Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Silylation of 2*H*-Indazoles by Photoinduced Hydrogen-Atom Transfer Catalysis

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1. General Information:

All reagents were purchased from commercial sources and used without further purification. ^{1}H NMR spectra were determined on 400 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 (multiplate) and coupling constants (J) were given in Hz. $^{13}C\{^{1}H\}$ NMR spectra were recorded at 100 MHz in $CDCl_3$ solution. NMR data are reported relative to residual $CHCl_3$ (^{1}H, δ = 7.26 ppm) and $CDCl_3$ (^{13}C, δ = 77.16 ppm). TLC was done on silica gel coated glass slide. All 2-arylindazoles[1] were prepared by the reported methods. All solvents were dried and distilled before use. Commercially available solvents were freshly distilled before the reaction. All reactions involving moisture sensitive reactants were executed using oven dried glassware. Melting points (M.p's) were determined after recrystallization of solid compounds from a solution of dichloromethane/petroleum ether (1:3).

1.2. Light Information:

Kessil 34 W blue LED (Model No. H150-BLUE) was used as a light source for light promoted reactions.

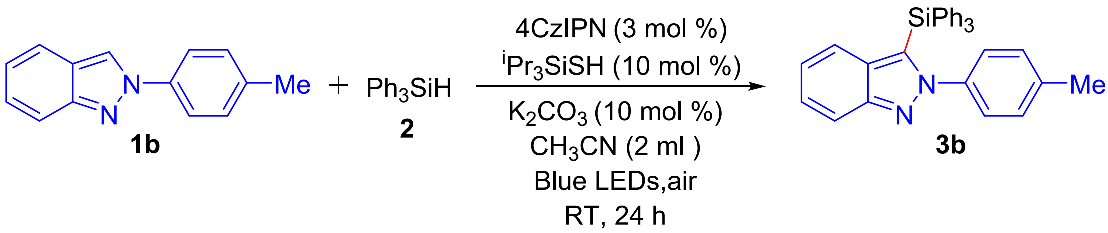
Rating of LED: 24VDC 1.5A 34W

Model: H150-BLUE

Range of wavelength: 450-530 nm. Manufacturer: Kessil, 1689 Regatta blvd, Richmond, CA94804 (www.kessil.com).

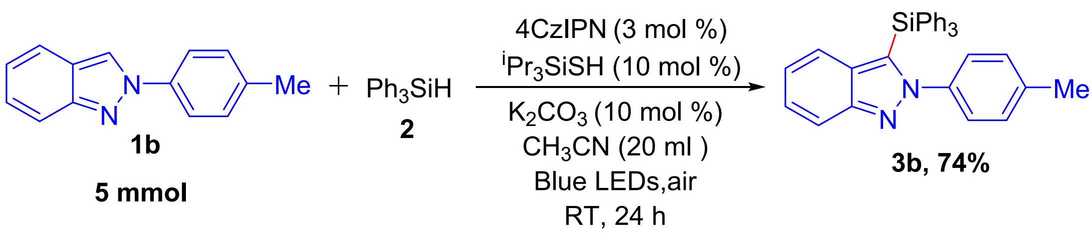
2. Experimental Procedures:

2.1. Typical Experimental Procedure for 3b:



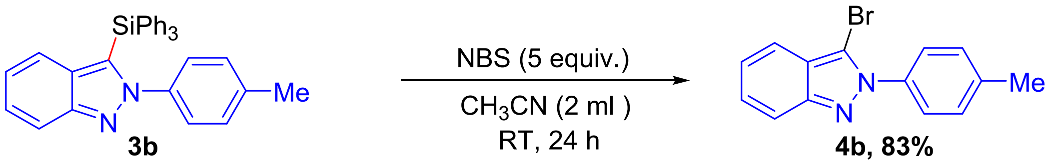
A mixture of 2-(*p*-tolyl)-2*H*-indazole (**1b**) (0.25 mmol, 52.0 mg), Ph_3SiH (**2**) (2.0 equiv., 130.2 mg), 4CzIPN (3 mol%, 5.9 mg), $^iPr_3SiSH$ (10 mol%, 4.8 mg), K_2CO_3 (10 mol%, 3.5 mg) and CH_3CN (2 ml) were added to an oven-dried reaction vessel (tube) equipped with a magnetic stirrer, and the reaction vessel was irradiated with Kessil 34 W blue LED at room temperature under open air atmosphere for 24 h. The progress of the reaction was monitored by TLC, the reaction was cooled to room temperature and extracted with ethyl acetate. The organic phase was dried over anhydrous Na_2SO_4. The crude residue was obtained after evaporating the solvent in vacuum and was purified by column chromatography on silica gel using a mixture of petroleum ether and ethyl acetate to afford the pure products.

3. Gram-Scale Synthesis for 3b:



A mixture of 2-(*p*-tolyl)-2*H*-indazole (**1b**) (5.0 mmol, 1.04 g), Ph_3SiH (2.0 equiv., 2.60 g), 4CzIPN (3 mol%, 118.3 mg), $^iPr_3SiSH$ (10 mol%, 95.2 mg), K_2CO_3 (10 mol%, 69.1 mg) and CH_3CN (20 ml) were added to an oven-dried reaction vessel (tube) equipped with a magnetic stirrer, and the reaction vessel was irradiated with Kessil 34 W blue LED at room temperature under open air atmosphere for 24 h. The progress of the reaction was monitored by TLC, the reaction was cooled to room temperature and extracted with ethyl acetate. The organic phase was dried over anhydrous Na_2SO_4. The crude residue was obtained after evaporating the solvent in vacuum and was purified by column chromatography on silica gel using a mixture of petroleum ether and ethyl acetate (92:08) as an eluting solvent to afford the pure product **3b** (1.72 g, 74%) as a white solid.

4. Synthetic Utility:[2]



A 25 mL flame-dried Schlenk tube equipped with a magnetic stir bar was charged with N-Bromosuccinimide (NBS) (177.9 mg, 5.0 equiv.), **3b** (93.3 mg, 0.2 mmol), fresh distilled CH_2Cl_2 or MeCN (2.0 mL) were then added under argon atmosphere. The reaction mixture was allowed to stir at room temperature for 24 h. The reaction mixture was diluted with ethyl acetate. The residue was purified by silica gel flash chromatography to afford the corresponding compound **4b** in 83% yield.

5. Starch-Iodide Test for the Detection of Hydrogenperoxide:[3]

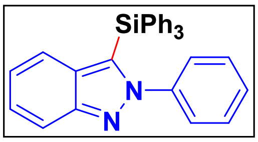
After the completion of reaction (monitored by TLC), aqueous potassium iodide solution was added to the reaction mixture. The aqueous layer turned to light brown-blue colour and the colour was enhanced by addition of starch. To the same aqueous layer, aqueous sodium thiosulfate solution was added and the aqueous layer immediately turned colourless.

The chemical equations involved in this reaction:

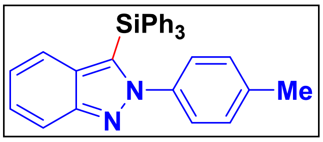
$$H_2O_2 + 2KI_{(aq)} \longrightarrow I_{2\,(aq)} + 2K^{+}_{(aq)} \quad \text{(brown-blue colour solution)}$$

$$I_{2\,(aq)} + 2S_2O_3^{2-}{}_{(aq)} \longrightarrow 2I^{-}_{(aq)} + S_4O_6^{2-}{}_{(aq)} \quad \text{(colourless solution)}$$

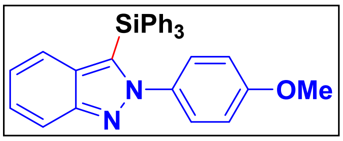
6. Characterization Data for the Synthesized Products:



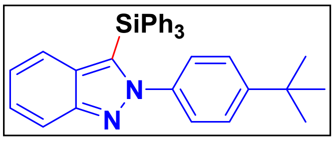
2-Phenyl-3-(triphenylsilyl)-2H-indazol **(3a):** White solid (82%, 92.7 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 151-152 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.89 (d, J = 8.8 Hz, 1H), 7.48 (d, J = 6.8 Hz, 6H), 7.38 (t, J = 7.6 Hz, 3H), 7.34-7.27 (m, 7H), 7.15-7.09 (m, 3H), 6.98 (d, J = 7.6 Hz, 2H), 6.91-6.86 (m, 2H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.4, 142.0, 136.2, 132.9, 131.9, 131.5, 129.9, 128.7, 128.3, 128.1, 126.8, 126.2, 122.7, 122.2, 117.9; HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $[C_{31}H_{25}N_2Si]^+$: 453.1782; found: 453.1794.



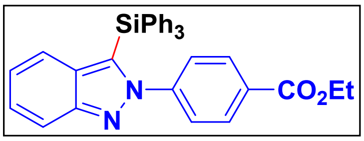
2-(p-Tolyl)-3-(triphenylsilyl)-2H-indazole **(3b):** White solid (85%, 99.0 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 177-178 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.88 (d, J = 8.8 Hz, 1H), 7.45 (d, J = 6.8 Hz, 6H), 7.37 (t, J = 7.6 Hz, 3H), 7.32-7.29 (m, 1H), 7.27-7.24 (m, 6H), 6.97 (d, J = 8.0 Hz, 2H), 6.87 (d, J = 3.6 Hz, 2H), 6.72 (d, J = 8.0 Hz, 2H), 2.21 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.3, 139.5, 138.6, 136.2, 135.1, 132.9, 131.7, 129.7, 128.8, 128.0, 126.5, 126.1, 122.6, 122.1, 117.9, 21.1; HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $[C_{32}H_{27}N_2Si]^+$: 467.1938; found: 467.1940.



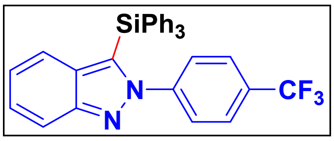
2-(4-Methoxyphenyl)-3-(triphenylsilyl)-2H-indazole **(3c):** White solid (70%, 84.4 mg); R_f = 0.50 (PE/EA = 88 : 12), M.P. 198-199 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.85 (d, J = 8.0 Hz, 1H), 7.45-7.43 (m, 6H), 7.36 (t, J = 7.6 Hz, 3H), 7.31-7.24 (m, 7H), 6.99-6.95 (m, 2H), 6.88-6.82 (m, 2H), 6.43-6.39 (m, 2H), 3.69 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 159.6, 149.3, 136.2, 135.1, 132.9, 131.9, 131.7, 129.8, 128.0, 127.9, 126.1, 122.6, 122.1, 117.8, 113.4, 55.5; HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $[C_{32}H_{27}N_2OSi]^+$: 483.1887; found: 483.1901.



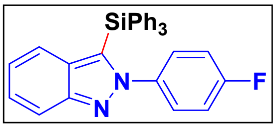
2-(4-(tert-Butyl)phenyl)-3-(triphenylsilyl)-2H-indazole **(3d):** White solid (81%, 103.0 mg); R_f = 0.50 (PE/EA = 93 : 07), M.P. 155-156 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.88 (d, J = 8.8 Hz, 1H), 7.49-7.47 (m, 6H), 7.38-7.34 (m, 3H), 7.32-7.29 (m, 1H), 7.28-7.24 (m, 6H), 7.06 (d, J = 8.0 Hz, 2H), 6.97 (d, J = 8.8 Hz, 2H), 6.88-6.87 (m, 2H), 1.22 (s, 9H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 151.5, 149.3, 139.4, 136.2, 133.0, 131.8, 131.4, 129.8, 128.0, 126.27, 126.20, 125.3, 122.6, 122.1, 117.9, 34.6, 31.3; Anal. Calcd for $C_{35}H_{32}N_2Si$: C, 82.63; H, 6.34; N, 5.51; Found: C, 82.78; H, 6.37; N, 5.61%.



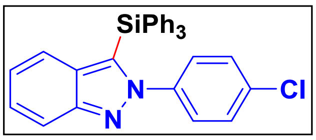
***Ethyl 4-(3-(triphenylsilyl)-2H-indazol-2-yl)benzoate* (3e):** White solid (83%, 108.8 mg); R_f = 0.50 (PE/EA = 88 : 12), M.P. 162-163 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.88 (d, J = 8.8 Hz, 1H), 7.63 (d, J = 8.4 Hz, 2H), 7.48 (d, J = 6.8 Hz, 6H), 7.38 (d, J = 7.6 Hz, 3H), 7.34-7.30 (m, 1H), 7.28-7.24 (m, 6H), 7.20 (d, J = 8.4 Hz, 2H), 6.91-6.85 (m, 2H), 4.38-4.33 (m, 2H), 1.39 (t, J = 7.2 Hz, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 165.7, 149.7, 145.4, 136.2, 132.6, 132.1, 131.8, 130.4, 130.0, 129.7, 128.2, 126.7, 126.6, 122.7, 122.5, 118.0, 61.2, 14.4; HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $[C_{34}H_{29}N_2O_2Si]^+$: 525.1993; found: 525.1998.



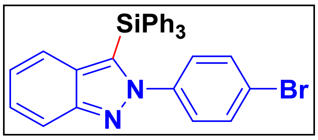
***2-(4-(Trifluoromethyl)phenyl)-3-(triphenylsilyl)-2H-indazole* (3f):** White solid (79%, 102.8 mg); R_f = 0.50 (PE/EA = 90 : 10), M.P. 171-172 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.89 (d, J = 8.4 Hz, 1H), 7.49-7.47 (m, 6H), 7.41-7.37 (m, 3H), 7.36-7.32 (m, 2H), 7.29 (d, J = 7.6 Hz, 5H), 7.25-7.21 (m, 4H), 6.94-6.91 (m, 2H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.6, 144.6, 136.1, 132.4, 132.2 (q, J = 226.0 Hz), 132.0, 130.6 (d, J = 32.0 Hz), 130.1, 128.2, 127.2, 126.7, 126.2 (q, J = 271.0 Hz), 125.4 (q, J = 4.0 Hz), 122.7, 122.6, 117.9; Anal. Calcd for $C_{32}H_{23}F_3N_2Si$: C, 73.82; H, 4.45; N, 5.38%; Found: C, 74.00; H, 4.43; N, 5.30%.



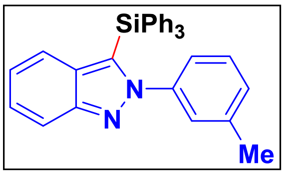
***2-(4-Fluorophenyl)-3-(triphenylsilyl)-2H-indazole* (3g):** White solid (78%, 91.7 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 162-163 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.54 (d, J = 8.8 Hz, 1H), 7.35-7.33 (m, 6H), 7.27 (t, J = 7.6 Hz, 3H), 7.22-7.13 (m, 7H), 6.95-6.92 (m, 2H), 6.79-6.73 (m, 2H), 6.53-6.47 (m, 2H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 162.4 (C−F, $^1J_{C-F}$ = 247.0 Hz), 149.4, 138.13, 138.11, 136.1, 135.1, 132.6, 132.1, 131.8, 130.0, 128.6 (C−F, $^3J_{C-F}$ = 9.0 Hz), 128.1, 126.5, 122.5 (C−F, $^2J_{C-F}$ = 25.0 Hz), 117.9, 115.1 (C−F, $^2J_{C-F}$ = 23.0 Hz); HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $[C_{31}H_{24}FN_2Si]^+$: 471.1687; found: 471.1703.



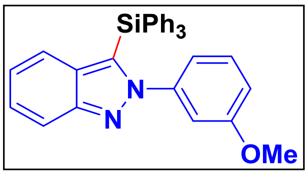
***2-(4-Chlorophenyl)-3-(triphenylsilyl)-2H-indazole* (3h):** White solid (69%, 84.0 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 184-185 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.86 (d, J = 8.8 Hz, 1H), 7.46 (d, J = 6.8 Hz, 6H), 7.40 (t, J = 7.6 Hz, 3H), 7.34-7.27 (m, 7H), 7.01 (d, J = 8.8 Hz, 2H), 6.90-6.86 (m, 4H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.5, 140.5, 136.2, 134.7, 132.6, 132.1, 131.9, 130.0, 128.4, 128.2, 128.1, 126.5, 122.6, 122.4, 117.9; Anal. Calcd for $C_{31}H_{23}ClN_2Si$: C, 76.44; H, 4.76; N, 5.75; Found: C, 76.24; H, 4.81; N, 5.63%.



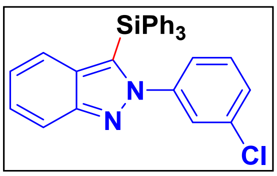
2-(4-Bromophenyl)-3-(triphenylsilyl)-2H-indazole **(3i):** White solid (75%, 99.6 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 187-188 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.86 (d, J = 8.8 Hz, 1H), 7.45 (d, J = 7.2 Hz, 6H), 7.41 (t, J = 7.2 Hz, 3H), 7.33-7.27 (m, 7H), 7.04 (d, J = 8.4 Hz, 2H), 6.95 (d, J = 8.4 Hz, 2H), 6.91-6.86 (m, 2H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.5, 140.9, 136.1, 132.5, 132.1, 131.9, 131.4, 130.0, 128.3, 128.2, 126.5, 123.0, 122.6, 122.4, 117.9; HRMS (ESI-TOF) m/z: $[M + Na]^+$ Calcd for $[C_{31}H_{23}BrN_2NaSi]^+$: 553.0706; found: 553.0706.



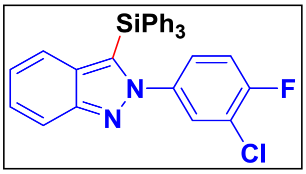
2-(m-Tolyl)-3-(triphenylsilyl)-2H-indazole **(3j):** White solid (83%, 96.8 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 183-184 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.88 (d, J = 8.8 Hz, 1H), 7.49-7.47 (m, 6H), 7.39-7.35 (m, 3H), 7.33-7.27 (m, 7H), 6.99-6.97 (m, 1H), 6.90-6.87 (m, 5H), 2.02 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.4, 141.9, 138.3, 136.2, 135.9, 132.9, 131.8, 129.8, 129.5, 128.2, 128.0, 127.6, 126.1, 123.8, 122.6, 122.1, 117.9, 20.9; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $[C_{32}H_{27}N_2Si]^+$: 467.1938; found: 467.1936.



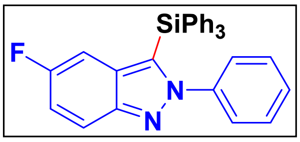
2-(3-Methoxyphenyl)-3-(triphenylsilyl)-2H-indazole **(3k):** White solid (85%, 102.5 mg); R_f = 0.50 (PE/EA = 88 : 12), M.P. 196-197 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.88 (d, J = 8.8 Hz, 1H), 7.50-7.48 (m, 6H), 7.38 (t, J = 7.6 Hz, 3H), 7.33-7.26 (m, 7H), 6.91-6.83 (m, 3H), 6.74 (d, J = 8.0 Hz, 1H), 6.66-6.62 (m, 2H), 3.38 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 159.2, 149.4, 143.0, 136.2, 132.9, 131.8, 131.5, 129.9, 129.3, 128.0, 126.2, 122.7, 122.2, 119.2, 118.0, 115.9, 111.6, 55.0; Anal. Calcd for $C_{32}H_{26}N_2OSi$: C, 79.63; H, 5.43; N, 5.80; Found: C, 79.79; H, 5.39; N, 5.88%.



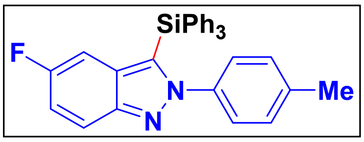
***2-(3-Chlorophenyl)-3-(triphenylsilyl)-2H-indazole* (3l):):** White solid (73%, 88.0 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 168-169 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.86 (d, J = 8.8 Hz, 1H), 7.50-7.48 (m, 6H), 7.39 (t, J = 7.2 Hz, 3H), 7.33-7.27 (m, 7H), 7.11-7.10 (m, 1H), 7.07-7.04 (m, 2H), 6.92-6.87 (m, 3H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 149.5, 142.9, 136.1, 134.0, 132.6, 132.0, 131.9, 130.1, 129.4, 129.0, 128.2, 127.4, 126.6, 125.0, 122.7, 122.5, 118.0; HRMS (ESI-TOF) *m/z*: [M + H]$^+$ Calcd for $[C_{31}H_{24}ClN_2Si]^+$: 487.1392; found: 487.1387.



***2-(3-Chloro-4-fluorophenyl)-3-(triphenylsilyl)-2H-indazole* (3m):** White solid (87%, 109.8 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 177-178 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.86 (d, J = 8.8 Hz, 1H), 7.50 (d, J = 6.8 Hz, 6H), 7.42 (t, J = 7.6 Hz, 3H), 7.35-7.30 (m, 7H), 7.14-7.12 (m, 1H), 7.04-7.00 (m, 1H), 6.93-6.88 (m, 2H), 6.71 (t, J = 8.8 Hz, 1H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 158.0 (C−F, $^1J_{C-F}$ = 251.0 Hz), 149.5, 138.56, 138.53, 136.1, 132.4 (C−F, $^3J_{C-F}$ = 9.0 Hz), 131.8, 130.2, 129.6, 128.2, 126.79, 126.76, 126.72, 122.6 (C−F, $^3J_{C-F}$ = 3.0 Hz), 120.8 (C−F, $^2J_{C-F}$ = 19.0 Hz), 117.9, 116.0 (C−F, $^2J_{C-F}$ = 22.0 Hz); Anal. Calcd for $C_{31}H_{22}ClFN_2Si$: C, 73.72; H, 4.39; N, 5.55; Found: C, 73.91; H, 4.36; N, 5.61%.

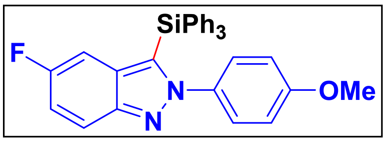


***5-Fluoro-2-phenyl-3-(triphenylsilyl)-2H-indazole* (3n):** White solid (72%, 84.6 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 157-158 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.85-7.82 (m, 1H), 7.46-7.44 (m, 6H), 7.40-7.36 (m, 3H), 7.27 (t, J = 8.0 Hz, 6H), 7.13-7.08 (m, 4H), 6.99-6.95 (m, 2H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 158.3 (C−F, $^1J_{C-F}$ = 238.0 Hz), 146.8, 141.9, 136.1, 132.5, 131.7, 131.5 (C−F, $^3J_{C-F}$ = 11.0 Hz), 130.0, 128.9, 128.5, 128.2, 126.7, 119.9 (C−F, $^3J_{C-F}$ = 10.0 Hz), 117.8 (C−F, $^2J_{C-F}$ = 29.0 Hz), 105.2 (C−F, $^2J_{C-F}$ = 24.0 Hz); Anal. Calcd for $C_{31}H_{23}FN_2Si$: C, 79.12; H, 4.93; N, 5.95; Found: C, 79.33; H, 4.97; N, 5.86%.

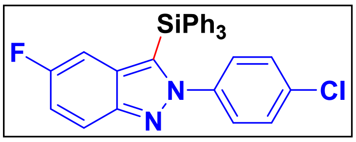


***5-Fluoro-2-(p-tolyl)-3-(triphenylsilyl)-2H-indazole* (3o):** White solid (76%, 92.0 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 183-184 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.83-7.80 (m, 1H), 7.43-7.41 (m, 6H), 7.37 (t, J = 7.6 Hz, 3H), 7.27 (d, J = 7.6 Hz, 4H), 7.24 (d, J = 3.2 Hz, 2H), 7.11-7.06 (m, 1H), 6.93 (d, J = 8.0 Hz, 2H), 6.71 (d, J = 8.0 Hz, 2H), 6.35-6.32 (m, 1H), 2.19 (s, 3H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 158.2 (C−F, $^1J_{C-F}$ = 239.0 Hz), 146.7, 139.4, 138.8, 136.1, 132.5, 131.8, 131.3 (C−F, $^3J_{C-F}$ = 11.0 Hz), 129.8, 128.9, 128.1, 126.4, 119.8 (C−F, $^3J_{C-F}$ = 10.0 Hz), 117.6 (C−F, $^2J_{C-F}$ = 29.0 Hz), 105.2 (C−F, $^2J_{C-F}$ = 24.0 Hz), 21.1;

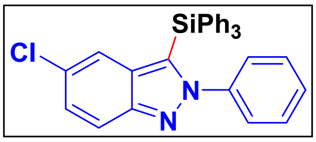
Anal. Calcd for $C_{32}H_{25}FN_2Si$: C, 79.31; H, 5.20; N, 5.78; Found: C, 79.14; H, 5.22; N, 5.88%.



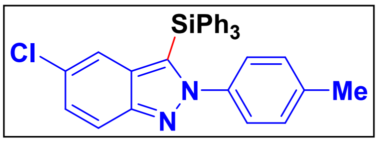
***5-Fluoro-2-(4-methoxyphenyl)-3-(triphenylsilyl)-2H-indazole* (3p):** White solid (68%, 85.1 mg); R_f = 0.50 (PE/EA = 87 : 13), M.P. 202-203 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.84-7.81 (m, 1H), 7.46-7.44 (m, 6H), 7.39 (t, J = 7.6 Hz, 3H), 7.30-7.26 (m, 6H), 7.12-7.07 (m, 1H), 7.00-6.96 (m, 2H), 6.44-6.41 (m, 2H), 6.36-6.33 (m, 1H), 3.70 (s, 3H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 159.8, 158.3 (C−F, $^1J_{C-F}$ = 239.0 Hz), 146.6, 136.2, 134.9, 132.6, 132.2, 131.3 (C−F, $^3J_{C-F}$ = 11.0 Hz), 130.0, 128.1, 127.9, 119.8 (C−F, $^3J_{C-F}$ = 9.0 Hz), 117.8 (C−F, $^2J_{C-F}$ = 29.0 Hz), 113.6, 105.2 (C−F, $^2J_{C-F}$ = 25.0 Hz), 55.6; Anal. Calcd for $C_{32}H_{25}FN_2OSi$: C, 76.77; H, 5.03; N, 5.60; Found: C, 76.64; H, 4.99; N, 5.53%.



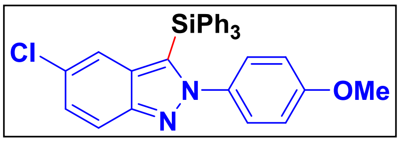
***2-(4-Chlorophenyl)-5-fluoro-3-(triphenylsilyl)-2H-indazole* (3q):** White solid (79%, 99.7 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 204-205 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.85-7.81 (m, 1H), 7.47-7.40 (m, 9H), 7.30 (t, J = 7.6 Hz, 6H), 7.14-7.09 (m, 1H), 7.01 (d, J = 7.2 Hz, 2H), 6.90 (d, J = 8.4 Hz, 2H), 6.38 (d, J = 10.0 Hz, 1H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 158.4 (C−F, $^1J_{C-F}$ = 239.0 Hz), 146.9, 140.3, 136.1, 134.9, 132.3, 132.2, 131.5 (C−F, $^3J_{C-F}$ = 12.0 Hz), 130.1, 128.5, 128.3, 128.0, 119.9 (C−F, $^3J_{C-F}$ = 10.0 Hz), 118.1 (C−F, $^2J_{C-F}$ = 29.0 Hz), 105.2 (C−F, $^2J_{C-F}$ = 25.0 Hz); Anal. Calcd for $C_{31}H_{22}ClFN_2Si$: C, 73.72; H, 4.39; N, 5.55; Found: C, 73.91; H, 4.44; N, 5.63%.



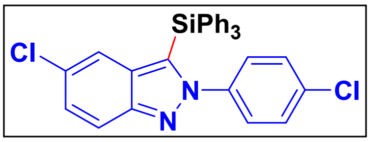
***5-Chloro-2-phenyl-3-(triphenylsilyl)-2H-indazole* (3r):** White solid (81%, 98.6 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 163-164 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.79 (d, J = 8.8 Hz, 1H), 7.45 (d, J = 7.2 Hz, 6H), 7.38 (t, J = 7.6 Hz, 3H), 7.28 (d, J = 7.6 Hz, 6H), 7.24-7.21 (m, 1H), 7.12-7.08 (m, 3H), 6.96 (t, J = 8.0 Hz, 2H), 6.68 (d, J = 1.2 Hz, 1H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$): δ 147.7, 141.7, 136.1, 135.0, 132.3, 131.6, 130.1, 128.9, 128.5, 128.2, 127.7, 127.6, 126.6, 121.4, 119.4; HRMS (ESI-TOF) *m/z*: $[M + H]^+$ Calcd for $[C_{31}H_{24}ClN_2Si]^+$: 487.1392; found: 487.1391.



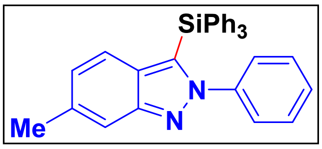
***5-Chloro-2-(p-tolyl)-3-(triphenylsilyl)-2H-indazole* (3s):** White solid (65%, 81.4 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 196-197 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.79 (d, J = 9.2 Hz, 1H), 7.43 (d, J = 6.8 Hz, 6H), 7.39 (t, J = 7.6 Hz, 3H), 7.27 (d, J = 8.0 Hz, 6H), 7.23-7.21 (m, 1H), 6.94 (d, J = 8.4 Hz, 2H), 6.73-6.69 (m, 3H), 2.20 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 147.7, 139.3, 138.9, 136.2, 132.5, 132.2, 131.8, 129.9, 128.9, 128.1, 127.7, 127.5, 126.4, 121.4, 119.4, 21.1; HRMS (ESI-TOF) m/z: $[M + H]^+$ Calcd for $[C_{32}H_{26}ClN_2Si]^+$: 501.1548; found: 501.1558.



