Functionalized Quinolones and Isoquinolones via 1,2-Difuntionalization of Arynes: Synthesis of Antagonist Agent AS2717638 and Floxacin Key Intermediates

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1. General information

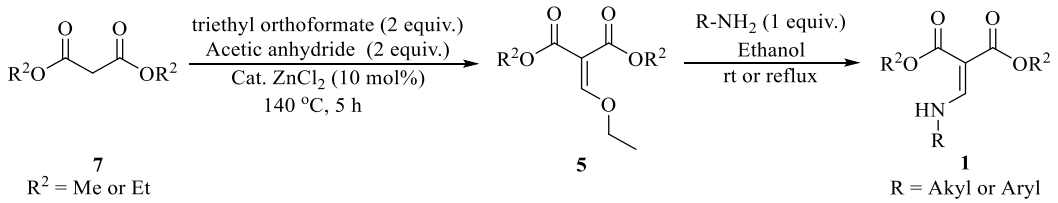
Unless otherwise specified, all reactions were performed under an inert atmosphere of argon using standard Schlenk technique. Acetonitrile (ACN) was purchased from commercial sources and freshly purified by distillation over calcium hydride and was transferred under argon. Anhydrous PhCN was purchased from commercial sources and stored under argon atmosphere. 25-30 °C corresponds to the room temperature (rt) of the lab when the experiments were performed. The *O*-silyl aryl triflate **2a** was purchased from commercial sources and all other *O*-silyl aryl triflates (**2b-2n**) were synthesized by following the literature procedure.[1] All glassware was stored in an oven or flame-dried (60-70 °C) for at least 3 h before use. Thin-layer chromatography (TLC) was performed using silica gel precoated aluminium plates which was visualized with UV light at 254 nm or under iodine. Column chromatography was performed on SiO_2 230-400 mesh. ^{1}H NMR (400 or 500 MHz), $^{13}C\{^{1}H\}$ NMR (50, 100.6 or 126 MHz) spectra were recorded on the NMR spectrometer. Deuterated chloroform was used as solvent and chemical shift values (δ) are reported in parts per million relative to the residual signals of the solvents [δ 7.27 for H (chloroform-*d*), δ 77.00 for C{H} (chloroform-*d*). Abbreviations used in the NMR experiments: br, broad; s, singlet; d, doublet; t, triplet; q, quartet; m, multiplet. High-resolution mass spectrometry (HRMS) was performed on a time-of-flight (TOF)/quadrupole-TOF mass spectrometer.

Safety considerations: Personal protecting equipment's (PPEs) such as safety goggles, apron and mask must be used while performing the reactions. For the synthesis of *O*-silyl aryl triflate n-BuLi (**CAS Number:109-72-8**) was used by taking proper safety as per SOP.

2. Experimental section

I] General procedure for the synthesis of enamine derivatives

Compound **5** and all enamine derivatives were synthesized by reported literature procedure.[2,5]



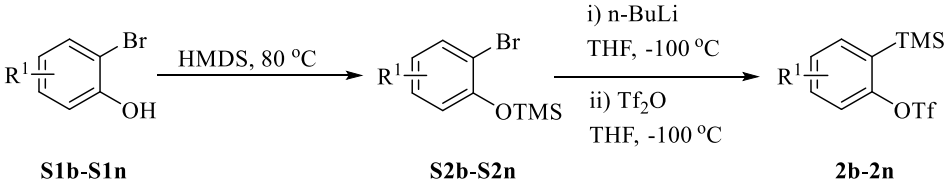
The solution of dialkyl malonate (**7**, 1 equiv.), triethyl orthoformate (2 equiv.) and acetic anhydride (2 equiv.) stirred at 140°C for 5 hours using zinc (II) chloride as catalyst. Monitor the reaction by TLC, After completion of reaction, the generated ethanol and acetic acid under evaporated under reduced pressure to obtain dialkyl 2-(ethoxymethylene)malonate (**7**) in 70-80% yield.

To a solution of aniline or amine (**6**, 1 equiv.) in ethanol (5% w/v) was added dimethyl ethoxy-methylene malonate (**5**, 1 equiv.) and stirred at room temperature or under reflux condition. After the reaction was completed, ethanol was evaporated from the reaction mixture under reduced pressure. The residue was purified by column chromatography (SiO_2), yielding the corresponding product **1a-1v** in 70-95%.

The spectral data of **5** and **1** obtained are in accordance with those described in the literature.

II] General procedure for the synthesis of *O*-silyl aryl triflates

O-silyl aryl triflates were synthesized by reported literature procedure[1].



A mixture of *O*-bromohydroxyarene **S1b-S1n** (1.0 equiv.) and HMDS (1.2-1.6 equiv.) was stirred at 80 °C for 45 min. in a flask protected with a $CaCl_2$ tube. Excess NH_3 and unreacted HMDS were then removed under vacuum and after ^1H NMR confirmation of the quantitative formation of the corresponding silyl ether, the crude product was dissolved in THF (0.15 M), the solution was cooled to -100 °C (external temperature, liquid N_2/Et_2O bath) and BuLi (1.1 equiv.) was added dropwise. The mixture was stirred for 20 min while the temperature reached -80 °C. Then the mixture was again cooled to -100 °C, Tf_2O (1.2 equiv.) was added dropwise,

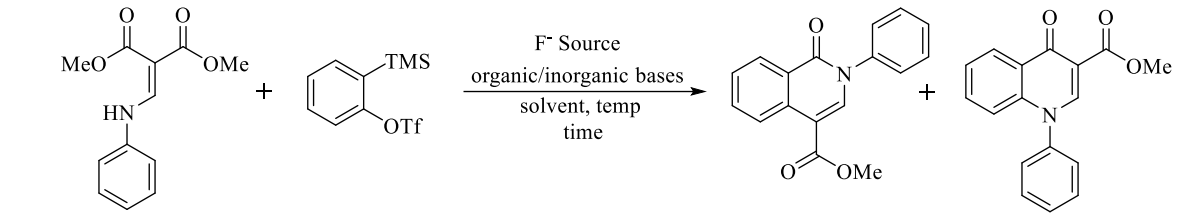
and stirring was continued for 20 min while the temperature reached to -80 °C. Cold sat. aq. $NaHCO_3$ was added, the two phases were separated and the aqueous layer was extracted with Et_2O. The combined organic layers were dried (Na_2SO_4), filtered, and concentrated under reduced pressure. Purification of the residue by column chromatography (SiO_2) afforded the corresponding triflates **2b**-**2n** in good yields.

The spectral data obtained are in accordance with those described in the literature.

III] Protocol optimization:

III-A] Optimization of the protocol for isoquinolones:

a) General procedure for the optimization of the reaction condition for isoquinolones

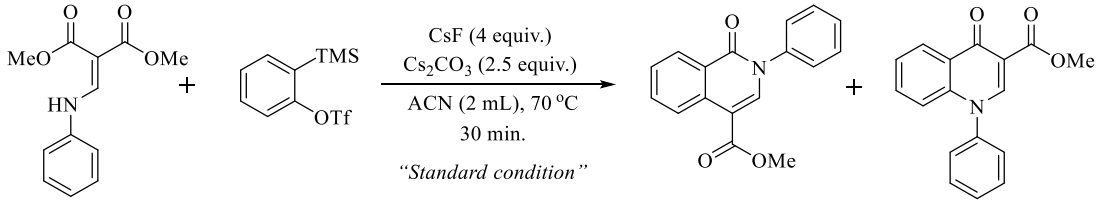


1a (0.17 mmol, 1 equiv.) **2a** (1-4 equiv.) **3a** (major) **4a** (minor)

An oven dried schlenk tube equipped with a magnetic stir bar was charged with F^- source (1-5 equiv.), and organic or inorganic base (1-4 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon atmosphere, solvent (1-5 mL) and 2-(trimethylsilyl)phenyl trifluoromethanesulfonate **2a** (1-3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of dimethyl 2-((phenylamino)methylene)malonate **1a** (40 mg, 0.17 mmol, 1 equiv.) in solvent (1-3 mL) dropwise at the same temperature and then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring at rt-80 ^oC and progress of the reaction was monitored by TLC. After completion of reaction, resultant reaction mixture was diluted with CH_2Cl_2 (5.0 mL), filtered and evaporated on a rotary evaporator. The crude product obtained were purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether (0.5:9.5) to afford the corresponding products **3a** as a major product and **4a** as a minor product.

Various permutations and combinations attempted are provided in the Table S1.

Table S1. Optimization studies for isoquinolones

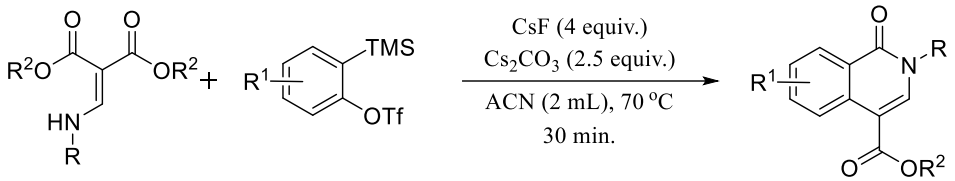


1a (0.17 mmol, 1 equiv.) **2a** (3 equiv.) **3a** (major) **4a** (minor)

Entry	Variation from the standard conditions	Yield (%) (3a)[b]
1.	None	77
2.	rt instead of 70 °C (reaction take longer time)	46
3.	50 °C instead of 70 °C (after 12 h starting remaining)	58
4.	80 °C instead of 70 °C	75
5.	K_2CO_3 instead of Cs_2CO_3	48
6.	Na_2CO_3 instead of Cs_2CO_3	30
7.	$NaHCO_3$ instead of Cs_2CO_3	20
8.	CsOAc instead of Cs_2CO_3	35
9.	Et_3N instead of Cs_2CO_3	ND
10.	DIPEA instead of Cs_2CO_3	ND
11.	Without Cs_2CO_3	trace
12.	DME instead of ACN	34
13.	PhCN instead of ACN	42
14.	THF instead of ACN	NR
15.	Toluene instead of ACN	NR
16.	DMF instead of ACN	NR
17.	ACN:Toluene (1:1) (after 8 h, 10 to 12% SM remaining)	45
18.	ACN:Toluene (2:1)[c]	60
19.	KF instead of CsF	61
20.	TBAF instead of CsF	55
21.	Without CsF	NR
22.	With 18-Crown-6	60
23.	2 equiv. of **2a** instead of 3 equiv.	56
24.	4 equiv. of **2a** instead of 3 equiv.	74
25.	2 and 3 equiv. of CsF instead of 4 equiv.	<66
26.	1 and 2 equiv. of Cs_2CO_3 instead of 2.5 equiv.	<60

[a]Standard reaction condition: **1a** (0.17 mmol), **2a** (3 equiv.), CsF (4 equiv.), Cs_2CO_3 (2.5 equiv.), ACN (2 mL), 70 °C, 30 min. [b]Isolated yields. [c]Reaction take 4 h for completion. [d]2-5% of **4a** observed in all cases.

b) General optimized procedure for the synthesis of isoquinolones.



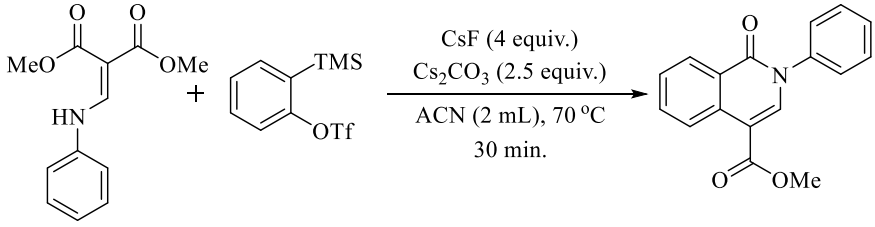
1 R = alkyl or aryl, R^2 = Me or Et

2 R^1 = akyl or aryl

3

An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (4.0 equiv.), and Cs_2CO_3 (2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon atmosphere, ACN (1 mL) and **2** (3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1** (40 mg, 1.0 equiv.) in ACN (1 mL) dropwise at the same temperature and then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 70 °C. The progress of the reaction was monitored by TLC. Upon completion, the reaction mixture was diluted with dichloromethane, filtered and evaporated on a rotary evaporator. The crude product obtained were purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether to afford the corresponding products **3** in good to excellent yields.

c) Typical procedure for the synthesis of representative product 3a



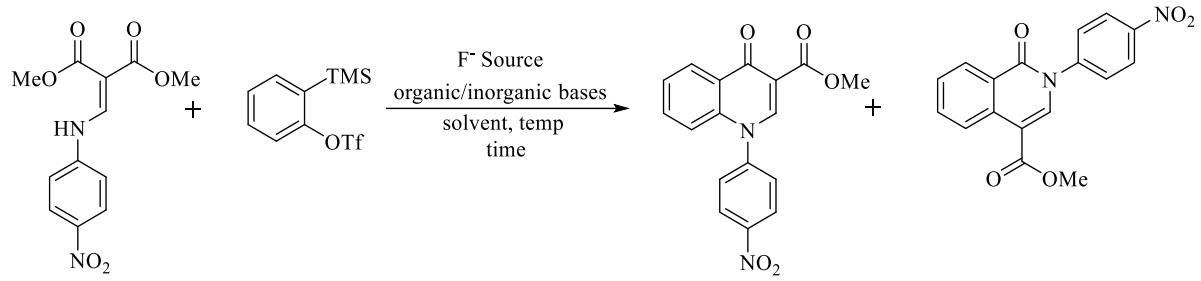
1a (0.17 mmol, 1 equiv.) **2a** (3 equiv.) **3a**

An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (103 mg, 0.68 mmol, 4.0 equiv.), and Cs_2CO_3 (138.5 mg, 0.425 mmol, 2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon atmosphere, ACN (1 mL) and **2a** (152 mg, 0.51 mmol, 3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1a** (40 mg, 0.17 mmol, 1.0 equiv.) in ACN (1 mL) dropwise at the same temperature and then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 70 °C. The progress of the reaction was monitored by TLC. The reaction was completed in 30 min. The reaction mixture was diluted with dichloromethane (5 mL),

filtered and evaporated on a rotary evaporator. The crude product obtained was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether (1:9) to afford the corresponding isoquinolone **3a** product as a white solid in 77% yield (36.6 mg).

III-B] Optimization of the protocol for quinolones:

a) General procedure for the optimization of the reaction condition for quinolones



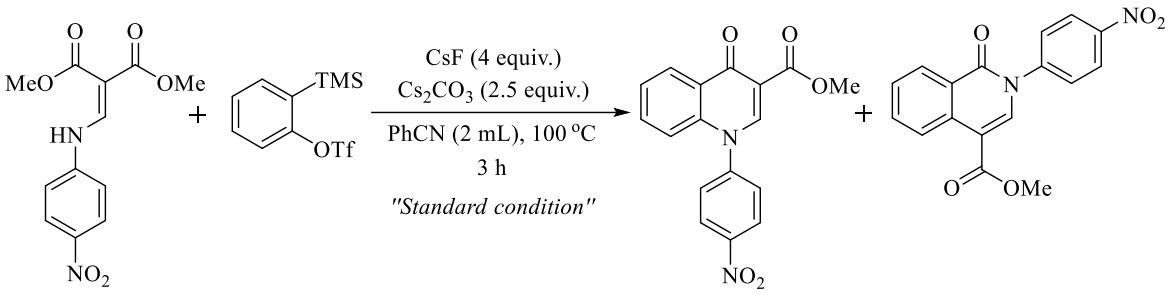
1i (0.14 mmol, 1 equiv) **2a** (3 equiv.) **4i** (major) **3i** (minor)

An oven dried schlenk tube equipped with a magnetic stir bar was charged with F^- source (1-5 equiv.), and organic or inorganic base (1-4 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon atmosphere, solvent (1-5 mL) and 2-(trimethylsilyl)phenyl trifluoromethanesulfonate **2a** (3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of dimethyl 2-(((4-nitrophenyl)amino)methylene)malonate **1i** (40 mg, 0.14 mmol, 1equiv.) at the same temperature and the schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at various temperature. The progress of the reaction was monitored by TLC. Upon completion, the resultant reaction mixture was diluted with CH_2Cl_2 (5.0 mL), filtered and evaporated on a rotary evaporator. The crude product obtained were purified by flash silica gel column chromatography using a gradient of ethyl acetate: petroleum ether: Et_3N (8:2:0.5) to afford the corresponding product **4i** as a major product and **3i** as a minor product.

Various permutations and combinations attempted are provided in the Table S2.

Note: Before loading the compound on column, silica packed column was neutralized by NEt_3:pet ether (5:95) system as eluant.

