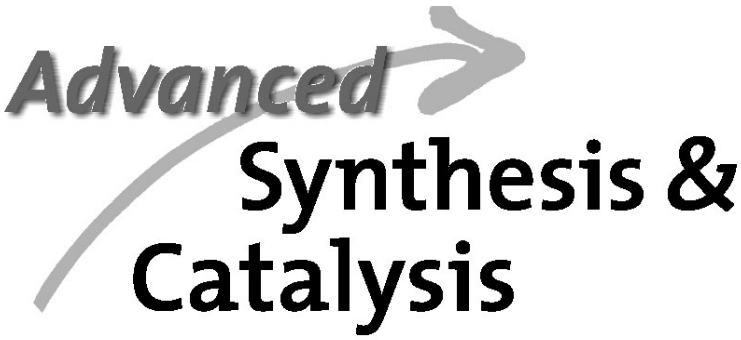

Supporting Information

Supporting Information

Copper(II)-Catalyzed Aerobic Oxidative Coupling between Chalcone and 2-Aminopyridine *via* C-H Amination: An Expedient Synthesis of 3-Aroylimidazo[1,2-*a*]pyridines

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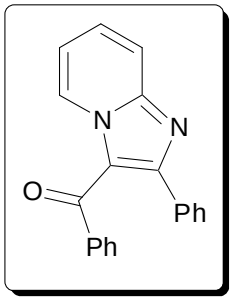
1. **Experimental Section**

A. General:

^{1}H NMR spectra were determined on a Bruker 400 (400 MHz) and Bruker 300 (300 MHz) spectrometer as solutions in $CDCl_3$. Chemical shifts are expressed in parts per million (δ) and the signals were reported as s (singlet), d (doublet), t (triplet), m (multiplet) and coupling constants *J* were given in Hz. ^{13}C NMR spectra were recorded at 100 MHz and 75 MHz in $CDCl_3$ solution. Chemical shifts are expressed in parts per million (δ) and are referenced to $CDCl_3$ (δ = 77.16) as internal standard. TLC was done on silica gel coated glass slide (Merck, Silica gel G for TLC). All solvents were dried and distilled before use. Commercially available substrates were freshly distilled before the reaction. Solvents, reagents and chemicals were purchased from Aldrich, Fluka, Merck, SRL, Spectrochem and Process Chemicals. All reactions involving moisture sensitive reactants were executed using oven dried glassware. The synthesis of chalcone was carried out according to the reported method.[1]

B. General procedure for synthesis of imidazo[1,2-*a*]pyridine derivatives:

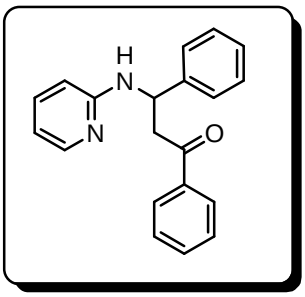


Phenyl-(2-phenyl-imidazo[1,2-a]pyridin-3-yl)-methanone (3a):

A mixture of 2-aminopyridine (**1a**, 1.2 mmol), chalcone(**2a**, 1 mmol), $Cu(OAc)_2.H_2O$ (0.1 mmol), and 1,10-Phenanthroline (0.1 mmol) in 1,2-dichlorobenzene (2 mL) was stirred in a reaction tube at 120 ^{O}C for 12 hours using O_2 baloon. The reaction was monitored by TLC. After completion of the reaction, it was cooled to room temperature. Then it was filtered and washed with dichloromethane. The filtrate was concentrated and the crude product was purified by column chromatography on silica gel using petroleum ether/ethyl acetate (2:1) as eluent. Yield:

84%; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.54 (d, *J* = 6.8 Hz, 1H), 7.80 (d, *J* = 9.2 Hz, 1H), 7.51 (d, *J* = 8.8 Hz, 2H), 7.3 (d, *J* = 9.6 Hz, 2H), 7.28-7.26 (m, 1H), 7.18-7.01 (m, 7H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ :187.2, 154.8, 147.2, 138.4, 133.8, 131.6, 130.0, 129.4, 129.1, 128.1, 127.6, 127.4 (2C), 119.8, 117.3, 114.5. Anal. Calcd. For (%) $C_{20}H_{14}N_2O$: C, 80.52; H, 4.73; N, 9.39. Found C, 80.51; H, 4.63; N, 9.41.

Typical procedure for synthesis of Michael adduct 1,3-diphenyl-3-(pyridin-2-ylamino)-propan-1-one (A):



1,3-Diphenyl-3-(pyridin-2-ylamino)-propan-1-one (A):

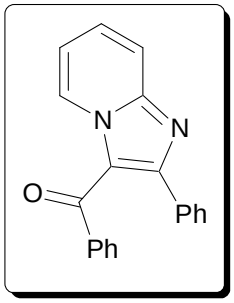
A mixture of 2-aminopyridine (**1a**, 1.2mmol), chalcone (**2a**, 1mmol) in 1,2 dichlorobenzene (2mL) was stirred in a reaction tube under ambient air at 120 ^{O}C for 18 hours. The reaction was monitored by TLC. After completion of the reaction, it was cooled to room temperature. Then it was filtered and washed with dichloromethane. The filtrate was concentrated and the crude product was purified by column chromatography on silica gel using petroleum ether/ethyl acetate (2:1) as eluent. Yield: 48%. ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 7.96 (d, *J* = 6.0 Hz, 1H), 7.84-7.81 (m, 2H), 7.48-7.41 (m, 1H), 7.39-7.32 (m, 4H), 7.29-7.20 (m, 3H), 7.19-7.17 (m, 1H), 6.47-6.44 (m, 1H), 6.27 (d, *J* = 8.4 Hz, 1H), 5.34-5.33 (m, 2H), 3.59-3.53 (m, 1H), 3.41-3.36 (m, 1H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ :197.9, 157.7, 148.0, 142.4, 137.4, 136.7, 133.2, 128.6, 128.5, 128.1, 127.2, 126.4, 113.3, 107.4, 52.5, 45.6. Anal. Calcd. For (%) $C_{20}H_{18}N_2O$: C, 79.44; H, 6.00; N, 9.26. Found C, 79.53; H, 6.12; N, 9.13.

Typical procedure for synthesis of phenyl-(2-phenyl-imidazo[1,2-a]pyridin-3-yl)-methanone (3a) from 1,3-diphenyl-3-(pyridin-2-ylamino)-propan-1-one (A):

A mixture of 1,3-diphenyl-3-(pyridin-2-ylamino)-propan-1-one (**A**, 0.25mmol), $Cu(OAc)_2.H_2O$ (0.025 mmol) and 1,10-Phenanthroline (0.025 mmol) in 1,2-dichlorobenzene (1 mL) was stirred in a reaction tube with O_2 baloon at 120 ^{O}C for 12 hours. The reaction was monitored by TLC. After completion of the reaction, it was cooled to room temperature. Then it was filtered and washed with dichloromethane. The filtrate was concentrated and the crude product was purified by short column chromatography on silica gel to afford the compound **3a**.

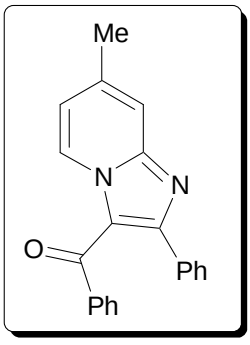
C. Spectroscopic Data:

Phenyl-(2-phenyl-imidazo[1,2-a]pyridin-3-yl)-methanone (Table 2, 3a):



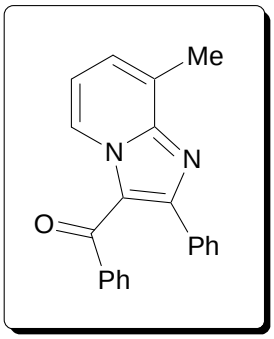
Yield: 250 mg, 84%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.54 (d, *J* = 6.8 Hz, 1H), 7.80 (d, *J* = 9.2 Hz, 1H), 7.51 (d, *J* = 8.8 Hz, 2H), 7.3 (d, *J* = 9.6 Hz, 2H), 7.28-7.26 (m, 1H), 7.18-7.01 (m, 7H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ :187.2, 154.8, 147.2, 138.4, 133.8, 131.6, 130.0, 129.4, 129.1, 128.1, 127.6, 127.4 (2C), 119.8, 117.3, 114.5 ; Anal. Calcd. For (%) $C_{20}H_{14}N_2O$: C, 80.52; H, 4.73; N, 9.39. Found C, 80.51; H, 4.63; N, 9.41.

(7-Methyl-2-phenyl-imidazo[1,2-a]pyridin-3-yl)-phenyl-methanone (Table 2, 3b):



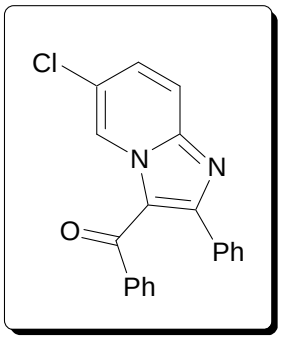
Yield: 249 mg, 80%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.35 (d, *J* = 7.2, 1H), 7.53 (s, 1H), 7.40 (d, *J* = 8.8 Hz, 2H), 7.22-7.14 (m, 3H), 7.05-6.96 (m, 5H), 6.86 (d, *J* = 6.8 Hz, 1H), 2.43 (s, 3H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.0, 154.9, 141.0, 138.6, 133.7, 131.5, 130.1, 129.4, 128.1, 127.6 (2C), 127.4, 119.6, 117.2, 115.9, 21.5; Anal. Calcd. For (%) $C_{21}H_{16}N_2O$: C, 80.75; H, 5.16; N, 8.97. Found C, 80.65; H, 5.14; N, 8.99.

(8-Methyl-2-phenyl-imidazo[1,2-a]pyridin-3-yl)-phenyl-methanone (Table 2, 3c):



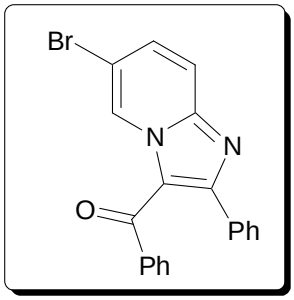
Yield: 243 mg, 78%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.29 (d, *J* = 6.8 Hz, 1H), 7.38 (d, *J* = 8.4 Hz, 2H), 7.22 (d, *J* = 7.6 Hz, 2H), 7.18-7.09 (m, 2H), 7.00-6.92 (m, 5H), 6.86 (t, *J* = 6.8 Hz, 1H), 2.61 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.2, 154.3, 147.4, 138.6, 134.1, 131.4, 130.1, 129.3, 127.9, 127.5, 127.5, 127.2, 125.7, 120.9, 114.4, 16.9; Anal. Calcd. For (%) $C_{21}H_{16}N_2O$: C, 80.75; H, 5.16; N, 8.97. Found C, 80.68; H, 5.26; N, 8.80.

(6-Chloro-2-phenyl-imidazo[1,2-a]pyridin-3-yl)-phenyl-methanone (Table 2, 3d):



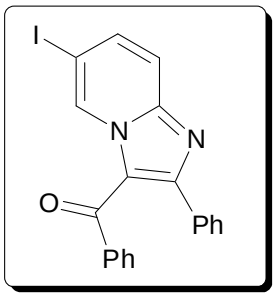
Yield: 269 mg, 81%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.54 (s, 1H), 7.67 (d, *J* = 9.6 Hz, 1H), 7.44-7.41 (m, 3H), 7.25-7.19 (m, 3H), 7.06-7.00 (m, 5H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.4, 155.2, 145.7, 138.3, 133.6, 132.1, 130.5, 130.2, 129.8, 128.6, 127.9, 126.3, 123.0, 120.3, 117.8; Anal. Calcd. For (%) $C_{20}H_{13}ClN_2O$: C, 72.18; H, 3.94; N, 8.42. Found C, 72.23; H, 4.01; N, 8.31.

(6-Bromo-2-phenyl-imidazo[1,2-a]pyridin-3-yl)-phenyl-methanone (Table 2, 3e):



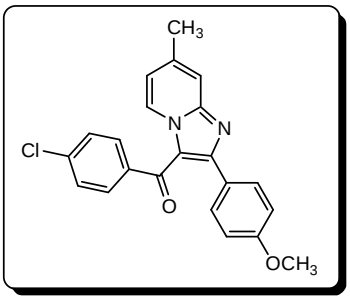
Yield: 286 mg, 76%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.70 (s, 1H) 7.71 (d, *J* = 9.6 Hz, 1H), 7.58 (d, *J* = 9.2 Hz, 1H), 7.50 (d, *J* = 8.0 Hz, 2H), 7.32-7.25 (m, 3H), 7.15-7.06 (m, 5H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.3, 154.8, 145.7, 141.2, 138.1, 133.4, 132.6, 132.1, 130.2, 129.6, 128.5, m128.3, 127.8, 117.9, 115.5, 109.5; Anal. Calcd. For (%) $C_{20}H_{13}BrN_2O$: C, 63.68; H, 3.47; N, 7.43. Found C, 63.80; H, 3.45; N, 7.47.

(6-Iodo-2-phenyl-imidazo[1,2-a]pyridin-3-yl)-phenyl-methanone (Table 2, 3f):



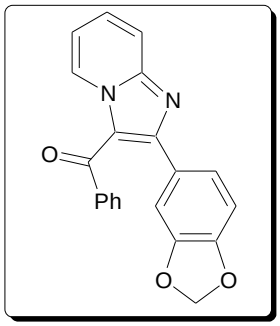
Yield: 335 mg, 79%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.78 (s, 1H), 8.09 (d, *J* = 6.4 Hz, 1H), 7.70-7.61 (m, 2H), 7.50-7.45 (m, 2H), 7.32-7.27 (m, 2H), 7.14-7.08 (m, 5H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.3, 154.3, 145.8, 138.1, 137.2, 133.0, 132.1, 130.2, 129.9, 129.6, 128.6, 128.3, 127.8, 119.7, 118.3, 78.0; Anal. Calcd. For (%) $C_{20}H_{13}IN_2O$: C, 56.62; H, 3.09; N, 6.60. Found C, 56.57; H, 3.29; N, 6.75

(4-Chloro-phenyl)-[2-(4-methoxy-phenyl)-7-methyl-imidazo[1,2-a]pyridin-3-yl]-methanone (Table 2, 3g):



Yield: 287 mg, 76%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.31 (d, *J* = 6.8 Hz, 1H), 7.51 (s, 1H), 7.32 (d, *J* = 6.8 Hz, 2H), 7.11 (d, *J* = 6.8 Hz, 2H), 6.99 (d, *J* = 6.8 Hz, 2H), 6.85 (d, *J* = 7.2 Hz, 1H), 6.53 (d, *J* = 8.8 Hz, 2H), 3.66 (s, 3H), 2.43 (s, 3H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 185.5, 159.9, 154.8, 147.7, 141.3, 137.6, 137.1, 131.4, 130.8, 127.9, 127.3, 125,.9, 119.2, 117.2, 115.9, 113.3, 55.2, 21.5; Anal. Calcd. For (%) $C_{22}H_{17}ClN_2O_2$: C, 70.12; H, 4.55; N, 7.43. Found C, 70.20; H, 4.67; N, 7.49.

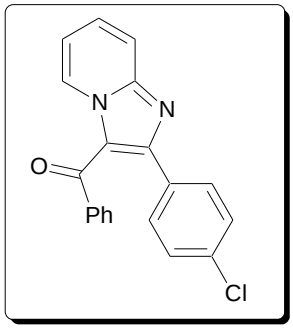
(2-Benzo[1,3]dioxol-5-yl-imidazo[1,2-a]pyridin-3-yl)-phenyl-methanone (Table 2, 3h):



Yield: 284 mg, 83%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.49 (d, *J* = 6.8 Hz, 1H), 7.78 (d, *J* = 8.4 Hz, 1H), 7.52-7.49 (m, 3H), 7.29 (t, *J* = 7.6 Hz, 1H), 7.14 (t, *J* = 7.6 Hz, 2H), 7.05 (t, *J* = 7.6 Hz, 1H), 6.85 (s, 1H), 6.75 (d, *J* = 8.0 Hz, 1H), 6.48 (d, *J* = 8.0 Hz, 1H), 5.83 (s, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.2, 154.3, 147.7, 147.2, 147.1, 138.7, 131.7, 129.4, 129.3, 128.1, 127.8, 127.6, 124.9, 119.6, 117.1,

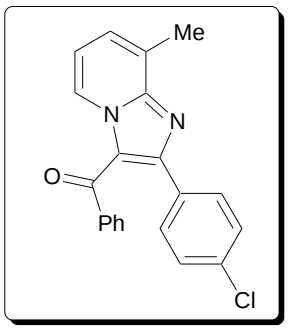
114.6, 110.1, 107.7, 101.0, 21.3; Anal. Calcd. For (%) $C_{21}H_{14}N_2O_3$: C, 73.68; H, 4.12; N, 8.18. Found C, 73.77; H, 4.25; N, 8.23.

[2-(4-Chloro-phenyl)-imidazo[1,2-a]pyridin-3-yl]-phenyl-methanone (Table 2, 3i):



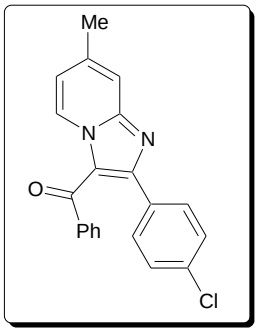
Yield: 269 mg, 81%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.44 (d, *J* = 6.8 Hz, 1H), 7.73 (d, *J* = 8.8 Hz, 1H), 7.46 (d, *J* = 8.4 Hz, 1H), 7.42 (d, *J* = 8.0 Hz, 2H), 7.24 (t, *J* = 7.6 Hz, 1H), 7.17 (d, *J* = 8.8 Hz, 2H), 7.07-7.02 (m, 3H), 6.98 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.0, 153.3, 147.3, 138.4, 134.4, 132.4, 131.9, 131.3, 129.4, 129.3, 128.1, 127.8, 119.9, 117.3, 114.7; Anal. Calcd. For (%) $C_{20}H_{13}ClN_2O$: C, 72.18; H, 3.94; N, 8.42. Found C, 72.24; H, 4.13; N, 8.46.

[2-(4-Chloro-phenyl)-8-methyl-imidazo[1,2-a]pyridin-3-yl]-phenyl-methanone (Table 2, 3j):



Yield: 263 mg, 76%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.41 (d, *J* = 6.4 Hz, 1H), 7.50 (d, *J* = 7.2 Hz, 2H), 7.36-7.27 (m, 4H), 7.14 (t, *J* = 7.6 Hz, 2H), 7.08-7.02 (m, 3H), 2.74 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 187.2, 153.1, 138.6, 134.2, 132.8, 131.8, 131.4, 129.4, 128.2, 127.9, 127.8, 127.5, 125.9, 114.8, 17.0; Anal. Calcd. For (%) $C_{21}H_{15}ClN_2O$: C, 72.73; H, 4.36; N, 8.08. Found C, 72.81; H, 4.51; N, 8.13.

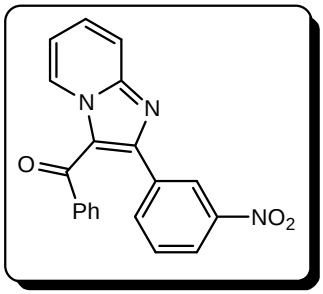
[2-(4-Chloro-phenyl)-7-methyl-imidazo[1,2-a]pyridin-3-yl]-phenyl-methanone (Table 2, 3k):



Yield: 270 mg, 78%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.43 (d, *J* = 7.2 Hz, 1H), 7.56 (s, 1H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.32 (t, *J* = 7.6 Hz, 1H), 7.24 (d, *J* = 8.4 Hz, 2H), 7.13 (t, *J* = 8.0 Hz, 2H), 7.06 (d, *J* = 8.4 Hz, 2H), 6.94 (d, *J* = 7.2 Hz, 1H), 2.52 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 186.8, 153.7, 147.8, 141.0, 138.6, 134.3, 132.6, 131.7, 131.3,

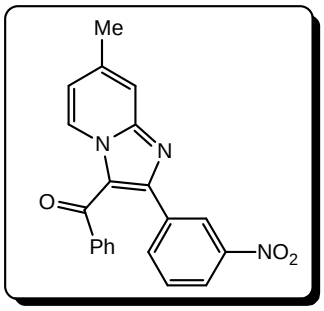
129.4, 127.8, 127.4, 119.7, 117.2, 116.0, 21.5; Anal. Calcd. For (%) $C_{21}H_{15}ClN_2O$: C, 72.73; H, 4.36; N, 8.08. Found C, 72.85; H, 4.51; N, 8.13.

[2-(3-Nitro-phenyl)-imidazo[1,2-a]pyridin-3-yl]-phenyl-methanone (Table 2, 3l):



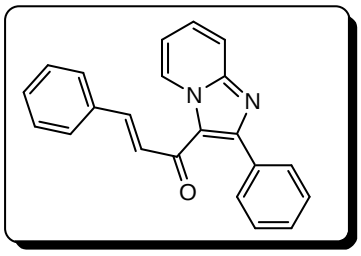
Yield: 277 mg, 81%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.47 (d, *J* = 7.2 Hz, 1H), 8.02 (s, *J* = 9.0 Hz, 1H), 7.90 (d, *J* = 8.8 Hz, 1H), 7.75 (d, *J* = 8.8 Hz, 1H), 7.62 (d, *J* = 8.0 Hz, 1H), 7.50 (t, *J* = 8.4 Hz, 1H), 7.40 (d, *J* = 8.4 Hz, 2H), 7.23-7.14 (m, 2H), 7.08 (t, *J* = 7.6 Hz, 1H), 7.0 (t, *J* = 8.0 Hz, 2H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 186.9, 152.0, 147.5, 147.4, 138.4, 135.7, 132.1, 129.9, 129.4, 128.8, 128.4, 128.0, 125.3, 122.9, 120.4, 117.6, 115.3; Anal. Calcd. For (%) $C_{20}H_{13}N_3O_3$: C, 69.96; H, 3.82; N, 12.24. Found C, 70.13; H, 3.95; N, 12.29.

[7-Methyl-2-(3-nitro-phenyl)-imidazo[1,2-a]pyridin-3-yl]-phenyl-methanone (Table 2, 3m):



Yield: 285 mg, 80%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.42 (d, *J* = 7.2 Hz, 1H), 8.05 (s, 1H), 7.94 (d, *J* = 7.2 Hz, 1H), 7.67 (d, *J* = 7.6 Hz, 1H), 7.55 (s, 1H), 7.43 (d, *J* = 7.2 Hz, 2H), 7.28-7.18 (m, 2H), 7.05 (t, *J* = 7.6 Hz, 2H), 6.96 (d, *J* = 7.2 Hz, 1H), 2.50 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 186.6, 152.2, 147.8, 147.3, 141.6, 138.6, 135.8, 135.6, 131.8, 129.3, 128.7, 127.9, 127.5, 125.2, 122.8, 120.1, 117.8, 116.1, 21.6; Anal. Calcd. For (%) $C_{21}H_{15}N_3O_3$: C, 70.58; H, 4.23; N, 11.76. Found C, 70.63; H, 4.33; N, 11.86.

