Supporting Information

Asymmetric Synthesis of CF_3-Containing Tetrahydroquinoline via Thiourea-Catalyzed Cascade Reaction

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1. General Information

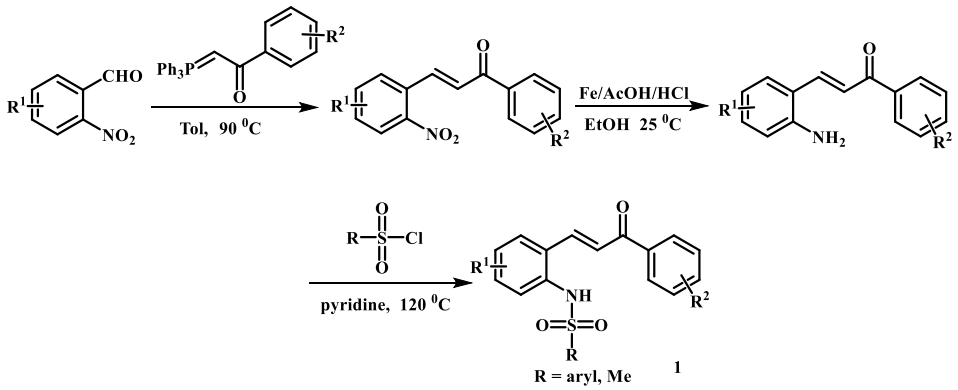
Reactions were monitored by TLC on silica gel GF_{254} (0.25 mm). Column chromatography purifications were carried out using silica gel (300-400 mesh). ^{1}H, ^{13}C and ^{19}F NMR spectra were recorded on AV300 or AV400 instruments (Bruker) in $CDCl_3$ or DMSO-d_6 using tetramethylsilane (TMS) as internal standard. Data are presented as follows: chemical shift, integration, multiplicity (br = broad, s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet) and coupling constant in Hertz (Hz). HRMS spectra were recorded using Q-TOF mass spectrometer. The ee values determination was carried out using chiral high-performance liquid chromatography (HPLC) with Chiracel IA column and Chiracel IC column. Optical rotations were measured on a digital polarimeter and are reported as follows: $[\alpha]_D^T$ (1 g/100 mL, $CHCl_3$).

All solvents were obtained from commercial sources and were purified according to standard procedures. (*E*)-4-methyl-N-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)benz-enesulfonamide (**1a**) was prepared according to literature procedure.[1]

Reference:

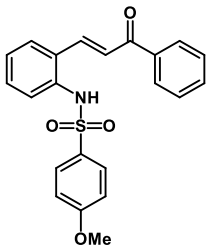
[1] (a) Gao, Z.; Wang, C.; Yuan, C.; Zhou, L.; Xiao, Y.; Guo, H. *Chem. Commun.* **2015**, *51*, 12653-12656. (b) Yang, W.; Du, D.-M. *Chem. Commun.* **2013**, *49*, 8842-8844.

2. General procedure for the syntheses of substrates 1b - 1w and their Analytical Data



A solution of 2-nitrobenzaldehyde (10 mmol, 1.0 equiv) and 1-phenyl-2-(triphenyl-15 -phospha-nylidene)ethan-1-one (1.1equiv) in toluene was stirred at 90 ℃ until complete disappearance of the starting materials, then the solvent was evaporated under reduced pressure and the crude residue was purified on silica gel flash column chromatography using ethyl acetate/Petroleum ether (1/7) eluent to give the corresponding 2-nitrochalcones, which were dissolved in ethanol, then iron powder (7.0 equiv) was added followed by acetic acid and hydrochloric acid, the mixture was stirred at 25 ℃ for 1h, then filtered, the filtrate was basified by saturated sodium carbonate until PH 7-8, the solution was exacted with DCM, and the organic layer was washed with water followed by saturated brine, dried by Na_2SO_4, after an evaporation of the organic solvent, the crude residue was recrystallized using Ethyl acetate/Petroleum ether to give the 2-aminochalcones. To a mixture of 2-aminochalcones and sulfonyl chloride (1.1 equiv) was added pyridine (2.0 equiv), which was stirred at 120 ℃ for 1h, then purified on silica gel flash column chromatography using ethyl acetate/Petroleum ether (1/4) eluent to give the corresponding substrates **1b - 1w** as described below.

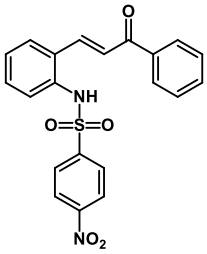
***(E)*-4-methoxy-N-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)benzenesulfonamide (1b)**



According to the general procedure, **1b** was obtained as a yellow solid (2.75 g, 70% yield), mp = 144 - 145 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 9.97 (s, 1H), 8.10 (d, *J* = 7.5 Hz, 2H), 8.03 (d, *J* = 7.2 Hz, 1H), 7.90 (d, *J* = 15.6 Hz, 1H), 7.71-7.50 (m, 6H), 7.40-7.30 (m, 2H), 6.98 (t, *J* = 9.5 Hz, 3H), 3.65 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 189.0, 162.3, 139.7, 137.4, 136.0, 133.1, 132.0, 130.9, 130.9, 128.8,

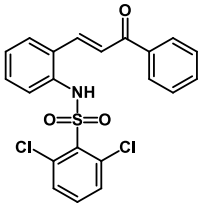
128.7, 128.5, 127.9, 127.5, 127.1, 122.7, 114.2, 55.4. HRMS (ESI) *m/z* calcd for $C_{22}H_{20}NO_4S$ $[M+H]^+$: 394.1108, found 394.1111.

(*E*)-4-nitro-N-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)benzenesulfonamide (1c)



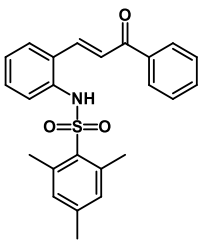
According to the general procedure, **1c** was obtained as a yellow solid (2.94 g, 72% yield), mp = 218 - 219 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.50 (s, 1H), 8.29 (d, *J* = 8.7 Hz, 2H), 8.04 (d, *J* = 6.9, 3H), 7.84 (d, *J* = 8.7 Hz, 2H), 7.78-7.65 (m, 3H), 7.59-7.53 (m, 2H), 7.40 (s, 2H), 7.06 (d, *J* = 6.3 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 189.0, 149.5, 145.0, 139.1, 137.3, 134.9, 133.1, 132.3, 131.1, 130.1, 128.7, 128.3, 128.2, 127.8, 127.7, 124.5, 123.3. HRMS (ESI) *m/z* calcd for $C_{21}H_{17}N_2O_5S$ $[M+H]^+$: 409.0853, found 409.0858.

(*E*)-2,6-dichloro-N-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)benzenesulfonamide (1d)



According to the general procedure, **1d** was obtained as a yellow solid (2.81 g, 65% yield), mp = 181 - 182 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.55 (s, 1H), 8.30 (d, *J* = 8.7 Hz, 2H), 8.07 (d, *J* = 8.4 Hz, 1H), 8.01 (d, *J* = 8.4 Hz, 2H), 7.84 (d, *J* = 8.7 Hz, 2H), 7.79-7.56 (m, 4H), 7.47-7.38 (m, 2H), 7.09-7.07 (m, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.7, 149.7, 144.8, 139.6, 138.4, 135.8, 135.2, 132.1, 131.4, 130.3, 128.9, 128.9, 128.2, 127.8, 127.7, 124.6, 123.0.. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}Cl_2NO_3S$ $[M+H]^+$: 432.0150, found 432.0155.

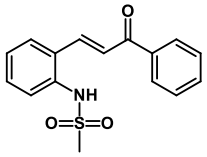
(*E*)-2,4,6-trimethyl-N-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)benzenesulfonamide (1e)



According to the general procedure, **1e** was obtained as a yellow solid (2.72 g, 67%

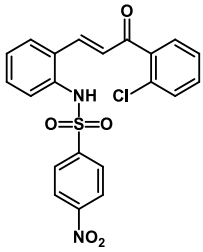
yield), mp = 151 - 152 ℃. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.93 (d, *J* = 7.2 Hz, 2H), 7.77 (d, *J* = 15.6 Hz, 1H), 7.60-7.55 (m, 2H), 7.51-7.46 (m, 2H), 7.34 (d, *J* = 3.9 Hz, 2H), 7.29-7.24 (m, 2H), 7.14 (d, *J* = 15.6 Hz, 1H), 6.72 (s, 2H), 2.39 (s, 6H), 1.96 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 190.0, 142.6, 139.6, 139.4, 137.6, 135.1, 133.0, 132.9, 132.2, 132.1, 131.0, 128.8, 128.7, 128.6, 127.5, 127.2, 123.8, 23.1, 20.7. HRMS (ESI) *m/z* calcd for $C_{24}H_{23}NNaO_3S$ $[M+Na]^+$: 428.1291, found 428.1302.

(*E*)-N-(2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)methanesulfonamide (1f)



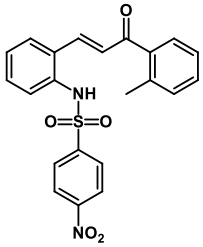
According to the general procedure, **1f** was obtained as a yellow solid (2.11 g, 70% yield), mp = 174 - 175 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 9.67 (s, 1H), 8.18-8.13 (m, 4H), 7.89 (d, *J* = 15.6 Hz, 1H), 7.69 (t, *J* = 7.4 Hz, 1H), 7.59 (t, *J* = 7.5 Hz, 2H), 7.53-7.48 (m, 1H), 7.43-7.36 (m, 2H), 3.01 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 189.4, 140.1, 137.5, 136.6, 133.1, 131.7, 131.3, 128.8, 128.6, 127.7, 127.5, 127.0, 122.9, 39.9. HRMS (ESI) *m/z* calcd for $C_{16}H_{16}NO_3S$ $[M+H]^+$: 302.0845, found 302.0853.

(*E*)-N-(2-(3-(2-chlorophenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1g)



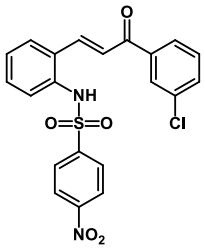
According to the general procedure, **1g** was obtained as a yellow solid (2.66 g, 60% yield), mp = 203 - 204 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.51 (s, 1H), 8.34 (d, *J* = 8.7 Hz, 2H), 7.95 (dd, *J* = 7.7, 1.4 Hz, 1H), 7.79 (d, *J* = 8.7 Hz, 2H), 7.60-7.48 (m, 5H), 7.47-7.35 (m, 2H), 7.12 (d, *J* = 16.2 Hz, 1H), 7.06 (dd, *J* = 7.8, 1.2 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 192.4, 149.6, 144.9, 140.9, 138.2, 135.0, 132.0, 131.6, 131.6, 130.1, 130.1, 129.4, 128.6, 128.1, 127.9, 127.5, 127.2, 126.9, 124.6. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}ClN_2O_5S$ $[M+H]^+$: 443.0463, found 443.0476.

(*E*)-4-nitro-N-(2-(3-oxo-3-(*o*-tolyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (1h)



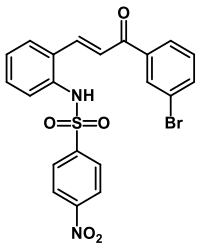
According to the general procedure, **1h** was obtained as a yellow solid (2.62 g, 62% yield), mp = 181 - 182 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.53 (s, 1H), 8.33 (d, *J* = 8.7 Hz, 2H), 7.99-7.96 (m, 1H), 7.84 (d, *J* = 8.7 Hz, 2H), 7.62-7.57 (m, 2H), 7.49-7.34 (m, 5H), 7.29 (d, *J* = 22.8 Hz, 1H), 7.13 (dd, *J* = 21.3, 20.1 Hz, 1H), 2.37 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 194.8, 150.0, 145.5, 140.3, 138.7, 137.1, 135.3, 132.5, 131.7, 131.3, 130.6, 129.1, 128.9, 128.6, 128.3, 128.0, 127.6, 126.1, 125.0, 20.4. HRMS (ESI) *m/z* calcd for $C_{22}H_{19}N_2O_5S$ $[M+H]^+$: 423.0936, found 423.0931.

(*E*)-N-(2-(3-(3-chlorophenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1i)



According to the general procedure, **1i** was obtained as a yellow solid (3.19 g, 72% yield), mp = 226 - 227 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.53 (s, 1H), 8.28 (d, *J* = 8.7 Hz, 2H), 8.22 (s, 1H), 8.07 (dd, *J* = 12.6, 7.8 Hz, 2H), 7.89-7.81 (m, 3H), 7.70 (q, *J* = 15.6 Hz, 2H), 7.52 (t, *J* = 8.0 Hz, 1H), 7.46-7.37 (m, 2H), 7.07 (d, *J* = 7.2 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.6, 149.5, 144.9, 139.8, 139.0, 135.1, 133.8, 132.9, 132.1, 131.4, 130.7, 130.1, 128.8, 128.2, 128.0, 126.9, 125.0, 124.5, 122.7. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}ClN_2O_5S$ $[M+H]^+$: 443.0463, found 443.0475.

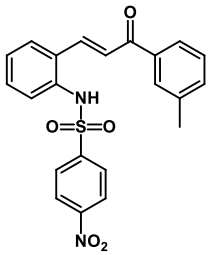
(*E*)-N-(2-(3-(3-bromophenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1j)



According to the general procedure, **1j** was obtained as a yellow solid (3.36 g, 69% yield), mp = 240 - 241 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.56 (s, 1H), 8.31-8.23 (m, 3H), 8.07 (d, *J* = 11.4 Hz, 2H), 7.86-7.64 (m, 5H), 7.48 (d, *J* = 29.7 Hz, 3H), 7.10 (d, *J* = 5.4 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.5, 149.5, 144.8, 139.8, 139.2, 135.8, 135.0, 132.1, 131.4, 130.9, 130.8, 128.8, 128.2, 127.9, 127.8, 127.3, 124.6,

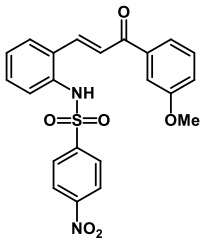
122.7, 122.3. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}BrN_2O_5S$ $[M+H]^+$: 486.9958, found 486.9981.

(*E*)-4-nitro-N-(2-(3-oxo-3-(*m*-tolyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (1k)



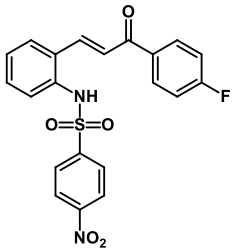
According to the general procedure, **1k** was obtained as a yellow solid (3.08 g, 73% yield), mp = 201 - 202 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.54 (s, 1H), 8.30 (d, *J* = 6.3 Hz, 2H), 8.06 (s, 3H), 7.86 (d, *J* = 6.3 Hz, 2H), 7.70 (q, *J* = 15.2 Hz, 2H), 7.41 (s, 2H), 7.08 (s, 3H), 3.88 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 194.4, 149.5, 145.0, 139.8, 138.2, 136.6, 134.8, 132.0, 131.2, 130.8, 130.1, 128.6, 128.4, 128.1, 127.8, 127.5, 127.1, 125.6, 124.5, 19.9. HRMS (ESI) *m/z* calcd for $C_{22}H_{18}N_2NaO_5S$ $[M+Na]^+$: 445.0829, found 445.0850.

(*E*)-N-(2-(3-(3-methoxyphenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1l)



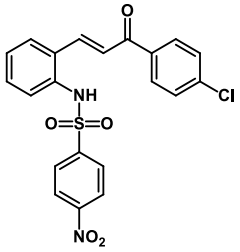
According to the general procedure, **1l** was obtained as a yellow solid (2.81 g, 64% yield), mp = 210 - 211 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.51 (s, 1H), 8.33 (d, *J* = 8.4 Hz, 2H), 7.97 (d, *J* = 7.2 Hz, 1H), 7.82 (d, *J* = 8.4 Hz, 2H), 7.59 (s, 1H), 7.55 (d, *J* = 6.3 Hz, 1H), 7.49-7.33 (m, 5H), 7.22 (d, *J* = 15.9 Hz, 1H), 7.04 (d, *J* = 7.5 Hz, 1H), 2.36 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 194.3, 149.5, 144.9, 139.7, 138.2, 136.6, 134.8, 132.0, 131.2, 130.8, 128.6, 128.4, 128.1, 128.1, 127.9, 127.5, 127.1, 125.6, 124.6, 20.0. HRMS (ESI) *m/z* calcd for $C_{22}H_{18}N_2NaO_6S$ $[M+Na]^+$: 461.0778, found 461.0771.

(*E*)-N-(2-(3-(4-fluorophenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1m)



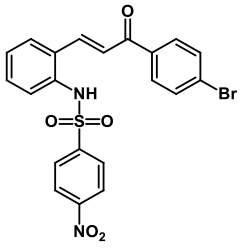
According to the general procedure, **1m** was obtained as a yellow solid (2.81 g, 66% yield), mp = 226 - 227 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.54 (s, 1H), 8.29 (d, *J* = 8.7 Hz, 2H), 8.18-8.14 (m, 2H), 8.06 (dd, *J* = 7.2, 1.8 Hz, 1H), 7.84 (d, *J* = 8.7 Hz, 2H), 7.70 (q, *J* = 16.0 Hz, 2H), 7.47-7.36 (m, 4H), 7.08 (dd, *J* = 7.4, 1.7 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.3, 165.0 (d, J_{C-F} = 250.5 Hz), 149.5, 144.9, 139.2, 134.9, 133.9, 132.3, 131.4, 131.3 (d, J_{C-F} = 6.0 Hz), 130.1, 128.8, 128.2, 127.8 (d, J_{C-F} = 8.3 Hz), 124.6, 123.0, 115.8 (d, J_{C-F} = 21.8 Hz). ^{19}F NMR (282 MHz, DMSO-d_6) δ −105.9. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}FN_2O_5S$ $[M+H]^+$: 427.0758, found 427.0769.

(*E*)-N-(2-(3-(4-chlorophenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1n)



According to the general procedure, **1n** was obtained as a yellow solid (3.14 g, 71% yield), mp = 198 - 199 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.54 (s, 1H), 8.29 (d, *J* = 9.0 Hz, 2H), 8.08 (d, *J* = 8.7 Hz, 3H), 7.83 (d, *J* = 8.7 Hz, 2H), 7.76 (d, *J* = 15.6 Hz, 1H), 7.66 (d, *J* = 6.0 Hz, 2H), 7.62 (s, 1H), 7.47-7.37 (m, 2H), 7.07 (dd, *J* = 7.5, 1.5 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.7, 149.5, 144.8, 139.5, 138.2, 135.8, 135.0, 132.2, 131.3, 130.3, 128.8, 128.8, 128.2, 127.8, 127.7, 124.6, 122.9. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}ClN_2O_5S$ $[M+H]^+$: 443.0463, found 443.0474.

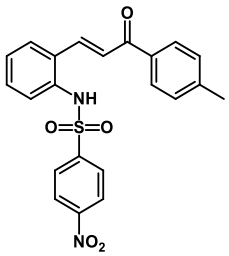
(*E*)-N-(2-(3-(4-bromophenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1o)



According to the general procedure, **1o** was obtained as a yellow solid (3.46 g, 71% yield), mp = 221 - 222 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.57 (s, 1H), 8.32-8.29 (m, 2H), 8.08-8.00 (m, 3H), 7.86-7.61 (m, 6H), 7.42 (d, *J* = 6.9 Hz, 2H), 7.10-7.08 (m,

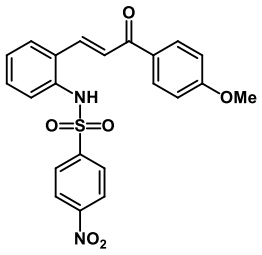
1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.9, 149.5, 144.8, 139.5, 136.1, 135.0, 132.2, 131.8, 131.3, 130.4, 128.8, 128.2, 127.8, 127.7, 127.4, 124.6, 122.8. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}BrN_2O_5S$ $[M+H]^+$: 486.9958, found 486.9974.

(*E*)-4-nitro-N-(2-(3-oxo-3-(p-tolyl)prop-1-en-1-yl)phenyl)benzenesulfonamide (1p)



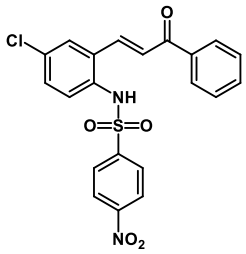
According to the general procedure, **1p** was obtained as a yellow solid (2.96 g, 70% yield), mp = 205 - 206 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.51 (s, 1H), 8.29 (d, *J* = 9.0 Hz, 2H), 8.06 (t, *J* = 7.5 Hz, 3H), 7.85 (d, *J* = 8.7 Hz, 2H), 7.69 (q, *J* = 15.0 Hz, 2H), 7.44-7.36 (m, 2H), 7.07 (d, *J* = 8.4 Hz, 3H), 3.88 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.0, 163.2, 149.5, 145.0, 138.1, 134.8, 132.5, 130.9, 130.7, 130.1, 128.7, 128.2, 127.8, 127.6, 124.5, 123.3, 113.9, 55.5. HRMS (ESI) *m/z* calcd for $C_{22}H_{19}N_2O_5S$ $[M+H]^+$: 423.1009, found 423.1021.

(*E*)-N-(2-(3-(4-methoxyphenyl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1q)



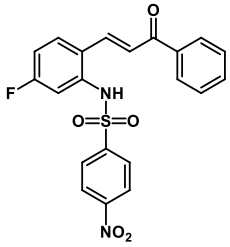
According to the general procedure, **1q** was obtained as a yellow solid (3.29 g, 75% yield), mp = 226 - 227 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.53 (s, 1H), 8.29 (d, *J* = 8.4 Hz, 2H), 8.07 (d, *J* = 8.4 Hz, 3H), 7.84 (d, *J* = 8.4 Hz, 2H), 7.68 (q, *J* = 13.7 Hz, 2H), 7.40 (t, *J* = 3.5 Hz, 2H), 7.07 (d, *J* = 8.4 Hz, 3H), 3.88 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.0, 163.2, 149.5, 145.0, 138.1, 134.8, 132.5, 130.9, 130.8, 130.1, 128.7, 128.2, 127.8, 127.7, 124.6, 123.2, 113.9, 55.5. HRMS (ESI) *m/z* calcd for $C_{22}H_{19}N_2O_6S$ $[M+H]^+$: 439.0958, found 439.0976.

(*E*)-N-(4-chloro-2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1r)



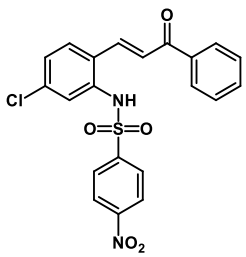
According to the general procedure, **1r** was obtained as a yellow solid (2.52 g, 57% yield), mp = 202 - 203 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.50 (s, 1H), 8.33 (d, *J* = 9.0 Hz, 2H), 7.96 (d, *J* = 1.2 Hz, 1H), 7.94 (d, *J* = 1.5 Hz, 2H), 7.78-7.58 (m, 2H), 7.54-7.49 (m, 3H), 7.45-7.34 (m, 2H), 7.12 (d, *J* = 16.2 Hz, 1H), 7.03 (dd, *J* = 7.7, 1.1 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 188.9, 149.7, 145.0, 139.2, 137.6, 135.2, 133.3, 132.5, 131.3, 128.7, 128.7, 128.3, 128.2, 127.9, 127.7, 124.5, 123.4. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}ClN_2O_5S$ $[M+H]^+$: 443.0463, found 443.0475.

(*E*)-N-(5-fluoro-2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1s)



According to the general procedure, **1s** was obtained as a yellow solid (2.52 g, 59% yield), mp = 220 - 221 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.54 (s, 1H), 8.28 (d, *J* = 8.7 Hz, 2H), 8.15 (q, *J* = 4.8 Hz, 2H), 8.06 (dd, *J* = 7.5, 1.8 Hz, 1H), 7.83 (d, *J* = 8.7 Hz, 2H), 7.69 (q, *J* = 14.7 Hz, 2H), 7.45-7.36 (m, 4H), 7.07 (dd, *J* = 7.5, 1.5 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 187.5, 165.2 (d, $J_{C\text{-}F}$ = 252.0 Hz), 149.7, 145.0, 139.3, 135.1, 133.9 (d, $J_{C\text{-}F}$ = 9.8 Hz), 132.3, 131.5, 131.3, 131.2, 128.9, 128.2, 127.9, 124.6, 123.0 (d, $J_{C\text{-}F}$ = 4.5 Hz), 115.8 (d, $J_{C\text{-}F}$ = 20.3 Hz). ^{19}F NMR (282 MHz, DMSO-d_6) δ −104.9. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}FN_2O_5S$ $[M+H]^+$: 427.0758, found 427.0777.

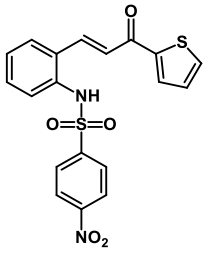
(*E*)-N-(5-chloro-2-(3-oxo-3-phenylprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1t)



According to the general procedure, **1t** was obtained as a yellow solid (2.39 g, 54%

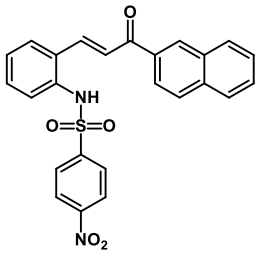
yield), mp = 199 - 200 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.54 (s, 1H), 8.29 (d, *J* = 9.0 Hz, 2H), 7.10-7.05 (m, 3H), 7.83 (d, *J* = 9.0 Hz, 2H), 7.75 (d, *J* = 15.3 Hz, 1H), 7.64 (t, *J* = 7.4 Hz, 3H), 7.46-7.37 (m, 2H), 7.07 (dd, *J* = 7.4, 1.4 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 188.0, 149.5, 144.7, 139.6, 136.1, 134.9, 132.3, 131.9, 131.4, 130.4, 128.9, 128.3, 127.9, 127.7, 127.4, 124.6, 122.9. HRMS (ESI) *m/z* calcd for $C_{21}H_{16}ClN_2O_5S$ $[M+H]^+$: 443.0463, found 443.0442.

(*E*)-4-nitro-N-(2-(3-oxo-3-(thiophen-2-yl)prop-1-en-1-yl)phenyl)benzenesulfonamide (1u)



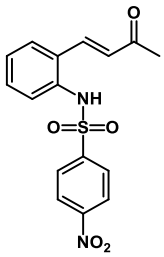
According to the general procedure, **1u** was obtained as a yellow solid (3.11 g, 75% yield), mp = 200 - 201 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.56 (s, 1H), 8.31 (d, *J* = 9.0 Hz, 2H), 8.22 (d, *J* = 3.0 Hz, 1H), 8.21-8.03 (m, 2H), 7.86 (d, *J* = 8.7 Hz, 2H), 7.67 (q, *J* = 21.6 Hz, 2H), 7.47-7.38 (m, 2H), 7.30 (dd, *J* = 4.8, 3.9 Hz, 1H), 7.09 (dd, *J* = 7.5, 1.8 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 181.2, 149.5, 145.1, 144.8, 138.2, 135.7, 134.9, 133.6, 132.1, 131.2, 128.8, 128.8, 128.2, 127.8, 127.7, 124.6, 123.0. HRMS (ESI) *m/z* calcd for $C_{19}H_{15}N_2O_5S_2$ $[M+H]^+$: 415.0417, found 415.0438.

(*E*)-N-(2-(3-(naphthalen-2-yl)-3-oxoprop-1-en-1-yl)phenyl)-4-nitrobenzenesulfonamide (1v)



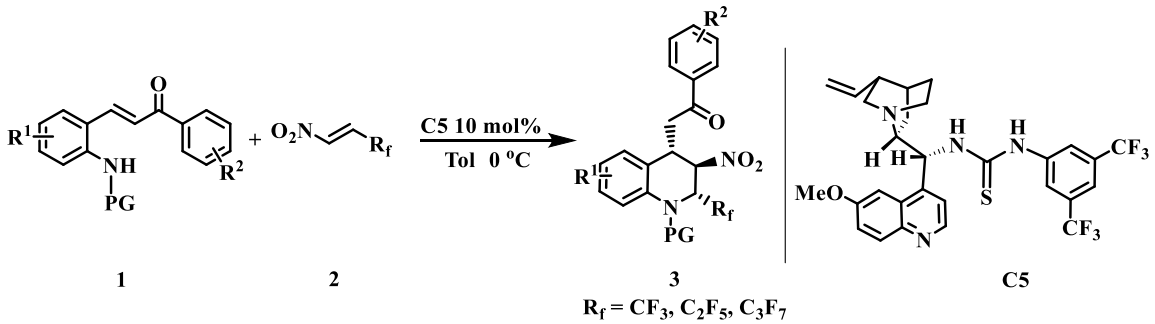
According to the general procedure, **1v** was obtained as a yellow solid (3.44 g, 75% yield), mp = 208 - 209 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.60 (s, 1H), 8.85 (s, 1H), 8.32 (d, *J* = 8.1 Hz, 2H), 8.19-8.13 (m, 2H), 8.08-8.03 (m, 3H), 7.91-7.87 (m, 4H), 7.74-7.65 (m, 2H), 7.48-7.43 (m, 2H), 7.14 (dd, *J* = 5.9, 2.3 Hz, 1H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 188.7, 149.5, 144.9, 139.0, 135.0, 135.0, 134.6, 132.4, 132.2, 131.2, 130.4, 129.6, 128.8, 128.7, 128.4, 128.2, 127.8, 127.7, 126.9, 124.5, 123.9, 123.4. HRMS (ESI) *m/z* calcd for $C_{25}H_{19}N_2O_5S$ $[M+H]^+$: 459.1009, found 459.1035.

(*E*)-4-nitro-N-(2-(3-oxobut-1-en-1-yl)phenyl)benzenesulfonamide (1w)



According to the general procedure, **1w** was obtained as a yellow solid (2.70 g, 78% yield), mp = 182 - 183 ℃. ^{1}H NMR (300 MHz, DMSO-d_6) δ 10.45 (s, 1H), 8.35 (d, *J* = 8.7 Hz, 2H), 7.83 (d, *J* = 8.7 Hz, 2H), 7.74 (d, *J* = 7.2 Hz, 1H), 7.53 (d, *J* = 16.5 Hz, 1H), 7.43-7.31 (m, 2H), 7.12 (d, *J* = 7.5 Hz, 1H), 6.50 (d, *J* = 16.2 Hz, 1H), 2.18 (s, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 197.6, 149.8, 144.8, 137.9, 134.6, 131.5, 131.0, 128.6, 128.4, 128.3, 127.8, 127.1, 124.6, 27.1. HRMS (ESI) *m/z* calcd for $C_{16}H_{14}N_2NaO_5S$ $[M+Na]^+$: 369.0516, found 369.0519.

3. Representative Procedure



1 **2** **3** **C5**

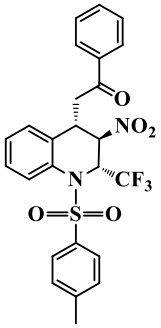
$R_f = CF_3, C_2F_5, C_3F_7$

To a solution of quinidine derived thiourea organocatalyst **C5** (12 mg, 0.02 mmol) and substrate **1** (0.2 mmol) in toluene (2.0 mL) was added *β*-R_f-nitroalkene (0.6 mmol) under nitrogen atmosphere at 0 ℃. The reaction mixture was monitored by TLC inspection. The solvent was evaporated under reduced pressure and the crude residue was purified on silica gel flash column chromatography using ethyl acetate/hexanes (1/7) eluent to give the corresponding tetrahydroquinolines **3aa-3pc**.

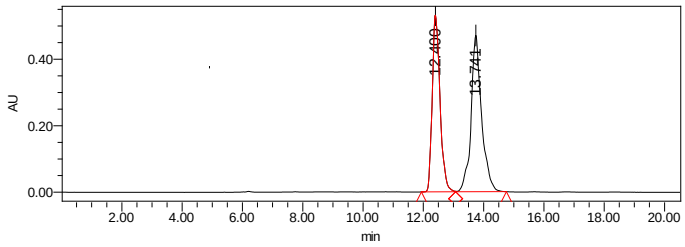
Racemates were prepared following the general procedure by DABCO.

4. Analytical Data and HPLC Chromatogram of Products

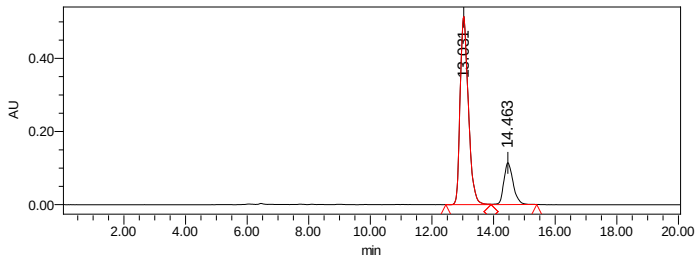
2-((2*R*,3*R*,4*S*)-3-nitro-1-tosyl-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl) -1-phenylethanone (3aa)



From 75.4 mg (0.2 mmol) **1a** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 79.8 mg (77% yield) compound **3aa** was obtained as a yellow solid, mp = 84-85 ℃. $[\alpha]_D^{20}$ = +14 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 60% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol 4:1, 1.0 mL/min). Retention time: t_{major} = 13.0 and t_{minor} = 14.5 min. ^1H NMR (300 MHz, $CDCl_3$) δ 7.83-7.80 (m, 2H), 7.62 (d, *J* = 7.8 Hz, 1H), 7.52 (t, *J* = 7.4 Hz, 1H), 7.44-7.37 (m, 4H), 7.28 (t, *J* = 7.7 Hz, 1H), 7.19-7.09 (m, 3H), 6.65 (d, *J* = 7.8 Hz, 1H), 5.70-5.61 (m, 1H), 4.79 (dd, *J* = 12.0, 6.3 Hz, 1H), 3.33 (dd, *J* = 18.3, 8.7 Hz, 1H), 2.92 (dd, *J* = 18.3, 2.7 Hz, 1H), 2.58 (t, *J* = 9.5 Hz, 1H), 2.33 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.5, 145.6, 135.7, 134.6, 134.2, 134.0, 130.8, 130.1, 129.0, 128.9, 128.5, 128.4, 128.0, 127.4, 125.4, 123.7 (q, J_{C-F} = 281.3 Hz), 88.2, 60.1 (q, J_{C-F} = 32.3 Hz), 35.7, 35.4, 21.7. ^{19}F NMR (282 MHz, $CDCl_3$) δ −75.0. HRMS (ESI) *m/z* calcd for $C_{25}H_{21}F_3N_2NaO_5S$ $[M+Na]^+$: 541.1015, found 541.1024.



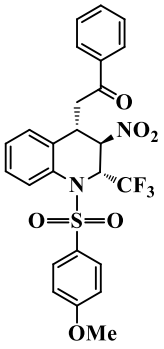
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.400	9561341	45.52	531446	bv	Unknown
2	13.741	11442235	54.48	470347	vb	Unknown



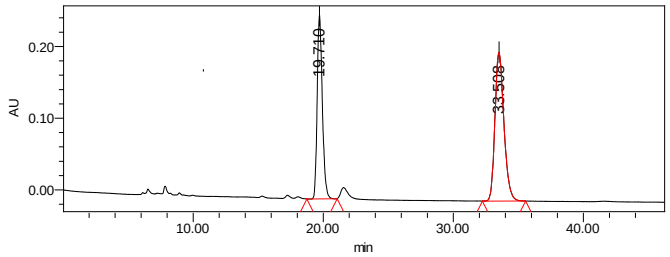
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.031	9508721	79.97	514431	bv	Unknown
2	14.463	2381063	20.03	114330	vb	Unknown

2-((2*R*,3*R*,4*S*)-1-((4-methoxyphenyl)sulfonyl)-3-nitro-2-(trifluoromethyl)-1,2,3,4-t

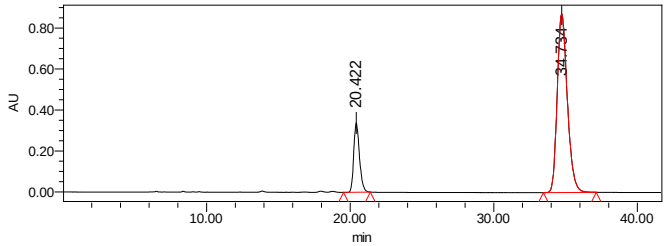
etrahydroquinolin-4-yl)-1-phenylethanone (3ba)



From 78.6 mg (0.2 mmol) **1b** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 81.2 mg (76% yield) compound **3ba** was obtained as a yellow solid, mp = 60-61 ℃. $[\alpha]_D^{20}$ = -31 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 64% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol/ DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 34.7 and t_{minor} = 20.4 min. ^1H NMR (300 MHz, $CDCl_3$) δ 7.81 (d, *J* = 7.5 Hz, 2H), 7.61 (d, *J* = 7.8 Hz, 1H), 7.54-7.45 (m, 3H), 7.39 (t, *J* = 7.7 Hz, 2H), 7.27 (t, *J* = 7.7 Hz, 1H), 7.11 (t, *J* = 7.5 Hz, 1H), 6.84 (d, *J* = 8.7 Hz, 2H), 6.66 (d, *J* = 7.8 Hz, 1H), 5.68-5.59 (m, 1H), 4.78 (dd, *J* = 12.0, 6.0 Hz, 1H), 3.78 (s, 3H), 3.35 (dd, *J* = 18.3, 8.4 Hz, 1H), 2.92 (d, *J* = 18.3, 1H), 2.63 (t, *J* = 9.8 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.5, 164.2, 135.8, 134.8, 134.0, 130.9, 129.5, 129.0, 128.9, 128.6, 128.5, 128.4, 128.0, 125.3, 123.8 (q, J_{C-F} = 281.3 Hz), 114.8, 88.3, 60.0 (q, J_{C-F} = 32.3 Hz), 55.8, 35.7, 35.5. ^{19}F NMR (282 MHz, $CDCl_3$) δ −75.0. HRMS (ESI) *m/z* calcd for $C_{25}H_{22}F_3N_2O_6S$ $[M+H]^+$: 535.1145, found 535.1152.



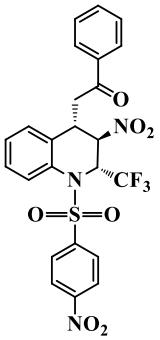
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	19.710	7078586	41.57	256158	bb	Unknown
2	33.508	9949340	58.43	207388	bb	Unknown



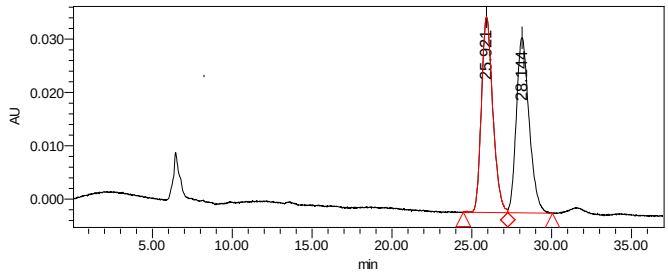
	Retention Time	Area	% Area	Height	Int Type	Peak Type

1	20.422	9416738	18.08	338287	bb	Unknown
2	34.734	42673050	81.92	870659	bb	Unknown

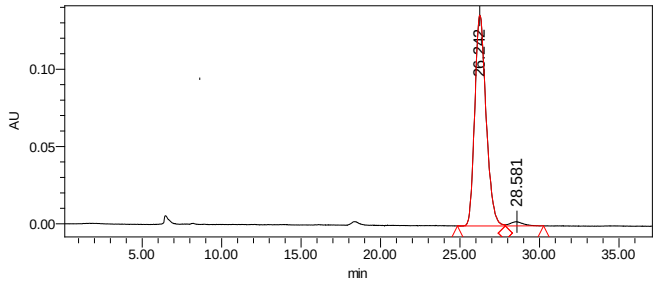
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3ca)



From 81.6 mg (0.2 mmol) **1c** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 101.0 mg (92% yield) compound **3ca** was obtained as a yellow solid, mp = 159-160 ℃. $[\alpha]_D^{20}$ = -283 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 96% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 15:1:0.02, 1.0 mL/min). Retention time: t_{major} = 26.2 and t_{minor} = 28.6 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.34 (d, *J* = 9.0 Hz, 2H), 7.82 (t, *J* = 8.4 Hz, 5H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.50-7.44 (m, 3H), 7.30-7.25 (m, 1H), 6.71 (d, *J* = 7.8 Hz, 1H), 5.76-5.67 (m, 1H), 4.75 (dd, *J* = 12.2, 6.2 Hz, 1H), 3.49 (dd, *J* = 18.3, 9.6 Hz, 1H), 2.82 (dd, *J* = 18.2, 2.3 Hz, 1H), 2.57 (t, *J* = 10.7 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.0, 151.2, 142.3, 135.3, 134.2, 133.9, 130.7, 129.5, 129.2, 129.0, 128.6, 128.5, 128.0, 125.5, 124.8, 123.4 (q, J_{C-F} = 279.8 Hz), 88.2, 60.6 (q, J_{C-F} = 33.0 Hz), 35.8, 35.4. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}F_3N_3NaO_7S$ $[M+Na]^+$: 572.0710, found 572.0715.

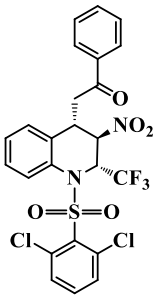


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	25.921	1818460	49.80	36660	bv	Unknown
2	28.144	1833328	50.20	32834	vb	Unknown

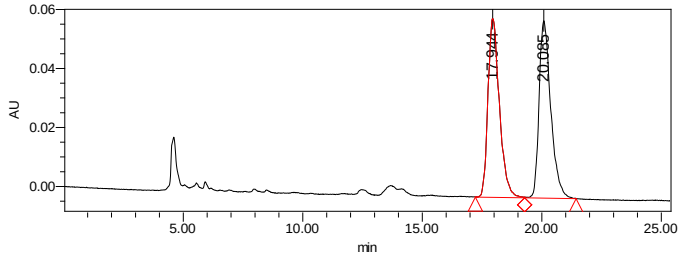


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	26.242	6765347	97.78	136484	bv	Unknown
2	28.581	153355	2.22	2723	vb	Unknown

2-((2*R*,3*R*,4*S*)-1-((2,6-dichlorophenyl)sulfonyl)-3-nitro-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3da)

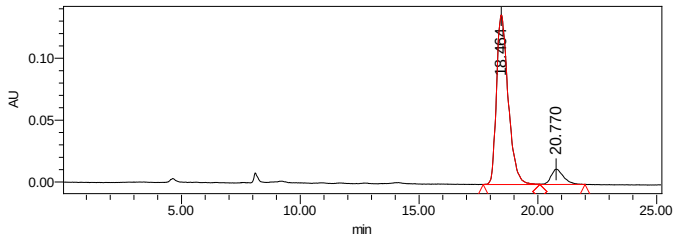


From 86.2 mg (0.2 mmol) **1d** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 101.8 mg (89% yield) compound **3da** was obtained as a yellow solid, mp = 140-141 ℃. $[\alpha]_D^{20}$ = +4 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 83% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 15:1:0.02, 1.0 mL/min). Retention time: t_{major} = 18.5 and t_{minor} = 20.8 min. ^1H NMR (300 MHz, $CDCl_3$) δ 7.88-7.85 (m, 2H), 7.74 (d, *J* = 8.1 Hz, 1H), 7.54 (t, *J* = 7.4 Hz, 1H), 7.44-7.37 (m, 4H), 7.29-7.23 (m, 2H), 7.14-7.09 (m, 1H), 6.75 (d, *J* = 7.8 Hz, 1H), 5.88-5.79 (m, 1H), 4.85 (dd, *J* = 11.7, 6.3 Hz, 1H), 3.61 (t, *J* = 9.9 Hz, 1H), 3.50 (dd, *J* = 17.9, 8.6 Hz, 1H), 3.11 (dd, *J* = 18.0, 2.7 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 195.0, 136.3, 135.8, 134.7, 134.0, 133.9, 133.7, 132.3, 130.8, 128.9, 128.9, 128.4, 128.1, 127.3, 125.2, 123.6 (q, J_{C-F} = 282.5 Hz), 87.9, 59.8 (q, J_{C-F} = 32.3 Hz), 35.8, 35.6. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.4. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}Cl_2F_3N_2O_5S$ $[M+H]^+$: 573.0260, found 573.0264.



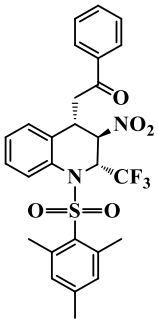
	Retention Time	Area	% Area	Height	Int Type	Peak Type

1	17.944	2017243	49.63	60613	bv	Unknown
2	20.085	2047273	50.37	60127	vb	Unknown

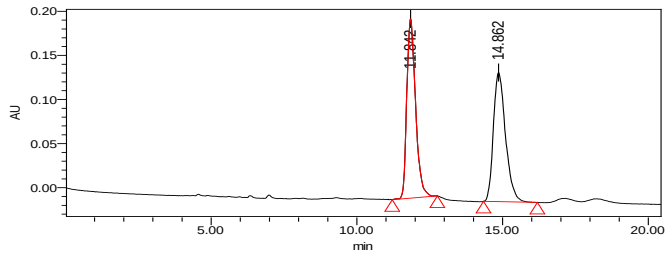


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	18.464	4701342	91.27	137071	bv	Unknown
2	20.770	449821	8.73	12283	vb	Unknown

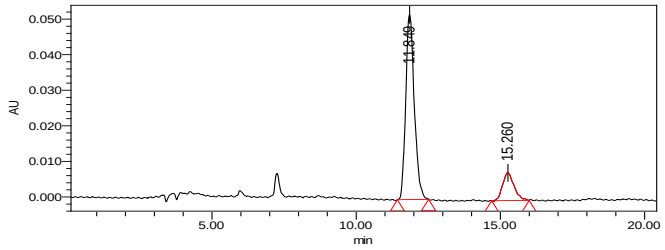
2-((2*R*,3*R*,4*S*)-1-(mesitylsulfonyl)-3-nitro-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethan-1-one (3ea)



From 81.0 mg (0.2 mmol) **1e** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 98.3 mg (90% yield) compound **3ea** was obtained as a yellow solid, mp = 66-67 ℃. $[\alpha]_D^{20}$ = +31 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 67% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol/DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 11.8 and t_{minor} = 15.3 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.01-7.98 (m, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.52 (t, *J* = 7.7 Hz, 2H), 7.25-7.13 (m, 2H), 6.98 (s, 2H), 6.94-6.89 (m, 2H), 5.79-5.70 (m, 1H), 5.16 (dd, *J* = 11.9, 6.2 Hz, 1H), 4.05-3.97 (m, 1H), 3.58-3.41 (m, 2H), 2.42 (s, 6H), 2.32 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.3, 143.4, 140.5, 135.0, 134.2, 132.9, 132.0, 131.4, 129.2, 127.9, 127.8, 127.5, 127.3, 127.0, 124.6, 123.0 (q, J_{C-F} = 268.7 Hz), 86.6, 57.4 (q, J_{C-F} = 32.0 Hz), 35.2, 34.2, 22.1, 20.1. ^{19}F NMR (282 MHz, $CDCl_3$) δ −73.9. HRMS (ESI) *m/z* calcd for $C_{27}H_{26}F_3N_2O_5S$ $[M+H]^+$: 547.1509, found 547.1521.

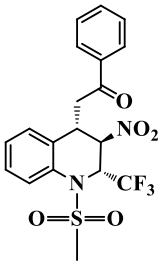


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	11.842	4252469	50.11	203486	bb	Unknown
2	14.862	4233496	49.89	146465	bb	Unknown

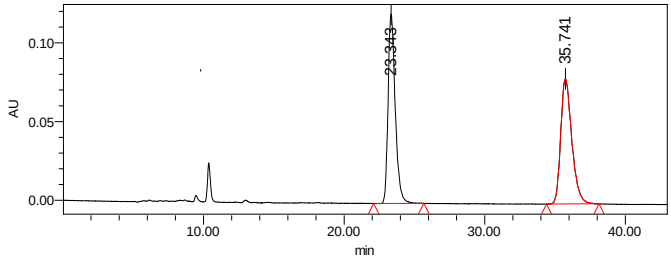


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	11.849	1076576	83.30	51994	bb	Unknown
2	15.260	215868	16.70	7855	bb	Unknown

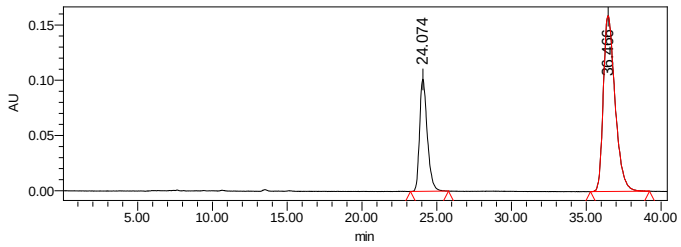
2-((2*R*,3*R*,4*S*)-1-(methylsulfonyl)-3-nitro-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3fa)



From 60.2 mg (0.2 mmol) **1f** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 80.5 mg (91% yield) compound **3fa** was obtained as a yellow oil. $[\alpha]_D^{20}$ = +8 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 41% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol 4:1, 1.0 mL/min). Retention time: t_{major} = 36.5 and t_{minor} = 24.1 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.04-8.01 (m, 2H), 7.70-7.63 (m, 2H), 7.55 (t, *J* = 7.5 Hz, 2H), 7.39 (t, *J* = 7.7 Hz, 1H), 7.30-7.24 (m, 1H), 6.95 (d, *J* = 7.8 Hz, 1H), 5.72-5.63 (m, 1H), 5.05 (dd, *J* = 11.6, 5.6 Hz, 1H), 3.99 (t, *J* = 9.2 Hz, 1H), 3.77 (dd, *J* = 18.3, 8.7 Hz, 1H), 3.34 (dd, *J* = 18.5, 2.9 Hz, 1H), 3.15 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 195.3, 135.7, 135.0, 134.3, 129.9, 129.4, 129.1, 128.4, 128.1, 127.1, 125.8, 123.5 (q, J_{C-F} = 282.0 Hz), 88.2, 59.9 (q, J_{C-F} = 32.5 Hz), 39.8, 36.6, 35.8. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.7. HRMS (ESI) *m/z* calcd for $C_{19}H_{18}F_3N_2O_5S$ $[M+H]^+$: 443.0883, found 443.0890.

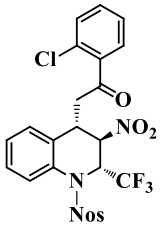


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	23.343	4273120	49.47	120333	bb	Unknown
2	35.741	4365497	50.53	79577	bb	Unknown

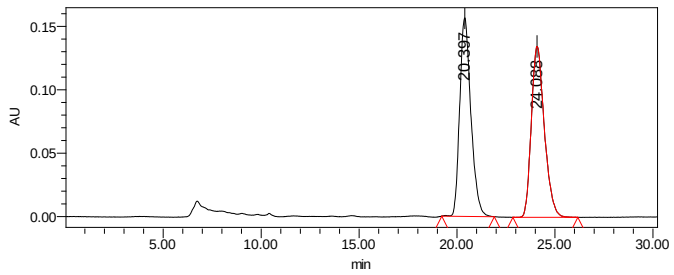


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	24.074	3620255	29.49	101474	bb	Unknown
2	36.466	8657621	70.51	159085	bb	Unknown

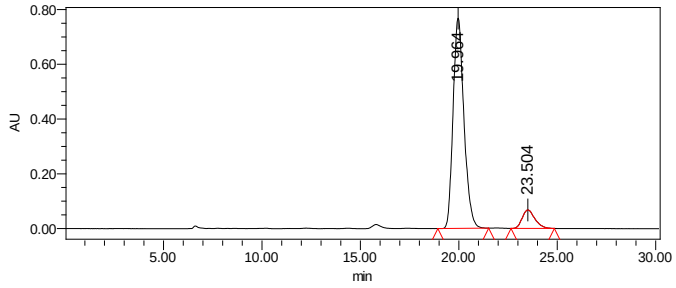
1-(2-chlorophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3ga)



From 88.4 mg (0.2 mmol) **1g** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 103.8 mg (89% yield) compound **3ga** was obtained as a yellow solid, mp = 34-35 ℃. $[\alpha]_D^{20}$ = -59 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 81% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 20.0 and t_{minor} = 23.5 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.34 (d, *J* = 9.0 Hz, 2H), 7.83-7.78 (m, 3H), 7.51-7.41 (m, 4H), 7.37-7.31 (m, 2H), 6.87 (d, *J* = 7.8 Hz, 1H), 5.77-5.68 (m, 1H), 4.73 (dd, *J* = 12.2, 6.2 Hz, 1H), 3.51 (dd, *J* = 18.6, 9.0 Hz, 1H), 2.96 (dd, *J* = 18.6, 2.7 Hz, 1H), 2.53 (t, *J* = 9.9 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 196.5, 151.1, 142.4, 136.8, 133.9, 133.0, 131.5, 131.1, 130.4, 129.8, 129.6, 129.2, 128.6, 128.4, 127.3, 125.6, 124.8, 123.4 (q, J_{C-F} = 281.5 Hz), 88.1, 60.5 (q, J_{C-F} = 32.8 Hz), 39.6, 36.2. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}ClF_3N_3O_7S$ $[M+H]^+$: 584.0501, found 584.0511.

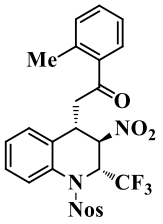


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	20.397	6206851	49.93	156645	bb	Unknown
2	24.088	6223286	50.07	134811	bb	Unknown

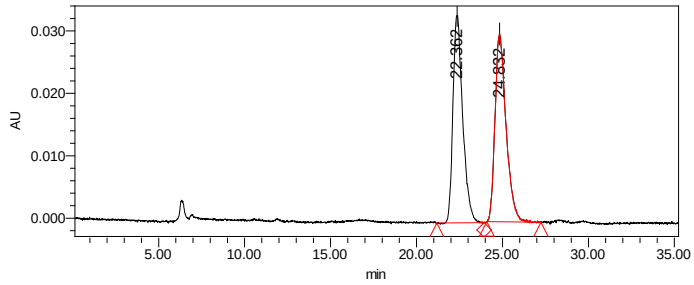


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	19.964	29414521	90.69	767753	bb	Unknown
2	23.504	3020098	9.31	67703	bb	Unknown

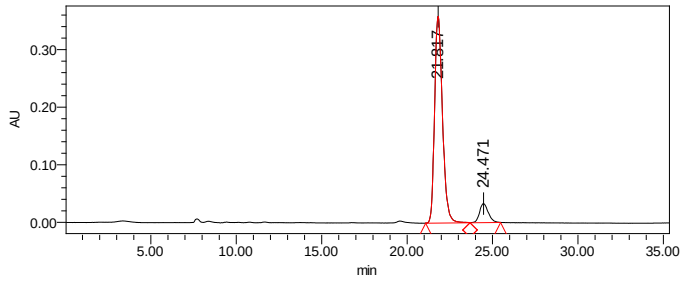
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-(o-tolyl)ethanone (3ha)



From 84.4 mg (0.2 mmol) **1h** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 100.2 mg (89% yield) compound **3ha** was obtained as a yellow solid, mp = 101-102 ℃. $[\alpha]_D^{20}$ = -67 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 81% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 21.8 and t_{minor} = 24.5 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.32 (d, *J* = 8.7 Hz, 2H), 7.81-7.76 (m, 3H), 7.70 (d, *J* = 7.5 Hz, 1H), 7.49-7.39 (m, 2H), 7.31-7.22 (m, 3H), 6.74 (d, *J* = 7.8 Hz, 1H), 5.76-5.67 (m, 1H), 4.72 (dd, *J* = 12.3, 6.3 Hz, 1H), 3.45 (dd, *J* = 18.0, 9.6 Hz, 1H), 2.75 (dd, *J* = 18.0, 2.4 Hz, 1H), 2.54 (t, *J* = 10.5 Hz, 1H), 2.28 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 196.7, 151.2, 142.1, 139.7, 135.2, 133.9, 132.7, 132.6, 131.0, 129.5, 129.2, 128.8, 128.6, 128.5, 126.0, 125.4, 124.8, 123.4 (q, J_{C-F} = 281.5 Hz), 88.2, 60.7 (q, J_{C-F} = 32.8 Hz), 37.5, 36.1, 21.4. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{25}H_{21}F_3N_3O_7S$ $[M+H]^+$: 564.1047, found 564.1054.

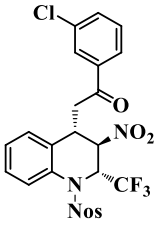


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	22.362	1312057	49.41	33255	bv	Unknown
2	24.832	1343651	50.59	30091	bb	Unknown

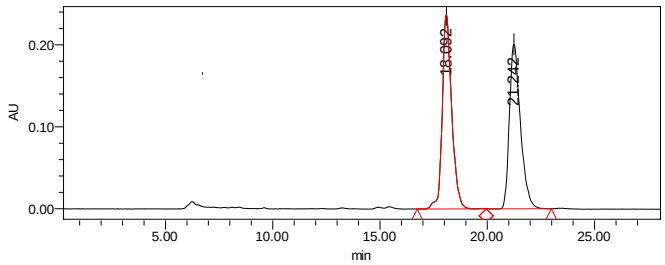


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	21.817	11468102	90.71	358569	BV	Unknown
2	24.471	1174190	9.29	33045	VB	Unknown

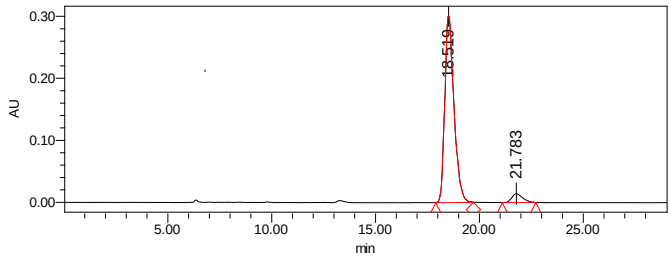
1-(3-chlorophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3ia)



From 88.4 mg (0.2 mmol) **1i** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 106.1 mg (91% yield) compound **3ia** was obtained as a yellow solid, mp = 169-170 ℃. $[\alpha]_D^{20}$ = -98 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 89% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 18.5 and t_{minor} = 21.8 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 8.7 Hz, 2H), 7.82-7.79 (m, 4H), 7.72 (d, *J* = 7.8, 1H), 7.60-7.57 (m, 1H), 7.49-7.40 (m, 2H), 7.31-7.26 (m, 1H), 6.69 (d, *J* = 7.8 Hz, 1H), 5.77-5.68 (m, 1H), 4.76 (dd, *J* = 12.3, 6.0 Hz, 1H), 3.46 (dd, *J* = 18.3, 9.3 Hz, 1H), 2.84 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.59 (t, *J* = 10.4 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 193.1, 151.1, 142.4, 136.9, 135.3, 134.0, 133.9, 130.4, 130.3, 129.5, 129.2, 128.6, 128.4, 128.1, 126.1, 125.4, 124.8, 123.5 (q, J_{C-F} = 285.0 Hz), 88.1, 60.5 (q, J_{C-F} = 33.0 Hz), 35.8, 35.6. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.8. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}ClF_3N_3O_7S$ $[M+H]^+$: 584.0501, found 584.0509.

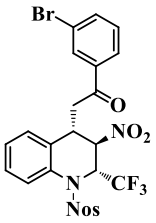


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	18.092	7290785	50.35	236675	bv	Unknown
2	21.242	7188629	49.65	200612	vb	Unknown

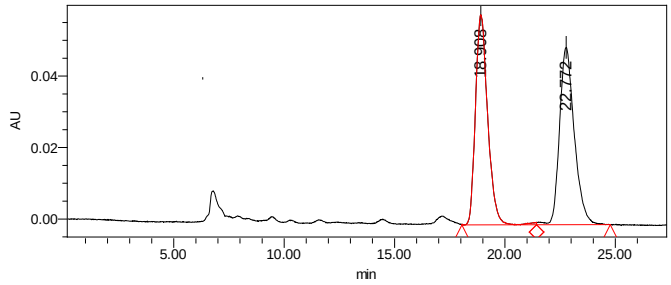


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	18.519	9274994	94.67	301591	BV	Unknown
2	21.783	522174	5.33	14265	BB	Unknown

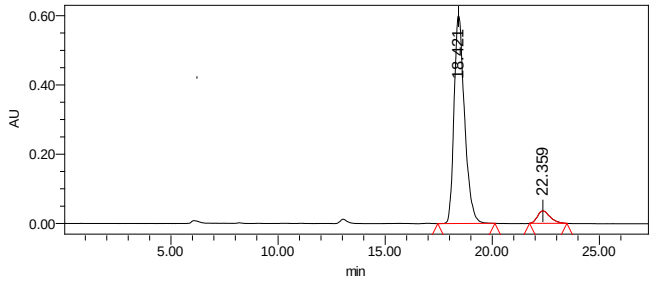
1-(3-bromophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3ja)



From 97.2 mg (0.2 mmol) **1j** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 115.4 mg (92% yield) compound **3ja** was obtained as a yellow solid, mp = 163-164 ℃. $[\alpha]_D^{20}$ = -81 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 87% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 18.4 and t_{minor} = 22.4 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.34 (d, *J* = 9.0 Hz, 2H), 7.95 (s, 1H), 7.82-7.72 (m, 5H), 7.47 (t, *J* = 7.7 Hz, 1H), 7.36 (t, *J* = 7.8 Hz, 1H), 7.29 (t, *J* = 7.5 Hz, 1H), 6.69 (d, *J* = 7.5 Hz, 1H), 5.76-5.67 (m, 1H), 4.77 (dd, *J* = 12.3, 6.0 Hz, 1H), 3.47 (dd, *J* = 18.3, 9.3 Hz, 1H), 2.84 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.57 (t, *J* = 10.4 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 192.9, 151.1, 142.3, 137.0, 133.9, 131.0, 130.6, 130.3, 129.6, 129.2, 128.6, 128.5, 126.5, 125.4, 124.8, 124.8, 123.3, 123.3 (q, J_{C-F} = 281.8 Hz), 88.1, 60.5 (q, J_{C-F} = 32.8 Hz), 35.8, 35.5. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}BrF_3N_3O_7S$ $[M+H]^+$: 627.9995, found 627.9999.

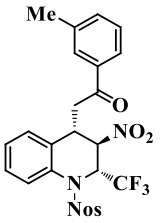


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	18.908	2266693	49.55	58844	bv	Unknown
2	22.772	2307996	50.45	49646	vb	Unknown

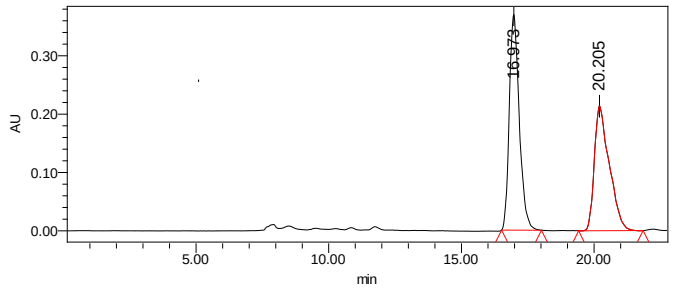


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	18.421	20424386	93.27	600355	bb	Unknown
2	22.359	1474392	6.73	36301	bb	Unknown

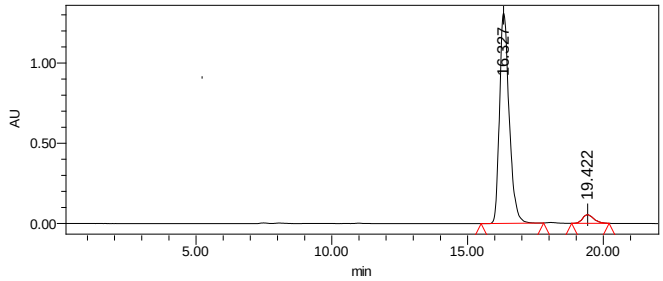
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-(m-tolyl)ethanone (3ka)



From 84.4 mg (0.2 mmol) **1k** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 101.4 mg (90% yield) compound **3ka** was obtained as a yellow solid, mp = 117-118 ℃. $[\alpha]_D^{20}$ = -93 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 91% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 16.3 and t_{minor} = 19.4 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 8.7 Hz, 2H), 7.82-7.78 (m, 3H), 7.63 (t, *J* = 2.0 Hz, 2H), 7.48-7.41 (m, 2H), 7.37-7.32 (m, 1H), 7.30-7.24 (m, 1H), 6.73 (d, *J* = 7.8 Hz, 1H), 5.76-5.67 (m, 1H), 4.77 (dd, *J* = 12.2, 6.2 Hz, 1H), 3.49 (dd, *J* = 18.2, 9.5 Hz, 1H), 2.82 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.57 (t, *J* = 10.8 Hz, 1H), 2.40 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.3, 151.1, 142.3, 138.9, 135.4, 134.9, 133.8, 130.7, 129.4, 129.2, 128.8, 128.6, 128.5, 128.4, 125.6, 125.3, 124.8, 123.4 (q, J_{C-F} = 281.5 Hz), 88.2, 60.6 (q, J_{C-F} = 32.8 Hz), 35.9, 35.4, 21.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{25}H_{21}F_3N_3O_7S$ $[M+H]^+$: 564.1047, found 564.1057.

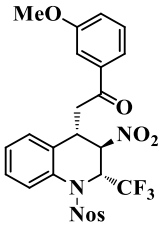


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	16.973	9700151	53.70	369768	bb	Unknown
2	20.205	8363530	46.30	213803	bb	Unknown

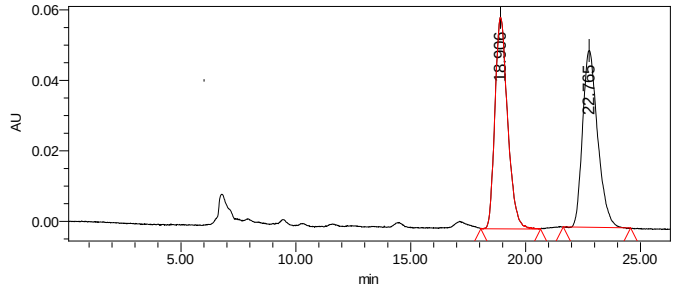


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	16.327	32445718	95.44	1309337	bb	Unknown
2	19.422	1549454	4.56	53801	bb	Unknown

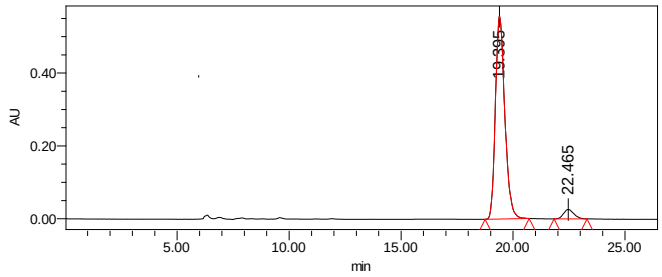
1-(3-methoxyphenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3la)



From 87.6 mg (0.2 mmol) **1l** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 105.4 mg (91% yield) compound **3la** was obtained as a yellow solid, mp = 121-122 ℃. $[\alpha]_D^{20}$ = -77 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 90% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 19.4 and t_{minor} = 22.5 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 9.0 Hz, 2H), 7.80 (d, *J* = 9.0 Hz, 3H), 7.48-7.41 (m, 2H), 7.37 (t, *J* = 7.7 Hz, 1H), 7.32-7.25 (m, 2H), 7.16-7.12 (m, 1H), 6.73 (d, *J* = 8.1 Hz, 1H), 5.76-5.67 (m, 1H), 4.76 (dd, *J* = 12.3, 6.0 Hz, 1H), 3.85 (s, 3H), 3.47 (dd, *J* = 18.3, 9.6 Hz, 1H), 2.82 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.58 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.0, 160.0, 151.2, 142.3, 136.7, 133.9, 130.7, 129.9, 129.4, 129.2, 128.6, 128.4, 125.5, 124.8, 123.4 (q, J_{C-F} = 281.8 Hz), 120.6, 120.4, 112.2, 88.2, 60.6 (q, J_{C-F} = 32.8 Hz), 55.5, 35.9, 35.4. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{25}H_{21}F_3N_3O_8S$ $[M+H]^+$: 580.0996, found 580.1005.

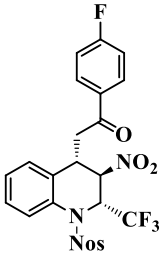


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	18.906	2303319	50.19	60076	bb	Unknown
2	22.765	2285679	49.81	50155	bb	Unknown



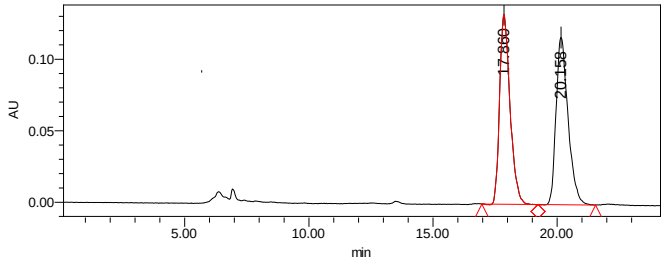
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	19.395	16246405	95.08	556961	BB	Unknown
2	22.465	840921	4.92	25967	BB	Unknown

1-(4-fluorophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3ma)

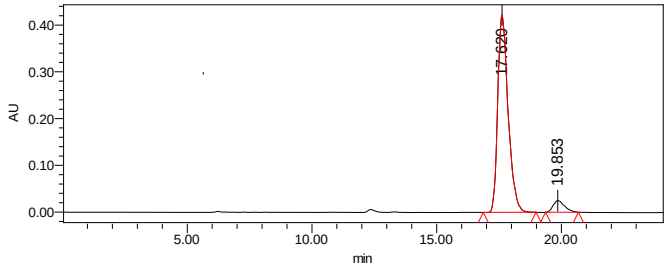


From 85.2 mg (0.2 mmol) **1m** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 104.3 mg (92% yield) compound **3ma** was obtained as a yellow solid, mp = 202-203 ℃. $[\alpha]_D^{20}$ = -73 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 88% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 17.6 and t_{minor} = 19.9 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 9.0 Hz, 2H), 7.90-7.78 (m, 5H), 7.46 (t, *J* = 7.8 Hz, 1H), 7.31-7.25 (m, 1H), 7.14 (t, *J* = 8.6 Hz, 2H), 6.70 (d, *J* = 7.8 Hz, 1H), 5.76-5.67 (m, 1H), 4.75 (dd, *J* = 12.0, 6.0 Hz, 1H), 3.46 (dd, *J* = 18.2, 9.5 Hz, 1H), 2.82 (dd, *J* = 18.2, 2.6 Hz, 1H), 2.59 (t, *J* = 10.4 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 192.5, 166.3 (d, J_{C-F} = 255.0 Hz), 151.2, 142.3, 133.9, 131.8 (d, J_{C-F} = 2.3 Hz), 130.8, 130.6 (d, J_{C-F} = 3.0 Hz), 129.5, 129.1, 128.6, 128.5, 125.3, 124.8, 123.4 (q, J_{C-F} = 281.5 Hz), 116.2 (d, J_{C-F} = 22.5 Hz), 88.2, 60.6 (q, J_{C-F} = 33.0 Hz), 35.8, 35.3. ^{19}F NMR (282 MHz,

$CDCl_3$) δ −74.9, −103.0. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}F_4N_3O_7S$ $[M+H]^+$: 568.0796, found 568.0804.

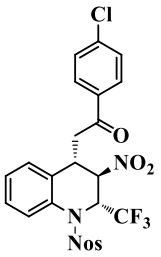


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	17.860	3881244	49.68	132617	bv	Unknown
2	20.158	3931838	50.32	116984	vb	Unknown



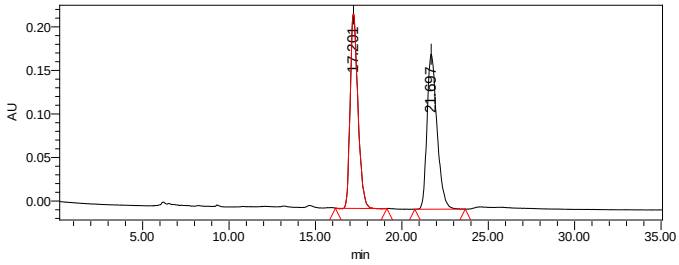
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	17.620	12241020	93.86	422746	bb	Unknown
2	19.853	800614	6.14	24945	bb	Unknown

1-(4-chlorophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3na)

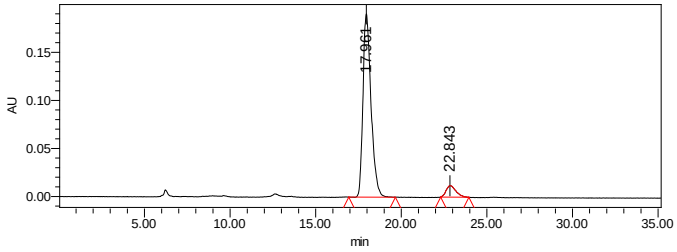


From 88.4 mg (0.2 mmol) **1n** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 107.3 mg (92% yield) compound **3na** was obtained as a yellow solid, mp = 204-205 ℃. $[\alpha]_D^{20}$ = -93 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 86% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 18.0 and t_{minor} = 22.8 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 8.7 Hz, 2H), 7.82-7.77 (m, 5H), 7.49-7.44 (m, 3H), 7.30-7.25 (m, 1H), 6.68 (d, *J* = 7.8 Hz, 1H), 5.76-5.67 (m, 1H), 4.74 (dd, *J* = 12.3, 6.0 Hz, 1H), 3.45 (dd, *J* = 18.2, 9.5 Hz, 1H), 2.81 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.58 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 192.9, 151.2, 142.4, 140.8, 133.9, 133.6,

130.5, 129.5, 129.4, 129.3, 129.1, 128.6, 128.5, 125.3, 124.8, 123.4 (q, $J_{C\text{-}F}$ = 281.3 Hz), 88.2, 60.6 (q, $J_{C\text{-}F}$ = 32.8 Hz), 35.8, 35.4. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}ClF_3N_3O_7S$ $[M+H]^+$: 584.0501, found 584.0509.

