

Synthesis of functionalized furans *via* chemoselective reduction/Wittig reaction using catalytic triethylamine and phosphine

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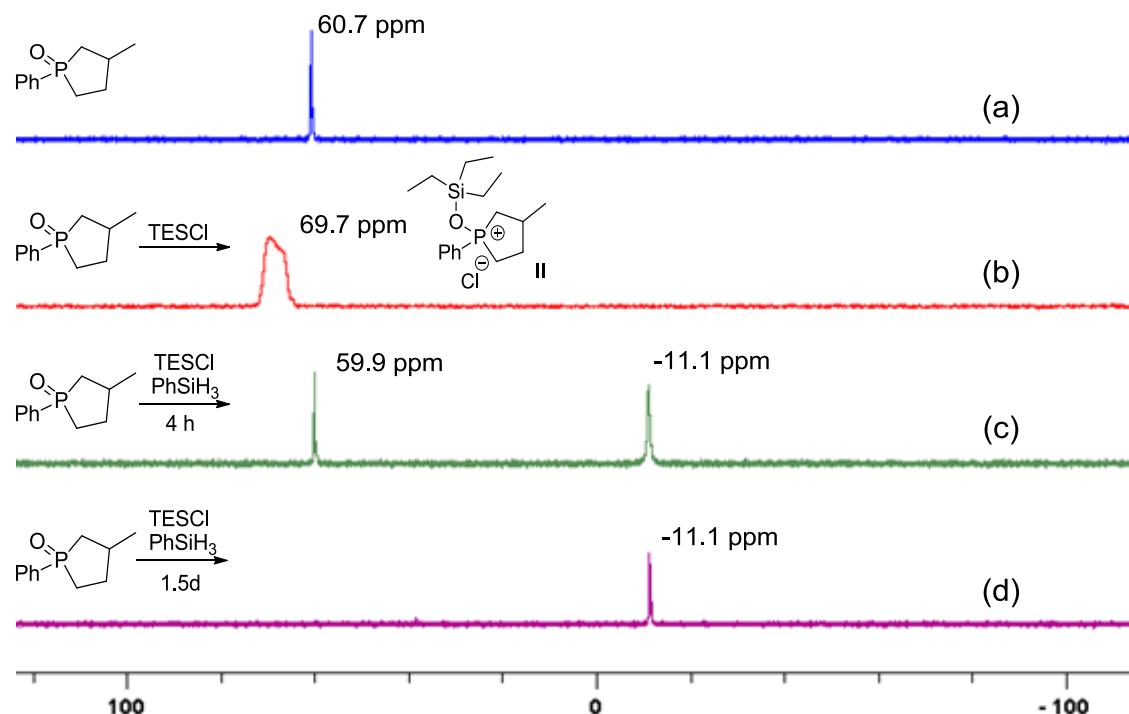
I. General information:

All reactions were carried out under a argon atmosphere in dried Schlenk flask. The starting materials purchased from commercial sources were used without further purification. Acetonitrile were continuously refluxed and freshly distilled from potassium hydroxide under nitrogen. IR spectra were recorded on a Perkin Elmer 500 spectrometer. NMR spectra were recorded on a Bruker Avance 400/500 NMR spectrometer. Chemical shifts are reported in δ ppm referenced to an internal TMS standard for ^1H NMR and chloroform-d (δ 77.0 ppm) for ^{13}C NMR. HRMS spectra were recorded on JEOL SX-102A. The X-ray diffraction measurements were carried out at 298 K on a KAPPA APEX II CCD area detector system equipped with a graphite monochromator and a Mo-K α fine-focus sealed tube ($k = 0.71073 \text{ \AA}$). Analytical thin layer chromatography (TLC) was performed using Merck 60 F254 precoated silica gel plate (0.2 mm thickness). Flash-chromatography was performed using Merck silica gel 60 (70–230 mesh).

II. Mechanism study: Control experiments related to the reduction of phosphine oxide **3**.

(1) A series of control experiments that monitored the reduction process at 30 °C

by ^{31}P NMR



A dry and argon-flushed NMR tube equipped with a septum was charged with **3** (0.2 mmol) and CDCl_3 (1 mL) at 30 °C. It was monitored by ^{31}P NMR (plot-a).

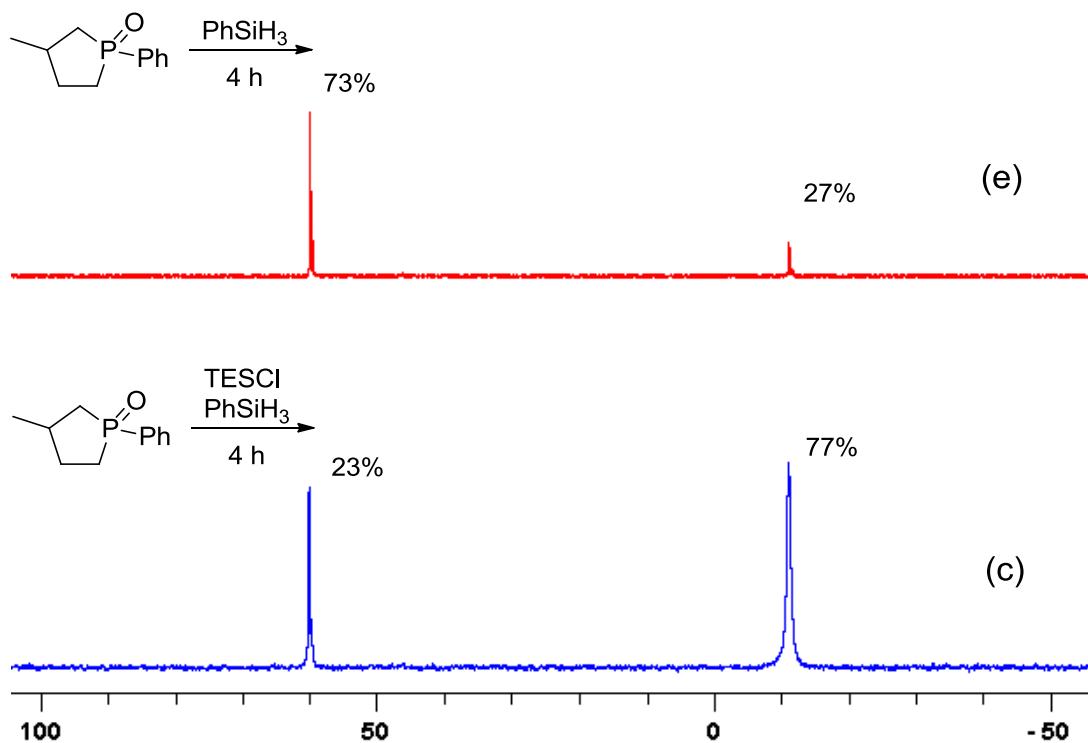
First of all, TESCl (2 equiv.) was added to the reaction mixture and the reaction progress was monitored by ^{31}P NMR (plot-b).

Then PhSiH_3 (16 equiv) was added into the same reaction mixture. Four hour later ^{31}P NMR (plot-c) was recorded.

Finally, the reaction was prolonged for 1.5 days and ^{31}P NMR was recorded again (plot-d).

While phosphine oxide **3** was treated with TESCl, appearance of a broad peak at 69.7 ppm was seen (plot-b). We assume this might be a characteristic peak of intermediate **II**. Furthermore, when PhSiH_3 was added to this reaction mixture, two peaks located at 59.9 and -11.1 ppm were seen in the ^{31}P NMR (plot-c). After 1.5 days, it was observed that all the phosphine oxide **3** was reduced (plot-d).

(2) Control experiments to demonstrate the influence of TESCl towards the reduction of phosphine oxide **3 at 30 °C.**



Two dry and argon-flushed NMR tubes equipped with septums were charged with **3** (0.2 mmol) and CDCl_3 (1 mL) at 30 °C. The first tube was treated with PhSiH_3 (16 equiv), while the second was treated with TESCl (2 equiv.) and PhSiH_3 (16 equiv). Four hour later, the progress of both the reactions was monitored by ^{31}P NMR.

From the result, we could conclude that TESCl indeed assists in the reduction process.

III. Typical experimental procedures

TP-A (Tables 2-4 and Scheme 2):

A dry and argon-flushed 10 mL Schlenk flask equipped with a magnetic stirring bar and a septum was sequentially charged with **1** (0.3 mmol), dry THF (1.5 mL), **3** (10 mol %), Et_3N (20 mol %), phenylsilane (1.6 equiv), TESCl (**4b**) (20 mol %) and acyl chloride **2** (1.1 equiv). The reaction mixture was stirred for corresponding time at 50 °C. Then the solvent was removed by evaporation *in vacuo* and the crude mixture was purified by flash column chromatography to provide **5**.

TP-B (Table 5):

A dry and argon-flushed 10 mL Schlenk flask equipped with a magnetic stirring bar and a septum was sequentially charged with dry THF (1.5 mL), **3** (10 mol %), phenylsilane (1.6 equiv) and with the corresponding reagents in table 5. The reaction mixture was stirred for 4 hours at corresponding temperature and directly diluted with CDCl₃ for the NMR experiments to determine the reduction of **3**.

TP-C (Table 6):

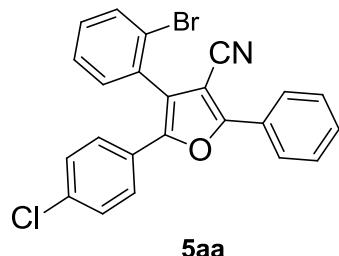
A dry and argon-flushed 10 mL Schlenk flask equipped with a magnetic stirring bar and a septum was sequentially charged with dry THF (1.5 mL), **3** or tributylphosphine oxide (10 mol %), phenylsilane (1.8 equiv) and **2a** (1.1 equiv) with the corresponding reagents in table 6. The reaction mixture was stirred for 4 hours at 50 °C and directly diluted by CDCl₃ for the NMR experiments to determine the reduction of **2a**.

TP-D (Scheme 3):

A dry and argon-flushed 10 mL Schlenk flask equipped with a magnetic stirring bar and a septum was sequentially charged with **1a** (0.3 mmol), dry THF (1.5 mL), tributylphosphine oxide (10 mol %), Et₃N (20 mol %), phenylsilane (1.8 equiv), TESCl (**4b**) (20 mol %). The reaction mixture was stirred for 24 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo* and crude mixture was purified by flash column chromatography to provide **11**.

IV. Analytical data for the products

Synthesis of 4-(2-bromophenyl)-5-(4-chlorophenyl)-2-phenylfuran-3-carbonitrile (**5aa**)^[a]



Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2a** (42 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 5 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5aa** as a white solid in 84% yield (109.1 mg)

mp.: 161.5-162.3 °C, R_f = 0.111. (DCM:Hexanes = 1:5)

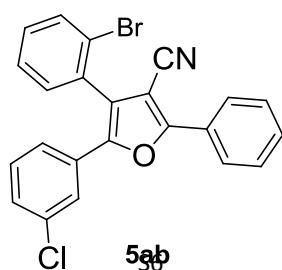
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.11 (d, 2H, J = 7.1 Hz), 7.77(d, 1H, J = 8.0 Hz), 7.57-7.42 (m, 4H), 7.41-7.33 (m, 4H), 7.28 (d, 2H, J = 8.8 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.1, 148.0, 134.7, 133.6, 131.8, 131.3, 130.9, 130.4, 129.2, 129.0, 128.2, 127.7, 127.4, 126.5, 125.5, 124.4, 123.5, 113.9, 96.3.

IR (KBr) ̄ (cm⁻¹): 2232, 1489, 1099, 730.

HRMS (EI) for C₂₃H₁₃BrClNO, [M]⁺ (432.9869) found: 432.9871.

Synthesis of 4-(2-bromophenyl)-5-(4-chlorophenyl)-2-phenylfuran-3-carbonitrile (**5ab**)



Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2b** (43 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 6 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:4) to provide **5ab** as a white solid in 73% yield (95.2 mg)

mp.: 146.9-147.1 °C, R_f = 0.190. (DCM:Hexanes = 1:4)

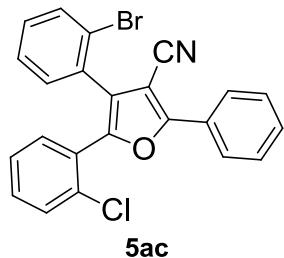
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.13 (d, 2H, J = 9.8 Hz), 7.78 (d, 1H, J = 8.8 Hz), 7.54 (t, 2H, J = 7.1 Hz), 7.52-7.41 (m, 3H), 7.42-7.35 (m, 2H), 7.28-7.25 (m, 1H), 7.21-7.18 (m, 2H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.4, 147.5, 134.9, 133.7, 131.8, 131.2, 131.0, 130.6, 130.5, 130.0, 129.2, 128.7, 128.2, 127.7, 125.6, 125.3, 124.4, 124.2, 123.3, 113.8, 96.4.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2229, 1491, 767, 688.

HRMS (EI) for C₂₃H₁₃BrClNO [M]⁺ (432.9869) found 432.9868.

Synthesis of 4-(2-bromophenyl)-5-(2-chlorophenyl)-2-phenylfuran-3-carbonitrile (**5ac**)



Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2c** (42 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 6 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture

was purified by flash column chromatography (DCM:Hexanes = 1:4) to provide **5ac** as a white solid in 61% yield (79.3 mg)

mp.: 148.6-148.9 °C, R_f = 0.190. (DCM:Hexanes = 1:4)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.01 (d, 2H, J = 7.0 Hz), 7.66 (d, 1H, J = 8.8 Hz), 7.41 (t, 2H, J = 7.3 Hz), 7.38-7.32 (m, 2H), 7.30-7.23 (m, 4H), 7.16 (d, 2H, J = 8.6 Hz).

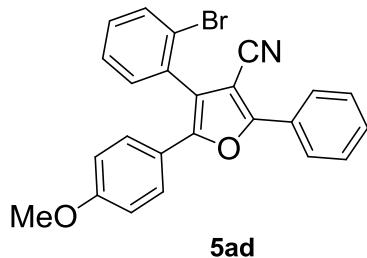
¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.2, 148.0, 134.7, 133.7, 131.8, 131.4, 130.9, 130.5, 129.2, 129.1, 128.3, 127.8, 127.5, 126.6, 125.5, 124.5, 123.6, 114.0, 96.4.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2228, 1491, 757, 688.

HRMS (EI) for C₂₃H₁₃BrClNO [M]⁺ (432.9869) found 432.9869.

Synthesis of

4-(2-bromophenyl)-5-(4-methoxyphenyl)-2-phenylfuran-3-carbonitrile (**5ad**)



Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2d** (46 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:4) to provide **5ad** as a white solid in 70% yield (89.0 mg)

mp.: 183.6-185.2 °C, R_f = 0.125. (DCM:Hexanes = 1:4)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.10 (d, 2H, J = 7.1 Hz), 7.76 (d, 1H, J = 8.0 Hz), 7.51 (t, 2H, J = 7.3 Hz), 7.48-7.39 (m, 3H), 7.39-7.31 (m, 3H), 6.83 (d, 2H, J

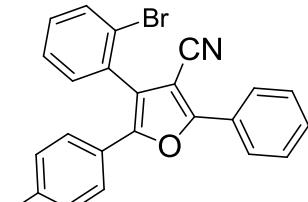
= 9.3 Hz), 3.79 (s, 3H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 160.0, 157.4, 149.3, 133.5, 132.1, 131.9, 130.6, 130.1, 129.1, 128.1, 128.0, 127.0, 125.4, 124.8, 121.8, 121.5, 114.2, 96.1, 55.3.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2931, 2227, 1511, 1255, 767, 688.

HRMS (EI) for C₂₄H₁₆BrNO₂ [M]⁺ (429.0364) found 429.0362.

Synthesis of 4-(2-bromophenyl)-2-phenyl-5-(*p*-tolyl)furan-3-carbonitrile (**5ae**)



5ae

Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2e** (45 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5ae** as a white solid in 77% yield (95.6 mg)

mp.: 183.6-185.2 °C, R_f = 0.250 (DCM:Hexanes = 1:5)

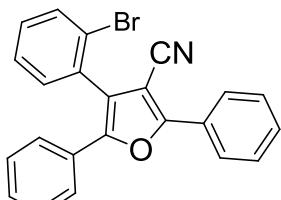
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.13 (d, 2H, J = 7.5 Hz), 7.77 (d, 1H, J = 8.0 Hz), 7.53 (t, 2H, J = 7.5 Hz), 7.50-7.39 (m, 3H), 7.39-7.28 (m, 3H), 7.12 (d, 2H, J = 8.2 Hz), 2.34 (s, 3H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 157.6, 149.3, 138.9, 133.4, 131.9, 131.8, 130.6, 130.1, 129.4, 129.1, 128.0, 127.9, 126.2, 125.4, 125.3, 125.2, 124.6, 122.3, 114.2, 96.1, 21.3.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2227, 1491, 819, 767, 687.

HRMS (EI) for C₂₄H₁₆BrNO [M]⁺ (413.0415) found 413.0417.

Synthesis of 4-(2-bromophenyl)-2,5-diphenylfuran-3-carbonitrile (5af)



5af

Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2f** (38 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5af** as a white solid in 80% yield (95.7 mg)

mp.: 127.3-128.5 °C, R_f = 0.225. (DCM:Hexanes = 1:5)

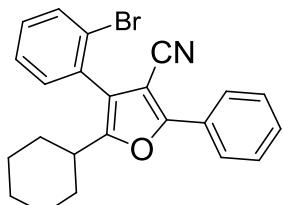
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.16 (d, 2H, J = 7.5 Hz), 7.80 (d, 1H, J = 7.9 Hz), 7.56 (t, 2H, J = 7.5 Hz), 7.53-7.36 (m, 6H), 7.36-7.30 (m, 3H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 157.7, 148.8, 133.4, 131.8, 131.5, 130.6, 130.1, 129.0, 128.8, 128.6, 128.0, 127.7, 125.3, 125.2, 124.4, 122.9, 114.0, 96.1.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2364, 2227, 1557, 1491, 767, 687.

HRMS (EI) for C₂₃H₁₄BrNO [M]⁺ (399.0259) found 399.0258.

Synthesis of 4-(2-bromophenyl)-5-cyclohexyl-2-phenylfuran-3-carbonitrile (5ag)



5ag

Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2g** (46 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 20 hours

at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:3) to provide **5ag** as a white solid in 33% yield (39.8 mg)

mp.: 107.0-108.2 °C, R_f = 0.250 (DCM:Hexanes = 1:3)

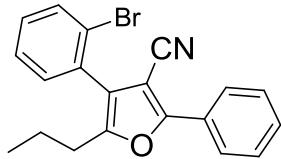
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.02 (d, 2H, *J* = 8.4 Hz), 7.70 (d, 1H, *J* = 8.0 Hz), 7.48 (t, 2H, *J* = 7.5 Hz), 7.43 (d, 1H, *J* = 7.5 Hz), 7.39 (d, 1H, *J* = 7.0 Hz), 7.34-7.24 (m, 2H), 2.56 (tt, 1H, *J* = 11.9, 3.2 Hz), 1.98-1.90 (m, 1H), 1.84-1.73 (m, 3H), 1.73-1.53 (m, 3H), 1.34-1.19 (m, 3H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 157.4, 156.8, 133.2, 132.1, 131.5, 130.2, 129.8, 129.0, 128.4, 127.5, 125.2, 124.8, 121.5, 114.7, 94.3, 36.6, 31.6, 30.8, 26.1, 26.0, 25.7.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2931, 2855, 2226, 1561, 767, 690.

HRMS (EI) for C₂₃H₂₀BrNO [M]⁺ (405.0728) found 405.0730

Synthesis of 4-(2-bromophenyl)-2-phenyl-5-propylfuran-3-carbonitrile (**5ah**)



5ah

Prepared according to **TP-A** using **1a** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2h** (35 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 14 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:4) to provide **5ah** as a white liquid in 66% yield (70.9 mg).

mp.: 107.0-108.2 °C, R_f = 0.250. (DCM:Hexanes = 1:4)

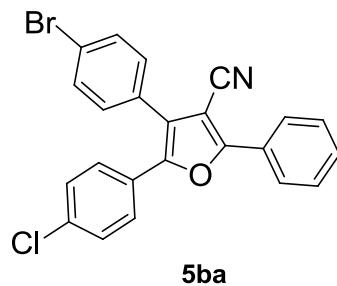
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.02 (d, 2H, *J* = 8.8 Hz), 7.71 (d, 1H, *J* = 8.0 Hz), 7.48 (t, 2H, *J* = 7.5 Hz), 7.42 (d, 1H, *J* = 7.1 Hz), 7.39 (d, 1H, *J* = 7.1 Hz), 7.36-7.24 (m, 2H), 2.69-2.49 (m, 2H), 1.77-1.62 (m, 2H), 0.93 (t, 3H, *J* = 7.5 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 157.8, 153.2, 133.2, 132.1, 131.2, 130.2, 129.8, 129.0, 128.3, 127.6, 125.2, 124.7, 123.0, 114.7, 94.2, 28.6, 21.2, 13.7.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2936, 2226, 1491, 767, 689.

HRMS (EI) for C₂₀H₁₆BrNO [M]⁺ (365.0415) found 365.0416.

Synthesis of 4-(4-bromophenyl)-5-(4-chlorophenyl)-2-phenylfuran-3-carbonitrile (**5ba**)



Prepared according to **TP-A** using **1b** (93.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2a** (42 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 6 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5ba** as a white solid in 85% yield (111.0 mg).

mp.: 187.5-188.7 °C, R_f = 0.350. (DCM:Hexanes = 1:5)

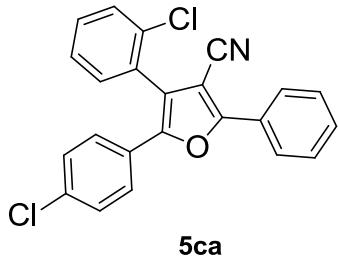
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.08 (d, 2H, *J* = 6.6 Hz), 7.61 (d, 2H, *J* = 8.4 Hz), 7.56-7.47 (m, 3H), 7.44 (d, 2H, *J* = 8.4 Hz), 7.37-7.28(m, 4H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.8, 147.6, 134.9, 132.5, 130.8, 130.5, 129.2, 129.1, 128.8, 127.6, 127.4, 127.2, 125.5, 123.3, 123.2, 114.2, 95.4.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2360, 1492, 831, 769, 687.

HRMS (EI) for C₂₃H₁₃BrClNO [M]⁺ (432.9869) found 432.9870.

**Synthesis of 4-(2-chlorophenyl)-5-(4-chlorophenyl)-2-phenylfuran-3-carbonitrile
(5ca)**



Prepared according to **TP-A** using **1c** (80.3 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2a** (42 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 6 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5ca** as a white solid in 94% yield (109.7 mg).

mp.: 169.3-169.4 °C, R_f = 0.175. (DCM:Hexanes = 1:5)

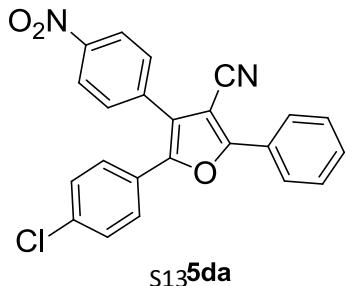
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.12 (d, 2H, J = 7.1 Hz), 7.59 (d, 1H, J = 8.0 Hz), 7.54 (d, 2H, J = 7.3 Hz), 7.51-7.42 (m, 2H), 7.42-7.39 (m, 2H), 7.37 (d, 2H, J = 8.8 Hz), 7.28 (d, 2H, J = 8.8 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.2, 148.2, 134.7, 134.4, 131.8, 130.7, 130.4, 129.2, 129.1, 129.0, 127.7, 127.6, 127.5, 126.5, 125.5, 121.7, 113.9, 96.4.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2229, 1492, 831, 755, 687.

HRMS (EI) for C₂₃H₁₃Cl₂NO [M]⁺ (389.0374) found 389.0375.

**Synthesis of 5-(4-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-carbonitrile
(5da)^[a]**



Prepared according to **TP-A** using **1d** (83.4 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2a** (42 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 4 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:3) to provide **5da** as a white solid in 98% yield (117.9 mg).

mp.: 241.1-241.6 °C, R_f = 0.146. (DCM:Hexanes = 1:3)

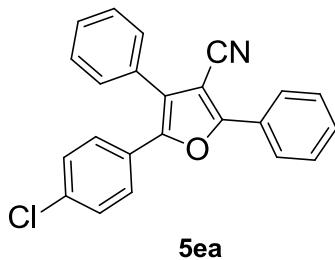
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.25 (d, 2H, J = 8.8 Hz), 8.01 (d, 2H, J = 7.5 Hz), 7.59 (d, 2H, J = 8.8 Hz), 7.50-7.40 (m, 3H), 7.35 (d, 2H, J = 8.8 Hz), 7.26 (d, 2H, J = 8.4 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 159.4, 148.6, 147.9, 136.7, 135.6, 130.8, 130.2, 129.3, 129.2, 127.8, 127.3, 126.7, 125.6, 124.5, 122.1, 113.9, 94.9.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2227, 1519, 1492, 1345, 769, 688.

HRMS (EI) for C₂₃H₁₃ClN₂O₃ [M]⁺ (400.0615) found 400.0616.

Synthesis of 5-(4-chlorophenyl)-2,4-diphenylfuran-3-carbonitrile (**5ea**)



Prepared according to **TP-A** using **1e** (70.0 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2a** (42 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5ea** as a white solid in 93% yield (100.1 mg).

mp.: 161.3-161.7 °C, R_f = 0.250 (DCM:Hexanes = 1:5)

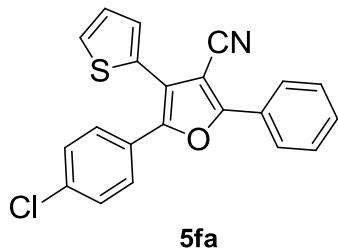
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.09 (d, 2H, J = 8.4 Hz), 7.51 (d, 2H, J = 7.1 Hz), 7.48-7.41 (m, 8H), 7.27 (d, 2H, J = 8.8 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.5, 147.4, 134.5, 130.3, 129.9, 129.2, 129.1, 128.9, 127.8, 127.5, 127.3, 125.5, 124.5, 114.4, 95.7.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2362, 2226, 1479, 831, 768, 688.

HRMS (EI) for C₂₃H₁₄ClNO [M]⁺ (355.0764) found 355.0764.

Synthesis of 5-(4-chlorophenyl)-2-phenyl-4-(thiophen-2-yl)furan-3-carbonitrile (5fa)^[a]



Prepared according to **TP-A** using **1f** (71.8 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2a** (42 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:4) to provide **5fa** as a white solid in 89% yield (96.1 mg).

mp.: 1676-168.1 °C, R_f = 0.350. (DCM:Hexanes = 1:4)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.10 (d, 2H, J = 7.5 Hz), 7.56-7.48 (m, 6H), 7.32 (d, 2H, J = 8.8 Hz), 7.29-7.24 (m, 1H), 7.18-7.13 (m, 1H).

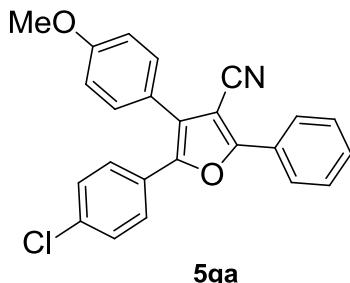
¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 158.6, 148.5, 135.1, 130.5, 129.8, 129.2, 129.0, 128.6, 127.9, 127.8, 127.6, 127.5, 127.1, 125.5, 117.8, 114.2, 96.2.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2361, 2227, 1484, 1096, 830, 768, 686.

HRMS (EI) for C₂₁H₁₂ClNO [M]⁺ (361.0328) found 361.0330.

Synthesis of

5-(4-chlorophenyl)-4-(4-methoxyphenyl)-2-phenylfuran-3-carbonitrile (**5ga**)



5ga

Prepared according to **TP-A** using **1g** (78.9 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2a** (42 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:5) to provide **5ga** as a yellow solid in 63% yield (73.0 mg).

mp.: 1953-196.5 °C; R_f = 0.125 (DCM:Hexanes = 1:5)

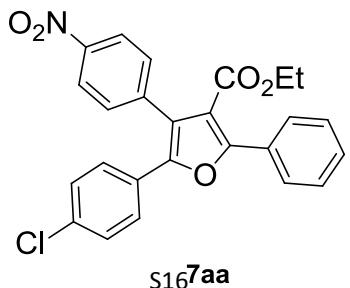
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.10 (d, 2H, J = 7.1 Hz), 7.54-7.44 (d, 5H, J = 8.4 Hz), 7.38 (d, 2H, J = 8.8 Hz), 7.28 (d, 2H, J = 8.8 Hz), 7.00 (d, 2H, J = 8.8 Hz), 3.87 (s, 3H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 160.0, 158.3, 147.2, 134.4, 130.4, 130.2, 129.1, 128.9, 127.9, 127.7, 127.1, 125.4, 124.3, 121.9, 114.7, 114.6, 95.9, 55.3.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2227, 1513, 1250, 832, 770, 687.

HRMS (EI) for C₂₄H₁₆ClNO₂ [M]⁺ (385.0870) found 385.0870.

Synthesis of ethyl 5-(4-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-carboxylate (**7aa**)^[a]



S16 **7aa**

Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2a** (42 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 9 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexs = 1:5) to provide **7aa** as a yellow solid in 85% yield (79.6 mg).

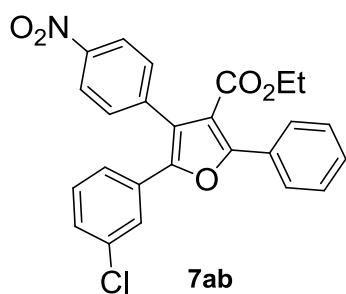
mp.: 172.9-173.5 °C, R_f = 0.100 (DCM:Hexs = 1:5)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.29 (d, 2H, J = 8.7 Hz), 7.90 (d, 2H, J = 7.5 Hz), 7.56 (d, 2H, J = 8.7 Hz), 7.50-7.44 (m, 3H), 7.30-7.24 (m, 4H), 4.09 (q, 2H, J = 7.2 Hz), 0.99 (t, 3H, J = 7.2 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 163.3, 156.0, 147.9, 147.5, 140.4, 134.4, 131.1, 129.7, 129.2, 128.9, 128.3, 128.2, 127.7, 127.2, 123.7, 121.9, 116.1, 60.8, 13.6. **IR** (KBr) $\tilde{\nu}$ (cm⁻¹): 2980 (w), 1719 (s), 1517 (s), 1346 (s), 1230 (m), 1119 (m), 855 (m), 691 (m).

HRMS (EI) for C₂₅H₁₈NO₅Cl, [M]⁺ (447.0874) found: 447.0877.

Synthesis of ethyl 5-(3-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-carboxylate (**7ab**)^[a]



Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 µL, 0.06 mmol), PhSiH₃ (61 µL, 0.48 mmol), **4b** (10 µL, 0.06 mmol), **2b** (43 µL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 7 hours

at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexs = 1:5) to provide **7ab** as a yellow solid in 92% yield (123.4 mg).

mp.: 133.6-134.1 °C, R_f = 0.100 (DCM:Hexs = 1:5)

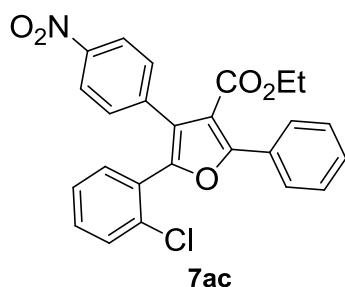
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.31 (d, 2H, *J* = 8.6 Hz), 7.92 (d, 2H, *J* = 6.3 Hz), 7.57 (d, 2H, *J* = 8.6 Hz), 7.51-7.46 (m, 4H), 7.26-7.23 (m, 1H), 7.17 (t, 1H, *J* = 7.8 Hz), 7.10 (d, 1H, *J* = 7.8 Hz), 4.10 (q, 2H, *J* = 7.1 Hz), 1.00 (t, 3H, *J* = 7.1 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 163.3, 156.2, 147.5, 147.4, 140.2, 134.8, 131.1, 130.9, 129.9, 129.8, 129.1, 128.4, 128.3, 128.2, 126.0, 124.0, 123.7, 122.5, 116.1, 60.9, 13.6.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2984, 1719, 1520, 1346, 1232, 1105, 851, 691.

HRMS (EI) for C₂₆H₁₈ClNO₅, [M]⁺ (447.0874) found: 447.0870.

Synthesis of ethyl 5-(2-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-carboxylate (**7ac**)^[a]



Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2c** (42 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 9 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexs = 1:5) to provide **7ac** as a yellow solid in 88% yield (117.7 mg).

mp.: 110.4-110.9 °C, R_f = 0.100 (DCM:Hexs = 1:5)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.15 (d, 2H, *J* = 8.8 Hz), 7.92 (d, 2H, *J* =

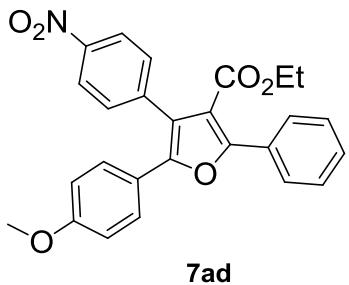
8.0 Hz), 7.47-7.42 (m, 6H), 7.32 (t, 1H, J = 8.6 Hz), 7.26-7.20 (m, 2H), 4.18 (q, 2H, J = 7.0 Hz), 1.07 (t, 3H, J = 7.0 Hz).

^{13}C NMR (100 MHz, CDCl_3 , 25 °C) δ /ppm: 163.7, 156.7, 147.9, 147.0, 139.6, 134.1, 132.2, 130.8, 130.6, 130.4, 129.6, 129.3, 128.4, 128.3, 128.2, 126.8, 124.2, 123.2, 114.5, 61.0, 13.7.

IR (KBr) $\tilde{\nu}$ (cm^{-1}): 2984, 1721, 1520, 1346, 1230, 1099, 855, 730.

HRMS (MALDI) for $\text{C}_{26}\text{H}_{19}\text{ClNO}_5$, $[\text{M}+\text{H}]^+$ (448.0952) found: 448.0965.

Synthesis of ethyl 5-(4-methoxyphenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-carboxylate (**7ad**)^[a]



Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et_3N (8.4 μL , 0.06 mmol), PhSiH_3 (61 μL , 0.48 mmol), **4b** (10 μL , 0.06 mmol), **2d** (46 μL , 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 18 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hекс = 1:1) to provide **7ad** as a yellow solid in 62% yield (81.9 mg).

mp.: 151.1-151.6 °C, R_f = 0.190 (DCM:Hекс = 1:1)

^1H NMR (400 MHz, CDCl_3 , 25 °C) δ /ppm: 8.27 (d, 2H, J = 8.6 Hz), 7.92 (d, 2H, J = 7.2 Hz), 7.55 (d, 2H, J = 8.6 Hz), 7.49-7.43 (m, 3H), 7.30 (d, 2H, J = 8.7 Hz), 6.81 (d, 2H, J = 8.7 Hz), 4.09 (q, 2H, J = 7.1 Hz), 3.78 (s, 3H), 1.00 (t, 3H, J = 7.1 Hz).

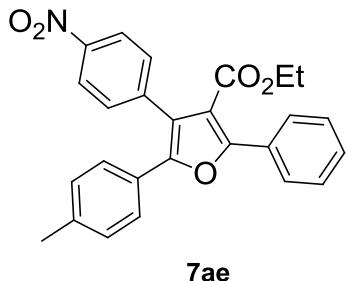
^{13}C NMR (100 MHz, CDCl_3 , 25 °C) δ /ppm: 163.5, 159.7, 155.1, 149.2, 147.1, 140.9, 131.2, 129.5, 129.3, 128.2, 128.0, 127.6, 123.5, 121.8, 119.9, 115.8, 114.1, 60.6, 55.2,

13.6.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2980, 2962, 1715, 1515, 1349, 1254, 1180, 1112, 833, 693.

HRMS (EI) for C₂₆H₂₁NO₆, [M]⁺ (443.1369) found: 443.1373.

Synthesis of ethyl 4-(4-nitrophenyl)-2-phenyl-5-p-tolylfuran-3-carboxylate (7ae):



7ae

Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2e** (45 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 15 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexs = 1:5) to provide **7ae** as a yellow solid in 73% yield (93.8 mg).

mp.: 145.4-146.2 °C, R_f = 0.100 (DCM:Hexs = 1:5)

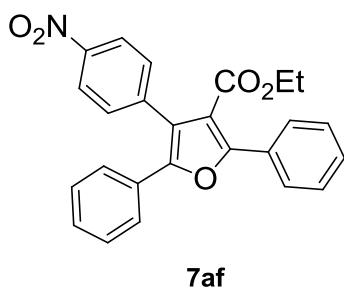
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.28 (d, 2H, J = 8.7 Hz), 7.92 (d, 2H, J = 8.2 Hz), 7.56 (d, 2H, J = 8.7 Hz), 7.50-7.44 (m, 3H), 7.25 (d, 2H, J = 7.8 Hz), 7.09 (d, 2H, J = 8.2 Hz), 4.09 (q, 2H, J = 7.1 Hz), 2.33 (s, 3H), 1.00 (t, 3H, J = 7.1 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 163.6, 155.4, 149.4, 147.3, 140.9, 138.7, 131.3, 129.6, 129.5, 129.4, 128.3, 128.2, 126.5, 126.2, 123.6, 120.8, 115.9, 60.7, 21.3, 13.7.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2980, 1715, 1517, 1344, 1230, 1114, 853, 691.

HRMS (EI) for C₂₆H₂₁NO₅, [M]⁺ (427.1420) found: 427.1428.

Synthesis of ethyl 4-(4-nitrophenyl)-2,5-diphenylfuran-3-carboxylate (7af)^[a]



7af

Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2f** (38 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 12 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hекс = 1:5) to provide **7af** as a yellow solid in 82% yield (101.6 mg).

mp.: 181.8-182.4 °C, R_f = 0.100 (DCM:Hекс = 1:5)

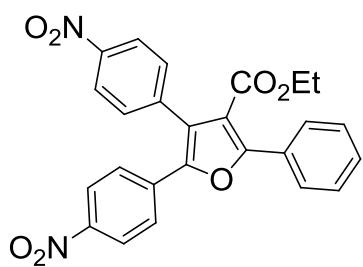
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.28 (d, 2H, J = 8.6 Hz), 7.92 (d, 2H, J = 7.8 Hz), 7.57 (d, 2H, J = 8.6 Hz), 7.49-7.48 (m, 3H), 7.38-7.35 (m, 2H), 7.29-7.27 (m, 3H), 4.10 (q, 2H, J = 7.1 Hz), 1.01 (t, 3H, J = 7.1 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 163.5, 155.7, 149.1, 147.4, 140.8, 131.2, 129.6, 129.4, 129.3, 128.7, 128.5, 128.3, 128.2, 126.2, 123.6, 121.5, 116.0, 60.8, 13.7.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2984, 1717, 1520, 1346, 1230, 1116, 855, 691.

HRMS (EI) for C₂₅H₁₉NO₅, [M]⁺ (413.1263) found: 413.1256.

Synthesis of ethyl 4,5-bis(4-nitrophenyl)-2-phenylfuran-3-carboxylate (7ai)^[a]



7ai

Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2i** (63 mg, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 9 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexs = 1:1) to provide **7ai** as a yellow solid in 91% yield (125.2 mg).

mp.: 219.5-220.0 °C, R_f = 0.190 (DCM:Hexs = 1:1)

¹H-NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.34 (d, 2H, J = 8.7 Hz), 8.13 (d, 2H, J = 9.0 Hz), 7.94-7.92 (m, 2H), 7.59 (d, 2H, J = 8.7 Hz), 7.52-7.50 (m, 5H), 4.10 (q, 2H, J = 7.1 Hz), 1.00 (t, 3H, J = 7.1 Hz).

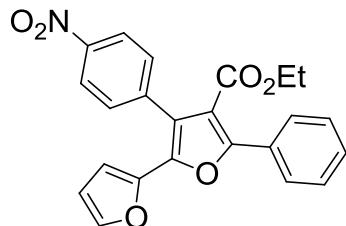
¹³C-NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 162.9, 157.3, 147.8, 147.0, 146.4, 139.7, 135.1, 131.0, 130.2, 128.8, 128.5, 128.4, 126.1, 125.0, 124.1, 124.0, 116.7, 61.0, 13.6.

MS (20 eV, EI) *m/z* (%): 458 [M]⁺ (100), 431 (26).

