

Electronic Supplementary Information

Synthesis of ketones via Organolithium Addition to Acid Chlorides Using Continuous Flow Chemistry

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1. Materials and Methods

All chemical reagents were purchased from Sigma-Aldrich, Alfa Aesar and TCI chemicals and were used without further purification. Reactions were monitored by thin layer chromatography (TLC) with 0.25-mm E. Merck pre-coated silica gel plates (Kieselgel 60F₂₅₄, Merck). Products were detected by viewing under UV light and by staining with either an anisaldehyde solution composed of acetic acid, sulfuric acid and MeOH or by staining with a KMnO₄ solution composed of potassium carbonate, sodium hydroxide and water. Flash column chromatography was performed on Merck 60 silica gel (70-230 mesh). Micromixers with inner diameters of 250, 300 and 500 μm were purchased from VICI (ZT1C, ZT1M), YMC (YMC-P-V-025, YMC-P-0058) and ITEC (SIMM-V2). Stainless steel (SUS316) microtube reactors with inner diameters of 1000 μm were purchased from GL Science and were cut into appropriate lengths (50 and 100 cm). The micromixer and microtube reactors were connected with stainless steel fittings (GL Science, 1/16" OUW) to construct the microreaction system. The microfluidic system was dipped in a cooling bath to control the temperature. Solutions were continuously injected into the microfluidic system using syringe pumps (Harvard Model PhD 2000) equipped with gastight syringes purchased from SGE Analytical Science. After a steady state was reached, the product solution was collected for 90 sec unless otherwise noted. GC analysis was performed on a TRACETM 1300 Gas Chromatograph (Thermo Scientific) using TraceGold TG-5MS Amine (0.25mm \times 0.25 μm \times 30m). ¹H and ¹³C spectra were recorded on a Bruker AM-300 spectrometer. Chemical shifts are reported as δ values relative to internal SiMe₄ or chloroform (δ 0.00 for ¹H and δ 77.0 for ¹³C). IR spectra were measured as neat oil or solids on a Varian Scimitar 800 FT-IR spectrometer. High resolution spectra were obtained at the Korea Basic Science Institute Mass Spectrometry Service Center.

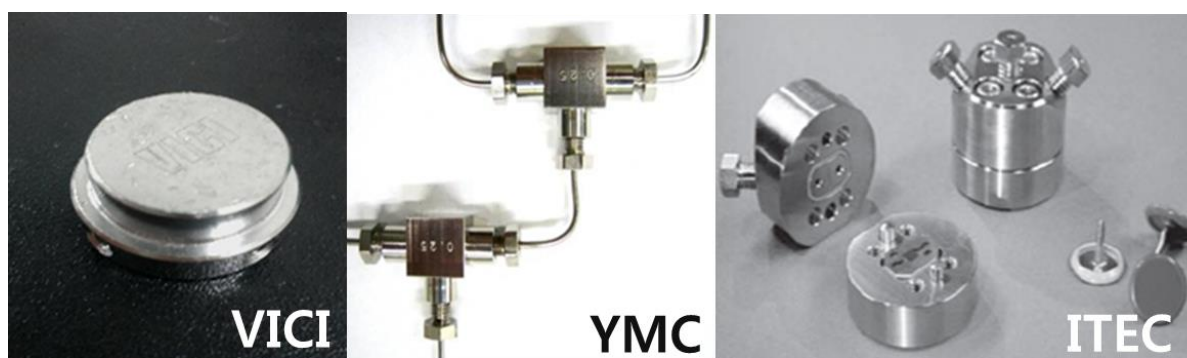
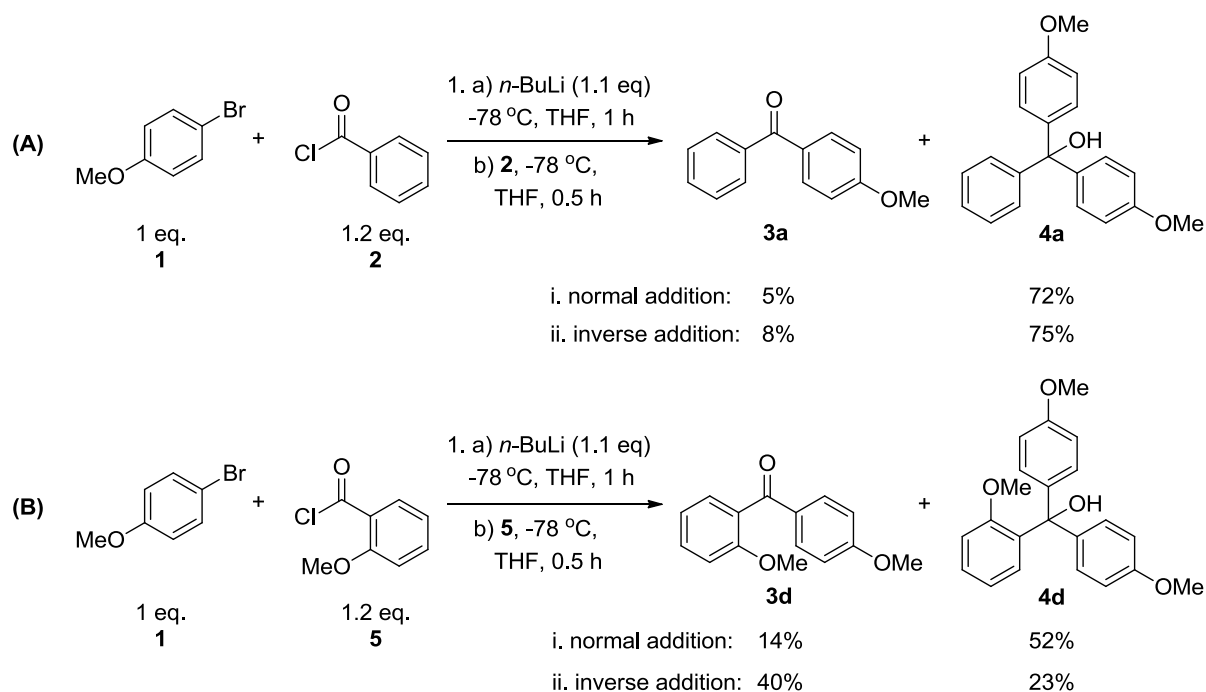


Figure 1. Micromixer types employed in this study.

2. Reaction between 1-bromo-4-methoxybenzene and benzoyl chlorides under standard

batch conditions.



Scheme 1.

(A) i. To a stirred solution of 1-bromo-4-methoxybenzene (0.187 g, 1.00 mmol) in dry THF (10 mL) at $-78\text{ }^{\circ}\text{C}$ was added *n*-BuLi (2.5 M in hexane, 0.44 mL, 1.10 mmol). The temperature was maintained at $-78\text{ }^{\circ}\text{C}$, the reaction mixture was stirred for 1 h. A solution of benzoyl chloride (0.169 g, 1.20 mmol) in dry THF (1 mL) at $-78\text{ }^{\circ}\text{C}$ was then added, and the reaction mixture was stirred for a further 0.5 h. The reaction mixture was quenched with sat. NH_4Cl aqueous solution, extracted with EtOAc (3 x 30 mL), dried with MgSO_4 and concentrated. The crude product was purified by flash column chromatography (eluent: *vide infra*) on silica gel. This afforded ketone **3a** in trace yield and tertiary alcohol **4a** (0.115 g, 0.36 mmol, 72 %) as a colorless solid.

(A) ii. To a stirred solution of 1-bromo-4-methoxybenzene (0.187 g, 1.00 mmol) in dry THF (10 mL) at $-78\text{ }^{\circ}\text{C}$ was added *n*-BuLi (2.5 M in hexane, 0.44 mL, 1.10 mmol). The temperature was maintained at $-78\text{ }^{\circ}\text{C}$, the reaction mixture was stirred for 1 h. This solution was added by cannula at $-78\text{ }^{\circ}\text{C}$ to a solution of benzoyl chloride (0.169 g, 1.20 mmol) in dry THF (1 mL) at $-78\text{ }^{\circ}\text{C}$ and the reaction mixture was stirred for a further 0.5 h. The reaction mixture was quenched with sat. NH_4Cl aqueous solution, extracted with EtOAc (3 x 30 mL), dried with MgSO_4 and concentrated. The crude product was purified by flash column chromatography (eluent: *vide infra*) on silica gel. This afforded ketone **3a** (0.017 g, 0.08 mmol, 8%) as a pale yellow solid and tertiary alcohol **4a** (0.120 g, 0.37 mmol, 75 %) as a colorless solid.

(B) i. To a stirred solution of 1-bromo-4-methoxybenzene (0.187 g, 1.00 mmol) in dry THF (10 mL) at $-78\text{ }^{\circ}\text{C}$ was added *n*-BuLi (2.5 M in hexane, 0.44 mL, 1.10 mmol). The temperature was maintained at $-78\text{ }^{\circ}\text{C}$, the reaction mixture was stirred for 1 h. A solution of 2-methoxybenzoyl chloride (0.205 g, 1.20 mmol) in dry THF (1 mL) at $-78\text{ }^{\circ}\text{C}$ was added, and the reaction mixture was stirred for a further 0.5 h. The reaction mixture was quenched with sat. NH_4Cl aqueous solution, extracted with EtOAc (3 x 30 mL), dried with MgSO_4 and concentrated. The crude product was purified by flash column chromatography on silica gel (eluent: *vide infra*). This afforded ketone product **3d** (0.034 g, 0.14 mmol, 14 %) as a white solid and tertiary alcohol **4d** (0.091 g, 0.26 mmol, 52 %) as a pale yellow oil.

(B) ii. To a stirred solution of 1-bromo-4-methoxybenzene (0.187 g, 1.00 mmol) in dry THF (10 mL) at $-78\text{ }^{\circ}\text{C}$ was added *n*-BuLi (2.5 M in hexane, 0.44 mL, 1.10 mmol). The temperature was maintained at $-78\text{ }^{\circ}\text{C}$, the reaction mixture was stirred for 1 h. This solution was added by cannula at $-78\text{ }^{\circ}\text{C}$ to a solution of 2-methoxybenzoyl chloride (0.205 g, 1.20 mmol) in dry THF (1 mL) at $-78\text{ }^{\circ}\text{C}$ and the reaction mixture was stirred for a further 0.5 h. The reaction mixture was quenched with sat. NH_4Cl aqueous solution, extracted with EtOAc (3 x 30 mL), dried with MgSO_4 and concentrated. The crude product was purified by flash column chromatography on silica gel (eluent: *vide infra*). This afforded ketone product **3d** (0.097 g, 0.40 mmol, 40 %) as a white solid and tertiary alcohol **4d** (0.040 g, 0.115 mmol, 23 %) as a pale yellow oil.

3. General Procedure



Figure 2. Flow chemistry reaction set-up employed in this study.



Figure 3. Pre-cooling coil employed in this study.

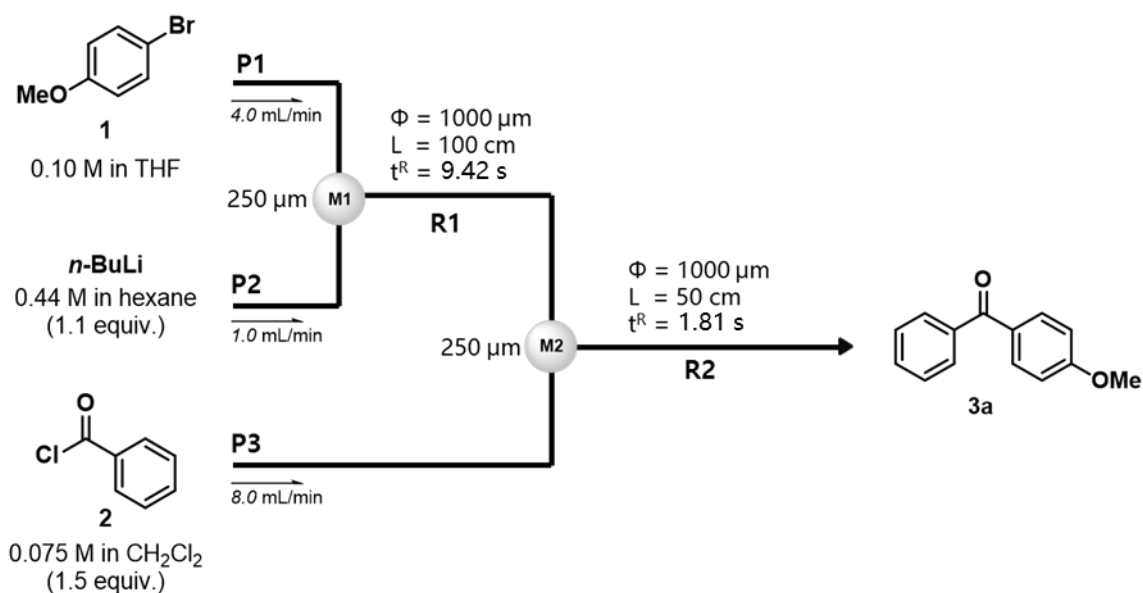
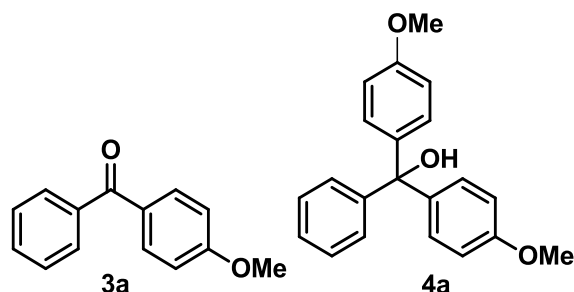


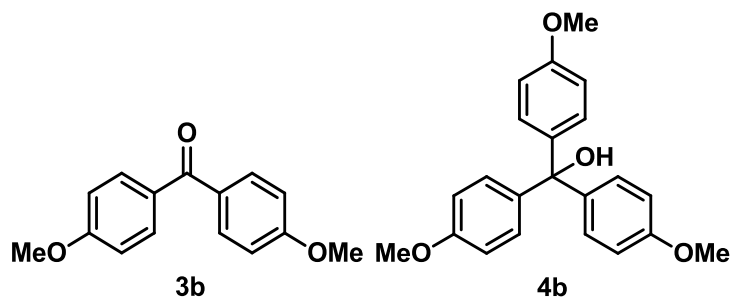
Figure 4. Schematic representation of continuous flow set up

A microfluidic system consisting of two T-shaped micromixers (**M1** and **M2**), two microtube reactors (**R1** and **R2**) and three tube pre-temperature-retaining units (**P1**, **P2** and **P3**) (inner diameter $\Phi = 1000 \mu\text{m}$, $L = 50 \text{ cm}$) were assembled as shown in the schematic representation above. A solution of 1-bromo-4-methoxybenzene (0.10 M in THF) (flow rate: 4.0 mL min^{-1}) and a solution of *n*-BuLi (0.44 M in hexane) (flow rate: 1.0 mL min^{-1}) were introduced to **M1** ($\Phi = 250 \mu\text{m}$) by syringe pumps. The resulting solution was passed through **R1** ($\Phi = 1000 \mu\text{m}$, $L = 100 \text{ cm}$) and was mixed with a solution of benzoyl chloride (0.075 M in

CH₂Cl₂) (flow rate: 8.0 mL min⁻¹) in **M2** (\emptyset =250 μ m). The resulting solution was passed through **R2** (\emptyset =1000 μ m, L=50 cm). After a steady state was reached, the product solution was collected for 90 sec and immediately quenched with a sat. NH₄Cl aqueous solution, extracted with EtOAc (3 x 20 mL) and purified by flash column chromatography on silica gel.



Compound (3a). The general procedure was used employing 1-bromo-4-methoxybenzene and benzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (10:1) provided pure **3a** (0.084 g, 0.40 mmol, 66 %) as a pale yellow solid. R_f 0.47 (hexane/ethyl acetate = 3:1); ¹H NMR (300 MHz, CDCl₃) δ 7.82 (d, J = 8.8 Hz, 2H), 7.77-7.72 (m, 2H), 7.59-7.51 (m, 1H), 7.50-7.42 (m, 2H), 6.95 (d, J = 8.8 Hz, 2H), 3.87 (s, 3H); ¹³C NMR (75 MHz, CDCl₃) δ 195.4, 163.1, 138.2, 132.5, 131.8, 130.0, 129.6, 128.1, 113.5, 55.4. Data is consistent with that reported in the literature.¹ **4a** (0.012 g, 0.04 mmol, 13 %) as a colorless solid. R_f 0.35 (hexane/ethyl acetate = 3:1); ¹H NMR (300 MHz, CDCl₃) δ 7.30-7.22 (m, 5H), 7.15 (d, J = 9.0 Hz, 4H), 6.80 (d, J = 8.9 Hz, 4H), 3.75 (s, 6H), 2.88 (br, 1H); ¹³C NMR (75 MHz, CDCl₃) δ 158.6, 147.4, 139.5, 129.2, 127.9, 127.8, 127.1, 113.2, 81.5, 55.3. Data is consistent with that reported in the literature.²

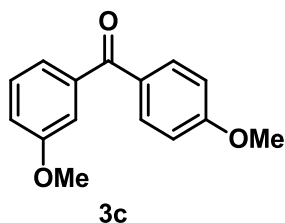


Compound (3b). The general procedure was used employing 1-bromo-4-methoxybenzene and 4-methoxybenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (10:1) provided pure **3b** (0.092 g, 0.38 mmol, 63 %) as a pale yellow solid. R_f 0.38 (hexane/ethyl acetate = 3:1); ¹H NMR (300 MHz, CDCl₃) δ 7.78 (d, J = 8.9 Hz, 4H), 6.95 (d,

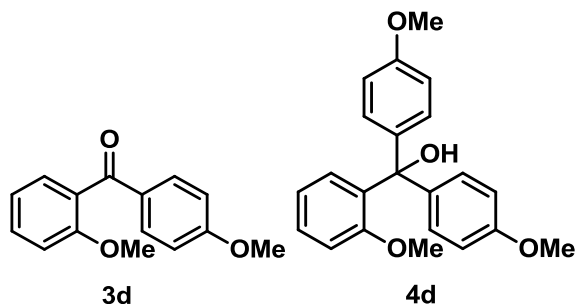
¹ Y. -X. Liao and Q. -S. Hu, *J. Org. Chem.*, 2010, **75**, 6986.

² M. Horn and H. Mayr, *Chem. Eur. J.*, 2010, **16**, 7469.

$J = 8.8$ Hz, 4H), 3.87 (s, 6H); ^{13}C NMR (75 MHz, CDCl_3) δ 194.3, 162.7, 132.1, 130.6, 113.4, 55.4. Data is consistent with that reported in the literature.¹ **4b** (0.010 g, 0.03 mmol, 9 %) as a colorless solid. R_f 0.36 (hexane/ethyl acetate = 3:1); ^1H NMR (300 MHz, CDCl_3) δ 7.15 (d, $J = 9.0$ Hz, 6H), 6.81 (d, $J = 9.0$ Hz, 6H), 3.77 (s, 9H), 2.78 (br, 1H); ^{13}C NMR (75 MHz, CDCl_3) δ 158.5, 139.7, 129.0, 113.1, 81.1, 55.2. Data is consistent with that reported in the literature.²

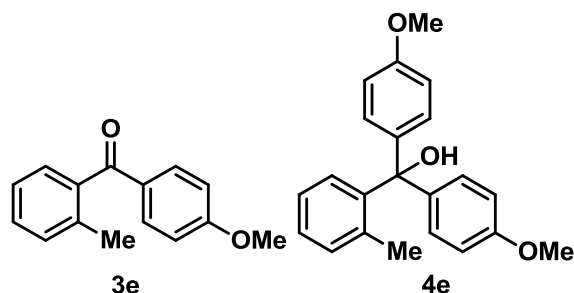


Compound (3c). The general procedure was used employing 1-bromo-4-methoxybenzene and 3-methoxybenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (15:1) provided pure **3c** (0.090 g, 0.37 mmol, 62 %) as a pale yellow solid. R_f 0.21 (hexane/ether = 5:1); ^1H NMR (300 MHz, CDCl_3) δ 7.84 (d, $J = 8.8$ Hz, 2H), 7.41-7.26 (m, 3H), 7.14-7.07 (m, 1H), 6.96 (d, $J = 8.8$ Hz, 2H), 3.89 (s, 3H), 3.86 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 195.3, 163.2, 159.4, 139.6, 132.5, 130.1, 129.1, 122.4, 118.2, 114.1, 113.5, 55.4, 55.39. Data is consistent with that reported in the literature.¹

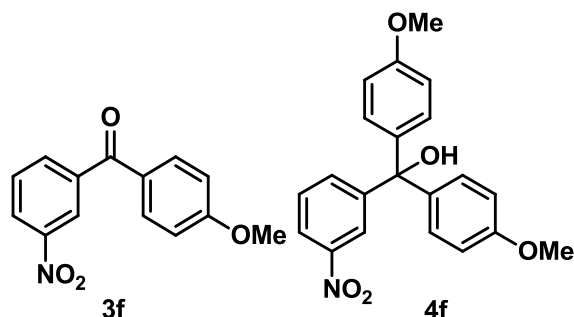


Compound (3d). The general procedure was used employing 1-bromo-4-methoxybenzene and 2-methoxy benzoylchloride. Flash chromatography on silica gel using hexane/ethyl acetate/toluene (20:1:1) provided pure **3d** (0.112 g, 0.46 mmol, 77 %) as a white solid. R_f 0.12 (hexane/ethyl acetate/toluene = 10:1:1); ^1H NMR (300 MHz, CDCl_3) δ 7.81 (d, $J = 8.7$ Hz, 2H), 7.45 (t, $J = 7.5$ Hz, 1H), 7.32 (dd, $J = 7.5$ and 1.8 Hz, 1H), 7.08-6.97 (m, 2H), 6.96 (d, $J = 6.9$ Hz, 2H), 3.87 (s, 3H), 3.75 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 195.1, 163.5, 157.0, 132.3, 131.4, 130.6, 129.2, 129.17, 120.4, 113.4, 111.3, 55.6, 55.4. Data is consistent with that reported in the literature.¹ **4d** (trace) as a pale yellow oil. R_f 0.19 (hexane/ethyl acetate/toluene = 10:1:1); IR (neat) 3522, 2954, 2836, 1608, 1583, 1507, 1463, 1246, 1172, 1026, 829, 756, 590 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.31-7.24 (m, 1H), 7.13 (d, $J = 8.9$ Hz, 4H), 6.97-6.93 (m, 1H), 6.86-6.78 (m, 5H), 6.53 (dd, $J = 7.7$ and 1.7 Hz, 1H), 5.26 (br, 1H), 3.80 (s, 6H), 3.68 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 158.4, 157.3, 139.2, 135.6, 130.2, 128.9, 128.8, 120.4, 112.9, 112.0, 81.5, 55.7, 55.2; HRMS-FAB: m/z 350.1512 [M^+ ; calcd. for $\text{C}_{22}\text{H}_{22}\text{O}_4$ $^+$:

350.1513].



Compound (3e). The general procedure was used employing 1-bromo-4-methoxybenzene and 2-methylbenzoyl chloride. Flash chromatography on silica gel using hexane/dichloromethane (2:1) provided pure **3e** (0.100 g, 0.44 mmol, 74 %) as a colorless oil. R_f 0.28 (hexane/dichloromethane = 1:1); $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 7.79 (d, $J = 8.9$ Hz, 2H), 7.40-7.33 (m, 1H), 7.31-7.21 (m, 3H), 6.92 (d, $J = 8.9$ Hz, 2H), 3.86 (s, 3H), 2.30 (s, 3H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3) δ 197.3, 163.6, 139.1, 136.1, 132.4, 130.7, 130.4, 129.7, 127.8, 125.1, 113.6, 55.4, 19.7. Data is consistent with that reported in the literature.³ **4e** (0.010 g, 0.03 mmol, 10 %) as a pale yellow solid. R_f 0.11 (hexane/dichloromethane = 1:1); $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 7.22-7.07 (m, 6H), 7.05-6.98 (m, 1H), 6.82 (d, $J = 8.9$ Hz, 4H), 6.76 (d, $J = 7.7$ Hz, 1H), 3.78 (s, 6H), 2.93 (br, 1H), 2.14 (s, 3H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3) δ 158.4, 144.9, 139.2, 137.9, 132.4, 129.3, 128.8, 127.6, 124.8, 113.1, 82.5, 55.2, 22.1. Data is consistent with that reported in the literature.⁴

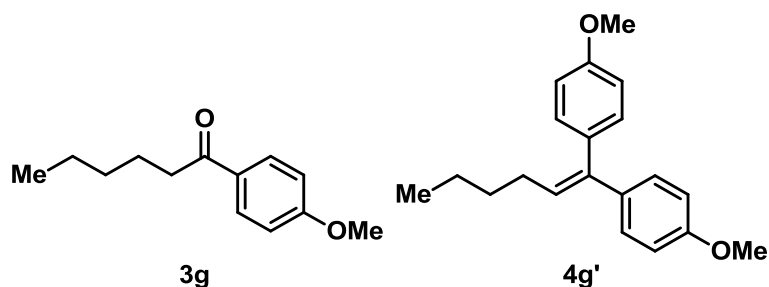


Compound (3f). The general procedure was used employing 1-bromo-4-methoxybenzene and 3-nitrobenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (10:1) provided pure **3f** (0.065 g, 0.25 mmol, 42 %) as a pale yellow solid. m.p. 58-60 °C; R_f 0.59 (hexane/ethyl acetate = 3:1); IR (neat) 2924, 2849, 1597, 1472, 1346, 1260, 1181, 1025, 956, 918, 850, 728, 668 cm^{-1} ; $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 8.58 (t, $J = 1.8$ Hz, 1H), 8.41 (ddd, J

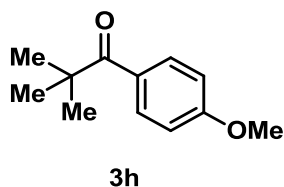
³ H. Xu, K. Ekoue-Kovi and C. Wolf, *J. Org. Chem.*, 2008, **73**, 7638.

⁴ G. Dyker, M. Hagel, O. Muth and C. Schirmacher, *Eur. J. Org. Chem.*, 2006, 2134.

= 8.2, 2.4 and 1.0 Hz, 1H), 8.10 (dt, $J = 7.6$ and 1.2 Hz, 1H), 7.82 (d, $J = 9.0$ Hz, 2H), 7.70 (t, $J = 8.0$ Hz, 1H), 7.01 (d, $J = 9.0$ Hz, 2H), 3.92 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 192.8, 163.9, 148.0, 139.8, 135.2, 132.6, 129.5, 128.8, 126.2, 124.4, 114.0, 55.6; HRMS-FAB: m/z 257.0683 [M^+ ; calcd. for $\text{C}_{14}\text{H}_{11}\text{O}_4\text{N}^+$: 257.0683]. **4f** (0.043 g, 0.12 mmol, 39 %) as a pale yellow solid. m.p. 75-76 °C; R_f 0.48 (hexane/ethyl acetate = 3:1); IR (neat) 3451, 2956, 2837, 1608, 1511, 1464, 1350, 1252, 1178, 1034, 828, 734 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 8.30-8.24 (m, 1H), 8.11 (d, $J = 8.0$ Hz, 1H), 7.66 (d, $J = 7.8$ Hz, 1H), 7.46 (t, $J = 8.0$ Hz, 1H), 7.15 (d, $J = 8.8$ Hz, 4H), 6.85 (d, $J = 8.7$ Hz, 4H), 3.80 (s, 6H), 2.85 (br, 1H); ^{13}C NMR (75 MHz, CDCl_3) δ 159.1, 149.5, 148.0, 138.2, 133.8, 129.0, 128.7, 122.5, 122.1, 113.6, 81.0, 55.3; HRMS-FAB: m/z 365.1258 [M^+ ; calcd. for $\text{C}_{21}\text{H}_{19}\text{O}_5\text{N}^+$: 365.1258].

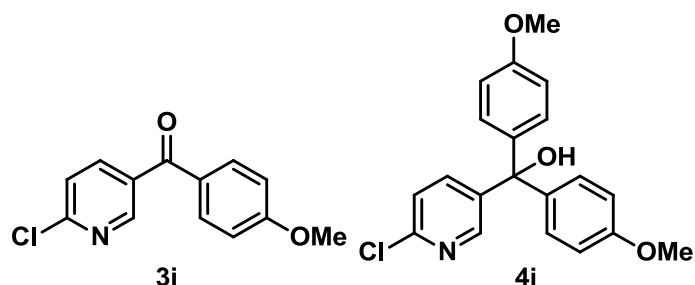


Compound (3g). The general procedure was used employing 1-bromo-4-methoxybenzene and hexanoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (30:1) provided pure **3g** (0.068 g, 0.33 mmol, 55 %) as a pale yellow oil. R_f 0.38 (hexane/ethyl acetate = 30:1); ^1H NMR (300 MHz, CDCl_3) δ 7.94 (d, $J = 9.0$ Hz, 2H), 6.93 (d, $J = 8.8$ Hz, 2H), 3.86 (s, 3H), 2.90 (t, $J = 7.3$ Hz, 2H), 1.79-1.65 (m, 2H), 1.41-1.29 (m, 4H), 0.95-0.86 (m, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 199.1, 163.2, 130.2, 130.1, 113.6, 55.4, 38.2, 31.5, 24.2, 22.5, 13.9. Data is consistent with that reported in the literature.¹ **4g'** (0.014 g, 0.05 mmol, 16 %) as a pale yellow oil. R_f 0.20 (hexane/ethyl acetate = 30:1); IR (neat) 2956, 2929, 1606, 1513, 1285, 1245, 1173, 1107, 1037, 830, 588 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.14 (d, $J = 8.8$ Hz, 2H), 7.09 (d, $J = 8.6$ Hz, 2H), 6.89 (d, $J = 8.6$ Hz, 2H), 6.79 (d, $J = 8.8$ Hz, 2H), 5.93 (t, $J = 7.4$ Hz, 1H), 3.84 (s, 3H), 3.79 (s, 3H), 2.15-2.05 (m, 2H), 1.44-1.24 (m, 4H), 0.86 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 158.5, 158.3, 140.3, 136.1, 132.9, 131.0, 128.4, 128.3, 113.4, 113.37, 55.3, 55.2, 32.3, 29.5, 22.4, 14.0; HRMS-FAB: m/z 296.1771 [M^+ ; calcd. for $\text{C}_{20}\text{H}_{24}\text{O}_2^+$: 296.1771].