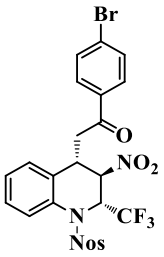


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	17.201	7002138	49.37	223431	bb	Unknown
2	21.697	7180445	50.63	177917	bb	Unknown



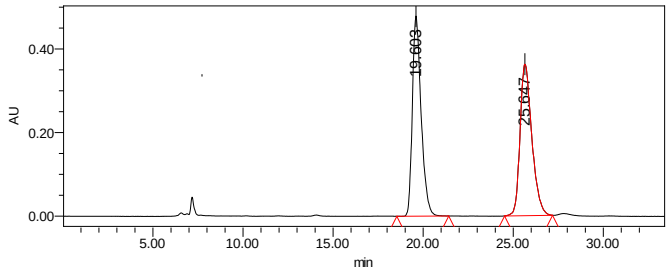
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	17.961	6266218	92.99	190791	bb	Unknown
2	22.843	472414	7.01	11882	bb	Unknown

1-(4-bromophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3oa)

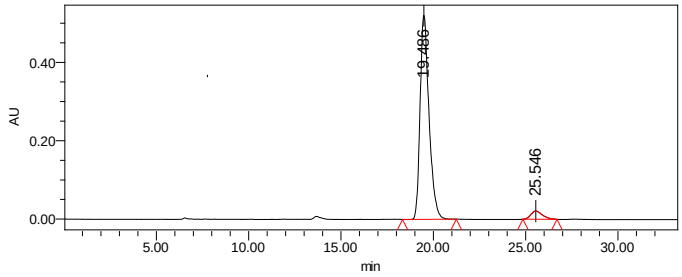


From 97.2 mg (0.2 mmol) **1o** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 116.6 mg (93% yield) compound **3oa** was obtained as a yellow solid, mp = 209-210 ℃. $[\alpha]_D^{20}$ = -86 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^{1}H and ^{19}F NMR analysis. 90% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 19.5 and t_{minor} = 25.5 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 9.0 Hz, 2H), 7.82-7.78 (m, 3H), 7.70 (dd, *J* = 6.6, 1.8 Hz, 2H), 7.61 (dd, *J* = 6.9, 1.8 Hz, 2H), 7.46 (t, *J* = 7.8 Hz, 1H), 7.28 (td, *J* = 7.7, 0.9 Hz, 1H), 6.68 (d, *J* = 7.8 Hz, 1H), 5.76-5.67 (m, 1H), 4.74 (dd, *J* = 12.2, 6.2 Hz, 1H), 3.45 (dd, *J* = 18.3, 9.3 Hz, 1H), 2.81 (dd, *J* = 18.2, 2.6 Hz, 1H), 2.58 (t, *J* = 10.4 Hz, 1H).

^{13}C NMR (75 MHz, $CDCl_3$) δ 193.2, 151.2, 142.3, 134.1, 133.9, 132.3, 130.5, 129.5, 129.5, 129.1, 128.6, 128.5, 125.3, 124.8, 124.8, 123.3 (q, J_{C-F} = 282.8 Hz), 88.2, 60.5 (q, J_{C-F} = 32.8 Hz), 35.8, 35.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}BrF_3N_3O_7S$ $[M+H]^+$: 627.9996, found 627.9990.

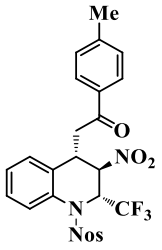


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	19.603	16210006	49.58	478437	bb	Unknown
2	25.647	16482936	50.42	362063	bb	Unknown



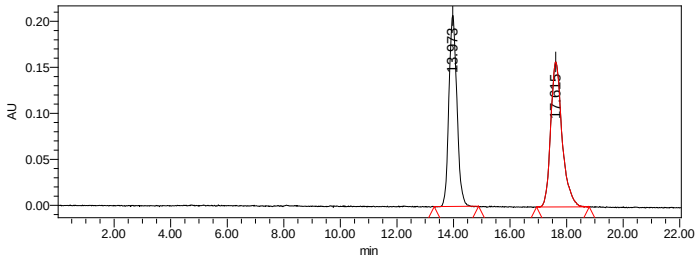
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	19.486	17447684	95.01	520513	bb	Unknown
2	25.546	917245	4.99	21100	bb	Unknown

2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-(p-tolyl)ethanone (3pa)

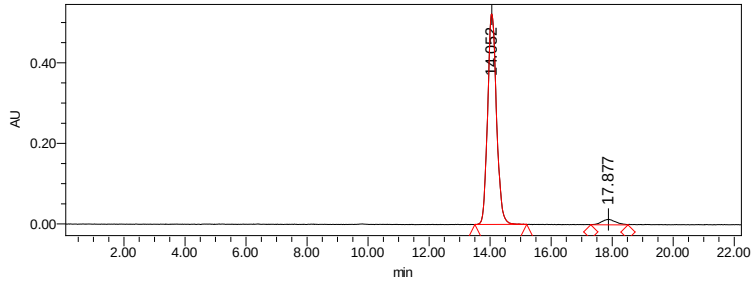


From 84.4 mg (0.2 mmol) **1p** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 101.4 mg (90% yield) compound **3pa** was obtained as a yellow solid, mp = 198-199 ℃. $[\alpha]_D^{20}$ = -71 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^{1}H and ^{19}F NMR analysis. 92% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 14.1 and t_{minor} = 17.9 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.33 (d, *J* = 9.0 Hz, 2H), 7.80 (d, *J* = 9.0 Hz, 3H), 7.73 (d, *J* = 8.1 Hz, 2H), 7.45 (t, *J* = 7.8 Hz, 1H), 7.28-7.24 (m, 3H), 6.72 (d, *J* = 7.8 Hz, 1H), 5.75-5.66 (m, 1H), 4.75 (dd, *J* = 12.2, 6.2 Hz, 1H), 3.46 (dd, *J* = 18.0, 9.6 Hz, 1H), 2.79

(dd, J = 18.0, 2.4 Hz, 1H), 2.57 (t, J = 10.7 Hz, 1H), 2.42 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 193.6, 151.1, 145.2, 142.3, 133.9, 132.9, 130.8, 129.6, 129.4, 129.1, 128.6, 128.4, 128.1, 125.6, 124.8, 123.4 (q, $J_{C\text{-}F}$ = 284.5 Hz), 88.3, 60.6 (q, $J_{C\text{-}F}$ = 33.0 Hz), 35.9, 35.2, 21.7. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{25}H_{21}F_3N_3O_7S$ $[M+H]^+$: 564.1047, found 564.1055.

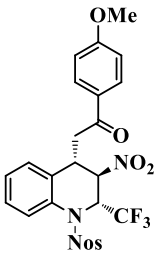


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.973	4089352	48.03	208032	bb	Unknown
2	17.615	4424794	51.97	157514	bb	Unknown



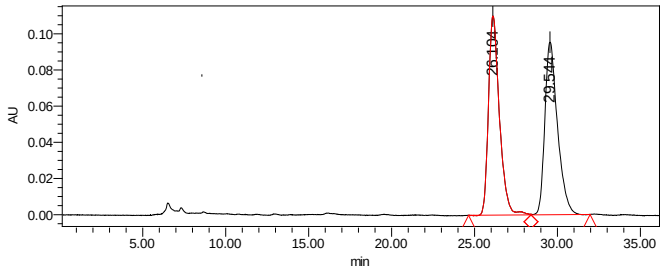
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.052	10593952	96.02	523459	bb	Unknown
2	17.877	439656	3.98	13585	VV	Unknown

1-(4-methoxyphenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3qa)

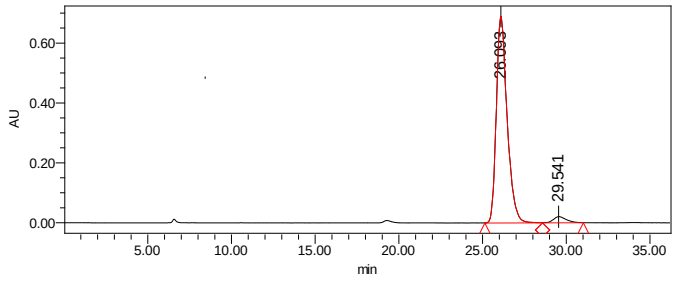


From 87.6 mg (0.2 mmol) **1q** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 104.2 mg (90% yield) compound **3qa** was obtained as a yellow solid, mp = 200-201 ℃. $[\alpha]_D^{20}$ = -103 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^{1}H and ^{19}F NMR analysis. 93% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 26.1 and t_{minor} = 29.5 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.23 (d, J = 8.7 Hz, 2H), 7.73-7.69 (m, 5H), 7.36 (t, J = 7.7

Hz, 1H), 7.18 (t, *J* = 7.5 Hz, 1H), 6.84 (d, *J* = 8.7 Hz, 2H), 6.66 (d, *J* = 7.8 Hz, 1H), 5.66-5.58 (m, 1H), 4.68 (dd, *J* = 12.2, 6.2 Hz, 1H), 3.79 (s, 3H), 3.35 (dd, *J* = 18.0, 9.6 Hz, 1H), 2.68 (d, *J* = 18.0 Hz, 1H), 2.49 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 192.4, 164.3, 151.2, 142.3, 133.9, 131.0, 130.3, 129.3, 129.1, 128.6, 128.5, 128.3, 125.6, 124.8, 123.4 (q, J_{C-F} = 283.3 Hz), 114.1, 88.3, 60.6 (q, J_{C-F} = 32.8 Hz), 55.6, 36.0, 35.0. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{25}H_{21}F_3N_3O_8S$ $[M+H]^+$: 580.0996, found 580.1003.

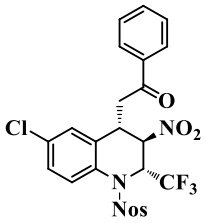


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	26.104	5063339	49.83	110077	bv	Unknown
2	29.544	5098084	50.17	95411	vb	Unknown



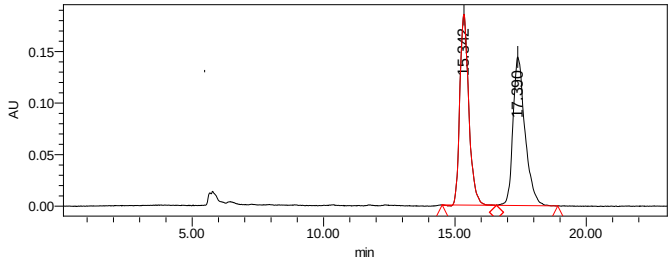
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	26.093	30941514	96.53	690024	BV	Unknown
2	29.541	1111091	3.47	20627	VB	Unknown

2-((2*R*,3*R*,4*S*)-6-chloro-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3ra)

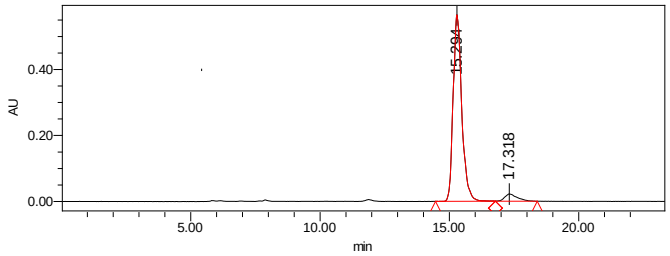


From 88.4 mg (0.2 mmol) **1r** and 64 μ L (0.6 mmol) *β*-CF_3-nitroalkene, 104.9 mg (90% yield) compound **3ra** was obtained as a yellow solid, mp = 166-167 ℃. $[\alpha]_D^{20}$ = -33 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^{1}H and ^{19}F NMR analysis. 89% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 15.3 and t_{minor} = 17.3 min. ^{1}H

NMR (300 MHz, $CDCl_3$) δ 8.38 (d, *J* = 8.7 Hz, 2H), 7.87-7.81 (m, 4H), 7.74 (d, *J* = 8.7 Hz, 1H), 7.63 (t, *J* = 7.5 Hz, 1H), 7.51-7.42 (m, 3H), 6.70 (d, *J* = 0.9 Hz, 1H), 5.73-5.64 (m, 1H), 4.75 (dd, *J* = 12.3, 6.0 Hz, 1H), 3.44 (dd, *J* = 18.6, 9.3 Hz, 1H), 2.89 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.55 (t, *J* = 10.2 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 193.8, 151.2, 142.2, 135.1, 135.1, 134.3, 132.6, 132.5, 129.7, 129.7, 129.0, 128.6, 128.0, 125.9, 125.0, 123.2 (q, J_{C-F} = 285.5 Hz), 87.9, 60.5 (q, J_{C-F} = 33.0 Hz), 35.7, 35.2. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.8. HRMS (ESI) *m/z* calcd for $C_{24}H_{17}ClF_3N_3NaO_7S$ $[M+Na]^+$: 606.0320, found 606.0323.

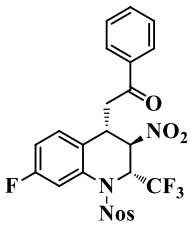


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	15.342	4409838	49.04	185108	bv	Unknown
2	17.390	4581628	50.96	144285	vb	Unknown



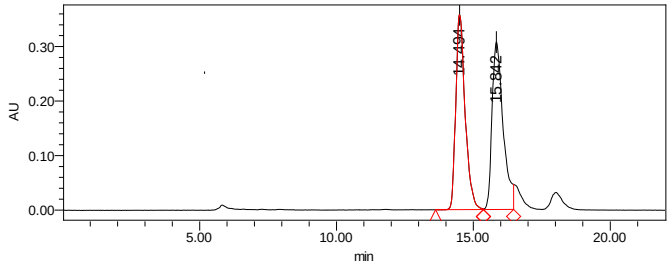
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	15.294	13155824	94.63	564565	bv	Unknown
2	17.318	746414	5.37	21915	vb	Unknown

2-((2*R*,3*R*,4*S*)-7-fluoro-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3sa)

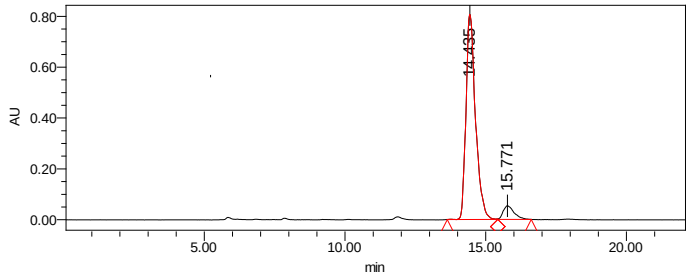


From 85.2 mg (0.2 mmol) **1s** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 103.2 mg (91% yield) compound **3sa** was obtained as a yellow solid, mp = 158-159 ℃. $[\alpha]_D^{20}$ = -29 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 86% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol

/DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 14.4 and t_{minor} = 15.8 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.36 (d, *J* = 9.0 Hz, 2H), 7.85 (t, *J* = 8.9 Hz, 4H), 7.64-7.54 (m, 2H), 7.47 (t, *J* = 7.7 Hz, 2H), 7.00 (td, *J* = 8.3, 3.5 Hz, 1H), 6.70 (dd, *J* = 8.4, 5.4 Hz, 1H), 5.75-5.66 (m, 1H), 4.77 (dd, *J* = 12.0, 6.0 Hz, 1H), 3.48 (dd, *J* = 18.3, 9.6 Hz, 1H), 2.87 (dd, *J* = 18.3, 2.1 Hz, 1H), 2.52 (t, *J* = 10.7 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 193.9, 162.4 (d, J_{C-F} = 249.0 Hz), 151.2, 142.2, 135.3, 135.1 (d, J_{C-F} = 3.0 Hz), 134.3, 129.0, 128.6, 128.0, 126.9 (d, J_{C-F} = 9.0 Hz), 126.5 (d, J_{C-F} = 3.8 Hz), 125.0, 123.3 (q, J_{C-F} = 281.3 Hz), 116.3 (d, J_{C-F} = 21.8 Hz), 115.8, 88.1, 60.5 (q, J_{C-F} = 33.0 Hz), 35.5, 35.4. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.8, −109.7. HRMS (ESI) *m/z* calcd for $C_{24}H_{17}F_4N_3NaO_7S$ $[M+Na]^+$: 590.0616, found 590.0624.

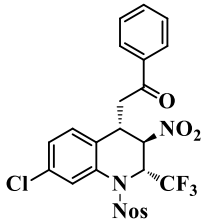


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.494	8508869	49.59	358522	bv	Unknown
2	15.842	8649150	50.41	307630	vv	Unknown



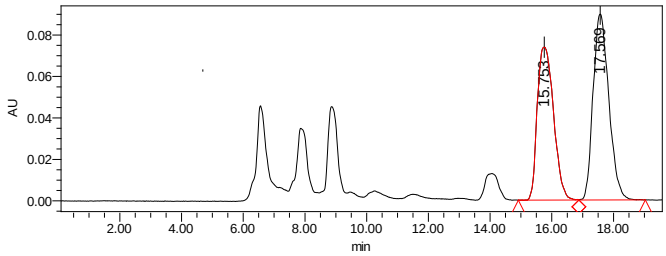
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.435	18984799	92.92	806820	bv	Unknown
2	15.771	1447038	7.08	53983	vb	Unknown

2-((2*R*,3*R*,4*S*)-7-chloro-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3ta)

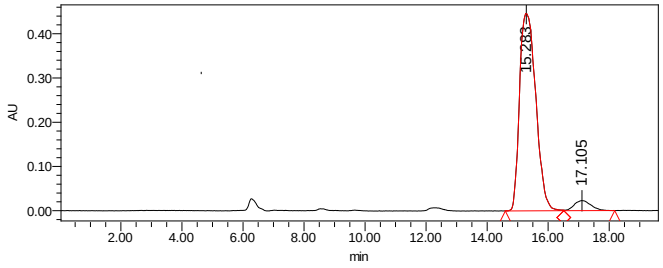


From 88.4 mg (0.2 mmol) **1t** and 64 μ L (0.6 mmol) *β*-CF_3-nitroalkene, 106.1 mg (91% yield) compound **3ta** was obtained as a yellow solid, mp = 161-162 ℃. $[\alpha]_D^{20}$ = -24 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^{1}H and ^{19}F NMR analysis. 90% ee was

determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 15.3 and t_{minor} = 17.1 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.36 (d, *J* = 8.7 Hz, 2H), 7.87-7.81 (m, 5H), 7.61 (t, *J* = 7.4 Hz, 1H), 7.47 (t, *J* = 7.5 Hz, 2H), 7.26-7.23 (m, 1H), 6.66 (d, *J* = 8.4 Hz, 1H), 5.69 (t, *J* = 6.5 Hz, 1H), 4.77 (dd, *J* = 12.2, 5.9 Hz, 1H), 3.46 (dd, *J* = 18.3, 9.6 Hz, 1H), 2.87 (d, *J* = 16.5, 1H), 2.54 (t, *J* = 10.4 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 193.9, 151.3, 142.2, 135.2, 135.0, 134.3, 129.3, 129.2, 129.0, 128.7, 128.4, 128.0, 126.6, 125.0, 125.0, 123.3 (q, J_{C-F} = 284.3 Hz), 88.0, 60.5 (q, J_{C-F} = 33.0 Hz), 35.6, 35.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.8. HRMS (ESI) *m/z* calcd for $C_{24}H_{18}ClF_3N_3O_7S$ $[M+H]^+$: 584.0501, found 584.0504.

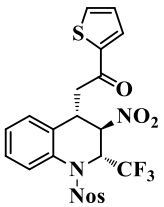


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	15.753	2702534	46.01	73758	bv	Unknown
2	17.569	3170651	53.99	89673	vb	Unknown



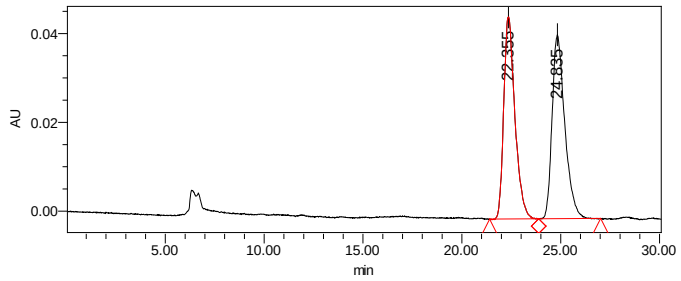
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	15.283	16527286	94.98	446052	bv	Unknown
2	17.105	873716	5.02	22658	vb	Unknown

2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-(thiophen-2-yl)ethanone (3ua)

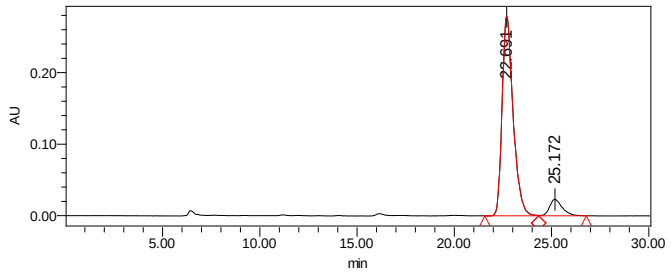


From 82.8 mg (0.2 mmol) **1u** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 103.2 mg (93% yield) compound **3ua** was obtained as a yellow solid, mp = 179-180 ℃. $[\alpha]_D^{20}$ = -34 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^{1}H and ^{19}F NMR analysis. 83% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol

/DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 22.7 and t_{minor} = 25.2 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.23 (d, *J* = 8.7 Hz, 2H), 7.73-7.70 (m, 3H), 7.62-7.61 (m, 2H), 7.38 (t, *J* = 7.8 Hz, 1H), 7.25-7.19 (m, 1H), 7.07 (t, *J* = 4.4 Hz, 1H), 6.77 (d, *J* = 7.8 Hz, 1H), 5.67-5.58 (m, 1H), 4.69 (dd, *J* = 12.3, 6.0 Hz, 1H), 3.33 (dd, *J* = 18.0, 9.6 Hz, 1H), 2.75 (dd, *J* = 18.0, 2.4 Hz, 1H), 2.48 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 186.9, 151.1, 142.3, 135.0, 133.8, 132.4, 130.5, 129.5, 129.2, 128.6, 128.5, 128.4, 125.5, 124.8, 124.8, 123.4 (q, J_{C-F} = 281.0 Hz), 88.1, 60.5 (q, J_{C-F} = 32.8 Hz), 36.0, 35.8. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.8. HRMS (ESI) *m/z* calcd for $C_{22}H_{17}F_3N_3O_7S_2$ $[M+H]^+$: 556.0455, found 556.0462.

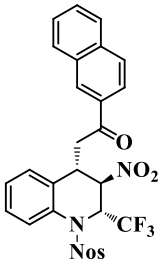


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	22.355	1785737	49.15	45517	bv	Unknown
2	24.835	1847672	50.85	41382	vb	Unknown



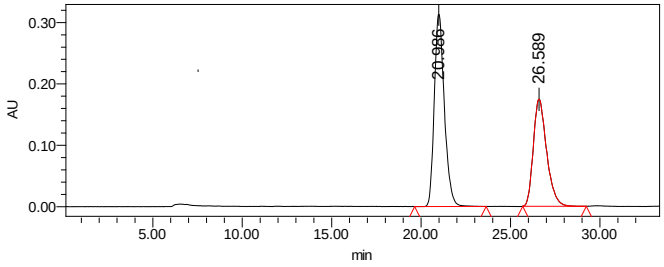
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	22.691	11005025	91.39	279017	bv	Unknown
2	25.172	1036910	8.61	22964	vb	Unknown

1-(naphthalen-2-yl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoro methyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3va)

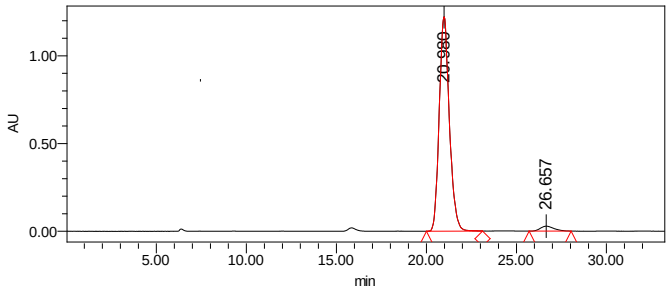


From 91.6 mg (0.2 mmol) **1v** and 64 μ L (0.6 mmol) β-CF_3-nitroalkene, 111.4 mg (93% yield) compound **3va** was obtained as a yellow oil. $[\alpha]_D^{20}$ = -100 (c = 1.0, $CHCl_3$). Dr

(>20:1) determined by ^{1}H and ^{19}F NMR analysis. 94% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 21.0 and t_{minor} = 26.7 min. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.37 (s, 1H), 8.30 (d, *J* = 9.0 Hz, 2H), 7.94 (d, *J* = 7.8 Hz, 1H), 7.87-7.77 (m, 6H), 7.64-7.54 (m, 2H), 7.44 (t, *J* = 7.7 Hz, 1H), 7.25 (t, *J* = 7.4 Hz, 1H), 6.77 (d, *J* = 7.8 Hz, 1H), 5.78-5.69 (m, 1H), 4.82 (dd, *J* = 12.0, 6.0 Hz, 1H), 3.64 (dd, *J* = 18.2, 9.5 Hz, 1H), 2.95 (dd, *J* = 18.0, 2.4 Hz, 1H), 2.65 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 194.0, 151.1, 142.3, 135.9, 133.9, 132.7, 132.3, 130.8, 129.9, 129.6, 129.4, 129.2, 128.9, 128.6, 128.4, 127.9, 127.2, 125.6, 124.8, 124.8, 123.5 (q, J_{C-F} = 283.0 Hz), 123.3, 88.3, 60.6 (q, J_{C-F} = 32.8 Hz), 36.0, 35.4. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.8. HRMS (ESI) *m/z* calcd for $C_{28}H_{21}F_3N_3O_7S$ $[M+H]^+$: 600.1047, found 600.1056.

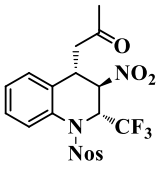


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	20.986	12285287	57.72	313589	bb	Unknown
2	26.589	8998254	42.28	174389	bb	Unknown



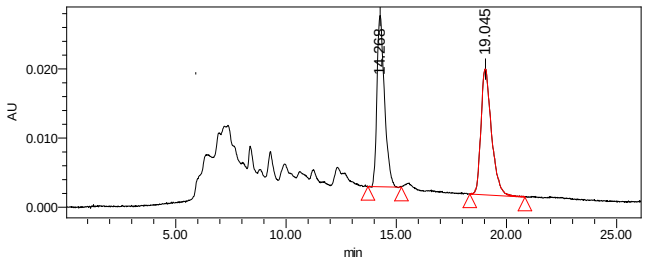
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	20.980	47917863	96.98	1221138	BV	Unknown
2	26.657	1491248	3.02	28496	BB	Unknown

1-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(trifluoromethyl)-1,2,3,4-tetrahydroquinolin-4-yl)propan-2-one (3wa)

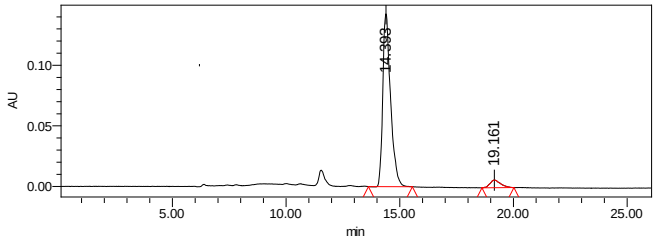


From 69.2 mg (0.2 mmol) **1w** and 64 μL (0.6 mmol) β-CF_3-nitroalkene, 91.6 mg (94% yield) compound **3wa** was obtained as a yellow solid, mp = 70-71 ℃. $[\alpha]_D^{20}$ = -29 (c

= 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 89% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 4:1:0.02, 1.0 mL/min). Retention time: t_{major} = 14.4 and t_{minor} = 19.2 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.30 (d, *J* = 8.7 Hz, 2H), 7.78 (d, *J* = 9.0 Hz, 3H), 7.47 (t, *J* = 7.7 Hz, 1H), 7.35 (td, *J* = 7.7, 1.2 Hz, 1H), 6.72 (d, *J* = 7.8 Hz, 1H), 5.73-5.64 (m, 1H), 4.60 (dd, *J* = 12.0, 6.0 Hz, 1H), 2.87 (dd, *J* = 18.3, 8.7 Hz, 1H), 2.42 (dd, *J* = 18.3, 3.0 Hz, 1H), 2.33 (d, *J* = 9.3 Hz, 1H), 2.14 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 202.3, 151.0, 142.4, 133.9, 130.4, 129.5, 129.1, 128.6, 128.5, 125.1, 124.7, 123.4 (q, J_{C-F} = 285.2 Hz), 88.0, 60.4 (q, J_{C-F} = 32.8 Hz), 40.1, 35.4, 29.9. ^{19}F NMR (282 MHz, $CDCl_3$) δ −74.9. HRMS (ESI) *m/z* calcd for $C_{19}H_{17}F_3N_3O_7S$ $[M+H]^+$: 488.0734, found 488.0737.

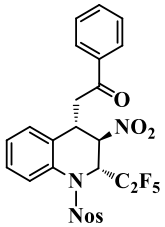


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.268	587002	49.11	24775	bb	Unknown
2	19.045	608183	50.89	18228	bb	Unknown



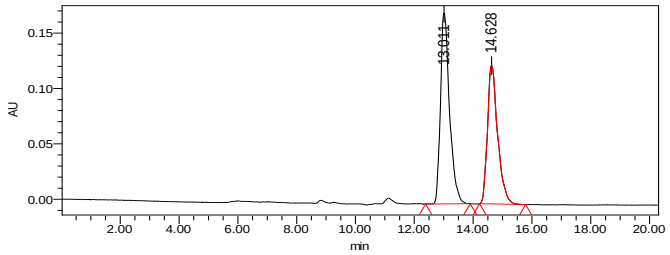
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.393	3403436	94.36	142701	bb	Unknown
2	19.161	203474	5.64	6306	bb	Unknown

2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoroethyl)-1,2,3,4-tetra hydroquinolin-4-yl)-1-phenylethanone (3cb)

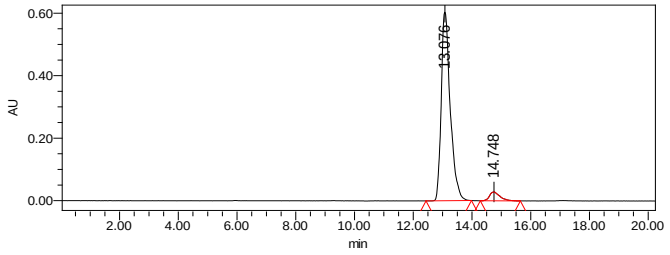


From 97.2 mg (0.2 mmol) **1c** and 60 μL (0.6 mmol) *β*-C_2F_5-nitroalkene, 123.6 mg (85% yield) compound **3cb** was obtained as a yellow solid, mp = 115-116 ℃. $[\alpha]_D^{20}$ =

-93 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 90% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 13.1 and t_{minor} = 14.7 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.32 (d, *J* = 9.0 Hz, 2H), 7.84-7.76 (m, 5H), 7.61 (t, *J* = 7.4 Hz, 1H), 7.47 (t, *J* = 7.7 Hz, 3H), 7.29 (t, *J* = 7.4 Hz, 1H), 6.73 (d, *J* = 7.8 Hz, 1H), 5.91 (dt, *J* = 20.2, 4.7 Hz, 1H), 4.91 (dd, *J* = 12.2, 4.7 Hz, 1H), 3.54 (dd, *J* = 18.3, 9.6 Hz, 1H), 2.86 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.56 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 194.0, 151.2, 142.1, 135.3, 134.2, 134.0, 131.0, 129.5, 129.3, 129.0, 128.8, 128.6, 128.0, 125.6, 124.8, 118.2 (dt, J_{C-F} = 285.0, 34.5 Hz), 113.0 (ddq, J_{C-F} = 264.3, 257.3, 36.8 Hz), 88.3, 59.4 (dd, J_{C-F} = 30.5, 20.5 Hz), 36.0, 35.6. ^{19}F NMR (282 MHz, $CDCl_3$) δ −81.2 (s, 3F), −115.3 (d, *J* = 282.0 Hz, 1F), −125.4 (d, *J* = 284.8 Hz, 1F). HRMS (ESI) *m/z* calcd for $C_{25}H_{18}F_5N_3NaO_7S$ $[M+Na]^+$: 622.0678, found 622.0702.

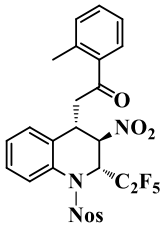


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.011	3688442	54.99	172647	bb	Unknown
2	14.628	3018879	45.01	124972	bb	Unknown



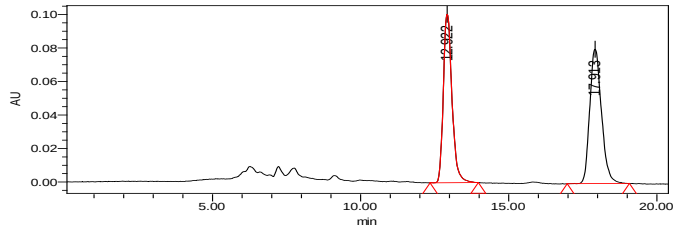
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.076	12868014	94.86	604299	bb	Unknown
2	14.748	697754	5.14	28530	bb	Unknown

2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoroethyl)-1,2,3,4-tetra hydroquinolin-4-yl)-1-(o-tolyl)ethanone (3hb)

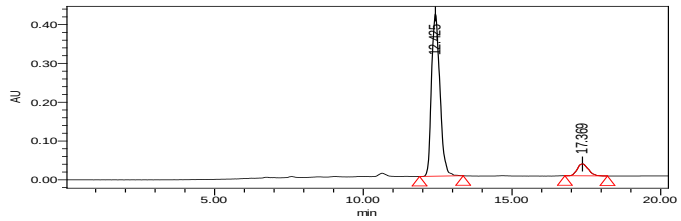


From 84.4 mg (0.2 mmol) **1h** and 60 μL (0.6 mmol) *β*-C_2F_5-nitroalkene, 107.9 mg (88% yield) compound **3hb** was obtained as a yellow solid, mp = 94-95 ℃. $[\alpha]_D^{20}$ =

-86 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 82% ee was determined by HPLC analysis (Daicel Chiralcel IA-H column, hexane/2-propanol/DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 12.4 and t_{minor} = 17.4 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.20 (d, *J* = 8.7 Hz, 2H), 7.67 (d, *J* = 8.7 Hz, 3H), 7.61 (d, *J* = 7.8 Hz, 1H), 7.40-7.29 (m, 2H), 7.22-7.12 (m, 3H), 6.64 (d, *J* = 7.8 Hz, 1H), 5.82 (dt, *J* = 20.4, 4.5 Hz, 1H), 4.76 (dd, *J* = 12.2, 5.3 Hz, 1H), 3.39 (dd, *J* = 18.0, 9.9 Hz, 1H), 2.68 (dd, *J* = 18.0, 2.4 Hz, 1H), 2.43 (t, *J* = 10.5 Hz, 1H), 2.16 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.9, 151.3, 142.0, 139.6, 135.3, 134.0, 132.6, 132.6, 131.4, 129.5, 129.3, 128.8, 128.8, 128.6, 126.0, 125.6, 124.8, 118.2 (qt, J_{C-F} = 285.2, 34.6 Hz), 113.1 (tq, J_{C-F} = 261.0, 36.3 Hz), 88.3, 59.5 (dd, J_{C-F} = 30.5, 20.5 Hz), 37.7, 36.3, 21.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −81.2 (s, 3F), −115.4 (d, *J* = 282.6 Hz, 1F), −125.6 (d, *J* = 282.8 Hz, 1F). HRMS (ESI) *m/z* calcd for $C_{26}H_{20}F_5N_3NaO_7S$ $[M+Na]^+$: 636.0834, found 636.0840.

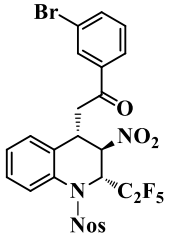


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.922	2049800	48.08	100534	bb	Unknown
2	17.913	2213478	51.92	80214	bb	Unknown



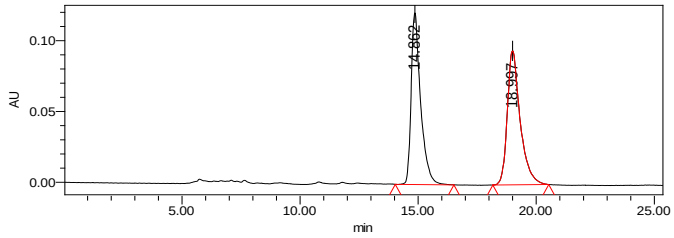
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.425	8206700	91.12	418204	bb	Unknown
2	17.369	799789	8.88	30751	bb	Unknown

1-(3-bromophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoroethyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3jb)

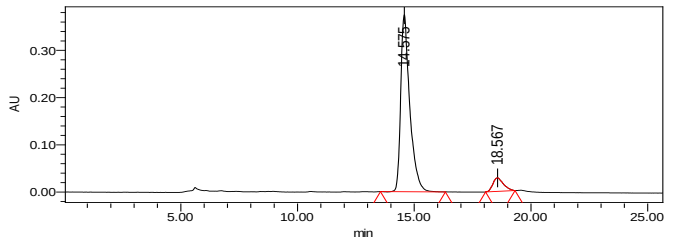


From 97.2 mg (0.2 mmol) **1j** and 60 μL (0.6 mmol) *β*-C_2F_5-nitroalkene, 117.8 mg (87% yield) compound **3jb** was obtained as a yellow solid, mp = 83-84 ℃. $[\alpha]_D^{20}$ =

-67 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 84% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol/DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 14.6 and t_{minor} = 18.6 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.23 (d, *J* = 8.7 Hz, 2H), 7.86 (s, 1H), 7.73-7.63 (m, 5H), 7.39 (t, *J* = 7.7 Hz, 1H), 7.30-7.18 (m, 2H), 6.61 (d, *J* = 7.8 Hz, 1H), 5.83 (dt, *J* = 20.1, 4.8 Hz, 1H), 4.83 (dd, *J* = 12.0, 5.1 Hz, 1H), 3.41 (dd, *J* = 18.3, 9.3 Hz, 1H), 2.79 (dd, *J* = 18.5, 2.6 Hz, 1H), 2.48 (t, *J* = 10.4 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.9, 150.1, 141.1, 136.0, 135.9, 132.9, 130.0, 129.6, 129.5, 128.6, 128.3, 127.8, 127.6, 125.5, 124.4, 123.7, 122.2, 117.1 (qt, J_{C-F} = 285.2, 34.1 Hz), 111.9 (ddq, J_{C-F} = 264.3, 257.3, 36.9 Hz), 87.2, 58.3 (dd, J_{C-F} = 31.0, 20.0 Hz), 34.9, 34.7. ^{19}F NMR (282 MHz, $CDCl_3$) δ −81.2 (s, 3F), −115.3 (d, *J* = 282.6 Hz, 1F), −125.2 (d, *J* = 282.6 Hz, 1F). HRMS (ESI) *m/z* calcd for $C_{25}H_{17}BrF_5N_3NaO_7S$ $[M+Na]^+$: 699.9783, found 699.9775.

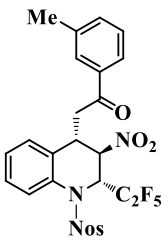


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.862	3376112	48.51	121142	bb	Unknown
2	18.997	3582868	51.49	94610	bb	Unknown

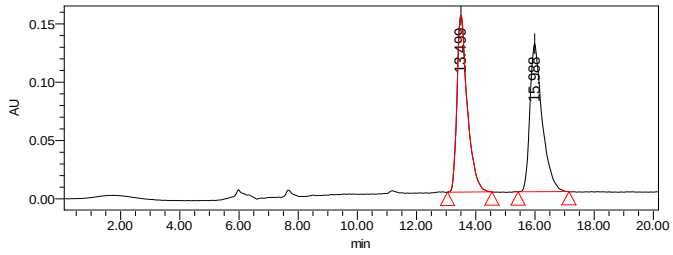


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	14.575	10145341	91.82	375463	bb	Unknown
2	18.567	903232	8.18	28696	bb	Unknown

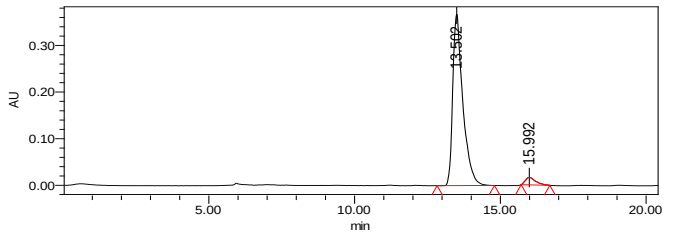
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoroethyl)-1,2,3,4-tetra hydroquinolin-4-yl)-1-(m-tolyl)ethanone (3kb)



From 84.4 mg (0.2 mmol) **1k** and 60 μL (0.6 mmol) β-C_2F_5-nitroalkene, 107.9 mg (88% yield) compound **3kb** was obtained as a yellow solid, mp = 94-95 ℃. $[\alpha]_D^{20}$ = -80 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 91% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol/DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 13.5 and t_{minor} = 16.0 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.23 (d, *J* = 8.4 Hz, 2H), 7.71 (d, *J* = 8.1 Hz, 3H), 7.54 (s, 2H), 7.40-7.18 (m, 4H), 6.64 (d, *J* = 7.5 Hz, 1H), 5.83 (d, *J* = 19.8 Hz, 1H), 4.83 (dd, *J* = 12.0, 4.5 Hz, 1H), 3.43 (dd, *J* = 18.3, 9.6 Hz, 1H), 2.77 (d, *J* = 18.3 Hz, 1H), 2.47 (t, *J* = 10.5 Hz, 1H), 2.32 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 193.2, 150.2, 141.1, 137.9, 134.4, 133.9, 132.9, 130.0, 128.4, 128.3, 127.8, 127.8, 127.5, 127.5, 124.6, 124.2, 123.7, 117.1 (dt, J_{C-F} = 286.0, 34.0 Hz), 111.9 (tq, J_{C-F} = 262.5, 37.7 Hz), 87.3, 58.4 (dd, J_{C-F} = 30.0, 20.0 Hz), 35.0, 34.6, 20.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −81.2 (s, 3F), −115.3 (d, *J* = 282.0 Hz, 1F), −125.4 (d, *J* = 282.0 Hz, 1F). HRMS (ESI) *m/z* calcd for $C_{26}H_{20}F_5N_3NaO_7S$ $[M+Na]^+$: 636.0834, found 636.0839.

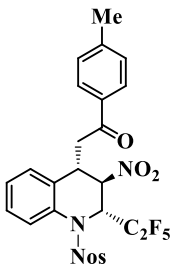


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.499	3684541	50.13	151525	bb	Unknown
2	15.988	3665914	49.87	127057	bb	Unknown

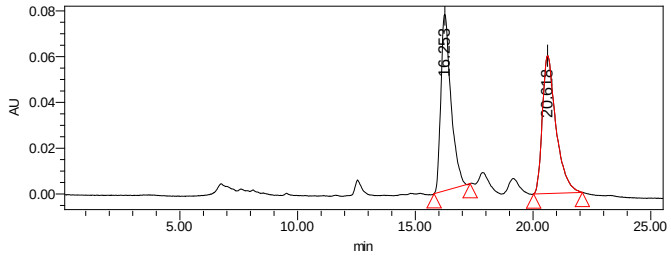


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.502	8842610	95.70	367665	bb	Unknown
2	15.992	397312	4.30	15871	bb	Unknown

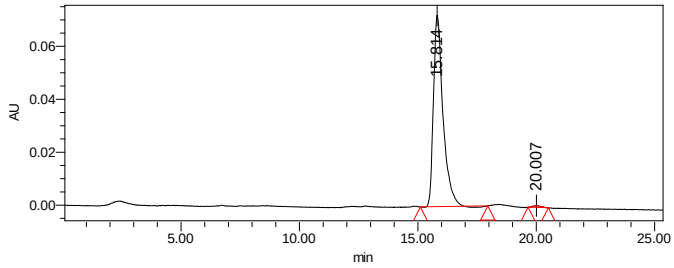
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoroethyl)-1,2,3,4-tetra hydroquinolin-4-yl)-1-(p-tolyl)ethanone (3pb)



From 84.4 mg (0.2 mmol) **1p** and 60 μL (0.6 mmol) β-C_2F_5-nitroalkene, 110.4 mg (90% yield) compound **3pb** was obtained as a yellow solid, mp = 100-101 ℃. $[\alpha]_D^{20}$ = -102 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 99% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 15.8 and t_{minor} = 20.0 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.23 (d, *J* = 9.0 Hz, 2H), 7.72-7.63 (m, 5H), 7.38 (t, *J* = 7.8 Hz, 1H), 7.22-7.17 (m, 3H), 6.64 (d, *J* = 7.8 Hz, 1H), 5.82 (dt, *J* = 20.2, 4.7 Hz, 1H), 4.82 (dd, *J* = 12.3, 5.1 Hz, 1H), 3.42 (dd, *J* = 18.0, 9.6 Hz, 1H), 2.73 (dd, *J* = 18.2, 2.3 Hz, 1H), 2.46 (t, *J* = 10.7 Hz, 1H), 2.34 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 192.5, 150.2, 144.2, 141.1, 132.9, 131.9, 130.1, 128.6, 128.4, 128.3, 127.7, 127.5, 127.1, 124.6, 123.7, 117.2 (qt, J_{C-F} = 285.2, 34.1 Hz), 111.9 (ddq, J_{C-F} = 265.5, 258.5, 37.4 Hz), 87.3, 58.4 (dd, J_{C-F} = 30.0, 20.0 Hz), 35.0, 34.4, 20.7. ^{19}F NMR (282 MHz, $CDCl_3$) δ −81.2 (s, 3F), −115.3 (d, *J* = 282.6 Hz, 1F), −125.5 (d, *J* = 282.6 Hz, 1F). HRMS (ESI) *m/z* calcd for $C_{26}H_{20}F_5N_3NaO_7S$ $[M+Na]^+$: 636.0834, found 636.0842.

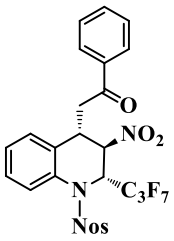


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	16.253	2295699	48.65	77063	bb	Unknown
2	20.618	2423163	51.35	60204	bb	Unknown

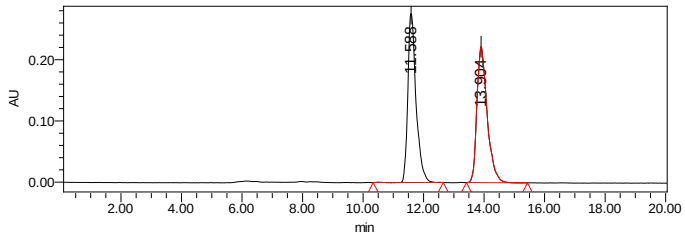


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	15.814	2055039	99.25	72424	bb	Unknown
2	20.007	15554	0.75	684	bb	Unknown

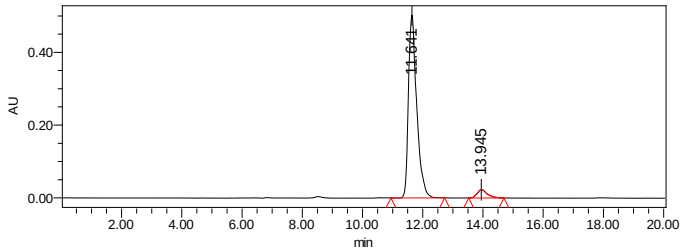
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoropropyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-phenylethanone (3cc)



From 97.2 mg (0.2 mmol) **1c** and 60 μL (0.6 mmol) β-C_3F_7-nitroalkene, 123.6 mg (85% yield) compound **3cc** was obtained as a yellow solid, mp = 129-130 ℃. $[\alpha]_D^{20}$ = -69 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 90% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 11.6 and t_{minor} = 13.9 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.31 (d, *J* = 8.7 Hz, 2H), 7.82 (t, *J* = 8.0 Hz, 5H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.47 (t, *J* = 7.7 Hz, 3H), 7.29 (t, *J* = 6.8 Hz, 1H), 6.72 (d, *J* = 7.8 Hz, 1H), 6.04 (dt, *J* = 17.2, 6.1 Hz, 1H), 4.92 (dd, *J* = 12.0, 4.8 Hz, 1H), 3.53 (dd, *J* = 18.3, 9.3 Hz, 1H), 2.88 (dd, *J* = 18.2, 2.0 Hz, 1H), 2.58 (t, *J* = 10.5 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 194.0, 151.2, 142.2, 135.4, 134.2, 134.1, 131.0, 129.5, 129.2, 128.9, 128.8, 128.5, 128.0, 125.6, 124.7, 117.4 (dt, J_{C-F} = 286.5, 33.8 Hz), 114.6 (tt, J_{C-F} = 261.8, 30.7 Hz), 108.8 (q, J_{C-F} = 37.7 Hz), 88.6, 59.8 (dd, J_{C-F} = 28.5, 20.5 Hz), 36.2, 35.6. ^{19}F NMR (282 MHz, $CDCl_3$) δ −80.4 (t, *J* = 11.0 Hz, 3F), −113.3 - −114.4 (m, 1F), −119.5 - −120.7 (m, 1F), −125.1 (dd, *J* = 34.5, 11.1 Hz, 2F). HRMS (ESI) *m/z* calcd for $C_{26}H_{18}F_7N_3NaO_7S$ $[M+Na]^+$: 672.0646, found 672.0637.

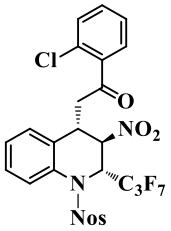


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	11.588	5225960	49.99	276191	bb	Unknown
2	13.904	5228463	50.01	222052	bb	Unknown

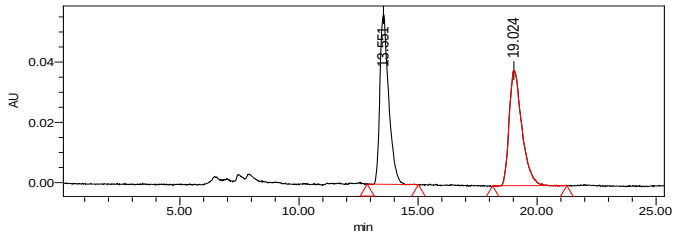


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	11.641	9607169	94.78	502709	bb	Unknown
2	13.945	528875	5.22	22712	bb	Unknown

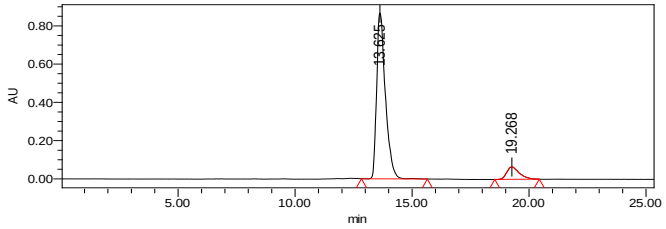
1-(2-chlorophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoropropyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3gc)



From 88.4 mg (0.2 mmol) **1g** and 60 μL (0.6 mmol) β-C_3F_7-nitroalkene, 117.5 mg (86% yield) compound **3gc** was obtained as a yellow solid, mp = 131-132 ℃. $[\alpha]_D^{20}$ = -48 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 81% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 13.6 and t_{minor} = 19.3 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.23 (d, *J* = 9.0 Hz, 2H), 7.75-7.70 (m, 3H), 7.44-7.33 (m, 4H), 7.29-7.23 (m, 2H), 6.78 (d, *J* = 7.8 Hz, 1H), 6.01-5.91 (m, 1H), 4.80 (dd, *J* = 12.0, 4.5 Hz, 1H), 3.46 (dd, *J* = 18.9, 9.0 Hz, 1H), 2.91 (dd, *J* = 18.8, 2.9 Hz, 1H), 2.46 (t, *J* = 9.9 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 195.4, 150.1, 141.2, 135.9, 133.2, 132.0, 130.5, 130.1, 129.7, 128.8, 128.6, 128.2, 127.8, 127.5, 126.3, 124.6, 123.7, 116.4 (qt, J_{C-F} = 286.7, 33.6 Hz), 113.5 (ddt, J_{C-F} = 265.3, 257.8, 31.7 Hz), 107.7 (tq, J_{C-F} = 264.5, 37.1 Hz), 87.4, 58.7 (dd, J_{C-F} = 29.0, 20.0 Hz), 38.8, 35.5. ^{19}F NMR (282 MHz, $CDCl_3$) δ −80.4 (t, *J* = 11.3 Hz, 3F), −113.3 - −114.5 (m, 1F), −119.5 - −120.6 (m, 1F), −125.2 (dd, *J* = 38.1, 9.9 Hz, 2F). HRMS (ESI) *m/z* calcd for $C_{26}H_{17}ClF_7N_3NaO_7S$ $[M+Na]^+$: 706.0256, found 706.0263.

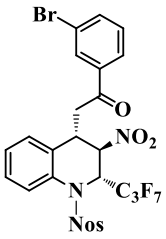


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.551	1449687	50.38	56346	bb	Unknown
2	19.024	1427813	49.62	38182	bb	Unknown

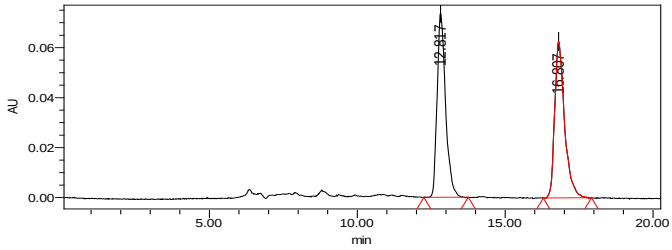


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.625	22530720	90.30	866047	bb	Unknown
2	19.268	2419212	9.70	64912	bb	Unknown

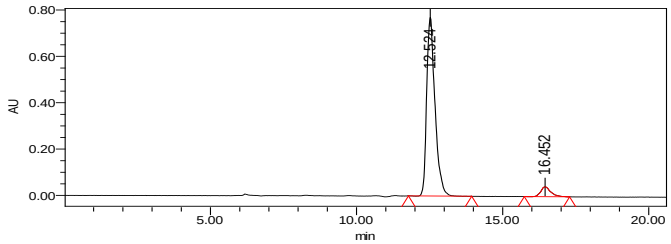
1-(3-bromophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoropropyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3jc)



From 97.2 mg (0.2 mmol) **1j** and 60 μL (0.6 mmol) β-C_3F_7-nitroalkene, 123.6 mg (85% yield) compound **3jc** was obtained as a yellow solid, mp = 87-88 ℃. $[\alpha]_D^{20}$ = -64 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 88% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 12.5 and t_{minor} = 16.5 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.32 (d, *J* = 9.0 Hz, 2H), 7.95 (t, *J* = 1.7 Hz, 1H), 7.83-7.72 (m, 5H), 7.48 (t, *J* = 7.7 Hz, 1H), 7.36 (t, *J* = 8.0 Hz, 1H), 7.32-7.27 (m, 1H), 6.69 (d, *J* = 7.8 Hz, 1H), 6.09-5.99 (m, 1H), 4.93 (dd, *J* = 12.3, 4.5 Hz, 1H), 3.50 (dd, *J* = 18.6, 9.3 Hz, 1H), 2.90 (dd, *J* = 18.3, 2.7 Hz, 1H), 2.59 (t, *J* = 10.1 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 193.0, 151.1, 142.2, 137.1, 137.0, 134.2, 131.0, 130.7, 130.6, 129.6, 129.3, 128.8, 128.5, 126.5, 125.4, 124.7, 123.3, 117.4 (dt, J_{C-F} = 287.5, 34.3 Hz), 115.9 (dt, J_{C-F} = 264.0, 34.0 Hz), 110.2 (dq, J_{C-F} = 303.0, 36.2 Hz), 88.4, 59.7 (dd, J_{C-F} = 29.0, 21.0 Hz), 36.1, 35.7. ^{19}F NMR (282 MHz, $CDCl_3$) δ −80.4 (t, *J* = 11.0 Hz, 3F), −113.3 - −114.5 (m, 1F), −119.4 - −120.5 (m, 1F), −125.1 - −125.2 (m, 2F). HRMS (ESI) *m/z* calcd for $C_{26}H_{17}BrF_7N_3NaO_7S$ $[M+Na]^+$: 749.9751, found 749.9862.

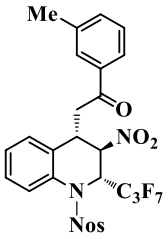


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.817	1469711	50.31	73685	bb	Unknown
2	16.807	1451485	49.69	62732	bb	Unknown

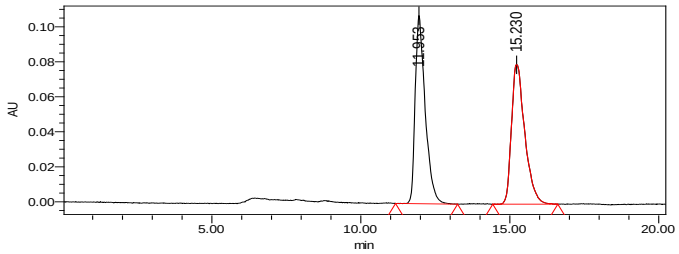


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.524	15220533	93.75	769745	bb	Unknown
2	16.452	1014964	6.25	42298	bb	Unknown

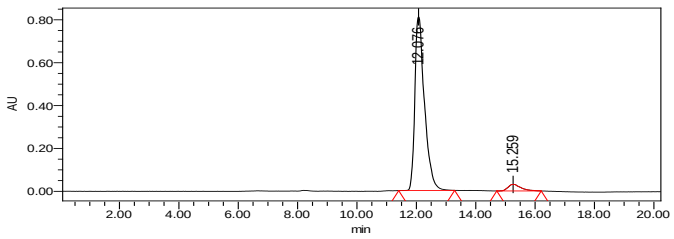
2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoropropyl)-1,2,3,4-tetrahydroquinolin-4-yl)-1-(m-tolyl)ethanone (3kc)



From 84.4 mg (0.2 mmol) **1k** and 60 μL (0.6 mmol) β-C_3F_7-nitroalkene, 116.7 mg (88% yield) compound **3kc** was obtained as a yellow solid, mp = 139-140 ℃. $[\alpha]_D^{20}$ = -76 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 90% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 12.1 and t_{minor} = 15.3 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.24 (d, *J* = 8.7 Hz, 2H), 7.75-7.70 (m, 3H), 7.55 (s, 2H), 7.37 (q, *J* = 8.0 Hz, 2H), 7.29 (d, *J* = 7.8 Hz, 1H), 7.23-7.18 (m, 1H), 6.65 (d, *J* = 7.8 Hz, 1H), 6.00-5.90 (m, 1H), 4.85 (dd, *J* = 12.0, 4.5 Hz, 1H), 3.44 (dd, *J* = 18.2, 9.5 Hz, 1H), 2.80 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.50 (t, *J* = 10.7 Hz, 1H), 2.33 (s, 3H) . ^{13}C NMR (100 MHz, $CDCl_3$) δ 193.2, 150.1, 141.2, 137.9, 134.4, 133.9, 133.1, 130.0, 128.4, 128.2, 127.8, 127.8, 127.5, 127.4, 124.6, 124.2, 123.7, 116.4 (dt, J_{C-F} = 289.5, 33.8 Hz), 114.9 (dt, J_{C-F} = 261.5, 31.8 Hz), 109.2 (dq, J_{C-F} = 300.0, 37.3 Hz), 87.5, 58.8 (dd, J_{C-F} = 28.5, 20.5 Hz), 35.2, 34.6, 20.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −80.4 (t, *J* = 9.9 Hz, 3F), −113.3 - −114.5 (m, 1F), −119.5 - −120.6 (m, 1F), −125.1 - −125.2 (m, 2F). HRMS (ESI) *m/z* calcd for $C_{27}H_{20}F_7N_3NaO_7S$ $[M+Na]^+$: 686.0802, found 686.0809.



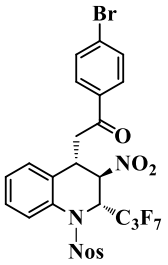
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	11.953	2520953	50.40	107666	bb	Unknown
2	15.230	2481227	49.60	79760	bb	Unknown



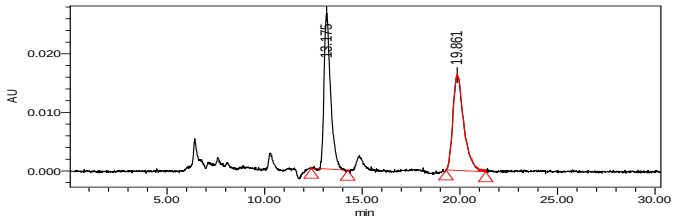
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.076	18254449	95.15	810177	bb	Unknown
2	15.259	931066	4.85	30686	bb	Unknown

1-(4-bromophenyl)-2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluor

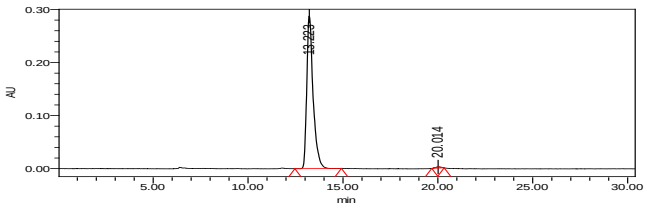
opropyl)-1,2,3,4-tetrahydroquinolin-4-yl)ethanone (3oc)



From 97.2 mg (0.2 mmol) **1o** and 60 μL (0.6 mmol) β-C_3F_7-nitroalkene, 130.9 mg (90% yield) compound **3oc** was obtained as a yellow solid, mp = 121-122 ℃. $[\alpha]_D^{20}$ = -44 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 99% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 13.2 and t_{minor} = 20.0 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.21 (d, *J* = 9.0 Hz, 2H), 7.72-7.69 (m, 3H), 7.62 (d, *J* = 8.4 Hz, 2H), 7.51 (d, *J* = 8.7 Hz, 1H), 7.38 (t, *J* = 7.7 Hz, 1H), 7.22-7.17 (m, 1H), 6.60 (d, *J* = 7.8 Hz, 1H), 6.00-5.90 (m, 1H), 4.83 (dd, *J* = 12.2, 5.0 Hz, 1H), 3.42 (dd, *J* = 18.3, 9.3 Hz, 1H), 2.78 (dd, *J* = 18.3, 2.4 Hz, 1H), 2.50 (t, *J* = 10.4 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 194.0, 151.2, 142.2, 135.3, 134.2, 134.1, 131.0, 129.5, 129.3, 129.0, 128.8, 128.5, 128.0, 125.6, 124.7, 117.5 (dt, J_{C-F} = 288.0, 32.5 Hz), 115.9 (dt, J_{C-F} = 257.5, 31.3 Hz), 110.3 (dq, J_{C-F} = 302.0, 38.7 Hz), 88.5, 59.8 (dd, J_{C-F} = 28.5, 20.5 Hz), 36.2, 35.6. ^{19}F NMR (282 MHz, $CDCl_3$) δ −80.4 (t, *J* = 11.0 Hz, 3F), −113.3 - −114.5 (m, 1F), −119.4 - −120.6 (m, 1F), −125.1 - −125.2 (m, 2F). HRMS (ESI) *m/z* calcd for $C_{26}H_{17}BrF_7N_3NaO_7S$ $[M+Na]^+$: 749.9751, found 749.9703.



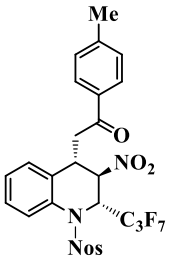
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.175	623657	49.68	26509	bb	Unknown
2	19.861	631776	50.32	16330	bb	Unknown



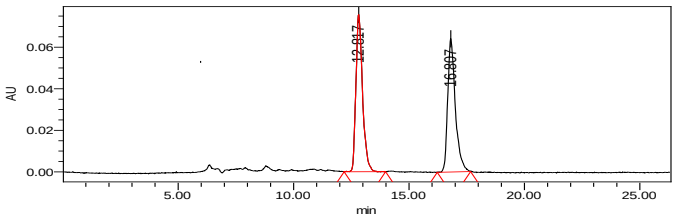
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	13.223	6707002	99.32	287840	bb	Unknown
2	20.014	45600	0.68	2197	bb	Unknown

2-((2*R*,3*R*,4*S*)-3-nitro-1-((4-nitrophenyl)sulfonyl)-2-(perfluoropropyl)-1,2,3,4-tetr

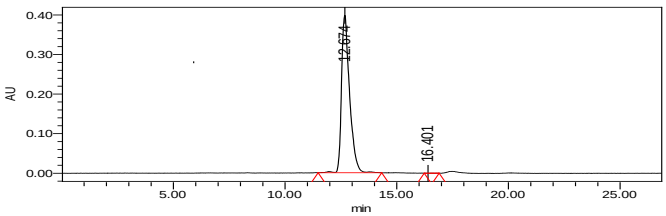
ahydroquinolin-4-yl)-1-(p-tolyl)ethanone (3pc)



From 84.4 mg (0.2 mmol) **1p** and 60 μL (0.6 mmol) β-C_3F_7-nitroalkene, 116.7 mg (88% yield) compound **3pc** was obtained as a yellow solid, mp = 146-147 ℃. $[\alpha]_D^{20}$ = -74 (c = 1.0, $CHCl_3$). Dr (>20:1) determined by ^1H and ^{19}F NMR analysis. 99% ee was determined by HPLC analysis (Daicel Chiralcel IC-H column, hexane/2-propanol /DCM 9:1:0.05, 1.0 mL/min). Retention time: t_{major} = 12.7 and t_{minor} = 16.4 min. ^1H NMR (300 MHz, $CDCl_3$) δ 8.24 (d, J = 8.7 Hz, 2H), 7.74-7.70 (m, 3H), 7.65 (d, J = 8.1 Hz, 2H), 7.39 (t, J = 7.8 Hz, 1H), 7.22-7.18 (m, 3H), 6.65 (d, J = 7.8 Hz, 1H), 6.00-5.90 (m, 1H), 4.84 (dd, J = 12.2, 4.7 Hz, 1H), 3.42 (dd, J = 18.3, 9.6 Hz, 1H), 2.77 (dd, J = 18.2, 2.3 Hz, 1H), 2.50 (t, J = 10.5 Hz, 1H), 2.35 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 193.2, 150.1, 141.2, 137.9, 134.4, 133.9, 133.1, 130.0, 128.4, 128.2, 127.8, 127.5, 124.6, 124.2, 123.7, 116.4 (qt, J_{C-F} = 287.2, 33.5 Hz), 113.5 (ddt, J_{C-F} = 265.0, 258.0, 31.5 Hz), 107.7 (tq, J_{C-F} = 264.8, 37.7 Hz), 87.5, 58.8 (dd, J_{C-F} = 29.0, 21.0 Hz), 35.2, 34.6, 20.3. ^{19}F NMR (282 MHz, $CDCl_3$) δ −80.4 (t, J = 11.3 Hz, 3F), −113.3 - −114.5 (m, 1F), −119.5 - −120.7 (m, 1F), −125.1 - −125.2 (m, 2F). HRMS (ESI) *m/z* calcd for $C_{27}H_{20}F_7N_3NaO_7S$ $[M+Na]^+$: 686.0802, found 686.0819.

