Electronic Supplementary Information (ESI) for

Visible-light-promoted difluoroamidated oxindole synthesis *via* electron donor-acceptor complexes

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Contents

1. General information

Unless otherwise noted, all solvents and reagents were purchased from commercial suppliers and used without further purification. Anhydrous DMSO was purchased from Energy Chemical, and added to molecular sieves during use and stored at room temperature. The ^{1}H, $^{13}C\{^{1}H\}$ and $^{19}F\{^{1}H\}$ NMR spectra were recorded on a Bruker Ascend 400MHz spectrometer (400 MHz for ^{1}H NMR, 101 MHz for $^{13}C\{^{1}H\}$ NMR, 377 MHz for $^{19}F\{^{1}H\}$ NMR) or on a Bruker Ascend 500MHz spectrometer (500 MHz for ^{1}H NMR, 126 MHz for $^{13}C\{^{1}H\}$ NMR, 471 MHz for $^{19}F\{^{1}H\}$ NMR). The chemical shifts (δ) for ^{1}H, $^{13}C\{^{1}H\}$ and $^{19}F\{^{1}H\}$ are reported in ppm and are referenced to Me_4Si (TMS) and the residual undeuterated solvent resonances (TMS at 0.00 ppm; $CHCl_3$ at 7.26 ppm ^{1}H NMR and 77.16 ppm $^{13}C\{^{1}H\}$ NMR respectively). Data were reported as follows: chemical shift, multiplicity (s = singlet; d = doublet; dd = doublet of doublet; t= triplet; q = quartet; brs = broad singlet; m = multiplet), coupling constants (Hz), integration. All UV/vis absorption spectra were recorded in 1 cm path quartz cuvettes on a Shimadzu UV-2450 UV-VIS spectrophotometer. High resolution mass spectra (HRMS) were acquired using a Q-Exactive plus hybrid quadrupole-orbitrap mass spectrometer (Q-Orbitrap MS) (Thermo Scientific, San Jose, USA) with electrospray ionization (ESI) source. Column chromatography was carried out on silica gel (200-300 mesh, Petroleum PE/EtOAc solvent systems). A 440-450 nm Blue LED photoreaction lighting was employed as a visible light source without the use of filters.

2. General procedures for the preparation of *N*-phenylacrylamides and bromodifluoroacetamides

N-phenylacrylamides **1a-1g**,[1] **1h**,[2] **1i**[1], and the trifluoromethyl alkenes **2a**,[3] **2b**[3], **2c**,[4] **2d-2i**[3], **2j**,[5] **2k**,[5] **2l**,[4] **2m**,[5] **2n**,[3] **2p**,[5] **2q**[5], and **2r**[6] were prepared according to the reported procedures.

Procedures for the preparation of compound **2o**

To a 10 mL flask were added methanamine (5 mmol) and $La(OTf)_3$ (0.25 mmol), then bromodifluoroacetate (6 mmol) was added to the mixture dropwise. When the reaction was completed as monitored by TLC, extracted with ethyl acetate three times. The combined organic layer was dried over anhydrous Na_2SO_4, filtered, and evaporated, and the resulting mixture was purified by column chromatography on silica gel to afford **2o** as a white solid.

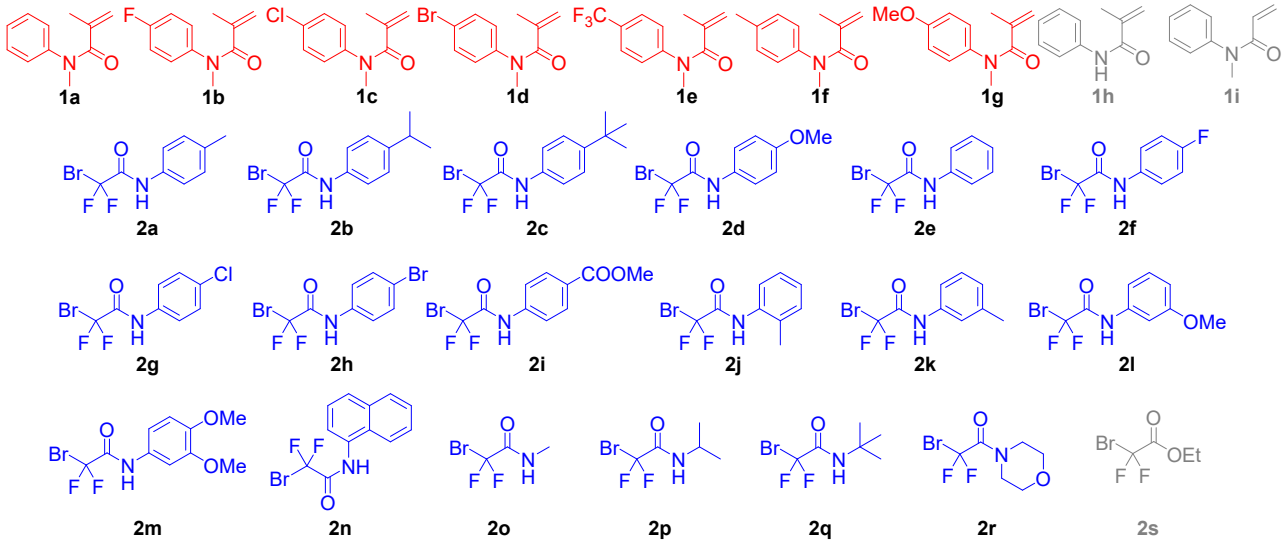
2-Bromo-2,2-difluoro-*N*-methylacetamide (2o)

2o

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.98 (s, 1H), 2.92 (d, J = 5.2 Hz, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 161.04 (t, J = 27.4 Hz), 111.79 (t, J = 315.6 Hz), 77.16 (t, J = 32.0 Hz), 26.81; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$) δ –60.5; HRMS (ESI-TOF) m/z: $[M + H]^+$ calcd for $C_3H_5{}^{79}BrF_2N_2O$, 187.9517; found, 187.9517.

Scheme S1. Structures of substrates

1 2 3



1a 1b 1c 1d 1e 1f 1g 1h 1i

2a 2b 2c 2d 2e 2f

2g 2h 2i 2j 2k 2l

2m 2n 2o 2p 2q 2r 2s

3. Experimental procedures

3.1 Experimental set-up

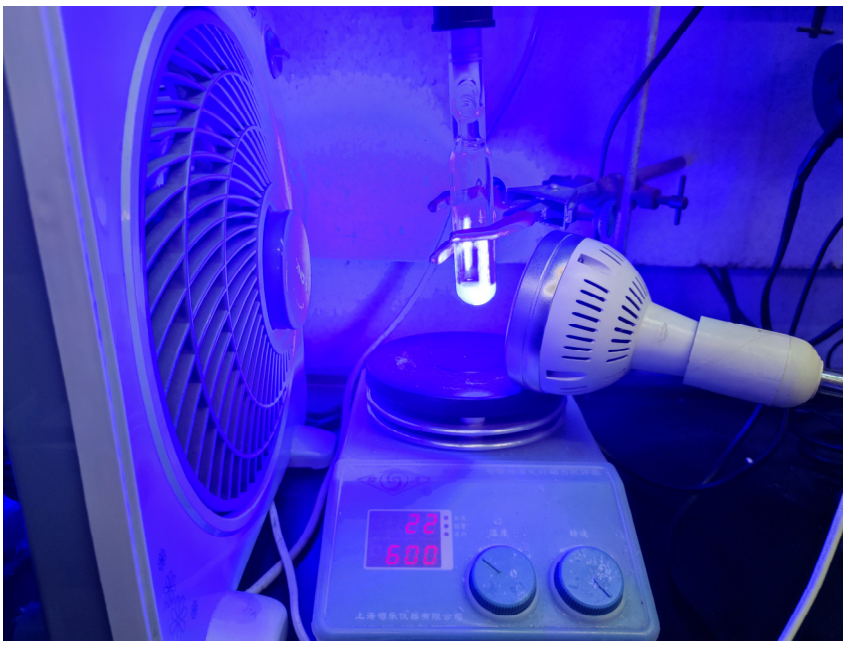
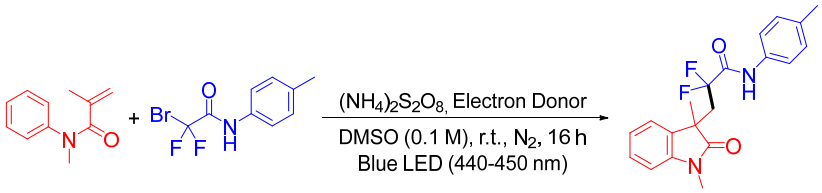


Figure S1. The set-up for the photochemical reactions.

3.2 Optimization of reaction conditions

Table S1. Screening of electron donor

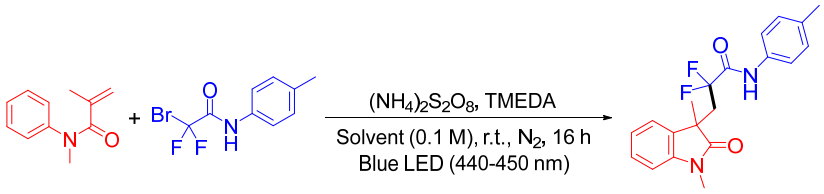


1a **2a** **3a**

Entry[a]	$S_2O_8^{2-}$ (equiv.)	Electron Donor (equiv.)	Solvent	Yield[b]
1	$(NH_4)_2S_2O_8$ (2.0)	DBU (2.0)	DMSO	11%
2	$(NH_4)_2S_2O_8$ (2.0)	DMAP (2.0)	DMSO	27%
3	$(NH_4)_2S_2O_8$ (2.0)	Et_3N (2.0)	DMSO	24%
4	$(NH_4)_2S_2O_8$ (2.0)	$^nBu_3N$ (2.0)	DMSO	14%
5	$(NH_4)_2S_2O_8$ (2.0)	DIPEA (2.0)	DMSO	34%
6	$(NH_4)_2S_2O_8$ (2.0)	DABCO (2.0)	DMSO	Trace
7	**$(NH_4)_2S_2O_8$ (2.0)**	**TMEDA (2.0)**	**DMSO**	**62%**
8	$(NH_4)_2S_2O_8$ (2.0)	PMDETA (2.0)	DMSO	38%
9	$(NH_4)_2S_2O_8$ (2.0)	Na_2CO_3 (2.0)	DMSO	Trace
10	$(NH_4)_2S_2O_8$ (2.0)	Na_2HPO_4 (2.0)	DMSO	Trace

[a]Reactions were run under the conditions: **1a** (0.10 mmol, 1.0 equiv.), **2a** (1.0 equiv.), electron donor (2.0 equiv.), $(NH_4)_2S_2O_8$ (2.0 equiv.), DMSO (1.0 mL), r.t., 440-450 nm, under a nitrogen atmosphere, 16 h; [b]^{1}H NMR yields with 1,3,5-trimethoxybenzene as an internal standard.

Table S2. Screening of solvent

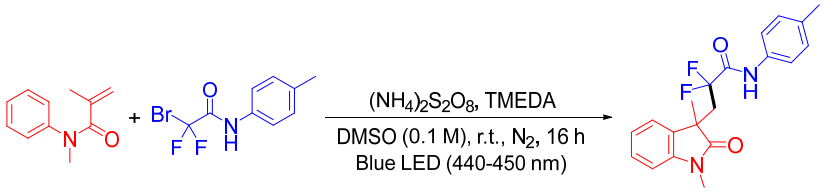


1a 2a 3a

Entry[a]	$S_2O_8^{2-}$ (equiv.)	Electron Donor (equiv.)	Solvent	Yield[b]
1	**$(NH_4)_2S_2O_8$ (2.0)**	**TMEDA (2.0)**	**DMSO**	**62%**
2	$(NH_4)_2S_2O_8$ (2.0)	TMEDA (2.0)	DMF	47%
3	$(NH_4)_2S_2O_8$ (2.0)	TMEDA (2.0)	DCE	N.D.
4	$(NH_4)_2S_2O_8$ (2.0)	TMEDA (2.0)	THF	N.D.

[a]Reactions were run under the conditions: **1a** (0.10 mmol, 1.0 equiv.), **2a** (1.0 equiv.), TMEDA (2.0 equiv.), $(NH_4)_2S_2O_8$ (2.0 equiv.), solvent (1.0 mL), r.t., 440-450 nm, under a nitrogen atmosphere, 16 h; [b]^{1}H NMR yields with 1,3,5-trimethoxybenzene as an internal standard.

Table S3. Screening of equiv. of oxidant and electron donor

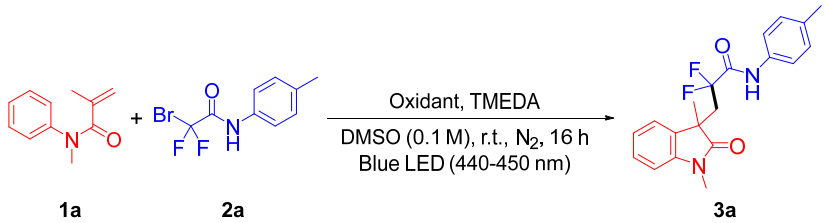


1a 2a 3a

Entry[a]	$S_2O_8^{2-}$ (equiv.)	Electron Donor (equiv.)	Solvent	Yield[b]
1	$(NH_4)_2S_2O_8$ (2.0)	TMEDA (2.0)	DMSO	62%
2	$(NH_4)_2S_2O_8$ (4.0)	TMEDA (2.0)	DMSO	72%
3	**$(NH_4)_2S_2O_8$ (6.0)**	**TMEDA (2.0)**	**DMSO**	**95%**
4	$(NH_4)_2S_2O_8$ (8.0)	TMEDA (2.0)	DMSO	55%
5	$(NH_4)_2S_2O_8$ (10.0)	TMEDA (2.0)	DMSO	27%
6	$(NH_4)_2S_2O_8$ (2.0)	TMEDA (1.0)	DMSO	58%
7	$(NH_4)_2S_2O_8$ (2.0)	TMEDA (3.0)	DMSO	63%

[a]Reactions were run under the conditions: **1a** (0.10 mmol, 1.0 equiv.), **2a** (1.0 equiv.), TMEDA, $(NH_4)_2S_2O_8$, DMSO (1.0 mL), r.t., 440-450 nm, under a nitrogen atmosphere, 16 h; [b]^{1}H NMR yields with 1,3,5-trimethoxybenzene as an internal standard.

Table S4. Screening of oxidant



1a 2a 3a

Entry[a]	Oxidant (equiv.)	Electron Donor (equiv.)	Solvent	Yield[b]
1	**$(NH_4)_2S_2O_8$ (6.0)**	**TMEDA (2.0)**	**DMSO**	**95%**
2	$Na_2S_2O_8$ (6.0)	TMEDA (2.0)	DMSO	31%
3	TBHP (6.0)	TMEDA (2.0)	DMSO	6%
4	DTBP (6.0)	TMEDA (2.0)	DMSO	49%

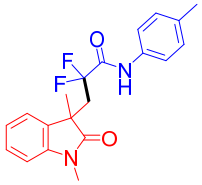
[a]Reactions were run under the conditions: **1a** (0.10 mmol, 1.0 equiv.), **2a** (1.0 equiv.), TMEDA (2.0 equiv.), Oxidant (6.0 equiv.), DMSO (1.0 mL), r.t., 440-450 nm, under a nitrogen atmosphere, 16 h; [b]^{1}H NMR yields with 1,3,5-trimethoxybenzene as an internal standard.

3.3 General procedures for the preparation for compounds 3

General procedure for the synthesis and characterization of difluoroamidated oxindoles:

N-acrylamide **1** (1.0 equiv.), *α*-bromo acetamide **2** (1.0 equiv.) and $(NH_4)_2S_2O_8$ (6.0 equiv.) were added to a 25 mL transparent Schlenk tube equipped with a stirring bar. The tube was evacuated and refilled with nitrogen (N_2) for three times. Then, DMSO (0.1 M), TMEDA (2.0 equiv.) were added via a gastight syringe under a nitrogen atmosphere. Afterward, the tube was sealed, and the reaction mixture was stirred under irradiation with a blue LED (440–450 nm, approximately 3.0 cm from the bulb) at room temperature for 16 h. The reaction mixture was washed with water and extracted with ethyl acetate (3 × 10 mL) to remove DMSO. The organic layers were combined and concentrated under vacuum. The desired product **3** was purified by flash column chromatography on silica gel.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(*p*-tolyl)propenamide (3a)

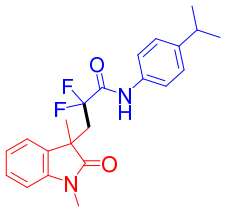


3a

The compound **3a** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 59.7 mg, 83% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.48 (s, 1H), 7.24 (d, J = 7.5 Hz, 1H), 7.21–7.13 (m, 3H), 7.08 (d, J = 8.0 Hz, 2H), 6.92 (t, J = 7.5 Hz, 1H), 6.81 (d, J = 7.5 Hz, 1H), 3.20 (s, 3H), 3.06–2.83 (m, 2H), 2.31 (s, 3H), 1.39 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.2, 161.2 (t, J = 27.7 Hz), 142.9, 135.1, 133.2, 130.8, 129.4, 128.4, 124.3, 122.6, 120.2, 116.6 (dd, J = 257.5 Hz, 253.7 Hz), 108.1, 44.5 (d, J = 5.0 Hz), 40.2 (t, J = 23.3 Hz), 26.4, 25.7, 20.9; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –97.9 (d, J = 260.0 Hz, 1F), –107.2 (d, J = 260.0 Hz, 1F); HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{20}H_{21}F_2N_2O_2$, 359.1566; found, 359.1573.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(4-isopropylphenyl)propenamide (3b)

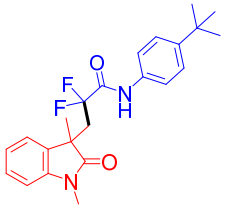


3b

The compound **3b** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2b** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 69.9 mg, 91% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43 (s, 1H), 7.26–7.20 (m, 3H), 7.20–7.13 (m, 3H), 6.94 (t, J = 7.5 Hz, 1H), 3.22 (s, 3H), 3.07–2.83 (m, 3H), 1.40 (s, 3H), 1.22 (d, J = 6.5 Hz, 6H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.3, 161.3 (t, J = 27.7 Hz), 146.3, 142.9, 133.4, 130.9, 128.4, 126.9, 124.3, 122.6, 120.3, 116.7 (dd, J = 257.3 Hz, 253.9 Hz), 108.1, 44.5 (d, J = 5.3 Hz), 40.2 (dd, J = 23.8 Hz, 22.6 Hz), 33.6, 26.5, 25.8, 24.0; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –98.3 (d, J = 259.8 Hz, 1F), –107.1 (d, J = 259.8 Hz, 1F); HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{22}H_{25}F_2N_2O_2$, 387.1879; found, 387.1892.

***N*-(4-(*tert*-butyl)phenyl)-3-(1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoropropanamide (3c)**

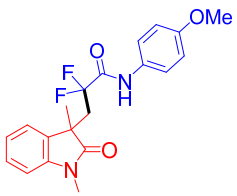


3c

The compound **3c** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2c** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as orange solid, 69.2 mg, 87% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.47 (s, 1H), 7.31 (d, J = 9.0 Hz, 2H), 7.27–7.21 (m, 3H), 7.18 (t, J = 7.8 Hz, 1H), 6.94 (t, J = 7.5 Hz, 1H), 6.82 (d, J = 7.6 Hz, 1H), 3.22 (s, 3H), 3.08–2.83 (m, 2H), 1.40 (s, 3H), 1.30 (s, 9H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.3, 161.3 (t, J = 27.9 Hz), 148.6, 142.9, 133.1, 131.0, 128.4, 125.8, 124.3, 122.6, 120.0, 116.7 (dd, J = 257.4 Hz, 254.0 Hz), 108.1, 44.5 (d, J = 5.0 Hz), 40.2 (dd, J = 23.9 Hz, 22.5 Hz), 34.5, 31.3, 26.5, 25.8; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –98.4 (d, J = 259.3 Hz, 1F), –106.9 (d, J = 259.3 Hz, 1F); HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{23}H_{27}F_2N_2O_2$, 401.2035; found, 401.2041.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(4-methoxyphenyl)propenamide (3d)



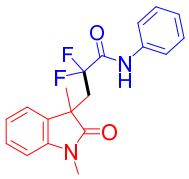
3d

The compound **3d** was prepared according to the general method described above: *N*-acrylamide **1a** (0.10 mmol, 1.0 equiv.), *α*-bromo acetamide **2d** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded

the desired product as brown solid, 26.9 mg, 72% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42 (bs, 1H), 7.26–7.20 (m, 3H), 7.17 (td, J = 7.8 Hz, 1.0 Hz, 1H), 6.93 (td, J = 7.5 Hz, 1.0 Hz, 1H), 6.84–6.80 (m, 3H), 3.79 (s, 3H), 3.22 (s, 3H), 3.07–2.84 (m, 2H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.4, 161.2 (t, J = 27.7 Hz), 157.2, 143.0, 131.0, 128.9, 128.5, 124.4, 122.7, 122.0, 116.8 (dd, J = 257.4 Hz, 253.6 Hz), 114.1, 108.2, 55.6, 44.6 (d, J = 5.5 Hz), 40.4 (dd, J = 24.0 Hz, 22.6 Hz), 26.6, 25.9; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –97.8 (d, J = 259.8 Hz, 1F), –107.4 (d, J = 259.8 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{20}H_{21}F_2N_2O_3$, 375.1515; found, 375.1518.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-phenylpropanamide (3e)

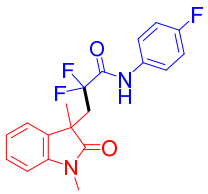


3e

The compound **3e** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2e** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow liquid, 46.0 mg, 67% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.51 (s, 1H), 7.32 (d, J = 9.5 Hz, 2H), 7.30 (d, J = 9.0 Hz, 2H), 7.24 (d, J = 9.0 Hz, 1H), 7.14 (t, J = 9.3 Hz, 2H), 6.90 (t, J = 9.5 Hz, 1H), 6.80 (d, J = 9.5 Hz, 1H), 3.21 (s, 3H), 3.08–2.82 (m, 2H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 179.2, 161.3 (t, J = 27.9 Hz), 142.9, 135.8, 130.8, 128.9, 128.4, 125.4, 124.3, 122.6, 120.1, 116.6 (dd, J = 257.5 Hz, 253.9 Hz), 108.1, 44.5 (d, J = 5.3 Hz), 40.3 (dd, J = 23.8 Hz, 22.8 Hz), 26.4, 25.7; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –97.8 (d, J = 260.0 Hz, 1F), –107.2 (d, J = 260.0 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{19}H_{19}F_2N_2O_2$, 345.1409; found, 345.1416.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(4-fluorophenyl)propenamide (3f)

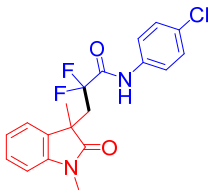


3f

The compound **3f** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2f** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 72.3 mg, 99% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.28–7.34 (m, 2H), 7.23 (d, J = 7.2 Hz, 1H), 7.16 (t, J = 7.6 Hz, 1H), 6.98 (t, J = 8.6 Hz, 2H), 6.91 (t, J = 7.4 Hz, 1H), 6.81 (d, J = 7.6 Hz, 1H), 3.21 (s, 3H), 3.07–2.81 (m, 2H), 1.39 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 179.2, 161.4 (t, J = 27.9 Hz), 161.2, 158.7, 142.9, 131.9 (d, J = 2.8 Hz), 130.8, 128.5, 124.3, 122.6, 122.0 (d, J = 8.0 Hz), 116.6 (dd, J = 257.4 Hz, 253.7 Hz), 115.8, 115.5, 108.1, 44.5 (d, J = 5.0 Hz), 40.2 (dd, J = 24.3 Hz, 23.3 Hz), 26.5, 25.8; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –97.7 (d, J = 260.3 Hz, 1F), –107.4 (d, J = 260.3 Hz, 1F), –116.2 (s, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{19}H_{18}F_3N_2O_2$, 363.1315; found, 363.1312.

***N*-(4-chlorophenyl)-3-(1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoropropanamide (3g)**

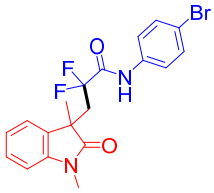


3g

The compound **3g** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2g** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 4:1) and afforded the desired product as yellow solid, 57.6 mg, 76% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.30 (d, J = 9.0 Hz, 2H), 7.25 (d, J = 9.0 Hz, 2H), 7.22 (d, J = 7.5 Hz, 1H), 7.14 (t, J = 7.8 Hz, 1H), 6.90 (t, J = 7.3 Hz, 1H), 6.81 (d, J = 8.0 Hz, 1H), 3.20 (s, 3H), 3.06–2.82 (m, 2H), 1.39 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.2, 161.5 (t, J = 28.1 Hz), 142.9, 134.5, 130.7, 130.5, 129.0, 128.5, 124.3, 122.7, 121.5, 116.6 (dd, J = 257.5 Hz, 253.8 Hz), 108.1, 44.5 (d, J = 5.4 Hz), 40.3 (dd, J = 24.1 Hz, 22.5 Hz), 26.5, 25.7; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –97.5 (d, J = 260.5 Hz, 1F), –107.4 (d, J = 260.5 Hz, 1F); HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{19}H_{18}{}^{35}ClF_2N_2O_2$, 379.1019; found, 379.1027.

***N*-(4-bromophenyl)-3-(1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoropropanamide (3h)**

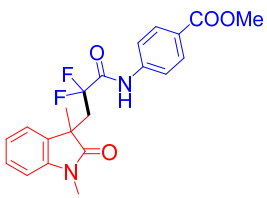


3h

The compound **3h** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2h** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 81.8 mg, 97% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.60 (s, 1H), 7.40 (d, J = 8.5 Hz, 2H), 7.23 (m, 3H), 7.15 (t, J = 7.8 Hz, 1H), 6.90 (t, J = 7.5 Hz, 1H), 6.81 (d, J = 8.0 Hz, 1H), 3.21 (s, 3H), 3.07–2.82 (m, 2H), 1.39 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.2, 161.5 (t, J = 28.2 Hz), 142.9, 135.0, 131.9, 130.7, 128.5, 124.3, 122.7, 121.7, 118.2, 116.5 (dd, J = 257.5 Hz, 253.7 Hz), 108.1, 44.5 (d, J = 5.7 Hz), 40.3 (dd, J = 24.2 Hz, 22.6 Hz), 26.5, 25.7; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –97.5 (d, J = 260.3 Hz, 1F), –107.5 (d, J = 260.3 Hz, 1F); HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{19}H_{18}{}^{79}BrF_2N_2O_2$, 423.0514; found, 423.0523.

Methyl 4-(3-(1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoropropanamido)benzoate (3i)



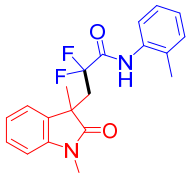
3i

The compound **3i** was prepared according to the general method described above: *N*-acrylamide **1a** (0.10 mmol, 1.0 equiv.), *α*-bromo acetamide **2i** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded

the desired product as yellow solid, 38.0 mg, 95% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (d, J = 8.8 Hz, 2H), 7.80 (s, 1H), 7.44 (d, J = 8.4 Hz, 2H), 7.22 (d, J = 7.2 Hz, 1H), 7.10 (t, J = 7.6 Hz, 1H), 6.86 (t, J = 7.2 Hz, 1H), 6.80 (d, J = 8.0 Hz, 1H), 3.91 (s, 3H), 3.20 (s, 3H), 3.09–2.83 (m, 2H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.2, 166.5, 161.7 (t, J = 28.1 Hz), 143.0, 140.1, 130.7, 130.7, 128.6, 126.9, 124.4, 122.7, 117.6 (dd, J = 258.2 Hz, 254.1 Hz), 108.2, 52.3, 44.6 (d, J = 5.7 Hz), 40.4 (dd, J = 24.7 Hz, 22.2 Hz), 26.6, 25.8; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$) δ –97.3 (d, J = 260.9 Hz,1F), –107.5 (d, J = 260.9 Hz, 1F); HRMS (ESI-TOF) m/z: [M + Na]$^+$ calcd for $C_{21}H_{21}F_2N_2O_4$, 425.1283; found, 425.1297.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(*o*-tolyl)propenamide (3j)

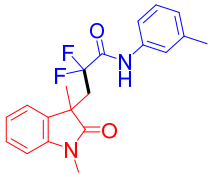


3j

The compound **3j** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2j** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 48.2 mg, 67% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.70 (d, J = 8.4 Hz, 1H), 7.38 (s, 1H), 7.25 (d, J = 7.2 Hz, 1H), 7.21–7.05 (m, 4H), 6.93 (t, J = 7.6 Hz, 1H), 6.81 (d, J = 7.6 Hz, 1H), 3.23 (s, 3H), 3.12–2.85 (m, 2H), 2.05 (s, 3H), 1.41 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 179.2, 161.3 (t, J = 27.7 Hz), 143.0, 133.8, 131.0, 130.5, 128.5, 128.3, 126.8, 125.9, 124.4, 122.6, 122.1, 116.9 (dd, J = 257.5 Hz, 253.8 Hz), 108.0, 44.5 (d, J = 5.4 Hz), 40.1 (dd, J = 24.0 Hz, 22.2 Hz), 26.5, 25.9, 17.2; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –97.6 (d, J = 261.7 Hz, 1F), –107.2 (d, J = 261.7 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{20}H_{21}F_2N_2O_2$, 359.1566; found, 359.1568.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(*m*-tolyl)propenamide (3k)

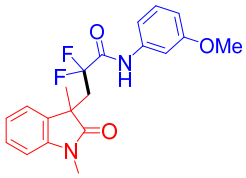


3k

The compound **3k** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2k** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 9:1 to 4:1) and afforded the desired product as yellow solid, 57.6 mg, 80% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (s, 1H), 7.25 (d, J = 7.6 Hz, 1H), 7.20–7.13 (m, 3H), 7.09 (d, J = 8.0 Hz, 1H), 6.95 (d, J = 8.8 Hz, 1H), 6.91 (t, J = 8.0 Hz, 1H), 6.82 (d, J = 8.0 Hz, 1H), 3.22 (s, 3H), 3.08–2.82 (m, 2H), 2.32 (s, 3H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 179.2, 161.3 (t, J = 27.8 Hz), 142.9, 138.9, 135.7, 130.9, 128.7, 128.4, 126.3, 124.3, 122.6, 120.8, 117.3, 116.6 (dd, J = 257.4 Hz, 253.8 Hz), 108.1, 44.5 (d, J = 5.9 Hz), 40.3 (dd, J = 24.2 Hz, 22.5 Hz), 26.5, 25.8, 21.4; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –98.0 (d, J = 259.4 Hz, 1F), –107.2 (d, J = 259.4 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{20}H_{21}F_2N_2O_2$, 359.1566; found, 359.1571.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(3-methoxyphenyl)propenamide (3l)

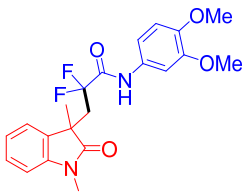


3l

The compound **3l** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2l** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 58.5 mg, 78% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.49 (s, 1H), 7.24 (d, J = 7.6 Hz, 1H), 7.19 (d, J = 8.0 Hz, 1H), 7.15 (d, J = 6.8 Hz, 1H), 7.07 (s, 1H), 6.92 (t, J = 7.6 Hz, 1H), 6.80 (t, J = 7.0 Hz, 2H), 6.69 (dd, J = 8.2 Hz, 1.8 Hz, 1H), 3.79 (s, 3H), 3.22 (s, 3H), 3.07–2.82 (m, 2H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 179.2, 161.4 (t, J = 28.0 Hz), 160.0, 142.9, 137.0, 130.8, 129.6, 128.5, 124.3, 122.6, 116.6 (dd, J = 257.6 Hz, 254.0 Hz), 112.4, 111.3, 108.1, 105.9, 55.4, 44.5 (d, J = 5.4 Hz), 40.3 (dd, J = 24.2 Hz, 22.5 Hz), 26.5, 25.8; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –98.1 (d, J = 259.6 Hz, 1F), –107.1 (d, J = 259.6 Hz, 1F); HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{20}H_{21}F_2N_2O_3$, 375.1515; found, 375.1514.

***N*-(3,4-Dimethoxyphenyl)-3-(1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoropropanamide (3m)**

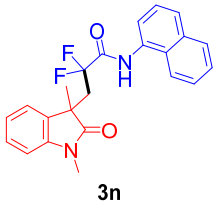


3m

The compound **3m** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2m** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 4:1 to 1:1) and afforded the desired product as colourless liquid, 71.9 mg, 89% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 (bs, 1H), 7.25 (d, J = 7.0 Hz, 1H), 7.19 (t, J = 8.0 Hz, 1H), 7.10 (s, 1H), 6.95 (d, J = 7.3 Hz, 1H), 6.82 (d, J = 7.5 Hz, 1H), 6.76 (s, 2H), 3.85 (s, 6H), 3.21 (s, 3H), 3.07–2.83 (m, 2H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.3, 161.2 (t, J = 27.7 Hz), 148.8, 146.6, 142.9, 130.9, 129.3, 128.4, 124.3, 122.6, 116.7 (dd, J = 257.1 Hz, 253.9 Hz), 112.4, 110.9, 108.1, 104.9, 56.0, 44.5 (d, J = 4.9 Hz), 40.3 (t, J = 23.3 Hz), 26.5, 25.8; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –98.2 (d, J = 259.3 Hz, 1F), –107.1 (d, J = 259.3 Hz, 1F); HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{21}H_{23}F_2N_2O_4$, 405.1620; found, 405.1623.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(naphthalen-1-yl)propenamide (3n)

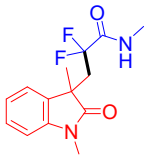


3n

The compound **3n** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2n** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as reddish brown solid, 62.7 mg, 80% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.88–7.83 (m, 1H), 7.78 (d, J = 7.5 Hz, 1H), 7.71 (d, J = 8.0 Hz, 1H), 7.52–7.41 (m, 4H), 7.29–7.25 (m, 1H), 7.10 (t, J = 7.5 Hz, 1H), 6.92 (t, J = 7.3 Hz, 1H), 6.77 (d, J = 8.0 Hz, 1H), 3.24 (s, 3H), 3.17–2.93 (m, 2H), 1.43 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.3, 161.9 (t, J = 27.7 Hz), 143.0, 133.9, 130.9, 130.1, 128.8, 128.5, 126.7, 126.6, 126.4, 126.3, 125.5, 124.4, 122.6, 120.4, 120.1, 117.1 (dd, J = 257.8 Hz, 253.7 Hz), 108.2, 44.6 (d, J = 5.4 Hz), 40.1 (dd, J = 24.2 Hz, 22.1 Hz), 26.5, 26.0; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –97.0 (d, J = 262.6 Hz, 1F), –106.8 (d, J = 262.6 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{23}H_{21}F_2N_2O_2$, 395.1566; found, 395.1573.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-methylpropanamide (3o)

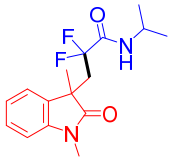


3o

The compound **3o** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2o** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 6:1) and afforded the desired product as white solid, 36.0 mg, 64% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30–7.22 (m, 2H), 7.06 (td, J = 7.5 Hz, 0.9 Hz, 1H), 6.86 (d, J = 8.0 Hz, 1H), 5.92 (s, 1H), 3.23 (s, 3H), 3.06–2.89 (m, 1H), 2.84–2.72 (m, 1H), 2.54 (d, J = 5.2 Hz, 3H), 1.38 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 179.4, 164.3 (t, J = 27.9 Hz), 143.0, 130.8, 128.4, 124.6, 122.4, 116.6 (dd, J = 256.5 Hz, 251.5 Hz), 108.1, 44.5 (d, J = 6.5 Hz), 40.2 (dd, J = 24.9 Hz, 22.0 Hz), 26.1 (t, J = 36.6 Hz); ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –97.6 (d, J = 260.7 Hz, 1F), –110.1 (d, J = 260.7 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{14}H_{17}F_2N_2O_2$, 283.1253; found, 283.1249.

3-(1,3-Dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-isopropylpropanamide (3p)

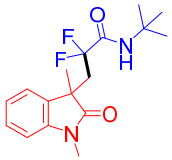


3p

The compound **3p** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2p** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 6:1) and afforded the desired product as white solid, 27.3 mg, 44% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28 (d, J = 7.5 Hz, 1H), 7.25 (d, J = 8.5 Hz, 1H), 7.05 (t, J = 7.5 Hz, 1H), 6.84 (d, J = 8.0 Hz, 1H), 5.72 (s, 1H), 3.78–3.69 (m, 1H), 3.24 (s, 3H), 3.05–2.93 (m, 1H), 2.83–2.72 (m, 1H), 1.38 (s, 3H), 1.07 (d, J = 6.5 Hz, 3H), 0.92 (d, J = 6.5 Hz, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.4, 162.6 (t, J = 27.9 Hz), 143.0, 131.1, 128.3, 124.5, 122.4, 116.6 (dd, J = 256.8 Hz, 252.0 Hz), 108.0, 44.5 (d, J = 5.8 Hz), 41.8, 39.8 (dd, J = 24.5 Hz, 21.8 Hz), 26.4, 25.9, 22.15, 22.10; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –98.0 (d, J = 261.7 Hz, 1F), –108.9 (d, J = 261.7 Hz, 1F); HRMS (ESI-TOF) m/z: [M + H]$^+$ calcd for $C_{16}H_{21}F_2N_2O_2$, 311.1566; found, 311.1571.

***N*-(*tert*-butyl)-3-(1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoropropanamide (3q)**

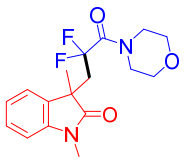


3q

The compound **3q** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2q** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 32.2 mg, 50% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30–7.24 (m, 2H), 7.05 (t, J = 7.6 Hz, 1H), 6.85 (t, J = 7.6 Hz, 1H), 5.76 (s, 1H), 3.24 (s, 3H), 3.00–2.69 (m, 2H), 1.38 (s, 3H), 1.22 (s, 9H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.5, 162.7 (t, J = 27.2 Hz), 143.0, 131.7, 128.2, 124.3, 122.8, 116.7 (dd, J = 257.7 Hz, 254.0 Hz), 108.2, 51.8, 44.7 (d, J = 4.5 Hz), 39.8 (dd, J = 24.0 Hz, 22.0 Hz), 28.4, 26.5, 26.1; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –99.3 (d, J = 259.8 Hz, 1F), –105.7 (d, J = 259.8 Hz, 1F); HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{17}H_{23}F_2N_2O_2$, 325.1722; found, 325.1732.

3-(2,2-Difluoro-3-morpholino-3-oxopropyl)-1,3-dimethylindolin-2-one (3r)



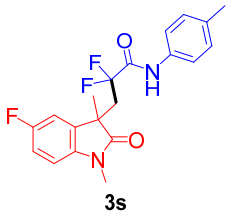
3r

The compound **3r** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2r** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 48.0 mg, 71%.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30 (td, J = 7.6 Hz, 1.2 Hz, 1H), 7.26 (d, J = 8.5 Hz, 1H), 7.07 (td, J = 7.5 Hz, 1.0 Hz, 1H), 6.87 (d, J = 7.5 Hz, 1H), 3.67–3.46 (m, 8H), 3.24 (s, 3H), 3.10–2.98 (m, 1H), 2.89–2.76 (m, 1H), 1.41 (s, 3H). The NMR data agreed with those in a literature report.[7]

HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{17}H_{21}F_2N_2O_3$, 339.1515; found, 339.1518.