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 2989, 1721, 1596, 1520, 1344, 1232, 1110, 851, 693.

HRMS (EI) for C₂₅H₁₈N₂O₇, [M]⁺ (458.1114) found: 458.1107

Synthesis of ethyl ethyl 3-(4-nitrophenyl)-5-phenyl-[2,2'-bifuran]-4-carboxylate (**7aj**)



7aj

Prepared according to **TP-A** using **6a** (97.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2j** (27 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 15 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was

purified by flash column chromatography (DCM:Hexs = 1:5) to provide **7aj** as a yellow solid in 76% yield (63.8 mg).

mp : 163.2-164.0 °C, R_f = 0.075 (DCM:Hexs = 1:5)

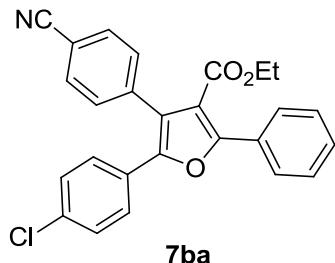
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.28 (d, 2H, J = 8.8 Hz), 7.90 (d, 2H, J = 8.0 Hz), 7.60 (m, 2H, J = 8.4 Hz), 7.51-7.41 (m, 3H), 7.34 (s, 1H), 6.46-6.37 (m, 2H), 4.10 (q, 2H, J = 7.2 Hz), 1.00 (t, 3H, J = 7.1 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 163.3, 155.8, 147.3, 144.5, 142.9, 141.9, 139.5, 131.1, 129.7, 129.1, 128.3, 128.2, 123.1, 120.9, 115.5, 111.4, 108.6, 60.8, 13.6.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 1717, 1517, 1345, 1234, 1095, 853, 735, 691.

HRMS (EI) for C₂₃H₁₇NO₆, [M]⁺ (403.1056) found: 403.1057.

Synthesis of ethyl 5-(4-chlorophenyl)-4-(4-cyanophenyl)-2-phenylfuran-3-carboxylate (**7ba**)^[a]



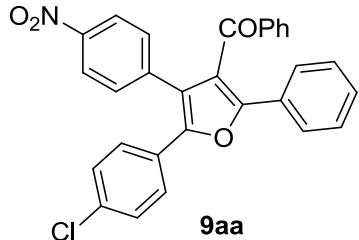
Prepared according to **TP-A** using **6b** (91.6 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2a** (42 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo* and the crude mixture was purified by flash column chromatography (DCM:Hexanes = 1:4) to provide **7ba** as a white solid in 90% yield (115.5 mg)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 7.90 (d, 2H, J = 7.1 Hz), 7.71 (d, 2H, J = 8.0 Hz), 7.56-7.40 (m, 5H), 7.32-7.20 (m, 4H), 4.08 (q, 2H, J = 7.2 Hz), 0.98 (t, 3H, J = 7.2 Hz)

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 163.3, 155.8, 147.7, 138.3, 134.3, 132.2, 130.9, 129.6, 129.2, 128.9, 128.3, 128.1, 127.7, 127.1, 122.2, 118.6, 116.1, 111.7, 60.7, 13.5.

Synthesis of

(5-(4-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-yl)(phenyl)methanone (9aa)^[a]



Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2a** (42 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9aa** as a yellow solid in 92% yield (132.2 mg).

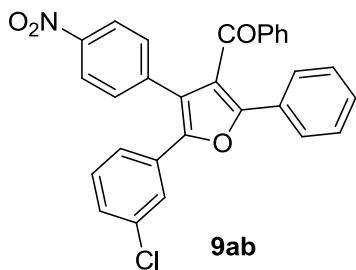
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.11 (d, 2H, *J* = 8.5 Hz), 7.81 (d, 2H, *J* = 7.9 Hz), 7.62-7.55 (m, 2H), 7.49-7.38 (m, 3H), 7.41 (d, 2H, *J* = 8.7 Hz), 7.34-7.26 (m, 7H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.4, 152.4, 148.1, 147.3, 139.1, 137.0, 134.6, 133.8, 130.7, 129.7, 129.1, 128.9, 128.7, 128.6, 127.8, 127.6, 126.6, 124.0, 123.0, 122.4.

Synthesis of

(5-(3-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-yl)(phenyl)methanone

(9ab)



Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2b** (43 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ab** as a yellow solid in 97% yield (139.4 mg).

mp: 175.5-176.2 °C; R_f = 0.125 (dichloromethane : Hexanes = 1:4)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.12 (d, 2H, J = 8.7 Hz), 7.80 (d, 2H, J = 7.5 Hz), 7.64-7.54 (m, 3H), 7.49-7.39 (m, 3H), 7.35-7.18 (m, 8H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.3, 152.6, 147.6, 147.3, 138.9, 137.0, 134.9, 133.8, 131.0, 130.7, 130.0, 129.7, 129.2, 128.8, 128.7, 128.63, 128.60, 126.7, 126.3, 124.3, 123.9, 123.0, 122.9.

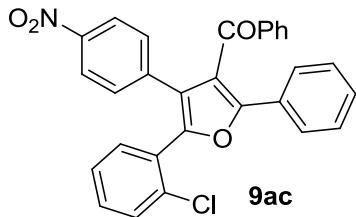
IR (KBr) $\tilde{\nu}$ (cm⁻¹): 1661, 1597, 1519, 11343, 693

HRMS (EI) for C₂₉H₁₈ClNO₄, [M]⁺ (479.0924) found: 479.0923

Synthesis of

(5-(2-chlorophenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-yl)(phenyl)methanone

(9ac)



Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2c** (42 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ac** as a pale yellow solid in 94% yield (135.1 mg).

mp: 77-77.3 °C; R_f = 0.1 (dichloromethane : Hexanes = 1:4)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.12 (d, 2H, J = 8.7 Hz), 7.80 (d, 2H, J = 7.5 Hz), 7.64-7.54 (m, 3H), 7.49-7.39 (m, 3H), 7.35-7.18 (m, 8H).

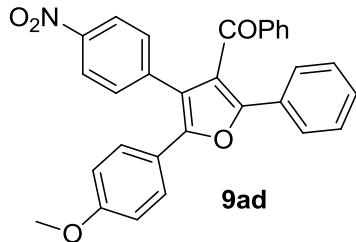
¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.3, 152.6, 147.6, 147.3, 138.9, 137.0, 134.9, 133.8, 131.0, 130.7, 130.0, 129.7, 129.2, 128.8, 128.7, 128.63, 128.60, 126.7, 126.3, 124.3, 123.9, 123.0, 122.9.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 1661, 1598, 1519, 1341, 692

HRMS (EI) for C₂₉H₁₈ClNO₄, [M]⁺ (479.0924) found: 479.0925.

Synthesis of

(5-(4-methoxyphenyl)-4-(4-nitrophenyl)-2-phenylfuran-3-yl)(phenyl)methanone (9ad)^[a]



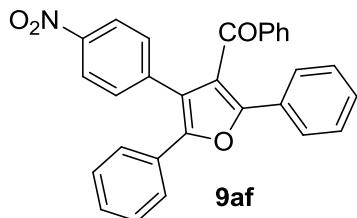
Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2d** (46 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude

mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ad** as a yellow solid in 92% yield (131.1 mg)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.09 (d, 2H, *J* = 8.1 Hz), 7.82 (d, 2H, *J* = 7.3 Hz), 7.58 (d, 2H, *J* = 7.7 Hz), 7.48-7.37 (m, 5H), 7.34-7.23 (m, 5H), 6.86 (d, 2H, *J* = 8.8 Hz), 3.82 (s, 3H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.8, 160.0, 151.7, 149.5, 147.0, 139.8, 137.2, 133.7, 130.7, 129.7, 129.2, 128.7, 128.6, 128.5, 128.1, 126.5, 123.8, 122.8, 121.9, 114.3, 55.3.

Synthesis of (4-(4-nitrophenyl)-2,5-diphenylfuran-3-yl)(phenyl)methanone (**9af**)^[a]



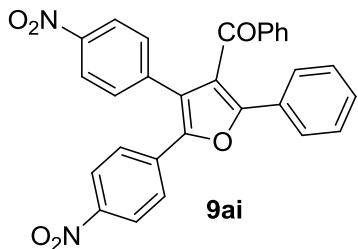
Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2f** (34 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9af** as a yellow solid in 91% yield (121.5 mg).

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.10 (d, 2H, *J* = 8.5 Hz), 7.82 (d, 2H, *J* = 7.8 Hz), 7.60-7.56 (m, 2H), 7.54-7.40 (m, 5H), 7.38-7.26 (m, 8H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.6, 152.2, 149.3, 147.1, 139.5, 137.1, 133.8, 130.7, 129.7, 129.3, 129.0, 128.9, 128.8, 128.7, 128.6, 128.5, 126.6, 126.5, 123.8, 122.9, 122.0.

Synthesis of (4,5-bis(4-nitrophenyl)-2-phenylfuran-3-yl)(phenyl)methanone

(9ai)^[a]



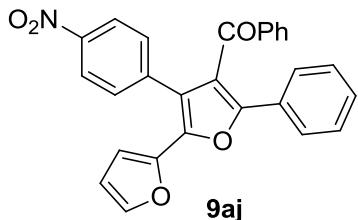
Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2i** (63 mg, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ai** as a yellow solid in 89% yield (130.9 mg).

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.22-8.14 (m, 4H), 7.81 (d, 2H, *J* = 7.5 Hz), 7.66-7.58 (m, 4H), 7.54-7.41 (m, 3H), 7.37-7.27 (m, 5H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 191.9, 153.6, 147.7, 147.0, 146.5, 138.4, 136.8, 135.1, 134.0, 130.7, 129.7, 129.6, 128.8, 128.7, 128.4, 126.8, 126.3, 125.4, 124.2, 123.6.

Synthesis of (3-(4-nitrophenyl)-5-phenyl-[2,2'-bifuran]-4-yl)(phenyl)methanone

(9aj)^[a]



Prepared according to **TP-A** using **8a** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2j**

(27 μ L, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 7 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9aj** as a yellow solid in 89% yield (116.2 mg).

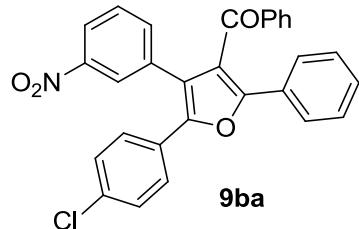
$^1\text{H NMR}$ (400 MHz, CDCl_3 , 25 °C) δ /ppm: 8.11 (d, 2H, J = 8.6 Hz), 7.81 (d, 2H, J = 7.7 Hz), 7.63-7.57 (m, 2H), 7.51 (d, 2H, J = 8.8 Hz), 7.44 (t, 1H, J = 7.4 Hz), 7.41-7.38 (m, 1H), 7.34-7.24 (m, 5H), 6.64 (d, 1H, J = 3.5 Hz), 6.48 (dd, 1H, J^1 = 3.5 Hz, J^2 = 1.8 Hz).

$^{13}\text{C NMR}$ (100 MHz, CDCl_3 , 25 °C) δ /ppm: 192.3, 152.3, 147.1, 144.8, 143.0, 141.7, 138.4, 137.0, 133.8, 130.7, 129.7, 129.1, 128.8, 128.6, 128.5, 126.6, 123.3, 122.5, 121.6, 111.6, 108.9.

Synthesis of

(5-(4-chlorophenyl)-2-phenyl-4-(thiophen-2-yl)furan-3-yl)(phenyl)methanone

(**9ba**)



Prepared according to **TP-A** using **8b** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et_3N (8.4 μ L, 0.06 mmol), PhSiH_3 (61 μ L, 0.48 mmol), **4b** (10 μ L, 0.06 mmol) and **2a** (42 μ L, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 36 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ba** as a yellow solid in 97% yield (139.4 mg).

mp: 164.4-164.5 °C; R_f : 0.13 (dichloromethane : Hexanes = 1:4)

$^1\text{H NMR}$ (400 MHz, CDCl_3 , 25 °C) δ /ppm: 8.15 (s, 1H), 8.09 (d, 1H, J = 8.4 Hz),

7.81 (d, 2H, J = 7.5 Hz), 7.67-7.56 (m, 3H), 7.49-7.37 (m, 4H), 7.34-7.22 (m, 7H).

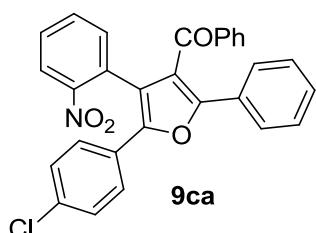
^{13}C NMR (100 MHz, CDCl_3 , 25 °C) δ/ppm: 192.4, 152.4, 148.3, 148.0, 137.1, 136.1, 134.4, 133.9, 133.7, 129.7, 129.6, 129.1, 128.9, 128.6, 128.5, 127.7, 127.2, 126.7, 124.8, 123.2, 122.8, 122.1.

IR (KBr) $\tilde{\nu}$ (cm^{-1}): 1660, 1530, 1493, 1348, 69

HRMS (EI) for $\text{C}_{29}\text{H}_{18}\text{ClNO}_4$, $[\text{M}]^+$ (479.0924) found: 479.0925

Synthesis of

(5-(4-chlorophenyl)-4-(2-nitrophenyl)-2-phenylfuran-3-yl)(phenyl)methanone (**9ca**)



Prepared according to **TP-A** using **8c** (107.2 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et_3N (8.4 μL , 0.06 mmol), PhSiH_3 (61 μL , 0.48 mmol), **4b** (10 μL , 0.06 mmol) and **2a** (42 μL , 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 10 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ca** as a yellow solid in 90% yield (129.3 mg).

mp: 164.3-165.2 °C; R_f : 0.1(dichloromethane : Hexanes = 1:4)

^1H NMR (400 MHz, CDCl_3 , 25 °C) δ/ppm: 8.03 (d, 2H, J = 8.4 Hz), 7.77 (d, 2H, J = 8.8 Hz), 7.60 (t, 1H, J = 7.1 Hz), 7.51 (t, 2H, J = 8.0 Hz), 7.48-7.43 (m, 2H), 7.35 (t, 1H, J = 7.5 Hz), 7.30 (d, 2H, J = 8.4 Hz), 7.24 (d, 2H, J = 8.8 Hz), 7.22-7.16 (m, 4H).

^{13}C NMR (100 MHz, CDCl_3 , 25 °C) δ/ppm: 191.8, 153.6, 149.0, 147.8, 136.9, 134.1, 133.4, 133.3, 133.1, 129.7, 129.4, 128.9, 128.9, 128.3, 128.2, 127.9, 127.5, 127.5,

126.7, 124.8, 123.2, 120.5.

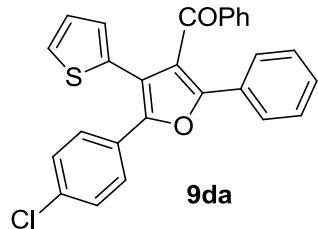
IR (KBr) $\tilde{\nu}$ (cm⁻¹): 1655, 1650, 1527, 1494, 1348, 739, 693

HRMS (EI) for $\mathbf{C}_{29}\mathbf{H}_{18}\mathbf{ClNO}_4$, [M]⁺ (479.0924) found: 479.0925

Synthesis of

(5-(4-chlorophenyl)-2-phenyl-4-(thiophen-2-yl)furan-3-yl)(phenyl)methanone

(9da)



Prepared according to **TP-A** using **8d** (97.5 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2a** (42 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 24 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9da** as a yellow solid in 85% yield (112.4 mg).

mp: 141.0-141.8 °C; R_f: 0.26 (dichloromethane : Hexanes = 1:4)

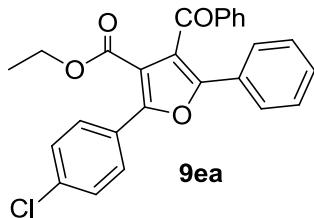
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 7.86 (d, 2H, *J* = 7.5 Hz), 7.60 (d, 2H, *J* = 8.4 Hz), 7.54 (d, 2H, *J* = 8.8 Hz), 7.43 (t, 1H, *J* = 7.5 Hz), 7.34-7.21 (m, 7H), 7.20 (d, 1H, *J* = 5.3 Hz), 6.94 (d, 1H, *J* = 3.5 Hz), 6.88 (dd, 1H, *J*¹ = 5.3 Hz, *J*² = 3.5 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.8, 150.9, 148.4, 137.2, 134.0, 133.5, 131.7, 129.7, 129.1, 128.7, 128.7, 128.6, 128.6, 128.6, 128.4, 128.1, 127.3, 127.3, 126.9, 126.1, 124.0, 117.1.

IR (KBr) $\tilde{\nu}$ (cm⁻¹): 1663, 1483, 1234, 1098, 691

HRMS (EI) for $\mathbf{C}_{27}\mathbf{H}_{17}\mathbf{ClO}_2\mathbf{S}$, [M]⁺ (440.0638) found: 440.0638

**Synthesis of ethyl 4-benzoyl-2-(4-chlorophenyl)-5-phenylfuran-3-carboxylate
(9ea)**



Prepared according to **TP-A** using **8e** (92.5 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and **2a** (42 μL, 0.33 mmol) in THF (1.5 mL). The reaction mixture was stirred for 7 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and the crude mixture was purified by flash column chromatography (DCM: Hexanes = 1:4) to provide **9ea** as a white solid in 99% yield (127.7mg).

mp: 103.3-103.4 °C; R_f: 0.11(dichloromethane : Hexanes = 1:4)

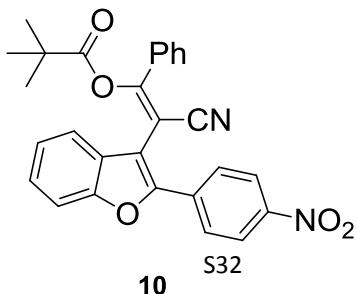
¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.04 (d, 2H, J = 8.8 Hz), 7.98 (d, 2H, J = 7.1 Hz), 7.68-7.60 (m, 2H), 7.56 (t, 1H, J = 7.1 Hz), 7.50-7.40 (m, 4H), 7.36-7.25 (m, 3H), 3.96 (q, 2H, J = 7.1 Hz), 0.87 (t, 3H, J = 7.1 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 192.0, 162.3, 154.7, 150.4, 137.5, 135.8, 133.6, 129.7, 129.3, 129.0, 128.7, 128.7, 128.6, 128.5, 127.3, 126.0, 122.0, 115.8, 61.0, 13.2.

IR (KBr) ̄ (cm⁻¹): 3062, 2982, 1721, 1673, 1227, 691

HRMS (EI) for C₂₆H₁₉ClO₄, [M]⁺ (430.0972) found: 430.0970.

Synthesis of (*E*)-2-cyano-2-(2-(4-nitrophenyl)benzofuran-3-yl)-1-phenylvinyl pivalate (10)^[b]



Prepared according to **TP-A** using **1h** (119.5 mg, 0.3 mmol), **3** (5.8 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol), **2k** (41 μL, 0.33 mmol) and THF (1.5 mL). The reaction mixture was stirred for 15 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (DCM:Hexs = 1:5) to provide **10** as a yellow solid in 68% yield (95.1mg).

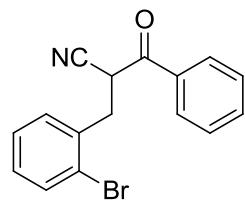
mp : 171.5-172.5 °C, R_f = 0.100 (DCM:Hexs = 1:5)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.37 (d, 2H, J = 8.8 Hz), 8.15 (d, 2H, J = 8.8 Hz), 7.89 (d, 2H, J = 7.5 Hz), 7.36-7.52 (m, 5H), 7.43 (t, 1H, J = 7.7 Hz), 7.36 (t, 1H, J = 7.5 Hz), 0.81 (s, 9H).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 174.6, 163.6, 154.0, 150.5, 147.8, 135.3, 132.1, 132.0, 129.1, 127.8, 127.6, 126.6, 124.2, 124.0, 120.9, 116.3, 111.7, 110.5, 94.7, 39.1, 26.3.

HRMS (ESI) for C₂₈H₂₂N₂O₅Na, [M+Na]⁺ (489.1426) found: 489.1421.

Synthesis of 2-(2-bromobenzyl)-3-oxo-3-phenylpropanenitrile (**11**):



11

Prepared according to **TP-D** using **1a** (93.6 mg, 0.3 mmol), P(O)Bu₃ (6.5 mg, 0.03 mmol), Et₃N (8.4 μL, 0.06 mmol), PhSiH₃ (61 μL, 0.48 mmol), **4b** (10 μL, 0.06 mmol) and THF (1.5 mL). The reaction mixture was stirred for 24 hours at 50 °C. Then the solvent was removed by evaporation *in vacuo*, and crude mixture was purified by flash column chromatography (EA:Hexs = 1:27) to provide **11** as a colorless liquid.

R_f = 0.4 (EA:Hexs = 1:8)

¹H NMR (400 MHz, CDCl₃, 25 °C) δ/ppm: 8.02 (d, 2H, *J* = 7.1 Hz), 7.65 (t, 1H, *J* = 7.5 Hz), 7.58 (d, 1H, *J* = 8.0 Hz), 7.52 (t, 2H, *J* = 7.4 Hz), 7.41 (d, 1H, *J* = 7.5 Hz), 7.31 (t, 1H, *J* = 7.5 Hz), 7.17 (t, 1H, *J* = 7.7 Hz), 4.81 (dd, 1H, *J* = 9.6, 6.0 Hz), 3.54 (dd, 1H, *J* = 13.9, 6.0 Hz), 3.33-3.21 (dd, 1H, *J* = 13.9, 9.6 Hz).

¹³C NMR (100 MHz, CDCl₃, 25 °C) δ/ppm: 190, 135.2, 134.7, 134.1, 133.1, 132.3, 129.6, 129.1, 128.9, 128.1, 124.2, 116.6, 39.2, 36.0.

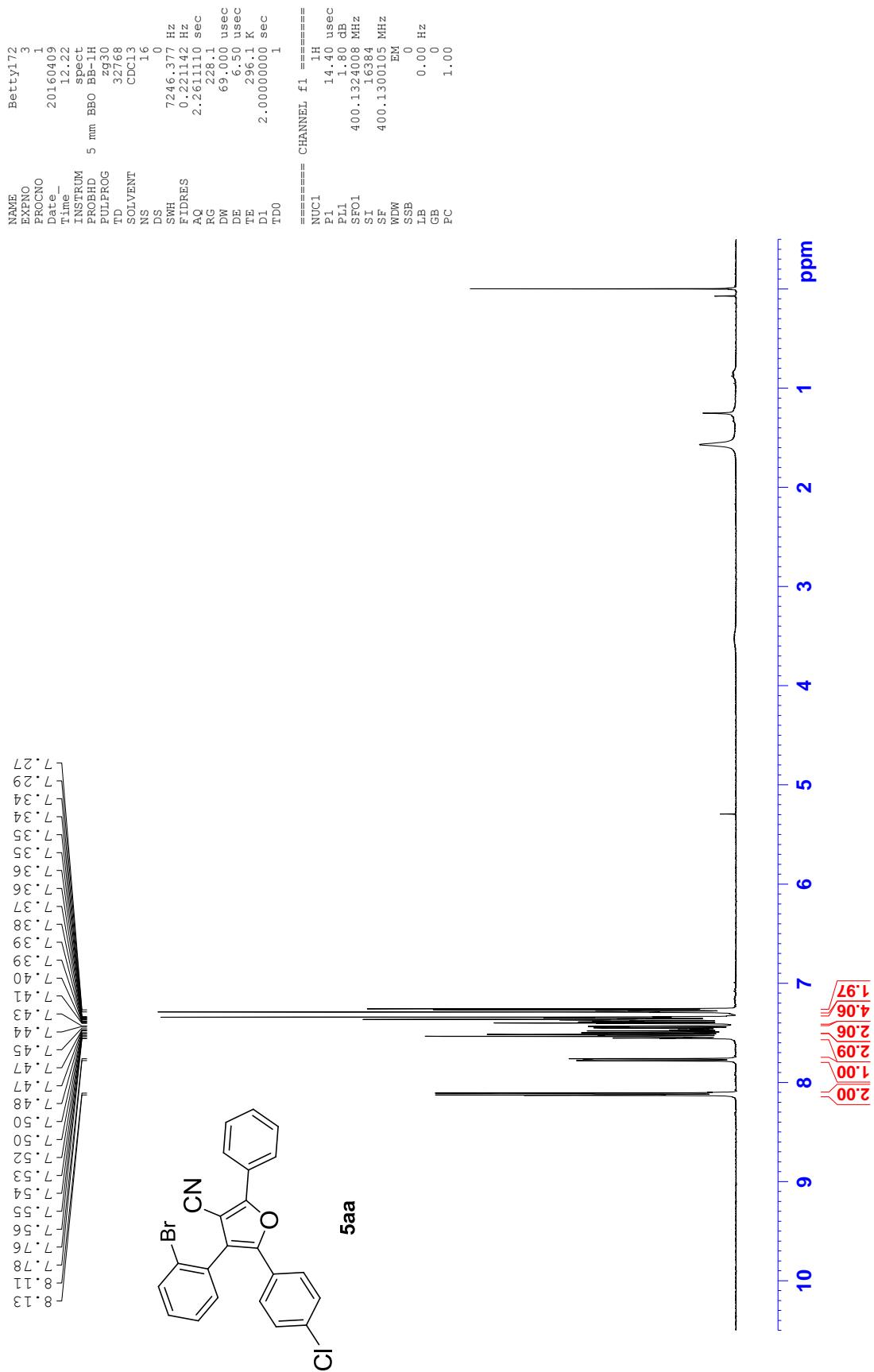
IR (KBr) $\tilde{\nu}$ (cm⁻¹): 3062, 2922, 1597, 1448, 1260, 1027, 752, 694.

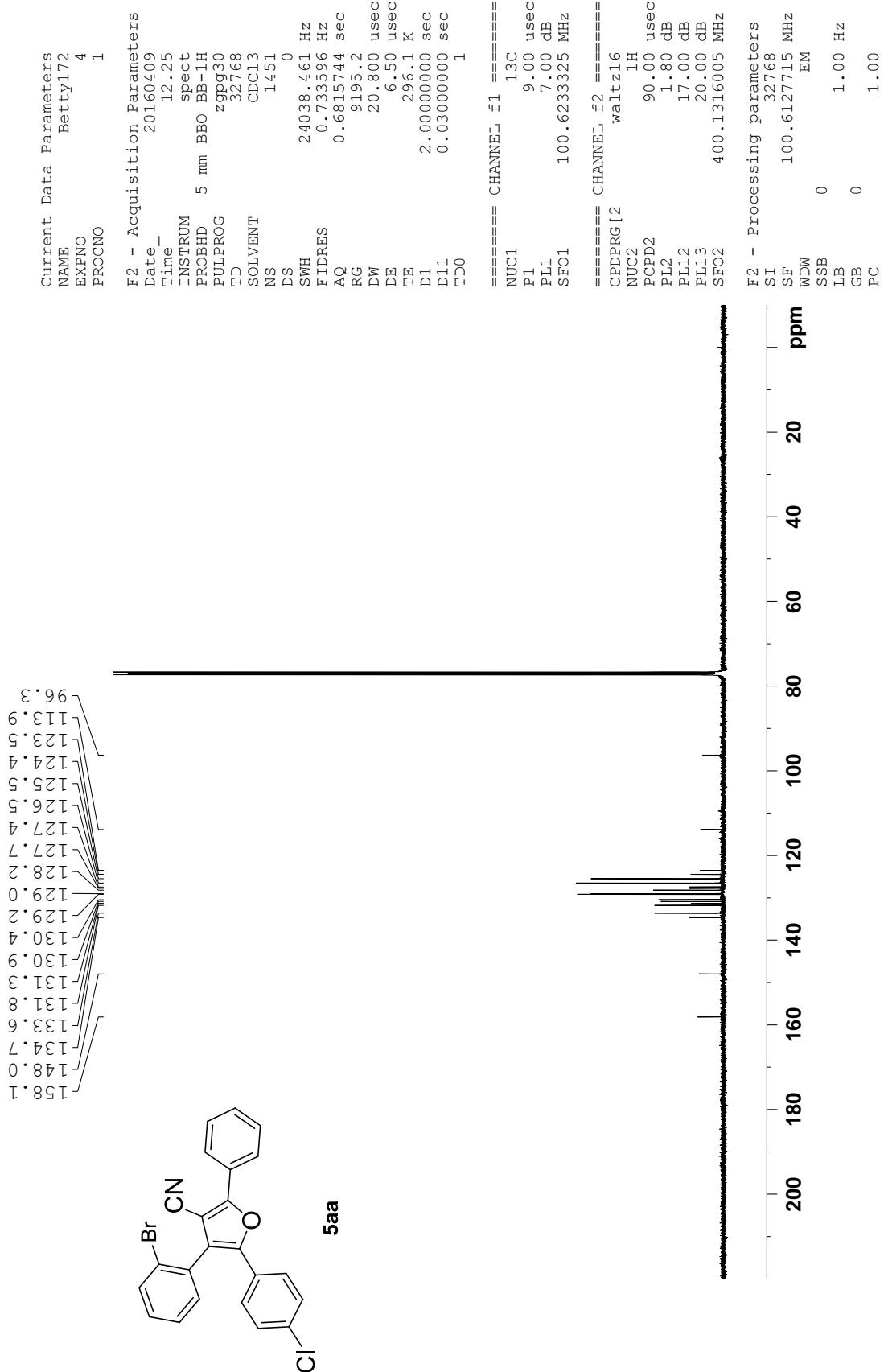
HRMS (ESI) for **C₁₆H₁₃BrNO, [M+H]⁺** (314.0175) found: 314.0181.

V. REFERENCES

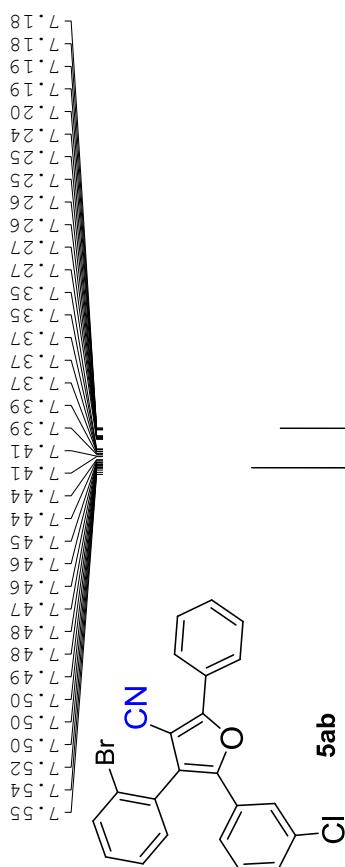
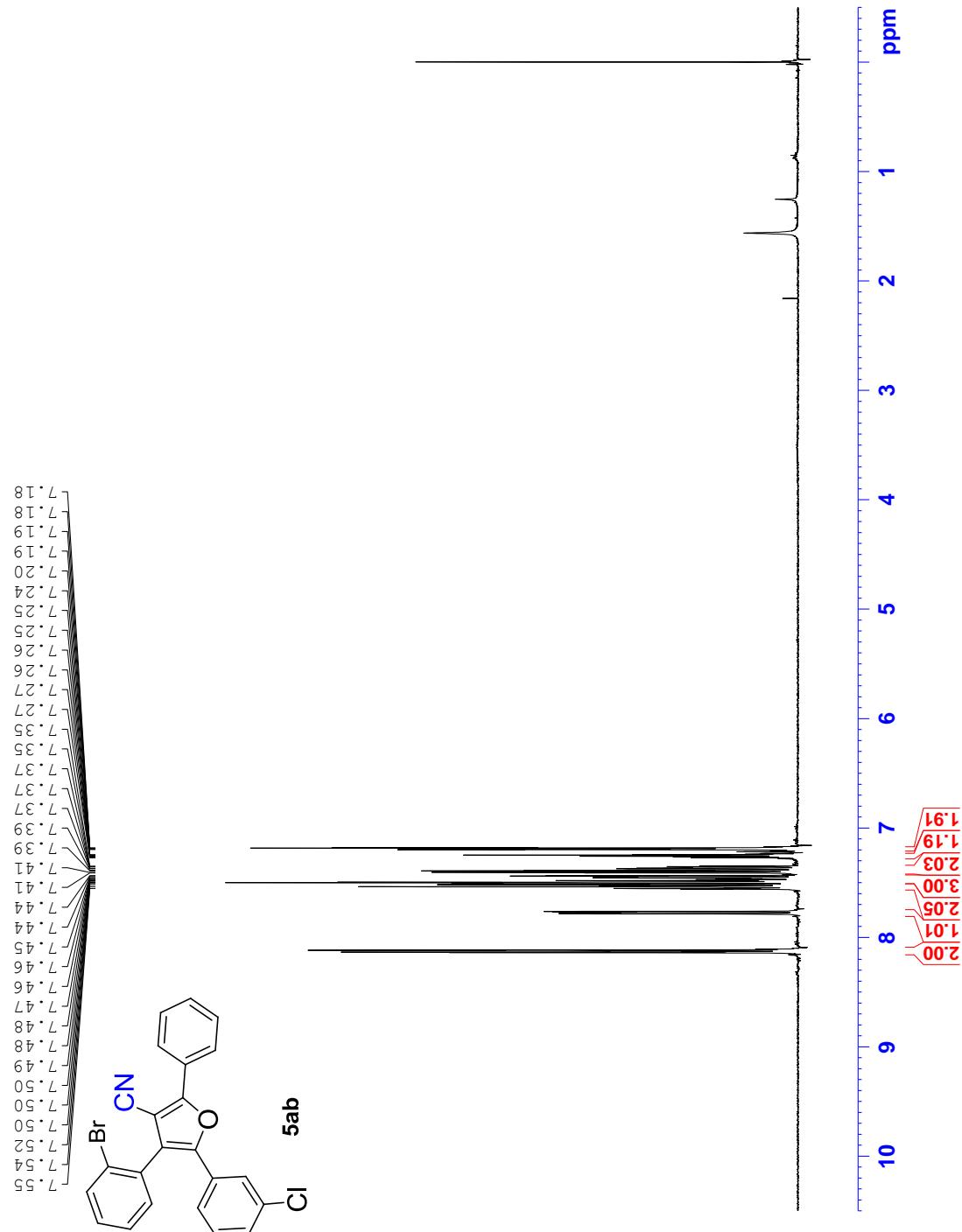
- [a] T.-T. Kao, S.-E. Syu, Y.-W. Jhang, W. Lin, *Org. Lett.* **2010**, *12*, 3066.
- [b] Y.-T. Lee, Y.-T. Lee, C.-J. Lee, C.-N. Sheu, B.-Y. Lin, J.-H. Wang, W. Lin, *Org. Biomol. Chem.* **2013**, *11*, 5156.