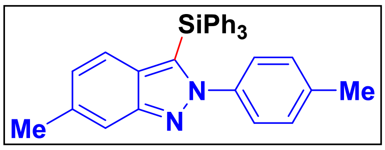
***5-Chloro-2-(4-methoxyphenyl)-3-(triphenylsilyl)-2H-indazole* (3t):** White solid (84%, 108.5 mg); R_f = 0.50 (PE/EA = 87 : 13), M.P. 199-200 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.79 (d, J = 9.2 Hz, 1H), 7.47-7.45 (m, 6H), 7.42-7.38 (m, 3H), 7.30 (t, J = 7.6 Hz, 6H), 7.24-7.22 (m, 1H), 7.01-6.97 (m, 2H), 6.71 (d, J = 1.2 Hz, 1H), 3.70 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 159.8, 147.7, 136.2, 134.9, 132.5, 132.1, 132.0, 130.0, 128.1, 127.8, 127.7, 127.5, 121.3, 119.3, 113.5, 55.5; Anal. Calcd for $C_{32}H_{25}ClN_2OSi$: C, 74.33; H, 4.87; N, 5.42; Found: C, 74.47; H, 4.84; N, 5.31%.



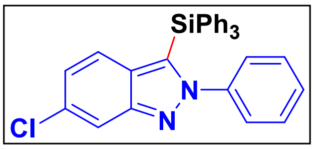
***5-Chloro-2-(4-chlorophenyl)-3-(triphenylsilyl)-2H-indazole* (3u):** White solid (89%, 116.0 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 154-155 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.80 (d, J = 8.8 Hz, 1H), 7.48-7.46 (m, 6H), 7.43 (d, J = 7.6 Hz, 3H), 7.32 (t, J = 7.6 Hz, 6H), 7.27-7.24 (m, 1H), 7.02 (d, J = 8.4 Hz, 2H), 6.91 (d, J = 8.8 Hz, 2H), 6.73 (d, J = 1.6 Hz, 1H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 147.9, 140.2, 136.1, 135.1, 135.0, 132.3, 132.2, 130.2, 128.5, 128.3, 128.0, 127.99, 127.95, 121.3, 119.4; Anal. Calcd for $C_{31}H_{22}Cl_2N_2Si$: C, 71.40; H, 4.25; N, 5.37; Found: C, 71.25; H, 4.23; N, 5.27%.



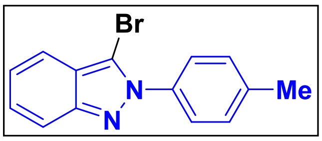
***6-Methyl-2-phenyl-3-(triphenylsilyl)-2H-indazole* (3v):** White solid (74%, 86.3 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 178-179 °C; ^1H NMR (400 MHz, $CDCl_3$): δ 7.62 (d, J = 0.8 Hz, 1H), 7.47-7.45 (m, 6H), 7.38-7.34 (m, 3H), 7.26 (t, J = 2.0 Hz, 6H), 7.12-7.07 (m, 3H), 6.95 (t, J = 8.0 Hz, 2H), 6.73 (s, 2H), 2.43 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.7, 141.8, 136.2, 135.1, 132.9, 131.6, 130.3, 129.9, 128.7, 128.4, 128.1, 126.8, 125.2, 122.2, 116.1, 22.1; Anal. Calcd for $C_{32}H_{26}N_2Si$: C, 82.36; H, 5.62; N, 6.00; Found: C, 82.52; H, 5.58; N, 6.12%.



***6-Methyl-2-(p-tolyl)-3-(triphenylsilyl)-2H-indazole* (3w):** White solid (71%, 85.3 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 189-190 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.60 (s, 1H), 7.44-7.42 (m, 6H), 7.37-7.33 (m, 3H), 7.24 (t, J = 7.6 Hz, 6H), 6.94 (d, J = 8.0 Hz, 2H), 6.72-6.68 (m, 4H), 2.42 (s, 3H), 2.18 (s, 3H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.9, 139.6, 138.5, 136.2, 136.0, 133.0, 131.5, 130.2, 129.7, 128.8, 128.0, 126.6, 125.0, 122.1, 116.2, 22.18, 21.15; Anal. Calcd for $C_{33}H_{28}N_2Si$: C, 82.46; H, 5.87; N, 5.83; Found: C, 82.26; H, 5.89; N, 5.75%.



***6-Chloro-2-phenyl-3-(triphenylsilyl)-2H-indazole* (3x):** White solid (67%, 81.5 mg); R_f = 0.50 (PE/EA = 92 : 08), M.P. 166-167 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 7.84 (d, J = 0.3 Hz, 1H), 7.45-7.43 (m, 6H), 7.41-7.35 (m, 3H), 7.29-7.25 (m, 6H), 7.13-7.09 (m, 3H), 6.99-6.95 (m, 2H), 6.83-6.80 (m, 1H), 6.74 (d, J = 8.8 Hz, 1H); $^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$): δ 149.6, 141.7 136.1, 132.6, 132.5, 132.3, 130.2, 130.1, 128.9, 128.5, 128.2, 126.7, 123.9, 123.7, 116.8; Anal. Calcd for $C_{31}H_{23}ClN_2Si$: C, 76.44; H, 4.76; N, 5.75; Found: C, 76.30; H, 4.79; N, 5.81%.

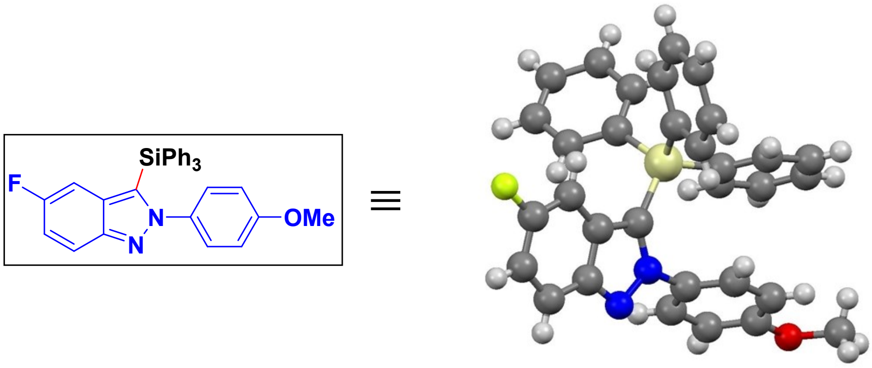


***3-Bromo-2-(p-tolyl)-2H-indazole* (4b)[4] :** White solid (83%, 47.6 mg); R_f = 0.50 (PE/EA = 96 : 04); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, J = 8.8 Hz, 1 H), 7.59-7.54 (m, 3H), 7.38-7.33 (m, 3H), 7.19-7.15 (m, 1 H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.1, 139.4, 136.7, 129.6, 127.5, 125.9, 122.8, 122.9, 119.7, 118.1, 106.3, 21.3.

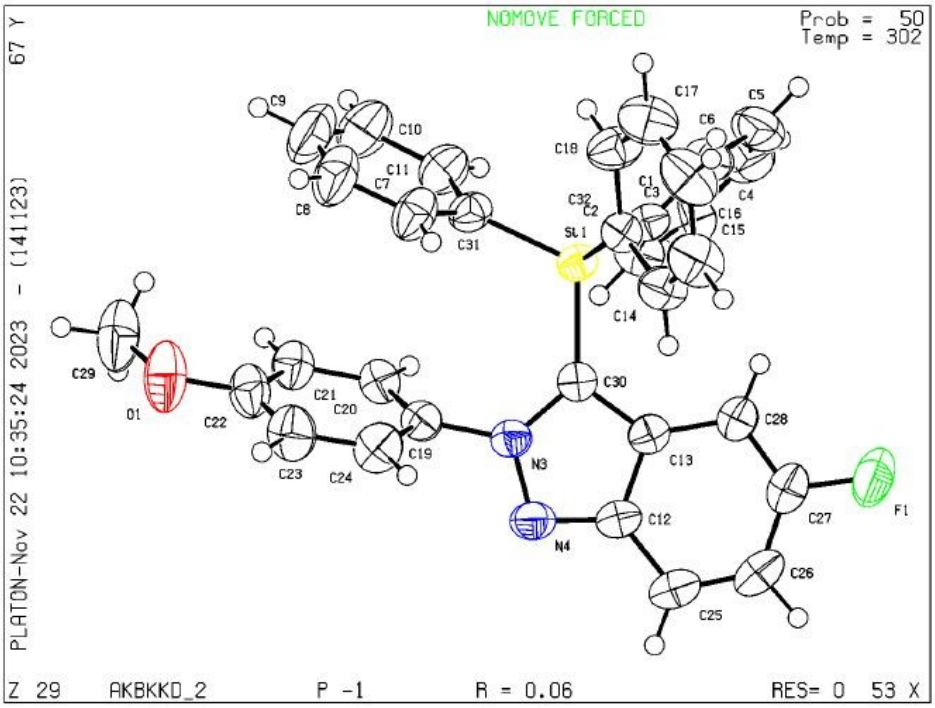
7. Structure Determination (X-ray Crystallographic Data for 3p):

The white crystal of **3p** was obtained by crystallization from a solution in dichloromethane/petroleum ether after purification by column chromatography. Chemical Formula**:** $C_{32}H_{25}FN_2OSi$.

View of ORTEP (with 50% probability) diagram for the structure 5-fluoro-2-(4-methoxyphenyl)-3-(triphenylsilyl)-2*H*-indazole (**3p**).



Datablock AKBKKD_2 - ellipsoid plot



Wavelength	0.71073 Å	
Formula	$C_{32}H_{25}FN_2OSi$	
Crystal system	Triclinic	
Space group	P -1	
Unit cell dimensions	a = 9.840(2)Å	α = 102.890(7)°
	b = 12.074(3) Å	β = 107.408(7)°
	c = 13.093(3) Å	γ = 110.200(6)°
Volume	1297.2 Å^3	
Z	2	
R factor	5.69	

The crystallographic data have been deposited with the Cambridge Crystallographic Data centre as a supplementary publication with a CCDC reference number 2308886.

8. References:

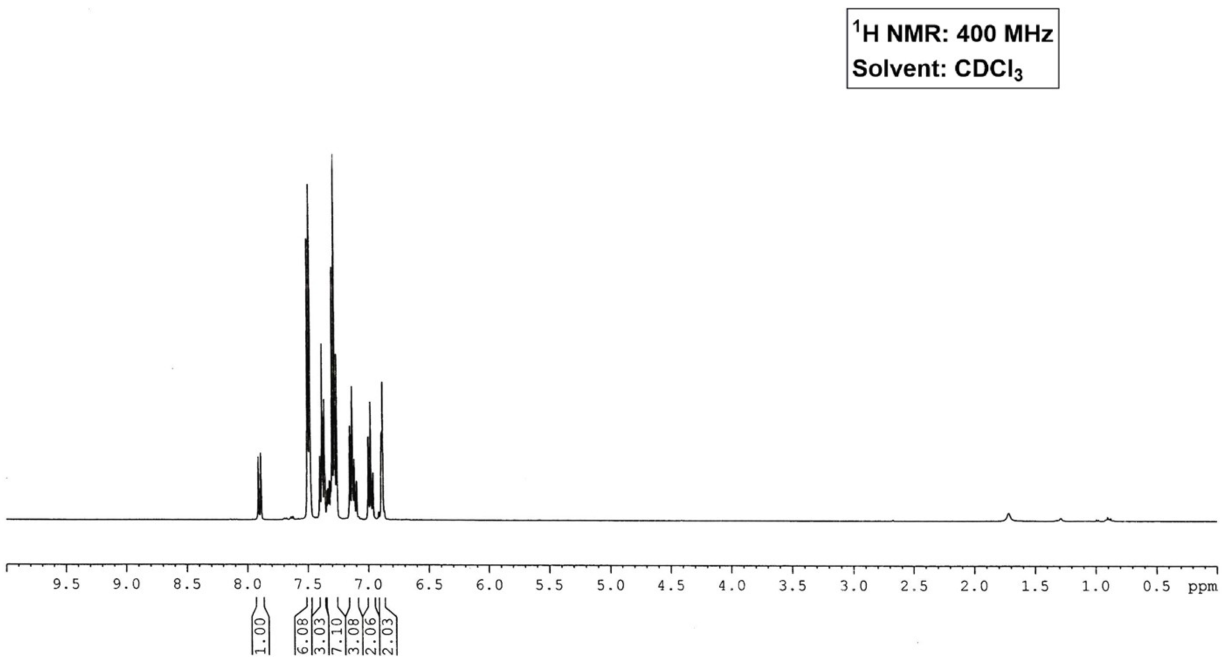
(1) (a) M. R. Kumar, A. Park, N. Park and S. Lee, *Org. Lett*., 2011, **13**, 3542. (b) G. Bogonda, H. Y. Kim, K. Oh, *Org. Lett*., 2018, **20**, 2711.

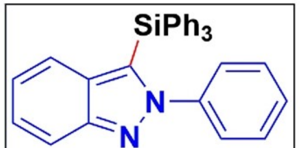
(2) C. Zarate, M. Nakajima and R. Martin, *J. Am. Chem. Soc.,* 2017, ***139***, 1191.

(3) (a) A. Guerrero-Corella, A. M. Martinez-Gualda, F. Ahmadi, E. Ming, A. Fraile and J. Alemán, *J. Chem. Commun.,* 2017, **53**, 10463. (b) G. K. Fekarurhobo, S. S. Angaye and F. G. Obomann, *J. Emerg. Trends Engg. Appl. Sci.,* (JETEAS) 2013, **4**, 394.

(4) X. Liu, Z. Wu, C. Feng, W. Liu, M. Li and Z. Shen, *Eur. J. Org. Chem.,* 2022, ***2022***, e202200262.

9. NMR Spectra for the Synthesized Products





3a

^{1}H NMR: 400 MHz

Solvent: $CDCl_3$

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Current Data Parameters
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EXPNO                  323
PROCNO                   1

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PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               8223.685 Hz
FIDRES            0.250967 Hz
AQ               1.9922944 sec
RG                   77.59
DW                  60.800 usec
DE                    6.50 usec
TE                   296.8 K
D1              1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           400.1524711 MHz
NUC1                    1H
P1                   14.75 usec
PLW1           12.00000000 W

F2 - Processing parameters
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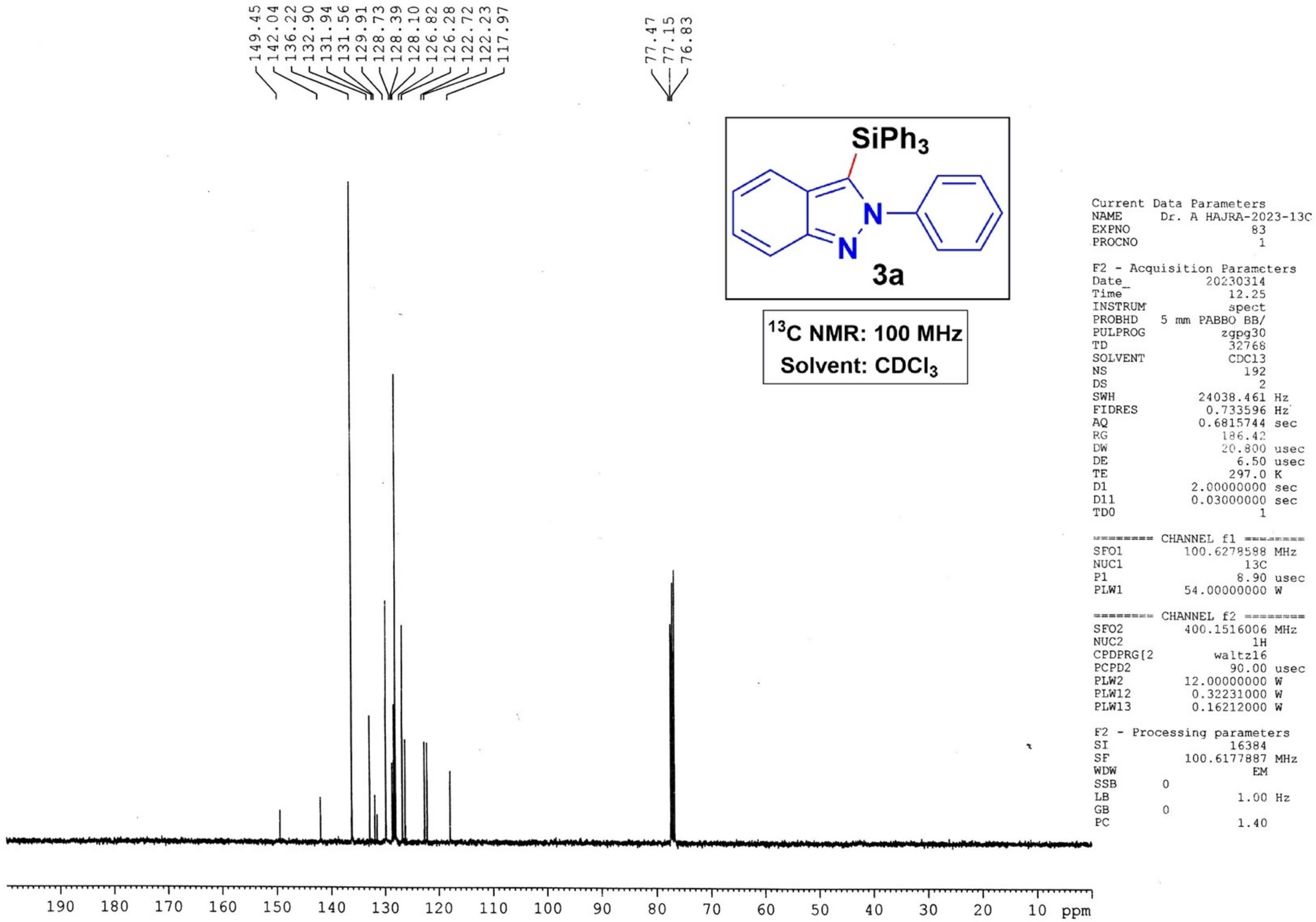
WDW                     EM
SSB      0
LB                    0.30 Hz
GB       0
PC                    1.00
```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132.90
131.94
131.56
129.91
128.73
128.39
128.10
126.82
126.28
122.72
122.23
117.97
77.47
77.15
76.83
SiPh3
N
N
3a
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
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EXPNO 83
PROCNO 1
F2 - Acquisition Parameters
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INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
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DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 297.0 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
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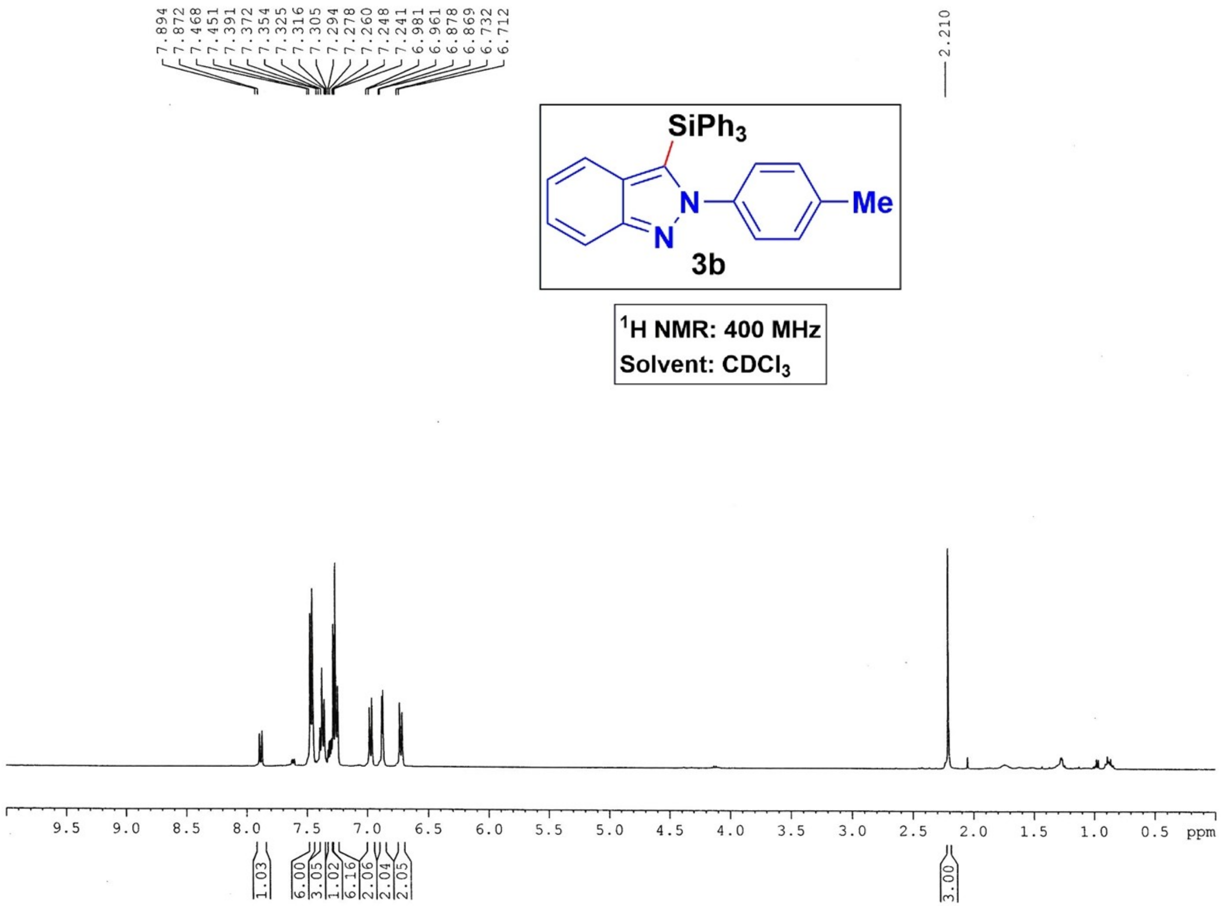
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



^{1}H NMR: 400 MHz

Solvent: $CDCl_3$

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PROCNO                    1

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TD                    32768
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NS                        8
DS                        2
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FIDRES             0.250967 Hz
AQ                1.9922944 sec
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DE                     6.50 usec
TE                    292.7 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
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NUC1                     1H
P1                    14.75 usec
PLW1            12.00000000 W

F2 - Processing parameters
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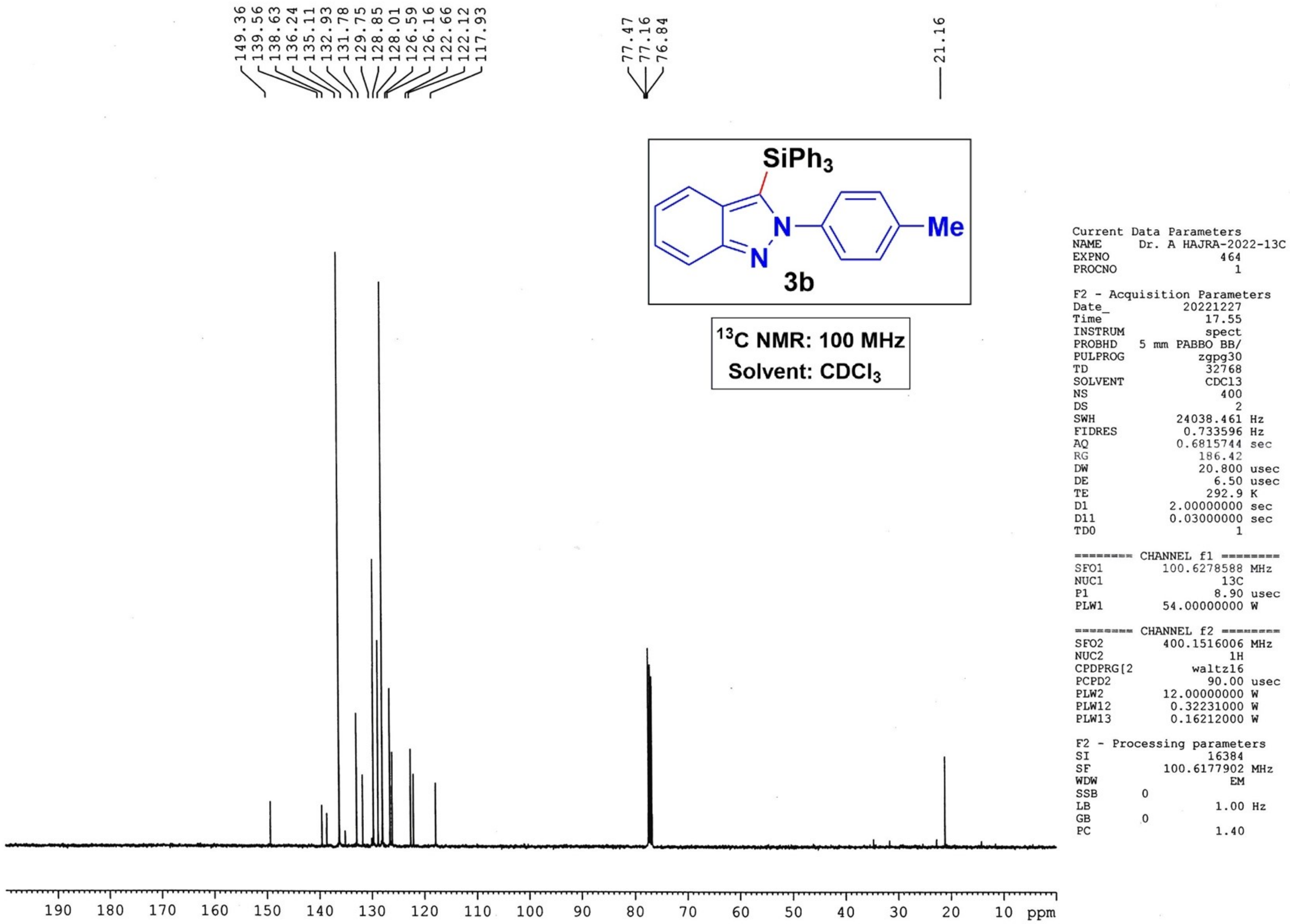
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122.66
122.12
117.93
77.47
77.16
76.84
21.16
SiPh3
N
N
Me
3b
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
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EXPNO 464
PROCNO 1
F2 - Acquisition Parameters
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Time 17.55
INSTRUM spect
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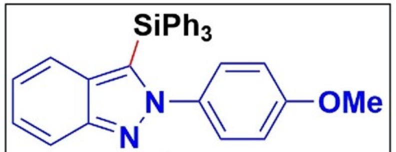
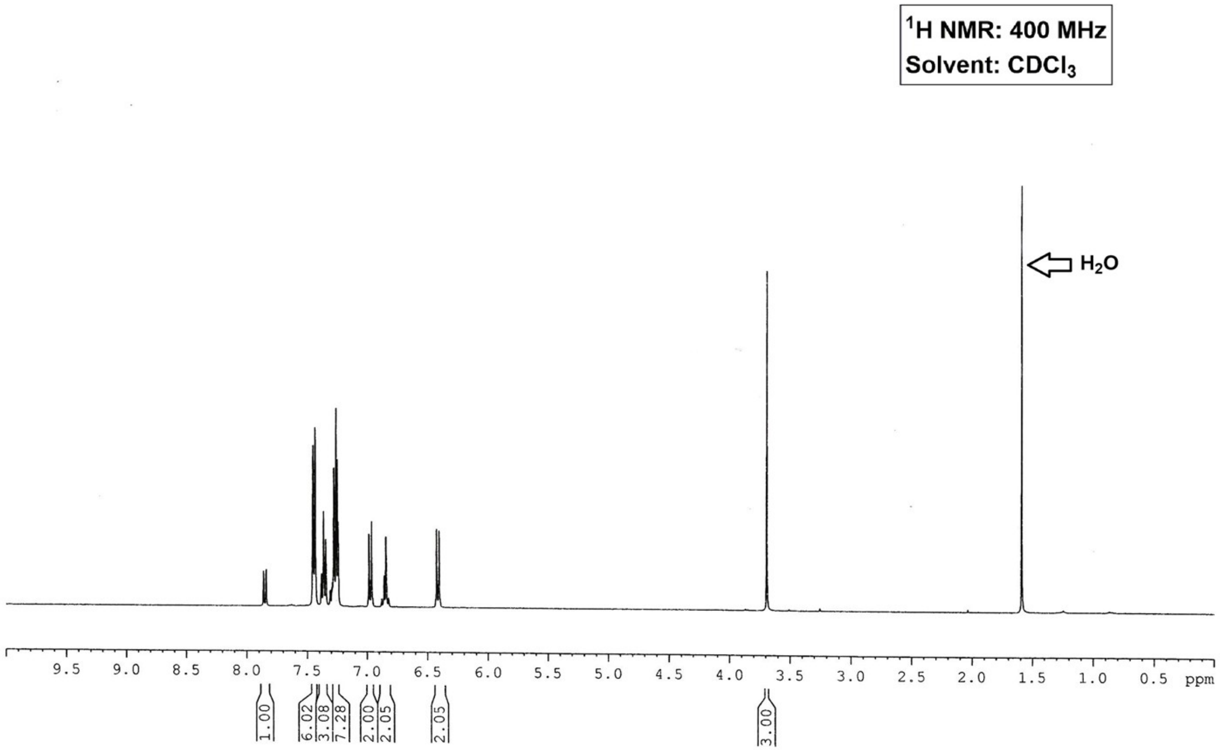
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 400
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 292.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177902 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



3c

^{1}H NMR: 400 MHz

Solvent: $CDCl_3$

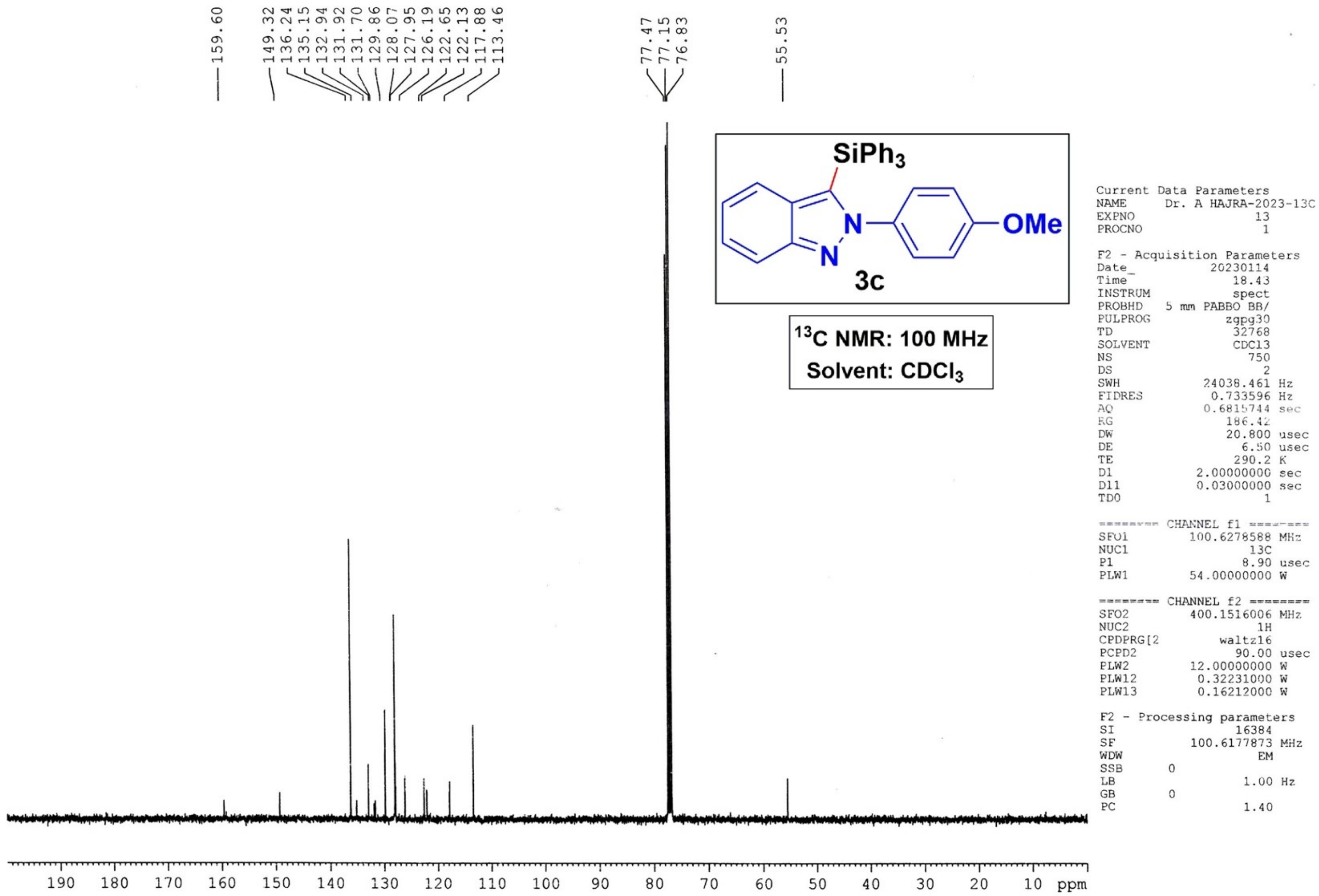


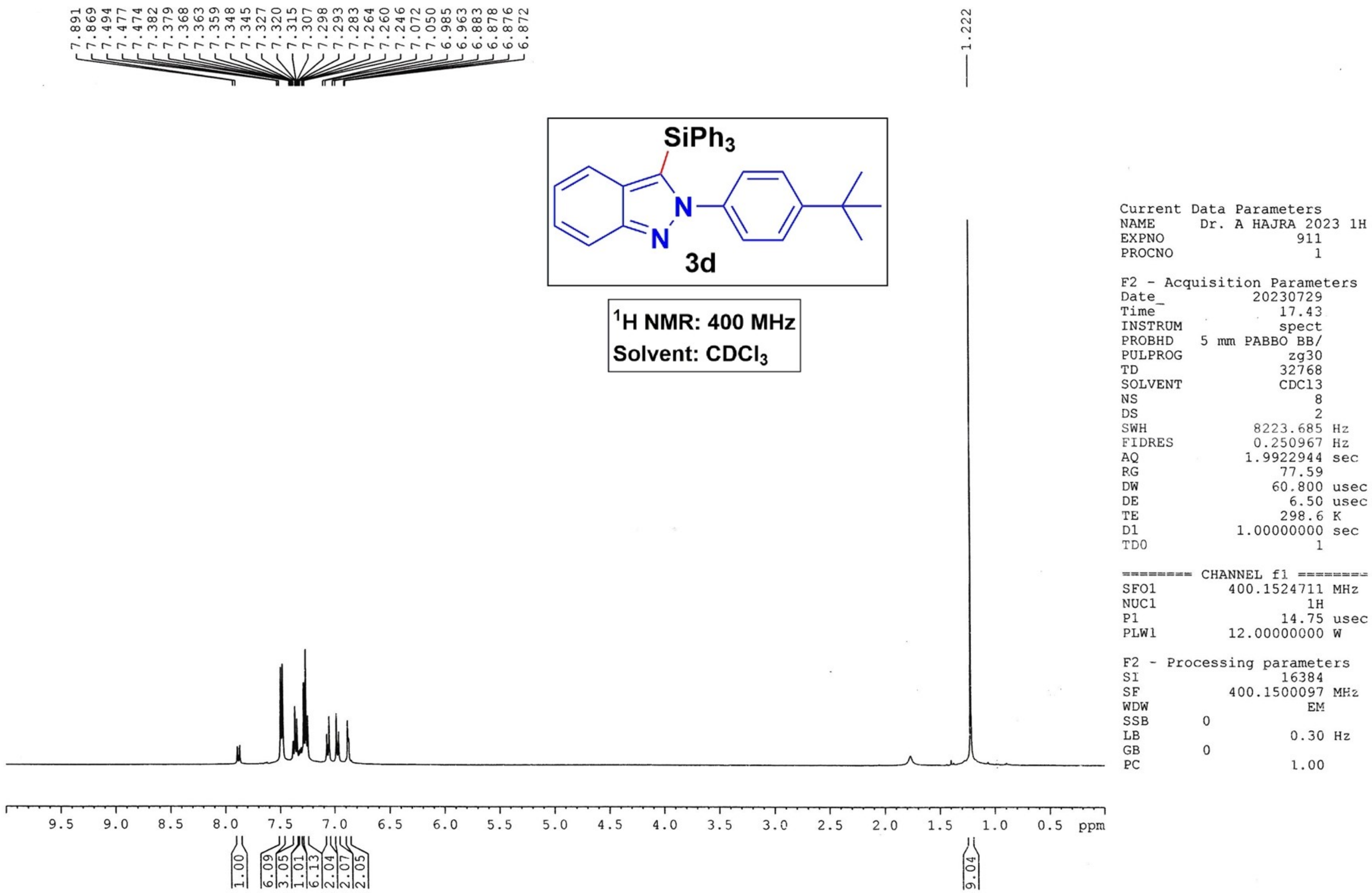