2,2-Difluoro-3-(5-fluoro-1,3-dimethyl-2-oxoindolin-3-yl)-*N*-(*p*-tolyl)propenamide (3s)



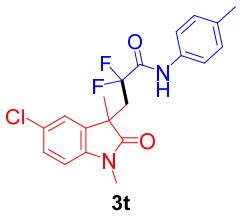
3s

The compound **3s** was prepared according to the general method described above: *N*-acrylamide **1b** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as brown solid, 45.1 mg, 60% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.25 (d, J = 8.5 Hz, 2H), 7.10 (d, J = 8.0 Hz, 2H), 7.03 (dd, J = 8.0 Hz, 2.5 Hz, 1H), 6.86 (td, J = 8.8 Hz, 2.5 Hz, 1H), 6.73 (dd, J = 8.5 Hz, 4.0 Hz, 1H), 3.20 (s, 3H), 3.02–2.83 (m, 2H), 2.31 (s, 3H), 1.40 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 178.9, 161.1 (t, J = 27.8 Hz), 159.1 (d, J = 241.0

Hz), 138.8 (d, J = 1.5 Hz), 135.3, 133.1, 132.6 (d, J = 8.0 Hz), 129.5, 120.1, 116.5 (dd, J = 257.1 Hz, 254.5 Hz), 114.7 (d, J = 23.6 Hz), 112.5 (d, J = 24.9 Hz), 108.6 (d, J = 8.2 Hz), 45.0 (d, J = 4.4 Hz), 40.1 (dd, J = 23.8 Hz, 22.6 Hz), 26.6, 25.7, 20.9; $^{19}F\{^{1}H\}$ NMR (471 MHz, $CDCl_3$): δ = –99.5 (d, J = 259.1 Hz, 1F), –106.2 (d, J = 259.1 Hz, 1F), –120.2 (s, 1F); HRMS (ESI-TOF) m/z: $[M + H]^+$ calcd for $C_{20}H_{20}F_3N_2O_2$, 377.1471; found, 377.1475.

3-(5-Chloro-1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(*p*-tolyl)propenamide (3t)

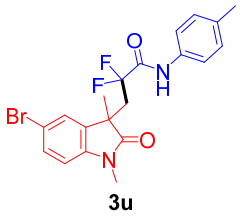


3t

The compound **3t** was prepared according to the general method described above: *N*-acrylamide **1c** (0.20 mmol, 1.0 equiv.), α-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 78.4 mg, 99% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 (s, 1H),7.28–7.22 (m, 3H), 7.15–7.08 (m, 3H), 6.73 (d, J = 8.0 Hz, 1H), 3.20 (s, 3H), 3.02–2.82 (m, 2H), 2.32 (s, 3H), 1.40 (s, 3H); $^{13}C\{^{1}H\}$ NMR (126 MHz, $CDCl_3$) δ 178.8, 161.0 (t, J = 27.7 Hz), 141.5, 135.3, 133.1, 132.6, 129.5, 128.4, 128.1, 124.9, 120.2, 116.5 (dd, J = 257.2 Hz, 254.3 Hz), 109.1, 44.8 (d, J = 5.0 Hz), 40.1 (t, J = 23.3 Hz), 26.6, 25.7, 21.0; $^{19}F\{^{1}H\}$ NMR (377 MHz, $CDCl_3$): δ = –99.1 (d, J = 259.2 Hz, 1F), –106.5 (d, J = 259.2 Hz, 1F); HRMS (ESI-TOF) m/z: $[M + H]^+$ calcd for $C_{20}H_{20}{}^{35}ClF_2N_2O_2$, 393.1176; found, 393.1184.

3-(5-Bromo-1,3-dimethyl-2-oxoindolin-3-yl)-2,2-difluoro-*N*-(*p*-tolyl)propenamide (3u)

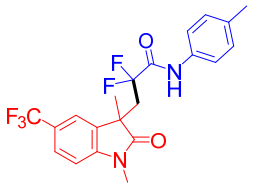


3u

The compound **3u** was prepared according to the general method described above: *N*-acrylamide **1a** (0.20 mmol, 1.0 equiv.), α-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 69.9 mg, 80% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (s, 1H), 7.38 (d, J = 1.5 Hz, 1H), 7.30–7.22 (m, 3H), 7.11 (d, J = 8.0 Hz, 2H), 6.68 (d, J = 8.0 Hz, 1H), 3.19 (s, 3H), 3.02–2.82 (m, 2H), 2.31 (s, 3H), 1.39 (s, 3H); $^{13}C\{^{1}H\}$ NMR (126 MHz, $CDCl_3$) δ 178.6, 161.0 (t, J = 27.7 Hz), 142.0, 135.3, 133.1, 133.0, 131.3, 129.5, 127.6, 120.2, 116.5 (dd, J = 254.2 Hz, 257.3 Hz), 115.4, 109.6, 44.7 (d, J = 4.9 Hz), 40.1 (dd, J = 23.9 Hz, 22.5 Hz), 26.6, 25.7, 21.0; $^{19}F\{^{1}H\}$ NMR (471 MHz, $CDCl_3$): δ = –98.9 (d, J = 259.8 Hz, 1F), –106.5 (d, J = 259.8 Hz, 1F); HRMS (ESI-TOF) m/z: $[M + H]^+$ calcd for $C_{20}H_{21}{}^{79}BrF_2N_2O_2$, 437.0671; found, 437.0679.

3-(1,3-Dimethyl-2-oxo-5-(trifluoromethyl)indolin-3-yl)-2,2-difluoro-*N*-(*p*-tolyl)propenamide (3v)

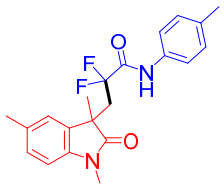


3v

The compound **3v** was prepared according to the general method described above: *N*-acrylamide **1e** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as light yellow solid, 63.5 mg, 75% yield.

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54–7.44 (m, 3H), 7.22 (d, J = 8.4 Hz, 2H), 7.10 (d, J = 8.4 Hz, 2H), 6.89 (d, J = 8.4 Hz, 2H), 3.26 (s, 3H), 3.09–2.86 (m, 2H), 2.31 (s, 3H), 1.44 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.1, 160.8 (t, J = 27.9 Hz), 145.9, 135.4, 133.0, 131.6, 129.5, 126.3 (q, J = 3.9 Hz), 124.9 (q, J = 32.9 Hz), 124.2 (q, J = 271.6 Hz), 121.4 (q, J = 3.3 Hz), 120.0, 116.5 (dd, J = 256.7 Hz, 254.9 Hz), 107.9, 44.5 (d, J = 4.5 Hz), 40.1 (t, J = 23.1 Hz), 26.7, 25.7, 20.9; ^{19}F{^{1}H} NMR (377 MHz, $CDCl_3$): δ = –61.4 (s, 1F), –99.8 (d, J = 259.6 Hz, 1F), –105.3 (d, J = 259.6 Hz, 1F); HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{21}H_{20}F_5N_2O_2$, 427.1439; found, 427.1449.

2,2-Difluoro-*N*-(*p*-tolyl)-3-(1,3,5-trimethyl-2-oxoindolin-3-yl)propenamide (3w)

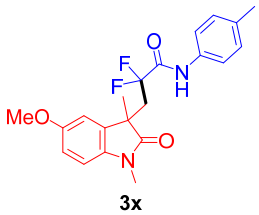


3w

The compound **3w** was prepared according to the general method described above: *N*-acrylamide **1f** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as reddish brown solid, 38.7 mg, 52% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (s, 1H), 7.18 (d, J = 8.5 Hz, 2H), 7.08 (d, J = 8.5 Hz, 2H), 7.02 (s, 1H), 6.90 (d, J = 7.5 Hz, 1H), 6.70 (d, J = 8.0 Hz, 1H), 3.21 (s, 3H), 3.09–2.97 (m, 1H), 2.92–2.82 (m, 1H), 2.31 (s, 3H), 2.04 (s, 3H), 1.37 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 179.3, 161.3 (t, J = 27.7 Hz), 140.5, 135.1, 133.2, 132.3, 130.5, 129.3, 128.8, 125.3, 119.9, 116.6 (dd, J = 258.1 Hz, 252.7 Hz), 107.7, 44.5 (d, J = 6.2 Hz), 40.2 (dd, J = 24.8 Hz, 22.2 Hz), 26.5, 25.7, 20.9, 20.8; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –96.1 (d, J = 259.8 Hz, 1F), –109.8 (d, J = 259.8 Hz, 1F); HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{21}H_{23}F_2N_2O_2$, 373.1722; found, 373.1720.

2,2-Difluoro-3-(5-methoxy-1,3-dimethyl-2-oxoindolin-3-yl)-*N*-(*p*-tolyl)propenamide (3x)



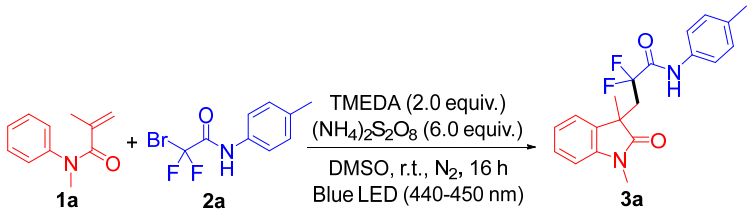
3x

The compound **3x** was prepared according to the general method described above: *N*-acrylamide **1g** (0.20 mmol, 1.0 equiv.), *α*-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated

by blue LED (440–450 nm) in the solution of DMSO under a nitrogen atmosphere for 16 h. Then the reaction mixture was purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) and afforded the desired product as yellow solid, 66.2 mg, 85% yield.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.47 (s, 1H), 7.21 (d, J = 8.5 Hz, 2H), 7.08 (d, J = 8.0 Hz, 2H), 6.84 (d, J = 2.5 Hz, 1H), 6.71 (d, J = 8.5 Hz, 1H), 6.63 (dd, J = 8.5 Hz, 2.5 Hz, 1H), 3.56 (s, 3H), 3.19 (s, 3H), 3.05–2.82 (m, 2H), 2.31 (s, 3H), 1.38 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 178.9, 161.3 (t, J = 27.8 Hz), 155.9, 136.4, 135.1, 133.2, 132.0, 129.4, 120.1, 116.7 (dd, J = 257.8 Hz, 253.4 Hz), 112.9, 111.8, 108.4, 55.5, 44.9 (d, J = 5.9 Hz), 40.2 (dd, J = 24.5 Hz, 22.6 Hz), 26.6, 25.8, 20.9; ^{19}F{^{1}H} NMR (471 MHz, $CDCl_3$): δ = –96.9 (d, J = 259.8 Hz, 1F), –108.6 (d, J = 259.8 Hz, 1F); HRMS (ESI-TOF) m/z: $[M + H]^+$ calcd for $C_{21}H_{23}F_2N_2O_3$, 389.1671; found, 389.1677.

3.4 Scale-up reaction



1a 5.0 mmol + **2a** → **3a** 0.92 g, 51%

N-acrylamide **1a** (5 mmol, 1.0 equiv.), *α*-bromo acetamide **2a** (1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.) and TMEDA (2.0 equiv.) were irradiated by blue LED (440–450 nm) in the solution of DMSO (30 mL) under a nitrogen atmosphere for 16 h. Then, the reaction mixture was diluted with ethyl acetate (35 mL), washed with brine (30 mL × 3), dried over anhydrous Na_2SO_4, filtered, concentrated under reduced pressure, the resulting mixture purified by flash column chromatography (petroleum ether/ethyl acetate = 10:1 to 4:1) to afford the desired product as yellow solid, 916.0 mg, 51% yield.

4. Mechanistic investigations

4.1 UV-vis absorption spectra as evidence of the EDA complexes

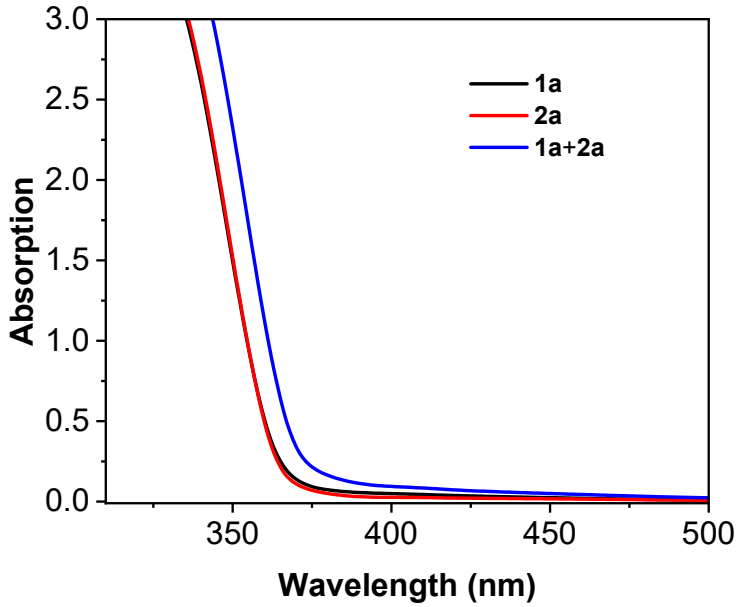


Figure S2. UV/vis absorptions of **1a** (0.1 M), **2a** (0.1 M) and their mixture in DMSO solution.

The UV/vis absorption spectra of DMSO solution of **1a** (0.1 M), **2a** (0.1 M), and a mixture of **1a** (0.1 M) and **2a** (0.1 M) are shown in Figure S2. In Figure S2, we don't really see a bathochromic shift. Upon mixing **1a** + **2a**, the new curve is completely superimposable to the sum of **1a** and **2a**. This observation excludes the formation of electron donor-acceptor (EDA) complexes.

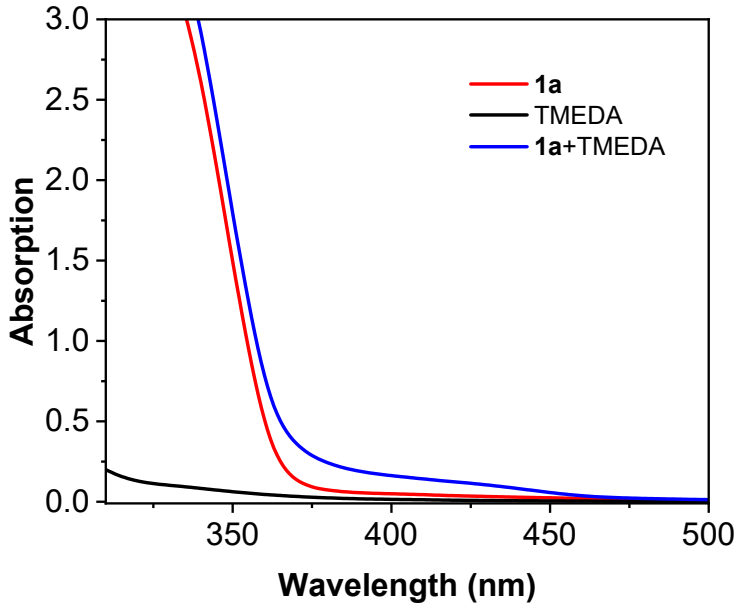
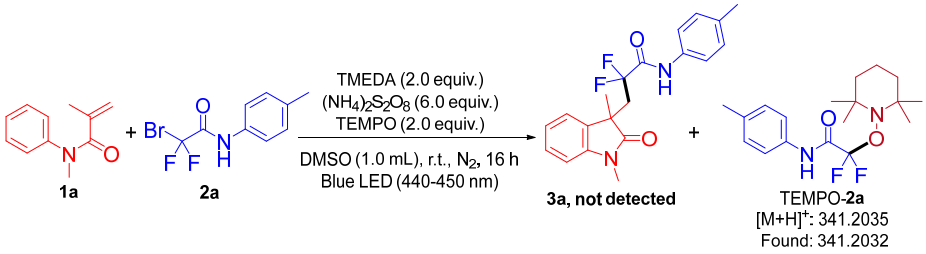


Figure S3. UV/vis absorptions of **1a** (0.1 M), **TMEDA** (0.2 M) and their mixture in DMSO solution.

The UV/vis absorption spectra of DMSO solution of **1a** (0.1 M), **TMEDA** (0.2 M), and a mixture of **1a** (0.1 M) and **TMEDA** (0.2 M) are shown in Figure S3. In Figure S3, we don't really see a bathochromic shift. Upon mixing **1a** + **TMEDA**, the new curve is completely superimposable to the sum of **1a** and **TMEDA**. This observation excludes the formation of electron donor-acceptor (EDA) complexes.

4.2 Free radical-trapping experiments

1a (0.10 mmol, 1.0 equiv.), **2a** (0.10 mmol, 1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.), and TEMPO (2,2,6,6-tetramethylpiperidinooxy, 0.20 mmol, 2.0 equiv.) were added to a 25 mL transparent Schlenk tube equipped with a stirring bar. The tube was evacuated and refilled with nitrogen (N_2) three times. Then, TMEDA (2.0 equiv.) and anhydrous DMSO (1.0 mL) were added via a gastight syringe under nitrogen atmosphere, and the tube was sealed and the mixture was stirred under irradiation with blue LED (440-450 nm, distance approximately 3.0 cm from the lamp) at room temperature for 16 h. The reaction mixture was analyzed by HRMS with ESI source, no desired product **3a** was detected, indicating that the reaction was completely inhibited by TEMPO. Meanwhile, free radical-trapping adduct TEMPO–**2a** was observed with HRMS analysis of the reaction solution (Figure S4). HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{18}H_{26}F_2N_2O_2$, 341.2035; found, 341.2032.



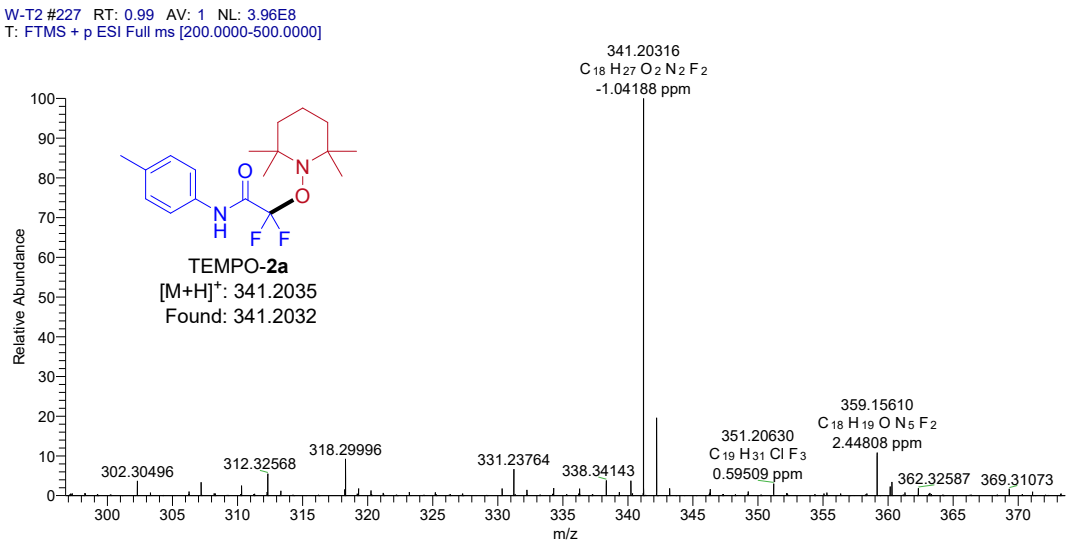


Figure S4. HRMS of radical trapping experiment with TEMPO.

1a (0.20 mmol, 1.0 equiv.), **2a** (0.20 mmol, 1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.), and BHT (butylated hydroxytoluene, 0.4 mmol, 2.0 equiv.) were added to a 25 mL transparent Schlenk tube equipped with a stirring bar. The tube was evacuated and refilled with nitrogen (N_2) three times. Then, TMEDA (2.0 equiv.) and anhydrous DMSO (2.0 mL) were added via a gastight syringe under nitrogen atmosphere, and the tube was sealed and the mixture was stirred under irradiation with blue LED (440-450 nm, distance approximately 3.0 cm from the lamp) at room temperature for 16 h. The reaction mixture was analyzed by HRMS with ESI source, desired product **3a** was in 17% yield, indicating that the reaction was inhibited by BHT. Meanwhile, free radical-trapping adduct TEMPO–**2a** was observed with HRMS analysis of the reaction solution (Figure S5). HRMS (ESI-TOF) *m/z*: [M + H]$^+$ calcd for $C_{24}H_{32}F_2NO_2$, 404.2396; found, 404.2387.

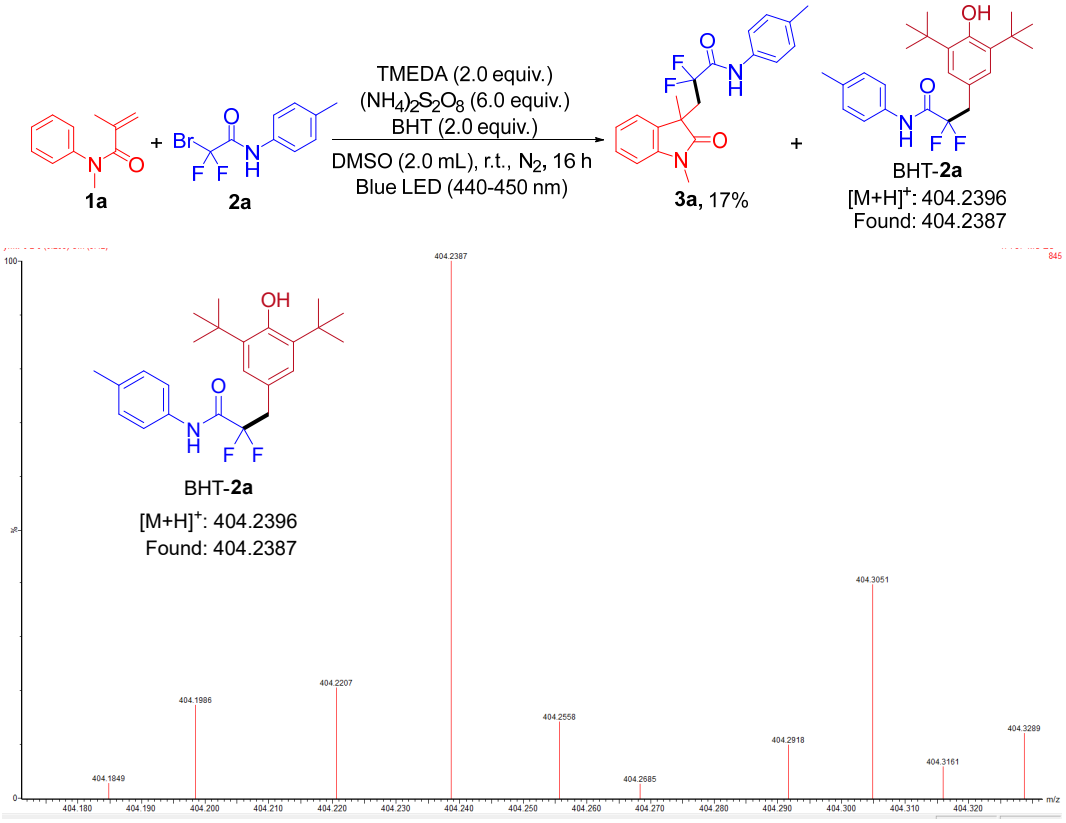


Figure S5. HRMS of radical trapping experiment with BHT.

1a (0.20 mmol, 1.0 equiv.), **2a** (0.20 mmol, 1.0 equiv.), $(NH_4)_2S_2O_8$ (6.0 equiv.), and 1,1-diphenylethylene (0.4 mmol, 2.0 equiv.) were added to a 25 mL transparent Schlenk tube equipped with a stirring bar. The tube was evacuated and refilled with nitrogen (N_2) three times. Then, TMEDA (2.0 equiv.) and anhydrous DMSO (2.0 mL) were added via a gastight syringe under nitrogen atmosphere, and the tube was sealed and the mixture was stirred under irradiation with blue LED (440-450 nm, distance approximately 3.0 cm from the lamp) at room temperature for 16 h. The reaction mixture was analyzed by HRMS with ESI source, no desired product **3a** was detected, indicating that the reaction was completely inhibited by 1,1-diphenylethylene. Meanwhile, free radical-trapping adduct 1,1-diphenylethylene–**2a** was observed with HRMS analysis of the reaction solution (Figure S6). HRMS (ESI-TOF) *m/z*: $[M + H]^+$ calcd for $C_{23}H_{20}F_2NO$, 364.1507; found, 364.1516.

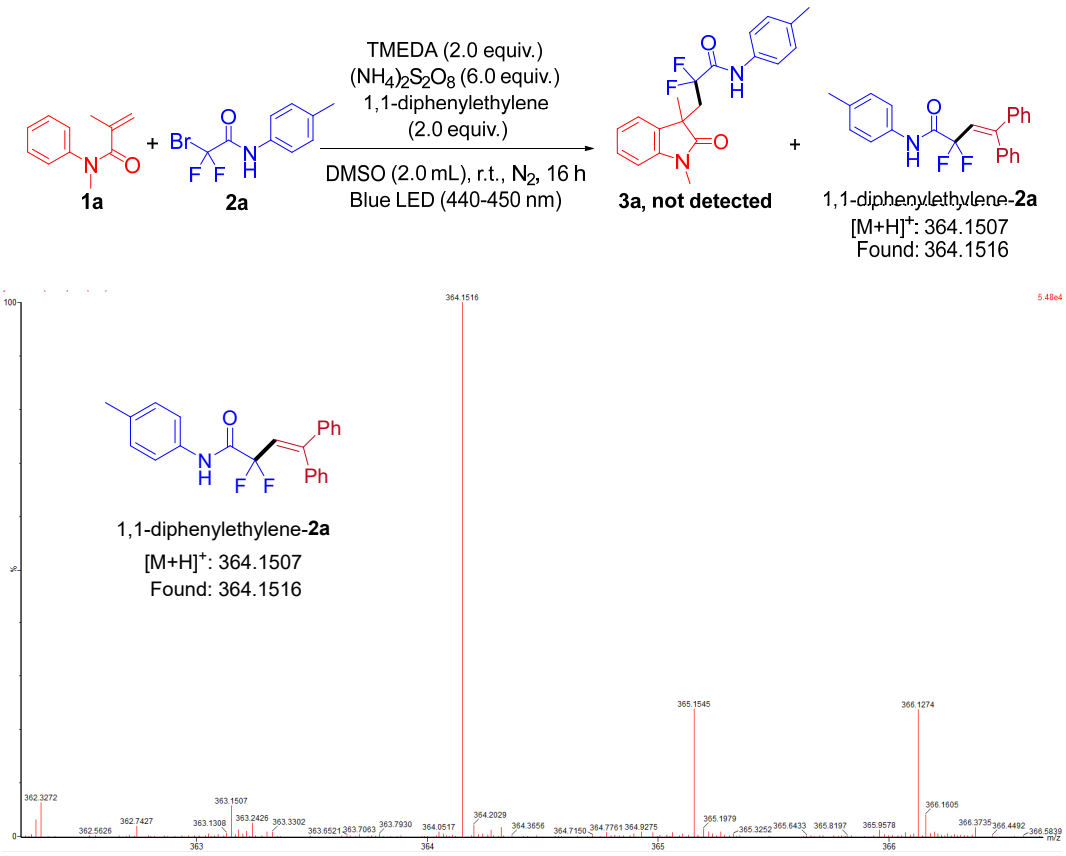
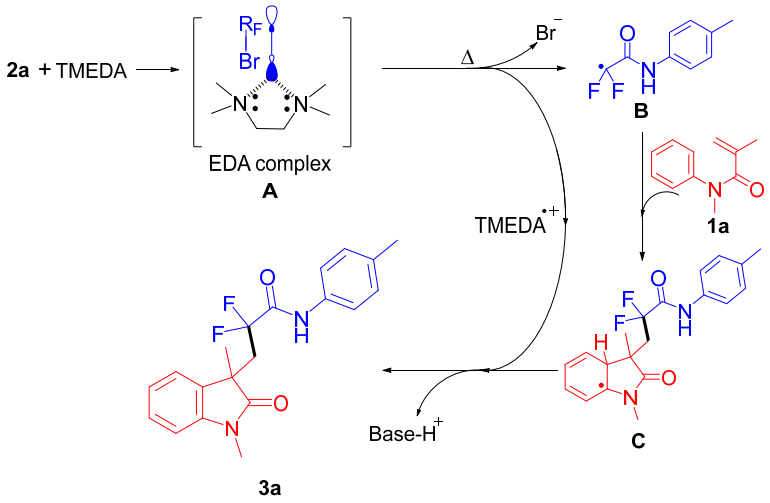


Figure S6. HRMS of radical trapping experiment with 1,1-diphenylethylene.

Note that product **3a** was isolated in 11% yield without light, and this reaction was probably initiated by the formation of non-covalent interactions between **2a** and TMEDA during the removal of solvent occurring during spin evaporation.



Scheme S2 Plausible thermal reaction mechanism

4.3 ^{1}H NMR titration experiments

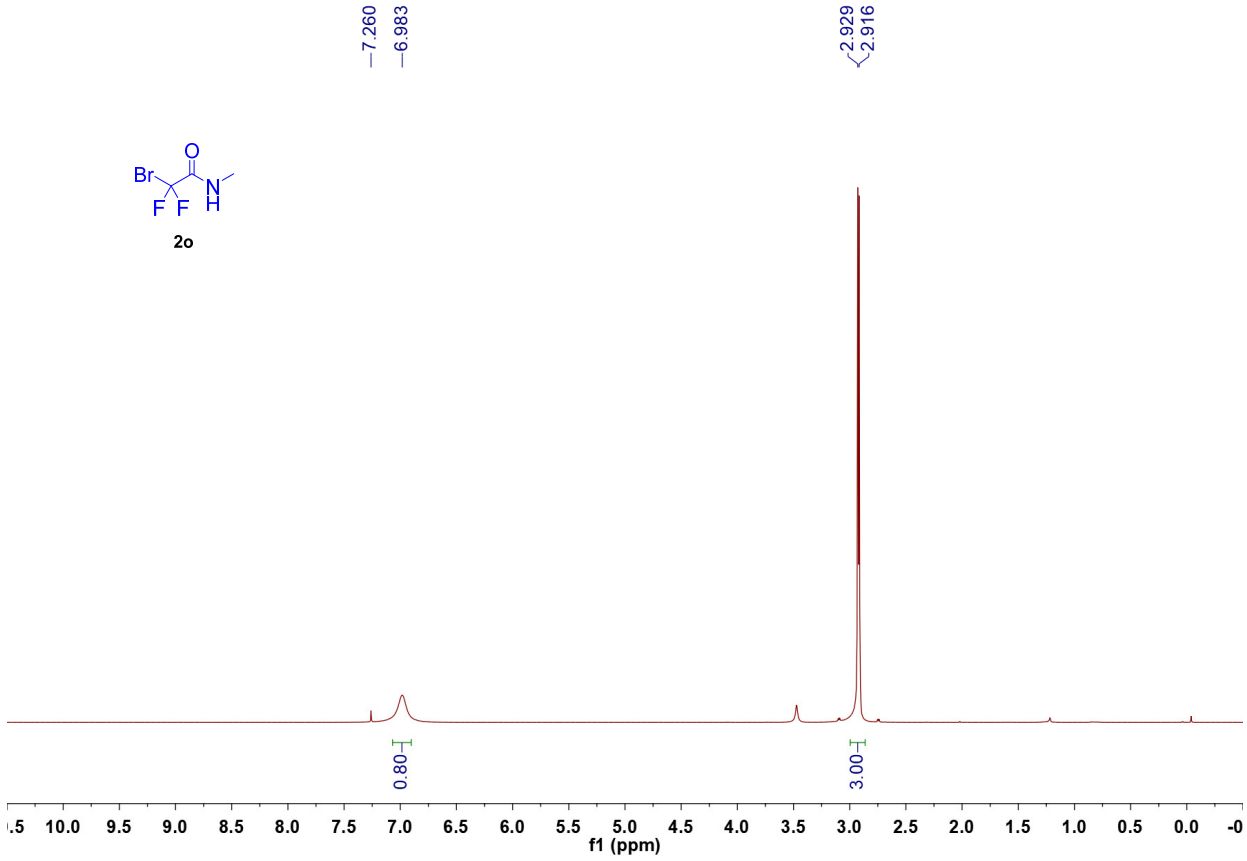
The $CDCl_3$ solutions were mixed with **2a** (0.10 mmol, 1.0 equiv.) and TMEDA by molar ratio from 1:0, 1:0.5, 1:1 to 1:2. The ^{1}H NMR experiments of different combinations of **2a** and TMEDA were performed at 400 MHz.

5. References

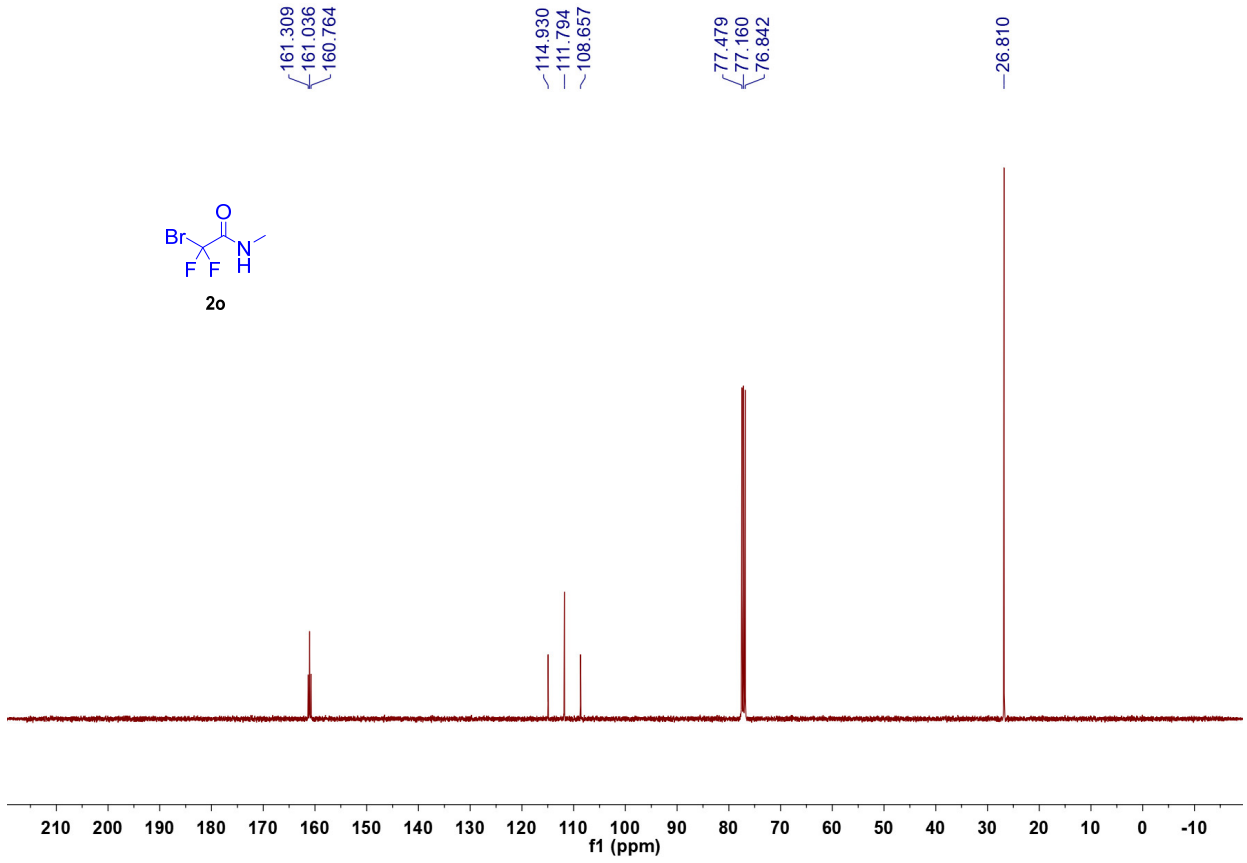
1. Y. Guo, S. Ma, L. Shi, L. Liu, X. Lei and P. Jiao, *Org. Chem. Front.*, 2023, **10**, 2257-2262.
2. M. Zhang, X. Ding, A. Lu, J. Kang, Y. Gao, Z. Wang, H. Li and Q. Wang, *Org. Chem. Front.*, 2021, **8**, 961-967.
3. X. Zhuang, L. Ling, Y. Wang, B. Li, B. Sun, W. Su and C. Jin, *Org. Lett.*, 2022, **24**, 1668-1672.
4. H. Chen, X. Wang, M. Guo, W. Zhao, X. Tang and G. Wang, *Org. Chem. Front.*, 2017, **4**, 2403-2407.
5. Z. Liu, Z.-C. Yin, W.-Q. Lu, C. Niu, M. Chen, S. Yang and G.-W. Wang, *Org. Lett.*, 2021, **23**, 4051-4056.
6. J. Zhang, W. Xu, Y. Qu, Y. Liu, Y. Li, H. Song and Q. Wang, *Chem. Commun.*, 2020, **56**, 15212-15215.
7. F. Ding, Y. Fang, Y. Jiang, K. Lin and L. Shi, *Chem. Asian J.*, 2018, **13**, 636-640.