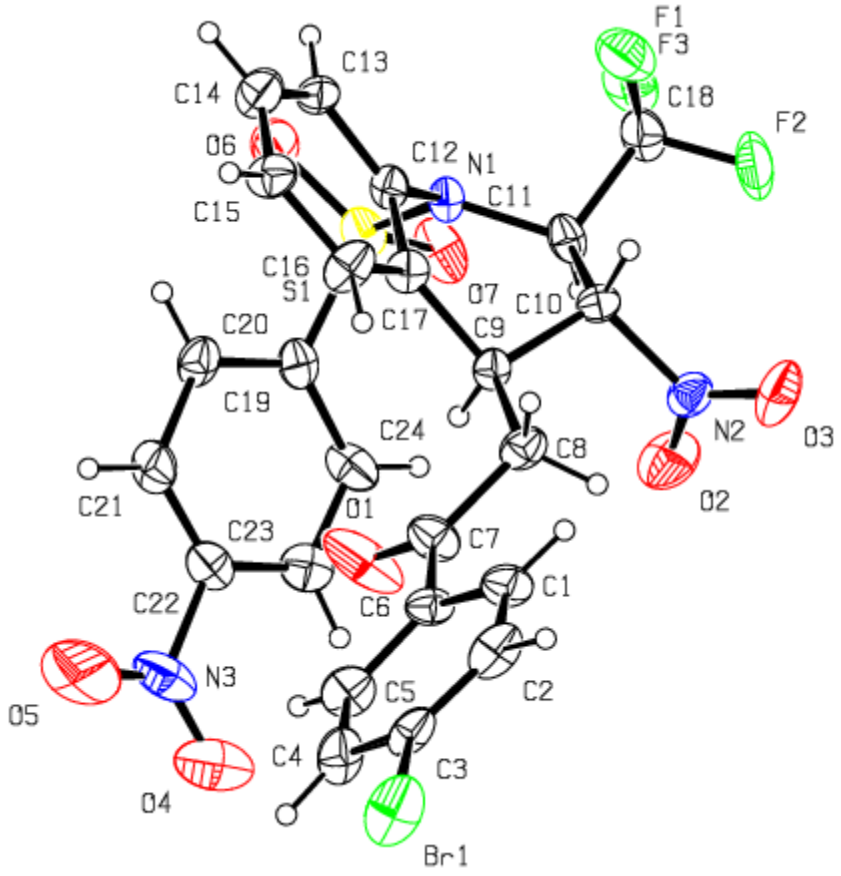


	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.817	1513082	50.60	75641	bb	Unknown
2	16.807	1477327	49.40	64187	bb	Unknown

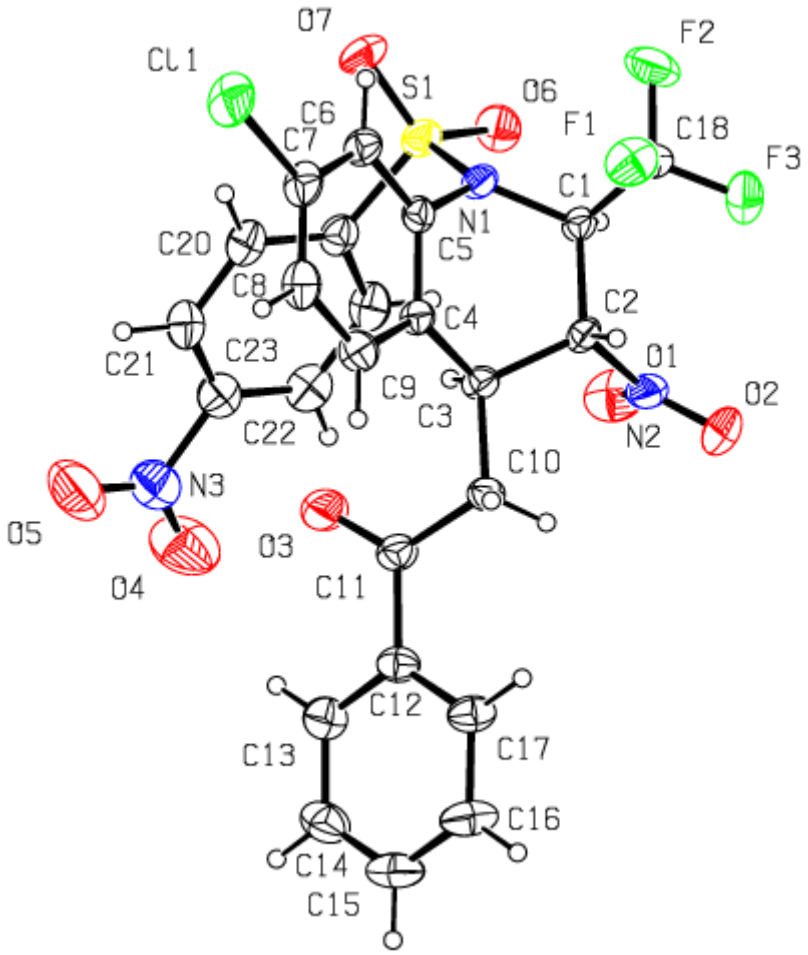


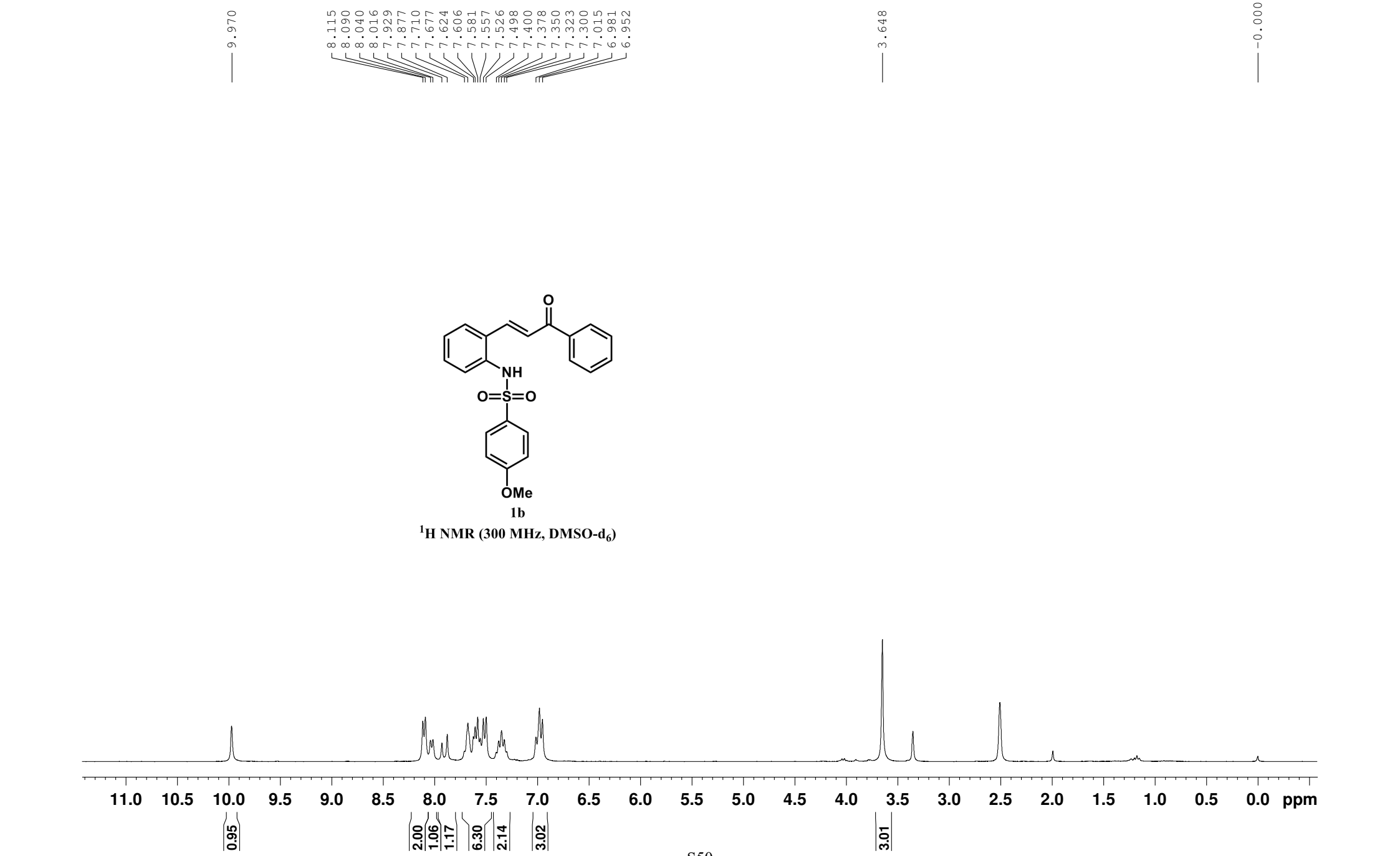
	Retention Time	Area	% Area	Height	Int Type	Peak Type
1	12.674	10007511	99.95	398297	bb	Unknown
2	16.401	5264	0.05	-296	bb	Unknown

5. X-ray Structure of Compound 3oa



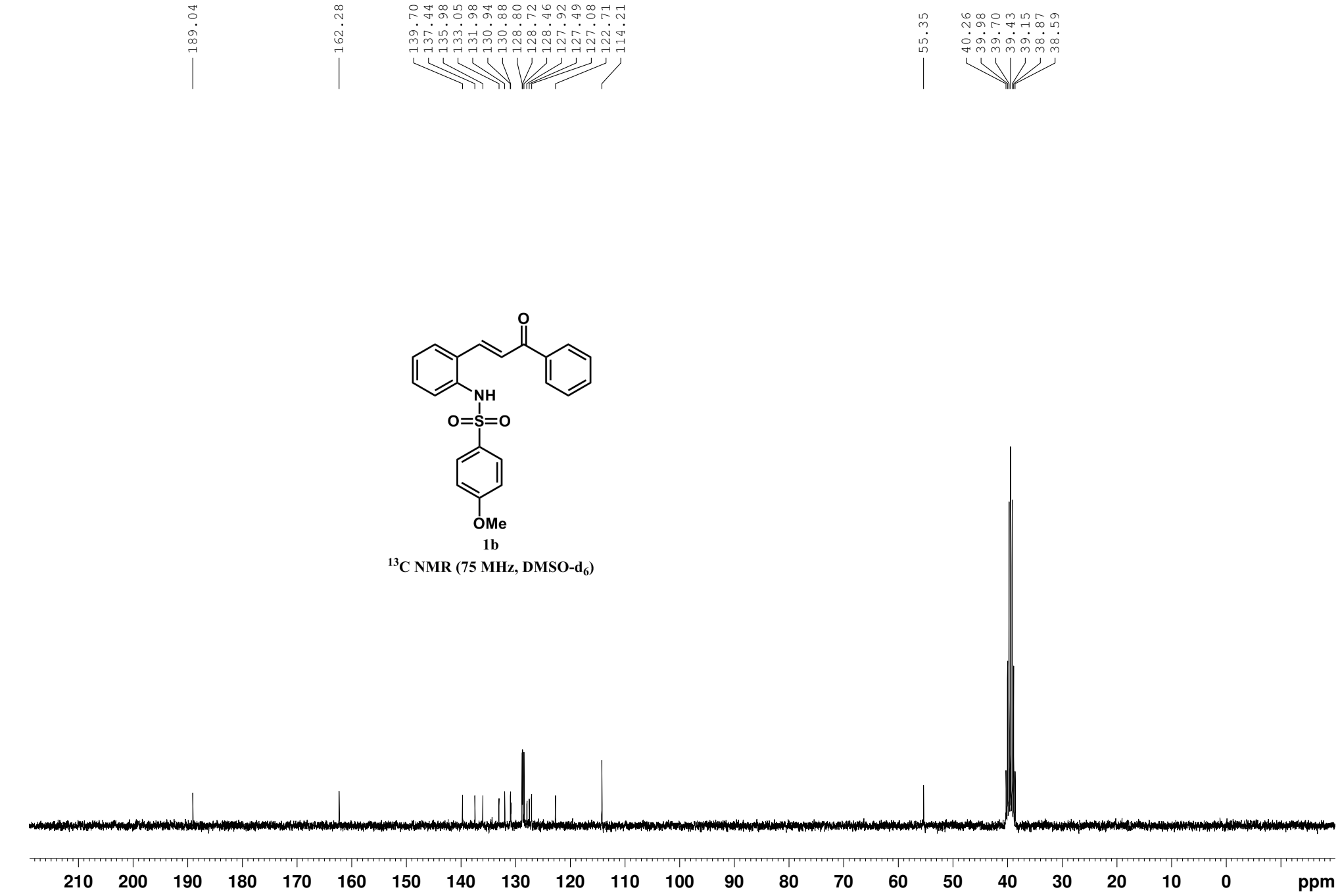
6. X-ray Structure of Compound 3ta





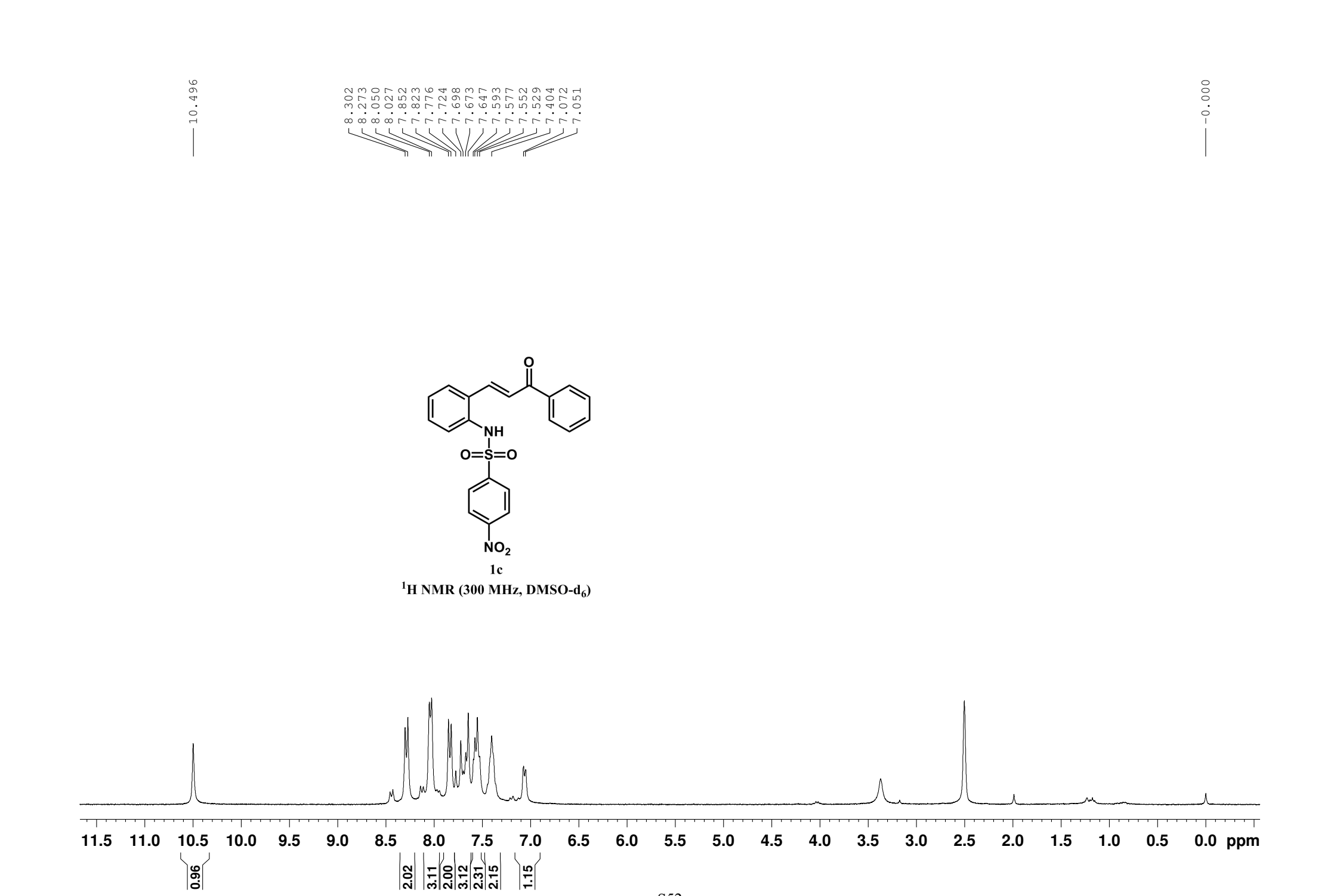
1b

^{1}H NMR (300 MHz, DMSO-d_6)



1b

^{13}C NMR (75 MHz, DMSO-d_6)



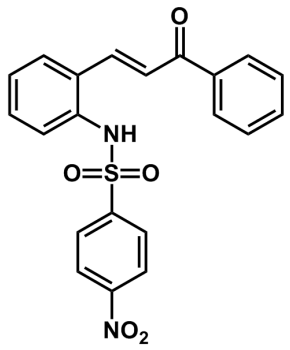
1c

^{1}H NMR (300 MHz, DMSO-d_6)

188.95

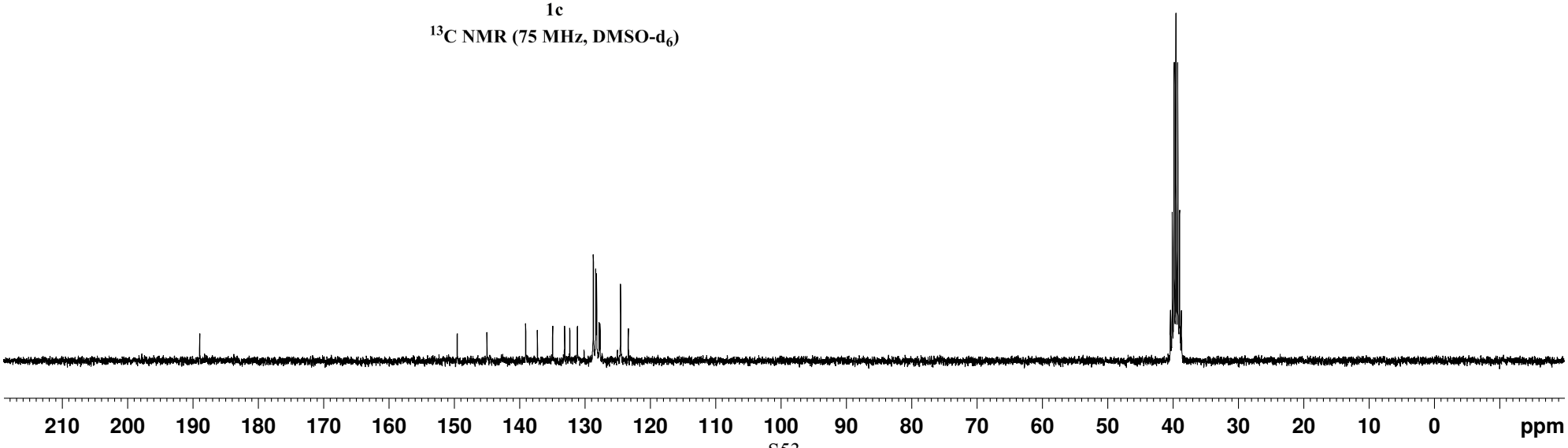
149.53
144.99
139.06
137.27
134.92
133.10
132.30
131.13
130.12
128.70
128.32
128.20
127.80
127.67
124.53
123.34

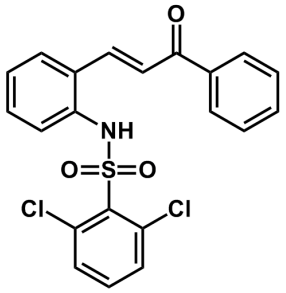
40.35
40.07
39.79
39.52
39.24
38.96
38.68



1c

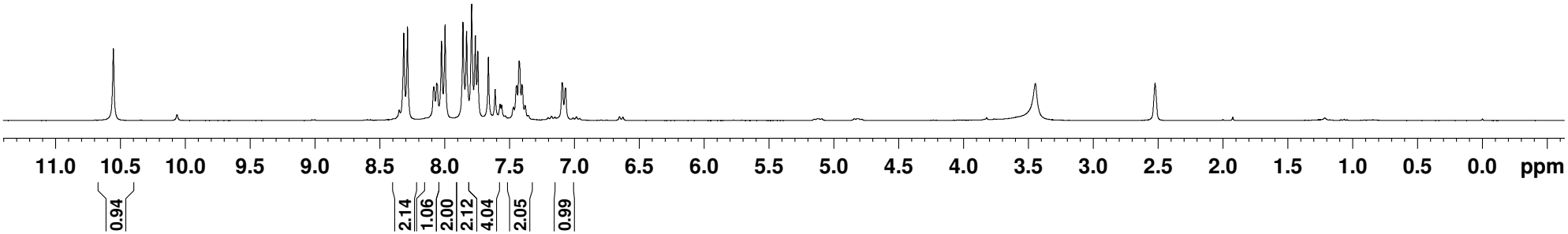
^{13}C NMR (75 MHz, DMSO-d$_6$)

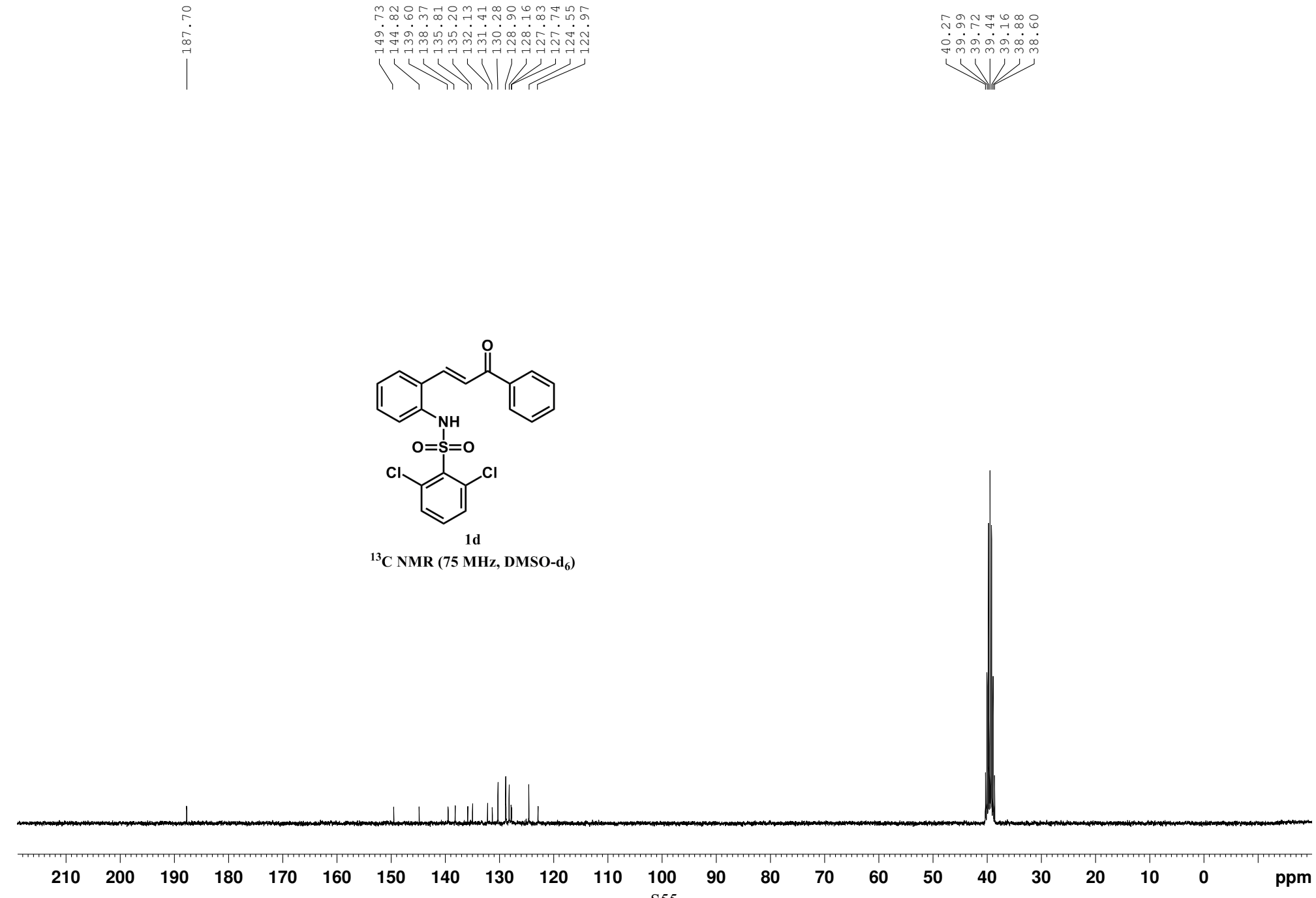




1d

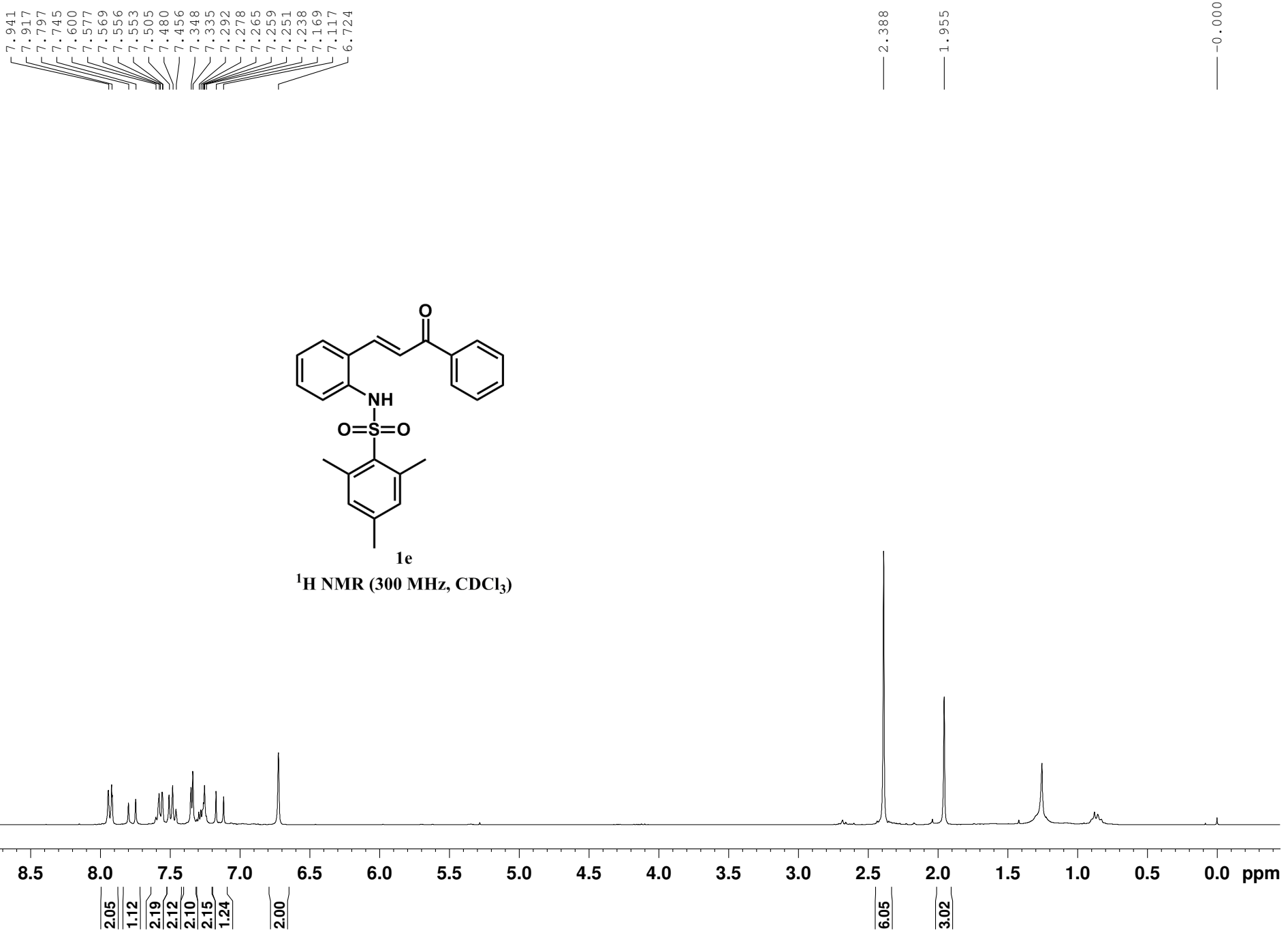
^{1}H NMR (300 MHz, DMSO-d_6)





1d

^{13}C NMR (75 MHz, DMSO-d$_6$)



1e

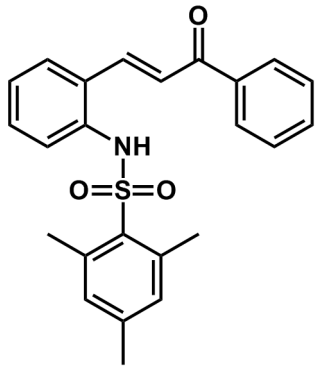
^{1}H NMR (300 MHz, $CDCl_3$)

189.96

142.57
139.58
139.40
137.60
135.12
133.02
132.92
132.19
132.09
130.96
128.76
128.67
128.63
127.54
127.16
123.77

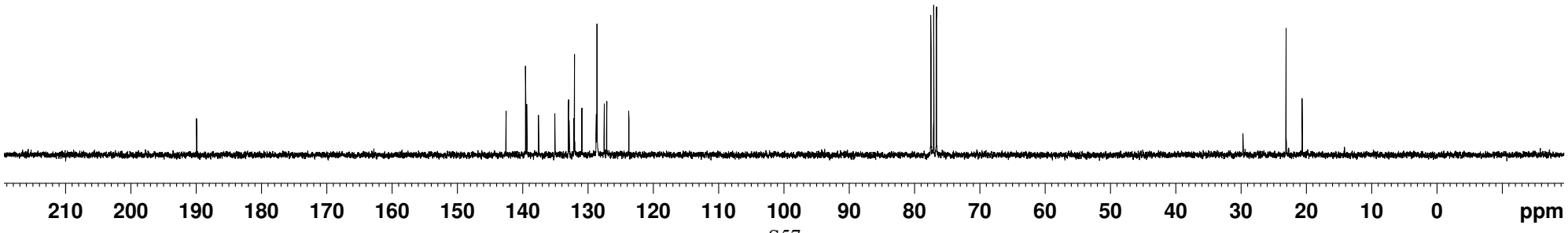
77.51
77.09
76.66

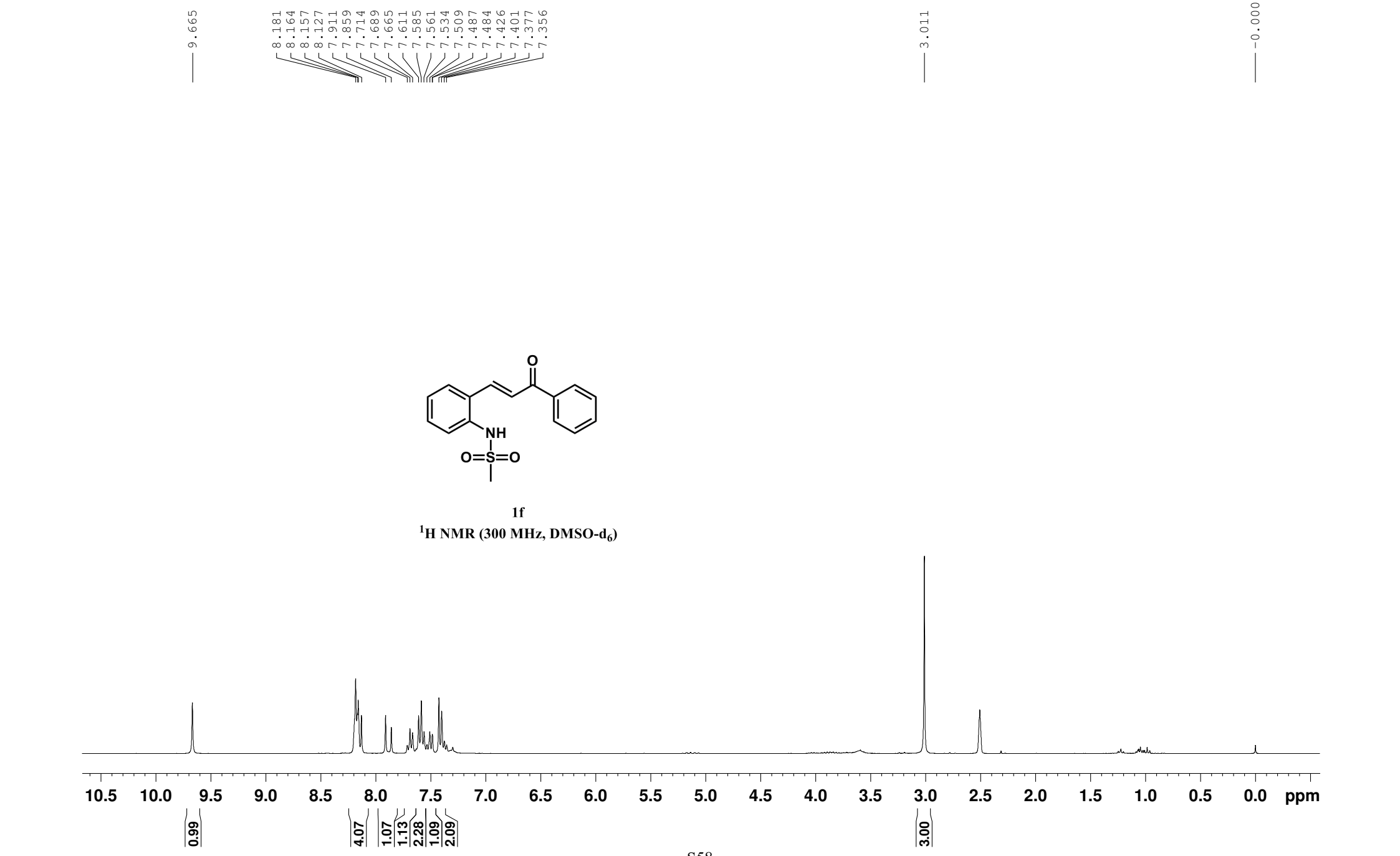
23.11
20.65



1e

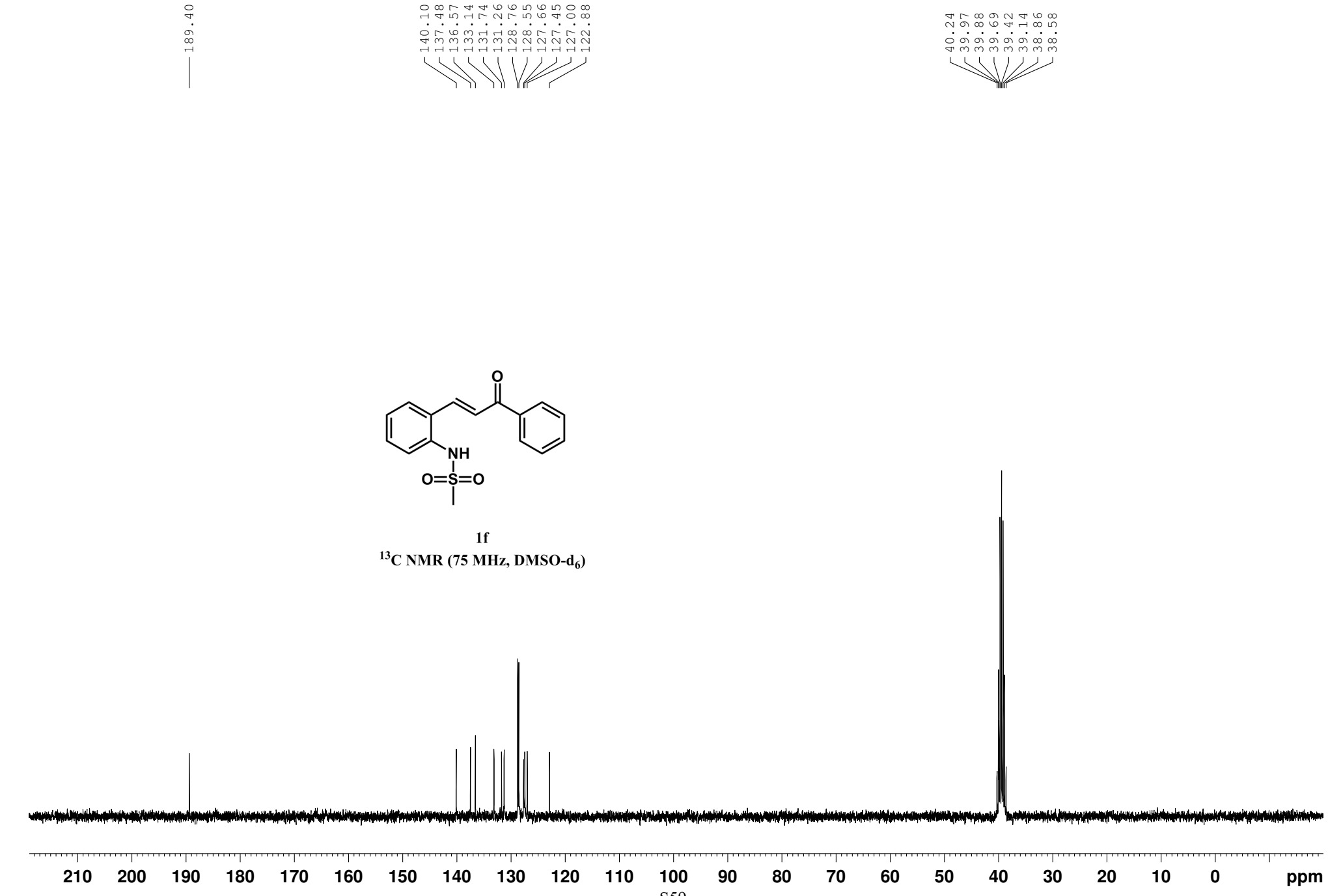
^{13}C NMR (75 MHz, $CDCl_3$)





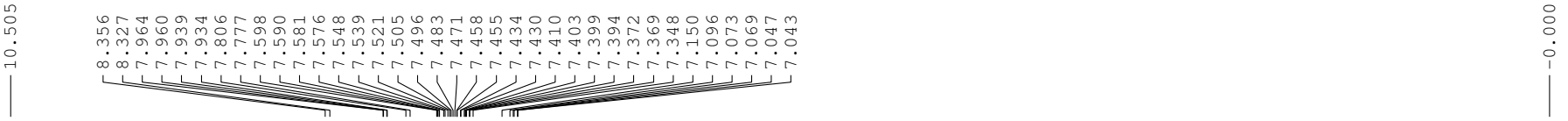
1f

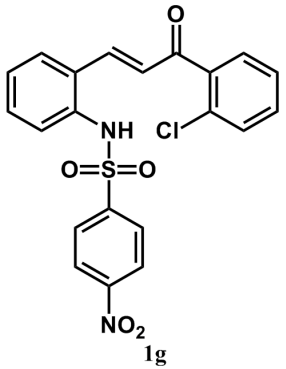
^{1}H NMR (300 MHz, DMSO-d_6)



1f

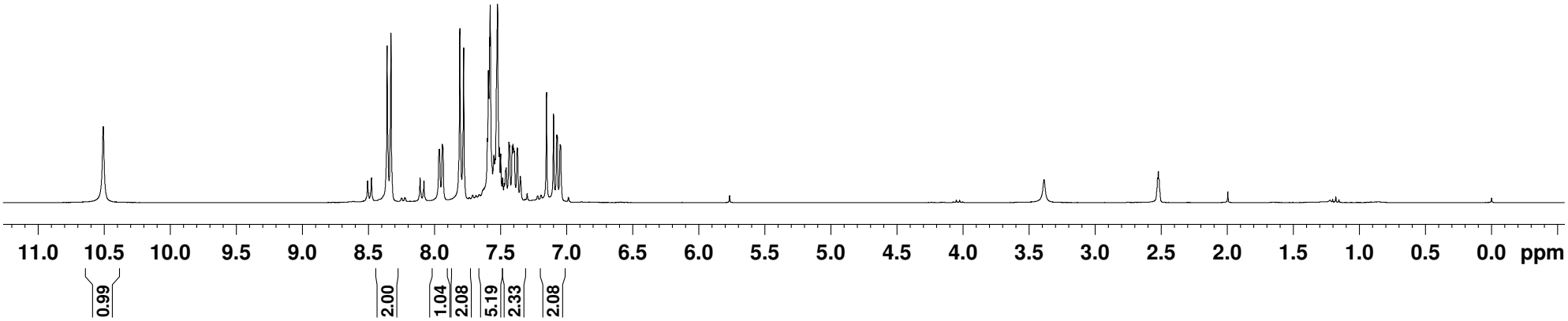
^{13}C NMR (75 MHz, DMSO-d_6)





1g

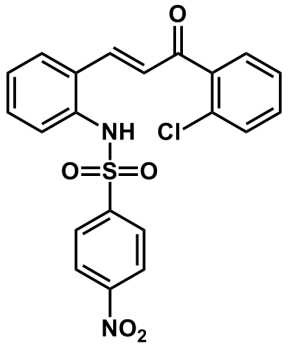
^{1}H NMR (300 MHz, DMSO-d_6)



192.43

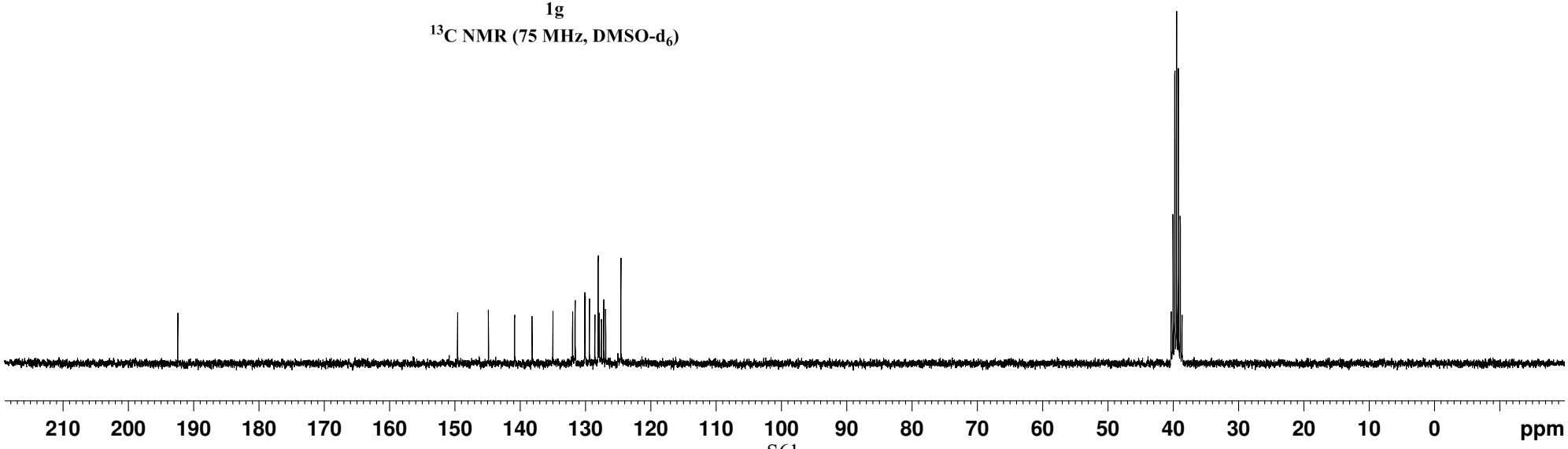
149.58
144.85
140.85
138.18
134.97
131.97
131.59
131.55
130.11
130.05
129.38
128.55
128.05
127.88
127.54
127.20
126.91
124.57

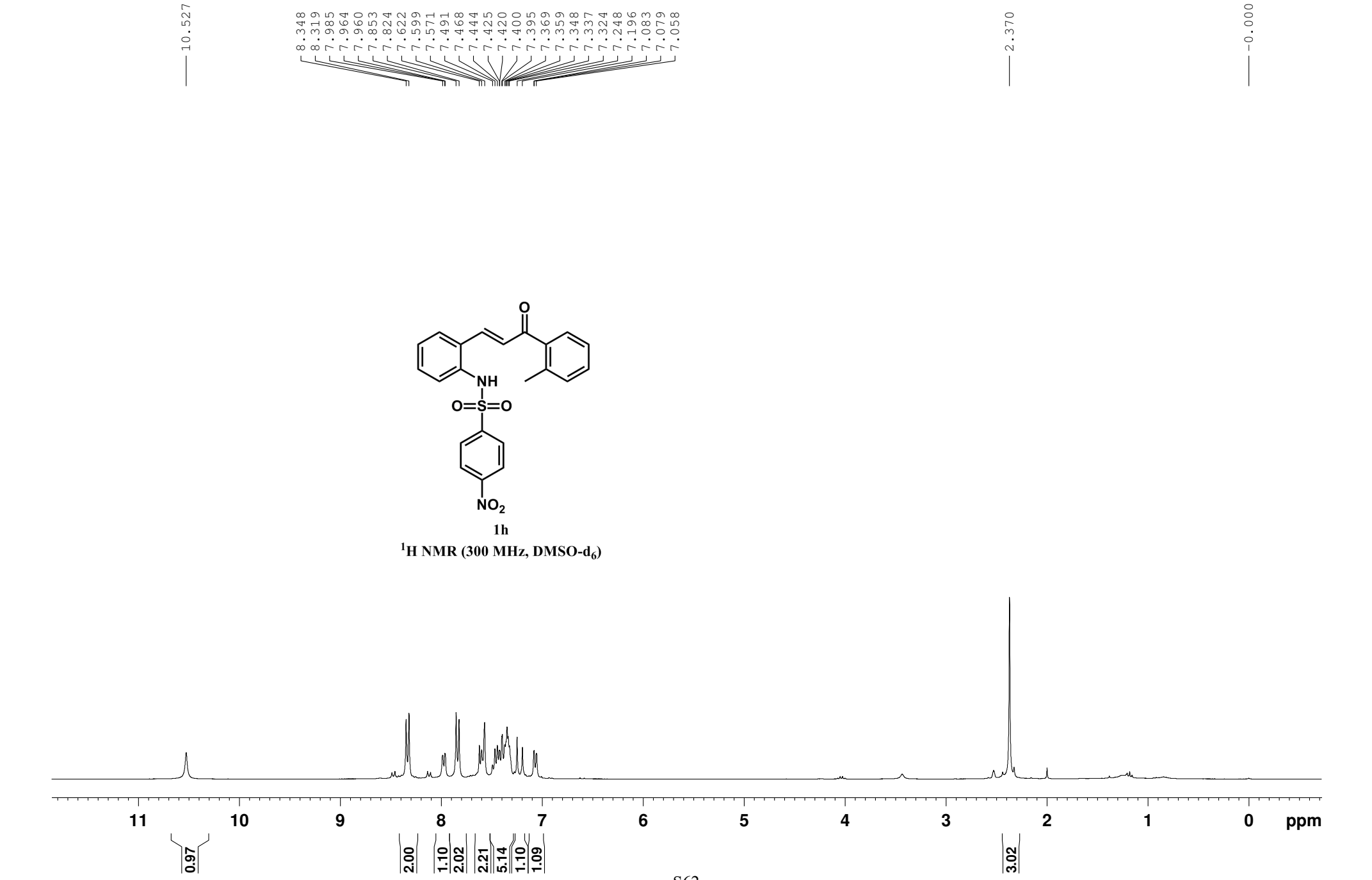
40.30
40.02
39.74
39.46
39.18
38.91
38.63



1g

^{13}C NMR (75 MHz, DMSO-d$_6$)





1h

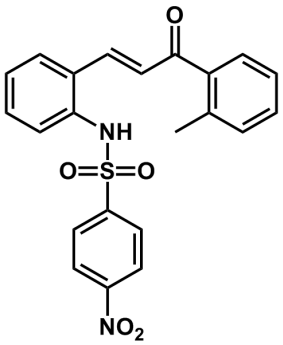
^{1}H NMR (300 MHz, DMSO-d_6)

194.84

150.03
145.45
140.26
138.72
137.10
135.34
132.49
131.70
131.30
130.58
129.06
128.90
128.62
128.32
128.02
127.58
126.09
125.02

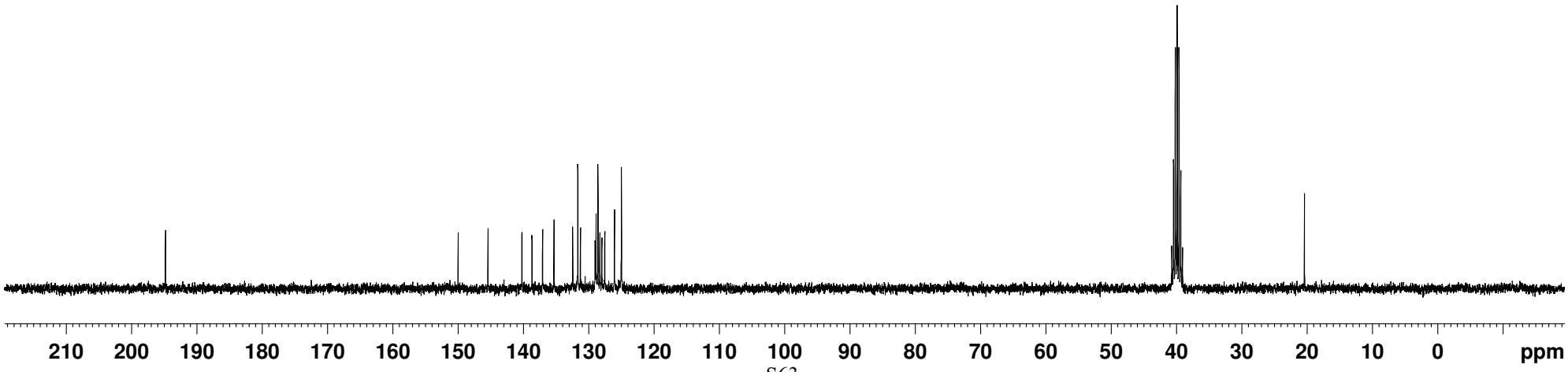
40.76
40.48
40.21
39.93
39.65
39.37
39.09

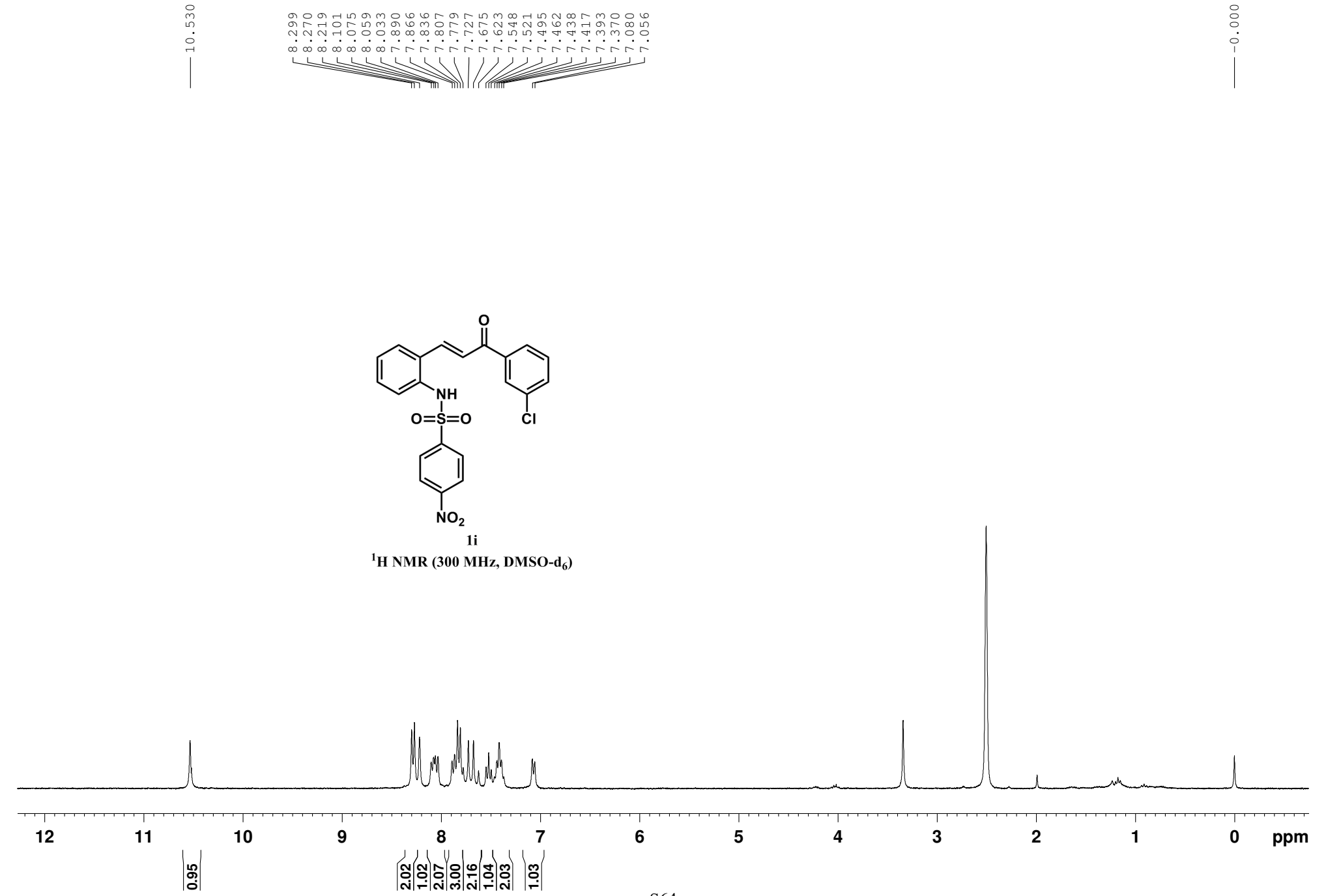
20.43



1h

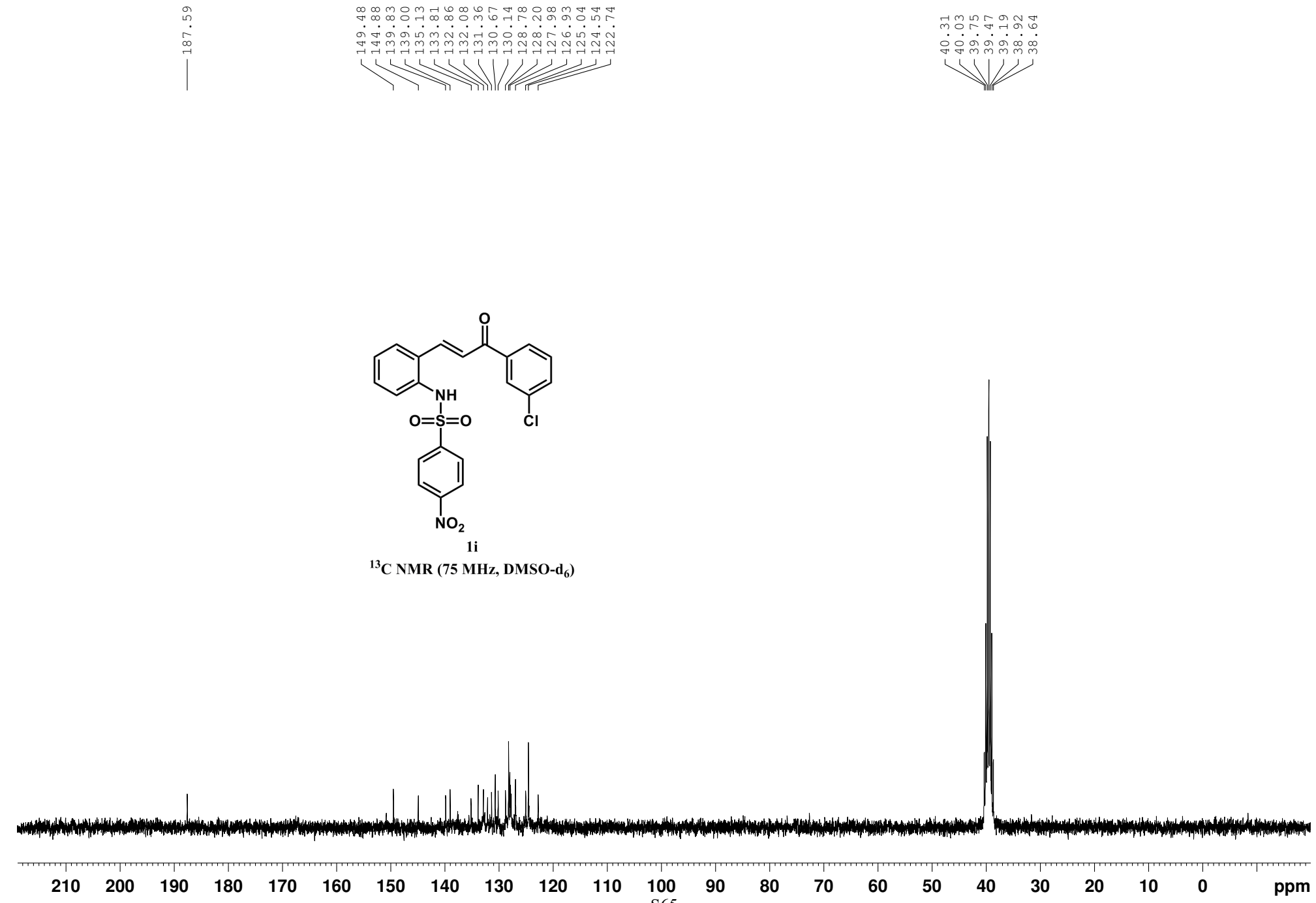
^{13}C NMR (75 MHz, DMSO-d$_6$)





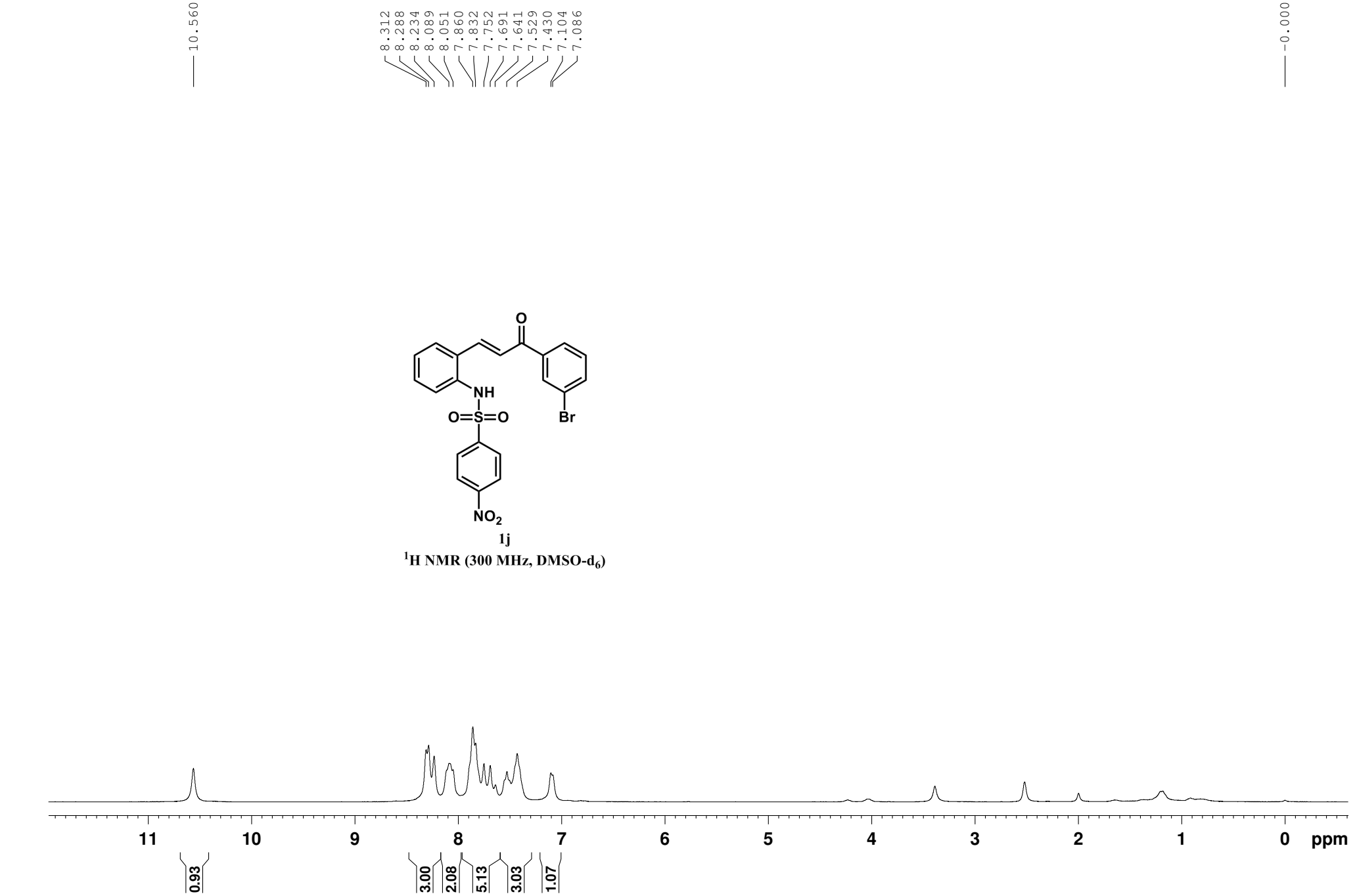
1i

^{1}H NMR (300 MHz, DMSO-d_6)



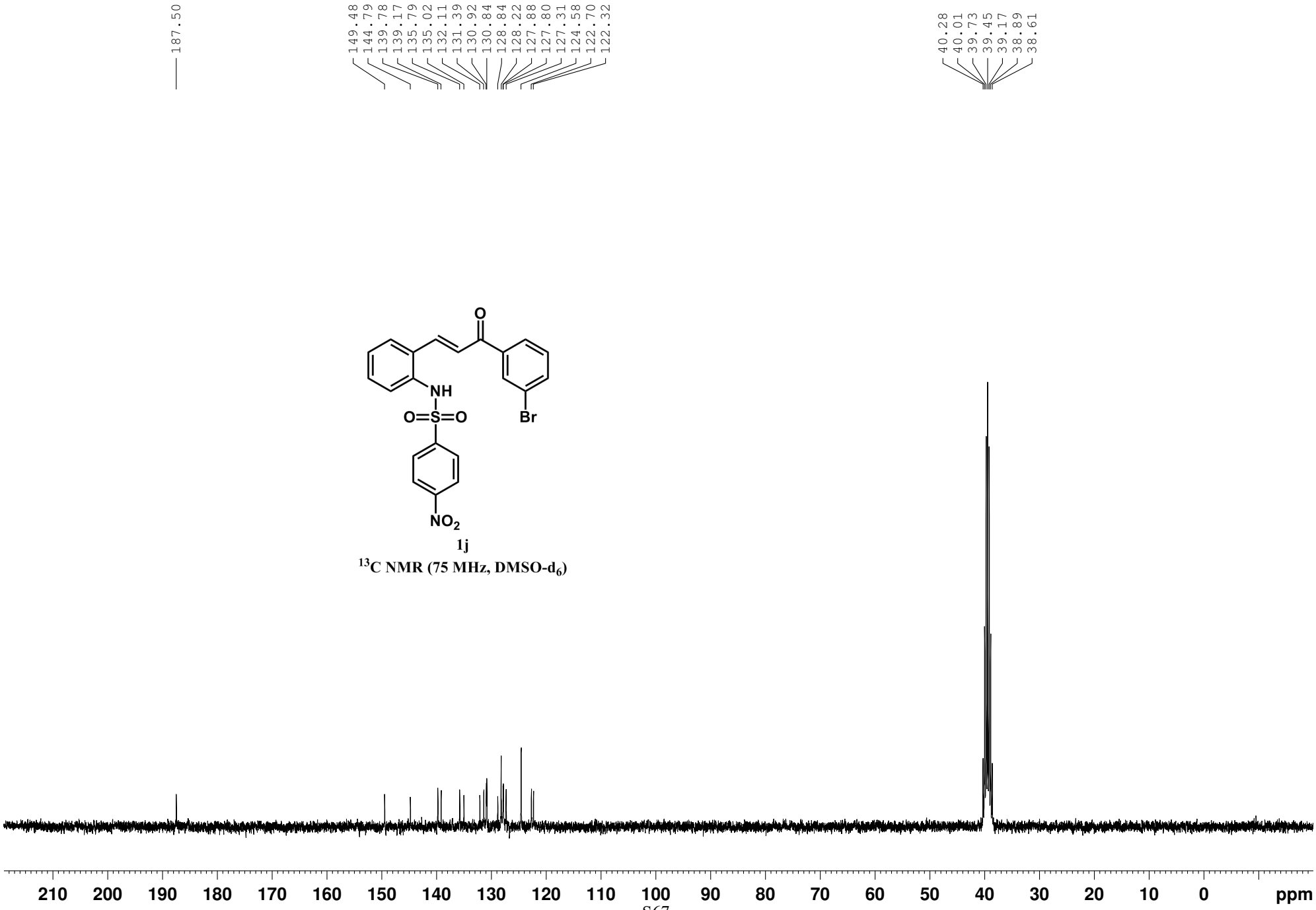
1i

^{13}C NMR (75 MHz, DMSO-d_6)



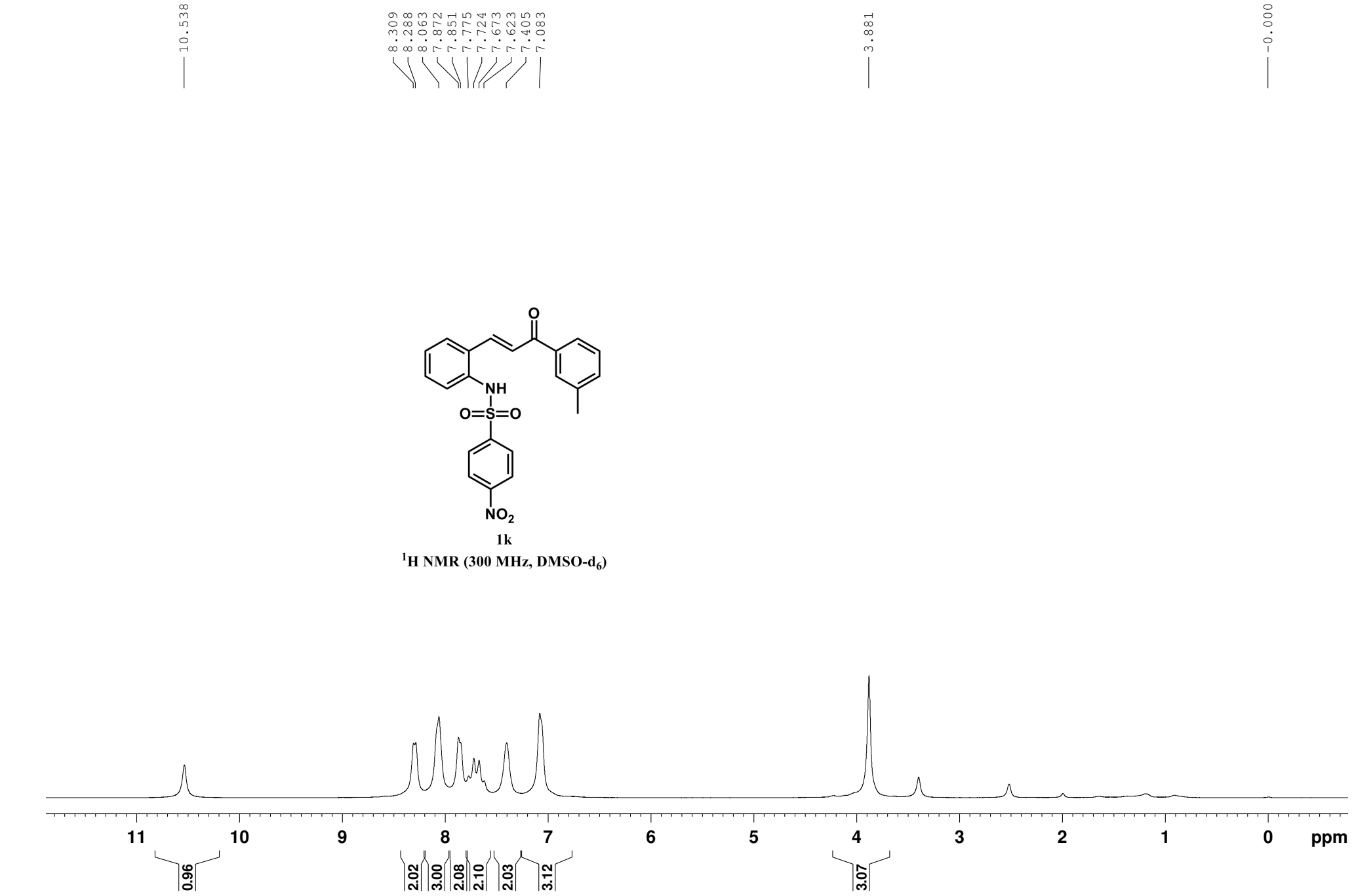
1j

^{1}H NMR (300 MHz, DMSO-d$_6$)



1j

^{13}C NMR (75 MHz, DMSO-d_6)



1k

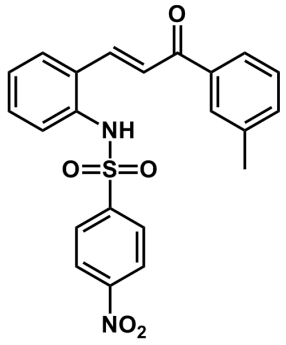
^{1}H NMR (300 MHz, DMSO-d_6)

194.35

149.53
144.96
139.76
138.22
136.60
134.84
131.99
131.20
130.80
130.08
128.56
128.40
128.12
127.82
127.52
127.08
125.59
124.52

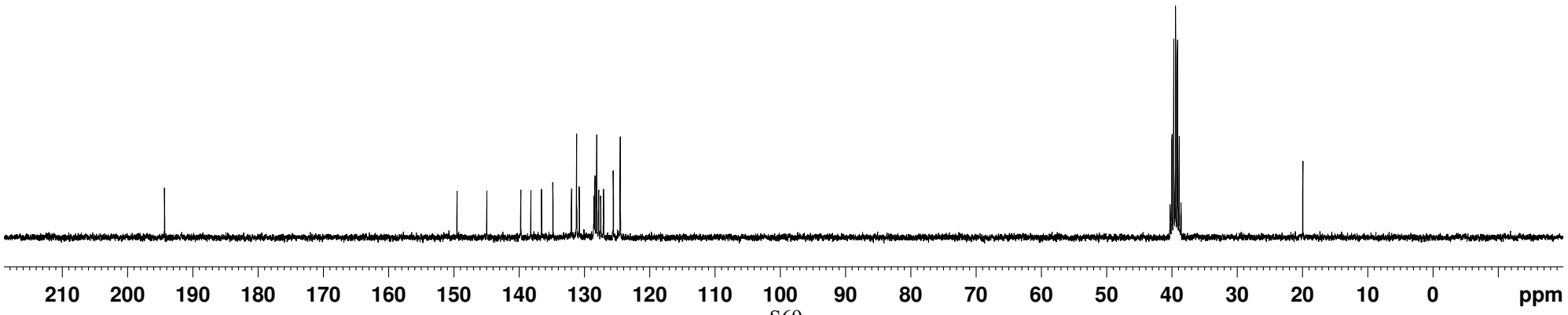
40.26
39.99
39.71
39.43
39.15
38.87
38.59

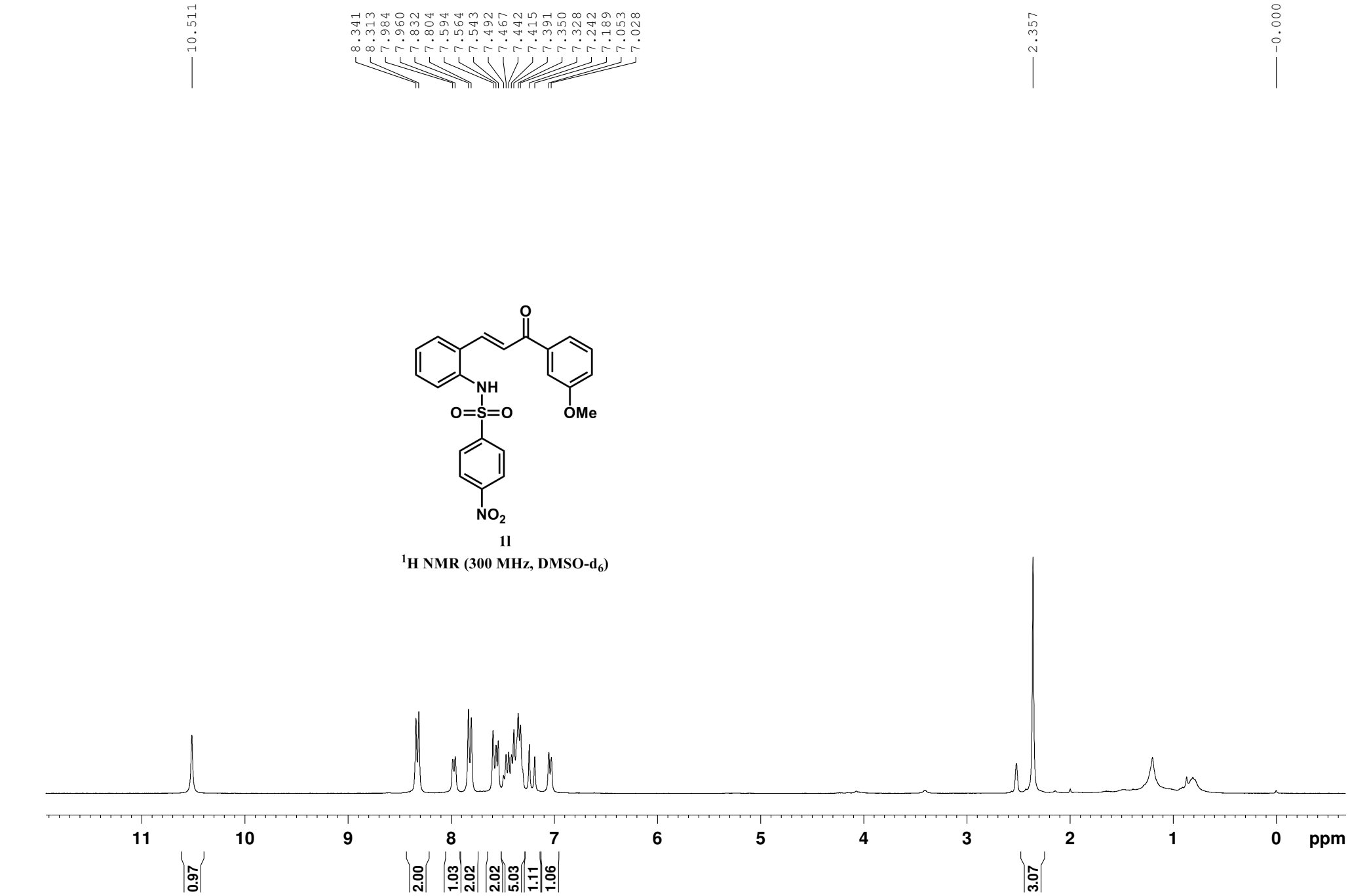
19.93



1k

^{13}C NMR (75 MHz, DMSO-d_6)





1l

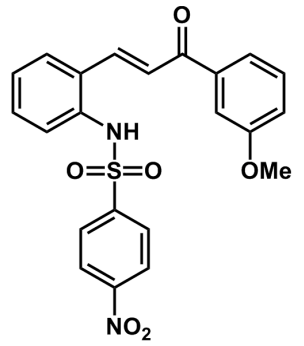
^{1}H NMR (300 MHz, DMSO-d_6)

194.34

149.53
144.91
139.74
138.20
136.59
134.82
131.99
131.22
130.82
128.57
128.42
128.12
127.85
127.54
127.05
125.61
124.56

