Supporting Information

Accelerated Preparation of Pyridazines Enabled by High-Temperature Diazo Cycloadditions in Continuous Flow Mode

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1. Materials and methods

Unless otherwise stated, all solvents were purchased from Fisher Scientific, Sigma Aldrich, and Honeywell and used without further purification. Substrates and reagents were purchased from Fluorochem, Alfa Aesar, TCI, or Sigma Aldrich and used as received.

^{1}H-NMR spectra were recorded on 400 MHz or 500 MHz instruments and are reported relative to residual solvent: $CDCl_3$ (δ 7.26 ppm) and DMSO-d_6 (δ 2.50 ppm). ^{13}C- NMR spectra were recorded on the same instruments (100 and 125 MHz) and are reported relative to $CDCl_3$ (δ 77.16 ppm) and DMSO-d_6 (δ 39.52 ppm). ^{19}F-NMR spectra were recorded on a 400 MHz (376 MHz) spectrometer. Data for ^{1}H-NMR are reported as follows: chemical shift (δ/ppm) (multiplicity, coupling constant (Hz), integration). Multiplicities are reported as follows: s = singlet, d = doublet, t = triplet, q = quartet, quin = quintet, sext = sextet, sept = septet, m = multiplet. Data for ^{13}C-NMR is reported in terms of chemical shift (δ/ ppm) and multiplicity (C, CH, CH_2 or CH_3). COSY, HSQC, and HMBC experiments were used in the structural assignment.

IR spectra were obtained by use of a Bruker Platinum spectrometer (neat, ATR sampling) with the intensities of the characteristic signals being reported as weak (w, <20% of tallest signal), medium (m, 21-70% of tallest signal) or strong (s, >71% of tallest signal).

High-resolution mass spectrometry data was acquired on an Agilent 6546 QTOF MS instrument with Agilent Jetstream ESI source, coupled to an Agilent Infinity Prime II quaternary HPLC system. GC-MS was carried out using a Waters GCT Premier instrument with an Agilent DB-5ms 15m column.

Continuous flow experiments were performed using: 10 mL reactor coils, consisting of PFA tubing (internal diameter = 1/16”, outer diameter = 1/8”); 10 mL static mixing coils, consisting of PFA tubing (internal diameter = 1/8”, outer diameter = 1/4”); or 5 mL reactor length, consisting of PFA tubing (internal diameter = 1/8”, outer diameter = 1/4”). Photochemical experiments were performed using a Vapourtec E-Series system with a UV150 photoreactor, equipped with a 365 nm LED. Thermal continuous flow experiments were performed using a Vapourtec R-Series reactor, equipped with one to three 10 mL heated coils, and an Upchurch back-pressure regulator (8 bar).

2. Synthetic Procedures

Procedure for the Synthesis of Difluorocyclopropenes in Flow from Alkynes **SI-4**

Reactions were carried out using a Vapourtec R-Series flow system. Alkyne (3 mmol, 1.0 equiv.) was dissolved in THF (6 mL, 0.5 M) under a N_2 atmosphere. NaI (0.3 mmol, 0.1 equiv.) by $TMSCF_3$ (6 mmol, 2 equiv.) were added subsequently. The mixture was stirred at room temperature for 10 minutes before injecting the supernatant through a 2 mL sample loop in portions. The mixture was passed through the flow reactor at 120 °C with a residence time of 15 minutes (0.667 mL/min flow rate) and a back pressure of 8 bar. The reaction output was collected and concentrated *in vacuo* to yield the crude difluorocyclopropene. The crude material was purified by column chromatography using cyclohexane:Et_3N (40:1) as eluent. *NB – Due to volatility and stability issues purification and isolation can be difficult.*

Note: Difluorocyclopropenes tend to decompose on silica. The column was preconditioned by first deactivating silica with cyclohexane:Et_3N (10:1), followed by one column volume of eluent. Samples were stored in the fridge under a N_2 atmosphere.

Procedure for the Synthesis of the Bestmann-Ohira Reagent **SI-5**

Dimethyl acetylmethylphosphonate (1.66 g, 10 mmol, 1.0 equiv.) was dissolved in toluene (25 mL, 0.4 M) and cooled to 0 °C. Sodium hydride (0.288 g, 12 mmol, 1.2 equiv.) was added slowly in portions under vigorous stirring. Note: The mixture became more viscous as sodium hydride was added; the round-bottomed flask was swirled periodically by hand to ensure mixing. Once the addition of sodium hydride was complete, the mixture warmed to room temperature for 15 minutes. The mixture was then cooled to 0 °C and a solution of tosyl azide (2.17 g, 11 mmol, 1.1 equiv.) in THF (10 mL, 1.1 M) was added dropwise. Once the addition was completed, the mixture warmed to room temperature and stirred for 16 hours. The mixture was diluted with Et_2O (25 mL) and filtered over a pad of Celite. The Celite cake was washed with Et_2O (20 mL x 3). The combined washes were then concentrated in vacuo. The resulting oil was purified by column chromatography (1:1 Et_2O:EtOAc) yielding the product as a yellow liquid (1.65 g, 8.6 mmol, 86%).

Procedure for the Synthesis of p-Tosyl Azide **SI-6**

In a vial, a solution of sodium azide (1.87 g, 28.8 mmol, 1.2 equiv.) in water (8 mL) was rapidly added to a solution of p-toluenesulfonyl chloride (4.60 g, 24 mmol, 1.0 equiv.) in isopropanol (14 mL). The mixture warmed slightly, and two phases were formed. After stirring at room temperature for 1 hour, H_2O (75 mL) was added. A white precipitate separated from the solution. The mixture was allowed to stir for a further hour. The biphasic mixture was extracted four times with DCM (4x25 mL). This solution was dried over Na_2SO_4 and concentrated under reduced pressure to provide the desired product as a colourless oil (4.54 g, 23.04 mmol, 96%).

Note: This material is hazardous due to potential decomposition, and leading references should be consulted before engaging in its preparation: *Org. Process Res. Dev.* **2020**, 24, 1, 67–84 and *Synth. Commun.* **1981**, 11(12), 947–956.

Procedure for the Synthesis of Alkynes **SI-4**

Aldehyde (5 mmol, 1 equiv.) was dissolved in MeOH (25 mL, 0.2 M) and cooled to 0 °C. K_2CO_3 (10 mmol, 2 equiv.) was added, and the mixture was stirred vigorously. The Bestmann-Ohira reagent (6 mmol, 1.2 equiv.) was added dropwise over approximately 5 minutes. The mixture was stirred for 5 minutes before warming to room temperature and stirring until completion as indicated by TLC. Once complete, the mixture was diluted with $CHCl_3$ (20 mL) and washed with sat. $NaHCO_3$ solution (20 mL). The fractions were separated, and the aqueous layer was further extracted with $CHCl_3$ (20 mL x 3). The combined organic fractions were dried over Na_2SO_4 and concentrated in vacuo. The resulting residue was purified by column chromatography (hexane/EtOAc, 9:1). *NB – Due to volatility and stability issues purification and isolation can be difficult.*

Procedure for the Synthesis of Monofunctionalised Diazo Species **2**

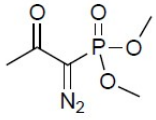
Ethyl acetoacetate (2.60 g, 20 mmol, 1.0 equiv.) and Et_3N (2.63 g, 26 mmol, 3.62 mL, 1.3 equiv.) were dissolved in MeCN (25 mL). This was cooled in an ice bath. Tosyl azide (4.33 g, 22 mmol, 1.1 equiv.) was dissolved in MeCN (25 mL) and added slowly to the substrate solution under strong stirring over five minutes. Once the addition was complete, the reaction was warmed to room temperature and stirred overnight (16-24 hours). Upon complete consumption of the starting materials, the reaction mixture was concentrated under reduced pressure. This residue was dissolved in Et_2O (60 mL). This was added to a separatory funnel and washed with a 5% aqueous KOH solution (100 mL). The organic layer was separated and transferred to a round-bottomed flask. A 5% aqueous KOH solution (100 mL) was added to this and stirred for 1 hour. The organic phase was separated, dried with brine, dried over Na_2SO_4 and concentrated *in vacuo* to give the product as a yellow oil in 87% yield (1.98 g, 17.4 mmol).

Procedure for the Synthesis of Pyridazines **3**

Reactions were carried out using a Vapourtec R-Series flow system. The difluorocyclopropene (1 mmol, 1.0 equiv.) was dissolved in acetonitrile (1 mL, 1 M) under N_2. Et_3N (1.5 mmol, 1.5 equiv.) was added to this solution. The diazo species (1 mmol, 1 equiv.) was dissolved in acetonitrile (1 mL, 1 M). This was mixed with the difluorocyclopropene solution. The mixture was circulated through the flow reactor at 140 °C with a back pressure of 8 bar for 15 mins at a flow rate of 2 mL/min. The product solution was concentrated *in vacuo* and purified by silica gel column chromatography.

3. Spectroscopic Data

Dimethyl (1-diazo-2-oxopropyl)phosphonate SI-5



Chemical Formula: $C_5H_9N_2O_4P$

Exact Mass: 192.03

Yield: 86% (1.651, 8.6 mmol)

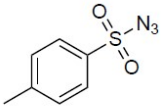
Appearance: Yellow oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_5H_9N_2O_4PH^+$ 193.0378; Found 193.0382

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 3.86 (s, 3H), 3.83 (s, 3H), 2.26 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ/ppm 190.0 (C), 53.7 (CH_3), 27.2 (CH_3), (C=N_2 signal was not observed).

This data is consistent with published work. [Donnelly, K.; Singh, A.; Tuttle, T.; Baumann, M. *Chem. Eur. J.* **2023**, 29 (54), e202301861.]

4-Methylbenzenesulfonyl azide (p-Tosyl Azide)



Chemical Formula: $C_7H_7N_3O_2S$
Exact Mass: 197.03

Yield: 96% (4.539 g, 23.04 mmol)

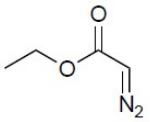
Appearance: Clear oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_7H_7N_3O_2SH^+$ 198.0337; Found 198.0345

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.85 (d, *J* = 8.3 Hz, 2H), 7.41 (d, *J* = 8.3 Hz, 2H), 2.48 (s, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 145.3 (C), 135.5 (C), 130.3 (CH), 127.6 (CH), 21.8 (CH_3)

This data is consistent with published work. [Bélanger, D.; Tong, X.; Soumaré, S.; Dory, Y. L.; Zhao, Y. *Chem. Eur. J.* **2009**, 15(17), 428-4436.]

Ethyl 2-diazoacetate (2)



Chemical Formula: $C_4H_6N_2O_2$
Exact Mass: 114.04

Yield: 87% (1.984 g, 17.4 mmol)

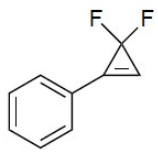
Appearance: Yellow oil

HR-MS (QTOF) m/z: [M+H]+ Calcd for $C_4H_6N_2O_2H^+$ 115.0508; Found 115.0499

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 4.72 (s, br, 1H), 4.21 (q, *J* = 7.2 Hz, 2H), 1.27 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 166.9 (C), 60.8 (CH), 46.1 (CH_2), 14.4 (CH_3).

This data is consistent with published work. [Kim, J.; Yoo, E. J. *Org. Lett.* **2021**, 23 (11), 4256-4260.]

(3,3-Difluorocycloprop-1-en-1-yl)benzene, SI-4a



Chemical Formula: $C_9H_6F_2$
Exact Mass: 152.04

Yield: 90% (0.410 g, 2.7 mmol)

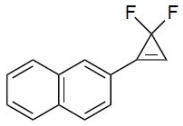
Appearance: Orange/Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.72-7.63 (m, 2H), 7.55-7.45 (m, 4H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 134.0 (t, *J* = 11 Hz, C), 131.7 (CH), 130.1 (CH), 129.1 (CH), 123.4 (C),

113.5 (t, J = 12 Hz, CH), 101.8 (t, J = 268 Hz, CF_2). **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -106.6 (s).

This data is consistent with published work. [Tran, G.; Gomez Pardo, D.; Tsuchiya, T.; Hillebrand, S.; Vors, J.-P.; Cossy, J. *Org. Lett.* **2015**, 17 (14), 3414-3417.]

2-(3,3-Difluorocycloprop-1-en-1-yl)naphthalene SI-4b



Chemical Formula: $C_{13}H_8F_2$

Exact Mass: 202.06

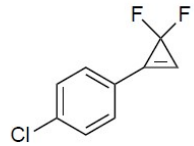
Yield: 57% (0.345 g, 1.71 mmol)

Appearance: Yellow oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 8.19 (s, 1H), 7.96-7.85 (m, 3H), 7.73-7.66 (m, 1H), 7.63-7.52 (m, 3H). [Trimethoxybenzene internal standard = δ/ppm 6.10 (s), 3.77 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -106.26 (s).

This data is consistent with published work. [Donnelly, K.; Singh, A.; Tuttle, T.; Baumann, M. *Chem. Eur. J.* **2023**, 29 (54), 202301861.]

1-Chloro-4-(3,3-difluorocycloprop-1-en-1-yl)benzene SI-4c [Alkyne Co-eluted]



Chemical Formula: $C_9H_5ClF_2$

Exact Mass: 186.00

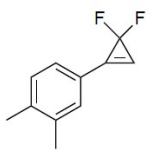
Yield: 24% (0.134 g, 0.72 mmol)

Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.62-7.56 (m, 2H), 7.50-7.47 (m, 2H), 7.47-7.44 (m, 1H). [Alkyne = 7.43-7.39 (m), 7.32-7.27 (m), 3.10 (s); Trimethoxybenzene internal standard = δ/ppm 6.08 (s), 3.76 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -106.42 (d, J = 2.1 Hz)

This data is consistent with published work. [Oftadeh, E.; Wong, M. J.; Yu, J.; Li, X.; Cao, Y.; Gallou, F.; Heinz, L.; Lipshutz, B. H. *J. Org. Chem.* **2024**, 89 (23), 17331-17337.]

4-(3,3-Difluorocycloprop-1-en-1-yl)-1,2-dimethylbenzene SI-4d [Crude product]



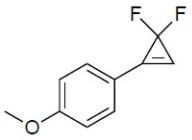
Chemical Formula: $C_{11}H_{10}F_2$

Exact Mass: 180.08

Yield: 12% (0.065 g, 0.36 mmol); 88% (2.64 mmol) Alkyne coeluted

Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.34-7.31 (m, 1H), 7.30-7.27 (m, 1H), 7.25-7.20 (m, 1H), 7.13-7.09 (m, 1H), 2.28 (s, 3H), 2.26 (s, 3H). [Alkyne = 7.30-7.27 (m, 1H), 7.25-7.20 (m, 1H), 7.10-7.06 (m, 1H), 3.01 (s, 3H), 2.26 (s, 3H), 2.24 (s, 3H); Trimethoxybenzene internal standard = δ/ppm 6.10 (s), 3.77 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -106.25 (d, *J* = 1.7 Hz).



Chemical Formula: $C_{10}H_8F_2O$
Exact Mass: 182.05

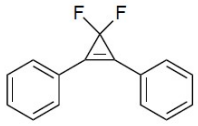
1-(3,3-Difluorocycloprop-1-en-1-yl)-4-methoxybenzene SI-4e [Alkyne Co-eluted]

Yield: 47% (0.257 g, 1.41 mmol); 53% (1.59 mmol); Alkyne coeluted

Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.63-7.58 (m, 2H), 7.28 (t, *J* = 2.0 Hz, 1H), 7.01-6.96 (m, 2H). [Alkyne = 7.45-7.40 (m, 2H), 6.87-6.81 (m, 2H), 2.99 (s, 1H); Trimethoxybenzene internal standard = δ/ppm 6.09 (s), 3.77 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -106.31 (d, *J* = 2.1 Hz).

This data is consistent with published work. [Donnelly, K.; Singh, A.; Tuttle, T.; Baumann, M. *Chem. Eur. J.* **2023**, 29 (54), e202301861.]



Chemical Formula: $C_{15}H_{10}F_2$
Exact Mass: 228.08

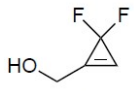
(3,3-Difluorocycloprop-1-ene-1,2-diyl)dibenzene SI-4f

Yield: 74% (0.506 g, 2.22 mmol)

Appearance: Yellow oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.82-7.76 (m, 4H), 7.58-7.52 (m, 6H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 131.1 (CH), 130.5 (CH), 129.3 (CH), 124.7 (C), 123.3 (t, *J* = 10.7 Hz, C) 102.4 (t, *J* = 272 Hz, CF_2). ^{19}F NMR (376 MHz, $CDCl_3$) δ/ppm -112.06 (s).

This data is consistent with published work. [Donnelly, K.; Singh, A.; Tuttle, T.; Baumann, M. *Chem. Eur. J.* **2023**, 29 (54), e202301861]



Chemical Formula: $C_4H_4F_2O$
Exact Mass: 106.02

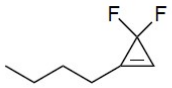
(3,3-Difluorocycloprop-1-en-1-yl)methanol SI-4h [Crude product]

Yield: 42% (0.134 g, 1.26 mmol)

Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.41-7.37 (m, 1H), 4.64 (q, *J* = 1.6 Hz, 2H). [Trimethoxybenzene internal standard = δ/ppm 6.08 (s), 3.76 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -103.01 (q, *J* = 1.6 Hz).

1-Butyl-3,3-difluorocycloprop-1-ene SI-4i [Crude product]



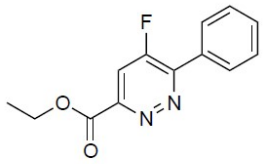
Chemical Formula: $C_7H_{10}F_2$
Exact Mass: 132.08

Yield: 37% (0.146 g, 1.11 mmol)

Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.22-7.18 (m, 1H), 2.54-2.46 (m, 2H), 1.65-1.57 (m, 2H), 1.47-1.36 (m, 2H), 0.94 (t, *J* = 7.3 Hz, 3H). **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -104.13 (s).

Ethyl 5-fluoro-6-phenylpyridazine-3-carboxylate, 3a



Chemical Formula: $C_{13}H_{11}FN_2O_2$
Exact Mass: 246.08

Yield: 84% (0.207 g, 0.84 mmol)

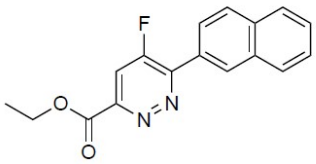
Appearance: Brown oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_{13}H_{11}FN_2O_2H^+$ 247.0883; Found 247.0881

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 8.18-8.10 (m, 2H), 7.97 (d, *J* = 11.2 Hz, 1H), 7.60-7.53 (m, 3H), 4.57 (q, *J* = 7.1 Hz, 2H), 1.50 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 163.3 (C), 160.7 (d, *J* = 280 Hz, C), 153.0 (C), 152.3 (C), 131.4 (C+CH), 129.6 (CH), 129.0 (CH), 115.1 (CH), 63.1 (CH_2), 14.4 (CH_3). **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -115.48 (d, *J* = 11.2 Hz).

This data is consistent with published work. [Tran, G.; Gomez Pardo, D.; Tsuchiya, T.; Hillebrand, S.; Vors, J.-P.; Cossy, J. *Org. Lett.* **2015**, 17 (14), 3414-3417.]

Ethyl 5-fluoro-6-(naphthalen-2-yl)pyridazine-3-carboxylate, 3b



Chemical Formula: $C_{17}H_{13}FN_2O_2$
Exact Mass: 296.10

Yield: 86% (0.255 g, 0.86 mmol)

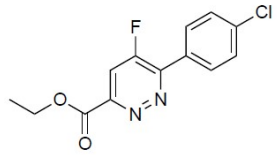
Appearance: Brown oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_{17}H_{13}FN_2O_2H^+$ 297.1039; Found 297.1033.

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 8.64 (s, 1H), 8.27 (dt, J = 8.6, 1.8 Hz, 1H), 8.03-7.94 (m, 2H), 7.99 (d, *J* = 11.36 Hz, 1H), 7.90 (d, J = 9.4 Hz, 1H), 7.62-7.52 (m, 2H), 4.58 (q, *J* = 7.2 Hz, 2H), 1.51 (t, *J* = 7.0 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 163.3 (C), 162.4 (d, J = 280 Hz, C), 159.6 (C), 152.9 (C), 152.2 (C), 134.5 (C), 133.1 (C), 130.5 (CH), 129.3 (CH), 128.8 (CH), 128.0 (CH), 127.9 (CH), 126.9 (CH), 125.7 (CH), 115.1 (d, *J* = 17.6 Hz, CH), 63.0 (CH_2), 14.4 (CH_3). **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -114.90 (d, *J* = 11.2 Hz).

This data is consistent with published work. [Tran, G.; Gomez Pardo, D.; Tsuchiya, T.; Hillebrand, S.; Vors, J.-P.; Cossy, J. *Org. Lett.* **2015**, 17 (14), 3414-3417.]