6. NMR spectra of related compounds

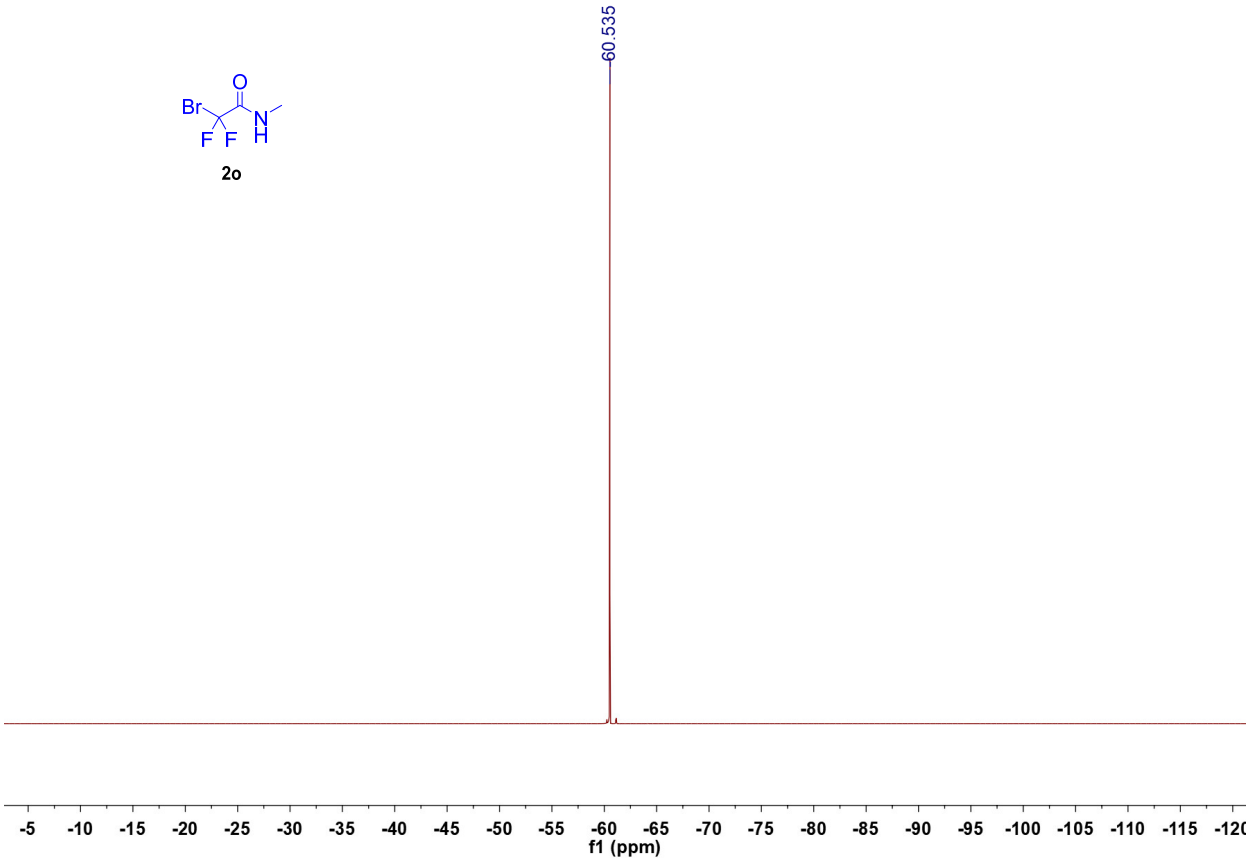
^{1}H NMR Spectra of compound **2o** (400 MHz, $CDCl_3$)



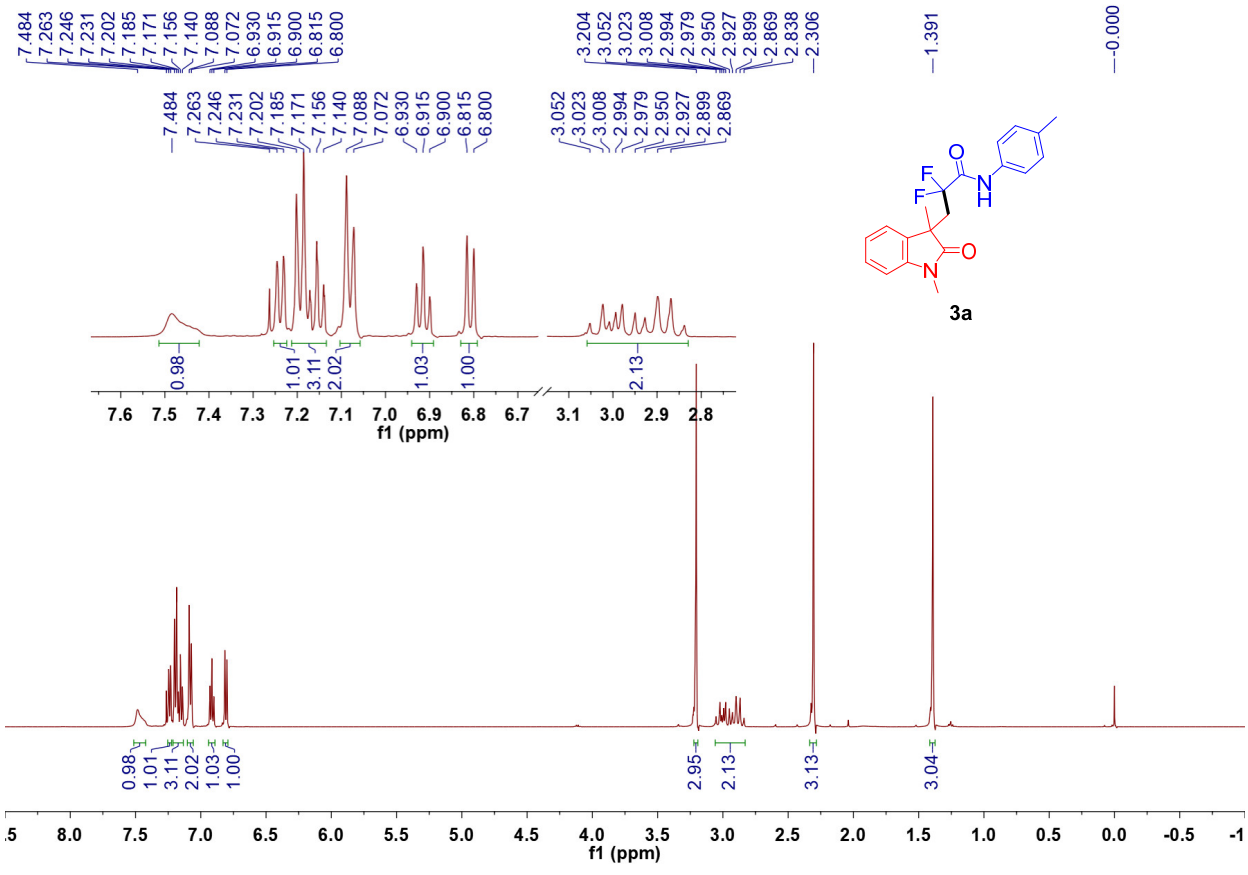
^{13}C{^{1}H} NMR Spectra of compound **2o** (101 MHz, $CDCl_3$)



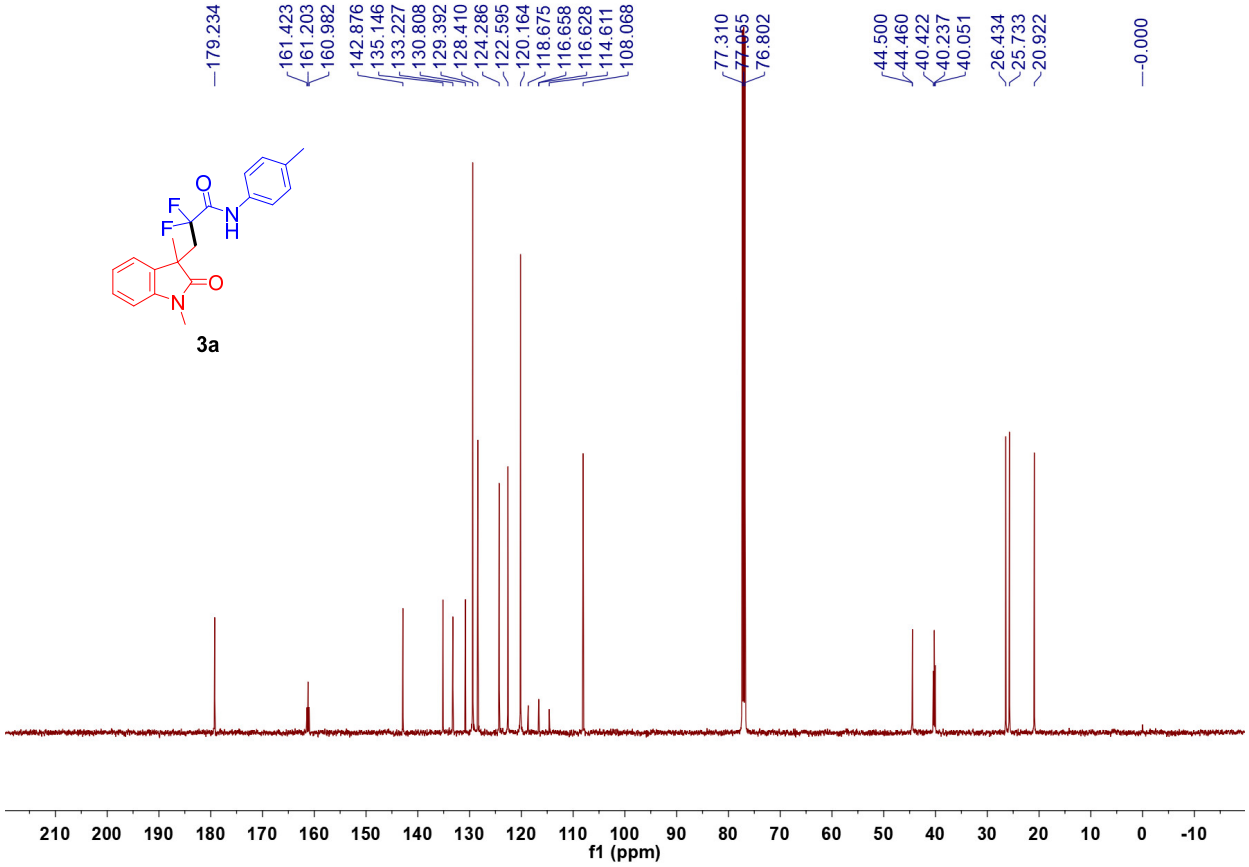
$^{19}F\{^{1}H\}$ NMR Spectra of compound **2o** (377 MHz, $CDCl_3$)



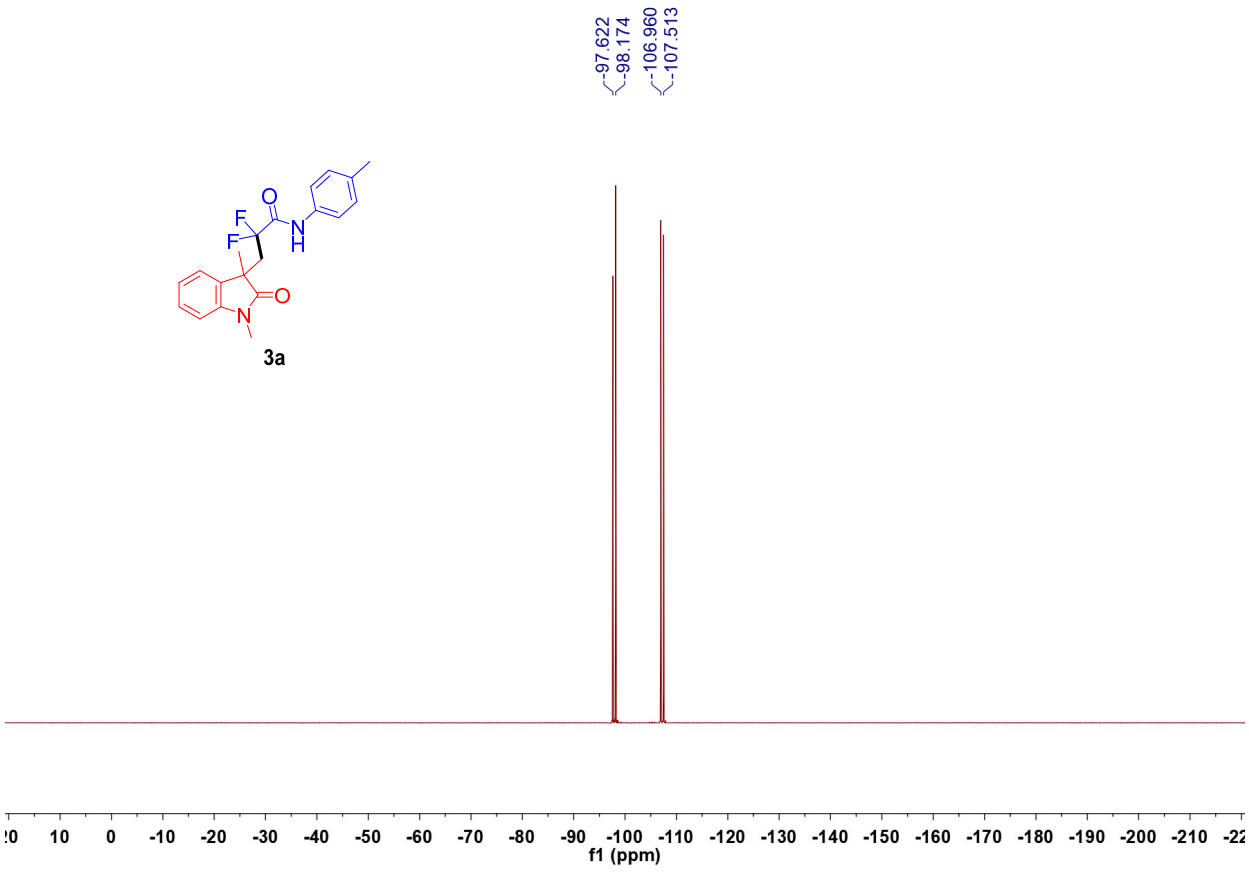
^{1}H NMR Spectra of compound **3a** (500 MHz, $CDCl_3$)



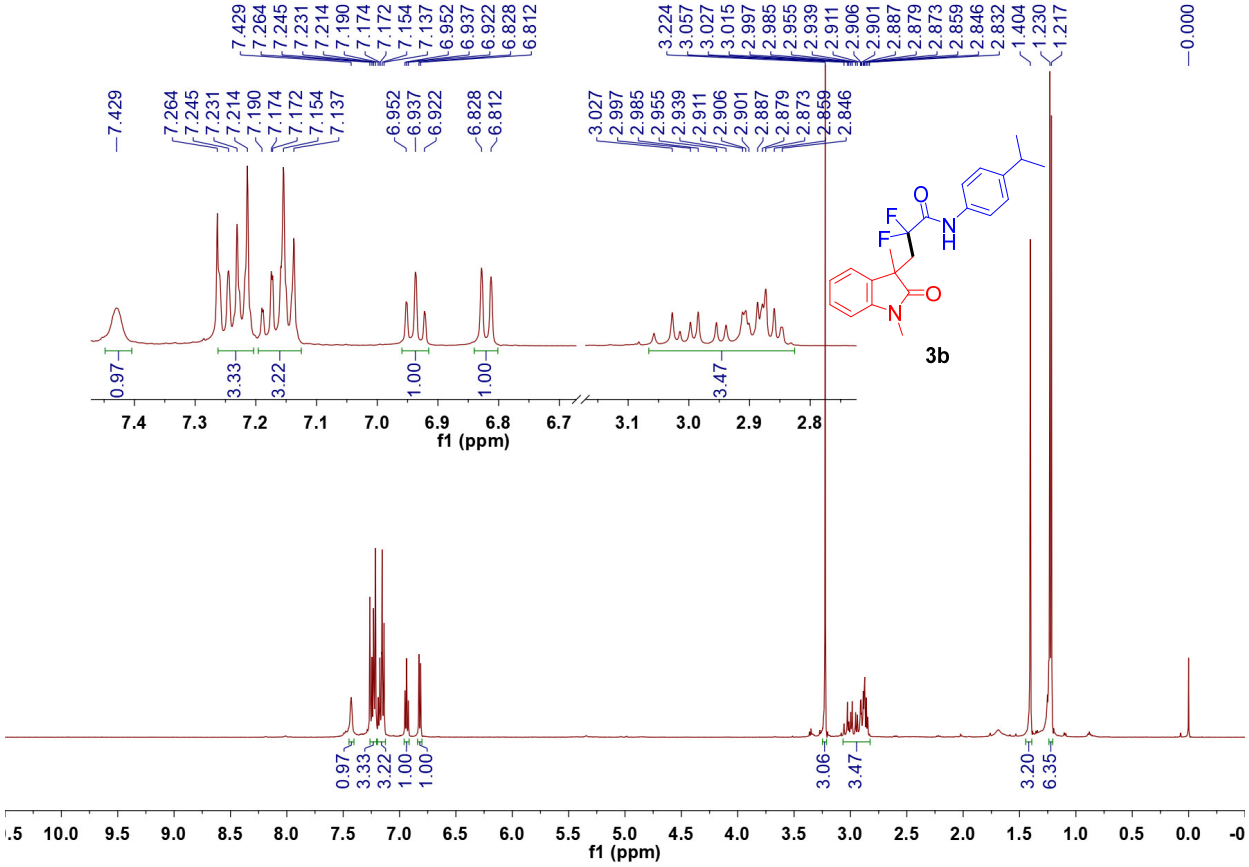
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3a** (126 MHz, $CDCl_3$)



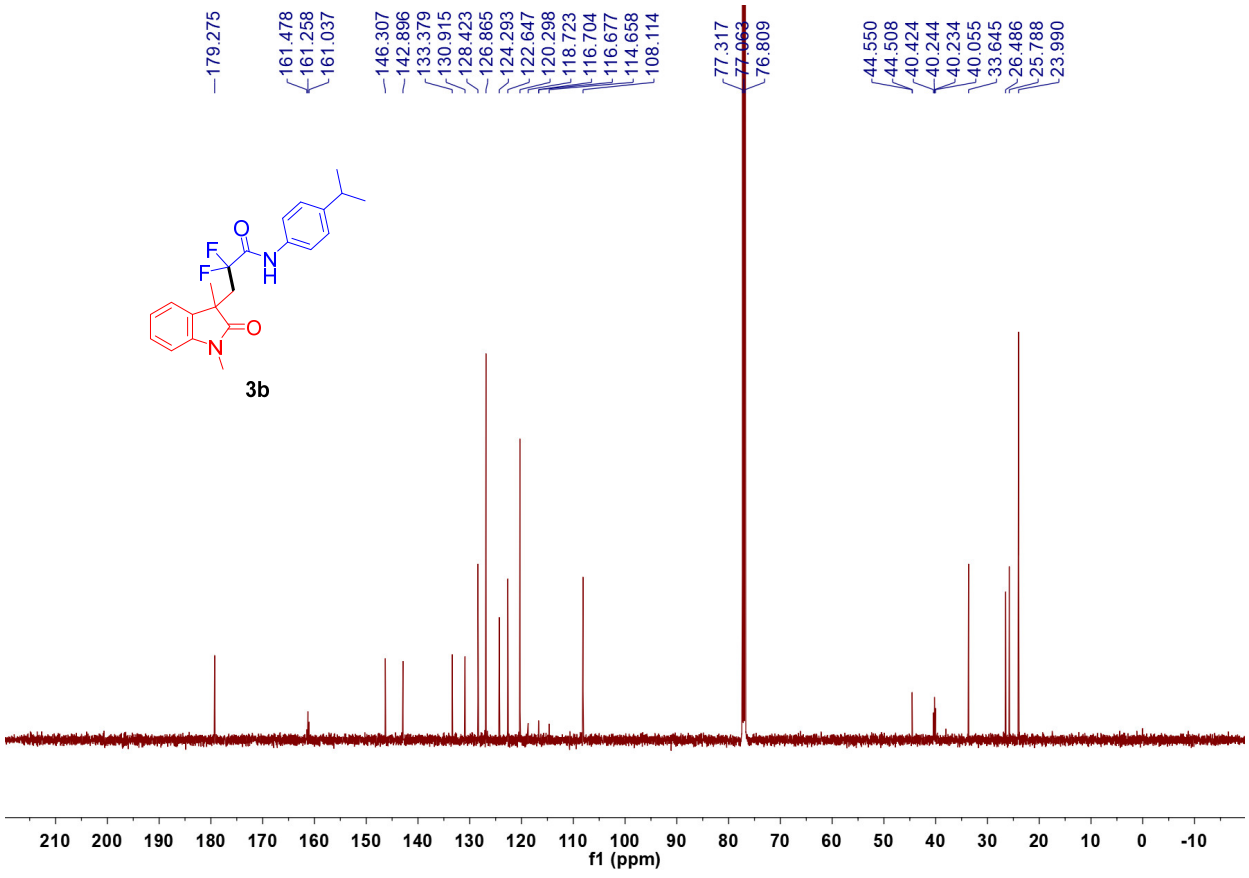
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3a** (471 MHz, $CDCl_3$)



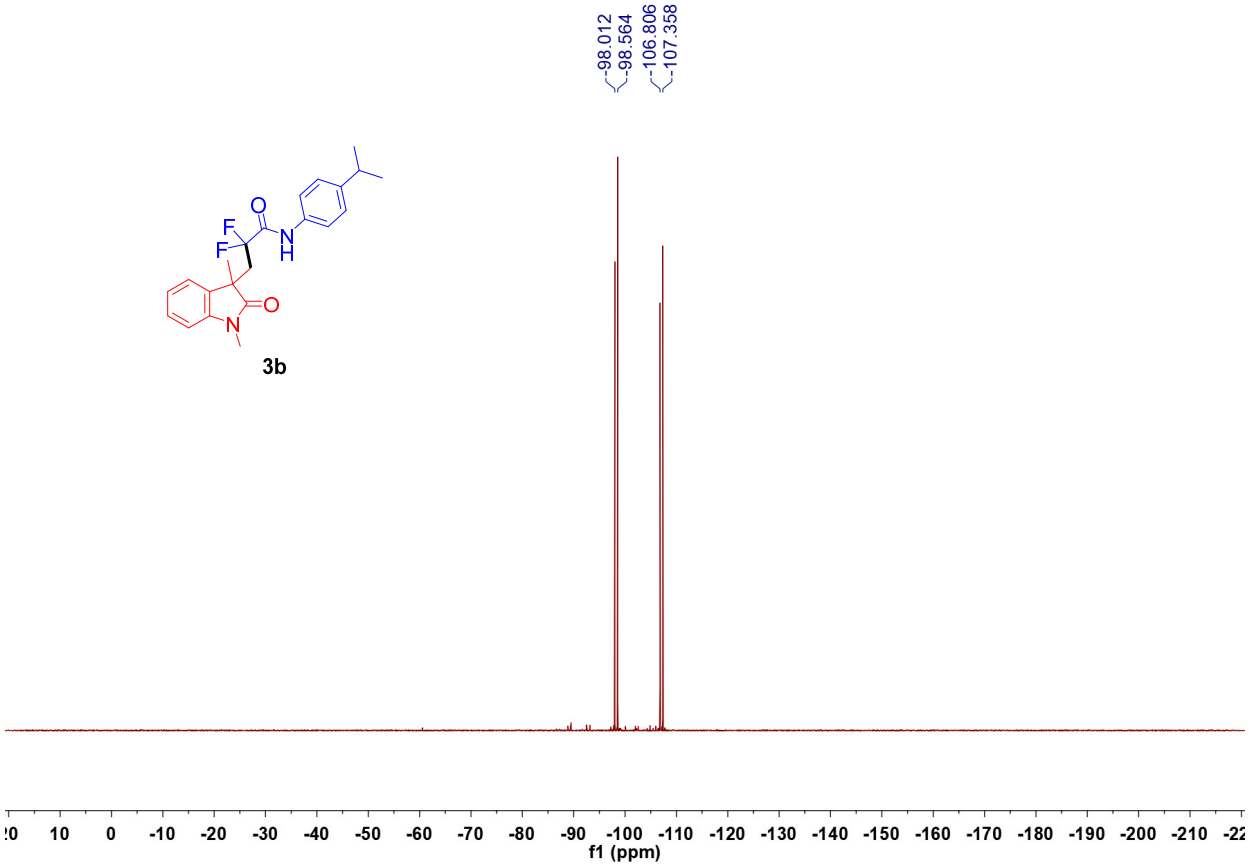
^{1}H NMR Spectra of compound **3b** (500 MHz, $CDCl_3$)



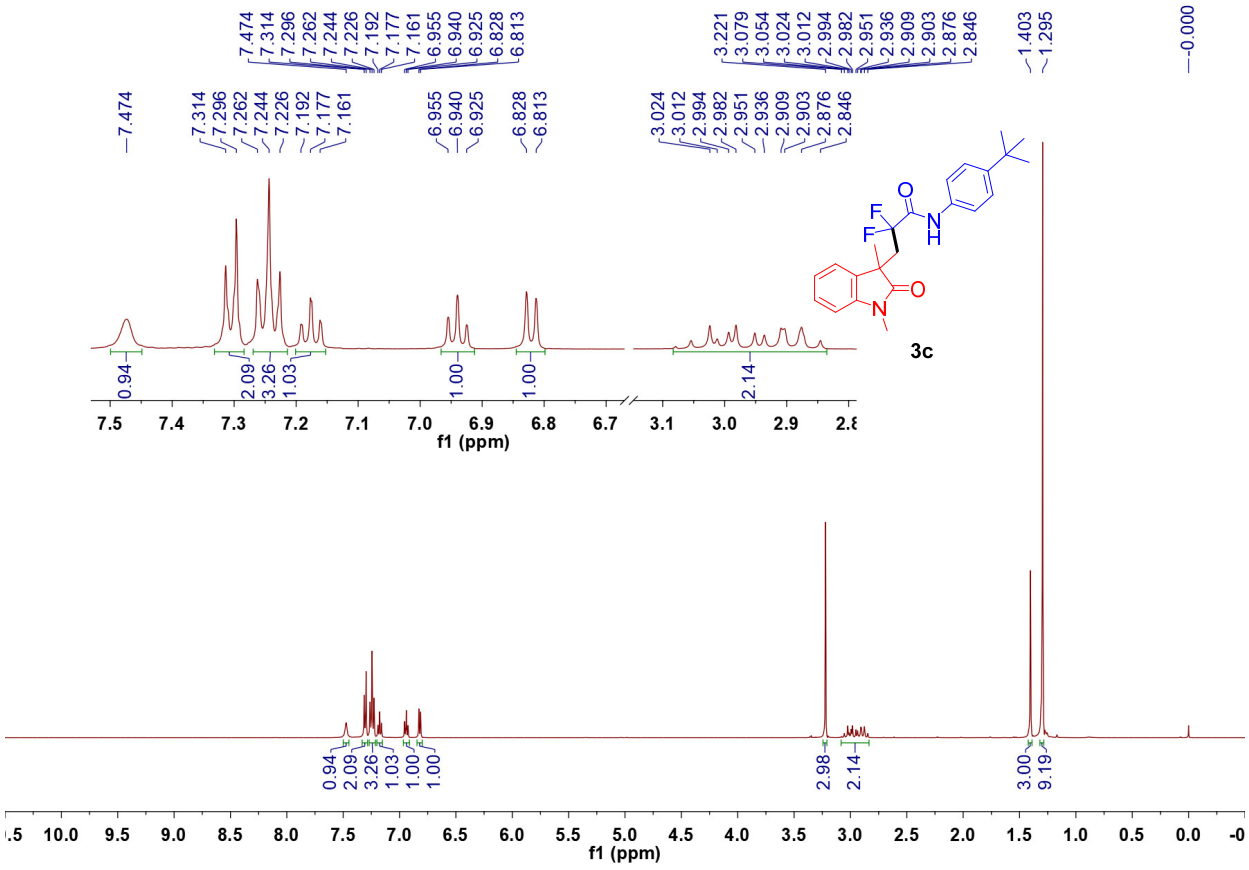
^{13}C{^{1}H} NMR Spectra of compound **3b** (126 MHz, $CDCl_3$)



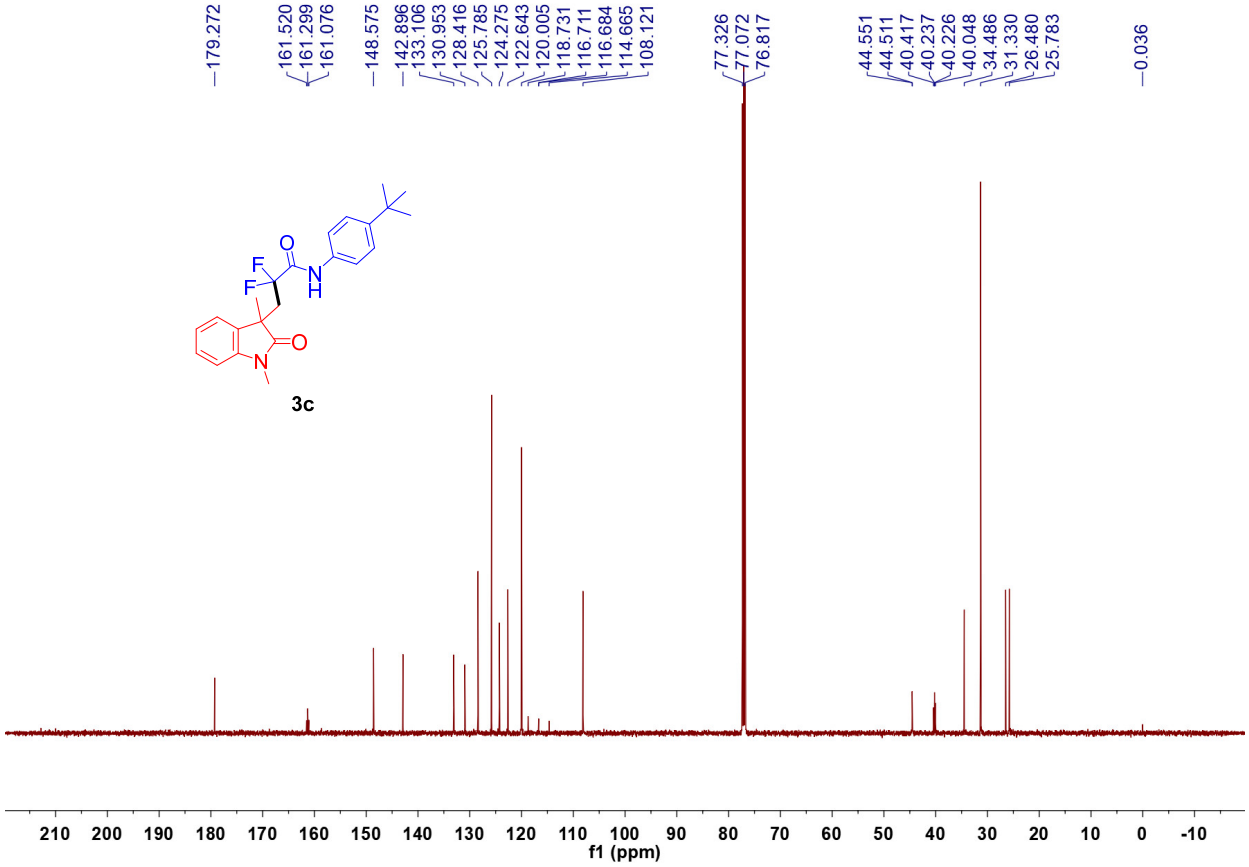
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3b** ($CDCl_3$, 471 MHz)



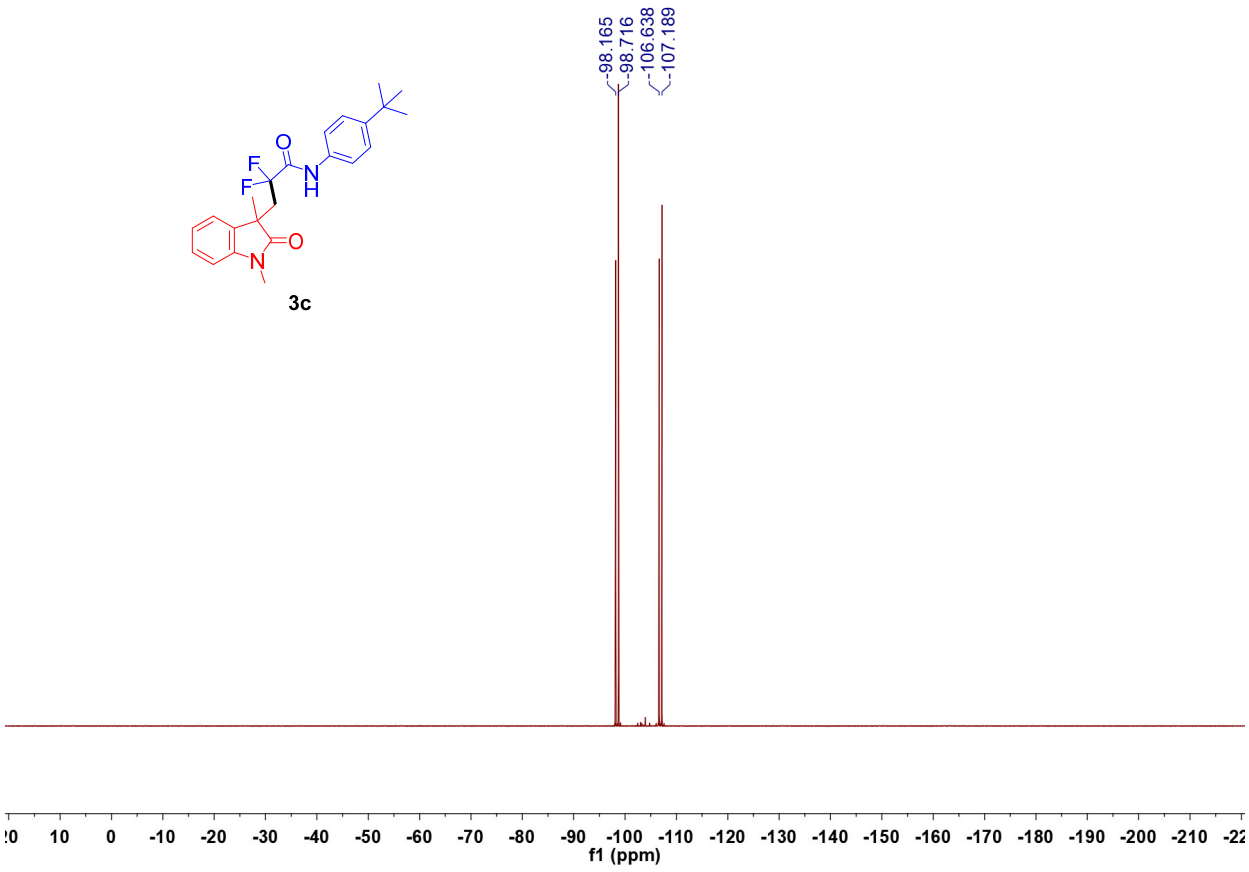
^{1}H NMR Spectra of compound **3c** ($CDCl_3$, 500 MHz)



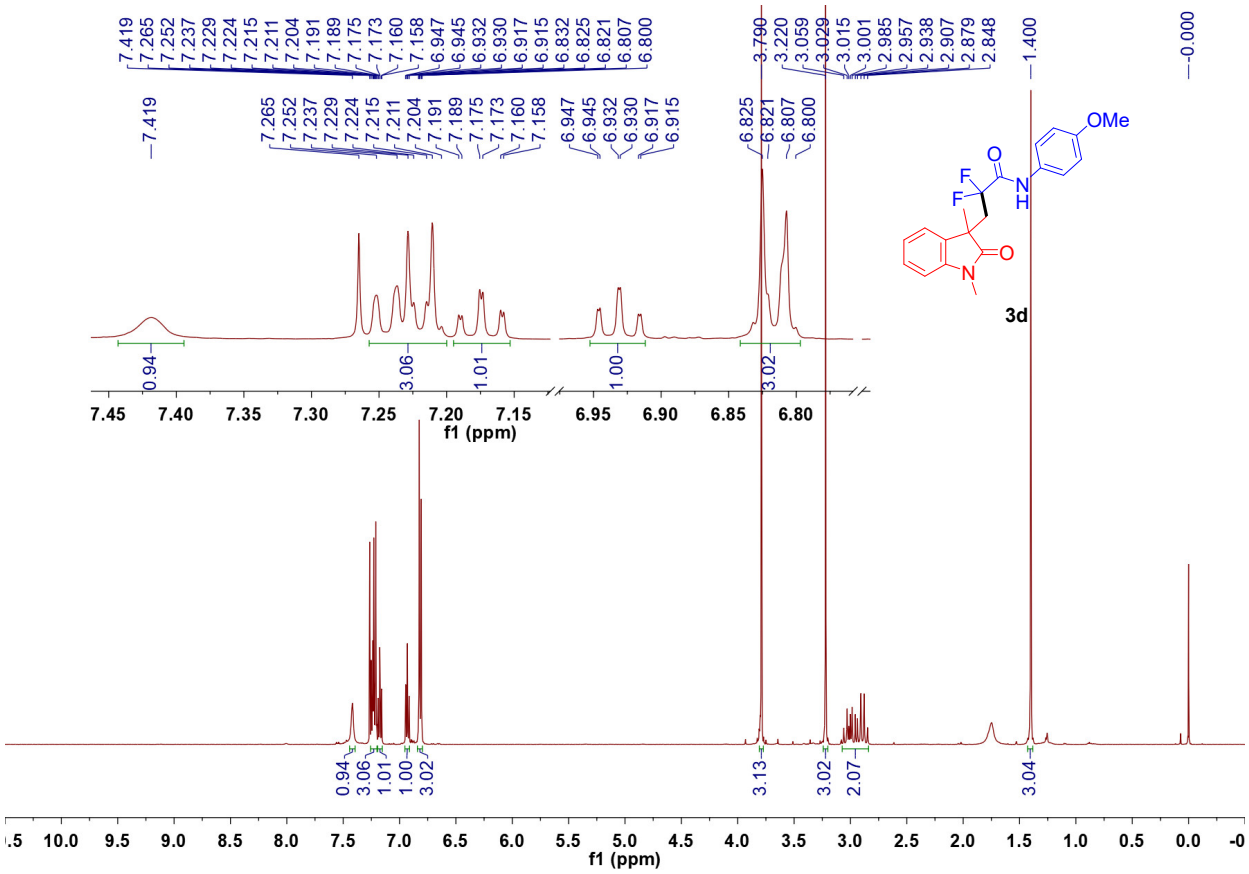
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3c** (126 MHz, $CDCl_3$)



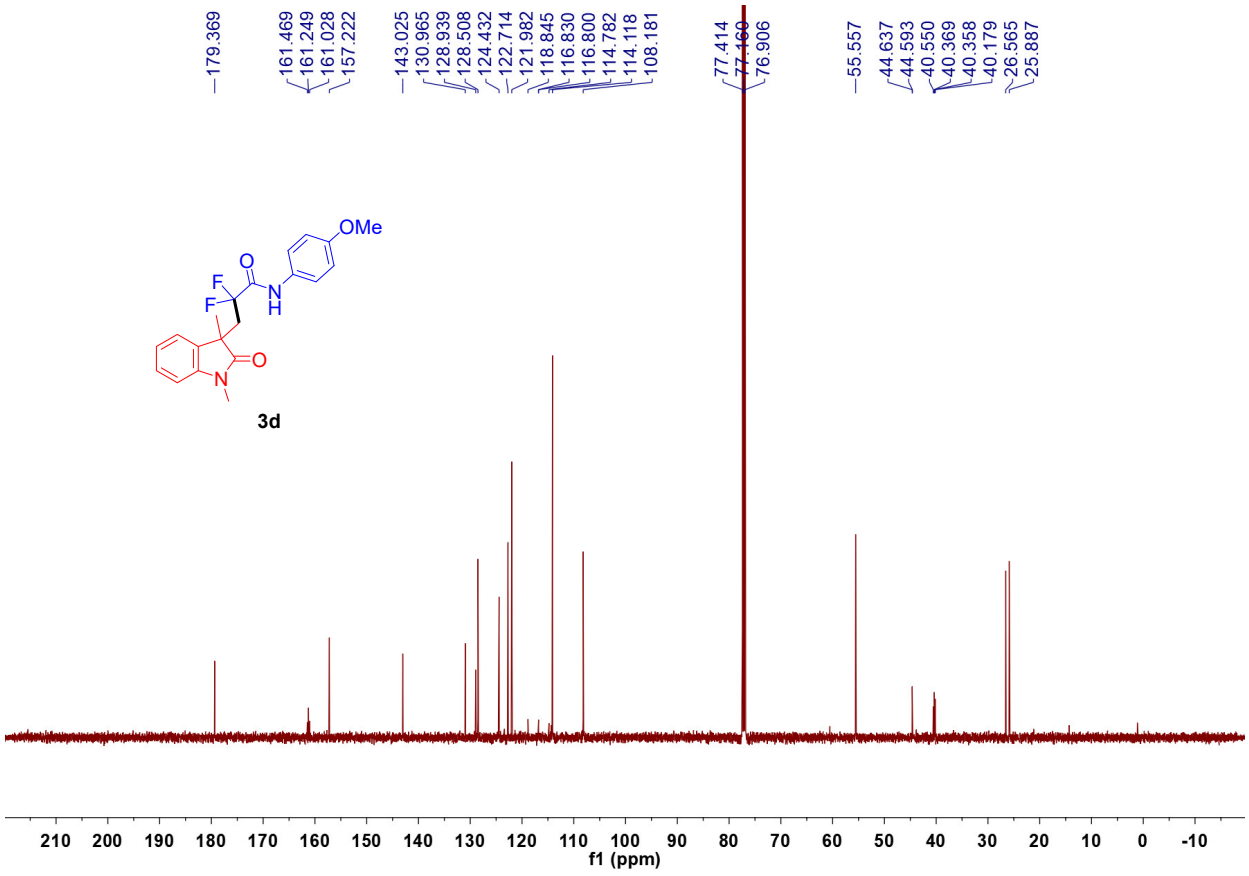
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3c** (471 MHz, $CDCl_3$)



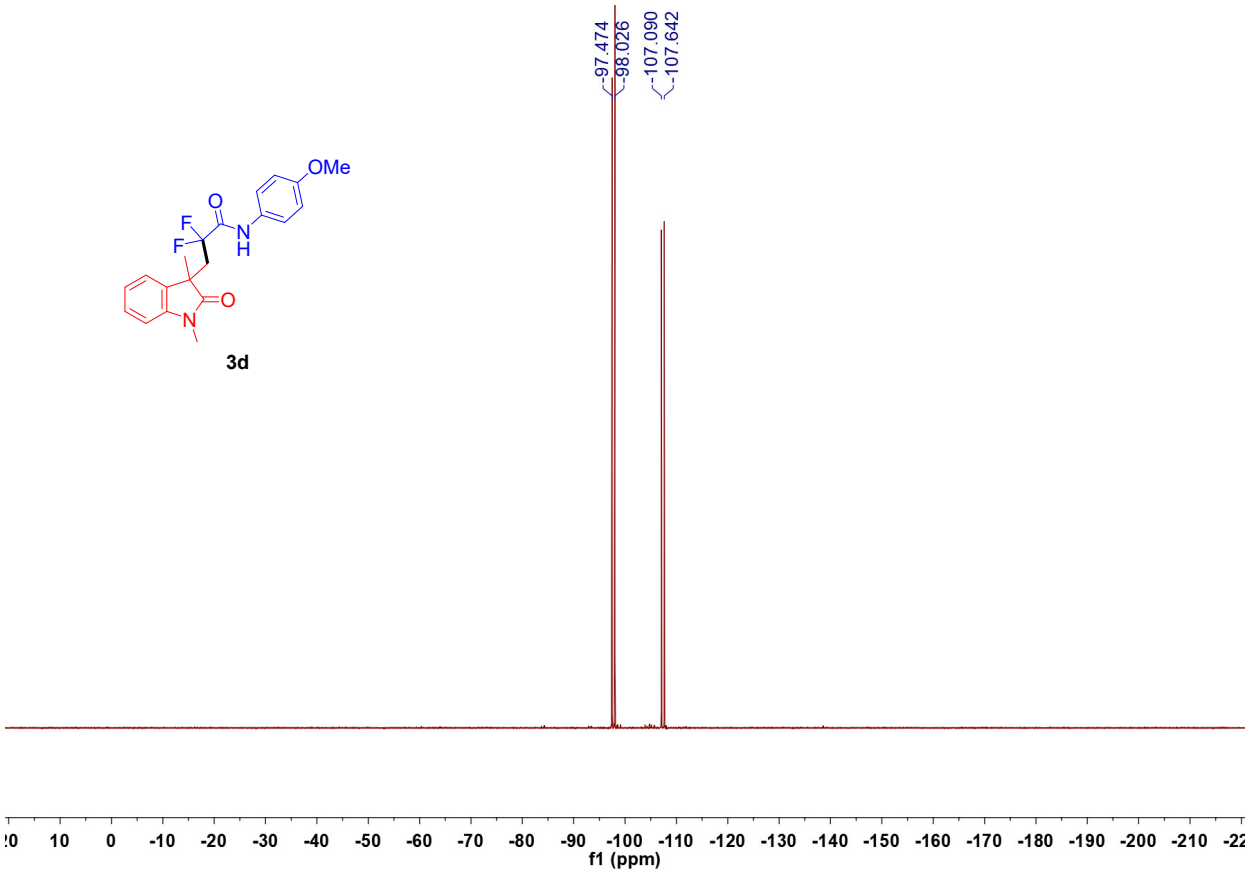
^{1}H NMR Spectra of compound **3d** (500 MHz, $CDCl_3$)