```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                   24
PROCNO                   1

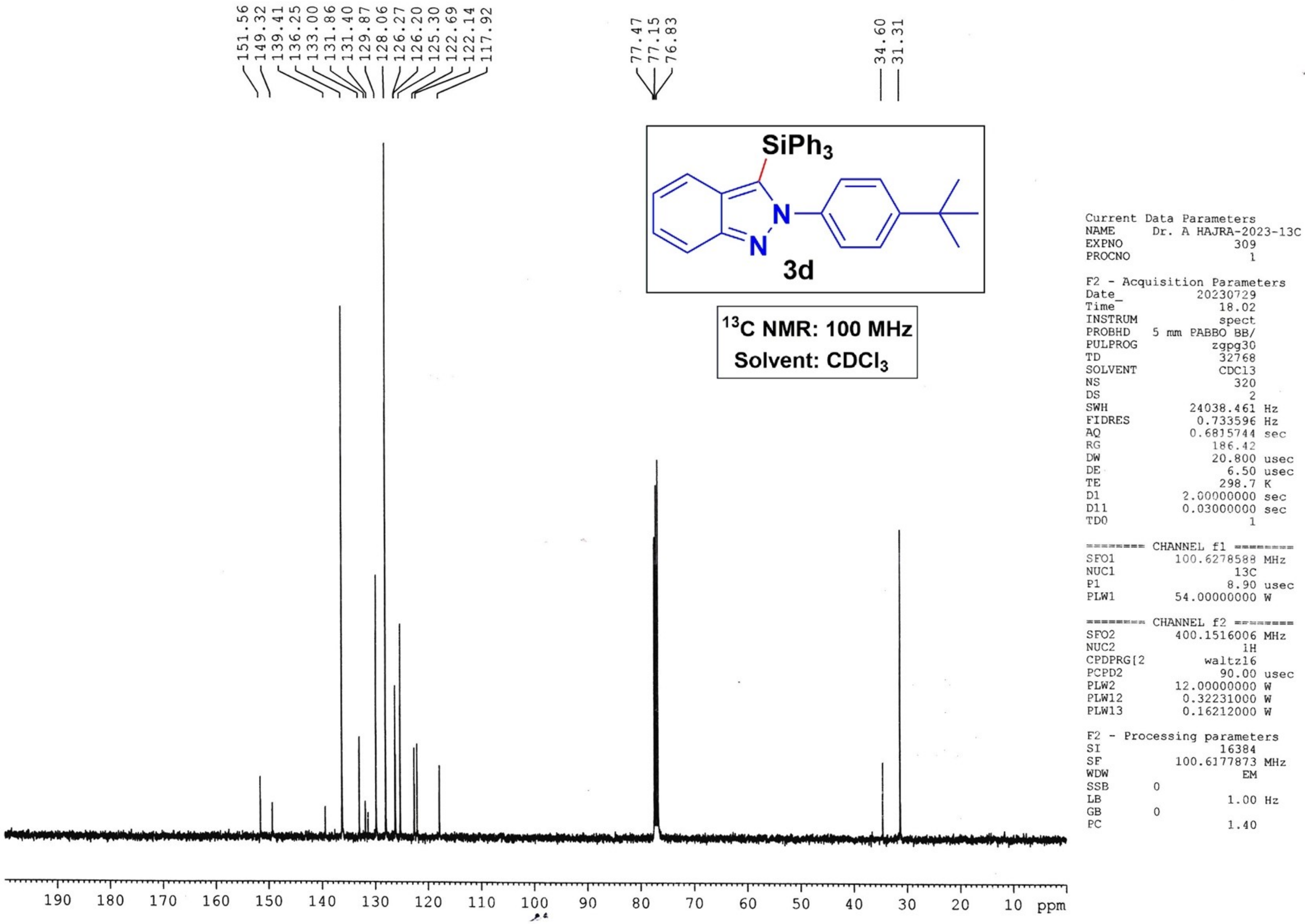
F2 - Acquisition Parameters
Date_             20230114
Time                 17.51
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               8223.685 Hz
FIDRES            0.250967 Hz
AQ               1.9922944 sec
RG                  148.91
DW                  60.800 usec
DE                    6.50 usec
TE                   289.8 K
D1              1.00000000 sec
TD0                      1

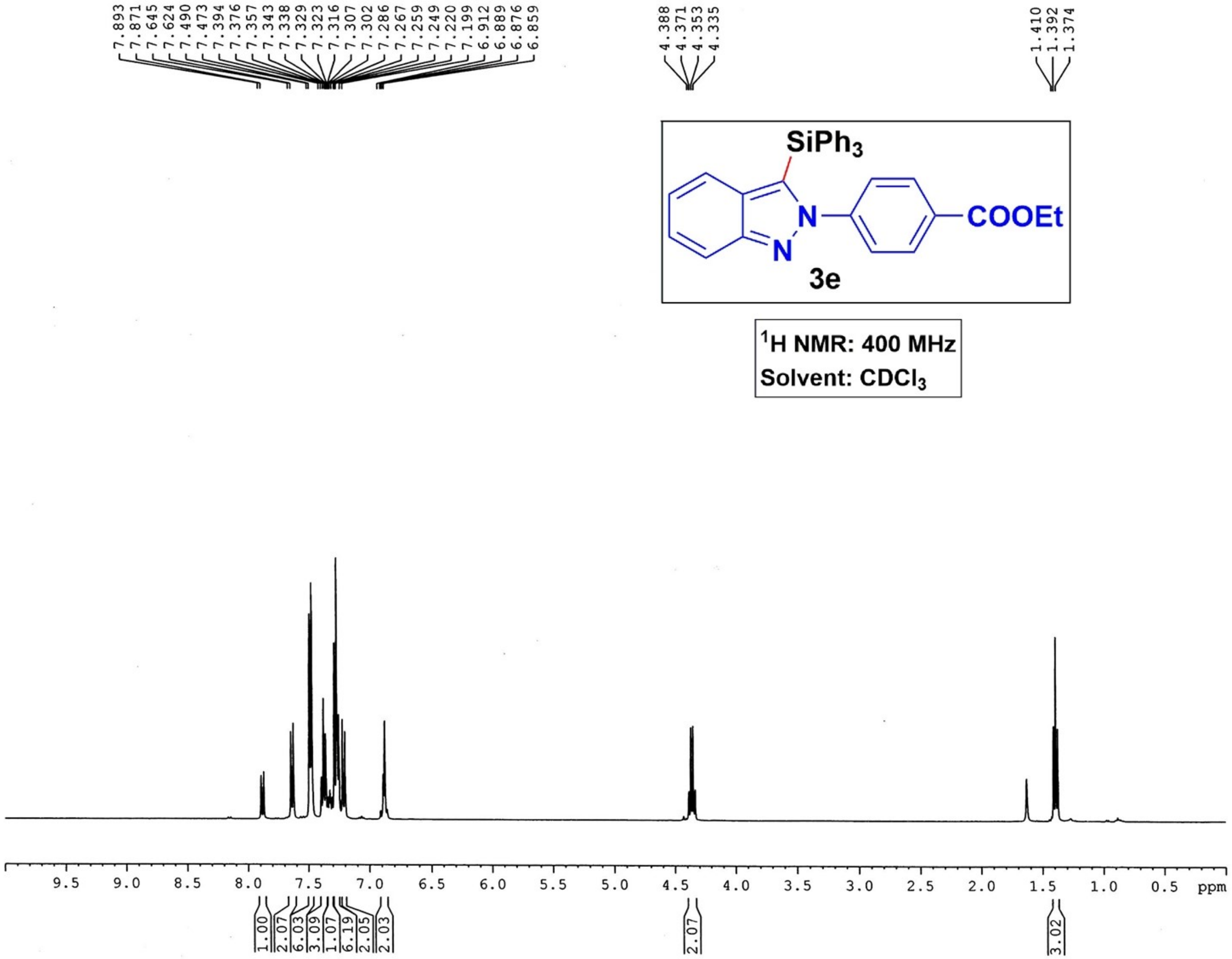
======== CHANNEL f1 ========
SFO1           400.1524711 MHz
NUC1                    1H
P1                   14.75 usec
PLW1           12.00000000 W

F2 - Processing parameters
SI                   16384
SF             400.1500147 MHz
WDW                     EM
SSB      0
LB                    0.30 Hz
GB       0
PC                    1.00
```


159.60
149.32
136.24
135.15
132.94
131.92
131.70
129.86
128.07
127.95
126.19
122.65
122.13
117.88
113.46
77.47
77.15
76.83
55.53
SiPh3
N
N
OMe
3c
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 13
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230114
Time 18.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 750
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 290.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177873 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm


7.891 7.869 7.494 7.477 7.474 7.382 7.379 7.368 7.363 7.359 7.348 7.345 7.327 7.320 7.315 7.307 7.298 7.293 7.283 7.264 7.260 7.246 7.072 7.050 6.985 6.963 6.883 6.878 6.876 6.872
1.222
SiPh3
N
N
3d
1H NMR: 400 MHz
Solvent: CDCl3
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00 6.09 3.05 1.01 6.13 2.04 2.07 2.05 9.04
Current Data Parameters
NAME Dr. A HAJRA 2023 1H
EXPNO 911
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230729
Time 17.43
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9922944 sec
RG 77.59
DW 60.800 usec
DE 6.50 usec
TE 298.6 K
D1 1.00000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 400.1524711 MHz
NUC1 1H
P1 14.75 usec
PLW1 12.00000000 W
F2 - Processing parameters
SI 16384
SF 400.1500097 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00


151.56
149.32
139.41
136.25
133.00
131.86
131.40
129.87
128.06
126.27
126.20
125.30
122.69
122.14
117.92
77.47
77.15
76.83
34.60
31.31
SiPh3
N
N
3d
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 309
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230729
Time 18.02
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 320
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 298.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177873 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

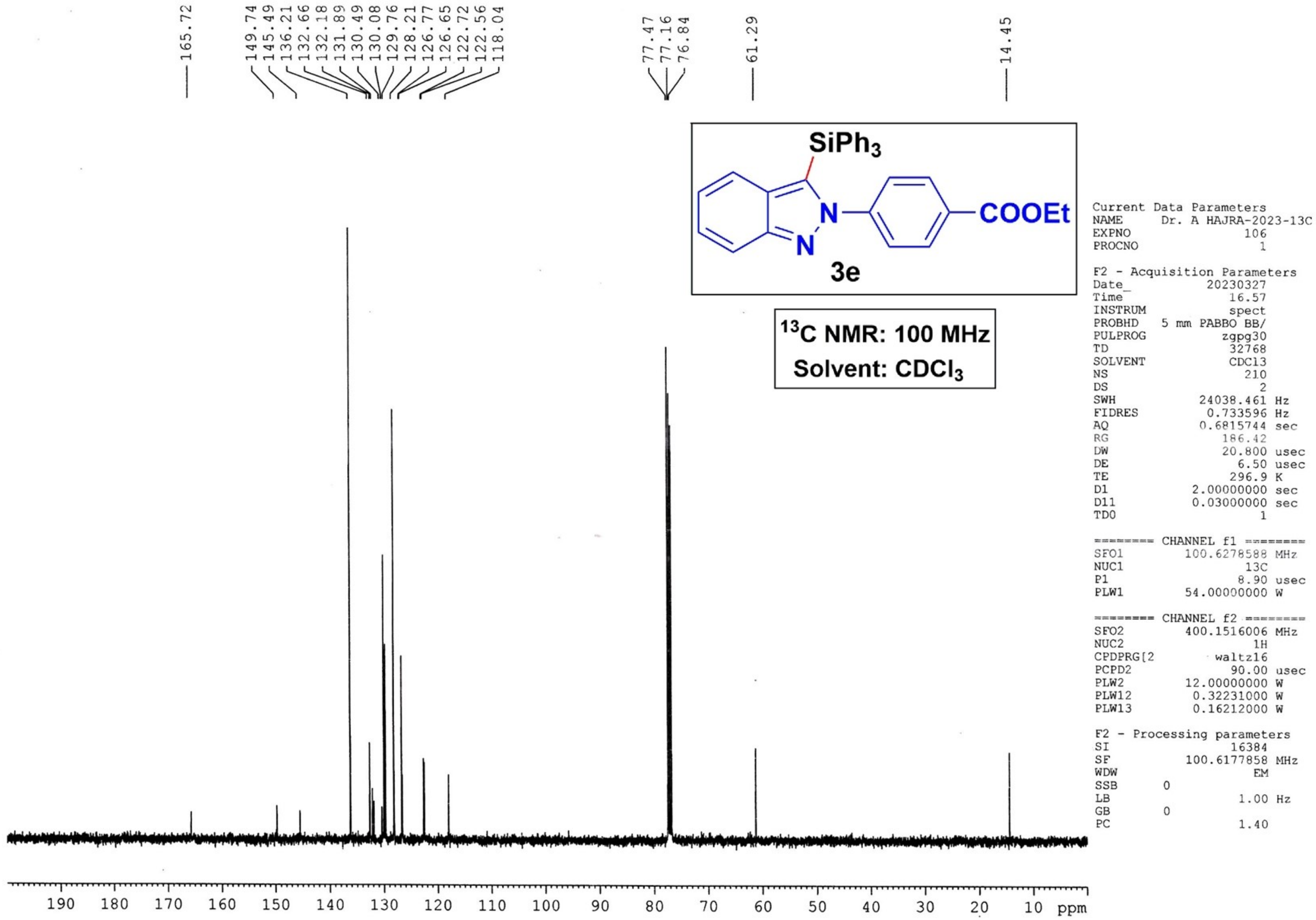


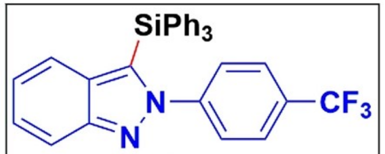
Current Data Parameters
NAME Dr. A HAJRA 2023 1H
EXPNO 381
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230327
Time 16.40
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9922944 sec
RG 87.66
DW 60.800 usec
DE 6.50 usec
TE 296.4 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1524711 MHz
NUC1 1H
P1 14.75 usec
PLW1 12.00000000 W

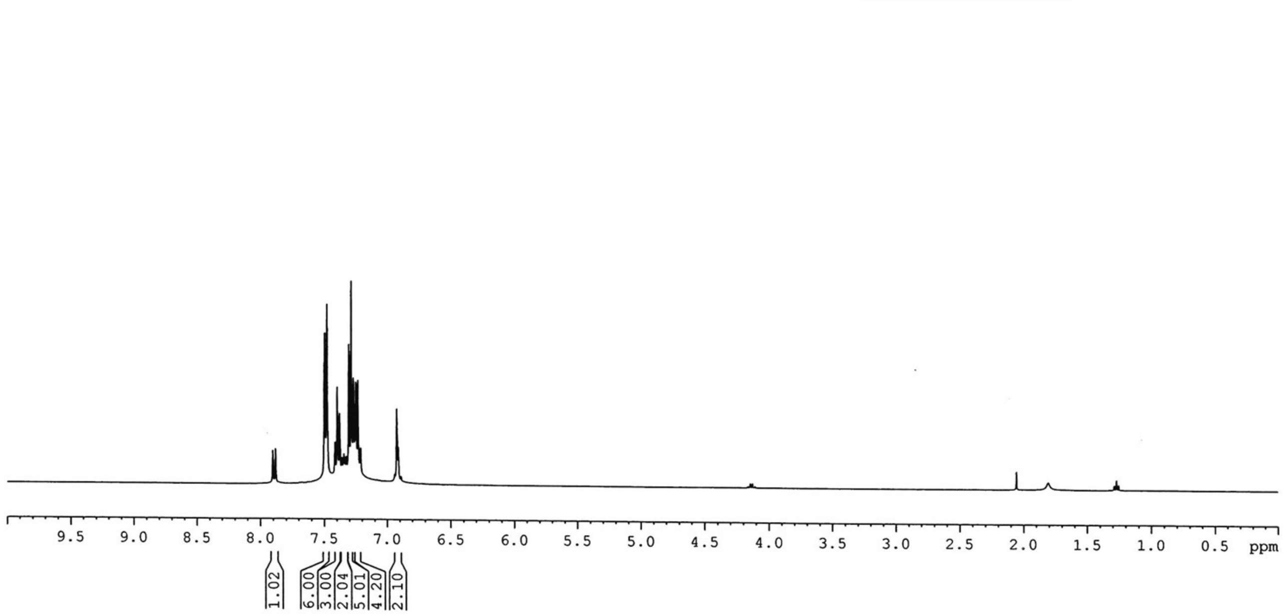
F2 - Processing parameters
SI 16384
SF 400.1500097 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00


165.72
149.74
145.49
136.21
132.66
132.18
131.89
130.49
130.08
129.76
128.21
126.77
126.65
122.72
122.56
118.04
77.47
77.16
76.84
61.29
14.45
SiPh3
N
N
COOEt
3e
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 106
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230327
Time 16.57
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 210
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 296.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======= CHANNEL f1 =======
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======= CHANNEL f2 =======
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177858 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



3f

^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

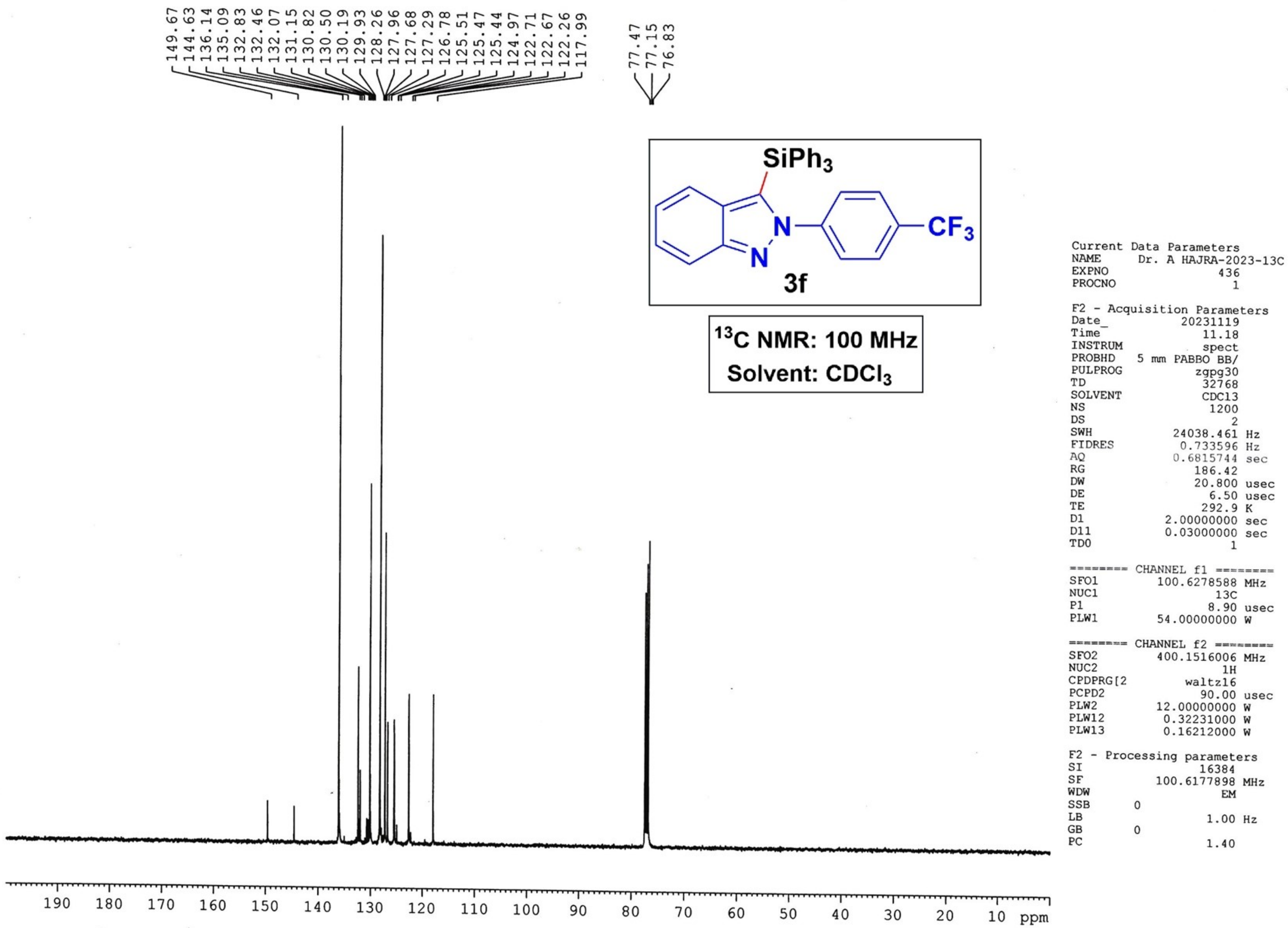



```
Current Data Parameters
NAME     Dr. A HAJRA 2023 1H
EXPNO                    692
PROCNO                     1

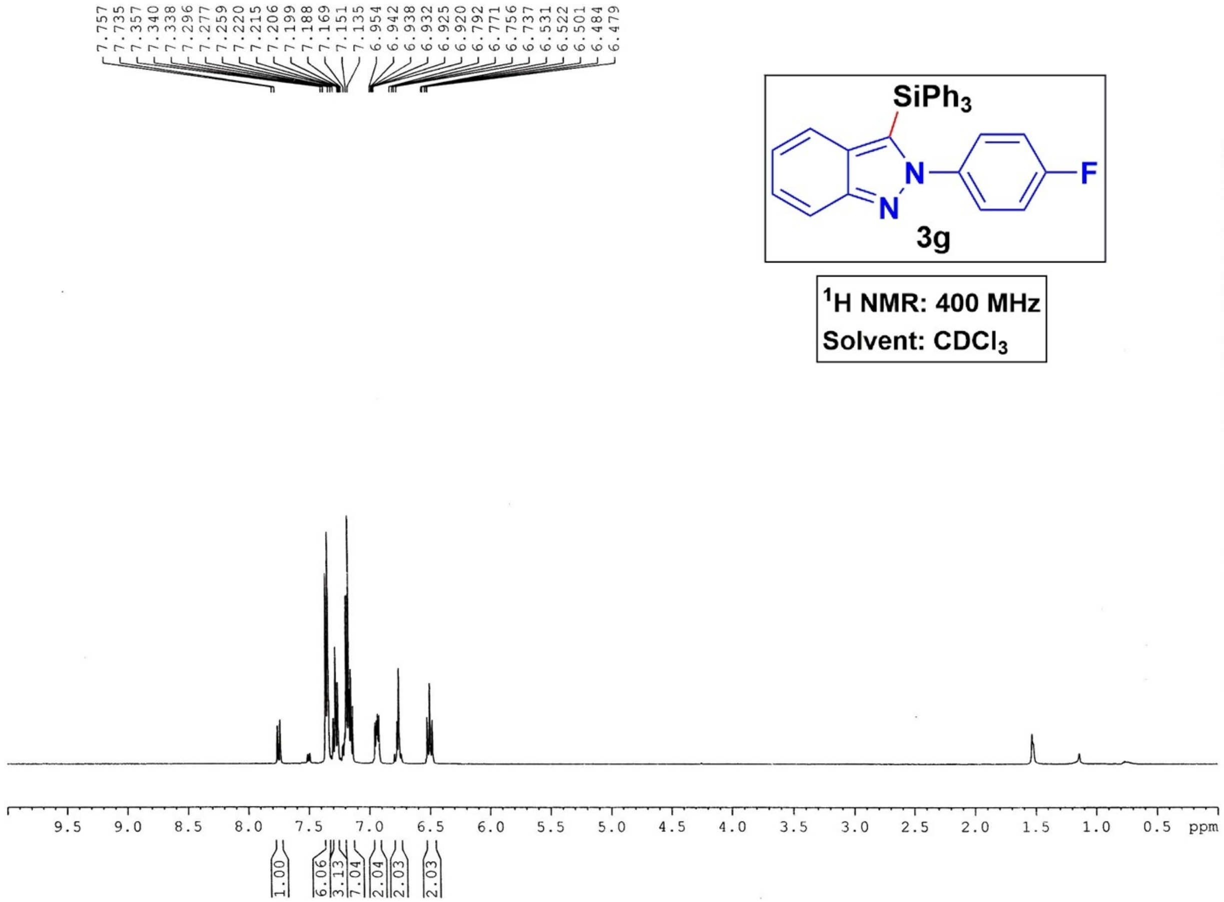
F2 - Acquisition Parameters
Date_               20230615
Time                   10.56
INSTRUM                spect
PROBHD   5 mm PABBO BB/
PULPROG                 zg30
TD                     32768
SOLVENT                CDCl3
NS                         8
DS                         2
SWH                 8223.685 Hz
FIDRES              0.250967 Hz
AQ                 1.9922944 sec
RG                     57.28
DW                    60.800 usec
DE                      6.50 usec
TE                     299.2 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             400.1524711 MHz
NUC1                      1H
P1                     14.75 usec
PLW1             12.00000000 W

