Supporting Information

Metal-Free N-Arylation of Sulfoximines using Diaryliodonium Salts at Room Temperature

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S1 General Considerations:

S1.1 Solvents and Reagents: All the reactions were carried out in flame or oven-dried glassware using anhydrous solvents unless otherwise indicated. All the reagents were commercially procured from Aldrich, TCI and Alfa Aesar and used without further purification. Solvents like THF were freshly dried and distilled over Na/benzophenone, and kept under an inert atmosphere, and were freshly distilled before use.

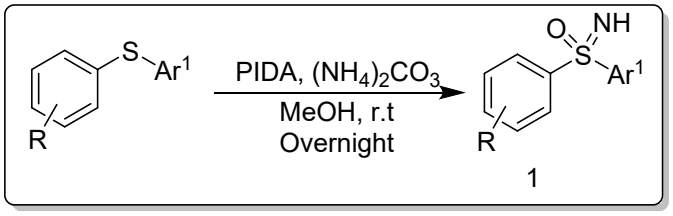
S1.2 NMR and Mass Spectrometry & Chromatography: ^{1}H and ^{13}C NMR spectra were recorded on a Bruker 400 (400 MHz) and Jeol 500 (500 MHz) spectrophotometer operating at 400 MHz and 500 MHz for ^{1}H and 126 MHz for ^{13}C experiments as solutions in $CDCl_3$; Spectra were recorded at 295 K in $CDCl_3$ and DMSO-d_6. Chemical shifts were calibrated to the residual proton and carbon resonance of the solvent, $CDCl_3$ (^{1}H δ 7.269; ^{13}C δ 77.0) and DMSO-d_6 (^{1}H δ 2.5; ^{13}C δ 39.5). Spin multiplicities are described as s (singlet), bs (broad singlet), d (doublet), dd (double doublet), t (triplet), q (quartet), sept (septet) and m (multiplet). Peaks at 1.26 ppm and 1.56 ppm in ^{1}H NMR spectra correspond to grease and moisture, respectively, whereas peak at 29.67 ppm in ^{13}C NMR spectra corresponds to grease. Coupling constant (*J*) values are reported in hertz (Hz). Analytical TLC was performed using 2 x 4 cm plate coated with a 0.25 mm thickness of silica gel ($60_{F\text{-}254}$ Merck), and visualization was accomplished with UV light or staining the plates with ethanolic *p*-anisaldehyde solution/ phosphomolybdic acid solution/ ninhydrin solution and heating to 120 °C. The abbreviations used:

singlet = s, doublet = d, triplet = t, quartet = q, double doublet = dd, multiplet = m, broad singlet = brs. Mass spectra were recorded on Water Q-ToF-Micro Micromass.

S2. Experimental Procedures, Analytical data, Gram Scale reaction and Control experiments

S2.1 General procedure for the synthesis of NH Sulfoximines (1)

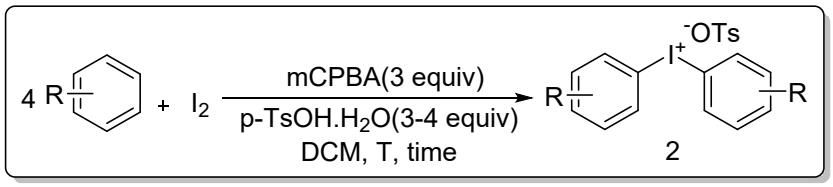
To a stirred solution of sulfide (186 mg, 1 mmol, 1 equiv.) in MeOH (10 mL) was added the $(NH_4)_2CO_3$ (144 mg, 1.5 mmol, 1.5 equiv.). Subsequently, $PhI(OAc)_2$ (740 mg, 2.3 mmol, 2.3 equiv.) was added and the solution was stirred at rt. After the disappearance of the sulfide (checked by TLC), the solvent was removed under reduced pressure. The crude product was purified by flash column chromatography. (10 mmol sulfide and 100 mL MeOH were used for the Gram-Scale Reaction)[1]



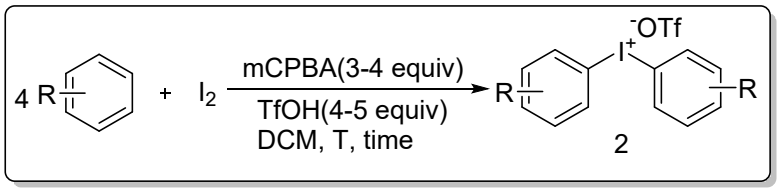
S2.2 General Procedure for the synthesis of iodonium salts (2)

Diaryliodonium salts (2) were synthesized according to the reported literature procedure and were directly used in the reaction.

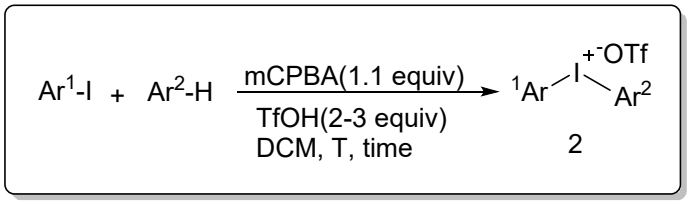
Method 1[2]



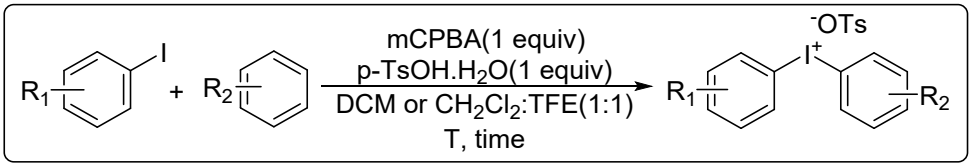
Method 2[3]



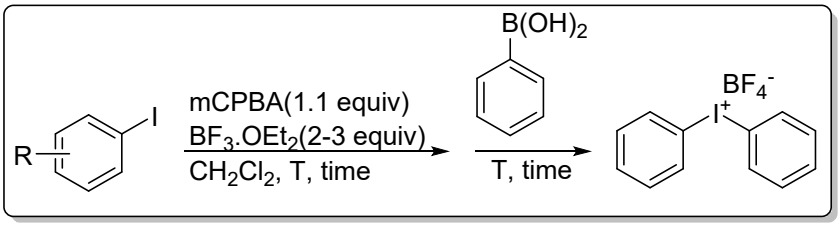
Method 3[3]



Method 4[2]

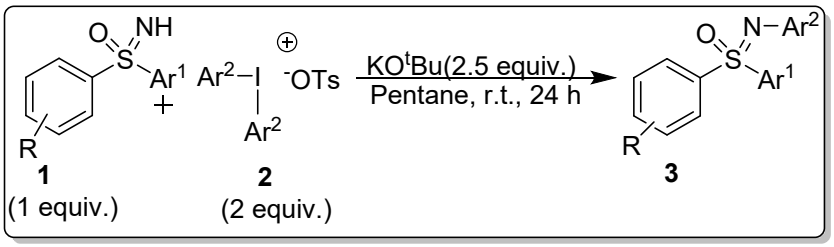


Method 5[3]



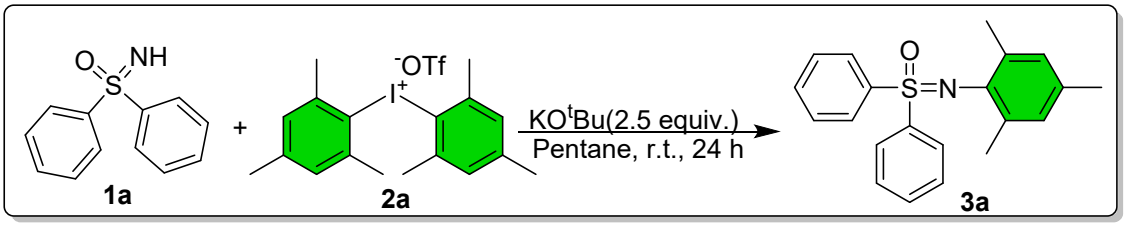
S2.3 General procedure for the synthesis of N-arylated sulfoximine (3)

The sulfoximine **1** (50 mg, 0.23 mmol**)**, diaryliodonium salt **2** (208 mg, 0.46 mmol**),** *t*-BuOK (64 mg, 0.57 mmol) and 5 mL anhydrous pentane were added to a dry 10 mL microwave vial, which was capped. The vial was evacuated and backfilled with nitrogen three times. The stirring was started. The solution was stirred at ambient temperature for 24 h. The crude reaction mixture was then transferred to a round-bottom flask using ethyl acetate. The solvent was evaporated and then the crude reaction was loaded onto silica without any work-up. The crude was purified using flash column chromatography to get the desired product (**3**)**.**



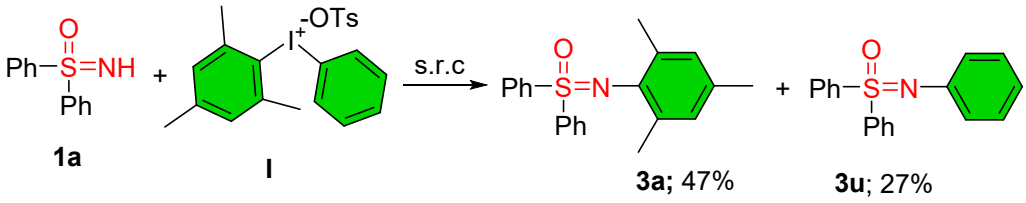
S2.4 Gram scale reaction for the synthesis of N-arylated sulfoximine (3a)

The sulfoximine **1a** (500 mg, 2.3 mmol), dimesityleneiodonium salt **2a** (2.36 g, 4.6 mmol), *t*-BuOK (644 mg, 5.75 mmol) and 20 mL anhydrous pentane were added to a dry 50 mL round-bottom flask, which was capped. The round-bottom flask was evacuated and backfilled with nitrogen three times. The stirring was started. The solution was stirred at ambient temperature for 24 h. The crude reaction mixture was then transferred to a round flask using ethyl acetate. The solvent was evaporated, and then the crude reaction was loaded onto silica without any work-up. The crude was purified using manual flash column chromatography to get the desired product (**3a**).

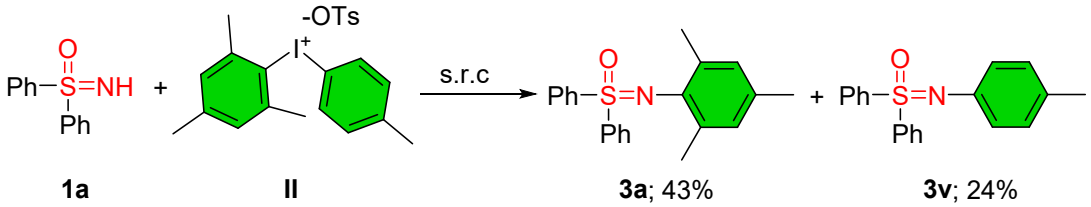


S2.5 Chemoselectivity Trends

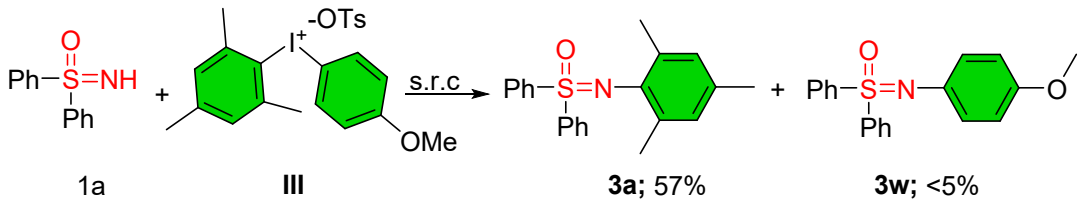
The chemoselectivity was investigated in the following reactions.



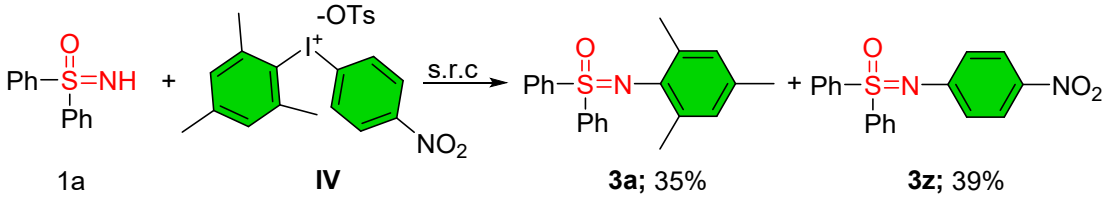
Following the general procedure S2.3. Sulfoximine **1a** (50 mg, 0.23 mmol), unsymmetrical salt **I** (227 mg, 0.46 mmol) and *t*-BuOK (65 mg, 0.57 mmol) were combined, and the resulting reaction mixture was stirred at rt for 24 h. After the completion of the reaction, the crude was purified by column chromatography to yield **3a** in 47% (36 mg) and product **3u** was obtained 27% (18 mg).



Following the general procedure S2.3. Sulfoximine **1a** (50 mg, 0.23 mmol), salt **II** (233 mg, 0.46 mmol) and *t*-BuOK (65 mg, 0.57 mmol) were combined, and the resulting reaction mixture was stirred at rt for 24 h. After the completion of the reaction, the solvent was evaporated under vacuum. The crude obtained was purified by column chromatography to yield **3a** in 43% (33 mg) and **3v** was obtained 24% (17 mg).



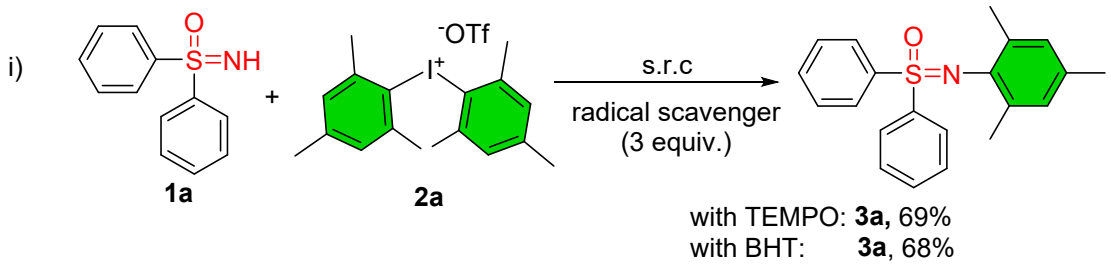
Following the general procedure S2.3. Sulfoximine **1a** (50 mg, 0.23 mmol), salt **III** (241 mg, 0.46 mmol) and *t*-BuOK (65 mg, 0.57 mmol) were combined, and the resulting reaction mixture was stirred at rt for 24 h. After the completion of the reaction, the crude was purified by column chromatography to yield **3a** in 57% (43 mg) and **3w** was obtained <5%.



Following the general procedure S2.3. Sulfoximine **1a** (50 mg, 0.23 mmol), salt **IV** (248 mg, 0.46 mmol) and *t*-BuOK (65 mg, 0.57 mmol) were combined, and the resulting reaction mixture was stirred at rt for 24 h. After the completion of the reaction, the crude was purified by column chromatography to yield **3a** in 35% (27 mg) and product **3z** was obtained 39% (30 mg).

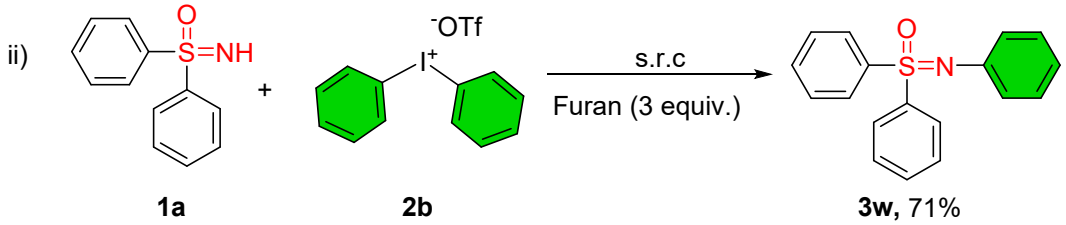
S2.6 Radical Trapping Method

i) Radical-trapping Experiment



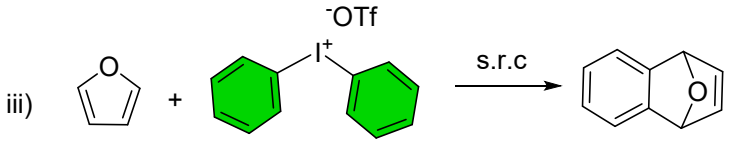
Following the general procedure S2.3. Sulfoximine **1a** (50 mg, 0.23 mmol), **2a** (236 mg, 0.46 mmol), *t*-BuOK (65 mg, 0.57 mmol) and TEMPO (107 mg, 0.69 mmol) or BHT (152 mg, 0.69 mmol) were added in pentane. The mixture was stirred at rt for 24 h. The crude obtained after solvent evaporation under vacuum was purified by column chromatography, yielding **3a** in 69% (53 mg) with TEMPO and 68% (52 mg) with BHT.

ii) Benzyne-trapping experiment



1a **2b** **3w,** 71%

Following the general procedure S2.3. Sulfoximine **1a** (50 mg, 0.23 mmol), **2b** (198 mg, 0.46 mmol), *t*-BuOK (65 mg, 0.57 mmol) and furan (65 mg, 0.69 mmol) dissolve in pentane. The mixture was stirred at rt for 24 h. The reaction mixture was purified by column chromatography; the yield of **3w** was 71% (47 mg).

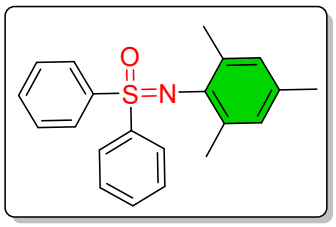


2b not obtained

Furan (1 mmol, 68 mg), **2b** (2 mmol, 860 mg), and *t*-BuOK (2.5 mmol, 280 mg) were taken in pentane. The mixture was stirred at rt for 24 h. We didn't observe any desired cycloadduct in the reaction mixture.

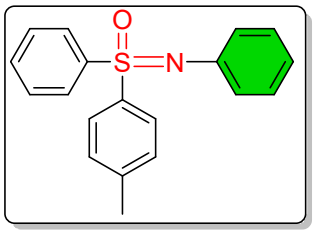
Analytical Data of Compound 3

(Mesitylimino)diphenyl-λ⁶-sulfanone (3a)[4, 5]



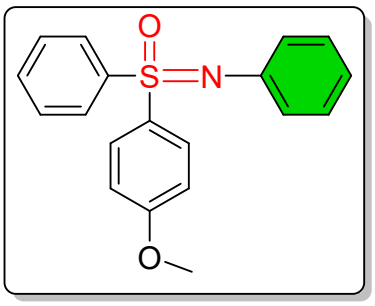
The General procedure S2.3 was followed. Transparent oil (55 mg, 72%); $R_{f=}$ 0.31 (10:90 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.06 – 7.86 (m, 4H), 7.61 – 7.50 (m, 2H), 7.51 – 7.42 (m, 4H), 6.77 (s, 2H), 2.26 (s, 6H), 2.21 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 142.32, 137.80, 133.52, 132.25, 131.90, 128.95, 128.89, 127.96, 20.62, 20.37. Spectral data are consistent with previous reports.

Phenyl(phenylimino)(p-tolyl)-λ⁶-sulfanone (3b)[6, 7]



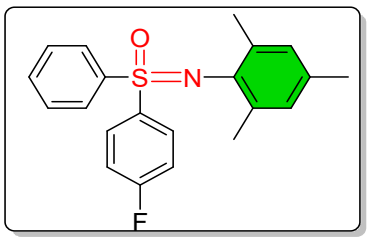
The General procedure S2.3 was followed. Colorless solid (51 mg, 73%); $R_{f=}$ 0.3 (15:85 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.07 (dd, *J* = 8.1, 1.4 Hz, 2H), 7.95 (d, *J* = 8.3 Hz, 2H), 7.56 – 7.44 (m, 3H), 7.28 (d, *J* = 6.8 Hz, 3H), 7.16 (d, *J* = 3.9 Hz, 4H), 6.90 (m, *J* = 8.5, 4.9, 3.7 Hz, 1H), 2.39 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 144.82, 143.51, 141.35, 137.91, 132.45, 129.95, 129.19, 128.92, 128.62, 128.40, 123.76, 121.58, 21.45. Spectral data are consistent with previous reports.

4-Methoxyphenyl)(phenyl)(phenylimino)-λ⁶-sulfanone (3c)[7]



The General procedure S2.3 was followed. Colorless solid (56 mg, 76%); $R_{f=}$ 0.3 (25:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.05 (dd, *J* = 8.0, 1.5 Hz, 2H), 8.03 – 7.97 (m, 2H), 7.53 – 7.42 (m, 3H), 7.16 (d, *J* = 4.2 Hz, 4H), 6.95 (d, *J* = 9.0 Hz, 2H), 6.90 (p, *J* = 4.3 Hz, 1H), 3.83 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 163.04, 144.88, 141.69, 132.33, 132.15, 130.73, 129.17, 128.92, 128.23, 123.76, 121.55, 114.56, 55.57. Spectral data are consistent with previous reports.

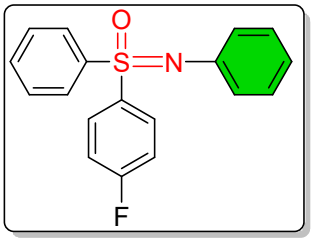
(4-Fluorophenyl)(mesitylimino)(phenyl)-λ⁶-sulfanone (3d)



The General procedure S2.3 was followed. Pale yellow solid (60 mg, 75%); $R_{f=}$ 0.32 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.03 – 7.89 (m, 4H), 7.54 (d, *J* = 7.4 Hz, 1H), 7.49 (t, *J* = 7.6 Hz, 2H), 7.15 (t, *J* = 8.6 Hz, 2H), 6.78 (s, 2H), 2.27 (s, 6H), 2.21 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 164.93 (d, *J* = 254.5 Hz), 142.26, 138.22, 137.61, 133.40, 132.40, 132.07, 130.72 (d, *J* = 9.3 Hz),

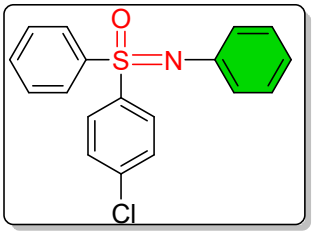
129.04, 129.00, 127.86, 116.13 (d, J = 22.5 Hz), 20.42. ^{19}F NMR (471 MHz, $CDCl_3$) δ -106.03. **HRMS** (ESI) calcd for $C_{11}H_{20}FNOS$ ($M+Na^+$) 376.1142; found 376.1146

(4-Fluorophenyl)(phenyl)(phenylimino)-λ^6-sulfanone (3e)[7, 8]



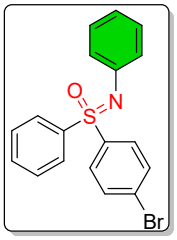
The general procedure S2.3 was followed. White solid (50 mg, 71%); R_f = 0.56 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.29 – 7.83 (m, 4H), 7.79 – 7.43 (m, 3H), 7.26 – 7.07 (m, 6H), 6.92 (ddt, J = 6.4, 4.6, 2.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 165.21(d, J = 255.3 Hz), 144.39, 140.90, 136.90, 136.87, 132.75, 131.32 (d, J = 9.5 Hz), 129.34, 129.02, 128.46, 123.75, 121.90, 116.52 (d, J = 22.6 Hz). Spectral data are consistent with previous reports.

(4-Chlorophenyl)(phenyl)(phenylimino)-λ^6-sulfanone (3f)[7]



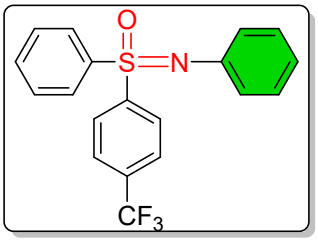
The General procedure S2.3 was followed. Colorless solid (54 mg, 72%); R_f = 0.3 (15:85 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.12 – 8.04 (m, 2H), 8.04 – 7.97 (m, 2H), 7.63 – 7.48 (m, 3H), 7.48 – 7.38 (m, 2H), 7.23 – 7.11 (m, 4H), 6.93 (ddd, J = 8.5, 4.5, 1.9 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 144.28, 140.66, 139.56, 139.35, 132.86, 130.05, 129.57, 129.38, 129.04, 128.51,123.74, 121.96. Spectral data are consistent with previous reports.

(4-Bromophenyl)(phenyl)(phenylimino)-λ^6-sulfanone (3g)[6]



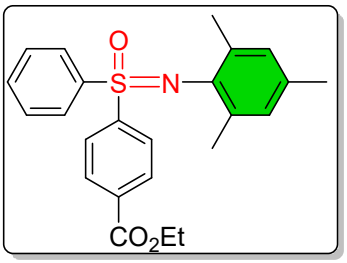
The General procedure S2.3 was followed. Yellow solid (63 mg, 74%); R_f = 0.3 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.12 – 8.05 (m, 2H), 7.92 (d, J = 8.7 Hz, 2H), 7.62 (d, J = 8.7 Hz, 2H), 7.52 (dt, J = 14.7, 7.1 Hz, 3H), 7.22 – 7.11 (m, 4H), 6.98 – 6.88 (m, 1H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 144.25, 140.60, 140.14, 132.87, 132.56, 130.16, 129.38, 129.04, 128.51, 127.90, 123.74, 121.97. Spectral data are consistent with previous reports.

