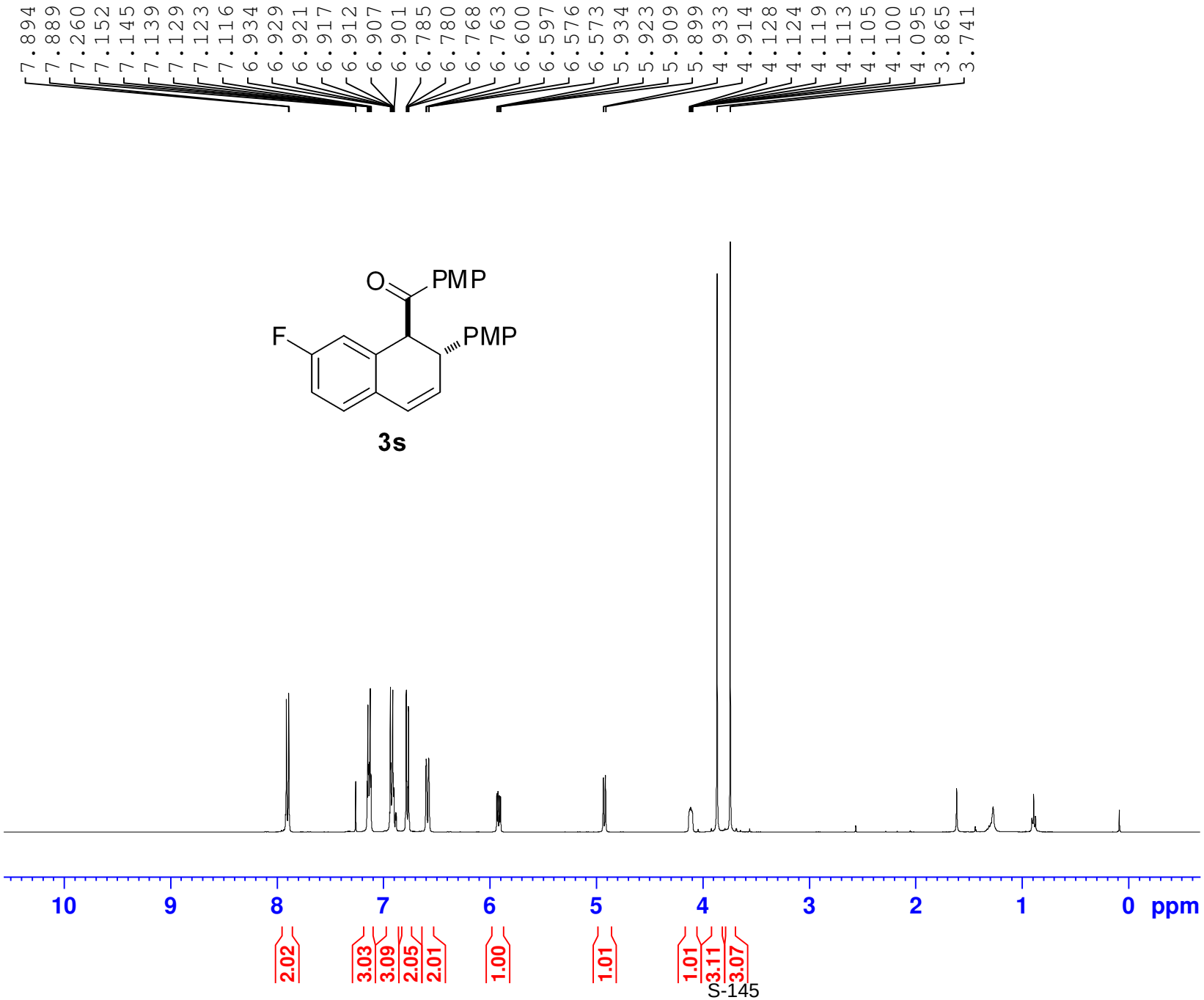
F2 - Acquisition Parameters
Date_ 20140319
Time 19.29
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 4
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 82.92
DW 62.400 usec
DE 6.50 usec
TE 295.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

F2 - Processing parameters
SI 65536
SF 400.1300095 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00




```
Current Data Parameters
NAME                qh-7175
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140319
Time                  19.33
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      100
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127576 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

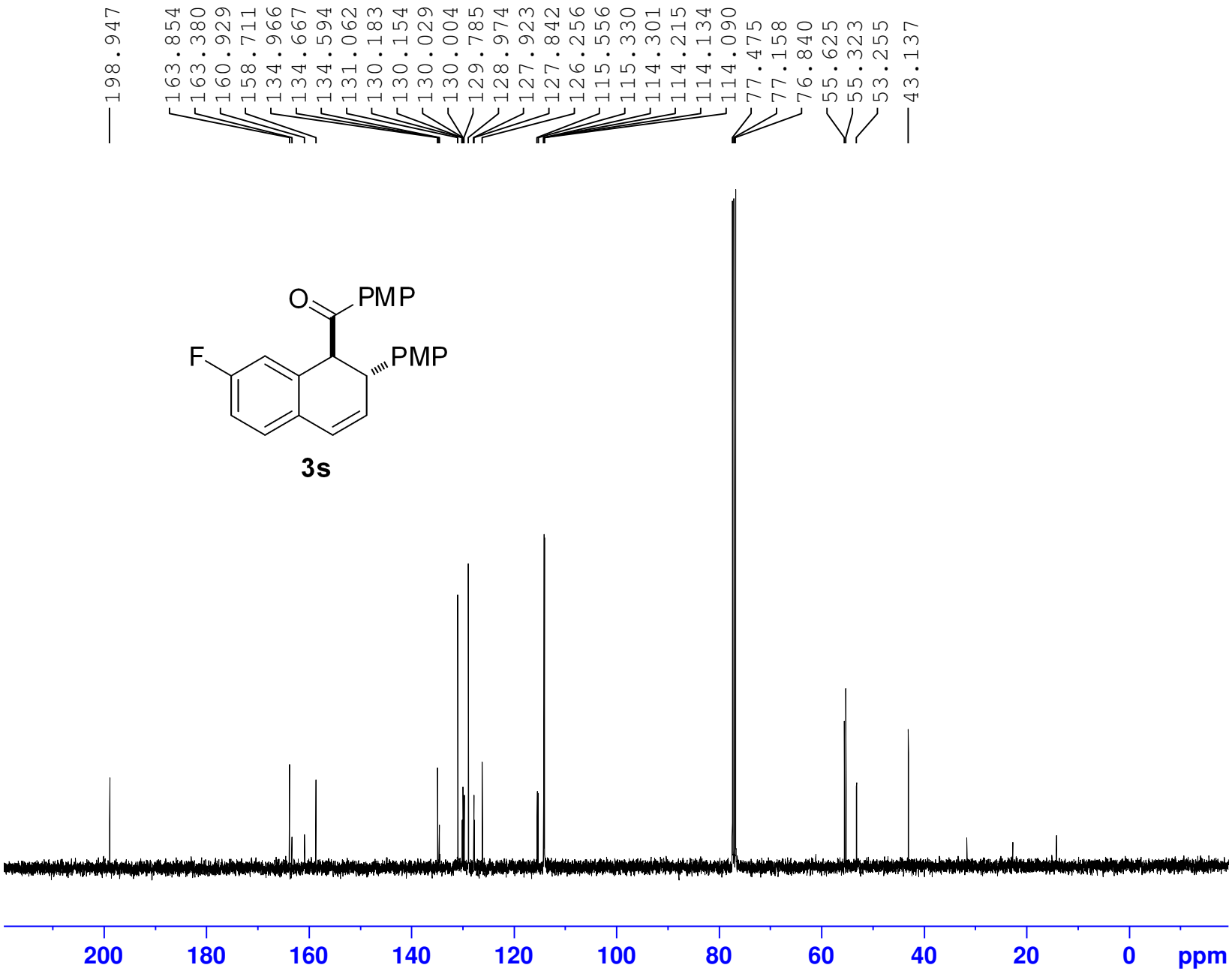


Current Data Parameters
NAME qh-7117
EXPNO 1
PROCNO 1

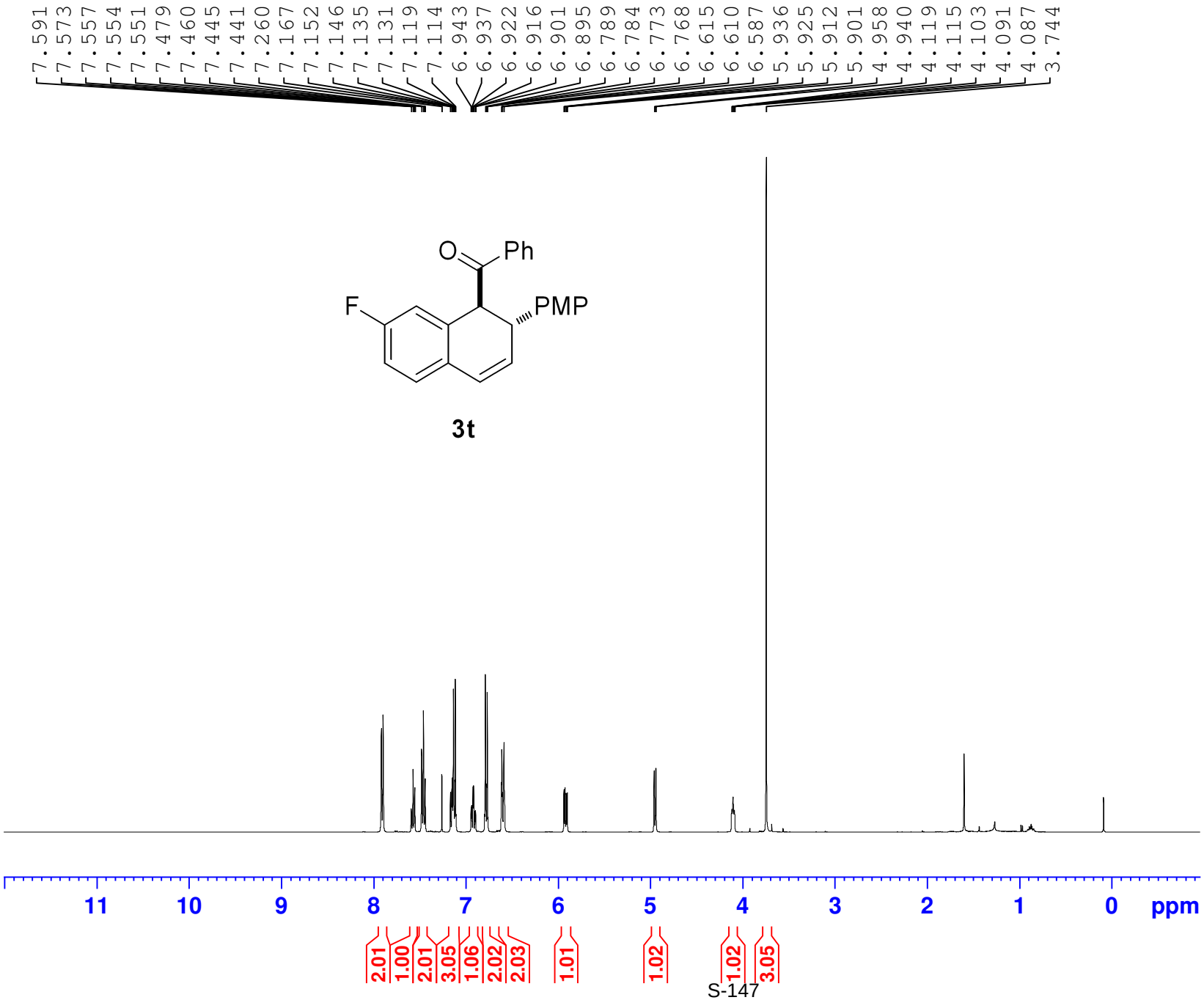
F2 - Acquisition Parameters
Date_ 20140303
Time 23.01
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 3
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 70.97
DW 62.400 usec
DE 6.50 usec
TE 296.7 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

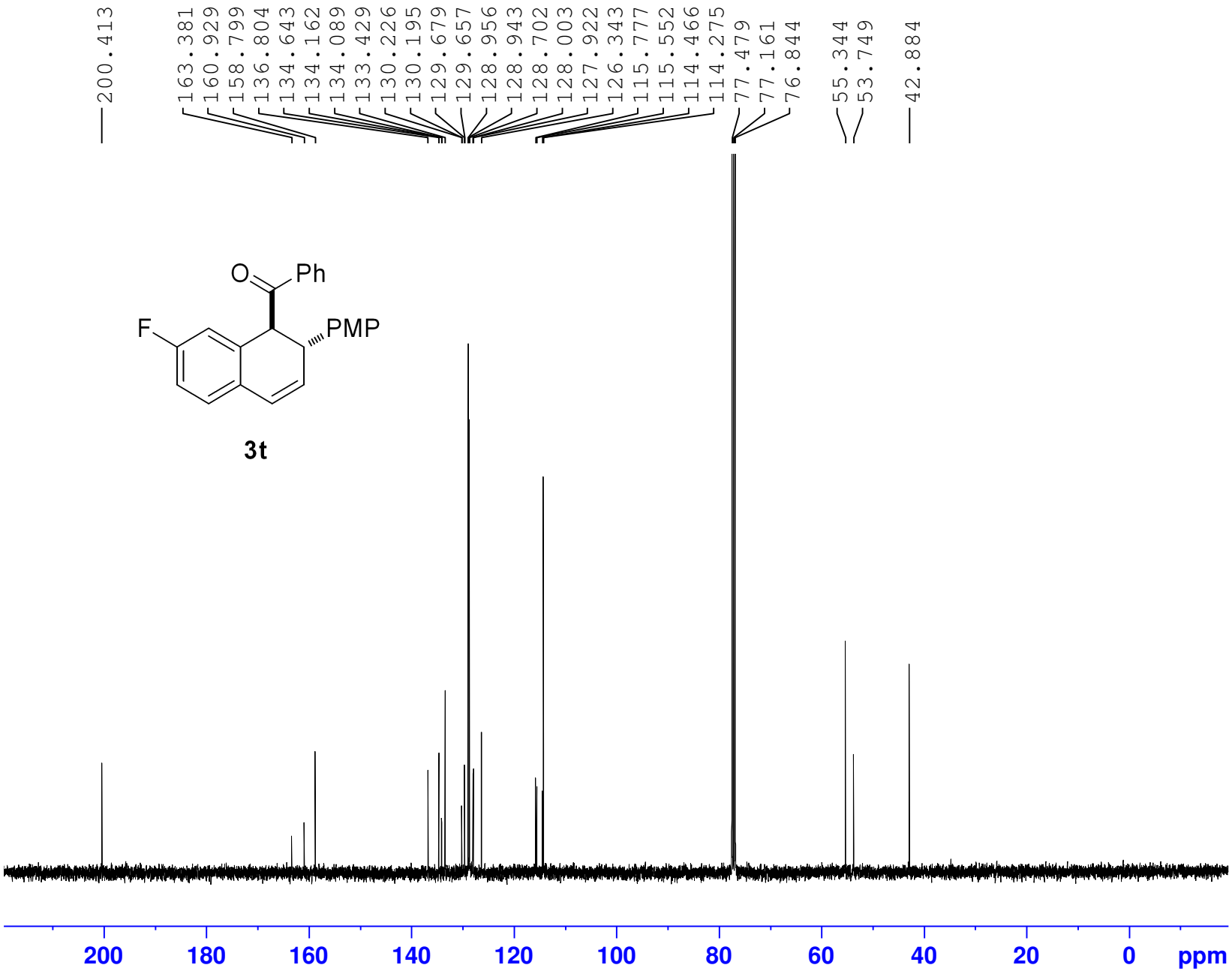
F2 - Processing parameters
SI 65536
SF 400.1300095 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



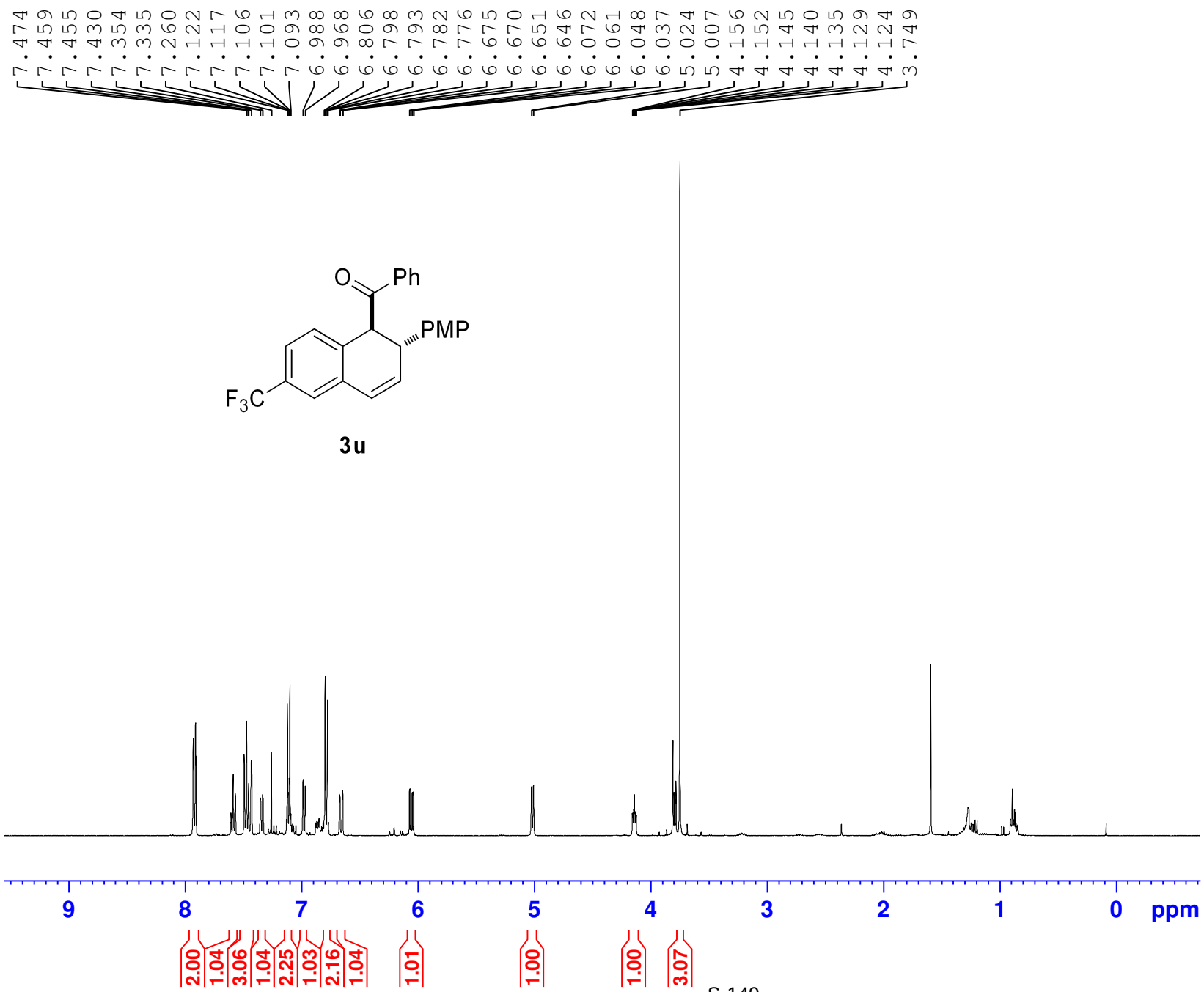

```
Current Data Parameters
NAME                qh-7117
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140303
Time                  23.03
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      108
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    297.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127582 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