Ethyl 6-(4-chlorophenyl)-5-fluoropyridazine-3-carboxylate, 3c



Chemical Formula: $C_{13}H_{10}ClFN_2O_2$
Exact Mass: 280.04

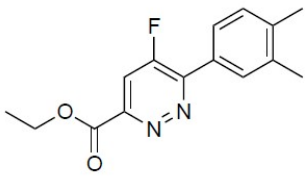
Yield: 93% (0.187 g, 0.67 mmol)

Appearance: Yellow/Brown oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_{13}H_{10}ClFN_2O_2H^+$ 281.0493; Found 281.0501

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 8.16-8.07 (m, 2H), 7.98 (d, *J* = 11.2 Hz, 1H), 7.59-7.50 (m, 2H), 4.58 (q, *J* = 7.1 Hz, 2H), 1.50 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 163.2 (C), 160.7 (d, *J* = 280.4 Hz, C), 152.6 (C), 151.9 (C), 137.8 (C), 130.8 (C), 130.0 (CH), 129.4 (CH), 115.2 (CH), 63.1 (CH_2), 14.4 (CH_3). **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -115.22 (d, *J* = 11.6 Hz).

Ethyl 6-(3,4-dimethylphenyl)-5-fluoropyridazine-3-carboxylate, 3d



Chemical Formula: $C_{15}H_{15}FN_2O_2$
Exact Mass: 274.11

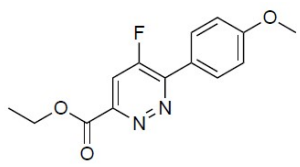
Yield: 60% (0.059 g, 0.216 mmol)

Appearance: Brown oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_{15}H_{15}FN_2O_2H^+$ 275.1120; Found 275.1113

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.94 (s, 1H), 7.94 (d, *J* = 11.5 Hz, 1H), 7.86 (d, *J* = 7.8 Hz, 1H), 7.31 (d, *J* = 7.8 Hz, 1H), 4.56 (q, *J* = 7.2 Hz, 2H), 2.37 (s, 3H), 2.36 (s, 3H), 1.49 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 129.8 (CH), 129.6 (CH), 126.4 (CH), 117.4 (CH), 63.7 (CH_2), 29.9 (CH_3), 19.9 (CH_3), 14.2 (CH_3) – several resonances were not observed as sample decomposed. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -115.43 (d, *J* = 11.6 Hz).

Ethyl 5-fluoro-6-(4-methoxyphenyl)pyridazine-3-carboxylate, 3e



Chemical Formula: $C_{14}H_{13}FN_2O_3$
Exact Mass: 276.09

Yield: 39% (0.108 g, 0.39 mmol)

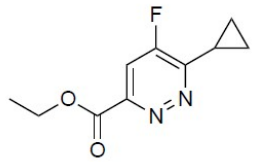
Appearance: Brown oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_{14}H_{13}FN_2O_3H^+$ 277.0988; Found 277.981

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 8.11 (d, *J* = 8.4 Hz, 2H), 7.88 (d, *J* = 11.7 Hz, 1H), 7.01 (d, *J* = 8.9 Hz, 2H), 4.52 (q, *J* = 7.1 Hz, 2H), 3.82 (s, 3H), 1.45 (t, *J* = 7.1 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ/ppm 163.3 (d, *J* = 3 Hz, C), 162.0 (C), 160.3 (d, *J* = 281 Hz, C), 152.2 (d, *J* = 4 Hz, C), 151.5 (d, *J* = 3 Hz, C), 131.1 (d, *J* = 6 Hz, 2xCH), 123.9 (d, *J* = 5 Hz, C), 114.8 (d, *J* = 17 Hz, CH), 114.4 (2xCH), 62.8 (CH_2), 55.4 (CH_3), 14.3 (CH_3). ^{19}F NMR (376 MHz, $CDCl_3$) δ/ppm -115.79 (d, *J* = 11.6).

This data is consistent with published work. [Tran, G.; Gomez Pardo, D.; Tsuchiya, T.; Hillebrand, S.; Vors, J.-P.; Cossy, J. *Org. Lett.* **2015**, 17 (14), 3414-3417.]

Ethyl 6-cyclopropyl-5-fluoropyridazine-3-carboxylate, 3g



Chemical Formula: $C_{10}H_{11}FN_2O_2$
Exact Mass: 210.08

Yield: 41% (0.086 g, 0.41 mmol)

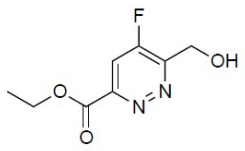
Appearance: Brown oil

HR-MS (QTOF) m/z: $[M+H]^+$ Calcd for $C_{10}H_{11}FN_2O_2H^+$ 211.0883; Found 211.0878

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.75 (d, *J* = 9.9 Hz, 1H), 4.50 (q, *J* = 7.1 Hz, 2H), 2.47–2.39 (m, 1H), 1.52–1.46 (m, 5H), 1.26 (t, *J* = 7.2 Hz, 3H). **^{13}C NMR (101 MHz, $CDCl_3$)** δ/ppm 163.6 (d, *J* = 3 Hz, C), 161.0 (d, *J* = 273 Hz, C), 158.8 (d, *J* = 9 Hz, C), 151.0 (d, *J* = 3 Hz, C), 112.5 (d, *J* = 15 Hz, CH), 62.8 (CH_2), 14.31 (CH_3), 11.96 (C), 9.70 (2xCH_2). **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -121.55 (d, *J* = 9.9 Hz).

This data is consistent with published work. [Tran, G.; Gomez Pardo, D.; Tsuchiya, T.; Hillebrand, S.; Vors, J.-P.; Cossy, J. *Org. Lett.* **2015**, 17 (14), 3414-3417.]

Ethyl 5-fluoro-6-(hydroxymethyl)pyridazine-3-carboxylate, 3h
[Crude product]

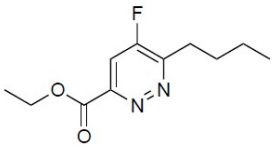


Chemical Formula: $C_8H_9FN_2O_3$
Exact Mass: 200.06

Yield: 7% (0.014 g, 0.07 mmol)

Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.88 (d, *J* = 9.4 Hz, 1H), 4.68-4.64 (m, 2H), 4.54 (q, *J* = 7.1 Hz, 2H), 1.31 (t, *J* = 7.2 Hz, 3H). [Trimethoxybenzene internal standard = δ/ppm 6.07 (s), 3.76 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -118.22 (d, *J* = 9.4 Hz).



Chemical Formula: $C_{11}H_{15}FN_2O_2$
Exact Mass: 226.11

Ethyl 6-butyl-5-fluoropyridazine-3-carboxylate, 3i [Crude product]

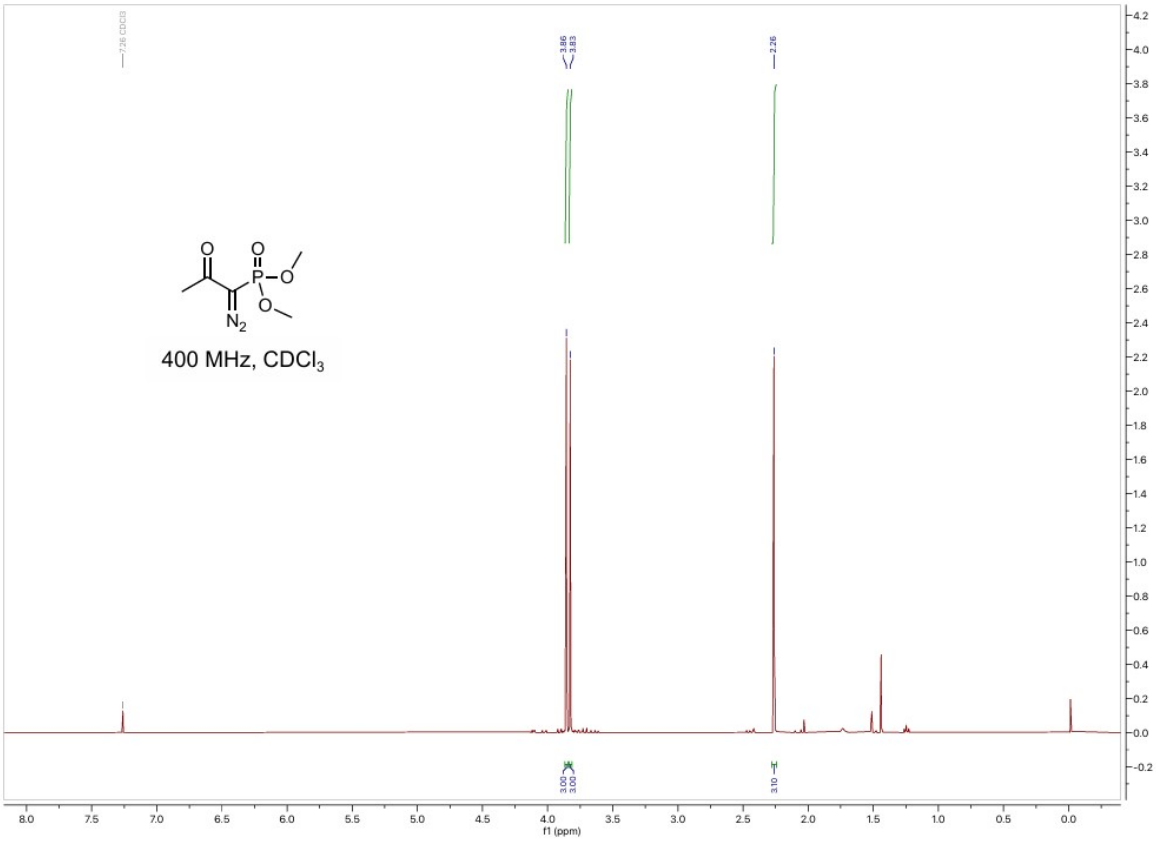
Yield: 4% (9 mg, 0.04 mmol)

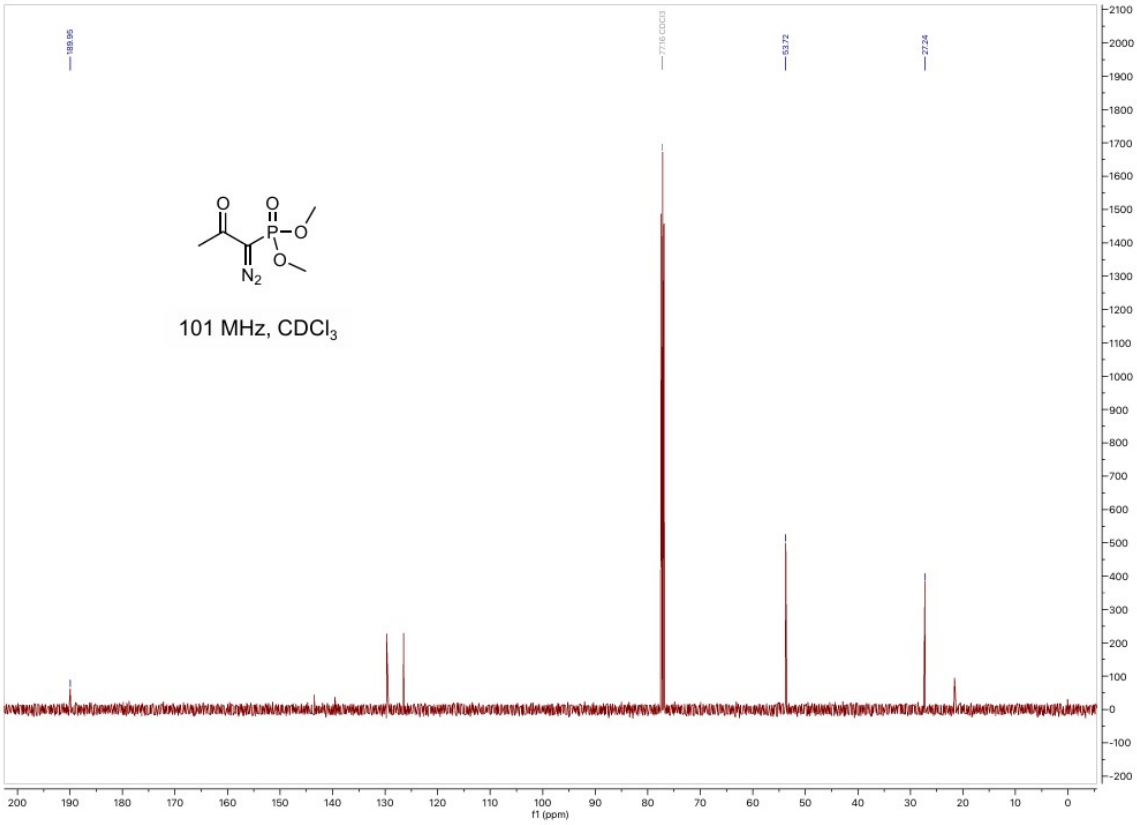
Appearance: Brown oil

^{1}H NMR (400 MHz, $CDCl_3$) δ/ppm 7.78 (d, *J* = 9.7 Hz, 1H), 4.05 (q, *J* = 7.1 Hz, 2H), 3.67-3.59 (m, 2H), 2.29-2.23 (m, 2H), 1.64-1.54 (m, 2H), 1.04 (t, *J* = 7.2 Hz, 3H). [Trimethoxybenzene internal standard = δ/ppm 6.06 (s), 3.74 (s)]. **^{19}F NMR (376 MHz, $CDCl_3$)** δ/ppm -117.46 (d, *J* = 9.9 Hz).

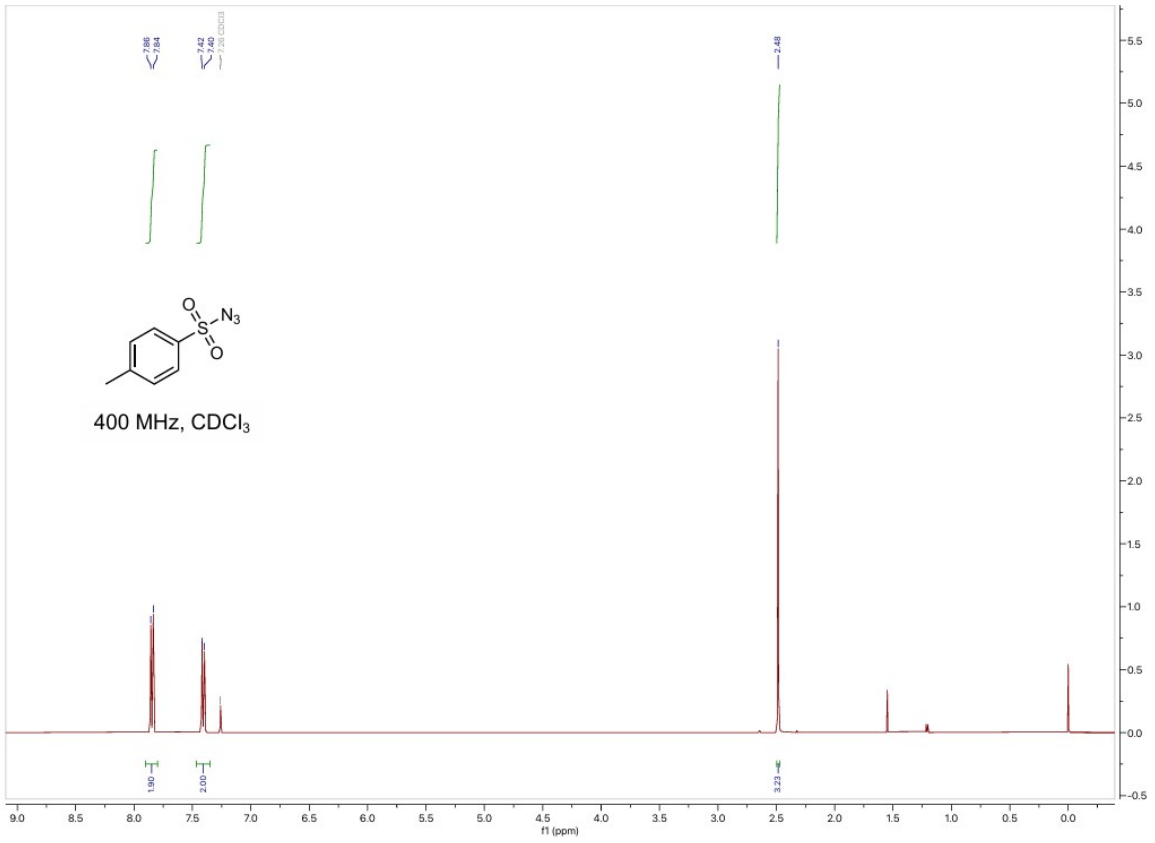
4. Copies of Representative NMR Spectra of Selected Compounds

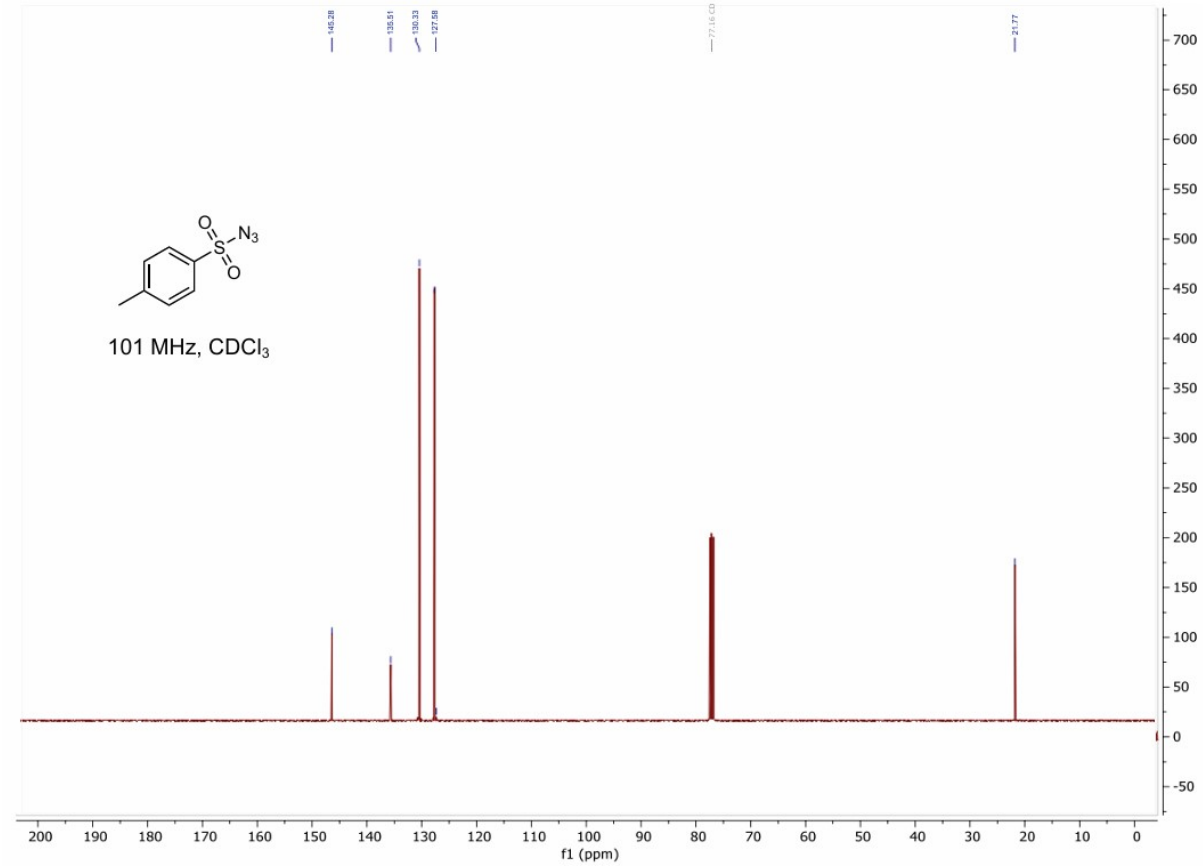
Dimethyl (1-diazo-2-oxopropyl)phosphonate (SI-5)