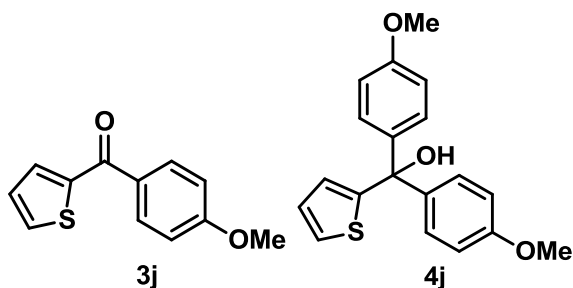


Compound (3h). The general procedure was used employing 1-bromo-4-methoxybenzene and pivaloyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **3h** (0.082 g, 0.43 mmol, 71 %) as a pale yellow oil. R_f 0.37 (hexane/ethyl acetate

= 20:1); ^1H NMR (300 MHz, CDCl_3) δ 7.85 (d, $J = 9.0$ Hz, 2H), 6.90 (d, $J = 9.0$ Hz, 2H), 3.85 (s, 3H), 1.37 (s, 9H); ^{13}C NMR (75 MHz, CDCl_3) δ 206.3, 162.0, 130.9, 130.1, 113.2, 55.3, 43.8, 28.4. Data is consistent with that reported in the literature.⁵



Compound (3i). The general procedure was used employing 1-bromo-4-methoxybenzene and 6-chloronicotinoyl chloride. Flash chromatography on silica gel using hexane/ether (10:1) provided pure **3i** (0.067 g, 0.27 mmol, 45 %) as a pale yellow solid. R_f 0.28 (hexane/ether = 3:1); ^1H NMR (300 MHz, CDCl_3) δ 8.75-8.72 (m, 1H), 8.04 (dd, $J = 8.2$ and 2.5 Hz, 1H), 7.81 (d, $J = 8.8$ Hz, 2H), 7.47 (dd, $J = 8.3$ and 0.5 Hz, 1H), 7.00 (d, $J = 8.9$ Hz, 2H), 3.91 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 192.1, 163.9, 154.4, 150.7, 139.6, 132.6, 132.4, 129.1, 124.2, 114.0, 55.6. Data is consistent with that reported in the literature.⁶ **4i** (0.043 g, 0.12 mmol, 40 %) as a pale yellow oil. R_f 0.10 (hexane/ether = 3:1); IR (neat) 3272, 2957, 2837, 1608, 1581, 1511, 1461, 1252, 1176, 1105, 1034, 829, 740, 590 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 8.28 (dd, $J = 2.6$ and 0.6 Hz, 1H), 7.62 (dd, $J = 8.4$ and 2.7 Hz, 1H), 7.26-7.22 (m, 1H), 7.13 (d, $J = 8.9$ Hz, 4H), 6.84 (d, $J = 9.0$, 4H), 3.80 (s, 6H), 2.93 (br, 1H); ^{13}C NMR (75 MHz, CDCl_3) δ 159.0, 150.0, 149.1, 141.8, 138.3, 138.0, 128.9, 123.3, 113.5, 79.8, 55.3; HRMS-FAB: m/z 355.0968 [M^+ ; calcd for $\text{C}_{20}\text{H}_{18}\text{O}_3\text{N}^{35}\text{Cl}^+$: 355.0970].

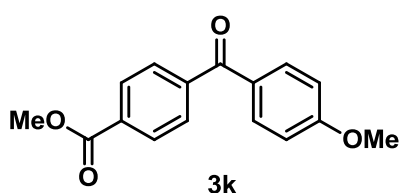


Compound (3j). The general procedure was used employing 1-bromo-4-methoxybenzene and thiophene-2-carbonyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate

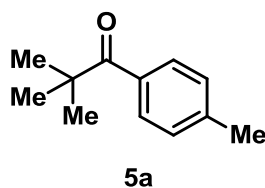
⁵ T. Fujihara, K. Semba, J. Terao and Y. Tsuji, *Angew. Chem. Int. Ed.*, 2010, **49**, 1472.

⁶ C. Duplais, F. Bures, I. Sapountzis, T. J. Korn, G. Cahiez and P. Knochel, *Angew. Chem. Int. Ed.*, 2004, **43**, 2968.

(20:1) provided pure **3j** (0.072 g, 0.33 mmol, 55 %) as a white solid. R_f 0.46 (hexane/ethyl acetate = 10:1); $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 7.90 (d, $J = 8.8$ Hz, 2H), 7.69 (dd, $J = 4.9$ and 0.7 Hz, 1H), 7.64 (dd, $J = 3.7$ and 0.8 Hz, 1H), 7.15 (dd, $J = 4.8$ and 3.6 Hz, 1H), 6.98 (d, $J = 8.8$ Hz, 2H), 3.88 (s, 3H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3) δ 187.0, 163.1, 143.6, 134.1, 133.5, 131.6, 130.5, 127.8, 113.6, 55.4. Data is consistent with that reported in the literature.⁷ **4j** (0.013 g, 0.04 mmol, 13 %) as a red oil. R_f 0.23 (hexane/ethyl acetate = 10:1); IR (neat) 3471, 3001, 2955, 2836, 1608, 1584, 1509, 1463, 1302, 1250, 1176, 1033, 830, 705, 606, 577 cm^{-1} ; $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 7.30-7.23 (m, 5H), 6.96-6.91 (m, 1H), 6.83 (d, $J = 8.9$ Hz, 4H), 6.70 (dd, $J = 3.6$ and 1.2 Hz, 1H), 3.80 (s, 6H), 2.88 (br, 1H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3) δ 158.9, 152.9, 139.1, 128.5, 126.5, 126.4, 125.4, 113.1, 79.5, 55.2; HRMS-FAB: m/z 326.0971 [M^+ ; calcd. for $\text{C}_{19}\text{H}_{18}\text{O}_3^{32}\text{S}^+$: 326.0971].



Compound (3k). The general procedure was used employing 1-bromo-4-methoxybenzene and methyl 4-(chlorocarbonyl)benzoate. Flash chromatography on silica gel using hexane/ethyl acetate (10:1) provided pure **3k** (0.071 g, 0.26 mmol, 44 %) as a pale yellow solid. R_f 0.50 (hexane/ethyl acetate = 3:1); $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 8.14 (d, $J = 8.3$ Hz, 2H), 7.87-7.75 (m, 4H), 6.97 (d, $J = 8.7$ Hz, 2H), 3.96 (s, 3H), 3.90 (s, 3H); $^{13}\text{C NMR}$ (75 MHz, CDCl_3) δ 194.8, 166.4, 163.6, 142.1, 132.7, 132.6, 129.5, 129.4 (2), 113.7, 55.5, 52.4. Data is consistent with that reported in the literature.⁸

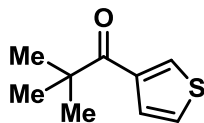


Compound (5a). The general procedure was used employing 1-bromo-4-methylbenzene and pivaloyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **5a** (0.069 g, 0.39 mmol, 65 %) as a pale yellow oil. R_f 0.25 (hexane/ethyl acetate = 30:1); $^1\text{H NMR}$ (300 MHz, CDCl_3) δ 7.66 (d, $J = 6.6$ Hz, 2H), 7.20 (d, $J = 8.1$, 2H), 2.38 (s,

⁷ Z. Zhang, M. G. Lindale and L. S. Liebeskind, *J. Am. Chem. Soc.*, 2011, **133**, 6403.

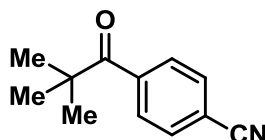
⁸ W. S. Bechara, G. Pelletier and A. B. Charette, *Nat. Chem.*, 2012, **4**, 228.

3H), 1.35 (s, 9H); ^{13}C NMR (75 MHz, CDCl_3) δ 208.3, 141.4, 135.4, 128.7, 128.3, 44.0, 28.1, 21.4. Data is consistent with that reported in the literature.⁹



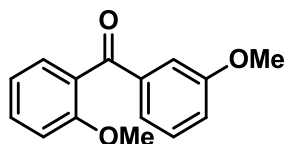
5b

Compound (5b). The general procedure was used employing 3-bromothiophene and pivaloyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **5b** (0.087 g, 0.53 mmol, 86 %) as a pale yellow oil. R_f 0.21 (hexane/ethyl acetate = 30:1); IR (neat) 2971, 1663, 1476, 1399, 1159, 981, 864, 748 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 8.02 (q, $J = 1.5$ Hz, 1H), 7.56 (dd, $J = 5.1$ and 1.2, 1H), 7.28 (dd, $J = 5.1$ and 3.0, 1H), 1.36 (s, 9H); ^{13}C NMR (75 MHz, CDCl_3) δ 201.0, 139.7, 131.3, 128.7, 125.0, 43.9, 27.8; HRMS-FAB: m/z 168.0603 [M^+ ; calcd. for $\text{C}_9\text{H}_{12}\text{O}^{32}\text{S}^+$: 168.0603].



5c

Compound (5c). The general procedure was used employing 4-bromobenzonitrile and pivaloyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (10:1) provided pure **5c** (0.056 g, 0.30 mmol, 50 %) as a pale yellow oil. R_f 0.40 (hexane/ethyl acetate = 3:1); IR (neat) 2973, 2232, 1681, 1478, 1401, 1276, 1193, 955, 847, 766 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.71 (s, 4H), 1.33 (s, 9H); ^{13}C NMR (75 MHz, CDCl_3) δ 208.4, 142.7, 132.0, 128.0, 118.1, 114.2, 44.4, 27.6; HRMS-FAB: m/z 187.0992 [M^+ ; calcd. for $\text{C}_{12}\text{H}_{13}\text{NO}^+$: 187.0992].

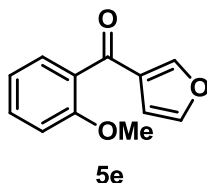


5d

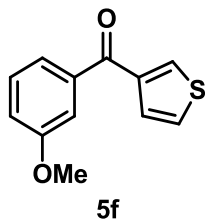
Compound (5d). The general procedure was used employing 1-bromo-3-methoxybenzene and 2-methoxybenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **5d** (0.105 g, 0.43 mmol, 72 %) as a pale yellow oil. R_f 0.30 (hexane/ethyl acetate = 20:1); IR (neat) 2941, 1734, 1653, 1489, 1245, 1109, 1023, 967, 830, 760, 637, 540 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.50-7.41 (m, 2H), 7.37-7.27 (m, 3H), 7.14-7.07 (m, 1H),

⁹ L. J. Gooßen, F. Rudolphi, C. Oppel and N. Rodríguez, *Angew. Chem. Int. Ed.*, 2008, **47**, 3043.

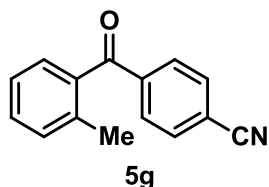
7.07-6.96 (m, 2H), 3.86 (s, 3H), 3.75 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 196.2, 159.6, 157.3, 139.1, 131.8, 129.4, 129.1, 128.8, 123.1, 120.4, 119.6, 113.4, 111.4, 55.6, 55.4; HRMS-FAB: m/z 242.0938 [M^+ ; calcd. for $\text{C}_{15}\text{H}_{14}\text{O}_3^+$: 242.0937].



Compound (5e). The general procedure was used employing 3-bromofuran and 2-methoxybenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **5e** (0.079 g, 0.39 mmol, 65 %) as a pale yellow oil. R_f 0.30 (hexane/ethyl acetate = 20:1); IR (neat) 3131, 2926, 2839, 1598, 1512, 1436, 1391, 1246, 1150, 1014, 828, 752, 599 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.75 (dd, $J = 1.4$ and 0.8 Hz, 1H), 7.48-7.41 (m, 2H), 7.41-7.37 (m, 1H), 7.03-6.97 (m, 2H), 6.85 (dd, $J = 1.9$ and 0.8 Hz, 1H), 3.80 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 189.4, 156.9, 149.7, 143.8, 131.9, 129.4, 129.0, 128.2, 120.2, 111.5, 109.3, 55.6; HRMS-FAB: m/z 202.0625 [M^+ ; calcd. for $\text{C}_{12}\text{H}_{10}\text{O}_3^+$: 202.0624].

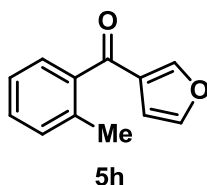


Compound (5f). The general procedure was used employing 3-bromothiophene and 3-methoxybenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **5f** (0.089 g, 0.41 mmol, 68 %) as a pale yellow solid. m.p. 68-70 $^\circ\text{C}$; R_f 0.16 (hexane/ethyl acetate = 30:1); IR (neat) 3106, 2938, 2836, 1727, 1658, 1596, 1485, 1389, 1411, 1275, 1180, 994, 875, 744 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.95 (dd, $J = 2.9$ and 1.2 Hz, 1H), 7.61 (dd, $J = 2.9$ and 1.2 Hz, 1H), 7.43-7.36 (m, 4H), 7.16-7.11 (m, 1H), 3.87 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 189.7, 159.6, 141.2, 139.9, 133.9, 129.3, 128.6, 126.1, 122.0, 118.6, 113.8, 55.4; HRMS-FAB: m/z 218.0396 [M^+ ; calcd. for $\text{C}_{12}\text{H}_{10}\text{O}_2^{32}\text{S}^+$: 218.0396].



Compound (5g). The general procedure was used employing 4-bromobenzonitrile and 2-methylbenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (30:1)

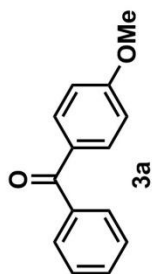
provided pure **5g** (0.074 g, 0.34 mmol, 56 %) as a white solid. m.p. 249-250 °C; R_f 0.16 (hexane/ethyl acetate = 30:1); IR (neat) 2964, 2231, 1667, 1295, 1265, 927, 857, 748, 665 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.88 (d, $J = 8.5$ Hz, 2H), 7.76 (d, $J = 8.5$ Hz, 2H), 7.48-7.41 (m, 1H), 7.36-7.27 (m, 3H), 2.36 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 196.8, 141.2, 137.5, 137.0, 132.3, 131.4, 131.2, 130.3, 129.0, 125.4, 118.0, 116.2, 20.2; HRMS-FAB: m/z 221.0833 [M^+ ; calcd. for $\text{C}_{15}\text{H}_{11}\text{ON}^+$: 221.0835].



Compound (5h). The general procedure was used employing 3-bromofuran and 2-methylbenzoyl chloride. Flash chromatography on silica gel using hexane/ethyl acetate (40:1) provided pure **5h** (0.084 g, 0.45 mmol, 75 %) as a pale yellow oil. R_f 0.29 (hexane/ethyl acetate = 30:1); IR (neat) 3132, 2928, 1650, 1557, 1511, 1455, 1386, 1316, 1188, 1151, 1014, 885, 742, 601 cm^{-1} ; ^1H NMR (300 MHz, CDCl_3) δ 7.70 (dd, $J = 1.4$ and 0.8 Hz, 1H), 7.48 (t, $J = 1.8$ Hz, 1H), 7.45-7.35 (m, 2H), 7.30-7.22 (m, 2H), 6.88 (dd, $J = 1.9$ and 0.7 Hz, 1H), 3.40 (s, 3H); ^{13}C NMR (75 MHz, CDCl_3) δ 191.7, 149.7, 144.2, 139.1, 136.6, 131.2, 130.4, 128.2, 127.9, 125.2, 109.4, 19.7; HRMS-FAB: m/z 186.0676 [M^+ ; calcd. for $\text{C}_{12}\text{H}_{10}\text{O}_2^+$: 186.0675].

Large scale synthesis of 2,2-dimethyl-1-(thiophen-3-yl)propan-1-one (**5b**) (5 mmol scale) using optimized continuous flow conditions

The general procedure was used employing 3-bromothiophene, pivaloyl chloride and *n*-BuLi. The product stream was collected for 12.5 min and immediately quenched with sat. NH_4Cl aqueous solution, extracted with EtOAc (3 x 100 mL), dried with MgSO_4 and concentrated. The crude product was purified by flash column chromatography on silica gel using hexane/ethyl acetate (40:1), yielding **5b** (0.715 g, 4.25 mmol, 85 %) as a pale yellow oil. R_f 0.21 (hexane/ethyl acetate = 30:1)

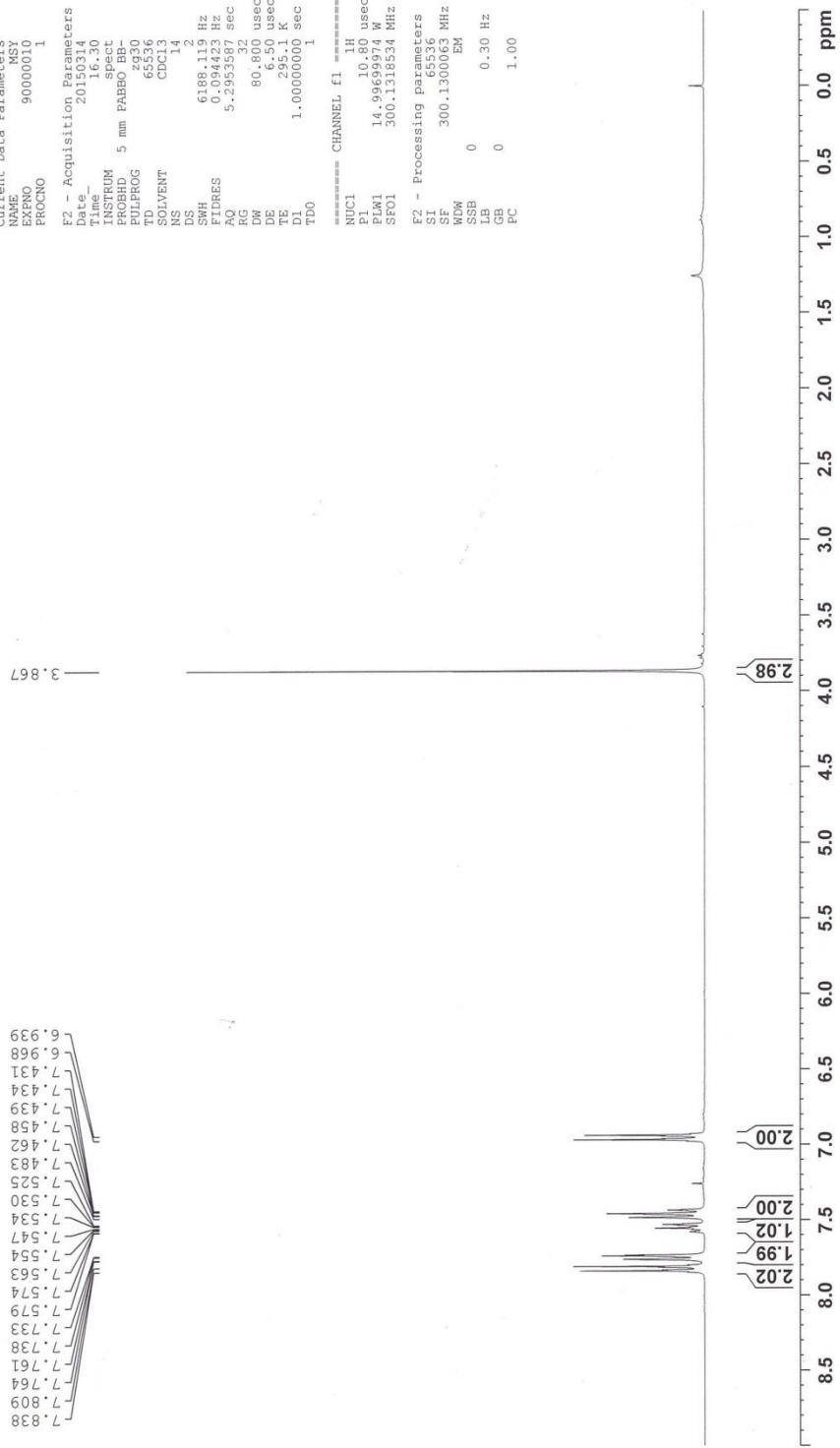


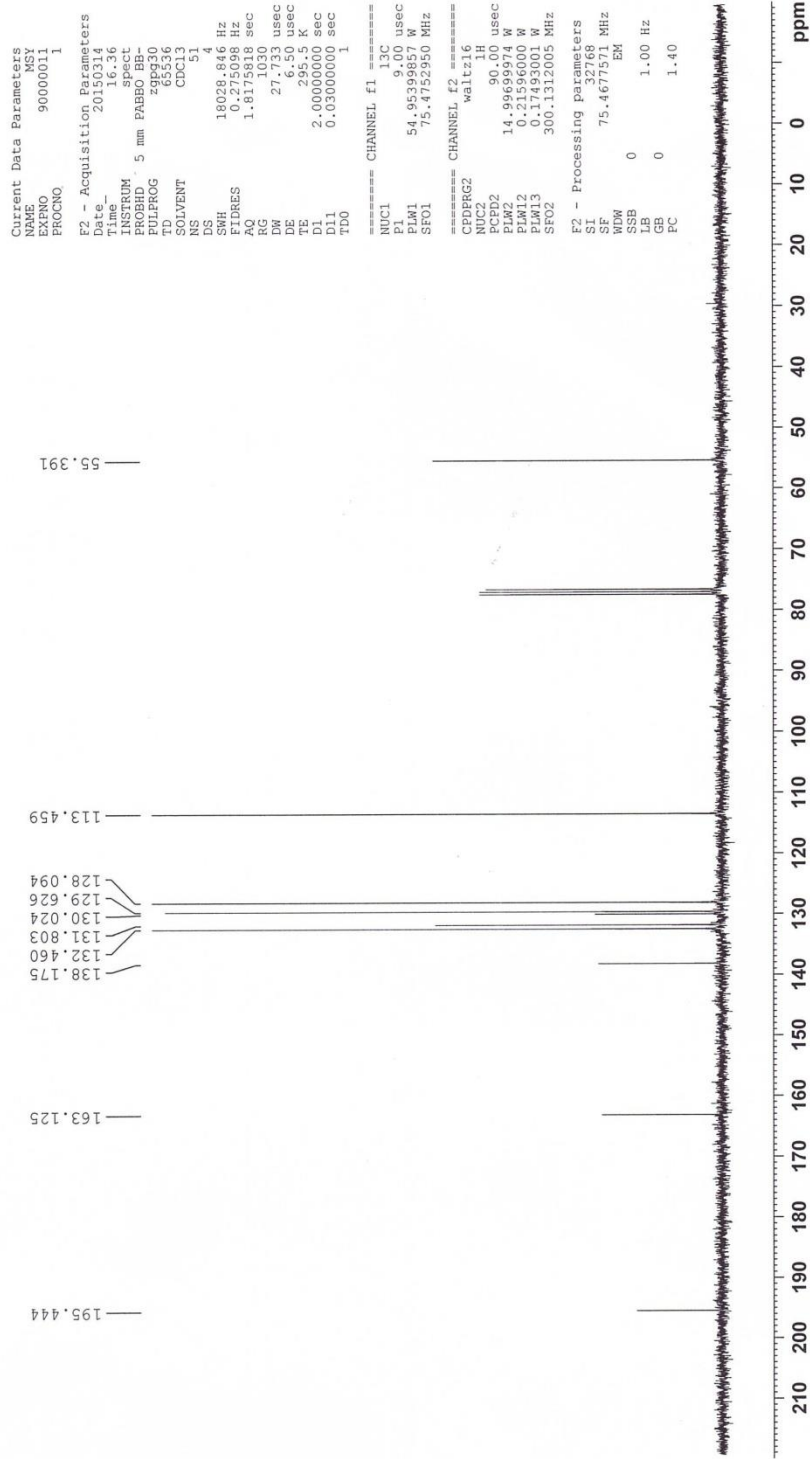
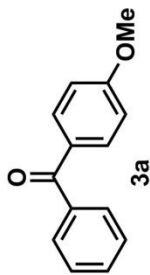
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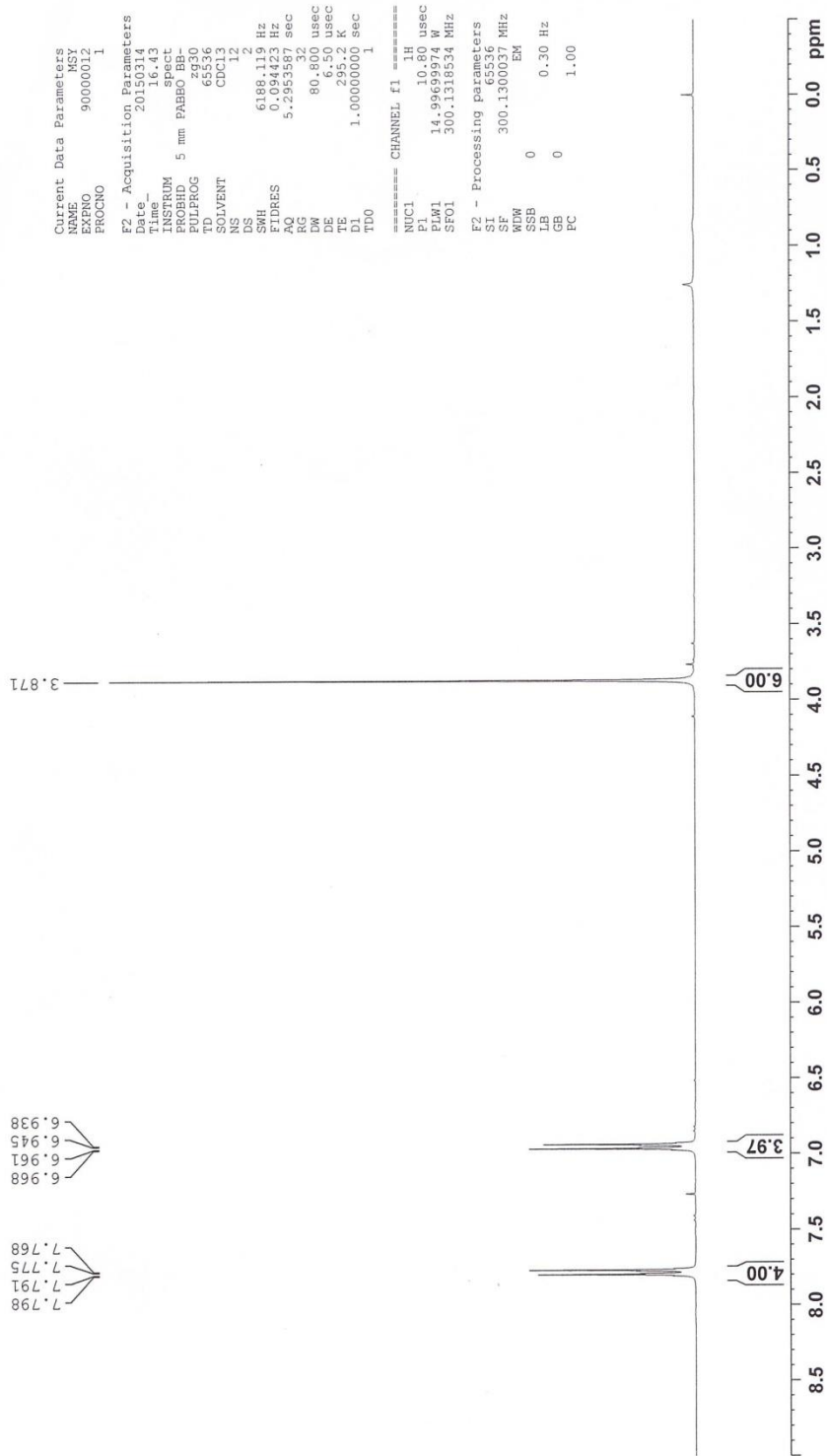
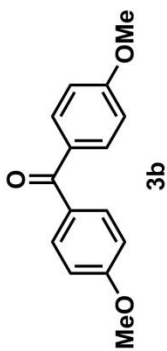
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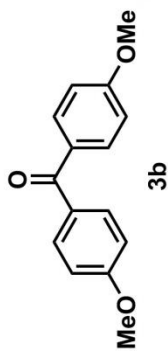
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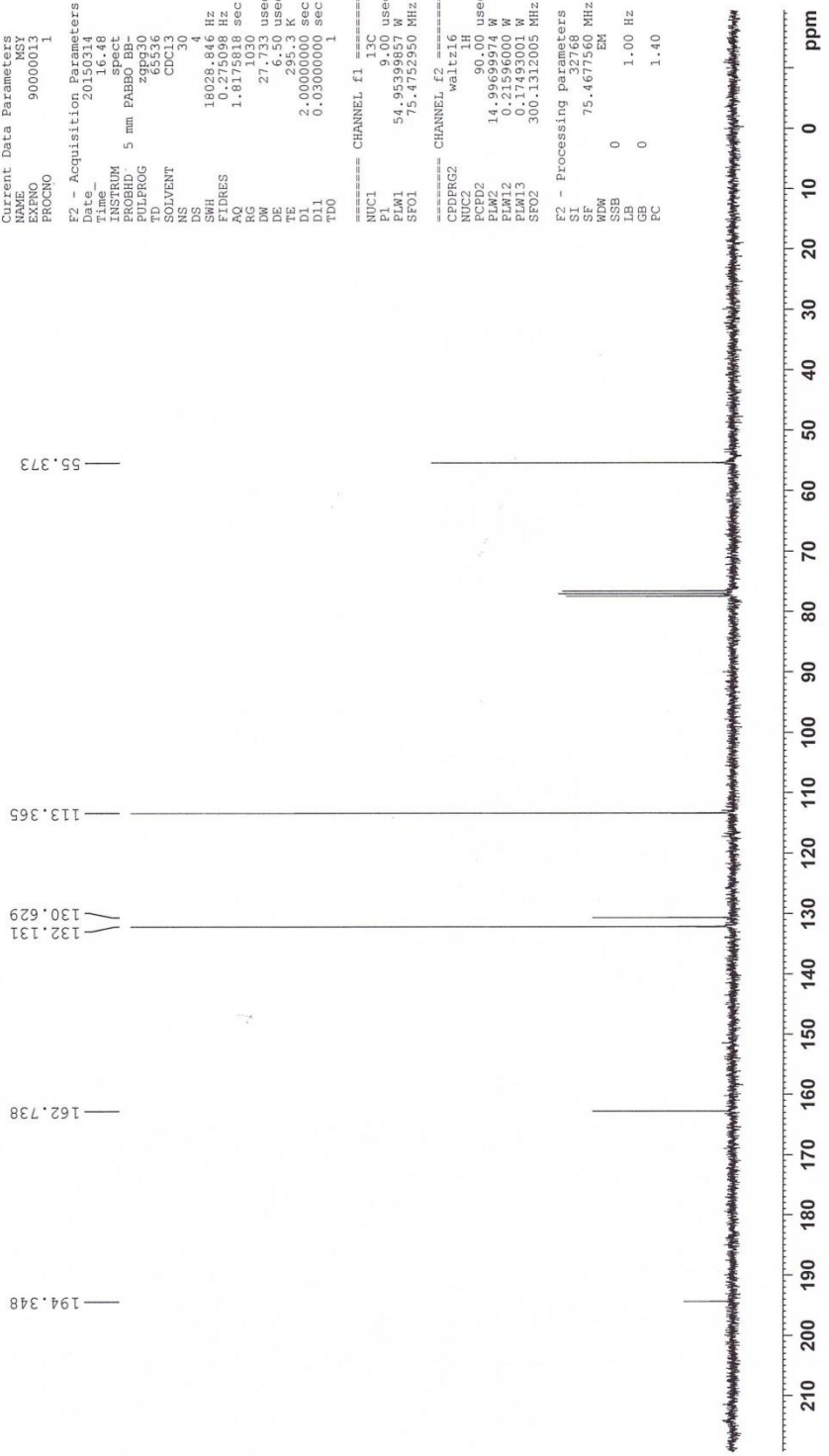