Phenyl(phenylimino)(4-(trifluoromethyl)phenyl)-λ^6-sulfanone (3h)[8]



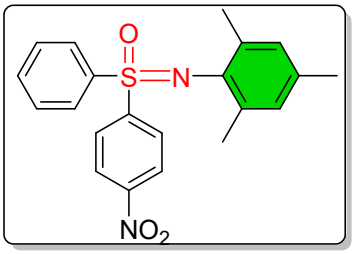
The General procedure S2.3 was followed. Colorless solid (57 mg, 69%); R_f = 0.3 (15:85 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.19 (d, J = 8.2 Hz, 2H), 8.10 (d, J = 7.5 Hz, 2H), 7.74 (d, J = 8.3 Hz, 2H), 7.55 (dd, J = 16.8, 7.4 Hz, 3H), 7.18 (q, J = 8.2 Hz, 4H), 6.94 (t, J = 6.6 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 144.88, 143.99, 140.10, 134.32 (q, J = 33 Hz), 134.19, 133.15, 129.49, 129.11, 129.09, 128.71, 126.37 (q, J = 3.7 Hz), 126.36, 123.74 (q, J = 274 Hz), 122.15. Spectral data are consistent with previous reports.

Ethyl 4-(N-mesitylphenylsulfonimidoyl)benzoate (3i)



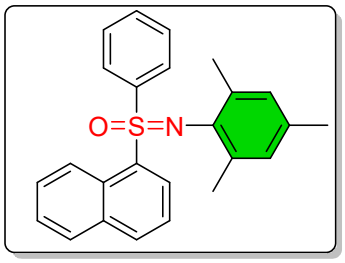
The General procedure S2.3 was followed. Pale yellow solid (66 mg, 71%); R_f = 0.3 (25:75 EtOAc: hexanes, visualized by 254 nm UV light). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.11 – 8.08 (m, 2H), 8.05 – 8.03 (m, 2H), 7.92 – 7.90 (m, 2H), 7.61 – 7.57 (m, 1H), 7.54-7.51 (m, 2H), 6.76 (s, 2H), 4.40 (q, *J* = 7.1 Hz, 2H), 2.24 (s, 6H), 2.20 (s, 3H), 1.40 (t, *J* = 7.1 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.26, 146.72, 141.26, 137.35, 133.63, 133.38, 132.77, 132.17, 130.00, 129.09, 129.03, 128.37, 127.56, 61.59, 29.71, 20.61, 20.35, 14.25. **HRMS** (ESI) calcd for $C_{24}H_{25}NO_3S$ ($M+H^+$) 408.1628; found 408.1638.

(Mesitylimino)(4-nitrophenyl)(phenyl)-λ^6-sulfanone (3j)



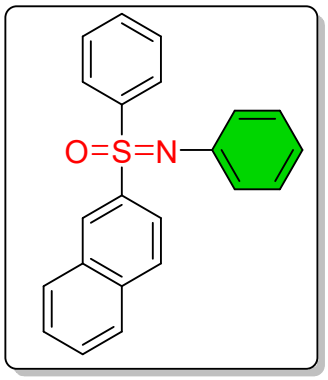
The General procedure S2.3 was followed. Yellow solid (59 mg, 68%); R_f = 0.3 (25:75 EtOAc: hexanes, visualized by 254 nm UV light). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.25 (d, *J* = 8.9 Hz, 2H), 8.14 – 8.08 (m, 2H), 7.98 (d, *J* = 8.9 Hz, 2H), 7.65 (t, *J* = 7.4 Hz, 1H), 7.58 (t, *J* = 7.7 Hz, 2H), 6.79 (s, 2H), 2.25 (s, 6H), 2.21 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 149.56, 149.06, 140.20, 136.89, 133.41, 133.24, 132.58, 129.43, 129.21, 128.72, 128.55, 124.09, 20.65, 20.40. **HRMS** (ESI) calcd for $C_{20}H_{21}N_2O_3S$($M+H^+$) 381.1267; found 381.1271.

(Mesitylimino)(naphthalen-1-yl)(phenyl)-λ^6-sulfanone (3k)



The General procedure S2.3 was followed. Yellow solid (69 mg, 78%); R_f = 0.5 (15:85 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.65 (s, 1H), 8.02 – 7.88 (m, 6H), 7.64 – 7.60 (m, 2H), 7.53 – 7.46 (m, 3H), 6.78 (s, 2H), 2.31 (s, 6H), 2.21 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 142.54, 139.14, 137.75, 134.70, 133.61, 132.30, 132.01, 129.40, 129.33, 129.09, 129.02, 128.95, 128.77, 127.93, 127.88, 127.38, 123.55, 20.65, 20.51. **HRMS** (ESI) calcd for $C_{25}H_{23}NOS$ ($M+H^+$) 386.1573; found 386.1575.

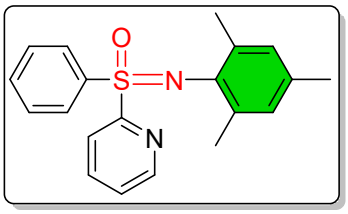
Naphthalen-1-yl(phenyl)(phenylimino)-λ^6-sulfanone (3l)[7, 8]



The General procedure S2.3 was followed. Yellow solid (59 mg, 72%); R_f = 0.55 (15:85 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.71 (s, 1H), 8.15 (d, *J* = 7.2 Hz, 2H), 7.99 (t, *J* = 6.6 Hz, 2H), 7.89 (dd, *J* = 20.3, 8.2 Hz, 2H), 7.68 – 7.57 (m, 2H),

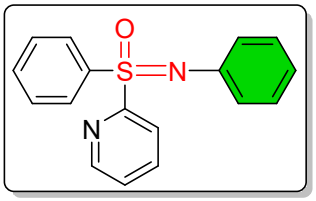
7.51 (q, J = 7.2 Hz, 3H), 7.24 – 7.15 (m, 4H), 6.91 (t, J = 7.2 Hz, 1H). Spectral data are consistent with previous reports.

(Mesitylimino)(phenyl)(pyridin-2-yl)-λ⁶-sulfanone (3m)



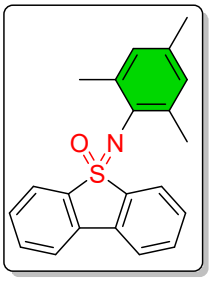
The General procedure S2.3 was followed. Yellow solid (56 mg, 73%); $R_{f=}$ 0.55 (25:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.58 – 8.53 (m, 1H), 8.30 – 8.21 (m, 2H), 8.08 (d, J = 7.9 Hz, 1H), 7.83 – 7.75 (m, 1H), 7.63 (d, J = 7.4 Hz, 1H), 7.57 (t, J = 7.6 Hz, 2H), 7.37 – 7.30 (m, 1H), 6.75 (s, 2H), 2.29 (s, 6H), 2.19 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 160.16, 149.75, 139.20, 137.53, 137.46, 133.94, 133.00, 132.16, 129.71, 128.80, 128.77, 125.92, 122.68, 20.67, 20.09. **HRMS** (ESI) calcd for $C_{20}H_{20}NOS$ ($M+H^+$) 337.1369; found 337.1390.

Phenyl(phenylimino)(pyridin-2-yl)-λ⁶-sulfanone (3n)[8]



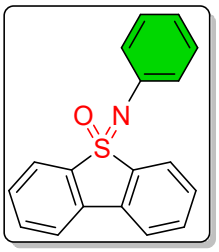
The General procedure S2.3 was followed. Colorless solid (48 mg, 71%); $R_{f=}$ 0.3 (25:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, DMSO-d_6) δ 8.79 – 8.60 (m, 1H), 8.40 (d, J = 7.9 Hz, 1H), 8.31 – 7.97 (m, 3H), 7.73 – 7.66 (m, 1H), 7.65 – 7.59 (m, 3H), 7.27 – 7.09 (m, 2H), 7.09 – 6.95 (m, 2H), 6.95 – 6.75 (m, 1H). **^{13}C NMR** (126 MHz, DMSO-d_6) δ 157.88, 150.93, 144.94, 139.43, 138.28, 134.07, 129.93, 129.70, 129.48, 127.73, 124.08, 123.70, 122.14. Spectral data are consistent with previous reports.

5-(Mesitylimino)-5H-5λ⁴-dibenzo[b,d]thiophene 5-oxide (3o)



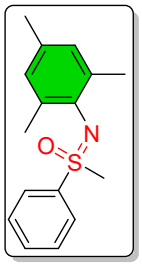
The General procedure S2.3 was followed. Yellow solid (50 mg, 65%); $R_{f=}$ 0.3 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.86 (d, J = 7.7 Hz, 2H), 7.63 (td, J = 7.6, 5.9 Hz, 4H), 7.47 (t, J = 7.5 Hz, 2H), 6.84 (s, 2H), 2.27 (s, 3H), 2.11 (s, 6H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 139.57, 137.29, 133.95, 132.79, 132.65, 131.38, 129.98, 128.87, 122.22, 121.61, 20.81, 19.16. **HRMS** (ESI) calcd for $C_{12}H_{16}NO_3$ ($M+H^+$) 334.1260; found 334.1268.

5-(phenylimino)-5H-5λ⁴-dibenzo[b,d]thiophene 5-oxide (3p)[8]



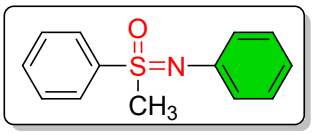
The General procedure S2.3 was followed Pale Yellow solid (47 mg, 77%); R_f = 0.5 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.86 (d, *J* = 7.7 Hz, 2H), 7.79 (d, *J* = 7.7 Hz, 2H), 7.64 (t, *J* = 7.6 Hz, 2H), 7.49 (t, *J* = 7.6 Hz, 2H), 7.31 – 7.25 (m, 4H), 7.08 (t, *J* = 6.9 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 143.88, 138.92, 133.13, 131.99, 130.20, 129.13, 124.55, 123.06, 122.46, 121.63. Spectral data are consistent with previous reports.

(Mesitylimino)(methyl)(phenyl)-λ^6-sulfanone (3q)[9]



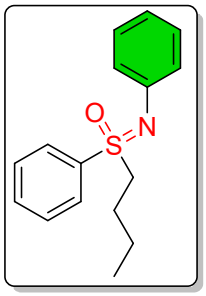
The General procedure S2.3 was followed. Brown Solid (45 mg, 72%); R_f = 0.5 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.22 – 8.16 (m, 2H), 7.66 (d, *J* = 7.3 Hz, 1H), 7.61 (t, *J* = 7.5 Hz, 2H), 6.88 (s, 2H), 3.07 (s, 3H), 2.37 (s, 6H), 2.27 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 141.47, 138.02, 133.80, 132.97, 132.36, 129.21, 129.07, 127.94, 43.33, 20.67, 19.94. Spectral data are consistent with previous reports.

(E)-1-methyl-N,1-diphenyl-λ^4-sulfanimine (3r)[6, 10]



The General procedure S2.3 was followed. White solid (40 mg, 75%); R_f = 0.3 (15:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.00 – 7.98 (m, 2H), 7.60-7.58 (m, 1H), 7.55-7.51 (m, 2H), 7.15-7.11 (m, 2H), 7.04 – 7.01 (m, 2H), 6.90-6.86 (m, 1H), 3.25 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 144.97, 139.58, 133.17, 129.50, 128.98, 128.62, 123.33, 121.70, 46.01. Spectral data are consistent with previous reports.

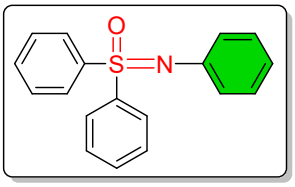
Butyl(phenyl)(phenylimino)-λ^6-sulfanone(3s)[11]



The General procedure S2.3 was followed. Brown Solid (46 mg, 74%); R_f = 0.3 (15:75 EtOAc: hexanes, visualized by 254 nm UV light **).^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.94 – 7.92 (m, 2H), 7.61-7.55 (m, 1H), 7.54-7.51 (m, 2H), 7.14-7.10 (m, 2H), 7.03 – 7.01 (m, 2H), 6.88-6.84 (m, 1H), 3.37 (ddd, *J* = 13.9, 11.4, 5.1 Hz, 1H), 3.27 (ddd, *J* = 13.9, 11.3, 5.1 Hz, 1H), 1.89 – 1.78 (m, 1H), 1.76 – 1.66 (m, 1H), 1.40 (dt, *J* = 14.8, 7.4 Hz, 2H), 0.90 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 145.23, 138.21, 137.78, 133.04, 129.38, 129.30, 128.91, 123.30, 121.38, 57.43, 24.67, 21.42, 13.52. Spectral data are consistent with previous reports.

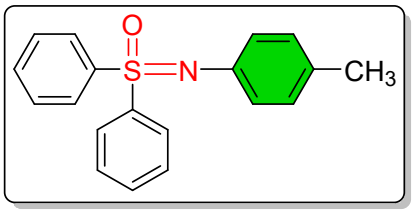
Diphenyl(phenylimino)-λ^6-sulfanone (3u)[6, 8, 10]

The General procedure S2.3 was followed. Colorless solid (49 mg, 73%); R_f = 0.5 (15:85 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.26 – 7.93 (m, 4H), 7.65 –



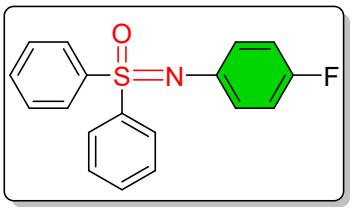
7.41 (m, 6H), 7.28 – 7.08 (m, 4H), 7.03 – 6.82 (m, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 144.66, 141.00, 132.62, 129.26, 128.96, 128.56, 123.77, 121.70. Spectral data are consistent with previous reports.

Diphenyl(*p*-tolylimino)-λ^6-sulfanone (3v)[7]



The General procedure S2.3 was followed. Colorless solid (48 mg, 68%); $R_{f=}$ 0.3 (15:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.05 – 7.82 (m, 4H), 7.49 – 7.30 (m, 6H), 6.97 (d, *J* = 8.3 Hz, 2H), 6.87 (d, *J* = 8.0 Hz, 2H), 2.14 (s, 1H). Spectral data are consistent with previous reports.

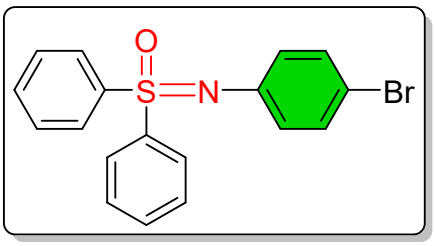
((4-((4-Fluorophenyl)imino)diphenyl-λ^6-sulfanone (3x)[7]



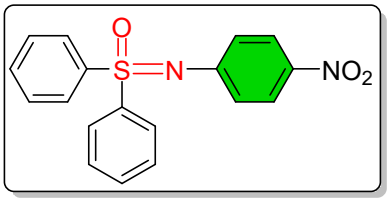
The General procedure S2.3 was followed. Colorless solid (53 mg, 74%); $R_{f=}$ 0.3 (15:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.08-8.06 (m, 4H), 7.52 (m, 6H), 7.12 (dd, *J* = 8.4, 4.9 Hz, 2H), 6.86 (t, *J* = 8.6 Hz, 2H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 158.37 (d, *J* = 239.8 Hz), 157.42, 140.67, 132.76, 129.38, 129.31, 128.57, 128.49, 124.79 (d, *J* = 7.8 Hz), 115.54 (d, *J* = 22.2 Hz). **^{19}F NMR** (471 MHz, $CDCl_3$) δ -122.22. Spectral data are consistent with previous reports.

((4-bromophenyl)imino)diphenyl-λ^6-sulfanone (3y)[12]

The General procedure S2.3 was followed. Pale solid (54 mg, 72%); $R_{f=}$ 0.3 (15:75 EtOAc: hexanes, visualized by 254 nm UV light).**^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.97–7.94 (m, 4H), 7.47–7.38 (m, 6H), 7.17-7.14 (m, 2H), 6.96-6.92 (m, 2H). Spectra data are consistent with previous reports



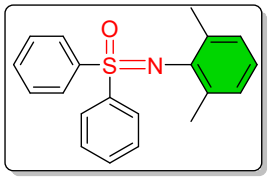
((4-Nitrophenyl)imino)diphenyl-λ^6-sulfanone (3z)[7, 8]



The General procedure S2.3 was followed. Colorless solid (58 mg, 75%); $R_{f=}$ 0.5 (25:75 EtOAc: hexanes, visualized by 254 nm UV light). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 8.09-8.04 (m, 4H), 7.61-7.56

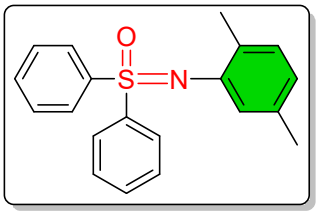
(m, 8H), 7.25-7.16 (m, 2H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 151.39, 142.23, 139.23, 133.65, 129.72, 128.37, 125.16, 123.08. Spectral data are consistent with previous reports.

((2,6-Dimethylphenyl)imino)diphenyl-λ^6-sulfanone (3aa)[8]



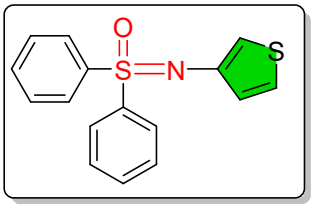
The General procedure S2.3 was followed. White solid (54 mg, 73%); $R_{f=}$ 0.7 (20:80 EtOAc: hexanes, visualized by 254 nm UV light).^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 – 7.76 (m, 4H), 7.55 – 7.32 (m, 6H), 6.85 (d, *J* = 7.4 Hz, 2H), 6.72 (t, *J* = 7.4 Hz, 1H), 2.19 (s, 6H). Spectral data are consistent with previous reports.

((2,5-Dimethylphenyl)imino)diphenyl-λ^6-sulfanone (3ab)[5]



The General procedure S2.3 was followed. Yellow solid (51 mg, 70%); $R_{f=}$ 0.7 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.07 – 8.04 (m, 4H), 7.54 – 7.46 (m, 6H), 7.01 – 6.96 (m, 2H), 6.72 (dd, *J* = 8.1, 2.2 Hz, 1H), 2.51 (s, 3H), 2.21 (s, 3H). Spectral data are consistent with previous reports.

Diphenyl(thiophen-3-ylimino)-λ^6-sulfanone (3ac)[7]



The General procedure S2.3 was followed. White solid (31 mg, 45%); $R_{f=}$ 0.5 (20:80 EtOAc: hexanes, visualized by 254 nm UV light). ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.09 – 8.07 (m, 4H), 7.58 – 7.50 (m, 6H), 6.70 (dd, *J* = 5.6, 3.6 Hz, 1H), 6.65 (dd, *J* = 5.6, 1.4 Hz, 1H), 6.48 (dd, *J* = 3.6, 1.4 Hz, 1H). Spectral data are consistent with previous reports.

S.3 References

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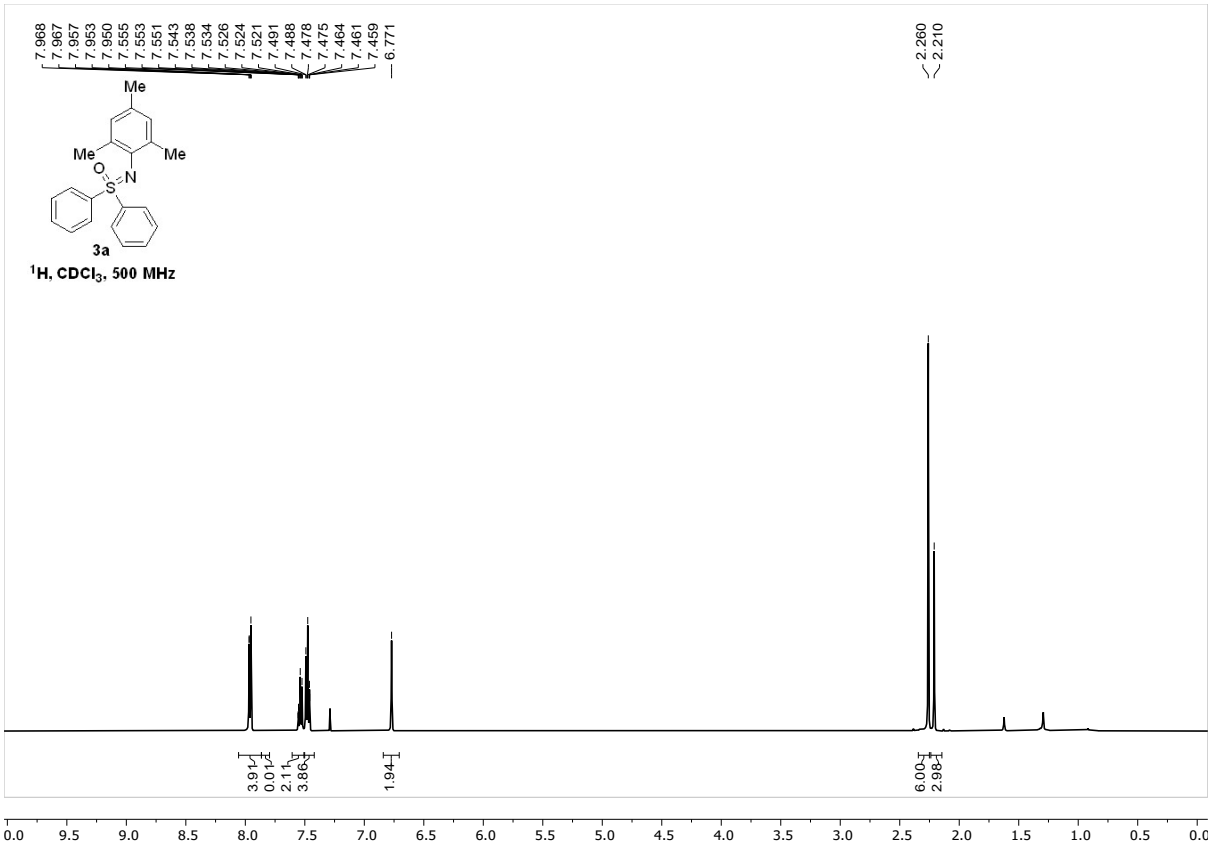
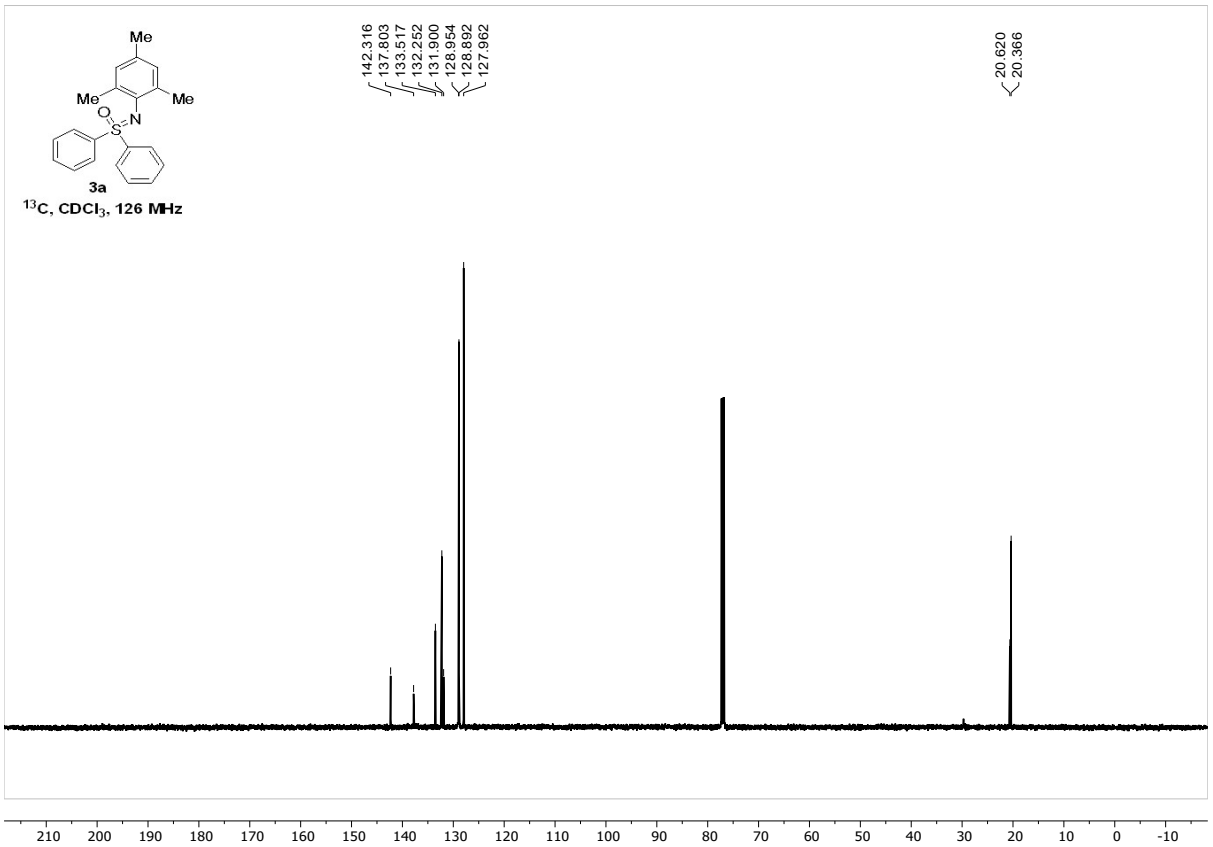
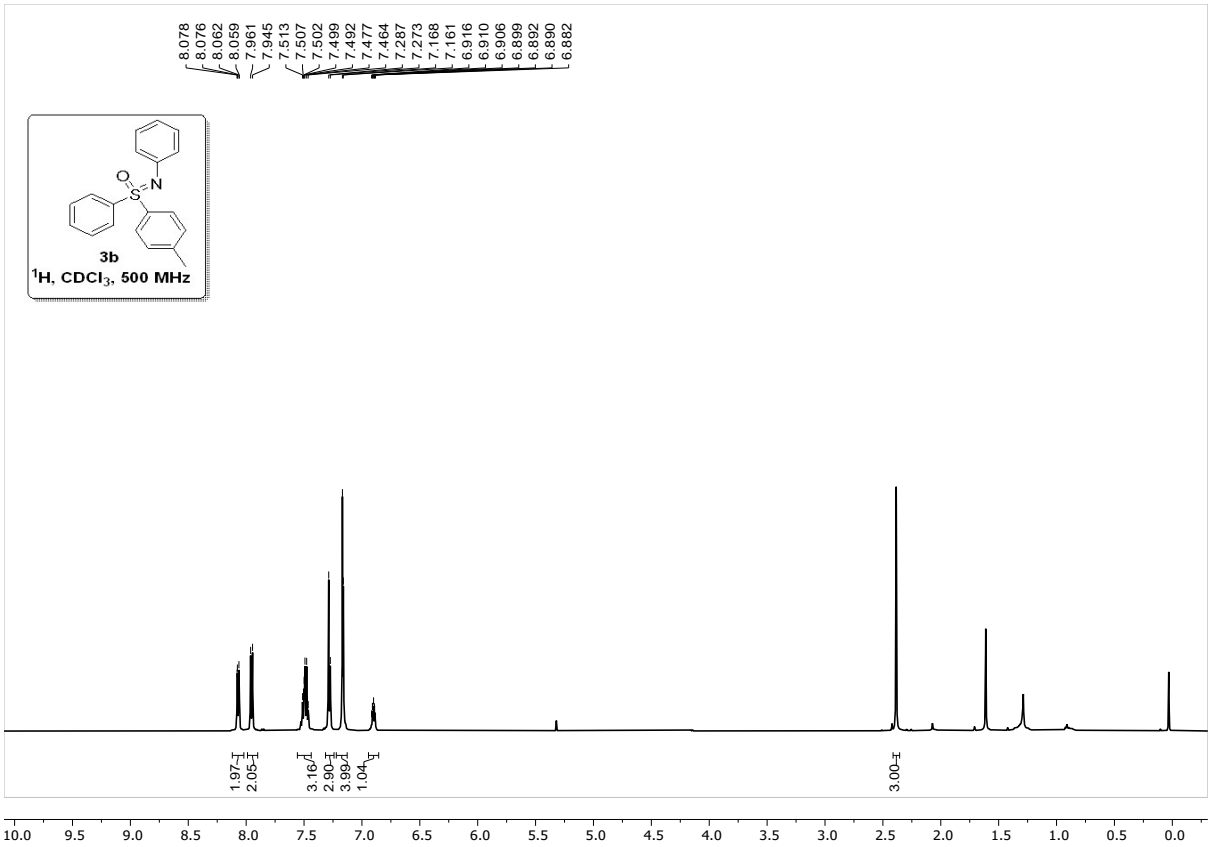
Copies of ^{1}H, ^{13}C, ^{19}F NMR Spectra of Compounds