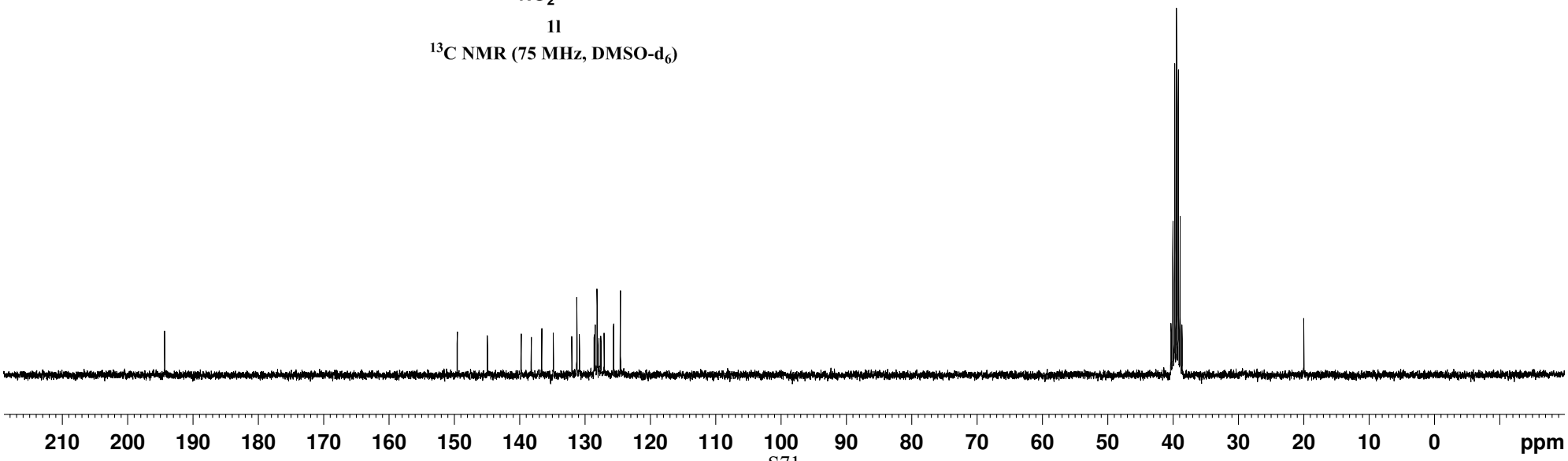
40.26
39.98
39.70
39.42
39.14
38.86
38.59

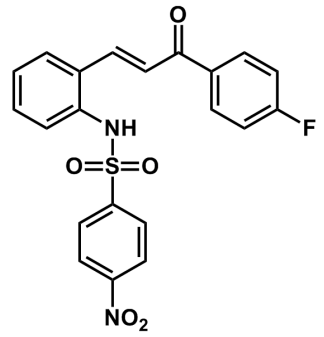
19.95



1l

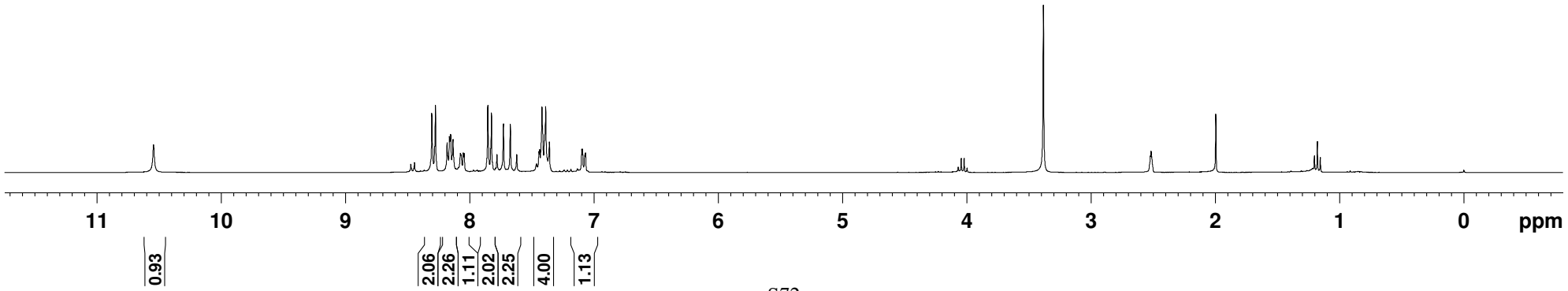
^{13}C NMR (75 MHz, DMSO-d$_6$)

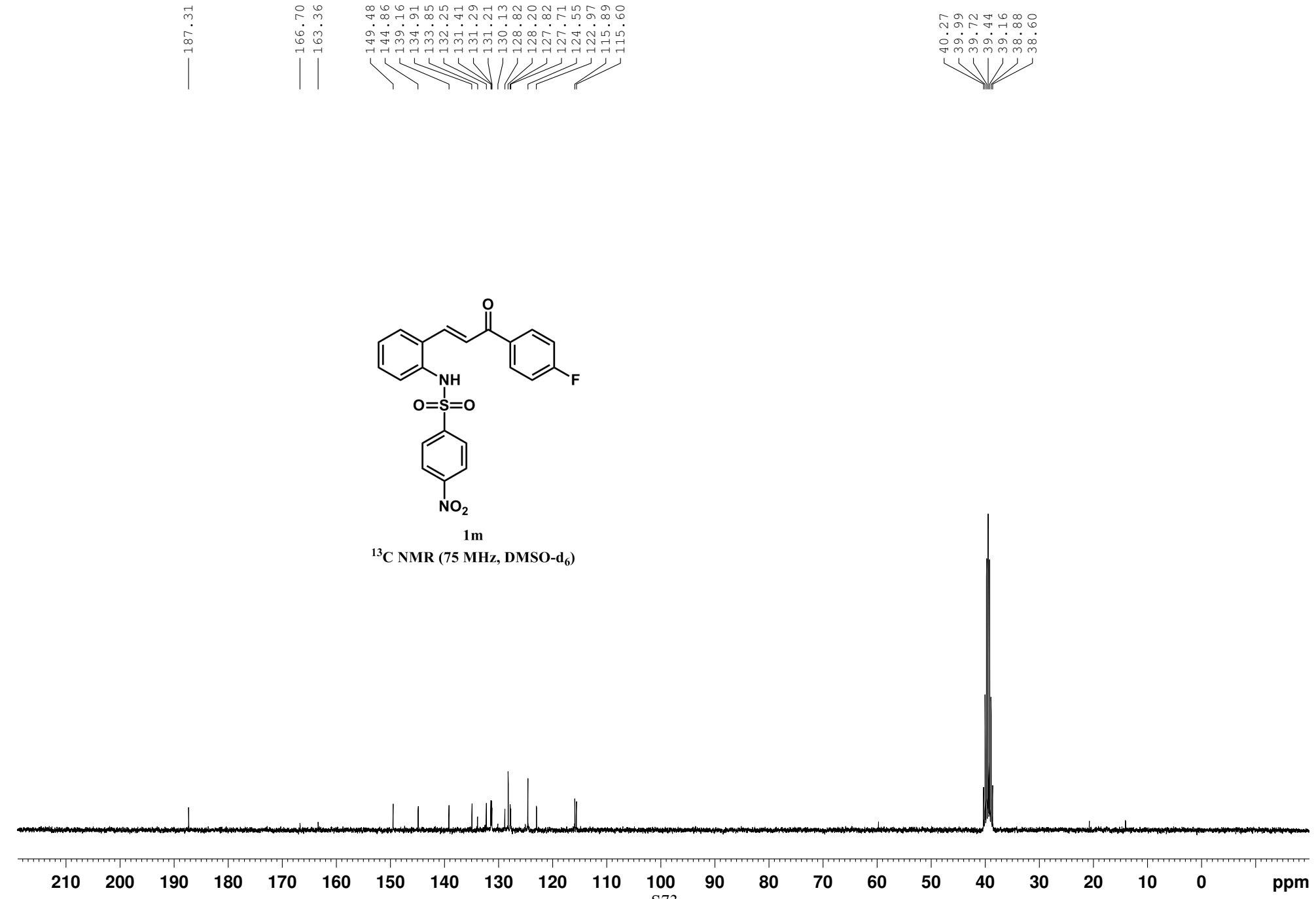




1m

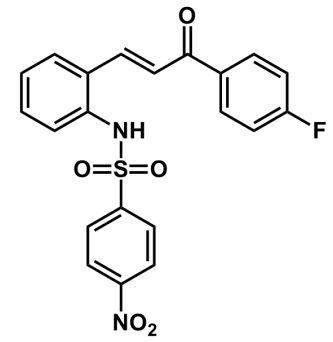
^{1}H NMR (300 MHz, DMSO-d$_6$)





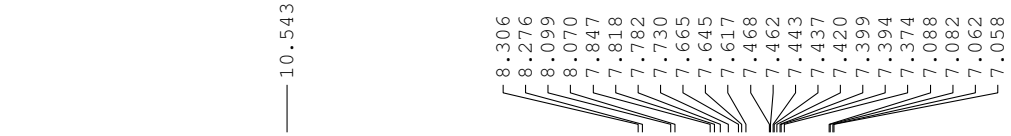
1m

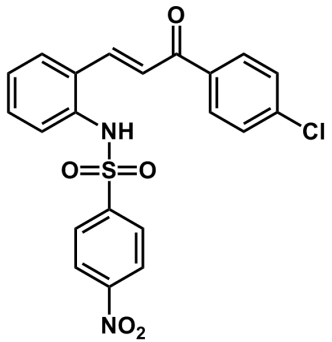
^{13}C NMR (75 MHz, DMSO-d$_6$)



1m

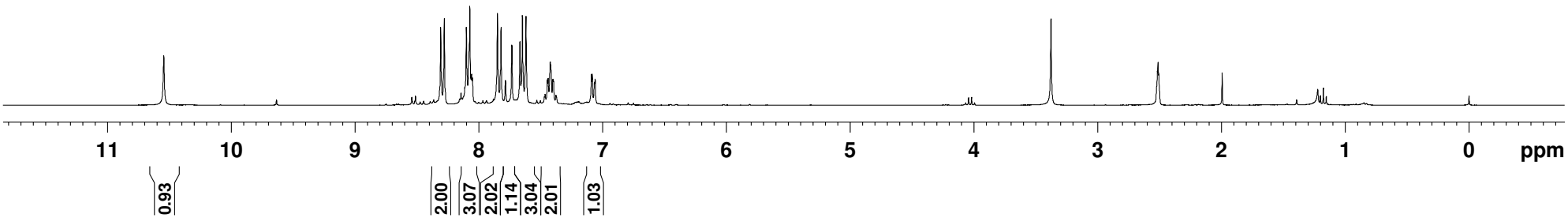
^{19}F NMR (282 MHz, DMSO-d$_6$)

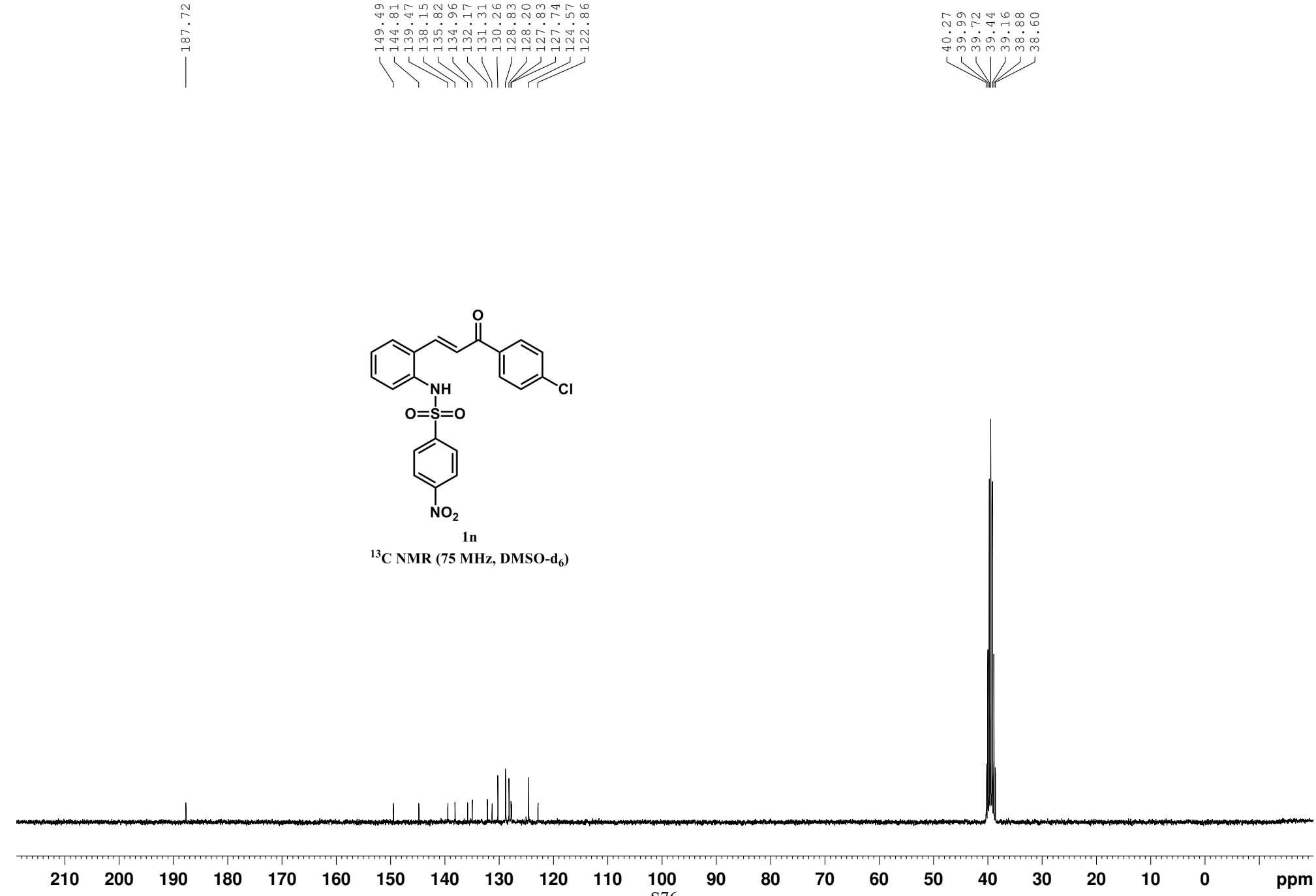




1n

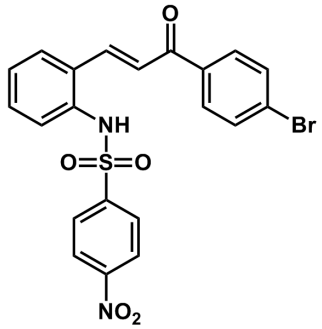
^{1}H NMR (300 MHz, DMSO-d_6)





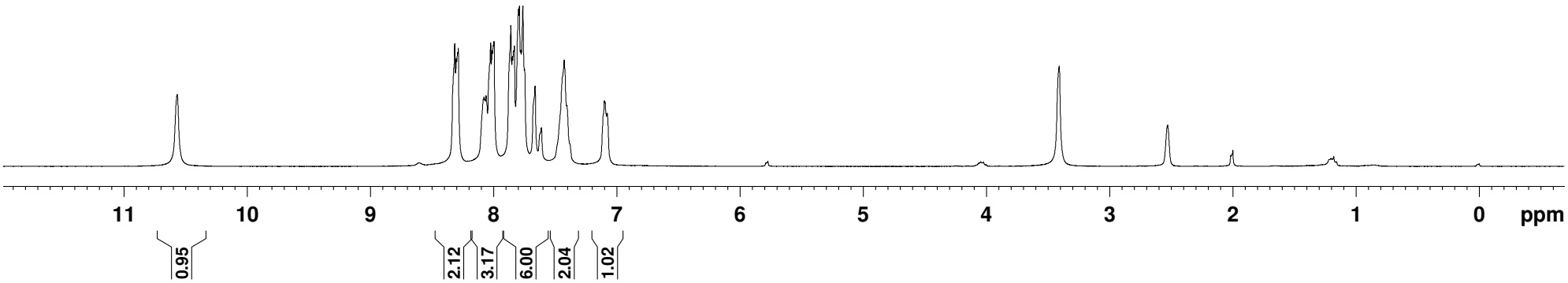
1n

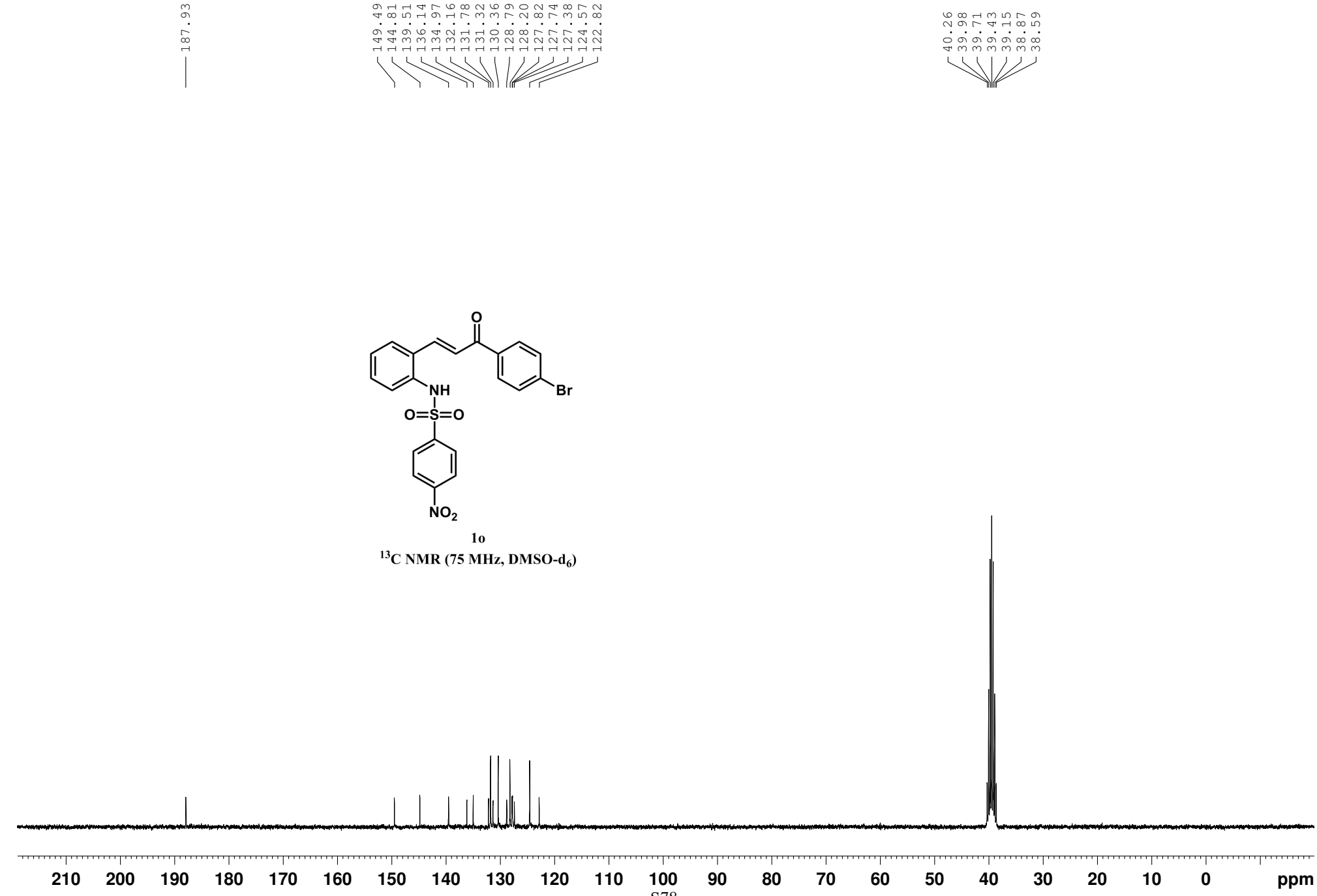
^{13}C NMR (75 MHz, DMSO-d_6)



1o

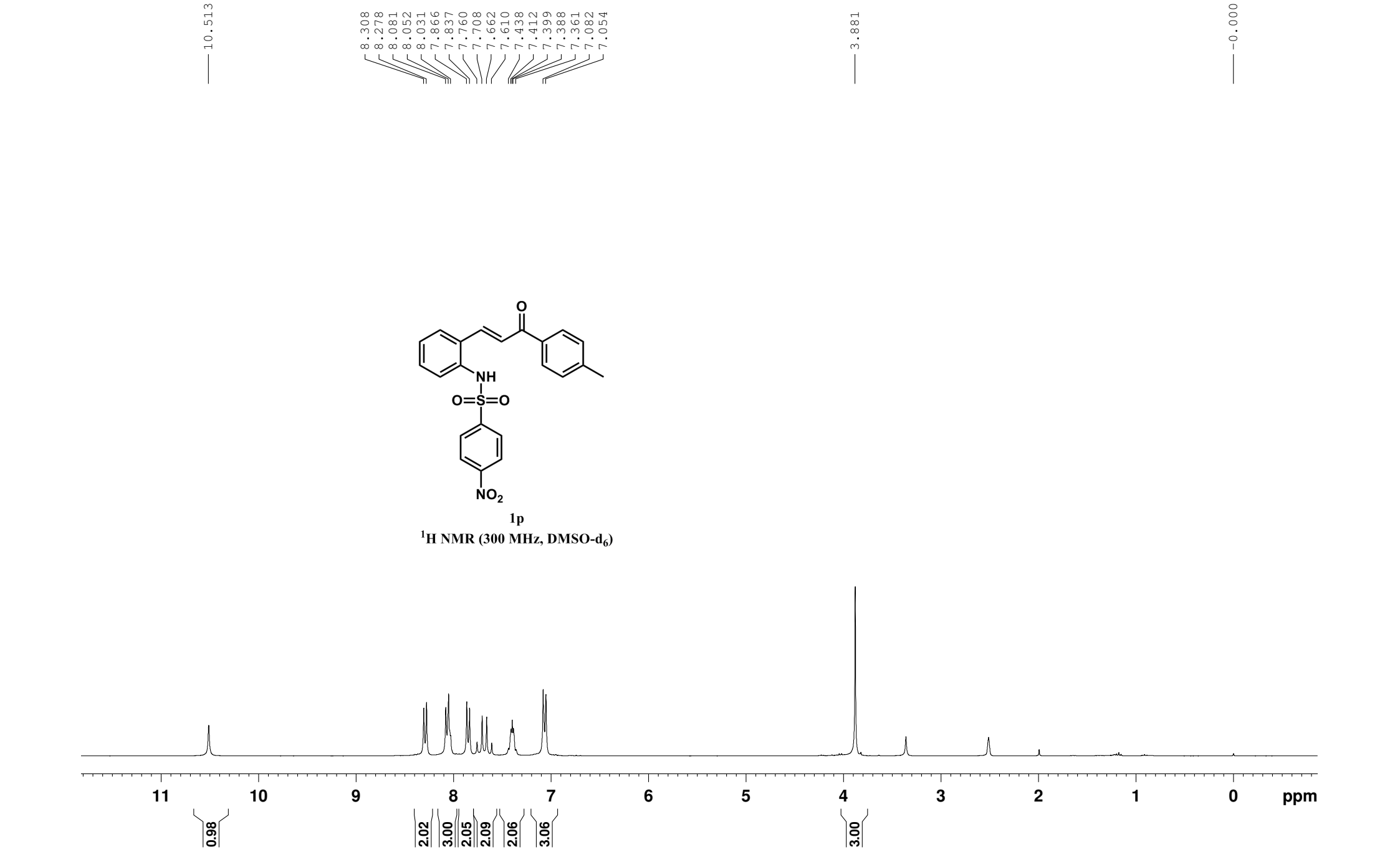
^{1}H NMR (300 MHz, DMSO-d_6)





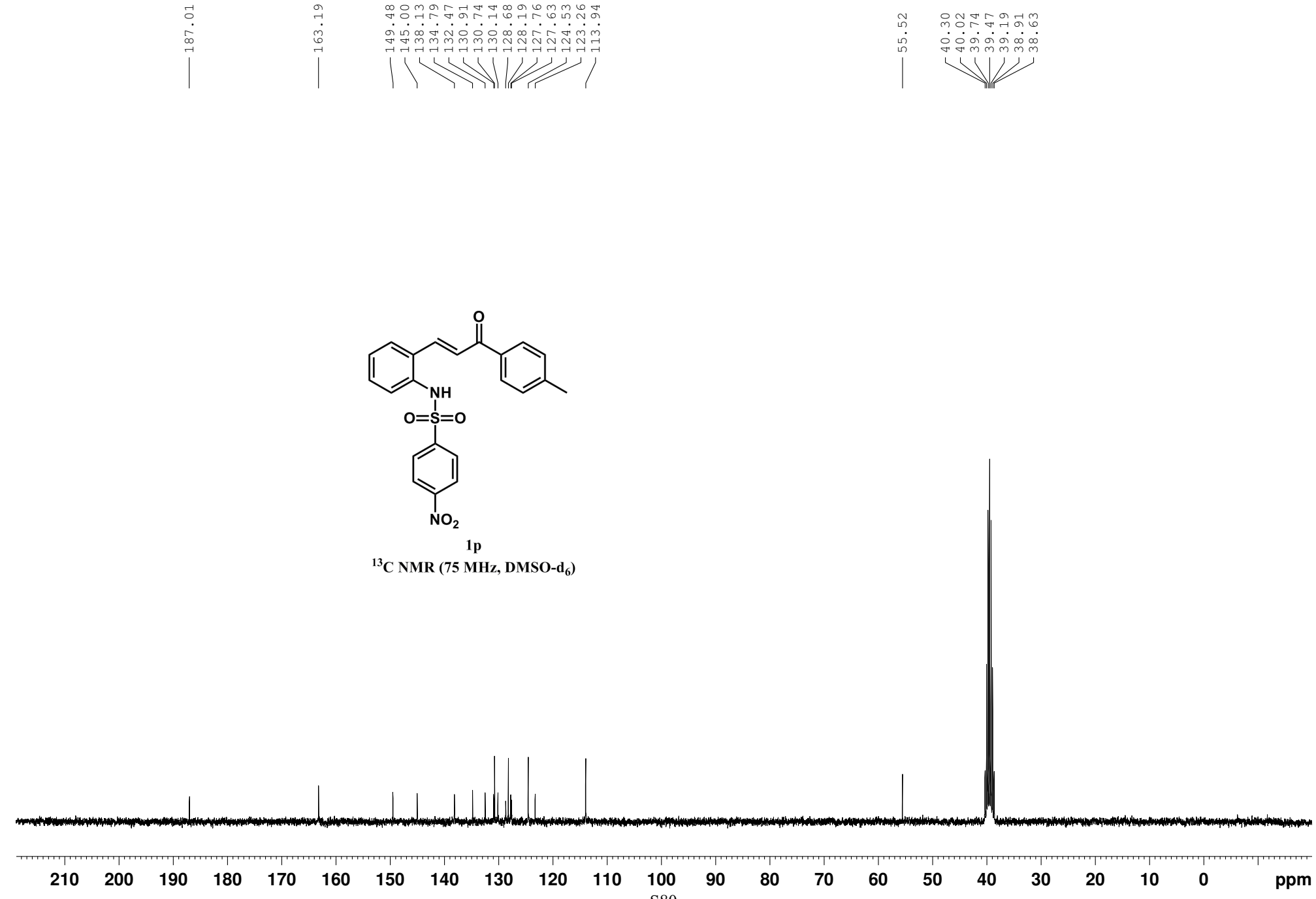
1o

^{13}C NMR (75 MHz, DMSO-d_6)



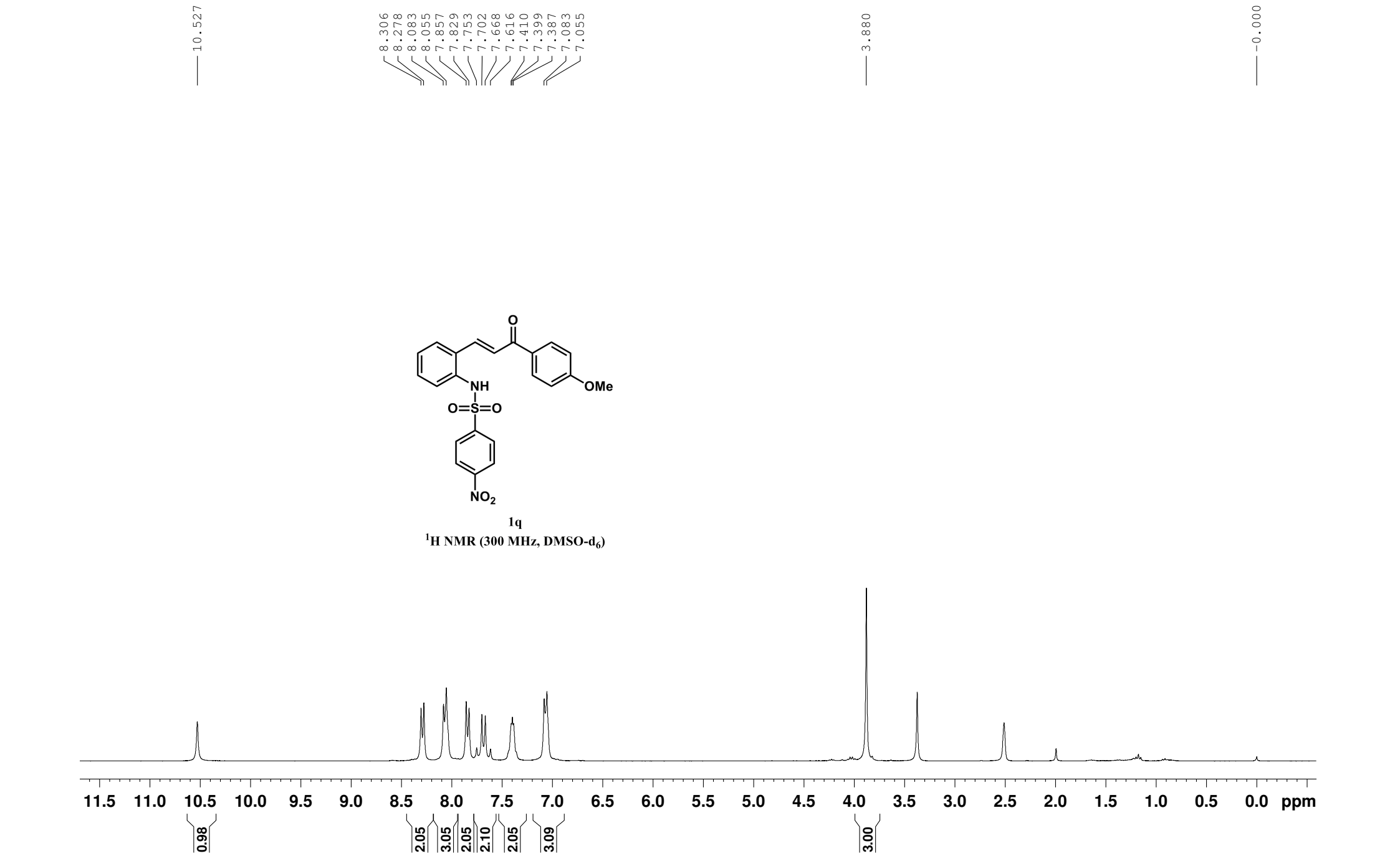
1p

^{1}H NMR (300 MHz, DMSO-d$_6$)



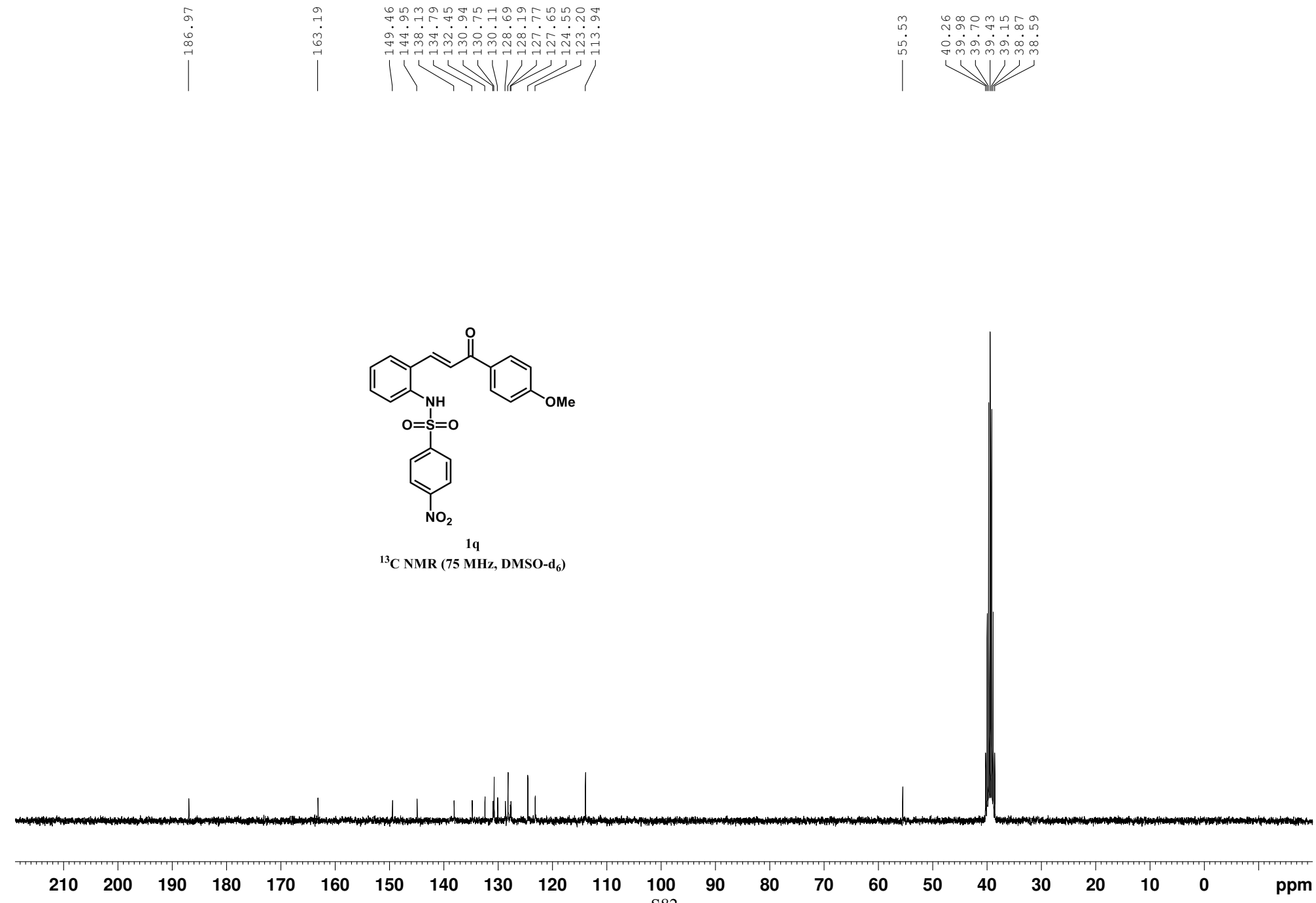
1p

^{13}C NMR (75 MHz, DMSO-d$_6$)



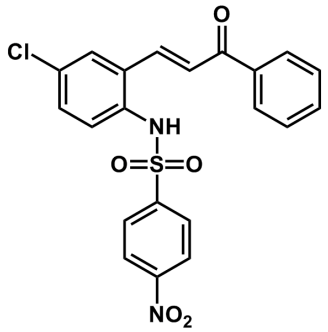
1q

^{1}H NMR (300 MHz, DMSO-d_6)



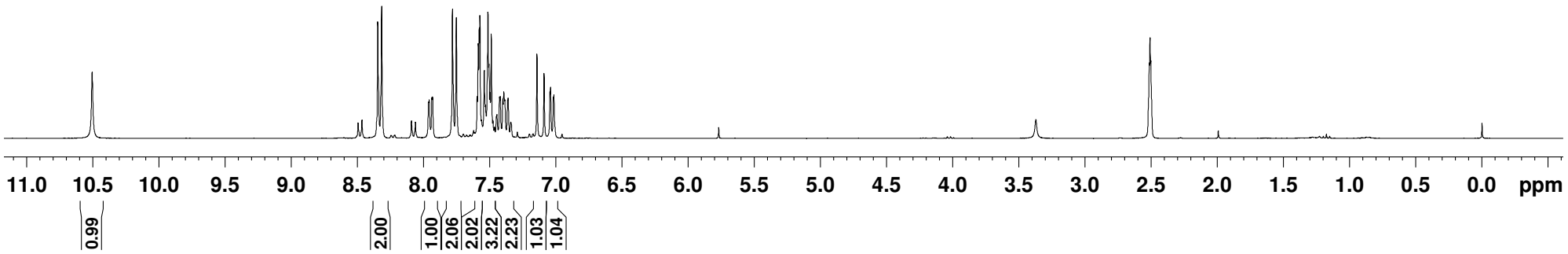
1q

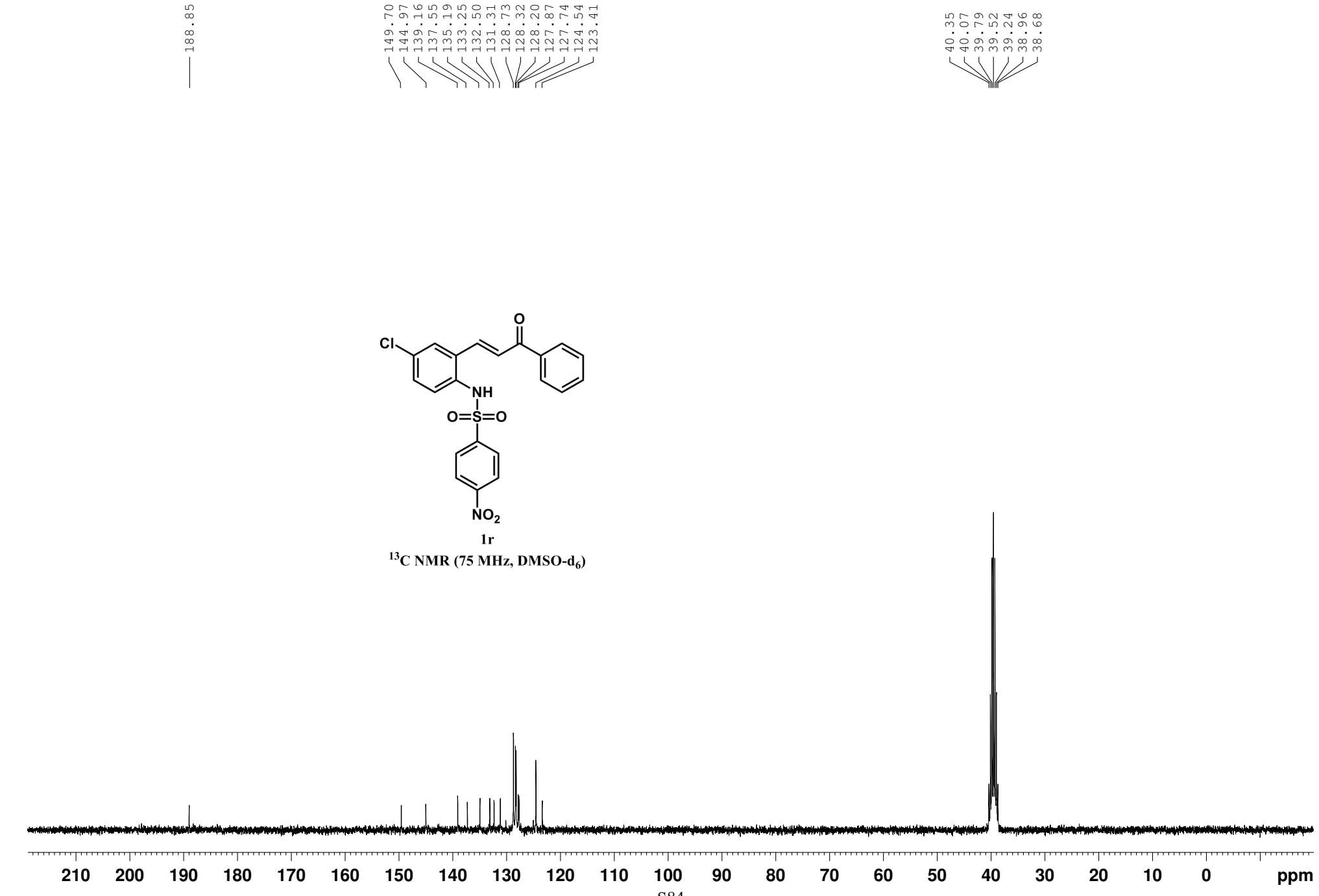
^{13}C NMR (75 MHz, DMSO-d$_6$)



1r

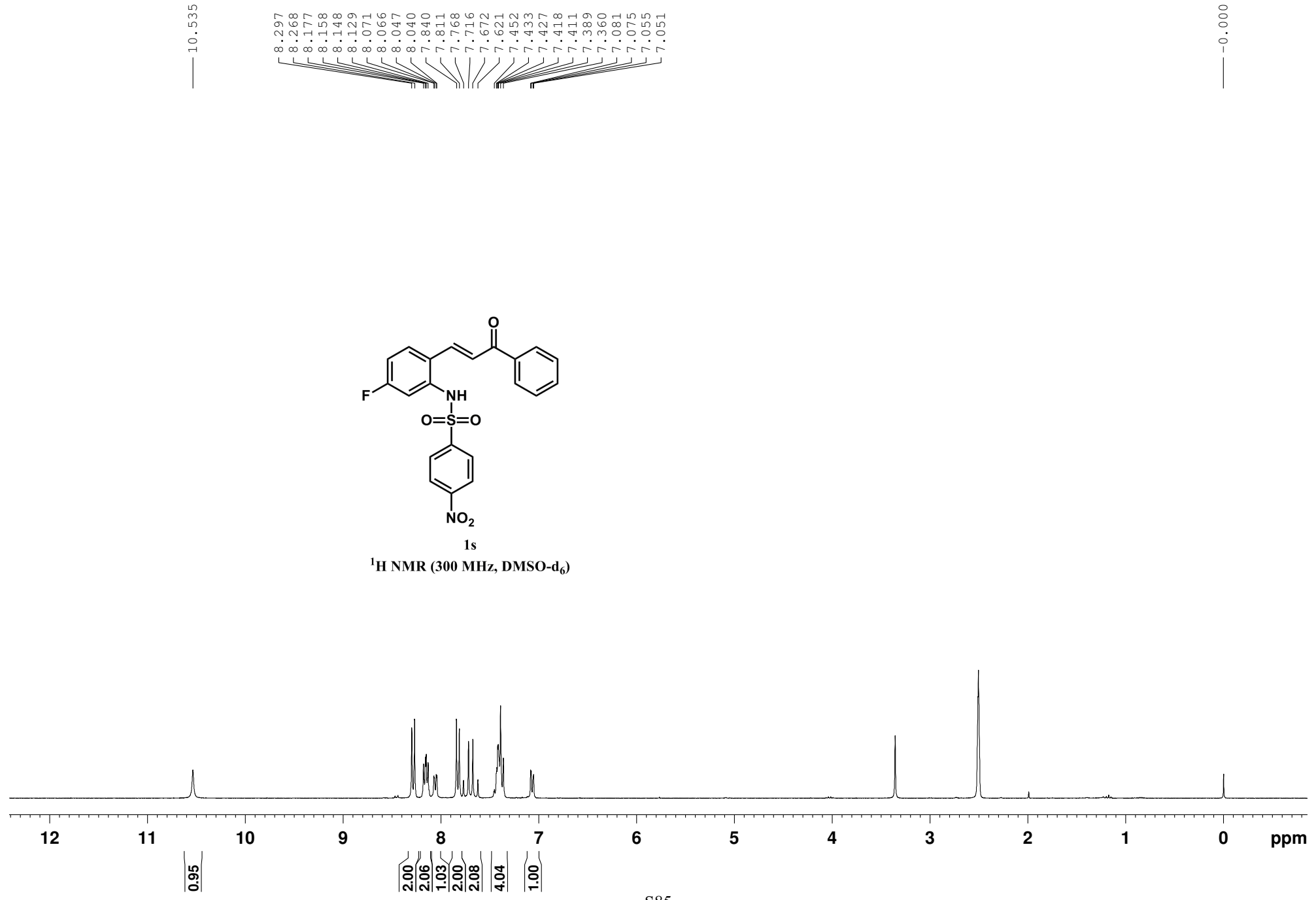
^{1}H NMR (300 MHz, DMSO-d_6)





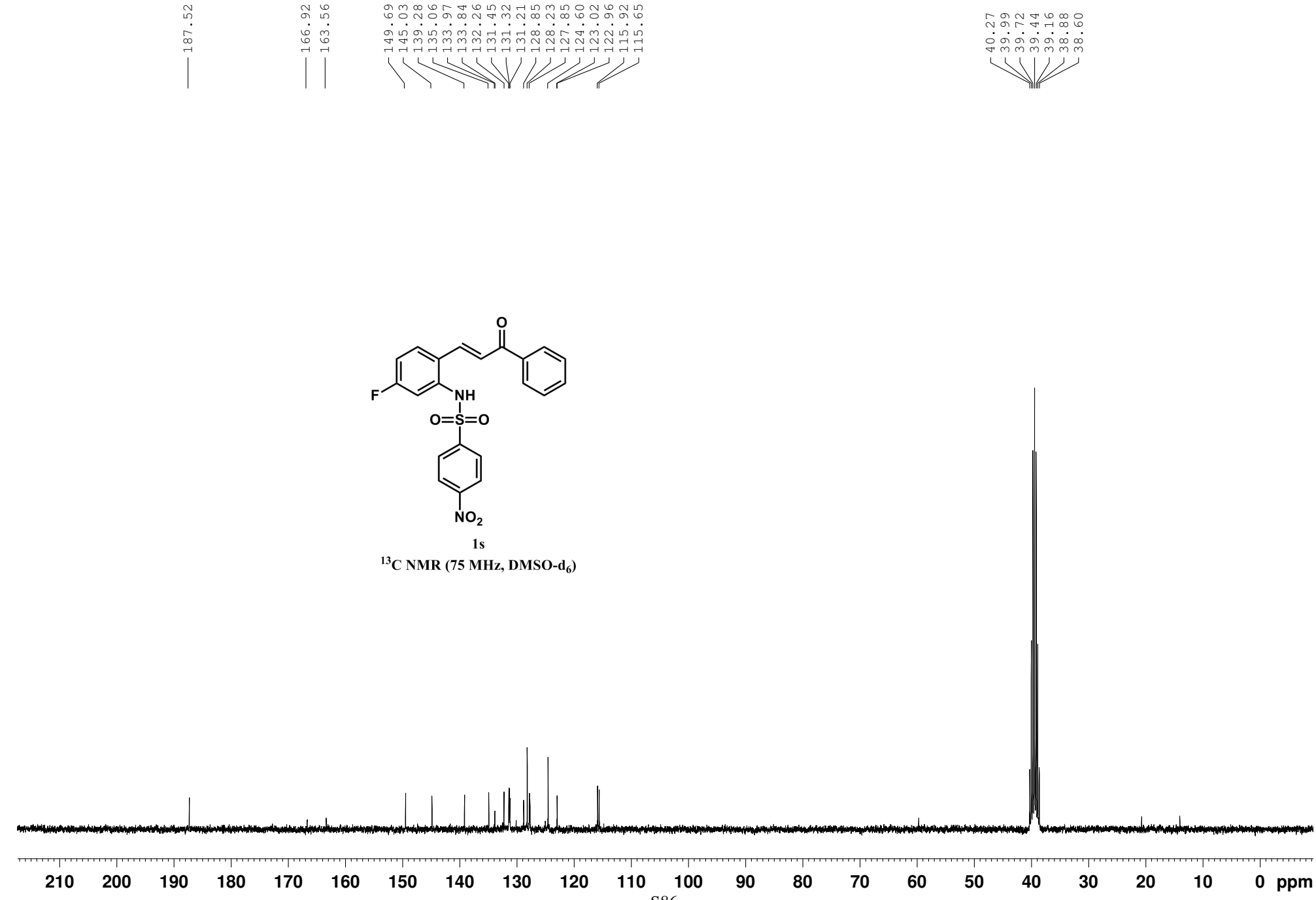
1r

^{13}C NMR (75 MHz, DMSO-d$_6$)



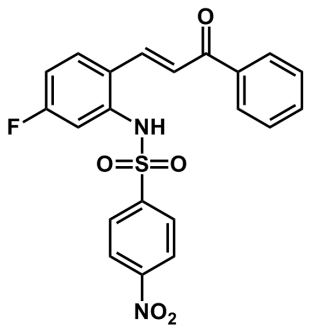
1s

^{1}H NMR (300 MHz, DMSO-d_6)



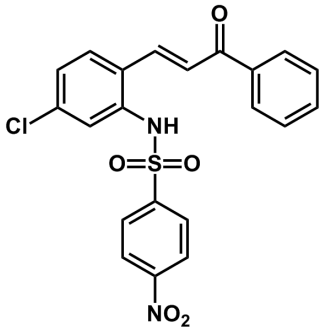
1s

^{13}C NMR (75 MHz, DMSO-d_6)



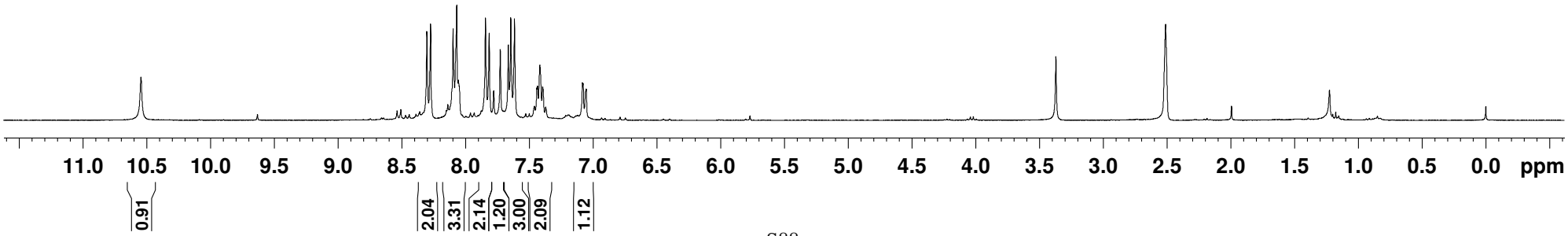
1s

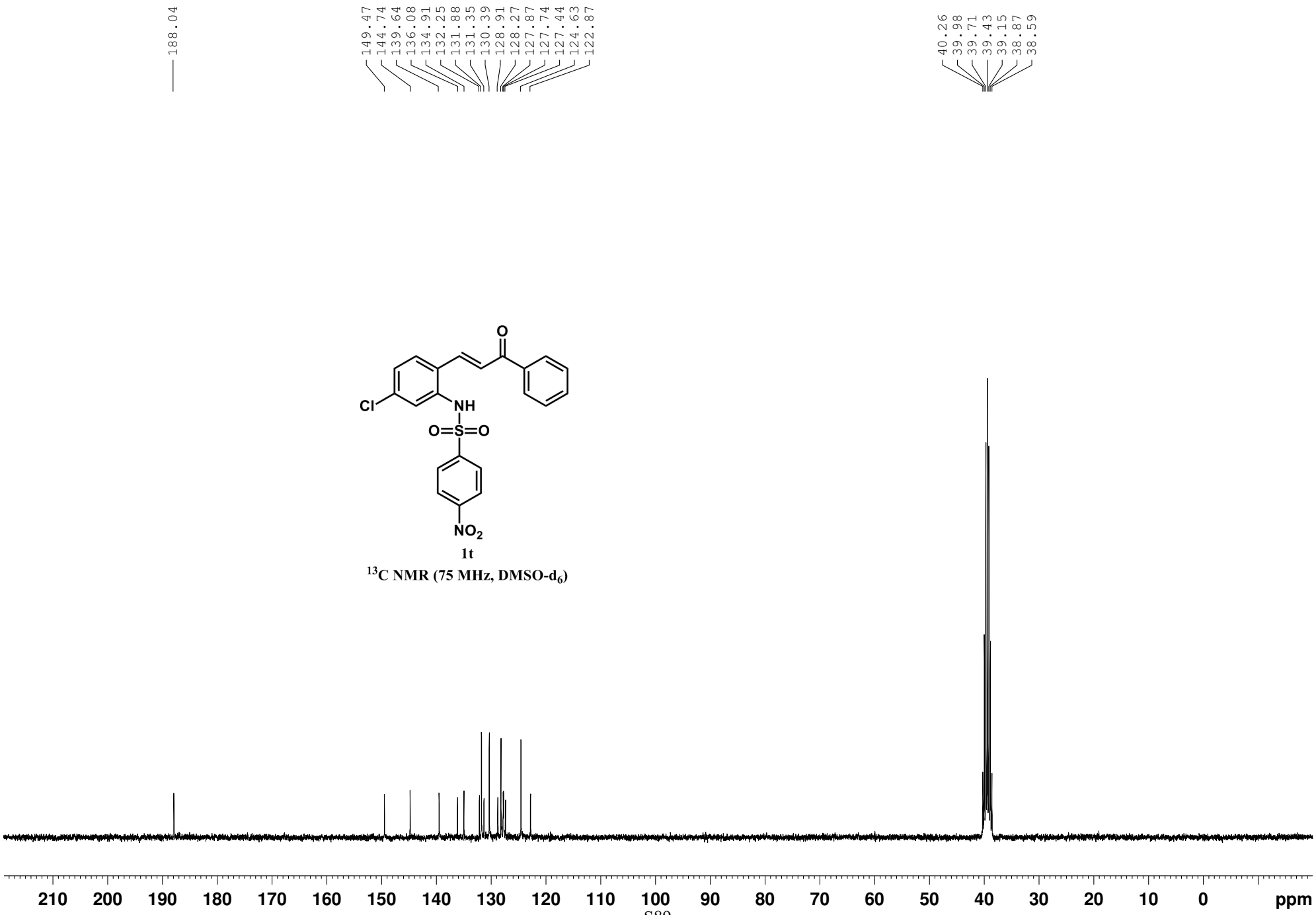
^{19}F NMR (282 MHz, DMSO-d_6)



1t

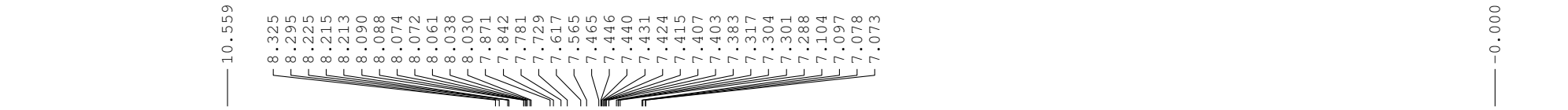
^{1}H NMR (300 MHz, DMSO-d_6)

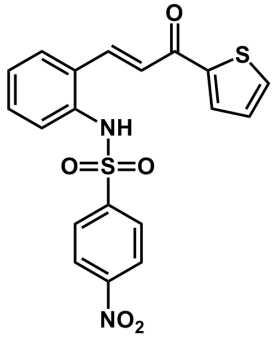




1t

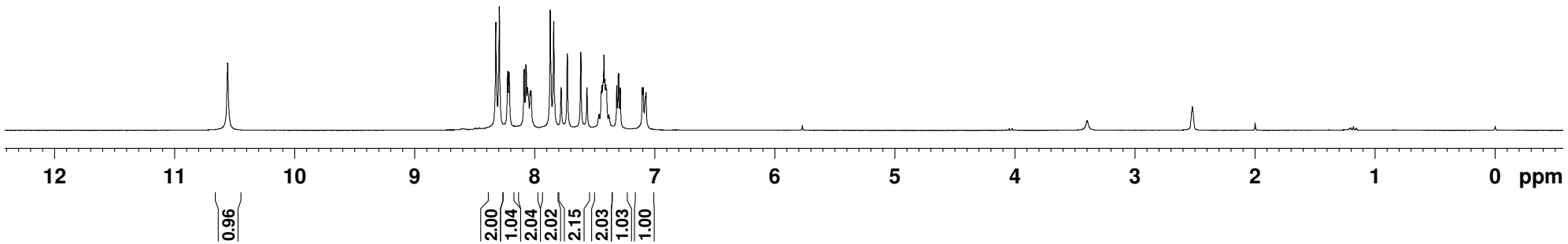
^{13}C NMR (75 MHz, DMSO-d_6)

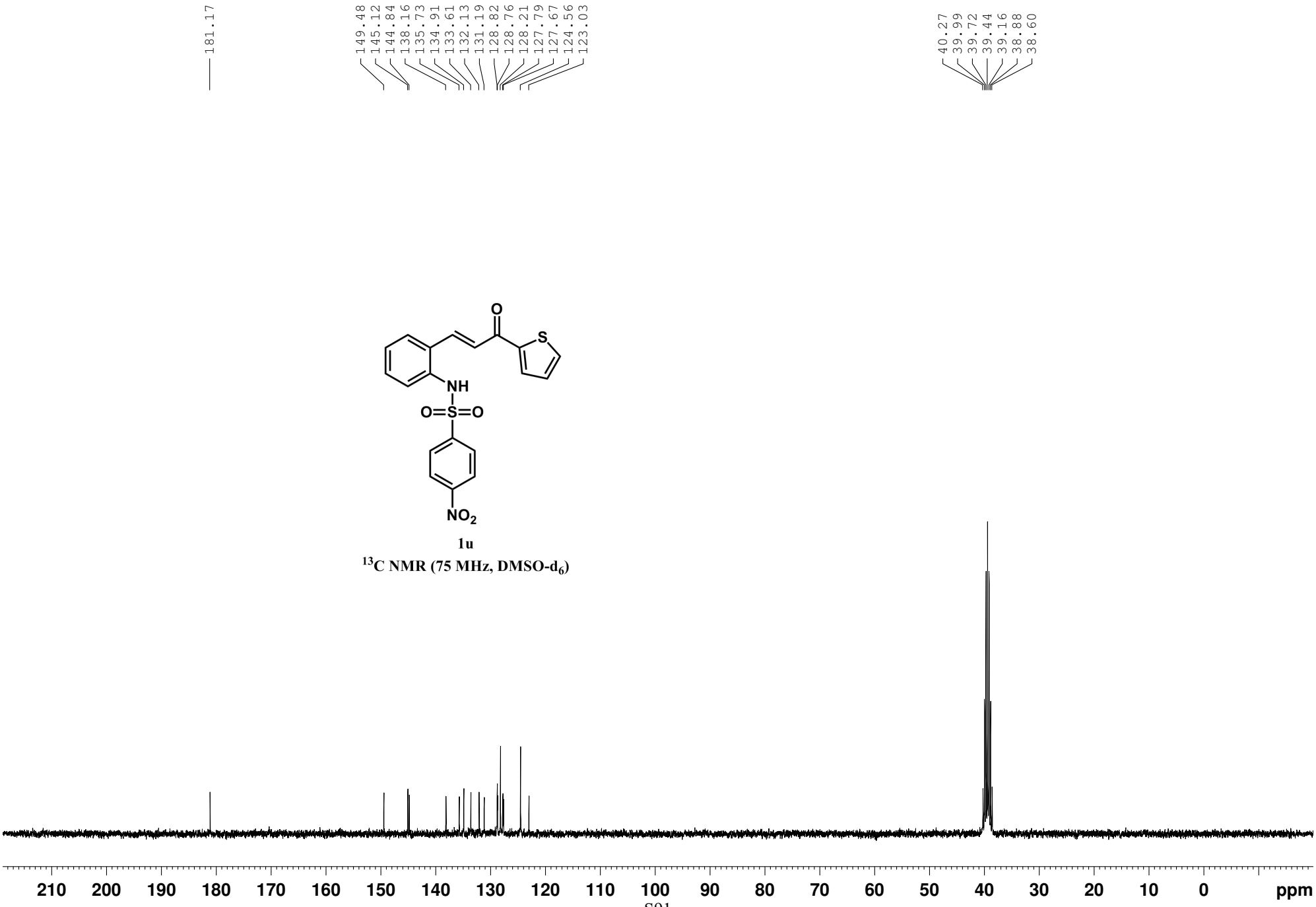




1u

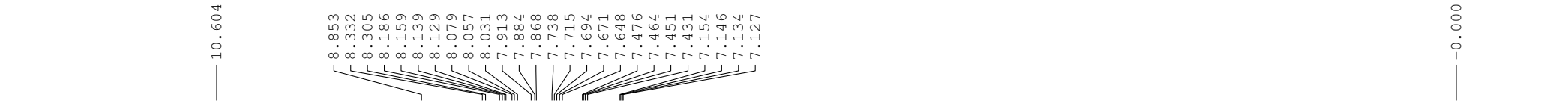
^{1}H NMR (300 MHz, DMSO-d$_6$)

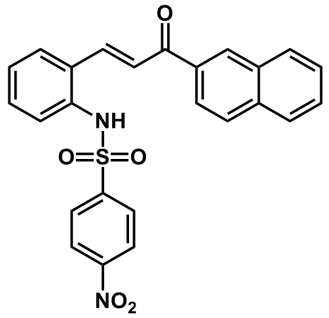




1u

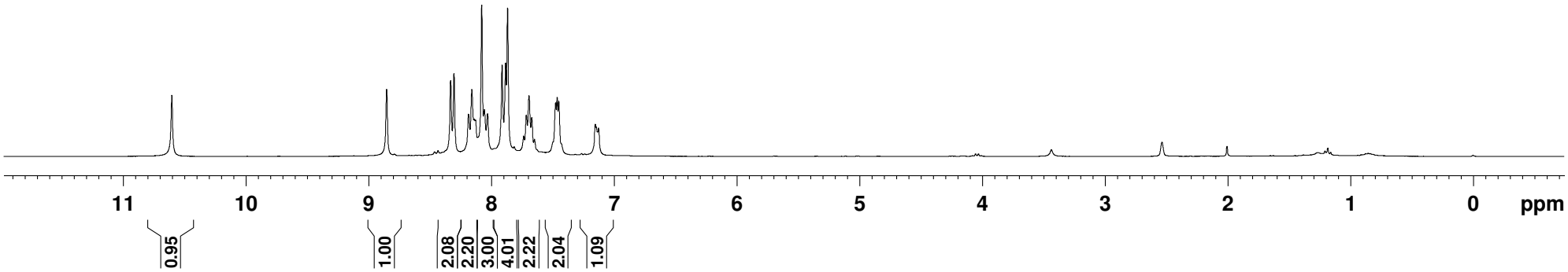
^{13}C NMR (75 MHz, DMSO-d_6)

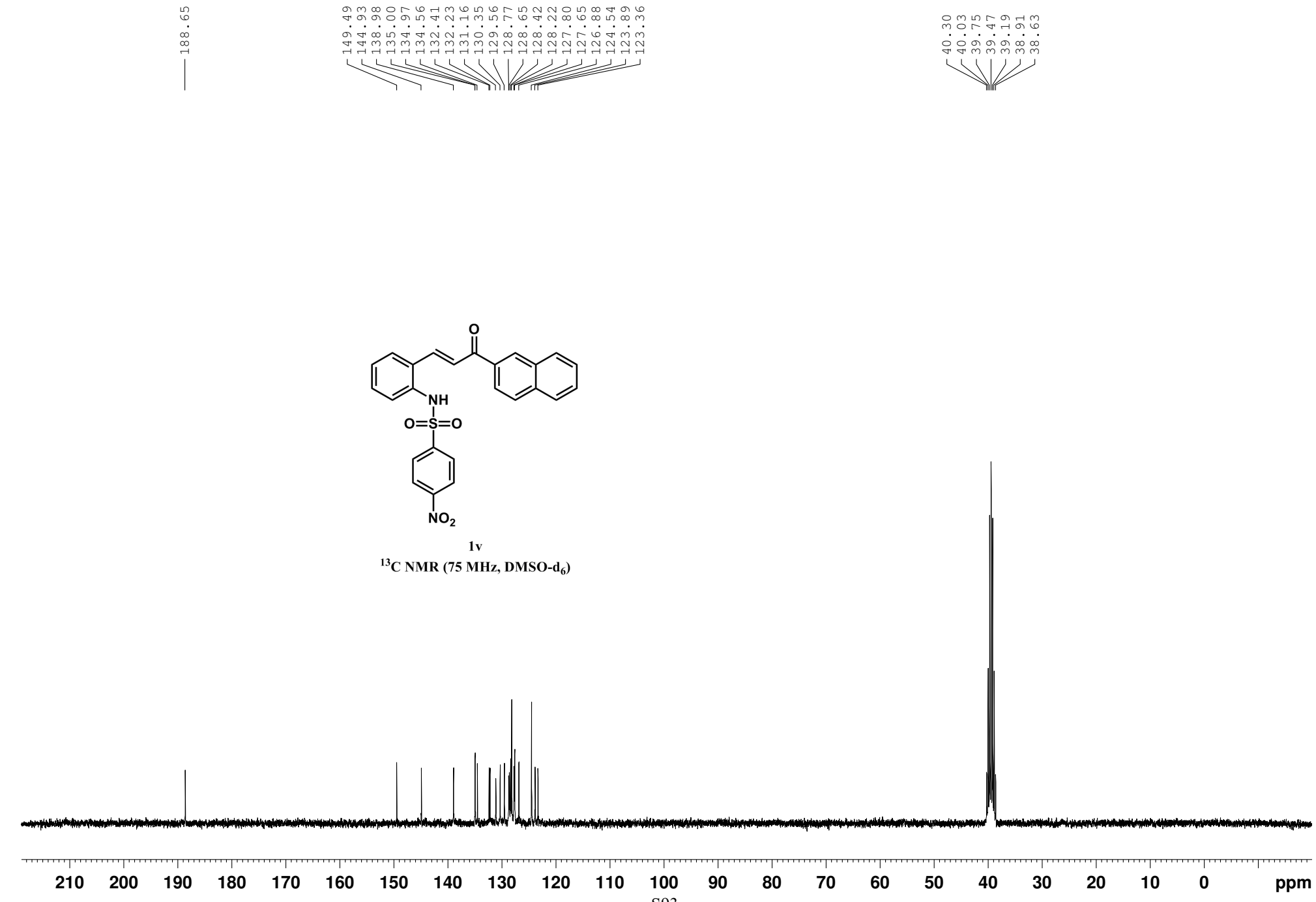




1v

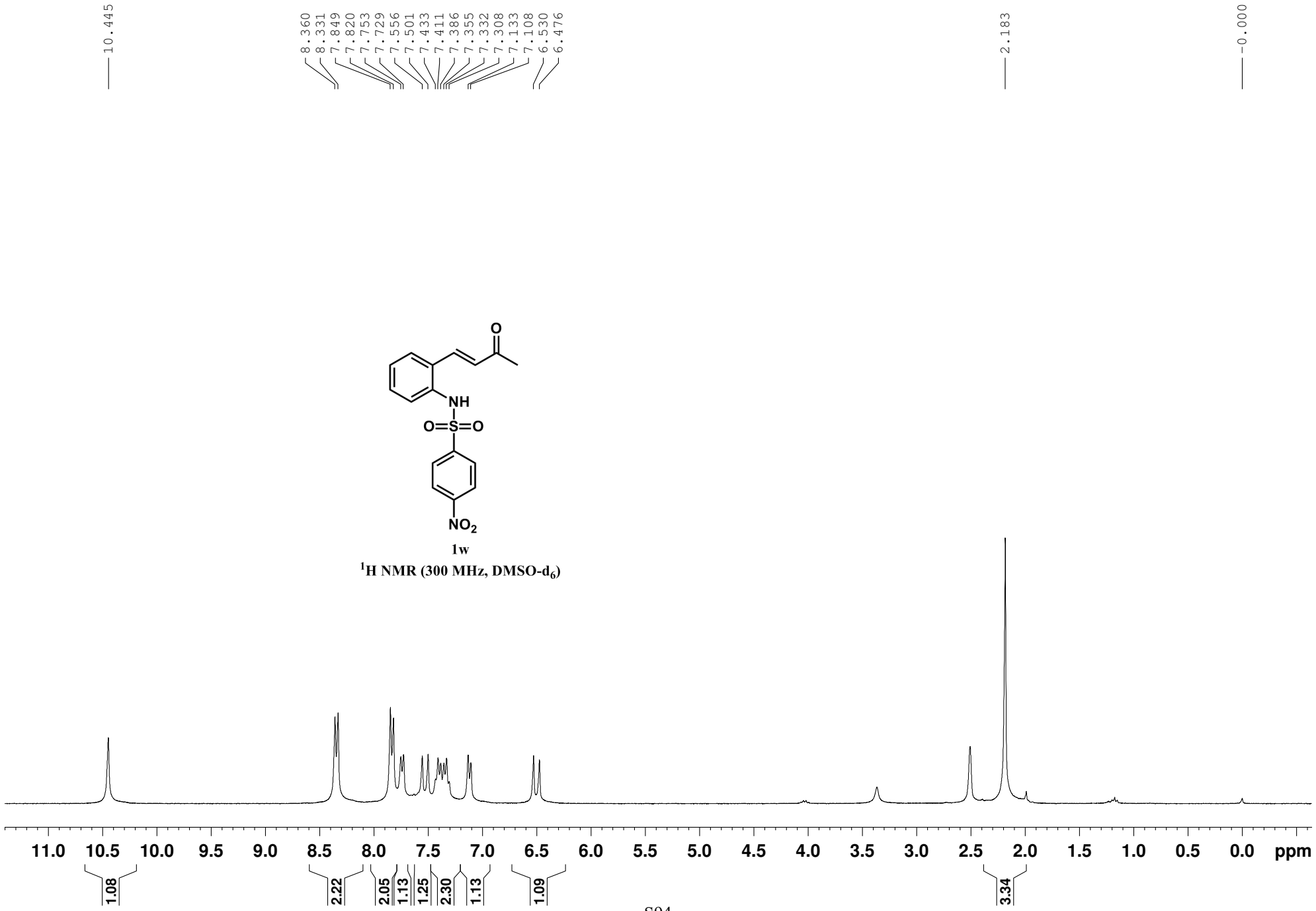
^{1}H NMR (300 MHz, DMSO-d_6)





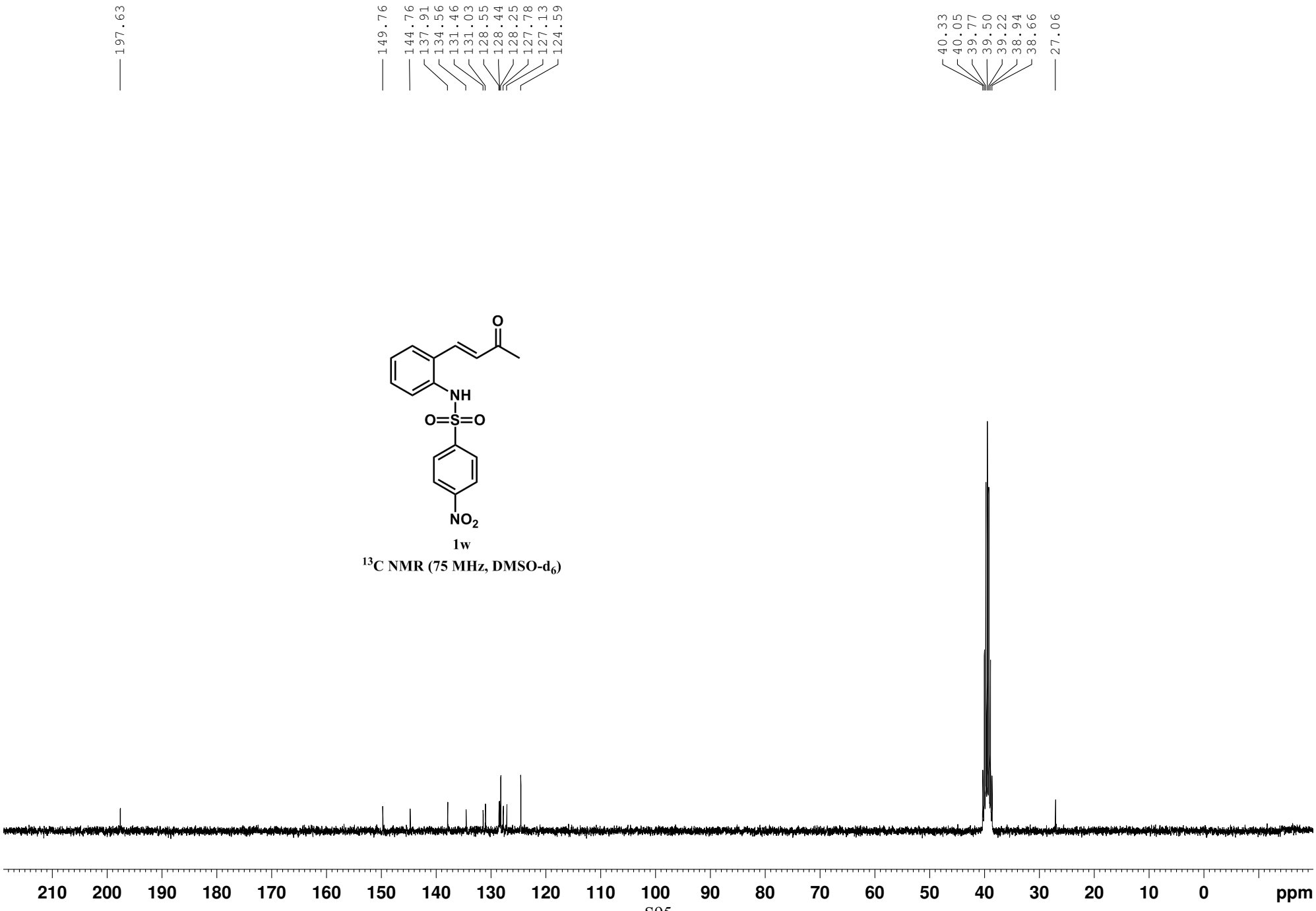
1v

^{13}C NMR (75 MHz, DMSO-d$_6$)