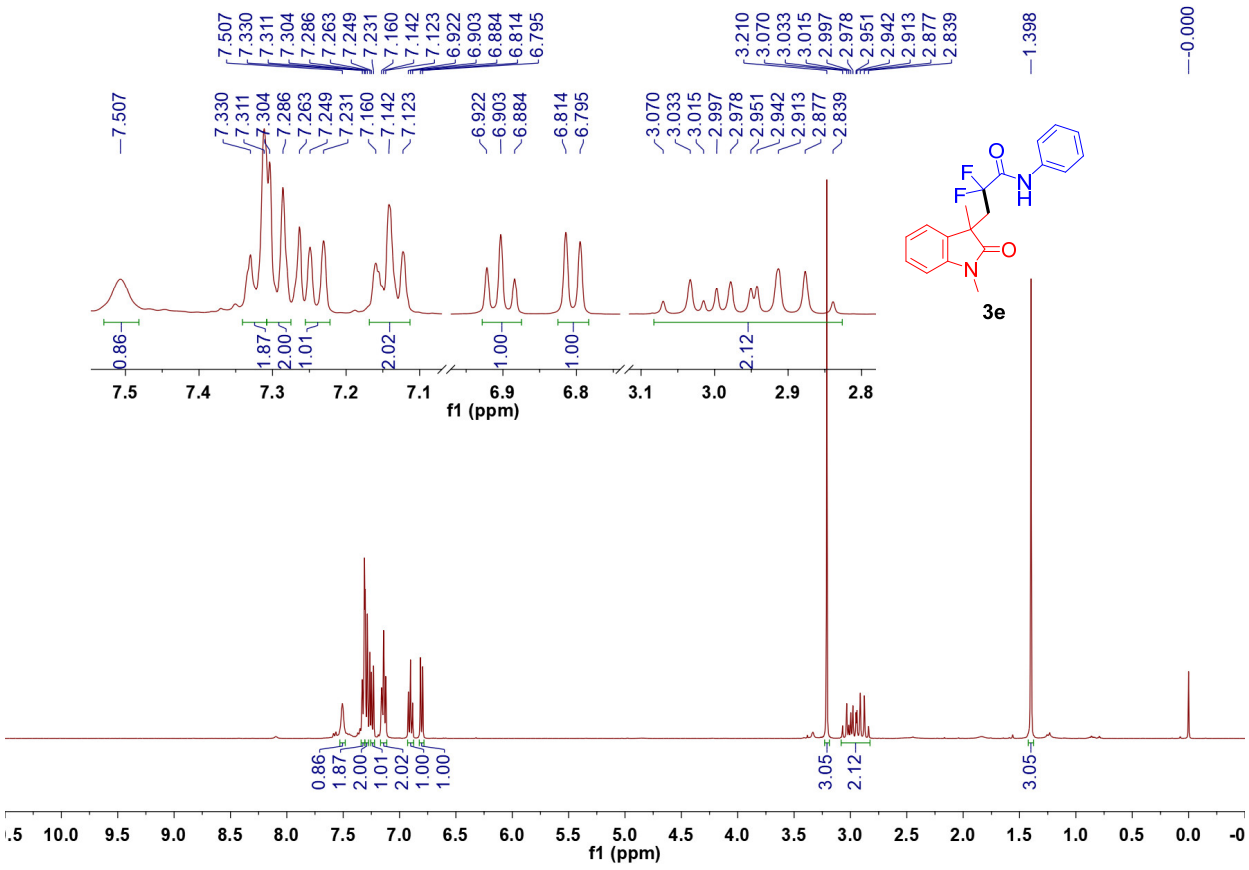
^{13}C{^{1}H} NMR Spectra of compound **3d** (126 MHz, $CDCl_3$)



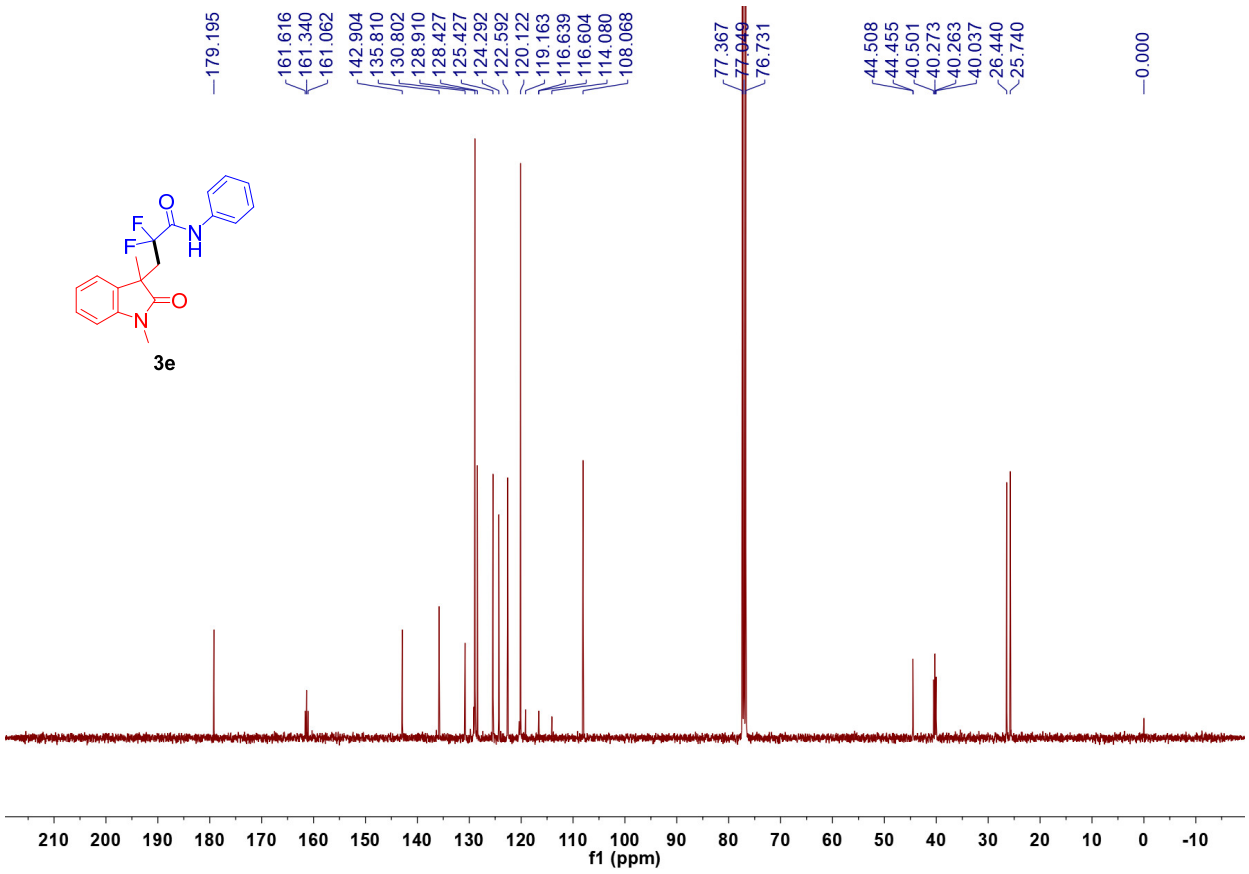
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3d** ($CDCl_3$, 471 MHz)



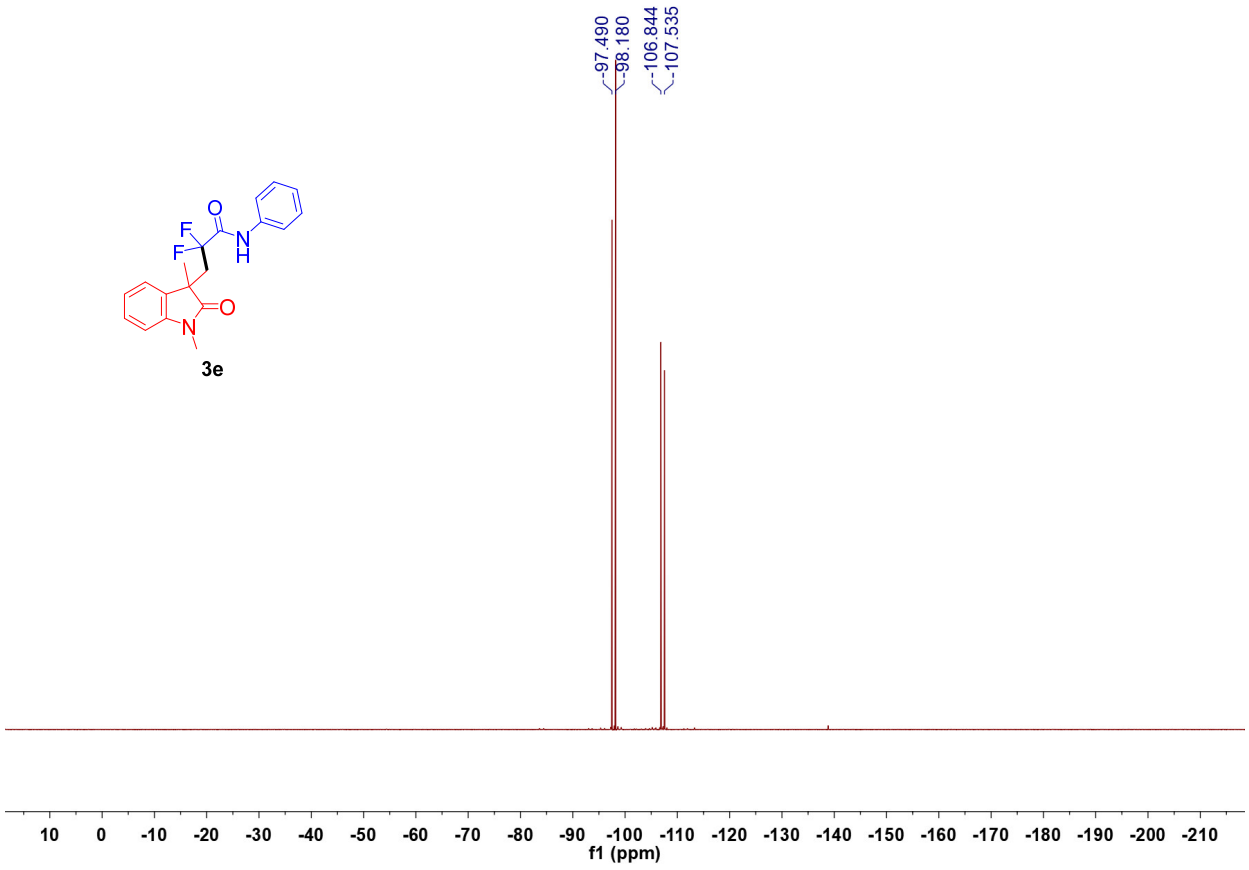
^{1}H NMR Spectra of compound **3e** ($CDCl_3$, 500 MHz)



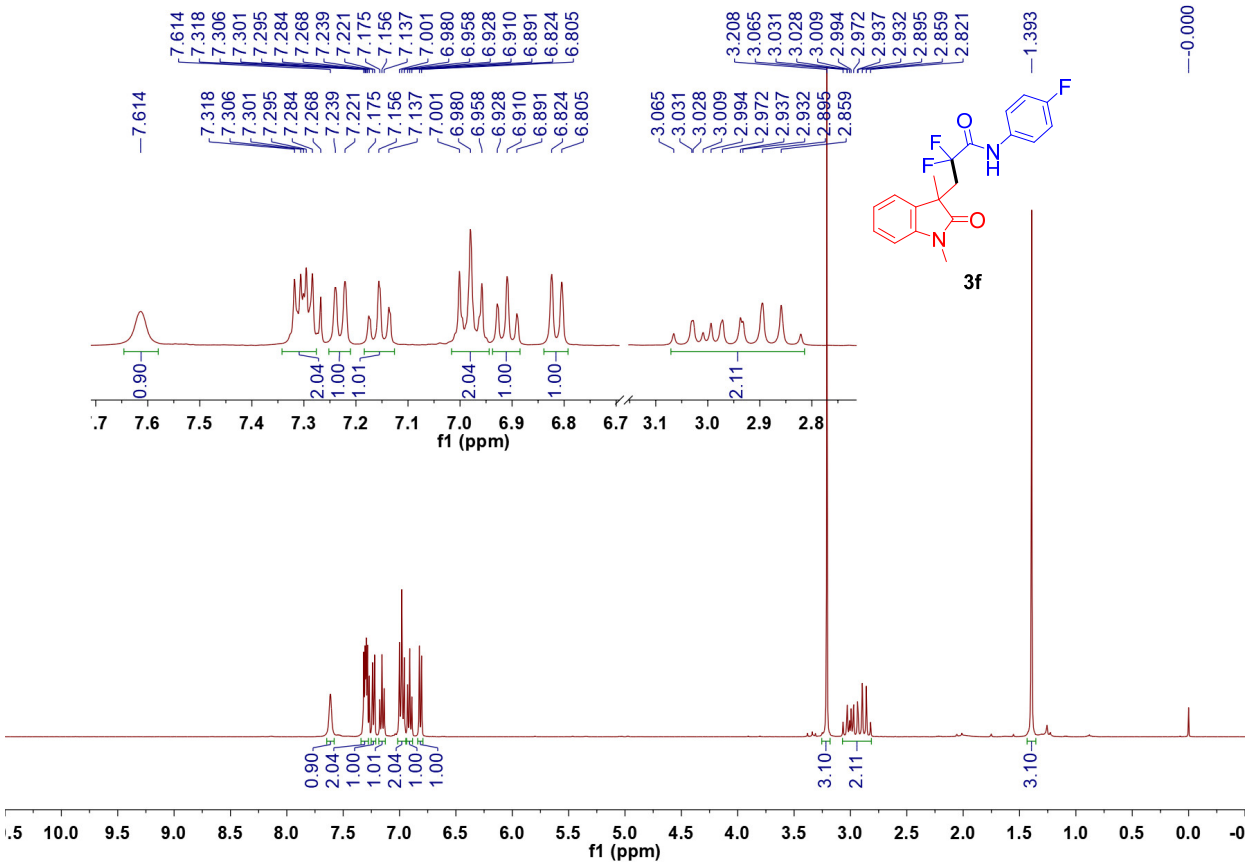
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3e** (101 MHz, $CDCl_3$)



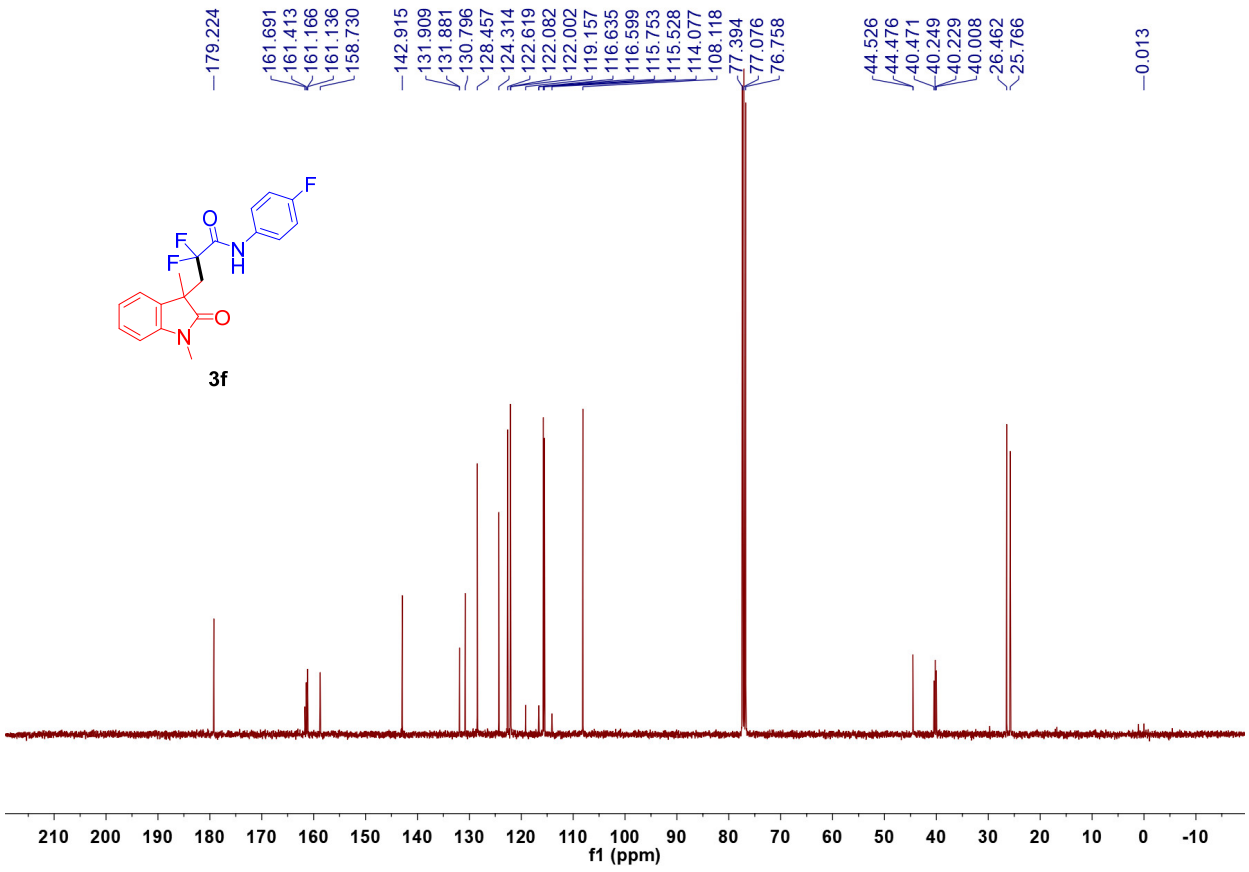
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3e** (377 MHz, $CDCl_3$)



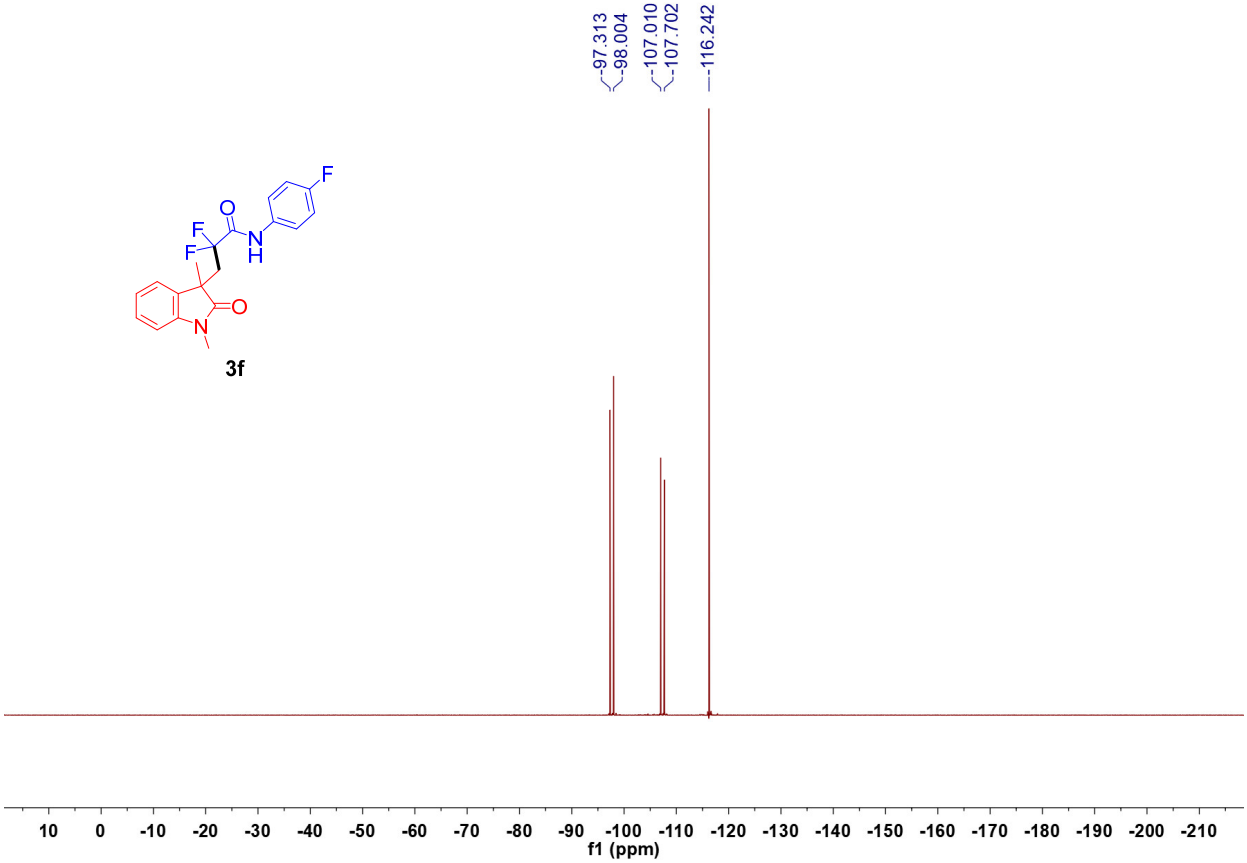
^{1}H NMR Spectra of compound **3f** (400 MHz, $CDCl_3$)



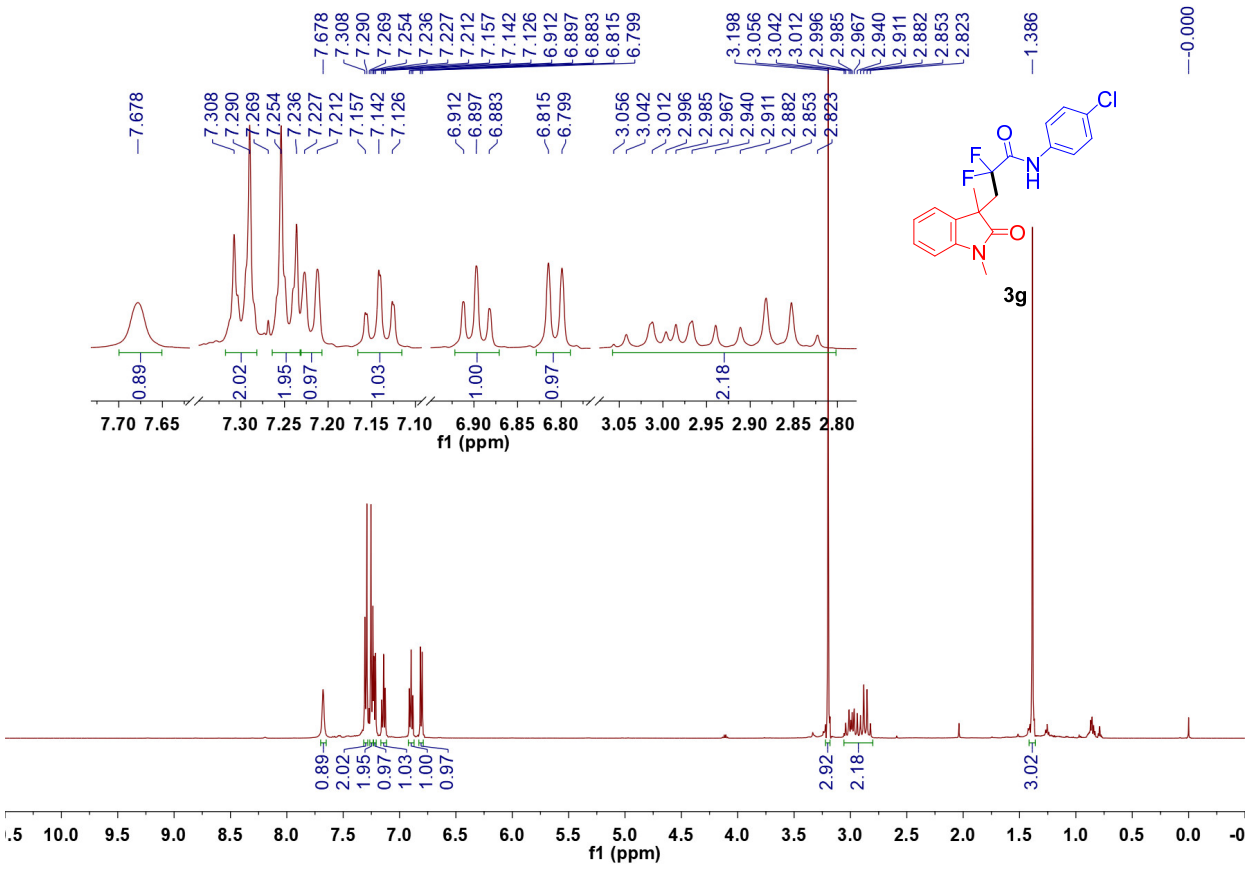
^{13}C{^{1}H} NMR Spectra of compound **3f** (101 MHz, $CDCl_3$)



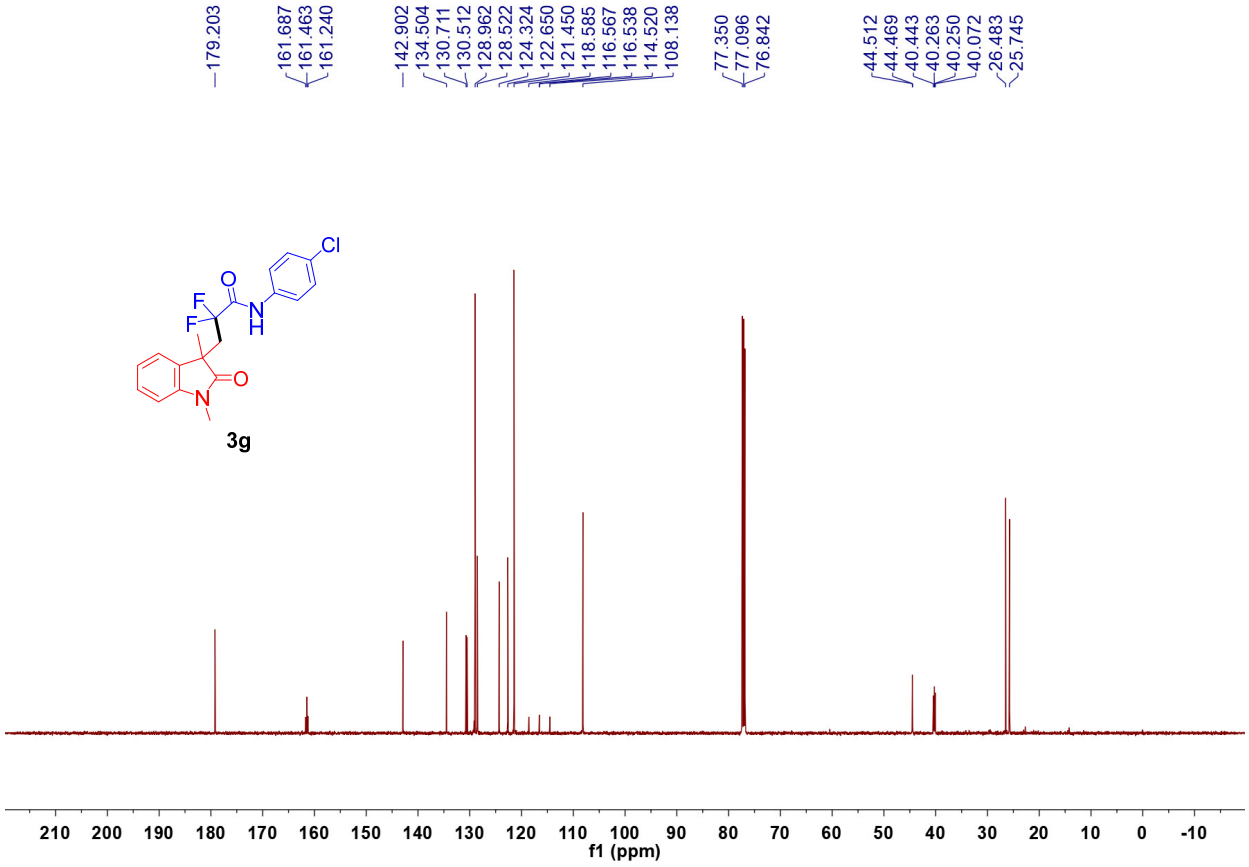
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3f** (377 MHz, $CDCl_3$)



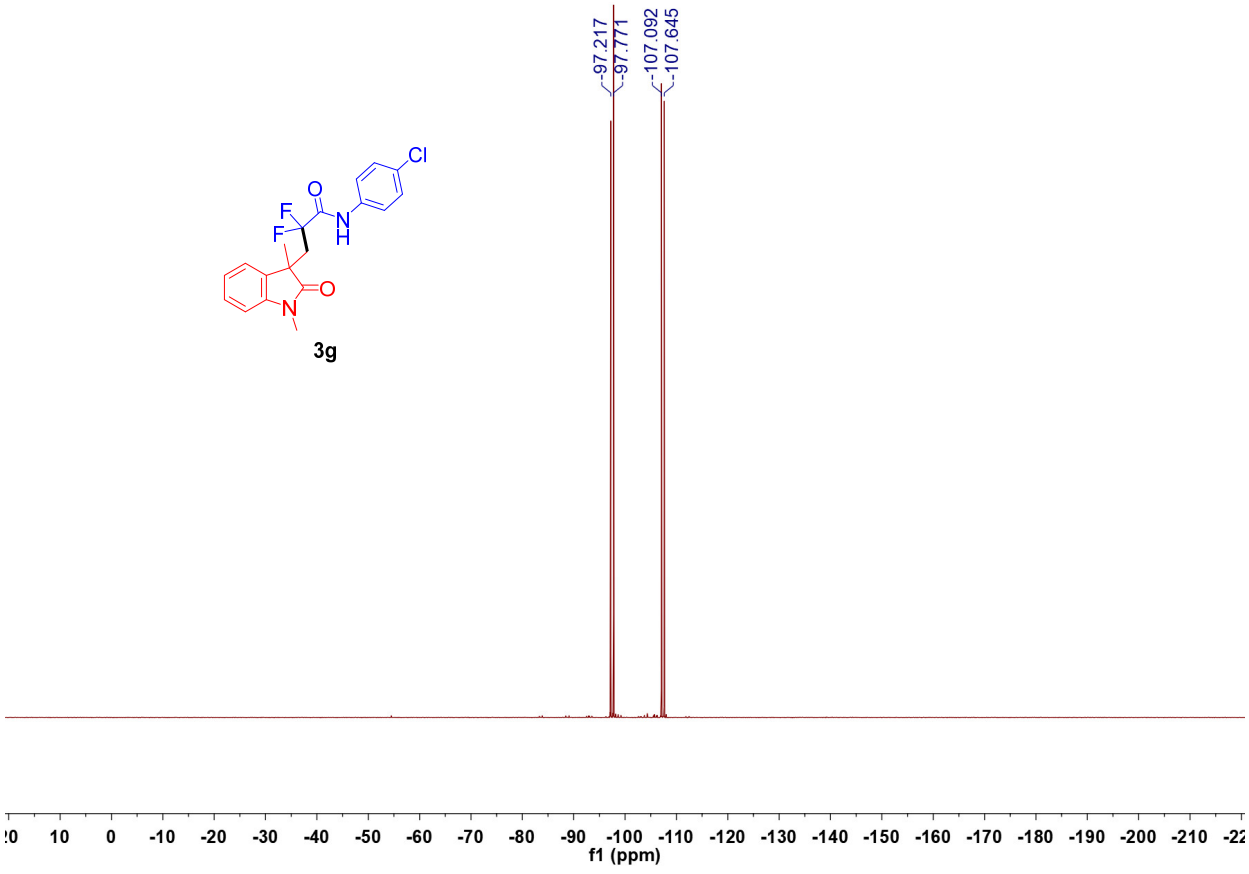
^{1}H NMR Spectra of compound **3g** (500 MHz, $CDCl_3$)



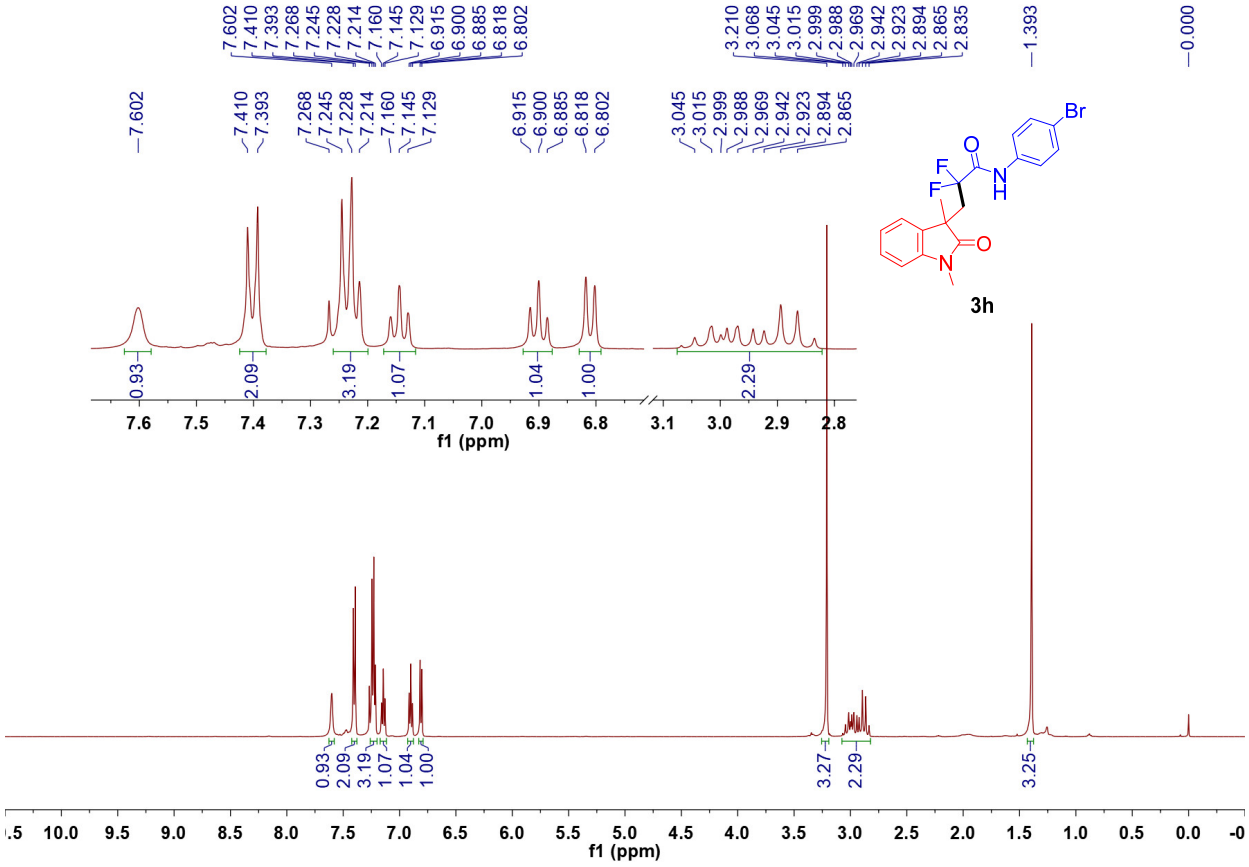
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3g** (126 MHz, $CDCl_3$)



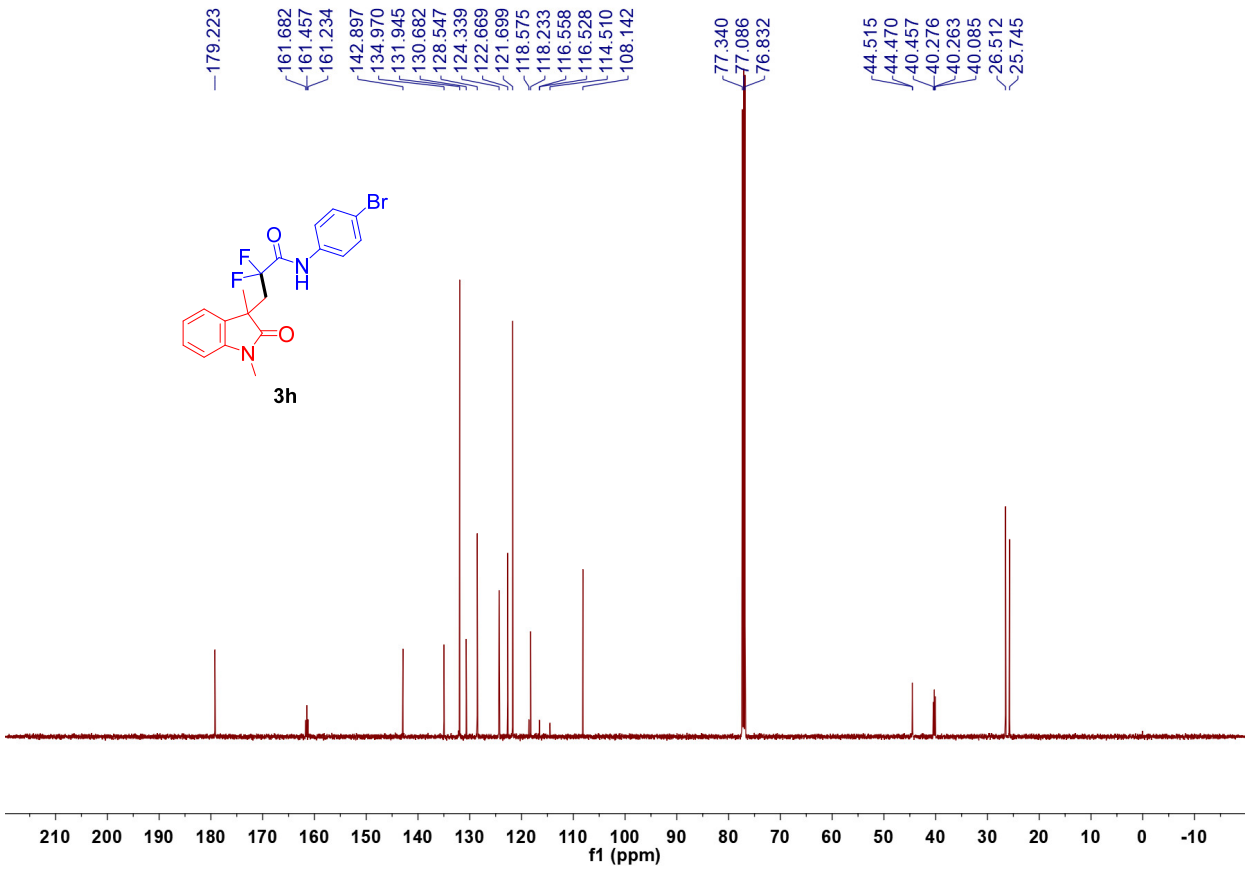
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3g** (471 MHz, $CDCl_3$)