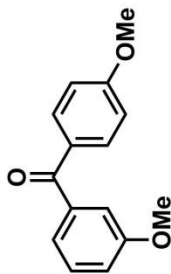




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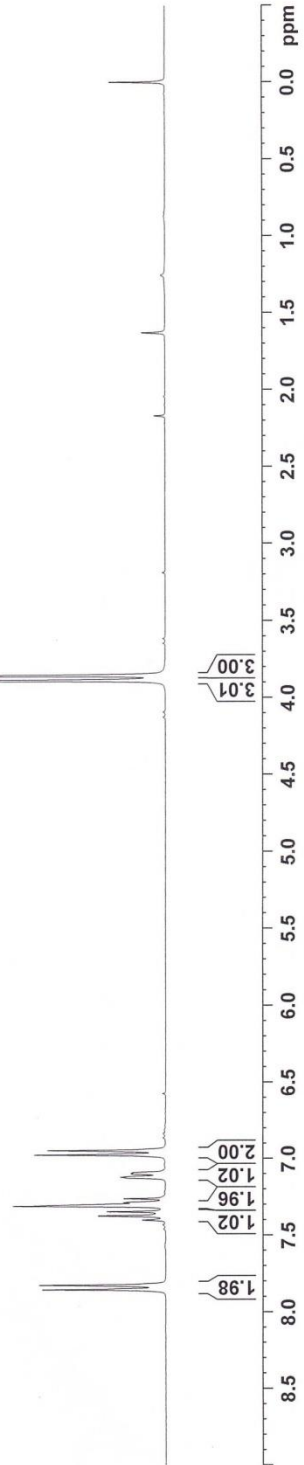
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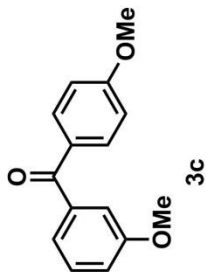
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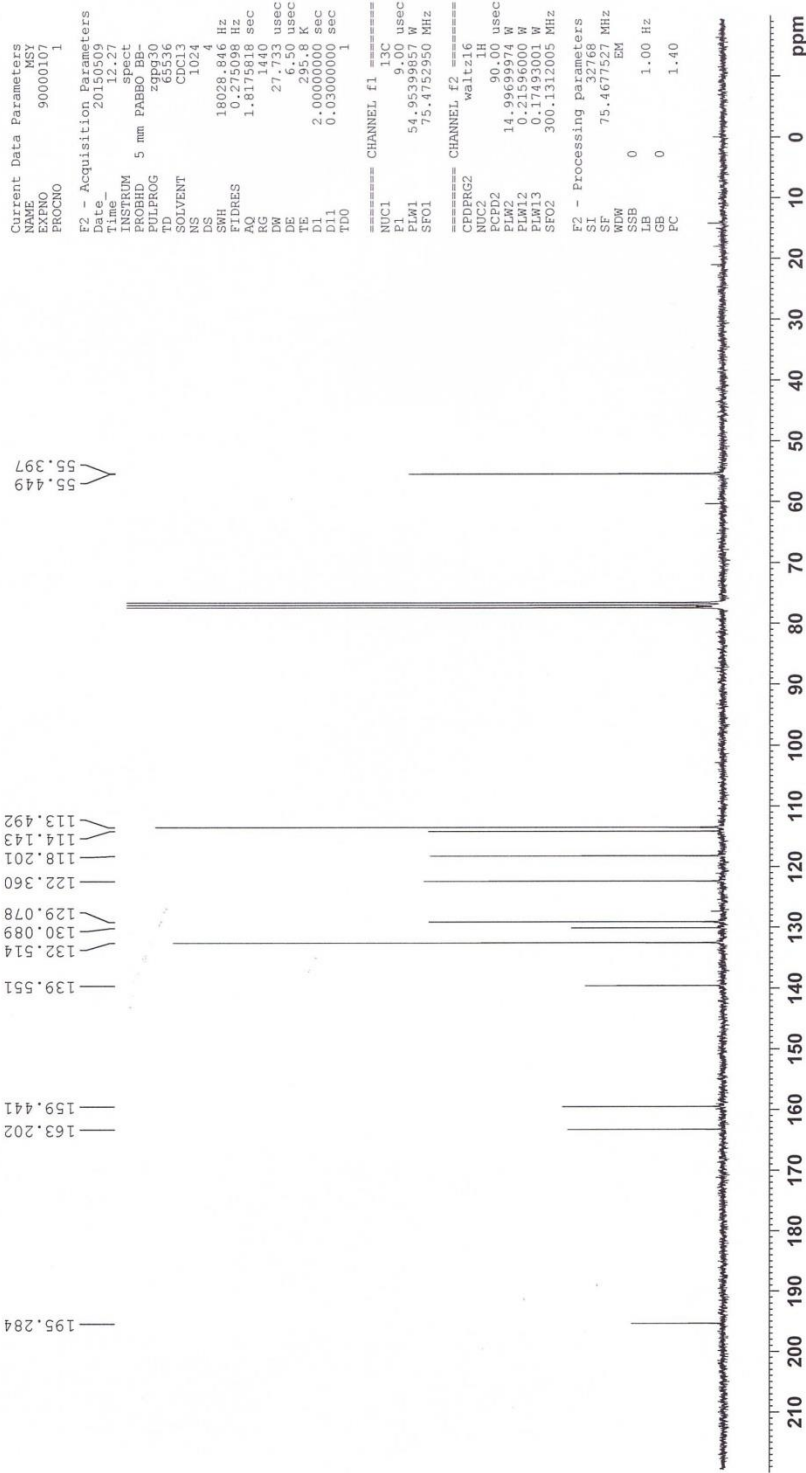
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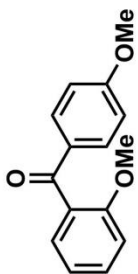
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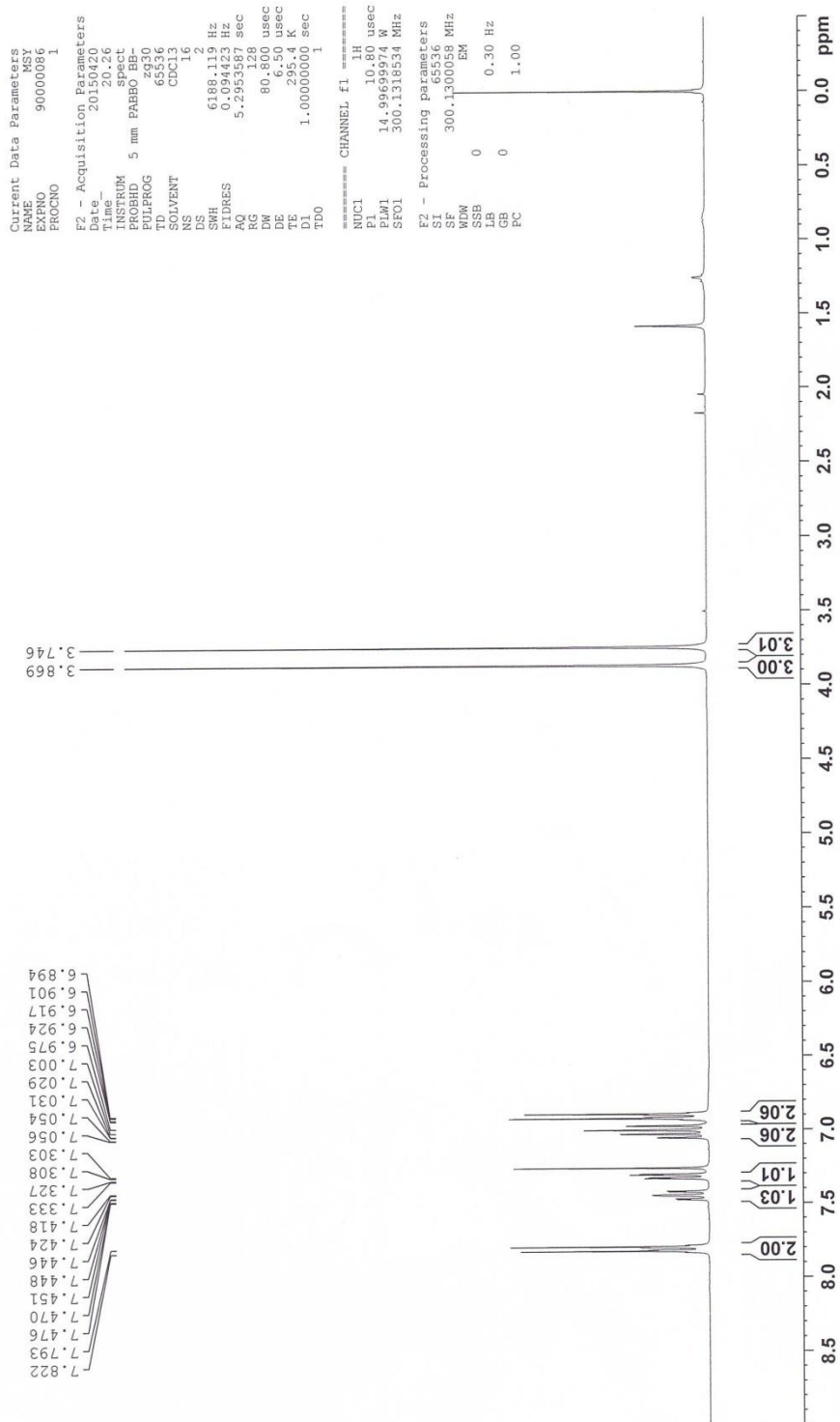
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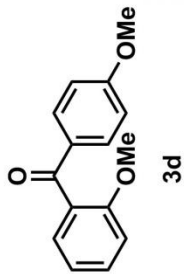
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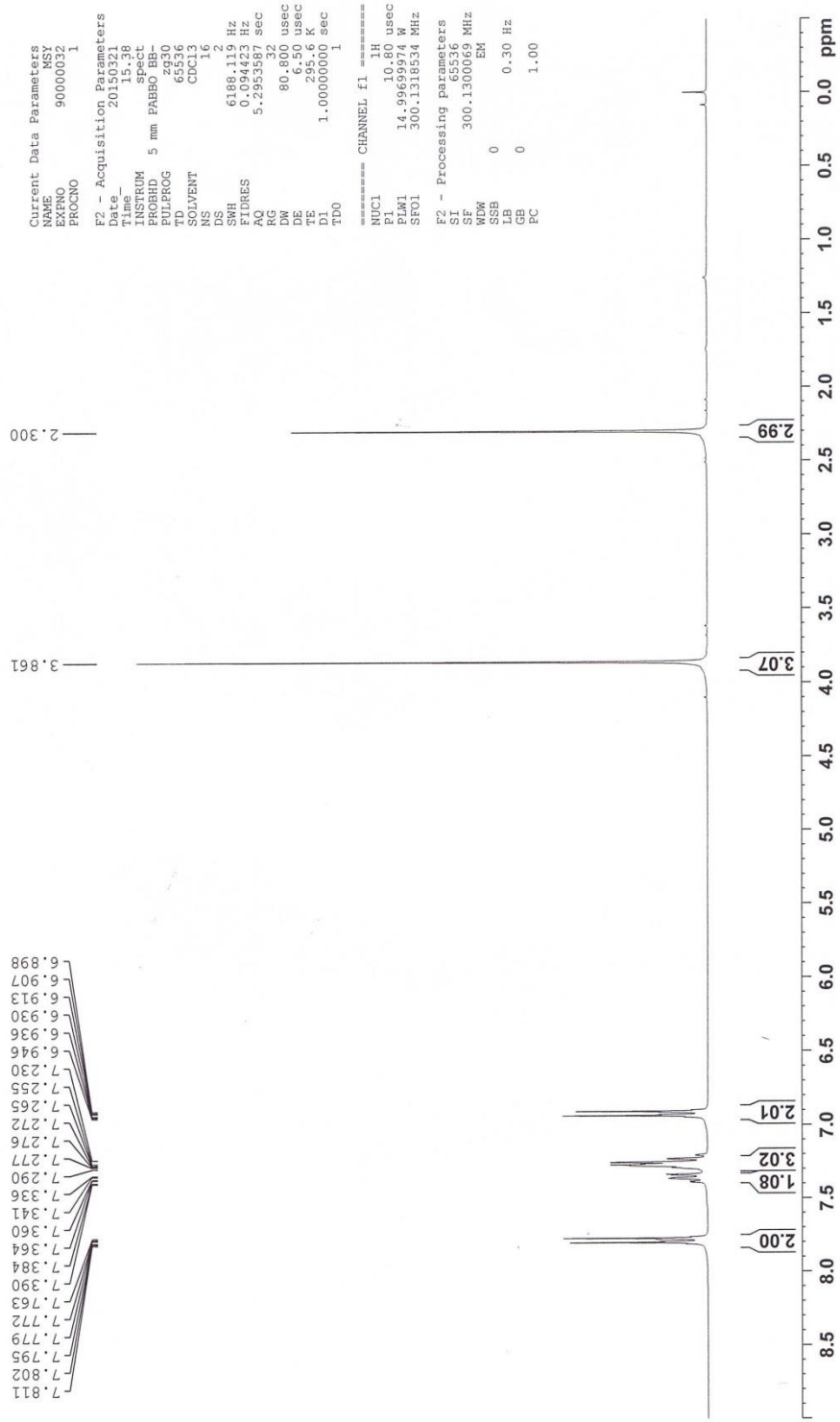
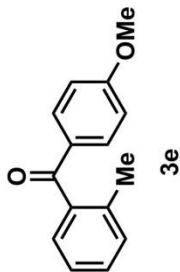


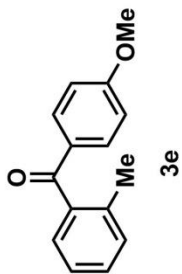


3d









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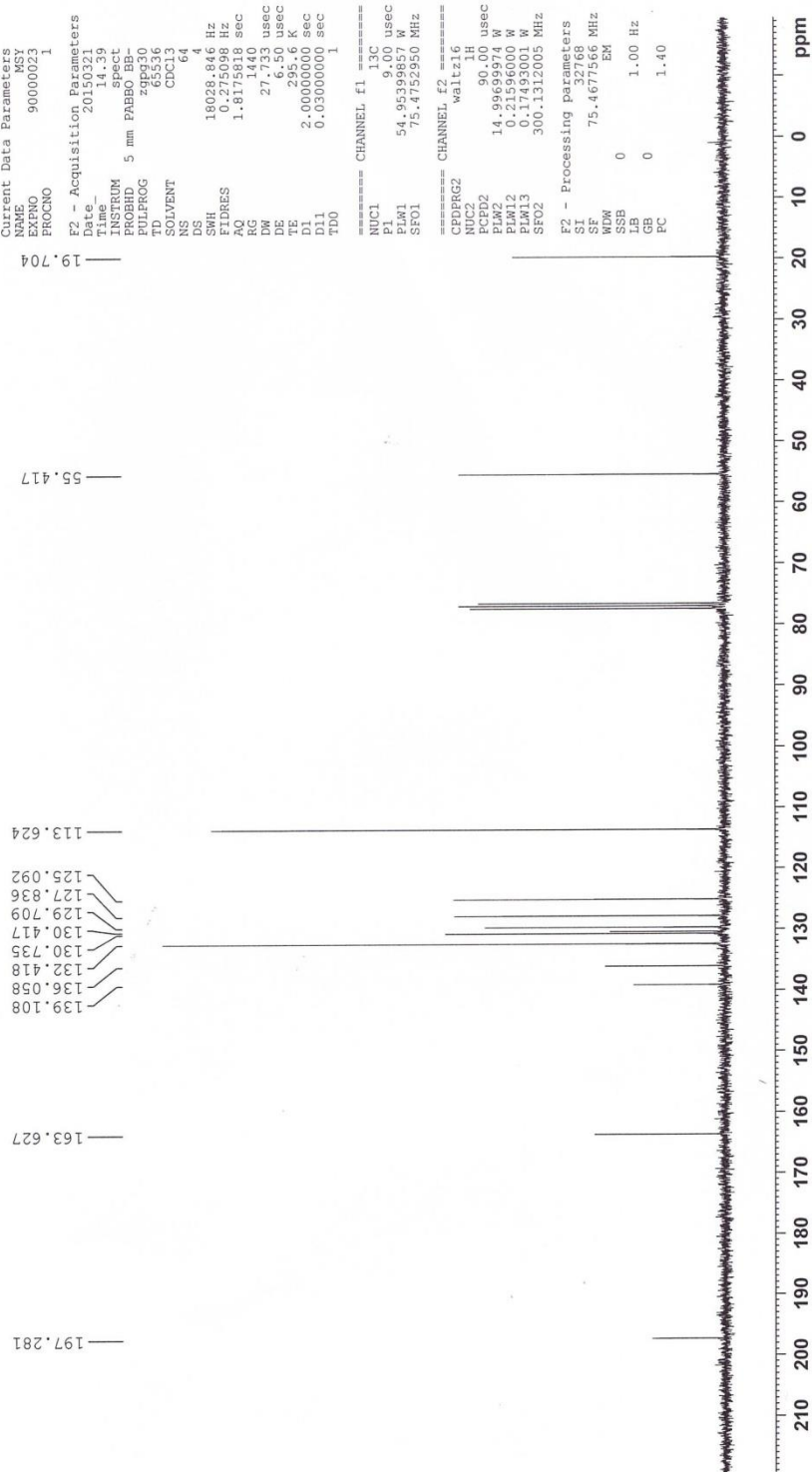
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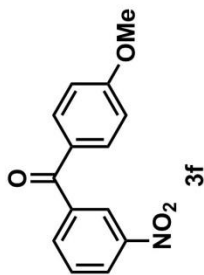
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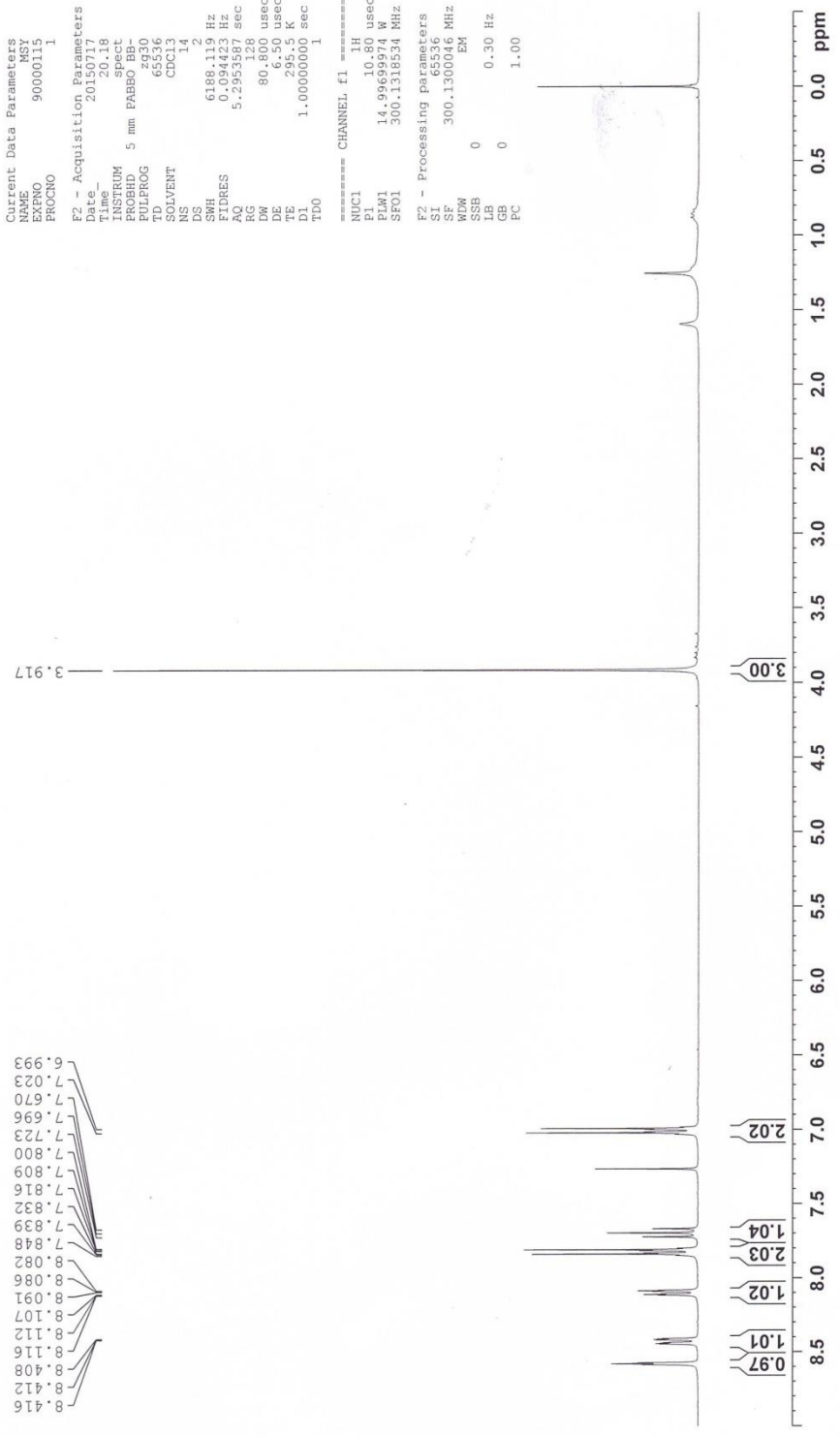
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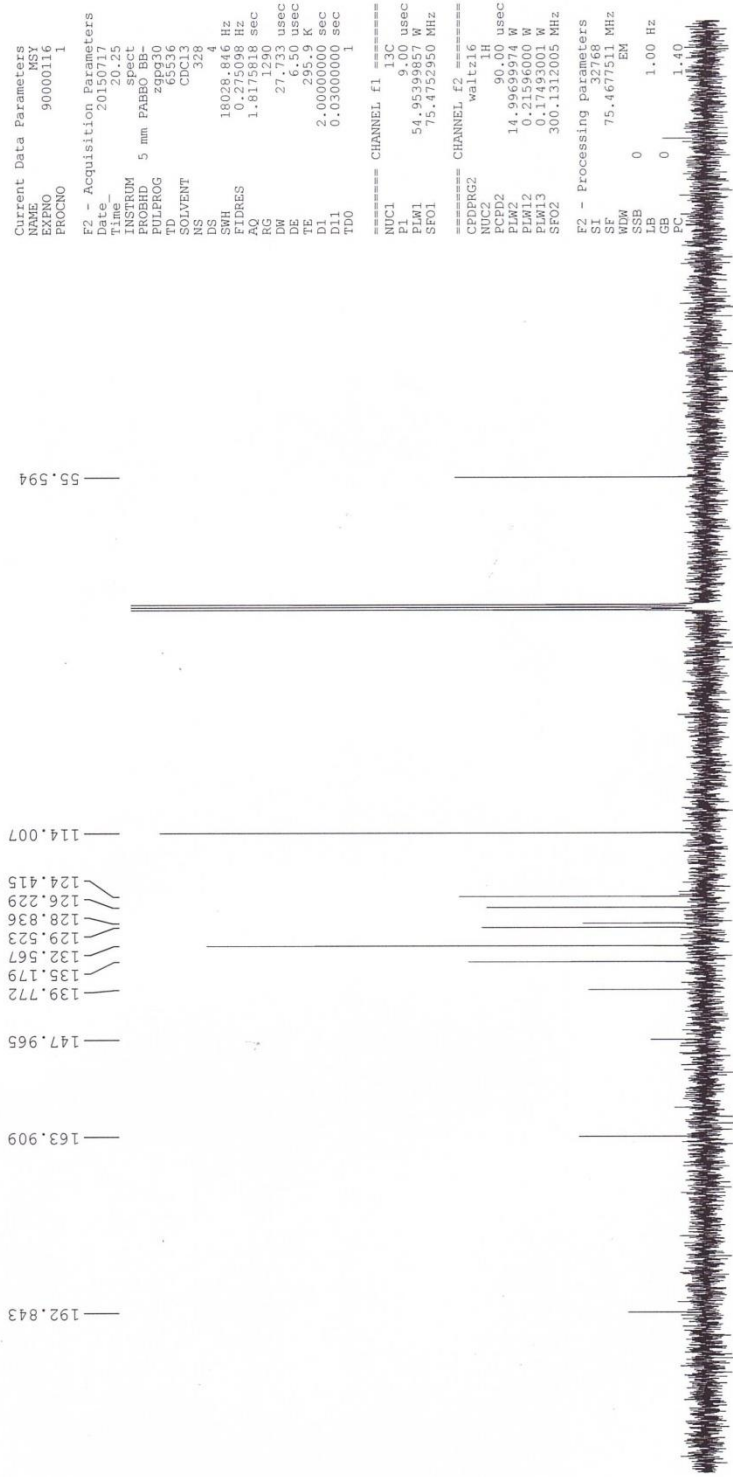
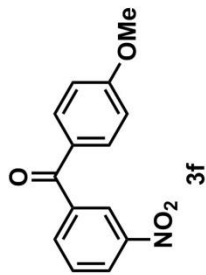


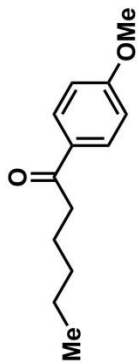


8.416
 8.412
 8.408
 8.116
 8.112
 8.107
 8.091
 8.086
 8.082
 7.848
 7.839
 7.832
 7.816
 7.809
 7.800
 7.723
 7.696
 7.670
 7.023
 6.993

Current Data Parameters
 NAME MSY
 EXPNO 90000115
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20150717
 Time_ 20.18
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 ID 6536
 SOLVENT CDCl3
 NS 14
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 128
 IN 80 usec
 DE 6.90 usec
 TE 295.5 K
 D1 1.00000000 sec
 TDO 1
 ===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PLW1 14.9969974 W
 SF01 300.1318534 MHz
 F2 - Processing parameters
 SI 6536
 SF 300.130000000 MHz
 SFO 300.130000000 MHz
 SSB 0
 LB 0 0.30 Hz
 GB 0
 PC 1.00







3g

7.957
7.928
6.941
6.911

3.860

2.927
2.902
2.877

1.749
1.725
1.701
1.375
1.363
1.351

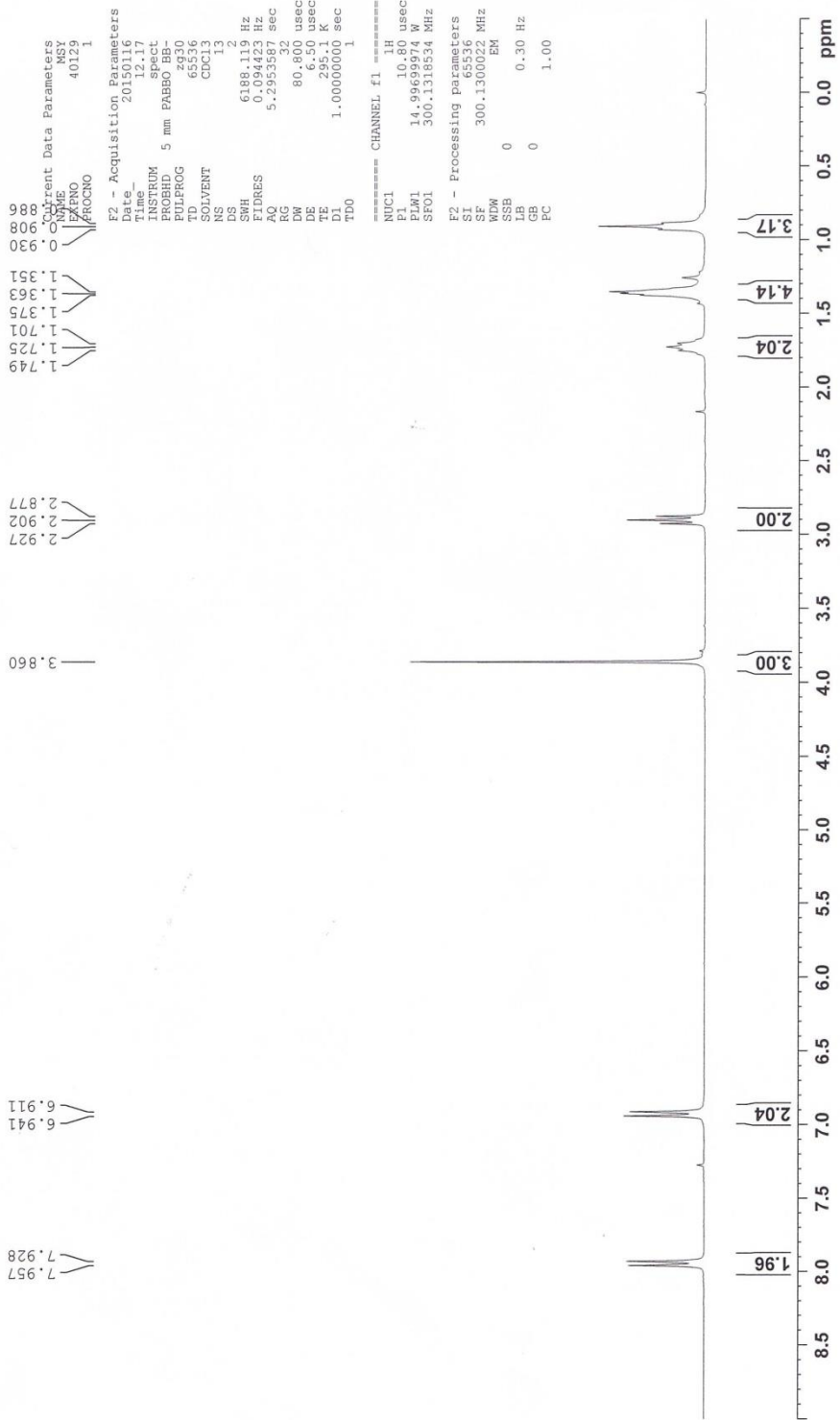
0.930
0.908
0.886

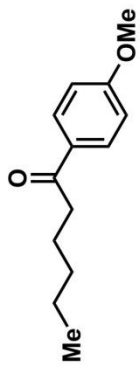
EXPNO 40129
PROCNO 1

F2 - Acquisition Parameters
Date_ 201210
Time 12.11
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
DS 12
SWH 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 32
DW 80.800 usec
DE 29.50 usec
TE 29.50 usec
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 10.00 usec
PL1 14.9960907 dB
SFO1 300.1318534 MHz

F2 - Processing parameters
SI 65536
SF 300.1300022 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00