Table S2. Optimization studies for quinolones

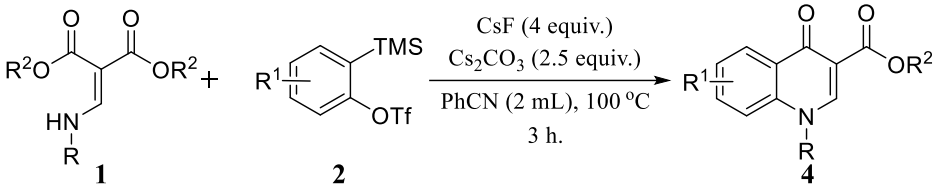


1i (0.14 mmol, 1 equiv.) **2a** (3 equiv.) **4i** (major) **3i** (minor)

entry	Variation from the standard conditions	Yield (%) (4i)[b]
1.	None	66
2.	70 °C instead of 100 °C	52
3.	120 °C instead of 100 °C	65
4.	rt instead of 70 °C (reaction take longer time)	Trace
5.	K_2CO_3 instead of Cs_2CO_3	50
6.	Na_2CO_3 instead of Cs_2CO_3	44
7.	$NaHCO_3$ instead of Cs_2CO_3	trace
8.	CsOAc instead of Cs_2CO_3	33
9.	Et_3N instead of Cs_2CO_3	Trace
10.	DIPEA instead of Cs_2CO_3	Trace
11.	Without Cs_2CO_3	Trace
12.	DME instead of PhCN	40
13.	ACN instead of PhCN	20
14.	THF instead of PhCN	NR
15.	Toluene instead of PhCN	NR
16.	DMF instead of PhCN	NR
17.	HFIP instead of PhCN	NR
18.	KF instead of CsF	52
19.	TBAF instead of CsF	45
20.	TBAT instead of CsF	20
21.	Without CsF	NR
22.	With 18-Crown-6	40

[a]Standard reaction condition: **1k** (0.14 mmol), **2a** (3 equiv.), CsF (4 equiv.), Cs_2CO_3 (2.5 equiv.), ACN (2 mL), 100 °C, 3 h. [b]Isolated yields. [c]3-6% of **3i** was observed in all the cases.

b) General optimized procedure for the synthesis of quinolones

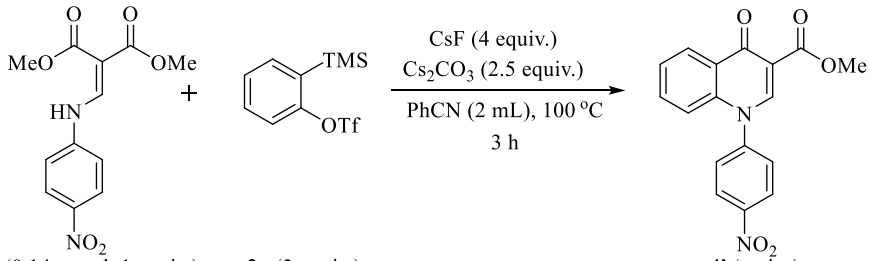


1 **2** **4**

(R = alkyl or aryl; R^2 = Me or Et; R^1 = akyl or aryl)

An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (4.0 equiv.), and Cs_2CO_3 (2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using schlenk line. Under an argon atmosphere, PhCN (2 mL) and **2** (3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1** (40 mg, 1.0 equiv.) then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 100 °C. The progress of the reaction was monitored by TLC. Upon completion, the reaction mixture was diluted with DCM, filtered and evaporated on a rotary evaporator. The crude products were purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether:Et_3N to afford the corresponding products **4** in good to excellent yields .

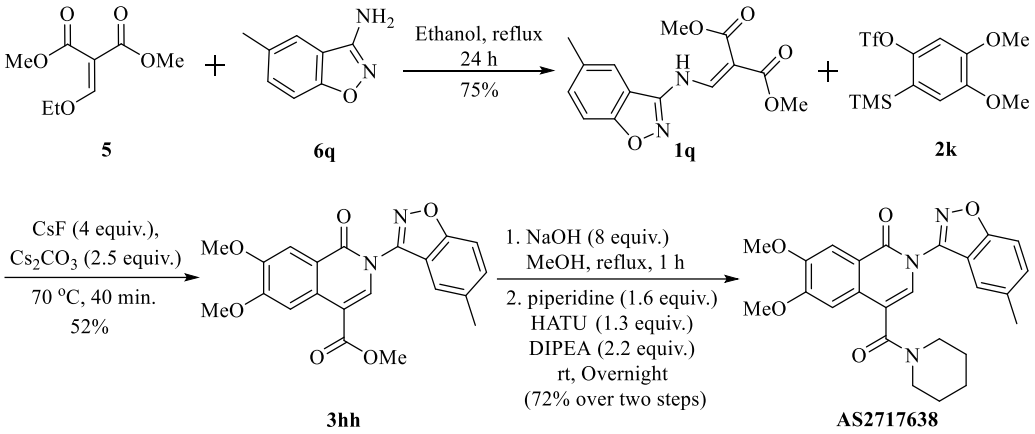
c) Typical procedure for the synthesis of representative product 4i.



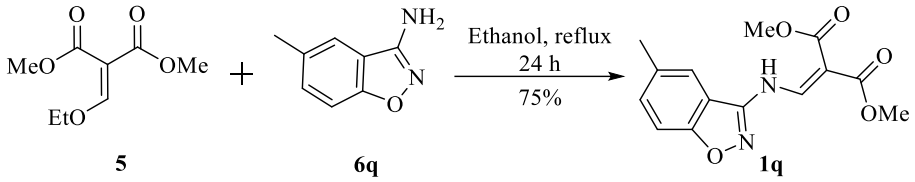
1i (0.14 mmol, 1 equiv.) **2a** (3 equiv.) **4i** (major)

An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (86.2 mg, 0.571 mmol, 4.0 equiv.), and Cs_2CO_3 (117 mg, 0.357 mmol, 2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon atmosphere, PhCN (2 mL) and **2a** (127.5 mg, 0.428 mmol, 3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1i** (40 mg, 0.142 mmol, 1.0 equiv.) then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 100 °C. The progress of the reaction was monitored by TLC. The reaction was completed after 3h. The reaction mixture was diluted with dichloromethane (5 mL), filtered and evaporated on a rotary evaporator. The crude product obtained was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether:Et_3N (8:2:0.5) to afford the corresponding product **4i** as yellowish solid in 66% yield (30.3 mg).

IV] Synthesis of AS2717638



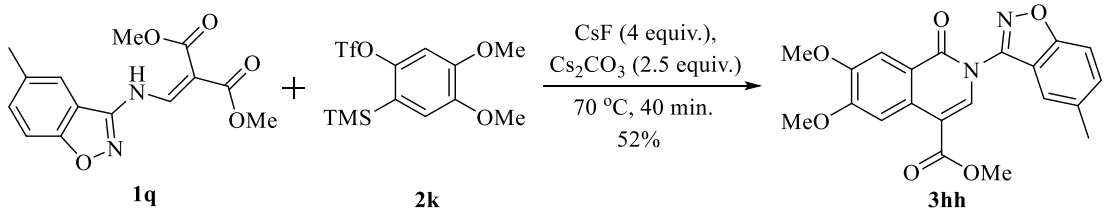
a) Procedure for the synthesis of enamine derivative 1q (Step 1)



To a solution of amine (**6q**, 200 mg, 1.35 mmol, 1 equiv.) in ethanol (5% w/v) was added dimethyl ethoxy-methylene malonate (**5**, 1.35 mmol, 1 equiv.) and stirred at reflux temperature for 24 h. After the reaction was completed, ethanol was evaporated from the reaction mixture under reduced pressure. The crude product obtained was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether (6:4) to afford the corresponding enamine **1q** as white solid in 75% yield (292 mg).

Note: The amine **6q** was synthesized according to the previously reported procedure.[3] The spectral data obtained are in accordance with those described in the literature.

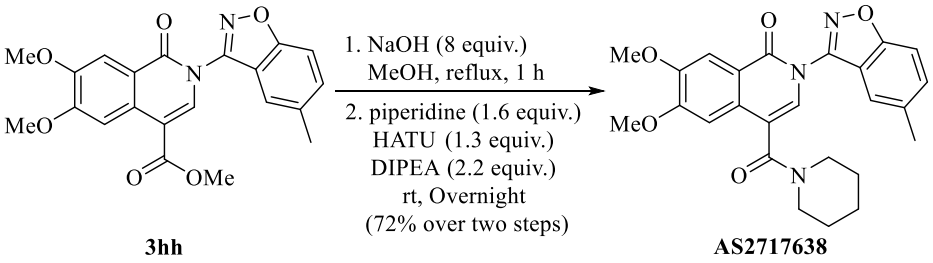
b) Procedure for the synthesis of isoquinolone 3hh (Step 2)



An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (126 mg, 0.826 mmol, 4.0 equiv.), and Cs_2CO_3 (126 mg, 0.516 mmol, 2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon

atmosphere, ACN (1.5 mL) and **2k** (186 mg, 0.620 mmol, 3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1q** (60 mg, 0.206 mmol, 1.0 equiv.) in ACN (1.5 mL) dropwise at the same temperature and then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 70 °C. The progress of the reaction was monitored by TLC. The reaction was completed in 40 min. The reaction mixture was diluted with dichloromethane (5 mL), filtered and evaporated on a rotary evaporator. The crude product obtained was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether (1:9) to afford the corresponding isoquinolone **3hh** product as a white solid in 52% yield (42 mg).

c) Procedure for the synthesis of AS2717638 (Step 3 & 4)



3hh **AS2717638**

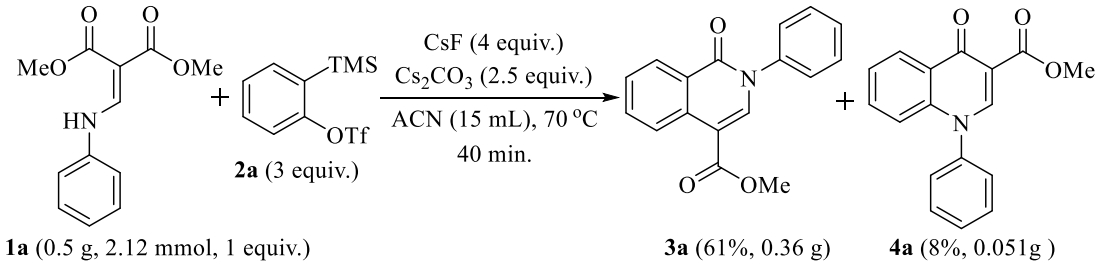
A round-bottom flask charged with compound **3hh** (30 mg, 0.076 mmol, 1 equiv.) dissolved in 2 mL of MeOH, followed by the addition of NaOH (24.3 mg, 0.609 mmol, 8 equiv.). The reaction mixture was then heated to 80 ^{o}C and stirred for 1 h. The volatile were then removed under reduced pressure and the residue was suspended in 0.5 mL of MeOH followed by the addition of water (3 mL) and acidified with 12 M aqueous HCl up to pH 2. The precipitate was then collected by filtration and dried by vacuum at 40 ^{o}C to afford crude acid that is used in the next step without further purification.

To a solution of acid (25 mg, 0.065 mmol, 1 equiv.), piperidine (9 mg, 0.105 mmol, 1.6 equiv.) and HATU (32.31 mg, 0.085 mmol, 1.3 equiv.) in DMF (0.1 M) was added DIPEA (18.70 mg, 0.145, 2.2 equiv.). The reaction mixture was then stirred overnight and the solvent was removed under reduced pressure. DCM (5 mL) and sat. $NaHCO_3$ (5 mL) were added. The organic layer was separated and dried by anhydrous magnesium sulfate. The solvent was then evaporated under reduced pressure and the residue was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether (2:8) to afford the target molecule **AS2717638** as white solid in 72% yield over two steps.

The spectral data obtained are in accordance with those described in the literature.[4]

V] Gram scale experiments:

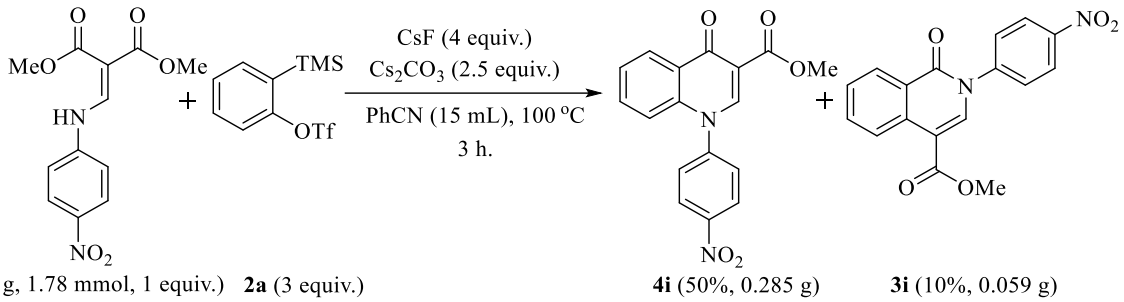
a) 0.5 Gram scale experimental procedure for the preparation of product 3a



1a (0.5 g, 2.12 mmol, 1 equiv.) **2a** (3 equiv.) **3a** (61%, 0.36 g) **4a** (8%, 0.051g)

An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (1.3 g, 8.51 mmol, 4.0 equiv.), and Cs_2CO_3 (1.72 g, 5.31 mmol, 2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using Schlenk line. Under an argon atmosphere, ACN (7 mL) and **2a** (1.901 g, 6.38 mmol, 3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1a** (0.5 g, 0.17 mmol, 1.0 equiv.) in ACN (8 mL) dropwise at the same temperature and then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 70 °C. The progress of the reaction was monitored by TLC. The reaction was completed in 30 min. The reaction mixture was diluted with dichloromethane (15 mL), filtered and evaporated on a rotary evaporator. The crude product obtained was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether (1:9) to afford the corresponding isoquinolone **3a** product as a white solid in 60% yield (0.36 g) and **4a** in 8% (0.051 g).

b) 0.5 Gram scale experimental procedure for the preparation of product 4i



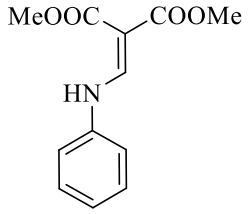
1i (0.5 g, 1.78 mmol, 1 equiv.) **2a** (3 equiv.) **4i** (50%, 0.285 g) **3i** (10%, 0.059 g)

An oven dried schlenk tube equipped with a magnetic stir bar was charged with CsF (1.07 g, 7.12 mmol, 4.0 equiv.), and Cs_2CO_3 (1.45 g, 4.45 mmol, 2.5 equiv.). The reaction vessel was evacuated and backfilled with argon for three times using schlenk line. Under an argon atmosphere, PhCN (15 mL) and **2a** (1.59 g, 5.34 mmol, 3 equiv.) were added and the resulting reaction mixture was stirred for 5 min. at room temperature, followed by the addition of **1i** (0.5 g, 1.78 mmol, 1.0 equiv.) then schlenk tube was tightly closed with the teflon stopper. The resulting mixture was kept for stirring in a preheated oil-bath at 100 °C. The progress of the reaction was monitored by TLC. The reaction was completed in 30 min. The reaction mixture was diluted with dichloromethane (15 mL), filtered and evaporated on a rotary evaporator. The crude product obtained was purified by flash silica gel column chromatography using a gradient of ethyl acetate:petroleum ether:Et_3N (8:2:0.5) to afford the corresponding products **4i** as yellowish solid in 50% yield (0.285 g) and **3i** in 10% (0.059 g).