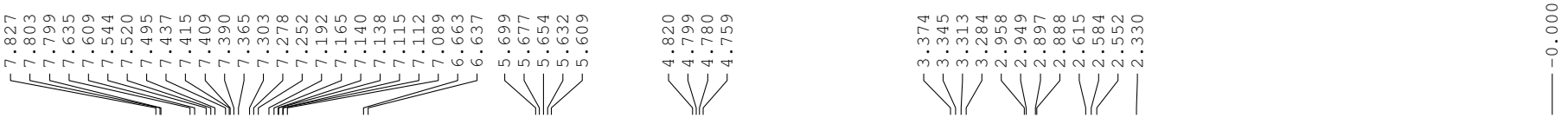
1w

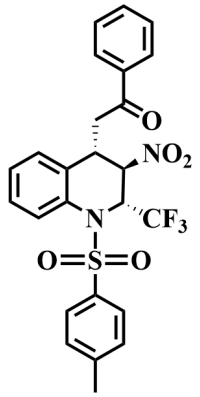
^{1}H NMR (300 MHz, DMSO-d_6)



1w

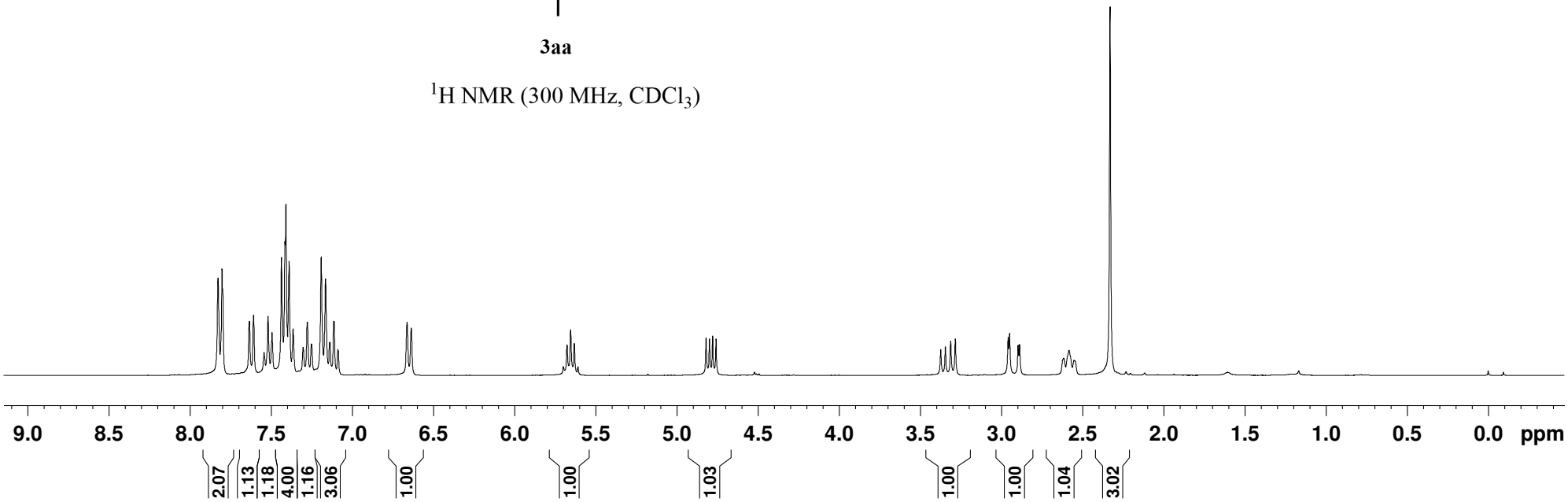
^{13}C NMR (75 MHz, DMSO-d$_6$)

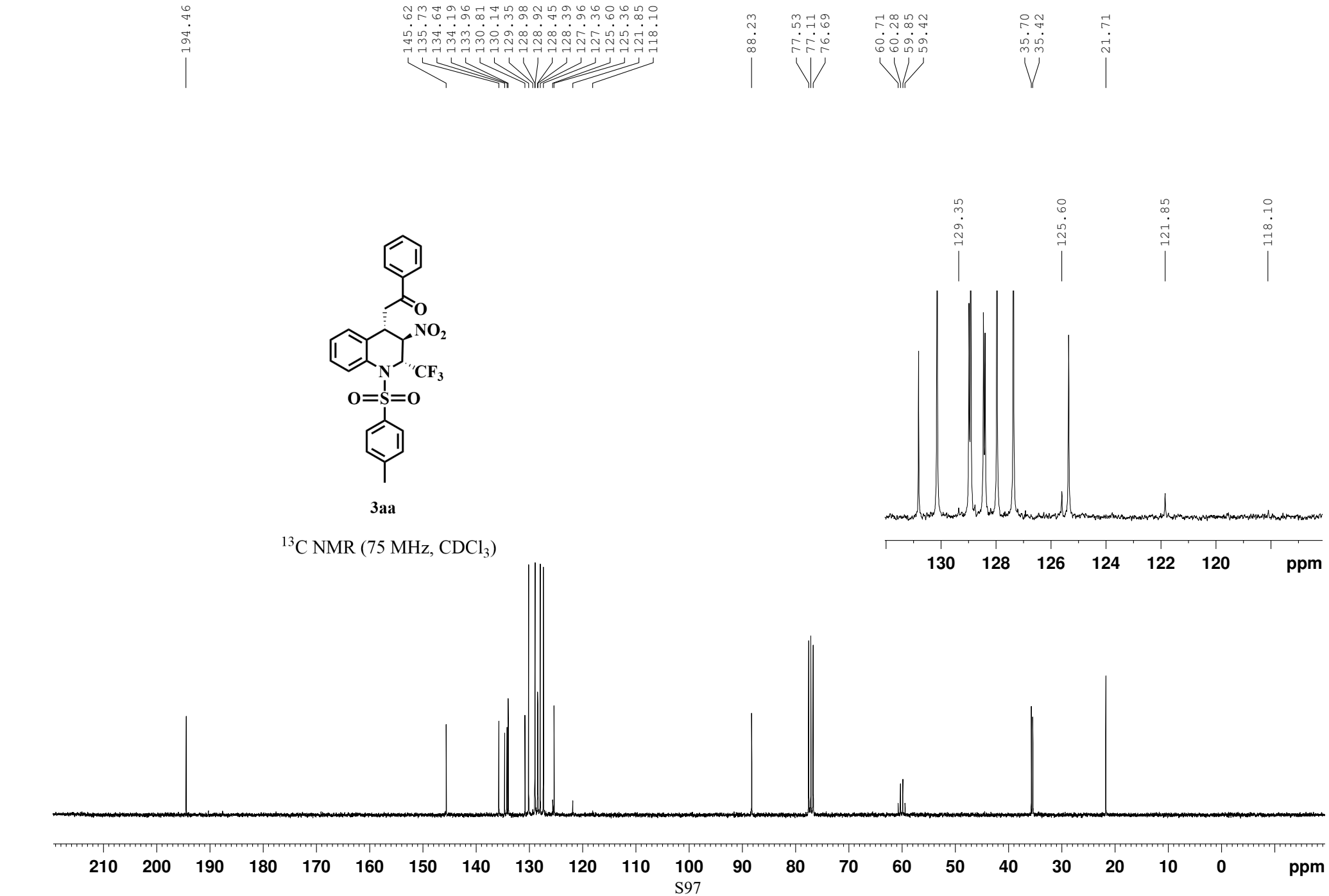


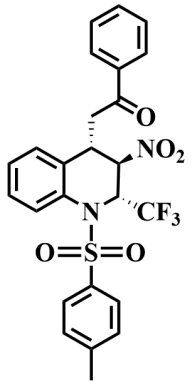


3aa

^{1}H NMR (300 MHz, $CDCl_3$)

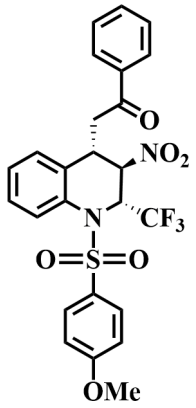



194.46
145.62
135.73
134.64
134.19
133.96
130.81
130.14
129.35
128.98
128.92
128.45
128.39
127.96
127.36
125.60
125.36
121.85
118.10
88.23
77.53
77.11
76.69
60.71
60.28
59.85
59.42
35.70
35.42
21.71
O
NO2
N
CF3
O=S=O
3aa
13C NMR (75 MHz, CDCl3)
129.35
125.60
121.85
118.10
130
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



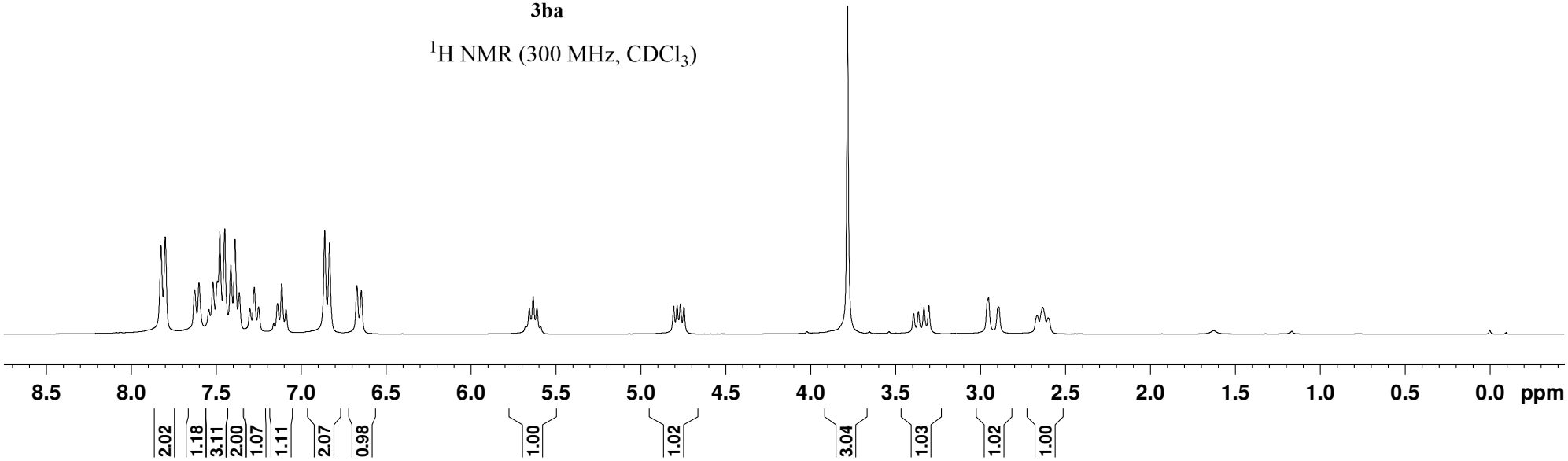
3aa

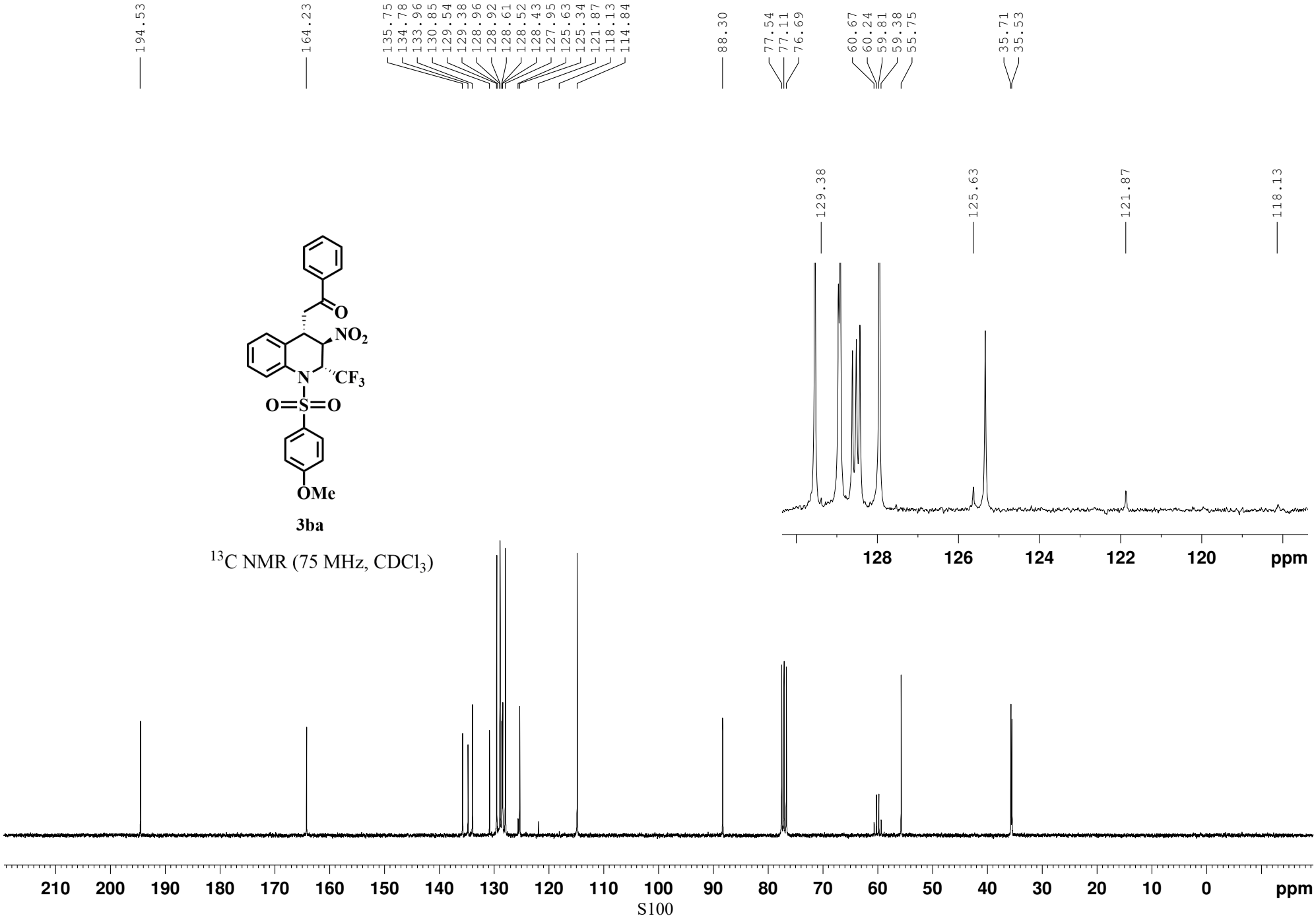
^{19}F NMR (282 MHz, $CDCl_3$)

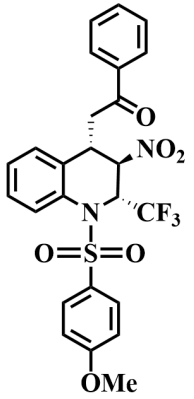


3ba

^{1}H NMR (300 MHz, $CDCl_3$)

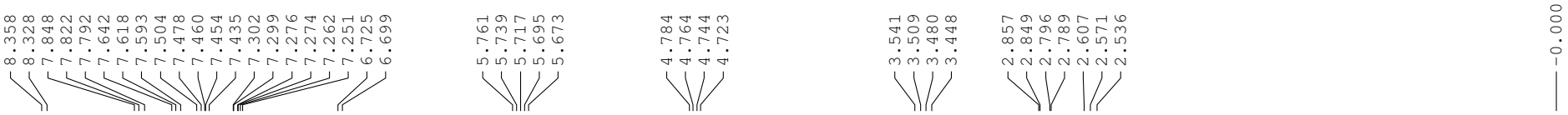


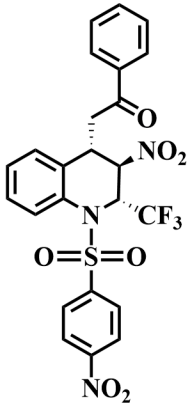

194.53
164.23
135.75
134.78
133.96
130.85
129.54
129.38
128.96
128.92
128.61
128.52
128.43
127.95
125.63
125.34
121.87
118.13
114.84
88.30
77.54
77.11
76.69
60.67
60.24
59.81
59.38
55.75
35.71
35.53
129.38
125.63
121.87
118.13
128
126
124
122
120
ppm
O
NO2
N
CF3
O=S=O
OMe
3ba
13C NMR (75 MHz, CDCl3)
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3ba

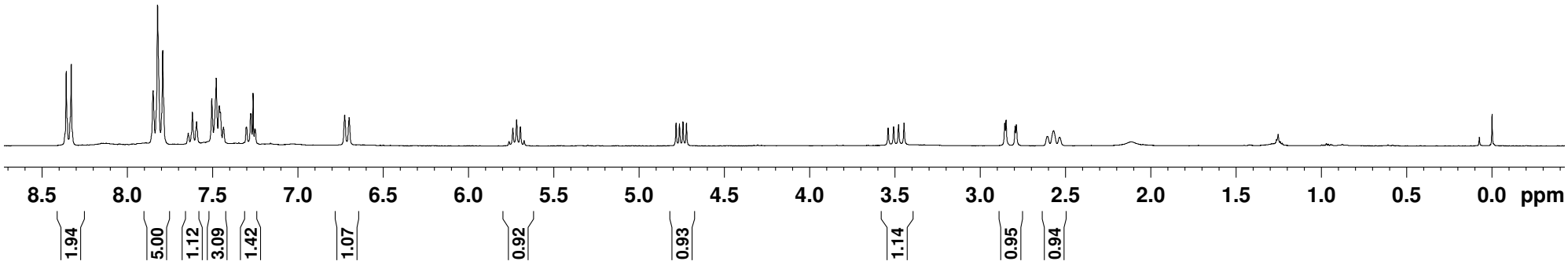
^{19}F NMR (282 MHz, $CDCl_3$)

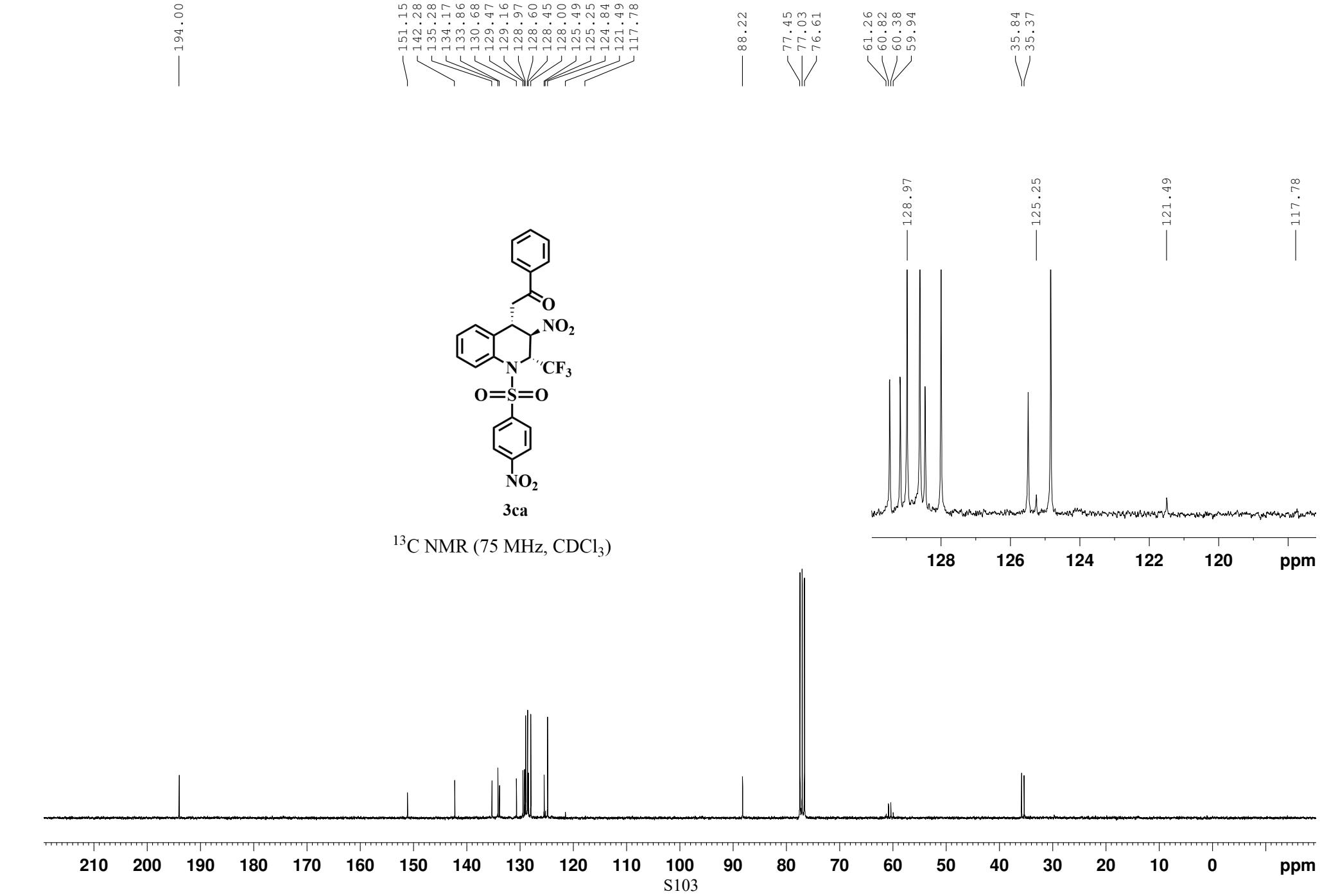




3ca

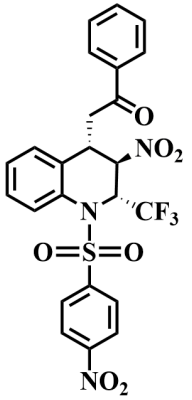
^{1}H NMR (300 MHz, $CDCl_3$)





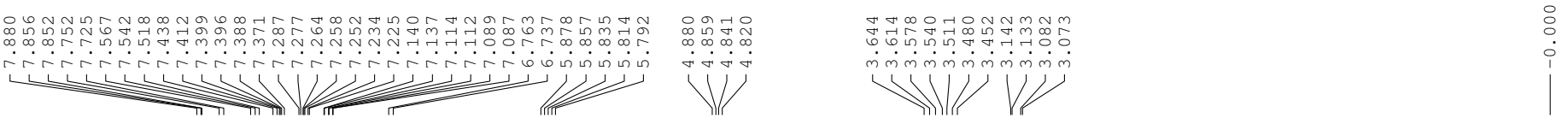
3ca

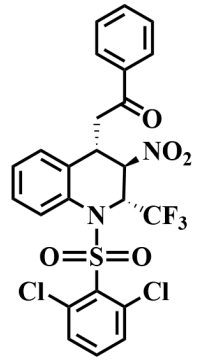
^{13}C NMR (75 MHz, $CDCl_3$)



3ca

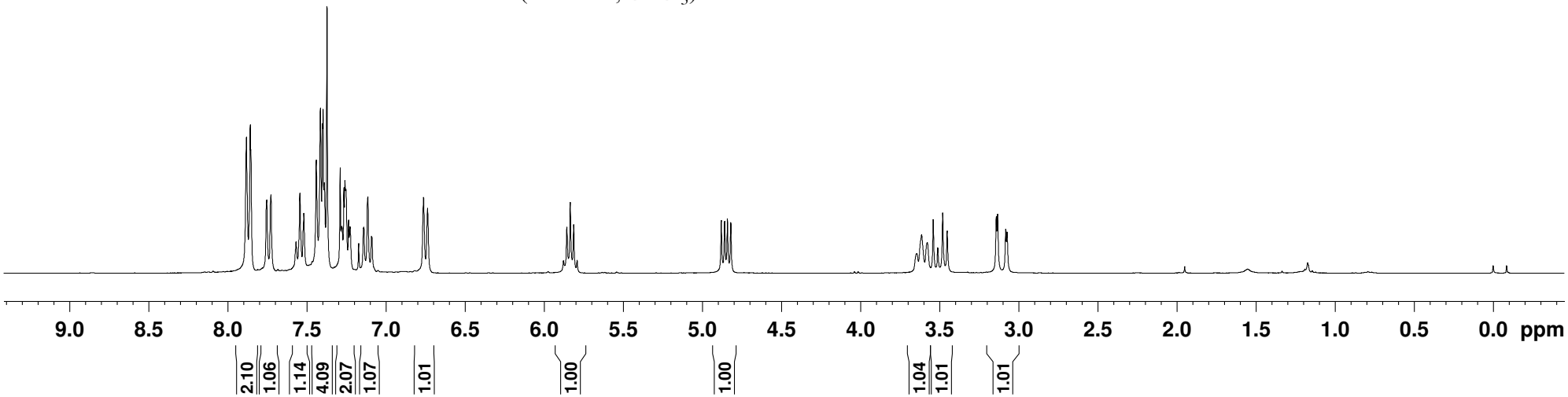
^{19}F NMR (282 MHz, $CDCl_3$)

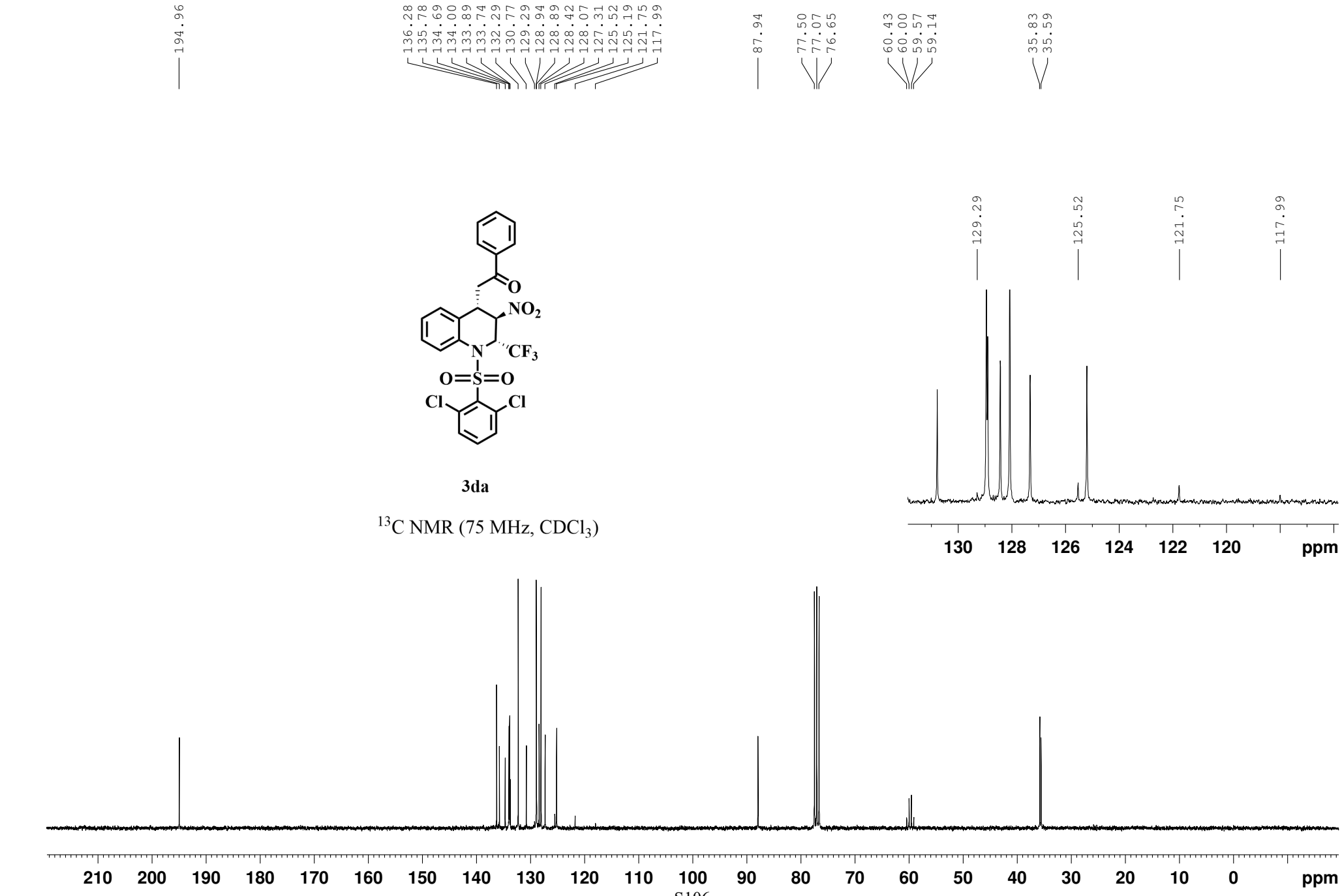




3da

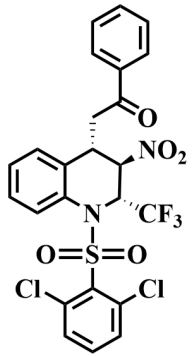
^{1}H NMR (300 MHz, $CDCl_3$)





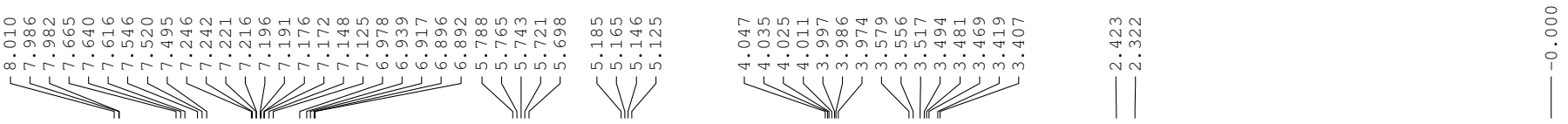
3da

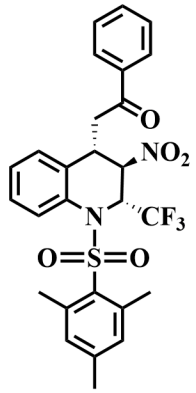
^{13}C NMR (75 MHz, $CDCl_3$)



3da

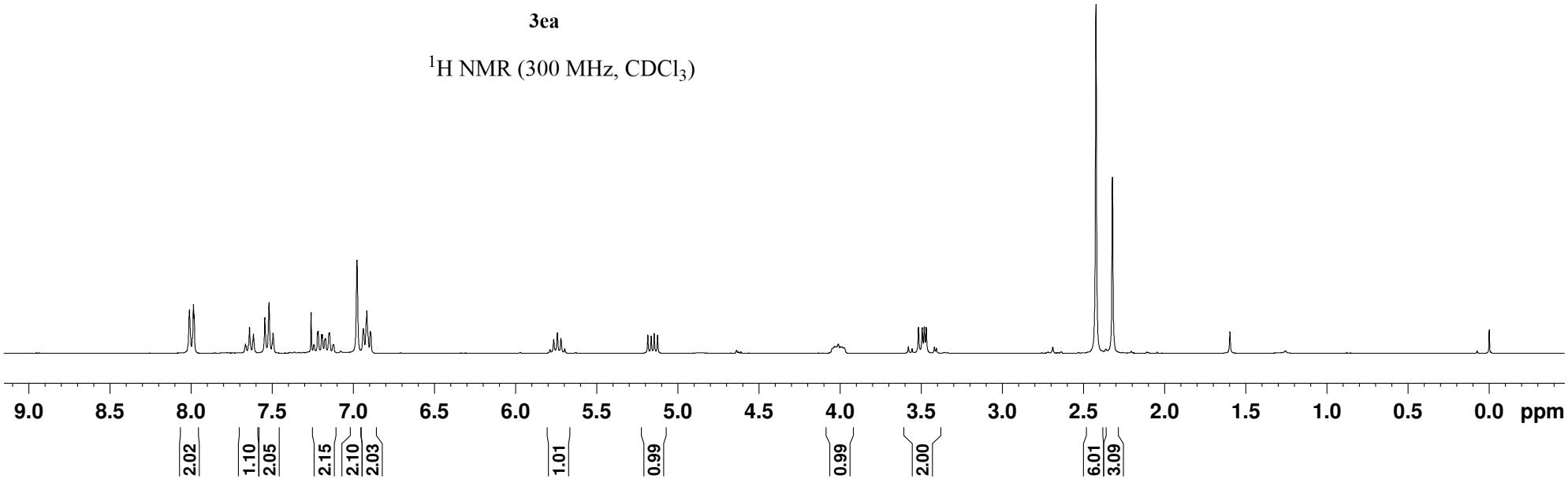
^{19}F NMR (282 MHz, $CDCl_3$)

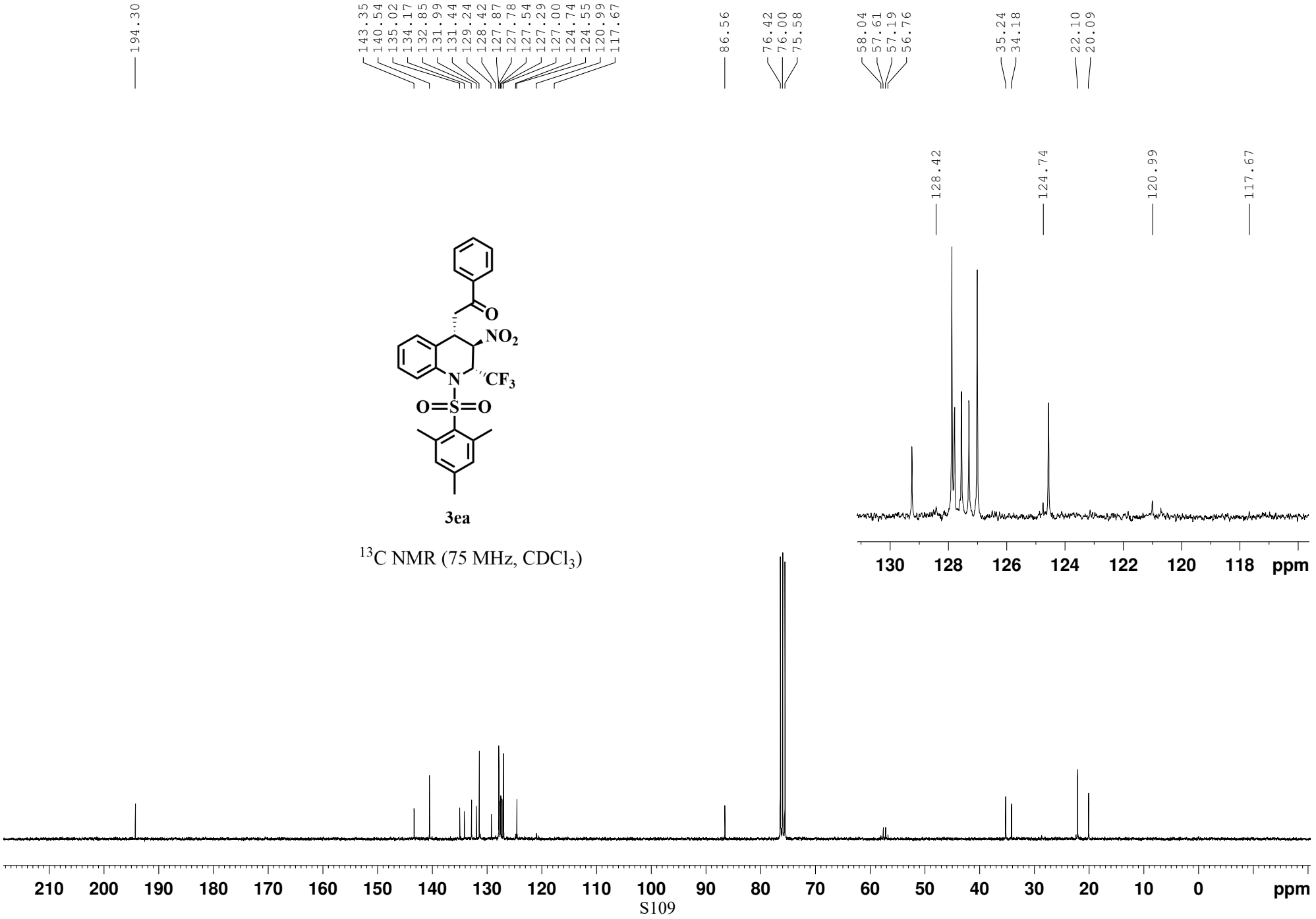


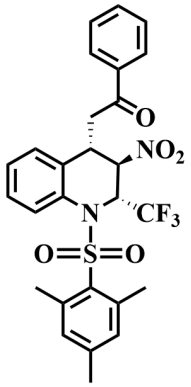


3ea

^{1}H NMR (300 MHz, $CDCl_3$)

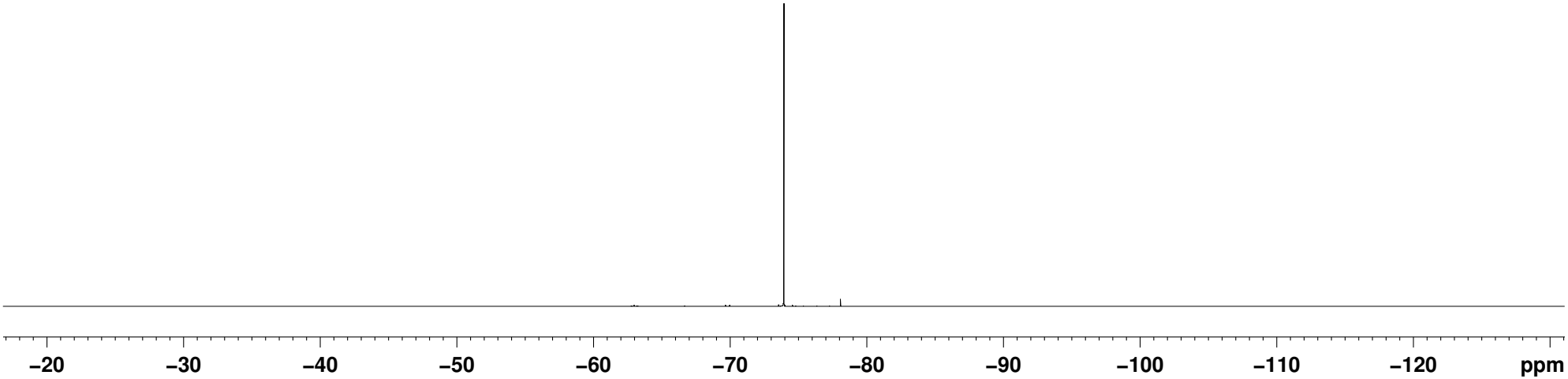


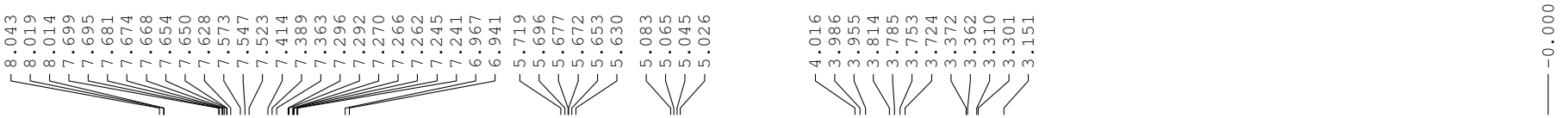

194.30
143.35
140.54
135.02
134.17
132.85
131.99
131.44
129.24
128.42
127.87
127.78
127.54
127.29
127.00
124.74
124.55
120.99
117.67
86.56
76.42
76.00
75.58
58.04
57.61
57.19
56.76
35.24
34.18
22.10
20.09
O
NO2
N
CF3
O=S=O
3ea
13C NMR (75 MHz, CDCl3)
128.42
124.74
120.99
117.67
130
128
126
124
122
120
118
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

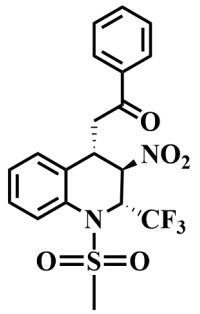


3ea

^{19}F NMR (282 MHz, $CDCl_3$)

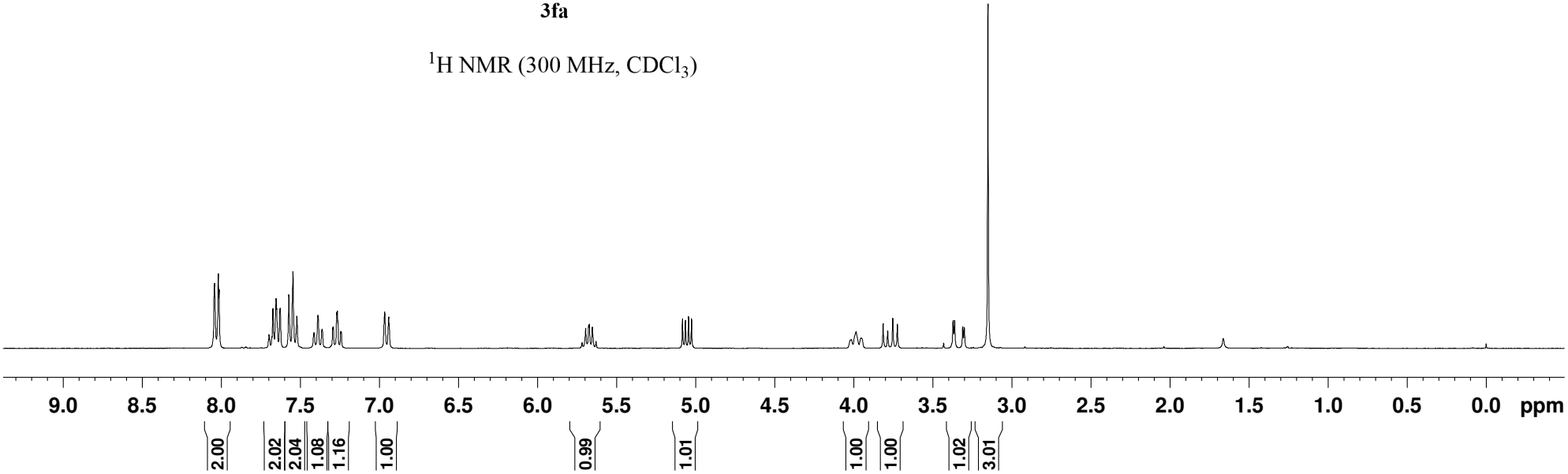


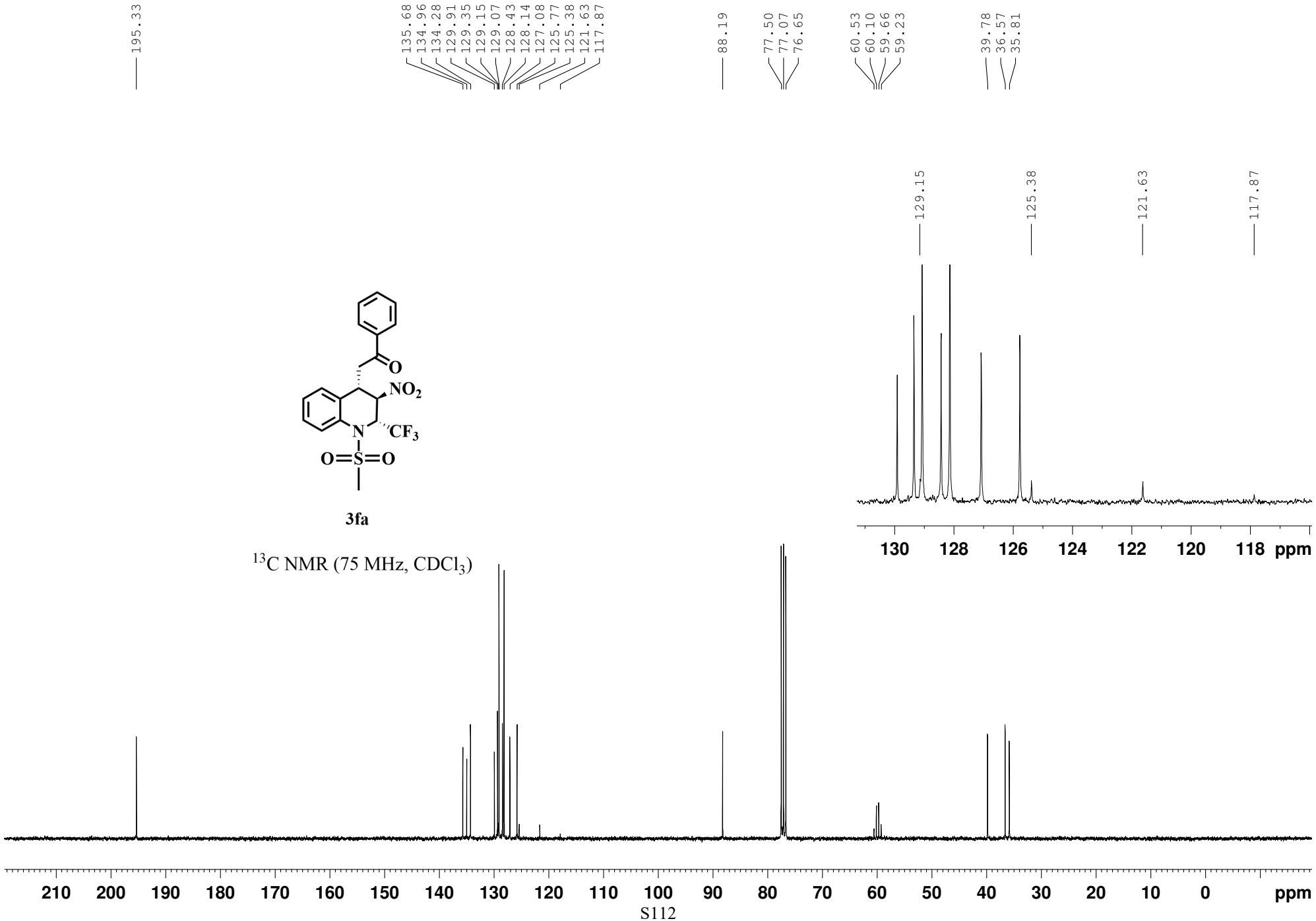


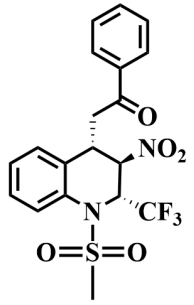


3fa

^{1}H NMR (300 MHz, $CDCl_3$)

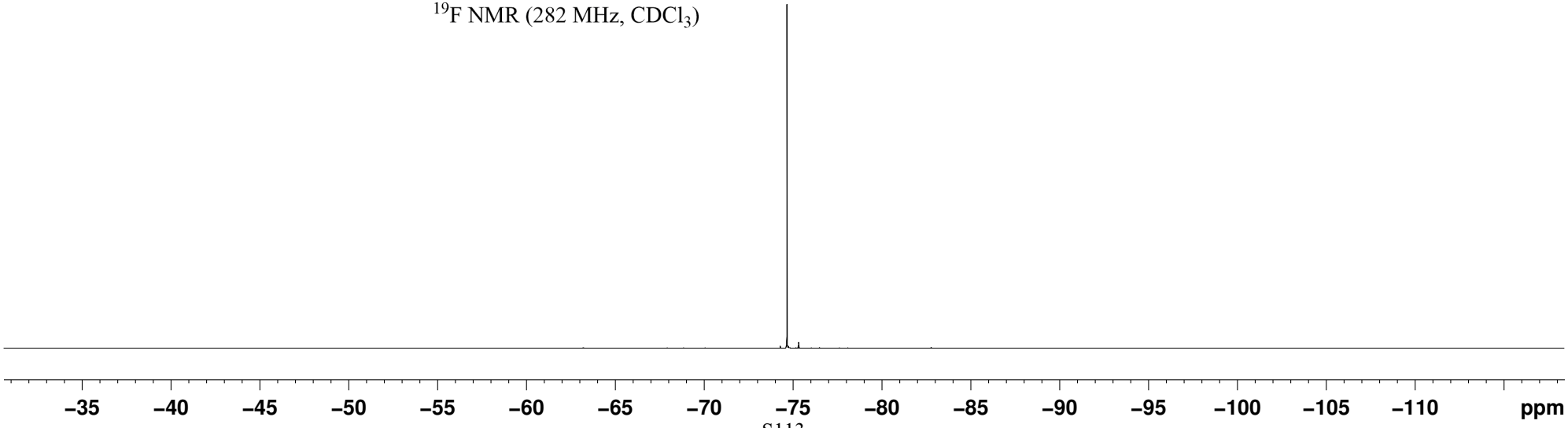


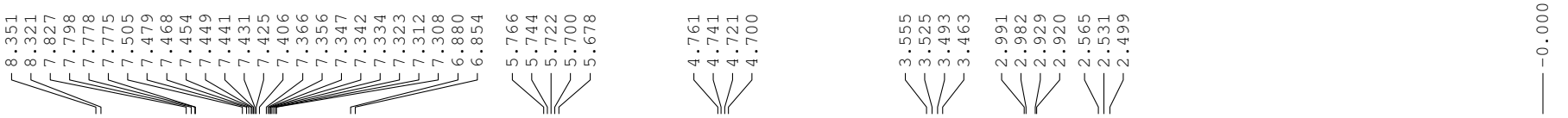

195.33
135.68
134.96
134.28
129.91
129.35
129.15
129.07
128.43
128.14
127.08
125.77
125.38
121.63
117.87
88.19
77.50
77.07
76.65
60.53
60.10
59.66
59.23
39.78
36.57
35.81
O
NO2
N
CF3
O=S=O
3fa
13C NMR (75 MHz, CDCl3)
129.15
125.38
121.63
117.87
130
128
126
124
122
120
118
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

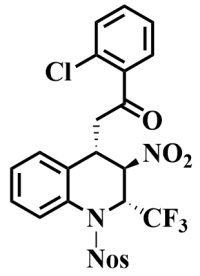


3fa

^{19}F NMR (282 MHz, $CDCl_3$)

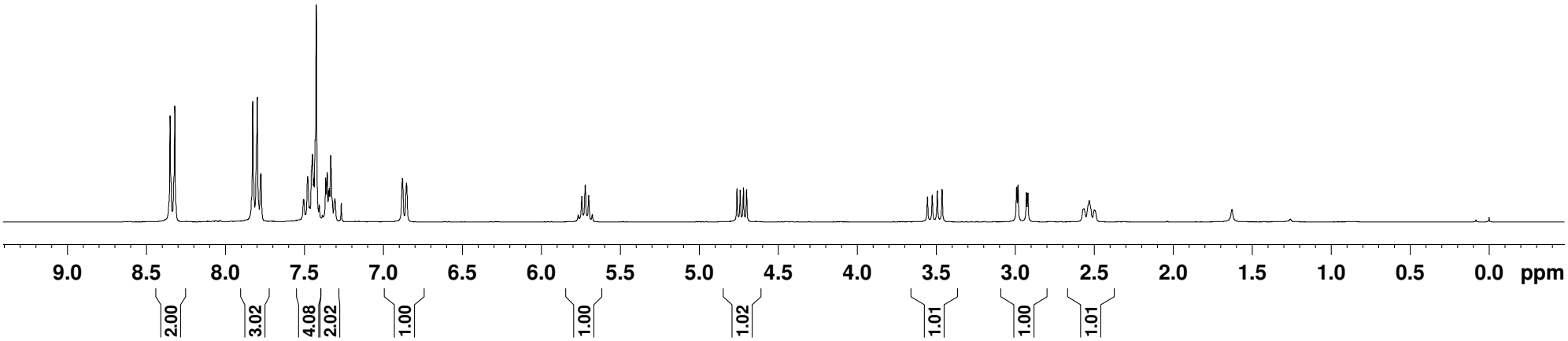


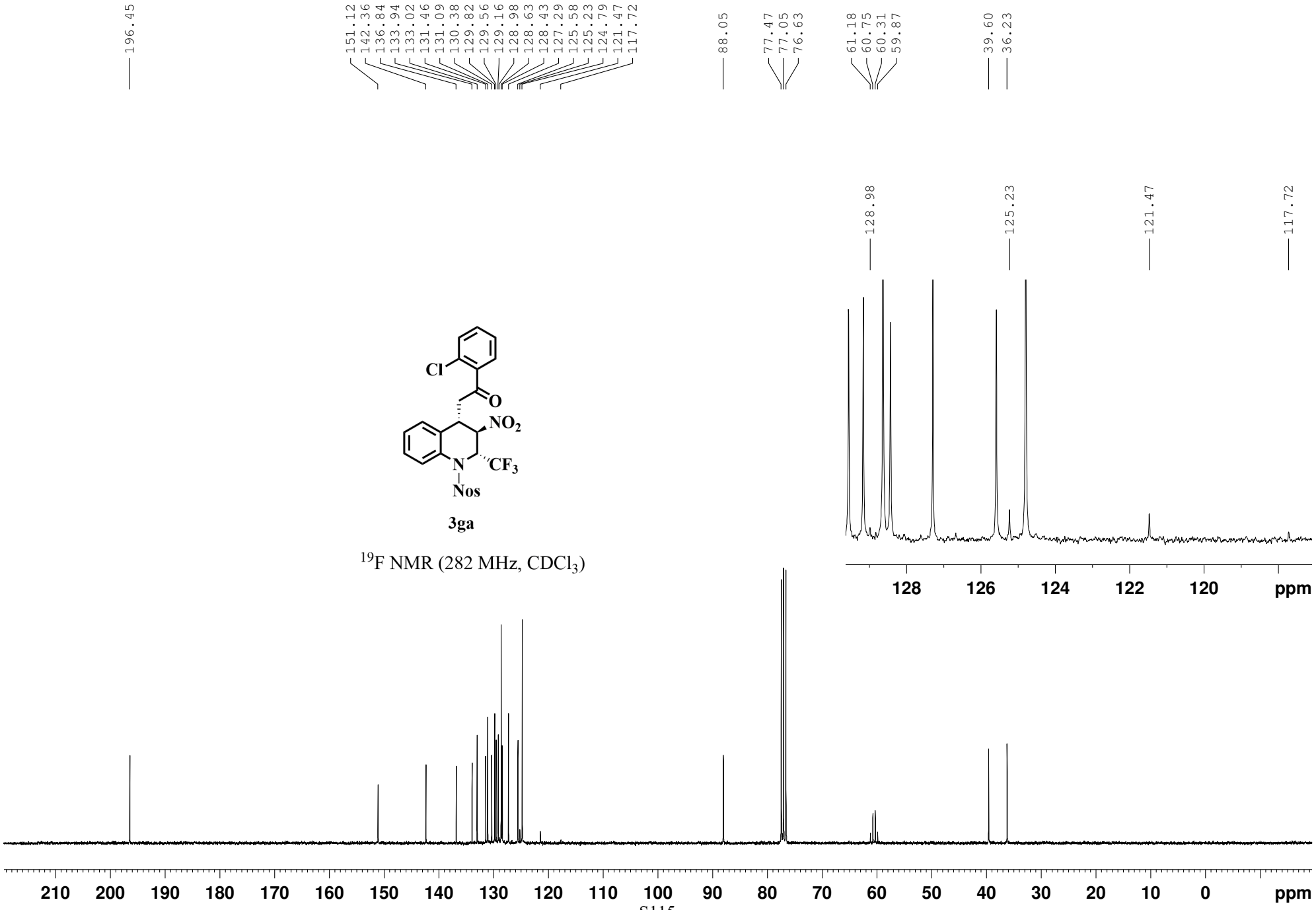


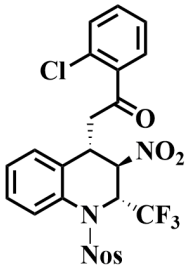


3ga

^{1}H NMR (300 MHz, $CDCl_3$)

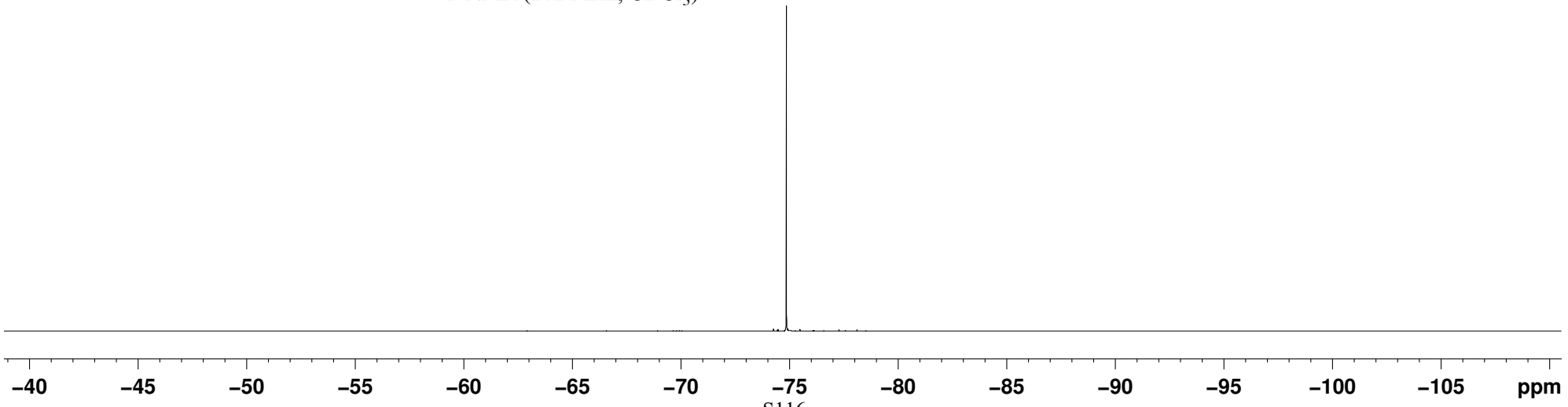


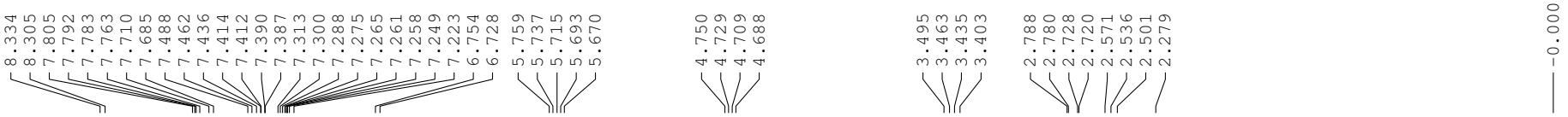

196.45
151.12
142.36
136.84
133.94
133.02
131.46
131.09
130.38
129.82
129.56
129.16
128.98
128.63
128.43
127.29
125.58
125.23
124.79
121.47
117.72
88.05
77.47
77.05
76.63
61.18
60.75
60.31
59.87
39.60
36.23
128.98
125.23
121.47
117.72
Cl
O
NO2
N
CF3
Nos
3ga
19F NMR (282 MHz, CDCl3)
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

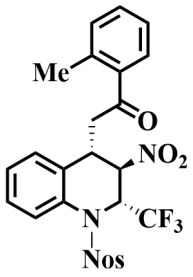


3ga

^{19}F NMR (282 MHz, $CDCl_3$)

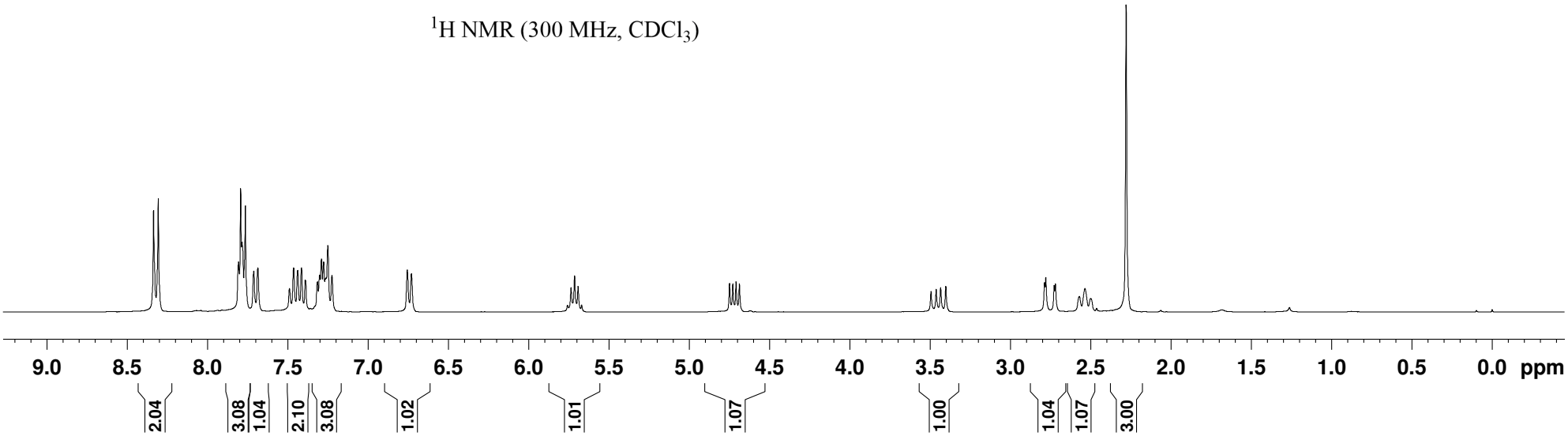


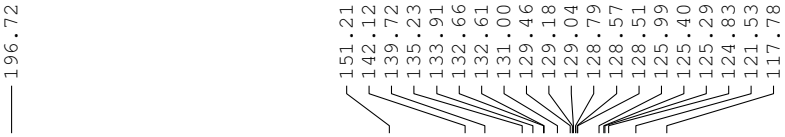


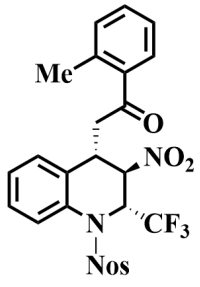


3ha

^{1}H NMR (300 MHz, $CDCl_3$)

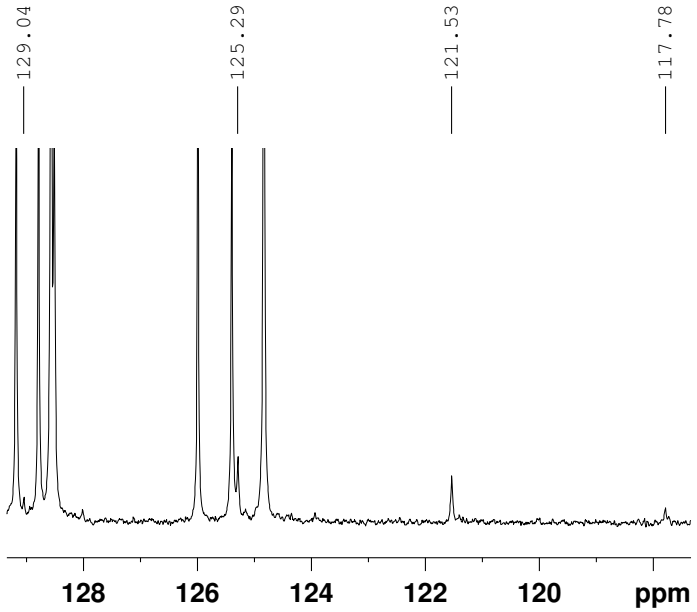


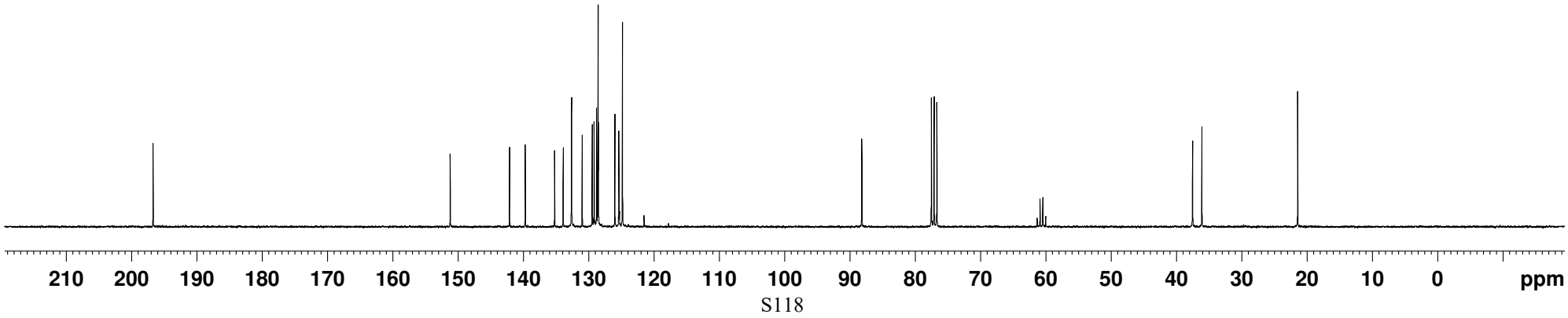


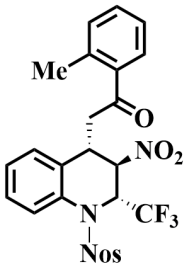


3ha

^{13}C NMR (75 MHz, $CDCl_3$)

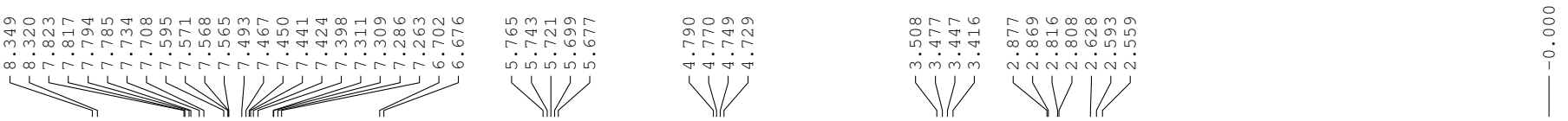


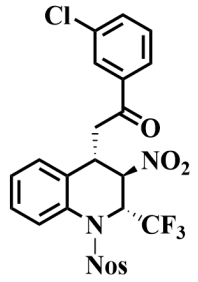




3ha

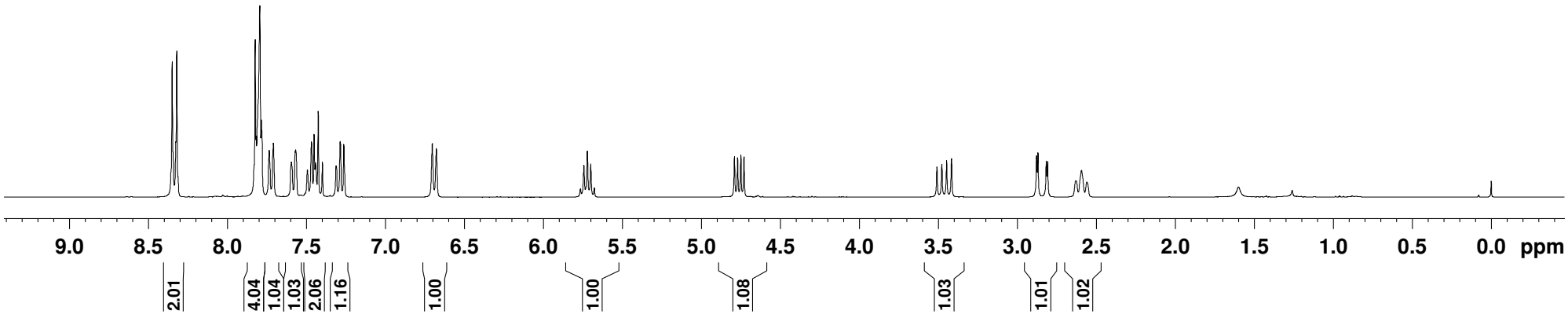
^{19}F NMR (282 MHz, $CDCl_3$)

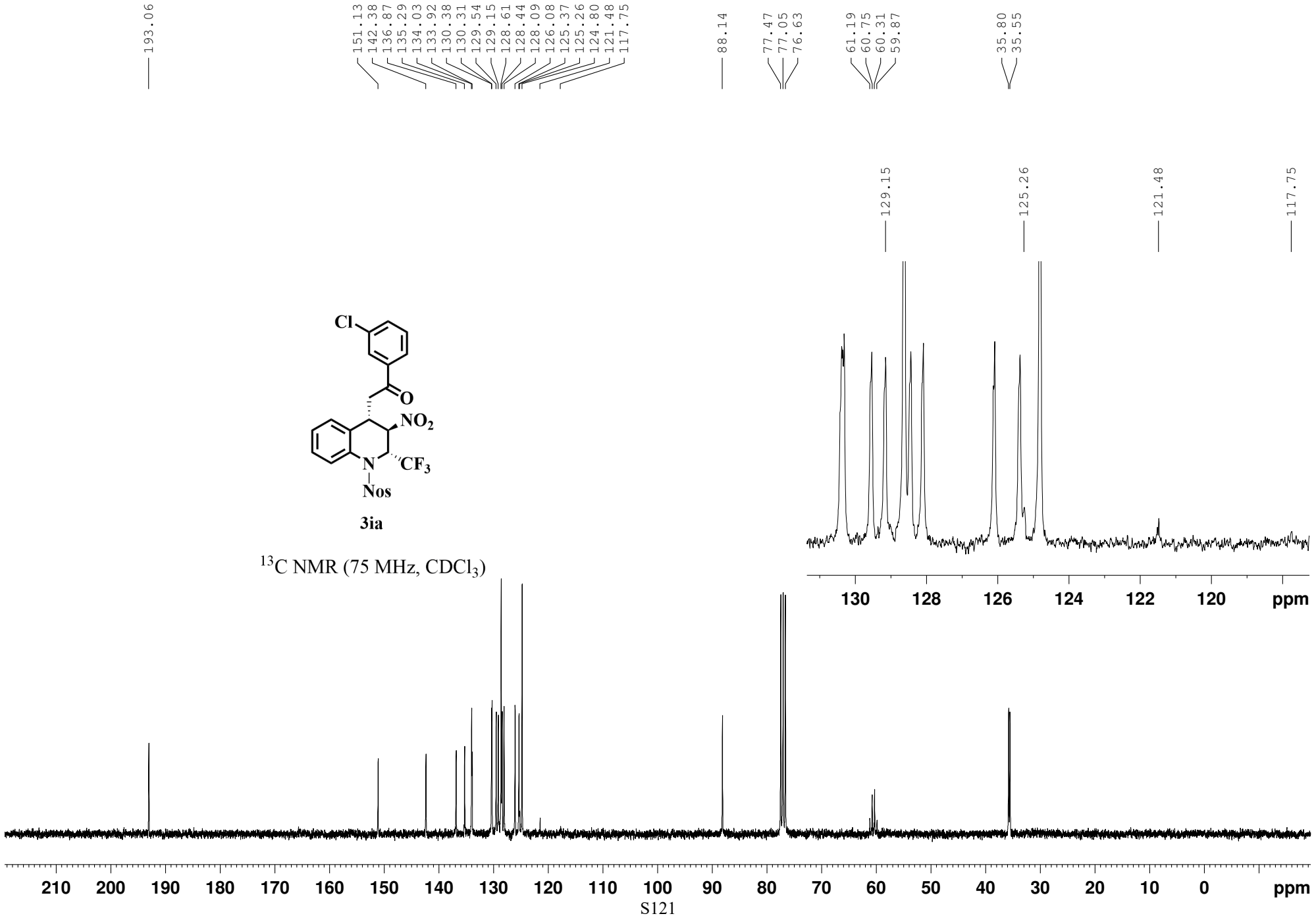


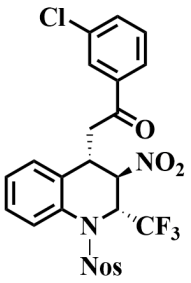


3ia

^{1}H NMR (300 MHz, $CDCl_3$)

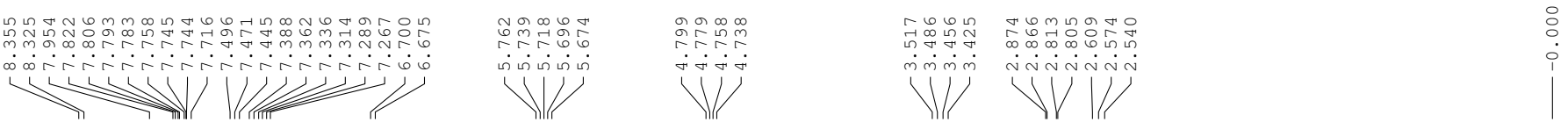


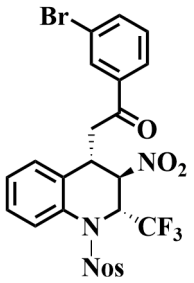

193.06
151.13
142.38
136.87
135.29
134.03
133.92
130.38
130.31
129.54
129.15
128.61
128.44
128.09
126.08
125.37
125.26
124.80
121.48
117.75
88.14
77.47
77.05
76.63
61.19
60.75
60.31
59.87
35.80
35.55
Cl
O
NO2
N
CF3
Nos
3ia
13C NMR (75 MHz, CDCl3)
129.15
125.26
121.48
117.75
130
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3ia