F2 - Processing parameters
SI                     16384
SF               400.1500102 MHz
WDW                       EM
SSB      0
LB                      0.30 Hz
GB       0
PC                      1.00
```



149.67
144.63
136.14
135.09
132.83
132.46
132.07
131.15
130.82
130.50
130.19
129.93
128.26
127.96
127.68
127.29
126.78
125.51
125.47
125.44
124.97
122.71
122.67
122.26
117.99
77.47
77.15
76.83
SiPh3
N
N
CF3
3f
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 436
PROCNO 1
F2 - Acquisition Parameters
Date_ 20231119
Time 11.18
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 1200
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 292.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177898 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



3g

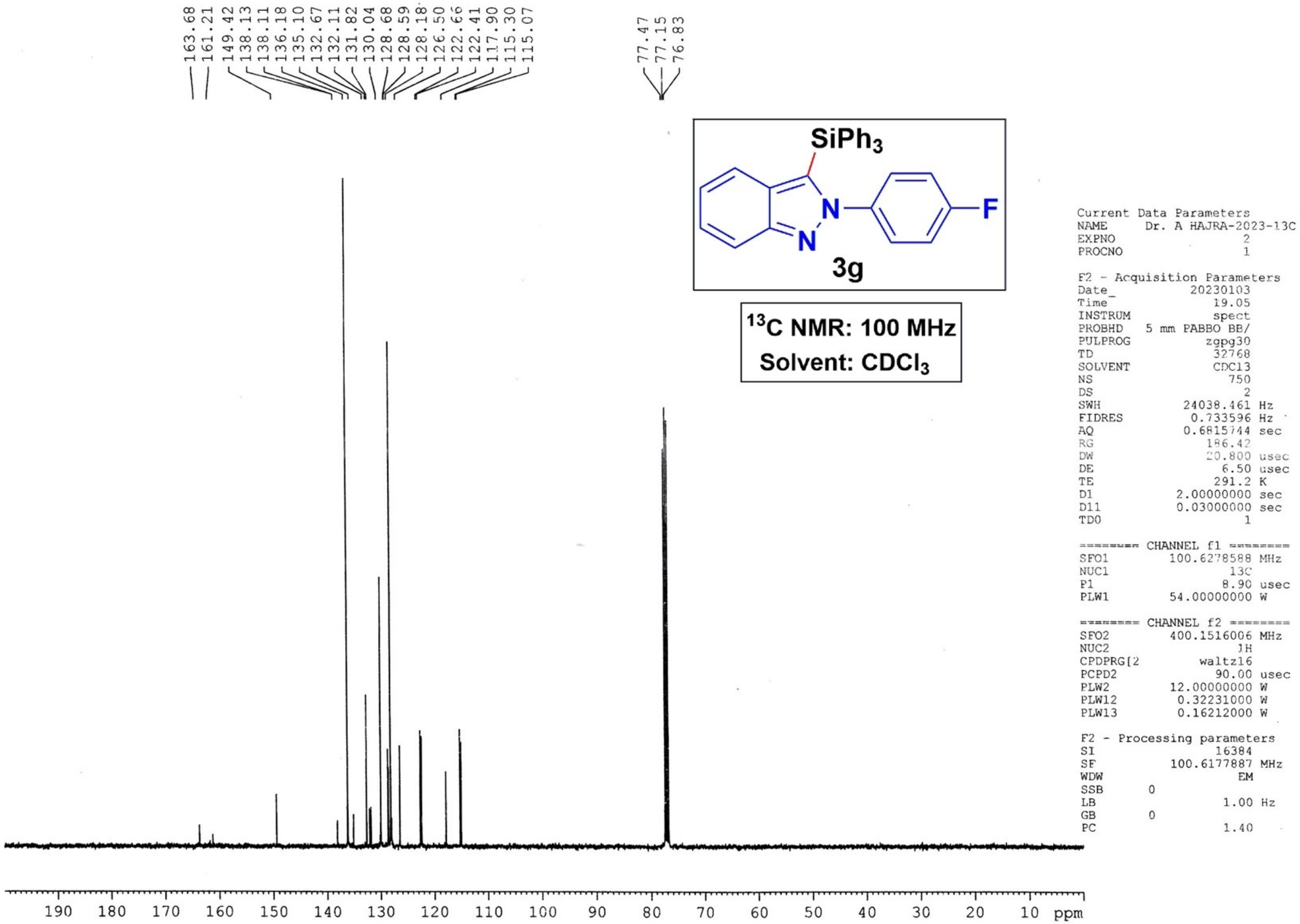
^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

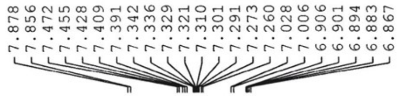
```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                     2
PROCNO                    1

F2 - Acquisition Parameters
Date_              20230103
Time                  18.20
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                8223.685 Hz
FIDRES             0.250967 Hz
AQ                1.9922944 sec
RG                    87.66
DW                   60.800 usec
DE                     6.50 usec
TE                    290.8 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1524711 MHz
NUC1                     1H
P1                    14.75 usec
PLW1            12.00000000 W

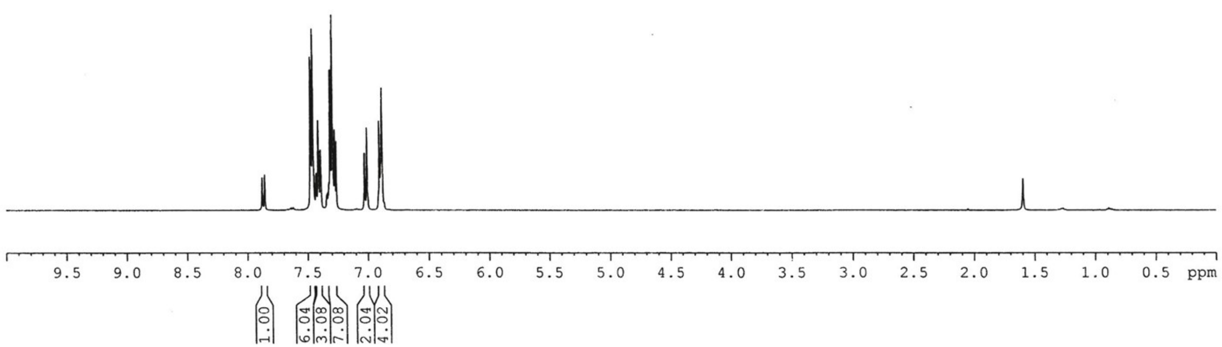
F2 - Processing parameters
SI                    16384
SF              400.1500597 MHz
WDW                      EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```


163.68
161.21
149.42
138.13
138.11
136.18
135.10
132.67
132.11
131.82
130.04
128.68
128.59
128.18
126.50
122.66
122.41
117.90
115.30
115.07
77.47
77.15
76.83
SiPh3
N
N
F
3g
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 2
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230103
Time 19.05
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 750
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 291.2 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======= CHANNEL f1 =======
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======= CHANNEL f2 =======
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177887 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



3h

^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

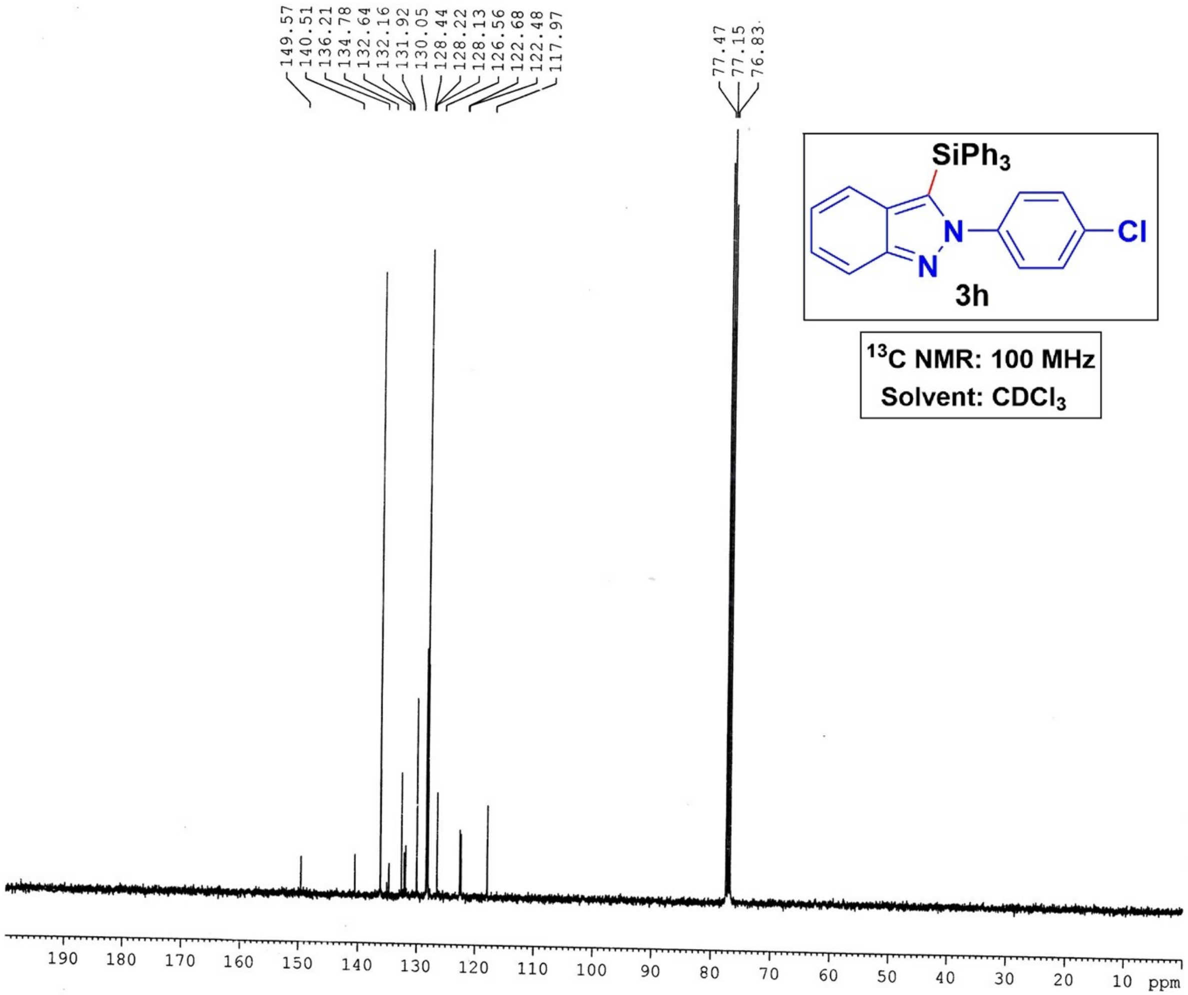



```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO              194
PROCNO               1

F2 - Acquisition Parameters
Date_          20230223
Time              19.49
INSTRUM           spect
PROBHD   5 mm PABBO BB/
PULPROG            zg30
TD                32768
SOLVENT           CDCl3
NS                    8
DS                    2
SWH            8223.685 Hz
FIDRES         0.250967 Hz
AQ            1.9922944 sec
RG                135.7
DW               60.800 usec
DE                 6.50 usec
TE                294.5 K
D1           1.00000000 sec
TD0                   1

======== CHANNEL f1 ========
SFO1        400.1524711 MHz
NUC1                 1H
P1                14.75 usec
PLW1        12.00000000 W

F2 - Processing parameters
SI                16384
SF          400.1500092 MHz
WDW                  EM
SSB      0
LB                 0.30 Hz
GB       0
PC                 1.00
```



3h

^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

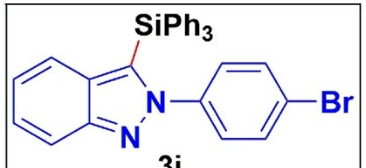
```
Current Data Parameters
NAME        Dr. A HAJRA-2023-13C
EXPNO                 64
PROCNO                 1

F2 - Acquisition Parameters
Date_           20230223
Time               20.32
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                 32768
SOLVENT            CDCl3
NS                   800
DS                     2
SWH           24038.461 Hz
FIDRES         0.733596 Hz
AQ            0.6815744 sec
RG                186.42
DW                20.800 usec
DE                  6.50 usec
TE                 295.0 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0                    1

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

======== CHANNEL f2 ========
SFO2         400.1516006 MHz
NUC2                  1H
CPDPRG[2          waltz16
PCPD2              90.00 usec
PLW2         12.00000000 W
PLW12         0.32231000 W
PLW13         0.16212000 W

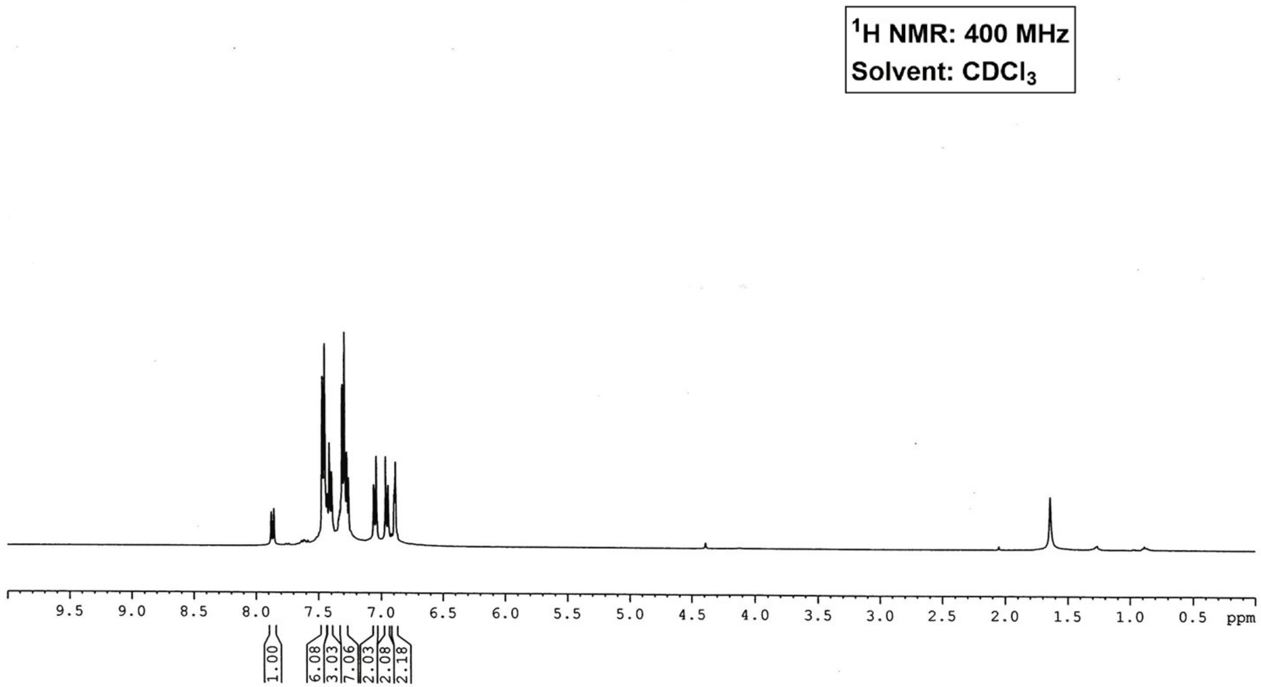
F2 - Processing parameters
SI                 16384
SF           100.6177858 MHz
WDW                   EM
SSB      0
LB                  1.00 Hz
GB       0
PC                  1.40
```



3i

^{1}H NMR: 400 MHz

Solvent: $CDCl_3$

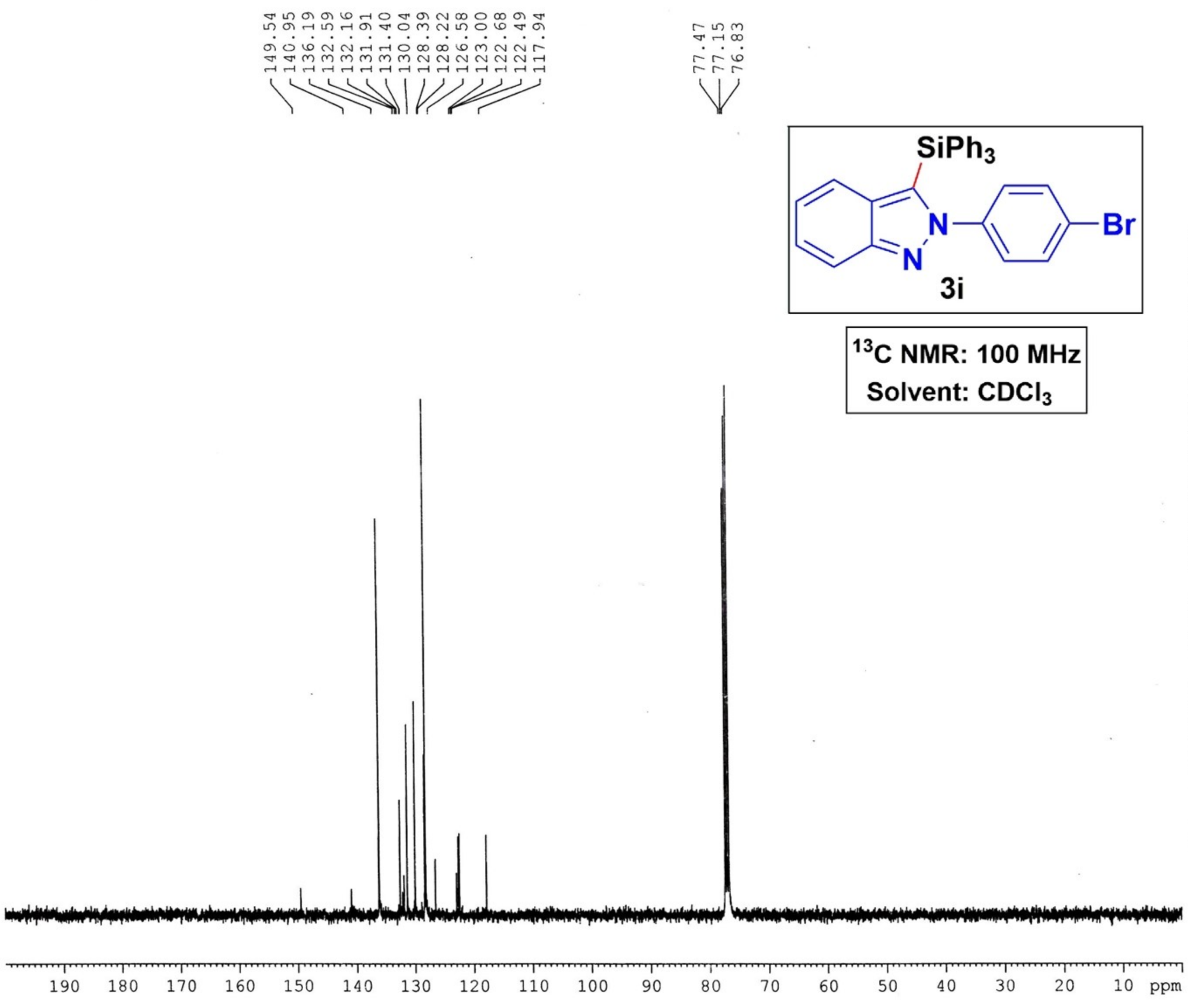



```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                    343
PROCNO                     1

F2 - Acquisition Parameters
Date_               20230321
Time                   13.26
INSTRUM                spect
PROBHD     5 mm PABBO BB/
PULPROG                 zg30
TD                     32768
SOLVENT                CDCl3
NS                         8
DS                         2
SWH                 8223.685 Hz
FIDRES              0.250967 Hz
AQ                 1.9922944 sec
RG                     135.7
DW                    60.800 usec
DE                      6.50 usec
TE                     293.5 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             400.1524711 MHz
NUC1                      1H
P1                     14.75 usec
PLW1             12.00000000 W

F2 - Processing parameters
SI                     16384
SF               400.1500097 MHz
WDW                       EM
SSB      0
LB                      0.30 Hz
GB       0
PC                      1.00
```



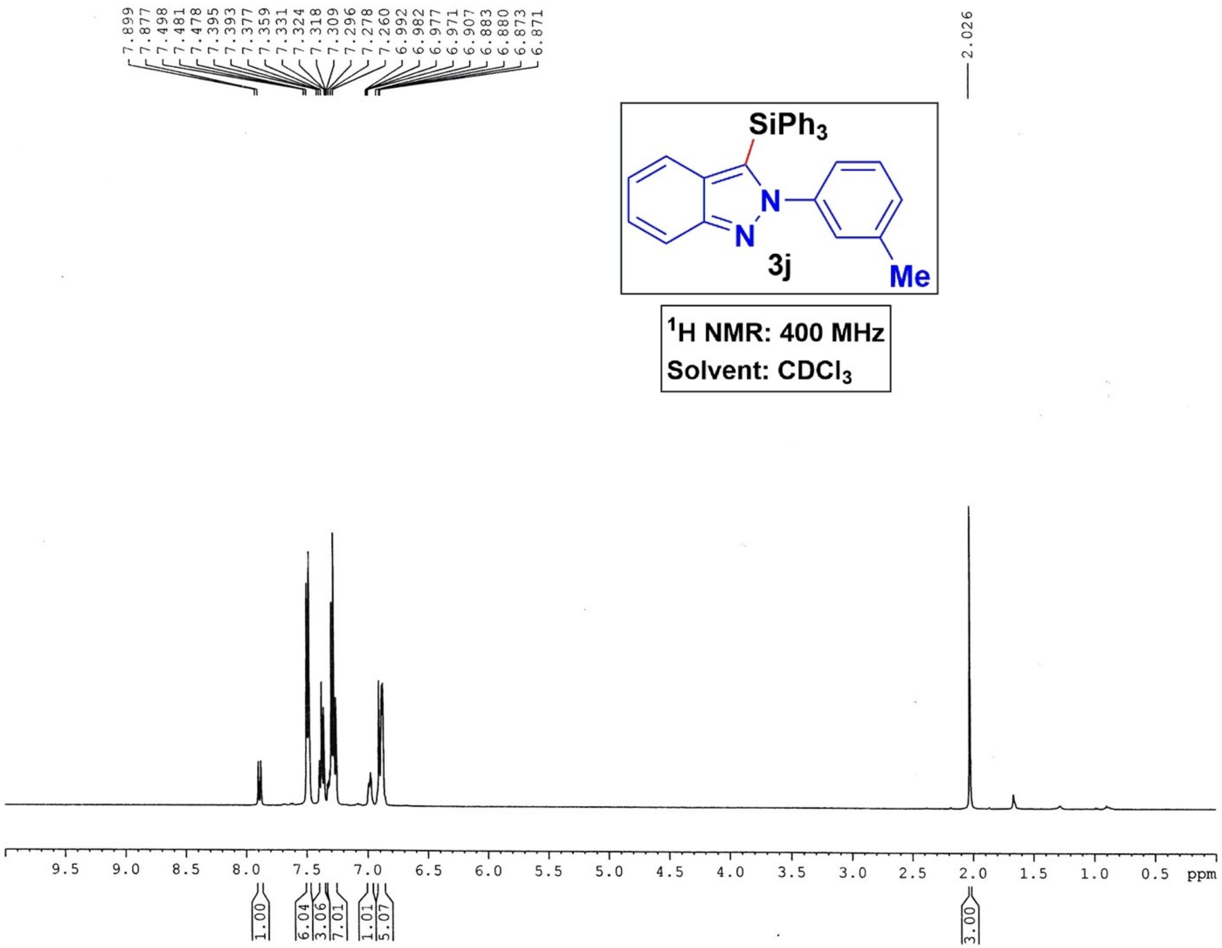
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 92
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230321
Time 13.45
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 300
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 294.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

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

======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W

F2 - Processing parameters
SI 16384
SF 100.6177873 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

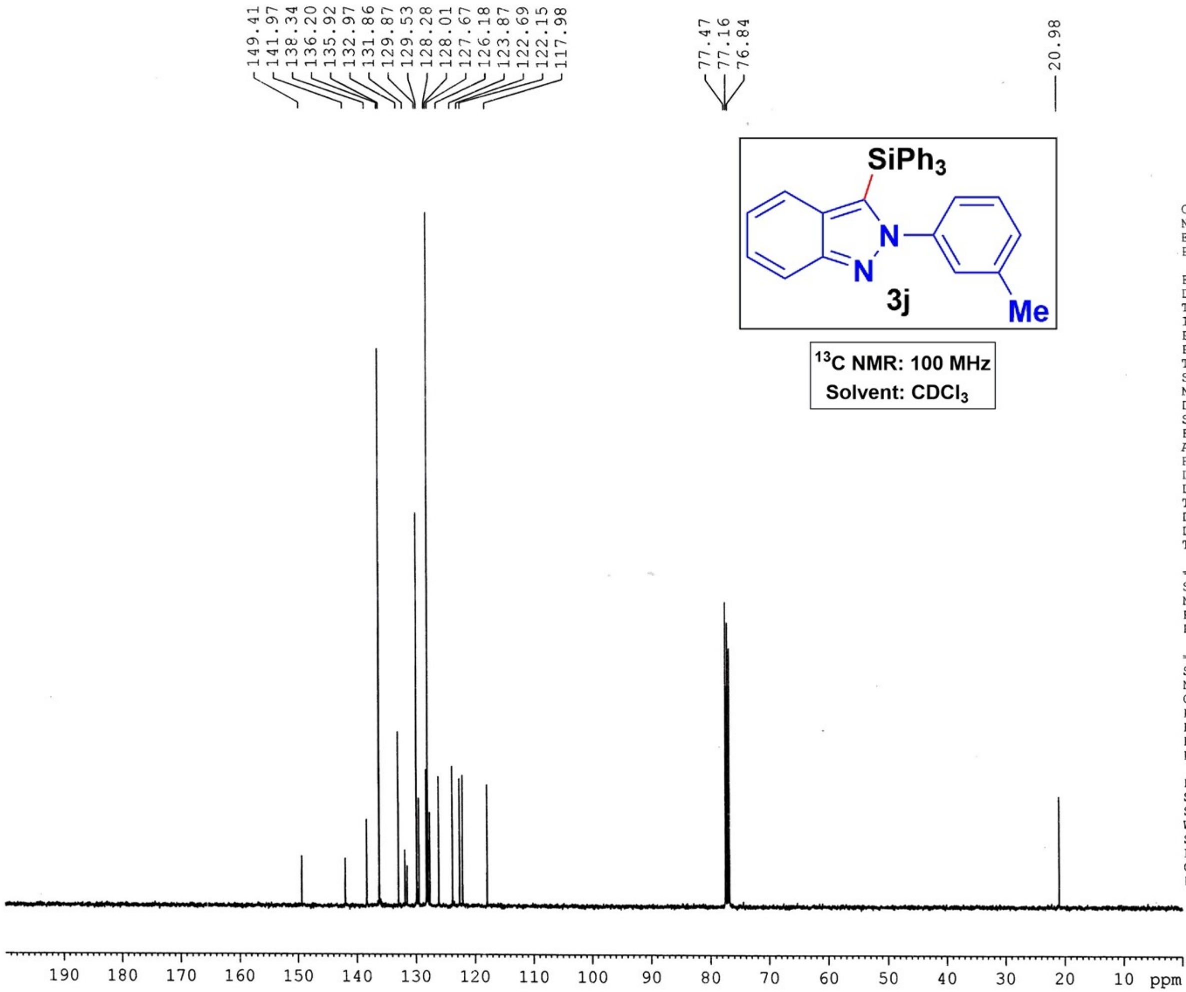


Current Data Parameters
NAME Dr. A HAJRA 2023 1H
EXPNO 304
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230308
Time 17.35
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9922944 sec
RG 62.69
DW 60.800 usec
DE 6.50 usec
TE 296.8 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1524711 MHz
NUC1 1H
P1 14.75 usec
PLW1 12.00000000 W

F2 - Processing parameters
SI 16384
SF 400.1500117 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