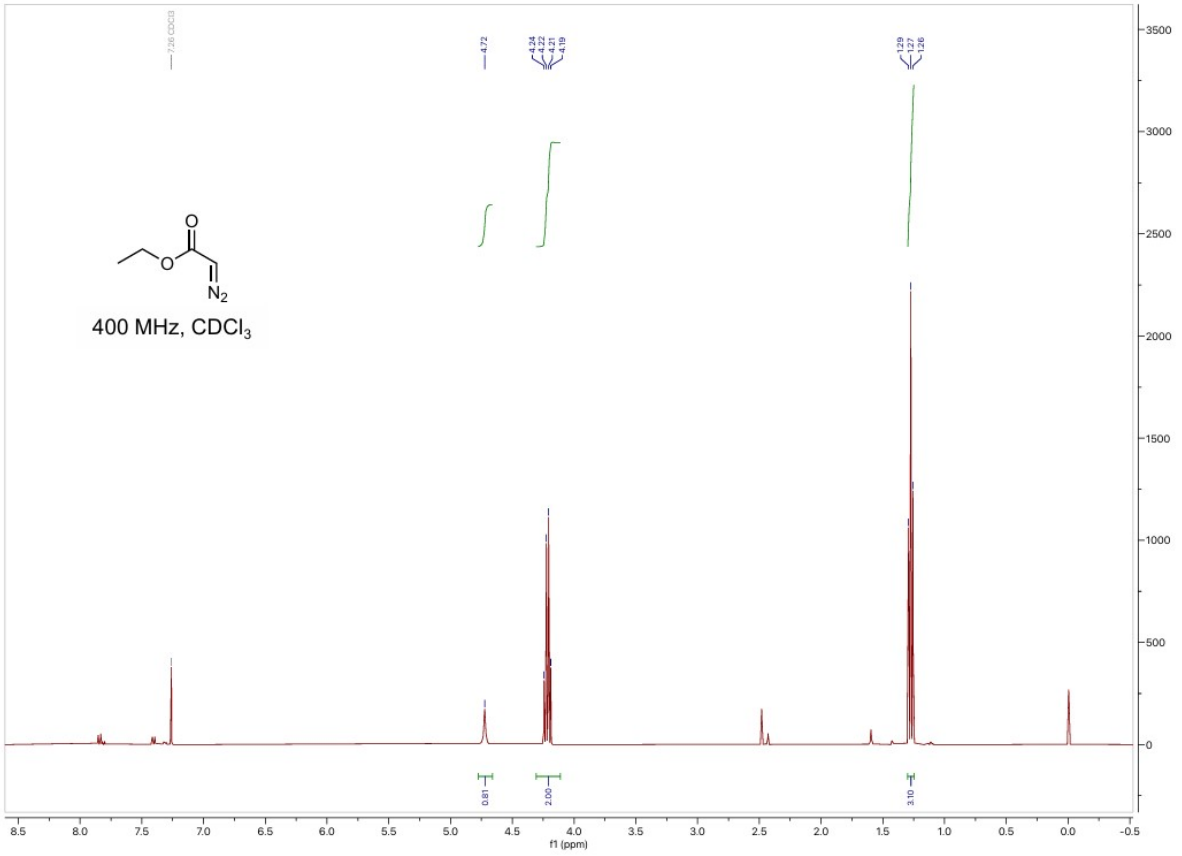


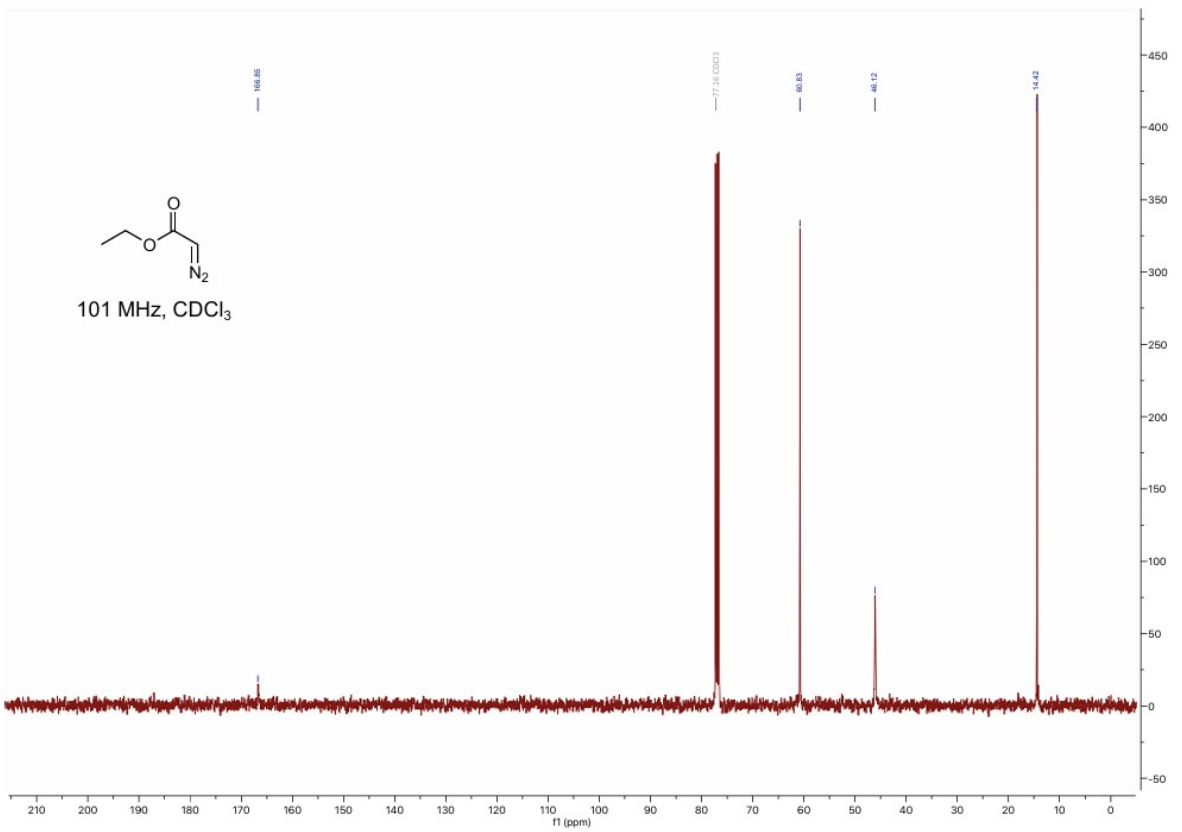
4-Methylbenzenesulfonyl azide (p-Tosyl Azide)



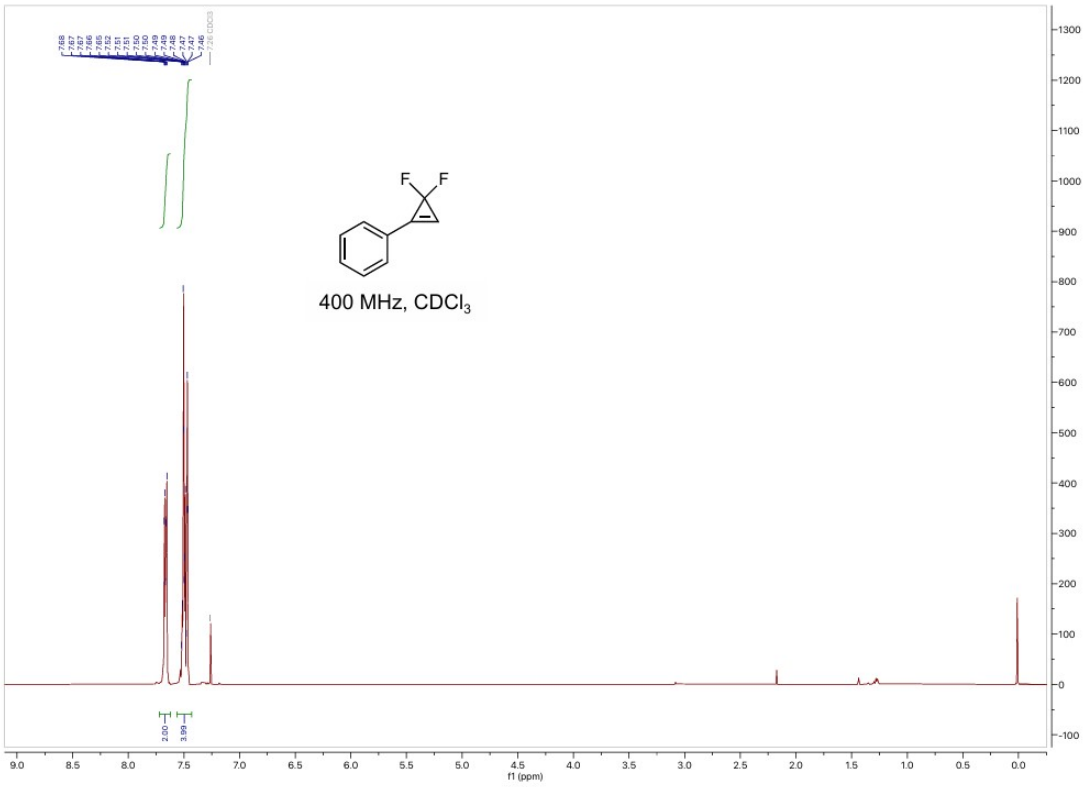


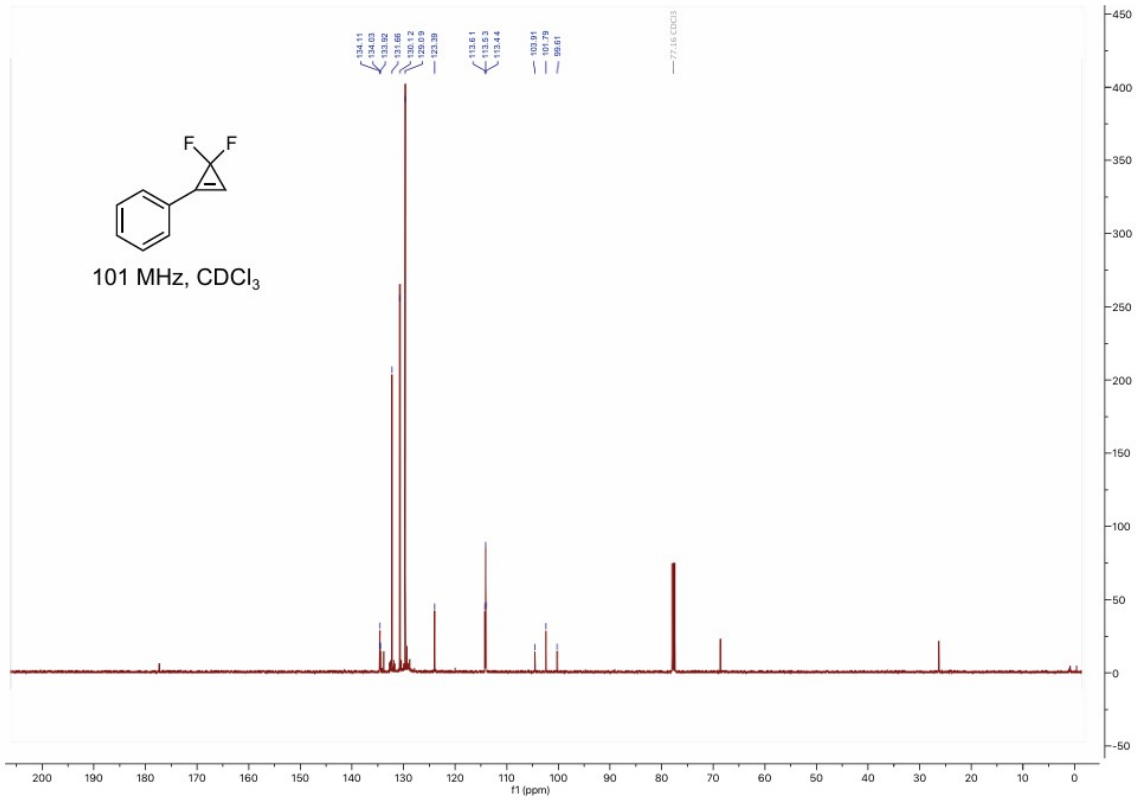
Ethyl 2-diazoacetate (2)

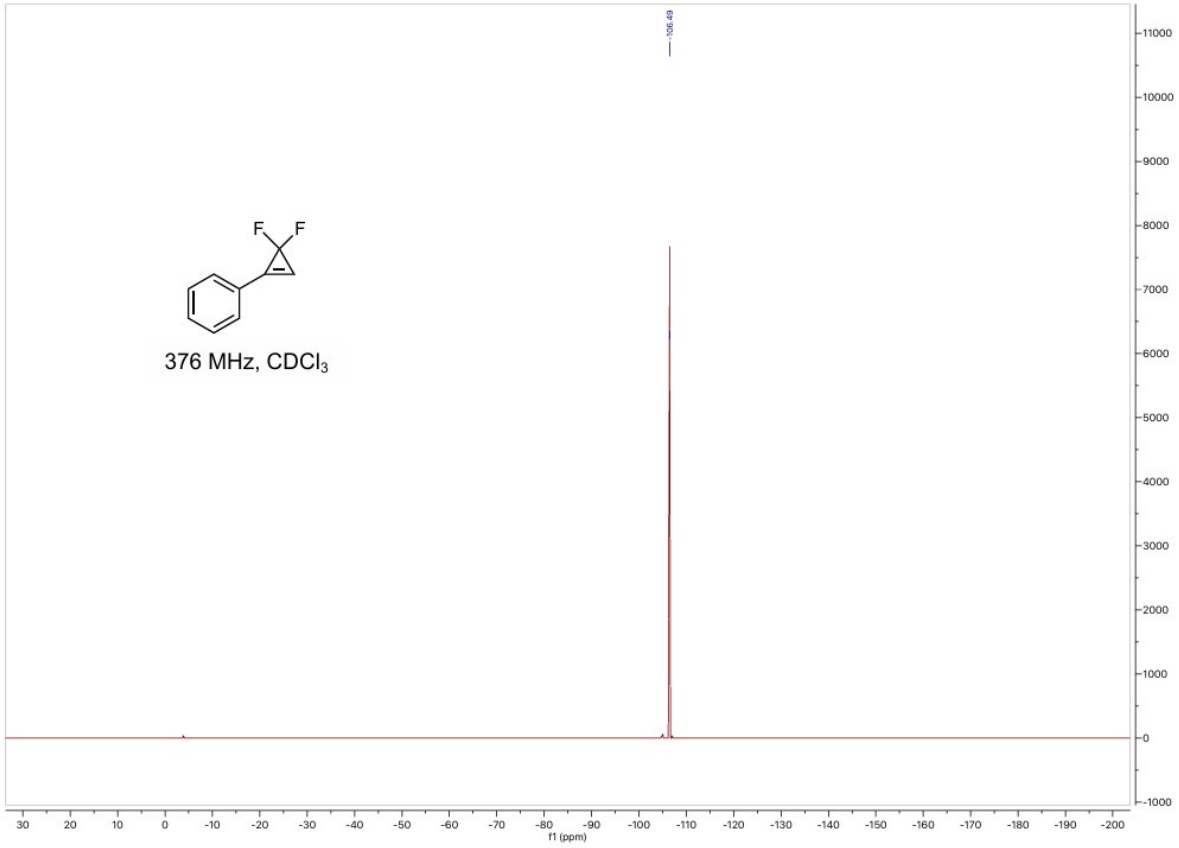




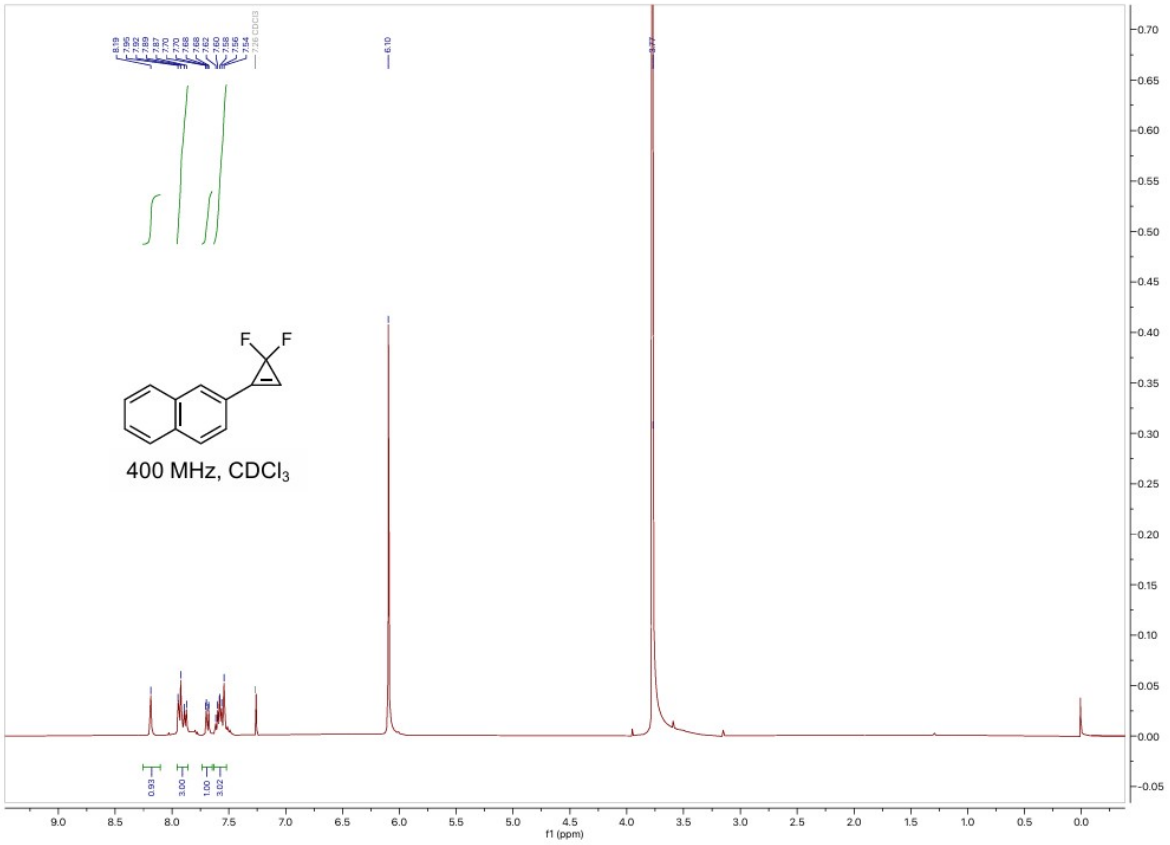
(3,3-Difluorocycloprop-1-en-1-yl)benzene (SI-4a)