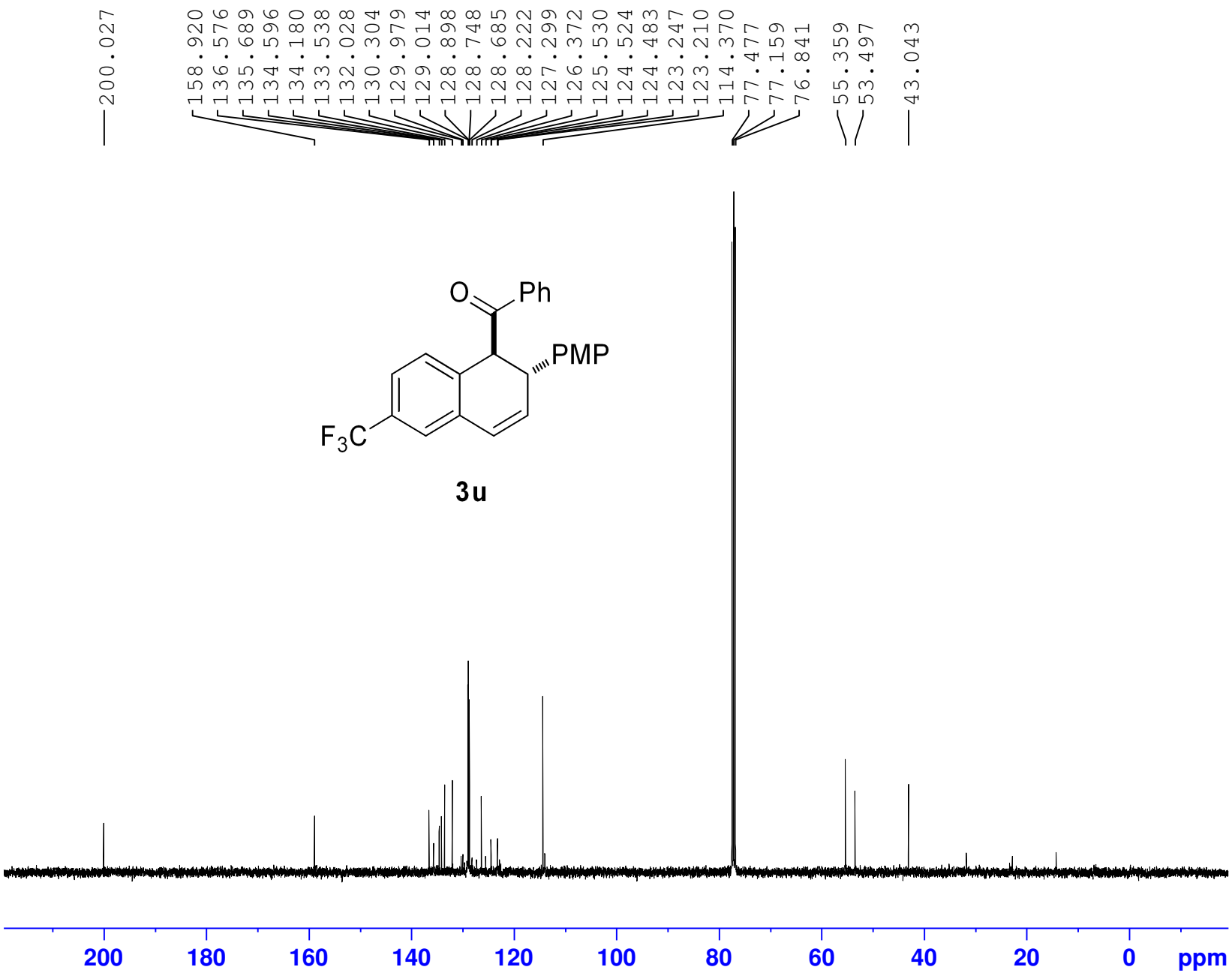

```
Current Data Parameters
NAME                 qh-0125
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20130831
Time                   18.48
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         3
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     82.92
DW                    62.400 usec
DE                     6.50 usec
TE                     297.2 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                     14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300097 MHz
WDW                       EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```



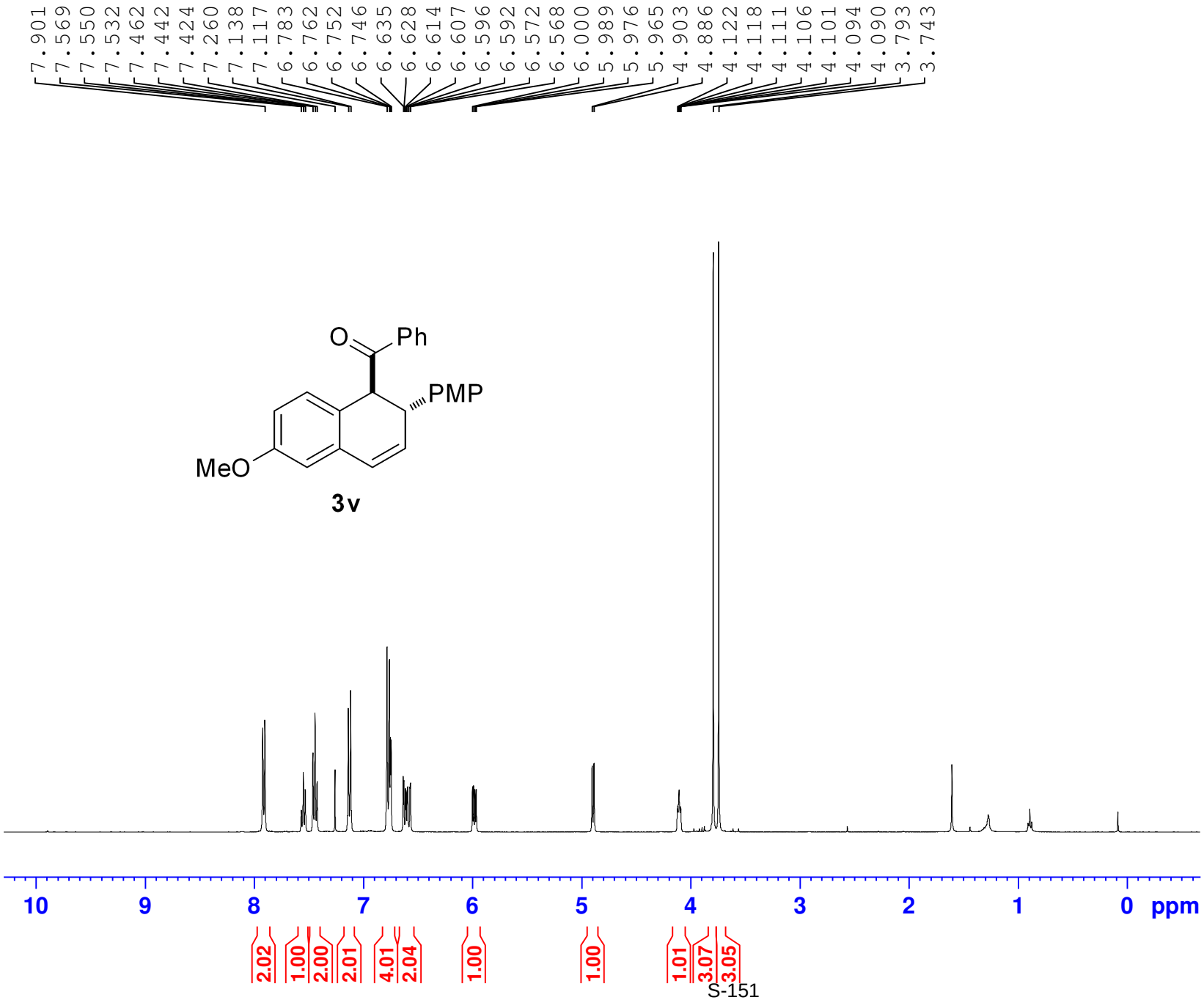

```
Current Data Parameters
NAME                qh-0125
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20130831
Time                   18.52
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       200
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
DW                    20.800 usec
DE                      6.50 usec
TE                     297.9 K
D1                 2.00000000 sec
D11                0.03000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             100.6228298 MHz
NUC1                     13C
P1                      9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                      1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6127575 MHz
WDW                       EM
SSB          0
LB                      1.00 Hz
GB           0
PC                      1.40
```




```
Current Data Parameters
NAME          qh-9069-2
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140823
Time              10.49
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                    1
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ            4.0894465 sec
RG                82.92
DW               62.400 usec
DE                6.50 usec
TE                296.4 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1                14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300098 MHz
WDW                   EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```




```
Current Data Parameters
NAME          qh-9069-2
EXPNO                 2
PROCNO                1

F2 - Acquisition Parameters
Date_          20140823
Time              10.55
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  380
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
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        100.6228298 MHz
NUC1                 13C
P1                 9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2         9.10000038 W
PLW12        0.24608000 W
PLW13        0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6127568 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```

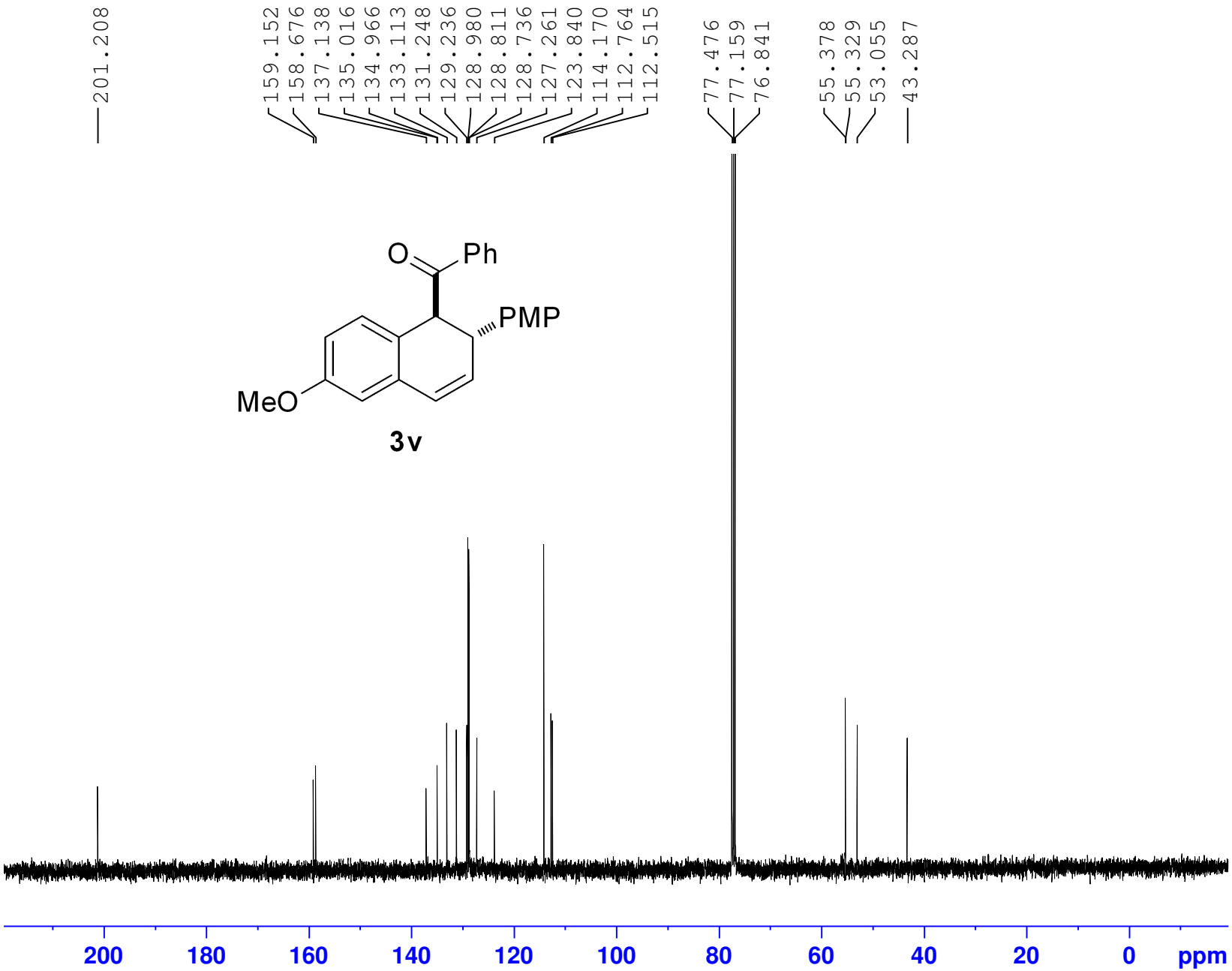


Current Data Parameters
NAME qh-7116
EXPNO 1
PROCNO 1

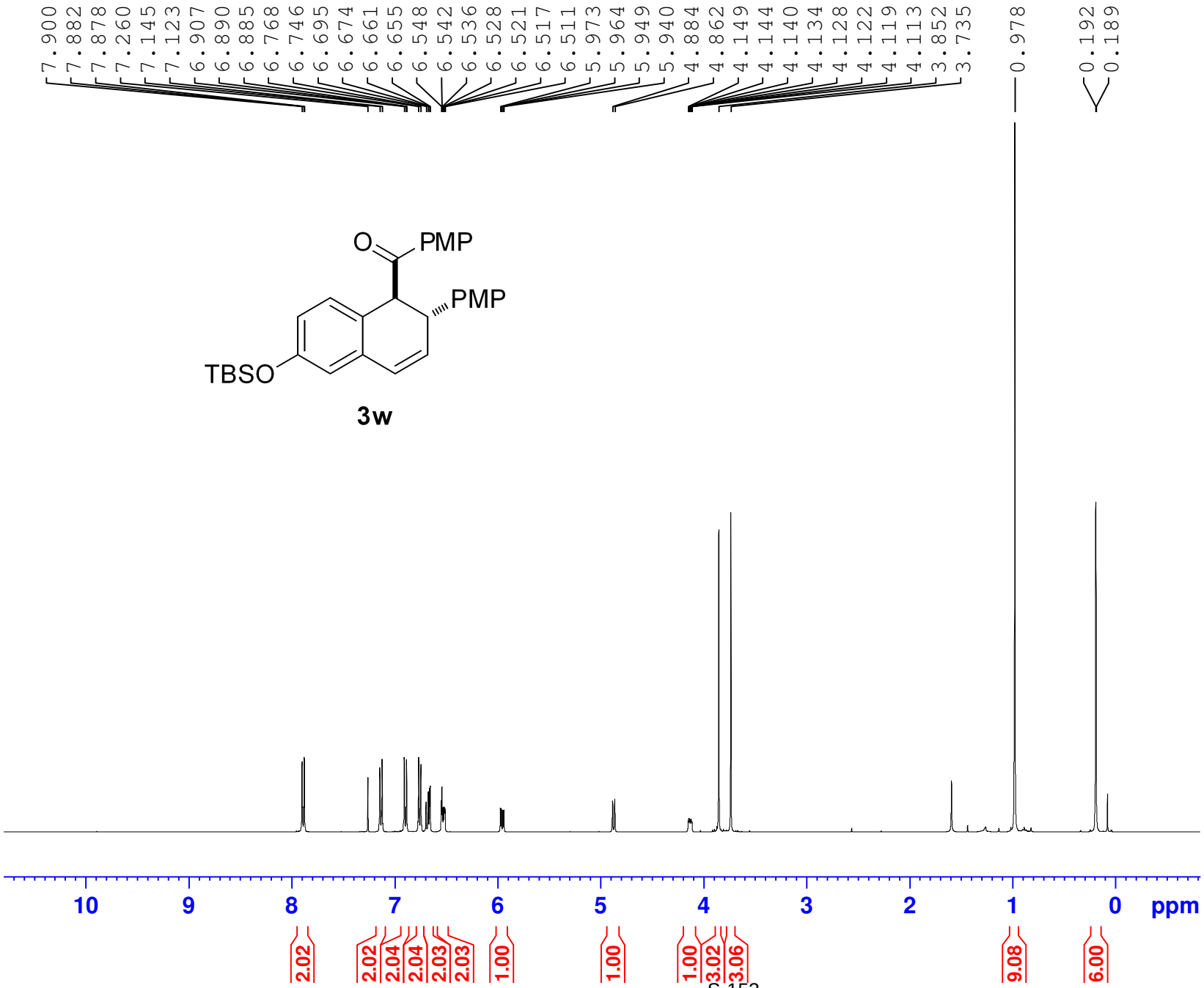
F2 - Acquisition Parameters
Date_ 20140303
Time 13.24
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 3
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 82.92
DW 62.400 usec
DE 6.50 usec
TE 296.0 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

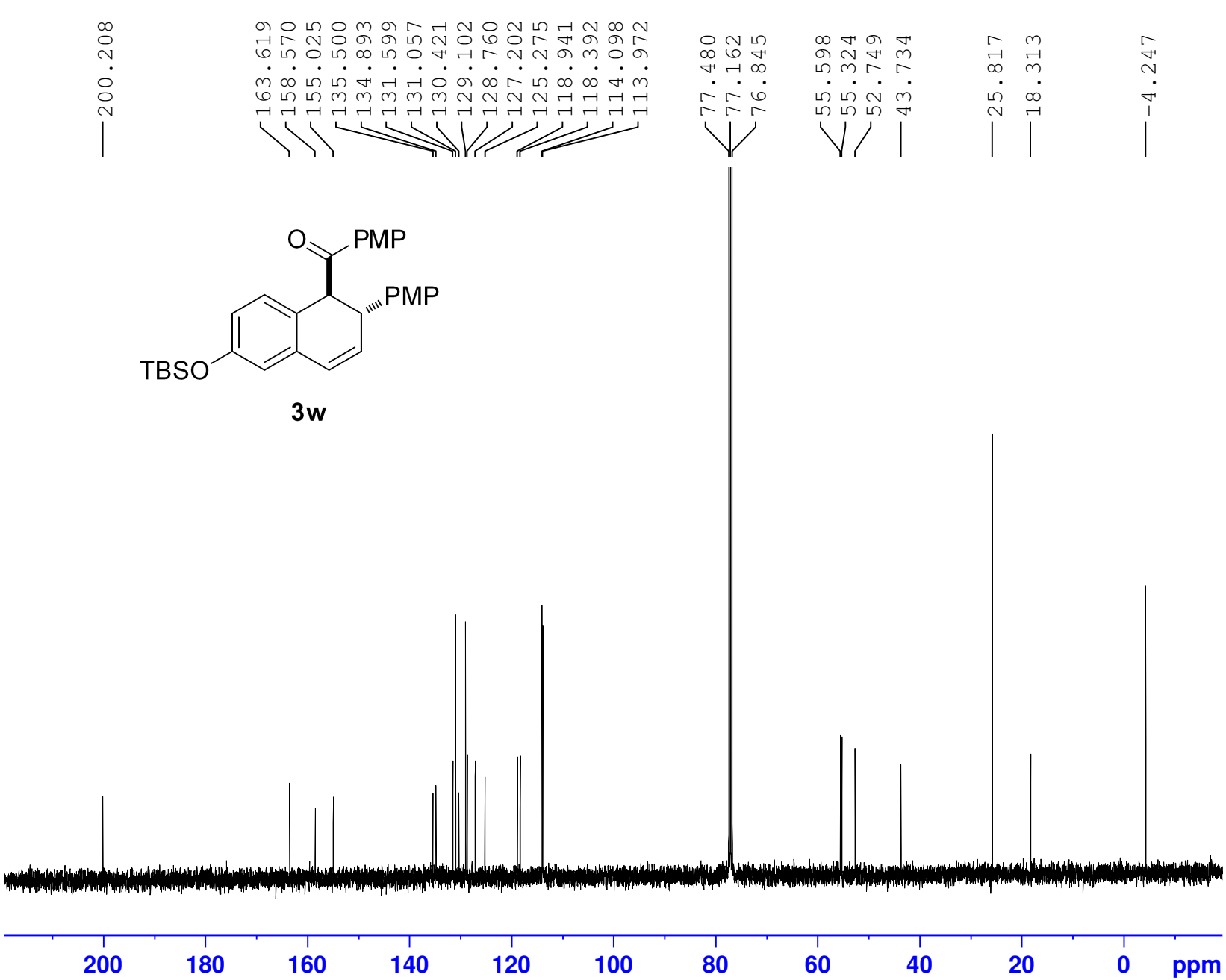
F2 - Processing parameters
SI 65536
SF 400.1300096 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



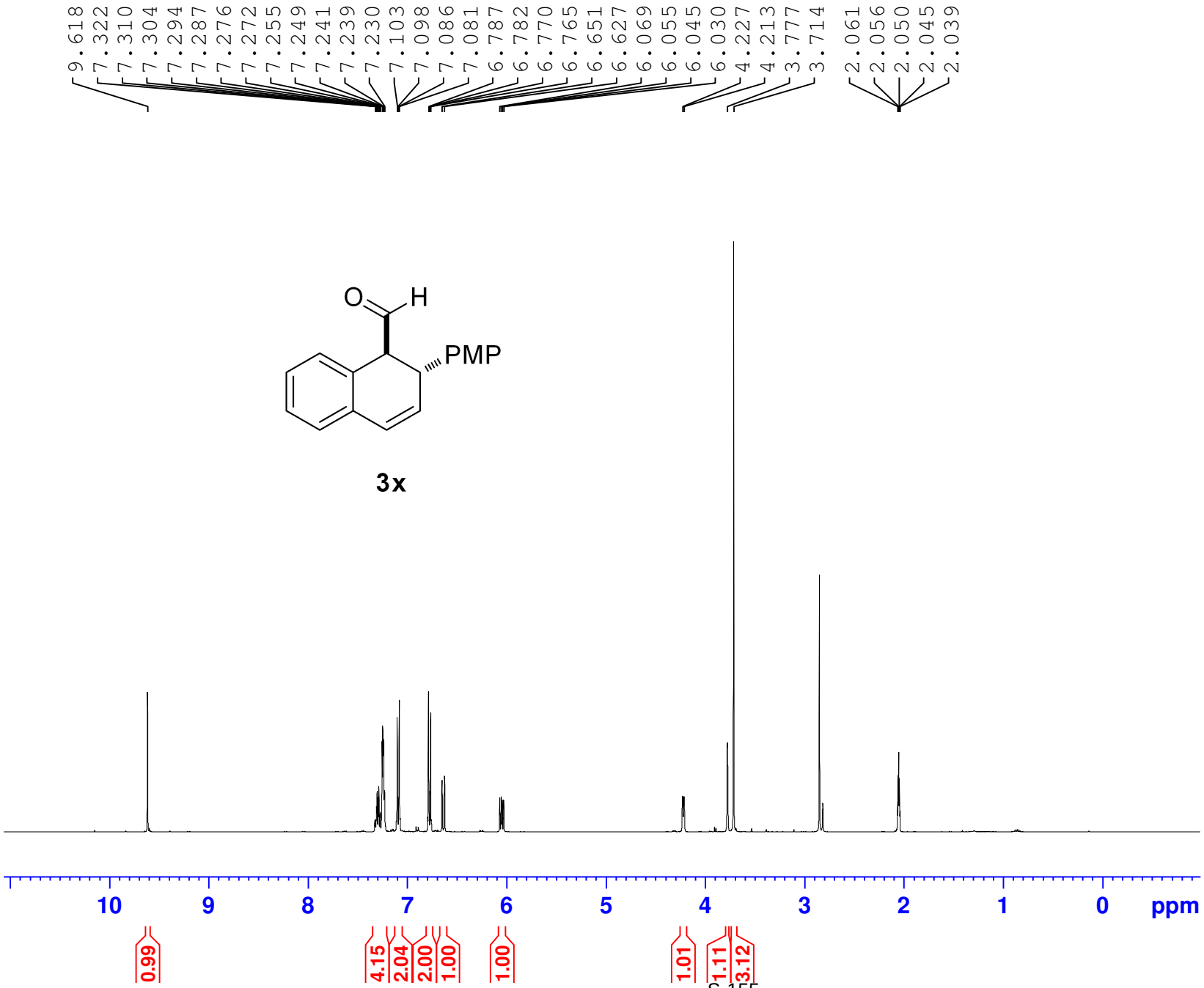