3. Characterization data

I] Characterization data for enamine derivatives

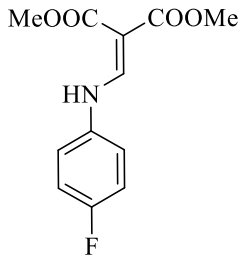
Dimethyl 2-((phenylamino)methylene)malonate (**1a**)



1a

White solid, m.p.: 48-50 ^{o}C, 89% (674 mg) isolated yield, R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 11.03 (d, *J* = 13.4 Hz, 1 H), 8.54 (d, *J* = 13.4 Hz, 1 H), 7.41 - 7.32 (m, 2 H), 7.18 - 7.09 (m, 3 H), 3.85 (s, 3 H), 3.77 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.3, 165.8, 152.2, 139.0, 129.7, 125.0, 117.2, 92.7, 51.5, 51.3. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{14}O_4N$ $[M+H]^+$: 236.0917, found: 236.0909. Known compound.[5]

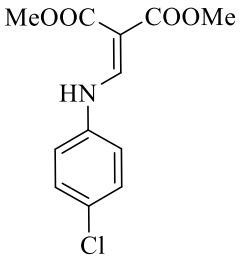
Dimethyl 2-(((4-fluorophenyl)amino)methylene)malonate (**1b**)



1b

White solid, m.p.: 88-90 ^{o}C, 85% (581 mg) isolated yield, R_f = 0.3 (1:9, EtOc : pet.ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 11.04 (d, *J* = 13.3 Hz, 1 H), 8.44 (d, *J* = 13.3 Hz, 1 H), 7.15 - 7.04 (m, 4 H), 3.85 (s, 3 H), 3.77 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.4, 165.8, 160.3 (d, *J* = 244.9 Hz), 152.7, 135.4 (d, *J* = 2.3 Hz), 118.5 (d, *J* = 224.3 Hz), 116.5 (d, *J* = 238.8 Hz), 92.9, 51.6, 51.4. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{13}O_4NF$ $[M+H]^+$: 254.0823, found: 254.0832. Known compound.[5]

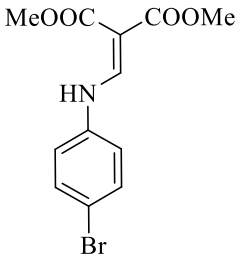
Dimethyl 2-(((4-chlorophenyl)amino)methylene)malonate (**1c**)



1c

White solid, m.p.: 96-98 °C, 82% (520 mg) isolated yield, R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.03 (d, *J* = 13.3 Hz, 1 H), 8.47 (d, *J* = 13.3 Hz, 1 H), 7.38 (d, *J* = 8.6 Hz, 2 H), 7.11 (d, *J* = 8.6 Hz, 2 H), 3.85 (s, 3 H), 3.78 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.3, 165.7, 151.9, 137.7, 130.3, 129.9, 118.4, 93.5, 51.6, 51.5. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{13}O_4N^{35}Cl$ $[M+H]^+$: 270.0528, found: 270.0525. Known compound.[5]

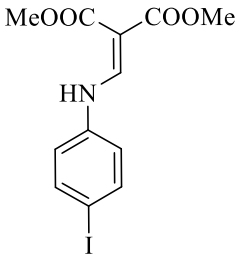
Dimethyl 2-(((4-bromophenyl)amino)methylene)malonate (**1d**)



1d

White solid, m.p.: 107-109 °C, 86% (471 mg) isolated yield, R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.02 (d, *J* = 13.6 Hz, 1 H), 8.47 (d, *J* = 13.6 Hz, 1 H), 7.48 (br s, 2 H), 7.02 (br s, 2 H), 3.86 (br s, 3 H), 3.78 (br s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.2, 165.7, 151.7, 138.2, 132.8, 118.7, 117.8, 93.6, 51.7, 51.5. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{13}O_4N^{79}Br$ $[M+H]^+$: 314.0022, found: 314.0033. Known compound.[5]

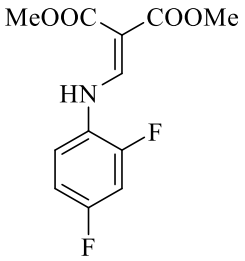
Dimethyl 2-(((4-iodophenyl)amino)methylene)malonate (**1e**)



1e

White solid, m.p.: 122-124 °C, 84% (415 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 10.99 (d, *J* = 13.4 Hz, 1 H), 8.46 (d, *J* = 13.4 Hz, 1 H), 7.61 (d, *J* = 8.5 Hz, 2 H), 6.85 (d, *J* = 8.6 Hz, 2 H), 3.84 (s, 3 H), 3.77 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.2, 165.6, 151.5, 138.8, 138.7, 118.9, 93.6, 88.1, 51.6, 51.5. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{13}O_4NI$ $[M+H]^+$: 361.9884, found: 361.9877.

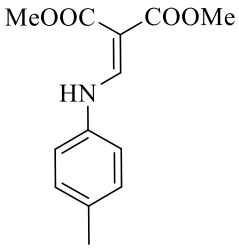
Dimethyl 2-(((2,4-difluorophenyl)amino)methylene)malonate (**1f**)



1f

White solid, m.p.: 133-135 °C, 88% (554 mg) isolated yield, R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.07 (d, *J* = 13.1 Hz, 1 H), 8.44 (d, *J* = 13.1 Hz, 1 H), 7.33 - 7.21 (m, 1 H), 7.02 - 6.86 (m, 2 H), 3.87 (s, 3 H), 3.78 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.0, 165.7, 159.7 (dd, *J* = 247.2, 10.7 Hz), 152.8 (dd, *J* = 249.5, 12.2 Hz), 151.8, 124.5 (d, *J* = 11.2, 3.8 Hz), 117.6 (d, *J* = 12.2, 9.9 Hz), 112.0 (dd, *J* = 19.1, 3.8 Hz), 105.0 (d, *J* = 26.7, 22.1 Hz), 94.4, 51.7, 51.6. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{12}O_4NF_2$ $[M+H]^+$: 272.0729, found: 272.0729. Known compound.[5]

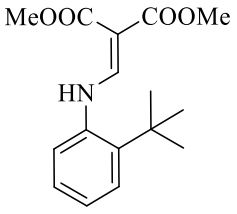
Dimethyl 2-((p-tolylamino)methylene)malonate (**1g**)



1g

White solid, m.p.: 70-72 °C, 83% (579 mg) isolated yield, R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.02 (d, *J* = 13.6 Hz, 1 H), 8.52 (d, *J* = 13.6 Hz, 1 H), 7.18 (d, *J* = 1.0 Hz, 2 H), 7.05 (d, *J* = 1.0 Hz, 2 H), 3.86 (s, 3 H), 3.78 (s, 3 H), 2.34 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.4, 166.0, 152.5, 136.7, 134.9, 130.3, 117.2, 92.2, 51.5, 51.4, 20.8. **HRMS** (ESI-TOF) m/z calcd for $C_{13}H_{16}O_4N$ $[M+H]^+$: 250.1074, found: 250.1068. Known compound.[5]

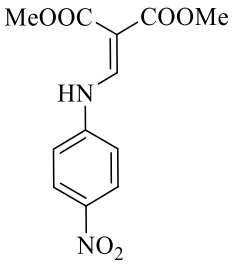
Dimethyl 2-(((2-(tert-butyl)phenyl)amino)methylene)malonate (**1h**)



1h

White solid, m.p.: 66-68 °C, 83% (486 mg) isolated yield, R_f = 0.28 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.25 (d, *J* = 13.0 Hz, 1 H), 8.40 (d, *J* = 13.0 Hz, 1 H), 7.43 (dd, *J* = 1.3, 7.9 Hz, 1 H), 7.32 - 7.27 (m, 1 H), 7.23 - 7.15 (m, 2 H), 3.88 (s, 3 H), 3.77 (s, 3 H), 1.47 (s, 9 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.4, 166.1, 154.9, 141.2, 138.5, 127.5, 127.0, 126.1, 121.4, 92.7, 51.6, 51.3, 34.5, 30.3. **HRMS** (ESI-TOF) m/z calcd for $C_{16}H_{22}O_4N$ $[M+H]^+$: 292.1543, found: 292.1544.

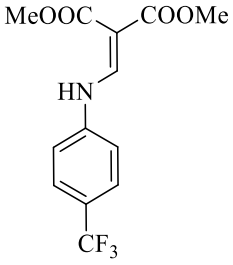
Dimethyl 2-(((4-nitrophenyl)amino)methylene)malonate (**1i**)



1i

Yellow solid, m.p.: 154-156 °C, 79% (481 mg) isolated yield, R_f = 0.3 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.21 (d, *J* = 13.1 Hz, 1 H), 8.52 (d, *J* = 13.1 Hz, 1 H), 8.26 (d, *J* = 1.0 Hz, 2 H), 7.23 (d, *J* = 1.0 Hz, 2 H), 3.87 (s, 3 H), 3.80 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 168.8, 165.2, 150.1, 144.3, 144.0, 125.9, 116.4, 96.5, 52.0, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{12}H_{13}O_6N_2$ $[M+H]^+$: 281.0768 found: 281.0775. Known compound.[5]

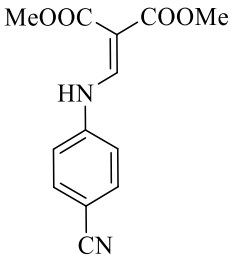
Dimethyl 2-(((4-(trifluoromethyl)phenyl)amino)methylene)malonate (**1j**)



1j

White solid, m.p.: 99-101 °C, 75% (423 mg) isolated yield, R_f = 0.3 (2:8, EtOAc : pet. ether). **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.11 (d, *J* = 13.3 Hz, 1 H), 8.54 (d, *J* = 13.3 Hz, 1 H), 7.66 (d, *J* = 8.4 Hz, 2 H), 7.22 (d, *J* = 8.4 Hz, 2 H), 3.86 (s, 3 H), 3.80 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.1, 165.5, 151.2, 141.9, 127.1 (q, *J* = 3.1, 3.8 Hz), 126.7 (q, *J* = 33.6, 66.4 Hz), 126.7 (q, *J* = 271.6 Hz), 116.8, 94.8, 51.8, 51.6. **HRMS** (ESI-TOF) m/z calcd for $C_{13}H_{13}O_4NF_3$ $[M+H]^+$: 304.0791 found: 304.0784.

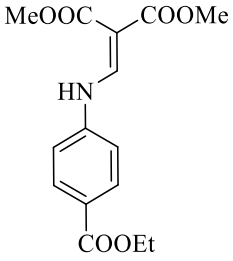
Dimethyl 2-(((4-cyanophenyl)amino)methylene)malonate (**1k**)



1k

White solid, m.p.: 172-174 ^{o}C, 82% (542 mg) isolated yield, R_f = 0.3 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 11.13 (d, *J* = 13.0 Hz, 1 H), 8.50 (d, *J* = 13.0 Hz, 1 H), 7.67 (d, *J* = 8.76 Hz, 2 H), 7.21 (d, *J* = 8.63 Hz, 2 H), 3.87 (s, 3 H), 3.80 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 168.9, 165.3, 150.3, 142.6, 134.0, 118.3, 117.0, 107.7, 95.8, 51.8, 51.7. **HRMS** (ESI-TOF) m/z calcd for $C_{13}H_{13}O_4N_2$ $[M+H]^+$: 261.0870, found: 261.0868.

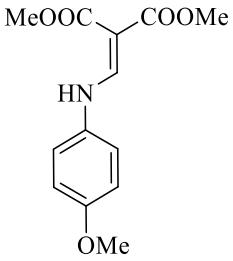
Dimethyl 2-(((4-(ethoxycarbonyl)phenyl)amino)methylene)malonate (**1l**)



1l

White solid, m.p.: 110-112 ^{o}C, 89% (498 mg) isolated yield, R_f = 0.35 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 11.11 (d, *J* = 13.5 Hz, 1 H), 8.55 (d, *J* = 13.5 Hz, 1 H), 8.05 (d, *J* = 8.6 Hz, 2 H), 7.16 (d, *J* = 8.6 Hz, 2 H), 4.36 (q, *J* = 7.1 Hz, 2 H), 3.85 (s, 3 H), 3.79 (s, 3 H), 1.38 (t, *J* = 7.1 Hz, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.0, 165.6, 165.5, 151.0, 142.6, 131.5, 126.7, 116.3, 94.6, 61.0, 51.7, 51.6, 14.3. **HRMS** (ESI-TOF) m/z calcd for $C_{15}H_{18}O_6N$ $[M+H]^+$: 308.1129, found: 308.1131.

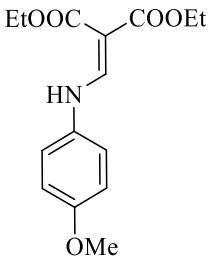
Dimethyl 2-(((4-methoxyphenyl)amino)methylene)malonate (**1m**)



1m

White solid, m.p.: 76-78 ^{o}C, 88% (568 mg) isolated yield, R_f = 0.35 (2:8, EtOAc : pet. ether). **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 11.01 (d, *J* = 13.5 Hz, 1 H), 8.45 (d, *J* = 13.5 Hz, 1 H), 7.08 (d, *J* = 9.0 Hz, 2 H), 6.80 (d, *J* = 9.0 Hz, 2 H), 3.85 (s, 3 H), 3.81 (s, 3 H), 3.77 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.5, 166.1, 157.3, 153.0, 132.6, 118.9, 115.0, 91.8, 55.5, 51.5, 51.3. **HRMS** (ESI-TOF) m/z calcd for $C_{13}H_{16}O_5N$ $[M+H]^+$: 266.1023, found: 266.1020. Known compound.[5]

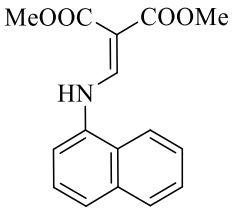
Diethyl 2-(((4-methoxyphenyl)amino)methylene)malonate (**1n**)



1n

Semisolid, 86% (614 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 10.95 (d, *J* = 13.8 Hz, 1 H), 8.40 (d, *J* = 13.8 Hz, 1 H), 7.04 (d, *J* = 8.9 Hz, 2 H), 6.87 (d, *J* = 8.9 Hz, 2 H), 4.27 (q, *J* = 7.0 Hz, 2 H), 4.21 (q, *J* = 7.0 Hz, 2 H), 3.76 (s, 3 H), 1.35 (t, *J* = 7.0 Hz, 3 H), 1.29 (t, *J* = 7.0 Hz, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.0, 165.7, 157.0, 152.5, 132.6, 118.6, 114.8, 92.3, 60.1, 59.8, 55.4, 14.3, 14.2. **HRMS** (ESI-TOF) m/z calcd for $C_{15}H_{20}O_5N$ $[M+H]^+$: 294.1336, found: 294.1334. Known compound.[5]

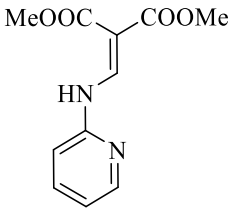
Dimethyl 2-((naphthalen-1-ylamino)methylene)malonate (**1o**)



1o

White solid, m.p.: 133-135 ºC, 83% (496 mg) isolated yield, R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.80 (d, *J* = 13.0 Hz, 1 H), 8.66 (d, *J* = 13.0 Hz, 1 H), 8.01 (d, *J* = 8.0 Hz, 1 H), 7.87 (d, *J* = 7.6 Hz, 1 H), 7.68 (d, *J* = 8.0 Hz, 1 H), 7.63 - 7.51 (m, 2 H), 7.49 - 7.40 (m, 1 H), 7.33 (d, *J* = 6.5 Hz, 1 H), 3.93 (s, 3 H), 3.81 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.7, 165.8, 153.7, 135.3, 134.1, 128.5, 126.9, 126.7, 125.6, 125.6, 125.3, 120.4, 113.2, 93.5, 51.7, 51.4. **HRMS** (ESI-TOF) m/z calcd for $C_{16}H_{16}O_4N$ $[M+H]^+$: 286.1074, found: 286.1061.

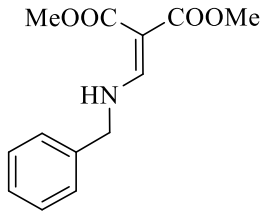
Dimethyl 2-((pyridin-2-ylamino)methylene)malonate (**1p**)



1p

White solid, m.p.: 70-72 ºC, 81% (609 mg) isolated yield, R_f = 0.2 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 11.11 (d, *J* = 12.4 Hz, 1 H), 9.20 (d, *J* = 12.4 Hz, 1 H), 8.35 (d, *J* = 4.6 Hz, 1 H), 7.69 - 7.62 (m, 1 H), 7.04 (dd, *J* = 5.3, 6.9 Hz, 1 H), 6.87 (d, *J* = 8.1 Hz, 1 H), 3.86 (s, 3 H), 3.78 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.2, 165.6, 150.5, 150.1, 148.7, 138.6, 119.7, 112.0, 94.8, 51.7, 51.4. **HRMS** (ESI-TOF) m/z calcd for $C_{11}H_{13}O_4N_2$ $[M+H]^+$: 237.0870, found: 237.0871.

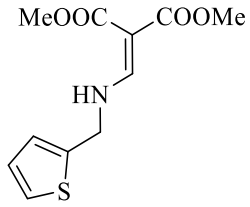
Dimethyl 2-((benzylamino)methylene)malonate (**1r**)



1r

White solid, m.p.: 138-140 °C, 80%, (558 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.50 (br s, 1 H), 8.13 (d, *J* = 14.1 Hz, 1 H), 7.42 - 7.29 (m, 3 H), 7.25 (d, *J* = 7.1 Hz, 2 H), 4.52 (d, *J* = 6.0 Hz, 2 H), 3.78 (s, 3 H), 3.72 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.5, 166.3, 160.1, 136.4, 129.0, 128.1, 127.2, 89.7, 53.4, 51.2, 51.1. **HRMS** (ESI-TOF) m/z calcd for $C_{13}H_{16}O_4N$ $[M+H]^+$: 250.1074, found: 250.1077. Known compound.[5]

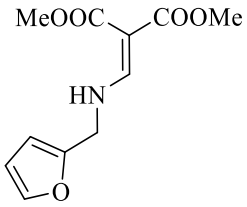
Dimethyl 2-(((thiophen-2-ylmethyl)amino)methylene)malonate (**1s**)



1s

Yellowish solid, m.p.: 92-94 °C, 90% (609 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether). **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.47 (br s, 1 H), 8.10 (d, *J* = 14.0 Hz, 1 H), 7.32 - 7.27 (m, 1 H), 7.02 - 6.93 (m, 2 H), 4.67 (d, *J* = 5.9 Hz, 2 H), 3.78 (s, 3 H), 3.72 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.4, 166.2, 159.4, 139.0, 127.2, 126.3, 126.0, 90.1, 51.2, 51.1, 47.9. **HRMS** (ESI-TOF) m/z calcd for $C_{11}H_{14}O_4NS$ $[M+H]^+$: 256.0638, found: 256.0638.