3g

```

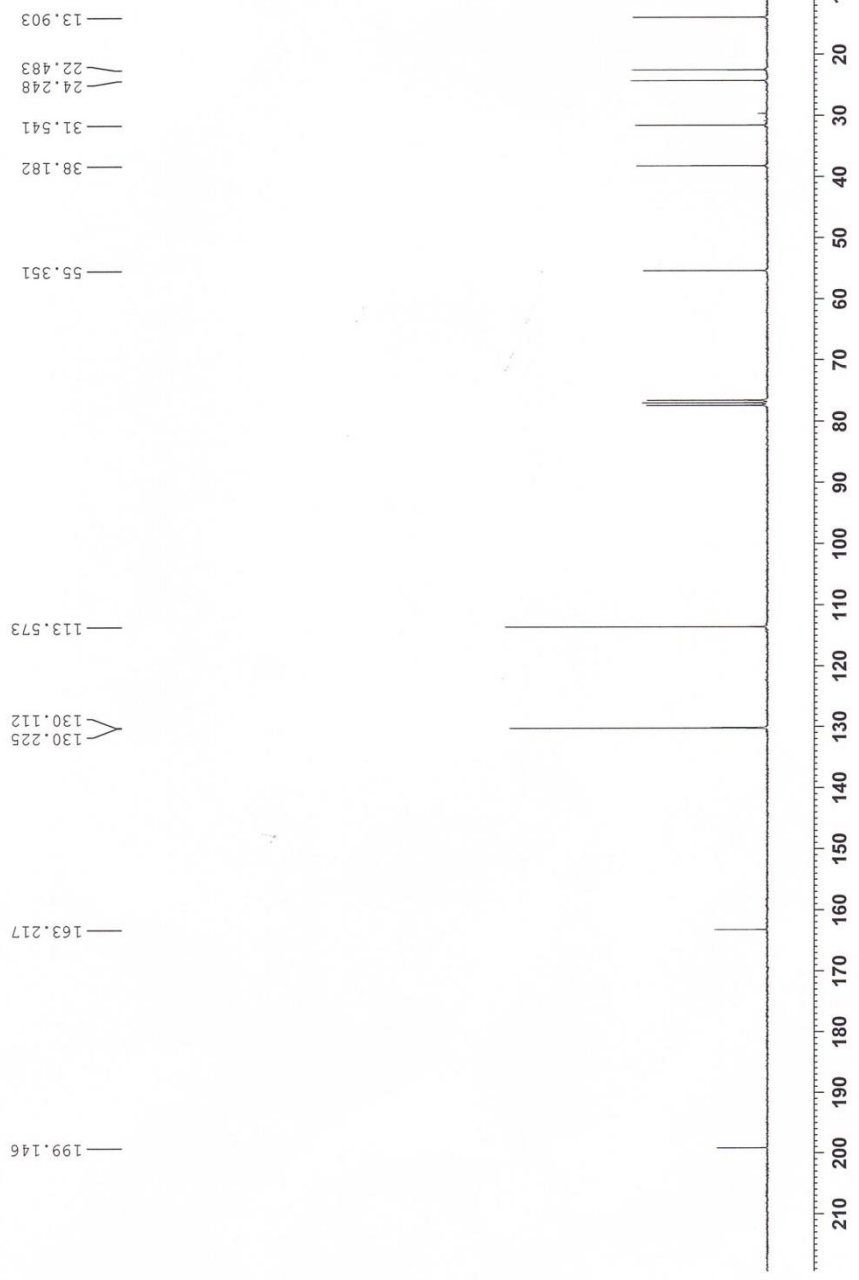
Current Data Parameters
NAME      MSY
EXPNO    40133
PROCNO   1

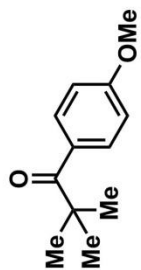
F2 - Acquisition Parameters
Date_    20150116
Time     12.37
INSTRUM  spect
PROBHD   5 mm PABBO BB-
PULPROG  zgpg30
SOLVENT  CDCl3
NS       516
DS       4
SWH      18028.846 Hz
FIDRES   0.275098 Hz
AQ       1.8175818 sec
RG       4096
DE       27.733 usec
TE       6.50 usec
TE       295.3 K
D1       2.0000000 sec
D11      0.03000000 sec
TD0      1

===== CHANNEL f1 =====
NUC1     13C
P1       9.00 usec
PLW1     54.95399857 W
SFO1     75.4752950 MHz

===== CHANNEL f2 =====
CPDPRG2  waltz16
NUC2     1H
PCPD2    90.00 usec
PLW2     14.99699974 W
PLW12    0.21596000 W
PLW13    0.17493001 W
SFO2     300.1312005 MHz

F2 - Processing parameters
SI       32768
SF       75.4677542 MHz
WDW      EM
SSB      0
LB       0
GB       0
PC       1.40
  
```



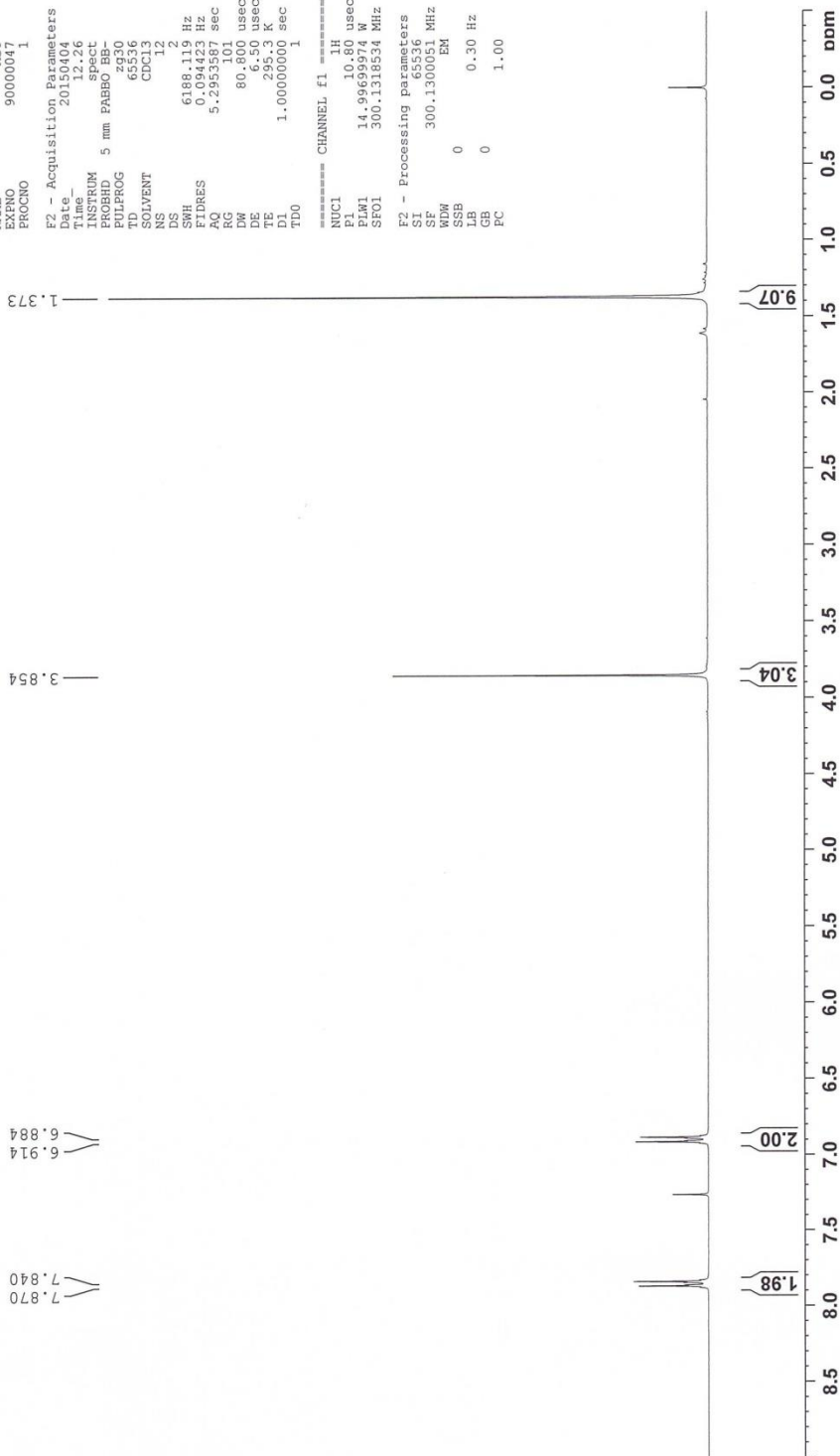


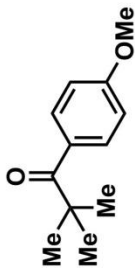
3h

Current Data Parameters
 NAME MSY
 EXPNO 90000047
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20180704
 Time_ 12.26
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 12
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 101
 DW 80.860 usec
 DE 19.5 usec
 TE 295.3 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PL1 14.9669974 W
 SF01 300.1318534 MHz

F2 - Processing parameters
 SI 65536
 SF 300.1300051 MHz
 SFO 300.1300051 MHz
 SSF 0
 LBB 0 0.30 Hz
 GB 0
 FC 1.00





3h

```

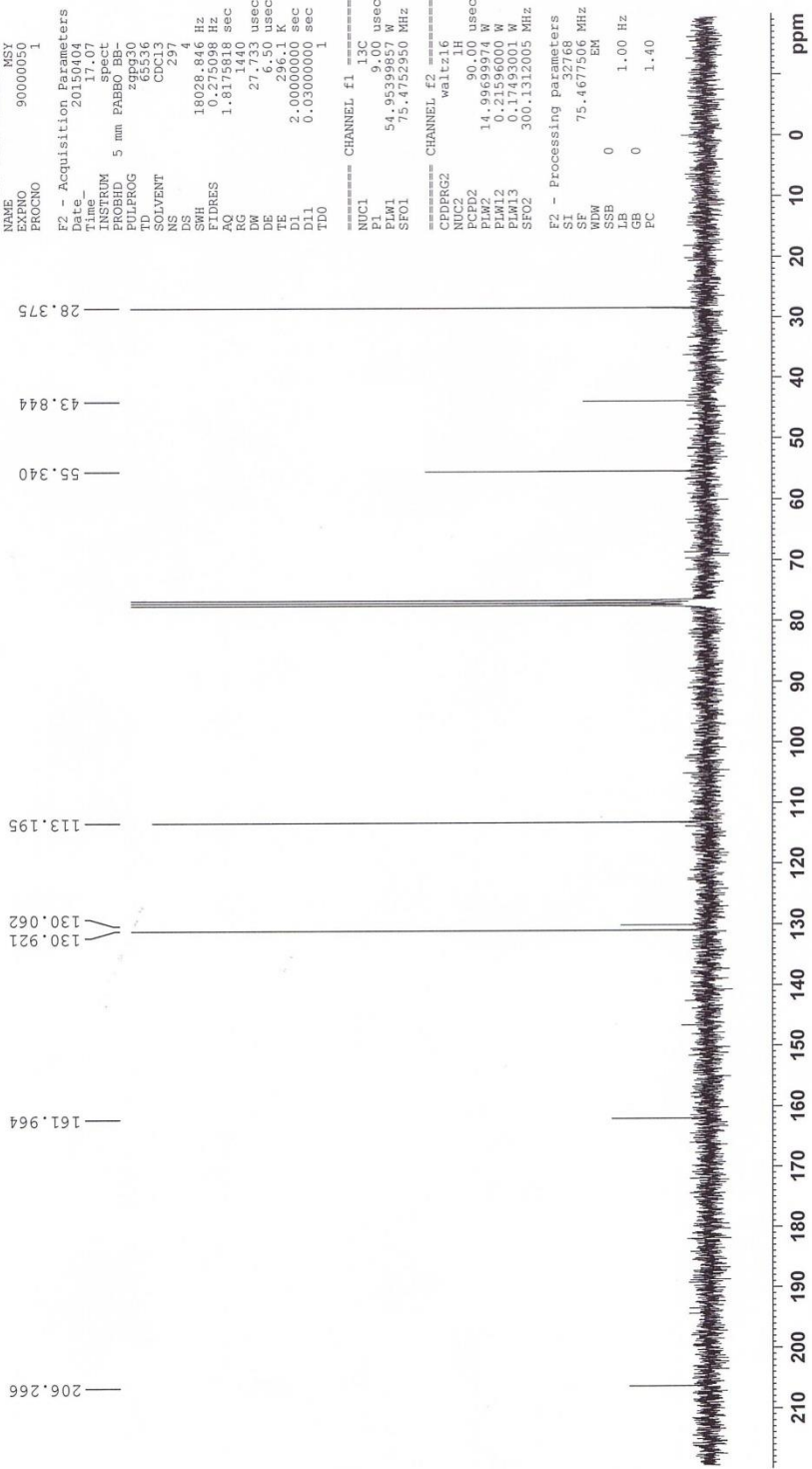
Current Data Parameters
NAME          MSY
EXPNO        90000050
PROCNO       1

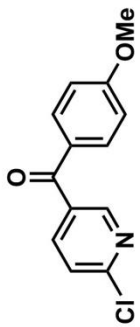
F2 - Acquisition Parameters
Date_         201704
Time         17.01
INSTRUM      spect
PROBHD       5 mm PABBO BB-
PULPROG      zgpg30
TD           65536
SOLVENT      CDCl3
NS           297
DS           4
SFO1         18028.846 Hz
SFO2         0.275098 Hz
FIDRES       1.8175818 sec
AQ           1.440
RG           27.733 usec
DE           6.50 usec
DI           0.0000000 sec
D11          0.0300000 sec
TD0          1

===== CHANNEL f1 =====
NUC1         13C
PC           9.00 usec
PLW1         54.95399857 W
SFO1         75.4752950 MHz

===== CHANNEL f2 =====
CPDPRG2     waitz16
NUC2         90.1H
PC2          90.1H usec
PLW2         14.99689974 W
SFO2         0.21596000 W
PLW13        0.17493001 W
SFO2         300.1312005 MHz

F2 - Processing parameters
SI           32768
SF           75.4677506 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```





3i

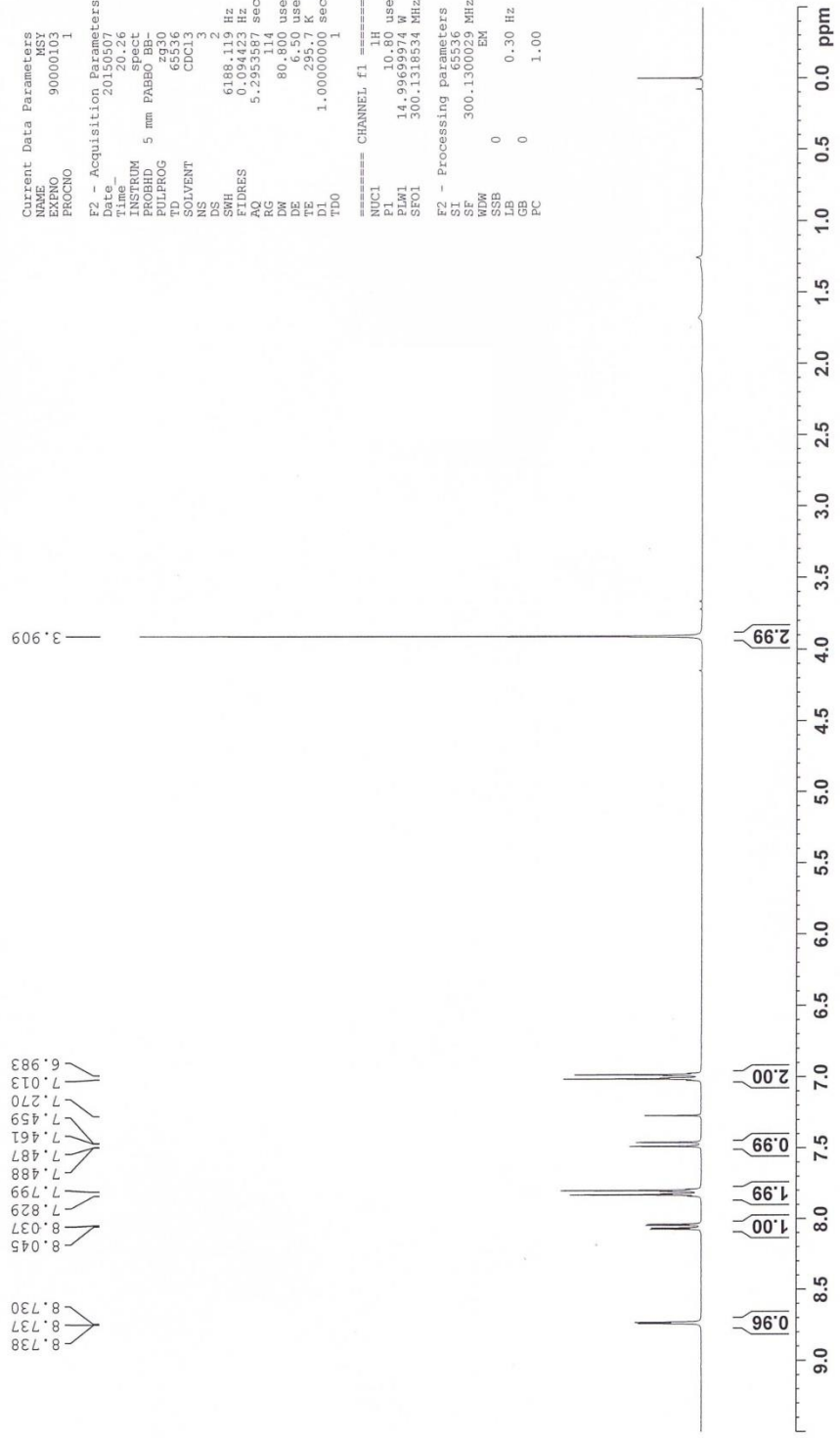
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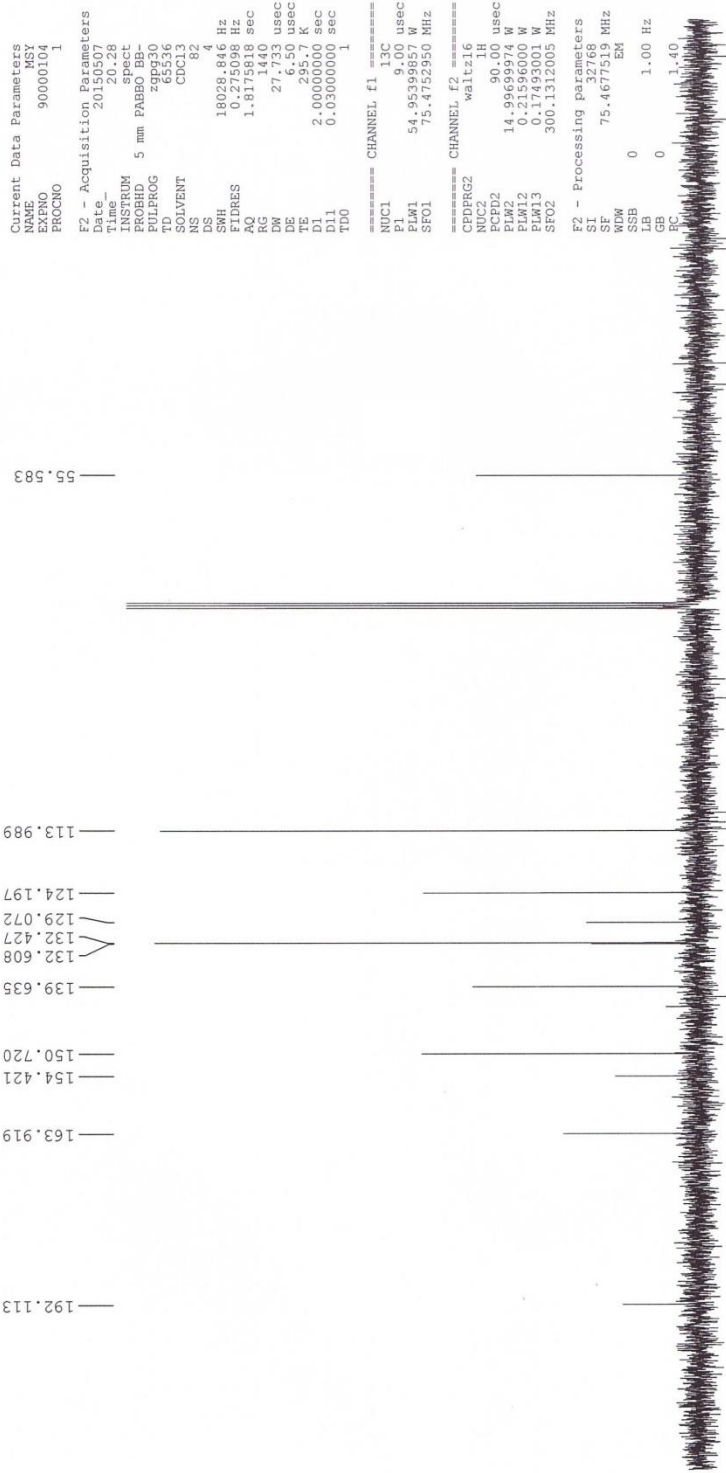
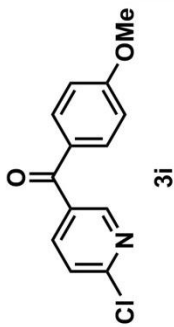
Current Data Parameters
NAME      MSY
EXPNO    90000103
PROCNO   1

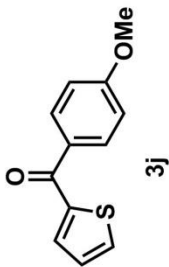
F2 - Acquisition Parameters
Date_    20150507
Time     20.26
INSTRUM  spect
PROBHD   5 mm PABBO BB-
PULPROG  zg30
TD        65536
NS        4096
SOLVENT  CDCl3
DS        2
SWH       6188.119 Hz
FIDRES    0.094423 Hz
AQ         5.2953587 sec
RG         114
RW         806.600 usec
DE         285.7 K
TE         1.00000000 sec
D1         1
D10        1

===== CHANNEL f1 =====
NUC1       1H
P1         10.80 usec
PL1        14.9969974 W
SFO1       300.1318534 MHz

F2 - Processing parameters
SI         65536
SF         300.1300029 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```







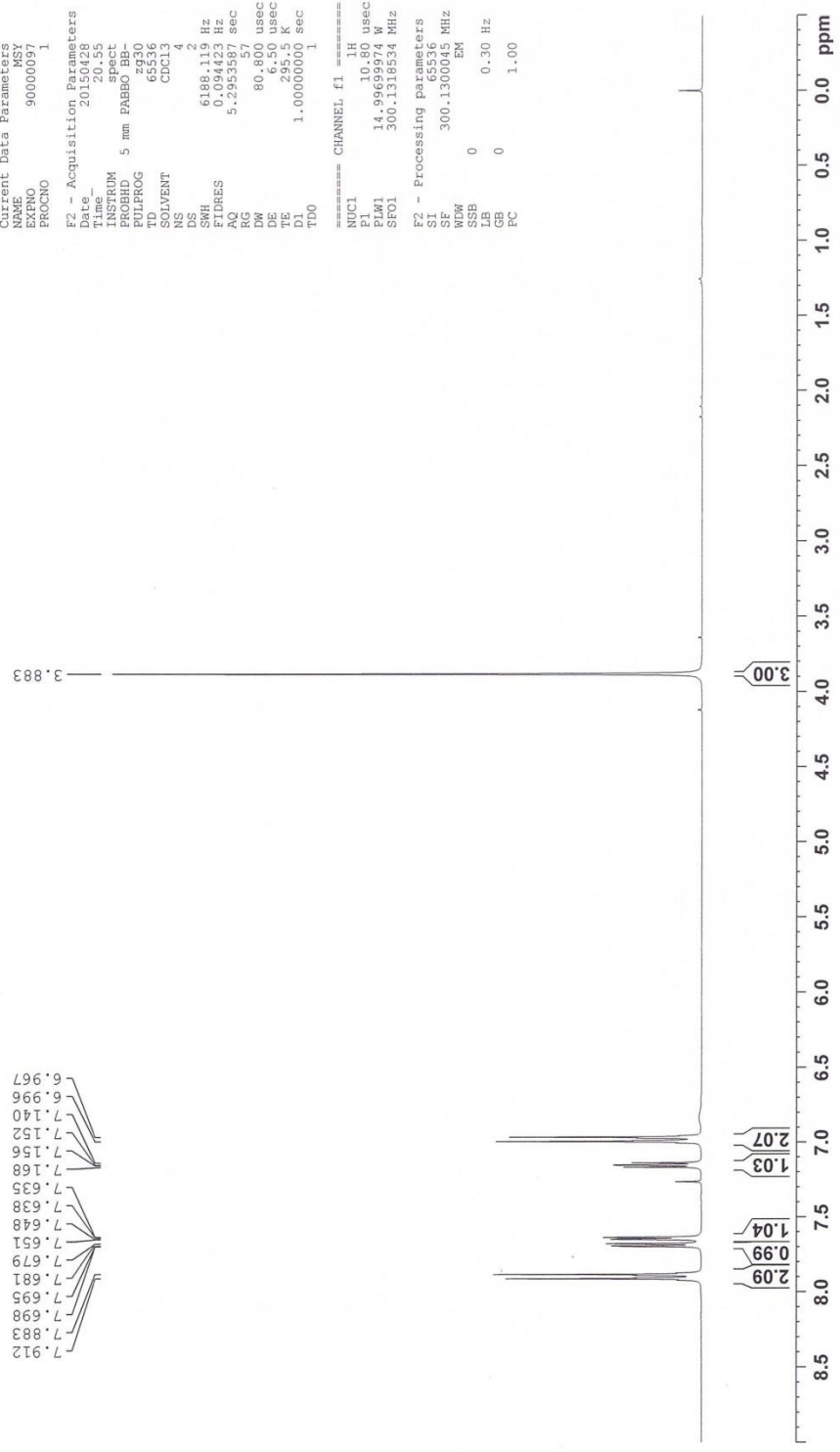
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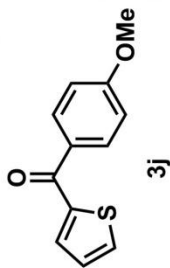
Current Data Parameters
NAME      MSY
EXPNO    90000097
PROCNO   1

F2 - Acquisition Parameters
Date_    20150428
Time     20.55
INSTRUM  spect
PROBHD   5 mm PABBO BB-
PULPROG  zg30
TD        65536
SFO1     300.1318534 MHz
SOLVENT  CDCl3
NS        2
DS        4
SWH      6188.119 Hz
FIDRES   0.094423 Hz
AQ        5.2953587 sec
RG        60.80 usec
DE        6.50 usec
TE        285.5 K
D1        1.00000000 sec
TD0       1

===== CHANNEL f1 =====
NUC1      1H
P1        10.80 usec
PLW1     14.9969974 W
SFO1     300.1318534 MHz

F2 - Processing parameters
SI        65536
SF        300.1300045 MHz
RG        60.80 usec
DE        6.50 usec
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```





```

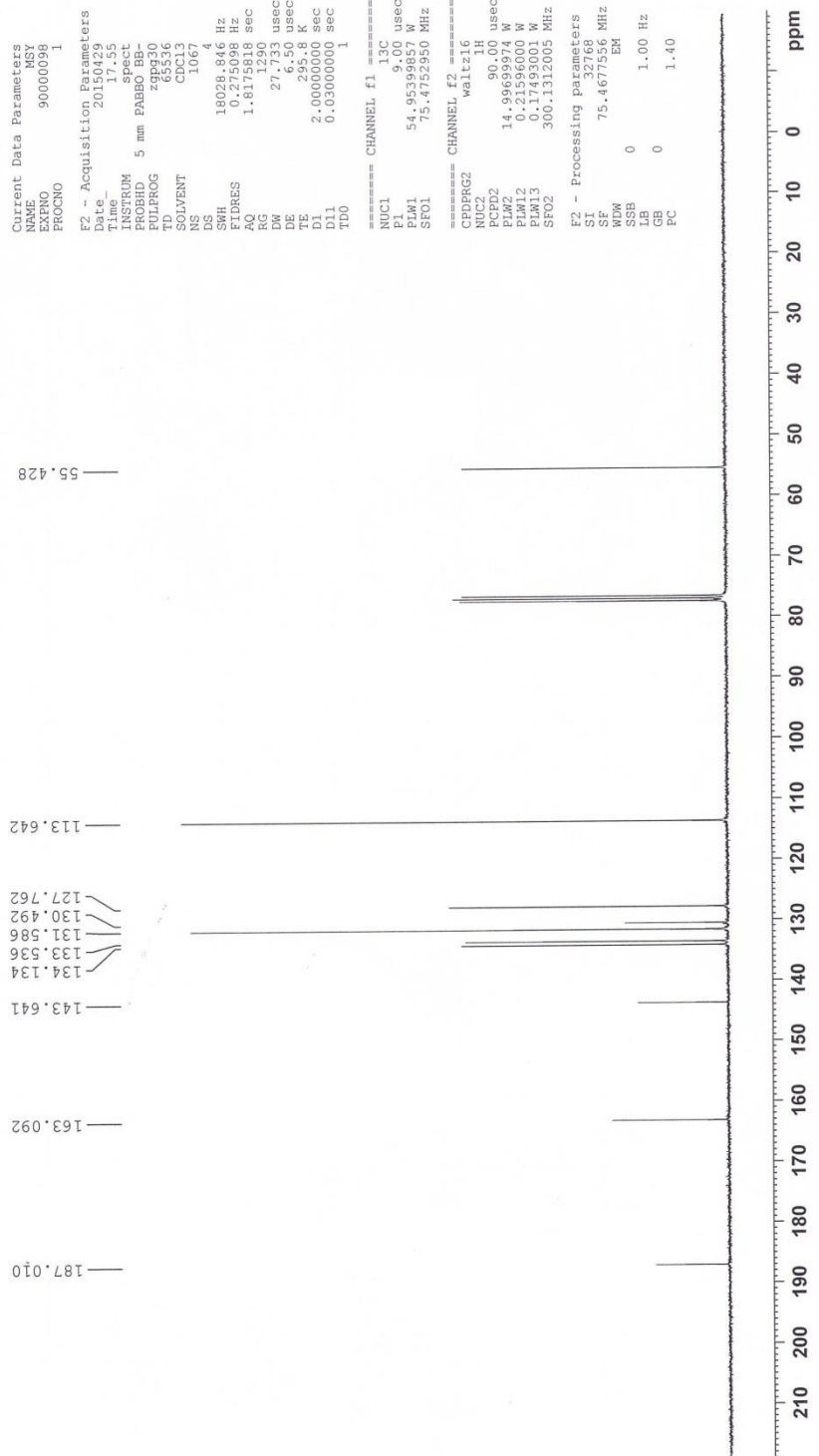
Current Data Parameters
NAME          MSY
EXPNO        90000098
PROCNO       1

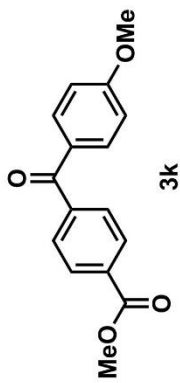
F2 - Acquisition Parameters
Time         20150426
Time         17.55
INSTRUM      spect
PROBHD       5 mm PABBO BB-
PULPROG      zgpg30
TD           65536
SOLVENT      CDCl3
DS           1064
SWH          18028.846 Hz
FIDRES       0.275098 Hz
AQ           1.8175818 sec
RG           1290
DW           27.733 usec
DE           1.00 usec
TE           295.8 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1

===== CHANNEL f1 =====
NUC1         13C
P1           9.00 usec
PLW1        54.9539857 W
SFO1        75.4752950 MHz

===== CHANNEL f2 =====
CFDPRG2     waltz16
NUC2         13C
P2           9.00 usec
PLW2        14.9969974 W
SFO2        300.1312005 MHz