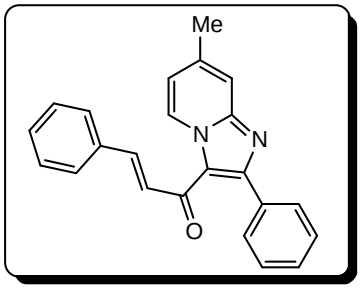
3-Phenyl-1-(2-phenyl-imidazo[1,2-a]pyridin-3-yl)-propenone (Table 2, 3n):



Yield: 269 mg, 83%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.81 (d, *J* = 7.2 Hz, 1H), 7.79 (d, *J* = 8.8 Hz, 1H), 7.70-7.64 (m, 3H), 7.52-7.45 (m, 4H), 7.25-7.20 (m, 3H), 7.09 (d, *J* = 6.8 Hz, 2H), 7.05 (t, *J* = 6.8 Hz, 1H), 6.83 (d, *J* = 15.6 Hz, 1H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 180.5, 154.2, 146.9, 141.0, 134.8,

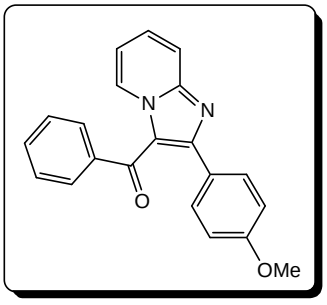
130.5, 129.9, 129.5, 129.2, 128.9, 128.6, 128.4, 128.0, 125.3, 122.0, 117.1, 114.8; Anal. Calcd. For (%) $C_{22}H_{16}N_2O$: C, 81.46; H, 4.97; N, 8.64. Found C, 81.55; H, 5.134; N, 8.77.

1-(7-Methyl-2-phenyl-imidazo[1,2-a]pyridin-3-yl)-3-phenyl-propenone (Table 2, 3o):



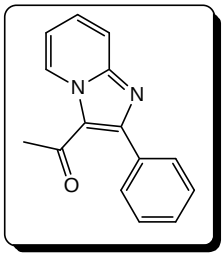
Yield: 270 mg, 80%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.62 (d, *J* = 7.2 Hz, 1H), 7.61-7.54 (m, 3H), 7.44-7.39 (m, 4H), 7.18-7.12 (m, 3H), 7.01 (d, *J* = 6.8 Hz, 2H), 6.81 (d, *J* = 7.2 Hz, 1H), 6.75 (d, *J* = 15.6Hz, 1H), 2.37 (s, 3H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 180.2, 154.8, 147.6, 141.2, 140.6, 135.2, 134.9, 130.5, 129.9, 129.2, 128.7, 128.4, 128.2, 128.1, 125.4, 121.9, 117.3, 115.9, 21.5; Anal. Calcd. For (%) $C_{23}H_{18}N_2O$: C, 81.63; H, 5.36; N, 8.28. Found C, 81.71; H, 5.47; N, 8.32.

[2-(4-Methoxy-phenyl)-imidazo[1,2-a]pyridin-3-yl]-phenyl-methanone (Table 2, 3p):



Yield: 242 mg, 74%; Gummy mass; ^{1}H NMR ($CDCl_3$, 300 MHz) δ : 9.48 (d, *J* = 6.0 Hz, 1H), 7.79 (d, *J* = 7.2 Hz, 1H), 7.50-7.44 (m, 3H), 7.26-7.22 (m, 3H), 7.11-7.00 (m, 3H), 6.58 (d, *J* = 6.9 Hz, 2H), 3.67 (s, 3H) ; ^{13}C NMR ($CDCl_3$, 75 MHz) δ : 187.4, 159.7, 154.6, 147.3, 146.3, 139.2, 138.6, 131.7, 131.5, 128.2, 127.8, 126.2, 119.6, 117.2, 114.5, 113.3, 55.2; Anal. Calcd. For (%) $C_{21}H_{16}N_2O_2$: C, 76.81; H, 4.91; N, 8.53. Found C, 76.79; H, 4.88; N, 8.50.

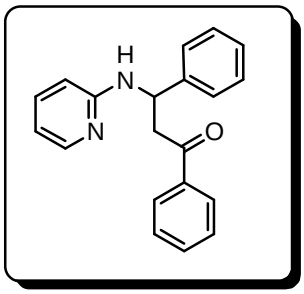
1-(2-Phenyl-imidazo[1,2-a]pyridin-3-yl)-ethanone (Table 2, 3q):



Yield: 61 mg, 26%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 9.80 (d, *J* = 7.2 Hz, 1H), 7.72 (d, *J* = 8.8 Hz, 1H), 7.47-7.45 (m, 3H), 7.19-7.17 (m, 2H), 7.07-7.05 (m, 2H), 2.13 (s, 3H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ : 192.0, 157.3, 145.9, 140.1, 139.0, 133.7, 133.0, 128.9, 128.5, 127.9, 123.2, 111.6, 21.8; Anal. Calcd. For (%) $C_{15}H_{12}N_2O$: C, 76.25; H, 5.12; N, 11.86. Found C,

76.21; H, 5.10; N, 11.83.

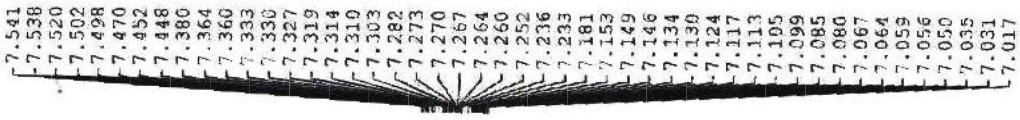
1,3-Diphenyl-3-(pyridin-2-ylamino)-propan-1-one (A):

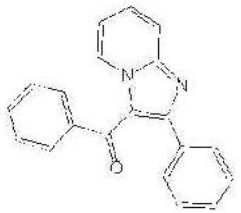


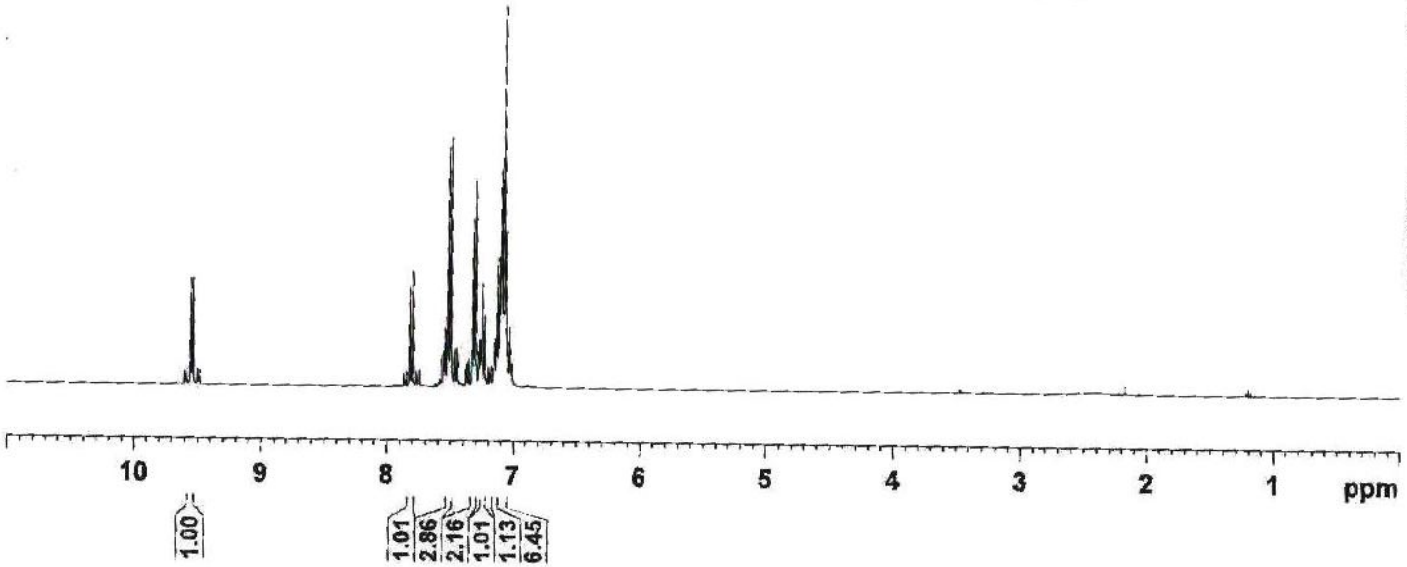
Yield: 145 mg, 48%; Gummy mass; ^{1}H NMR ($CDCl_3$, 400 MHz) δ : 7.96 (d, *J* = 6.0 Hz, 1H), 7.84-7.81 (m, 2H), 7.48-7.41 (m, 1H), 7.39-7.32 (m, 4H), 7.29-7.20 (m, 3H), 7.19-7.17 (m, 1H), 6.47-6.44 (m, 1H), 6.27 (d, *J* = 8.4 Hz, 1H), 5.34-5.33 (m, 2H), 3.59-3.53 (m, 1H), 3.41-3.36 (m, 1H) ; ^{13}C NMR ($CDCl_3$, 100 MHz) δ :197.9, 157.7, 148.0, 142.4, 137.4, 136.7, 133.2, 128.6, 128.5, 128.1, 127.2, 126.4, 113.3, 107.4, 52.5, 45.6; Anal. Calcd. For (%) $C_{20}H_{18}N_2O$: C, 79.44; H, 6.00; N, 9.26. Found C, 79.53; H, 6.12; N, 9.13.

2. References:

1. *Vogel's Textbook of Practical Organic Chemistry* (5th Edition) [A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford, P.W.G. Smith], Page No: 1034.







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PROCNO 1

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PULPROG zg30
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SOLVENT CDCl3
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FIDRES 0.250967 Hz
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RG 37.83
DW 60.800 usec
DE 6.50 usec
TE 291.1 K
D1 1.00000000 sec
TD0 1

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P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz

F2 - Processing parameters
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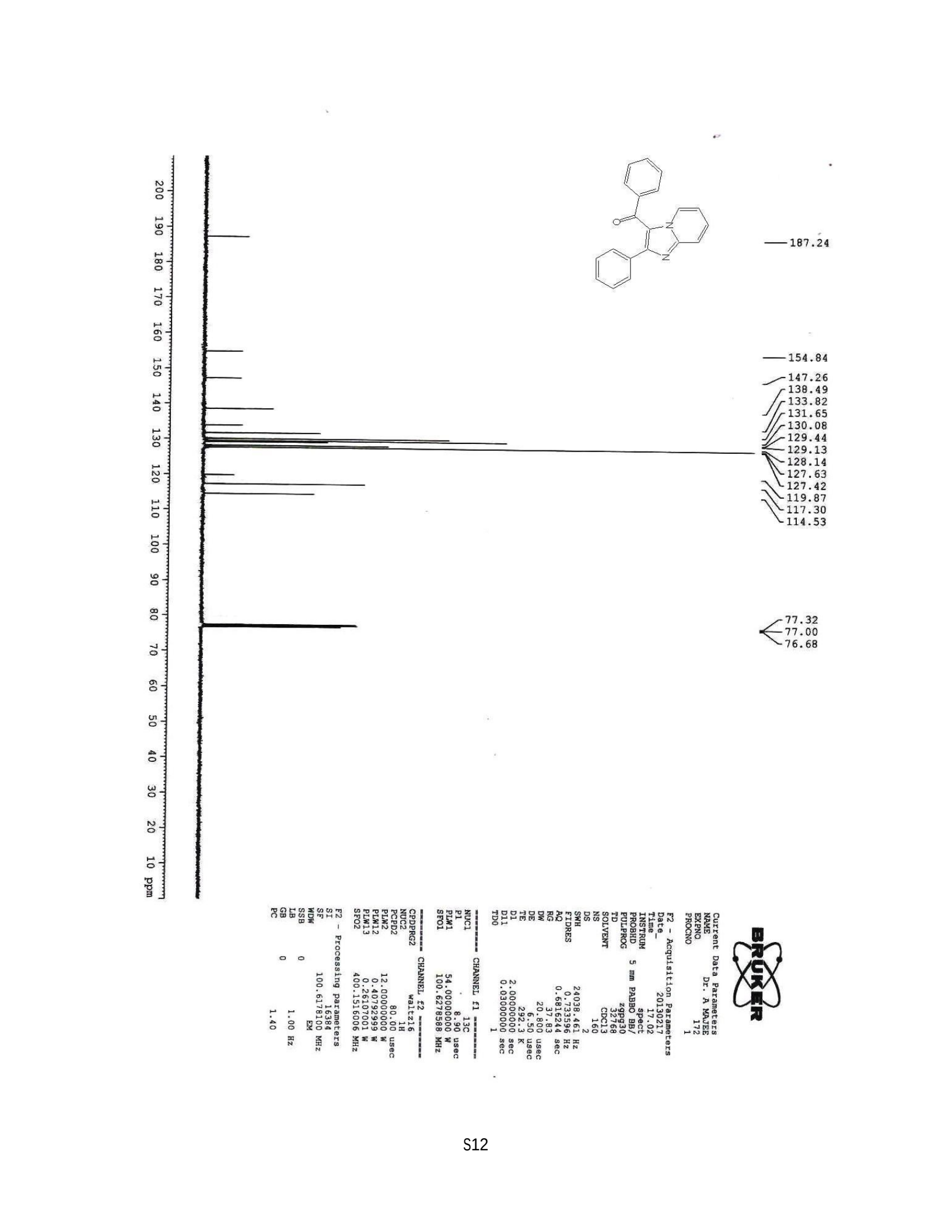
SF 400.1500000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00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117.30
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76.68
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EXPNO 172
PROCNO 1
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PULPROG zgpg30
TD 32768
SOLVENT CDCl3
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DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 37.83
DW 20.800 usec
DE 6.50 usec
TE 292.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
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P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz
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NUC2 1H
PCPD2 80.00 usec
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PLW12 0.40792999 W
PLW13 0.26107001 W
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F2 - Processing parameters
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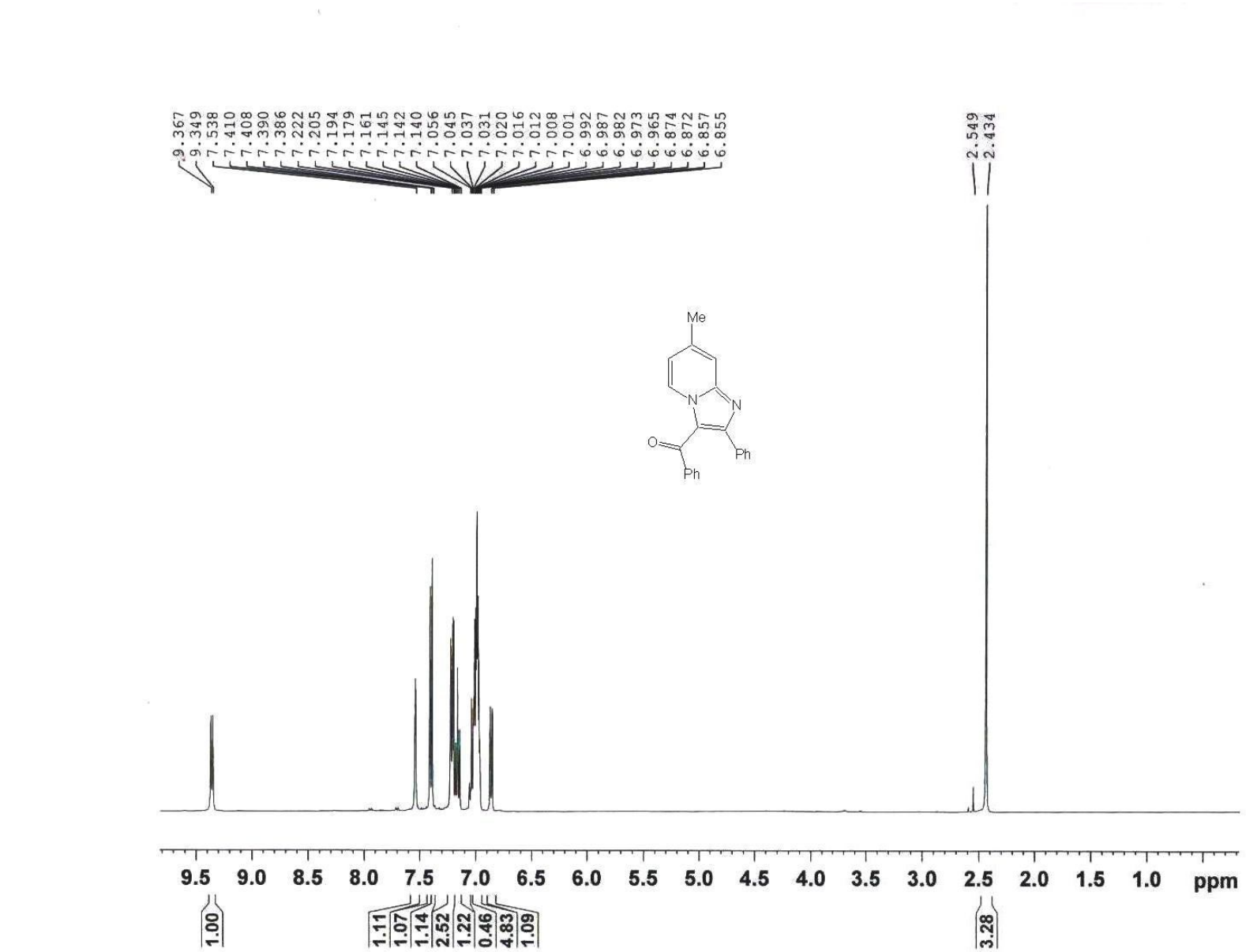
WDW EM
SSB 0 1.00 Hz
LB 0
GB 0
PC 1.40



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EXPNO                     2
PROCNO                    1

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Time                  12.12
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PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                       32
DS                        2
SWH                8223.685 Hz
FIDRES            0.250967 Hz
AQ                1.9923444 sec
RG                    67.81
DW                   60.800 usec
DE                    6.50 usec
TE                   295.7 K
D1                1.00000000 sec
TD0                       1

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NUC1                     1H
P1                    14.75 usec
PLW1          11.99499989 W
SFO1          400.1524711 MHz

