

Electronic Supplementary Information (ESI) for:

**Visible-light-enabled room-temperature dealkylative imidation of
secondary and tertiary amine promoted by aerobic ruthenium
catalysis**

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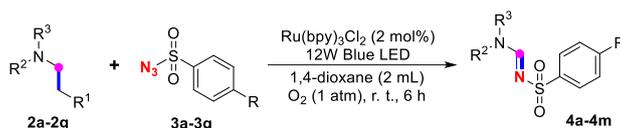
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General Remarks

All commercially available compounds were purchased from Sigma-Aldrich, TCI, Acros, J&K Chemicals and Adamas-beta. Unless otherwise noted, materials obtained from commercial suppliers were used without further purification. All anhydrous solvents, including ethyl acetate (EtOAc) (99.8%, SafeDry, water < 50 ppm), 1,4-dioxane (99.7%, SafeDry, water < 50 ppm), acetonitrile (MeCN) (99.9%, SafeDry, water < 50 ppm), 1,2-dichloroethane (DCE) (99.5%, SafeDry, water < 50 ppm) and THF (99.8%, SafeDry, water < 50 ppm), were purchased from Adamas-beta. Ru(bpy)₃Cl₂ (98% purity, CAS No. 14323-06-9) were purchased from Adamas-beta. Except for tosyl azide (TsN₃, **3a**, 98%+ purity, in 75% EtOAc solution, CAS No. 941-55-9) that was purchased from Adamas-beta, all other sulfonyl azides **3** were prepared through condensation reactions between sodium azide and corresponding sulfonyl chlorides according to literature reported methods.^[1-3] All visible-light induced reactions were performed on Titan Scientific Lab PR-6 parallel photoreactor purchased from Shanghai Titan Scientific Co., Ltd.^[4] Products were purified by flash chromatography on silica gel using petroleum ether, ethyl acetate and dichloromethane as the eluents. ¹H-NMR spectra were recorded on Bruker AVANCE III-400 and JNM-ECZ400S/L1 spectrometers. Chemical shifts (in ppm) were referenced with TMS in CDCl₃ (0 ppm); s = singlet, d = doublet, t = triplet, q = quartet, p = pentad, se = sextet, h = heptet, o = octet. ¹³C-NMR spectra were obtained by using the same NMR spectrometers and were calibrated with CDCl₃ (δ = 77.00 ppm) or DMSO-*d*₆ (δ = 39.50 ppm). High resolution mass spectra were obtained from an Agilent 6520B Q-TOF mass spectrometer with electron spray ionization (ESI) as the ion source.

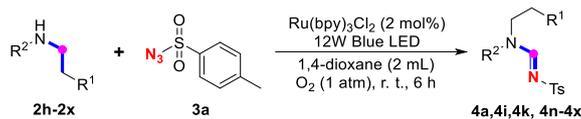
Experimental Procedure and Characterization Data

1) Visible-light-enabled imidation of tertiary amines with azides promoted by aerobic ruthenium catalysis (Table 2)



Typical Procedure: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of sulfonyl azide (**3**, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of tertiary amine (**2a-2g**, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation using Titan Scientific Lab PR-6 parallel photoreactor (460-465 nm blue LED irradiation module from the bottom and side of the reaction mixture in a Shlenk tube with a diameter of 2 cm) with temperature-controlling module as shown in the above images (the distance between the bottom of the reaction mixture and the light source is approximately 1.5 cm, and the distance between the side of the reaction mixture and the light source is approximately 1 cm). The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate as the eluent on silical gel to afford iminated product **4a-4m**. The yields of **4** from tertiary amines were calculated based on the loading of **2a-2g**: acquisition of 0.5 mmol of **4a-4m** from **2a-2g** is equivalent to 100% yield.

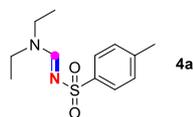
2) Visible-light-enabled imidation of secondary amines with azides promoted by aerobic ruthenium catalysis (Table 3)



Typical Procedure: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of sulfonyl azide (**3**, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of secondary amine (**2h-2x**, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation using Titan Scientific Lab PR-6 parallel photoreactor (460-465 nm blue LED irradiation module from the bottom and side of the reaction mixture in a Shlenk tube with a diameter of 2 cm) with temperature-controlling module as shown in the above images (the distance between the bottom of the reaction mixture and the light source is approximately 1.5 cm, and the distance between the side of the reaction mixture and the light source is approximately 1 cm). The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate as the eluent on silica gel to afford iminated product **4a**, **4i**, **4k** and **4n-4x**. The yields of **4** from secondary amines were calculated based on the loading of **2h-2x**: acquisition of 0.25 mmol of **4a**, **4i**, **4k** and **4n-4x** from **2h-2x** is equivalent to 100% yield.

3) Characterization of the imidated product 4

(E)-N,N-Diethyl-N'-tosylformimidamide (4a)^[2]



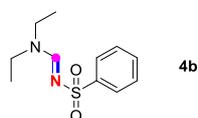
From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation afforded 115.6 mg of **4a** (91%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, *v/v*) as the eluent.

From secondary amine: The reaction of 0.5 mmol of diethylamine (DEA, 36.6 mg, **2h**) and tosyl azide

(3a, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 58.6 mg of **4a** (92%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.14 (s, 1H), 7.76 (d, J = 8.2 Hz, 2H), 7.25 (d, J = 8.2 Hz, 2H), 3.47 (q, J = 7.2 Hz, 2H), 3.37 (q, J = 7.2 Hz, 2H), 2.39 (s, 3H), 1.25 (t, J = 7.2 Hz, 3H), 1.14 (t, J = 7.2 Hz, 3H) ppm. $^{13}\text{C NMR}$ (CDCl_3 , 100 MHz): δ = 158.00, 142.17, 139.74, 129.19, 126.27, 46.96, 40.83, 21.36, 14.41, 11.99 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{12}\text{H}_{18}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 255.1162, found 255.1167.

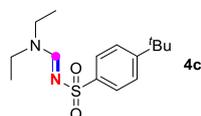
(E)-N,N-Diethyl-N'-(phenylsulfonyl)formimidamide (4b) ^[3]



From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and benzenesulfonyl azide (**3b**, 274.5 mg, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 96.6 mg of **4b** (80%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.16 (s, 1H), 7.90-7.87 (m, 2H), 7.50-7.46 (m, 3H), 3.48 (q, J = 7.2 Hz, 2H), 3.38 (q, J = 7.2 Hz, 2H), 1.26 (t, J = 7.2 Hz, 3H), 1.15 (t, J = 7.2 Hz, 3H) ppm. $^{13}\text{C NMR}$ (CDCl_3 , 100 MHz): δ = 158.15, 142.64, 131.67, 128.64, 126.32, 47.07, 40.96, 14.47, 12.05 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{11}\text{H}_{16}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 241.1005, found 241.1002; calcd for $[\text{C}_{11}\text{H}_{16}\text{N}_2\text{O}_2\text{S}+\text{Na}]^+$ 263.0825, found 263.0827.

(E)-N,N-Diethyl-N'-((4-(tert-butyl)phenyl)sulfonyl)formimidamide (4c) ^[3]

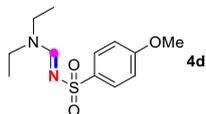


From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and 4-(tert-butyl)benzenesulfonyl azide (**3c**, 358.6 mg, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 127.2 mg of **4c** (86%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.16 (s, 1H), 7.80 (d, J = 8.6 Hz, 2H), 7.47 (d, J = 8.6 Hz, 2H), 3.48 (q, J = 7.2 Hz, 2H), 3.38 (q, J = 7.2 Hz, 2H), 1.33 (s, 9H), 1.26 (t, J = 7.2 Hz, 3H), 1.16 (t, J = 7.2 Hz,

3H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): $\delta = 158.11, 155.24, 139.65, 126.12, 125.60, 46.97, 40.87, 34.96, 31.09, 14.45, 12.06$ ppm. HRMS m/z (ESI) calcd for $[\text{C}_{15}\text{H}_{24}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 297.1631, found 297.1634; calcd for $[\text{C}_{11}\text{H}_{16}\text{N}_2\text{O}_2\text{S}+\text{Na}]^+$ 319.1451, found 319.1452.

(E)-N,N-Diethyl-N'-((4-methoxyphenyl)sulfonyl)formimidamide (4d) ^[3]



From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and 4-methoxybenzenesulfonyl azide (**3d**, 319.5 mg, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 °C in O_2 under blue LED (12W) irradiation afforded 90.5 mg of **4d** (67%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

White solid, m.p. 72.5-73.4 °C. ^1H NMR (CDCl_3 , 400 MHz): $\delta = 8.13$ (s, 1H), 7.81 (d, $J = 9.0$ Hz, 2H), 6.93 (d, $J = 9.0$ Hz, 2H), 3.84 (s, 3H), 3.46 (q, $J = 7.2$ Hz, 2H), 3.37 (q, $J = 7.2$ Hz, 2H), 1.25 (t, $J = 7.2$ Hz, 3H), 1.13 (t, $J = 7.2$ Hz, 3H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): $\delta = 162.04, 157.80, 134.52, 128.20, 113.71, 55.40, 46.90, 40.75, 14.37, 11.94$ ppm. HRMS m/z (ESI) calcd for $[\text{C}_{12}\text{H}_{18}\text{N}_2\text{O}_3\text{S}+\text{H}]^+$ 271.1111, found 271.1113.

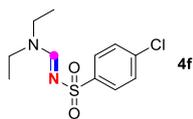
(E)-N,N-Diethyl-N'-((4-fluorophenyl)sulfonyl)formimidamide (4e) ^[3]



From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and 4-fluorobenzenesulfonyl azide (**3e**, 301.5 mg, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 °C in O_2 under blue LED (12W) irradiation afforded 124.9 mg of **4e** (97%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. ^1H NMR (CDCl_3 , 400 MHz): $\delta = 8.15$ (s, 1H), 7.88 (dd, $J = 8.8$ Hz, 3.6 Hz, 2H), 7.16-7.11 (m, 2H), 3.48 (q, $J = 7.2$ Hz, 2H), 3.40 (q, $J = 7.2$ Hz, 2H), 1.27 (t, $J = 7.2$ Hz, 3H), 1.14 (t, $J = 7.2$ Hz, 3H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): $\delta = 164.47$ (d, $J = 251.4$ Hz), 158.06, 138.68 (d, $J = 3.1$ Hz), 128.87 (d, $J = 9.0$ Hz), 115.73 (d, $J = 22.2$ Hz), 47.12, 40.97, 14.38, 11.98 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{11}\text{H}_{15}\text{FN}_2\text{O}_2\text{S}+\text{H}]^+$ 259.0911, found 259.0910; calcd for $[\text{C}_{11}\text{H}_{15}\text{FN}_2\text{O}_2\text{S}+\text{Na}]^+$ 281.0731, found 281.0731.

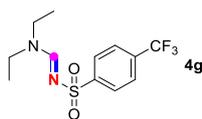
(E)-N,N-Diethyl-N'-((4-chlorophenyl)sulfonyl)formimidamide (4f)



From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and 4-chlorobenzenesulfonyl azide (**3f**, 325.5 mg, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation afforded 112.6 mg of **4f** (82%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. ¹H NMR (CDCl₃, 400 MHz): δ = 8.14 (s, 1H), 7.82 (d, *J* = 8.7 Hz, 2H), 7.43 (d, *J* = 8.7 Hz, 2H), 3.48 (q, *J* = 7.2 Hz, 2H), 3.40 (q, *J* = 7.2 Hz, 2H), 1.27 (t, *J* = 7.2 Hz, 3H), 1.14 (t, *J* = 7.2 Hz, 3H) ppm. ¹³C NMR (CDCl₃, 100 MHz): δ = 158.08, 141.19, 137.93, 128.85, 127.80, 47.12, 40.99, 14.39, 11.99 ppm. HRMS *m/z* (ESI) calcd for [C₁₁H₁₅ClN₂O₂S+H]⁺ 275.0616, found 275.0619.

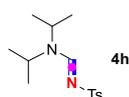
(*E*)-*N,N*-Diethyl-*N'*-((4-(trifluoromethyl)phenyl)sulfonyl)formimidamide (4g**)**



From tertiary amine: The reaction of 0.5 mmol of triethylamine (TEA, 50.6 mg, **2a**) and 4-(trifluoromethyl)benzenesulfonyl azide (**3g**, 376.5 mg, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation afforded 138.4 mg of **4g** (90%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. ¹H NMR (CDCl₃, 400 MHz): δ = 8.16 (s, 1H), 8.01 (d, *J* = 8.3 Hz, 2H), 7.73 (d, *J* = 8.3 Hz, 2H), 3.50 (q, *J* = 7.2 Hz, 2H), 3.41 (q, *J* = 7.2 Hz, 2H), 1.28 (t, *J* = 7.2 Hz, 3H), 1.16 (t, *J* = 7.2 Hz, 3H) ppm. ¹³C NMR (CDCl₃, 100 MHz): δ = 158.27, 146.12, 133.41 (q, *J* = 32.6 Hz), 126.87, 125.80 (q, *J* = 3.7 Hz), 123.40 (q, *J* = 271.2 Hz), 47.25, 41.13, 14.40, 12.02 ppm. HRMS *m/z* (ESI) calcd for [C₁₂H₁₅F₃N₂O₂S+H]⁺ 309.0879, found 309.0879; calcd for [C₁₂H₁₅F₃N₂O₂S+Na]⁺ 331.0699, found 331.0705.

(*E*)-*N,N*-Diisopropyl-*N'*-tosylformimidamide (4h**)** ^[3]

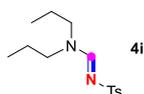


From tertiary amine: The reaction of 0.5 mmol of diisopropyl ethanamine (DIPEA, 64.6 mg, **2b**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation afforded 125.9 mg of **4h** (89%) after flash chromatography on

silica gel using petroleum ether and ethyl acetate (6:1, v/v) as the eluent.

White solid, m.p. 82.5-84.0 °C. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.25 (s, 1H), 7.75 (d, J = 8.2 Hz, 2H), 7.25 (d, J = 8.2 Hz, 1H), 4.52 (p, J = 6.8 Hz, 1H), 3.68 (p, J = 6.8 Hz, 1H), 2.39 (s, 3H), 1.31 (d, J = 6.8 Hz, 6H), 1.21 (d, J = 6.8 Hz, 6H) ppm. $^{13}\text{C NMR}$ (CDCl_3 , 100 MHz): δ = 156.26, 142.01, 139.91, 129.16, 126.17, 48.46, 47.83, 23.49, 21.34, 19.51 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{14}\text{H}_{22}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 283.1475, found 283.1477.

(E)-N,N-Dipropyl-N'-tosylformimidamide (4i) ^[3]

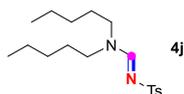


From tertiary amine: The reaction of 0.5 mmol of tripropylamine (71.6 mg, **2c**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 °C in O_2 under blue LED (12W) irradiation afforded 120.4 mg of **4i** (85%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

From secondary amine: The reaction of 0.5 mmol of dipropylamine (50.6 mg, **2i**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 °C in O_2 under blue LED (12W) irradiation afforded 60.9 mg of **4i** (86%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.15 (s, 1H), 7.75 (d, J = 8.2 Hz, 2H), 7.24 (d, J = 8.2 Hz, 1H), 3.36 (t, J = 7.6 Hz, 2H), 3.26 (t, J = 7.4 Hz, 2H), 2.39 (s, 3H), 1.65-1.54 (m, 4H), 0.90 (t, J = 7.4 Hz, 3H), 0.85 (t, J = 7.4 Hz, 3H) ppm. $^{13}\text{C NMR}$ (CDCl_3 , 100 MHz): δ = 158.85, 142.14, 139.79, 129.20, 126.27, 54.20, 47.80, 21.84, 21.39, 19.90, 11.13, 10.78 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{14}\text{H}_{22}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 283.1475, found 283.1475.

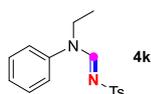
(E)-N,N-Dipentyl-N'-tosylformimidamide (4j)



From tertiary amine: The reaction of 0.5 mmol of tripentylamine (113.7 mg, **2d**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 °C in O_2 under blue LED (12W) irradiation afforded 138.7 mg of **4j** (82%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.13 (s, 1H), 7.75 (d, J = 8.2 Hz, 2H), 7.24 (d, J = 8.2 Hz, 1H), 3.39 (t, J = 7.6 Hz, 2H), 3.28 (t, J = 7.4 Hz, 2H), 2.39 (s, 3H), 1.71-1.49 (m, 4H), 1.36-1.15 (m, 8H), 0.90 (t, J = 7.3 Hz, 3H), 0.82 (t, J = 7.2 Hz, 3H) ppm. $^{13}\text{C NMR}$ (CDCl_3 , 100 MHz): δ = 158.77, 142.17, 139.91, 129.22, 126.31, 52.53, 46.15, 28.81, 28.50, 28.31, 26.30, 22.25, 22.20, 21.43, 13.88, 13.82 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{18}\text{H}_{30}\text{N}_2\text{O}_2\text{S}+\text{Na}]^+$ 361.1920, found 361.1919.

(*E*)-*N*-Ethyl-*N*-phenyl-*N'*-tosylformimidamide (4k) [2]



From tertiary amine: The reaction of 0.5 mmol of *N,N*-diethylaniline (74.6 mg, **2e**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 72.8 mg of **4k** (48%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (8:1 to 6:1, v/v) as the eluent.

From secondary amine: The reaction of 0.5 mmol of *N*-ethylaniline (60.5 mg, **2k**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 41.1 mg of **4k** (54%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (8:1 to 6:1, v/v) as the eluent.

Yellow oil. $^1\text{H NMR}$ (CDCl_3 , 400 MHz): δ = 8.45 (s, 1H), 7.81 (d, J = 8.2 Hz, 2H), 7.45-7.41 (m, 2H), 7.36-7.34 (m, 1H), 7.28 (d, J = 8.0 Hz, 2H), 7.20-7.18 (m, 2H), 3.96 (q, J = 7.2 Hz, 2H), 2.41 (s, 3H), 1.17 (t, J = 7.2 Hz, 3H) ppm. $^{13}\text{C NMR}$ (CDCl_3 , 100 MHz): δ = 158.05, 142.63, 141.88, 139.11, 129.82, 129.34, 127.65, 126.56, 123.54, 44.05, 21.44, 12.32 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{16}\text{H}_{18}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 303.1162, found 303.1160.

(*E*)-*N*-Ethyl-*N*-cyclohexyl-*N'*-tosylformimidamide (4l)

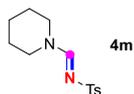


From tertiary amine: The reaction of 0.5 mmol of *N,N*-diethylcyclohexanamine (77.6 mg, **2f**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 103.6 mg of **4l** (67%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (8:1 to 6:1, v/v) as the eluent.

From secondary amine: The reaction of 0.5 mmol of *N*-ethylcyclohexanamine (63.6 mg, **2n**) and tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation for 24 hours afforded 55.6 mg of **4l** (72%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (8:1 to 6:1, v/v) as the eluent.