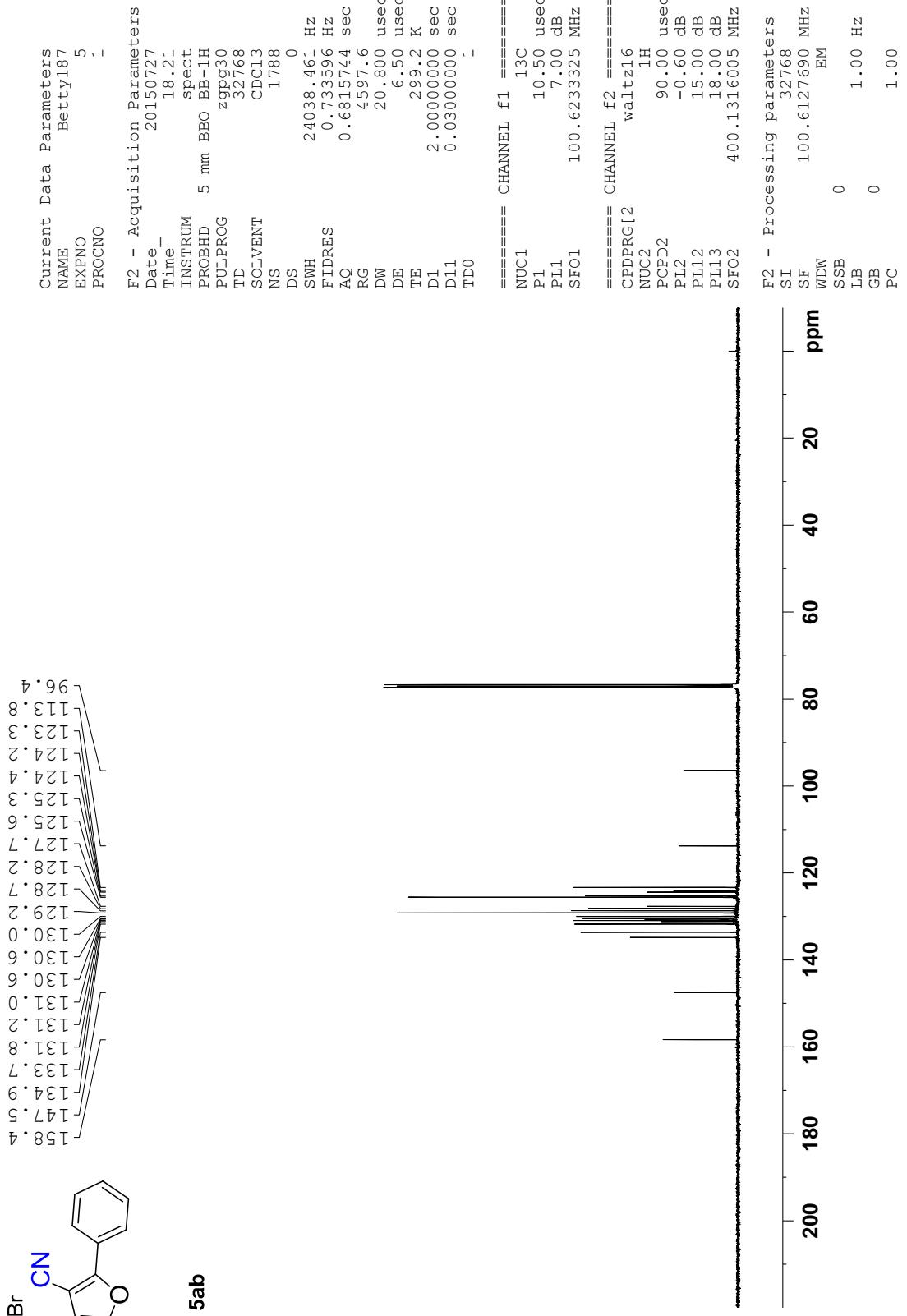
VI. ^1H NMR and ^{13}C NMR spectra of the products

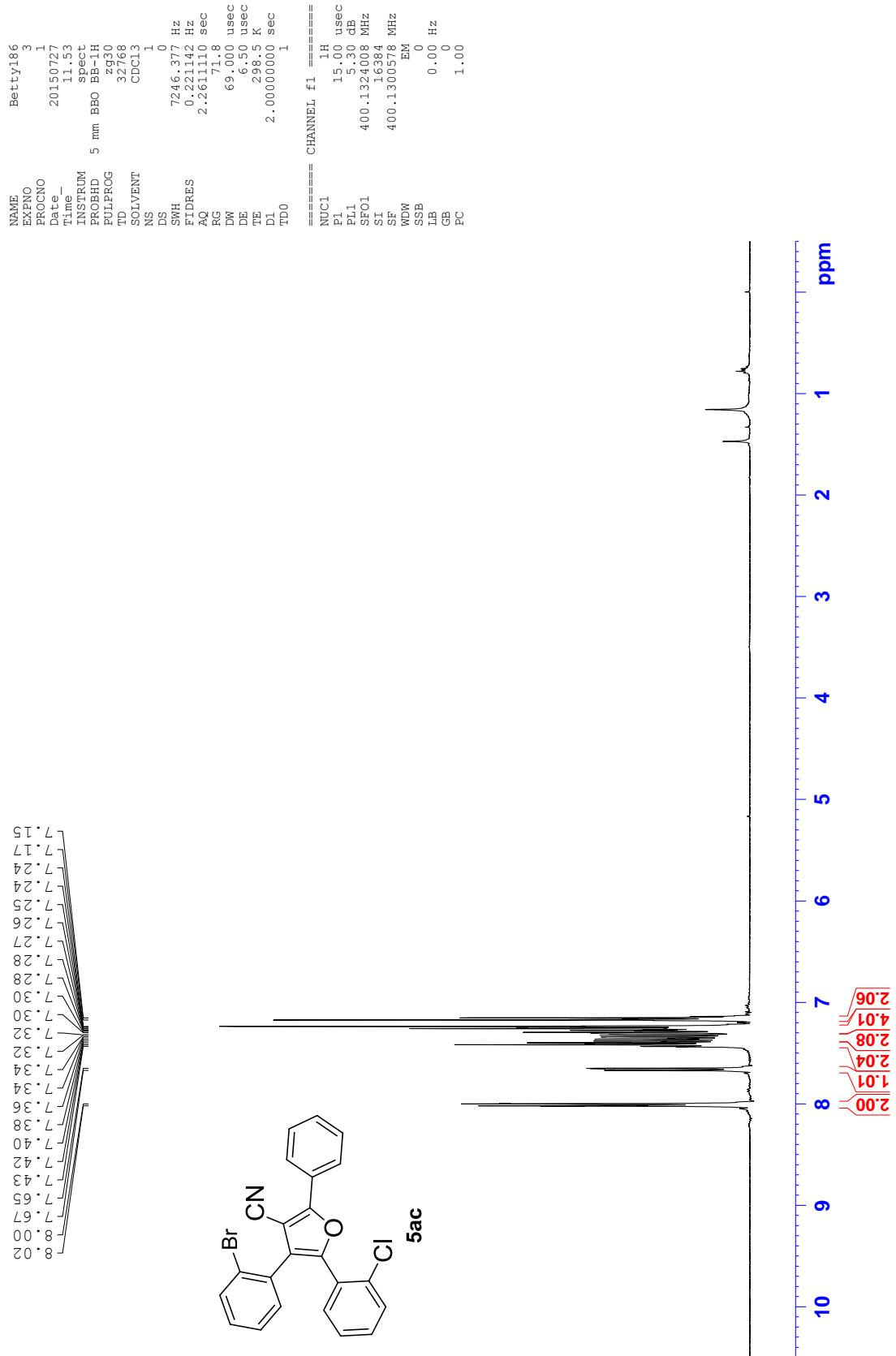


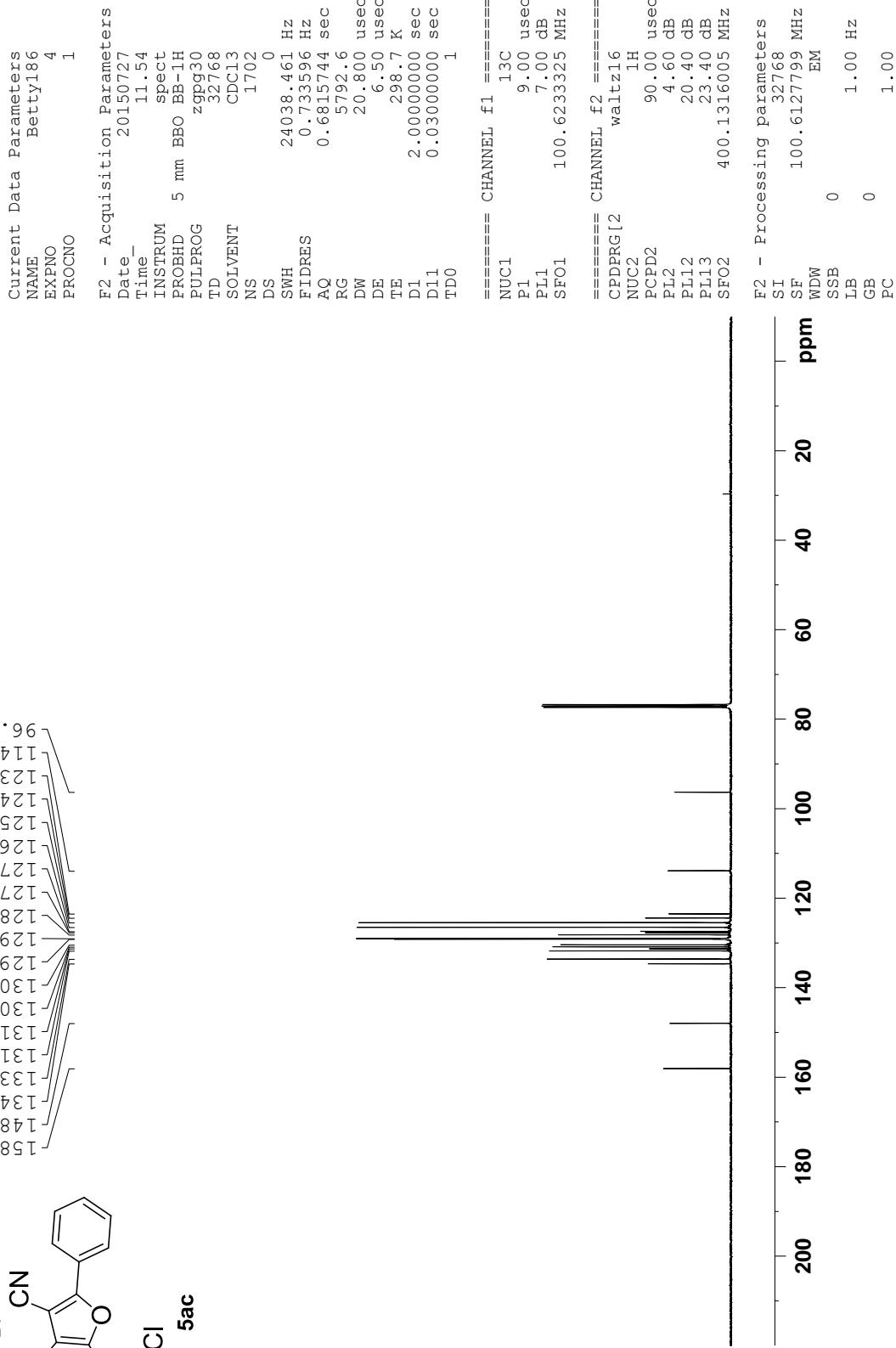
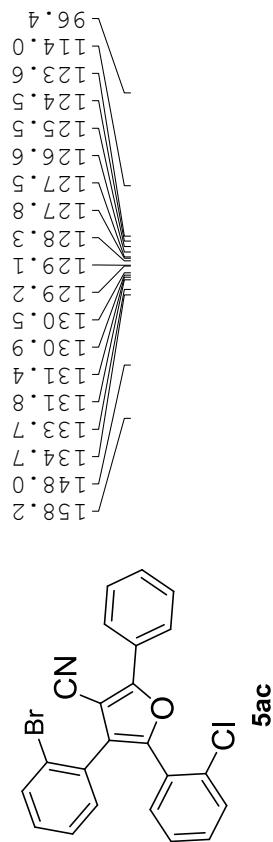


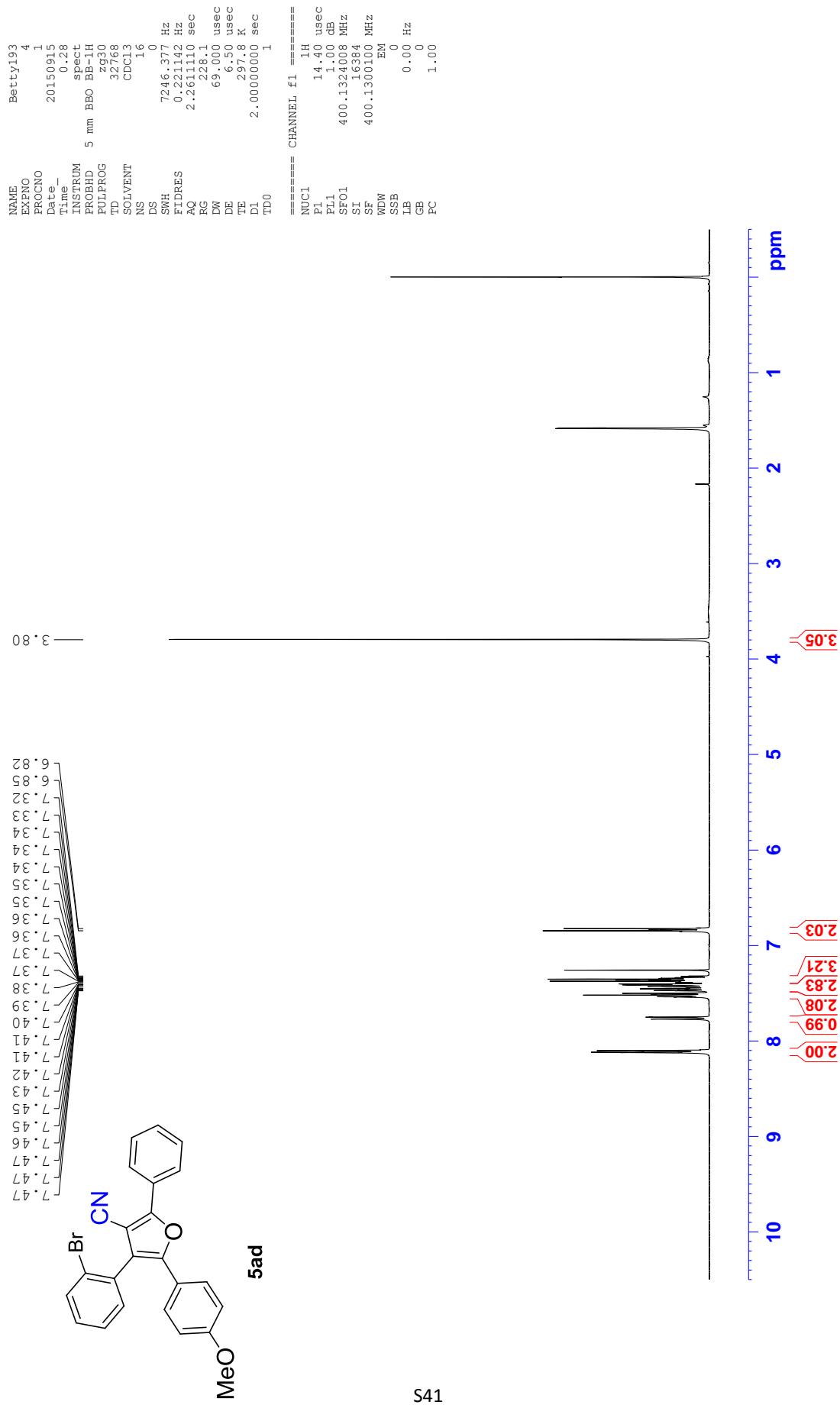
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EXPNO	4
PROCNO	1
Date	20150727
Time	18:19
INSTRUM	Spect
FROBPROG	BB-1H
FULLPROG	2930
TD	32768
SOLVENT	CDC13
NS	1
DS	0
SWH	7246.377 Hz
FDIRES	0.22142 sec
AQ	2.261110 sec
RG	114
DW	69.000 usec
DE	6.50 usec
TE	28.8 K
D1	2.0000000 sec
TDO	1
===== CHANNEL f1 =====	
NUC1	1H
P1	15.00 usec
PL1	5.30 dB
SFO1	400.1324008 MHz
SI	400.13000140 MHz
WWDW	EM
SSB	0
LB	0.00 Hz
GB	1.00
PC	

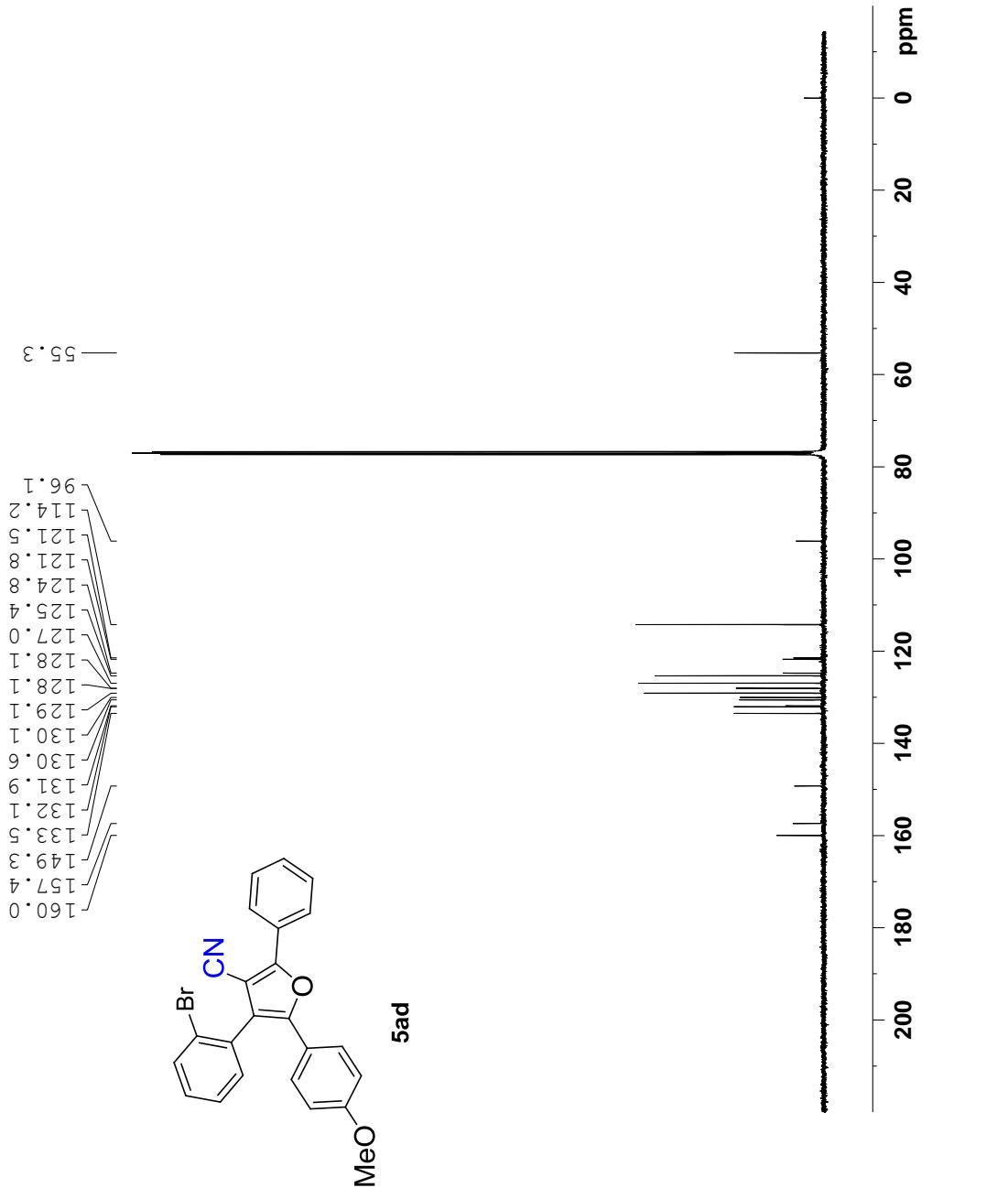




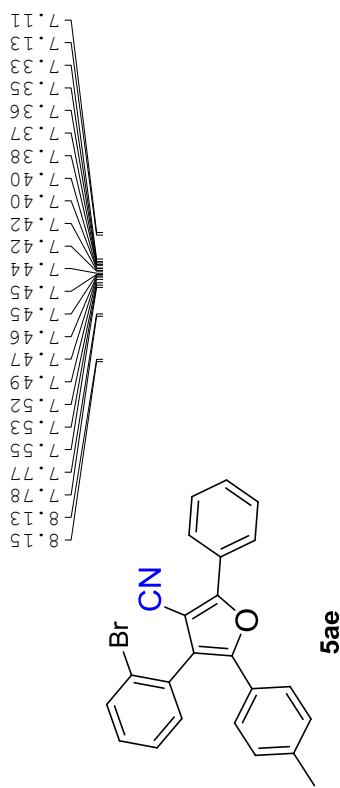
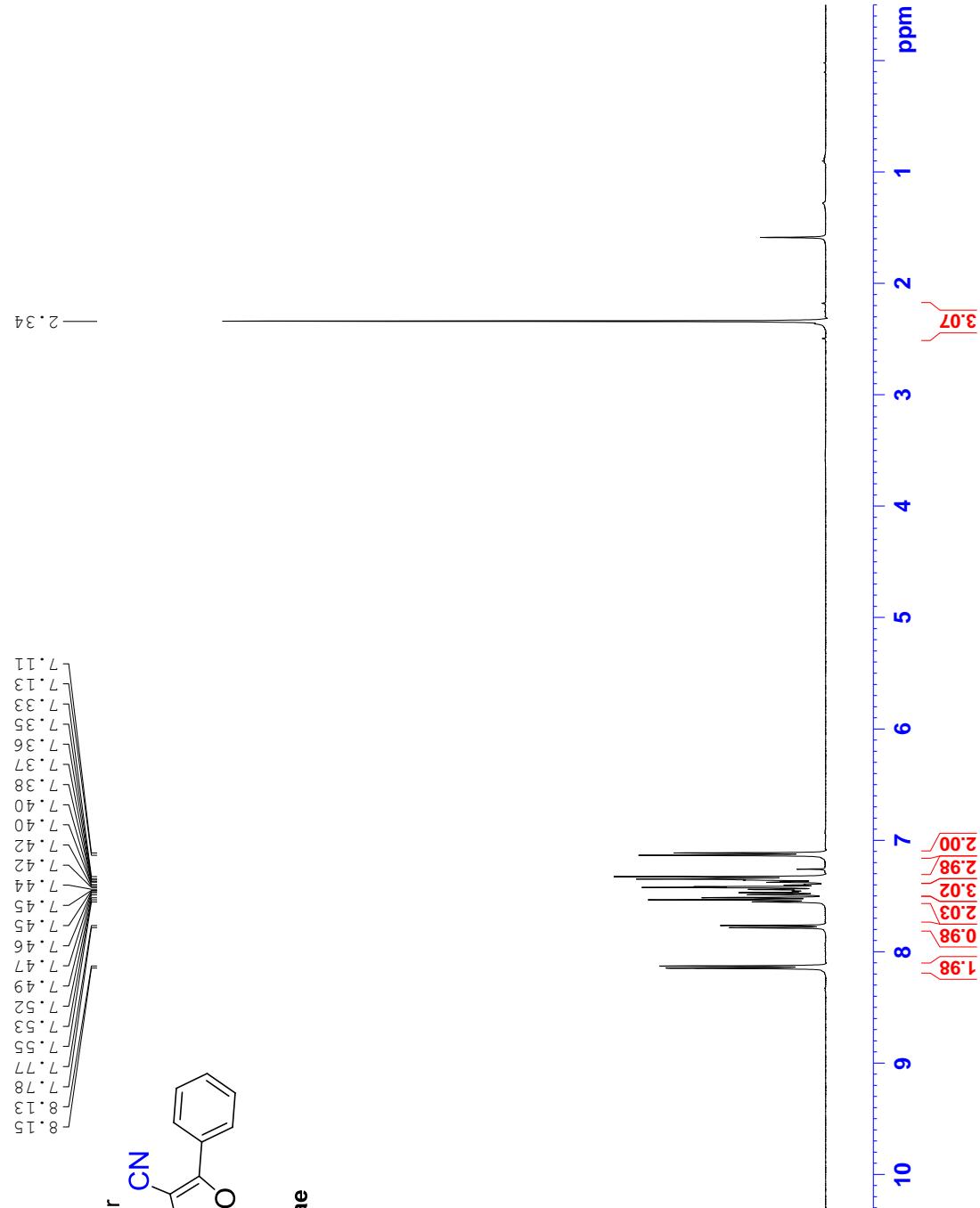




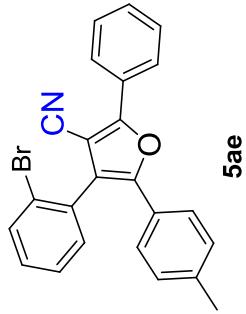




	NAME	Betty306
	EXPNO	1
PROCNO		
Date	20151222	
Time	11:51	
INSTRUM		spect
FIELDPGM	5 mm	BBO BB-1H
TD		zg30
SOLVENT		32768
NS		CDC13
DS	7246.377	0
SWH	2.2611100	Hz
FTDRES	AQ	2.2611100 sec
DW	RG	114
DE	DW	69,000 usec
TE	DE	6.50 usec
DL	TE	29.71 K
TDO	DL	2.0000000 sec
	TDO	1
=====	CHANNEL f1	=====
NUC1	P1	1H
	PL1	14.40 usec
	SF	1.80 dB
	SI	400.1324008 MHz
	SF	400.136384 MHz
	WDW	EM
	SSB	0
	LB	0.00 Hz
	GB	0
	PC	1.00