F2 - Processing parameters
SI          32768
SF          75.4677556 MHz
WDW         EM
SSB         0
LB          1.00 Hz
GB          0
PC          1.40
  
```





8.152
8.125
7.834
7.804
7.773
6.988
6.959

3.964
3.897

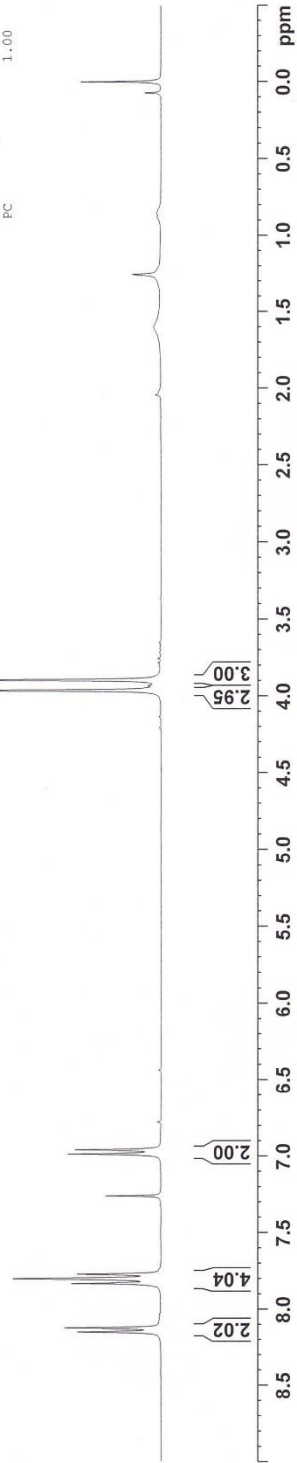
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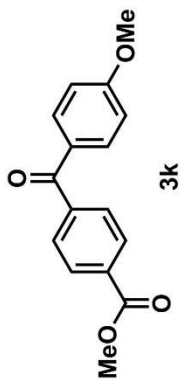
Current Data Parameters
NAME      MSY
EXPNO    90000127
PROCNO   1

F2 - Acquisition Parameters
File      20130824
Type     22.4
INSTRUM  spect
PROBHD   5 mm PABBO BB-
PULPROG  zg30
TD       65536
SOLVENT  CDCl3
NS       4
DS       4
SWH      6188.119 Hz
FIDRES   0.094423 Hz
AQ       5.2953587 sec
RG       144
DW       80.800 usec
DE       36.0 usec
TE       30.0 C
D1       1.00000000 sec
TD0      1

===== CHANNEL f1 =====
NUC1     1H
P1       10.0 usec
PL1      14.9969974 W
SFO1     300.1318534 MHz

F2 - Processing parameters
SI       65536
SF       300.1300057 MHz
WDW      EM
SSB      0
LB       0
GB       0
PC       1.00
  
```





```

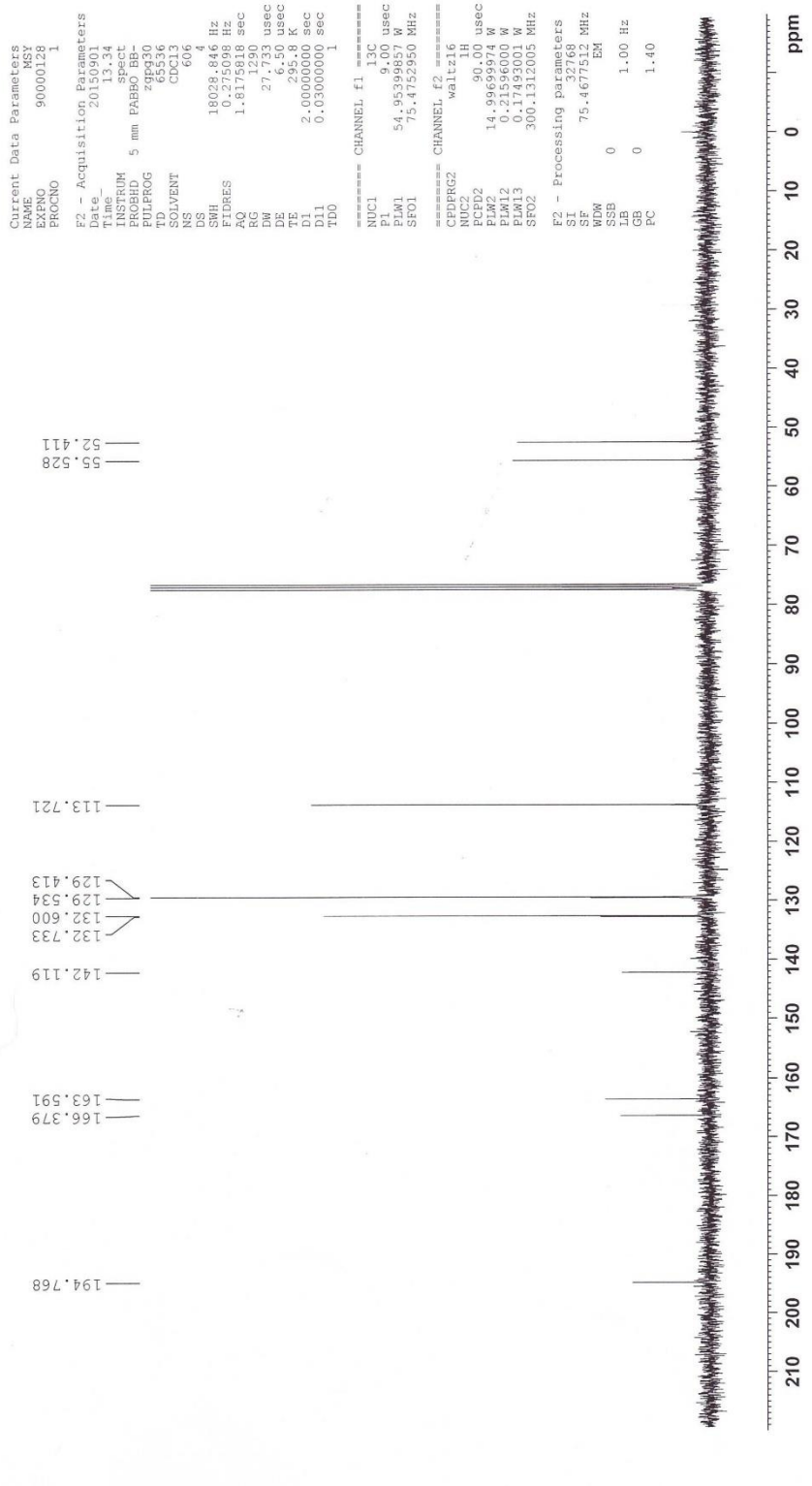
Current Data Parameters
NAME          NSY
EXPNO         90000128
PROCNO       1

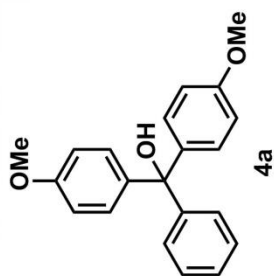
F2 - Acquisition Parameters
Date_         20150901
Time         13.34
INSTRUM      spect
PROBHD       5 mm FAPB0 BE-
PULPROG      zgpg30
TD           65536
CQ           0.0
SOLVENT      CDCl3
NS          606
DS           4
SWH          18028.846 Hz
FIDRES       0.275098 Hz
AQ           1.8175818 sec
RG           27.1250
DE           27.1250 usec
TE           295.8 K
D1           2.00000000 sec
D11          0.03000000 sec
TDO          1

===== CHANNEL f1 =====
NUC1         13C
P1           9.00 usec
PLW1        54.95399857 W
SFO1        75.4752950 MHz

===== CHANNEL f2 =====
CPCPRG2      waltz16
NUC2         1H
PCPD2        90.00 usec
PLW2        14.99699974 W
PLM12       0.21596000 W
PLM13       0.17493001 W
SFO2        300.1312005 MHz

F2 - Processing parameters
SI           32768
SF           75.4677512 MHz
WDW          EM
SSB          0
LB           1.00 Hz
GB           0
PC           1.40
  
```





7.259
 7.163
 7.134
 6.813
 6.783

3.752
 2.882

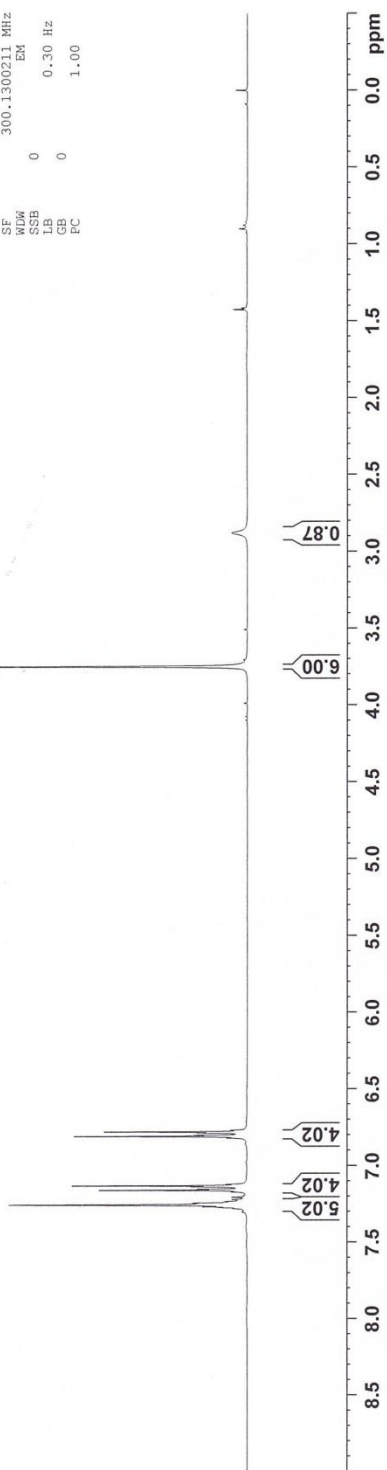
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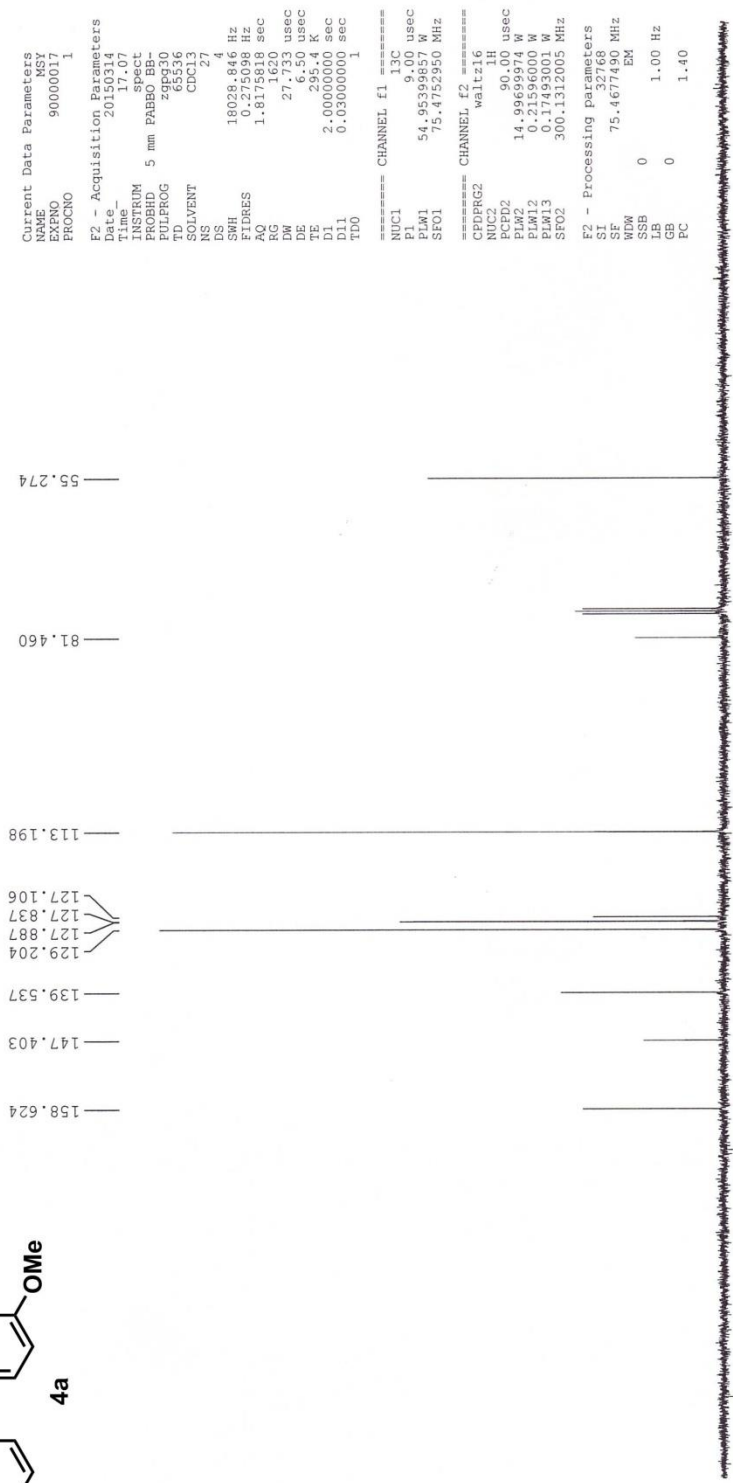
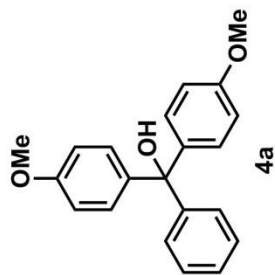
Current Data Parameters
NAME      MSY
EXPNO    90000016
PROCNO   1

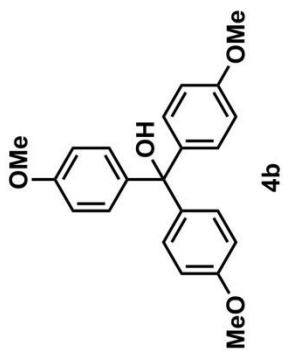
F2 - Acquisition Parameters
Date_    20180317
Time     17.02
INSTRUM  spect
PROBHD   5 mm PABBO BB-
PULPROG  zg30
TD        65536
SOLVENT  CDCl3
DS        1
SWH       6188.119 Hz
FIDRES    0.094423 Hz
AQ        5.2953587 sec
RG        32
DW        80.800 usec
DE        0.400 usec
TE        295.2 K
D1        1.00000000 sec
TDO       1

===== CHANNEL f1 =====
NUC1      1H
P1        10.80 usec
PL1       14.9969974 W
SFO1      300.1318534 MHz

F2 - Processing Parameters
SI        65536
SF        300.1300211 MHz
SWH       0
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```



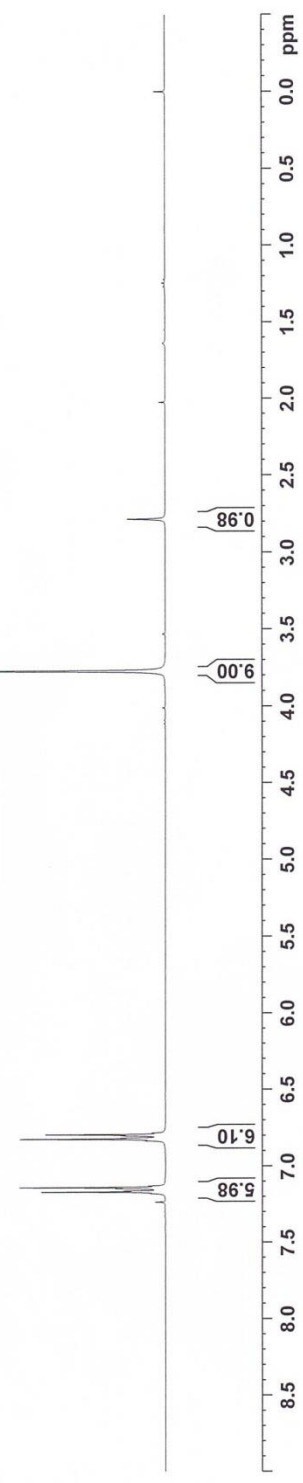


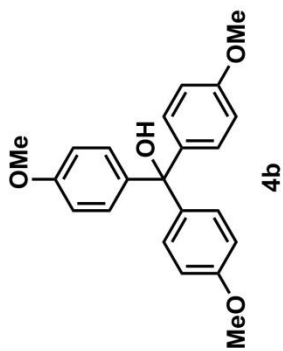


Current Data Parameters
 NAME MS3
 EXPNO 1
 PROCNO 90000053
 1
 F2 - Acquisition Parameters
 Date_ 20150404
 Time 17.34
 INSTRUM spect
 F2PROG 20150404
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.08427 Hz
 AQ 5.295387 sec
 RG 32
 DW 80.800 usec
 DE 6.50 usec
 TE 296.1 K
 D1 1.00000000 sec
 TDO 1
 ===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PLW1 14.9969974 W
 SFO1 300.1318534 MHz
 F2 - Processing parameters
 SI 65536
 SF 300.1300132 MHz
 WDW EM
 SSB 0
 LB 0
 GB 0
 EC 1.00

2.785
 3.774

6.794
 6.824
 7.140
 7.170





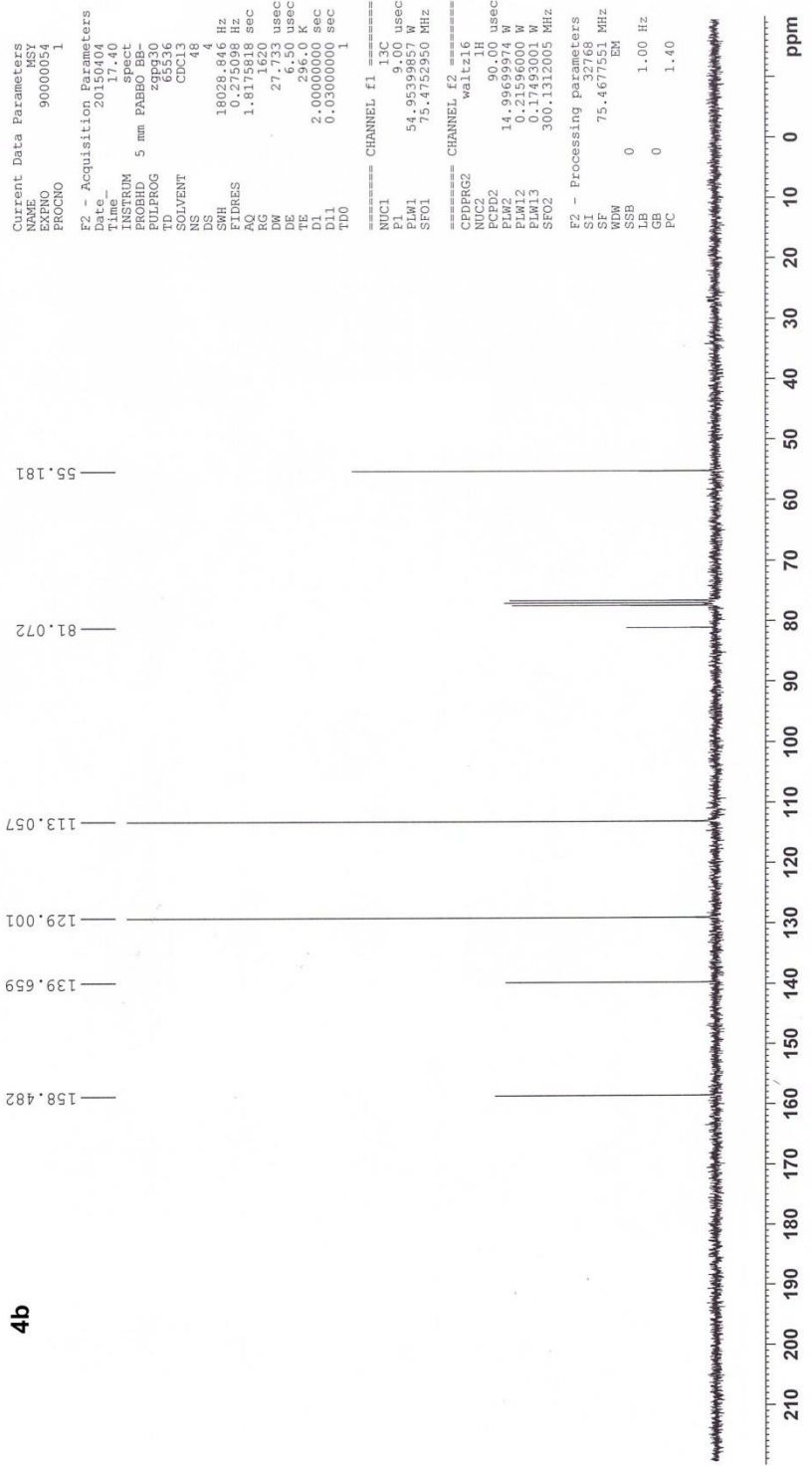
Current Data Parameters
 F2 1
 EXPR0 90000054
 PROCNO 1

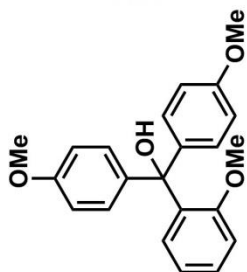
F2 - Acquisition Parameters
 Date_ 20150404
 Time 17.40
 INSTRUM spect
 PROBR0 5 mm PABBO-ECT
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 48
 DS 4
 SWH 18028.84 Hz
 FIDRES 0.275096 Hz
 AQ 1.8175818 sec
 RG 1620
 DW 27.733 usec
 DE 6.50 usec
 TE 296.0 K
 D1 2.0000000 sec
 D11 0.11
 TDO 0.03000000 sec

===== CHANNEL f1 =====
 NUC1 13C
 P1 9.00 usec
 PL1 54.9530550 W
 SFO1 75.4752950 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 P2 90.00 usec
 PL2 14.9569574 W
 PL12 0.1749000 W
 PL13 0.1749000 W
 SFO2 300.1312005 MHz

F2 - Processing parameters
 SI 32768
 SF 75.4677551 MHz
 EQ
 SSB 0
 LB 0 1.00 Hz
 GB 0
 PC 1.40



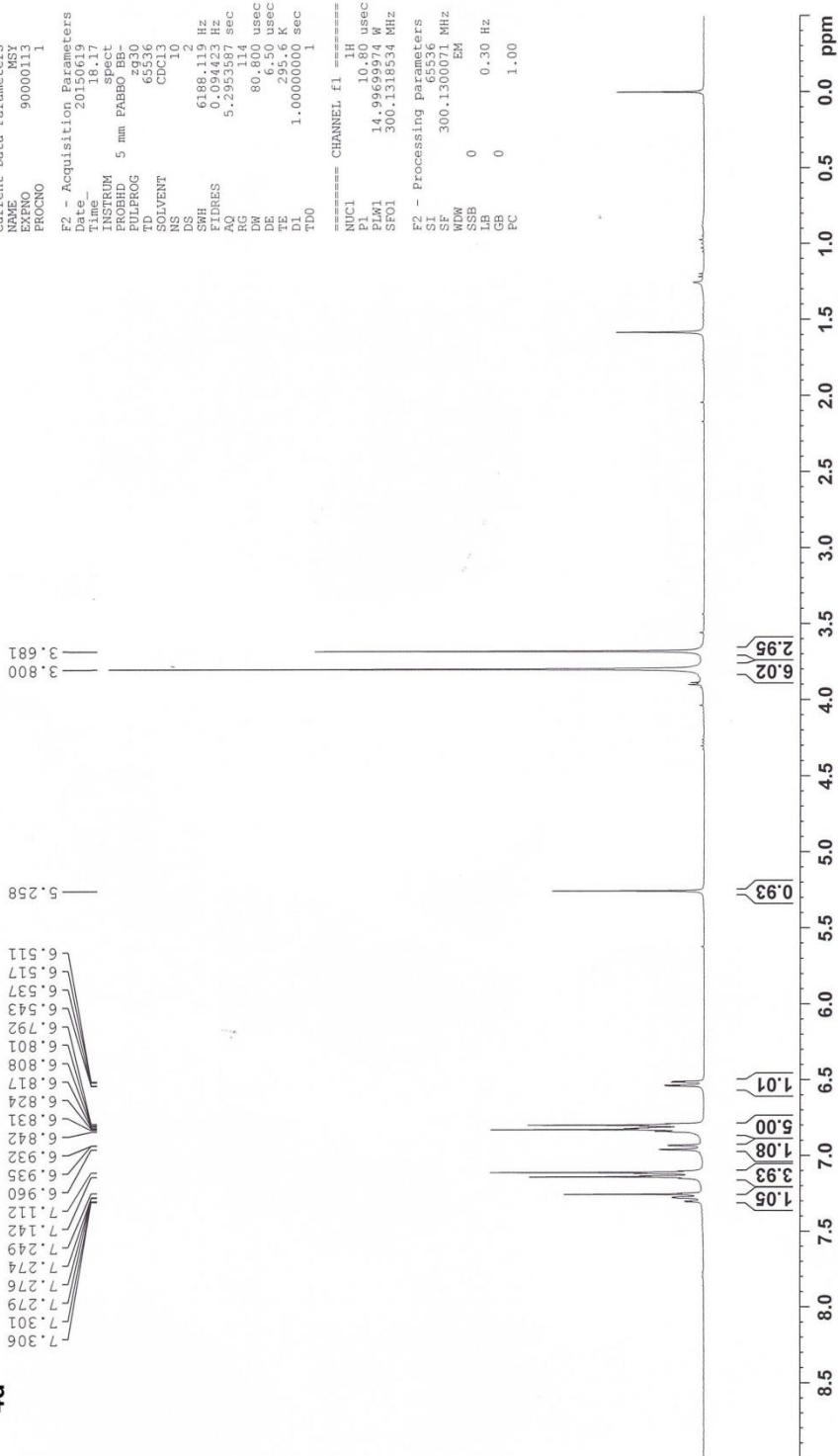


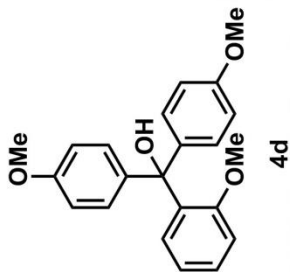
Current Data Parameters
 NAME MSY
 EXENO 90000113
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20150619
 Time_ 18.17
 INSTRUM spect
 PROBD 5 mm PABEO BB
 PULPROG zg30
 ID 65536
 SOLVENT CDCl3
 NS 1
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 114
 DW 80.114 usec
 DE 6.50 usec
 TE 295.6 K
 DI 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PL1 14.9969974 W
 SF01 300.1318534 MHz

F2 - Processing Parameters
 SI 65536 MHz
 SF 300.1300000 MHz
 EQ 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





```

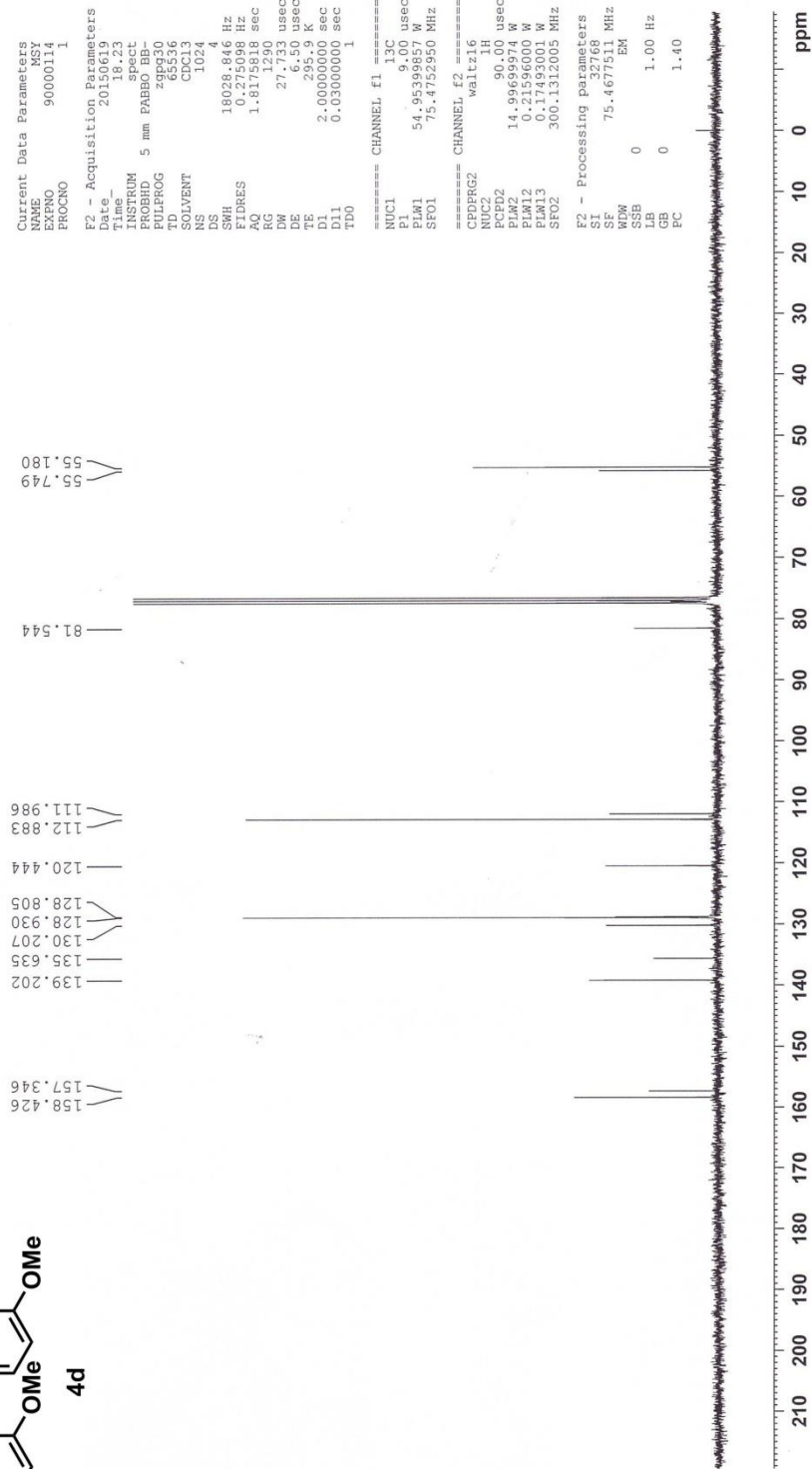
Current Data Parameters
NAME          MSY
EXPNO        90000114
PROCNO       1

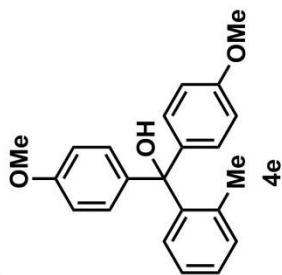
F2 - Acquisition Parameters
Date_        20150619
Time_       18.23
INSTRUM     spect
PROBHD      5 mm PABBO BB-
PULPROG     zgpg30
AQ          1.790
RG          27.790 usec
DE          6.50 usec
TE          295.9 K
D1          2.00000000 sec
D11         0.03000000 sec
TD0         1

===== CHANNEL f1 =====
NUC1        13C
P1          9.00 usec
PLW1       54.9539857 W
SFO1       75.4752950 MHz

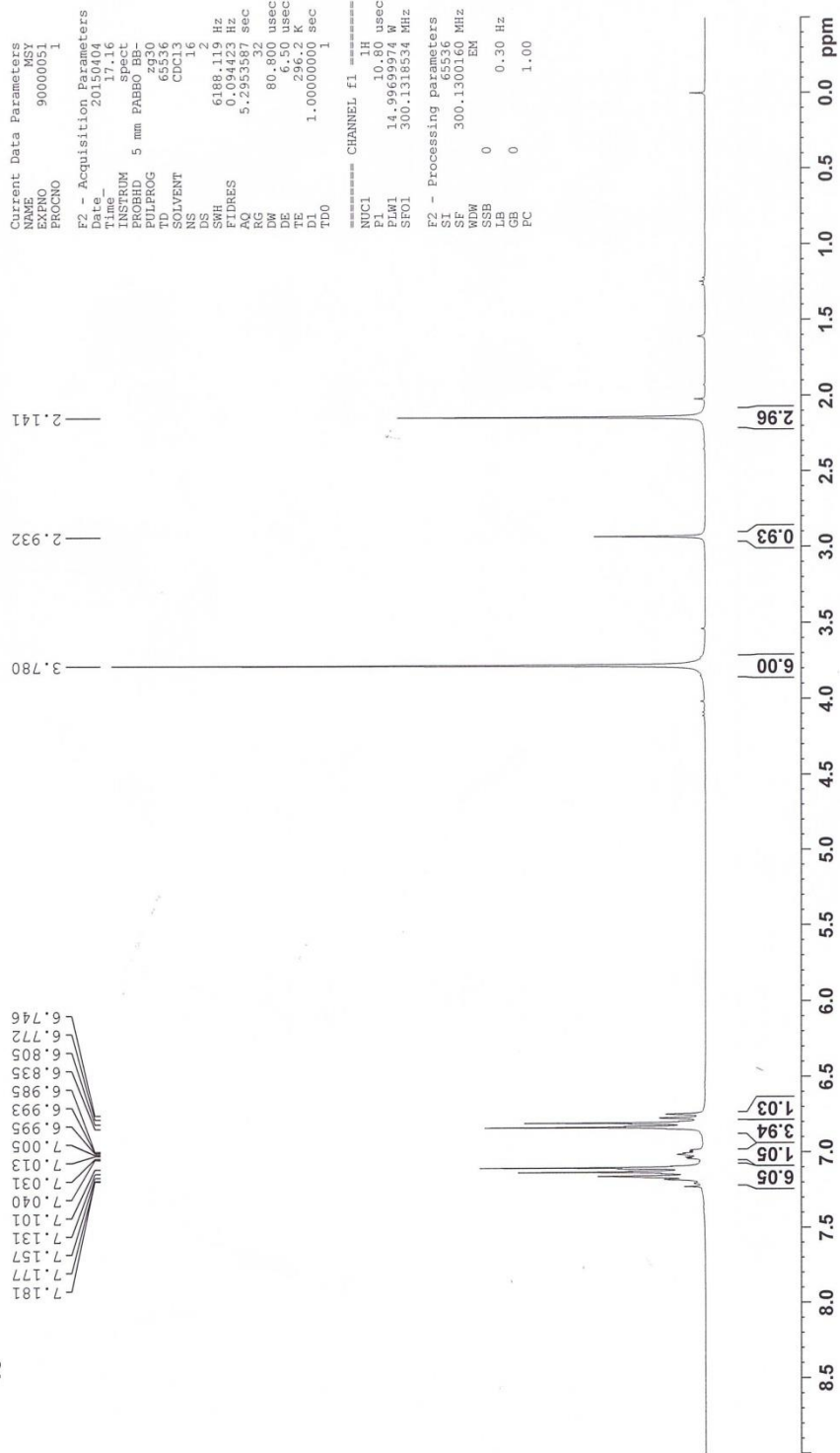
===== CHANNEL f2 =====
CPRPRG2    waltz16
NUC2        1H
PCPD2      90.00 usec
PLW2       14.9969974 W
PLW12      0.21596000 W
PLW13      0.17493001 W
SFO2       300.1312005 MHz

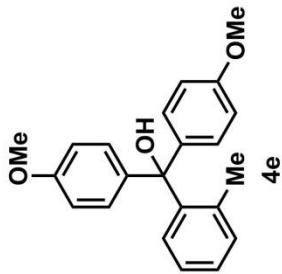
F2 - Processing parameters
SI          32768
SF          75.4677511 MHz
WDW         EM
SSB         0
LB          1.00 Hz
GB          0
EC          1.40
  