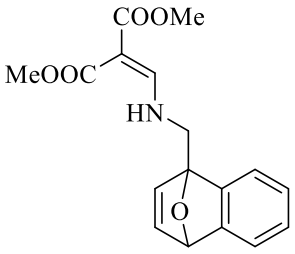
Dimethyl 2-(((furan-2-ylmethyl)amino)methylene)malonate (**1t**)



1t

White solid, m.p.: 94-96 ^{o}C, 85% (628 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.37 (br s, 1 H), 8.09 (d, *J* = 14.0 Hz, 1 H), 7.53 - 7.28 (m, 1 H), 6.33 (dd, *J* = 1.9, 3.1 Hz, 1 H), 6.27 (d, *J* = 3.3 Hz, 1 H), 4.46 (d, *J* = 5.9 Hz, 2 H), 3.77 (s, 3 H), 3.71 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.4, 166.2, 159.8, 149.5, 143.1, 110.5, 108.4, 90.1, 51.2, 51.1, 45.9. **HRMS** (ESI-TOF) m/z calcd for $C_{11}H_{14}O_5N$ $[M+H]^+$: 240.0866, found: 240.0867.

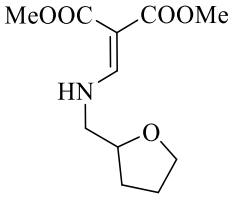
Dimethyl 2-(((1,4-epoxynaphthalen-1(4H)-ylmethyl)amino)methylene)malonate (**1ta**)



1ta

White solid, *insitu* formation, m.p.: 130-132 ^{o}C, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.77 - 9.61 (m, 1 H), 8.42 (d, *J* = 14.0 Hz, 1 H), 7.51 - 7.46 (m, 1 H), 7.40 - 7.33 (m, 2 H), 7.27 - 7.20 (m, 2 H), 7.05 (d, *J* = 5.5 Hz, 1 H), 5.97 (s, 1 H), 4.47 (dq, *J* = 6.1, 14.9 Hz, 2 H), 4.01 (s, 3 H), 3.96 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.3, 166.2, 160.6, 150.2, 147.5, 146.0, 141.4, 125.4, 125.1, 120.5, 118.8, 91.4, 90.3, 82.1, 51.2, 51.1, 48.3. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{18}O_5N$ $[M+H]^+$: 316.1179, found: 316.1184.

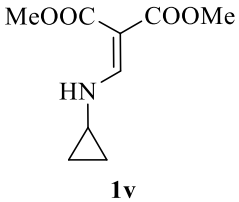
Dimethyl 2-((((tetrahydrofuran-2-yl)methyl)amino)methylene)malonate (**1u**)



1u

Yellowish solid, m.p.: 62-64 ºC, 82% (591.62 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.33 (d, *J* = 14.0 Hz, 1 H), 8.03 (d, *J* = 14.3 Hz, 1 H), 3.99 (dq, *J* = 3.9, 6.7 Hz, 1 H), 3.88 (td, *J* = 6.6, 8.4 Hz, 1 H), 3.81 - 3.73 (m, 4 H), 3.71 (s, 3 H), 3.48 (ddd, *J* = 3.8, 6.3, 13.7 Hz, 1 H), 3.32 (td, *J* = 6.1, 13.6 Hz, 1 H), 2.06 - 1.95 (m, 1 H), 1.90 (quin, *J* = 7.0 Hz, 2 H), 1.57 (qd, *J* = 7.5, 12.0 Hz, 1 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.5, 166.4, 160.7, 89.3, 77.4, 68.5, 53.4, 51.2, 51.1, 28.4, 25.9. **HRMS** (ESI-TOF) m/z calcd for $C_{11}H_{18}O_5N$ $[M+H]^+$: 244.1179, found: 244.1180.

Dimethyl 2-((cyclopropylamino)methylene)malonate (**1v**)

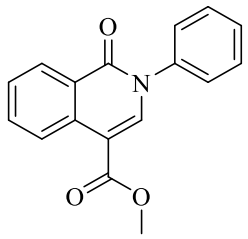


1v

Colourless liquid, 75% (784 mg) isolated yield, R_f = 0.32 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.27 (d, *J* = 10.9 Hz, 1 H), 8.12 (d, *J* = 14.0 Hz, 1 H), 3.77 (s, 3 H), 3.72 (s, 3 H), 2.91-2.74 (m, 1 H), 0.86 - 0.79 (m, 2 H), 0.77 - 0.70 (m, 2 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 169.4, 166.2, 160.6, 89.8, 51.2, 51.1, 29.7, 6.5. **HRMS** (ESI-TOF) m/z calcd for $C_9H_{14}O_4N$ $[M+H]^+$: 200.0917, found: 200.0913.

II] Characterization data for isoquinolone derivatives

Methyl 1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3a**)

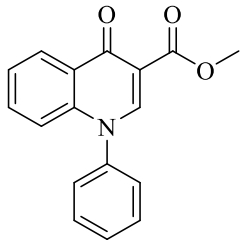


3a

White solid, m.p.: 162-164 ^{o}C, 77% (36 mg) isolated yield, R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.4 Hz, 1 H), 8.50 (dd, *J* = 1.1, 8.1 Hz, 1 H), 8.25 (s, 1 H), 7.78 (ddd, *J* = 1.5, 7.1, 8.4 Hz, 1 H), 7.60 - 7.51 (m, 3 H), 7.50 - 7.42 (m, 3 H), 3.89 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.5, 161.9, 140.5, 140.1, 134.2, 133.3, 129.4, 128.6, 128.4, 127.5, 126.7, 125.6, 125.3, 106.8, 51.7. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{14}O_3N$ $[M+H]^+$: 280.0968, found: 280.0966. Known compound.[6]

Along with **3a** we also observed 4% of **4a**.

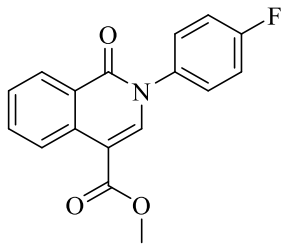
Methyl 4-oxo-1-phenyl-1,4-dihydroquinoline-3-carboxylate (**4a**)



4a

White solid, m.p.: 222-224 ^{o}C, 4% (1.6 mg) isolated yield, R_f = 0.25 (8:2, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.60 - 8.54 (m, 2 H), 7.67 - 7.60 (m, 3 H), 7.53 (dt, *J* = 1.6, 7.8 Hz, 1 H), 7.44 (tt, *J* = 2.2, 4.8 Hz, 3 H), 7.00 (d, *J* = 8.4 Hz, 1 H), 3.93 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 174.4, 166.3, 148.9, 140.6, 140.6, 132.4, 130.4, 130.0, 128.4, 127.5, 127.3, 125.3, 117.6, 111.0, 52.1. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{14}O_3N$ $[M+H]^+$: 280.0968, found: 280.0976. Known compound.[7]

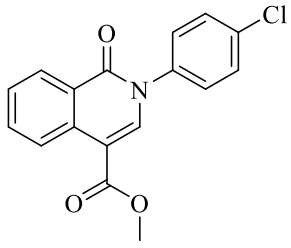
Methyl 2-(4-fluorophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3b**)



3b

White solid, m.p.: 92-94 ºC, 71% (33.4 mg) isolated yield, R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.86 (d, *J* = 8.4 Hz, 1 H), 8.49 (dd, *J* = 0.9, 8.1 Hz, 1 H), 8.21 (s, 1 H), 7.80 (ddd, *J* = 1.4, 7.1, 8.4 Hz, 1 H), 7.61 - 7.56 (m, 1 H), 7.47 - 7.41 (m, 2 H), 7.26 - 7.20 (m, 2 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$):** δ ppm 165.4, 163.3, 162.0, 161.4, 140.0, 136.5, 134.3, 133.6, 128.5, 127.7, 127.3 (d, *J* = 391 Hz), 127.2 (d, *J* = 395.8 Hz), 116.5 (d, *J* = 23.8 Hz), 107.1, 51.9 **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_3NF$ $[M+H]^+$: 298.0874, found: 298.0868.

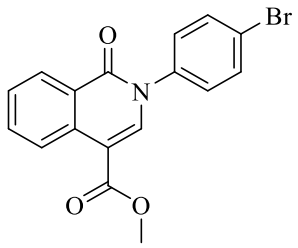
Methyl 2-(4-chlorophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3c**)



3c

White solid, m.p.: 136-138 ºC, 70% (32.5 mg) isolated yield, R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (500 MHz, $CDCl_3$):** δ ppm 8.86 (d, *J* = 8.4 Hz, 1 H), 8.49 (d, *J* = 7.5 Hz, 1 H), 8.20 (s, 1 H), 7.83 - 7.77 (m, 1 H), 7.59 (t, *J* = 7.4 Hz, 1 H), 7.52 (d, *J* = 8.8 Hz, 2 H), 7.41 (d, *J* = 8.8 Hz, 2 H), 3.92 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.4, 161.8, 139.6, 138.9, 134.7, 134.2, 133.6, 129.6, 128.5, 128.1, 127.7, 125.6, 125.5, 107.3, 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_3N^{35}Cl$ $[M+H]^+$: 314.0578, found: 314.0591. Known compound.[6]

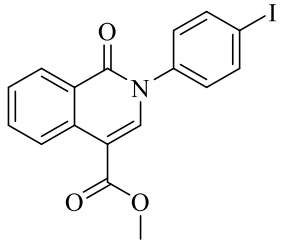
Methyl 2-(4-bromophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3d**)



3d

White solid, m.p.: 154-156 ^{o}C, 67% (30.5 mg) isolated yield, R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.3 Hz, 1 H), 8.49 (d, *J* = 8.0 Hz, 1 H), 8.20 (s, 1 H), 7.80 (t, *J* = 7.7 Hz, 1 H), 7.68 (d, *J* = 8.5 Hz, 2 H), 7.59 (t, *J* = 7.6 Hz, 1 H), 7.35 (d, *J* = 8.5 Hz, 2 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.4, 161.7, 139.5, 139.4, 134.2, 133.6, 132.6, 128.5, 128.4, 127.7, 125.6, 125.5, 122.7, 107.3, 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_3N^{79}Br$ $[M+H]^+$: 358.0073, found: 358.0071.

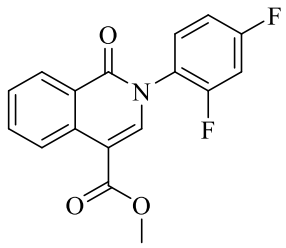
Methyl 2-(4-iodophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3e**)



3e

White solid, m.p.: 136-138 ^{o}C, 60% (27 mg) isolated yield, R_f = 0.33 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.4 Hz, 1 H), 8.49 (d, *J* = 8.1 Hz, 1 H), 8.20 (s, 1 H), 7.88 (d, *J* = 8.4 Hz, 2 H), 7.83 - 7.78 (m, 1 H), 7.59 (t, *J* = 7.6 Hz, 1 H), 7.22 (d, *J* = 8.5 Hz, 2 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.4, 161.7, 140.2, 139.5, 138.7, 134.2, 133.6, 128.6, 128.5, 127.8, 125.6, 125.5, 107.4, 94.2, 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_3NI$ $[M+H]^+$: 405.9935, found: 405.9930.

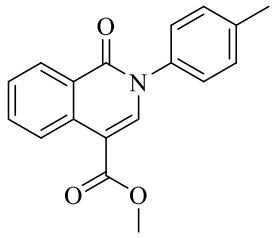
Methyl 2-(2,4-difluorophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3f**)



3f

White solid, m.p.: 116-118 ºC, 87% (40.5 mg) isolated yield, R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.4 Hz, 1 H), 8.48 (d, *J* = 8.0 Hz, 1 H), 8.11 (s, 1 H), 7.81 (t, *J* = 7.8 Hz, 1 H), 7.59 (t, *J* = 7.6 Hz, 1 H), 7.47 - 7.40 (m, 1 H), 7.06 (t, *J* = 8.1 Hz, 2 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.3, 162.9 (dd, *J* = 252.5, 11.4 Hz), 161.5, 157.7 (dd, *J* = 255.6, 13 Hz), 139.8, 134.2, 133.7, 130.0 (dd, *J* = 10.7, 3.8 Hz), 128.5, 127.8, 125.6, 125.4, 124.34 (dd, *J* = 13, 3.8 Hz), 112.13 (dd, *J* = 18.3, 3.8 Hz), 107.5, 105.51 (dd, *J* = 23.7, 3.0 Hz), 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{12}O_3NF_2$ $[M+H]^+$: 316.0780, found: 316.0789.

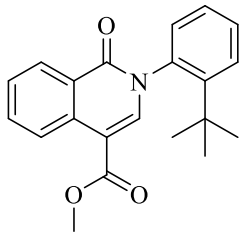
Methyl 1-oxo-2-(p-tolyl)-1,2-dihydroisoquinoline-4-carboxylate (**3g**)



3g

White solid, m.p.: 152-154 ºC, 73% (34.5 mg) isolated yield, R_f = 0.31 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.3 Hz, 1 H), 8.50 (d, *J* = 7.9 Hz, 1 H), 8.24 (s, 1 H), 7.78 (t, *J* = 7.6 Hz, 1 H), 7.56 (t, *J* = 7.5 Hz, 1 H), 7.33 (br. s, 4 H), 3.90 (s, 3 H), 2.44 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.6, 162.0, 140.4, 138.7, 138.0, 134.2, 133.3, 130.0, 128.4, 127.4, 126.4, 125.6, 125.3, 106.7, 51.7, 21.1. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{16}O_3N$ $[M+H]^+$: 294.1125, found: 294.1122.

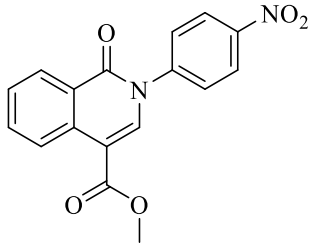
Methyl 2-(2-(tert-butyl)phenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3h**)



3h

White solid, m.p.: 164-166 ^{o}C, 72% (33 mg) isolated yield, R_f = 0.28 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.90 (d, *J* = 8.4 Hz, 1 H), 8.50 (d, *J* = 7.4 Hz, 1 H), 8.16 (s, 1 H), 7.83 - 7.77 (m, 1 H), 7.69 - 7.64 (m, 1 H), 7.58 (t, *J* = 7.6 Hz, 1 H), 7.48 - 7.43 (m, 1 H), 7.37 - 7.32 (m, 1 H), 7.13 - 7.08 (m, 1 H), 3.89 (s, 3 H), 1.29 (s, 9 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.6, 163.1, 146.6, 141.6, 138.8, 134.5, 133.4, 130.4, 129.5, 129.2, 128.5, 127.5, 127.5, 125.7, 125.4, 105.9, 51.8, 35.9, 31.8. **HRMS** (ESI-TOF) m/z calcd for $C_{21}H_{22}O_3N$ $[M+H]^+$: 336.1594, found: 336.1599.

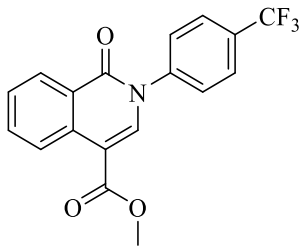
Methyl 2-(4-nitrophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3i**)



3i

Yellow solid, m.p.: 192-194 ^{o}C, 45% (21 mg) isolated yield, R_f = 0.4 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.87 (d, *J* = 8.4 Hz, 1 H), 8.51 (d, *J* = 8.0 Hz, 1 H), 8.43 (d, *J* = 8.8 Hz, 2 H), 8.23 (s, 1 H), 7.84 (t, *J* = 7.8 Hz, 1 H), 7.70 (d, *J* = 8.8 Hz, 2 H), 7.62 (t, *J* = 7.6 Hz, 1 H), 3.94 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.2, 161.5, 147.3, 145.5, 138.4, 134.0, 134.0, 128.6, 128.1, 127.9, 125.7, 125.5, 124.8, 108.2, 52.1. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_5N_2$ $[M+H]^+$: 325.0819, found: 325.0815.

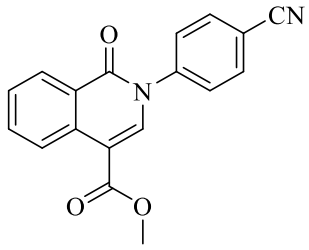
Methyl 1-oxo-2-(4-(trifluoromethyl)phenyl)-1,2-dihydroisoquinoline-4-carboxylate (**3j**)



3j

Yellow solid, m.p.: 116-118^{o}C, 57% (26.2 mg) isolated yield, R_f = 0.4 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.87 (d, *J* = 8.3 Hz, 1 H), 8.50 (d, *J* = 7.3 Hz, 1 H), 8.22 (s, 1 H), 7.85 - 7.79 (m, 3 H), 7.64 - 7.58 (m, 3 H), 3.92 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.3, 161.7, 143.4, 139.1, 134.2, 133.8, 131.1, 130.7, 128.5, 127.9, 127.4, 126.7 (q, *J* = 3.05, 6.9 Hz), 125.6, 122.3, 107.7, 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{13}O_3NF_3$ $[M+H]^+$: 348.0842, found: 348.0835.