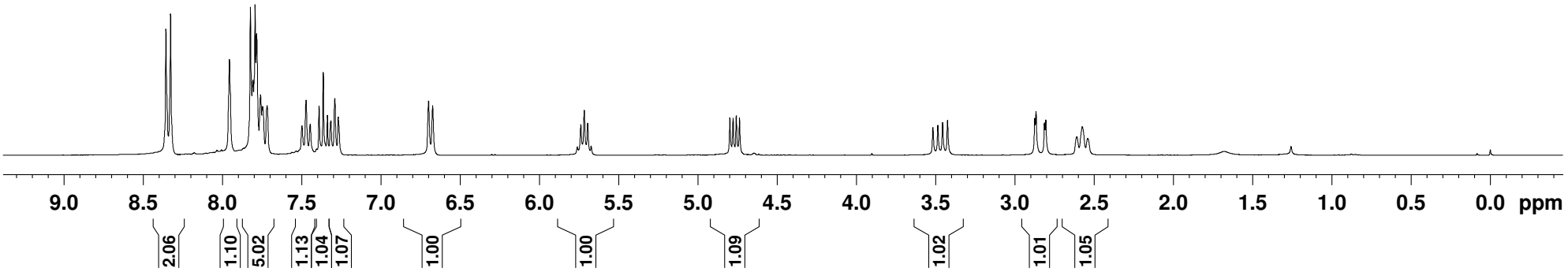
^{19}F NMR (282 MHz, $CDCl_3$)

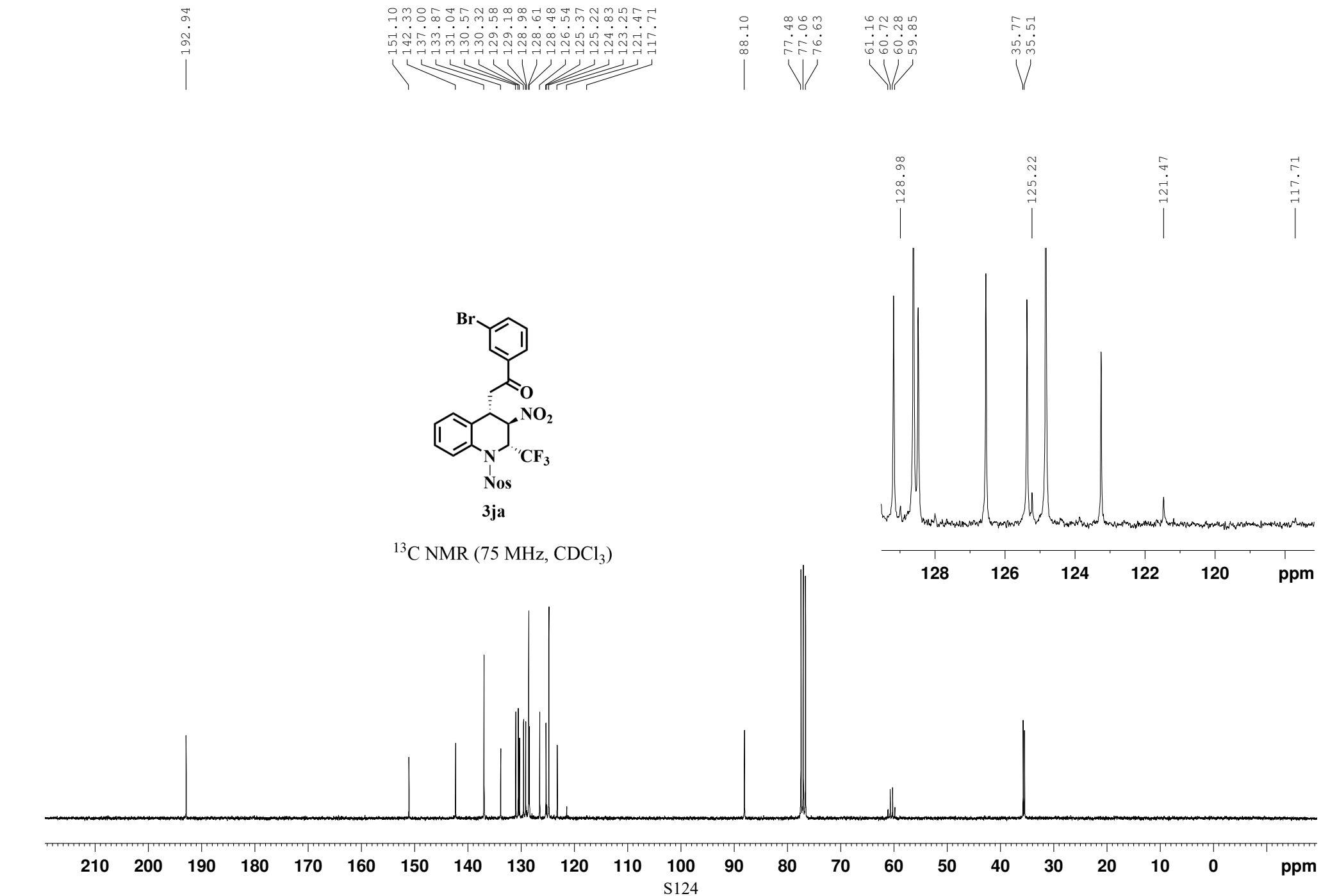


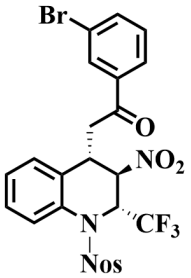


3ja

^{1}H NMR (300 MHz, $CDCl_3$)

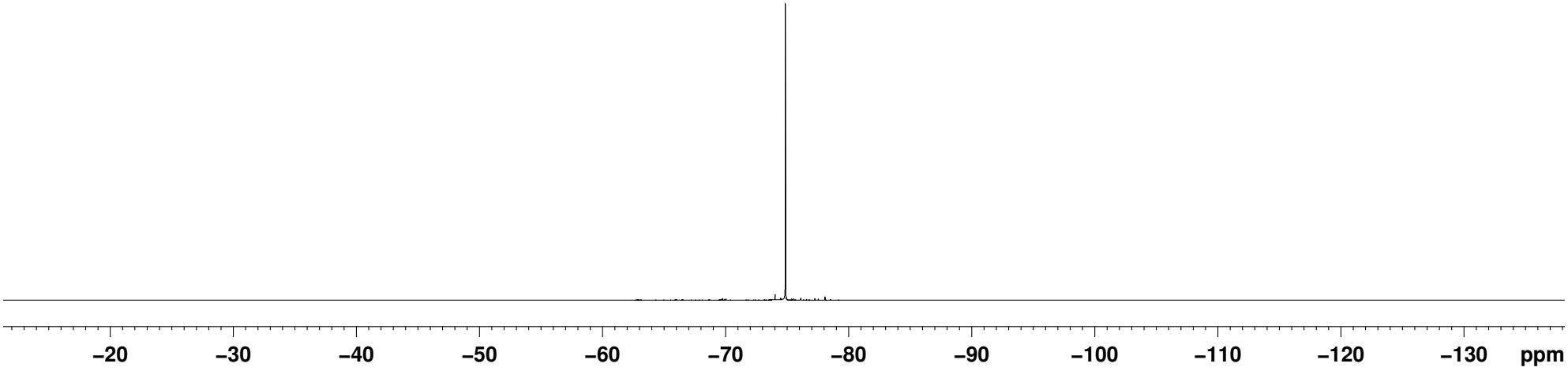


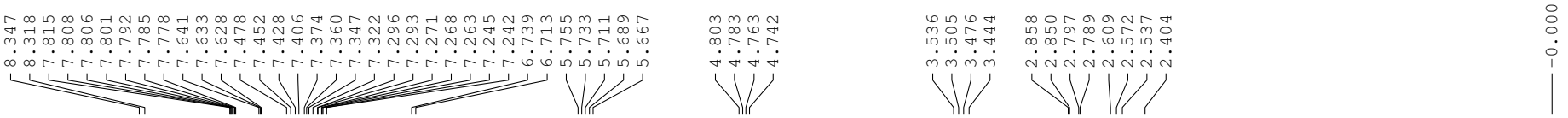

192.94
151.10
142.33
137.00
133.87
131.04
130.57
130.32
129.58
129.18
128.98
128.61
128.48
126.54
125.37
125.22
124.83
123.25
121.47
117.71
88.10
77.48
77.06
76.63
61.16
60.72
60.28
59.85
35.77
35.51
Br
O
NO2
N
CF3
Nos
3ja
13C NMR (75 MHz, CDCl3)
128.98
125.22
121.47
117.71
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

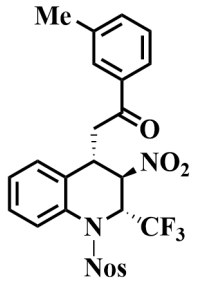


3ja

^{19}F NMR (282 MHz, $CDCl_3$)

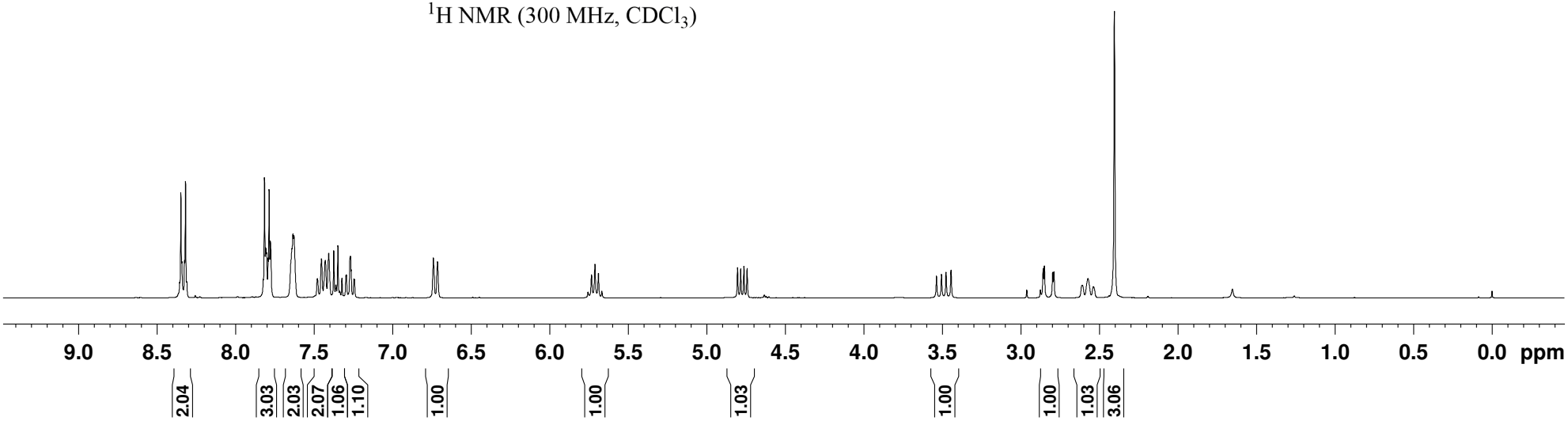


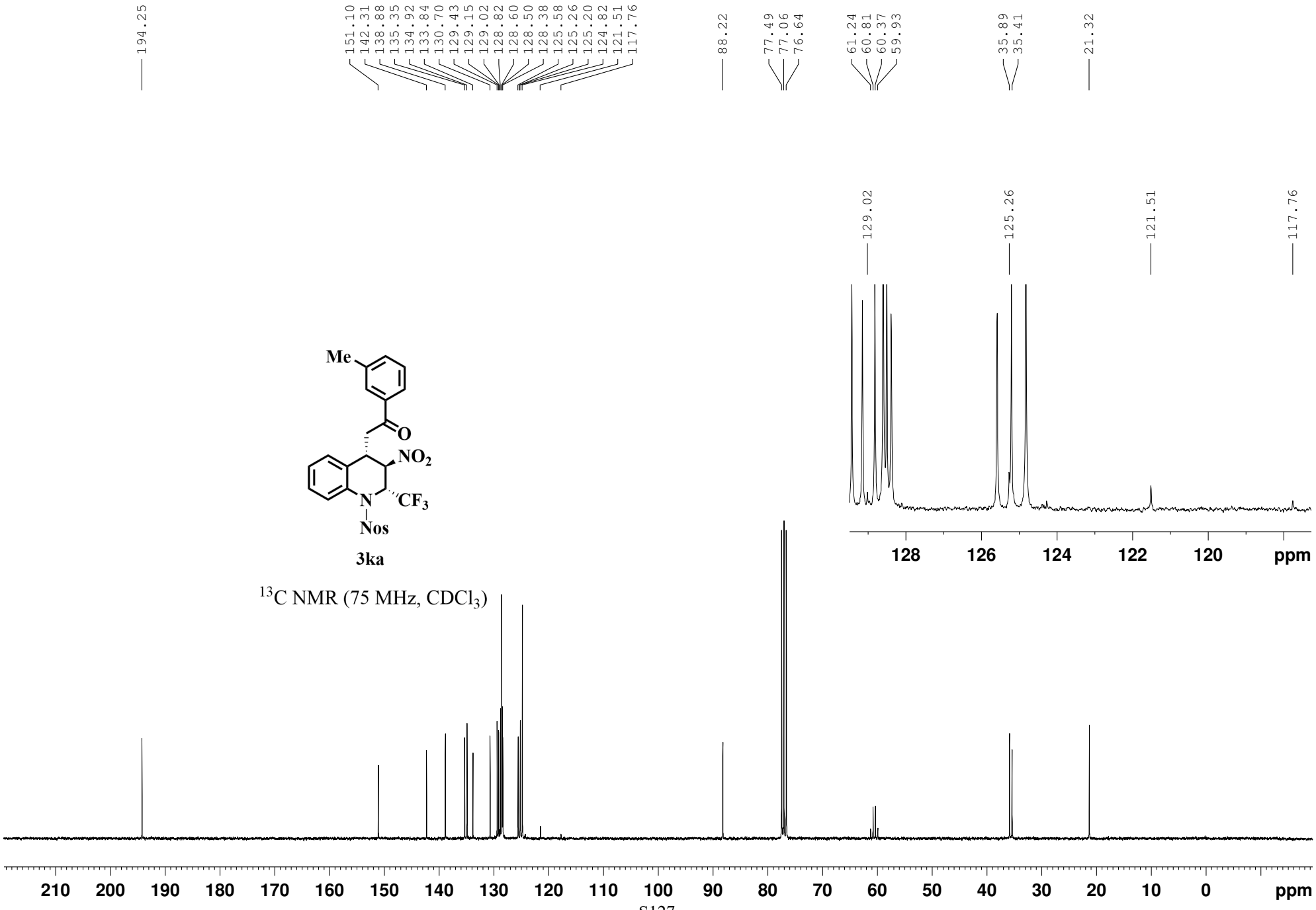


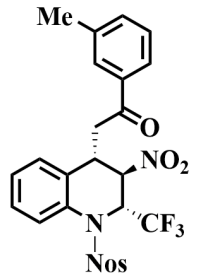


3ka

^{1}H NMR (300 MHz, $CDCl_3$)

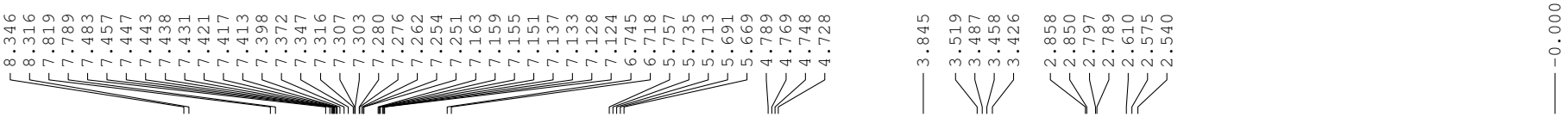


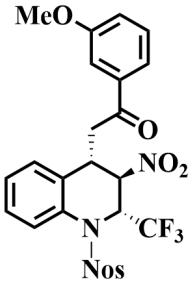

194.25
151.10
142.31
138.88
135.35
134.92
133.84
130.70
129.43
129.15
129.02
128.82
128.60
128.50
128.38
125.58
125.26
125.20
124.82
121.51
117.76
88.22
77.49
77.06
76.64
61.24
60.81
60.37
59.93
35.89
35.41
21.32
129.02
125.26
121.51
117.76
Me
O
NO2
N
CF3
Nos
3ka
13C NMR (75 MHz, CDCl3)
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3ka

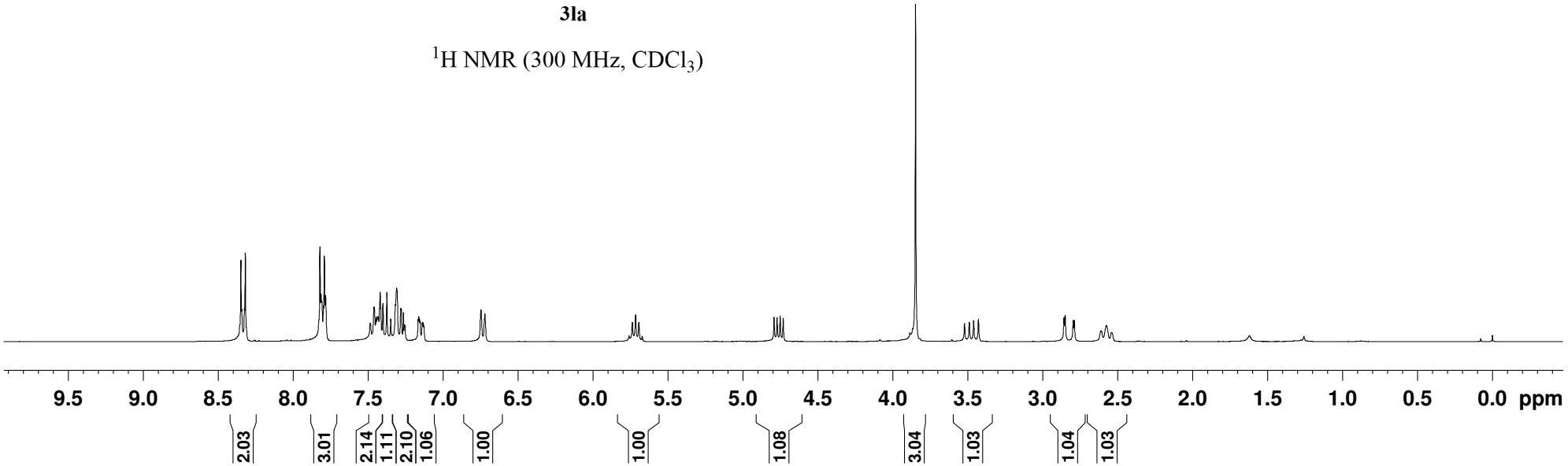
^{19}F NMR (282 MHz, $CDCl_3$)

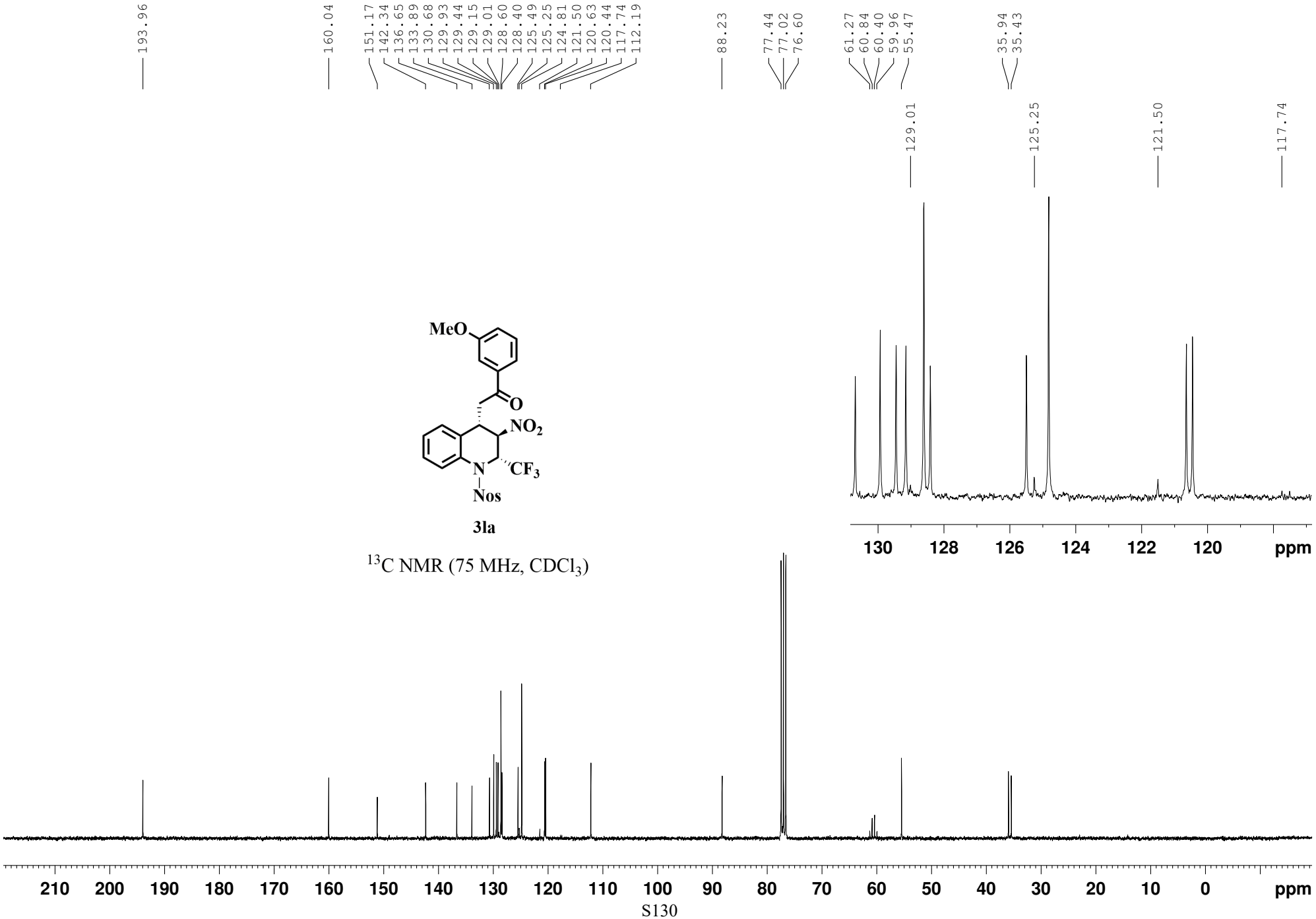


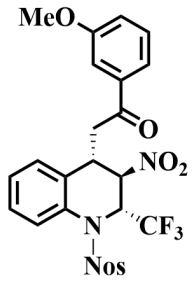


3la

^{1}H NMR (300 MHz, $CDCl_3$)

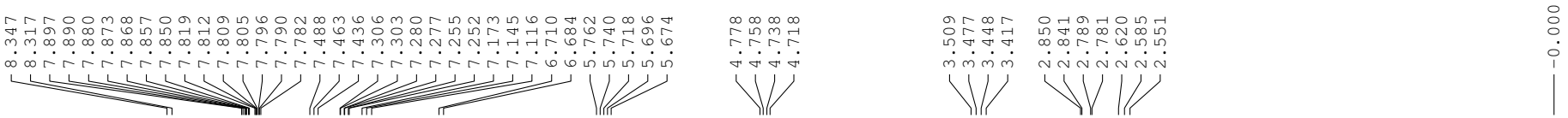


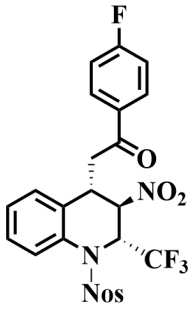

193.96
160.04
151.17
142.34
136.65
133.89
130.68
129.93
129.44
129.15
129.01
128.60
128.40
125.49
125.25
124.81
121.50
120.63
120.44
117.74
112.19
88.23
77.44
77.02
76.60
61.27
60.84
60.40
59.96
55.47
35.94
35.43
MeO
O
NO2
N
CF3
Nos
3la
13C NMR (75 MHz, CDCl3)
129.01
125.25
121.50
117.74
130
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3la

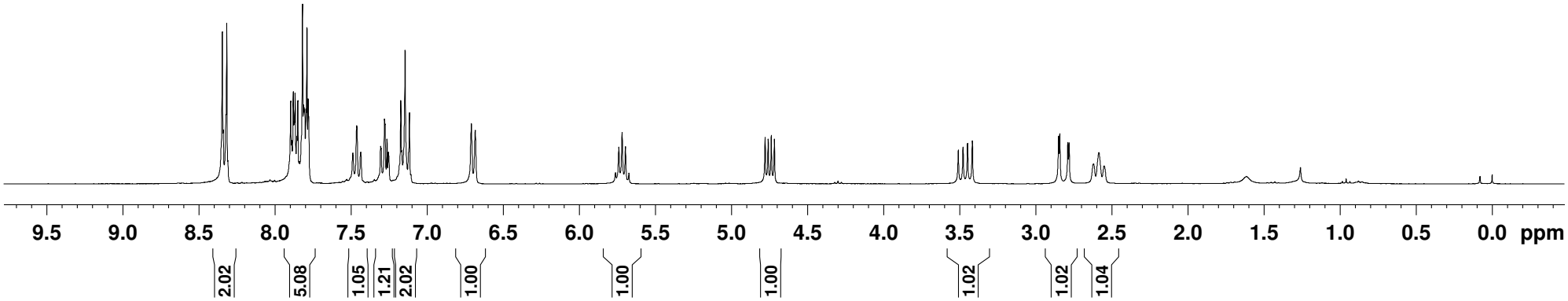
^{19}F NMR (282 MHz, $CDCl_3$)

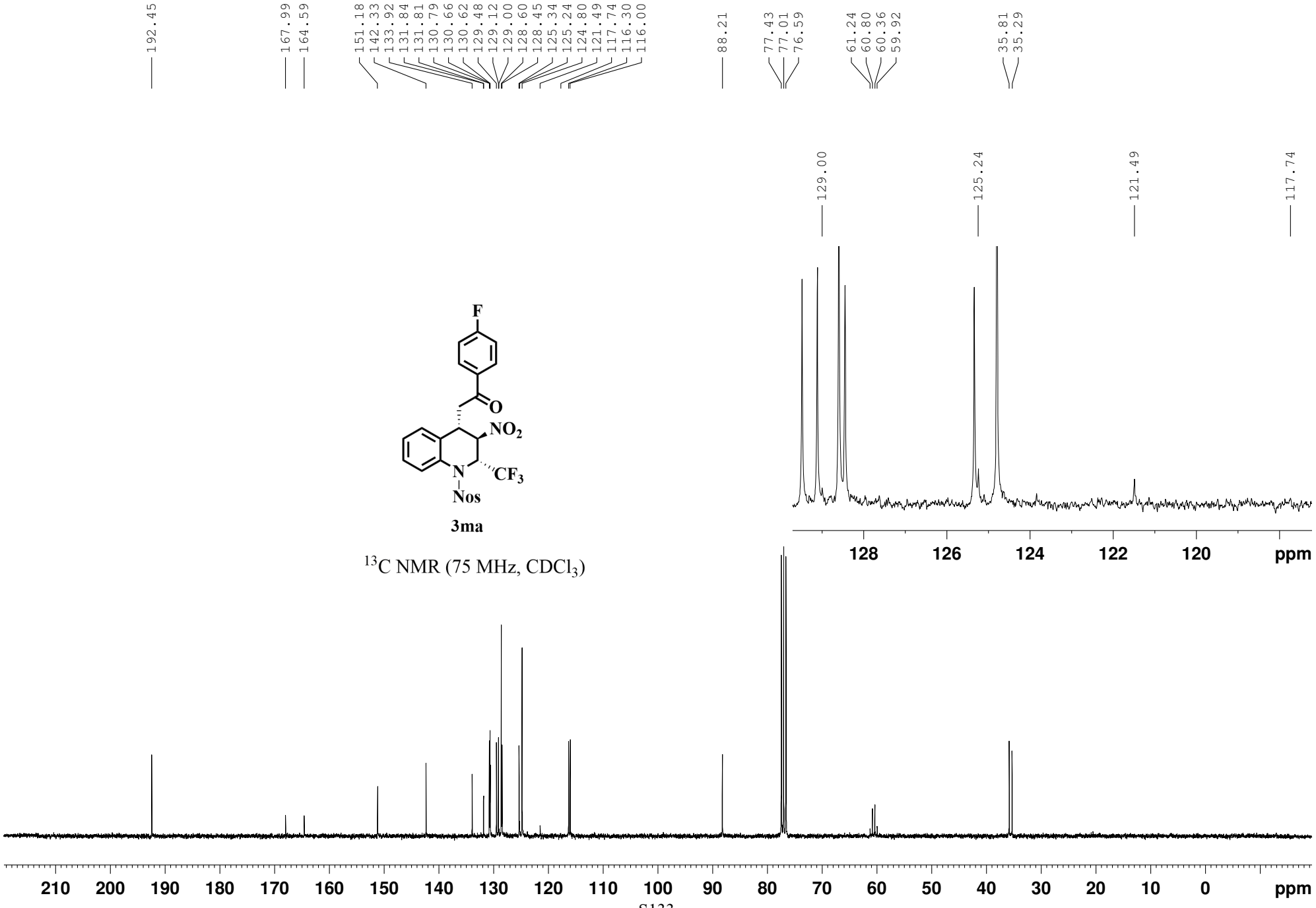




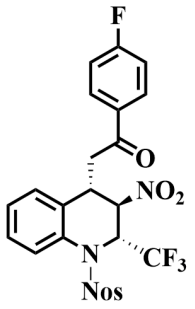
3ma

^{1}H NMR (300 MHz, $CDCl_3$)



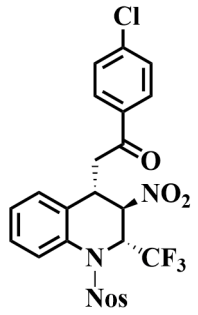


^{13}C NMR (75 MHz, $CDCl_3$)



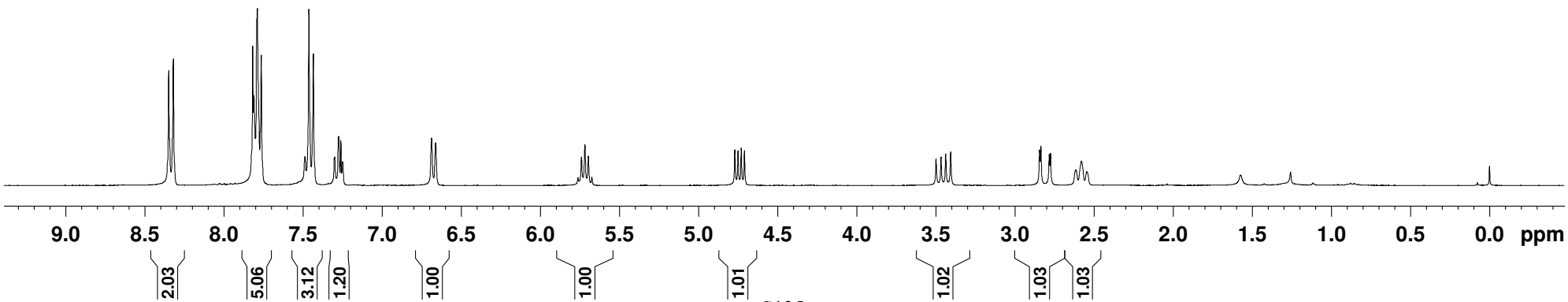
3ma

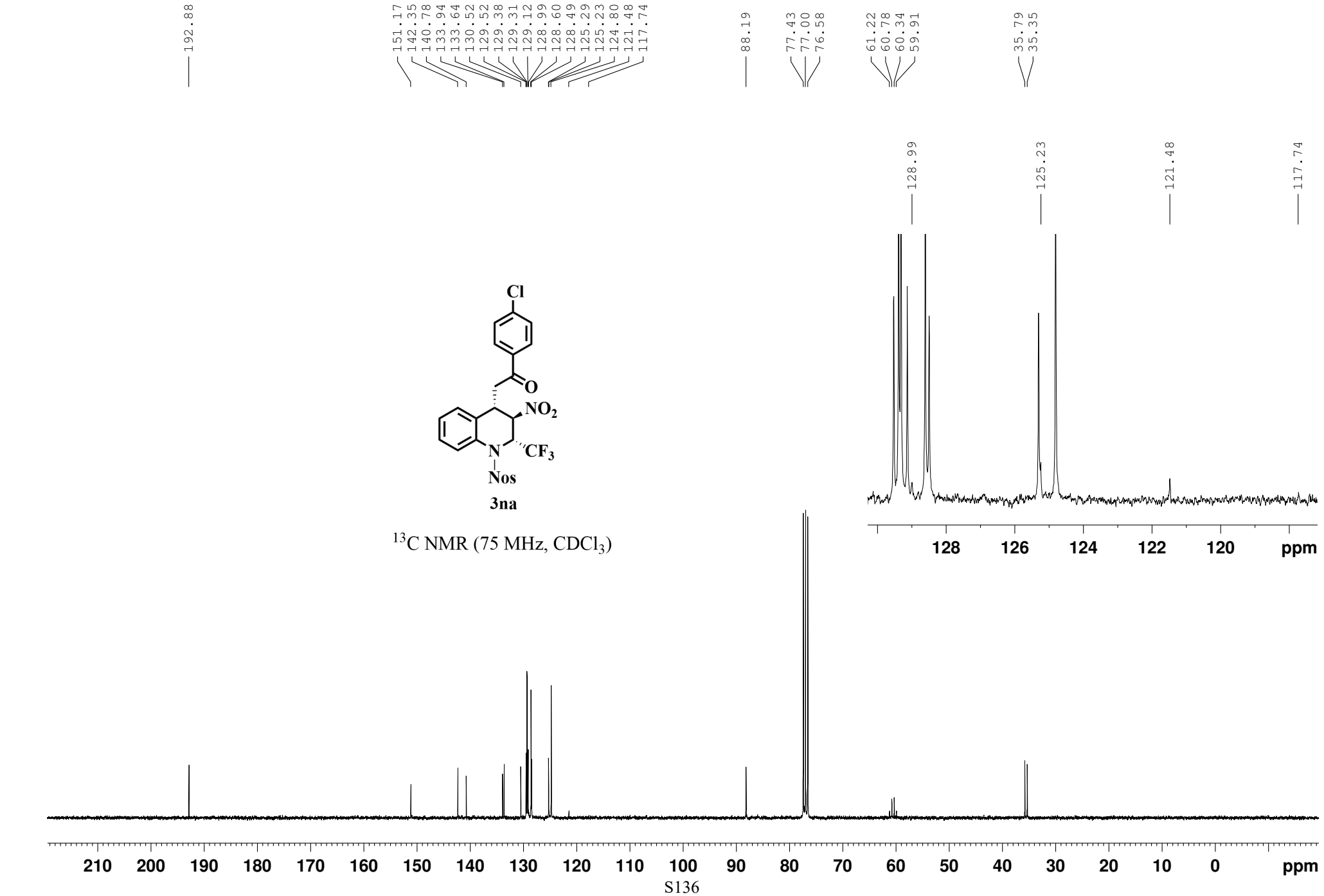
^{19}F NMR (282 MHz, $CDCl_3$)

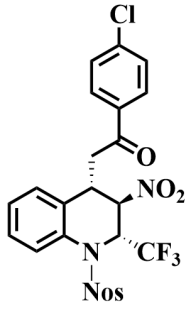


3na

^{1}H NMR (300 MHz, $CDCl_3$)

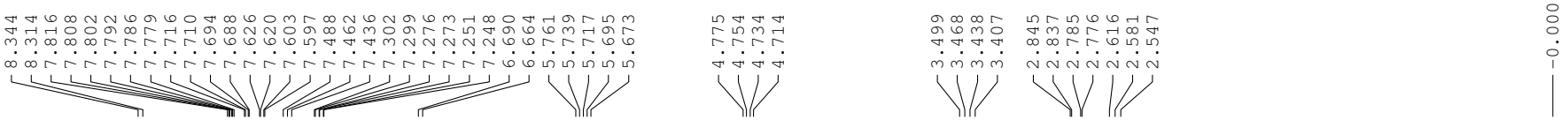


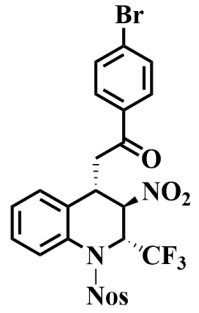

192.88
151.17
142.35
140.78
133.94
133.64
130.52
129.52
129.38
129.31
129.12
128.99
128.60
128.49
125.29
125.23
124.80
121.48
117.74
88.19
77.43
77.00
76.58
61.22
60.78
60.34
59.91
35.79
35.35
Cl
O
NO2
CF3
N
Nos
3na
13C NMR (75 MHz, CDCl3)
128.99
125.23
121.48
117.74
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3na

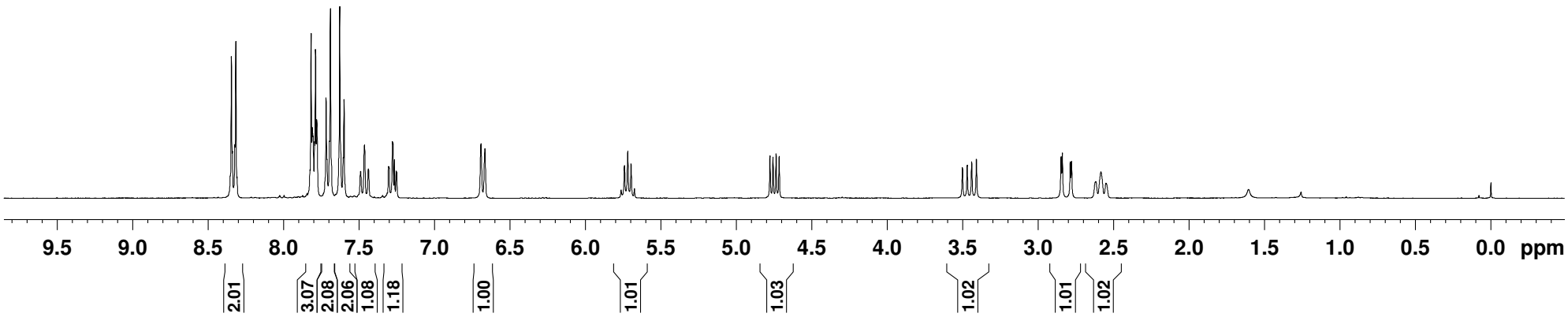
^{19}F NMR (282 MHz, $CDCl_3$)

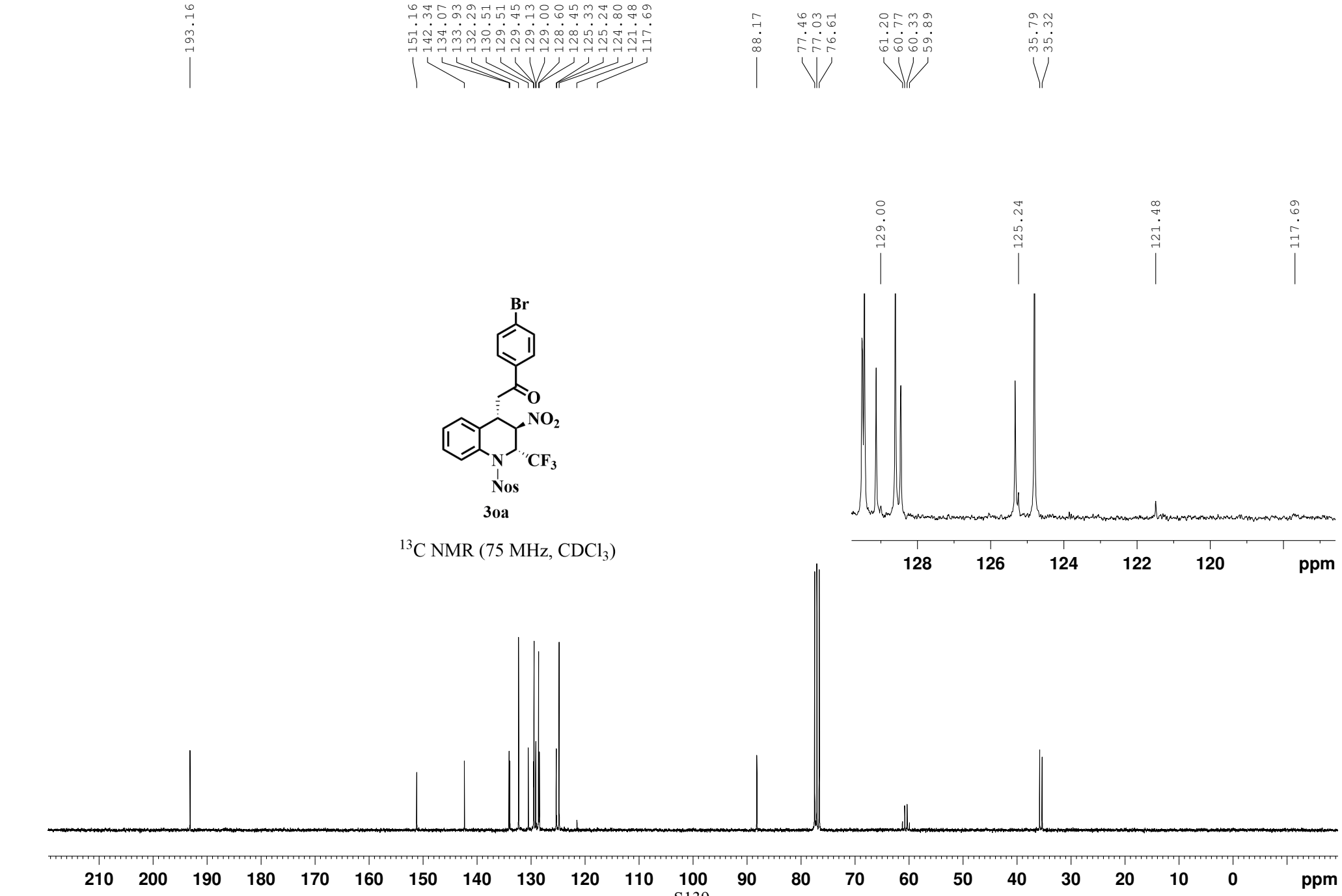


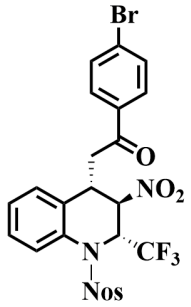


3oa

^{1}H NMR (300 MHz, $CDCl_3$)

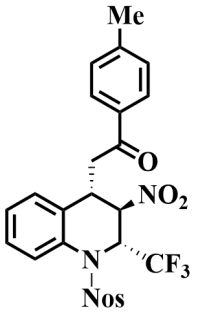



193.16
151.16
142.34
134.07
133.93
132.29
130.51
129.51
129.45
129.13
129.00
128.60
128.45
125.33
125.24
124.80
121.48
117.69
88.17
77.46
77.03
76.61
61.20
60.77
60.33
59.89
35.79
35.32
Br
O
NO2
N
CF3
Nos
3oa
13C NMR (75 MHz, CDCl3)
129.00
125.24
121.48
117.69
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



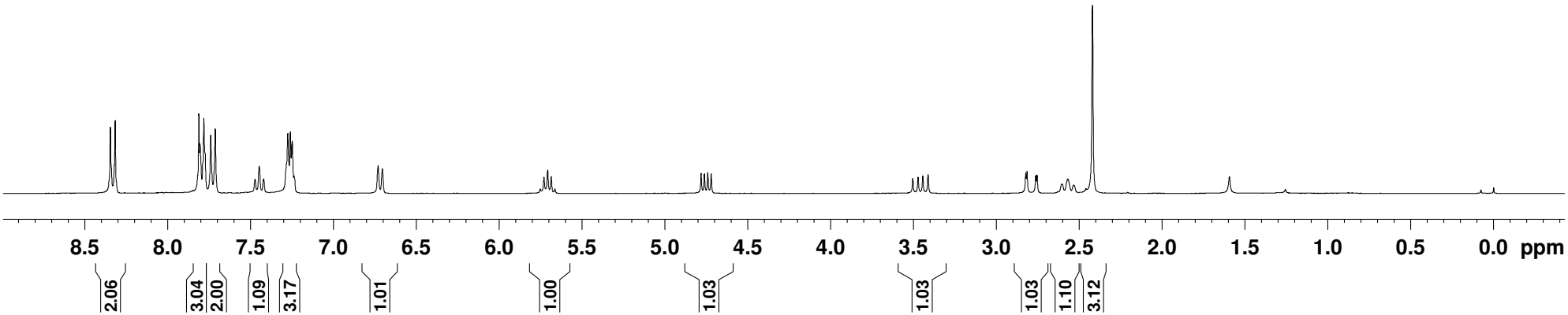
3oa

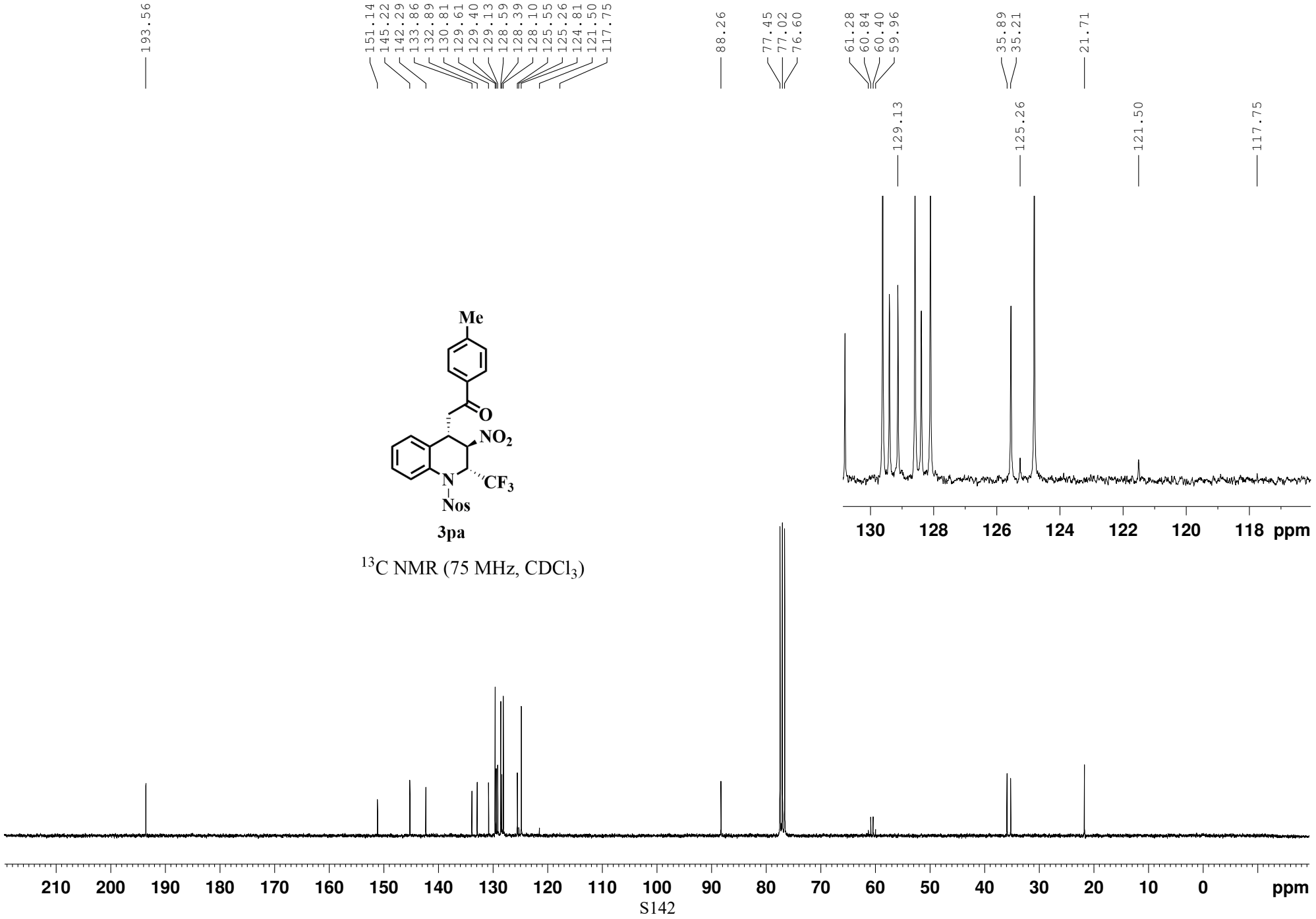
^{19}F NMR (282 MHz, $CDCl_3$)

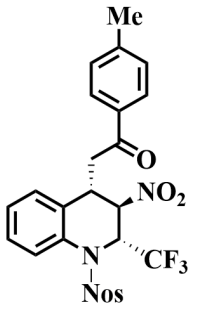


3pa

^{1}H NMR (300 MHz, $CDCl_3$)

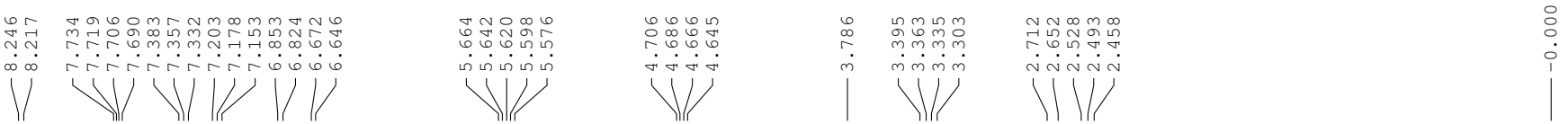


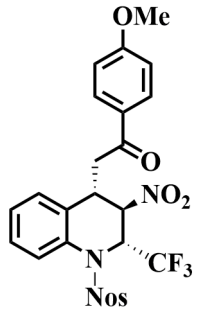

193.56
151.14
145.22
142.29
133.86
132.89
130.81
129.61
129.40
129.13
128.59
128.39
128.10
125.55
125.26
124.81
121.50
117.75
88.26
77.45
77.02
76.60
61.28
60.84
60.40
59.96
35.89
35.21
21.71
Me
O
NO2
N
CF3
Nos
3pa
13C NMR (75 MHz, CDCl3)
129.13
125.26
121.50
117.75
130
128
126
124
122
120
118
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3pa

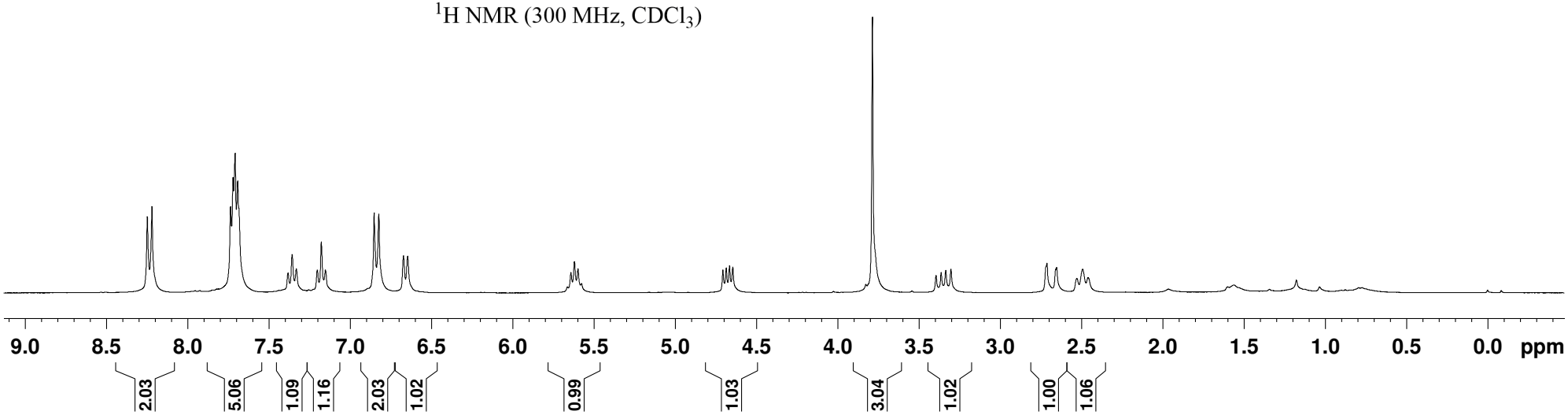
^{19}F NMR (282 MHz, $CDCl_3$)

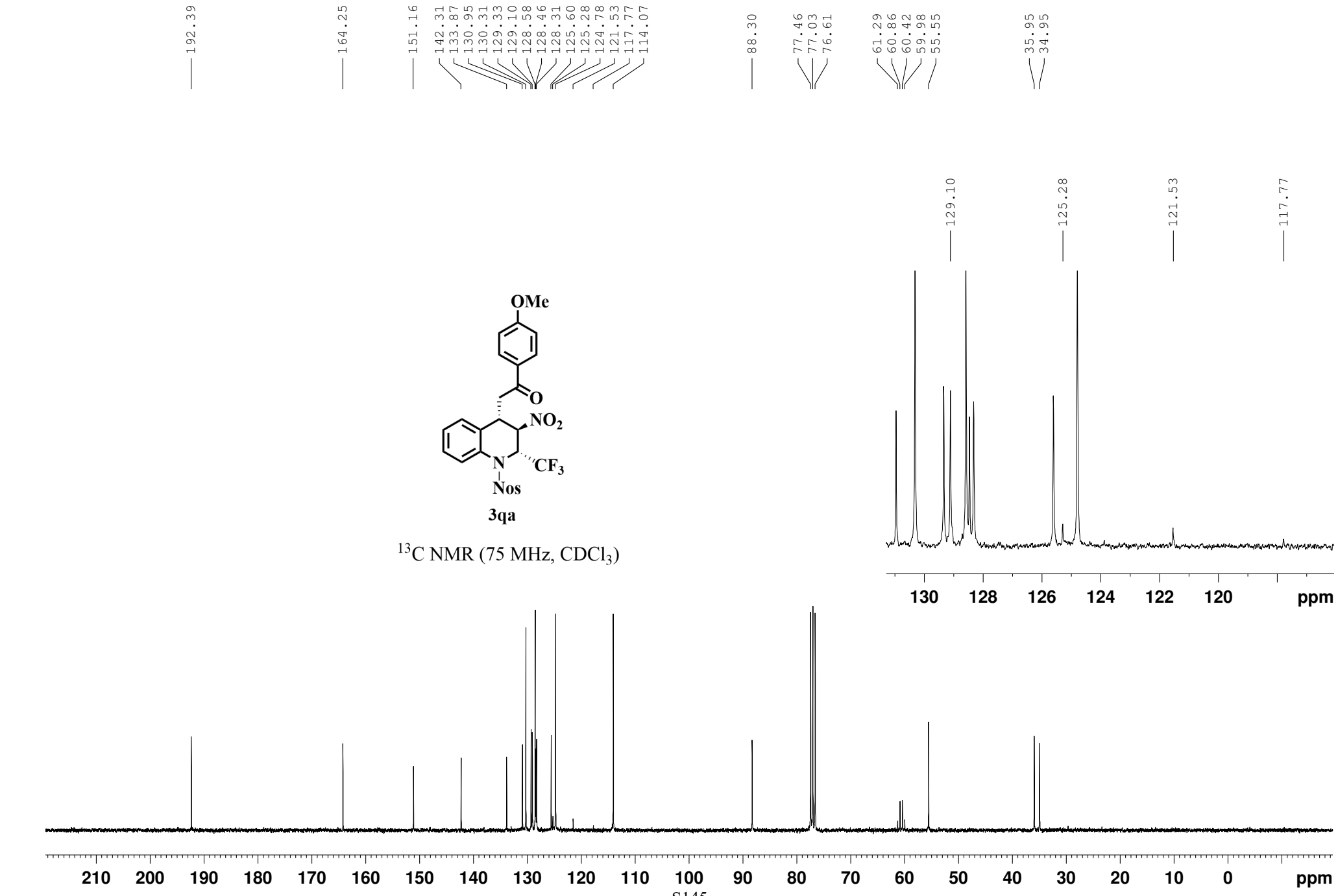


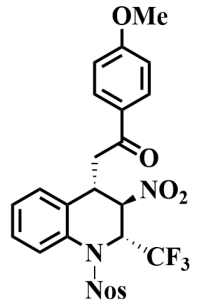


3qa

^{1}H NMR (300 MHz, $CDCl_3$)

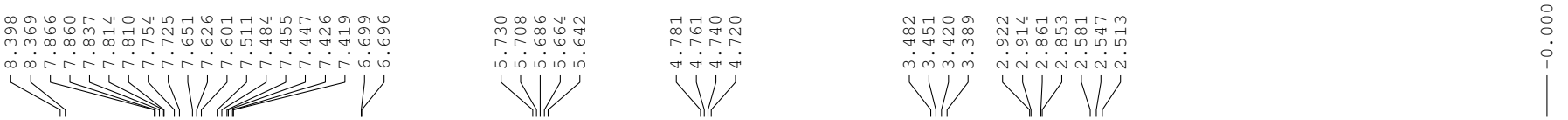


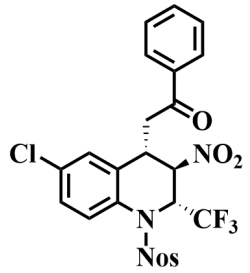

192.39
164.25
151.16
142.31
133.87
130.95
130.31
129.33
129.10
128.58
128.46
128.31
125.60
125.28
124.78
121.53
117.77
114.07
88.30
77.46
77.03
76.61
61.29
60.86
60.42
59.98
55.55
35.95
34.95
OMe
O
NO2
CF3
N
Nos
3qa
13C NMR (75 MHz, CDCl3)
129.10
125.28
121.53
117.77
130
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3qa

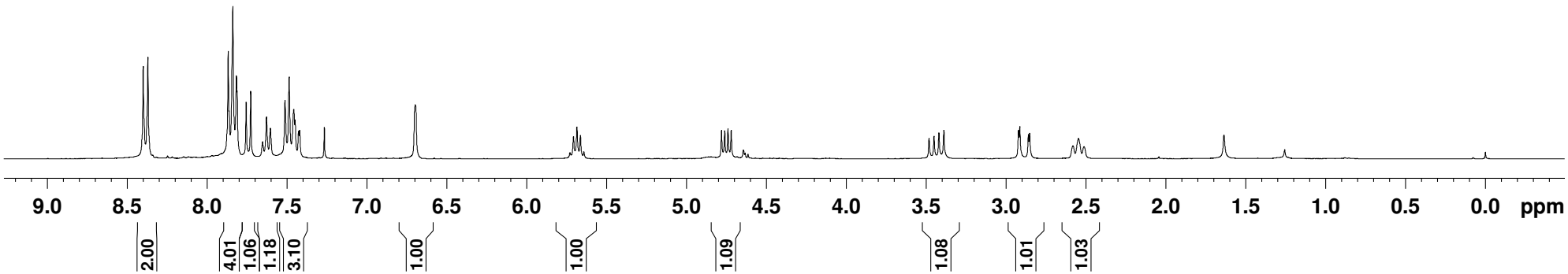
^{19}F NMR (282 MHz, $CDCl_3$)

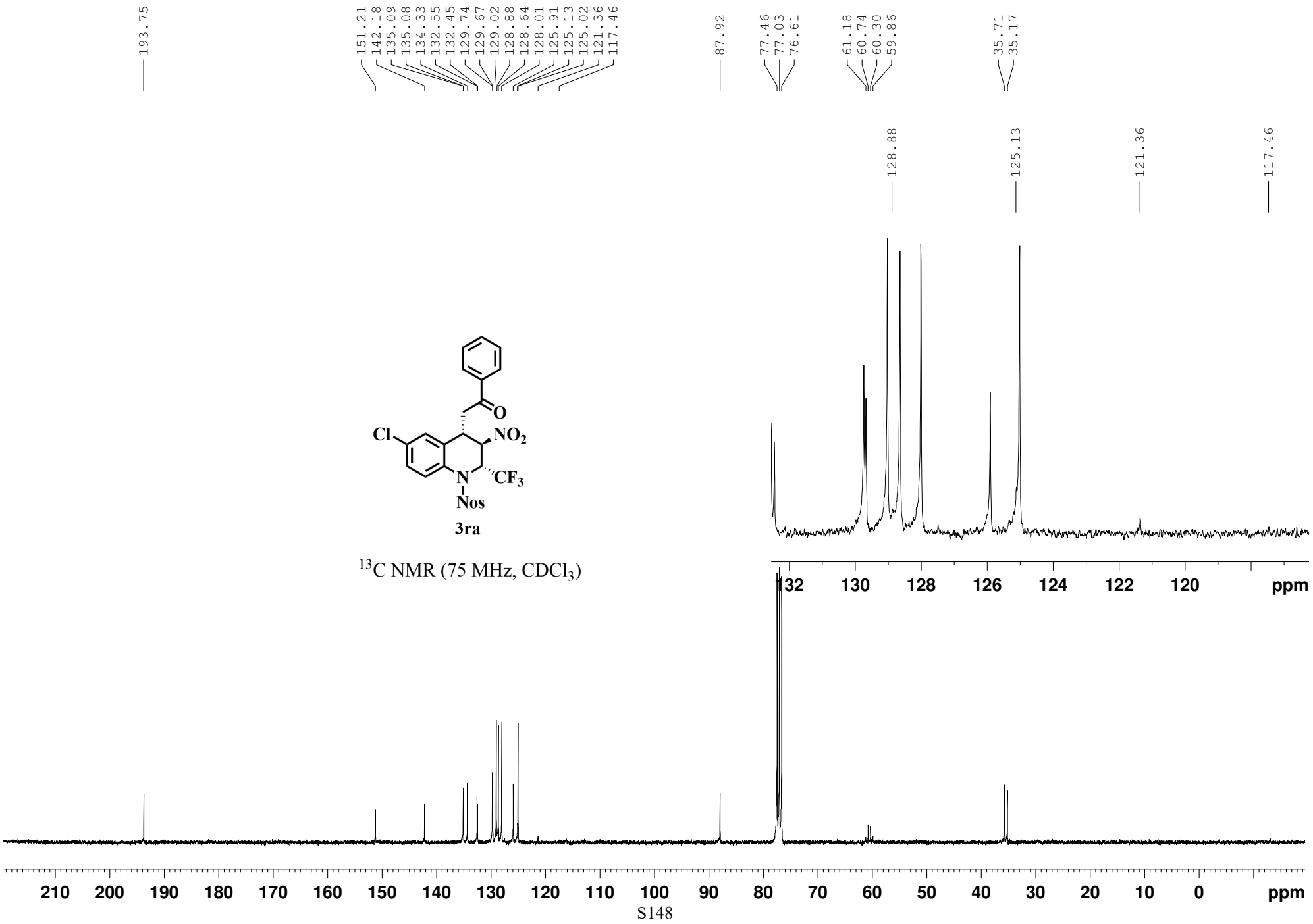




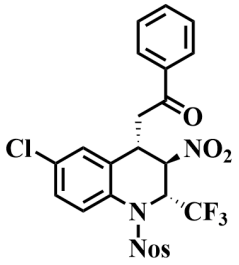
3ra

^{1}H NMR (300 MHz, $CDCl_3$)



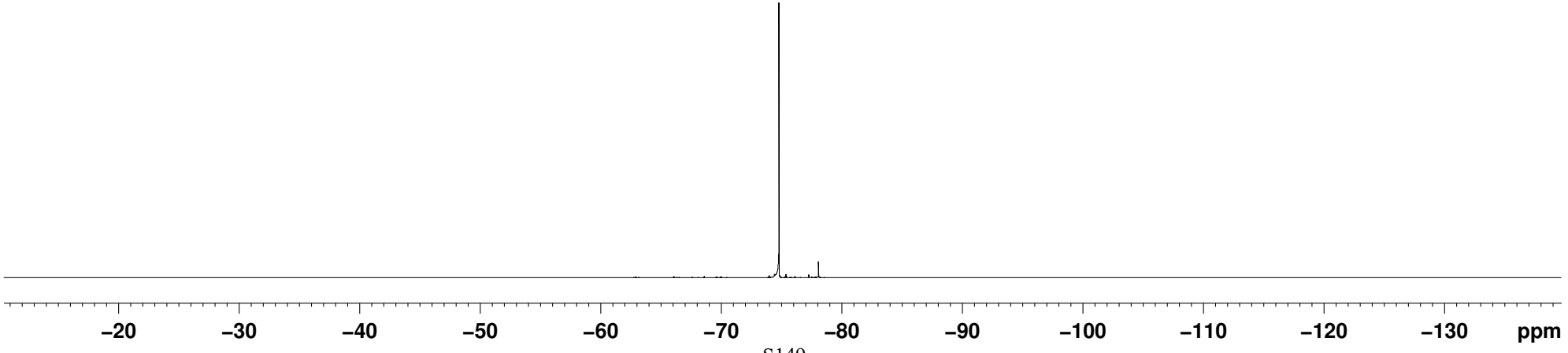


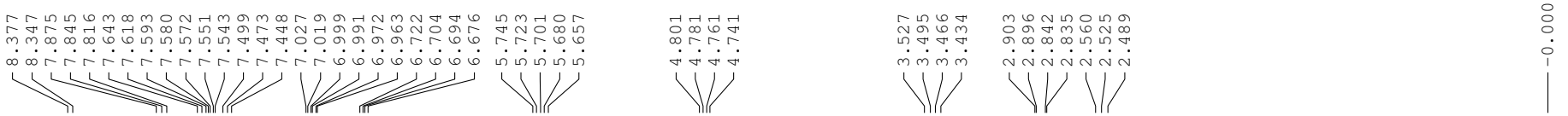
^{13}C NMR (75 MHz, $CDCl_3$)

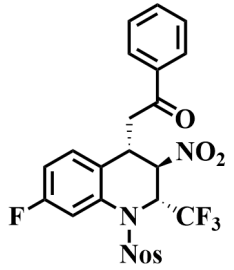


3ra

^{19}F NMR (282 MHz, $CDCl_3$)

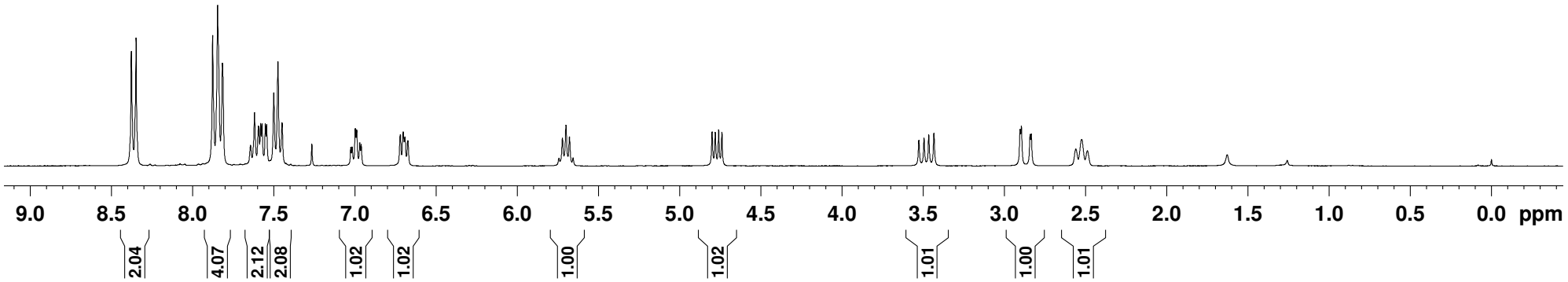


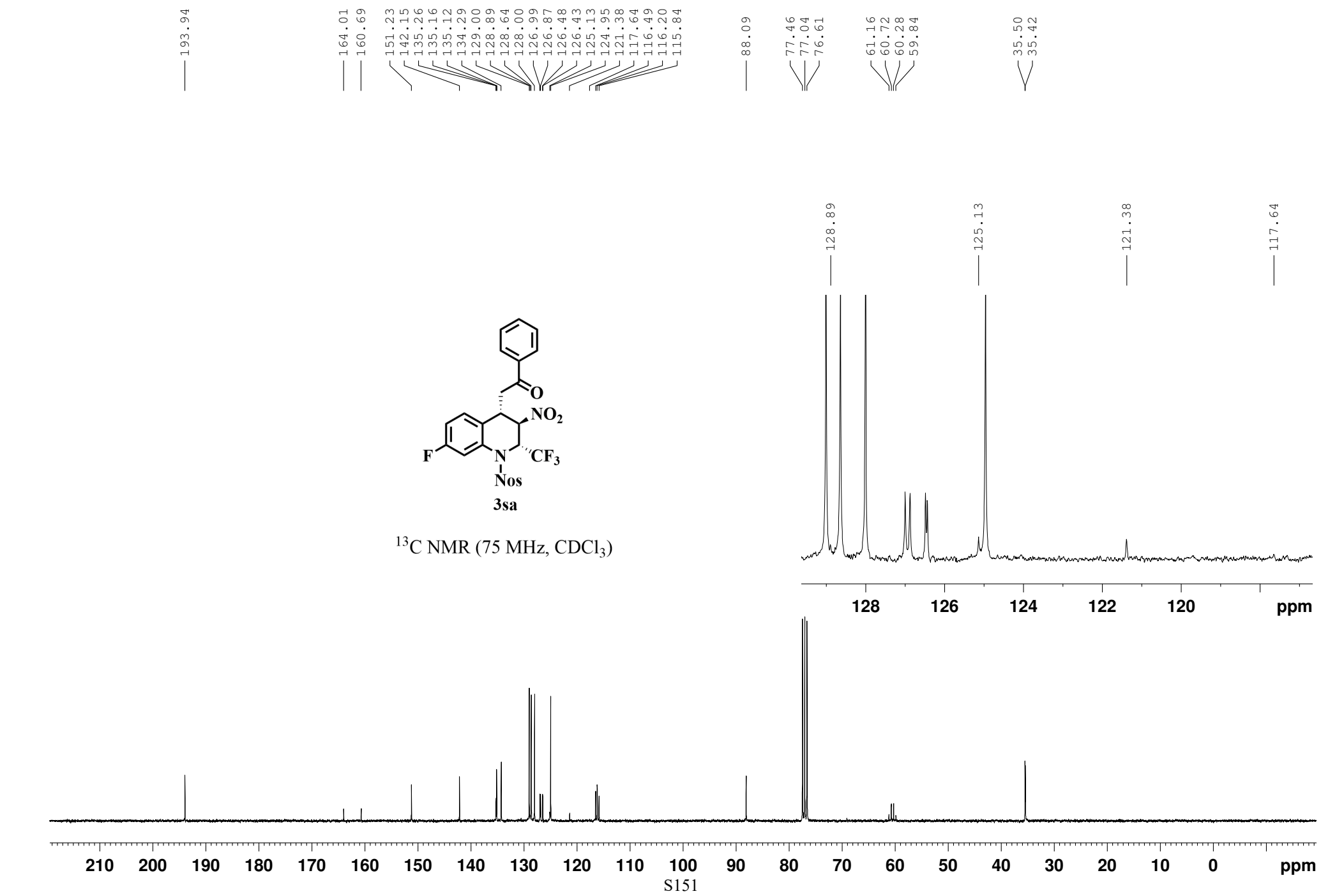


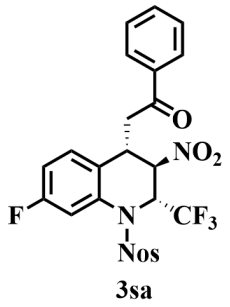


3sa

^{1}H NMR (300 MHz, $CDCl_3$)

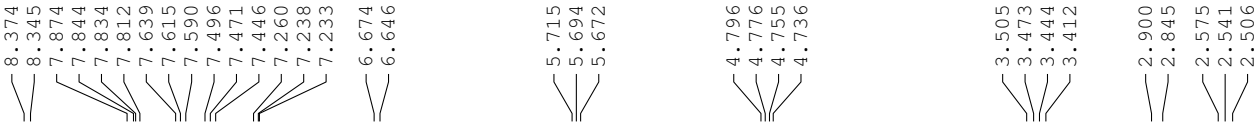


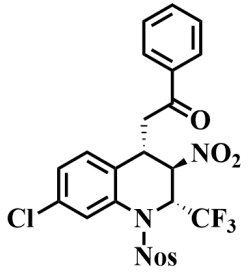

193.94
164.01
160.69
151.23
142.15
135.26
135.16
135.12
134.29
129.00
128.89
128.64
128.00
126.99
126.87
126.48
126.43
125.13
124.95
121.38
117.64
116.49
116.20
115.84
88.09
77.46
77.04
76.61
61.16
60.72
60.28
59.84
35.50
35.42
O
NO2
F
N
CF3
Nos
3sa
13C NMR (75 MHz, CDCl3)
128.89
125.13
121.38
117.64
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3sa