```





Current Data Parameters
 NAME MSY
 EXPNO 90000051
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20150404
 Time 11.16
 INSTRUM spect
 PROBD 5 mm PABBO BB
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 4
 SWH 6188.116 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 32
 DW 80.800 usec
 DE 6.50 usec
 TE 26.2 K
 D1 1.00000000 sec
 TDO 1
 CHANNEL f1
 NUC1 1H
 P1 10.80 usec
 PL1 14.95204 MHz
 SFO1 300.1318534 MHz
 F2 - Processing parameters
 SI 65536
 SF 300.1300160 MHz
 WDW EM
 SSB 0
 GB 0
 PC 1.00





```

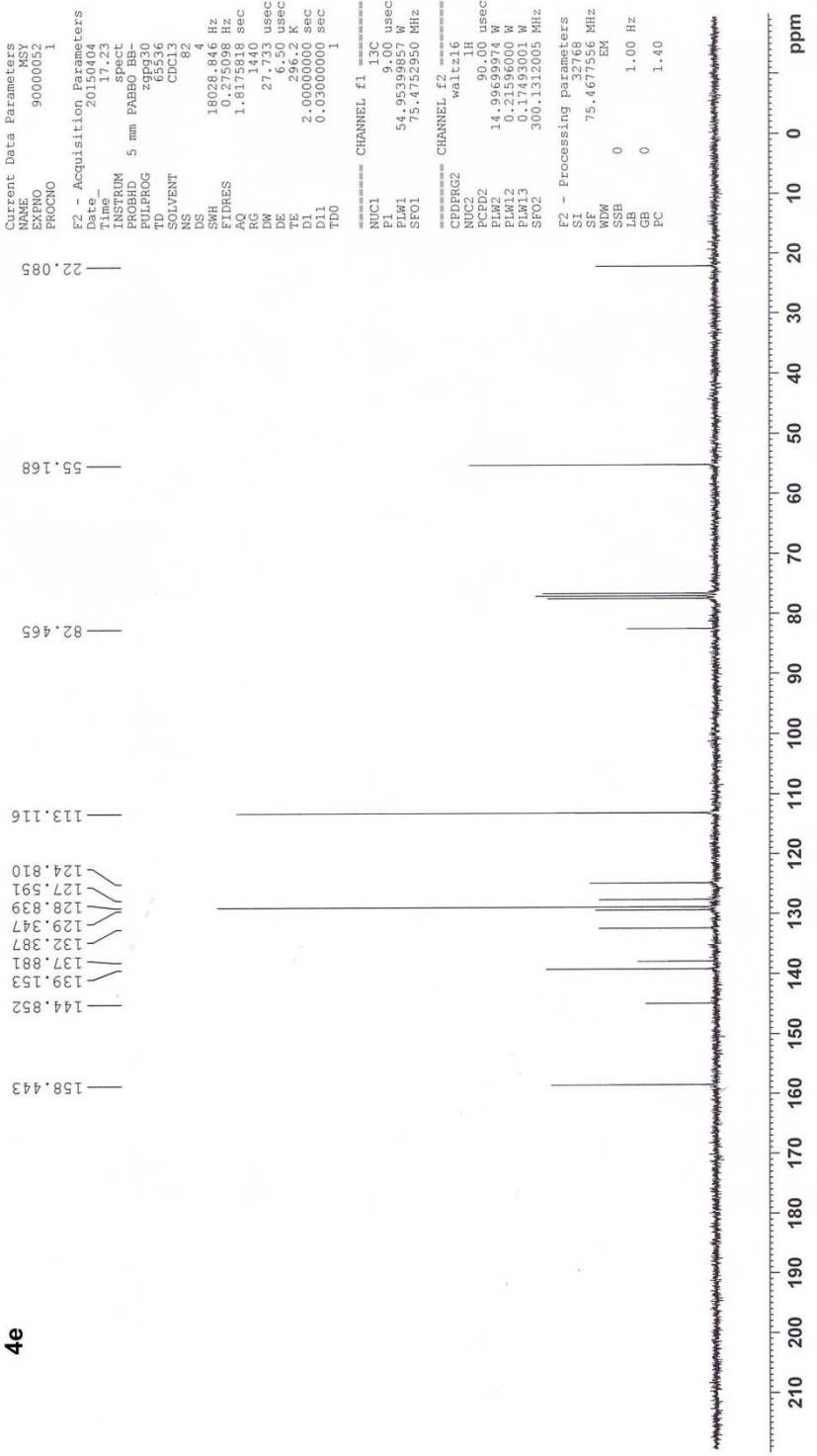
Current Data Parameters
NAME      MSY
EXPNO    90000052
PROCNO   1

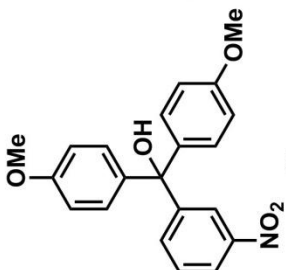
F2 - Acquisition Parameters
Date_    20150404
Time    17.23
INSTRUM spect
PROBHD  5 mm PABBO BB-
PULPROG zgpg30
TD      65536
SOLVENT CDCl3
NS      82
DS      4
SWH     18008.846 Hz
FIDRES  0.275098 Hz
AQ      1.8175818 sec
RG      1440
DW      27.733 usec
DE      6.50 usec
TE      26.02 C
T1      2.0000000 sec
D11     0.03000000 sec
TD0     1

===== CHANNEL f1 =====
NUC1    13C
P1      13C
PL1     54.9599850 usec
SFO1    75.4752950 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2    1H
PCPD2   80.00 usec
PL2     14.9965000 usec
PLM1    0.21596000 W
PLM2    0.17493001 W
PLM3    0.17493001 W
SFO2    300.1312005 MHz

F2 - Processing parameters
SI      32768
SF      75.467756 MHz
RG      ER
SSB     0
LB      1.00 Hz
GB      0
PC      1.40
  
```



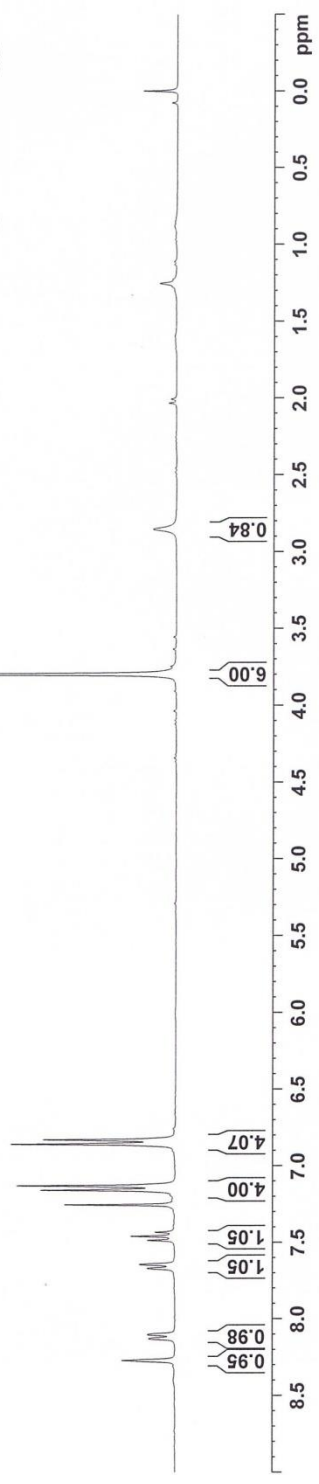


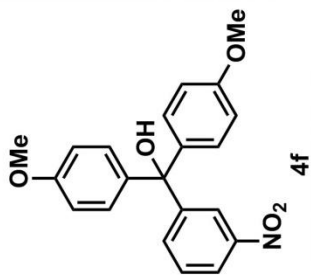
8.270
8.128
8.101
7.670
7.644
7.487
7.460
7.433
7.161
7.132
6.861
6.832

Current Data Parameters
 F2 - Acquisition Parameters
 Date_ 20150116
 Time 12.22
 NS/DM 5 mm PABBO-20
 PRG/PROG 65536
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 6186.129 Hz
 FIDRES 0.69423 Hz
 AQ 5.2953587 sec
 RG 71.8
 DW 80.800 usec
 DE 6.50 usec
 TE 295.1 K
 D1 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PLW1 14.99699974 W
 SFO1 300.1318534 MHz

F2 - Processing parameters
 SI 65536
 SF 300.1300070 MHz
 WDW EM
 LB 0
 GB 0
 PC 1.00





```

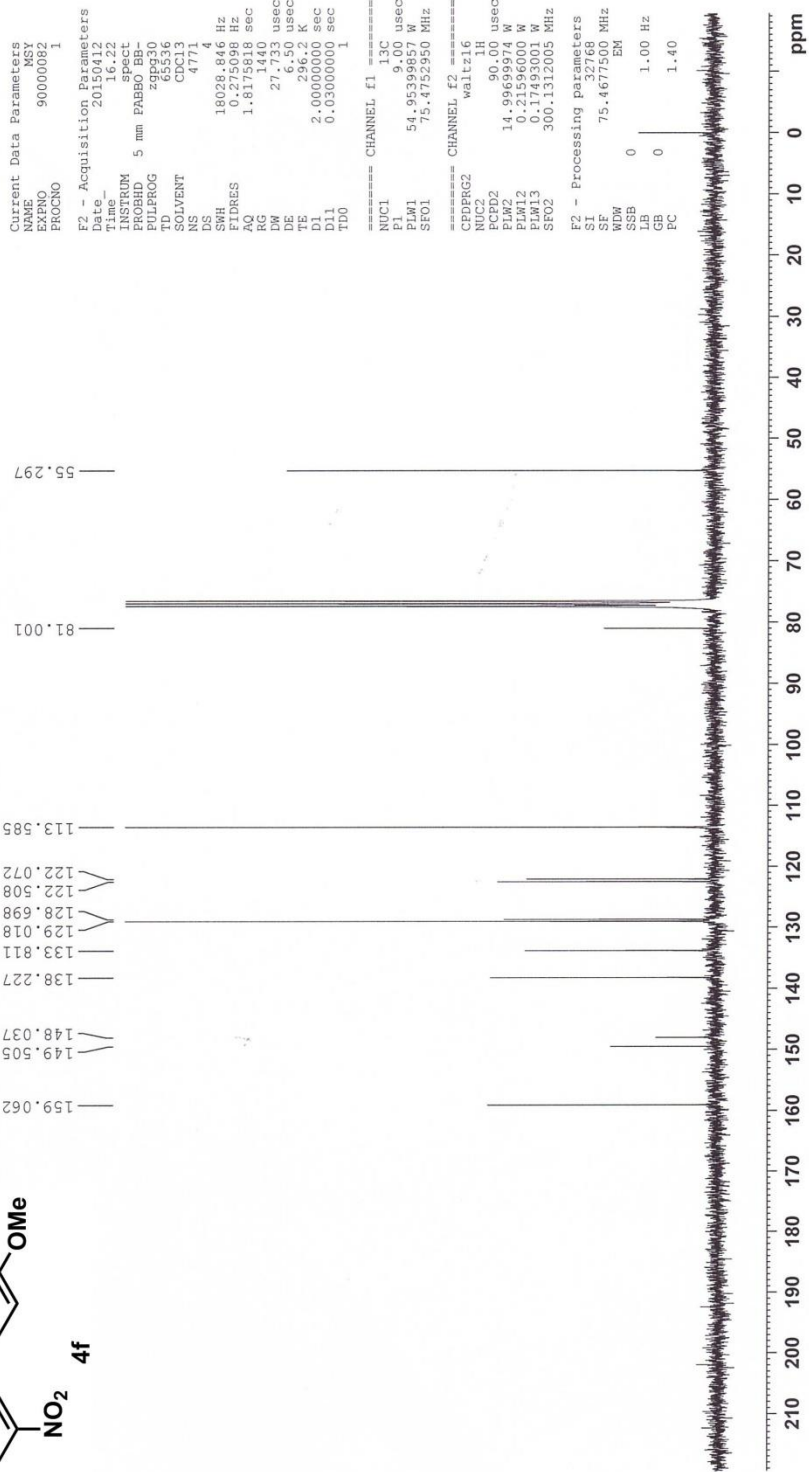
Current Data Parameters
NAME      NSY
EXPNO    90000082
PROCNO   1

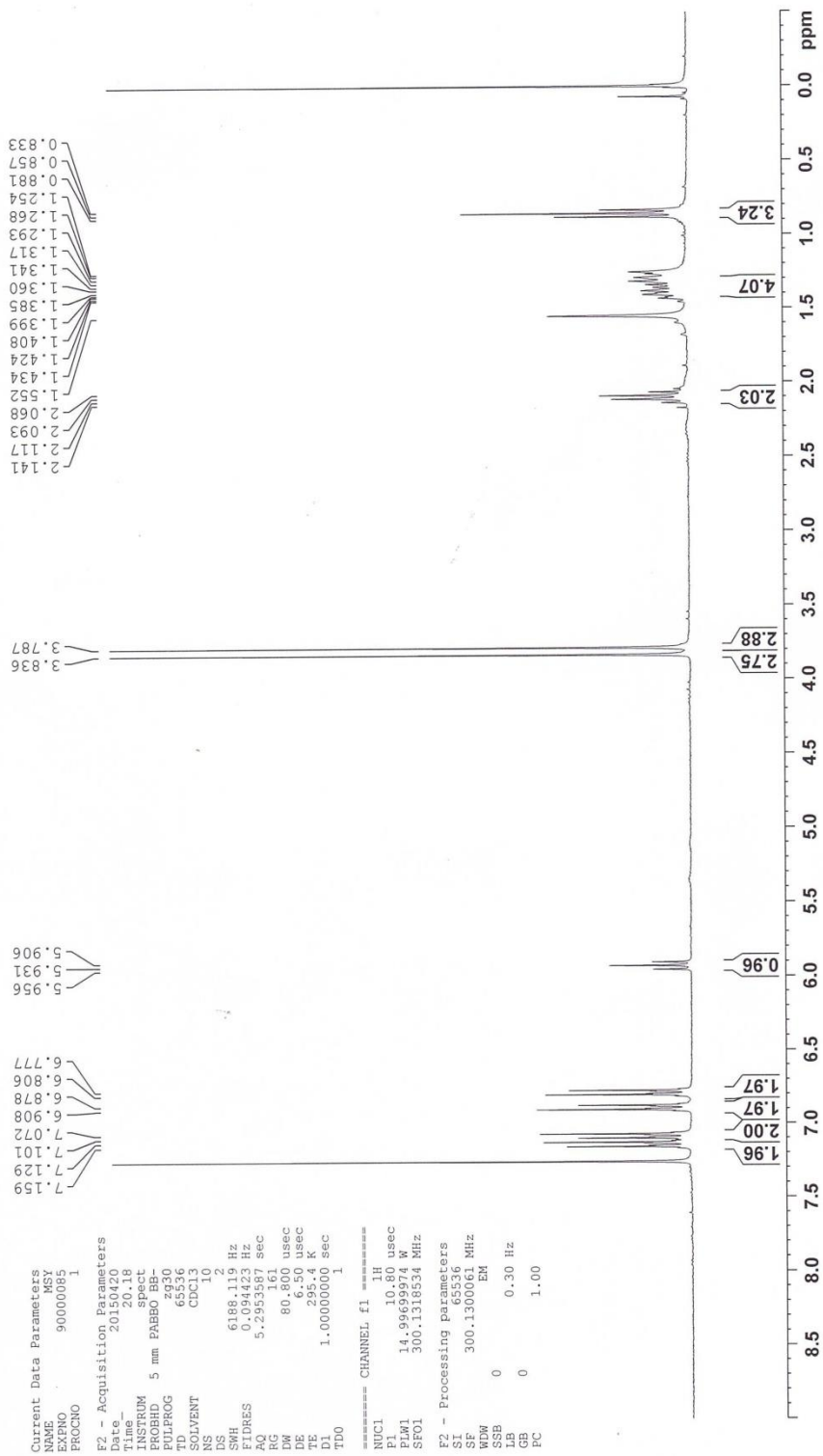
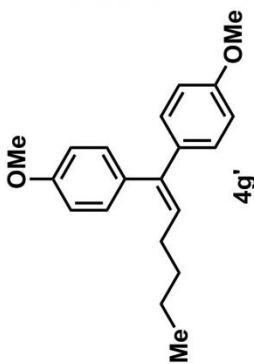
F2 - Acquisition Parameters
Date_    20150412
Time     16:22
INSTRUM spect
PROBHD   5 mm PABBO BB-
PULPROG zgpg30
TD       65536
SOLVENT  CDCl3
NS       4771
SI       18028.846 Hz
SF       0.275098 Hz
FIDRES   1.8175818 sec
AQ       1440
RG       27.733 usec
DW       6.50 usec
DE       0.0000000 sec
TE       300.2 K
D1       2.0000000 sec
D11      0.0300000 sec
TD0      1

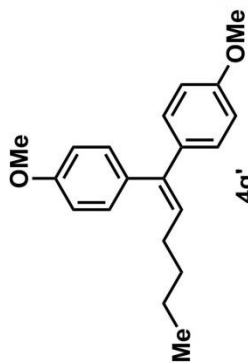
===== CHANNEL f1 =====
NUC1      13C
P1        0.00 usec
PL1       54.9639857 W
SFO1      75.4752950 MHz

===== CHANNEL f2 =====
CPDPRG2  waltz16
NUC2      1H
PCPD2     80.00 usec
PL2       14.9962987 W
PL12      0.2159600 W
PL13      0.1749300 W
SF02      300.1312005 MHz

F2 - Processing parameters
SI       32768
SF       75.4677700 MHz
WDW      EM
SSB      0
LB       1.00 Hz
GB       0
FC       1.40
  
```







```

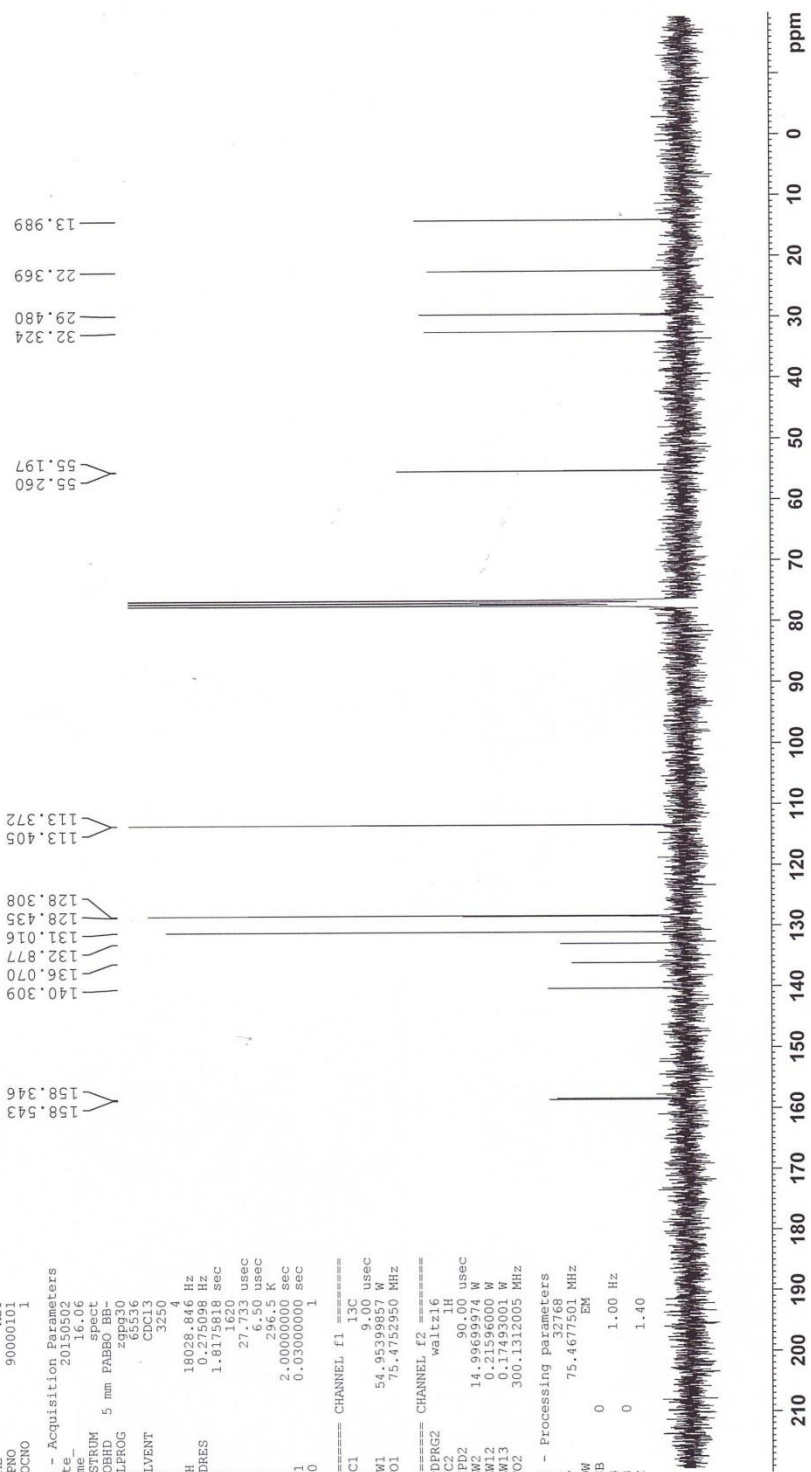
NAME MSY
EXPNO 90000101
PROCNO 1

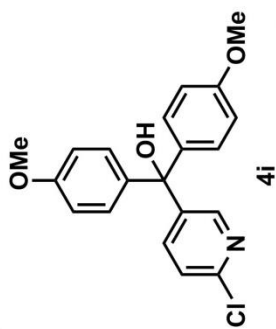
F2 - Acquisition Parameters
File_ 2013132
Type_ 16.00
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 3250
DS 0
SWH 18028.846 Hz
FIDRES 0.275098 Hz
AQ 1.8175818 sec
RG 1620
DW 27.733 usec
DE 6.50 usec
TE 29.90000000
D1 2.00000000 sec
D11 0.03000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.00 usec
PLW1 54.95399857 W
SFO1 75.4752950 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
P2 90.00 usec
PLW2 14.99699974 W
SFO2 0.21596000 W
PLW13 0.17493001 W
SFO2 300.1312005 MHz

F2 - Processing parameters
SI 32768
SF 75.4677501 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
FC 1.40
  
```





Chemical shift values (ppm) for the aromatic region of the spectrum:

- 8.289
- 8.287
- 8.280
- 8.278
- 7.639
- 7.630
- 7.611
- 7.602
- 7.261
- 7.233
- 7.231
- 7.144
- 7.137
- 7.121
- 7.114
- 6.854
- 6.846
- 6.831
- 6.824

Current Data Parameters

NAME MSY
EXPNO 40142
PROCNO 1

F2 - Acquisition Parameters

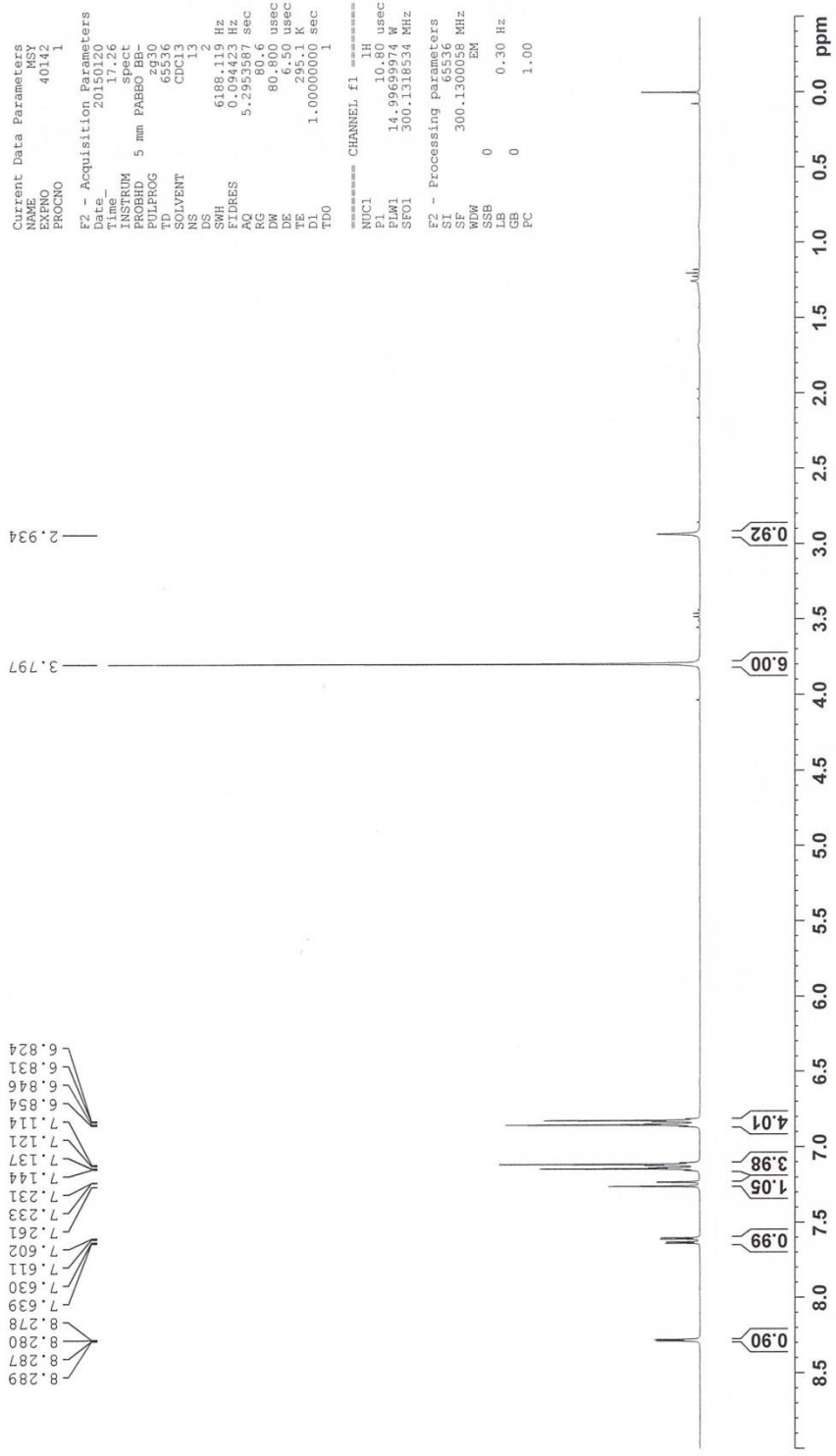
Date_ 20150120
Time 11.26
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 13
DSH 13
SFO 6188.119 Hz
FIDRES 0.094423 Hz
AQ 5.2953587 sec
RG 80.6
DW 80.800 usec
DE 6.50 usec
TE 298.15 K
D1 1.0000000 sec
TD0 1