—21.3—



```

Current Data Parameters          F2 - Acquisition Parameters
NAME      Betty306             Date    20151222
EXPNO     3                   Time_   11.54
PROCNO    1

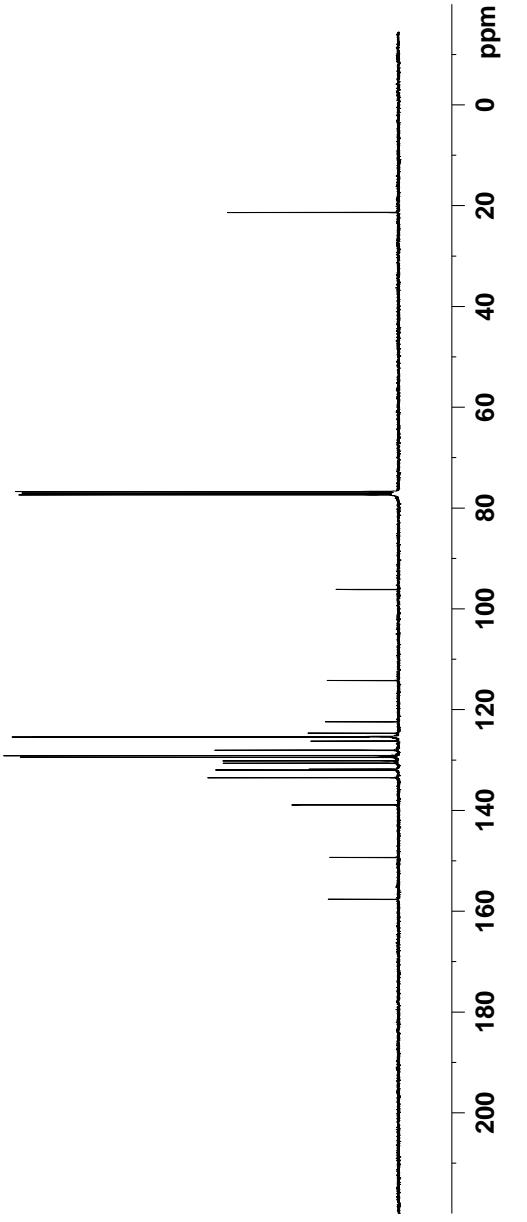
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Date    20151222
Time_   11.54
INSTRUM spect
PROBHD  5 mm BBO BB-1H
PULPROG zgppg30
TD      32768
SOLVENT CDC13
NS      1693
DS      0
SWH    240.038461 Hz
FIDRES 0.7353964 sec
AQ     0.6815744 sec
RG     5792.6
DW     20.800 us
DE     6.50 us
TE     297.2 K
D1     2.0000000 sec
D11    0.03000000 sec
TDOO    1

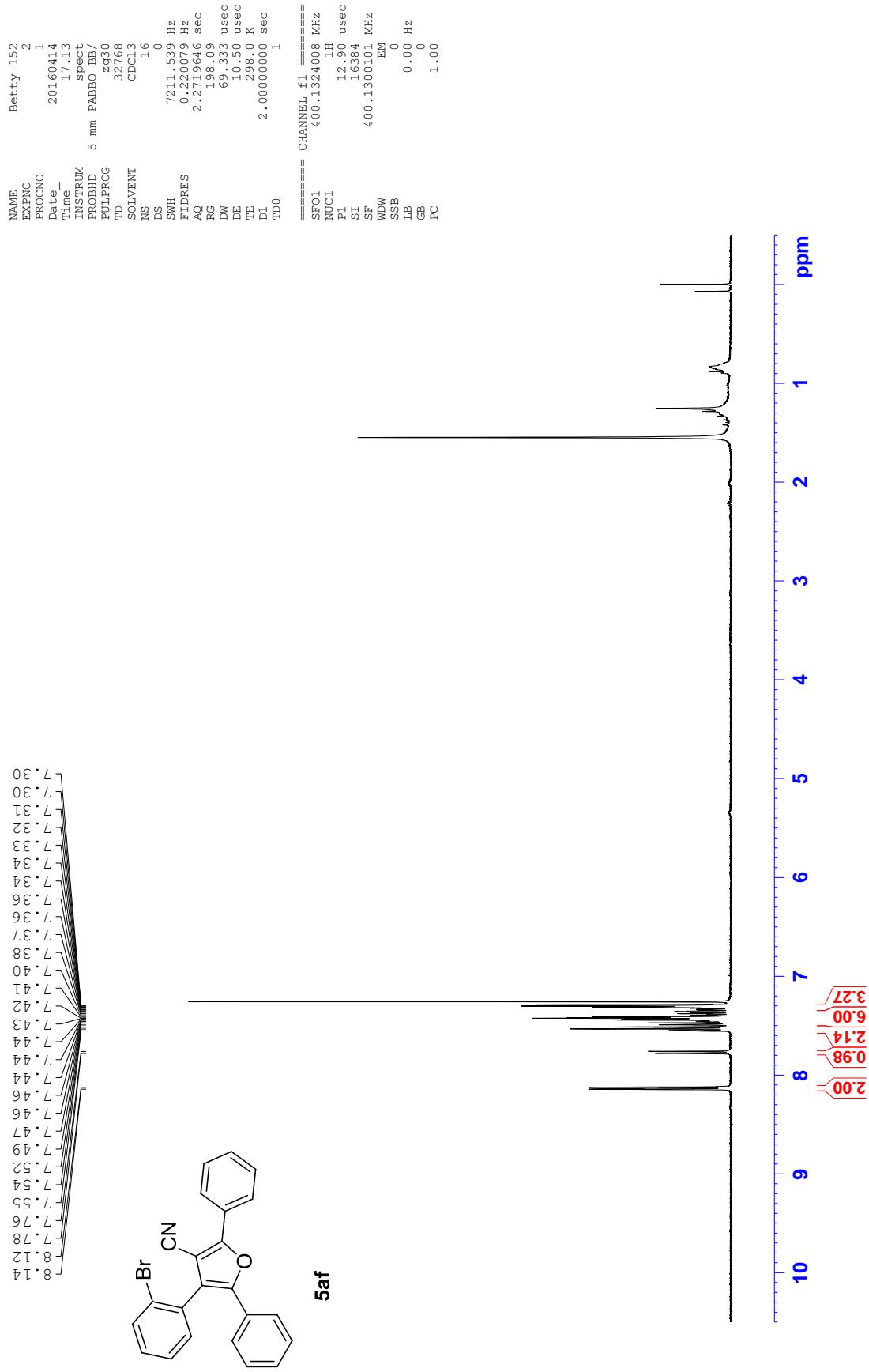
===== CHANNEL f1 =====
NUC1    13C
P1      9.00 us
PL1    7.00 dB
SFO1   100.6233325 MHz

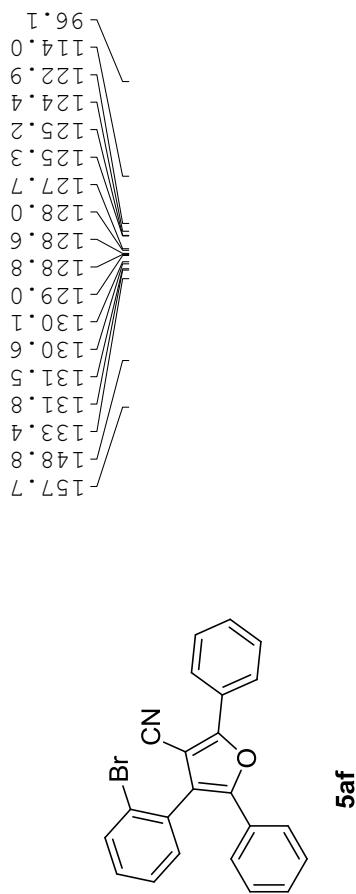
===== CHANNEL f2 =====
CPDPRG [2
NUC2    1H
PCPD2   90.00 us
PL2     1.80 dB
PLL2   17.00 dB
PLL3   20.00 dB
SFO2   400.1316005 MHz

F2 - Processing parameters
SI      32768
SF      100.627764 MHz
WDW    EM
SSB    0
LB      1.00 Hz
GB      0
PC      1.00

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Current Data Parameters
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EXPNO     13
PROCNO    1

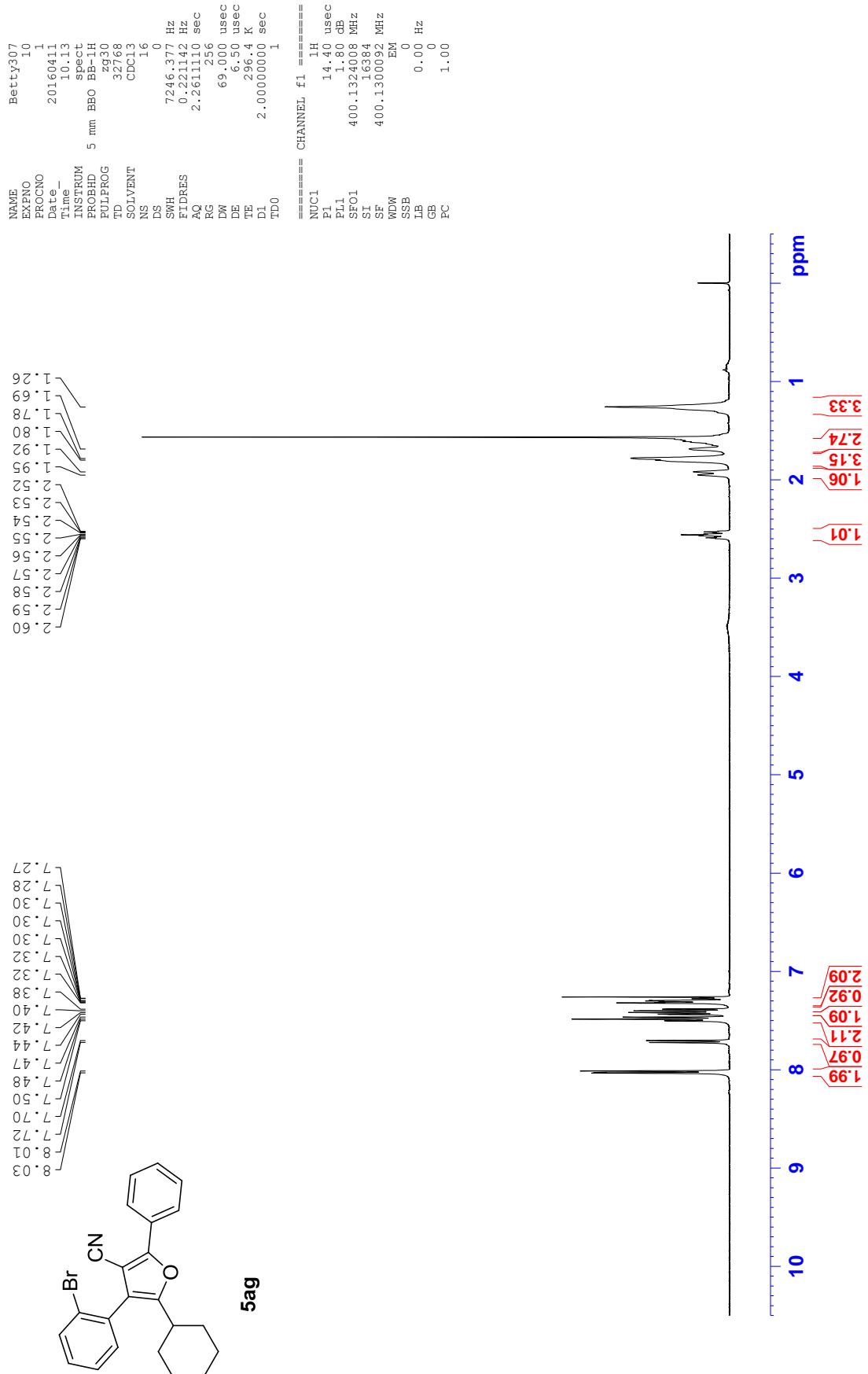
F2 - Acquisition Parameters
Date_   20160414
Time_   20.28
INSTRUM PROBHD
PROBHD  5 mm BBO BB-1H
PULPROG zgpg30
TD      32768
SOLVENT CDCl3
NS      308
DS      0
SWH    24038.461 Hz
FIDRES 0.733596 Hz
AQ     0.6815744 sec
RG      2048
DW      20.800 usec
DE      6.500 usec
TE      295.9 K
D1      2.00000000 sec
D11     0.03000000 sec
TD0      1

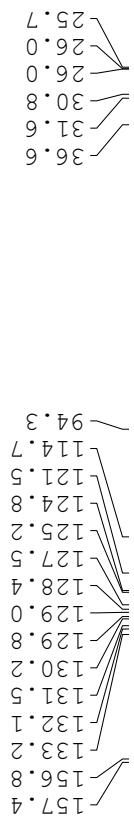
===== CHANNEL f1 =====
NUC1      13C
P1        9.00 usec
PL1      7.00 dB
SFO1     100.62333325 MHz

===== CHANNEL f2 =====
CPDPRT2  waltz16
NUC2      1H
PCPD2    90.00 usec
PL2      1.80 dB
PL12     17.00 dB
PL13     20.00 dB
SFO2     400.1316005 MHz

F2 - Processing parameters
SI      32768
SF      100.6127947 MHz
WDW
SSB    0
LB      1.00 Hz
GB      0
PC      1.00

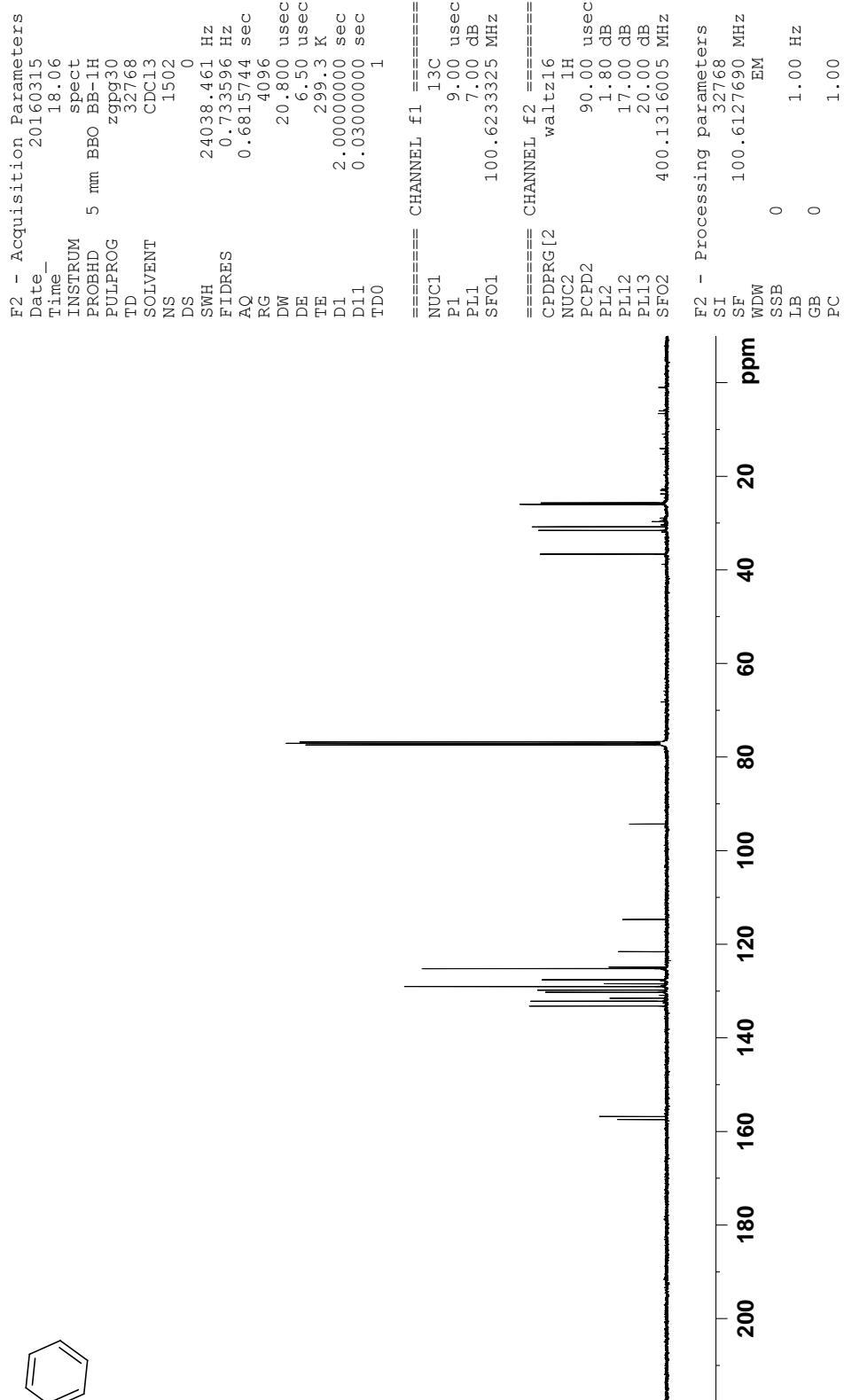
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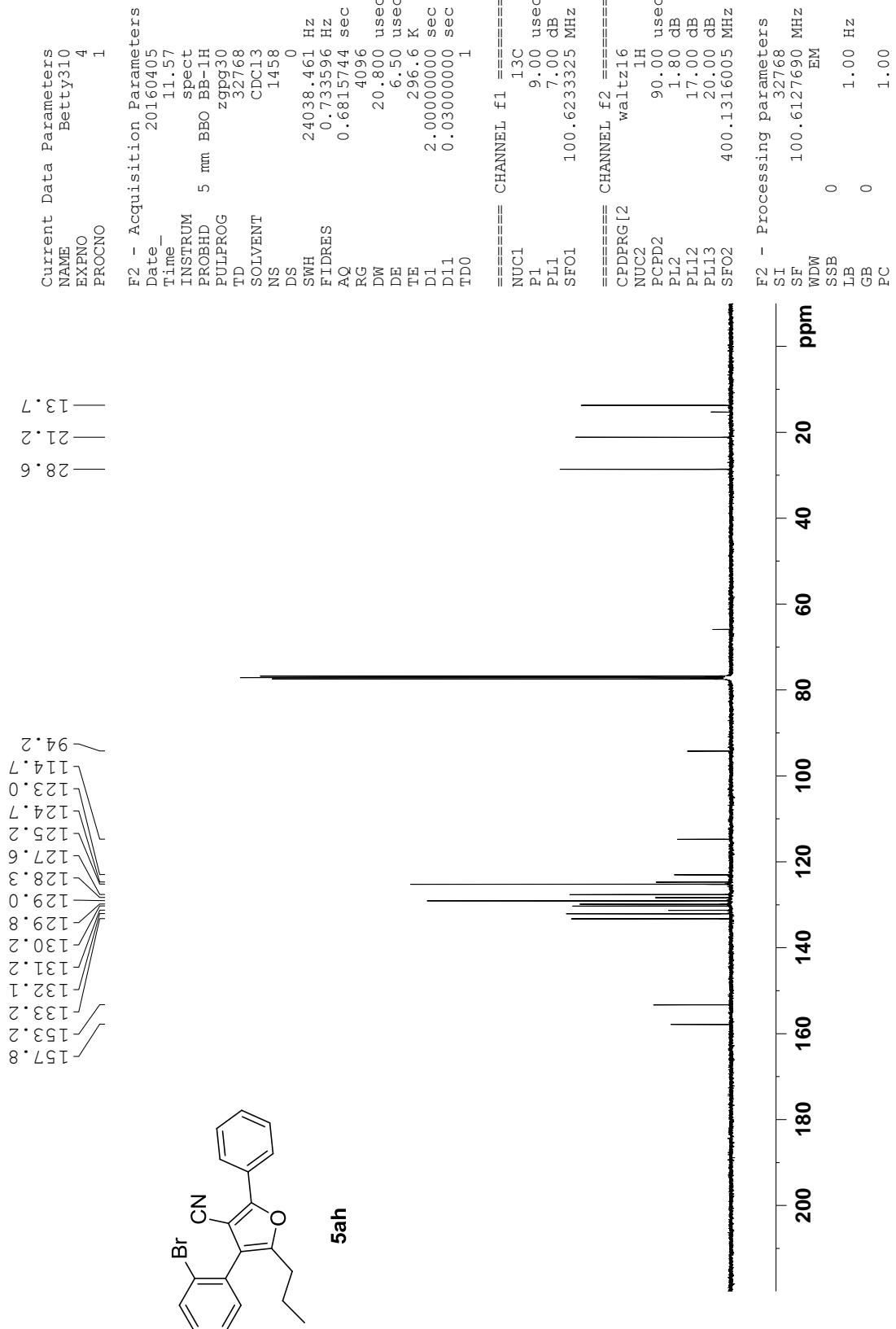




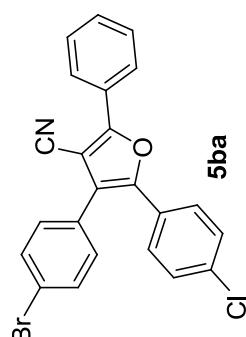
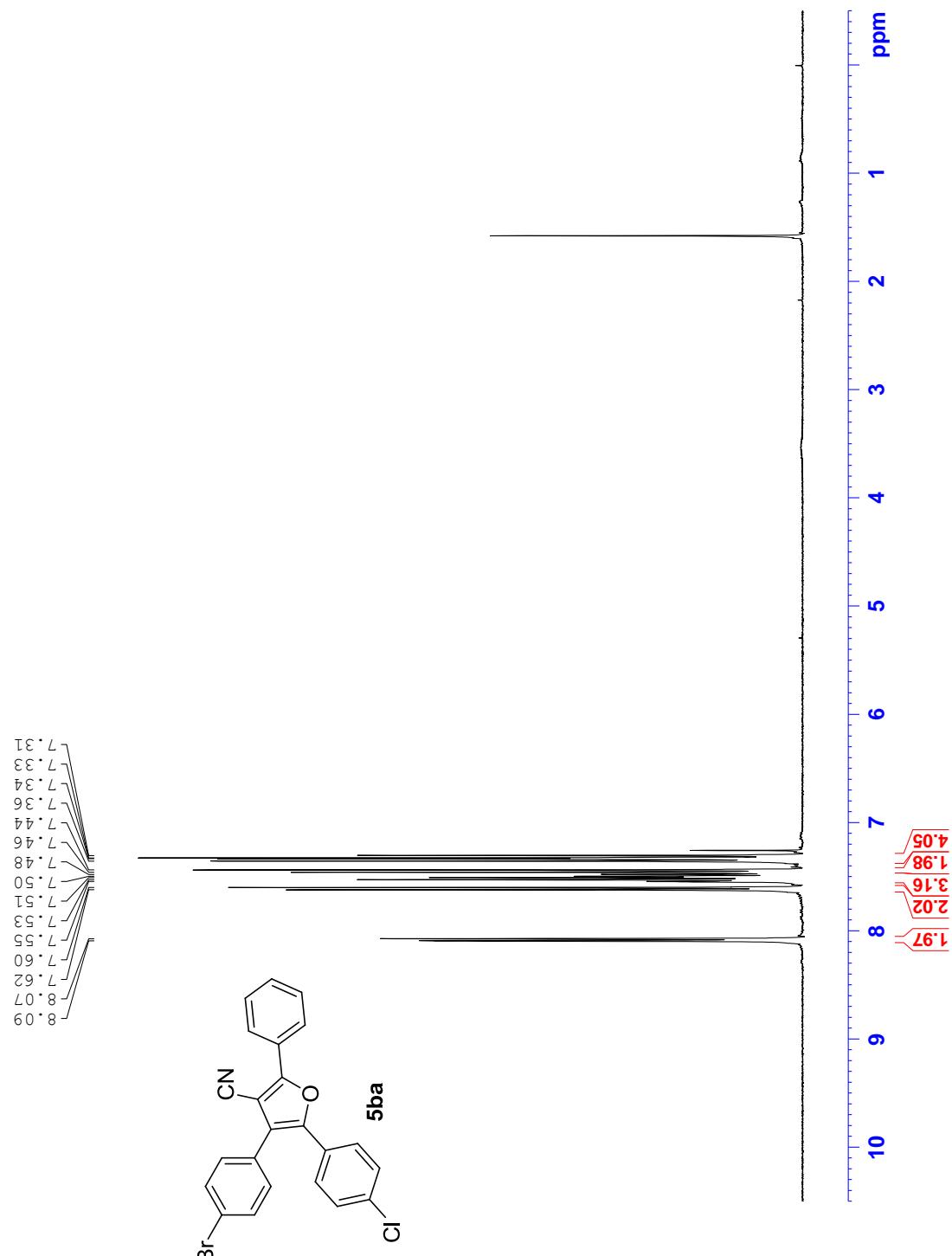
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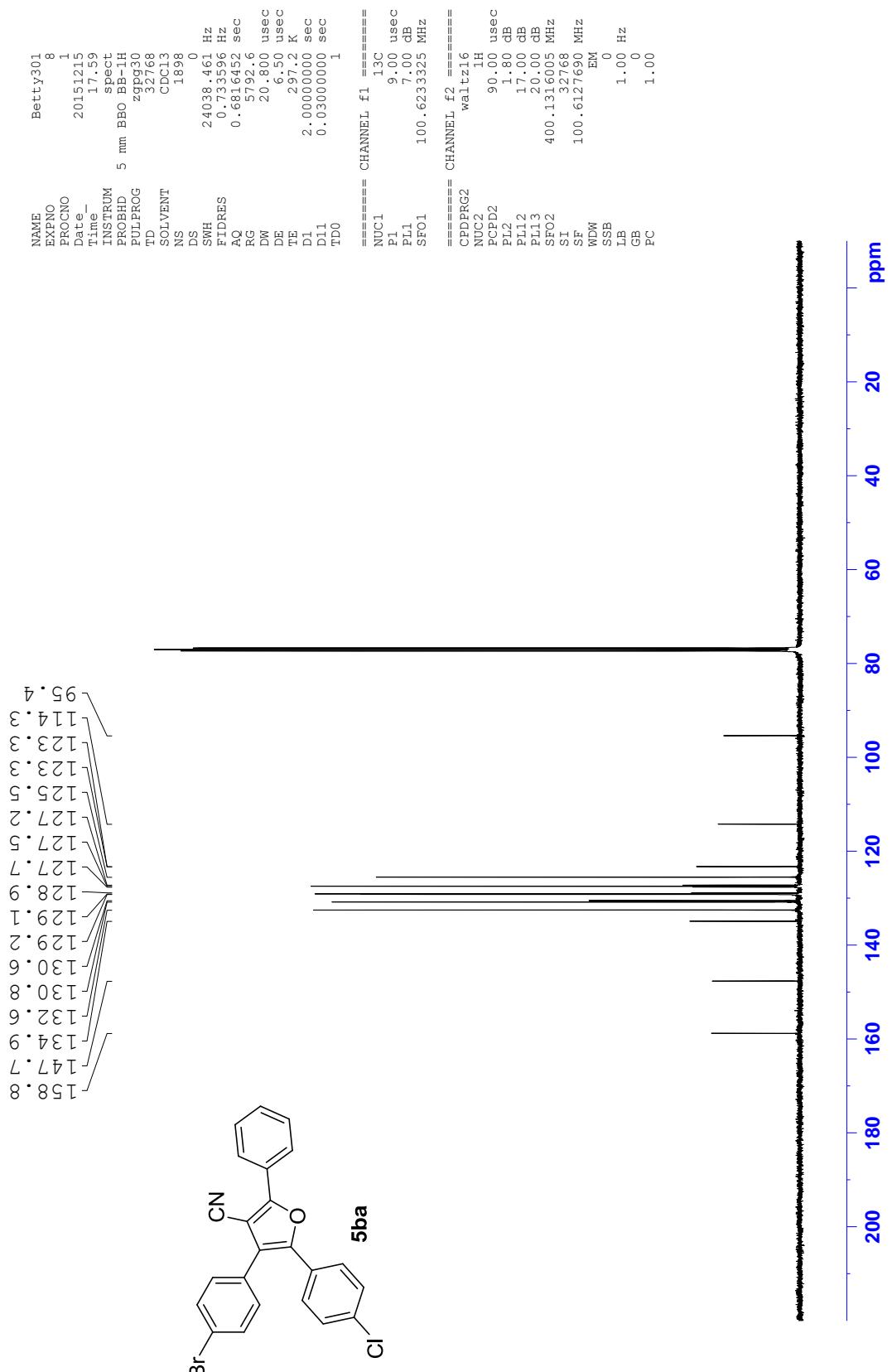
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EXPNO 6
PROCNO 1

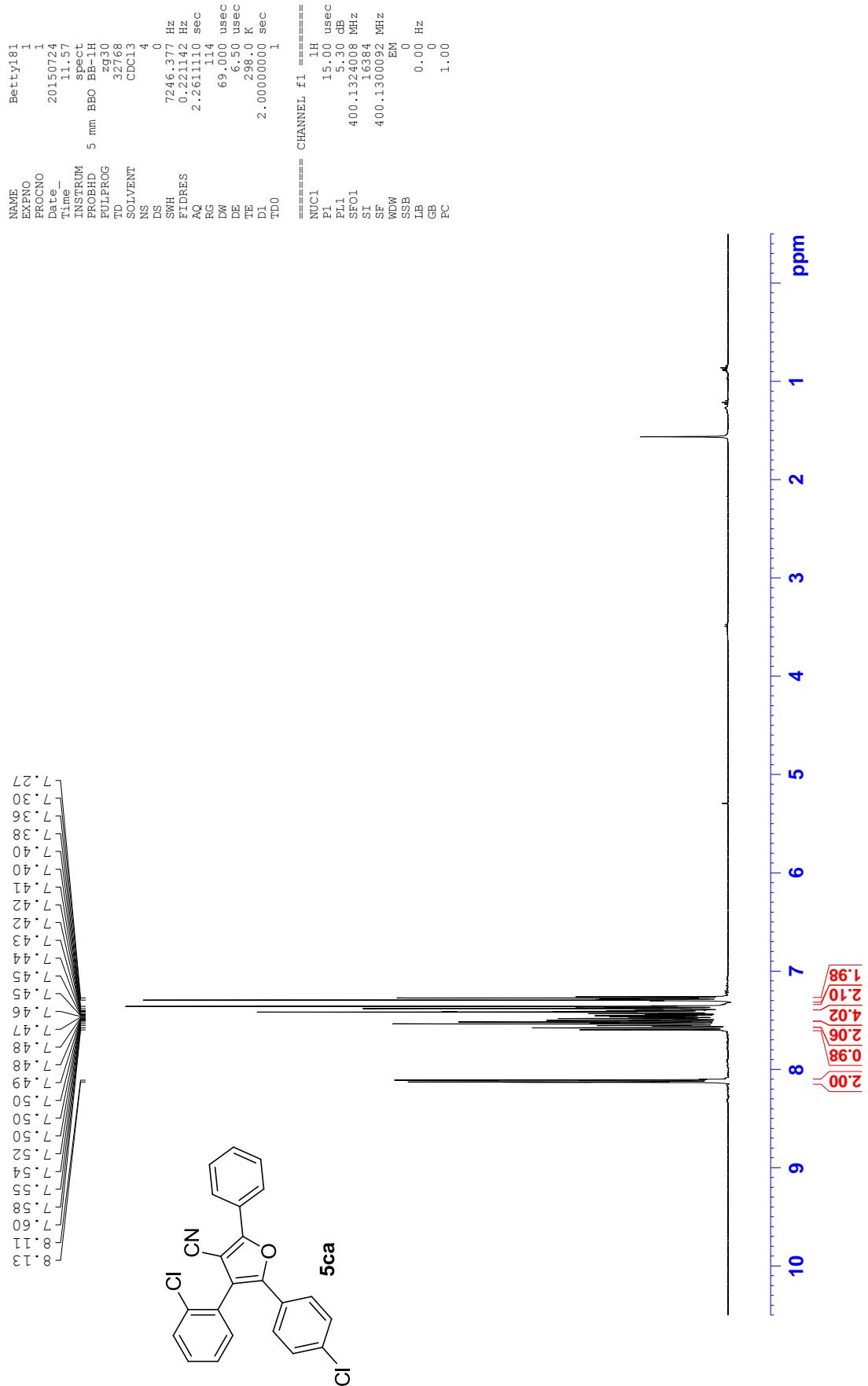


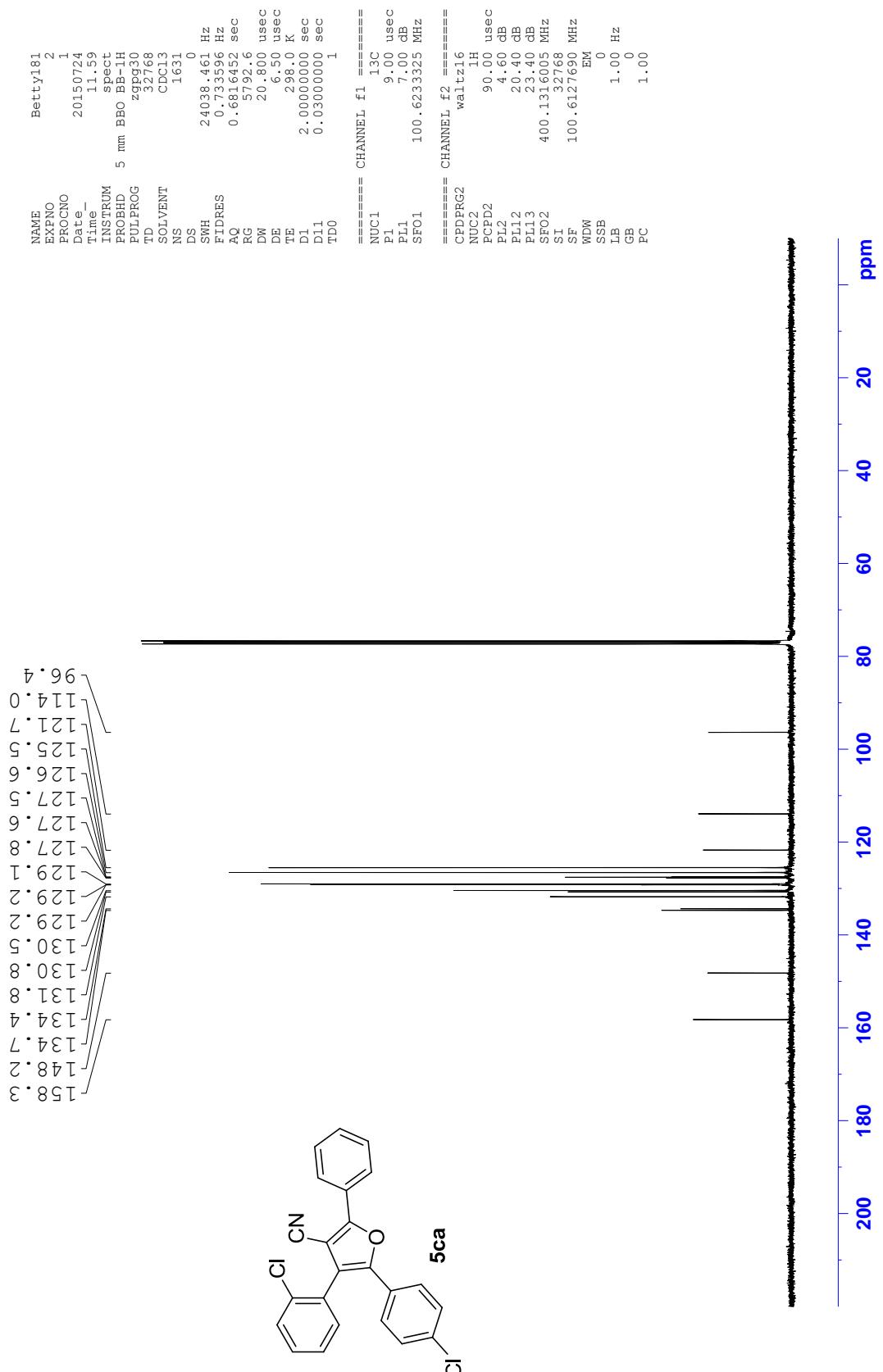


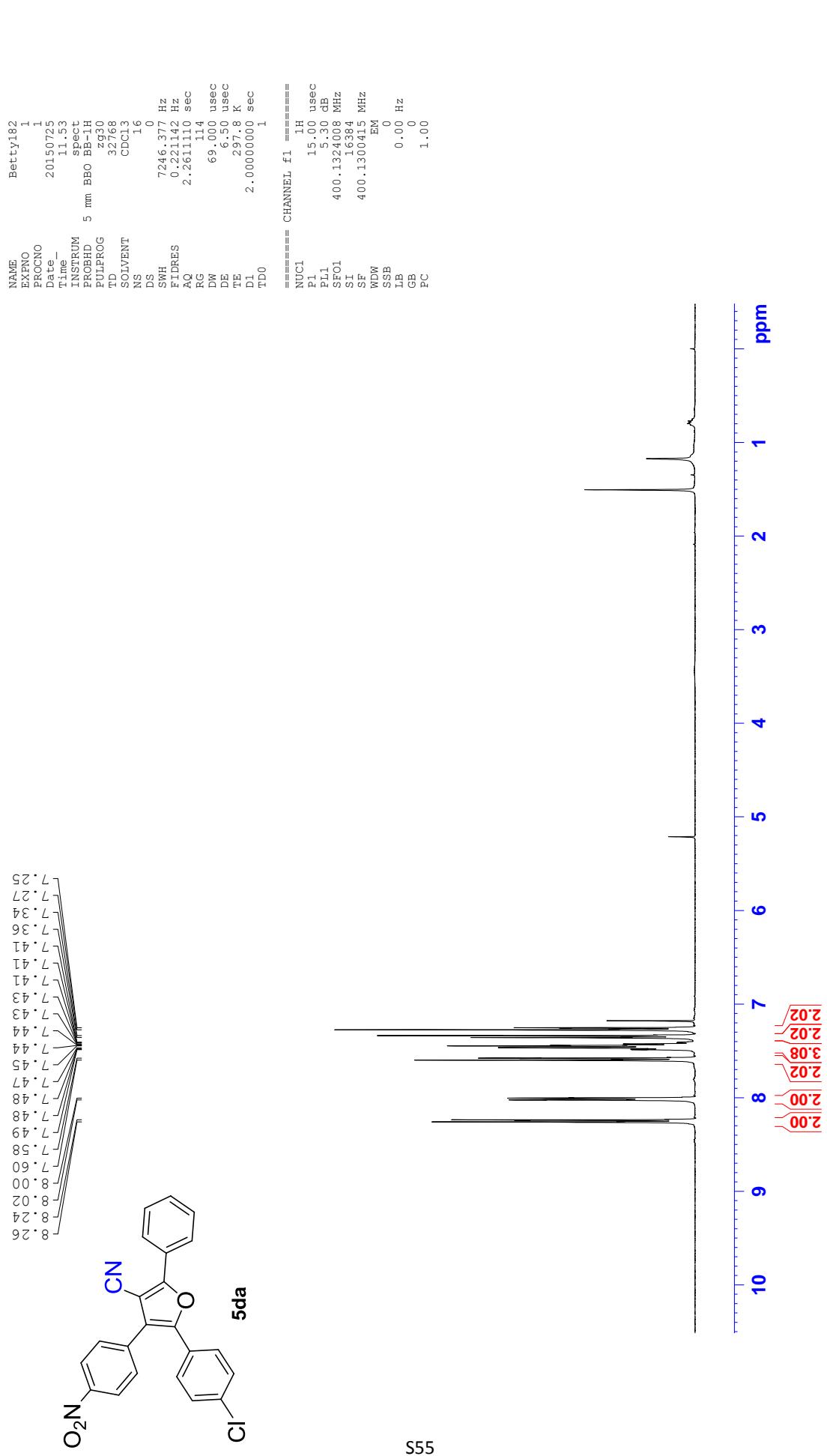
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NAME	EXPM0			
PROCM0				
Date	20151215			
time—		17.58		
INSTRM	SPECT			
PROBD	5 mm	BBO	BB-1H	
PULPROG		2930		
TD		32768		
SOLVENT	CDCl ₃			
NS	4			
DS		0		
SMH		7246.377	Hz	
FIDRES		0.2221142	Hz	
AQ		2.261110	sec	
RG		114		
DW		69.000	usec	
DE		6.50	usec	
TE		297.2	K	
DI		2.0000000	sec	
TDO		1		
===== CHANNEL f1 =====				
NUC1		1H		
P1		14.40	usec	
PL1		1.80	dB	
SFO1		400.1324008	MHz	
SI		1.1384		
SF		400.1300092	MHz	
WDW		EM		
SSB		0		
LB		0.00	Hz	
GB		0		
PC		1.00		



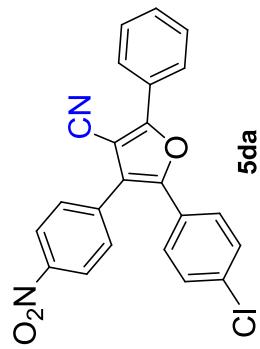








94.9
 113.1
 122.1
 125.6
 126.7
 127.3
 127.8
 129.3
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 130.2
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 136.7
 147.9
 148.6
 159.4



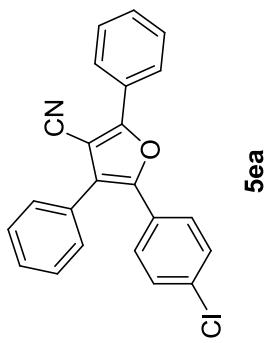
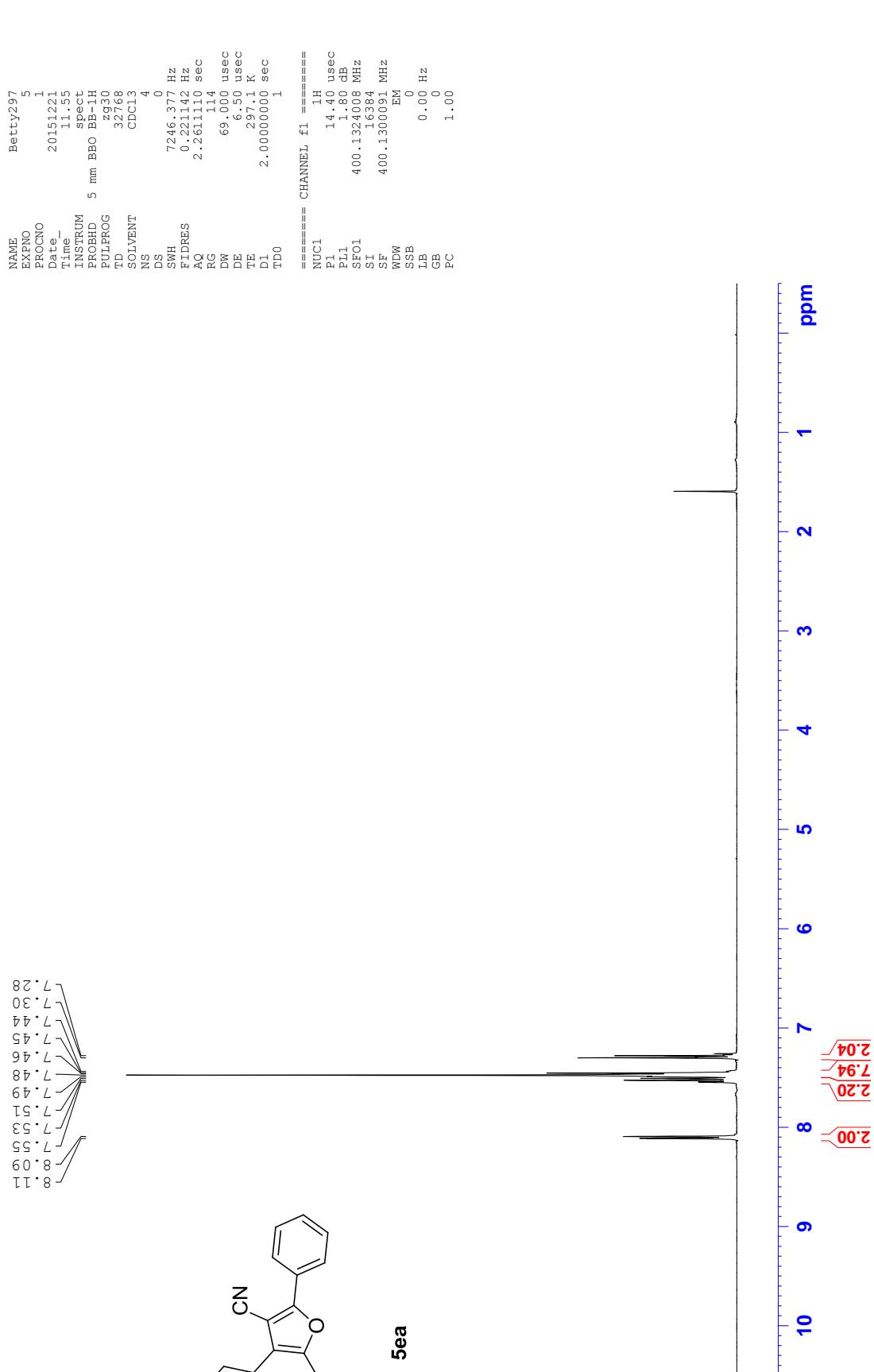
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 NAME Betty182
 EXPNO 2
 PROCNO 1

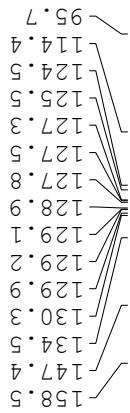
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 Date 20150725
 Time 11.56
 INSTRUM spect
 PROBHD 5 mm BBO BB-1H
 PULPROG zppg30
 TD 32768
 SOLVENT CDCl3
 NS 1715
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.733596 Hz
 AQ 0.6815744 sec
 RG 5792.6
 DW 20.800 usec
 DE 6.50 usec
 TE 297.8 K
 D1 2.0000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 9.00 usec
 PL1 100.6233325 MHz

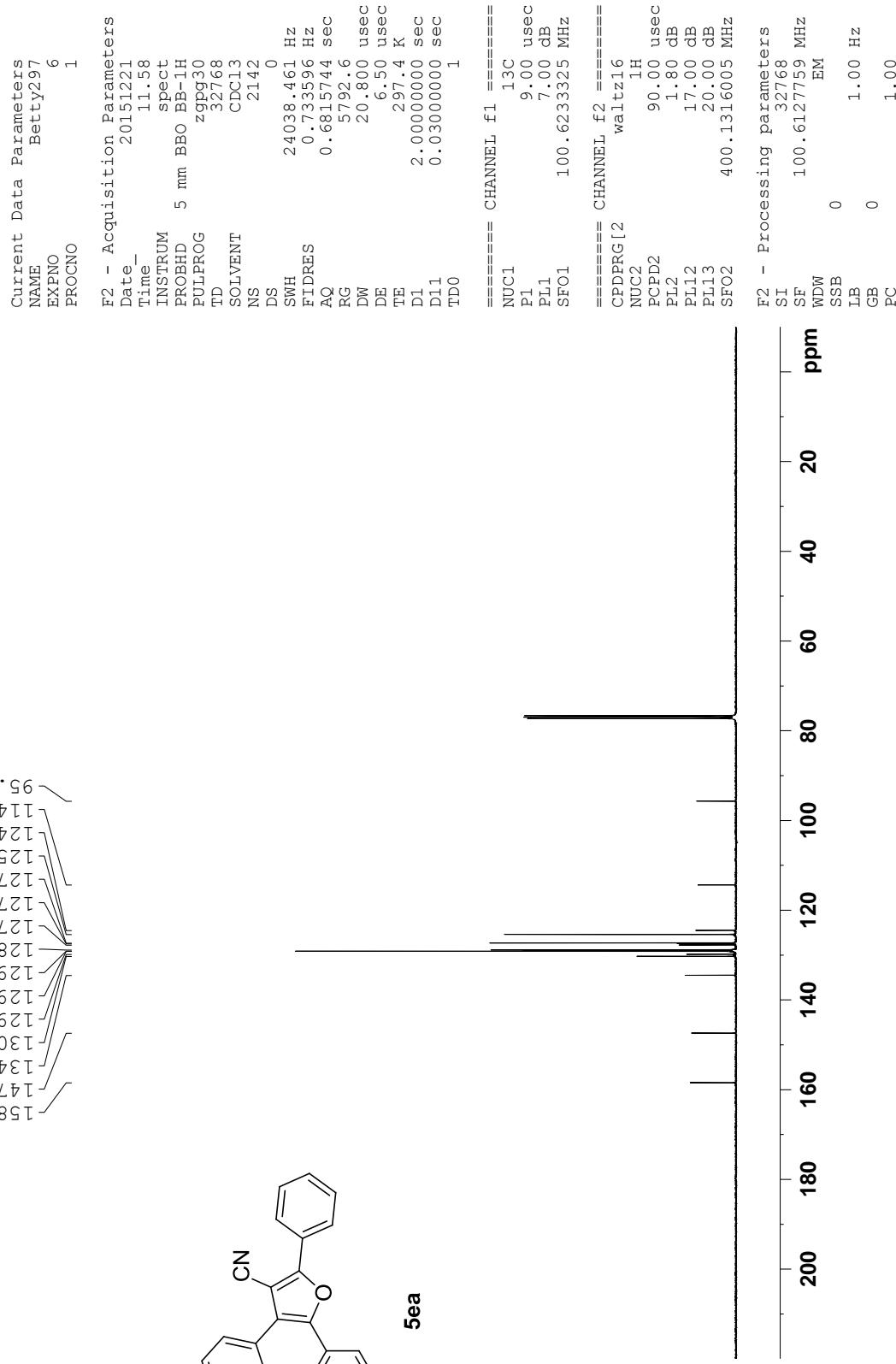
===== CHANNEL f2 =====
 CPDPRG[2 waltz16
 NUC2 1H
 PCPD2 90.00 usec
 PL2 4.60 dB
 PL12 20.40 dB
 PL13 23.40 dB
 SFO2 400.1316005 MHz

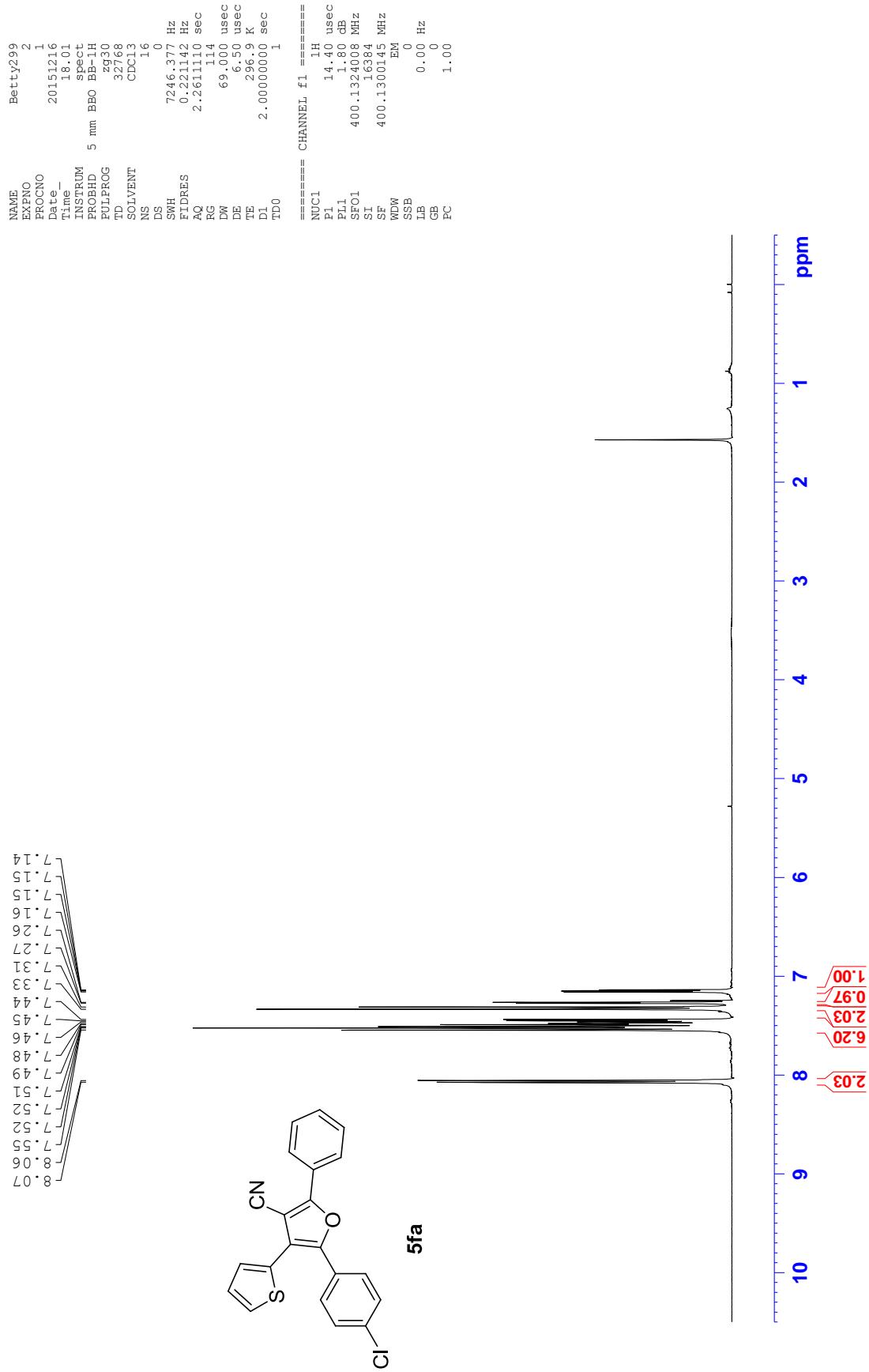
F2 - Processing parameters
 SI 32768
 SF 100.6127732 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.00

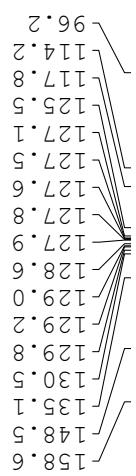




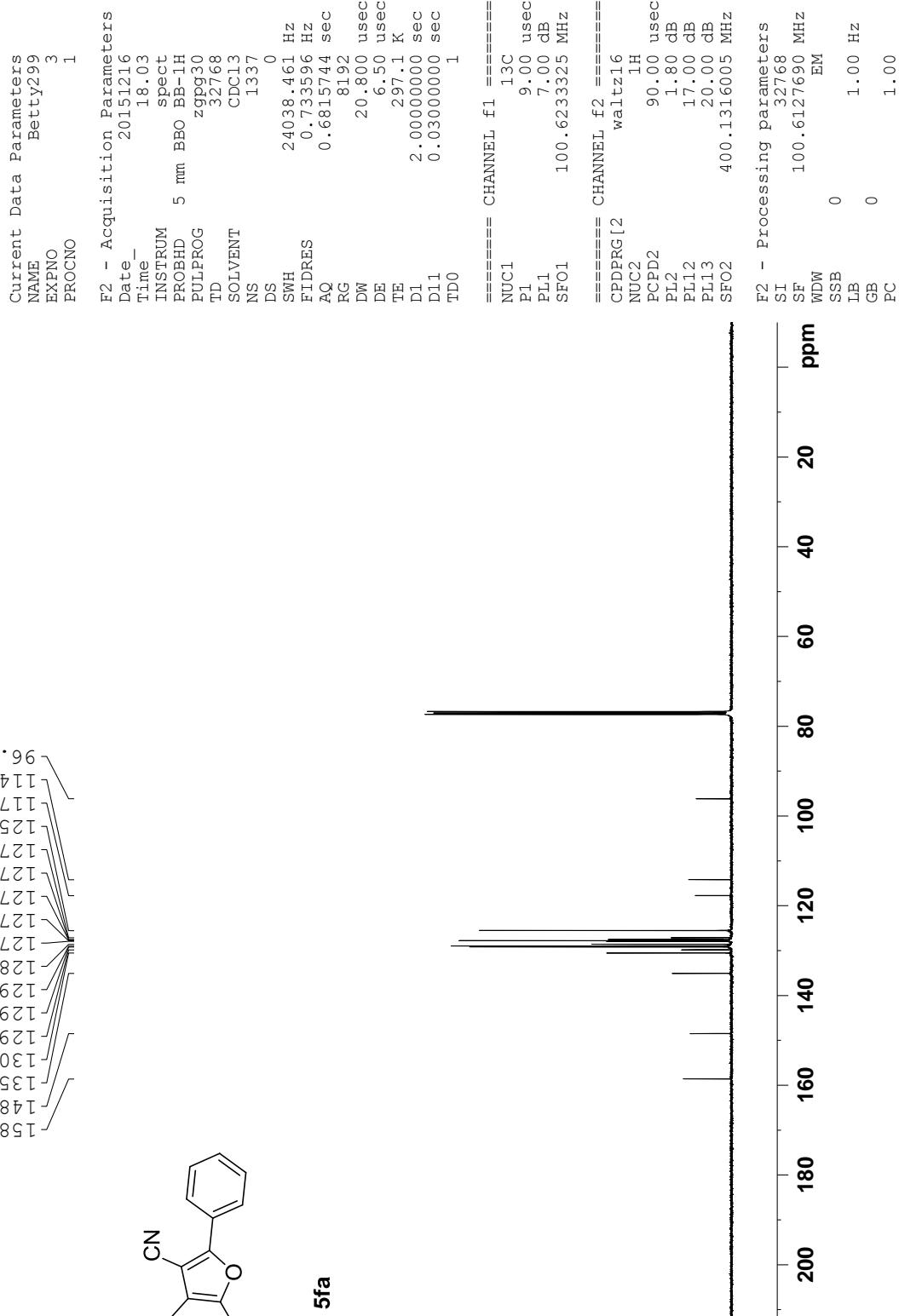
5ea







5fa



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NAME          Betty300
EXPNO         4
PROCNO        1
Date         20151215
Time        12.02
INSTRUM      spect
PROBHD      5 mm BBO BB-1H
PULPROG      32768
TD           32768
SOLVENT      CDCl3
NS            1
DS            0
SWH         7246.377 Hz
FIDRES     0.2221142 Hz
AQ           2.2611110 sec
RG           114
DW           69.000 usec
DE           6.500 usec
TE           297.2 K
D1           2.0000000 sec
TDO          1

```

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

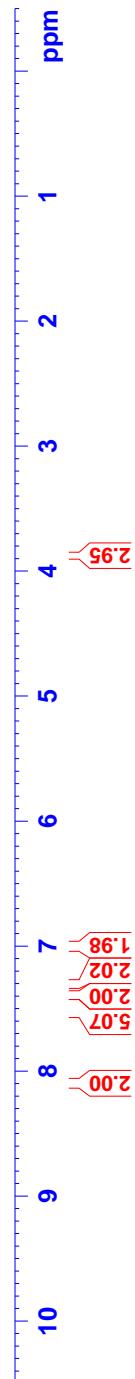
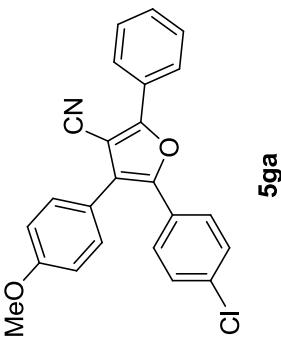
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NUC1          1H
P1           14.40 usec
PL1          1.80 dB
SFO1        400.1324008 MHz
SI            16384
SF          400.1300091 MHz
WDW
SSB           0
LB           0.00 Hz
GB           0
PC           1.00

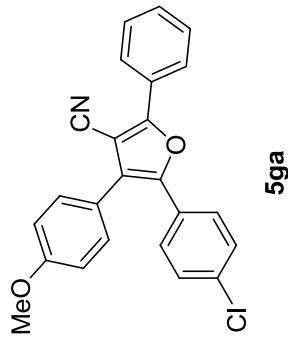
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— 3.87 —

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7.48
7.49
7.50
7.52
7.53
7.54
7.58
8.08
8.10



160.0
 158.3
 147.2
 147.0
 134.4
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 130.2
 129.1
 128.9
 127.9
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 95.9