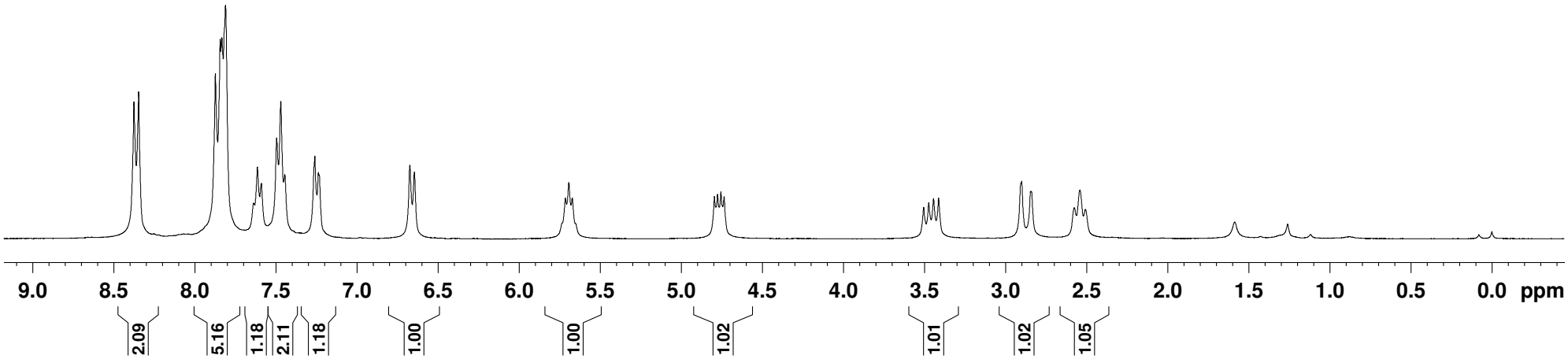
^{19}F NMR (282 MHz, $CDCl_3$)

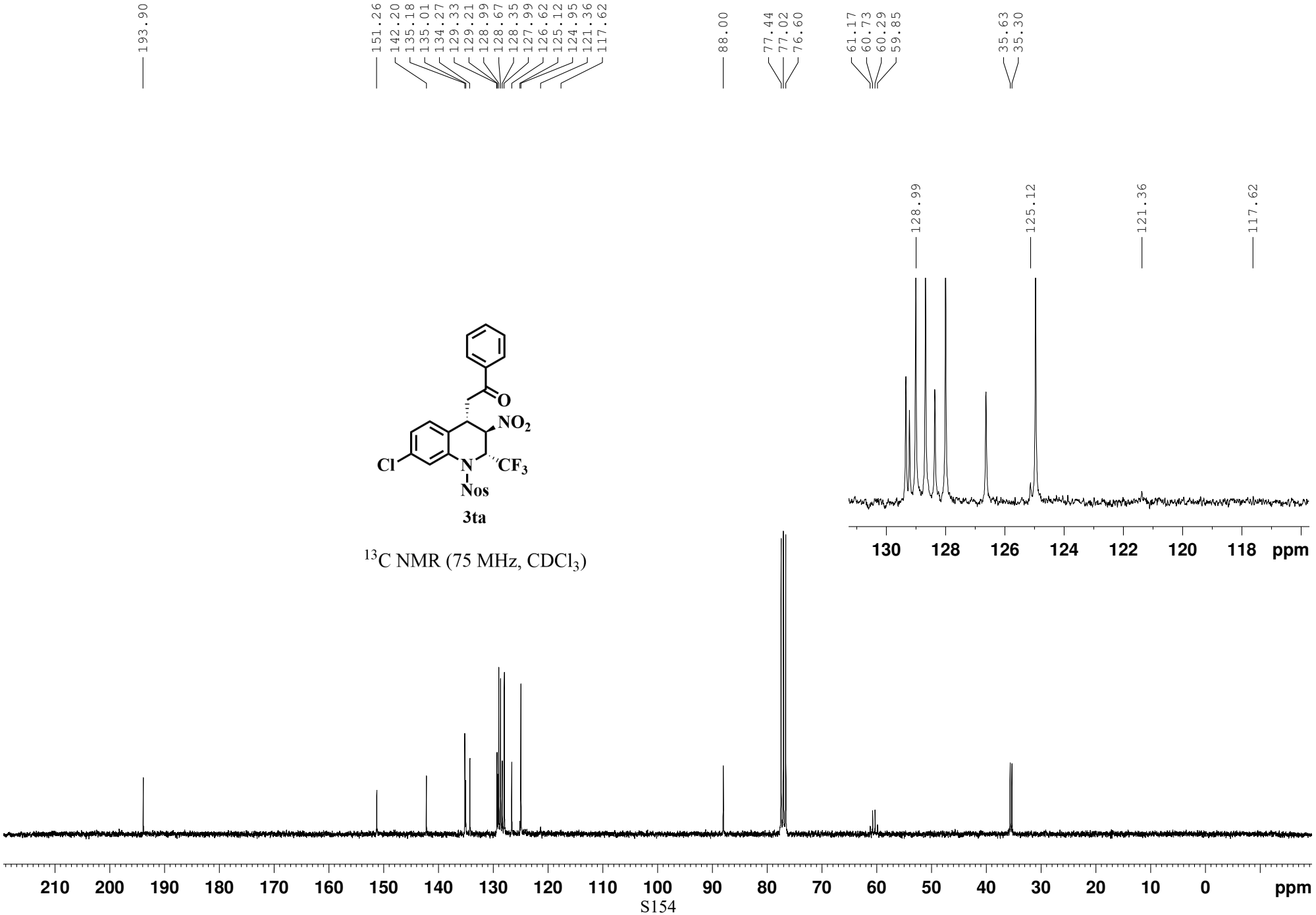


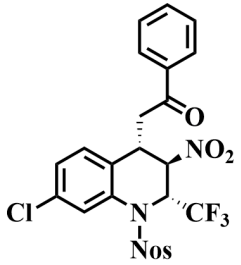


3ta

^{1}H NMR (300 MHz, $CDCl_3$)

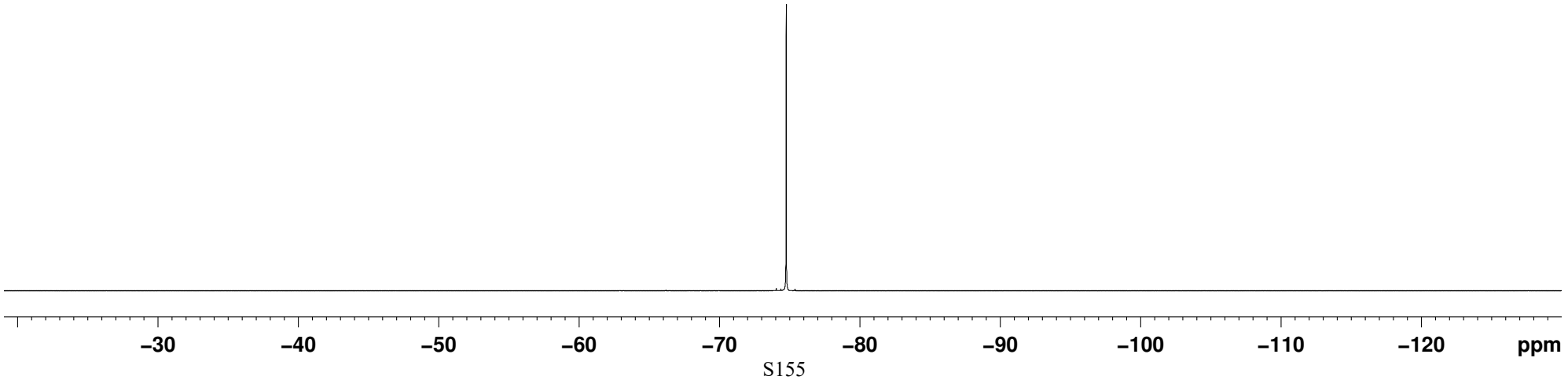


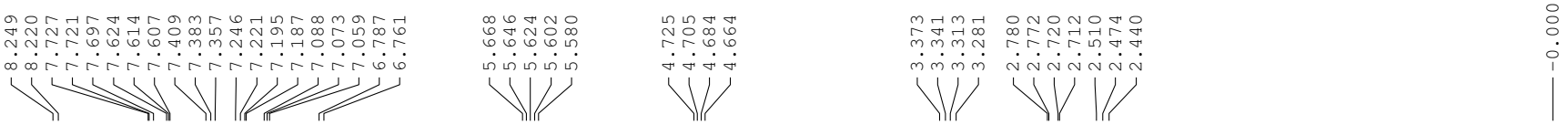

193.90
151.26
142.20
135.18
135.01
134.27
129.33
129.21
128.99
128.67
128.35
127.99
126.62
125.12
124.95
121.36
117.62
88.00
77.44
77.02
76.60
61.17
60.73
60.29
59.85
35.63
35.30
128.99
125.12
121.36
117.62
O
NO2
Cl
N
CF3
Nos
3ta
13C NMR (75 MHz, CDCl3)
130
128
126
124
122
120
118
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

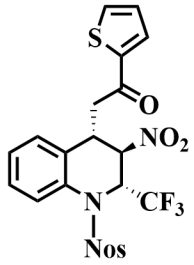


3ta

^{19}F NMR (282 MHz, $CDCl_3$)

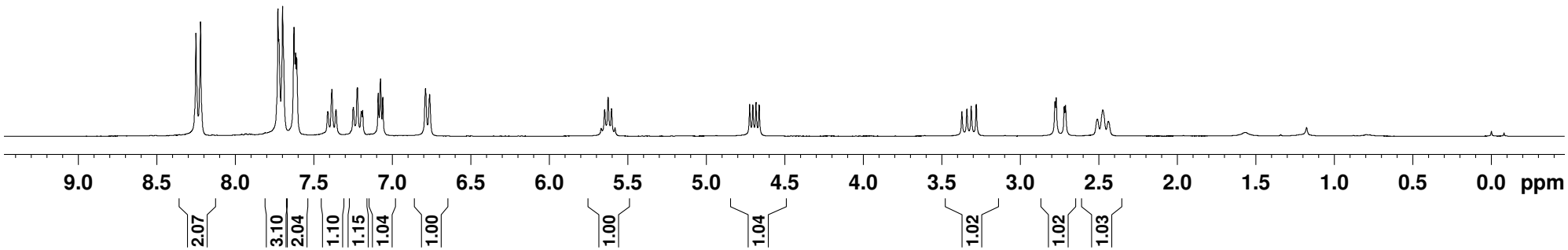


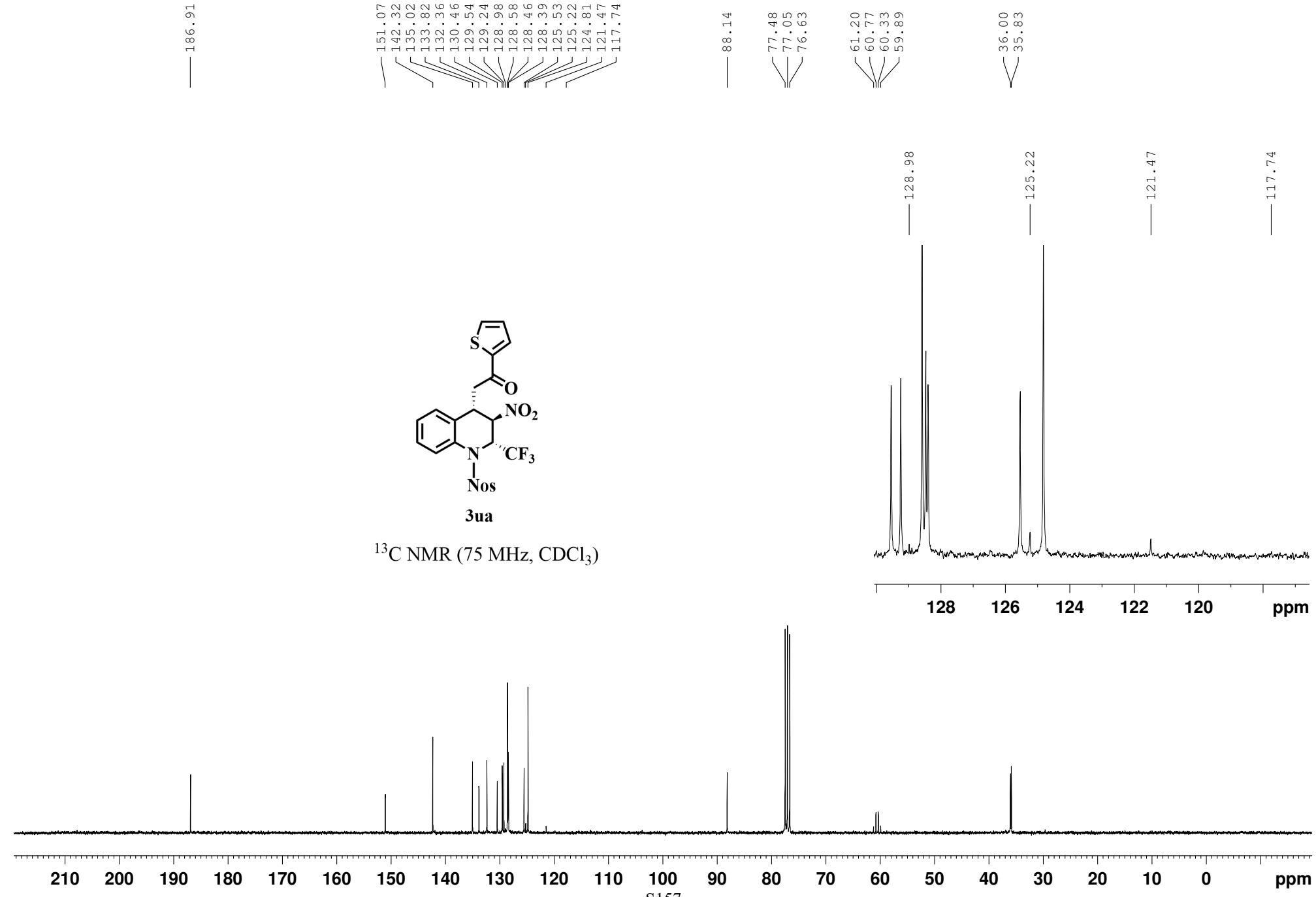


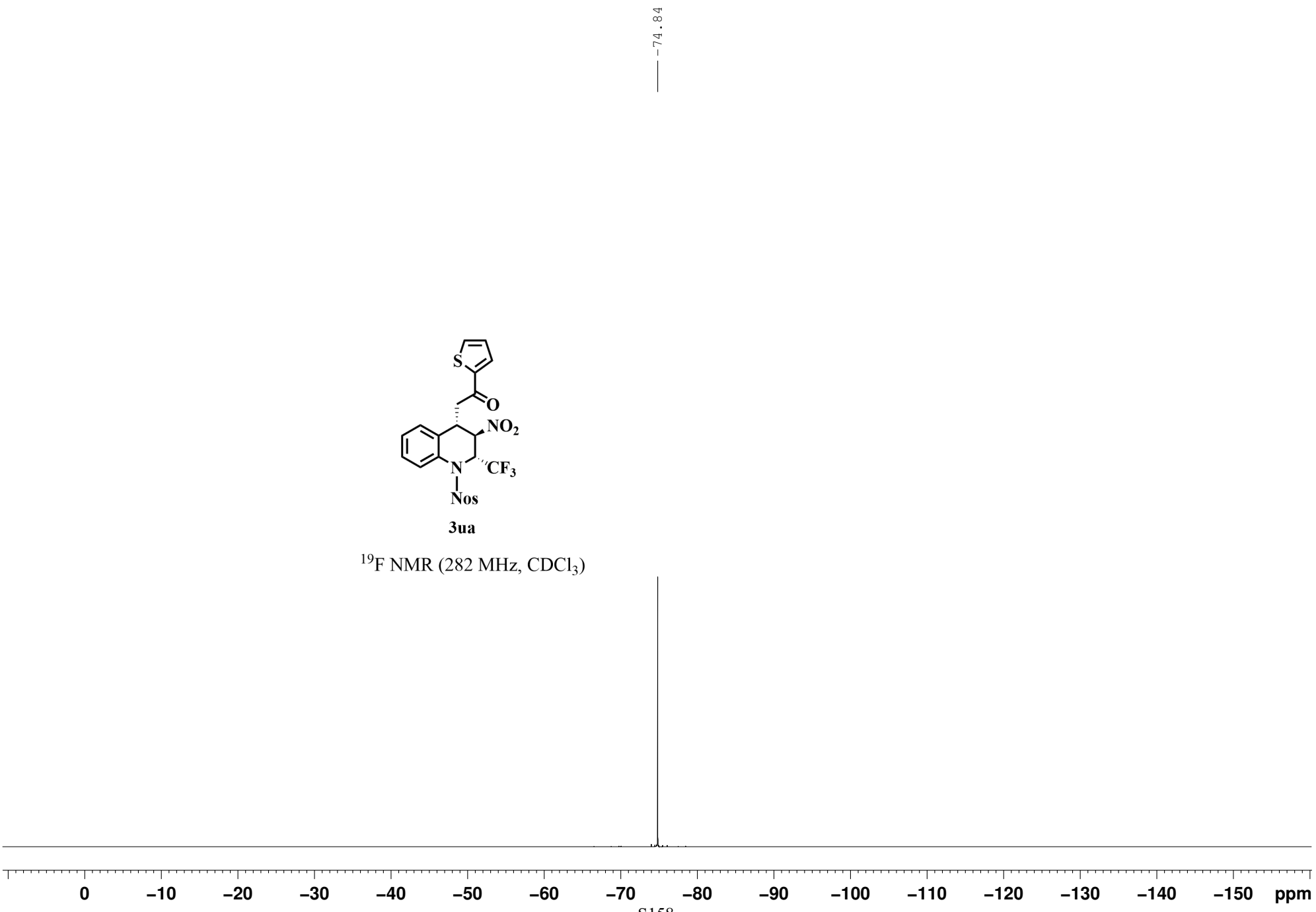


3ua

^{1}H NMR (300 MHz, $CDCl_3$)

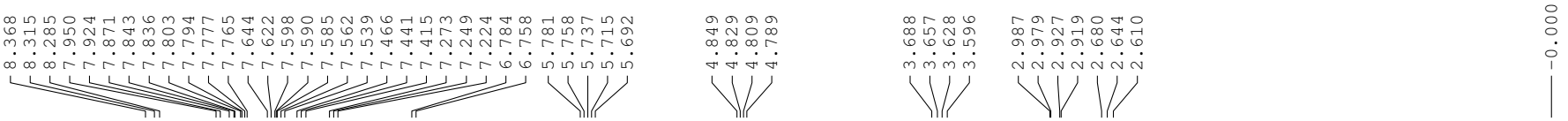


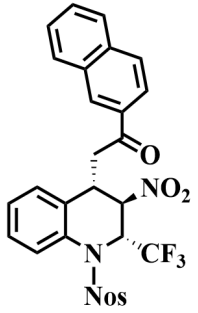

186.91
151.07
142.32
135.02
133.82
132.36
130.46
129.54
129.24
128.98
128.58
128.46
128.39
125.53
125.22
124.81
121.47
117.74
88.14
77.48
77.05
76.63
61.20
60.77
60.33
59.89
36.00
35.83
S
O
NO2
CF3
N
Nos
3ua
13C NMR (75 MHz, CDCl3)
128.98
125.22
121.47
117.74
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



3ua

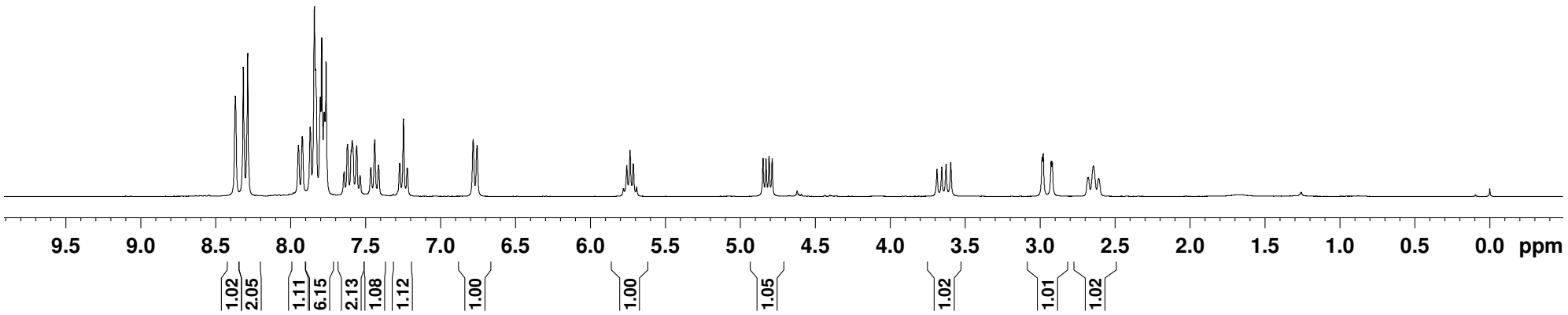
^{19}F NMR (282 MHz, $CDCl_3$)

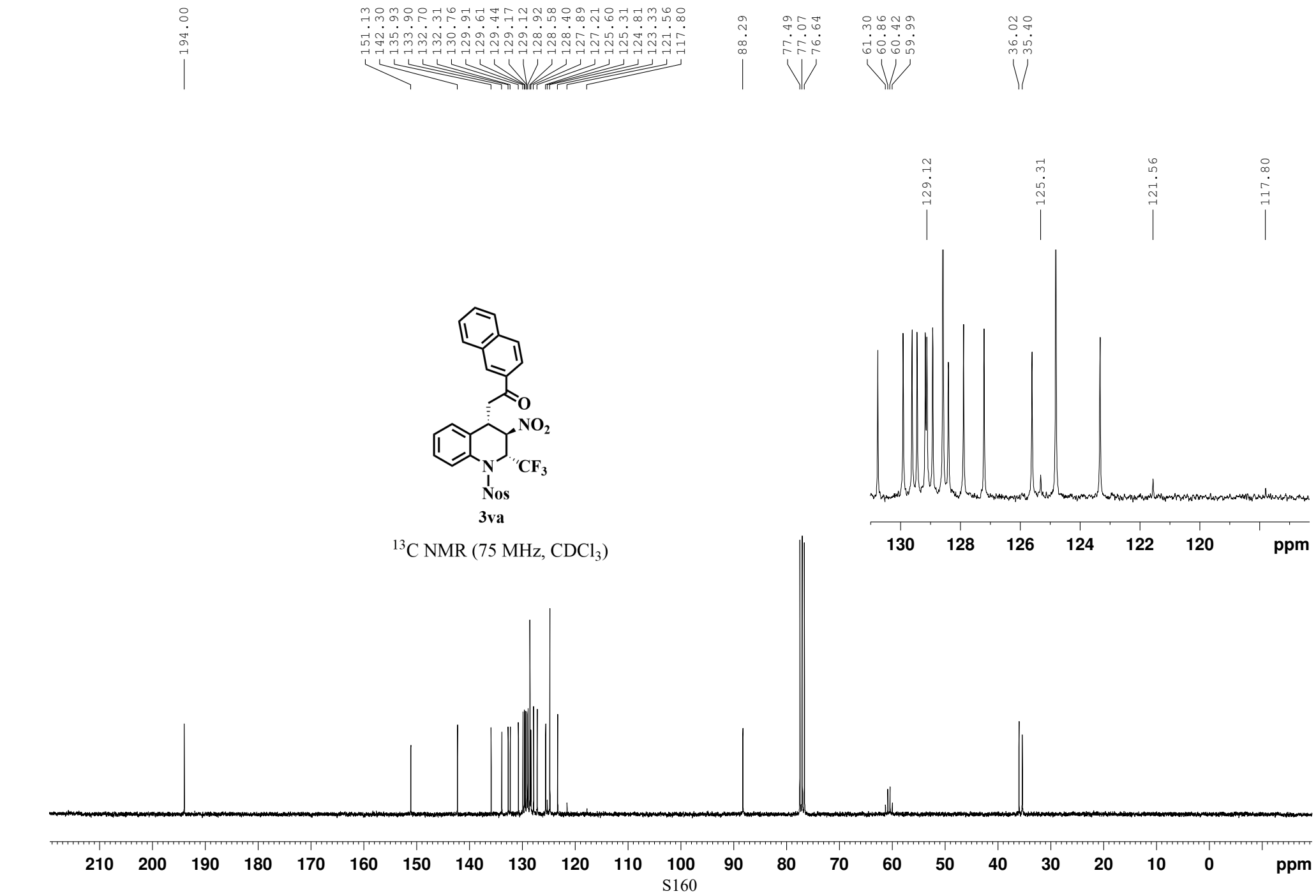


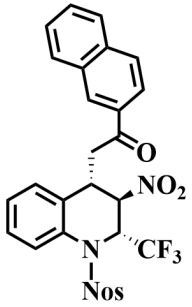


3va

^{1}H NMR (300 MHz, $CDCl_3$)

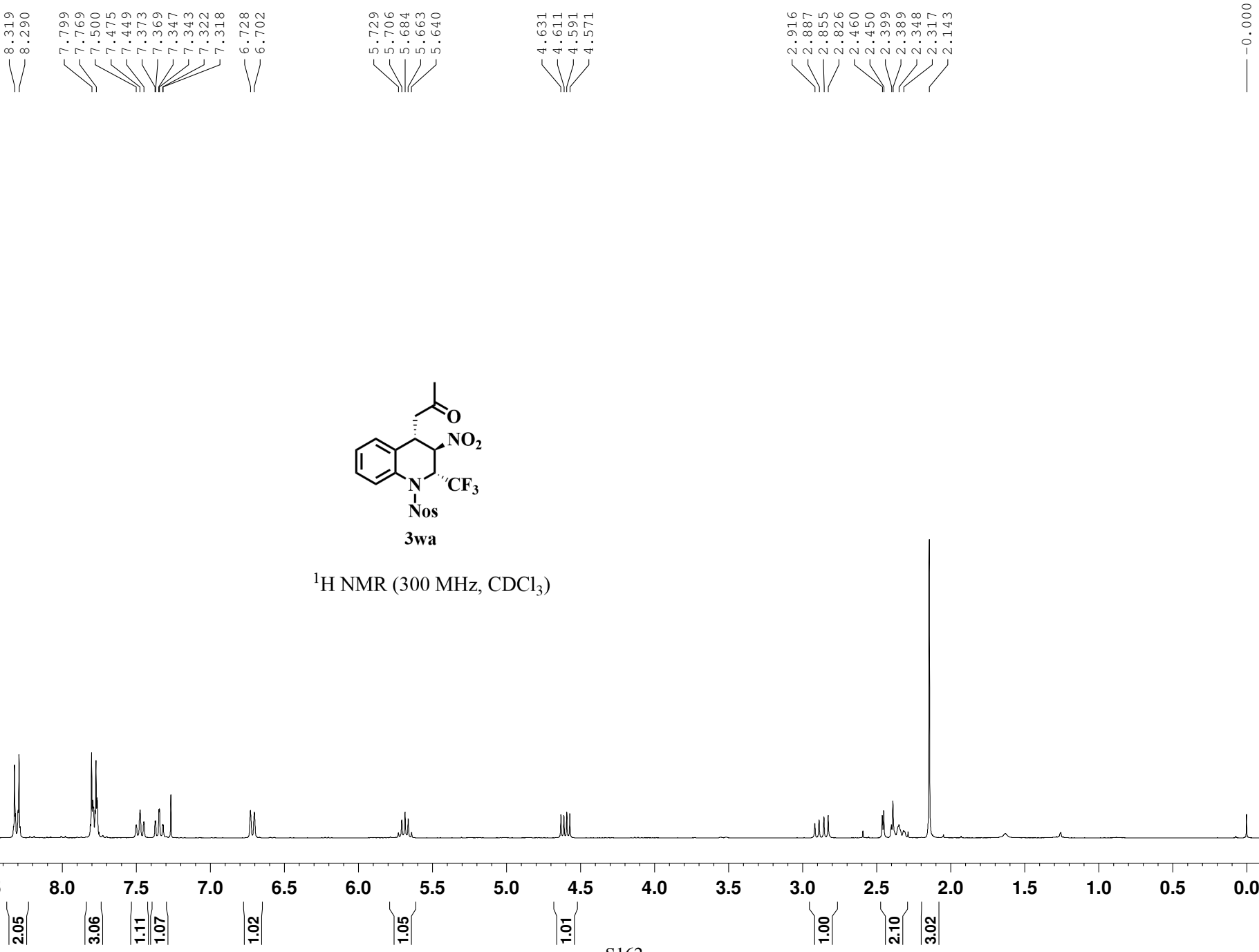



194.00
151.13
142.30
135.93
133.90
132.70
132.31
130.76
129.91
129.61
129.44
129.17
129.12
128.92
128.58
128.40
127.89
127.21
125.60
125.31
124.81
123.33
121.56
117.80
88.29
77.49
77.07
76.64
61.30
60.86
60.42
59.99
36.02
35.40
O
NO2
N
CF3
Nos
3va
13C NMR (75 MHz, CDCl3)
129.12
125.31
121.56
117.80
130
128
126
124
122
120
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



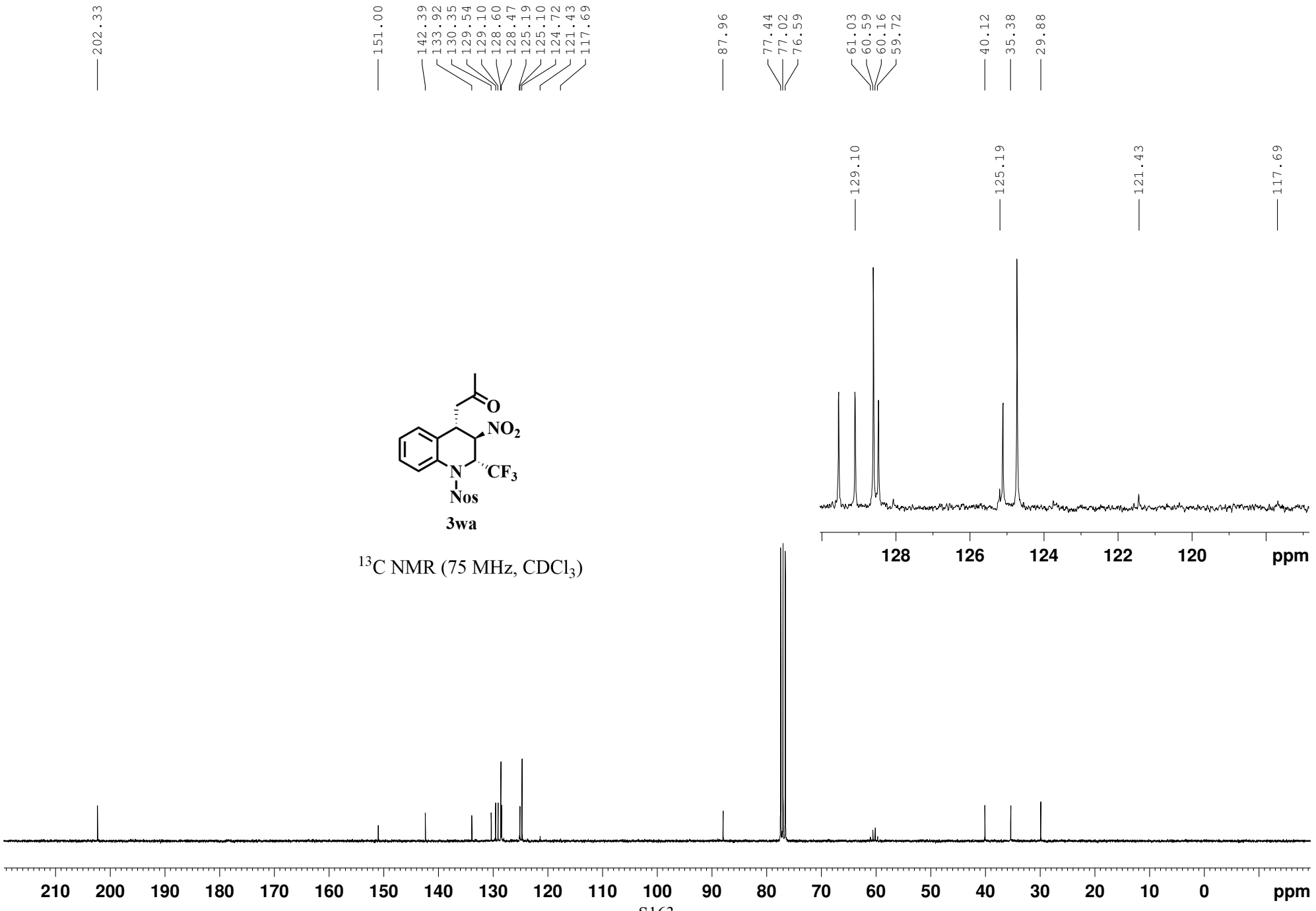
3va

^{19}F NMR (282 MHz, $CDCl_3$)



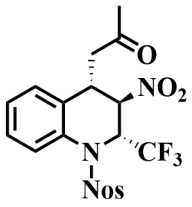
3wa

^{1}H NMR (300 MHz, $CDCl_3$)



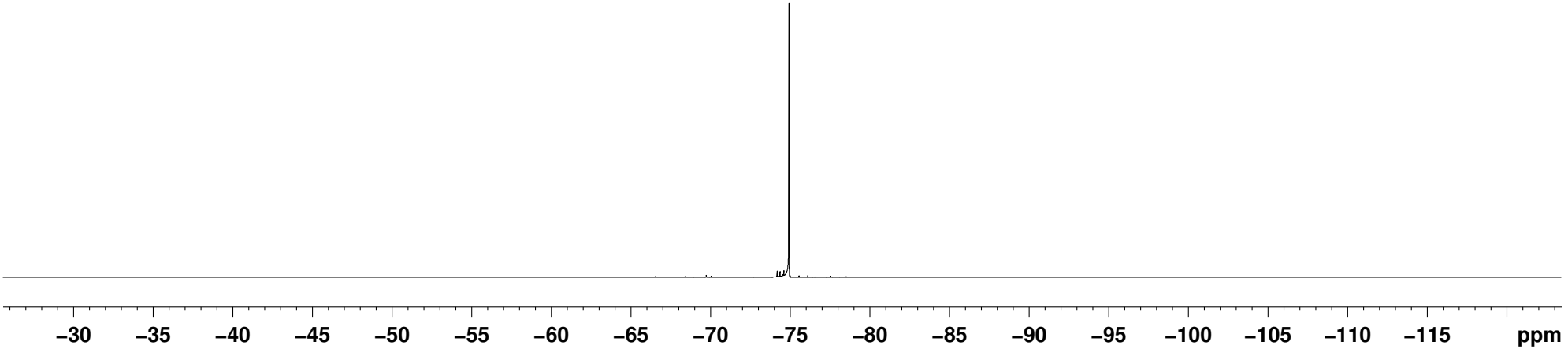
3wa

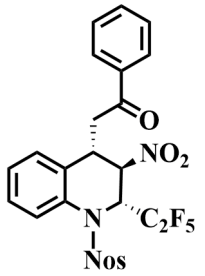
^{13}C NMR (75 MHz, $CDCl_3$)



3wa

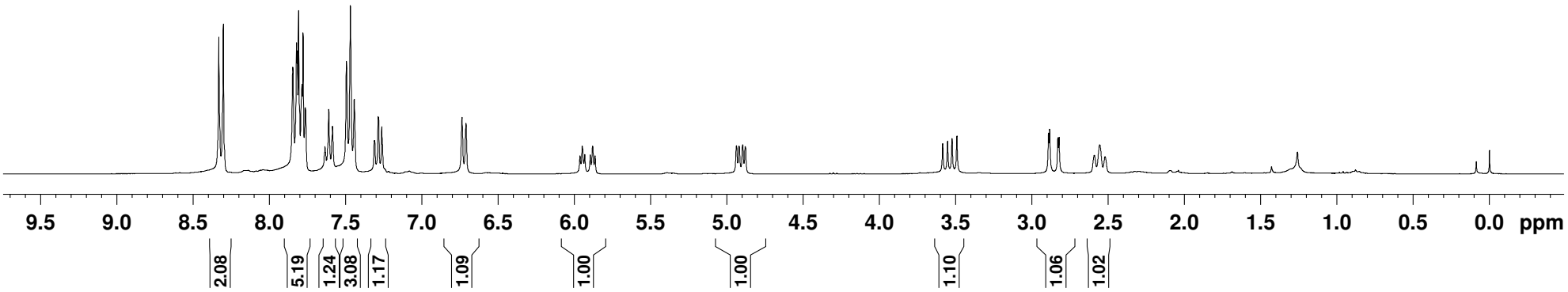
^{19}F NMR (282 MHz, $CDCl_3$)

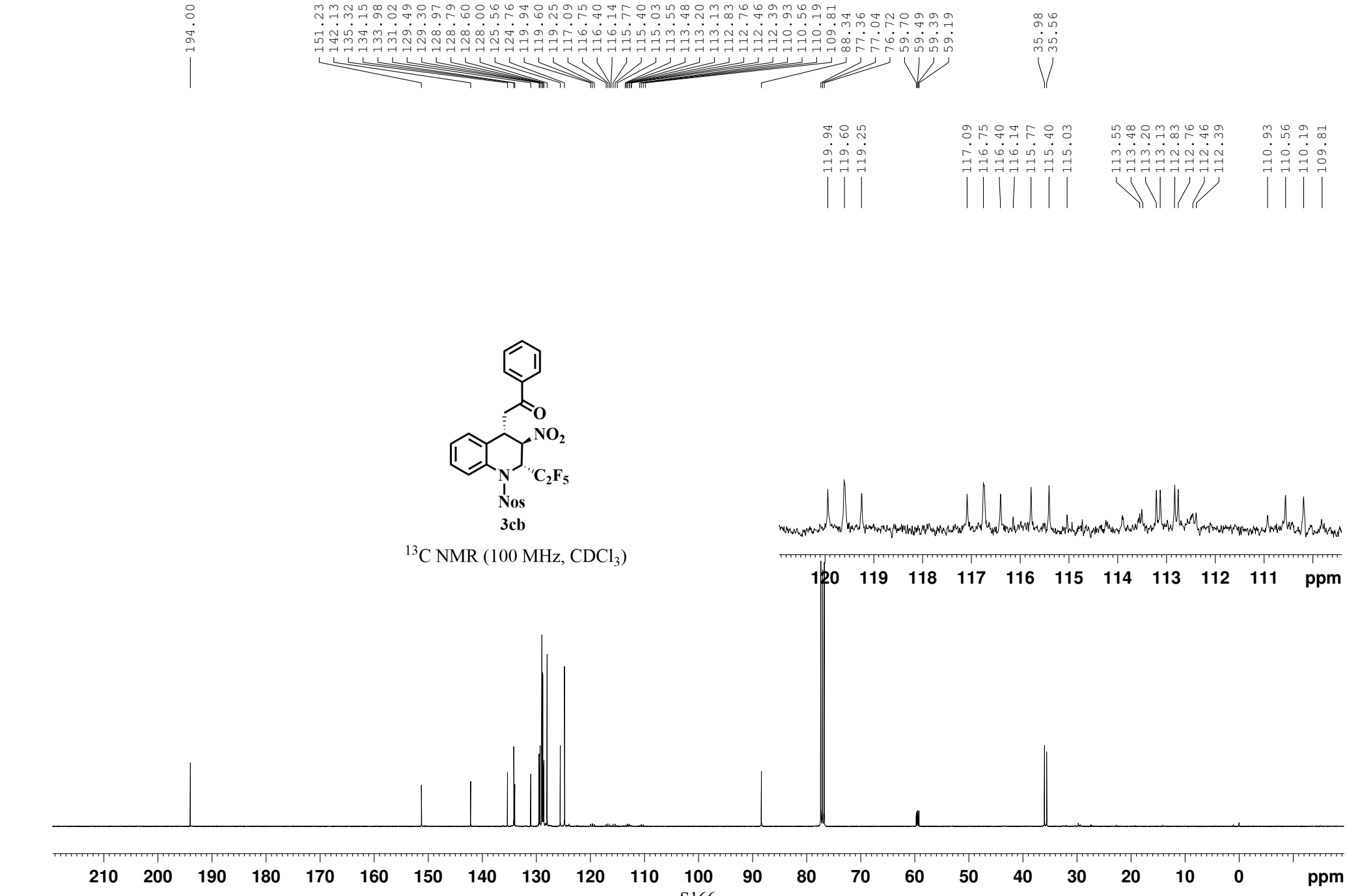


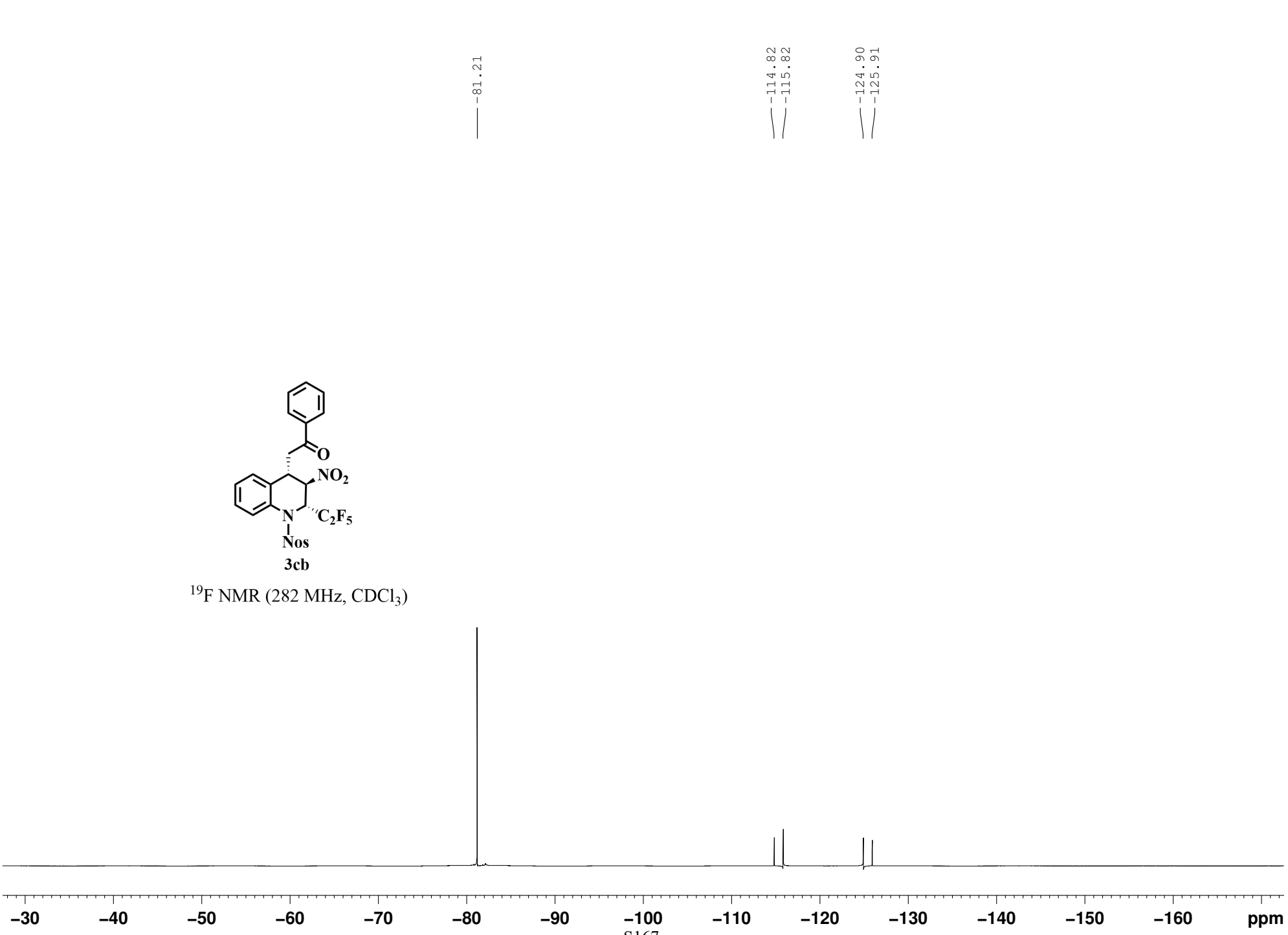


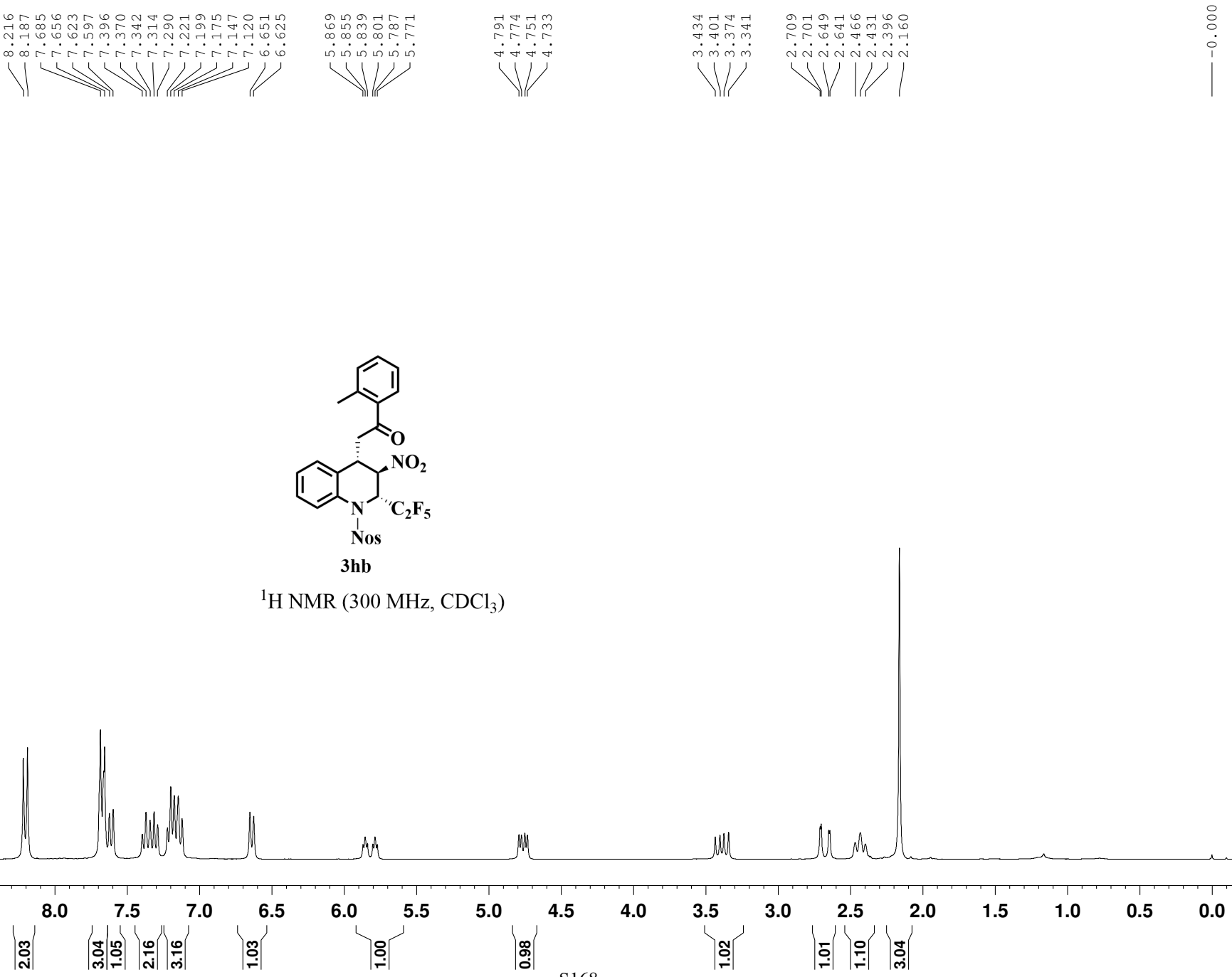
3cb

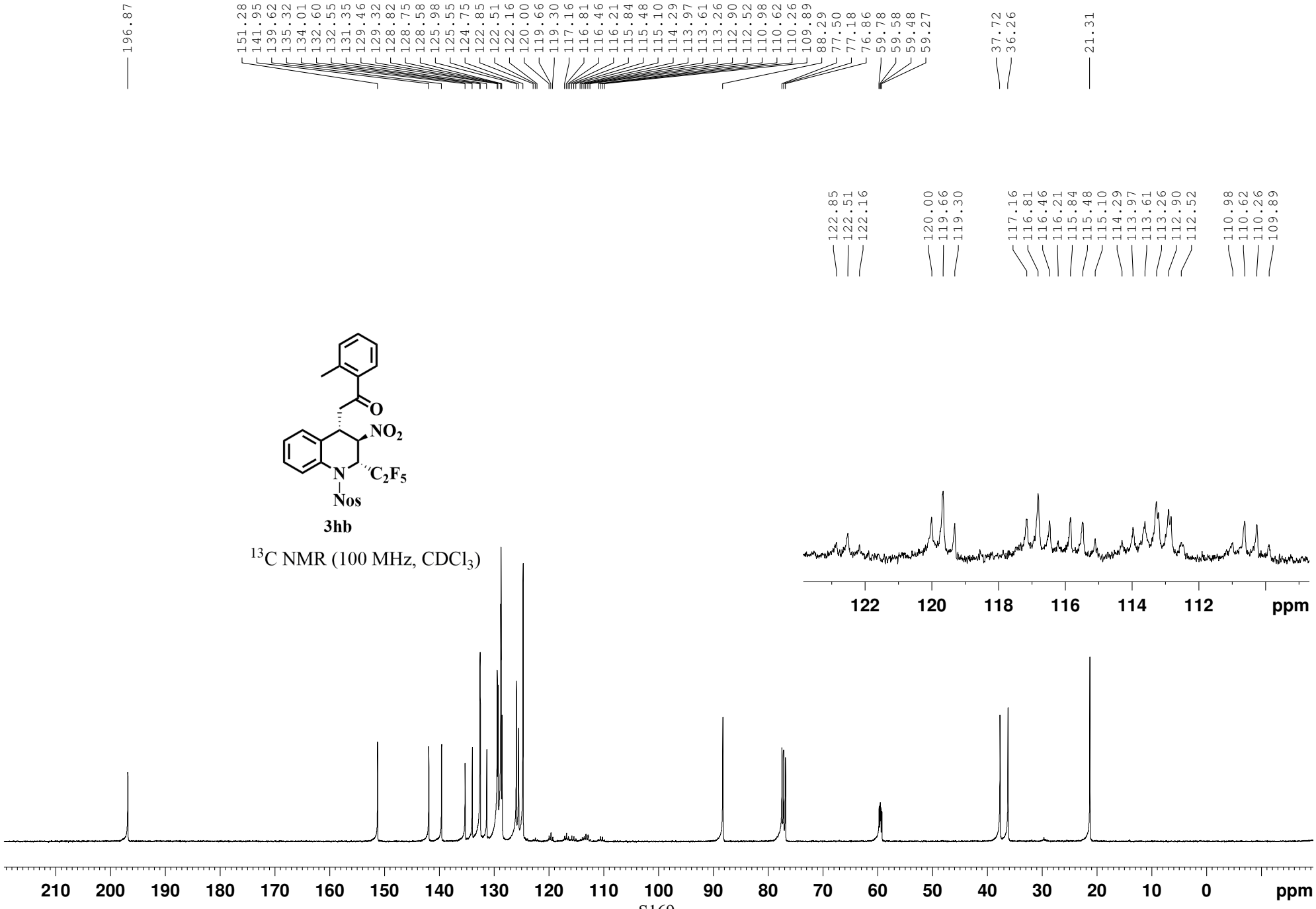
^{1}H NMR (300 MHz, $CDCl_3$)

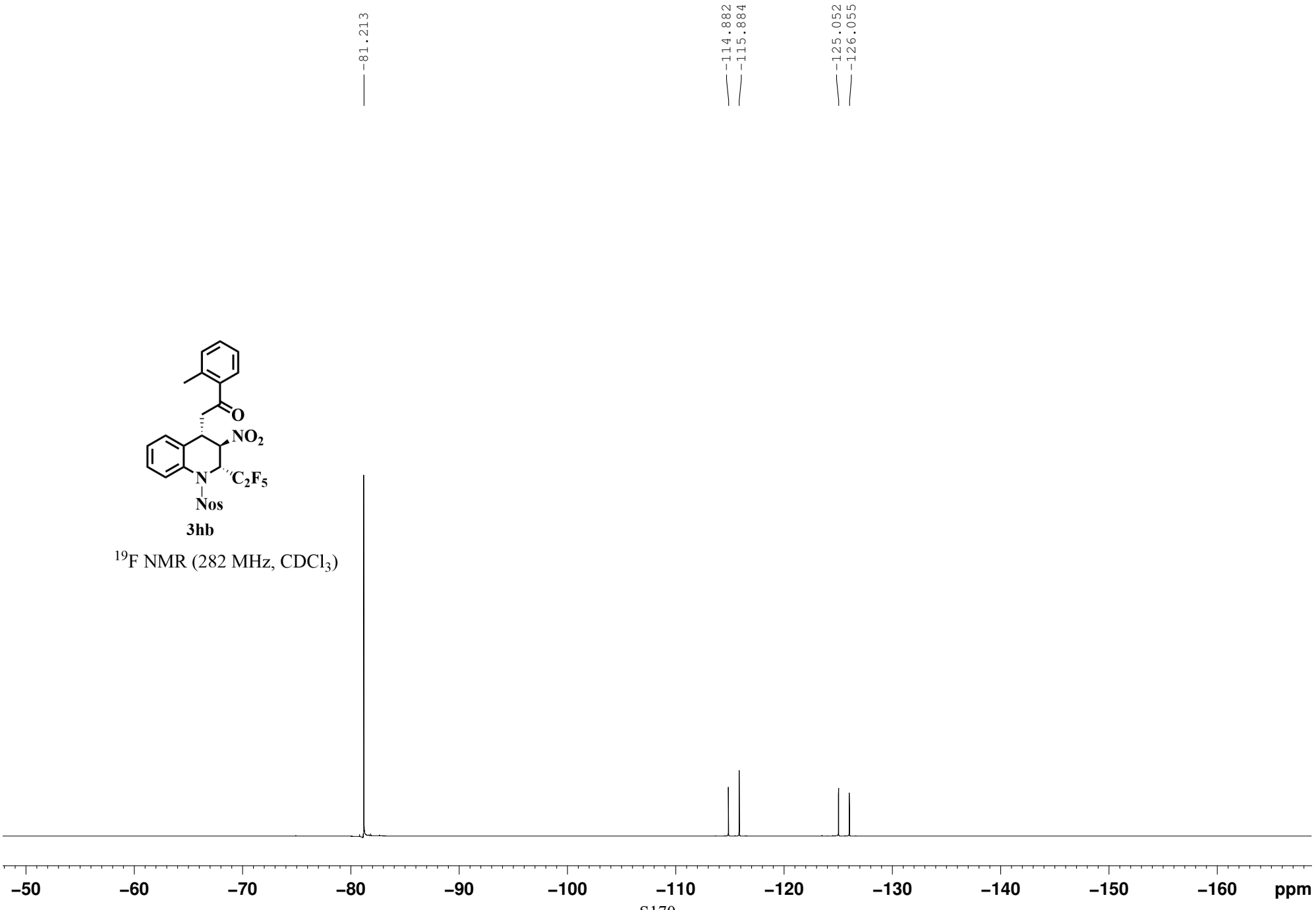


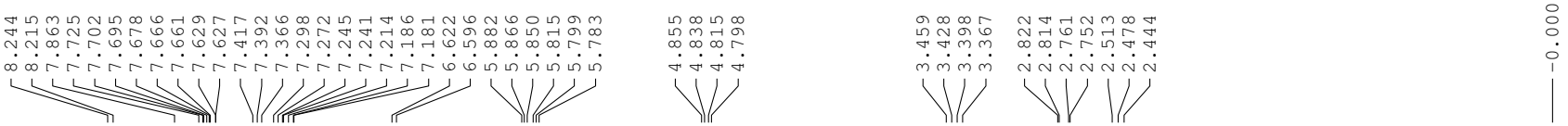

194.00
151.23
142.13
135.32
134.15
133.98
131.02
129.49
129.30
128.97
128.79
128.60
128.00
125.56
124.76
119.94
119.60
119.25
117.09
116.75
116.40
116.14
115.77
115.40
115.03
113.55
113.48
113.20
113.13
112.83
112.76
112.46
112.39
110.93
110.56
110.19
109.81
88.34
77.36
77.04
76.72
59.70
59.49
59.39
59.19
35.98
35.56
O
NO2
N
C2F5
Nos
3cb
13C NMR (100 MHz, CDCl3)
120 119 118 117 116 115 114 113 112 111 ppm
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

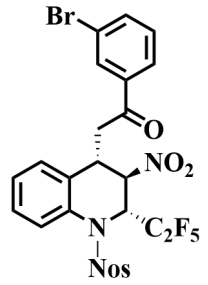

-81.21
-114.82
-115.82
-124.90
-125.91
O
NO2
N
C2F5
Nos
3cb
19F NMR (282 MHz, CDCl3)
–30
–40
–50
–60
–70
–80
–90
–100
–110
–120
–130
–140
–150
–160
ppm


8.216
8.187
7.685
7.656
7.623
7.597
7.396
7.370
7.342
7.314
7.290
7.221
7.199
7.175
7.147
7.120
6.651
6.625
5.869
5.855
5.839
5.801
5.787
5.771
4.791
4.774
4.751
4.733
3.434
3.401
3.374
3.341
2.709
2.701
2.649
2.641
2.466
2.431
2.396
2.160
0.000
O
NO2
N
C2F5
Nos
3hb
1H NMR (300 MHz, CDCl3)
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
ppm
2.03
3.04
1.05
2.16
3.16
1.03
1.00
0.98
1.02
1.01
1.10
3.04


196.87
151.28
141.95
139.62
135.32
134.01
132.60
132.55
131.35
129.46
129.32
128.82
128.75
128.58
125.98
125.55
124.75
122.85
122.51
122.16
120.00
119.66
119.30
117.16
116.81
116.46
116.21
115.84
115.48
115.10
114.29
113.97
113.61
113.26
112.90
112.52
110.98
110.62
110.26
109.89
88.29
77.50
77.18
76.86
59.78
59.58
59.48
59.27
37.72
36.26
21.31
O
NO2
N
C2F5
Nos
3hb
13C NMR (100 MHz, CDCl3)
ppm
S169

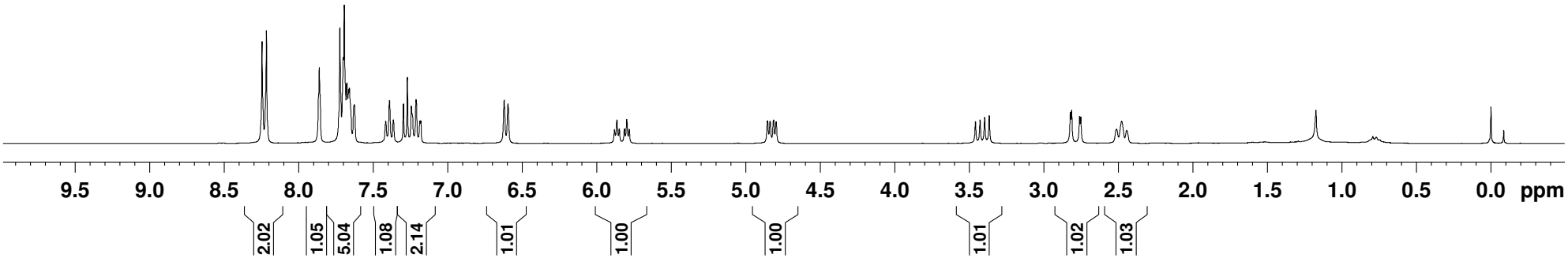

-81.213
-114.882
-115.884
-125.052
-126.055
O
NO2
N
C2F5
Nos
3hb
19F NMR (282 MHz, CDCl3)
−50
−60
−70
−80
−90
−100
−110
−120
−130
−140
−150
−160
ppm

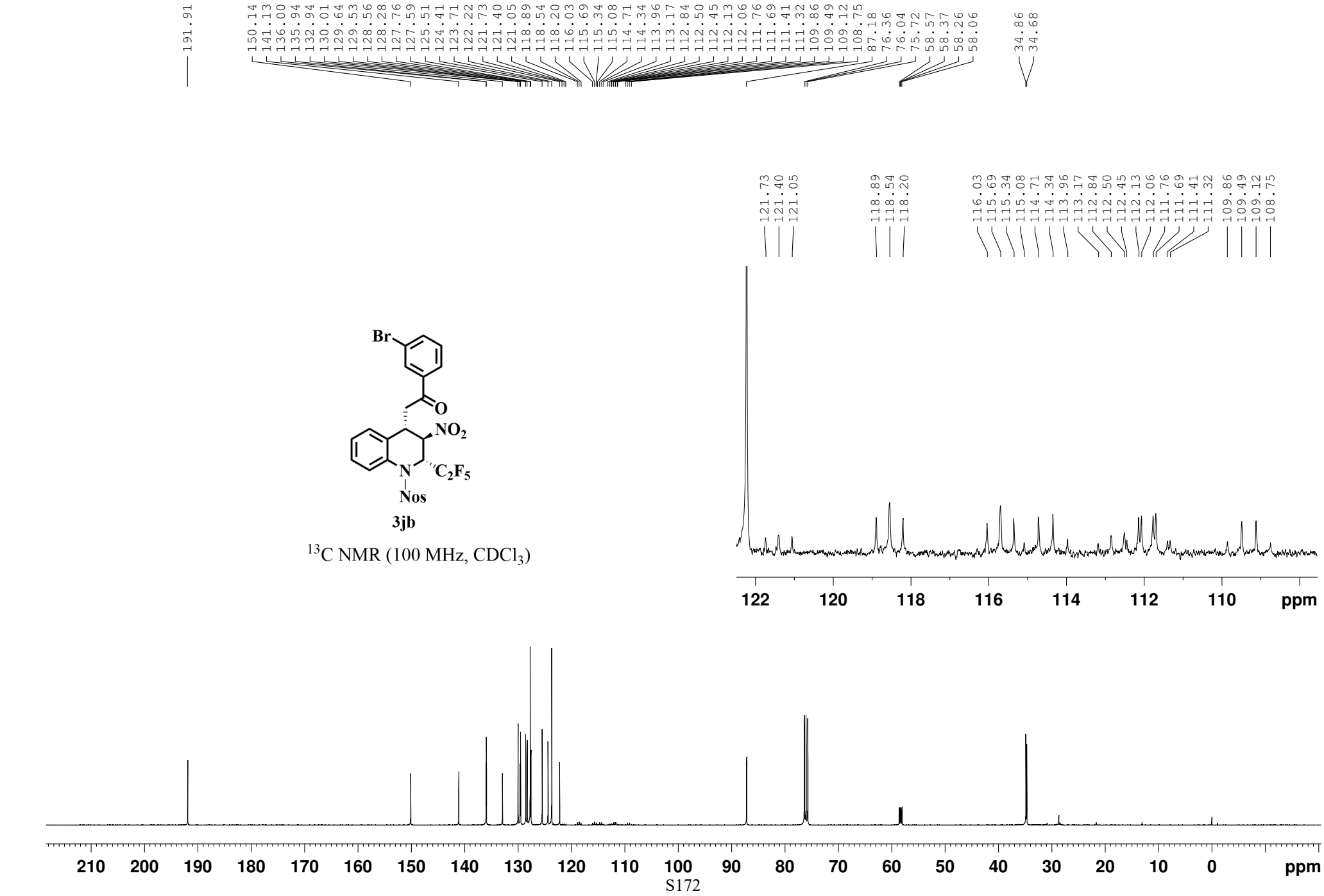




3jb

^{1}H NMR (300 MHz, $CDCl_3$)

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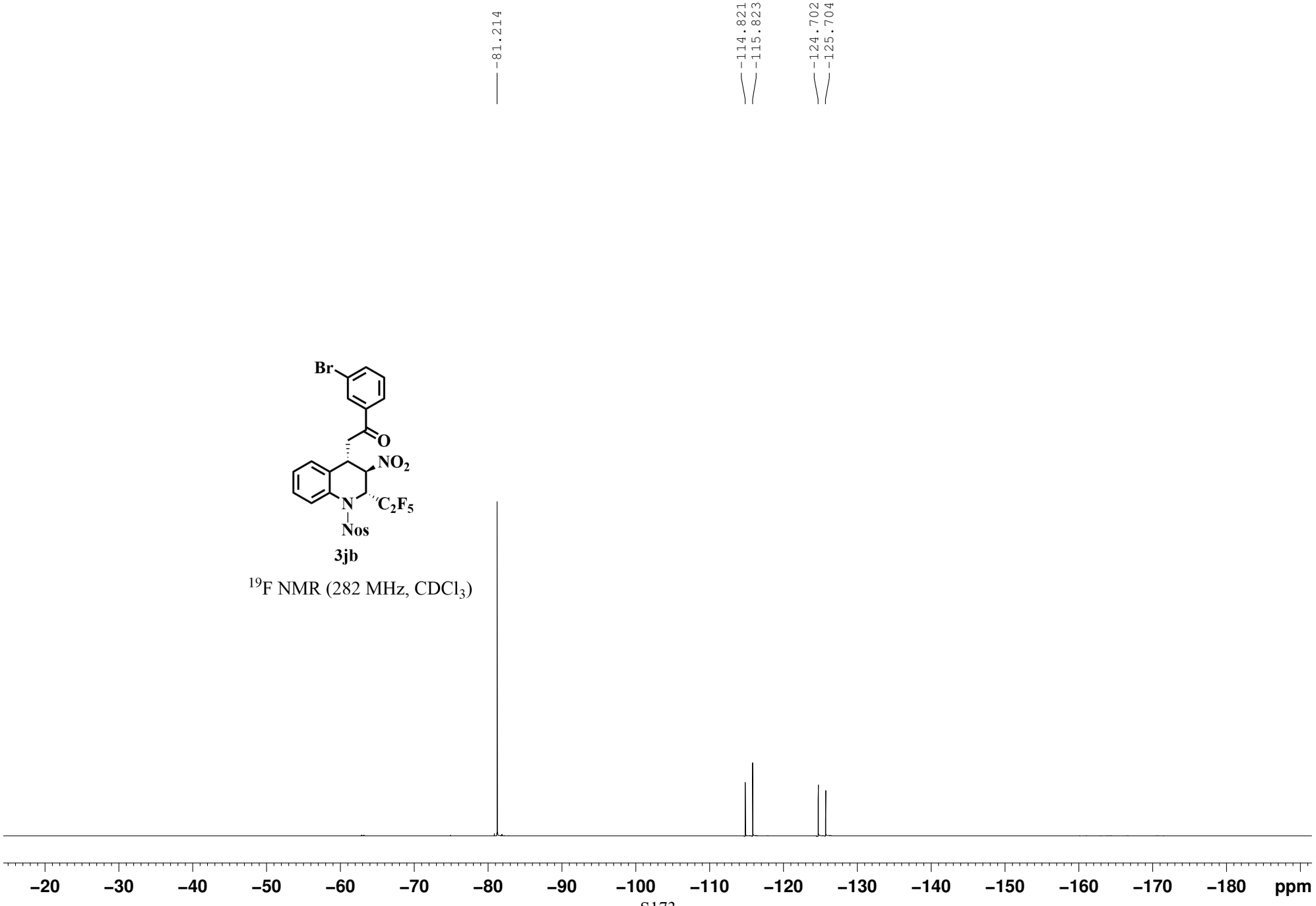
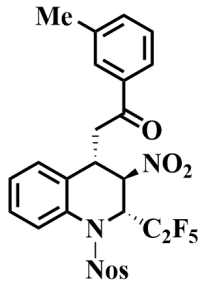
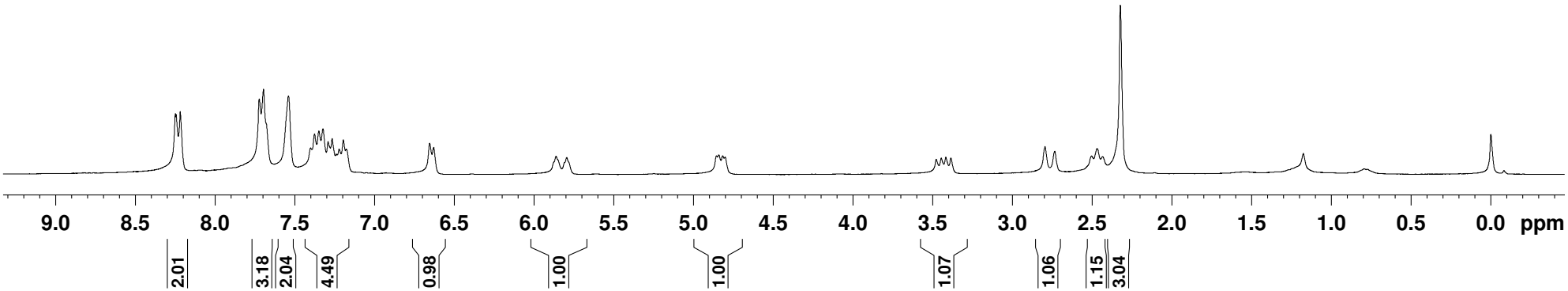
150.14
141.13
136.00
135.94
132.94
130.01
129.64
129.53
128.56
128.28
127.76
127.59
125.51
124.41
123.71
122.22
121.73
121.40
121.05
118.89
118.54
118.20
116.03
115.69
115.34
115.08
114.71
114.34
113.96
113.17
112.84
112.50
112.45
112.13
112.06
111.76
111.69
111.41
111.32
109.86
109.49
109.12
108.75
87.18
76.36
76.04
75.72
58.57
58.37
58.26
58.06
34.86
34.68
Br
O
NO2
N
C2F5
Nos
3jb
13C NMR (100 MHz, CDCl3)
121.73
121.40
121.05
118.89
118.54
118.20
116.03
115.69
115.34
115.08
114.71
114.34
113.96
113.17
112.84
112.50
112.45
112.13
112.06
111.76
111.69
111.41
111.32
109.86
109.49
109.12
108.75
122
120
118
116
114
112
110
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

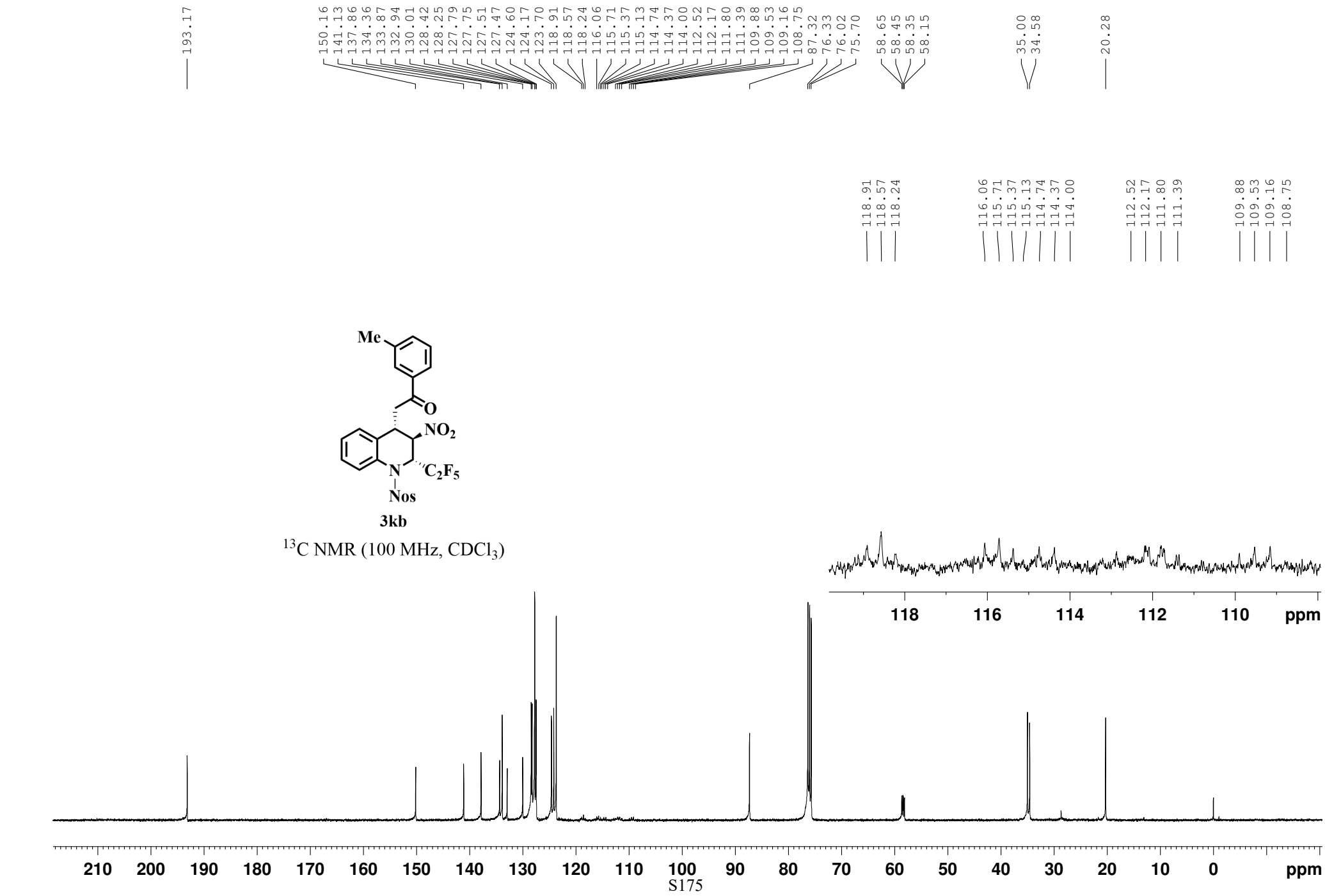

-81.214
-114.821
-115.823
-124.702
-125.704
Br
O
NO2
N
C2F5
Nos
3jb
19F NMR (282 MHz, CDCl3)
–20
–30
–40
–50
–60
–70
–80
–90
–100
–110
–120
–130
–140
–150
–160
–170
–180
ppm