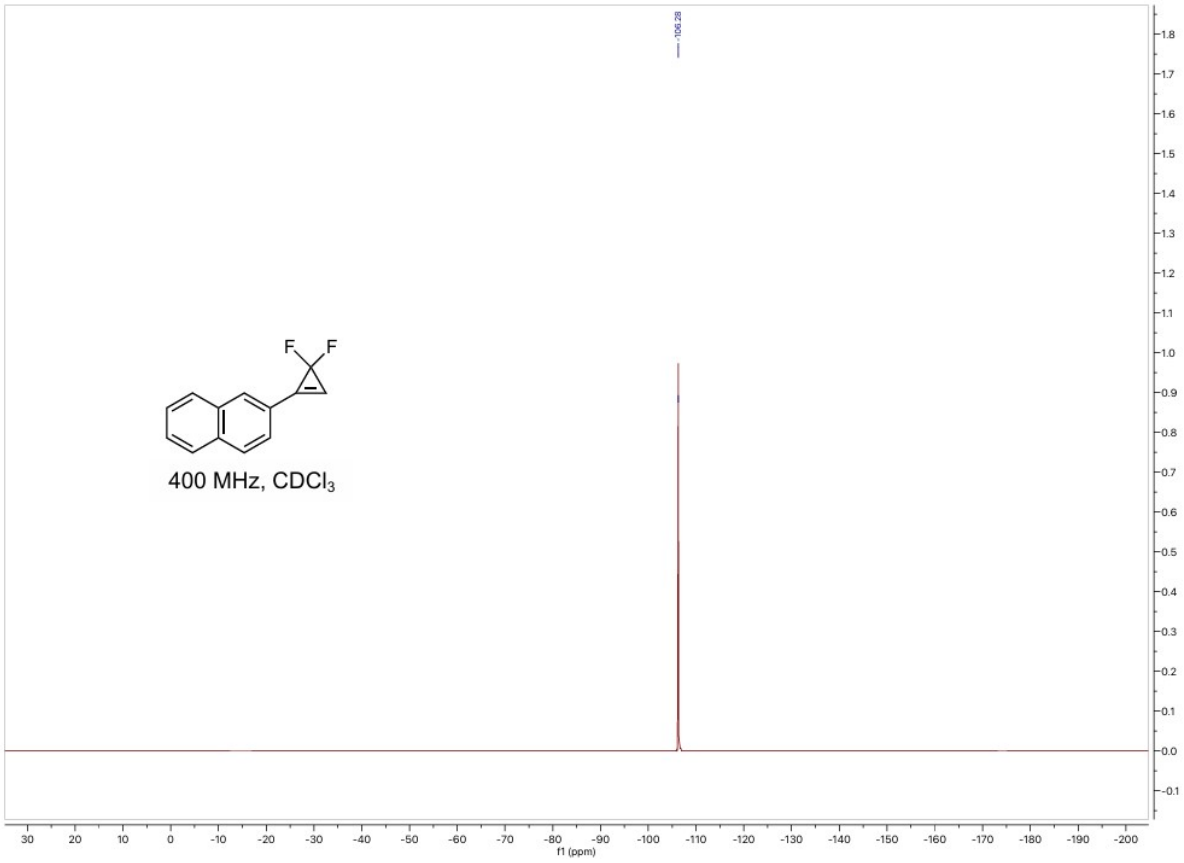




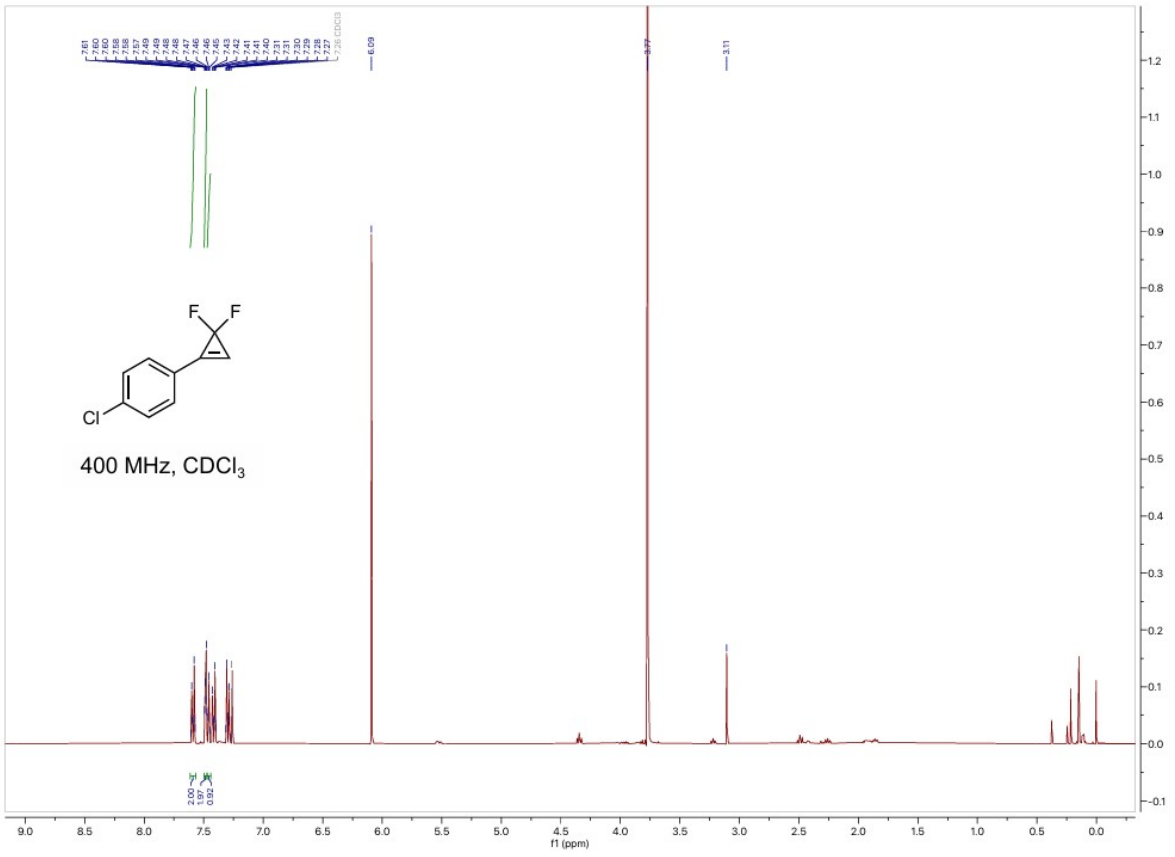


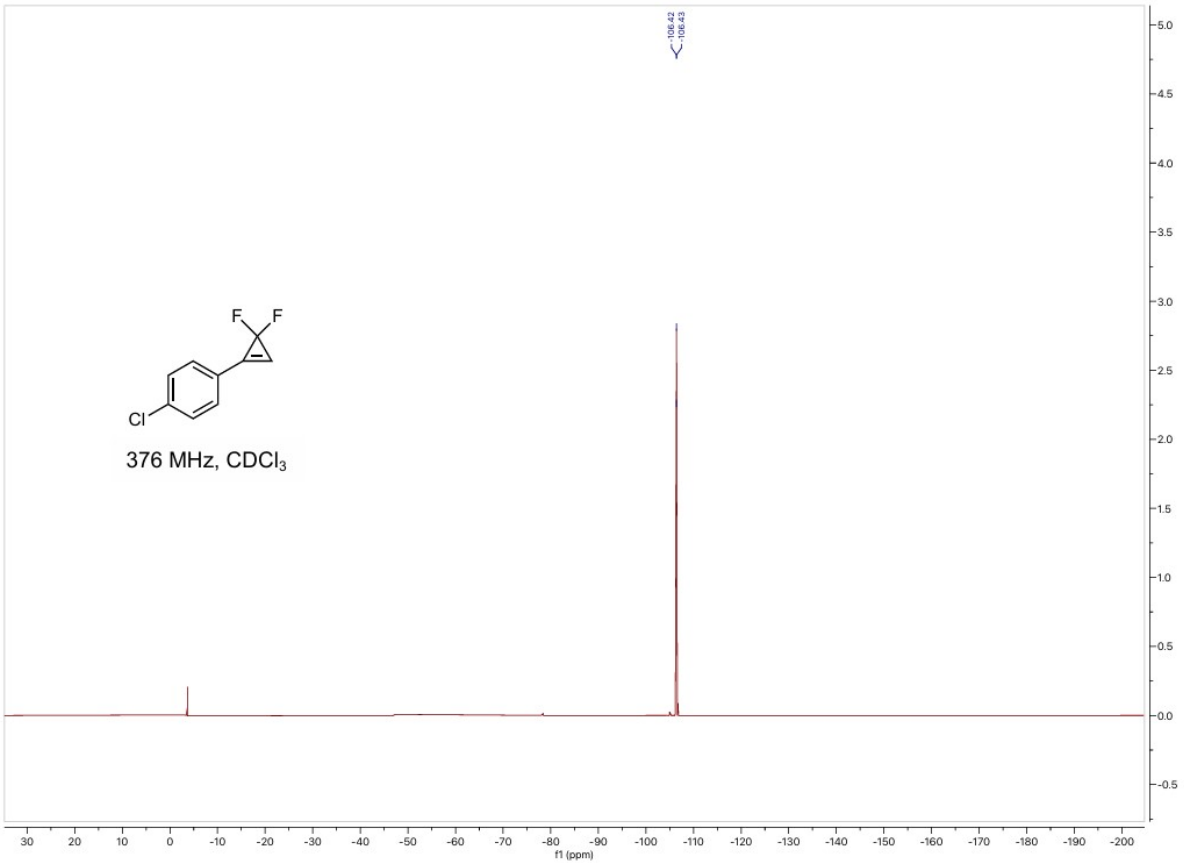
2-(3,3-Difluorocycloprop-1-en-1-yl)naphthalene (SI-4b)



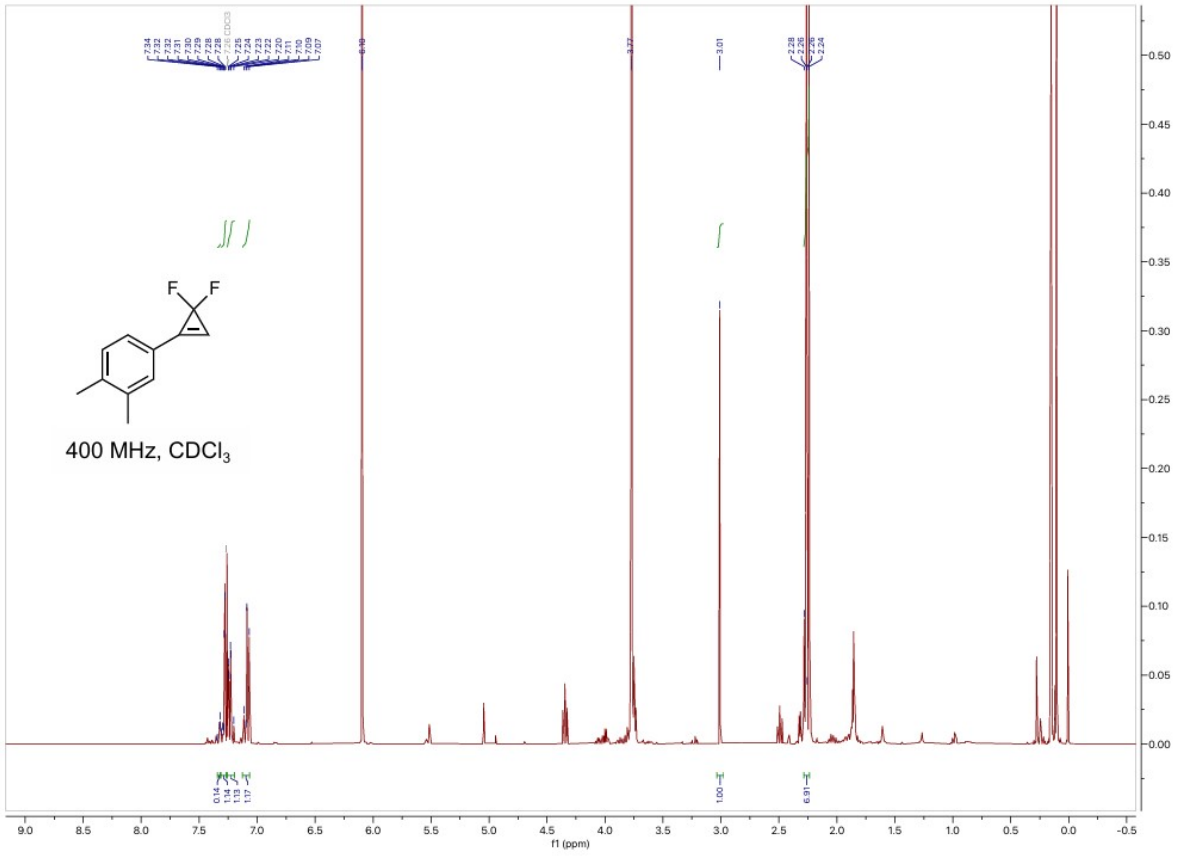


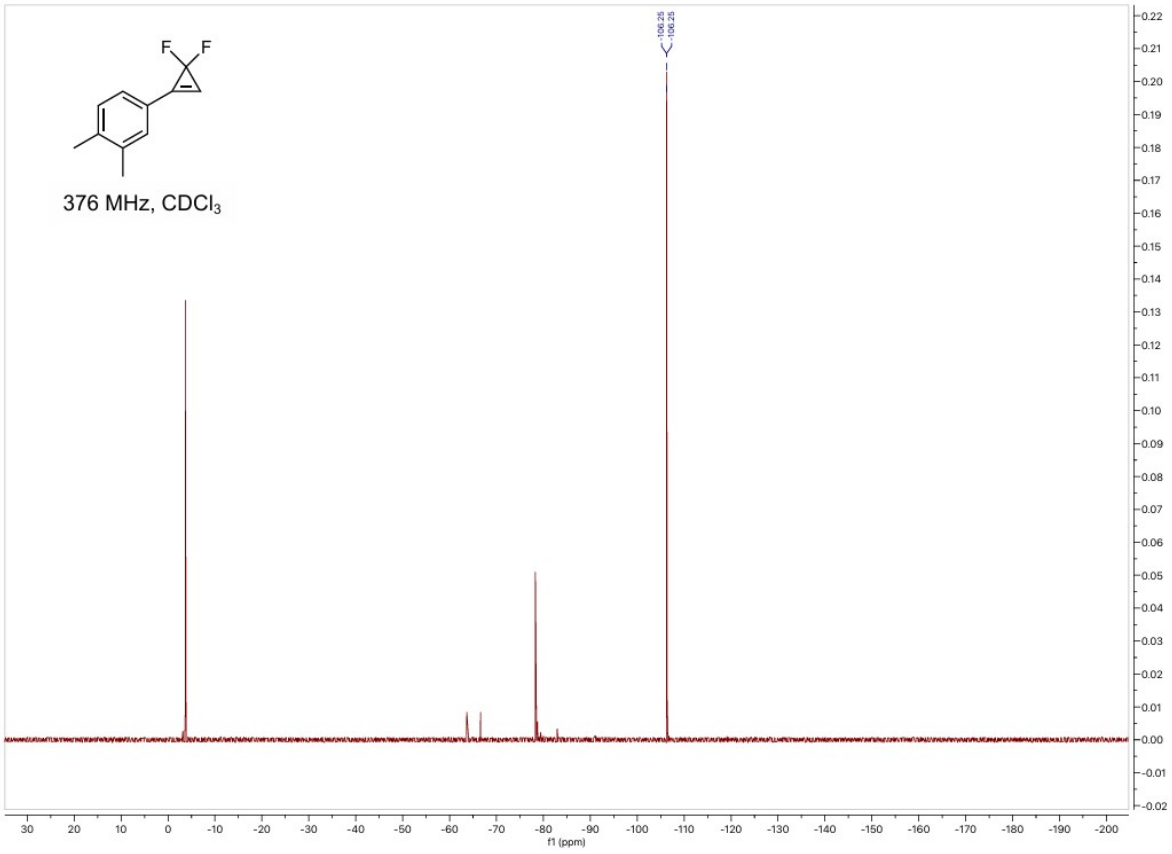
1-Chloro-4-(3,3-difluorocycloprop-1-en-1-yl)benzene (SI-4c)



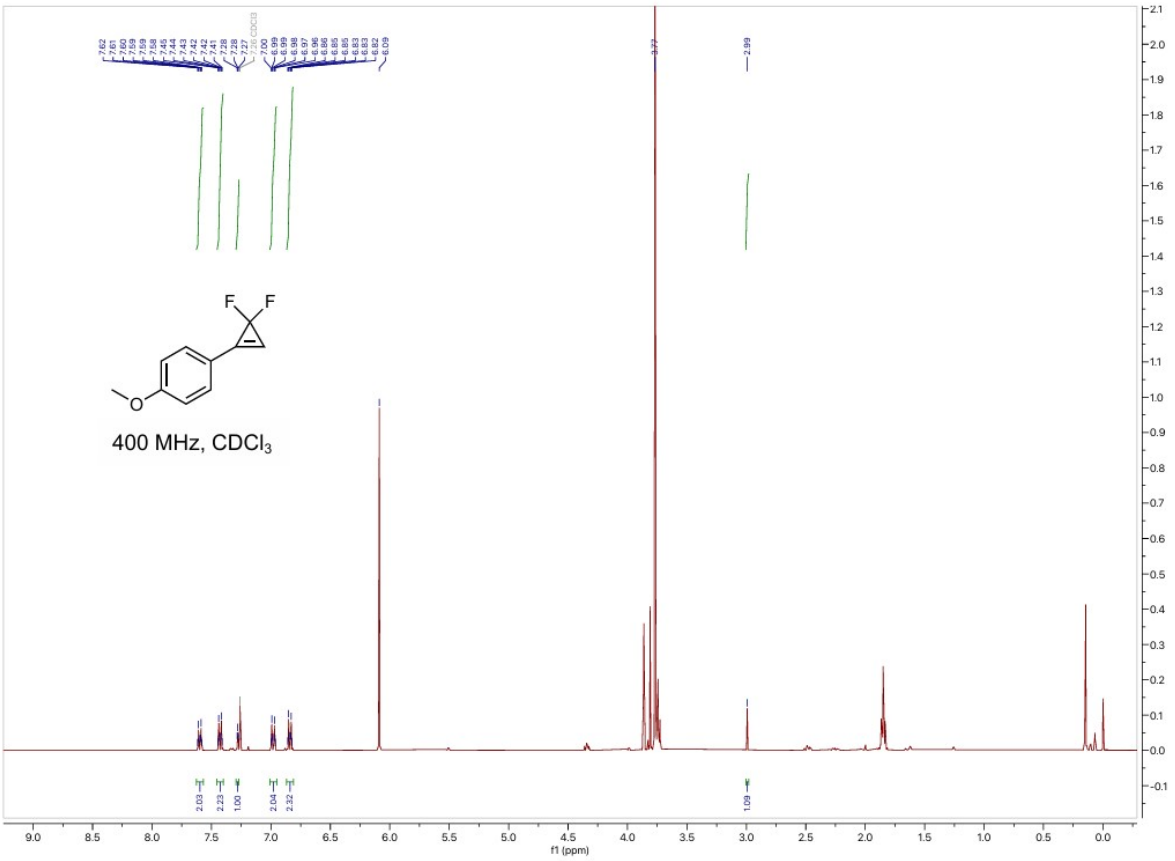


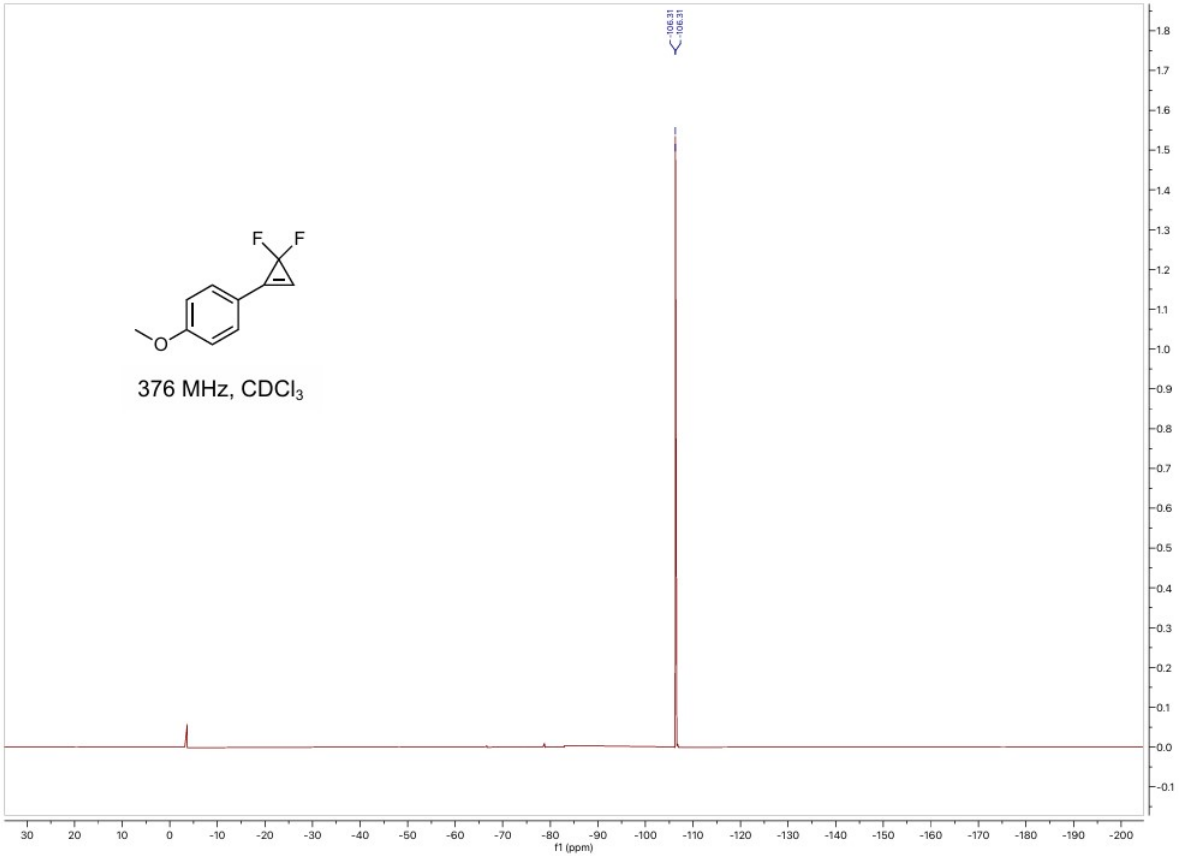
4-(3,3-Difluorocycloprop-1-en-1-yl)-1,2-dimethylbenzene (SI-4d) [Crude product]