— 55.3 —

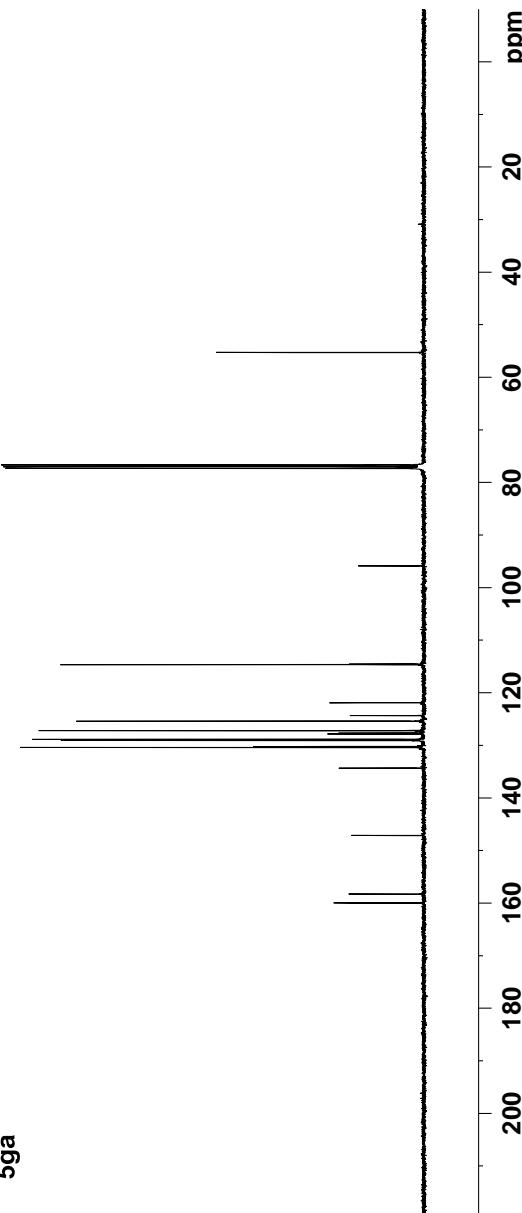
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 NAME Betty300
 EXPNO 5
 PROCNO 1

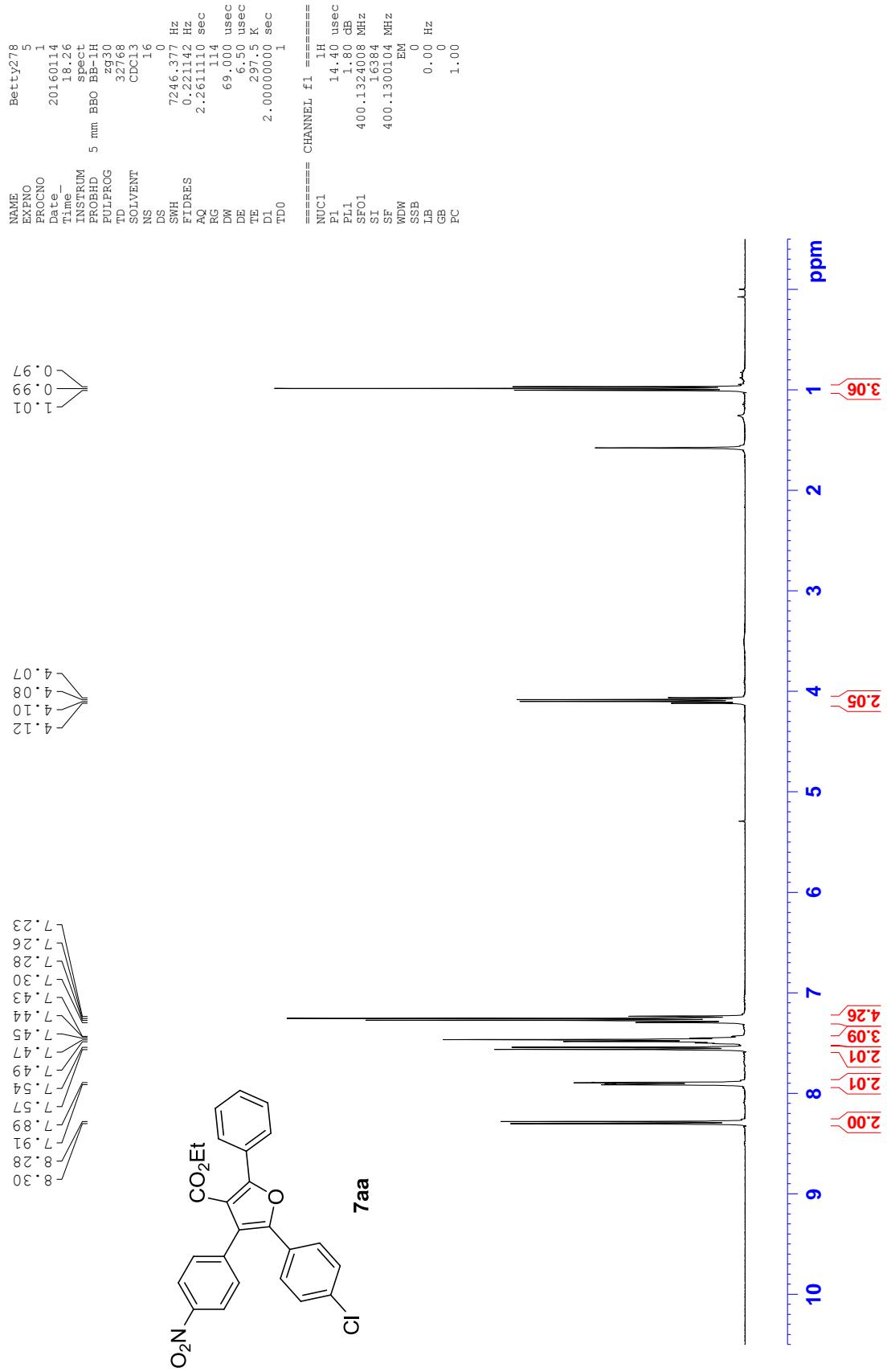
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 Date 20151215
 Time 12.03
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 PROBTD 5 mm BBO BB-1H
 PULPROG zgppg30
 TD 32768
 SOLVENT CDCl3
 NS 1261
 DS 0
 SWH 24038.461 Hz
 ETDRES 0.733596 Hz
 AQ 0.6815744 sec
 RG 5792.6
 DW 20.800 usec
 DE 6.50 usec
 TE 297.3 K
 D1 2.0000000 sec
 D11 0.03000000 sec
 TDO 1

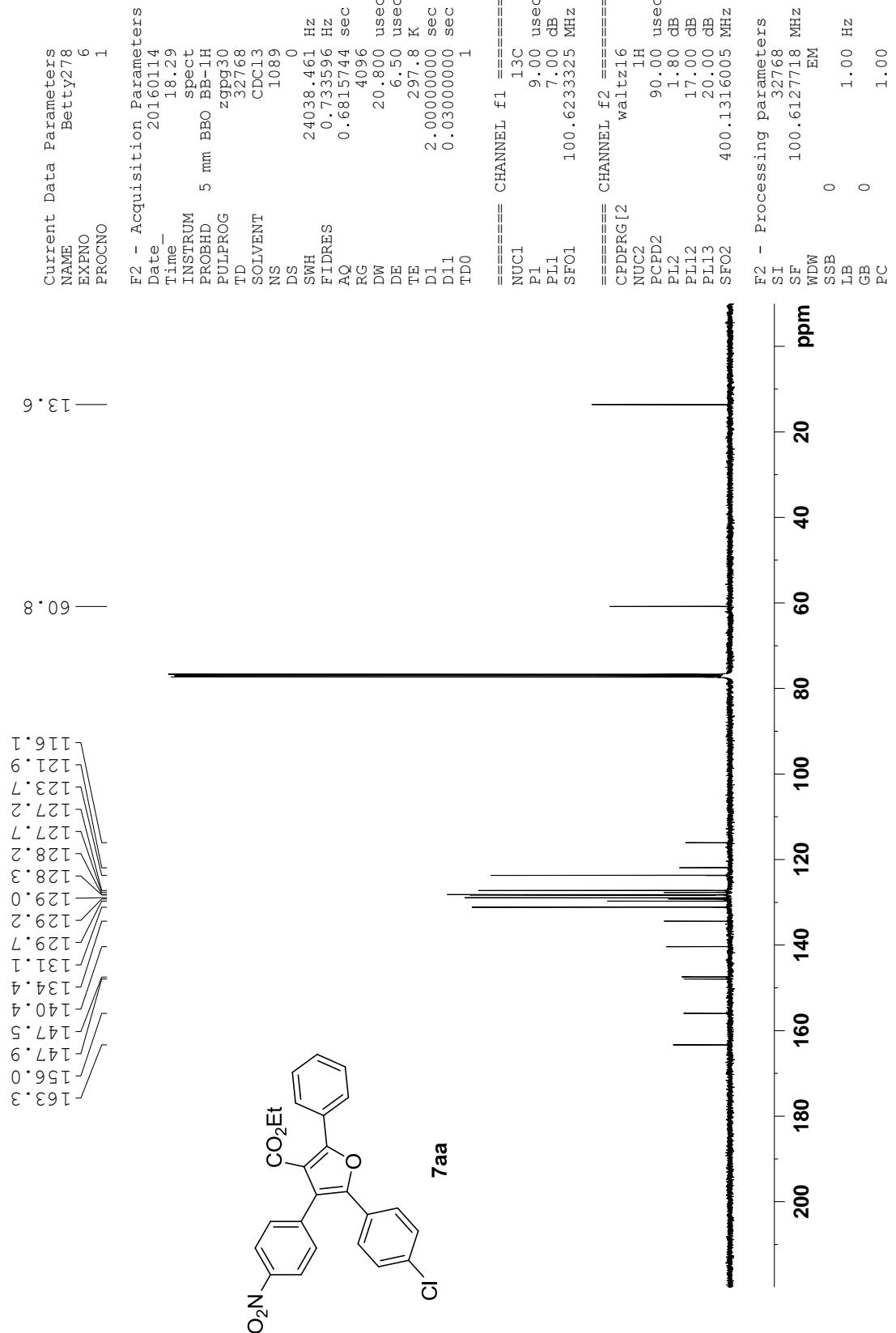
===== CHANNEL f1 ======
 NUC1 13C
 P1 9.00 usec
 PLL1 7.00 dB
 SFO1 100.6233325 MHz

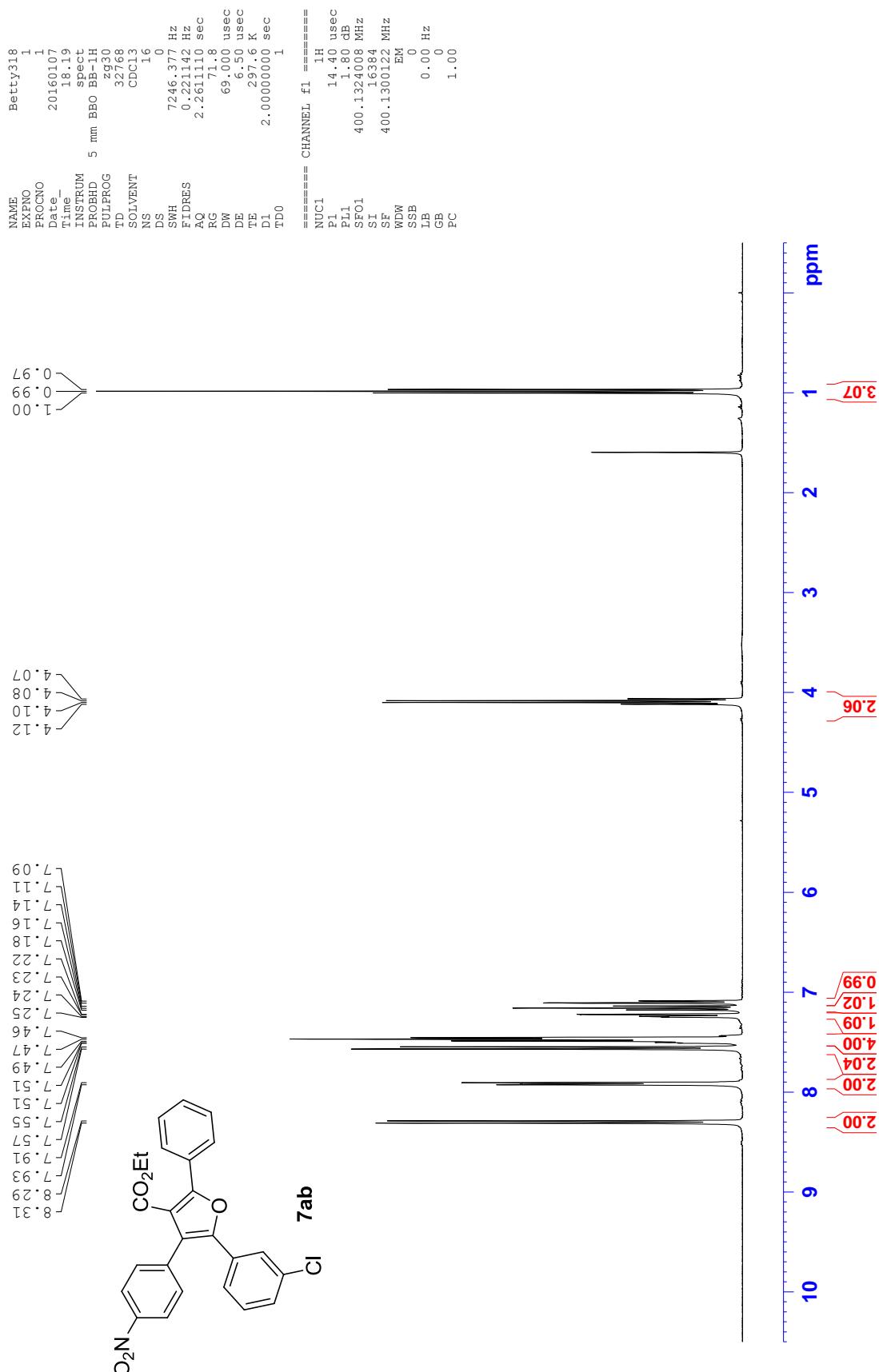
===== CHANNEL f2 ======
 CPDPGRG[2] waltz16
 NUC2 1H
 FCPD2 90.00 usec
 PLL2 1.80 dB
 PLL3 17.00 dB
 SFO2 400.1316005 MHz

F2 - Processing parameters
 SI 32768
 SF 100.6127750 MHz
 WDW 0
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.00









— 13.6 —

— 60.8 —

— 116.1 —

— 122.5 —

— 123.7 —

— 125.9 —

— 128.2 —

— 128.4 —

— 129.1 —

— 129.8 —

— 129.9 —

— 130.9 —

— 131.1 —

— 134.7 —

— 140.2 —

— 147.5 —

— 156.2 —

— 163.2 —

— 170.1 —

— 176.0 —

— 182.9 —

— 188.8 —

— 194.7 —

— 200.6 —

— 206.5 —

— 212.4 —

— 218.3 —

— 224.2 —

— 230.1 —

— 236.0 —

— 241.9 —

— 247.8 —

— 253.7 —

— 259.6 —

— 265.5 —

— 271.4 —

— 277.3 —

— 283.2 —

— 289.1 —

— 295.0 —

— 300.9 —

— 306.8 —

— 312.7 —

— 318.6 —

— 324.5 —

— 330.4 —

— 336.3 —

— 342.2 —

— 348.1 —

— 354.0 —

— 360.9 —

— 366.8 —

— 372.7 —

— 378.6 —

— 384.5 —

— 390.4 —

— 396.3 —

— 402.2 —

— 408.1 —

— 414.0 —

— 420.9 —

— 426.8 —

— 432.7 —

— 438.6 —

— 444.5 —

— 450.4 —

— 456.3 —

— 462.2 —

— 468.1 —

— 474.0 —

— 480.9 —

— 486.8 —

— 492.7 —

— 498.6 —

— 504.5 —

— 510.4 —

— 516.3 —

— 522.2 —

— 528.1 —

— 534.0 —

— 540.9 —

— 546.8 —

— 552.7 —

— 558.6 —

— 564.5 —

— 570.4 —

— 576.3 —

— 582.2 —

— 588.1 —

— 594.0 —

— 600.9 —

— 606.8 —

— 612.7 —

— 618.6 —

— 624.5 —

— 630.4 —

— 636.3 —

— 642.2 —

— 648.1 —

— 654.0 —

— 660.9 —

— 666.8 —

— 672.7 —

— 678.6 —

— 684.5 —

— 690.4 —

— 696.3 —

— 702.2 —

— 708.1 —

— 714.0 —

— 720.9 —

— 726.8 —

— 732.7 —

— 738.6 —

— 744.5 —

— 750.4 —

— 756.3 —

— 762.2 —

— 768.1 —

— 774.0 —

— 780.9 —

— 786.8 —

— 792.7 —

— 798.6 —

— 804.5 —

— 810.4 —

— 816.3 —

— 822.2 —

— 828.1 —

— 834.0 —

— 840.9 —

— 846.8 —

— 852.7 —

— 858.6 —

— 864.5 —

— 870.4 —

— 876.3 —

— 882.2 —

— 888.1 —

— 894.0 —

— 900.9 —

— 906.8 —

— 912.7 —

— 918.6 —

— 924.5 —

— 930.4 —

— 936.3 —

— 942.2 —

— 948.1 —

— 954.0 —

— 960.9 —

— 966.8 —

— 972.7 —

— 978.6 —

— 984.5 —

— 990.4 —

— 996.3 —

— 1002.2 —

— 1008.1 —

— 1014.0 —

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— 1074.0 —

— 1080.9 —

— 1086.8 —

— 1092.7 —

— 1098.6 —

— 1104.5 —

— 1110.4 —

— 1116.3 —

— 1122.2 —

— 1128.1 —

— 1134.0 —

— 1140.9 —

— 1146.8 —

— 1152.7 —

— 1158.6 —

— 1164.5 —

— 1170.4 —

— 1176.3 —

— 1182.2 —

— 1188.1 —

— 1194.0 —

— 1200.9 —

— 1206.8 —

— 1212.7 —

— 1218.6 —

— 1224.5 —

— 1230.4 —

— 1236.3 —

— 1242.2 —

— 1248.1 —

— 1254.0 —

— 1260.9 —

— 1266.8 —

— 1272.7 —

— 1278.6 —

— 1284.5 —

— 1290.4 —

— 1296.3 —

— 1302.2 —

— 1308.1 —

— 1314.0 —

— 1320.9 —

— 1326.8 —

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— 1356.3 —

— 1362.2 —

— 1368.1 —

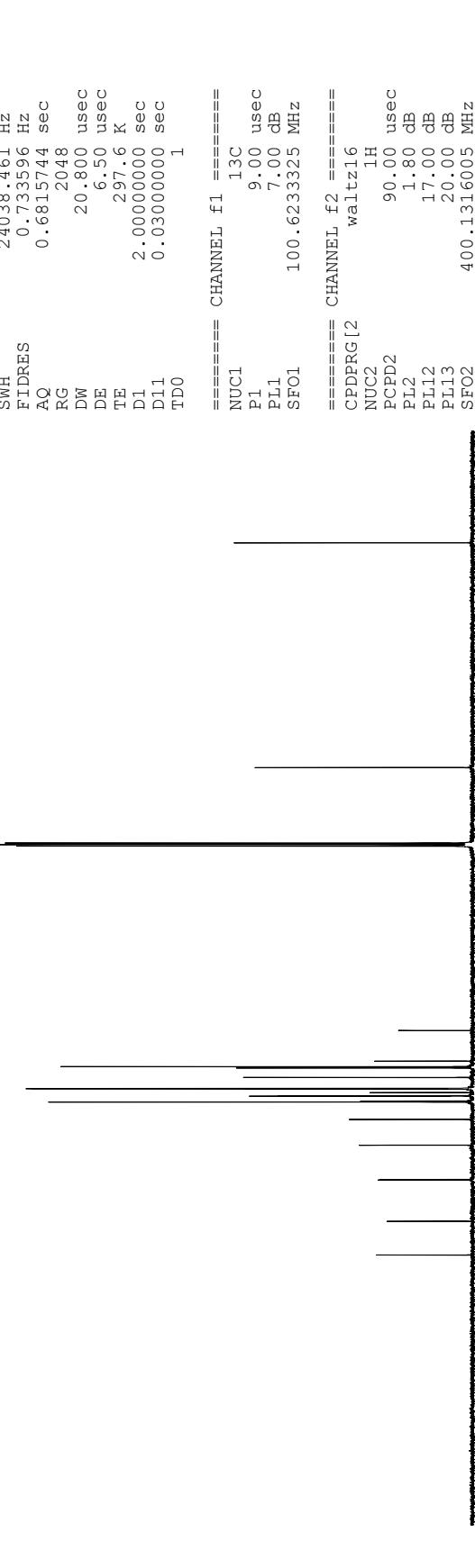
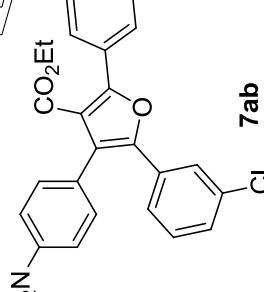
— 1374.0 —

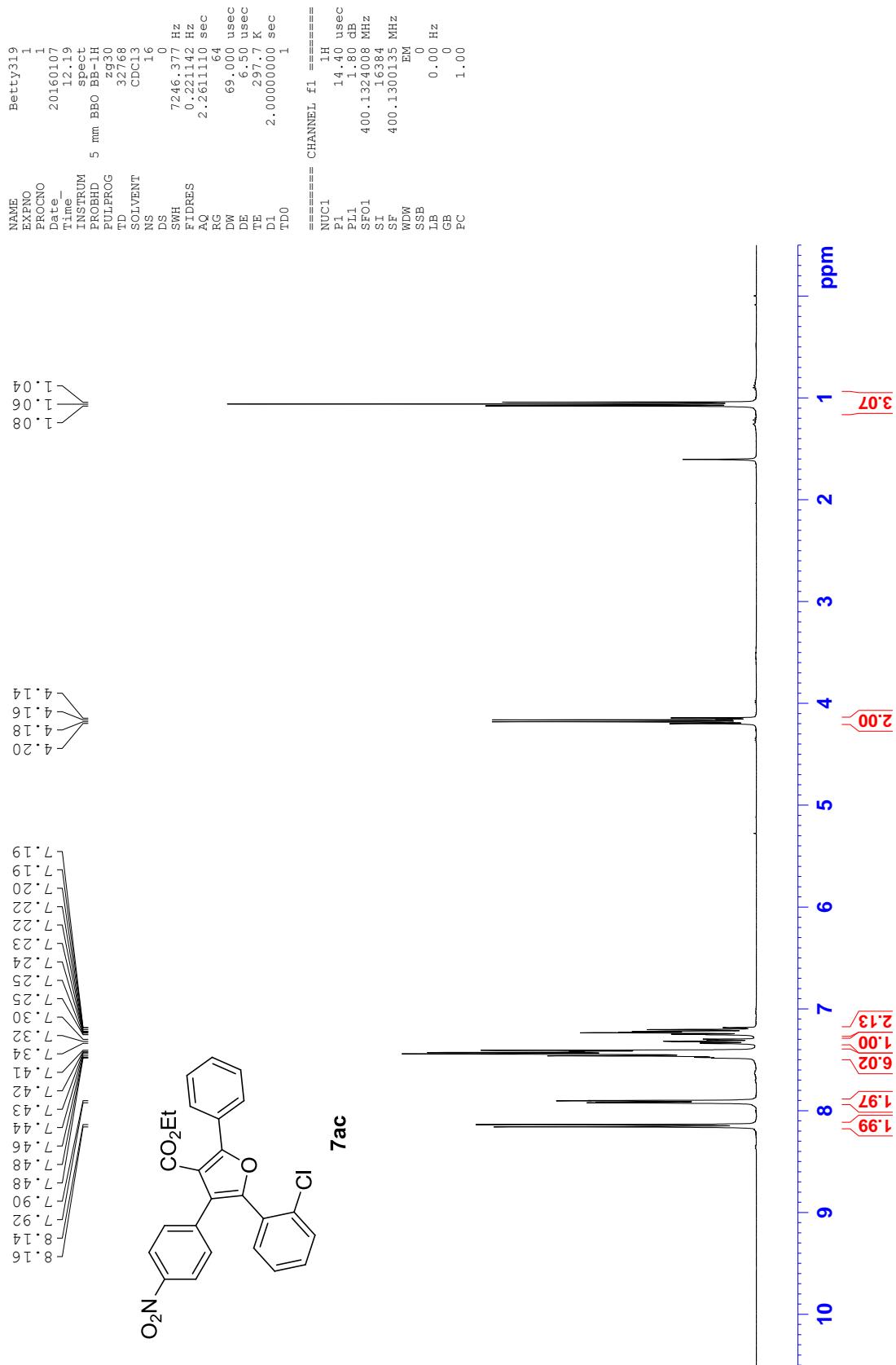
— 1380.9 —

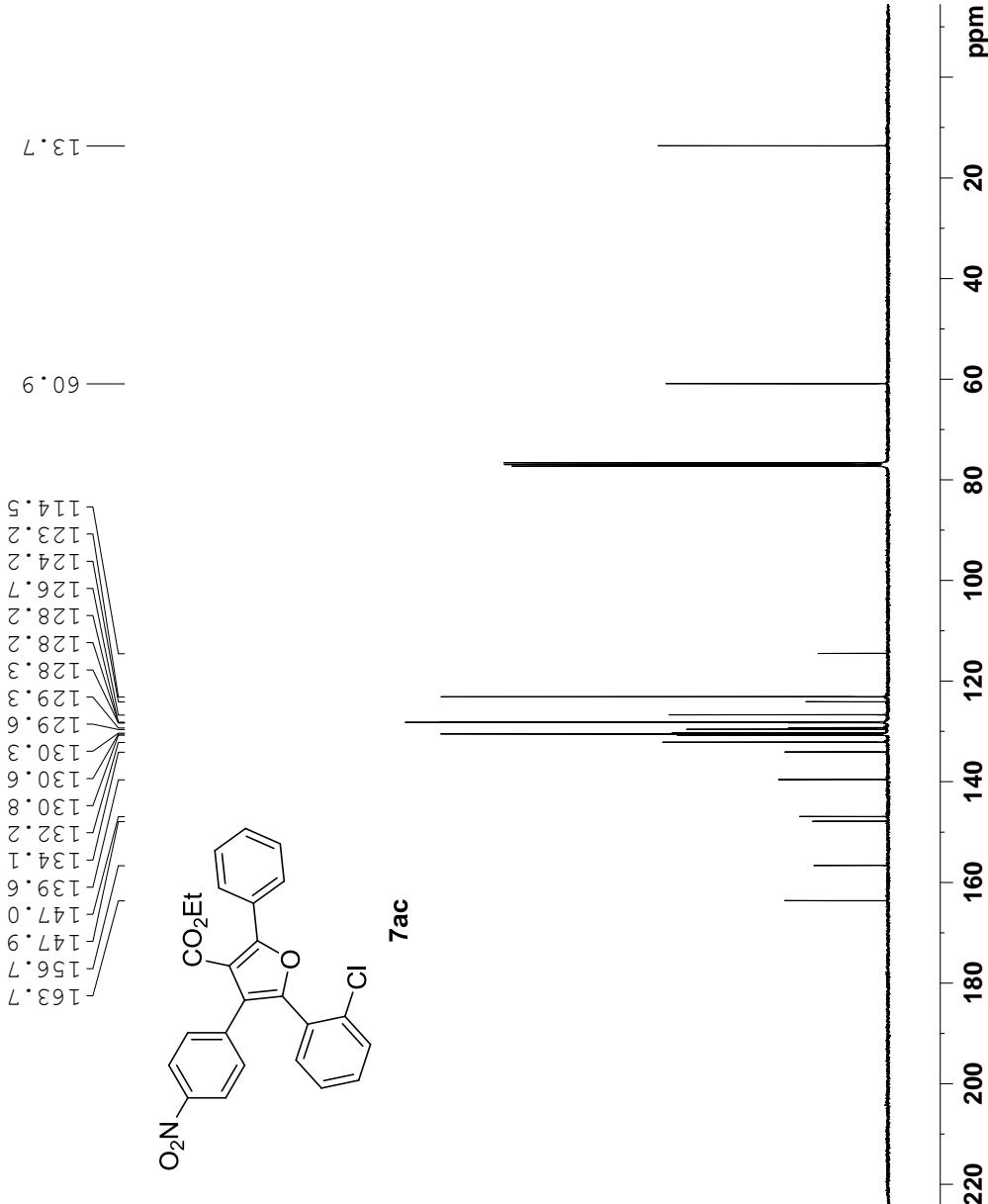
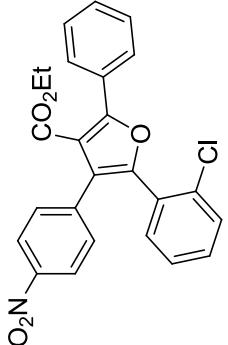
— 1386.8 —

— 1392.7 —

— 1400.0 —







Current NAME	Data EXPNO	Parameters PROCNO
Betty319	2	1

F2 - Acquisition Parameters

Date	2016/01/07
Time	13.29
INSTRUM	BB-1H
PROBHD	5 mm
PULPROG	zgpg30
TD	32768
SOLVENT	CDC13
NS	1504
DS	0
SWH	24038.461 Hz
ETRDRES	0.733596 Hz
AQ	0.6815744 sec
RG	2048
DW	20.800 usec
DE	6.50
TE	298.7 K
D1	2.00000000 sec
TDO	0.03000000 sec

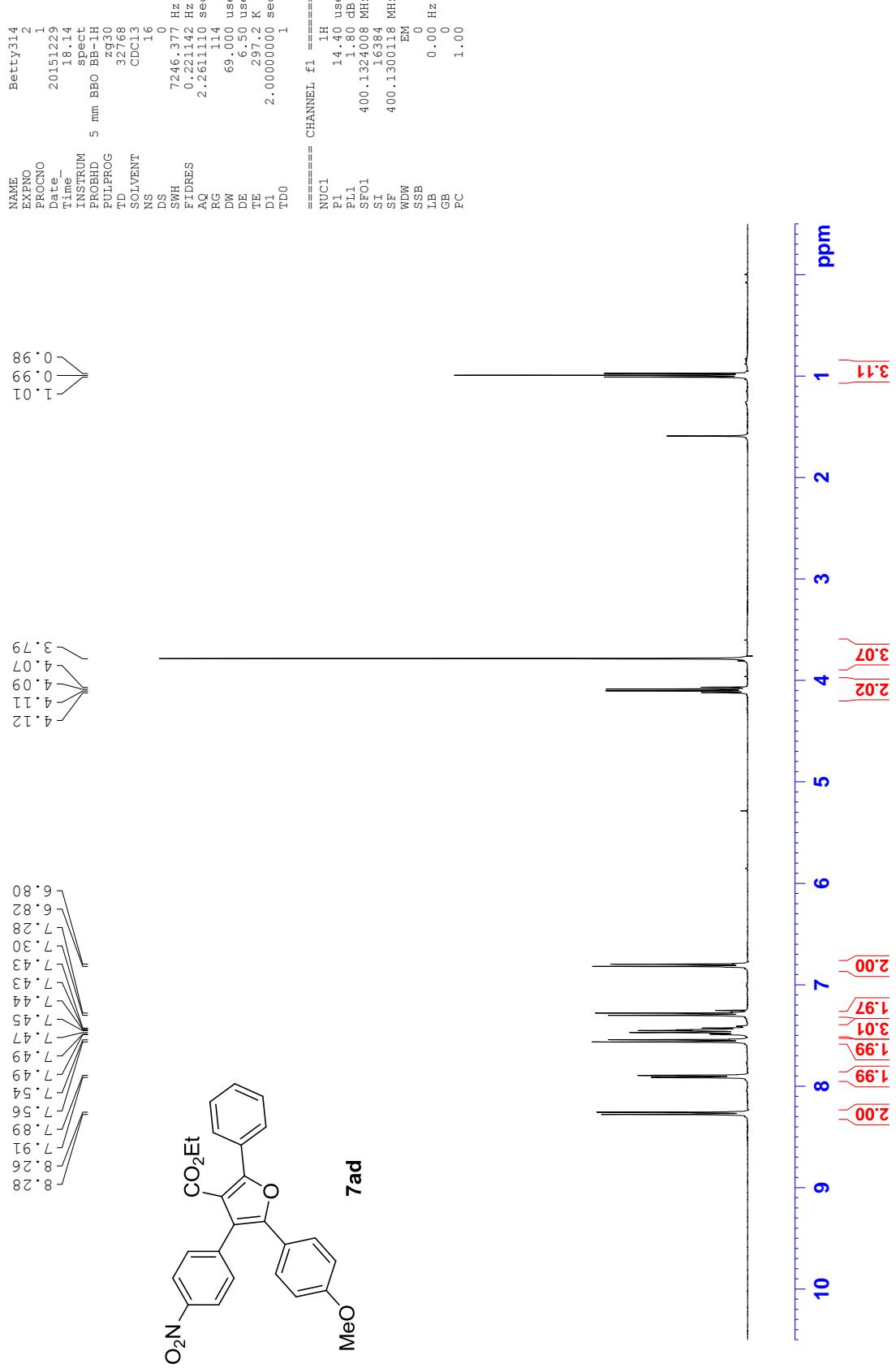
```

===== CHANNEL f1 =====
NUC1          13C
P1             9.00  usec
PL1            7.00  dB
SE01           100.6233325 MHz

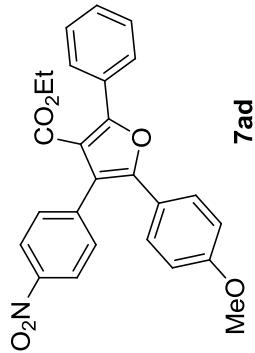
===== CHANNEL f2 =====
CEDPRG [2]    wallz16
NUC2          1H
PCPD2         90.00  usec
PL2            1.80  dB
PL12           17.00  dB
PL13           20.00  dB
S050          100.1211000 MHz

```

F2	-	Processing parameters
SI		32768
SF		100.6127766
WDW		MH
SSB	0	EM
LB	0	1.00 Hz
GB	0	1.00
PC		



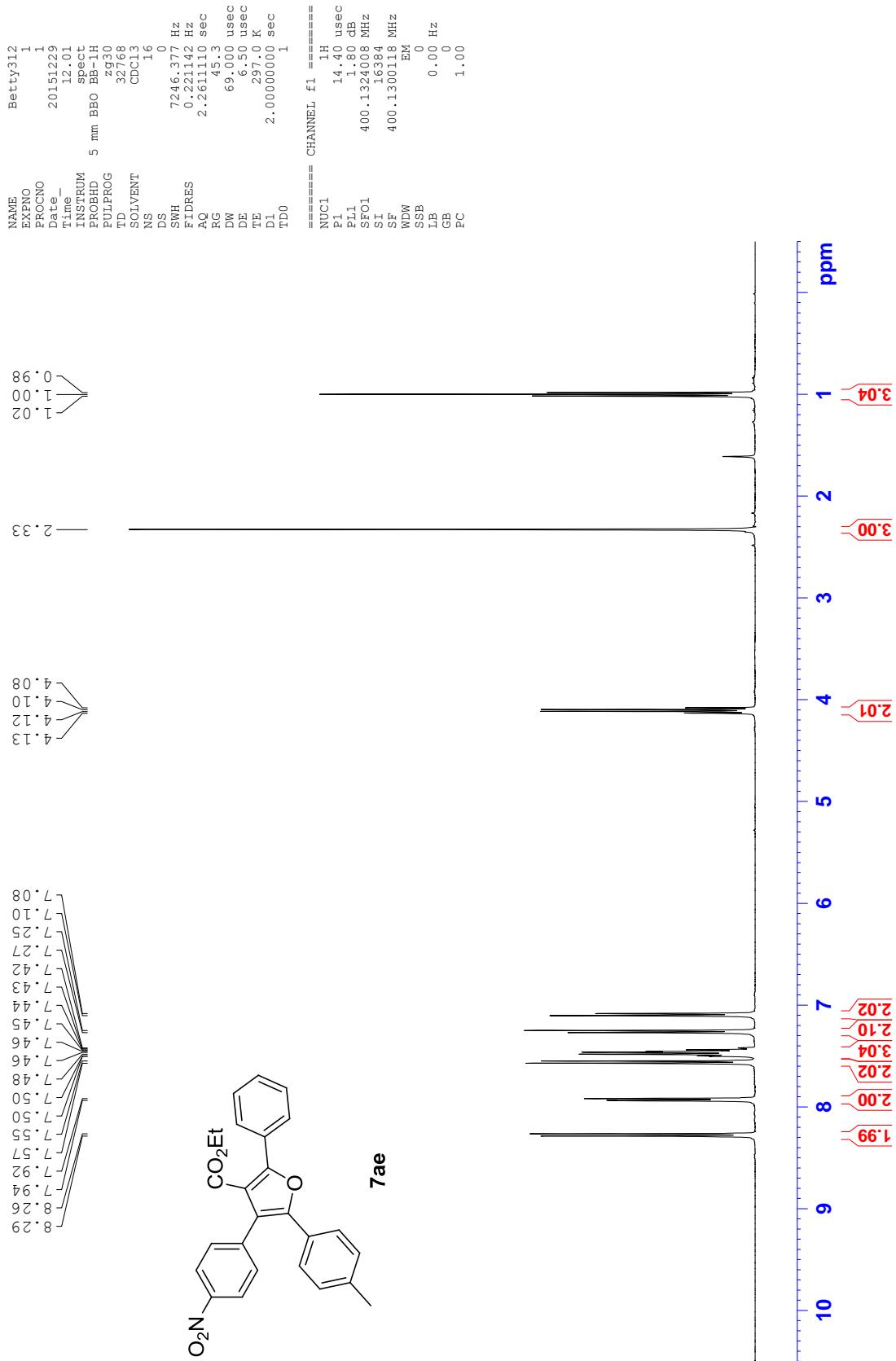
13.6
 55.3
 60.7
 114.1
 115.0
 120.0
 121.9
 123.5
 127.7
 128.1
 129.4
 129.5
 131.0
 141.2
 147.3
 149.2
 155.8
 159.6
 163.6



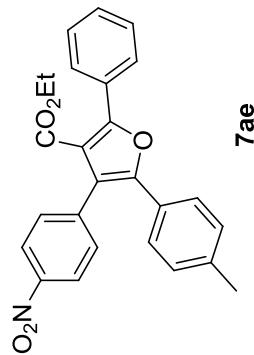
Current Data Parameters
 NAME Betty314
 EXPNO 3
 PROCNO 1

F2 - Acquisition Parameters
 Date 20151229
 Time 18.16
 INSTRUM spect
 PROBHD 5 mm BBO BB-1H
 PULPROG zgpg30
 TD 32768
 SOLVENT CDCl3
 NS 2253
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.733596 Hz
 AQ 0.6815744 sec
 RG 5792.6
 DW 20.800 usec
 DE 6.50 usec
 TE 297.2 K
 D1 2.0000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 ======
 NUC1 13C
 P1 9.00 usec
 PL1 100.6233325 MHz
 SFO1 100.6233325 MHz
 ===== CHANNEL f2 ======
 CPDRG [2] waltz16
 NUC2 1H
 PCPD2 90.00 usec
 PL2 1.80 dB
 PL12 17.00 dB
 PL13 20.00 dB
 SFO2 400.1316005 MHz
 F2 - Processing parameters
 SI 32768
 SF 100.6127741 MHz
 WDM EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.00



60.7
21.2
13.6



Current Data Parameters
NAME Betty312
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20151229
TTime_ 12.04
INSTRUM PROBHD
PROBTD 5 mm BBO BB-1H
PULPROG zgppg30
TD 32768
SOLVENT CDC13
NS 1699
DS 0
SWH 24038.461 Hz
ETDRES 0.73596 Hz
AQ 0.6815744 sec
RG 4096
DW 20.800 usec
DE 6.50 usec
TE 297.0 K
D1 2.0000000 sec
D11 0.0300000 sec
TDO 1