White solid, m.p. 94.4-95.5 °C. ¹H NMR (CDCl₃, 400 MHz): δ = 8.21 (s, 1H), 7.76 (d, *J* = 8.2 Hz, 2H), 7.25 (d, *J* = 8.1 Hz, 2H), 3.43 (q, *J* = 7.2 Hz, 2H), 3.25-3.17 (m, 1H), 2.39 (s, 3H), 1.88-1.68 (m, 6H), 1.54-1.44 (m, 2H), 1.36-1.24 (m, 2H), 1.15 (t, *J* = 7.2 Hz, 3H) ppm. ¹³C NMR (CDCl₃, 100 MHz): δ = 157.22, 142.07, 139.94, 129.19, 126.26, 62.97, 40.54, 32.52, 25.56, 24.96, 21.40, 13.27 ppm. HRMS *m/z* (ESI) calcd for [C₁₆H₂₄N₂O₂S+H]⁺ 309.1631, found 309.1631.

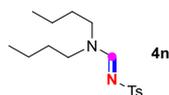
(*E*)-4-Methyl-*N*-(piperidin-1-ylmethylene)benzenesulfonimide (4m**)** [2]



From tertiary amine: The reaction of 0.5 mmol of *N*-ethylpiperidine (56.6, **2g**) and tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation afforded 93.5 mg of **4m** (70%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. ¹H NMR (CDCl₃, 400 MHz): δ = 8.12 (s, 1H), 7.76 (d, *J* = 8.2 Hz, 2H), 7.25 (d, *J* = 8.0 Hz, 2H), 3.59 (t, *J* = 5.6 Hz, 2H), 3.41 (t, *J* = 5.6 Hz, 2H), 2.39 (s, 3H), 1.67-1.57 (m, 6H) ppm. ¹³C NMR (CDCl₃, 100 MHz): δ = 157.23, 142.27, 139.65, 129.23, 126.40, 51.82, 44.58, 26.36, 24.79, 23.90, 21.40 ppm. HRMS *m/z* (ESI) calcd for [C₁₃H₁₈N₂O₂S+H]⁺ 267.1162, found 267.1164.

(*E*)-*N,N*-Dibutyl-*N'*-tosylformimidamide (4n**)** [2]

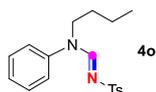


From secondary amine: The reaction of 0.5 mmol of dibutylamine (71.6 mg, **2j**) and tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) at 25 °C in O₂ under blue LED (12W) irradiation afforded 69.6 mg of **4n** (90%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent.

Colourless oil. ¹H NMR (CDCl₃, 400 MHz): δ = 8.13 (s, 1H), 7.75 (d, *J* = 8.3 Hz, 2H), 7.25 (d, *J* = 8.0 Hz,

1H), 3.39 (t, $J = 7.6$ Hz, 2H), 3.28 (t, $J = 7.4$ Hz, 2H), 2.39 (s, 3H), 1.59-1.47 (m, 4H), 1.33-1.23 (m, 4H), 0.94 (t, $J = 7.3$ Hz, 3H), 0.87 (t, $J = 7.3$ Hz, 3H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): $\delta = 158.70, 142.14, 139.84, 129.18, 126.29, 52.26, 45.93, 30.66, 28.65, 21.41, 19.90, 19.59, 13.63, 13.53$ ppm. HRMS m/z (ESI) calcd for $[\text{C}_{16}\text{H}_{26}\text{N}_2\text{O}_2\text{S}+\text{Na}]^+$ 333.1607, found 333.1611.

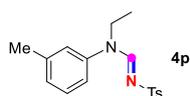
(*E/Z*)-*N*-Butyl-*N*-phenyl-*N'*-tosylformimidamide (*E:Z* \approx 97:3) (4o**)**



From secondary amine: The reaction of 0.5 mmol of *N*-butylaniline (74.6 mg, **2l**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation afforded 39.8 mg of **4o** (48%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (8:1 to 6:1, v/v) as the eluent.

Yellow oil. ^1H NMR (CDCl_3 , 400 MHz): $\delta = 8.46$ (s, 1H), 7.80 (d, $J = 8.3$ Hz, 2H), 7.45-7.41 (m, 2H), 7.36-7.32 (m, 1H), 7.30-7.27 (m, 2H), 7.20-7.18 (m, 2H), 3.92 (t, $J = 7.6$ Hz, 2H), 2.42 (s, 3H), 1.53 (p, $J = 7.6$ Hz, 2H), 1.31-1.21 (m, 2H), 0.83 (t, $J = 7.3$ Hz, 3H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): $\delta = 158.53, 142.64, 142.06, 139.09, 129.84, 129.35, 127.65, 126.54, 123.59, 48.53, 28.91, 21.50, 19.79, 13.59$ ppm. HRMS m/z (ESI) calcd for $[\text{C}_{18}\text{H}_{22}\text{N}_2\text{O}_2\text{S}+\text{Na}]^+$ 353.1294, found 353.1285.

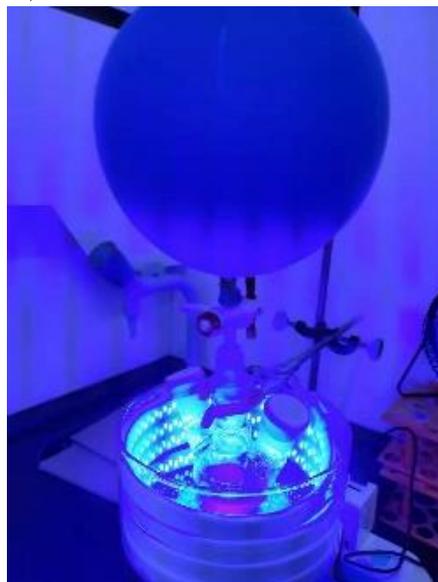
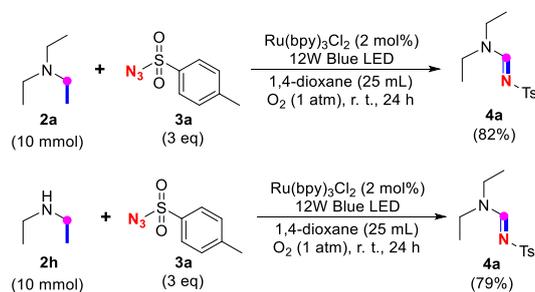
(*E*)-*N*-Ethyl-*N*-(*m*-tolyl)-*N'*-tosylformimidamide (4p**)**



From secondary amine: The reaction of 0.5 mmol of *N*-ethyl-3-methylaniline (67.6 mg, **2m**) and tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation for 24 hours afforded 43.4 mg of **4p** (55%) after flash chromatography on silica gel using petroleum ether and ethyl acetate (8:1 to 6:1, v/v) as the eluent.

Yellow oil. ^1H NMR (CDCl_3 , 400 MHz): $\delta = 8.44$ (s, 1H), 7.81 (d, $J = 8.0$ Hz, 2H), 7.32-7.26 (m, 3H), 7.15 (d, $J = 7.6$ Hz, 1H), 6.99-6.98 (m, 2H), 3.95 (q, $J = 7.2$ Hz, 2H), 2.41 (s, 3H), 2.39 (s, 3H), 1.17 (t, $J = 7.2$ Hz, 3H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): $\delta = 158.06, 142.62, 141.83, 140.06, 139.16, 129.59, 129.36, 128.43, 126.56, 124.22, 120.53, 44.05, 21.49, 21.33, 12.37$ ppm. HRMS m/z (ESI) calcd for $[\text{C}_{17}\text{H}_{20}\text{N}_2\text{O}_2\text{S}+\text{H}]^+$ 317.1318, found 317.1322.

4) Gram-scale reactions of visible-light-enabled imidation with azides promoted by aerobic ruthenium catalysis (Scheme 2)

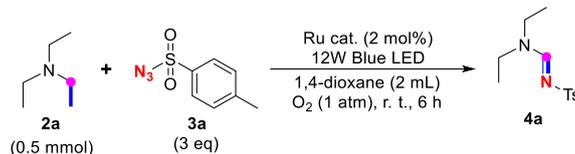


Typical Procedure: To a three-necked flask charged with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (128.1 mg, 0.2 mmol) was added a solution of tosyl azide (**3a**, 8.76 mL of 75% solution in EtOAc, 30 mmol) in anhydrous 1,4-dioxane (15 mL) via a syringe under O_2 (1 atm). Then a solution of triethylamine (**2a**, 1.01 g, 10 mmol) in anhydrous 1,4-dioxane (10 mL) was added via a syringe upon blue LED irradiation of a coiled 12W blue LED band (2 meters long, coiled as a four-layer ring with a diameter of 16 cm, and the flask is located in the center of this LED ring, as shown in the above picture). The reaction mixture was stirred at 25 °C in O_2 under blue LED (12W) irradiation for 24 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (4:1 to 3:1, *v/v*) as the eluent on silical gel to afford 2.09 g of the iminated product **4a** (82%). The yield of **4a** from this tertiary amine was calculated based on the loading of **2a**: acquisition of 10 mmol of **4a** from **2a** is equivalent to 100% yield.

Employing the same apparatus via the above procedure, the reaction of 10 mmol of diethylamine (**2h**, g, 10 mmol) and tosyl azide (**3a**, 8.76 mL of 75% solution in EtOAc, 30 mmol) with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (128.1 mg, 0.2

mmol) at 25 °C in O₂ under blue LED (12W) irradiation for 24 hours afforded 1.01 g of the iminated product **4a** (79%). The yield of **4a** from this secondary amine was calculated based on the loading of **2h**: acquisition of 5 mmol of **4a** from **2h** is equivalent to 100% yield.

5) Reactions with other commonly used ruthenium catalysts

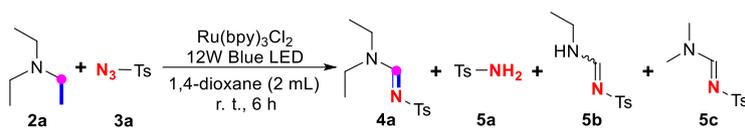


Entry	Ru cat.	Yield (%) ^a
1	Ru(Ph ₃ P) ₂ (CO) ₂ Cl ₂ (14564-35-3)	7%
2	Ru(COD)Cl ₂ (50982-13-3)	12%
3	Ru(Ph ₃ P) ₃ Cl ₂ (15529-49-4)	14%
4	RuCl ₃ (10049-08-8)	21%

^a Reaction conditions: TEA **2a** (0.5 mmol), TsN₃ (1.5 mmol), Ru catalyst (0.01 mmol) in 1,4-dioxane (2 mL) at room temperature in O₂ (1 atm) under 12W blue LED irradiation for 6 hours. ^b Isolated yields of **4a** based on **2a**.

Control Experiments

1) Control experiments on tertiary amine 2a (Table 4)



Typical Procedures:

Entry 1: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (3a, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of triethylamine (TEA, 2a, 50.6 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (3:1 to 2:1 to 1:1, *v/v*) as the eluent on silical gel to afford 109.8 mg of 4a (86%), 76.4 mg of 5a (89%), 8.1 mg of 5b (7%) and 7.0 mg of 5c (6%).

Entry 2: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (3a, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under argon (1 atm). Then a solution of triethylamine (TEA, 2a, 50.6 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in argon under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (3:1 to 2:1 to 1:1, *v/v*) as the eluent on silical gel to afford 66.4 mg of 4a (52%), 76.8 mg of 5a (90%), 5.7 mg of 5b (5%) and 8.8 mg of 5c (8%).

Entry 3: To a reaction tube was added a solution of tosyl azide (3a, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of triethylamine (TEA, 2a, 50.6 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash

chromatography using petroleum ether and ethyl acetate (3:1 to 2:1 to 1:1, v/v) as the eluent on silical gel to afford 32.3 mg of **4a** (25%), 38.2 mg of **5a** (45%) and 7.0 mg of **5b** (6%). None of **5c** could be observe on GC-MS.

Entry 4: To a reaction tube was added a solution of tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under argon (1 atm). Then a solution of triethylamine (TEA, **2a**, 50.6 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in argon under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (3:1 to 2:1 to 1:1, v/v) as the eluent on silical gel to afford 33.1 mg of **4a** (26%), 42.2 mg of **5a** (49%) and 5.4 mg of **5b** (5%). None of **5c** could be observe on GC-MS.

Entry 5: To a reaction tube tightly wrapped with tinfoil and charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of triethylamine (TEA, **2a**, 50.6 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe. The reaction mixture was stirred at 25 °C in dark for 6 hours, and none of **4a** or **5a-c** could be observed on GC-MS.

Entry 6: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of triethylamine (TEA, **2a**, 50.6 mg, 0.5 mmol) and TEMPO (390.6 mg, 2.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, and none of **4a** or **5a-c** could be observed on GC-MS.

Entry 7: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (2 mL) via a syringe under O₂ (1 atm). Then the reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, and none of **4a** or **5a-c** could be observed on GC-MS.

4-Methylbenzenesulfonamide (**5a**)^[5]

White solid, m.p. 114.0-114.6 °C. ¹H NMR (DMSO-d₆, 400 MHz): δ = 7.71 (d, *J* = 8.2 Hz, 2H), 7.36 (d, *J* = 8.0 Hz, 2H), 7.26 (s, 2H), 2.37 (s, 3H) ppm. ¹³C NMR (DMSO-d₆, 100 MHz): δ = 141.82, 141.42, 129.26, 125.59, 20.87 ppm. GC-MS *m/z* (EI) calcd for [C₇H₉NO₂S] 171.04, found 171.0.

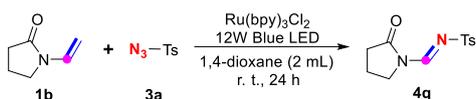
(E/Z)-N-Ethyl-N'-tosylformimidamide (E:Z ≈ 4:1) (5b)

White solid, m.p. 80.2-80.7 °C. ¹H NMR (CDCl₃, 400 MHz): δ = 8.26 (d, *J* = 5.1 Hz, 1.00H), 8.12 (d, *J* = 13.5 Hz, 0.28H), 7.75-7.71 (m, 2.56H), 7.28-7.25 (m, 2.54H), 6.67 (s, 1.00H), 3.42-3.34 (m, 2.47H), 2.40 (s, 3.78 H), 1.24 (t, *J* = 7.2 Hz, 0.75H), 1.16 (t, *J* = 7.3 Hz, 3.01H) ppm. ¹³C NMR (CDCl₃, 100 MHz): δ = 157.64, 142.87, 142.57, 139.20, 138.86, 129.48, 129.34, 126.35, 126.33, 41.30, 36.74, 21.44, 18.99, 15.91, 13.68 ppm. HRMS *m/z* (ESI) calcd for [C₁₀H₁₄N₂O₂S+H]⁺ 227.0849, found 227.0857.

(E)-N,N-Dimethyl-N'-tosylformimidamide (5c) [2]

Light-yellow solid, m.p. 93.2-93.8 °C. ¹H NMR (CDCl₃, 400 MHz): δ = 8.13 (s, 1H), 7.77 (d, *J* = 8.0 Hz, 2H), 7.26 (d, *J* = 8.0 Hz, 2H), 3.31 (s, 3H), 3.01 (s, 3H), 2.40 (s, 3H) ppm. ¹³C NMR (CDCl₃, 100 MHz): δ = 159.03, 142.44, 139.46, 129.29, 126.45, 41.43, 35.46, 21.45 ppm. HRMS *m/z* (ESI) calcd for [C₁₀H₁₄N₂O₂S+H]⁺ 227.0849, found 227.0852.

2) Control experiments on N-substituted enamine 1b (Table 5)



Typical Procedures:

Entry 1: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of 1-vinylpyrrolidin-2-one (**1b**, 55.5 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 24 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (4:1 to 3:1, *v/v*) as the eluent on silical gel to afford 41.5 mg of **4x** (31%).

Entry 2: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under argon (1 atm). Then a solution of 1-vinylpyrrolidin-2-one (**1b**, 55.5 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in argon under blue LED (12W) irradiation for 24 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (4:1 to 3:1, *v/v*) as the eluent on silical gel to afford 14.9 mg of **4x** (11%).

Entry 3: To a reaction tube was added a solution of tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O_2 (1 atm). Then a solution of 1-vinylpyrrolidin-2-one (**1b**, 55.5 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 $^\circ\text{C}$ in O_2 under blue LED (12W) irradiation for 24 hours, and only trace amount of amidine **4q** could be observed on TLC.

Entry 4: To a reaction tube was added a solution of tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under argon (1 atm). Then a solution of 1-vinylpyrrolidin-2-one (**1b**, 55.5 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 $^\circ\text{C}$ in argon under blue LED (12W) irradiation for 24 hours, and only trace amount of amidine **4q** could be observed on TLC.

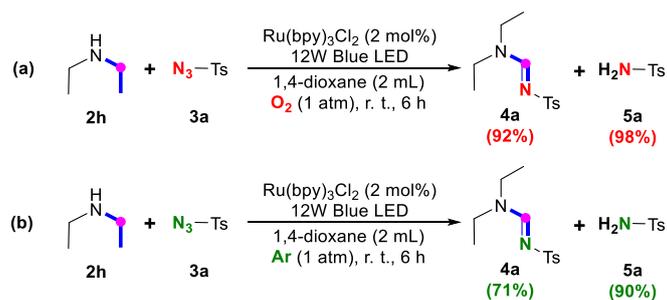
Entry 5: To a reaction tube tightly wrapped with tinfoil and charged with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O_2 (1 atm). Then a solution of 1-vinylpyrrolidin-2-one (**1b**, 55.5 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe. The reaction mixture was stirred in dark at 25 $^\circ\text{C}$ in O_2 for 24 hours, and only trace amount of amidine **4q** could be observed on TLC.

Entry 6: To a reaction tube tightly wrapped with tinfoil and charged with $\text{Ru}(\text{bpy})_3\text{Cl}_2$ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μL of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under argon (1 atm). Then a solution of 1-vinylpyrrolidin-2-one (**1b**, 55.5 mg, 0.5 mmol) in anhydrous 1,4-dioxane (1 mL) was added via a syringe. The reaction mixture was stirred in dark at 25 $^\circ\text{C}$ in argon for 24 hours, and only trace amount of amidine **4q** could be observed on TLC.

(E)-4-Methyl-N-((2-oxopyrrolidin-1-yl)methylene)benzenesulfonamide (4q)

White solid, m.p. 137.2-137.7 $^\circ\text{C}$. ^1H NMR (CDCl_3 , 400 MHz): δ = 9.00 (s, 1H), 7.81 (d, J = 7.9 Hz, 2H), 7.32 (d, J = 7.9 Hz, 2H), 3.77 (t, J = 7.3 Hz, 2H), 3.62 (t, J = 8.1 Hz, 2H), 2.43 (s, 3H), 2.16 (p, J = 7.7 Hz, 2H) ppm. ^{13}C NMR (CDCl_3 , 100 MHz): δ = 175.80, 153.32, 144.10, 136.46, 129.67, 127.50, 44.15, 31.42, 21.59, 17.76 ppm. HRMS m/z (ESI) calcd for $[\text{C}_{12}\text{H}_{14}\text{N}_2\text{O}_3\text{S}+\text{H}]^+$ 267.0798, found 267.0800.