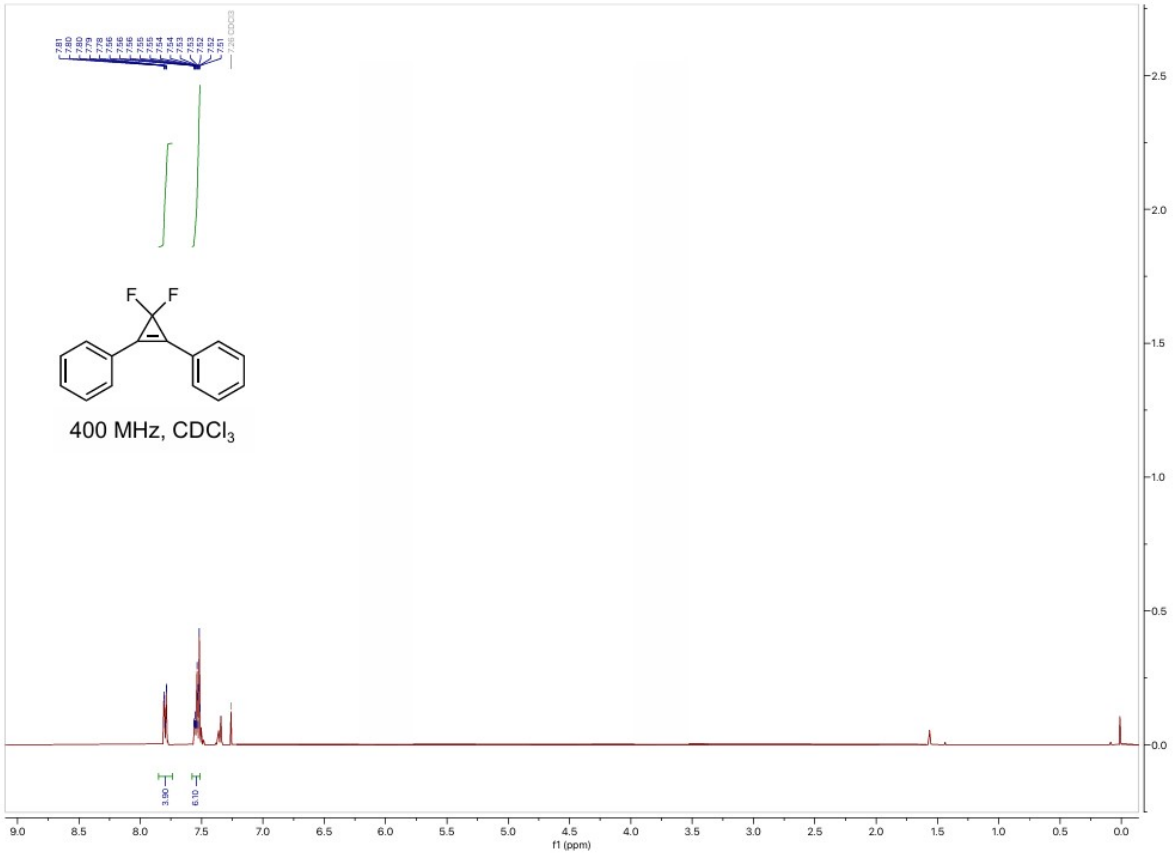


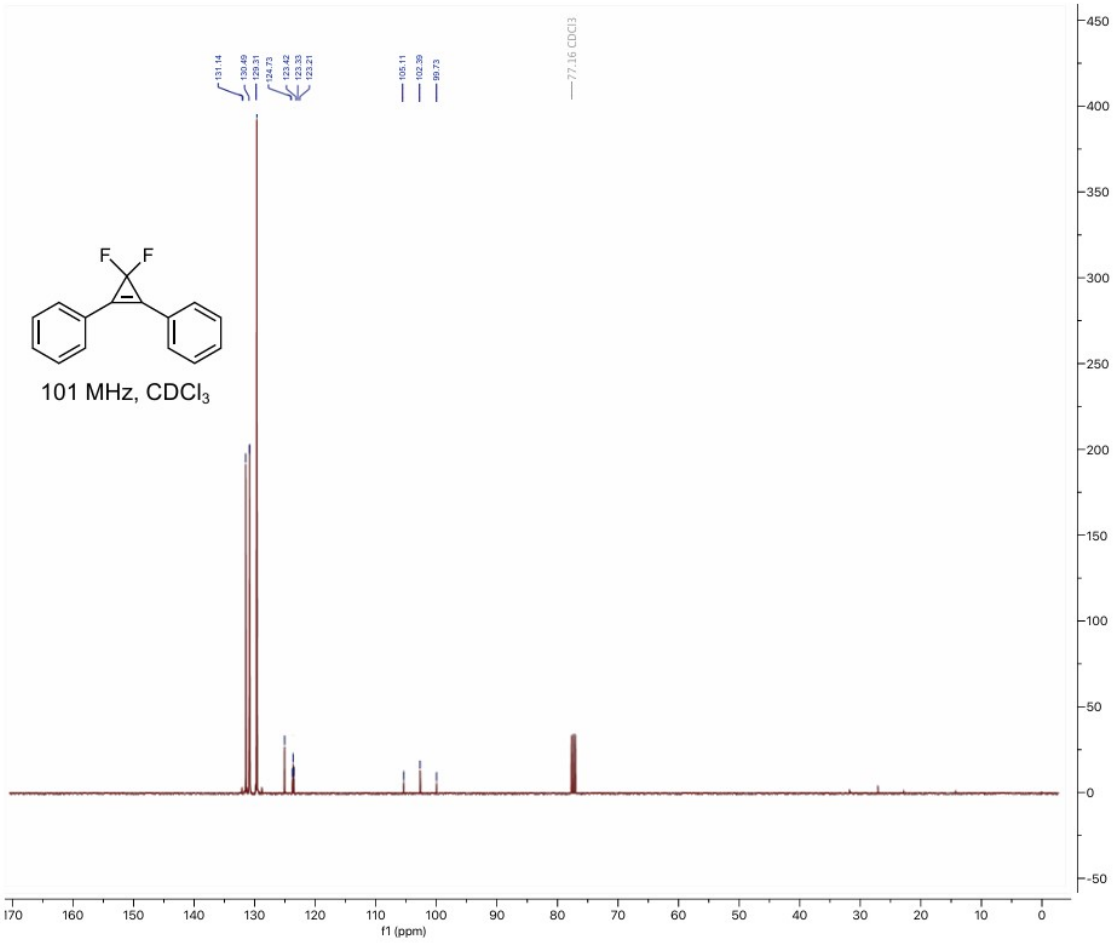
1-(3,3-Difluorocycloprop-1-en-1-yl)-4-methoxybenzene (SI-4e) [Alkyne Co-eluted]

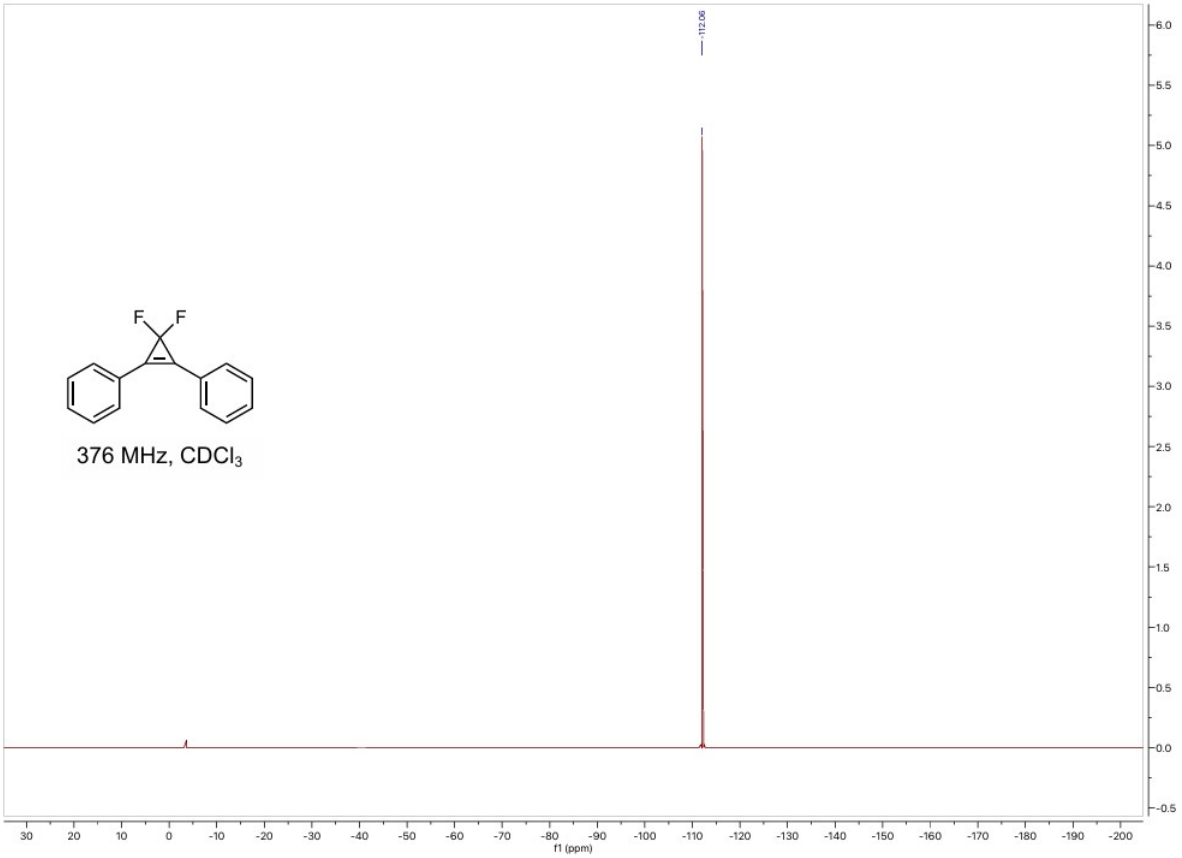




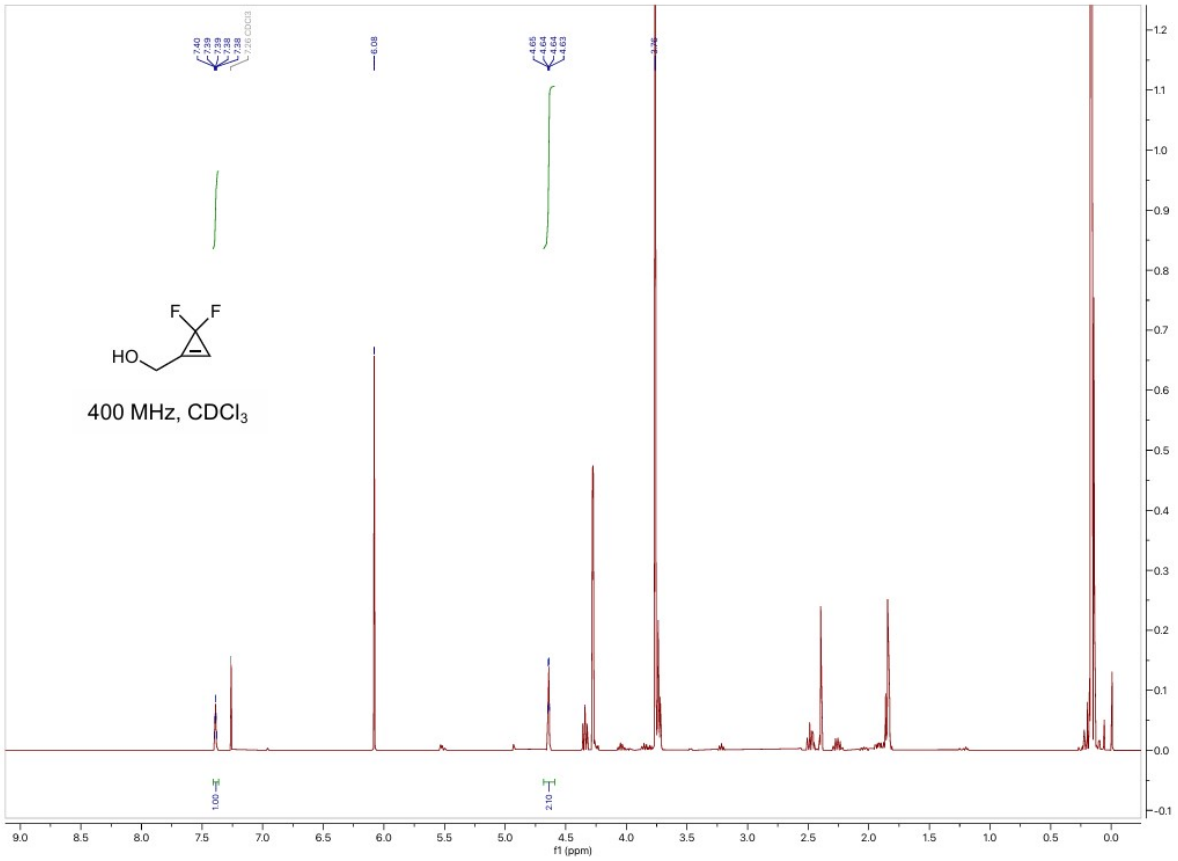
(3,3-Difluorocycloprop-1-ene-1,2-diyl)dibenzene (SI-4f)

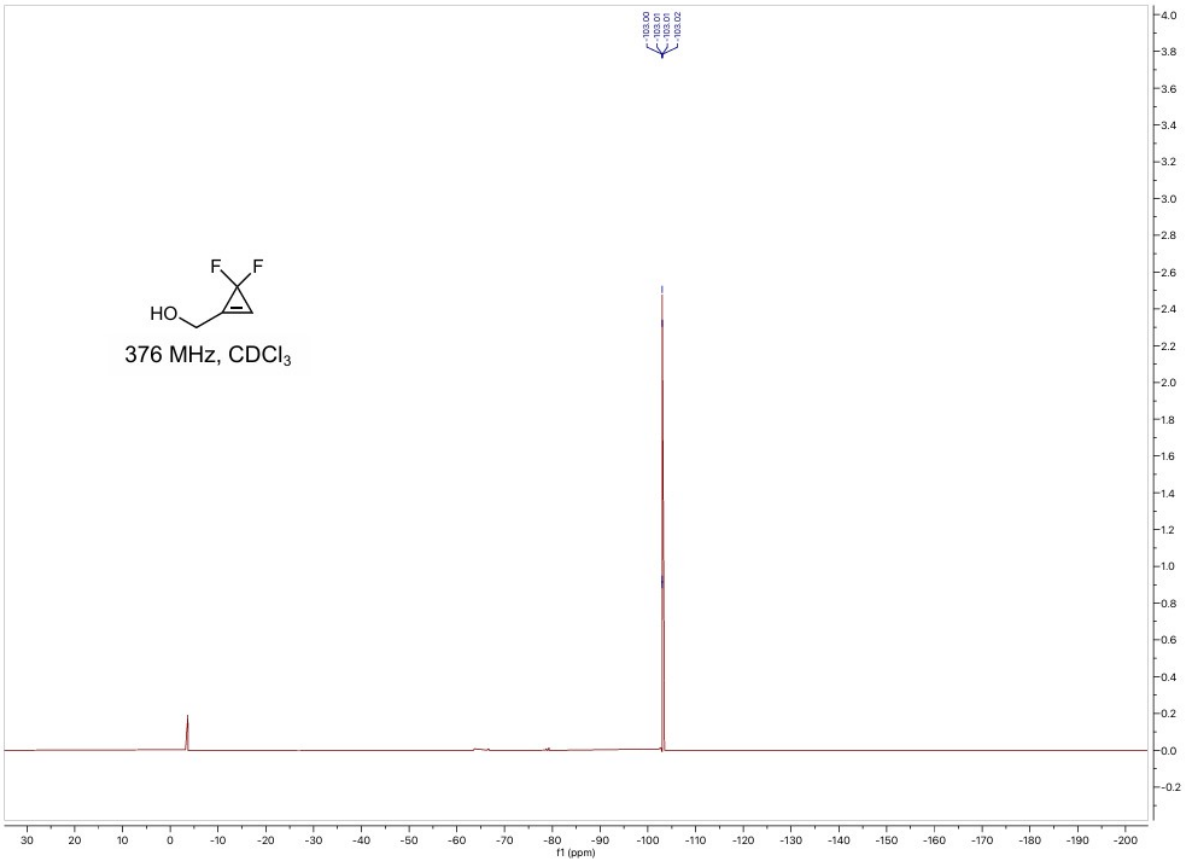



131.14
130.49
129.31
124.73
123.42
123.33
123.21
105.11
102.39
99.73
77.16 CDCl3
F
F
101 MHz, CDCl3
f1 (ppm)

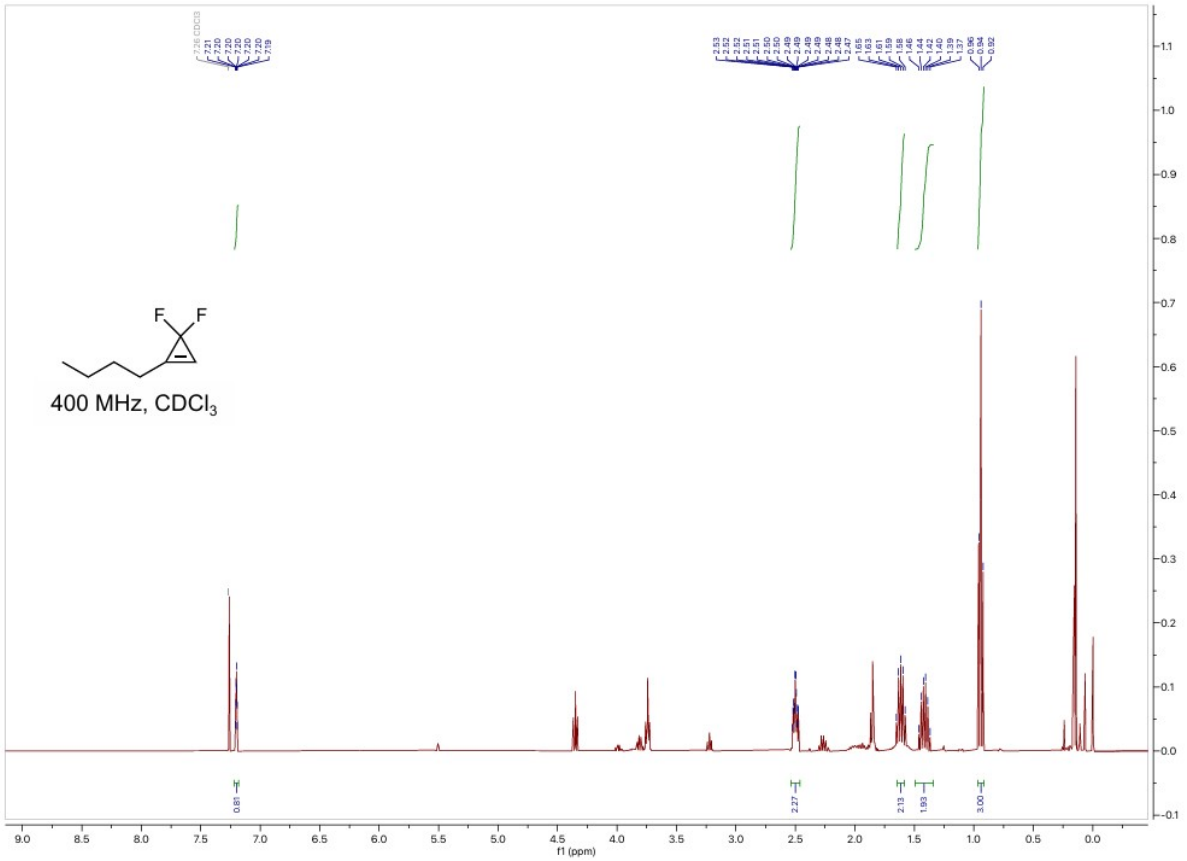

112.06
F
F
376 MHz, CDCl3
f1 (ppm)

(3,3-Difluorocycloprop-1-en-1-yl)methanol (SI-4h) [Crude product]