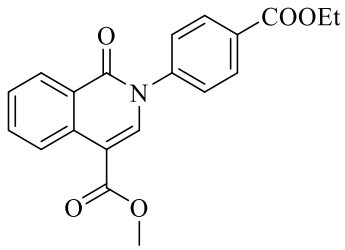
Methyl 2-(4-cyanophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3k**)



3k

White solid, m.p.: 224-226 ^{o}C, 69% (32.3 mg) isolated yield, R_f = 0.3 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.3 Hz, 1 H), 8.49 (d, *J* = 7.4 Hz, 1 H), 8.20 (s, 1 H), 7.89 - 7.79 (m, 3 H), 7.66 - 7.58 (m, 3 H), 3.93 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.2, 161.5, 144.0, 138.6, 134.0, 133.9, 133.4, 128.6, 128.0, 127.8, 125.7, 125.5, 117.8, 112.6, 108.1, 52.0. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{13}O_3N_2$ $[M+H]^+$: 305.0921, found: 305.0916.

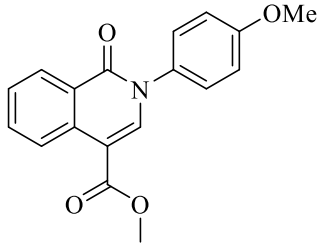
Methyl 2-(4-(ethoxycarbonyl)phenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3l**)



3l

White solid, m.p.: 170-172 ^{o}C, 77% (35.3 mg) isolated yield, R_f = 0.3 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.4 Hz, 1 H), 8.50 (d, *J* = 8.0 Hz, 1 H), 8.32 - 8.17 (m, 3 H), 7.80 (t, *J* = 7.3 Hz, 1 H), 7.62 - 7.53 (m, 3 H), 4.43 (q, *J* = 7.1 Hz, 2 H), 3.92 (s, 3 H), 1.43 (t, *J* = 7.1 Hz, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.6, 165.4, 161.7, 144.1, 139.3, 134.1, 133.6, 130.8, 130.7, 128.5, 127.8, 126.8, 125.6, 125.5, 107.5, 61.4, 51.9, 14.3. **HRMS** (ESI-TOF) m/z calcd for $C_{20}H_{18}O_5N$ $[M+H]^+$: 352.1179, found: 352.1177.

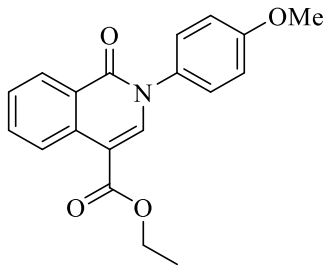
Methyl 2-(4-methoxyphenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3m**)



3m

White solid, m.p.: 156-158 ^{o}C, 81% (37.8 mg) isolated yield, R_f = 0.3 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.86 (d, *J* = 8.3 Hz, 1 H), 8.50 (dd, *J* = 1.0, 8.1 Hz, 1 H), 8.24 (s, 1 H), 7.78 (ddd, *J* = 1.4, 7.2, 8.4 Hz, 1 H), 7.60 - 7.55 (m, 1 H), 7.38 - 7.34 (m, 2 H), 7.06 - 7.02 (m, 2 H), 3.90 (s, 3 H), 3.88 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.6, 162.2, 159.6, 140.5, 134.3, 133.4, 133.3, 128.4, 127.8, 127.5, 125.7, 125.4, 114.6, 106.7, 55.6, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{16}O_4N$ $[M+H]^+$: 310.1074, found: 310.1079.

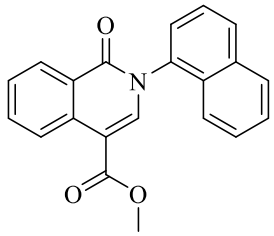
Ethyl 2-(4-methoxyphenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3n**)



3n

White solid, m.p.: 115-117 ^{o}C, 77% (34 mg) isolated yield, R_f = 0.29 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.87 (d, *J* = 8.3 Hz, 1 H), 8.54 - 8.45 (m, 1 H), 8.22 (s, 1 H), 7.78 (dt, *J* = 1.4, 7.8 Hz, 1 H), 7.60 - 7.54 (m, 1 H), 7.37 (d, *J* = 8.9 Hz, 2 H), 7.06 (d, *J* = 8.9 Hz, 2 H), 4.39 (q, *J* = 7.1 Hz, 2 H), 3.88 (s, 3 H), 1.40 (t, *J* = 7.1 Hz, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.2, 162.3, 159.6, 140.3, 134.4, 133.4, 133.3, 128.4, 127.9, 127.4, 125.7, 125.4, 114.6, 107.0, 60.8, 55.6, 14.4. **HRMS** (ES-TOF) m/z calcd for $C_{19}H_{18}O_4N$ $[M+H]^+$: 324.1230, found: 324.1227.

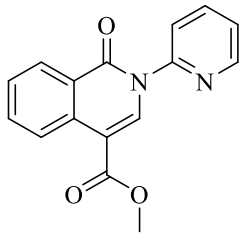
Methyl 2-(naphthalen-1-yl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3o**)



3o

White solid, m.p.: 126-128 ^{o}C, 81% (37.5 mg) isolated yield, R_f = 0.35 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.96 (d, *J* = 8.4 Hz, 1 H), 8.66 - 8.48 (m, 1 H), 8.24 (s, 1 H), 7.99 (d, *J* = 8.1 Hz, 1 H), 8.03 (d, *J* = 8.1 Hz, 1 H), 7.88 - 7.82 (m, 1 H), 7.63 (t, *J* = 7.6 Hz, 2 H), 7.59 - 7.50 (m, 4 H), 3.87 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.5, 162.3, 141.0, 137.2, 134.6, 134.4, 133.6, 129.8, 129.4, 128.6, 128.6, 127.6, 126.8, 125.6, 125.5, 125.5, 125.4, 122.1, 106.8, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{21}H_{16}O_3N$ $[M+H]^+$: 330.1125, found: 330.1123.

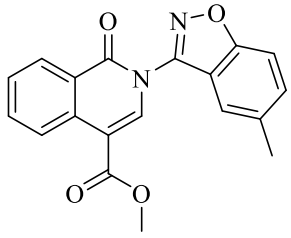
Methyl 1-oxo-2-(pyridin-2-yl)-1,2-dihydroisoquinoline-4-carboxylate (**3p**)



3p

White solid, m.p.: 158-160 ^{o}C, 50% (24 mg) isolated yield, R_f = 0.2 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.87 (d, *J* = 8.3 Hz, 1 H), 8.81 (s, 1 H), 8.68 - 8.58 (m, 1 H), 8.53 (d, *J* = 8.0 Hz, 1 H), 7.97 (d, *J* = 8.1 Hz, 1 H), 7.92 - 7.86 (m, 1 H), 7.83 - 7.76 (m, 1 H), 7.58 (t, *J* = 7.6 Hz, 1 H), 7.38 (dd, *J* = 5.2, 6.9 Hz, 1 H), 3.93 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.6, 161.7, 151.4, 149.0, 138.1, 137.9, 134.2, 133.7, 128.5, 127.5, 125.9, 125.5, 123.3, 121.5, 107.7, 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{16}H_{13}O_3N_2$ $[M+H]^+$: 281.0921, found: 281.0930.

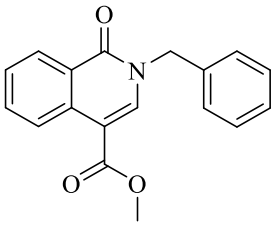
Methyl 2-(5-methylbenzo[d]isoxazol-3-yl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3q**)



3q

White solid, m.p.: 134-136 ^{o}C, 59% (27.3 mg) isolated yield, R_f = 0.3 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.91 (d, *J* = 8.3 Hz, 1 H), 8.56 (d, *J* = 8.0 Hz, 1 H), 8.51 (s, 1 H), 7.89 - 7.83 (m, 1 H), 7.64 (t, *J* = 7.6 Hz, 1 H), 7.57 - 7.53 (m, 2 H), 7.46 (d, *J* = 8.8 Hz, 1 H), 3.94 (s, 3 H), 2.49 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.1, 163.6, 160.8, 156.0, 138.5, 134.4, 134.3, 132.7, 128.7, 128.6, 128.1, 125.9, 125.3, 122.3, 117.1, 110.1, 108.7, 52.0, 21.2. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{15}O_4N_2$ $[M+H]^+$: 335.1026, found: 335.1043.

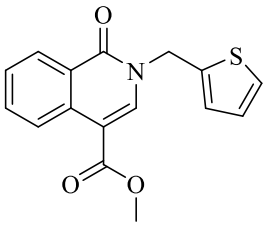
Methyl 2-benzyl-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3r**)



3r

White solid, m.p.: 120-122 ºC, 78% (36.6 mg) isolated yield, R_f = 0.31 (3:7, EtOAc : pet. ether), **^{1}H NMR (500 MHz, $CDCl_3$):** δ ppm 8.81 (d, *J* = 8.5 Hz, 1 H), 8.49 (d, *J* = 8.2 Hz, 1 H), 8.20 (s, 1 H), 7.75 (t, *J* = 7.8 Hz, 1 H), 7.55 (t, *J* = 7.6 Hz, 1 H), 7.39 - 7.34 (m, 4 H), 7.34 - 7.28 (m, 1 H), 5.27 (s, 2 H), 3.89 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.5, 162.3, 139.6, 136.0, 134.2, 133.2, 129.0, 128.3, 128.2, 127.9, 127.3, 125.4, 125.3, 107.0, 52.5, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{16}O_3N$ $[M+H]^+$: 294.1125, found: 294.1122.

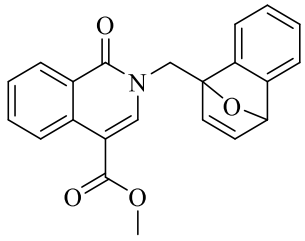
Methyl 1-oxo-2-(thiophen-2-ylmethyl)-1,2-dihydroisoquinoline-4-carboxylate (**3s**)



3s

White solid, m.p.: 120-122 ºC, 65% (30.5 mg) isolated yield, R_f = 0.28 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.79 (d, *J* = 8.4 Hz, 1 H), 8.49 (d, *J* = 8.0 Hz, 1 H), 8.23 (s, 1 H), 7.76 - 7.71 (m, 1 H), 7.54 (t, *J* = 7.5 Hz, 1 H), 7.29 (d, *J* = 6.1 Hz, 1 H), 7.17 (d, *J* = 3.3 Hz, 1 H), 6.98 (dd, *J* = 3.6, 5.0 Hz, 1 H), 5.39 (s, 2 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.5, 161.9, 138.9, 137.7, 134.2, 133.2, 128.2, 127.7, 127.4, 127.0, 126.6, 125.4, 125.3, 107.2, 51.8, 47.3. **HRMS** (ESI-TOF) m/z calcd for $C_{16}H_{14}O_3NS$ $[M+H]^+$: 300.0689, found: 300.0686.

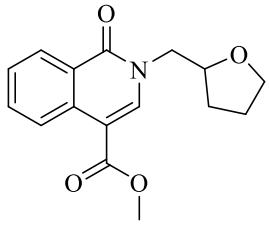
Methyl 2-(1,4-epoxynaphthalen-1(4H)-ylmethyl)-1-oxo-1,2-dihydroisoquinoline-4-carbo xylate (**3t**)



3t

White solid, m.p.: 120-122 ^{o}C, 59% (39 mg) isolated yield, R_f = 0.28 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.84 (d, *J* = 8.4 Hz, 1 H), 8.51 (d, *J* = 8.0 Hz, 1 H), 8.36 (s, 1 H), 7.77 - 7.72 (m, 1 H), 7.54 (t, *J* = 7.5 Hz, 1 H), 7.35 (dd, *J* = 2.2, 5.3 Hz, 1 H), 7.26 - 7.20 (m, 1 H), 7.05 - 6.97 (m, 3 H), 6.91 (d, *J* = 5.5 Hz, 1 H), 5.75 - 5.67 (m, 1 H), 5.57 (d, *J* = 14.8 Hz, 1 H), 4.57 (d, *J* = 14.6 Hz, 1 H), 3.88 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.5, 162.5, 150.1, 147.8, 145.3, 142.3, 141.0, 134.5, 133.2, 128.2, 127.1, 125.4, 125.3, 125.2, 125.1, 120.2, 119.4, 106.5, 92.4, 82.0, 51.7, 46.4. **HRMS** (ESI-TOF) m/z calcd for $C_{22}H_{18}O_4N$ $[M+H]^+$: 360.1230, found: 360.1243.

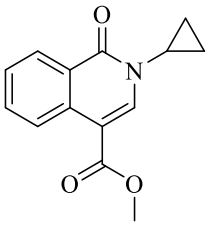
Methyl 1-oxo-2-((tetrahydrofuran-2-yl)methyl)-1,2-dihydroisoquinoline-4-carboxylate (**3u**)



3u

White solid, m.p.: 118-120 ^{o}C, 81% (38.4 mg) isolated yield, R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.82 (d, *J* = 8.4 Hz, 1 H), 8.45 (d, *J* = 8.0 Hz, 1 H), 8.29 (s, 1 H), 7.74 (t, *J* = 7.3 Hz, 1 H), 7.52 (t, *J* = 7.5 Hz, 1 H), 4.44 (dd, *J* = 2.9, 13.6 Hz, 1 H), 4.27 (dq, *J* = 2.9, 7.2 Hz, 1 H), 3.92 (s, 3 H), 3.91 - 3.86 (m, 2 H), 3.81 - 3.74 (m, 1 H), 2.15 - 2.06 (m, 1 H), 1.90 (quin, *J* = 6.9 Hz, 2 H), 1.68 - 1.58 (m, 1 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.8, 162.4, 141.1, 134.4, 133.0, 128.0, 127.0, 125.3, 125.2, 106.1, 77.2, 68.2, 52.7, 51.7, 28.9, 25.7. **HRMS** (ESI-TOF) m/z calcd for $C_{16}H_{18}O_4N$ $[M+H]^+$: 288.1230, found: 288.1226.

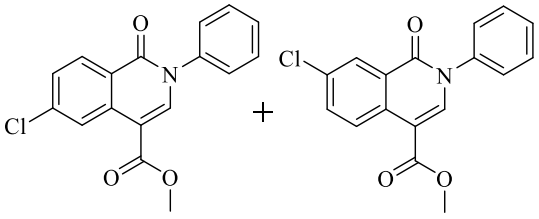
Methyl 2-cyclopropyl-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3v**)



3v

White solid, m.p.: 146-148 ^{o}C, 75% (36.7 mg) isolated yield, R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.78 (d, *J* = 8.4 Hz, 1 H), 8.48 (d, *J* = 8.9 Hz 1 H), 8.18 (s, 1 H), 7.76 - 7.70 (m, 1 H), 7.53 (t, *J* = 7.6 Hz, 1 H), 3.92 (s, 3 H), 3.45 - 3.38 (m, 1 H), 1.24 - 1.18 (m, 2 H), 0.98 - 0.93 (m, 2 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.7, 163.5, 139.6, 133.9, 133.1, 127.9, 127.2, 125.4, 125.2, 106.4, 51.8, 32.5, 6.9. **HRMS** (ESI-TOF) m/z calcd for $C_{14}H_{14}O_3N$ $[M+H]^+$: 244.0968, found: 244.0965.

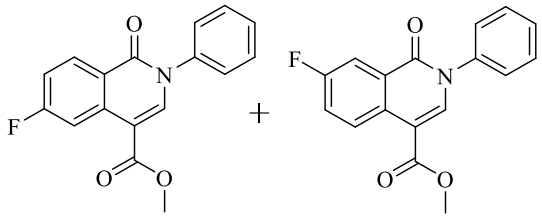
Methyl 6-chloro-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate and Methyl 7-chloro-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3w + 3w'**)



3w + 3w'

Off white solid, m.p.: 164-166 ^{o}C, 69% (36.5 mg) isolated yield as inseparable mixture of regioisomers (**3w + 3w'**) in ratio (1:0.7), R_f = 0.35 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.92 (d, *J* = 2.0 Hz, 0.55 H), 8.86 (d, *J* = 8.9 Hz, 0.39 H), 8.46 (d, *J* = 2.3 Hz, 0.39 H), 8.42 (d, *J* = 8.6 Hz, 0.57 H), 8.29 (s, 0.57 H), 8.25 (s, 0.39 H), 7.73 (dd, *J* = 2.4, 8.9 Hz, 0.39 H), 7.61 - 7.41 (m, 5.60 H), 3.91 (s, 1.80 H), 3.91 (s, 1.20 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.3, 165.2, 161.4, 160.9, 141.3, 140.4, 140.3, 140.3, 140.2, 135.5, 133.8, 133.8, 132.7, 130.1, 129.6, 129.5, 128.9, 128.1, 127.8, 127.3, 127.0, 126.7, 125.2, 124.0, 106.4, 105.9, 52.0, 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_3N^{35}Cl$ $[M+H]^+$: 314.0578, found: 314.0586.