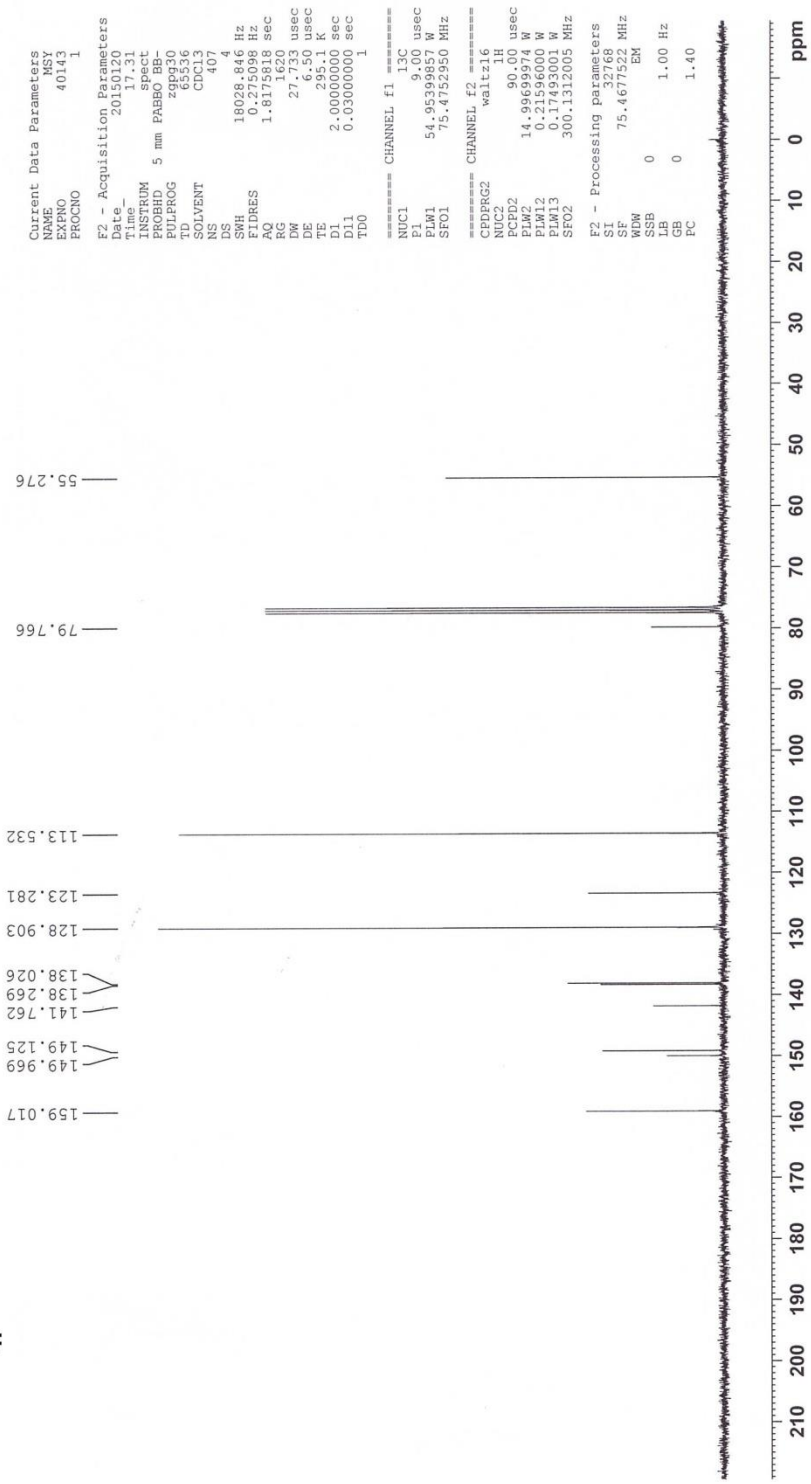
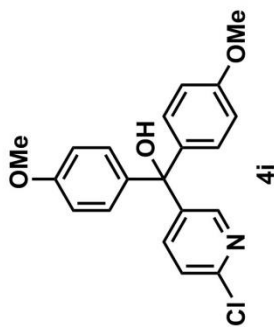
CHANNEL F1

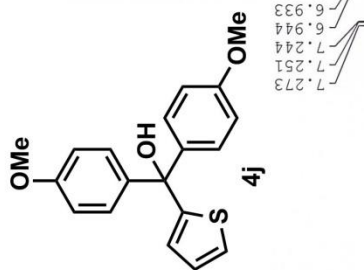
NUC1 1H
P1 10.80 usec
PL1 0.00
SFO1 300.1318534 MHz

F2 - Processing parameters

SI 65536
SF 300.1300058 MHz
WDW EM
SSB 0
GB 0
PC 1.00



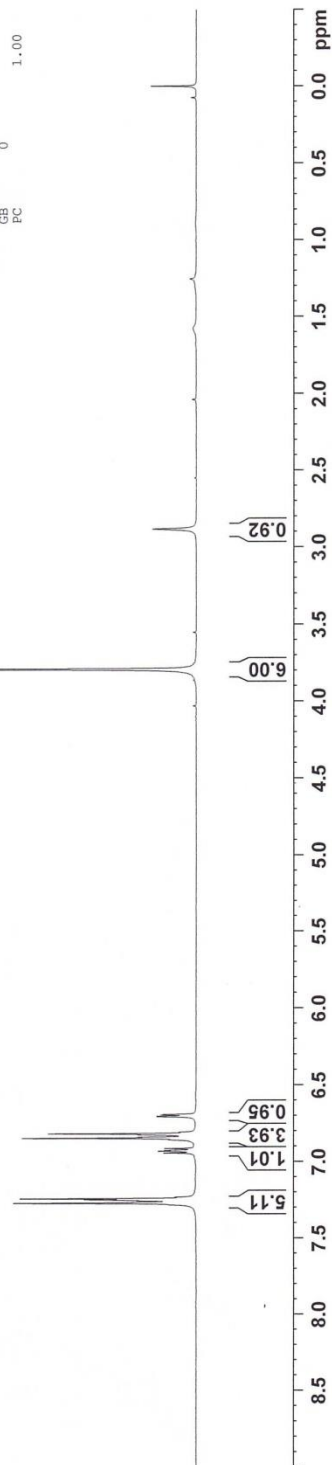


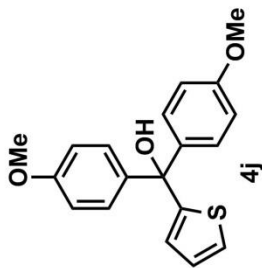


7.273
 7.251
 7.244
 7.244
 6.944
 6.933
 6.928
 6.916
 6.916
 6.849
 6.819
 6.709
 6.705
 6.697
 6.693

3.794
 2.884

Current Data Parameters
 NAME: 4j
 EXPNO: 90000064
 PROCNO: 1
 F2 - Acquisition Parameters
 Date_: 20150410
 Time: 20.42
 PROBHD: 5 mm PABBO-BB
 PULPROG: zg30
 TD: 65536
 SOLVENT: CDCl3
 NS: 16
 DS: 2
 SH: 6188.112 Hz
 FIDRES: 0.1094423 Hz
 AQ: 5.2953587 sec
 RG: 90.5
 DW: 80.800 usec
 DE: 6.50 usec
 TE: 295.5 K
 D1: 1.00000000 sec
 TDO: 1
 ===== CHANNEL f1 =====
 NUC1: 1H
 P1: 10.80 usec
 PLW1: 14.9969974 W
 SF01: 300.1318534 MHz
 F2 - Processing parameters
 SI: 65536
 SF: 300.1300088 MHz
 WDW: EM
 SSB: 0
 GB: 0
 PC: 0.30 Hz
 1.00





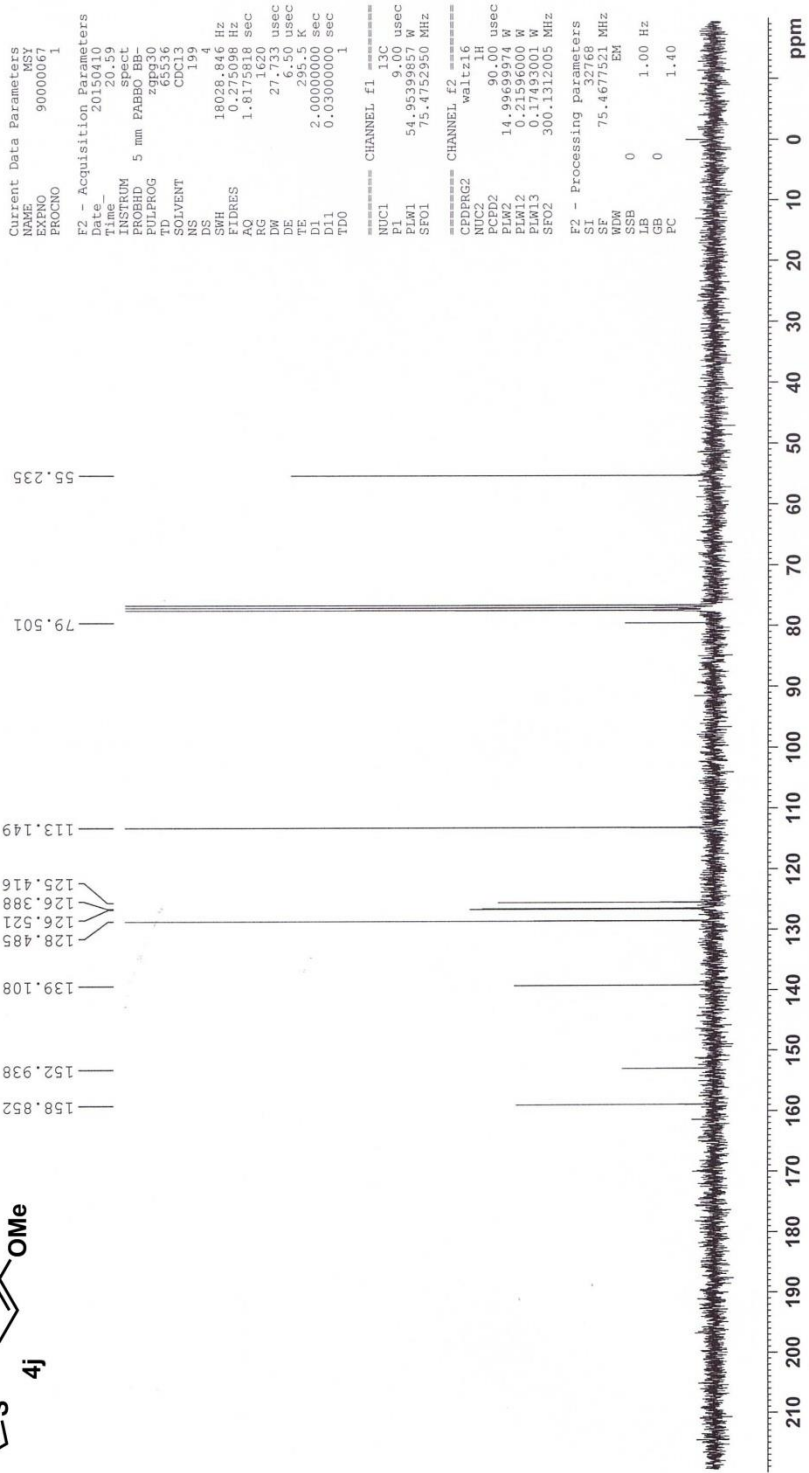
Current Data Parameters
 NAME MSY
 EXPNO 90000067
 PROCNO 1

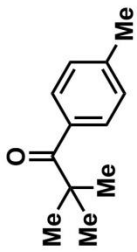
F2 - Acquisition Parameters
 Date_ 20150419
 Time 19:05:19
 INSTRUM spect
 PROHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 199
 SHH 18028.846 Hz
 SFO1 0.275098 Hz
 FIDRES 1.8175918 sec
 AQ 1620
 RG 1620
 DW 27.733 usec
 DE 6.50 usec
 TE 300.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TD0 1

CHANNEL F1
 NUC1 13C
 P1 0.10 usec
 PL1 54.9539857 W
 SFO1 75.4752950 MHz

CHANNEL F2
 CDPRG2 waltz16
 NUC2 1H
 P2 0.0000000 usec
 PL2 14.9969974 W
 SFO2 300.1312005 MHz

F2 - Processing parameters
 SI 32768
 SF 75.4677561 MHz
 REF 100
 EX
 SSB 0 1.00 Hz
 LB 0
 GB 0
 PC 1.40

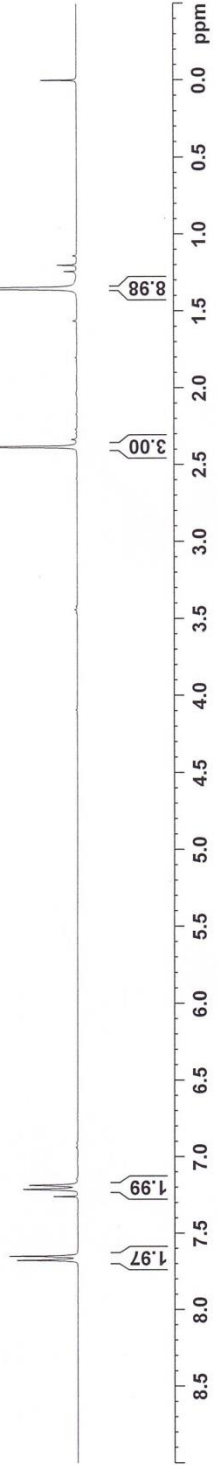


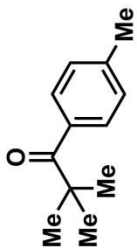


5a

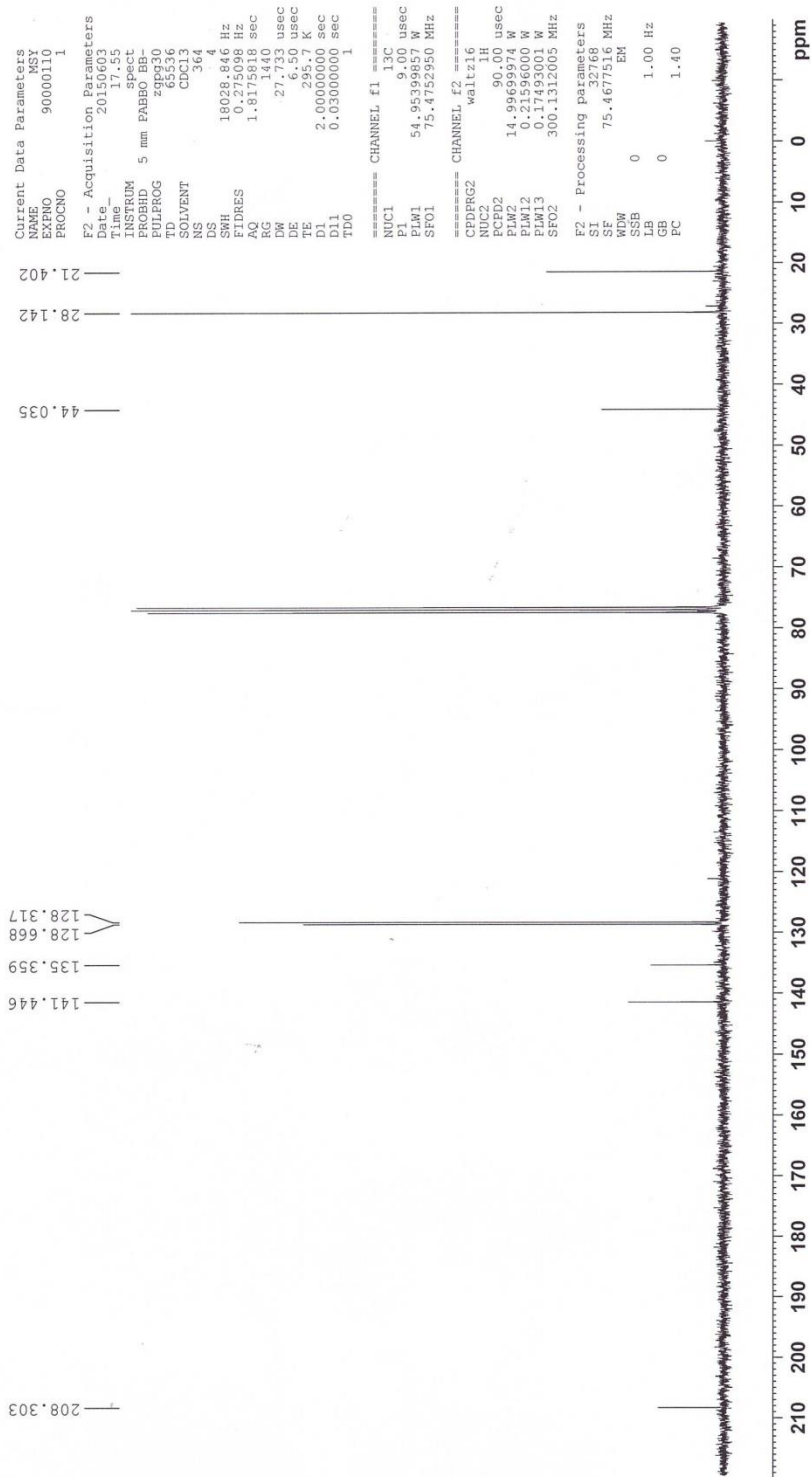
Current Data Parameters
 NAME MSY
 EXENO 90000109
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20150603
 Time_ 17.49
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 FULLPROG zg30
 TD 65519
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 80.06
 IN 80.06 usec
 DE 6.50 usec
 TE 295.6 K
 D1 1.00000000 sec
 TDO 1
 ===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PL1 14.9969974 W
 SF01 300.1318534 MHz
 F2 - Processing Parameters
 SI 65536
 SF 300.1300000 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 FC 1.00

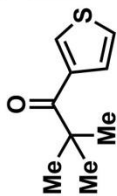
7.677
 7.650
 7.213
 7.186
 2.383
 1.333





5a

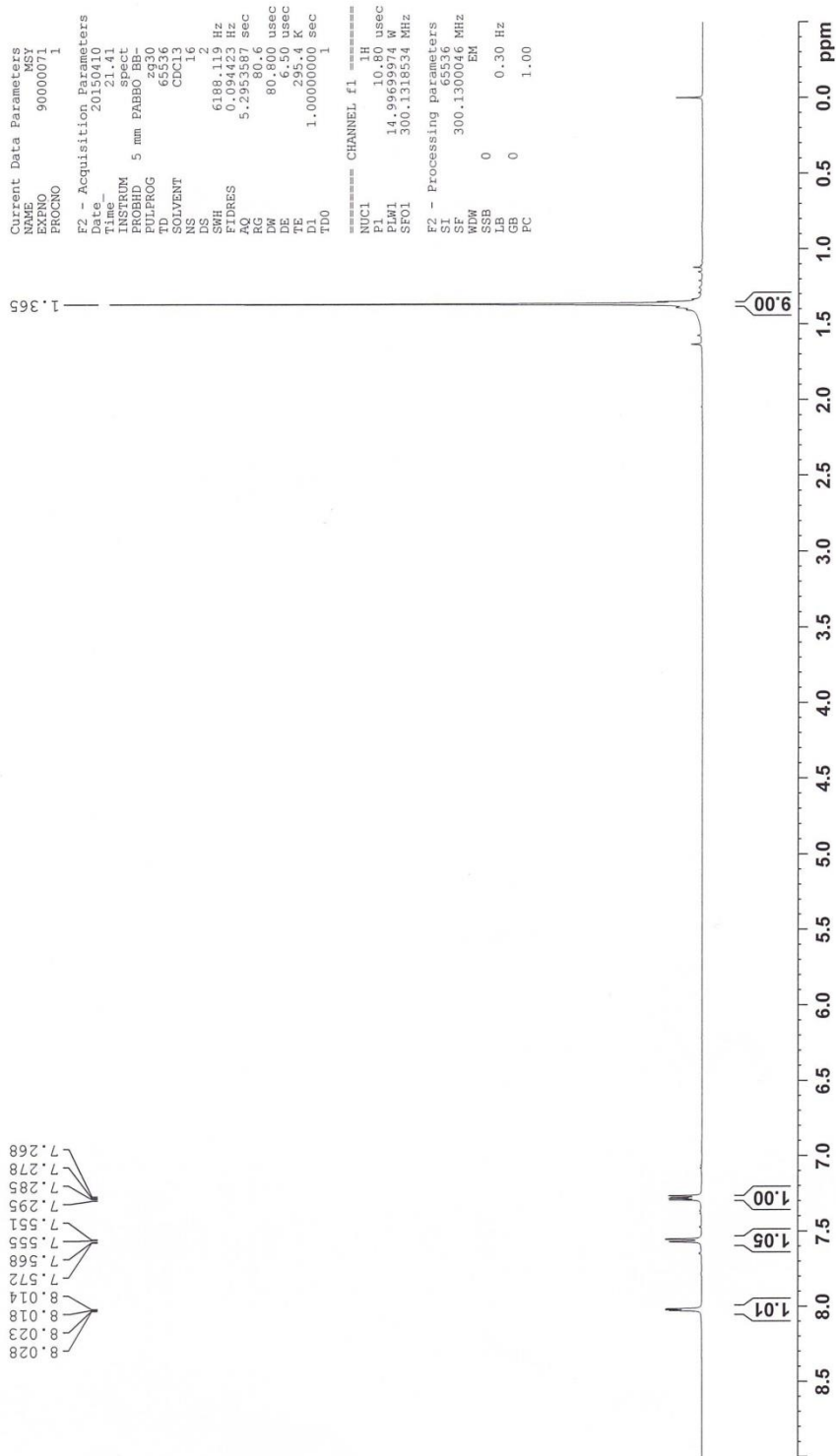


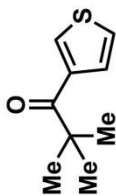


5b

8.028
8.023
8.018
8.014
7.572
7.568
7.555
7.551
7.295
7.285
7.278
7.268

Current Data Parameters
 NAME: NSY
 EXPNO: 90000071
 PROCNO: 1
 F2 - Acquisition Parameters
 Date_: 20150410
 Time: 21.41
 INSTRUM: spect
 PROBHD: 5 mm PABBO BB-
 PULPROG: zg30
 TD: 65536
 SOLVENT: CDCl3
 NS: 16
 DS: 4
 SWH: 6188.119 Hz
 FIDRES: 0.094423 Hz
 AQ: 5.2953587 sec
 RG: 80.6
 DM: 80.800 usec
 DE: 6.50 usec
 TE: 295.4 K
 D1: 1.00000000 sec
 TDO: 1
 ===== CHANNEL f1 =====
 NUC1: 1H
 P1: 10.80 usec
 PL1: 0.00 dB
 FWH: 14.995674 Hz
 STQ1: 300.1318534 MHz
 F2 - Processing parameters
 SI: 65536
 SF: 300.1300046 MHz
 WDW: EM
 SSB: 0
 GB: 0
 GR: 0
 FC: 1.00