3) Control experiments on secondary amine 2h (Scheme 3)



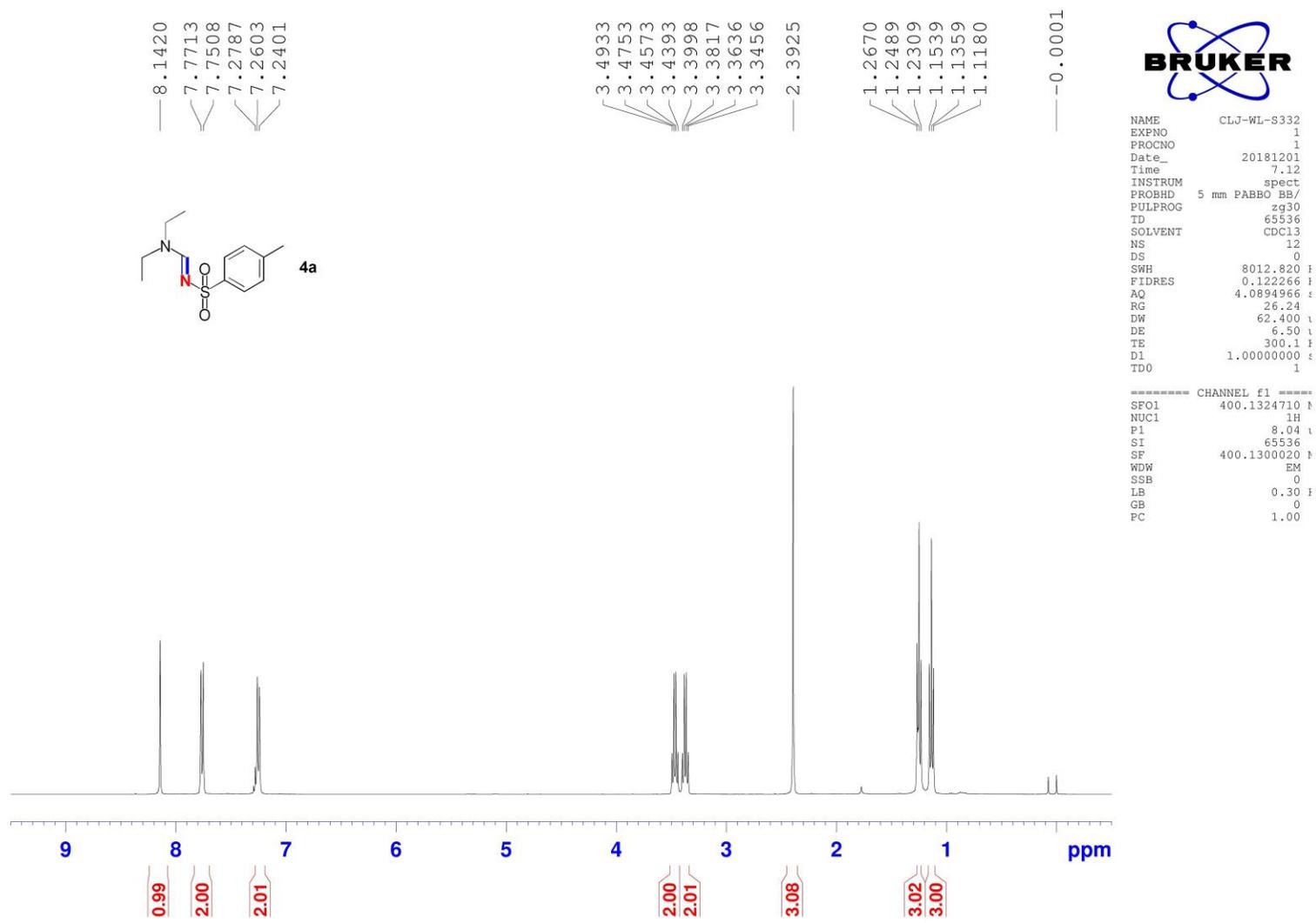
Typical Procedure for Scheme 3a: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under O₂ (1 atm). Then a solution of diethylamine (DEA, **2h**, 36.6 mg) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in O₂ under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent on silical gel to afford 58.2 mg of **4a** (92%) and 84.0 mg of **5a** (98%).

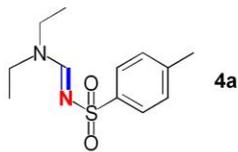
Typical Procedure for Scheme 3b: To a reaction tube charged with Ru(bpy)₃Cl₂ (6.4 mg, 0.01 mmol) was added a solution of tosyl azide (**3a**, 438 μ L of 75% solution in EtOAc, 1.5 mmol) in anhydrous 1,4-dioxane (1 mL) via a syringe under argon (1 atm). Then a solution of diethylamine (DEA, **2h**, 36.6 mg) in anhydrous 1,4-dioxane (1 mL) was added via a syringe upon blue LED (12W) irradiation. The reaction mixture was stirred at 25 °C in argon under blue LED (12W) irradiation for 6 hours, followed by concentration *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (4:1 to 3:1, v/v) as the eluent on silical gel to afford 89.8 mg of **4a** (71%) and 76.6 mg of **5a** (90%).

References

- [1] T. Jiang, Z. Y. Gu, L. Yin, S. Y. Wang and S. J. Ji, *J. Org. Chem.*, 2017, **82**, 7913-7919.
- [2] J. Gui, H. Xie, H. Jiang and W. Zeng, *Org. Lett.*, 2019, **21**, 2804-2807.
- [3] R. Ding, H. Chen, Y.-L. Xu, H.-T. Tang, Y.-Y. Chen and Y.-M. Pan, *Adv. Synth. Catal.*, 2019, **361**, 3656-3660.
- [4] Please visit https://www.tansoole.com/upload/detail/05/YC93_WGLV_05039134.html for purchasing the Titan Scientific Lab PR-6 parallel photoreactor (May 19th, 2021).
- [5] E. Hayashi, Y. Yamaguchi, Y. Kita and M. Hara, *Chem. Commun.*, 2020, **56**, 2095-2098.

¹H and ¹³C NMR spectra of 4a-q and 5a-c





— 157.999
 — 142.172
 — 139.742
 — 129.190
 — 126.274

77.318
 77.000
 76.682

— 46.962
 — 40.834

— 21.364
 — 14.412
 — 11.994

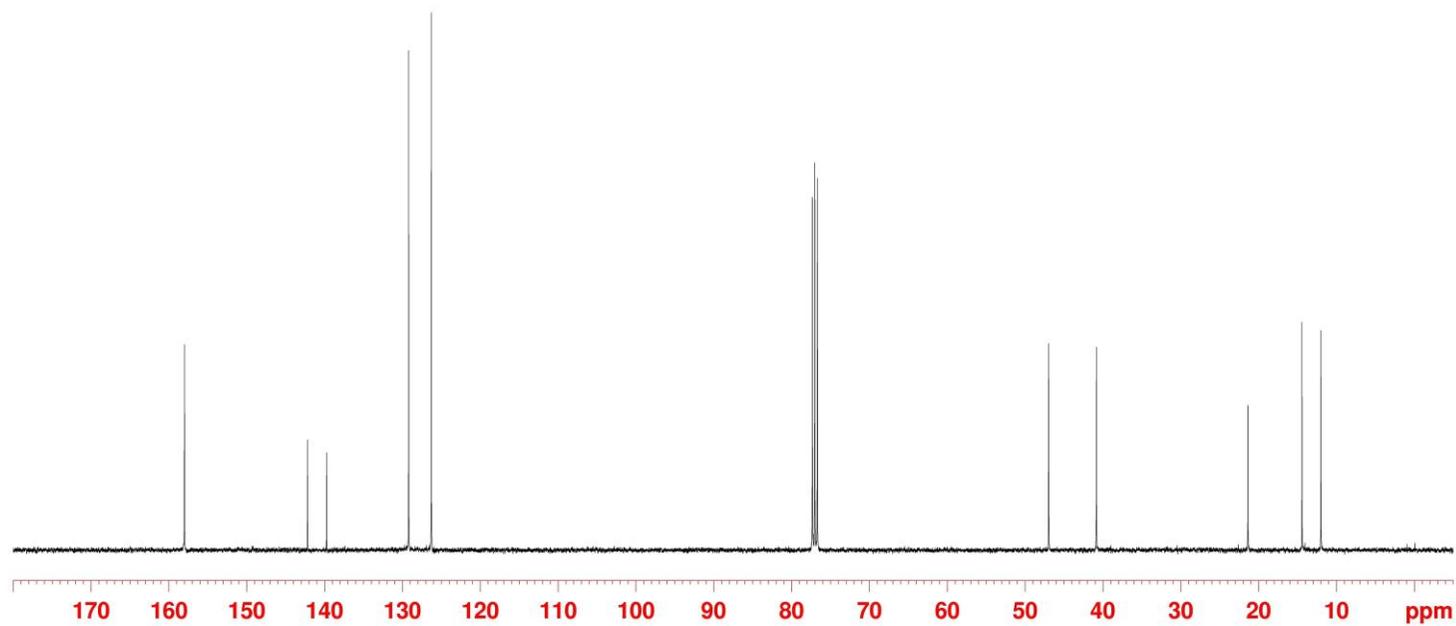


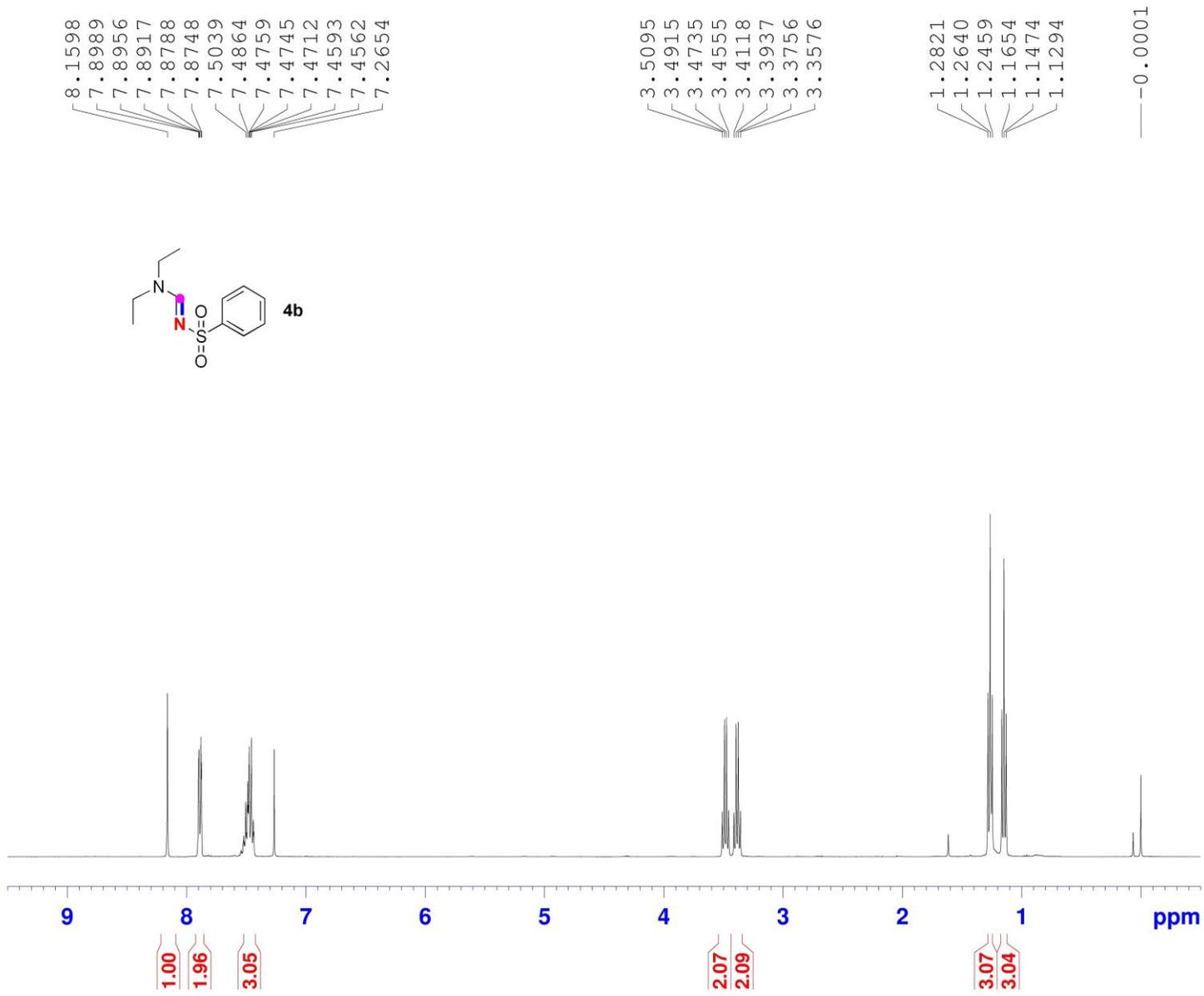
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NAME      CLJ-WL-S332
EXPNO     2
PROCNO    1
Date_     20181201
Time      7.43
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.2 K
D1         2.00000000 sec
D11        0.03000000 sec
TDO       1
  
```

```

===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127768 MHz
WDW        EM
SSB         0
LB         1.00 Hz
GB         0
PC         1.40
  
```





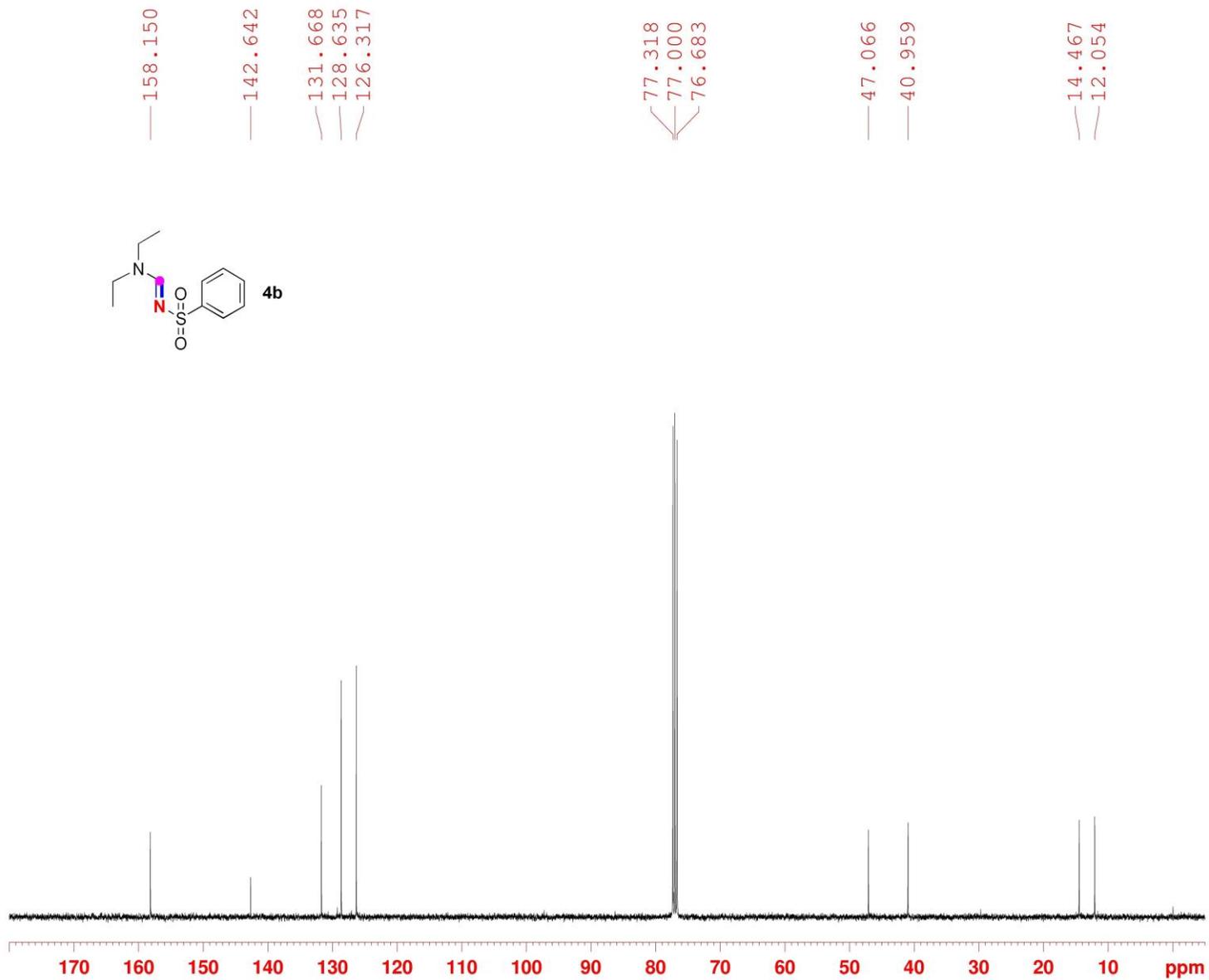
BRUKER

```

NAME          CLJ-WL-S366
EXPNO         2
PROCNO        1
Date_         20190106
Time_         7.14
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 s
RG            77.71
DW            62.400 us
DE            6.50 us
TE            300.1 K
D1            1.00000000 s
TD0           1