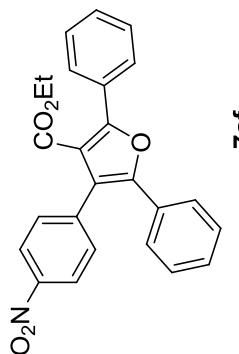
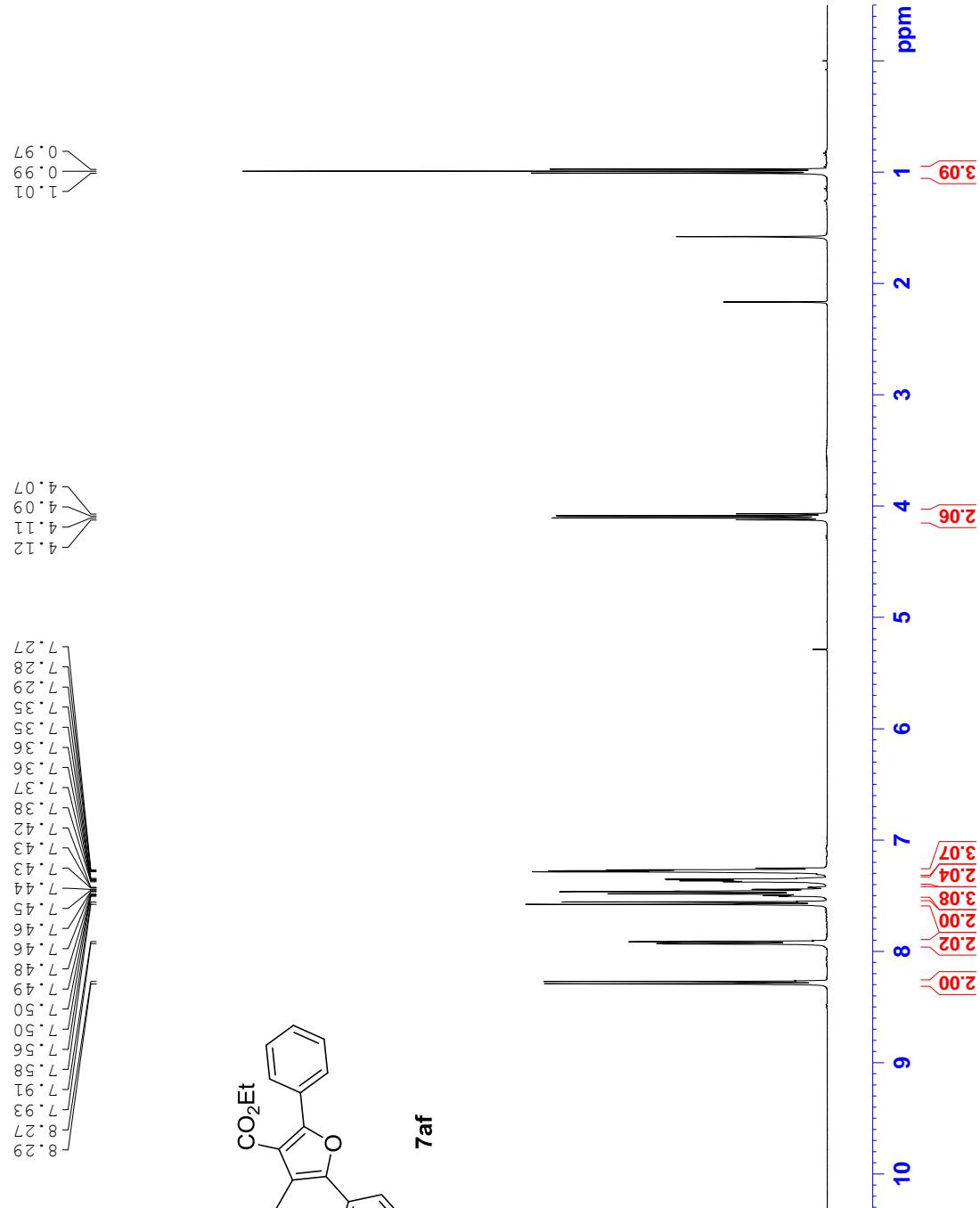
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 7.00 dB
SFO1 100.6233325 MHz

===== CHANNEL f2 =====
CPDPRG[2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 1.80 dB
PL12 17.00 dB
PL13 20.00 dB
SFO2 400.1316005 MHz

F2 - Processing parameters
SI 32768
SF 100.6127780 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.00



	NAME	Betty323
EXPNO	2	
PROCNO		
Date	20160115	
Time	18:01	
INSTRUM	BBQ	spect
PULPROG	BB1H	
TD	2930	
SOLVENT	32768	
NS	CDC13	
DS	1.6	
SWH	7246.377	Hz
FIDRES	2.221142	Hz
AQ	2.261110	sec
RG	114	
DW	69.000	usec
DE	6.50	usec
TE	29.15	K
DM	2.000000	sec
TDO	1	
===== CHANNEL f1 =====		
NUC1	1H	
P1	14.40	usec
PL1	1.80	MHz
SFO1	400.1324008	MHz
SI	16384	
SF	400.1300118	MHz
WDW	EM	
SSB	0	Hz
LB	0.00	
GB	0	
PC	1.00	

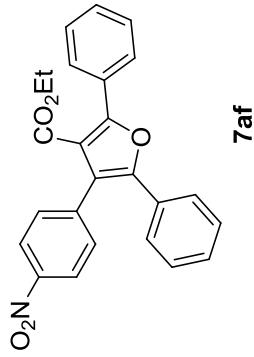


7af

— 13.6 —

— 60.8 —

116.0
121.5
123.6
128.1
128.2
128.3
128.5
128.6
129.2
129.4
129.6
131.2
140.7
147.3
149.0
155.5
163.0

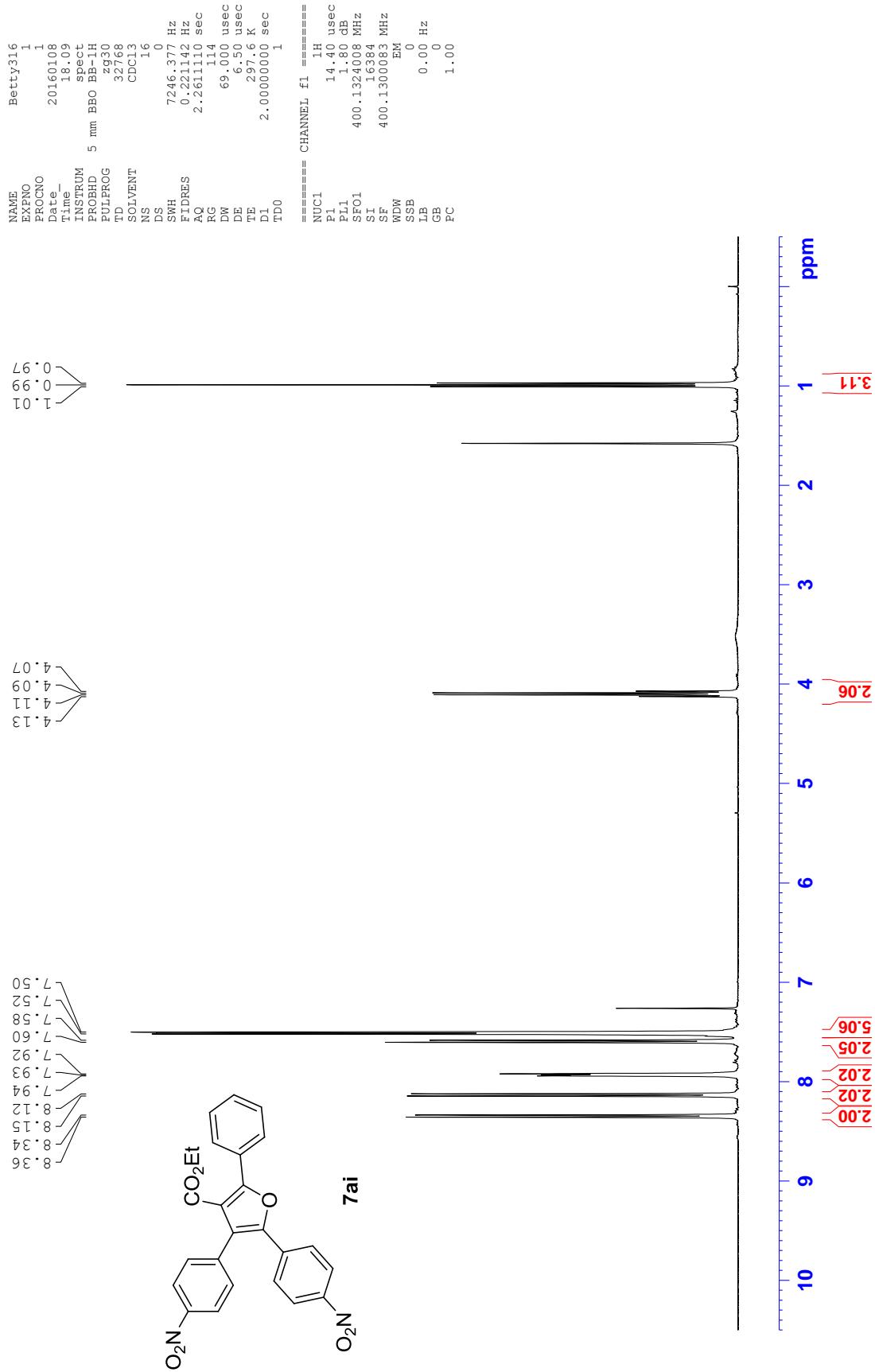


Current Data Parameters
NAME Betty323
EXPNO 3
PROCNO 1

F2 - Acquisition Parameters
Date 20160115
Time 19.06
INSTRUM spect
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 32768
SOLVENT CDCl₃
NS 1408
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 4096
DW 20.800 usec
DE 6.50 usec
TE 298.5 K
D1 2.0000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 100.6233325 MHz
SFO1 100.6233325 MHz
===== CHANNEL f2 =====
CPDRG [2] waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 1.80 dB
PL12 17.00 dB
PL13 20.00 dB
SFO2 400.1316005 MHz
F2 - Processing parameters
SI 32768
SF 100.6127732 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.00





162.9
 147.8
 146.9
 146.4
 139.7
 135.1
 131.0
 130.2
 128.8
 128.4
 128.1
 126.1
 125.0
 124.1
 123.9
 123.6
 116.6

13.6
 61.0

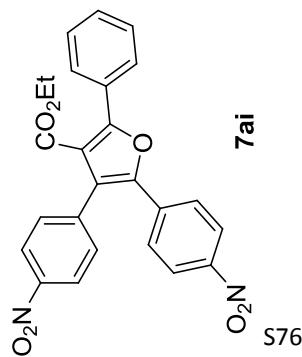
Current Data Parameters
 NAME Betty316
 EXPNO 2
 PROCNO 1

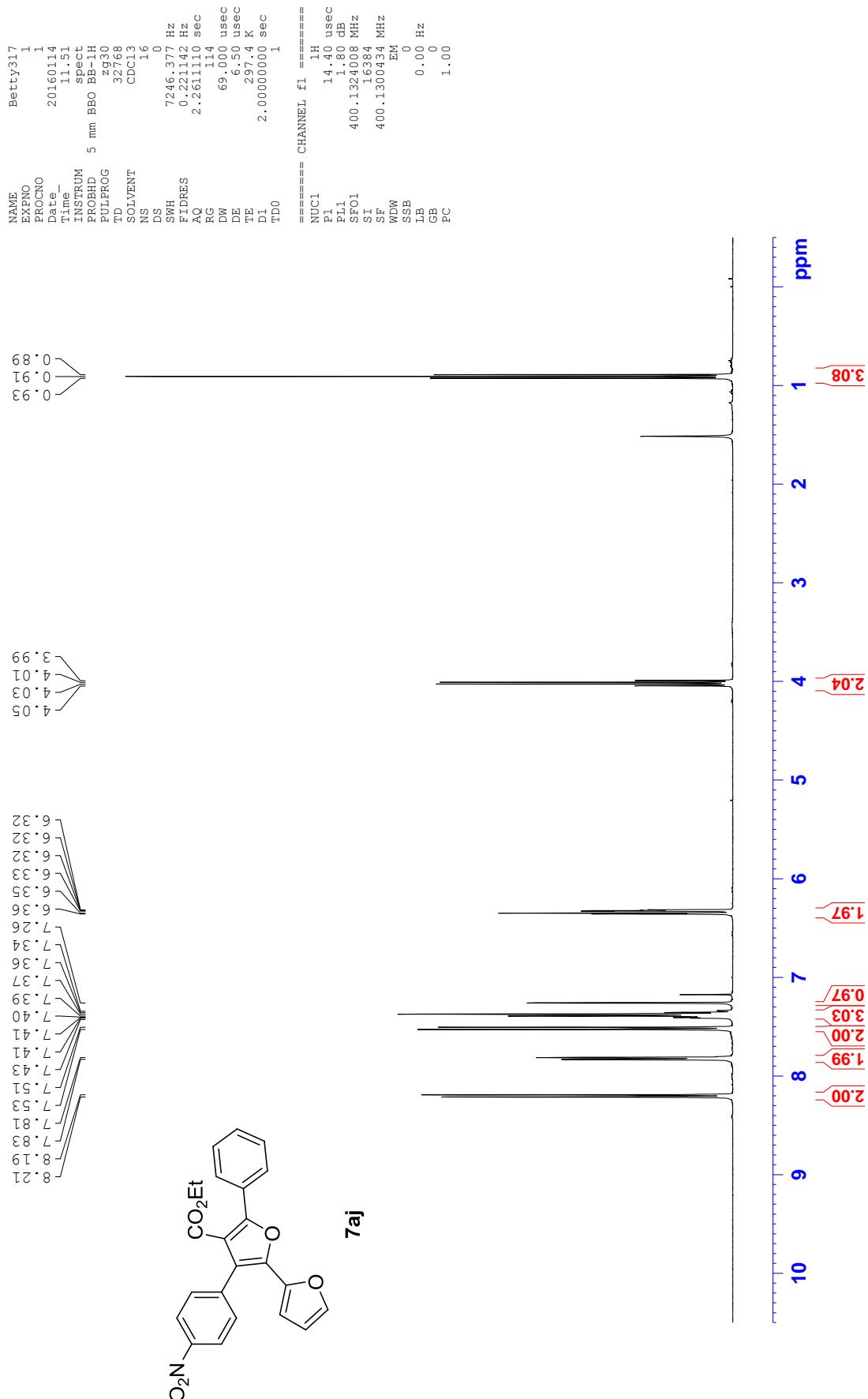
F2 - Acquisition Parameters
 Date 20160108
 Time 18.11
 INSTRUM spect
 PROBHD 5 mm BBO BB-1H
 PULPROG zgpg30
 TD 32768
 SOLVENT CDCl3
 NS 2194
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.733596 Hz
 AQ 0.6815744 sec
 RG 5792.6
 DW 20.800 usec
 DE 6.50 usec
 TE 297.7 K
 D1 2.0000000 sec
 D11 0.03000000 sec
 TDO 1

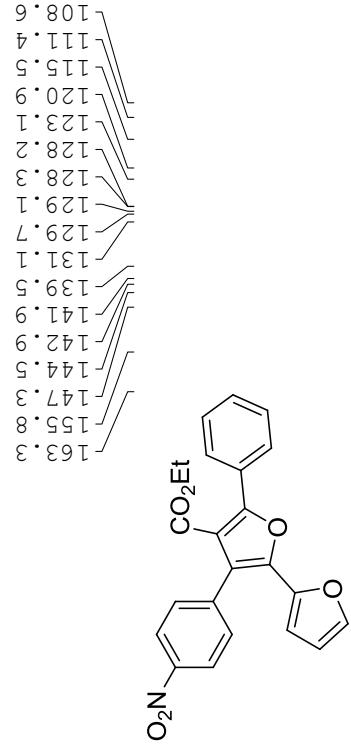
===== CHANNEL f1 =====
 NUC1 13C
 P1 9.00 usec
 PL1 100.6233325 MHz
 SFO1 400.1316005 MHz

===== CHANNEL f2 =====
 CPDRG[2] waltz16
 NUC2 1H
 PCPD2 90.00 usec
 PL2 1.80 dB
 PL12 17.00 dB
 PL13 20.00 dB
 SFO2 400.1316005 MHz

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





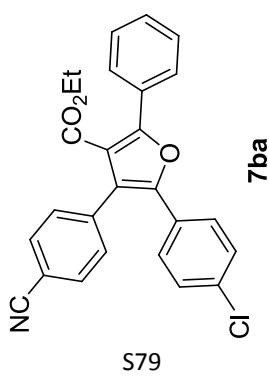
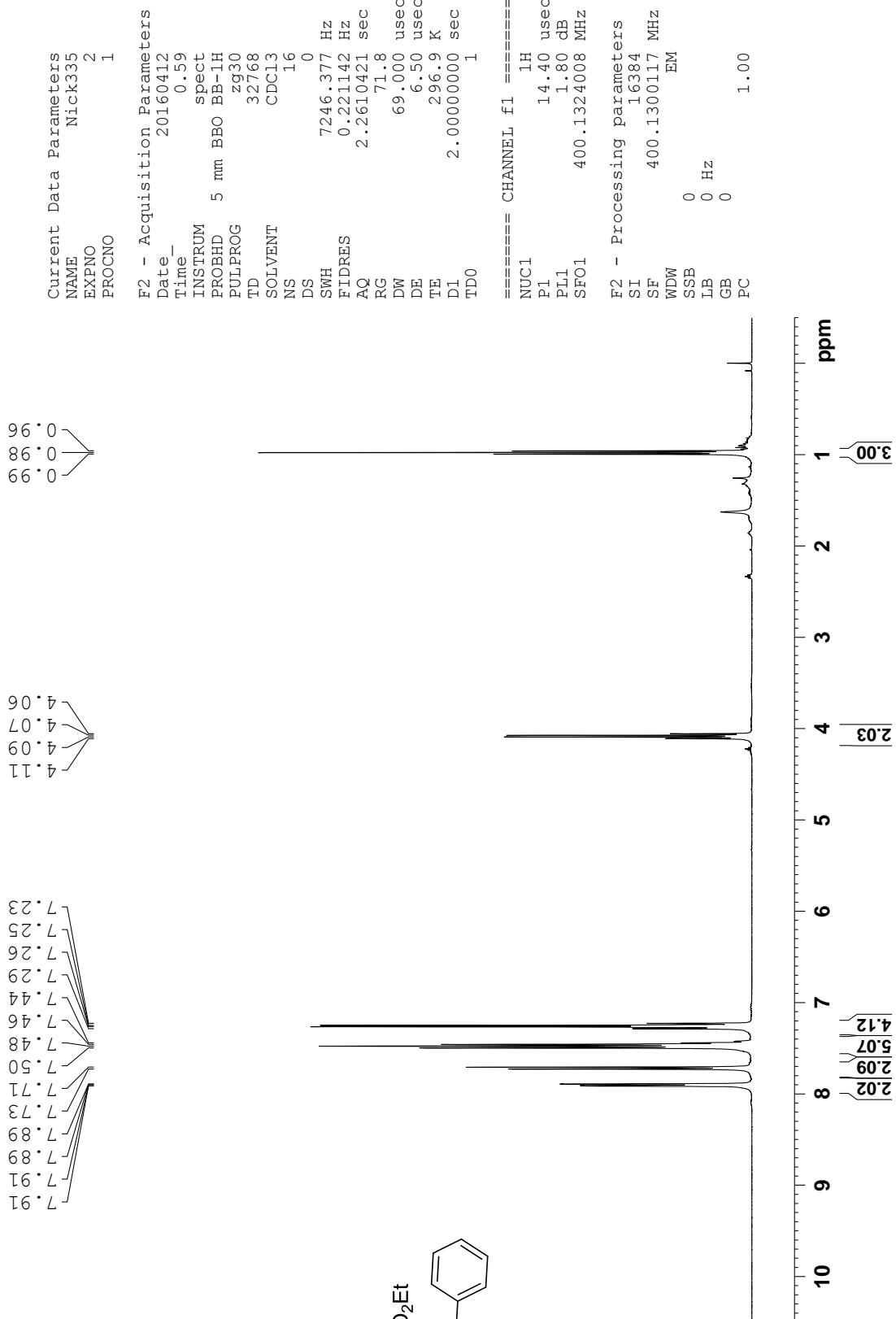


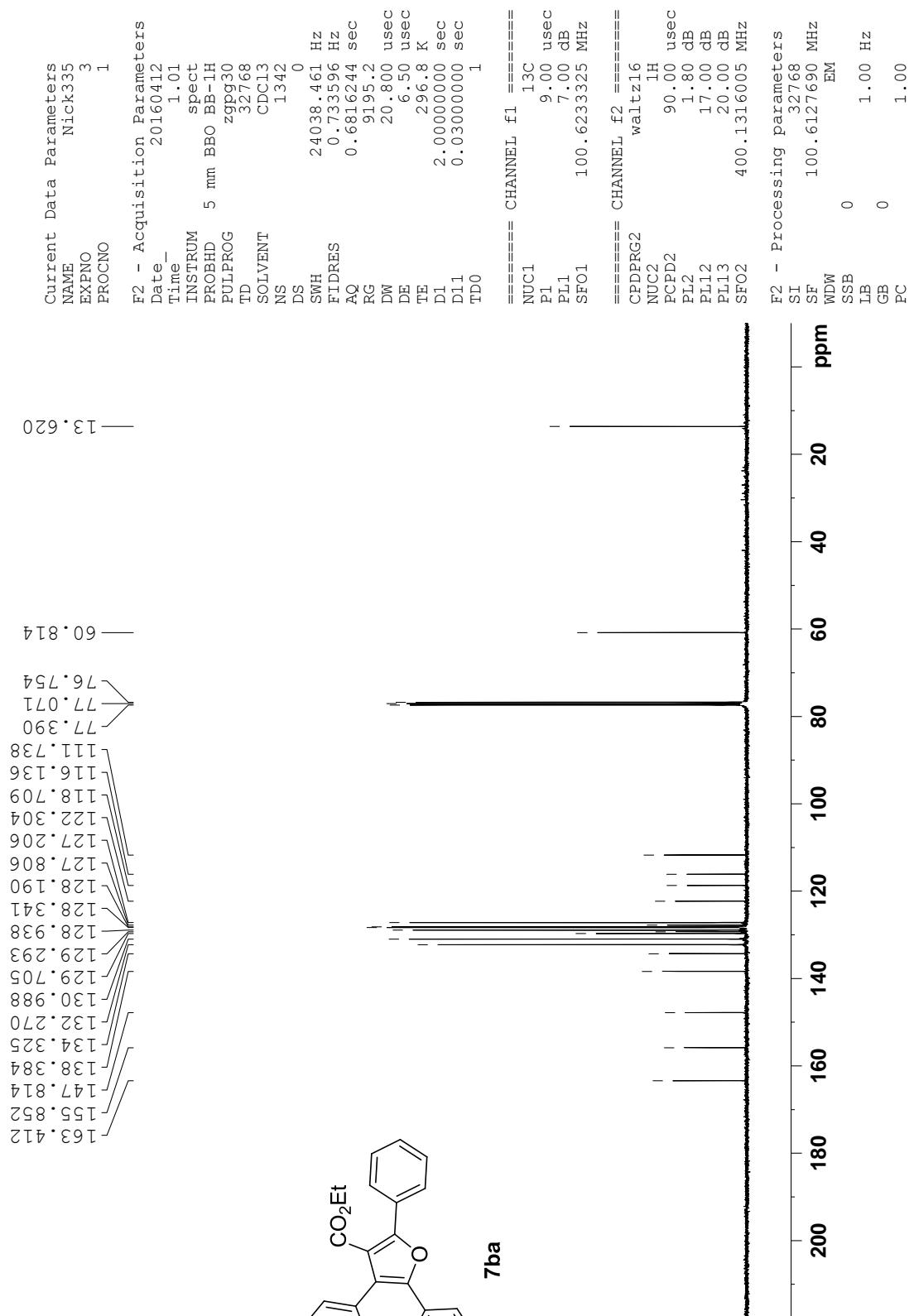
—
60.8 —
—
13.6 —

Current Data Parameters
 NAME Betty317
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20160114
 Time_ 11.54
 INSTRUM spect
 PROBHD 5 mm BBO BB-1H
 PULPROG zgpg30
 TD 32768
 SOLVENT CDCl3
 NS 1608
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.733596 Hz
 AQ 0.6815744 sec
 RG 4096
 DW 20.800 usec
 DE 6.50 usec
 TE 297.5 K
 D1 2.0000000 sec
 D11 0.03000000 sec
 TDO 1

===== CHANNEL f1 ======
 NUC1 13C
 P1 9.00 usec
 PL1 100.6233325 MHz
 SFO1 100.6233325 MHz
 ===== CHANNEL f2 ======
 CPDRG [2] waltz16
 NUC2 1H
 PCPD2 90.00 usec
 PL2 1.80 dB
 PL12 17.00 dB
 PL13 20.00 dB
 SFO2 400.1316005 MHz
 ===== Processing parameters =====
 SI 32768
 SF 100.6127742 MHz
 WDM EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.00

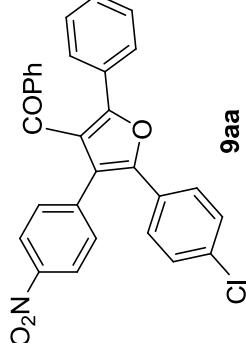
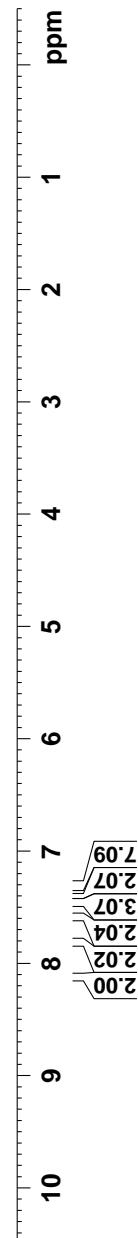


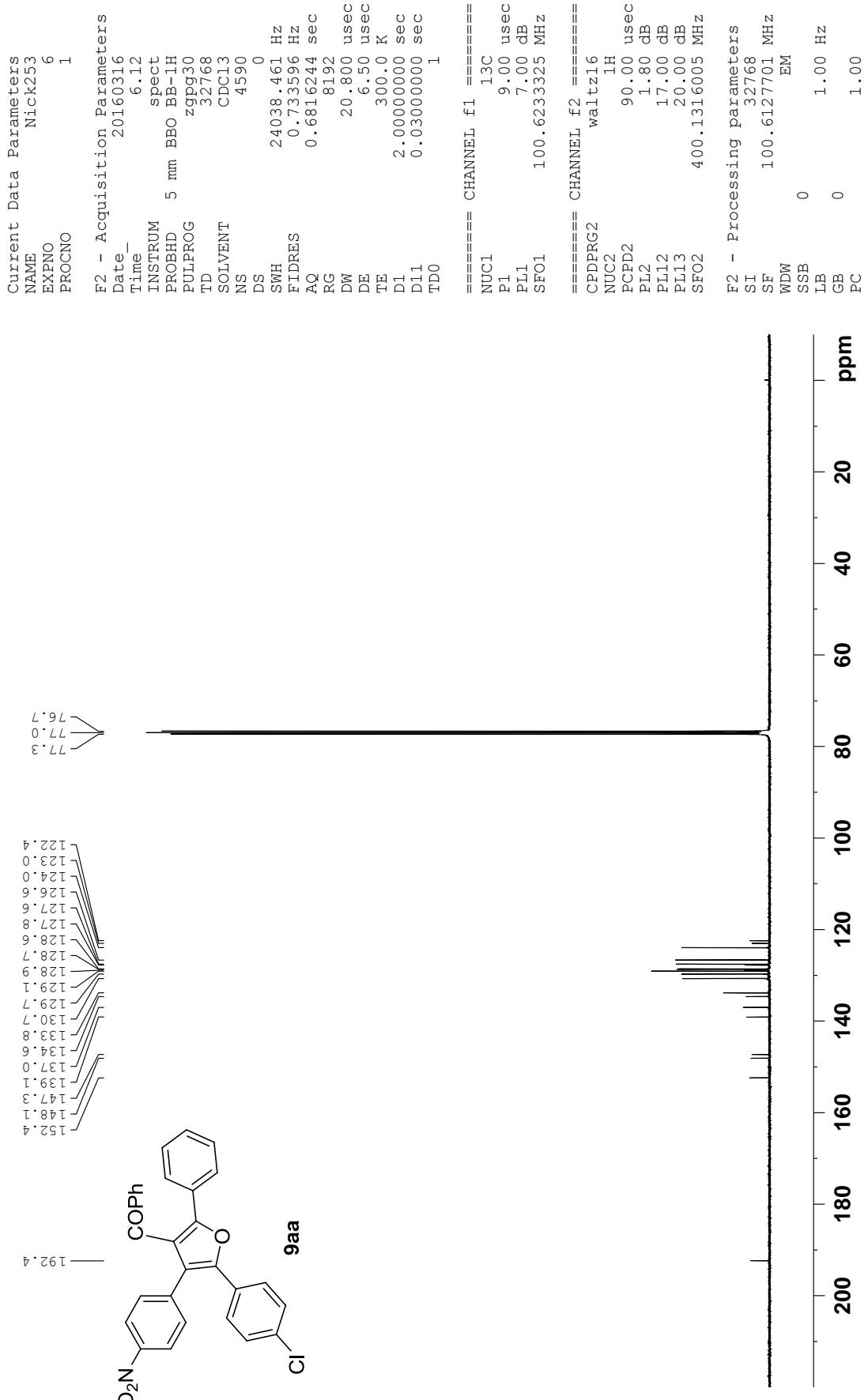


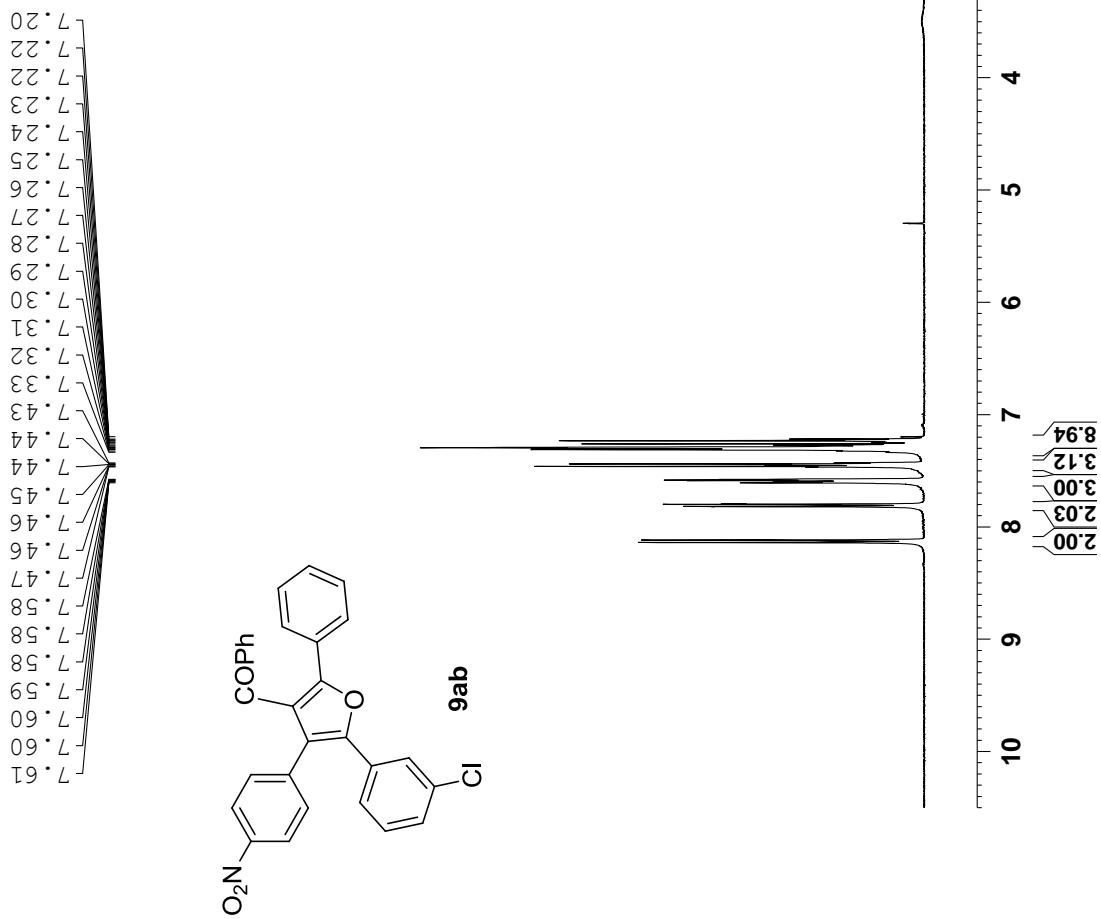
Current Data Parameters
 NAME Nick253
 EXPNO 5
 PROCNO 1

F2 - Acquisition Parameters
 Date 20160315
 Time 22:16
 INSTRUM spect
 PROBHD 5 mm BBO BB-1H
 PULPROG 2g30
 TD 32768
 SOLVENT CDCl₃
 NS 0
 SWH 7246.377 Hz
 FIDRES 0.221142 Hz
 AQ 2.2610421 sec
 RG 256
 DW 69.000 usec
 DE 6.50 usec
 TE 299.4 K
 D1 2.00000000 sec
 TDO 1

===== CHANNEL f1 ======
 NUC1 1H
 P1 14.40 usec
 PL1 1.80 dB
 SFO1 400.1324008 MHz
 ====== Processing parameters ======
 SI 16384
 SF 400.1300100 MHz
 WDW EM
 SSB 0
 LB 0 Hz
 GB 0 Hz
 PC 1.00







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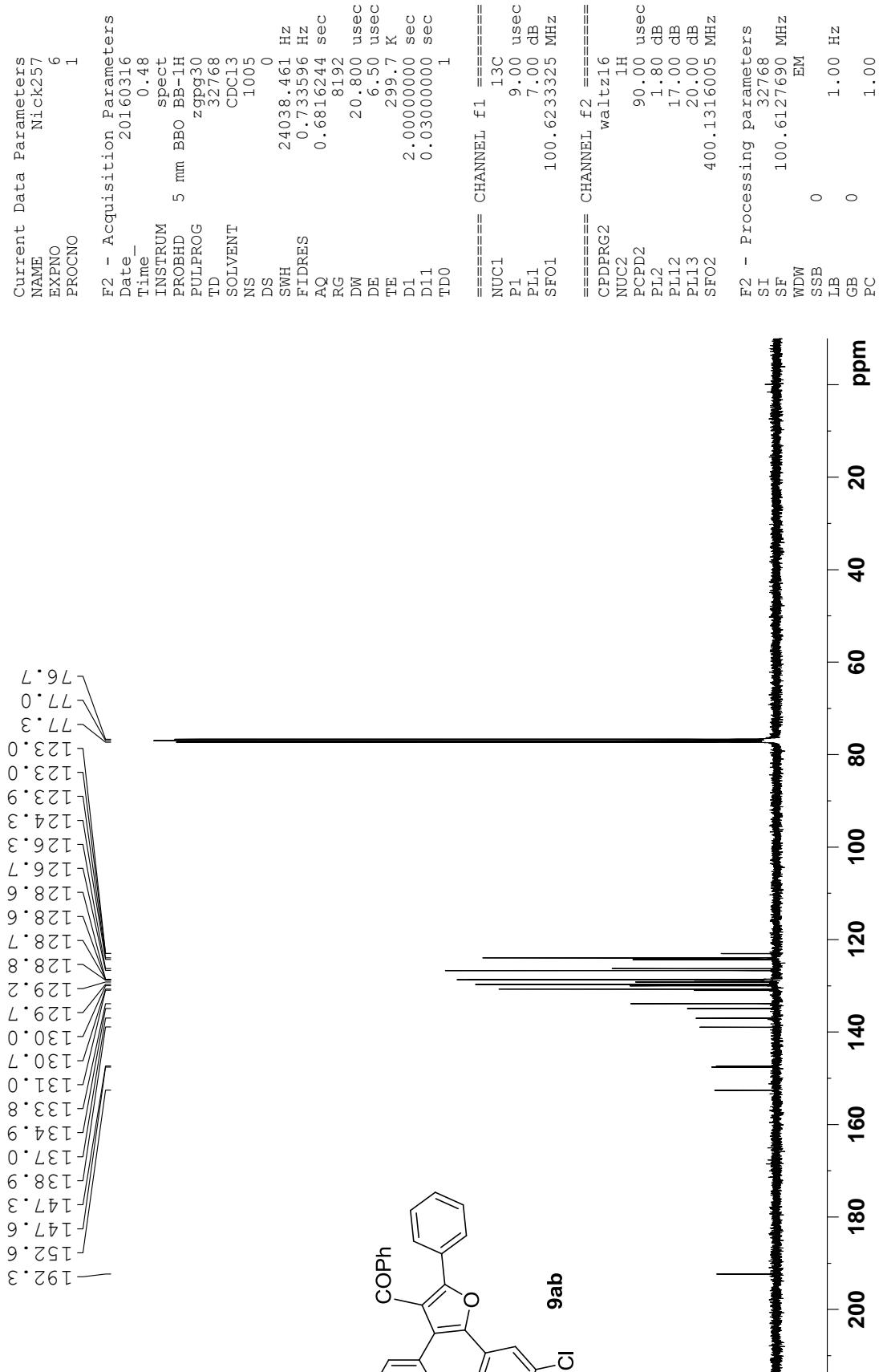
Current Data Parameters
NAME      Nick257
EXPNO     7
PROCNO    1

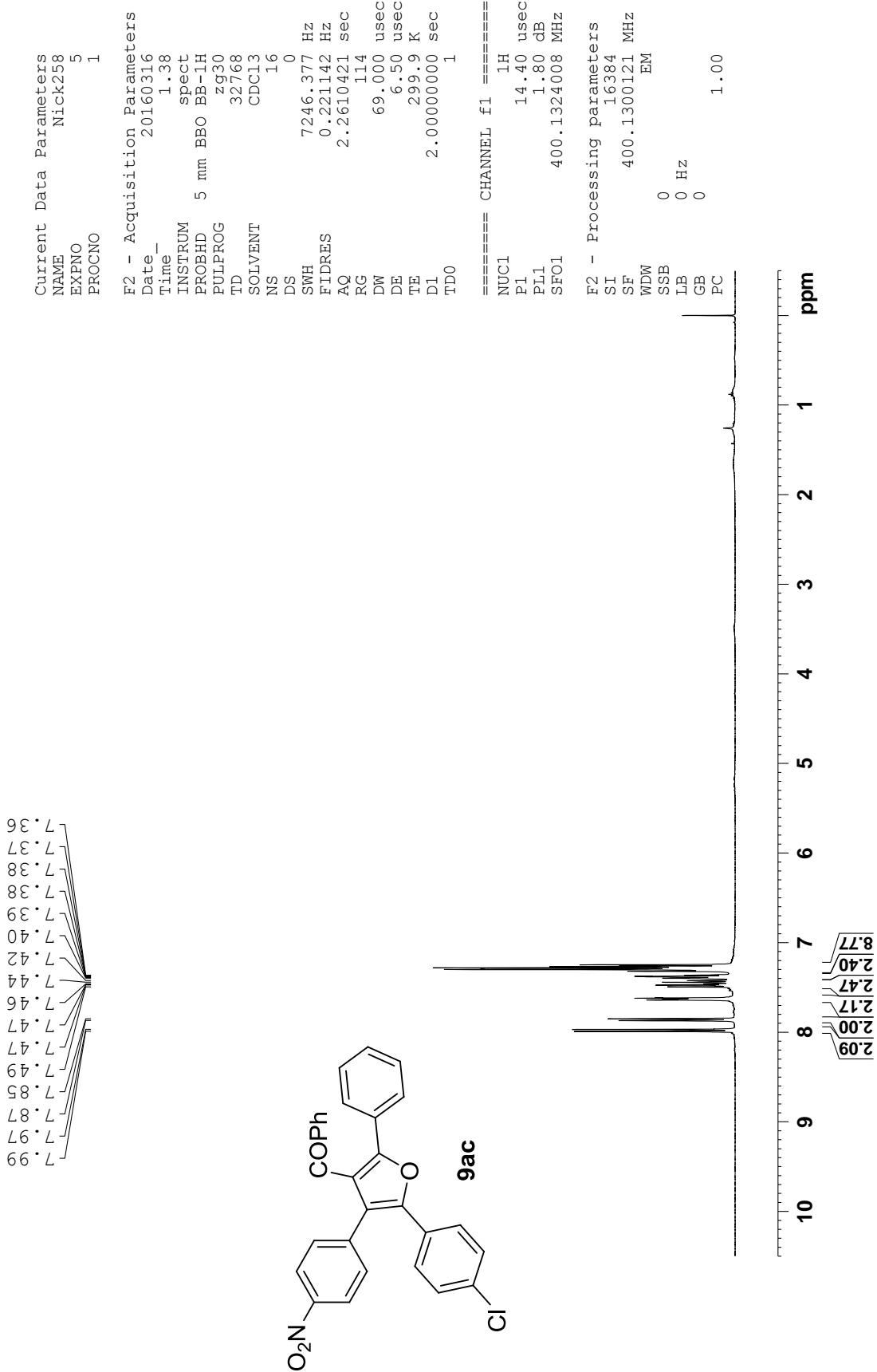
F2 - Acquisition Parameters
Date_   20160412
Time_   0.53
INSTRUM spect
PROBHD  5 mm BBO BB-1H
PULPROG
TD      32768
SOLVENT CDCl3
NS      0
DS      16
SWH    7246.377 Hz
FIDRES 0.221142 Hz
AQ     2.2610421 sec
RG     256
DW     69.000 usec
DE     6.500 usec
TE     297.1 K
D1     2.00000000 sec
TDO   1