F2 - Processing parameters
SI                    16384
SF            400.1500353 MHz
WDW                      EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
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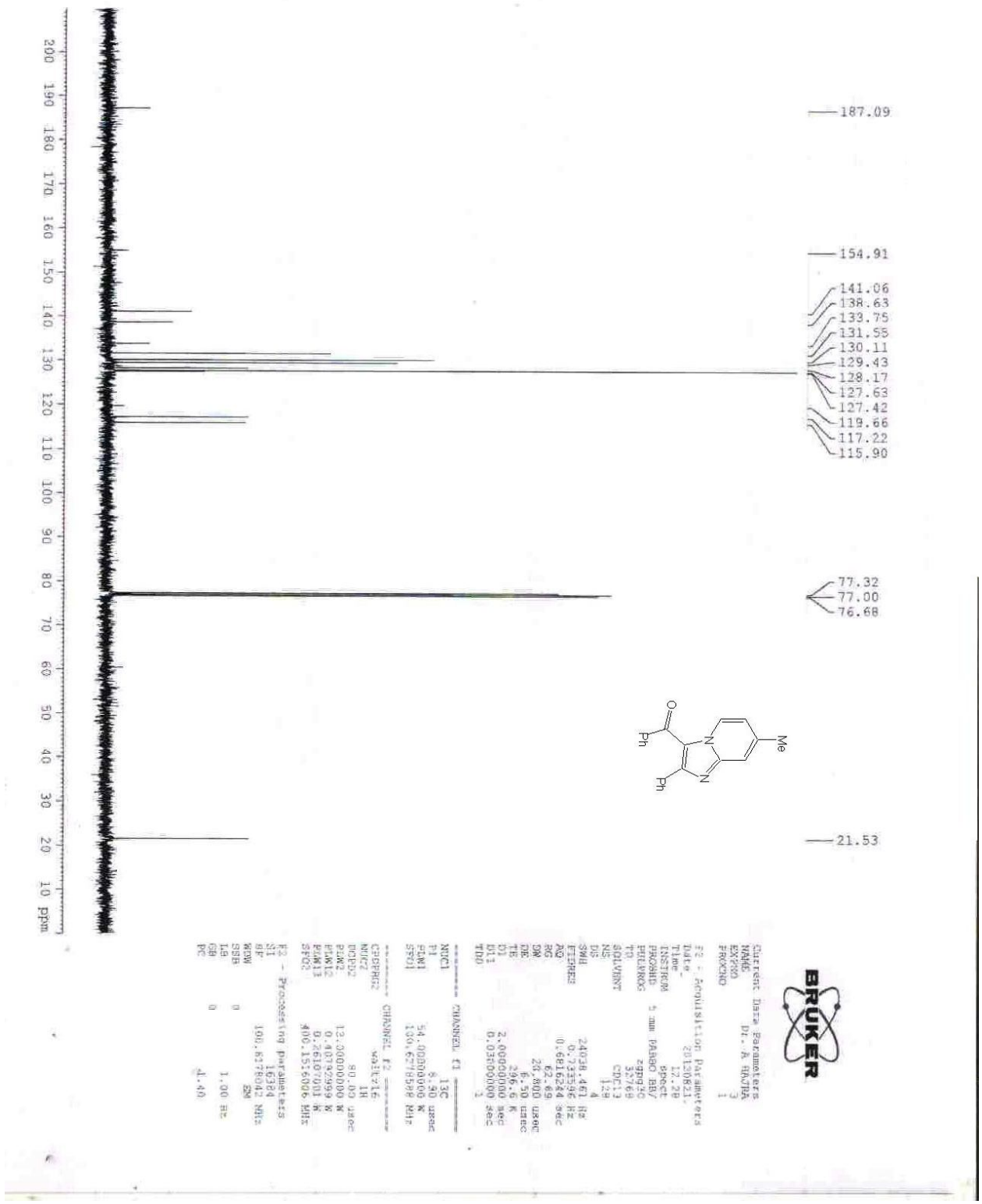
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77.32
77.00
76.68
21.53
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Ph
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O
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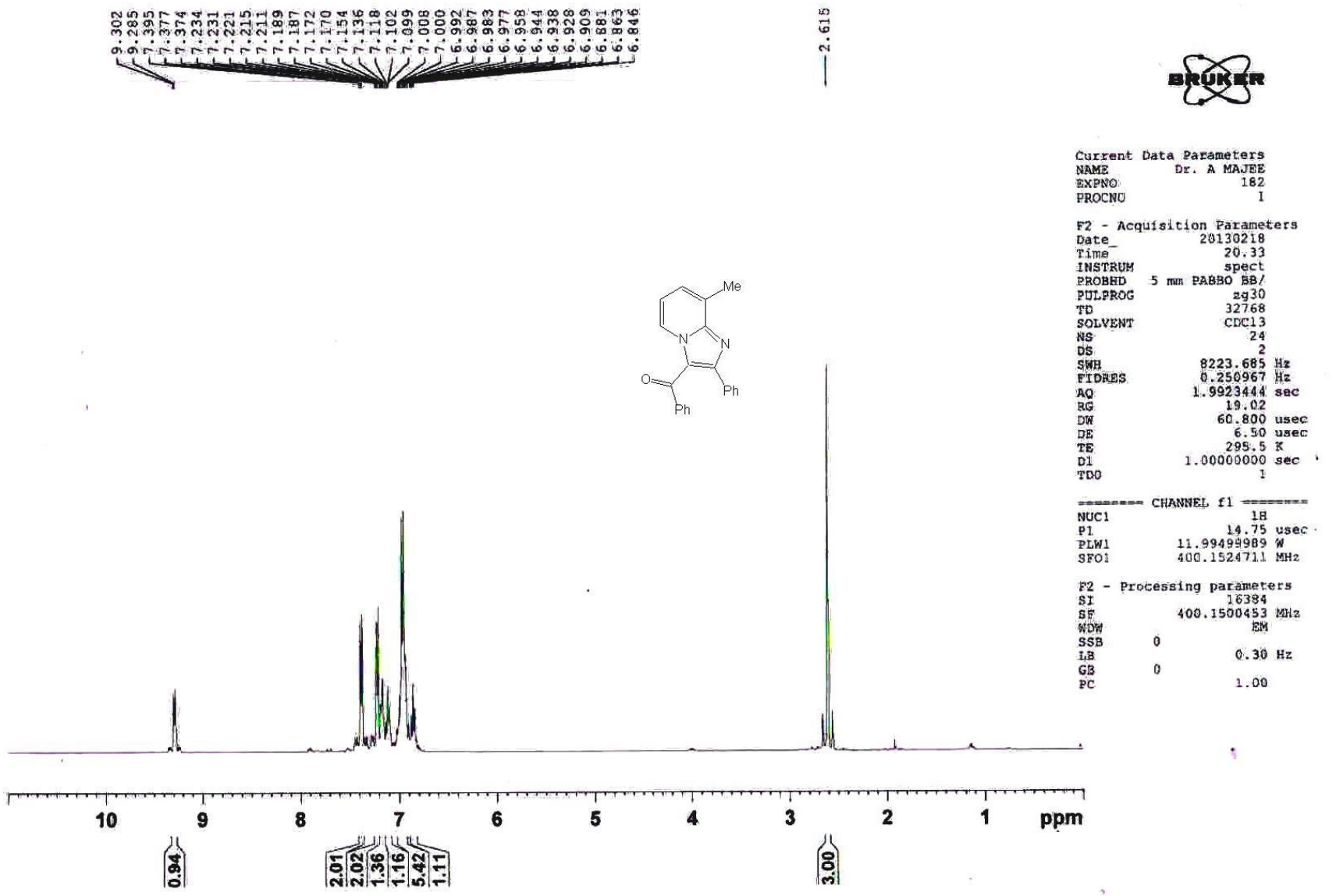
BRUKER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7.000
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6.846
2.615
Me
N
N
O
Ph
Ph
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9
8
7
6
5
4
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2
1
ppm
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1.11
3.00
BRUKER
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EXPNO 182
PROCNO 1
F2 - Acquisition Parameters
Date_ 20130218
Time 20.33
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
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FIDRES 0.250967 Hz
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RG 19.02
DW 60.800 usec
DE 6.50 usec
TE 295.5 K
D1 1.00000000 sec
TD0 1
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P1 14.75 usec
PLW1 11.99499989 W
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F2 - Processing parameters
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SF 400.1500453 MHz
WDW EM
SSB 0
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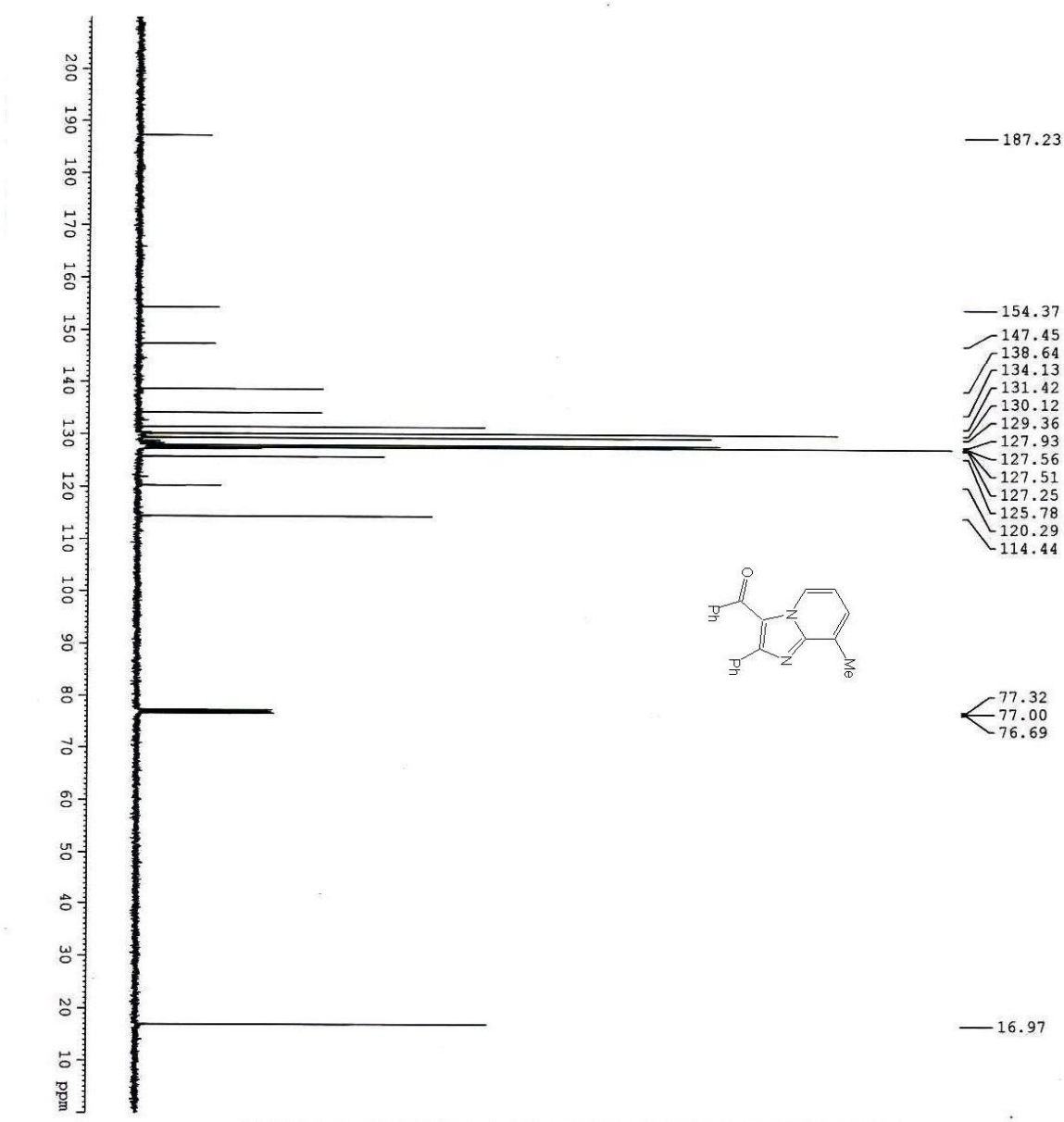
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77.00
76.69
16.97
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Current Data Parameters
NAME Dr. A MAJEE
EXPNO 183
PROCNO 1
F2 - Acquisition Parameters
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Time 20.40
INSTRUM spect
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PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 120
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 19.02
DW 20.800 usec
DE 6.50 usec
TE 296.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
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NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz
======== CHANNEL f2 ========
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NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
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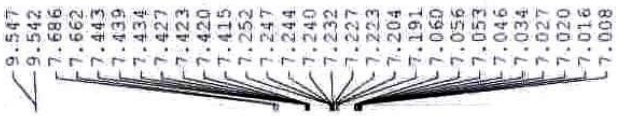

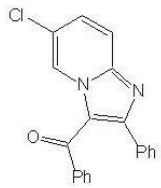

BRUKER

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EXPNO                 743
PROCNO                  1

F2 - Acquisition Parameters
Date_          20130525
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INSTRUM           spect
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PULPROG           zg30
TD               32768
SOLVENT          CDCl3
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DS                   2
SWH           8223.685 Hz
FIDRES        0.250967 Hz
AQ            1.9923444 sec
RG                87.66
DW               60.800 usec
DE                6.50 usec
TE               296.8 K
D1            1.00000000 sec
TD0                  1

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NUC1                1H
P1                14.75 usec
PLW1        11.99499989 W
SFO1        400.1524711 MHz

F2 - Processing parameters
SI                16384
SF          400.1500362 MHz
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LB                0.30 Hz
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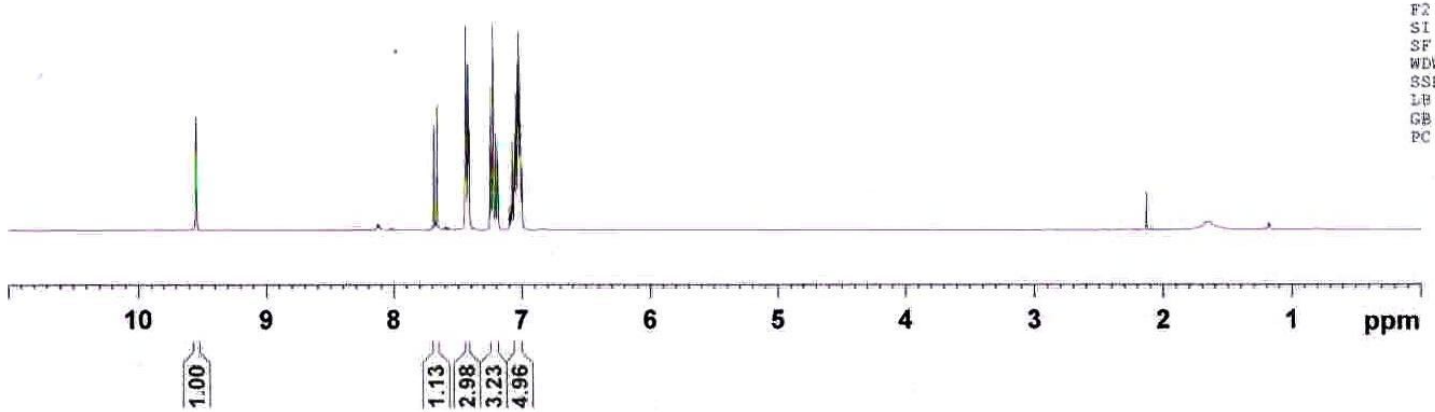

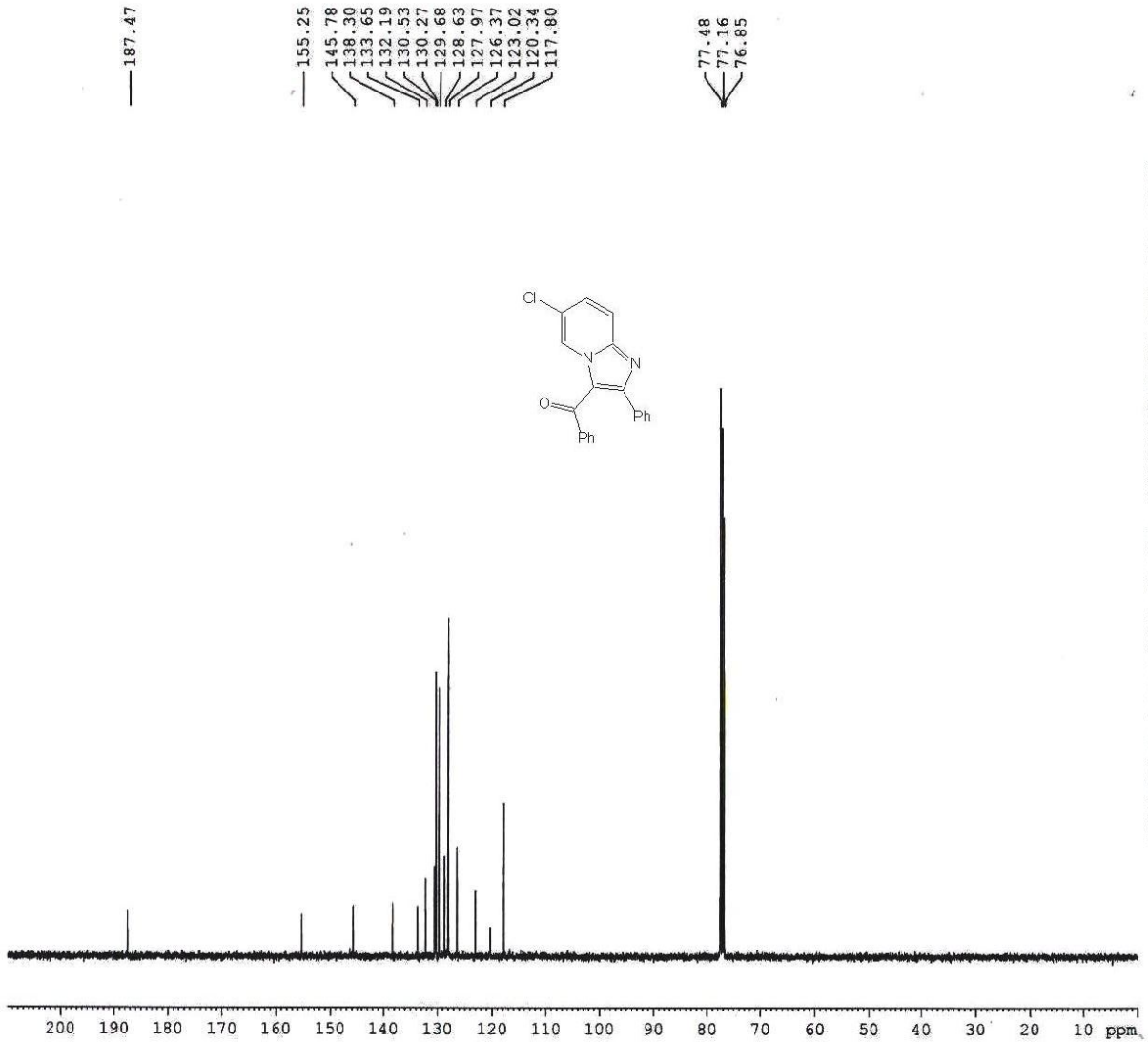

BRUKER

Current Data Parameters
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EXPNO 751
PROCNO 1

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SOLVENT CDCl3
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SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 87.66
DW 20.800 usec
DE 6.50 usec
TE 295.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
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P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz

======== CHANNEL f2 ========
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NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1516006 MHz

F2 - Processing parameters
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SSB 0
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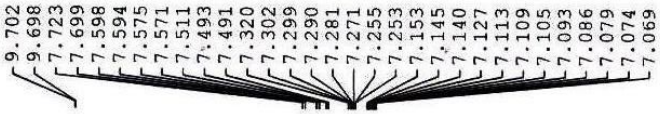

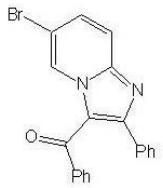

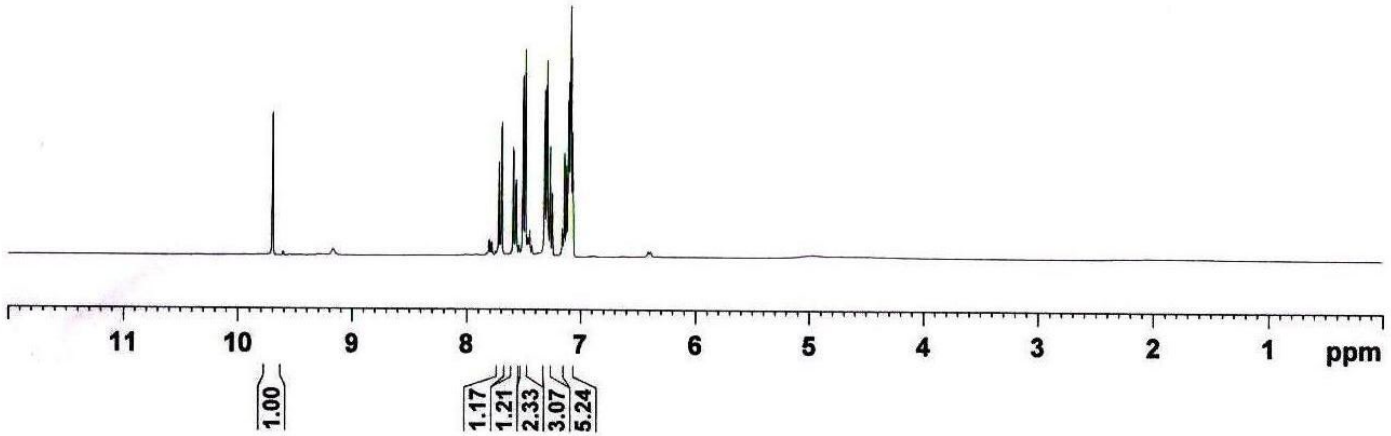


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PROCNO                1

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PULPROG           zg30
TD               32768
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DS                   2
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FIDRES        0.250967 Hz
AQ            1.9923444 sec
RG                54.07
DW               60.800 usec
DE                6.50 usec
TE               295.5 K
D1           1.00000000 sec
TD0                  1

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P1               14.75 usec
PLW1        11.99499989 W
SFO1        400.1524711 MHz

F2 - Processing parameters
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SF          400.1500000 MHz
WDW                  EM
SSB       0
LB               0.30 Hz
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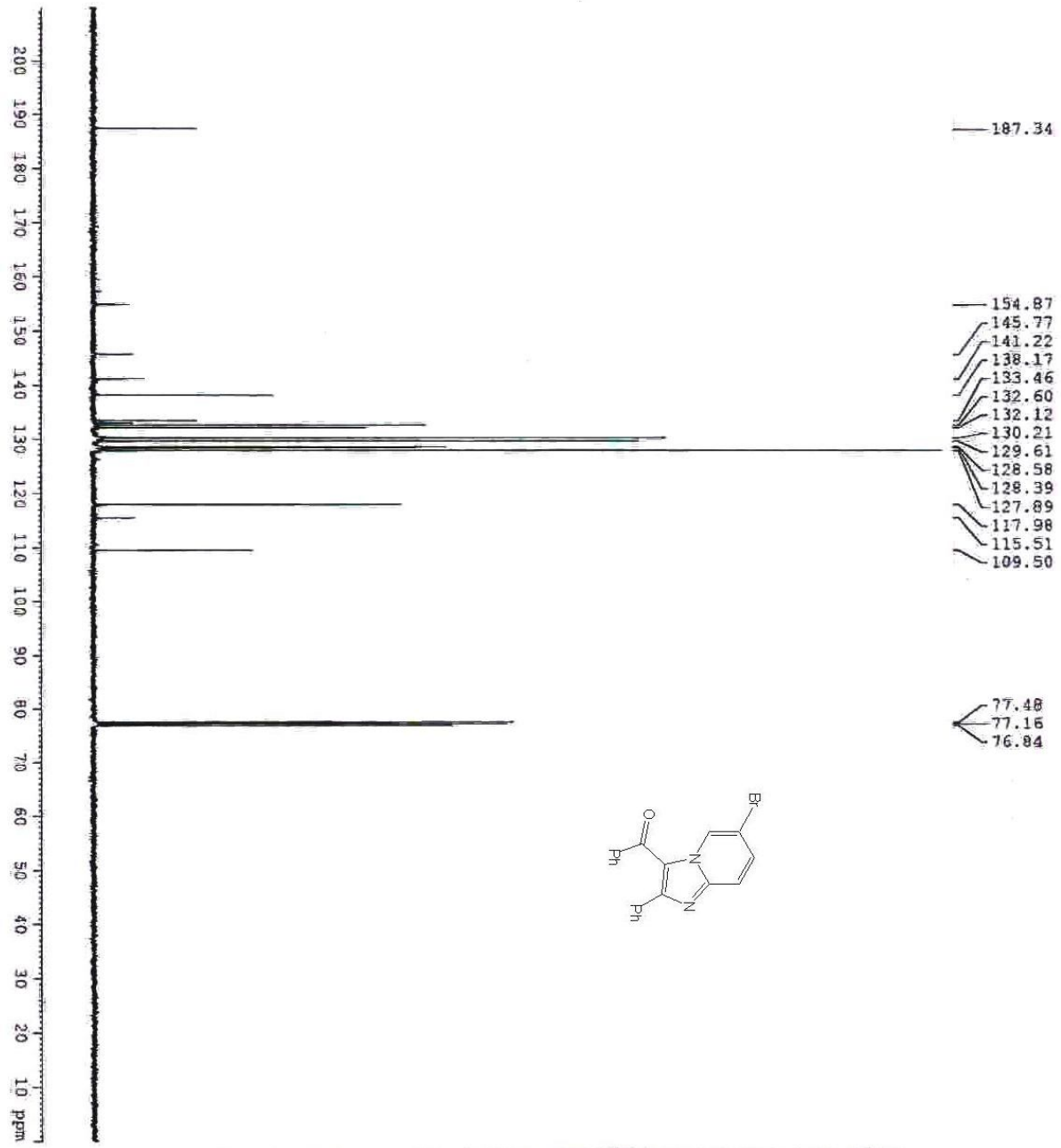


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PROCNO                         1

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TD                      32768
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SWH                 24038.461 Hz
FIDRES              0.733596 Hz
AQ                  0.68160244 sec
RG                      57.28
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DE                      6.50 usec
TE                    292.8 K
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D11                 0.03000000 sec
TD0                         1