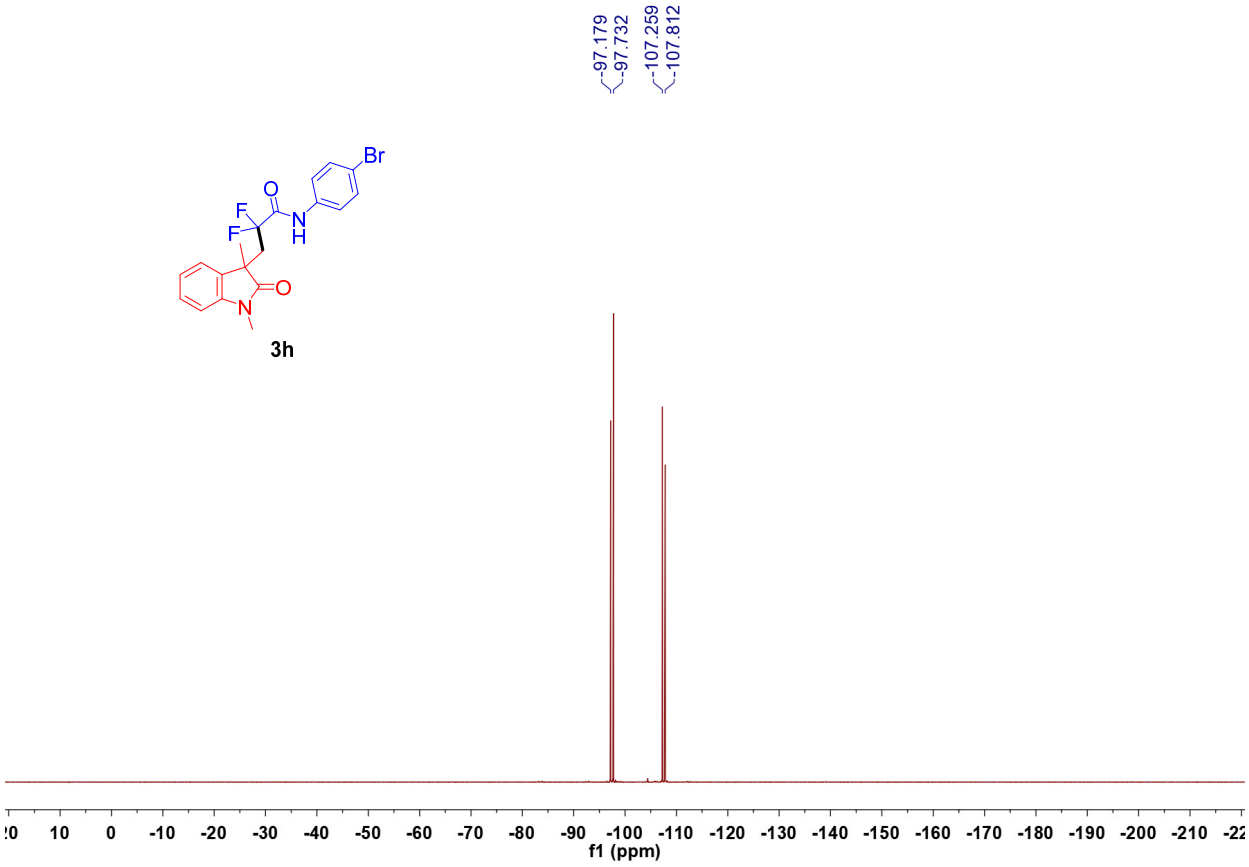
^{1}H NMR Spectra of compound **3h** (500 MHz, $CDCl_3$)



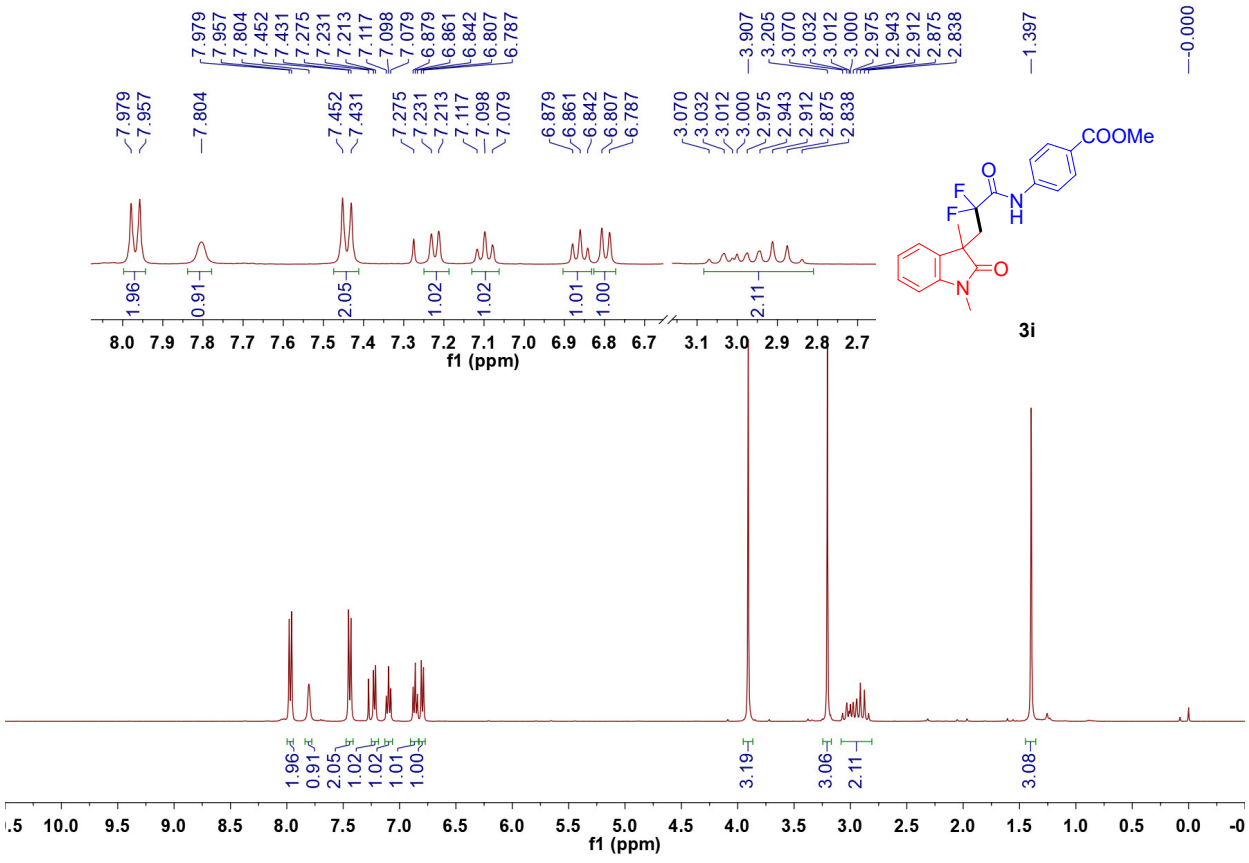
^{13}C{^{1}H} NMR Spectra of compound **3h** (126 MHz, $CDCl_3$)



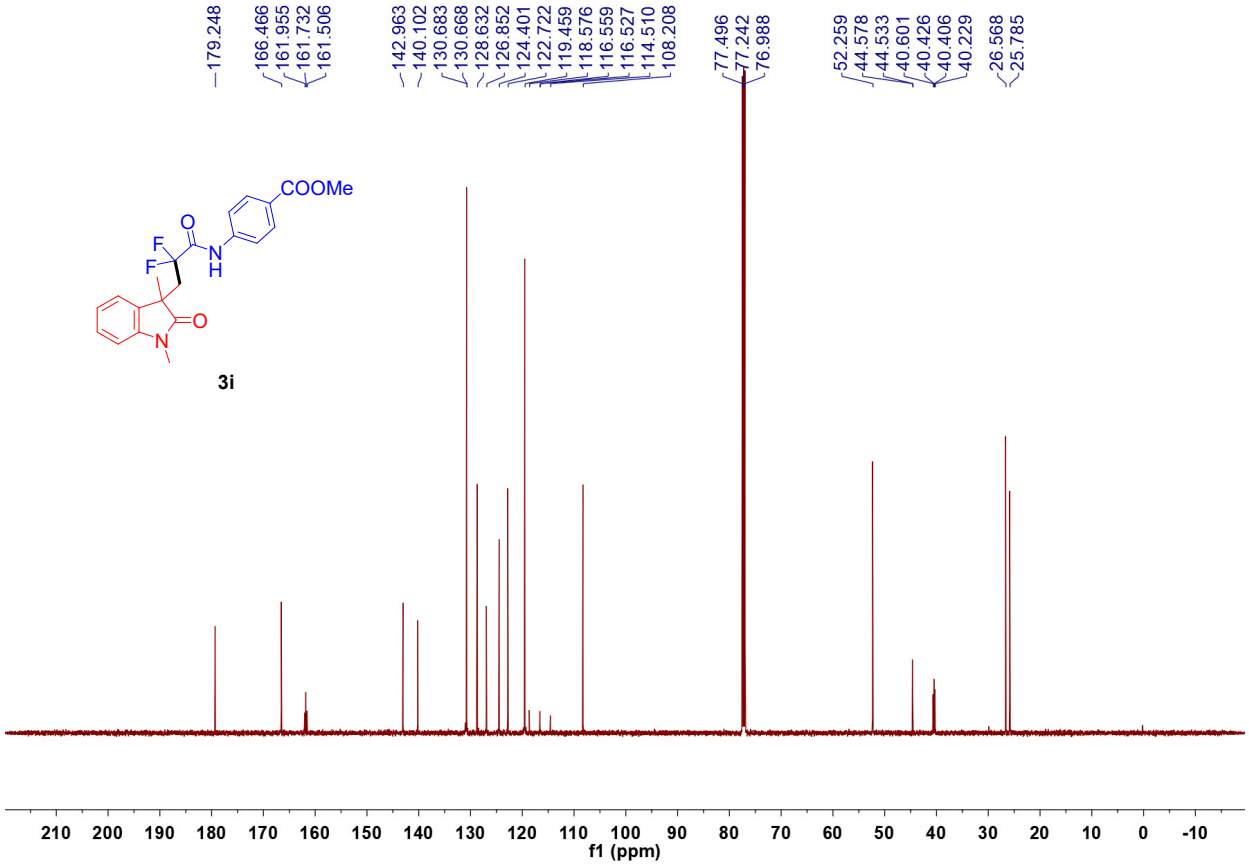
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3h** ($CDCl_3$, 471 MHz)



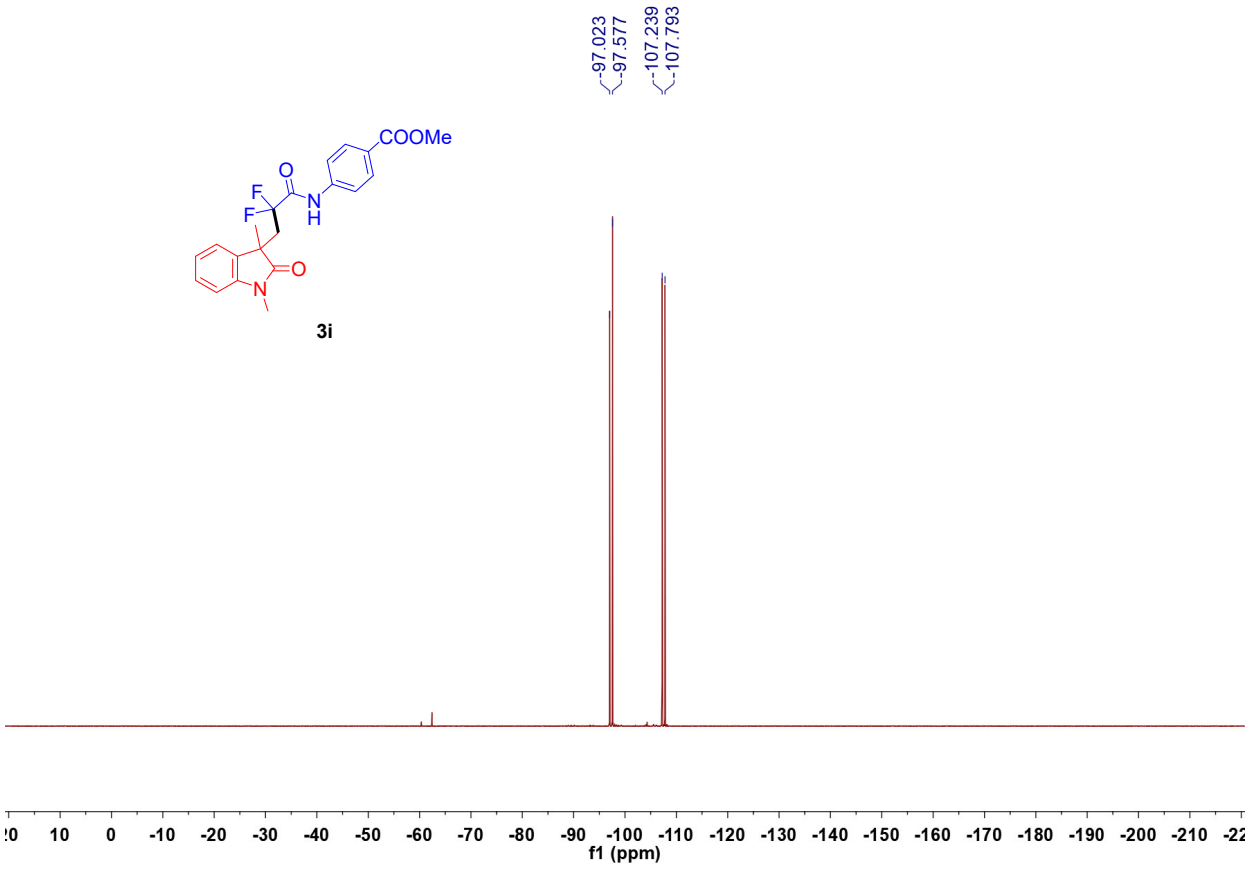
^{1}H NMR Spectra of compound **3i** ($CDCl_3$, 400 MHz)



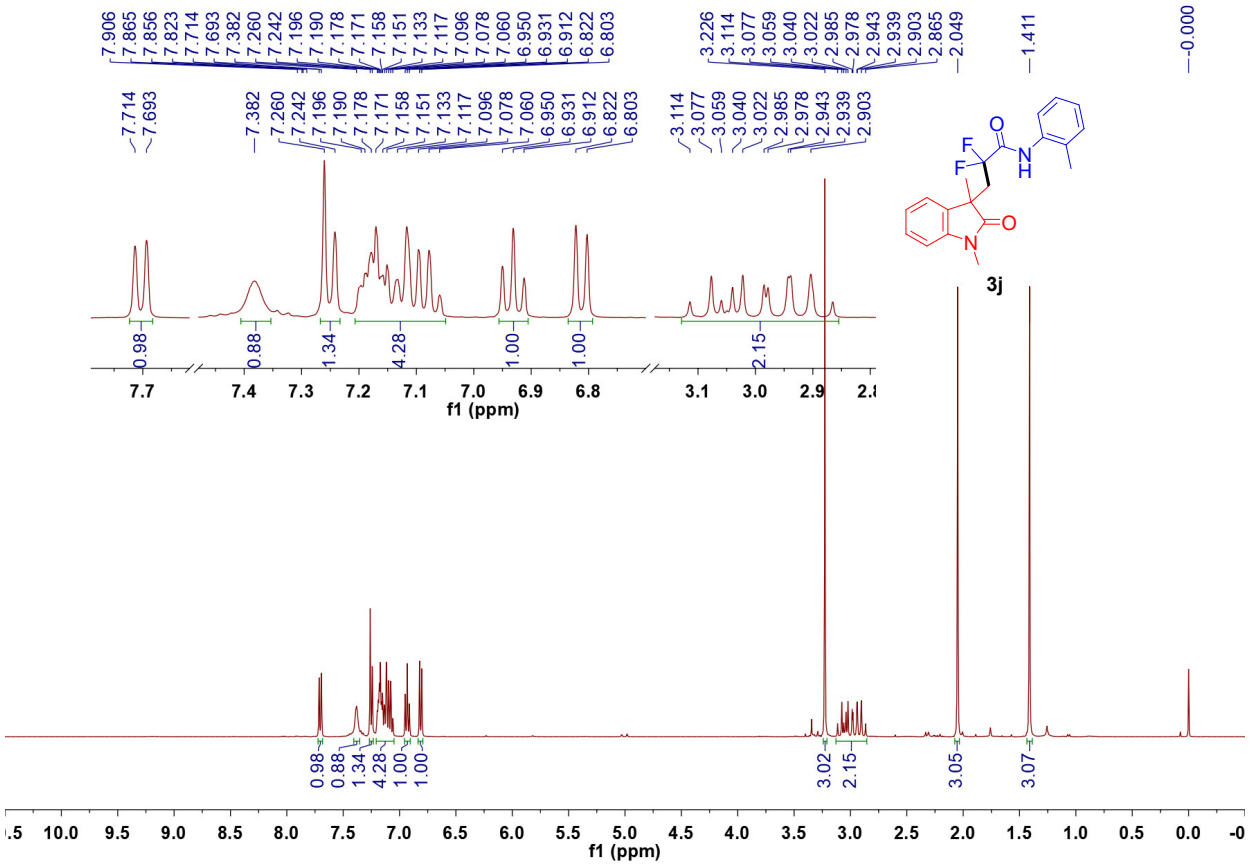
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3i** (126 MHz, $CDCl_3$)



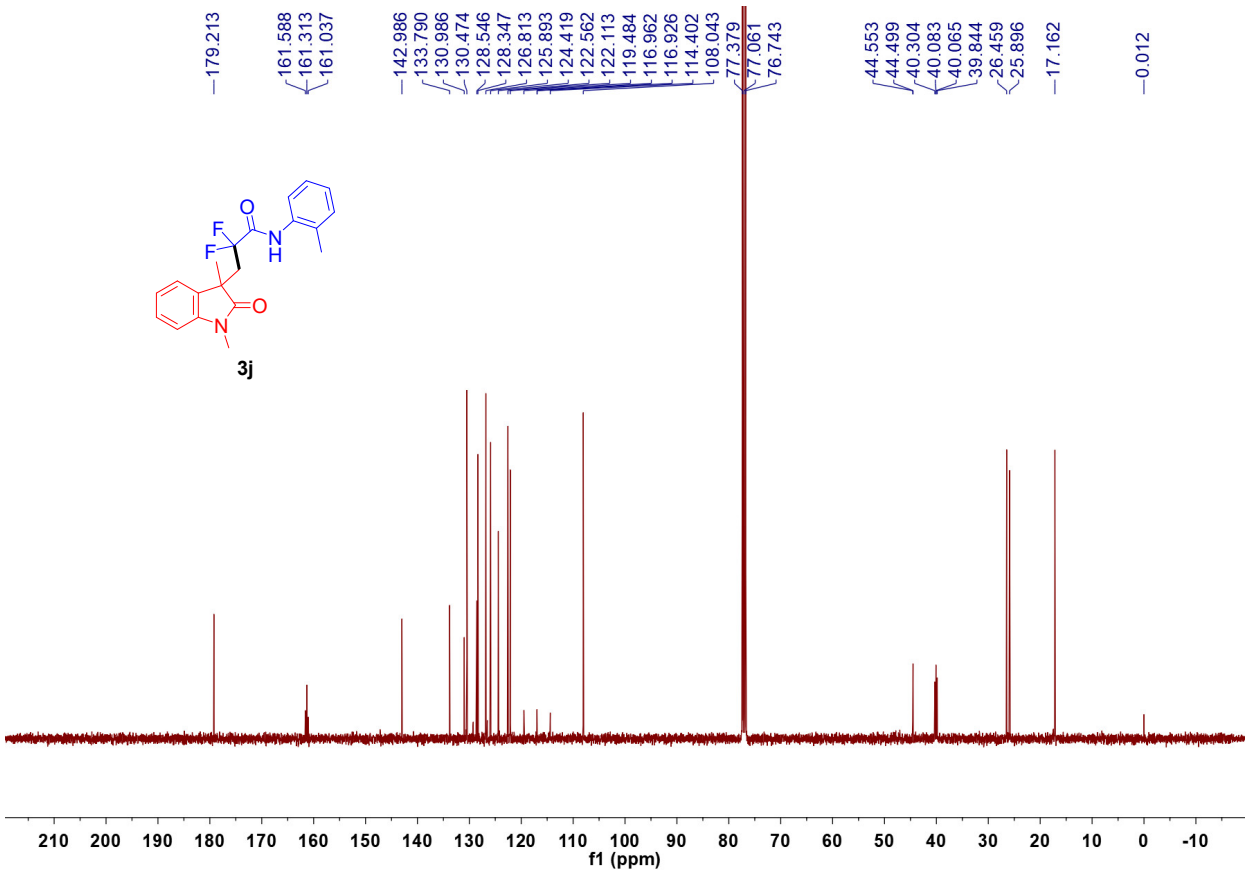
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3i** (471 MHz, $CDCl_3$)



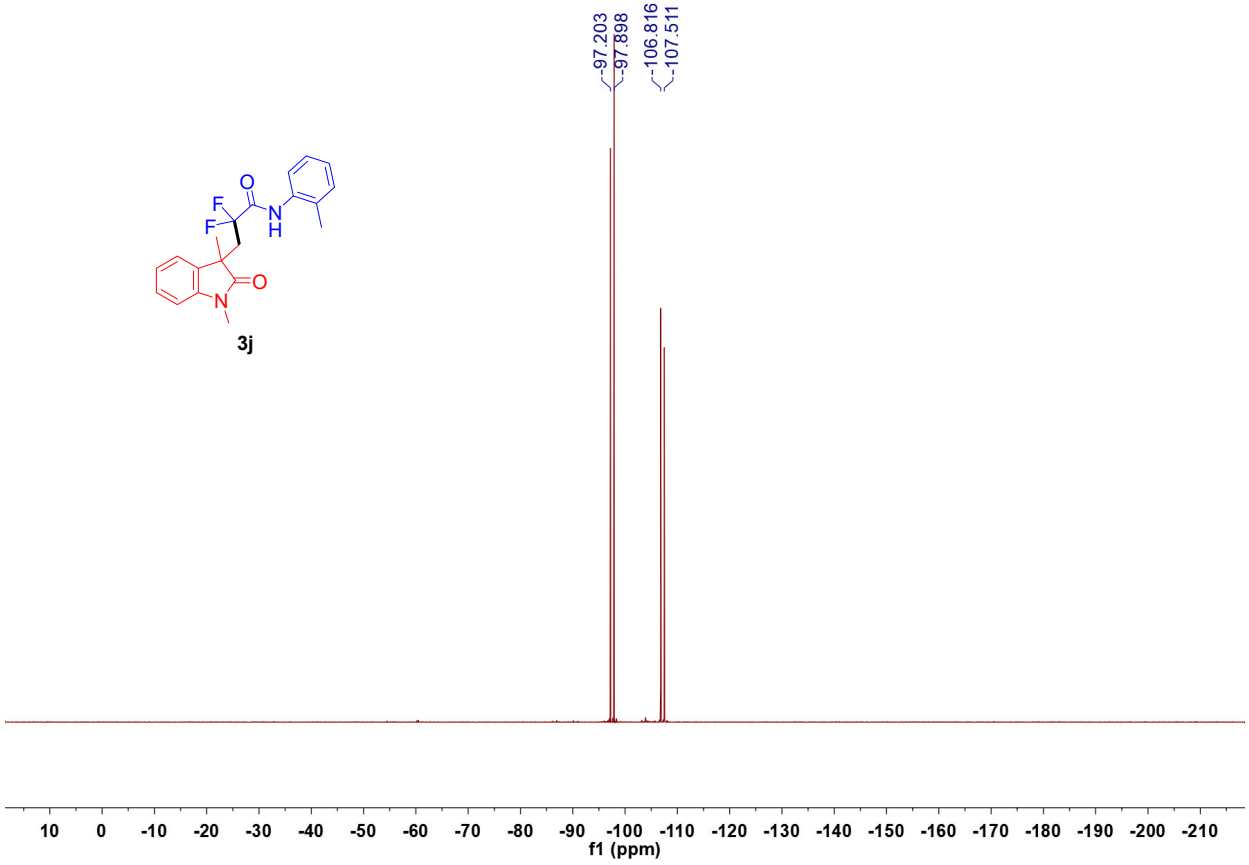
^{1}H NMR Spectra of compound **3j** (400 MHz, $CDCl_3$)



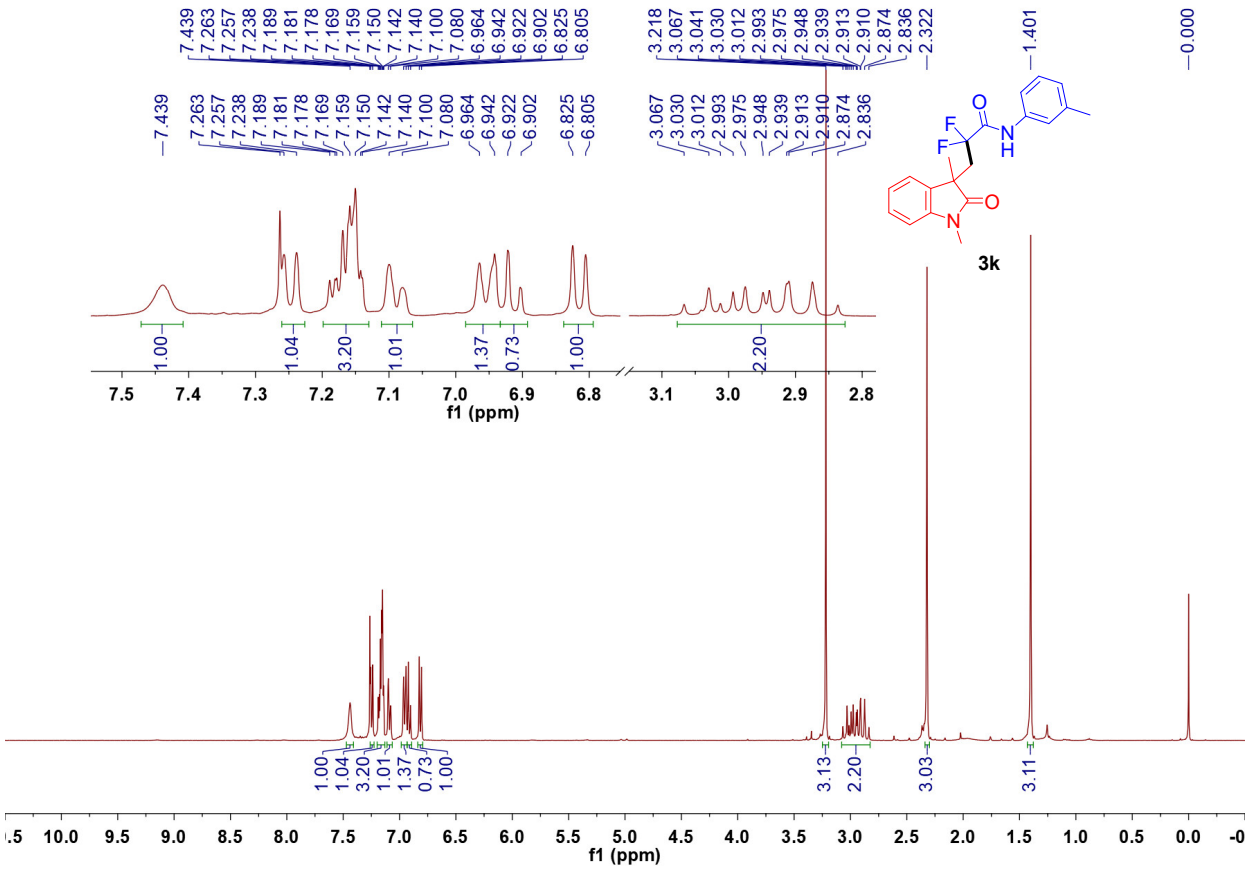
^{13}C{^{1}H} NMR Spectra of compound **3j** (101 MHz, $CDCl_3$)



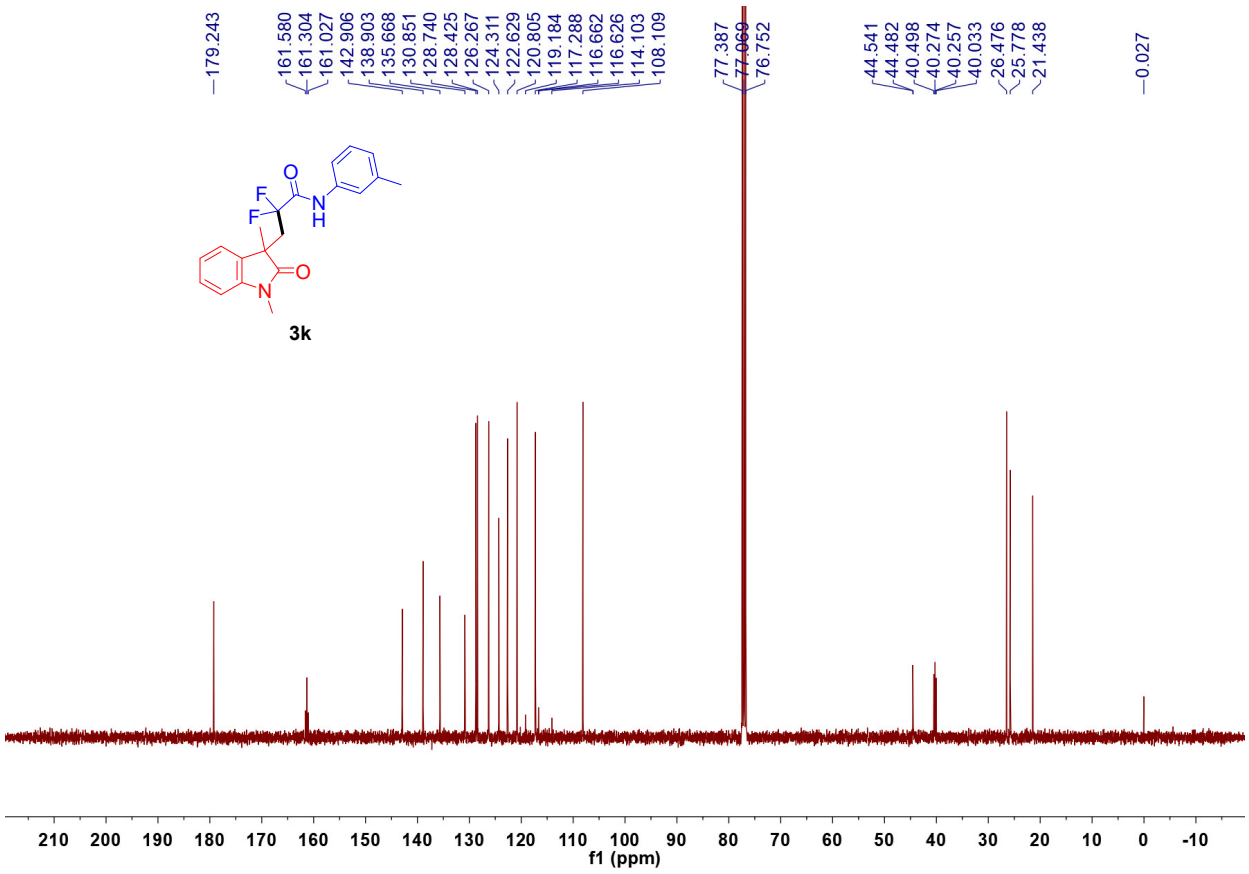
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3j** (377 MHz, $CDCl_3$)



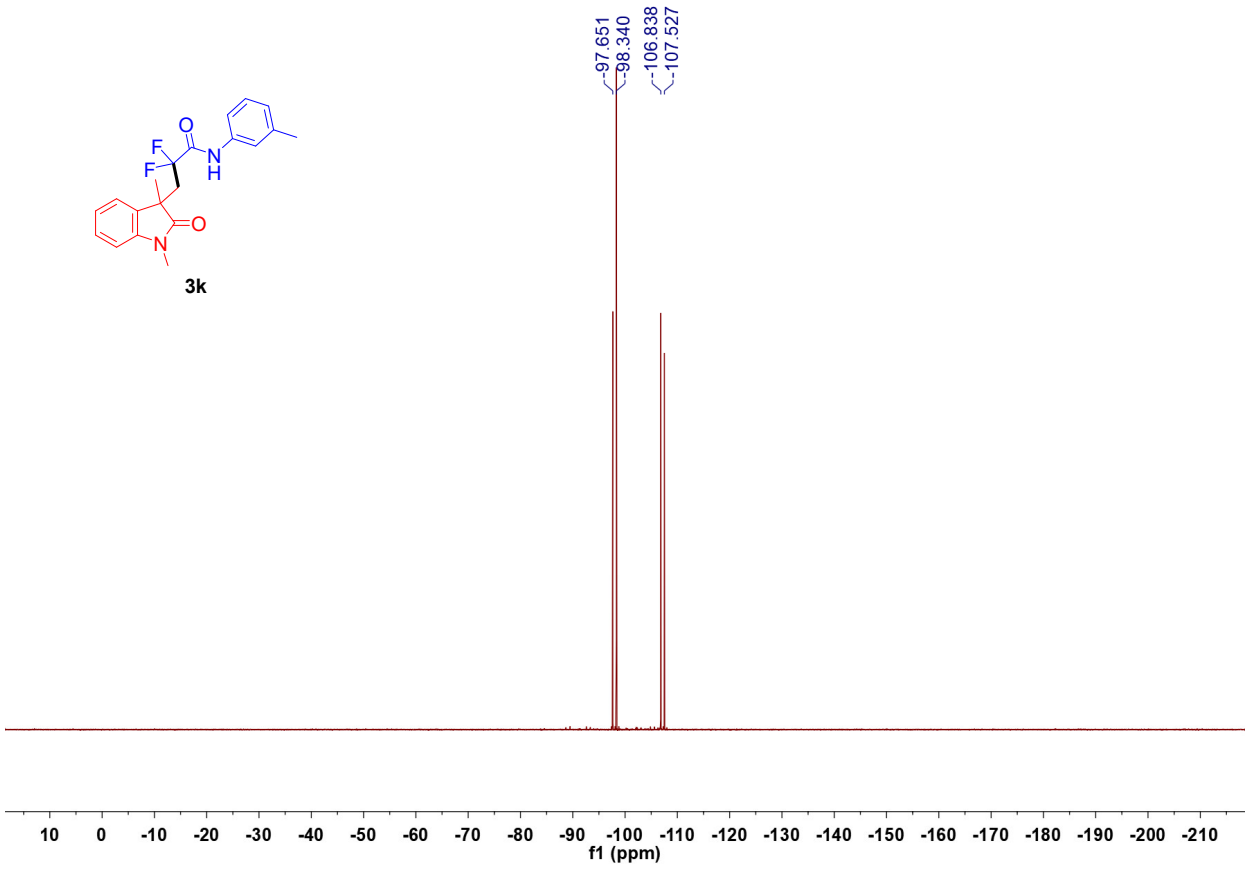
^{1}H NMR Spectra of compound **3k** (400 MHz, $CDCl_3$)



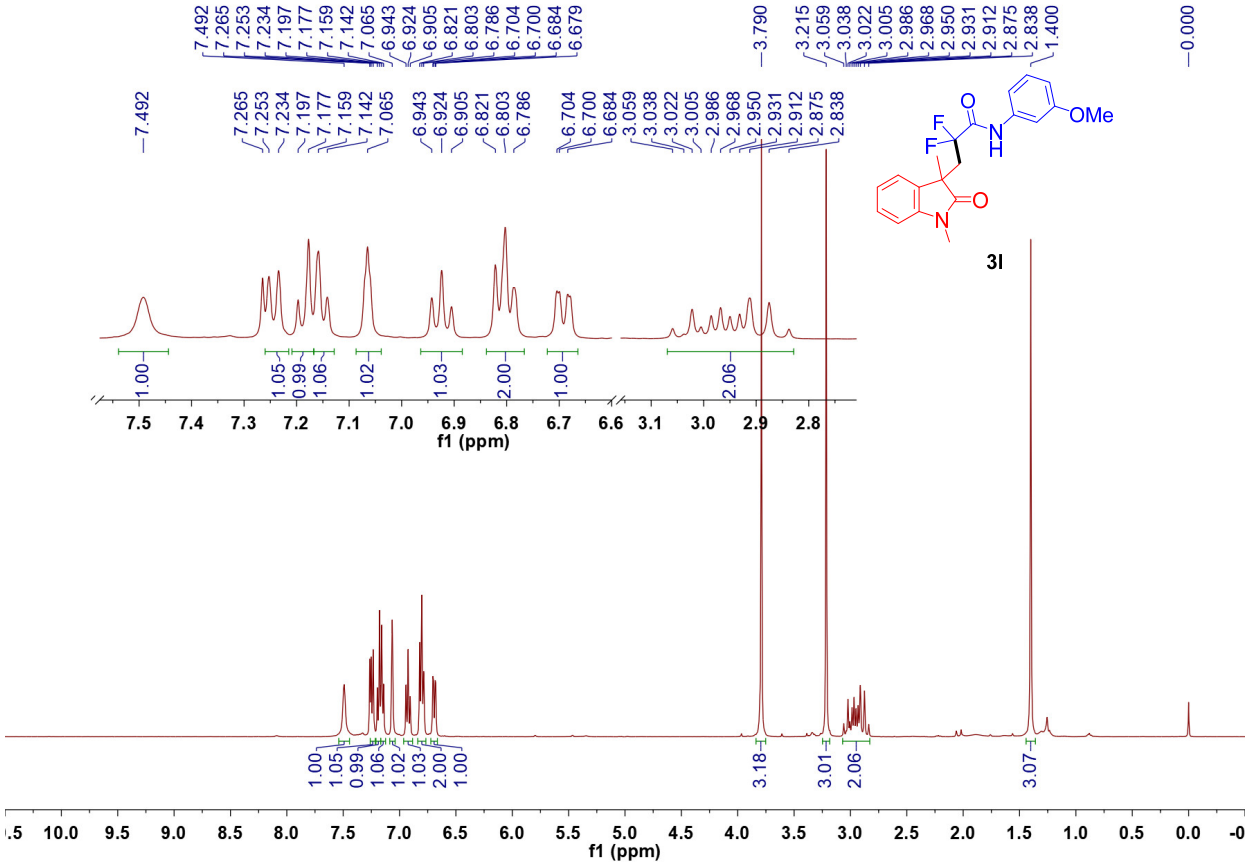
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3k** (101 MHz, $CDCl_3$)



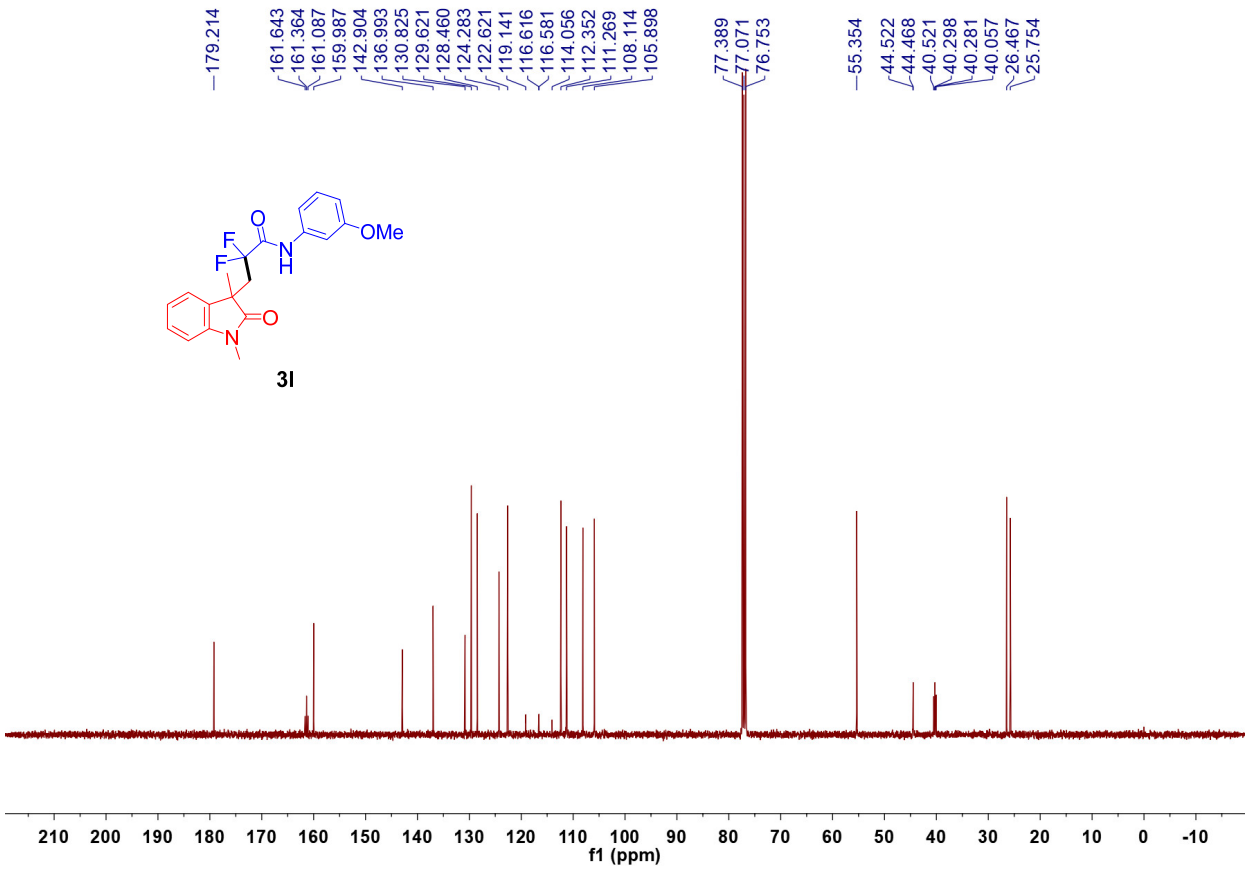
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3k** (377 MHz, $CDCl_3$)