```
Current Data Parameters
NAME                qh-7116
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140303
Time                  13.27
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      110
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127582 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



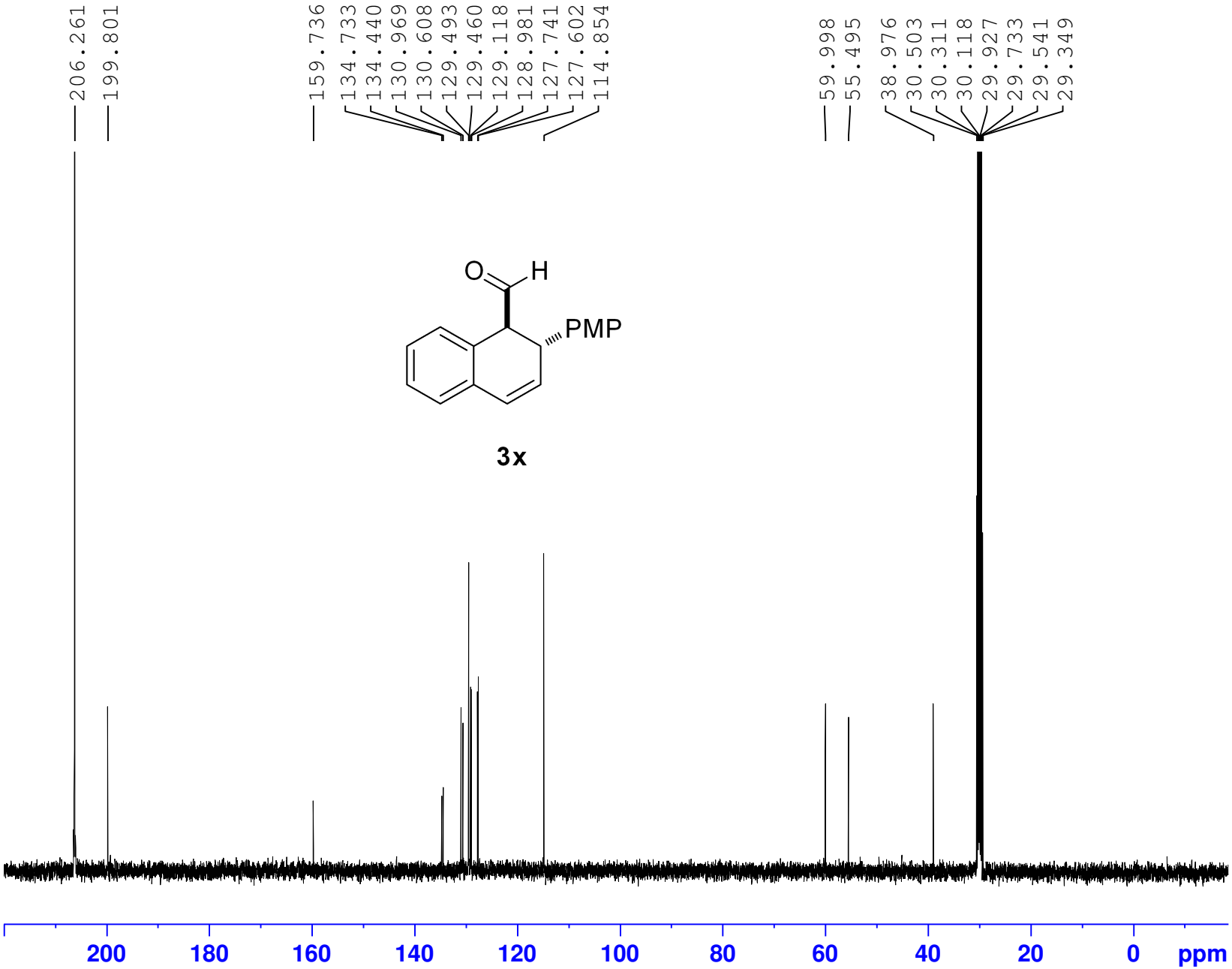

```
Current Data Parameters
NAME                 qh-8021
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140403
Time                    9.53
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         3
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     82.92
DW                    62.400 usec
DE                     6.50 usec
TE                    296.9 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300095 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



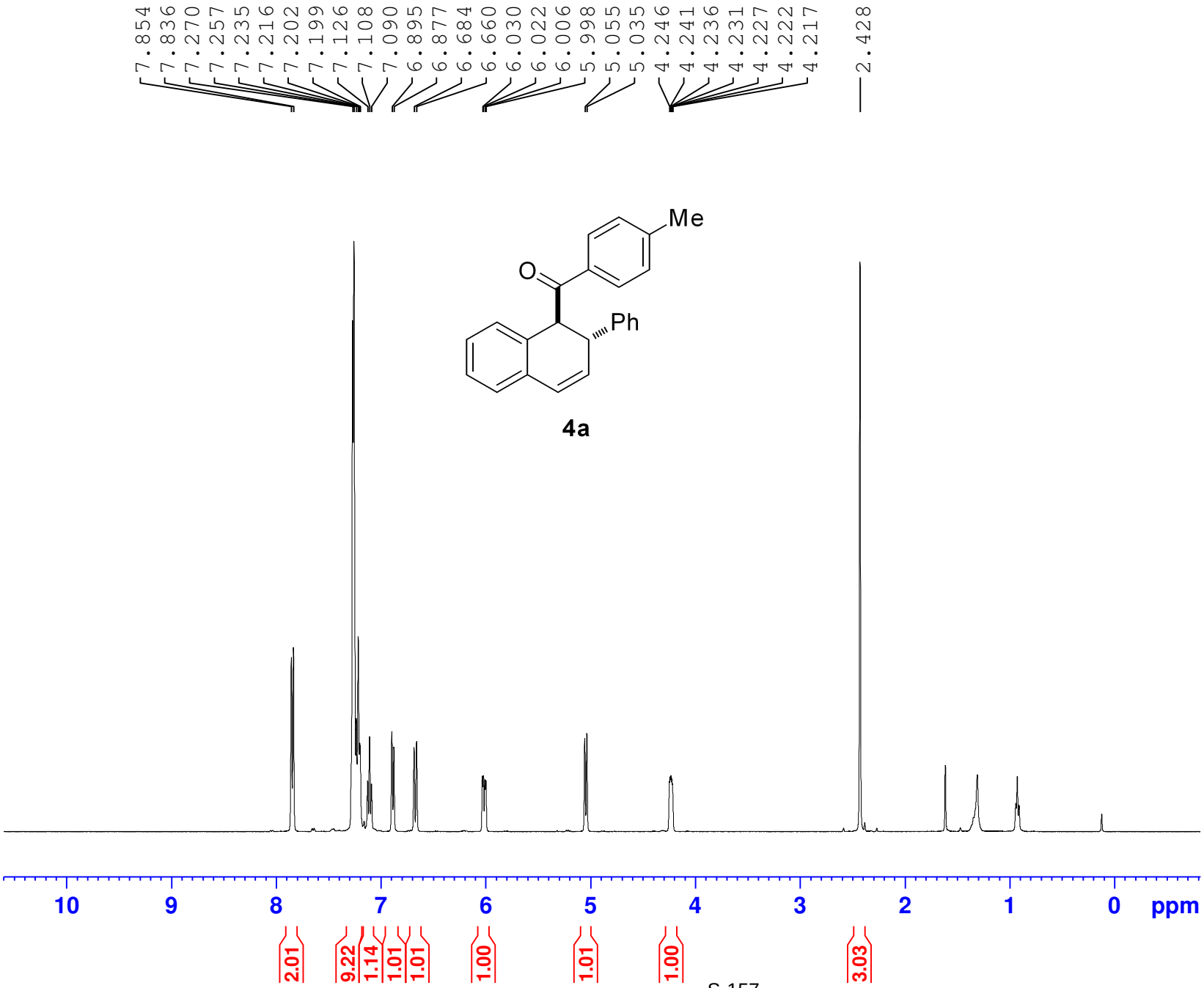

```
Current Data Parameters
NAME                qh-8021
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140403
Time                    9.56
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG               zgpg30
TD                     65536
SOLVENT                CDCl3
NS                       160
DS                         2
SWH                24038.461 Hz
FIDRES              0.366798 Hz
AQ                 1.3631488 sec
RG                    196.92
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             100.6228298 MHz
NUC1                      13C
P1                     9.60 usec
PLW1             31.98900032 W

======== CHANNEL f2 ========
SFO2             400.1316005 MHz
NUC2                       1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2              9.10000038 W
PLW12             0.24608000 W
PLW13             0.19933000 W

F2 - Processing parameters
SI                     32768
SF               100.6127561 MHz
WDW                       EM
SSB          0
LB                     1.00 Hz
GB           0
PC                     1.40
```



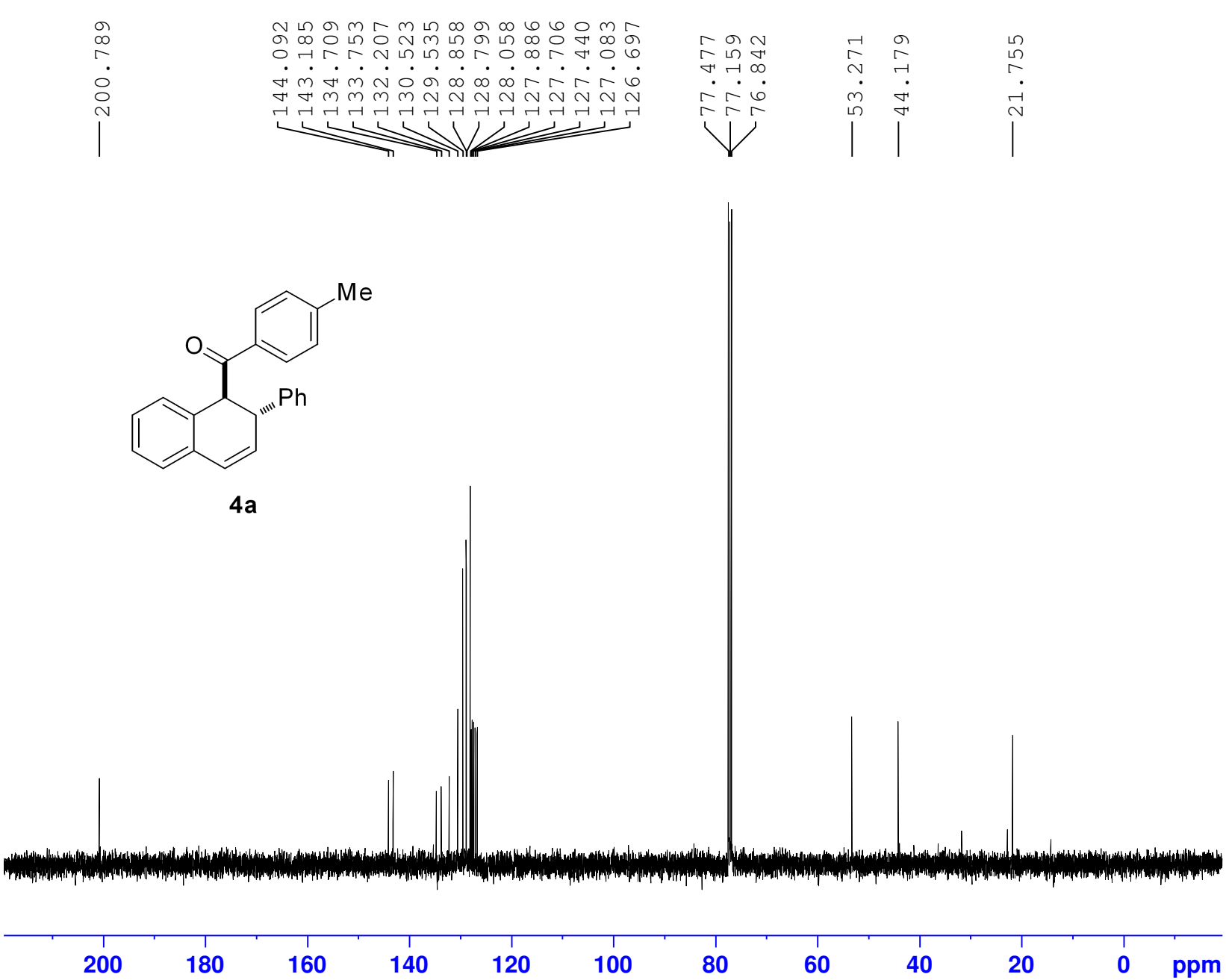

```
Current Data Parameters
NAME            qh-11050
EXPNO                  3
PROCNO                 1

F2 - Acquisition Parameters
Date_           20141126
Time               16.59
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG             zg30
TD                 65536
SOLVENT          Acetone
NS                     3
DS                     0
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ            4.0894465 sec
RG               112.31
DW               62.400 usec
DE                6.50 usec
TE                295.7 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                  1H
P1                14.30 usec
PLW1          9.10000038 W

F2 - Processing parameters
SI                 65536
SF          400.1300068 MHz
WDW                   EM
SSB       0
LB                 0.30 Hz
GB        0
PC                 1.00
```



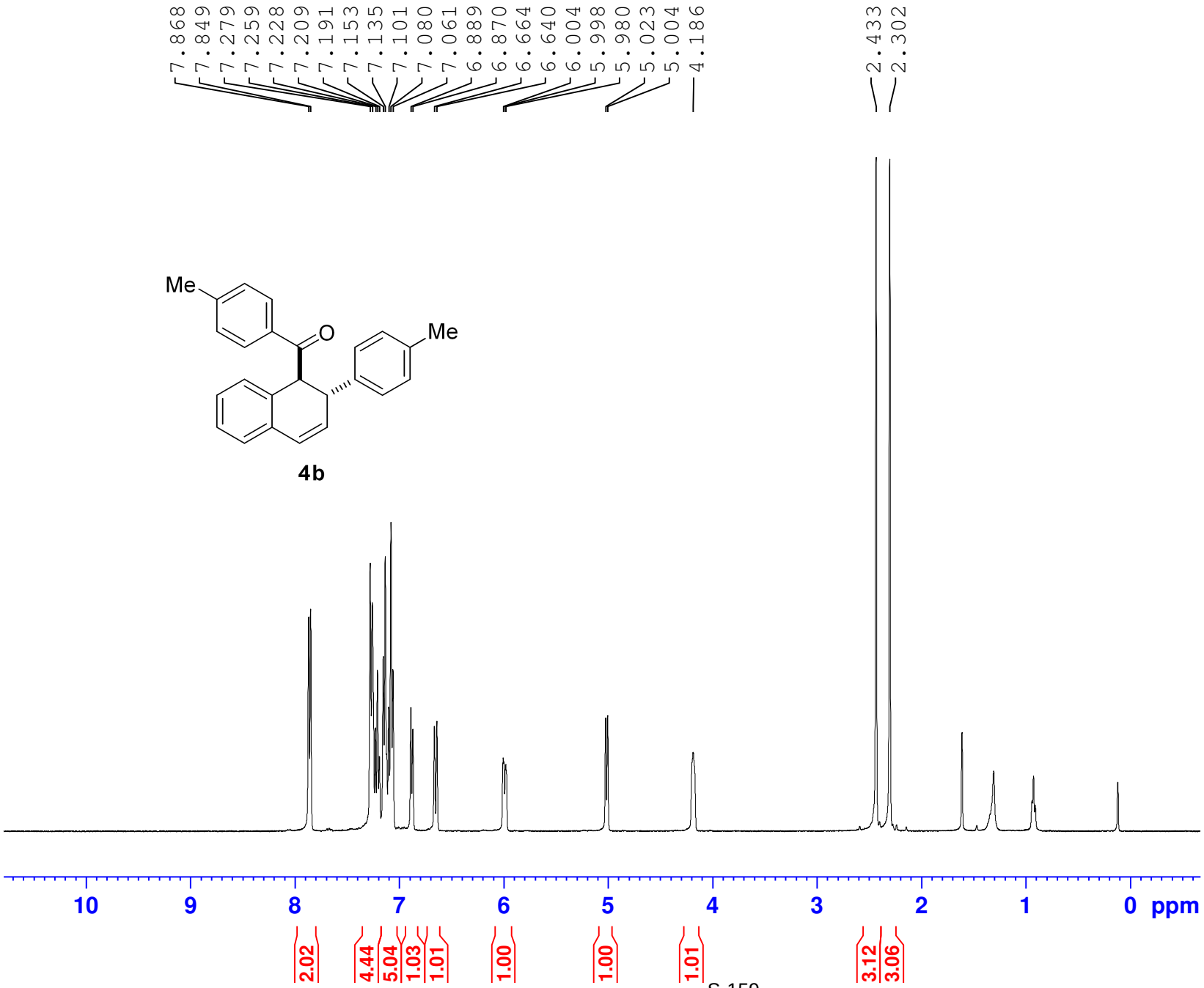