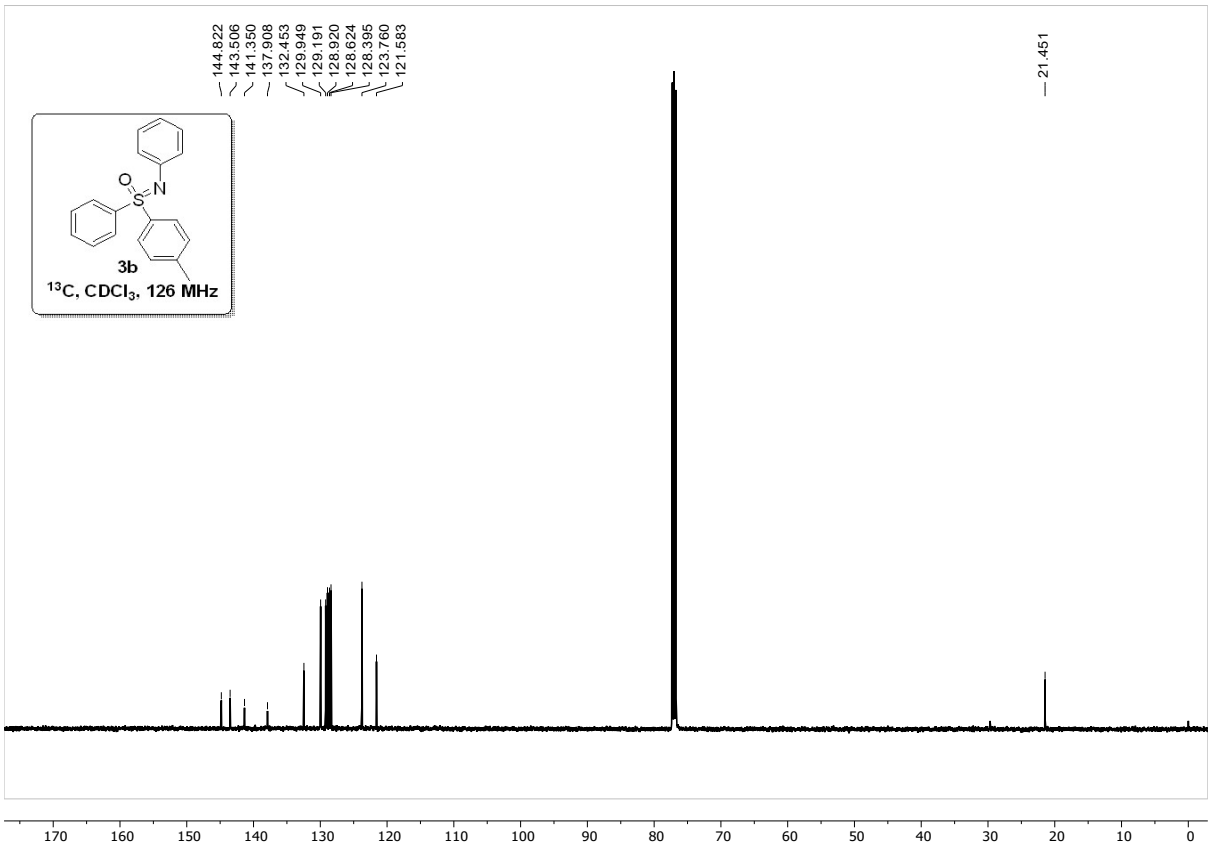


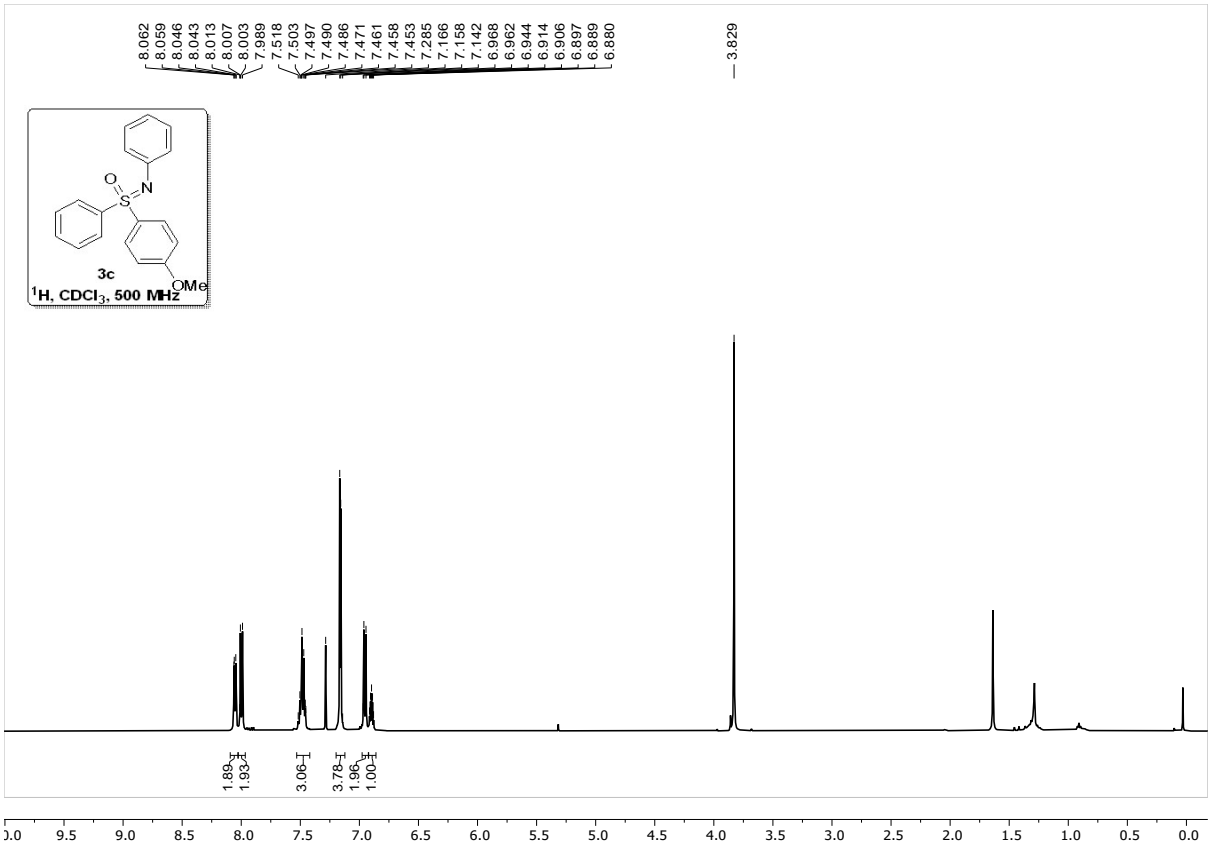
^{1}H, $CDCl_3$, 500 MHz

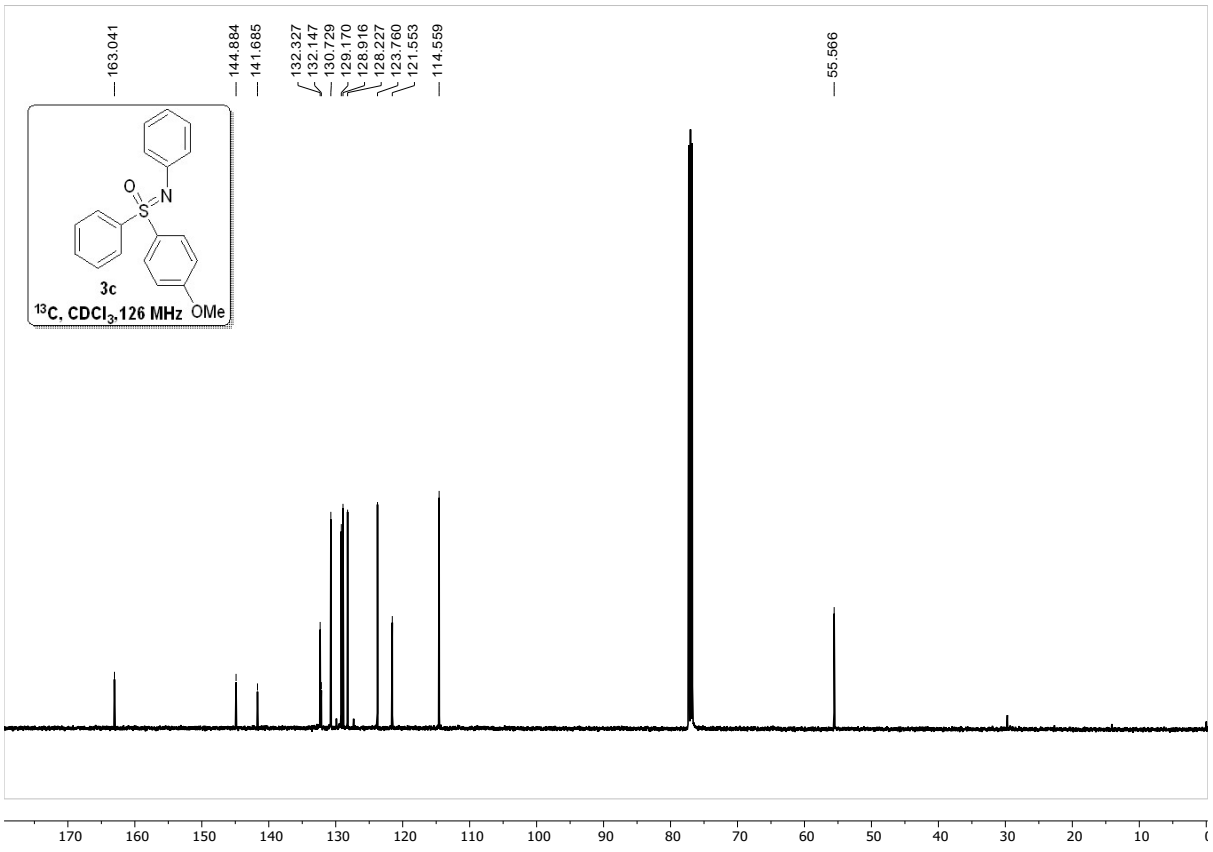


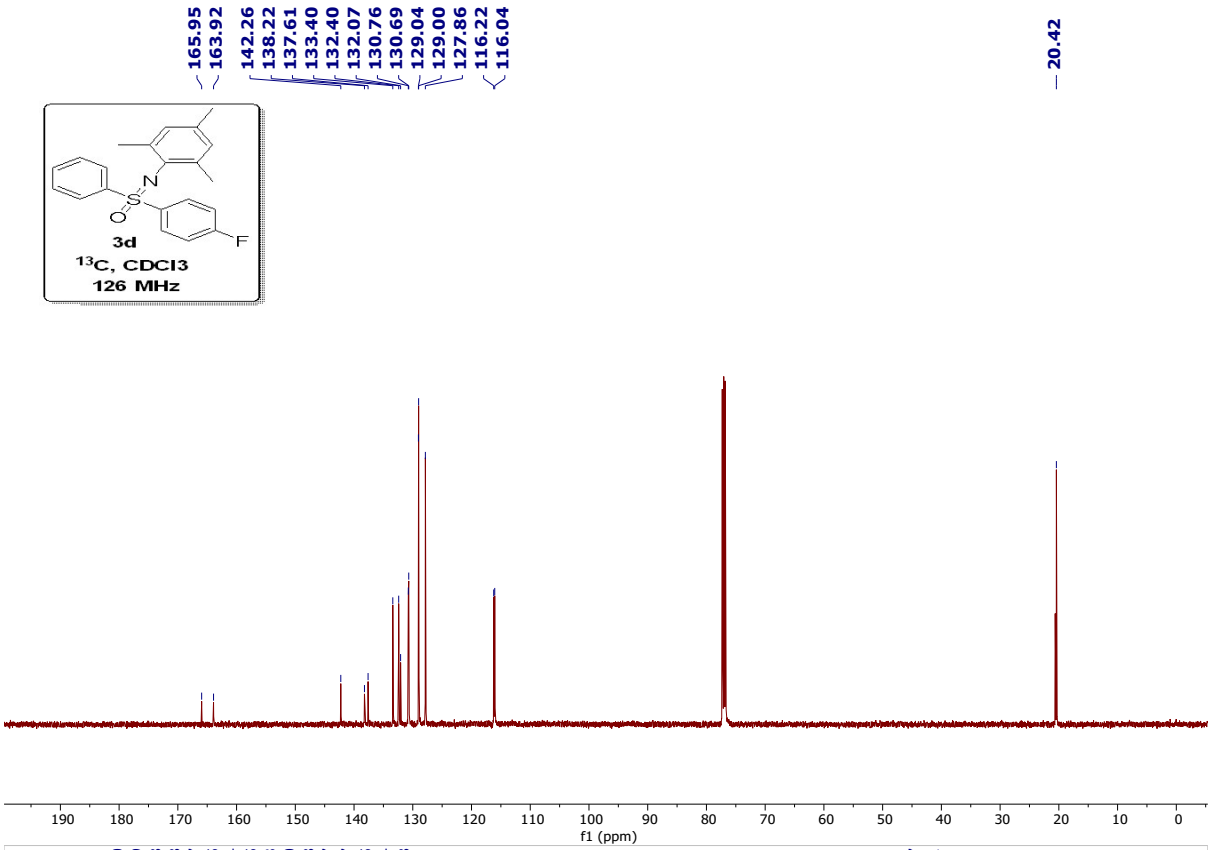
^{13}C, $CDCl_3$, 126 MHz

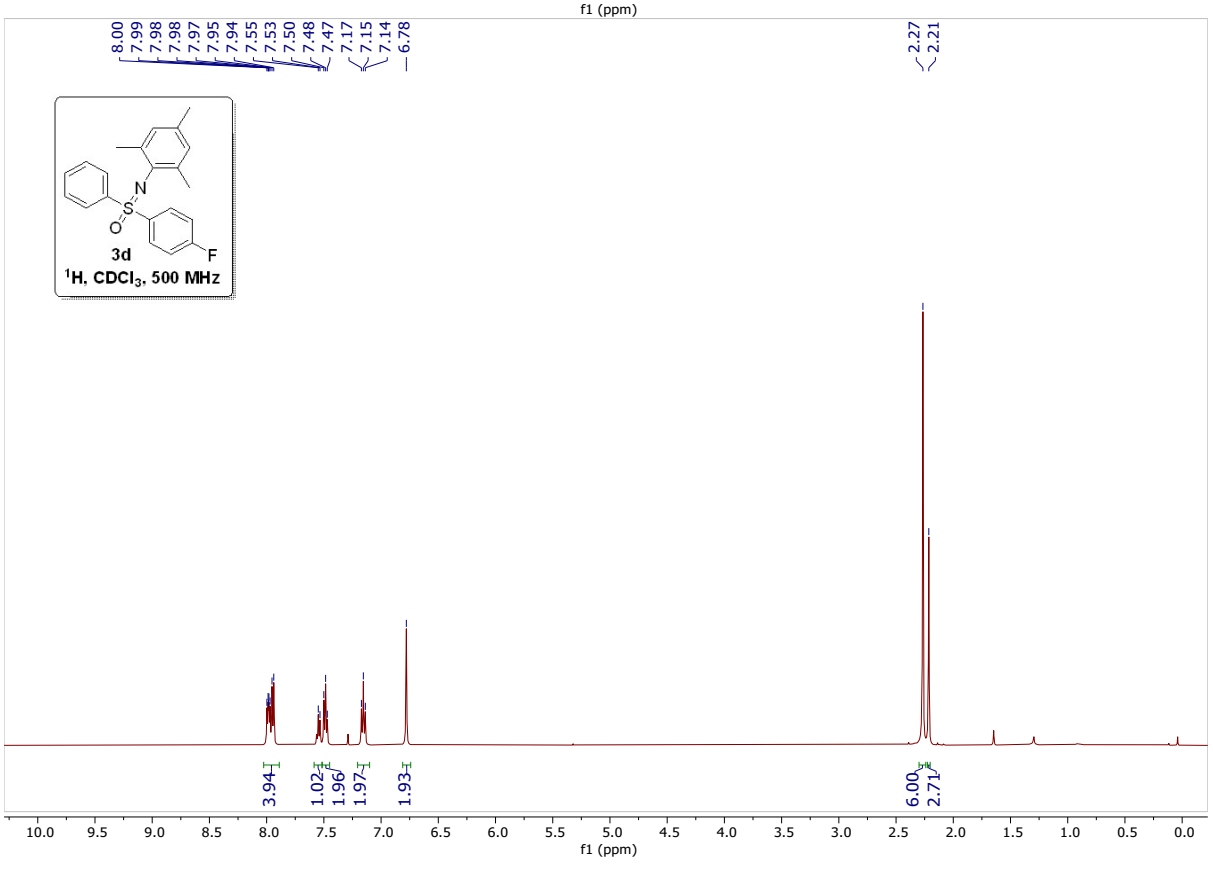

8.078
8.076
8.062
8.059
7.961
7.945
7.513
7.507
7.502
7.499
7.492
7.477
7.464
7.287
7.273
7.168
7.161
6.916
6.910
6.906
6.899
6.892
6.890
6.882
3b
1H, CDCl3, 500 MHz
1.97
2.05
3.16
2.90
3.99
1.04
3.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

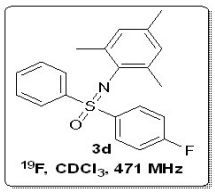

144.822
143.506
141.350
137.908
132.453
129.949
129.191
128.920
128.624
128.395
123.760
121.583
21.451
3b
13C, CDCl3, 126 MHz
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0


8.062
8.059
8.046
8.043
8.013
8.007
8.003
7.989
7.518
7.503
7.497
7.490
7.486
7.471
7.461
7.458
7.453
7.285
7.166
7.158
7.142
6.968
6.962
6.944
6.914
6.906
6.897
6.889
6.880
3.829
3c
1H, CDCl3, 500 MHz
OMe
1.89
1.93
3.06
3.78
1.96
1.00

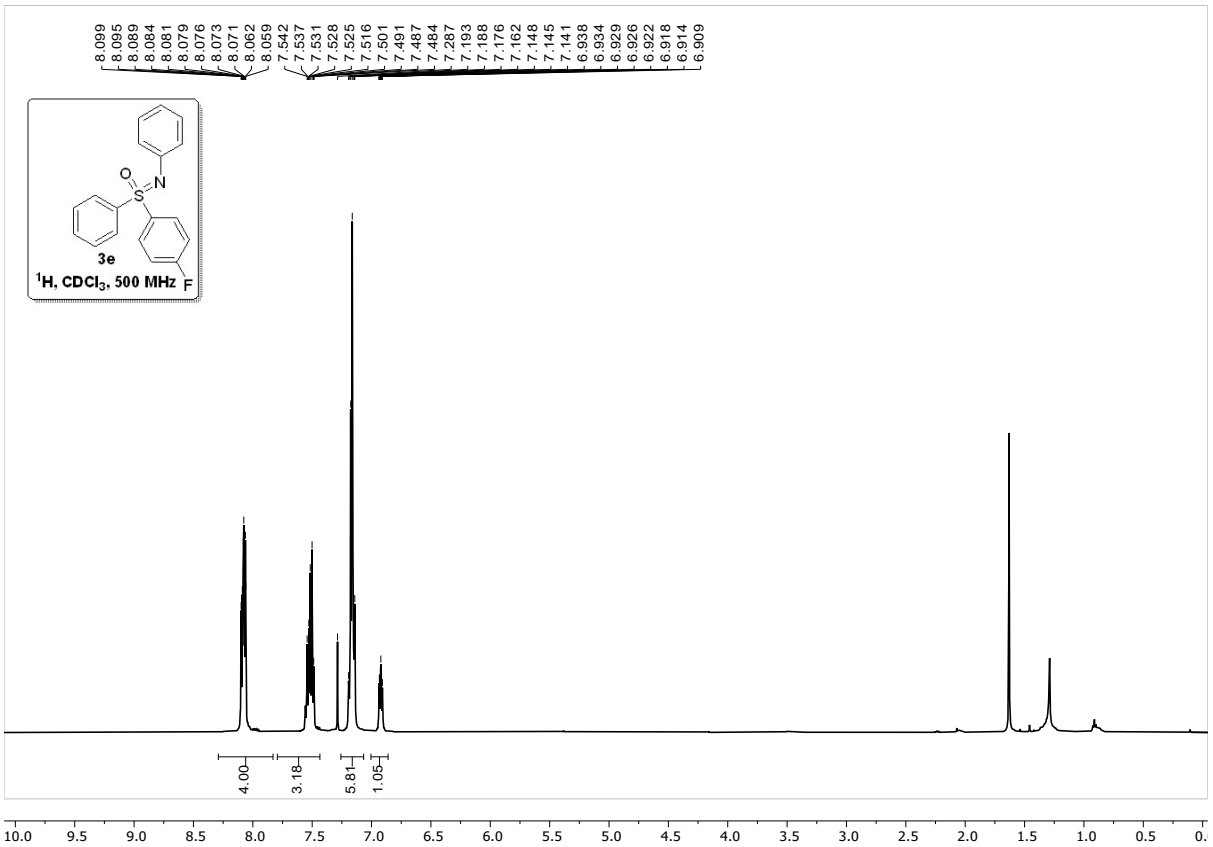

163.041
144.884
141.685
132.327
132.147
130.729
129.170
128.916
128.227
123.760
121.553
114.559
55.566
3c
13C, CDCl3,126 MHz
OMe