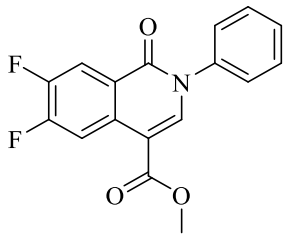
Methyl 6-fluoro-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylateand + Methyl 7-fluoro-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3x + 3x'**)



3x + 3x'

Faint yellow solid, m.p.: 104-106 ^{o}C, 63% (32 mg) isolated yield as inseparable mixture of regioisomers (**3x + 3x'**) in ratio (1:0.3), R_f = 0.31 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.93 (dd, *J* = 5.3, 9.1 Hz, 0.75 H), 8.6 (dd, *J* = 8.8, 11.3 Hz, 0.25 H), 8.5 (dd, *J* = 6.1, 9.0 Hz, 0.25 H), 8.3 (s, 0.25 H), 8.23 (s, 0.75 H), 8.14 (dd, *J* = 2.8, 9.2 Hz, 0.75 H), 7.58 - 7.52 (m, 2.3 H), 7.52 - 7.47 (m, 1.50 H), 7.47 - 7.42 (m, 2.20 H), 3.90 (s, 3 H). **^{13}C NMR (100 MHz, $CDCl_3$):** δ ppm 165.4, 165.2, 163.0, 161.2, 161.1 (d, *J* = 3.1 Hz), 160.5, 139.9 (d, *J* = 84.7 Hz), 139.8 (d, *J* = 84 Hz), 131.21 (d, *J* = 82.4 Hz), 131.18 (d, *J* = 74.8 Hz) 129.5, 128.9, 128.1 (d, *J* = 56 Hz), 128.0 (d, *J* = 57.2 Hz), 126.7, 121.8 (d, *J* = 22.9 Hz), 114.8 (d, *J* = 249.5 Hz), 114.5 (d, *J* = 248.1 Hz), 111.3 (d, *J* = 25.2 Hz), 106.6, 106.1 (d, *J* = 3.8 Hz), 51.9. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_3NF$ $[M+H]^+$: 298.0874, found: 298.0872.

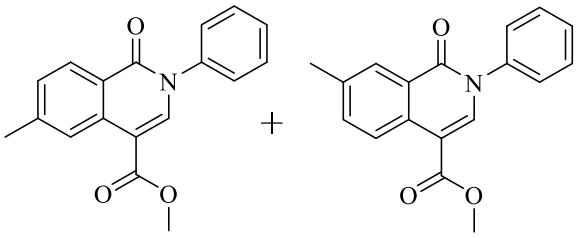
Methyl 6,7-difluoro-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3y**)



3y

White solid, m.p.: 149-151 ^{o}C, 77% (41 mg) isolated yield, R_f = 0.28 (1:9, EtOAc : pet. ether), **^{1}H NMR (500 MHz, $CDCl_3$):** δ ppm 8.78 (dd, *J* = 7.6, 12.5 Hz, 1 H), 8.28 (s, 1 H), 8.24 (d, *J* = 9.5 Hz, 1 H), 7.58 - 7.54 (m, 2 H), 7.52 - 7.48 (m, 1 H), 7.43 (d, *J* = 7.9 Hz, 2 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$):** δ ppm 165.1, 160.5, 154.3 (dd, *J* = 255.6, 14.3 Hz), 150.2 (dd, *J* = 252.7, 13.4 Hz), 140.8, 140.1, 132.3 (d, *J* = 7.6 Hz), 129.6, 129.0, 126.6, 123.2 (d, *J* = 3.8 Hz), 115.42 (d, *J* = 296.6 Hz), 115.28 (d, *J* = 298.5 Hz), 105.8, 52.0. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{12}O_3NF_2$ $[M+H]^+$: 316.0780, found: 316.0774.

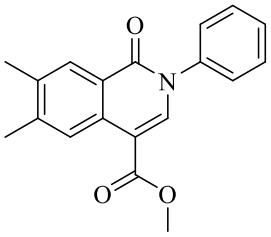
Methyl 6-methyl-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate + Methyl 7-methyl-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3z + 3z'**)



3z + 3z'

White solid, m.p.: 122-124 ^{o}C, 73% (36.3 mg) isolated yield as inseparable mixture of regioisomers (**3z + 3z'**) in ratio (1:0.7), R_f = 0.25 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.75 (d, *J* = 8.5 Hz, 0.40 H), 8.67 (s, 0.60 H), 8.39 (d, *J* = 8.1 Hz, 0.60 H), 8.30 (s, 0.40 H), 8.23 (s, 0.60 H), 8.20 (s, 0.40 H), 7.61 (d, *J* = 8.4 Hz, 0.40 H), 7.58 - 7.50 (m, 2 H), 7.50 - 7.42 (m, 3 H), 7.40 (d, *J* = 8.1 Hz, 0.6 H), 3.90 (s, 3 H), 2.56 (s, 1.80 H), 2.52 (s, 1.20 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.7, 161.9, 144.3, 140.7, 140.6, 140.2, 139.3, 137.7, 134.8, 134.3, 131.8, 129.4, 129.0, 128.6, 128.4, 128.0, 126.8, 125.6, 125.3, 125.2, 123.4, 106.9, 106.6, 51.7, 22.3, 21.3. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{16}O_3N$ $[M+H]^+$: 294.1125, found: 294.1136.

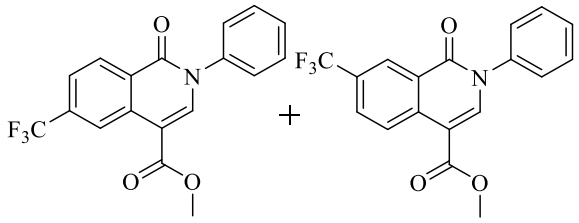
Methyl 6,7-dimethyl-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3aa**)



3aa

White solid, m.p.: 137-139 ^{o}C, 80% (42 mg) isolated yield, R_f = 0.3 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.62 (s, 1 H), 8.24 (s, 1 H), 8.18 (s, 1 H), 7.56 - 7.51 (m, 2 H), 7.49 - 7.42 (m, 3 H), 3.89 (s, 3 H), 2.47 (s, 3 H), 2.42 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.8, 161.9, 143.5, 140.7, 139.4, 137.1, 132.3, 129.4, 128.51, 128.5, 126.8, 125.7, 123.8, 106.6, 51.7, 20.7, 19.8. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{18}O_3N$ $[M+H]^+$: 308.1281, found: 308.1295.

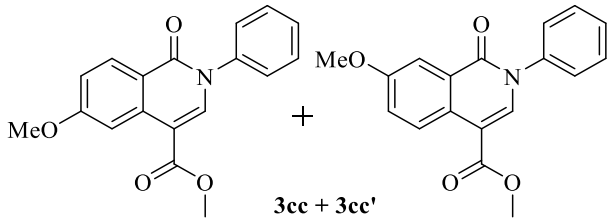
Methyl 1-oxo-2-phenyl-6-(trifluoromethyl)-1,2-dihydroisoquinoline-4-carboxylate + methyl 1-oxo-2-phenyl-7-(trifluoromethyl)-1,2-dihydroisoquinoline-4-carboxylate (**3bb + 3bb'**)



3bb + 3bb'

Yellowish solid, m.p.: 116-118 ºC, 64% (38 mg) isolated yield as inseparable mixture of regioisomers (**3bb + 3bb'**) in ratio (1:0.7), R_f = 0.3 (1:9, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 9.26 (s, 0.39 H), 9.04 (d, *J* = 8.8 Hz, 0.55 H), 8.77 (s, 0.55 H), 8.61 (d, *J* = 8.4 Hz, 0.39 H), 8.42 - 8.33 (m, 1.24 H), 8.01 - 7.92 (m, 0.80 H), 7.78 (d, *J* = 8.4 Hz, 0.39 H), 7.61 - 7.42 (m, 5 H), 3.93 (s, 1.35 H), 3.93 (s, 1.65 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.1, 161.2, 161.2, 142.0, 141.4, 140.1, 136.9, 135.0, 134.7, 134.5, 131.3 (q, *J* = 3.1, 6.9 Hz), 129.6, 129.5, 129.4, 129.4, 129.4, 129.3, 129.1, 128.1, 127.9, 126.62, 126.61, 126.5, 125.9 (q, *J* = 4.9, 8.4 Hz), 125.7, 125.3, 125.1, 123.6 (q, *J* = 3.8, 6.9 Hz), 123.1 (q, *J* = 3.8, 8.4 Hz), 122.4, 121.8 (q, *J* = 3.8, 7.6 Hz), 120.1, 106.4, 106.3, 52.0. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{13}O_3NF_3$ $[M+H]^+$: 348.0842, found: 348.0850.

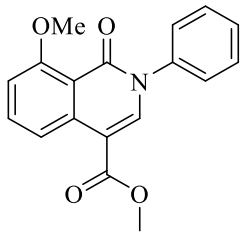
Methyl 6-methoxy-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate + Methyl 7-methoxy-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3cc + 3cc'**)



3cc + 3cc'

Yellowish solid, m.p.: 130-132 ºC, 68% (36 mg) isolated yield as inseparable mixture of regioisomers (**3cc + 3cc'**) in ratio (1:0.8), R_f = 0.15 (1:9, EtOAc : pet. ether), **^{1}H NMR (500 MHz, $CDCl_3$):** δ ppm 8.80 (d, *J* = 9.2 Hz, 0.58 H), 8.42 - 8.36 (m, 0.90 H), 8.27 (s, 0.45 H), 8.14 (s, 0.58 H), 7.89 (br. s., 0.58 H), 7.58 - 7.50 (m, 2.20 H), 7.50 - 7.43 (m, 3 H), 7.38 (d, *J* = 8.9 Hz, 0.60 H), 7.12 (d, *J* = 8.9 Hz, 0.45 H), 3.98 (s, 1.30 H), 3.93 (s, 1.70 H), 3.89 (s, 3 H). **^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$):** δ ppm 165.7, 163.7, 161.6, 161.5, 159.0, 141.0, 140.7, 140.5, 137.9, 136.5, 130.4, 129.4, 128.6, 128.1, 127.2, 126.8, 126.7, 123.3, 119.2, 117.0, 108.5, 107.0, 106.6, 106.1, 55.5, 51.8, 51.7. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{16}O_4N$ $[M+H]^+$: 310.1074, found: 310.1072.

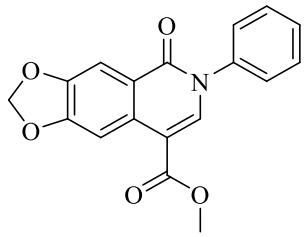
Methyl 8-methoxy-1-oxo-2-phenyl-1,2-dihydroisoquinoline-4-carboxylate (**3dd**)



3dd

White solid, m.p.: 152-154 ^{o}C, 66% (34 mg) isolated yield, R_f = 0.15 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.47 (d, *J* = 8.3 Hz, 1 H), 8.23 (s, 1 H), 7.69 (t, *J* = 8.3 Hz, 1 H), 7.54 - 7.48 (m, 2 H), 7.47 - 7.39 (m, 3 H), 7.02 (d, *J* = 8.3 Hz, 1 H), 3.98 (s, 3 H), 3.88 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.7, 161.5, 160.3, 140.9, 140.8, 137.4, 134.3, 129.3, 128.5, 127.1, 117.2, 115.1, 109.4, 106.1, 56.2, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{16}O_4N$ $[M+H]^+$: 310.1074, found: 310.1079.

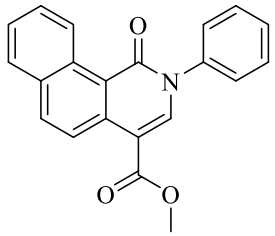
Methyl 5-oxo-6-phenyl-5,6-dihydro-[1,3]dioxolo[4,5-g]isoquinoline-8-carboxylate (**3ee**)



3ee

White solid, m.p.: 220-222 ^{o}C, 73% (40 mg) isolated yield, R_f = 0.30 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.34 (s, 1 H), 8.18 (s, 1 H), 7.83 (s, 1 H), 7.56 - 7.51 (m, 2 H), 7.50 - 7.42 (m, 3 H), 6.13 (s, 2 H), 3.88 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.7, 161.1, 152.9, 148.0, 140.6, 139.0, 131.7, 129.4, 128.7, 126.8, 121.5, 106.7, 106.2, 104.0, 102.0, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{14}O_5N$ $[M+H]^+$: 324.0866, found: 324.0883.

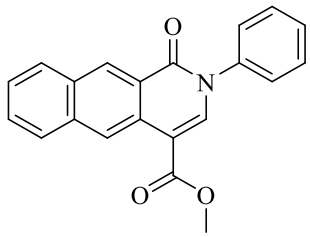
Methyl 1-oxo-2-phenyl-1,2-dihydrobenzo[h]isoquinoline-4-carboxylate (**3ff**)



3ff

White solid, m.p.: 254-256 ^{o}C, 60% (33.5 mg) isolated yield, R_f = 0.32 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 10.13 (d, *J* = 8.6 Hz, 1 H), 8.99 (d, *J* = 9.0 Hz, 1 H), 8.44 (s, 1 H), 8.18 (d, *J* = 9.1 Hz, 1 H), 7.96 (d, *J* = 7.8 Hz, 1 H), 7.75 - 7.69 (m, 1 H), 7.68 - 7.57 (m, 3 H), 7.55 - 7.48 (m, 3 H), 3.94 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.7, 162.3, 141.1, 140.7, 137.0, 135.0, 132.4, 131.9, 129.5, 128.9, 128.6, 128.3, 127.3, 127.1, 126.9, 122.3, 119.5, 107.0, 52.0. **HRMS** (ESI-TOF) m/z calcd for $C_{21}H_{16}O_3N$ $[M+H]^+$: 330.1125, found: 330.1141.

Methyl 1-oxo-2-phenyl-1,2-dihydrobenzo[g]isoquinoline-4-carboxylate (**3gg**)

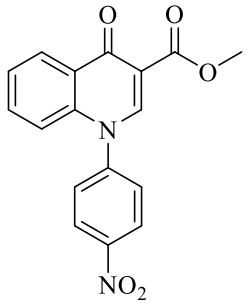


3gg

White solid, m.p.: 196-198 ^{o}C, 75% (42 mg) isolated yield, R_f = 0.32 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.37 (s, 1 H), 9.10 (s, 1 H), 8.25 (s, 1 H), 8.06 (d, *J* = 9.1 Hz, 2 H), 7.65 (dt, *J* = 1.0, 7.6 Hz, 1 H), 7.60 - 7.54 (m, 3 H), 7.52 - 7.47 (m, 3 H), 3.95 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.8, 162.5, 140.6, 139.7, 135.8, 131.7, 130.0, 129.5, 129.4, 129.2, 128.7, 128.6, 128.5, 126.9, 126.7, 124.8, 123.7, 106.8, 51.8. **HRMS** (ESI-TOF) m/z calcd for $C_{21}H_{16}O_3N$ $[M+H]^+$: 330.1125, found: 330.1141.

III] Characterization data for quinolone derivatives

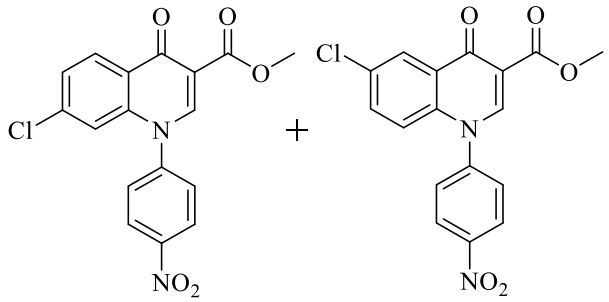
Methyl 1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4i**)



4i

Yellow solid, m.p.: 97-99 ºC, 66% (30.55 mg) isolated yield, R_f = 0.2 (8:2, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.54 (s, 1 H), 8.51 (d, *J* = 2.4 Hz, 3 H), 7.74 (d, *J* = 8.8 Hz, 2 H), 7.60 - 7.54 (m, 1 H), 7.49 - 7.44 (m, 1 H), 6.97 (d, *J* = 8.4 Hz, 1 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 174.0, 165.5, 148.3, 148.0, 145.7, 139.7, 132.7, 128.9, 128.1, 127.6, 125.9, 125.7, 117.0, 111.5, 52.1. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{13}O_5N_2$ $[M+H]^+$: 325.0819, found: 325.0829.

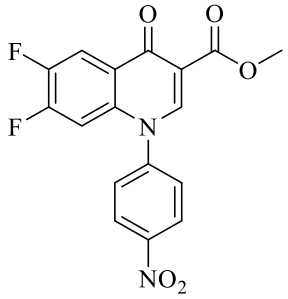
Methyl 7-chloro-1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate + methyl 6-chloro-1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4b + 4b'**)



4b +4b'

Yellow solid, m.p.: 215-217 ºC, 63% (32.2 mg isolated yield, as mixture of inseparable regioisomers (**4b + 4b'**) in ratio (2.3:1)), R_f = 0.25 (7:3, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.58 - 8.51 (m, 2 H), 8.50 (m, 0.7 H), 8.48 (s, 0.3 H), 8.38 (d, *J* = 2.4 Hz, 0.3 H), 8.28 (s, 0.7 H), 7.81 - 7.73 (m, 2 H), 7.50 (dd, *J* = 2.5, 9.0 Hz, 0.7 H), 7.38 (s, 0.3 H), 6.97 - 6.90 (m, 1 H), 3.89 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 173.0, 165.2, 148.6, 148.5, 148.3, 148.1, 145.2, 145.0, 140.5, 139.5, 138.2, 133.1, 132.3, 129.5, 129.2, 128.7, 127.1, 126.5, 126.2, 126.0, 118.7, 116.7, 112.2, 111.8, 52.3. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{12}O_5N_2{}^{35}Cl$ $[M+H]^+$: 359.0429, found: 359.0443.