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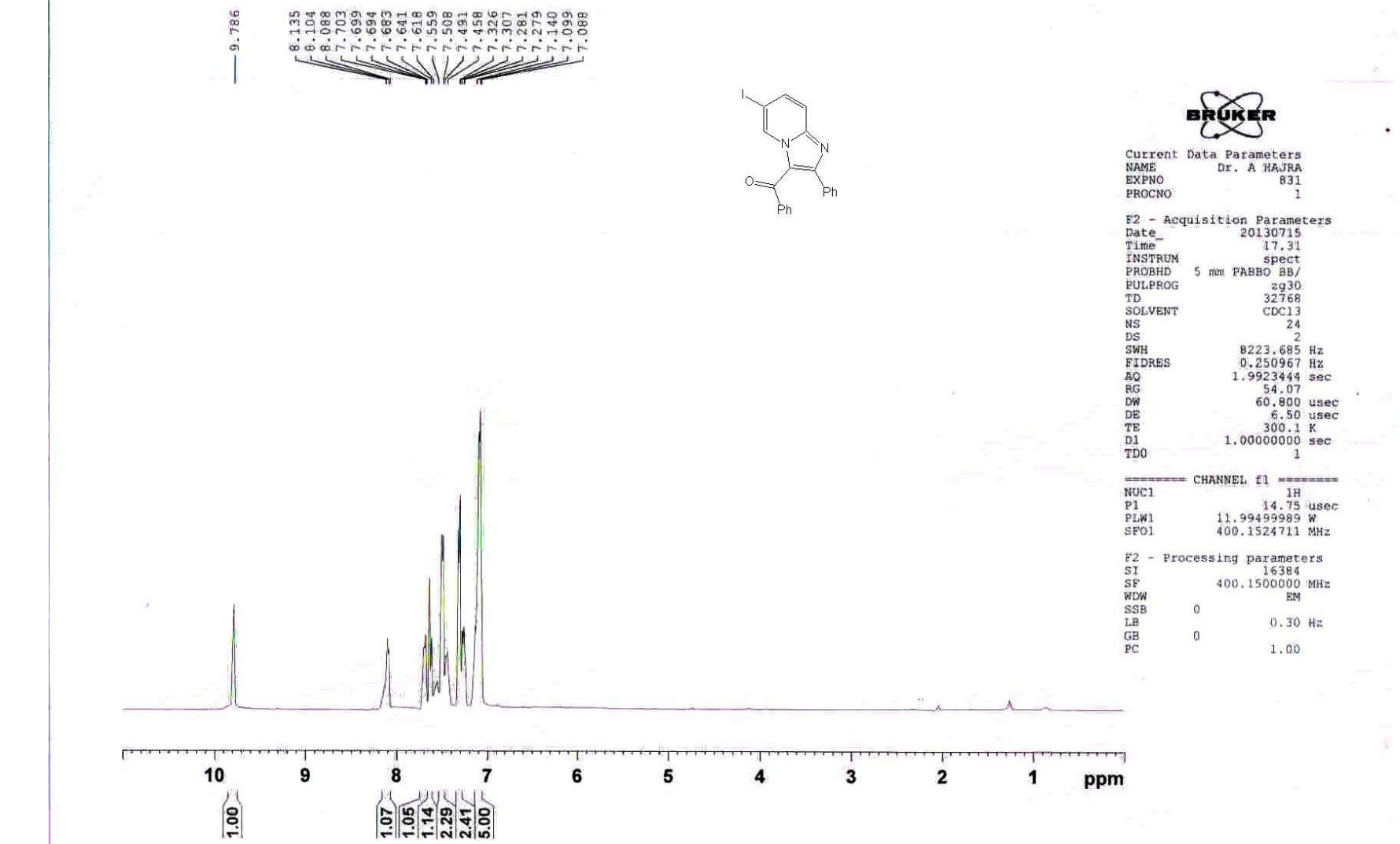
======== CHANNEL f2 ========
CPDPRG2                 waltz16
NUC2                        1H
PCPD2                  80.00 usec
PL2                 12.00000000 W
PL12                 0.40192969 W
PL13                 0.26197001 W
SFO2               400.1316006 MHz