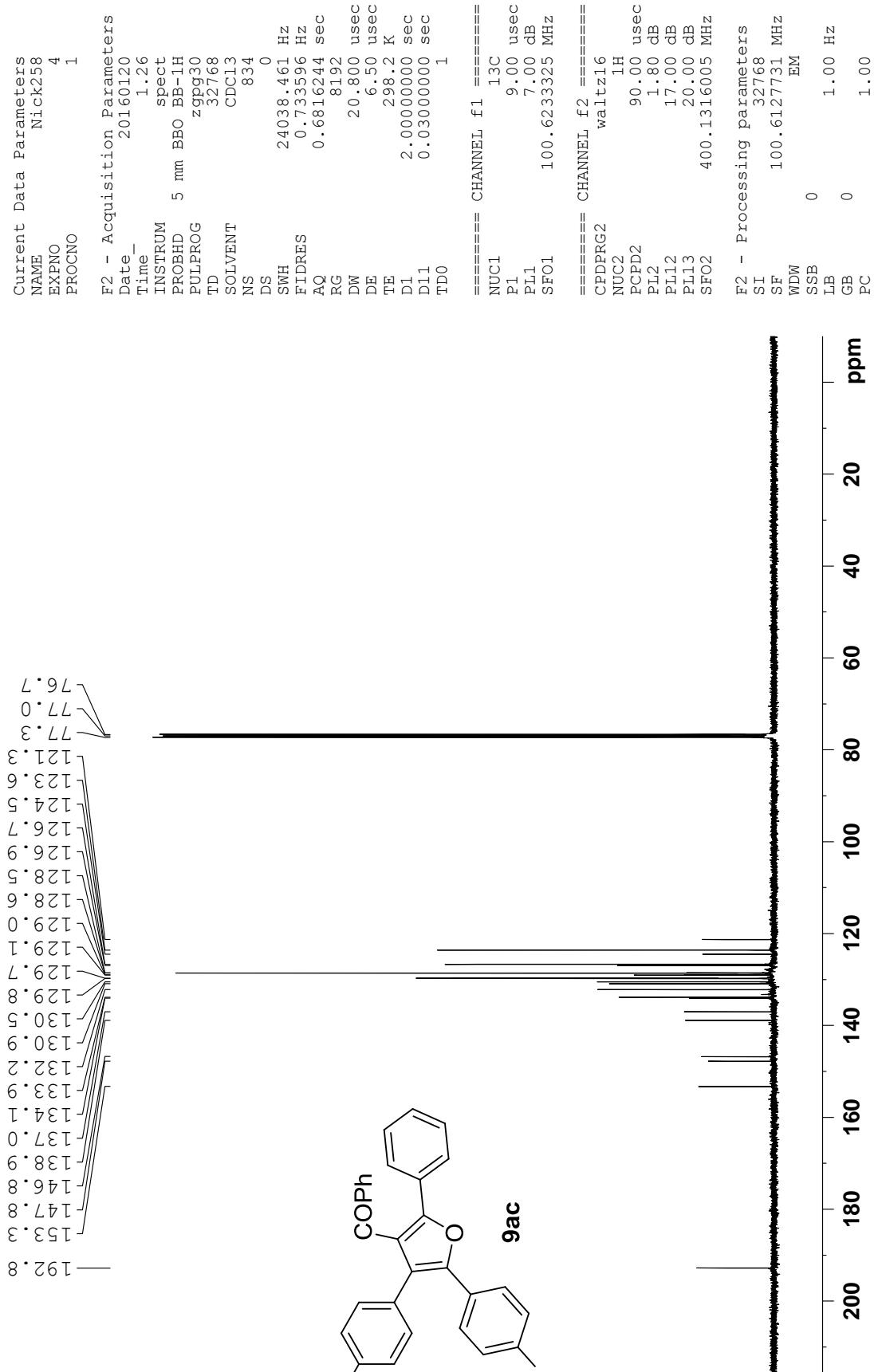
===== CHANNEL f1 =====
NUC1   1H
P1     14.40 usec
PL1
SFO1  400.1324008 MHz

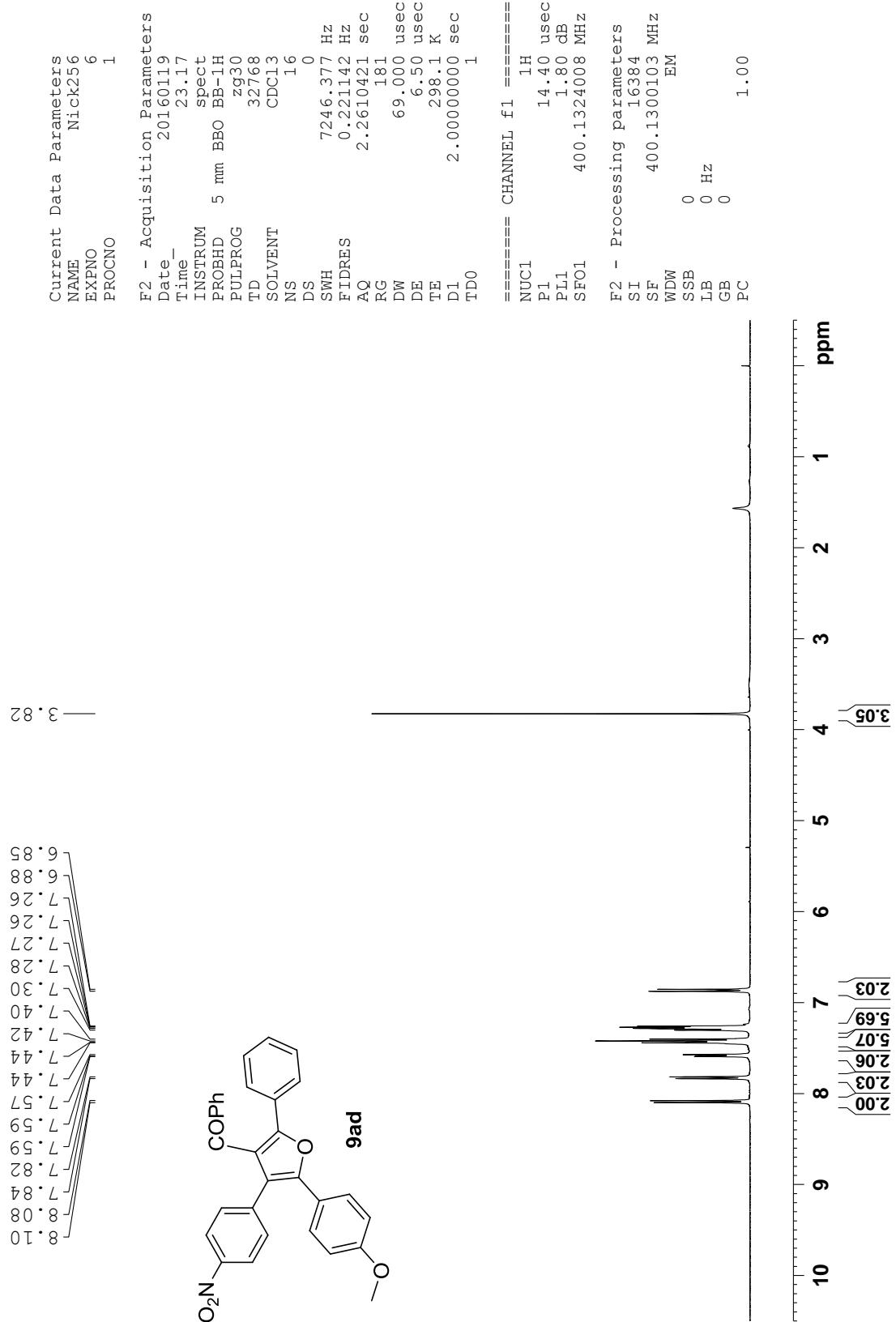
F2 - Processing parameters
SI      16384
SF     400.1300096 MHz
WDW
SSB
LB     0 Hz
GB     0 Hz
PC     1.00

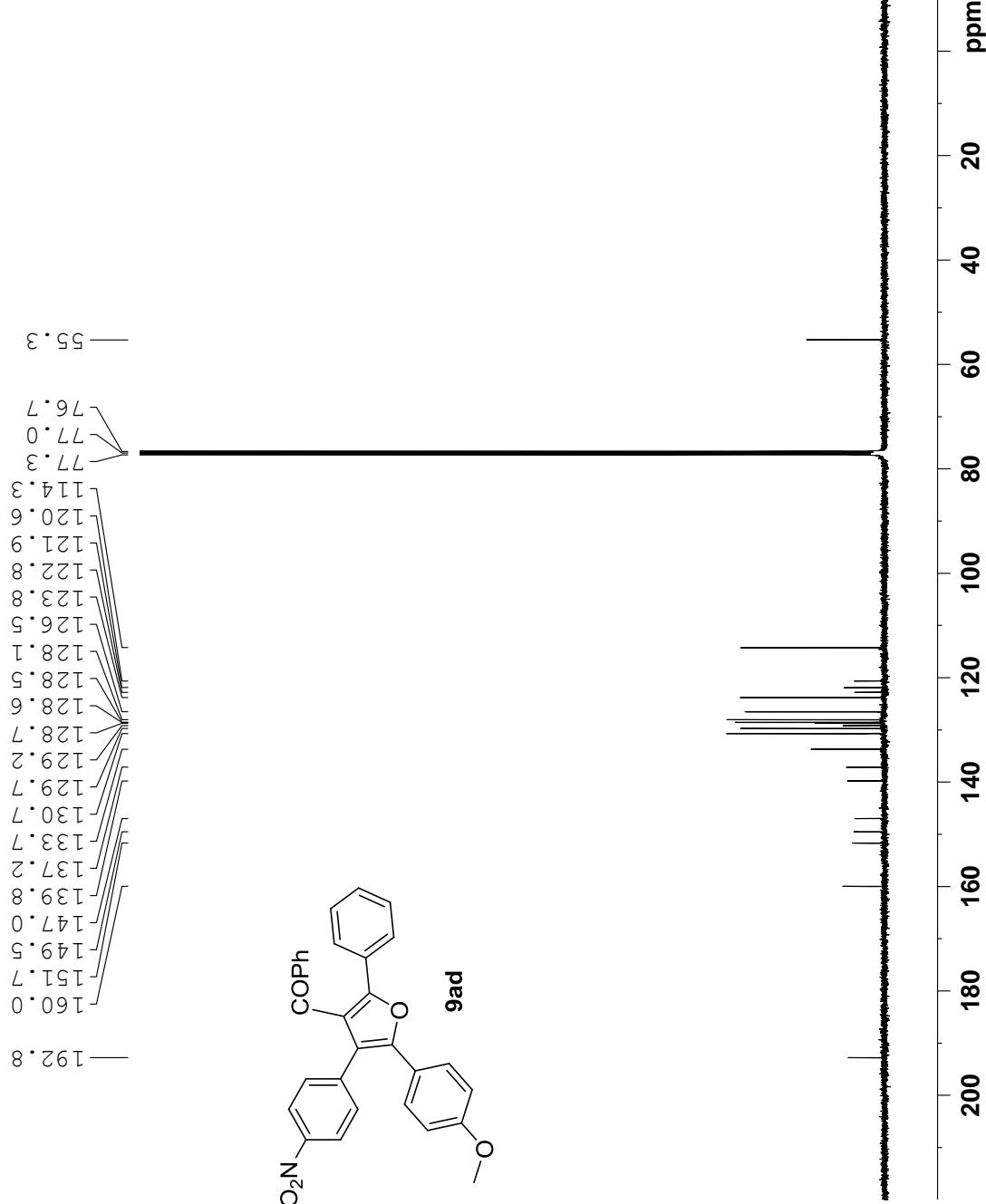
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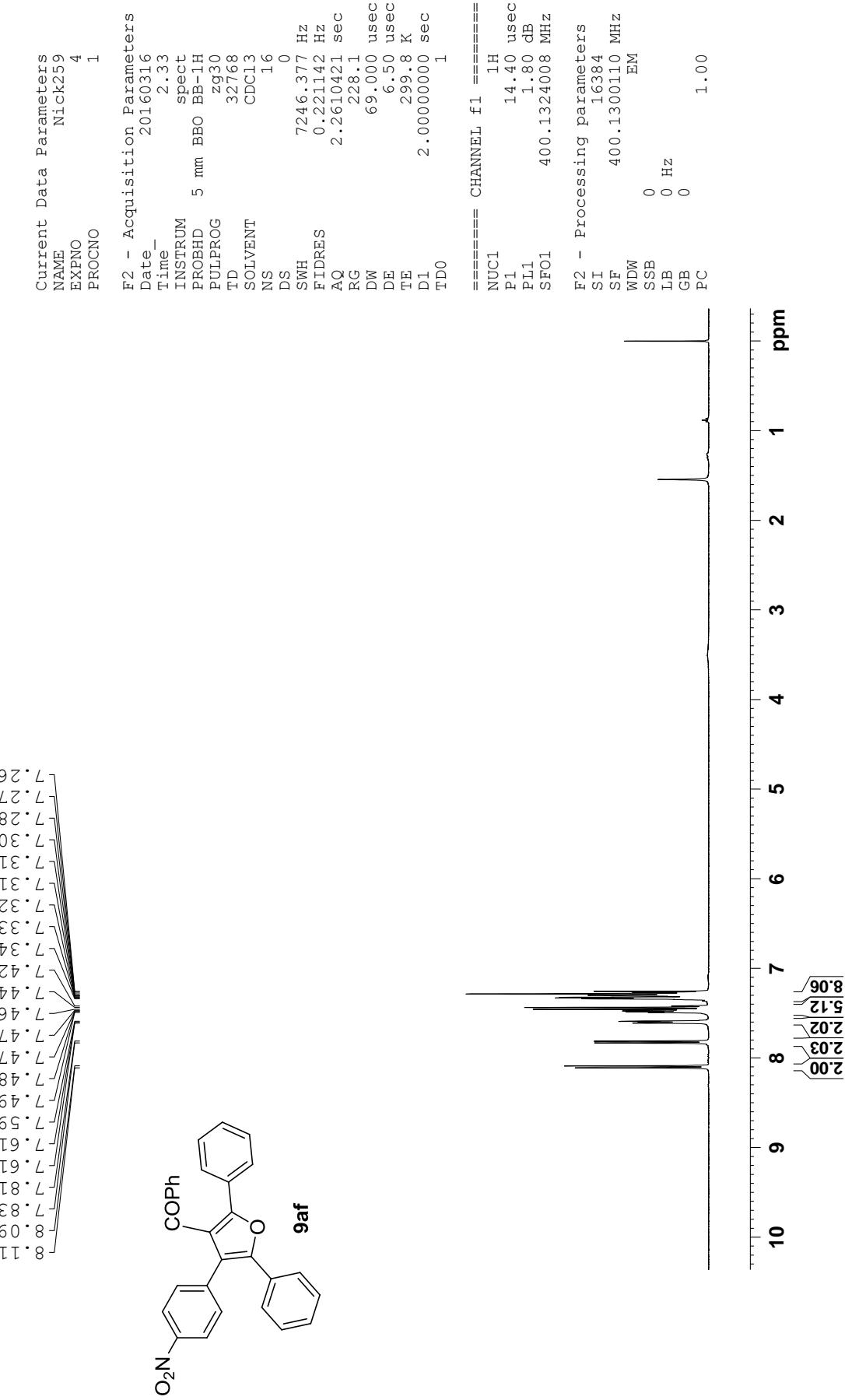


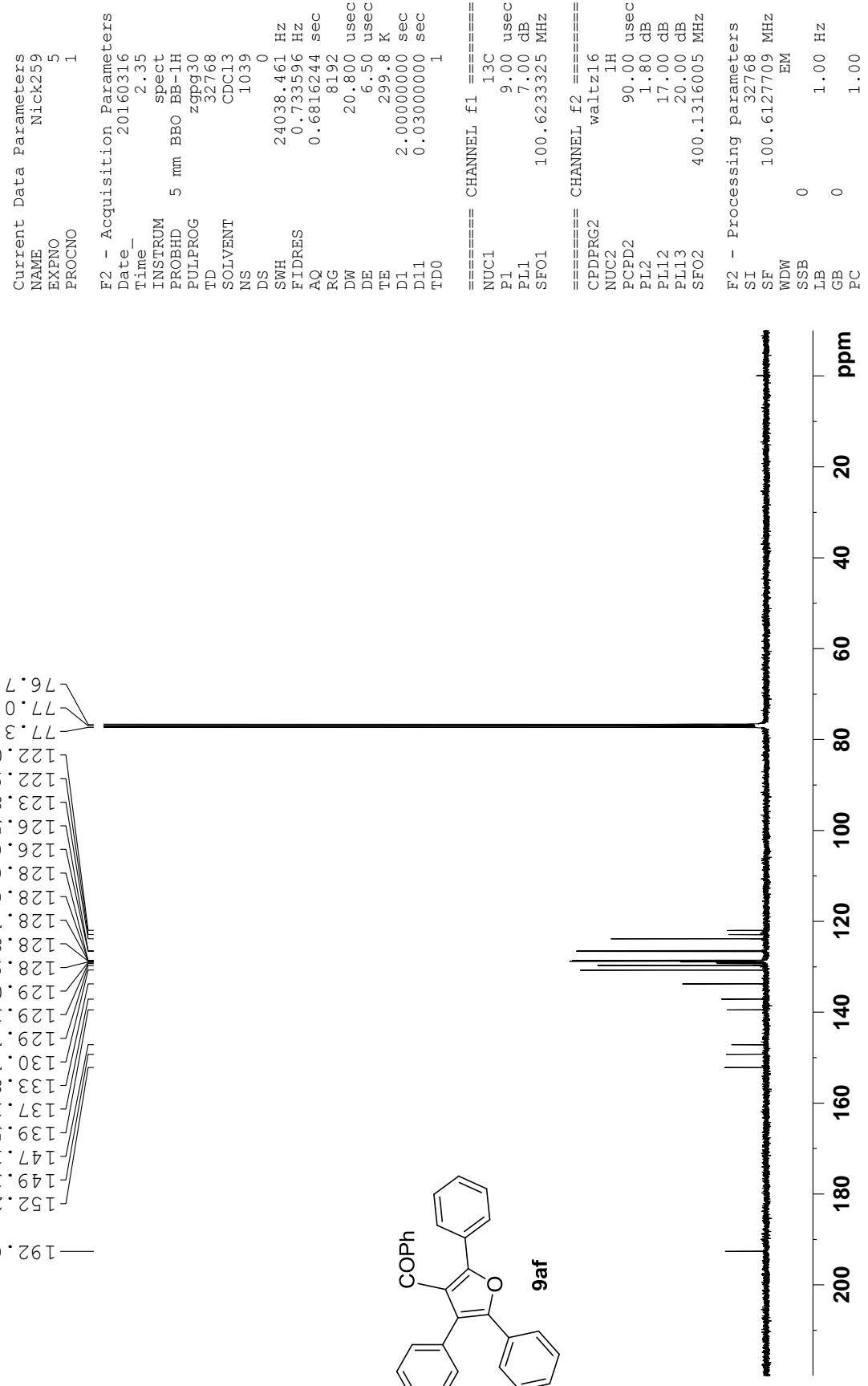


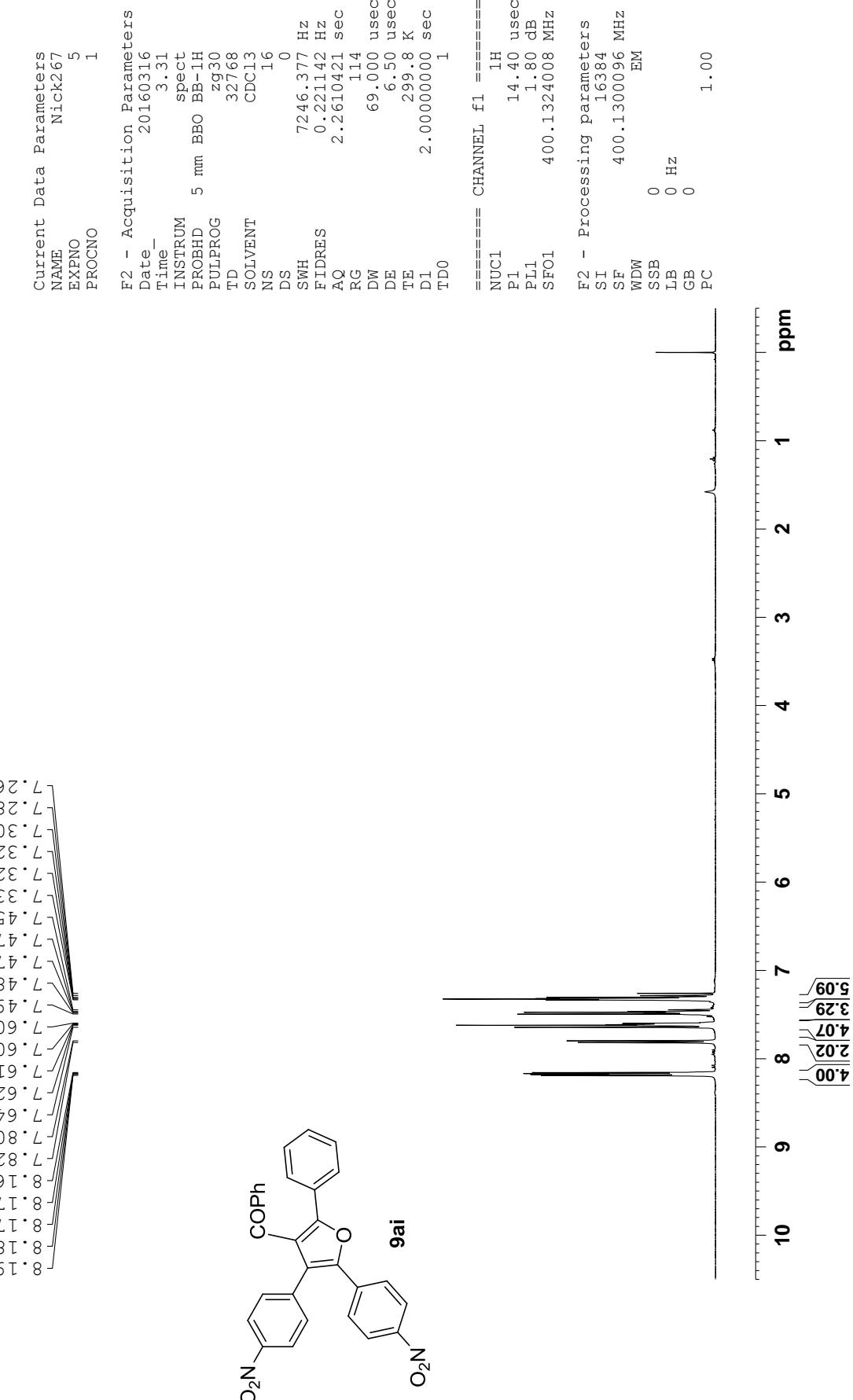


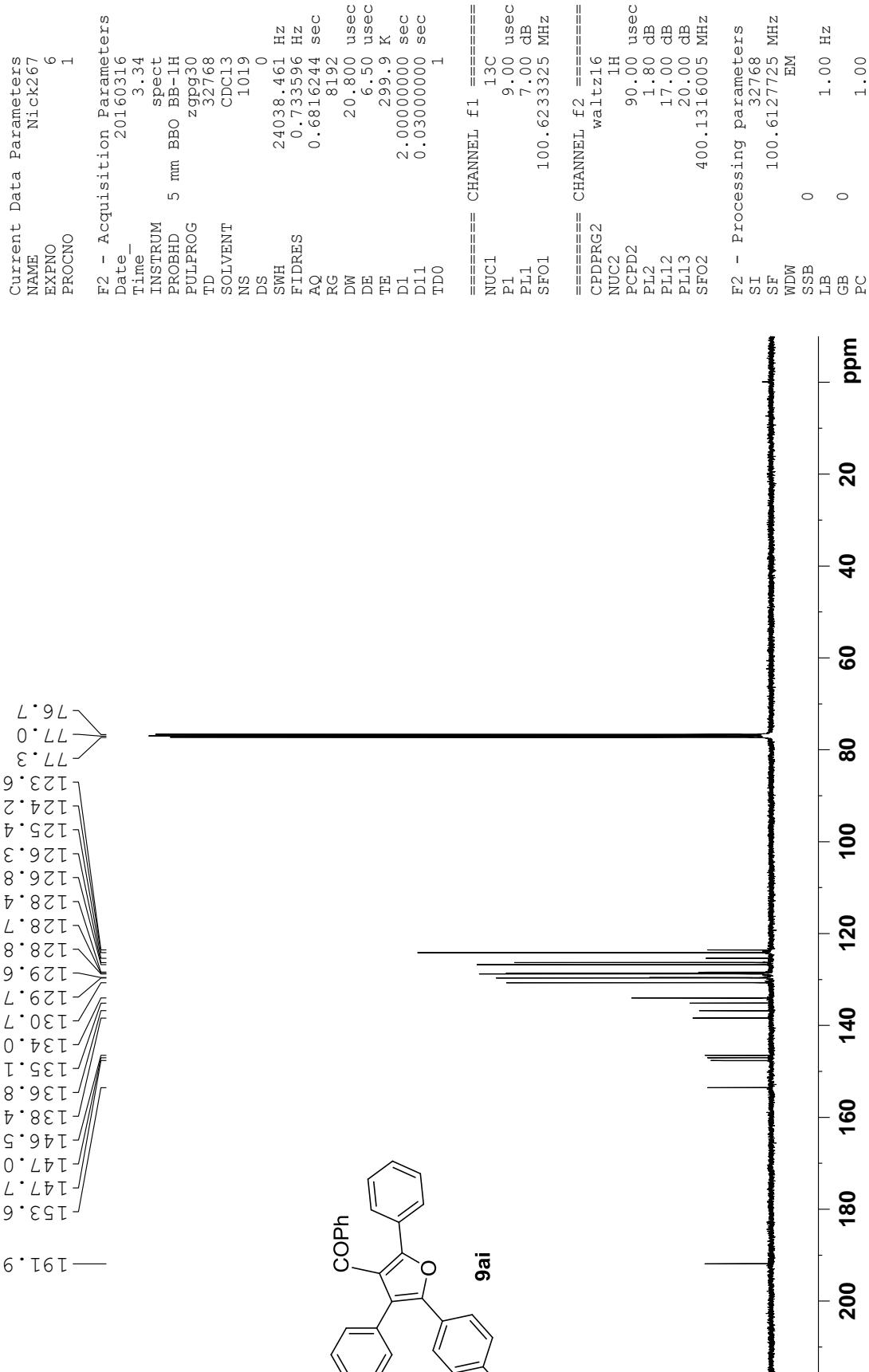


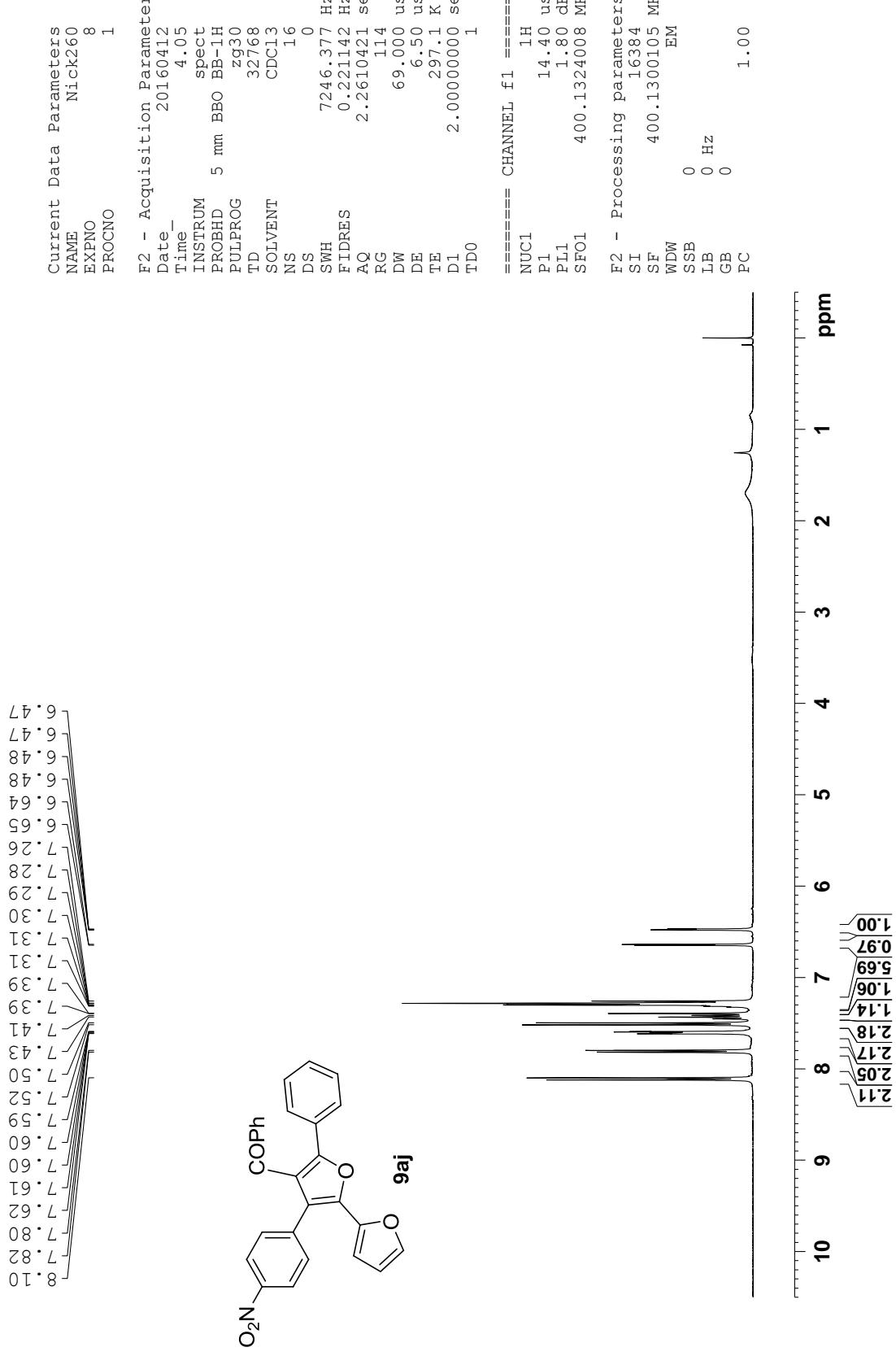


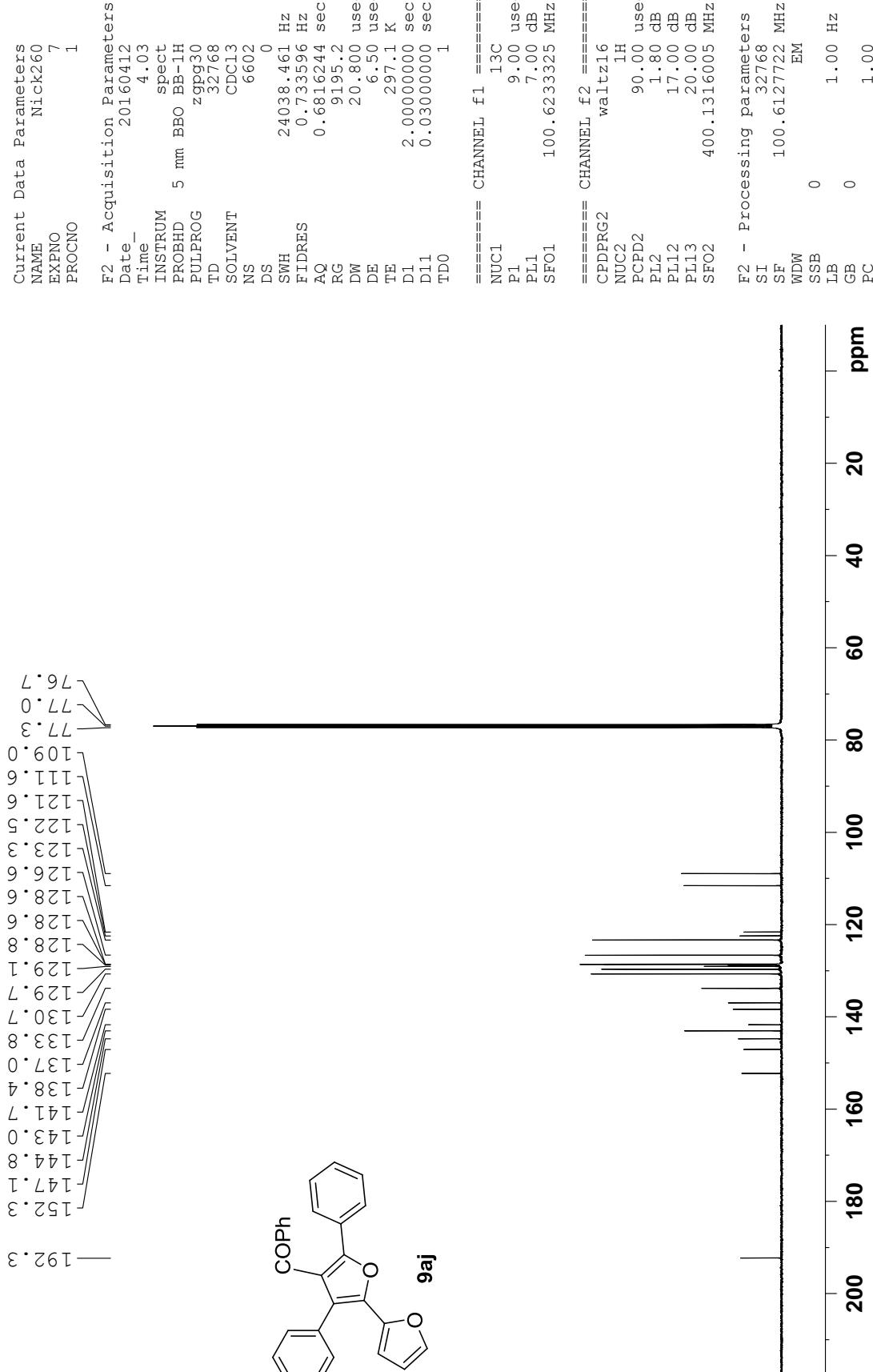


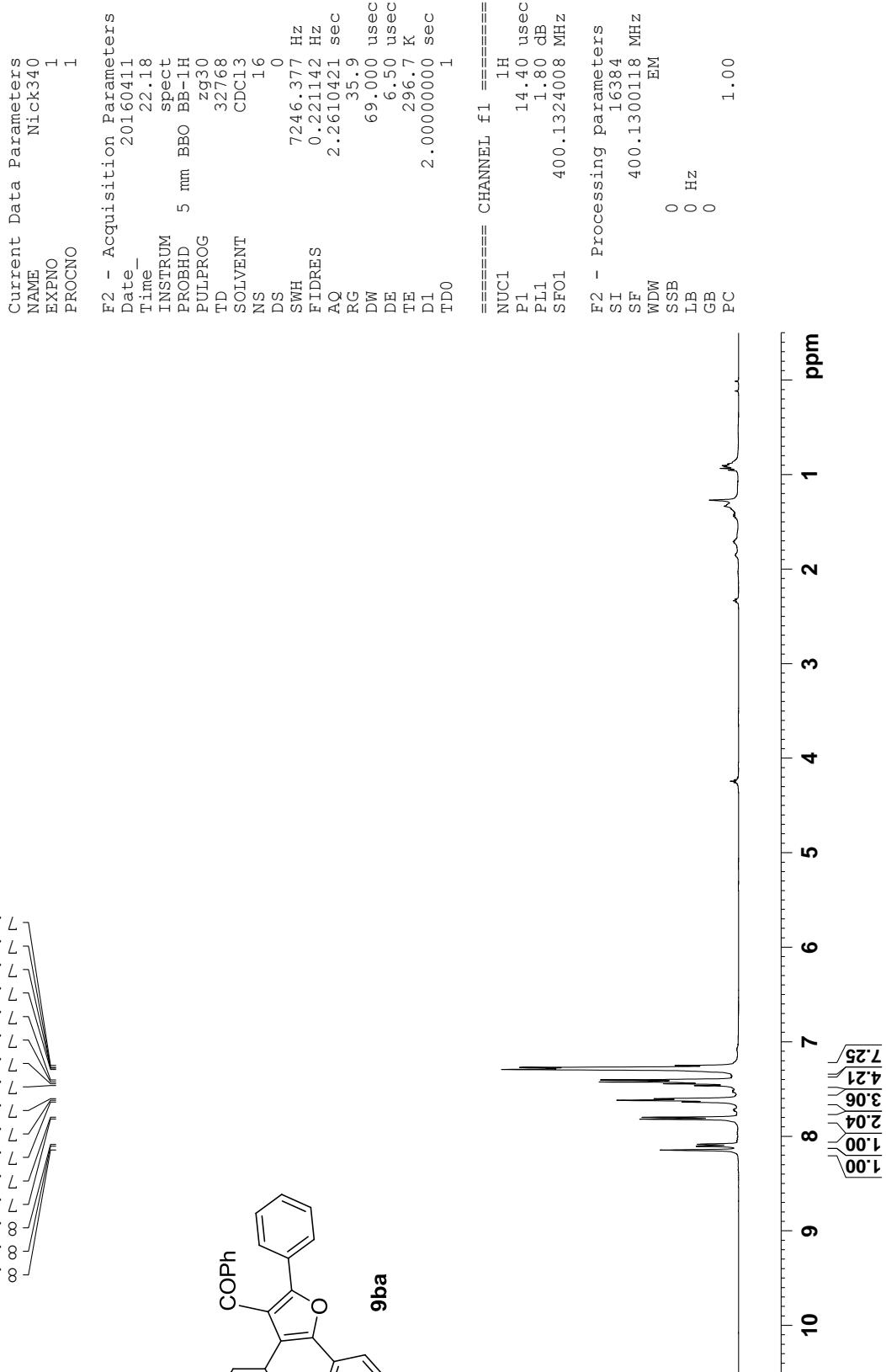
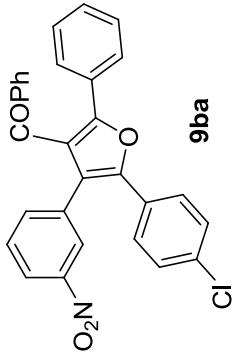
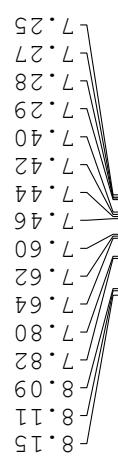