```
Current Data Parameters
NAME            qh-11050
EXPNO                  4
PROCNO                 1

F2 - Acquisition Parameters
Date_           20141126
Time               17.04
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT          Acetone
NS                   128
DS                     2
SWH            24038.461 Hz
FIDRES          0.366798 Hz
AQ             1.3631488 sec
RG                196.92
DW                20.800 usec
DE                  6.50 usec
TE                 296.4 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         100.6228298 MHz
NUC1                  13C
P1                  9.60 usec
PLW1         31.98900032 W

======== CHANNEL f2 ========
SFO2         400.1316005 MHz
NUC2                   1H
CPDPRG[2         waltz16
PCPD2              90.00 usec
PLW2          9.10000038 W
PLW12         0.24608000 W
PLW13         0.19933000 W

F2 - Processing parameters
SI                 32768
SF           100.6126717 MHz
WDW                   EM
SSB       0
LB                  1.00 Hz
GB        0
PC                  1.40
```



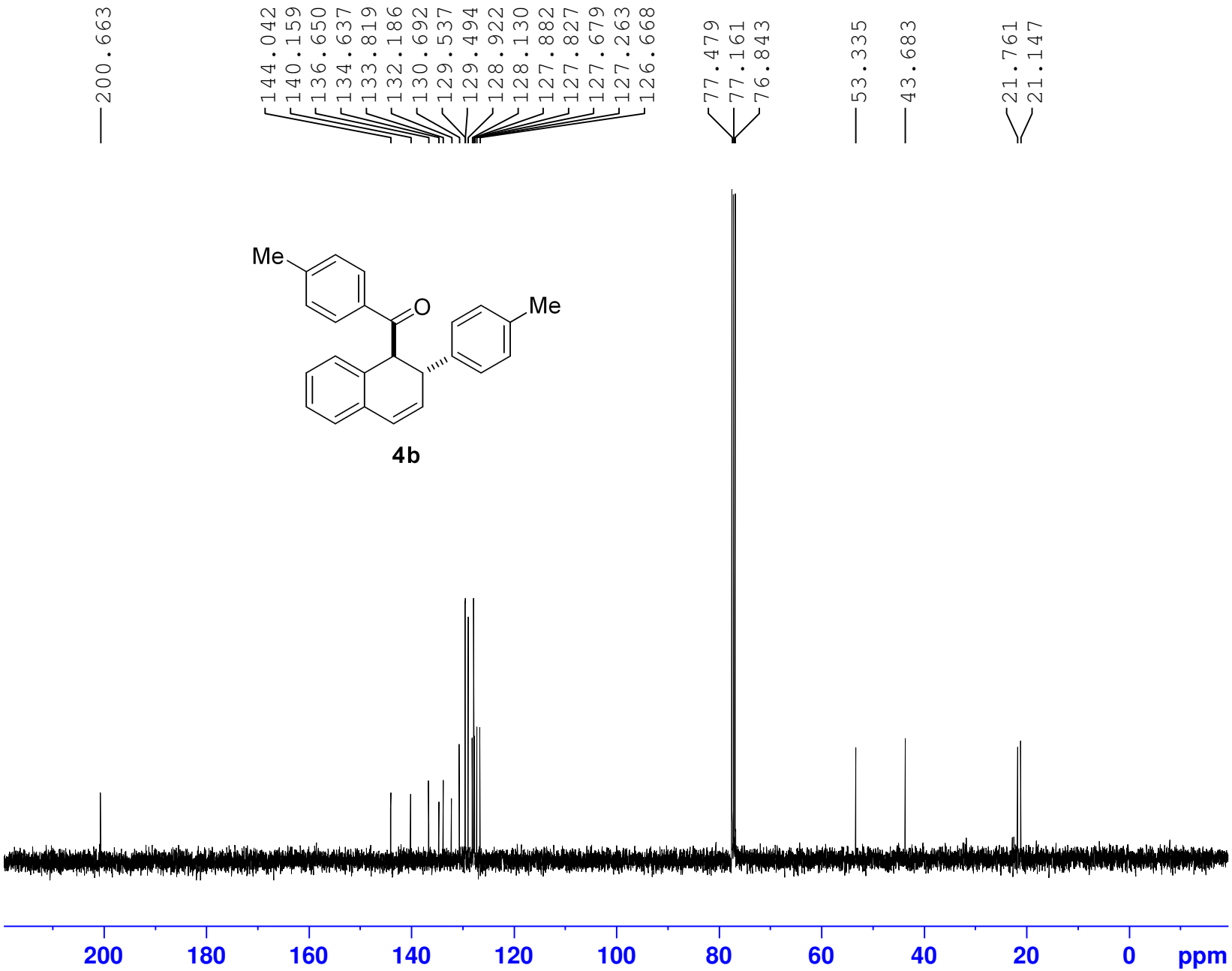

```
Current Data Parameters
NAME                 qh-7190
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140324
Time                   22.08
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     70.97
DW                    62.400 usec
DE                     6.50 usec
TE                    296.5 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300000 MHz
WDW                        EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



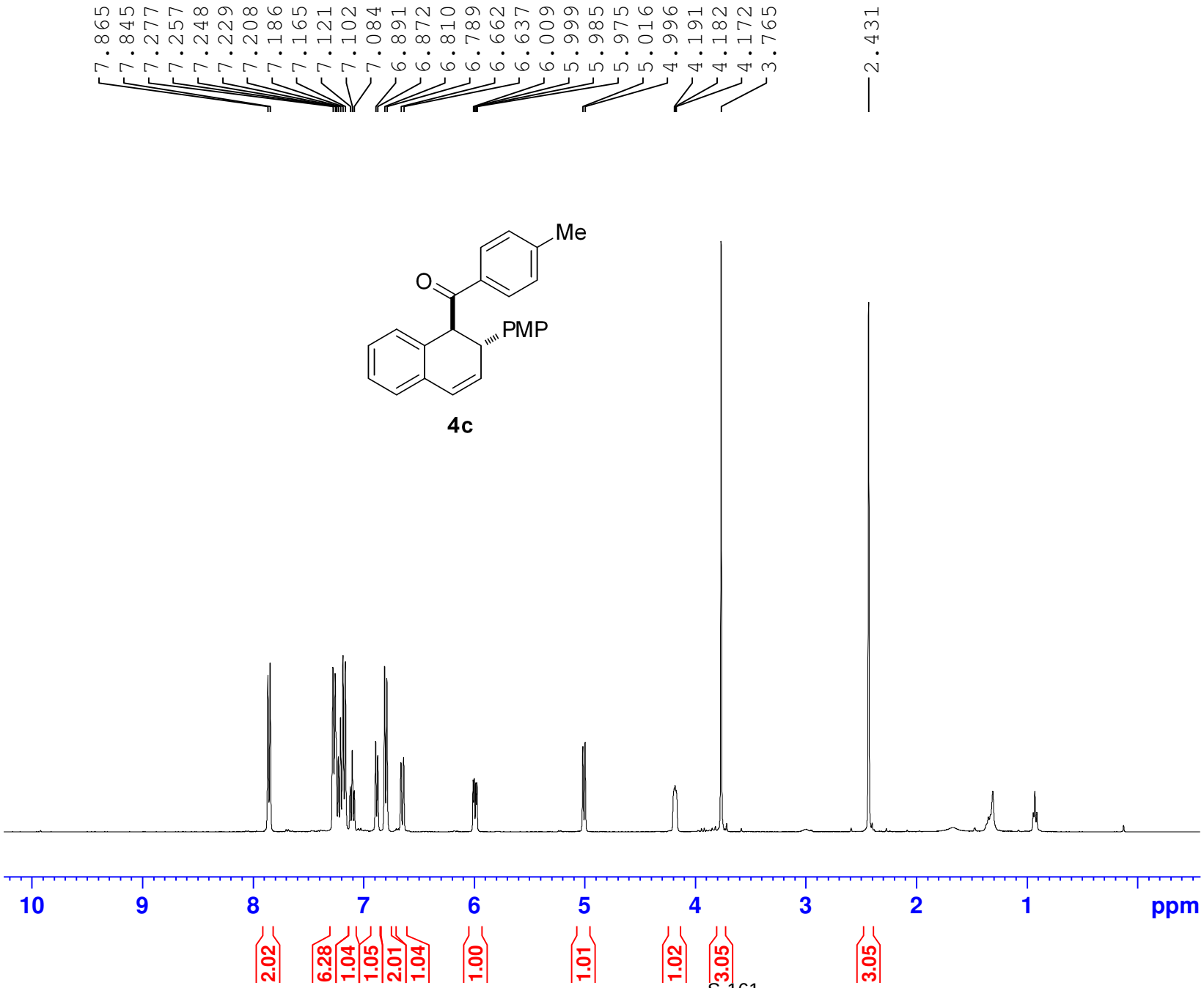

```
Current Data Parameters
NAME                qh-7190
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140324
Time                  22.10
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       32
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127593 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



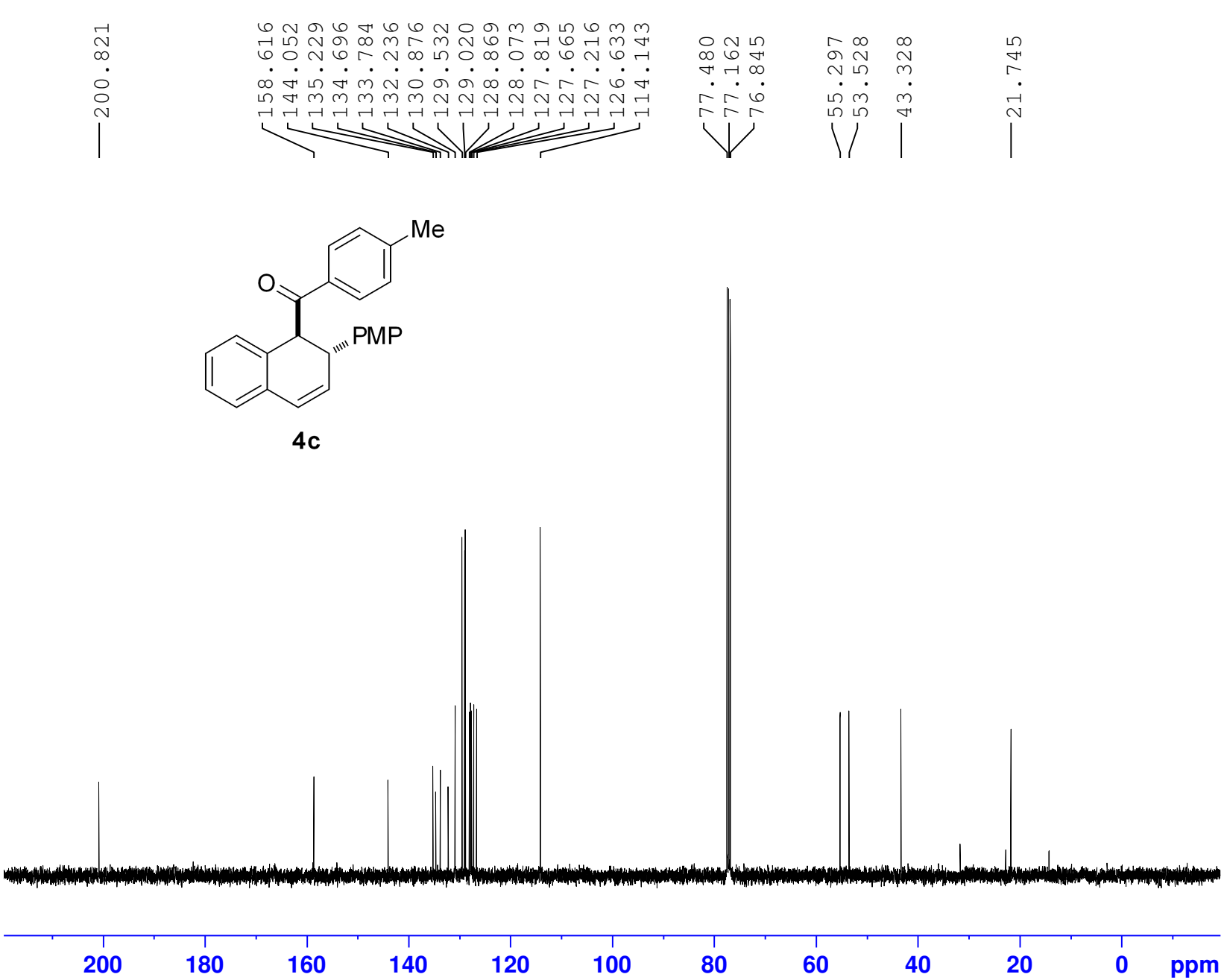

```
Current Data Parameters
NAME            qh-7191
EXPNO                 1
PROCNO                1

F2 - Acquisition Parameters
Date_          20140324
Time              22.13
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zg30
TD                65536
SOLVENT           CDCl3
NS                    1
DS                    0
SWH            8012.820 Hz
FIDRES         0.122266 Hz
AQ           4.0894465 sec
RG               70.97
DW               62.400 usec
DE                6.50 usec
TE               296.7 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1324710 MHz
NUC1                 1H
P1               14.30 usec
PLW1         9.10000038 W

F2 - Processing parameters
SI                65536
SF          400.1300000 MHz
WDW                  EM
SSB      0
LB                0.30 Hz
GB       0
PC                1.00
```



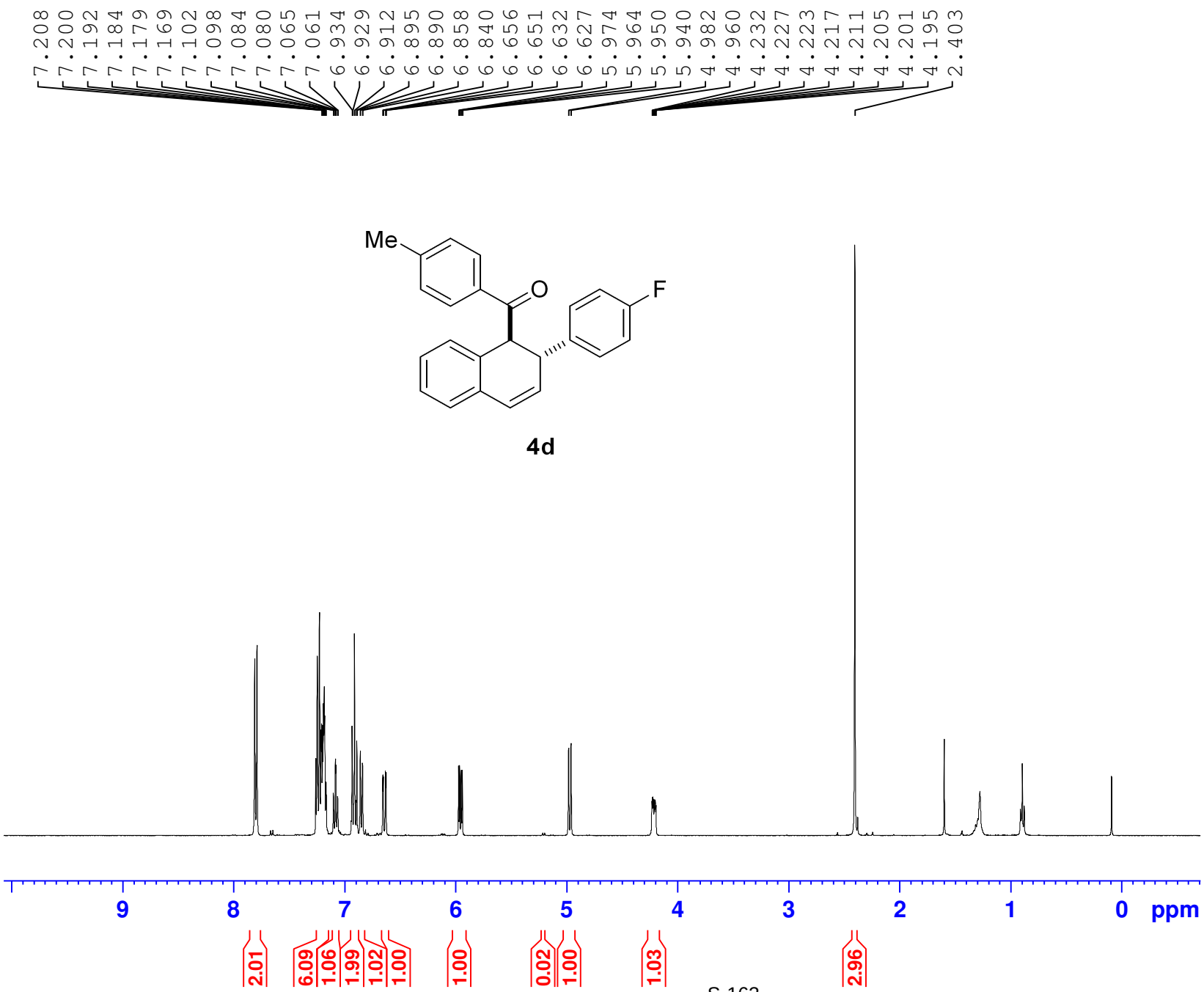

```
Current Data Parameters
NAME                qh-7191
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140324
Time                  22.16
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       48
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    297.3 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127584 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