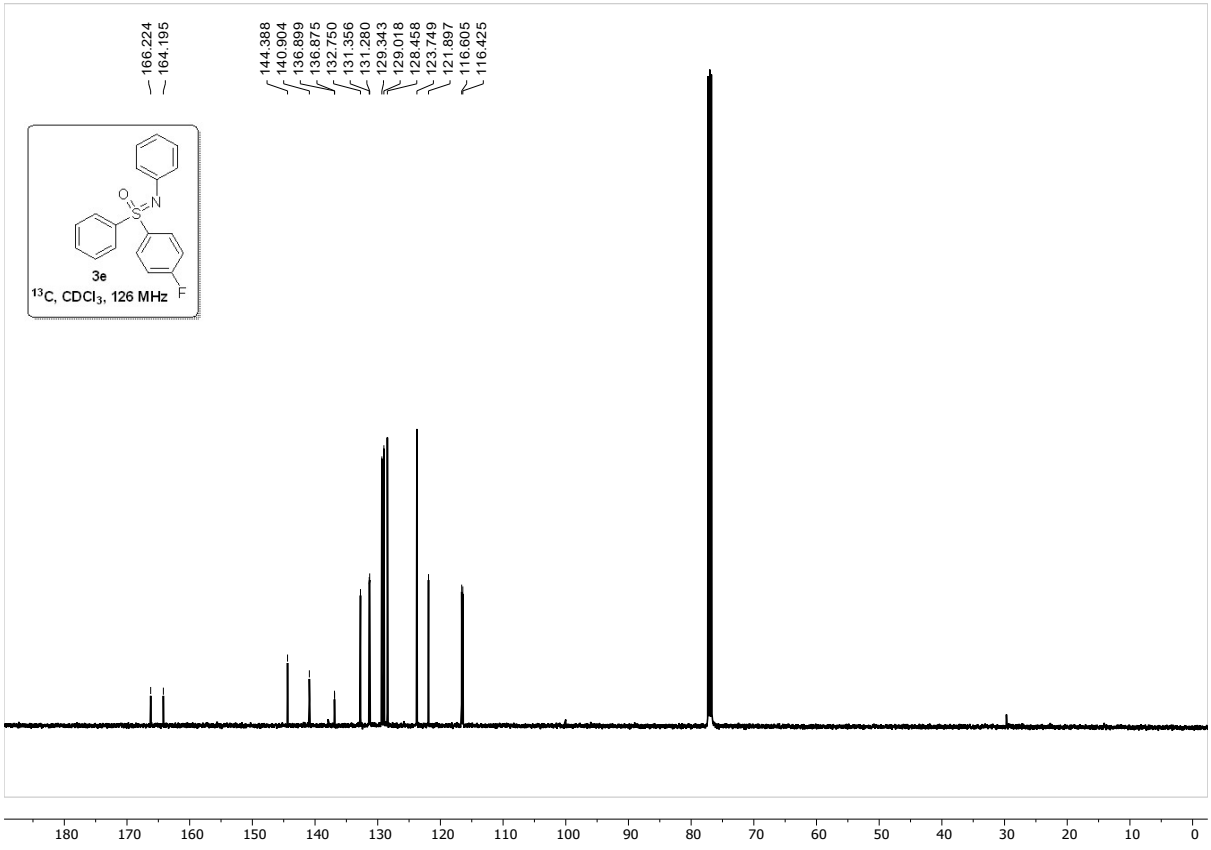

165.95
163.92
142.26
138.22
137.61
133.40
132.40
132.07
130.76
130.69
129.04
129.00
127.86
116.22
116.04
20.42
3d
13C, CDCl3
126 MHz
f1 (ppm)

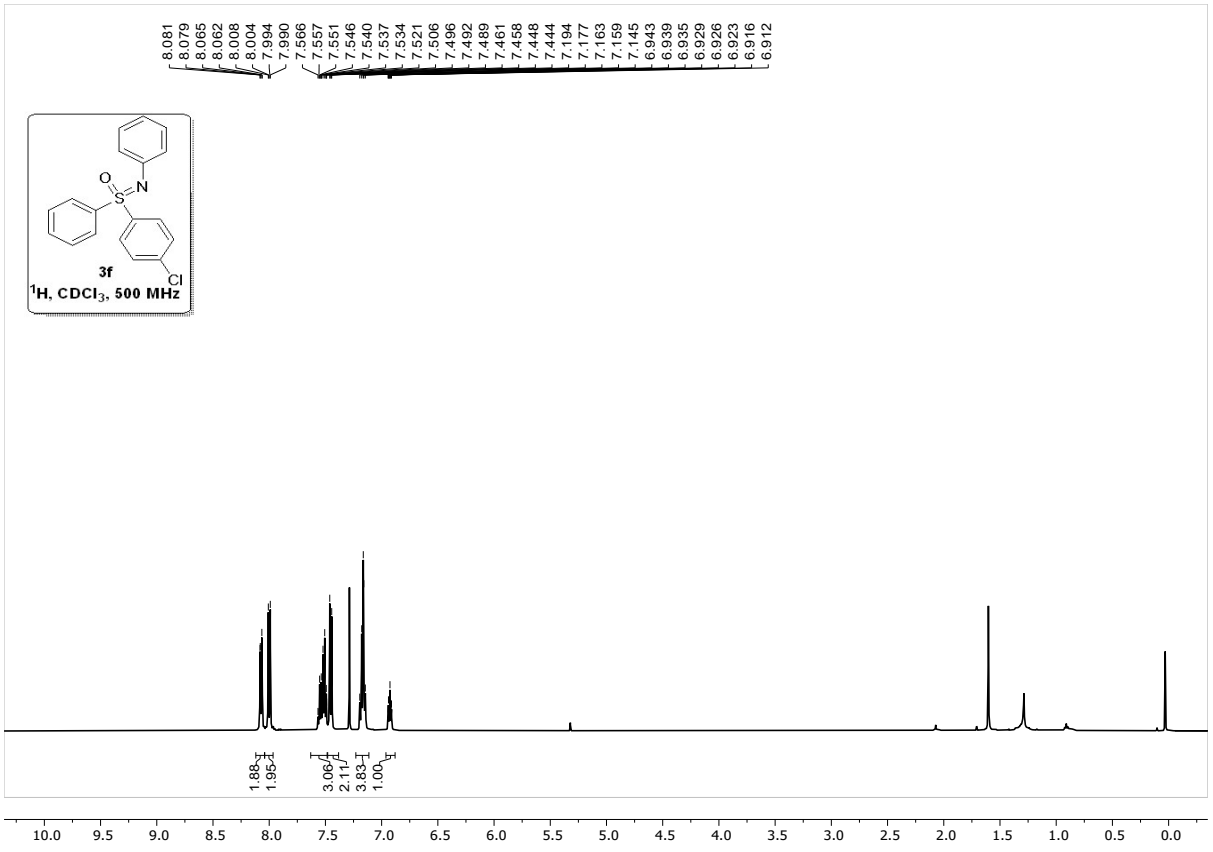

8.00
7.99
7.98
7.98
7.97
7.95
7.94
7.55
7.53
7.50
7.48
7.47
7.17
7.15
7.14
6.78
2.27
2.21
3d
1H, CDCl3, 500 MHz
3.94
1.02
1.96
1.97
1.93
6.00
2.71
f1 (ppm)

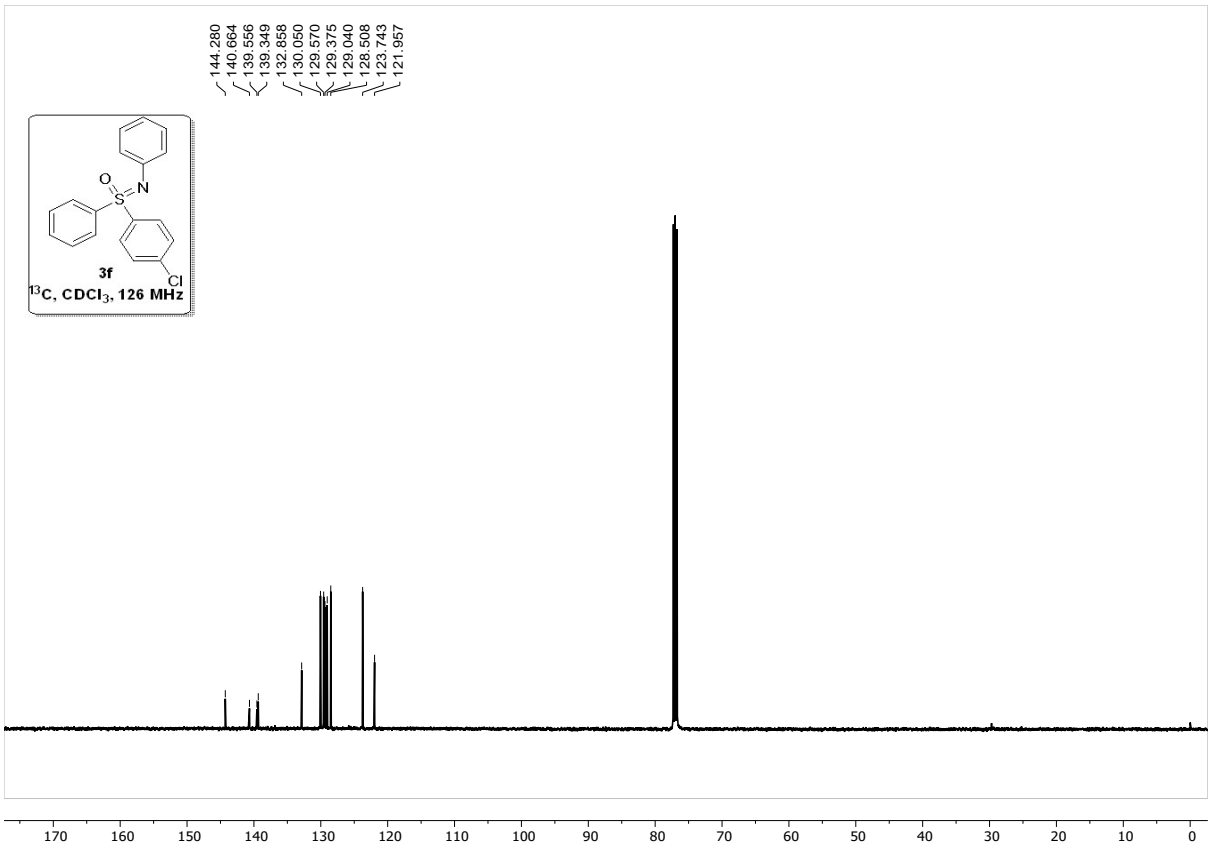

3d
^{19}F, CDCl$_3$, 471 MHz

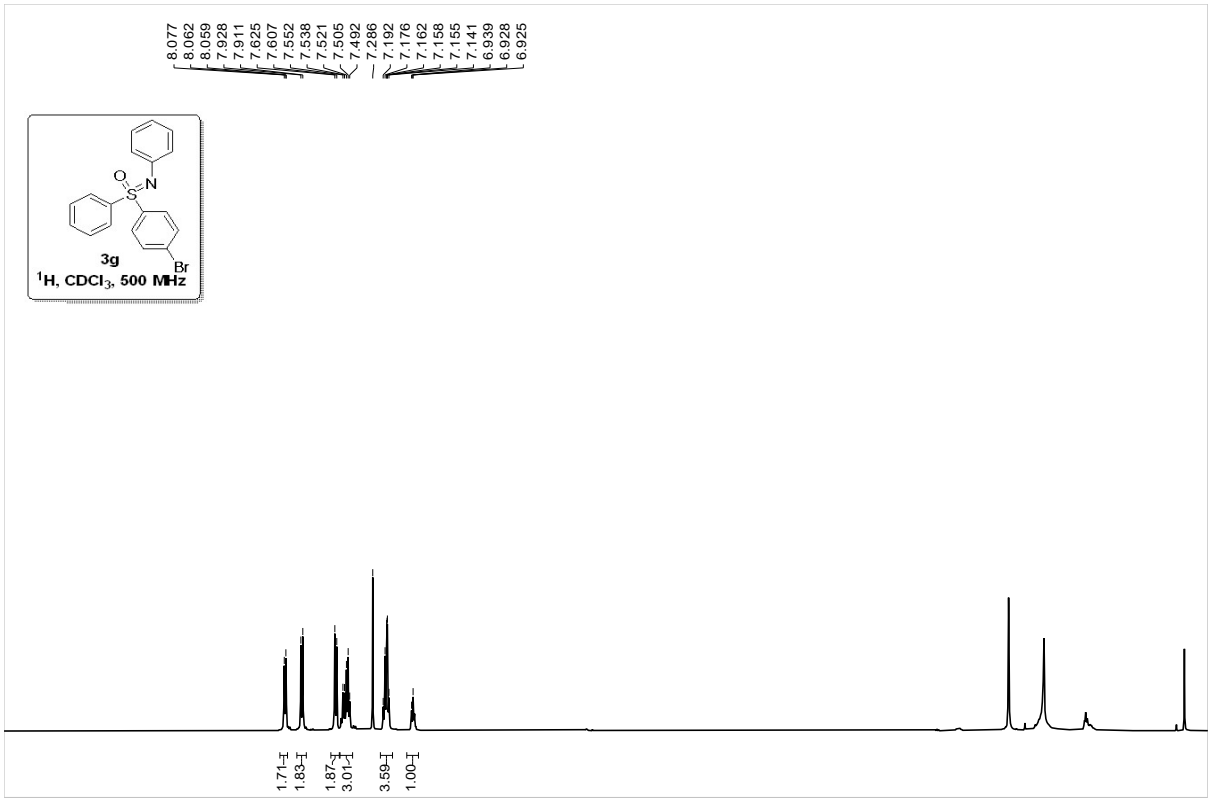
-106.03
f1 (ppm)

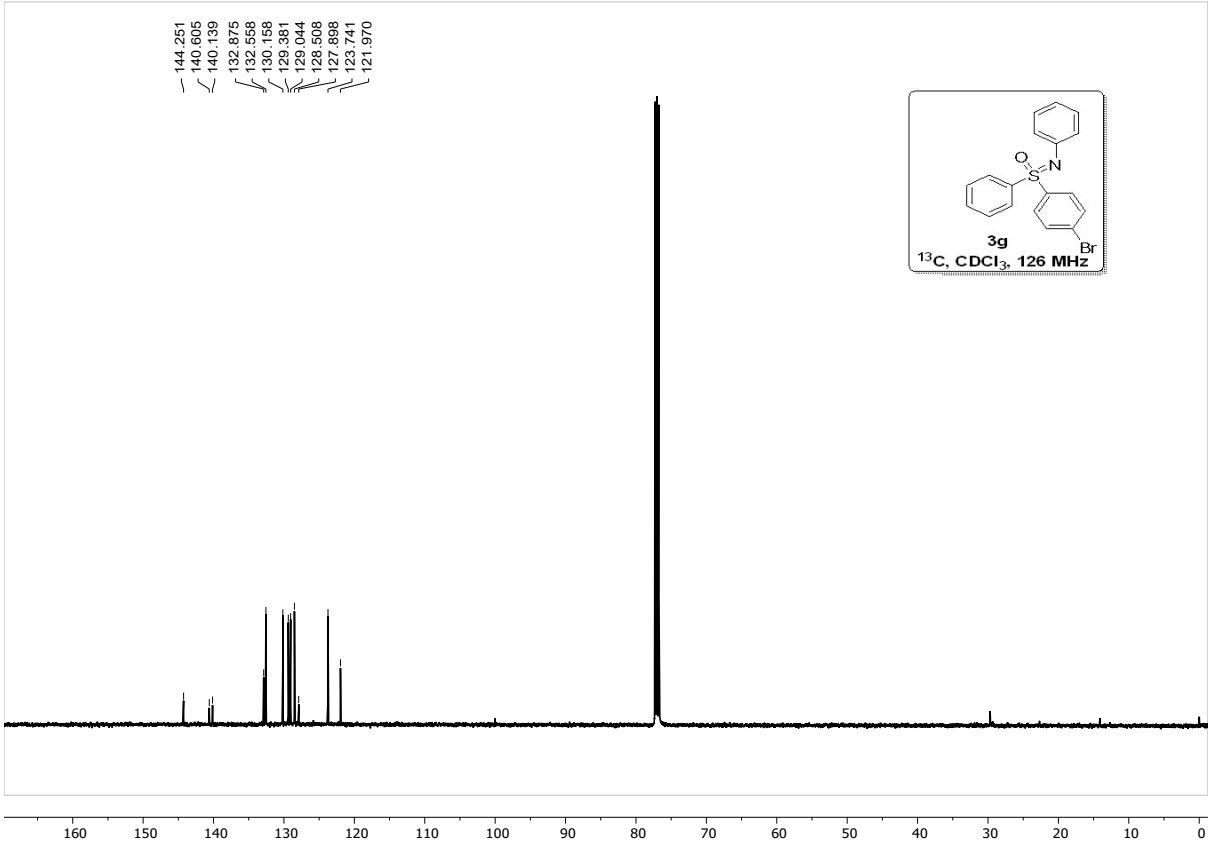

8.099
8.095
8.089
8.084
8.081
8.079
8.076
8.073
8.071
8.062
8.059
7.542
7.537
7.531
7.528
7.525
7.516
7.501
7.491
7.487
7.484
7.287
7.193
7.188
7.176
7.162
7.148
7.145
7.141
6.938
6.934
6.929
6.926
6.922
6.918
6.914
6.909
3e
^{1}H, CDCl$_3$, 500 MHz
4.00
3.18
5.81
1.05

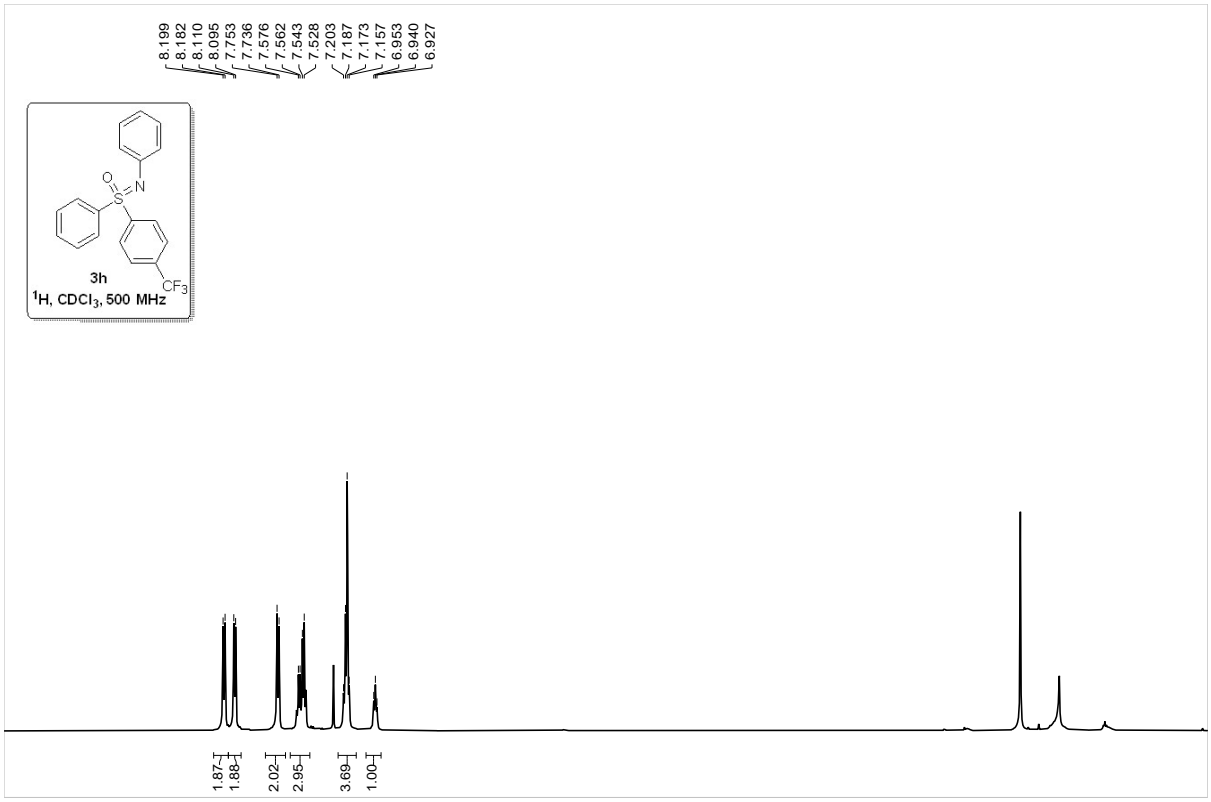

166.224
164.195
144.388
140.904
136.899
136.875
132.750
131.356
131.280
129.343
129.018
128.458
123.749
121.897
116.605
116.425
O
S
N
F
3e
^{13}C, CDCl$_3$, 126 MHz
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

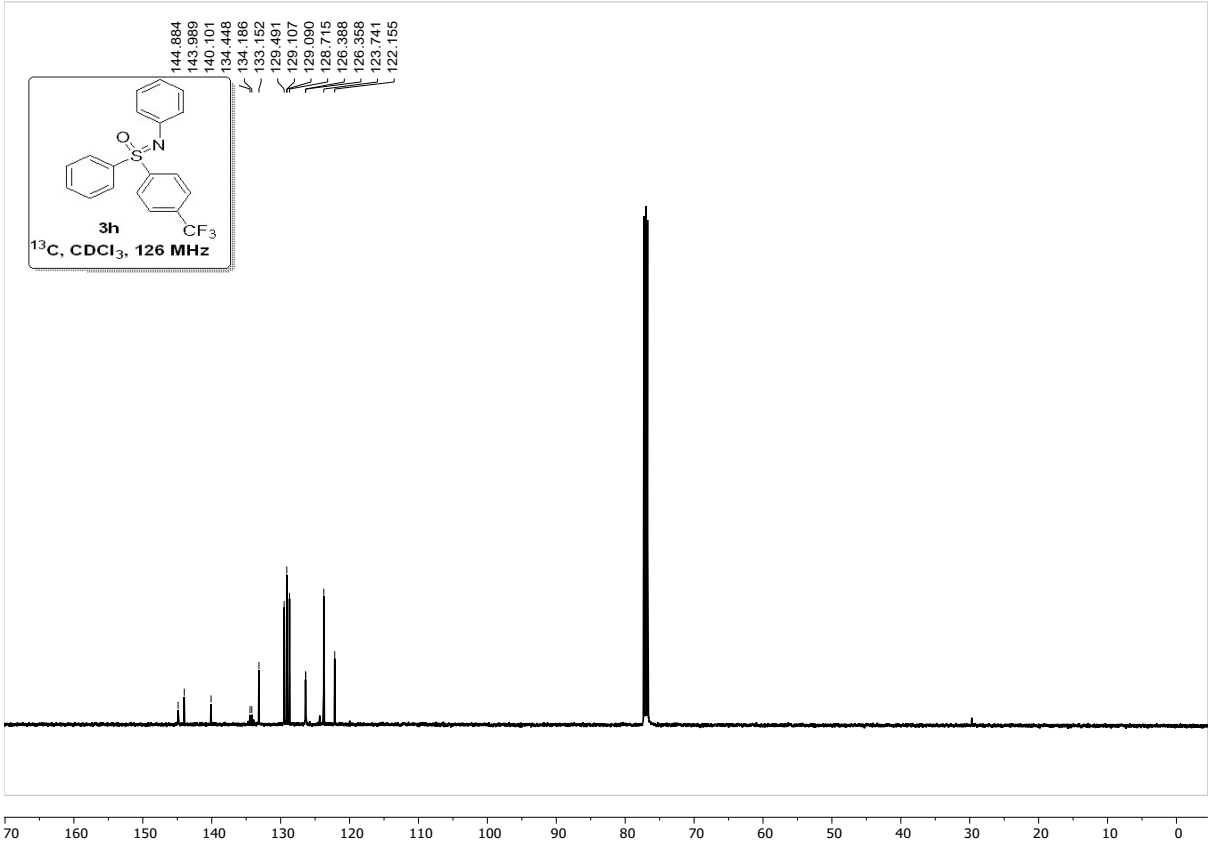

8.081
8.079
8.065
8.062
8.008
8.004
7.994
7.990
7.566
7.557
7.551
7.546
7.540
7.537
7.534
7.521
7.506
7.496
7.492
7.489
7.461
7.458
7.448
7.444
7.194
7.177
7.163
7.159
7.145
6.943
6.939
6.935
6.929
6.926
6.923
6.916
6.912
O
S
N
Cl
3f
1H, CDCl3, 500 MHz
1.88
1.95
3.06
2.11
3.83
1.00
10.0
9.5
9.0
8.5
8.0
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
0.0

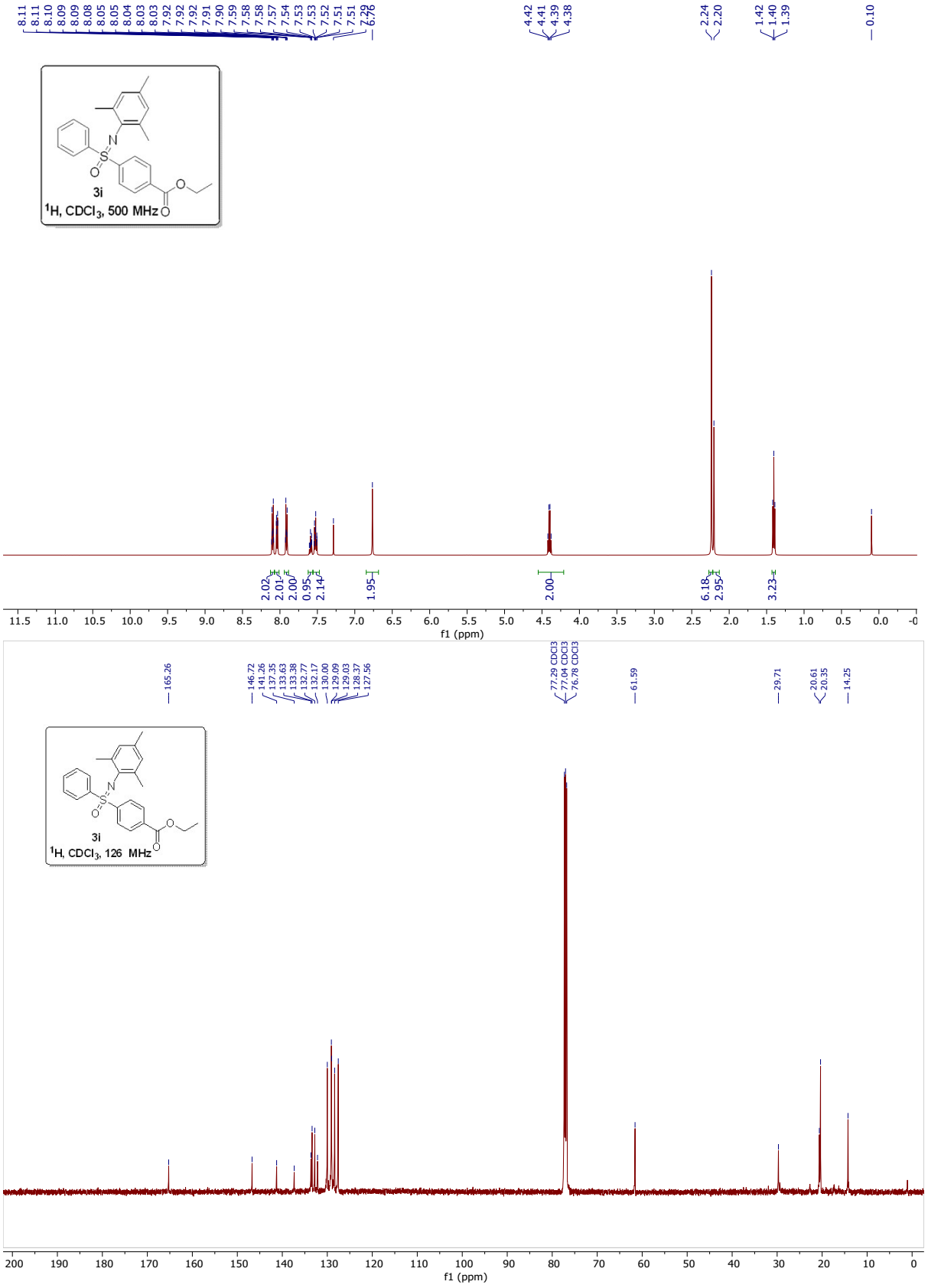

144.280
140.664
139.556
139.349
132.858
130.050
129.570
129.375
129.040
128.508
123.743
121.957
O
S
N
Cl
3f
13C, CDCl3, 126 MHz
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