3j

^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

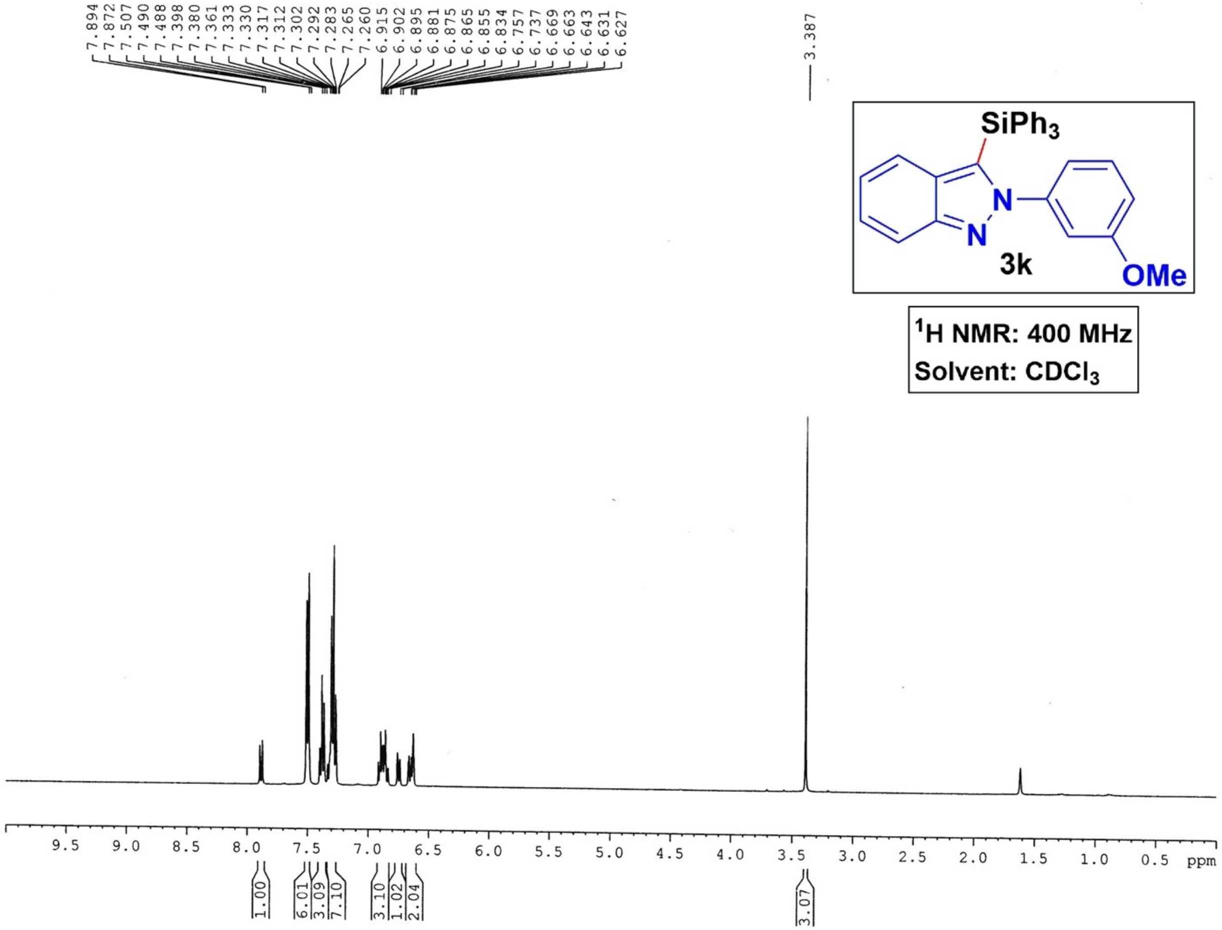
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 77
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230308
Time 18.00
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 440
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 297.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

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

======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W

F2 - Processing parameters
SI 16384
SF 100.6177887 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

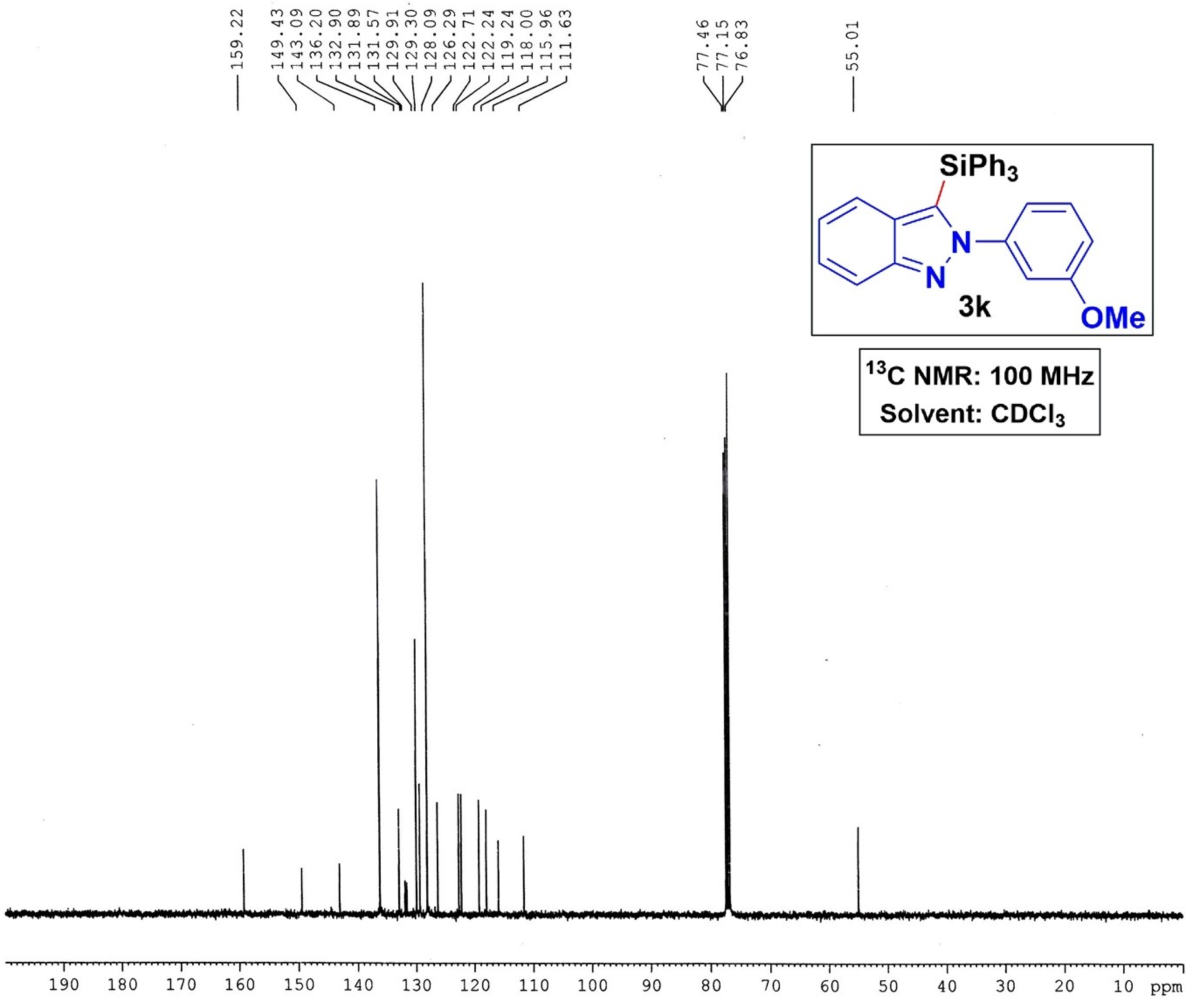



```
Current Data Parameters
NAME       Dr. A HAJRA 2023 1H
EXPNO                    220
PROCNO                     1

F2 - Acquisition Parameters
Date_               20230304
Time                   16.38
INSTRUM                spect
PROBHD     5 mm PABBO BB/
PULPROG                 zg30
TD                     32768
SOLVENT                CDCl3
NS                         8
DS                         2
SWH                 8223.685 Hz
FIDRES              0.250967 Hz
AQ                 1.9922944 sec
RG                     87.66
DW                    60.800 usec
DE                      6.50 usec
TE                     295.5 K
D1                1.00000000 sec
TD0                        1

======== CHANNEL f1 ========
SFO1             400.1524711 MHz
NUC1                      1H
P1                     14.75 usec
PLW1             12.00000000 W

F2 - Processing parameters
SI                     16384
SF               400.1500097 MHz
WDW                       EM
SSB      0
LB                      0.30 Hz
GB       0
PC                      1.00
```



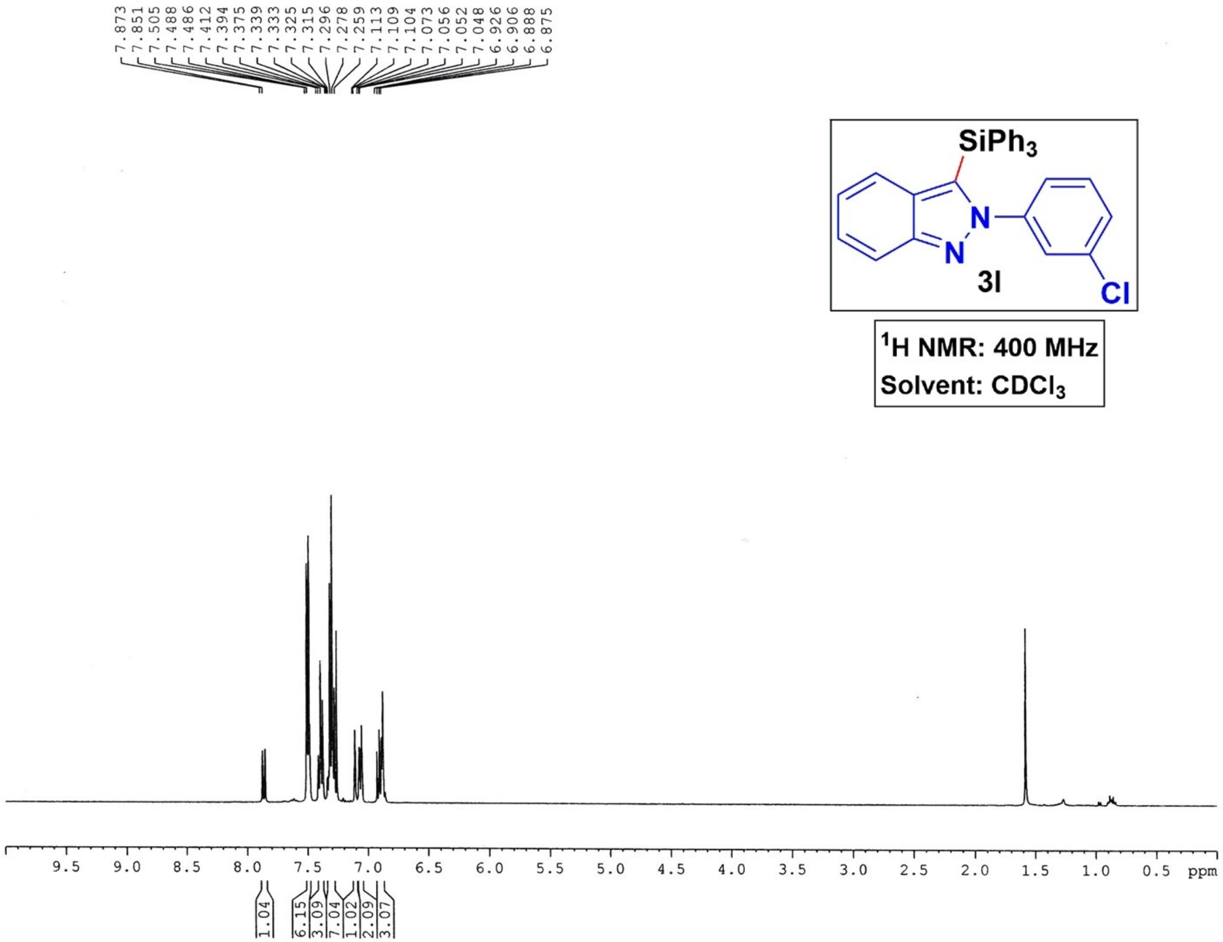

```
Current Data Parameters
NAME       Dr. A HAJRA-2023-13C
EXPNO                   73
PROCNO                   1

F2 - Acquisition Parameters
Date_             20230304
Time                 17.03
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG            zgpg30
TD                  32768
SOLVENT             CDCl3
NS                    490
DS                      2
SWH             24038.461 Hz
FIDRES           0.733596 Hz
AQ              0.6815744 sec
RG                 186.42
DW                 20.800 usec
DE                   6.50 usec
TE                  296.0 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                     1

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

======== CHANNEL f2 ========
SFO2          400.1516006 MHz
NUC2                   1H
CPDPRG[2          waltz16
PCPD2               90.00 usec
PLW2          12.00000000 W
PLW12          0.32231000 W
PLW13          0.16212000 W

F2 - Processing parameters
SI                  16384
SF            100.6177872 MHz
WDW                    EM
SSB      0
LB                   1.00 Hz
GB       0
PC                   1.40
```



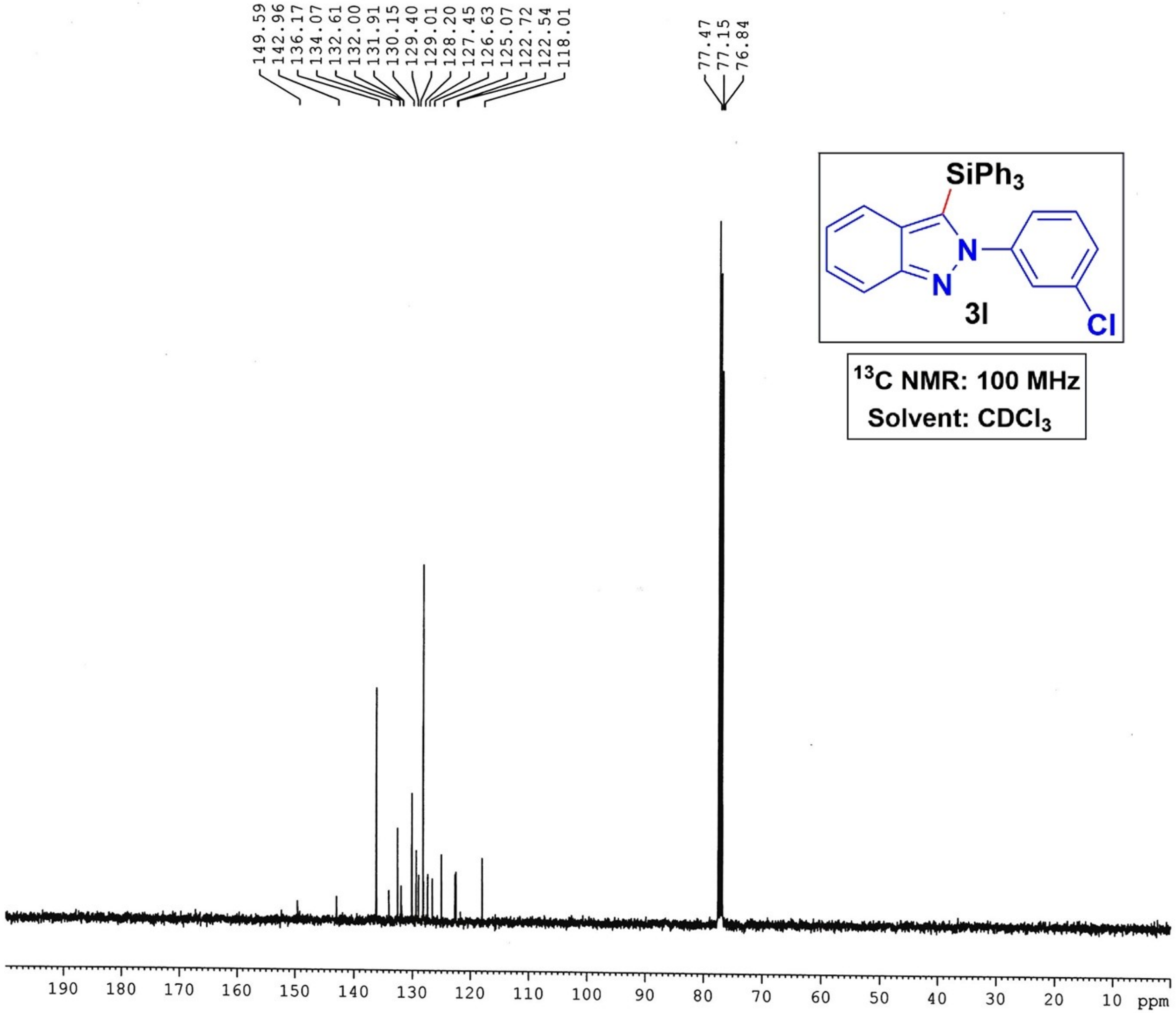
^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

```
Current Data Parameters
NAME     Dr. A HAJRA 2023 1H
EXPNO                 388
PROCNO                  1

F2 - Acquisition Parameters
Date_           20230329
Time                9.32
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG             zg30
TD                 32768
SOLVENT            CDCl3
NS                     8
DS                     2
SWH             8223.685 Hz
FIDRES          0.250967 Hz
AQ             1.9922944 sec
RG                168.31
DW                60.800 usec
DE                  6.50 usec
TE                 296.3 K
D1            1.00000000 sec
TD0                    1

======== CHANNEL f1 ========
SFO1         400.1524711 MHz
NUC1                  1H
P1                 14.75 usec
PLW1         12.00000000 W

F2 - Processing parameters
SI                 16384
SF           400.1500096 MHz
WDW                   EM
SSB      0
LB                  0.30 Hz
GB       0
PC                  1.00
```



3l

^{13}C NMR: 100 MHz

Solvent: $CDCl_3$

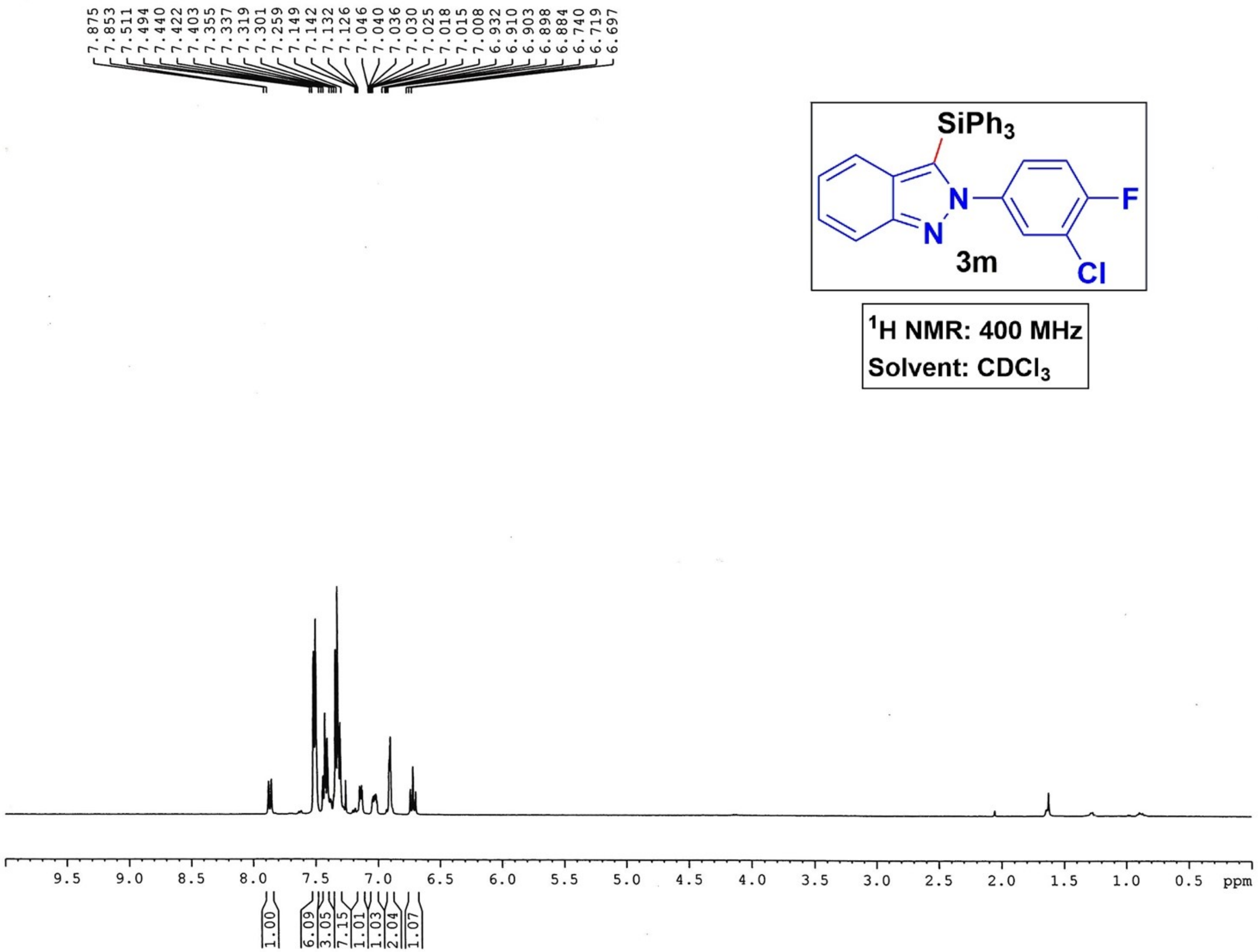
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 108
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230329
Time 9.58
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 420
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 296.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

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

======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W

F2 - Processing parameters
SI 16384
SF 100.6177844 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40



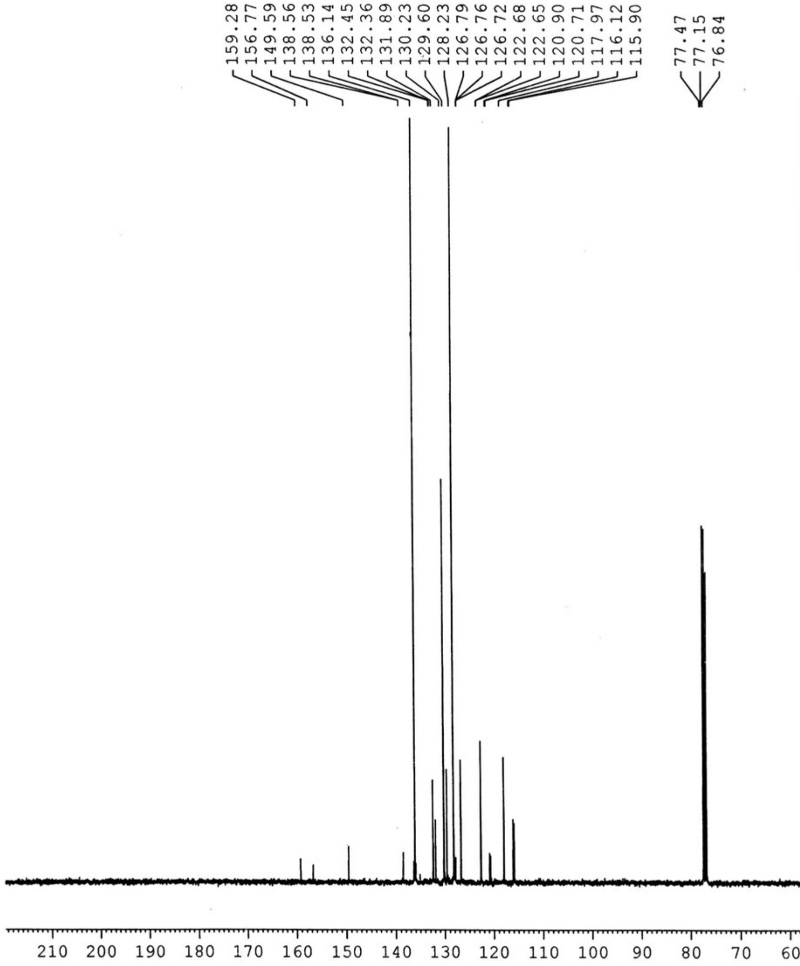
^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

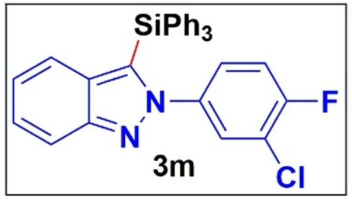
```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                 316
PROCNO                  1

F2 - Acquisition Parameters
Date_            20230312
Time                16.13
INSTRUM             spect
PROBHD    5 mm PABBO BB/
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      2
SWH              8223.685 Hz
FIDRES           0.250967 Hz
AQ              1.9922944 sec
RG                  77.59
DW                 60.800 usec
DE                   6.50 usec
TE                  295.8 K
D1             1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1          400.1524711 MHz
NUC1                   1H
P1                  14.75 usec
PLW1          12.00000000 W

F2 - Processing parameters
SI                  16384
SF            400.1500098 MHz
WDW                    EM
SSB      0
LB                   0.30 Hz
GB       0
PC                   1.00
```





3m

^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

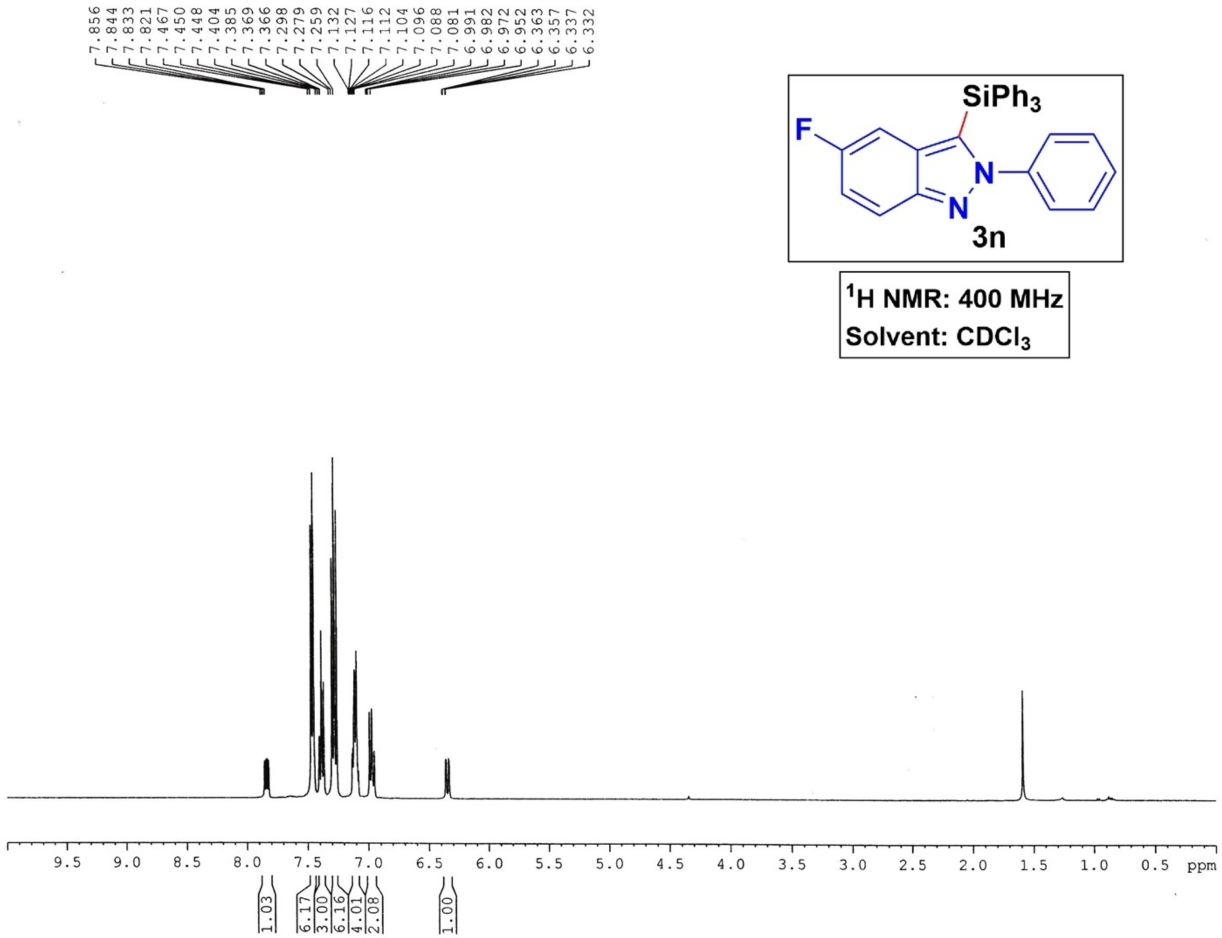
```
Current Data Parameters
NAME      Dr. A HAJRA-2023-13C
EXPNO                   80
PROCNO                   1

F2 - Acquisition Parameters
Date_             20230313
Time                 10.44
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG            zgpg30
TD                  32768
SOLVENT             CDCl3
NS                    380
DS                      2
SWH             24038.461 Hz
FIDRES           0.733596 Hz
AQ              0.6815744 sec
RG                 186.42
DW                 20.800 usec
DE                   6.50 usec
TE                  297.6 K
D1             2.00000000 sec
D11            0.03000000 sec
TD0                     1

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

======== CHANNEL f2 ========
SFO2          400.1516006 MHz
NUC2                   1H
CPDPRG[2          waltz16
PCPD2               90.00 usec
PLW2          12.00000000 W
PLW12          0.32231000 W
PLW13          0.16212000 W

F2 - Processing parameters
SI                  16384
SF            100.6177873 MHz
WDW                    EM
SSB      0
LB                   1.00 Hz
GB       0
PC                   1.40
```