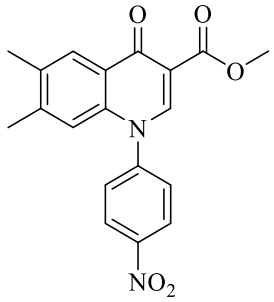
Methyl 6,7-difluoro-1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4c**)



4c

White solid, m.p.: 254-256 ^{o}C, 68% (35 mg) isolated yield, R_f = 0.2 (8:2, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.55 (d, *J* = 8.9 Hz, 2 H), 8.48 (s, 1 H), 8.26 (dd, *J* = 8.8, 9.9 Hz, 1 H), 7.74 (d, *J* = 8.9 Hz, 2 H), 6.78 (dd, *J* = 6.2, 10.7 Hz, 1 H), 3.91 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 172.3, 165.1, 153.4 (dd, *J* = 255.6, 15.3 Hz), 152.5, 148.9 (dd, *J* = 252.6, 13.7 Hz), 148.6, 146.6 (d, *J* = 321 Hz), 136.7 (dd, *J* = 9.2, 2.3 Hz), 127.5 (d, *J* = 244 Hz) , 126.3, 125.4 (dd, *J* = 5.3 Hz, 2.2 Hz), 115.6 (dd, *J* = 19.0, 2.3 Hz), 113.3 (d, *J* = 174 Hz), 106.1 (d, *J* = 22.9 Hz), 52.3. **HRMS** (ESI-TOF) m/z calcd for $C_{17}H_{11}O_5N_2F_2$ $[M+H]^+$: 361.0631, found: 361.0645.

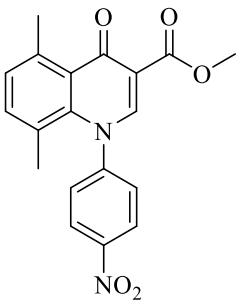
Methyl 6,7-dimethyl-1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4d**)



4d

Yellow solid, m.p.: 286-288 ^{o}C, 63% (32 mg) isolated yield, R_f = 0.18 (7:3, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.53 (d, *J* = 8.9 Hz, 2 H), 8.41 (s, 1 H), 8.20 (s, 1 H), 7.73 (d, *J* = 8.9 Hz, 2 H), 6.68 (s, 1 H), 3.88 (s, 3 H), 2.35 (s, 3 H), 2.26 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 174.0, 165.9, 148.2, 147.4, 145.9, 143.1, 138.1, 135.4, 128.7, 127.5, 126.3, 125.8, 117.1, 111.4, 52.1, 20.5, 19.4. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_5N_2$ $[M+H]^+$: 353.1132, found: 353.1142.

Methyl 5,8-dimethyl-1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4e**)

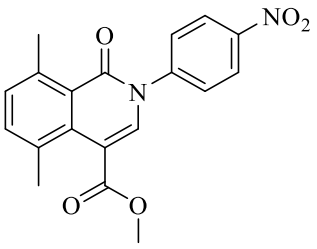


4e

White solid, m.p.: 286-288 ^{o}C, 74% (37 mg) isolated yield, R_f = 0.2 (9:1, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.50 (s, 1 H), 8.43 - 8.37 (m, *J* = 8.8 Hz, 2 H), 7.56 - 7.51 (m, *J* = 8.9 Hz, 2 H), 7.27 (d, *J* = 7.6 Hz, 1 H), 7.18 (d, *J* = 7.6 Hz, 1 H), 3.93 (s, 3 H), 2.93 (s, 3 H), 1.75 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.1, 165.9, 150.2, 146.8, 140.6, 136.3, 133.3, 133.0, 130.0, 128.6, 126.2, 125.7, 125.1, 113.2, 52.4, 24.0, 22.4. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_5N_2$ $[M+H]^+$: 353.1132, found: 353.1134.

Along with **4e** we also observed 20% of **3ei**.

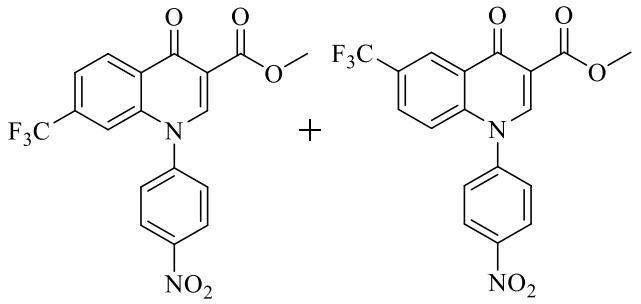
Methyl 5,8-dimethyl-2-(4-nitrophenyl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3ei**)



3ei

Yellow solid, m.p.: 112-114 ^{o}C, 20% (10 mg) isolated yield, R_f = 0.2 (6:4, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.83 (s, 1 H), 8.33 (d, *J* = 8.8 Hz, 2 H), 7.50 (d, *J* = 8.9 Hz, 2 H), 7.22 (d, *J* = 7.5 Hz, 1 H), 7.08 (d, *J* = 7.6 Hz, 1 H), 3.96 (s, 3 H), 2.66 (s, 3 H), 1.61 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.3, 159.7, 147.0, 146.5, 143.1, 141.1, 137.8, 136.6, 130.8, 125.7, 124.0, 123.2, 120.8, 119.7, 52.7, 22.5, 19.1. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_5N_2$ $[M+H]^+$: 353.1132, found: 353.1150.

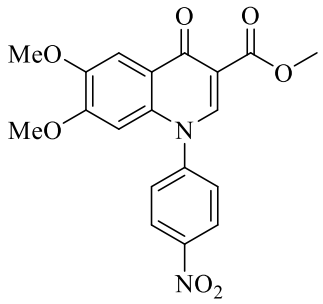
Methyl 1-(4-nitrophenyl)-4-oxo-7-(trifluoromethyl)-1,4-dihydroquinoline-3-carboxylate + Methyl 1-(4-nitrophenyl)-4-oxo-6-(trifluoromethyl)-1,4-dihydroquinoline-3-carboxylate (**4f + 4f'**)



4f + 4f'

Yellow solid, m.p.: 246-248 °C, 65% (36 mg isolated yield, as mixture of inseparable regioisomers (**4f + 4f'**) in ratio (2.1:1)), R_f = 0.2 (9:1, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.79 (s, 0.3 H), 8.65 (d, *J* = 8.4 Hz, 0.7 H), 8.62 - 8.50 (m, 3 H), 7.75 (d, *J* = 8.5 Hz, 2 H), 7.69 (d, *J* = 8.3 Hz, 0.7 H), 7.21 (s, 0.7 H), 7.10 (d, *J* = 7.6 Hz, 0.3 H), 3.93 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 173.1, 165.2, 148.8, 148.7, 148.5, 145.0, 144.9, 141.7, 141.3, 139.6, 134.8, 134.4, 130.3, 129.4, 128.7, 128.6, 128.1, 126.3, 126.2, 125.8, 122.7 (q, *J* = 3.1, 6.1 Hz), 117.9, 114.4 (q, *J* = 3.8, 8.4 Hz), 113.0, 112.8, 52.5. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{12}O_5N_2F_3$ $[M+H]^+$: 393.0693, found: 393.0706.

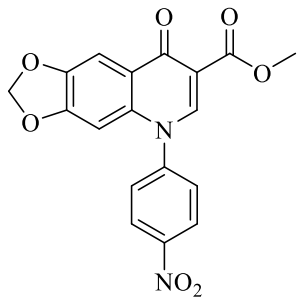
Methyl 6,7-dimethoxy-1-(4-nitrophenyl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4g**)



4g

White solid, m.p.: 286-288 °C, 73% (40 mg) isolated yield, R_f = 0.2 (9:1, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.53 (d, *J* = 8.6 Hz, 2 H), 8.40 (s, 1 H), 7.88 (s, 1 H), 7.75 (d, *J* = 8.6 Hz, 2 H), 6.29 (s, 1 H), 4.00 (s, 3 H), 3.91 (s, 3 H), 3.74 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 173.1, 166.0, 153.6, 148.4, 148.3, 146.5, 145.9, 135.0, 128.6, 125.9, 122.6, 111.4, 107.1, 98.4, 56.4, 56.2, 52.2. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_7N_2$ $[M+H]^+$: 385.1030, found: 385.1031.

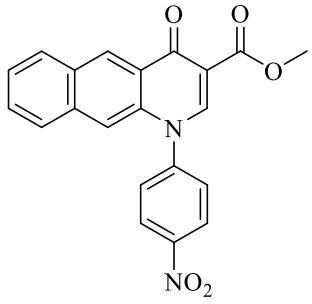
Methyl 5-(4-nitrophenyl)-8-oxo-5,8-dihydro-[1,3]dioxolo[4,5-g]quinoline-7-carboxylate (**4h**)



4h

Yellow solid, m.p.: 265-267 ^{o}C, 68% (35.7 mg) isolated yield, R_f = 0.2 (9:1, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.52 (d, *J* = 8.6 Hz, 2 H), 8.35 (s, 1 H), 7.87 - 7.70 (m, 3 H), 6.31 (s, 1 H), 6.07 (s, 2 H), 3.89 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 172.8, 165.8, 152.2, 148.3, 146.9, 146.6, 145.9, 136.7, 128.8, 125.9, 124.3, 111.2, 104.8, 102.5, 96.5, 52.2. **HRMS** (ESI-TOF) m/z calcd for $C_{18}H_{13}O_7N_2$ $[M+H]^+$: 369.0717, found: 369.0722.

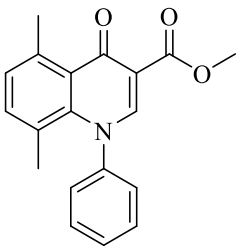
Methyl 1-(4-nitrophenyl)-4-oxo-1,4-dihydrobenzo[g]quinoline-3-carboxylate (**4j**)



4j

White solid, m.p.: 276-278 ^{o}C, 66% (35 mg) isolated yield, R_f = 0.2 (8:2, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.04 (s, 1 H), 8.58 (t, *J* = 4.4 Hz, 3 H), 8.04 (d, *J* = 8.1 Hz, 1 H), 7.83 (d, *J* = 8.9 Hz, 2 H), 7.71 (d, *J* = 8.1 Hz, 1 H), 7.60 - 7.52 (m, 2 H), 7.34 (s, 1 H), 3.92 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 175.0, 165.8, 149.4, 148.4, 146.0, 137.0, 134.7, 130.5, 129.6, 129.1, 129.0, 128.6, 127.3, 127.2, 126.6, 126.1, 114.4, 109.5, 52.2. **HRMS** (ESI-TOF) m/z calcd for $C_{21}H_{15}O_5N_2$ $[M+H]^+$: 375.0975, found: 375.0990.

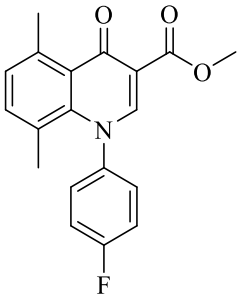
Methyl 5,8-dimethyl-4-oxo-1-phenyl-1,4-dihydroquinoline-3-carboxylate (**4k**)



4k

White solid, m.p.: 142-144 ^{o}C, 69% (36.06 mg) isolated yield, R_f = 0.4 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.47 (s, 1 H), 7.54 - 7.44 (m, 3 H), 7.35 - 7.31 (m, 2 H), 7.19 (d, *J* = 7.5 Hz, 1 H), 7.10 (d, *J* = 7.6 Hz, 1 H), 3.92 (s, 3 H), 2.95 (s, 3 H), 1.70 (s, 3 H). **^{13}C NMR (100 MHz, CDCl$_3$):** δ ppm 177.3, 166.3, 151.2, 145.5, 141.1, 140.2, 135.9, 130.0, 129.0, 128.8, 128.5, 125.9, 125.4, 112.0, 52.0, 24.2, 22.1. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{18}O_3N$ $[M+H]^+$: 308.1281, found: 308.1281.

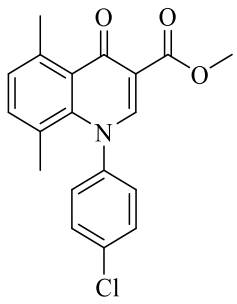
Methyl 1-(4-fluorophenyl)-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4l**)



4l

White solid, m.p.: 170-172 ^{o}C, 68% (35 mg) isolated yield, R_f = 0.3 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.40 (s, 1 H), 7.35 - 7.29 (m, 2 H), 7.23 - 7.17 (m, 3 H), 7.09 (d, *J* = 7.6 Hz, 1 H), 3.91 (s, 3 H), 2.93 (s, 3 H), 1.72 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.3, 166.2, 161.9 (d, *J* = 251.0 Hz), 151.1, 141.5 (d, *J* = 3.8 Hz), 141.2, 140.4, 136.1, 129.2, 128.7, 127.8 (d, *J* = 8.4 Hz), 125.1, 117.0 (d, *J* = 22.9 Hz), 112.2, 52.1, 24.3, 22.4. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_3NF$ $[M+H]^+$: 326.1187, found: 326.1184.

Methyl 1-(4-chlorophenyl)-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4m**)

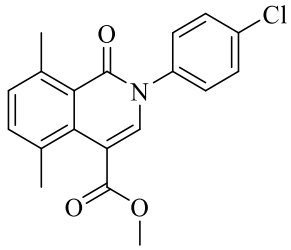


4m

White solid, m.p.: 178-182 ^{o}C, 65% (34 mg) isolated yield, R_f = 0.35 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.40 (s, 1 H), 7.51 - 7.47 (m, 2 H), 7.30 - 7.26 (m, 2 H), 7.21 (d, *J* = 7.6 Hz, 1 H), 7.10 (d, *J* = 7.6 Hz, 1 H), 3.91 (s, 3 H), 2.93 (s, 3 H), 1.75 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.2, 166.2, 150.9, 143.9, 141.0, 140.4, 136.0, 134.4, 130.2, 129.3, 128.8, 127.1, 125.1, 112.4, 52.1, 24.2, 22.4. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{16}O_3N^{35}ClNa$ $[M+Na]^+$: 364.0711, found: 364.0728.

Along with **4m** we also observed 12% of **3mi** and 9% of **4ma**.

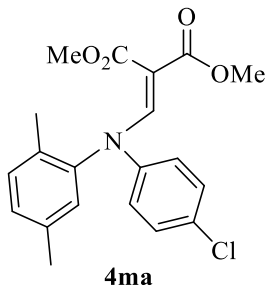
Methyl 2-(4-chlorophenyl)-5,8-dimethyl-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3mi**)



3mi

Semisolid, 12% (6.5 mg) isolated yield, R_f = 0.35 (3:7, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.80 (s, 1 H), 7.44 (d, *J* = 8.5 Hz, 2 H), 7.24 (d, *J* = 8.5 Hz, 2 H), 7.19 (d, *J* = 7.6 Hz, 1 H), 7.03 (d, *J* = 7.6 Hz, 1 H), 3.95 (s, 3 H), 2.64 (s, 3 H), 1.65 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.7, 160.1, 142.7, 141.7, 139.2, 137.7, 136.3, 134.2, 131.1, 128.9, 125.0, 123.6, 120.8, 119.4, 52.6, 22.6, 19.2. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_3N^{35}Cl$ $[M+H]^+$: 342.0891, found: 342.0904.

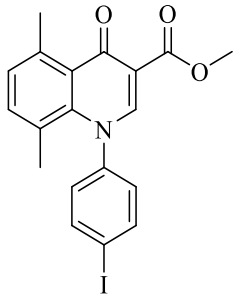
Dimethyl 2-(((4-chlorophenyl)(2,5-dimethylphenyl)amino)methylene)malonate (**4ma**)



4ma

Semisolid, 9% (5 mg) isolated yield, R_f = 0.35 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 7.98 (s, 1 H), 7.25 (s, 2 H), 7.15 (d, *J* = 7.8 Hz, 1 H), 7.09 (d, *J* = 7.8 Hz, 1 H), 6.96 (s, 1 H), 6.87 (d, *J* = 8.6 Hz, 2 H), 3.74 (s, 3 H), 3.08 (s, 3 H), 2.32 (s, 3 H), 1.99 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 166.8, 165.5, 145.7, 144.3, 137.1, 133.0, 131.5, 130.2, 129.44, 129.41, 129.0, 121.5, 118.4, 102.3, 51.9, 51.3, 20.7, 17.5. **HRMS** (ESI-TOF) m/z calcd for $C_{20}H_{21}O_4N^{35}Cl$ $[M+H]^+$: 374.1154, found: 374.1150.