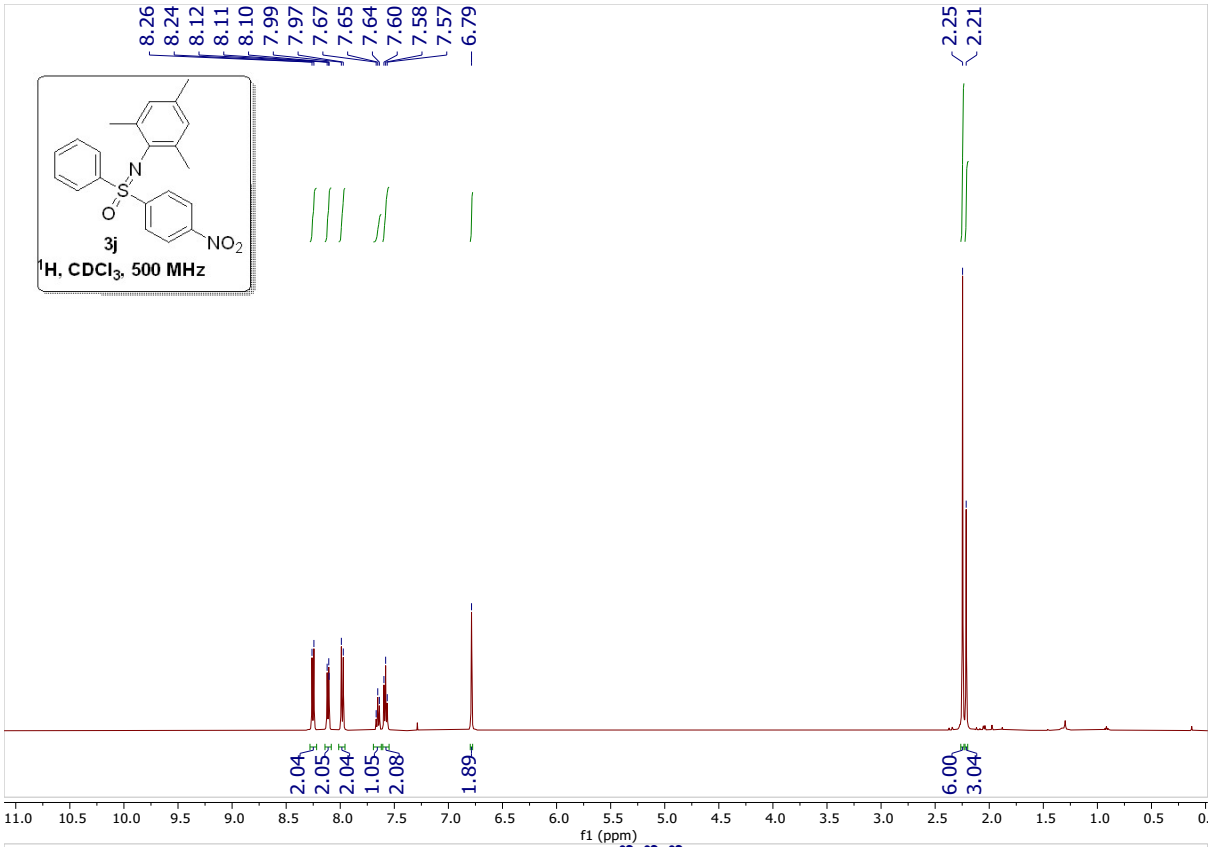

8.077
8.062
8.059
7.928
7.911
7.625
7.607
7.552
7.538
7.521
7.505
7.492
7.286
7.192
7.176
7.162
7.158
7.155
7.141
6.939
6.928
6.925
3g
1H, CDCl3, 500 MHz
Br
1.71
1.83
1.87
3.01
3.59
1.00
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

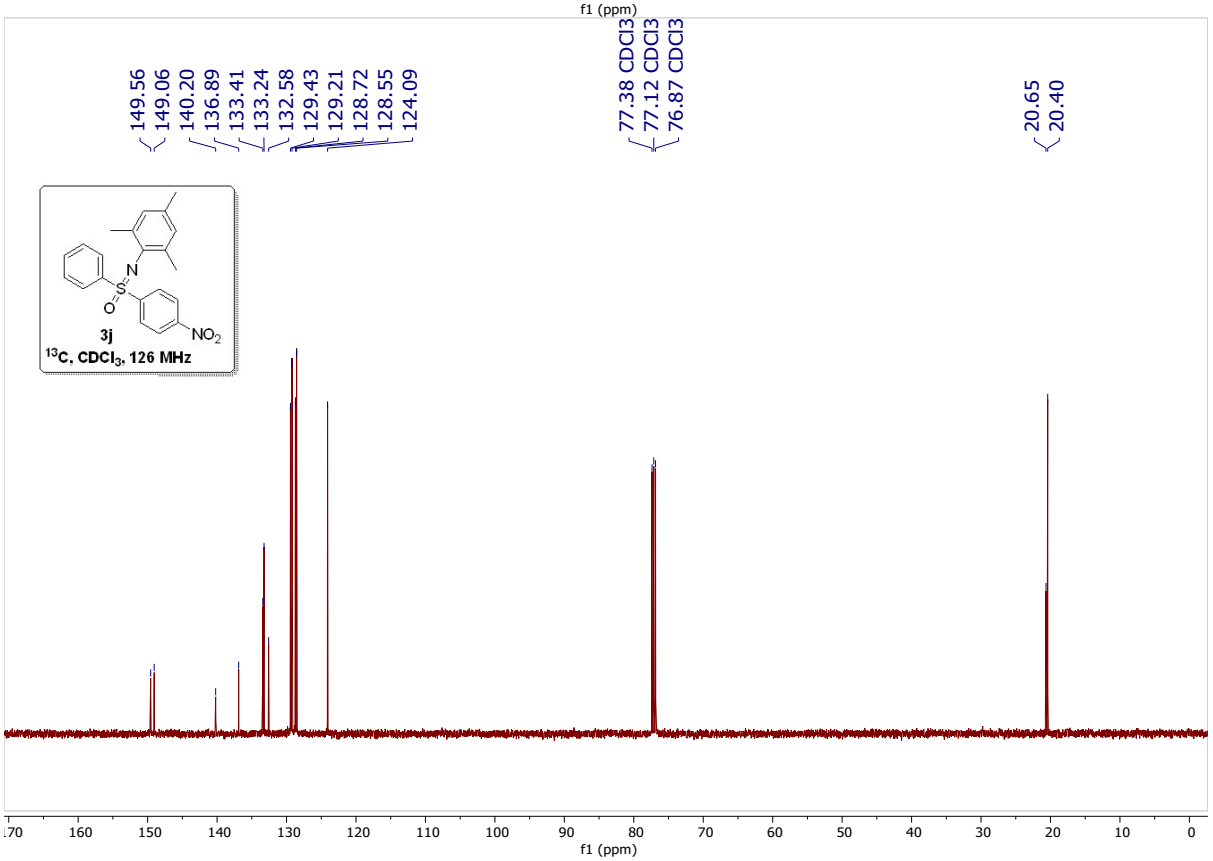

144.251
140.605
140.139
132.875
132.558
130.158
129.381
129.044
128.508
127.898
123.741
121.970
3g
13C, CDCl3, 126 MHz
Br
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

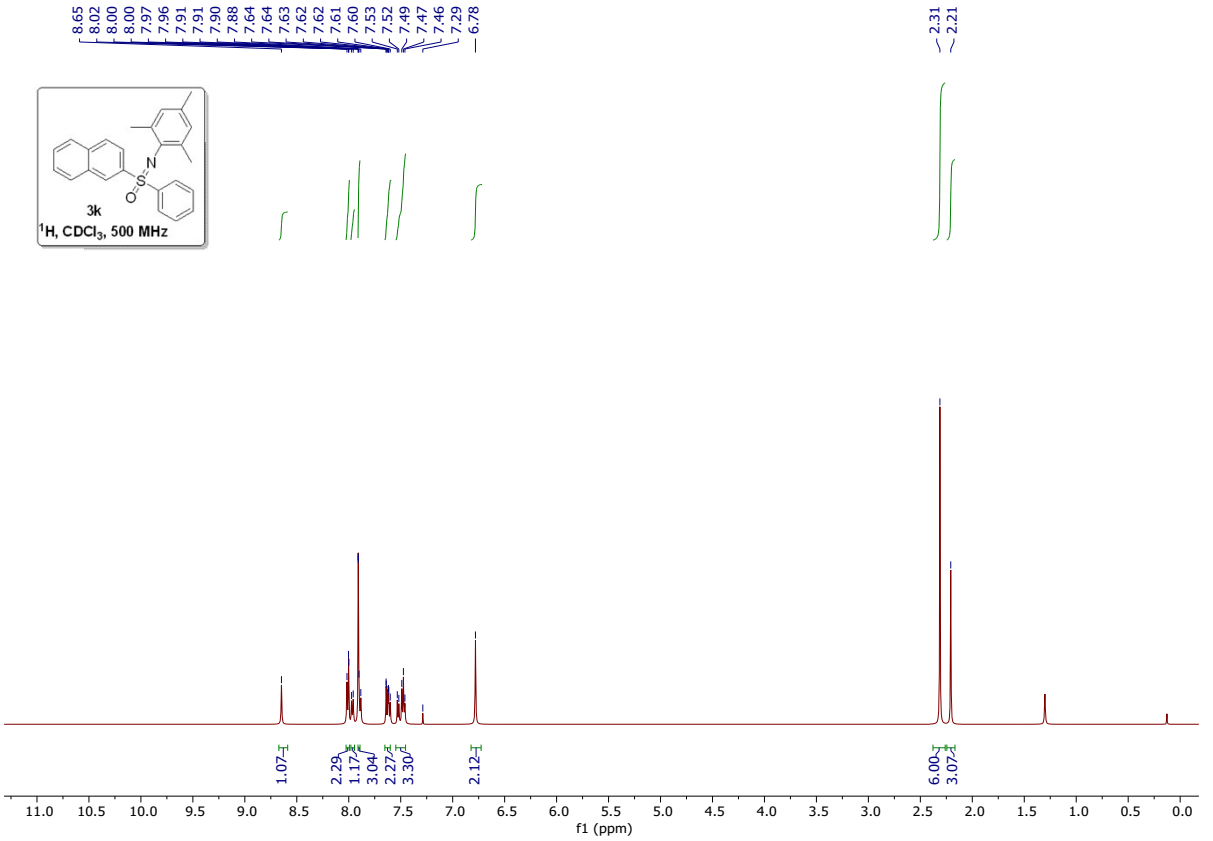

8.199
8.182
8.110
8.095
7.753
7.736
7.576
7.562
7.543
7.528
7.203
7.187
7.173
7.157
6.953
6.940
6.927
3h
^{1}H, CDCl$_3$, 500 MHz
1.87
1.88
2.02
2.95
3.69
1.00

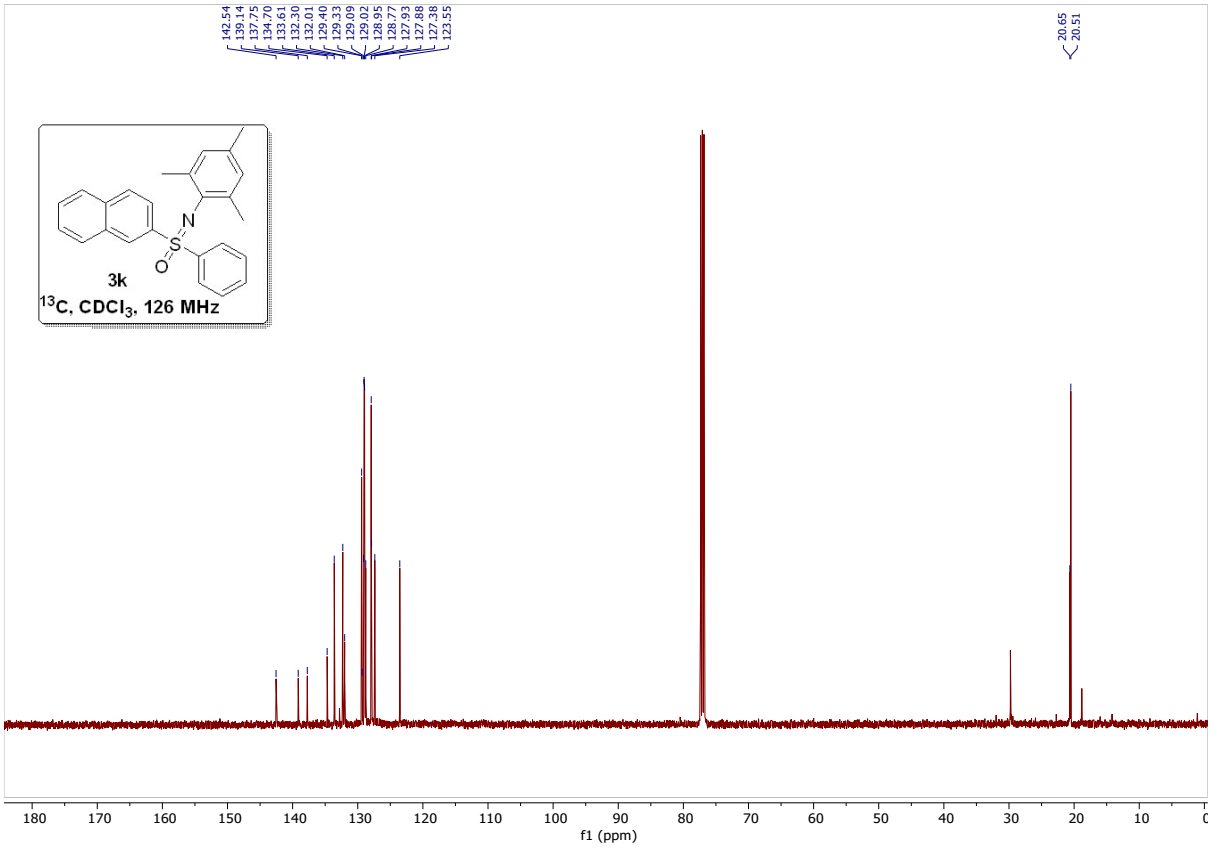

144.884
143.989
140.101
134.448
134.186
133.152
129.491
129.107
129.090
128.715
126.388
126.358
123.741
122.155
3h
^{13}C, CDCl$_3$, 126 MHz

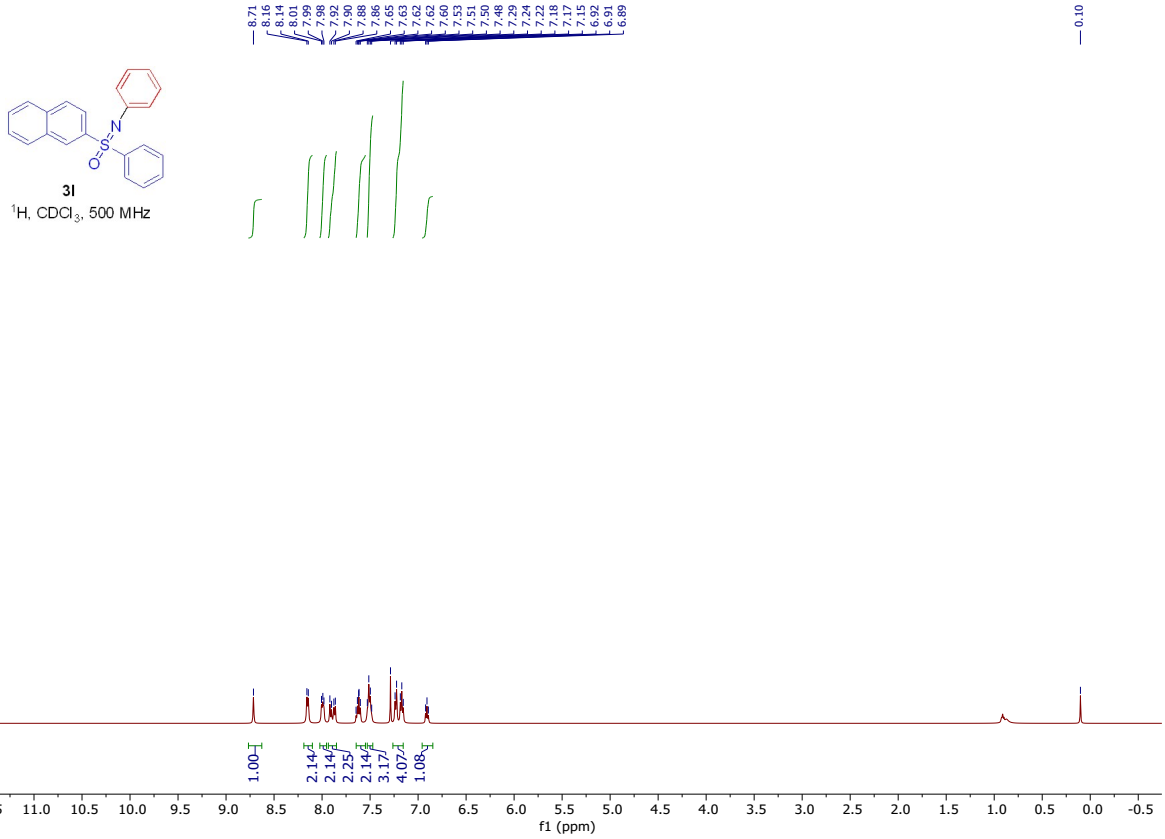

8.11
8.11
8.10
8.09
8.09
8.08
8.05
8.05
8.04
8.03
8.03
7.92
7.92
7.92
7.91
7.90
7.59
7.58
7.58
7.57
7.54
7.53
7.53
7.52
7.51
7.51
7.29
6.76
4.42
4.41
4.39
4.38
2.24
2.20
1.42
1.40
1.39
0.10
3i
1H, CDCl3, 500 MHz
2.02
2.01
2.00
0.95
2.14
1.95
2.00
6.18
2.95
3.23
f1 (ppm)
165.26
146.72
141.26
137.35
133.63
133.38
132.77
132.17
130.00
129.09
129.03
128.37
127.56
77.29 CDCl3
77.04 CDCl3
76.78 CDCl3
61.59
29.71
20.61
20.35
14.25
3i
1H, CDCl3, 126 MHz
f1 (ppm)

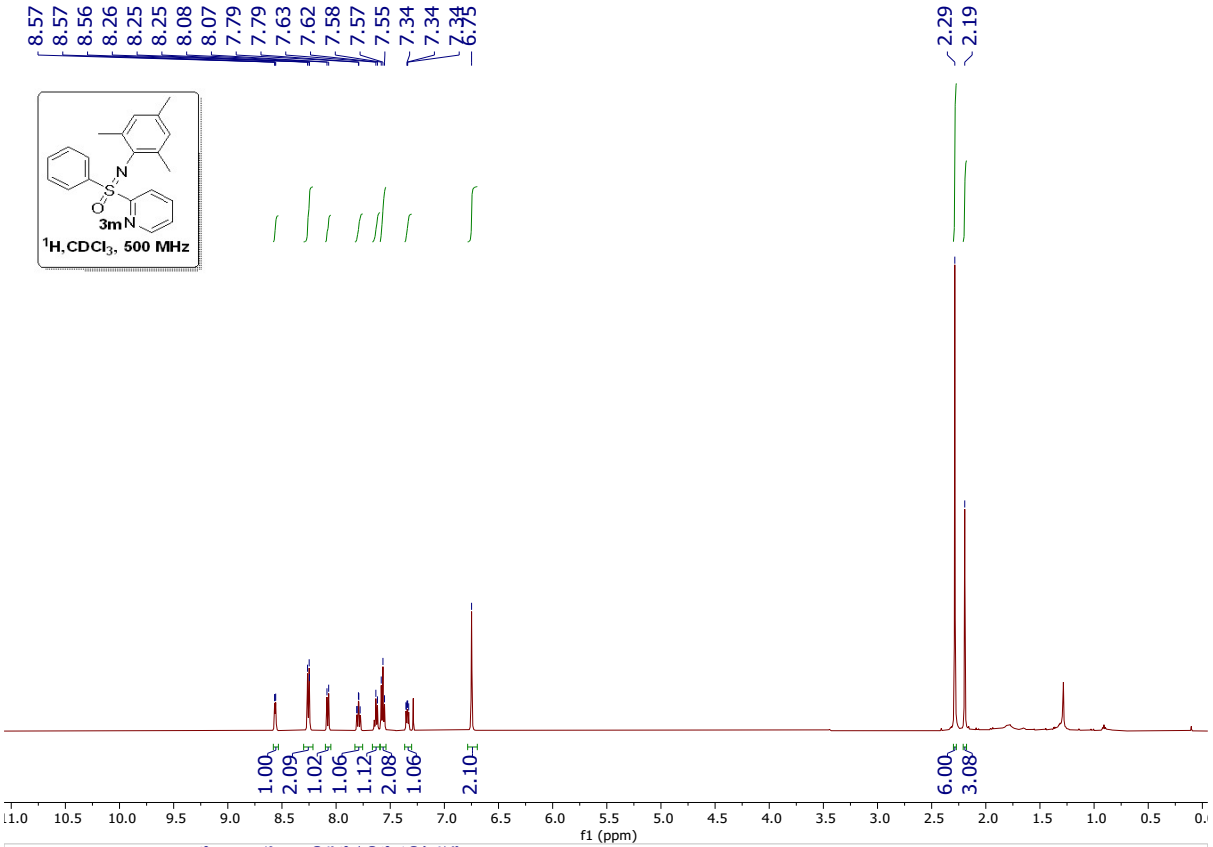

8.26
8.24
8.12
8.11
8.10
7.99
7.97
7.67
7.65
7.64
7.60
7.58
7.57
6.79
2.25
2.21
3j
1H, CDCl3, 500 MHz
2.04
2.05
2.04
1.05
2.08
1.89
6.00
3.04
f1 (ppm)

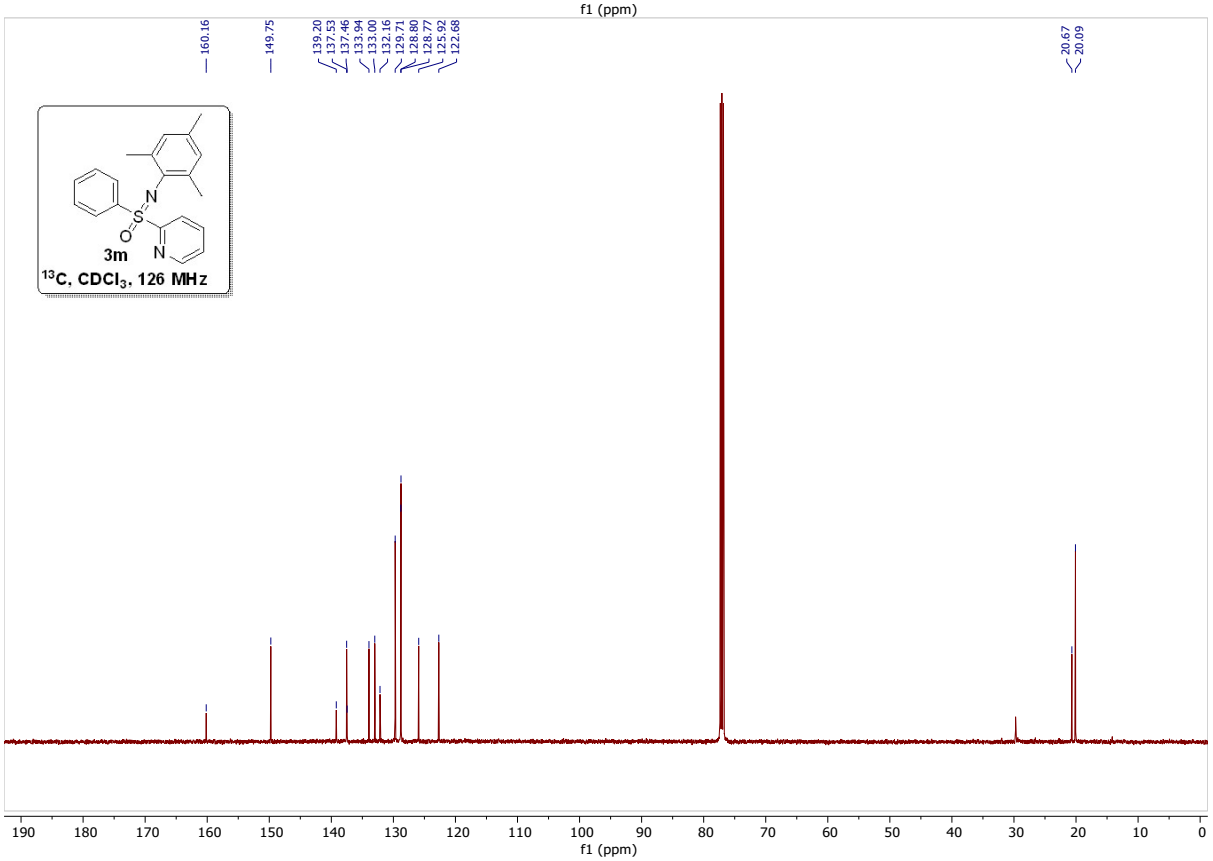

149.56
149.06
140.20
136.89
133.41
133.24
132.58
129.43
129.21
128.72
128.55
124.09
77.38 CDCl3
77.12 CDCl3
76.87 CDCl3
20.65
20.40
3j
13C, CDCl3, 126 MHz
f1 (ppm)