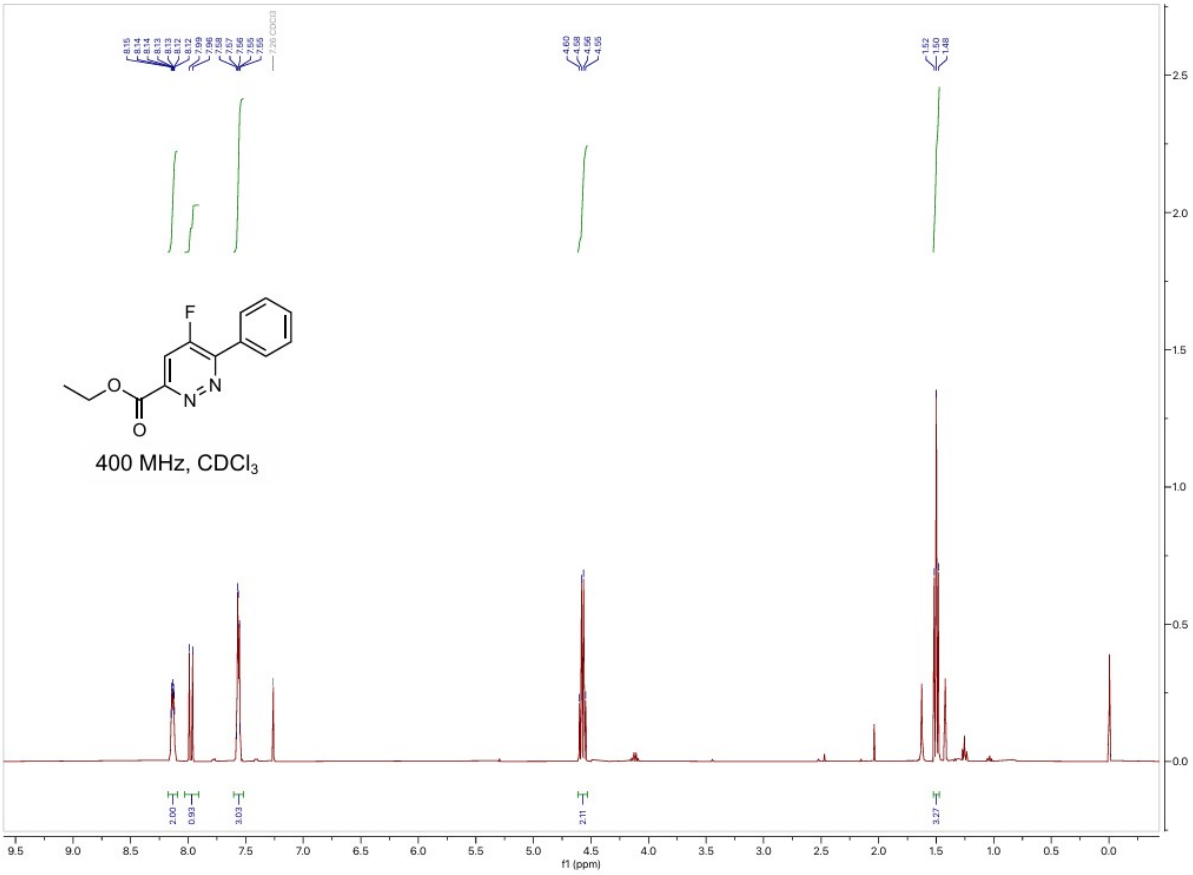


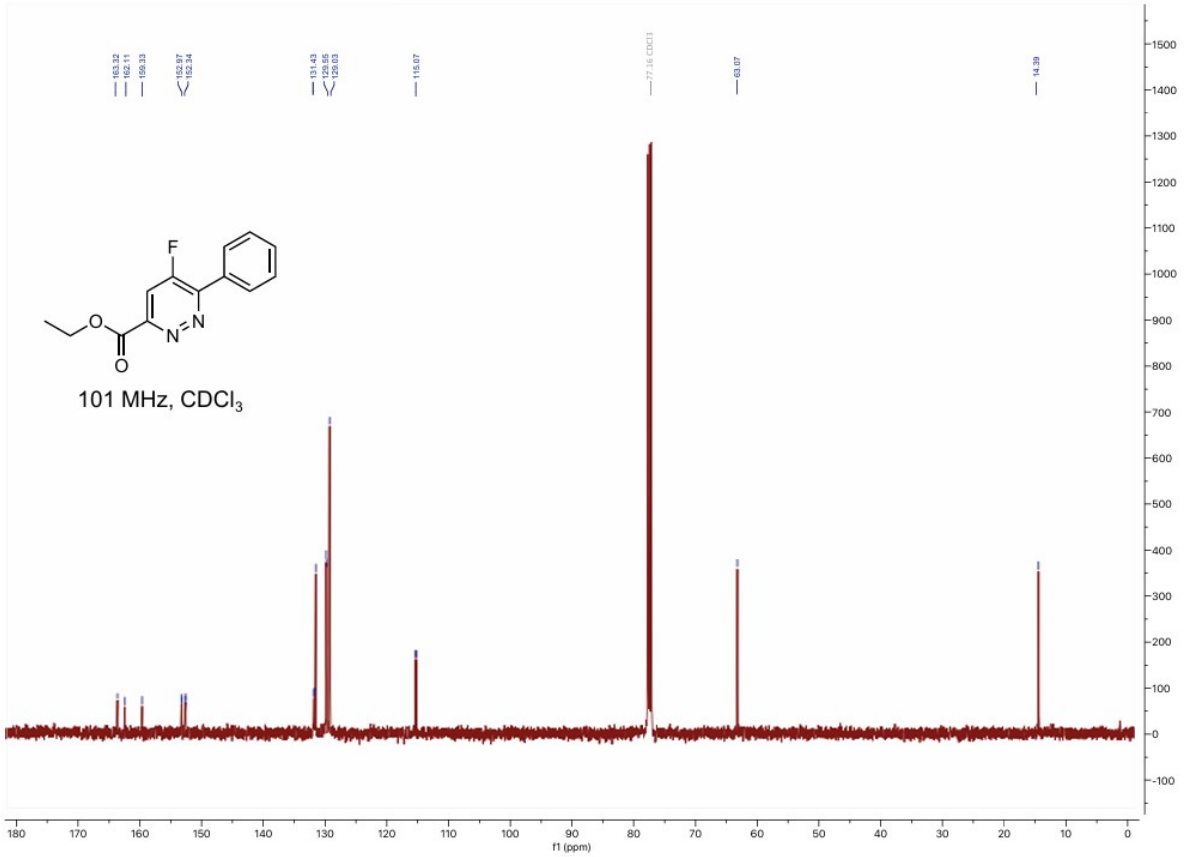


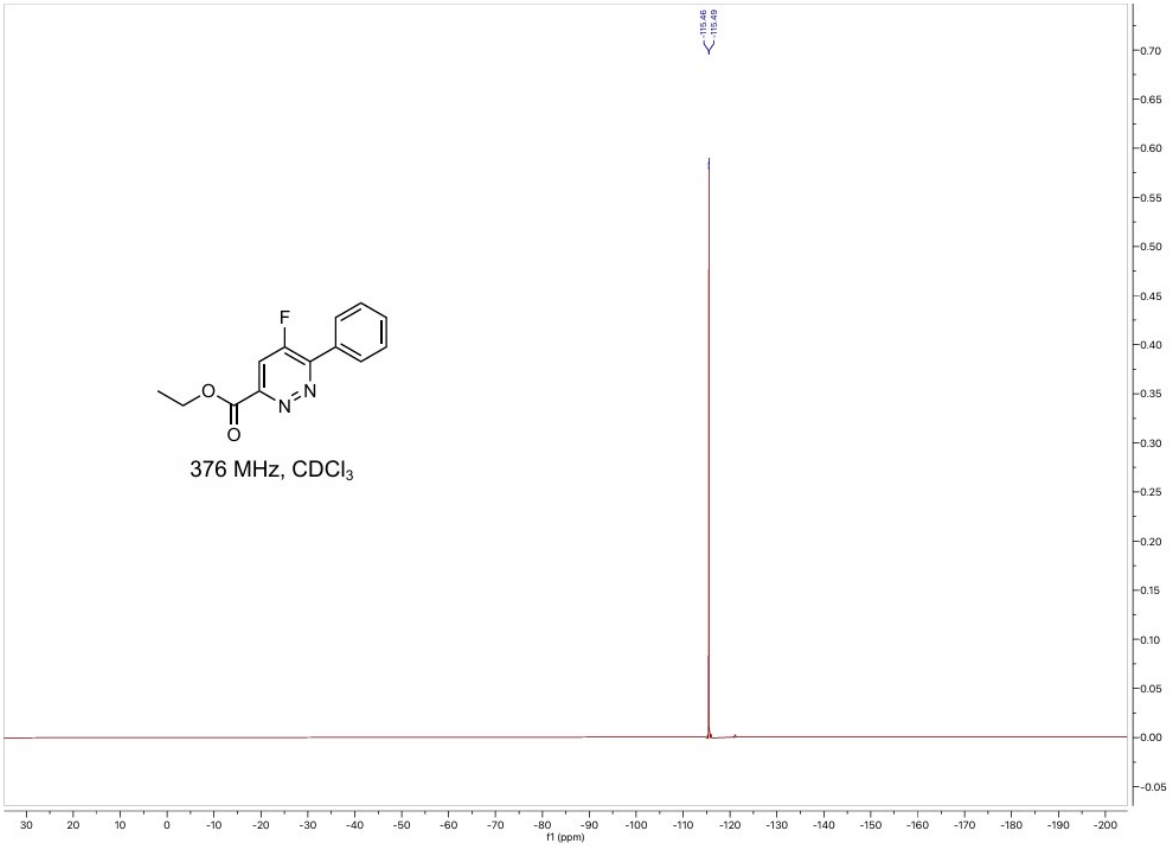
1-Butyl-3,3-difluorocycloprop-1-ene (SI-4i) [Crude product]



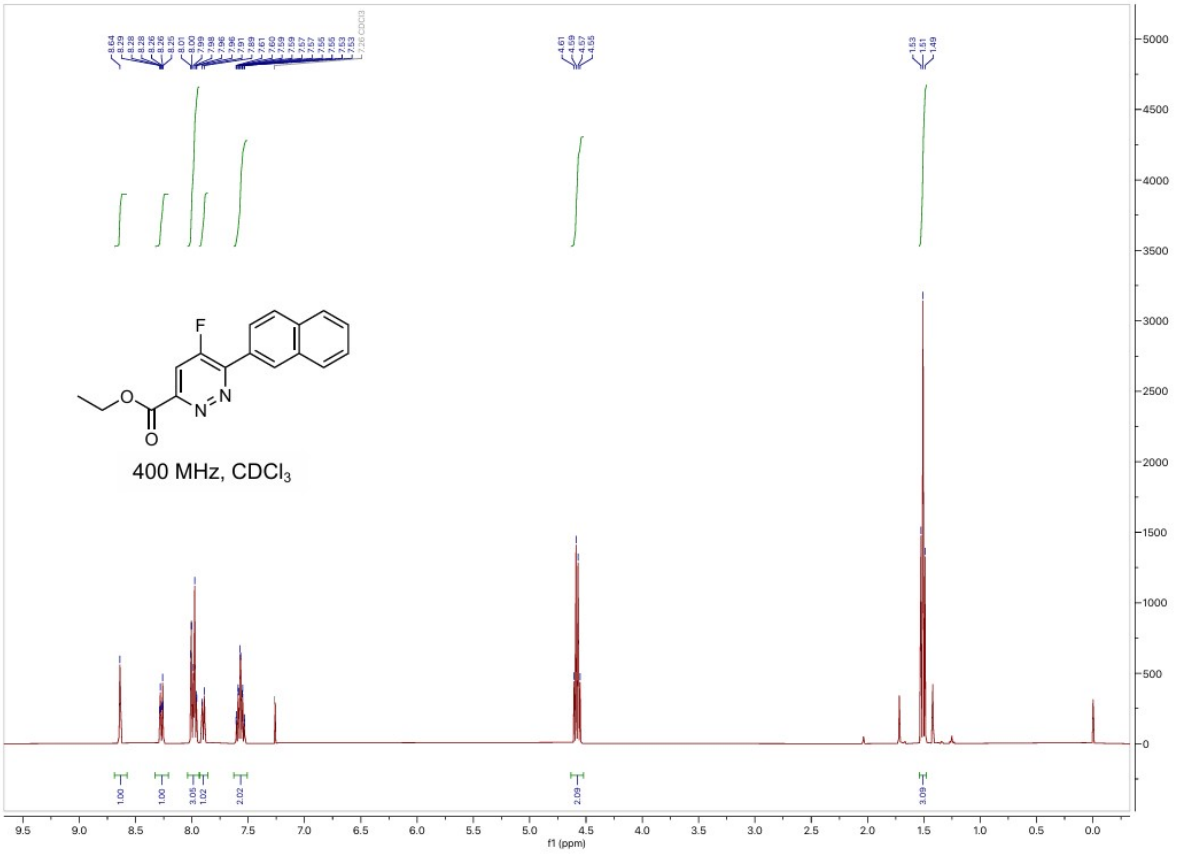
Ethyl 5-fluoro-6-phenylpyridazine-3-carboxylate, 3a

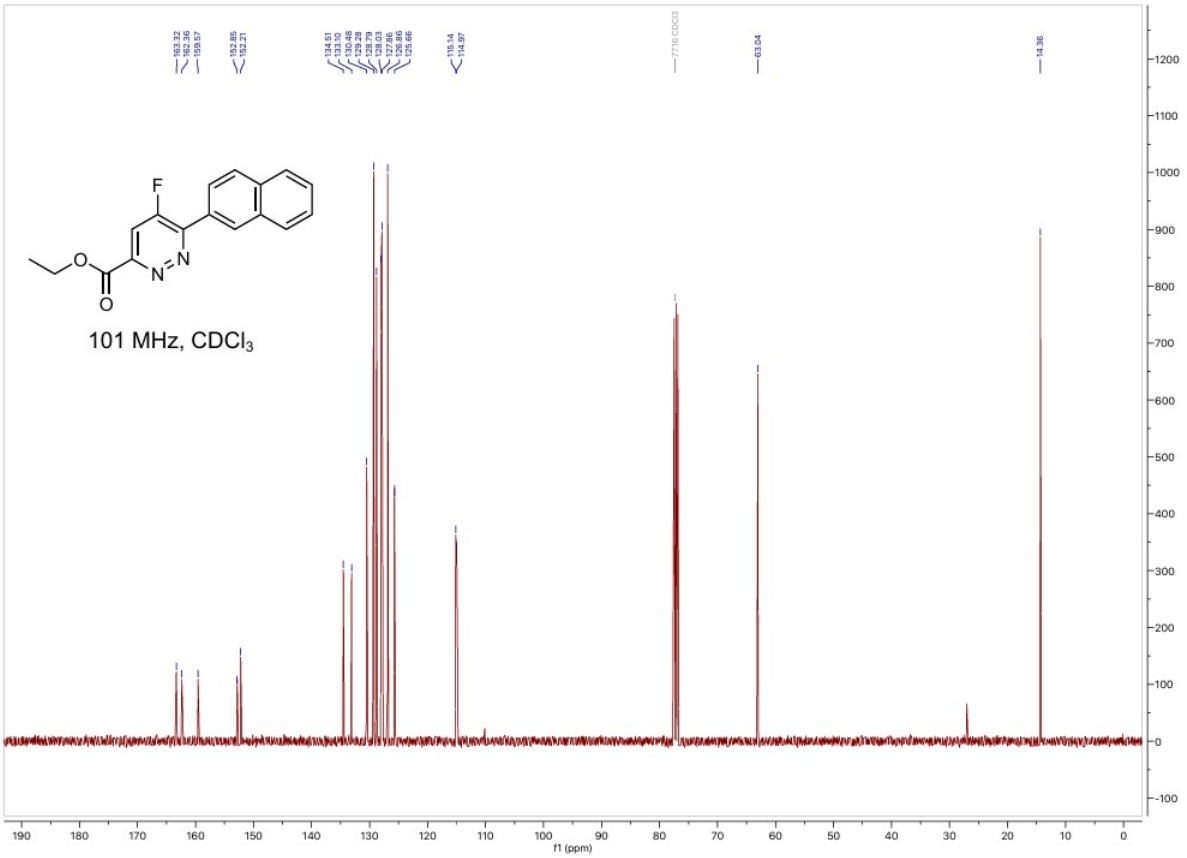


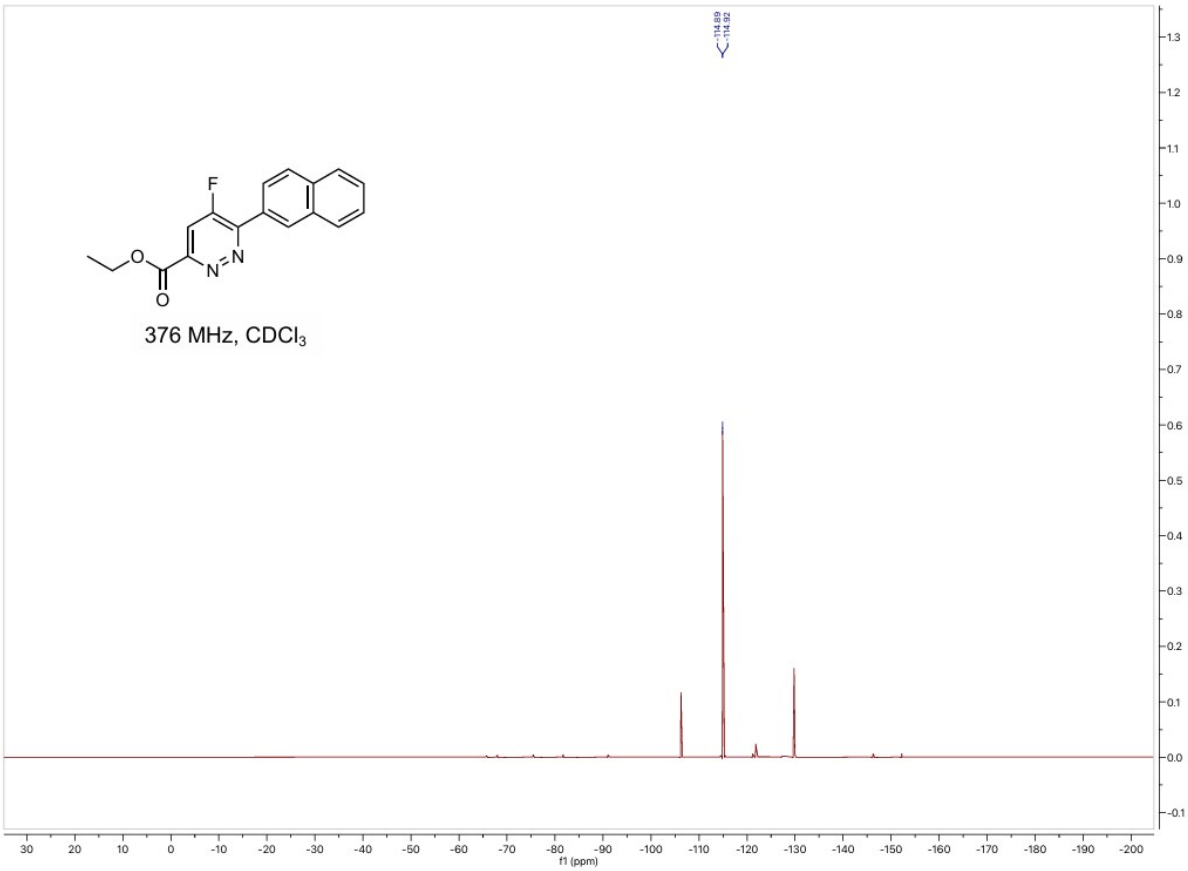




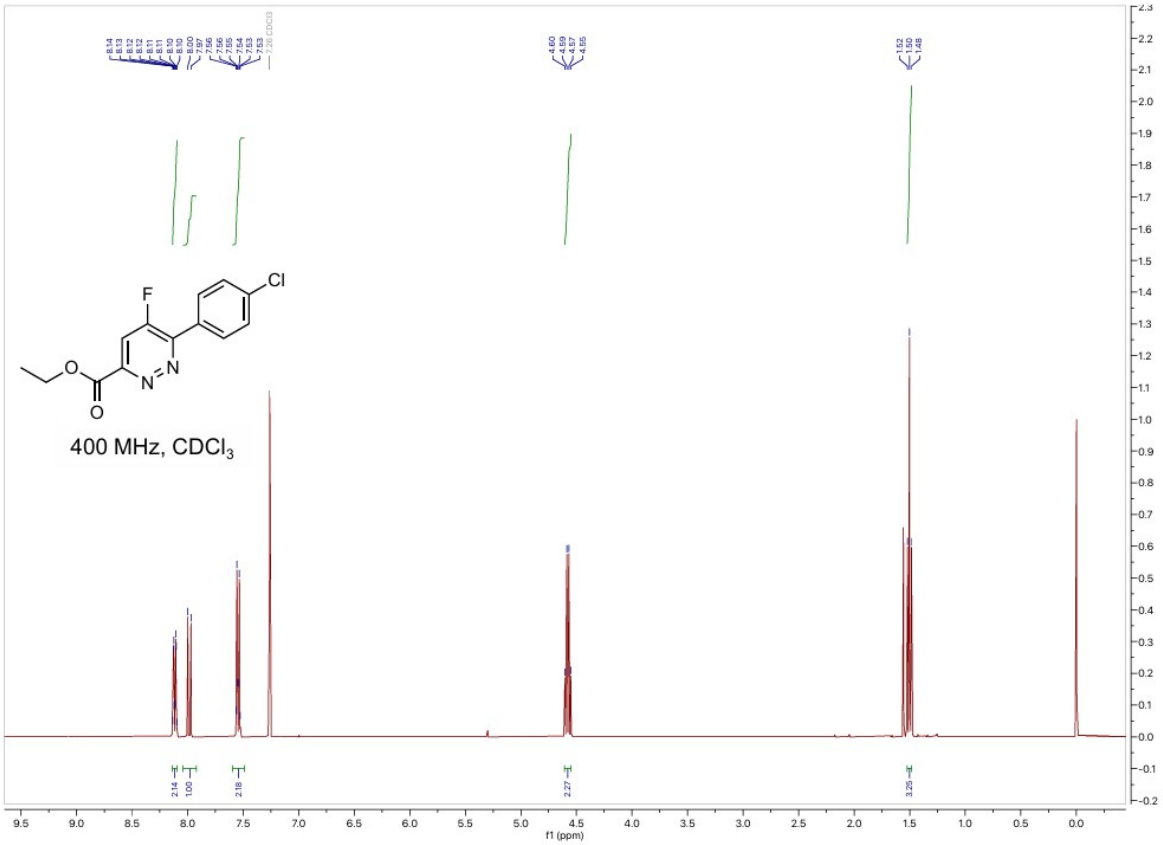
Ethyl 5-fluoro-6-(naphthalen-2-yl)pyridazine-3-carboxylate, 3b