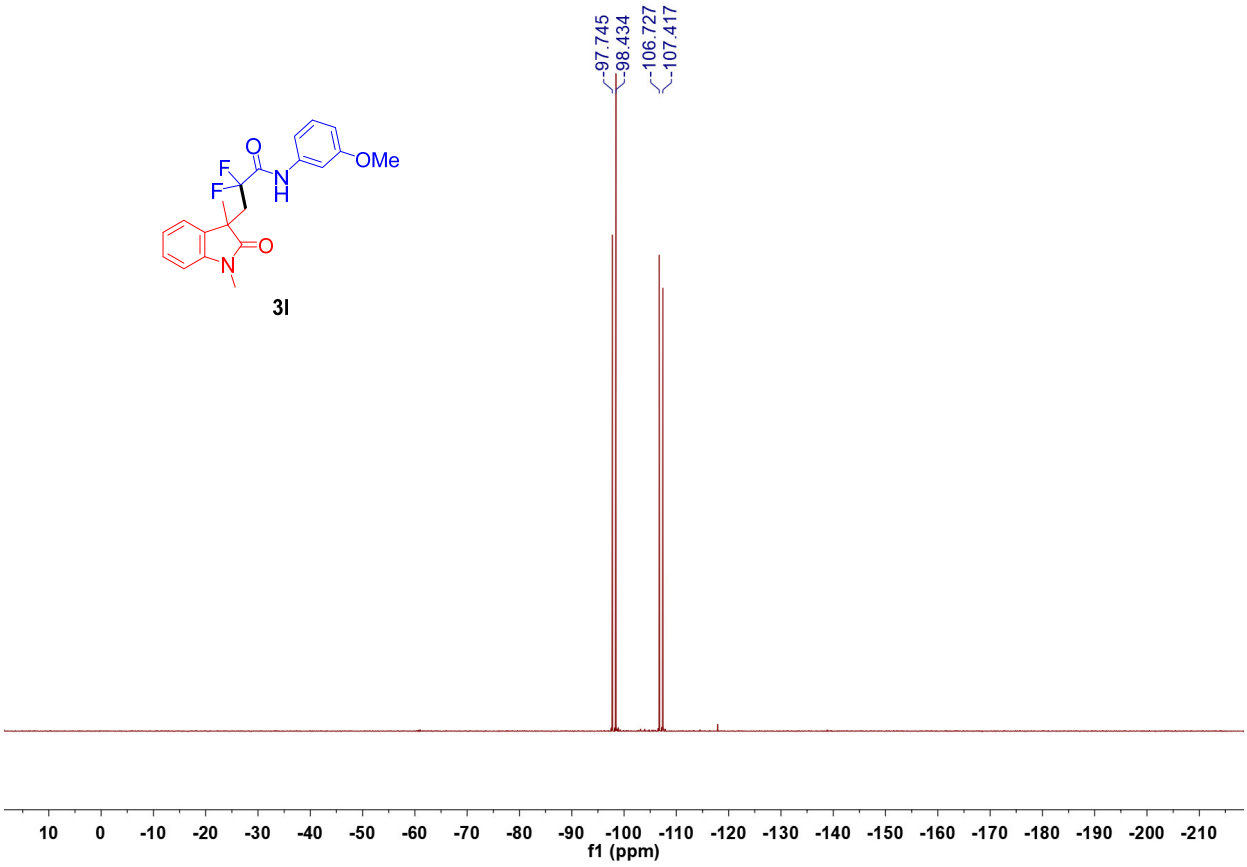
^{1}H NMR Spectra of compound **3l** (400 MHz, $CDCl_3$)



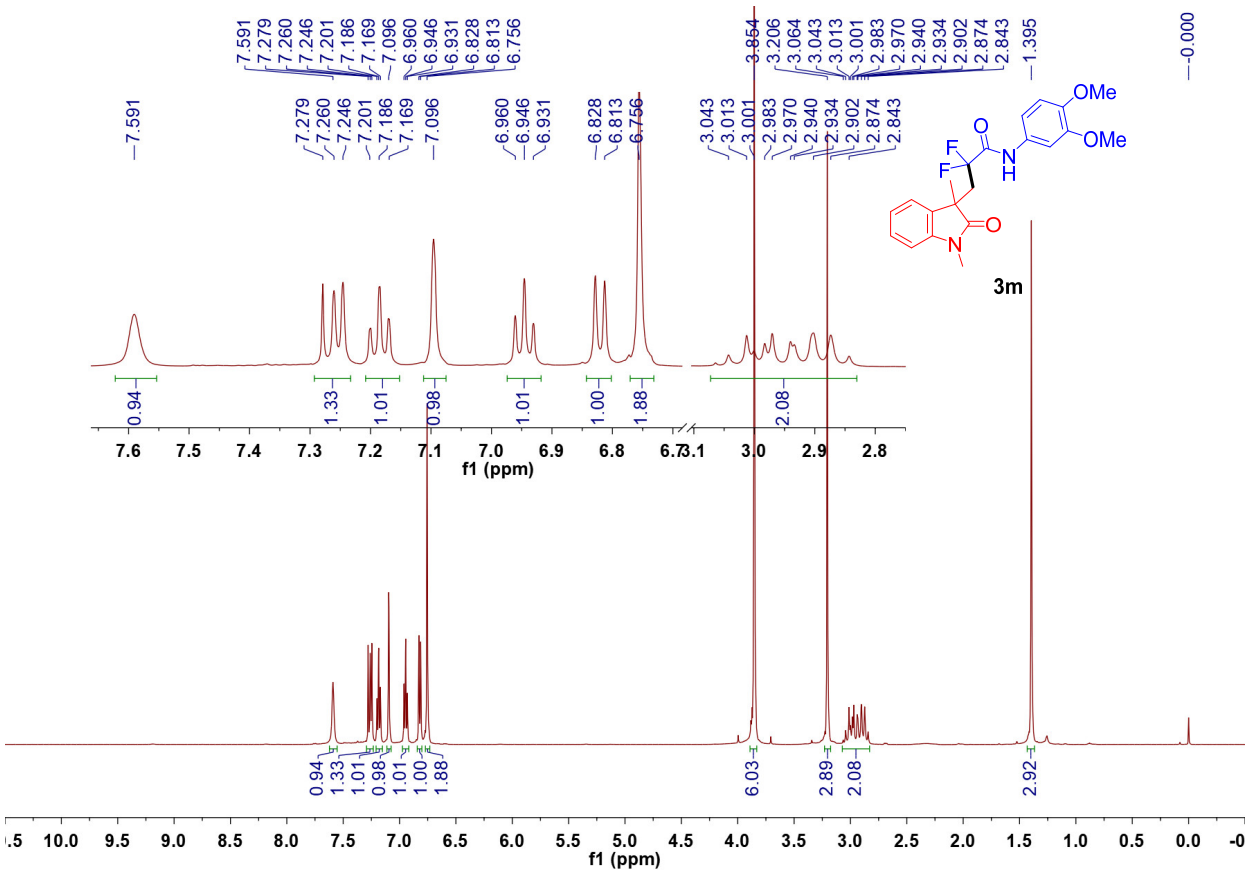
^{13}C{^{1}H} NMR Spectra of compound **3l** (101 MHz, $CDCl_3$)



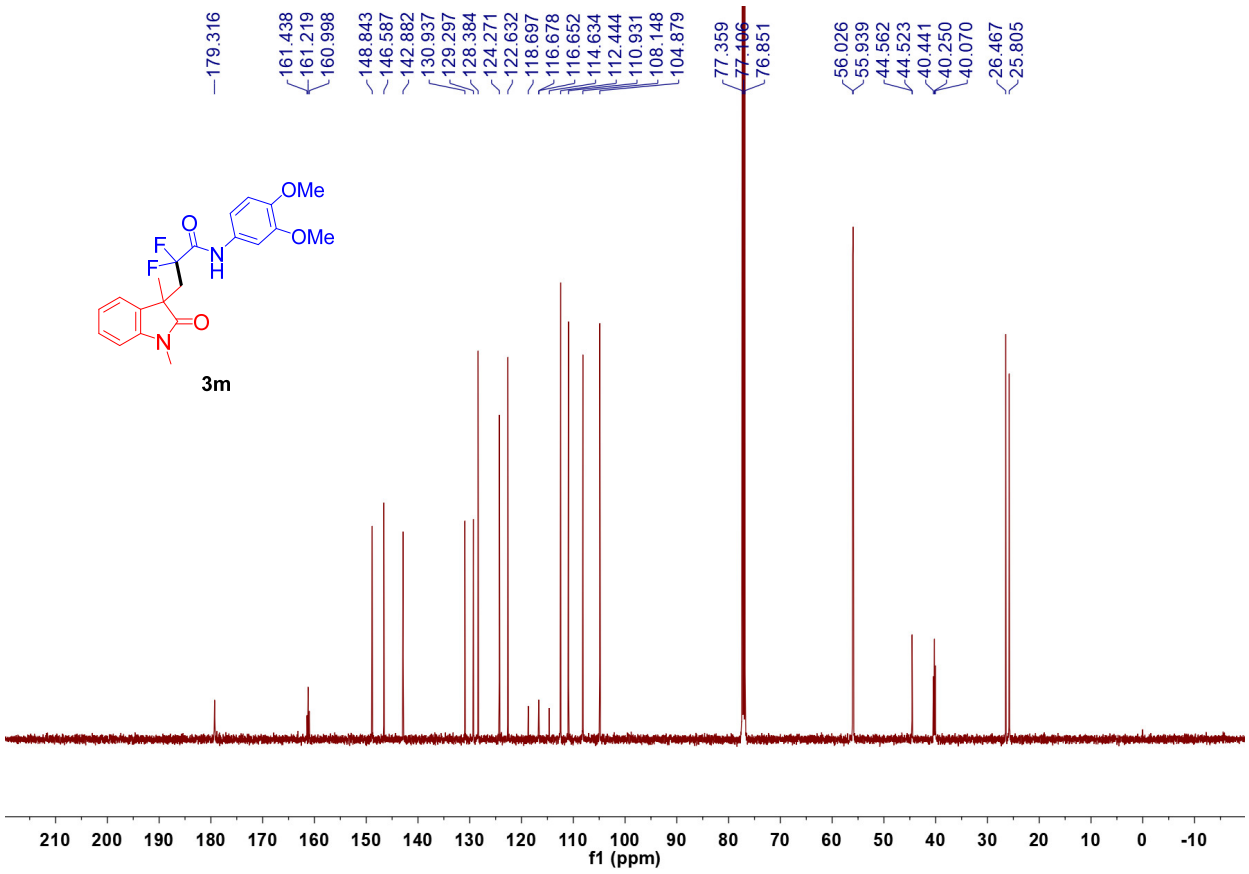
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3l** (377 MHz, $CDCl_3$)



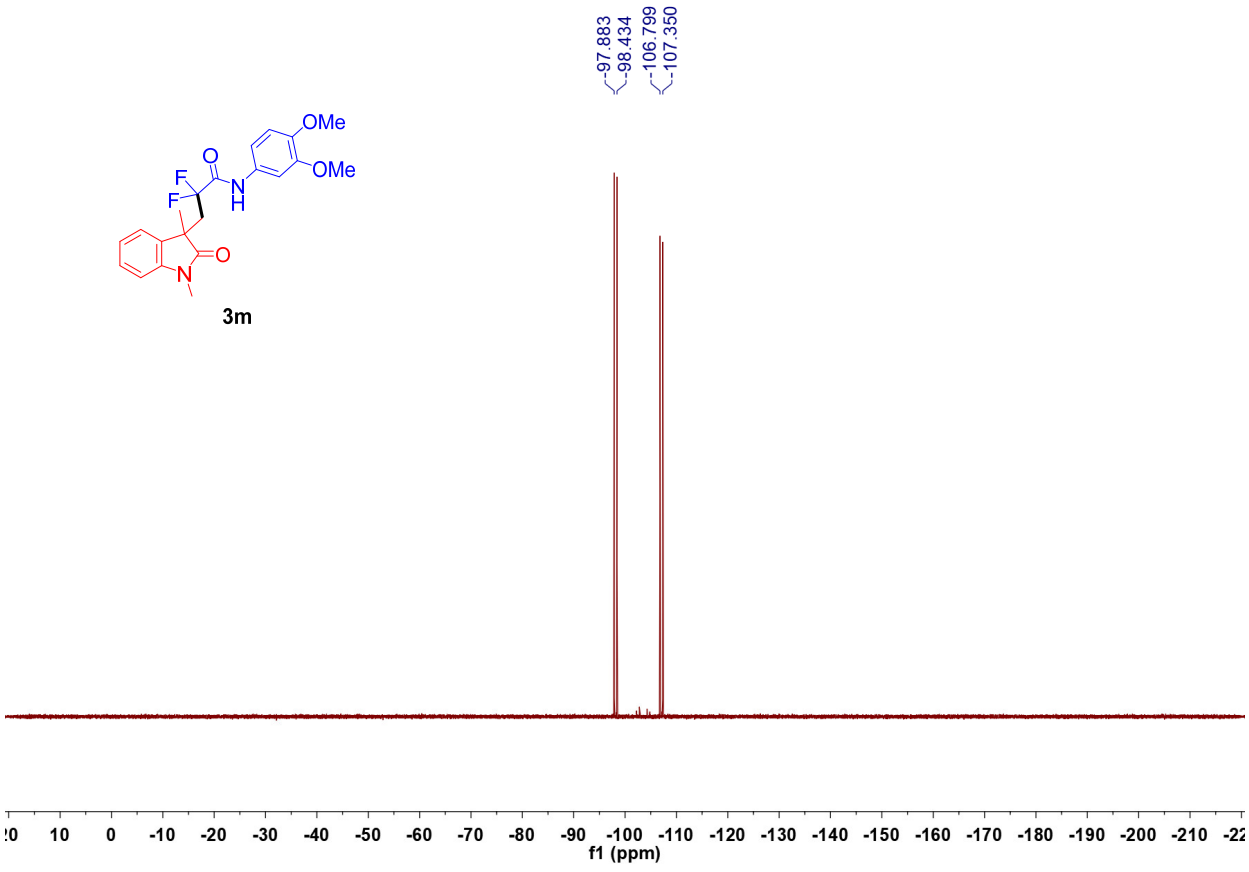
^{1}H NMR Spectra of compound **3m** (500 MHz, $CDCl_3$)



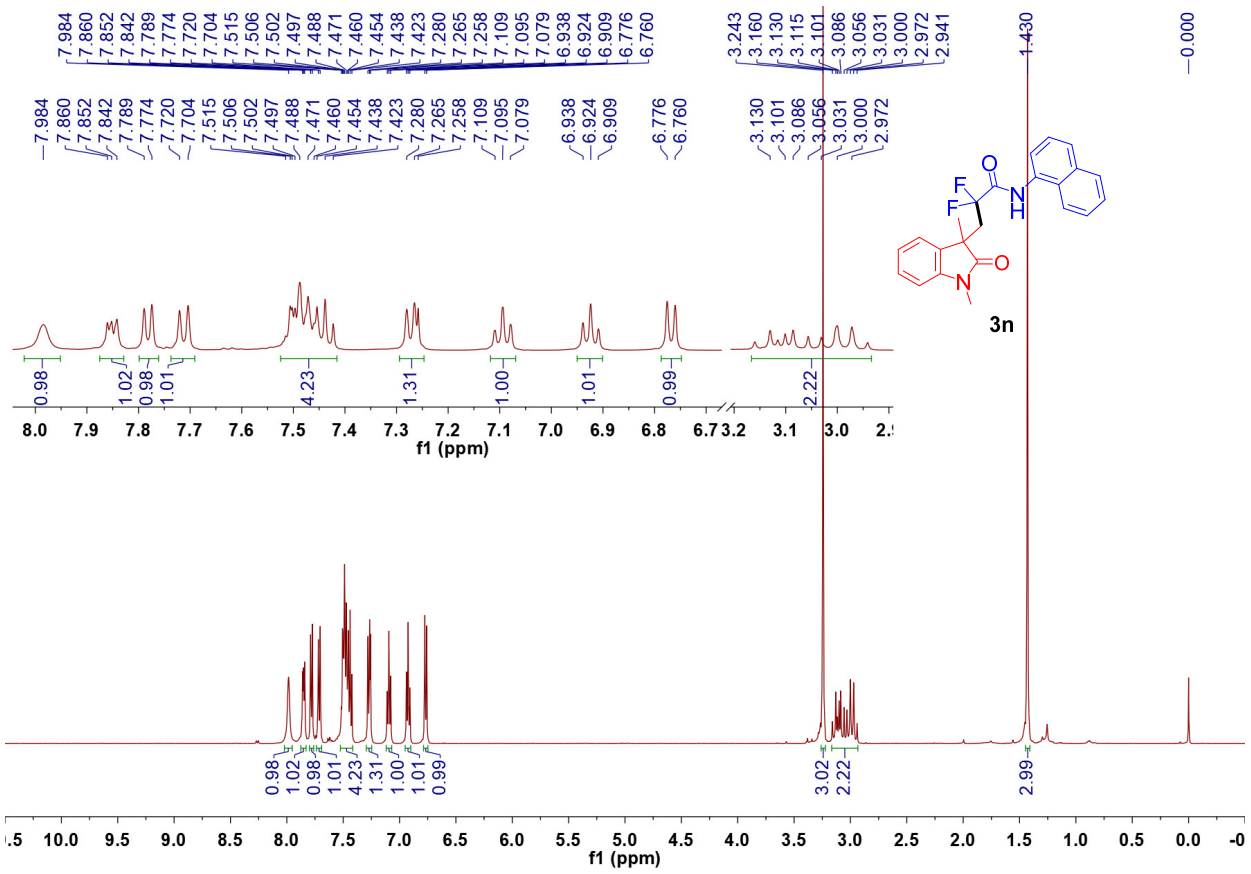
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3m** (126 MHz, $CDCl_3$)



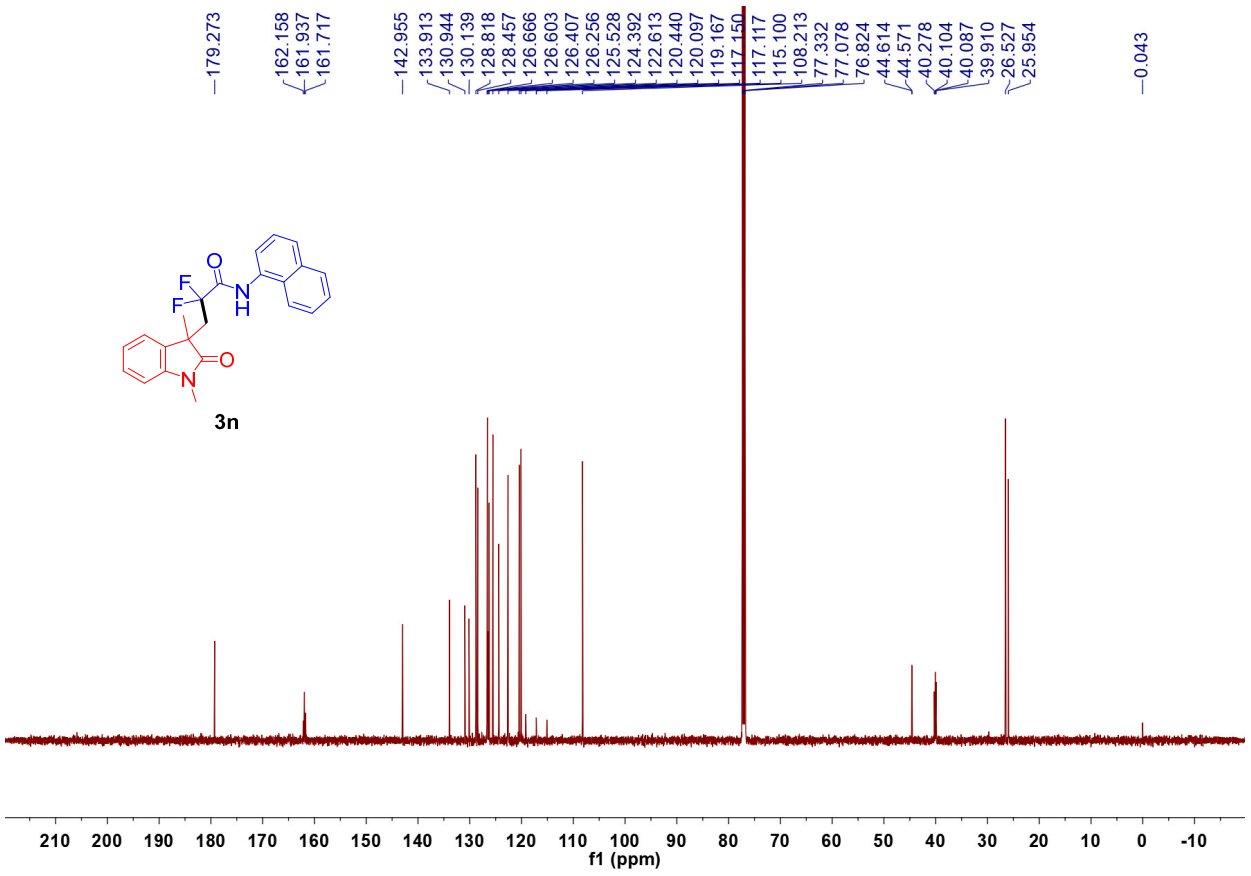
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3m** (471 MHz, $CDCl_3$)



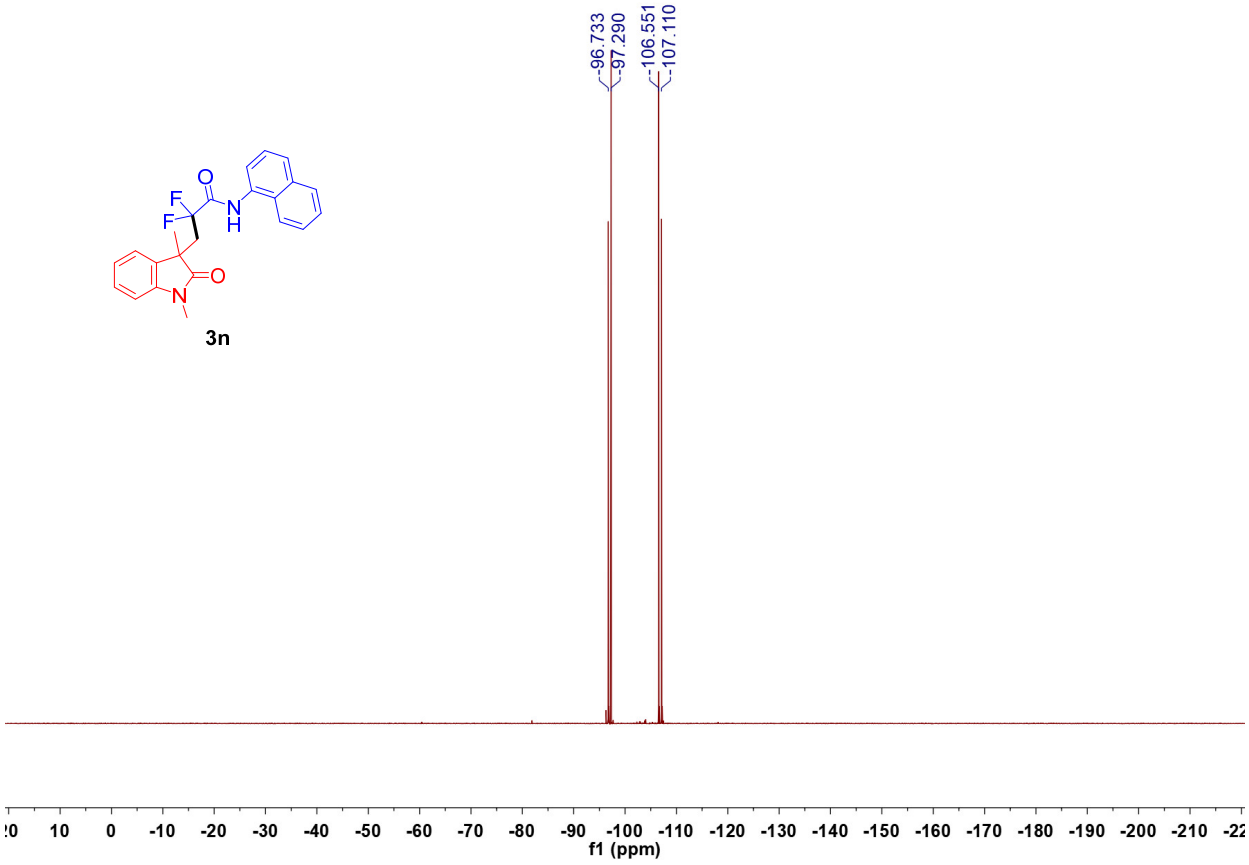
^{1}H NMR Spectra of compound **3n** (500 MHz, $CDCl_3$)



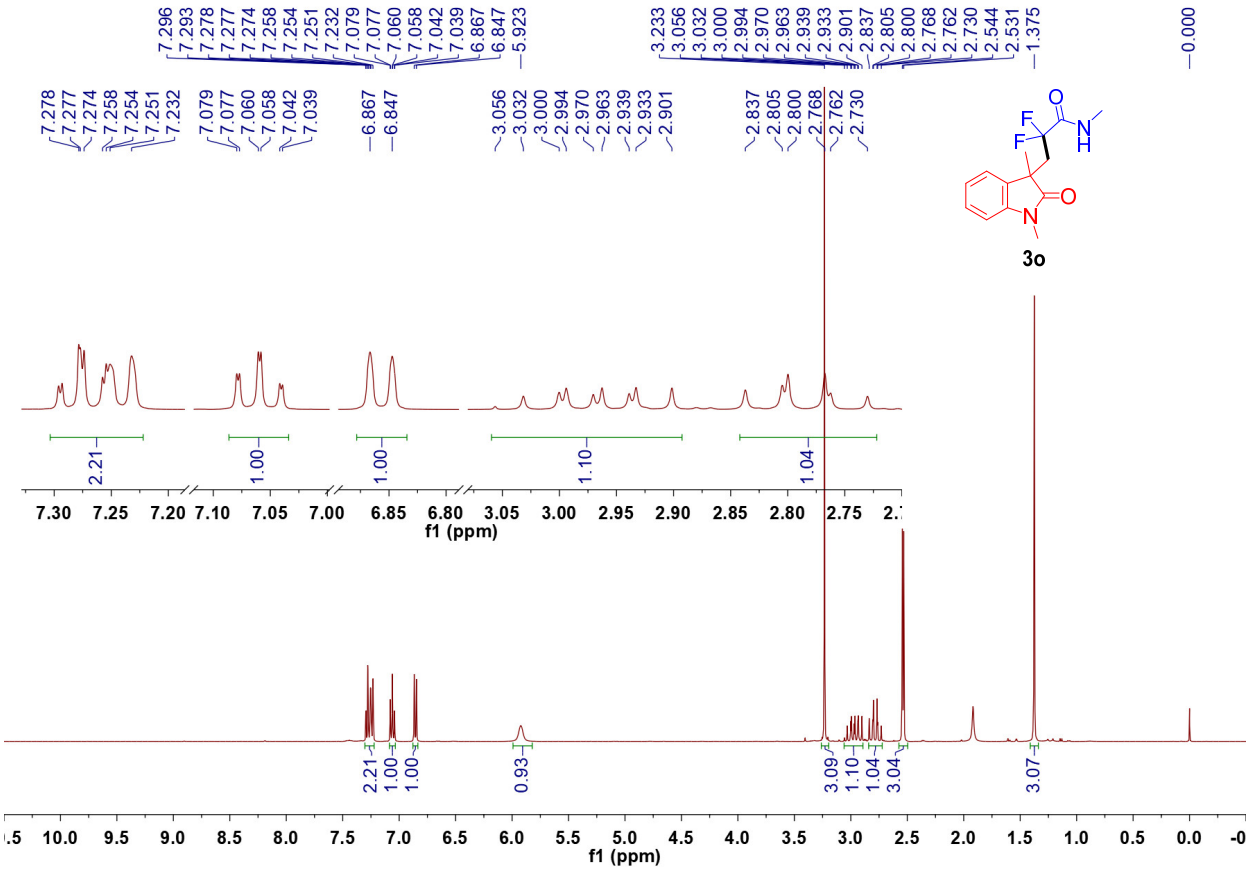
^{13}C{^{1}H} NMR Spectra of compound **3n** (126 MHz, $CDCl_3$)



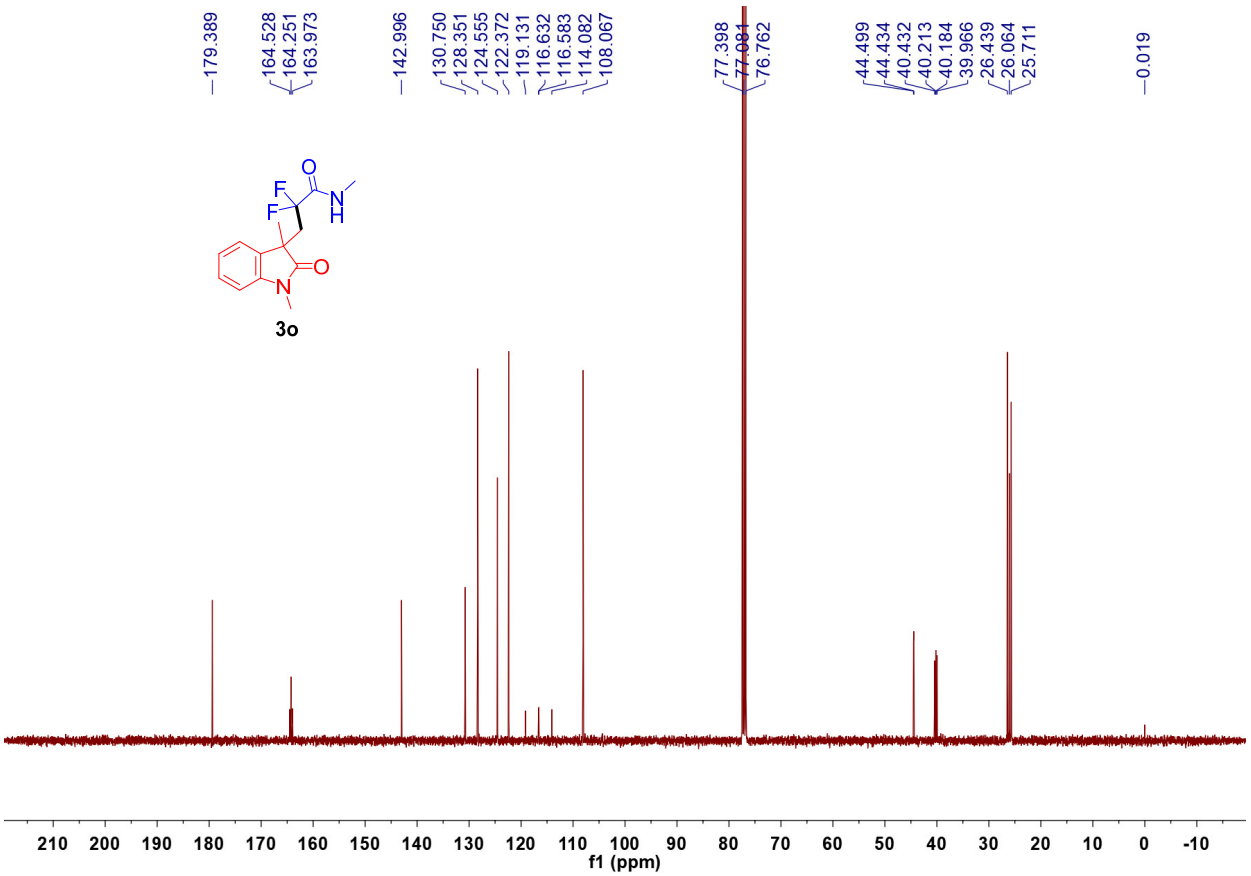
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3n** ($CDCl_3$, 471 MHz)



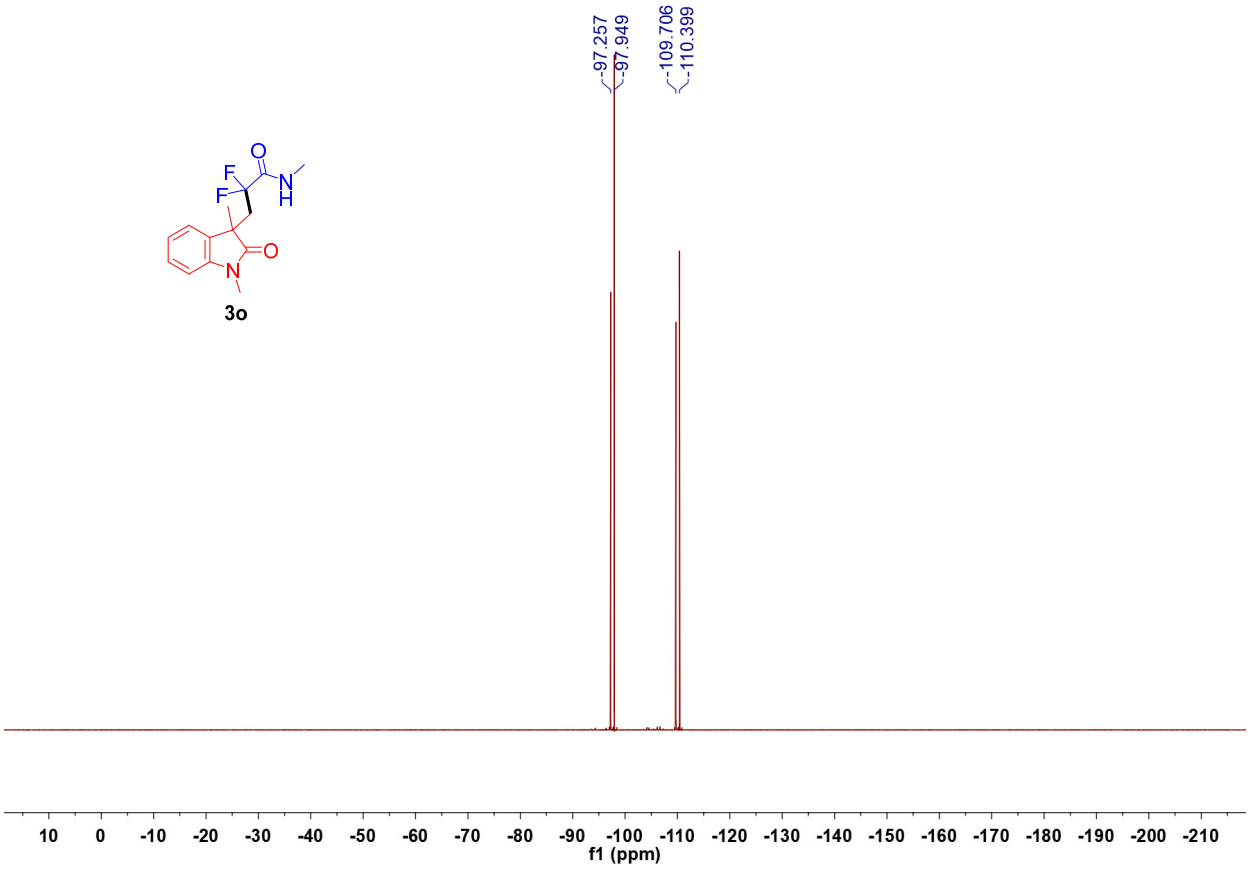
^{1}H NMR Spectra of compound **3o** ($CDCl_3$, 400 MHz)



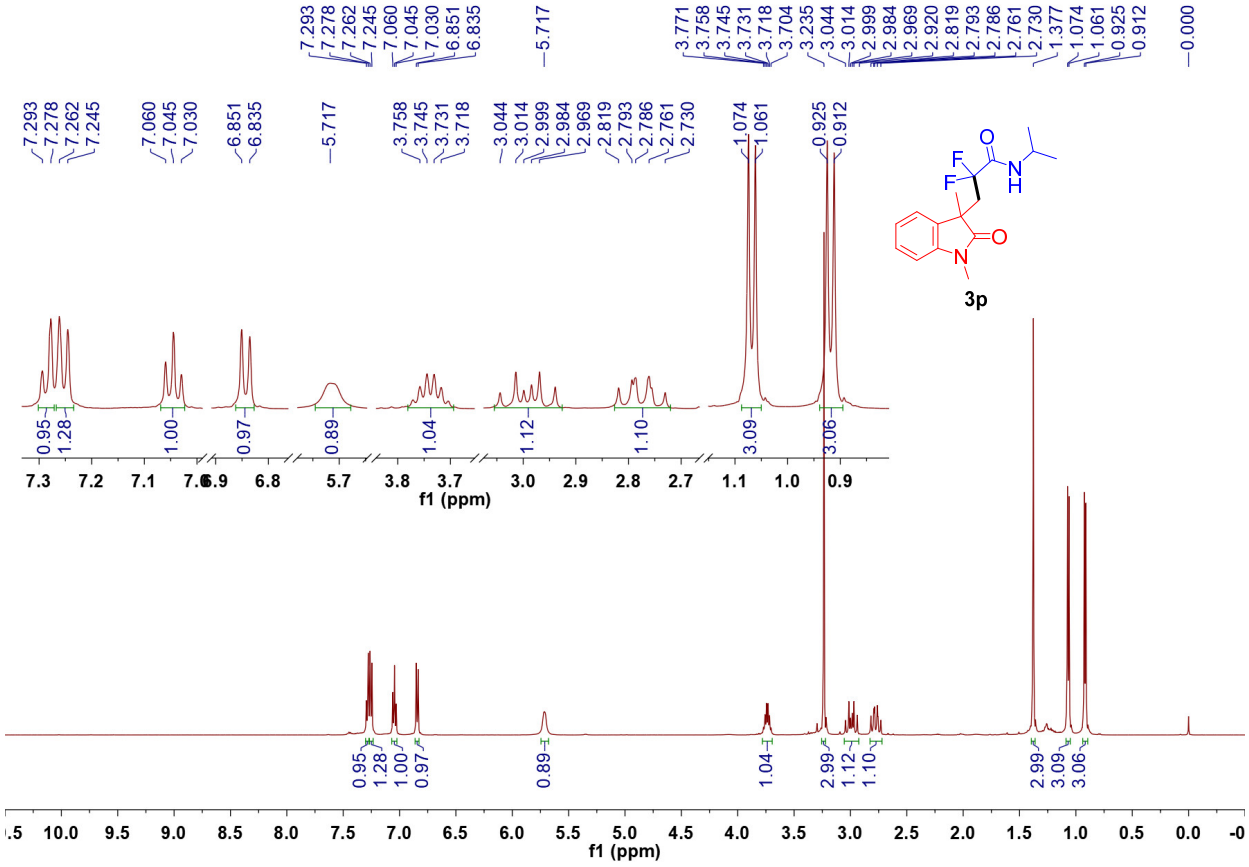
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3o** (101 MHz, $CDCl_3$)