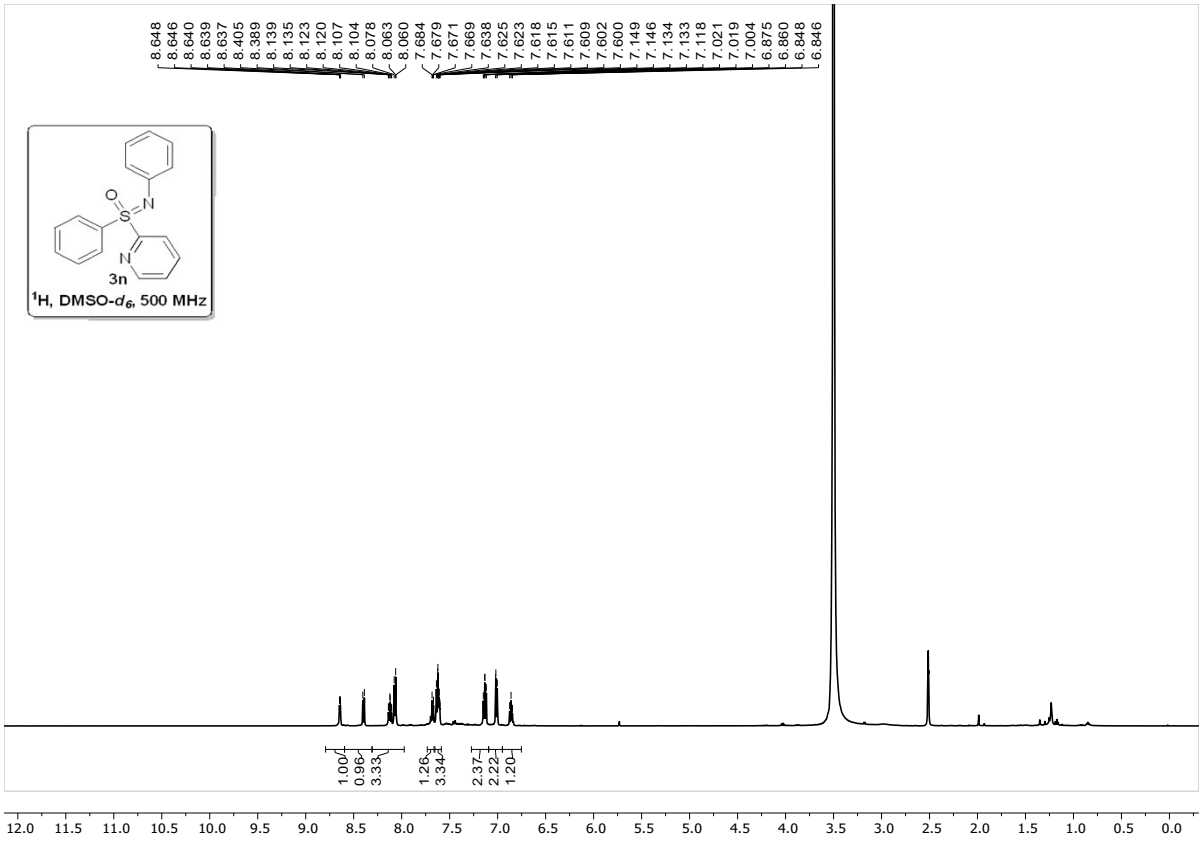

8.65
8.02
8.00
8.00
7.97
7.96
7.91
7.91
7.90
7.88
7.64
7.64
7.63
7.62
7.62
7.61
7.60
7.53
7.52
7.49
7.47
7.46
7.29
6.78
2.31
2.21
3k
1H, CDCl3, 500 MHz
1.07
2.29
1.17
3.04
2.27
3.30
2.12
6.00
3.07
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

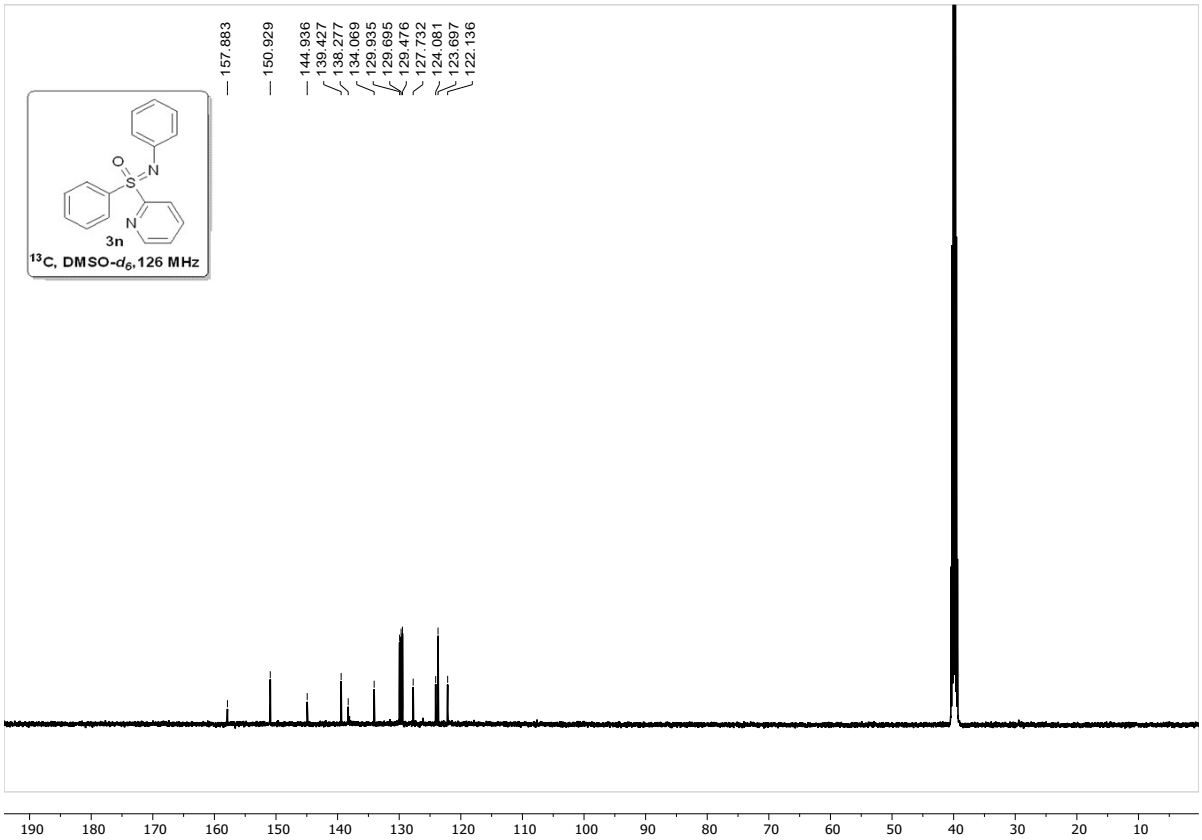

142.54
139.14
137.75
134.70
133.61
132.30
132.01
129.40
129.33
129.09
129.02
128.95
128.77
127.93
127.88
127.38
123.55
20.65
20.51
3k
13C, CDCl3, 126 MHz
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

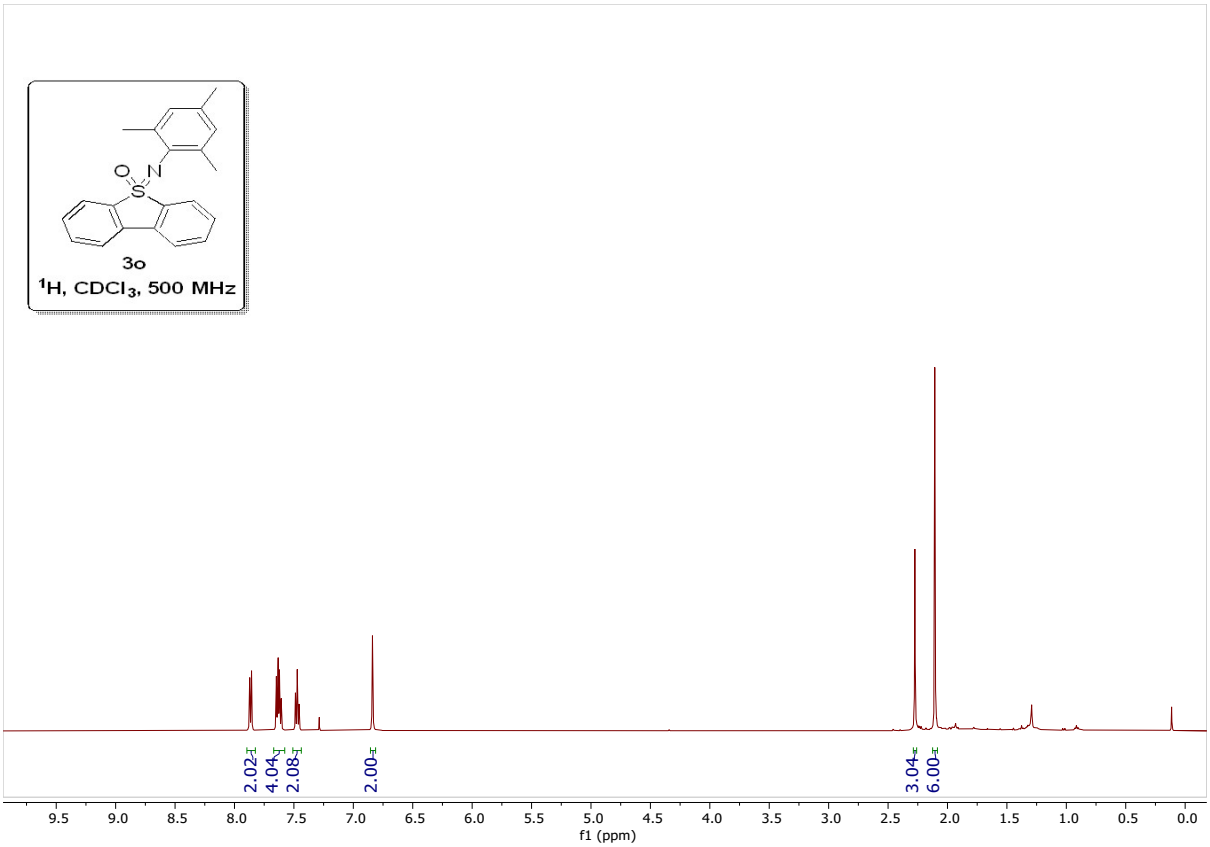

8.71
8.16
8.14
8.01
7.99
7.98
7.92
7.90
7.88
7.86
7.65
7.63
7.62
7.62
7.60
7.53
7.51
7.50
7.48
7.29
7.24
7.22
7.18
7.17
7.15
6.92
6.91
6.89
0.10
3l
1H, CDCl3, 500 MHz
1.00
2.14
2.14
2.25
2.14
3.17
4.07
1.08
11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)

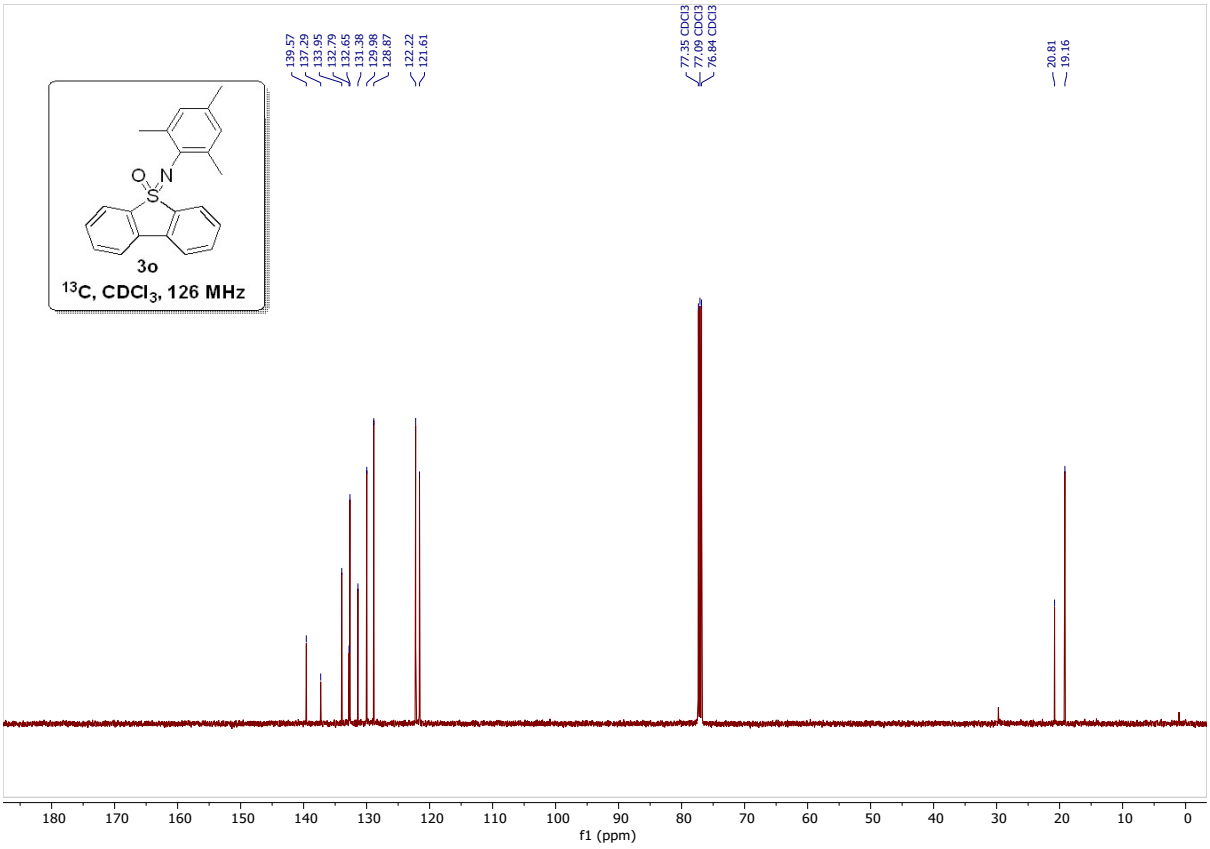

8.57
8.57
8.56
8.26
8.25
8.25
8.08
8.07
7.79
7.79
7.63
7.62
7.58
7.57
7.55
7.34
7.34
7.34
6.75
2.29
2.19
3m
^{1}H, CDCl$_3$, 500 MHz
1.00
2.09
1.02
1.06
1.12
2.08
1.06
2.10
6.00
3.08
f1 (ppm)

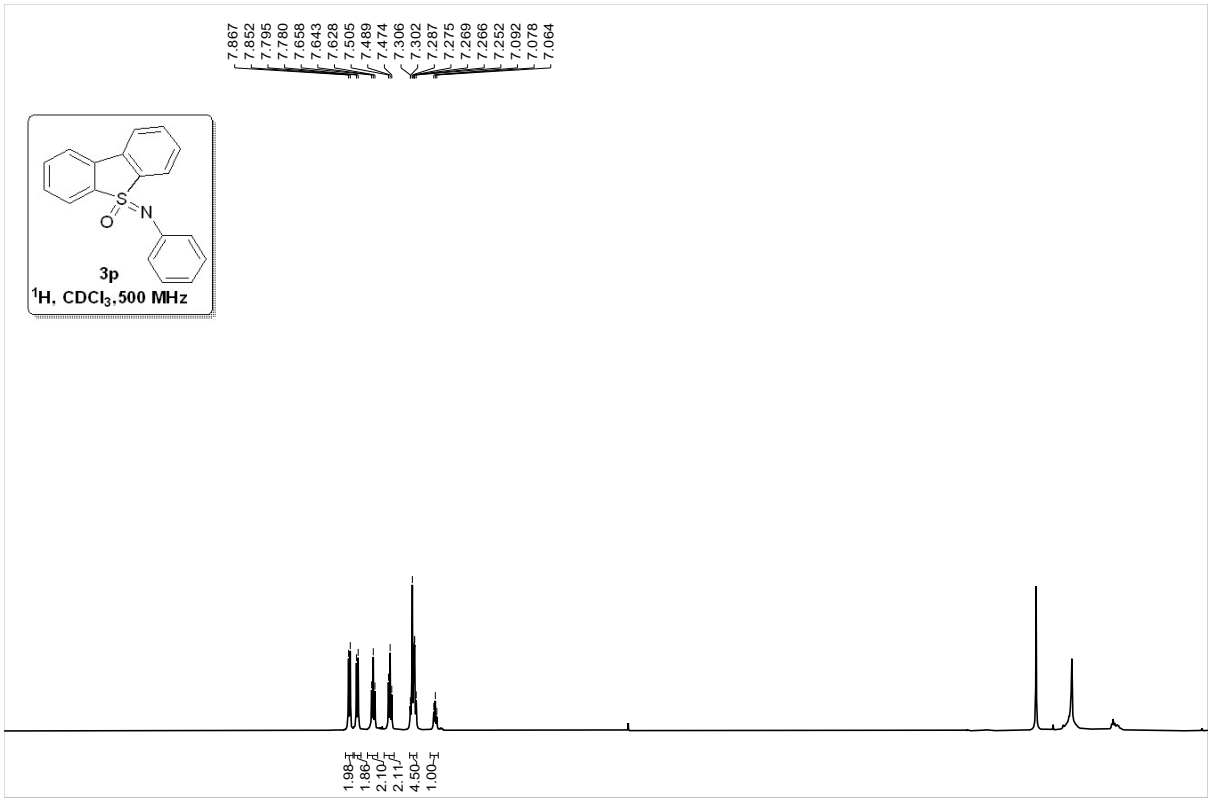

160.16
149.75
139.20
137.53
137.46
133.94
133.00
132.16
129.71
128.80
128.77
125.92
122.68
20.67
20.09
3m
^{13}C, CDCl$_3$, 126 MHz
f1 (ppm)

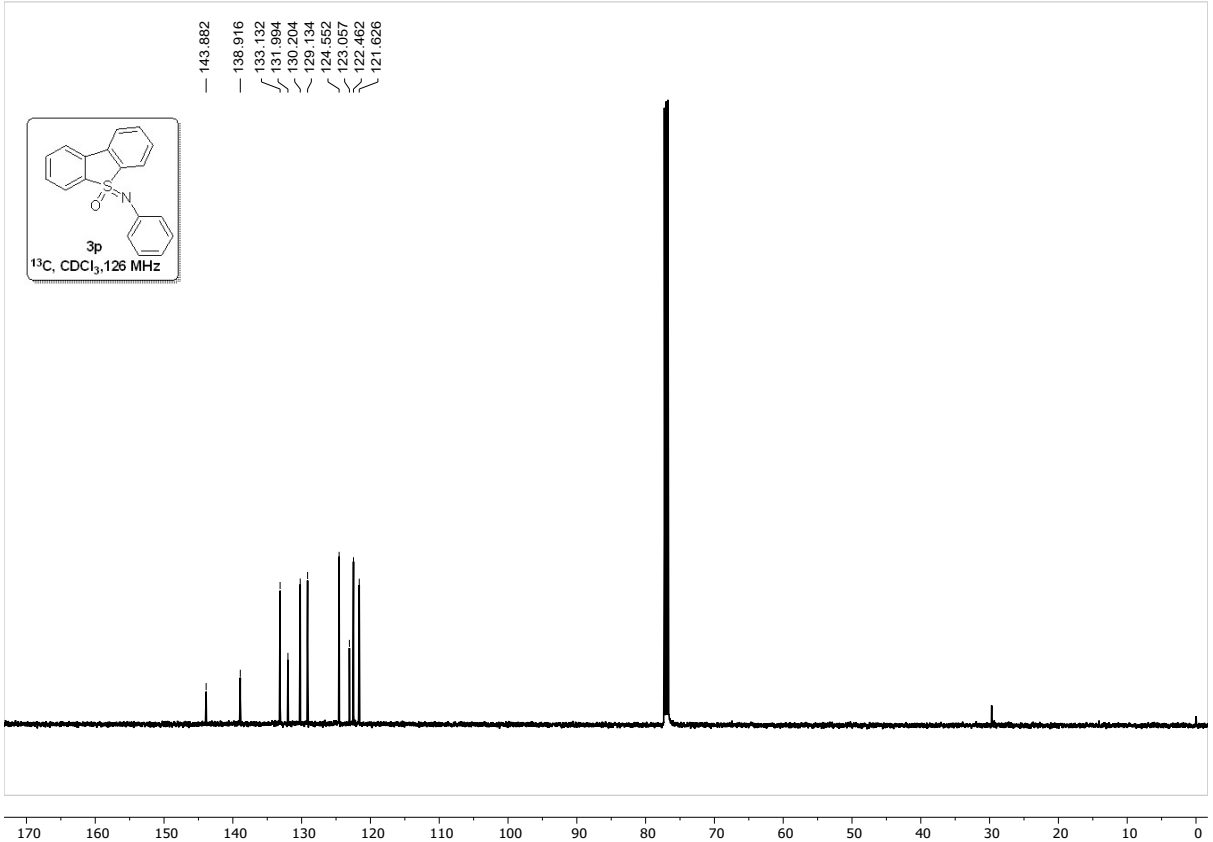

8.648
8.646
8.640
8.639
8.637
8.405
8.389
8.139
8.135
8.123
8.120
8.107
8.104
8.078
8.063
8.060
7.684
7.679
7.671
7.669
7.638
7.625
7.623
7.618
7.615
7.611
7.609
7.602
7.600
7.149
7.146
7.134
7.133
7.118
7.021
7.019
7.004
6.875
6.860
6.848
6.846
3n
^{1}H, DMSO-d_6, 500 MHz
1.00
0.96
3.33
1.26
3.34
2.37
2.22
1.20
12.0 11.5 11.0 10.5 10.0 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 0.0

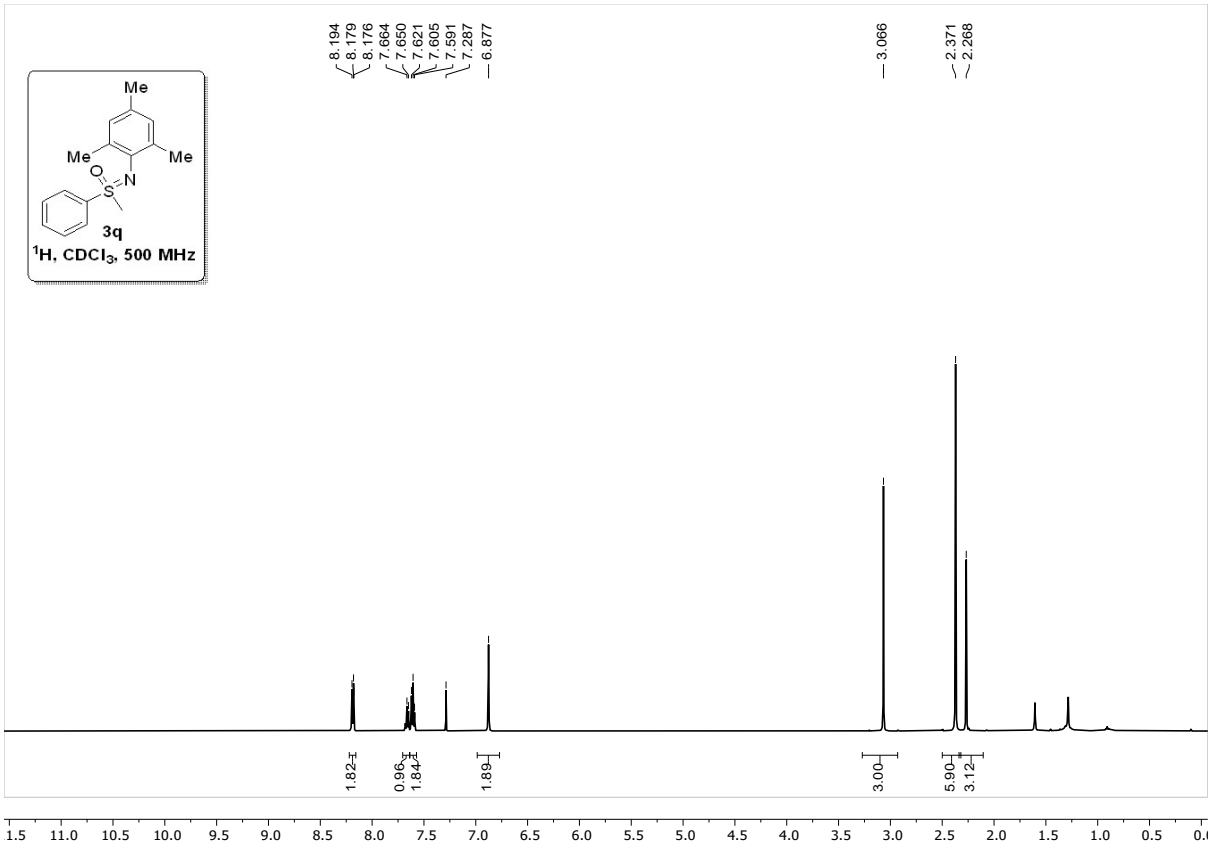

157.883
150.929
144.936
139.427
138.277
134.069
129.935
129.695
129.476
127.732
124.081
123.697
122.136
3n
^{13}C, DMSO-d_6,126 MHz
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10