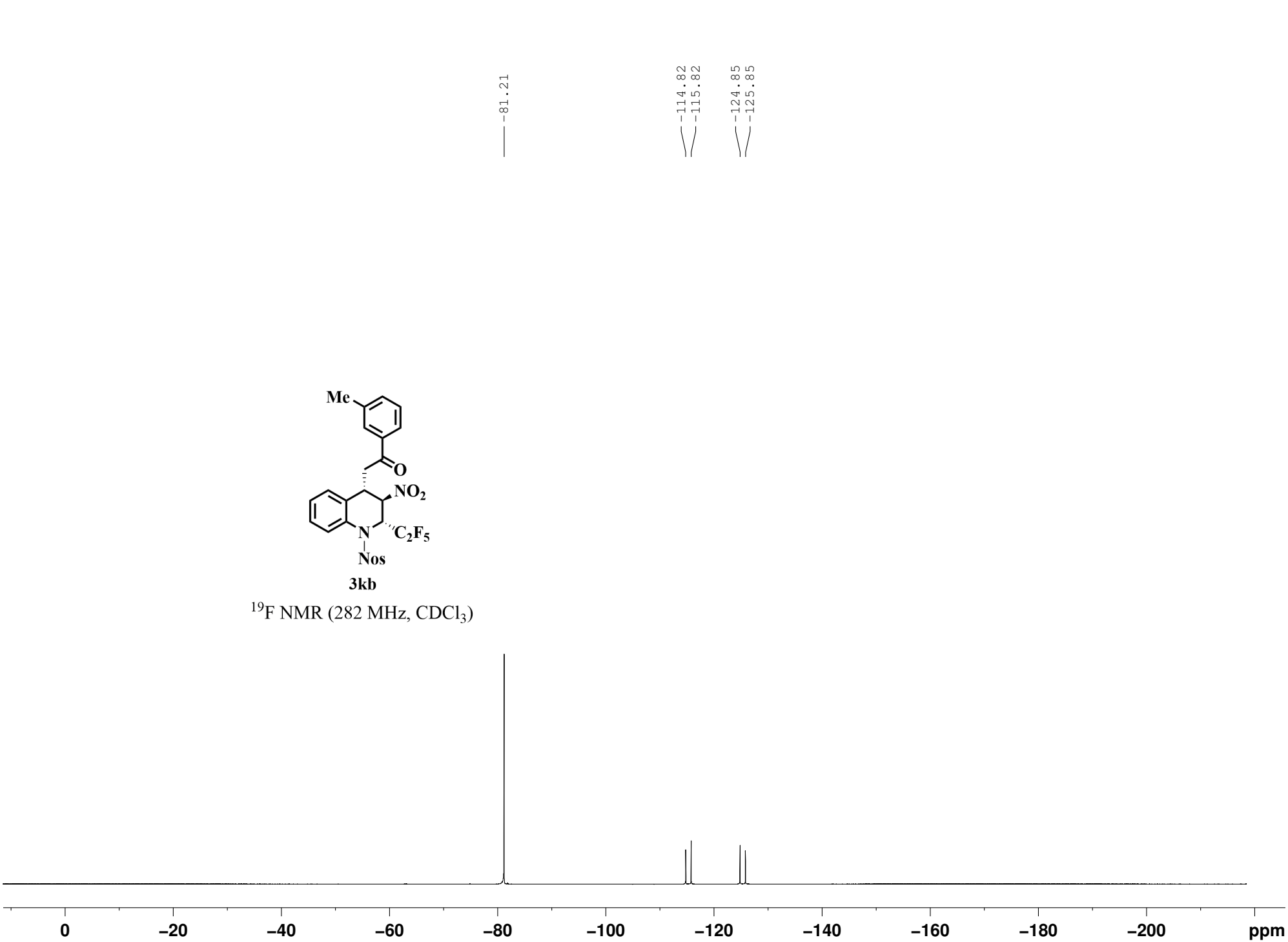


3kb

^{1}H NMR (300 MHz, $CDCl_3$)

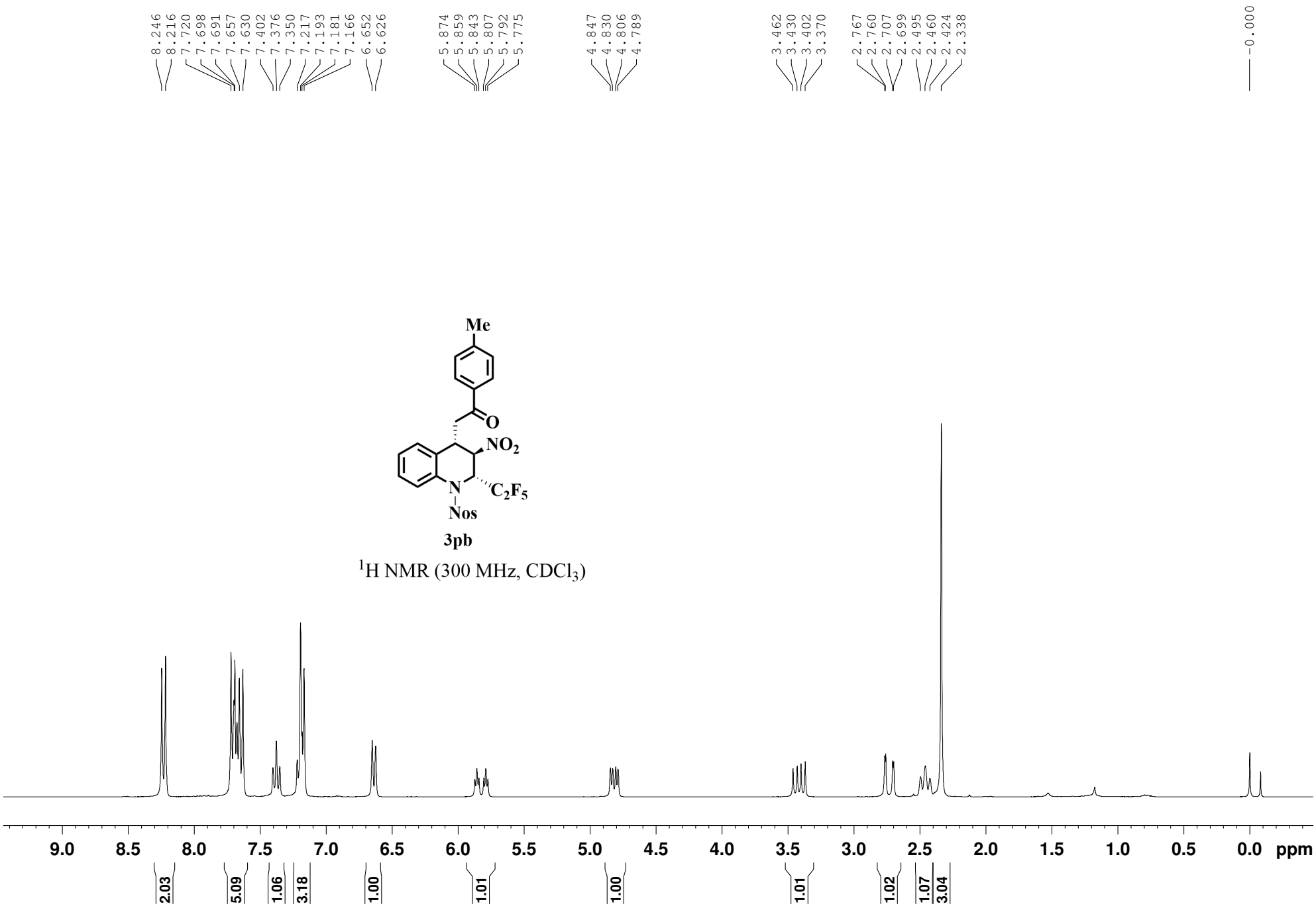



193.17
150.16
141.13
137.86
134.36
133.87
132.94
130.01
128.42
128.25
127.79
127.75
127.51
127.47
124.60
124.17
123.70
118.91
118.57
118.24
116.06
115.71
115.37
115.13
114.74
114.37
114.00
112.52
112.17
111.80
111.39
109.88
109.53
109.16
108.75
87.32
76.33
76.02
75.70
58.65
58.45
58.35
58.15
35.00
34.58
20.28
Me
O
NO2
N
C2F5
Nos
3kb
13C NMR (100 MHz, CDCl3)
118
116
114
112
110
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



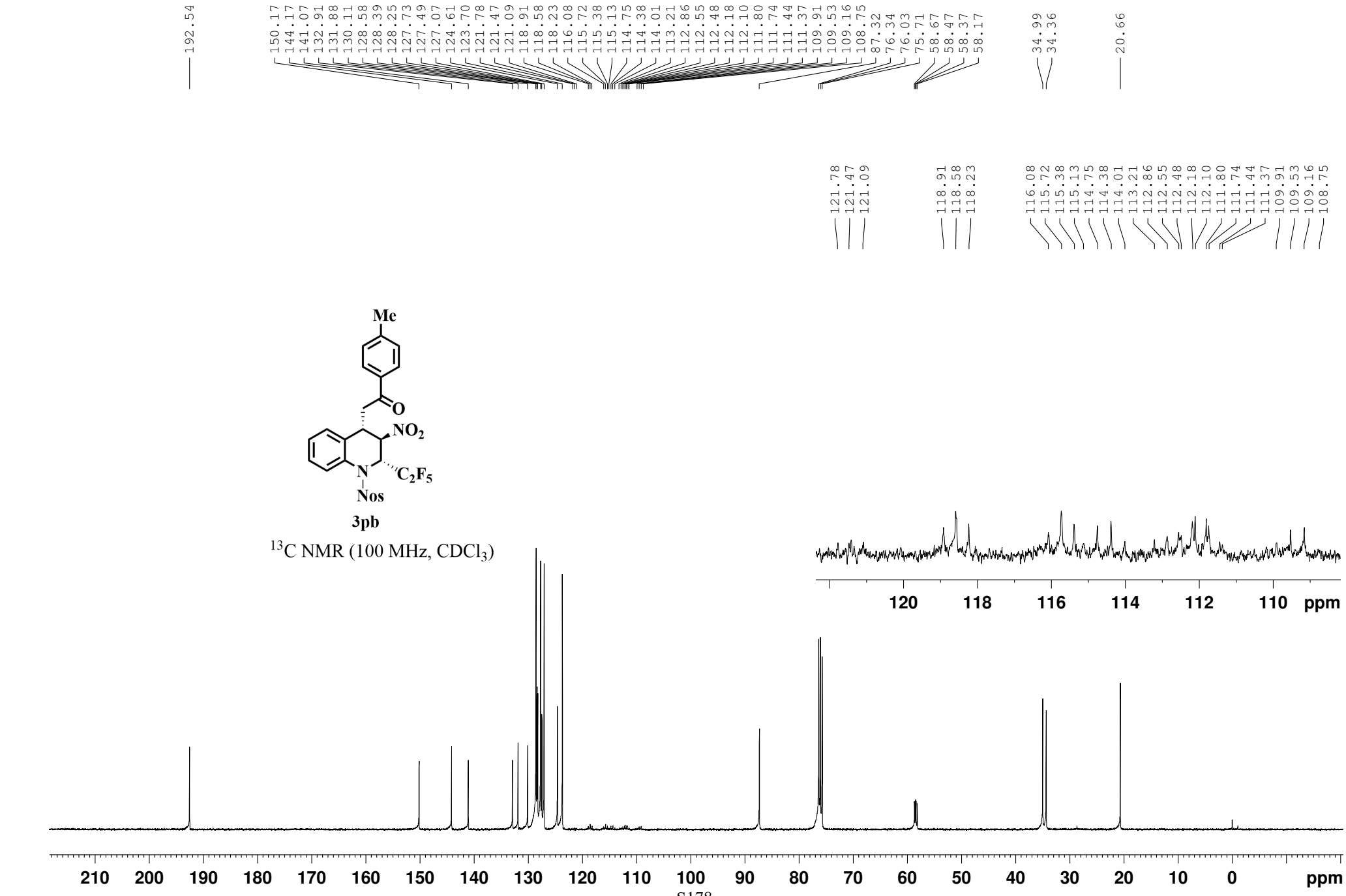
3kb

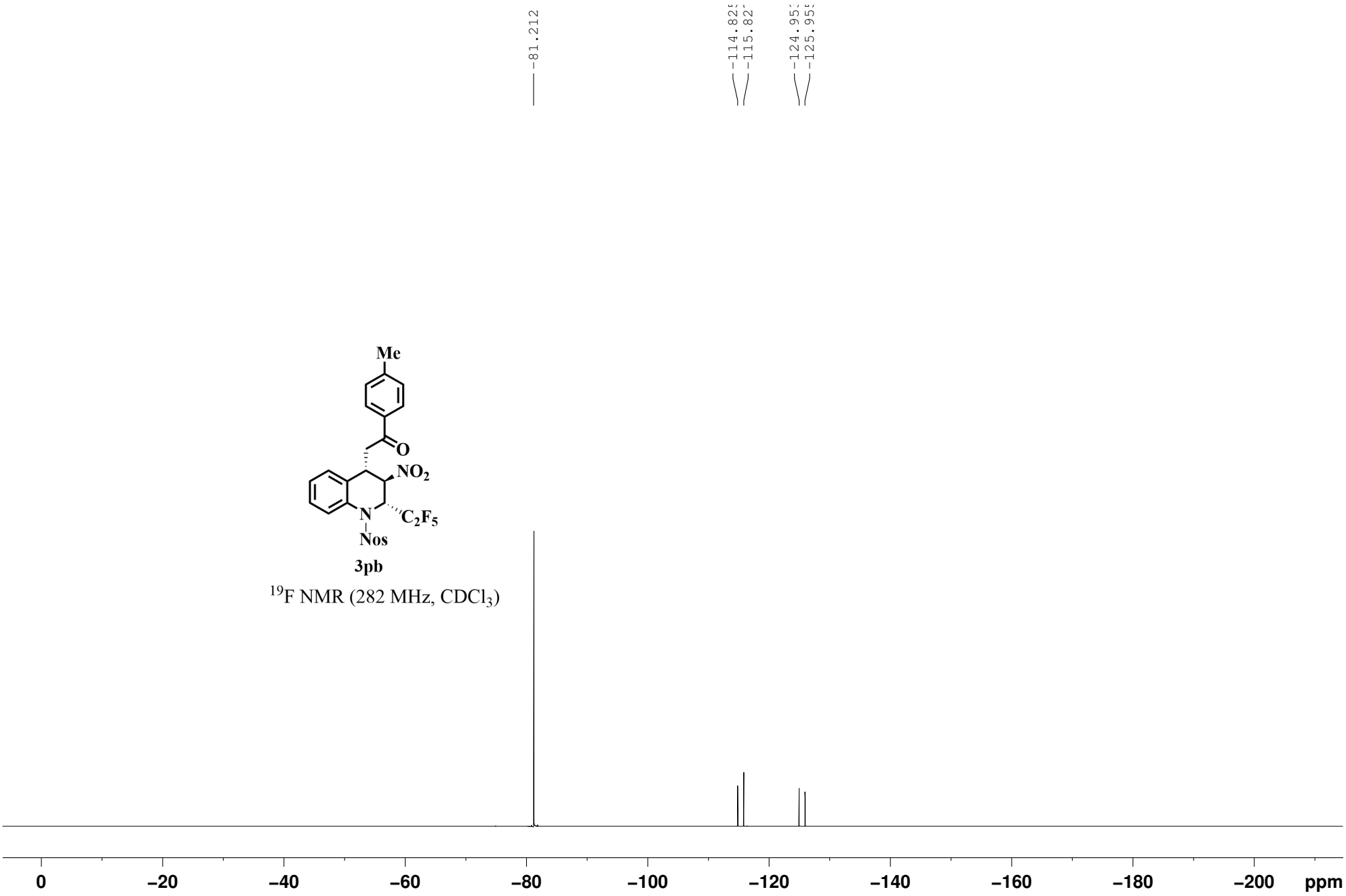
^{19}F NMR (282 MHz, $CDCl_3$)

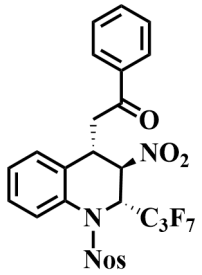


3pb

^{1}H NMR (300 MHz, $CDCl_3$)

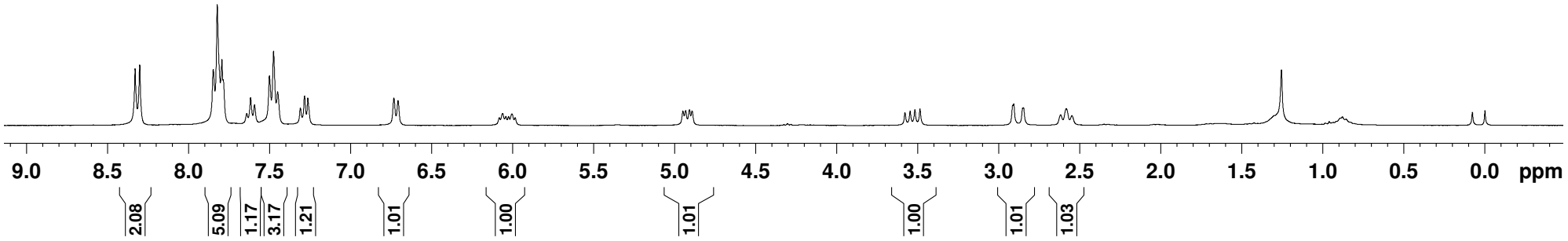

192.54
150.17
144.17
141.07
132.91
131.88
130.11
128.58
128.39
128.25
127.73
127.49
127.07
124.61
123.70
121.78
121.47
121.09
118.91
118.58
118.23
116.08
115.72
115.38
115.13
114.75
114.38
114.01
113.21
112.86
112.55
112.48
112.18
112.10
111.80
111.74
111.44
111.37
109.91
109.53
109.16
108.75
87.32
76.34
76.03
75.71
58.67
58.47
58.37
58.17
34.99
34.36
20.66
121.78
121.47
121.09
118.91
118.58
118.23
116.08
115.72
115.38
115.13
114.75
114.38
114.01
113.21
112.86
112.55
112.48
112.18
112.10
111.80
111.74
111.44
111.37
109.91
109.53
109.16
108.75
Me
O
NO2
N
C2F5
Nos
3pb
13C NMR (100 MHz, CDCl3)
120
118
116
114
112
110
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

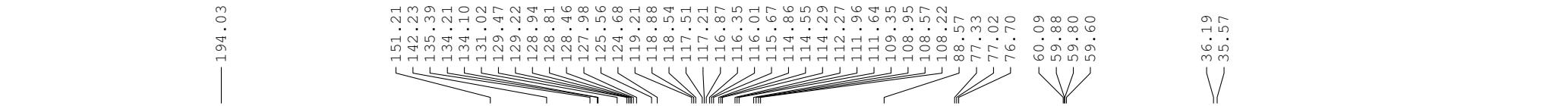

-81.212
-114.82
-115.82
-124.95
-125.95
Me
O
NO2
N
C2F5
Nos
3pb
19F NMR (282 MHz, CDCl3)
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
ppm

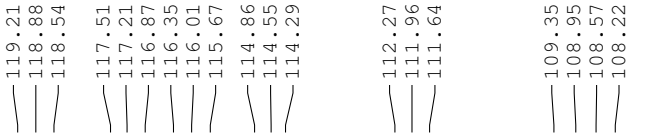


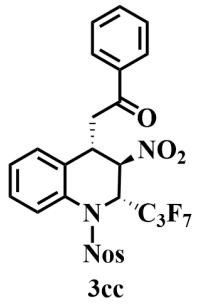
3cc

^{1}H NMR (300 MHz, $CDCl_3$)



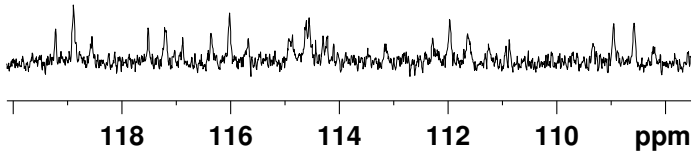


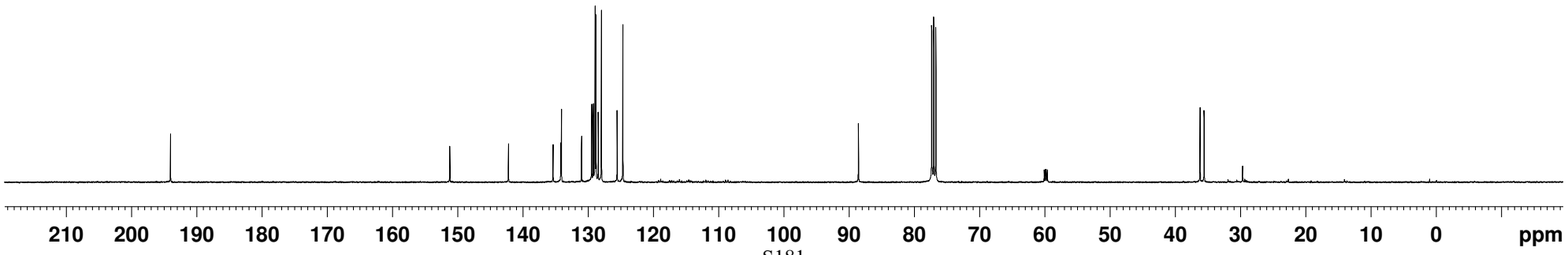


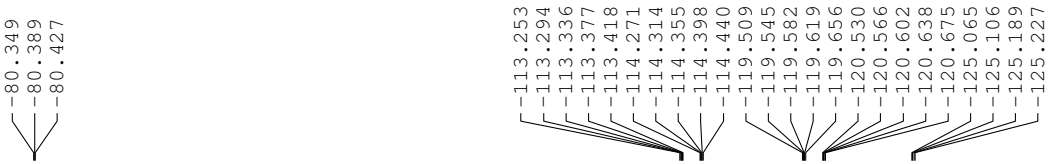


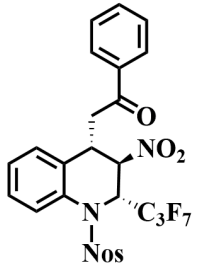
3cc

^{13}C NMR (100 MHz, $CDCl_3$)



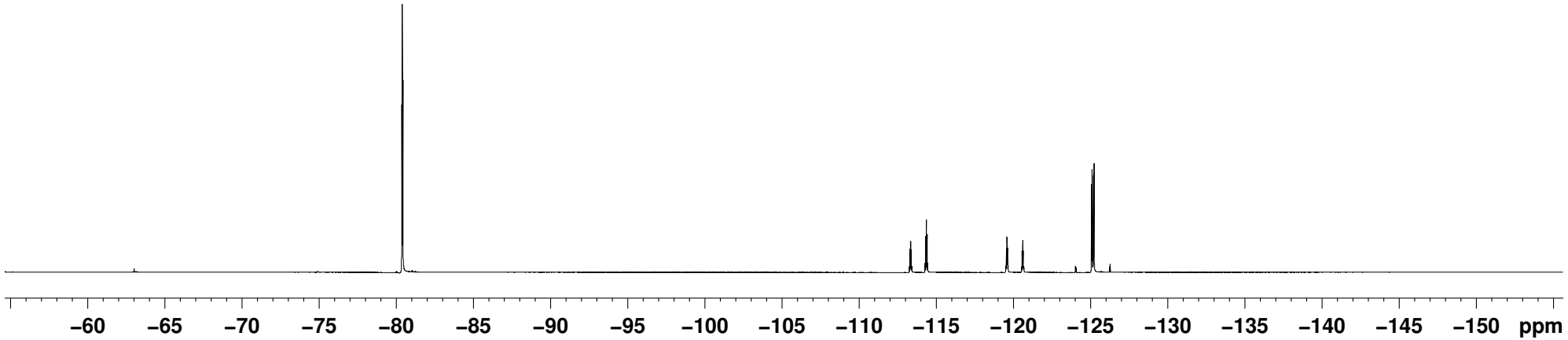


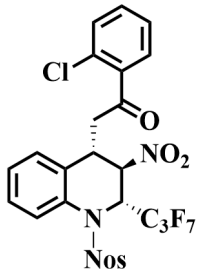




3cc

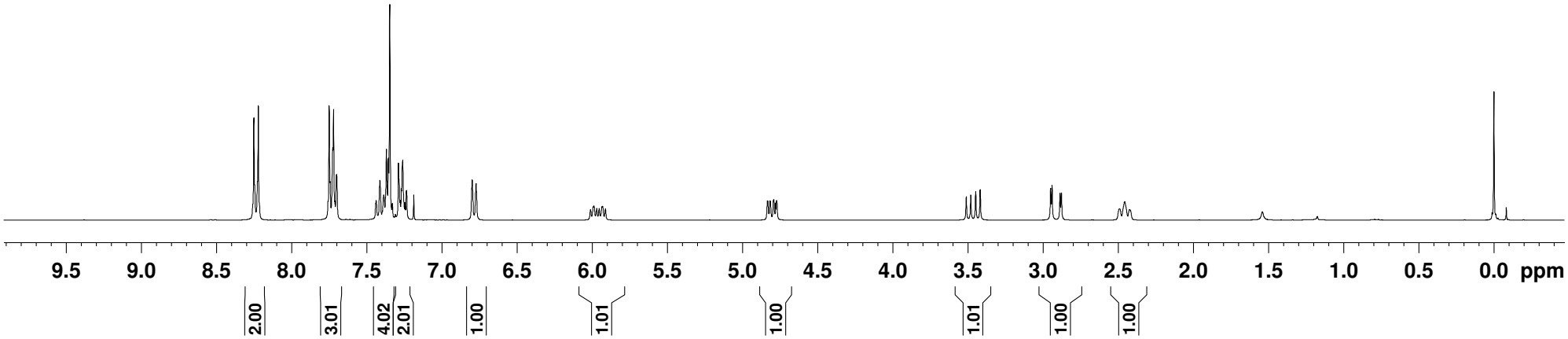
^{19}F NMR (282 MHz, $CDCl_3$)

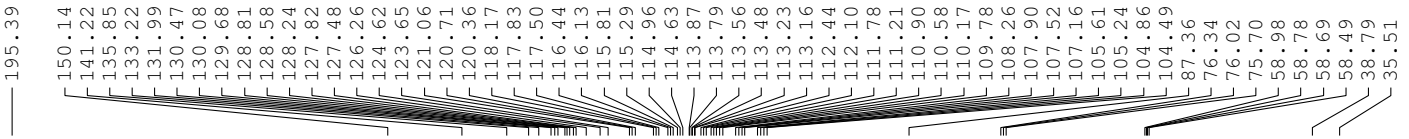


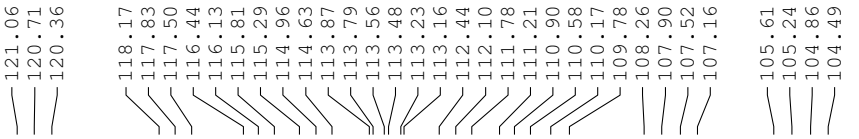


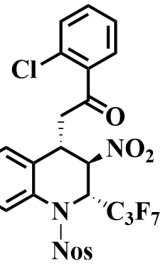
3gc

^{1}H NMR (300 MHz, $CDCl_3$)



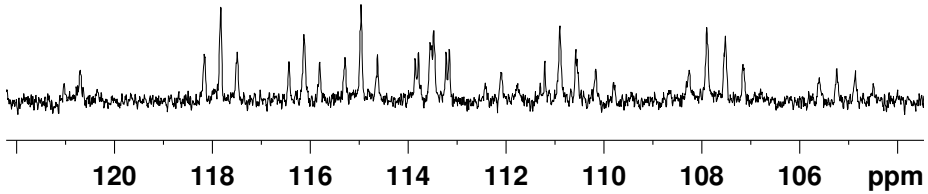


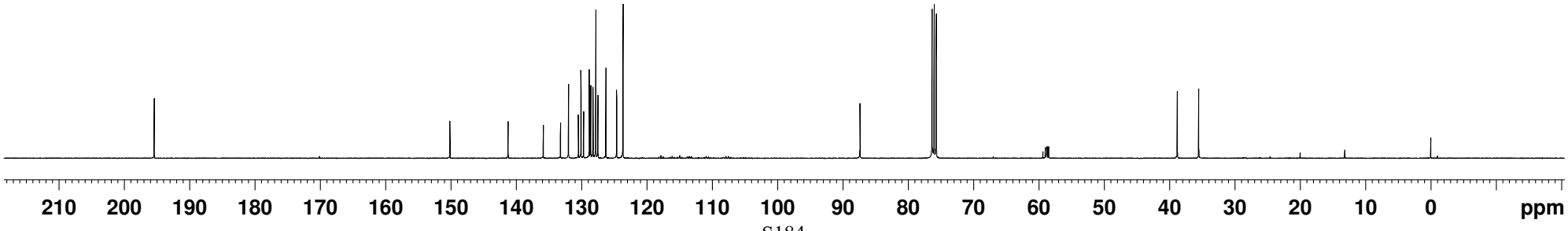


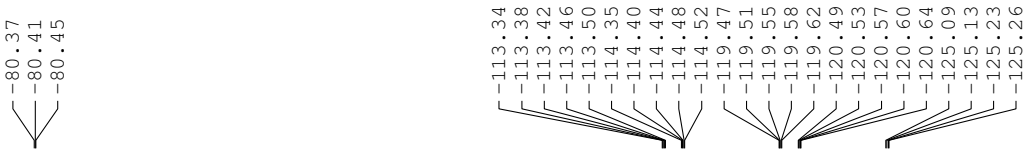


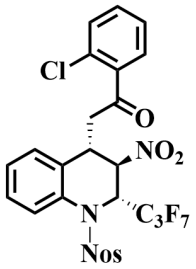
3gc

^{13}C NMR (100 MHz, $CDCl_3$)



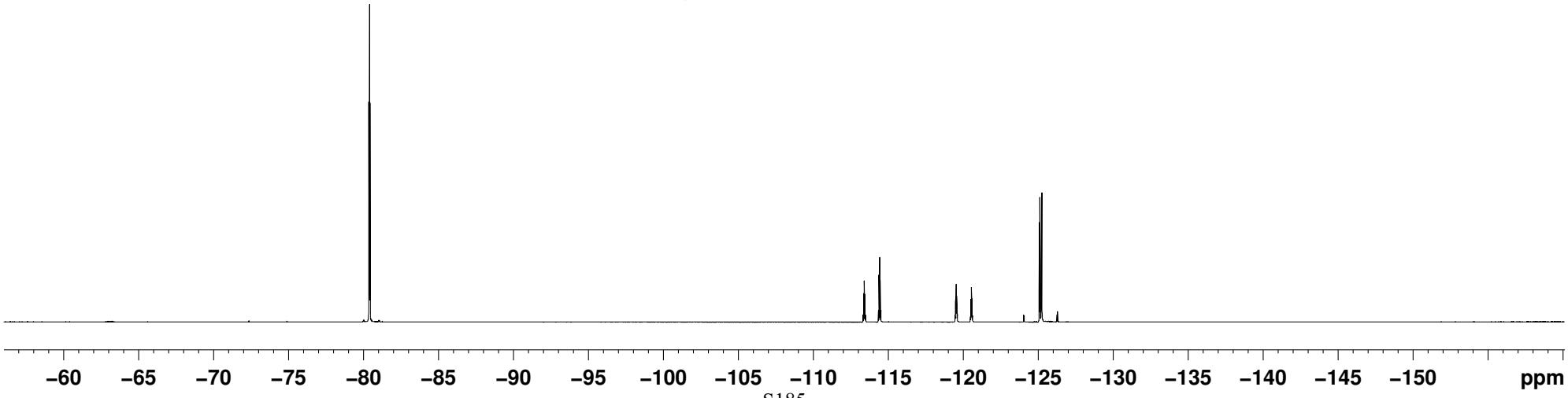


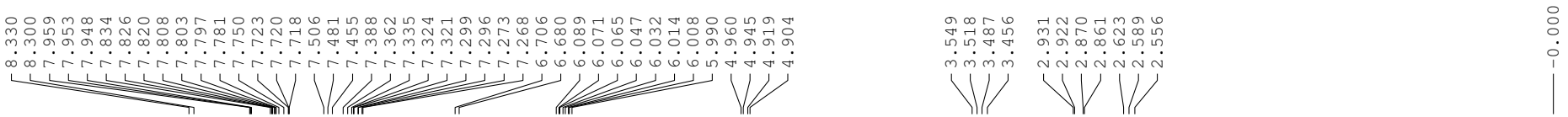


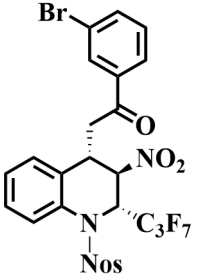


3gc

^{19}F NMR (282 MHz, $CDCl_3$)

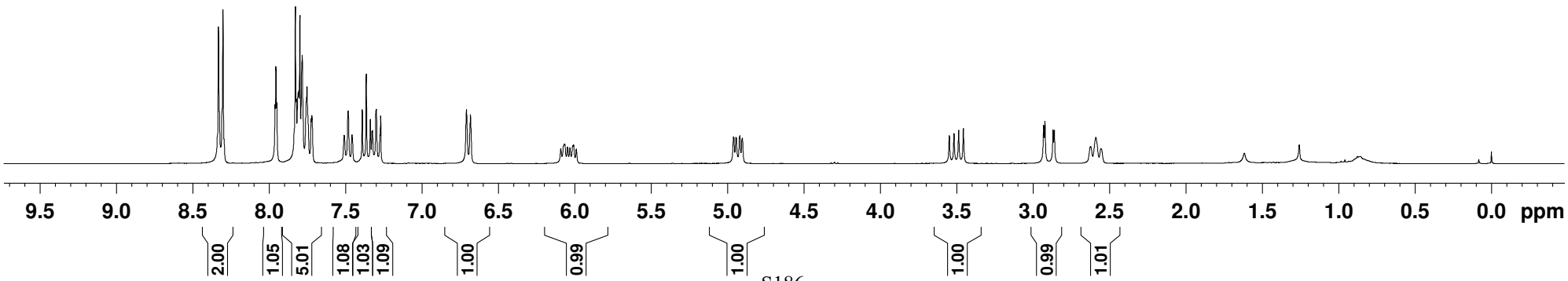


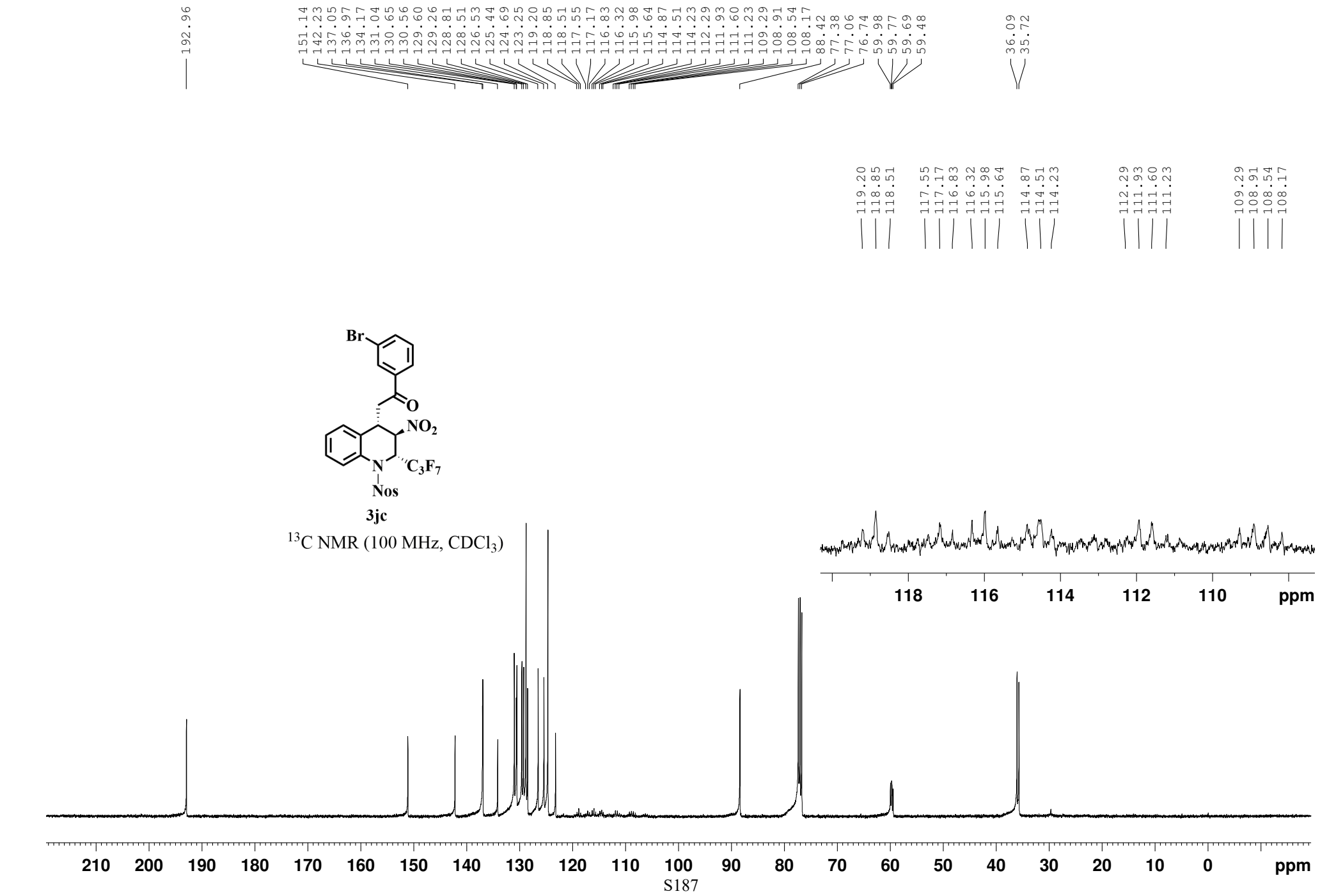




3jc

^{1}H NMR (300 MHz, $CDCl_3$)

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142.23
137.05
136.97
134.17
131.04
130.65
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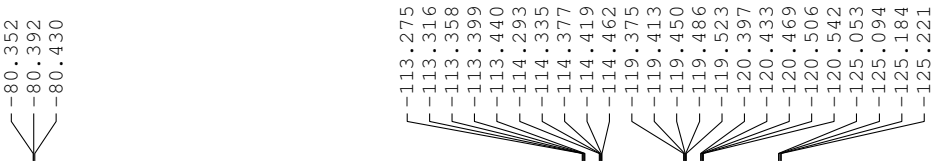
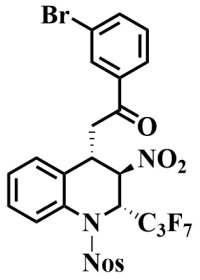
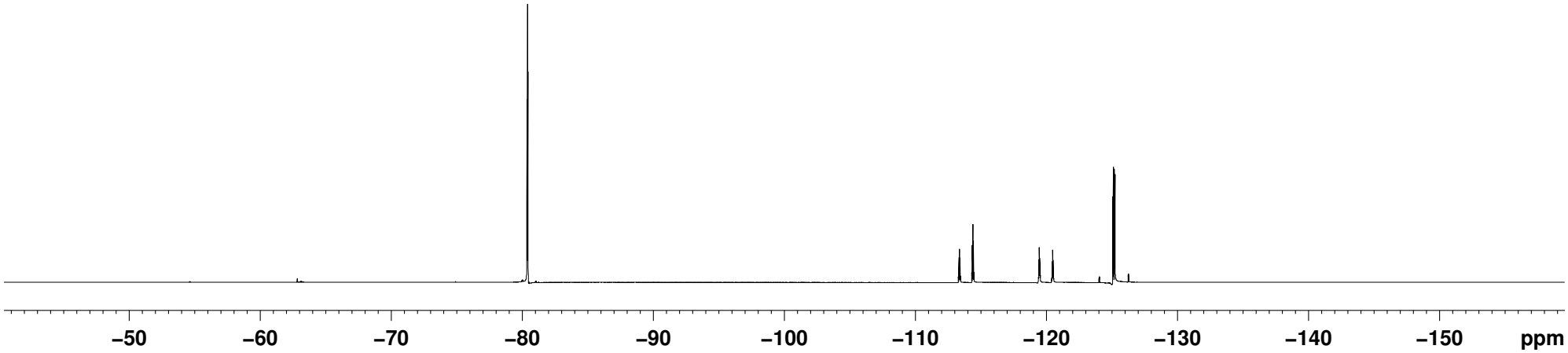
129.60
129.26
128.81
128.51
126.53
125.44
124.69
123.25
119.20
118.85
118.51
117.55
117.17
116.83
116.32
115.98
115.64
114.87
114.51
114.23
112.29
111.93
111.60
111.23
109.29
108.91
108.54
108.17
88.42
77.38
77.06
76.74
59.98
59.77
59.69
59.48
36.09
35.72
Br
O
NO2
N
C3F7
Nos
3jc
13C NMR (100 MHz, CDCl3)
118
116
114
112
110
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

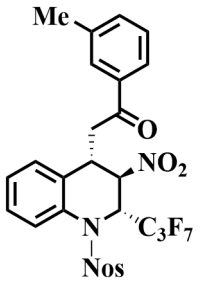




3jc

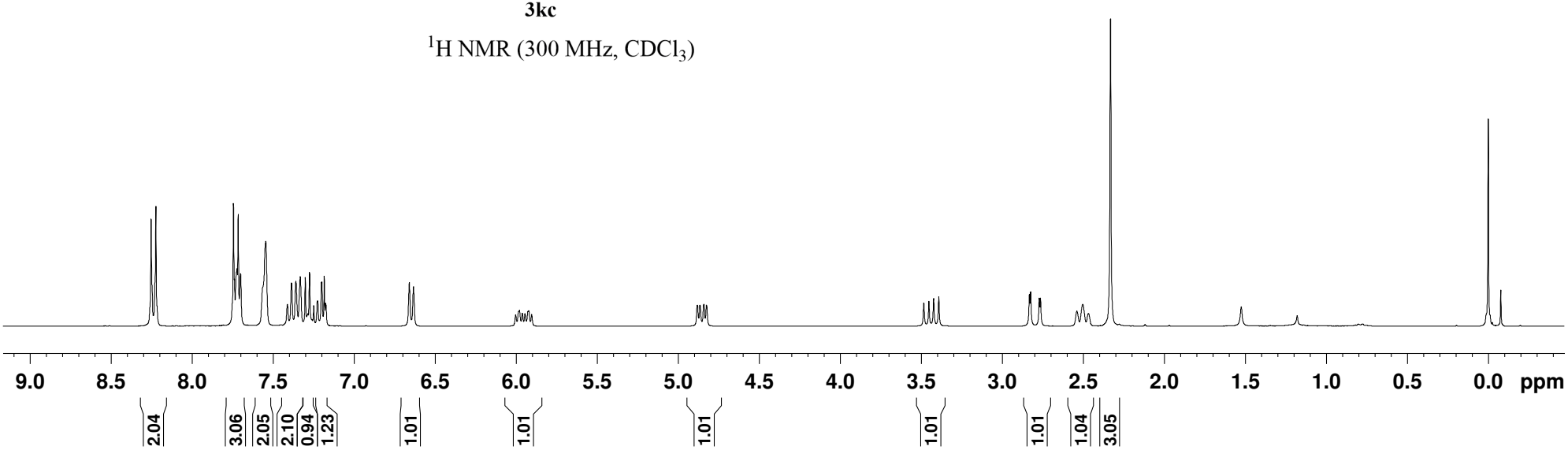
^{19}F NMR (282 MHz, $CDCl_3$)

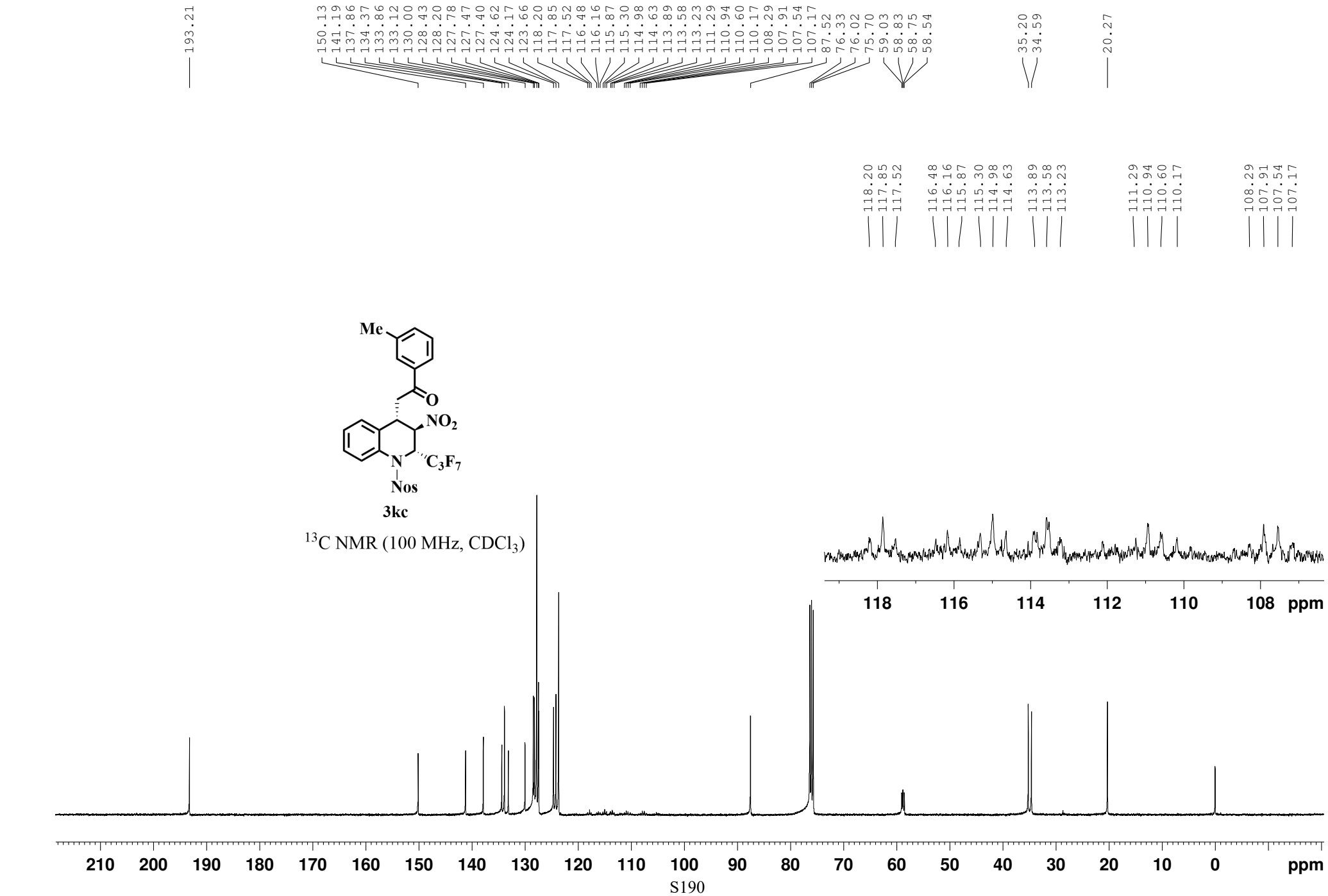




3kc

^{1}H NMR (300 MHz, $CDCl_3$)




193.21
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141.19
137.86
134.37
133.86
133.12
130.00
128.43
128.20
127.78
127.47
127.40
124.62
124.17
123.66
118.20
117.85
117.52
116.48
116.16
115.87
115.30
114.98
114.63
113.89
113.58
113.23
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110.94
110.60
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107.91
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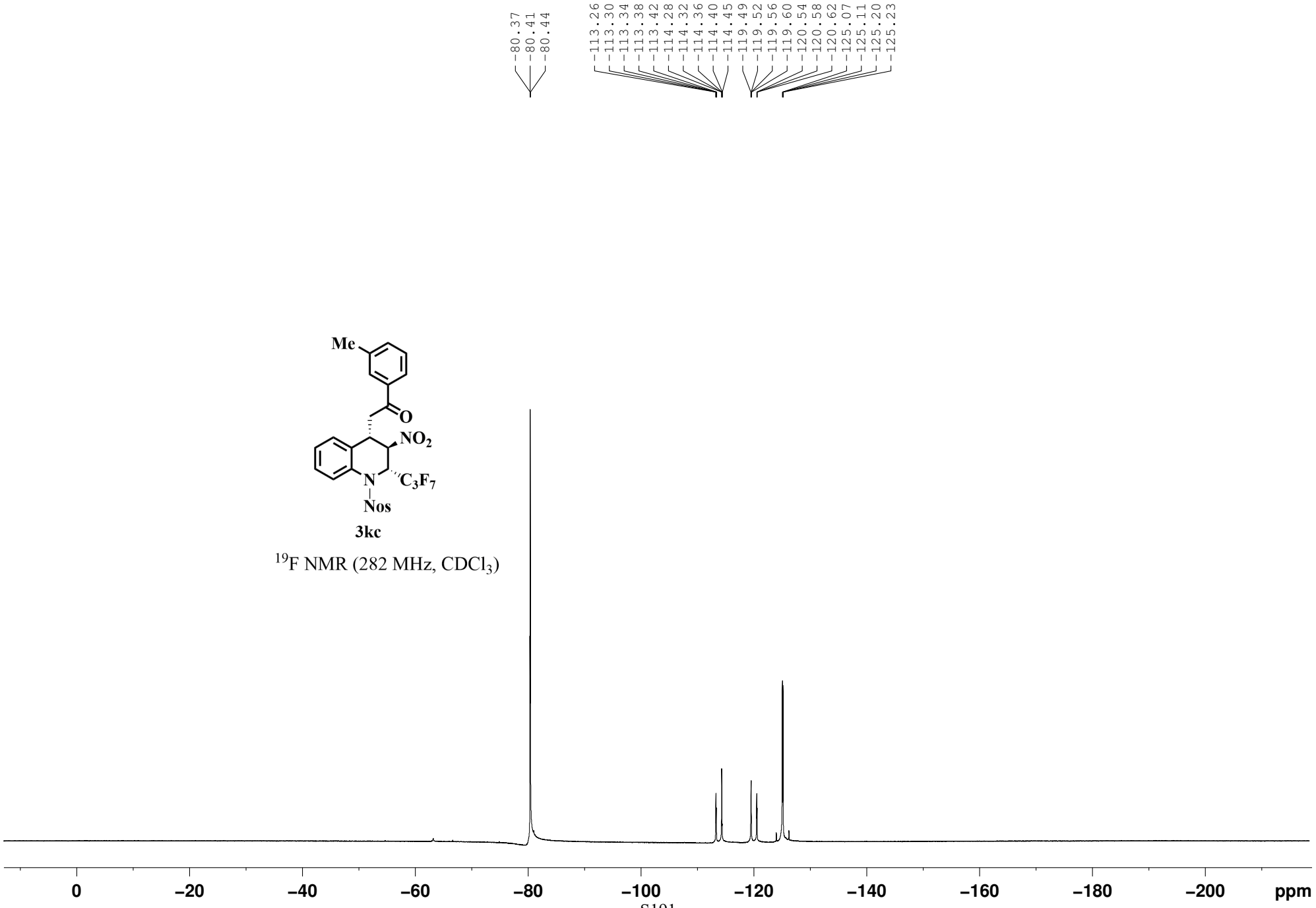
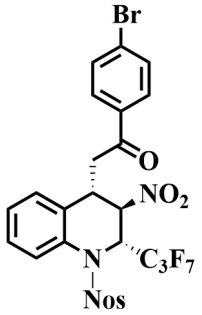
107.17
87.52
76.33
76.02
75.70
59.03
58.83
58.75
58.54
35.20
34.59
20.27
Me
O
NO2
N
C3F7
Nos
3kc
13C NMR (100 MHz, CDCl3)
118
116
114
112
110
108
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm



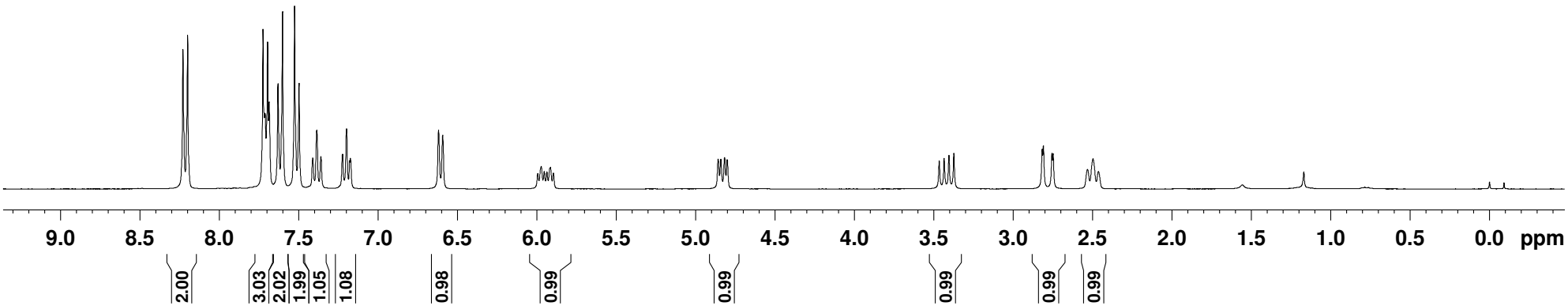
3kc

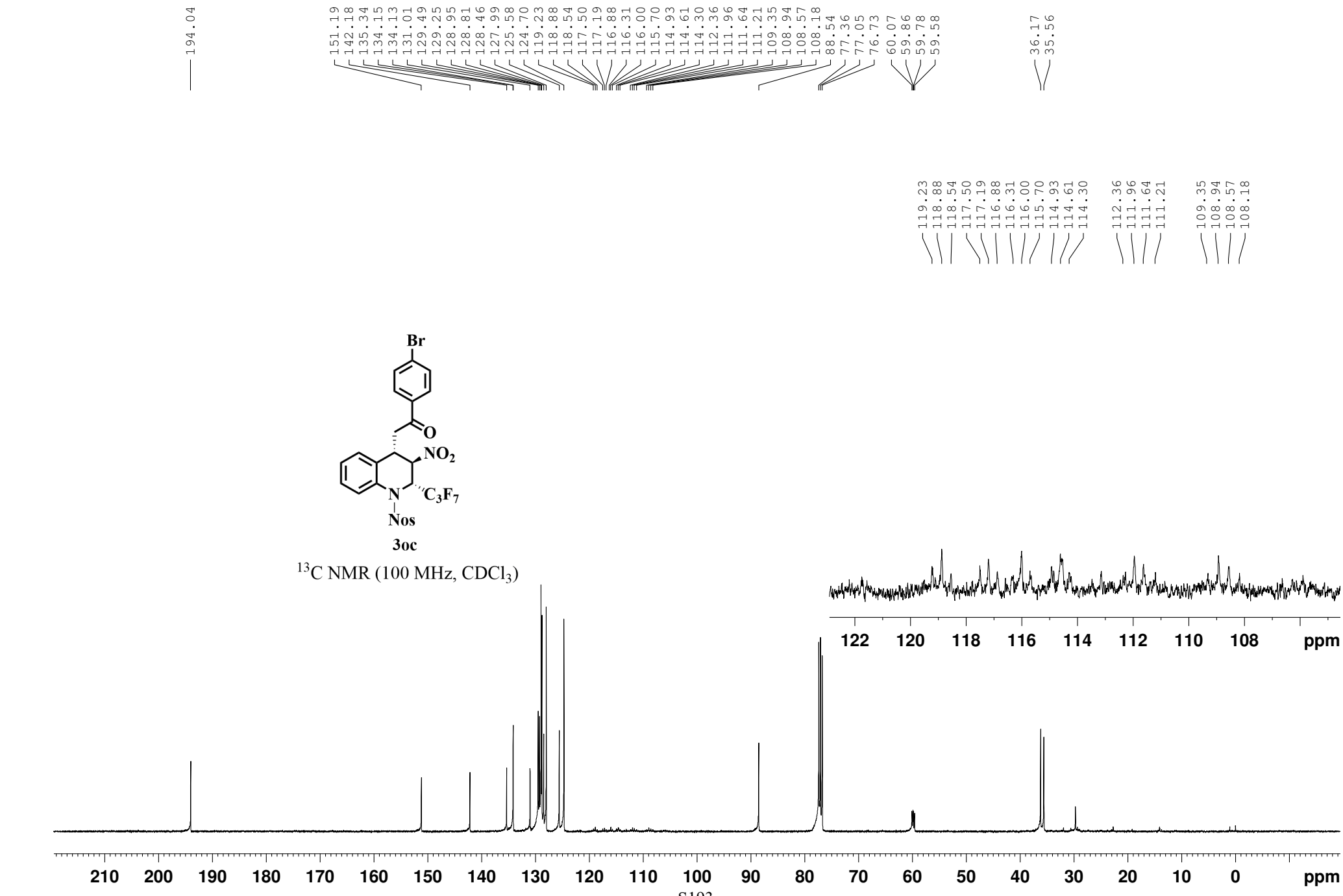
^{19}F NMR (282 MHz, $CDCl_3$)

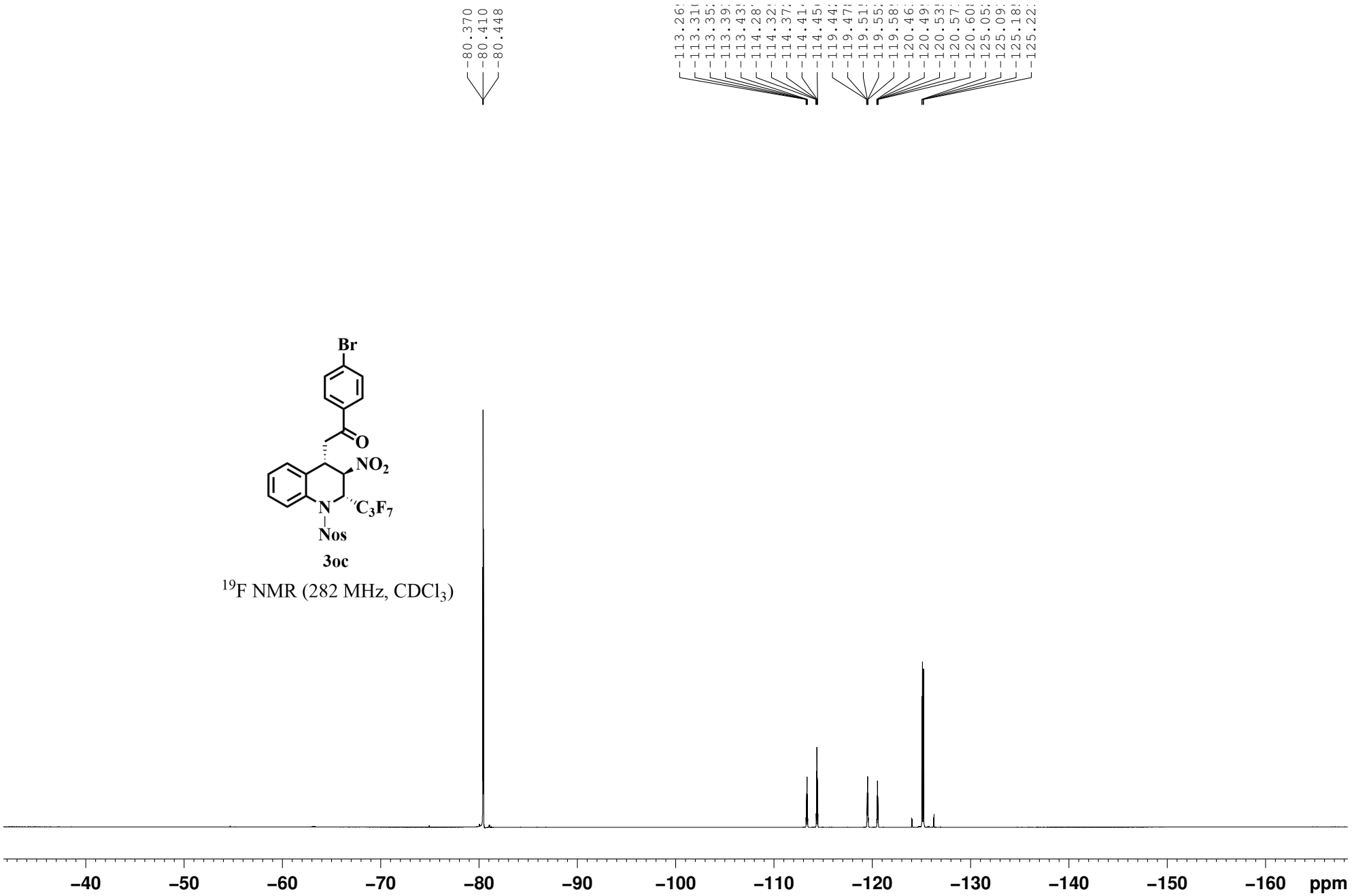


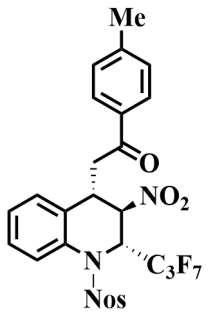
3oc

^{1}H NMR (300 MHz, $CDCl_3$)



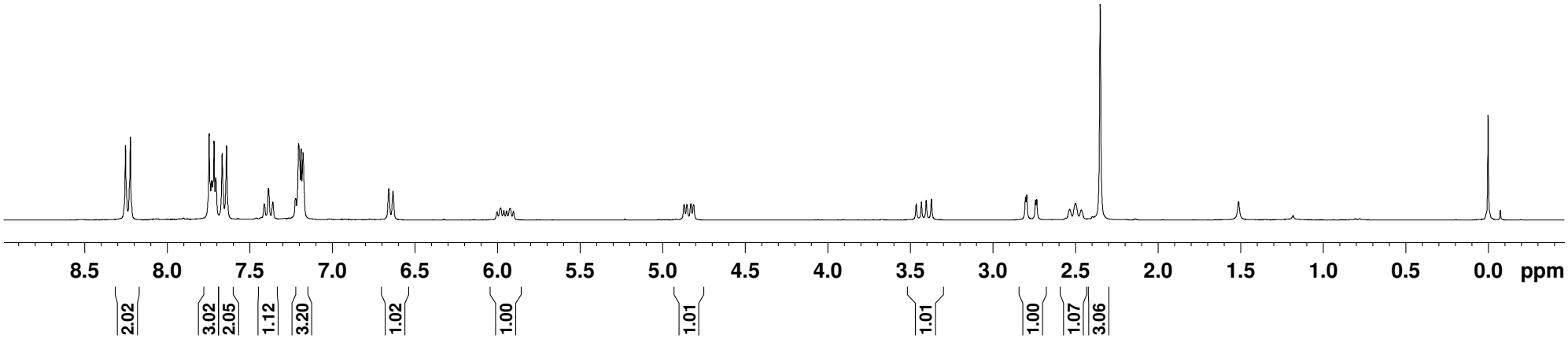

194.04
151.19
142.18
135.34
134.15
134.13
131.01
129.49
129.25
128.95
128.81
128.46
127.99
125.58
124.70
119.23
118.88
118.54
117.50
117.19
116.88
116.31
116.00
115.70
114.93
114.61
114.30
112.36
111.96
111.64
111.21
109.35
108.94
108.57
108.18
88.54
77.36
77.05
76.73
60.07
59.86
59.78
59.58
36.17
35.56
Br
O
NO2
N
C3F7
Nos
3oc
13C NMR (100 MHz, CDCl3)
122
120
118
116
114
112
110
108
ppm
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

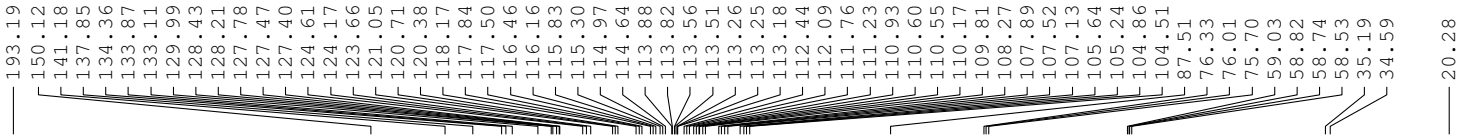

-80.370
-80.410
-80.448
-113.26
-113.31
-113.35
-113.39
-113.43
-114.28
-114.32
-114.37
-114.41
-114.45
-119.44
-119.47
-119.51
-119.55
-119.58
-120.46
-120.49
-120.53
-120.57
-120.60
-125.05
-125.09
-125.18
-125.22
Br
O
NO2
N
C3F7
Nos
3oc
19F NMR (282 MHz, CDCl3)
−40
−50
−60
−70
−80
−90
−100
−110
−120
−130
−140
−150
−160
ppm

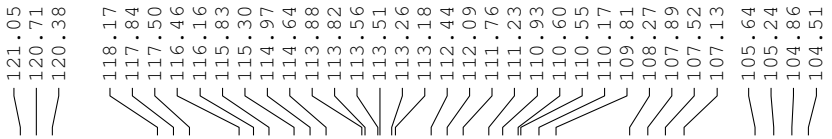


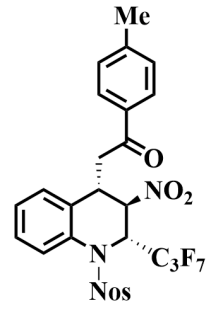
3pc

^{1}H NMR (300 MHz, $CDCl_3$)



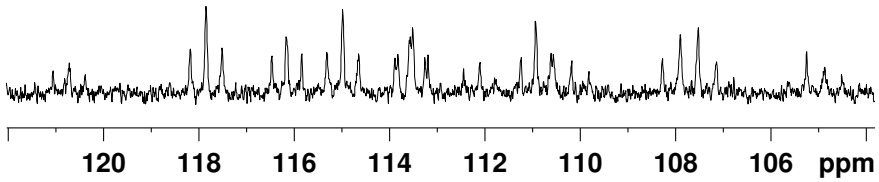


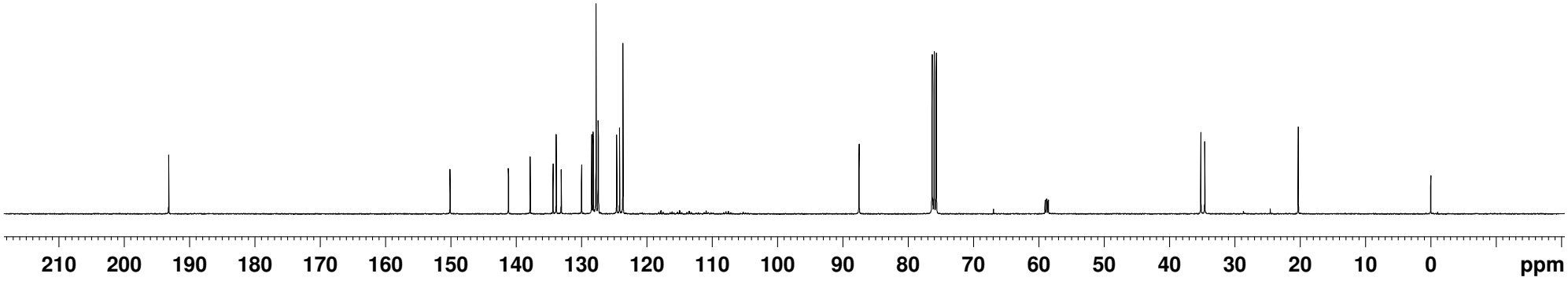


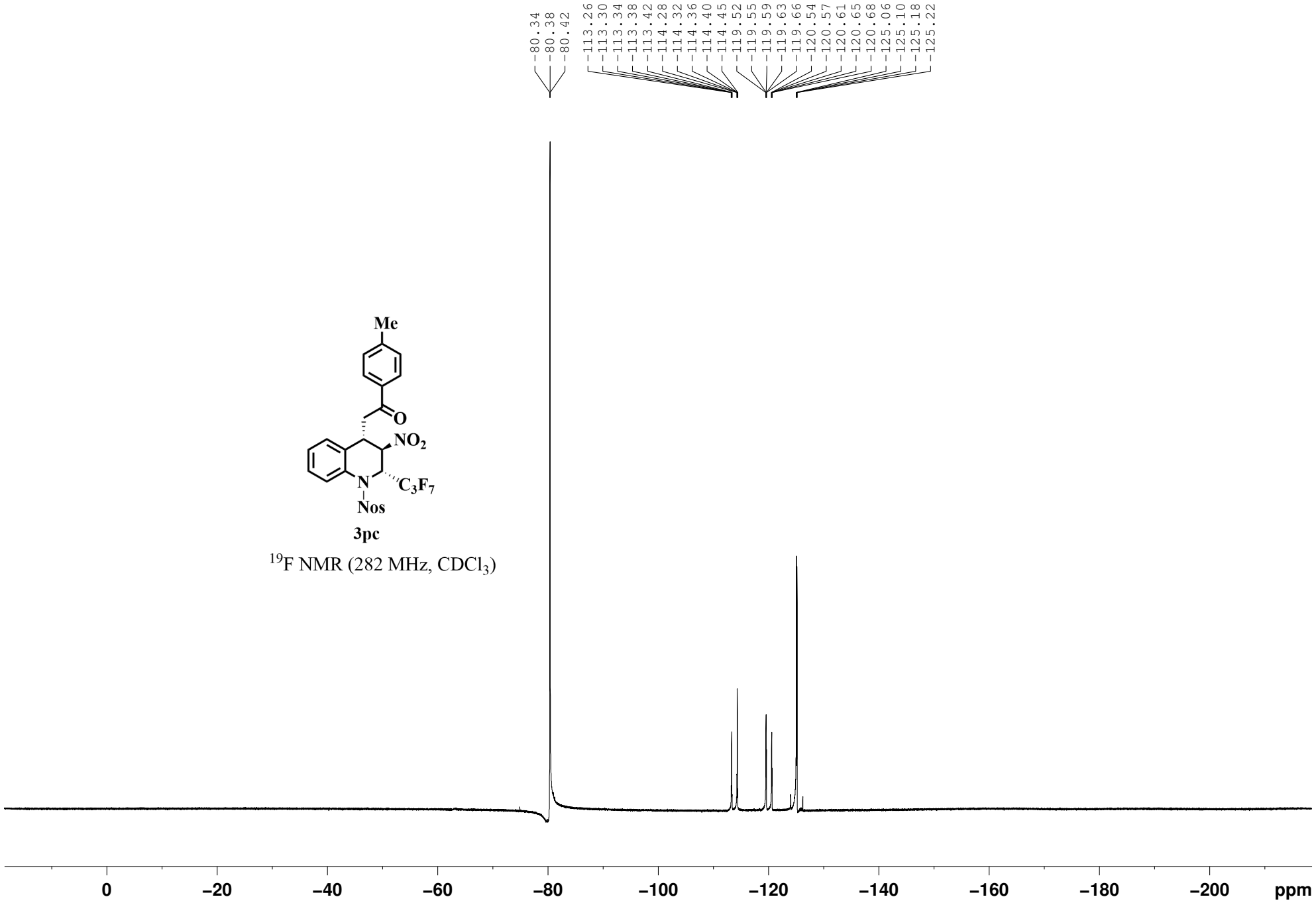


3pc

^{13}C NMR (100 MHz, $CDCl_3$)







3pc

^{19}F NMR (282 MHz, $CDCl_3$)