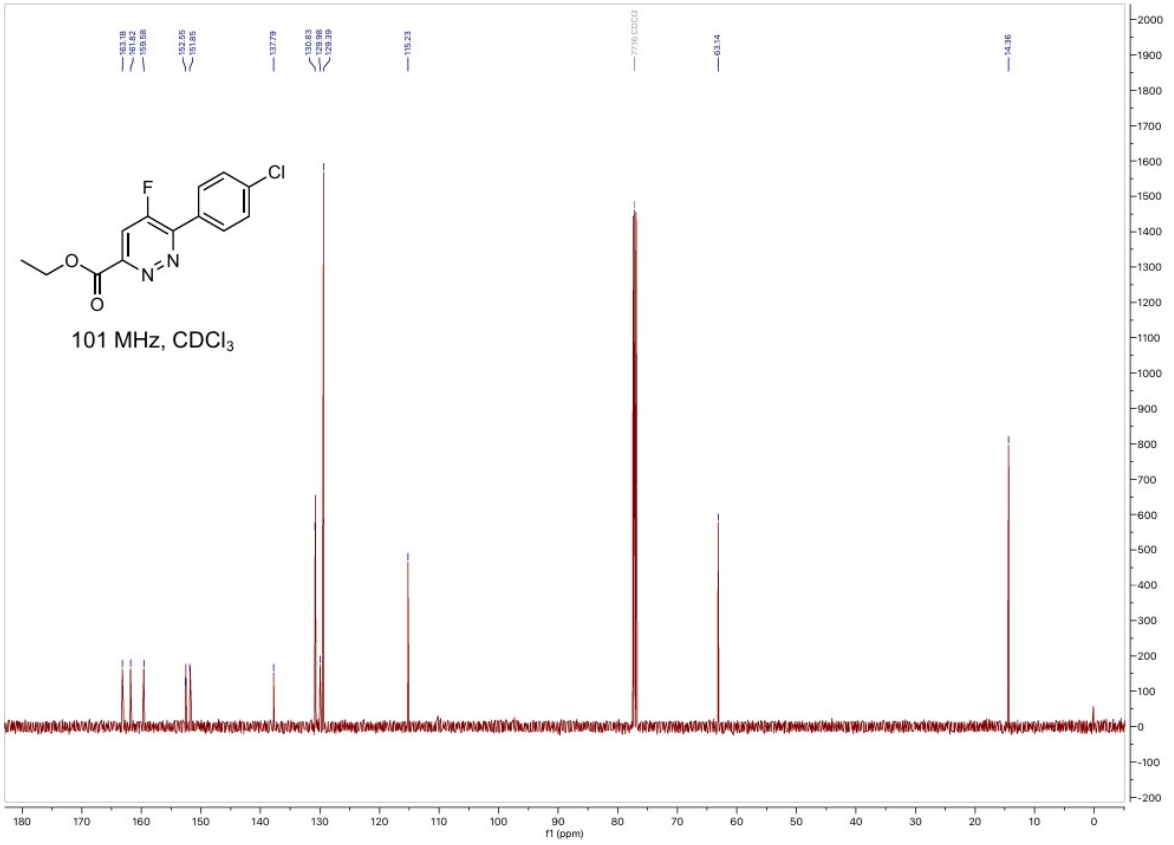


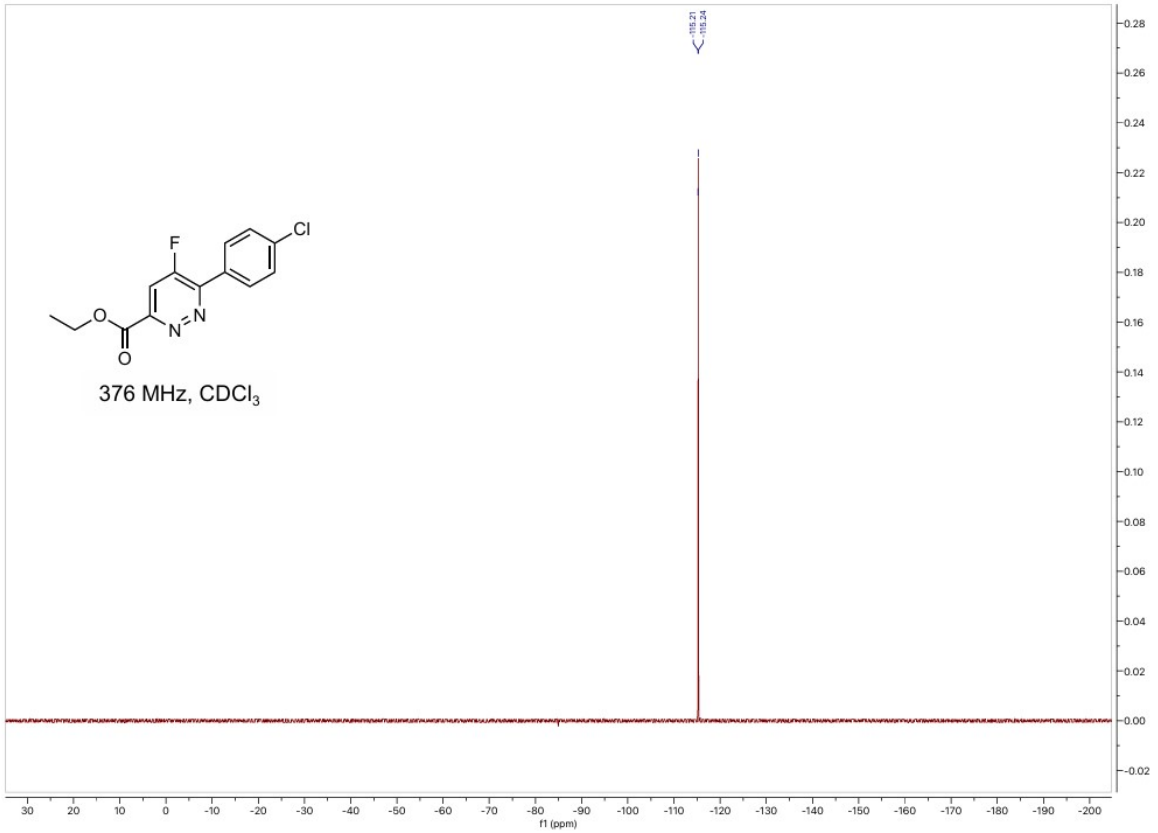

163.32
162.36
159.57
153.85
152.21
134.51
133.10
130.48
129.29
129.29
128.03
127.86
127.65
125.66
115.14
114.97
77.16 CDCl3
63.04
14.36
F
O
N
N
O
101 MHz, CDCl3
f1 (ppm)


114.89
114.92
F
O
N
N
O
376 MHz, CDCl3
f1 (ppm)

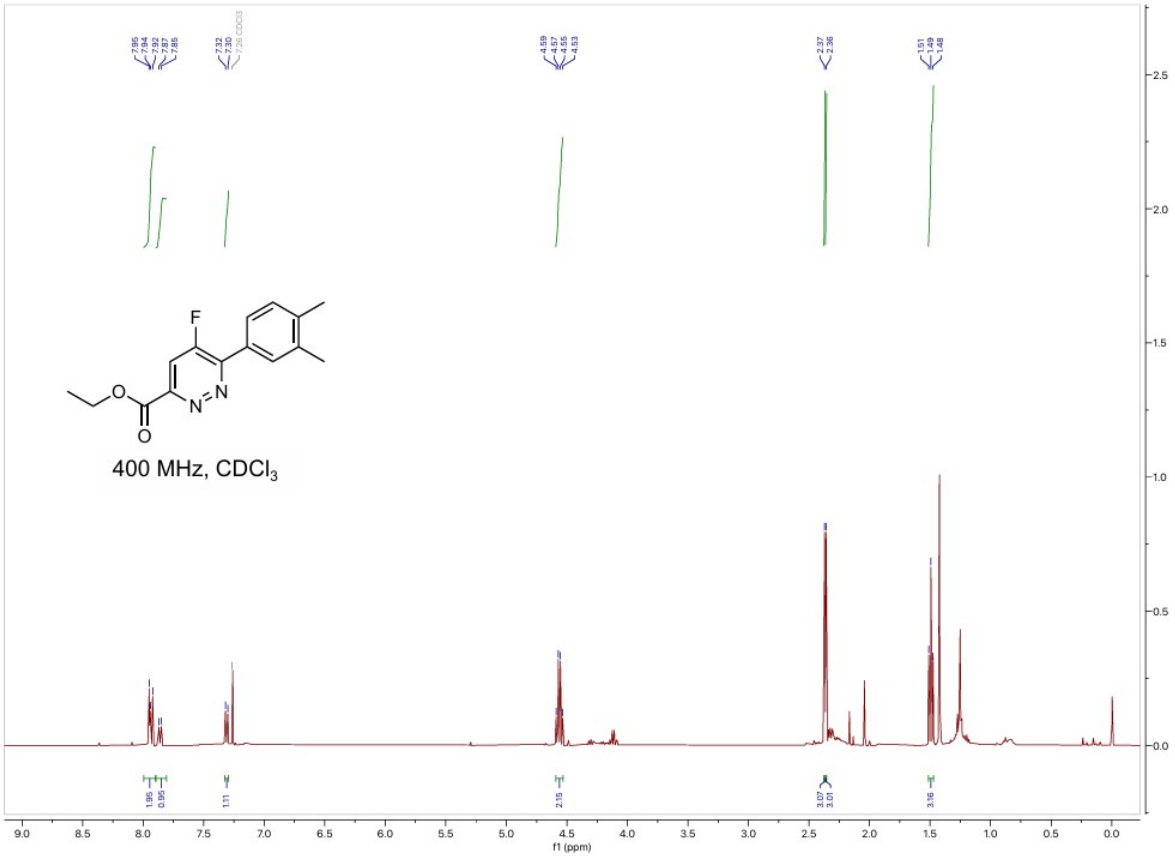
Ethyl 6-(4-chlorophenyl)-5-fluoropyridazine-3-carboxylate, 3c

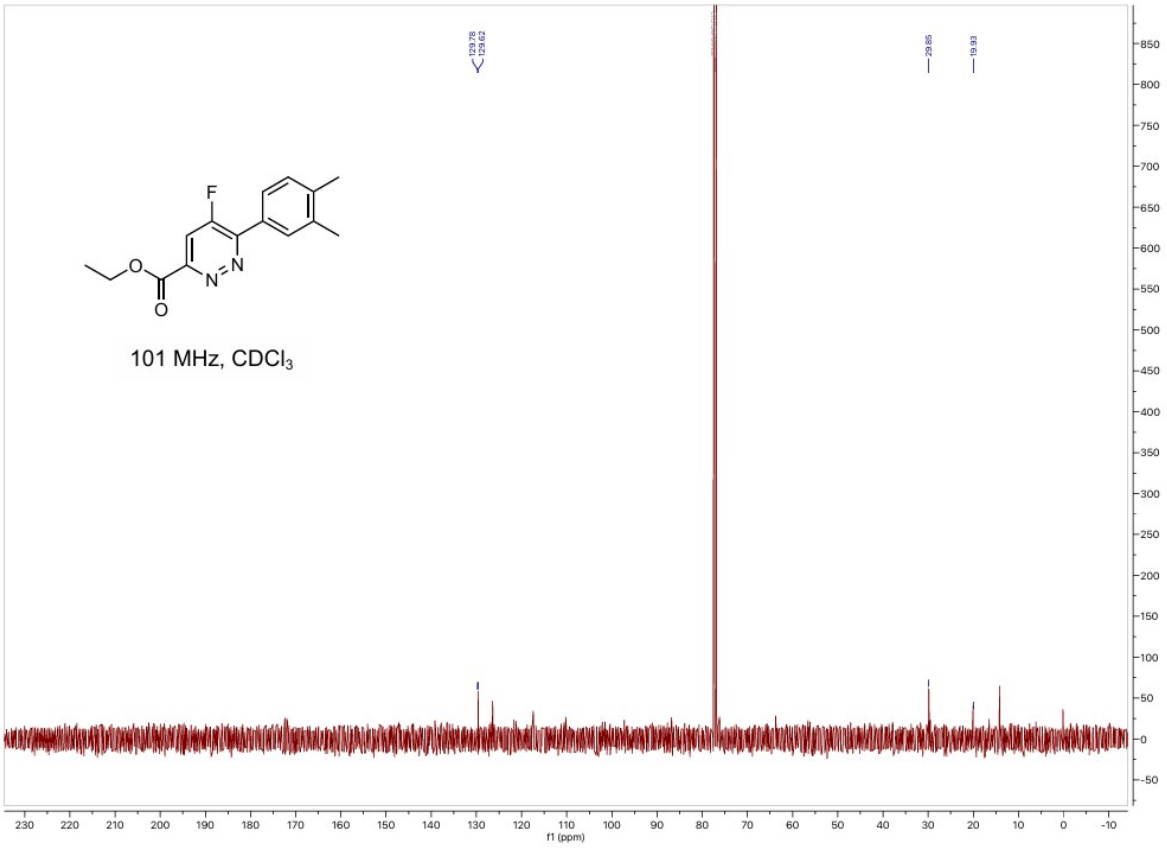


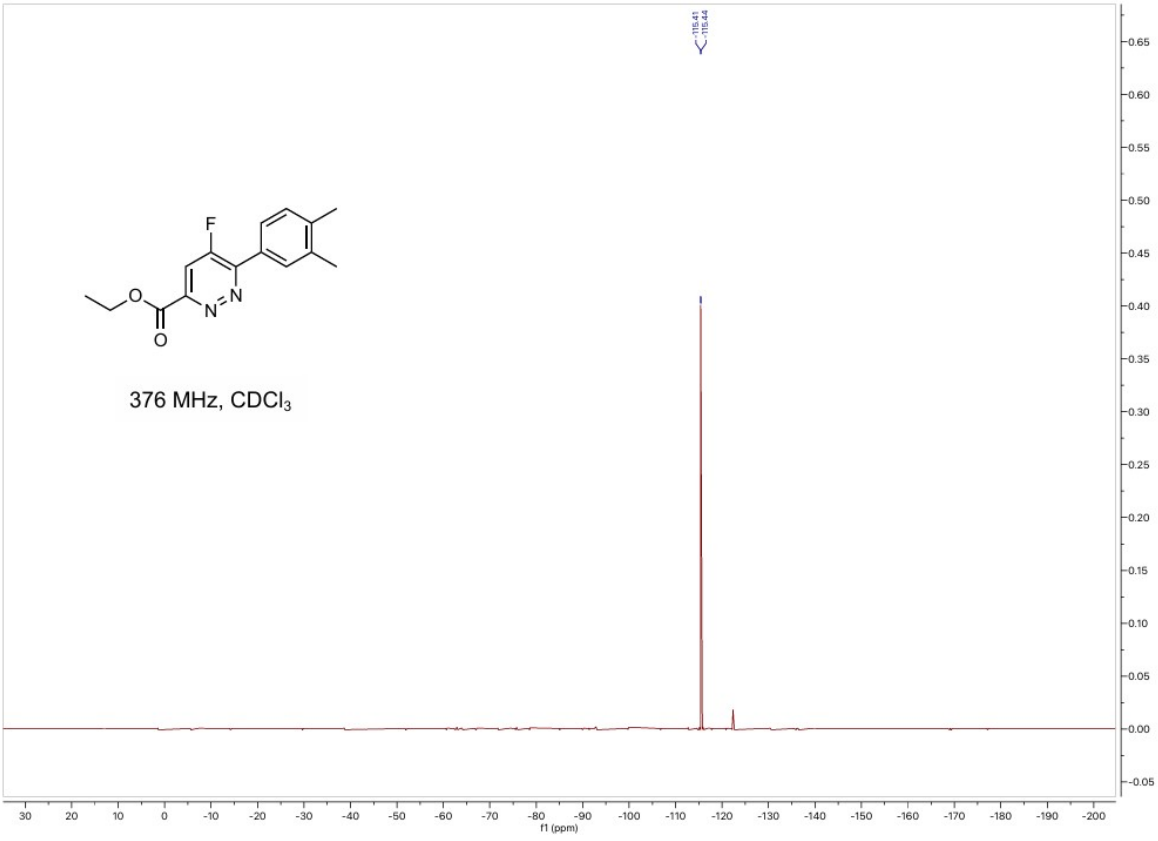




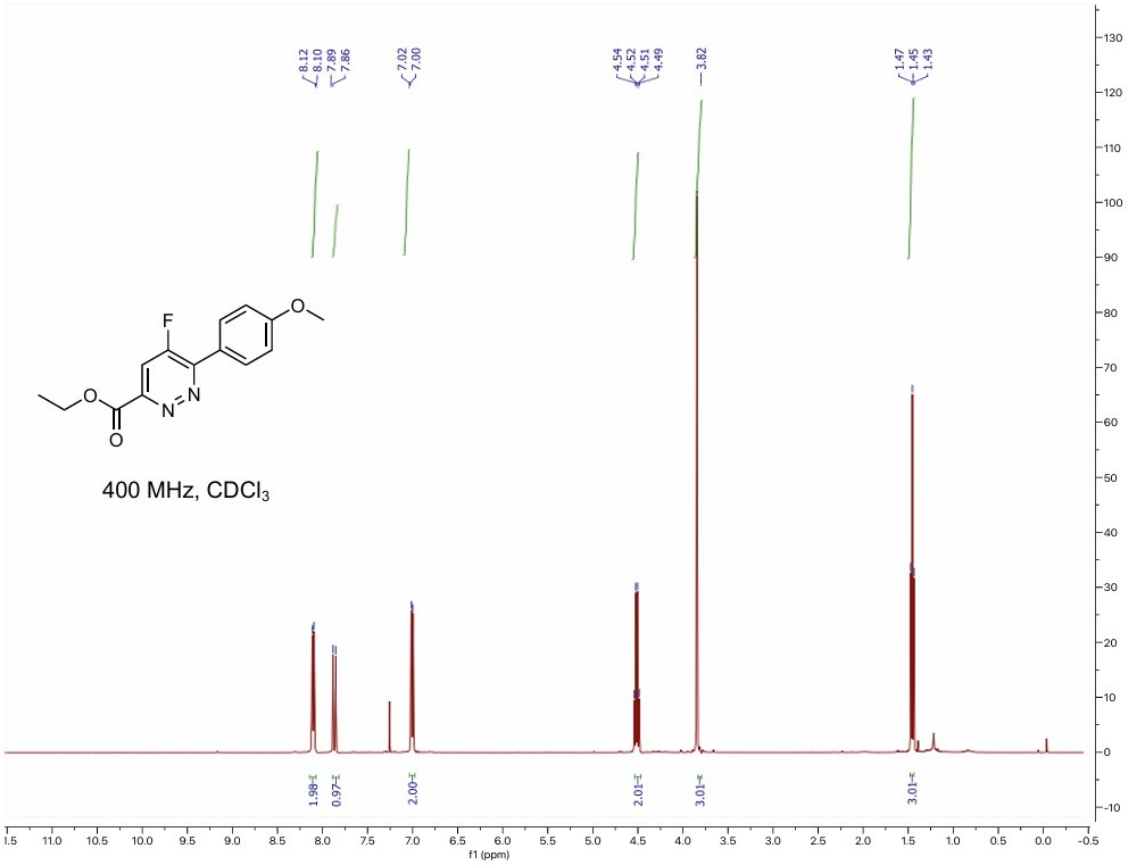
Ethyl 6-(3,4-dimethylphenyl)-5-fluoropyridazine-3-carboxylate, 3d