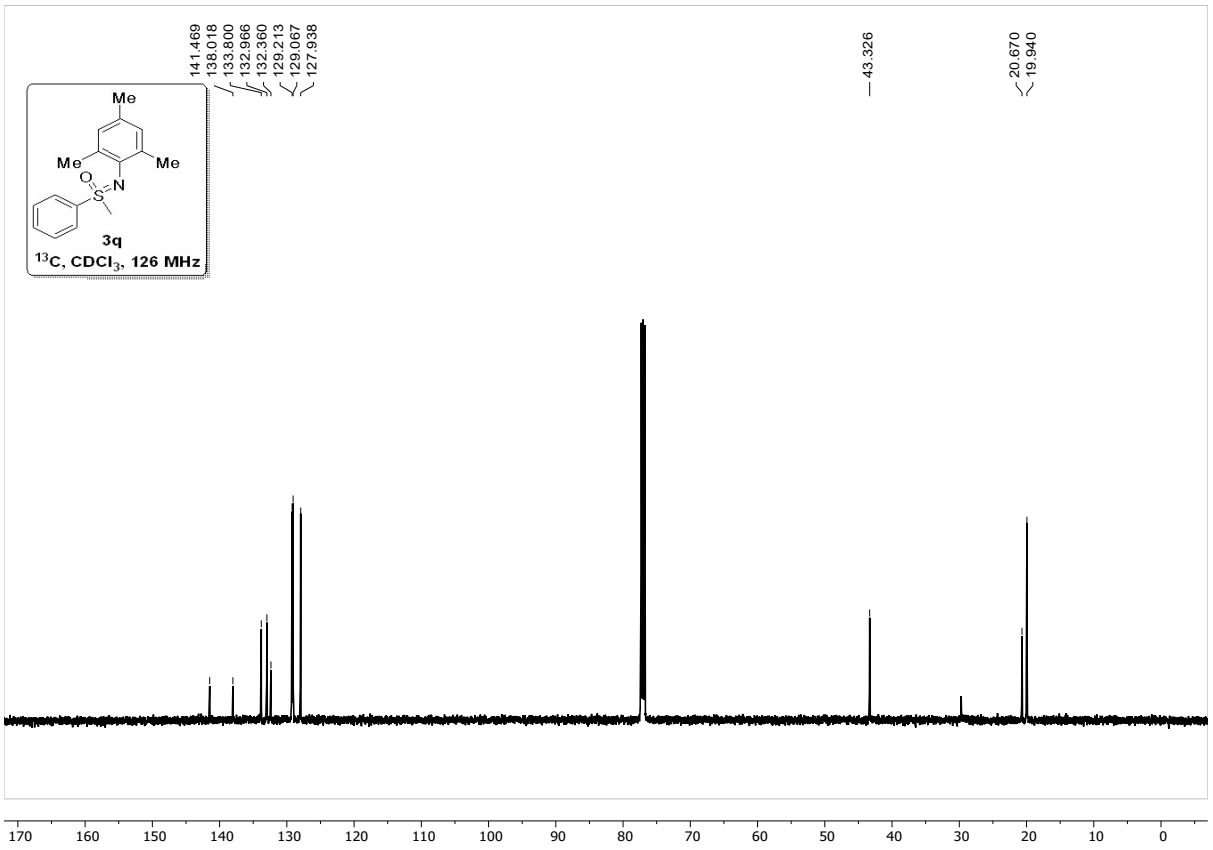

3o
^{1}H, CDCl$_3$, 500 MHz
2.02
4.04
2.08
2.00
3.04
6.00
f1 (ppm)

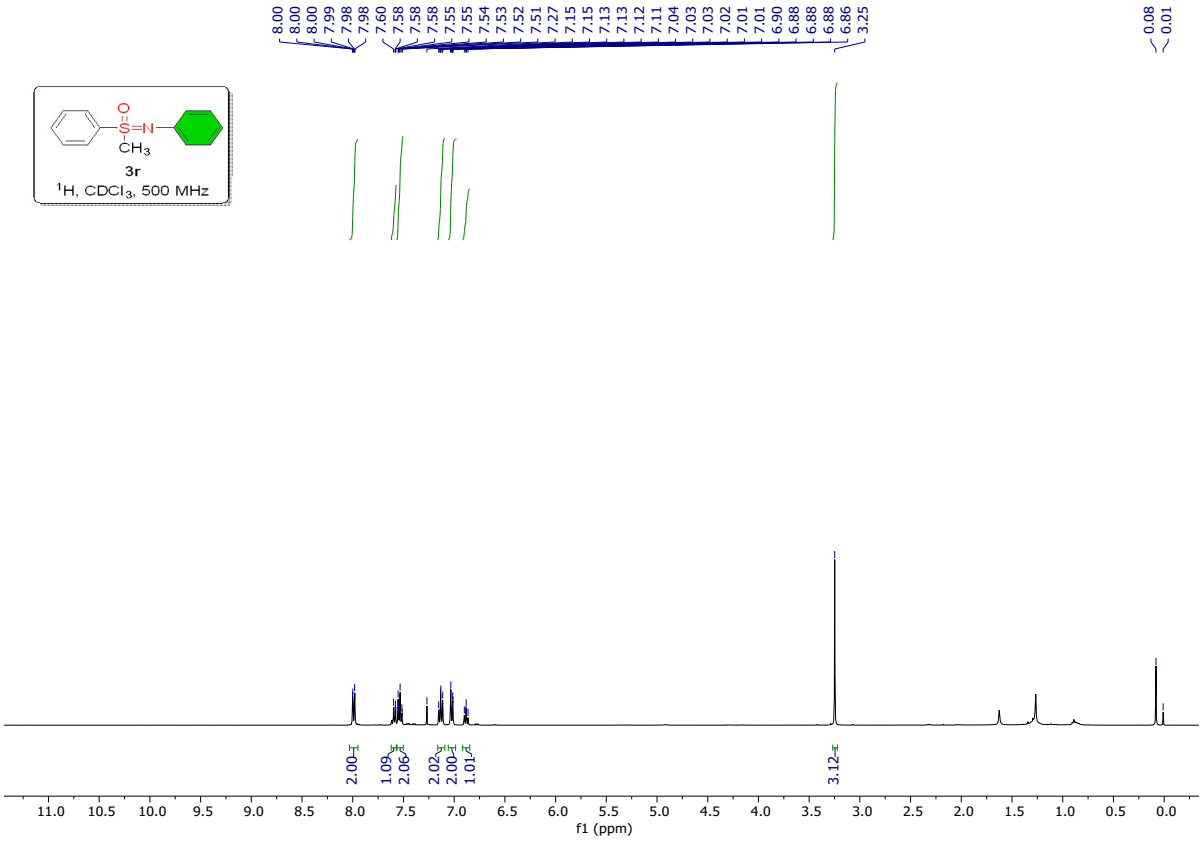

3o
^{13}C, CDCl$_3$, 126 MHz
139.57
137.29
133.95
132.79
132.65
131.38
129.98
128.87
122.22
121.61
77.35 CDCl3
77.09 CDCl3
76.84 CDCl3
20.81
19.16
f1 (ppm)

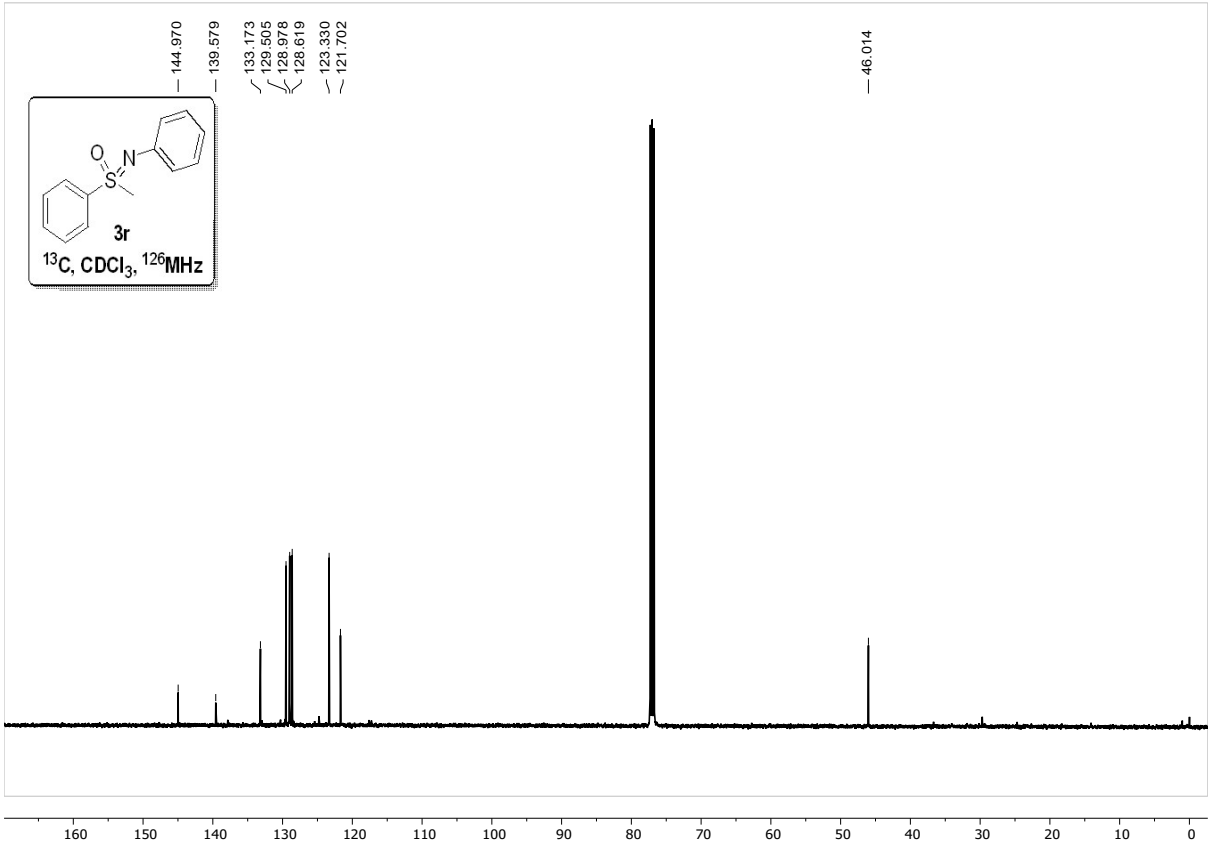

7.867
7.852
7.795
7.780
7.658
7.643
7.628
7.505
7.489
7.474
7.306
7.302
7.287
7.275
7.269
7.266
7.252
7.092
7.078
7.064
3p
1H, CDCl3,500 MHz
1.98
1.86
2.10
2.11
4.50
1.00
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5

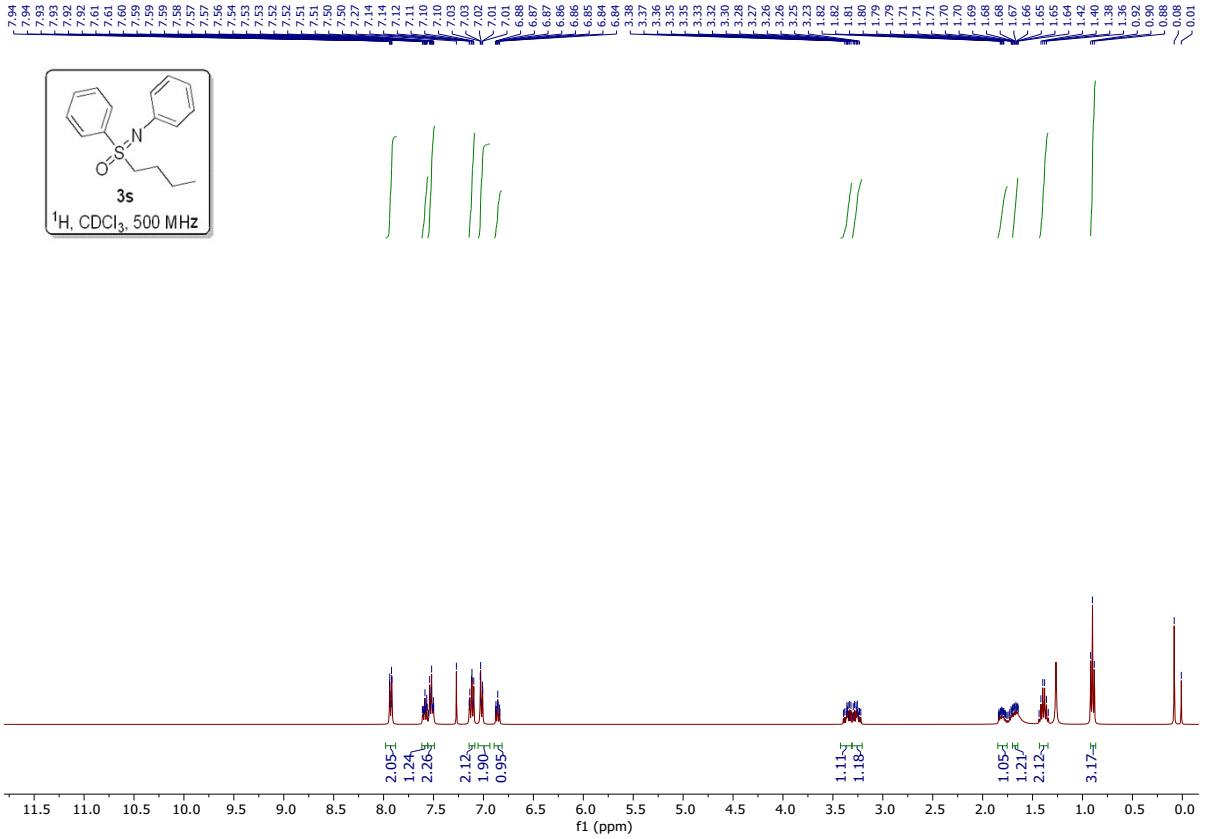

143.882
138.916
133.132
131.994
130.204
129.134
124.552
123.057
122.462
121.626
3p
13C, CDCl3,126 MHz
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

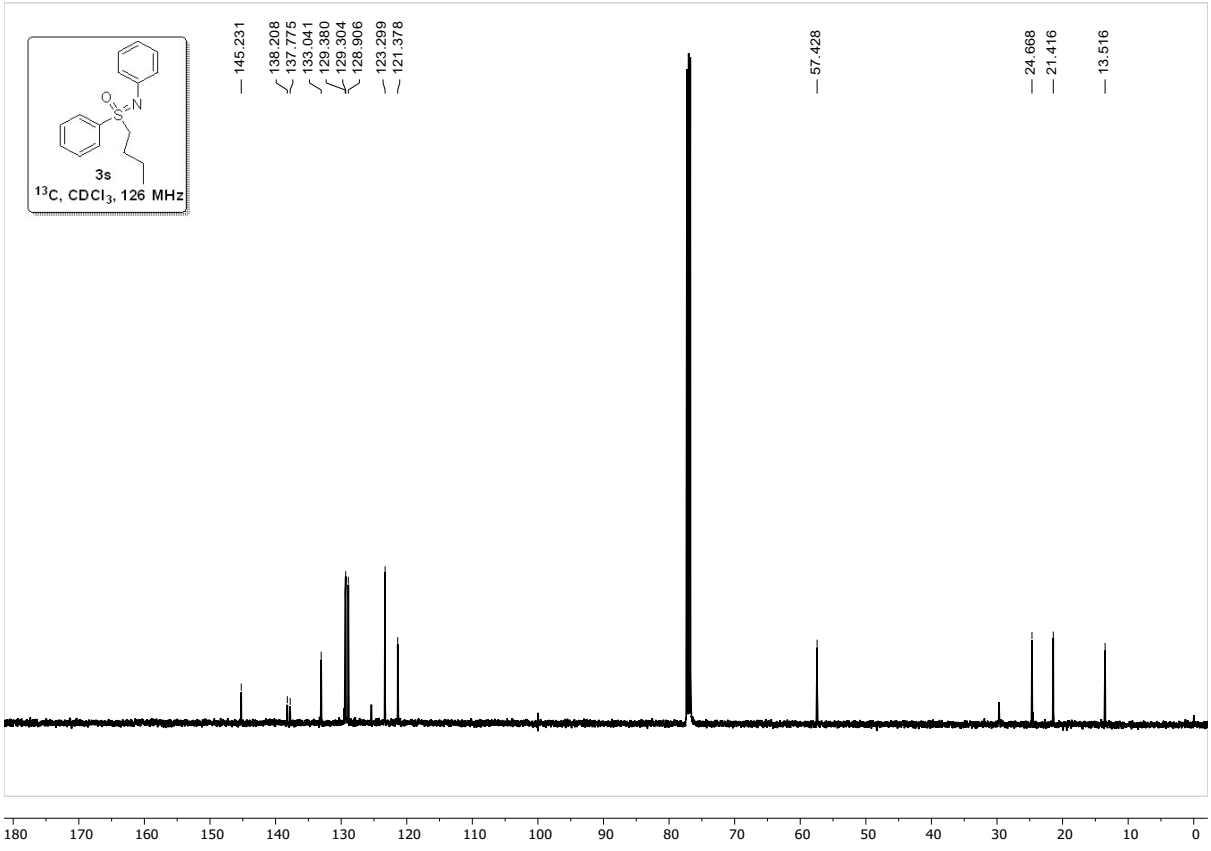

8.194
8.179
8.176
7.664
7.650
7.621
7.605
7.591
7.287
6.877
3.066
2.371
2.268
Me
Me
Me
O
S
N
3q
^{1}H, CDCl$_3$, 500 MHz
1.82
0.96
1.84
1.89
3.00
5.90
3.12

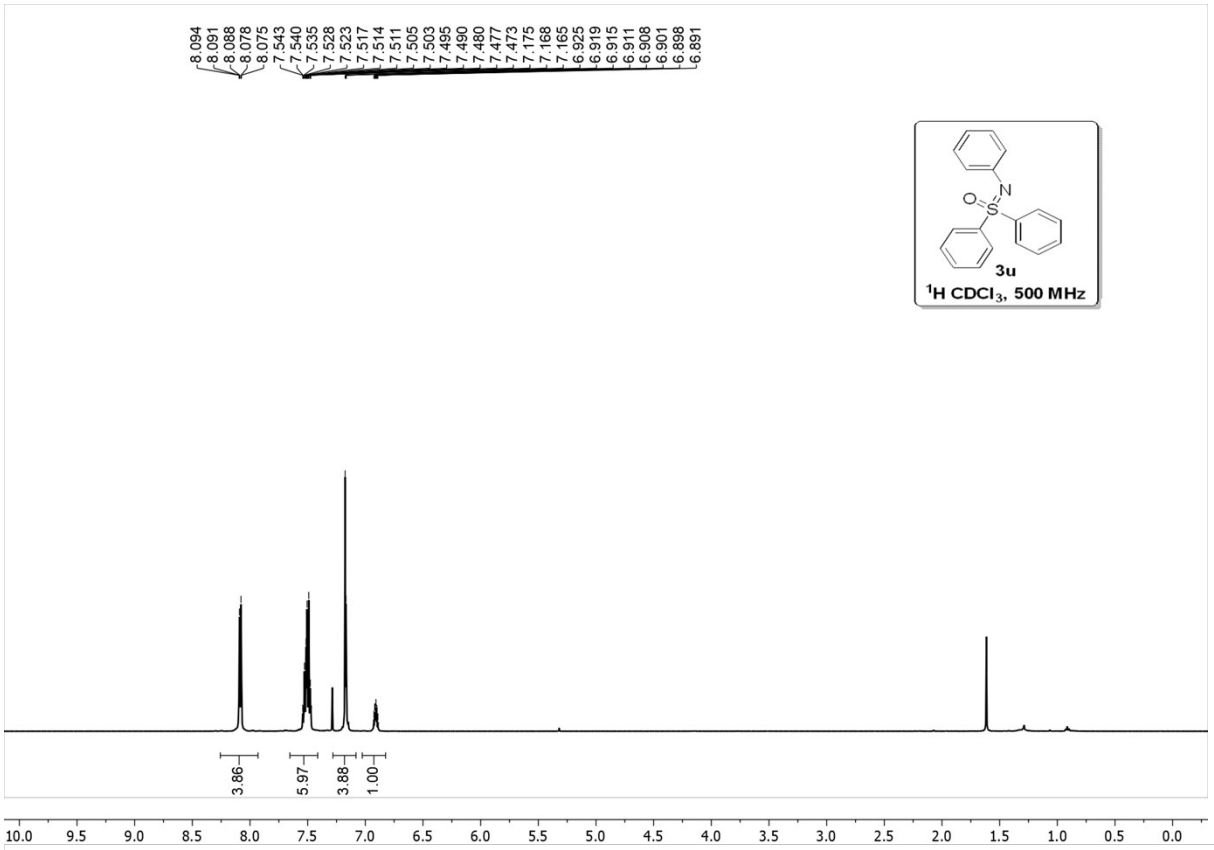

141.469
138.018
133.800
132.966
132.360
129.213
129.067
127.938
43.326
20.670
19.940
Me
Me
Me
O
S
N
3q
^{13}C, CDCl$_3$, 126 MHz

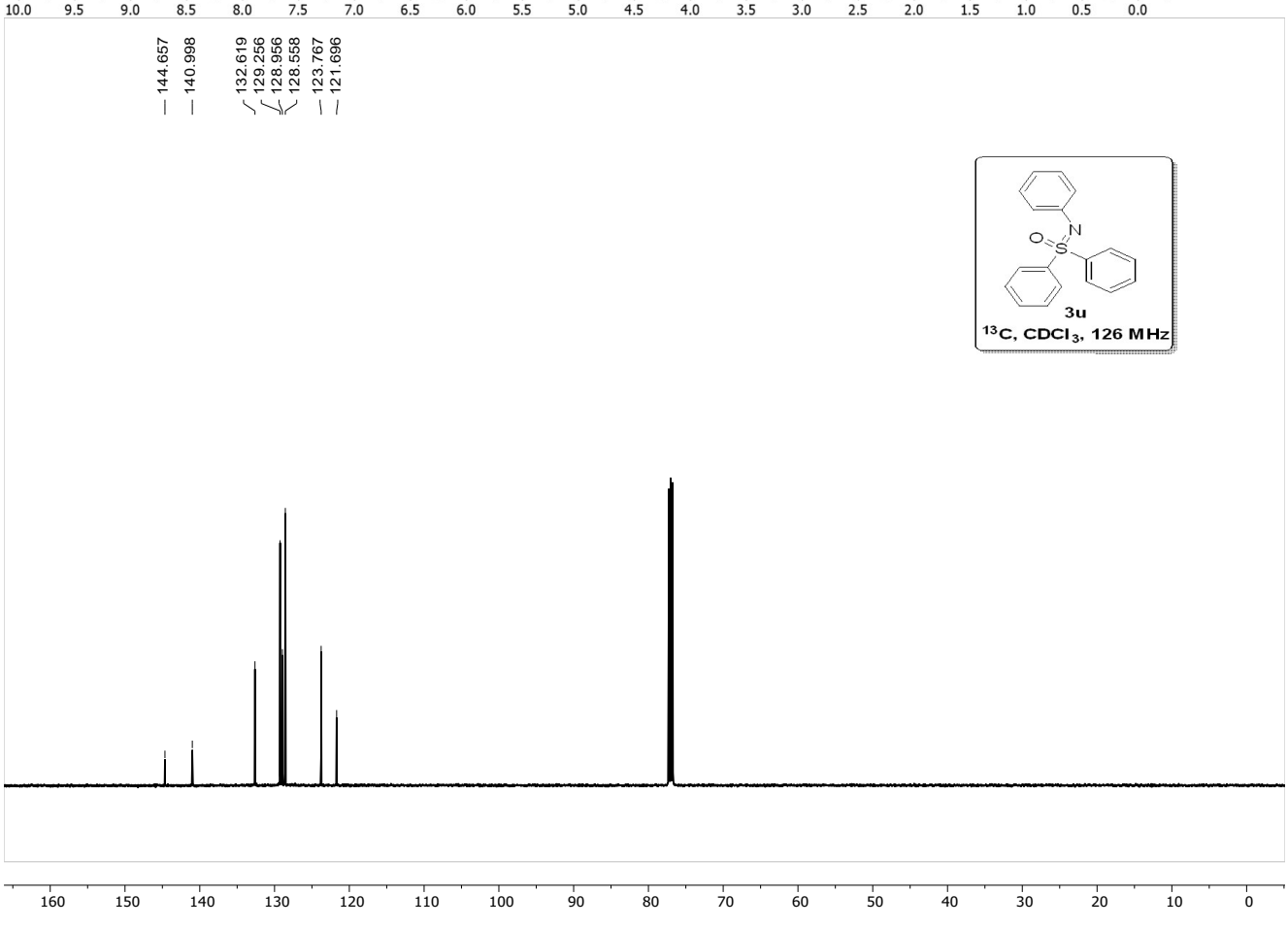

8.00
8.00
8.00
7.99
7.98
7.98
7.60
7.58
7.58
7.58
7.55
7.55
7.54
7.53
7.52
7.51
7.27
7.15
7.15
7.13
7.13
7.12
7.11
7.04
7.03
7.03
7.02
7.01
7.01
6.90
6.88
6.88
6.86
3.25
0.08
0.01
3r
1H, CDCl3, 500 MHz
2.00
1.09
2.06
2.02
2.00
1.01
3.12
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

