

Supporting Information:

Synthesis of Chiral Trifluoromethyl Substituted Hydrazines via Pd-Catalyzed Asymmetric Hydrogenation and Reductive Amination

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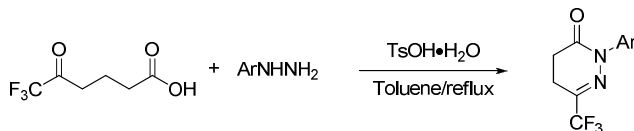
1. General and Materials

General: Commercially available reagents were used without further purification. Solvents were treated prior to use according to the standard methods. ^1H NMR, ^{13}C NMR and ^{19}F NMR spectra were recorded at room temperature in CDCl_3 on 400 MHz instrument with tetramethylsilane (TMS) as internal standard. Enantiomeric excess was determined by HPLC analysis, using chiral column described below in detail. Optical rotations were measured by polarimeter. Flash column chromatography was performed on silica gel (200-300 mesh).

2. General Procedure for Synthesis of $\alpha\text{-CF}_3$ Hydrazones

General Procedure A for the synthesis of cyclic substrates (1a-1k)

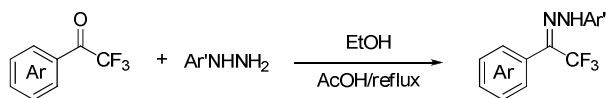
All cyclic substrates were prepared from the accessible starting materials appropriate fluorinated γ -ketoacids and arylhydrazines according to the literature methods.^[1] Hydrazones **1a**, **1c**, **1d**, **1f**, and **1i** are known and their NMR data matched the literature data.



Fluorinated γ -ketoacids (4.0 mmol), TsOH (0.4 mmol), and arylhydrazines (4.0 mmol) were mixed and refluxed in toluene (30 mL) for 12 h under nitrogen atmosphere. Then the mixture was cooled to room temperature. Solvent was removed under reduced pressure and the crude mixture was subjected to flash column chromatography on silica gel using petroleum ether/dichloromethane (1:1) as eluent to afford the pure products.

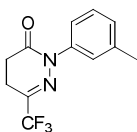
General Procedure B for the synthesis of linear substrates (3a-3j)

All acyclic substrates were prepared from the accessible starting materials appropriate 2,2,2-trifluoro-1-arylethanones and arylhydrazines according to the literature methods.^[2] Hydrazones **3a-b** are known and their NMR data matched the literature data.

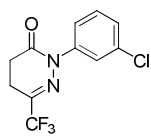


2,2,2-Trifluoro-1-arylethanones (5.0 mmol), AcOH (5.0 mmol) and arylhydrazines (6.0 mmol) were mixed and refluxed in EtOH (30 mL) for 12 h. Then the mixture was cooled to room temperature. Solvent was removed under reduced pressure and the crude mixture was subjected to flash column chromatography on silica gel using petroleum ether/dichloromethane (10:1) as eluent to afford the pure products.

2-*m*-Tolyl-6-(trifluoromethyl)-4,5-dihydropyridazin-3(2*H*)-one (1b): Yellow oil; yield 21%; ^1H NMR (400 MHz, CDCl_3) δ 7.30 (t, $J = 7.7$ Hz, 1H), 7.23 (d, $J = 8.5$ Hz, 2H), 7.13 (d, $J = 7.7$ Hz, 1H), 2.88–2.80 (m, 2H), 2.79–2.77 (m, 2H), 2.38 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.3, 140.8 (q, $J_{\text{C-F}} = 36.4$ Hz), 140.0, 138.8, 128.6, 128.4, 125.7, 122.2, 120.7 (q, $J_{\text{C-F}} = 272.0$ Hz), 27.0, 21.4, 20.3; ^{19}F NMR (377 MHz, CDCl_3) δ -70.9 (s, 3F); HRMS Calculated For $\text{C}_{12}\text{H}_{12}\text{F}_3\text{N}_2\text{O}$ $[\text{M}+\text{H}]^+$ 257.0902, found 257.0896.

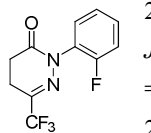


2-(3-Chlorophenyl)-6-(trifluoromethyl)-4,5-dihydropyridazin-3(2H)-one (1e) Yellow oil;



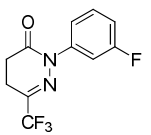
yield 46%; ^1H NMR (400 MHz, CDCl_3) δ 7.51 (t, J = 1.9 Hz, 1H), 7.39–7.38 (m, 1H), 7.33 (t, J = 7.9 Hz, 1H), 7.29–7.27 (m, 1H), 2.90–2.84 (m, 2H), 2.83–2.76 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.1, 141.6 (q, $J_{\text{C-F}}$ = 36.7 Hz), 140.9, 134.3, 129.6, 127.4, 124.9, 122.8, 120.7 (q, $J_{\text{C-F}}$ = 272.0 Hz), 27.0, 20.3; ^{19}F NMR (377 MHz, CDCl_3) δ -71.0 (s, 3F); HRMS Calculated For $\text{C}_{11}\text{H}_9\text{ClF}_3\text{N}_2\text{O}$ $[\text{M}+\text{H}]^+$ 277.0356, found: 277.0350.

2-(2-Fluorophenyl)-6-(trifluoromethyl)-4,5-dihydropyridazin-3(2H)-one (1g) Yellow solid;



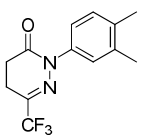
mp: 54–55 $^\circ\text{C}$, yield 39%; ^1H NMR (400 MHz, CDCl_3) δ 7.40–7.34 (m, 2H), 7.24–7.15 (m, 2H), 2.94–2.90 (m, 2H), 2.85–2.80 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.0, 157.3 (d, $J_{\text{C-F}}$ = 252.3 Hz), 141.3 (q, $J_{\text{C-F}}$ = 36.4 Hz), 130.3 (d, $J_{\text{C-F}}$ = 8.0 Hz), 128.5, 127.9 (d, $J_{\text{C-F}}$ = 12.5 Hz), 124.6 (d, $J_{\text{C-F}}$ = 3.8 Hz), 119.0 (q, $J_{\text{C-F}}$ = 272.0 Hz), 116.6 (d, $J_{\text{C-F}}$ = 19.8 Hz), 26.4, 20.4; ^{19}F NMR (377 MHz, CDCl_3) δ -71.0 (s, 3F), -119.7 (s, 1F); HRMS Calculated For $\text{C}_{11}\text{H}_9\text{F}_4\text{N}_2\text{O}$ $[\text{M}+\text{H}]^+$ 261.0651, found: 261.0646.

2-(3-Fluorophenyl)-6-(trifluoromethyl)-4,5-dihydropyridazin-3(2H)-one (1h) Yellow oil;



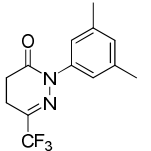
yield 49%; ^1H NMR (400 MHz, CDCl_3) δ 7.40–7.27 (m, 3H), 7.01 (t, J = 8.2 Hz, 1H), 2.90–2.86 (m, 2H), 2.84–2.80 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.1, 162.5 (d, $J_{\text{C-F}}$ = 246.1 Hz), 141.3 (q, $J_{\text{C-F}}$ = 36.4 Hz), 141.3 (d, $J_{\text{C-F}}$ = 10.0 Hz), 129.8 (d, $J_{\text{C-F}}$ = 9.0 Hz), 120.2 (q, $J_{\text{C-F}}$ = 272.0 Hz), 120.0 (d, $J_{\text{C-F}}$ = 3.2 Hz), 114.1 (d, $J_{\text{C-F}}$ = 21.0 Hz), 112.1 (d, $J_{\text{C-F}}$ = 25.2 Hz), 27.0, 20.2; ^{19}F NMR (377 MHz, CDCl_3) δ -71.0 (s, 3F), -111.8 (s, 1F); HRMS Calculated For $\text{C}_{11}\text{H}_9\text{F}_4\text{N}_2\text{O}$ $[\text{M}+\text{H}]^+$ 261.0651, found: 261.0646.

2-(3,4-Dimethylphenyl)-6-(trifluoromethyl)-4,5-dihydropyridazin-3(2H)-one (1j) Yellow oil;



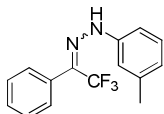
yield 49%; ^1H NMR (400 MHz, CDCl_3) δ 7.18–7.64 (m, 3H), 2.85–2.81 (m, 2H), 2.79–2.74 (m, 2H), 2.27 (s, 3H), 2.26 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.3, 140.6 (q, $J_{\text{C-F}}$ = 36.7 Hz), 137.8, 137.3, 136.4, 129.9, 126.3, 122.6, 120.8 (q, $J_{\text{C-F}}$ = 272.0 Hz), 26.9, 20.3, 19.9, 19.4; ^{19}F NMR (377 MHz, CDCl_3) δ -70.9 (s, 3F); HRMS Calculated For $\text{C}_{13}\text{H}_{14}\text{F}_3\text{N}_2\text{O}$ $[\text{M}+\text{H}]^+$ 271.1058, found: 271.1053.

2-(3,5-Dimethylphenyl)-6-(trifluoromethyl)-4,5-dihydropyridazin-3(2H)-one (1k) Yellow solid;



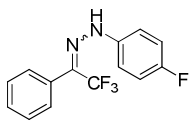
mp: 104–105 $^\circ\text{C}$, yield 47%; ^1H NMR (400 MHz, CDCl_3) δ 7.02 (s, 2H), 6.96 (s, 1H), 2.85 (d, J = 7.2 Hz, 2H), 2.80–2.76 (m, 2H), 2.34 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 164.3, 140.6 (q, $J_{\text{C-F}}$ = 36.7 Hz), 139.9, 138.6, 129.5, 123.0, 120.8 (q, $J_{\text{C-F}}$ = 272.0 Hz), 27.0, 21.3, 20.3; ^{19}F NMR (377 MHz, CDCl_3) δ -70.9 (s, 3F); HRMS Calculated For $\text{C}_{13}\text{H}_{14}\text{F}_3\text{N}_2\text{O}$ $[\text{M}+\text{H}]^+$ 271.1058, found: 271.1053.

1-m-Tolyl-2-(2,2,2-trifluoro-1-phenylethylidene)hydrazine (3c) Yellow oil; yield 60%;

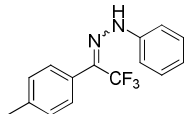


^1H NMR (400 MHz, CDCl_3) δ 7.75 (s, 1H), 7.57–7.52 (m, 3H), 7.39 (d, J = 7.1 Hz, 2H), 7.13 (t, J = 7.8 Hz, 1H), 6.88 (s, 1H), 6.82 (d, J = 8.1 Hz, 1H), 6.75 (d, J = 7.5 Hz, 1H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 142.9, 139.4, 131.3 (q, $J_{\text{C-F}}$ = 34.8 Hz), 130.6, 129.9, 129.2, 129.0, 127.1, 122.8, 121.8 (q, $J_{\text{C-F}}$ = 270.8 Hz), 114.2, 110.8, 21.5; ^{19}F NMR (377 MHz, CDCl_3) δ -66.2 (s, 3F); HRMS Calculated For $\text{C}_{15}\text{H}_{14}\text{F}_3\text{N}_2$ $[\text{M}+\text{H}]^+$ 279.1109, found: 279.1104.

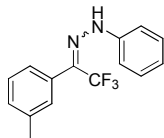
1-(4-Fluorophenyl)-2-(2,2,2-trifluoro-1-phenylethylidene)hydrazine (3d): Yellow oil; yield 63%; ^1H NMR (400 MHz, CDCl_3) δ 7.78 (s, 1H), 7.60–7.52 (m, 3H), 7.41 (d, $J = 5.5$ Hz, 2H), 7.02–6.92 (m, 4H); ^{13}C NMR (100 MHz, CDCl_3) δ 158.3 (d, $J_{\text{C-F}} = 239.8$ Hz), 139.3, 131.7 (q, $J_{\text{C-F}} = 35.0$ Hz), 130.7, 129.9, 128.9, 127.0, 121.8 (q, $J_{\text{C-F}} = 270.8$ Hz), 115.9 (d, $J = 22.8$ Hz), 114.8 (d, $J_{\text{C-F}} = 7.7$ Hz); ^{19}F NMR (377 MHz, CDCl_3) δ -66.3 (s, 3F), -122.3 (s, 1F); HRMS Calculated For $\text{C}_{14}\text{H}_{11}\text{F}_4\text{N}_2$ $[\text{M}+\text{H}]^+$ 283.0858, found: 283.0853.



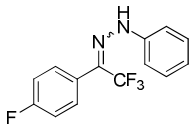
1-Phenyl-2-(2,2,2-trifluoro-1-*p*-tolylethylidene)hydrazine (3e): Yellow oil; yield 50%; ^1H NMR (400 MHz, CDCl_3) δ 7.80 (s, 1H), 7.37 (d, $J = 7.6$ Hz, 2H), 7.30–7.24 (m, 4H), 7.06–7.03 (m, 2H), 6.94–6.91 (m, 1H), 2.44 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 143.0, 140.8, 131.8 (q, $J_{\text{C-F}} = 34.8$ Hz), 130.5, 129.3, 128.8, 124.0, 121.8, 121.2 (q, $J_{\text{C-F}} = 270.7$ Hz), 113.5, 21.5; ^{19}F NMR (377 MHz, CDCl_3) δ -66.4 (s, 3F); HRMS Calculated For $\text{C}_{15}\text{H}_{14}\text{F}_3\text{N}_2$ $[\text{M}+\text{H}]^+$ 279.1109, found: 279.1104.



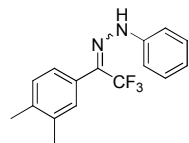
1-Phenyl-2-(2,2,2-trifluoro-1-*m*-tolylethylidene)hydrazine (3f): Yellow oil; yield 52%; ^1H NMR (400 MHz, CDCl_3) δ 7.79 (s, 1H), 7.47–7.43 (m, 1H), 7.36–7.33 (m, 1H), 7.28–7.20 (m, 4H), 7.07–7.04 (m, 2H), 6.96–6.91 (m, 1H), 2.44 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 143.0, 139.9, 131.8 (q, $J_{\text{C-F}} = 34.8$ Hz), 131.4, 129.7, 129.4, 129.3, 127.0, 126.0, 121.8, 121.2 (q, $J_{\text{C-F}} = 270.7$ Hz), 113.6, 21.5; ^{19}F NMR (377 MHz, CDCl_3) δ -66.4 (s, 3F); HRMS Calculated For $\text{C}_{15}\text{H}_{14}\text{F}_3\text{N}_2$ $[\text{M}+\text{H}]^+$ 279.1109, found: 279.1104.



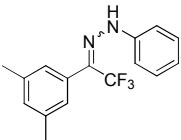
1-Phenyl-2-(2,2,2-trifluoro-1-(4-fluorophenyl)ethylidene)hydrazine (3g): Yellow oil; yield 25%; ^1H NMR (400 MHz, CDCl_3) δ 7.72 (s, 1H), 7.43–7.39 (m, 2H), 7.29–7.24 (m, 4H), 7.08–7.04 (m, 2H), 6.98–6.93 (m, 1H); ^{13}C NMR (101 MHz, CDCl_3) δ 163.8 (d, $J_{\text{C-F}} = 251.7$ Hz), 142.8, 132.0 (d, $J_{\text{C-F}} = 8.6$ Hz), 130.5 (q, $J_{\text{C-F}} = 35.2$ Hz), 129.4, 122.9 (d, $J_{\text{C-F}} = 3.7$ Hz), 122.1, 120.3 (q, $J_{\text{C-F}} = 270.5$ Hz), 117.2 (d, $J_{\text{C-F}} = 21.8$ Hz), 113.6; ^{19}F NMR (377 MHz, CDCl_3) δ -66.5 (s, 3F), -108.7 (s, 1F); HRMS Calculated For $\text{C}_{14}\text{H}_{11}\text{F}_4\text{N}_2$ $[\text{M}+\text{H}]^+$ 283.0858, found: 283.0853.



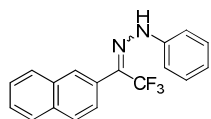
1-(1-(3,4-Dimethylphenyl)-2,2,2-trifluoroethylidene)-2-phenylhydrazine (3h): Yellow oil; yield 83%; ^1H NMR (400 MHz, CDCl_3) δ 7.82 (s, 1H), 7.33–7.30 (m, 1H), 7.28–7.23 (m, 2H), 7.16–7.11 (m, 2H), 7.06–7.04 (m, 2H), 6.96–6.91 (m, 1H), 2.35 (s, 3H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ 143.1, 139.5, 138.5, 132.0 (q, $J_{\text{C-F}} = 34.8$ Hz), 131.0, 129.7, 129.3, 126.3, 124.4, 121.9 (q, $J_{\text{C-F}} = 270.7$ Hz), 121.7, 113.5, 19.9, 19.8; ^{19}F NMR (377 MHz, CDCl_3) δ -66.5 (s, 3F); HRMS Calculated For $\text{C}_{16}\text{H}_{16}\text{F}_3\text{N}_2$ $[\text{M}+\text{H}]^+$ 293.1266, found: 293.1260.



1-(1-(3,5-Dimethylphenyl)-2,2,2-trifluoroethylidene)-2-phenylhydrazine (3i): Yellow oil; yield 80%; ^1H NMR (400 MHz, CDCl_3) δ 7.77 (s, 1H), 7.21 (t, $J = 7.9$ Hz, 2H), 7.13 (s, 1H), 7.02 (d, $J = 7.9$ Hz, 2H), 6.97 (s, 2H), 6.89 (t, $J = 7.3$ Hz, 1H), 2.36 (s, 6H); ^{13}C NMR (100 MHz, CDCl_3) δ 143.1, 139.8, 132.3, 132.2 (q, $J_{\text{C-F}} = 34.8$ Hz), 129.4, 127.0, 126.4, 121.8, 121.7 (q, $J_{\text{C-F}} = 270.7$ Hz), 113.6, 21.4; ^{19}F NMR (377 MHz, CDCl_3) δ -66.3 (s, 3F); HRMS Calculated For $\text{C}_{16}\text{H}_{16}\text{F}_3\text{N}_2$ $[\text{M}+\text{H}]^+$ 293.1266, found: 293.1260.

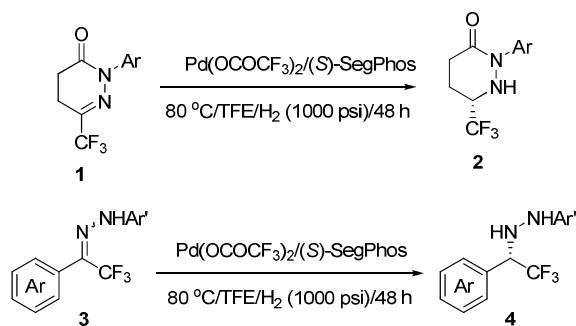


1-Phenyl-2-(2,2,2-trifluoro-1-(naphthalen-2-yl)ethylidene)hydrazine (3j): Pale yellow solid; mp = 130–131 °C, yield 73%; ^1H NMR (400 MHz, CDCl_3) δ 8.03 (d, $J = 8.5$ Hz, 1H), 7.93–7.86



(m, 4H), 7.64–7.56 (m, 2H), 7.45 (d, $J = 8.4$ Hz, 1H), 7.27–7.22 (m, 2H), 7.05 (d, $J = 7.7$ Hz, 2H), 6.93 (t, $J = 7.3$ Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ 142.9, 133.9, 133.4, 131.6 (q, $J_{\text{C-F}} = 34.8$ Hz), 129.9, 129.4, 129.3, 128.5, 128.0, 127.8, 127.2, 125.3, 124.4, 122.6 (q, $J_{\text{C-F}} = 270.7$ Hz), 121.9, 113.6; ^{19}F NMR (377 MHz, CDCl_3) δ -66.1 (s, 3F); HRMS Calculated For $\text{C}_{18}\text{H}_{14}\text{F}_3\text{N}_2$ $[\text{M}+\text{H}]^+$ 315.1109, found: 315.1104.

3. General Procedure for Hydrogenation of $\alpha\text{-CF}_3$ Hydrazones



General procedure: (*S*)-SegPhos (6.7 mg, 0.011 mmol) and $\text{Pd}(\text{OCOCF}_3)_2$ (3.3 mg, 0.01 mmol) were placed in a dried Schlenk tube under nitrogen atmosphere, and 1 mL degassed anhydrous acetone was added. The mixture was stirred at room temperature for 1 h, and then solvent was removed under vacuum to give the catalyst. In a glovebox, trifluoromethyl substituted hydrazones (0.2 mmol) and the above catalyst together with TFE (2.0 mL) were stirred at room temperature for 1 min. Subsequently, trifluoroacetic acid (TFA, 22.8 mg, 0.2 mmol) was added to the reaction mixture. The hydrogenation was performed at 80 °C under H_2 (1000 psi) in a stainless steel autoclave for 48 h. After carefully releasing the hydrogen, the resulting mixture was concentrated under vacuum and dissolved in saturated aqueous sodium bicarbonate (5 mL). After stirring for 10 min, the mixture was extracted with dichloromethane and dried over sodium sulfate. After purification by silica gel chromatography using petroleum ether/dichloromethane (1:1) as eluent, the enantiomeric excess of the products were determined by HPLC with chiral column.

Scalable reaction: (*R*)-SegPhos (33.5 mg, 0.055 mmol) and $\text{Pd}(\text{OCOCF}_3)_2$ (16.5 mg, 0.05 mmol) were placed in a dried Schlenk tube under nitrogen atmosphere, and 2 mL degassed anhydrous acetone was added. The mixture was stirred at room temperature for 1 h, and then solvent was removed under vacuum to give the catalyst. In a glovebox, trifluoromethyl substituted hydrazones **1c** (256.2 mg, 1.0 mmol) and the above catalyst together with TFE (5.0 mL) were stirred at room temperature for 1 min. Subsequently, trifluoroacetic acid (TFA, 114.0 mg, 1.0 mmol) was added to the reaction mixture. The hydrogenation was performed at 80 °C under H_2 (1000 psi) in a stainless steel autoclave for 48 h. After carefully releasing the hydrogen, the resulting mixture was concentrated under vacuum and dissolved in saturated aqueous sodium bicarbonate (20 mL). After stirring for 10 min, the mixture was extracted with dichloromethane and dried over sodium sulfate. The residue was purified by silica gel column chromatography (petroleum ester/ dichloromethane = 1/1) to afford a yellow oil compound: 0.245 g, 95% yield. The enantiomeric excess of the product **2c** were determined by HPLC: 95% ee; (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), $t_1 = 12.0$ min, $t_2 = 17.8$ min (maj).

(+)-2-Phenyl-6-(trifluoromethyl)piperazin-3-one (2a): Yellow oil; yield 94%, 95% ee, $[\alpha]_D^{20} = +5.0$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.70–7.67 (m, 2H), 7.36–7.31 (m, 2H), 7.15 (t, *J* = 7.4 Hz, 1H), 4.78 (d, *J* = 7.6 Hz, 1H), 3.76–3.67 (m, 1H), 2.70–2.60 (m, 2H), 2.43–2.36 (m, 1H), 2.17–2.10 (m, 1H); ¹³C NMR (101 MHz, CDCl₃) δ 172.4, 141.3, 128.5, 125.3, 125.0 (q, *J*_{C-F} = 278.7 Hz), 121.4, 55.7 (q, *J*_{C-F} = 30.2 Hz), 31.0, 21.7; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.1 (s, 3F); HRMS Calculated For C₁₁H₁₂F₃N₂O [M+H]⁺ 245.0902, found: 245.0896; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), *t*₁ = 12.6 min (maj), *t*₂ = 20.0 min.

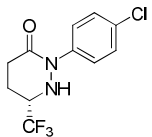
(+)-2-*m*-Tolyl-6-(trifluoromethyl)piperazin-3-one (2b): Yellow oil; yield 91%, 95% ee, $[\alpha]_D^{20} = +7.0$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.48–7.42 (m, 2H), 7.21 (t, *J* = 7.8 Hz, 1H), 6.97 (d, *J* = 7.5 Hz, 1H), 4.81 (d, *J* = 7.7 Hz, 1H), 3.71–3.62 (m, 1H), 2.67–2.52 (m, 2H), 2.40–2.32 (m, 4H), 2.15–2.07 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.5, 141.2, 138.4, 128.3, 126.3, 125.3 (q, *J*_{C-F} = 278.8 Hz), 122.4, 118.8, 55.6 (q, *J*_{C-F} = 30.2 Hz), 30.9, 21.7, 21.6; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.0 (s, 3F); HRMS Calculated For C₁₂H₁₄F₃N₂O [M+H]⁺ 259.1058, found: 259.1053; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), *t*₁ = 11.1 min (maj), *t*₂ = 17.2 min.

(+)-2-*p*-Tolyl-6-(trifluoromethyl)piperazin-3-one (2c): Yellow oil; yield 95%, 95% ee, $[\alpha]_D^{20} = +6.6$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.51 (d, *J* = 8.5 Hz, 2H), 7.13 (d, *J* = 8.3 Hz, 2H), 4.84 (d, *J* = 7.6 Hz, 1H), 3.70–3.61 (m, 1H), 2.66–2.55 (m, 2H), 2.37–2.31 (m, 4H), 2.14–2.03 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.4, 138.8, 135.2, 129.1, 126.0 (q, *J*_{C-F} = 278.8 Hz), 121.7, 55.6 (q, *J*_{C-F} = 30.2 Hz), 30.9, 21.7, 20.9; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.1 (s, 3F); HRMS Calculated For C₁₂H₁₄F₃N₂O [M+H]⁺ 259.1058, found: 259.1053; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), *t*₁ = 11.5 min (maj), *t*₂ = 17.4 min.

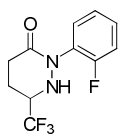
(+)-2-(4-Methoxyphenyl)-6-(trifluoromethyl)piperazin-3-one (2d): Yellow oil; yield 93%, 95% ee, $[\alpha]_D^{20} = +5.2$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.54–7.49 (m, 2H), 6.87–6.83 (m, 2H), 4.89 (d, *J* = 7.6 Hz, 1H), 3.78 (s, 3H), 3.71–3.60 (m, 1H), 2.66–2.56 (m, 2H), 2.39–2.34 (m, 1H), 2.15–2.05 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.2, 157.2, 134.4, 124.7 (q, *J*_{C-F} = 278.7 Hz), 123.5, 113.7, 55.6 (q, *J*_{C-F} = 30.1 Hz), 55.4, 30.7, 21.8; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.1 (s, 3F); HRMS Calculated For C₁₂H₁₄F₃N₂O₂ [M+H]⁺ 275.1007, found: 275.1002; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), *t*₁ = 17.3 min (maj), *t*₂ = 31.1 min.

(+)-2-(3-Chlorophenyl)-6-(trifluoromethyl)piperazin-3-one (2e): Yellow solid; mp = 99–100 °C, yield 95%, 95% ee, $[\alpha]_D^{20} = +3.0$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.78 (t, *J* = 2.1 Hz, 1H), 7.66–7.62 (m, 1H), 7.24 (t, *J* = 8.2 Hz, 1H), 7.12–7.09 (m, 1H), 4.86 (d, *J* = 7.4 Hz, 1H), 3.76–3.67 (m, 1H), 2.65–2.54 (m, 2H), 2.42–2.36 (m, 1H), 2.14–2.06 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.7, 142.4, 134.1, 129.5, 125.1, 125.0 (q, *J*_{C-F} = 278.7 Hz), 121.0, 118.9, 55.5 (q, *J*_{C-F} = 30.1 Hz), 31.1, 21.4; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.1 (s, 3F); HRMS Calculated For C₁₁H₁₁ClF₃N₂O [M+H]⁺ 279.0512, found: 279.0507; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), *t*₁ = 11.2 min (maj), *t*₂ = 18.6 min.

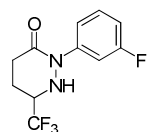
(S)-2-(4-Chlorophenyl)-6-(trifluoromethyl)piperazin-3-one (2f): Pale yellow solid; mp = 148–149 °C, yield 93%, 97% ee, $[\alpha]_D^{20} = +6.0$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.71 (d, *J* = 9.0 Hz, 2H), 7.29 (d, *J* = 9.1 Hz, 2H), 4.74 (d, *J* = 7.5 Hz, 1H), 3.81–3.70 (m, 1H), 2.74–2.58 (m, 2H), 2.47–2.40 (m, 1H), 2.19–2.12 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.3, 139.9, 130.2, 128.5, 122.2, 125.0 (q, *J*_{C-F} = 278.8 Hz), 55.6 (q, *J*_{C-F} = 30.1 Hz), 31.1, 21.5; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.1 (s, 3F); HRMS Calculated For C₁₁H₁₁ClF₃N₂O [M+H]⁺ 279.0512, found: 279.0507; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), t₁ = 11.3 min (maj), t₂ = 16.0 min.



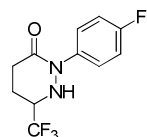
(+)-2-(2-Fluorophenyl)-6-(trifluoromethyl)piperazin-3-one (2g): Yellow oil; yield 82%, 92% ee, $[\alpha]_D^{20} = +6.6$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.31–7.26 (m, 2H), 7.17–7.10 (m, 2H), 5.13 (d, *J* = 7.8 Hz, 1H), 3.74 (dt, *J* = 16.2, 8.2 Hz, 1H), 2.74–2.59 (m, 2H), 2.43 (dq, *J* = 9.9, 5.3 Hz, 1H), 2.25–2.17 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.6, 157.2 (d, *J*_{C-F} = 249.1 Hz), 129.3 (d, *J*_{C-F} = 8.0 Hz), 128.5 (d, *J*_{C-F} = 12.3 Hz), 128.1, 126.0 (q, *J*_{C-F} = 278.6 Hz), 124.4 (d, *J*_{C-F} = 3.7 Hz), 116.4 (d, *J*_{C-F} = 19.8 Hz), 55.6 (q, *J*_{C-F} = 30.0 Hz), 29.6, 22.0; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.3 (s, 3F), -119.7 (s, 1F); HRMS Calculated For C₁₁H₁₁F₄N₂O [M+H]⁺ 263.0808, found: 263.0802; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), t₁ = 15.4 min (maj), t₂ = 24.6 min.



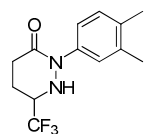
(+)-2-(3-Fluorophenyl)-6-(trifluoromethyl)piperazin-3-one (2h): Yellow oil; yield 90%, 95% ee, $[\alpha]_D^{20} = +5.8$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.61–7.56 (m, 2H), 7.31–7.25 (m, 1H), 6.86–6.82 (m, 1H), 4.75 (d, *J* = 7.4 Hz, 1H), 3.80–3.71 (m, 1H), 2.74–2.58 (m, 2H), 2.47–2.39 (m, 1H), 2.18–2.11 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.7, 162.6 (d, *J*_{C-F} = 243.9 Hz), 142.9 (d, *J*_{C-F} = 10.3 Hz), 129.6 (d, *J*_{C-F} = 9.1 Hz), 124.9 (q, *J*_{C-F} = 278.7 Hz), 116.1 (d, *J*_{C-F} = 3.0 Hz), 111.7 (d, *J*_{C-F} = 21.2 Hz), 108.2 (d, *J*_{C-F} = 26.9 Hz), 55.5 (q, *J*_{C-F} = 30.6 Hz), 31.2, 21.4; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.2 (s, 3F), -112.0 (s, 1F); HRMS Calculated For C₁₁H₁₁F₄N₂O [M+H]⁺ 263.0808, found: 263.0802; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), t₁ = 10.5 min (maj), t₂ = 16.4 min.



(+)-2-(4-Fluorophenyl)-6-(trifluoromethyl)piperazin-3-one (2i): Yellow oil; yield 92%, 96% ee, $[\alpha]_D^{20} = +6.2$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.67–7.64 (m, 2H), 7.04–6.99 (m, 2H), 4.83 (d, *J* = 7.6 Hz, 1H), 3.79–3.68 (m, 1H), 2.71–2.55 (m, 2H), 2.44–2.39 (m, 1H), 2.19–2.11 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.4, 159.9 (d, *J*_{C-F} = 244.9 Hz), 137.3 (d, *J*_{C-F} = 2.9 Hz), 124.4 (q, *J*_{C-F} = 278.7 Hz), 123.2 (d, *J*_{C-F} = 8.1 Hz), 115.1 (d, *J*_{C-F} = 22.5 Hz), 55.5 (q, *J*_{C-F} = 30.2 Hz), 30.9, 21.7; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.1 (s, 3F), -117.1 (s, 1F); HRMS Calculated For C₁₁H₁₁F₄N₂O [M+H]⁺ 263.0808, found: 263.0802; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), t₁ = 11.3 min (maj), t₂ = 17.6 min.

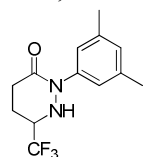


(-)-2-(3,4-Dimethylphenyl)-6-(trifluoromethyl)piperazin-3-one (2j): Yellow oil; yield 86%, 95% ee, $[\alpha]_D^{20} = -3.2$ (c 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.40 (d, *J* = 2.0 Hz, 1H), 7.40–7.33 (m, 1H), 7.08 (d, *J* = 8.2 Hz, 1H), 4.80 (d, *J* = 7.7 Hz, 1H), 3.70–3.61 (m, 1H), 2.65–2.56 (m, 2H), 2.37–2.33 (m, 1H), 2.24 (s, 3H), 2.21 (s, 3H), 2.15–2.03 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.3, 139.0, 136.8, 134.1, 129.6, 124.7 (q, *J*_{C-F} = 278.7 Hz), 123.2, 119.5, 55.6 (q, *J*_{C-F} = 30.0 Hz), 30.8, 21.8, 20.0, 19.2; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.0 (s, 3F); HRMS Calculated For C₁₃H₁₆F₃N₂O [M+H]⁺ 273.1215, found:

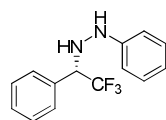


273.1209; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), t_1 = 11.5 min (maj), t_2 = 17.8 min.

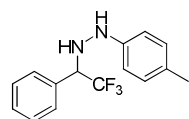
(+)-2-(3,5-Dimethylphenyl)-6-(trifluoromethyl)piperazin-3-one (2k): Yellow oil; yield 97%, 96% ee, $[\alpha]_D^{20}$ = +2.4 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.26 (s, 2H), 6.81 (s, 1H), 4.72 (d, *J* = 7.9 Hz, 1H), 3.77–3.64 (m, 1H), 2.71–2.59 (m, 2H), 2.40–2.35 (m, 1H), 2.31 (s, 6H), 2.18–2.11 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 172.2, 141.0, 138.2, 127.4, 125.5 (q, *J*_{C-F} = 278.6 Hz), 119.7, 55.7 (q, *J*_{C-F} = 30.1 Hz), 30.9, 21.7, 21.5; ¹⁹F NMR (377 MHz, CDCl₃) δ -76.0 (s, 3F); HRMS Calculated For C₁₃H₁₆F₃N₂O [M+H]⁺ 273.1215, found: 273.1209; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 1.0 mL/min), t_1 = 10.6 min (maj), t_2 = 19.8 min.



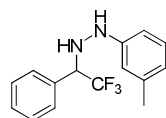
(S)-1-Phenyl-2-(2,2,2-trifluoro-1-phenylethyl)hydrazine (4a): Pale yellow solid; mp = 44–45 °C, yield 94%, 92% ee, $[\alpha]_D^{20}$ = +91.6 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.43–7.40 (m, 5H), 7.23–7.22 (m, 2H), 6.85–6.78 (m, 3H), 5.27 (br, 1H), 4.39 (q, *J* = 7.4 Hz, 1H), 4.13 (br, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 147.6, 132.8, 129.5, 129.4, 129.1, 128.5, 126.3 (q, *J*_{C-F} = 280.6 Hz), 120.1, 113.2, 65.0 (q, *J*_{C-F} = 27.6 Hz); ¹⁹F NMR (377 MHz, CDCl₃) δ -72.6 (s, 3F); HRMS Calculated For C₁₄H₁₄F₃N₂ [M+H]⁺ 267.1109, found: 267.1104; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 95/5, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 25.7 min, t_2 = 26.9 min (maj).



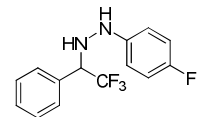
(-)-1-*p*-Tolyl-2-(2,2,2-trifluoro-1-phenylethyl)hydrazine (4b): Pale yellow oil; yield 89%, 93% ee, $[\alpha]_D^{20}$ = -103.0 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.43–7.38 (m, 5H), 7.02–7.01 (m, 2H), 6.72–6.70 (m, 2H), 5.15 (br, 1H), 4.40 (q, *J* = 7.5 Hz, 1H), 4.12 (br, 1H), 2.26 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 145.2, 132.9, 129.9, 129.5, 129.5, 129.1, 128.5, 125.7 (q, *J*_{C-F} = 280.5 Hz), 113.5, 64.7 (q, *J*_{C-F} = 27.6 Hz), 20.5; ¹⁹F NMR (377 MHz, CDCl₃) δ -72.6 (s, 3F); HRMS Calculated For C₁₅H₁₆F₃N₂ [M+H]⁺ 281.1266, found: 281.126; HPLC (OD-H, elute: Hexanes/*i*-PrOH = 95/5, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 21.1 min, t_2 = 28.3 min (maj).



(+)-1-*m*-Tolyl-2-(2,2,2-trifluoro-1-phenylethyl)hydrazine (4c): Pale yellow oil; yield 87%, 93% ee, $[\alpha]_D^{20}$ = +43.6 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.44–7.38 (m, 5H), 7.10 (t, *J* = 7.9 Hz, 1H), 6.67–6.60 (m, 3H), 5.23 (br, 1H), 4.44–4.35 (m, 1H), 4.11 (d, *J* = 4.1 Hz, 1H), 2.28 (br, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 147.6, 139.3, 132.9, 129.5, 129.2, 129.1, 128.5, 124.9 (q, *J*_{C-F} = 280.5 Hz), 121.0, 113.9, 110.2, 64.9 (q, *J*_{C-F} = 27.6 Hz), 21.6; ¹⁹F NMR (377 MHz, CDCl₃) δ -72.6 (s, 3F); HRMS Calculated For C₁₅H₁₆F₃N₂ [M+H]⁺ 281.1266, found: 281.126; HPLC (OG-H, elute: Hexanes/*i*-PrOH = 95/5, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 12.1 min (maj), t_2 = 13.7 min.



(+)-1-(4-Fluorophenyl)-2-(2,2,2-trifluoro-1-phenylethyl)hydrazine (4d): Pale yellow oil; yield 93%, 93% ee, $[\alpha]_D^{20}$ = +37.0 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.45–7.38 (m, 5H), 6.91 (dd, *J* = 9.7, 7.7 Hz, 2H), 6.80–6.76 (m, 2H), 5.15 (br, 1H), 4.40–4.33 (m, 1H), 4.16 (d, *J* = 5.9 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 157.3 (d, *J*_{C-F} = 237.6 Hz), 143.8 (d, *J*_{C-F} = 2.0 Hz), 132.7, 129.6, 129.1, 128.4, 125.6 (q, *J*_{C-F} = 280.5 Hz), 115.8 (d, *J*_{C-F} = 22.5 Hz), 114.4 (d, *J*_{C-F} = 7.6 Hz), 65.0 (q, *J*_{C-F} = 27.6 Hz); ¹⁹F NMR (377 MHz, CDCl₃) δ -72.5 (s, 3F), -124.8 (s, 1F); HRMS Calculated For C₁₄H₁₃F₄N₂ [M+H]⁺ 285.1009, found: 285.0998; HPLC (OG-H, elute: Hexanes/*i*-PrOH = 95/5, detector: 254



nm, flow rate: 0.7 mL/min), t_1 = 15.9 min (maj), t_2 = 20.3 min.

(+)-1-Phenyl-2-(2,2,2-trifluoro-1-p-tolyethyl)hydrazine (4e): Pale yellow oil; yield 91%, 92% ee, $[\alpha]_D^{20}$ = +94.0 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.29 (d, *J* = 8.1 Hz, 2H), 7.24–7.19 (m, 4H), 6.85–6.79 (m, 3H), 5.25 (br, 1H), 4.39–4.32 (m, 1H), 4.09 (d, *J* = 5.4 Hz, 1H), 2.38 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 147.6, 139.5, 129.8, 129.4, 128.4, 125.8 (q, *J*_{C-F} = 280.4 Hz), 123.0, 120.0, 113.1, 64.6 (q, *J*_{C-F} = 27.6 Hz), 21.2; ¹⁹F NMR (377 MHz, CDCl₃) δ -72.8 (s, 3F); HRMS Calculated For C₁₅H₁₆F₃N₂ [M+H]⁺ 281.1266, found: 281.1260; HPLC (AD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 10.1 min, t_2 = 13.9 min (maj).

(+)-1-Phenyl-2-(2,2,2-trifluoro-1-m-tolyethyl)hydrazine (4f): Pale yellow oil; yield 94%, 92% ee, $[\alpha]_D^{20}$ = +69.0 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.32 (t, *J* = 7.8 Hz, 1H), 7.25–7.18 (m, 5H), 6.86–6.80 (m, 3H), 5.25 (br, 1H), 4.39–4.31 (m, 1H), 4.13–4.10 (m, 1H), 2.39 (s, 3H); ¹³C NMR (100 MHz, CDCl₃) δ 147.6, 138.9, 132.7, 130.3, 129.4, 129.1, 129.0, 126.4 (q, *J*_{C-F} = 280.4 Hz), 125.5, 120.0, 113.1, 64.9 (q, *J*_{C-F} = 27.6 Hz), 21.5; ¹⁹F NMR (377 MHz, CDCl₃) δ -72.6 (s, 3F); HRMS Calculated For C₁₅H₁₆F₃N₂ [M+H]⁺ 281.1266, found: 281.1260; HPLC (AD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 9.5 min, t_2 = 13.0 min (maj).

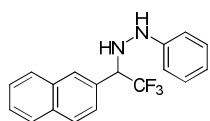
(+)-1-Phenyl-2-(2,2,2-trifluoro-1-(4-fluorophenyl)ethyl)hydrazine (4g): Pale yellow solid; mp: 49–50 °C, yield 91%, 91% ee, $[\alpha]_D^{20}$ = +91.0 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.40–7.36 (m, 2H), 7.24–7.19 (m, 2H), 7.13–7.07 (m, 2H), 6.86–6.77 (m, 3H), 5.24 (br, 1H), 4.44–4.37 (m, 1H), 4.10–4.08 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 163.3 (d, *J*_{C-F} = 248.8 Hz), 147.5, 130.4 (d, *J*_{C-F} = 8.4 Hz), 129.4, 128.7, 125.7 (q, *J*_{C-F} = 279.8 Hz), 120.2, 116.1 (d, *J*_{C-F} = 21.7 Hz), 113.1, 64.3 (q, *J*_{C-F} = 27.7 Hz); ¹⁹F NMR (377 MHz, CDCl₃) δ -72.9 (s, 3F), -111.7 (s, 1F); HRMS Calculated For C₁₄H₁₃F₄N₂ [M+H]⁺ 285.1009, found: 285.0998; HPLC (AD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 10.9 min, t_2 = 13.6 min (maj).

(+)-1-(1-(3,4-Dimethylphenyl)-2,2,2-trifluoroethyl)-2-phenylhydrazine (4h): Pale yellow oil; yield 93%, 91% ee, $[\alpha]_D^{20}$ = +132.6 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.23–7.10 (m, 5H), 6.84–6.79 (m, 3H), 5.23 (br, 1H), 4.31 (p, *J* = 7.4 Hz, 1H), 4.09–4.07 (m, 1H), 2.29 (s, 6H); ¹³C NMR (100 MHz, CDCl₃) δ 147.7, 138.2, 137.5, 130.3, 130.1, 129.6, 129.4, 125.9, 125.2 (q, *J*_{C-F} = 280.4 Hz), 120.0, 113.2, 64.7 (q, *J*_{C-F} = 27.6 Hz), 19.9, 19.6; ¹⁹F NMR (377 MHz, CDCl₃) δ -72.7 (s, 3F); HRMS Calculated For C₁₆H₁₈F₃N₂ [M+H]⁺ 295.1422, found: 295.1415; HPLC (AD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 0.7 mL/min), t_1 = 9.8 min, t_2 = 12.6 min (maj).

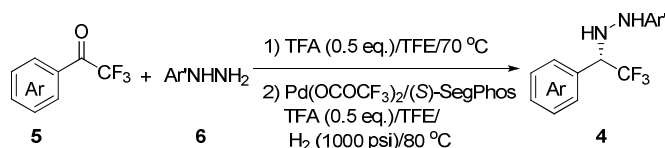
(+)-1-(1-(3,5-Dimethylphenyl)-2,2,2-trifluoroethyl)-2-phenylhydrazine (4i): Pale yellow oil; yield 92%, 93% ee, $[\alpha]_D^{20}$ = +113.8 (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.23–7.18 (m, 2H), 7.05 (s, 1H), 6.98 (s, 2H), 6.85–6.79 (m, 3H), 5.22 (d, *J* = 1.4 Hz, 1H), 4.29 (p, *J* = 7.4 Hz, 1H), 4.09 (dd, *J* = 6.8, 2.1 Hz, 1H), 2.34 (s, 6H); ¹³C NMR (100 MHz, CDCl₃) δ 147.7, 138.8, 132.6, 131.2, 129.4, 126.2, 126.0 (q, *J*_{C-F} = 280.4 Hz), 120.0, 113.2, 65.0 (q, *J*_{C-F} = 27.6 Hz), 21.3; ¹⁹F NMR (377 MHz,

CDCl₃) δ -72.5 (s, 3F); HRMS Calculated For C₁₆H₁₈F₃N₂ [M+H]⁺ 295.1422, found: 295.1415; HPLC (AD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 0.7 mL/min), *t*₁ = 8.1 min, *t*₂ = 10.0 min (maj).

(+)-1-Phenyl-2-(2,2,2-trifluoro-1-(naphthalen-2-yl)ethyl)hydrazine (4j): Pale yellow solid; mp = 106-107 °C, yield 92%, 93% ee, $[\alpha]_D^{20} = +125.4$ (*c* 0.50, CHCl₃); ¹H NMR (400 MHz, CDCl₃) δ 7.92–7.85 (m, 4H), 7.55–7.52 (m, 3H), 7.21–7.19 (m, 2H), 6.86–6.80 (m, 3H), 5.26 (d, *J* = 1.5 Hz, 1H), 4.57 (p, *J* = 7.3 Hz, 1H), 4.25–4.22 (m, 1H); ¹³C NMR (100 MHz, CDCl₃) δ 147.6, 133.7, 133.1, 130.1, 129.4, 129.1, 128.6, 128.2, 127.8, 127.0, 126.8, 126.6 (q, *J*_{C-F} = 280.6 Hz), 125.2, 120.1, 113.2, 65.1 (q, *J*_{C-F} = 27.9 Hz); ¹⁹F NMR (377 MHz, CDCl₃) δ -72.3 (s, 3F); HRMS Calculated For C₁₈H₁₆F₃N₂ [M+H]⁺ 317.1266, found: 317.1244; HPLC (AD-H, elute: Hexanes/*i*-PrOH = 90/10, detector: 254 nm, flow rate: 0.7 mL/min), *t*₁ = 14.7 min, *t*₂ = 22.1 min (maj).



4. General Procedure for Direct Reductive Amination



General procedure: (*S*)-SegPhos (6.7 mg, 0.011 mmol) and Pd(OCOCF₃)₂ (3.3 mg, 0.01 mmol) were placed in a dried Schlenk tube under nitrogen atmosphere, and degassed anhydrous acetone was added. The mixture was stirred at room temperature for 1 h, and then solvent was removed under vacuum to give the catalyst. Ketone **5** (0.22 mmol), trifluoroacetic acid (0.1 mmol) and arylhydrazine **6** (0.20 mmol) were stirred in anhydrous TFE (1 mL) for 4 h at 70 °C in a tube under nitrogen atmosphere. In a glovebox, the above catalyst together with TFE (1 mL) was added to the tube and the reaction was stirred at room temperature for 1 min. Subsequently, another portion of trifluoroacetic acid (0.1 mmol) was added to the reaction mixture. The hydrogenation was performed at 80 °C under H₂ (1000 psi) in a stainless steel autoclave for 48 h. After carefully releasing the hydrogen, the resulting mixture was concentrated under vacuum and dissolved in saturated aqueous sodium bicarbonate (5 mL). After stirring for 10 min, the mixture was extracted with dichloromethane and dried over sodium sulfate. After purification by silica gel chromatography using petroleum ether/dichloromethane (1:1) as eluent, the enantiomeric excess of the products were determined by HPLC with chiral column.

5. The X-ray Crystallographic Analysis of Products

The absolute configuration of hydrogenation product **2i** was assigned as (*S*)-2-(4-chloro-phenyl)-6-(trifluoromethyl)piperazin-3-one based on X-ray diffraction analysis after recrystallization from mixture solvent dichloromethane/*n*-hexane to upgrade ee to >99%. The configurations of the other chiral products are assigned by analogy. The CCDC 1410066 contains detail supplementary crystallographic data for this paper. These can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk.

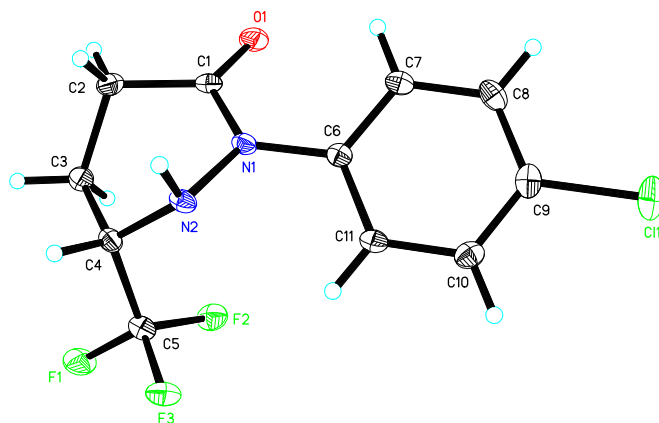


Figure S1. The X-ray structure of (*S*)-2-(4-chlorophenyl)-6-(trifluoromethyl)piperazin-3-one **2i**.

The absolute configuration of hydrogenation product **4a** was assigned as (*S*)-1-phenyl-2-(2,2,2-trifluoro-1-phenylethyl)hydrazine based on X-ray diffraction analysis after recrystallization from mixture solvent dichloromethane/*n*-hexane to upgrade ee to >99%. The configurations of the other chiral products are assigned by analogy. The CCDC 1410075 contains detail supplementary crystallographic data for this paper. These can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk.

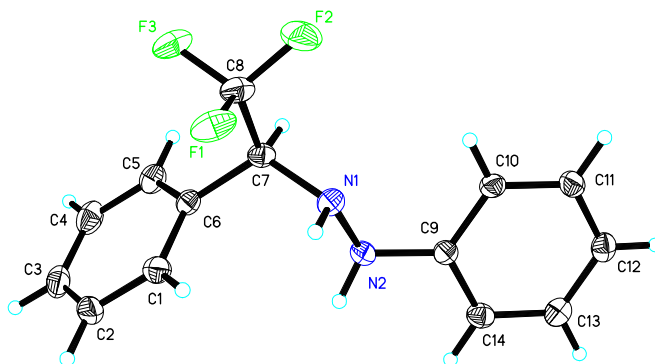


Figure S2. X-ray structure of (*S*)-1-phenyl-2-(2,2,2-trifluoro-1-phenylethyl)hydrazine **4a**

6. References

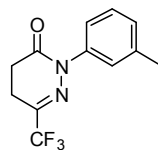
- [1] Wan, W.; Hou, J.; Jiang, H.; Wang, Y.; Zhu, S.; Deng, H.; Hao, J. *Tetrahedron* **2009**, *65*, 4212–4219.
- [2] (a) Hu, J.; Xu, H.; Nie, P.; Xie, X.; Nie, Z.; Rao, Y. *Chem. Eur. J.* **2014**, *20*, 3932–3938. (b) Kiselyov, A. S. *Tetrahedron Lett.* **1995**, *36*, 1383–1386.

7. Copy of NMR of Substrates and Products

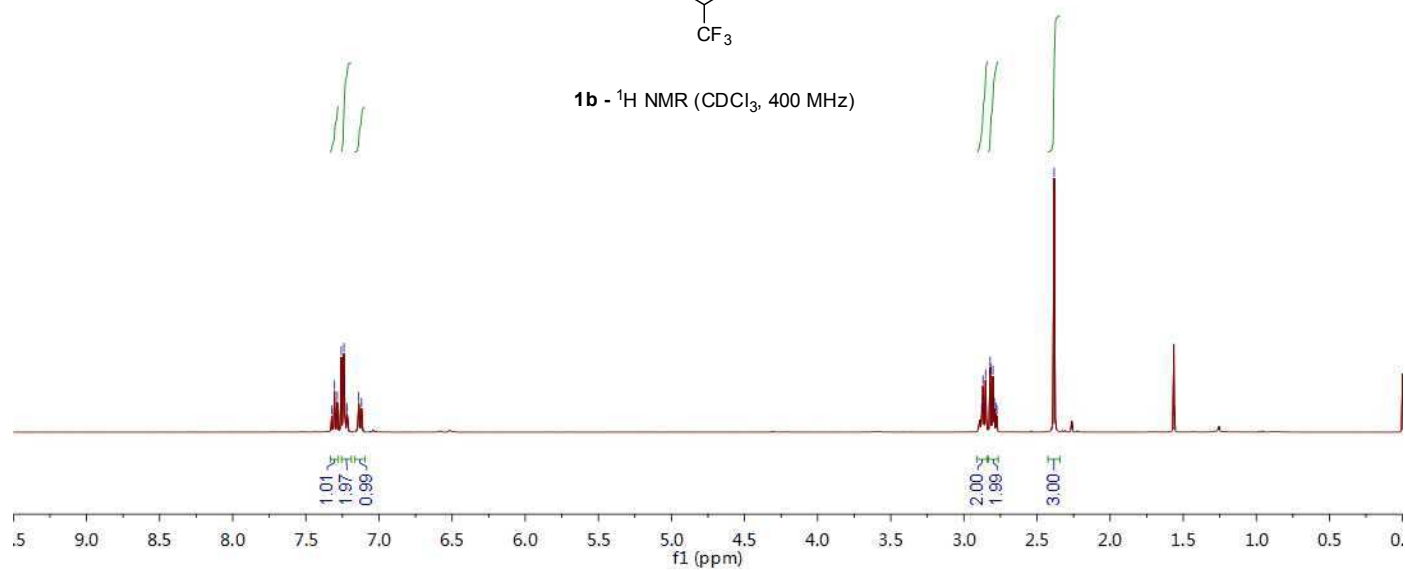
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2.8517
2.8205
2.8173
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2.7923
2.7822
2.7750
2.3827

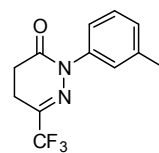
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PROTON CDCl₃ (D:\NMR400\201) nmr 17



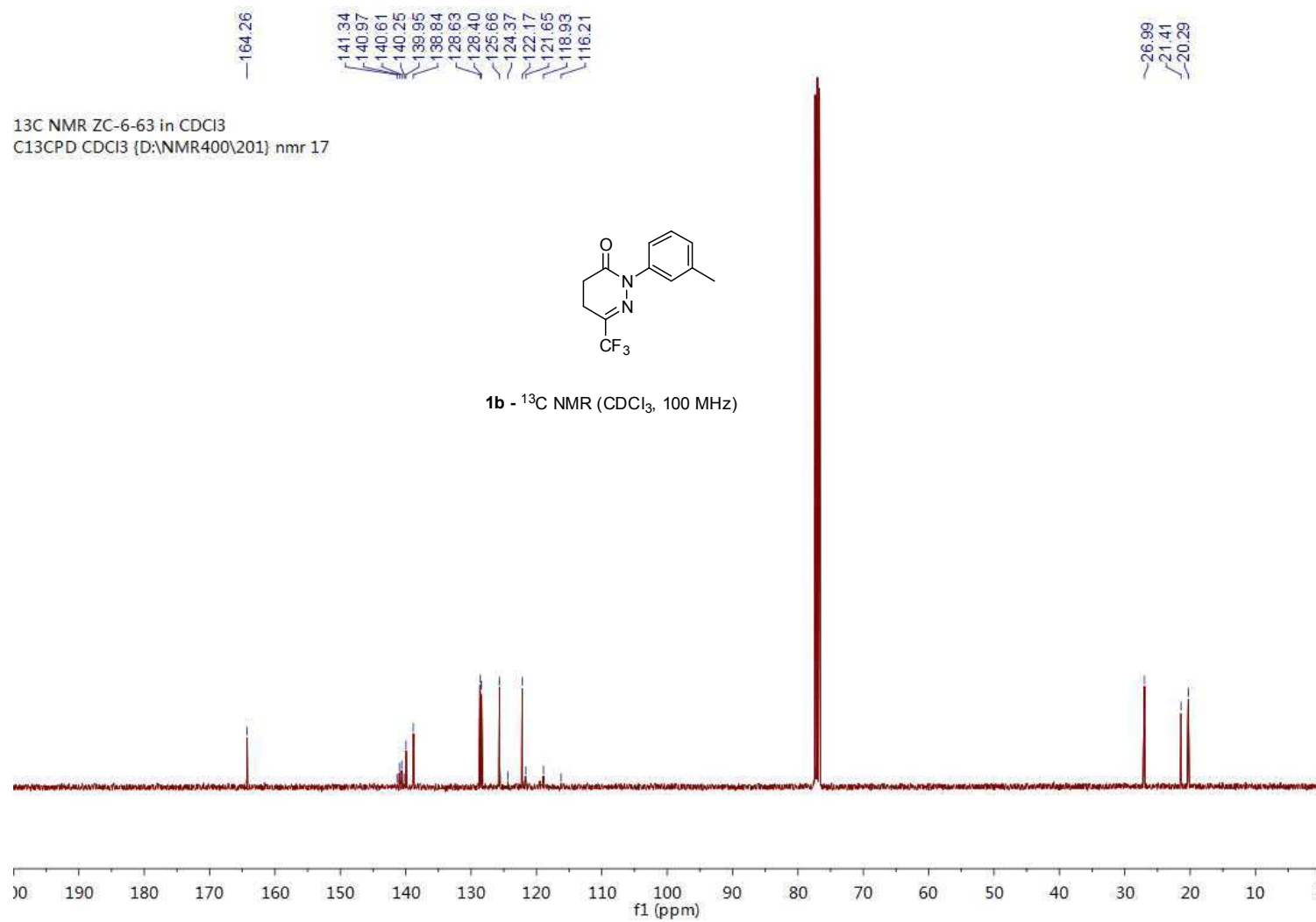
1b - ¹H NMR (CDCl₃, 400 MHz)



¹³C NMR ZC-6-63 in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 17

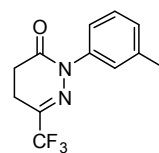


1b - ¹³C NMR (CDCl₃, 100 MHz)

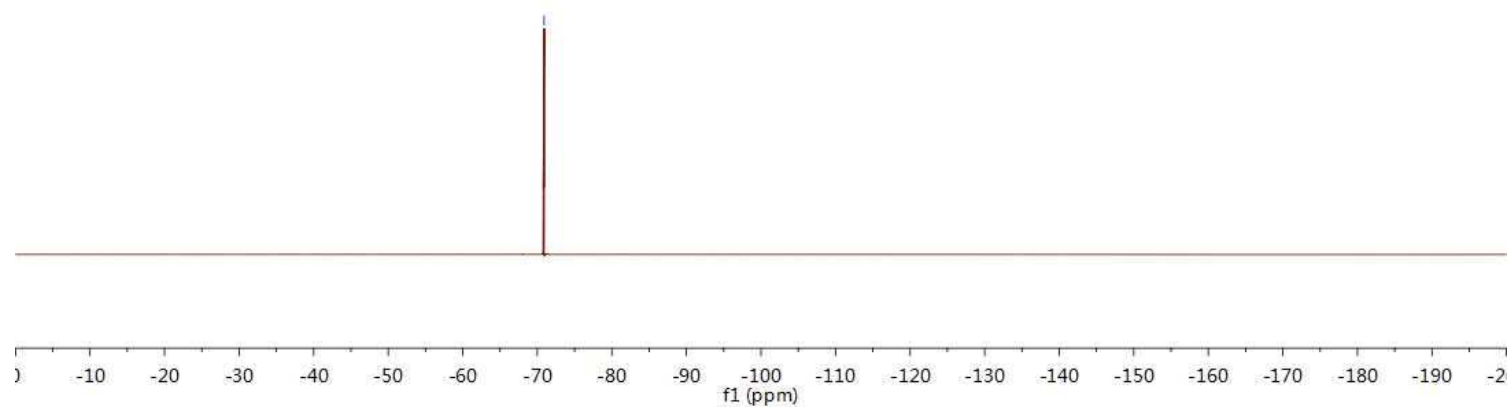


19F NMR ZC-6-63 in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 17

--70.92



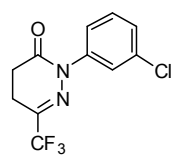
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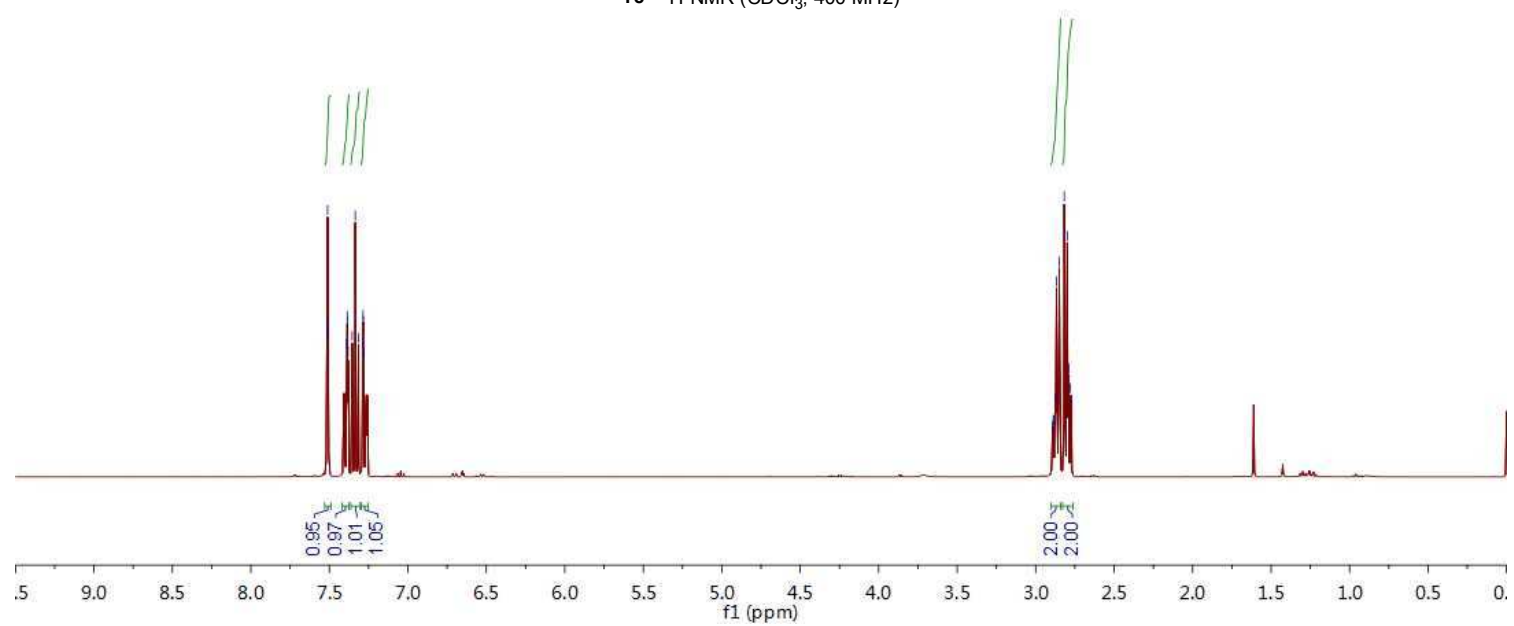
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7.2799

2.8931
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2.8675
2.8493
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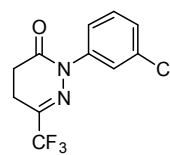
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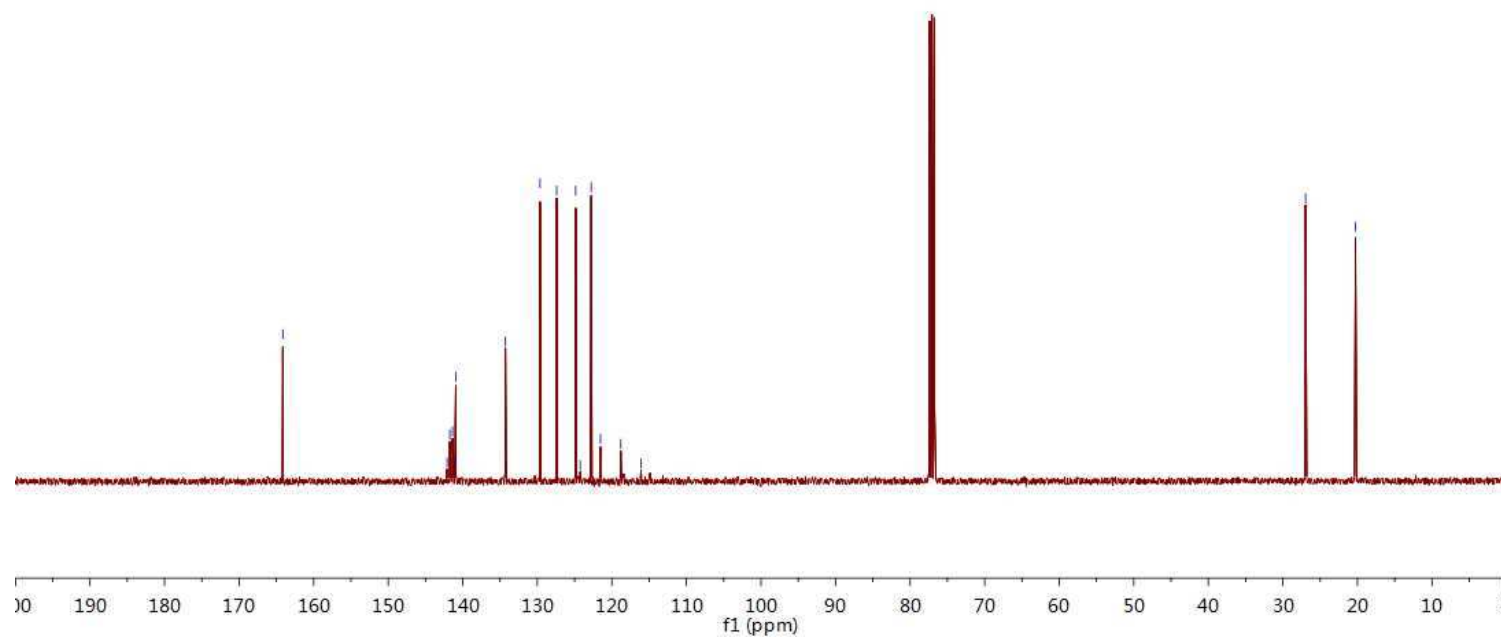
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141.01
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129.63
127.40
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124.25
122.77
121.53
118.80
116.08

26.95
20.25

¹³C NMR ZC-6-74 in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 21

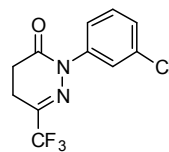


1e - ¹³C NMR (CDCl₃, 100 MHz)

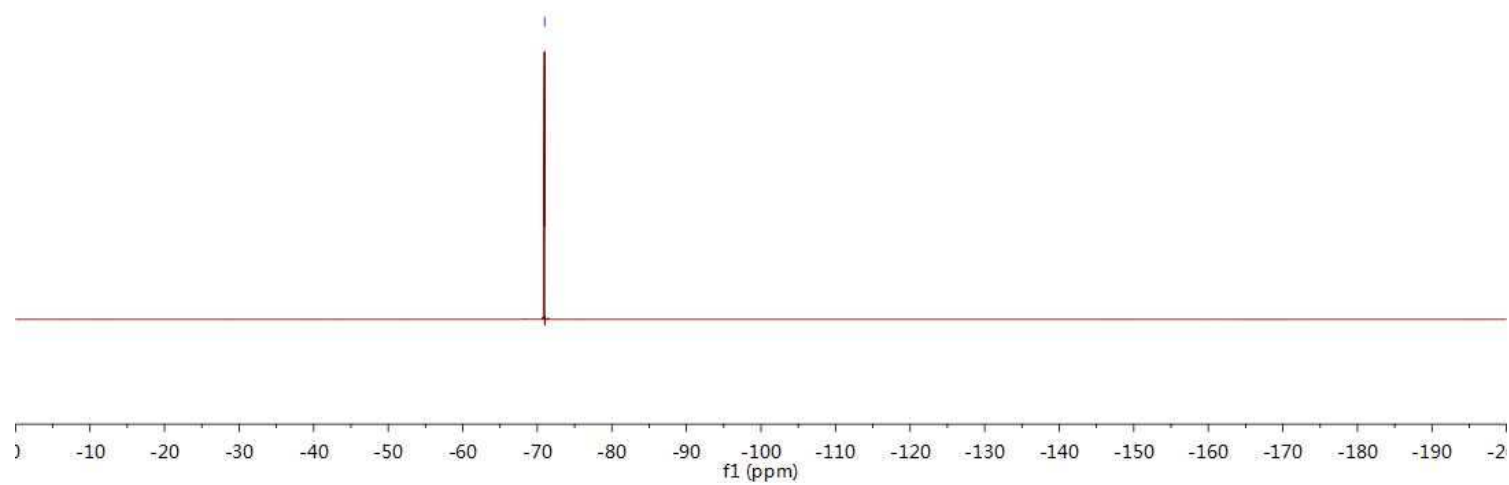


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---70.99



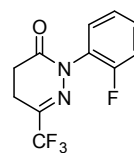
1e - ¹⁹F NMR (CDCl₃, 377 MHz)



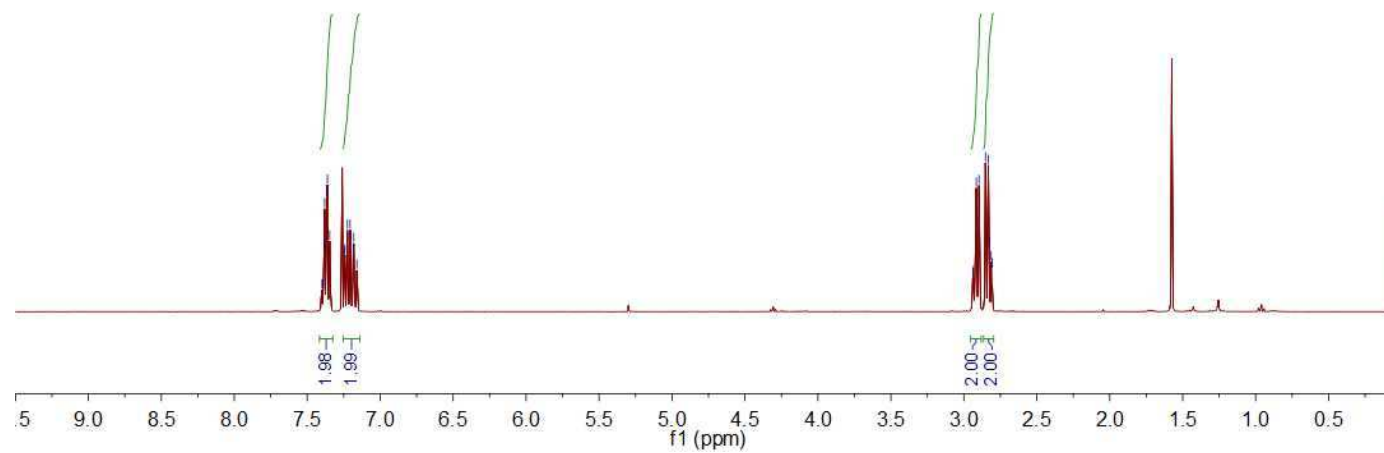
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7.2035
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7.1598

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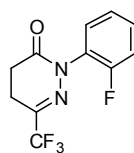
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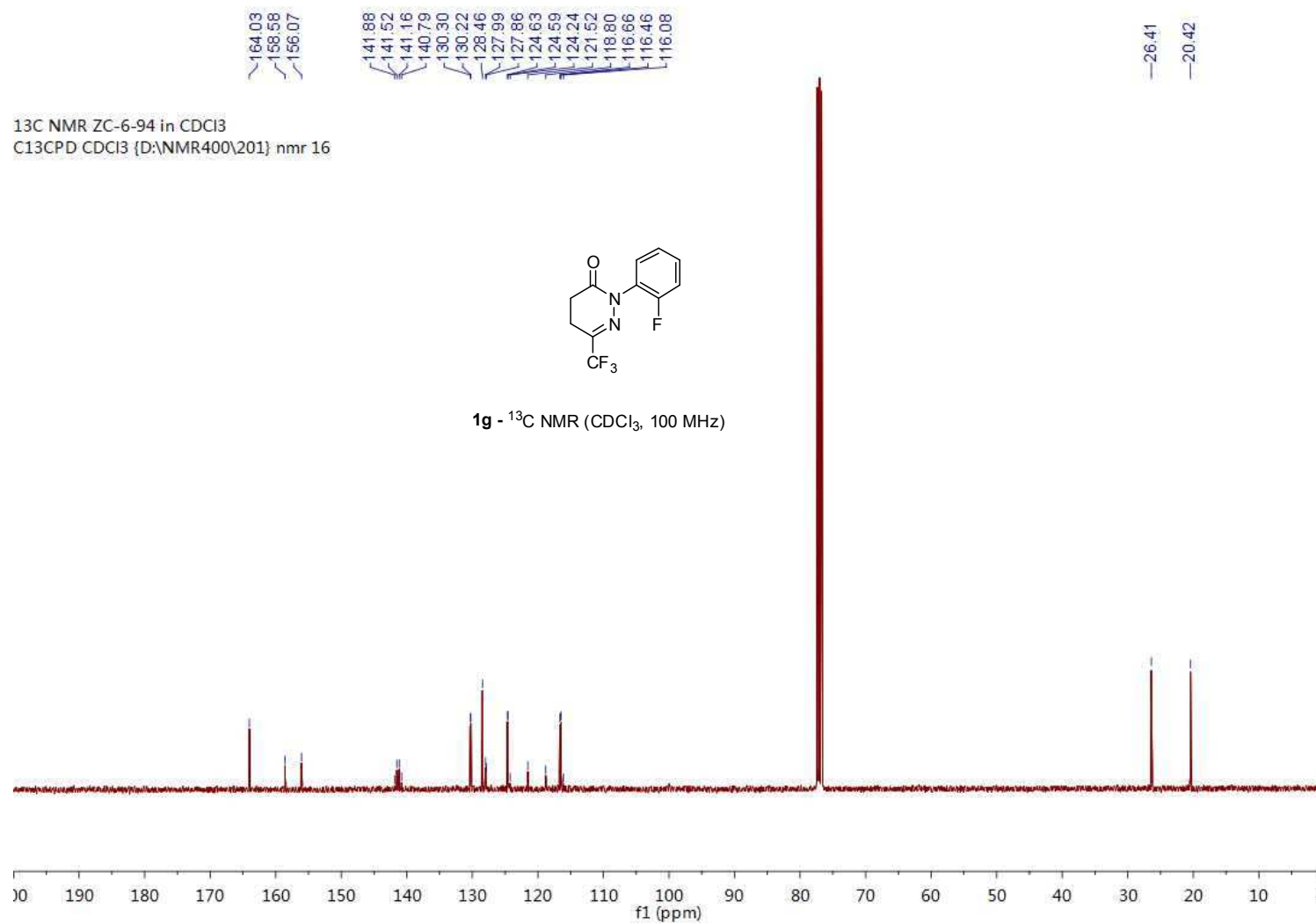
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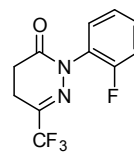
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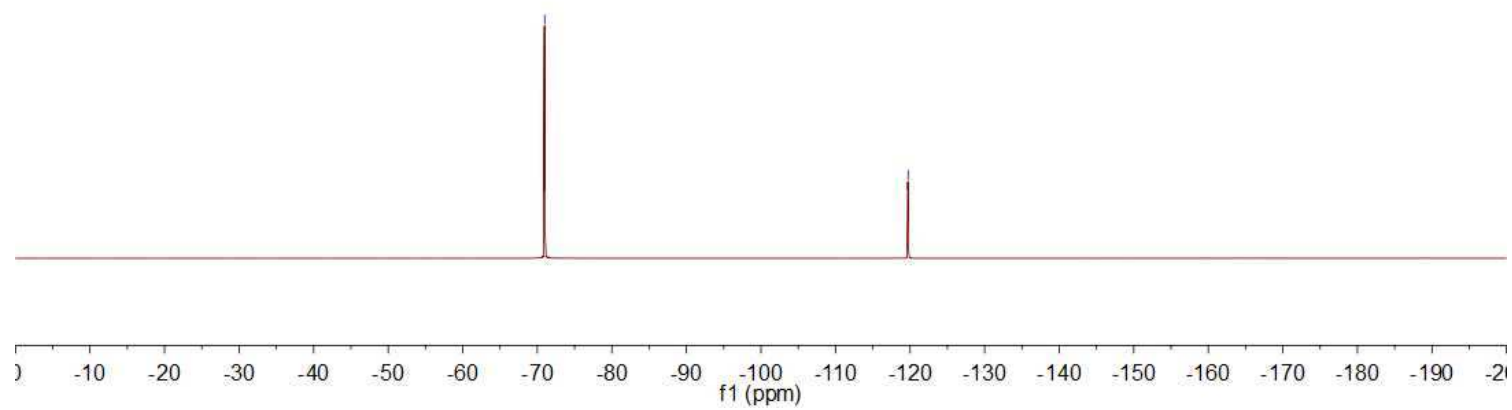
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70.99

119.73



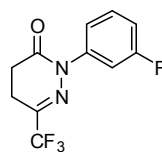
1g - ^{19}F NMR (CDCl_3 , 377 MHz)



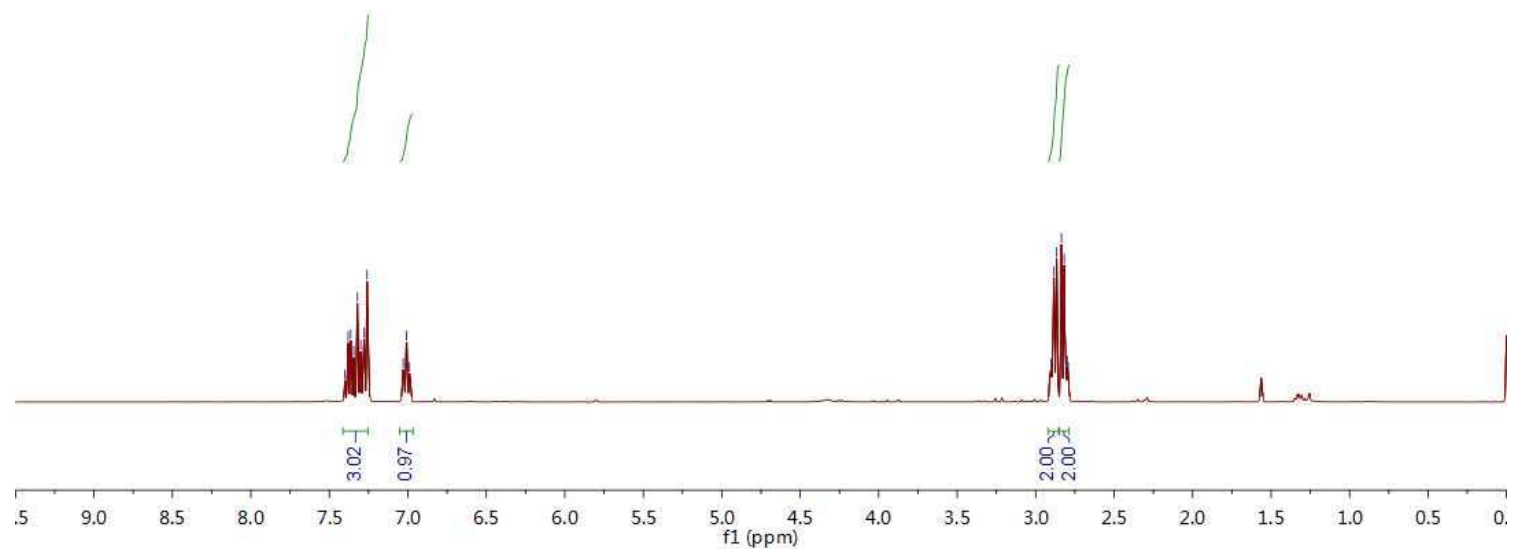
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6.9889

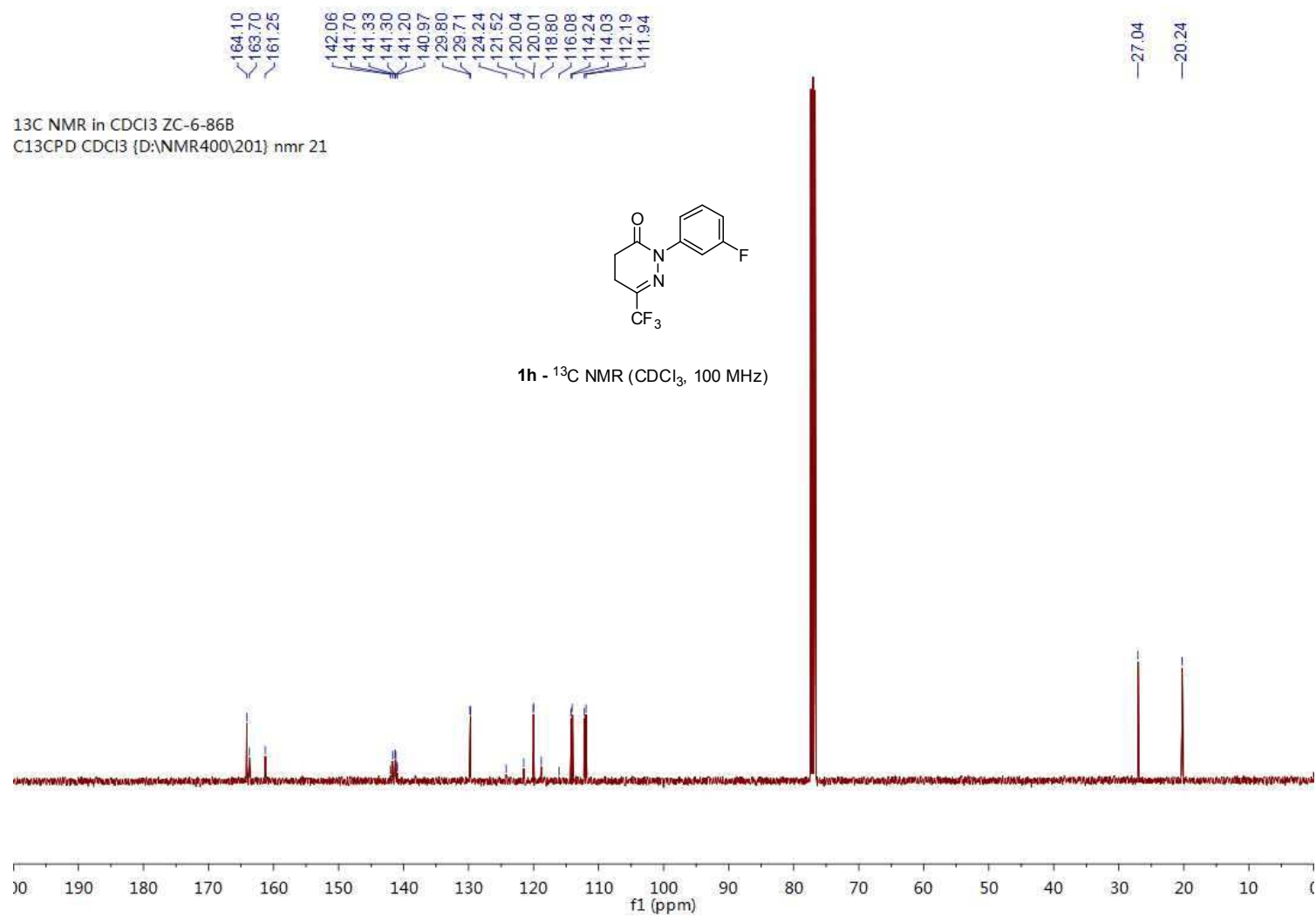
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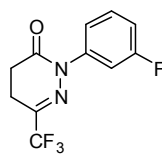


1h - ¹H NMR (CDCl₃, 400 MHz)

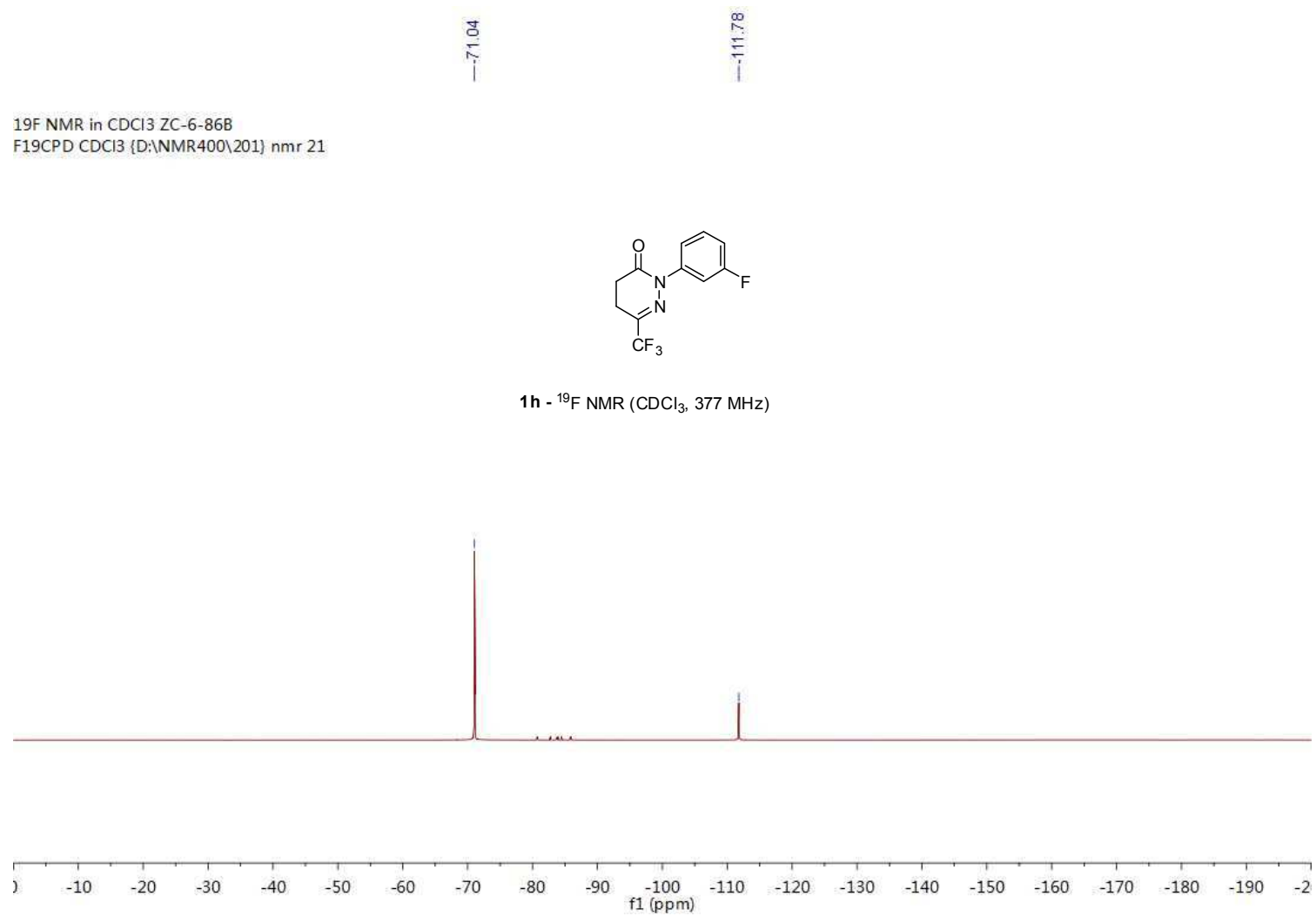




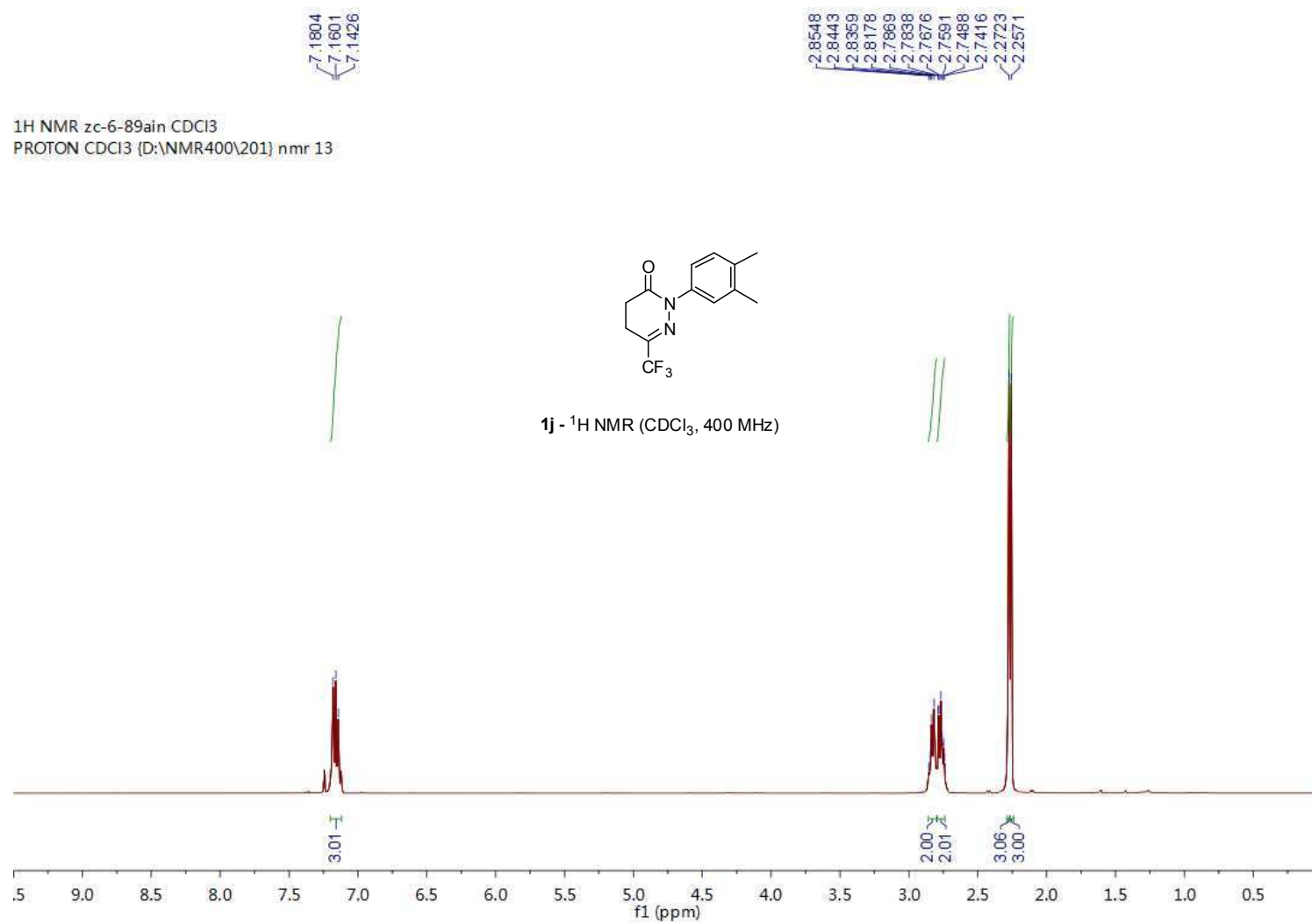
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F19CPD CDCl3 {D:\NMR400\201} nmr 21



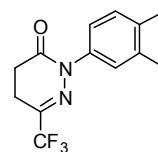
1h - ^{19}F NMR (CDCl_3 , 377 MHz)



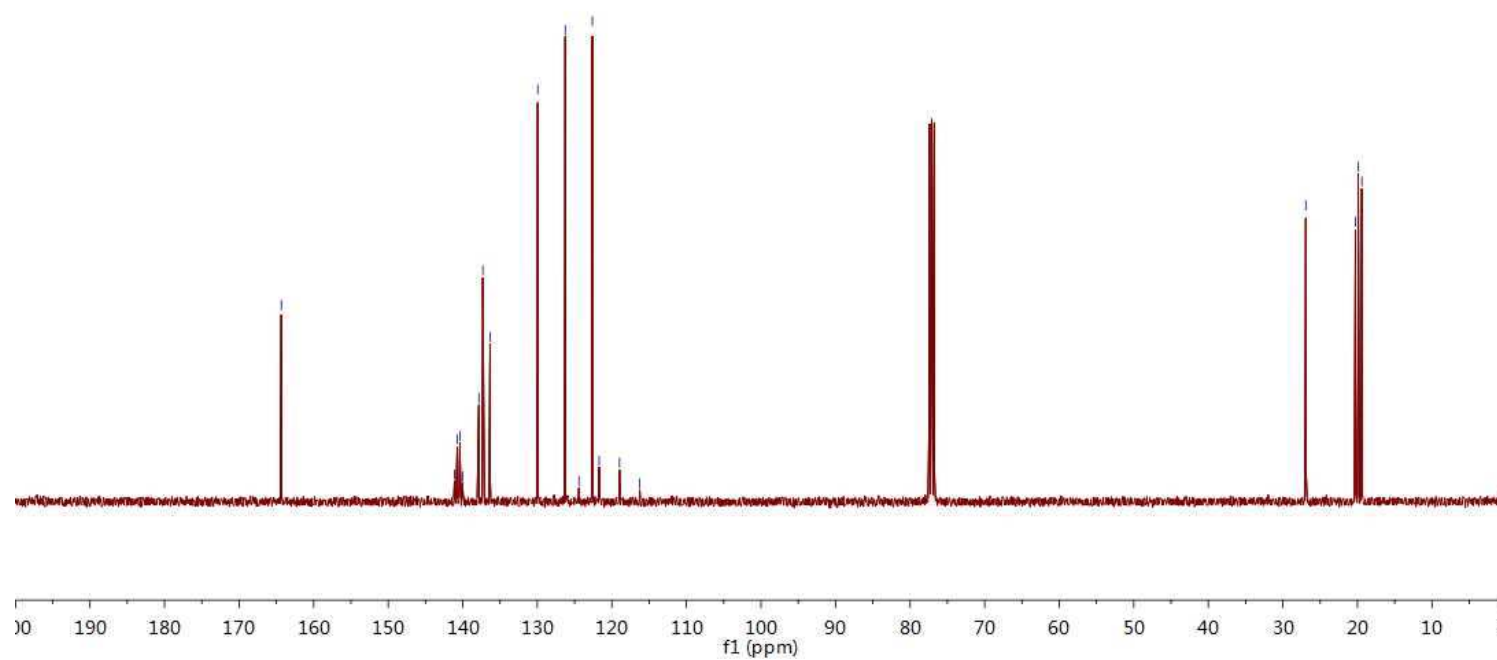
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¹³C NMR ZC-6-89a in CDCl₃
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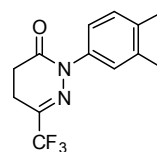


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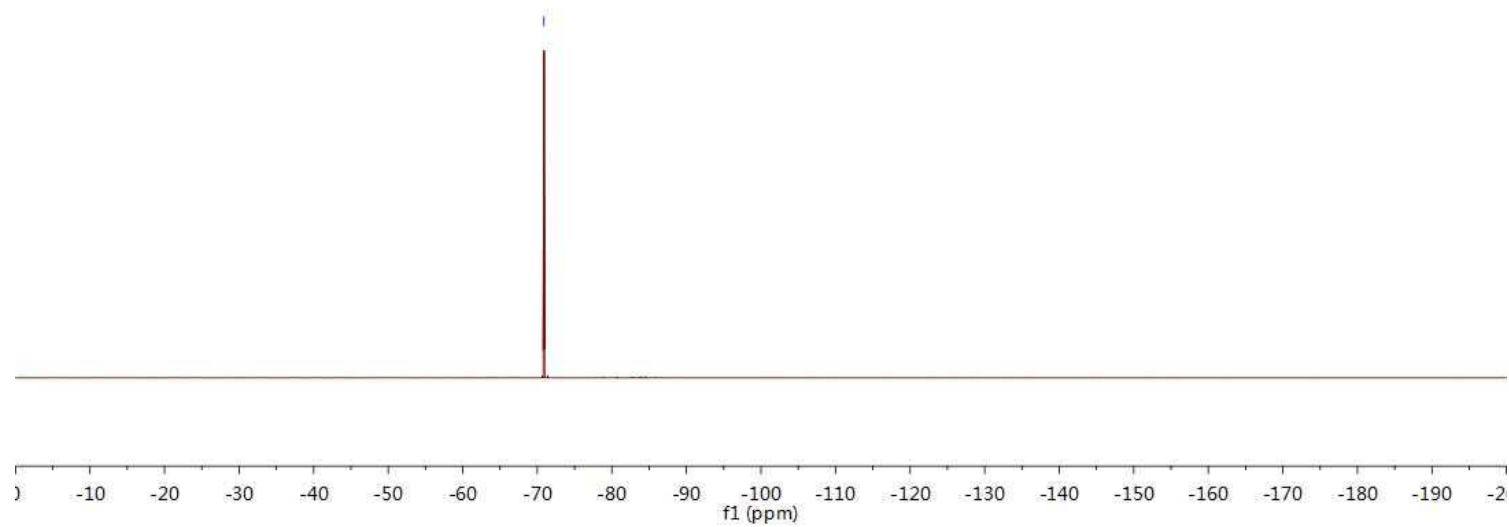


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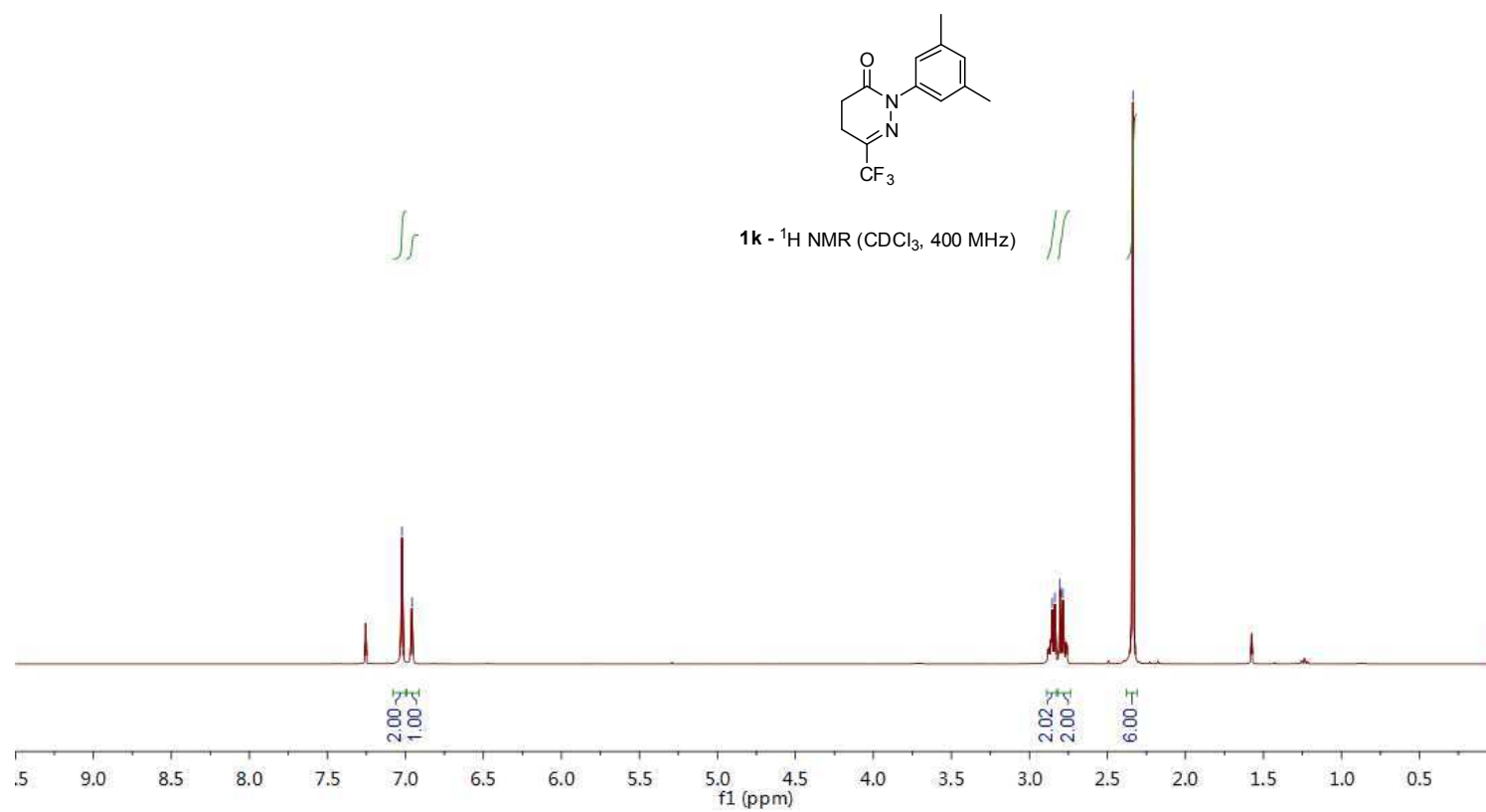
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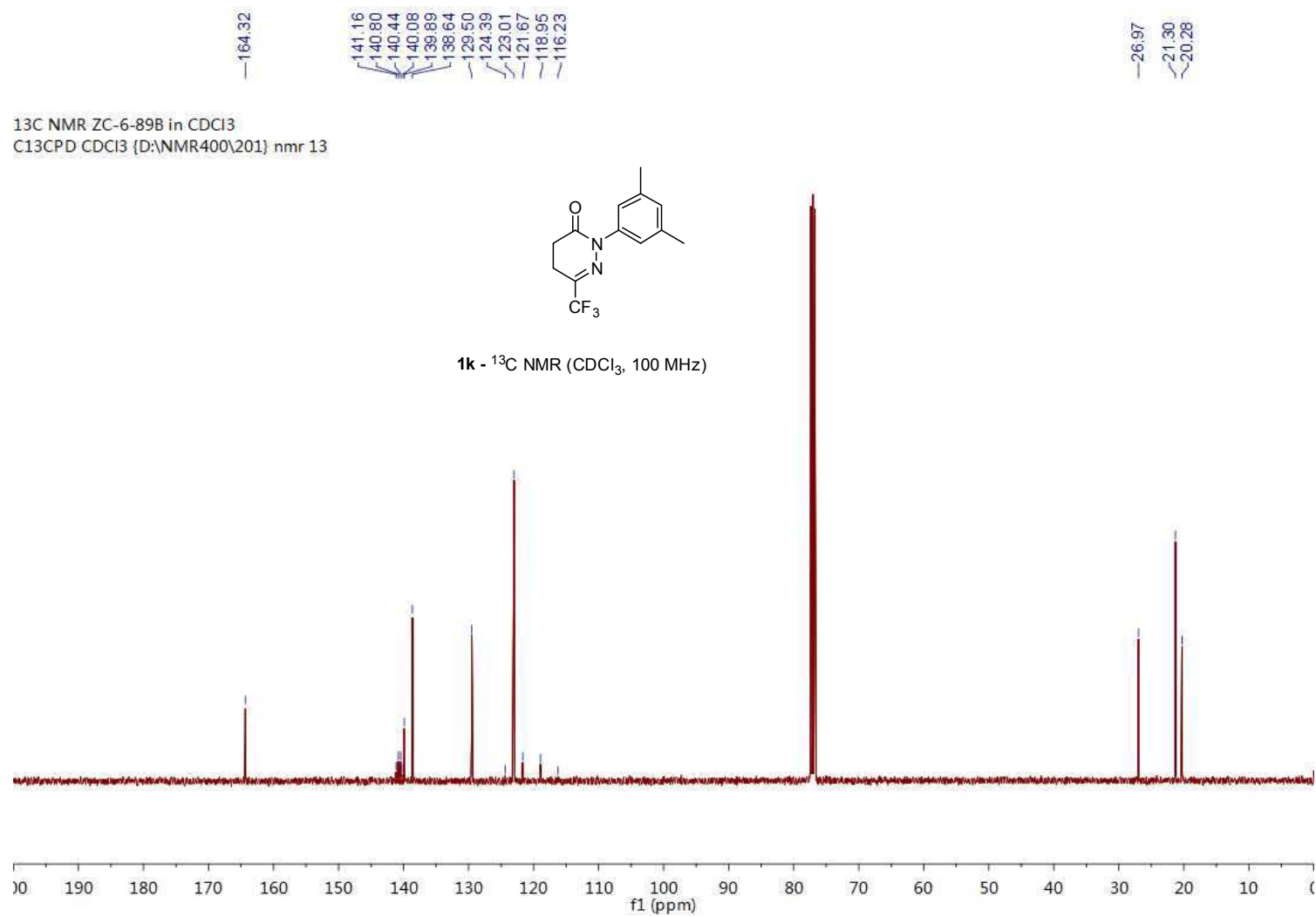


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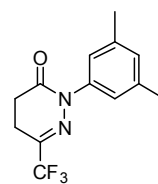
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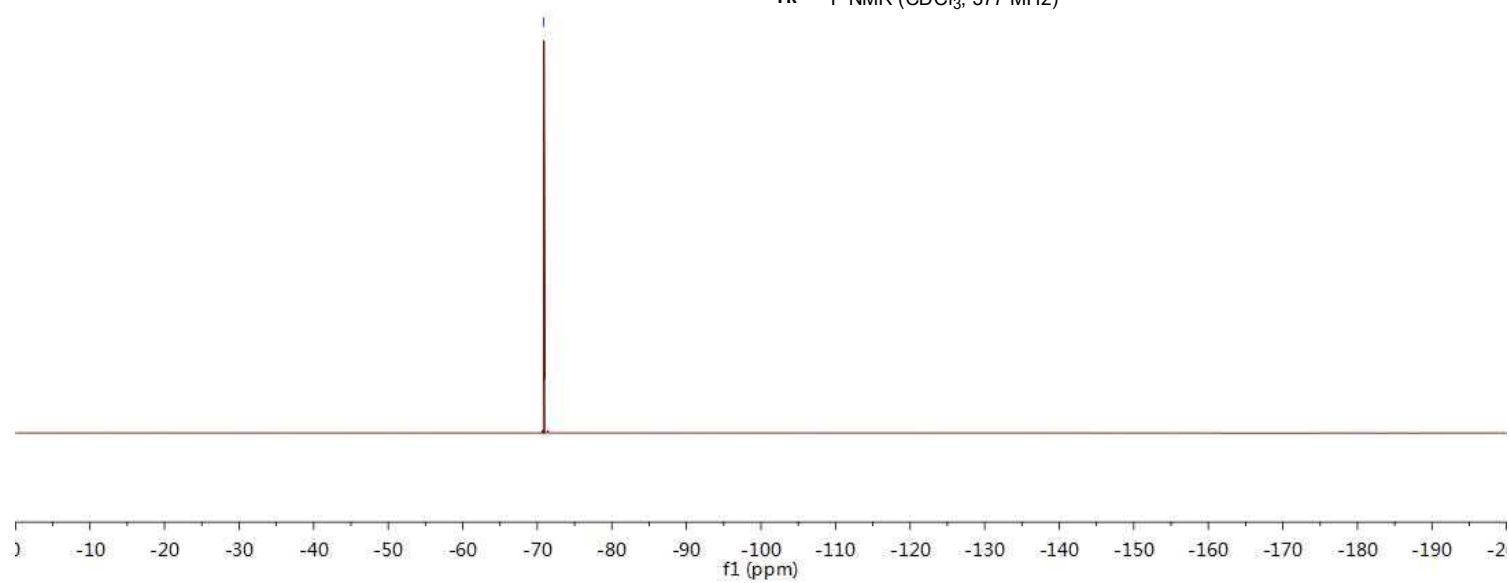


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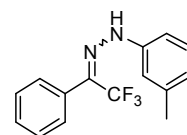
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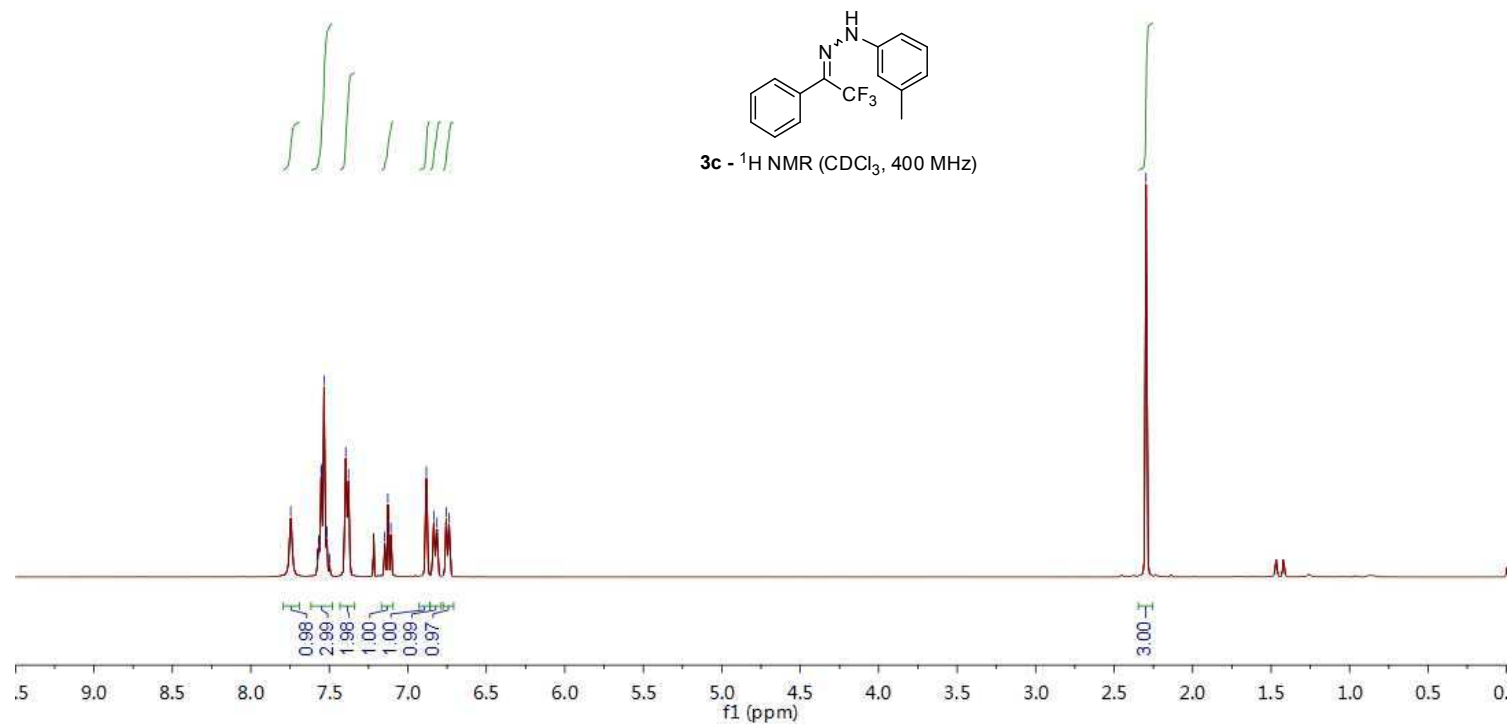
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6.8141
6.7552
6.7365

—2.2975

¹H NMR ZC-7-10B1 in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 12



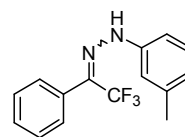
3c - ¹H NMR (CDCl₃, 400 MHz)



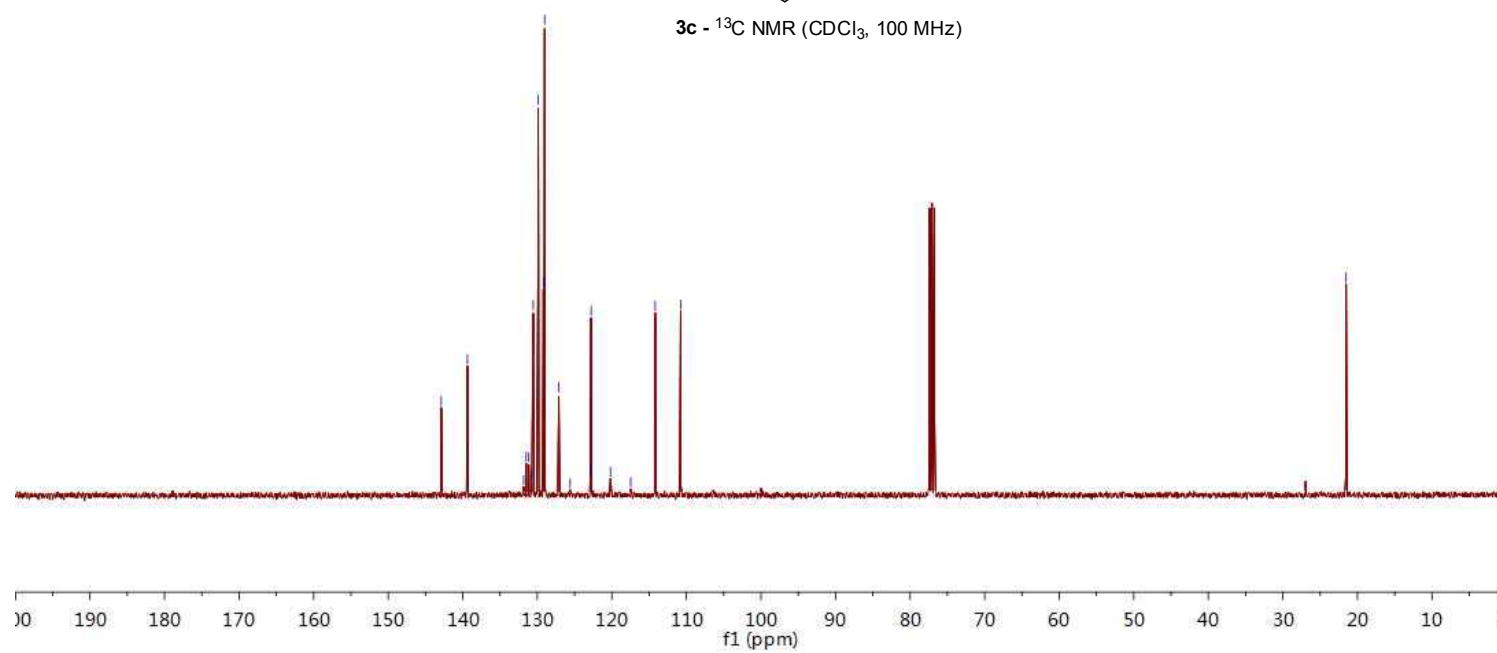


—21.52

¹³C NMR ZC-7-10B1 in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 12

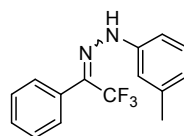


3c - ¹³C NMR (CDCl₃, 100 MHz)

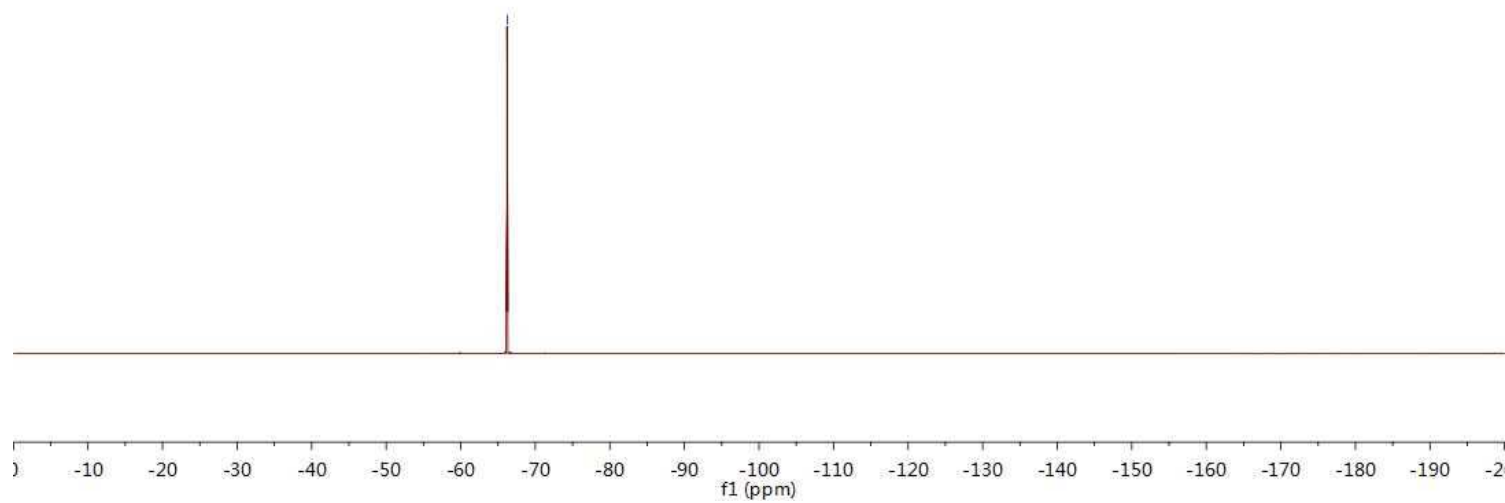


¹⁹F NMR ZC-7-10B1 in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 12

-66.22

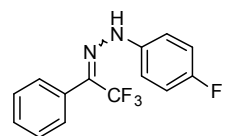
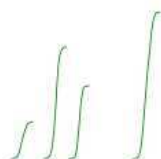


3c - ¹⁹F NMR (CDCl₃, 377 MHz)

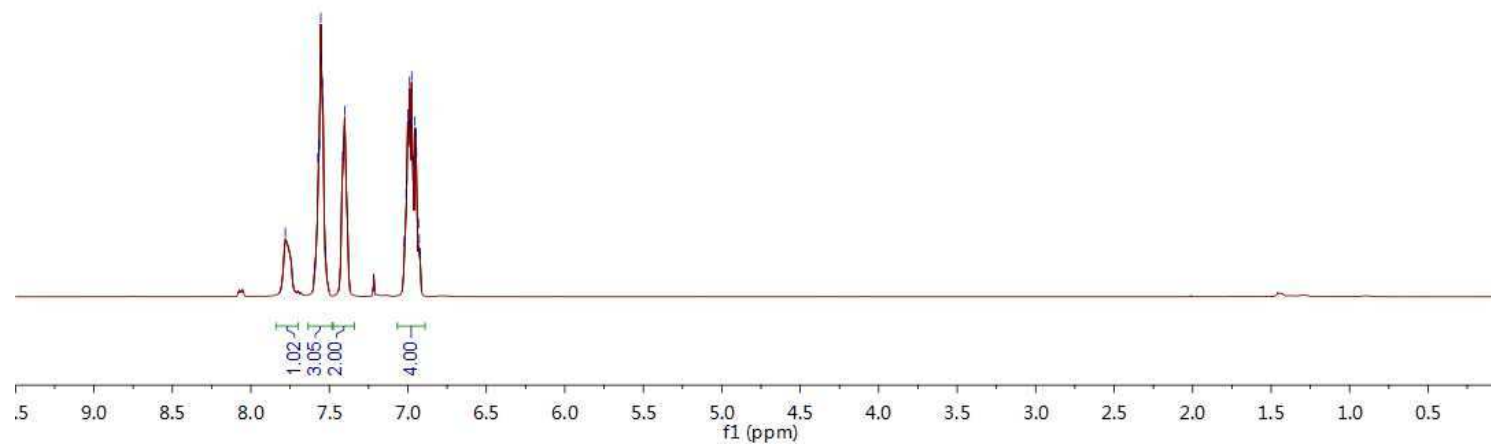


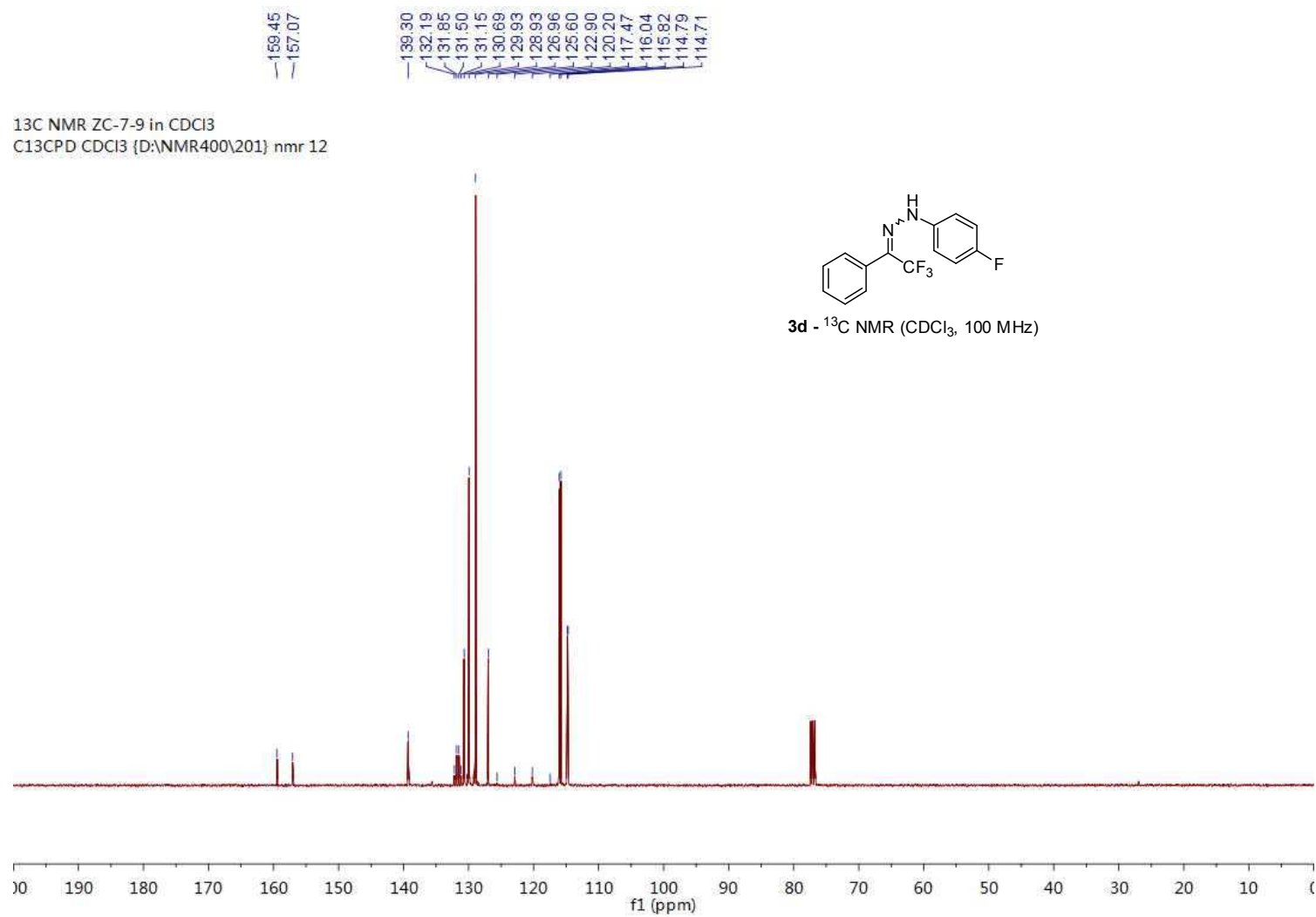
7.7803
7.5962
7.5731
7.5685
7.5660
7.5643
7.5545
7.5495
7.5450
7.5402
7.5240
7.4158
7.4021
7.0233
7.0111
7.0064
7.0003
6.9949
6.9886
6.9833
6.9754
6.9642
6.9548
6.9513
6.9487
6.9448
6.9321
6.9270
6.9218

¹H NMR zc-7-9 in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 12



3d - ¹H NMR (CDCl₃, 400 MHz)

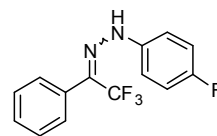




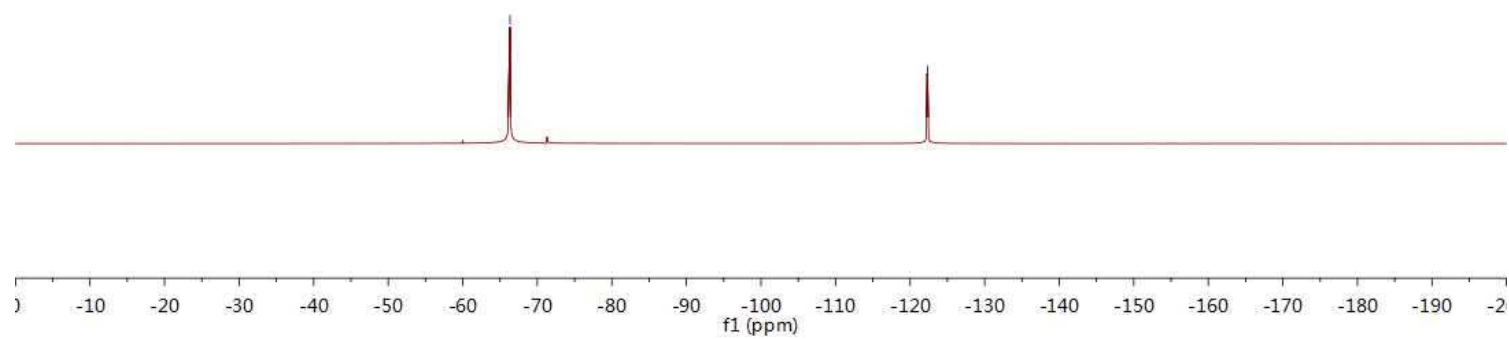
19f NMR ZC-7-9 in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 12

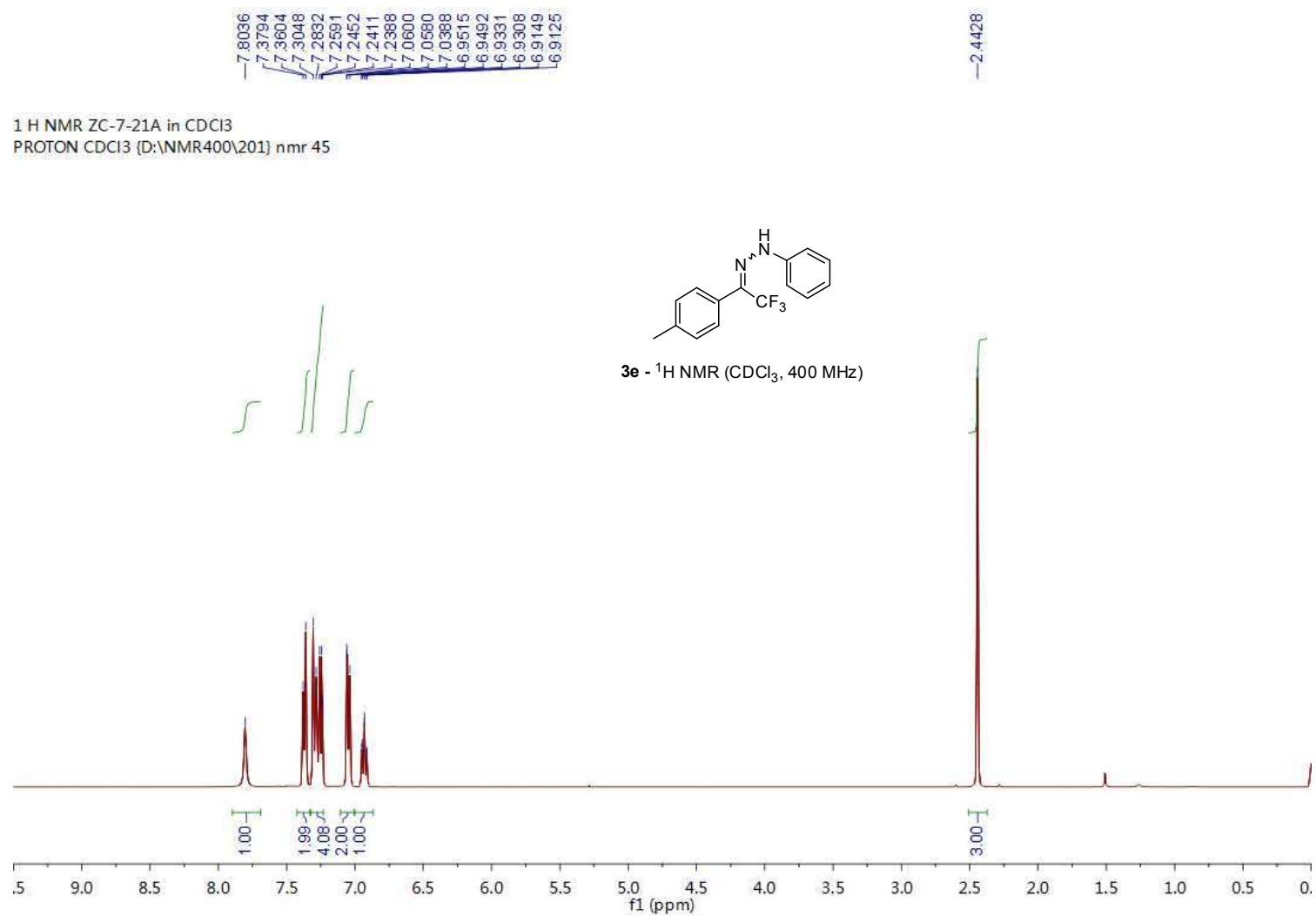
66.34

122.34



3d - ¹H NMR (CDCl₃, 400 MHz)

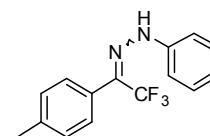




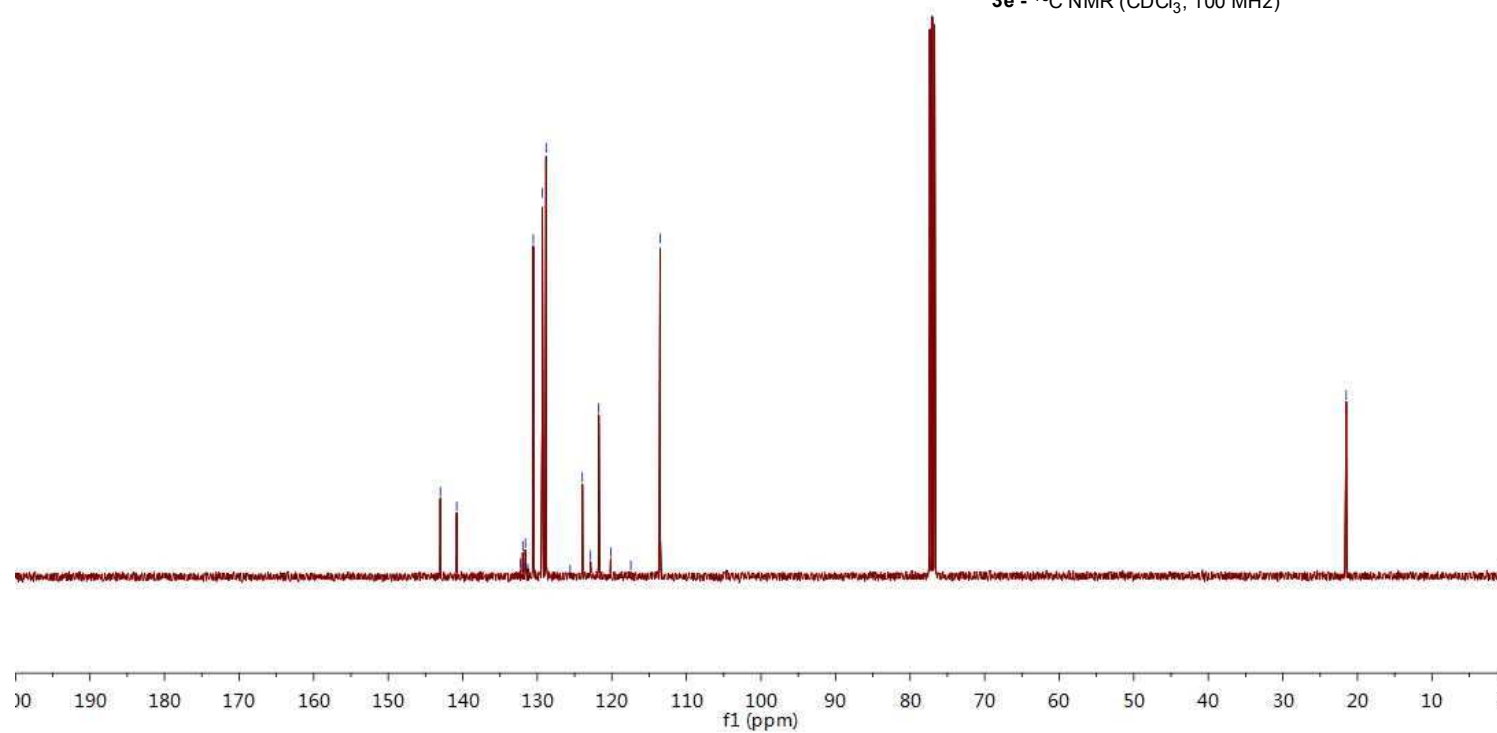
1 ¹³C NMR ZC-7-21A in CDCl₃
 C13CPD CDCl₃ {D:\NMR400\201} nmr 45

143.00
 140.81
 132.29
 131.95
 131.60
 131.27
 130.54
 129.32
 128.82
 125.59
 123.97
 122.86
 121.76
 120.16
 117.46
 113.53

21.50

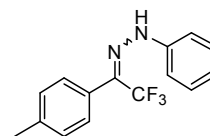


3e - ¹³C NMR (CDCl₃, 100 MHz)

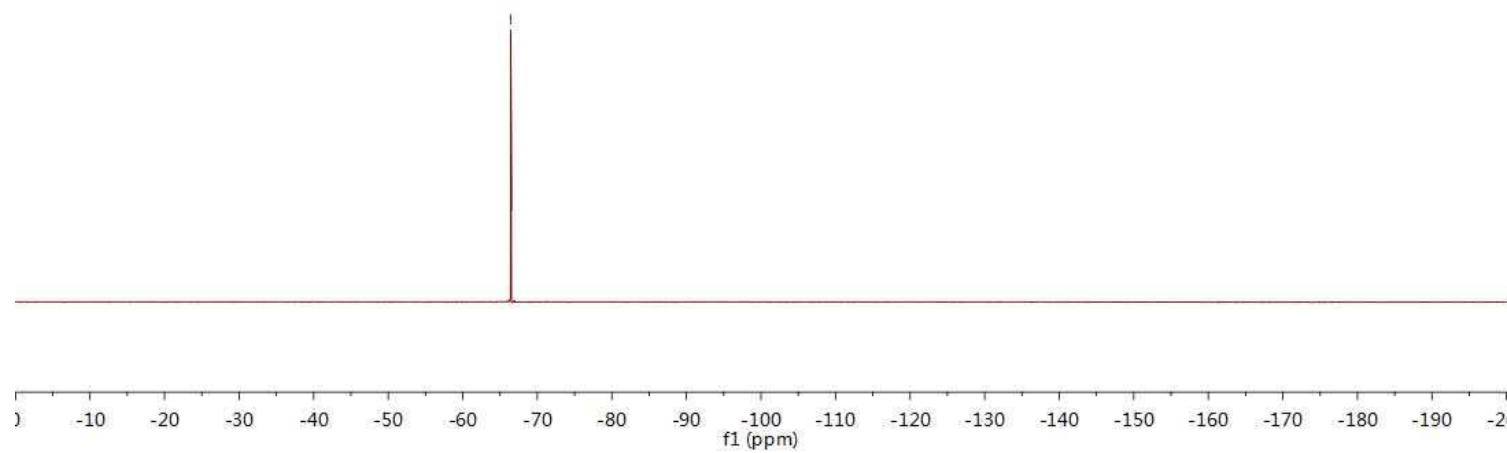


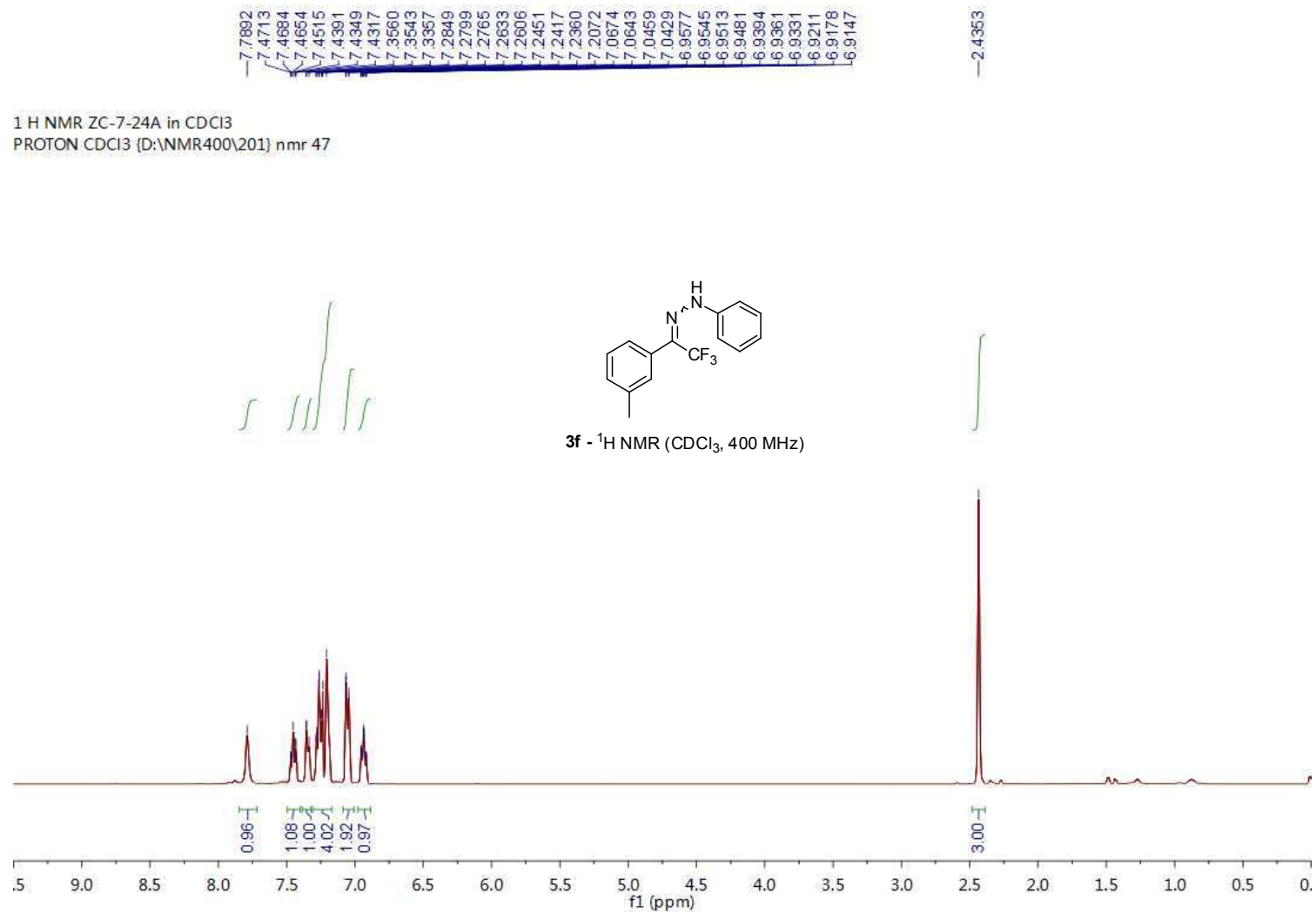
1 9F NMR ZC-7-21A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 45

-66.44



3e - ^{19}F NMR (CDCl_3 , 377 MHz)

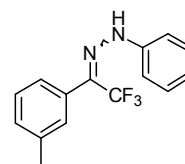




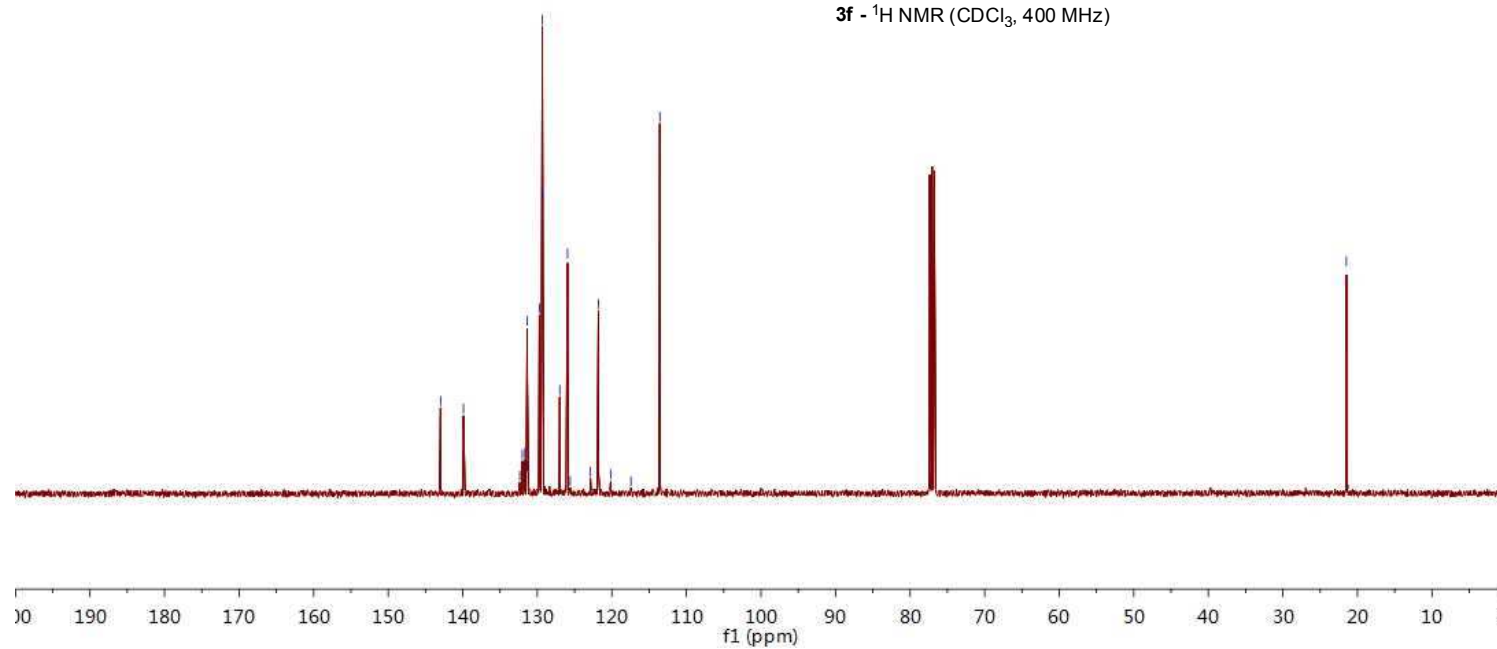
1 ¹³C NMR ZC-7-24A in CDCl₃
 C13CPD CDCl₃ {D:\NMR400\201} nmr 47

142.98
 139.90
 132.36
 132.01
 131.66
 131.36
 131.32
 129.72
 129.35
 129.33
 126.99
 125.95
 125.58
 122.87
 121.81
 120.15
 117.45
 113.56

21.48

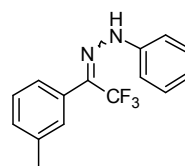


3f - ¹H NMR (CDCl₃, 400 MHz)

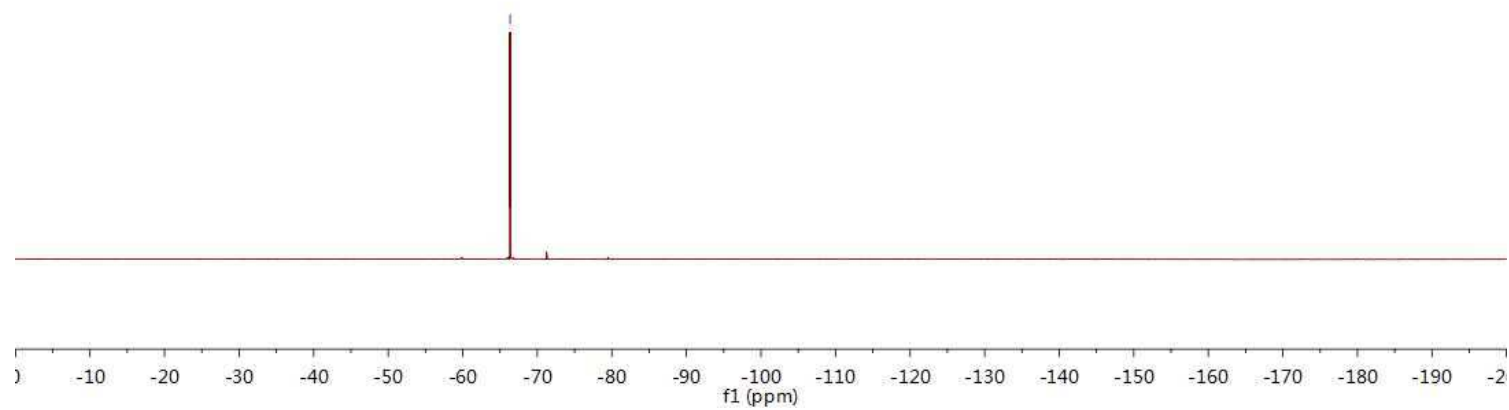


1 9F NMR ZC-7-24A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 47

66.35

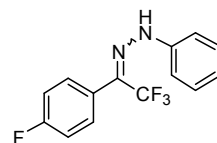


3f - ^1H NMR (CDCl_3 , 400 MHz)

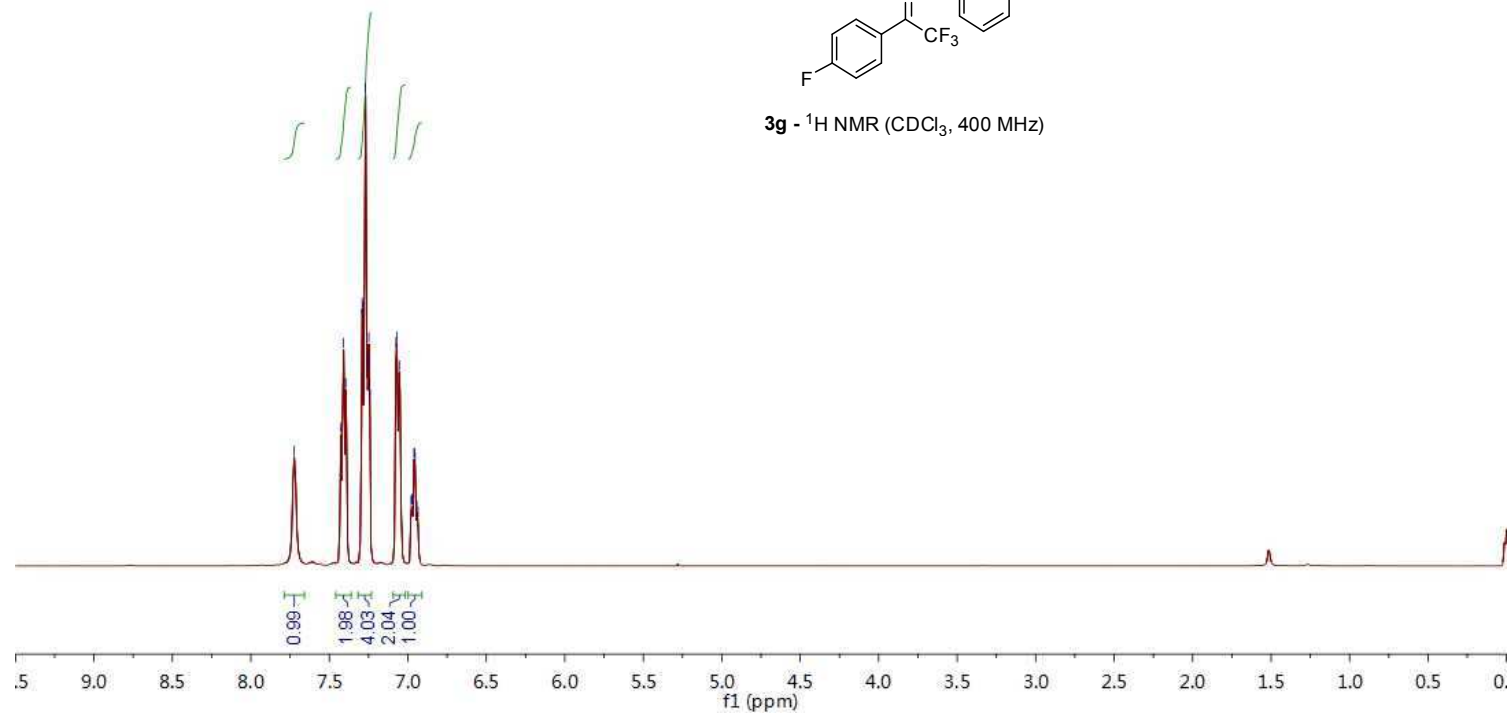


7.7240
7.7262
7.4262
7.4091
7.3952
7.2908
7.2885
7.2866
7.2695
7.2577
7.2530
7.2482
7.2450
7.2426
7.0749
7.0707
7.0541
6.9788
6.9747
6.9715
6.9605
6.9566
6.9533
6.9422
6.9351

¹H NMR in CDCl₃ ZC-7-31A
PROTON CDCl₃ [D:\NMR400\201] nmr 56

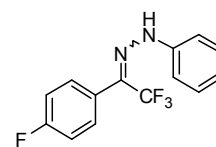


3g - ¹H NMR (CDCl₃, 400 MHz)

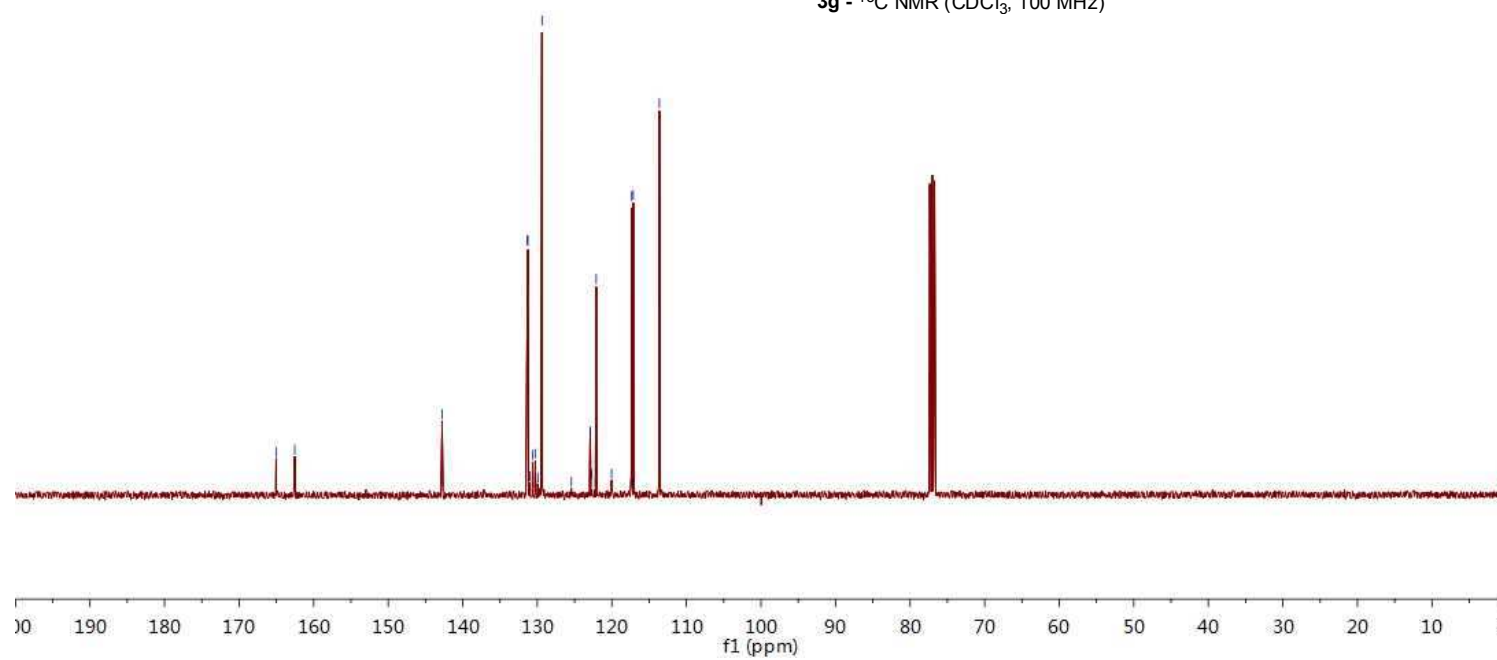




^{13}C NMR in CDCl_3 ZC-7-31A
 C13CPD CDCl_3 {D:\NMR400\201} nmr 56



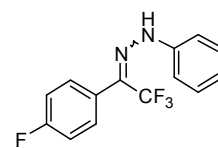
3g - ^{13}C NMR (CDCl_3 , 100 MHz)



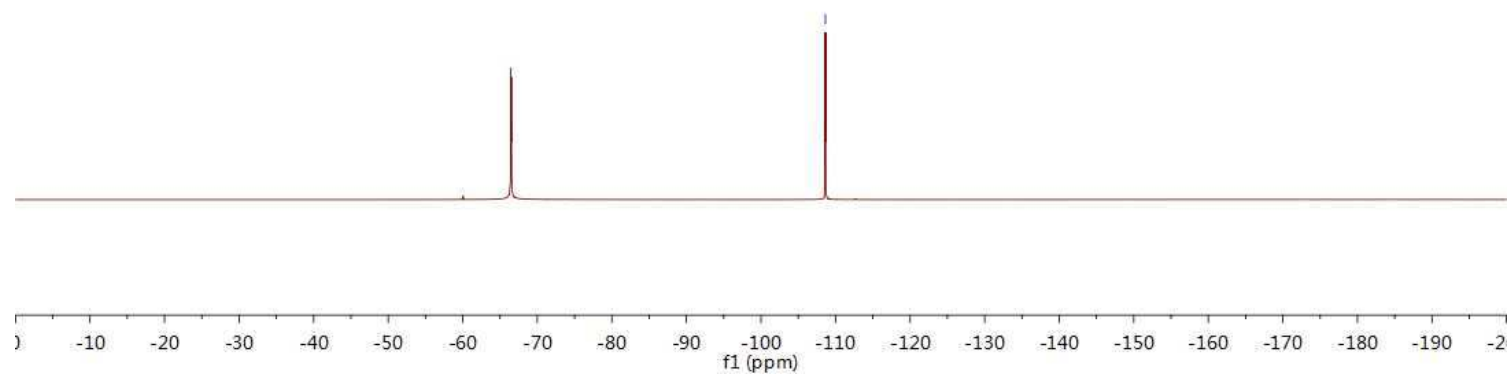
¹⁹F NMR in CDCl₃ ZC-7-31A
F19CPD CDCl₃ {D:\NMR400\201} nmr 56

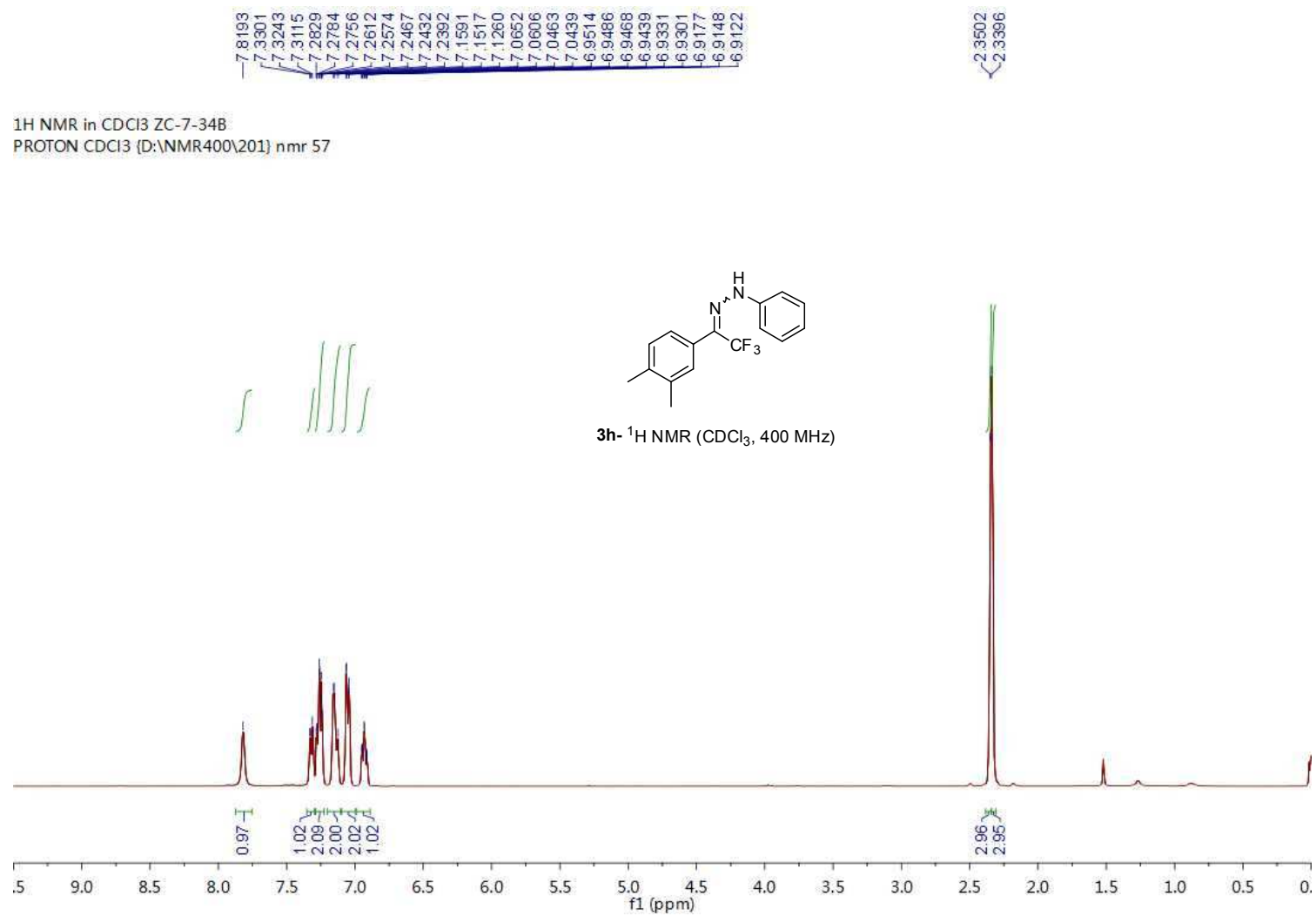
66.46

108.65



3g - ¹⁹F NMR (CDCl₃, 377 MHz)

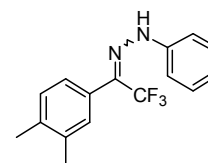




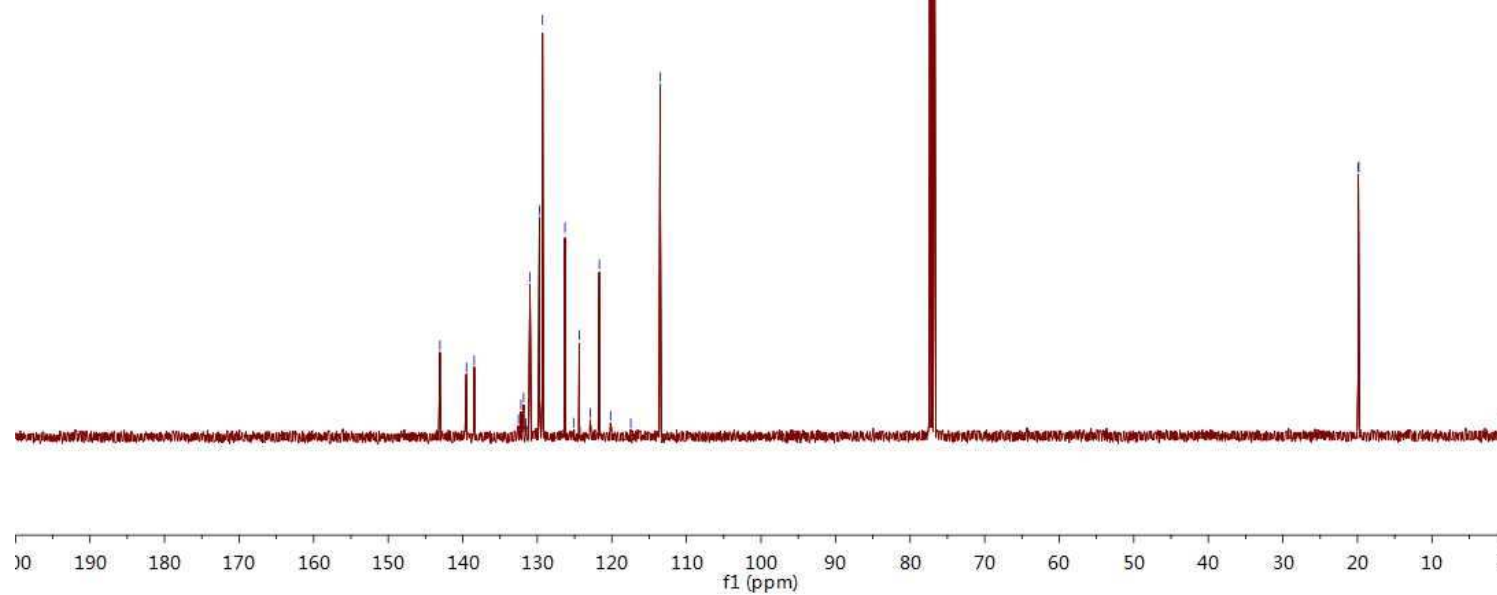
13C NMR in CDCl3 ZC-7-34B
 C13CPD CDCl3 {D:\NMR400\201} nmr 57

143.06
 139.51
 138.46
 132.53
 132.18
 131.84
 131.52
 130.98
 129.71
 129.30
 128.29
 125.07
 124.38
 122.89
 121.68
 120.17
 117.47
 113.52

19.88
 19.82

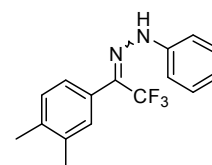


3h- ¹³C NMR (CDCl₃, 300 MHz)

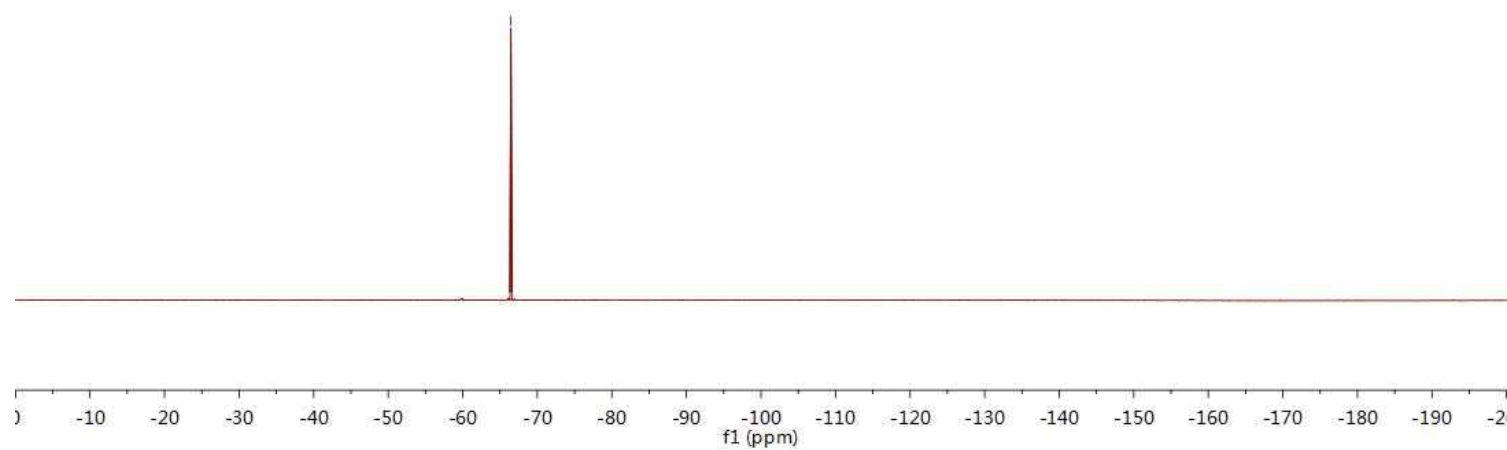


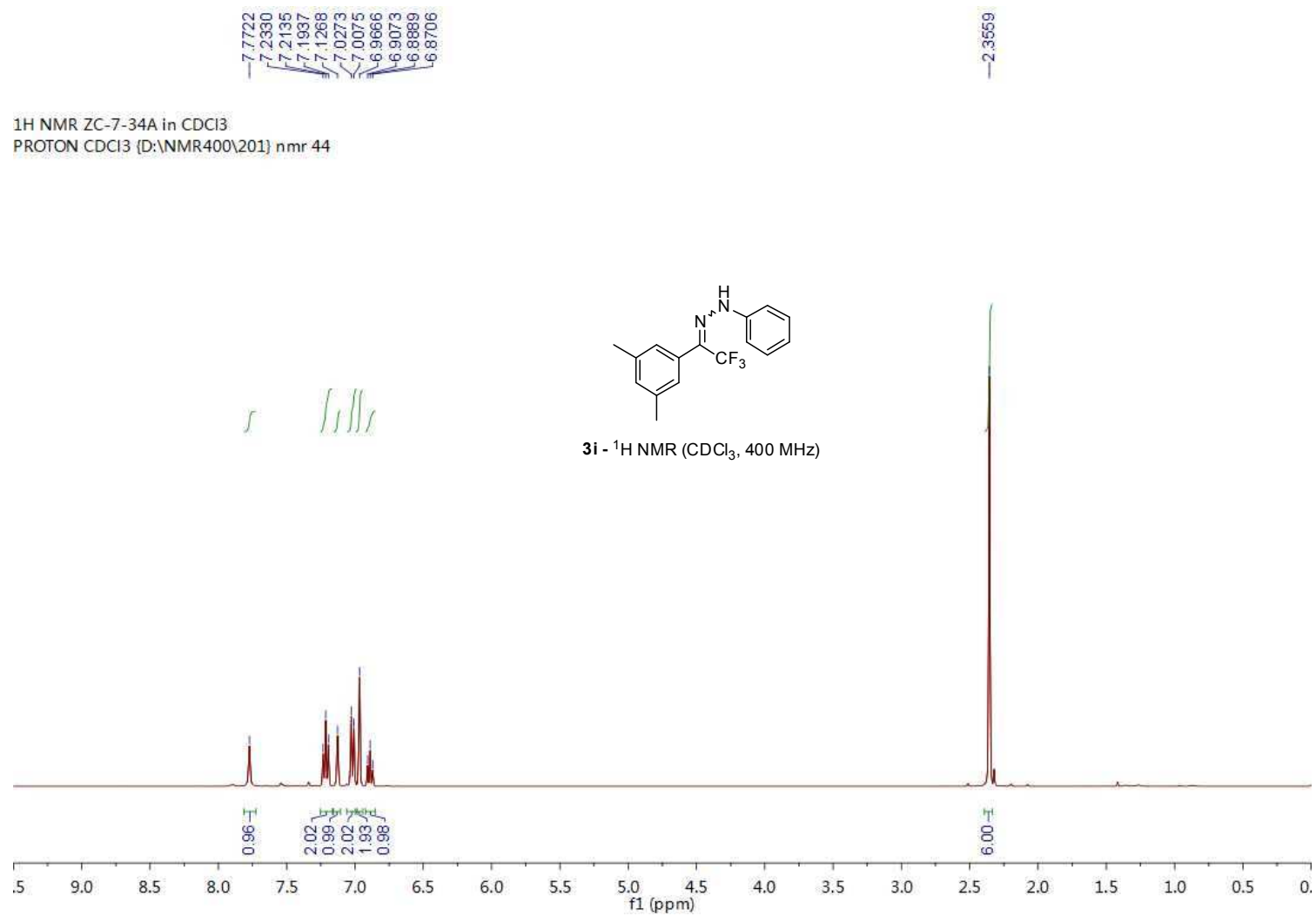
19F NMR in CDCl3 ZC-7-34B
F19CPD CDCl3 {D:\NMR400\201} nmr 57

—66.45



3h - ¹⁹F NMR (CDCl₃, 400 MHz)

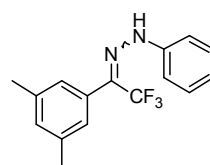




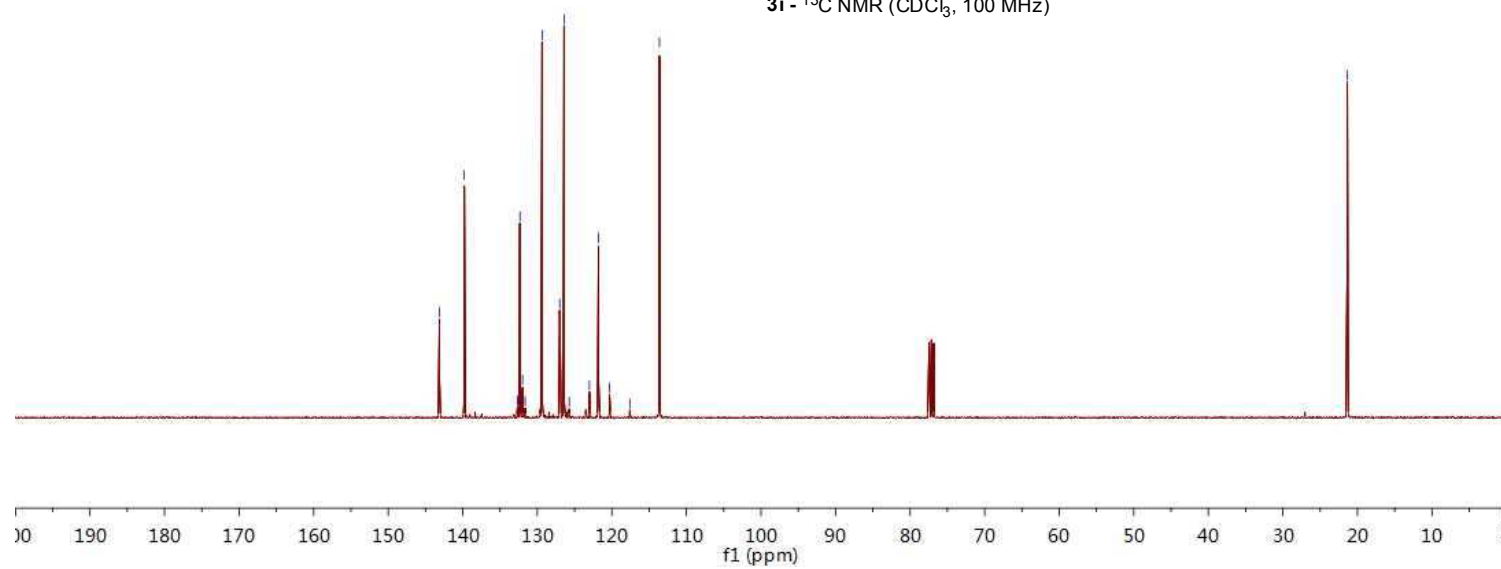
13C NMR in CDCl3 ZC-7-34A
C13CPD CDCl3 {D:\NMR400\201} nmr 19

143.13
139.79
132.67
132.33
131.98
131.63
129.36
126.99
126.42
125.72
123.01
121.80
120.31
117.60
113.62

21.35

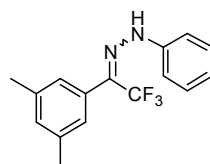


3i - ¹³C NMR (CDCl₃, 100 MHz)

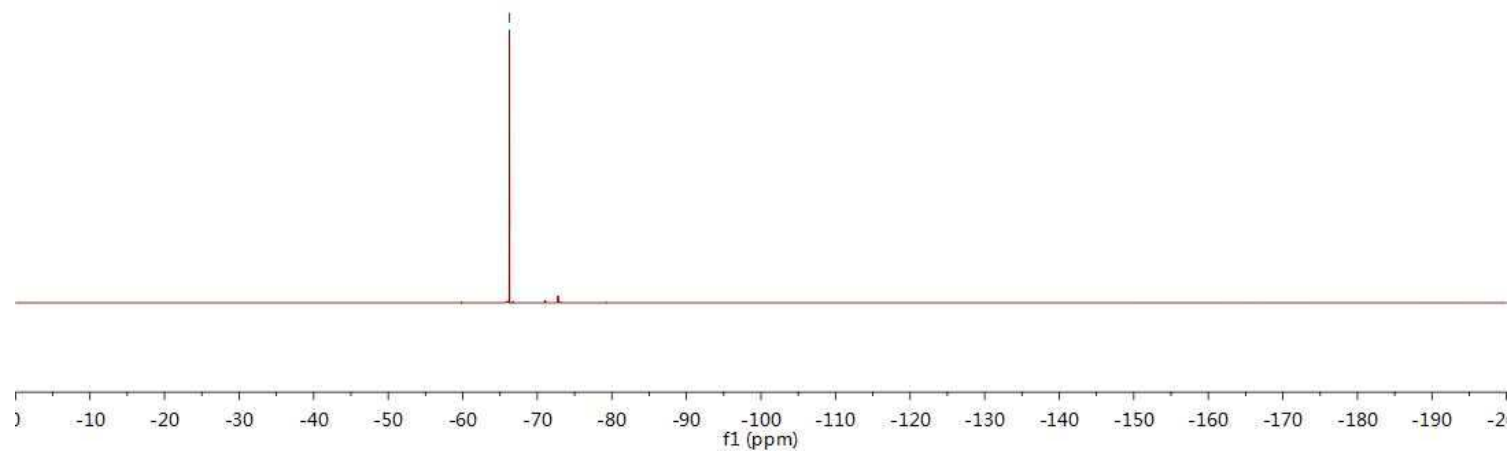


19F NMR ZC-7-34A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 44

-66.26

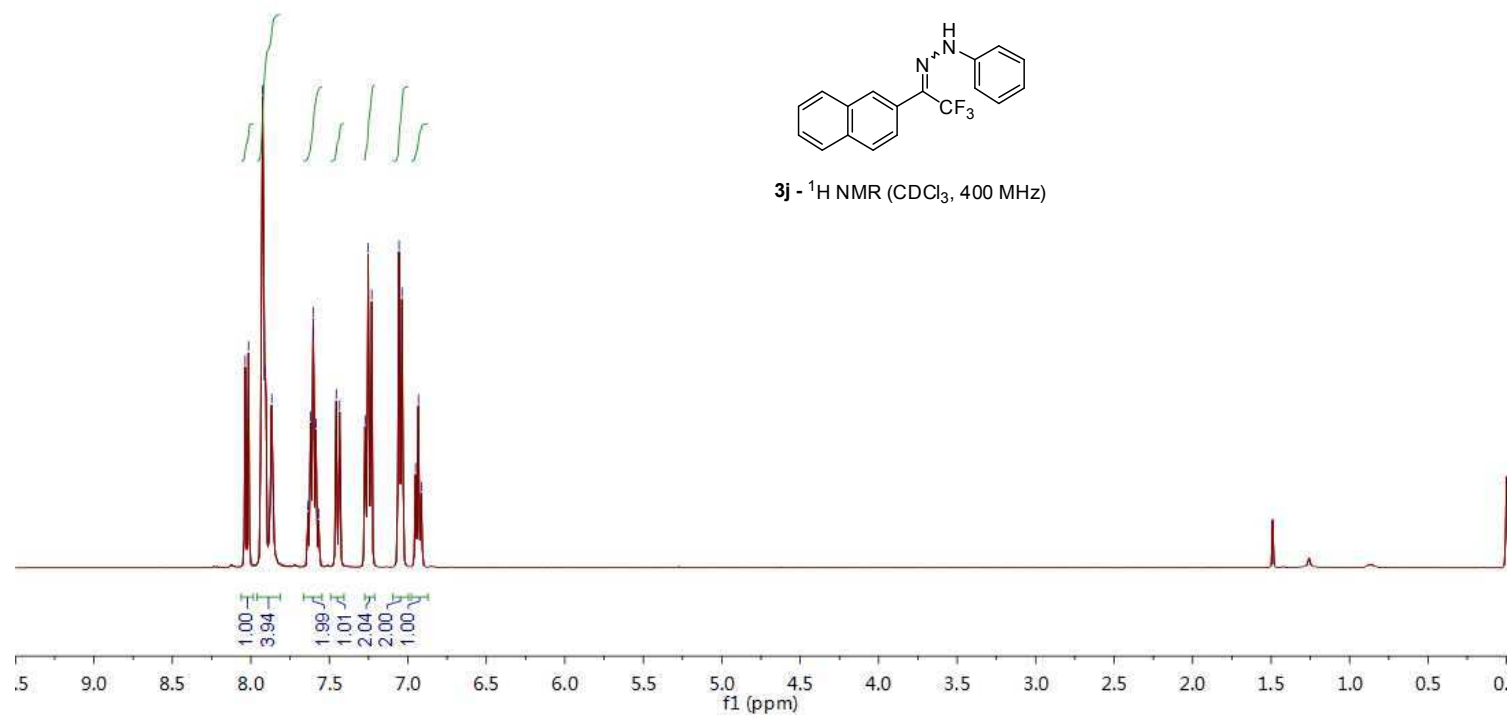


3i - ¹⁹F NMR (CDCl₃, 377 MHz)



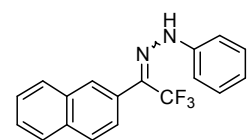
8.0360
8.0149
7.9253
7.9072
7.8672
7.6358
7.6188
7.6030
7.6008
7.5858
7.5681
7.4556
7.4346
7.2721
7.2527
7.2294
7.0559
7.0367
6.9506
6.9324
6.9139

¹H NMR ZC-7-32B in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 43

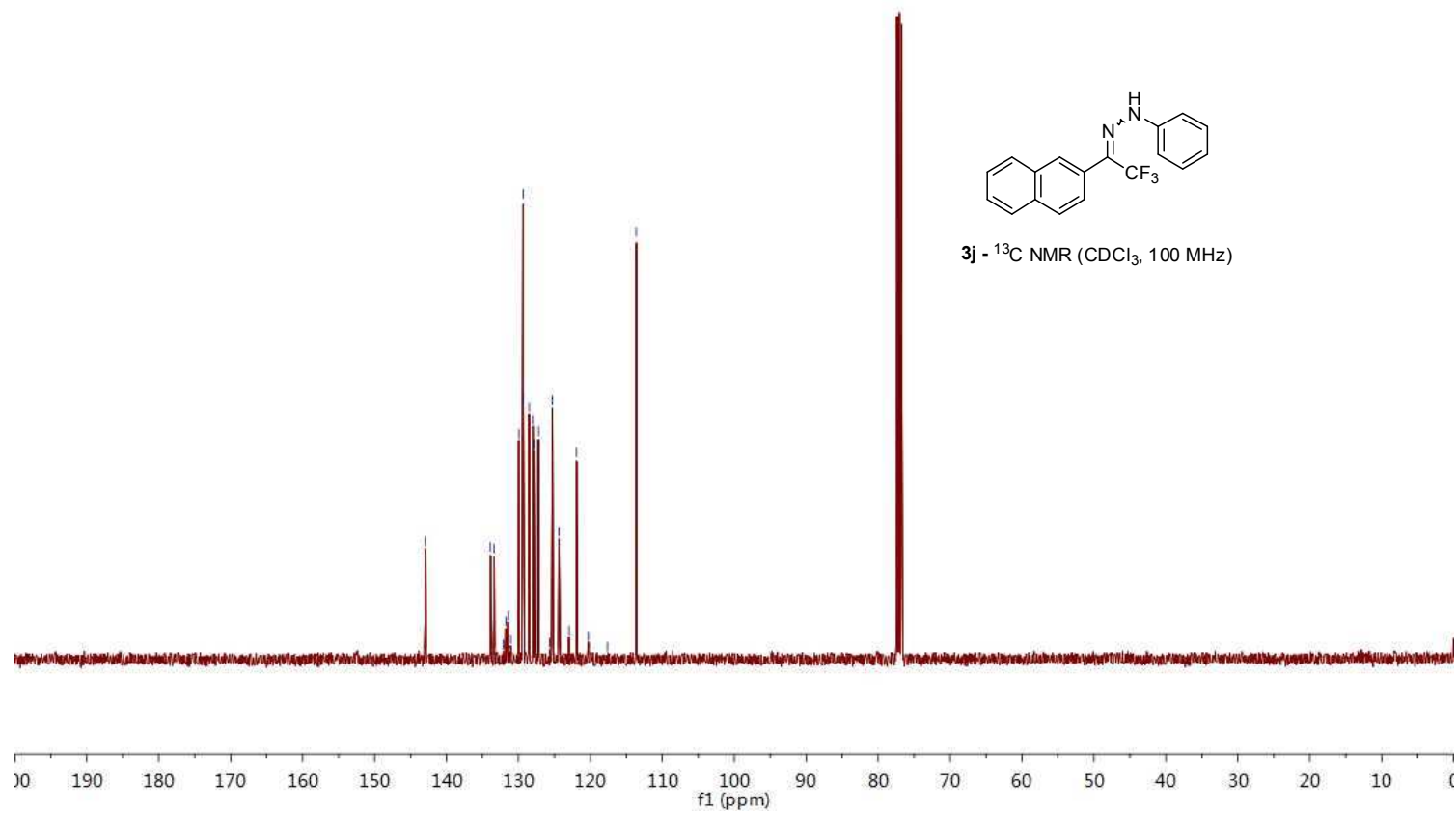




¹³C NMR ZC-7-32B in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 43

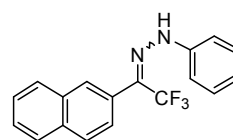


3j - ¹³C NMR (CDCl₃, 100 MHz)

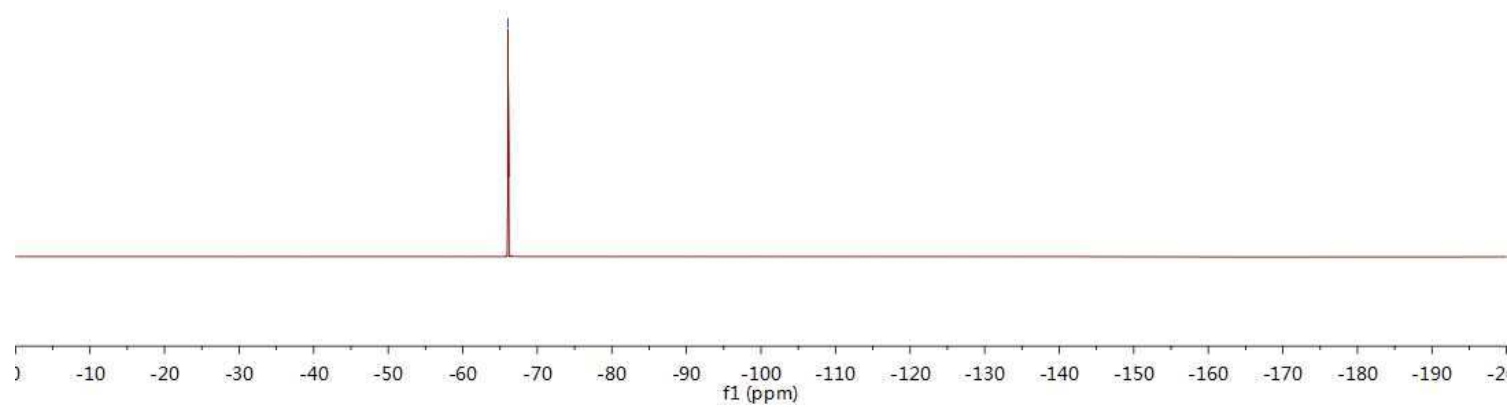


19F NMR ZC-7-32B in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 43

—66.05



3j - ¹⁹F NMR (CDCl₃, 400 MHz)



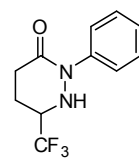
7.6989
7.6963
7.6769
7.3544
7.3495
7.3357
7.3144
7.2601
7.1688
7.1503
7.1319

4.8105
4.7914

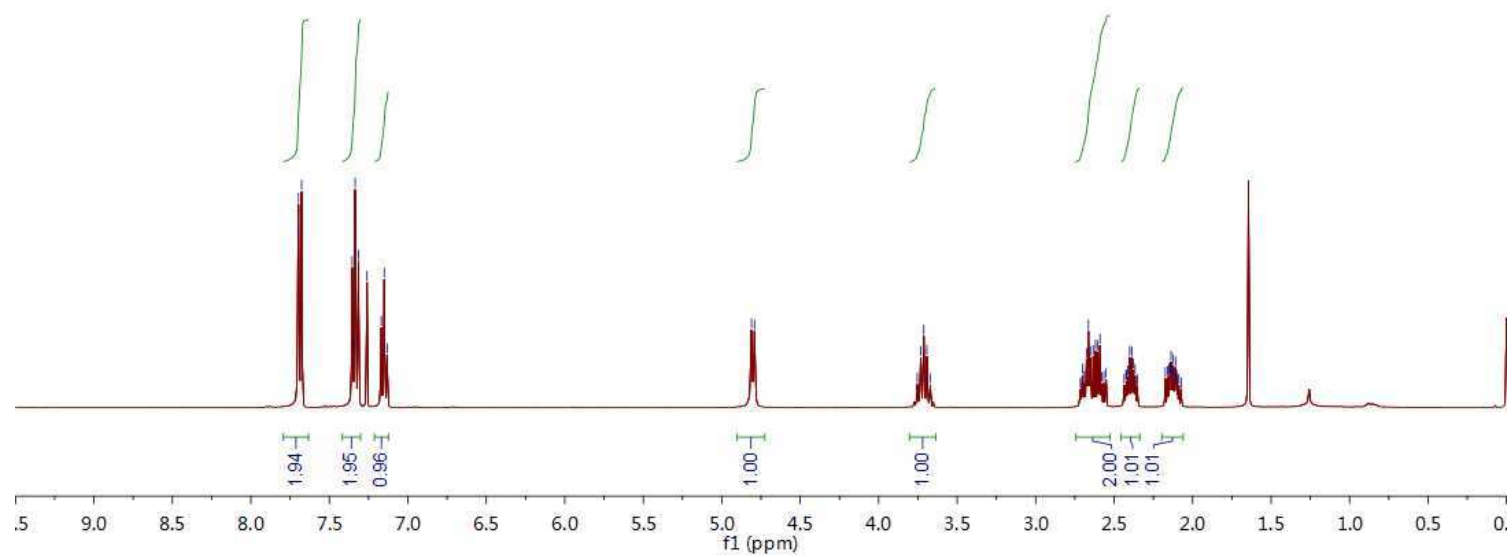
3.7540
3.7320
3.7127
3.6934
3.6713

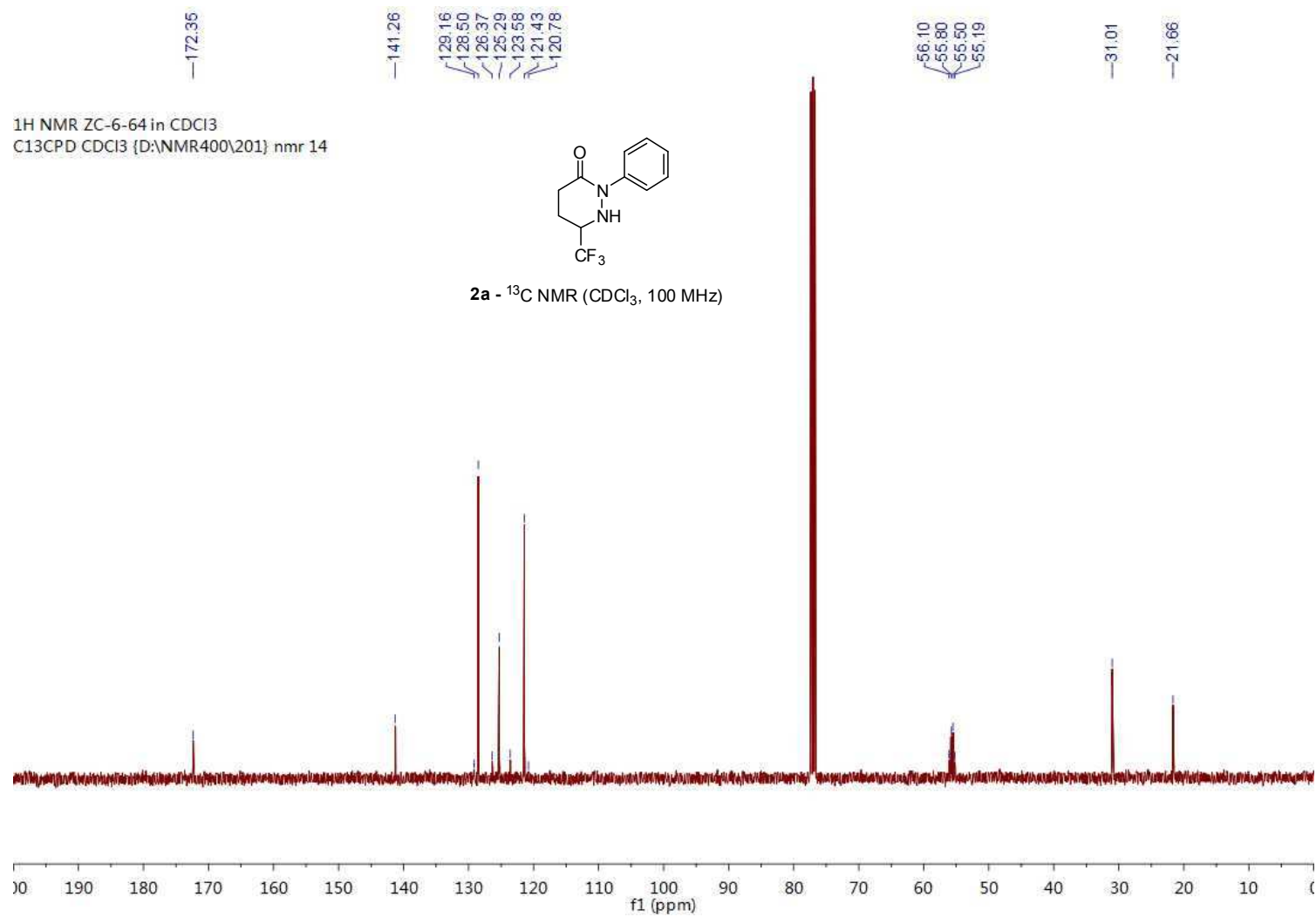
2.7021
2.6761
2.6637
2.6511
2.6331
2.6186
2.6045
2.5900
2.5512
2.4245
2.4217
2.4124
2.4008
2.3876
2.3774
2.3667
2.1736
2.1594
2.1510
2.1449
2.1375
2.1306
2.1229
2.1159
2.1060

¹H NMR ZC-6-64 in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 26



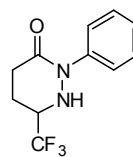
2a - ¹H NMR (CDCl₃, 400 MHz)



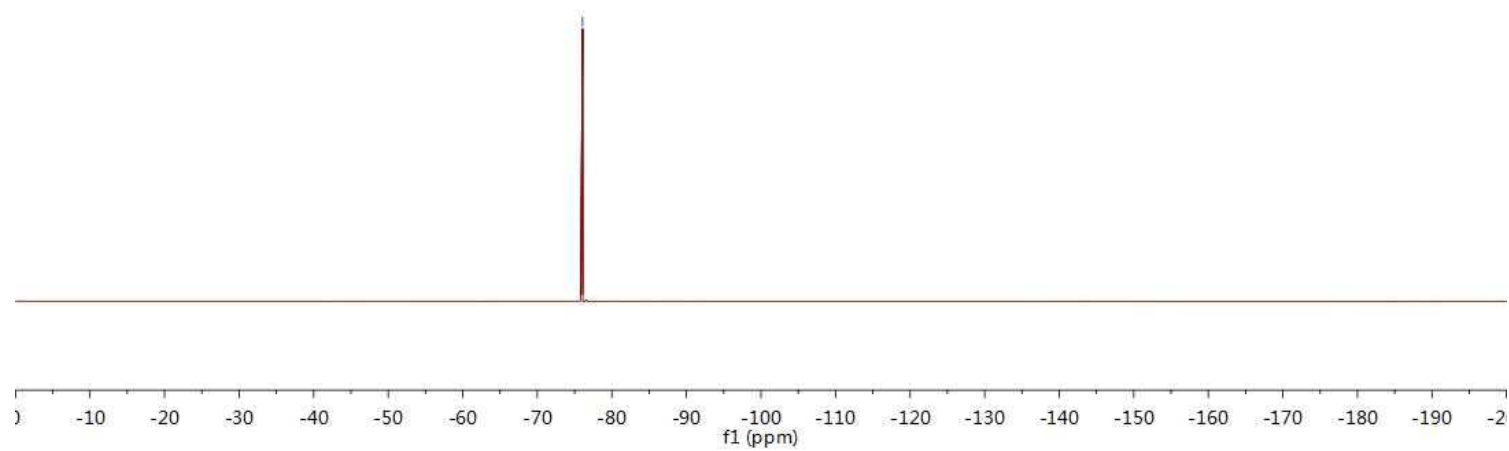


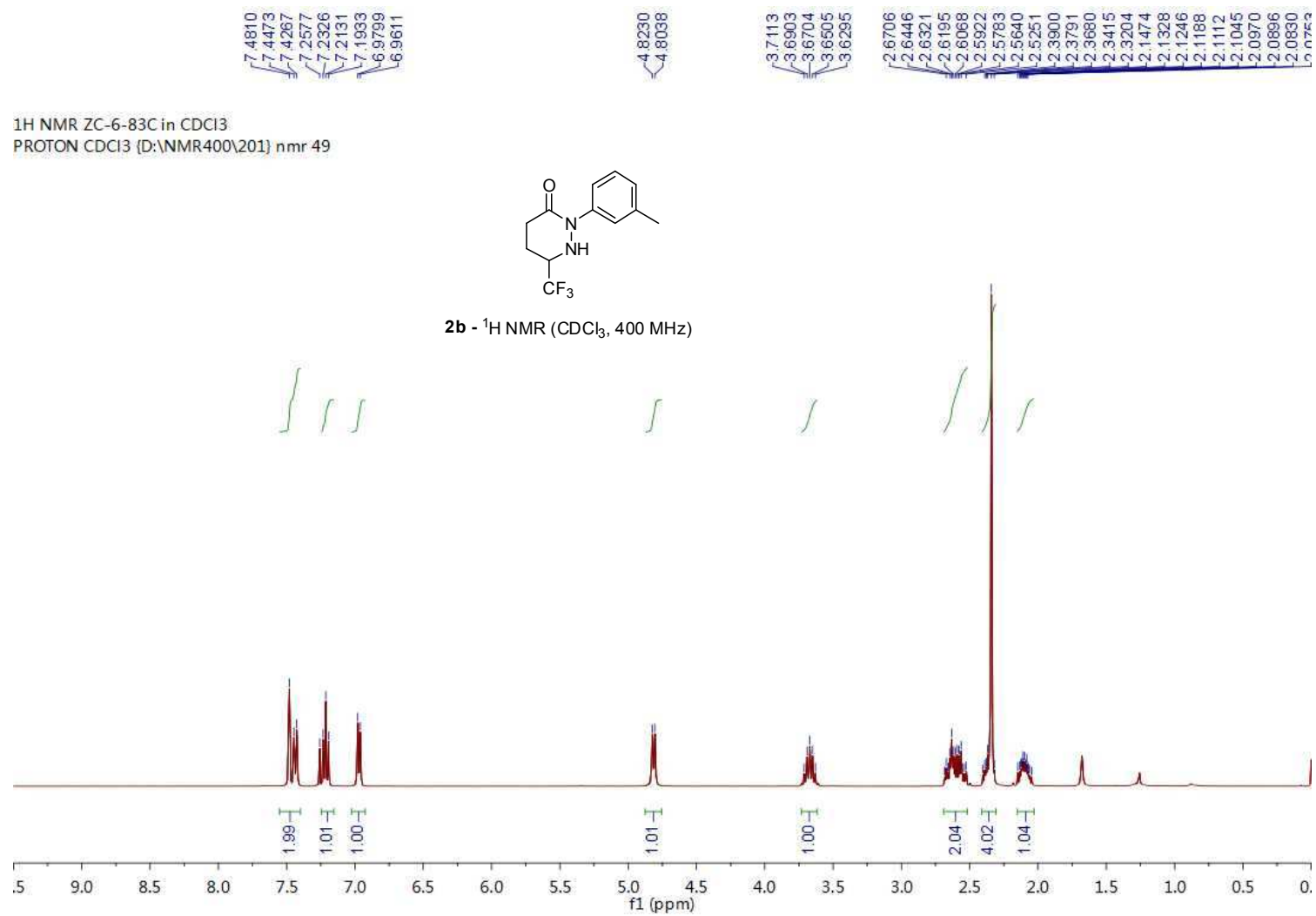
19F NMR ZC-6-64 in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 14

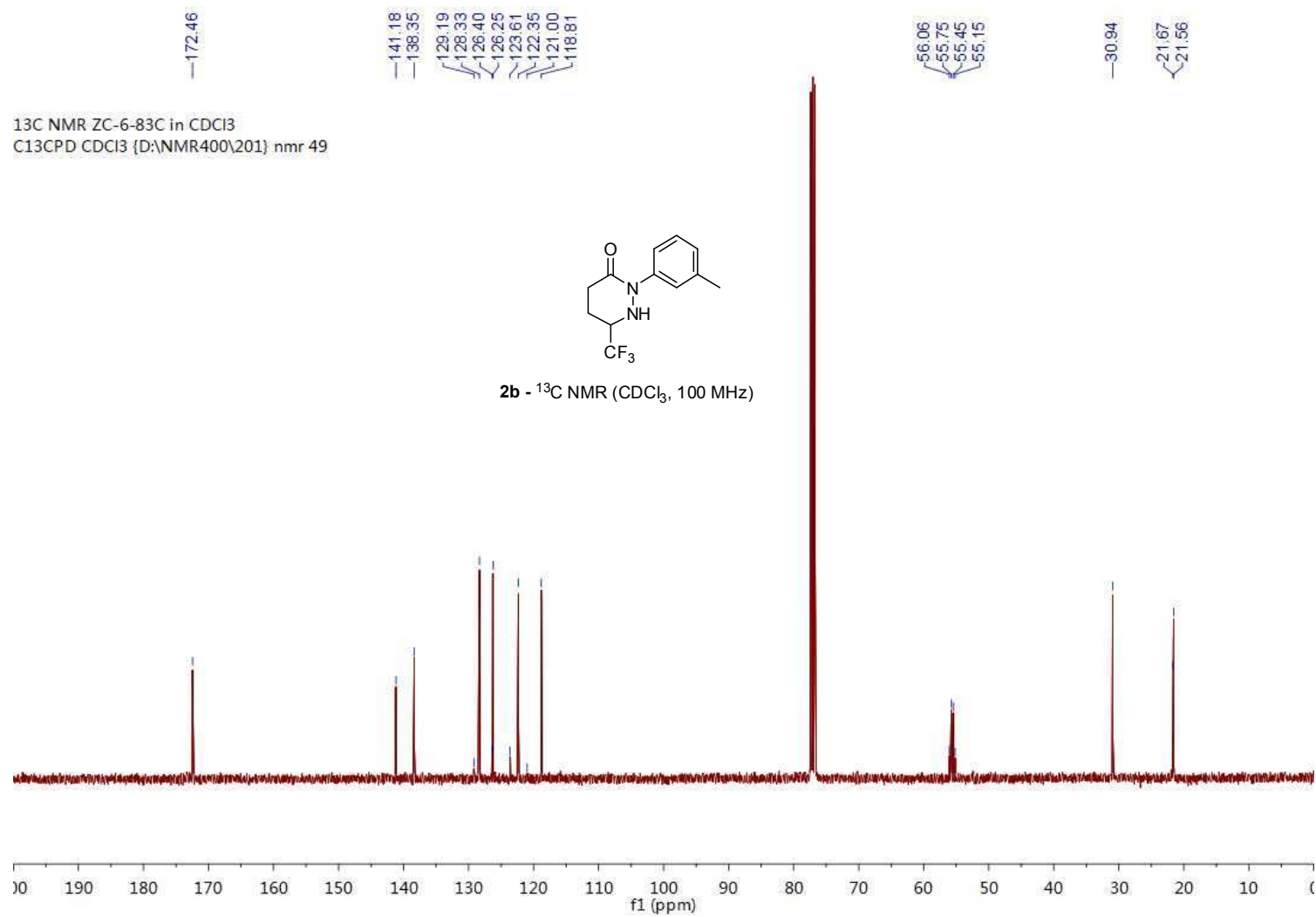
-76.07



2a - ¹⁹F NMR (CDCl₃, 377 MHz)

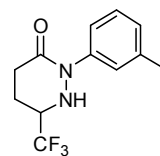




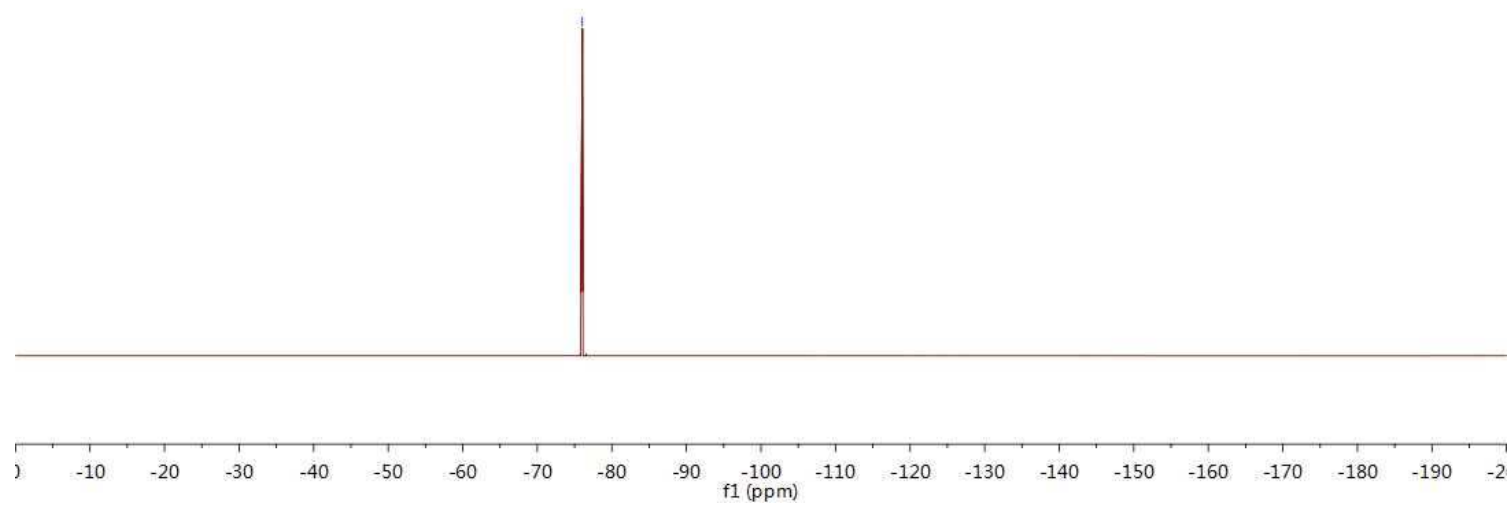


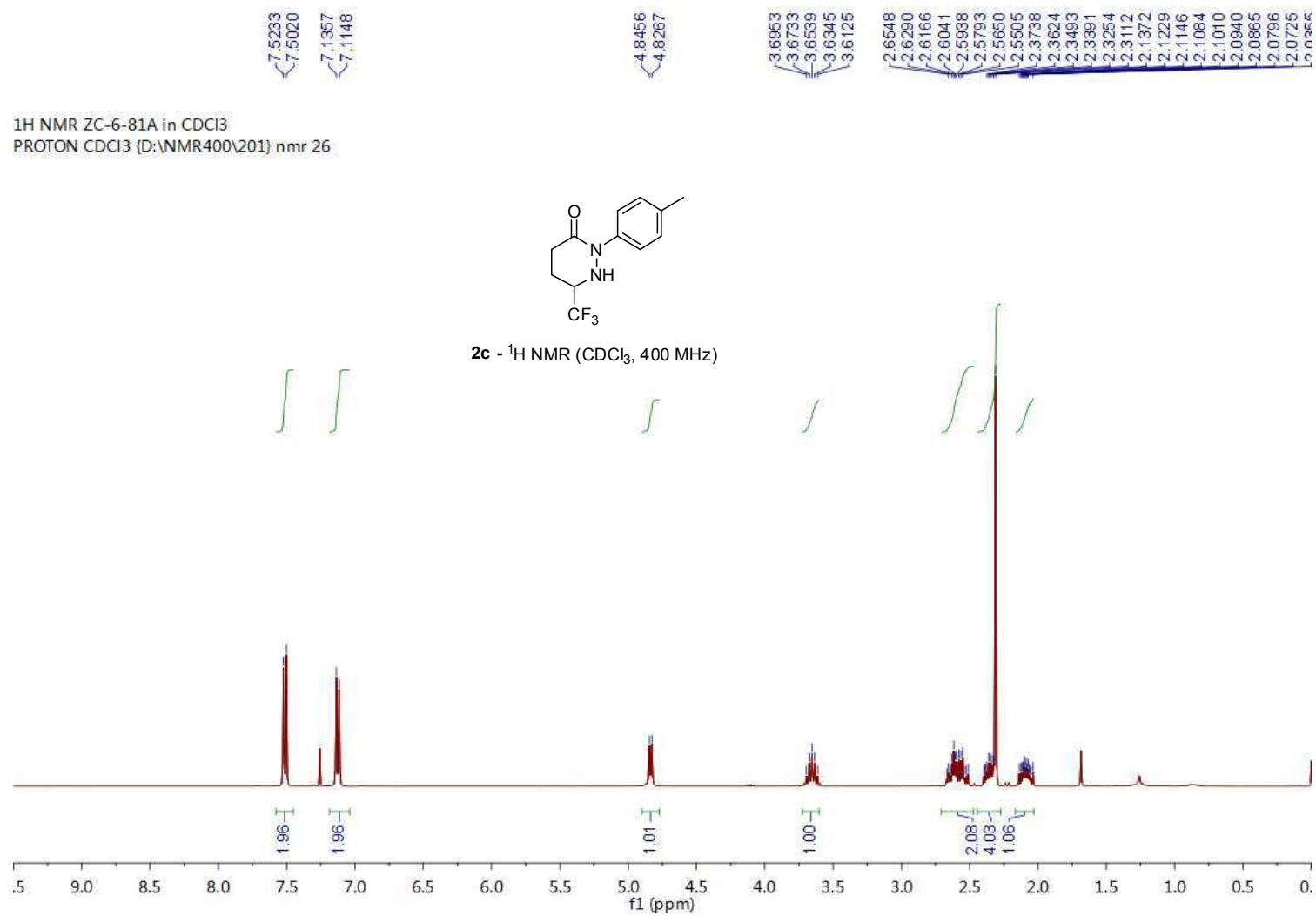
¹⁹F NMR ZC-6-83C in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 49

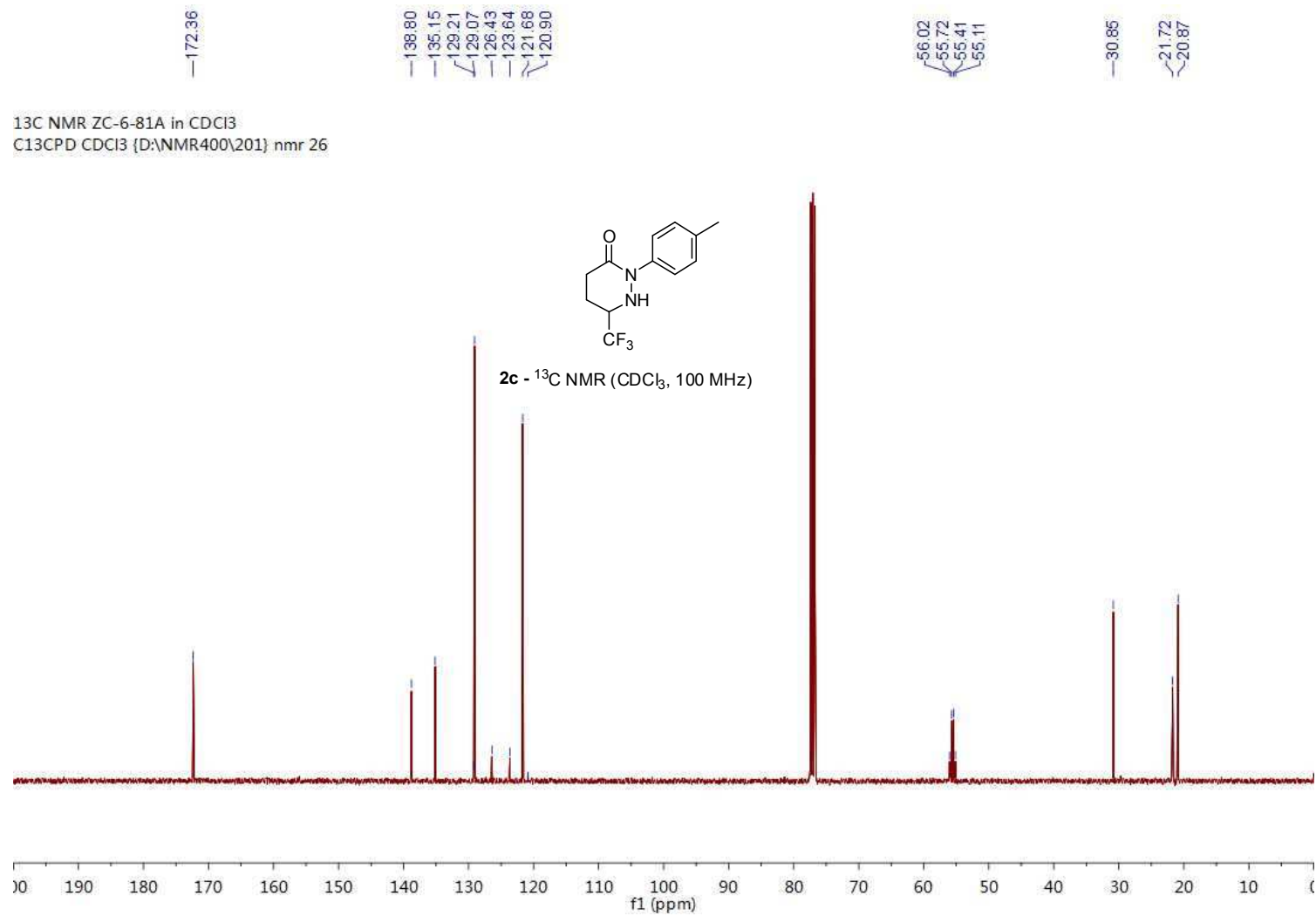
—76.04



2b - ¹⁹F NMR (CDCl₃, 377 MHz)

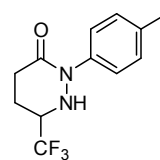




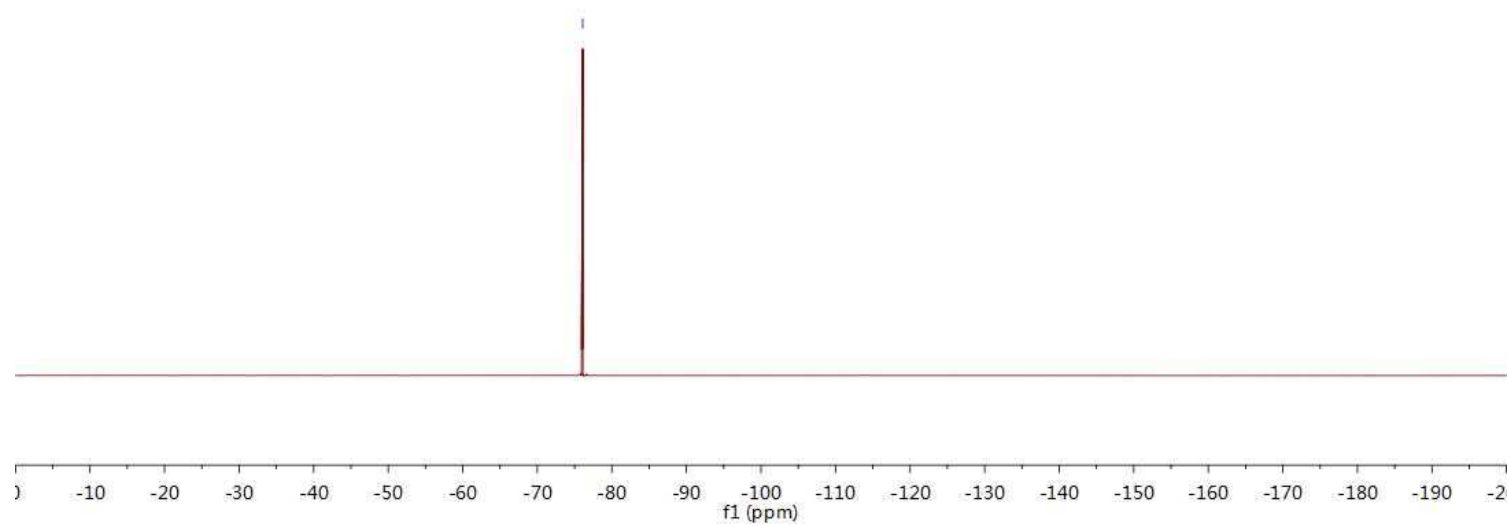


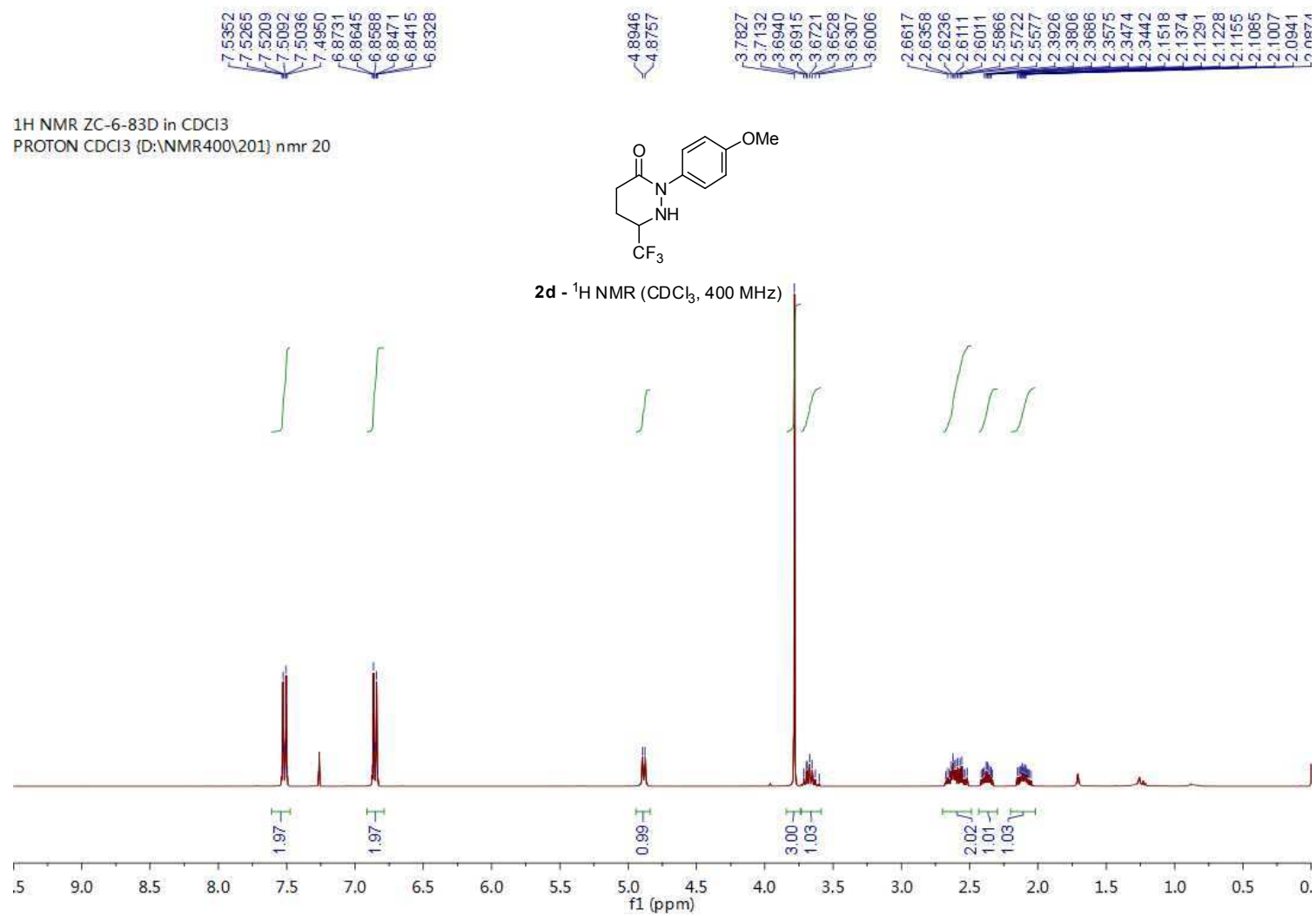
19F NMR ZC-6-81A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 26

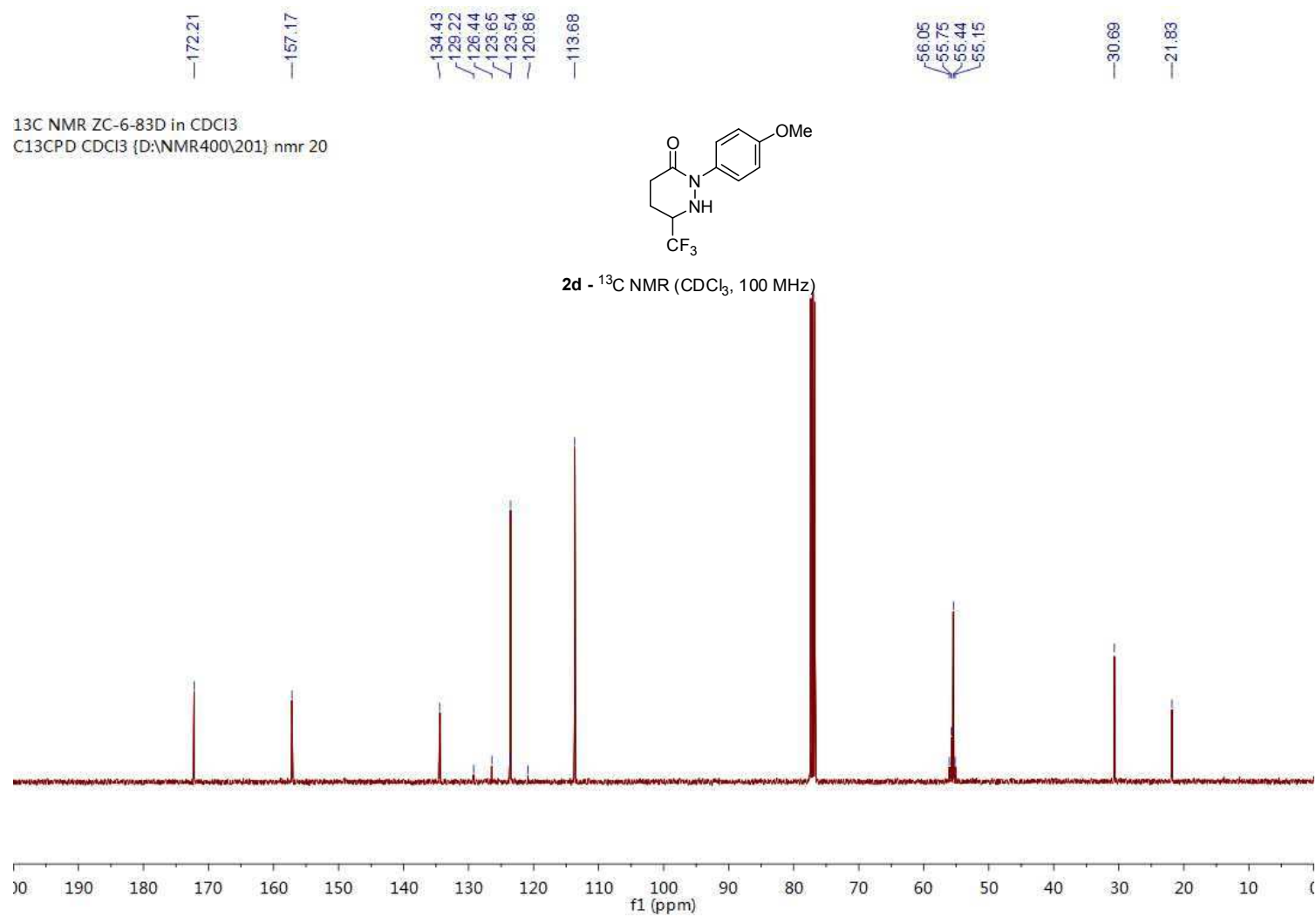
-76.08



2c - ^{19}F NMR (CDCl_3 , 377 MHz)

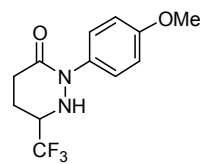




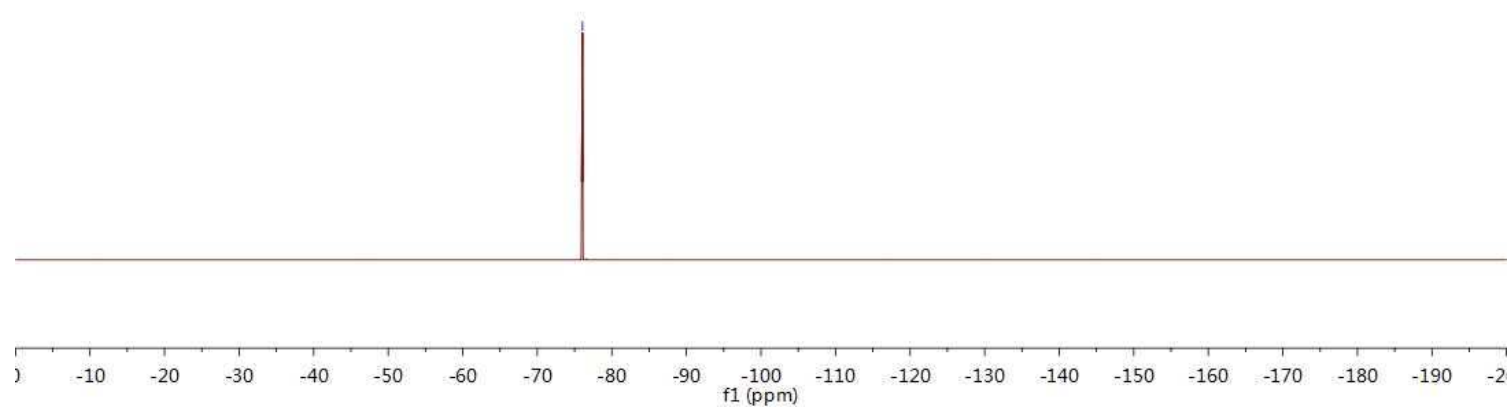


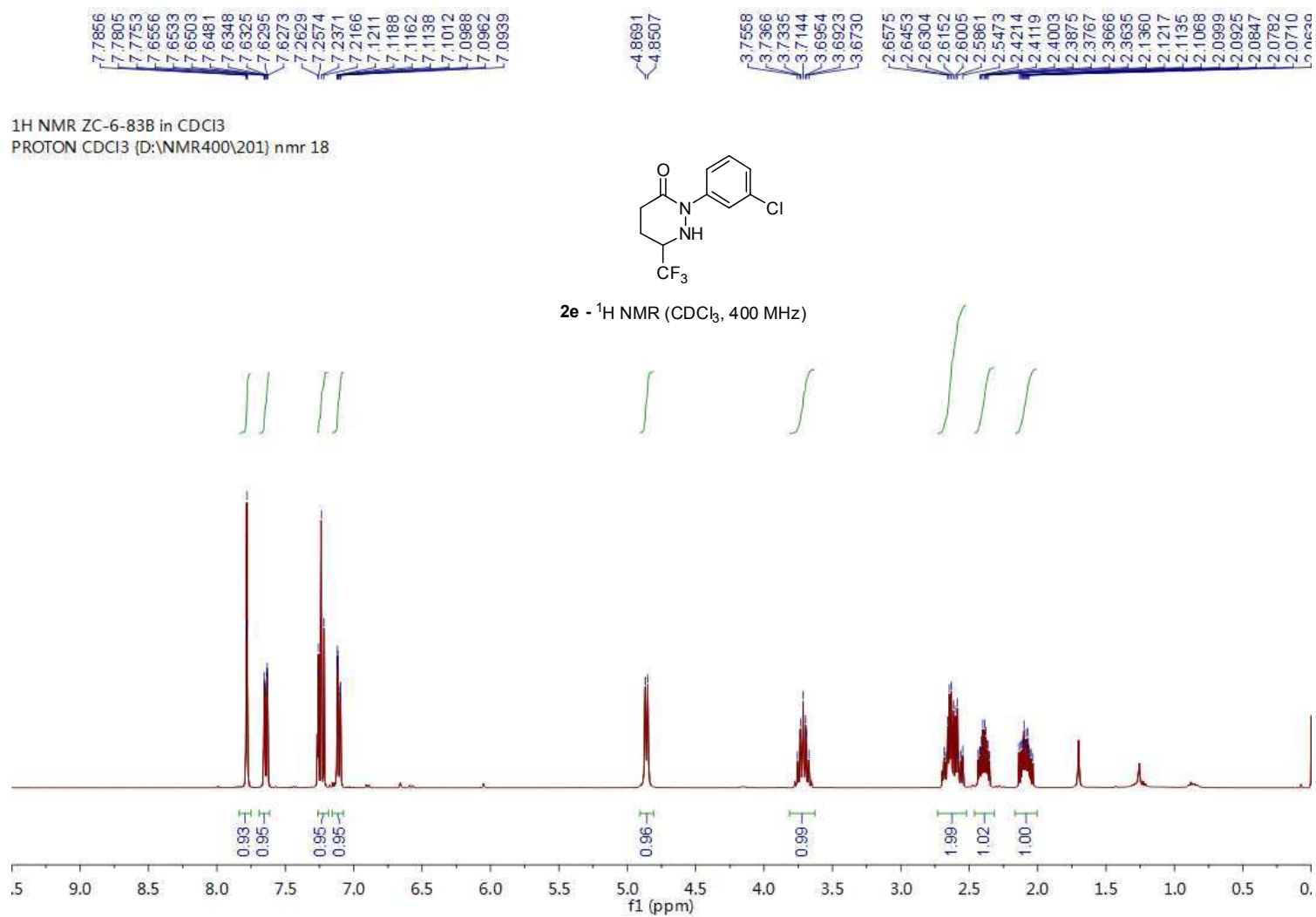
19F NMR ZC-6-83D in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 20

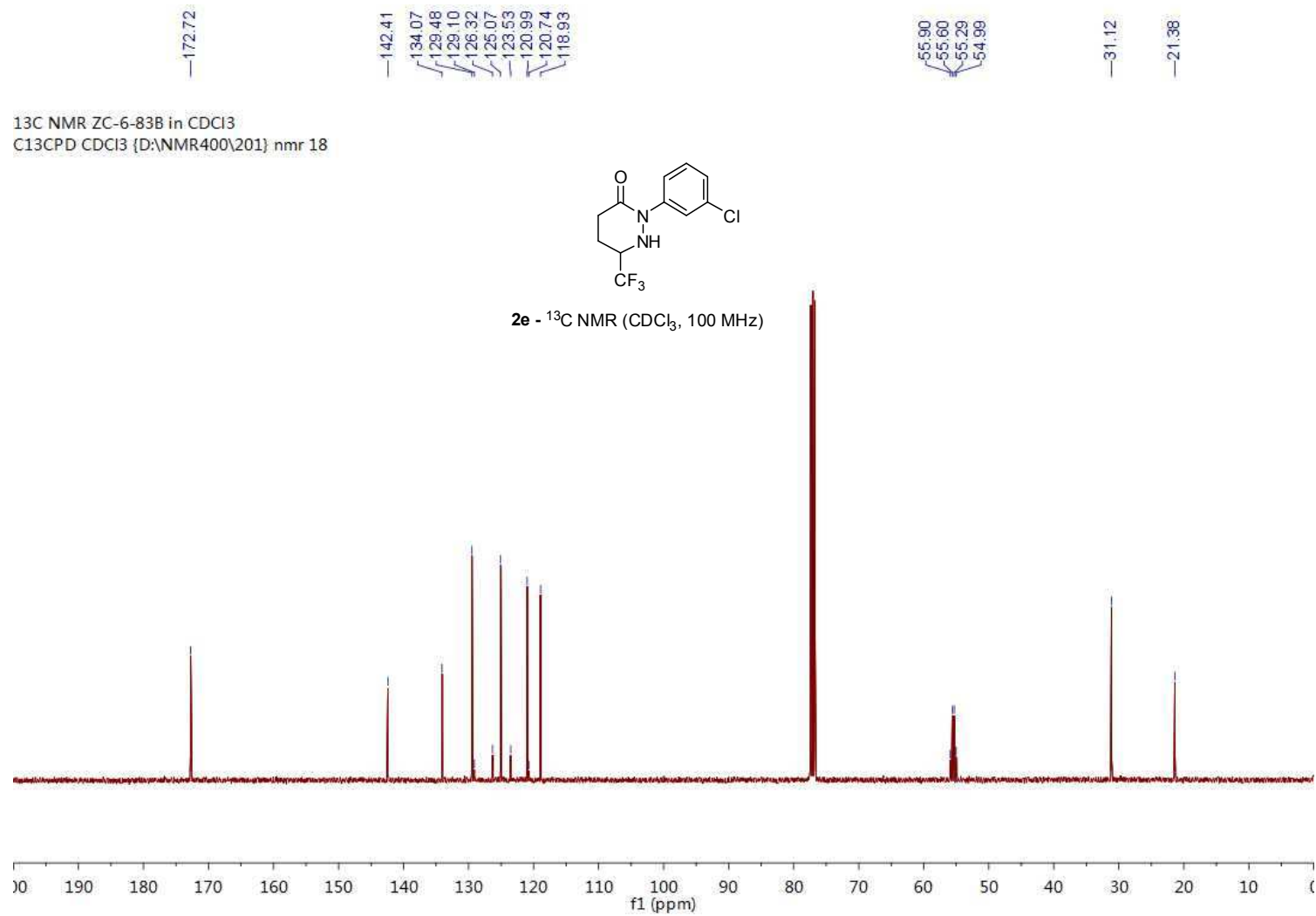
-76.05



2d - ¹⁹F NMR (CDCl₃, 377 MHz)

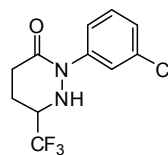




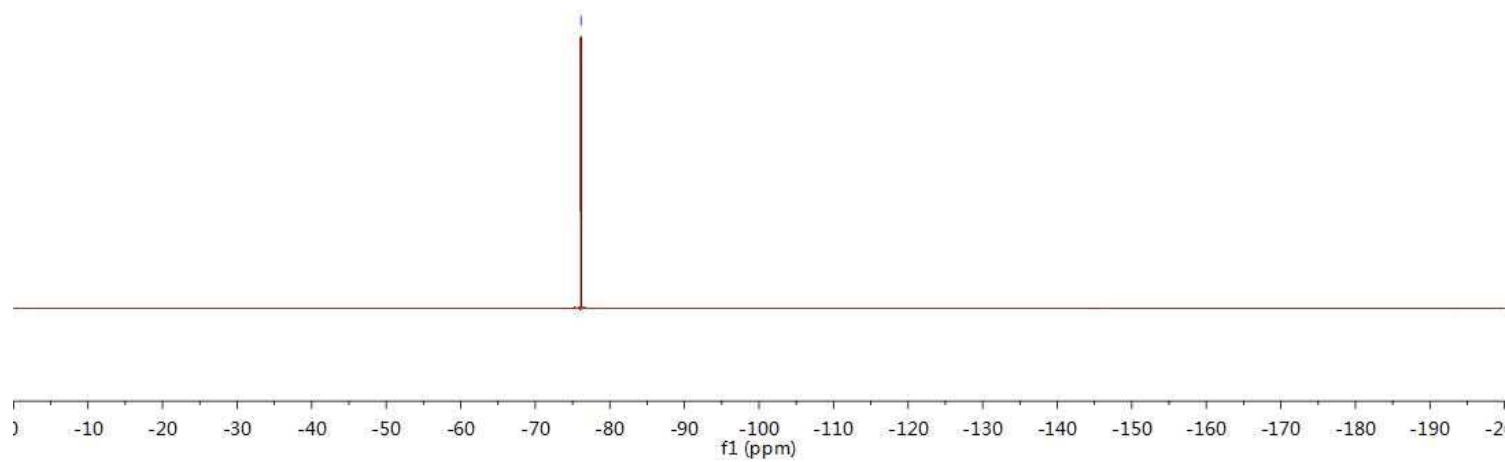


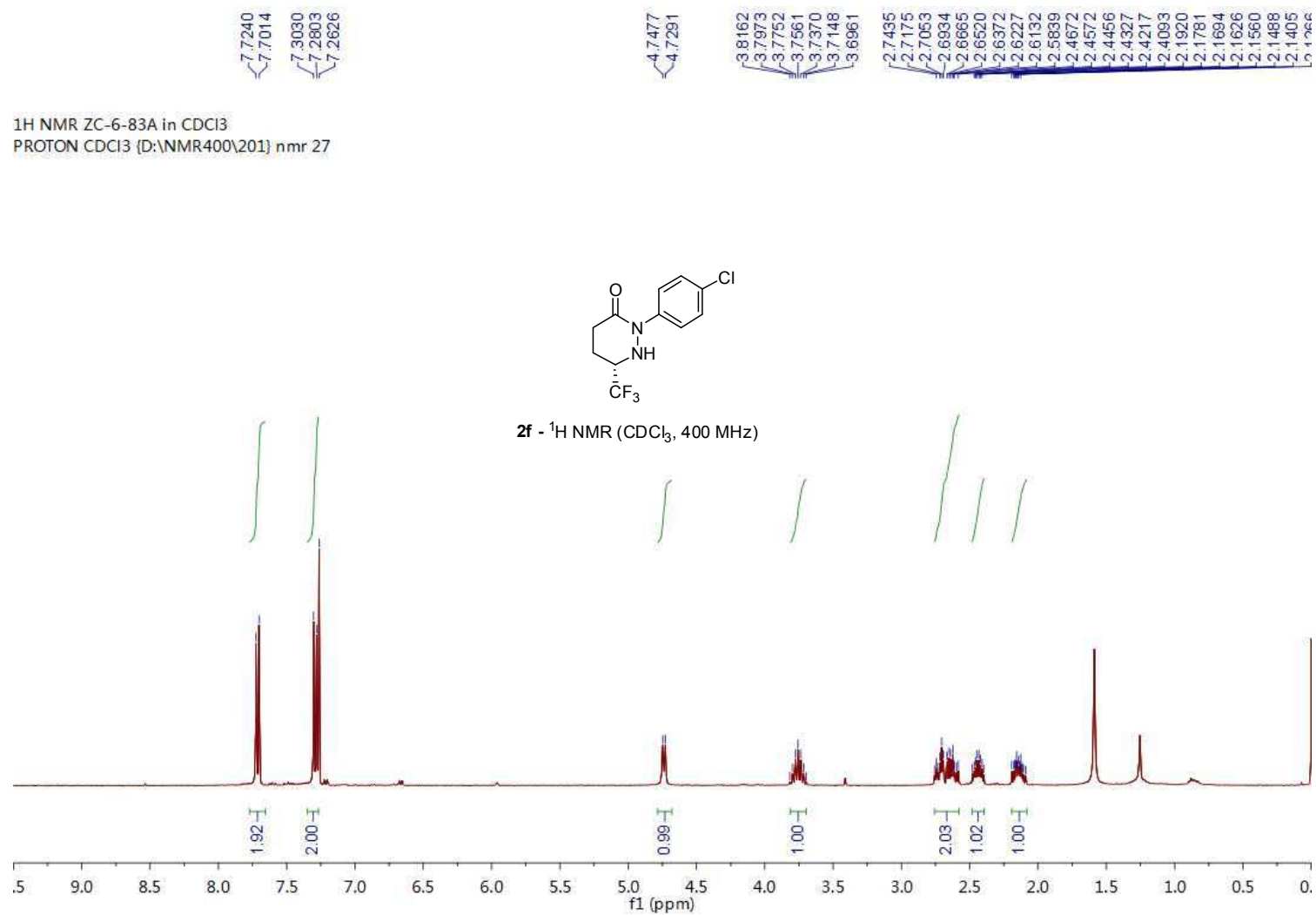
¹⁹F NMR ZC-6-83B in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 18

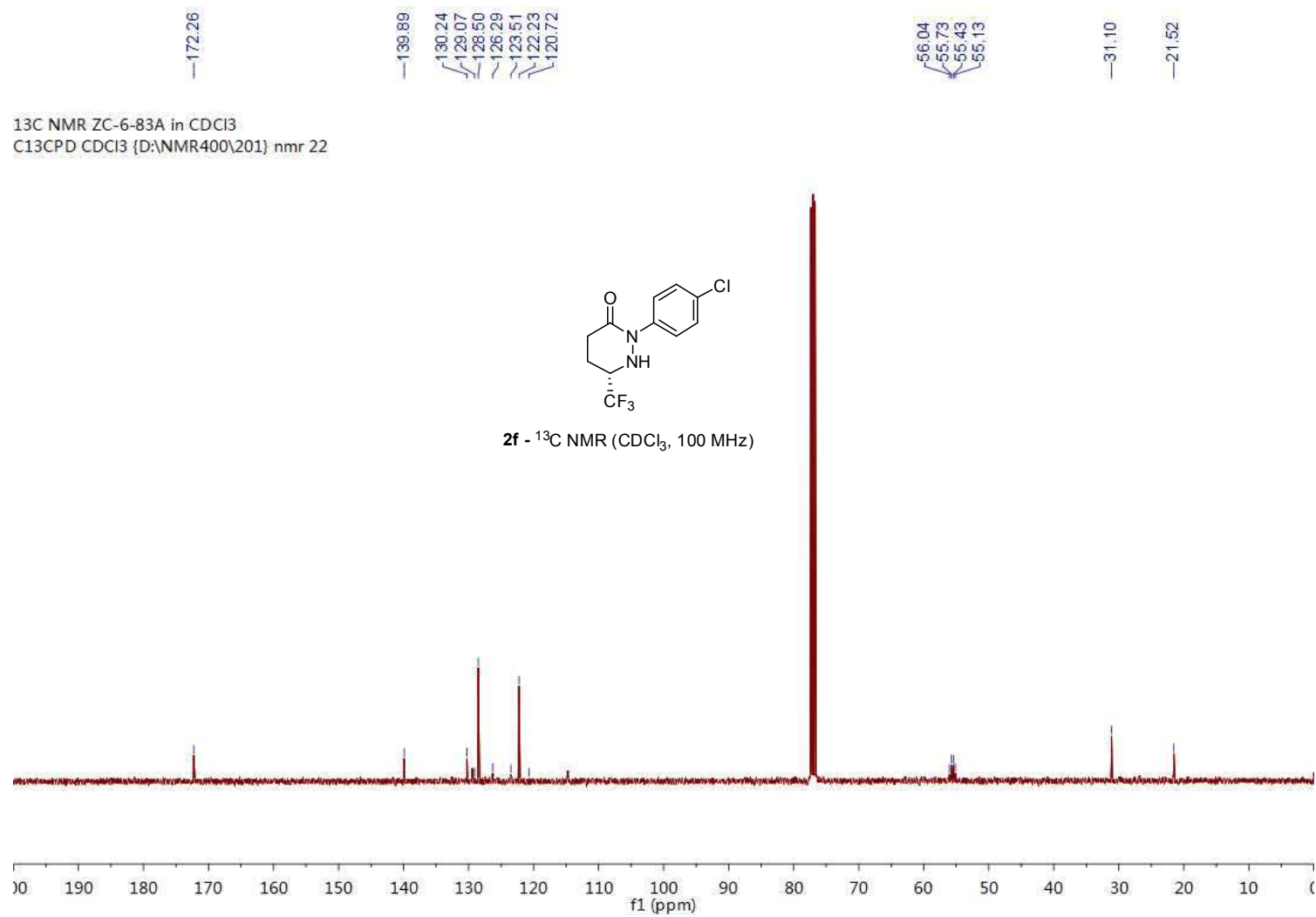
-76.13



2e - ¹⁹F NMR (CDCl₃, 377 MHz)

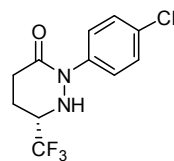




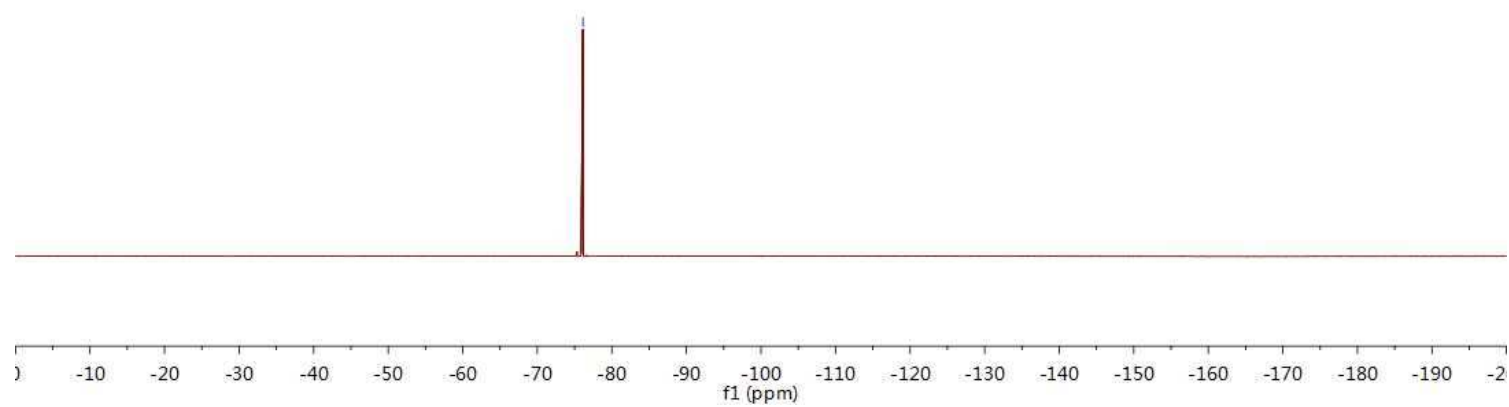


19F NMR ZC-6-83A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 27

-76.12



2f - ¹⁹F NMR (CDCl₃, 377 MHz)



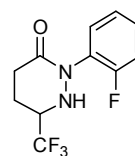
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7.2912
7.2737
7.2652
7.1730
7.1523
7.1238
7.1026

5.1390
5.1195

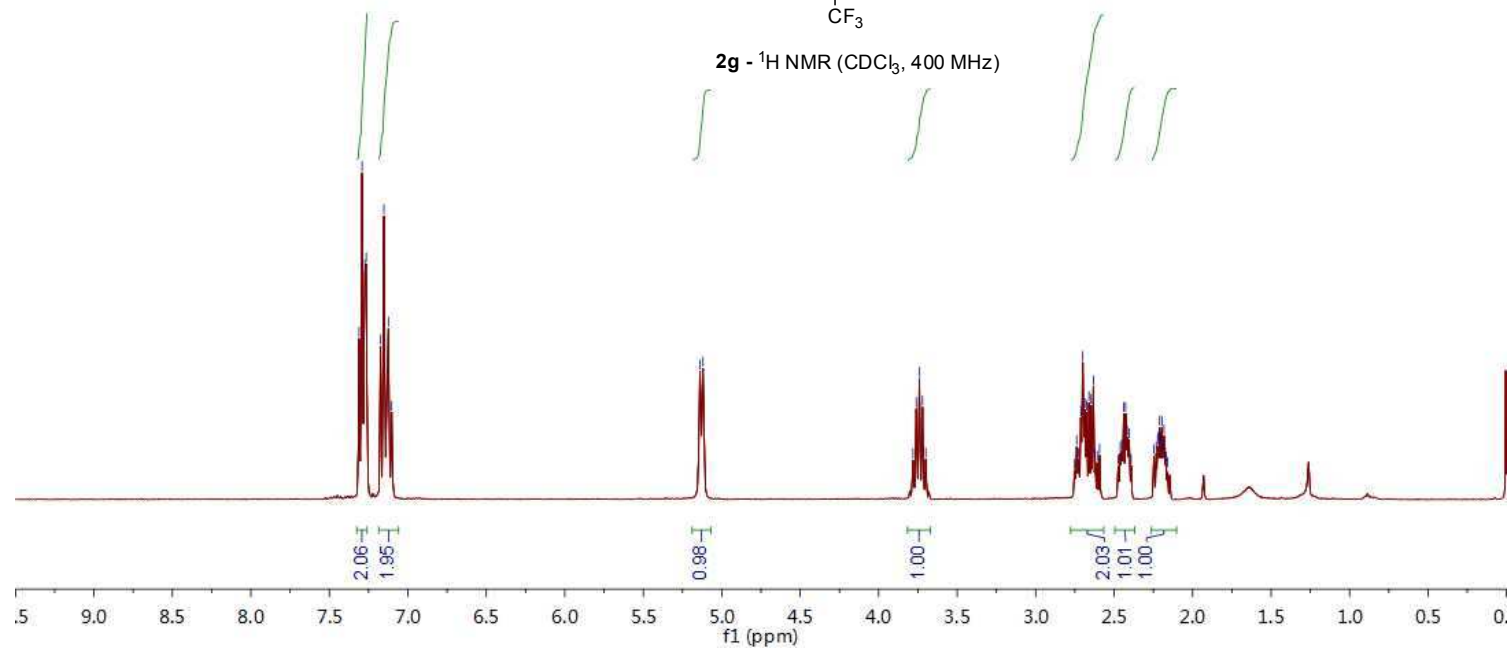
3.7815
3.7609
3.7407
3.7206
3.7001

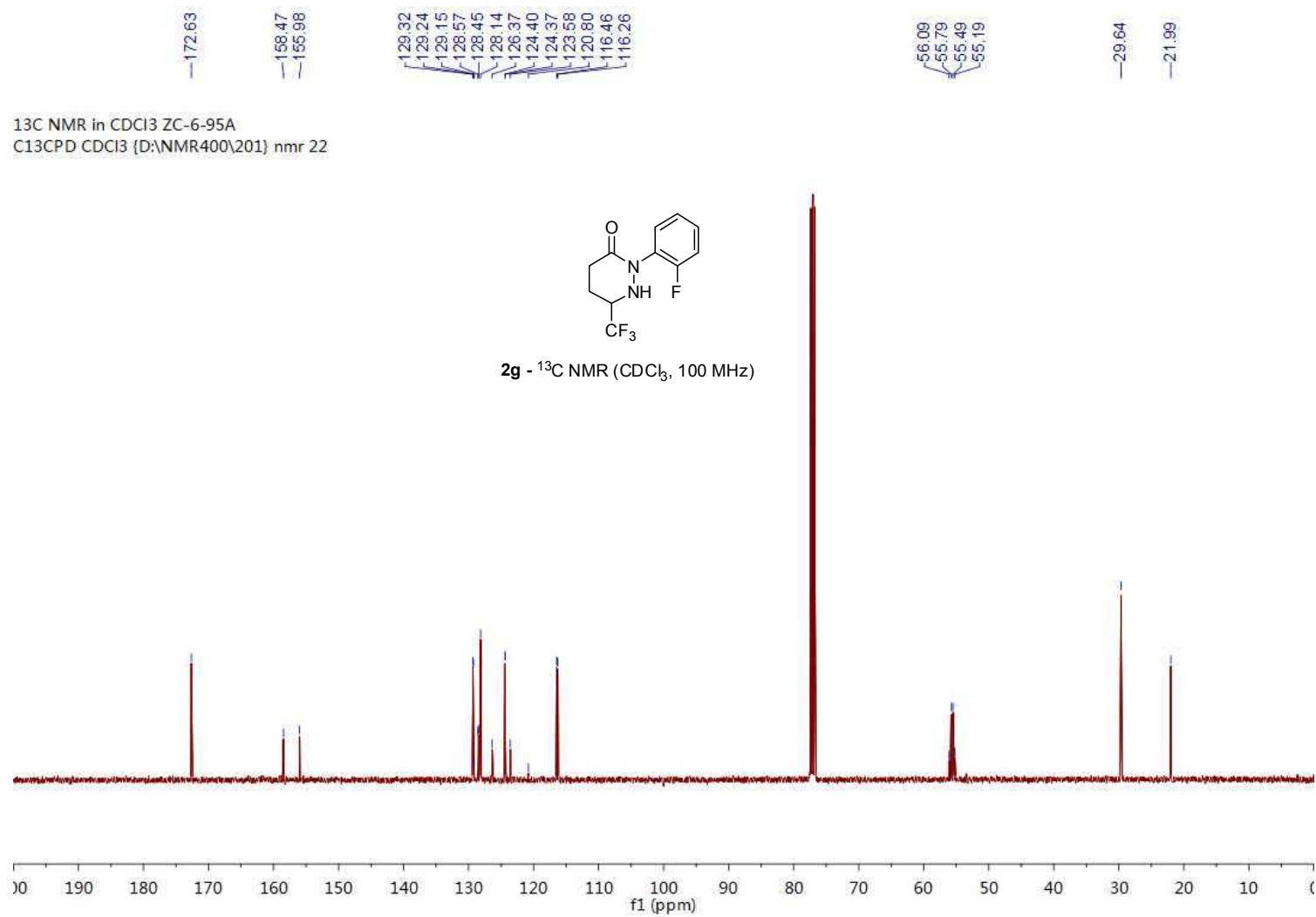
2.7386
2.7120
2.6994
2.6870
2.6751
2.6604
2.6468
2.6324
2.5926
2.4805
2.4514
2.4390
2.4267
2.4165
2.4051
2.2463
2.2316
2.2232
2.2184
2.2101
2.2039
2.1959
2.1883
2.1821
2.1738

¹H NMR ZC-6-95A in CDCl₃
PROTON CDCl₃ [D:\NMR 400\201] nmr 22

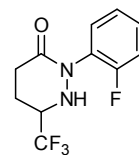


2g - ¹H NMR (CDCl₃, 400 MHz)

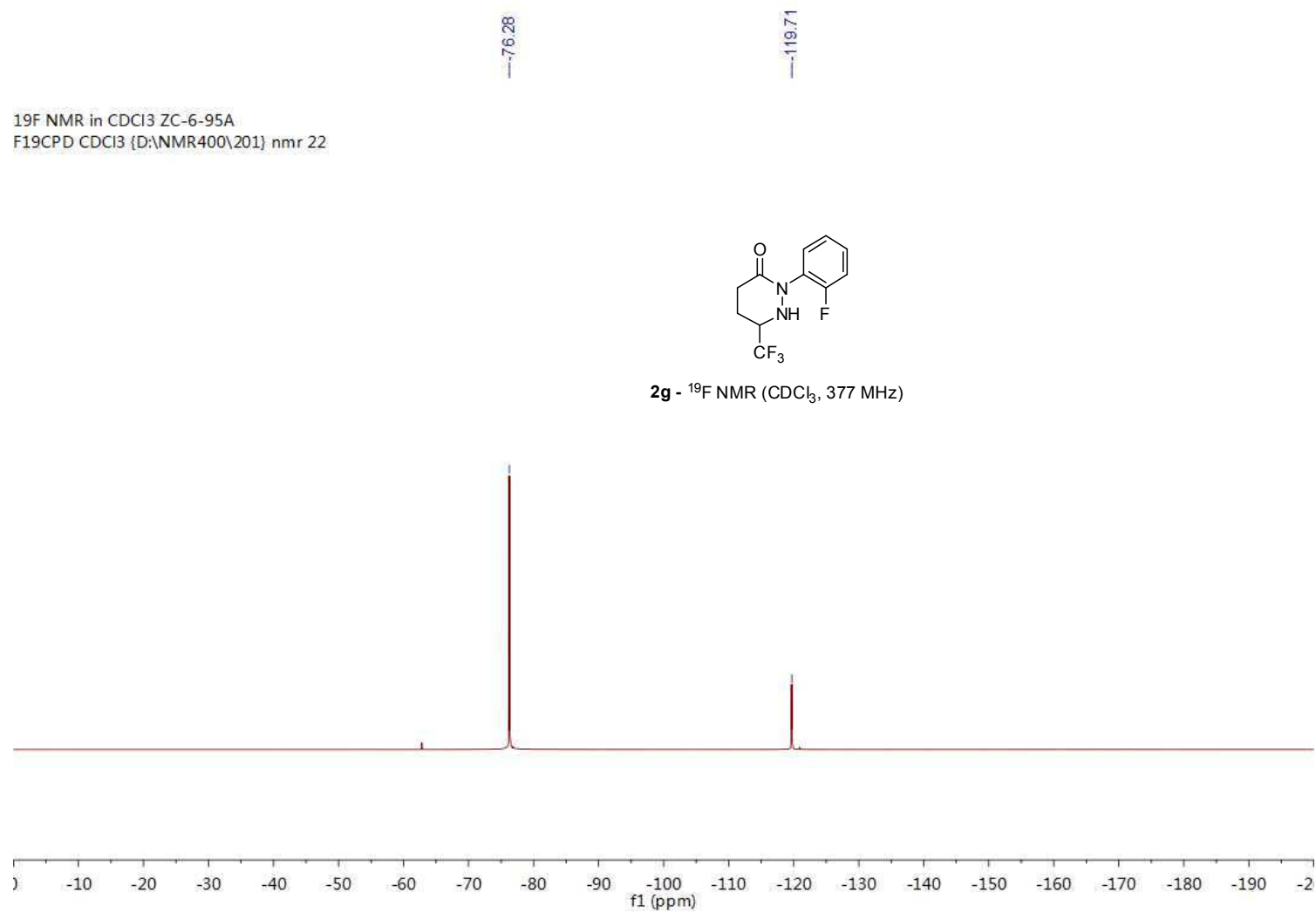




19F NMR in CDCl3 ZC-6-95A
F19CPD CDCl3 {D:\NMR400\201} nmr 22



2g - ¹⁹F NMR (CDCl₃, 377 MHz)



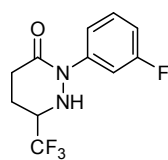
7.6146
7.5930
7.5621
7.3079
7.2883
7.2656
7.2509
6.8602
6.8414
6.8238

4.7588
4.7402

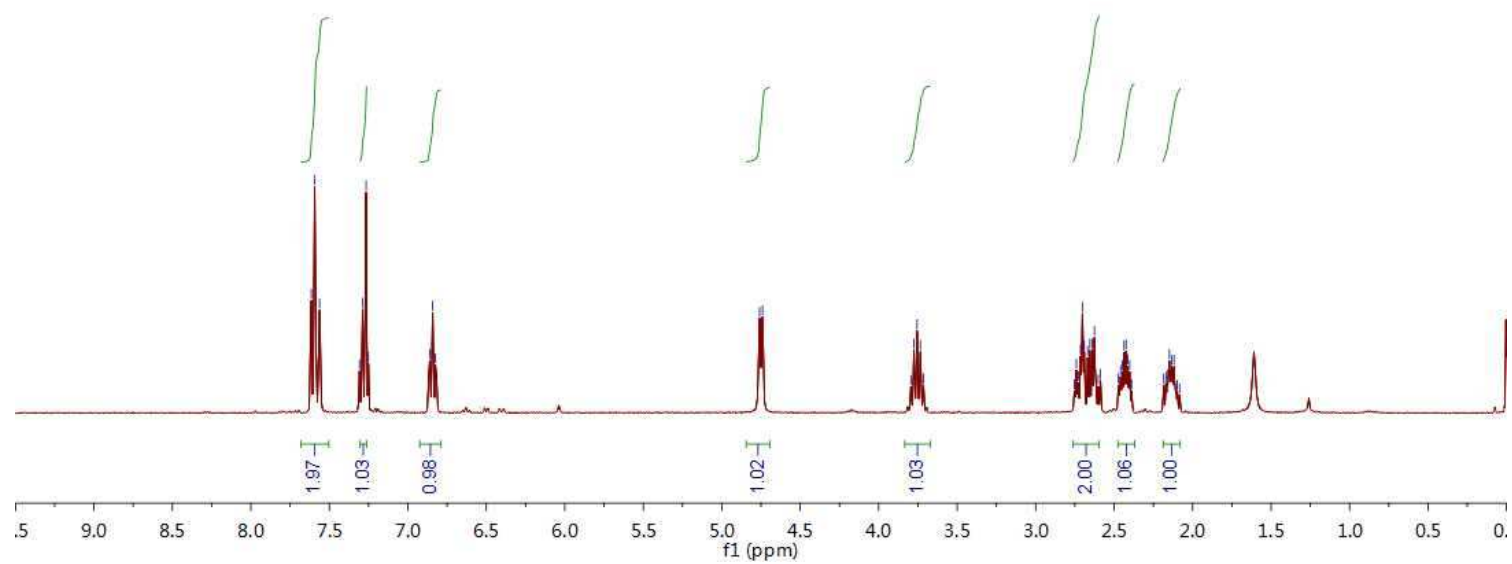
3.7952
3.7749
3.7554
3.7346
3.7144

2.7405
2.7286
2.7142
2.7020
2.6901
2.6688
2.6544
2.6397
2.6255
2.6011
2.5867
2.4721
2.4592
2.4483
2.4366
2.4240
2.4130
2.4010
2.3892
2.1839
2.1700
2.1614
2.1480
2.1330
2.1180

¹H NMR ZC-6-90A In CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 19

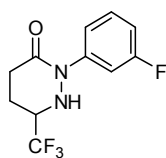


2h - ¹H NMR (CDCl₃, 400 MHz)

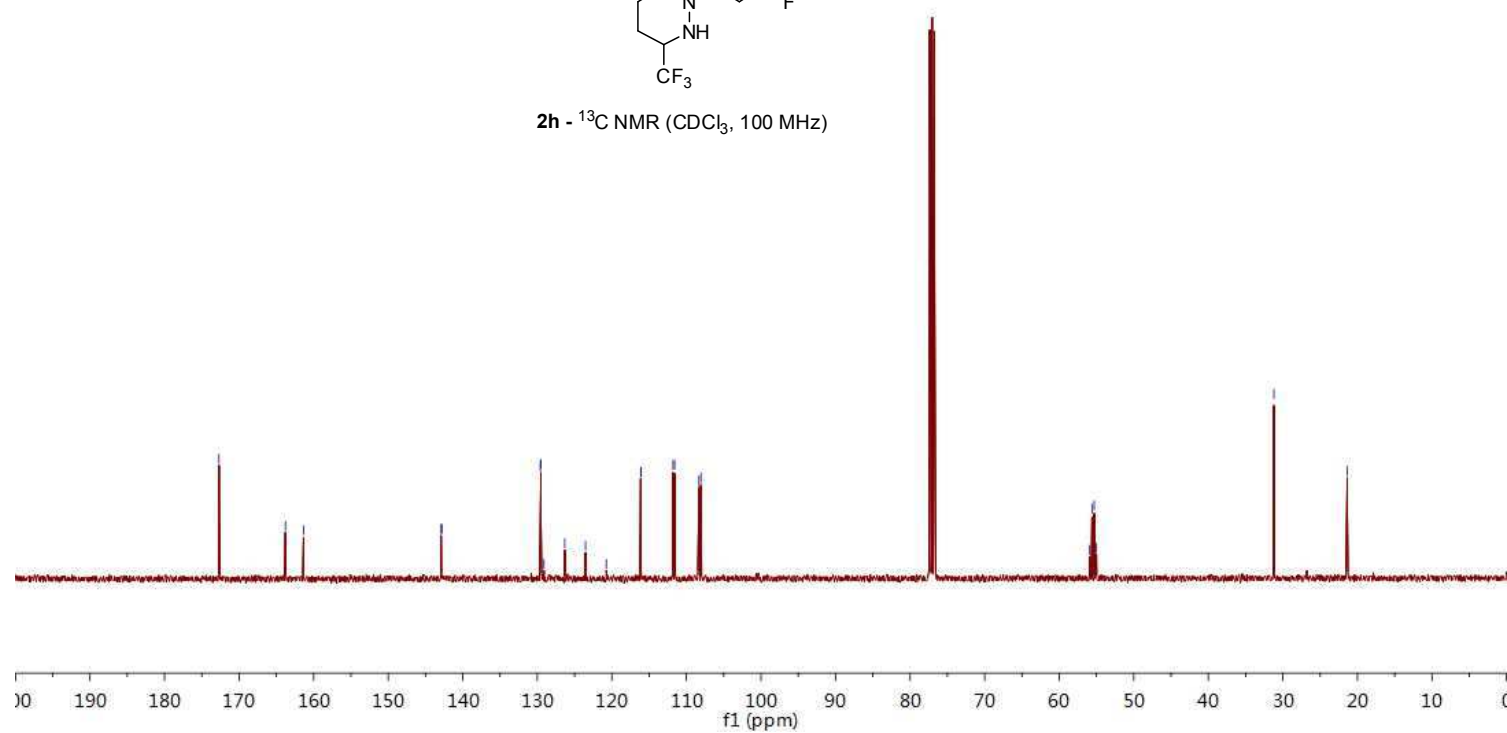




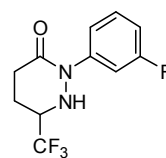
¹³C NMR ZC-6-90A in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 19



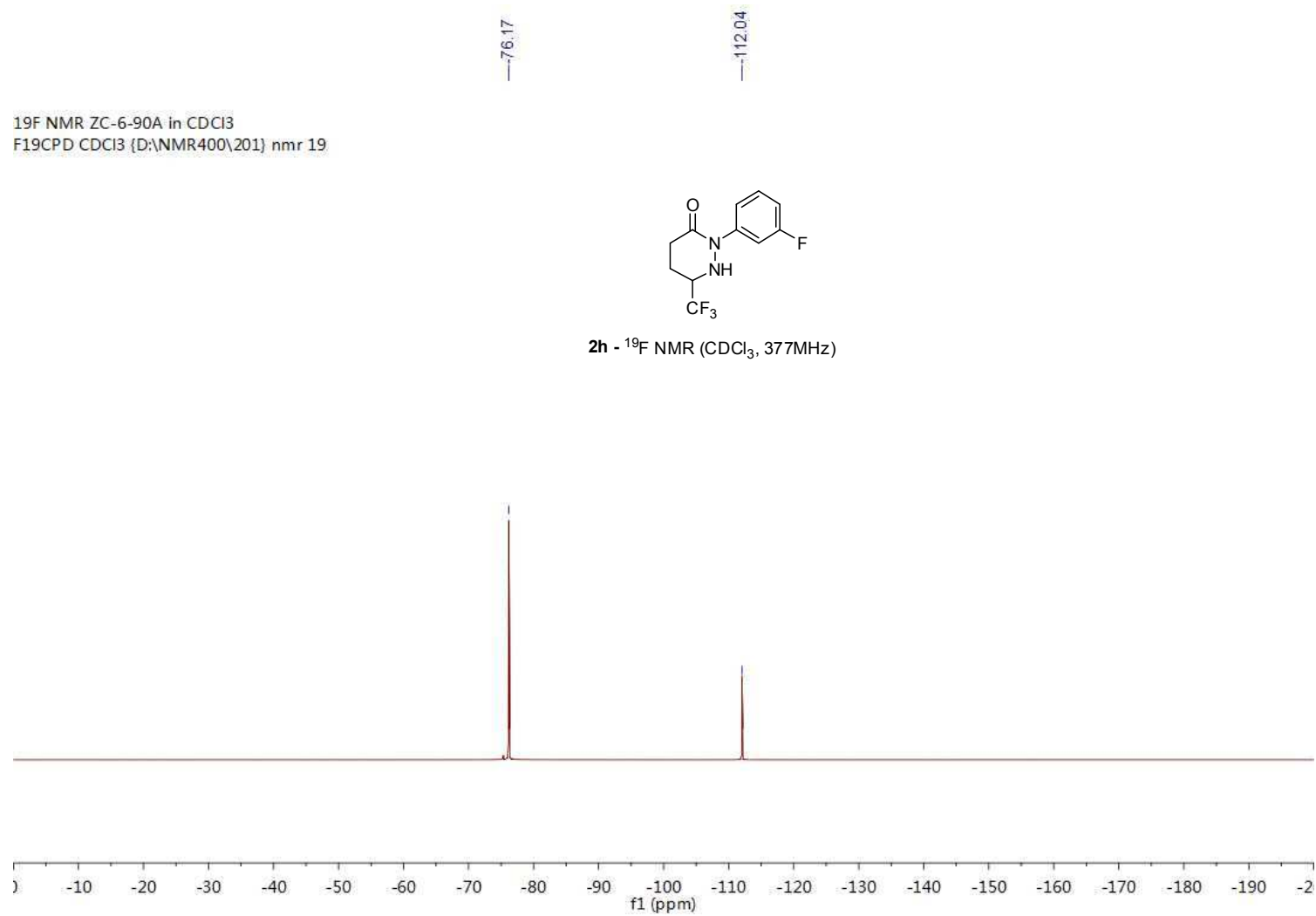
2h - ¹³C NMR (CDCl₃, 100 MHz)



19F NMR ZC-6-90A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 19



2h - ¹⁹F NMR (CDCl₃, 377MHz)



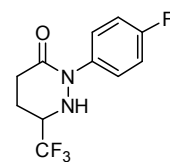
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7.6691
7.6625
7.6571
7.6516
7.6451
7.6394
7.2652
7.0346
7.0289
7.0229
7.0137
7.0118
7.0026
6.9966
6.9909

4.8389
4.8200

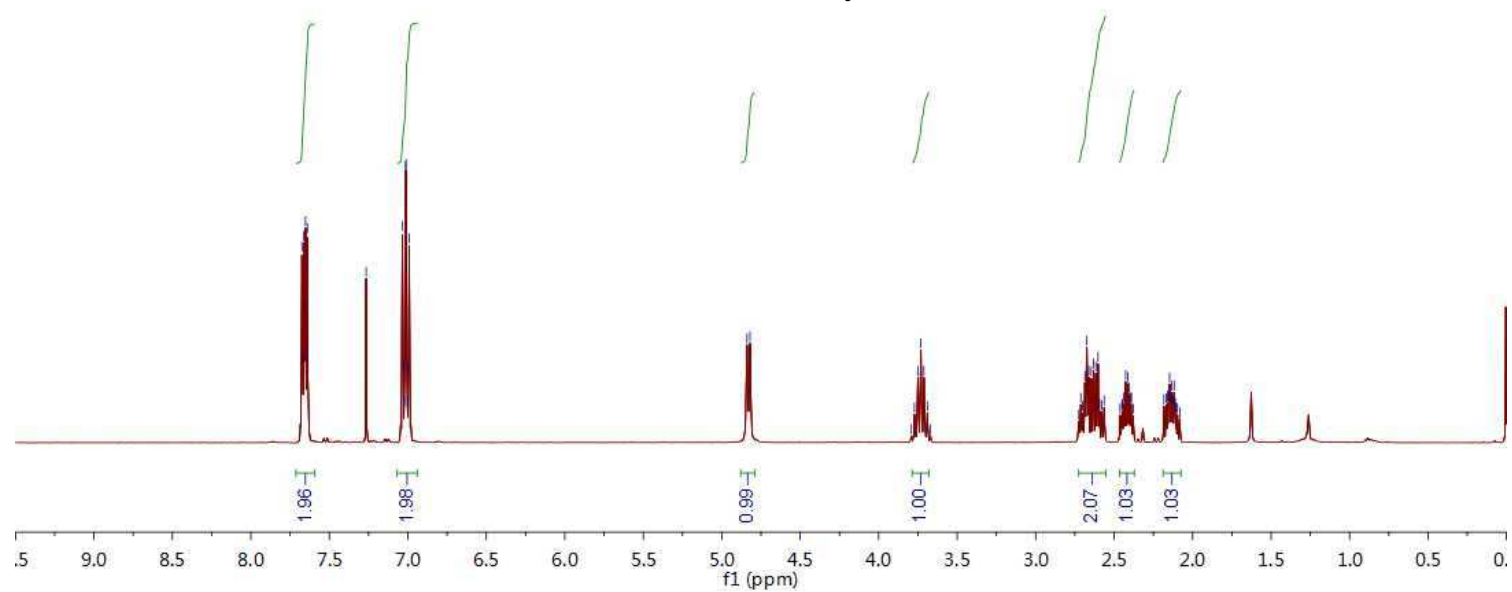
3.7916
3.7725
3.7503
3.7311
3.7119
3.6898
3.6706

2.7122
2.6861
2.6738
2.6614
2.6456
2.6310
2.6166
2.6021
2.5633
2.4382
2.4266
2.4138
2.4031
2.3931
2.3900
2.1829
2.1687
2.1603
2.1538
2.1467
2.1396
2.1317
2.1251
2.1178

¹H NMR ZC-6-81D In CDCl₃



2i - ¹H NMR (CDCl₃, 400 MHz)



172.41

161.14
158.70

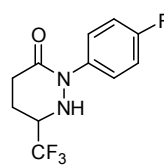
137.33
137.30
129.15
126.37
123.58
123.28
123.20
120.80
115.24
115.02

56.00
55.70
55.39
55.09

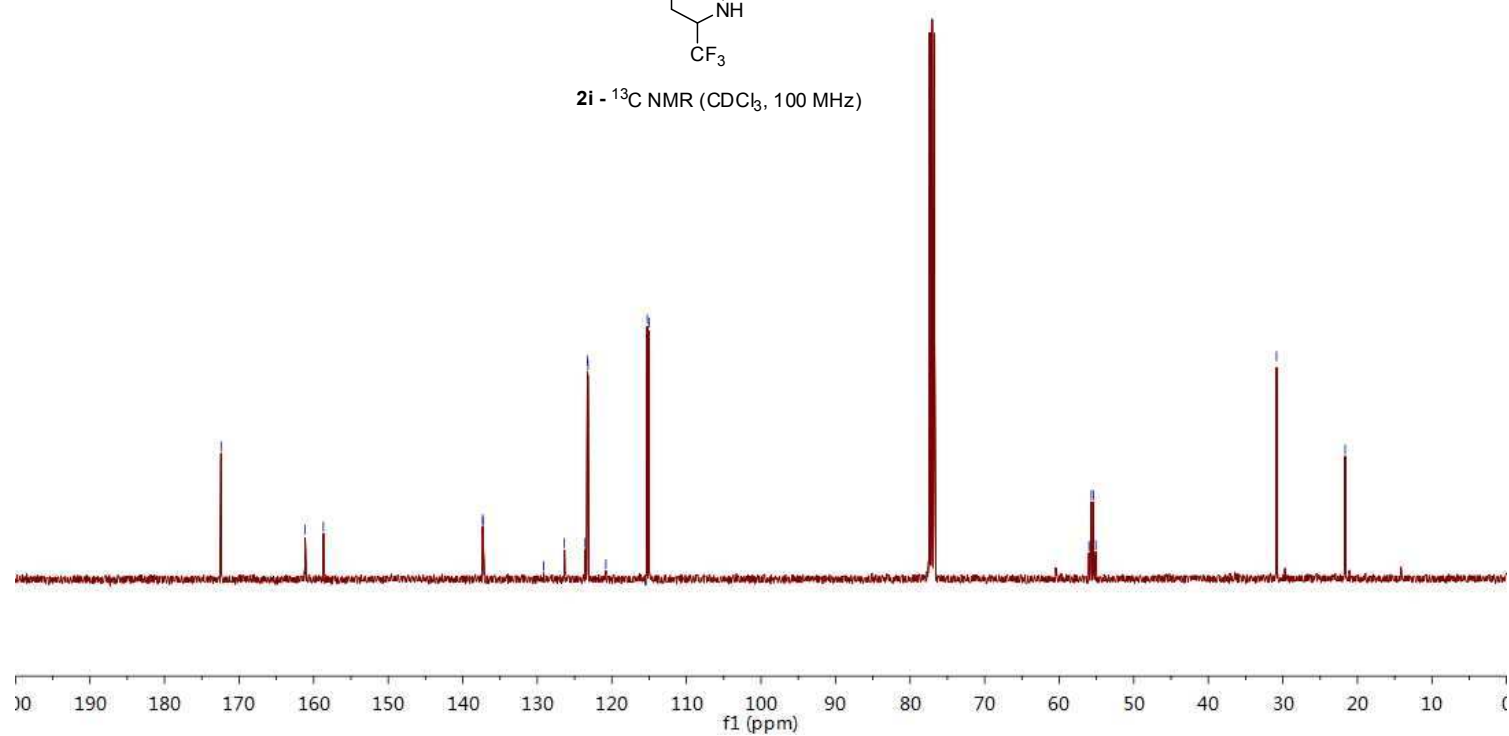
30.85

21.65

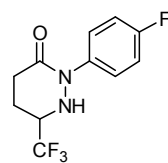
¹³C NMR ZC-6-81D in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 14



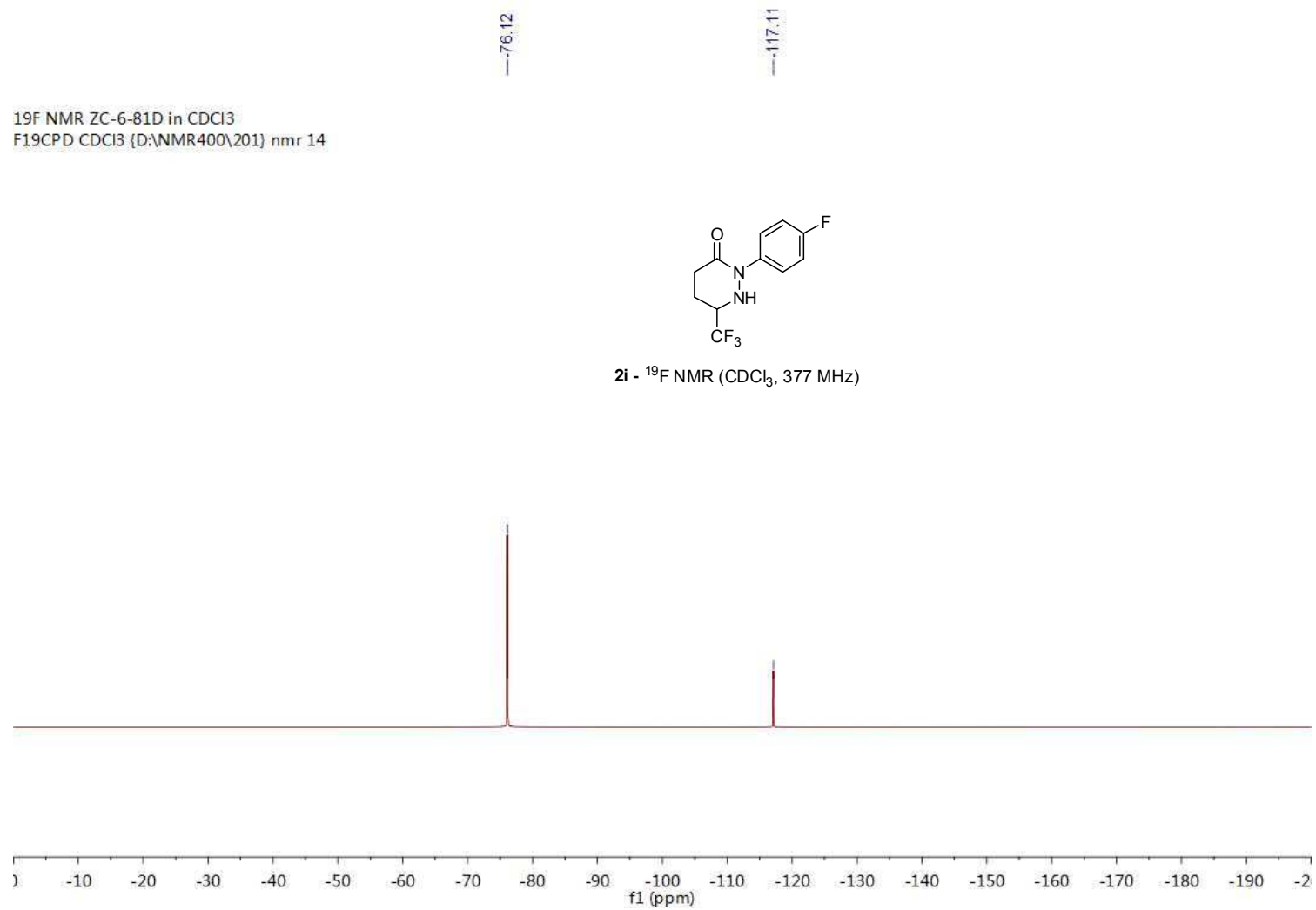
2i - ¹³C NMR (CDCl₃, 100 MHz)

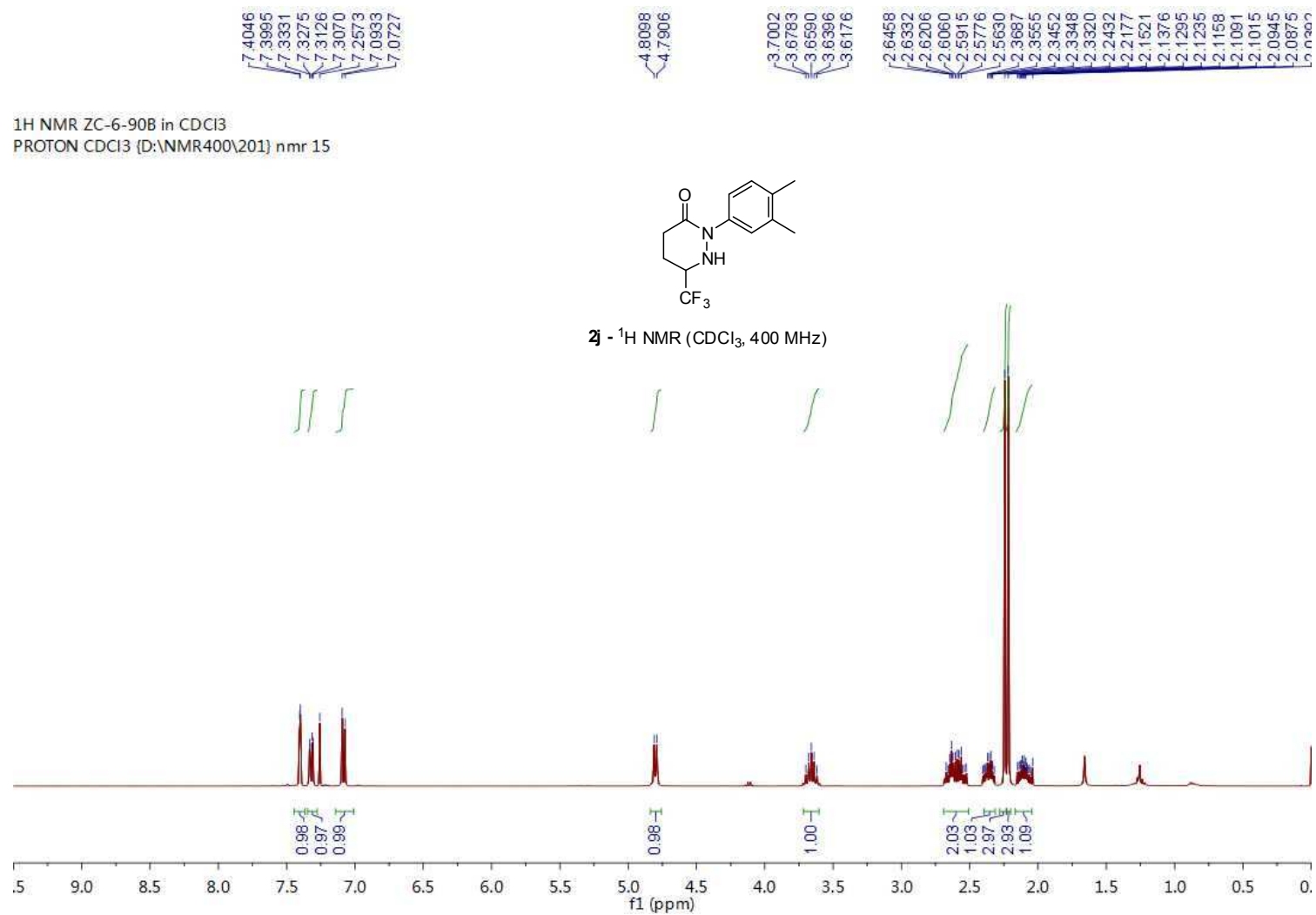


19F NMR ZC-6-81D in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 14

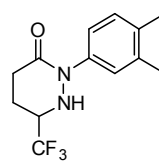


2i - ¹⁹F NMR (CDCl₃, 377 MHz)

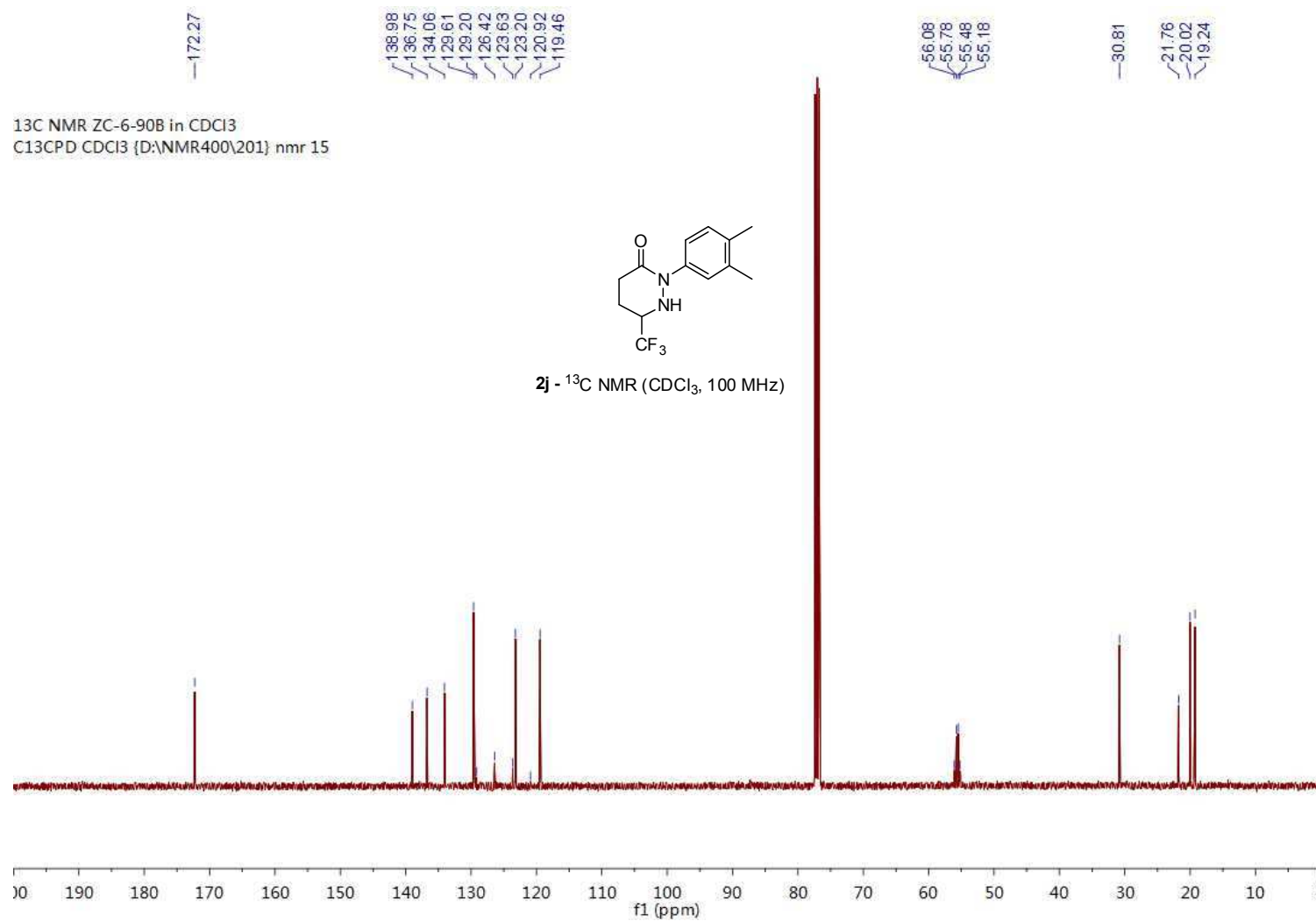




¹³C NMR ZC-6-90B in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 15

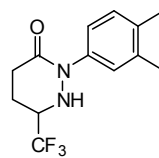


2j - ¹³C NMR (CDCl₃, 100 MHz)

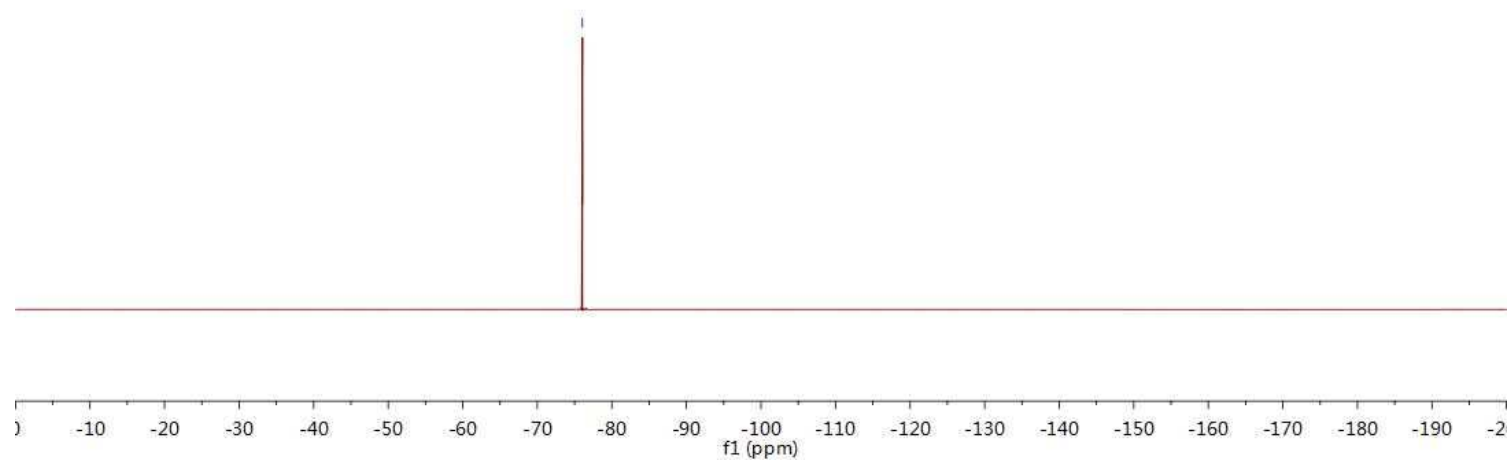


¹⁹F NMR ZC-6-90B in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 15

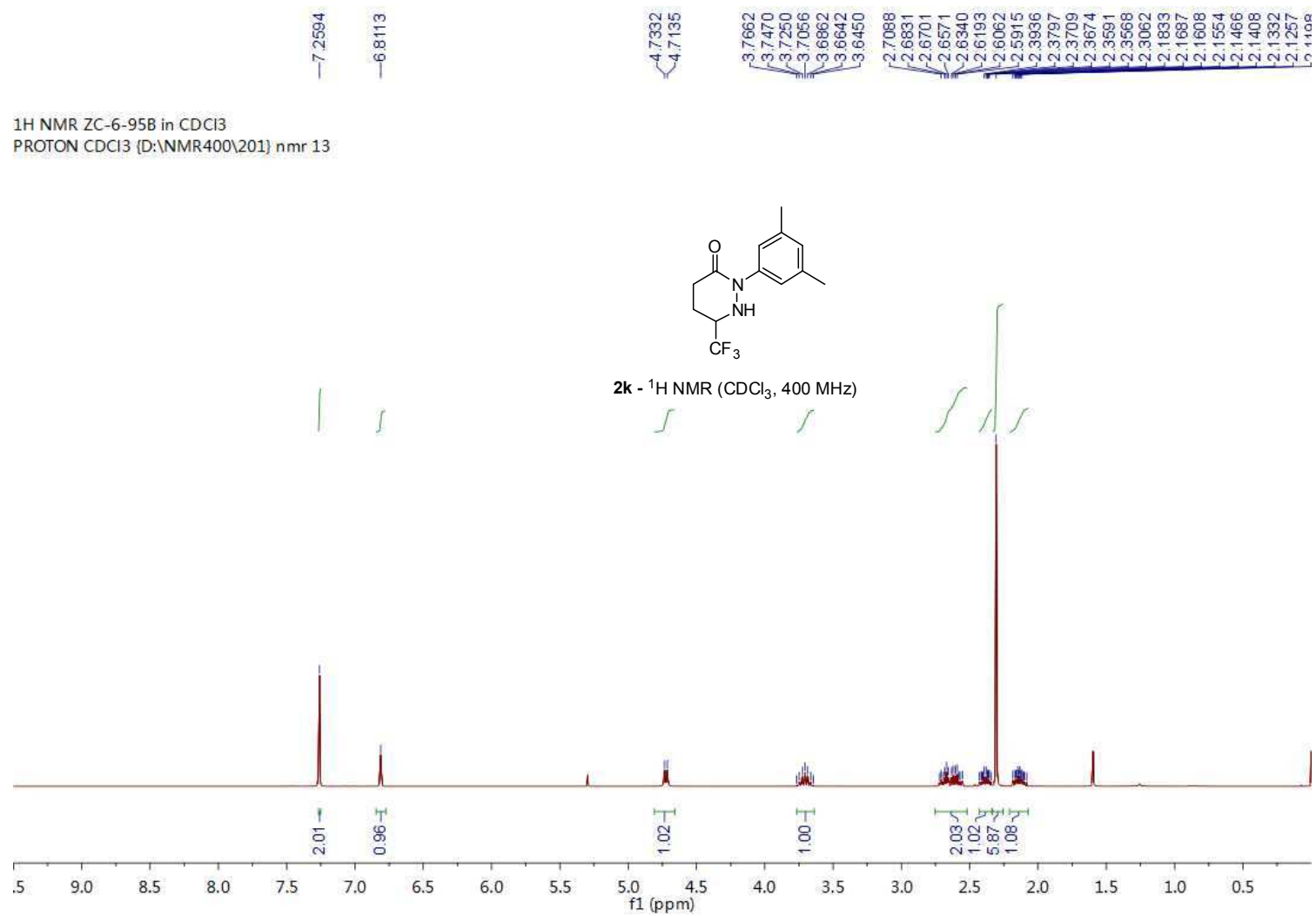
—76.04

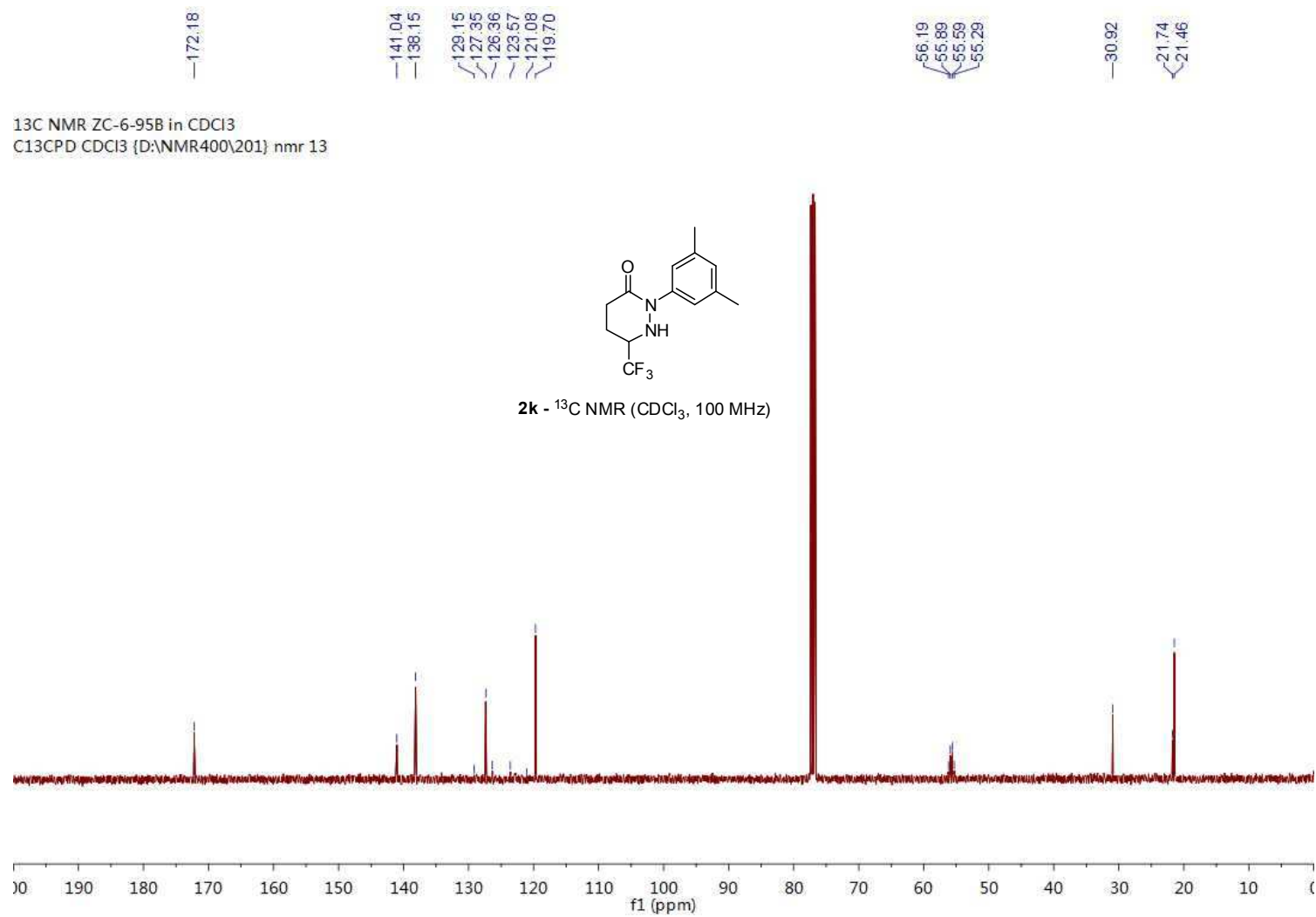


2j - ¹⁹F NMR (CDCl₃, 377 MHz)



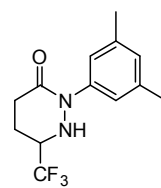
¹H NMR ZC-6-95B in CDCl₃
 PROTON CDCl₃ [D:\NMR400\201] nmr 13



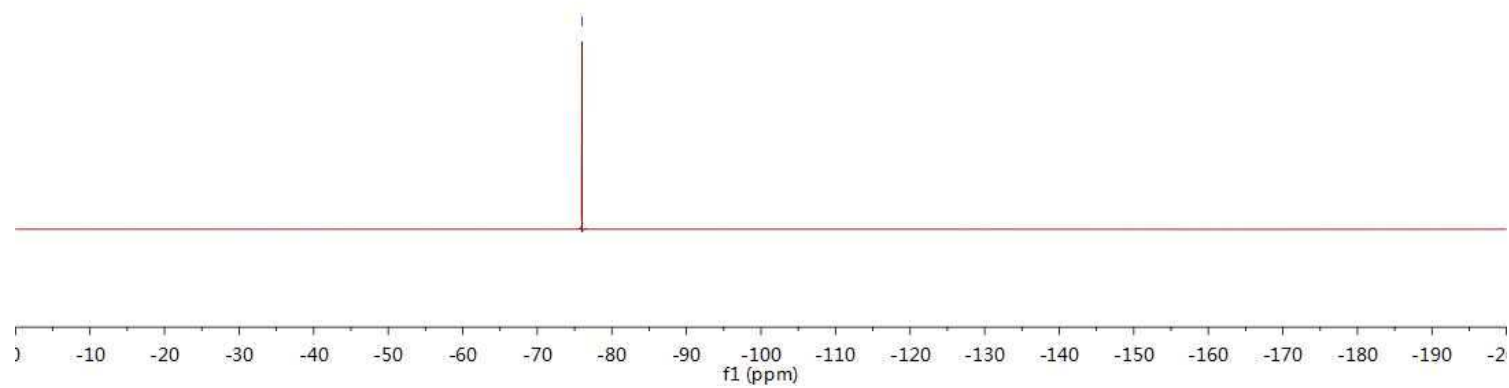


19F NMR ZC-6-95B in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 13

75.98

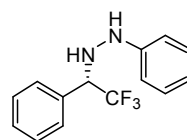


2k - ¹⁹F NMR (CDCl₃, 377 MHz)

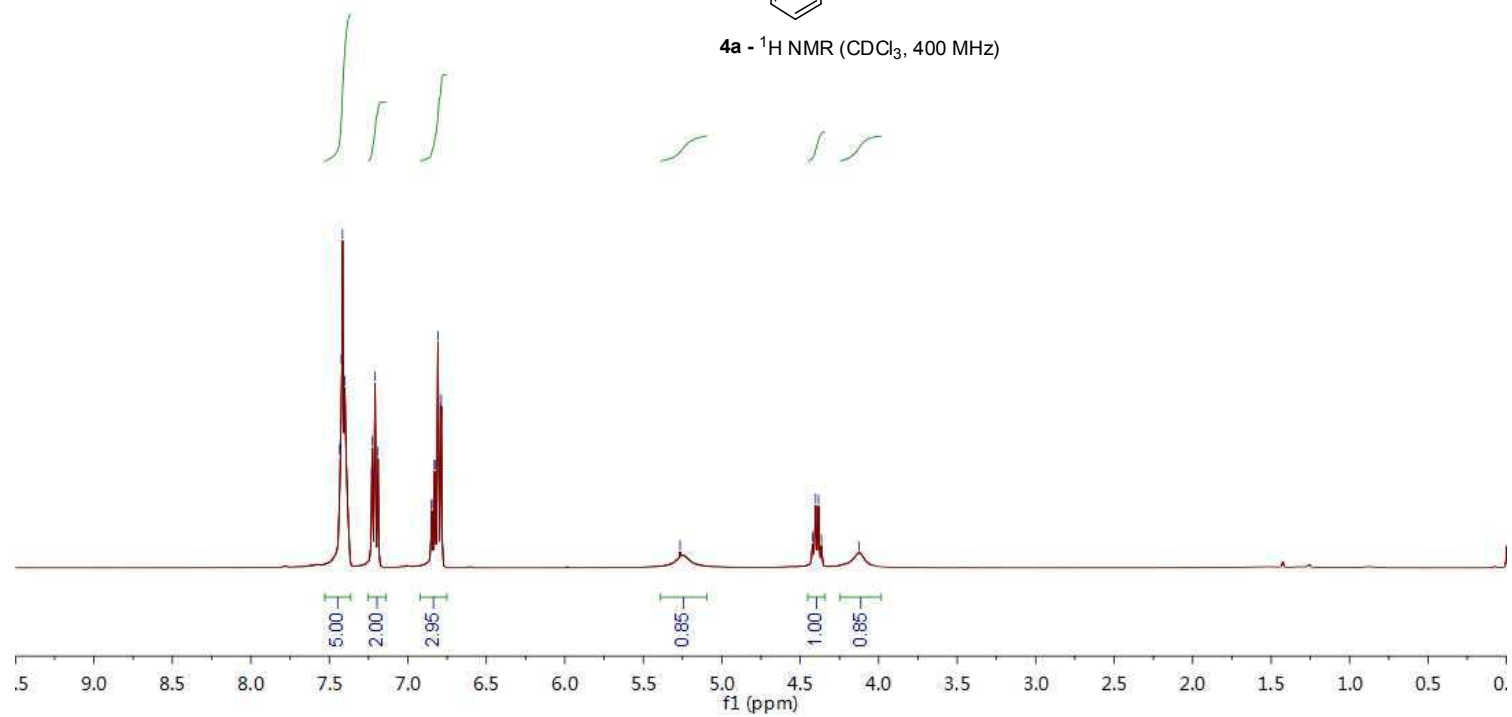




¹H NMR ZC-7-6 in CDCl₃
 PROTON CDCl₃ [D:\NMR400\201] nmr 37

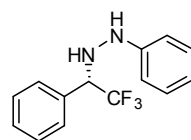


4a - ¹H NMR (CDCl₃, 400 MHz)

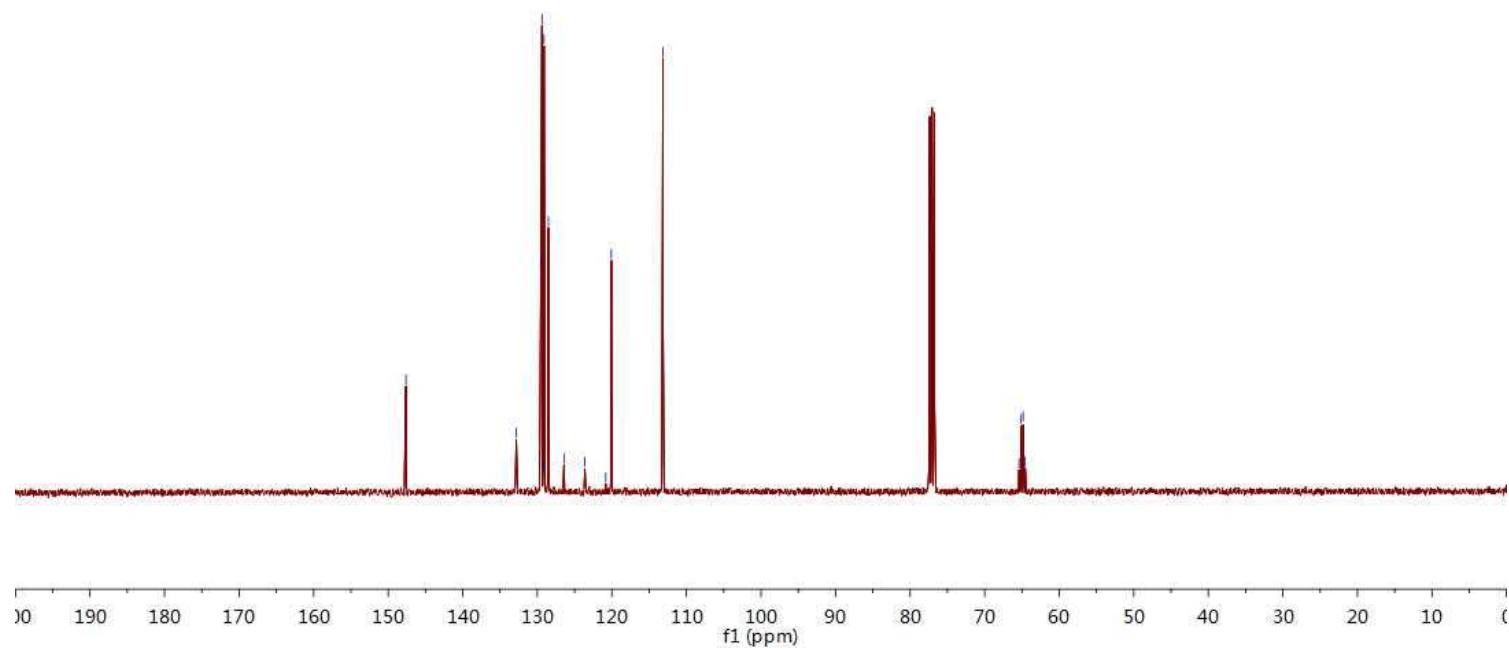




¹³C NMR ZC-7-6 in CDCl₃
 C13CPD CDCl₃ {D:\NMR400\201} nmr 37

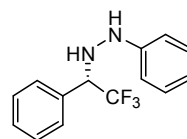


4a - ¹³C NMR (CDCl₃, 100 MHz)

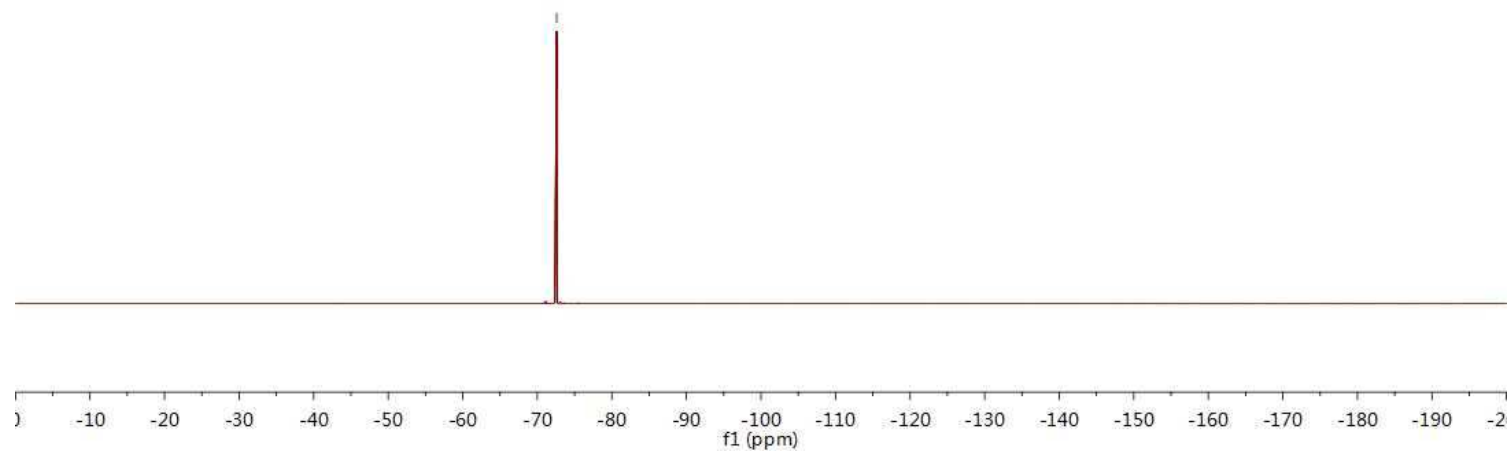


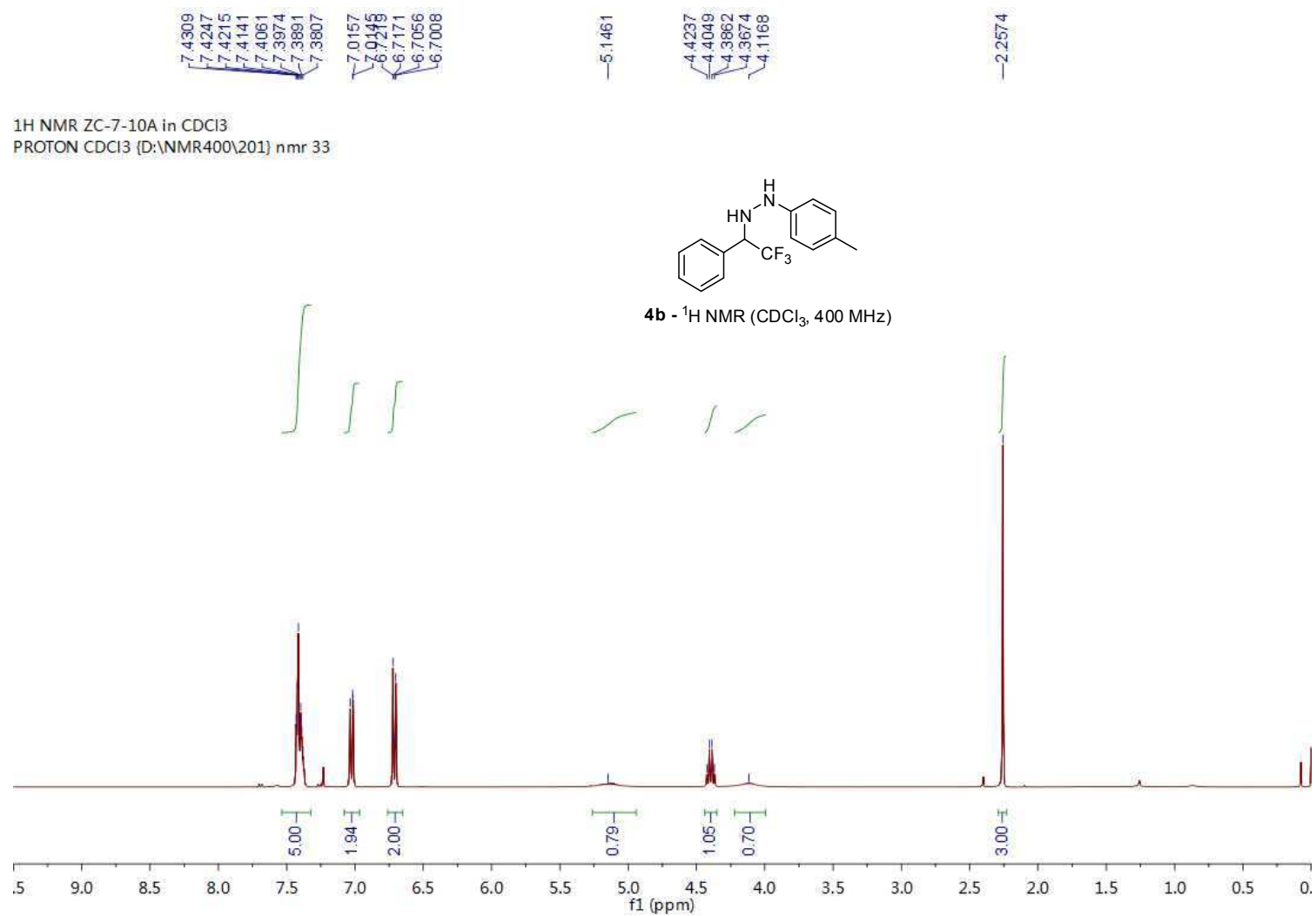
¹⁹F NMR ZC-7-6 in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 37

-72.60

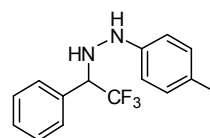


4a - ¹⁹F NMR (CDCl₃, 377 MHz)

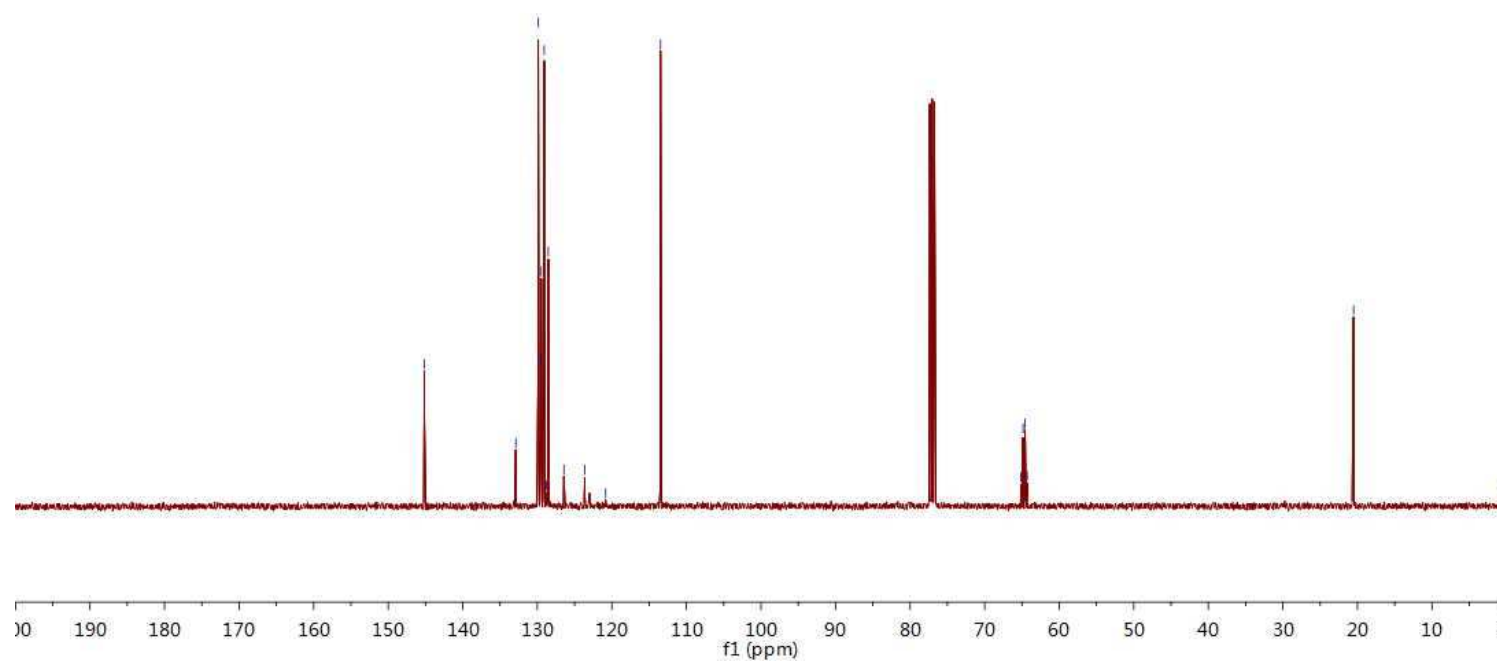




¹³C NMR ZC-7-10A in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 33

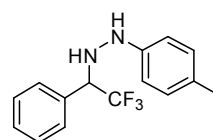


4b - ¹³C NMR (CDCl₃, 100 MHz)

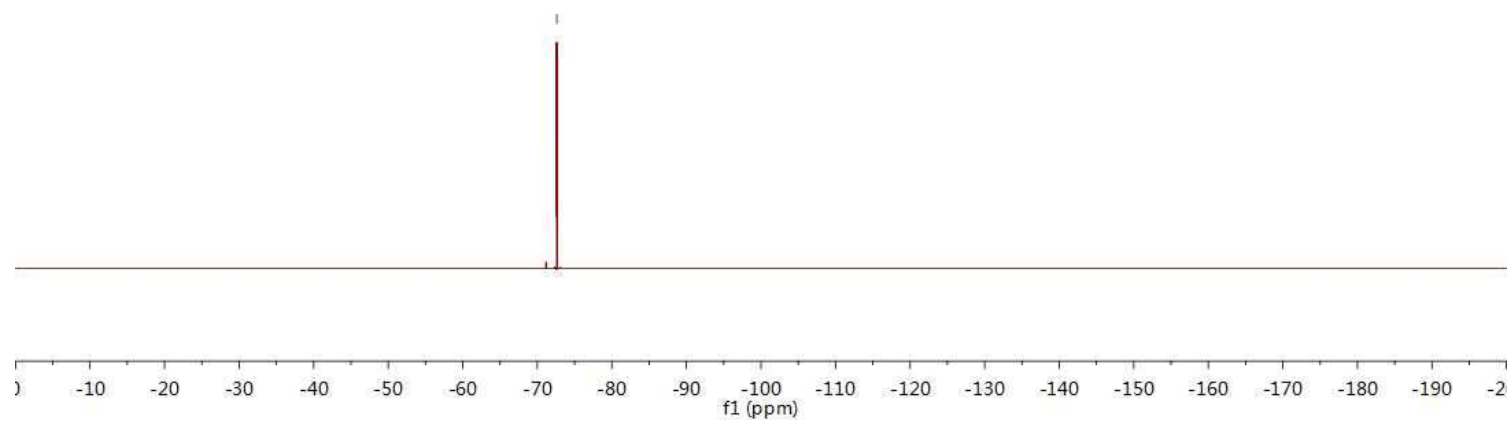


19F NMR ZC-7-10A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 33

-72.61



4b - ¹⁹F NMR (CDCl₃, 377 MHz)



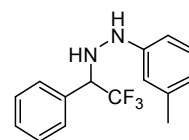
7.4446
7.4348
7.4277
7.4205
7.4148
7.4063
7.3964
7.3891
7.1234
7.1047
7.0841
6.8686
6.6507
6.6192
6.6006

5.2252

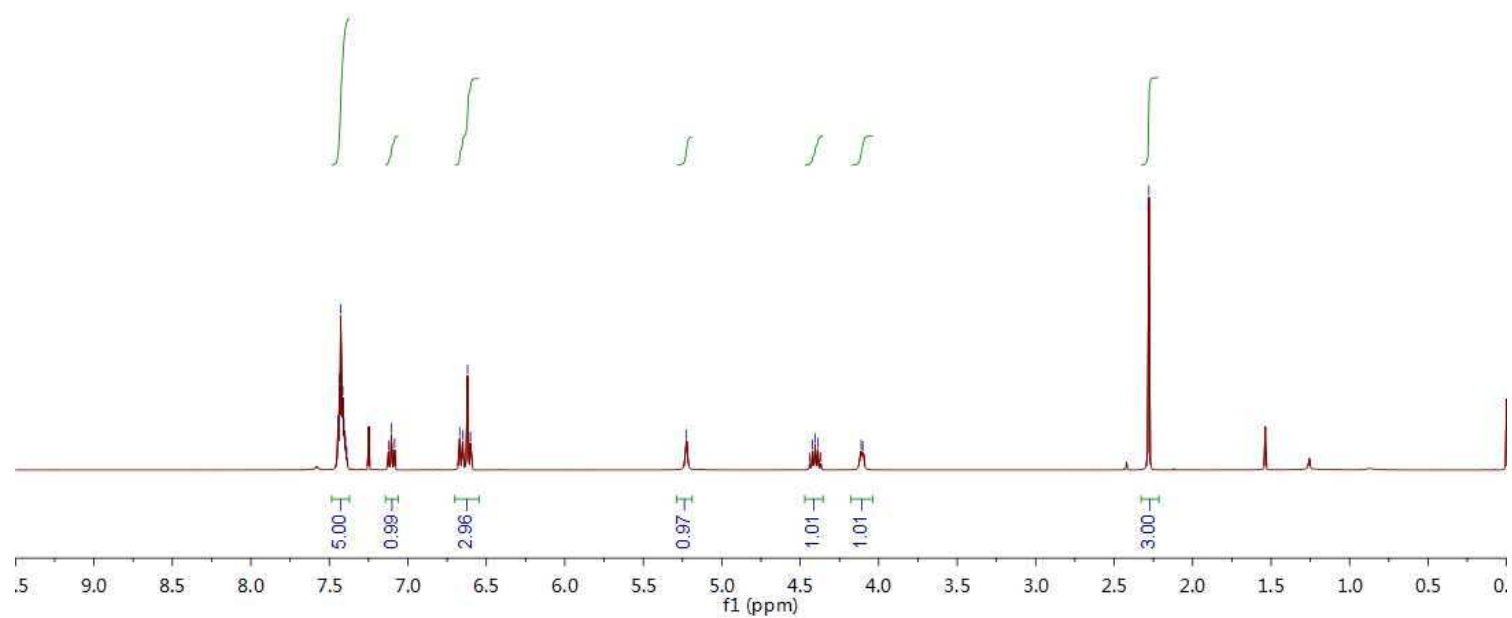
4.4400
4.4215
4.4048
4.3867
4.3681
4.1118
4.1016

2.2788

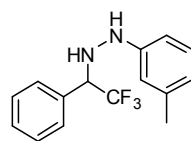
¹H NMR ZC-7-10B in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 6



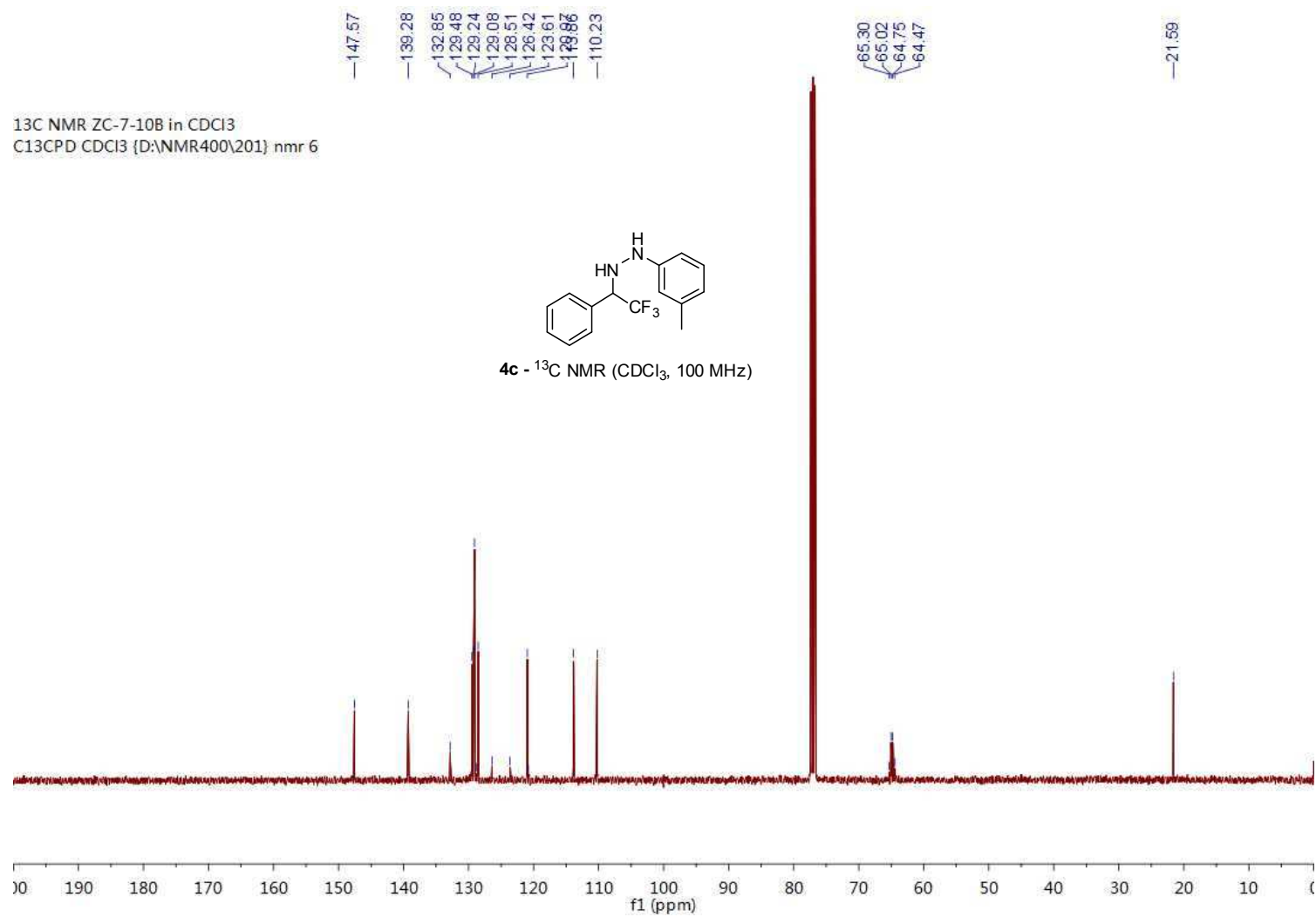
4c - ¹H NMR (CDCl₃, 400 MHz)



13C NMR ZC-7-10B in CDCl3
C13CPD CDCl3 {D:\NMR400\201} nmr 6

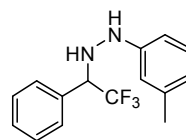


4c - ^{13}C NMR (CDCl_3 , 100 MHz)

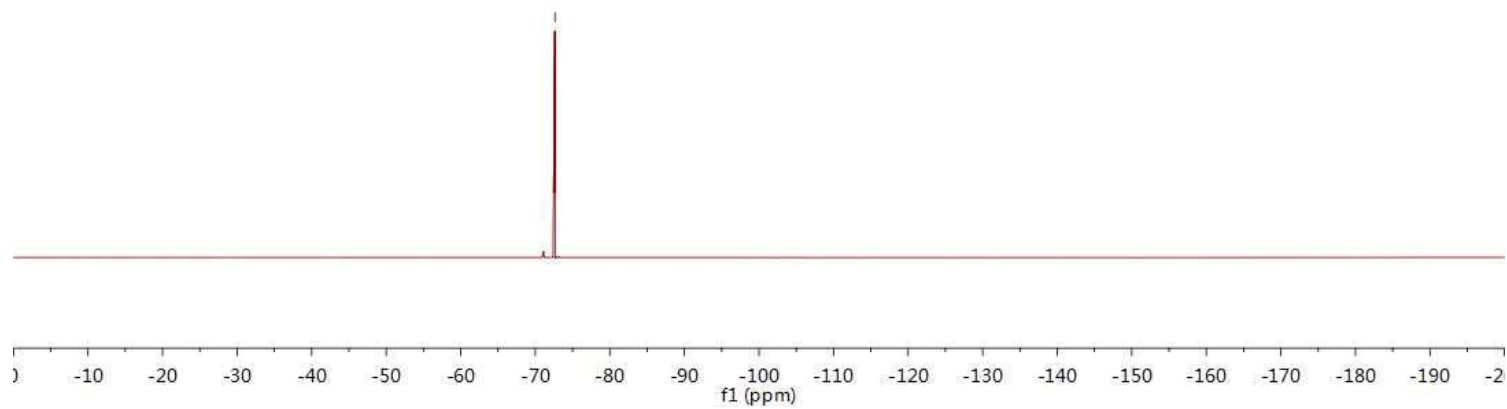


¹⁹F NMR ZC-7-10B in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 6

-72.64

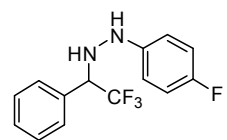


4c - ¹⁹F NMR (CDCl₃, 377 MHz)

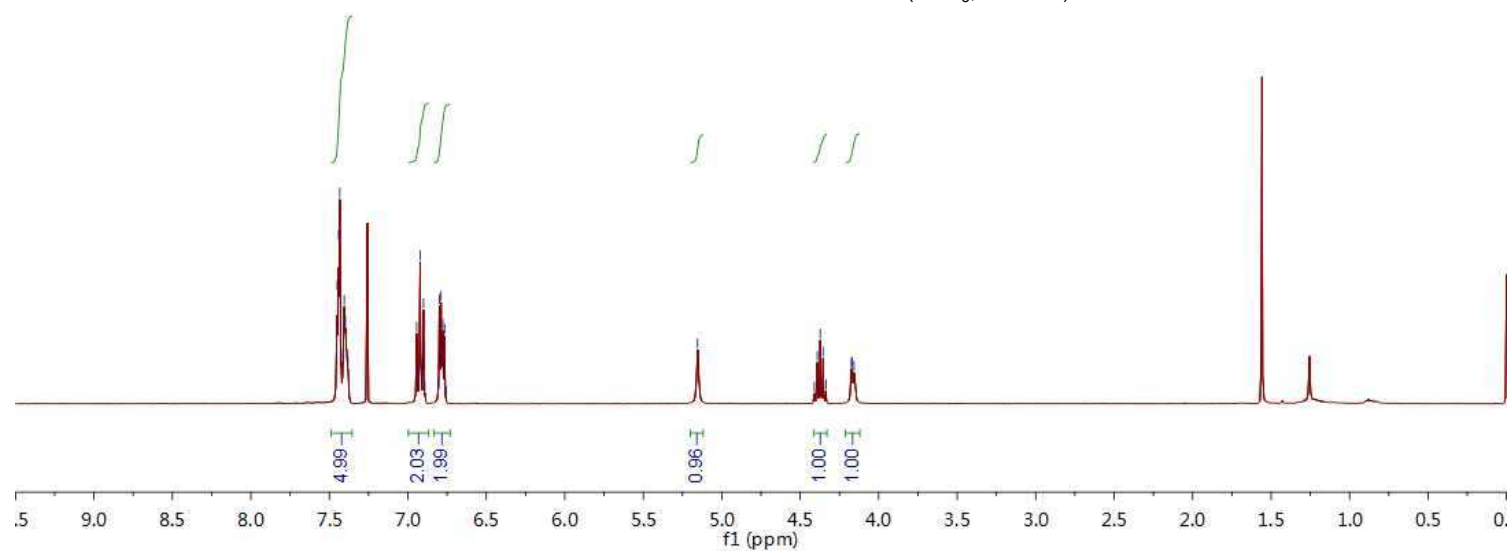




¹H NMR ZC-7-13A in CDCl₃
 PROTON CDCl₃ [D:\NMR400\201] nmr 28



4d - ¹H NMR (CDCl₃, 400 MHz)

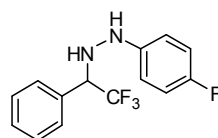


158.45
156.09

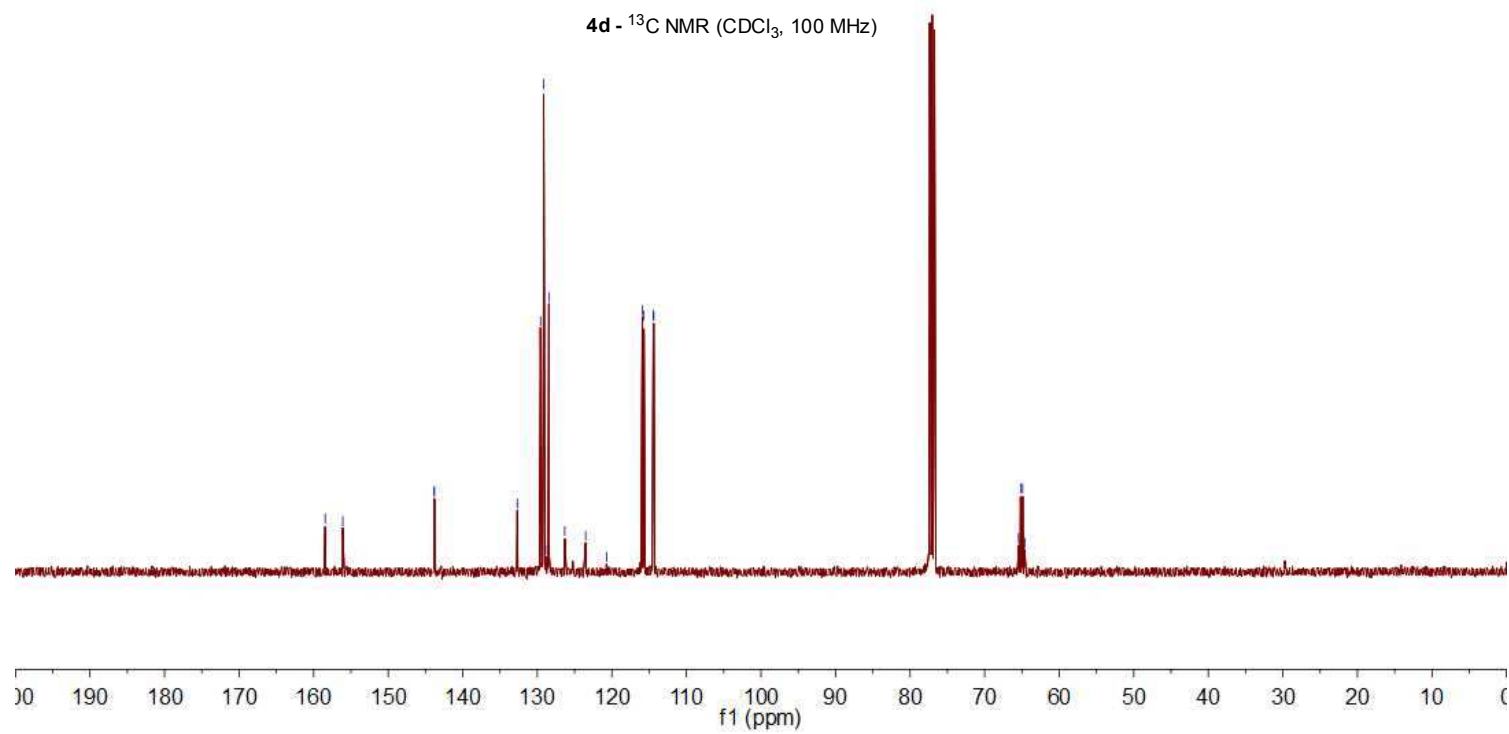
143.83
143.81
132.68
129.56
129.14
128.88
128.44
126.32
123.52
120.71
115.92
115.69
114.45
114.37

65.45
65.18
64.90
64.62

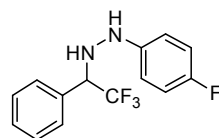
¹³C NMR ZC-7-13A in CDCl₃
C13CPD CDCl₃ {D:\NMR400\201} nmr 12



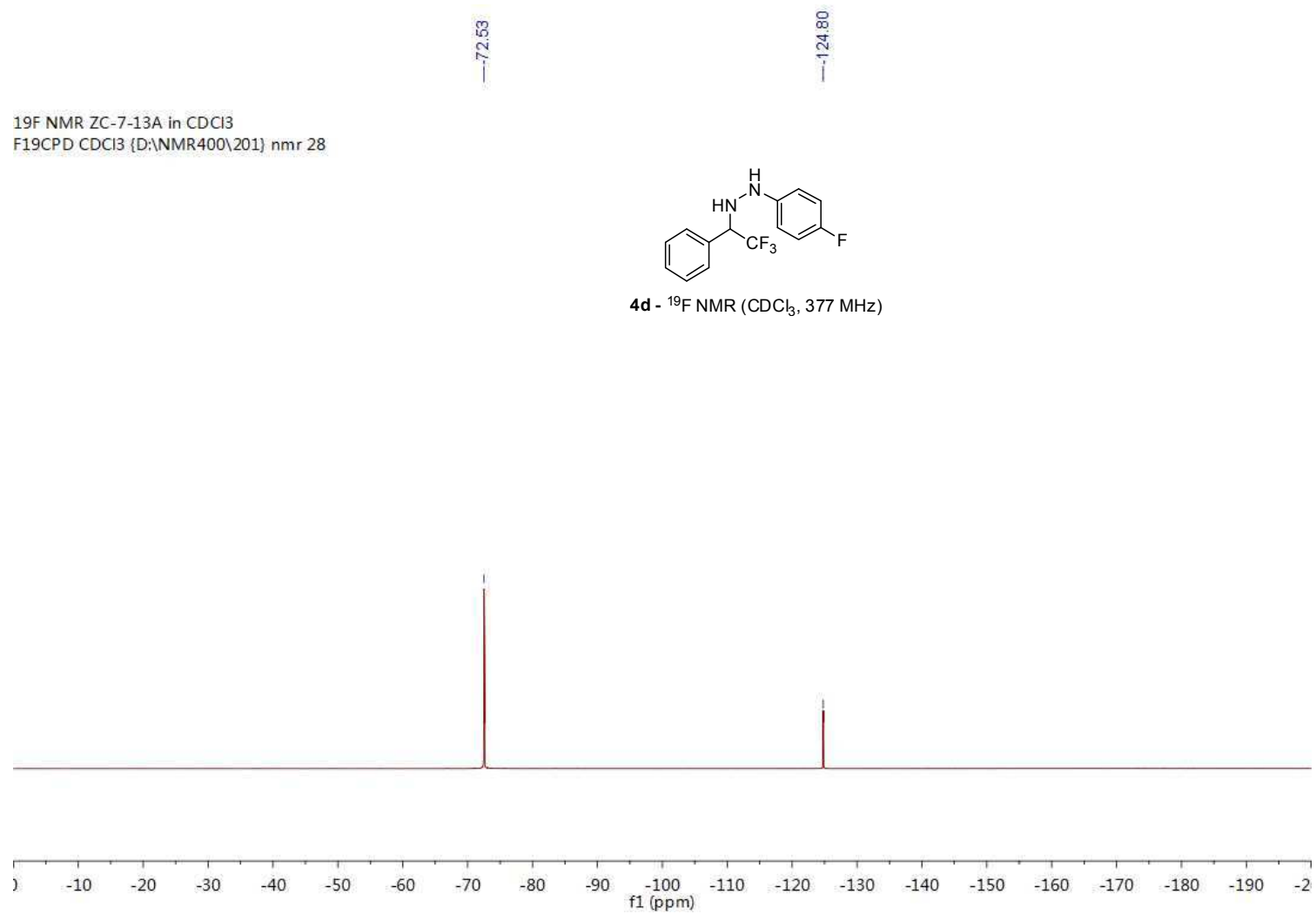
4d - ¹³C NMR (CDCl₃, 100 MHz)



19F NMR ZC-7-13A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 28



4d - ¹⁹F NMR (CDCl₃, 377 MHz)



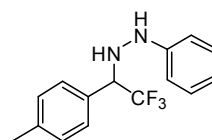
7.2956
7.2754
7.2448
7.2324
7.2268
7.2251
7.2139
7.2112
7.1974
7.1927
6.8491
6.8466
6.8308
6.8160
6.8133
6.7945
6.7922

5.2482

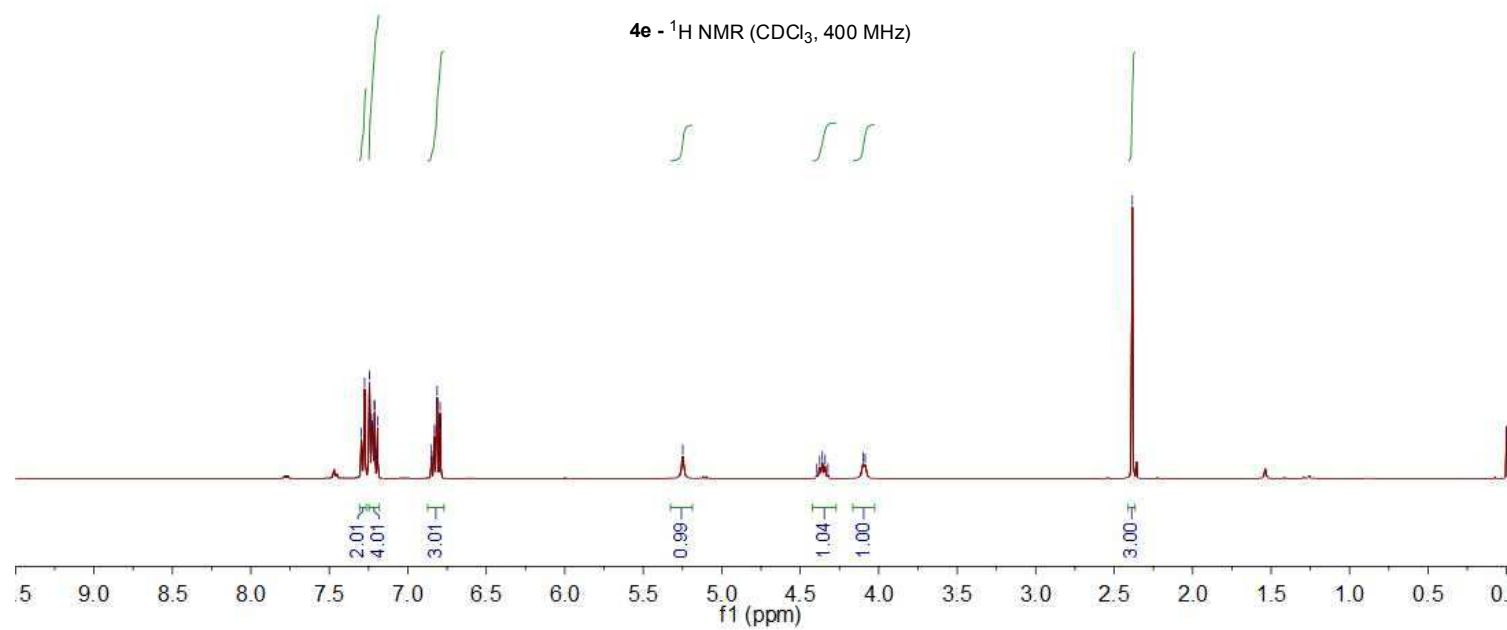
4.3938
4.3756
4.3586
4.3413
4.3229
4.0998
4.0863

2.3843

¹H NMR ZC-7-22B in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 30



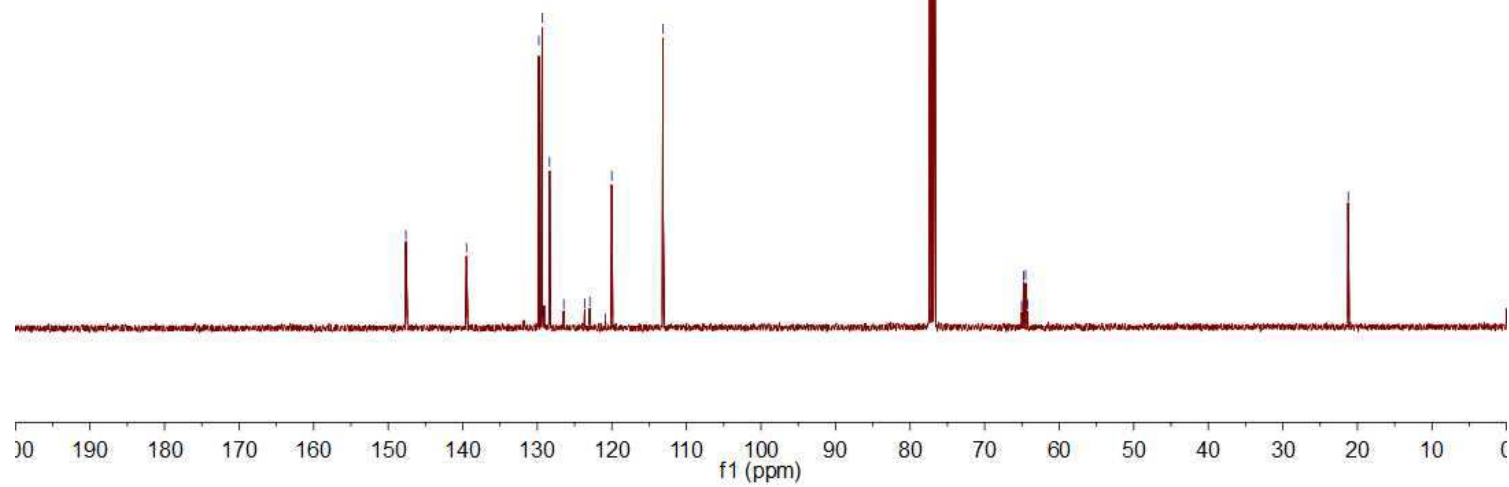
4e - ¹H NMR (CDCl₃, 400 MHz)



13C NMR ZC-7-22B in CDCl3
 C13CPD CDCl3 {D:\NMR400\201} nmr 30

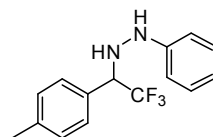


4e - ¹³C NMR (CDCl₃, 100 MHz)

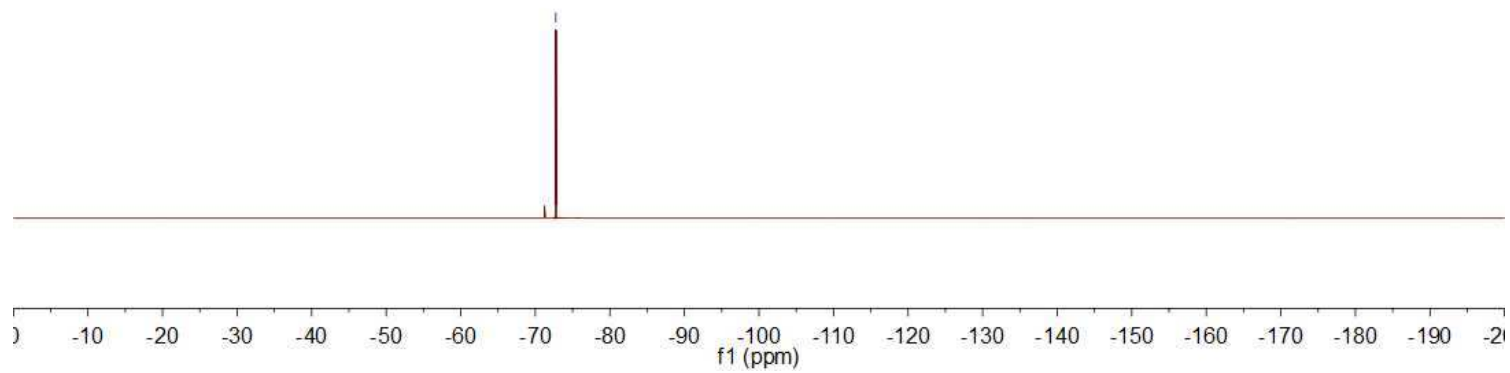


19F NMR ZC-7-22B in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 30

-72.75



4e - ^{19}F NMR (CDCl₃, 400 MHz)



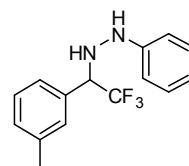
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7.2475
7.2378
7.2327
7.2192
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7.1819
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6.8352
6.8251
6.8228
6.8173
6.8037

—5.2521

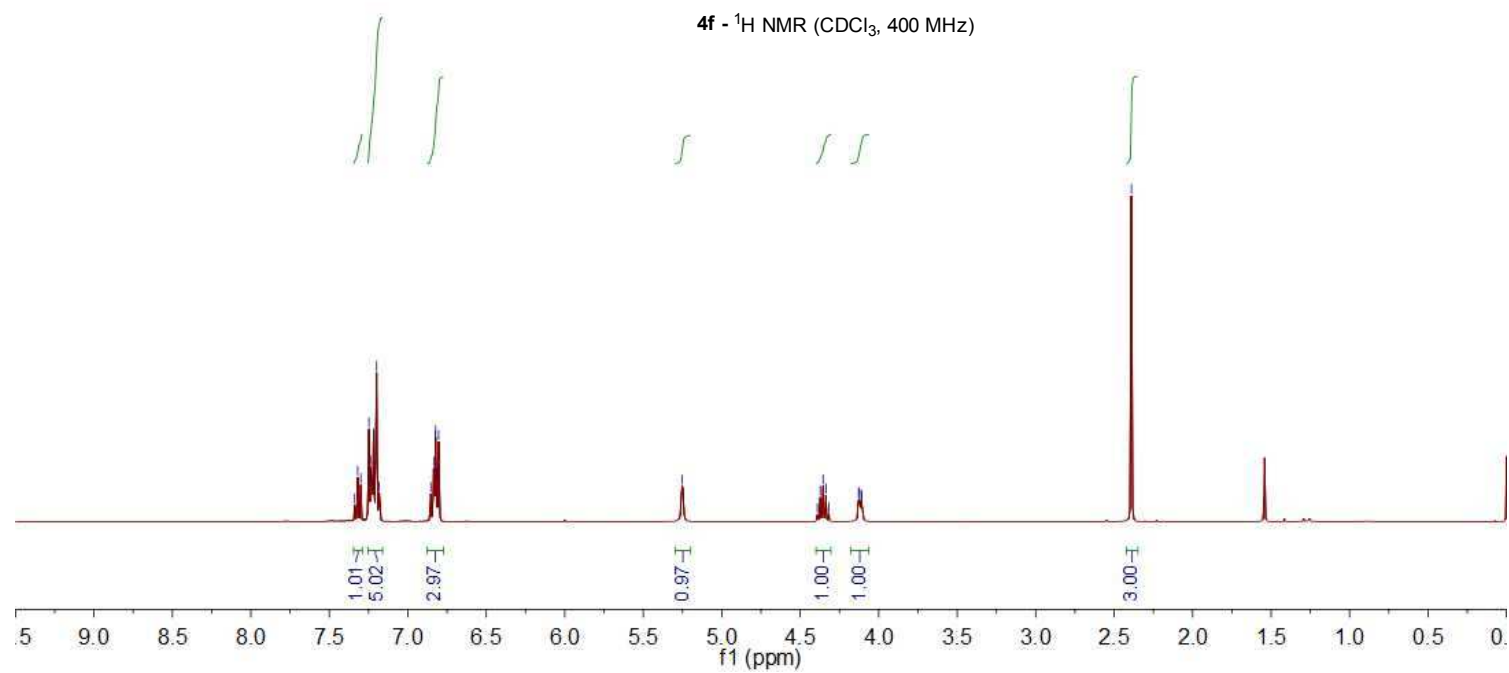
4.3908
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4.3544
4.3363
4.3178
4.1280
4.1230
4.1118
4.1068

—2.3900

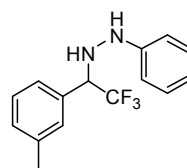
¹H NMR ZC-7-25B in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 19



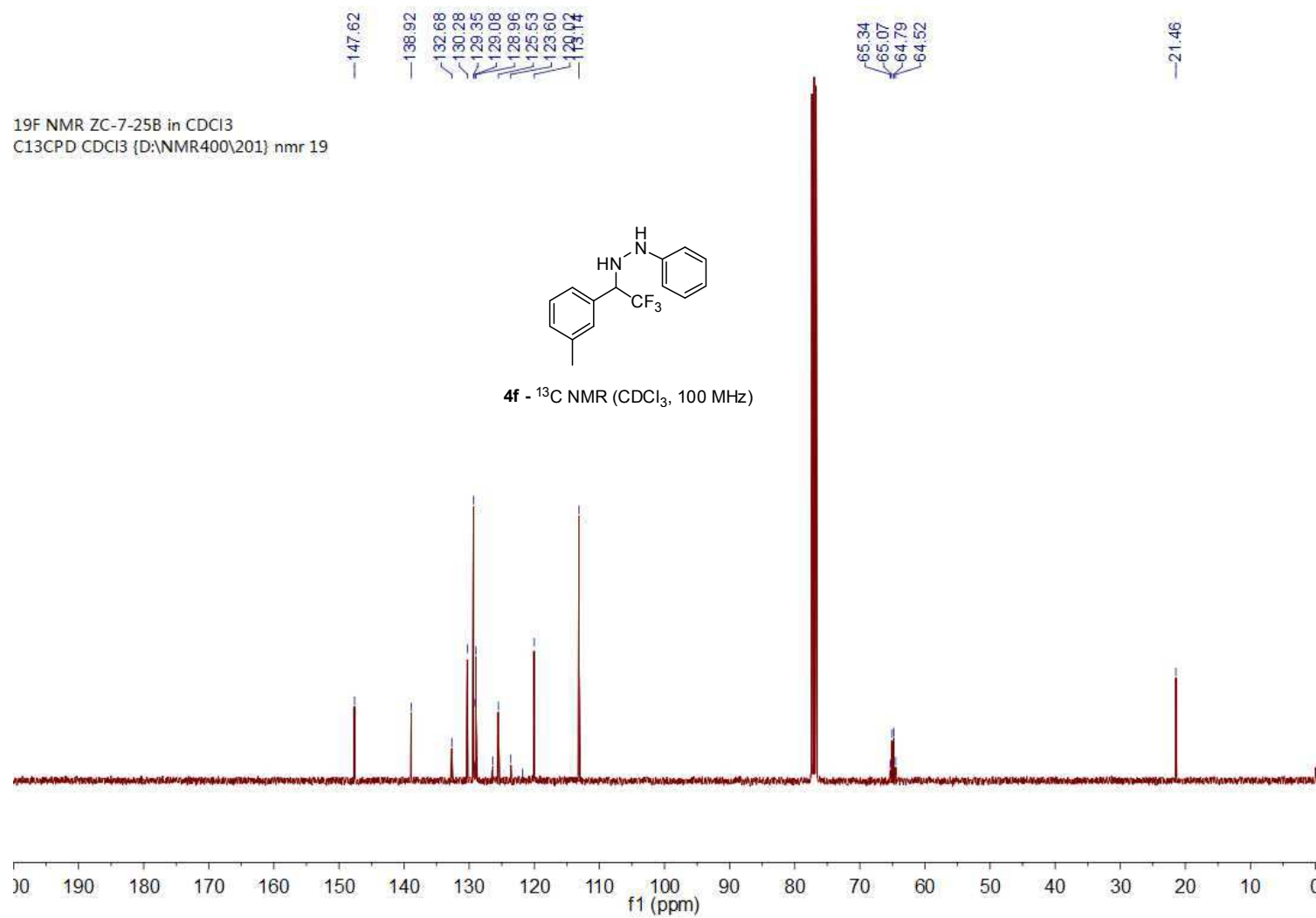
4f - ¹H NMR (CDCl₃, 400 MHz)



19F NMR ZC-7-25B in CDCl3
 C13CPD CDCl3 {D:\NMR400\201} nmr 19

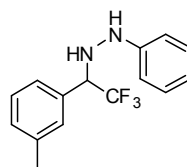


4f - ^{13}C NMR (CDCl_3 , 100 MHz)

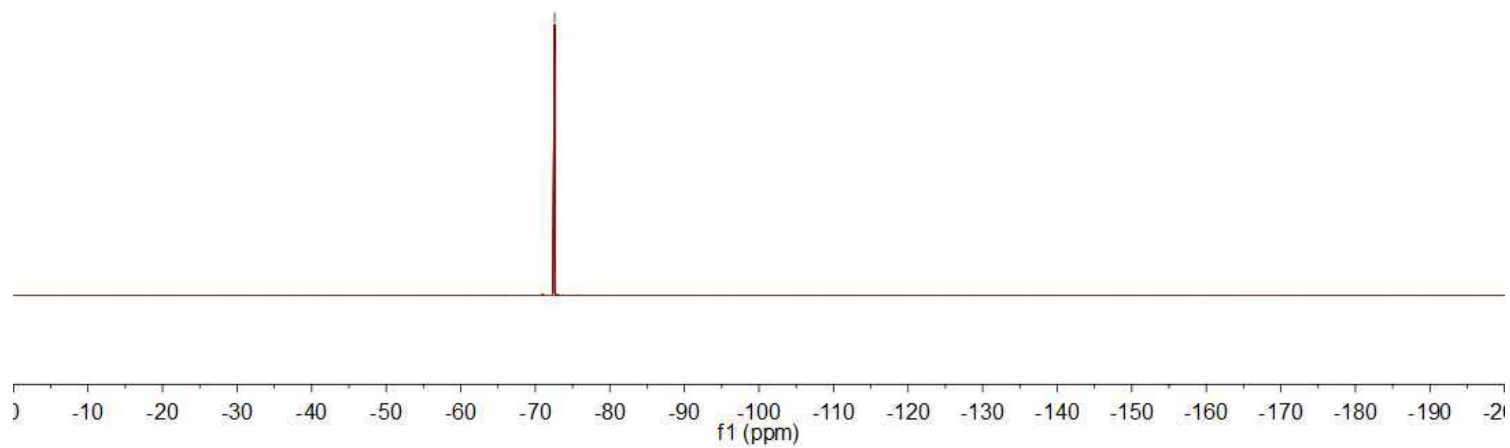


19F NMR ZC-7-25B in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 19

-72.59



4f - ^{19}F NMR (CDCl_3 , 377 MHz)

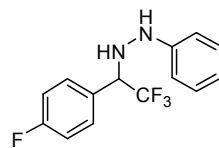


7.3972
7.3838
7.3758
7.3626
7.2323
7.2264
7.2136
7.2113
7.1927
7.1309
7.1236
7.1184
7.1021
7.0855
7.0805
7.0731
6.8549
6.8366
6.8182
6.7919
6.7887
6.7706

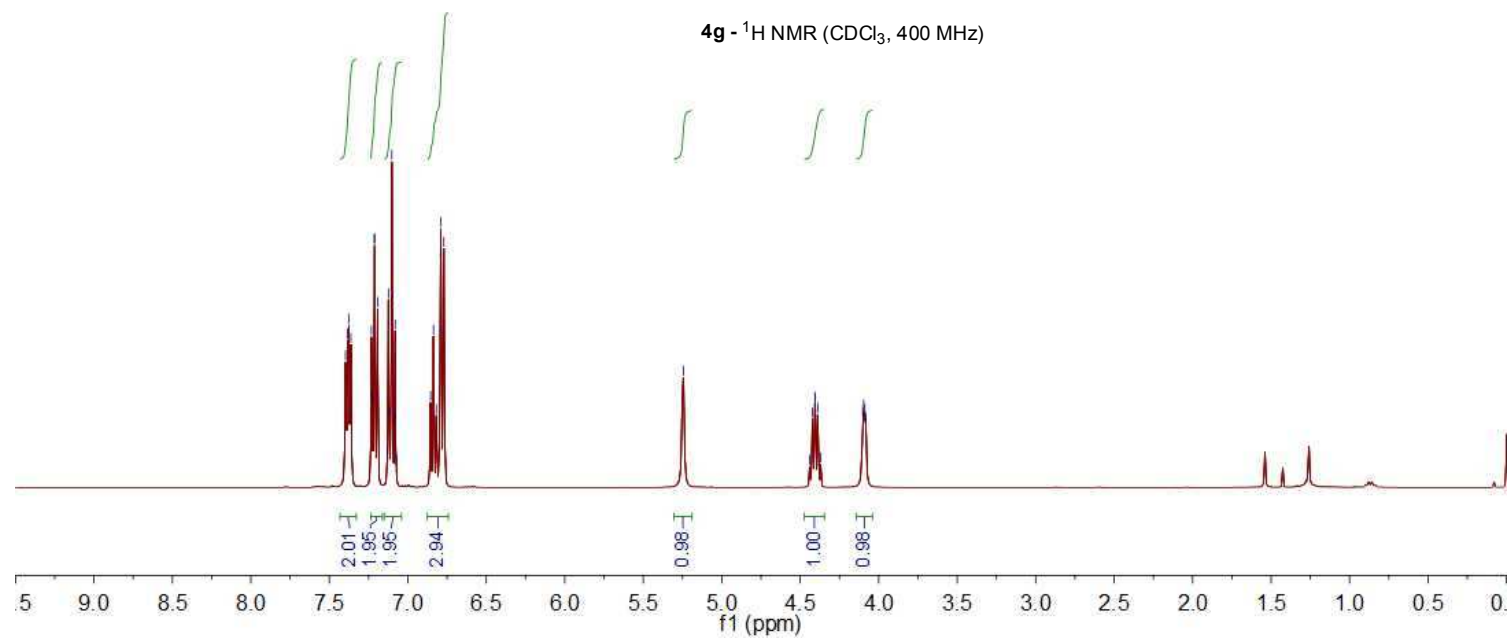
— 5.2447

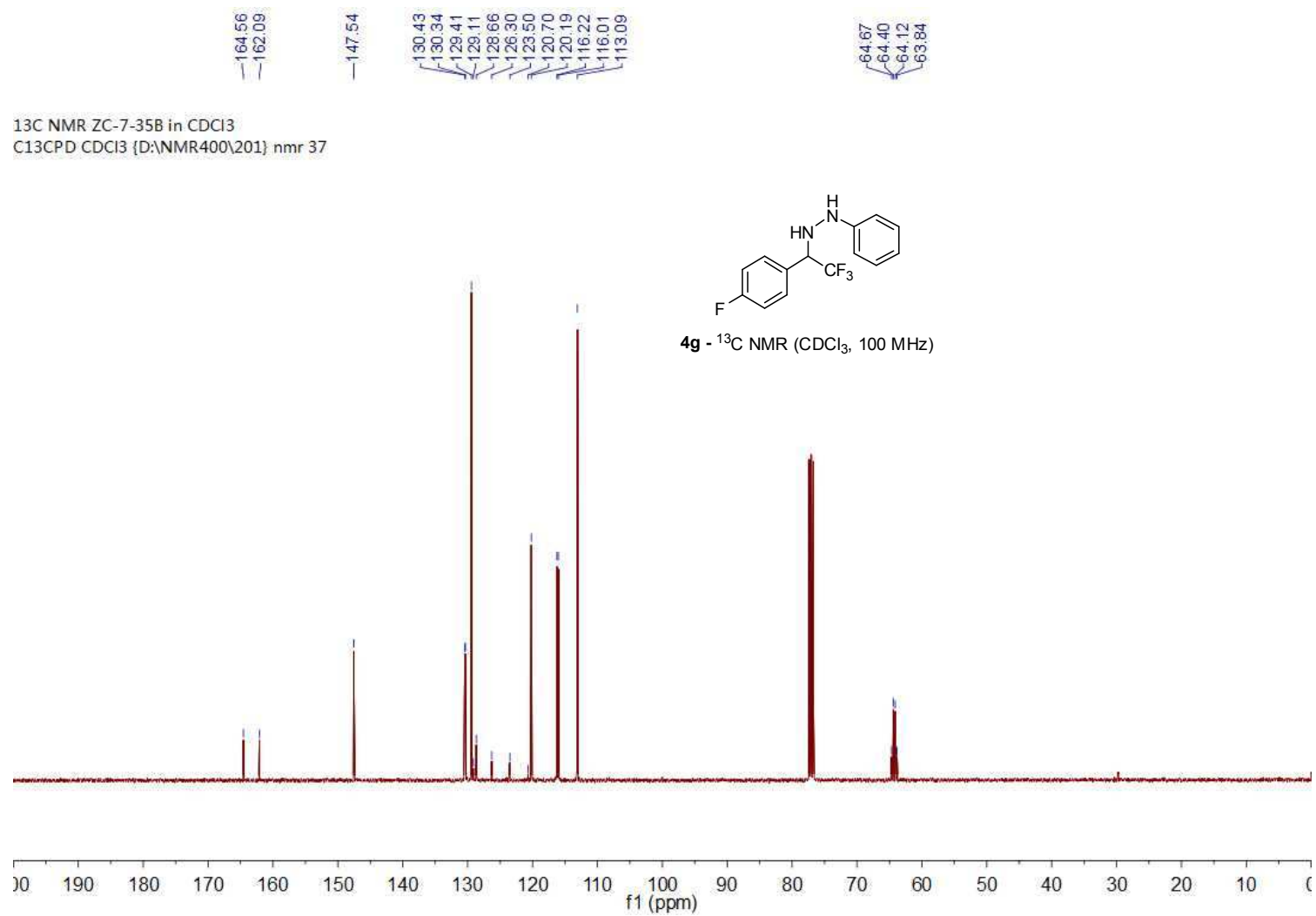
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4.4216
4.4064
4.4039
4.3885
4.3703
4.1016
4.0960
4.0885
4.0828

¹H NMR ZC-7-35B in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 37

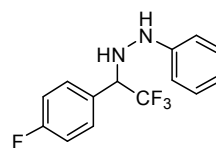


4g - ¹H NMR (CDCl₃, 400 MHz)

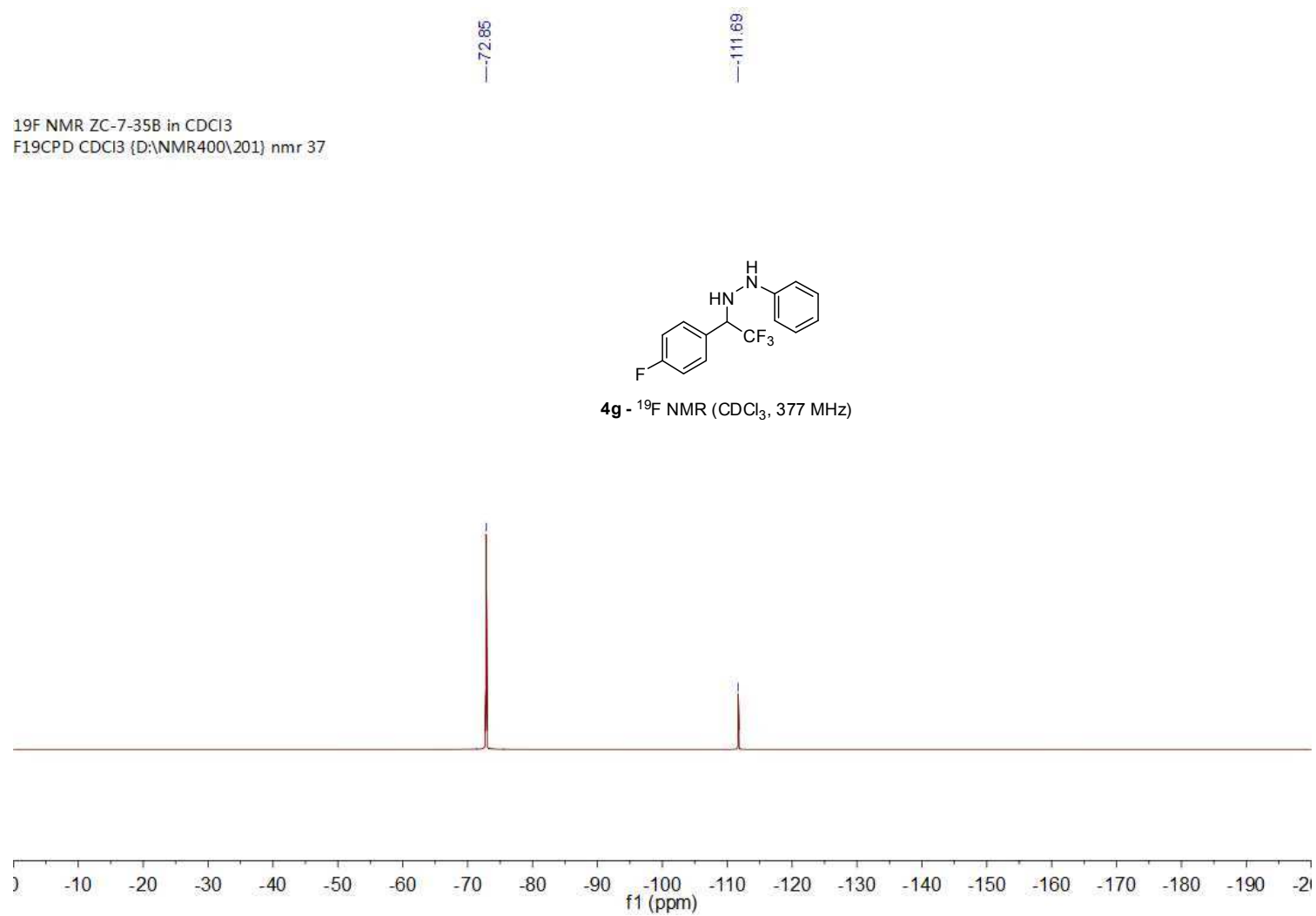


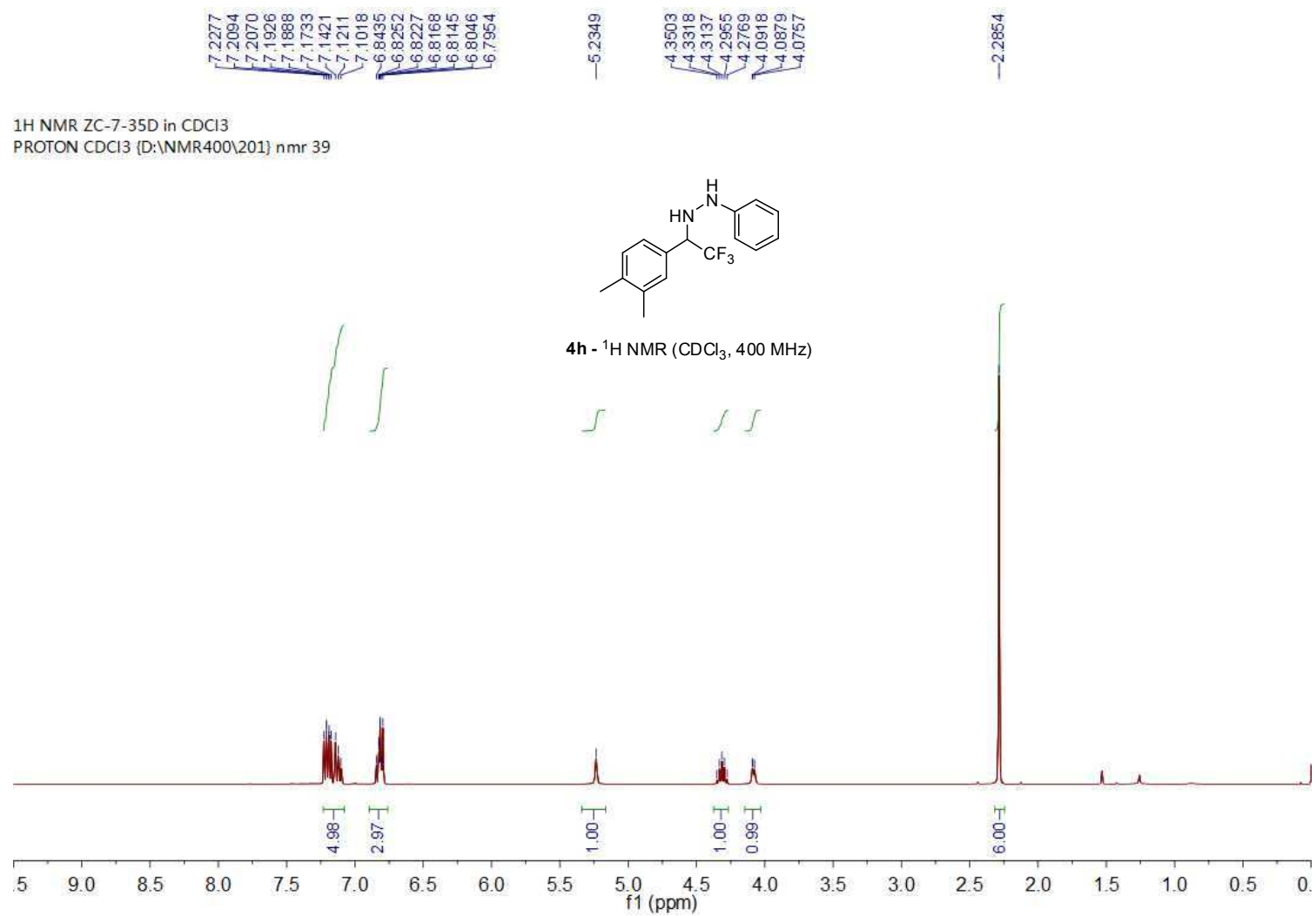


¹⁹F NMR ZC-7-35B in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 37

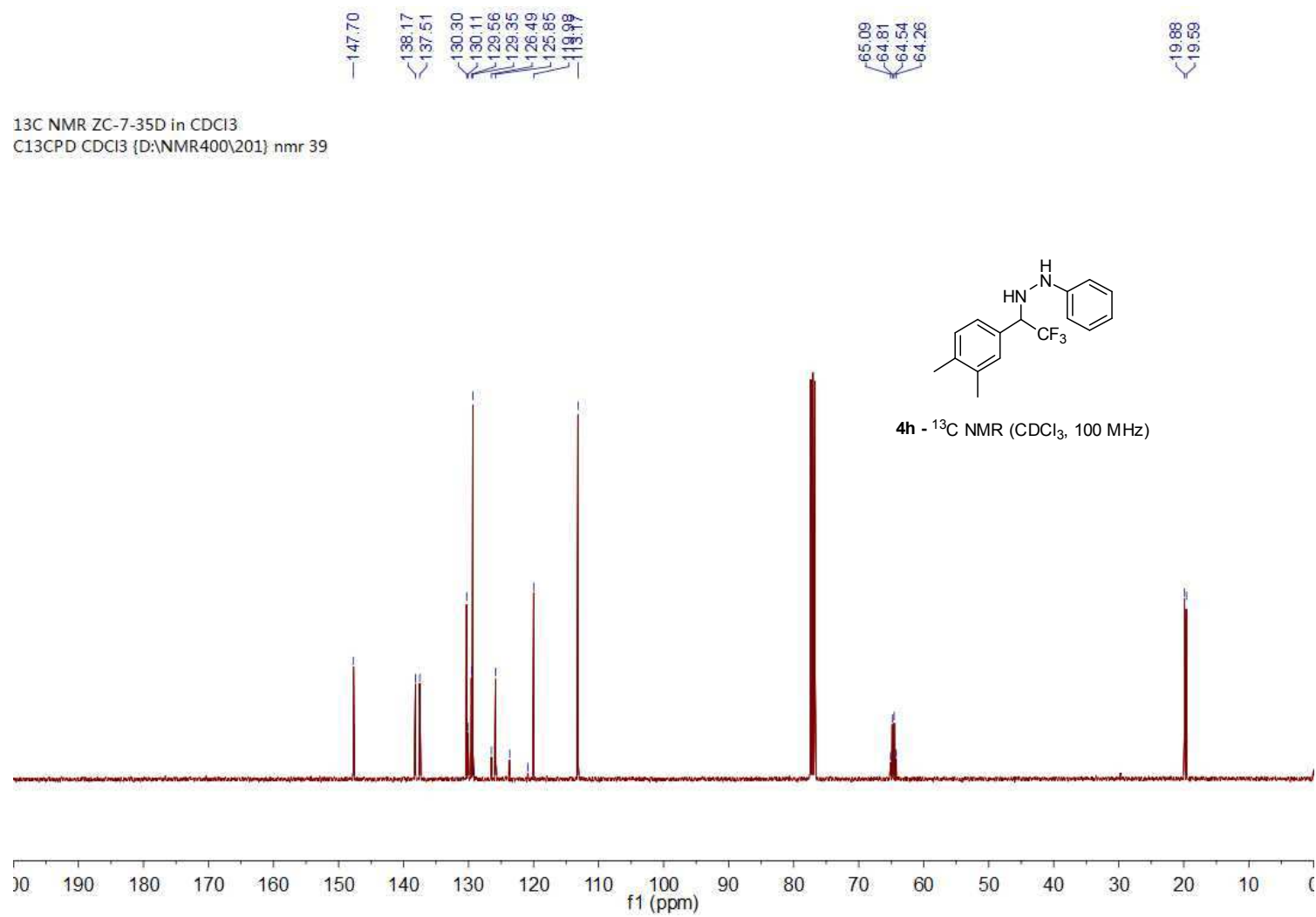


4g - ¹⁹F NMR (CDCl₃, 377 MHz)



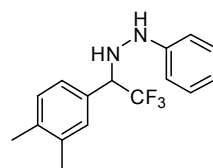


13C NMR ZC-7-35D in CDCl₃
 C13CPD CDCl₃ {D:\NMR400\201} nmr 39

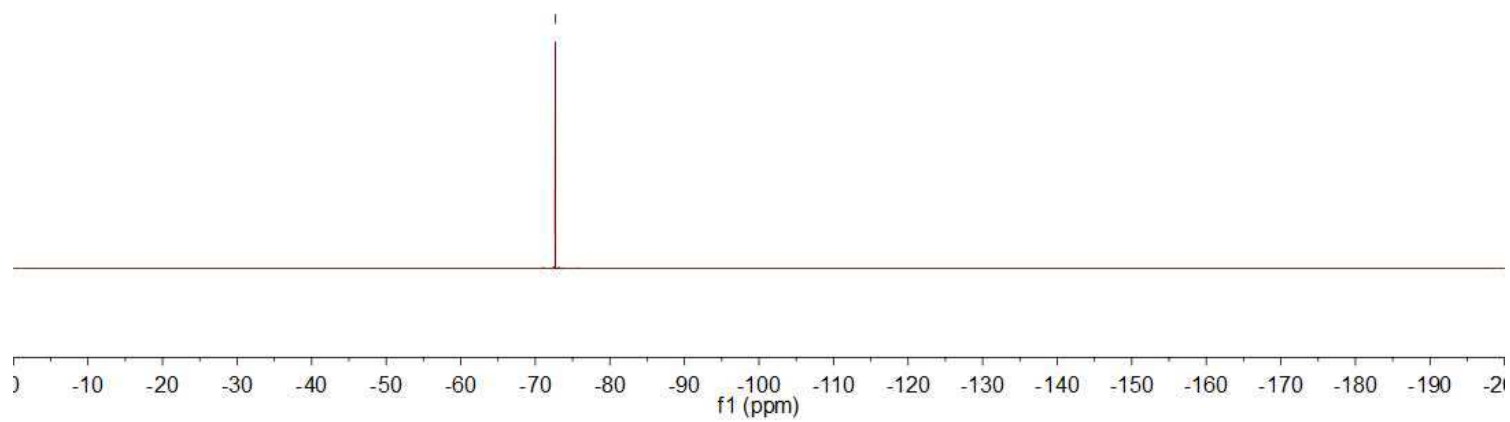


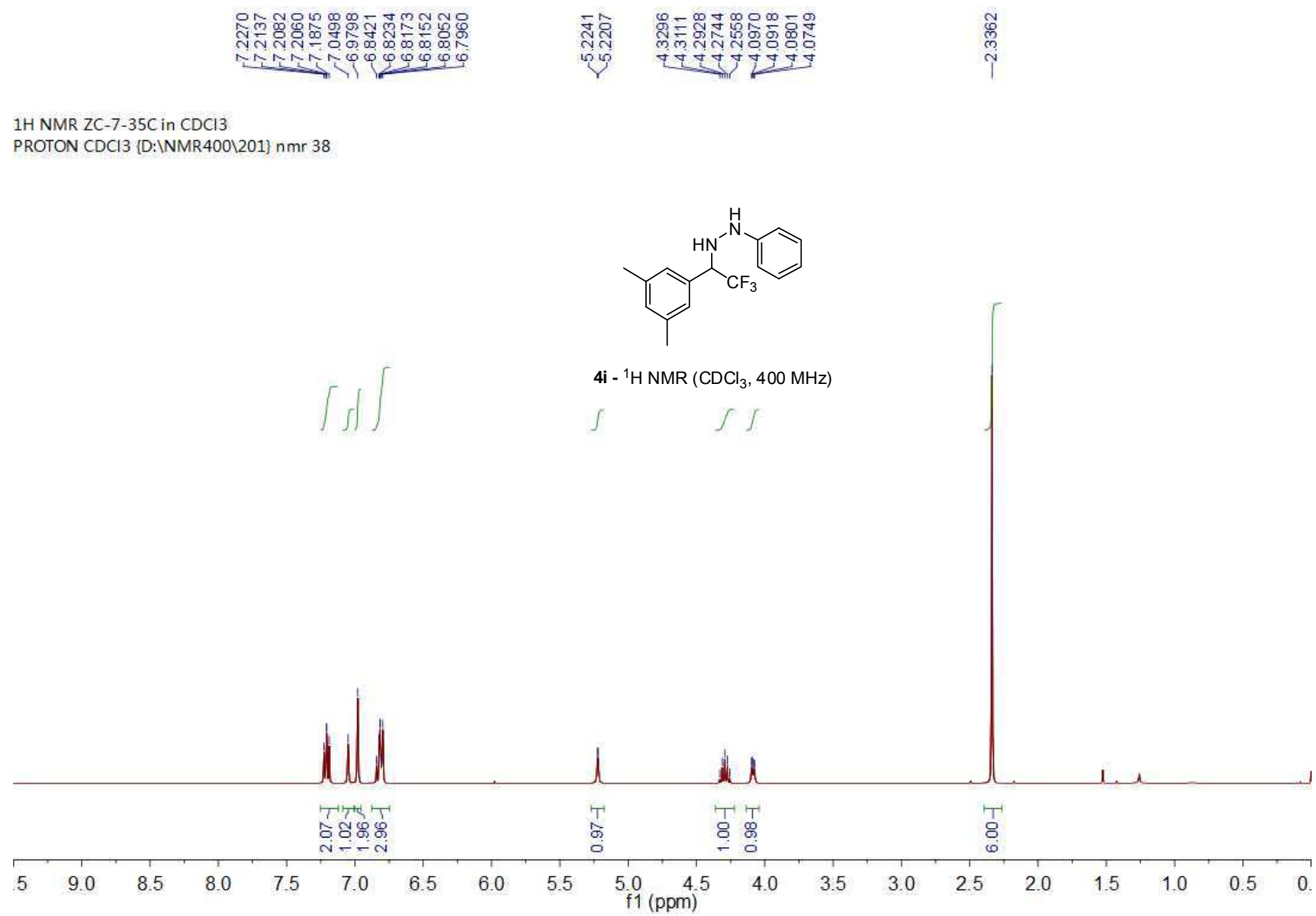
19F NMR ZC-7-35D in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 39

-72.67

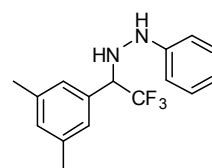


4h - ^{19}F NMR (CDCl_3 , 377 MHz)

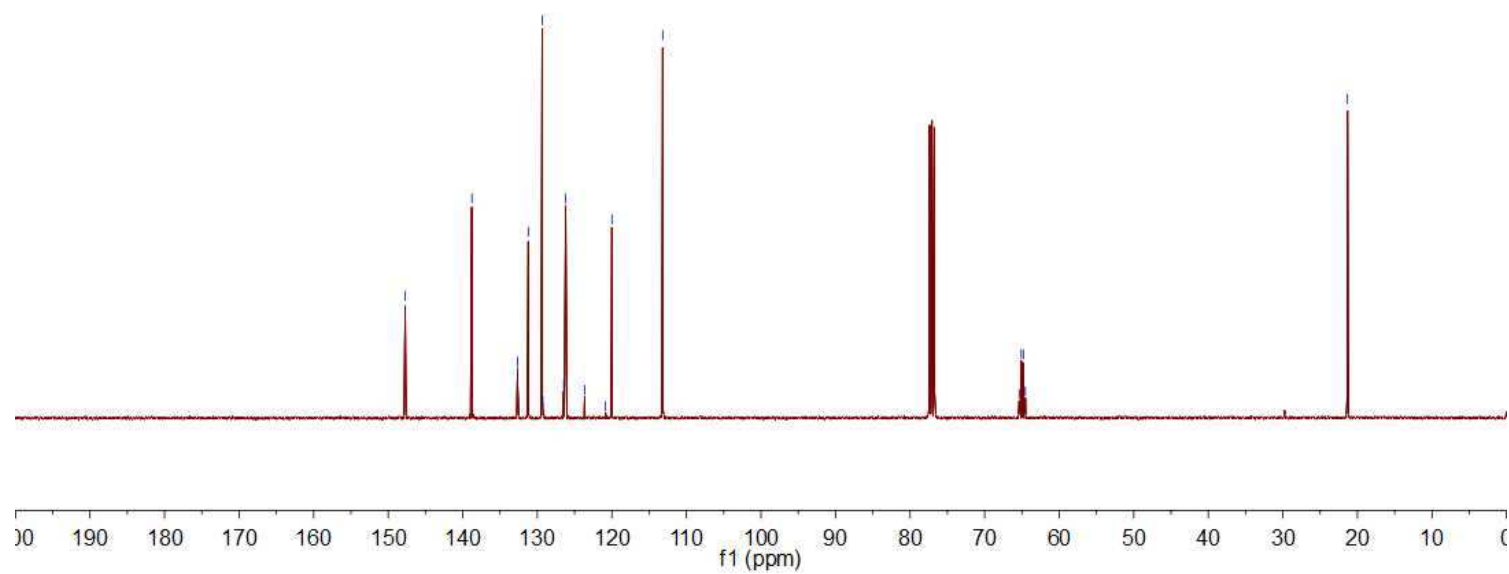




13C NMR ZC-7-35C in CDCl3
C13CPD CDCl3 {D:\NMR400\201} nmr 38

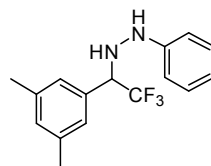


4i - ^{13}C NMR (CDCl₃, 100 MHz)

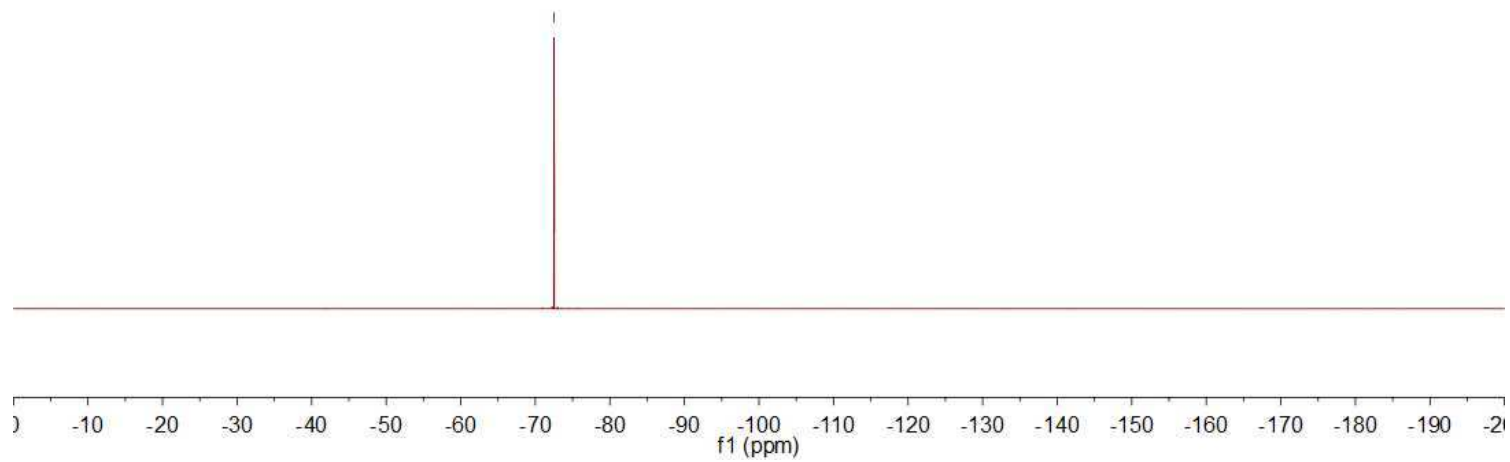


¹⁹F NMR ZC-7-35C in CDCl₃
F19CPD CDCl₃ {D:\NMR400\201} nmr 38

-72.52



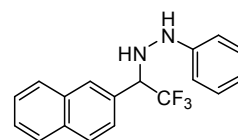
4i - ¹⁹F NMR (CDCl₃, 377 MHz)



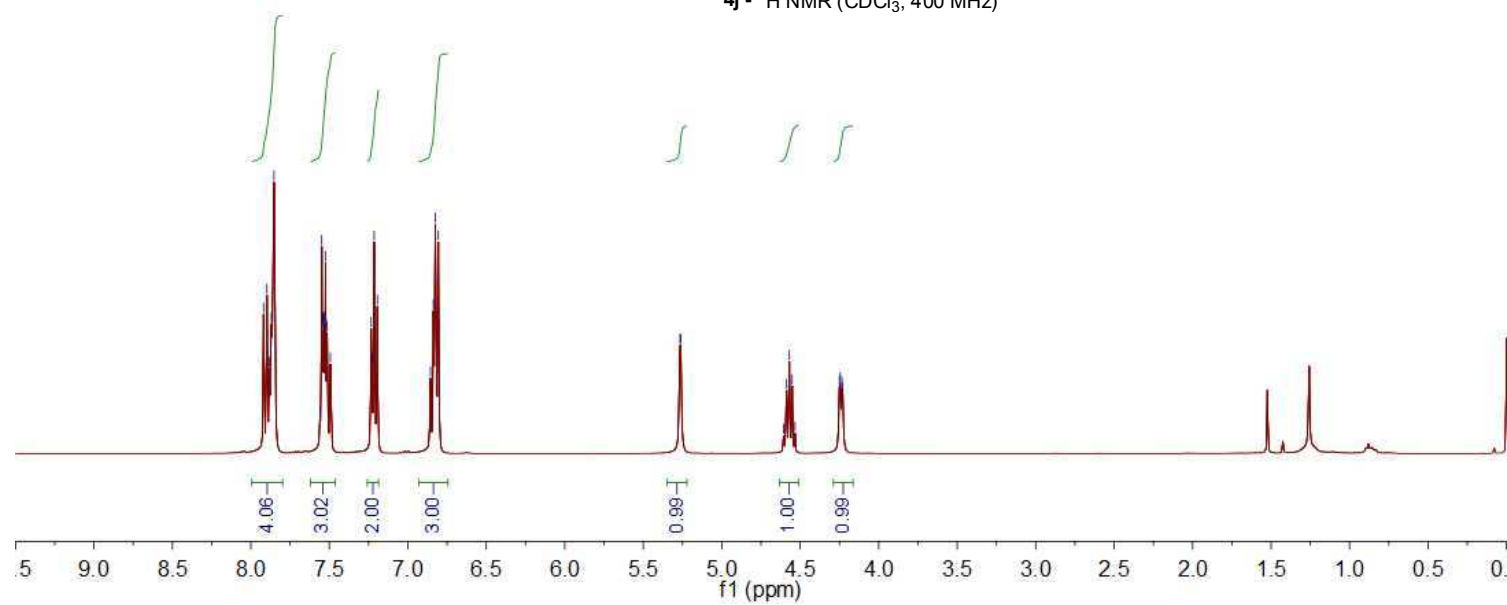
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7.8693
7.8525
7.5481
7.5341
7.5243
7.2144
7.1943
6.8853
6.8371
6.8249
6.8056

5.2656
5.2619
4.6052
4.5869
4.5692
4.5511
4.5328
4.2505
4.2450
4.2343
4.2288

¹H NMR ZC-7-35A in CDCl₃
PROTON CDCl₃ [D:\NMR400\201] nmr 36

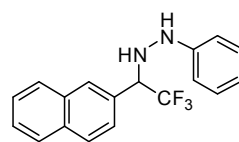


4j - ¹H NMR (CDCl₃, 400 MHz)

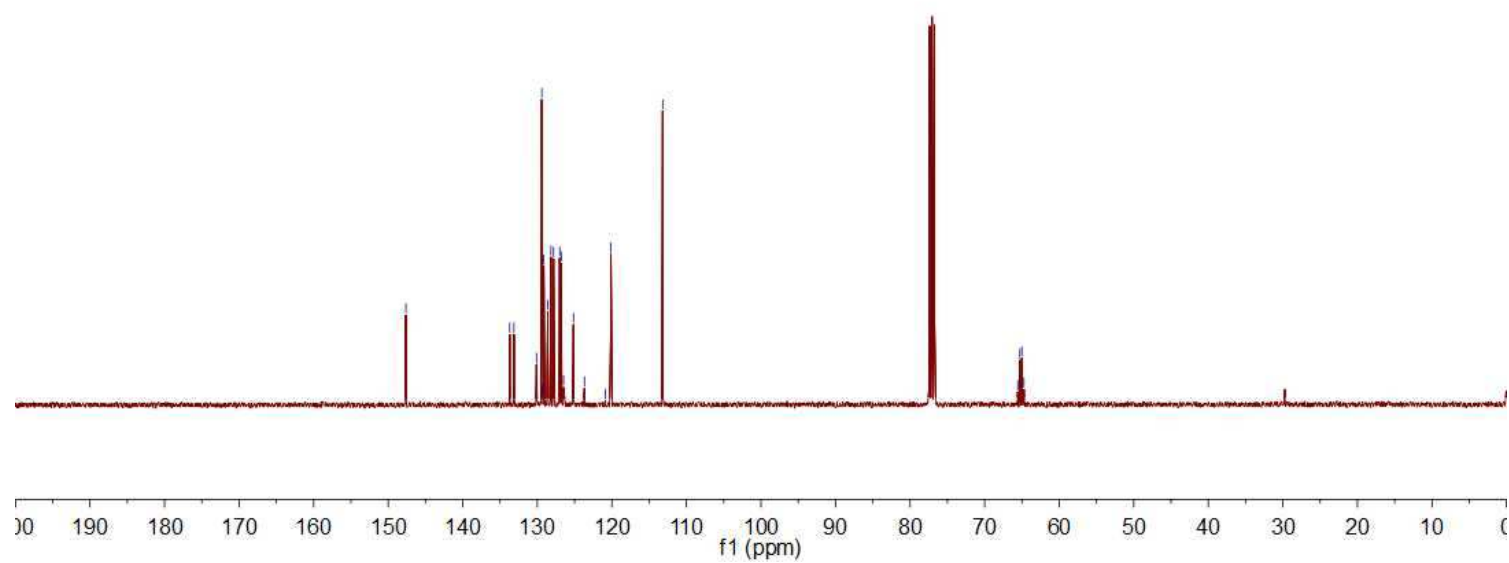




¹³C NMR ZC-7-35A in CDCl₃
 C13CPD CDCl₃ {D:\NMR400\201} nmr 36

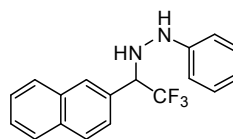


4j - ¹³C NMR (CDCl₃, 100 MHz)

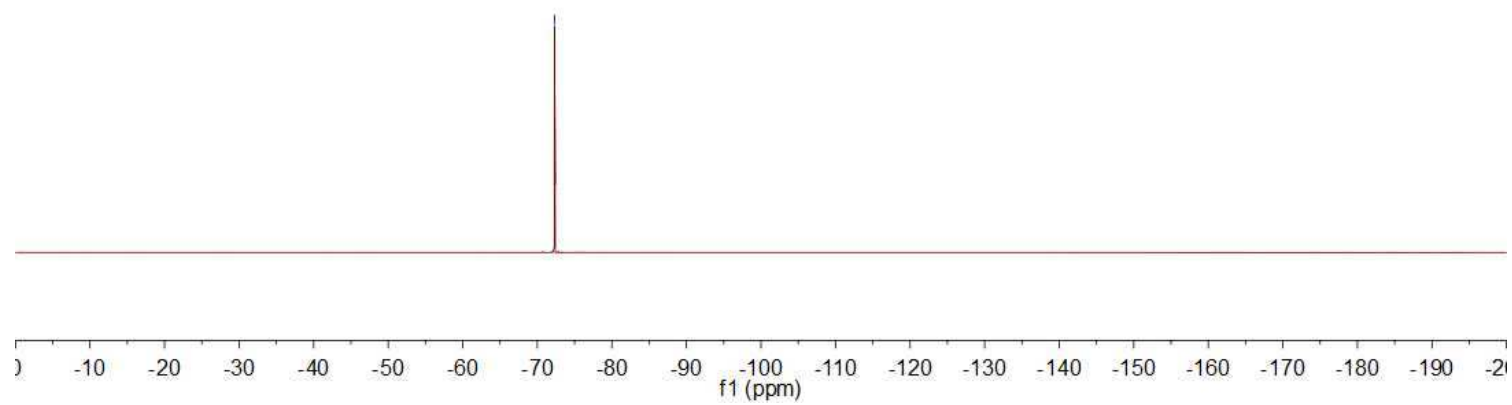


19F NMR ZC-7-35A in CDCl3
F19CPD CDCl3 {D:\NMR400\201} nmr 36

—72.31



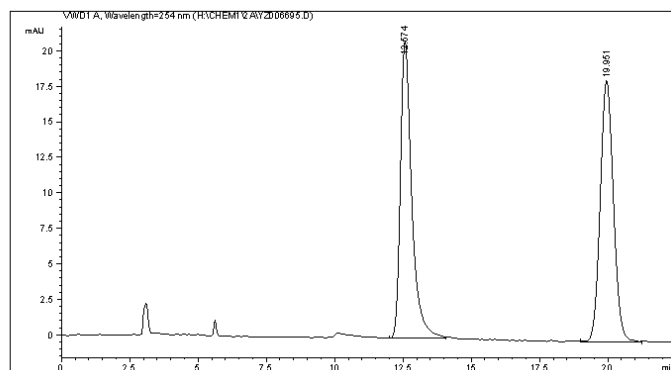
4j - ¹⁹F NMR (CDCl₃, 377 MHz)



8. Copy of HPLC for Racemic and Chiral Products

Data File H:\CHEM1\2A\YZ006695.D
Sample Name: ZC-6-48+-

```
=====
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1          Location : Vial 1
Injection Date  : 11/16/2014 7:44:41 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF.LC1.M
Last changed    : 11/16/2014 7:28:59 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF.LC.M
Last changed    : 6/18/2015 8:51:12 AM by
                  (modified after loading)
Sample Info     : 0D-H, H/I-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
=====
```



Area Percent Report

```
=====
Sorted By      : Signal
Multiplier:    : 1.0000
Dilution:      : 1.0000
Use Multiplier & Dilution Factor with ISTDs
=====
```

Signal 1: VWD1 A, Wavelength=254 nm

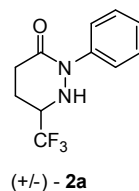
Peak #	RetTime [min]	Type	Width [min]	Area mAU	s	Height [mAU]	Area %
1	12.574	VB	0.4329	603.40637		20.90183	49.4354
2	19.951	VB	0.5256	617.18915		18.38611	50.5646

Totals : 1220.59552 39.28795

*** End of Report ***

Instrument 1 6/18/2015 8:52:01 AM

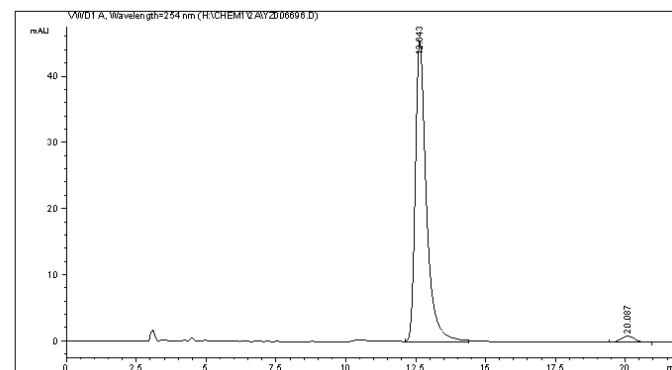
Page 1 of 1



(+/-) - 2a

Data File H:\CHEM1\2A\YZ006696.D
Sample Name: ZC-6-48+-

```
=====
Acq. Operator   : ZHOU
Acq. Instrument : Instrument 1          Location : Vial 1
Injection Date  : 11/16/2014 8:10:02 AM
Acq. Method     : C:\HPCHEM\1\METHODS\DEF.LC1.M
Last changed    : 11/16/2014 8:09:25 AM by ZHOU
                  (modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF.LC.M
Last changed    : 6/18/2015 8:58:11 AM by
                  (modified after loading)
Sample Info     : 0D-H, H/I-PrOH = 90/10, 0.8 mL/min, 30 oC, 254 nm
=====
```



Area Percent Report

```
=====
Sorted By      : Signal
Multiplier:    : 1.0000
Dilution:      : 1.0000
Use Multiplier & Dilution Factor with ISTDs
=====
```

Signal 1: VWD1 A, Wavelength=254 nm

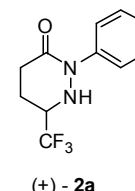
Peak #	RetTime [min]	Type	Width [min]	Area mAU	s	Height [mAU]	Area %
1	12.643	BB	0.4126	1255.16357		45.42476	97.5173
2	20.087	EV	0.4965	31.95575		9.44749e-1	2.4827

Totals : 1287.11933 46.36951

*** End of Report ***

Instrument 1 6/18/2015 8:58:16 AM

Page 1 of 1

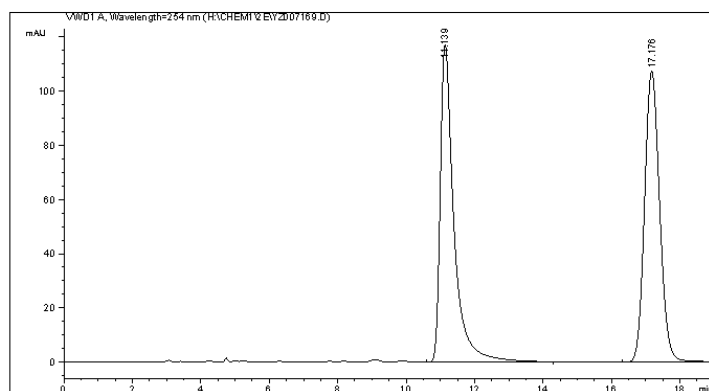


(+) - 2a

Data File H:\CHEM1\2E\YZ007169.D
Sample Name: ZC-6-83C+

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/3/2015 10:51:43 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 2/3/2015 10:18:11 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:54:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

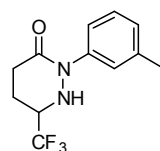
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.139	VB	0.4077	3249.28711		117.28435	49.7007
2	17.176	BB	0.4736	3288.42651		107.42029	50.2993

Totals : 6537.71362 224.70464

*** End of Report ***

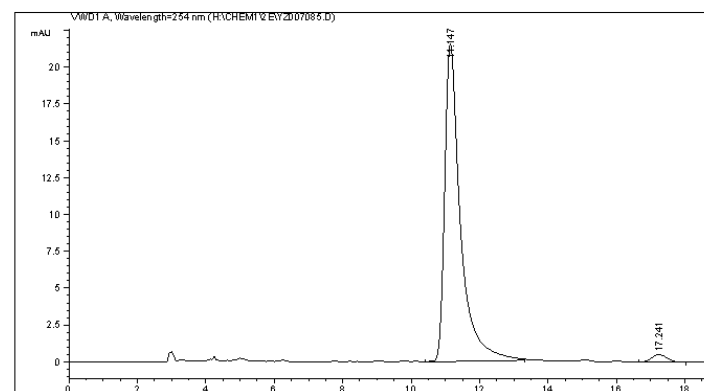


(+/-) - 2b

Data File H:\CHEM1\2E\YZ007085.D
Sample Name: ZC-6-83C

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/23/2015 1:47:14 PM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 1/23/2015 11:25:23 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:54:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

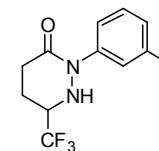
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.147	VB	0.4664	688.96716		21.53752	97.7247
2	17.241	BB	0.4733	16.04084		5.24434e-1	2.2753

Totals : 705.00801 22.06196

*** End of Report ***

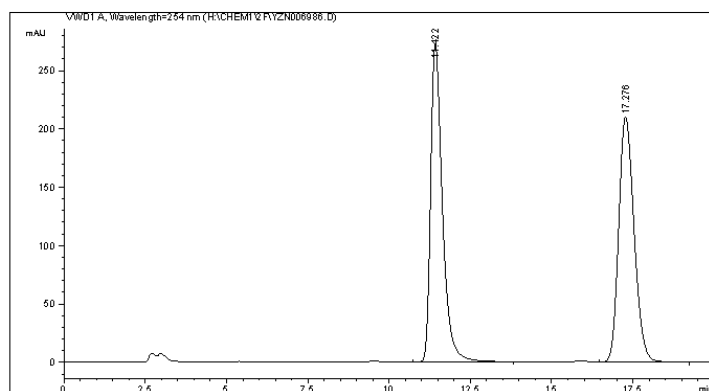


(+) - 2b

Data File H:\CHEM1\2F\YZN006986.D
Sample Name: ZC-6-81A+-

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/16/2015 2:24:34 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 1/16/2015 2:23:41 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:55:54 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

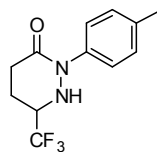
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.422	VB	0.3827	6895.84961		272.40884	50.0094
2	17.276	VB	0.5110	6893.26074		210.06381	49.9906

Totals : 1.37891e4 482.47266

*** End of Report ***



(+/-) - 2c

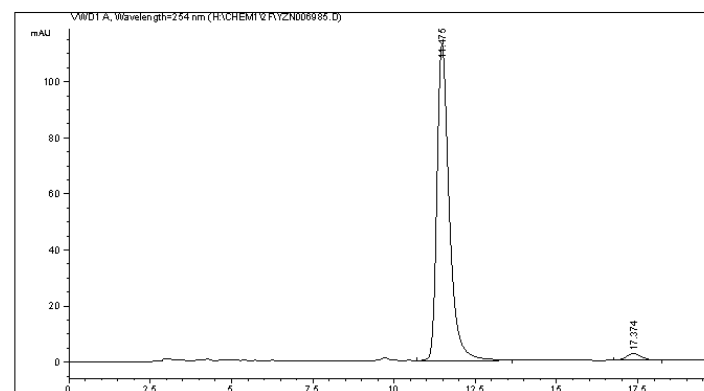
Instrument 1 6/18/2015 8:56:10 AM

Page 1 of 1

Data File H:\CHEM1\2F\YZN006985.D
Sample Name: ZC-6-81A

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/16/2015 2:00:19 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 1/16/2015 1:41:37 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:55:54 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

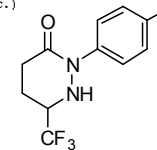
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.475	VB	0.3975	2971.37354		112.81668	97.4194
2	17.374	BB	0.5053	78.71133		2.39777	2.5806

Totals : 3050.08487 115.21445

*** End of Report ***



(+) - 2c

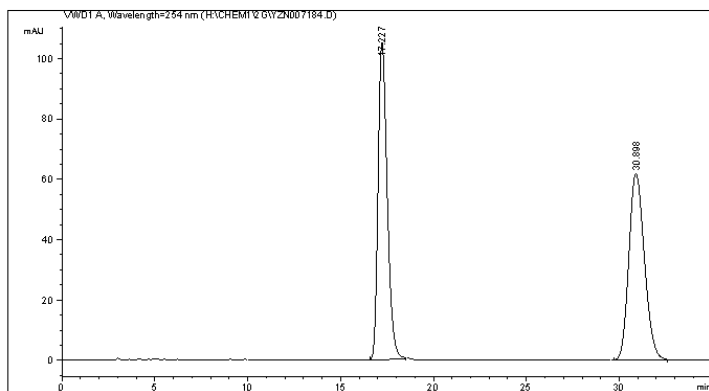
Instrument 1 6/18/2015 8:55:58 AM

Page 1 of 1

Data File H:\CHEM1\26\YZN007184.D
Sample Name: ZC-6-83D+-

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 2:54:58 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 2:52:31 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 10:36:42 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

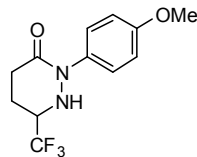
Peak #	RetTime [min]	Type	Width [min]	Area mAU	Area %s	Height [mAU]	Area %
1	17.227	BB	0.5260	3585.50659		105.14455	49.8469
2	30.898	BB	0.9024	3607.53857		61.79690	50.1531

Totals : 7193.04517 166.94144

*** End of Report ***

Instrument 1 6/18/2015 10:36:45 AM

Page 1 of 1

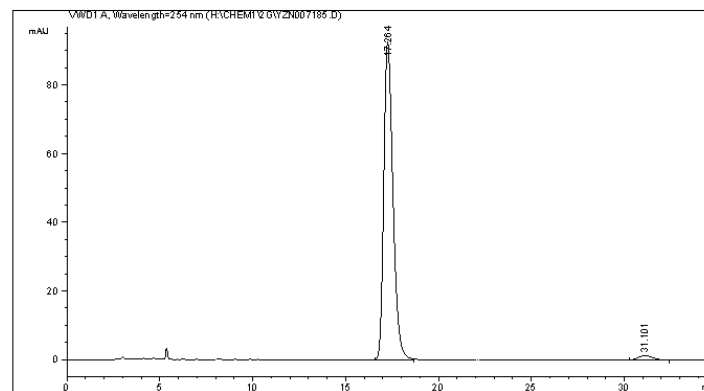


(+/-) - 2d

Data File H:\CHEM1\26\YZN007185.D
Sample Name: ZC-6-83D

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 3:42:49 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 3:41:35 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 10:36:42 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

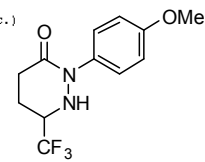
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	Area %s	Height [mAU]	Area %
1	17.264	BB	0.5256	3174.64355		92.49857	97.7746
2	31.101	BB	0.6970	72.25686		1.26772	2.2254

Totals : 3246.90041 93.76629

*** End of Report ***



(+) - 2d

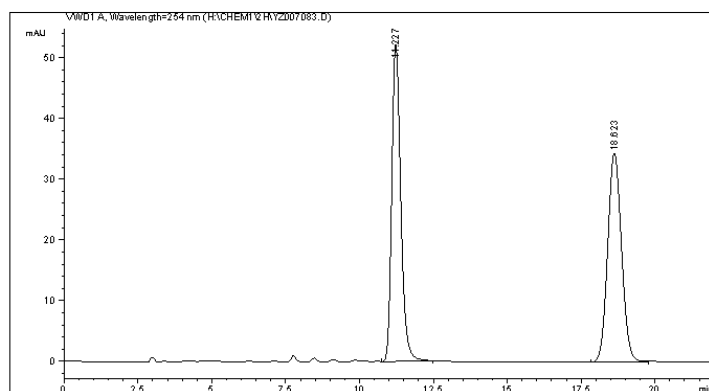
Instrument 1 6/18/2015 10:36:59 AM

Page 1 of 1

Data File H:\CHEM1\2H\YZ007083.D
Sample Name: ZC-6-83B+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/23/2015 12:33:34 PM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 1/23/2015 11:25:23 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:58:11 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



=====
Area Percent Report
=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.227	VB	0.3266	1109.48413		52.20356	49.7802
2	18.623	BB	0.5079	1119.26137		34.38651	50.2196

Totals : 2228.76550 86.59206

=====
*** End of Report ***

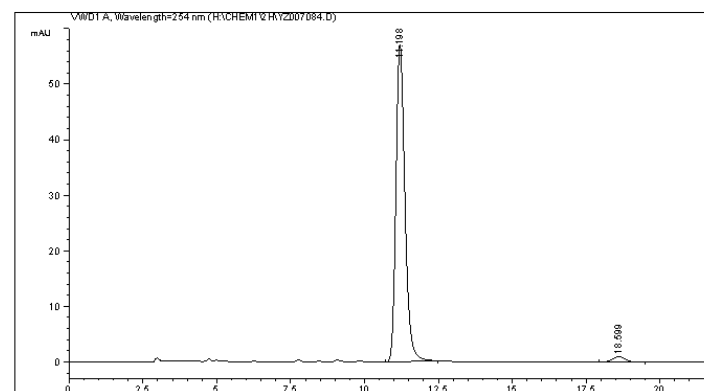
Instrument 1 6/18/2015 8:58:34 AM

Page 1 of 1

Data File H:\CHEM1\2H\YZ007084.D
Sample Name: ZC-6-83B

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/23/2015 1:02:58 PM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 1/23/2015 11:25:23 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:58:11 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



=====
Area Percent Report
=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

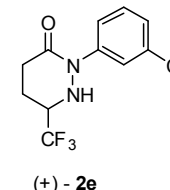
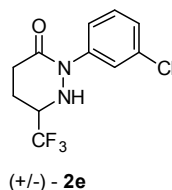
Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.198	VB	0.3228	1210.07837		57.14421	97.4190
2	18.599	BB	0.5176	32.05967		9.75050e-1	2.5810

Totals : 1242.13804 58.11926

=====
*** End of Report ***

Instrument 1 6/18/2015 8:58:46 AM

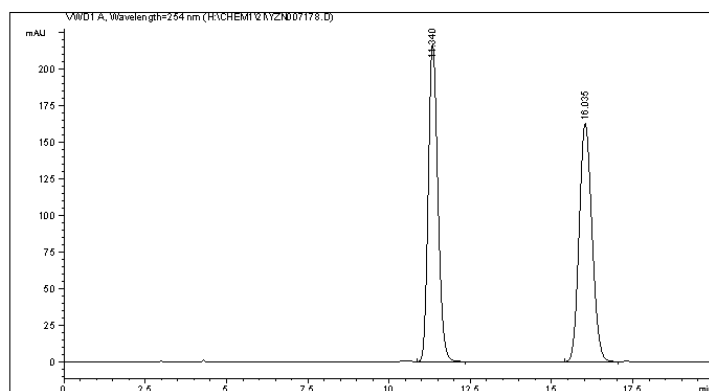
Page 1 of 1



Data File H:\CHEM1\2I\YZN007178.D
Sample Name: ZC-6-83A+-

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 10:38:17 AM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 10:36:09 AM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 10:52:46 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

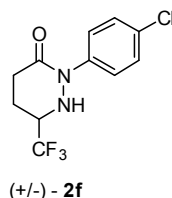
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.340	VB	0.3187	4453.69238		216.39081	50.0642
2	16.035	EB	0.4269	4438.72363		162.25356	49.9158
Totals :				8892.41602		378.64436	

*** End of Report ***

Instrument 1 6/18/2015 10:52:49 AM

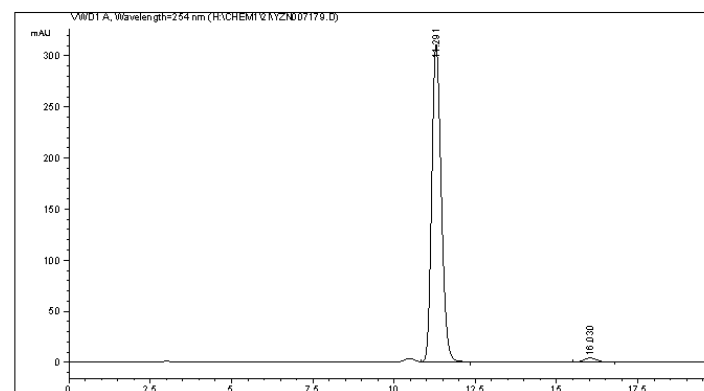
Page 1 of 1



Data File H:\CHEM1\2I\YZN007179.D
Sample Name: ZC-6-83A

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 11:00:25 AM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 10:59:11 AM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 10:52:46 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

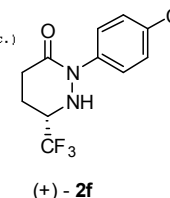
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.291	VB	0.3164	6338.86279		311.04852	98.3670
2	16.030	EB	0.4258	105.23393		3.85969	1.6330
Totals :				6444.09673		314.90822	

*** End of Report ***

Instrument 1 6/18/2015 10:53:02 AM

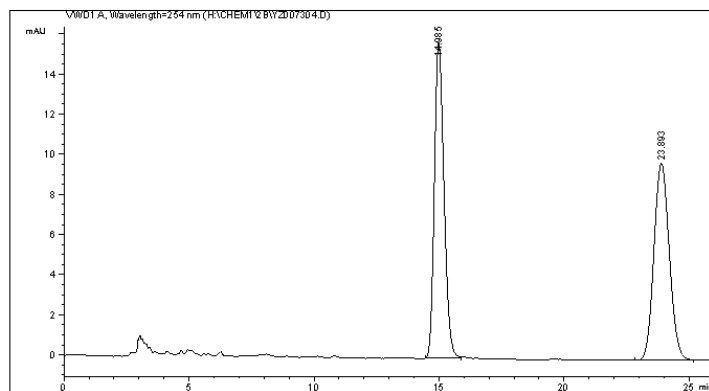
Page 1 of 1



Data File H:\CHEM1\2B\YZ007304.D
Sample Name: ZC-6-95A+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 3/17/2015 6:57:56 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 3/17/2015 6:05:26 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:52:59 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm

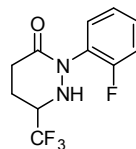


Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	14.985	BB	0.4104	420.46619		15.75248	50.1148
2	23.893	BB	0.6666	418.54004		9.81093	49.8852
Totals :				839.00623		25.56341	



(+/-) - 2g

*** End of Report ***

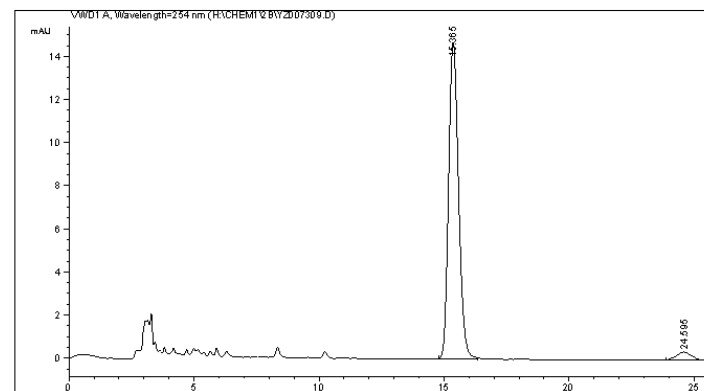
Instrument 1 6/18/2015 8:53:04 AM

Page 1 of 1

Data File H:\CHEM1\2B\YZ007309.D
Sample Name: ZC-6-95A

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 3/17/2015 9:13:28 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 3/17/2015 6:05:26 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:52:59 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm

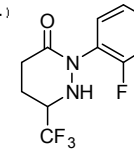


Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	15.365	BB	0.4288	404.26141		14.68888	96.2711
2	24.595	BB	0.5728	15.65833		3.78591e-1	3.7289
Totals :				419.91974		15.06747	



(+) - 2g

*** End of Report ***

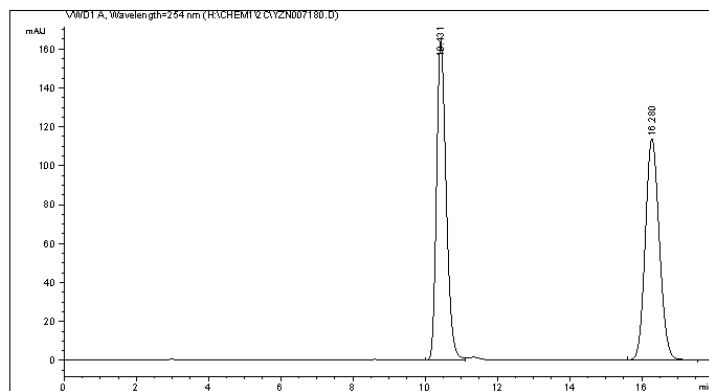
Instrument 1 6/18/2015 8:53:18 AM

Page 1 of 1

Data File H:\CHEM1\2C\YZN007180.D
Sample Name: ZC-6-90A+-

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 11:22:28 AM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 11:21:17 AM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:53:44 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

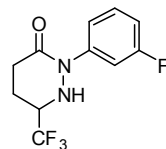
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	Area %s	Height [mAU]	Area %
1	10.431	VV	0.2870	3037.55591	163.20886	49.8886	
2	16.280	BB	0.4179	3051.11890	113.69422	50.1114	

Totals : 6088.67480 276.90308

*** End of Report ***



(+/-) - 2h

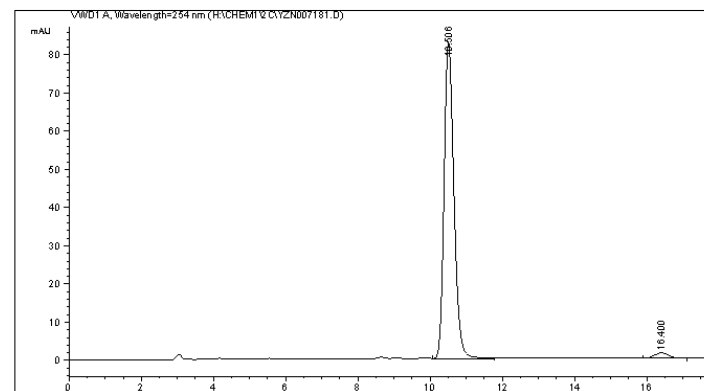
Instrument 1 6/18/2015 8:53:49 AM

Page 1 of 1

Data File H:\CHEM1\2C\YZN007181.D
Sample Name: ZC-6-90A

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 1:43:47 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 1:27:55 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:53:44 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

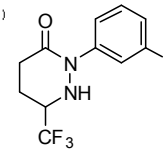
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	Area %s	Height [mAU]	Area %
1	10.506	VB	0.2905	1566.03333	82.81664	97.7174	
2	16.400	BB	0.4202	36.58137	1.36590	2.2826	

Totals : 1602.61469 84.18253

*** End of Report ***



(+) - 2h

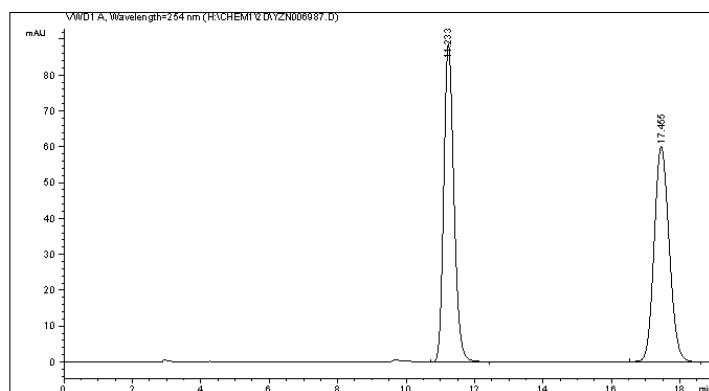
Instrument 1 6/18/2015 8:54:03 AM

Page 1 of 1

Data File H:\CHEM1\2D\YZN006987.D
Sample Name: ZC-6-82D+-

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/16/2015 2:46:11 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 1/16/2015 2:45:27 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:54:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

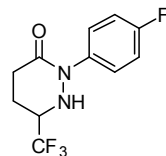
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.233	VB	0.3194	1828.37659	88.60506	49.9646	
2	17.455	EB	0.4781	1830.96826	60.03961	50.0354	

Totals : 3659.34485 148.64467

*** End of Report ***



(+/-) - 2i

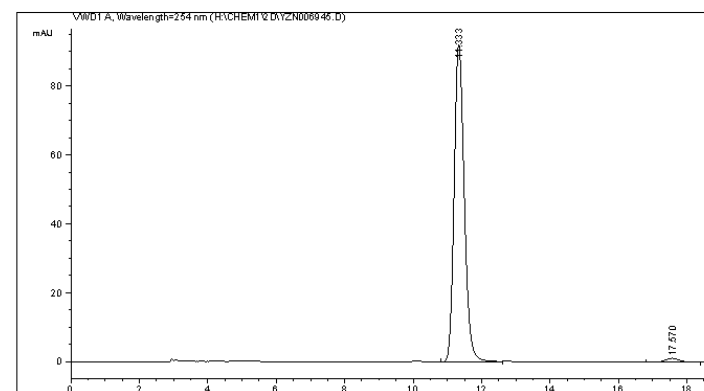
Instrument 1 6/18/2015 8:54:52 AM

Page 1 of 1

Data File H:\CHEM1\2D\YZN006945.D
Sample Name: ZC-6-82D

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 1/12/2015 4:19:33 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 1/12/2015 4:17:50 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 8:54:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

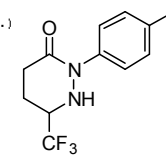
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.333	VB	0.3181	1891.79065	92.17707	98.1449	
2	17.570	EB	0.4782	35.75892	1.17238	1.8551	

Totals : 1927.54957 93.34945

*** End of Report ***



(+) - 2i

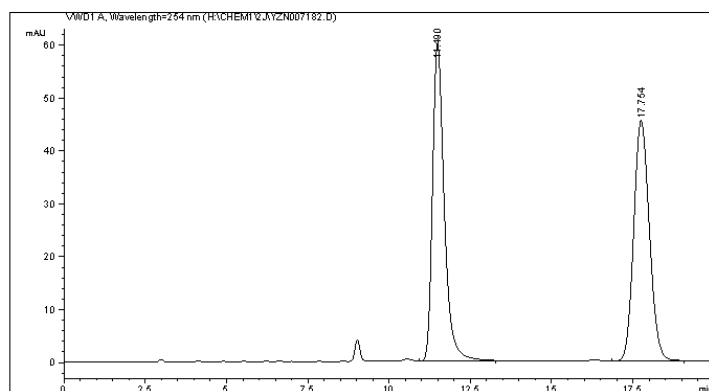
Instrument 1 6/18/2015 8:54:40 AM

Page 1 of 1

Data File H:\CHEM1\2J\YZN007182.D
Sample Name: ZC-6-90B+

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 2:06:49 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 2:02:37 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:00:01 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

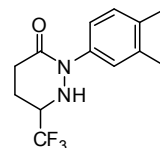
Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.490	VB	0.3810	1507.85657	59.91132	49.8168	
2	17.754	VB	0.5213	1518.94897	45.40733	50.1832	

Totals : 3026.80554 105.31865

*** End of Report ***

Instrument 1 6/18/2015 9:00:35 AM

Page 1 of 1

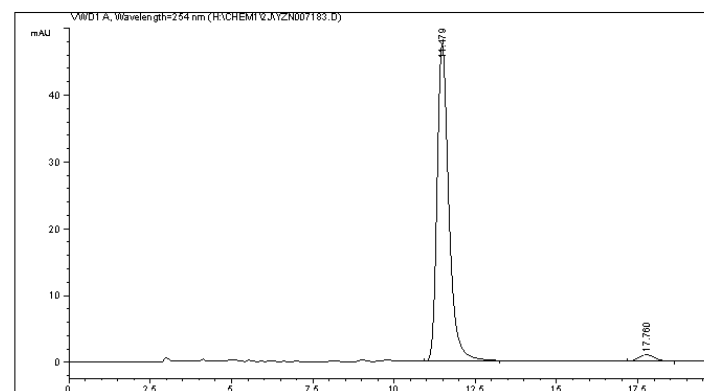


(+/-) - 2j

Data File H:\CHEM1\2J\YZN007183.D
Sample Name: ZC-6-90B

=====

Acq. Operator : Z
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 2/2/2015 2:28:09 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 2/2/2015 2:27:27 PM by Z
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:00:01 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

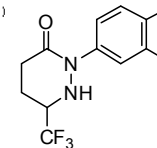
Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	11.479	VB	0.3850	1198.51807	47.44415	97.3406	
2	17.760	BB	0.5194	32.74408	9.76434e-1	2.6594	

Totals : 1231.26214 48.42058

*** End of Report ***

Instrument 1 6/18/2015 9:00:48 AM

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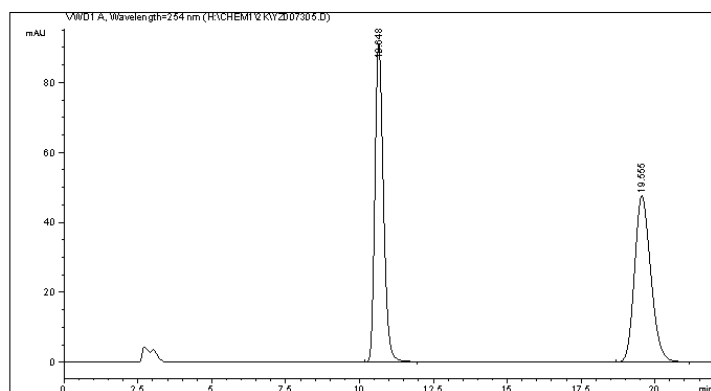


(+) - 2j

Data File H:\CHEM1\2K\YZ007305.D
Sample Name: ZC-6-95B+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 3/17/2015 7:25:59 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 3/17/2015 6:05:26 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:01:06 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



=====

Area Percent Report

=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

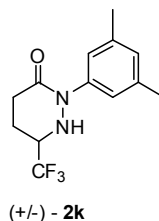
Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	10.648	BB	0.3095	1821.92859	90.90729	50.0896	
2	19.555	VB	0.5905	1815.41003	47.61079	49.9104	
Totals :				3637.33862		138.51808	

=====

*** End of Report ***

Instrument 1 6/18/2015 9:01:11 AM

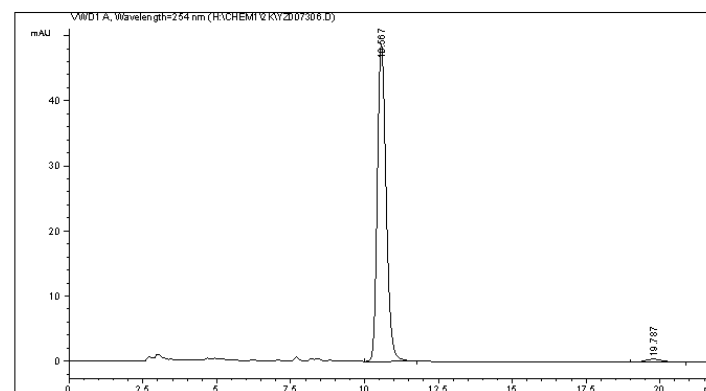
Page 1 of 1



Data File H:\CHEM1\2K\YZ007306.D
Sample Name: ZC-6-95B

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 3/17/2015 7:54:21 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 3/17/2015 6:05:26 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:01:06 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 90/10, 1.0 mL/min, 30 oC, 254 nm



=====

Area Percent Report

=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

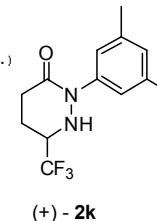
Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	10.567	VB	0.3195	1006.19208	48.73051	98.0240	
2	19.787	BB	0.5763	20.26308	4.86831e-1	1.9760	
Totals :				1026.47516		49.21734	

=====

*** End of Report ***

Instrument 1 6/18/2015 9:01:23 AM

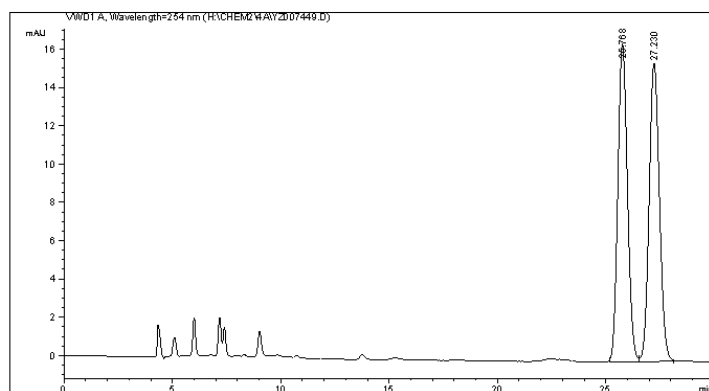
Page 1 of 1



Data File H:\CHEM2\4A\YZ007449.D
Sample Name: ZC-7-7+

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/1/2015 6:20:20 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/1/2015 5:48:22 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:36:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

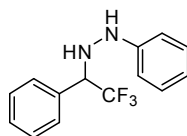
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	25.768	BV	0.4786	510.58746		16.58194	49.8712
2	27.230	VB	0.5130	513.22377		15.55796	50.1288

Totals : 1023.81323 32.13991

*** End of Report ***

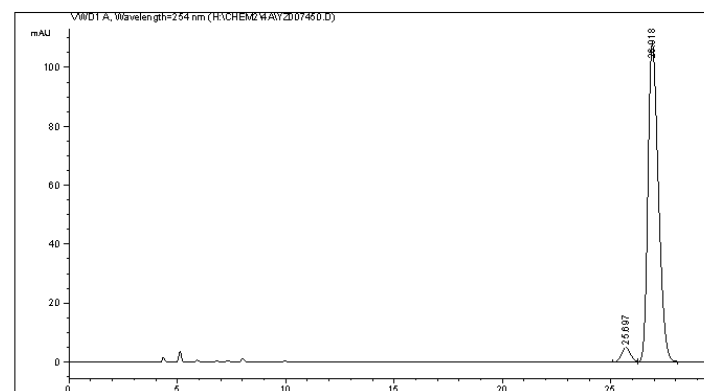


(+/-)-4a

Data File H:\CHEM2\4A\YZ007450.D
Sample Name: ZC-7-7

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/1/2015 6:51:50 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/1/2015 5:48:22 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:36:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

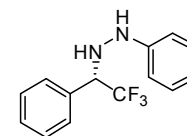
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	25.697	BV	0.4607	146.53606		4.96692	3.8944
2	26.918	VB	0.5191	3616.22485		107.90073	96.1056

Totals : 3762.76091 112.86764

*** End of Report ***

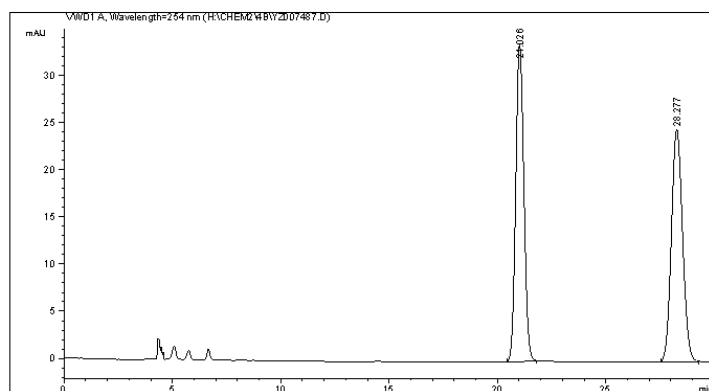


(+)-4a

Data File H:\CHEM2\4B\YZ007487.D
Sample Name: ZC-7-10A+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/8/2015 12:43:11 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/8/2015 12:03:19 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:36:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

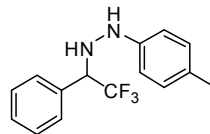
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	21.026	BB	0.4056	875.48938		33.62932	49.8087
2	28.277	BB	0.5600	882.21411		24.66276	50.1913

Totals : 1757.70349 58.29208

*** End of Report ***

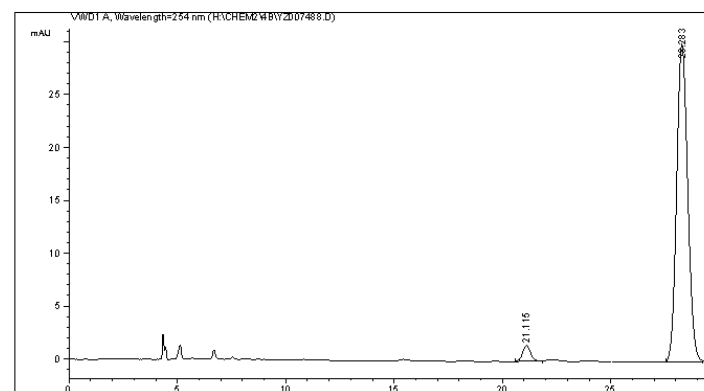


(+/-)-4b

Data File H:\CHEM2\4B\YZ007488.D
Sample Name: ZC-7-10A

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/8/2015 1:17:44 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/8/2015 12:03:19 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:36:35 AM by
(modified after loading)
Sample Info : OD-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

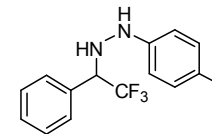
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	21.115	BB	0.4005	36.84633		1.46821	3.3451
2	28.283	BB	0.5534	1064.64722		30.02701	96.6549

Totals : 1101.49355 31.49521

*** End of Report ***

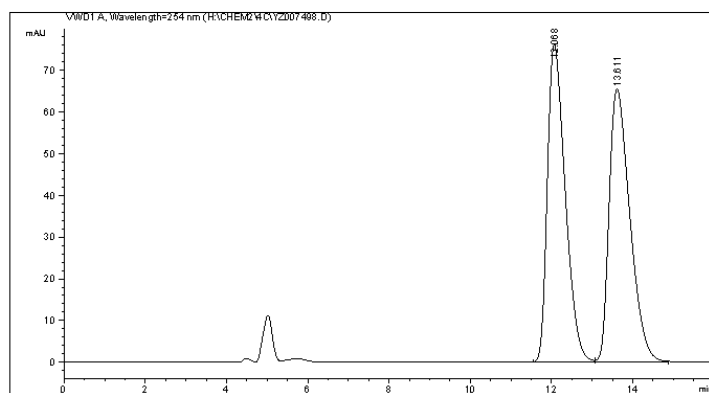


(-)-4b

Data File H:\CHEM2\4C\YZ007498.D
Sample Name: ZC-7-10B+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/8/2015 7:17:15 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/8/2015 6:58:17 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:38:06 AM by
(modified after loading)
Sample Info : 0G-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

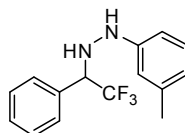
Peak #	RetTime [min]	Type	Width [min]	Area mAU	Area %s	Height [mAU]	Area %
1	12.068	BV	0.4720	2320.57983	76.14135	50.0593	
2	13.611	VB	0.5474	2315.06081	65.32496	49.9407	

Totals : 4635.66064 141.46631

*** End of Report ***

Instrument 1 6/18/2015 9:38:11 AM

Page 1 of 1

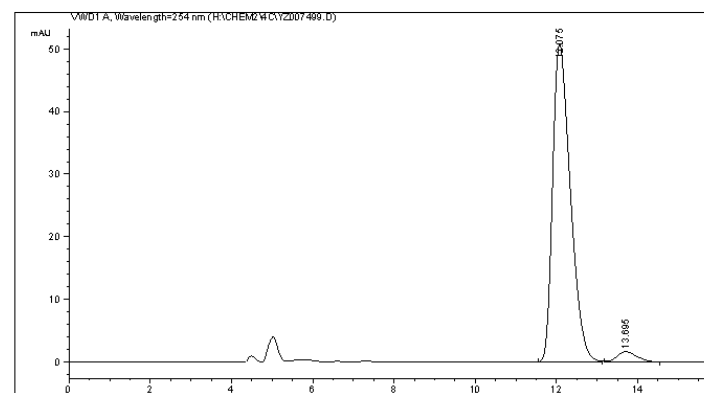


(+/-) -4c

Data File H:\CHEM2\4C\YZ007499.D
Sample Name: ZC-7-10B

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/8/2015 7:34:57 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/8/2015 6:58:17 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:38:06 AM by
(modified after loading)
Sample Info : 0G-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

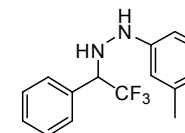
Peak #	RetTime [min]	Type	Width [min]	Area mAU	Area %s	Height [mAU]	Area %
1	12.075	BB	0.4680	1541.45471	50.73899	96.2590	
2	13.695	BB	0.5182	59.90747	1.69091	3.7410	

Totals : 1601.36218 52.42990

*** End of Report ***

Instrument 1 6/18/2015 9:38:22 AM

Page 1 of 1

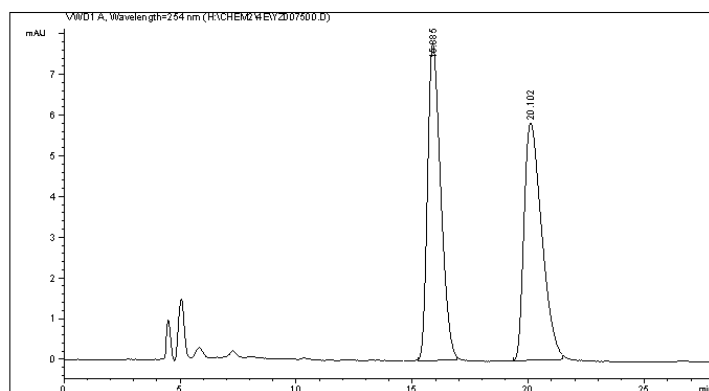


(+) - 4c

Data File H:\CHEM2\4E\YZ007500.D
Sample Name: ZC-7-13A+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/8/2015 7:54:20 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/8/2015 6:58:17 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:39:48 AM by
(modified after loading)
Sample Info : 0G-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

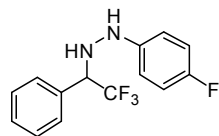
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	15.862	EB	0.5977	306.99426		7.77185	49.8745
2	20.102	EB	0.8061	308.53973		5.83535	50.1255

Totals : 615.53400 13.60720

*** End of Report ***

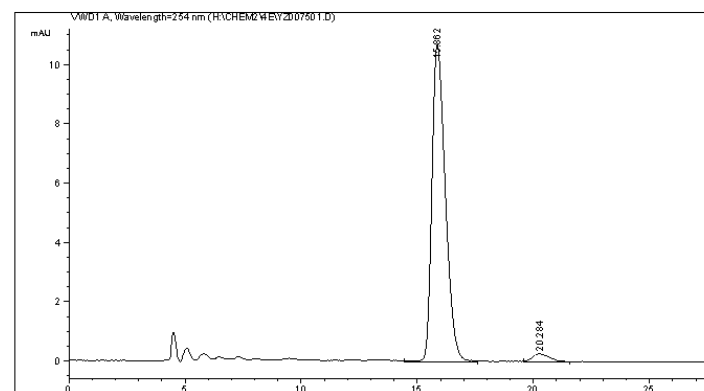


(+/-) - 4d

Data File H:\CHEM2\4E\YZ007501.D
Sample Name: ZC-7-13A

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/8/2015 8:25:10 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/8/2015 6:58:17 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:40:30 AM by
(modified after loading)
Sample Info : 0G-H, H/i-PrOH = 95/5, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

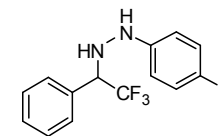
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	15.862	VB	0.6216	431.76489		10.71247	96.7474
2	20.284	EV	0.6680	14.51573		2.72539e-1	3.2526

Totals : 446.28062 10.98501

*** End of Report ***

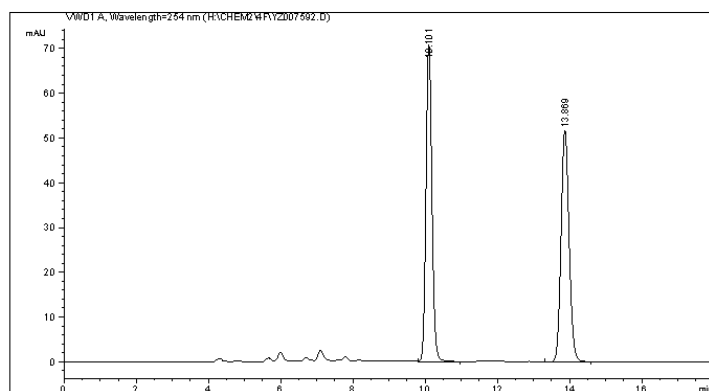


(+) - 4d

Data File H:\CHEM2\4F\YZ007592.D
Sample Name: ZC-7-22B+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/20/2015 5:43:21 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/20/2015 4:19:30 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:41:18 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



=====

Area Percent Report

=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

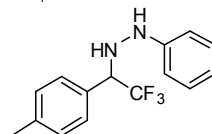
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	10.101	BB	0.1761	821.77594		70.85675	50.4166
2	13.869	VV	0.2460	808.19501		51.83339	49.5834

Totals : 1629.97095 122.69014

=====

*** End of Report ***

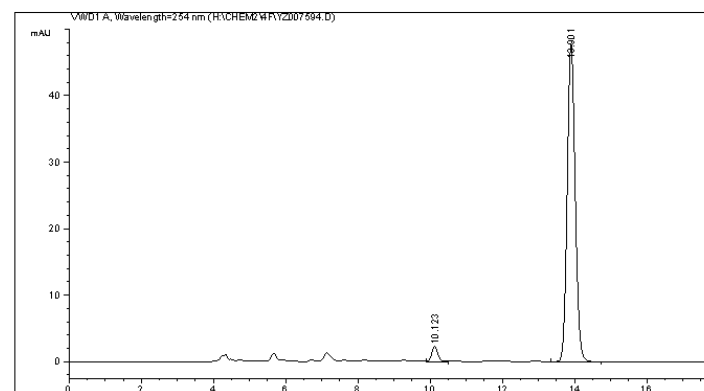


(+/-) - 4e

Data File H:\CHEM2\4F\YZ007594.D
Sample Name: ZC-7-22B

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/20/2015 6:17:58 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/20/2015 4:19:30 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:41:18 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



=====

Area Percent Report

=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

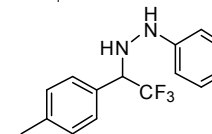
Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	10.123	VV	0.1884	29.15045		2.30396	3.7971
2	13.901	VV	0.2389	738.54449		47.70629	96.2029

Totals : 767.69495 50.01024

=====

*** End of Report ***

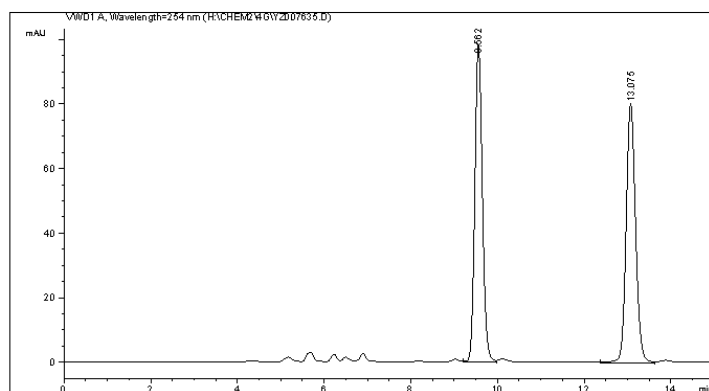


(+) - 4e

Data File H:\CHEM2\46\YZ007635.D
Sample Name: ZC-7-25A+-

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/23/2015 11:00:04 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/23/2015 10:04:22 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:43:11 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



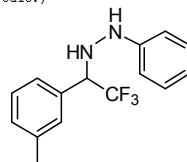
=====
Area Percent Report
=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	9.562	VV	0.1889	1199.47913		98.35246	49.9588
2	13.075	VV	0.2334	1201.45911		80.01448	50.0412

Totals : 2400.93823 178.36694



(+/-) - 4f

=====
*** End of Report ***

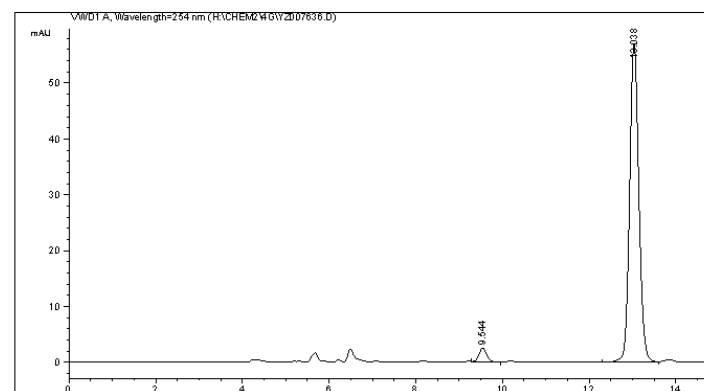
Instrument 1 6/18/2015 9:43:16 AM

Page 1 of 1

Data File H:\CHEM2\46\YZ007636.D
Sample Name: ZC-7-25A

=====

Acq. Operator : ZHOU
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 4/23/2015 11:18:29 AM
Acq. Method : C:\HPCHEM\1\METHODS\DEF LC.M
Last changed : 4/23/2015 10:04:22 AM by ZHOU
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:42:28 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



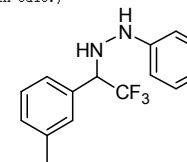
=====
Area Percent Report
=====

Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Sample Amount: : 1.00000 [ng/ul] (not used in calc.)
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	9.544	VV	0.1970	33.34391		2.58588	3.7901
2	13.038	VV	0.2318	846.40784		56.89514	96.2099

Totals : 879.75174 59.48101



(+) - 4f

=====
*** End of Report ***

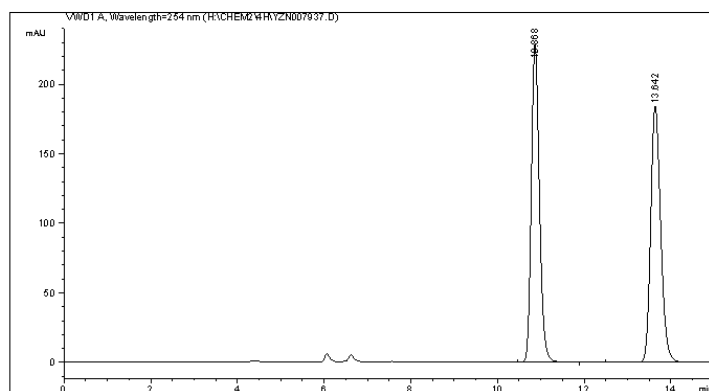
Instrument 1 6/18/2015 9:42:32 AM

Page 1 of 1

Data File H:\CHEM2\4H\YZN007937.D
Sample Name: ZC-7-35B+

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/9/2015 4:05:58 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/9/2015 4:05:36 PM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:43:48 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

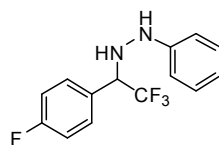
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VMD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	10.868	VV	0.1984	2973.02539		228.42072	50.0562
2	13.642	VB	0.2461	2966.34937		184.25774	49.9438

Totals : 5939.37476 412.67845

*** End of Report ***



(+/-) - 4g

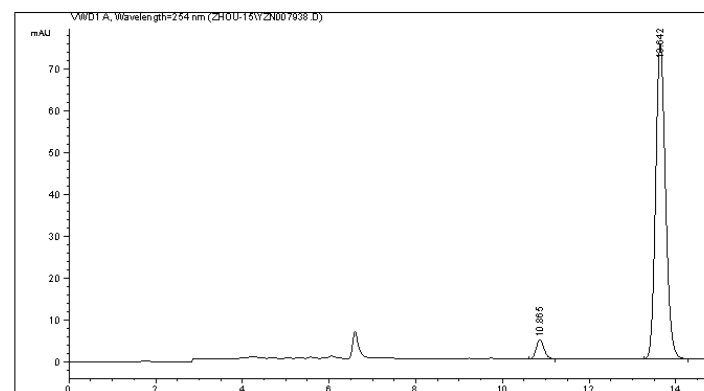
Instrument 1 6/18/2015 9:43:52 AM

Page 1 of 1

Data File C:\CHEM32\1\DATA\ZHOU-15\YZN007938.D
Sample Name: ZC-7-35B

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/9/2015 4:26:22 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/9/2015 4:24:57 PM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/29/2015 9:48:38 PM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

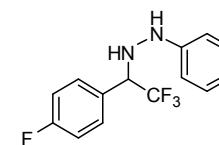
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VMD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	10.865	BB	0.1962	59.35877		4.67394	4.7359
2	13.642	BB	0.2448	1194.01746		75.23602	95.2641

Totals : 1253.37622 79.90995

*** End of Report ***



(+) - 4g

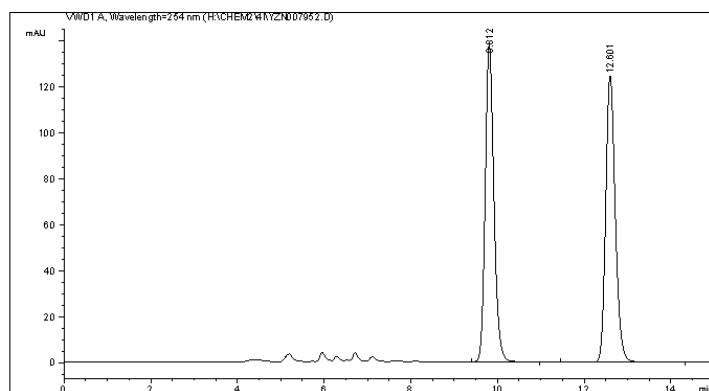
Instrument 1 6/29/2015 9:48:54 PM

Page 1 of 1

Data File H:\CHEM2\4I\YZN007952.D
Sample Name: ZC-7-35D+-

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/11/2015 11:11:38 AM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/11/2015 11:11:07 AM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:44:41 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

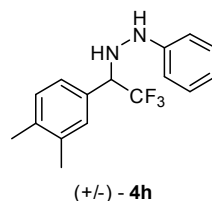
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VMD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	9.812	VV	0.2164	1943.36780		138.30321	50.2470
2	12.601	VB	0.2383	1924.26355		124.70526	49.7530

Totals : 3867.63135 263.00847

*** End of Report ***



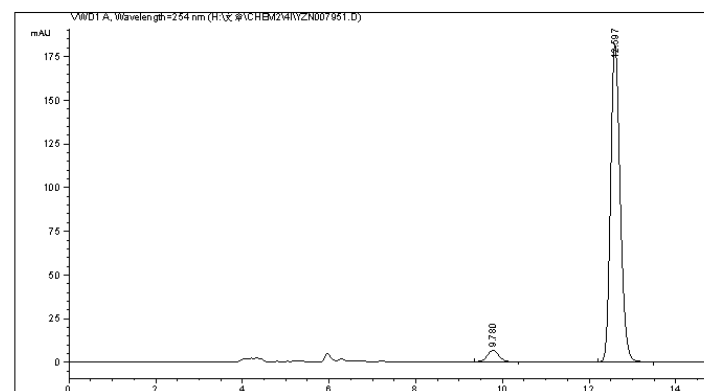
Instrument 1 6/18/2015 9:44:45 AM

Page 1 of 1

Data File H:\文章\CHEM2\4I\YZN007951.D
Sample Name: ZC-7-35D

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/11/2015 10:55:46 AM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/11/2015 10:54:09 AM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/29/2015 10:03:09 PM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

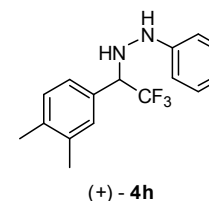
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VMD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	9.780	BB	0.3022	127.42157		6.56298	4.3531
2	12.597	BB	0.2379	2799.73633		181.82721	95.6469

Totals : 2927.15790 188.39019

*** End of Report ***



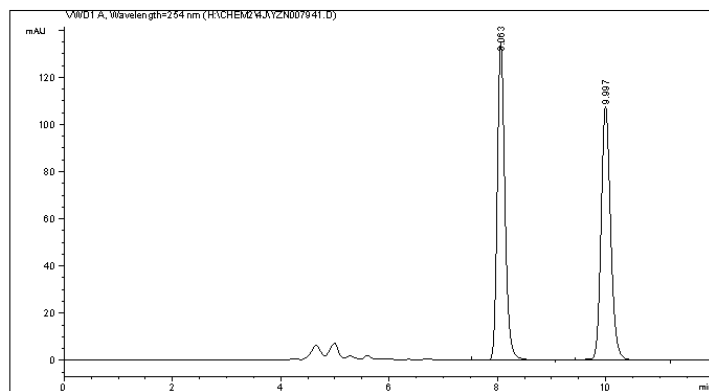
Instrument 1 6/29/2015 10:03:16 PM

Page 1 of 1

Data File H:\CHEM2\4J\YZN007941.D
Sample Name: ZC-7-35C+

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/9/2015 5:12:40 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/9/2015 5:12:17 PM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:45:37 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

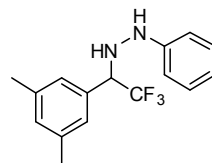
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	8.063	VV	0.1571	1339.34399		134.32906	50.2918
2	9.997	VB	0.1904	1323.80115		107.38113	49.7082

Totals : 2663.14514 241.71019

*** End of Report ***



(+/-) - 4i

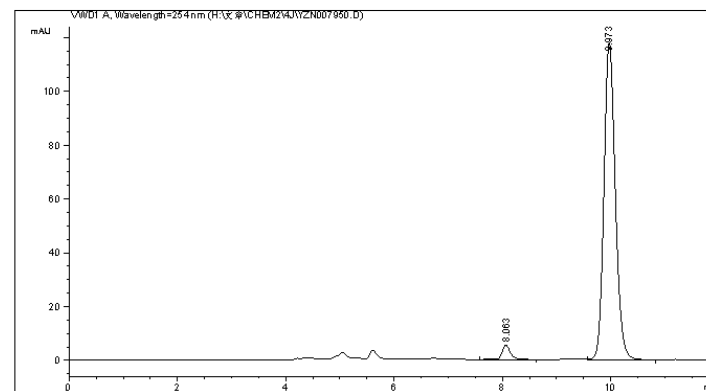
Instrument 1 6/18/2015 9:45:42 AM

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Data File H:\文童\CHEM2\4J\YZN007950.D
Sample Name: ZC-7-35C

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Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/11/2015 10:26:48 AM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/11/2015 10:25:01 AM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/29/2015 10:04:30 PM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

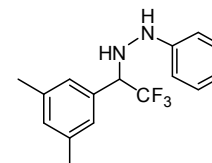
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	8.063	BB	0.1625	59.62142		5.45301	3.3474
2	9.973	BB	0.2255	1721.50269		118.00705	96.6526

Totals : 1781.12410 123.46006

*** End of Report ***



(+) - 4i

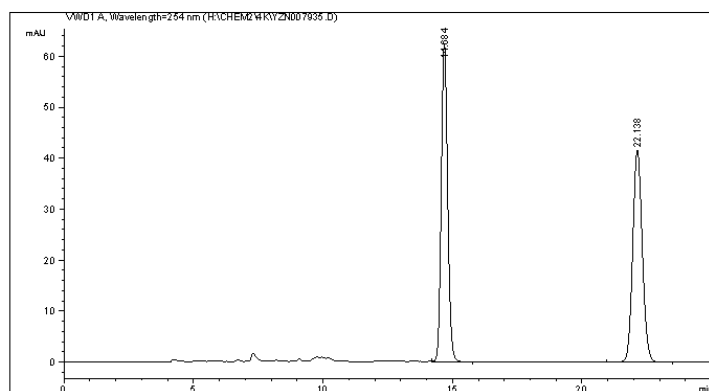
Instrument 1 6/29/2015 10:04:37 PM

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Data File H:\CHEM2\4K\YZN007935.D
Sample Name: ZC-7-35A+-

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/9/2015 3:15:16 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/9/2015 2:50:14 PM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:46:24 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

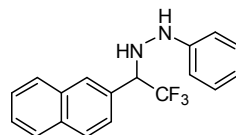
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	14.684	BB	0.2645	1070.27478		62.28136	49.9903
2	22.138	BB	0.3995	1070.69067		41.57169	50.0097

Totals : 2140.96545 103.85305

*** End of Report ***

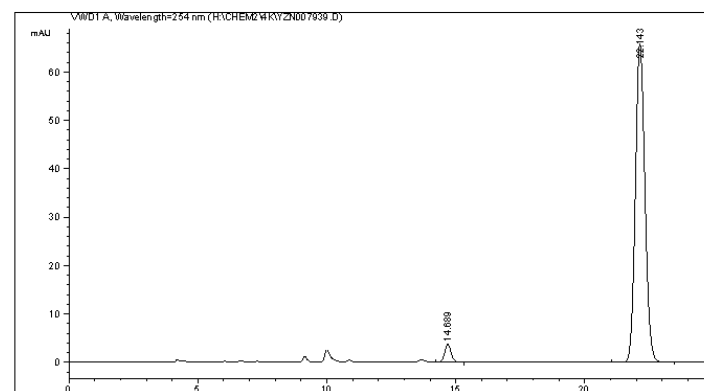


(+/-) - 4j

Data File H:\CHEM2\4K\YZN007939.D
Sample Name: ZC-7-35A

=====

Acq. Operator :
Acq. Instrument : Instrument 1 Location : Vial 1
Injection Date : 5/9/2015 4:44:32 PM
Acq. Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 5/9/2015 4:42:47 PM by
(modified after loading)
Analysis Method : C:\CHEM32\1\METHODS\DEF LC.M
Last changed : 6/18/2015 9:46:24 AM by
(modified after loading)
Sample Info : AD-H, H/i-PrOH = 90/10, 0.7 mL/min, 30 oC, 254 nm



Area Percent Report

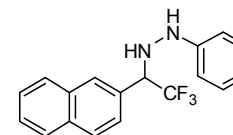
Sorted By : Signal
Multiplier: : 1.0000
Dilution: : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: VWD1 A, Wavelength=254 nm

Peak #	RetTime [min]	Type	Width [min]	Area mAU	%s	Height [mAU]	Area %
1	14.689	VV	0.2678	64.74899		3.70737	3.6807
2	22.143	BB	0.4000	1694.41821		65.67294	96.3193

Totals : 1759.16721 69.38030

*** End of Report ***



(+) - 4j