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1          1H
P1            8.04 us
SI            65536
SF            400.1300075 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00

```

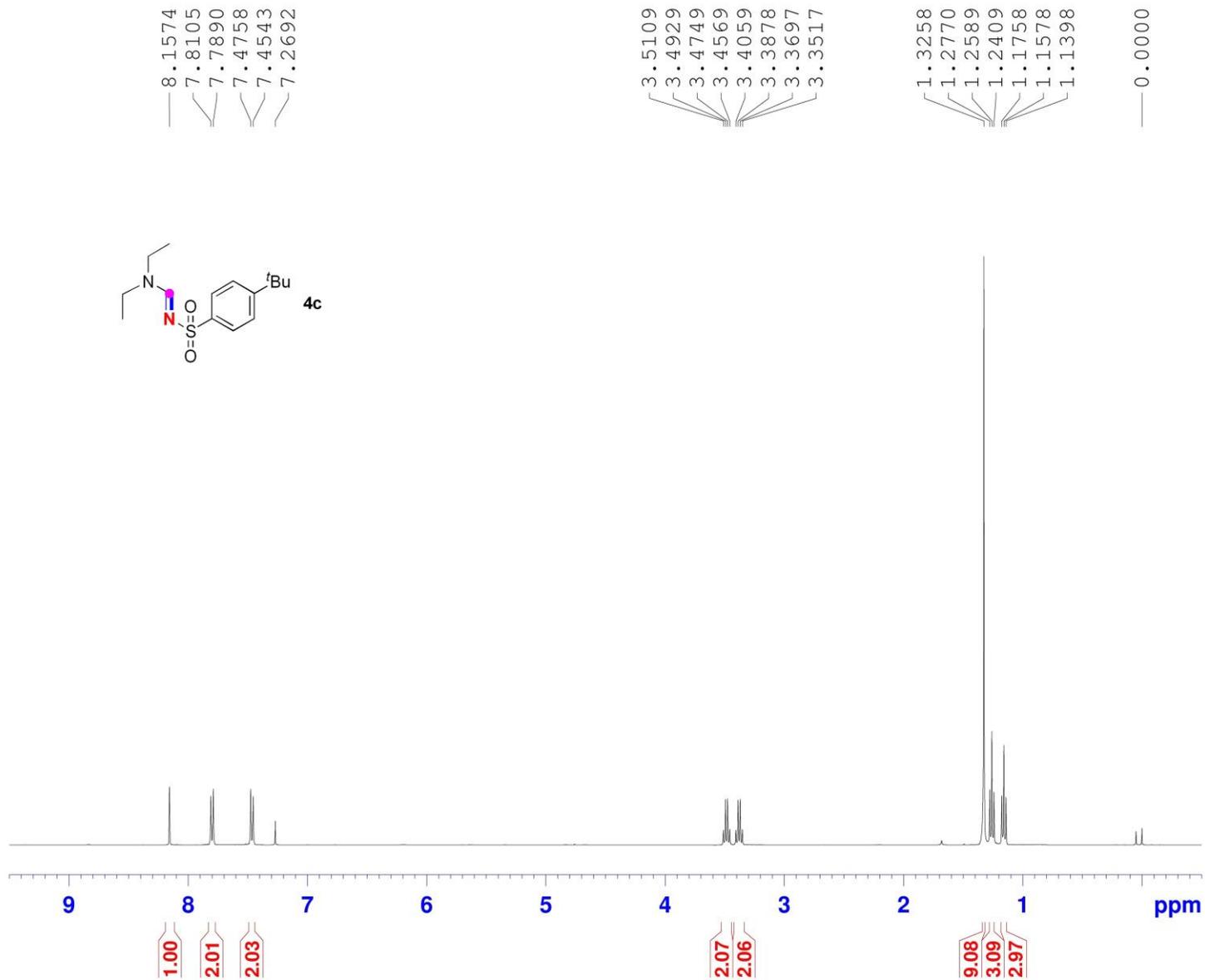
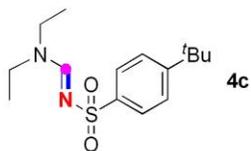


```

NAME          CLJ-WL-S366
EXPNO         1
PROCNO        1
Date_         20190106
Time          7.12
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            512
DS            0
SWH           24038.461 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            194.26
DW            20.800 usec
DE            6.50 usec
TE            300.1 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1
  
```

```

===== CHANNEL f1 =====
SF01          100.6228293 MHz
NUC1          13C
P1            8.54 usec
SI            32768
SF            100.6127718 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

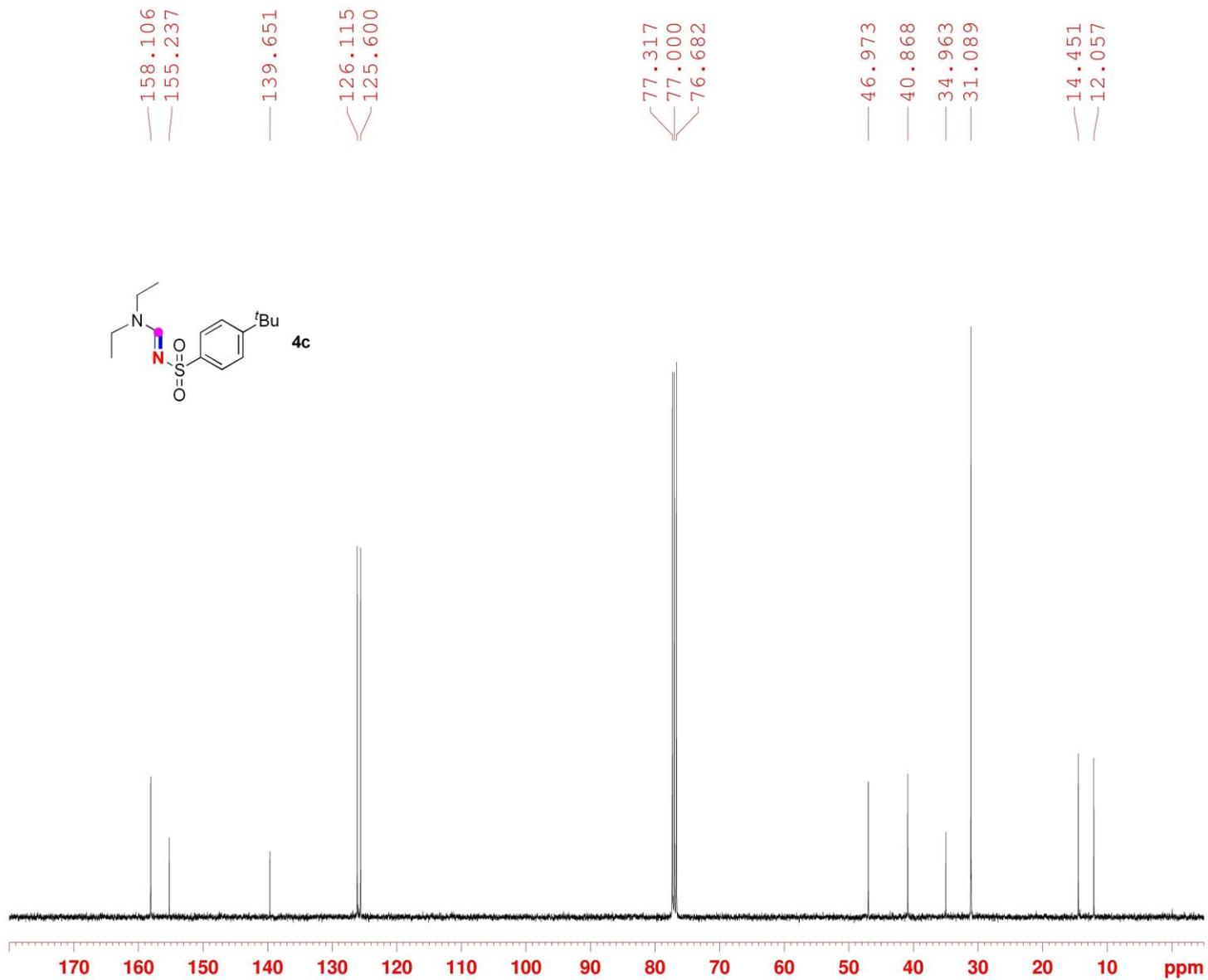
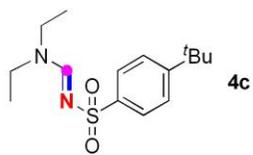


```

NAME          CLJ-WL-S373
EXPNO         1
PROCNO        1
Date_         20190111
Time_         20.45
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 s
RG            51.19
DW            62.400 us
DE            6.50 us
TE            300.1 K
D1            1.00000000 s
TD0           1

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1           1H
P1            8.04 us
SI            65536
SF            400.1300058 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00

```

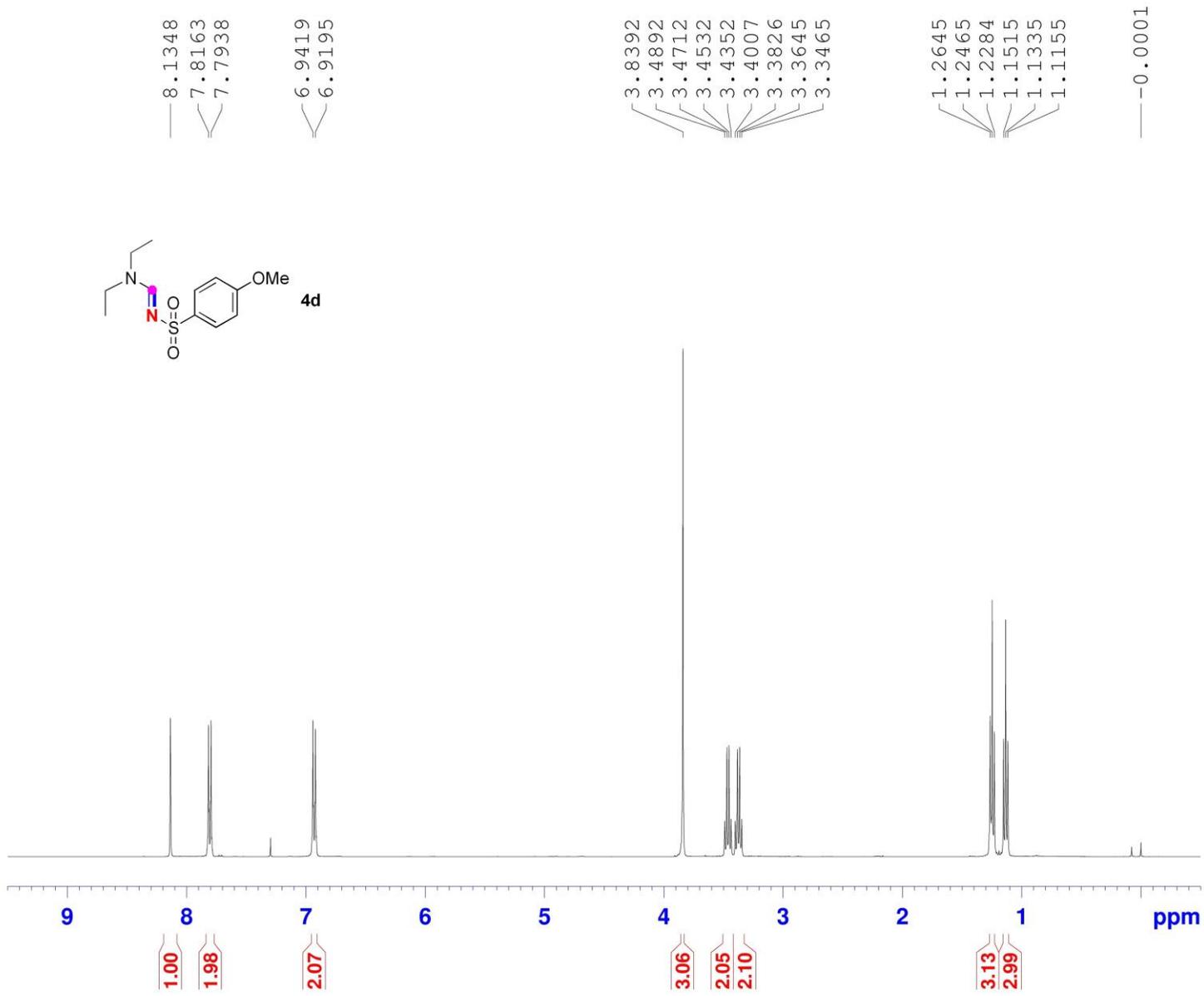


```

NAME      CLJ-WL-S373
EXPNO     2
PROCNO    1
Date_     20190111
Time      21.15
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.2 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

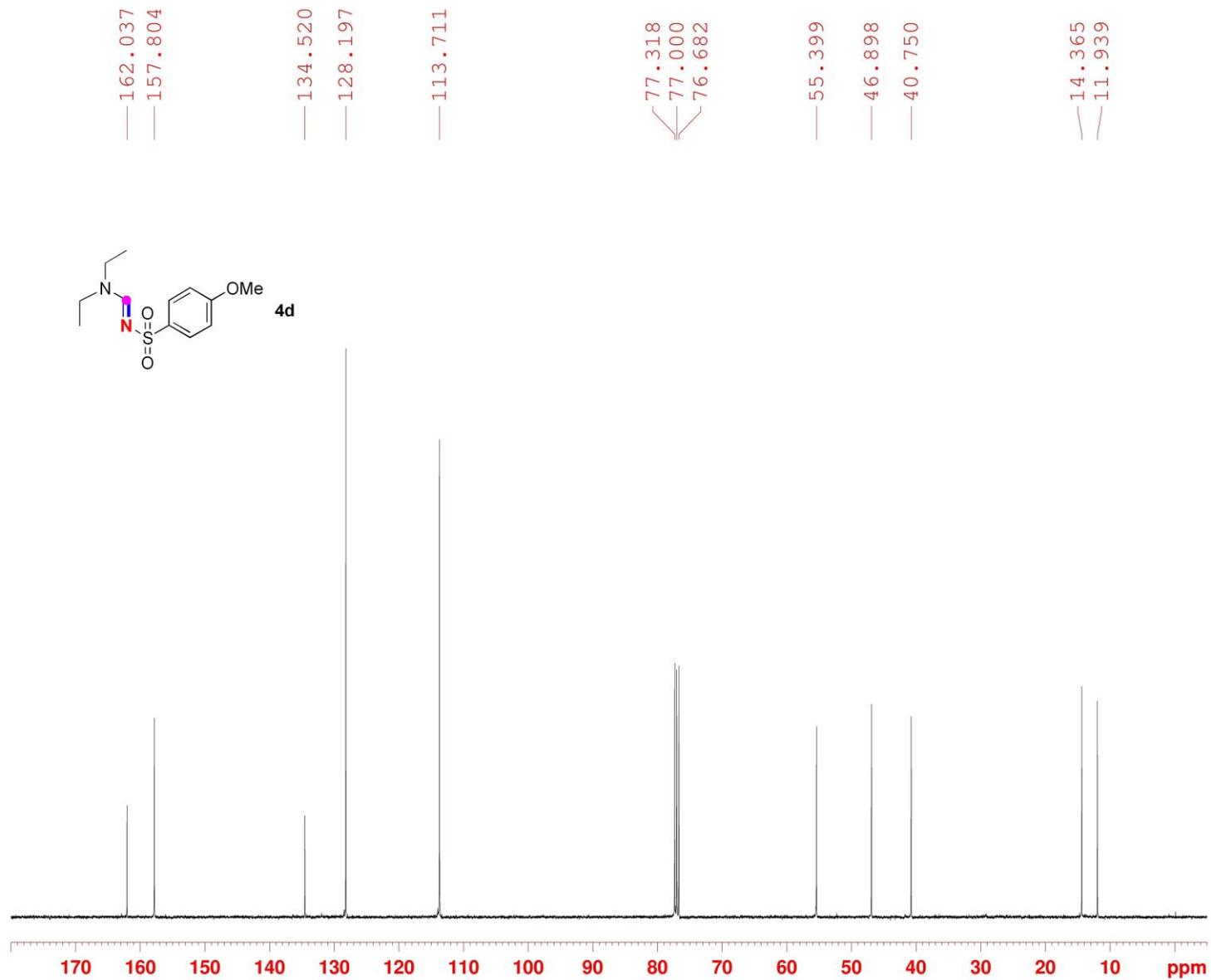
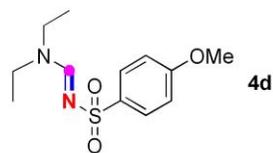
===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127729 MHz
WDW        EM
SSB         0
LB         1.00 Hz
GB         0
PC         1.40
  
```



```

NAME          CLJ-WL-S375
EXPNO         2
PROCNO        1
Date_         20190113
Time_         9.27
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 F
FIDRES        0.122266 F
AQ            4.0894966 s
RG            21.11
DW            62.400 s
DE            6.50 s
TE            300.1 F
D1            1.00000000 s
TD0           1
===== CHANNEL f1 =====
SF01          400.1324710 M
NUC1           1H
P1             8.04 s
SI            65536
SF            400.1299947 M
WDW           EM
SSB           0
LB            0.30 F
GB            0
PC            1.00

```

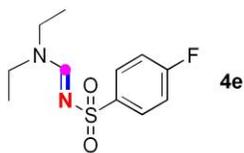


```

NAME      CLJ-WL-S375
EXPNO     1
PROCNO    1
Date_     20190113
Time      9.25
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.1 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127808 MHz
WDW        EM
SSB         0
LB         1.00 Hz
GB         0
PC         1.40
  
```



8.1521
7.8974
7.8845
7.8754
7.8625
7.1599
7.1493
7.1384
7.1278
7.1062

3.5038
3.4858
3.4678
3.4498
3.4276
3.4096
3.3915
3.3734

1.2848
1.2667
1.2487
1.1625
1.1445
1.1265

0.0000

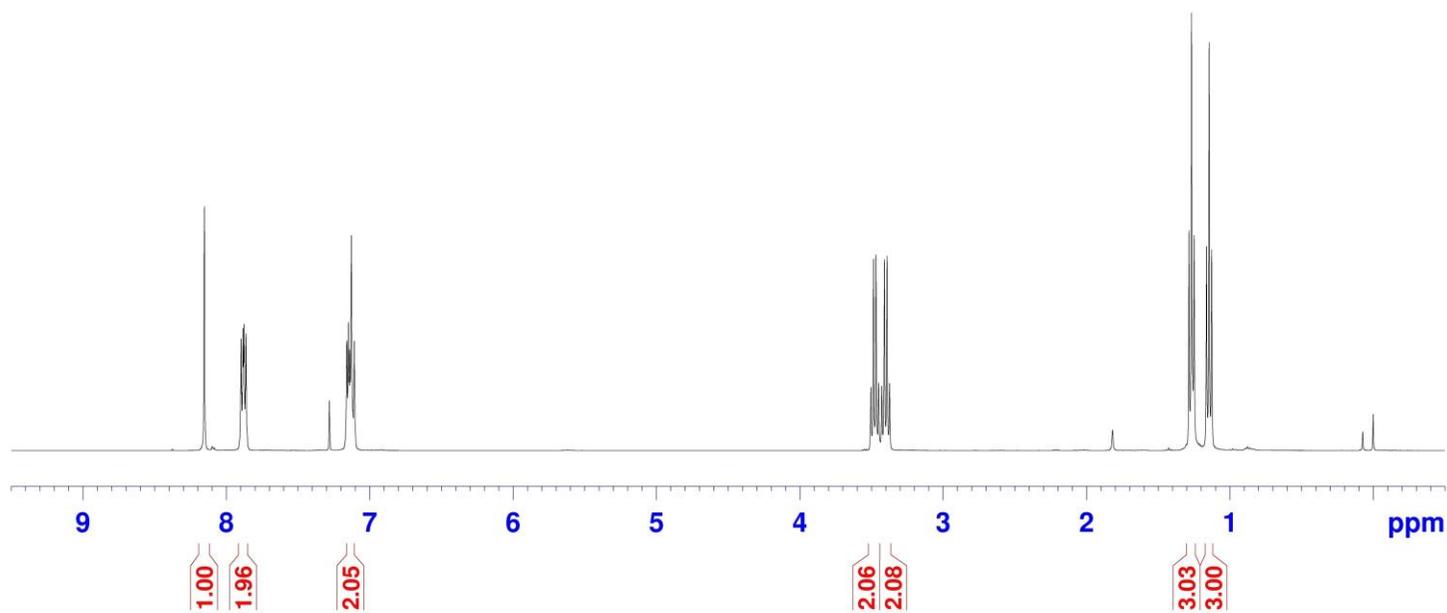


```

NAME          CLJ-WL-S374
EXPNO         1
PROCNO        1
Date_         20190111
Time_         21.20
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 s
RG            41.07
DW            62.400 us
DE            6.50 us
TE            300.2 K
D1            1.00000000 s
TD0           1
  