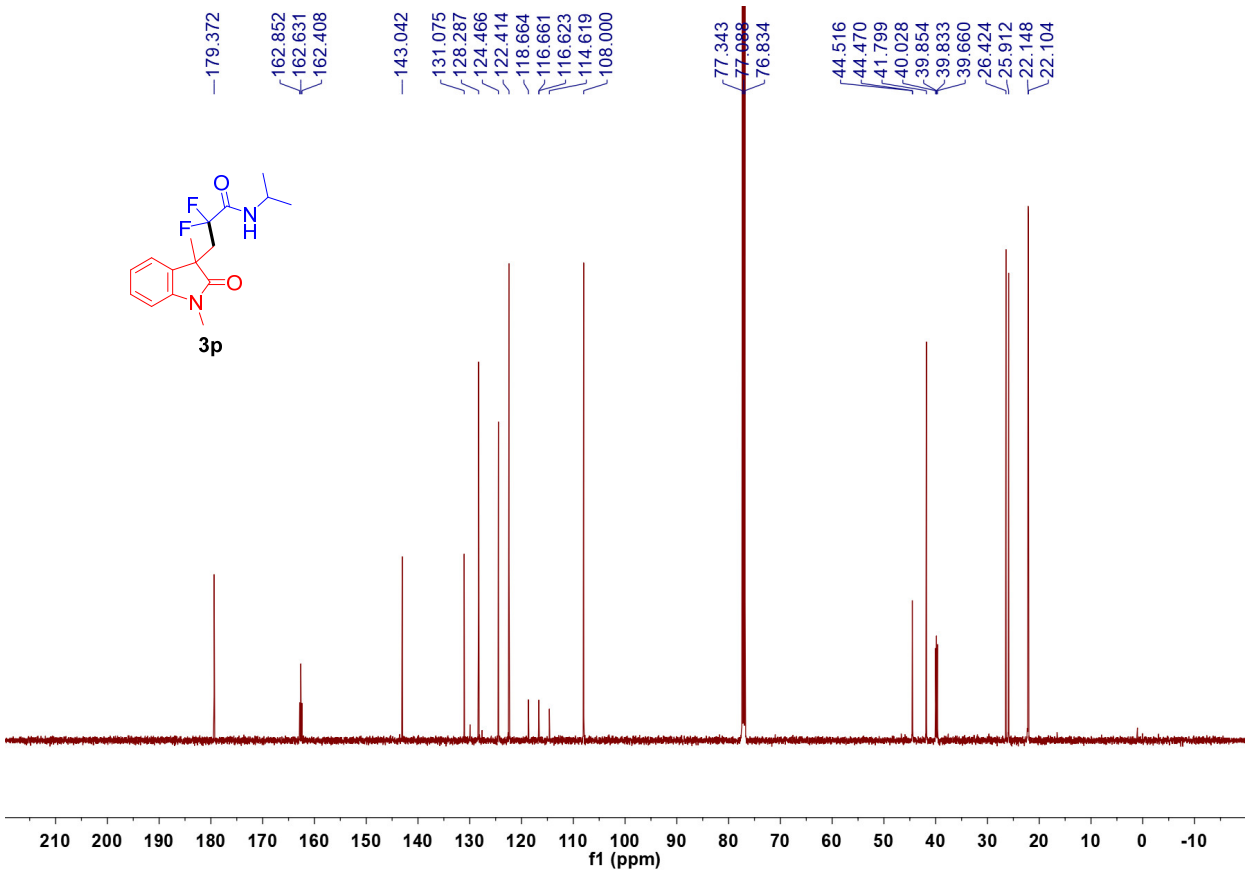
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3o** (377 MHz, $CDCl_3$)



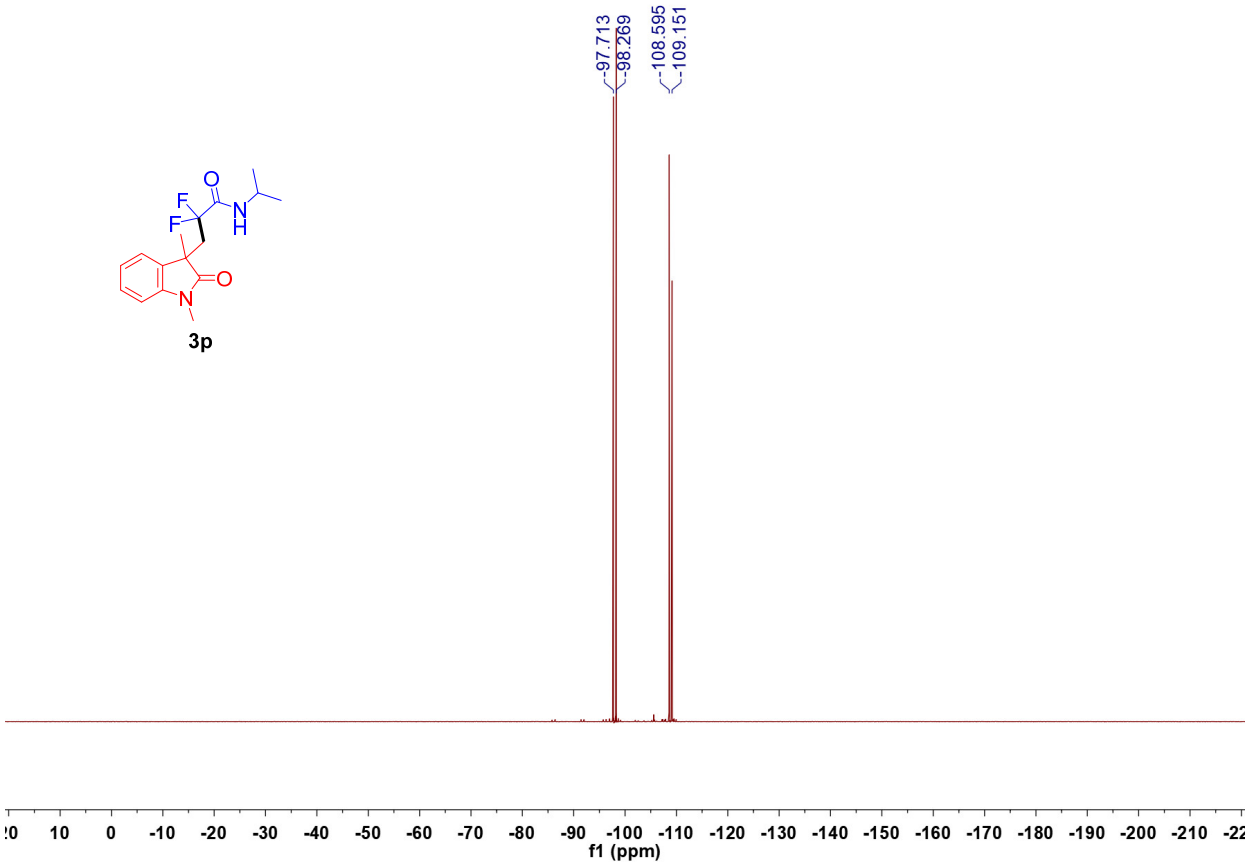
^{1}H NMR Spectra of compound **3p** (500 MHz, $CDCl_3$)



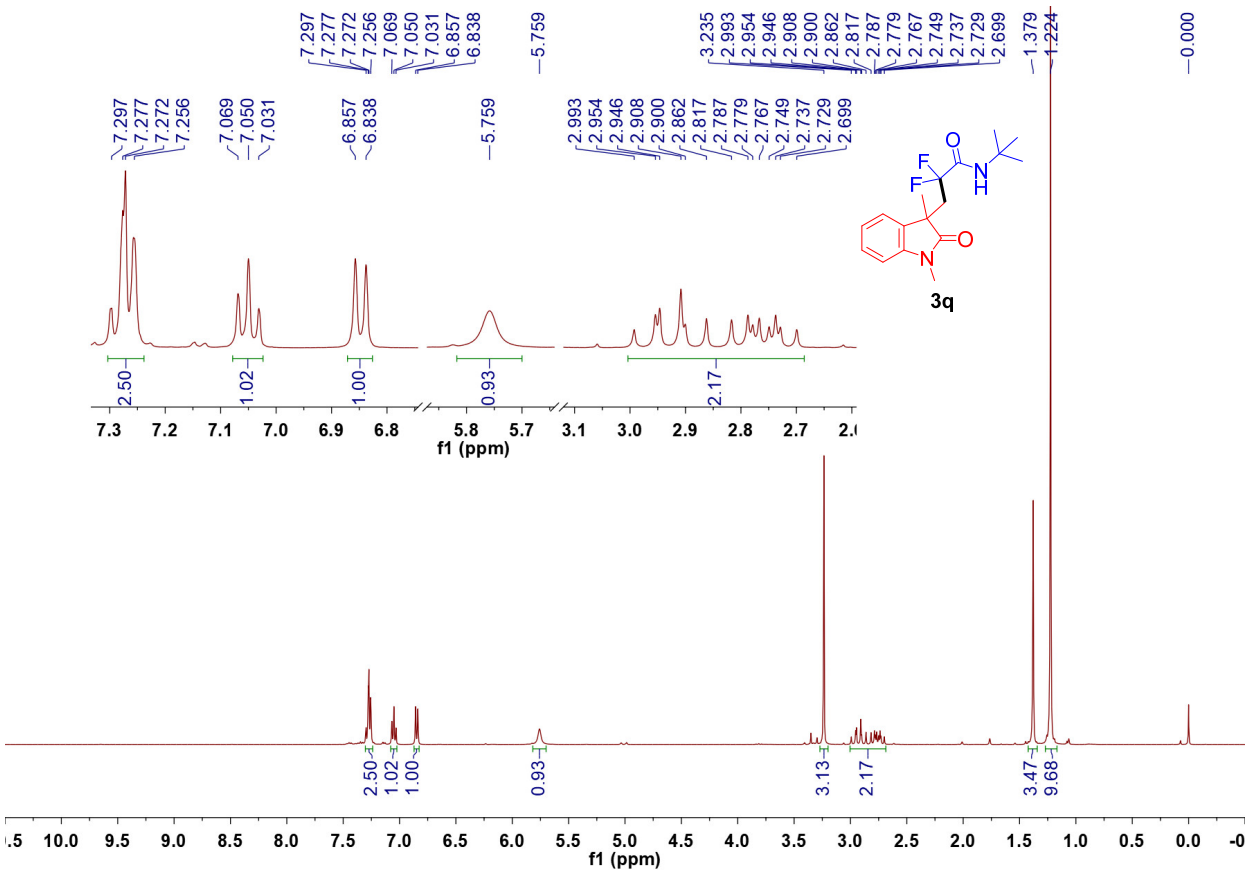
^{13}C{^{1}H} NMR Spectra of compound **3p** (126 MHz, $CDCl_3$)



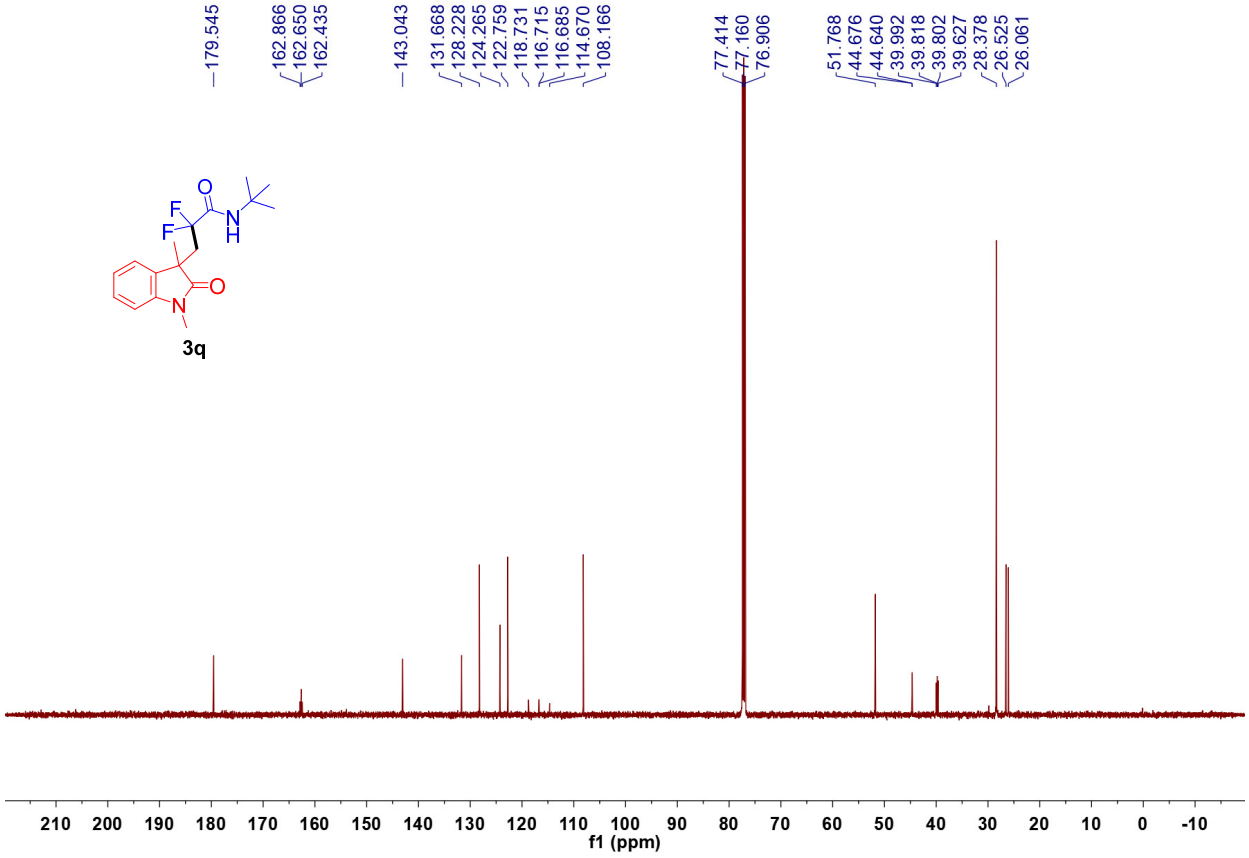
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3p** ($CDCl_3$, 471 MHz)



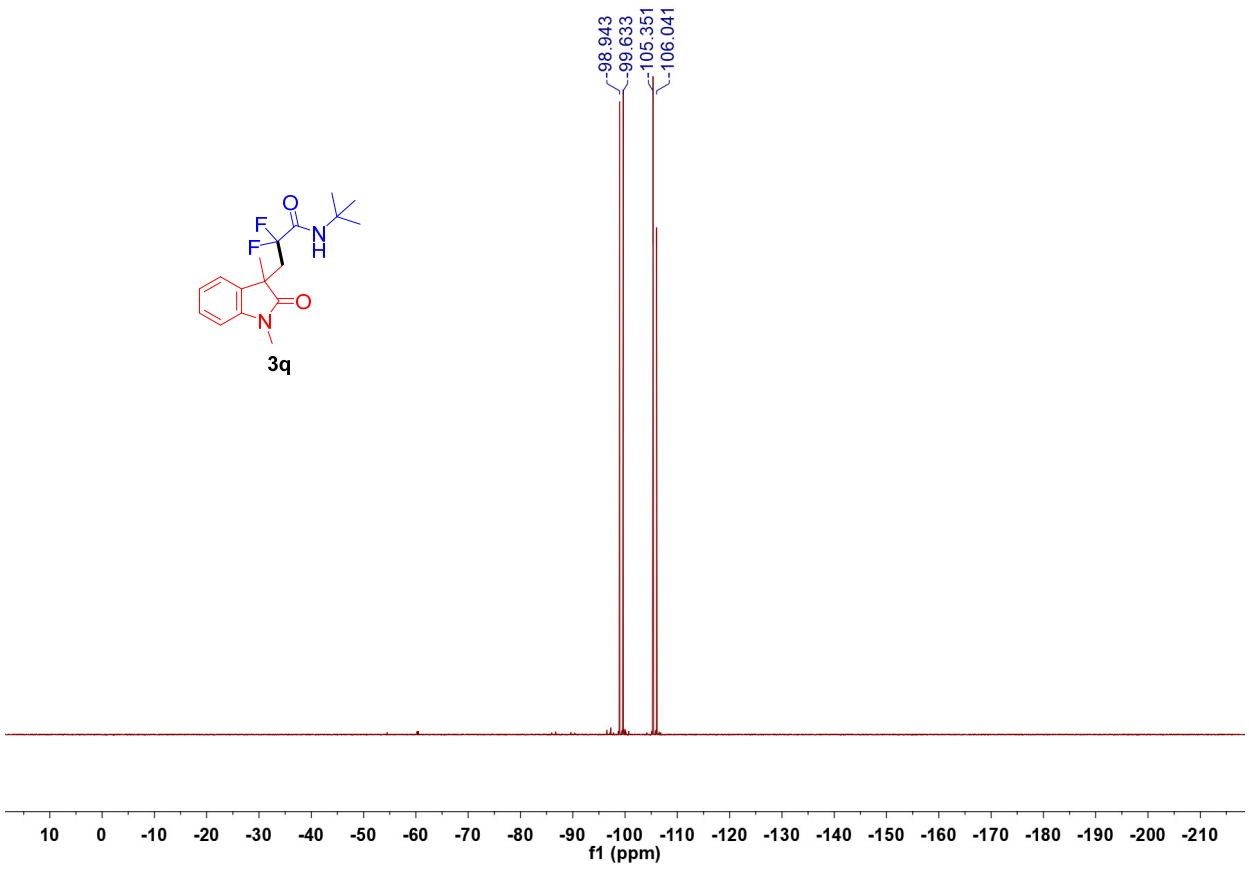
^{1}H NMR Spectra of compound **3q** ($CDCl_3$, 400 MHz)



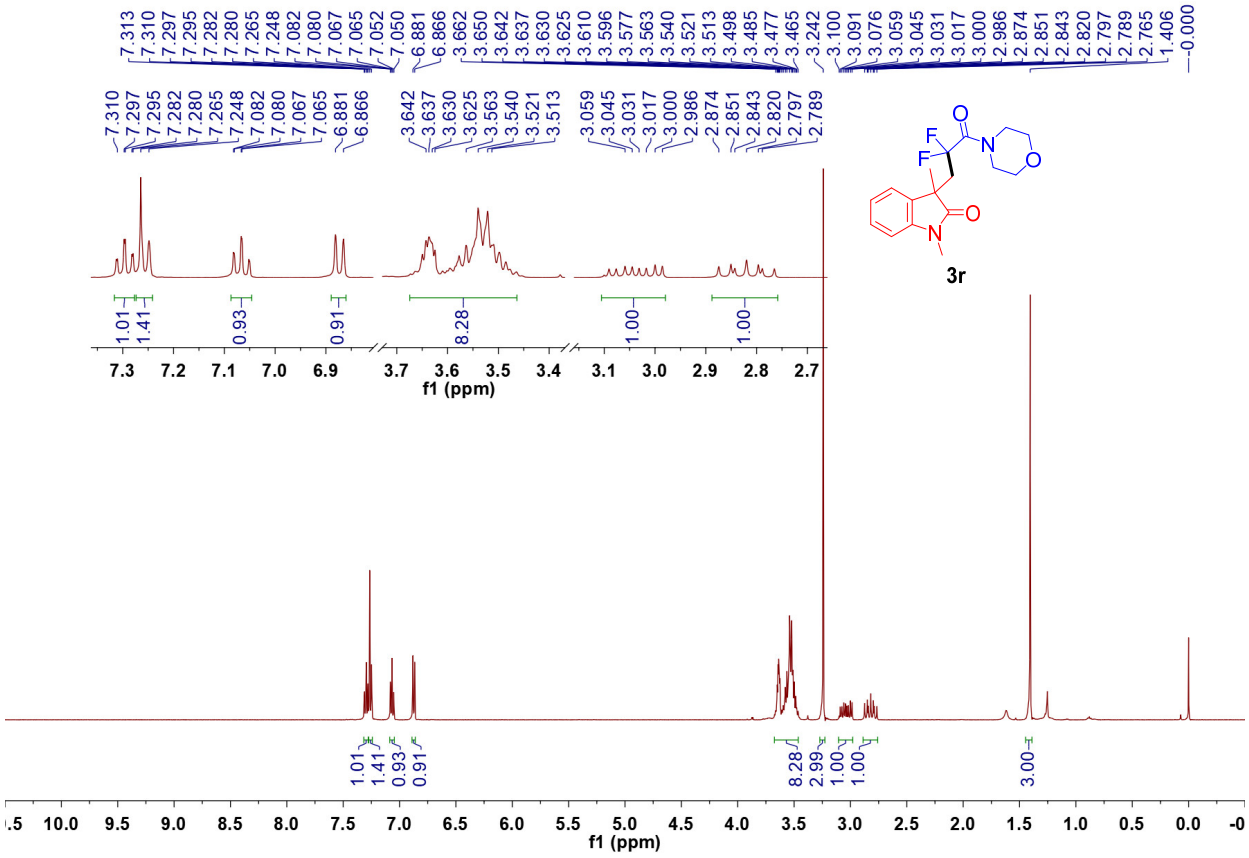
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3q** (126 MHz, $CDCl_3$)



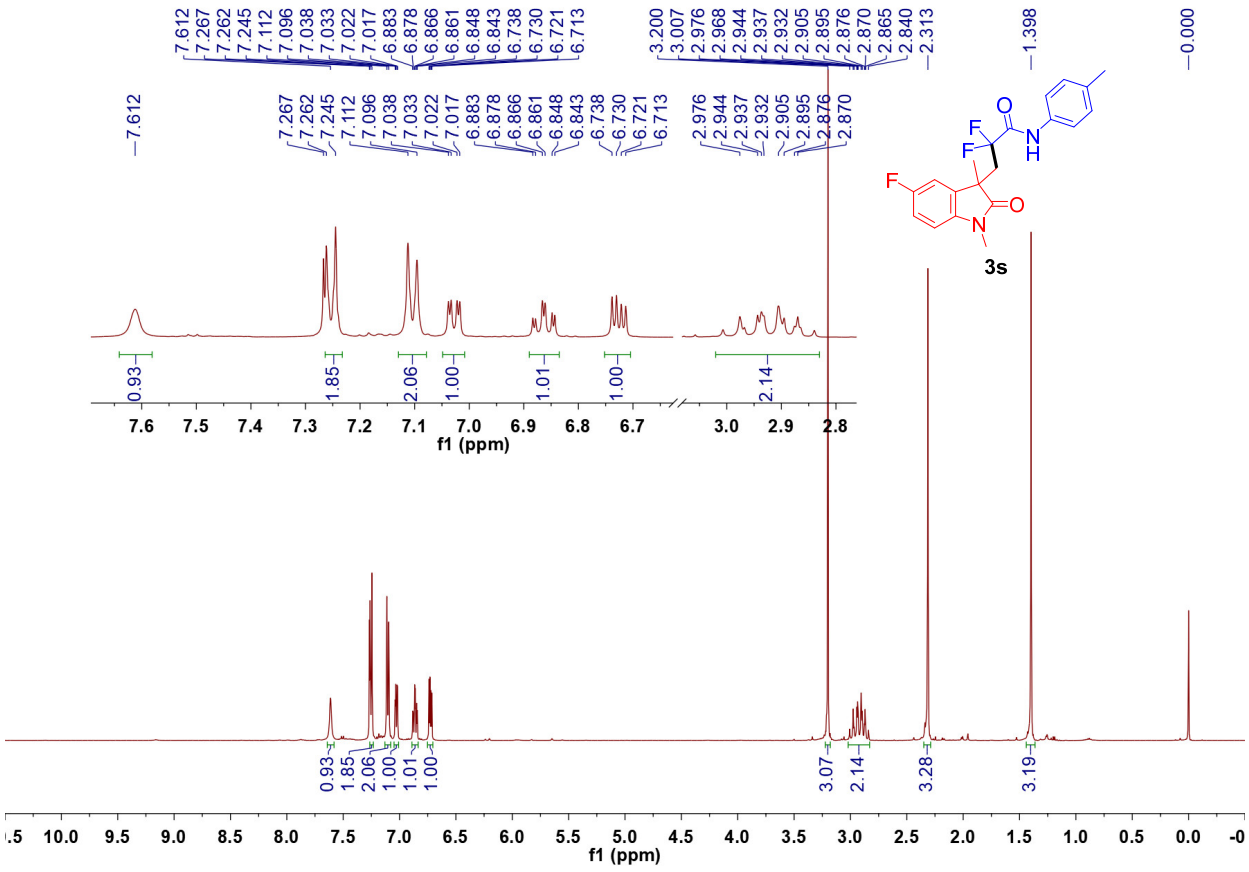
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3q** (377 MHz, $CDCl_3$)



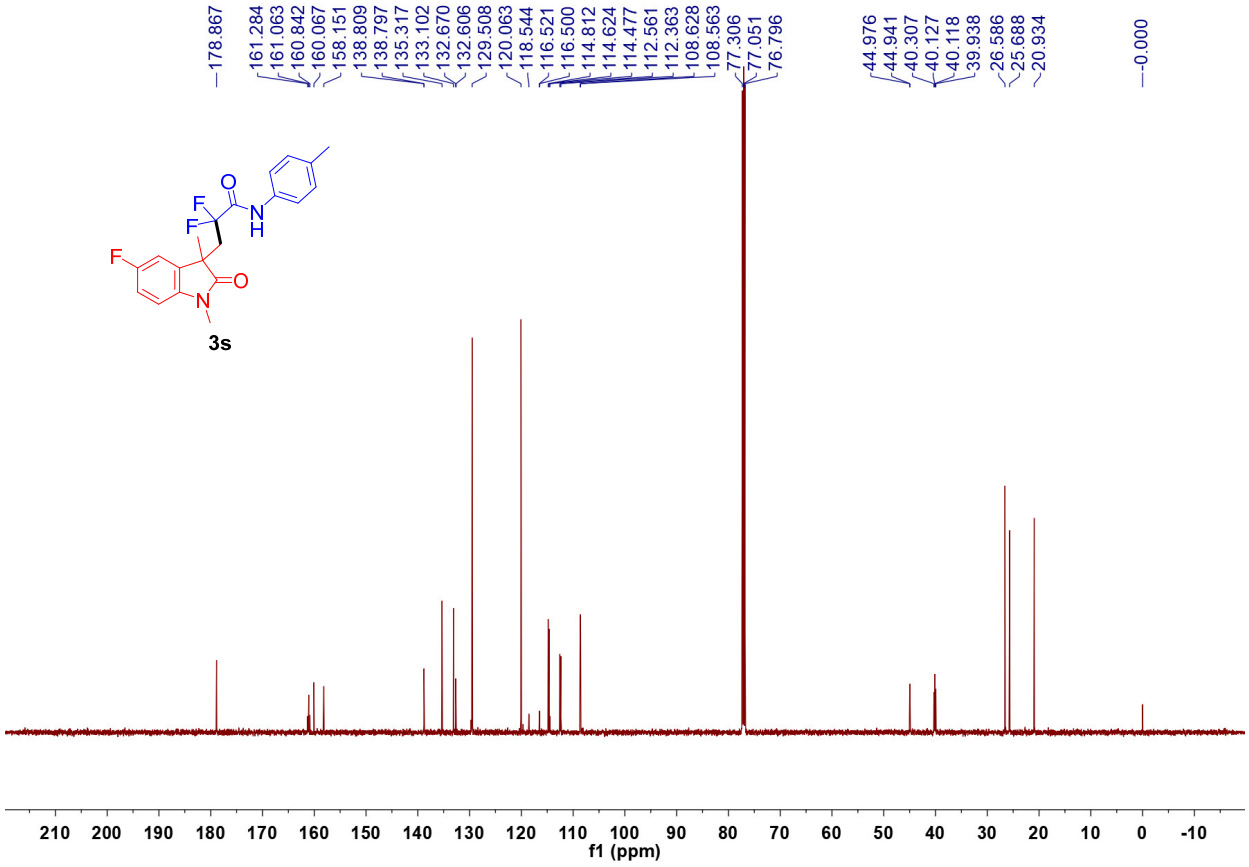
^{1}H NMR Spectra of compound **3r** (500 MHz, $CDCl_3$)



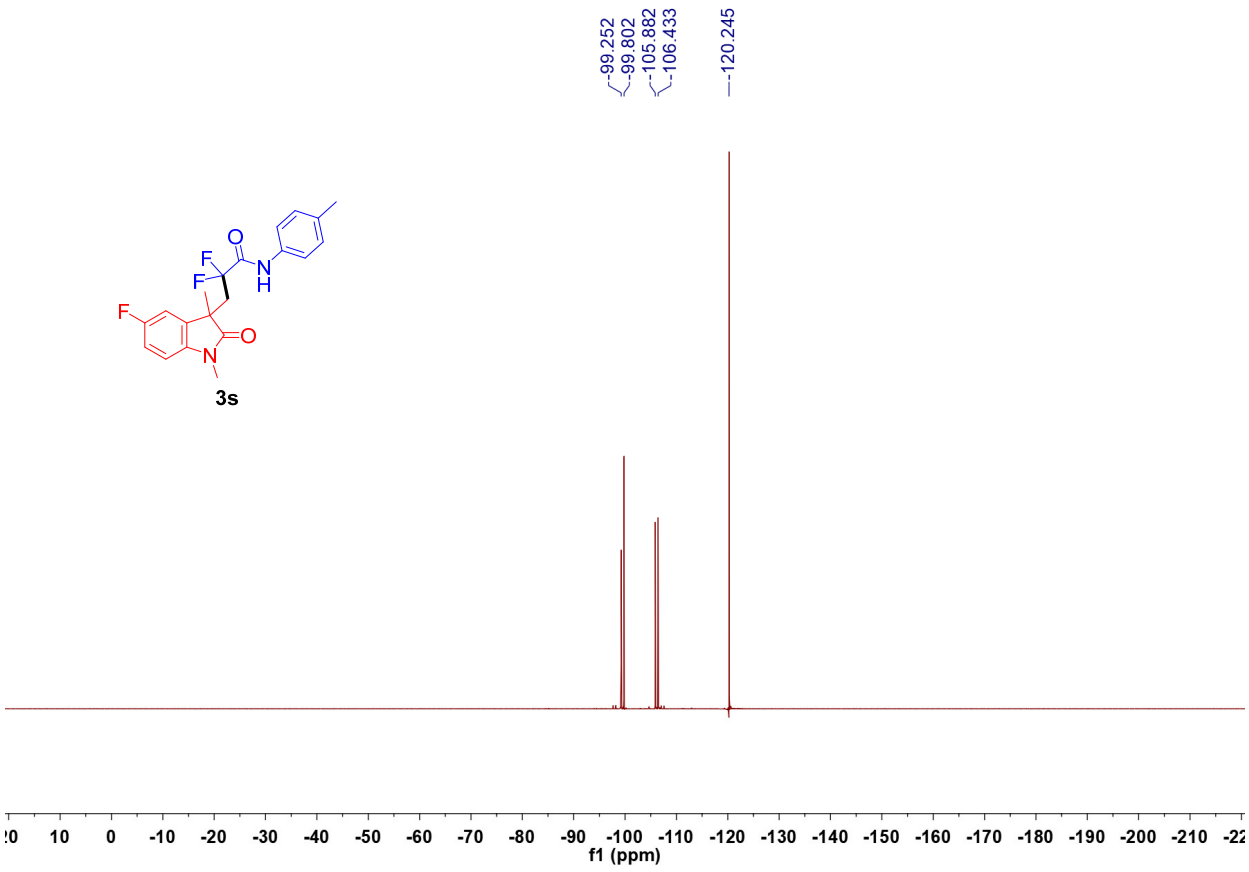
^{1}H NMR Spectra of compound **3s** (500 MHz, $CDCl_3$)



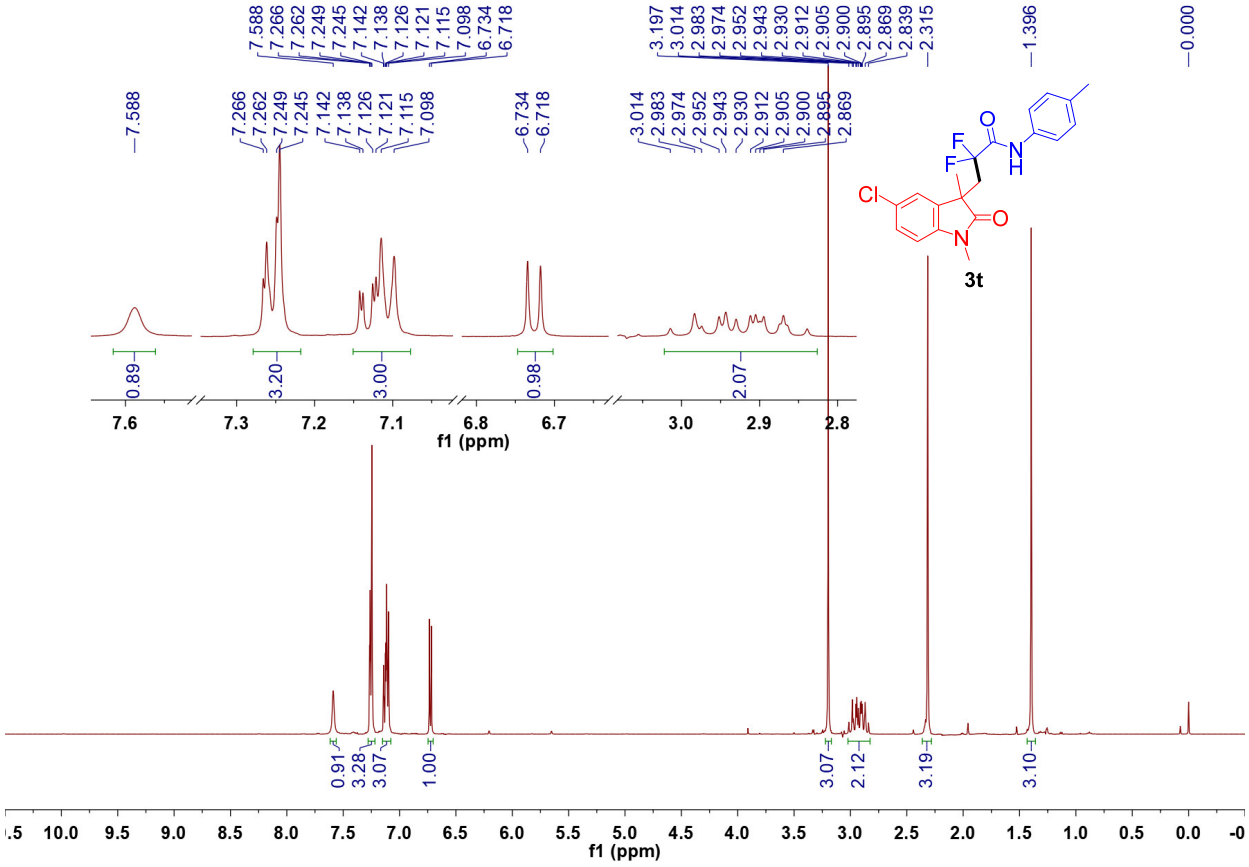
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3s** (126 MHz, $CDCl_3$)



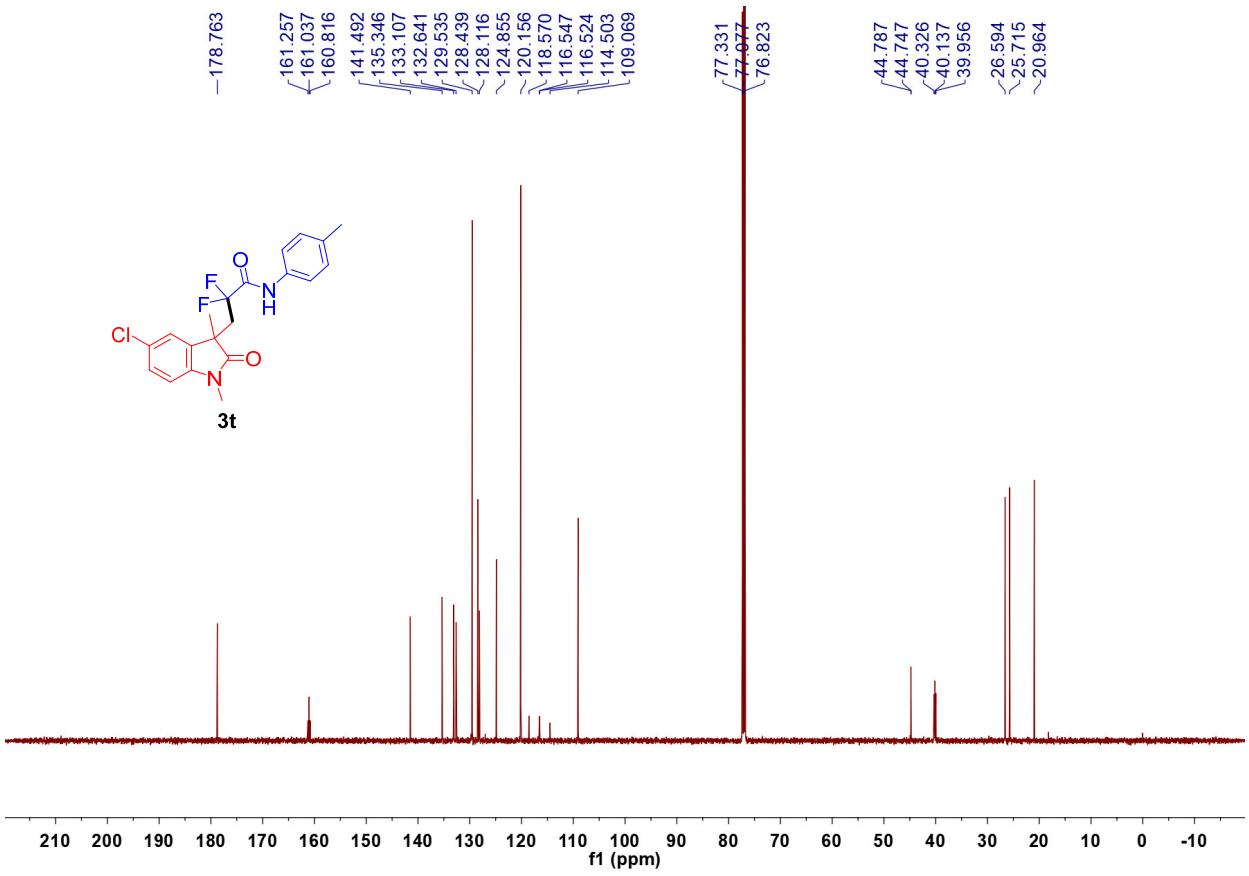
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3s** (471 MHz, $CDCl_3$)



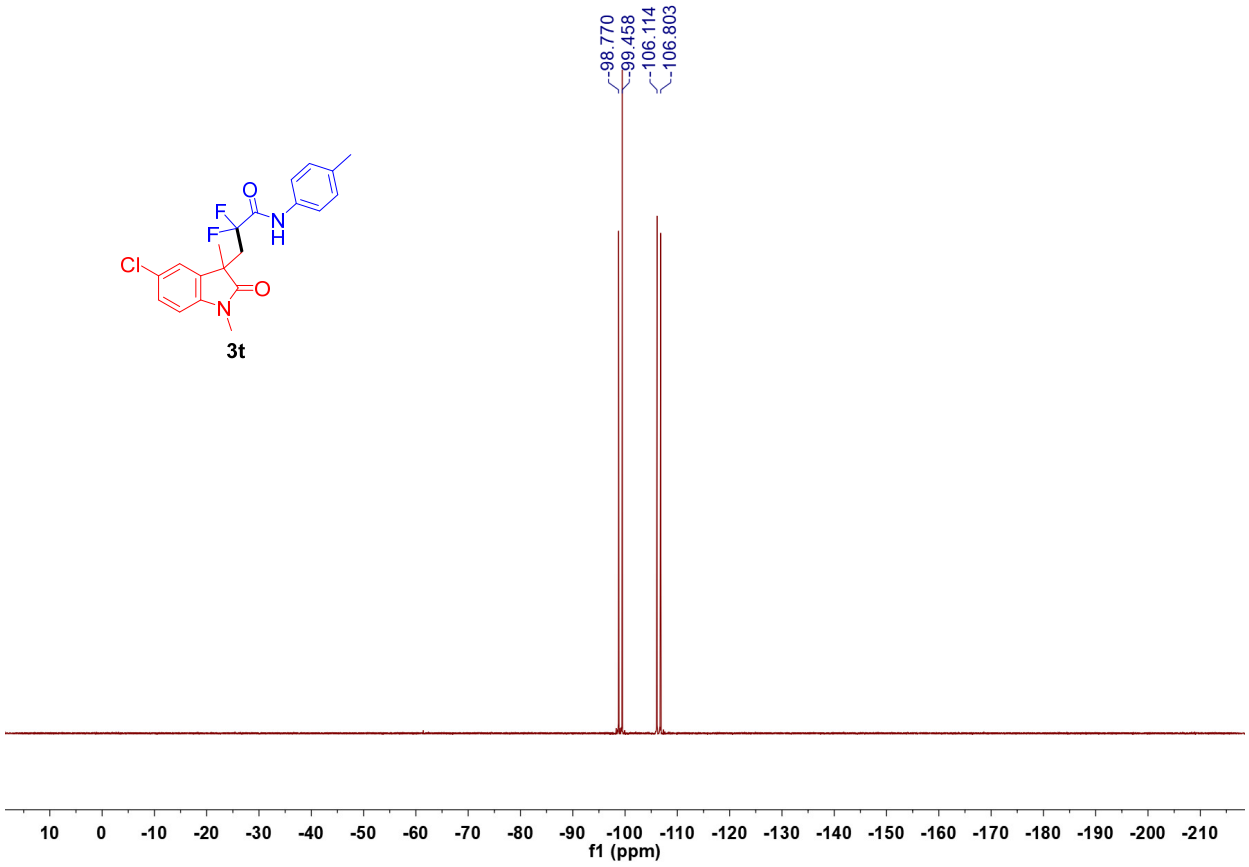
^{1}H NMR Spectra of compound **3t** (500 MHz, $CDCl_3$)