F2 - Processing parameters
SI                      16384
SF                 100.6177924 MHz
WDW                        EM
SSB                         0
LB                       1.00 Hz
GB                          0
PC                       1.40
```



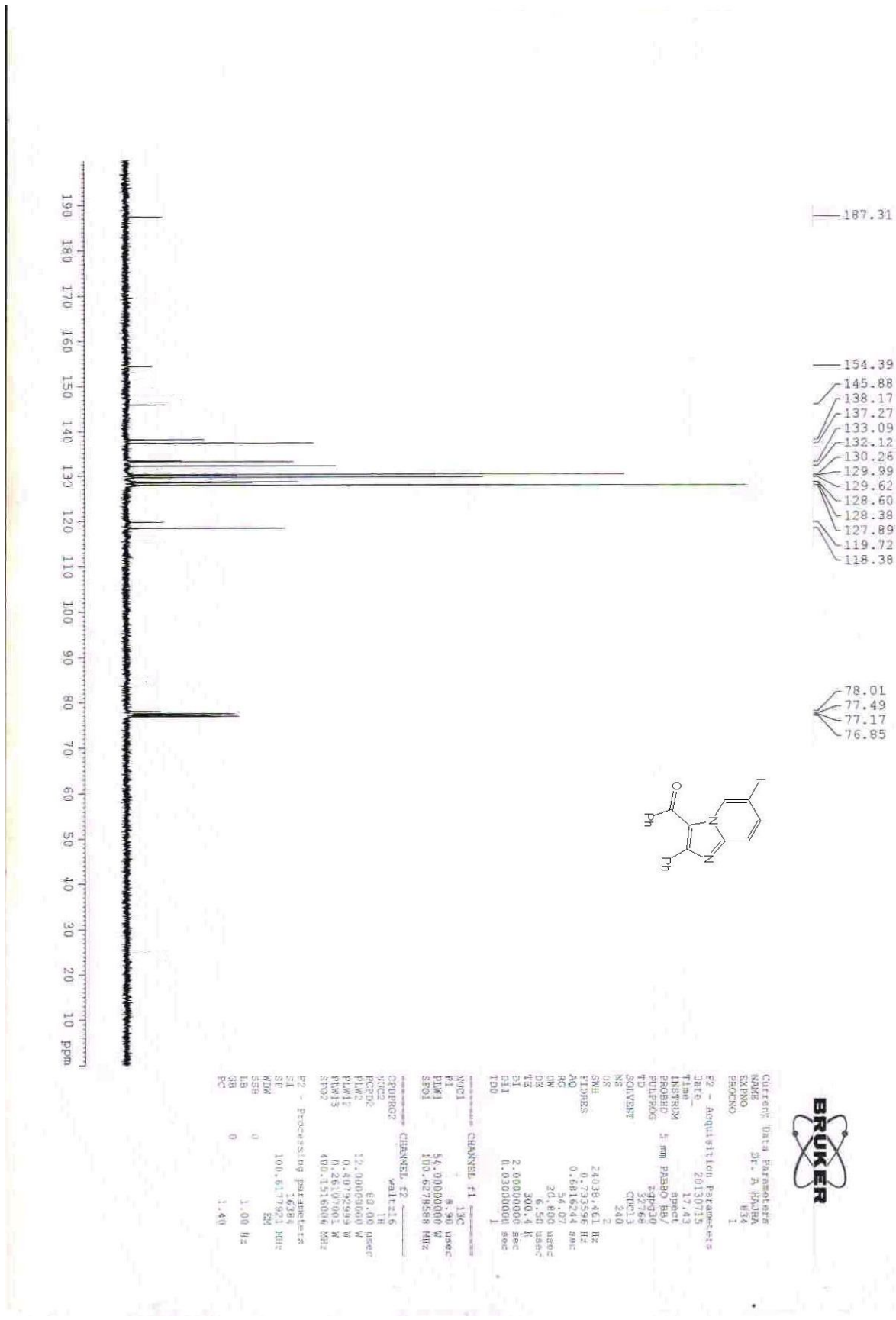
BRUKER

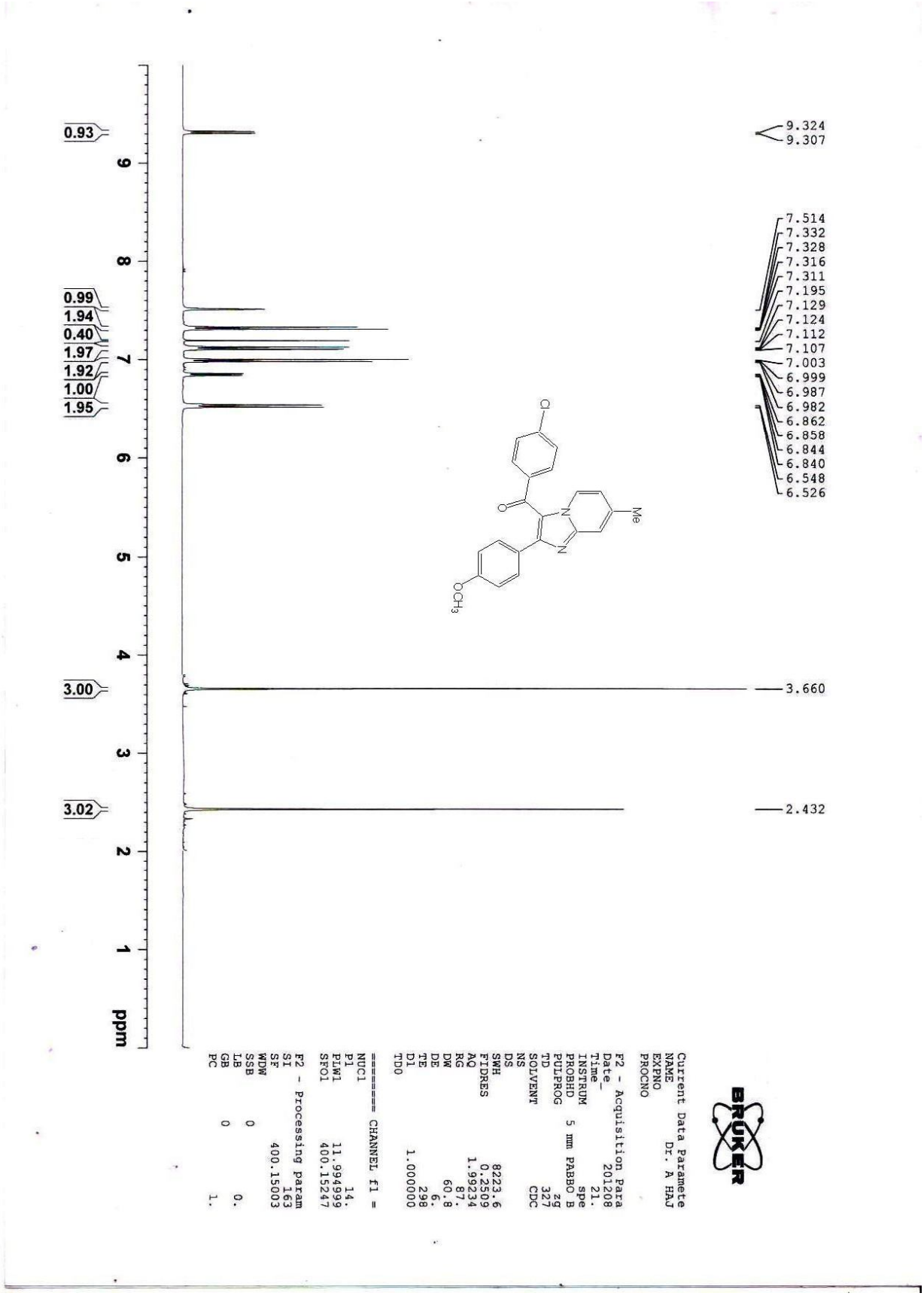
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 831
PROCNO 1

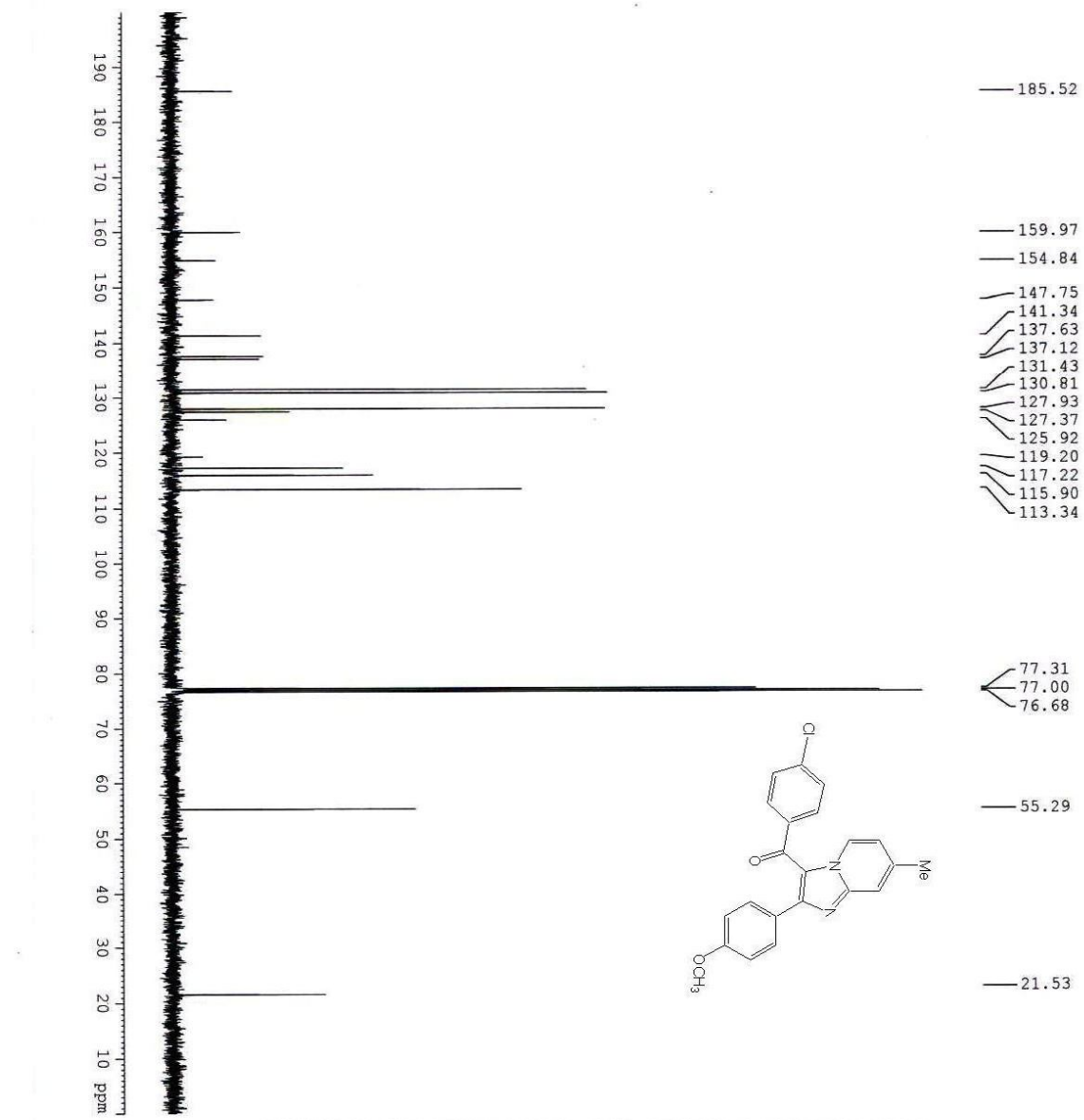
F2 - Acquisition Parameters
Date_ 20130715
Time 17.31
INSTRUM spect
PROBHD 5 mm FABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 24
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 54.07
DW 60.800 usec
DE 6.50 usec
TE 300.1 K
D1 1.00000000 sec
TD0 1

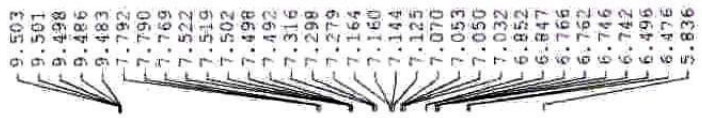
======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz

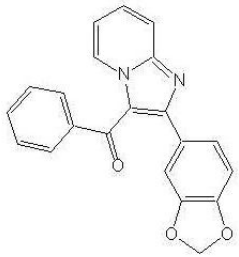
F2 - Processing parameters
SI 16384
SF 400.1500000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

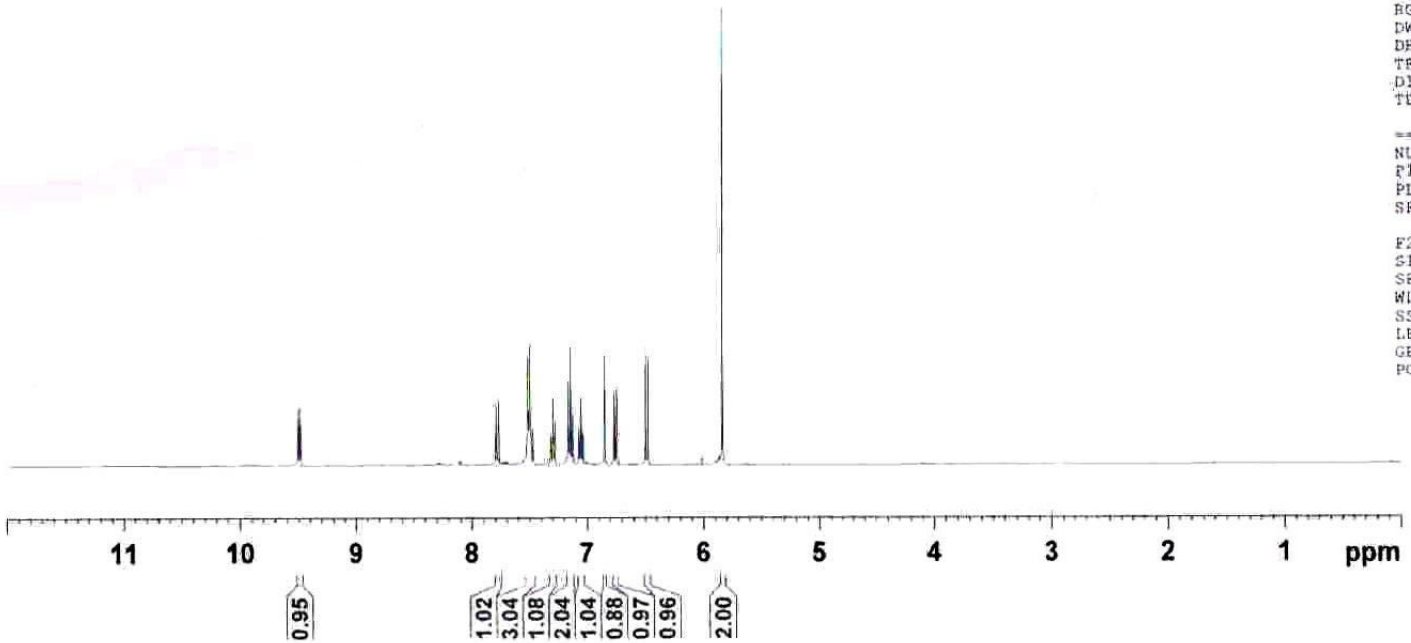

187.31
154.39
145.88
138.17
137.27
133.09
132.12
130.26
129.99
129.62
128.60
128.38
127.89
119.72
118.38
78.01
77.49
77.17
76.85
O
Ph
N
N
Ph
I
BRUKER
Current Data Parameters
NAME Dr. B HAJRA
EXPNO 836
PROCNO 1
F2 - Acquisition Parameters
Date_ 20130715
Time 17.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 240
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 54.07
DW 20.800 usec
DE 6.50 usec
TE 300.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40729299 W
PLW13 0.26107002 W
SFO2 400.1516004 MHz
F2 - Processing parameters
SI 16384
SF 100.6117921 MHz
WDW EM
SSB 0 2M
LB 1.00 Hz
GB 0
PC 1.40
199 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm


9.324
9.307
7.514
7.332
7.328
7.316
7.311
7.195
7.129
7.124
7.112
7.107
7.003
6.999
6.987
6.982
6.862
6.858
6.844
6.840
6.548
6.526
3.660
2.432
0.93
0.99
1.94
0.40
1.97
1.92
1.00
1.95
3.00
3.02
ppm
Cl
O
N
N
Me
OCH3
BRUKER
Current Data Parameters
NAME Dr. A HAJ
EXPNO
PROCNO
F2 - Acquisition Parameters
Date_ 201208
Time_ 21.
INSTRUM spe
PROBHD 5 mm PABBO B
PULPROG zg
TD 327
SOLVENT CDC
NS
DS
SWH 8223.6
FIDRES 0.2509
AQ 1.99234
RG 87.
DW 60.8
DE 6.
TE 298
D1 1.000000
TDO
======== CHANNEL f1 ========
NUC1
P1 14.
PLW1 11.994999
SFO1 400.15247
F2 - Processing parameters
SI 163
SF 400.15003
WDW
SSB 0
LB 0.
GB 0
PC 1.


185.52
159.97
154.84
147.75
141.34
137.63
137.12
131.43
130.81
127.93
127.37
125.92
119.20
117.22
115.90
113.34
77.31
77.00
76.68
55.29
21.53
Cl
O
N
Me
OCH3
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm
BRUKER
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 38
PROCNO 1
F2 - Acquisition Parameters
Date_ 20120827
Time 22.08
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 256
DS 4
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.68116244 sec
RG 62.69
DW 20.800 usec
DE 6.50 usec
TE 299.1 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1316006 MHz
F2 - Processing parameters
SI 16384
SF 100.6178012 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40





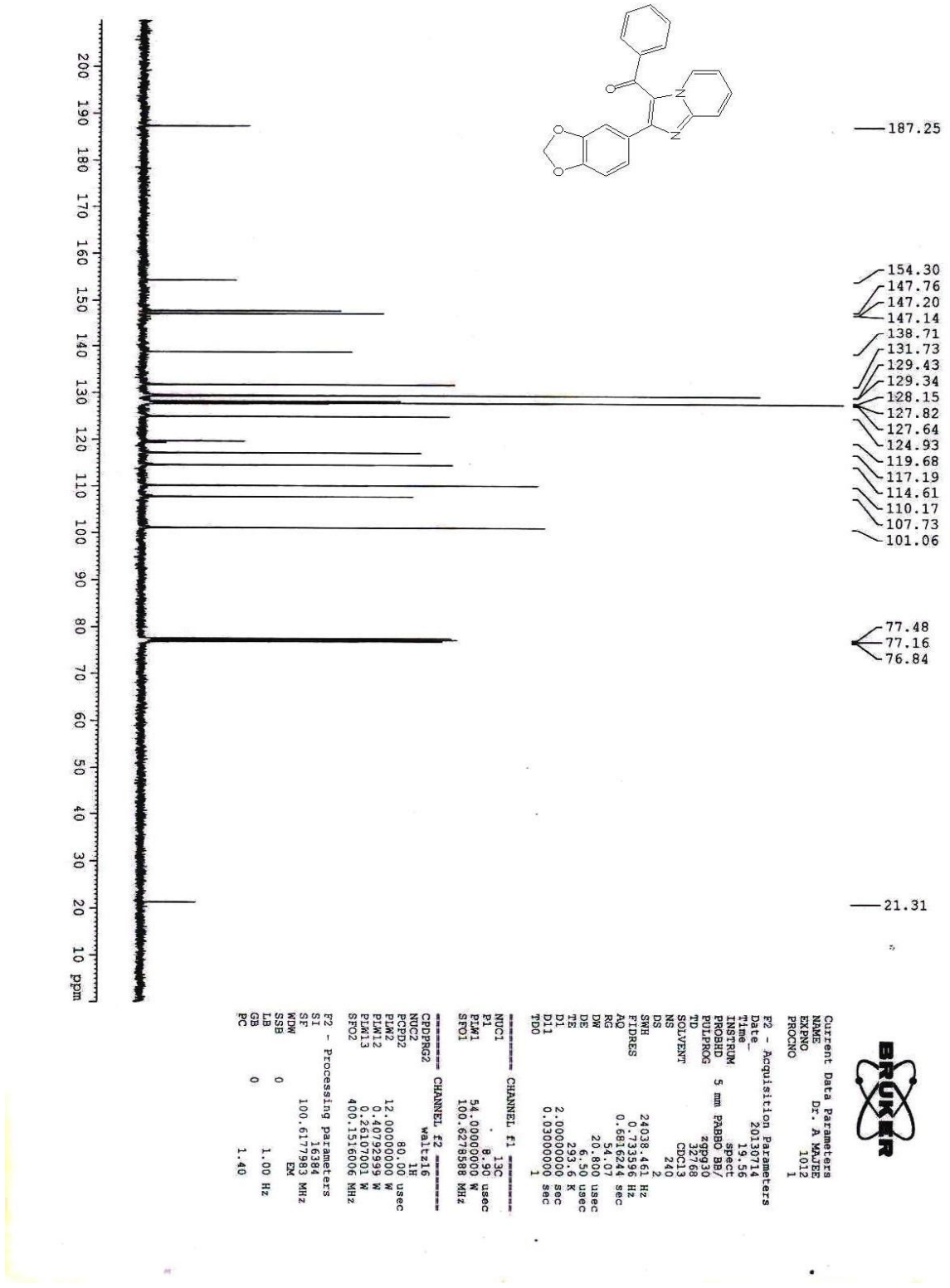


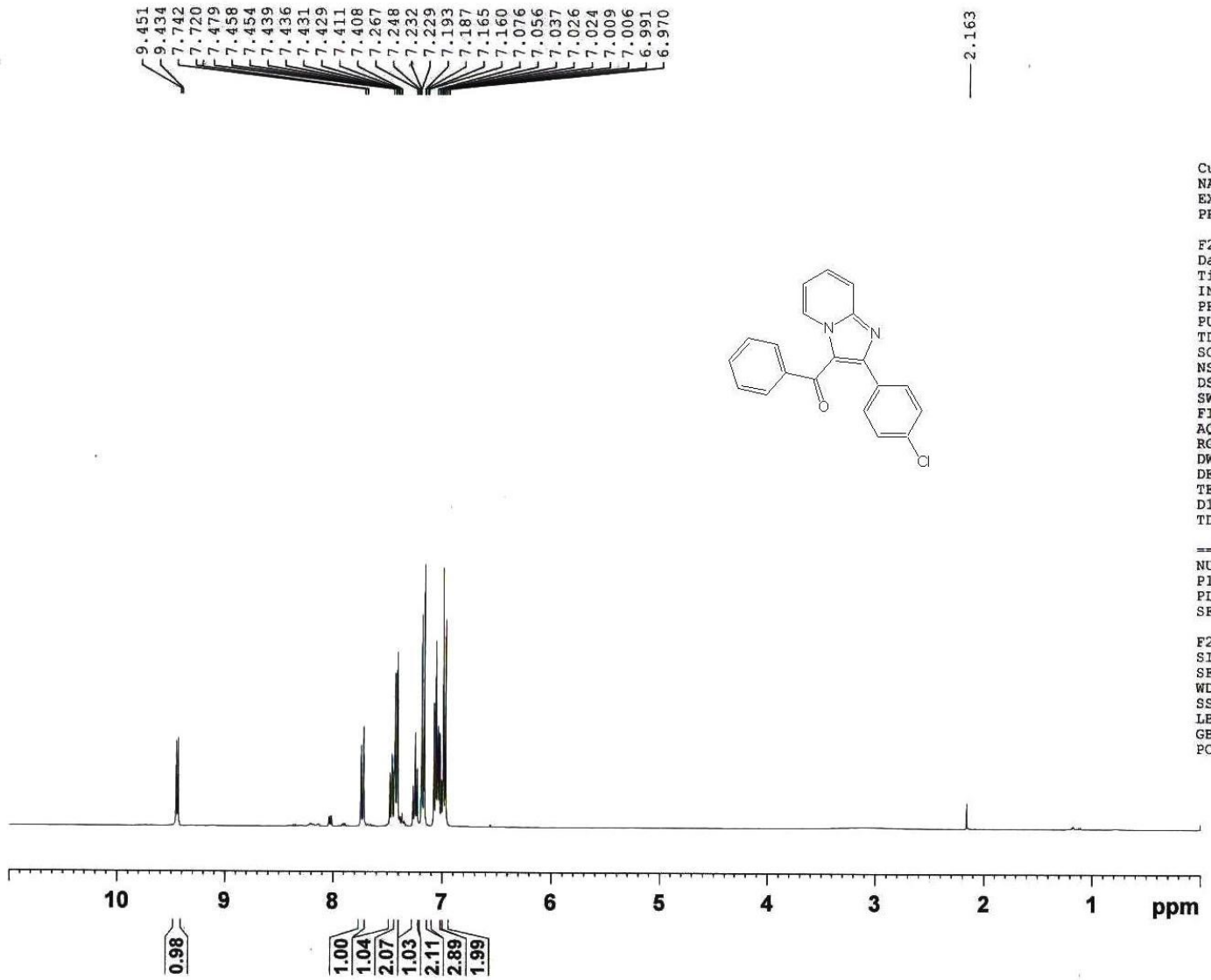
Current Data Parameters
NAME Dr. A MAJEE
EXPNO 1005
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130712
Time 20.54
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 24
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 40.87
DW 60.800 usec
DE 6.50 usec
TE 296.1 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz

F2 - Processing parameters
SI 16384
SF 400.1500000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00


187.25
154.30
147.76
147.20
147.14
138.71
131.73
129.43
129.34
128.15
127.82
127.64
124.93
119.68
117.19
114.61
110.17
107.73
101.06
77.48
77.16
76.84
21.31
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm
Current Data Parameters
NAME Dr. A MAJEE
EXPNO 1012
PROCNO 1
F2 - Acquisition Parameters
Date_ 20130714
Time 19.56
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 240
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6812644 sec
RG 54.07
DW 20.800 usec
DE 6.50 usec
TE 293.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
CHANNEL f1
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz
CHANNEL f2
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1516006 MHz
F2 - Processing parameters
SI 16384
SF 100.6177983 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



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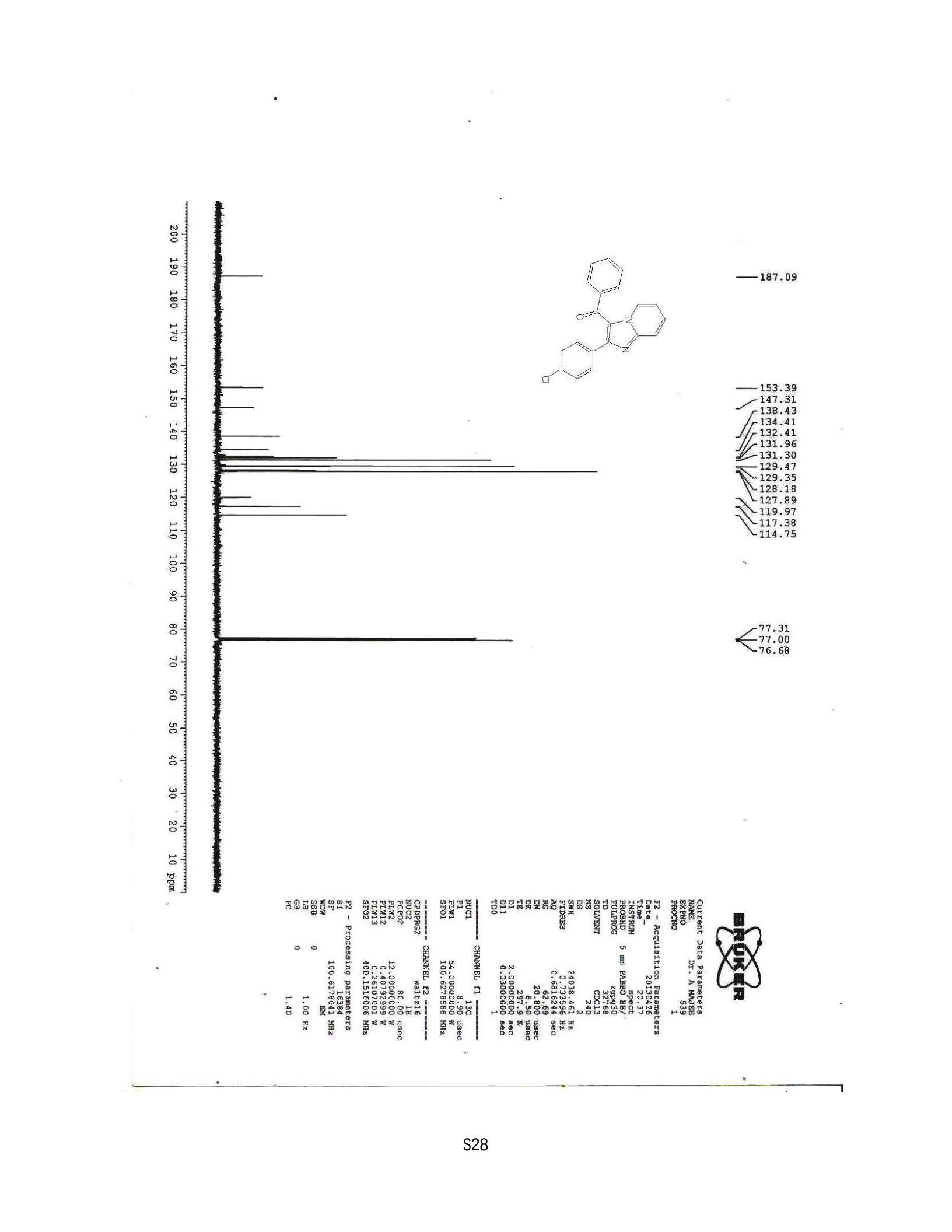
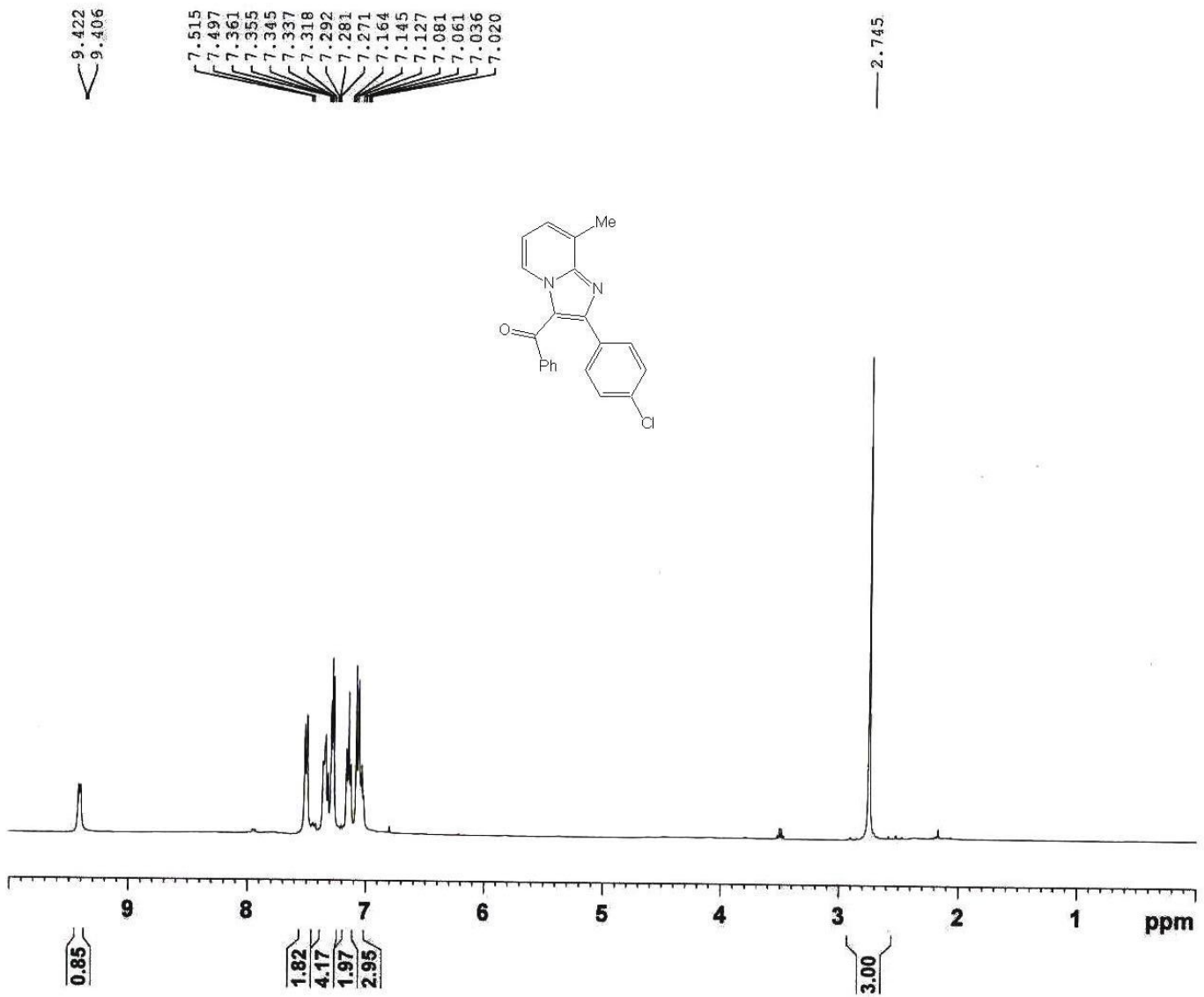
Current Data Parameters
NAME Dr. A MAJEE
EXPNO 538
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130426
Time 20.30
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 32
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 67.81
DW 60.800 usec
DE 6.50 usec
TE 297.1 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz

F2 - Processing parameters
SI 16384
SF 400.1500353 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00


187.09
153.39
147.31
138.43
134.41
132.41
131.96
131.30
129.47
129.35
128.18
127.89
119.97
117.38
114.75
77.31
77.00
76.68
Cl
N
N
O
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm
BRUKER
Current Data Parameters
NAME Dr. A MAJEE
EXPNO 539
PROCNO 1
F2 - Acquisition Parameters
Date_ 20130426
Time_ 20.37
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 240
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 62.69
DW 20.800 usec
DE 6.50 usec
TE 297.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6279588 MHz
======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1516006 MHz
F2 - Processing parameters
SI 16384
SF 100.6178041 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

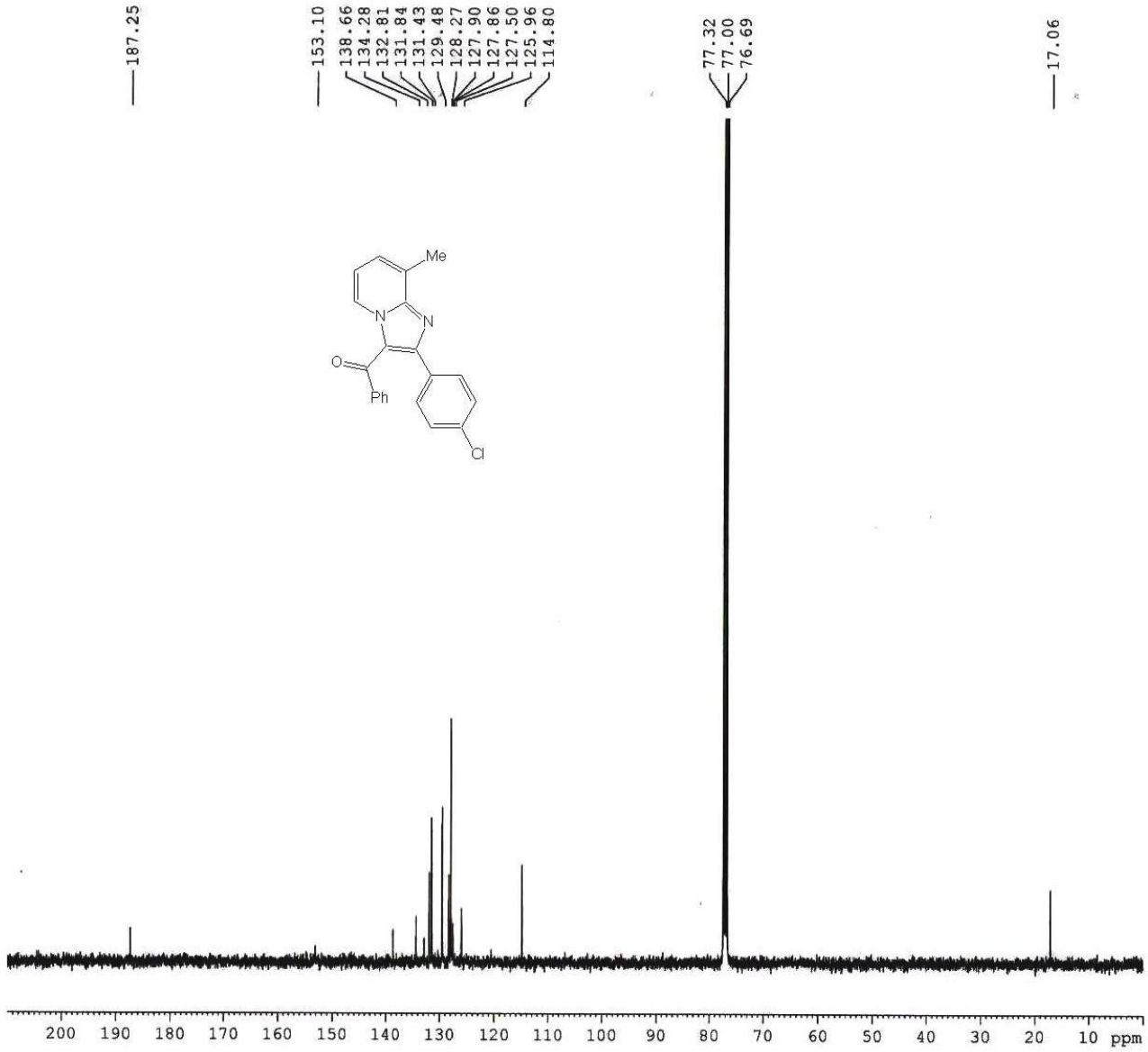


Current Data Parameters
NAME Dr. A MAJEE
EXPNO 552
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130428
Time 20.35
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 32
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 106.66
DW 60.800 usec
DE 6.50 usec
TE 297.5 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz

F2 - Processing parameters
SI 16384
SF 400.1500000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



BRUKER

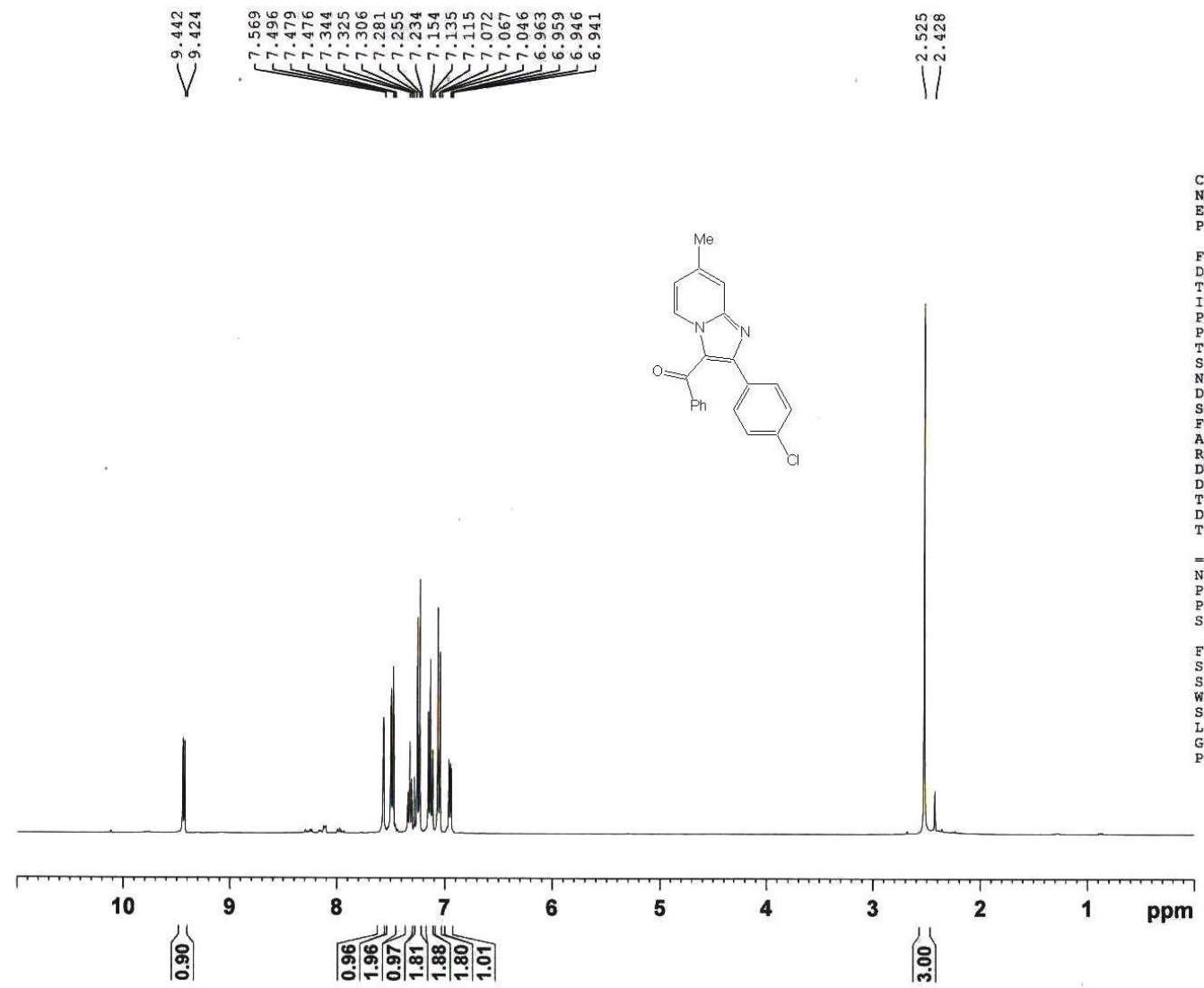
```
Current Data Parameters
NAME          Dr. A MAJEE
EXPNO                 564
PROCNO                  1