```

```

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1           1H
P1             8.04 us
SI            65536
SF            400.1300013 MHz
WDW            EM
SSB            0
LB             0.30 MHz
GB            0
PC            1.00
  
```





165.723
163.209
158.059

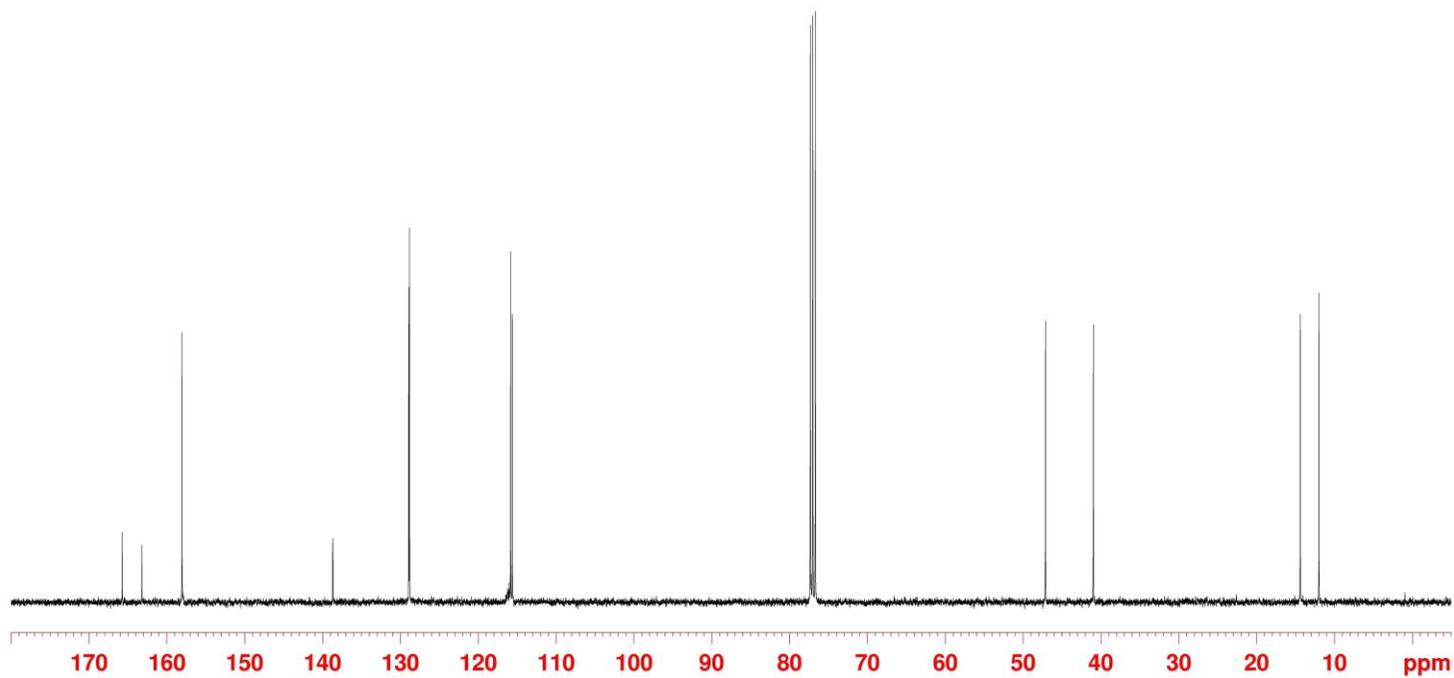
138.695
138.664
128.918
128.828

115.843
115.621

77.317
77.000
76.682

47.116
40.967

14.375
11.979

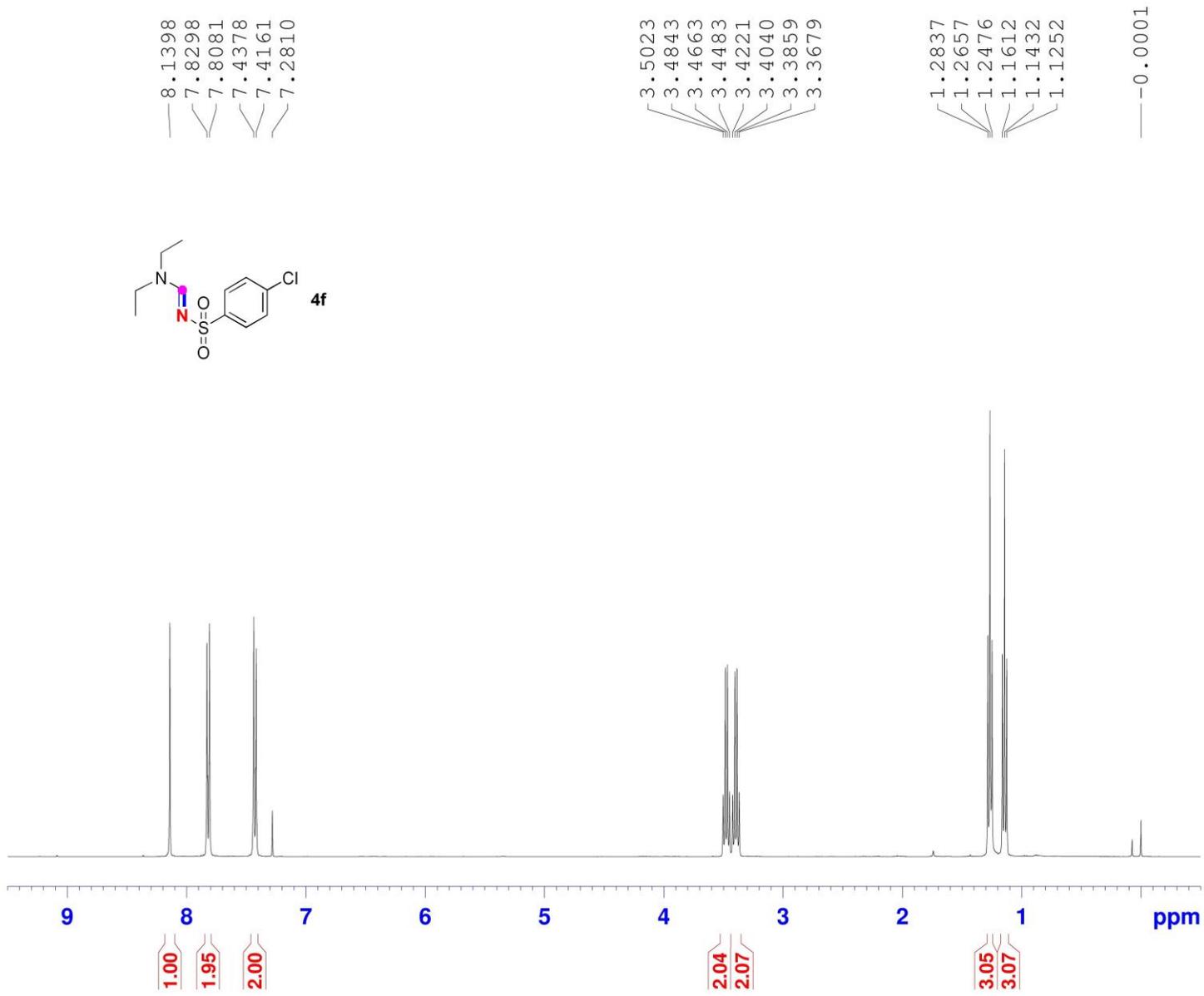


```

NAME      CLJ-WL-S374
EXPNO     2
PROCNO    1
Date_     20190111
Time      21.50
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH       24038.461 Hz
FIDRES    0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.1 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127759 MHz
WDW        EM
SSB         0
LB         1.00 Hz
GB         0
PC         1.40
  
```

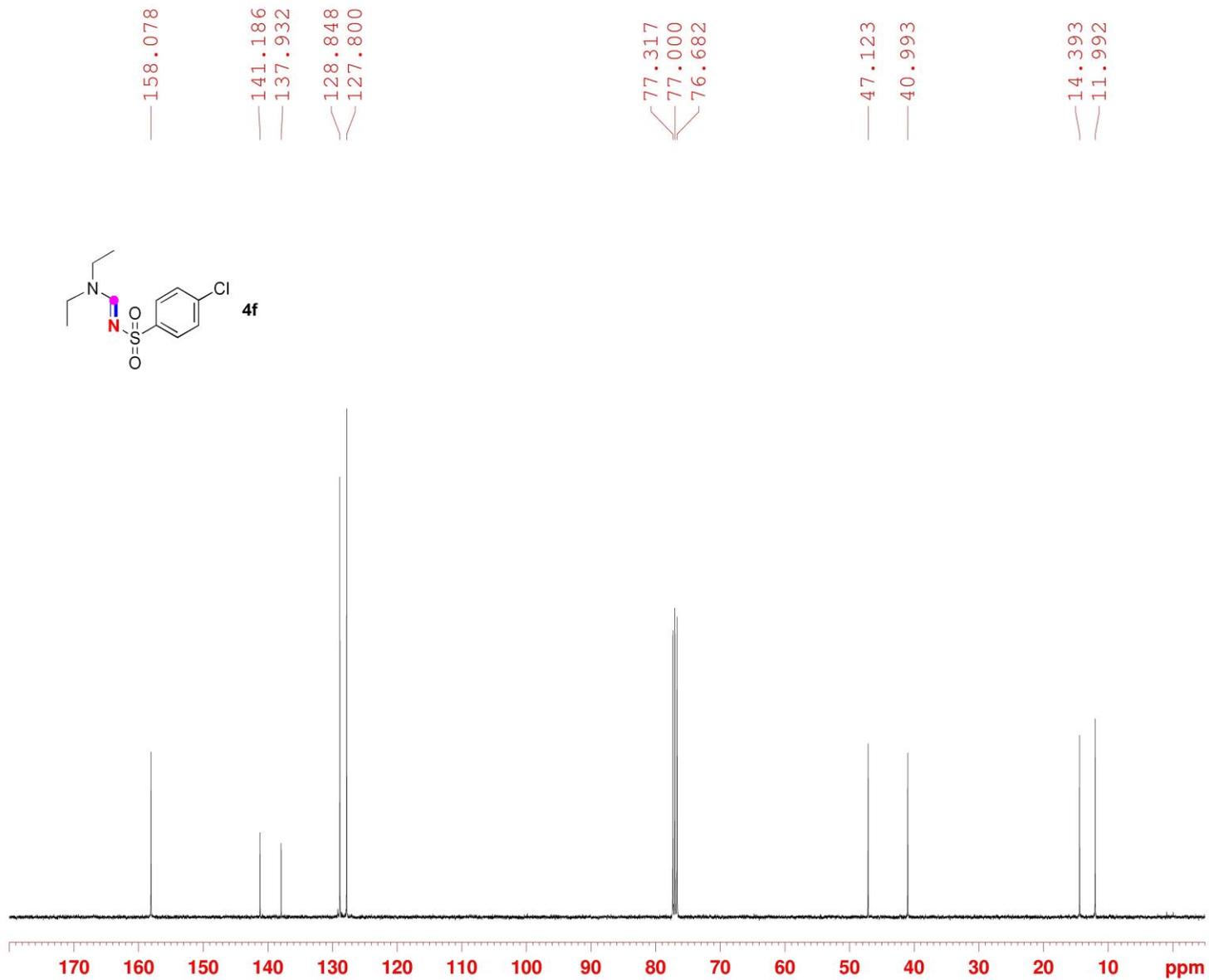


```

NAME          CLJ-WL-S376
EXPNO         2
PROCNO        1
Date_         20190113
Time_         10.27
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 sec
RG            47.53
DW            62.400 usec
DE            6.50 usec
TE            300.1 K
D1            1.00000000 sec
TD0           1
  
```

```

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1          1H
P1            8.04 usec
SI            65536
SF            400.1300011 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
  
```

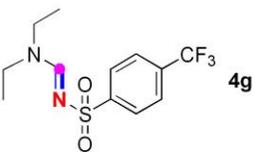


```

NAME      CLJ-WL-S376
EXPNO     1
PROCNO    1
Date_     20190113
Time      10.00
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.2 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127760 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```



8.1641
8.0248
8.0042
7.7370
7.7162
7.2728

3.5200
3.5020
3.4840
3.4660
3.4394
3.4213
3.4032
3.3852

1.2992
1.2811
1.2630
1.1747
1.1567
1.1387

— -0.0001

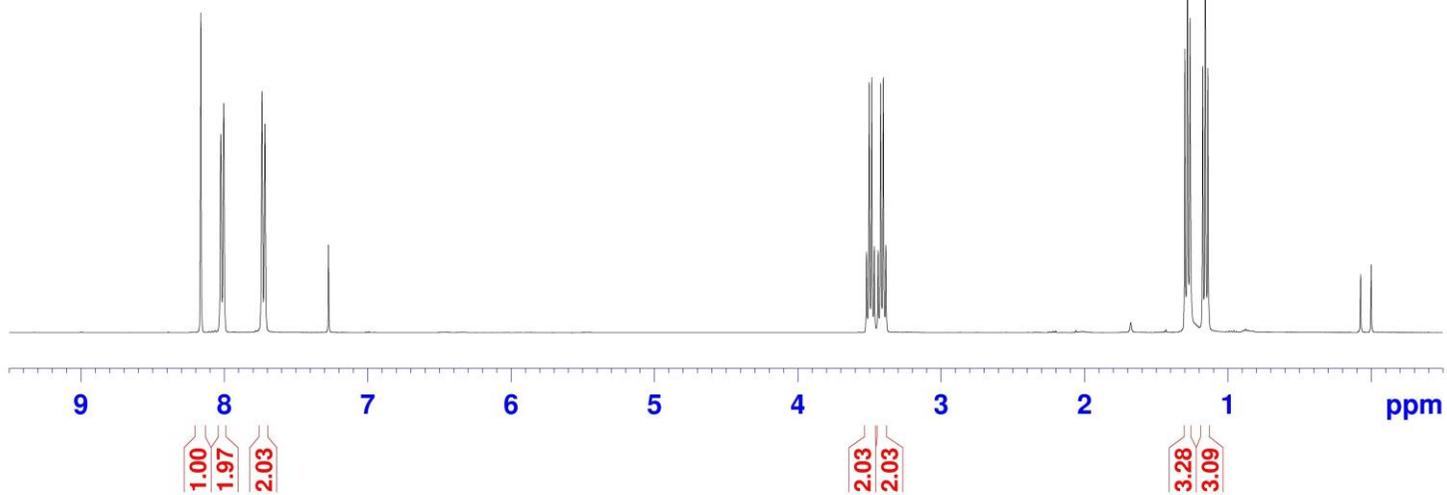


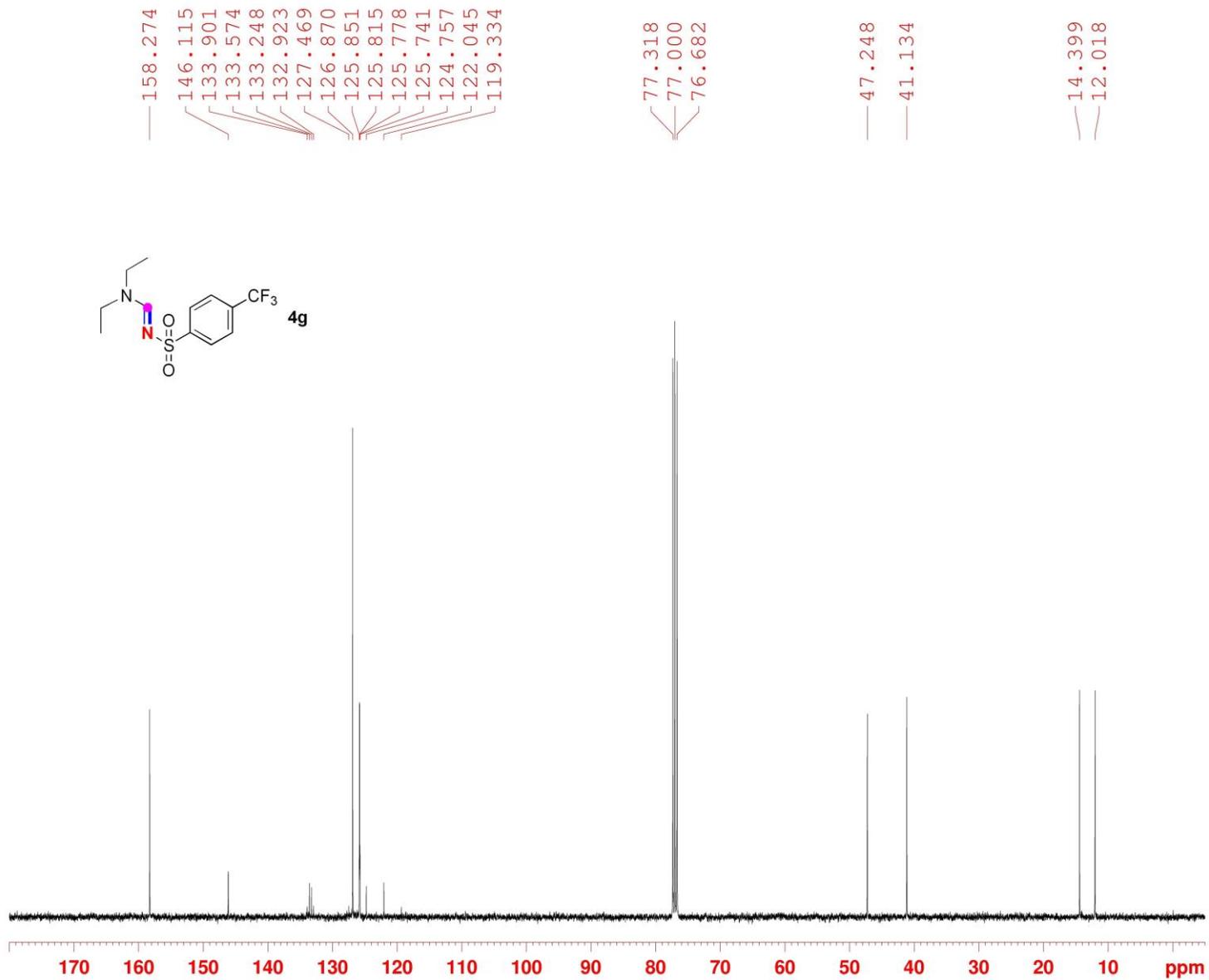
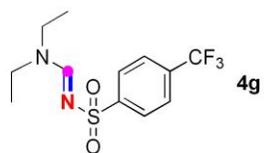
```