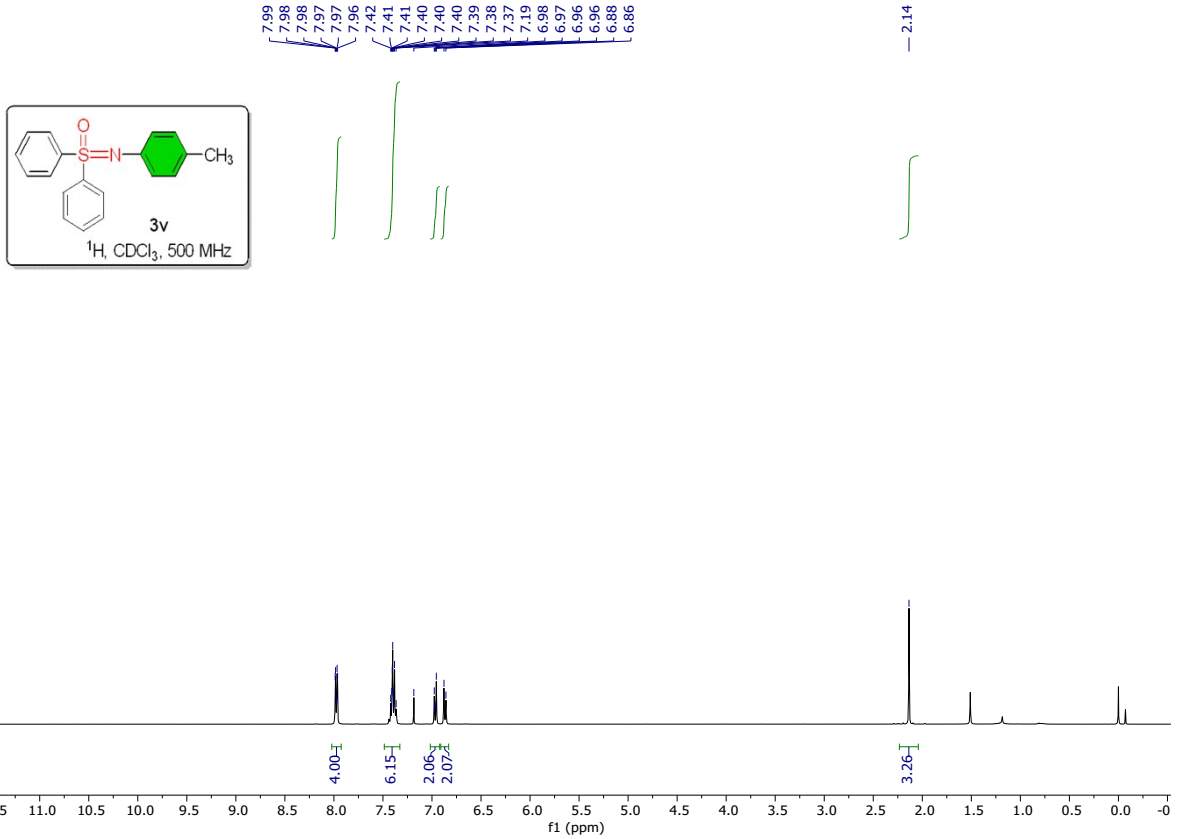

144.970
139.579
133.173
129.505
128.978
128.619
123.330
121.702
46.014
3r
13C, CDCl3, 126MHz
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

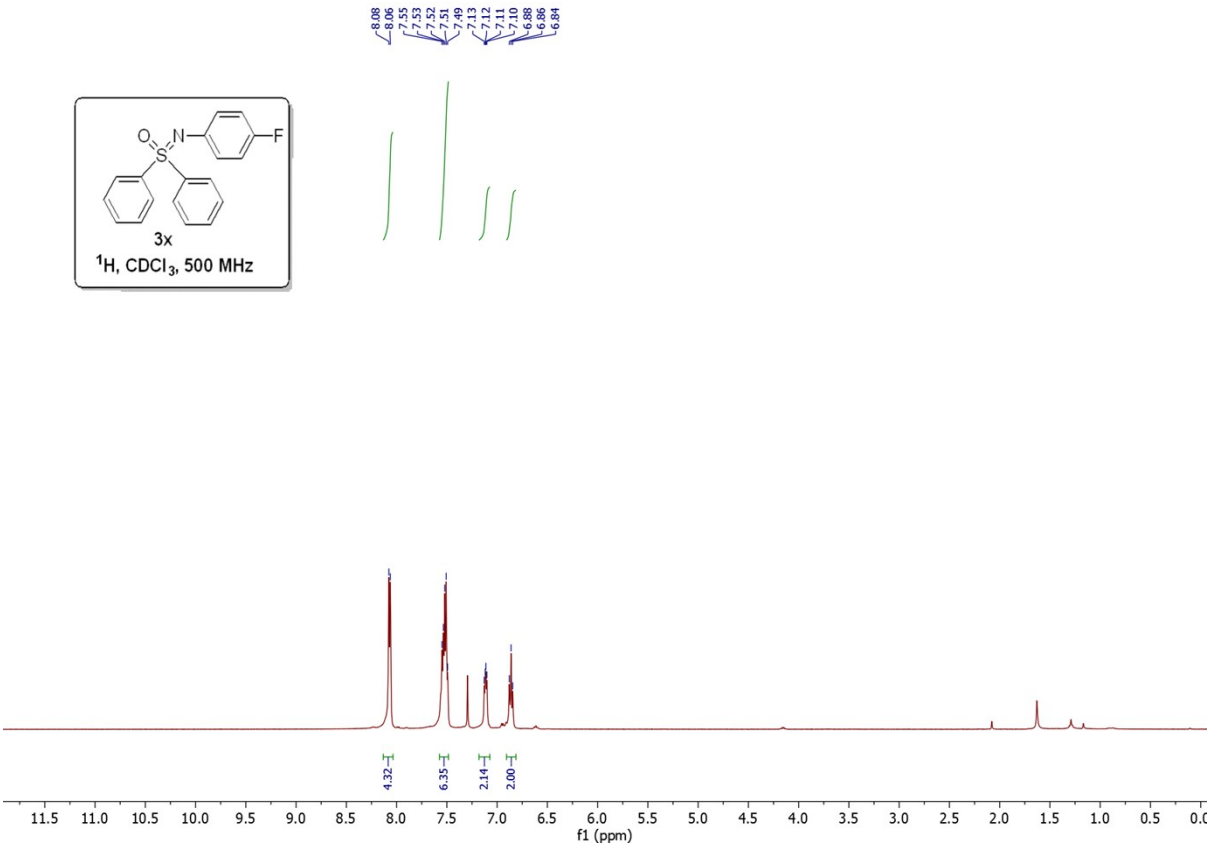

3s
^{1}H, CDCl$_3$, 500 MHz
f1 (ppm)

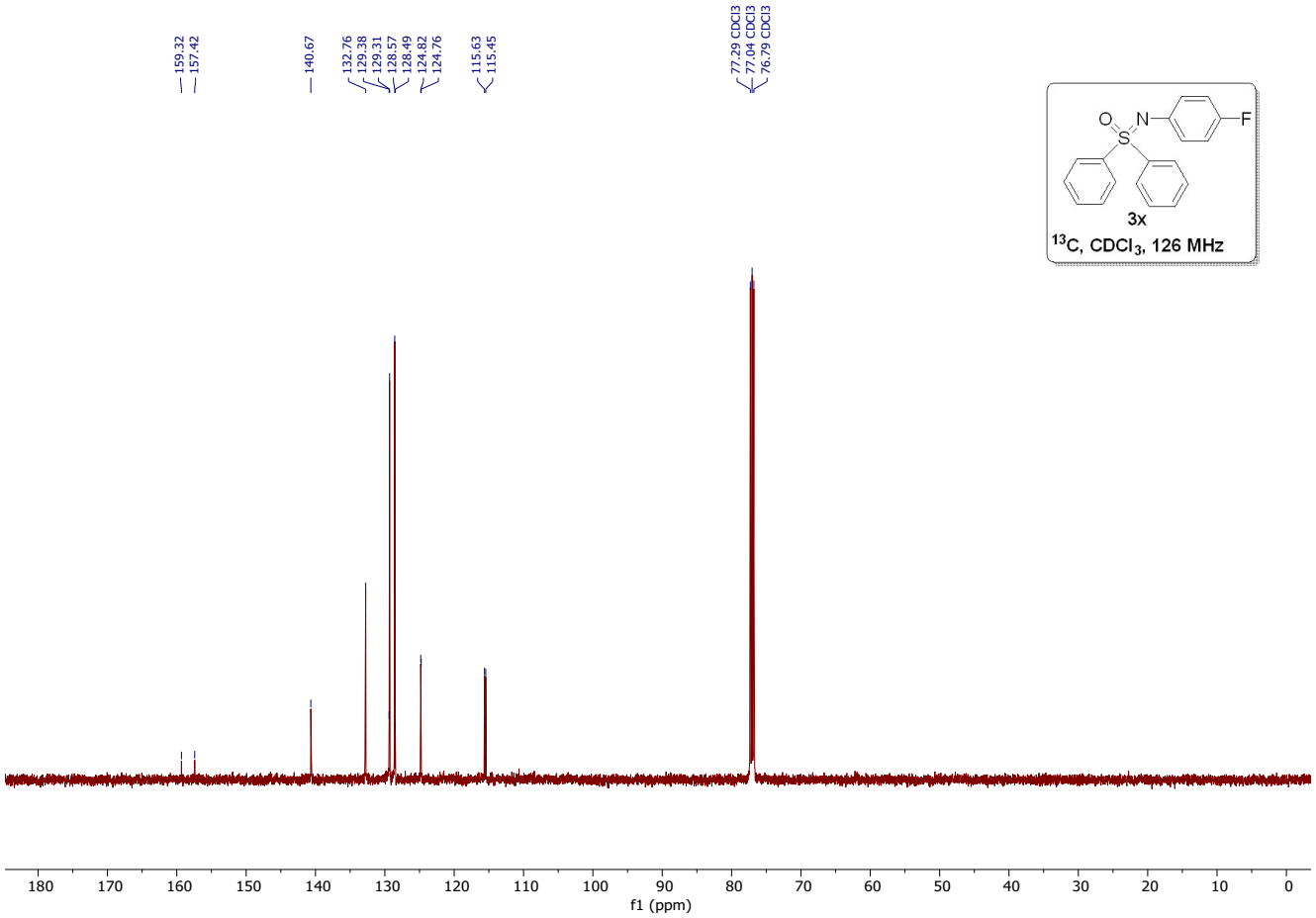

3s
^{13}C, CDCl$_3$, 126 MHz

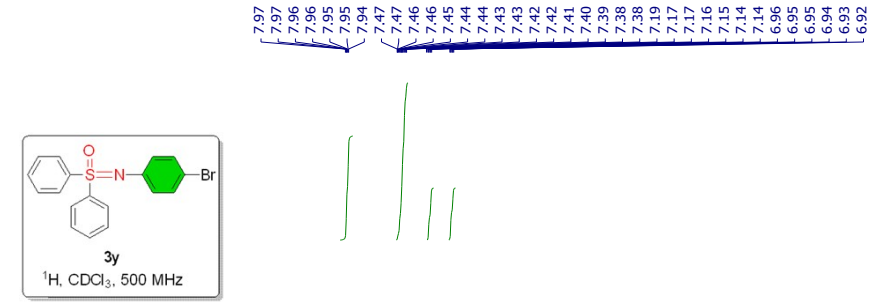

8.094
8.091
8.088
8.078
8.075
7.543
7.540
7.535
7.528
7.523
7.517
7.514
7.511
7.505
7.503
7.495
7.490
7.480
7.477
7.473
7.175
7.168
7.165
6.925
6.919
6.915
6.911
6.908
6.901
6.898
6.891
3.86
5.97
3.88
1.00
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3u
^{1}H CDCl$_3$, 500 MHz


144.657
140.998
132.619
129.256
128.956
128.558
123.767
121.696
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
3u
^{13}C, CDCl$_3$, 126 MHz


7.99
7.98
7.98
7.97
7.97
7.96
7.42
7.41
7.41
7.40
7.40
7.40
7.39
7.38
7.37
7.19
6.98
6.97
6.96
6.96
6.88
6.86
2.14
3v
^{1}H, CDCl$_3$, 500 MHz
4.00
6.15
2.06
2.07
3.26
f1 (ppm)

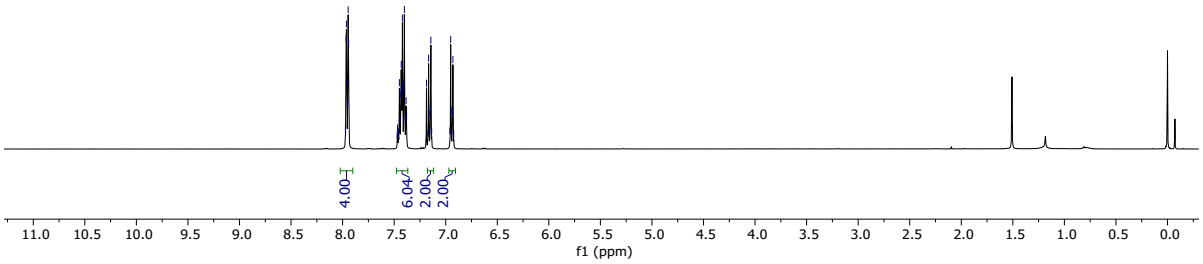

8.08
8.06
7.55
7.53
7.52
7.51
7.49
7.13
7.12
7.11
7.10
6.88
6.86
6.84
3x
^{1}H, CDCl$_3$, 500 MHz
4.32
6.35
2.14
2.00
f1 (ppm)

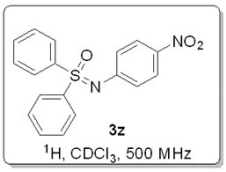

159.32
157.42
140.67
132.76
129.38
129.31
128.57
128.49
124.82
124.76
115.63
115.45
77.29 CDCl3
77.04 CDCl3
76.79 CDCl3
O
S
N
F
3x
13C, CDCl3, 126 MHz
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



3y

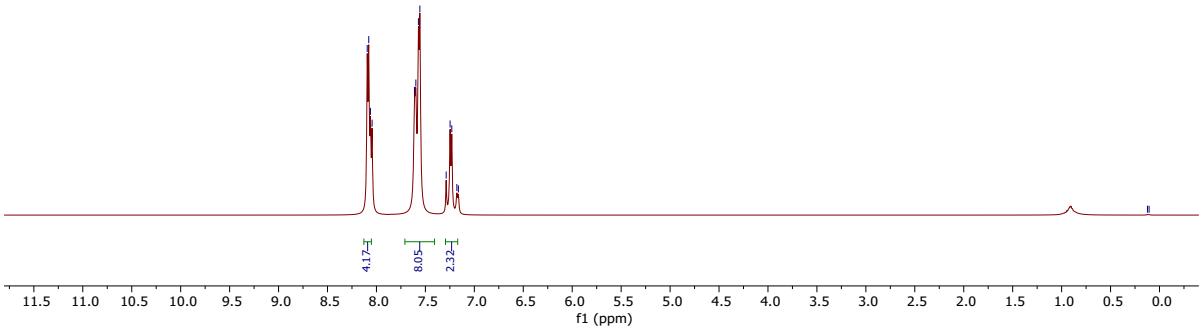
^{1}H, $CDCl_3$, 500 MHz

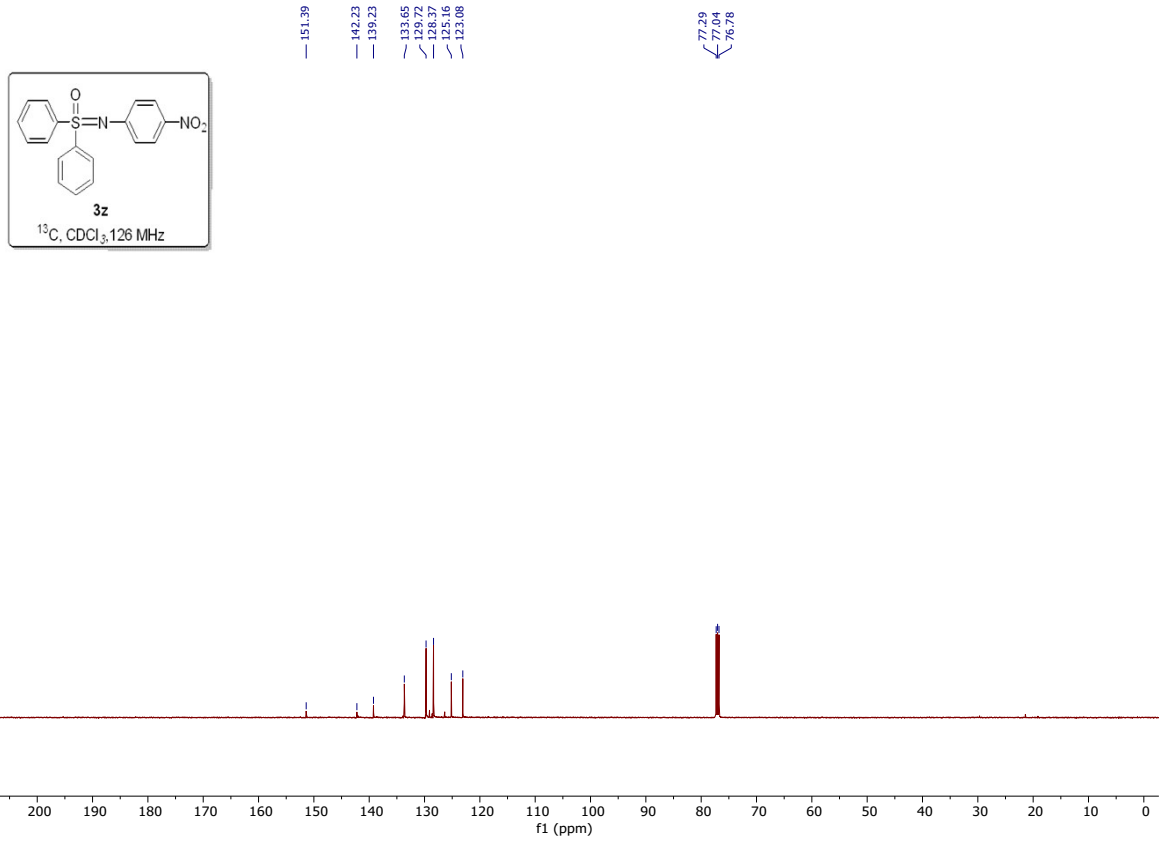


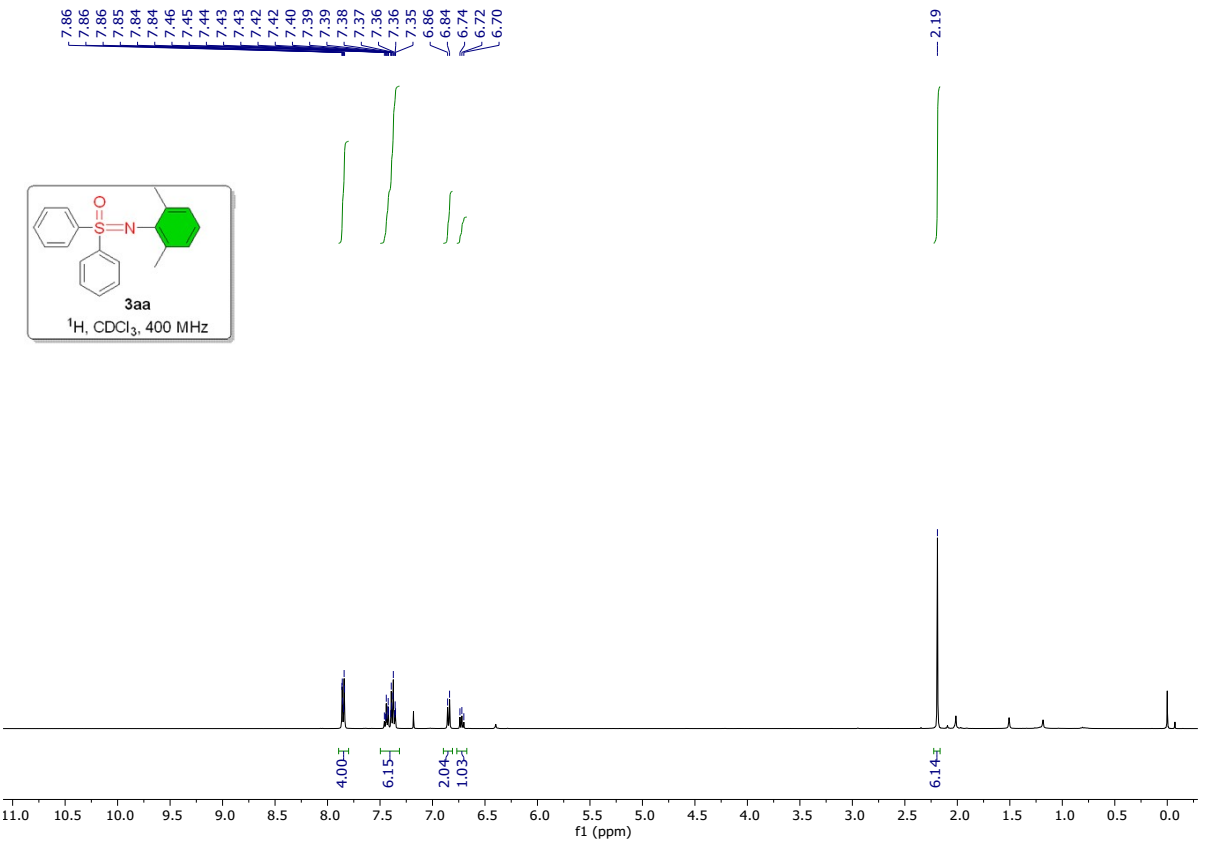


3z

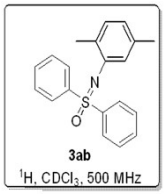
^{1}H, $CDCl_3$, 500 MHz

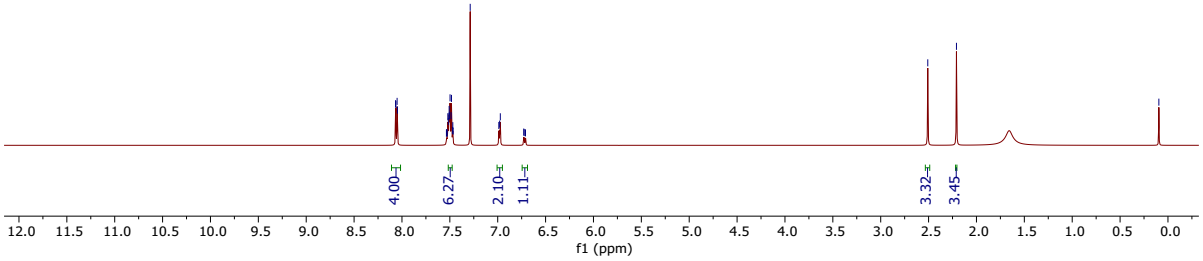


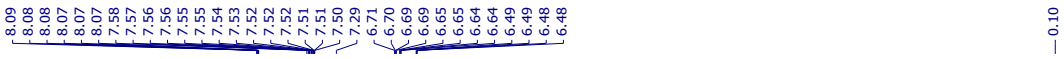

151.39
142.23
139.23
133.65
129.72
128.37
125.16
123.08
77.29
77.04
76.78
O
S
N
NO2
3z
13C, CDCl3,126 MHz
f1 (ppm)

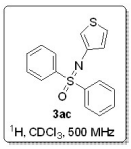

7.86
7.86
7.86
7.85
7.84
7.84
7.46
7.45
7.44
7.43
7.43
7.42
7.42
7.40
7.39
7.39
7.38
7.37
7.36
7.36
7.35
6.86
6.84
6.74
6.72
6.70
2.19
O
S
N
3aa
1H, CDCl3, 400 MHz
4.00
6.15
2.04
1.03
6.14
f1 (ppm)

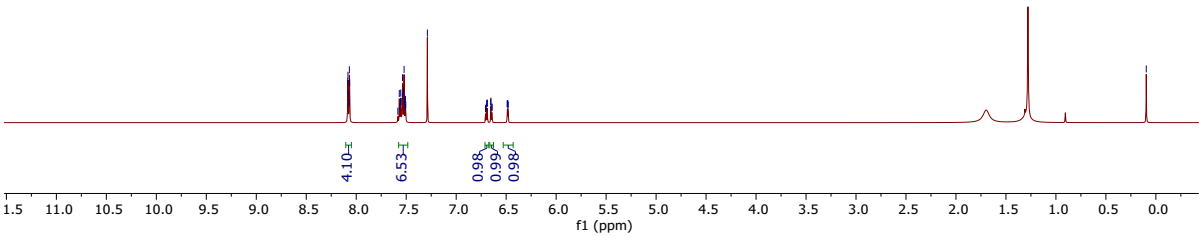

8.07
8.06
8.05
8.05
7.54
7.53
7.53
7.52
7.52
7.51
7.51
7.50
7.50
7.49
7.48
7.47
7.47
7.47
7.29
6.99
6.98
6.97
6.73
6.72
6.71
2.51
2.21
0.10


3ab
^{1}H, CDCl$_3$, 500 MHz


4.00
6.27
2.10
1.11
3.32
3.45
12.0 11.5 11.0 10.5 10.0 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 0.0
f1 (ppm)


8.09
8.08
8.08
8.07
8.07
8.07
7.58
7.57
7.56
7.56
7.55
7.55
7.54
7.53
7.52
7.52
7.52
7.51
7.51
7.50
7.29
6.71
6.70
6.69
6.69
6.65
6.65
6.64
6.64
6.49
6.49
6.48
6.48
0.10


3ac
^{1}H, CDCl$_3$, 500 MHz


4.10
6.53
0.98
0.99
0.98
1.5 11.0 10.5 10.0 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 0.0
f1 (ppm)