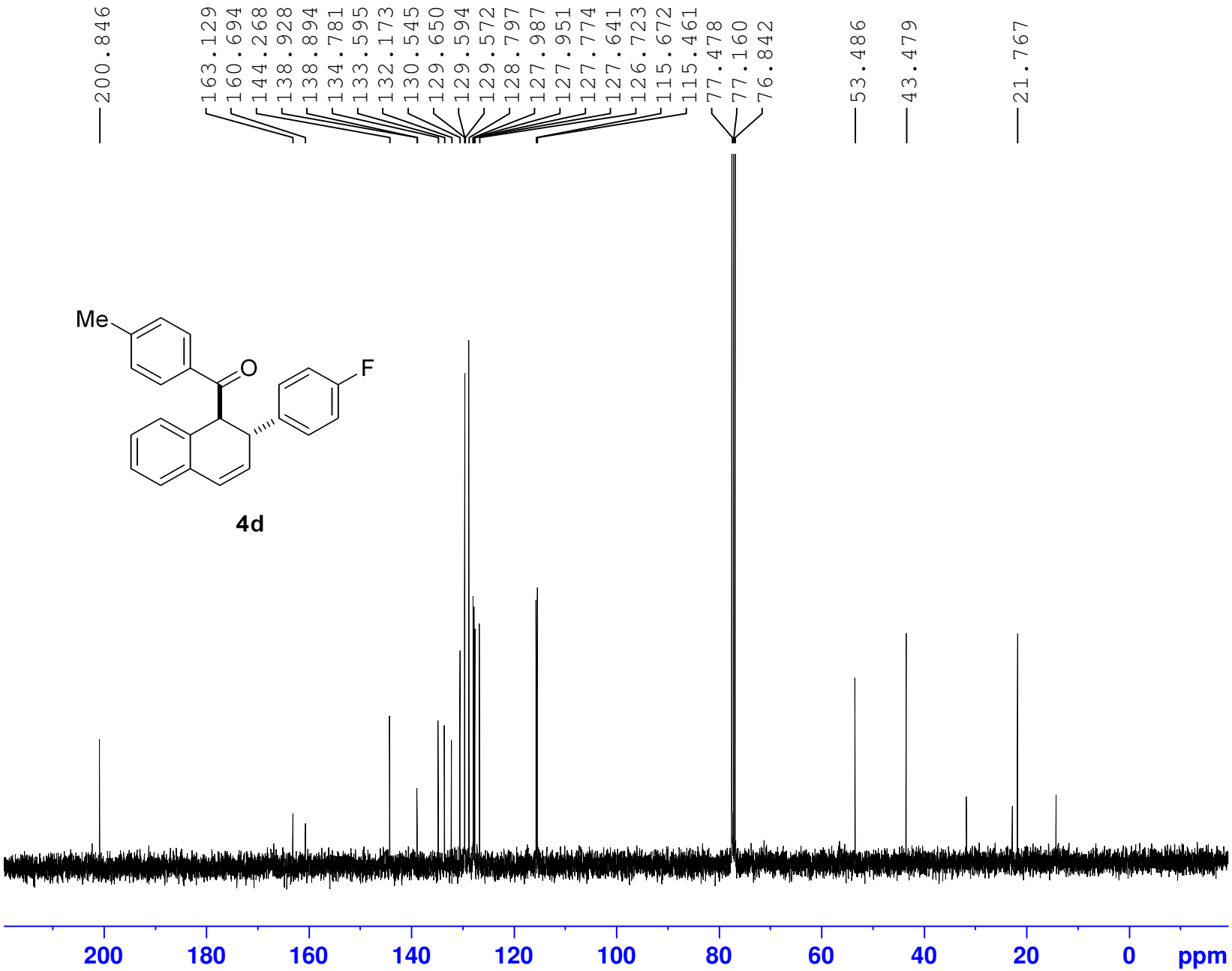

```
Current Data Parameters
NAME                qh-7092
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140224
Time                   22.44
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     49.32
DW                    62.400 usec
DE                     6.50 usec
TE                    296.4 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300000 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



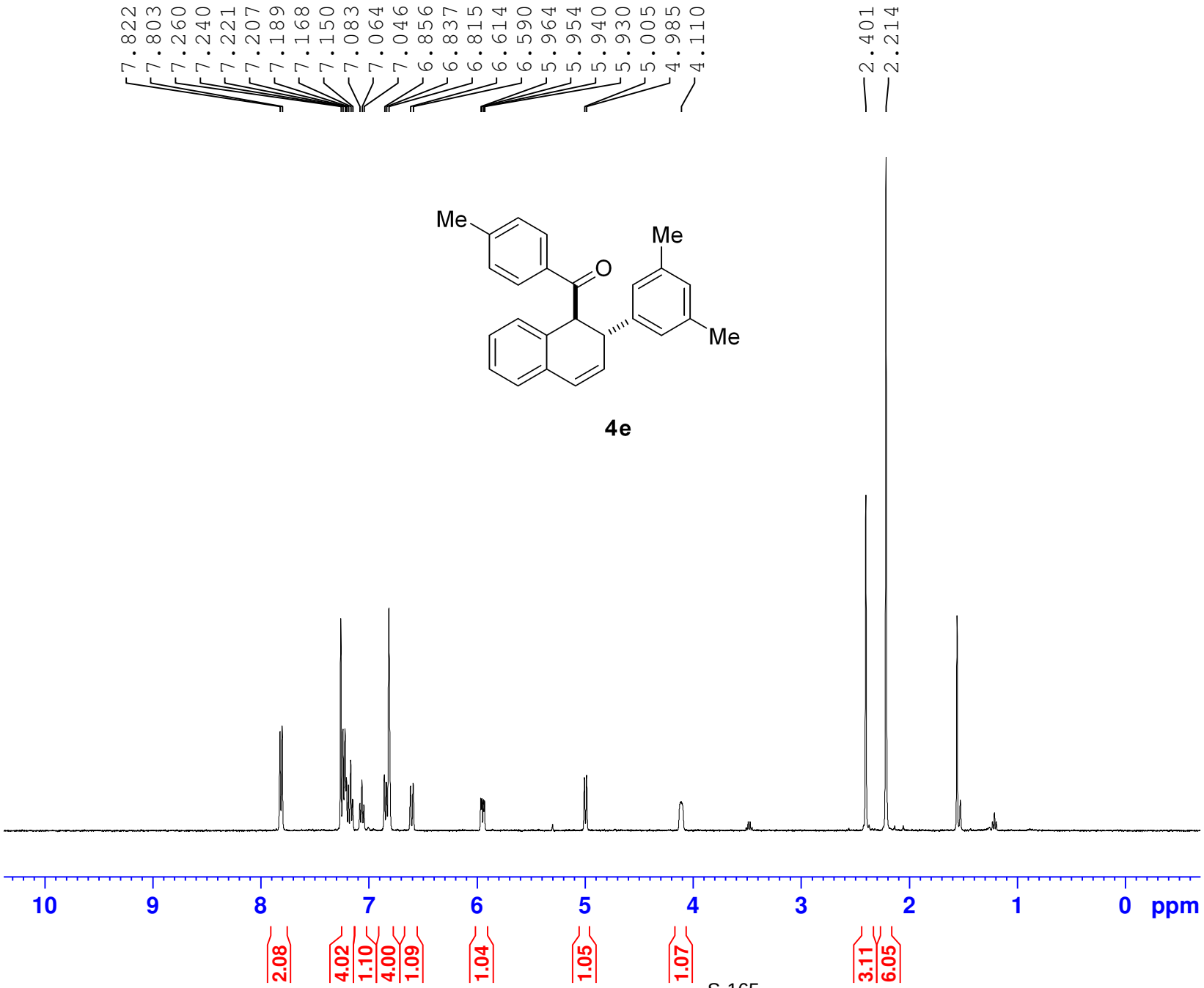

```
Current Data Parameters
NAME                qh-7092
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140224
Time                  22.47
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       58
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    297.2 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127605 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



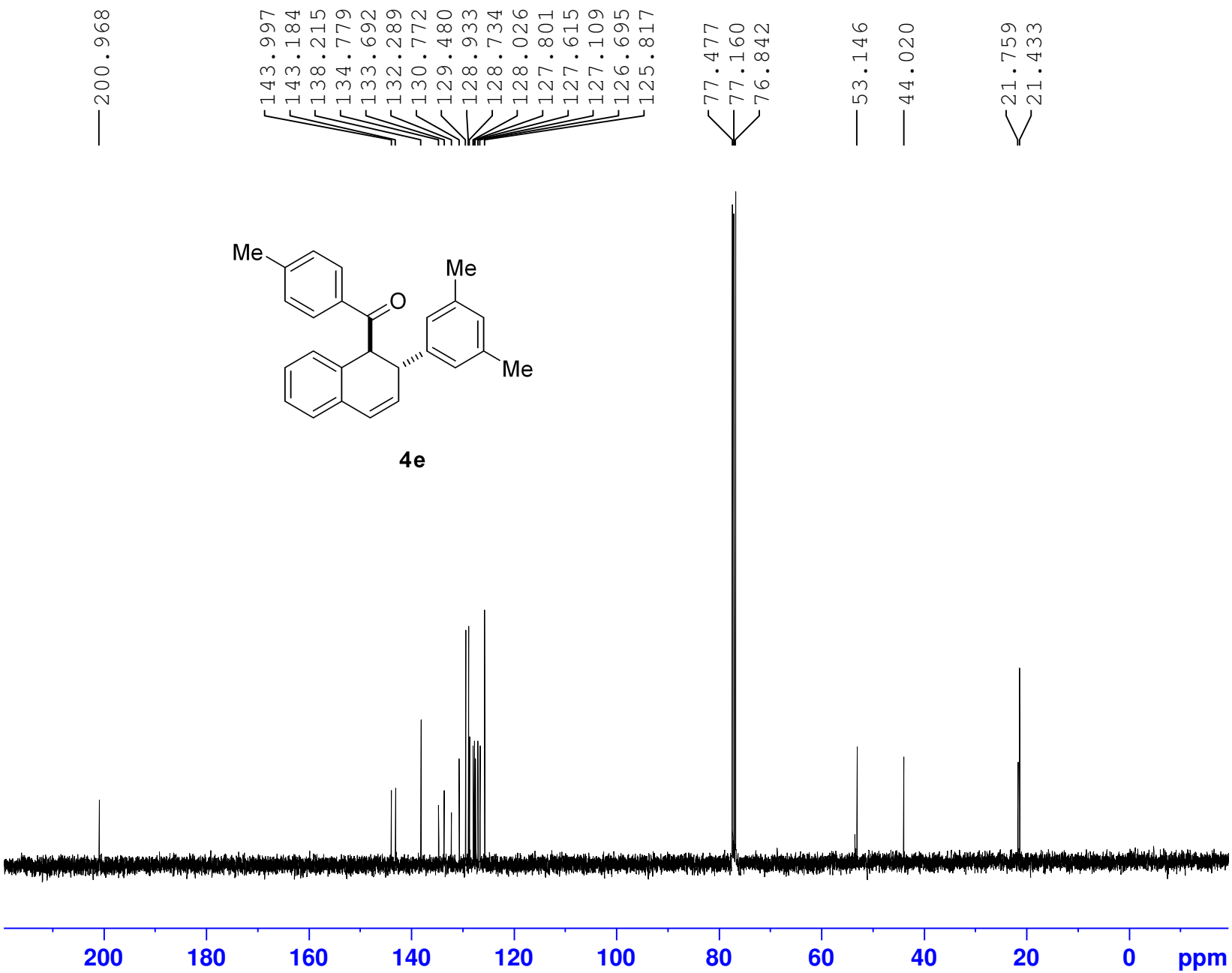

```
Current Data Parameters
NAME                qh-7198
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140326
Time                  16.47
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        1
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    70.97
DW                   62.400 usec
DE                    6.50 usec
TE                   295.6 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                   14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                    65536
SF              400.1300096 MHz
WDW                       EM
SSB        0
LB                    0.30 Hz
GB         0
PC                    1.00
```



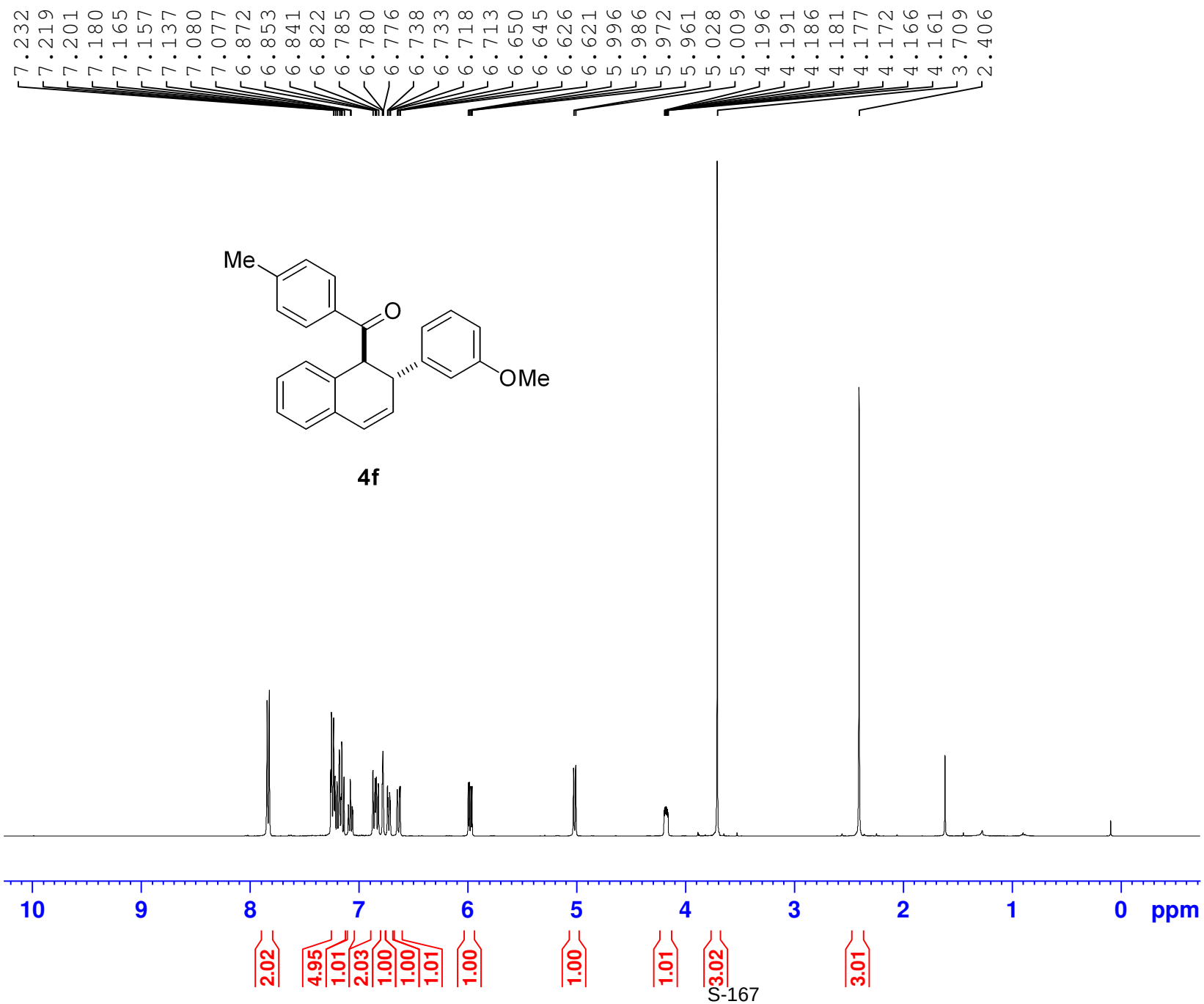

```
Current Data Parameters
NAME                qh-7198
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140326
Time                  16.49
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       78
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.2 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127584 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



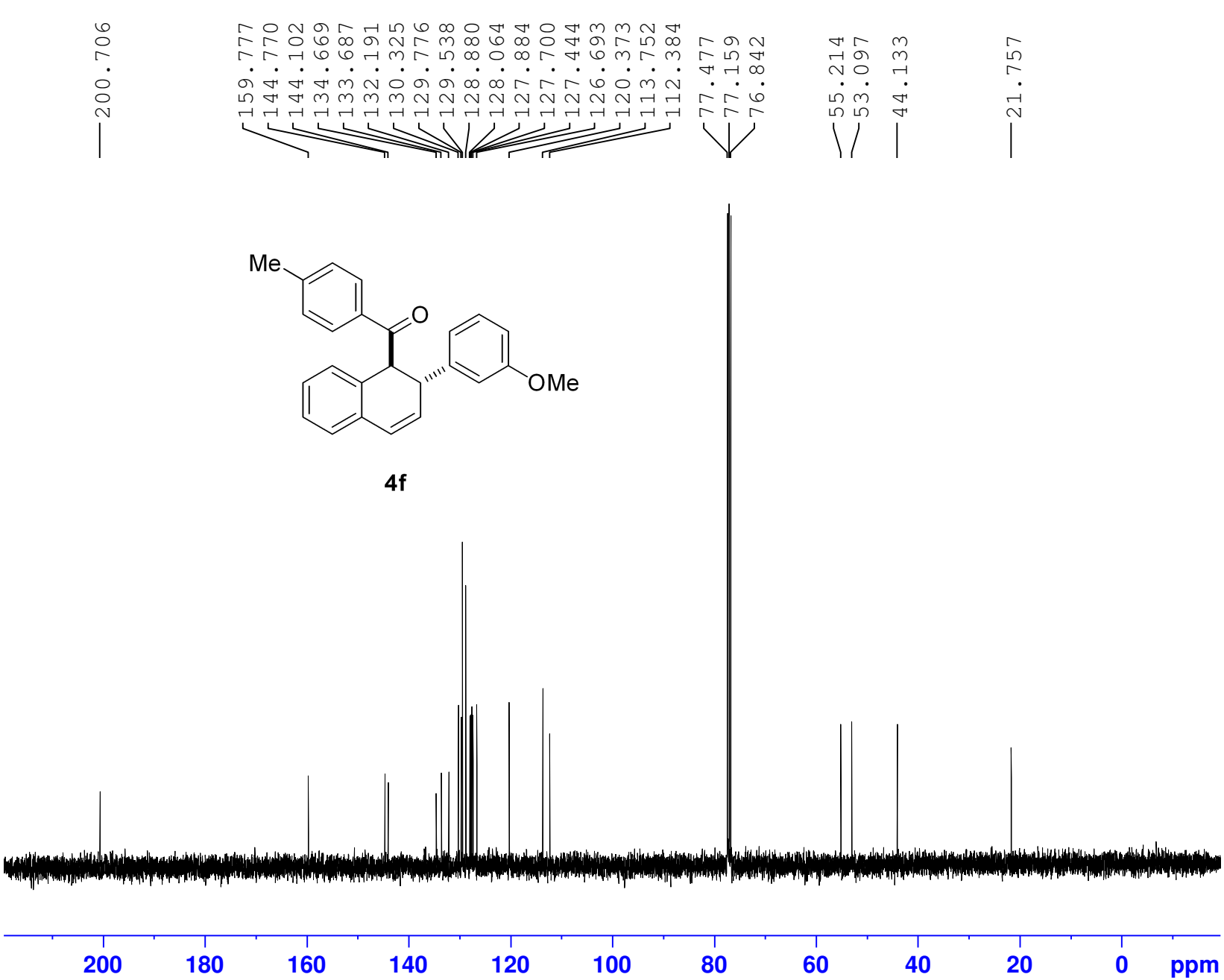