NAME          CLJ-WL-S377
EXPNO         2
PROCNO        1
Date_         20190113
Time_         12.42
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 sec
RG            57.79
DW            62.400 usec
DE            6.50 usec
TE            300.1 K
D1            1.00000000 sec
TD0           1
  
```

```

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1           1H
P1             8.04 usec
SI            65536
SF            400.1300042 MHz
WDW            EM
SSB            0
LB             0.30 Hz
GB             0
PC             1.00
  
```



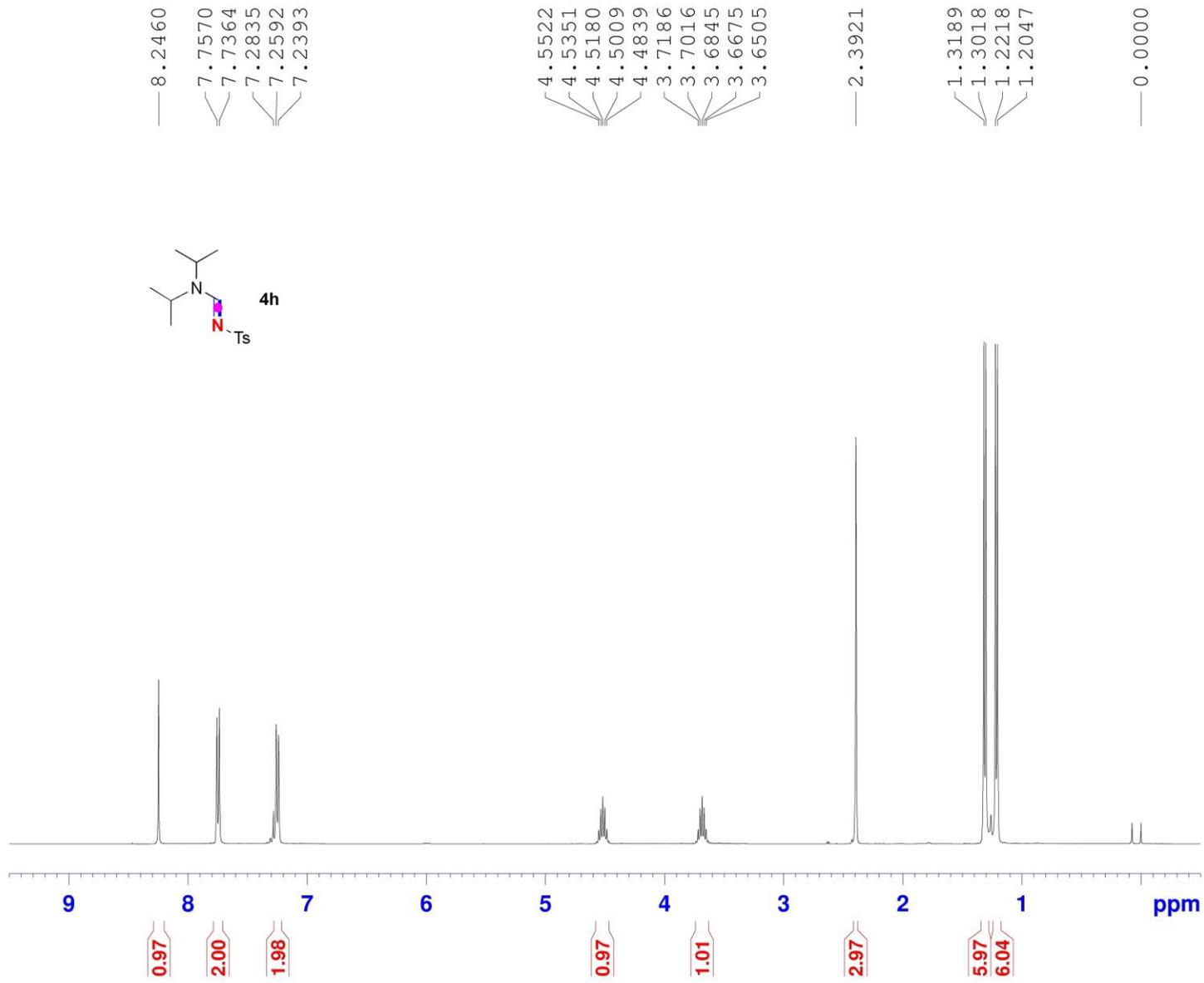


```

NAME          CLJ-WL-S377
EXPNO         1
PROCNO        1
Date_         20190113
Time          11.21
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zgpg30
TD            65536
SOLVENT       CDCl3
NS            512
DS            0
SWH           24038.461 Hz
FIDRES        0.366798 Hz
AQ            1.3631988 sec
RG            194.26
DW            20.800 usec
DE            6.50 usec
TE            300.2 K
D1            2.00000000 sec
D11           0.03000000 sec
TD0           1
  
```

```

===== CHANNEL f1 =====
SFO1          100.6228293 MHz
NUC1          13C
P1            8.54 usec
SI            32768
SF            100.6127724 MHz
WDW           EM
SSB           0
LB            1.00 Hz
GB            0
PC            1.40
  
```

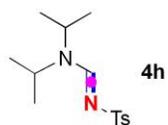


```

NAME          CLJ-WL-S368
EXPNO         1
PROCNO        1
Date_         20190109
Time          8.10
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 MHz
FIDRES        0.122266 MHz
AQ            4.0894966 sec
RG            21.11
DW            62.400 usec
DE            6.50 usec
TE            300.2 K
D1            1.00000000 sec
TD0           1
  
```

```

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1          1H
P1            8.04 usec
SI            65536
SF            400.1299999 MHz
WDW           EM
SSB           0
LB            0.30 MHz
GB            0
PC            1.00
  
```



156.260

142.011
139.911

129.156
126.165

77.319
77.001
76.682

48.464
47.831

23.485
21.341
19.510

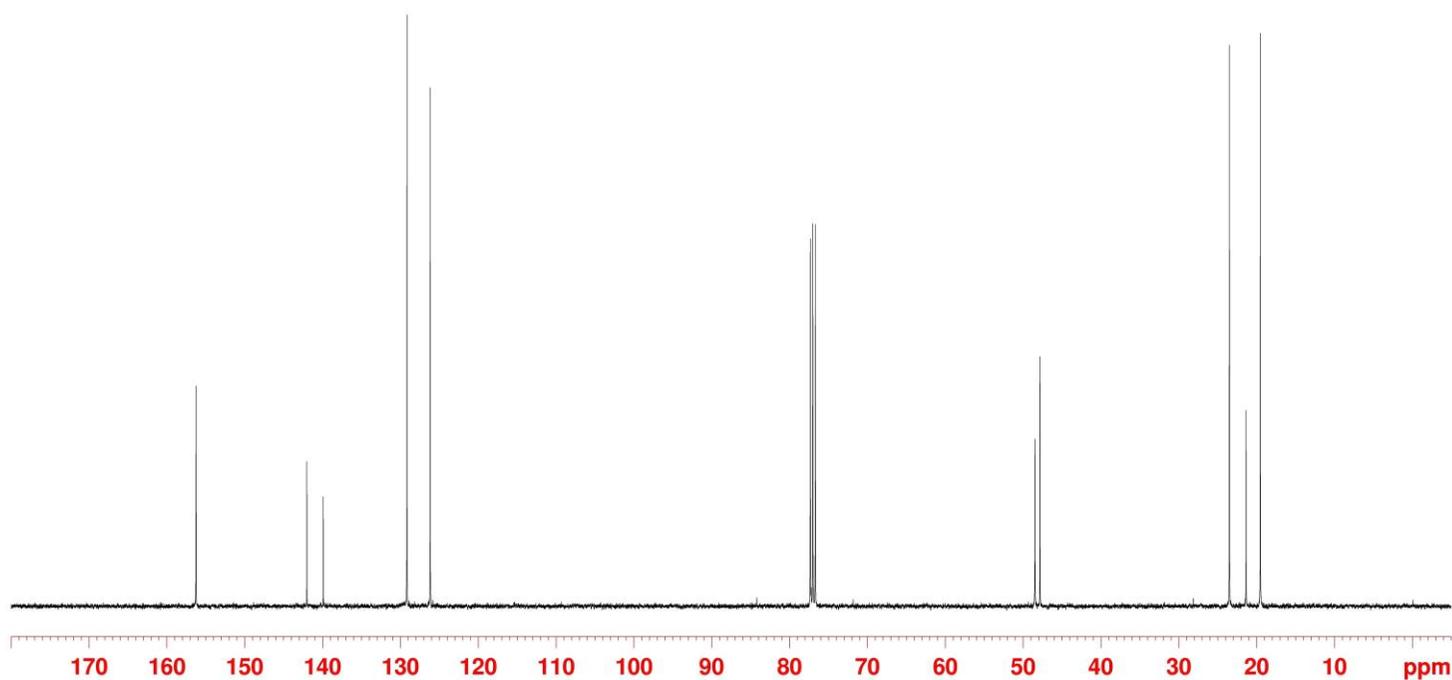


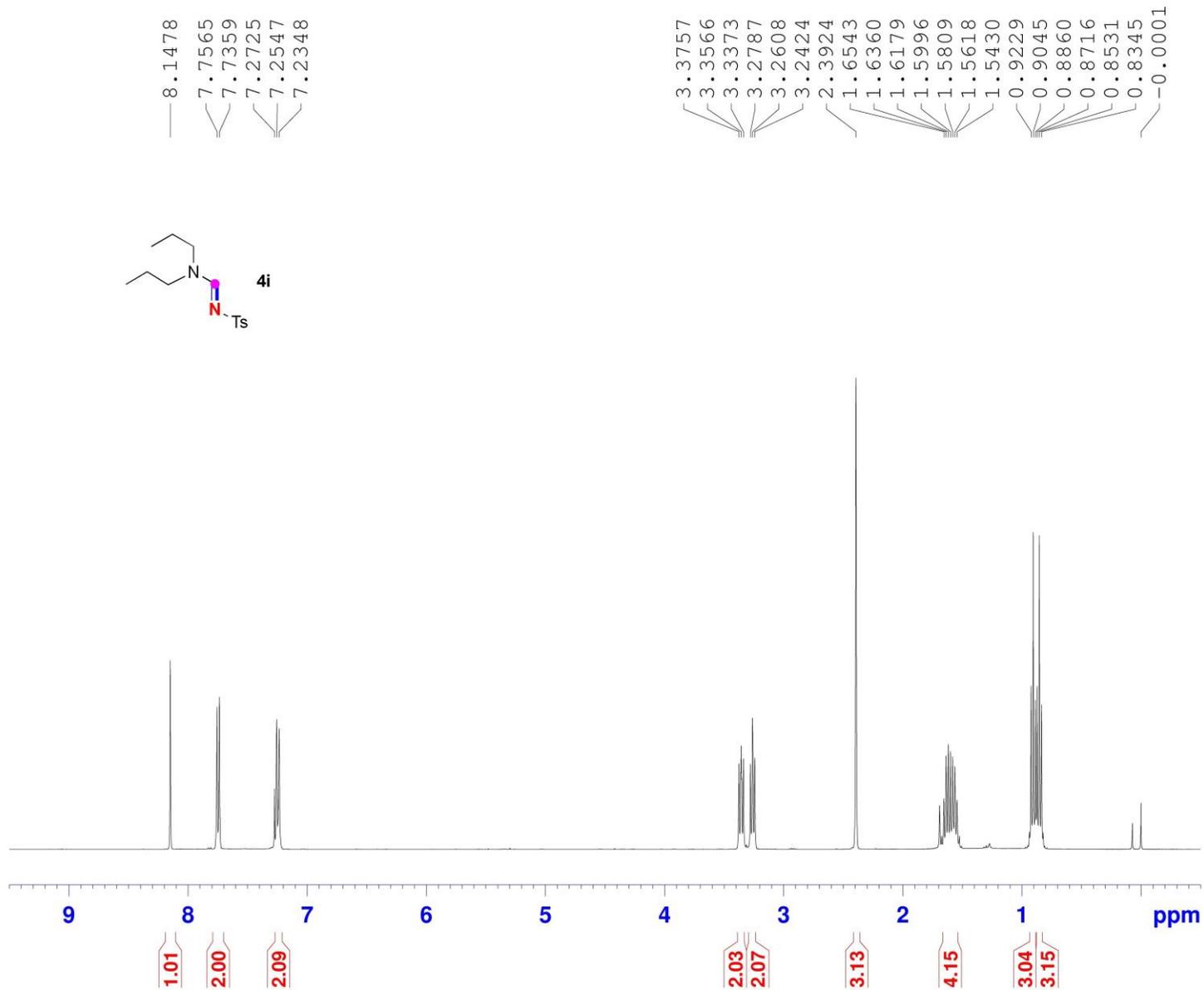
```

NAME      CLJ-WL-S368
EXPNO     2
PROCNO    1
Date_     20190109
Time      8.40
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.1 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1      13C
P1         8.54 usec
SI         32768
SF         100.6127780 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```



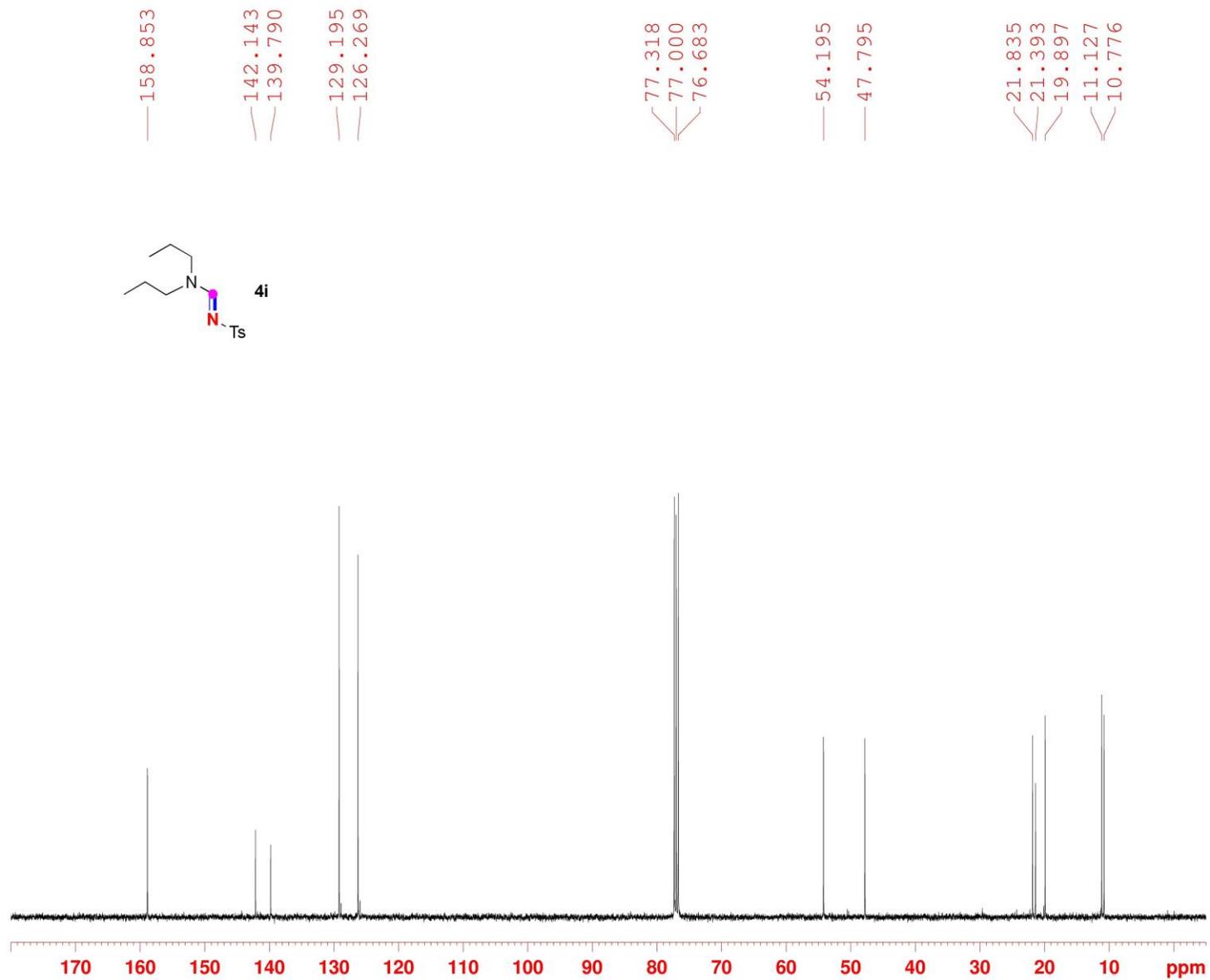


```

NAME          CLJ-WL-S353
EXPNO         1
PROCNO        1
Date_         20181225
Time_         8.54
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 F
FIDRES        0.122266 F
AQ            4.0894966 s
RG            47.53
DW            62.400 s
DE            6.50 s
TE            300.1 F
D1            1.00000000 s
TD0           1
  
```

```

===== CHANNEL f1 =====
SF01          400.1324710 M
NUC1          1H
P1            8.04 s
SI            65536
SF            400.1300045 M
WDW           EM
SSB           0
LB            0.30 F
GB            0
PC            1.00
  