F2 - Acquisition Parameters
Date_            20130429
Time                20.50
INSTRUM             spect
PROBHD   5 mm PABBO BB/
PULPROG           zgpg30
TD                 32768
SOLVENT            CDCl3
NS                   512
DS                     2
SWH           24038.461 Hz
FIDRES         0.733596 Hz
AQ             0.6816244 sec
RG                 87.66
DW                20.800 usec
DE                 6.50 usec
TE                297.1 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  13C
P1                 8.90 usec
PLW1          54.00000000 W
SFO1         100.6278588 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                  1H
PCPD2              80.00 usec
PLW2          12.00000000 W
PLW12          0.40792999 W
PLW13          0.26107001 W
SFO2         400.1516006 MHz

F2 - Processing parameters
SI                 16384
SF           100.6177997 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```

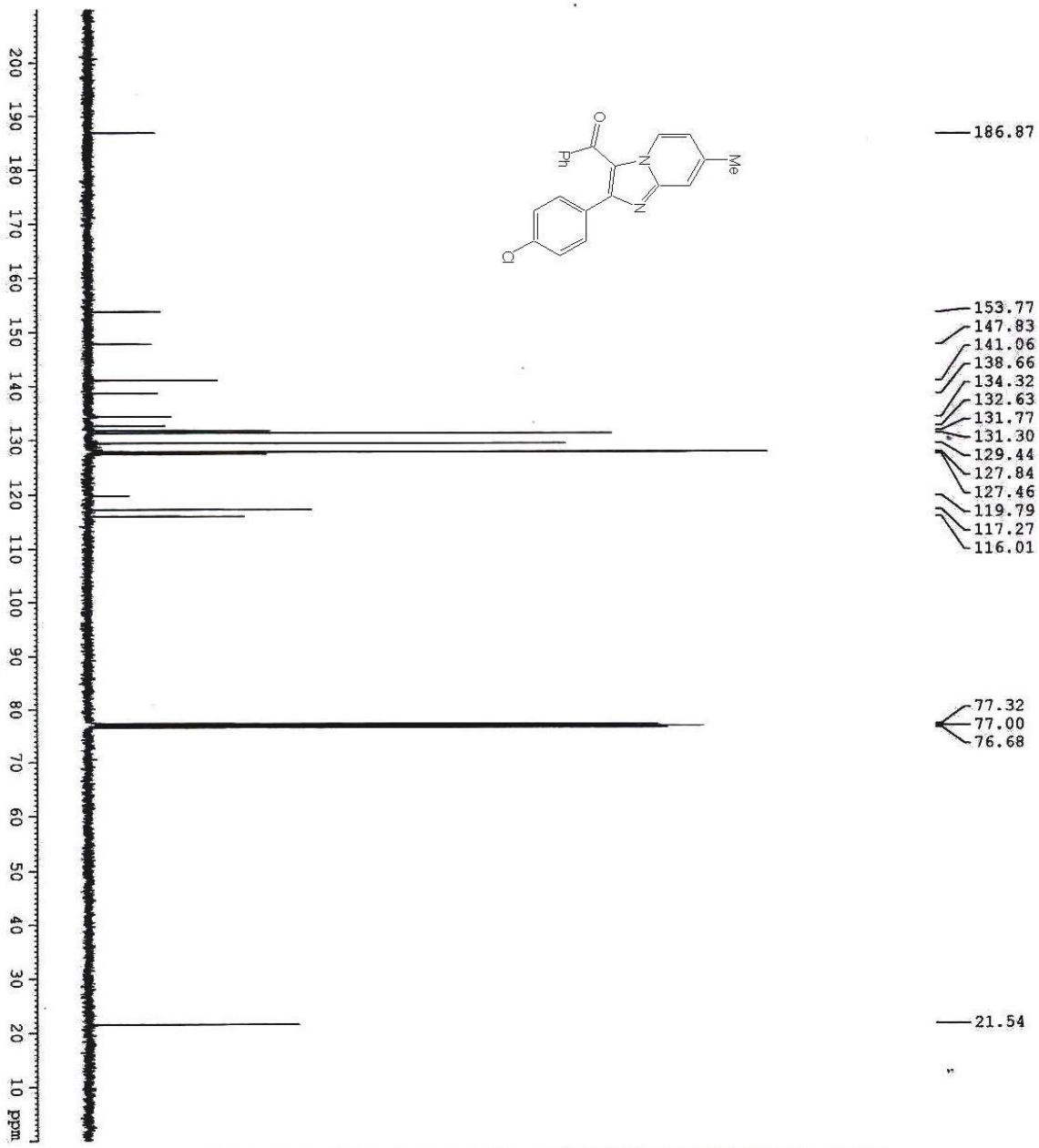



```
Current Data Parameters
NAME          Dr. A MAJEE
EXPNO                 579
PROCNO                  1

F2 - Acquisition Parameters
Date_            20130503
Time                19.47
INSTRUM             spect
PROBHD   5 mm PABBO BB/
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                     24
DS                      2
SWH              8223.685 Hz
FIDRES           0.250967 Hz
AQ               1.9923444 sec
RG                  77.59
DW                 60.800 usec
DE                  6.50 usec
TE                 299.1 K
D1              1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
NUC1                   1H
P1                  14.75 usec
PLW1          11.99499989 W
SFO1          400.1524711 MHz

F2 - Processing parameters
SI                  16384
SF            400.1500000 MHz
WDW                    EM
SSB       0
LB                  0.30 Hz
GB        0
PC                  1.00
```



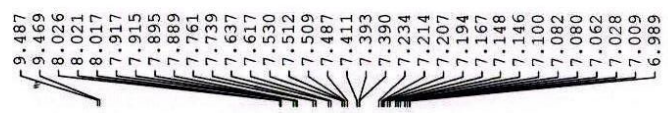

```
Current Data Parameters
NAME                  Dr. A MAJEE
EXPNO                         580
PROCNO                          1

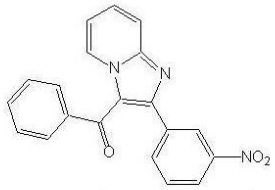
F2 - Acquisition Parameters
Date_               20130503
Time                      20.07
INSTRUM                   spect
PROBHD     5 mm PABBO BB/
PULPROG                 zgpg30
TD                       32768
SOLVENT                  CDCl3
NS                         400
DS                           2
SWH                  24038.461 Hz
FIDRES                0.733596 Hz
AQ                    0.6816244 sec
RG                        77.59
DW                       20.800 usec
DE                        6.50 usec
TE                       300.2 K
D1                    2.00000000 sec
D11                   0.03000000 sec
TD0                           1

======== CHANNEL f1 ========
NUC1                       13C
P1                        8.90 usec
PLW1                54.00000000 W
SFO1               100.6278588 MHz

======== CHANNEL f2 ========
CPDPRG2                waltz16
NUC2                       1H
PCPD2                    80.00 usec
PLW2                12.00000000 W
PLW12                0.40792999 W
PLW13                0.26107001 W
SFO2               400.1516006 MHz

F2 - Processing parameters
SI                        16384
SF                 100.6178012 MHz
WDW                          EM
SSB                           0
LB                         1.00 Hz
GB                            0
PC                         1.40
```





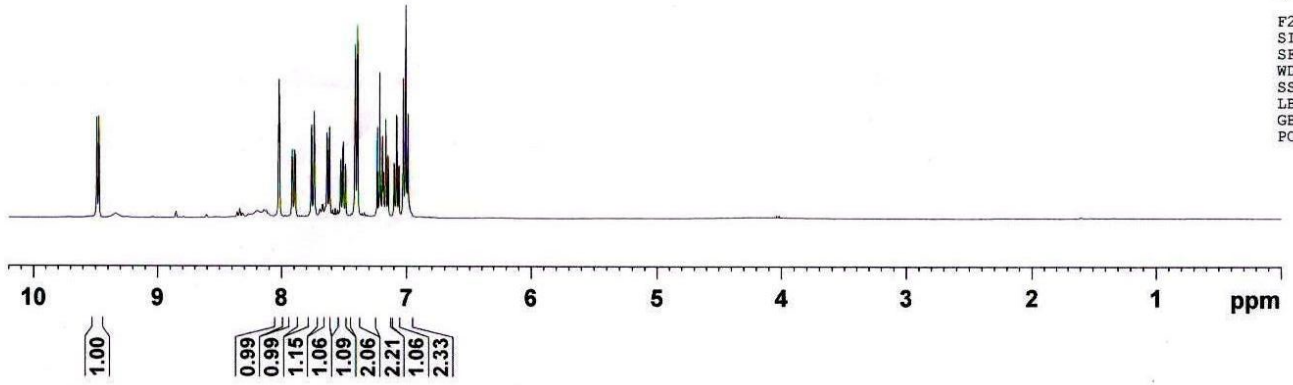
BRUKER

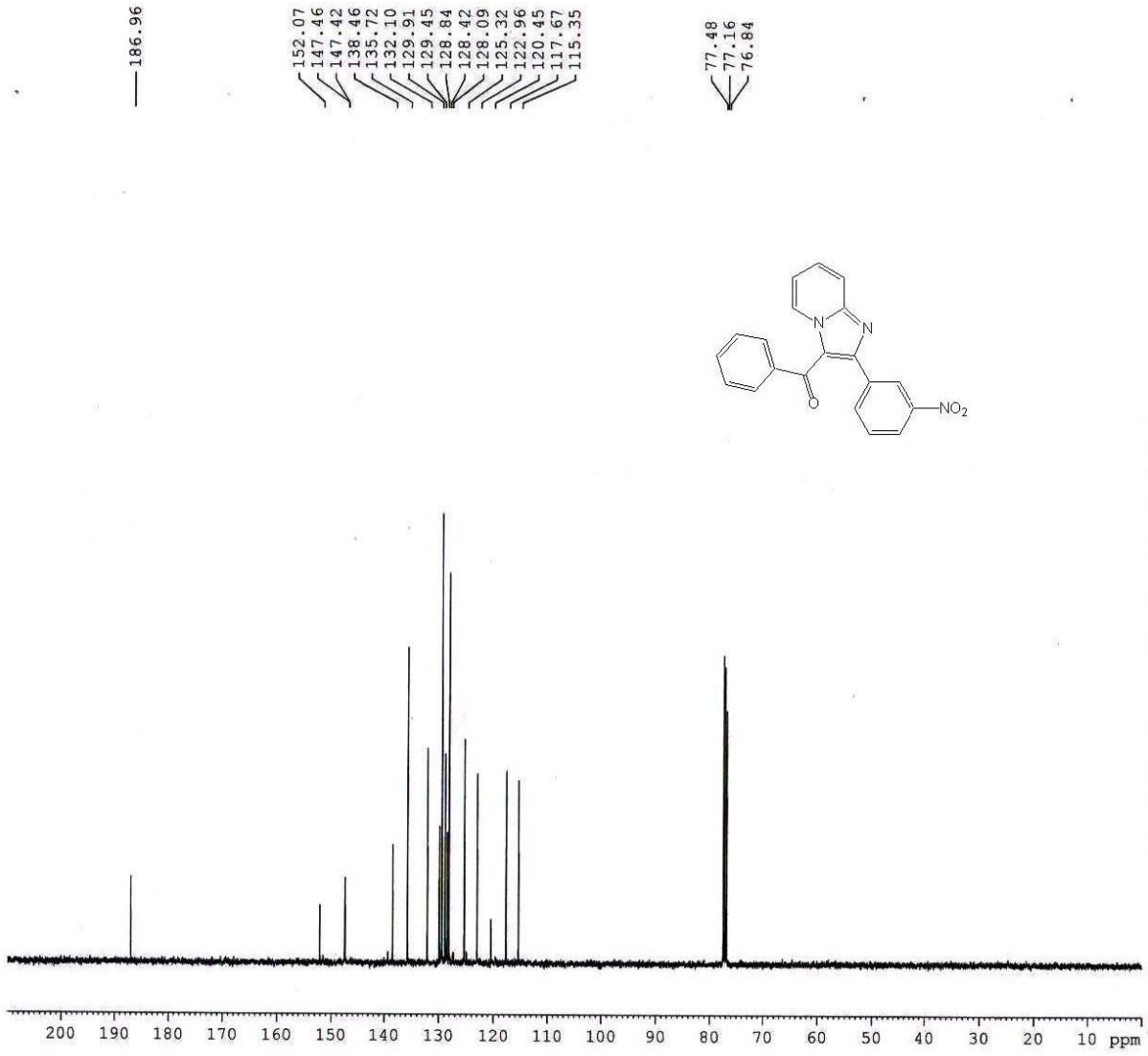
Current Data Parameters
NAME Dr. A MAJEE
EXPNO 1010
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130714
Time 17.17
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 24
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 54.07
DW 60.800 usec
DE 6.50 usec
TE 292.8 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz

F2 - Processing parameters
SI 16384
SF 400.1500298 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00





BRUKER

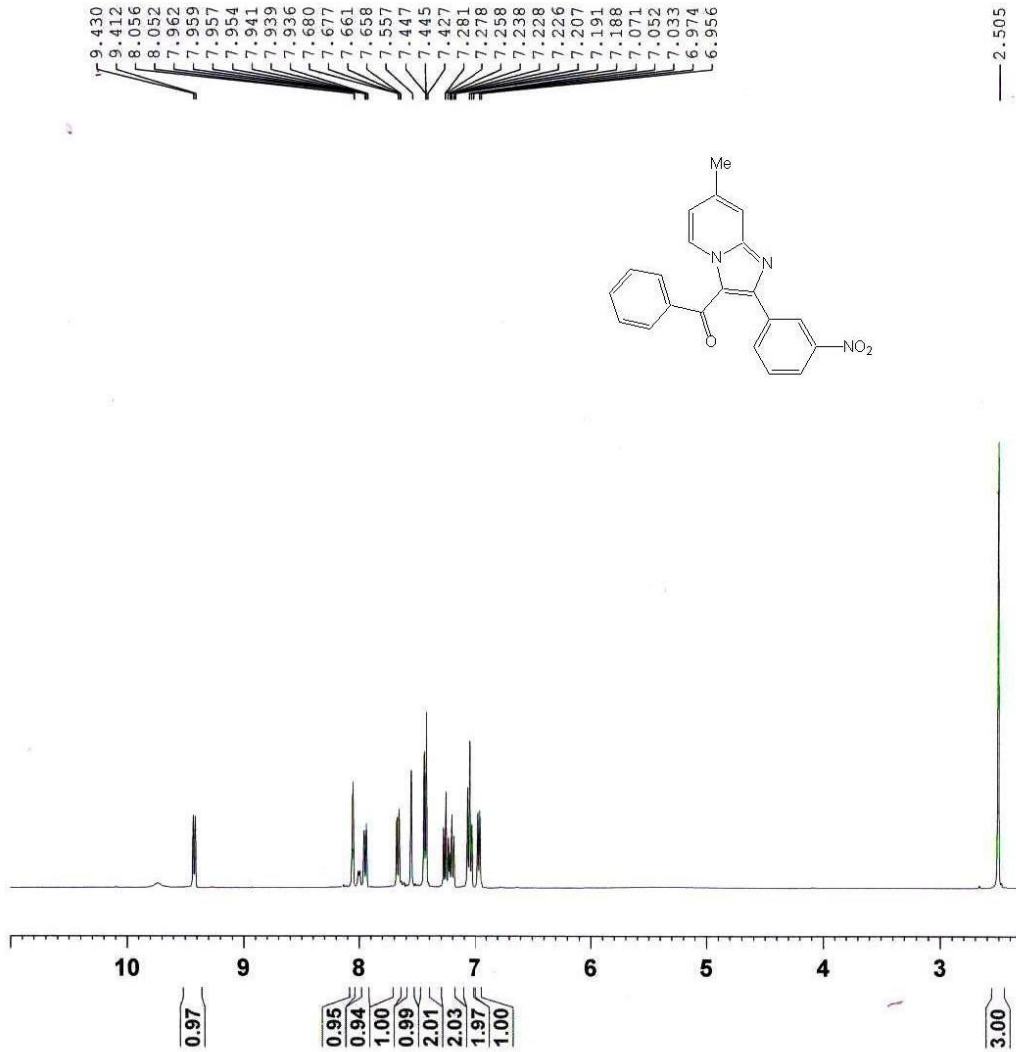
```
Current Data Parameters
NAME          Dr. A MAJEE
EXPNO               1011
PROCNO                 1

F2 - Acquisition Parameters
Date_           20130714
Time               17.29
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG         zgpg30
TD                32768
SOLVENT           CDCl3
NS                  240
DS                    2
SWH           24038.461 Hz
FIDRES         0.733596 Hz
AQ             0.6816244 sec
RG                54.07
DW               20.800 usec
DE                6.50 usec
TE               293.5 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
NUC1                 13C
P1                 8.90 usec
PLW1        54.00000000 W
SFO1       100.6278588 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2             80.00 usec
PLW2        12.00000000 W
PLW12        0.40792999 W
PLW13        0.26107001 W
SFO2       400.1516006 MHz

F2 - Processing parameters
SI                16384
SF         100.6177924 MHz
WDW                  EM
SSB       0
LB                1.00 Hz
GB        0
PC                1.40
```



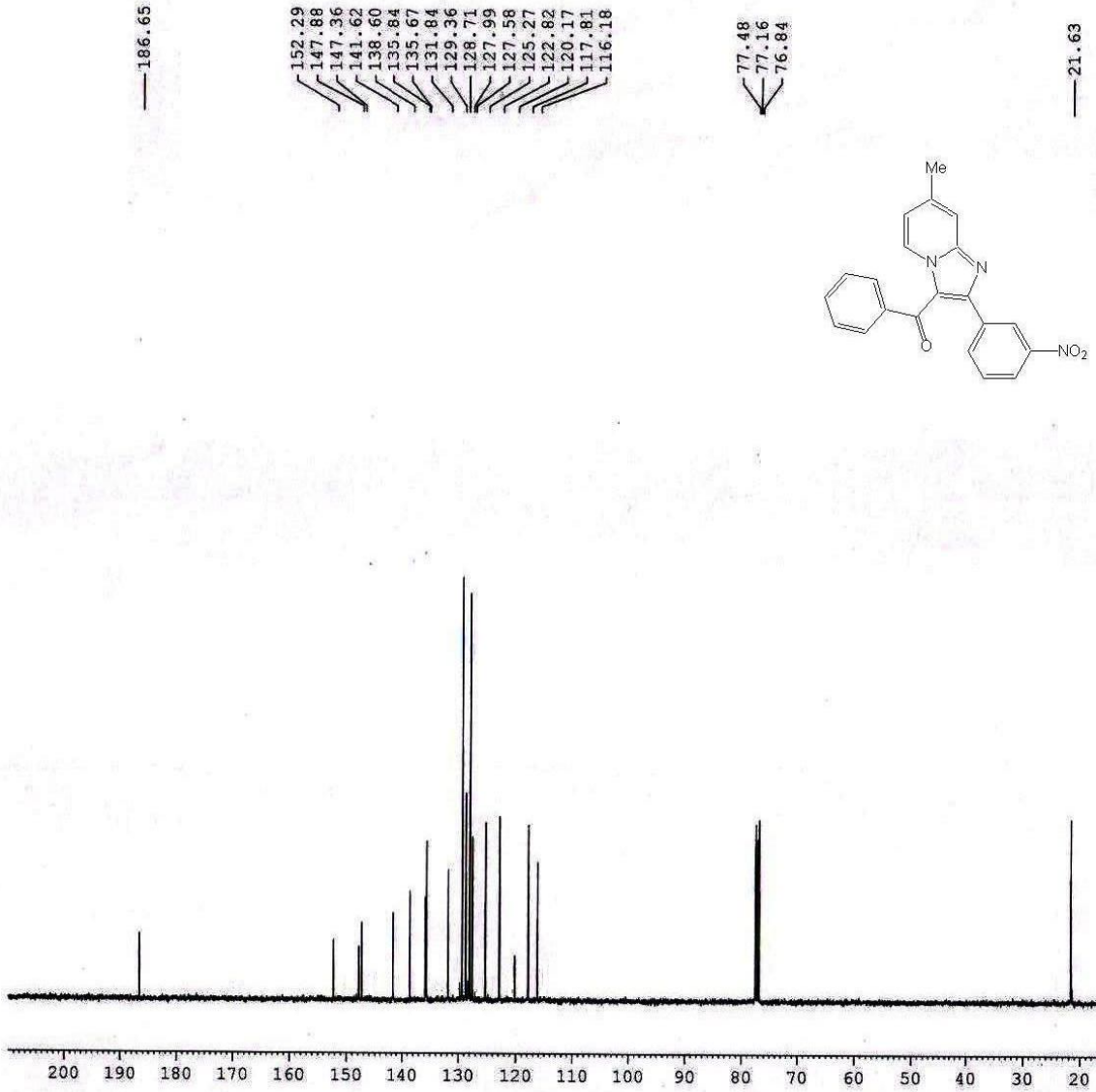
BRUKER

```
Current Data Parameters
NAME         Dr. A HAJRA
EXPNO                850
PROCNO                 1

F2 - Acquisition Parameters
Date_           20130724
Time               20.34
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                    16
DS                     2
SWH             8223.685 Hz
FIDRES          0.250967 Hz
AQ              1.9923444 sec
RG                 37.83
DW                60.800 usec
DE                 6.50 usec
TE                296.8 K
D1              1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
NUC1                  1H
P1                 14.75 usec
PLW1          11.99499989 W
SFO1          400.1524711 MHz

F2 - Processing parameters
SI                 16384
SF          400.1500000 MHz
WDW                   EM
SSB       0
LB                 0.30 Hz
GB        0
PC                 1.00
```