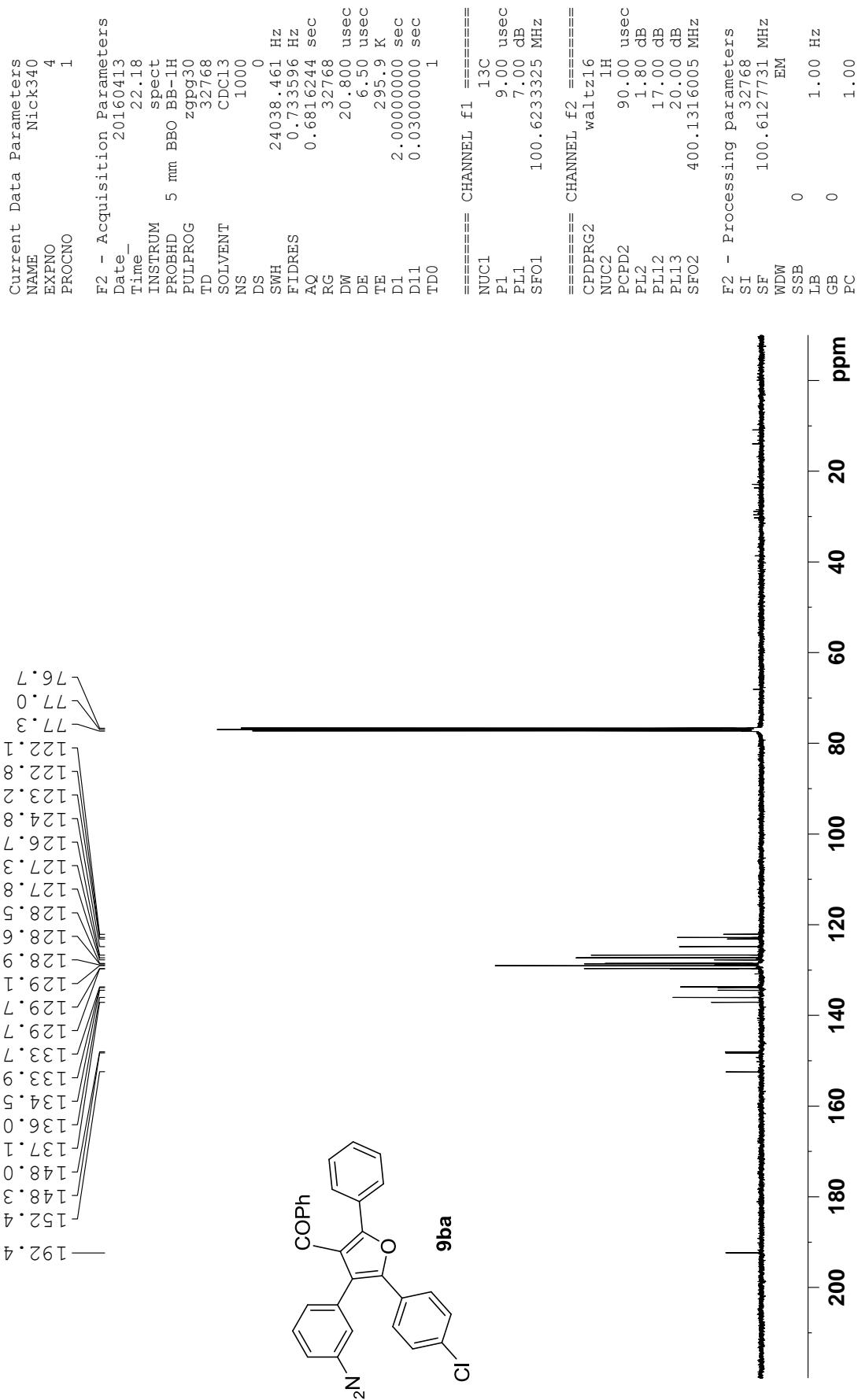


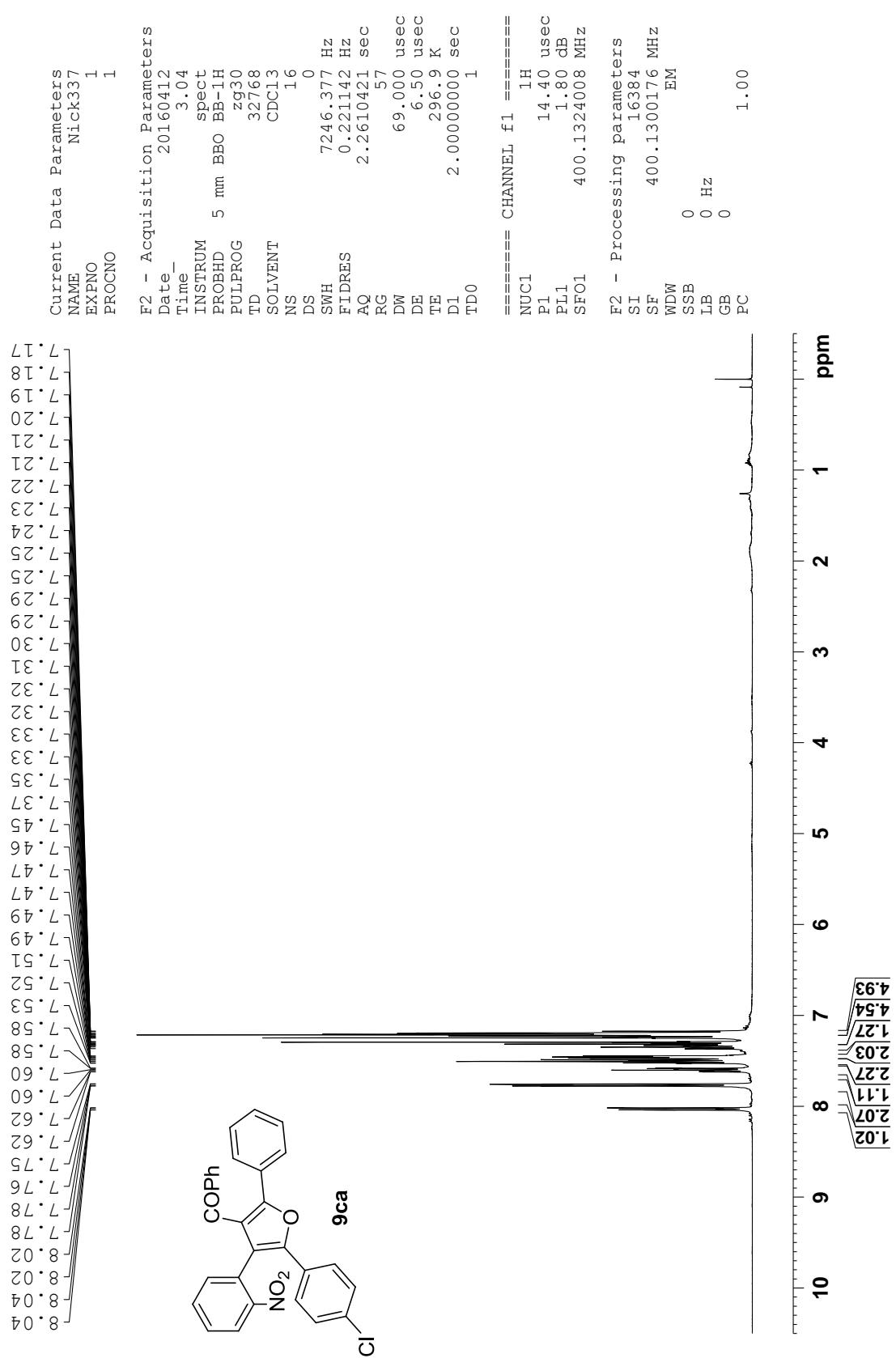


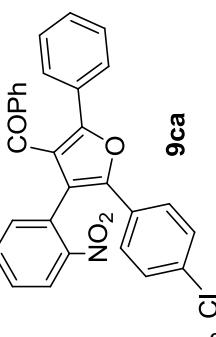
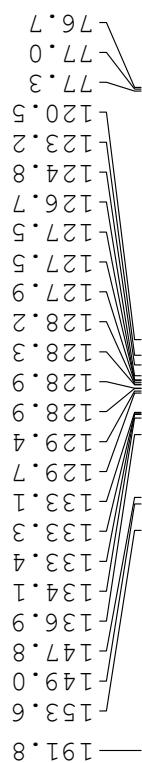












S98

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Current Data Parameters
NAME Nick337
EXPNO 2
PROCNO 1

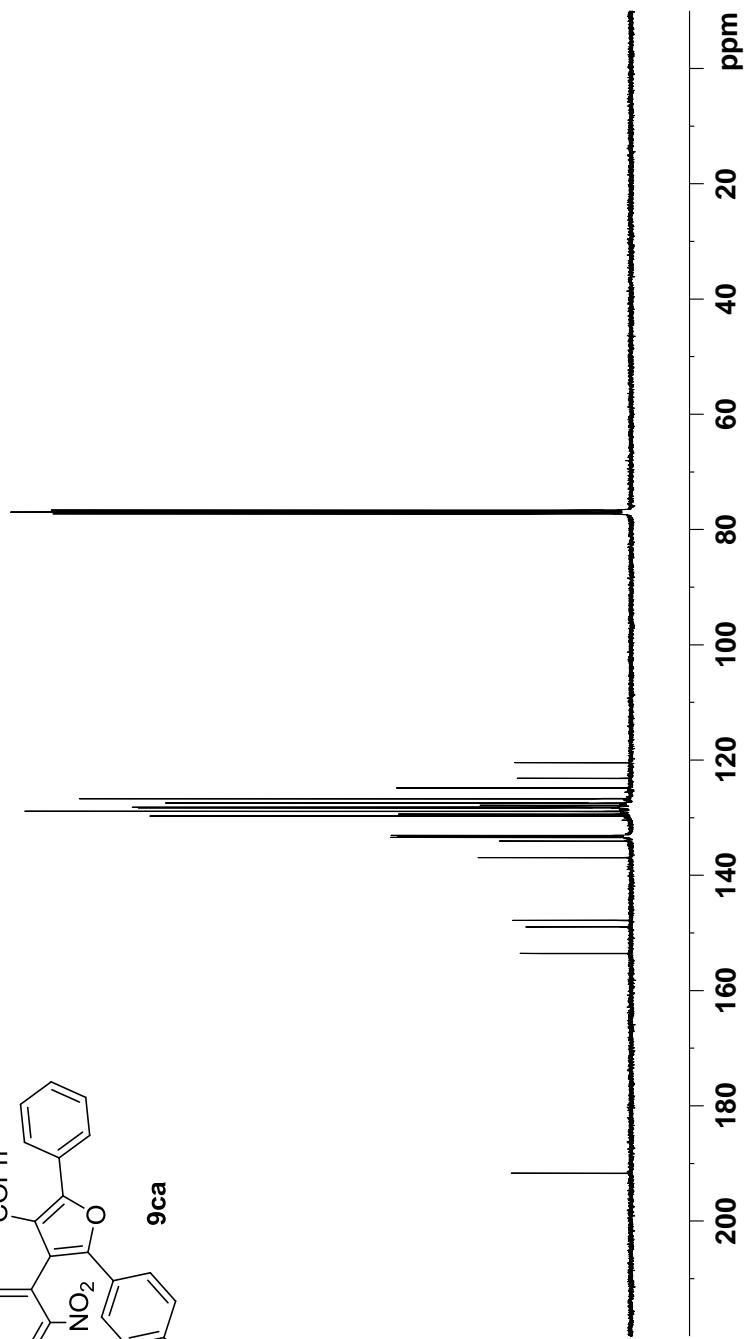
F2 - Acquisition Parameters
Date_ 20160412
Time_ 3.09
INSTRUM spect
PROBHD 5 mm BBO BB-1H
PULPROG zpgp30
TD 32768
SOLVENT CDCl3
NS 1008
DS 0
SWH 24038.461 Hz
FTDRES 0.733596 Hz
AQ 0.6816244 sec
RG 9195.2
DW 20.800 usec
DE 6.50 usec
TE 297.0 K
D1 2.0000000 sec
D11 0.0300000 sec
TD0 1

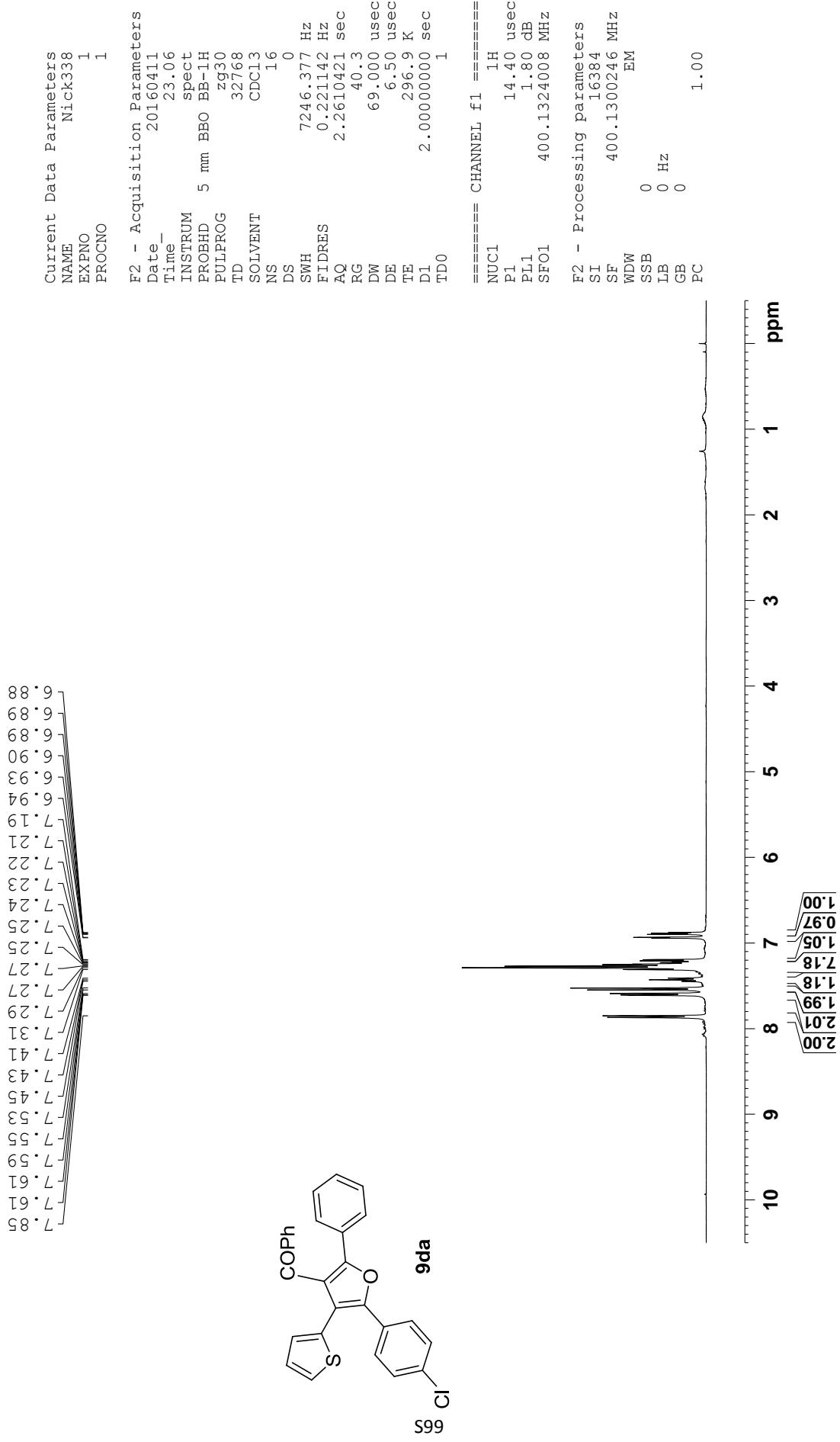
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 7.00 dB
SFO1 100.6233325 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 1.80 dB
PL12 17.00 dB
PL13 20.00 dB
SFO2 400.1316005 MHz

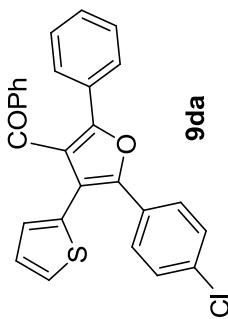
F2 - Processing parameters
SI 32768
SF 100.6127789 MHz
WDW EM
SSB 0
LB 1.00 Hz
SF 0
PC 1.00

```





192.8
 150.9
 148.4
 137.2
 134.0
 133.0
 131.7
 129.7
 128.7
 128.6
 128.6
 128.7
 128.7
 128.6
 128.6
 128.4
 127.1
 127.3
 126.9
 127.3
 126.1
 124.0
 126.0
 127.0
 127.3
 127.6
 127.7
 127.7
 127.0
 126.7
 126.7
 126.7



```

Current Data Parameters
NAME Nick338
EXPNO 2
PROCNO 1

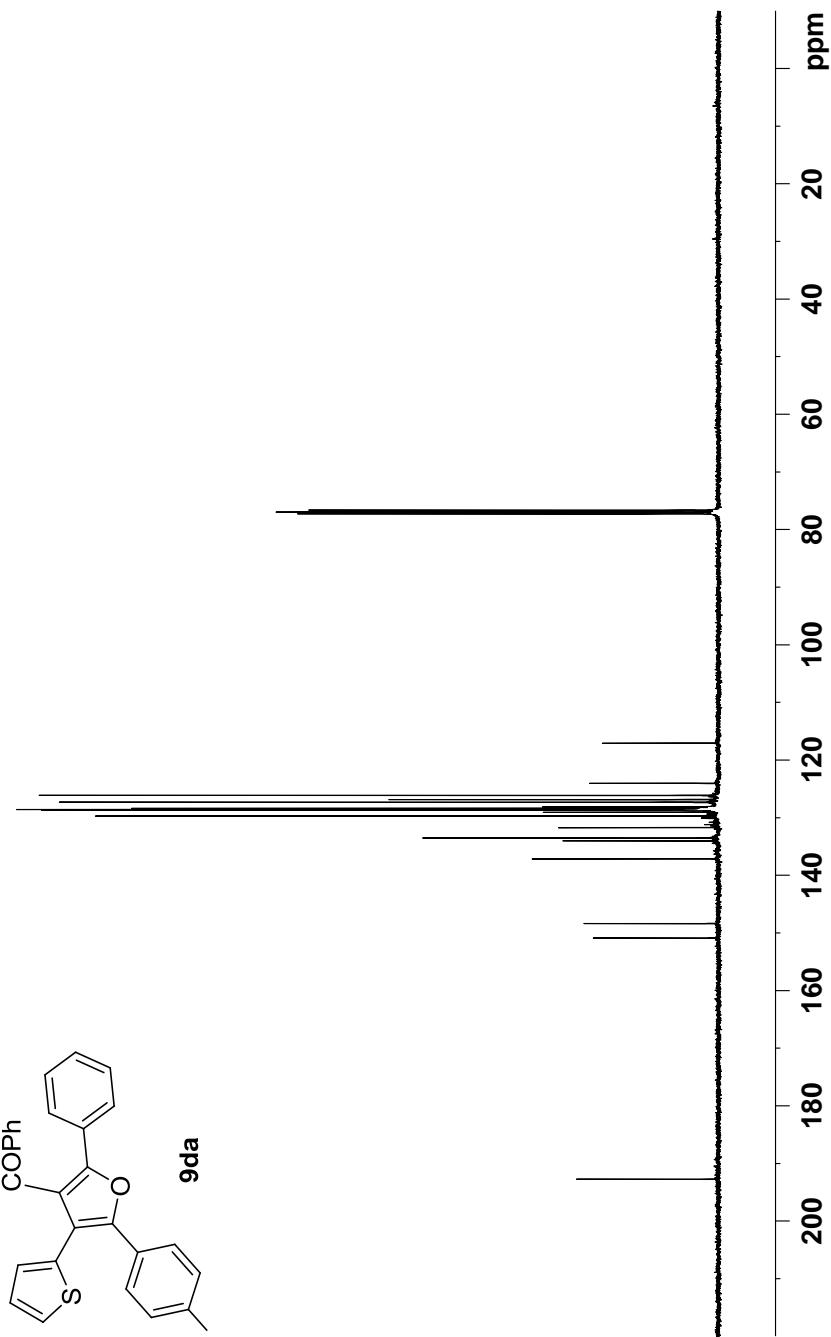
F2 - Acquisition Parameters
Date_ 20160411
Time_ 23.08
INSTRUM spect
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1013
DS 0
SWH 24038.461 Hz
FITRES 0.733596 Hz
AQ 0.6816244 sec
RG 9195.2
DW 20.800 usec
DE 6.50 usec
TE 297.0 K
D1 2.0000000 sec
D11 0.03000000 sec
TD0 1

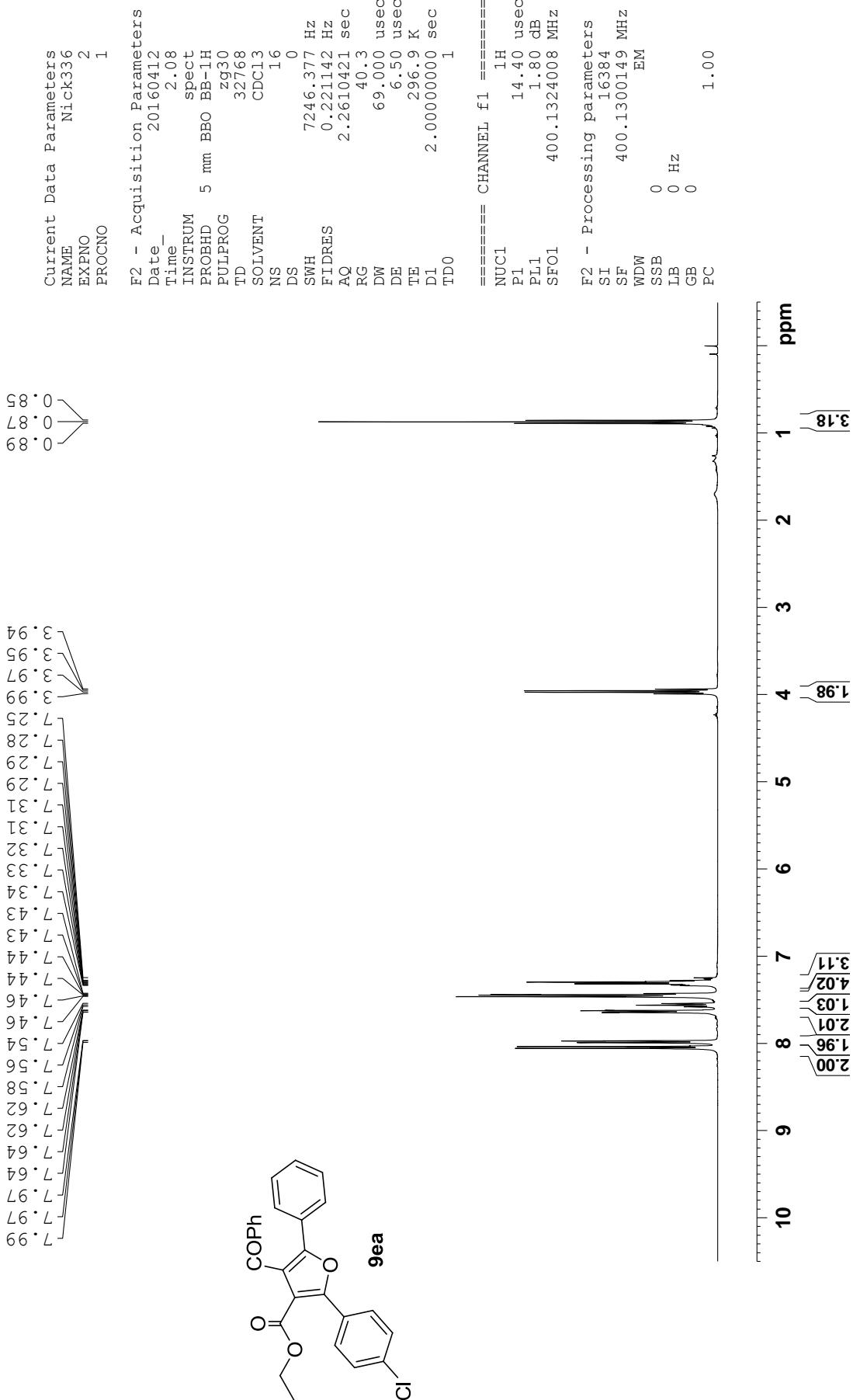
===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 7.00 dB
SFO1 100.6233325 MHz

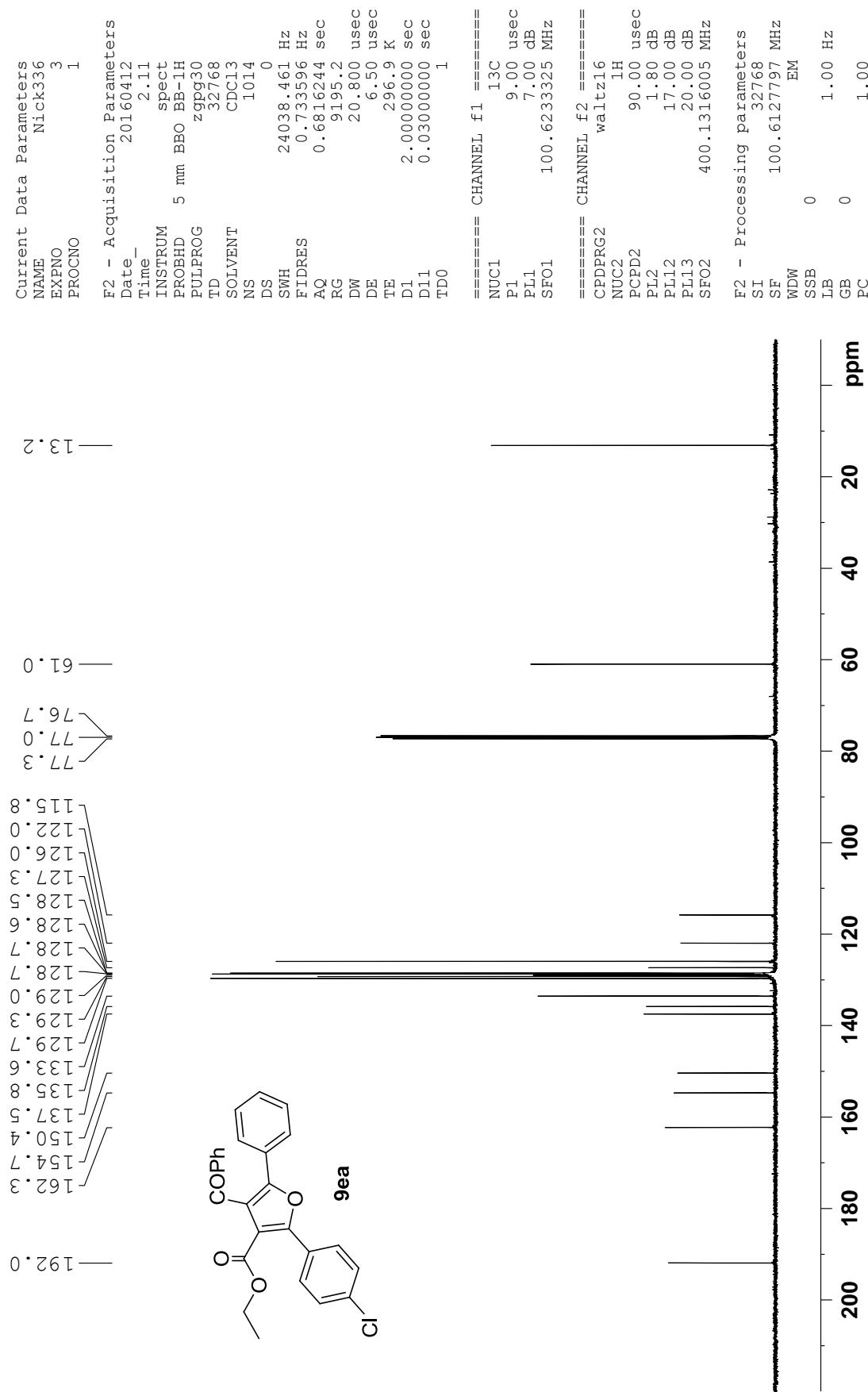
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 90.00 usec
PL2 1.80 dB
PL12 17.00 dB
PL13 20.00 dB
SFO2 400.1316005 MHz

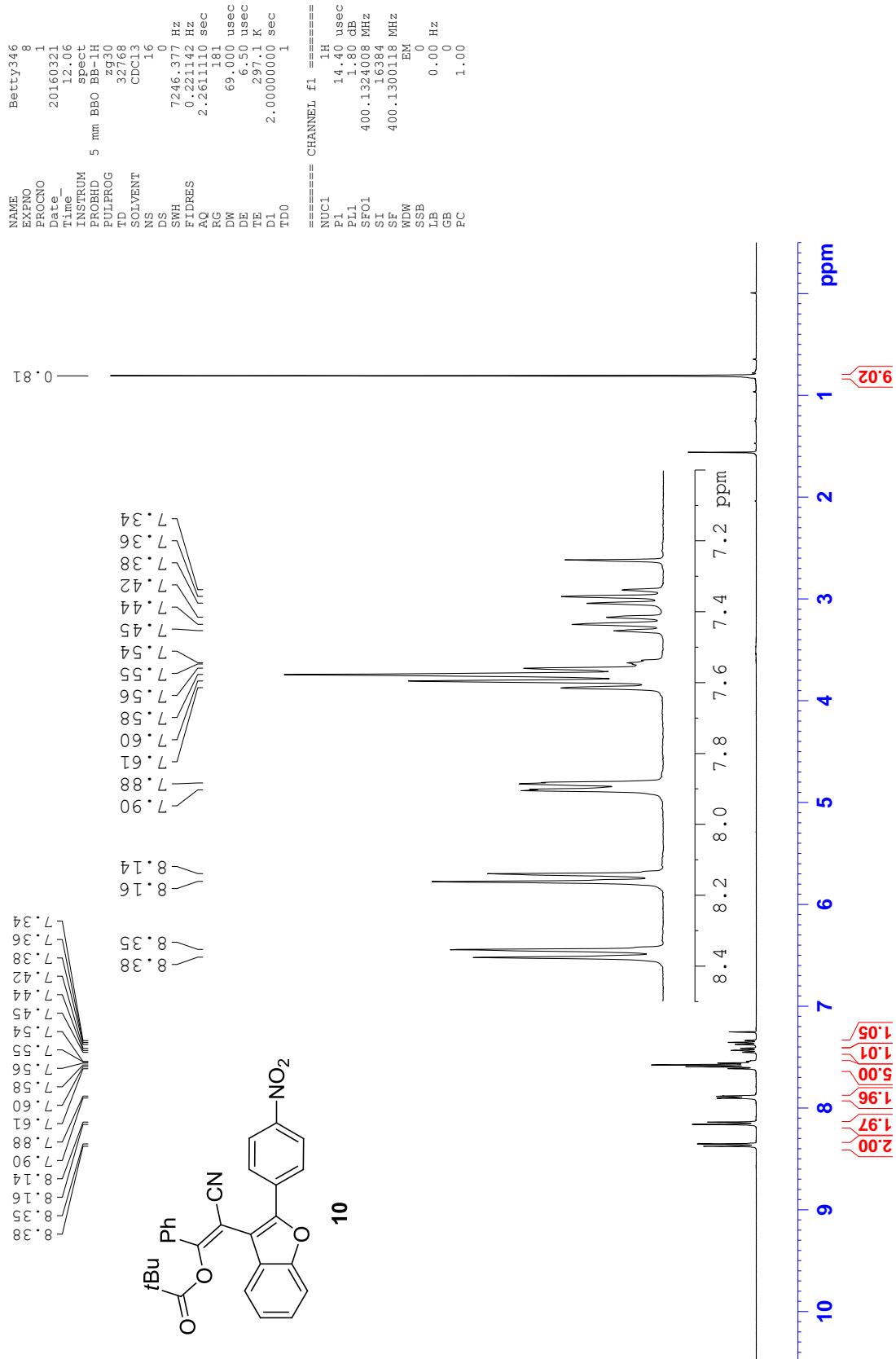
F2 - Processing parameters
SI 32768
SF 100.6127819 MHz
WDW EM
SSB 0
LB 1.00 Hz
SF 0
PC 1.00

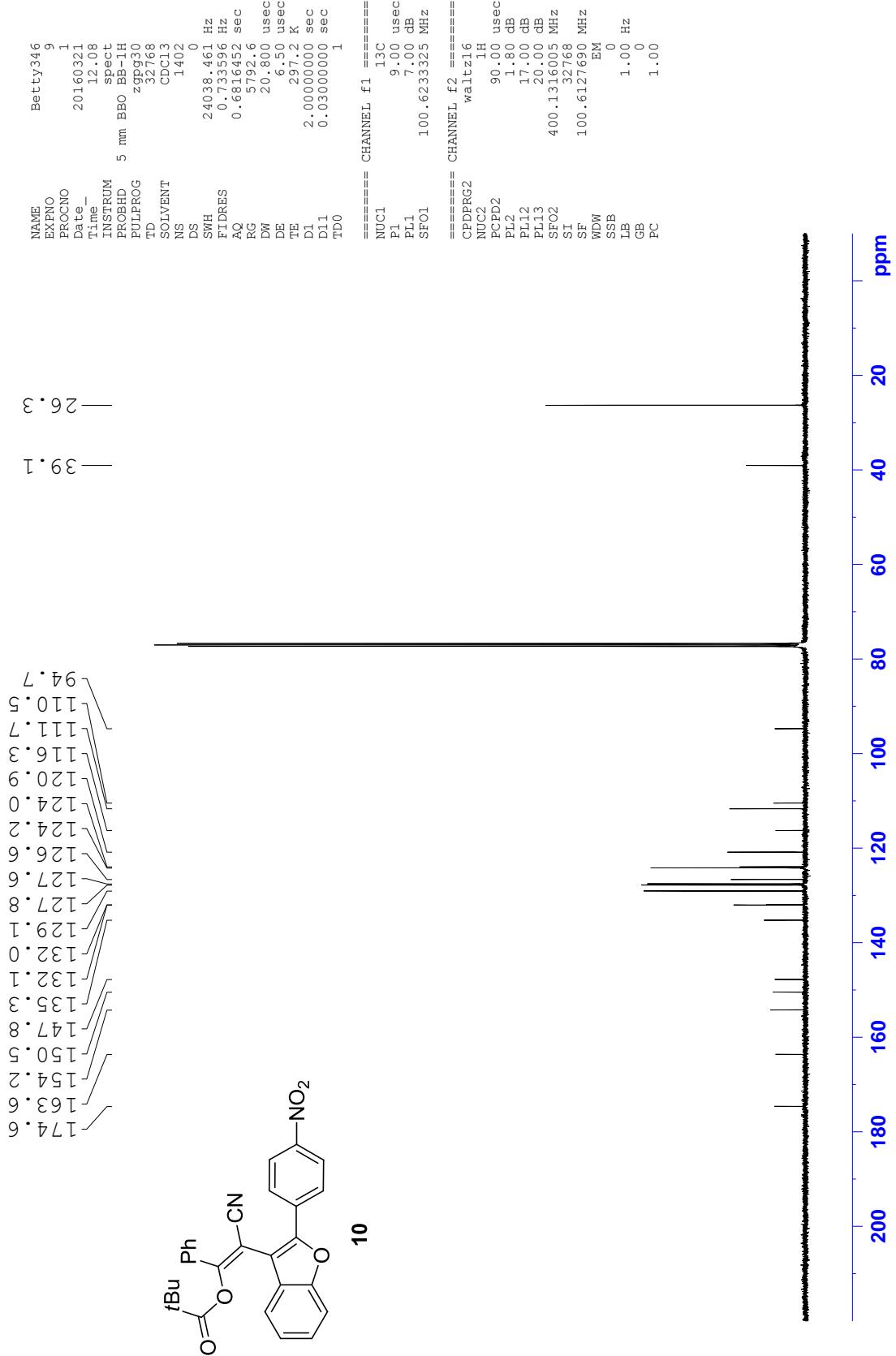
```









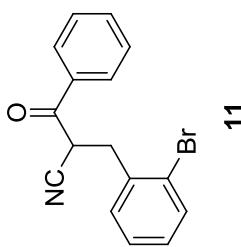
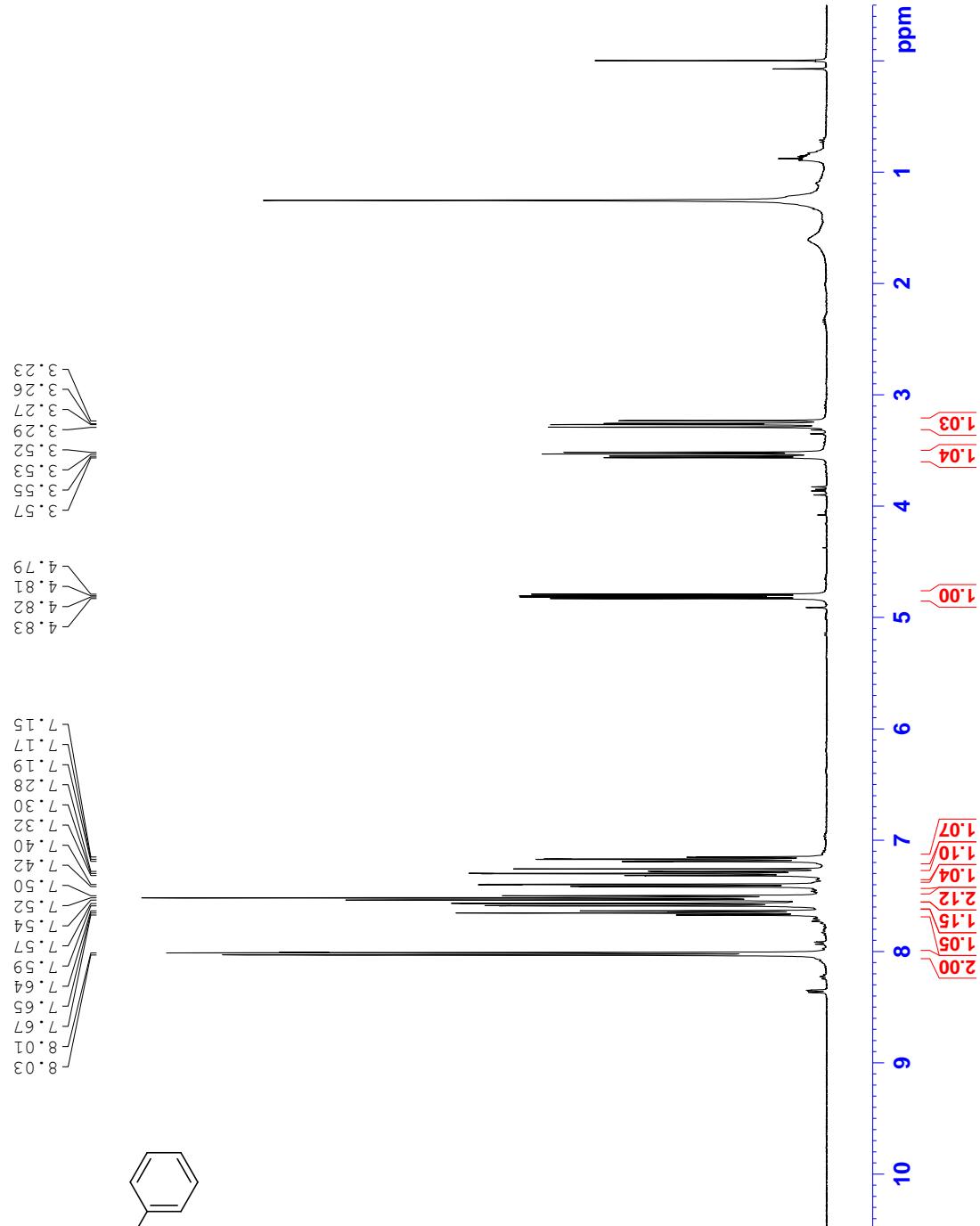


```

NAME          Betty350
EXPNO         13
PROCNO        1
Date         20160413
Time         23.41
INSTRUM      BBO
PROPHD       5 mm
PULPROG      BB1H
TD           2930
SOLVENT      CDC13
NS           16
DS           0
SWH         7246.377 Hz
FIDRES      0.222142 Hz
AQ          2.261110 sec
RG           114
DW           69.000 usec
DE           6.50 usec
TE           236.0 K
D1          2.0000000 sec
TDO          1

===== CHANNEL f1 =====
NUC1L        1H
P1           14.40 usec
PL1          1.80 MHz
SFO1        400.1324000 MHz
SI           16384
SF           400.1300100 MHz
WWDW         0
SSB          0.00 Hz
LB           0
GB           0
PC           1.00

```



190.0

135.2
134.1
133.1
132.3
129.6
129.1
128.9
128.1
124.2
116.6

0.0
36.0
39.0
114.0
128.0
129.0
132.0
133.0
134.0
135.0

Current Data Parameters
NAME Betty350
EXPNO 14
PROCNO 1

E2 - Acquisition Parameters
Date_ 20160414
Time_ 0.16

INSTRUM BBOBHD
PROBHD 5 mm BBO BB-1H
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1779
DS 0
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 32768
DW 20.800 usec
DE 6.50 usec
TE 296.8 K
D1 2.0000000 sec
D11 0.03000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PL1 7.00 dB
SFO1 100.6233325 MHz

===== CHANNEL f2 =====
CPDPGRG[2] waltz16
NUC2 1H
ECPD2 90.00 usec
EL2 1.80 dB
PL12 17.00 dB
EL13 20.00 dB
SFO2 400.1316005 MHz

E2 - Processing parameters
SI 32768
SF 100.6127690 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.00