3n

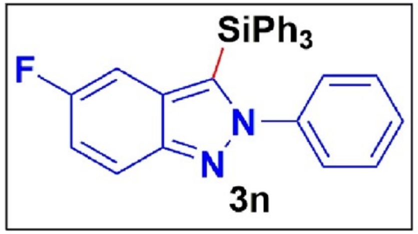
^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

```
Current Data Parameters
NAME       Dr. A HAJRA 2023 1H
EXPNO                   151
PROCNO                    1

F2 - Acquisition Parameters
Date_              20230214
Time                  19.24
INSTRUM               spect
PROBHD     5 mm PABBO BB/
PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                8223.685 Hz
FIDRES             0.250967 Hz
AQ                1.9922944 sec
RG                   148.91
DW                   60.800 usec
DE                     6.50 usec
TE                    291.8 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1524711 MHz
NUC1                     1H
P1                    14.75 usec
PLW1            12.00000000 W

F2 - Processing parameters
SI                    16384
SF              400.1500097 MHz
WDW                      EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```



3n

^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

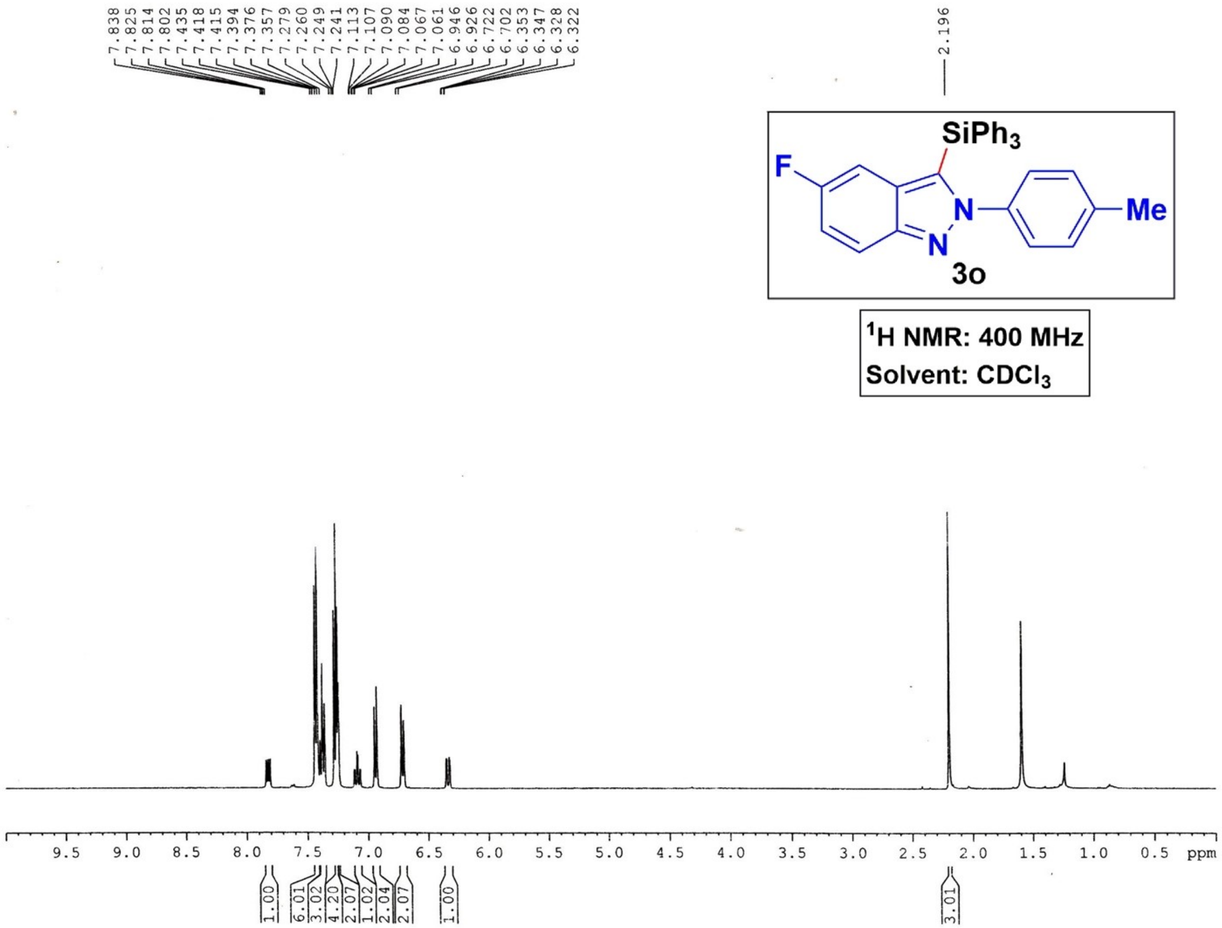
```
Current Data Parameters
NAME      Dr. A HAJRA-2023-13C
EXPNO                       49
PROCNO                       1

F2 - Acquisition Parameters
Date_               20230215
Time                   10.53
INSTRUM                spect
PROBHD    5 mm PABBO BB/
PULPROG              zgpg30
TD                     32768
SOLVENT                CDCl3
NS                       950
DS                         2
SWH               24038.461 Hz
FIDRES             0.733596 Hz
AQ                0.6815744 sec
RG                    186.42
DW                    20.800 usec
DE                      6.50 usec
TE                     292.9 K
D1                2.00000000 sec
D11               0.03000000 sec
TD0                        1

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

======== CHANNEL f2 ========
SFO2            400.1516006 MHz
NUC2                      1H
CPDPRG[2             waltz16
PCPD2                  90.00 usec
PLW2             12.00000000 W
PLW12             0.32231000 W
PLW13             0.16212000 W

F2 - Processing parameters
SI                     16384
SF              100.6177858 MHz
WDW                       EM
SSB       0
LB                      1.00 Hz
GB        0
PC                      1.40
```

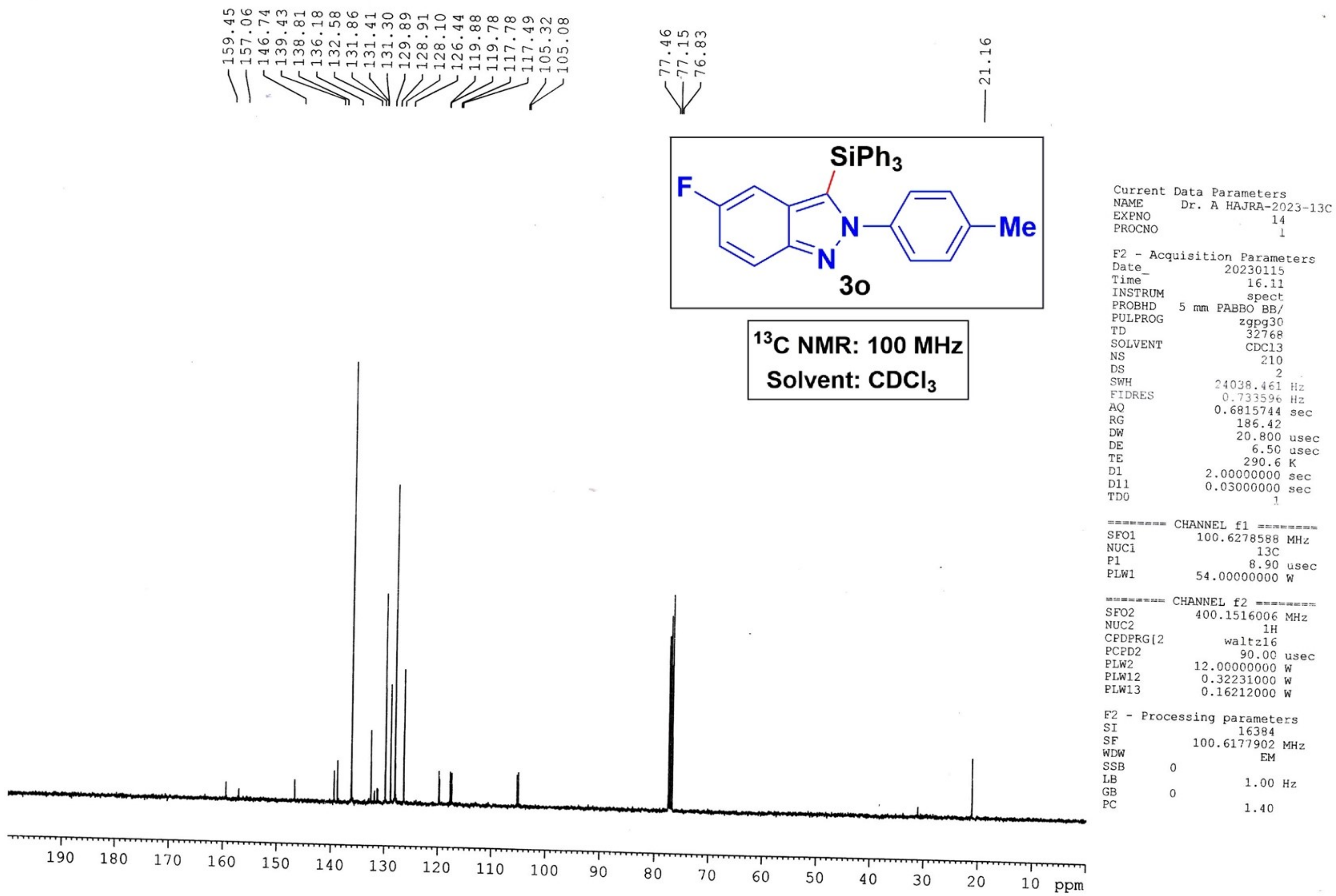


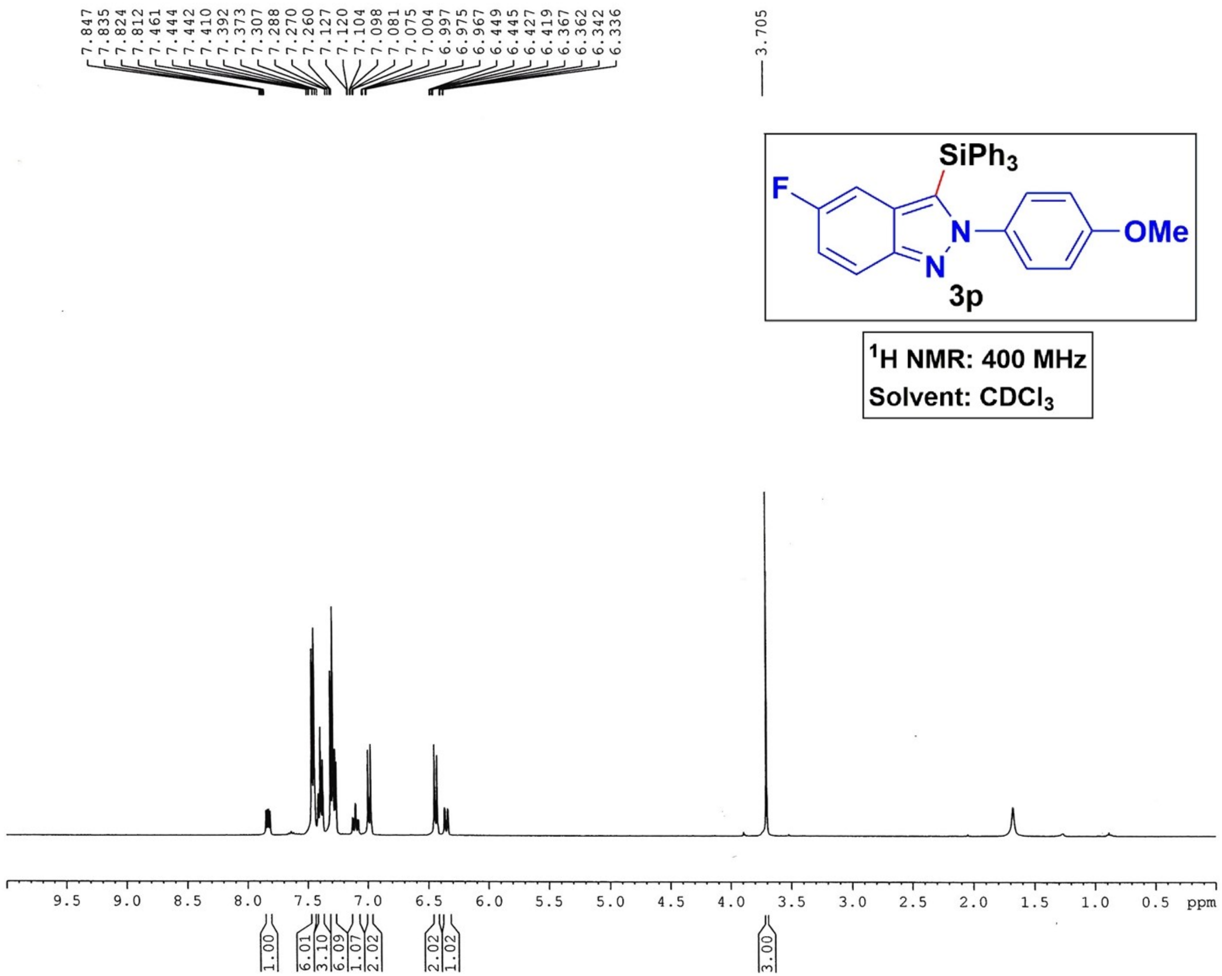

```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                     4
PROCNO                    1

F2 - Acquisition Parameters
Date_              20230105
Time                  17.00
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                8223.685 Hz
FIDRES             0.250967 Hz
AQ                1.9922944 sec
RG                   168.31
DW                   60.800 usec
DE                     6.50 usec
TE                    290.1 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1         400.1524711 MHz
NUC1                     1H
P1                    14.75 usec
PLW1            12.00000000 W

F2 - Processing parameters
SI                    16384
SF           400.1500137 MHz
WDW                      EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```


159.45
157.06
146.74
139.43
138.81
136.18
132.58
131.86
131.41
131.30
129.89
128.91
128.10
126.44
119.88
119.78
117.78
117.49
105.32
105.08
77.46
77.15
76.83
21.16
SiPh3
F
N
N
Me
3o
^{13}C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 14
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230115
Time 16.11
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 210
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 290.6 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177902 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

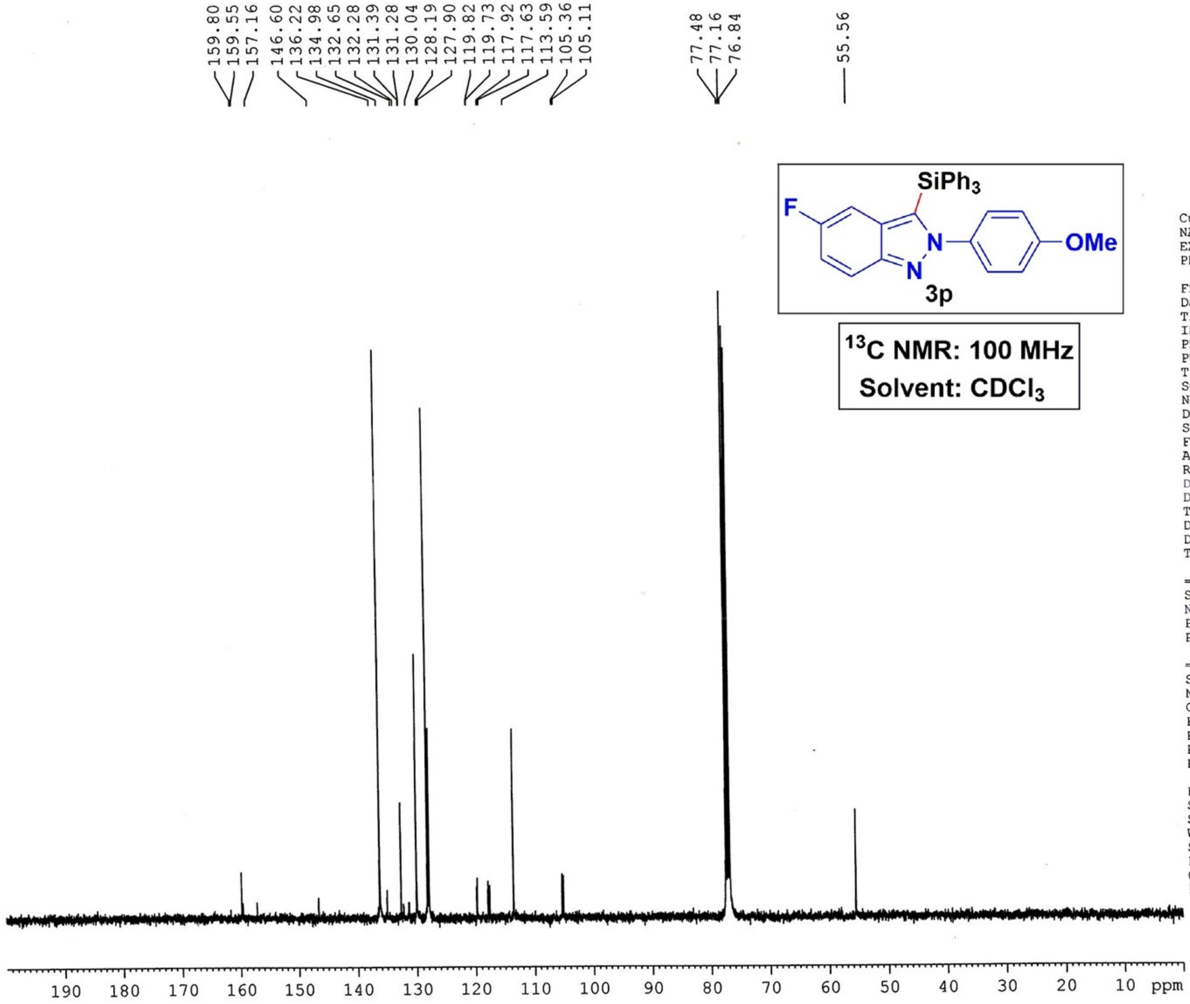



```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                     658
PROCNO                      1

F2 - Acquisition Parameters
Date_              20230601
Time                  12.17
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                8223.685 Hz
FIDRES             0.250967 Hz
AQ                1.9922944 sec
RG                    135.7
DW                   60.800 usec
DE                     6.50 usec
TE                    296.0 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1524711 MHz
NUC1                     1H
P1                    14.75 usec
PLW1            12.00000000 W

F2 - Processing parameters
SI                    16384
SF              400.1500097 MHz
WDW                      EM
SSB      0
LB                     0.30 Hz
GB       0
PC                     1.00
```



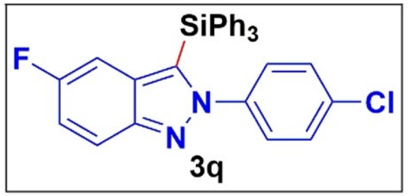

```
Current Data Parameters
NAME      Dr. A HAJRA-2023-13C
EXPNO                211
PROCNO                 1

F2 - Acquisition Parameters
Date_           20230602
Time               17.29
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                  900
DS                    2
SWH           24038.461 Hz
FIDRES         0.733596 Hz
AQ            0.6815744 sec
RG                135.7
DW               20.800 usec
DE                 6.50 usec
TE                300.6 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

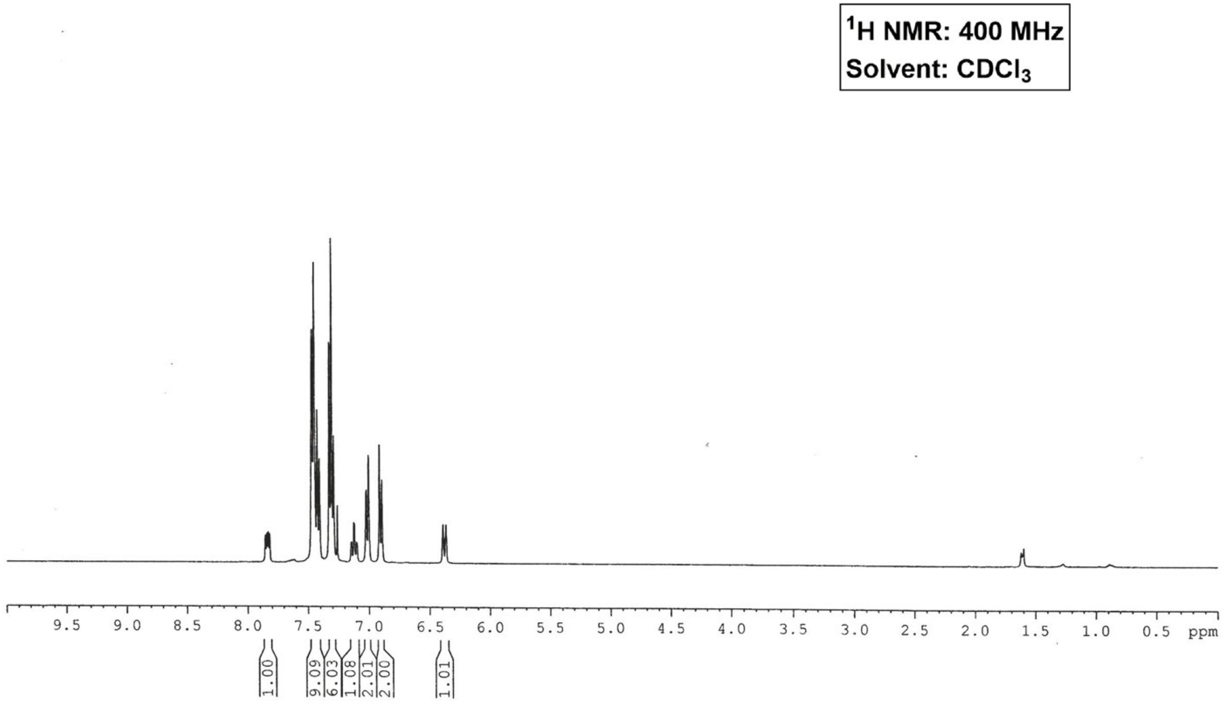
======== CHANNEL f1 ========
SFO1        100.6278588 MHz
NUC1                13C
P1                 8.90 usec
PLW1        54.00000000 W

======== CHANNEL f2 ========
SFO2        400.1516006 MHz
NUC2                 1H
CPDPRG[2         waltz16
PCPD2             90.00 usec
PLW2        12.00000000 W
PLW12        0.32231000 W
PLW13        0.16212000 W

F2 - Processing parameters
SI                16384
SF          100.6177843 MHz
WDW                  EM
SSB      0
LB                 1.00 Hz
GB       0
PC                 1.40
```



^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

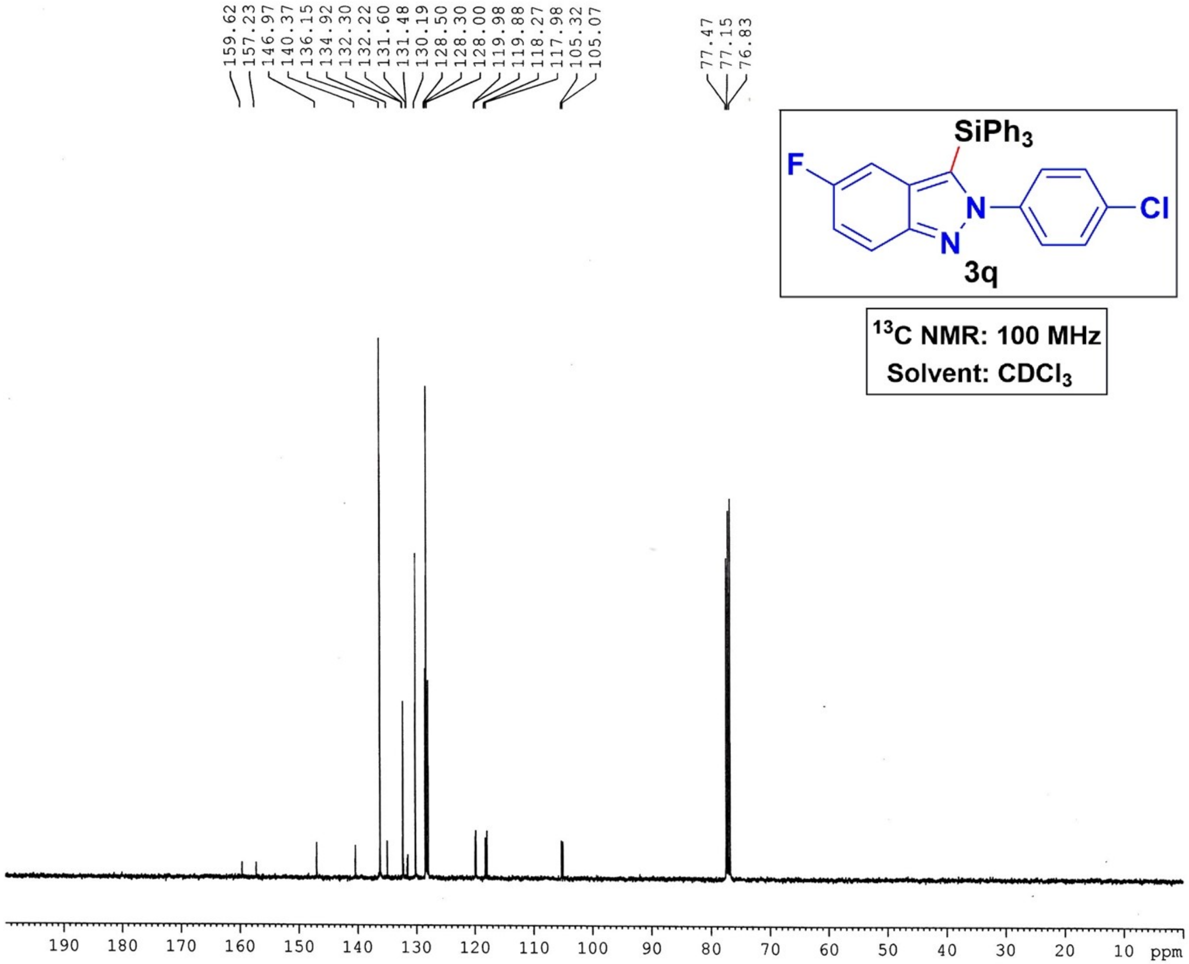



```
Current Data Parameters
NAME       Dr. A HAJRA 2023 1H
EXPNO                  202
PROCNO                   1

F2 - Acquisition Parameters
Date_             20230227
Time                 17.17
INSTRUM              spect
PROBHD    5 mm PABBO BB/
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               8223.685 Hz
FIDRES            0.250967 Hz
AQ               1.9922944 sec
RG                   77.59
DW                  60.800 usec
DE                    6.50 usec
TE                   294.6 K
D1             1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           400.1524711 MHz
NUC1                    1H
P1                   14.75 usec
PLW1           12.00000000 W

F2 - Processing parameters
SI                   16384
SF             400.1500097 MHz
WDW                     EM
SSB      0
LB                    0.30 Hz
GB       0
PC                    1.00
```



^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

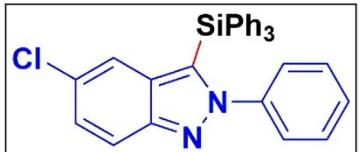
```
Current Data Parameters
NAME      Dr. A HAJRA-2023-13C
EXPNO                   68
PROCNO                   1

F2 - Acquisition Parameters
Date_             20230227
Time                 17.53
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG            zgpg30
TD                   32768
SOLVENT              CDCl3
NS                     720
DS                       2
SWH             24038.461 Hz
FIDRES           0.733596 Hz
AQ              0.6815744 sec
RG                  186.42
DW                  20.800 usec
DE                    6.50 usec
TE                   294.8 K
D1              2.00000000 sec
D11             0.03000000 sec
TD0                      1

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

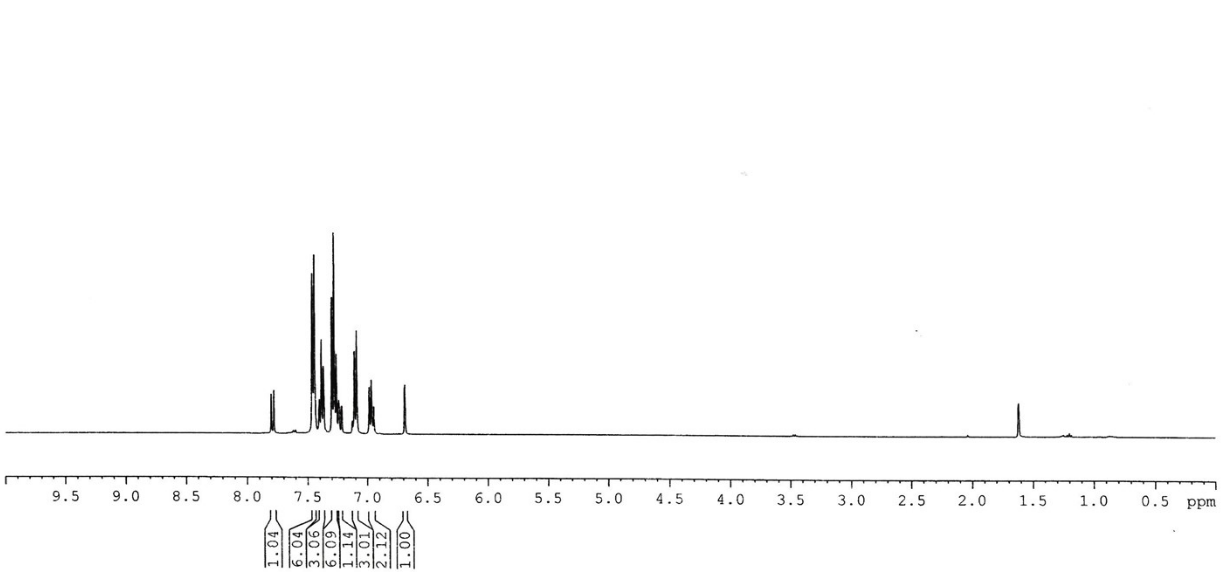
======== CHANNEL f2 ========
SFO2          400.1516006 MHz
NUC2                    1H
CPDPRG[2           waltz16
PCPD2                90.00 usec
PLW2           12.00000000 W
PLW12           0.32231000 W
PLW13           0.16212000 W

F2 - Processing parameters
SI                   16384
SF             100.6177873 MHz
WDW                     EM
SSB      0
LB                    1.00 Hz
GB       0
PC                    1.40
```