BRUKER

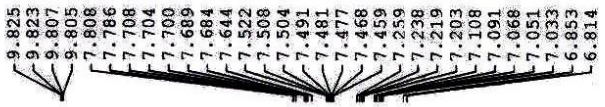
```
Current Data Parameters
NAME          Dr. A HAJRA
EXPNO                 851
PROCNO                  1

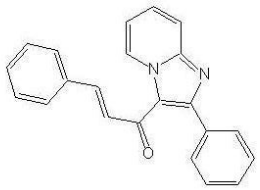
F2 - Acquisition Parameters
Date_          20130724
Time              20.45
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG         zgpg30
TD                32768
SOLVENT           CDCl3
NS                  160
DS                    2
SWH           24038.461 Hz
FIDRES         0.733596 Hz
AQ             0.6816244 sec
RG                37.83
DW               20.800 usec
DE                6.50 usec
TE               297.4 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                   1

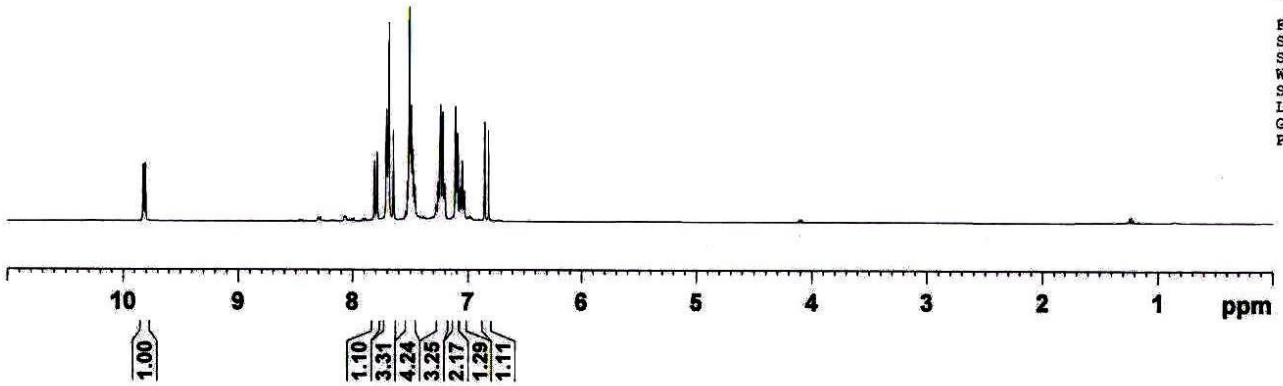
======== CHANNEL f1 ========
NUC1                 13C
P1                  8.90 usec
PLW1         54.00000000 W
SFO1        100.6278588 MHz

======== CHANNEL f2 ========
CPDPRG2          waltz16
NUC2                 1H
PCPD2              80.00 usec
PLW2         12.00000000 W
PLW12         0.40792999 W
PLW13         0.26107001 W
SFO2        400.1516006 MHz

F2 - Processing parameters
SI                 16384
SF          100.6177946 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```







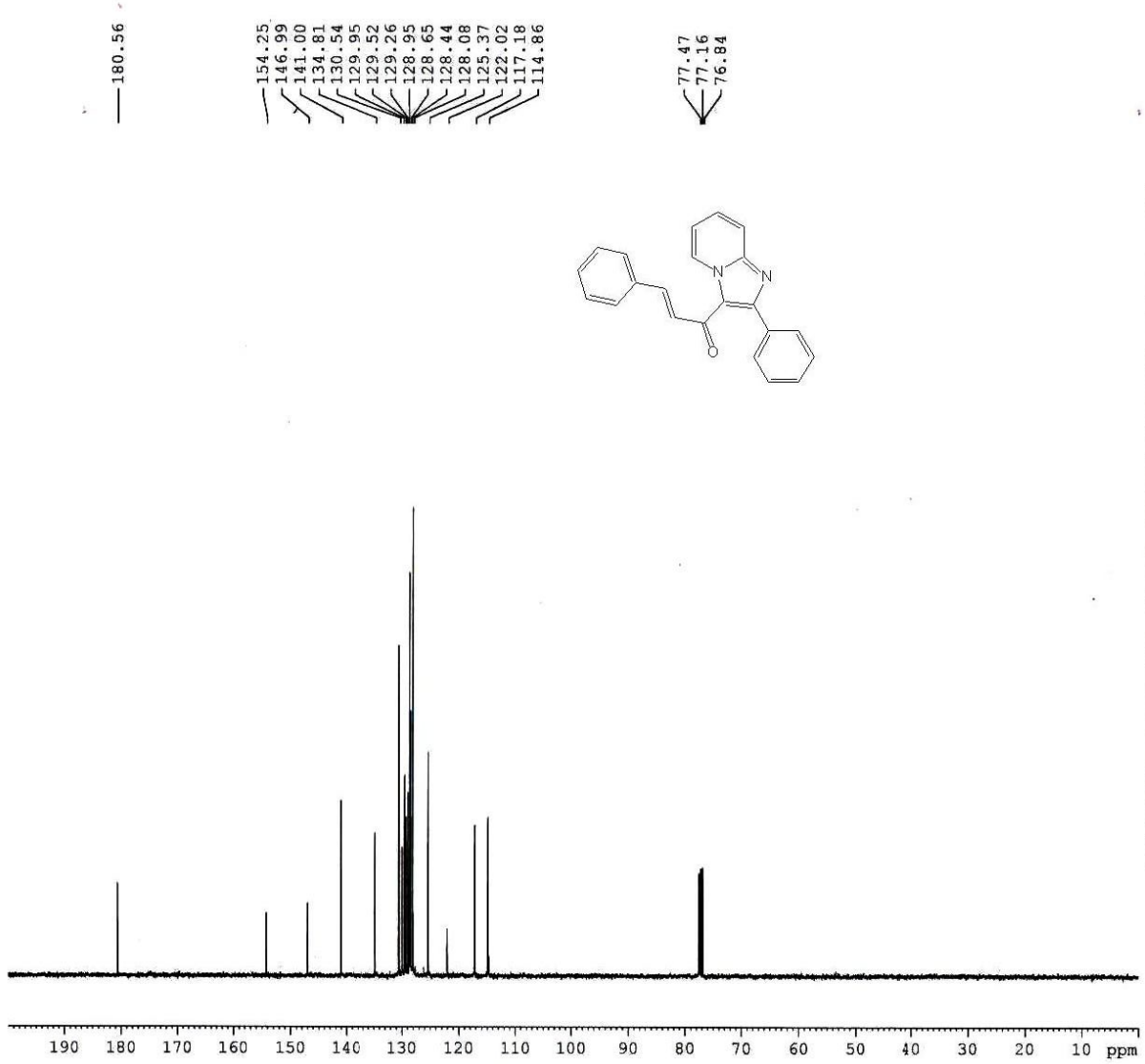
BRUKER

```
Current Data Parameters
NAME          Dr. A HAJRA
EXPNO              880
PROCNO               1

F2 - Acquisition Parameters
Date_          20130731
Time              12.55
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG           zg30
TD               32768
SOLVENT          CDCl3
NS                  16
DS                   2
SWH            8223.685 Hz
FIDRES        0.250967 Hz
AQ            1.9923444 sec
RG                30.11
DW               60.800 usec
DE                6.50 usec
TE               305.7 K
D1          1.00000000 sec
TD0                  1

======== CHANNEL f1 ========
NUC1                 1H
P1                14.75 usec
PLW1        11.99499989 W
SFO1        400.1524711 MHz

F2 - Processing parameters
SI                16384
SF          400.1500000 MHz
WDW                  EM
SSB       0
LB                0.30 Hz
GB        0
PC                1.00
```



BRUKER

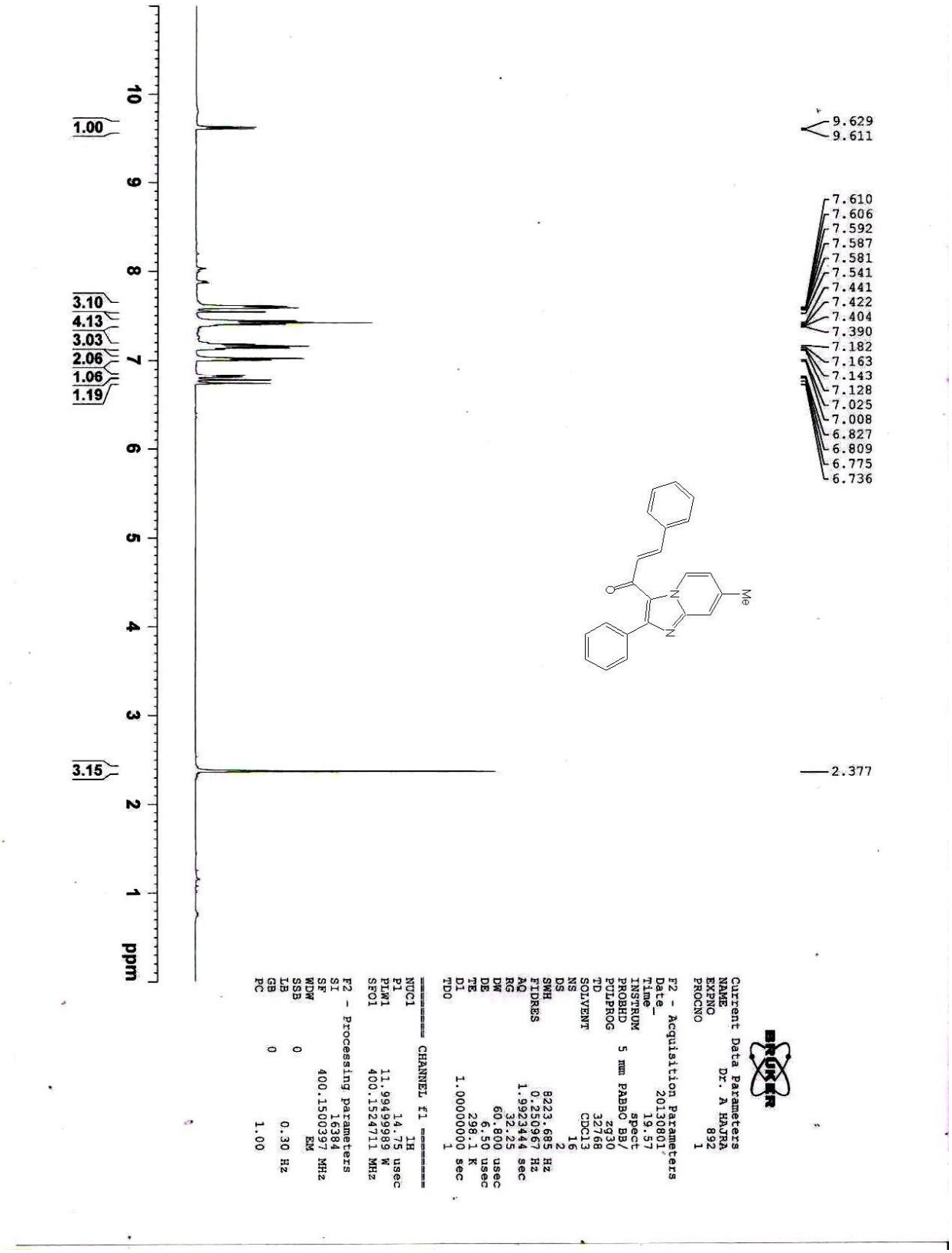
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 881
PROCNO 1

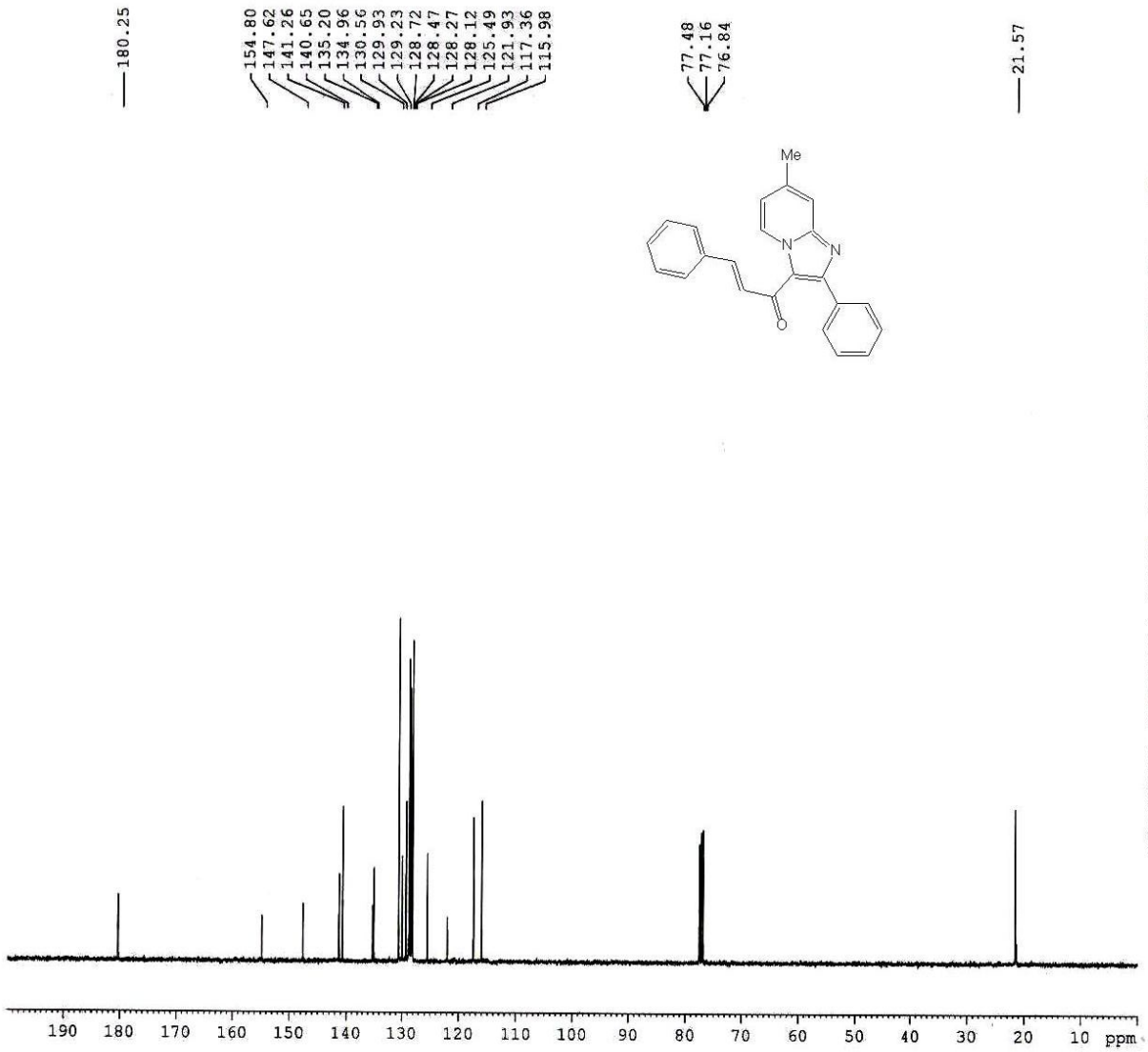
F2 - Acquisition Parameters
Date_ 20130731
Time 13.06
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 160
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 30.11
DW 20.800 usec
DE 6.50 usec
TE 304.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1516006 MHz

F2 - Processing parameters
SI 16384
SF 100.6178012 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40


9.629
9.611
7.610
7.606
7.592
7.587
7.581
7.541
7.441
7.422
7.404
7.390
7.182
7.163
7.143
7.128
7.025
7.008
6.827
6.809
6.775
6.736
2.377
Me
N
N
O
1.00
3.10
4.13
3.03
2.06
1.06
1.19
3.15
10
9
8
7
6
5
4
3
2
1
ppm
BRUKER
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 892
PROCNO 1
F2 - Acquisition Parameters
Date_ 20130801
Time_ 19.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 16
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 32.25
DW 60.800 usec
DE 6.50 usec
TE 298.1 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz
F2 - Processing parameters
SI 16384
SF 400.1500397 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



BRUKER

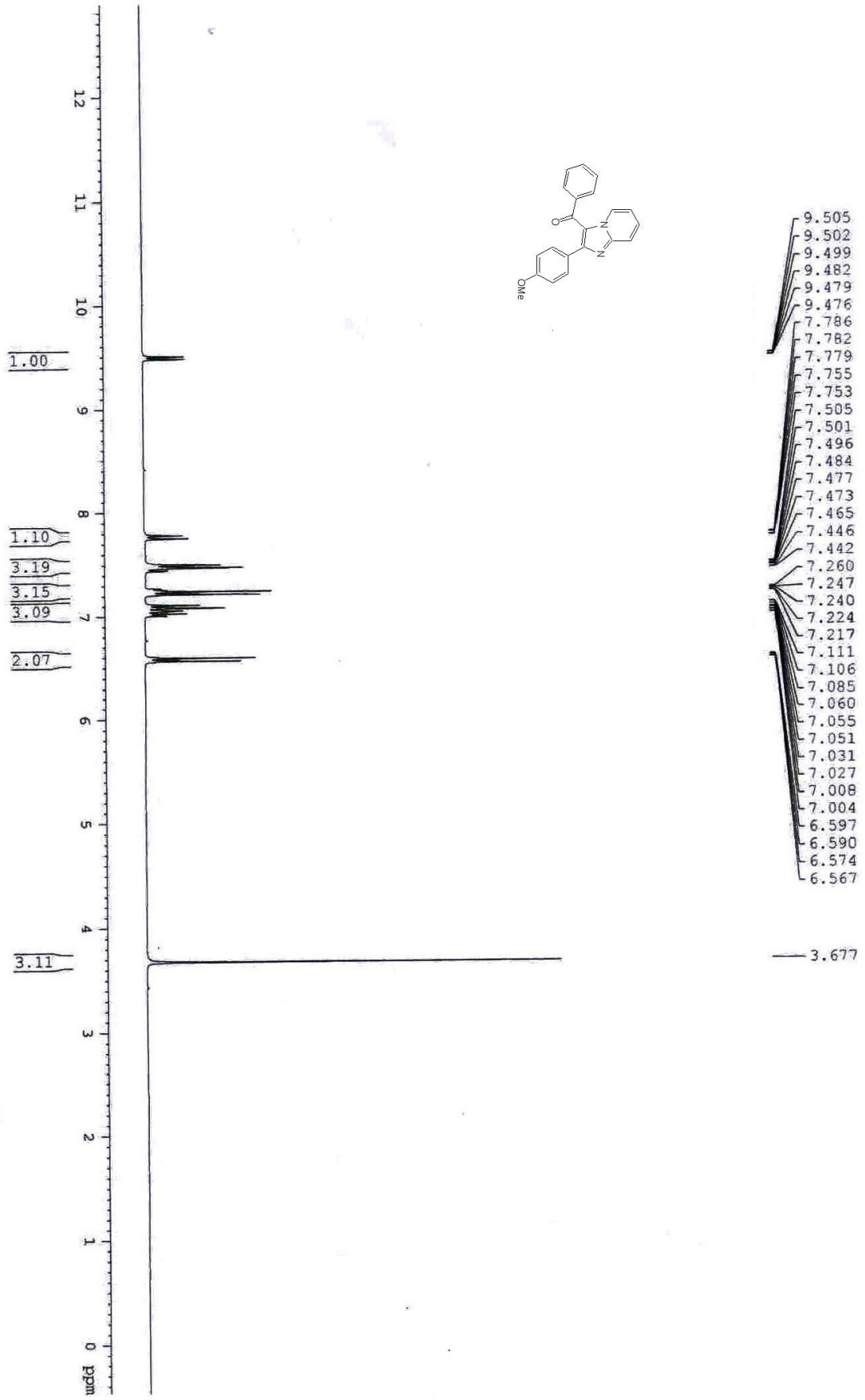
```
Current Data Parameters
NAME         Dr. A HAJRA
EXPNO               893
PROCNO                1

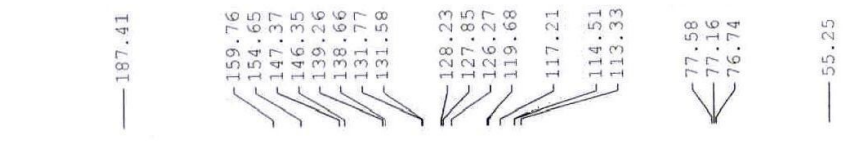
F2 - Acquisition Parameter
Date_          20130801
Time              20.07
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG         zgpg30
TD               32768
SOLVENT          CDCl3
NS                 160
DS                   2
SWH          24038.461 Hz
FIDRES        0.733596 Hz
AQ            0.6816244 sec
RG                32.25
DW               20.800 usec
DE                6.50 usec
TE               298.9 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                  1

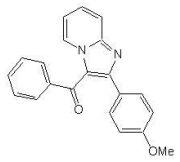
======== CHANNEL f1 ========
NUC1                13C
P1                 8.90 usec
PLW1        54.00000000 W
SFO1       100.6278588 MHz

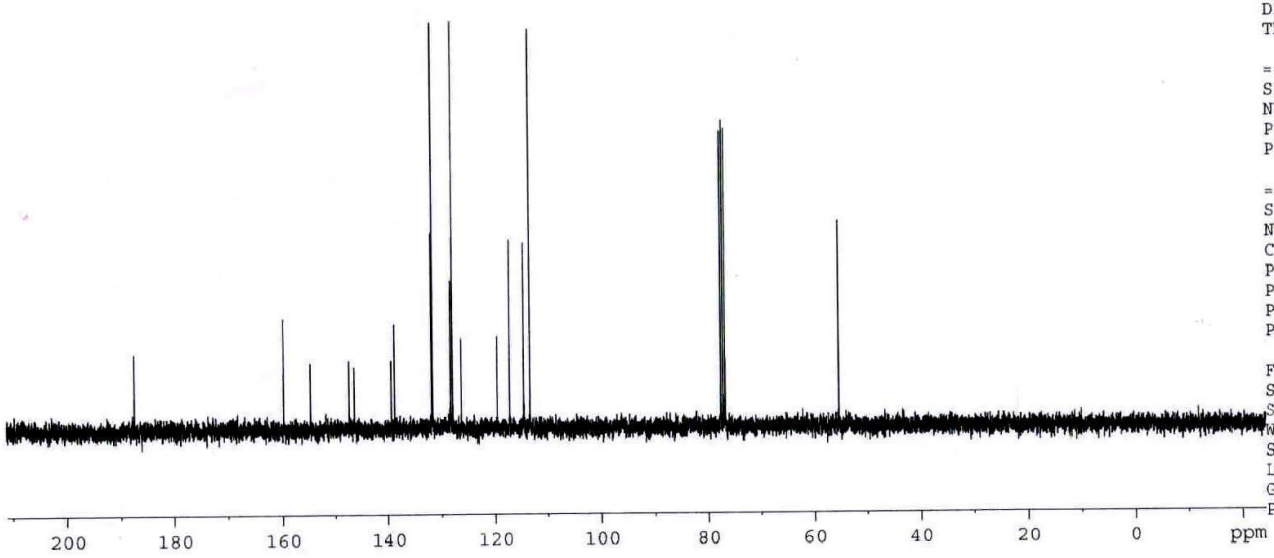
======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
PCPD2           80.00 usec
PLW2        12.00000000 W
PLW12        0.40792999 W
PLW13        0.26107001 W
SFO2       400.1516006 MHz

F2 - Processing parameters
SI                 16384
SF         100.6177953 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```


9.505
9.502
9.499
9.482
9.479
9.476
7.786
7.782
7.779
7.755
7.753
7.505
7.501
7.496
7.484
7.477
7.473
7.465
7.446
7.442
7.260
7.247
7.240
7.224
7.217
7.111
7.106
7.085
7.060
7.055
7.051
7.031
7.027
7.008
7.004
6.597
6.590
6.574
6.567
3.677
1.00
1.10
3.19
3.15
3.09
2.07
3.11
OMe
ppm