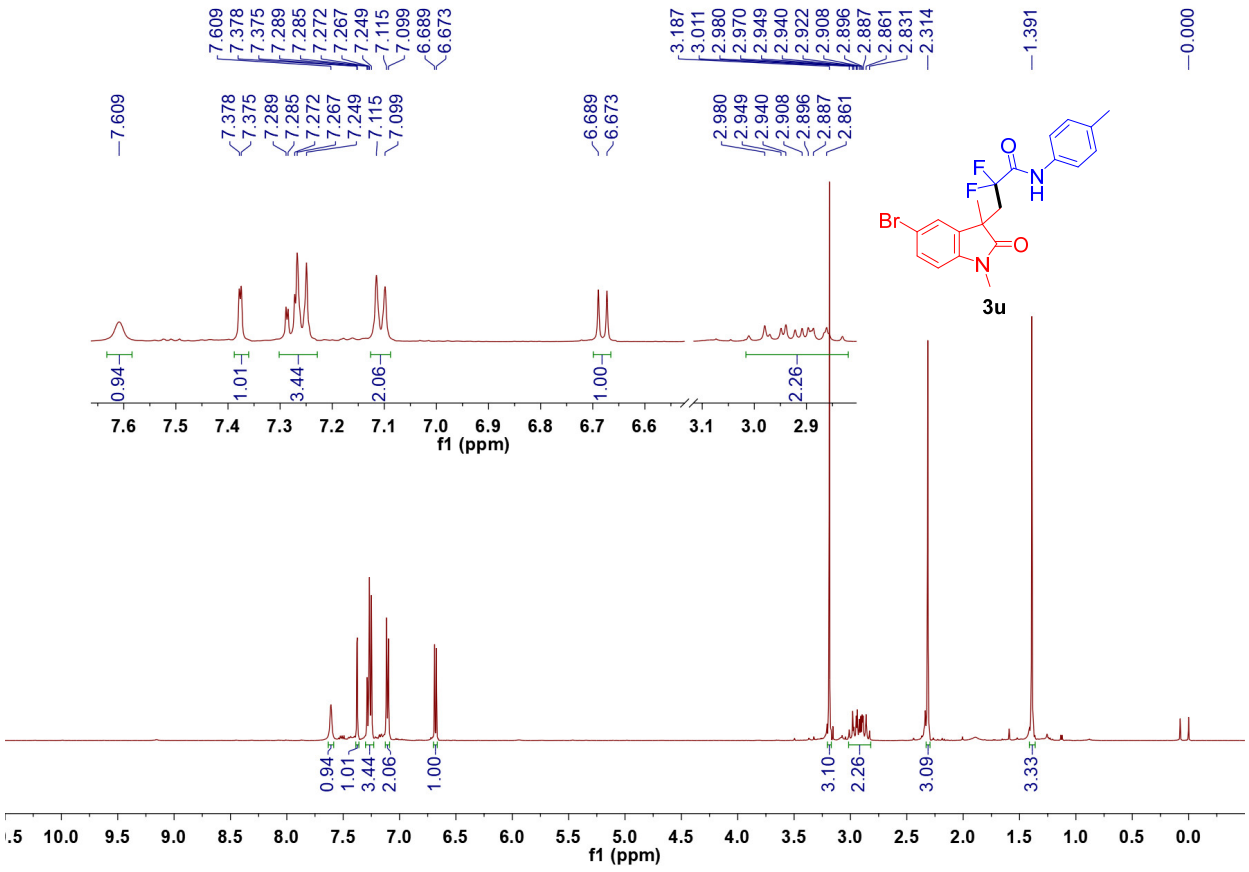
^{13}C{^{1}H} NMR Spectra of compound **3t** (126 MHz, $CDCl_3$)



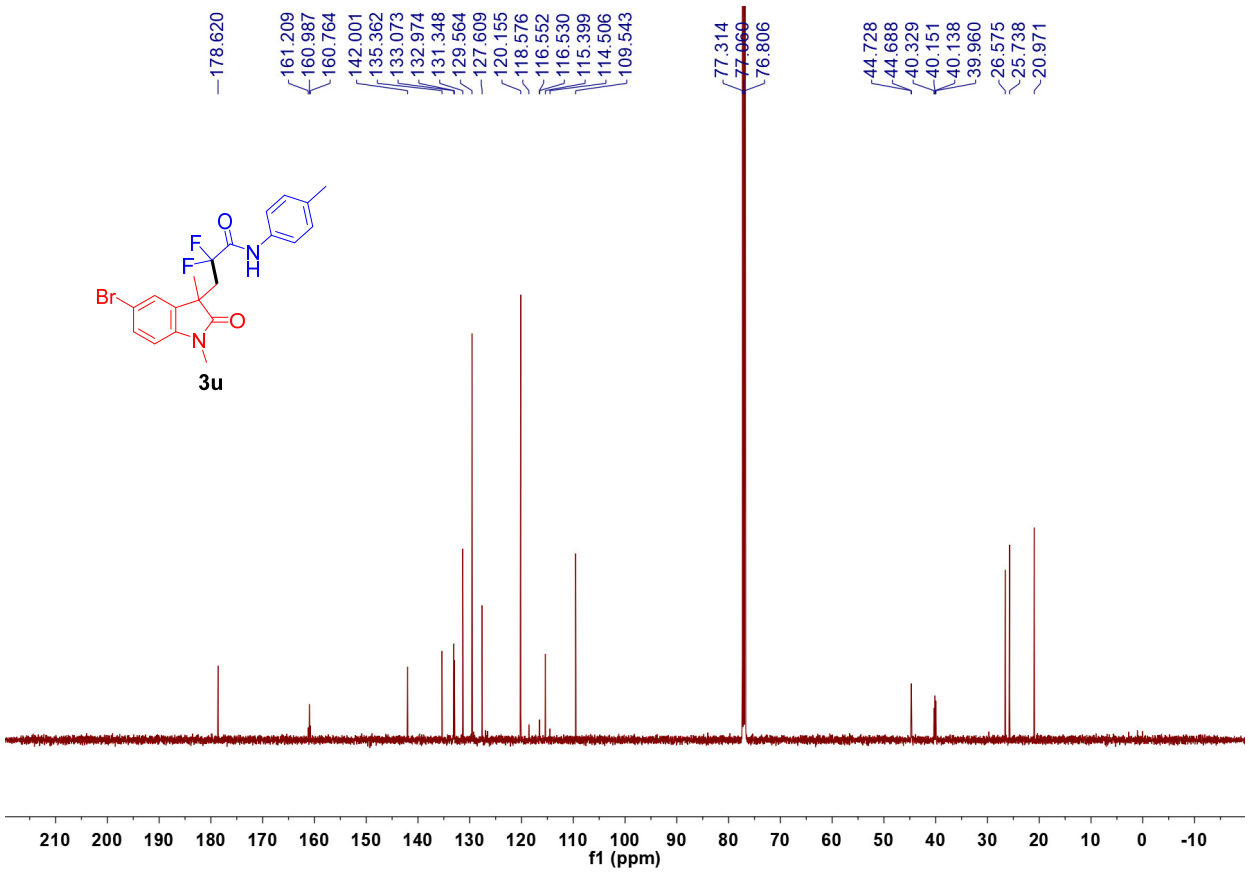
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3t** (377 MHz, $CDCl_3$)



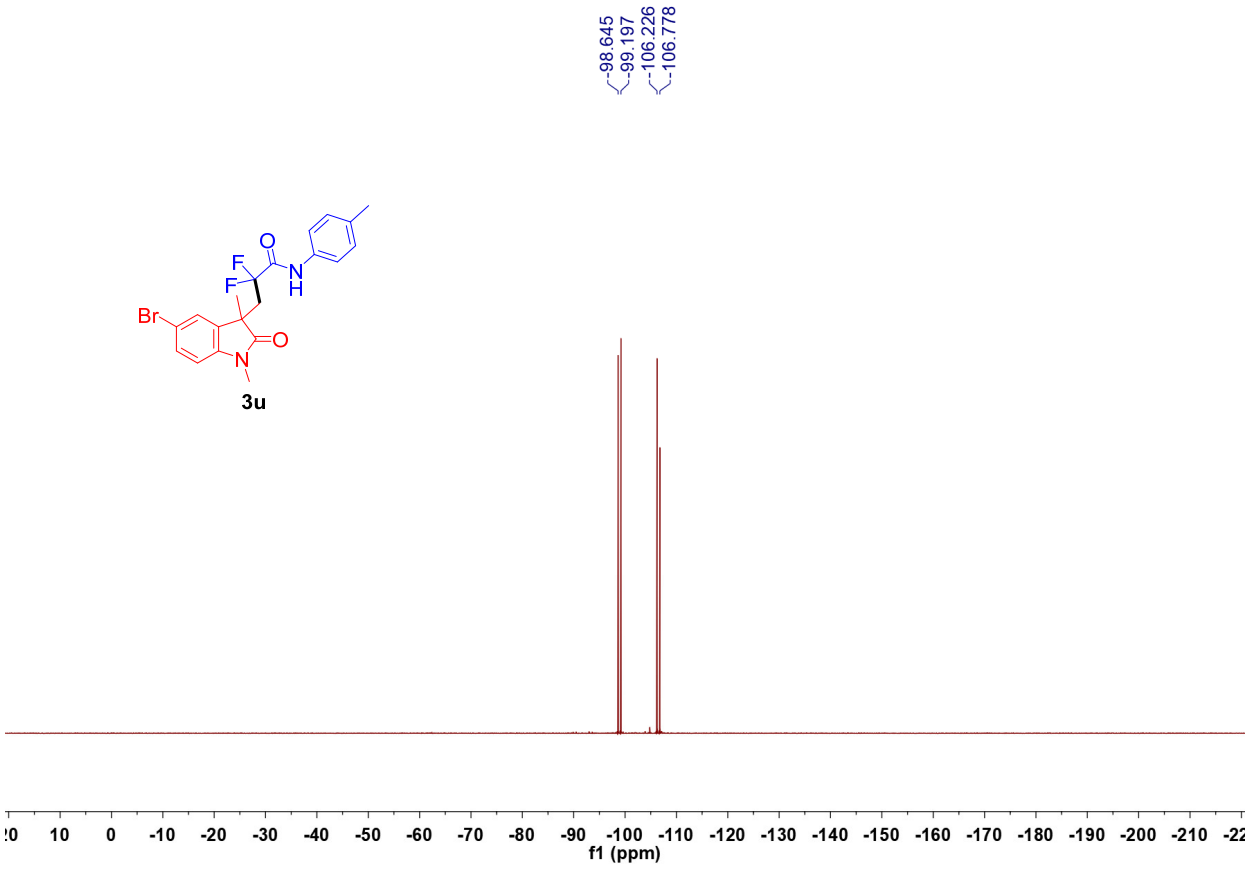
^{1}H NMR Spectra of compound **3u** (500 MHz, $CDCl_3$)



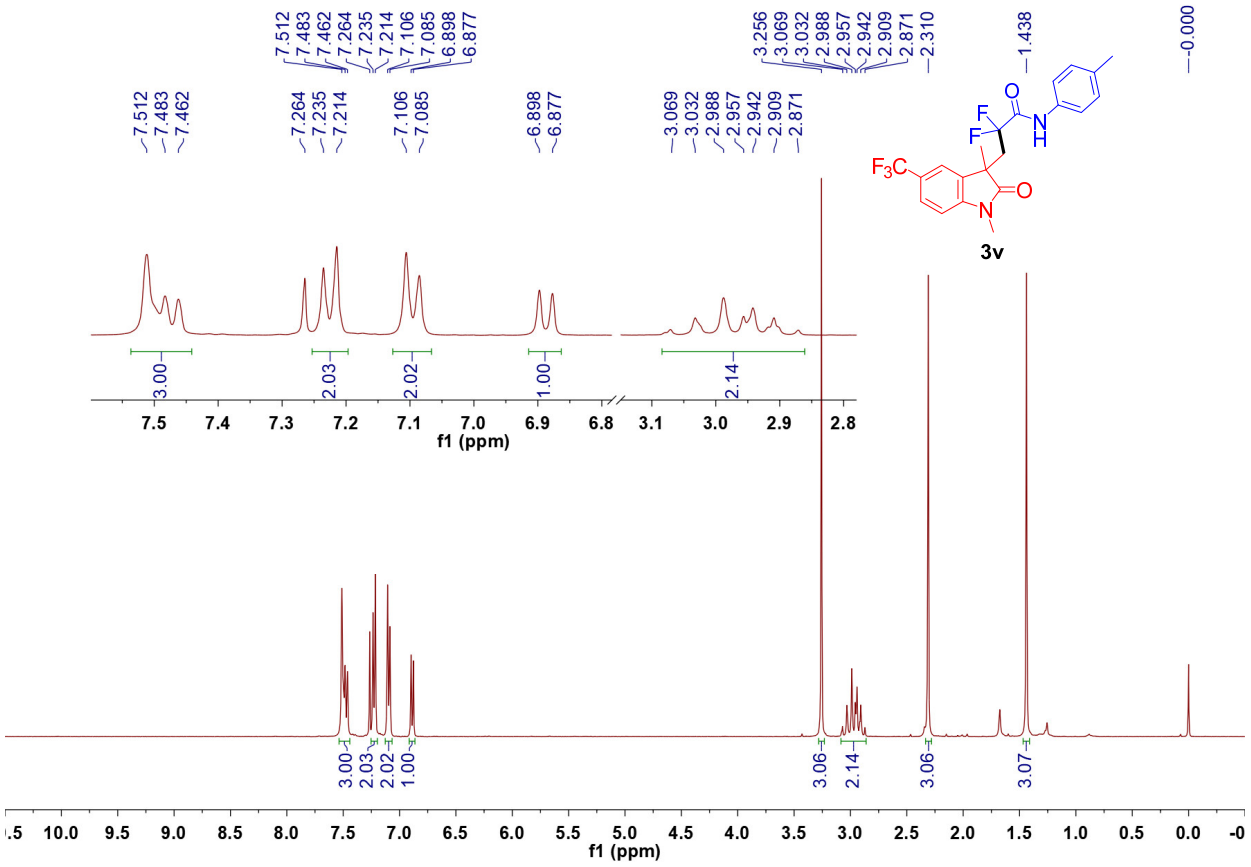
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3u** (126 MHz, $CDCl_3$)



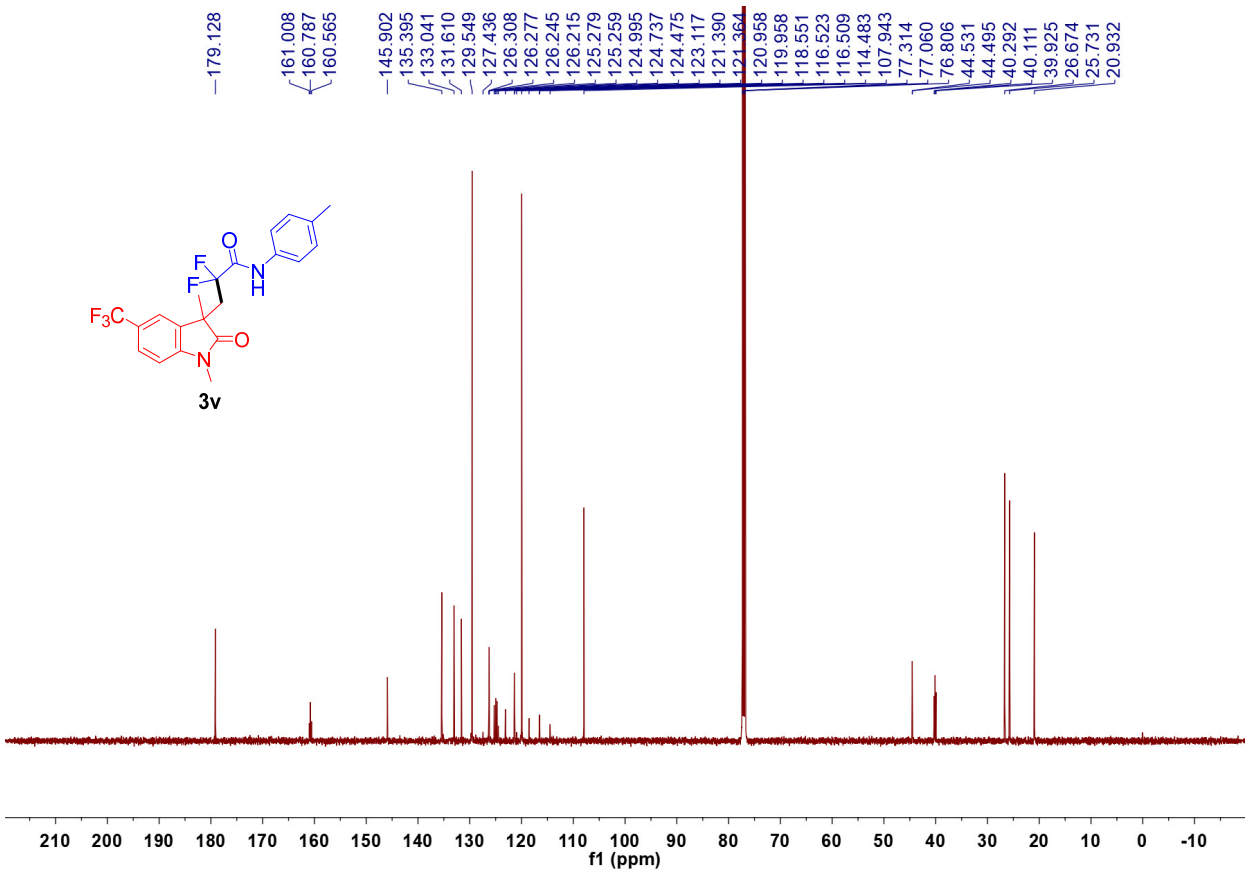
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3u** (471 MHz, $CDCl_3$)



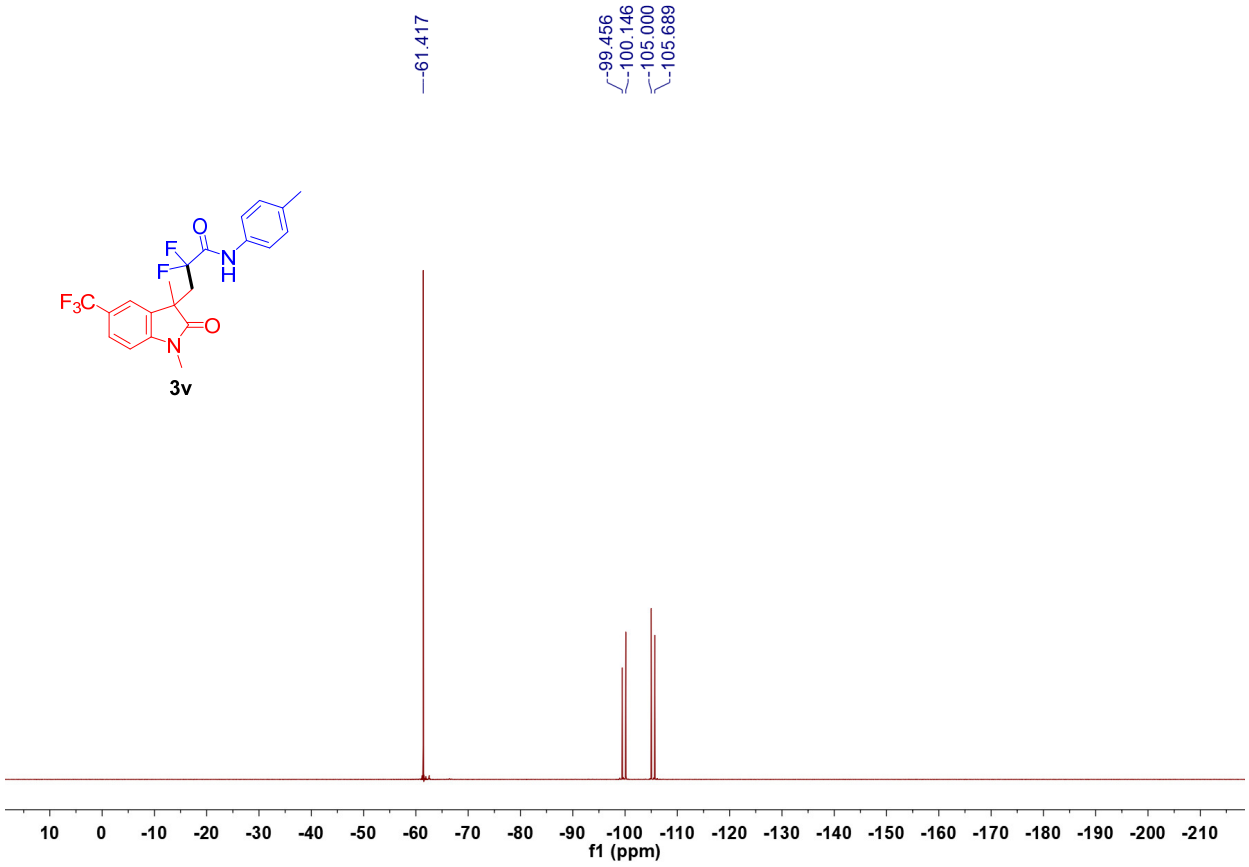
^{1}H NMR Spectra of compound **3v** (400 MHz, $CDCl_3$)



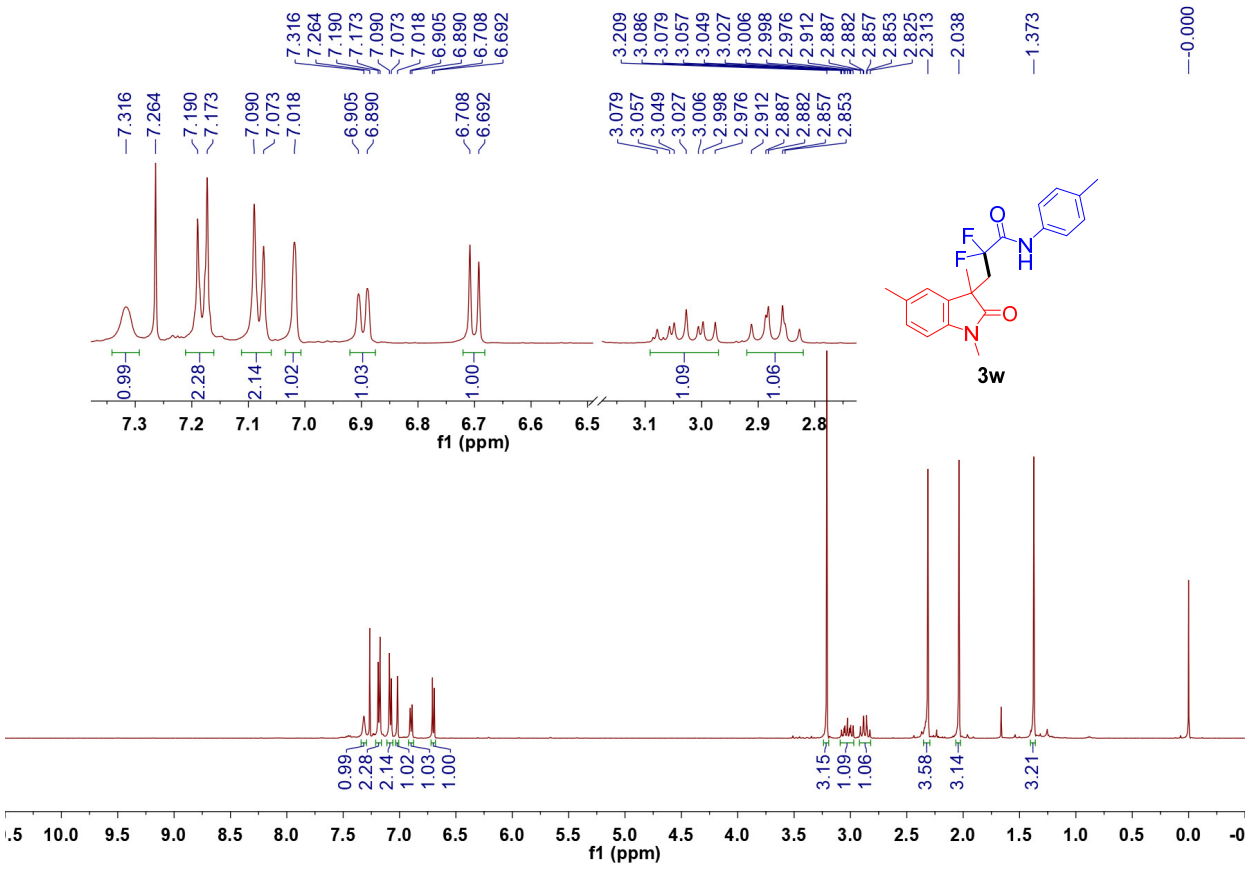
^{13}C{^{1}H} NMR Spectra of compound **3v** (126 MHz, $CDCl_3$)



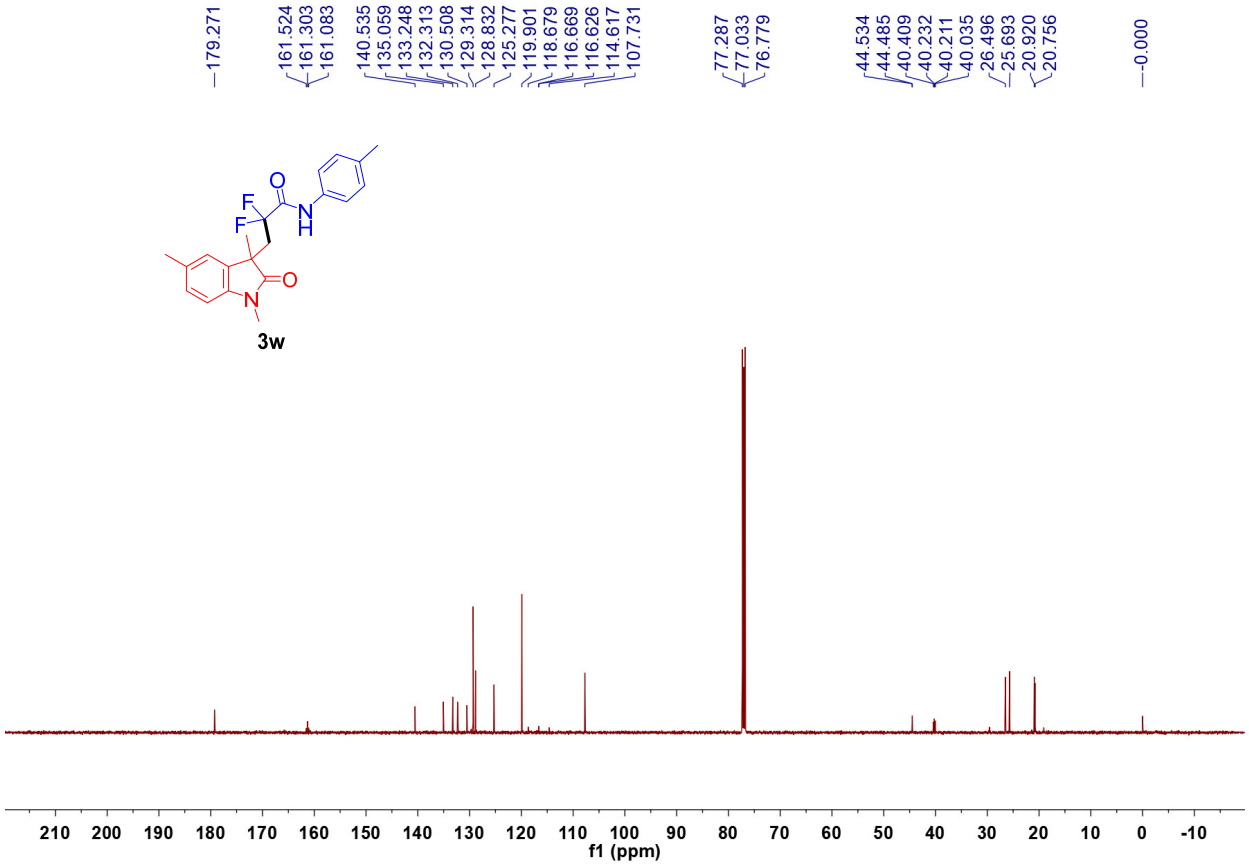
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3v** (377 MHz, $CDCl_3$)



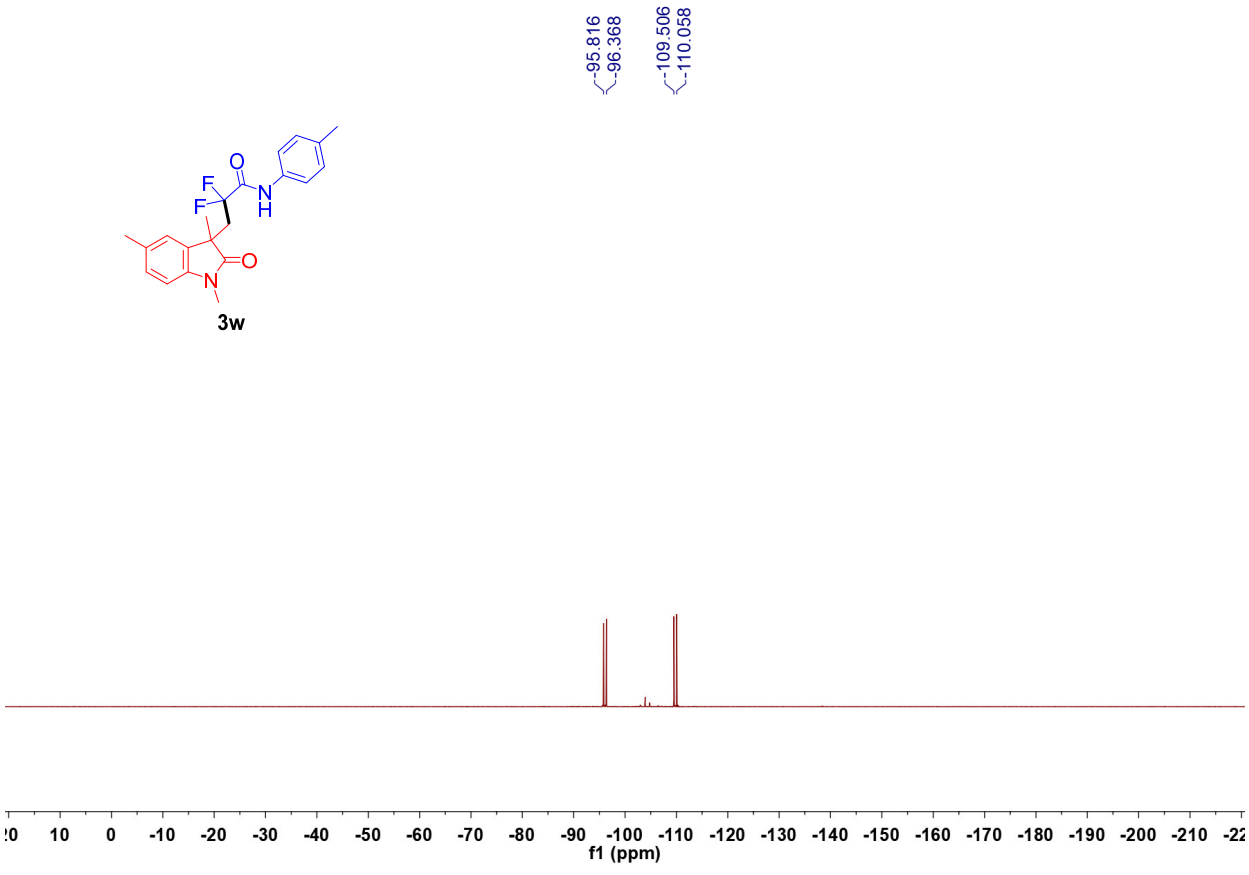
^{1}H NMR Spectra of compound **3w** (500 MHz, $CDCl_3$)



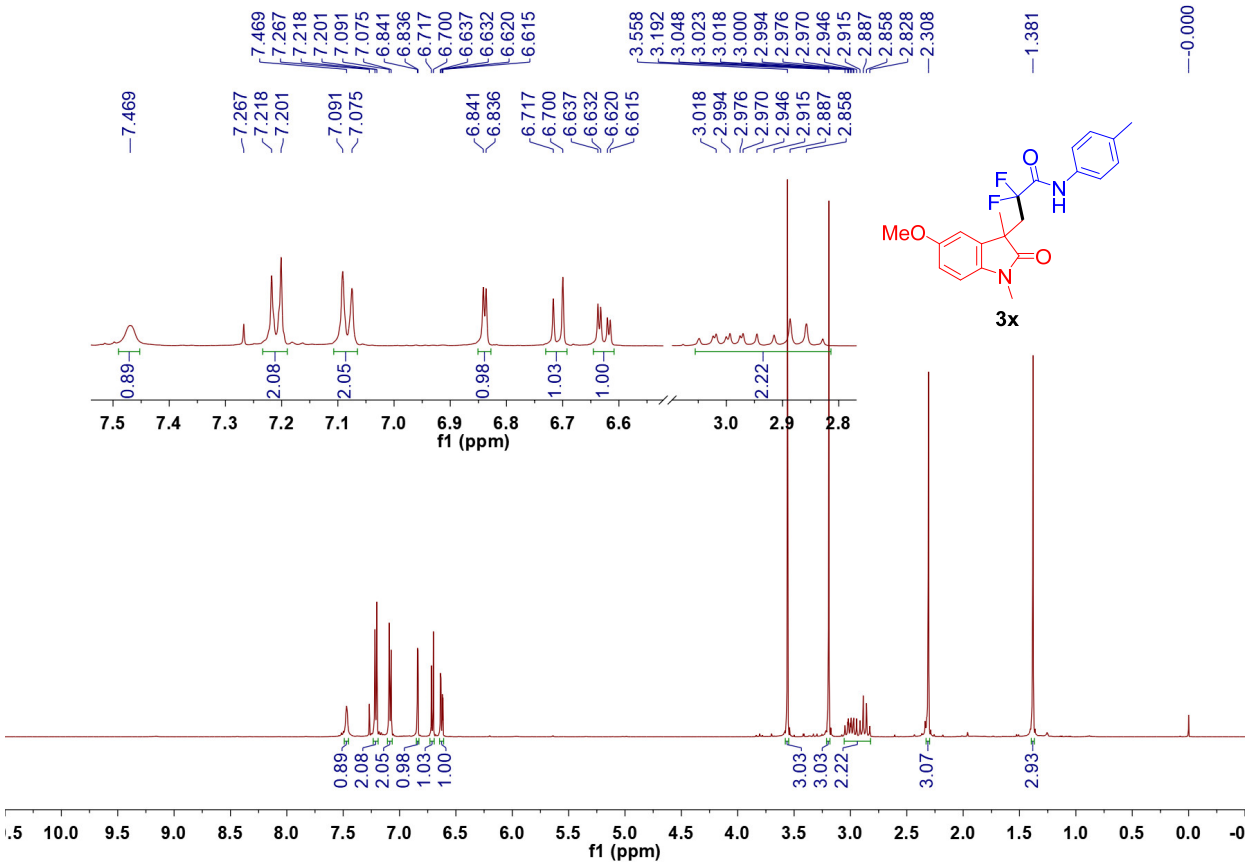
$^{13}C\{^{1}H\}$ NMR Spectra of compound **3w** (126 MHz, $CDCl_3$)



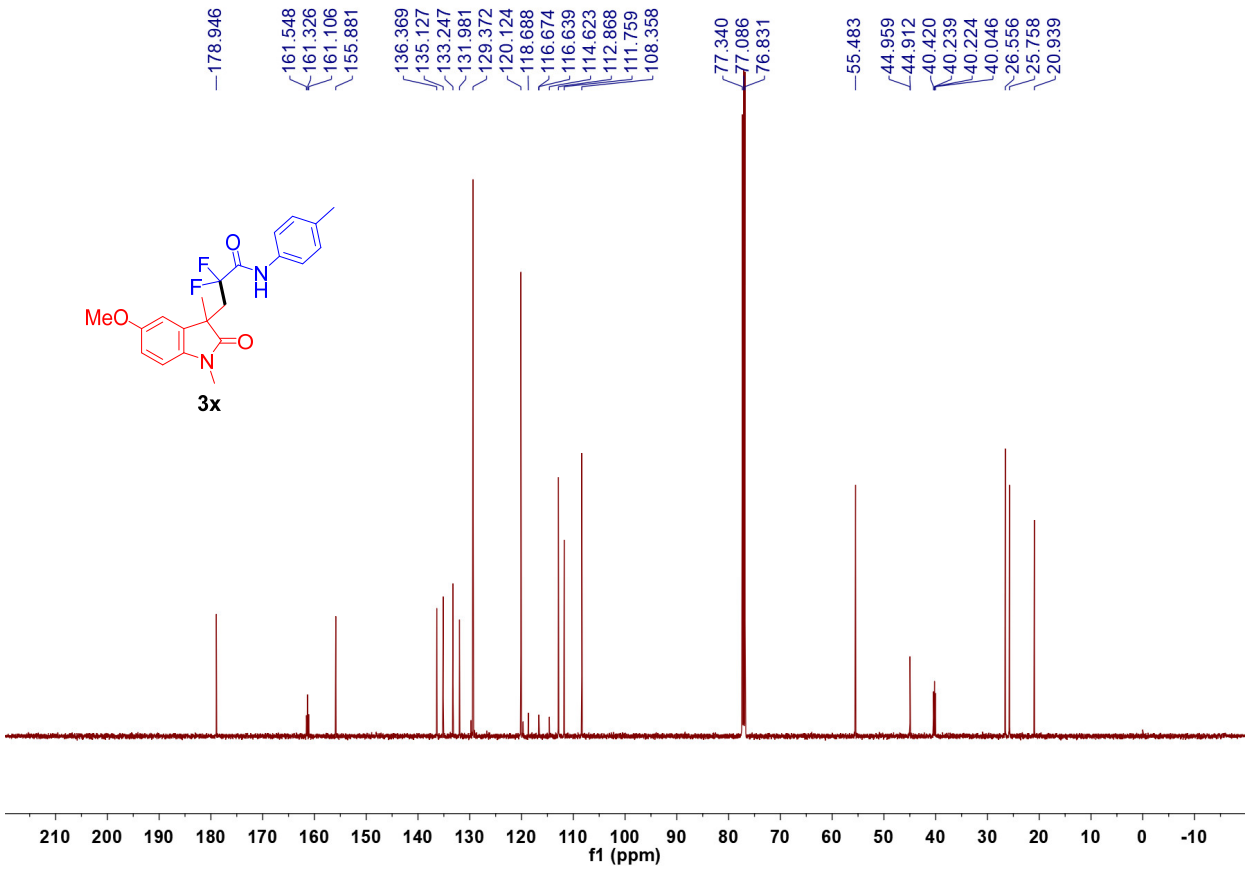
$^{19}F\{^{1}H\}$ NMR Spectra of compound **3w** (471 MHz, $CDCl_3$)



^{1}H NMR Spectra of compound **3x** (500 MHz, $CDCl_3$)



^{13}C{^{1}H} NMR Spectra of compound **3x** (126 MHz, $CDCl_3$)



$^{19}F\{^{1}H\}$ NMR Spectra of compound **3x** (471 MHz, $CDCl_3$)