3r

^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

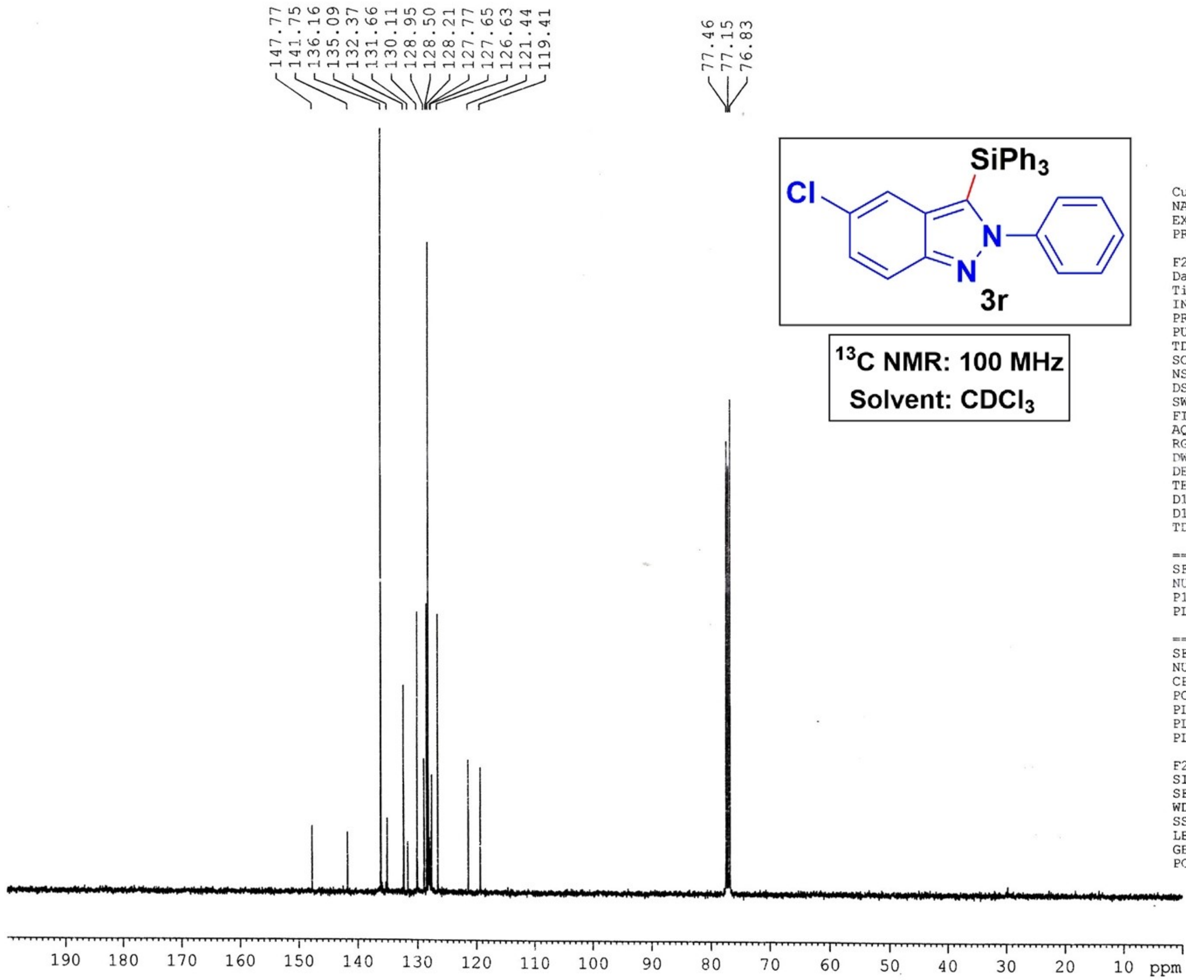



```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                   11
PROCNO                   1

F2 - Acquisition Parameters
Date_             20230108
Time                 17.45
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               8223.685 Hz
FIDRES            0.250967 Hz
AQ               1.9922944 sec
RG                   77.59
DW                  60.800 usec
DE                    6.50 usec
TE                   290.5 K
D1              1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1           400.1524711 MHz
NUC1                    1H
P1                   14.75 usec
PLW1           12.00000000 W

F2 - Processing parameters
SI                   16384
SF             400.1500156 MHz
WDW                     EM
SSB       0
LB                    0.30 Hz
GB        0
PC                    1.00
```



^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

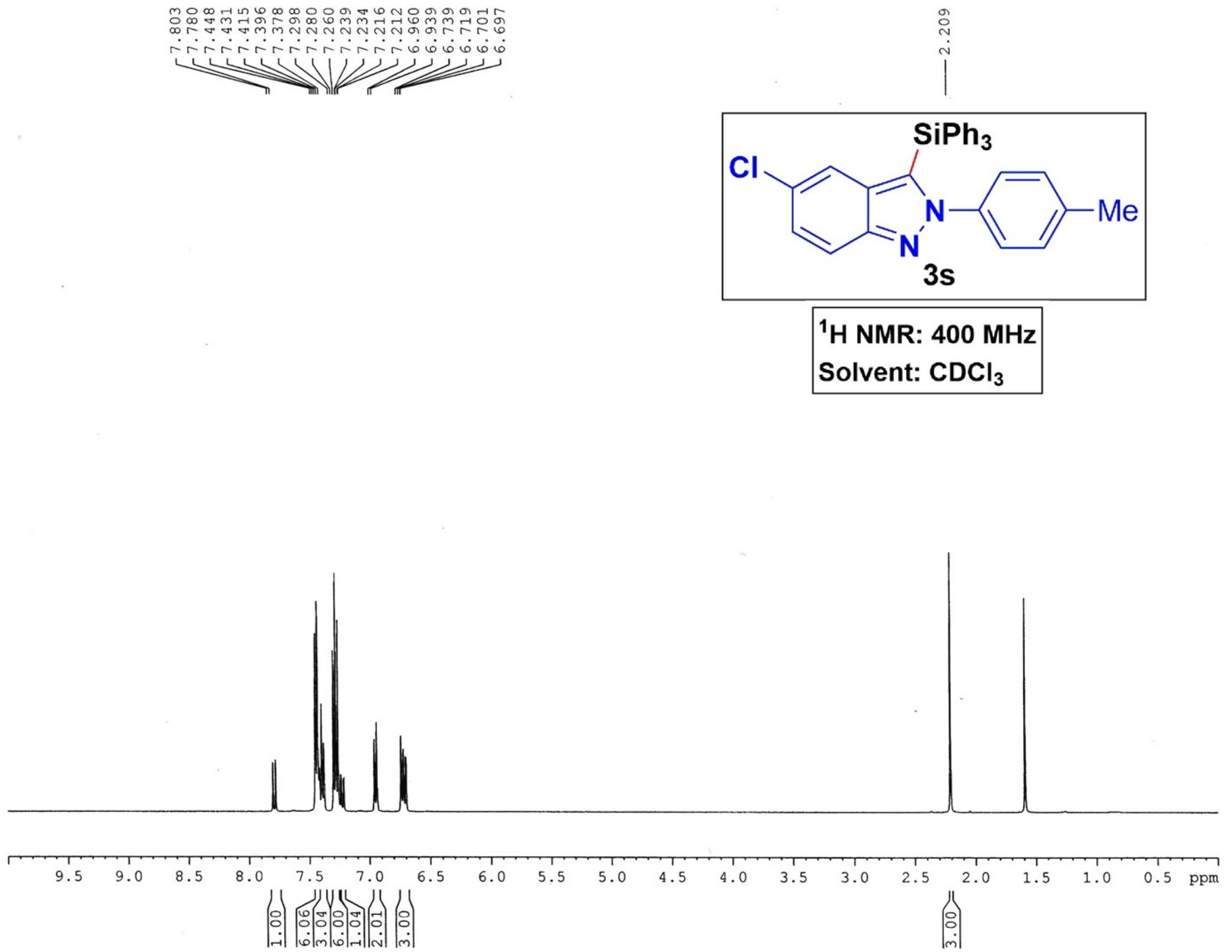
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 5
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230107
Time 19.59
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 520
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 289.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

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

======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W

F2 - Processing parameters
SI 16384
SF 100.6177902 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

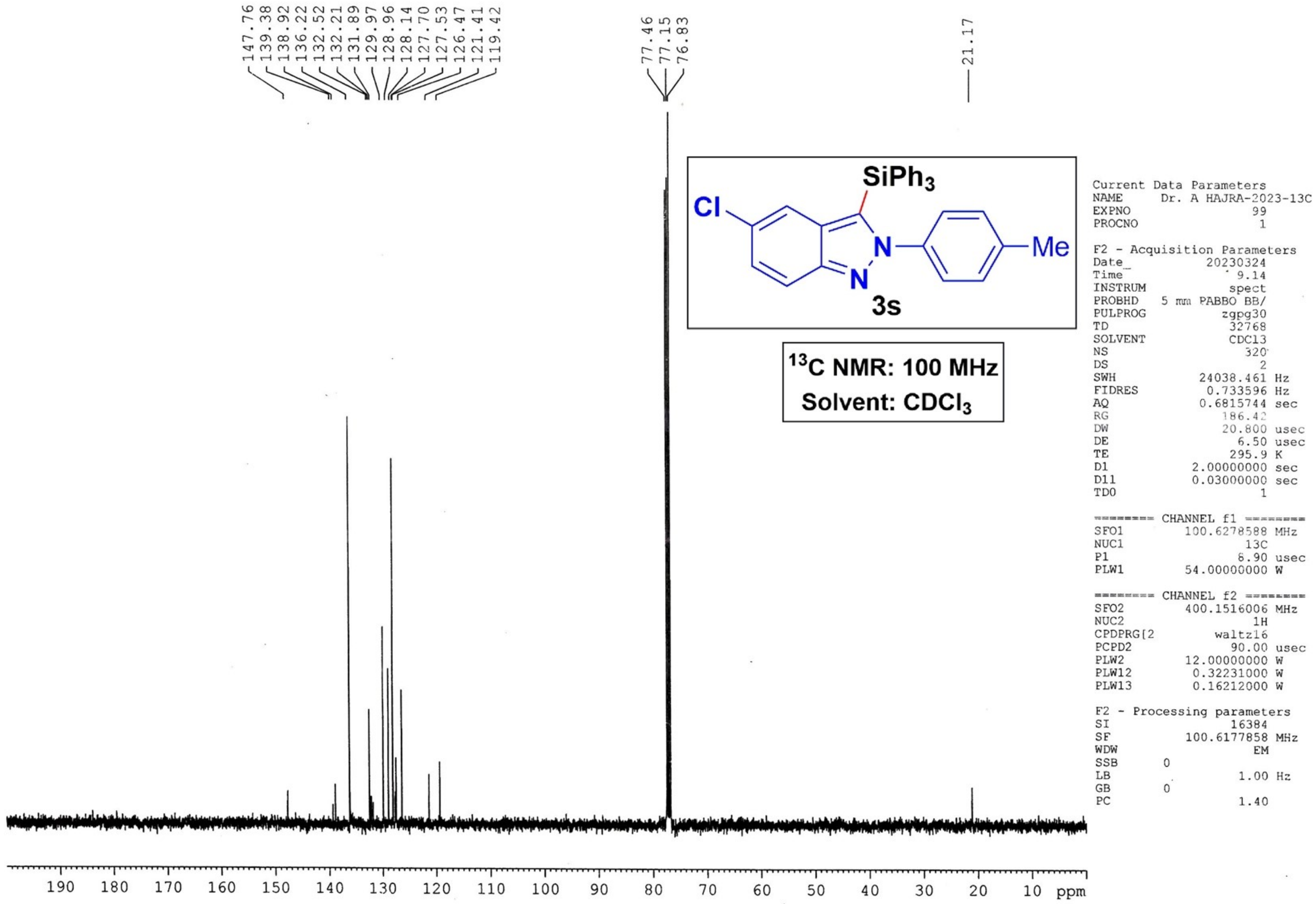


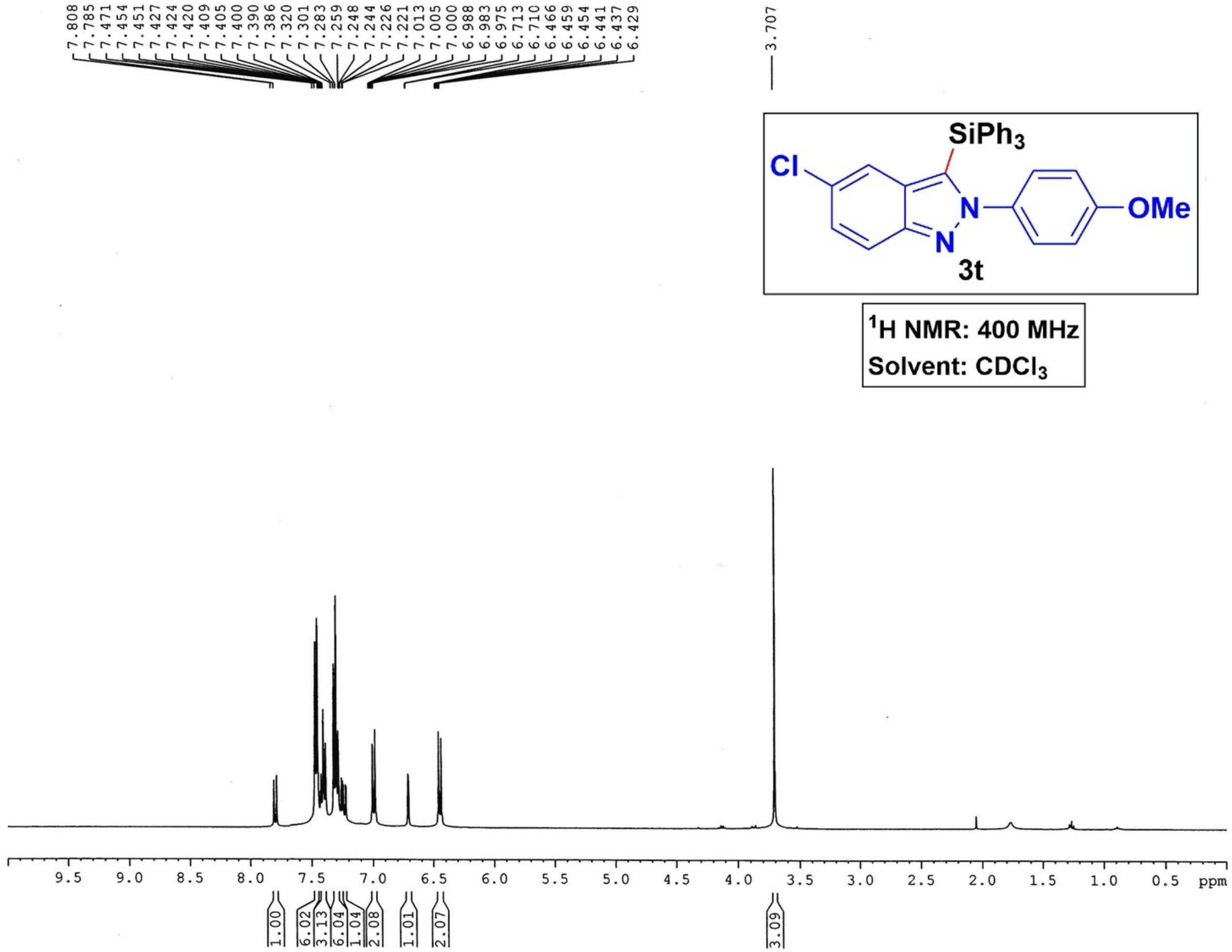

```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                 360
PROCNO                  1

F2 - Acquisition Parameters
Date_            20230324
Time                 8.52
INSTRUM             spect
PROBHD   5 mm PABBO BB/
PULPROG              zg30
TD                  32768
SOLVENT             CDCl3
NS                      8
DS                      2
SWH              8223.685 Hz
FIDRES           0.250967 Hz
AQ              1.9922944 sec
RG                 148.91
DW                 60.800 usec
DE                   6.50 usec
TE                  295.4 K
D1             1.00000000 sec
TD0                     1

======== CHANNEL f1 ========
SFO1          400.1524711 MHz
NUC1                   1H
P1                  14.75 usec
PLW1          12.00000000 W

F2 - Processing parameters
SI                  16384
SF            400.1500097 MHz
WDW                    EM
SSB      0
LB                   0.30 Hz
GB       0
PC                   1.00
```


147.76
139.38
138.92
136.22
132.52
132.21
131.89
129.97
128.96
128.14
127.70
127.53
126.47
121.41
119.42
77.46
77.15
76.83
21.17
SiPh3
Cl
N
N
Me
3s
13C NMR: 100 MHz
Solvent: CDCl3
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 HAJRA-2023-13C
EXPNO 99
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230324
Time 9.14
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 320
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 295.9 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 6.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177858 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

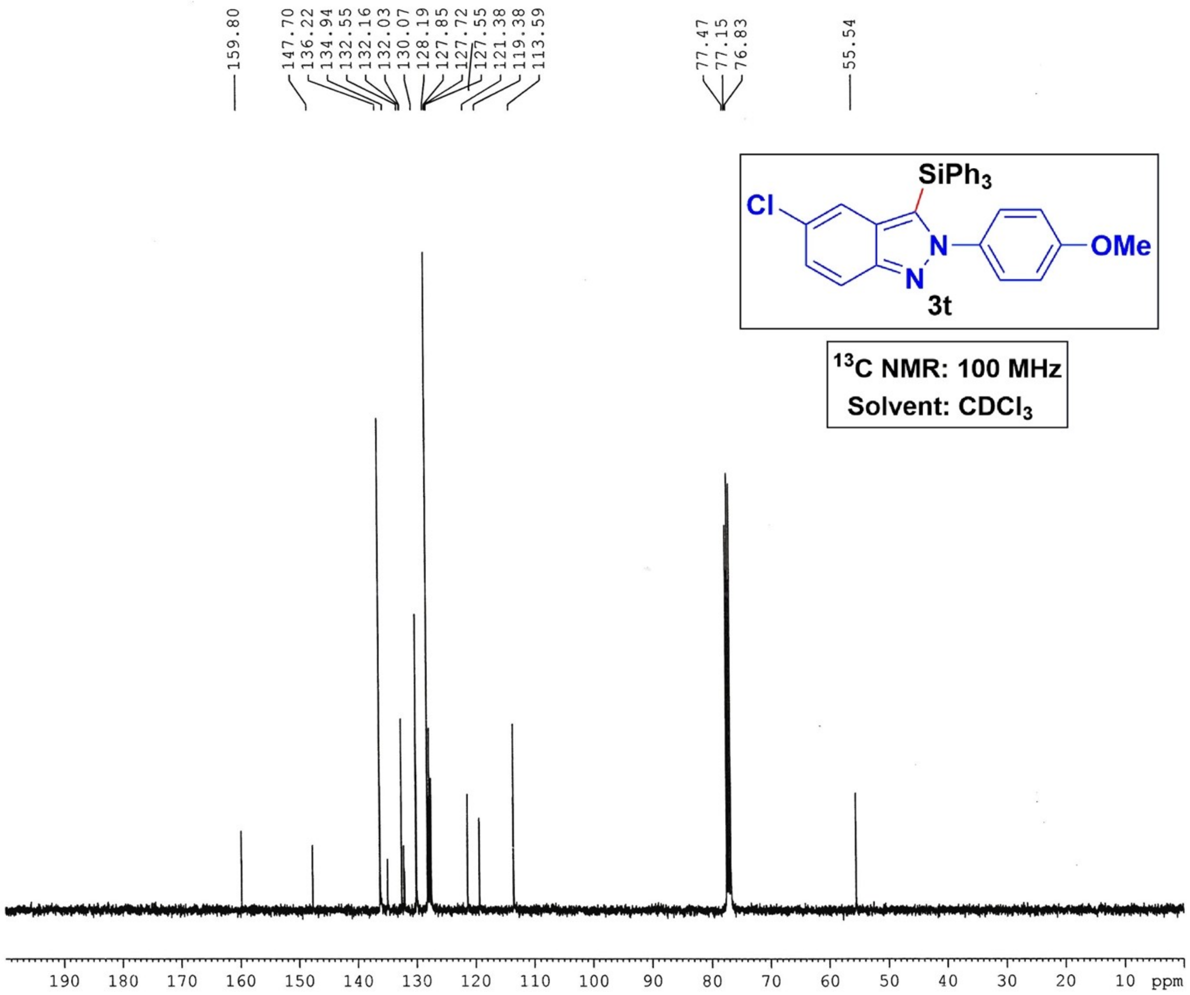



```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                   664
PROCNO                    1

F2 - Acquisition Parameters
Date_              20230602
Time                  16.19
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                8223.685 Hz
FIDRES             0.250967 Hz
AQ                1.9922944 sec
RG                    77.59
DW                   60.800 usec
DE                     6.50 usec
TE                    297.9 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1         400.1524711 MHz
NUC1                      1H
P1                     14.75 usec
PLW1           12.00000000 W

F2 - Processing parameters
SI                    16384
SF              400.1500097 MHz
WDW                      EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```



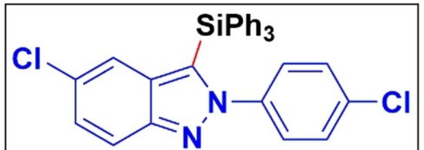

```
Current Data Parameters
NAME      Dr. A HAJRA-2023-13C
EXPNO                210
PROCNO                 1

F2 - Acquisition Parameters
Date_           20230602
Time               16.41
INSTRUM            spect
PROBHD   5 mm PABBO BB/
PULPROG          zgpg30
TD                32768
SOLVENT           CDCl3
NS                  300
DS                    2
SWH           24038.461 Hz
FIDRES         0.733596 Hz
AQ            0.6815744 sec
RG                135.7
DW               20.800 usec
DE                 6.50 usec
TE                298.4 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0                   1

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

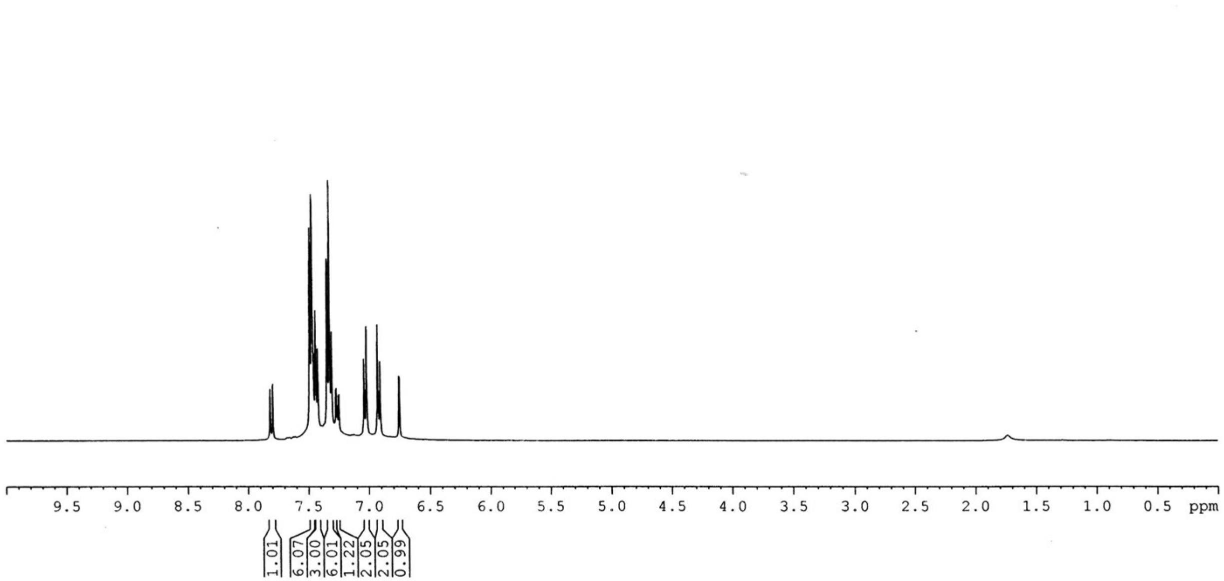
======== CHANNEL f2 ========
SFO2        400.1516006 MHz
NUC2                 1H
CPDPRG[2        waltz16
PCPD2             90.00 usec
PLW2        12.00000000 W
PLW12        0.32231000 W
PLW13        0.16212000 W

F2 - Processing parameters
SI                16384
SF          100.6177872 MHz
WDW                  EM
SSB      0
LB                 1.00 Hz
GB       0
PC                 1.40
```



3u

^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

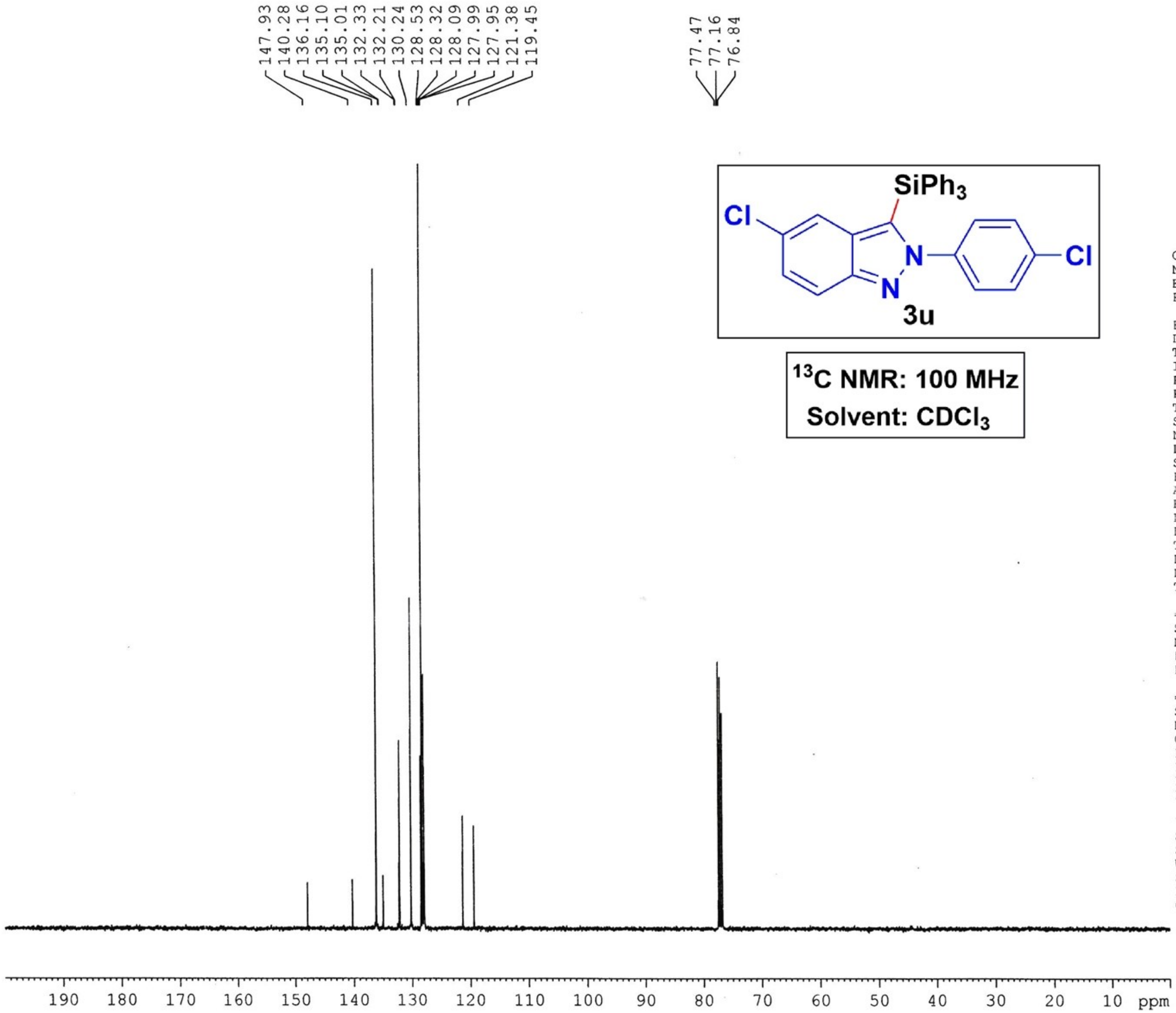



```
Current Data Parameters
NAME      Dr. A HAJRA 2023 1H
EXPNO                   691
PROCNO                    1

F2 - Acquisition Parameters
Date_              20230615
Time                  10.20
INSTRUM               spect
PROBHD    5 mm PABBO BB/
PULPROG                zg30
TD                    32768
SOLVENT               CDCl3
NS                        8
DS                        2
SWH                8223.685 Hz
FIDRES             0.250967 Hz
AQ                1.9922944 sec
RG                    57.28
DW                   60.800 usec
DE                     6.50 usec
TE                    298.4 K
D1               1.00000000 sec
TD0                       1

======== CHANNEL f1 ========
SFO1            400.1524711 MHz
NUC1                     1H
P1                    14.75 usec
PLW1            12.00000000 W