```
Current Data Parameters
NAME                qh-8004
EXPNO                     3
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140328
Time                  14.06
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        3
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                   187.77
DW                   62.400 usec
DE                    6.50 usec
TE                   295.6 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                   14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                    65536
SF              400.1300095 MHz
WDW                      EM
SSB        0
LB                    0.30 Hz
GB         0
PC                    1.00
```



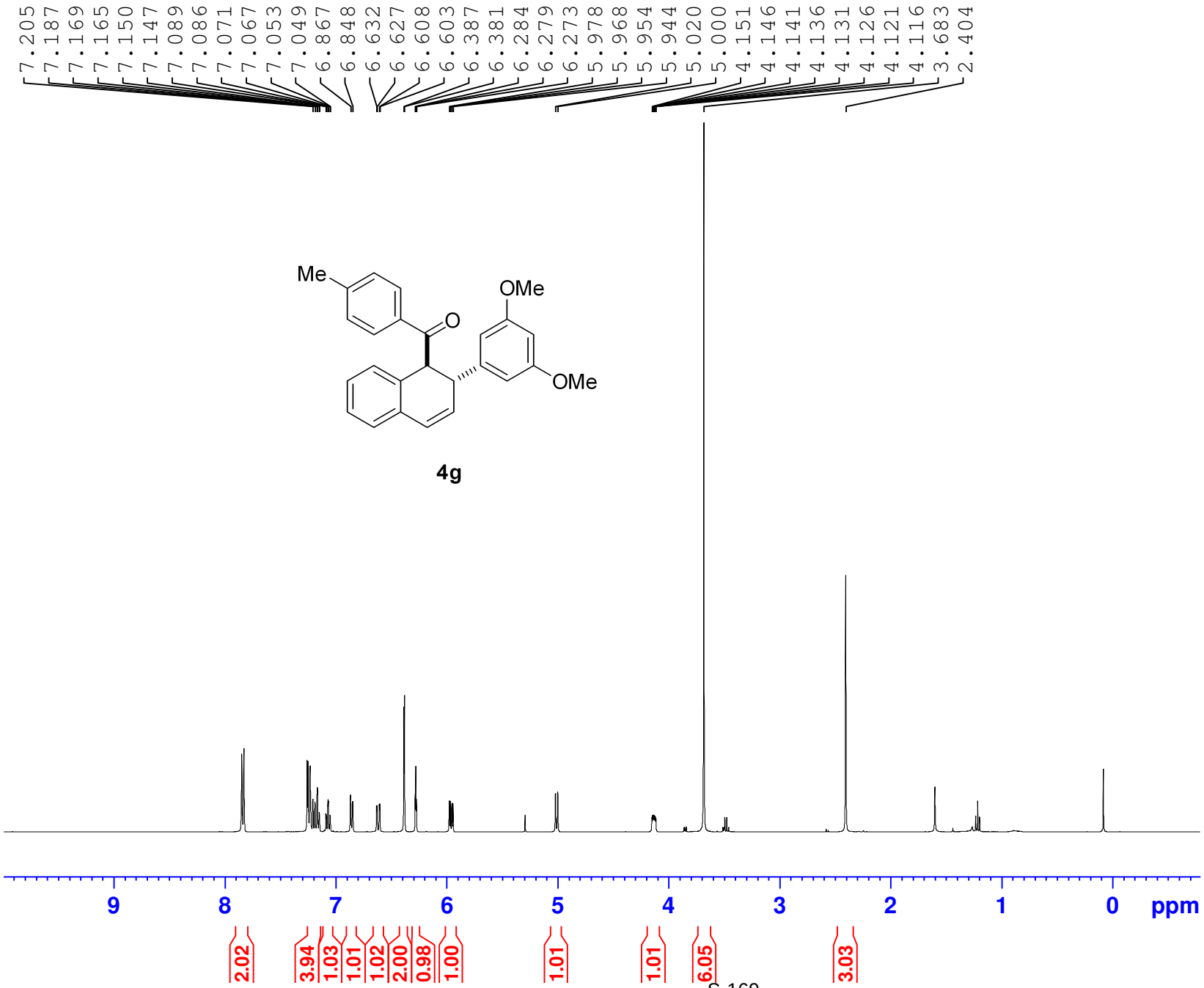

```
Current Data Parameters
NAME                qh-8004
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140328
Time                  12.39
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       68
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.2 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127587 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



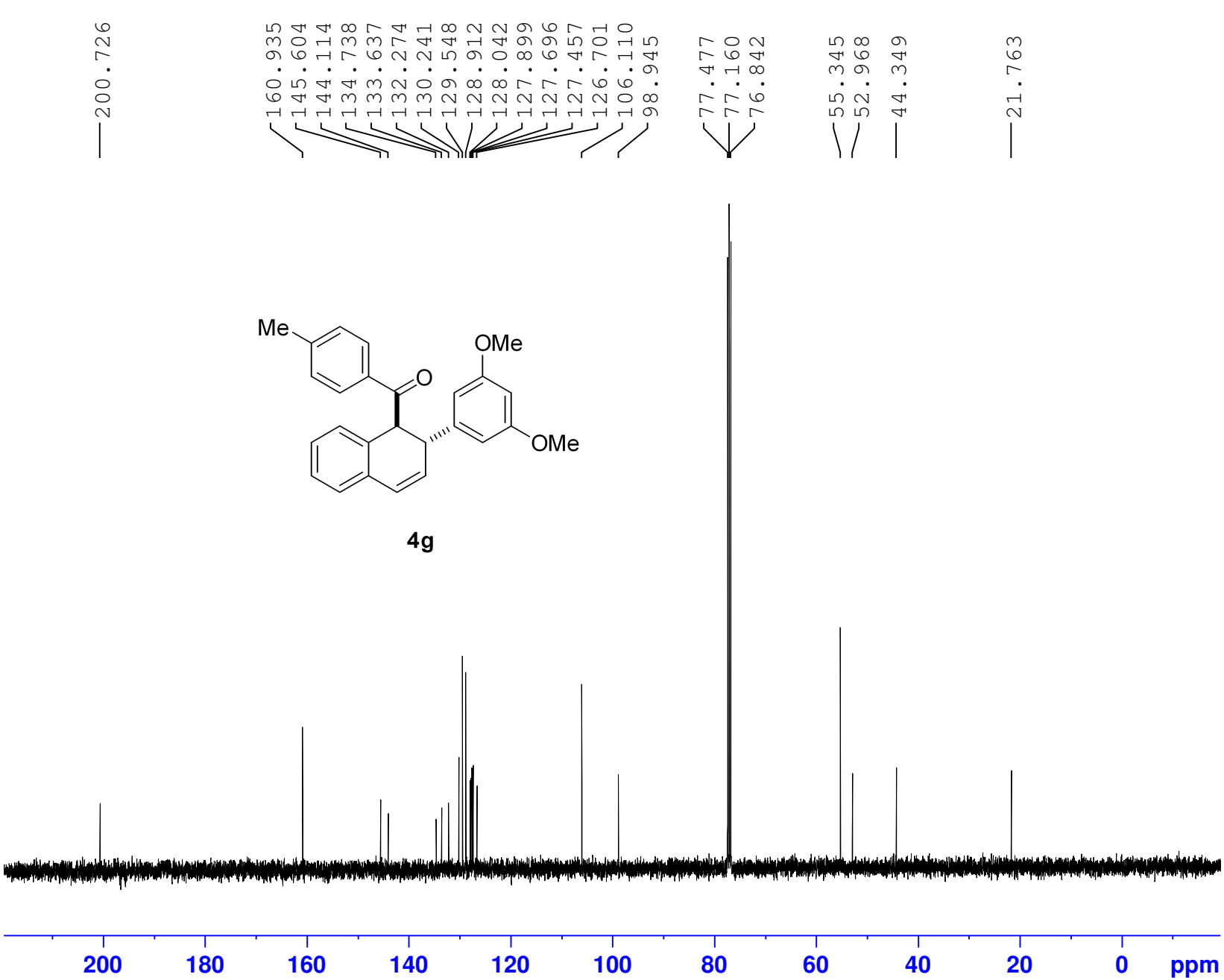

```
Current Data Parameters
NAME                qh-8005
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140328
Time                  20.46
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG                zg30
TD                    65536
SOLVENT               CDCl3
NS                        1
DS                        0
SWH                8012.820 Hz
FIDRES             0.122266 Hz
AQ                4.0894465 sec
RG                    62.93
DW                   62.400 usec
DE                    6.50 usec
TE                   295.8 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                    65536
SF              400.1300095 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```



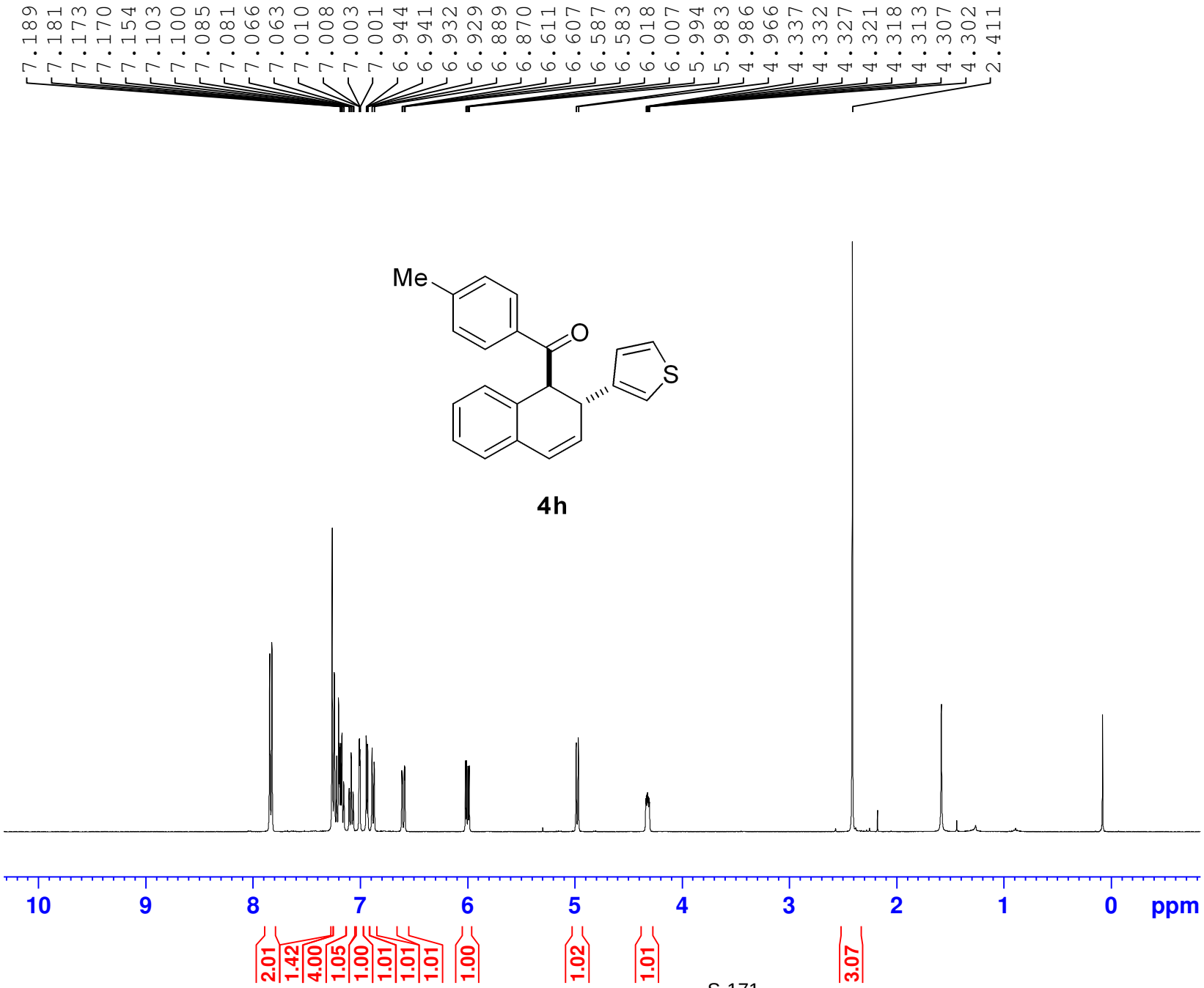

```
Current Data Parameters
NAME                qh-8005
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140328
Time                  20.49
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       29
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    296.2 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127600 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```




```
Current Data Parameters
NAME                 qh-8003
EXPNO                      1
PROCNO                     1

F2 - Acquisition Parameters
Date_               20140327
Time                   23.21
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                         2
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     82.92
DW                    62.400 usec
DE                     6.50 usec
TE                     297.0 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                       1H
P1                     14.30 usec
PLW1              9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300096 MHz
WDW                        EM
SSB        0
LB                      0.30 Hz
GB         0
PC                      1.00
```




```
Current Data Parameters
NAME                qh-8003
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140327
Time                  23.23
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                       62
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127575 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

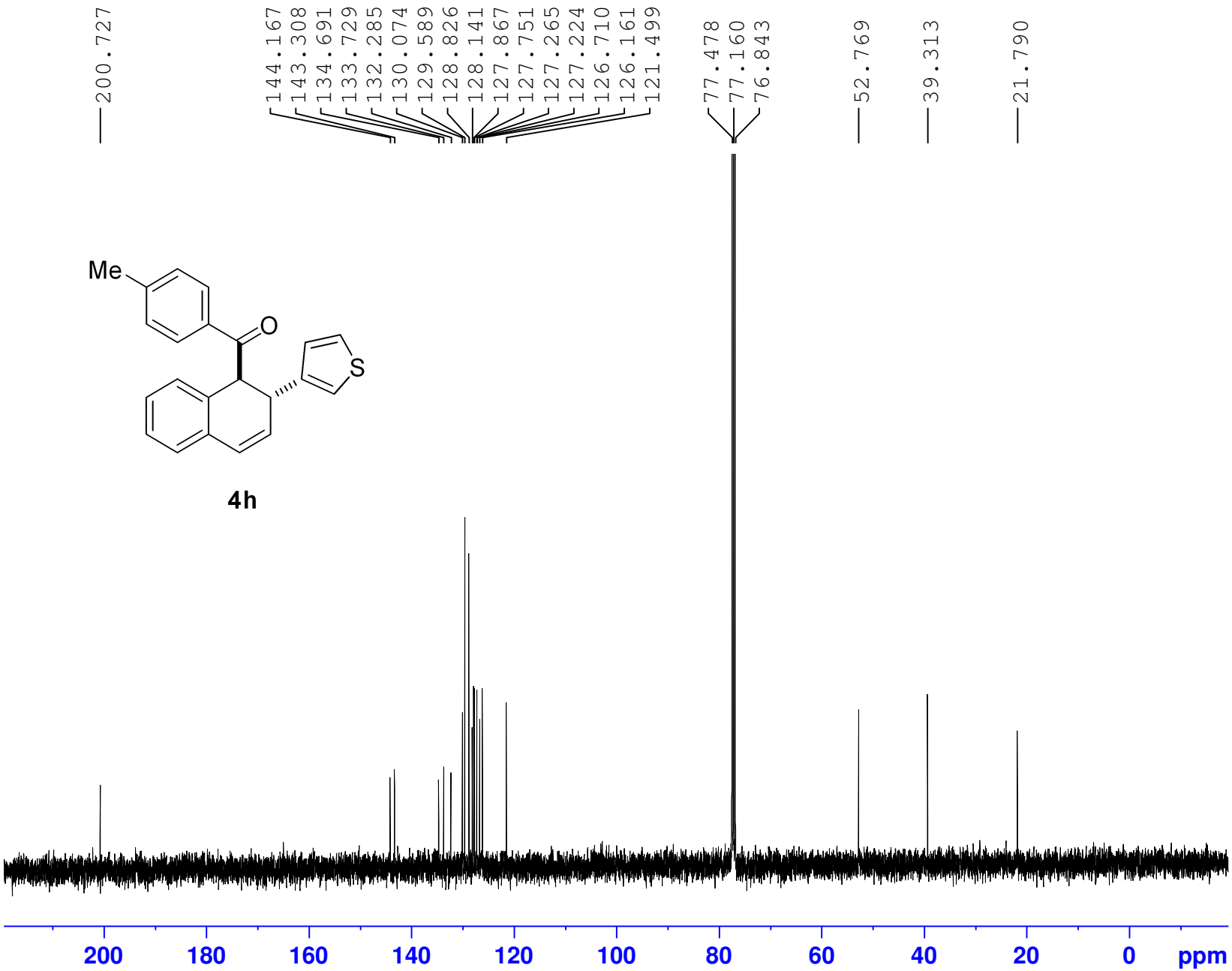


Current Data Parameters
NAME qh-8044
EXPNO 1
PROCNO 1

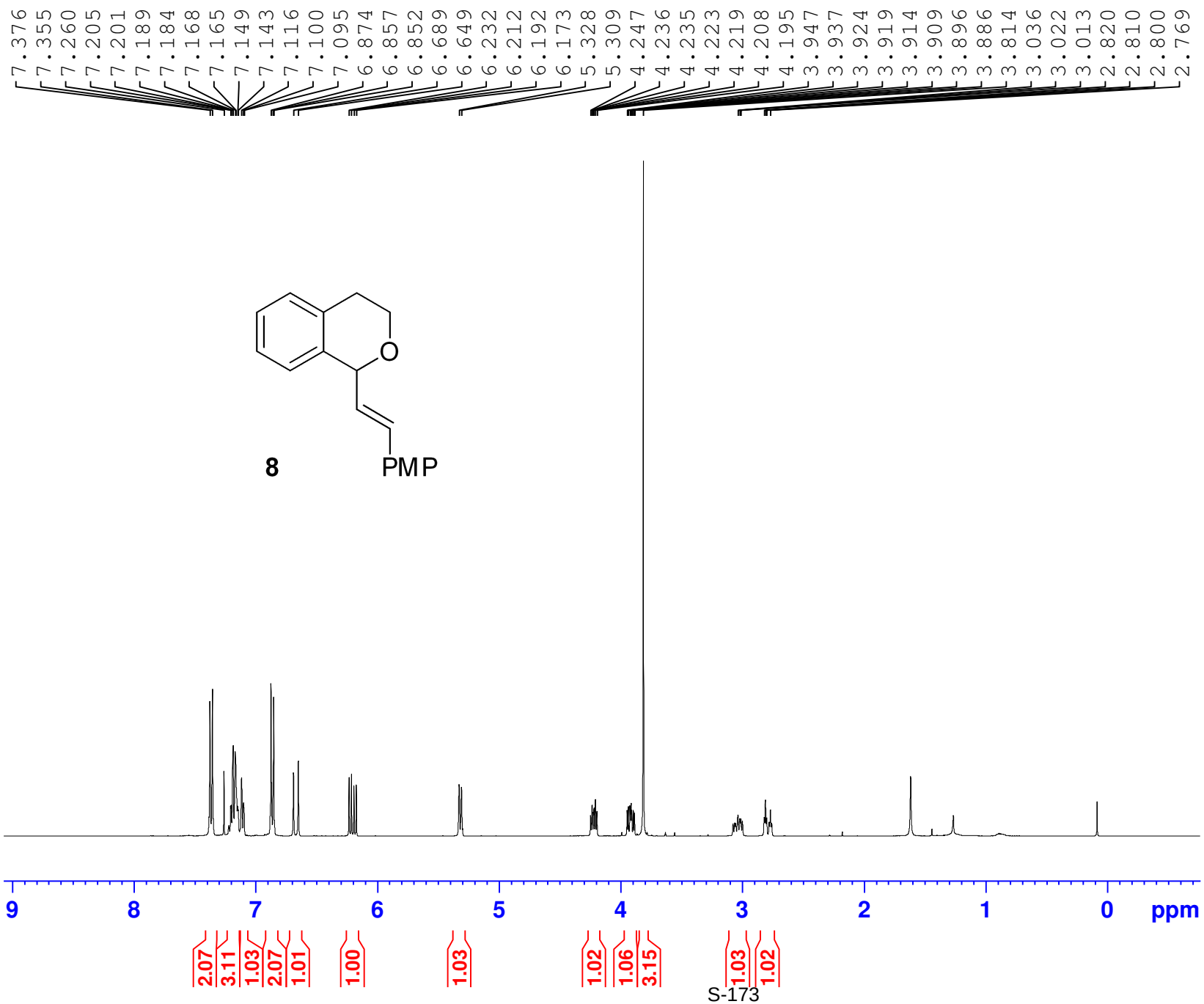
F2 - Acquisition Parameters
Date_ 20140422
Time 11.08
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 5
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 112.31
DW 62.400 usec
DE 6.50 usec
TE 295.0 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

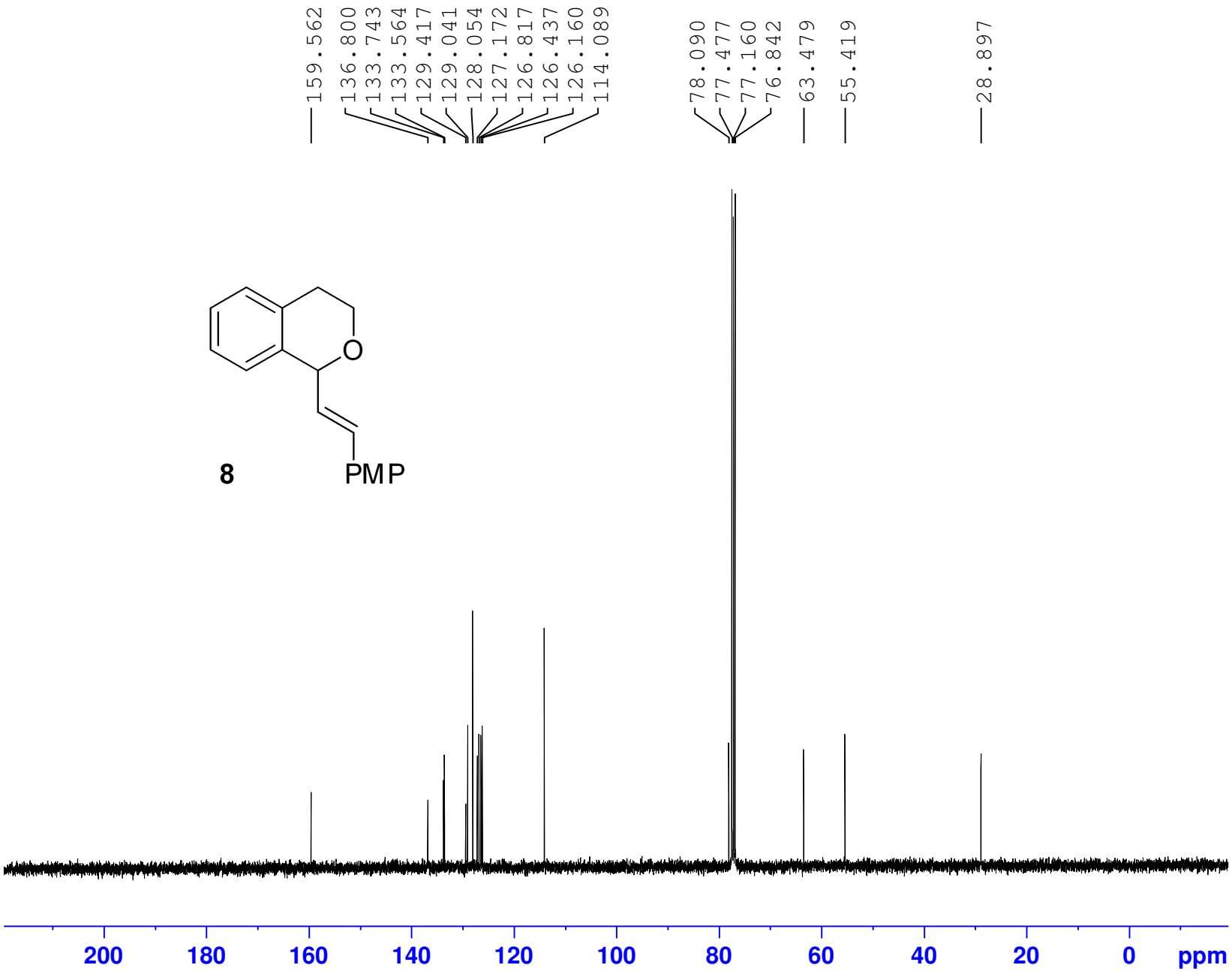
F2 - Processing parameters
SI 65536
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



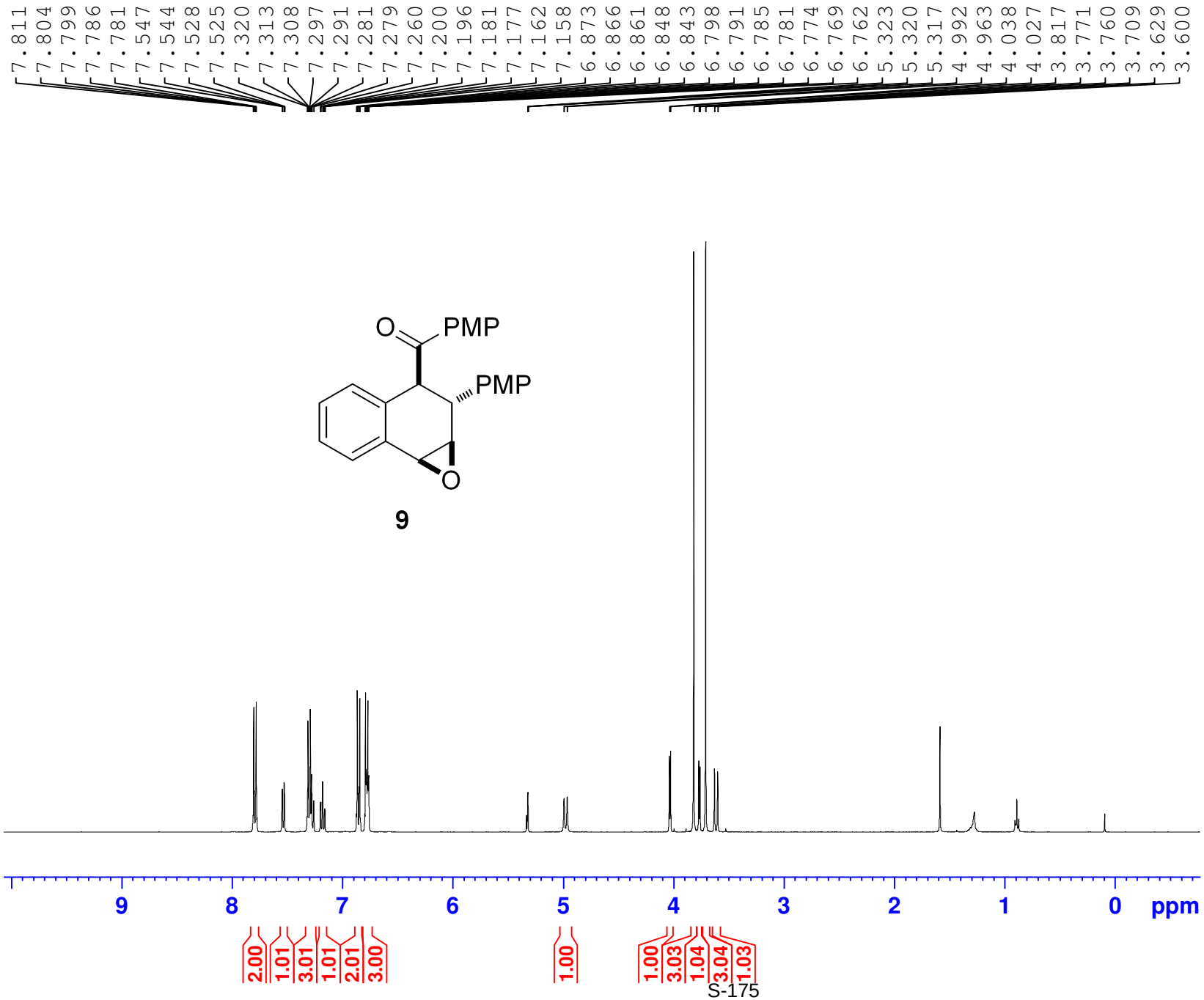