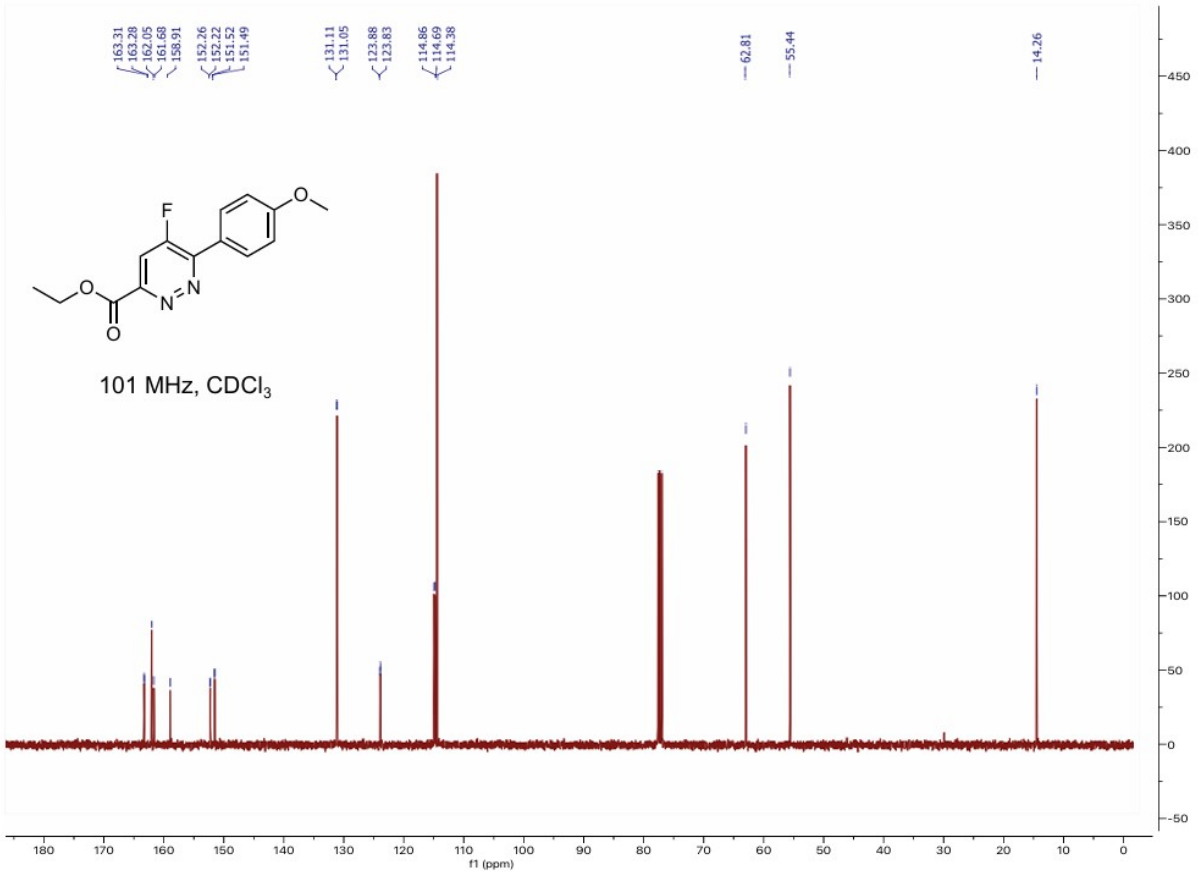


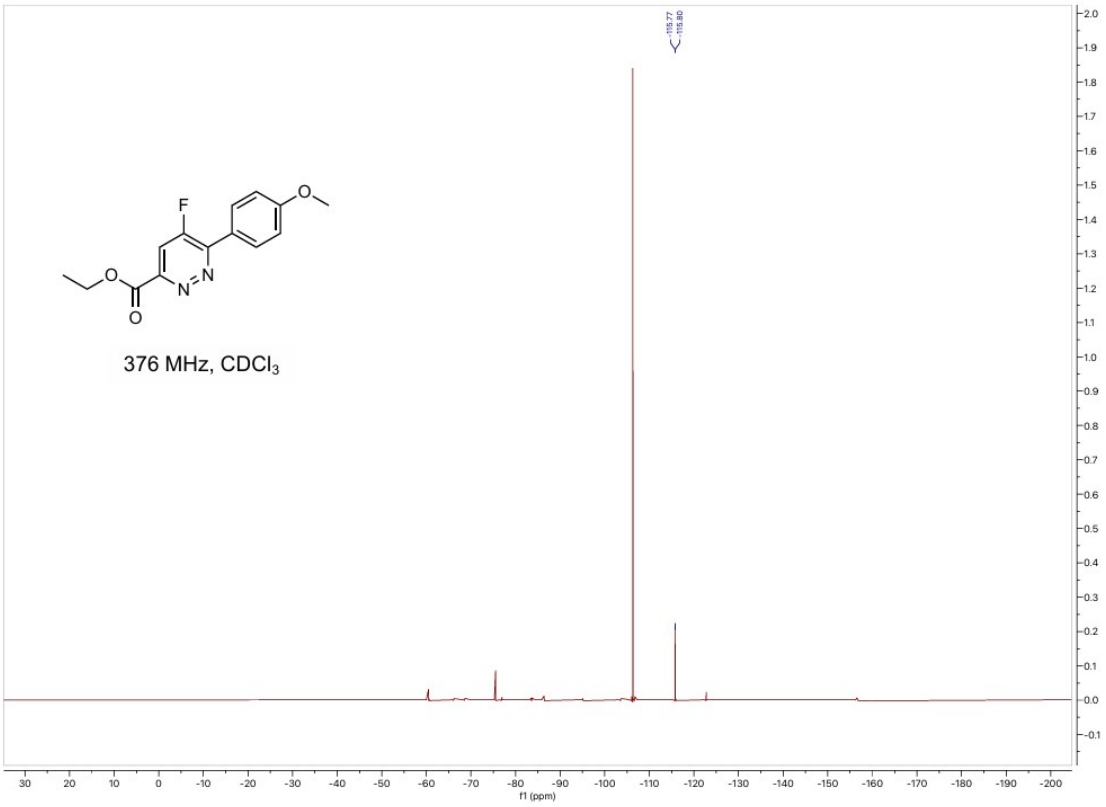

F
O
O
N
N
101 MHz, CDCl3
129.78
129.62
29.65
19.93
f1 (ppm)


F
O
O
N
N
376 MHz, CDCl3
115.41
115.44
f1 (ppm)

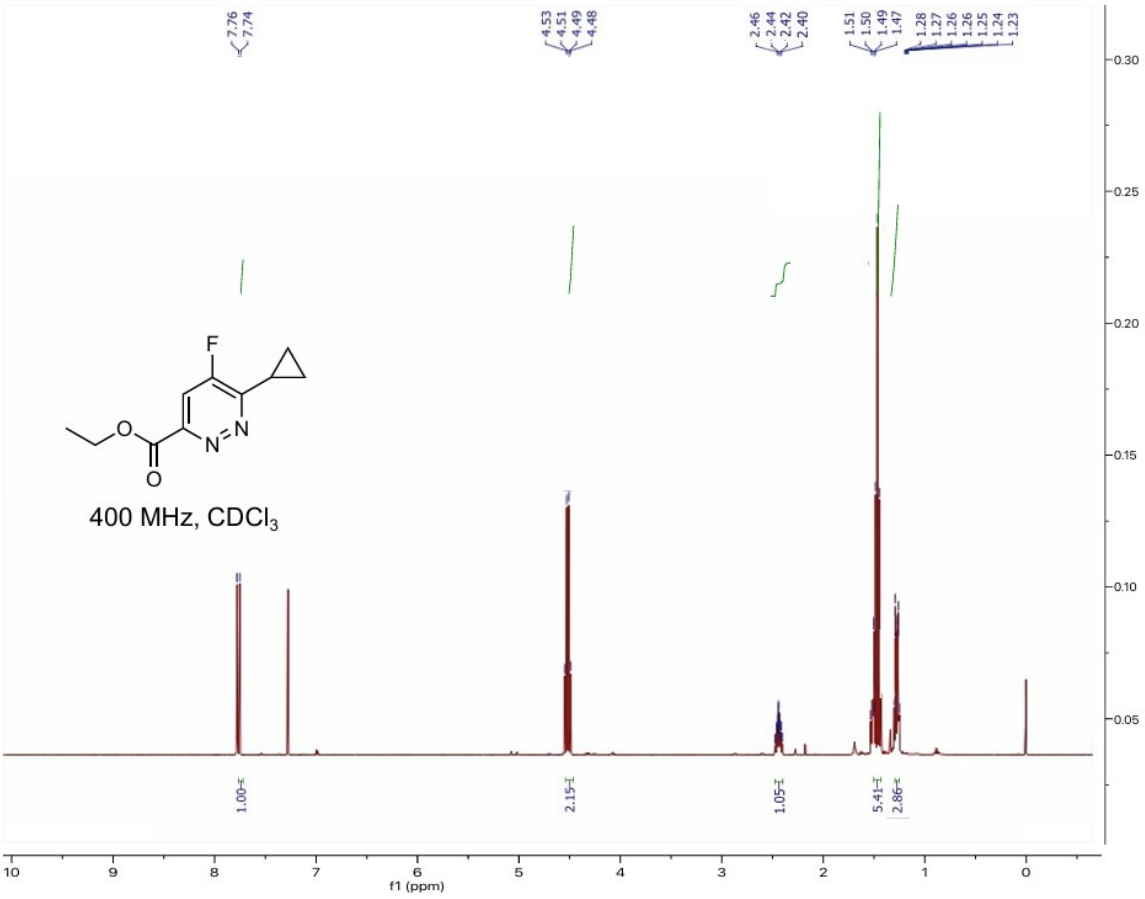
Ethyl 5-fluoro-6-(4-methoxyphenyl)pyridazine-3-carboxylate, 3e

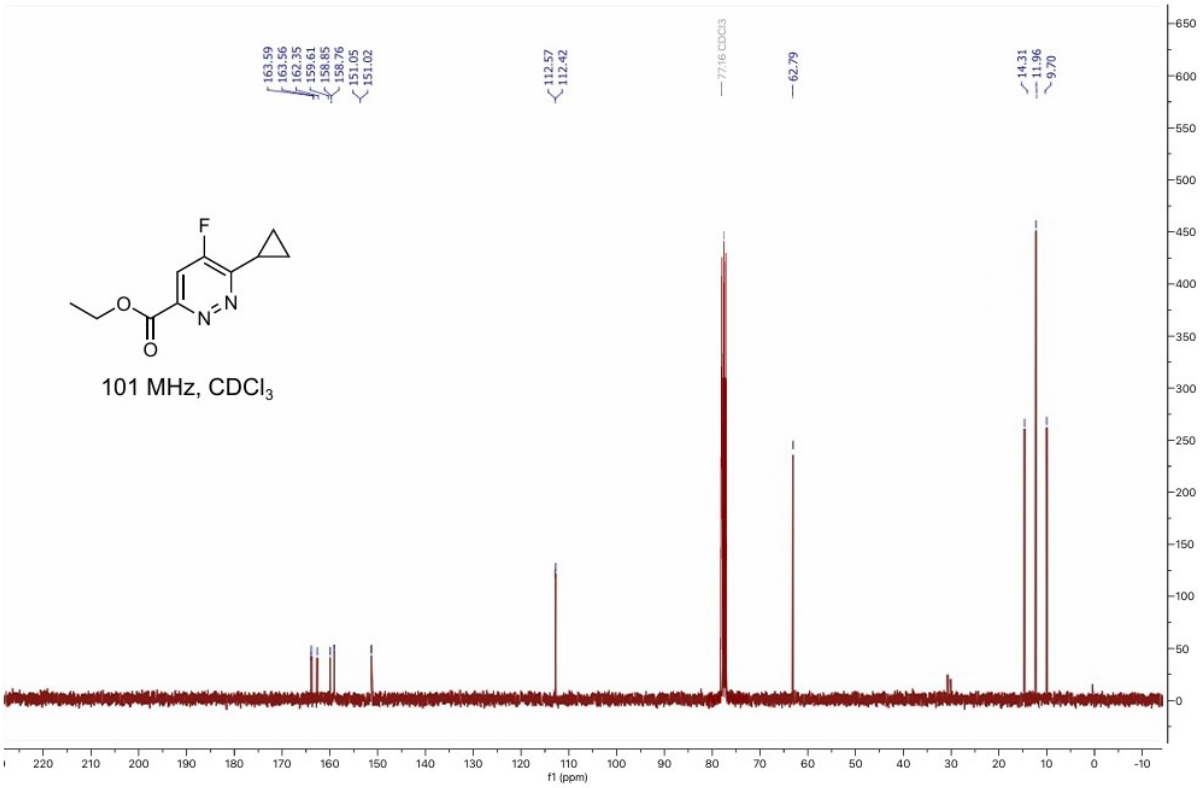


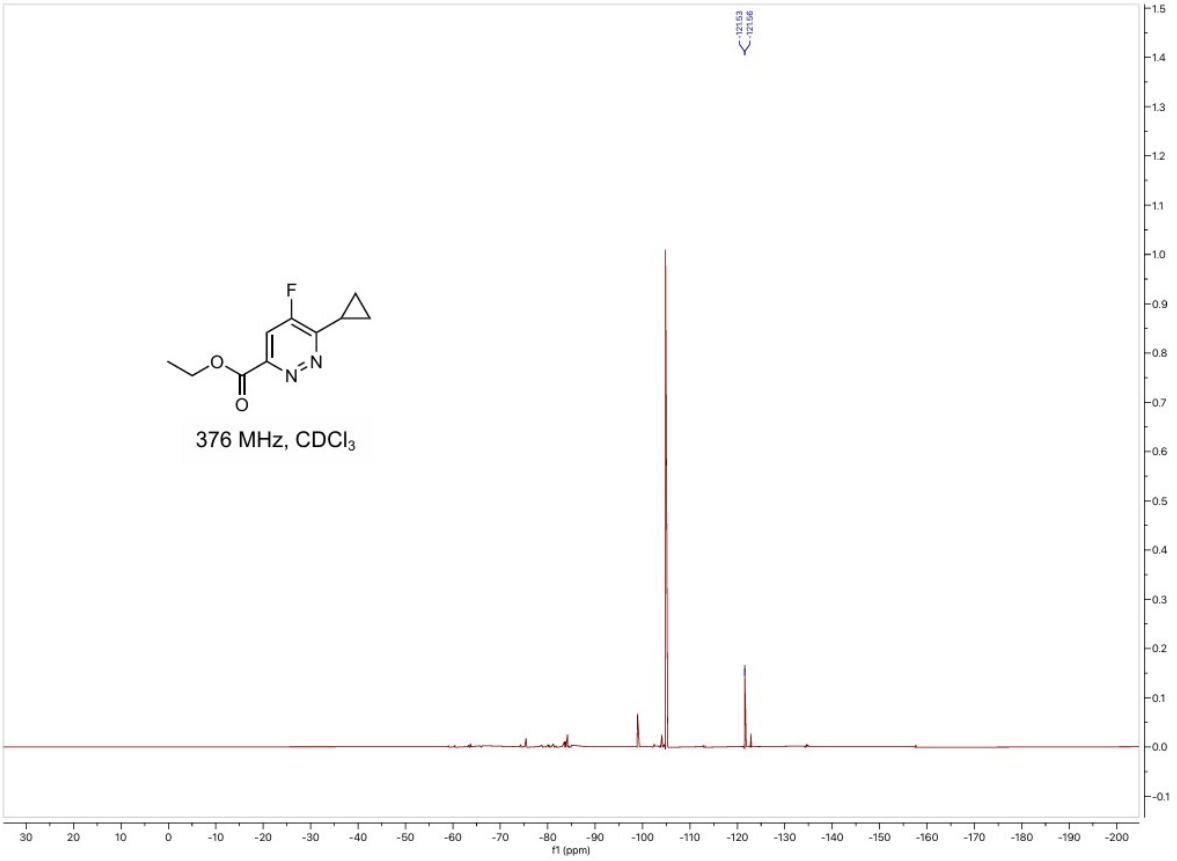




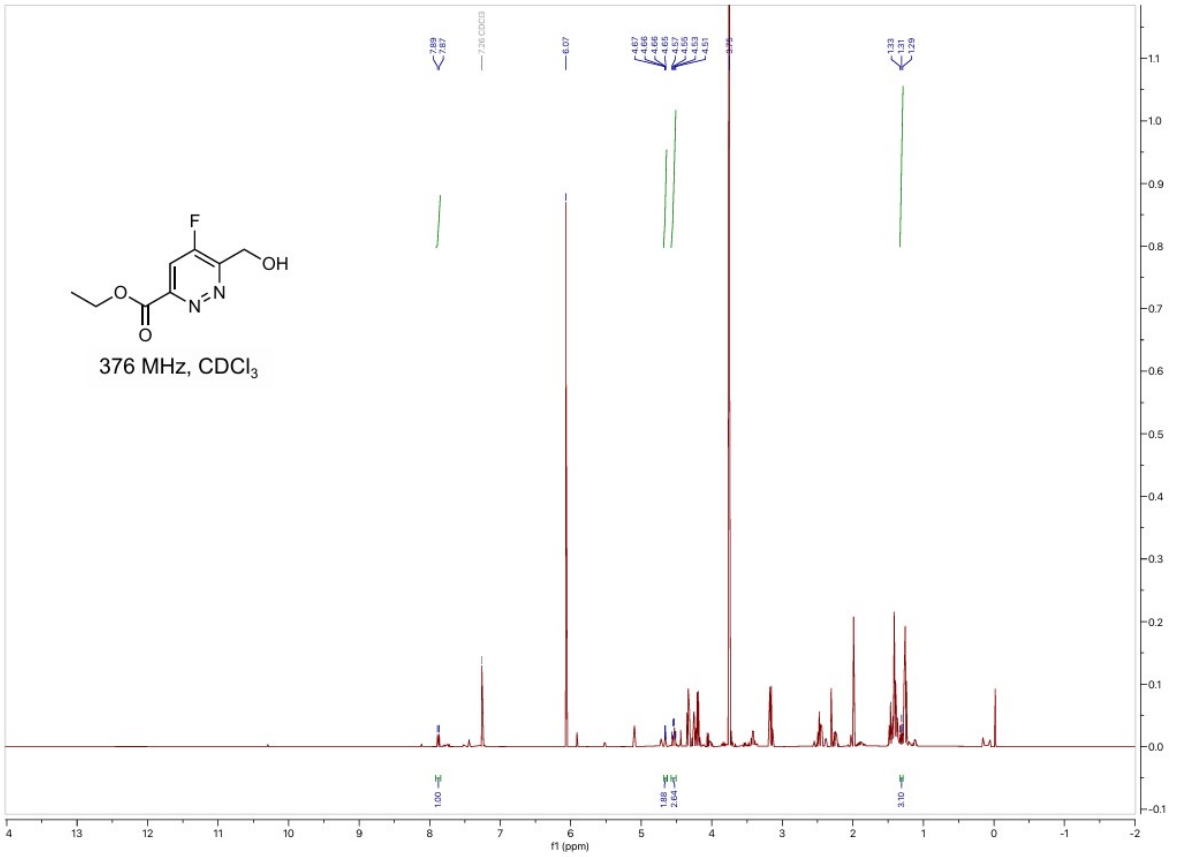
Ethyl 6-cyclopropyl-5-fluoropyridazine-3-carboxylate, 3g

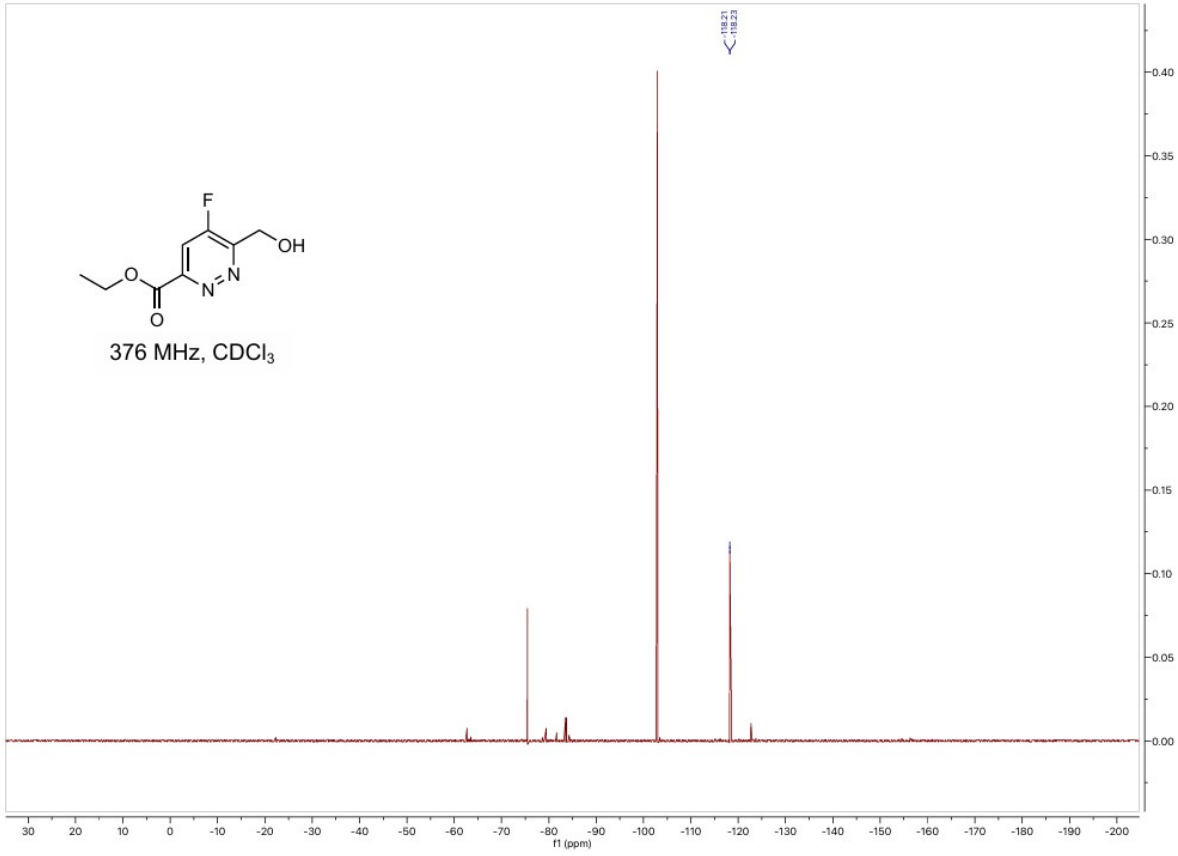



163.59
163.56
162.35
159.61
158.85
158.76
151.05
151.02
112.57
112.42
77.16 CDCl3
62.79
14.31
11.96
9.70
F
O
N
N
O
101 MHz, CDCl3
f1 (ppm)


-121.53
-121.56
F
O
N
N
O
376 MHz, CDCl3
f1 (ppm)

Ethyl 5-fluoro-6-(hydroxymethyl)pyridazine-3-carboxylate, 3h





Ethyl 6-butyl-5-fluoropyridazine-3-carboxylate, 3i