5b

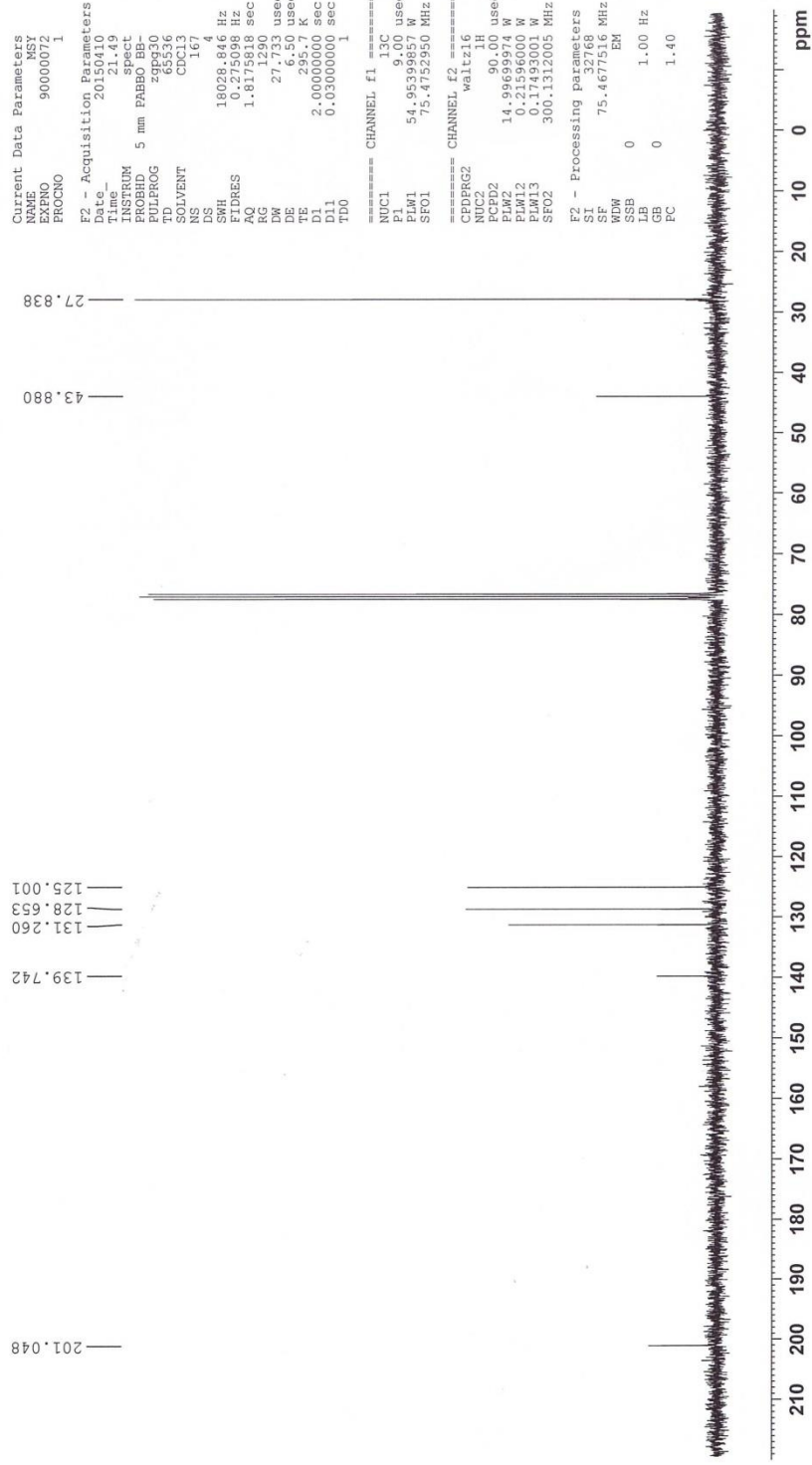
```

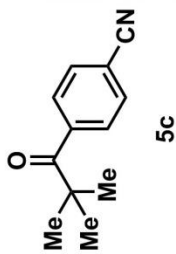
Current Data Parameters
=====
EXPNO      1
PROCNO     1
Date_      20150410
Time       21.49
INSTRUM    spect
PROBHD     5 mm PABBO
PULPROG    zgpg30
TD         65536
SOLVENT    CDCl3
NS         167
DS         4
SWH        18029.846 Hz
FIDRES     0.245 Hz
AQ         1.8175818 sec
RG         1280
DM         27.733 usec
DE         6.50 usec
TE         295.7 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1

===== CHANNEL f1 =====
NUC1       13C
P1         9.00 usec
PLM1       54.9539857 W
SFO1       75.4752950 MHz

===== CHANNEL f2 =====
CPDPRG2    waltz16
NUC2       1H
PCPD2      90.00 usec
PLM2       14.9669974 W
SFO2       0.17600000 MHz
PLM3       0.17600000 W
SFO3       0.17600000 MHz
SFO2       300.1312005 MHz

F2 - Processing parameters
SI         32768
SF         75.4677516 MHz
AQ         1.8175818 sec
RG         1280
SBB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```



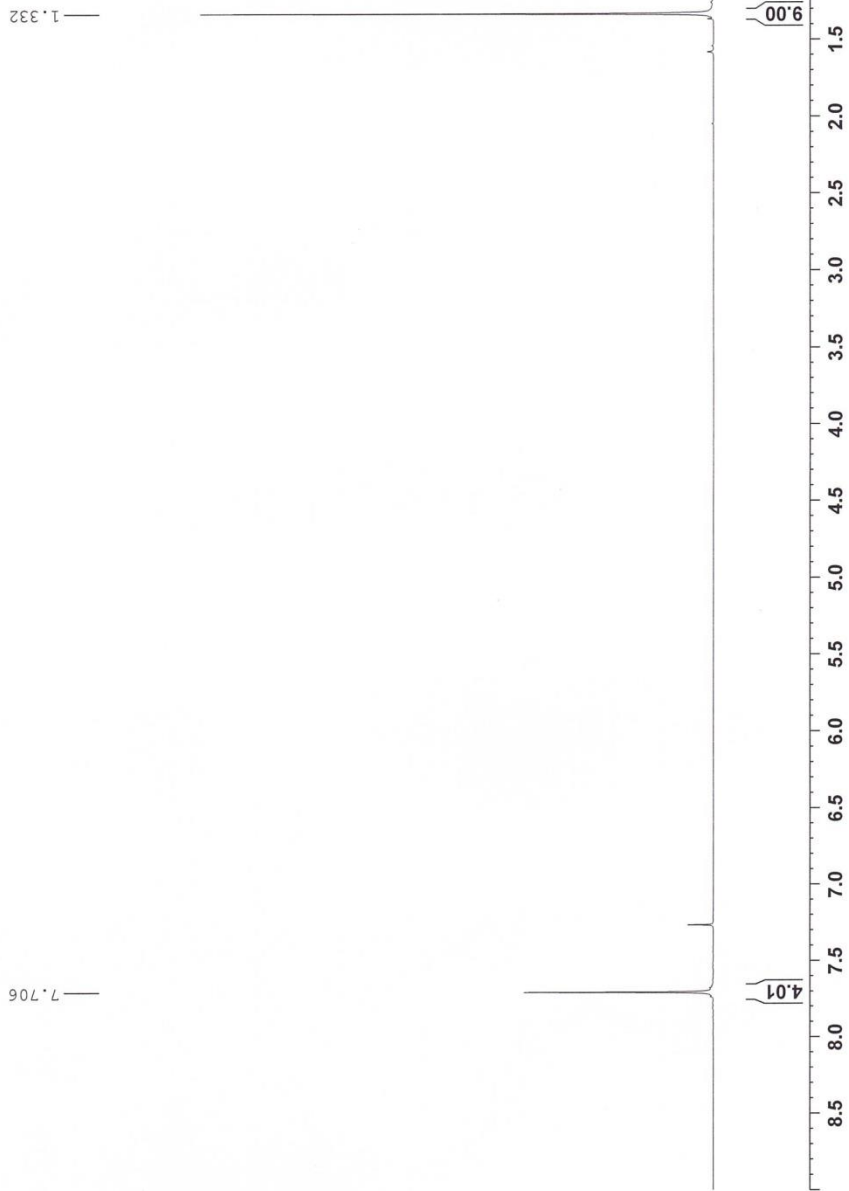


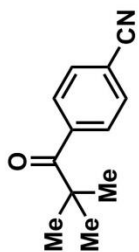
Current Data Parameters
 NAME MSY
 EXPNO 90000065
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20111116
 Time 20.49
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 2
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 114
 DW 80.800 usec
 DE 2.50 usec
 TE 29.5
 D1 1.00000000 sec
 TDO 1

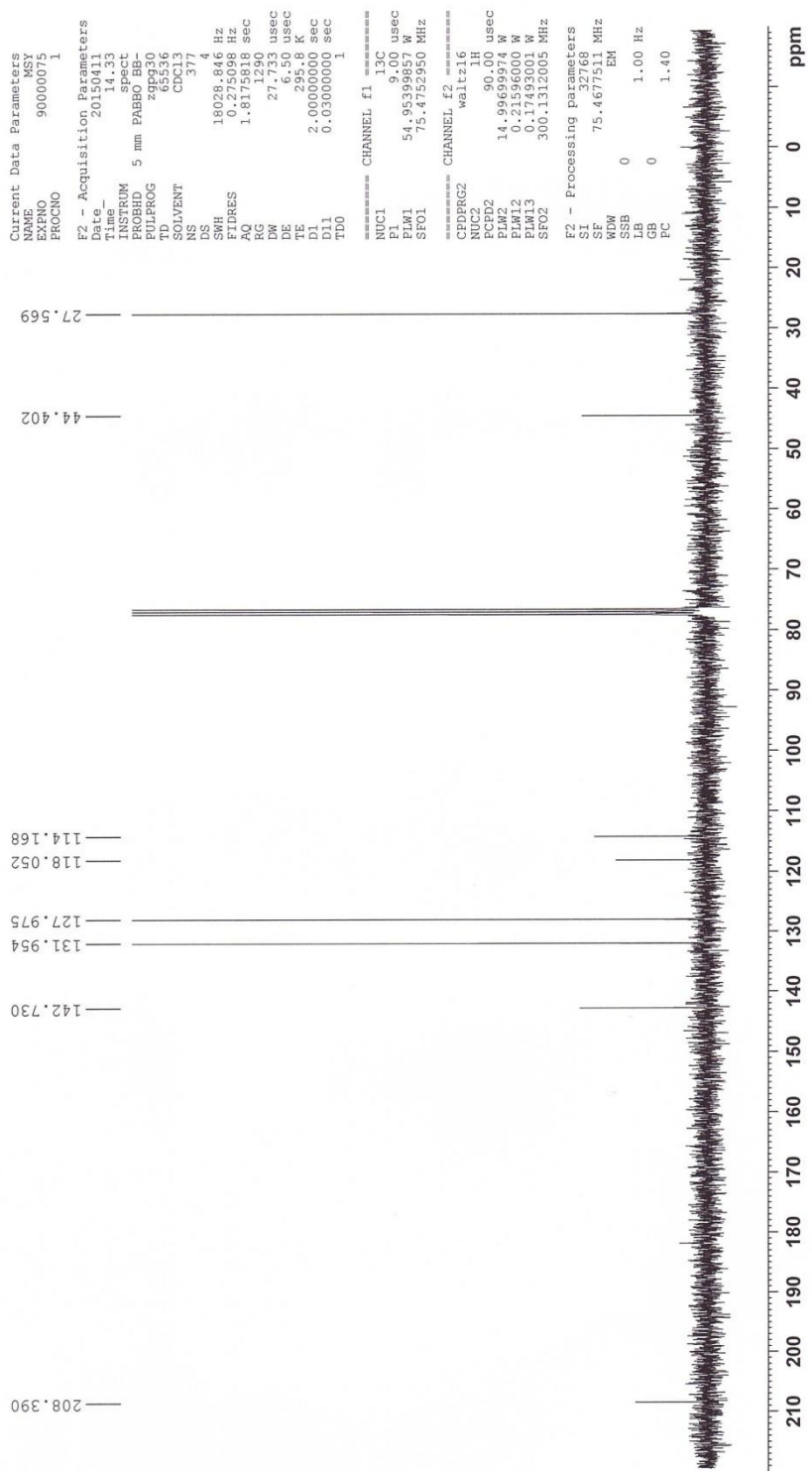
===== CHANNEL f1 =====
 NUC1 1H
 P1 10.00 usec
 PL1 14.9969974 W
 SF01 300.1318534 MHz

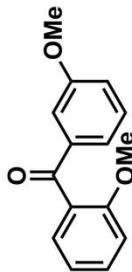
F2 - Processing parameters
 SI 65536
 SF 300.1300041 MHz
 SW 0
 SSB 0
 LB 0
 GB 0
 PC 0 0.30 Hz
 1.00





5c



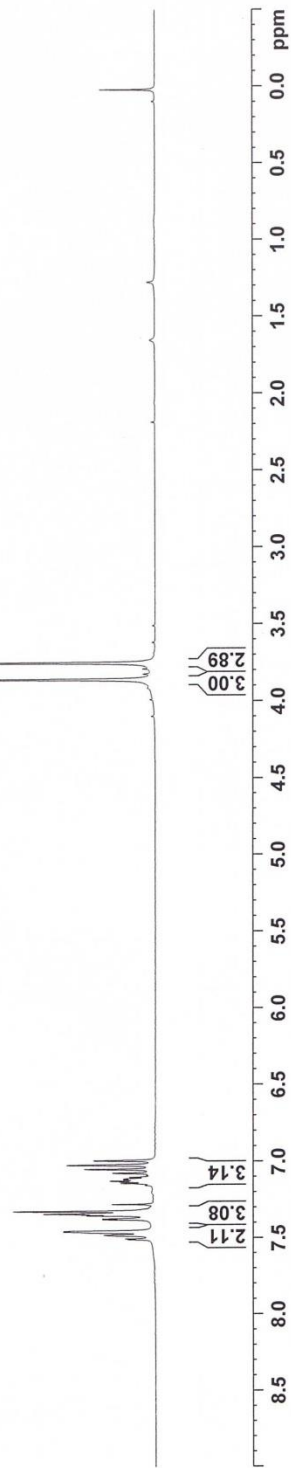


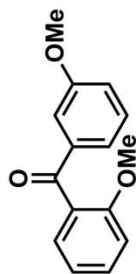
5d

7.510
7.504
7.480
7.458
7.453
7.378
7.373
7.353
7.353
7.347
7.340
7.335
7.323
7.143
7.134
7.128
7.121
7.116
7.112
7.103
7.075
7.053
7.051
7.025
6.995

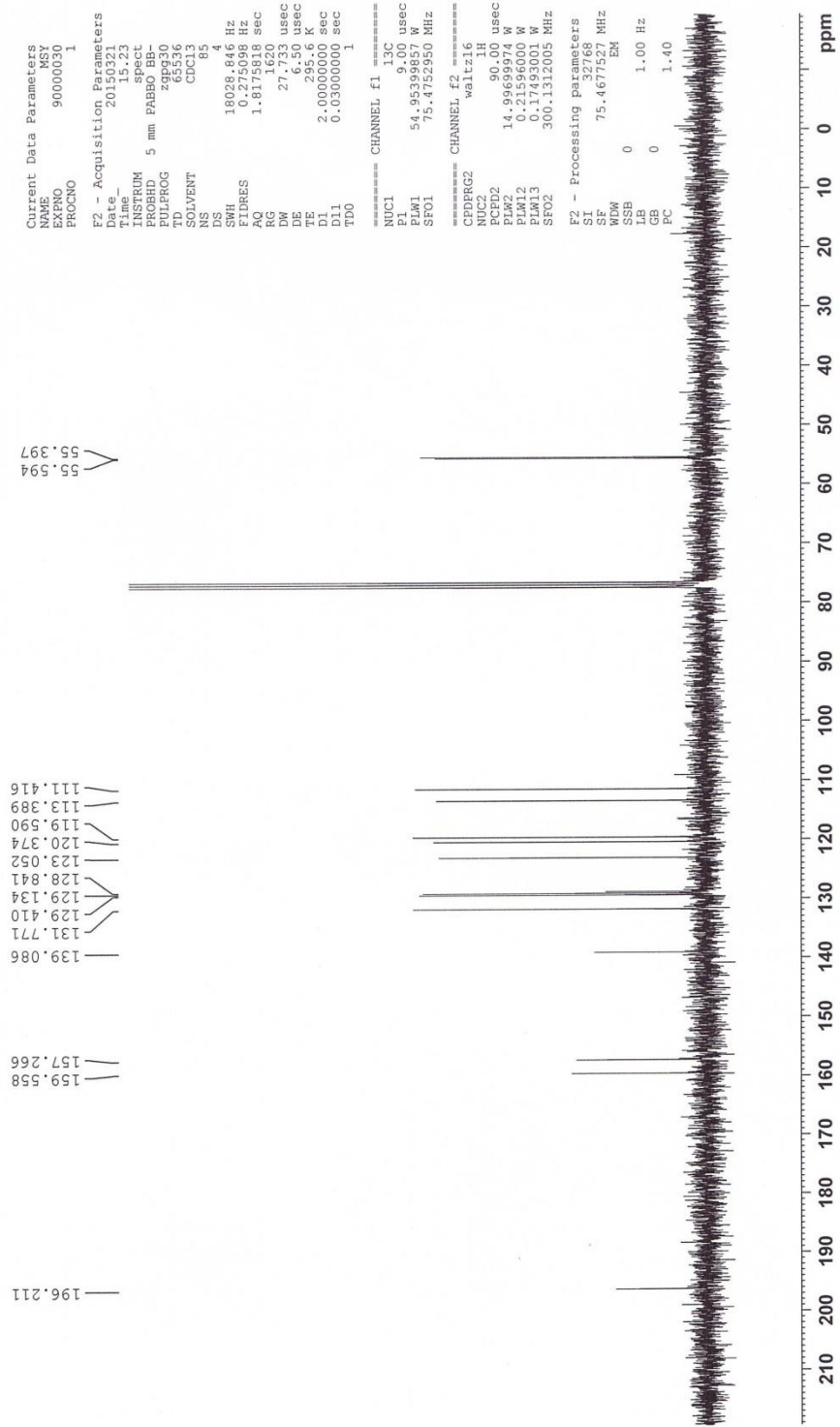
3.862
3.754

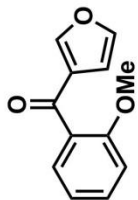
Current Data Parameters
 NAME MSY
 EXPNO 90000029
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20150117
 Time 16:07:14
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SFOH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 80.6
 DW 80.800 usec
 DE 6.50 usec
 TE 298.4 K
 D1 1.00000000 sec
 TDO 1
 CHANNEL f1
 NUC1 1H
 P1 10.00 usec
 PL1 0.00 dB
 FWH 14.9969094 MHz
 SFO1 300.1318534 MHz
 F2 - Processing parameters
 SI 65536
 SF 300.1300000 MHz
 WDW EM
 LB 0
 GB 0
 PC 1.00





5d

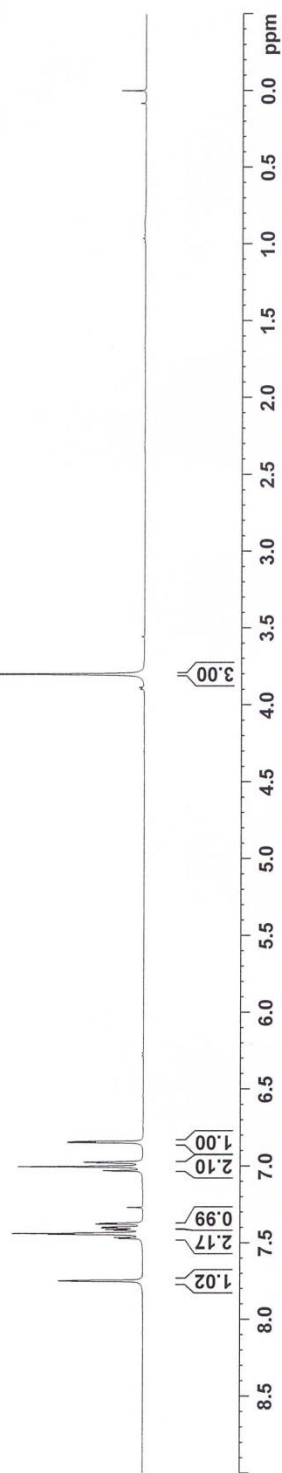


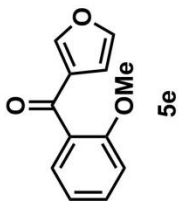


5e

7.754
7.751
7.749
7.747
7.743
7.467
7.447
7.441
7.436
7.420
7.414
7.405
7.404
7.399
7.379
7.374
7.034
7.031
7.006
6.984
6.981
6.977
6.850
6.848
6.844
6.841

Current Data Parameters
 NAME MS
 EXPNO 40141
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20150120
 Time 17.20
 INSTRUM spect
 PROBD 5 mm PABBO BB
 PULPROG zg30
 TD 65536
 SOLVENT CDC13
 NS 11
 DS 2
 SWH 6188.116 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 32
 DW 80.800 usec
 DE 6.50 usec
 TE 295.1 K
 D1 1.0000000 sec
 TDO 1
 ===== CHANNEL f1 =====
 NUC1 1H
 P1 10.80 usec
 PL1 14.9969974 W
 SFO1 300.1318534 MHz
 F2 - Processing parameters
 SI 65536
 SF 300.1300024 MHz
 WDM 0
 SSB 0
 GB 0
 PC 1.00





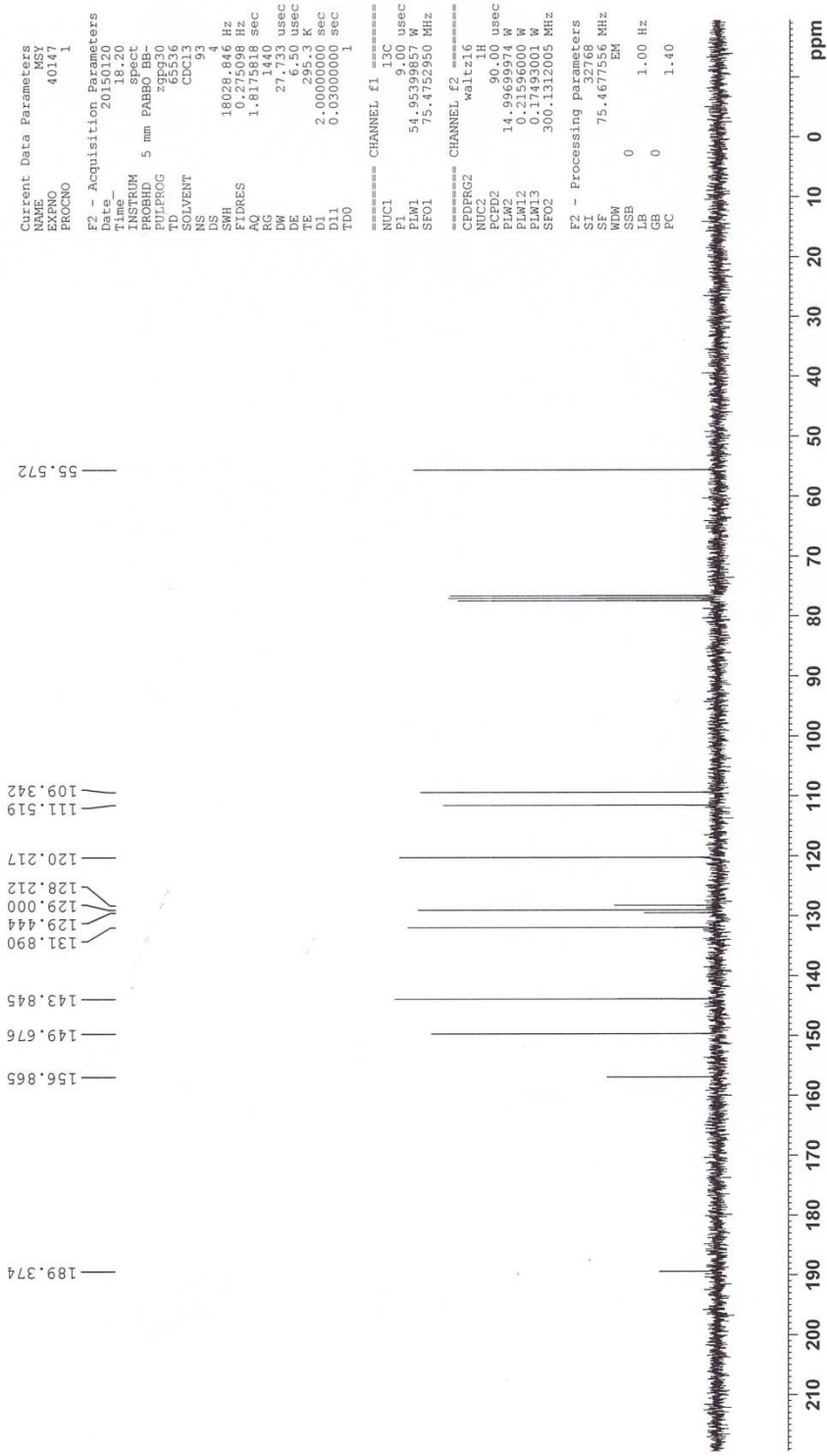
Current Data Parameters
 NAME MSY
 EXPNO 40147
 PROCNO 1

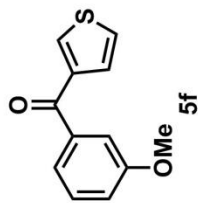
F2 - Acquisition Parameters
 Date_ 20150120
 Time 18.20
 INSTRUM spect
 PROBHID 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 93
 SH 18028.846 Hz
 FIDRES 0.275088 Hz
 AQ 1.8175818 sec
 RG 1440
 DW 27.733 usec
 DE 6.50 usec
 TE 295.2 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TDO 1

CHANNEL F1
 NUC1 13C
 P1 8.00 usec
 PL1 54.9539857 MHz
 SF01 75.4752950 MHz

CHANNEL F2
 CEDEFG2 waltz16
 NUC2 1H
 PCPD2 90.00 usec
 PL1 14.9969000 MHz
 PL12 0.21596000 W
 PL13 0.17493001 W
 SF02 300.1312005 MHz

F2 - Processing parameters
 SI 32768
 SF 75.4677556 MHz
 NFW EX
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



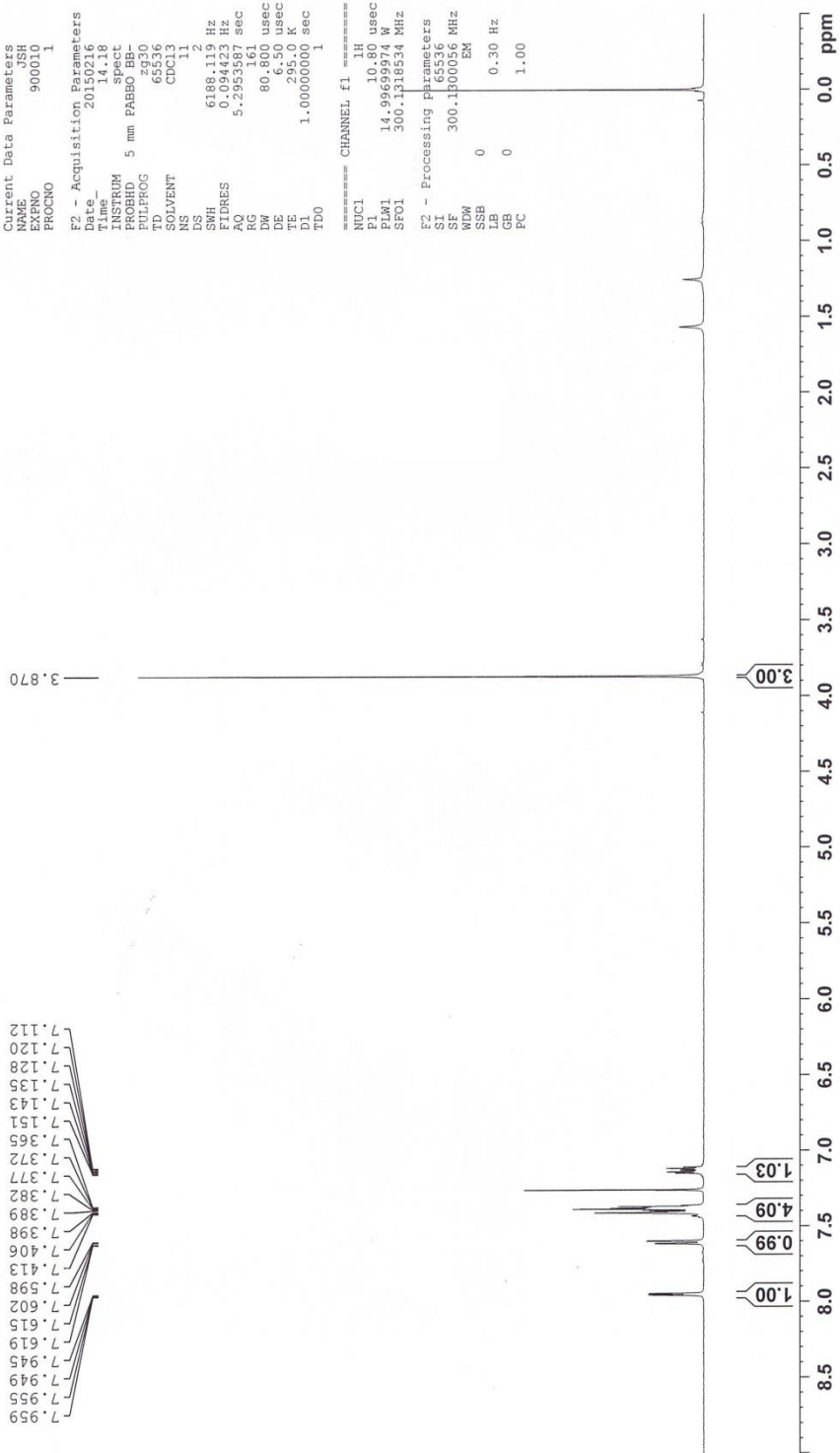


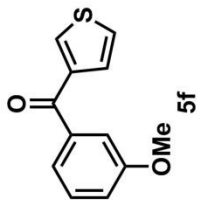
Current Data Parameters
 NAME JSH
 EXPNO 900010
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20130218
 Time 10:21:18
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 1
 DS 2
 SWH 6188.119 Hz
 FIDRES 0.094423 Hz
 AQ 5.2953587 sec
 RG 161
 DW 80.800 usec
 DE 6.50 usec
 DI 25.00 usec
 D1 1.00000000 sec
 TD0 1

CHANNEL F1
 NUC1 1H
 P1 10.00 usec
 PL1 0.00 dB
 SFO1 300.1318534 MHz

F2 - Processing parameters
 SI 65536
 SF 300.1300056 MHz
 WDW EM
 SS 0
 LB 0.30 Hz
 GB 0
 PC 1.00





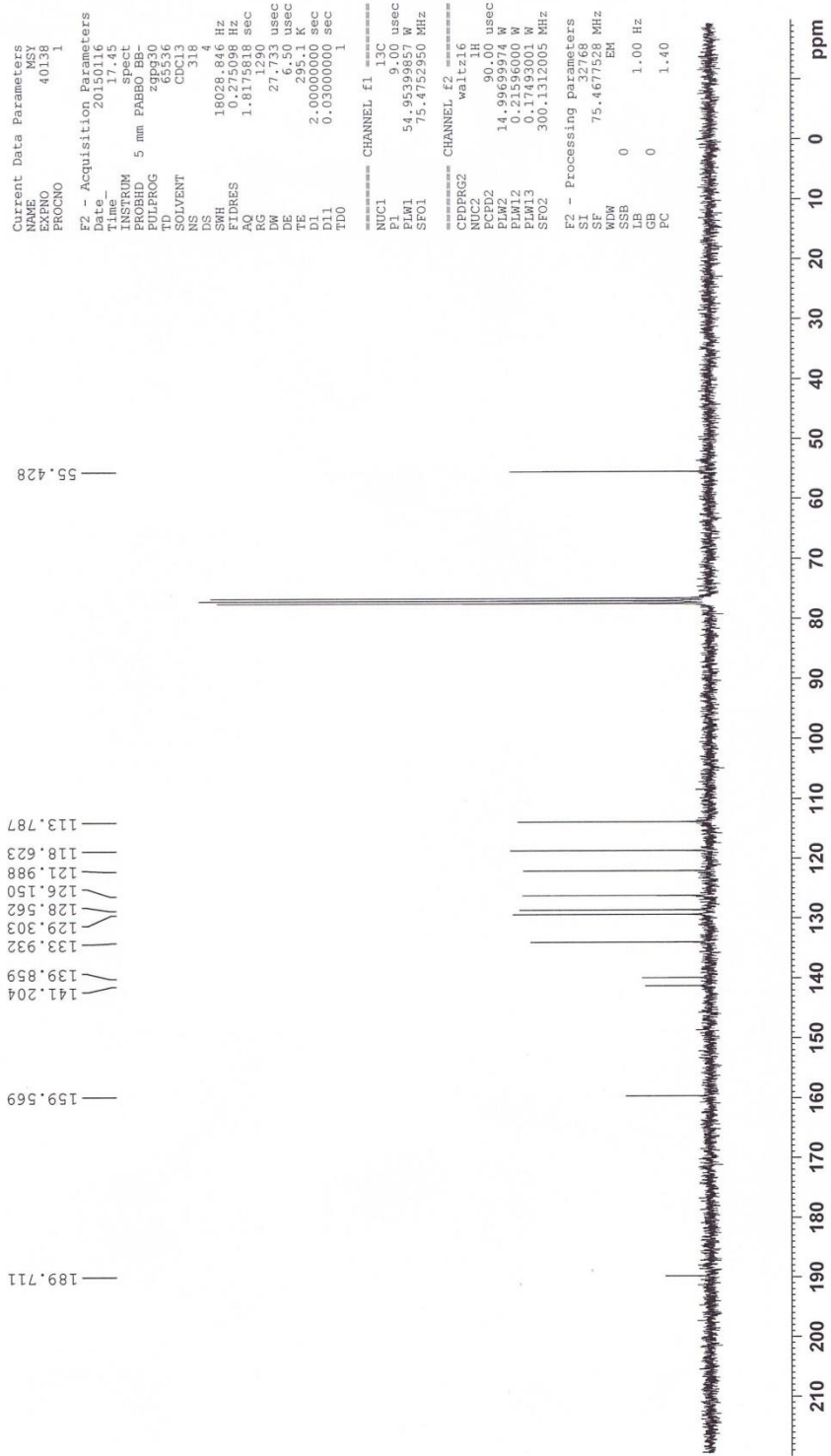
Current Data Parameters
 NAME MSY
 EXPNO 40138
 PROCNO 1

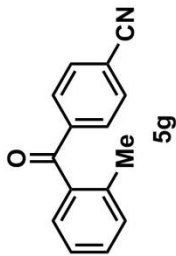
F2 - Acquisition Parameters
 Date_ 20150116
 Time_ 17.45
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 CPDPRG2 zgpg30
 SOLVENT CDCl3
 NS 318
 DS 4
 SWH 18028.846 Hz
 FIDRES 0.275098 Hz
 AQ 1.8175818 sec
 RG 271.730
 DE 27.730 usec
 TE 6.50 usec
 TD 295.1 K
 D1 2.0000000 sec
 D11 0.0300000 sec
 TDO 1

CHANNEL f1
 NUC1 13C
 P1 9.00 usec
 PLW1 54.95399857 W
 SFO1 75.4752950 MHz

CHANNEL f2
 wait:16
 NUC2 1H
 P2 90.00 usec
 PLW2 14.99699974 W
 PLM2 0.21596000 W
 PLM3 0.17493001 W
 SFO2 300.1312005 MHz

F2 - Processing parameters
 SI 32768
 SF 75.4677528 MHz
 WDR EM
 SSB 0
 GB 0
 PC 1.40

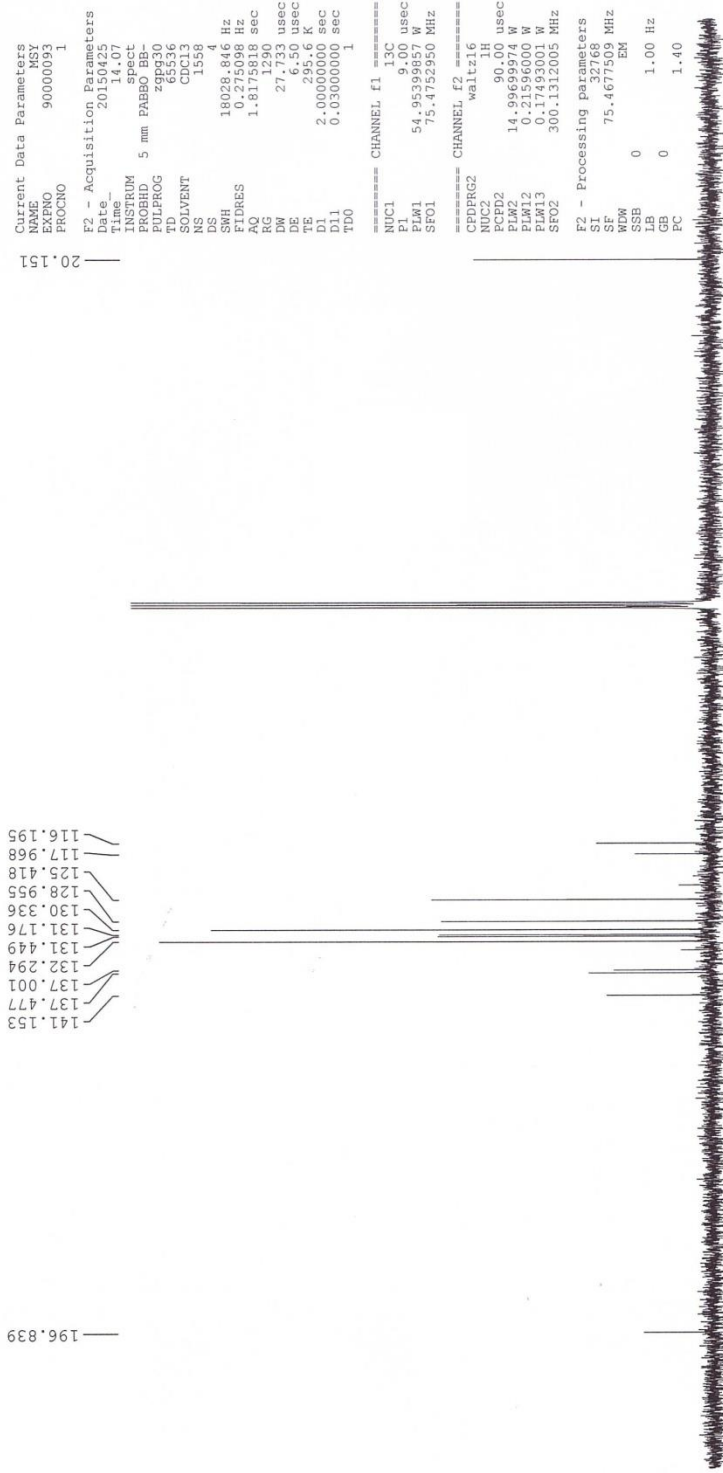
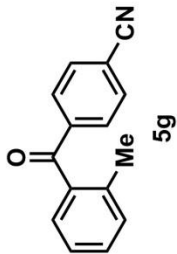


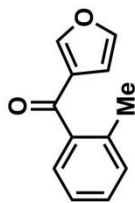


7.998
 7.870
 7.779
 7.751
 7.474
 7.454
 7.447
 7.440
 7.428
 7.419
 7.343
 7.317
 7.290
 7.282
 7.263

Current Data Parameters
 ExpNO 90000092
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20150425
 Time 14.01
 INSTRUM spect
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 6186.113 Hz
 FIDRES 0.14123 Hz
 AQ 5.2953587 sec
 RG 161
 DW 80.800 usec
 DE 6.50 usec
 TE 295.3 K
 D1 1.00000000 sec
 TDO 1
 CHANNEL f1
 NUC1 1H
 P1 10.80 usec
 PLW1 14.9969974 W
 SF01 300.1318534 MHz
 F2 - Processing parameters
 SI 65536
 SF 300.1300053 MHz
 EM
 WDW 0
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00







5h