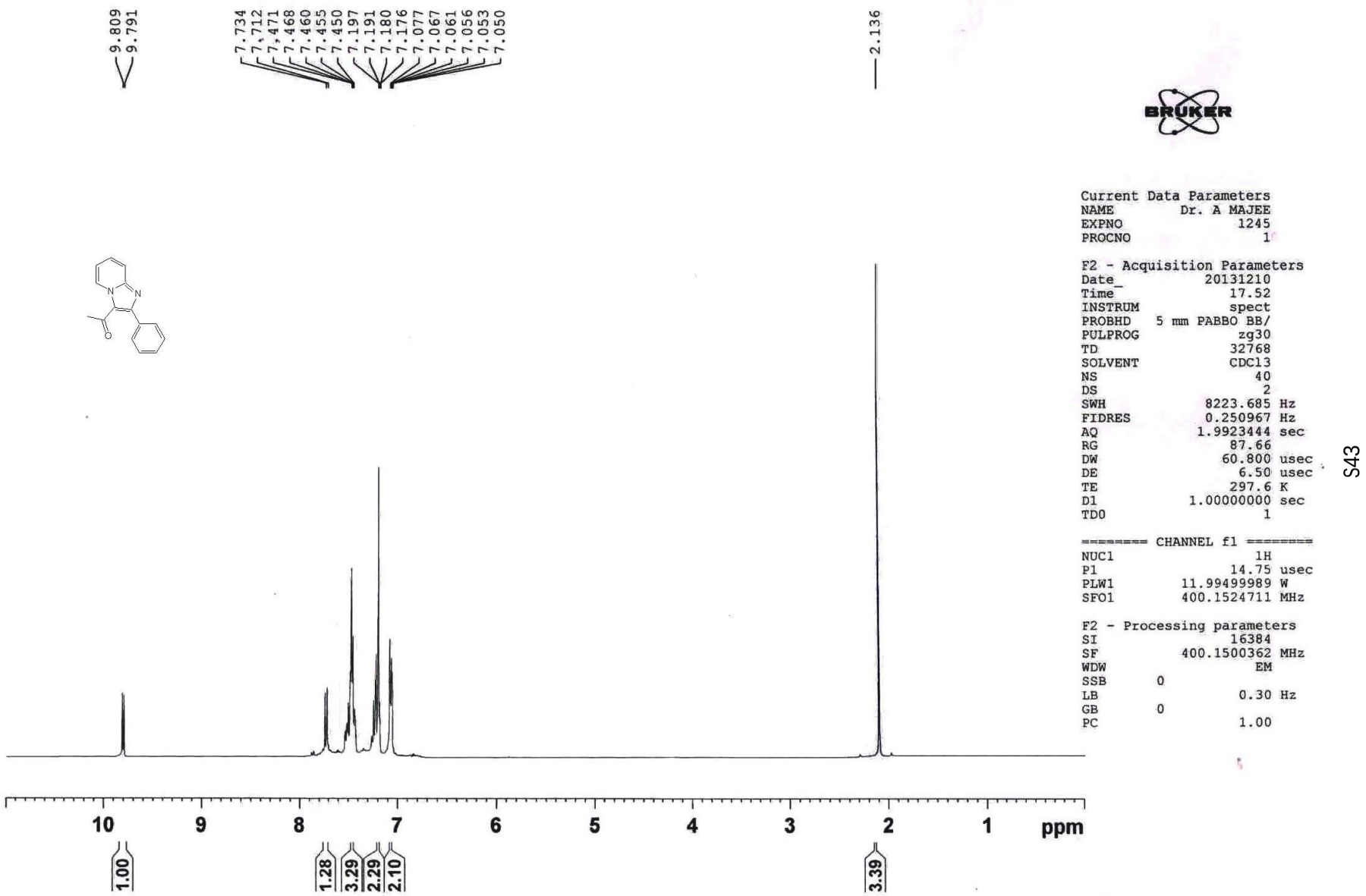

```
Current Data Parameters
NAME       DK-VBKM-2-13C
EXPNO                  1
PROCNO                 1

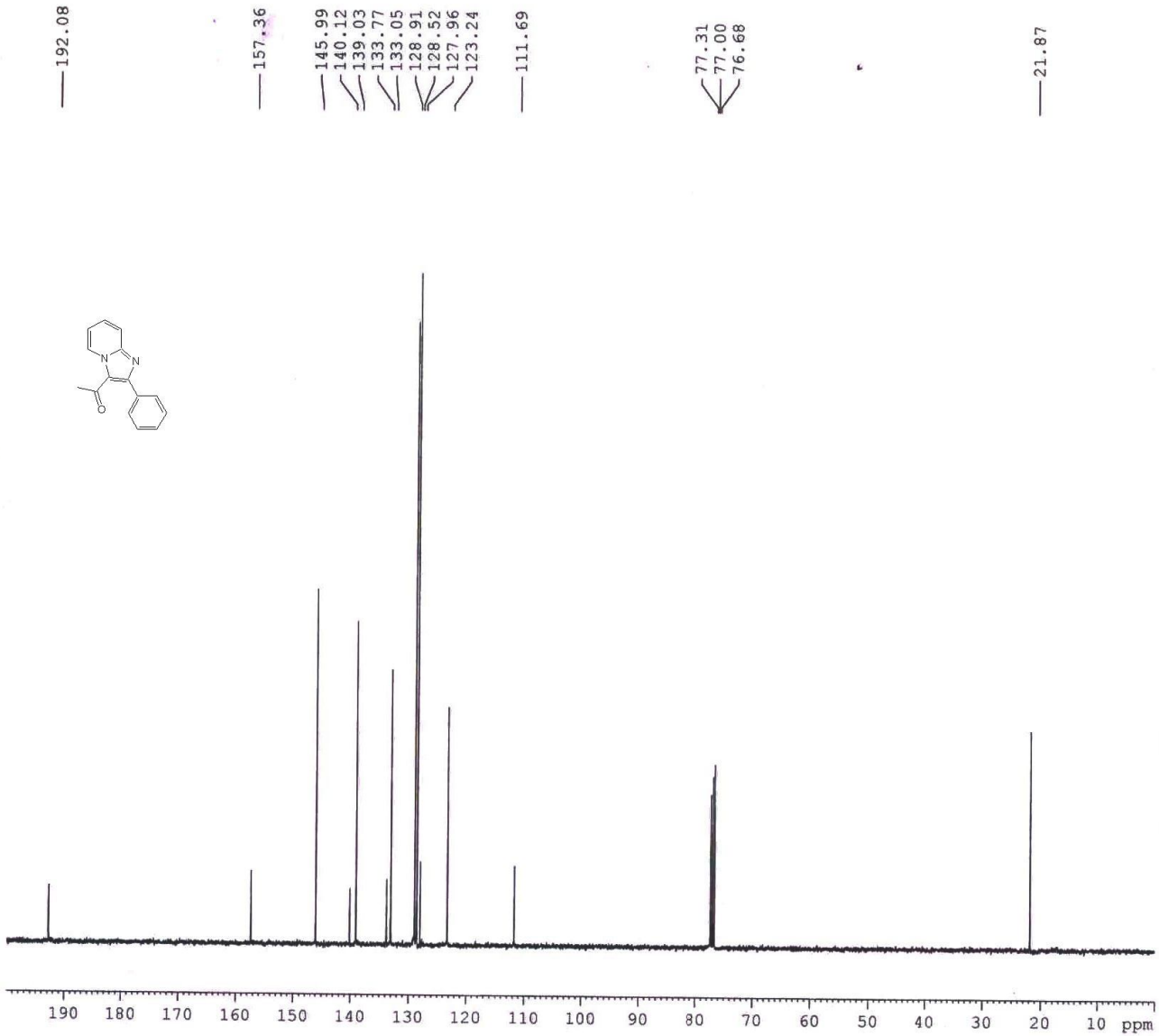
F2 - Acquisition Parameters
Date_           20131212
Time               12.20
INSTRUM            spect
PROBHD   5 mm PABBO BB-
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                   52
DS                    4
SWH           21929.824 Hz
FIDRES         0.669245 Hz
AQ             0.7471104 sec
RG                16.41
DW               22.800 usec
DE                6.50 usec
TE                297.9 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1         75.4752949 MHz
NUC1                13C
P1                9.25 usec
PLW1        34.00000000 W

======== CHANNEL f2 ========
SFO2        300.1312005 MHz
NUC2                1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2           6.99840021 W
PLW12          0.17545000 W
PLW13          0.14211001 W

F2 - Processing parameters
SI                 32768
SF           75.4677455 MHz
WDW                   EM
SSB       0
LB                 1.00 Hz
GB        0
PC                 1.40
```


9.809
9.791
7.734
7.712
7.471
7.468
7.460
7.455
7.450
7.197
7.191
7.180
7.176
7.077
7.067
7.061
7.056
7.053
7.050
2.136
BRUKER
Current Data Parameters
NAME Dr. A MAJEE
EXPNO 1245
PROCNO 1
F2 - Acquisition Parameters
Date_ 20131210
Time 17.52
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 40
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 87.66
DW 60.800 usec
DE 6.50 usec
TE 297.6 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz
F2 - Processing parameters
SI 16384
SF 400.1500362 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
10
9
8
7
6
5
4
3
2
1
ppm
1.00
1.28
3.29
2.29
2.10
3.39



BRUKER

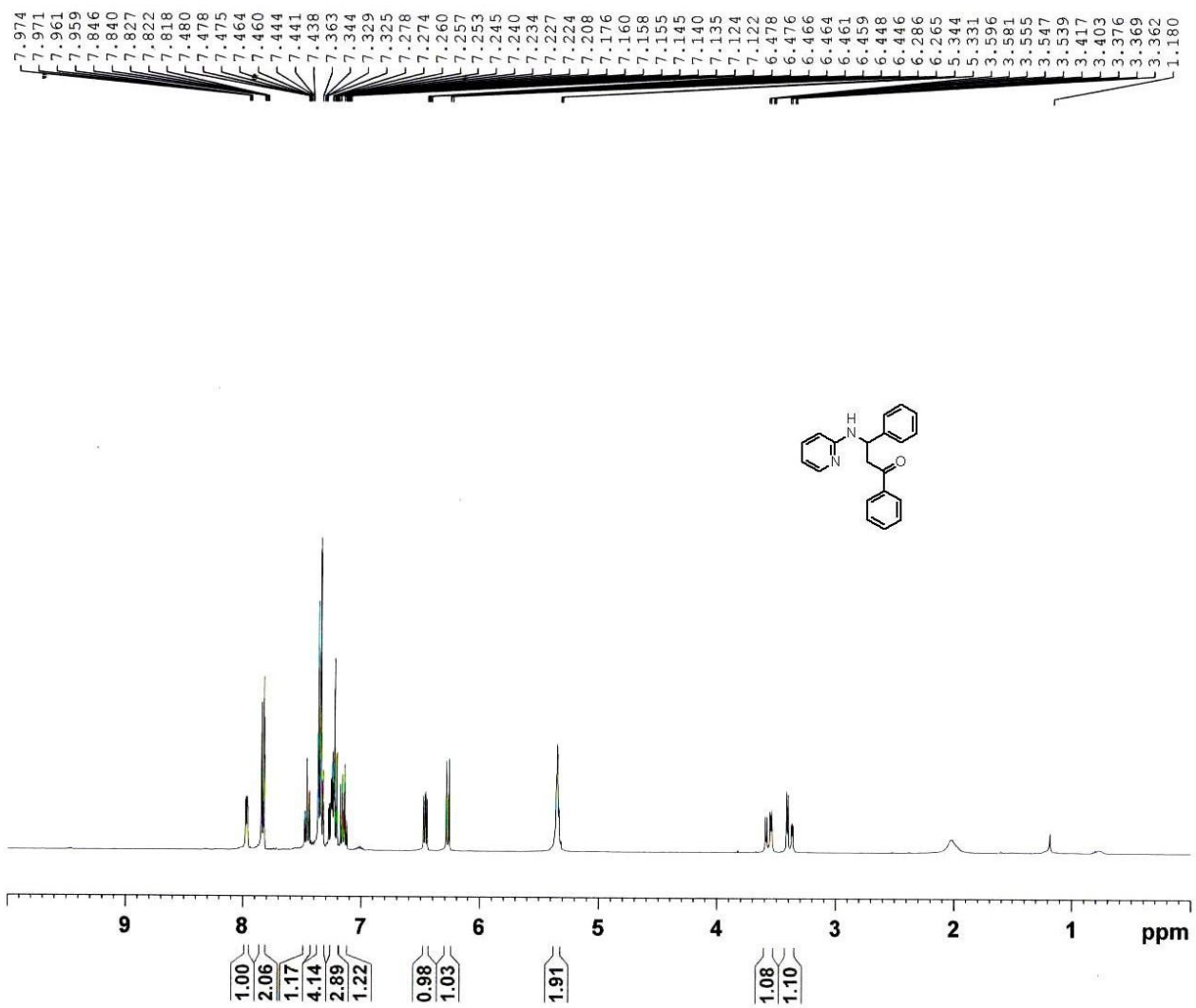
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 972
PROCNO 1

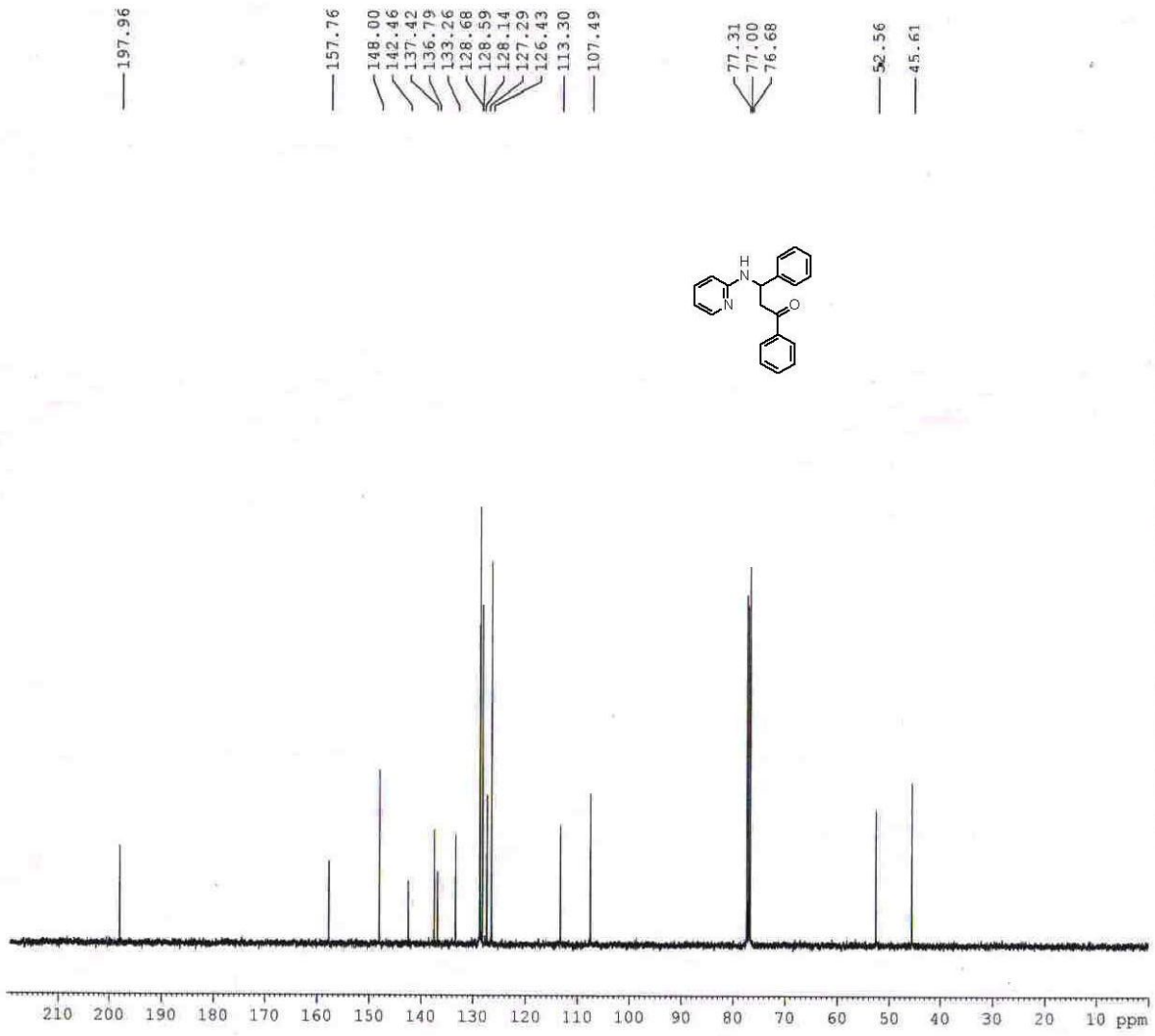
F2 - Acquisition Parameters
Date_ 20130823
Time 21.19
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 200
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 40.87
DW 20.800 usec
DE 6.50 usec
TE 298.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6278588 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1516006 MHz

F2 - Processing parameters
SI 16384
SF 100.6178099 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40


7.974
7.971
7.961
7.959
7.846
7.840
7.827
7.822
7.818
7.480
7.478
7.475
7.464
7.460
7.444
7.441
7.438
7.363
7.344
7.329
7.325
7.278
7.274
7.260
7.257
7.253
7.245
7.240
7.234
7.227
7.224
7.208
7.176
7.160
7.158
7.155
7.145
7.140
7.135
7.124
7.122
6.478
6.476
6.466
6.464
6.461
6.459
6.448
6.446
6.286
6.265
5.344
5.331
3.596
3.581
3.555
3.547
3.539
3.417
3.403
3.376
3.369
3.362
1.180
BRUKER
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 937
PROCNO 1
F2 - Acquisition Parameters
Date_ 20130817
Time 17.29
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 32
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 67.81
DW 60.800 usec
DE 6.50 usec
TE 299.7 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
NUC1 1H
P1 14.75 usec
PLW1 11.99499989 W
SFO1 400.1524711 MHz
F2 - Processing parameters
SI 16384
SF 400.1500421 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00
H
N
N
O
9
8
7
6
5
4
3
2
1
ppm
1.00
2.06
1.17
4.14
2.89
1.22
0.98
1.03
1.91
1.08
1.10



BRUKER

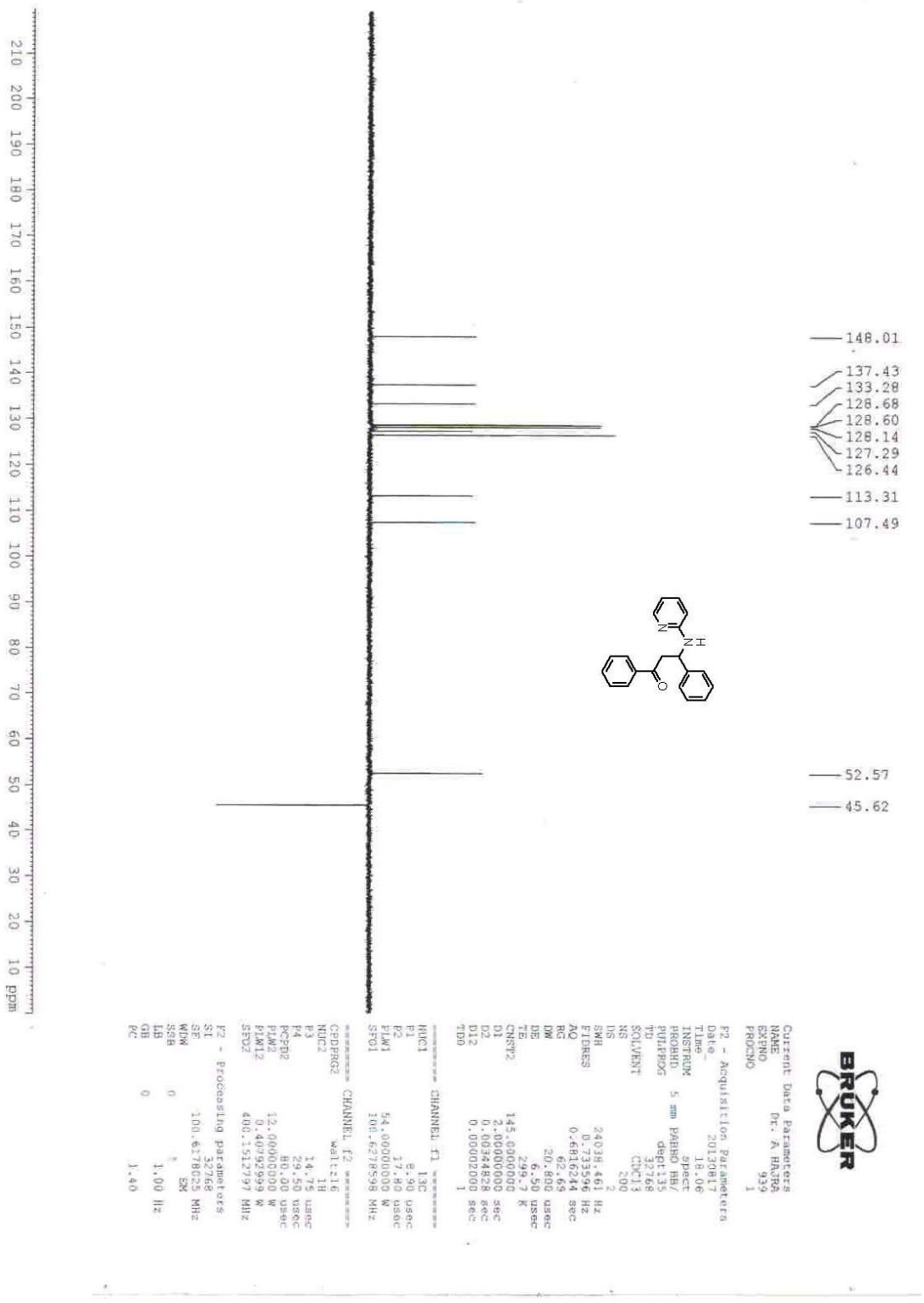
Current Data Parameters
NAME Dr. A HAJRA
EXPNO 938
PROCNO 1

F2 - Acquisition Parameters
Date_ 20130817
Time 17.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 400
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6816244 sec
RG 62.69
DW 20.800 usec
DE 6.50 usec
TE 300.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

======== CHANNEL f1 ========
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
SFO1 100.6276588 MHz

======== CHANNEL f2 ========
CPDPRG2 waltz16
NUC2 1H
PCPD2 80.00 usec
PLW2 12.00000000 W
PLW12 0.40792999 W
PLW13 0.26107001 W
SFO2 400.1516006 MHz

F2 - Processing parameters
SI 16384
SF 100.6178023 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40


148.01
137.43
133.28
128.68
128.60
128.14
127.29
126.44
113.31
107.49
52.57
45.62
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm