

Electronic Supplementary Information

Design, synthesis, and biological evaluation of multiple F-18 S1PR1 radiotracers in rodent and nonhuman primate

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1. The brain time tissue activity curves (SUV) of [¹⁸F]FS1P1, [¹⁸F]TZ4877, [¹⁸F]7c, [¹⁸F]7d, and [¹⁸F]15b

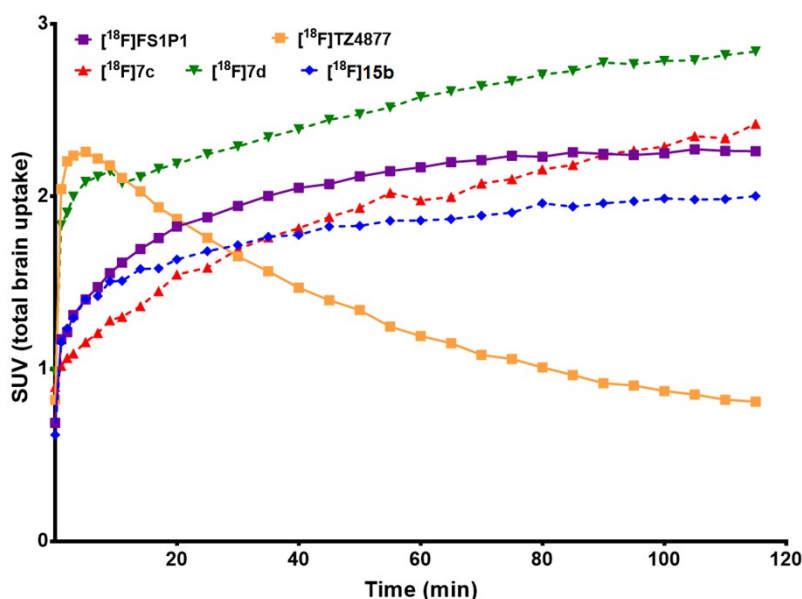
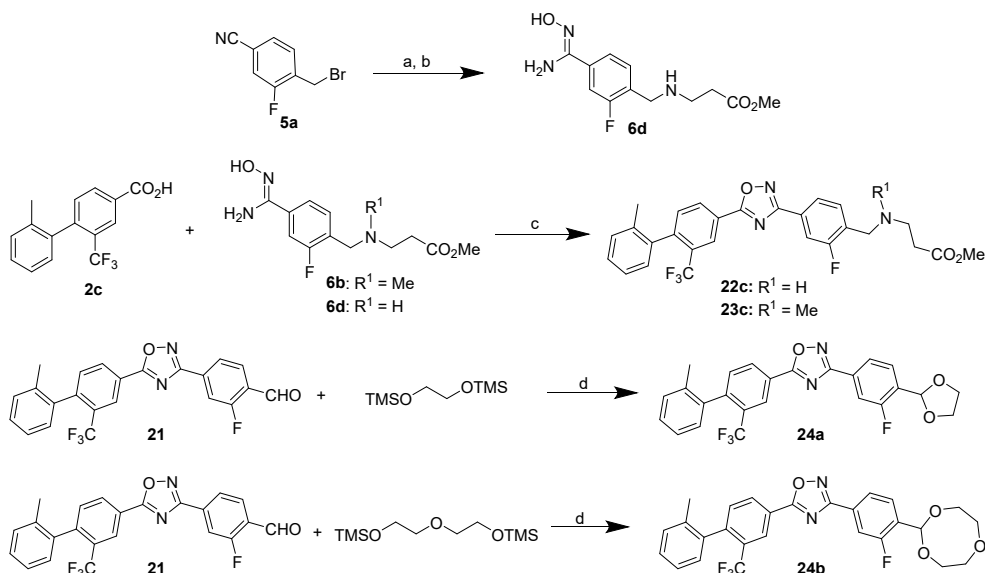


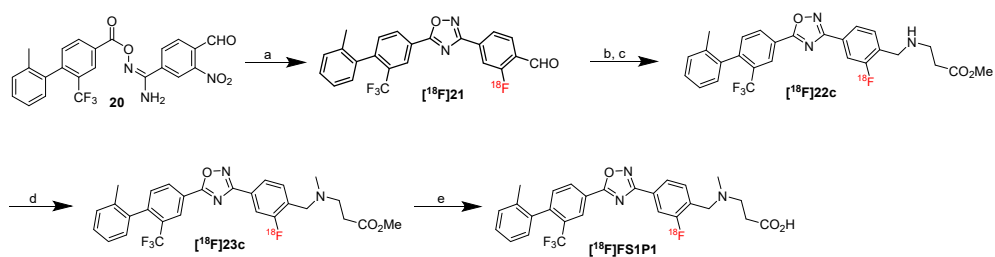
Figure S1. The brain time-activity curves of [¹⁸F]FS1P1, and [¹⁸F]TZ4877, [¹⁸F]7c, [¹⁸F]7d, and [¹⁸F]15b in macaques.

2. Synthesis scheme of 22c, 23c, 24a, and 24b



Scheme S1. Synthesis of 22c, 23c, 24a, and 24b. Reagents and conditions: (a) methyl 3-aminopropionate hydrochloride, Et₃N, MeOH, RT; (b) NH₂OH·HCl, NaHCO₃, MeOH, reflux; (c) EDCI, HOBT, DMF, RT to 120 °C; (d) FeCl₃, MeCN, reflux, 0.5 h.

3. Confirmation of the radioactive intermediates in making [¹⁸F]FS1P1



Scheme S2. Radiosynthesis of [¹⁸F]FS1P1, reagents and conditions: (a) [¹⁸F]KF, Kryptofix 222, TMEDA, DMSO/H₂O, 150 °C, 5 min; (b) methyl 3-aminopropionate hydrochloride, TMEDA, AcOH, EtOH, 100 °C, 5 min; (c) NaCNBH₃, RT, 2 min; (d) formalin, 100 °C, 5 min, then NaCNBH₃, RT, 2 min; (e) NaOH (5 M), 100 °C, 5 min, then AcOH for neutralization.

4. HPLC Radioactive chromatograms of radioactive compounds.

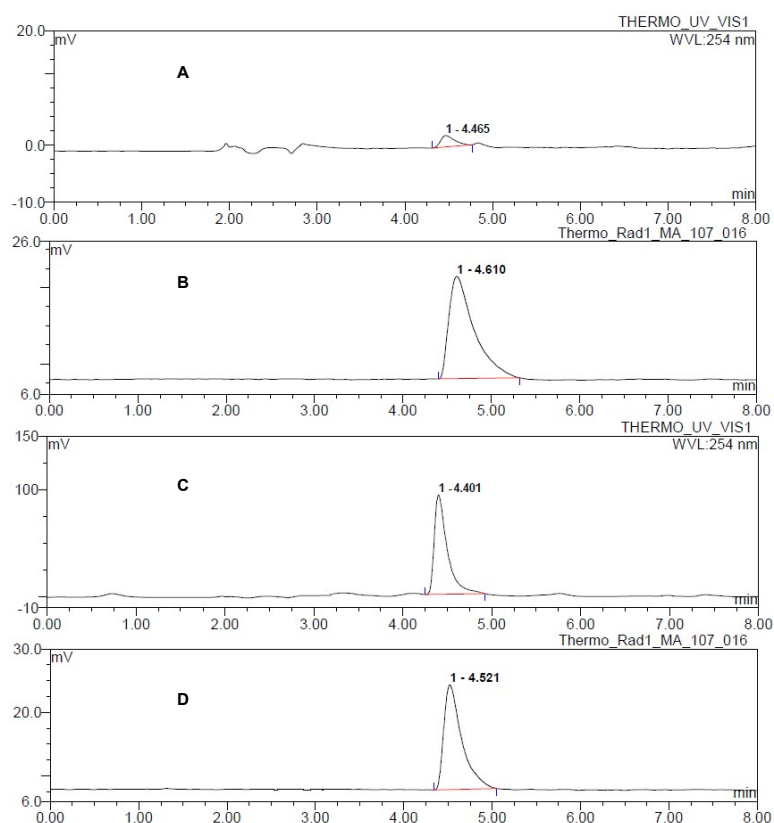


Figure S2. HPLC analysis of final radioactive dose [^{18}F]**7c**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 70% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**7c** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**7c**; B) radioactive chromatograph of production dose [^{18}F]**7c**; C) UV chromatograph of co-injection of [^{18}F]**7c** and cold **7c**; D) radiochemical chromatograph of co-injection of [^{18}F]**7c** and **7c**.

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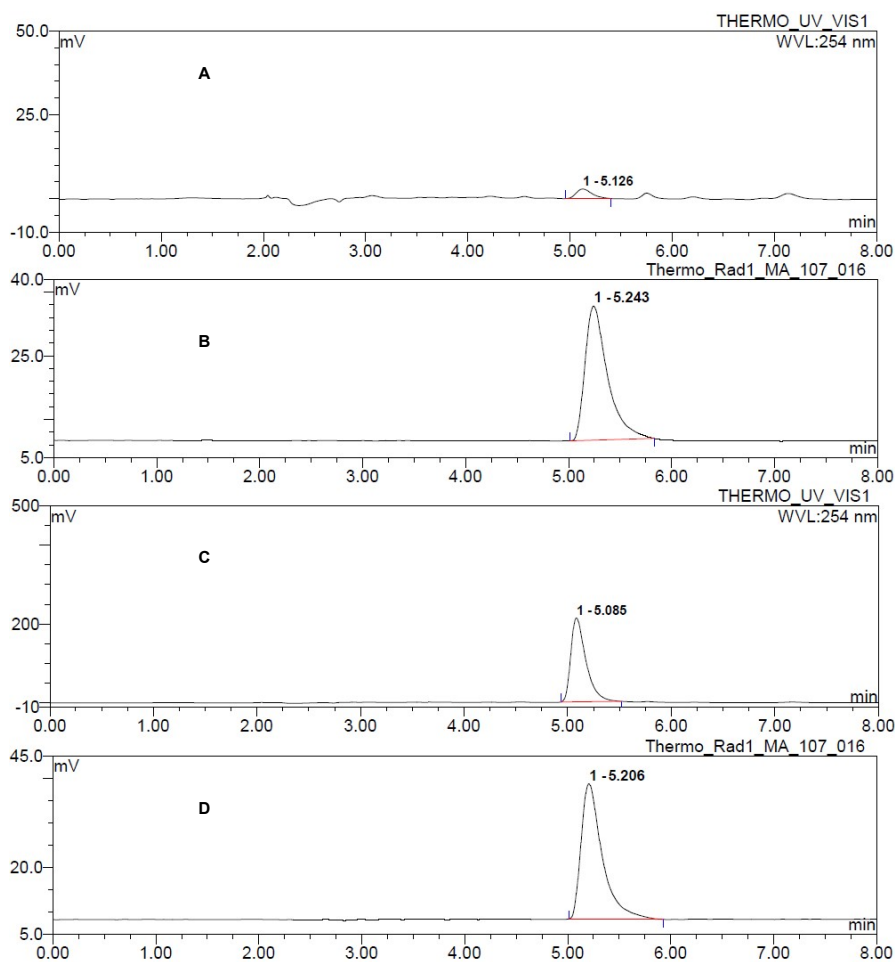


Figure S3. HPLC analysis of final radioactive dose [^{18}F]7d. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 80% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]7d in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]7d; B) radioactive chromatograph of production dose [^{18}F]7d; C) UV chromatograph of co-injection of [^{18}F]7d and cold 7d; D) radiochemical chromatograph of co-injection of [^{18}F]7d and 7d.

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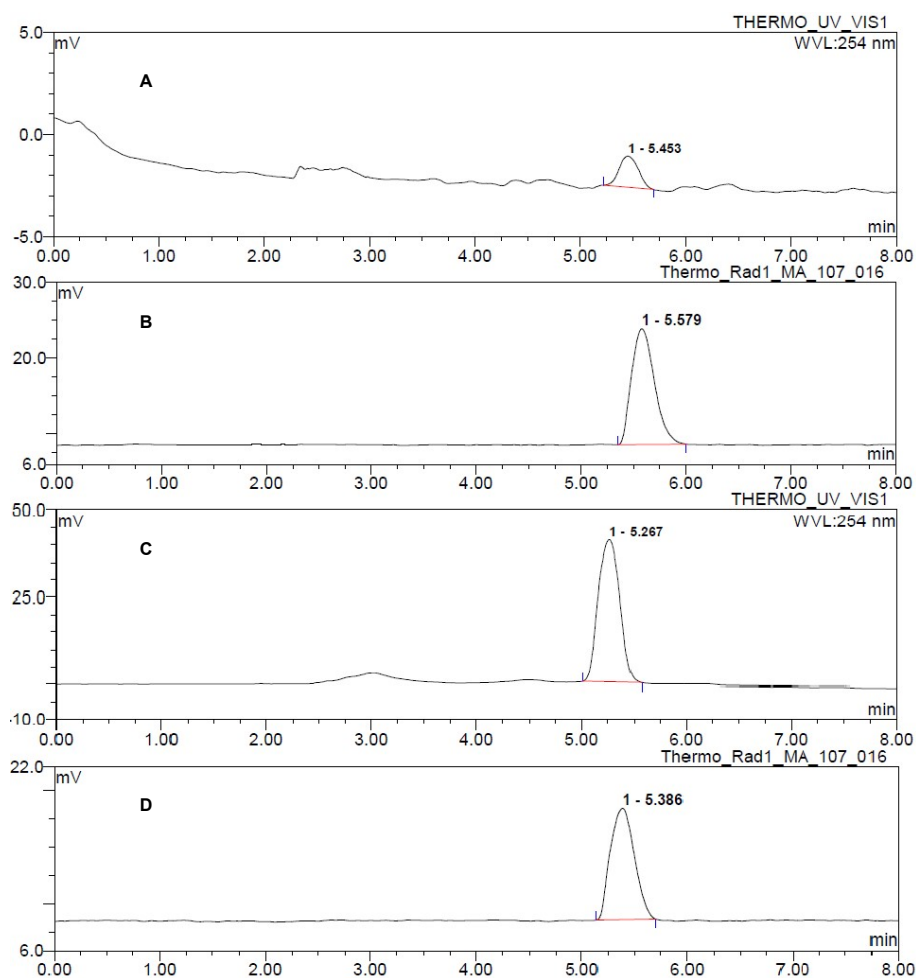


Figure S4. HPLC analysis of final radioactive dose [^{18}F]**9a**. Analytical HPLC conditions: Agilent SB-C18 analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**9a** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**9a**; B) radioactive chromatograph of production dose [^{18}F]**9a**; C) UV chromatograph of co-injection of [^{18}F]**9a** and cold **9a**; D) radiochemical chromatograph of co-injection of [^{18}F]**9a** and **9a**.

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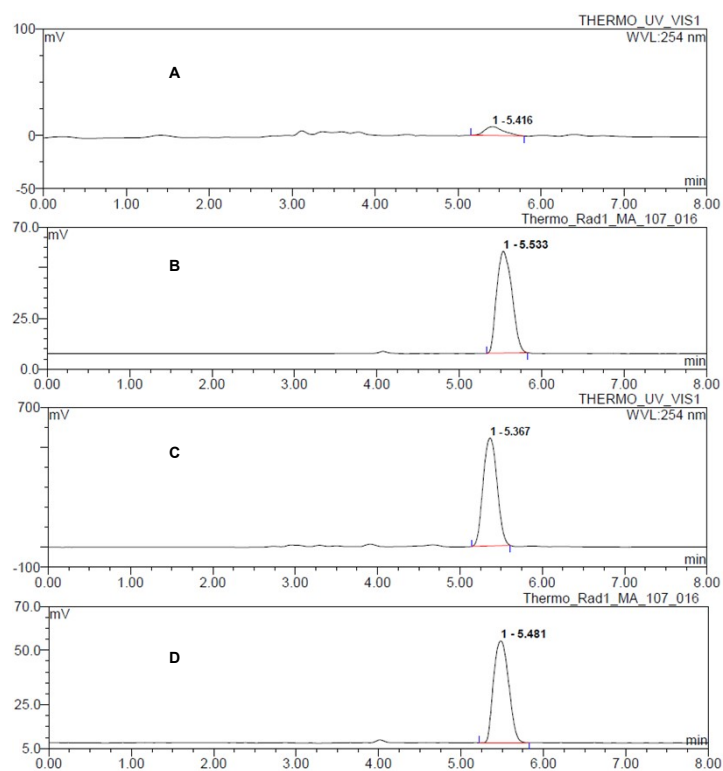


Figure S5. HPLC analysis of final radioactive dose [^{18}F]**9c**. Analytical HPLC conditions: Agilent SB-C18 analytic column (250 \times 4.6 mm, 5 μm), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**9c** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**9c**; B) radioactive chromatograph of production dose [^{18}F]**9c**; C) UV chromatograph of co-injection of [^{18}F]**9c** and cold **9c**; D) radiochemical chromatograph of co-injection of [^{18}F]**9c** and **9c**.

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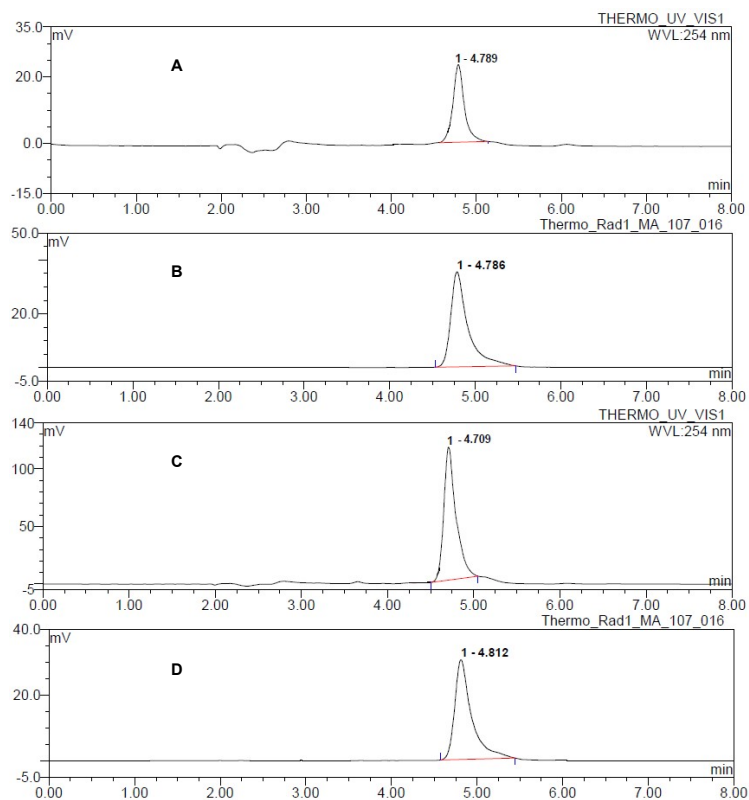


Figure S6. HPLC analysis of final radioactive dose [^{18}F]**12b**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 80% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**12b** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**12b**; B) radioactive chromatograph of production dose [^{18}F]**12b**; C) UV chromatograph of co-injection of [^{18}F]**12b** and cold **12b**; D) radiochemical chromatograph of co-injection of [^{18}F]**12b** and **12b**.

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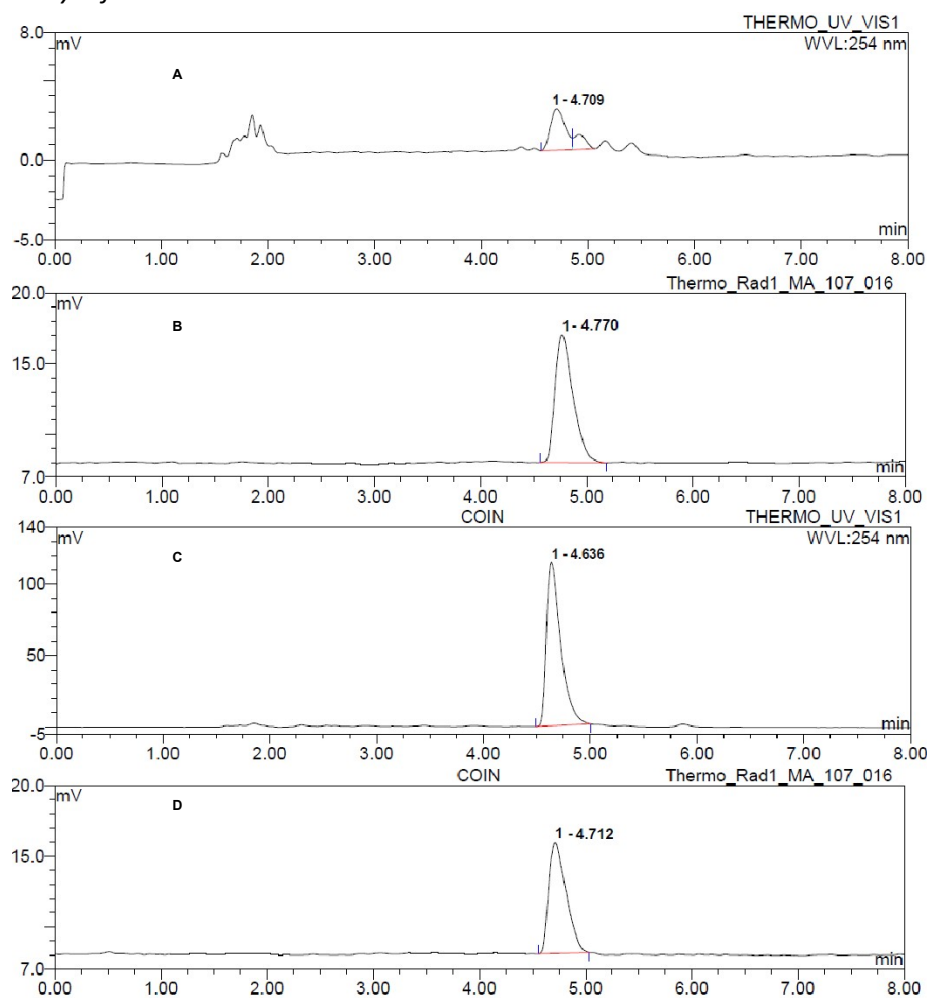


Figure S7. HPLC analysis of final radioactive dose [¹⁸F]**15b**. Analytical HPLC conditions: Agilent SB-C18 analytic column (250 × 4.6 mm, 5 μm), mobile phase 90% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [¹⁸F]**15b** in 10% ethanol in 0.9% saline. A) UV chromatogram of production dose [¹⁸F]**15b**; B) radioactive chromatogram of production dose [¹⁸F]**15b**; C) UV chromatogram of co-injection of [¹⁸F]**15b** and cold **15b**; D) radiochemical chromatogram of co-injection of [¹⁸F]**15b** and **15b**.

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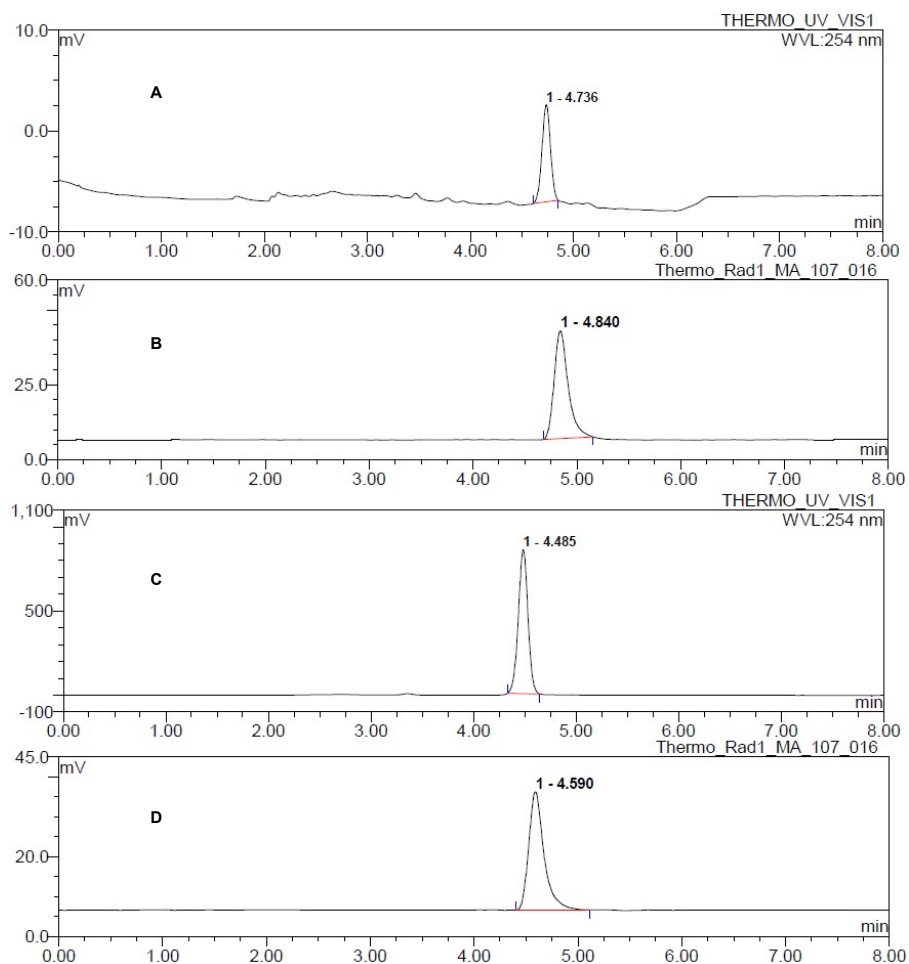


Figure S8. HPLC analysis of final radioactive dose [^{18}F]**18a**. Analytical HPLC conditions: Agilent SB-C18 analytic column (250 \times 4.6 mm, 5 μm), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**18a** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**18a**; B) radioactive chromatograph of production dose [^{18}F]**18a**; C) UV chromatograph of co-injection of [^{18}F]**18a** and cold **18a**; D) radiochemical chromatograph of co-injection of [^{18}F]**18a** and **18a**.

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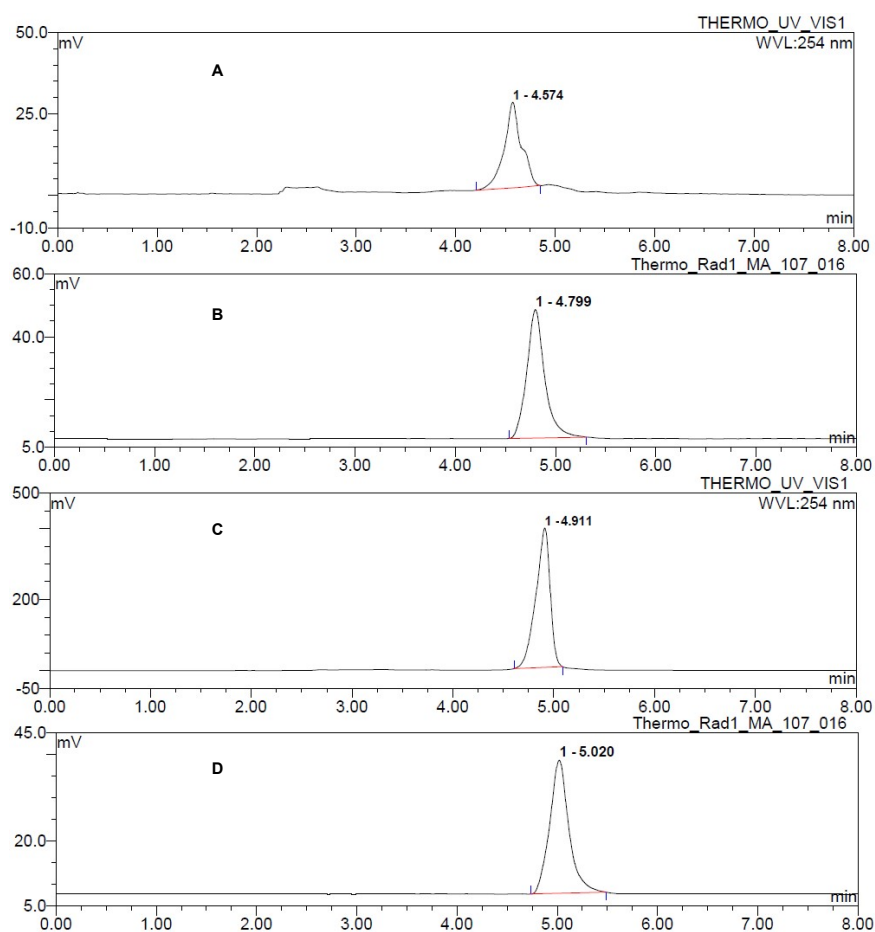


Figure S9. HPLC analysis of final radioactive dose [^{18}F]**18b**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250 \times 4.6 mm, 5 μm), mobile phase 80% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**18b** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**18b**; B) radioactive chromatograph of production dose [^{18}F]**18b**; C) UV chromatograph of co-injection of [^{18}F]**18b** and cold **18b**; D) radiochemical chromatograph of co-injection of [^{18}F]**18b** and **18b**.

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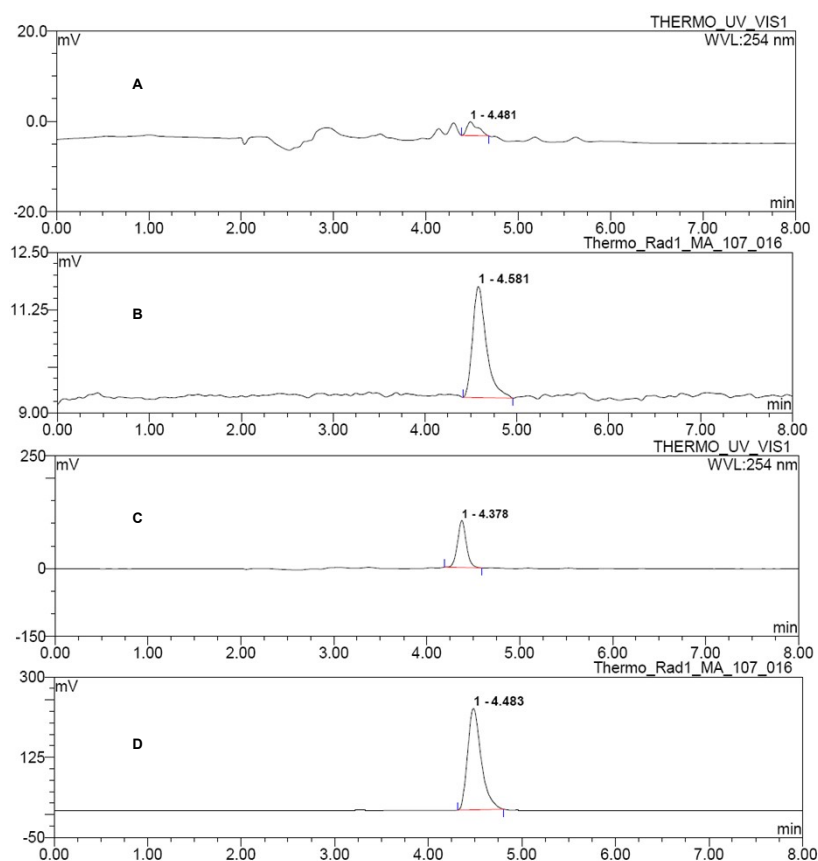


Figure S10. HPLC analysis of final radioactive dose [^{18}F]**18c**. Analytical HPLC conditions: Agilent SB-C18 analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 75% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.0 mL/min, detection wavelength 254 nm. The production dose is a solution of [^{18}F]**18c** in 10% ethanol in 0.9% saline. A) UV chromatograph of production dose [^{18}F]**18c**; B) radioactive chromatograph of production dose [^{18}F]**18c**; C) UV chromatograph of co-injection of [^{18}F]**18c** and cold **18c**; D) radiochemical chromatograph of co-injection of [^{18}F]**18c** and **18c**.

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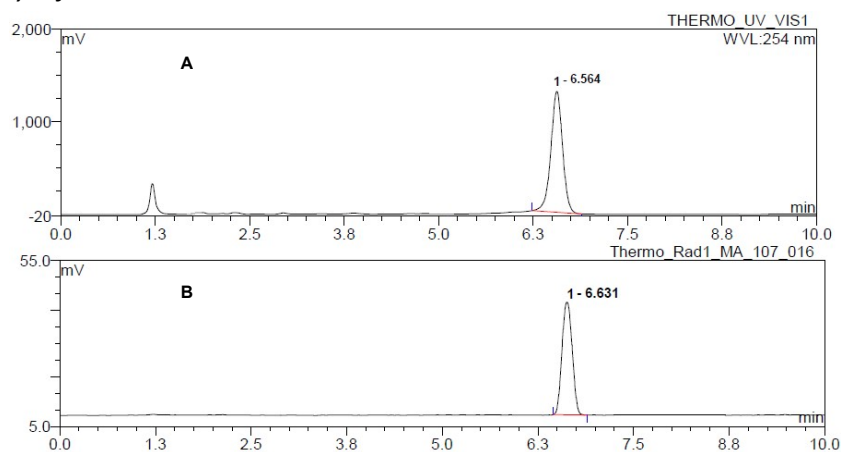


Figure S11. HPLC analysis of [^{18}F]**17**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 90% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.5 mL/min, detection wavelength 254 nm. A) UV chromatograph of co-injection of [^{18}F]**17** and **17**; B) radiochemical chromatograph of co-injection of [^{18}F]**17** and **17**.

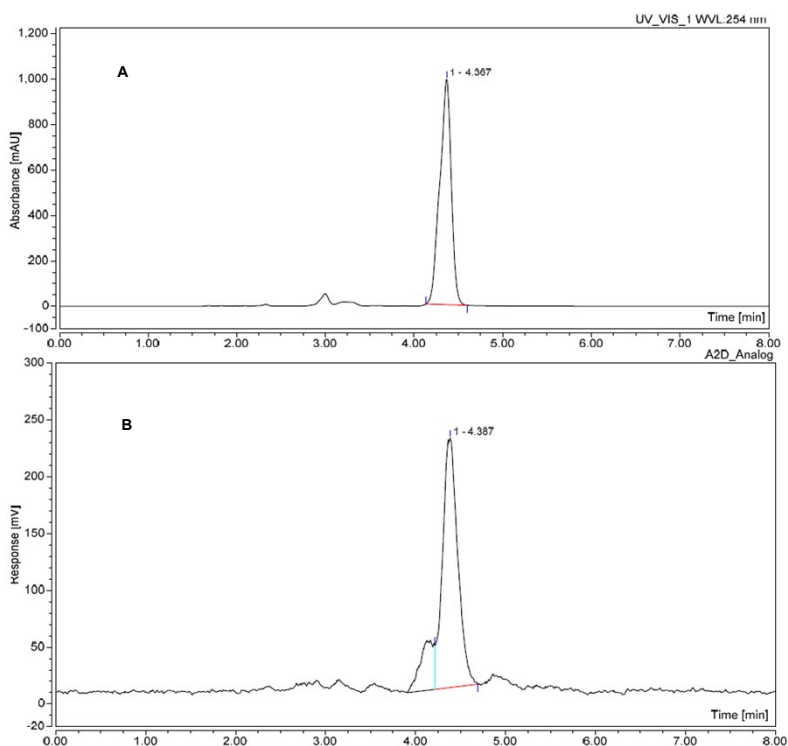


Figure S12. HPLC analysis of [^{18}F]**22c**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.5 mL/min, detection wavelength 254 nm. A) UV chromatograph of co-injection of [^{18}F]**22c** and **22c**; B) radiochemical chromatograph of co-injection of [^{18}F]**17** and **17**.

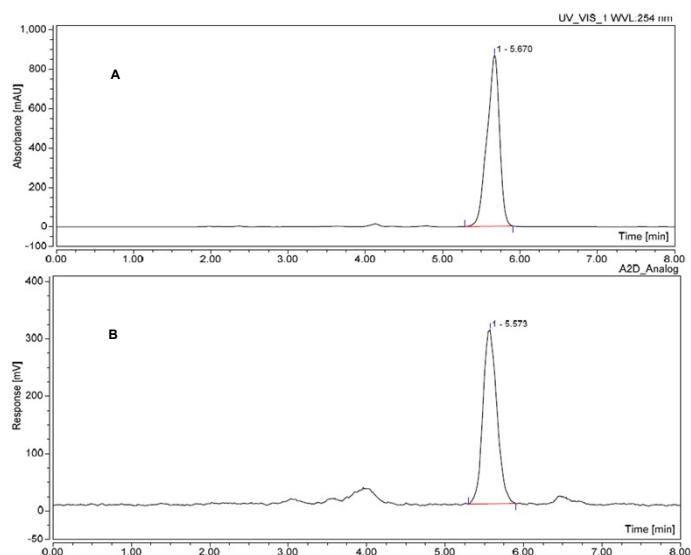


Figure S13. HPLC analysis of [^{18}F]**23c**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.5 mL/min, detection wavelength 254 nm. A) UV chromatograph of co-injection of [^{18}F]**23c** and **23c**; B) radiochemical chromatograph of co-injection of [^{18}F]**23** and **23**.

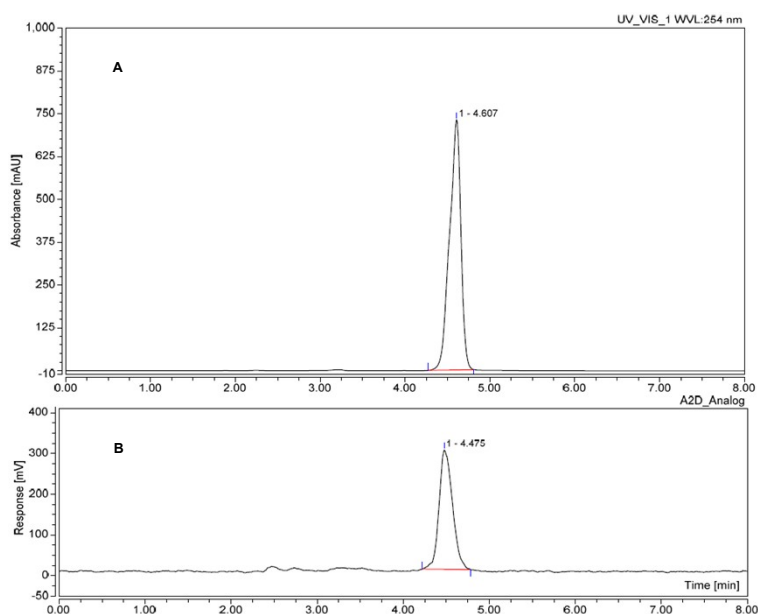


Figure S14. HPLC analysis of [^{18}F]**24a**. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.5 mL/min, detection wavelength 254 nm. A) UV chromatograph of co-injection of [^{18}F]**24a** and **24a**; B) radiochemical chromatograph of co-injection of [^{18}F]**24a** and **24a**.

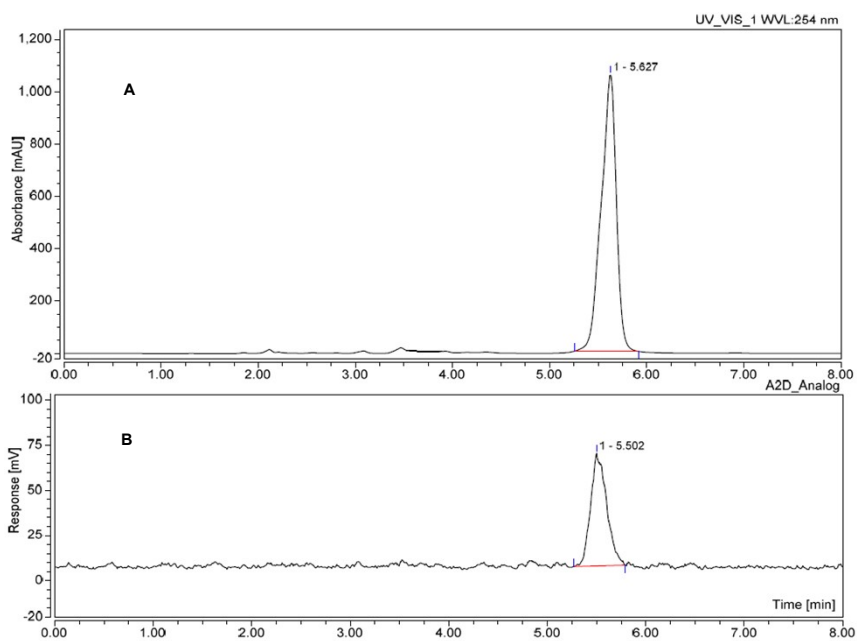


Figure S15. HPLC analysis of $[^{18}\text{F}]\mathbf{24b}$. Analytical HPLC conditions: Phenomenex prodigy analytic column (250×4.6 mm, $5 \mu\text{m}$), mobile phase 95% acetonitrile in 0.1 M ammonium formate, pH 4.5, flow rate 1.5 mL/min, detection wavelength 254 nm. A) UV chromatograph of co-injection of $[^{18}\text{F}]\mathbf{24b}$ and $\mathbf{24b}$; B) radiochemical chromatograph of co-injection of $[^{18}\text{F}]\mathbf{24b}$ and $\mathbf{24b}$.

5. NMR data of compounds 6d, 22c, 23c, 24a, and 24b**Methyl (Z)-3-((2-fluoro-4-(N'-hydroxycarbamimidoyl)benzyl)amino)propanoate (6d)**

Synthesized by general procedure C starting with **5** and methyl 3-aminopropionate hydrochloride; yield: 53%; yellow oil; ¹H NMR (400 MHz, Acetone-*d*₆) δ 7.52 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.47 (t, *J* = 7.7 Hz, 1H), 7.42 (dd, *J* = 11.6, 1.4 Hz, 1H), 5.53 (s, 2H), 3.83 (s, 2H), 3.61 (s, 3H), 3.31 (s, 1H), 2.85 (t, *J* = 6.7 Hz, 3H), 2.51 (t, *J* = 6.7 Hz, 2H); ¹³C NMR (100 MHz, Acetone-*d*₆) δ 172.49, 160.69 (d, *J*_{C-F} = 242.0 Hz), 150.22, 134.22 (d, *J*_{C-F} = 8.0 Hz), 129.92 (d, *J*_{C-F} = 5.0 Hz), 128.40 (d, *J*_{C-F} = 16.0 Hz), 121.02, 111.91 (d, *J*_{C-F} = 26.0 Hz), 50.70, 50.66, 45.92, 45.89, 44.37, 34.26.

Methyl 3-((2-fluoro-4-(5-(2'-methyl-2-(trifluoromethyl)-[1,1'-biphenyl]-4-yl)-1,2,4-oxadiazol-3-yl)benzyl)amino)propanoate (22c)

Synthesized by general procedure F starting from **2c** and **6d**; yield: 58%; yellow oil; ¹H NMR (400 MHz, Acetone-*d*₆) δ 8.60 (s, 1H), 8.51 (d, *J* = 7.9 Hz, 1H), 7.98 (dd, *J* = 7.9, 1.2 Hz, 1H), 7.82 (dd, *J* = 10.6, 1.2 Hz, 1H), 7.73 (t, *J* = 7.7 Hz, 1H), 7.65 (d, *J* = 8.0 Hz, 1H), 7.36 (q, *J* = 7.0 Hz, 2H), 7.29 (td, *J* = 7.1, 1.9 Hz, 1H), 7.20 (d, *J* = 7.5 Hz, 1H), 3.93 (s, 2H), 3.63 (s, 3H), 2.90 (t, *J* = 6.6 Hz, 2H), 2.54 (t, *J* = 6.6 Hz, 2H), 2.43 (s, 1H), 2.08 (d, *J* = 3.2 Hz, 3H); ¹³C NMR (100 MHz, Acetone-*d*₆) δ 174.60, 172.43, 168.05, 160.98 (d, *J*_{C-F} = 245.0 Hz), 145.32, 137.67, 135.45, 133.40, 131.88, 131.73, 131.11, 130.92 (d, *J*_{C-F} = 5.0 Hz), 129.79, 129.35 (d, *J*_{C-F} = 30.0 Hz), 128.87, 128.53, 126.88 (d, *J*_{C-F} = 9.0 Hz), 125.58 (q, *J*_{C-F} = 5.0 Hz), 125.11, 124.92, 123.67, 123.56 (q, *J*_{C-F} = 272.0 Hz), 123.06 (d, *J*_{C-F} = 3.0 Hz), 113.62 (d, *J*_{C-F} = 25.0 Hz), 50.67, 45.95, 45.92, 44.54, 34.36, 19.25; HRMS (ESI) calcd for C₂₇H₂₄F₄N₃O₃ [M + H]⁺ 514.1748, found 514.1737.

Methyl 3-((2-fluoro-4-(5-(2'-methyl-2-(trifluoromethyl)-[1,1'-biphenyl]-4-yl)-1,2,4-oxadiazol-3-yl)benzyl)-(methyl)amino)propanoate (23c)

Synthesized by general procedure F starting with **2c** and **6b**; yield: 60%; yellow oil; ¹H NMR (400 MHz, Acetone-*d*₆) δ 8.56 (s, 1H), 8.43 (d, *J* = 7.9 Hz, 1H), 7.93 (d, *J* = 7.9 Hz, 1H), 7.78 (d, *J* = 10.4 Hz, 1H), 7.63 (t, *J* = 7.6 Hz, 1H), 7.58 (d, *J* = 8.0 Hz, 1H), 7.39 – 7.30 (m, 2H), 7.27 (t, *J* = 7.1 Hz, 1H), 7.18 (d, *J* = 7.5 Hz, 1H), 3.63 (s, 5H), 2.77 (t, *J* = 7.0 Hz, 2H), 2.54 (t, *J* = 7.0 Hz, 2H), 2.25 (s, 3H), 2.07 (s, 3H); ¹³C NMR (100 MHz, Acetone-*d*₆) δ 174.48, 172.08, 167.97 (d, *J*_{C-F} = 2.0 Hz), 161.16 (d, *J*_{C-F} = 245.0 Hz), 145.33, 137.64, 135.43, 133.30, 131.94 (d, *J*_{C-F} = 4.0 Hz), 131.00, 129.80 (t, *J*_{C-F} = 7.0 Hz), 129.38 (d, *J*_{C-F} = 30.0 Hz), 128.88, 128.54, 127.10 (d, *J*_{C-F} = 9.0 Hz), 125.54 (q, *J*_{C-F} = 5.0 Hz), 125.10, 123.57, 123.53 (q, *J*_{C-F} = 272.0 Hz), 122.94 (d, *J*_{C-F} = 3.0 Hz), 113.80 (d, *J*_{C-F} = 25.0 Hz), 53.81, 52.71, 50.79, 50.76, 41.34, 32.39, 19.37; HRMS (ESI) calcd for C₂₈H₂₆F₄N₃O₃ [M + H]⁺ 528.1905, found 528.1895.

3-(4-(1,3-Dioxolan-2-yl)-3-fluorophenyl)-5-(2'-methyl-2-(trifluoromethyl)-[1,1'-biphenyl]-4-yl)-1,2,4-oxadiazole (24a)

To a suspension of anhydrous iron(III) chloride (0.5 equiv) and 2-fluoro-4-(5-(2'-methyl-2-(trifluoromethyl)-[1,1'-biphenyl]-4-yl)-1,2,4-oxadiazol-3-yl)benzaldehyde **19** (1.0 equiv) in acetonitrile (50 mL/mmol) were added 1, 2-bis(trimethylsiloxy)ethane (5.0 equiv). The resulting reaction mixture was stirred at RT for 1 h and monitored *via* TLC. Once the starting material was consumed, the solution was cooled to room temperature, and the solvent was removed under reduced pressure to afford the crude residue. The resulting residue was purified by silica gel column chromatography with 20~40% EtOAc in hexane to afford the desired acetal ring. Yield: 86%; white solid; ¹H NMR (400 MHz, Acetone-*d*₆) δ 8.61 (s, 1H), 8.52 (d, *J* =

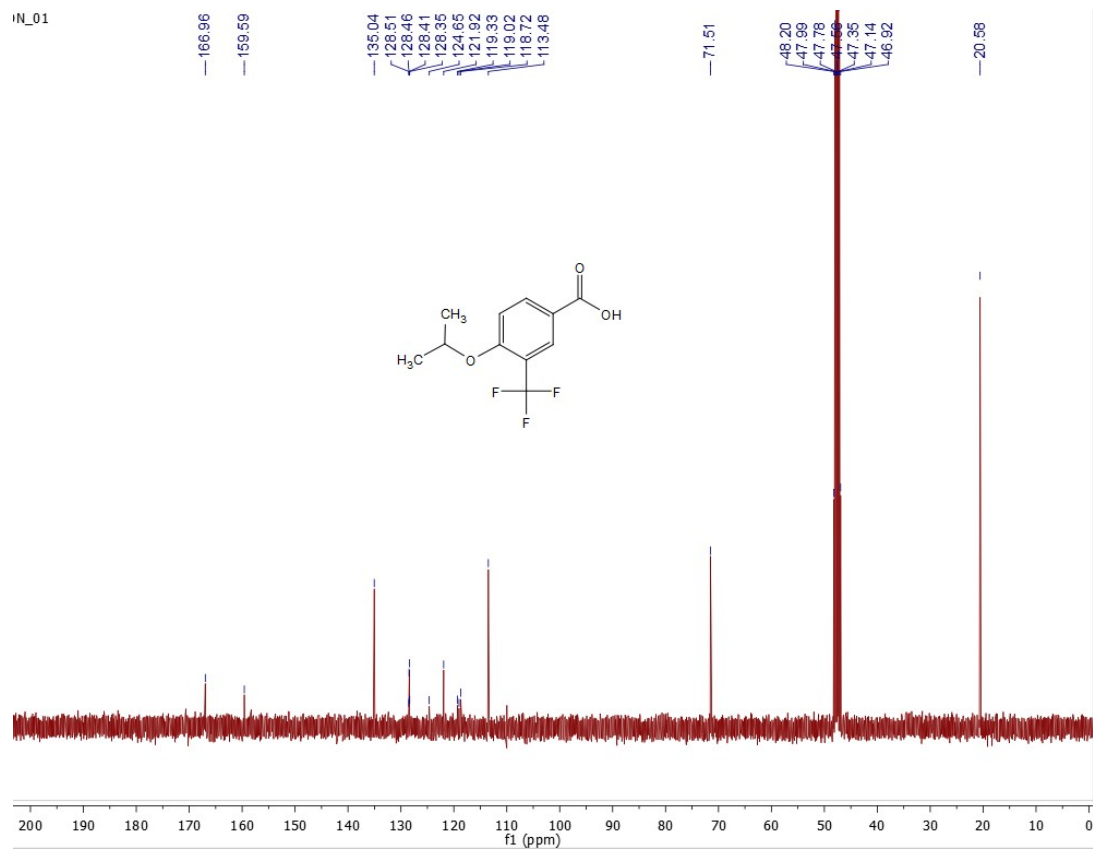
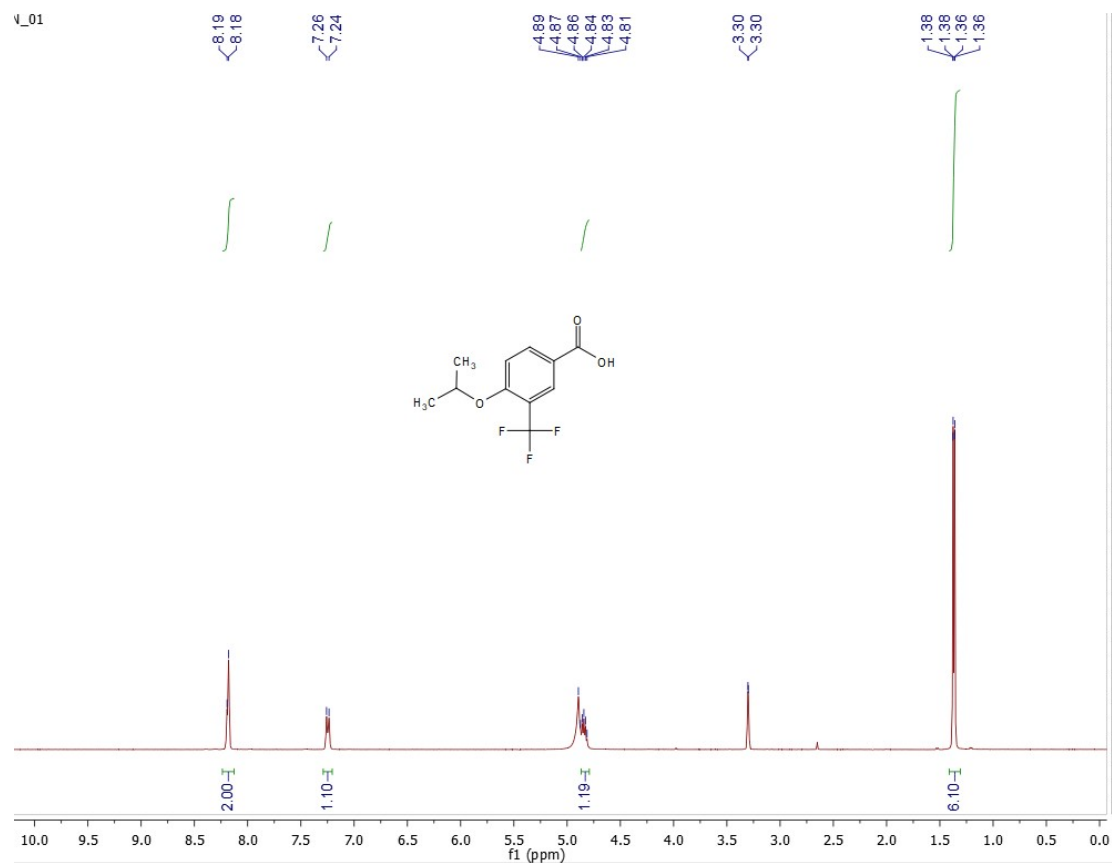
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8.0 Hz, 1H), 8.03 (d, $J = 8.0$ Hz, 1H), 7.89 (d, $J = 10.8$ Hz, 1H), 7.79 (t, $J = 7.3$ Hz, 1H), 7.65 (d, $J = 7.9$ Hz, 1H), 7.41 – 7.31 (m, 2H), 7.27 (t, $J = 7.1$ Hz, 1H), 7.19 (d, $J = 7.5$ Hz, 1H), 6.09 (s, 1H), 4.20 – 4.10 (m, 2H), 4.10 – 4.00 (m, 2H), 2.06 (s, 3H); ^{13}C NMR (100 MHz, Acetone- d_6) δ 174.82, 167.79, 161.04 (d, $J_{\text{C-F}} = 249.0$ Hz), 145.36, 137.64, 135.43, 133.43, 131.17, 129.78, 129.26, 129.16 (d, $J_{\text{C-F}} = 5.0$ Hz), 129.00 (d, $J_{\text{C-F}} = 4.0$ Hz), 128.86 (d, $J_{\text{C-F}} = 1.0$ Hz), 128.53, 125.61 (q, $J_{\text{C-F}} = 6.0$ Hz), 125.10, 123.60, 123.54 (q, $J_{\text{C-F}} = 273.0$ Hz), 123.06 (d, $J_{\text{C-F}} = 3.0$ Hz), 114.20 (d, $J_{\text{C-F}} = 24.0$ Hz), 98.02 (d, $J_{\text{C-F}} = 4.0$ Hz), 65.27, 19.23. HRMS (ESI) calcd for $\text{C}_{25}\text{H}_{19}\text{F}_4\text{N}_2\text{O}_3$ [$\text{M} + \text{H}$] $^+$ 471.1326, found 471.1309.

3-(3-Fluoro-4-(1,3,6-trioxocan-2-yl)phenyl)-5-(2'-methyl-2-(trifluoromethyl)-[1,1'-bi phenyl]-4-yl)-1,2,4-oxadiazole (24b)

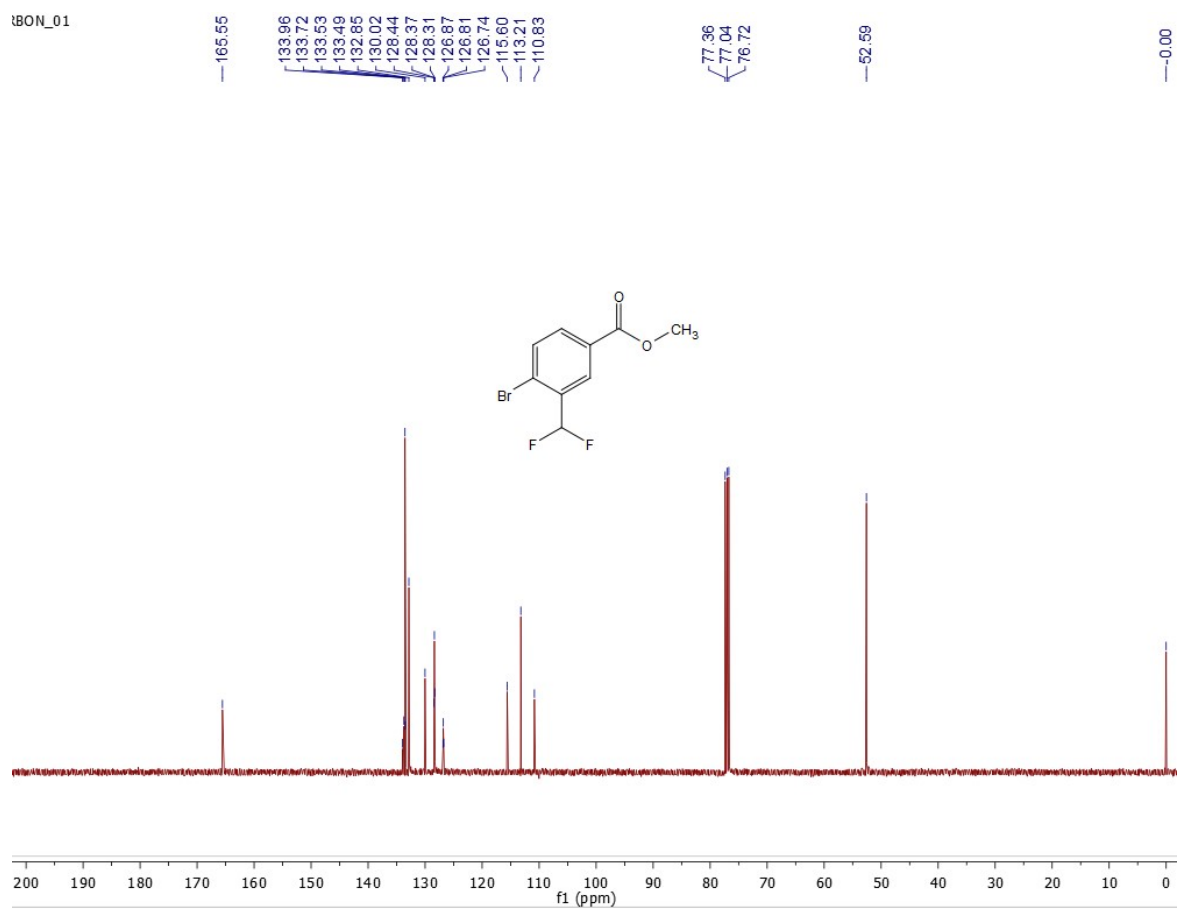
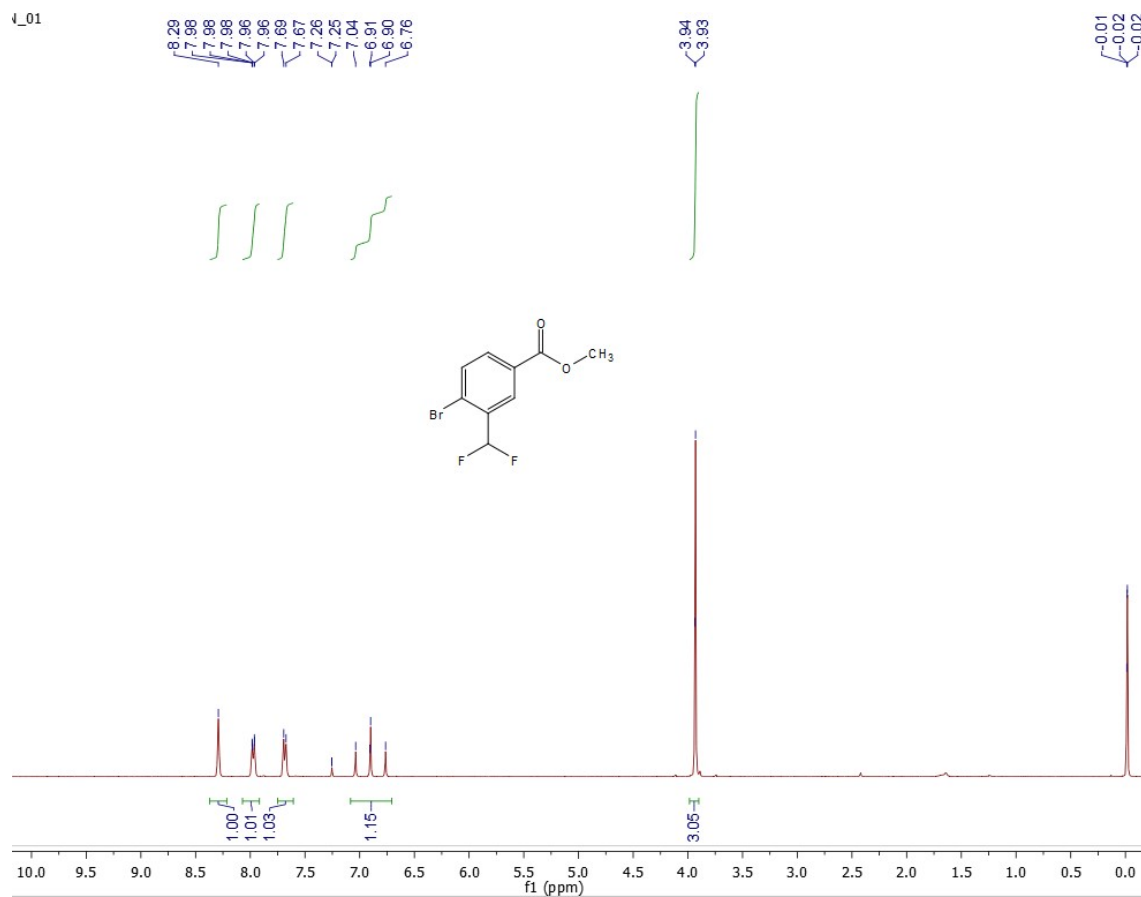
To a suspension of anhydrous iron(III) chloride (0.5 equiv) and 2-fluoro-4-(5-(2'-methyl-2-(trifluoromethyl)-[1,1'-biphenyl]-4-yl)-1,2,4-oxadiazol-3-yl)benzaldehyde **19** (1.0 equiv) in acetonitrile (50 mL/mmol) were added 2, 2, 10, 10-tetramethyl-3, 6, 9-trioxa-2, 10-disilaundecane (5.0 equiv). The resulting reaction mixture was stirred at RT for 1 h and monitored *via* TLC. Once the starting material was consumed, the solution was cooled to room temperature, and the solvent was removed under reduced pressure to afford the crude residue. The resulting residue was purified by neutral aluminum oxide column chromatography for (**22b**) with 20~40% EtOAc in hexane to afford the desired acetal ring. Yield: 78%; colorless oil; ^1H NMR (400 MHz, Acetone- d_6) δ 8.61 (s, 1H), 8.51 (d, $J = 8.0$ Hz, 1H), 8.05 – 7.96 (m, 1H), 7.90 – 7.77 (m, 2H), 7.65 (d, $J = 8.0$ Hz, 1H), 7.36 (q, $J = 7.5$ Hz, 2H), 7.32 – 7.25 (m, 1H), 7.20 (d, $J = 7.5$ Hz, 1H), 5.93 (s, 1H), 4.11 – 3.84 (m, 6H), 3.74 (ddd, $J = 11.1, 8.6, 3.9$ Hz, 2H), 2.08 (s, 3H); ^{13}C NMR (100 MHz, Acetone- d_6) δ 174.72, 167.91, 160.00 (d, $J_{\text{C-F}} = 247.0$ Hz), 145.35, 137.66, 135.44, 133.41, 131.56 (d, $J_{\text{C-F}} = 13.0$ Hz), 131.14, 129.79, 129.51, 129.21, 128.88, 128.54, 128.27 (d, $J_{\text{C-F}} = 8.0$ Hz), 128.06 (d, $J_{\text{C-F}} = 4.0$ Hz), 125.60 (q, $J_{\text{C-F}} = 6.0$ Hz), 125.11, 123.63, 123.56 (q, $J_{\text{C-F}} = 273.0$ Hz), 122.82 (d, $J_{\text{C-F}} = 3.0$ Hz), 114.09, 113.85, 109.99, 101.17, 73.38, 71.42, 19.26. HRMS (ESI) calcd for $\text{C}_{27}\text{H}_{23}\text{F}_4\text{N}_2\text{O}_4$ [$\text{M} + \text{H}$] $^+$ 515.1588, found 515.1582.

6. NMR spectra of new compounds



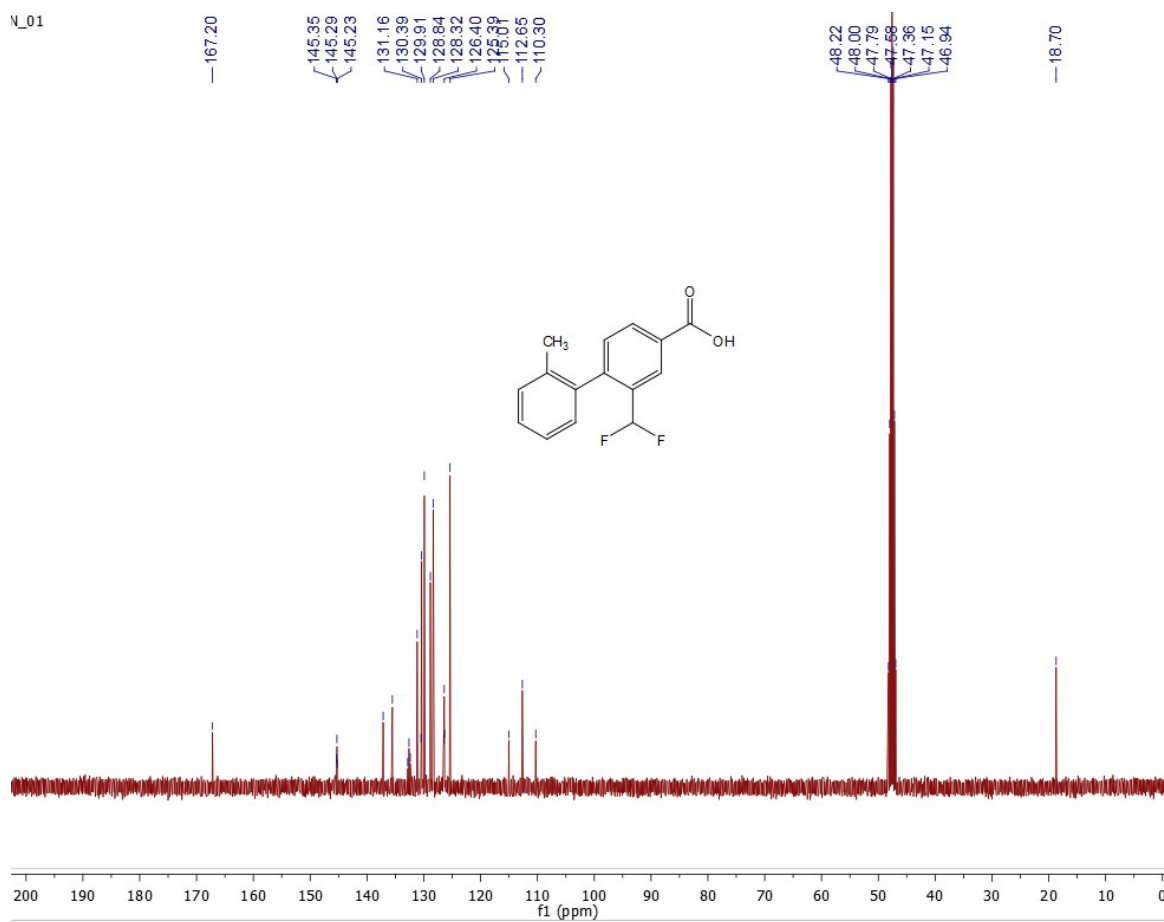
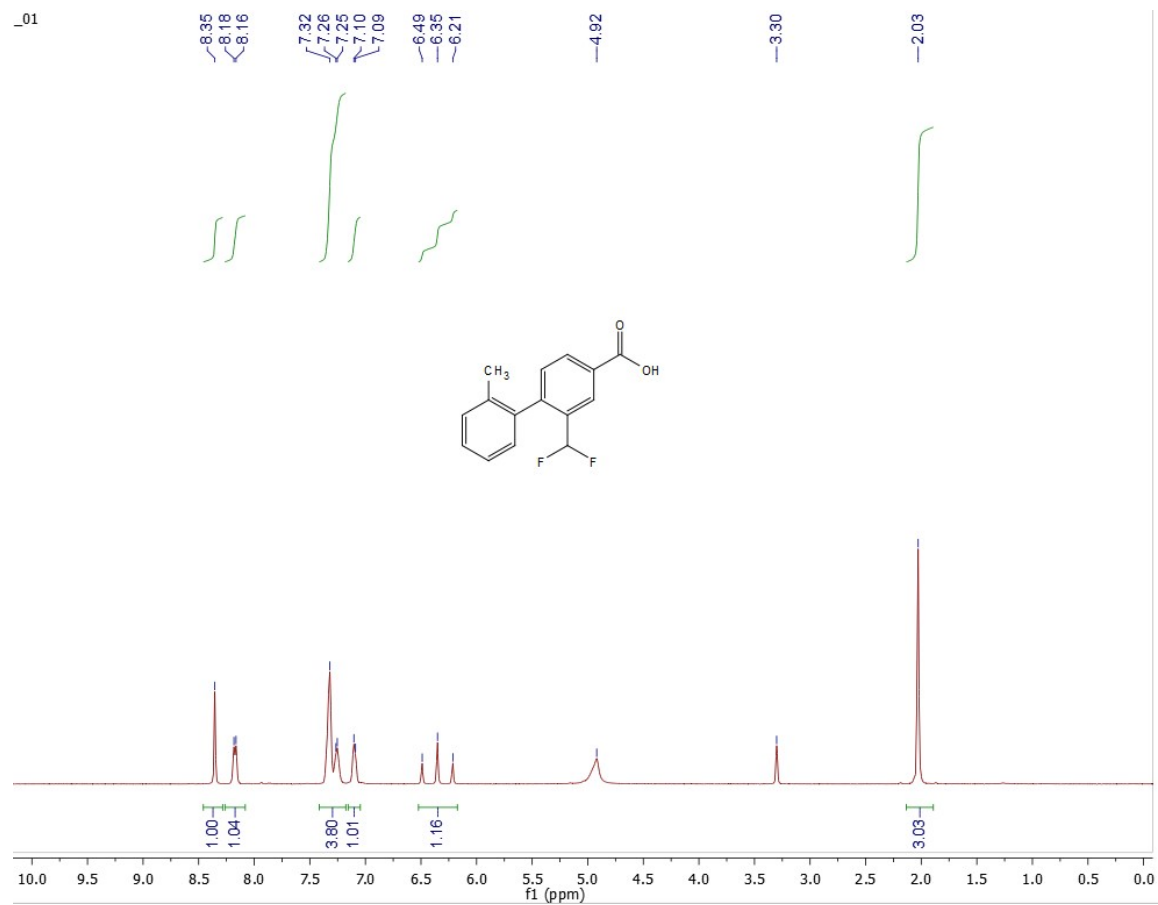
^1H NMR and ^{13}C NMR of **2a**

Electronic Supplementary Information



¹H NMR and ¹³C NMR of 4

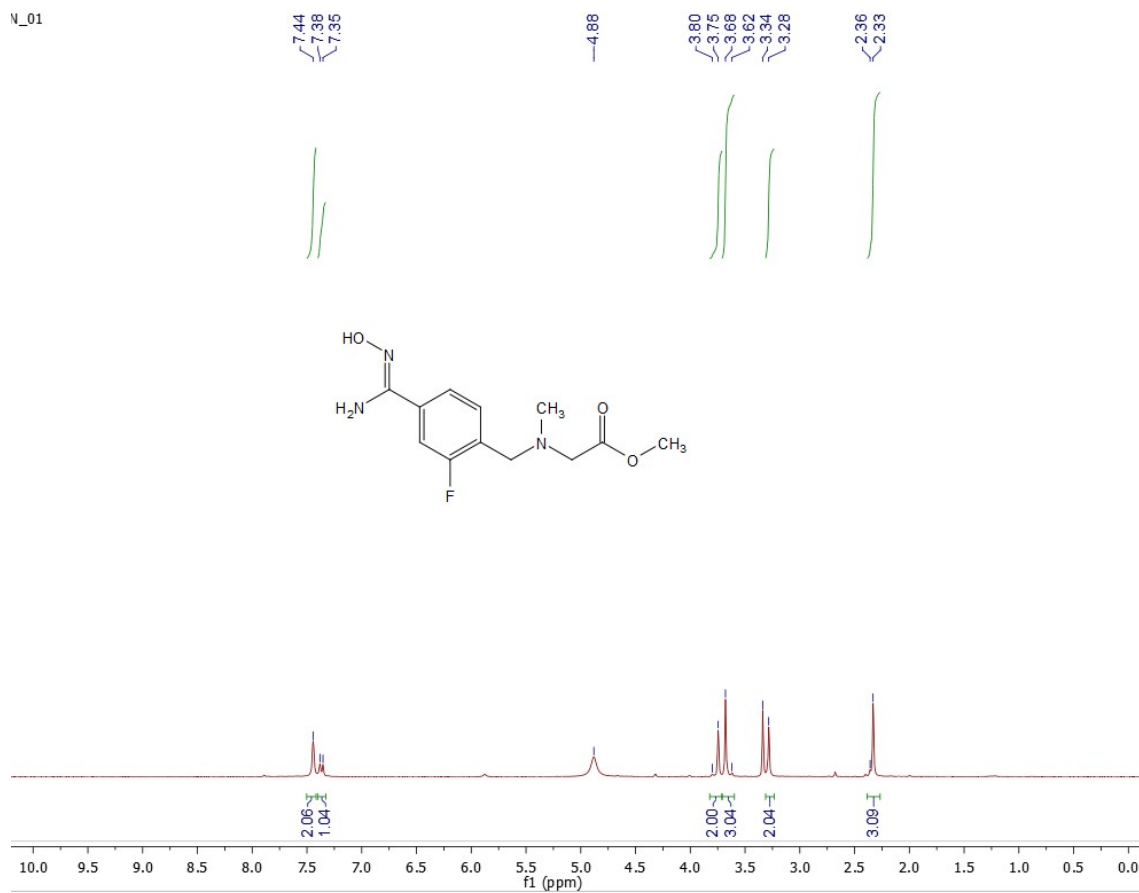
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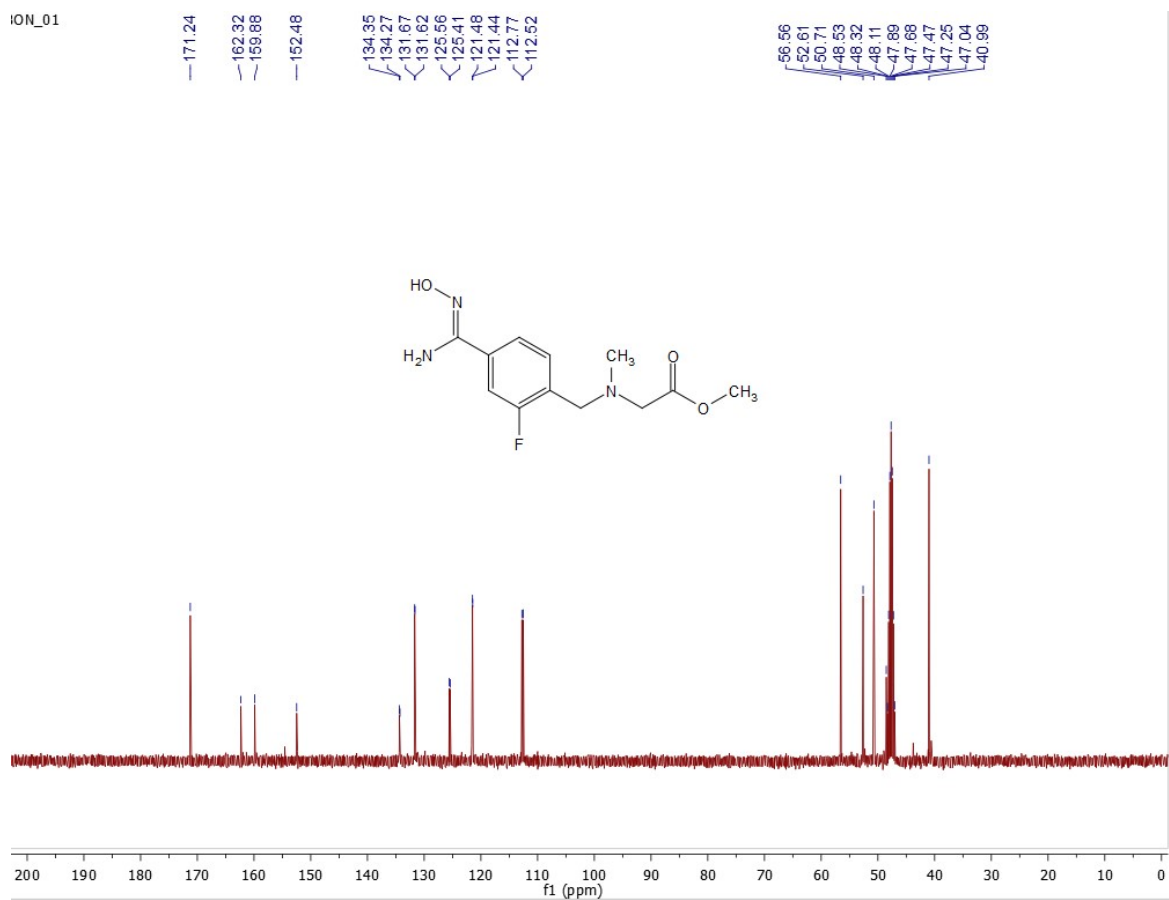
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Electronic Supplementary Information

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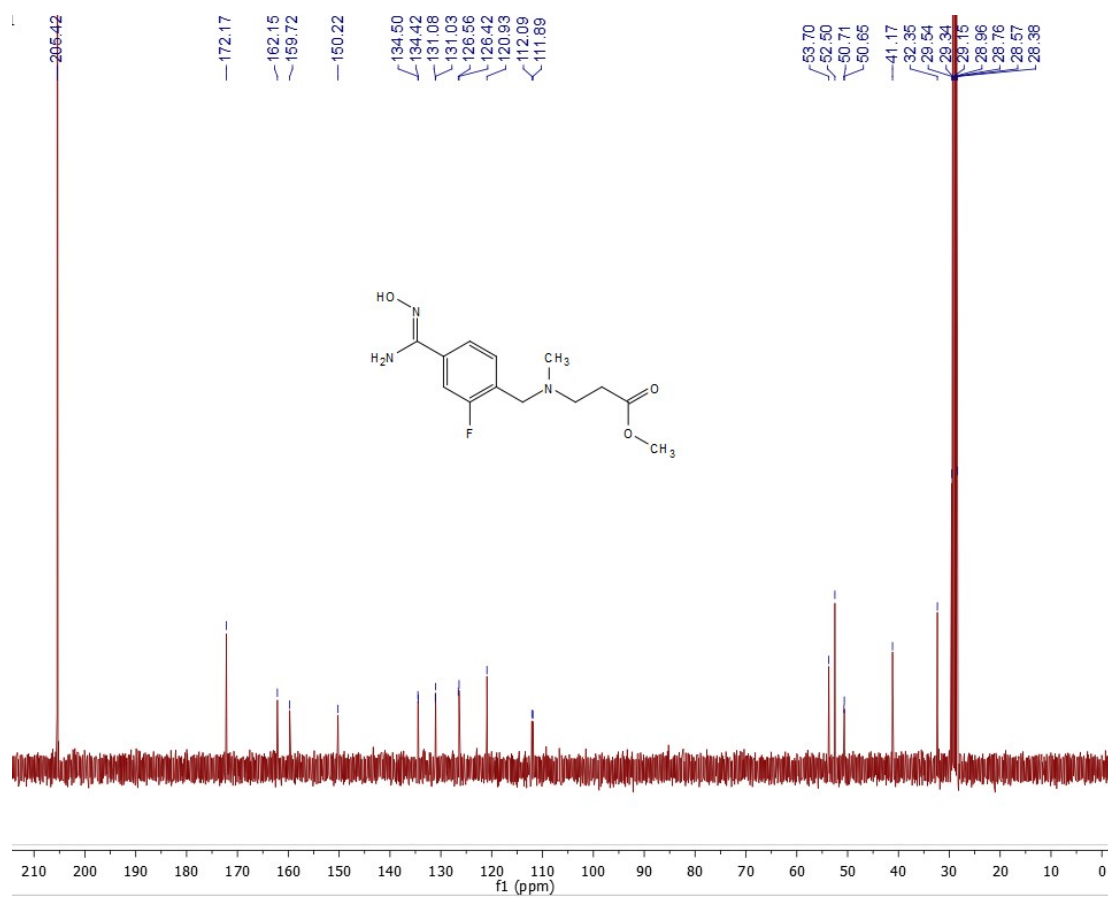
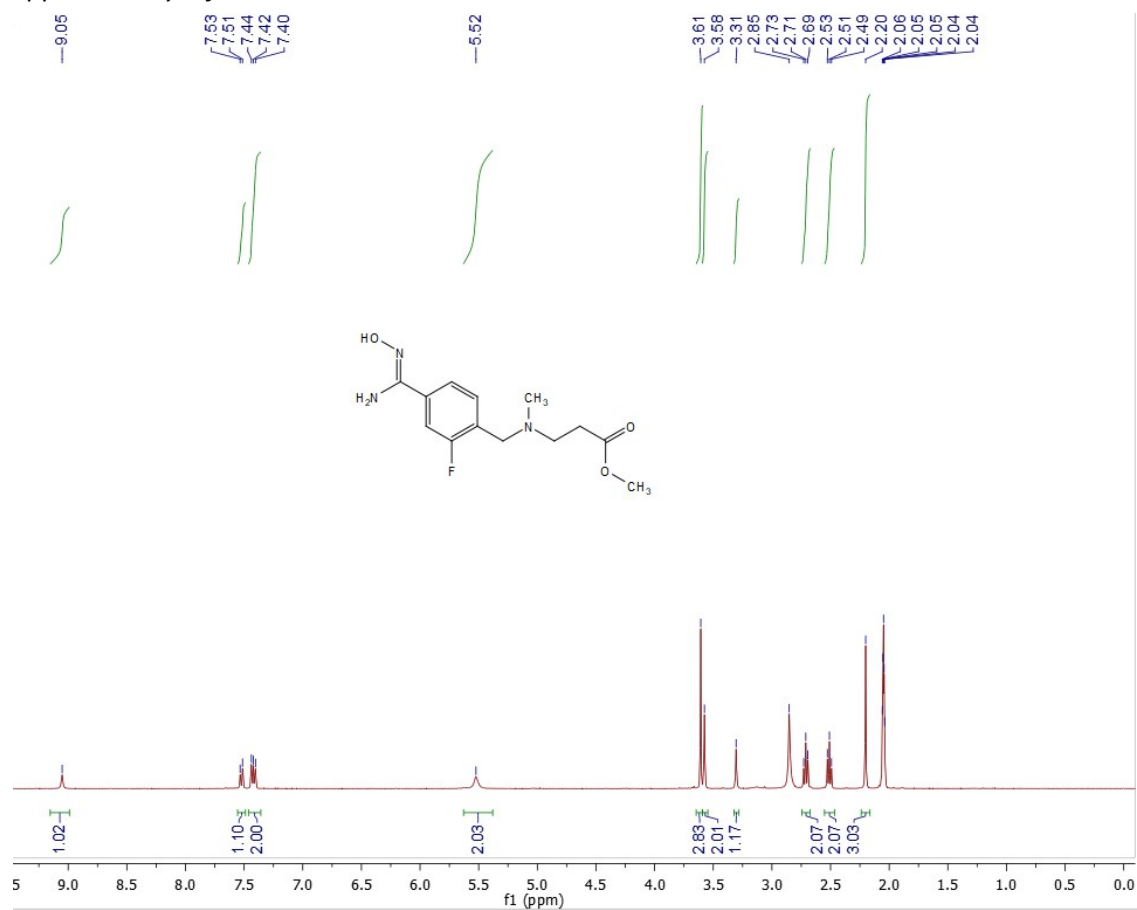


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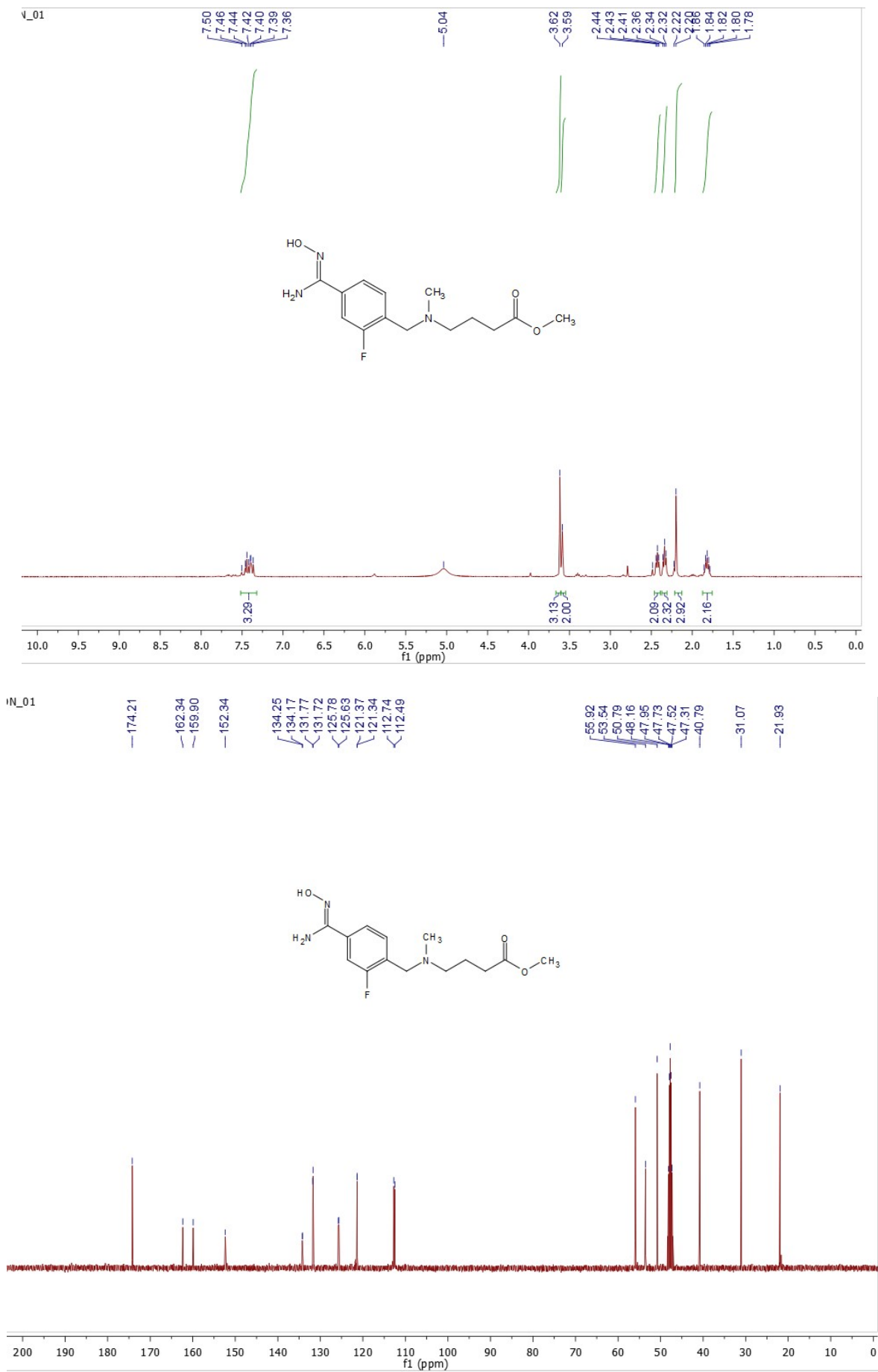
¹H NMR and ¹³C NMR of **6a**

Electronic Supplementary Information



^1H NMR and ^{13}C NMR of **6b**

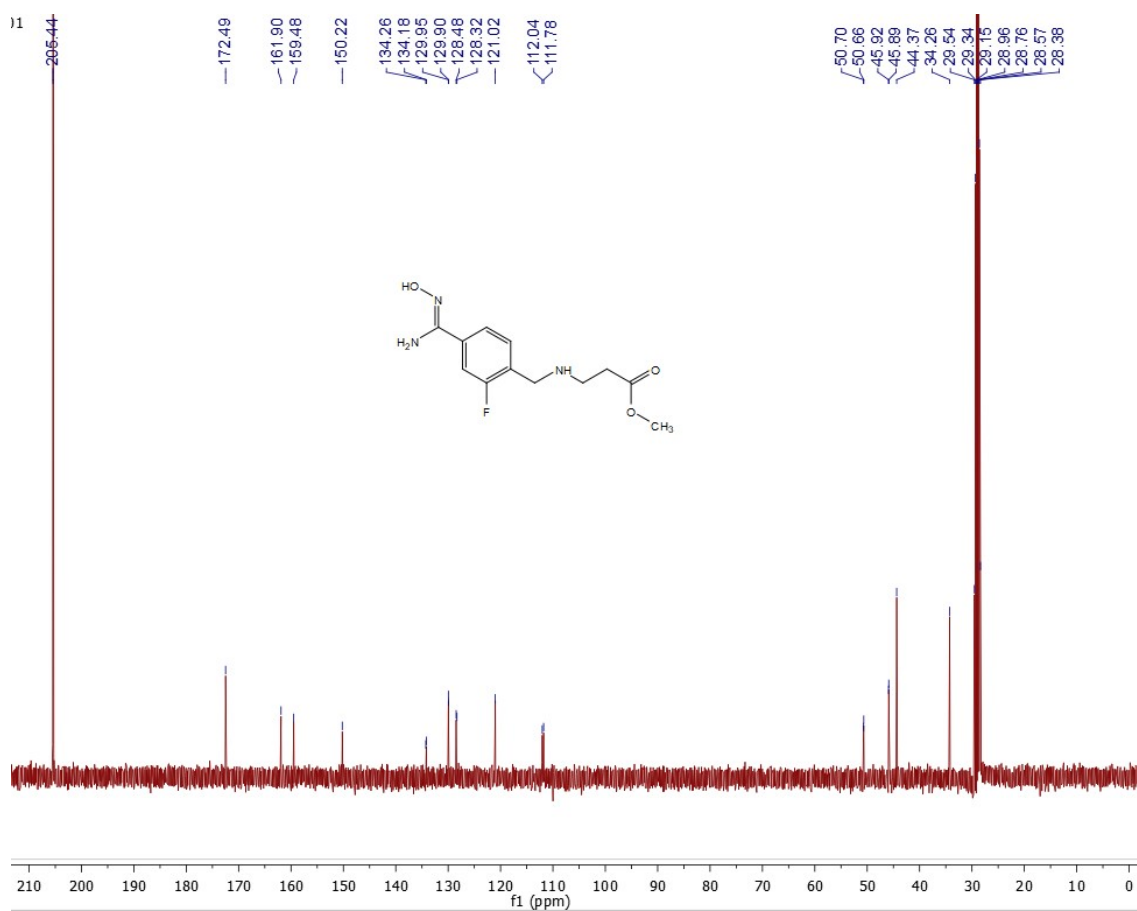
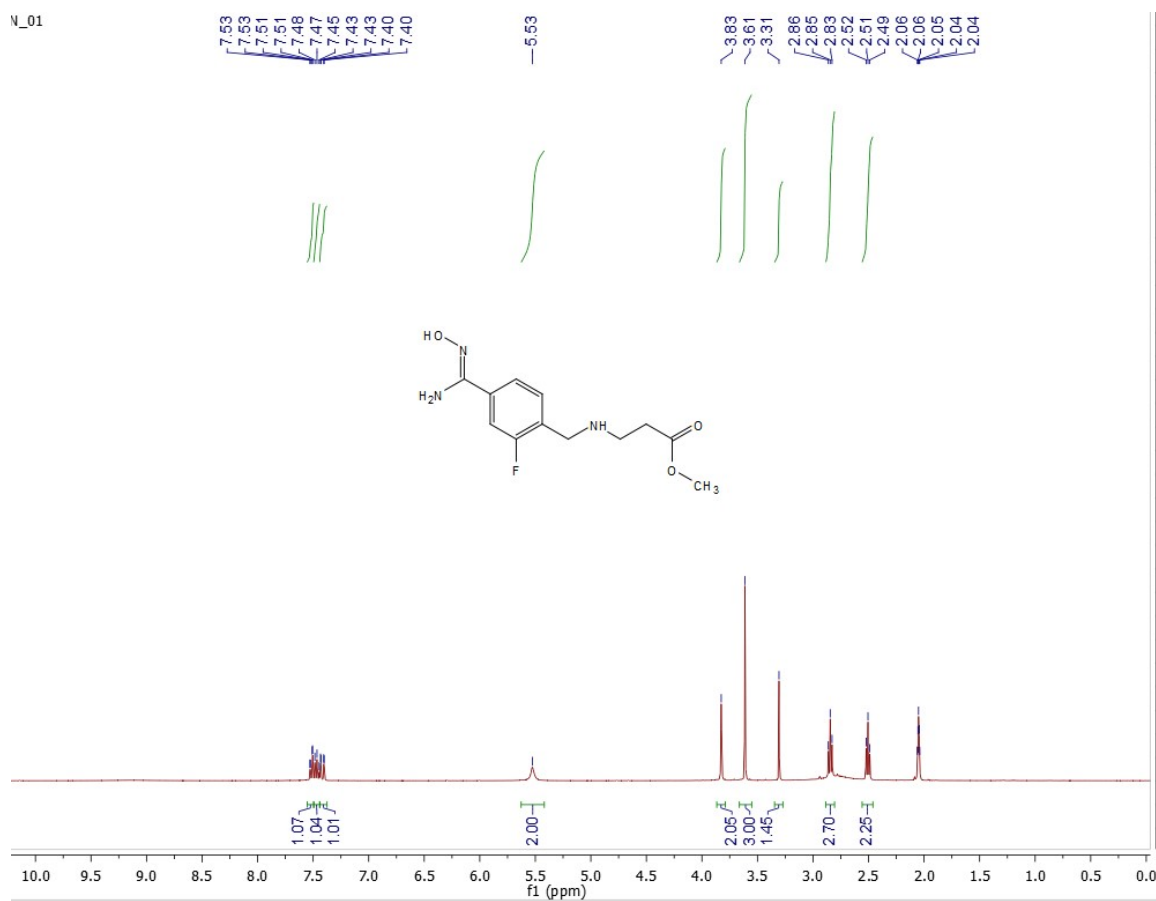
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^1H NMR and ^{13}C NMR of **6c**

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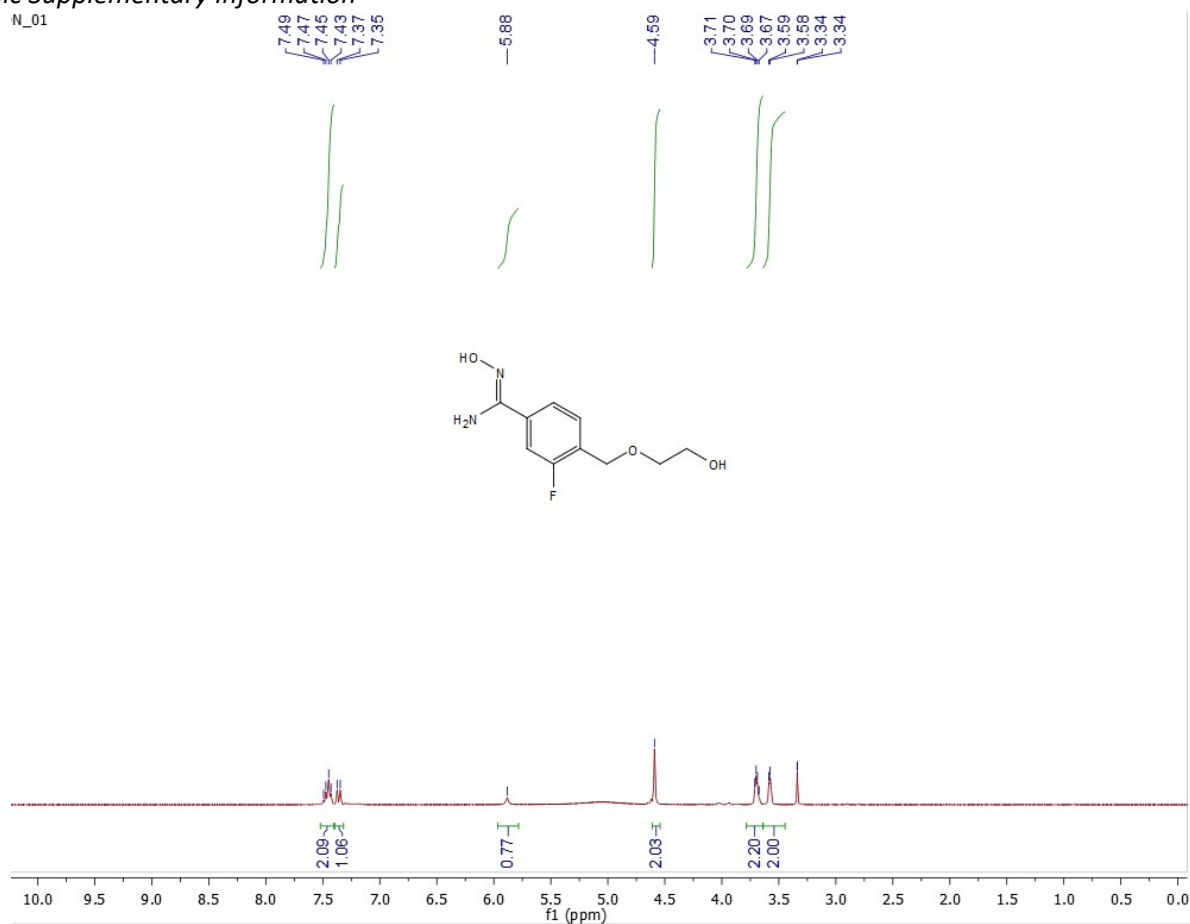
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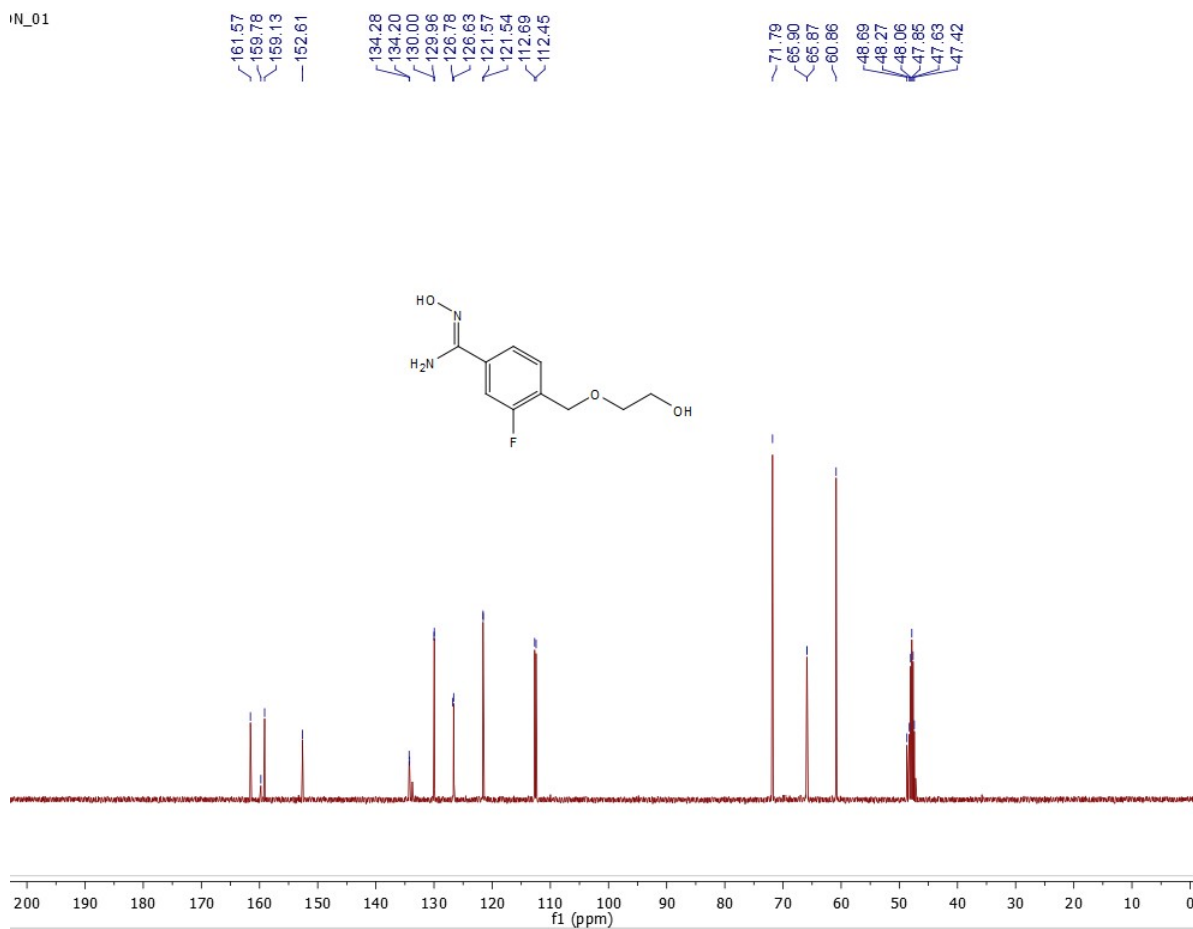
¹H NMR and ¹³C NMR of 6d

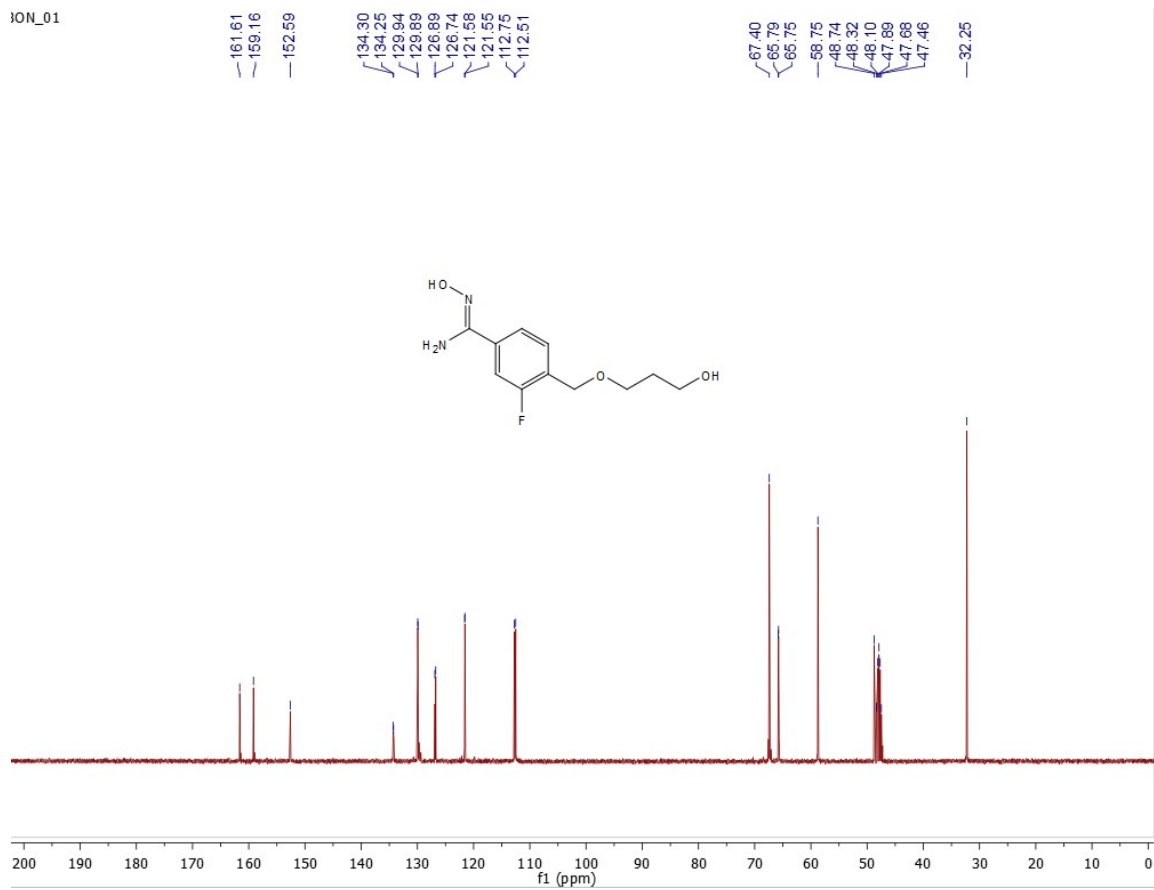
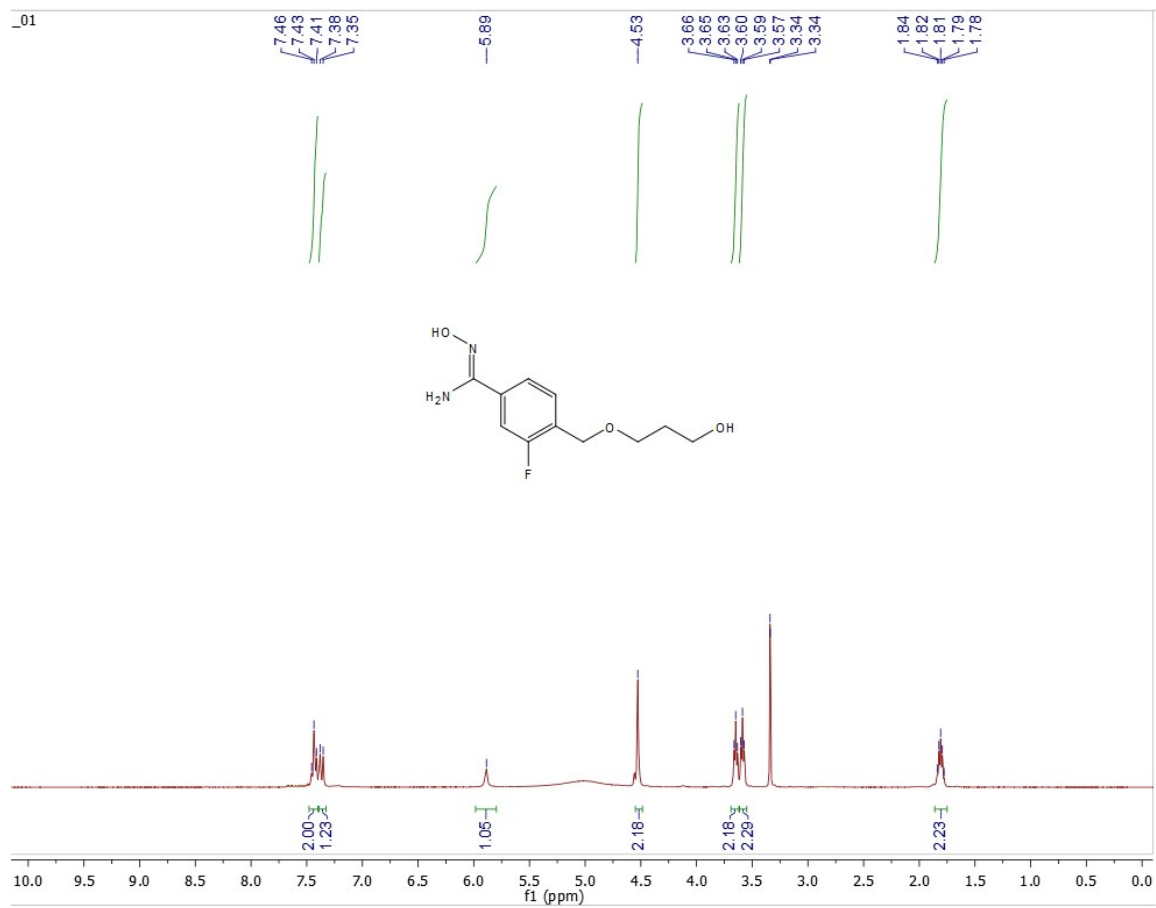
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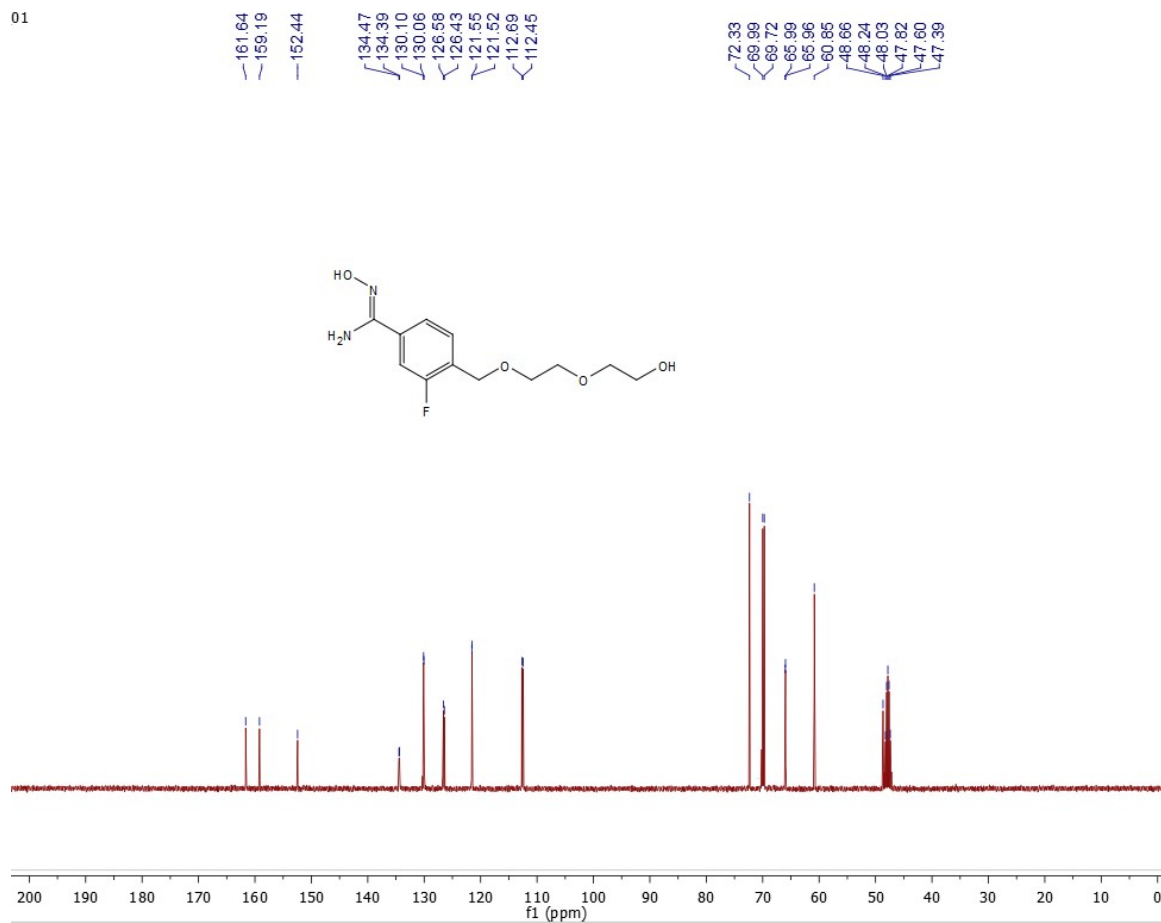
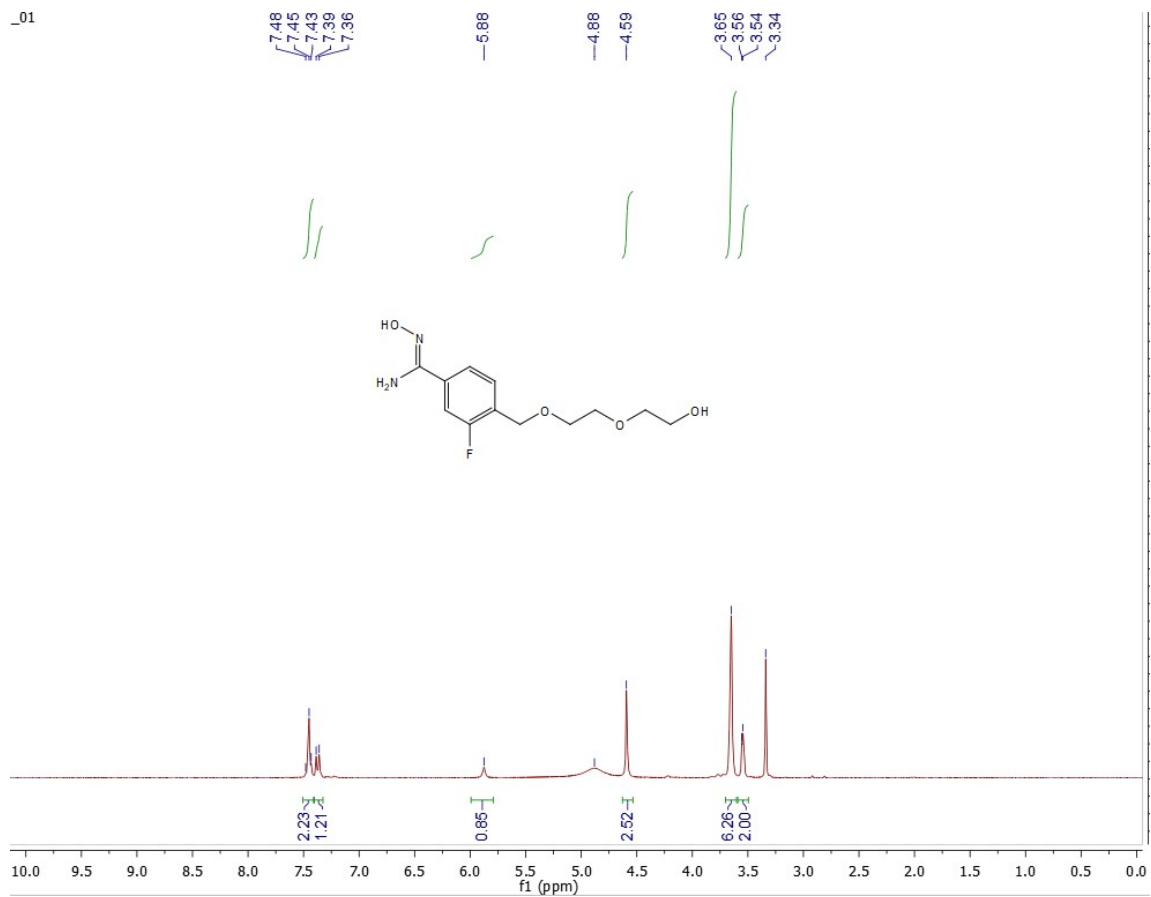
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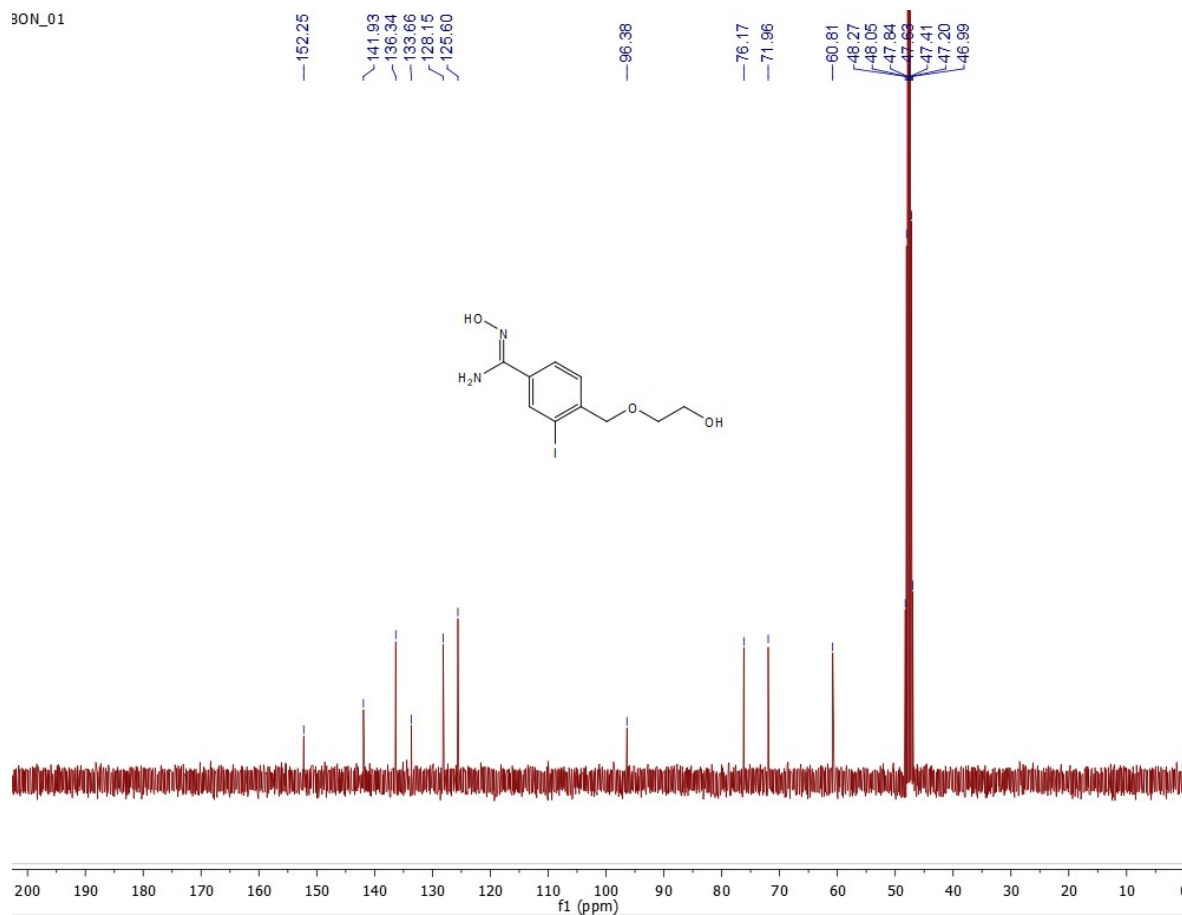
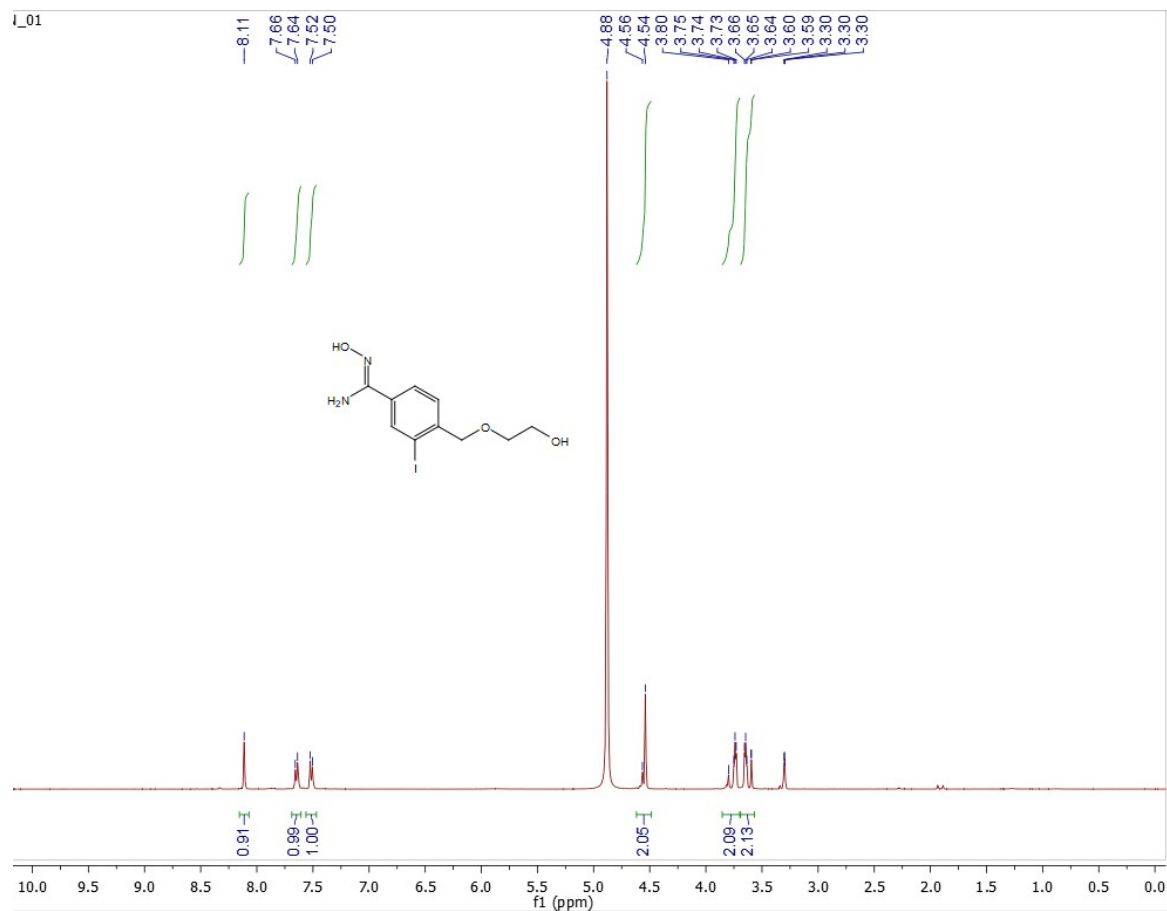


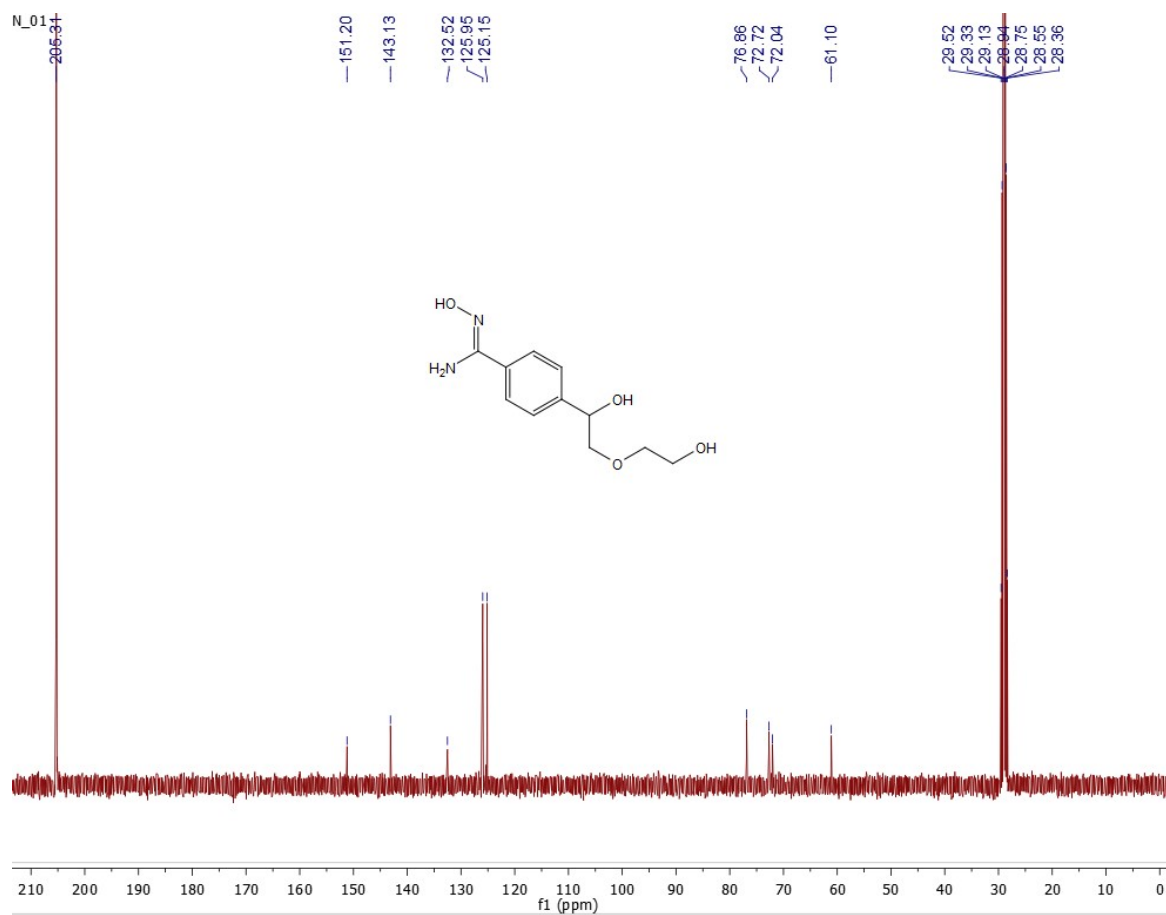
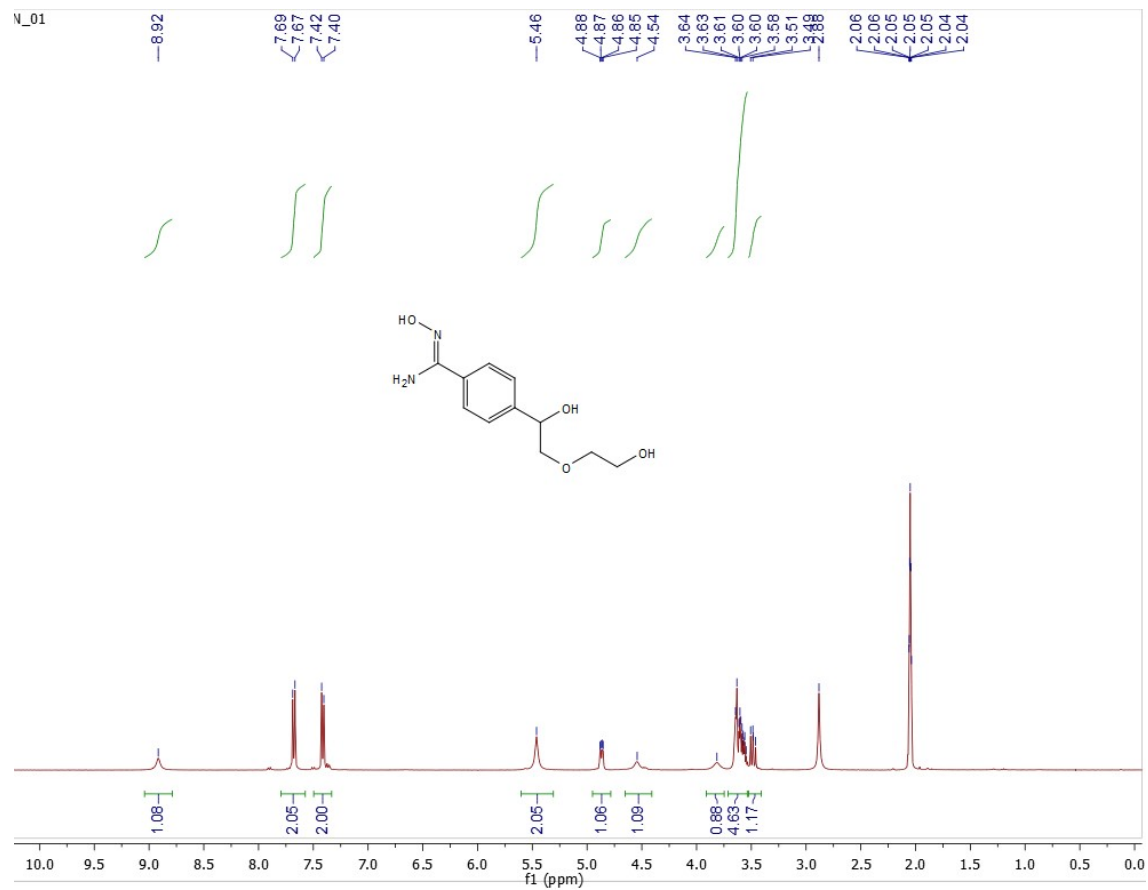
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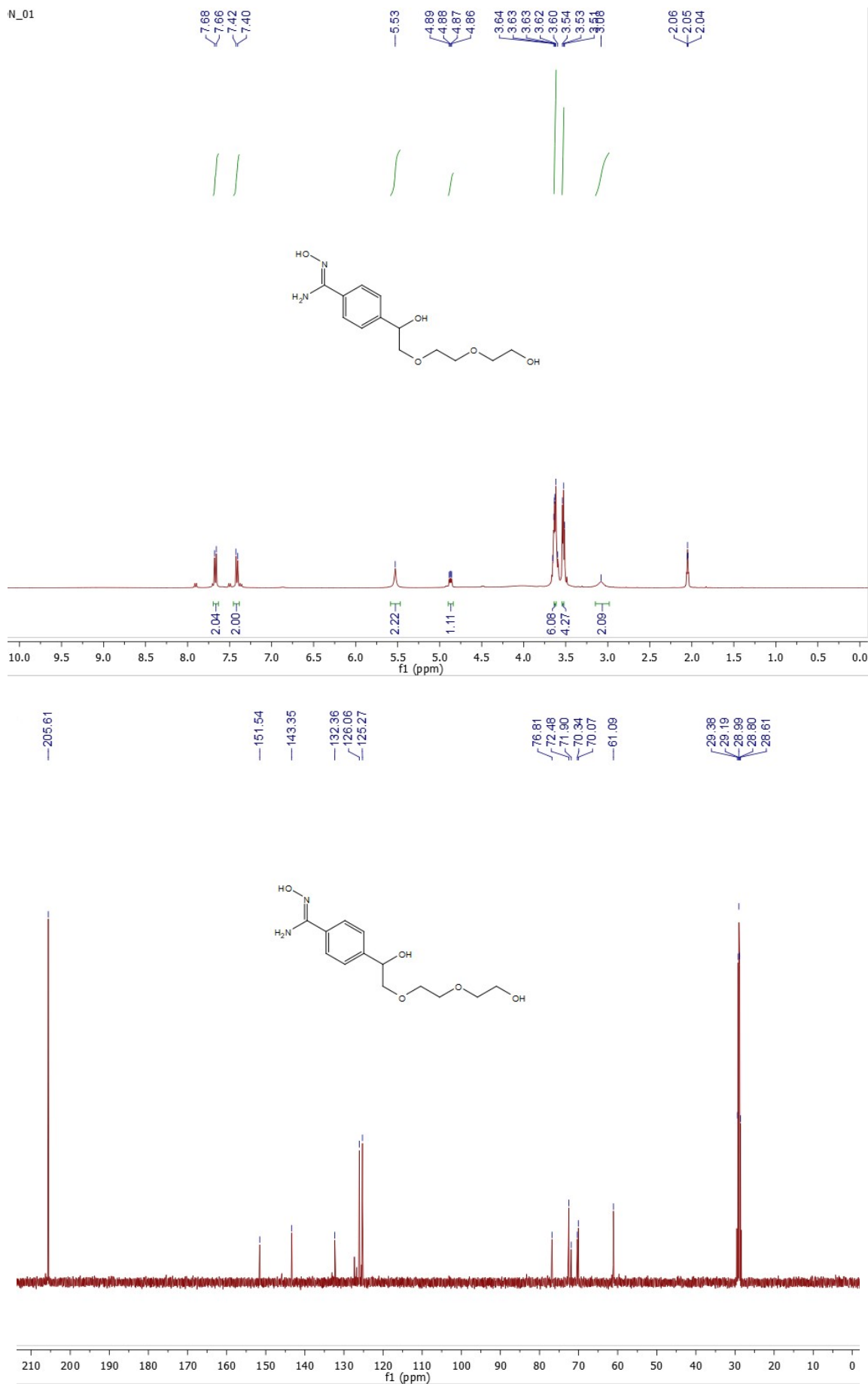


^1H NMR and ^{13}C NMR of **8a**

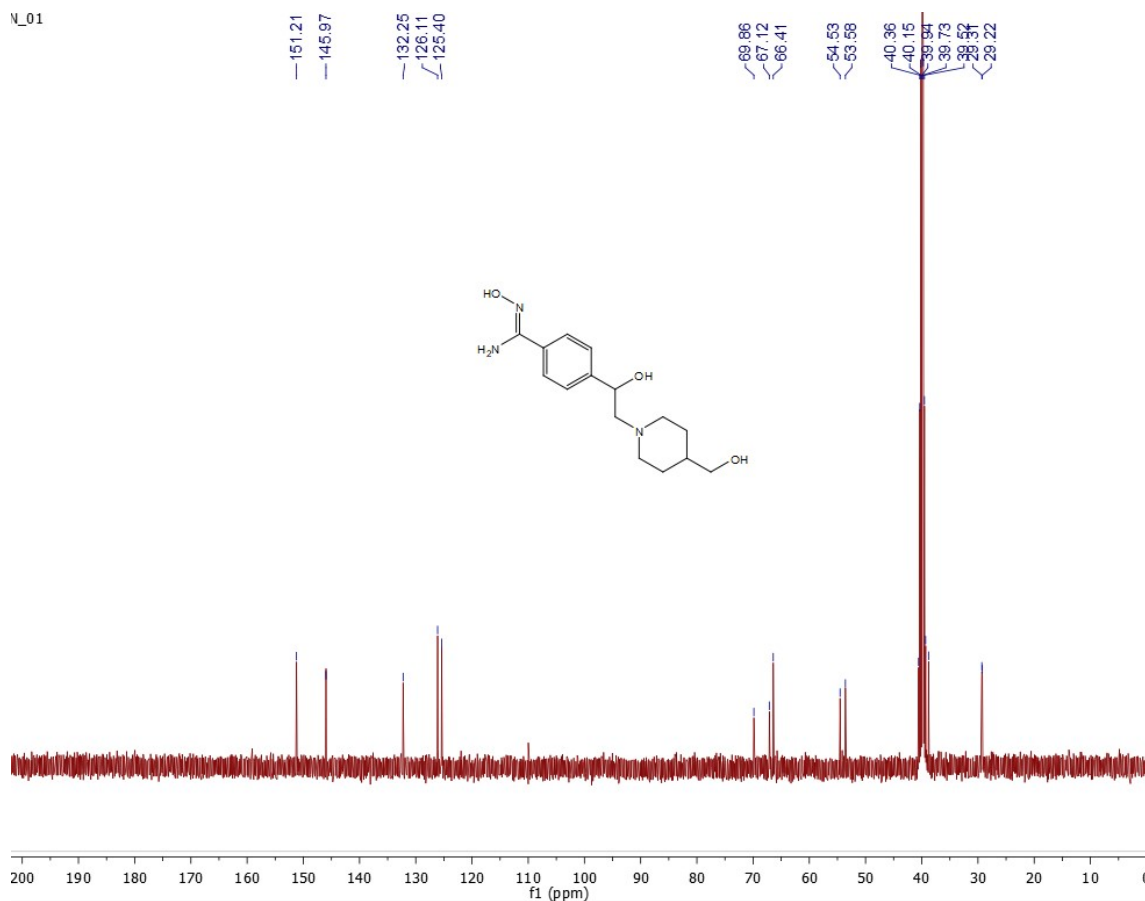
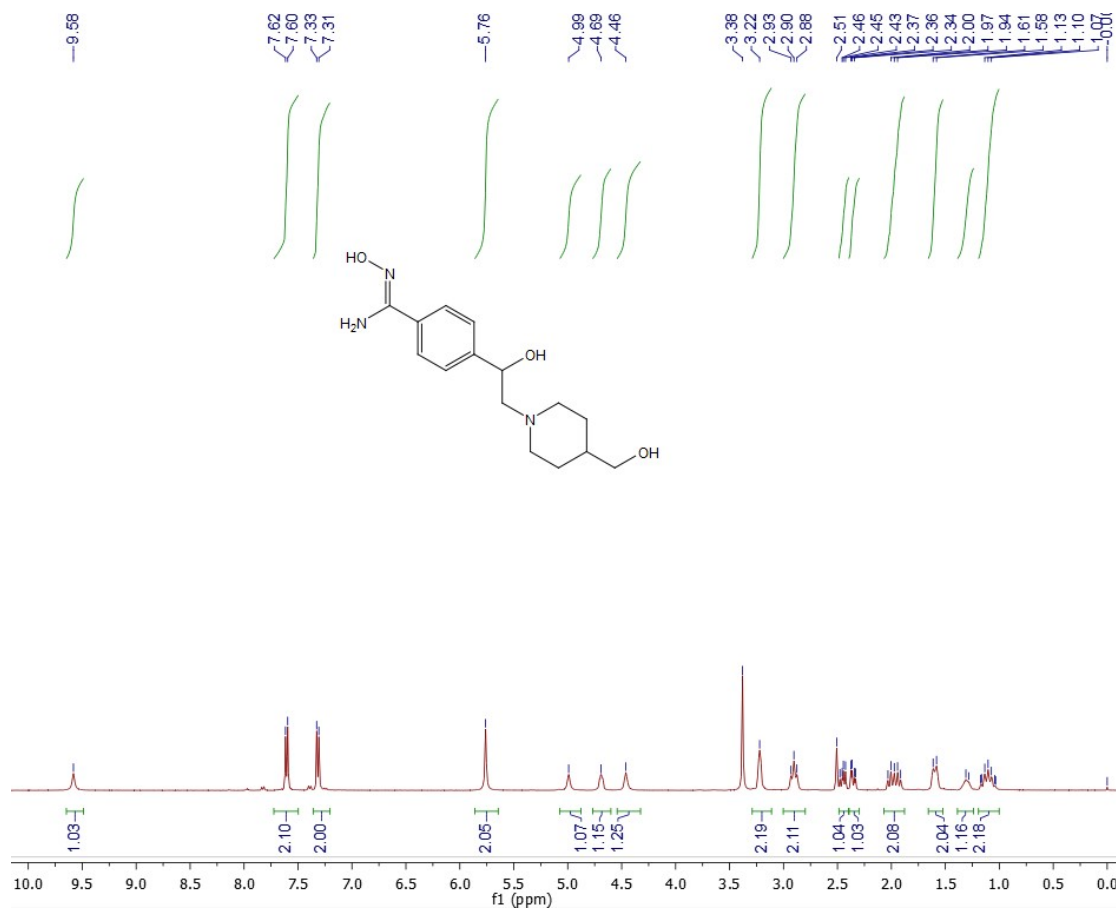
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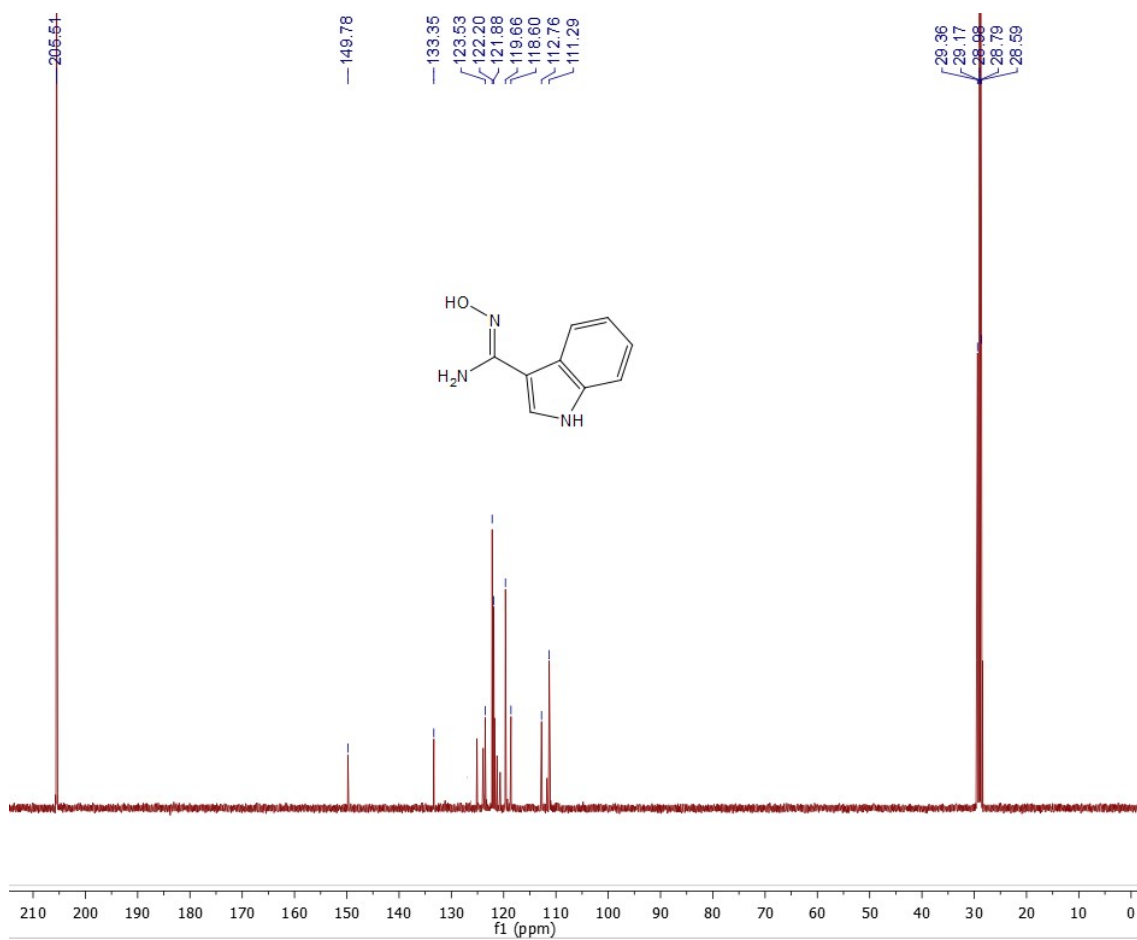
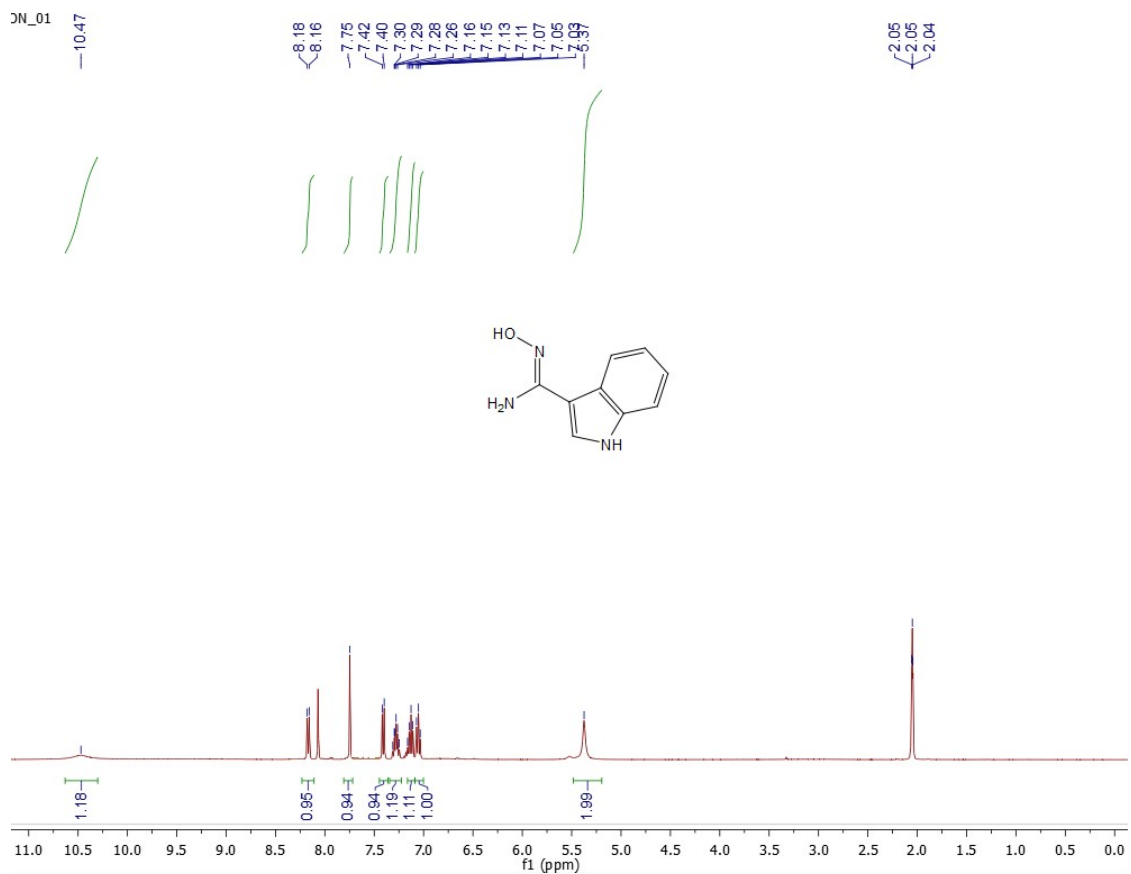
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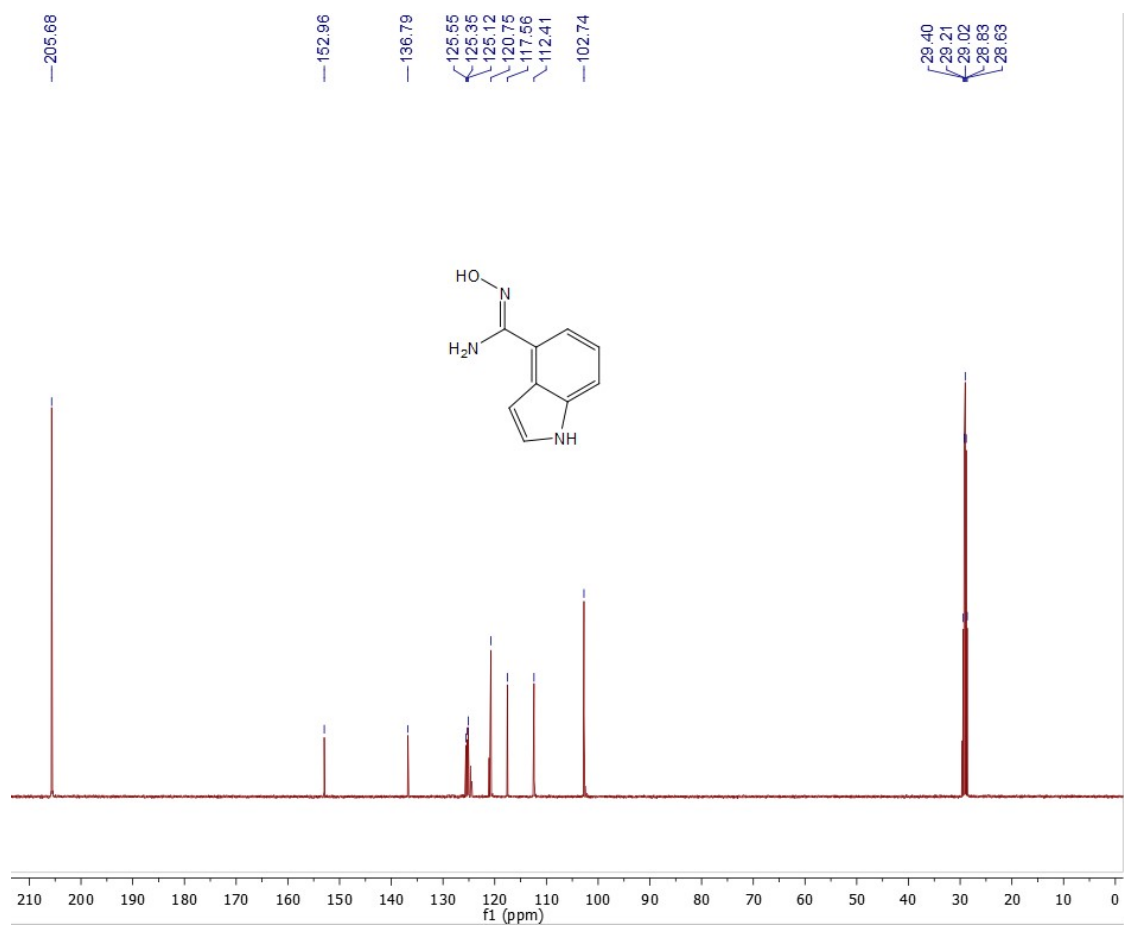
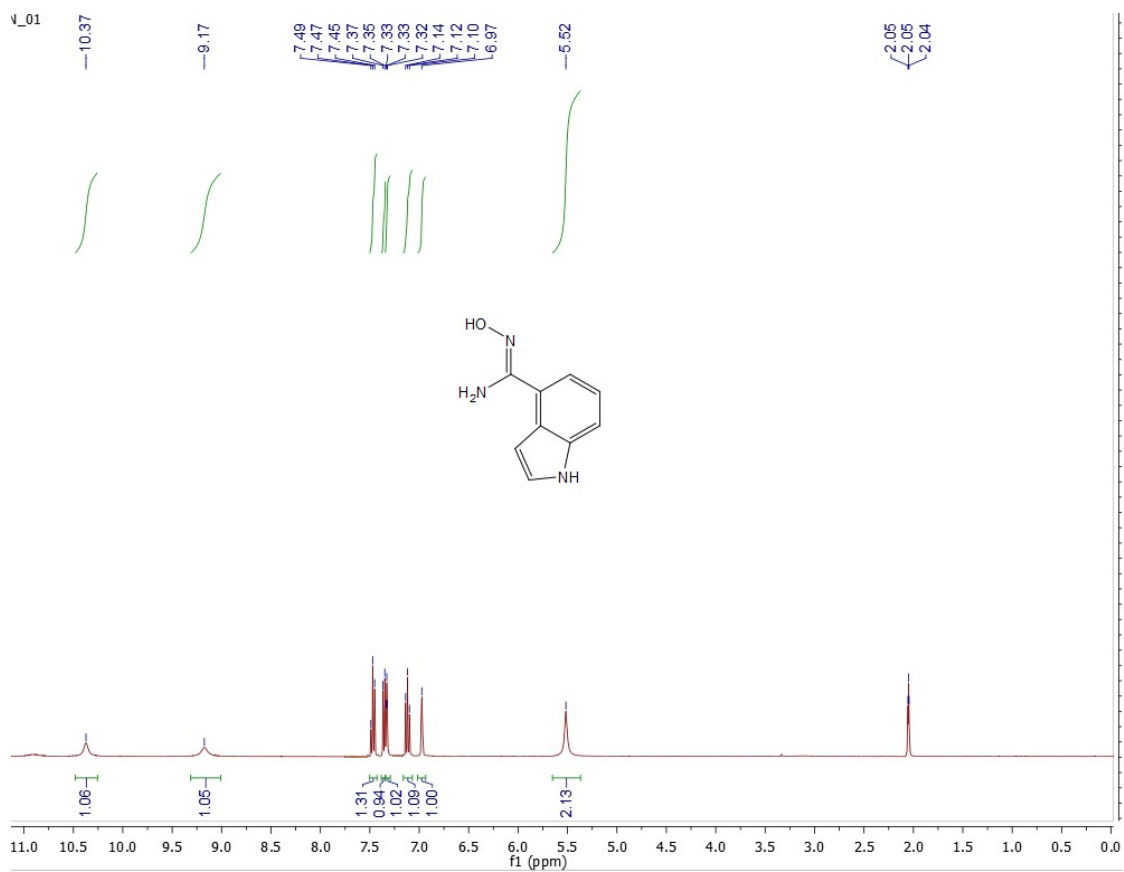
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^1H NMR and ^{13}C NMR of **8e**

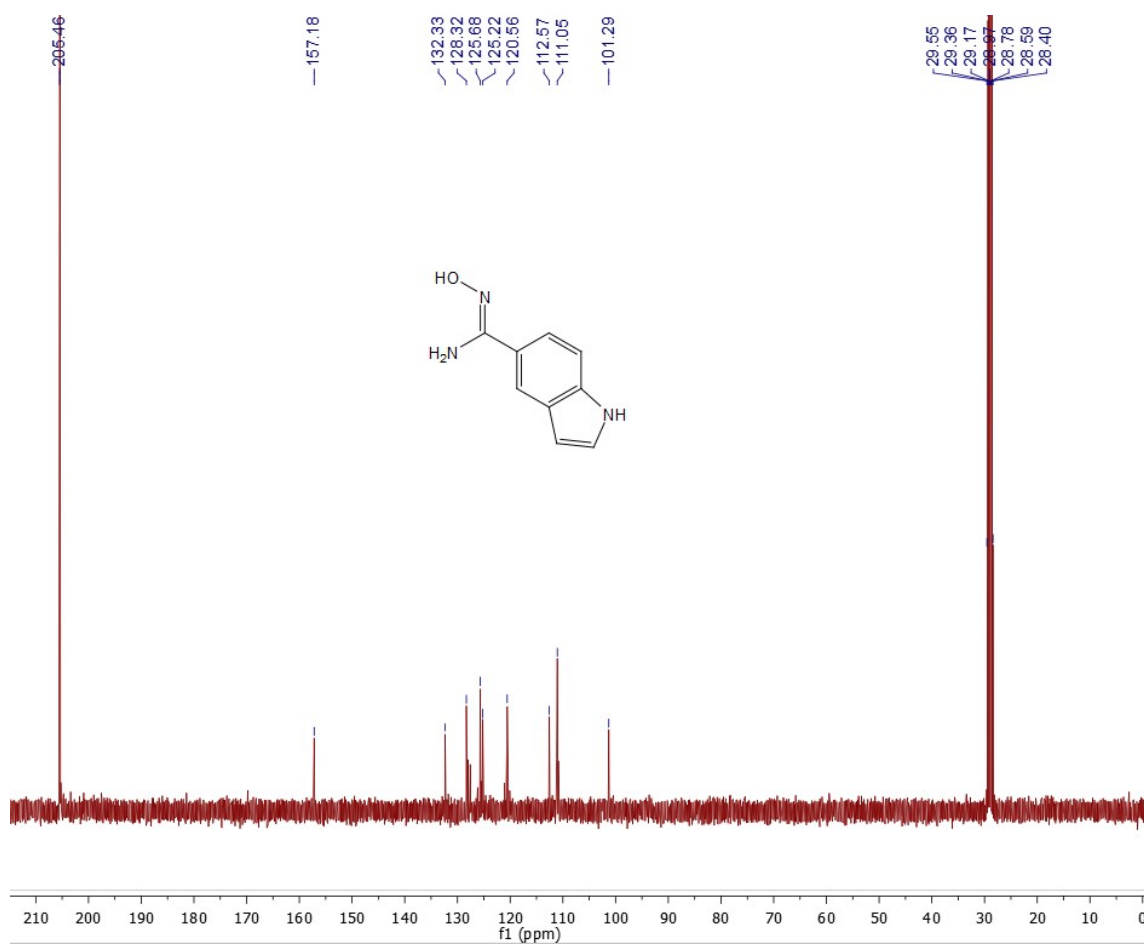
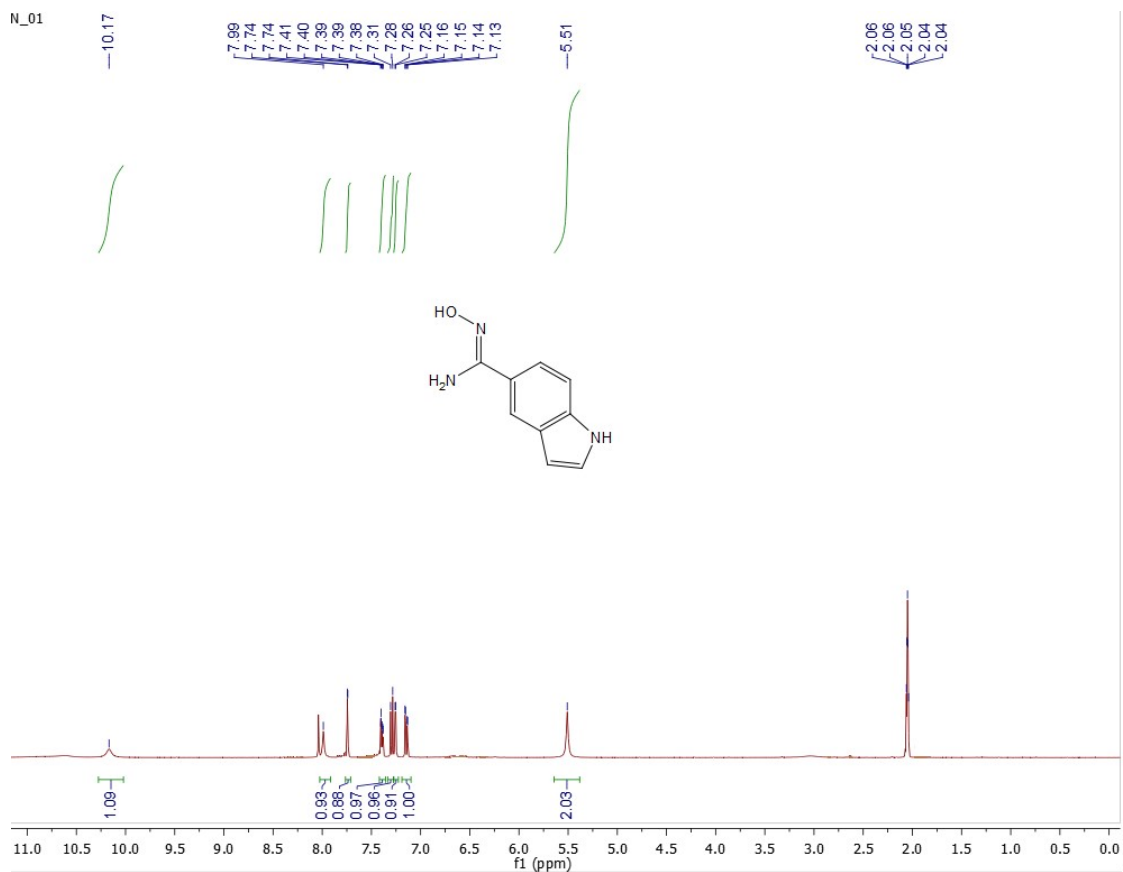
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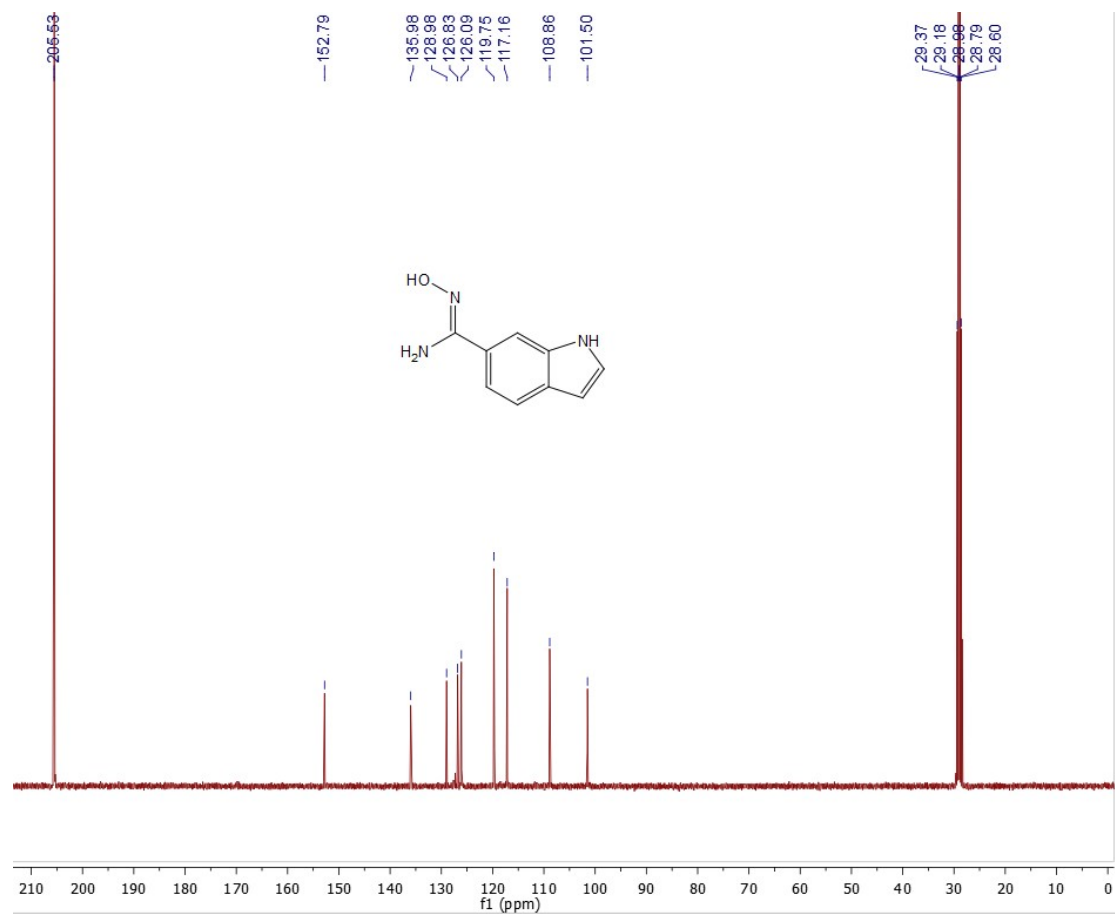
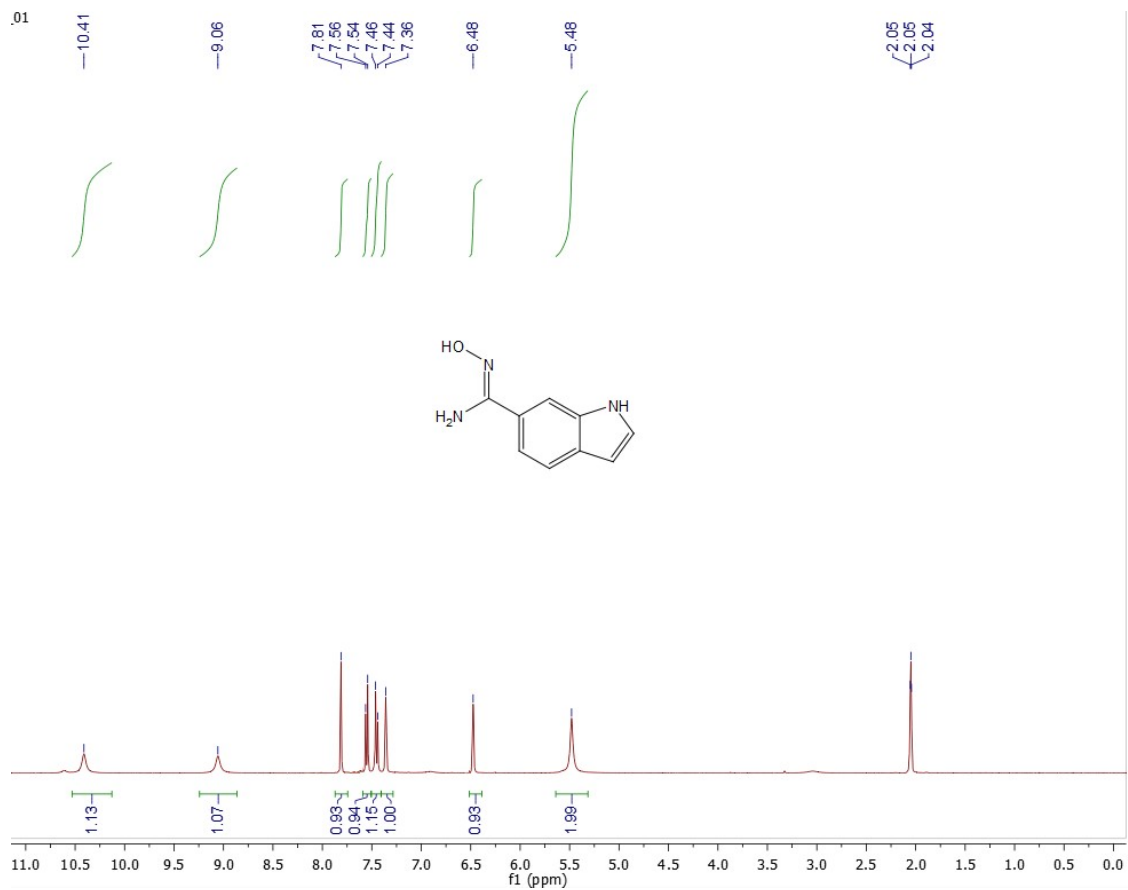


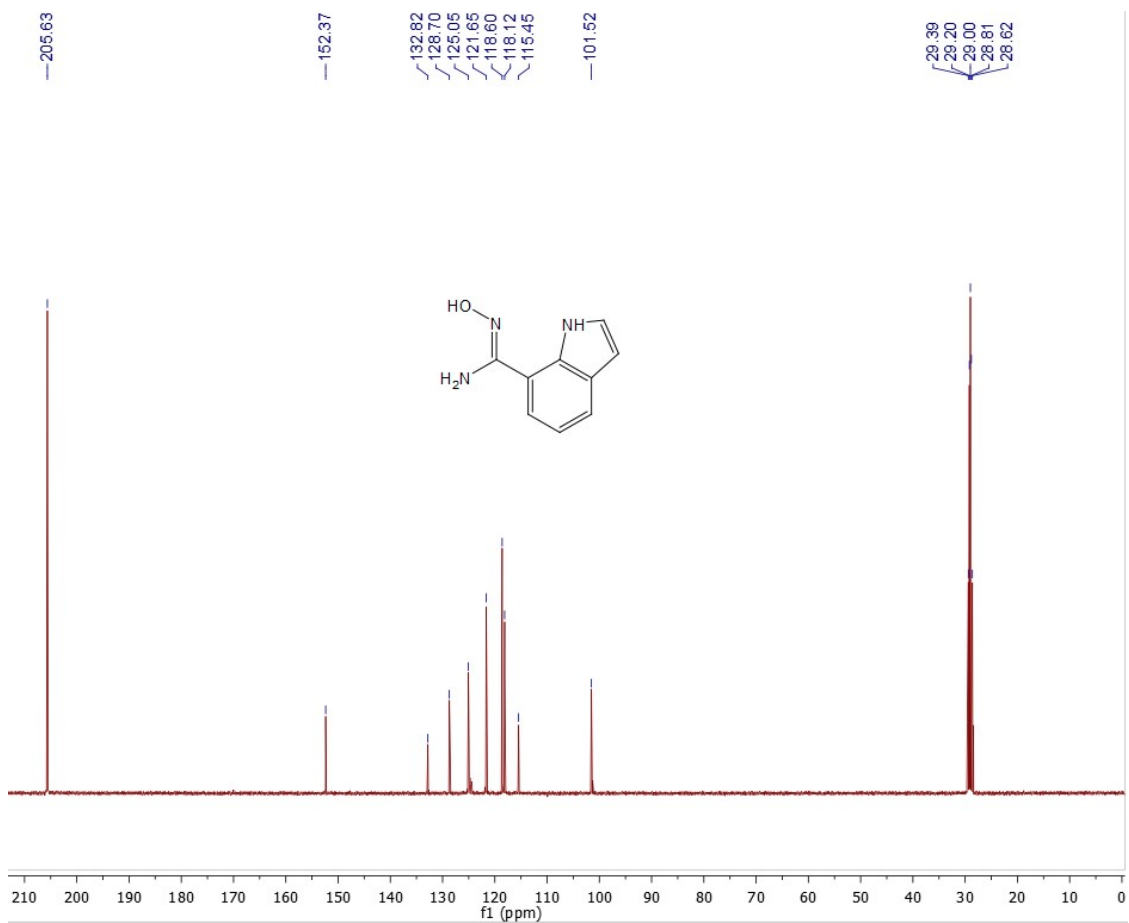
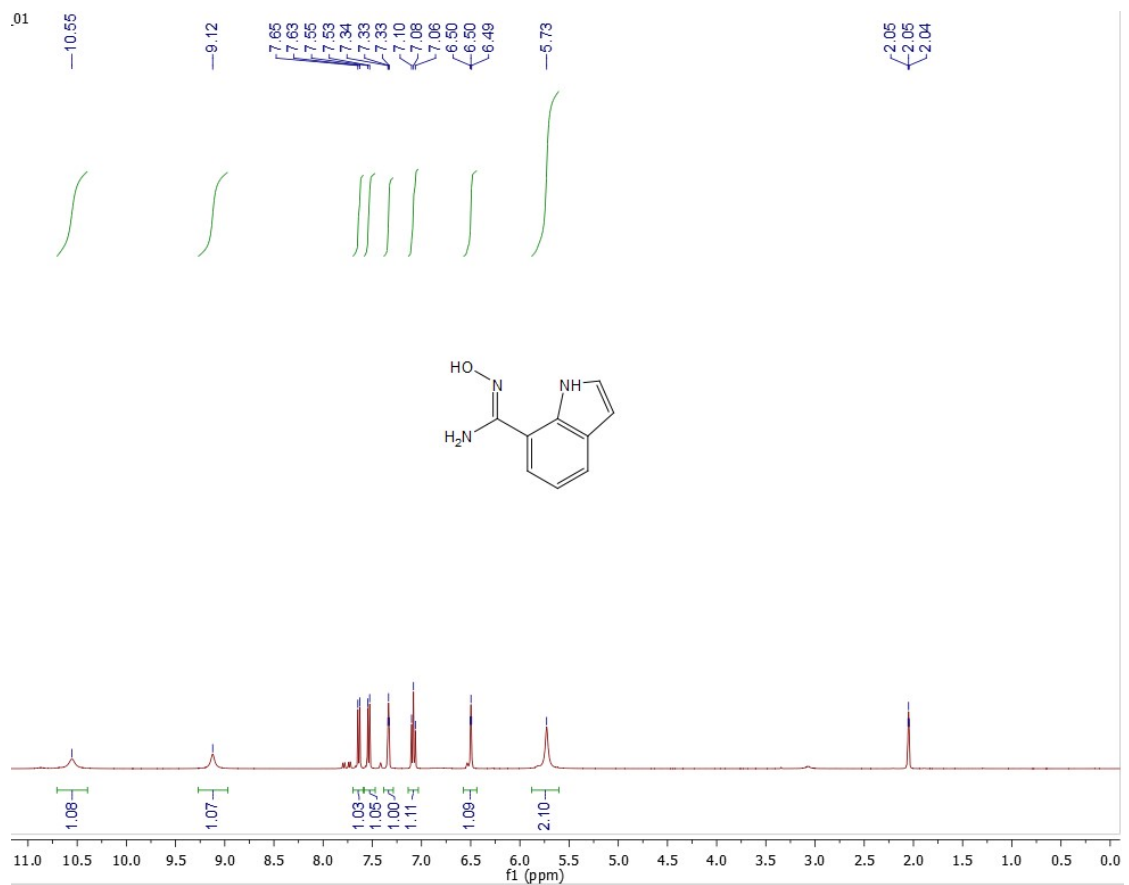
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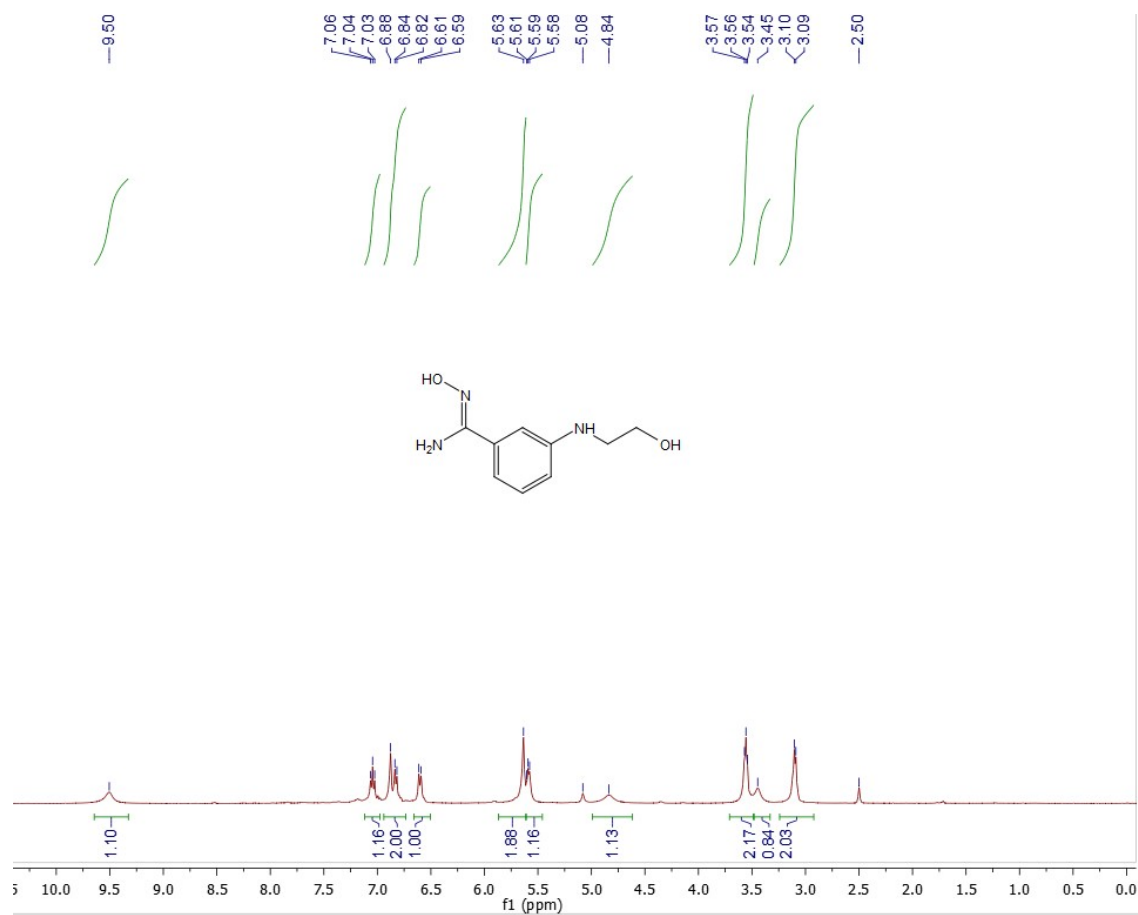
^1H NMR and ^{13}C NMR of **11a**

¹H NMR and ¹³C NMR of **11b**

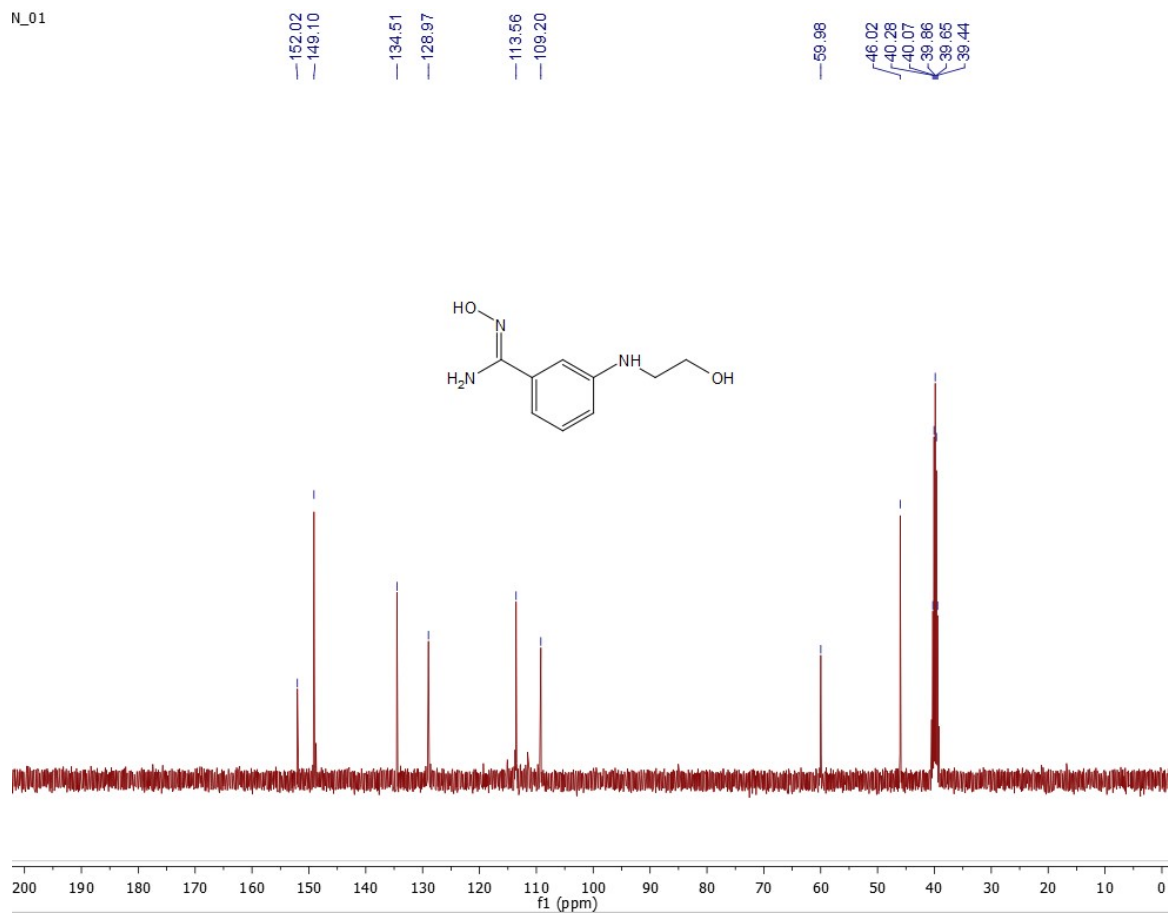


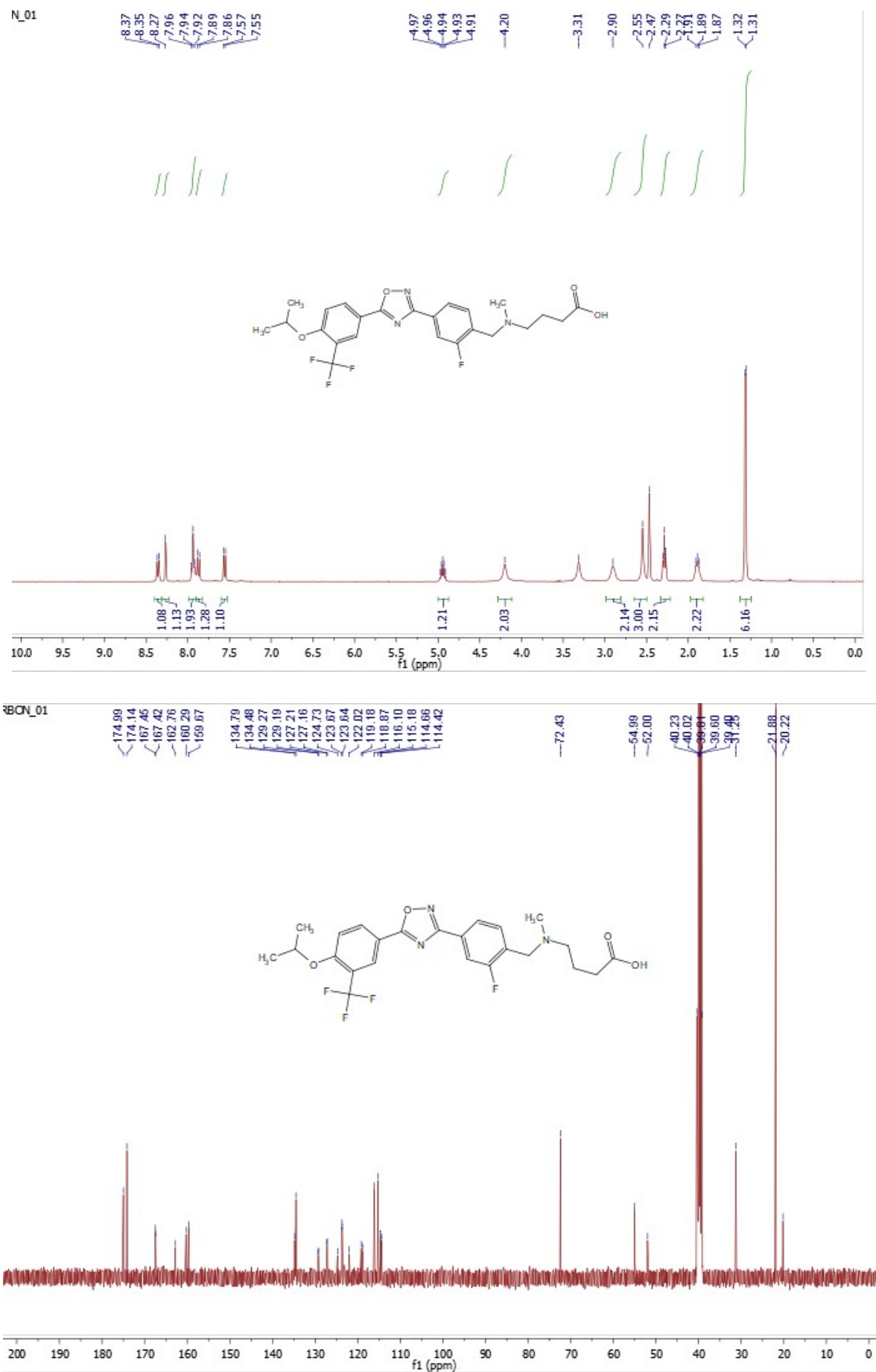
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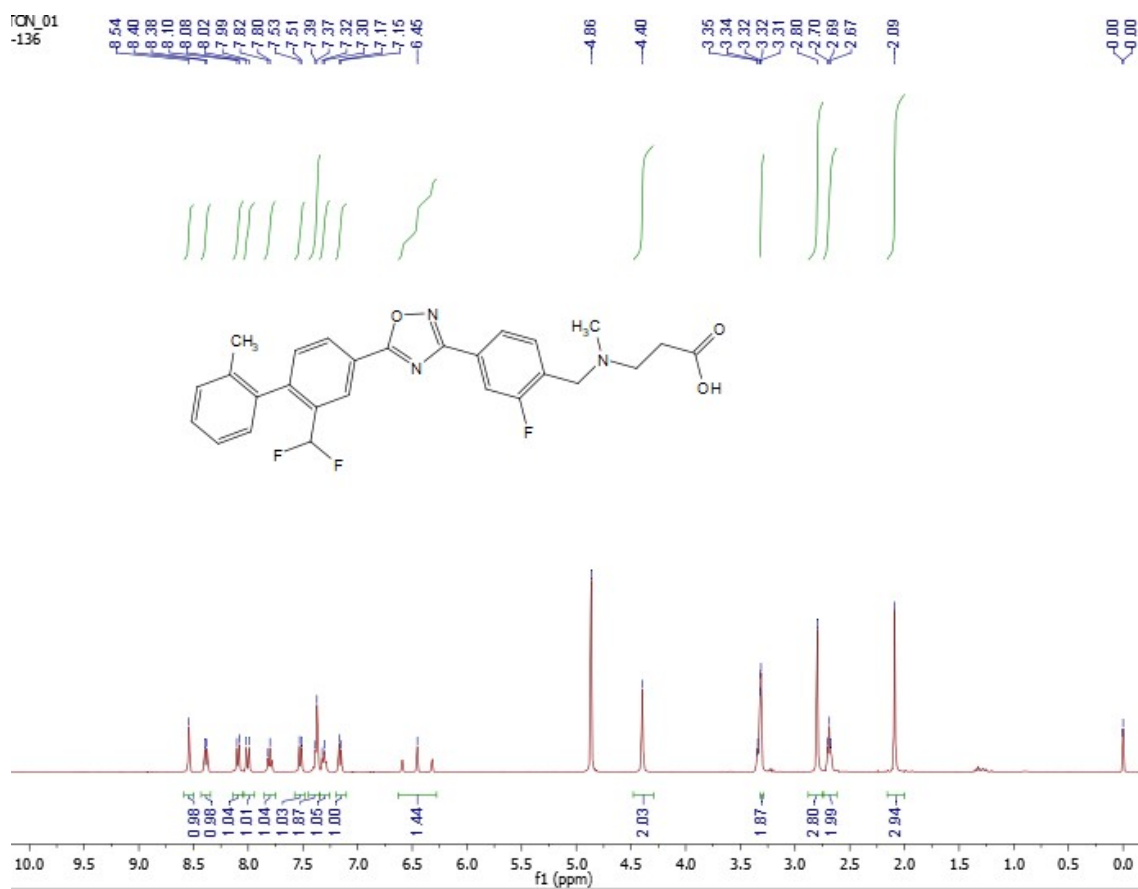
^1H NMR and ^{13}C NMR of **11d**

^1H NMR and ^{13}C NMR of **11e**

N_01

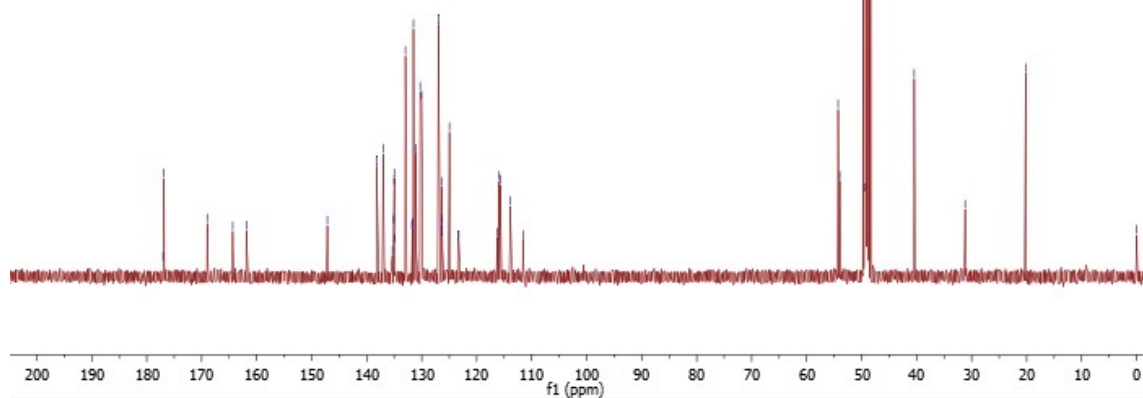
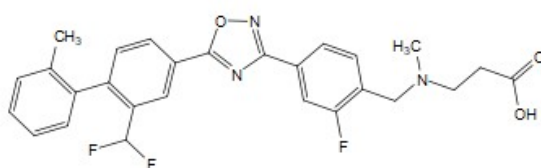


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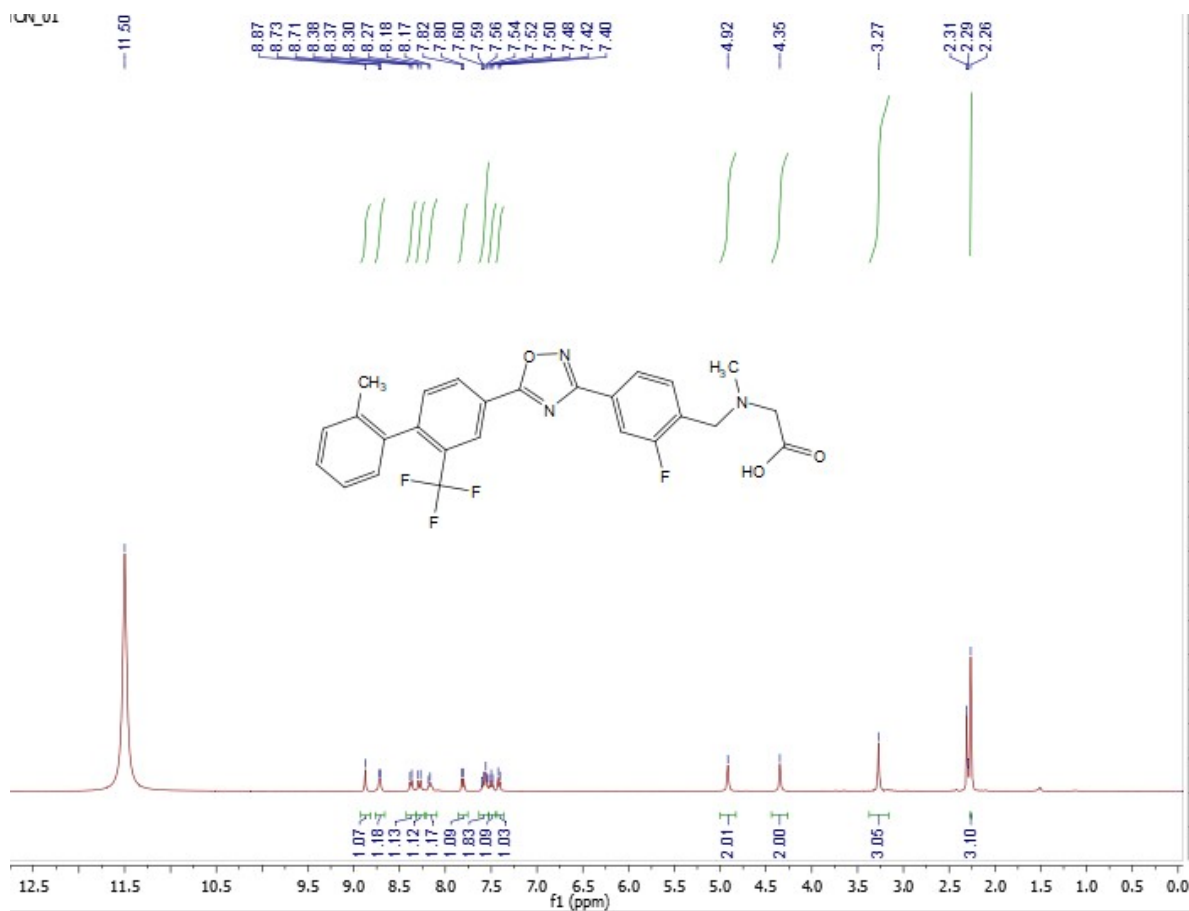
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Electronic Supplementary Information

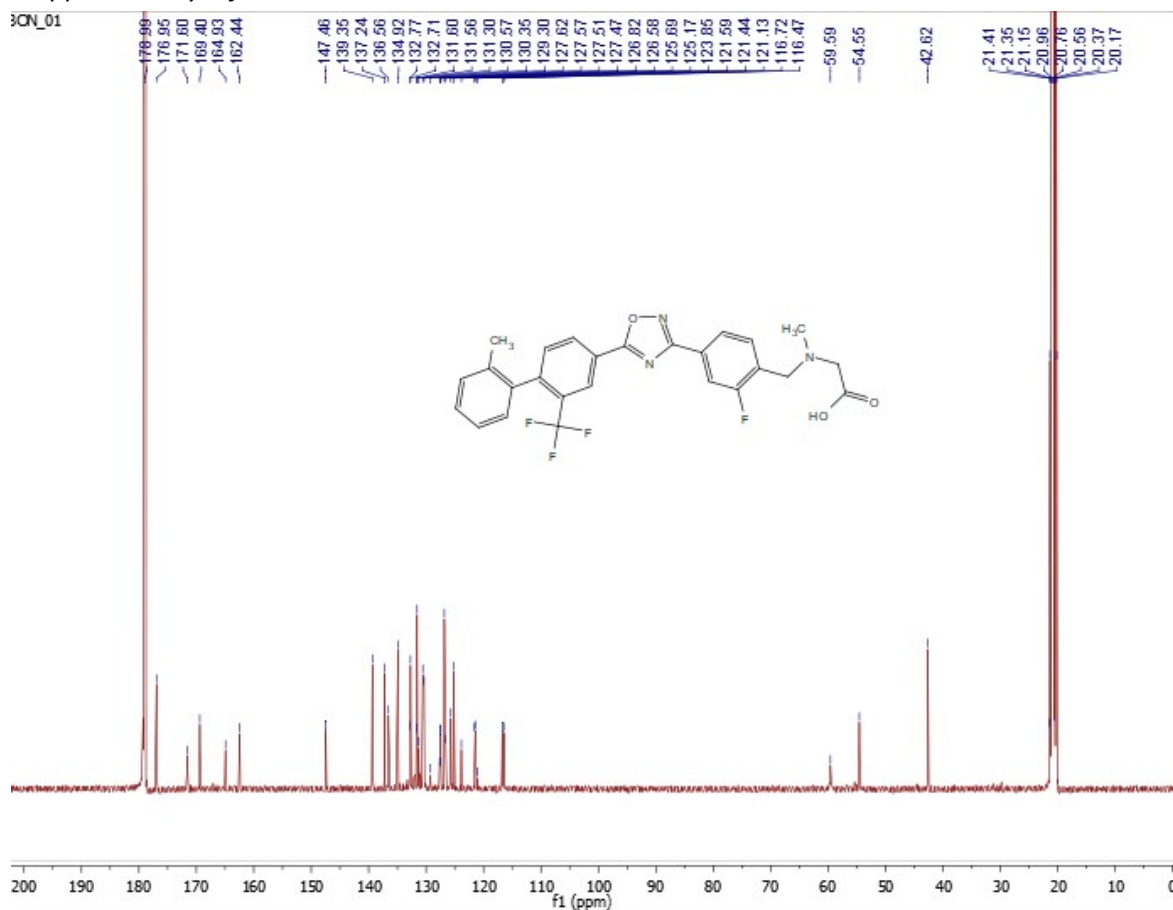
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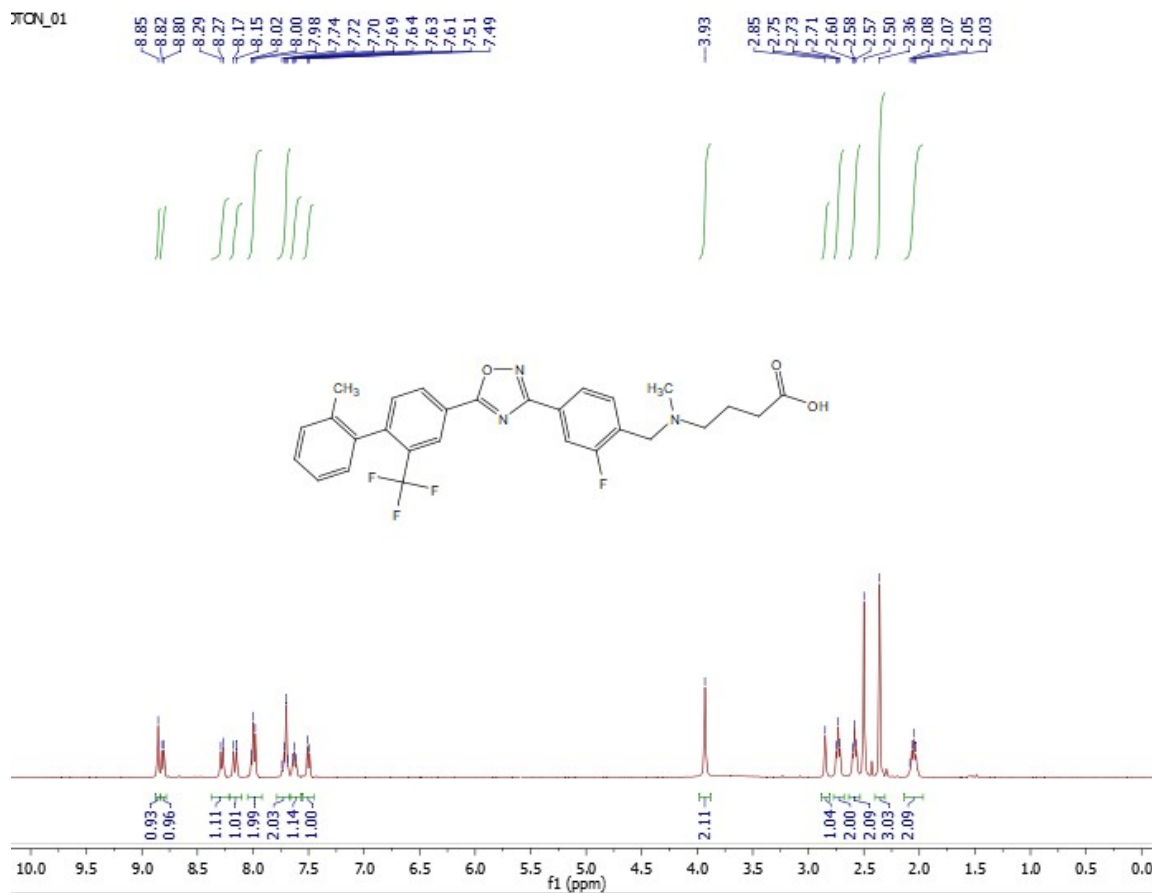
¹H NMR and ¹³C NMR of 7b



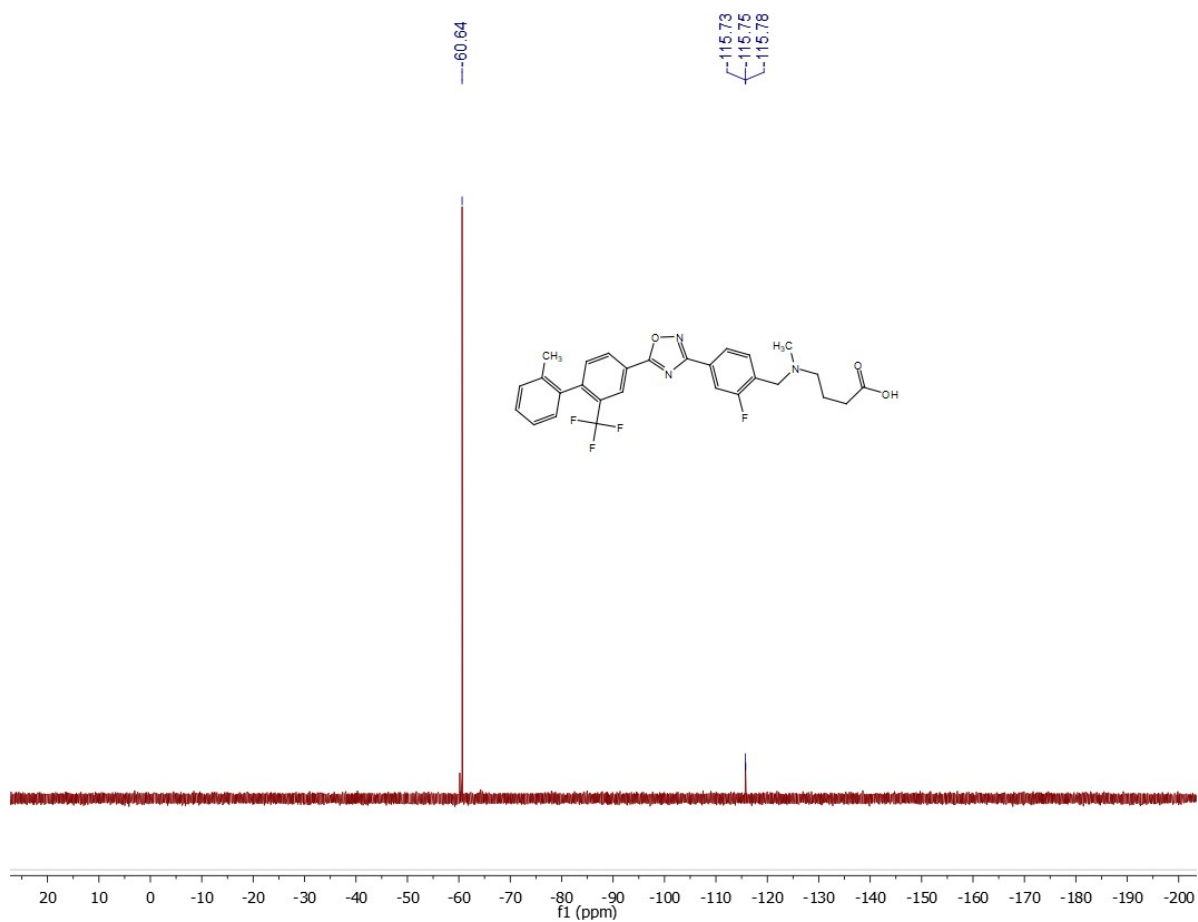
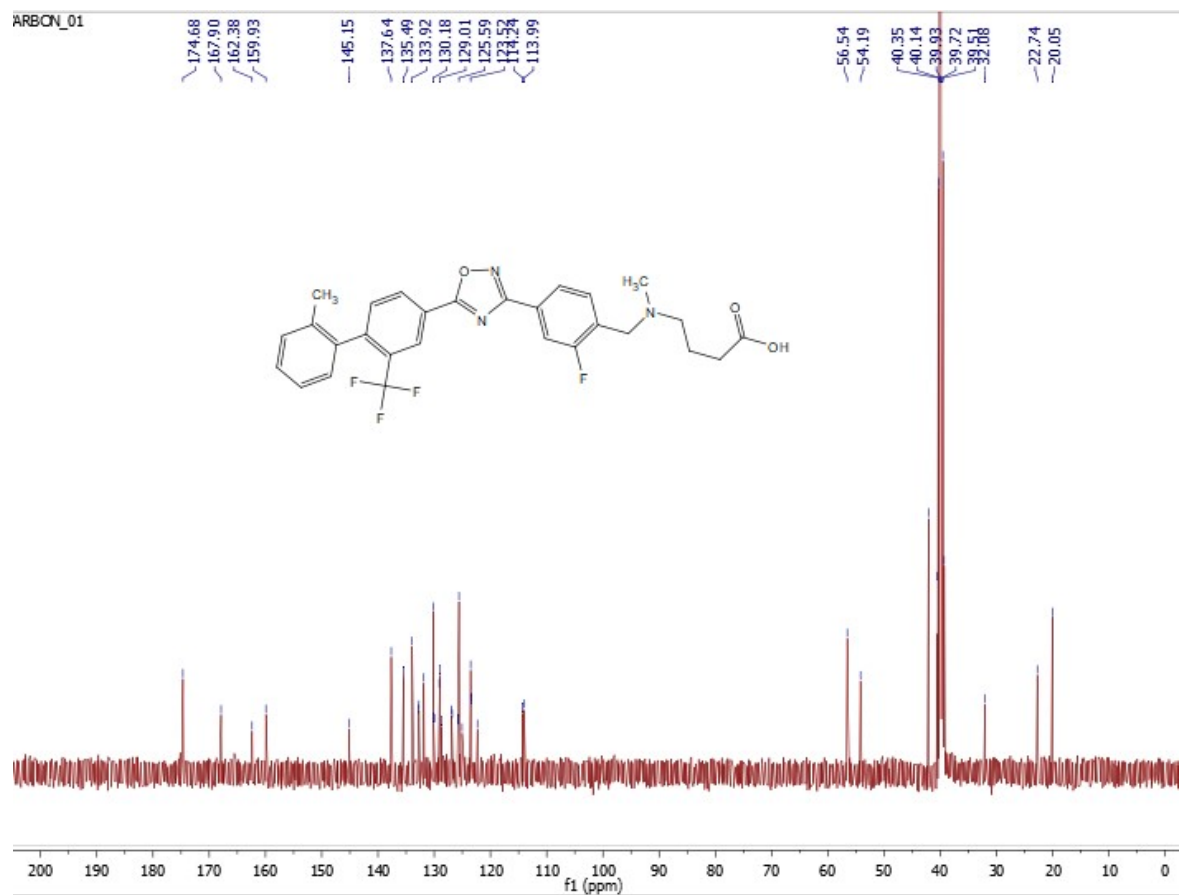
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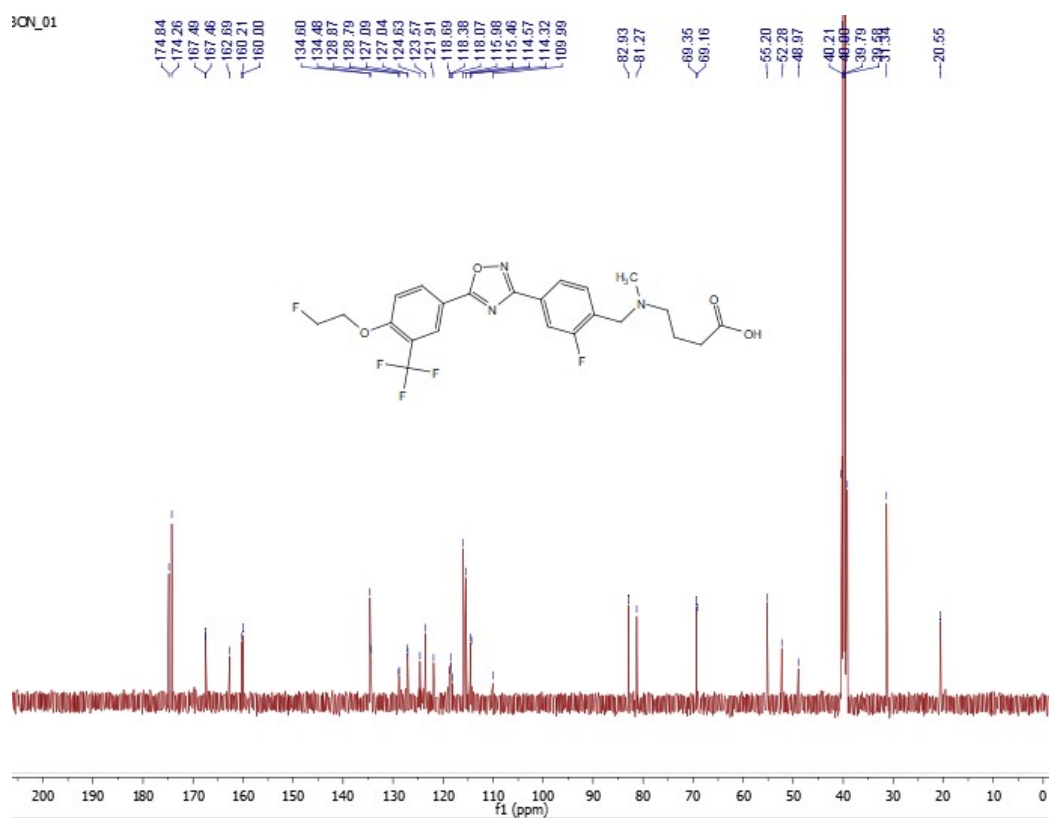
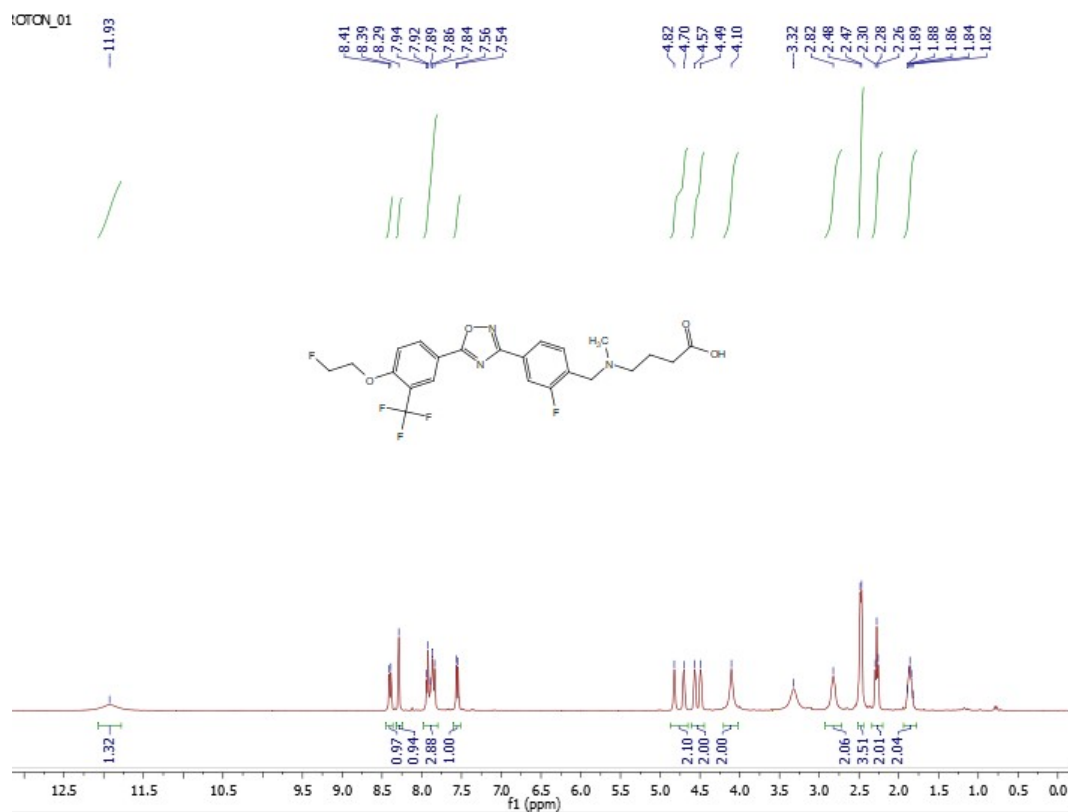
^1H NMR and ^{13}C NMR of 7c



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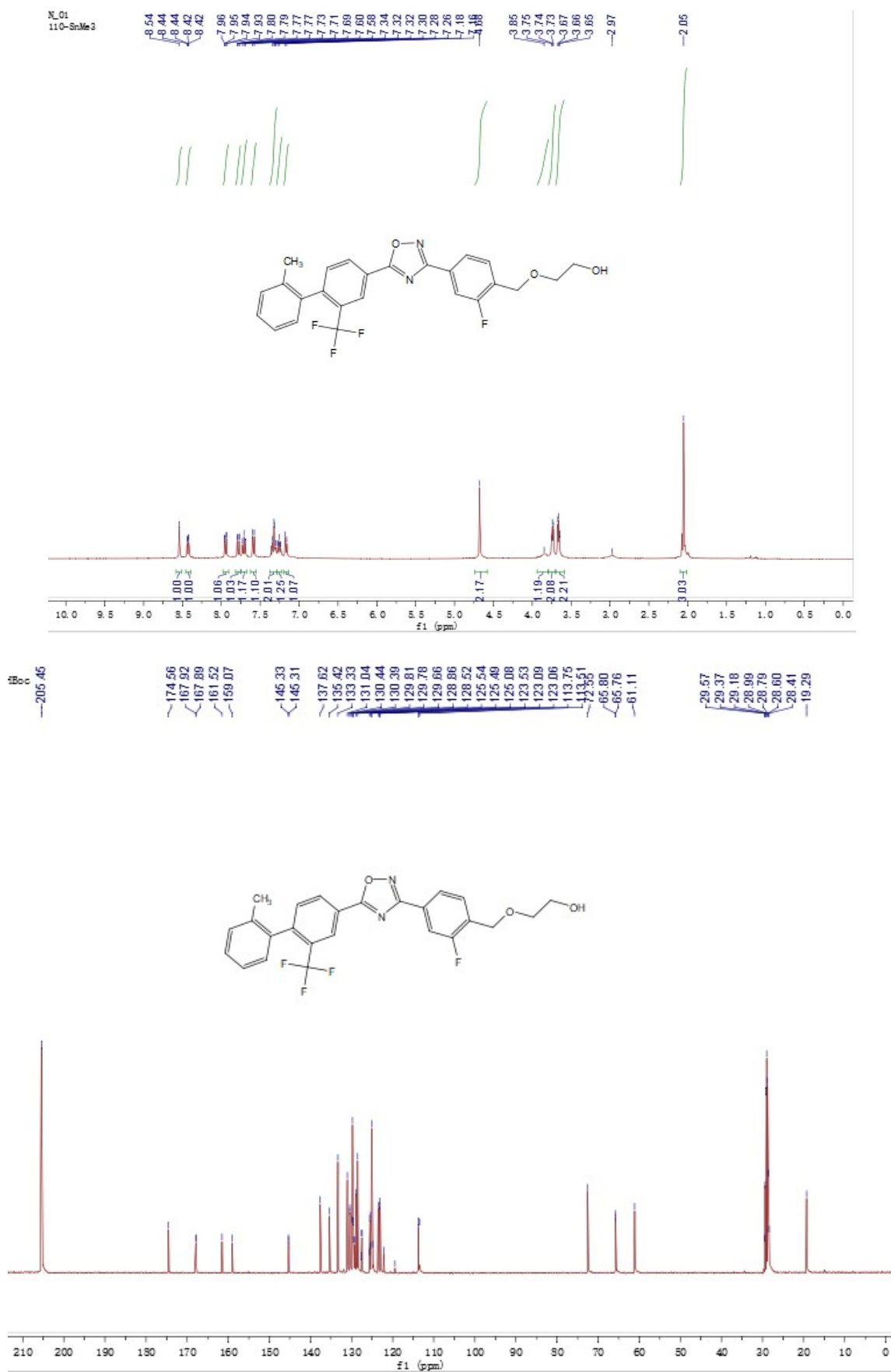


^1H NMR, ^{13}C NMR, and ^{19}F NMR of **7d**



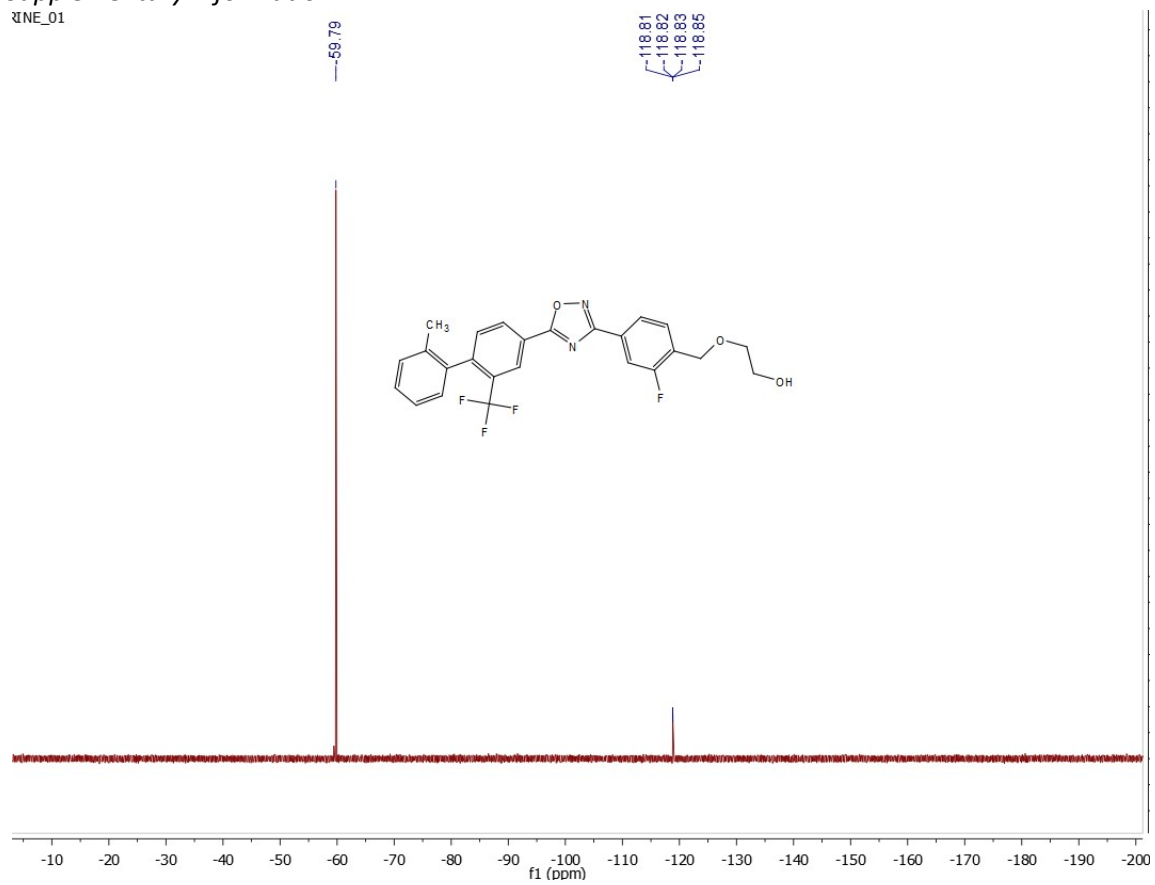
¹H NMR and ¹³C NMR of 7e

Electronic Supplementary Information



Electronic Supplementary Information

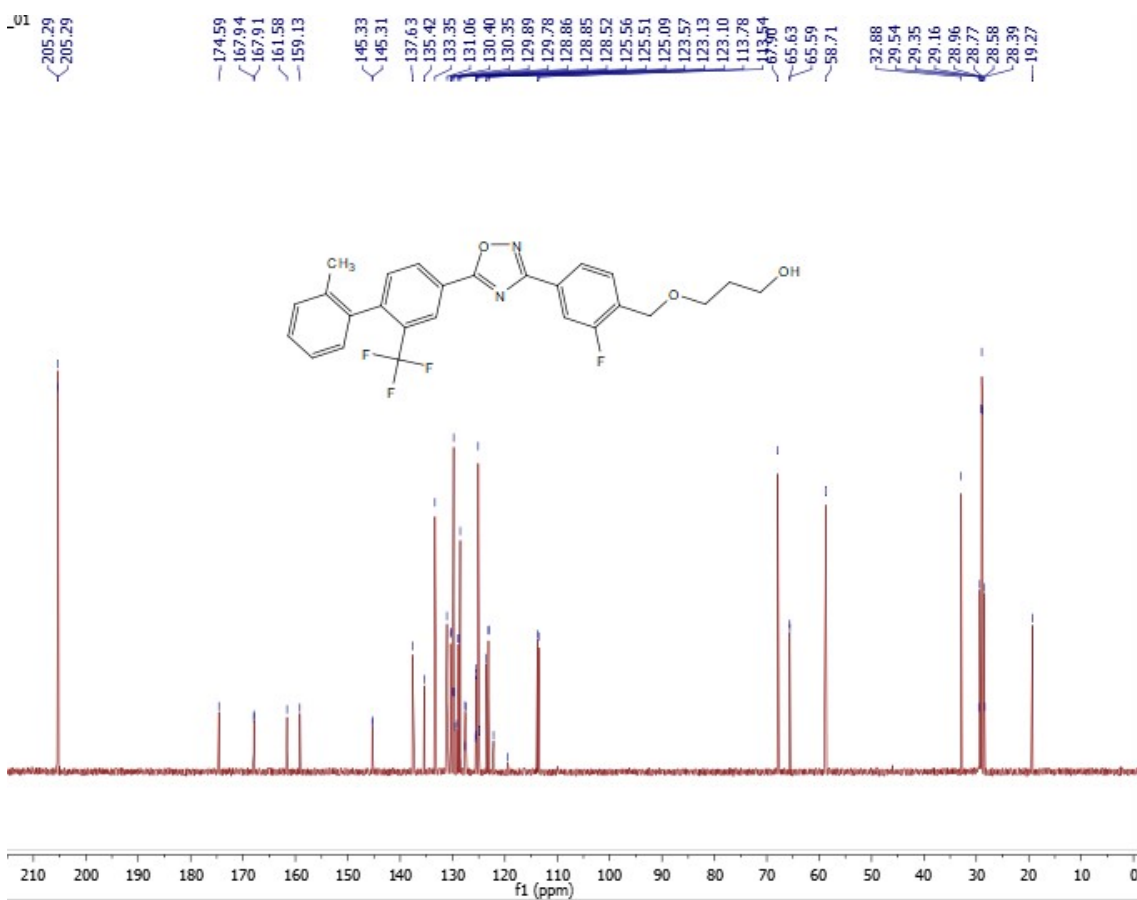
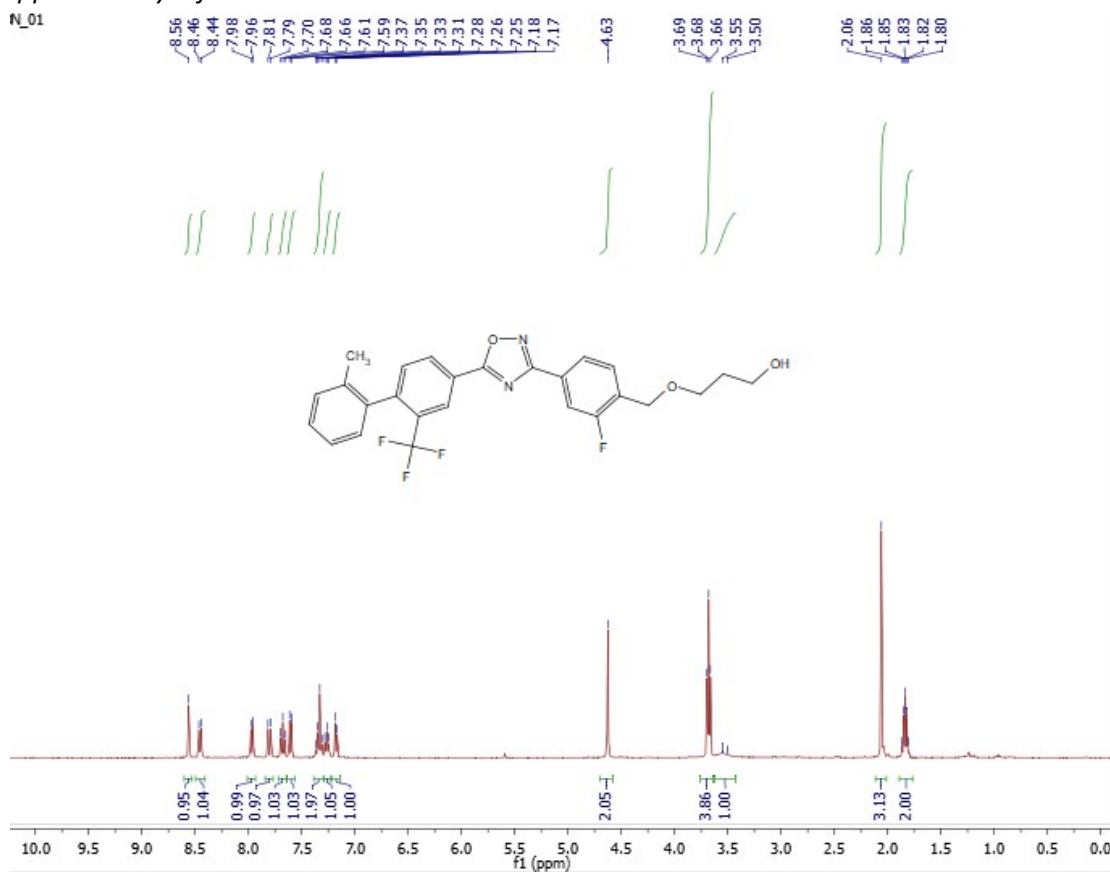
7NE_01



^1H NMR, ^{13}C NMR, and ^{19}F NMR of **9a**

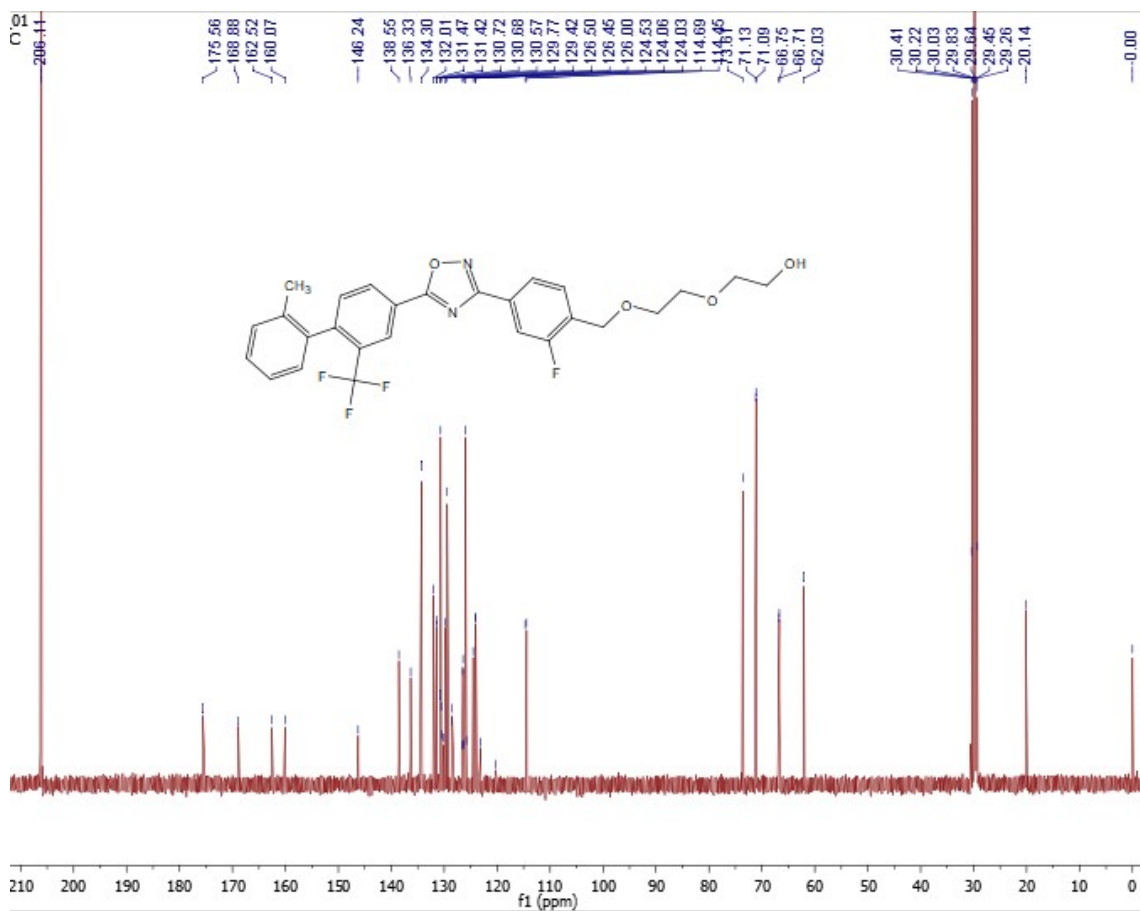
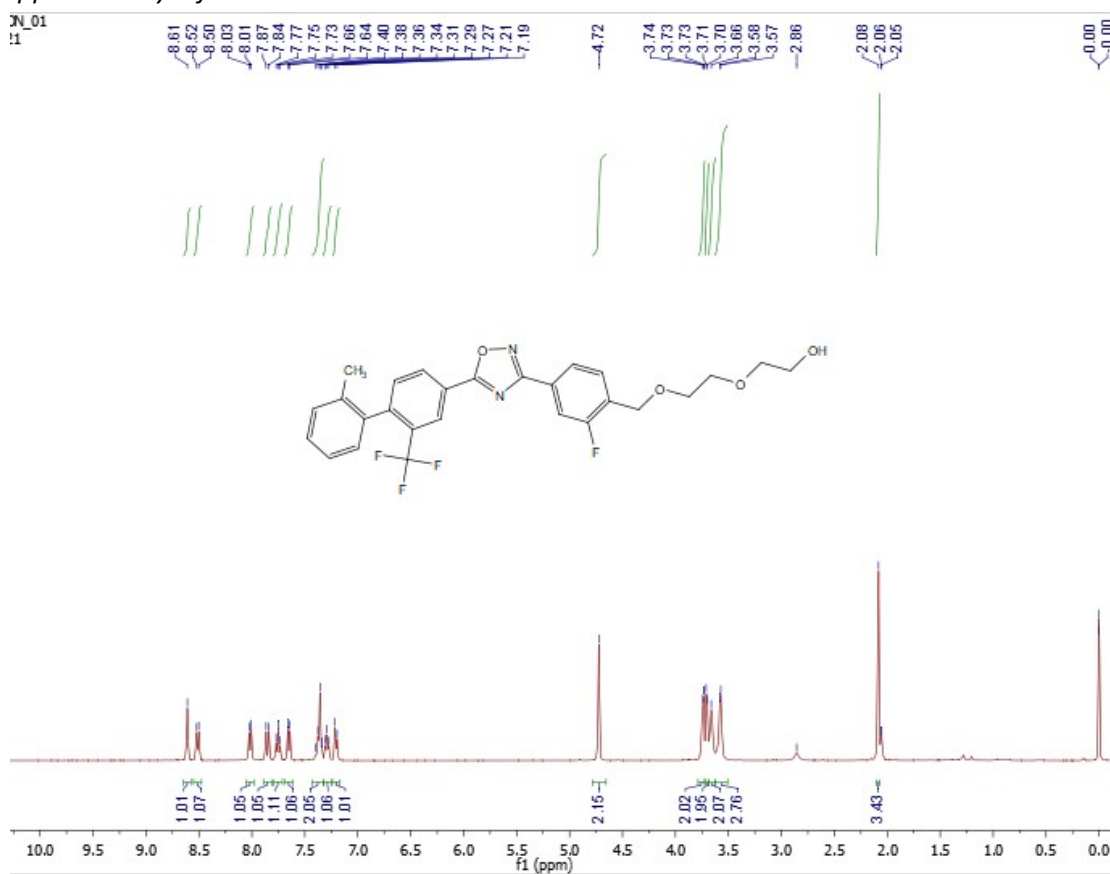
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N_01



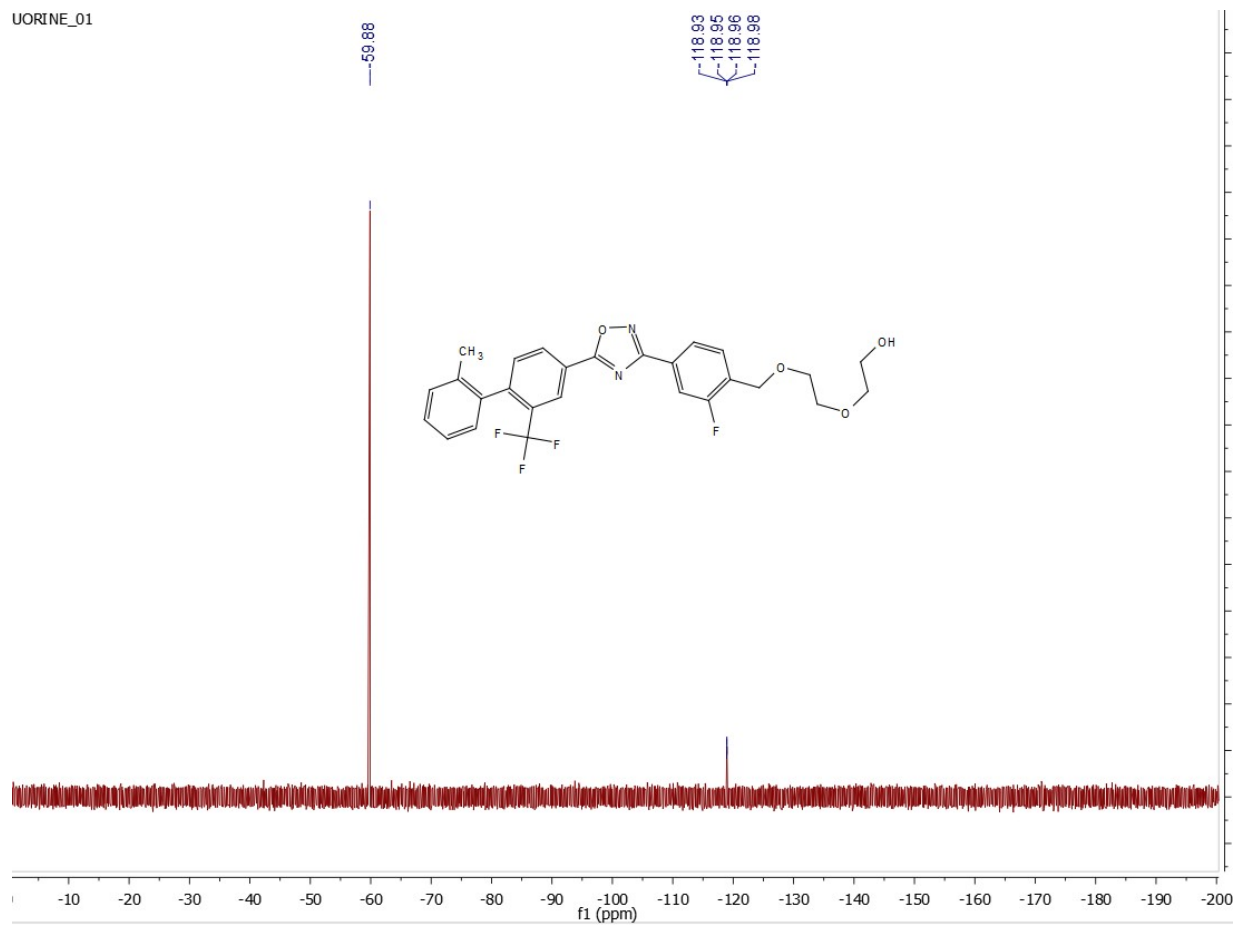
¹H NMR and ¹³C NMR of **9b**

Electronic Supplementary Information



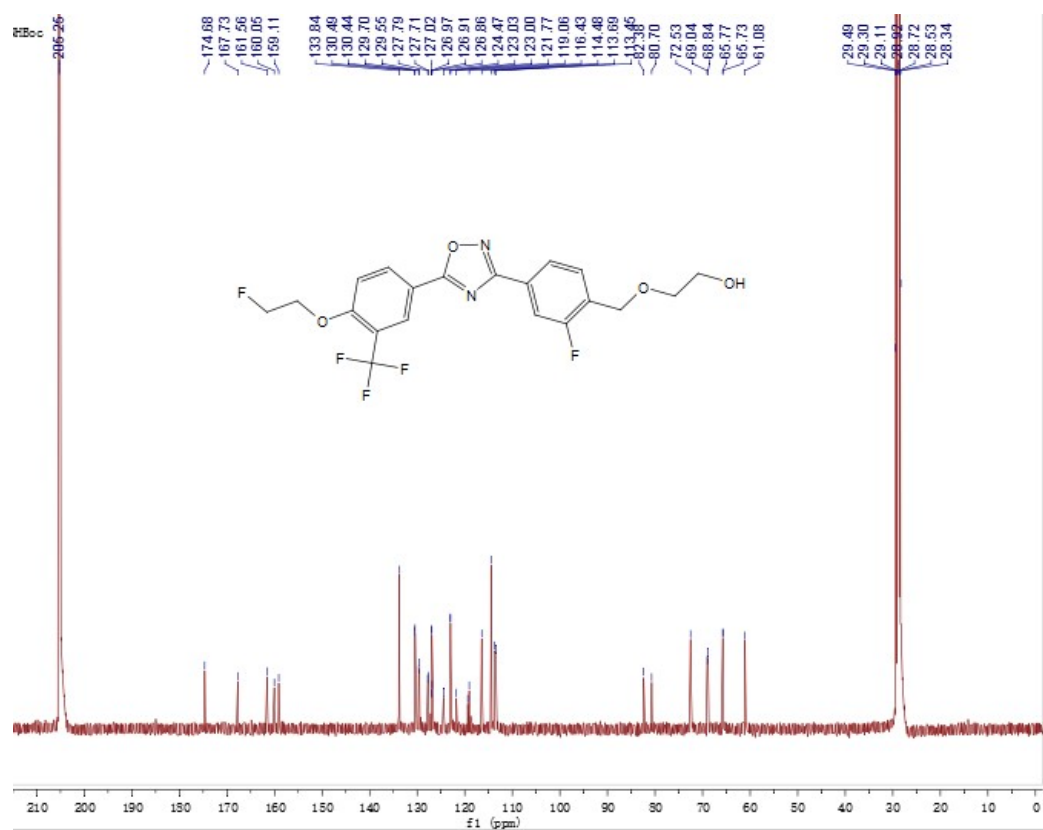
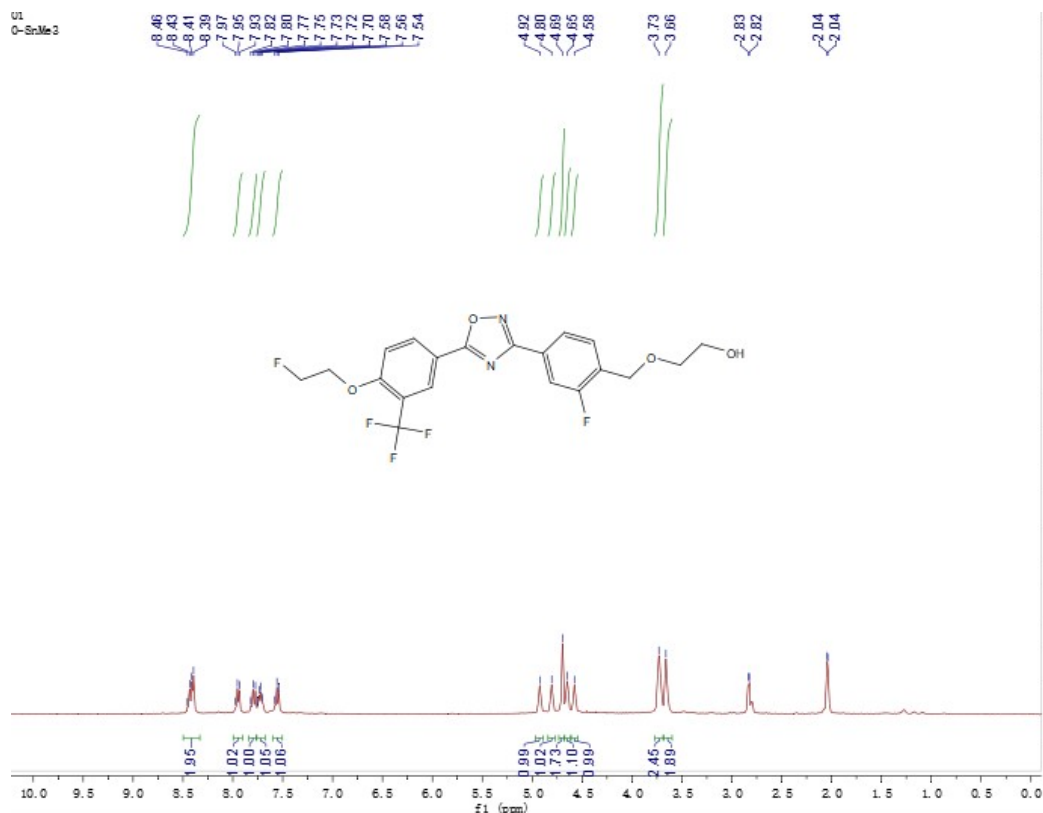
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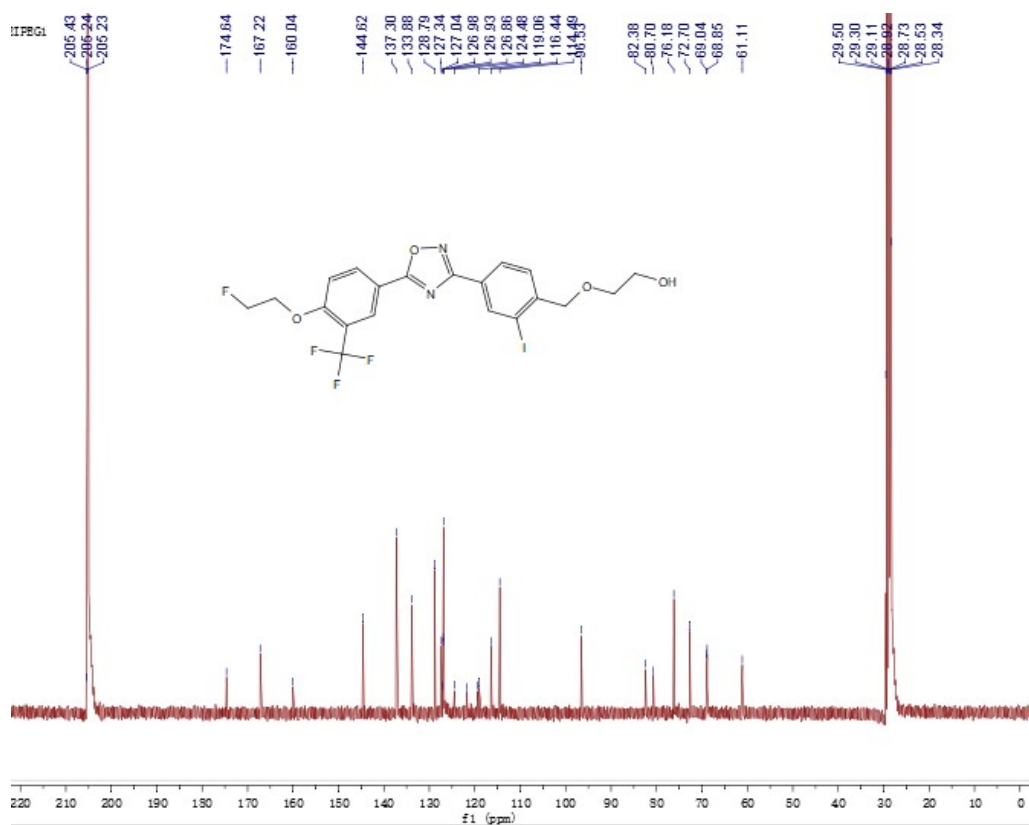
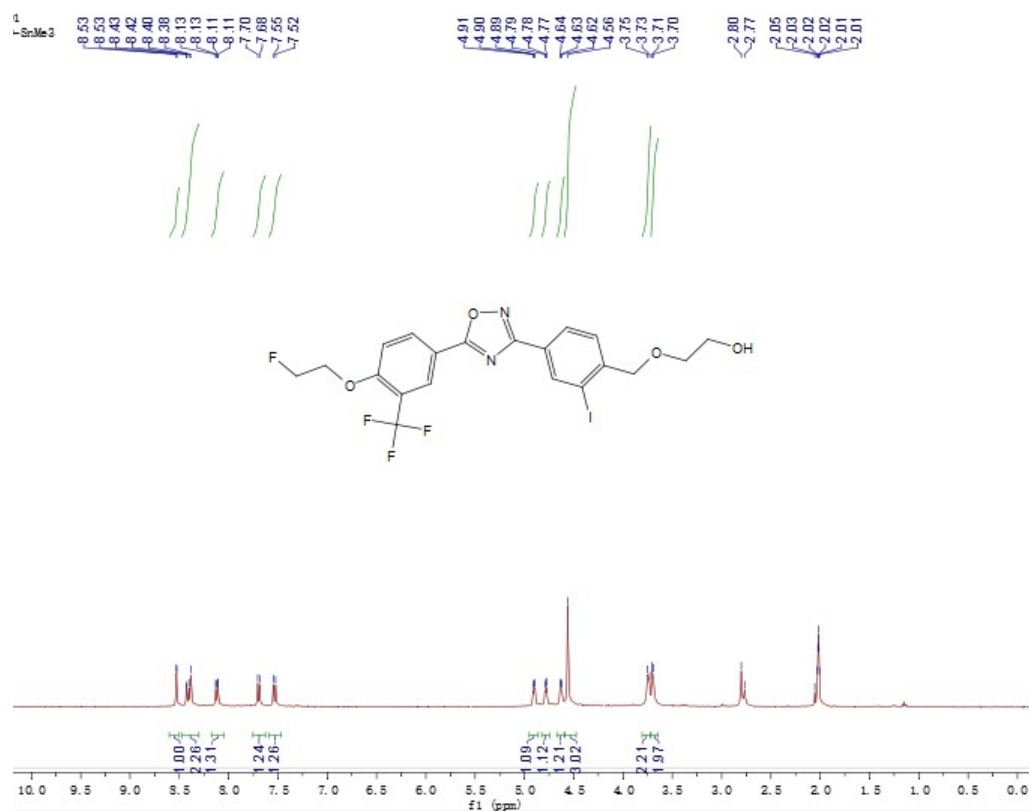
^1H NMR, ^{13}C NMR, and ^{19}F NMR of **9c**

Electronic Supplementary Information



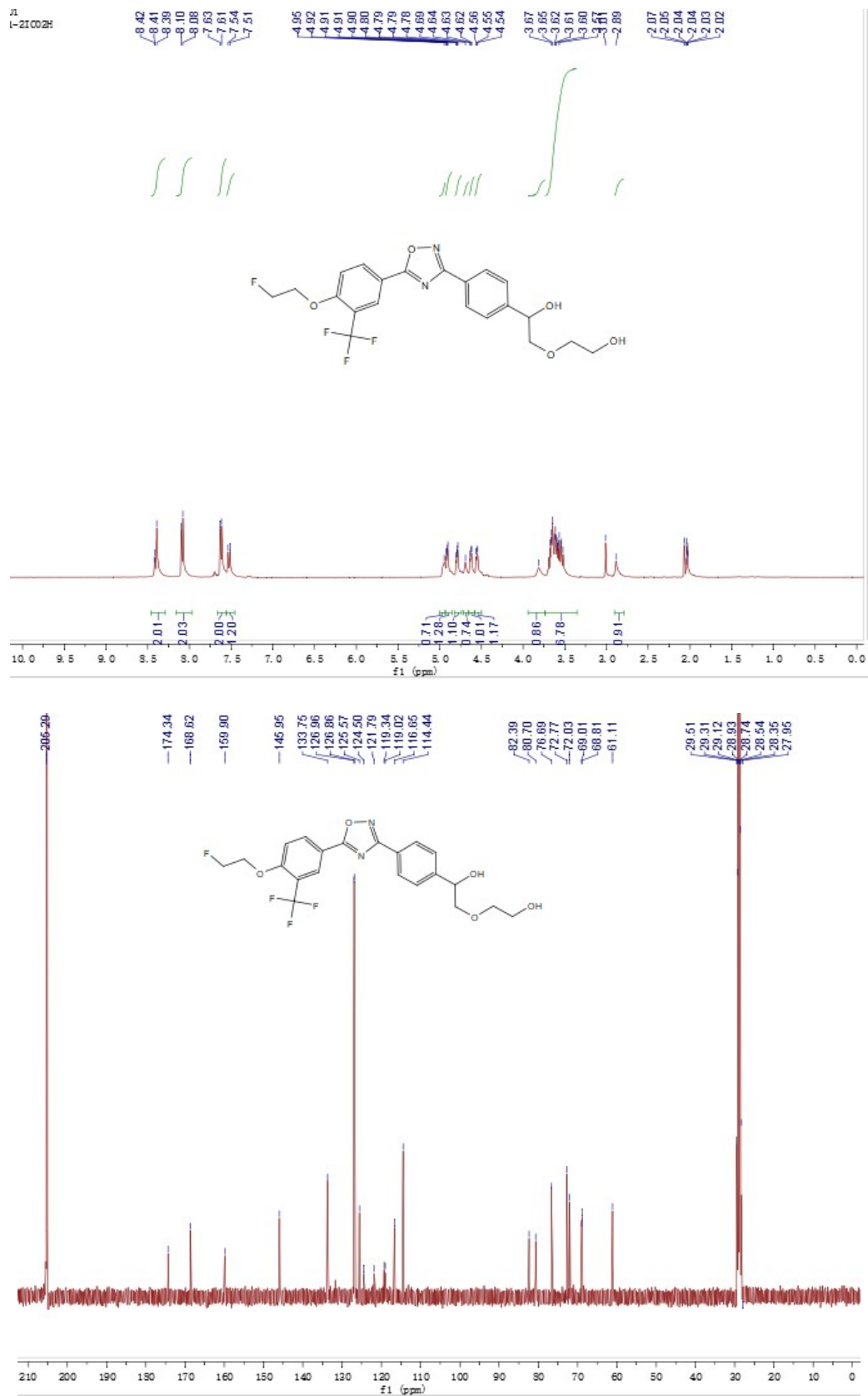
¹H NMR and ¹³C NMR of **9d**

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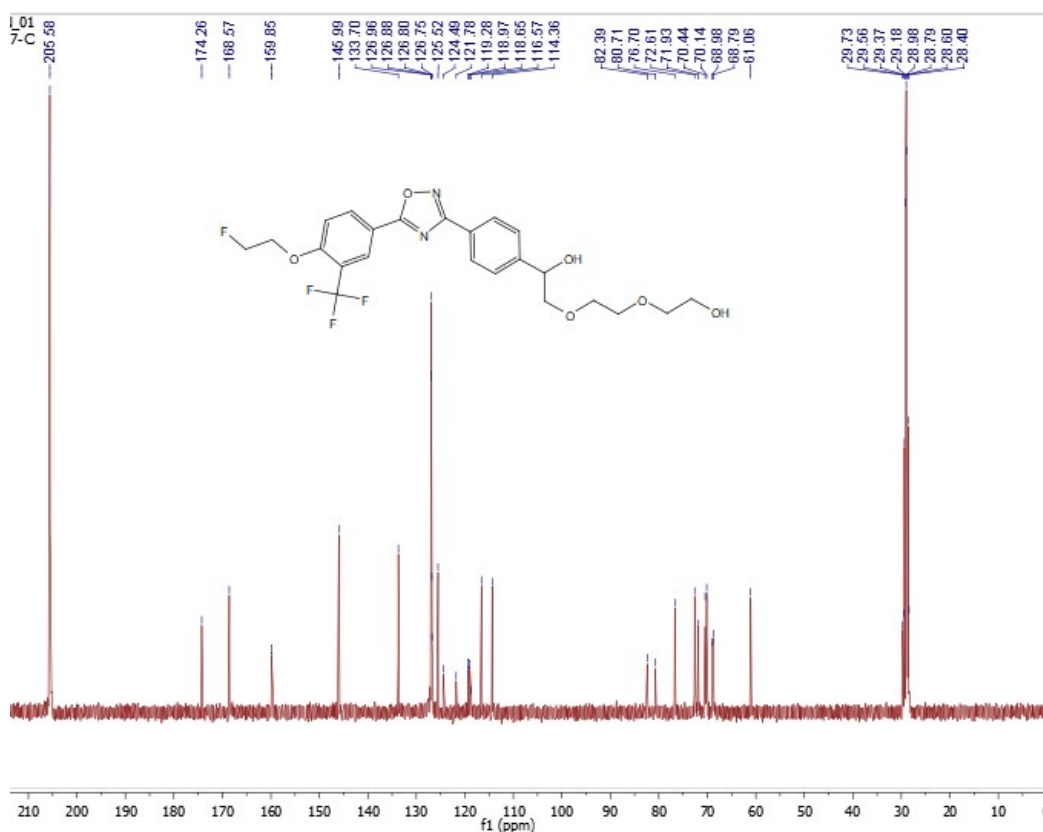
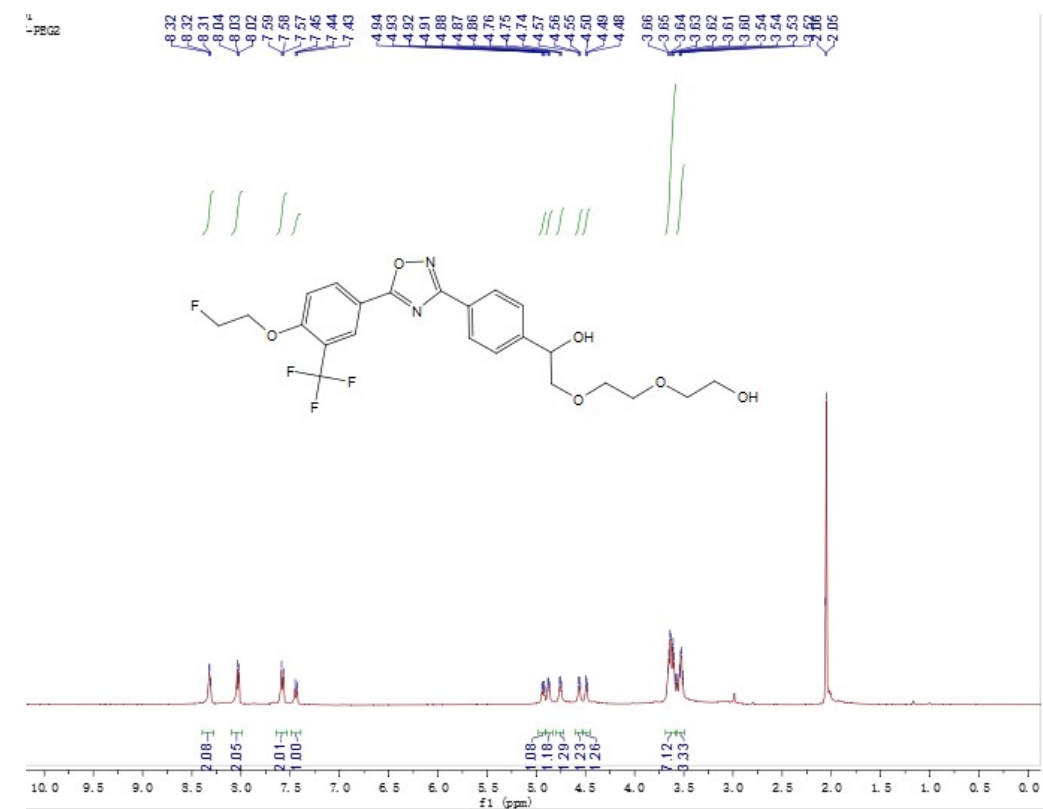
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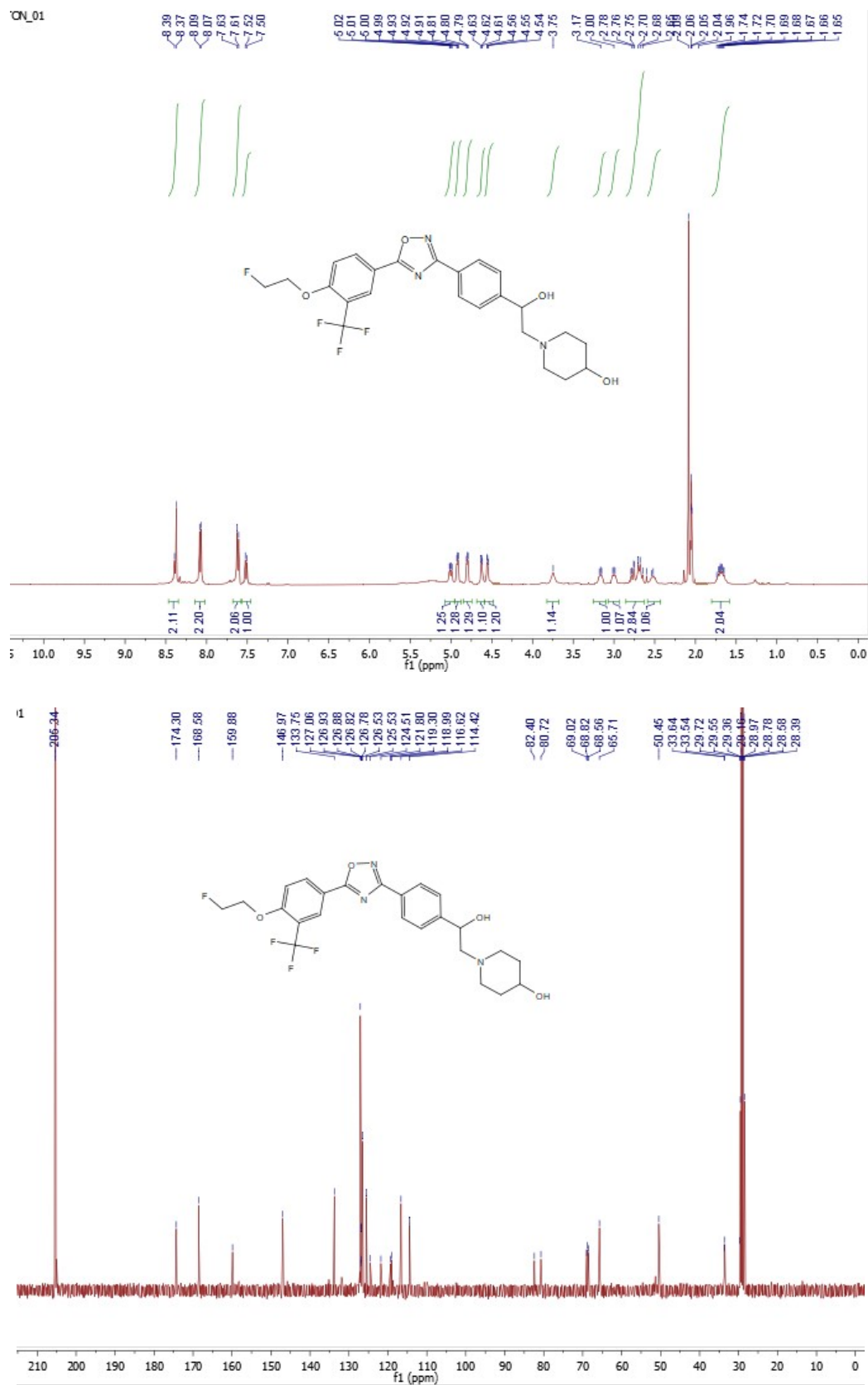
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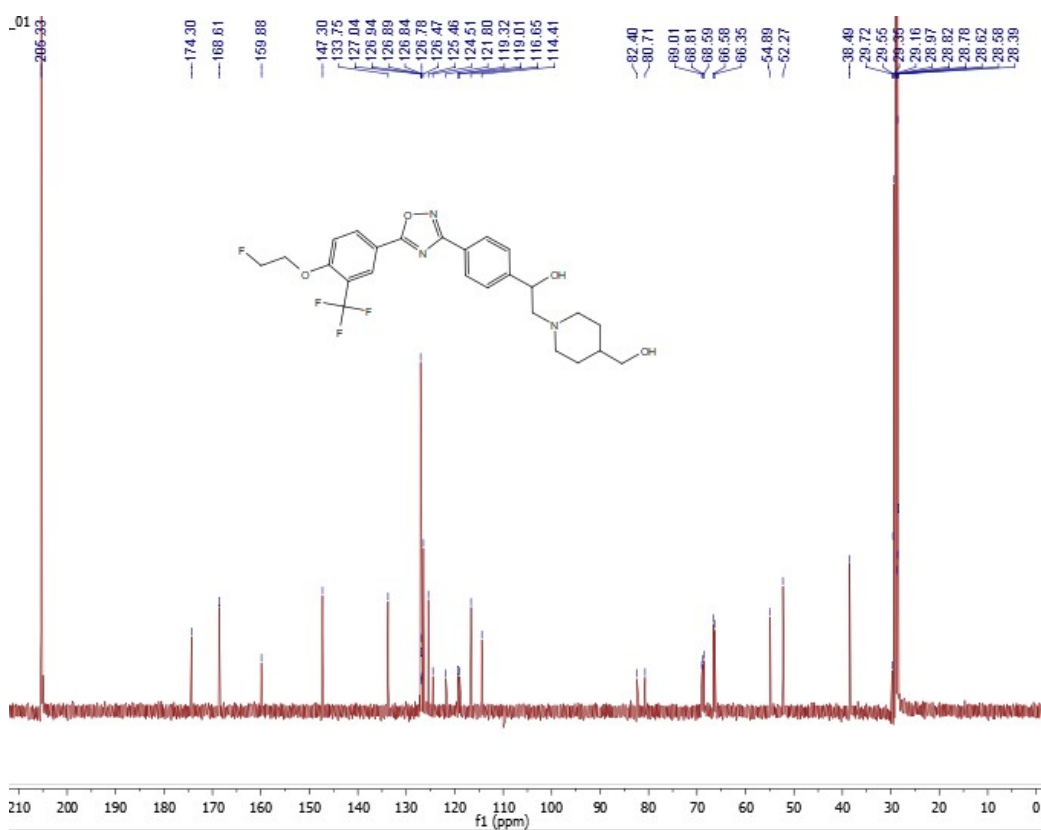
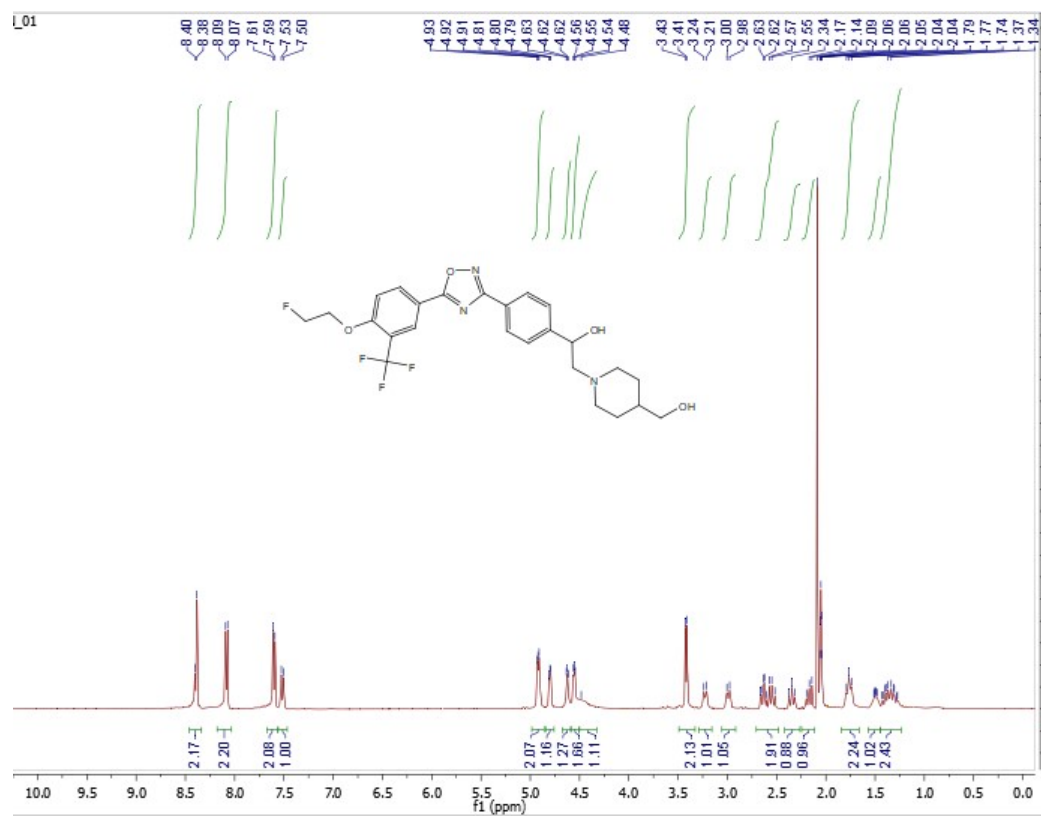


¹H NMR and ¹³C NMR of 9g

Electronic Supplementary Information

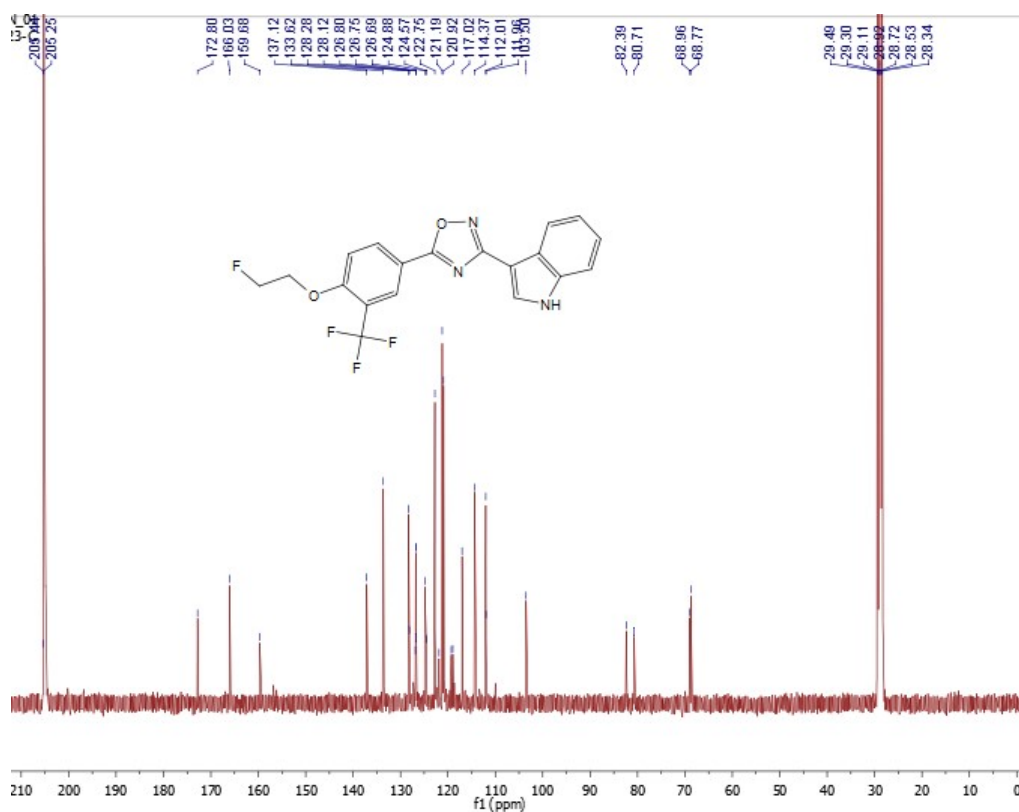
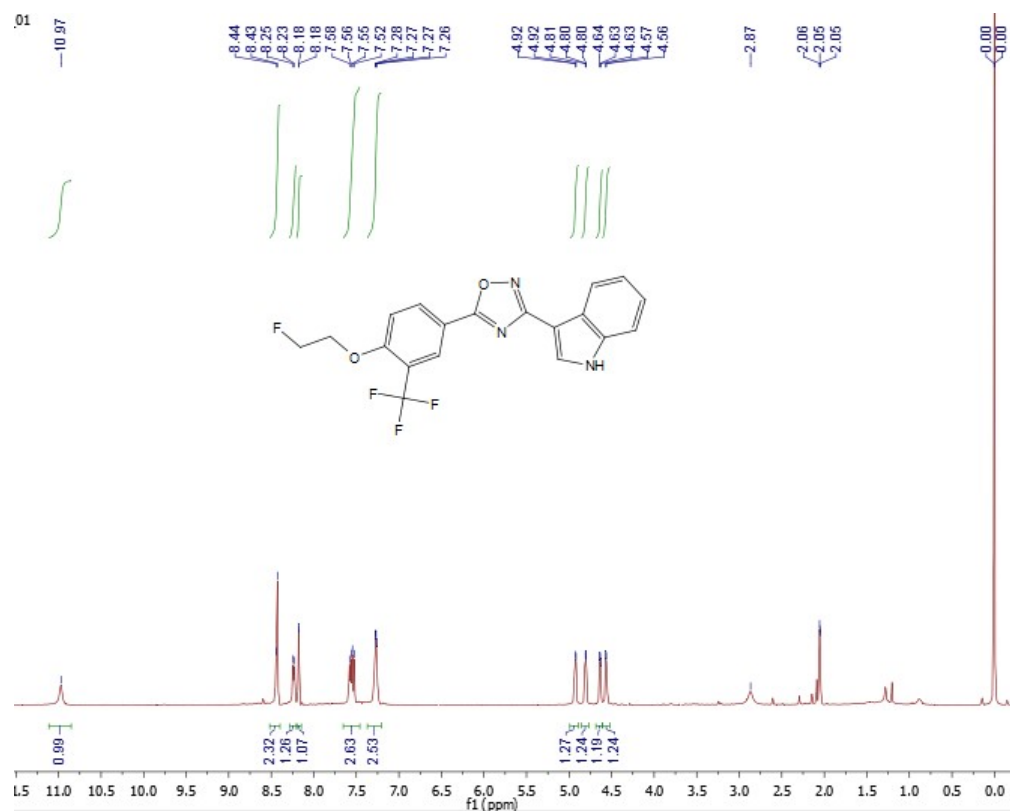


¹H NMR and ¹³C NMR of 9h



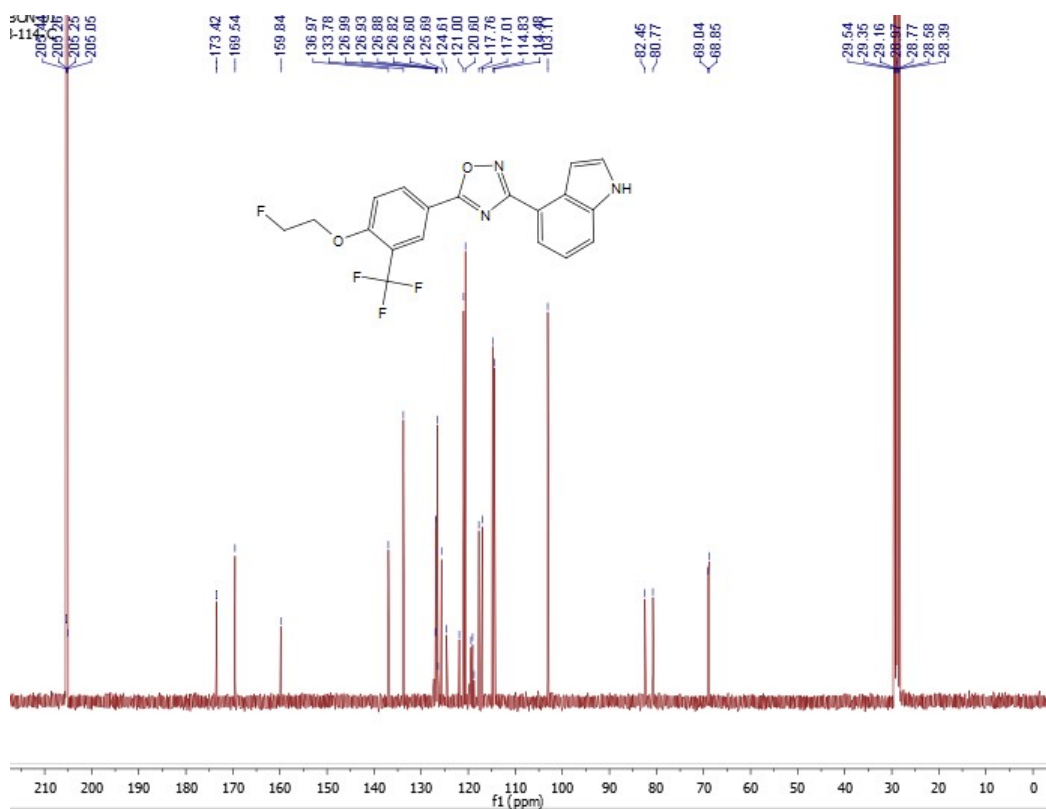
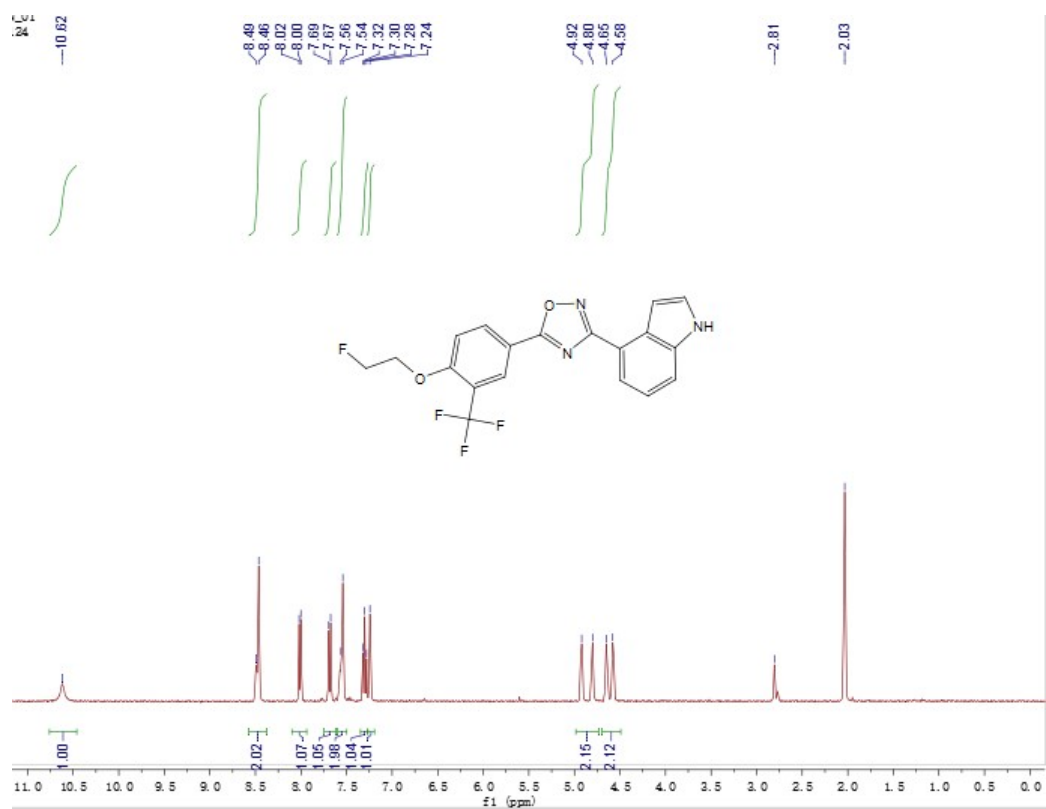
¹H NMR and ¹³C NMR of **9i**

Electronic Supplementary Information

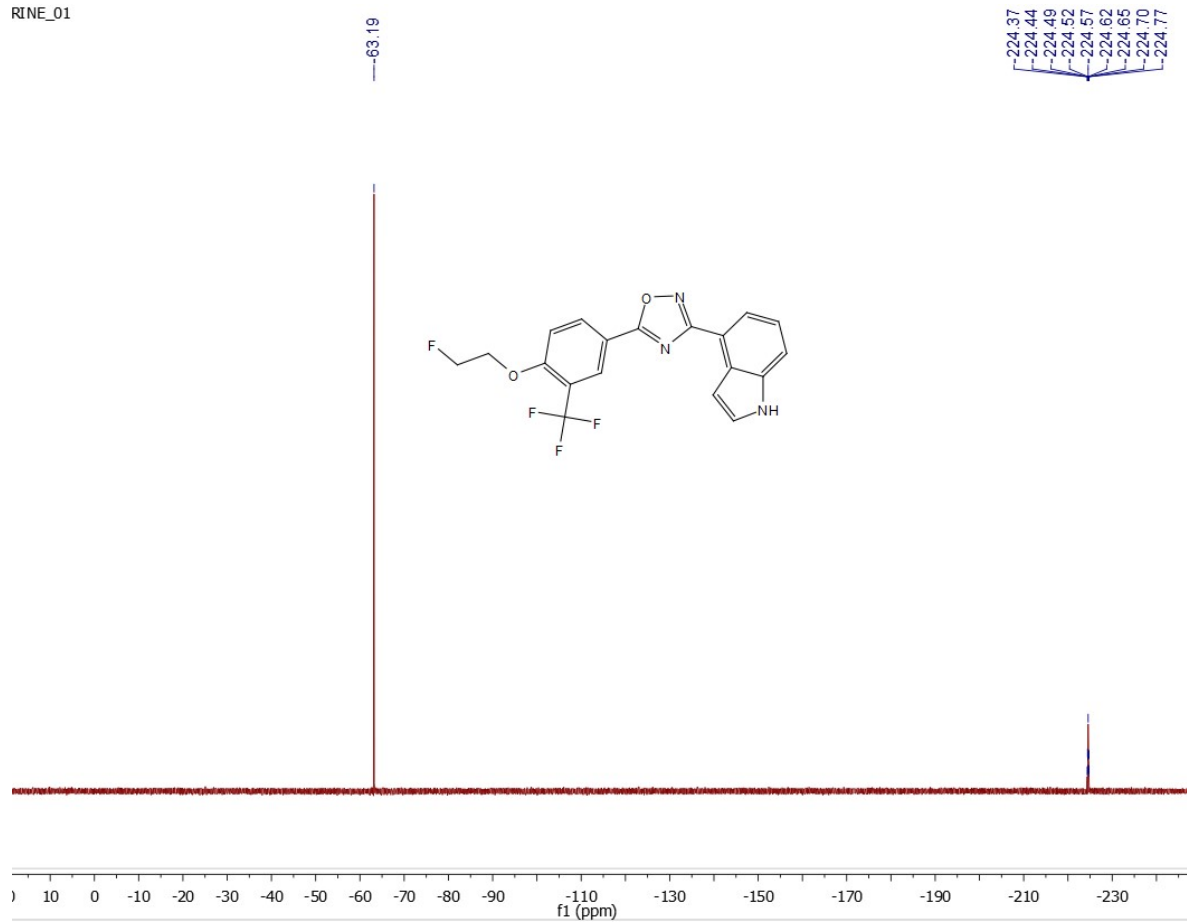


¹H NMR and ¹³C NMR of 12a

Electronic Supplementary Information

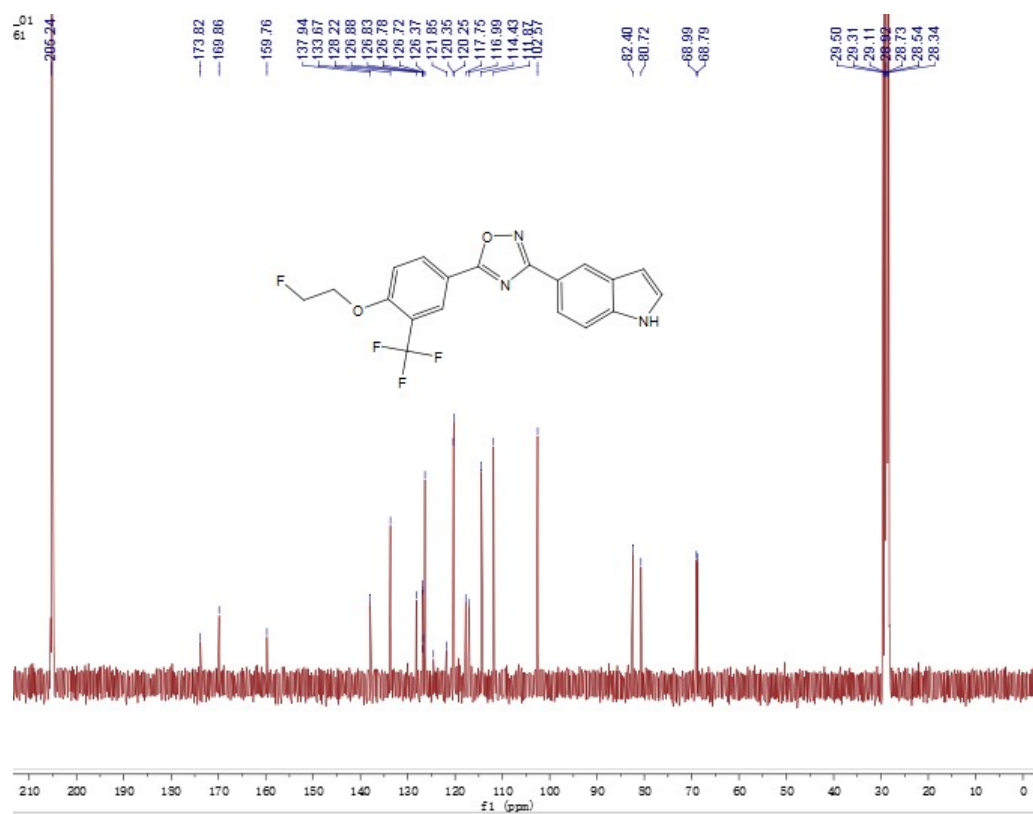
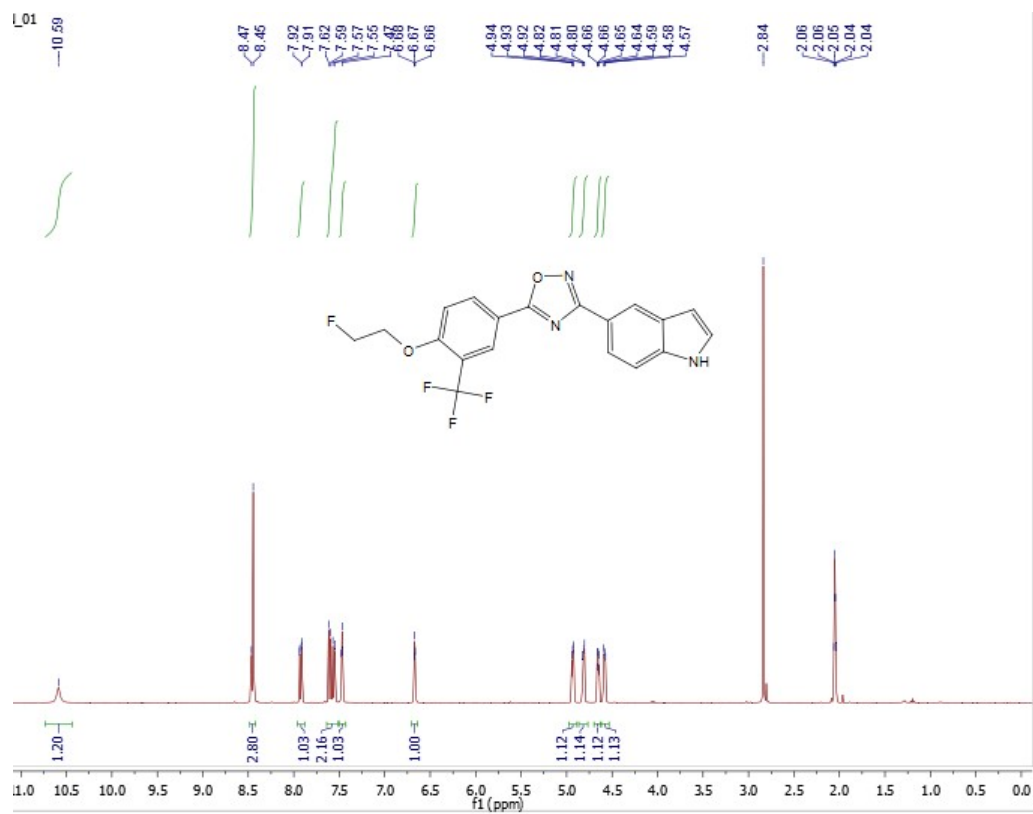


RINE_01



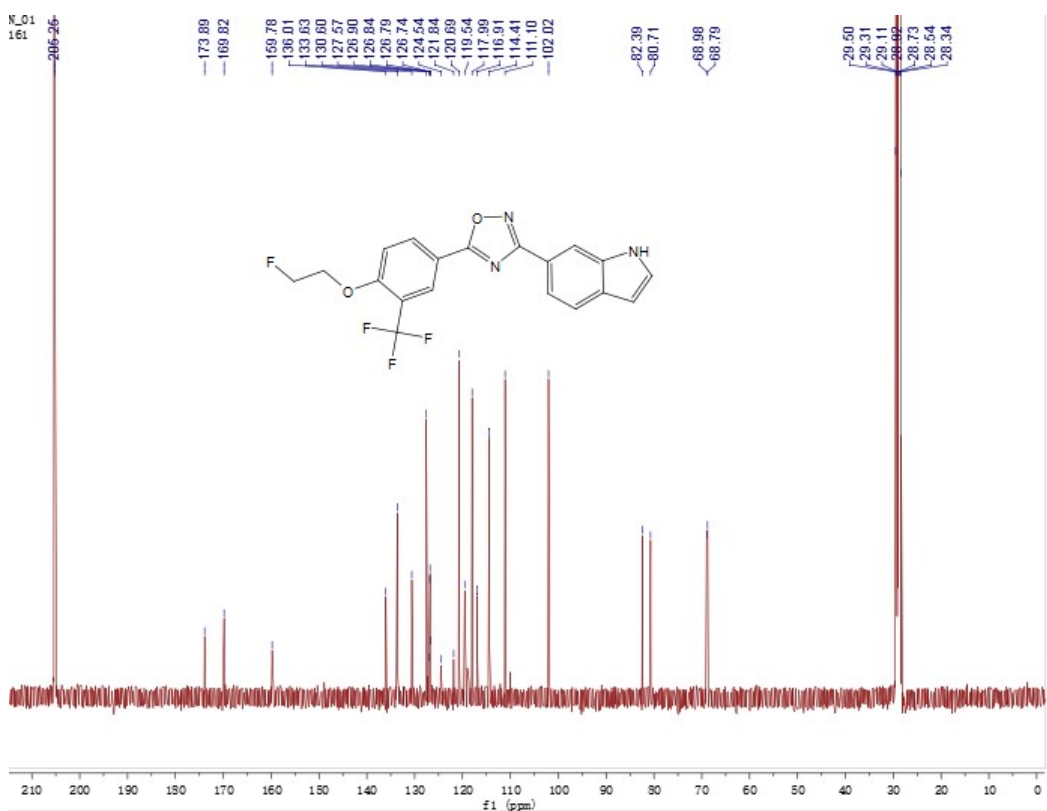
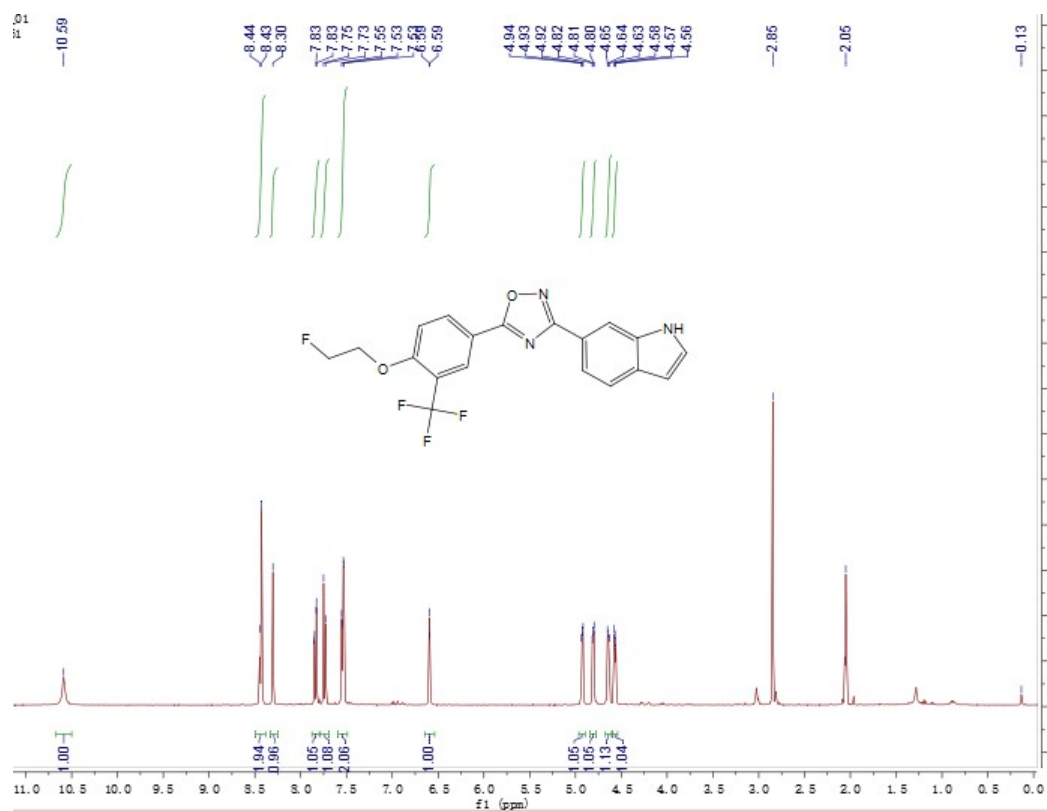
¹H NMR, ¹³C NMR, and ¹⁹F NMR of **12b**

Electronic Supplementary Information



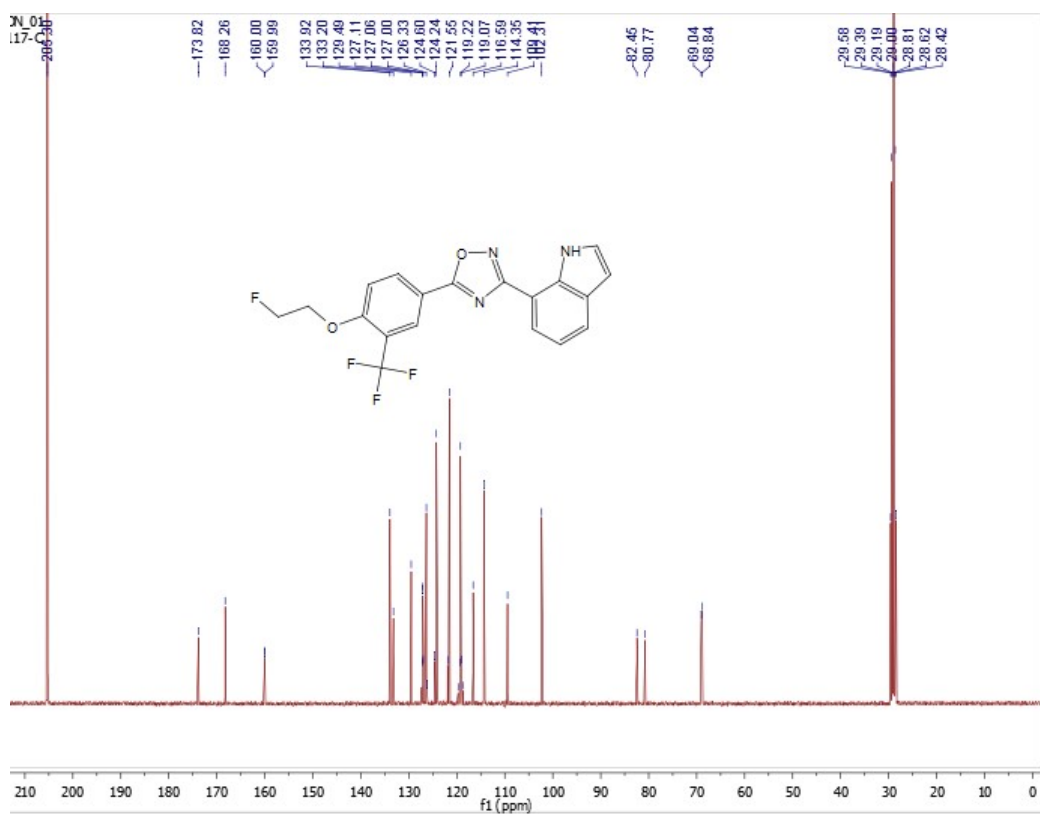
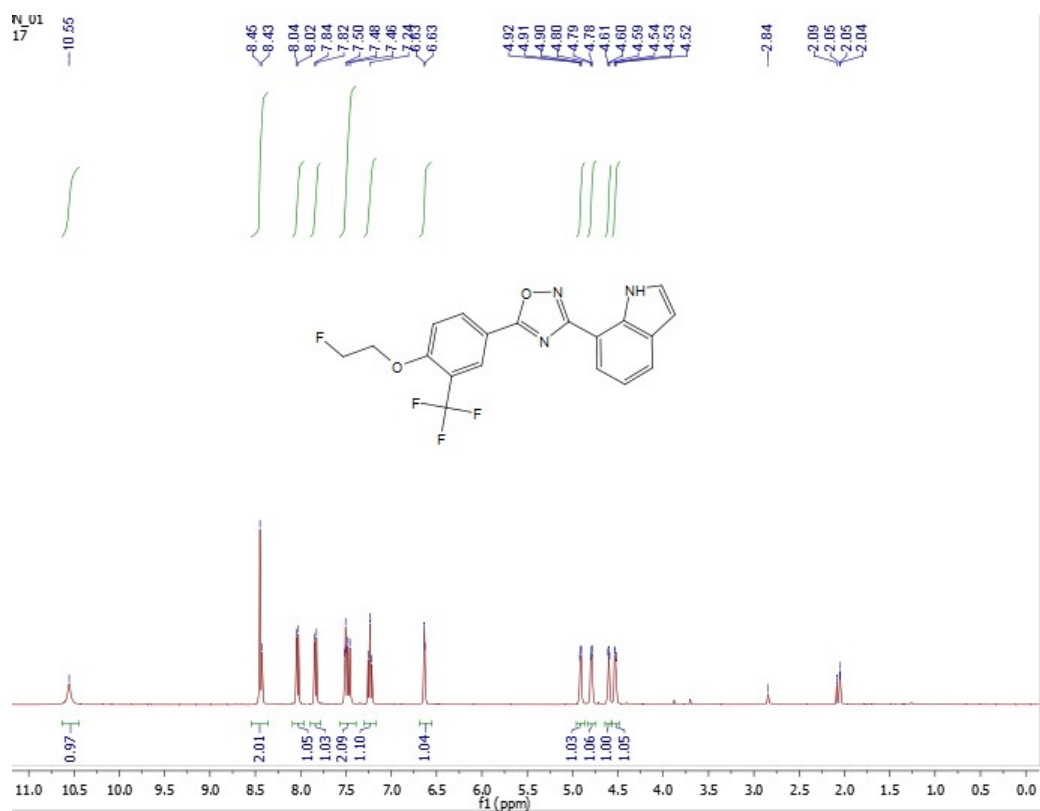
¹H NMR and ¹³C NMR of 12c

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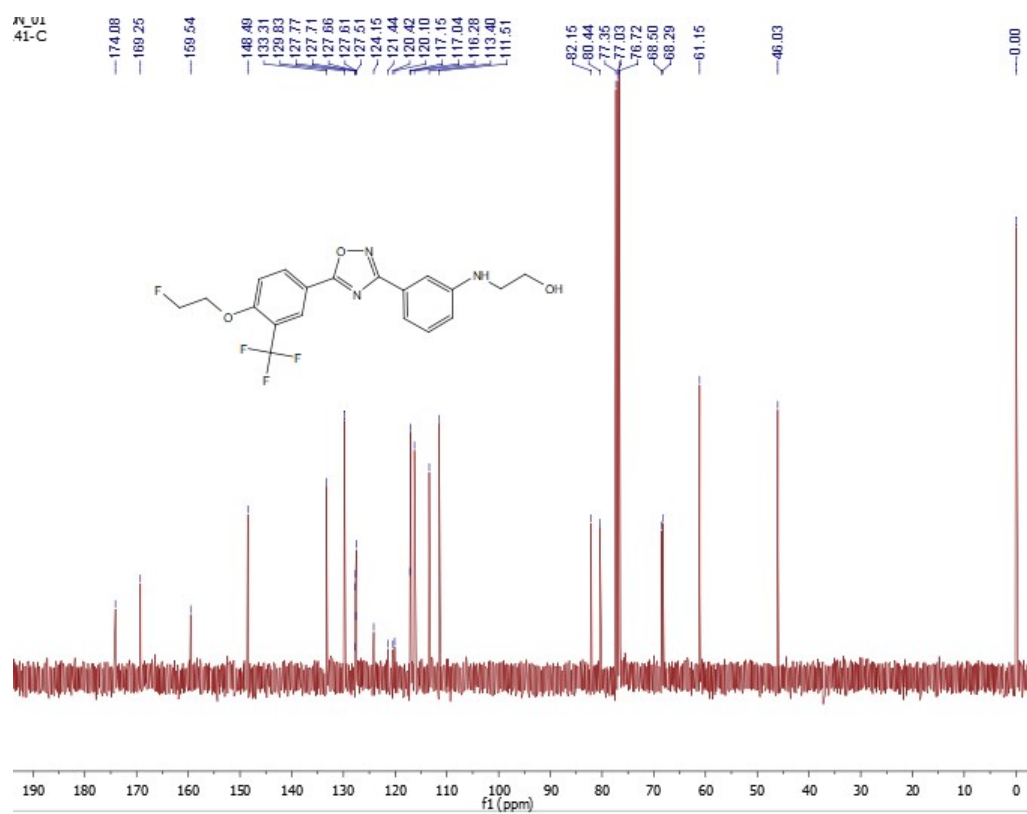
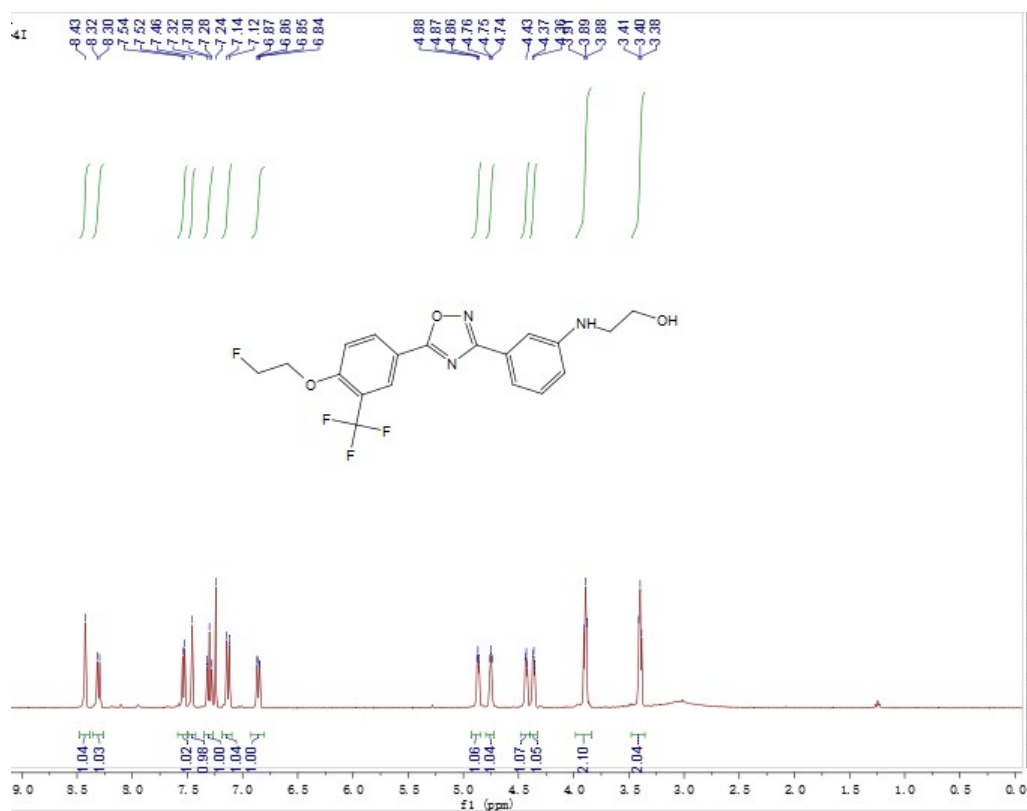
¹H NMR and ¹³C NMR of **12d**

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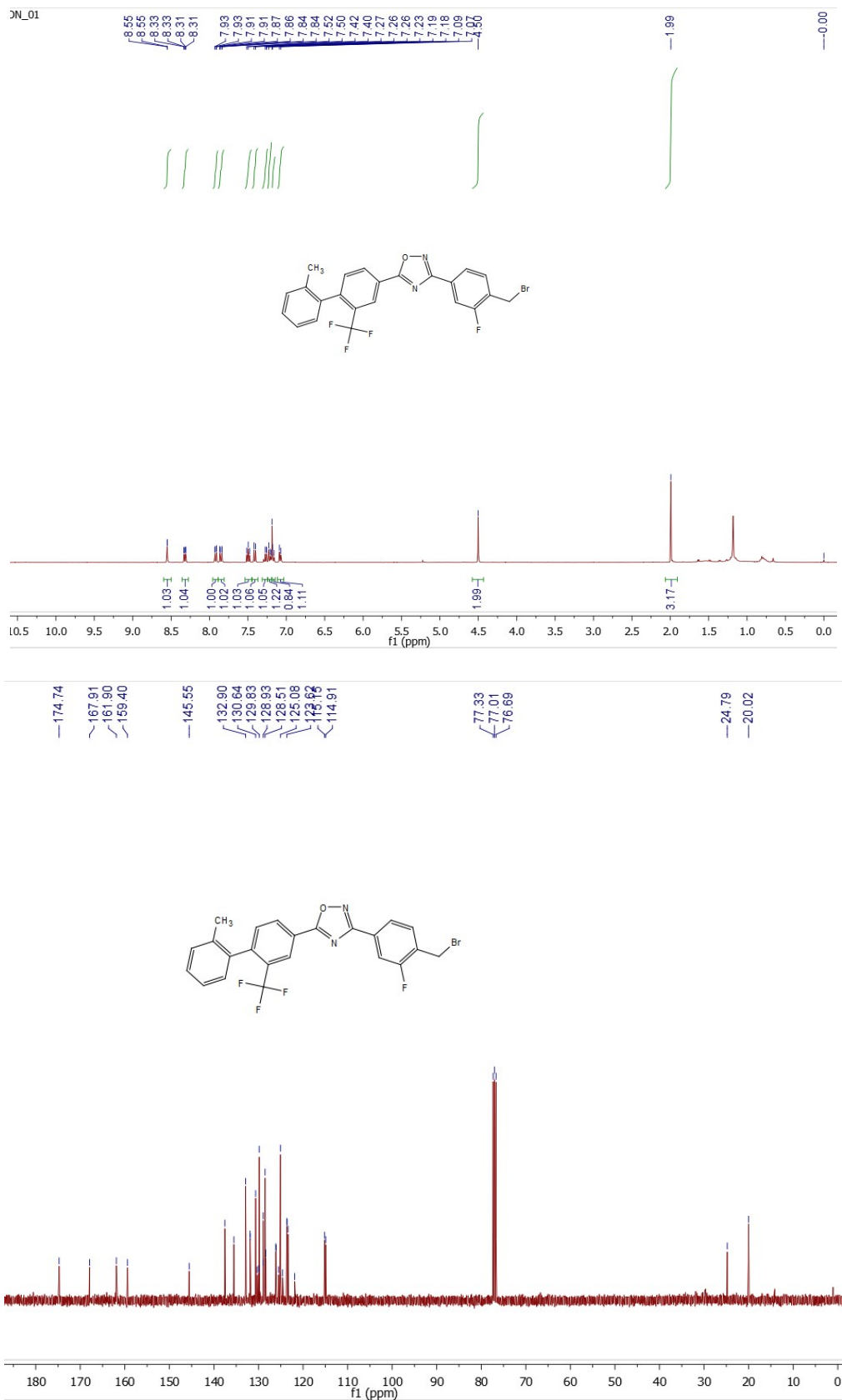
¹H NMR and ¹³C NMR of 12e

Electronic Supplementary Information



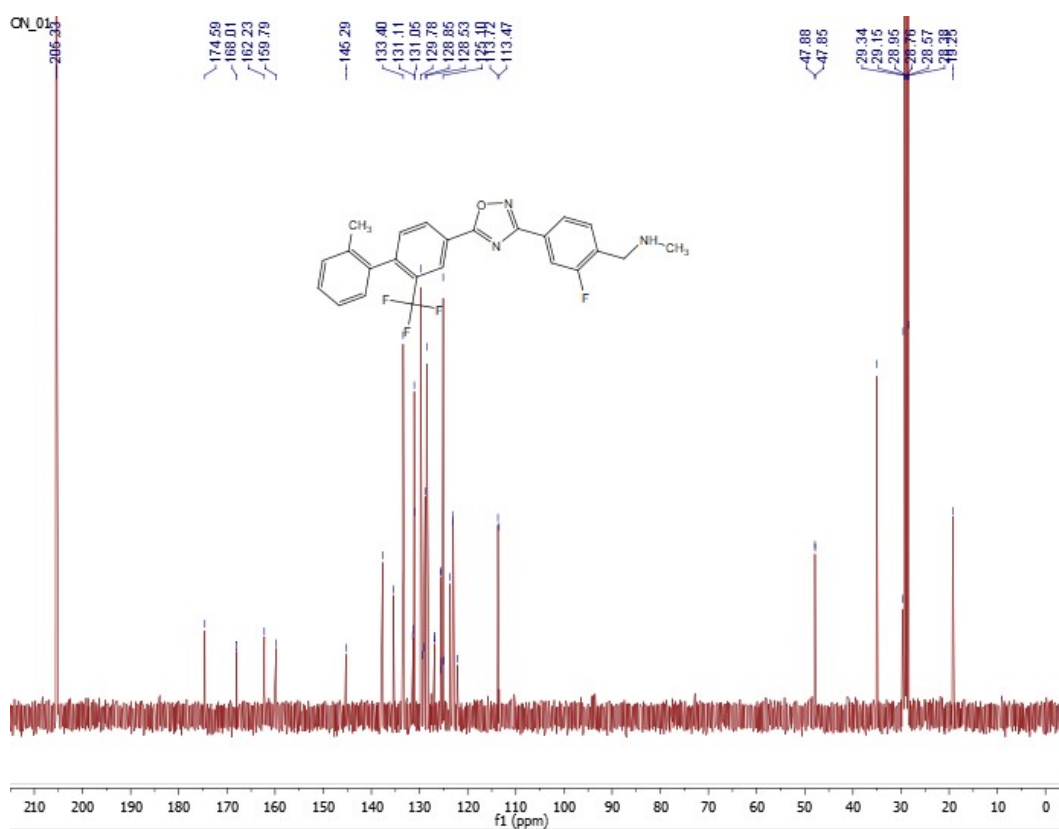
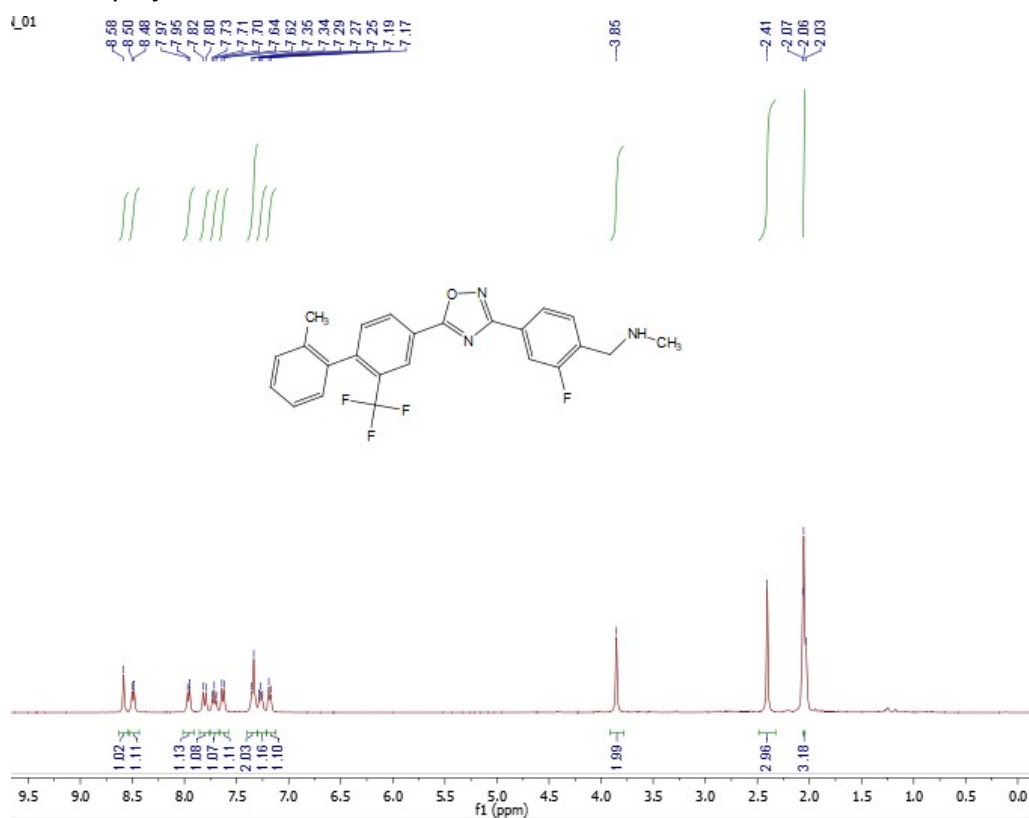
^1H NMR and ^{13}C NMR of **15a**

Electronic Supplementary Information



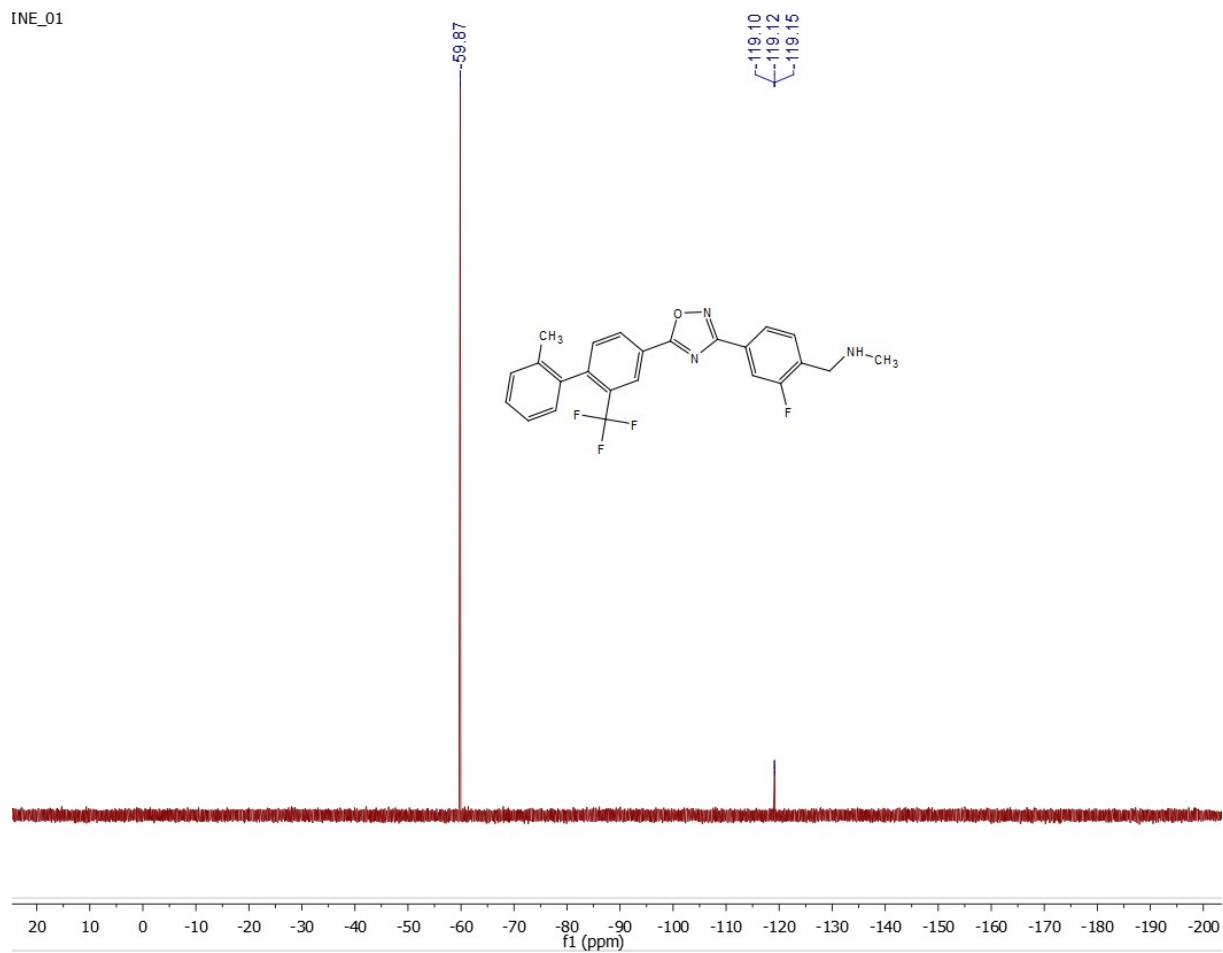
¹H NMR and ¹³C NMR of 17

Electronic Supplementary Information



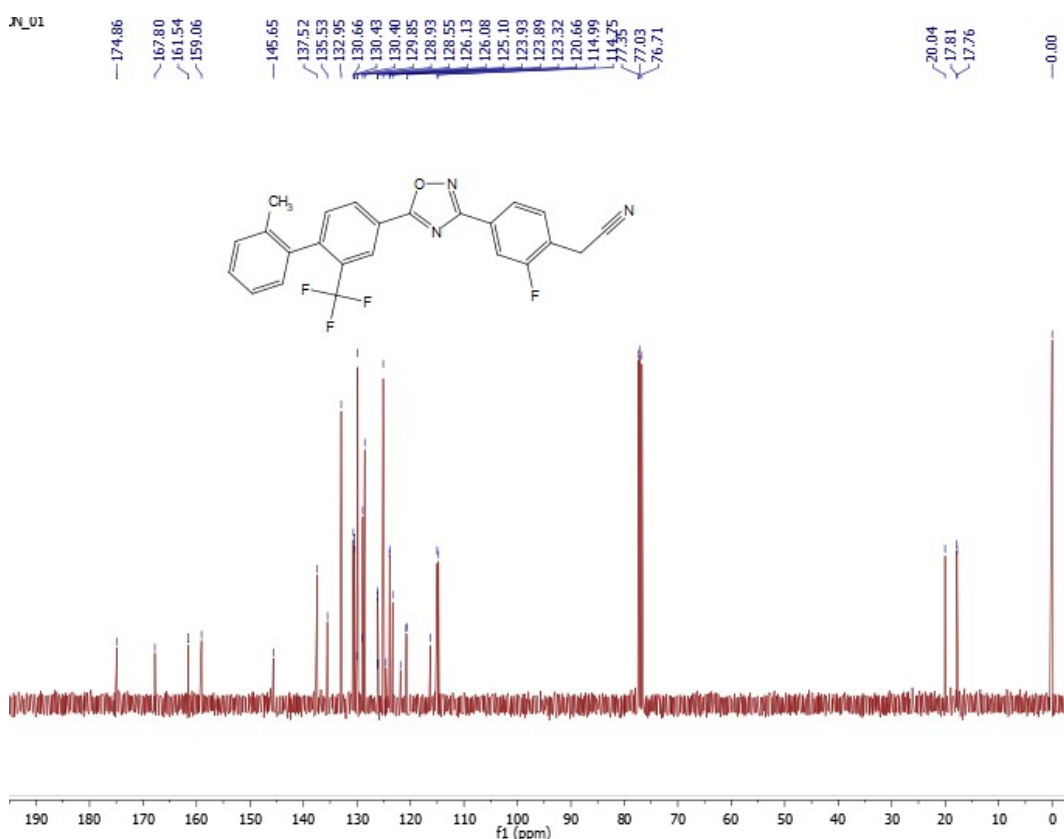
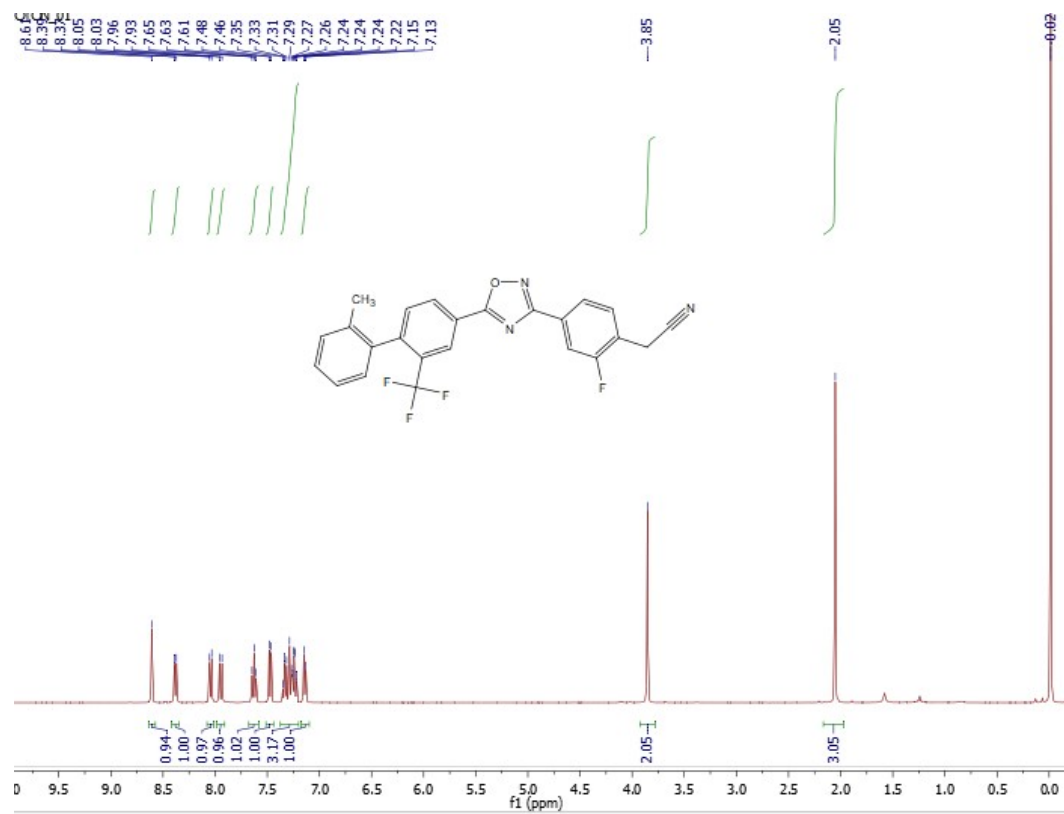
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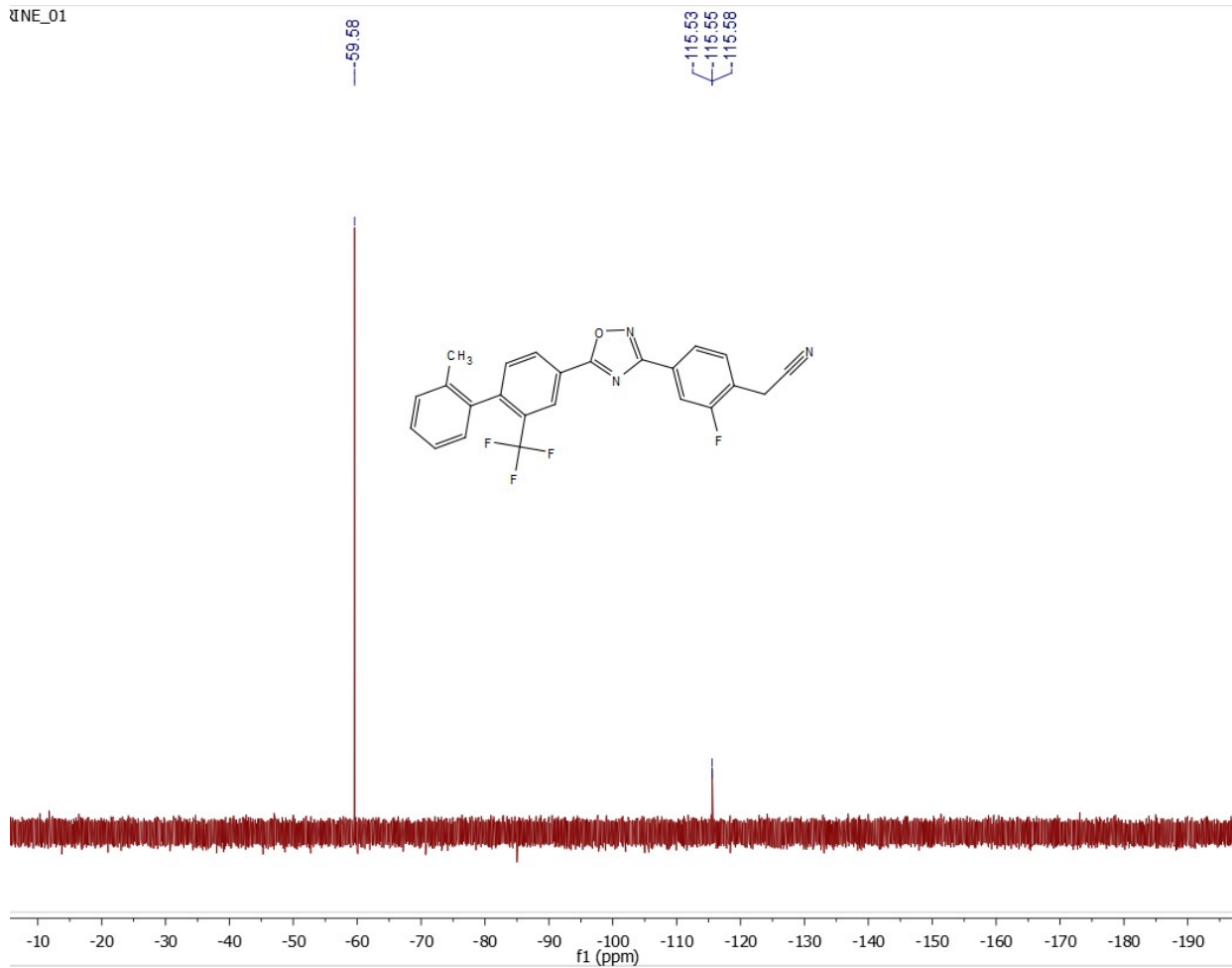


^1H NMR, ^{13}C NMR, and ^{19}F NMR of **15b**

Electronic Supplementary Information

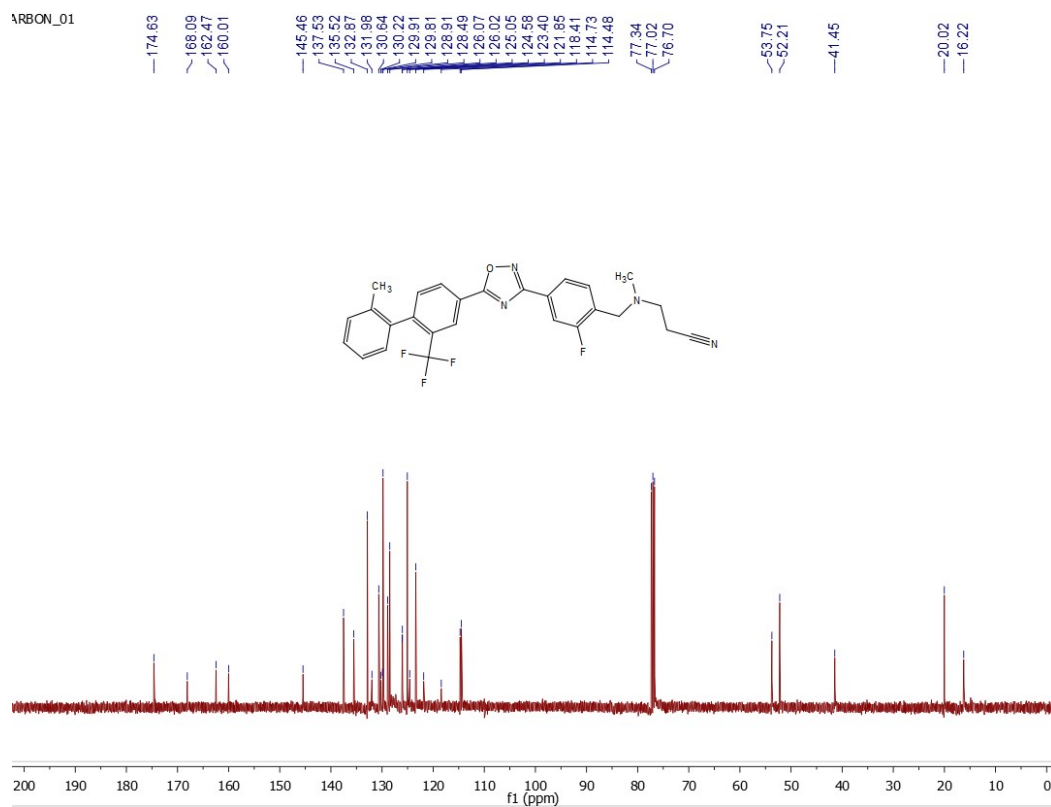
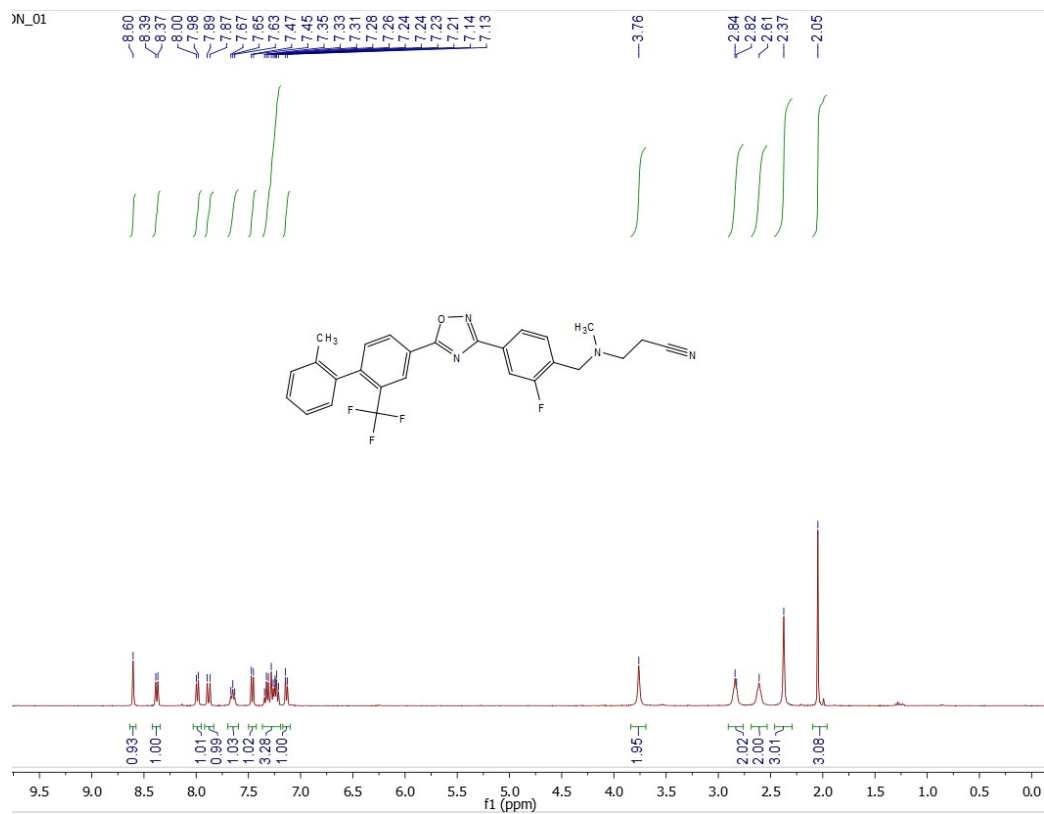


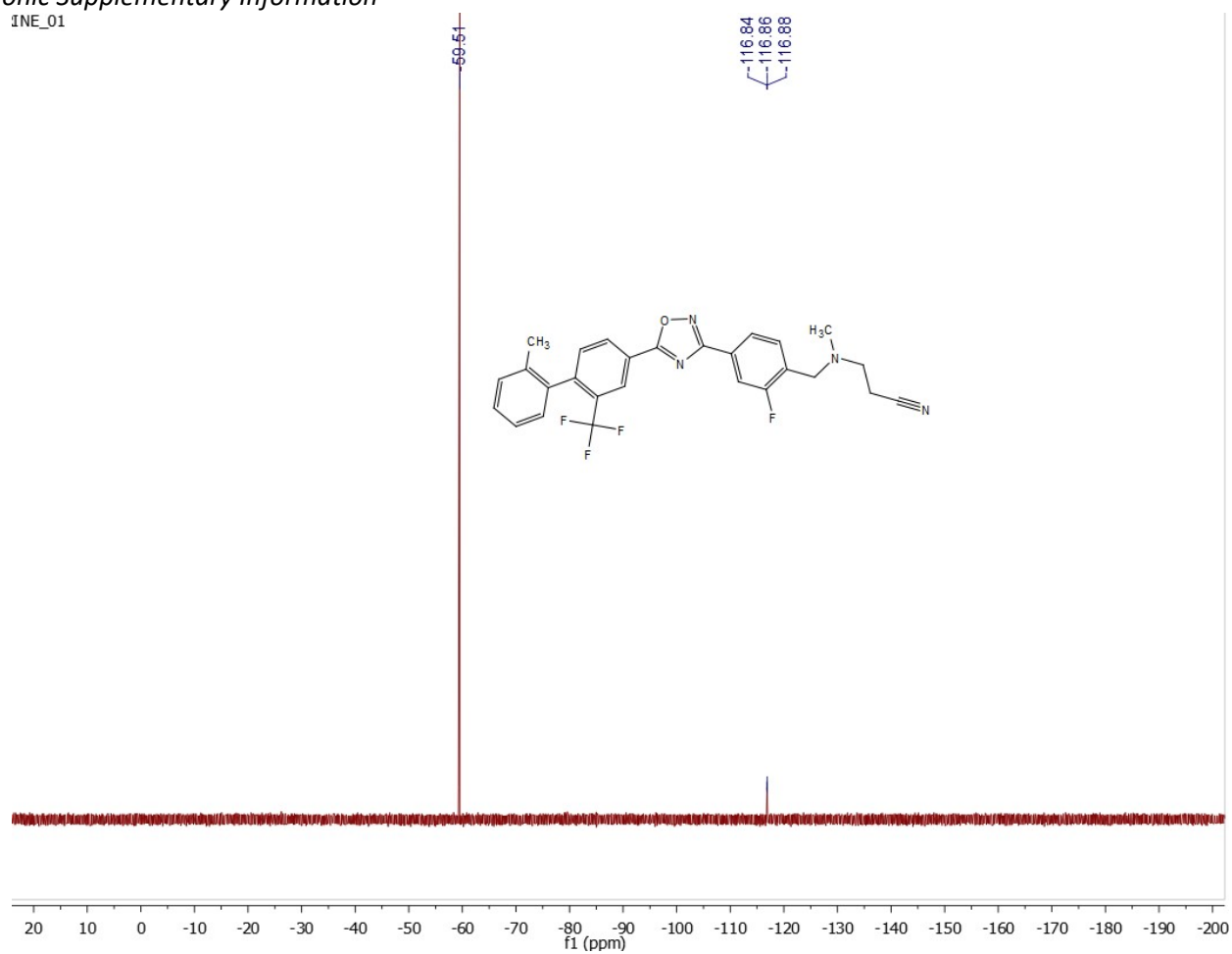
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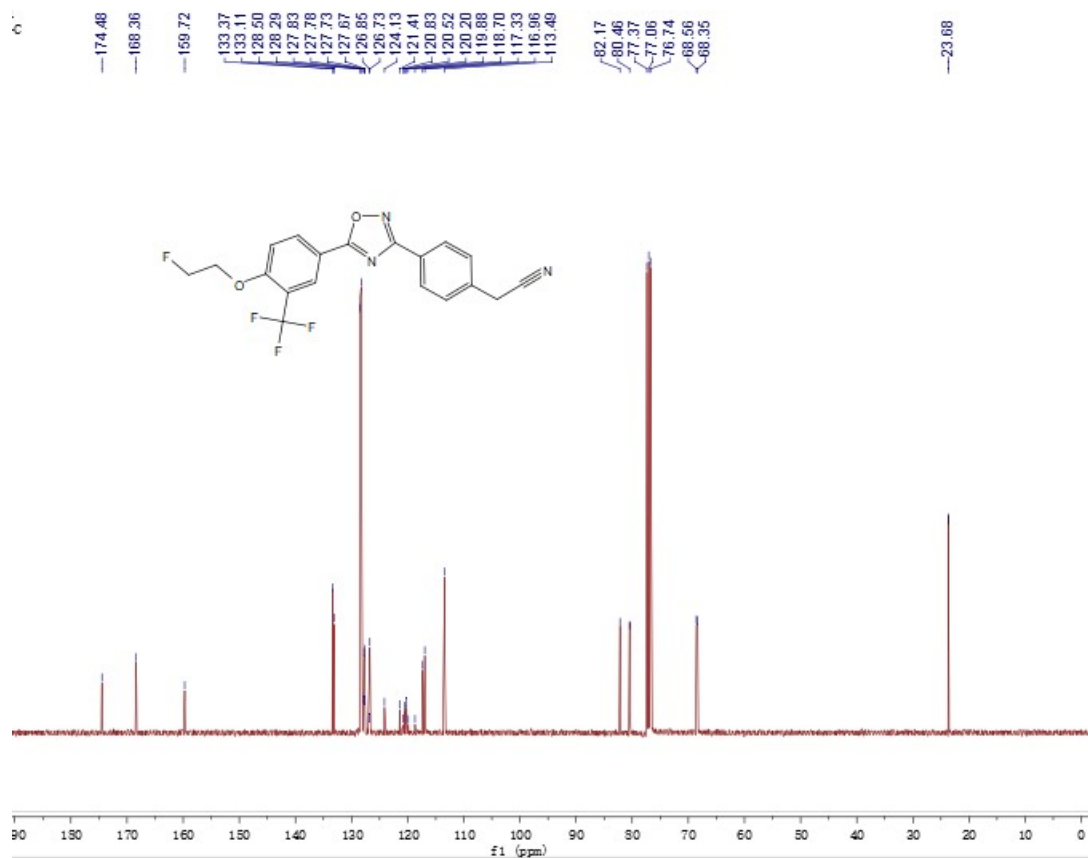
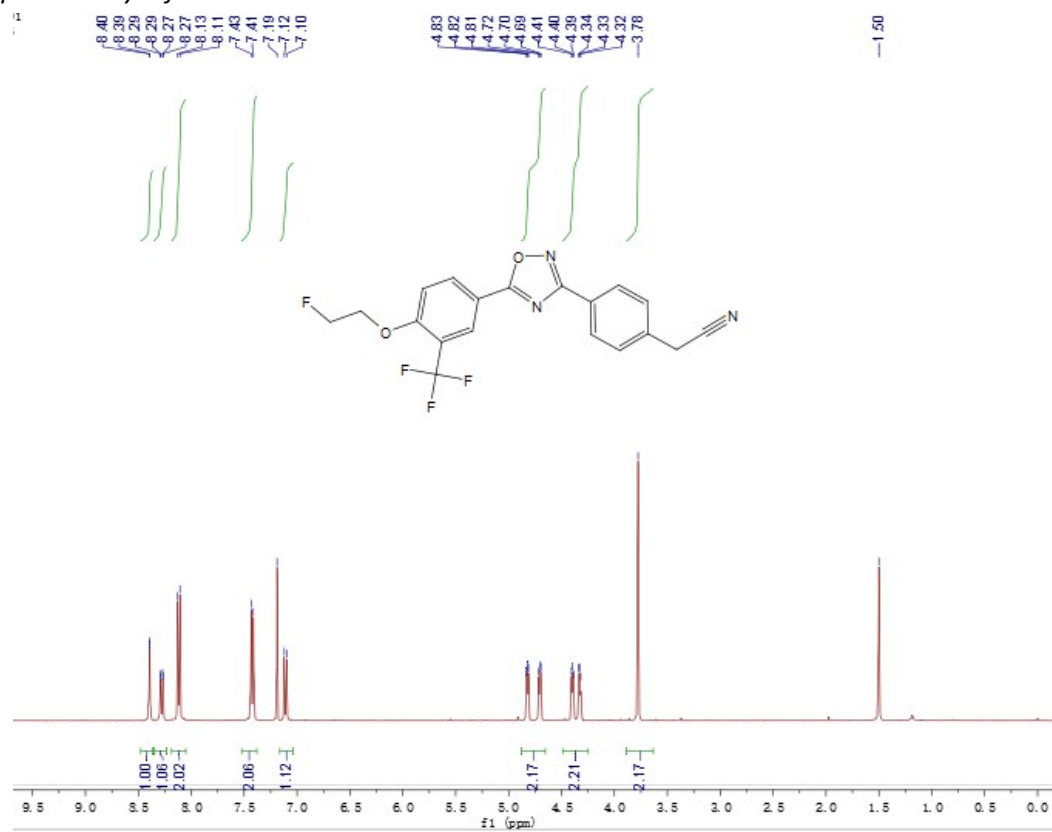
^1H NMR, ^{13}C NMR, and ^{19}F NMR of **18a**

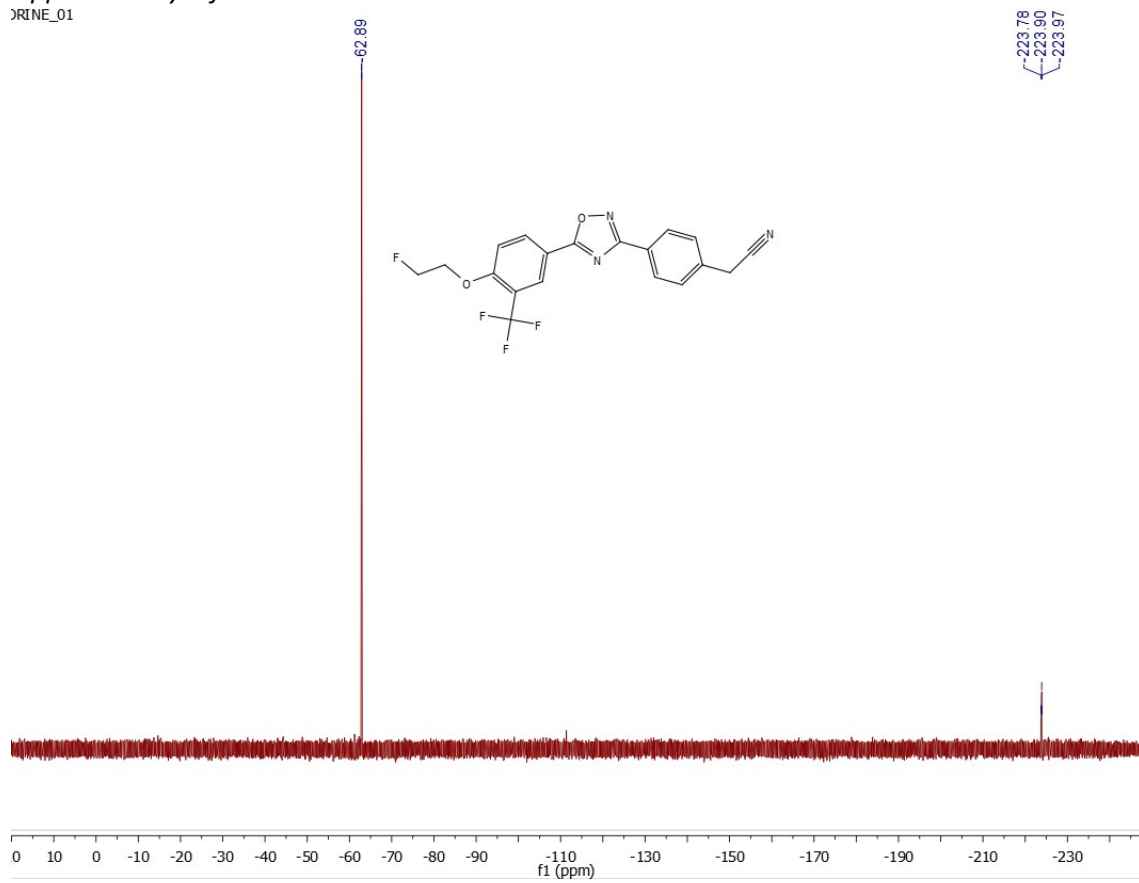
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 ^1H NMR, ^{13}C NMR, and ^{19}F NMR of **18b**

Electronic Supplementary Information



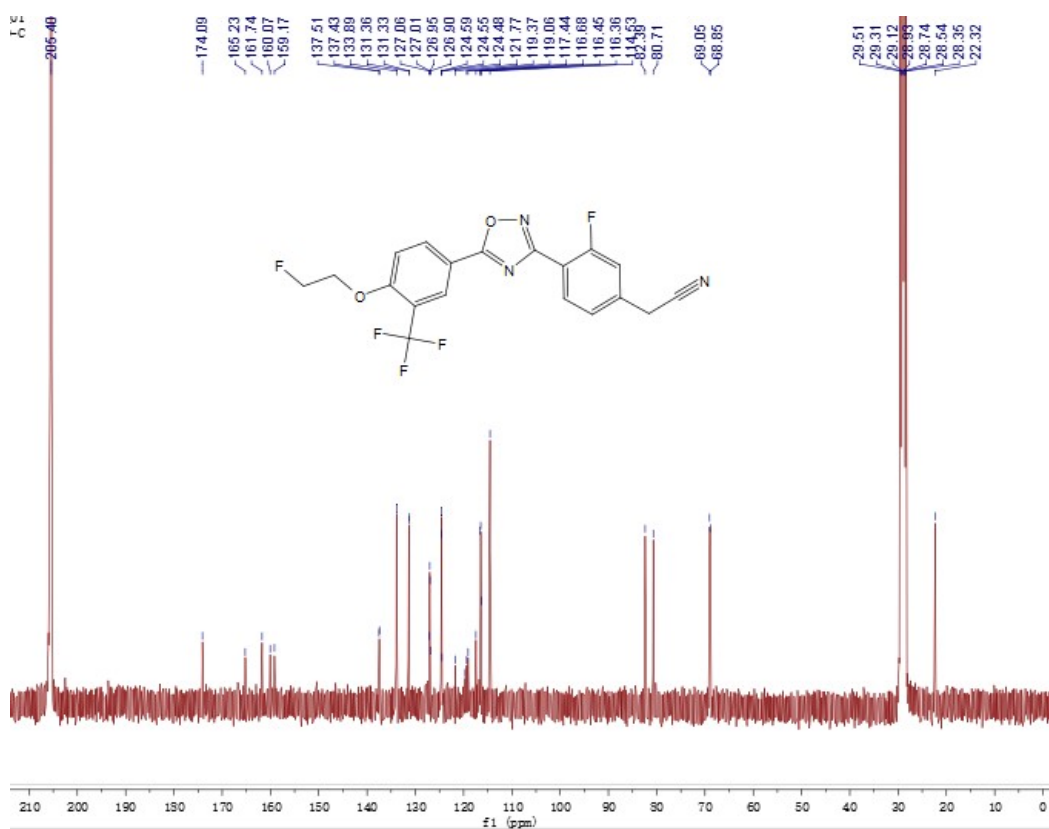
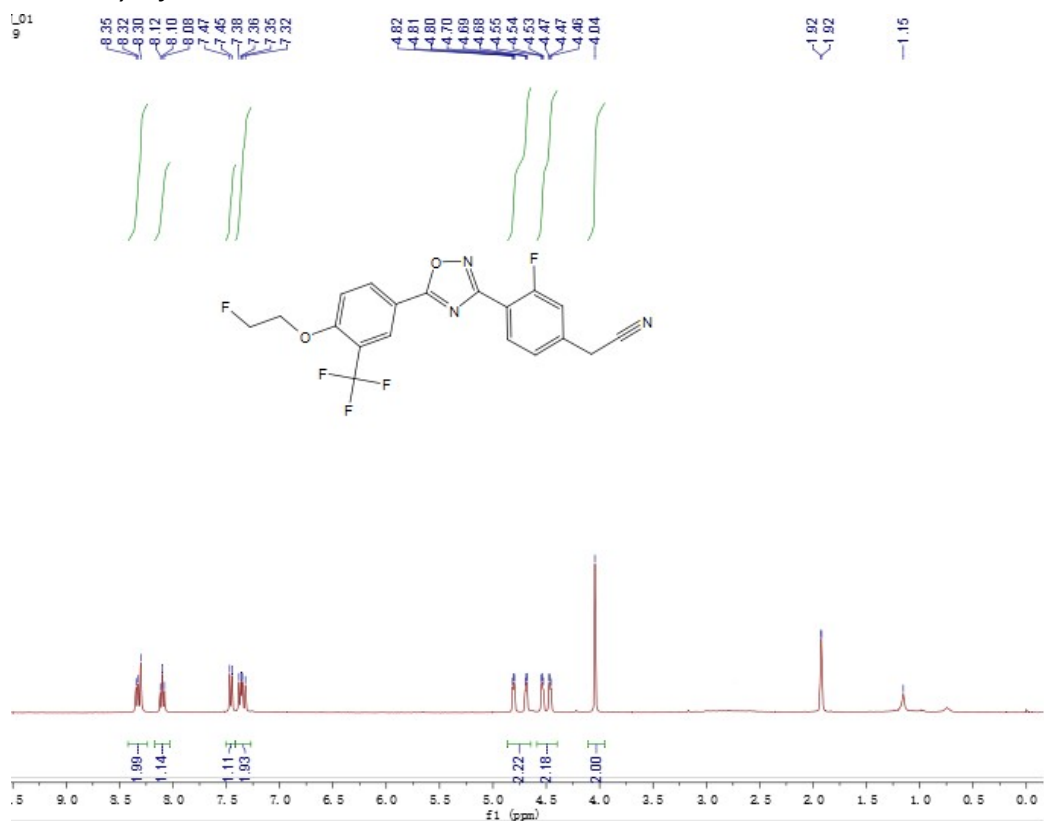
 ^1H NMR, ^{13}C NMR, and ^{19}F NMR of **18c**

Electronic Supplementary Information



¹H NMR and ¹³C NMR of **18d**

Electronic Supplementary Information



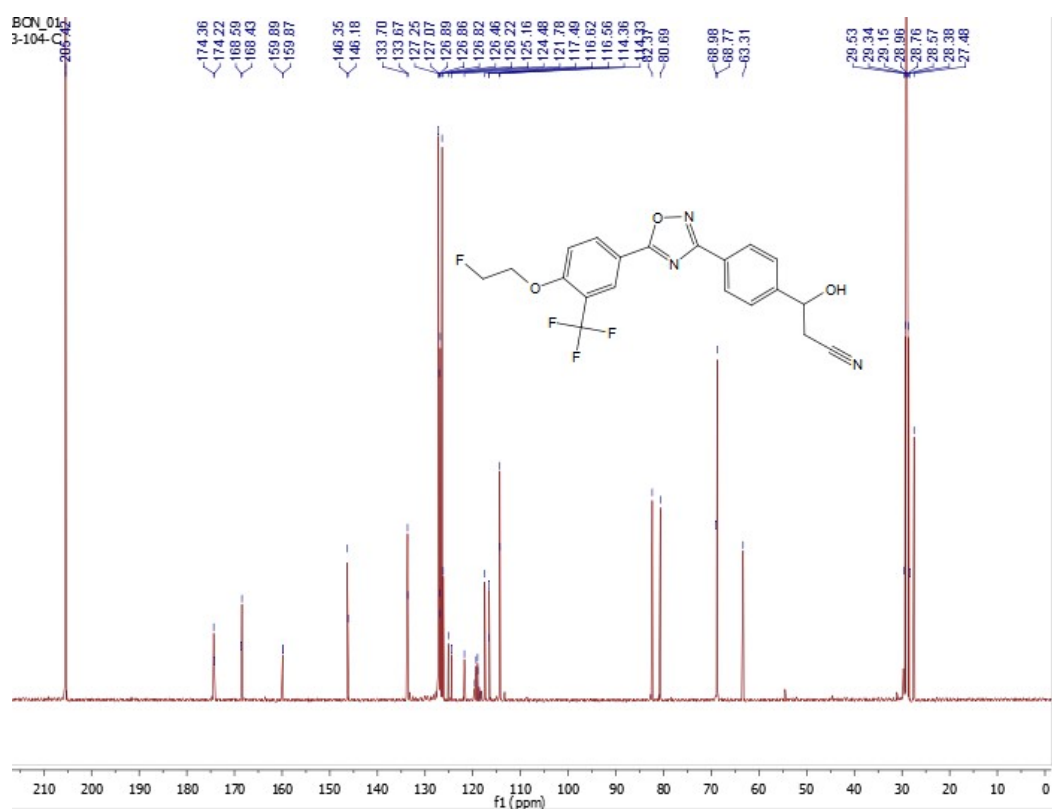
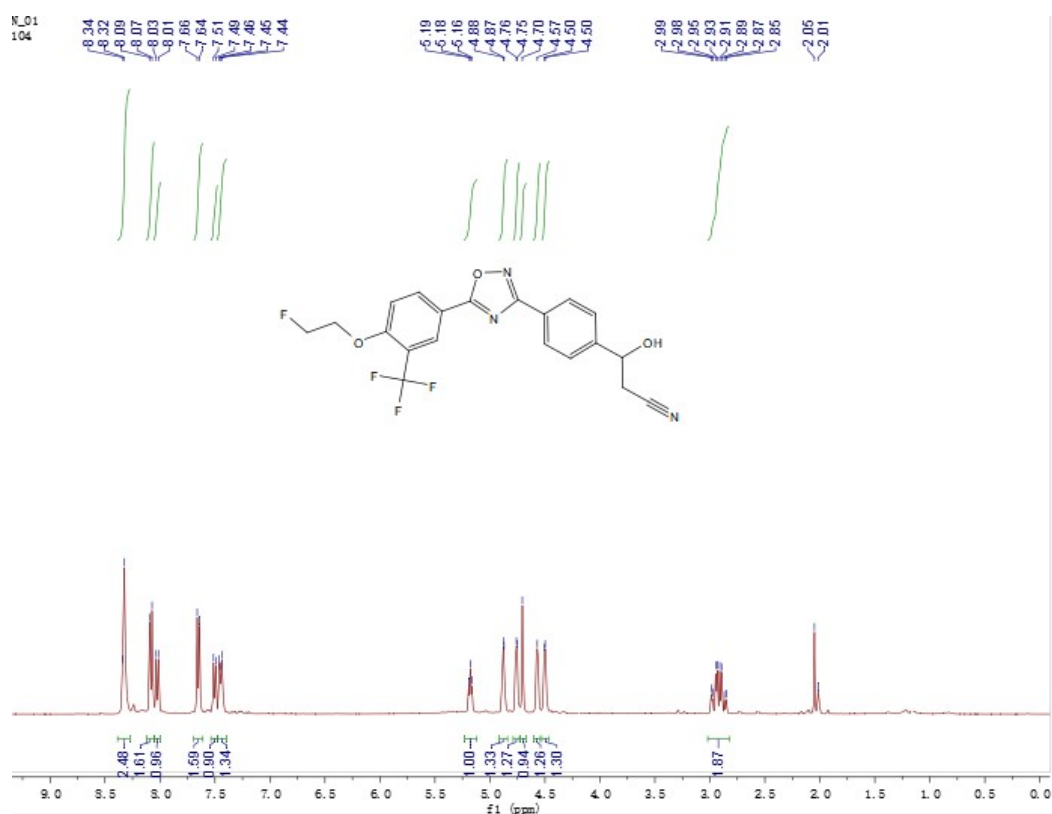
¹H NMR and ¹³C NMR of **18e**

Electronic Supplementary Information



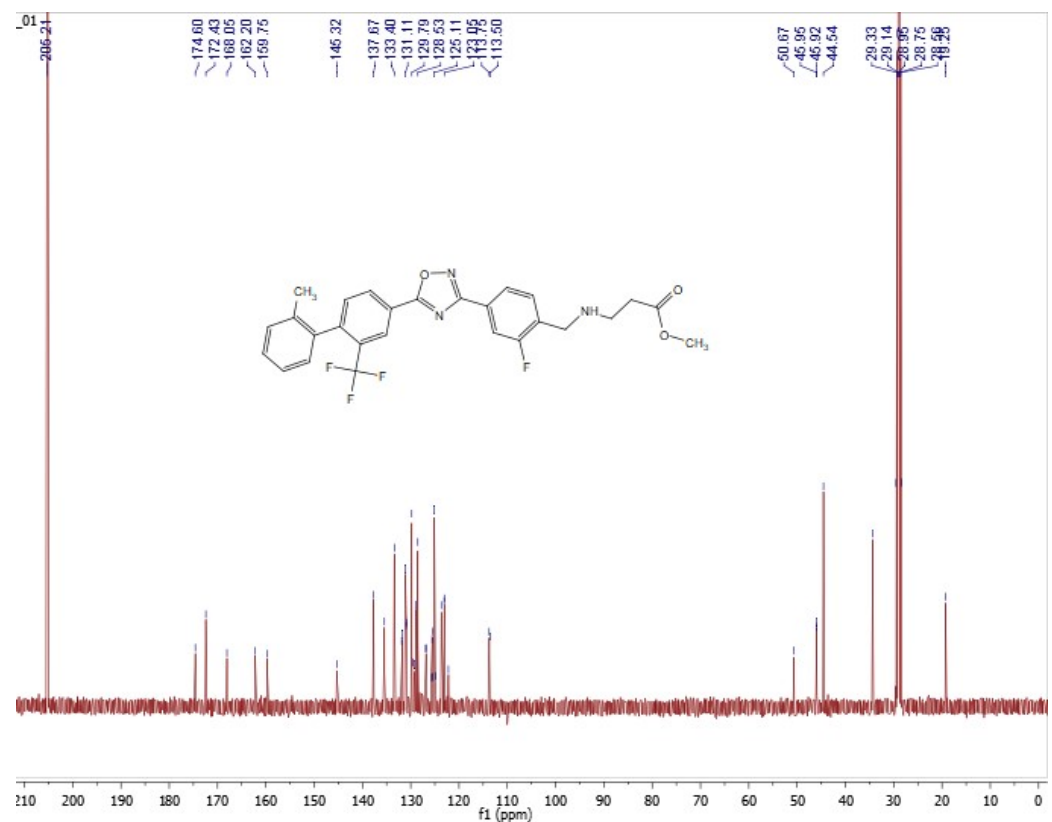
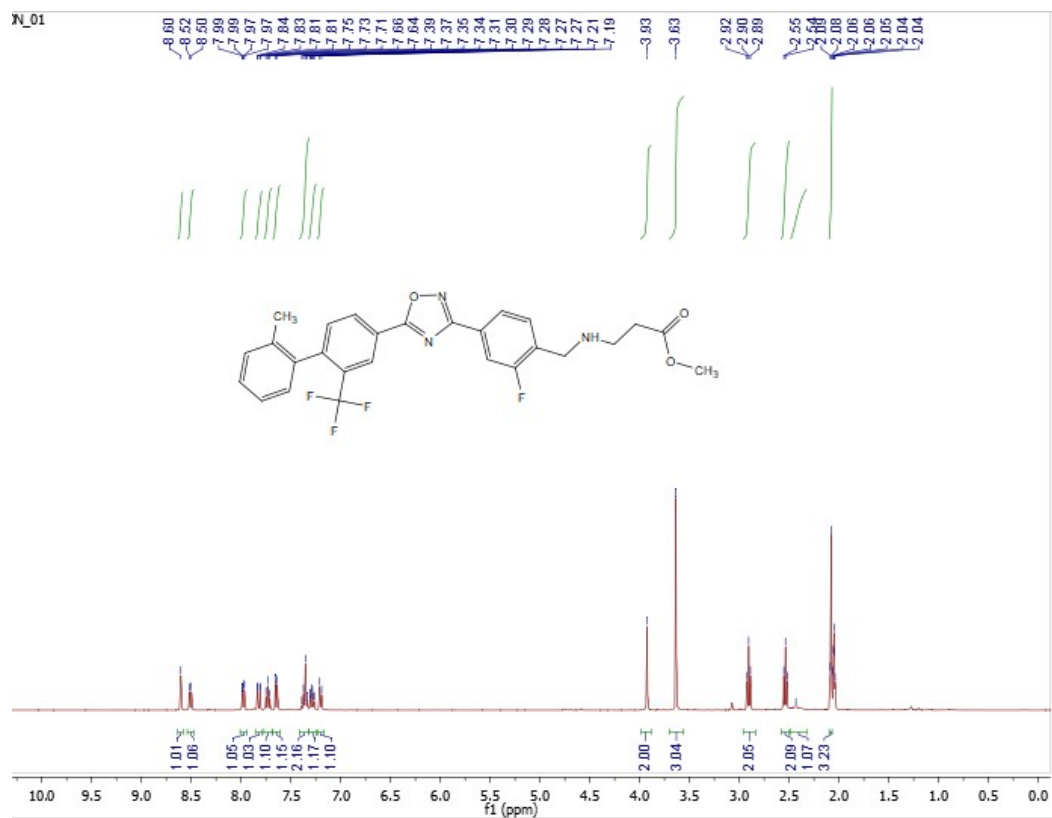
¹H NMR and ¹³C NMR of **18f**

Electronic Supplementary Information



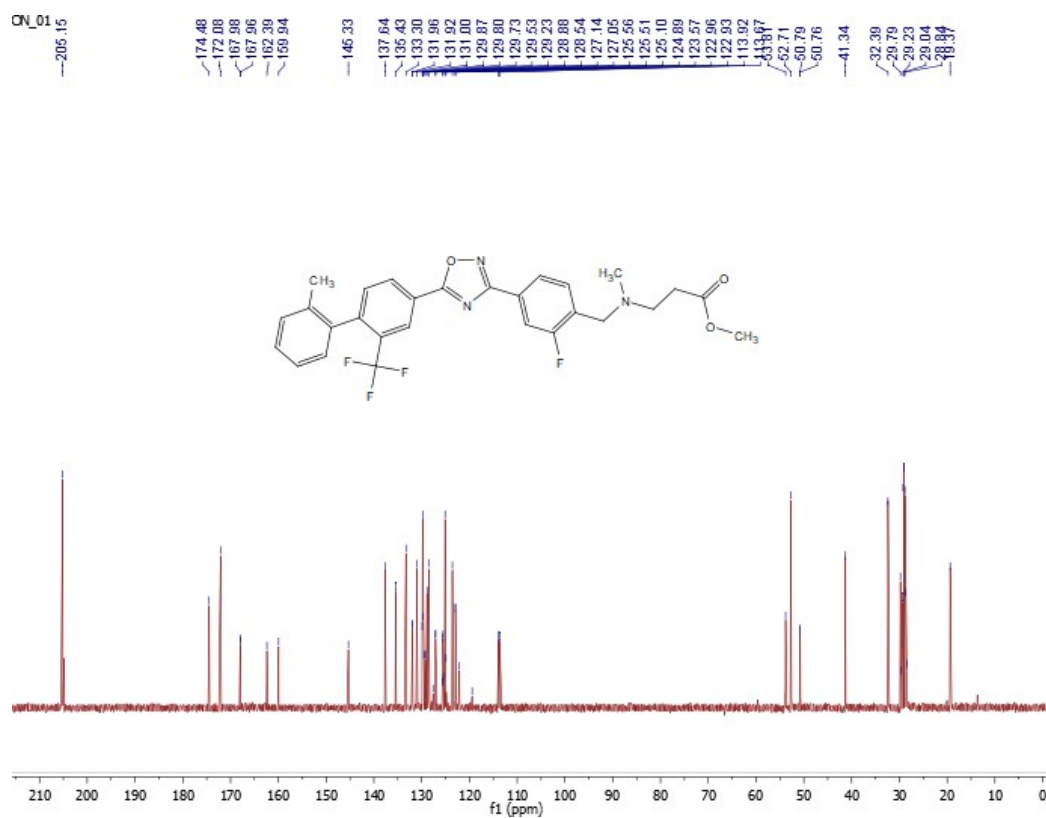
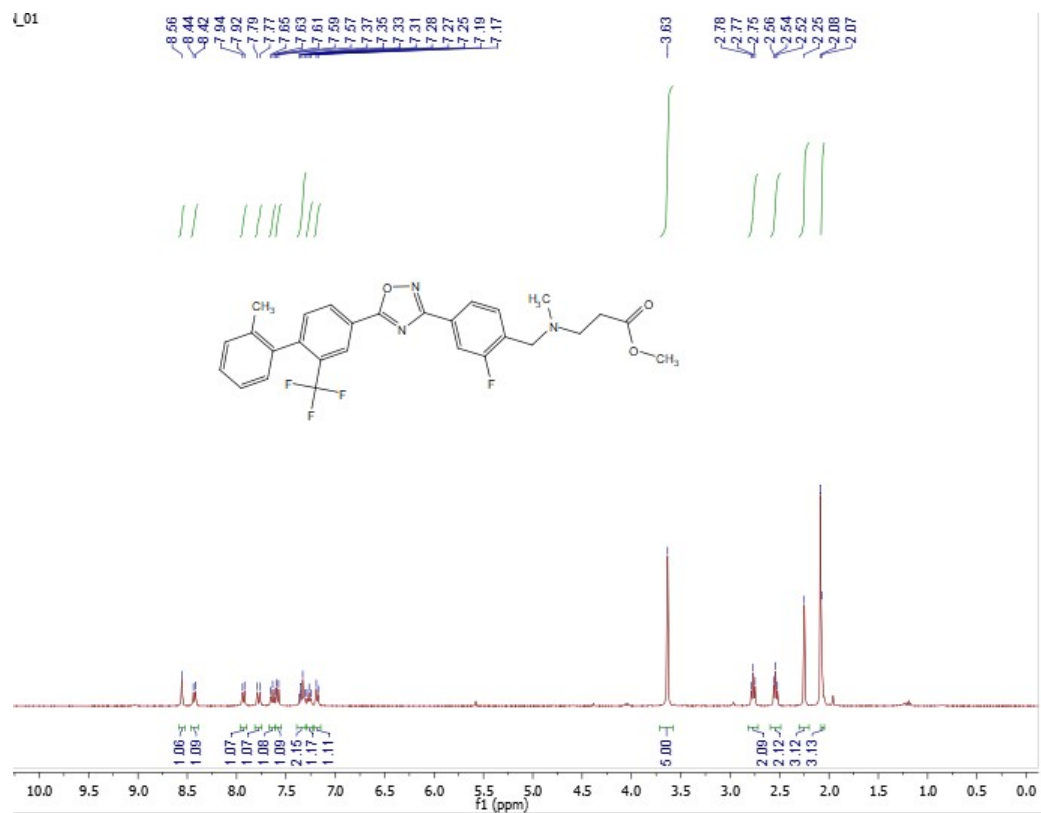
¹H NMR and ¹³C NMR of **18g**

Electronic Supplementary Information



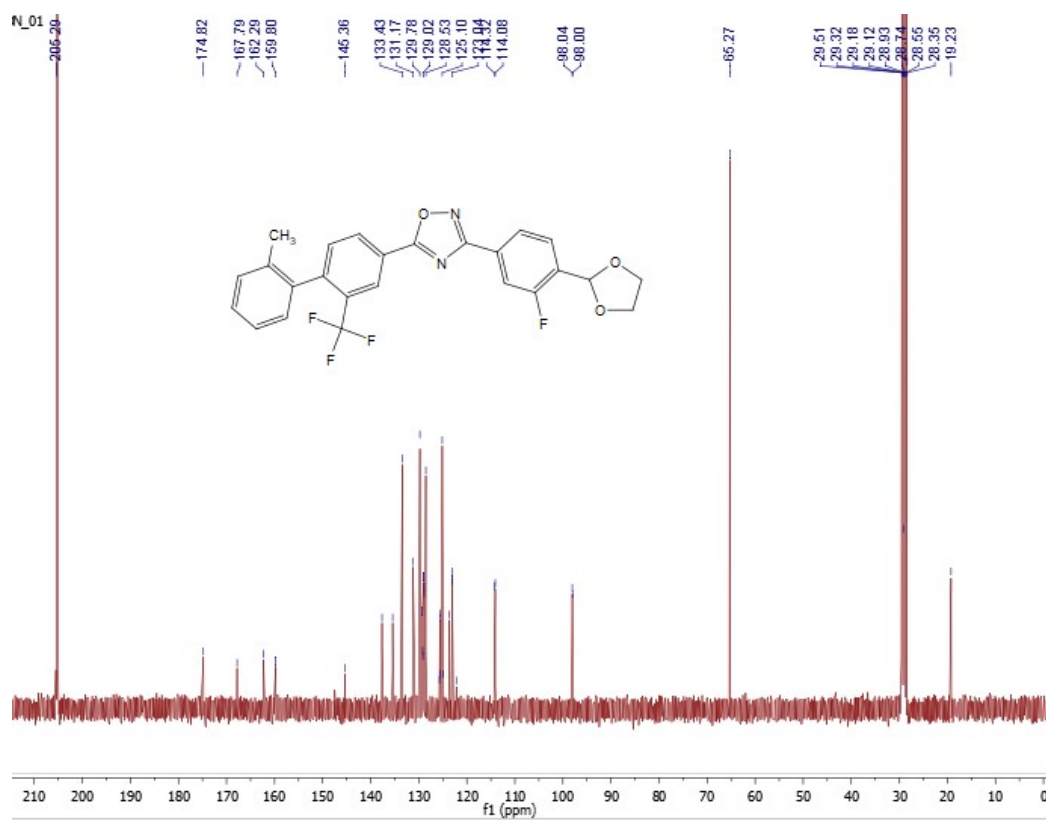
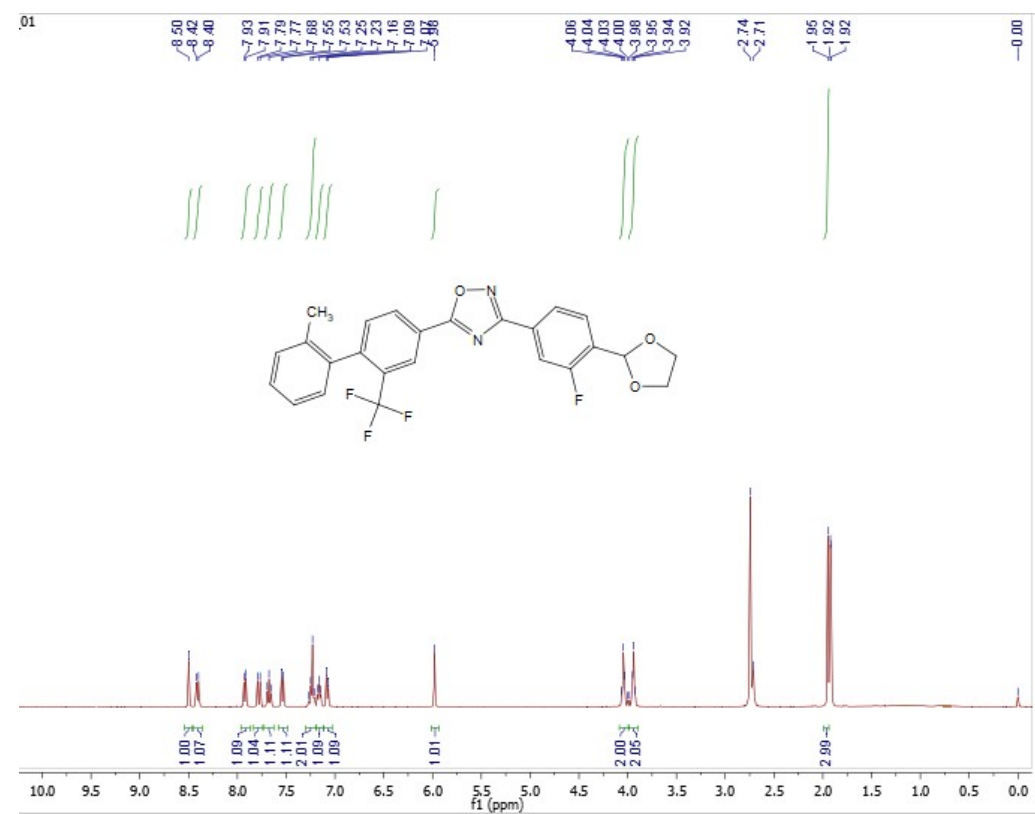
^1H NMR and ^{13}C NMR of 22c

Electronic Supplementary Information



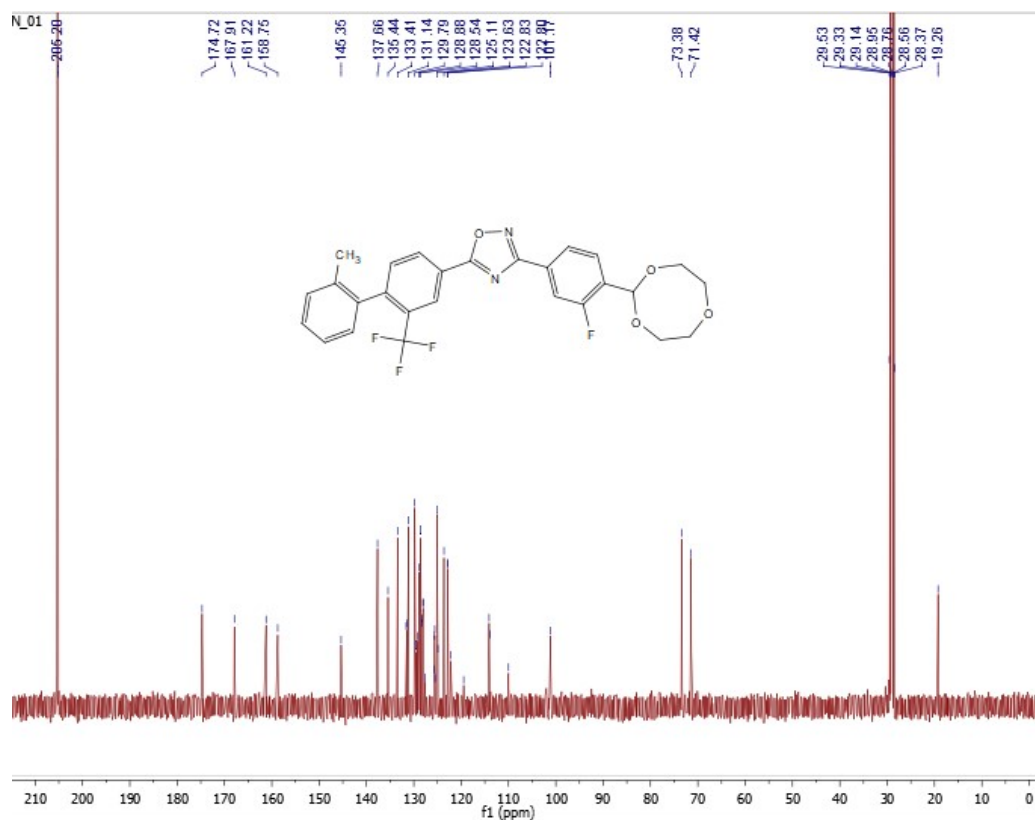
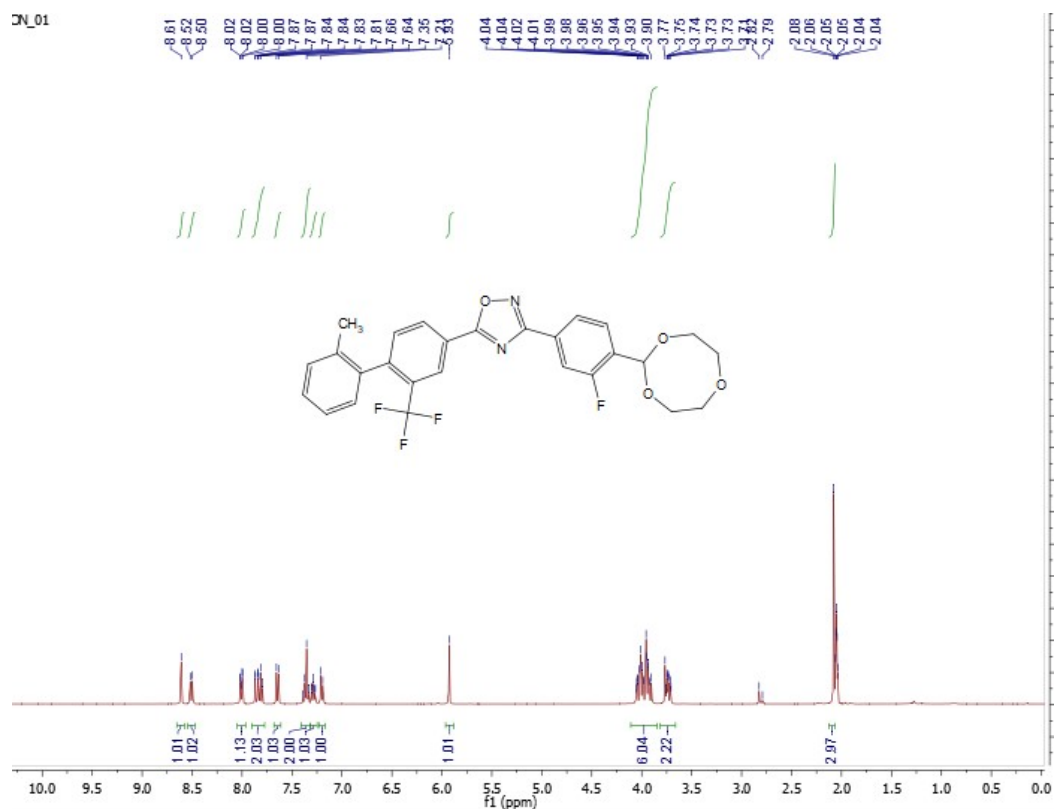
^1H NMR and ^{13}C NMR of 23c

Electronic Supplementary Information



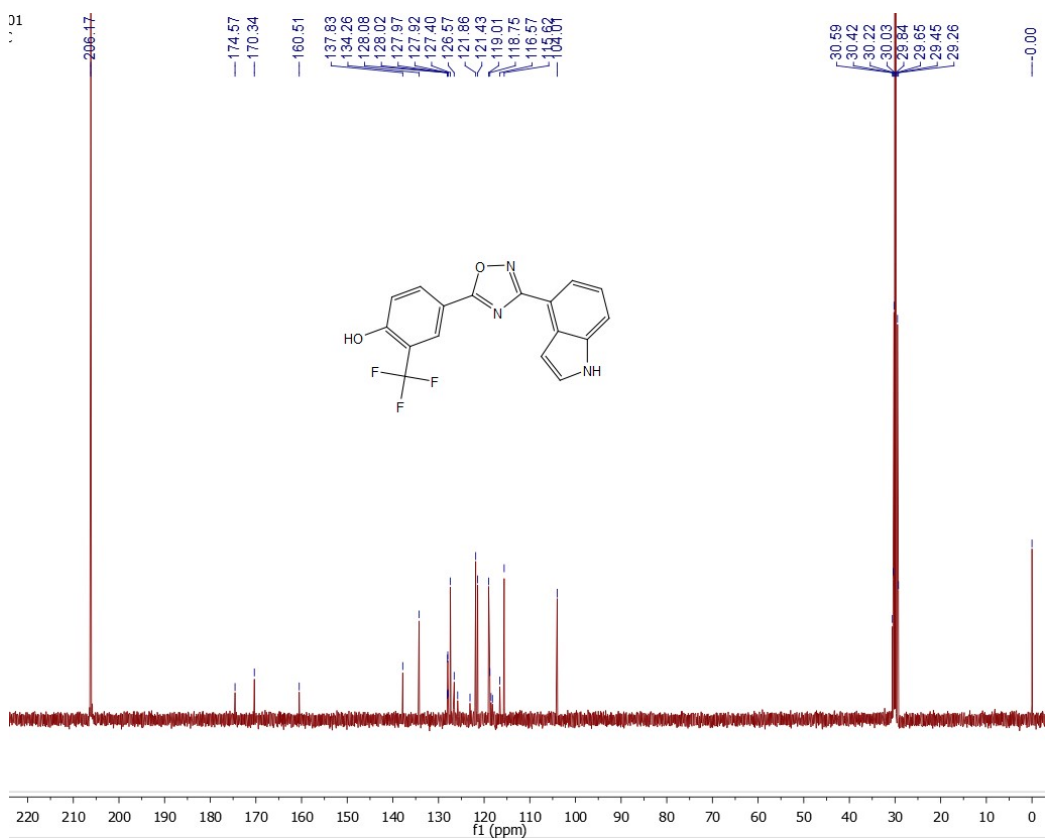
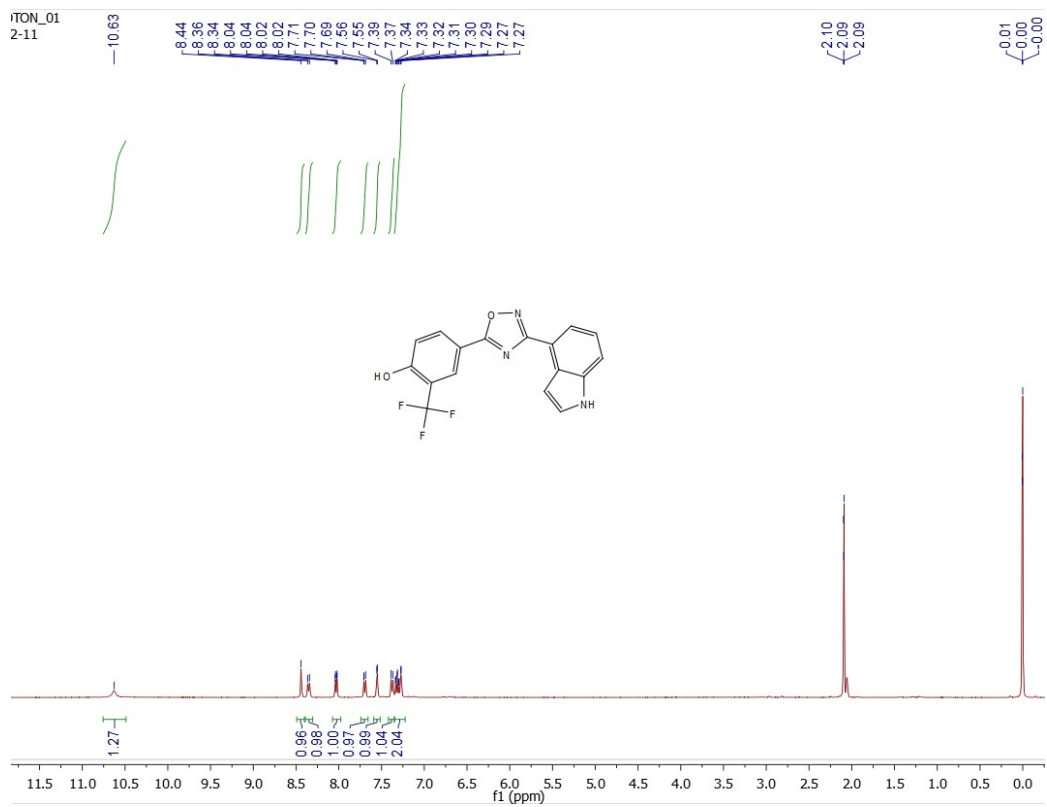
$^1\text{H NMR}$ and $^{13}\text{C NMR}$ of **24a**

Electronic Supplementary Information



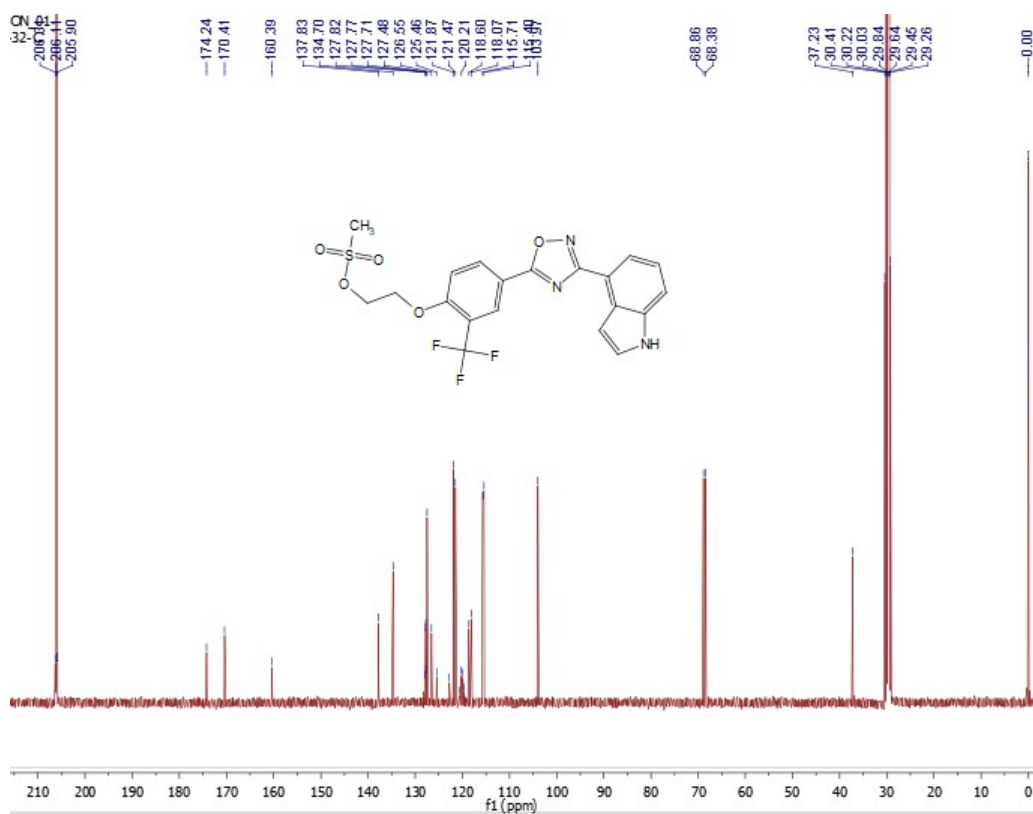
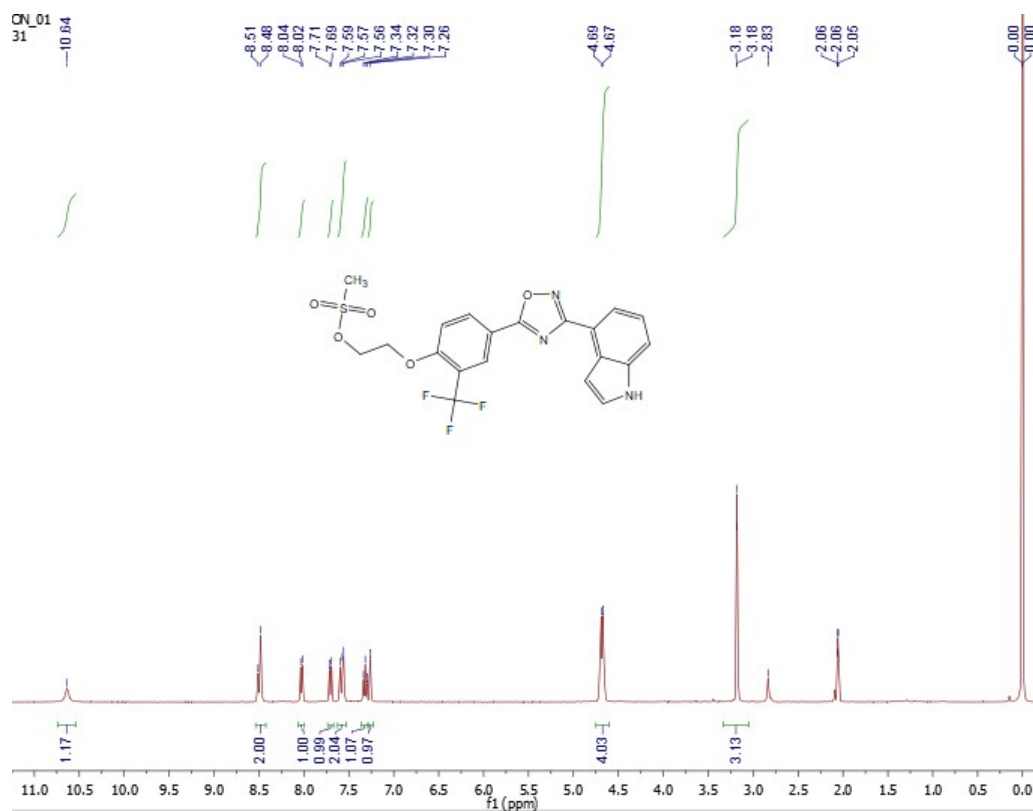
^1H NMR and ^{13}C NMR of **24b**

Electronic Supplementary Information



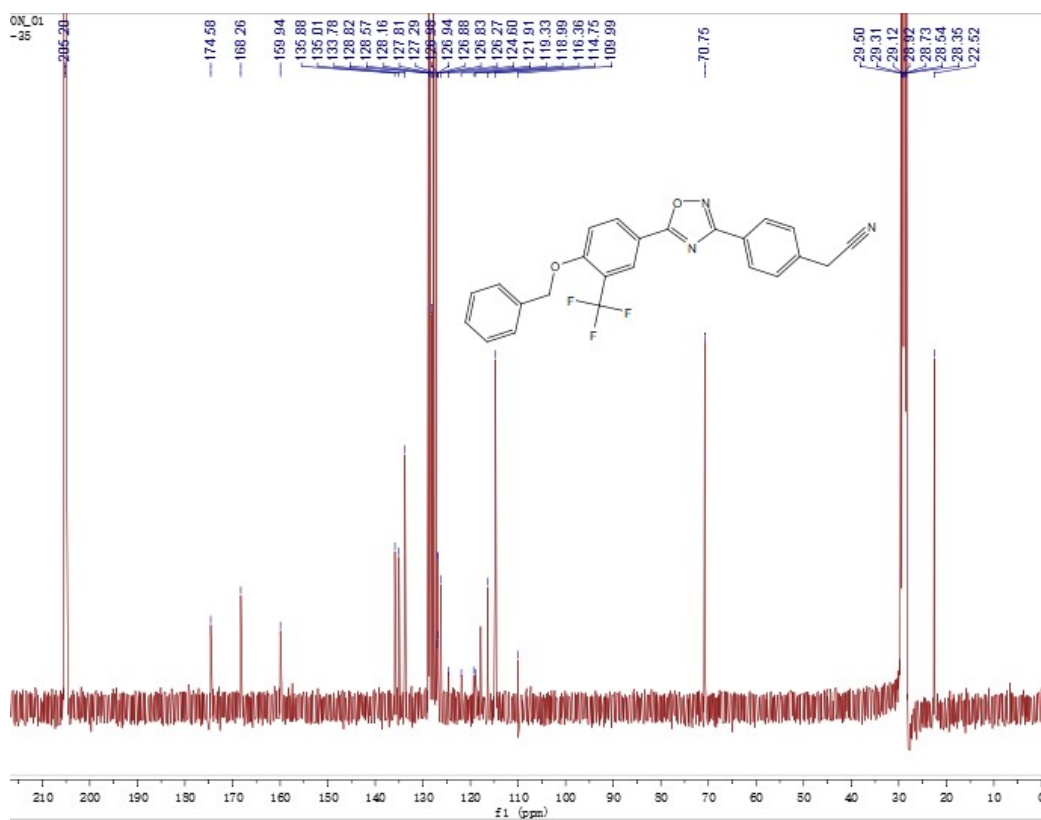
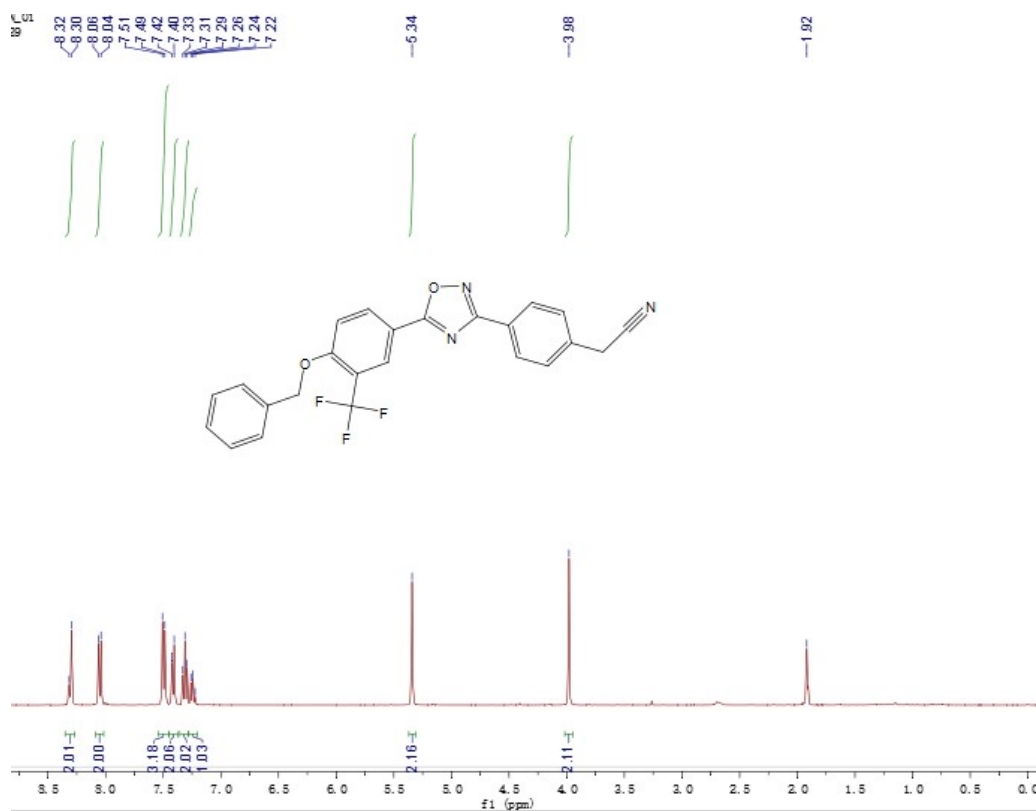
¹H NMR and ¹³C NMR of **26**

Electronic Supplementary Information



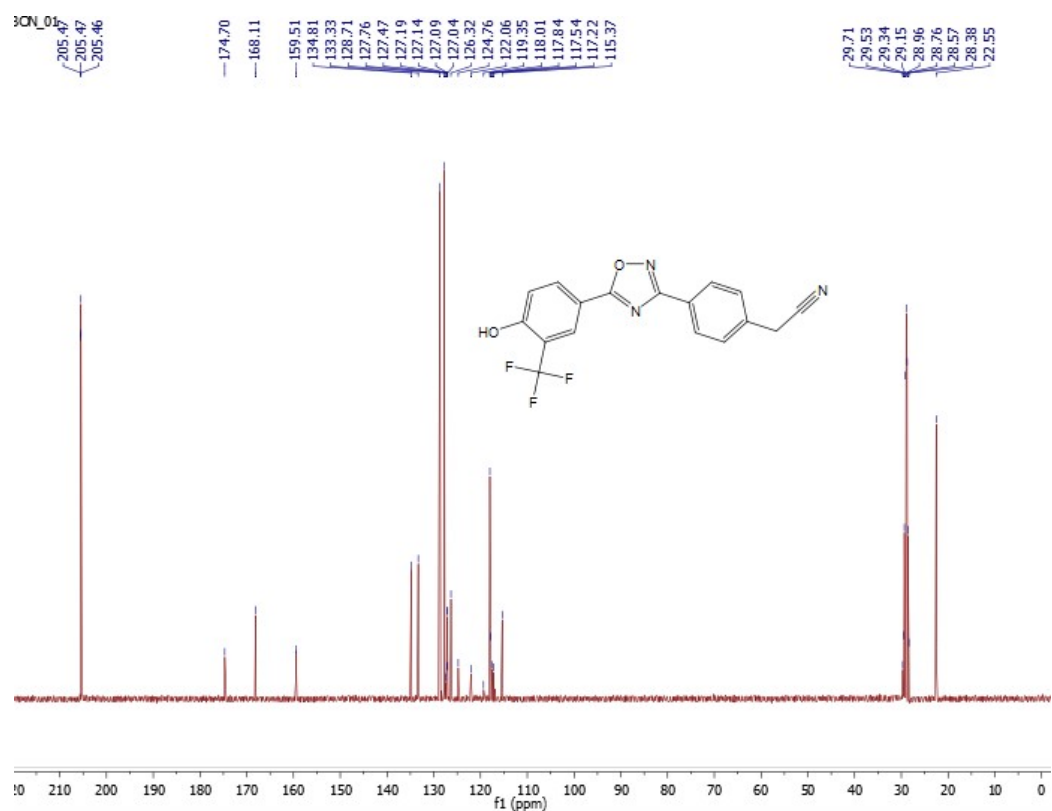
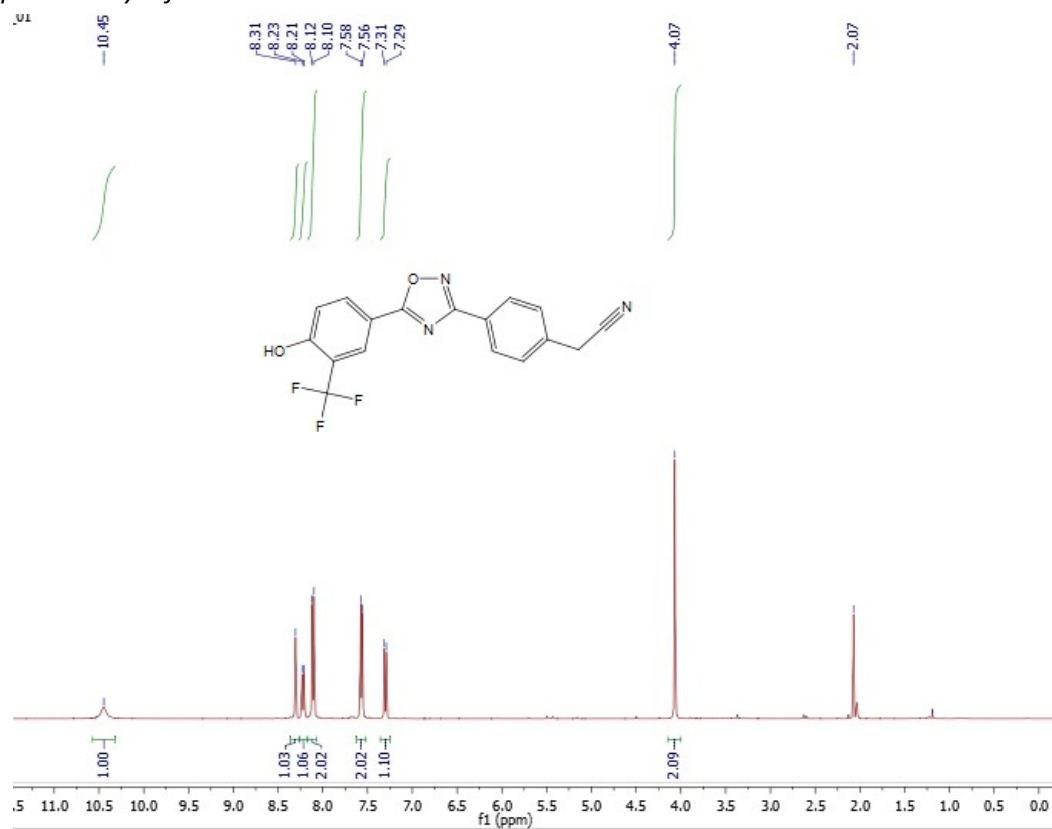
^1H NMR and ^{13}C NMR of **27**

Electronic Supplementary Information



¹H NMR and ¹³C NMR of **30**

Electronic Supplementary Information



¹H NMR and ¹³C NMR of 31