F2 - Processing parameters
SI                    16384
SF              400.1500099 MHz
WDW                      EM
SSB       0
LB                     0.30 Hz
GB        0
PC                     1.00
```



3u

^{13}C NMR: 100 MHz
Solvent: $CDCl_3$

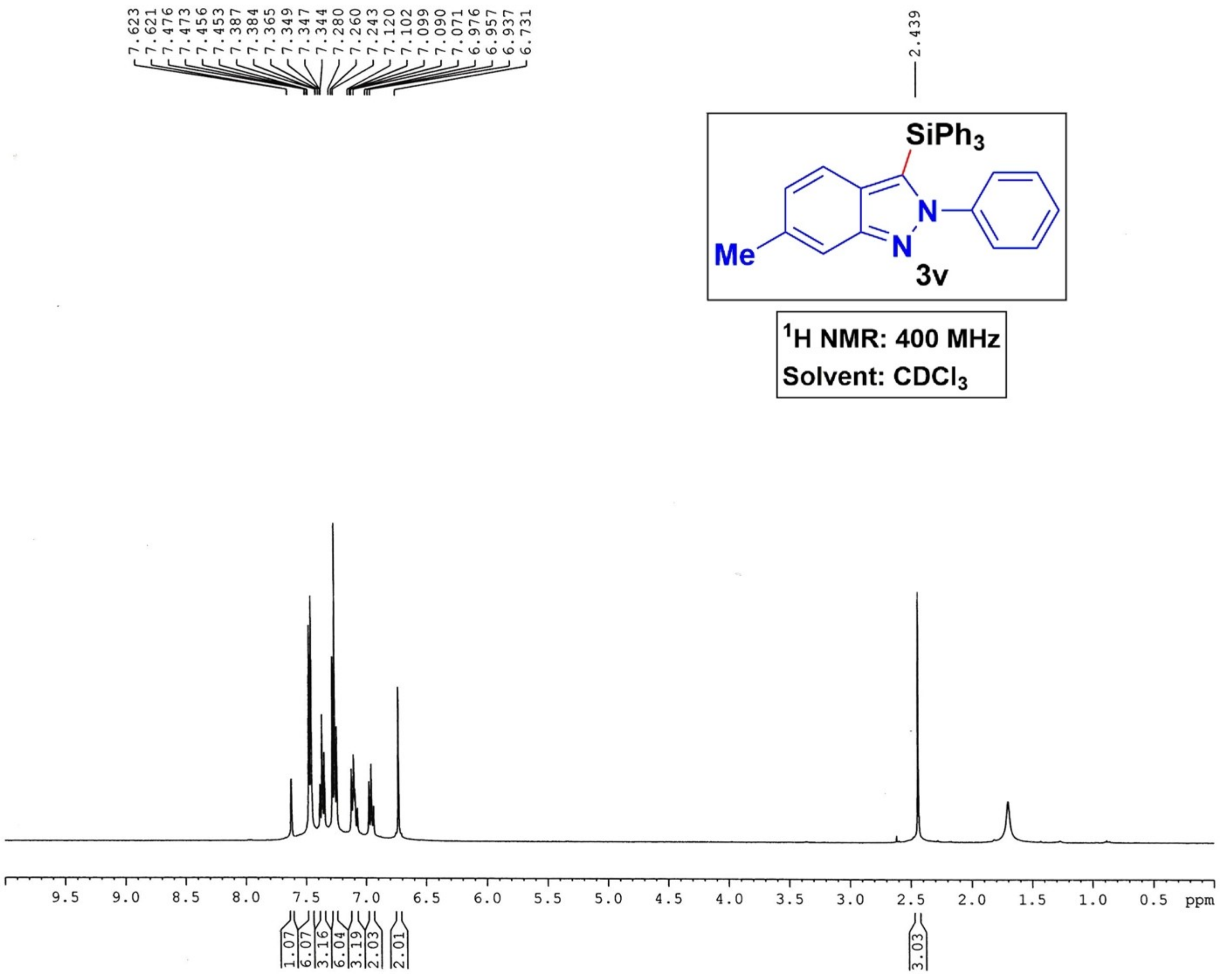
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 221
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230615
Time 10.46
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 320
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 135.7
DW 20.800 usec
DE 6.50 usec
TE 299.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

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

======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W

F2 - Processing parameters
SI 16384
SF 100.6177887 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

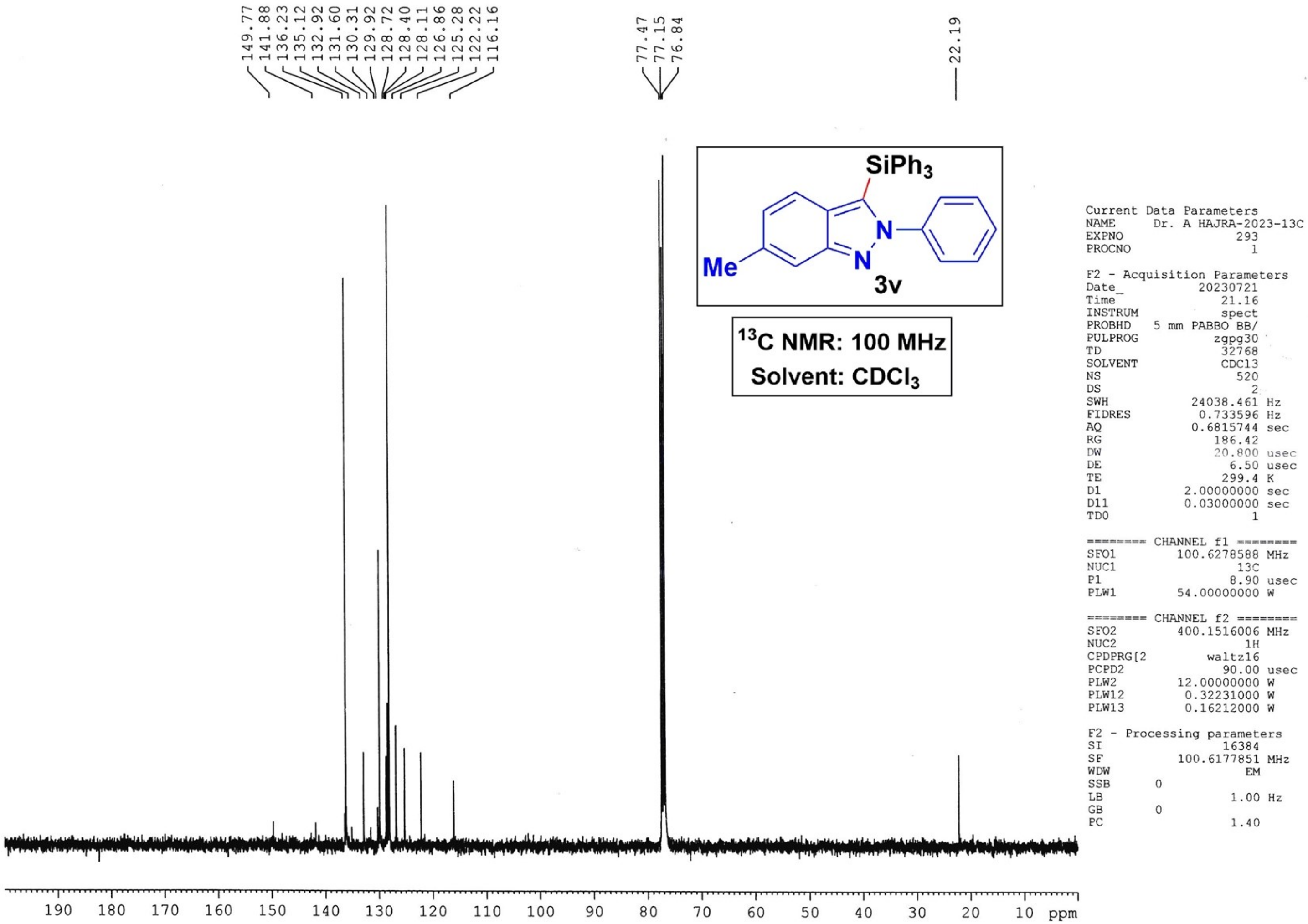


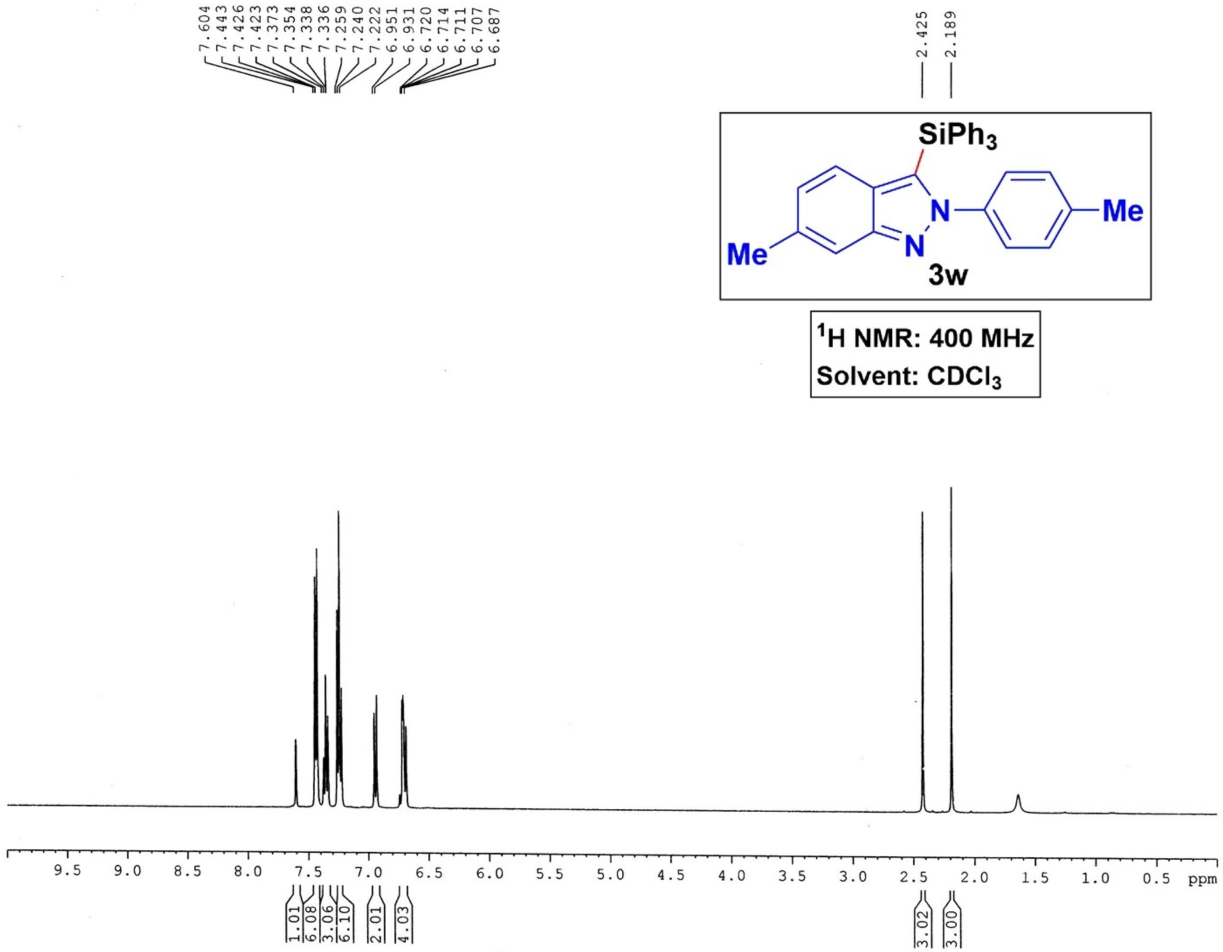

```
Current Data Parameters
NAME       Dr. A HAJRA 2023 1H
EXPNO                     869
PROCNO                      1

F2 - Acquisition Parameters
Date_                20230720
Time                    11.46
INSTRUM                 spect
PROBHD    5 mm PABBO BB/
PULPROG                  zg30
TD                      32768
SOLVENT                 CDCl3
NS                          8
DS                          2
SWH                  8223.685 Hz
FIDRES               0.250967 Hz
AQ                  1.9922944 sec
RG                      135.7
DW                     60.800 usec
DE                       6.50 usec
TE                      297.1 K
D1                 1.00000000 sec
TD0                         1

======== CHANNEL f1 ========
SFO1              400.1524711 MHz
NUC1                       1H
P1                      14.75 usec
PLW1              12.00000000 W

F2 - Processing parameters
SI                      16384
SF                400.1500097 MHz
WDW                        EM
SSB       0
LB                       0.30 Hz
GB        0
PC                       1.00
```


149.77
141.88
136.23
135.12
132.92
131.60
130.31
129.92
128.72
128.40
128.11
126.86
125.28
122.22
116.16
77.47
77.15
76.84
22.19
SiPh3
N
N
Me
3v
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 293
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230721
Time 21.16
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 520
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 299.4 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177851 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

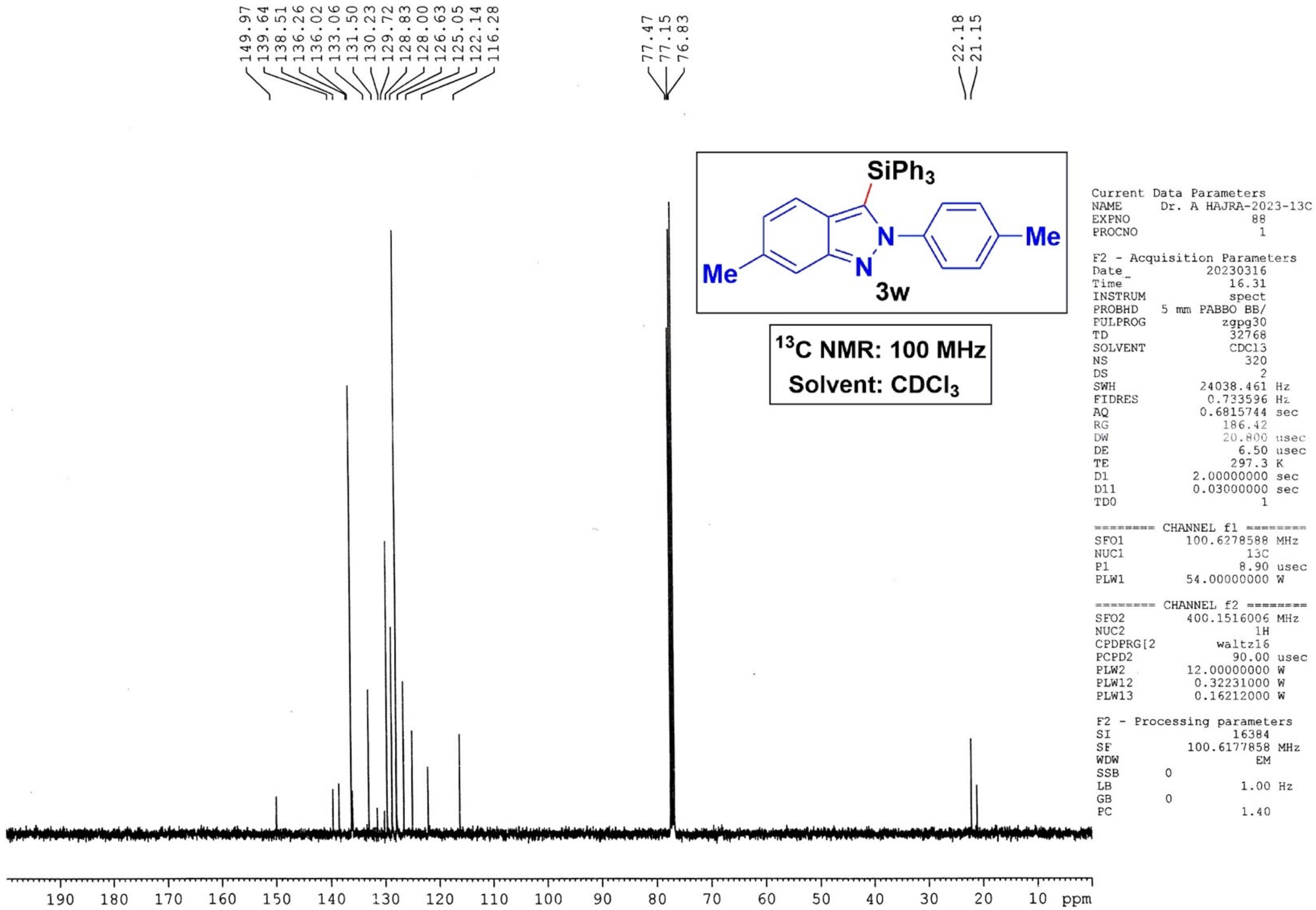


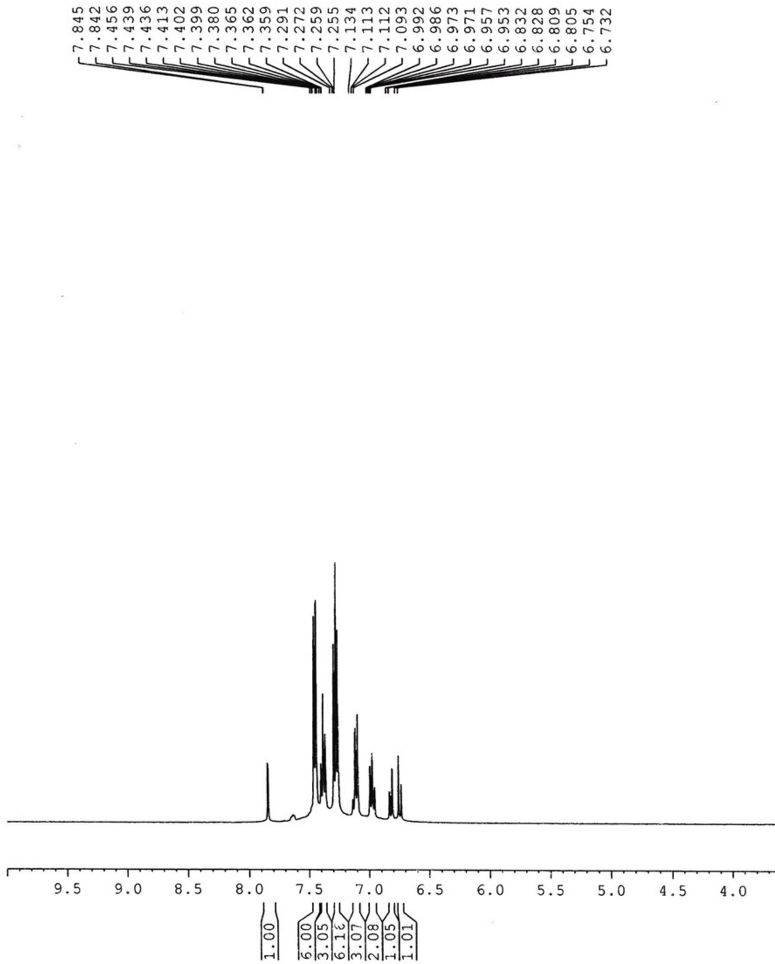

```
Current Data Parameters
NAME       Dr. A HAJRA 2023 1H
EXPNO                  331
PROCNO                   1

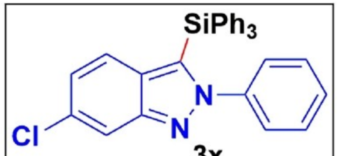
F2 - Acquisition Parameters
Date_             20230316
Time                 16.13
INSTRUM              spect
PROBHD   5 mm PABBO BB/
PULPROG               zg30
TD                   32768
SOLVENT              CDCl3
NS                       8
DS                       2
SWH               8223.685 Hz
FIDRES            0.250967 Hz
AQ               1.9922944 sec
RG                  120.16
DW                  60.800 usec
DE                    6.50 usec
TE                   297.1 K
D1              1.00000000 sec
TD0                      1

======== CHANNEL f1 ========
SFO1          400.1524711 MHz
NUC1                    1H
P1                   14.75 usec
PLW1           12.00000000 W

F2 - Processing parameters
SI                   16384
SF            400.1500152 MHz
WDW                     EM
SSB      0
LB                    0.30 Hz
GB       0
PC                    1.00
```


149.97
139.64
138.51
136.26
136.02
133.06
131.50
130.23
129.72
128.83
128.00
126.63
125.05
122.14
116.28
77.47
77.15
76.83
22.18
21.15
SiPh3
N
N
Me
Me
3w
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 88
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230316
Time 16.31
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 320
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 297.3 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6278588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177858 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm





3x

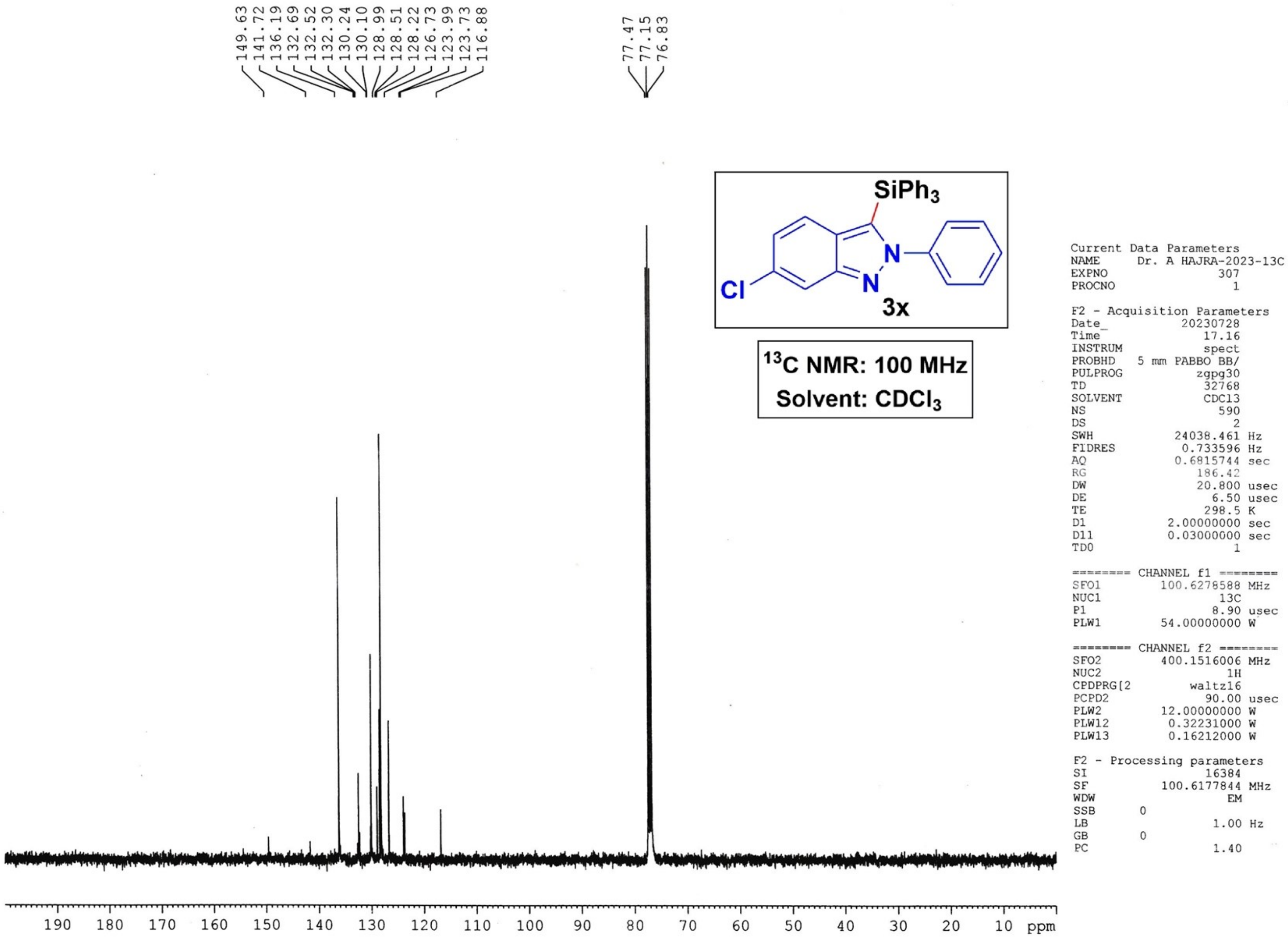
^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

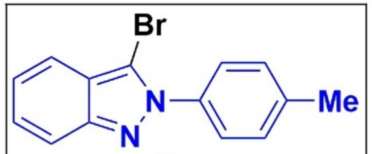
Current Data Parameters
NAME Dr. A HAJRA 2023 1H
EXPNO 906
PROCNO 1

F2 - Acquisition Parameters
Date_ 20230728
Time 16.39
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9922944 sec
RG 148.91
DW 60.800 usec
DE 6.50 usec
TE 297.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1524711 MHz
NUC1 1H
P1 14.75 usec
PLW1 12.00000000 W

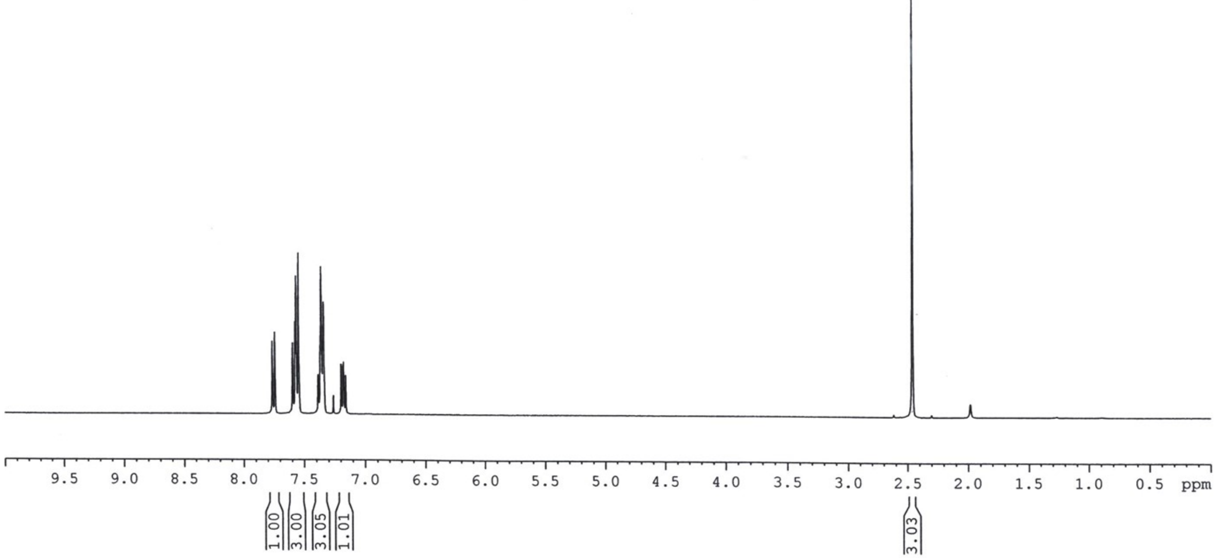
F2 - Processing parameters
SI 16384
SF 400.1500097 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00


149.63
141.72
136.19
132.69
132.52
132.30
130.24
130.10
128.99
128.51
128.22
126.73
123.99
123.73
116.88
77.47
77.15
76.83
SiPh3
N
N
Cl
3x
13C NMR: 100 MHz
Solvent: CDCl3
Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 307
PROCNO 1
F2 - Acquisition Parameters
Date_ 20230728
Time 17.16
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 590
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 298.5 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1
======== CHANNEL f1 ========
SFO1 100.6276588 MHz
NUC1 13C
P1 8.90 usec
PLW1 54.00000000 W
======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W
F2 - Processing parameters
SI 16384
SF 100.6177844 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



4b

^{1}H NMR: 400 MHz
Solvent: $CDCl_3$

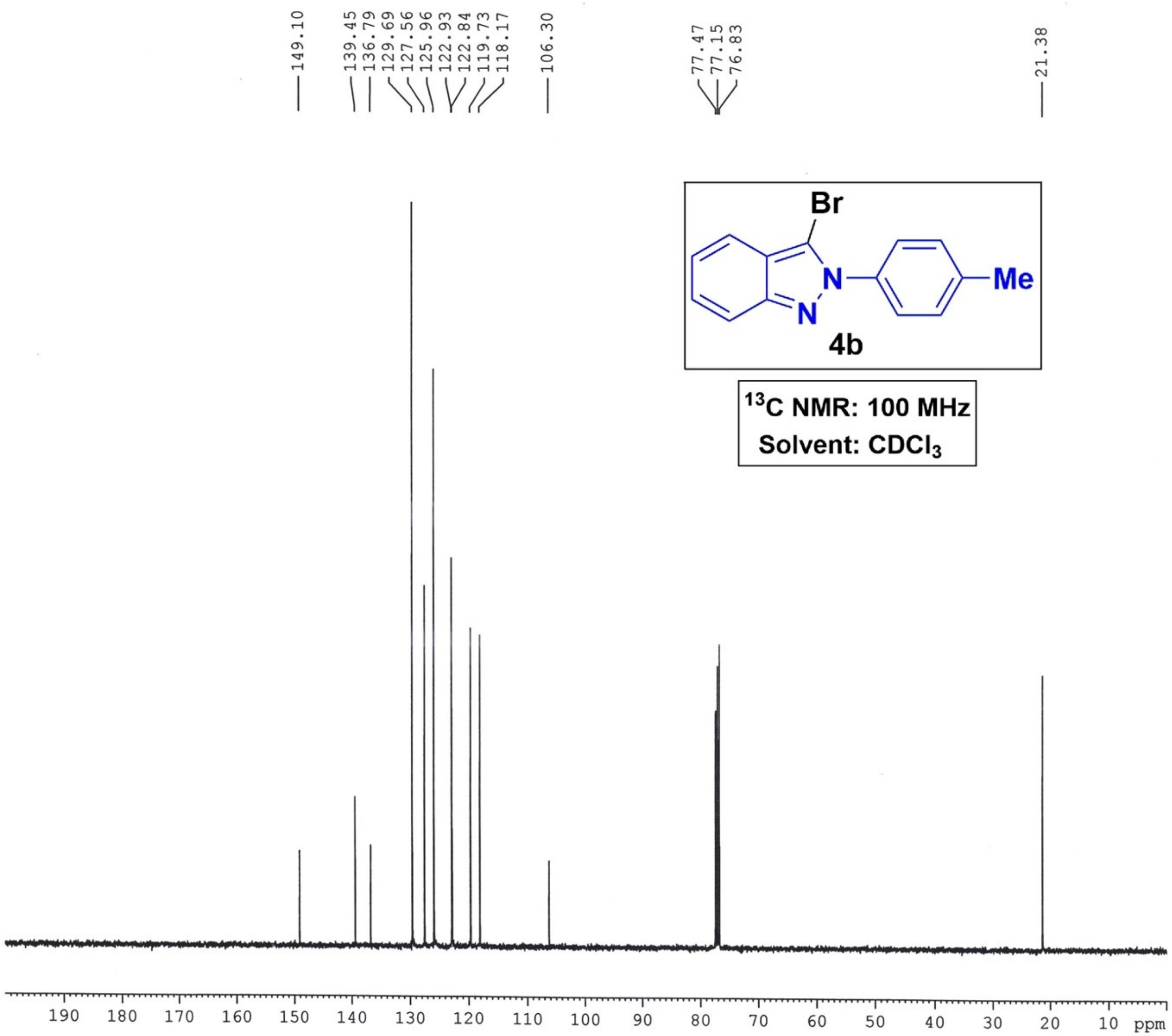


Current Data Parameters
NAME Dr. A HAJRA 2023 1H
EXPNO 1299
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231218
Time 10.45
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 2
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9922944 sec
RG 54.07
DW 60.800 usec
DE 6.50 usec
TE 286.9 K
D1 1.00000000 sec
TD0 1

======== CHANNEL f1 ========
SFO1 400.1524711 MHz
NUC1 1H
P1 14.75 usec
PLW1 12.00000000 W

F2 - Processing parameters
SI 16384
SF 400.1500095 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



Current Data Parameters
NAME Dr. A HAJRA-2023-13C
EXPNO 449
PROCNO 1

F2 - Acquisition Parameters
Date_ 20231218
Time 11.00
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zgpg30
TD 32768
SOLVENT CDCl3
NS 215
DS 2
SWH 24038.461 Hz
FIDRES 0.733596 Hz
AQ 0.6815744 sec
RG 186.42
DW 20.800 usec
DE 6.50 usec
TE 287.7 K
D1 2.00000000 sec
D11 0.03000000 sec
TD0 1

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

======== CHANNEL f2 ========
SFO2 400.1516006 MHz
NUC2 1H
CPDPRG[2 waltz16
PCPD2 90.00 usec
PLW2 12.00000000 W
PLW12 0.32231000 W
PLW13 0.16212000 W

F2 - Processing parameters
SI 16384
SF 100.6177961 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40