```



```

NAME      CLJ-WL-S353
EXPNO     2
PROCNO    1
Date_     20181225
Time      9.13
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         307
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.2 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

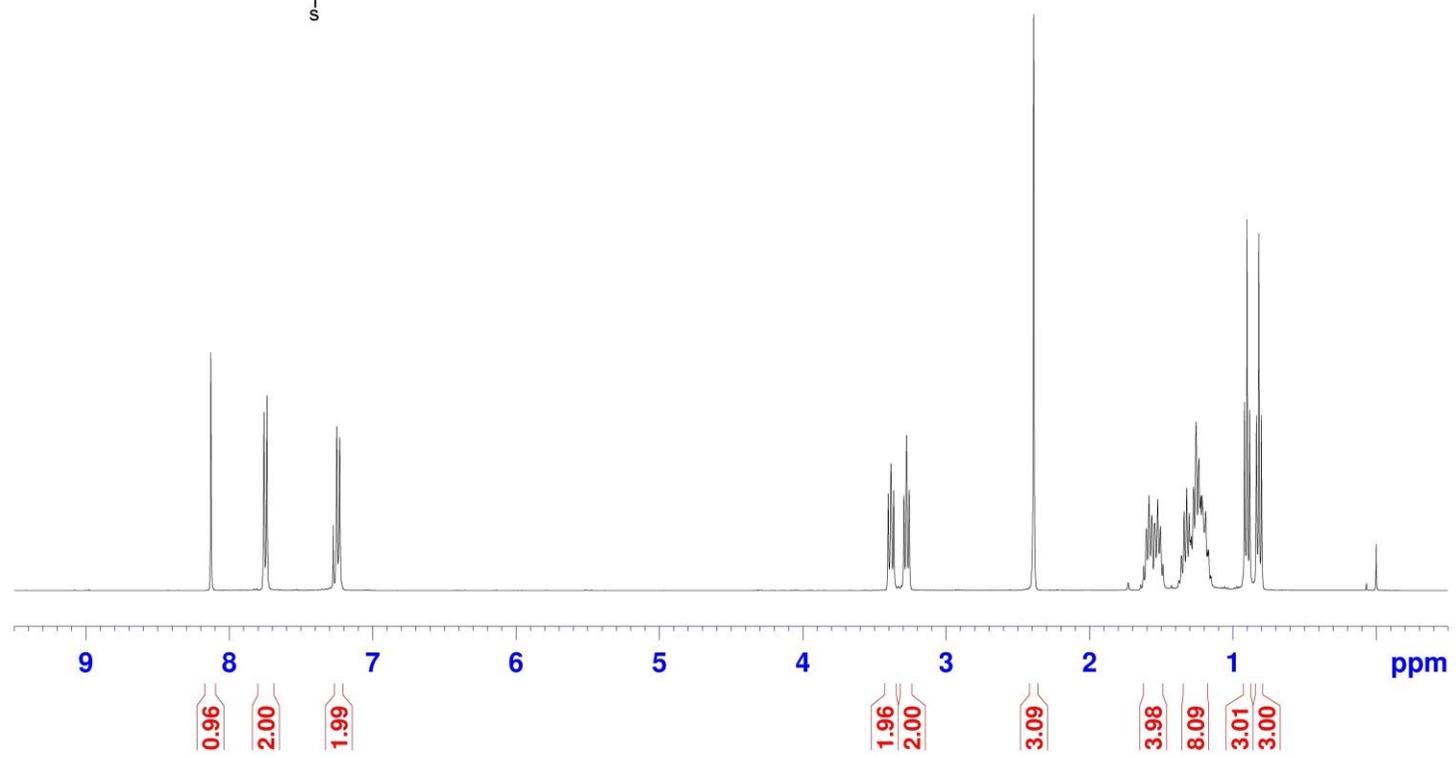
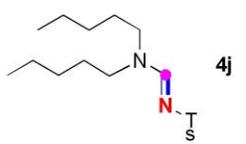
===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127742 MHz
WDW        EM
SSB         0
LB         1.00 Hz
GB         0
PC         1.40
  
```

8.1274
7.7572
7.7366
7.2750
7.2504
7.2305
5.2971
3.4036
3.3847
3.3656
3.2942
3.2760
3.2576
2.3888
1.7091
1.6216
1.6028
1.5844
1.5651
1.5463
1.5433
1.5239
1.5051
1.4864
1.3598
1.3567
1.3395
1.3219
1.3046
1.2960
1.2893
1.2744
1.2571
1.2364
1.2240
1.2147
1.2079
1.1894
1.1774
1.1688
1.1553
1.1506
0.9182
0.9005
0.8823
0.8358
0.8183
0.8002
0.0730
-0.0001



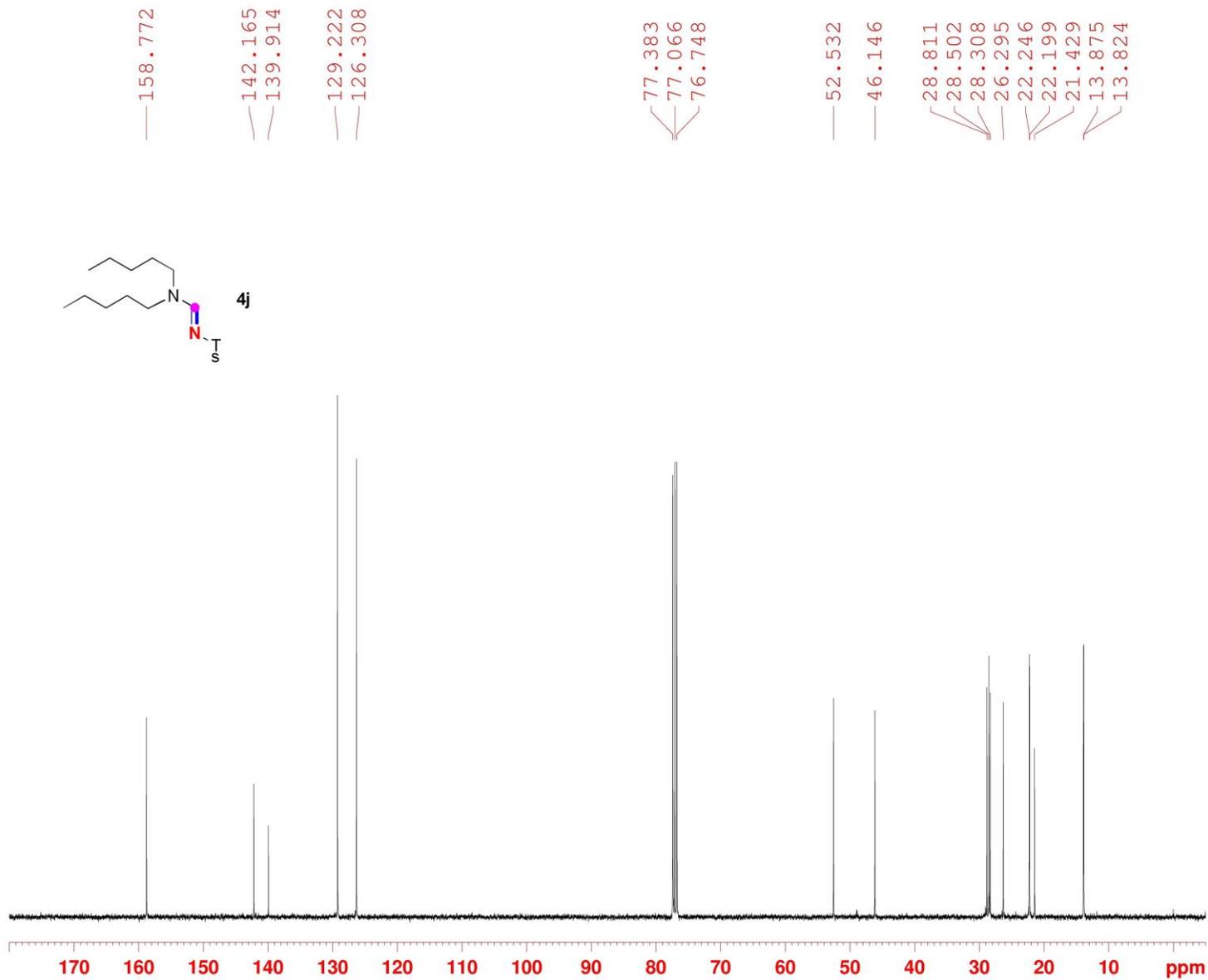
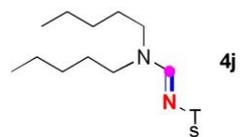
```

NAME          CLJ-WL-S367
EXPNO         1
PROCNO        1
Date_         20190109
Time          7.35
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 P
FIDRES        0.122266 P
AQ            4.0894966 s
RG            23.9
DW            62.400 u
DE            6.50 u
TE            300.1 P
D1            1.00000000 s
TDO           1
  
```



```

===== CHANNEL f1 =====
SF01         400.1324710 M
NUC1          1H
P1            8.04 u
SI           65536
SF           400.1300036 M
WDW           EM
SSB           0
LB            0.30 P
GB            0
PC            1.00
  
```

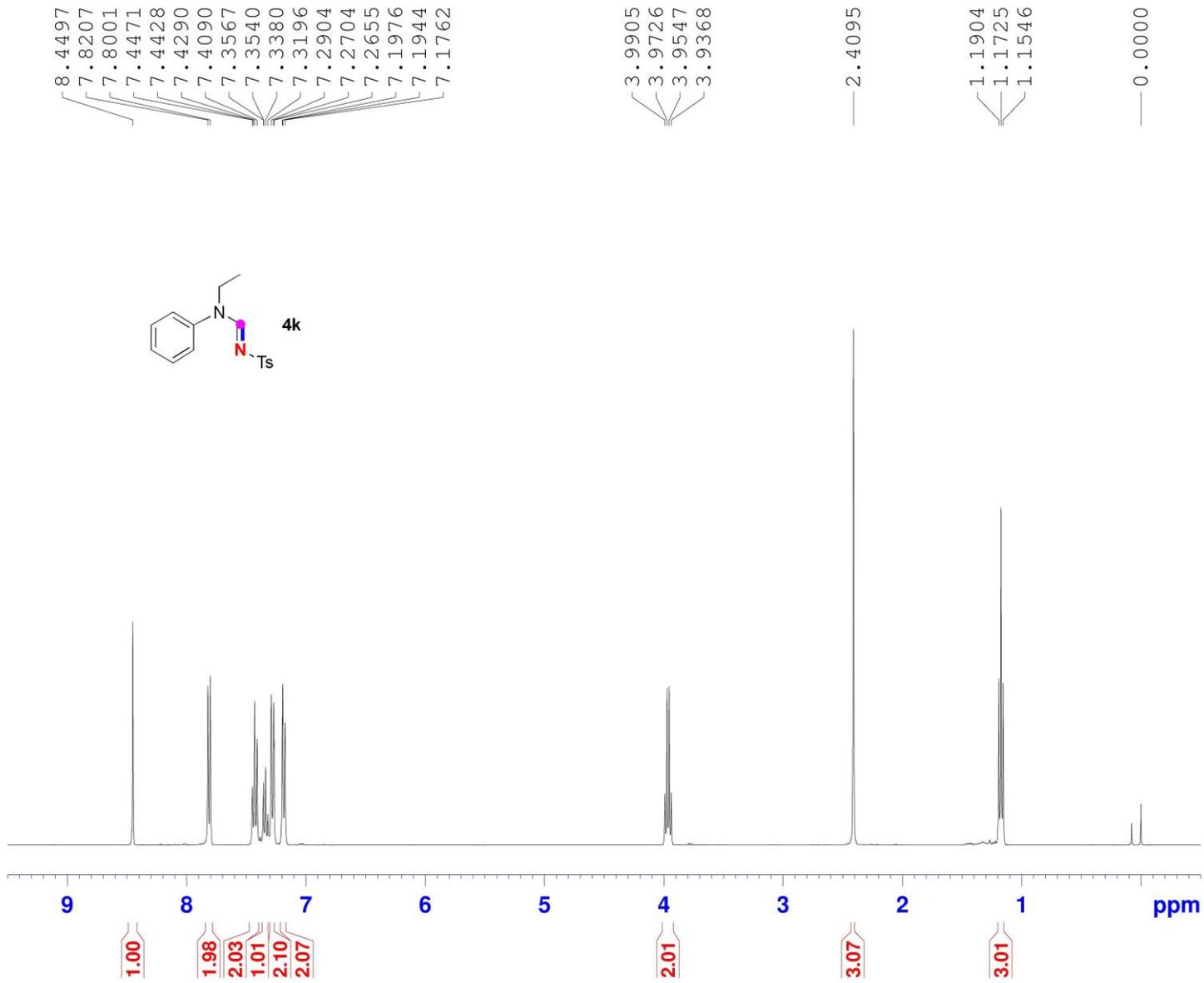


```

NAME          CLJ-WL-S367
EXPNO         2
PROCNO       1
Date_        20190109
Time         8.05
INSTRUM      spect
PROBHD       5 mm PABBO BB/
PULPROG      zgpg30
TD           65536
SOLVENT      CDCl3
NS           512
DS           0
SWH          24038.461 Hz
FIDRES      0.366798 Hz
AQ          1.3631988 sec
RG          194.26
DW          20.800 usec
DE           6.50 usec
TE           300.1 K
D1           2.00000000 sec
D11          0.03000000 sec
TD0          1
  
```

```

===== CHANNEL f1 =====
SFO1          100.6228293 MHz
NUC1          13C
P1            8.54 usec
SI           32768
SF           100.6127685 MHz
WDW           EM
SSB           0
LB           1.00 Hz
GB           0
PC           1.40
  
```



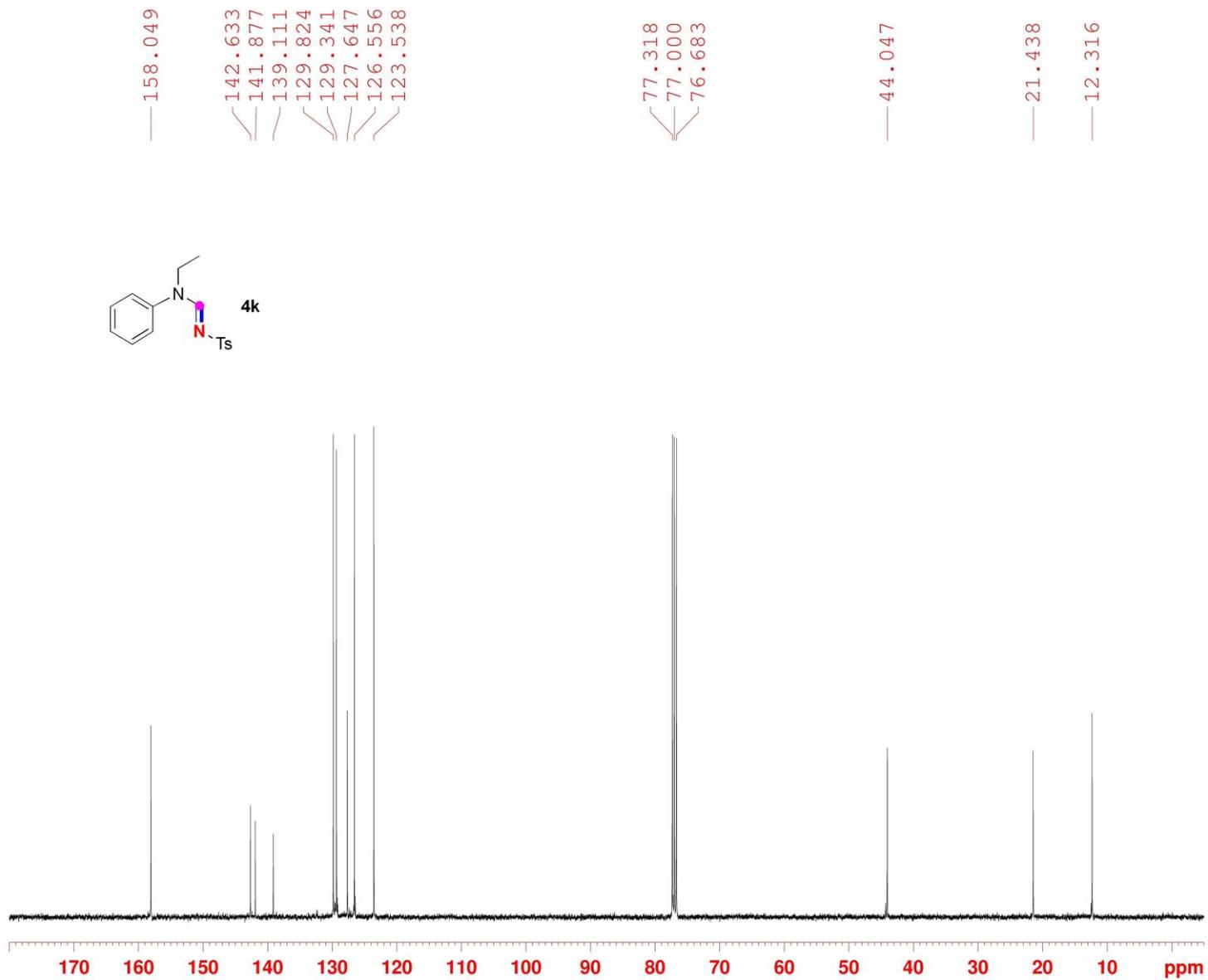
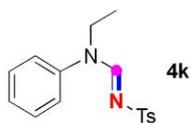
BRUKER

```

NAME          CLJ-WL-S384
EXPNO         1
PROCNO        1
Date_         20190118
Time_         7.30
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 sec
RG            47.53
DW            62.400 usec
DE            6.50 usec
TE            300.2 K
D1            1.00000000 sec
TD0           1

===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1          1H
P1            8.04 usec
SI            65536
SF            400.1300073 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00