```
Current Data Parameters
NAME                qh-8044
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140422
Time                  11.12
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG              zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      120
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
DW                   20.800 usec
DE                     6.50 usec
TE                    295.7 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127572 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```




```
Current Data Parameters
NAME                qh-8093
EXPNO                     1
PROCNO                    1

F2 - Acquisition Parameters
Date_               20140509
Time                   10.19
INSTRUM                spect
PROBHD    5 mm DUL 13C-1
PULPROG                 zg30
TD                     65536
SOLVENT                CDCl3
NS                        10
DS                         0
SWH                 8012.820 Hz
FIDRES              0.122266 Hz
AQ                 4.0894465 sec
RG                     82.92
DW                    62.400 usec
DE                     6.50 usec
TE                    296.0 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1            400.1324710 MHz
NUC1                      1H
P1                    14.30 usec
PLW1             9.10000038 W

F2 - Processing parameters
SI                     65536
SF              400.1300097 MHz
WDW                       EM
SSB        0
LB                     0.30 Hz
GB         0
PC                     1.00
```




```
Current Data Parameters
NAME                qh-8093
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140509
Time                  10.26
INSTRUM               spect
PROBHD    5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT               CDCl3
NS                      121
DS                        2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                    13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                     1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127579 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```

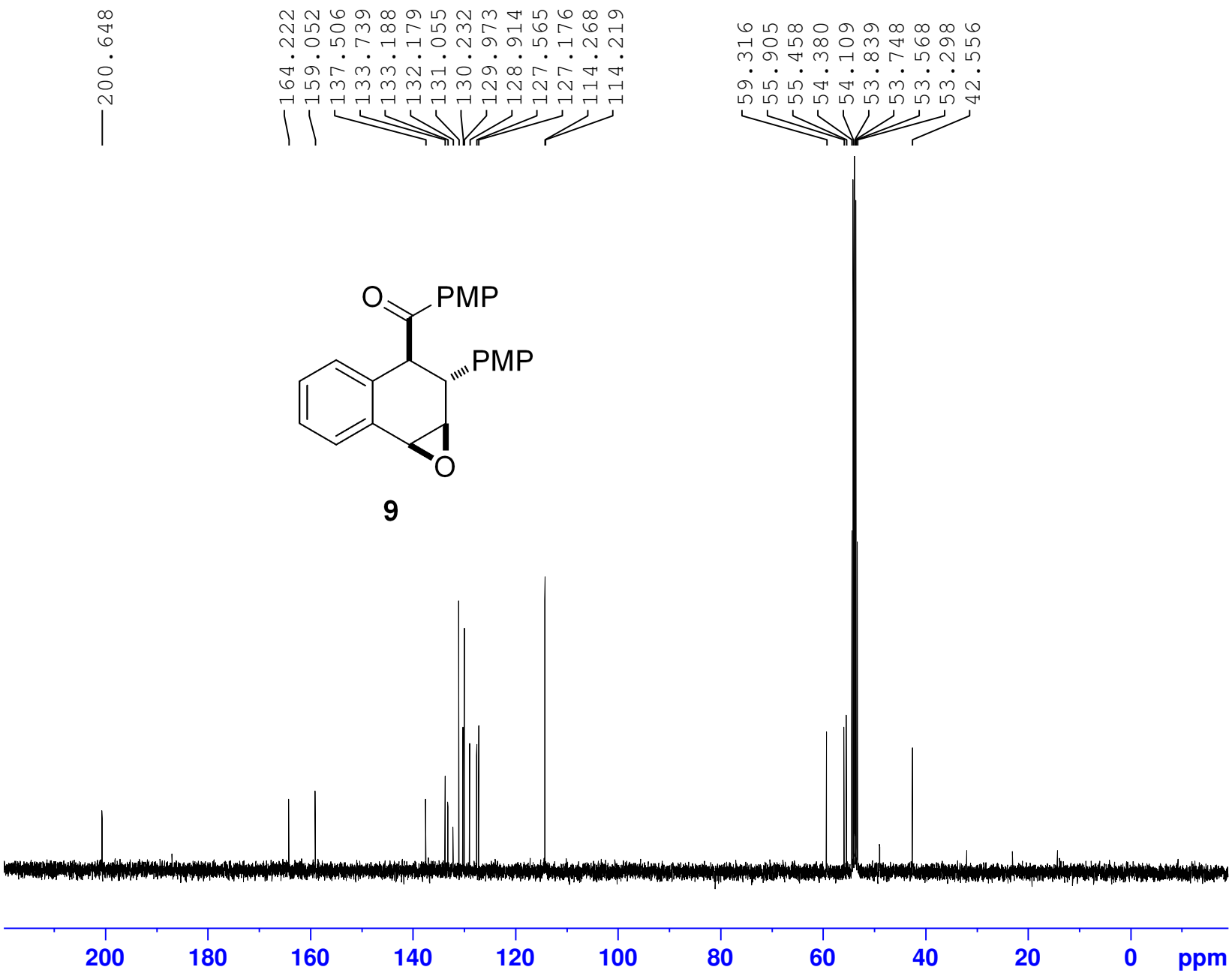


Current Data Parameters
NAME qh-8055
EXPNO 1
PROCNO 1

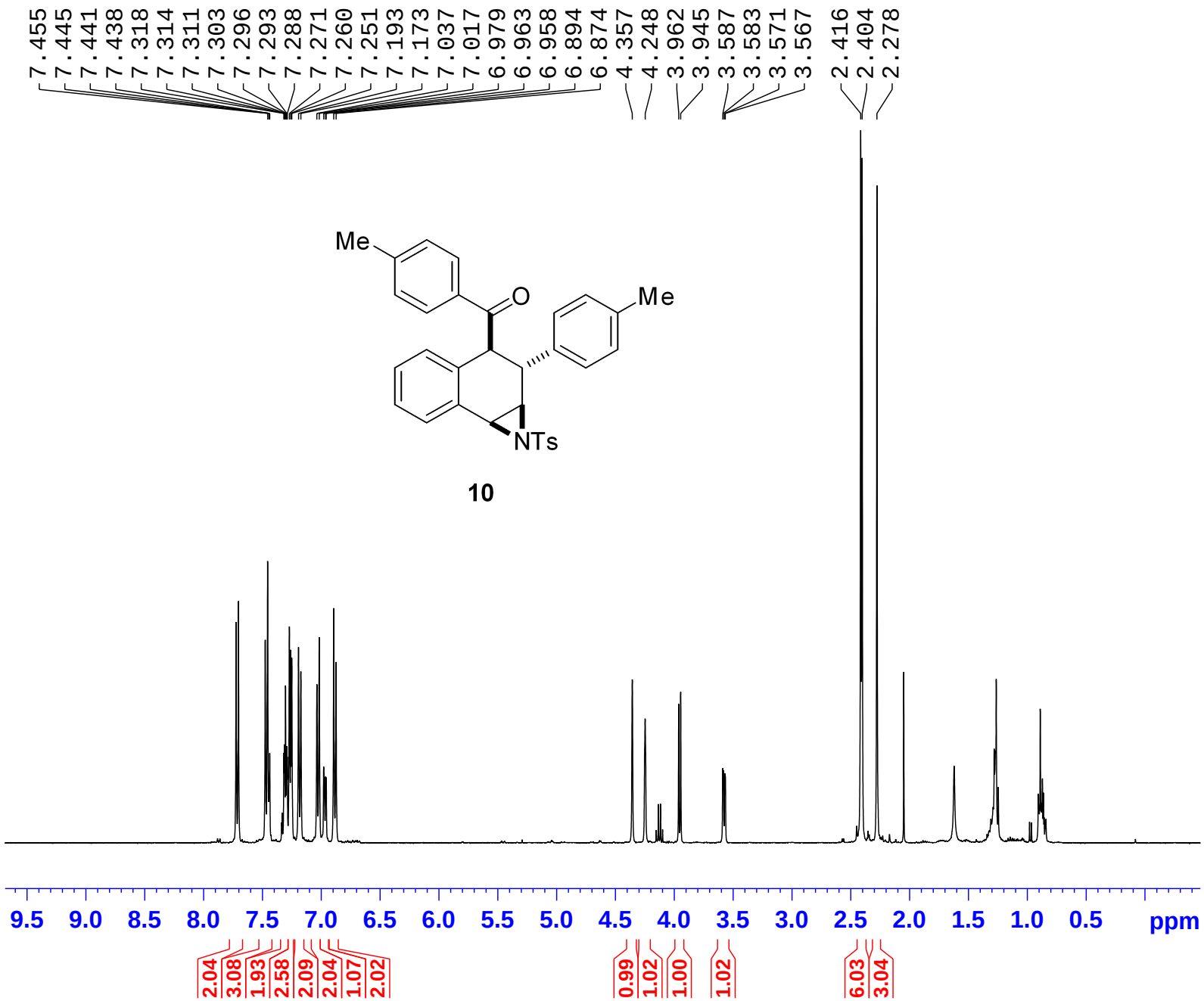
F2 - Acquisition Parameters
Date_ 20140425
Time 19.29
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CD2Cl2
NS 2
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 88.84
DW 62.400 usec
DE 6.50 usec
TE 295.8 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

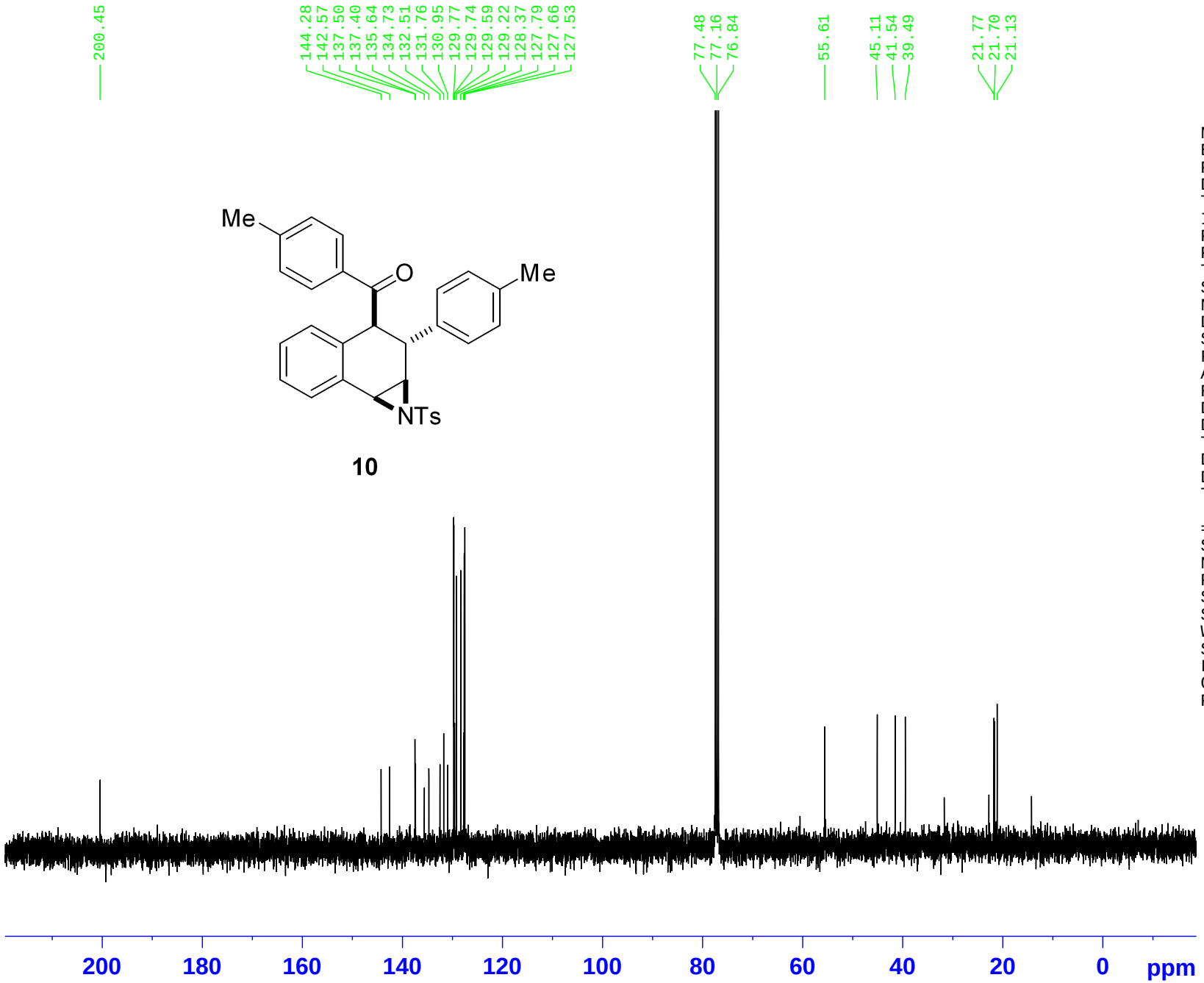
F2 - Processing parameters
SI 65536
SF 400.1300154 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



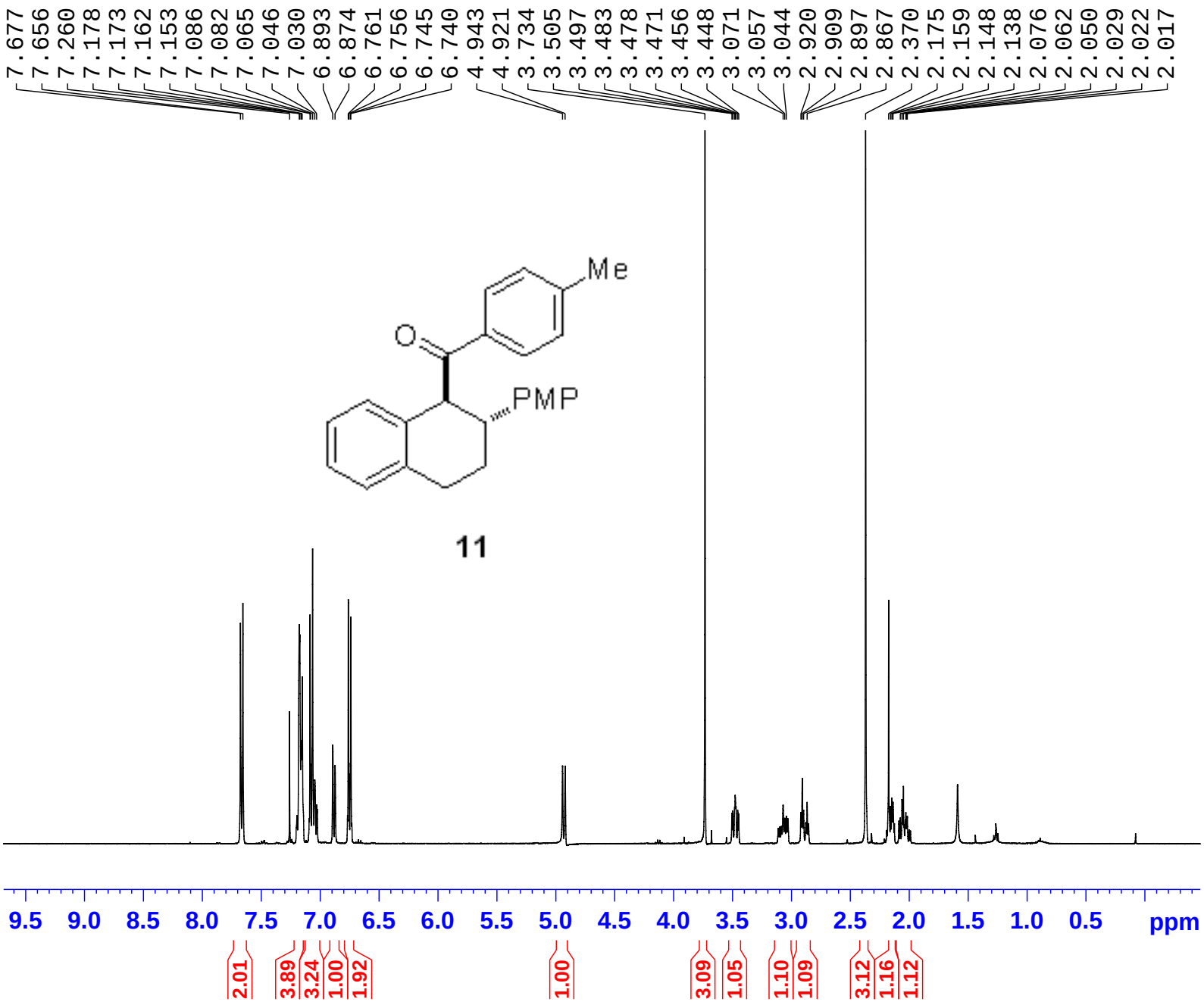

```
Current Data Parameters
NAME                qh-8055
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20140425
Time                  19.35
INSTRUM               spect
PROBHD   5 mm DUL 13C-1
PULPROG             zgpg30
TD                    65536
SOLVENT             CD2Cl2
NS                       108
DS                         2
SWH               24038.461 Hz
FIDRES             0.366798 Hz
AQ                1.3631488 sec
RG                   196.92
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            100.6228298 MHz
NUC1                     13C
P1                     9.60 usec
PLW1            31.98900032 W

======== CHANNEL f2 ========
SFO2            400.1316005 MHz
NUC2                      1H
CPDPRG[2            waltz16
PCPD2                 90.00 usec
PLW2             9.10000038 W
PLW12            0.24608000 W
PLW13            0.19933000 W

F2 - Processing parameters
SI                    32768
SF              100.6127291 MHz
WDW                      EM
SSB         0
LB                     1.00 Hz
GB          0
PC                     1.40
```



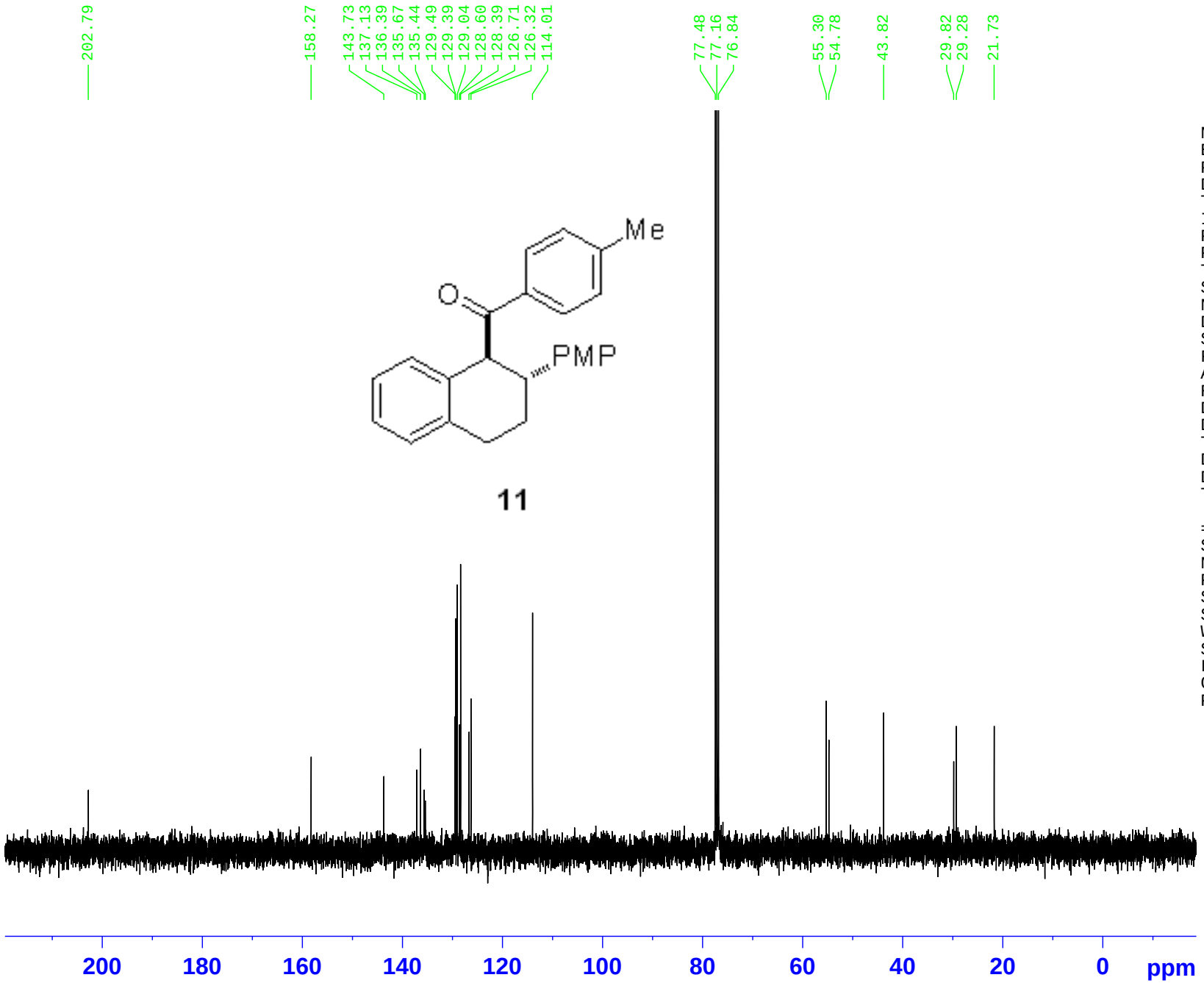

```
NAME              qh-8090
EXPNO                   1
PROCNO                  1
Date_            20140509
Time               13.10
INSTRUM            spect
PROBHD   5 mm DUL 13C-1
PULPROG             zg30
TD                 65536
SOLVENT            CDCl3
NS                      1
DS                      0
SWH             8012.820 Hz
FIDRES          0.122266 Hz
AQ             4.0894966 sec
RG                 82.92
DW                62.400 usec
DE                 6.50 usec
TE                295.7 K
D1            1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1         400.1324710 MHz
NUC1                  1H
P1                14.30 usec
SI                65536
SF           400.1300098 MHz
WDW                   EM
SSB                    0
LB                  0.30 Hz
GB                     0
PC                  1.00
```



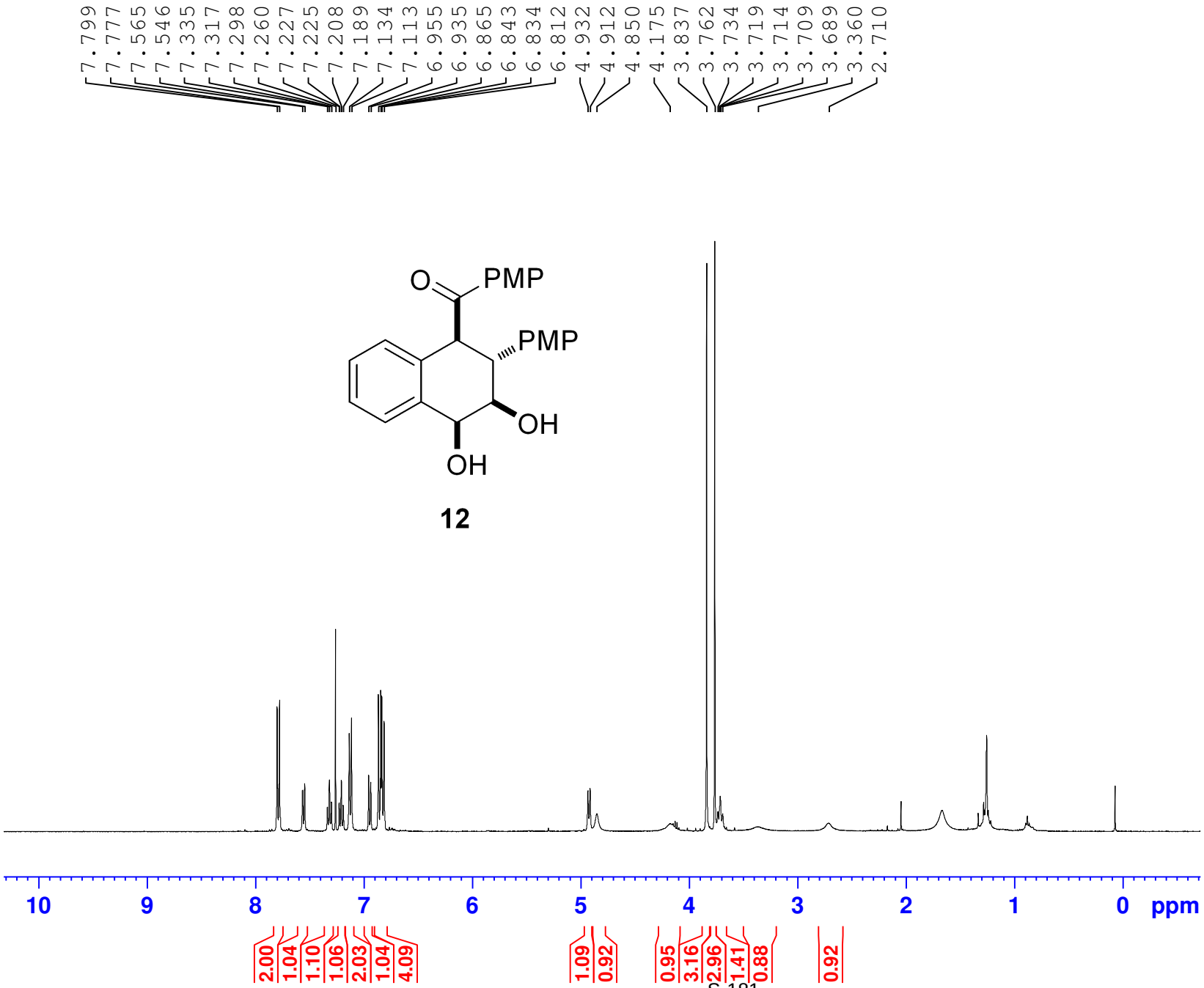

```
NAME            qh-8090
EXPNO                 2
PROCNO                1
Date_          20140509
Time              13.15
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                   71
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631988 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.4 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                  9.60 usec
SI                 32768
SF          100.6127582 MHz
WDW                   EM
SSB                    0
LB                  1.00 Hz
GB                     0
PC                  1.40
```




```
NAME            qh-8034
EXPNO                 8
PROCNO                1
Date_          20140416
Time              14.22
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG            zgpr
TD                32768
SOLVENT           CDCl3
NS                    3
DS                    4
SWH            6402.049 Hz
FIDRES         0.195375 Hz
AQ           2.5592308 sec
RG               70.97
DW              78.100 usec
DE              15.65 usec
TE              296.0 K
D1           2.00000000 sec
D12          0.00002000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1321287 MHz
NUC1                  1H
P1               14.30 usec
SI               16384
SF          400.1300094 MHz
WDW                  EM
SSB                   0
LB                 0.00 Hz
GB                    0
PC                 1.00
```



NAME	qh-8034	
EXPNO	7	
PROCNO	1	
Date_	20140416	
Time	14.20	
INSTRUM	spect	
PROBHD	5 mm DUL 13C-1	
PULPROG	zgpg30	
TD	65536	
SOLVENT	CDCl3	
NS	71	
DS	2	
SWH	24038.461	Hz
FIDRES	0.366798	Hz
AQ	1.3631988	sec
RG	196.92	
DW	20.800	usec
DE	6.50	usec
TE	296.3	K
D1	2.00000000	sec
D11	0.03000000	sec
TD0	1	
======== CHANNEL f1 ========		
SFO1	100.6228298	MHz
NUC1	13C	
P1	9.60	usec
SI	32768	
SF	100.6127570	MHz
WDW	EM	
SSB	0	
LB	1.00	Hz
GB	0	
PC	1.40	

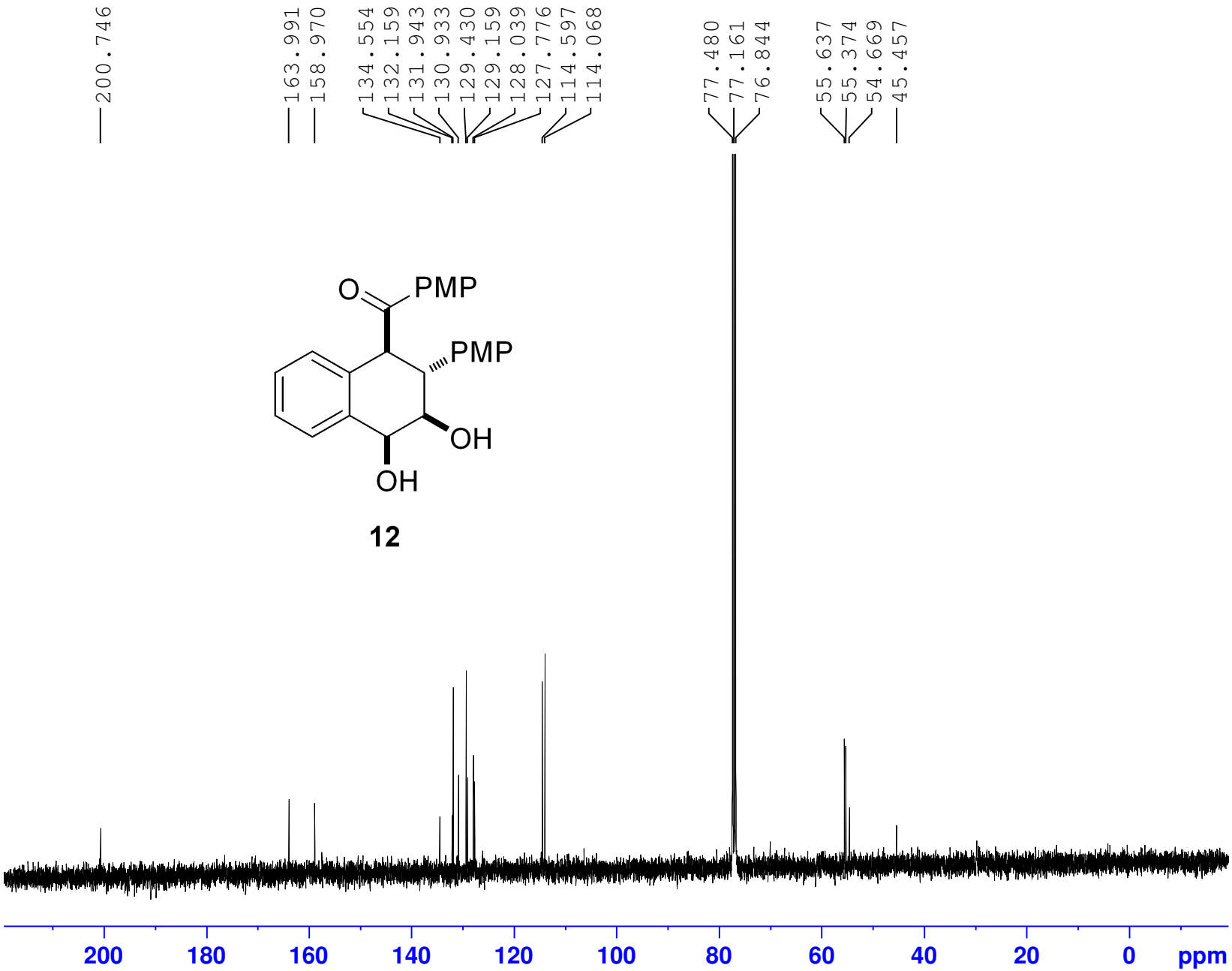


Current Data Parameters
NAME qh-8062-1
EXPNO 3
PROCNO 1

F2 - Acquisition Parameters
Date_ 20140429
Time 12.29
INSTRUM spect
PROBHD 5 mm DUL 13C-1
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 4
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894465 sec
RG 126.97
DW 62.400 usec
DE 6.50 usec
TE 295.7 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1324710 MHz
NUC1 1H
P1 14.30 usec
PLW1 9.10000038 W

F2 - Processing parameters
SI 65536
SF 400.1300098 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00




```
Current Data Parameters
NAME          qh-8062-1
EXPNO                 4
PROCNO                1

F2 - Acquisition Parameters
Date_          20140429
Time              12.31
INSTRUM           spect
PROBHD   5 mm DUL 13C-1
PULPROG          zgpg30
TD                65536
SOLVENT           CDCl3
NS                  348
DS                    2
SWH           24038.461 Hz
FIDRES         0.366798 Hz
AQ            1.3631488 sec
RG               196.92
DW               20.800 usec
DE                 6.50 usec
TE                296.3 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        100.6228298 MHz
NUC1                 13C
P1                 9.60 usec
PLW1        31.98900032 W

======== CHANNEL f2 ========
SFO2        400.1316005 MHz
NUC2                  1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2          9.10000038 W
PLW12         0.24608000 W
PLW13         0.19933000 W

F2 - Processing parameters
SI                32768
SF          100.6127560 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```