```

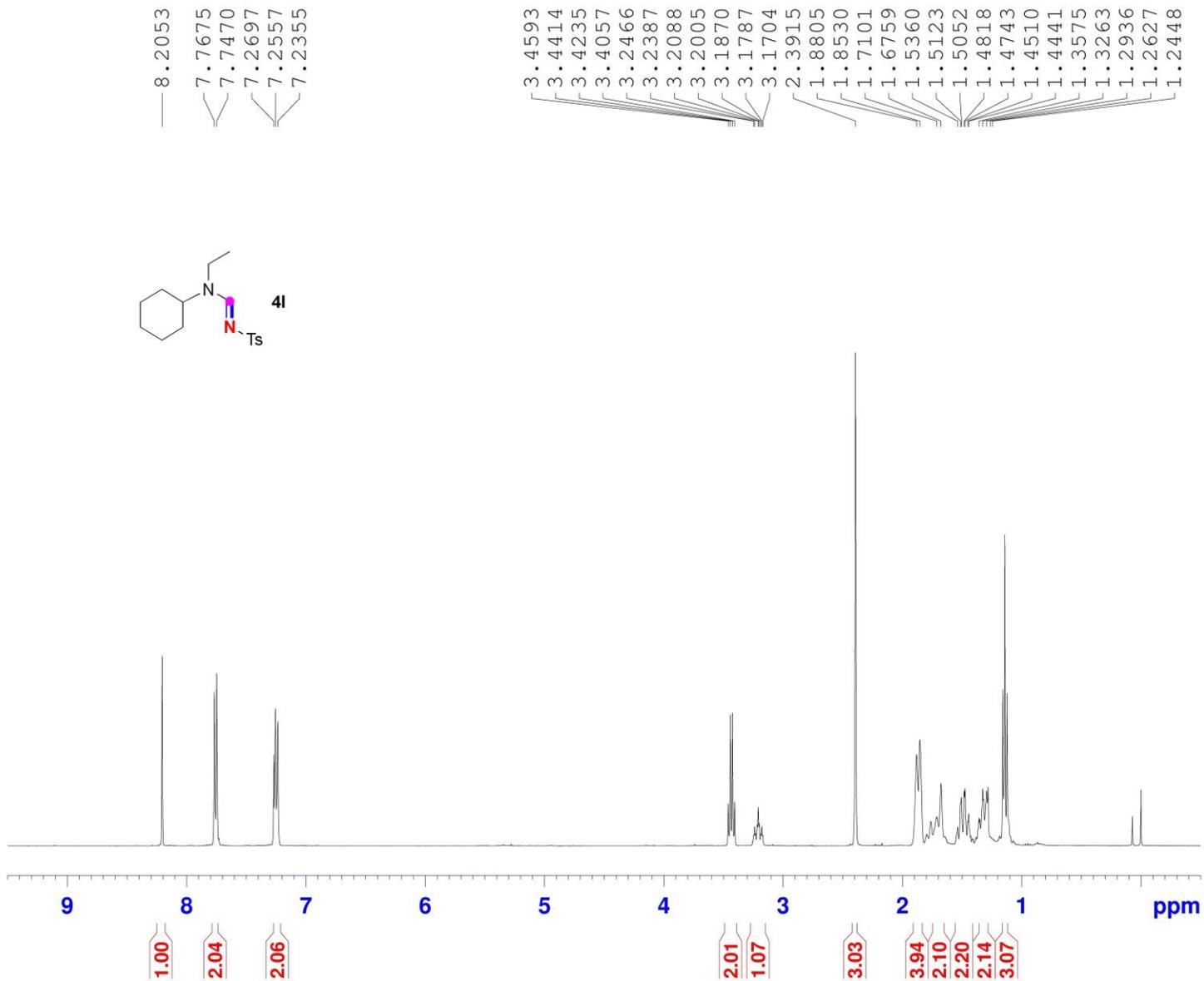
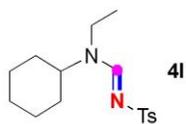


```

NAME      CLJ-WL-S384
EXPNO     2
PROCNO    1
Date_     20190118
Time      8.01
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH       24038.461 Hz
FIDRES    0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.2 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

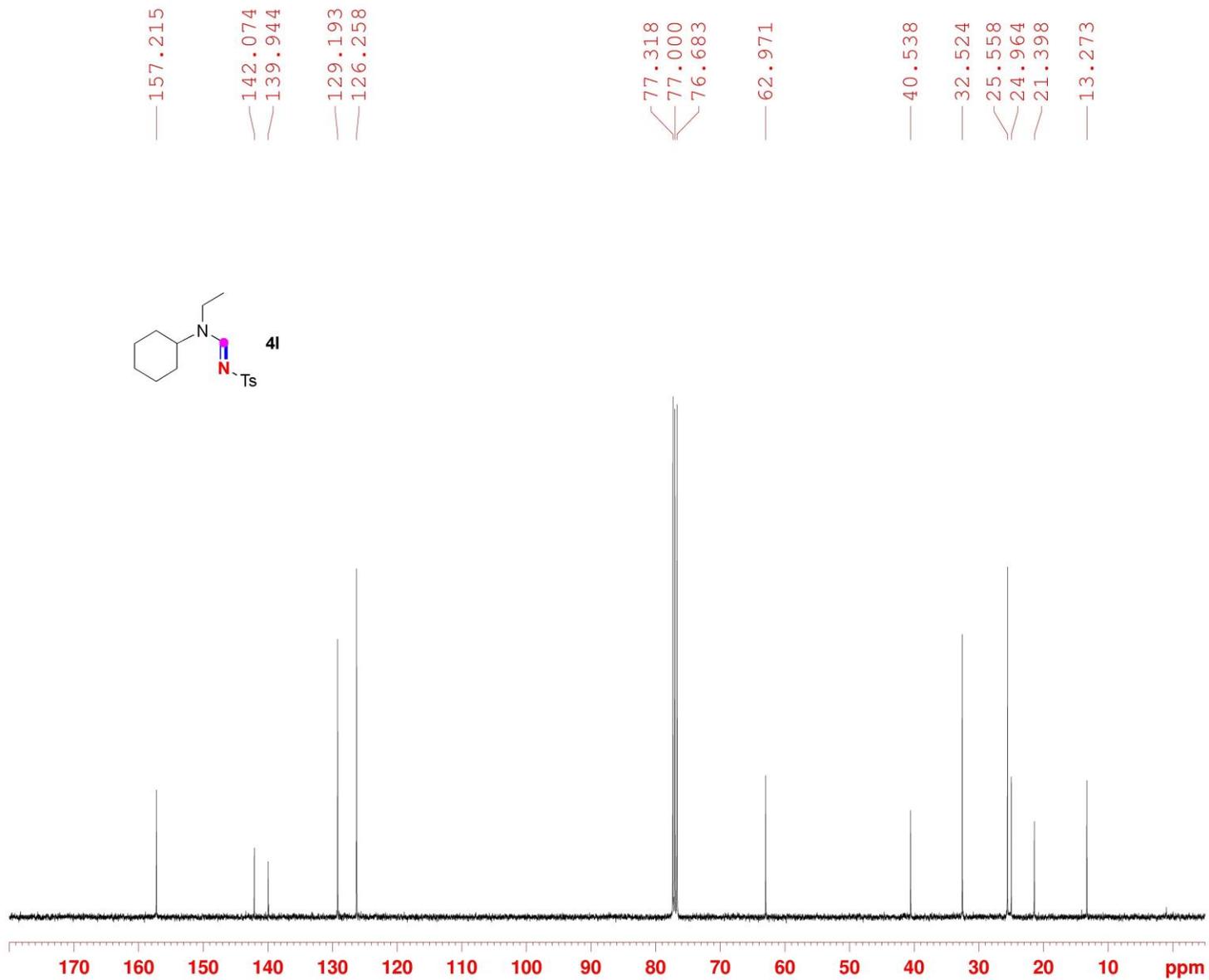
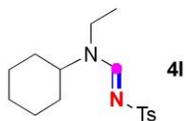
===== CHANNEL f1 =====
SFO1     100.6228293 MHz
NUC1      13C
P1        8.54 usec
SI        32768
SF        100.6127756 MHz
WDW       EM
SSB       0
LB        1.00 Hz
GB         0
PC         1.40
  
```



```

NAME          CLJ-WL-S392
EXPNO         1
PROCNO        1
Date_         20190226
Time_         7.34
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            8
DS            0
SWH           8012.820 Hz
FIDRES        0.122266 Hz
AQ            4.0894966 s
RG            51.19
DW            62.400 us
DE            6.50 us
TE            300.7 K
D1            1.00000000 s
TD0           1
===== CHANNEL f1 =====
SF01          400.1324710 MHz
NUC1           1H
P1            8.04 us
SI            65536
SF            400.1300056 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00

```

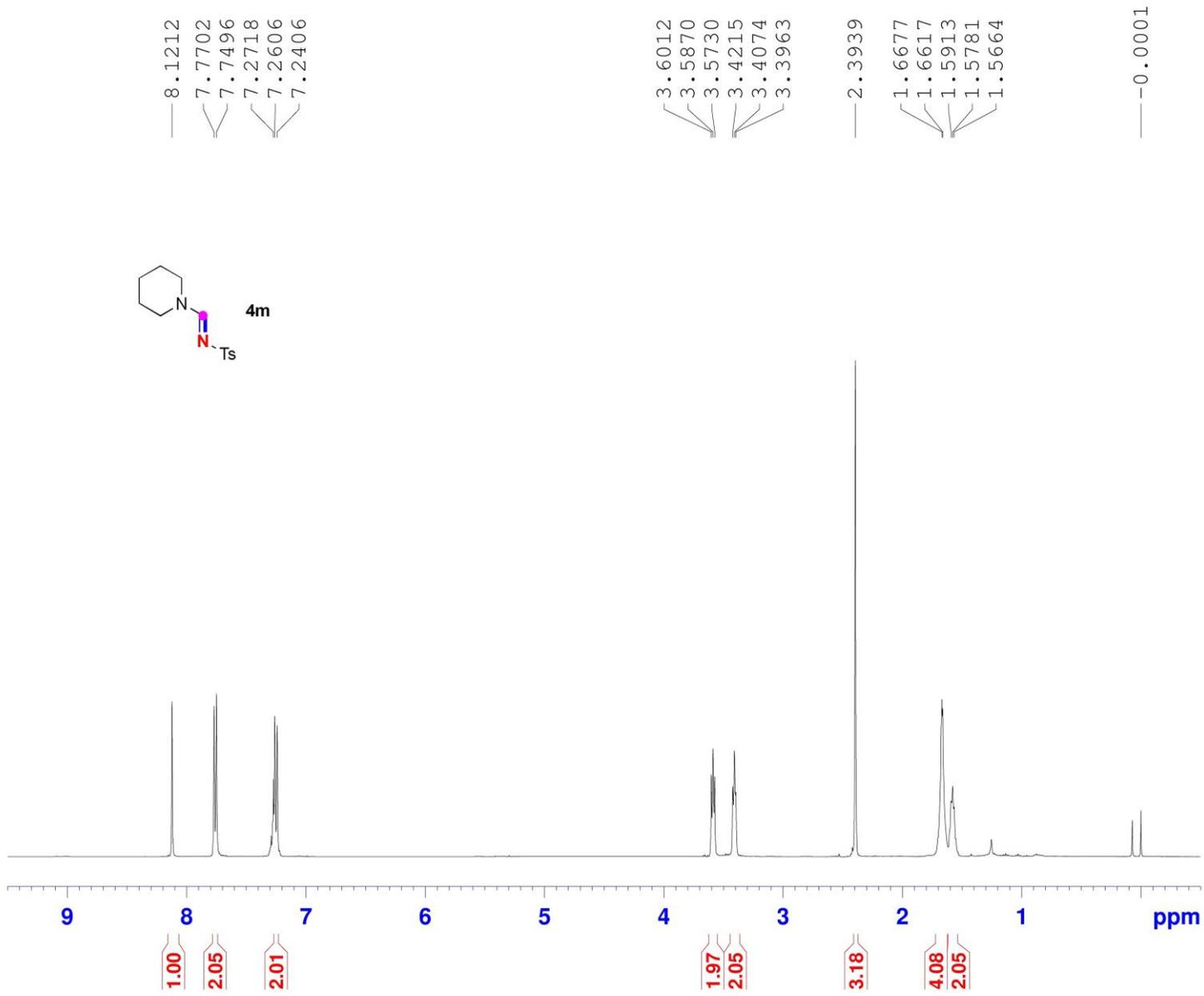
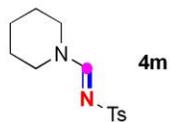


```

NAME      CLJ-WL-S392
EXPNO     2
PROCNO    1
Date_     20190226
Time      8.05
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES    0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.6 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

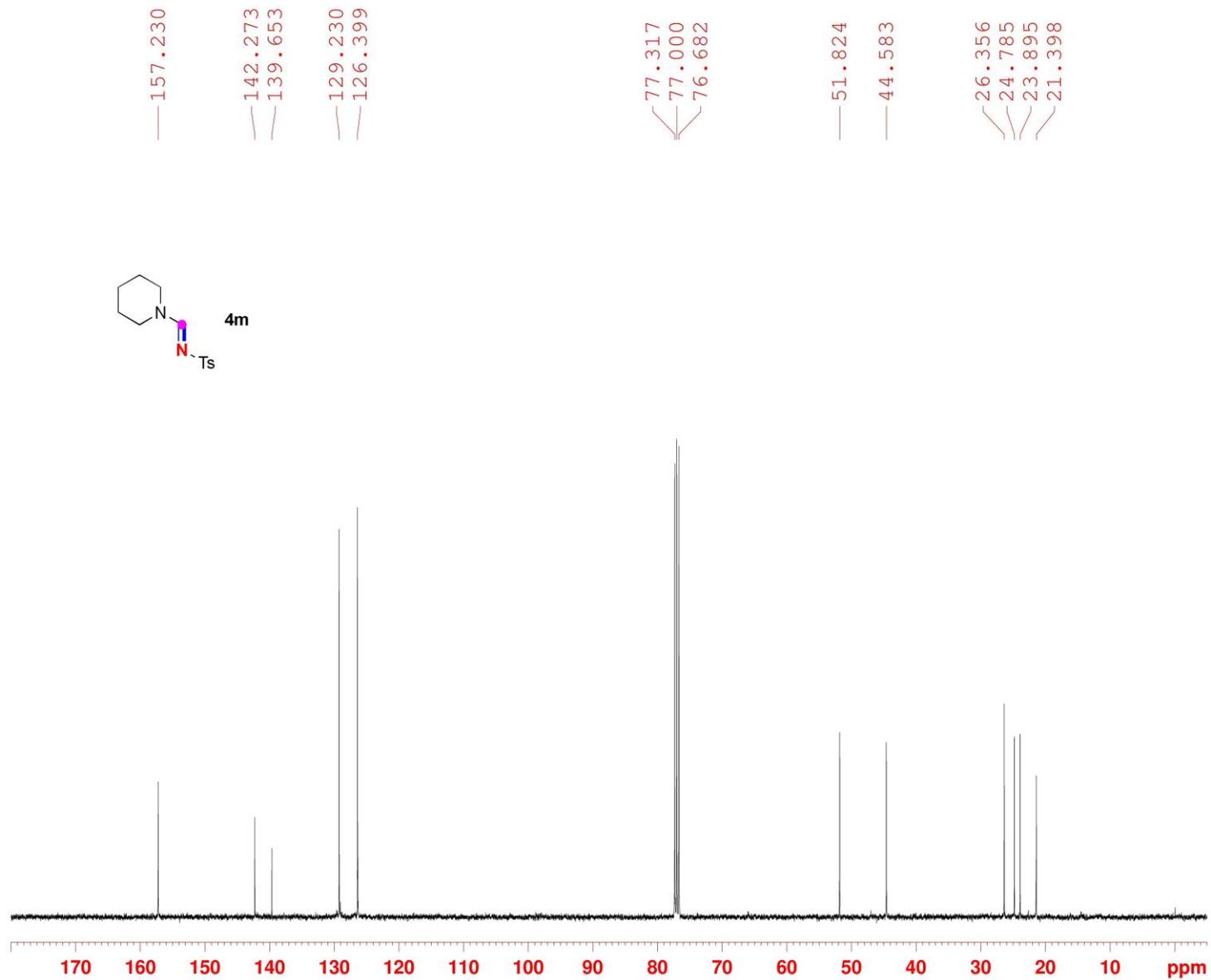
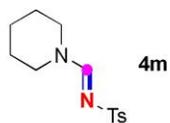
===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127734 MHz
WDW        EM
SSB        0
LB         1.00 Hz
GB         0
PC         1.40
  
```



```

NAME          CLJ-WL-S383
EXPNO         1
PROCNO        1
Date_         20190115
Time_         0.52
INSTRUM       spect
PROBHD        5 mm PABBO BB/
PULPROG       zg30
TD            65536
SOLVENT       CDC13
NS            12
DS            0
SWH           8012.820 P
FIDRES        0.122266 P
AQ            4.0894966 s
RG            47.53
DW            62.400 u
DE            6.50 u
TE            300.1 P
D1            1.00000000 s
TD0           1
===== CHANNEL f1 =====
SF01          400.1324710 M
NUC1          1H
P1            8.04 u
SI            65536
SF            400.1300047 M
WDW           EM
SSB           0
LB            0.30 P
GB            0
PC            1.00

```

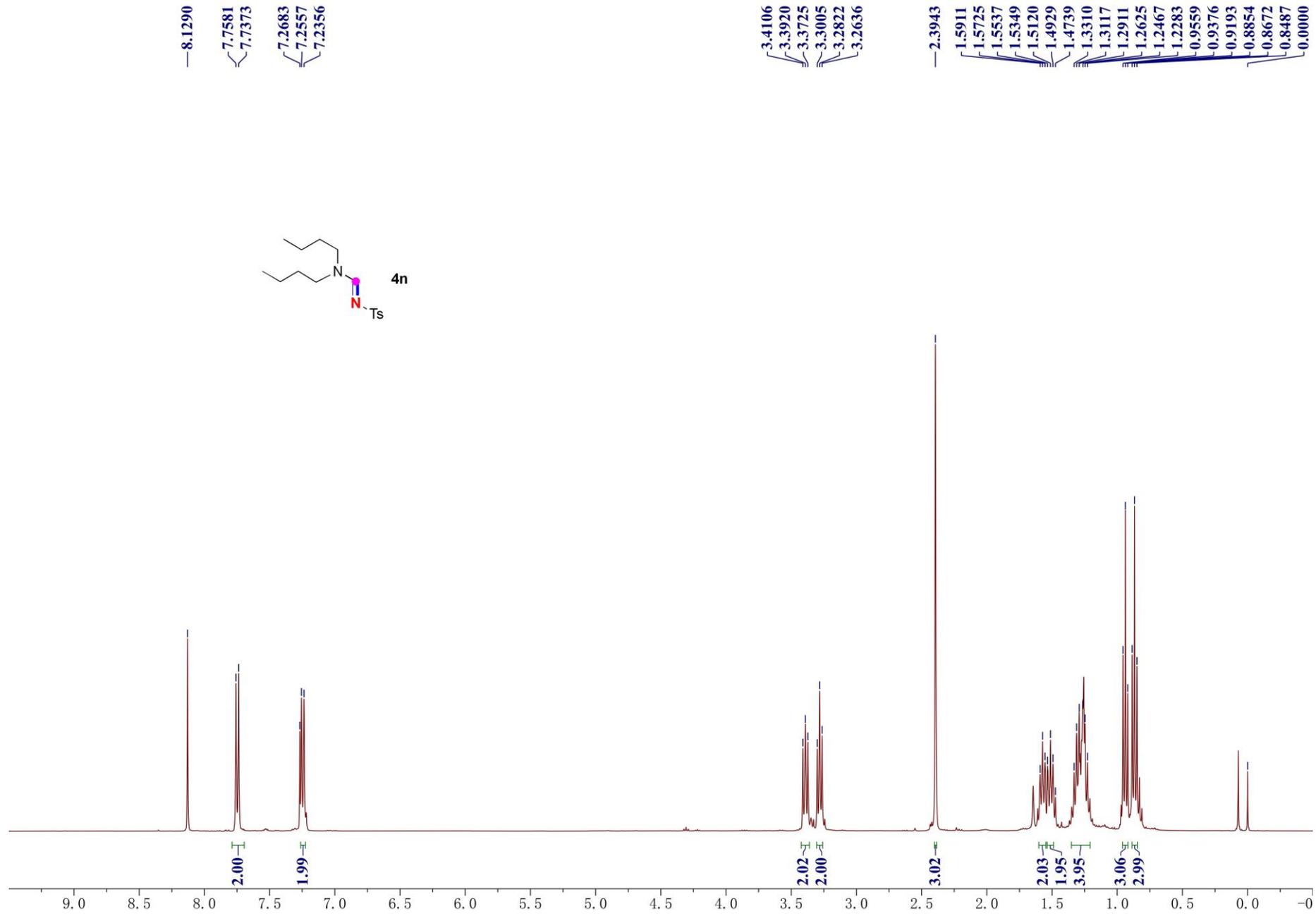


```

NAME      CLJ-WL-S383
EXPNO     2
PROCNO    1
Date_     20190115
Time      1.22
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zgpg30
TD         65536
SOLVENT   CDCl3
NS         512
DS         0
SWH        24038.461 Hz
FIDRES     0.366798 Hz
AQ         1.3631988 sec
RG         194.26
DW         20.800 usec
DE         6.50 usec
TE         300.1 K
D1         2.00000000 sec
D11        0.03000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1      100.6228293 MHz
NUC1       13C
P1         8.54 usec
SI         32768
SF         100.6127752 MHz
WDW        EM
SSB         0
LB         1.00 Hz
GB         0
PC         1.40
  
```



— 158.6993
— 142.1400
— 139.8448
— 129.1833
— 126.2926
77.3180
77.0000
76.6827
— 52.2637
— 45.9325
— 30.6558
— 28.6543
21.4061
19.8968
19.5934
13.6289
13.5335