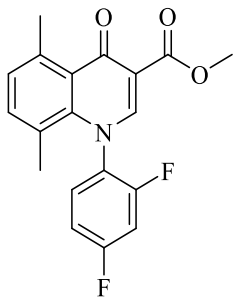
Methyl 1-(4-iodophenyl)-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4n**)



4n

White solid, m.p.: 166-168 ^{o}C, 63% (30 mg) isolated yield, R_f = 0.35 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.40 (s, 1 H), 7.84 (d, *J* = 8.5 Hz, 2 H), 7.21 (d, *J* = 7.5 Hz, 1 H), 7.12 - 7.07 (m, 3 H), 3.91 (s, 3 H), 2.94 (s, 3 H), 1.75 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 177.3, 166.2, 150.8, 145.2, 140.9, 140.4, 139.2, 136.0, 129.3, 128.8, 127.6, 125.2, 112.5, 93.4, 52.2, 24.2, 22.5. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{17}O_3NI$ $[M+H]^+$: 434.0248, found: 434.0244.

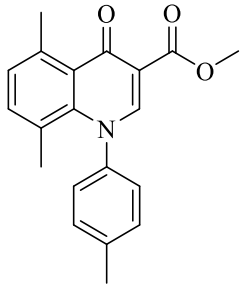
Methyl 1-(2,4-difluorophenyl)-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4o**)



4o

White solid, m.p.:168-170 ^{o}C, 70% (35 mg) isolated yield, R_f = 0.35 (6:4, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.27 (s, 1 H), 7.37 - 7.28 (m, 1 H), 7.21 (d, *J* = 7.5 Hz, 1 H), 7.11 - 7.00 (m, 3 H), 3.91 (s, 3 H), 2.93 (s, 3 H), 1.77 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 177.3, 166.0, 162.6 (dd, *J* = 254.1, 10.7 Hz), 157.3 (dd, *J* = 254.8, 13 Hz), 150.7, 141.3, 140.7, 136.2, 129.5 (d, *J* = 9.9 Hz), 129.2 (dd, *J* = 4.6, 2.4 Hz), 129.1, 128.5, 124.3, 112.9, 112.6 (dd, *J* = 22.9, 3.8 Hz), 105.7 (dd, *J* = 22.9, 82 Hz), 52.2, 24.3, 21.3. **HRMS** (ESI-TOF) m/z calcd for $C_{19}H_{16}O_3NF_2$ $[M+H]^+$: 344.1093, found: 344.1090.

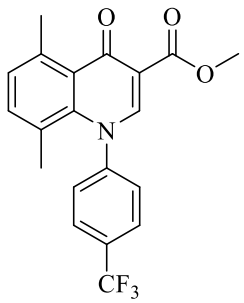
Methyl 5,8-dimethyl-4-oxo-1-(p-tolyl)-1,4-dihydroquinoline-3-carboxylate (**4p**)



4p

White solid, m.p.: 158-160 ^{o}C, 65% (33 mg) isolated yield, R_f = 0.35 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.44 (s, 1 H), 7.31 - 7.27 (m, 2 H), 7.22 - 7.17 (m, 3 H), 7.08 (d, *J* = 7.6 Hz, 1 H), 3.91 (s, 3 H), 2.95 (s, 3 H), 2.44 (s, 3 H), 1.72 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 177.4, 166.5, 151.3, 143.0, 141.3, 140.3, 138.7, 135.9, 130.5, 129.0, 128.8, 125.8, 125.5, 111.9, 52.1, 24.3, 22.3, 21.1. **HRMS** (ESI-TOF) m/z calcd for $C_{20}H_{20}O_3N$ $[M+H]^+$: 322.1438, found: 322.1440.

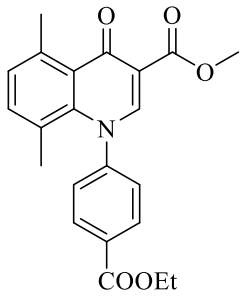
Methyl 5,8-dimethyl-4-oxo-1-(4-(trifluoromethyl)phenyl)-1,4-dihydroquinoline-3-carboxylate (**4q**)



4q

White solid, m.p.: 156-158 ºC, 61% (30 mg) isolated yield, R_f = 0.30 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.44 (s, 1 H), 7.82 - 7.77 (m, 2 H), 7.47 (d, *J* = 7.9 Hz, 2 H), 7.23 (d, *J* = 7.5 Hz, 1 H), 7.14 (d, *J* = 7.5 Hz, 1 H), 3.92 (s, 3 H), 2.94 (s, 3 H), 1.72 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.2, 166.2, 150.8, 148.1, 140.9, 140.5, 136.4, 129.8, 128.4, 127.4 (q, *J* = 3.6, 7.7 Hz), 126.2, 125.3, 124.7, 122.0, 112.4, 52.4, 24.2, 22.4. **HRMS** (ESI-TOF) m/z calcd for $C_{20}H_{17}O_3NF_3$ $[M+H]^+$: 376.1155, found: 376.1158.

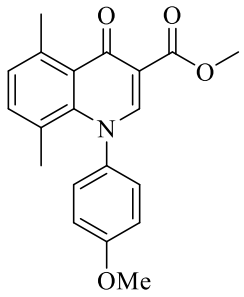
Methyl 1-(4-(ethoxycarbonyl)phenyl)-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4r**)



4r

White solid, m.p.: 148-150 ºC, 71% (35 mg) isolated yield, R_f = 0.35 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.51 (br s, 1 H), 8.18 (d, *J* = 7.3 Hz, 2 H), 7.42 (d, *J* = 7.6 Hz, 2 H), 7.23 (d, *J* = 7.6 Hz, 1 H), 7.14 (d, *J* = 7.5 Hz, 1 H), 4.43 (q, *J* = 7.0 Hz, 2 H), 3.92 (s, 3 H), 2.94 (s, 3 H), 1.72 (s, 3 H), 1.43 (t, *J* = 7.1 Hz, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.2, 166.2, 165.2, 150.7, 148.7, 140.9, 140.3, 136.2, 131.4, 130.4, 129.6, 128.5, 125.6, 125.4, 112.3, 61.5, 52.3, 24.1, 22.3, 14.2. **HRMS** (ESI-TOF) m/z calcd for $C_{22}H_{22}O_5N$ $[M+H]^+$: 380.1492, found: 380.1508.

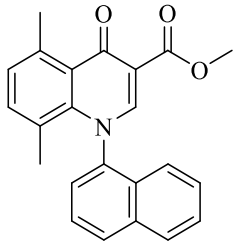
Methyl 1-(4-methoxyphenyl)-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4s**)



4s

White solid, m.p.: 172-174 ^{o}C, 72% (36.5 mg) isolated yield, R_f = 0.30 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.42 (s, 1 H), 7.23 (d, *J* = 8.8 Hz, 2 H), 7.18 (d, *J* = 7.5 Hz, 1 H), 7.07 (d, *J* = 7.5 Hz, 1 H), 6.98 (d, *J* = 8.9 Hz, 2 H), 3.91 (s, 3 H), 3.88 (s, 3 H), 2.94 (s, 3 H), 1.73 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.4, 166.5, 159.5, 151.4, 141.4, 140.3, 138.4, 136.0, 128.9, 128.7, 127.3, 125.4, 114.9, 111.7, 55.6, 52.1, 24.4, 22.4. **HRMS** (ESI-TOF) m/z calcd for $C_{20}H_{20}O_4N$ $[M+H]^+$: 338.1387, found: 338.1385.

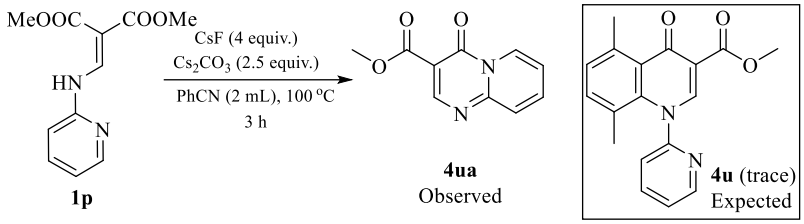
Methyl 5,8-dimethyl-1-(naphthalen-1-yl)-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4t**)



4t

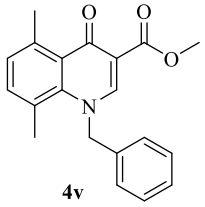
White solid, m.p.: 205-207 ^{o}C, 66% (33 mg) isolated yield, R_f = 0.32 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.43 (s, 1 H), 8.01 (t, *J* = 8.2 Hz, 2 H), 7.63 - 7.54 (m, 4 H), 7.51 - 7.46 (m, 1 H), 7.13 - 7.07 (m, 2 H), 3.89 (s, 3 H), 3.01 (s, 3 H), 1.43 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.5, 166.3, 151.1, 142.0, 141.3, 140.7, 136.2, 134.2, 129.9, 129.8, 129.0, 128.8, 128.5, 128.3, 127.3, 125.3, 125.2, 125.0, 121.8, 112.0, 52.1, 24.6, 21.8. **HRMS** (ESI-TOF) m/z calcd for $C_{23}H_{20}O_3N$ $[M+H]^+$: 358.1438, found: 358.1440.

Methyl 4-oxo-4H-pyrido[1,2-a]pyrimidine-3-carboxylate (**4ua**)



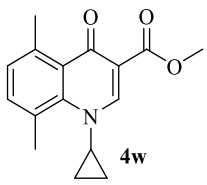
White solid, m.p.: 145-147 °C, 70% (24.2 mg) isolated yield, R_f = 0.4 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 9.27 (d, *J* = 7.0 Hz, 1 H), 9.04 (s, 1 H), 7.97 (t, *J* = 7.8 Hz, 1 H), 7.78 (d, *J* = 8.8 Hz, 1 H), 7.35 (t, *J* = 6.9 Hz, 1 H), 3.94 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 165.2, 159.3, 154.6, 153.4, 139.2, 128.8, 126.8, 117.3, 105.0, 52.2. **HRMS** (ESI-TOF) m/z calcd for $C_{10}H_9O_3N_2$ $[M+H]^+$: 205.0608, found: 205.0604.

Methyl 1-benzyl-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4v**)



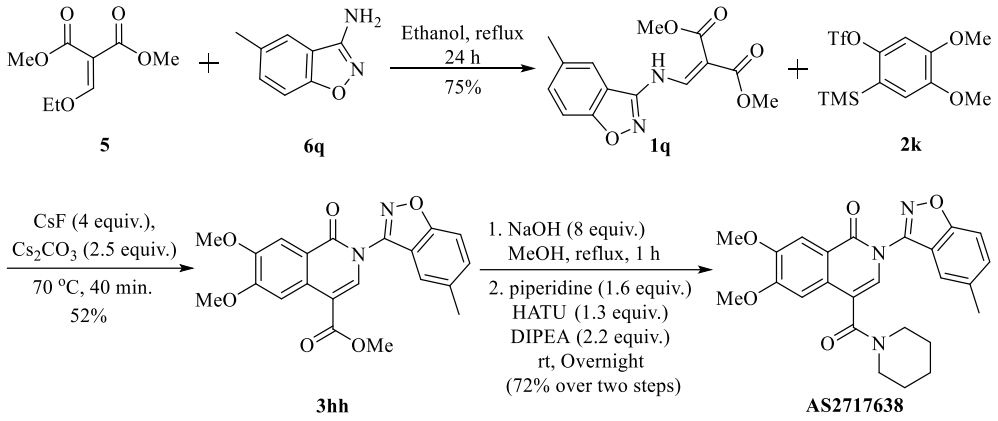
White sticky solid, 15% (5.4 mg) isolated yield, R_f = 0.32 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.40 (s, 1 H), 7.34 - 7.29 (m, 3 H), 7.24 (s, 1 H), 7.07 (d, *J* = 7.6 Hz, 1 H), 7.02 (d, *J* = 6.6 Hz, 2 H), 5.48 (s, 2 H), 3.91 (s, 3 H), 2.92 (s, 3 H), 2.59 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 172.1, 166.3, 160.5, 151.6, 142.4, 140.8, 136.2, 129.6, 129.3, 128.9, 128.3, 126.1, 123.8, 112.7, 59.8, 51.9, 24.3, 23.3. **HRMS** (ESI-TOF) m/z calcd for $C_{20}H_{20}O_3N$ $[M+H]^+$: 322.1438, found: 322.1435.

Methyl 1-cyclopropyl-5,8-dimethyl-4-oxo-1,4-dihydroquinoline-3-carboxylate (**4w**)

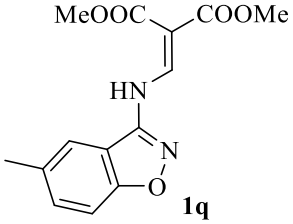


White solid, m.p.: 115-117 °C, 25% (13.6 mg) isolated yield, R_f = 0.32 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, CDCl$_3$):** δ ppm 8.62 (s, 1 H), 7.30 (d, *J* = 7.5 Hz, 1 H), 7.04 (d, *J* = 7.6 Hz, 1 H), 3.95 - 3.89 (m, 1H), 3.92 (s, 3 H), 2.86 (s, 3 H), 2.77 (s, 3 H), 1.14 (q, *J* = 6.7 Hz, 2 H), 0.88 (q, *J* = 6.7 Hz, 2 H). **^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$):** δ ppm 177.0, 166.8, 151.8, 143.1, 139.9, 136.6, 129.1, 127.7, 125.7, 110.5, 52.5, 40.4, 24.2, 22.9, 11.2. **HRMS** (ESI-TOF) m/z calcd for $C_{16}H_{18}O_3N$ $[M+H]^+$: 272.1281, found: 272.1279.

IV] Characterization data of AS2717638:

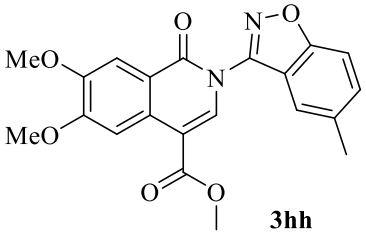


Dimethyl 2-(((5-methylbenzo[d]isoxazol-3-yl)amino)methylene)malonate (**1q**)



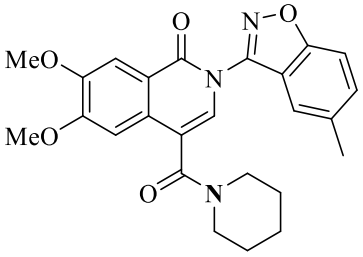
White solid, m.p.: 140-142 °C, 65% (382 mg) isolated yield, R_f = 0.2 (5:5, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 10.99 (d, *J* = 12.6 Hz, 1 H), 8.67 (d, *J* = 12.6 Hz, 1 H), 7.24 (s, 2 H), 7.06 (s, 1 H), 3.72 (s, 3 H), 3.61 (s, 3 H), 2.30 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 169.1, 164.7, 162.6, 152.8, 150.9, 133.9, 132.7, 118.7, 114.6, 110.1, 97.6, 52.1, 51.7, 21.0. **HRMS** (ESI-TOF) m/z calcd for $C_{14}H_{15}O_5N_2$ $[M+H]^+$: 291.0975, found: 291.0987.

Methyl 6,7-dimethoxy-2-(5-methylbenzo[d]isoxazol-3-yl)-1-oxo-1,2-dihydroisoquinoline-4-carboxylate (**3hh**)



White solid, m.p.: 266-268 °C, 52% (28 mg) isolated yield, R_f = 0.30 (2:8, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 8.50 (s, 1 H), 8.47 (s, 1 H), 7.90 (s, 1 H), 7.58 - 7.52 (m, 2 H), 7.48 - 7.42 (m, 1 H), 4.10 (s, 3 H), 4.05 (s, 3 H), 3.91 (s, 3 H), 2.48 (s, 3 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.5, 163.5, 160.0, 156.3, 154.6, 149.7, 137.4, 134.3, 132.6, 130.1, 122.4, 119.3, 117.2, 110.1, 108.4, 107.8, 106.6, 56.3, 56.2, 51.9, 21.2. **HRMS** (ESI-TOF) m/z calcd for $C_{21}H_{19}O_6N_2$ $[M+H]^+$: 395.1238, found: 395.1254.

6,7-Dimethoxy-2-(5-methylbenzo[d]isoxazol-3-yl)-4-(piperidine-1-carbonyl)isoquinolin-1(2H)-one (**AS2717638**)



AS2717638

White sticky solid, R_f = 0.30 (4:6, EtOAc : pet. ether), **^{1}H NMR (400 MHz, $CDCl_3$):** δ ppm 7.92 (s, 1 H), 7.56 (s, 1 H), 7.55 - 7.47 (m, 2 H), 7.46 - 7.41 (m, 1 H), 7.03 (s, 1 H), 4.05 (s, 3 H), 4.02 (s, 3 H), 3.77 - 3.49 (m, 4 H), 2.48 (s, 3 H), 1.85 - 1.63 (m, 6 H). **^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$):** δ ppm 165.6, 163.4, 159.8, 156.4, 154.5, 150.1, 134.1, 132.5, 129.8, 128.2, 122.6, 119.9, 117.3, 115.3, 110.0, 108.8, 104.9, 56.34, 56.29, 31.6, 24.4, 22.6, 21.2. **HRMS** (ESI-TOF) m/z calcd for $C_{25}H_{26}O_5N_3$ $[M+H]^+$: 448.1867, found: 448.1876. Known compound.[4]

4. References

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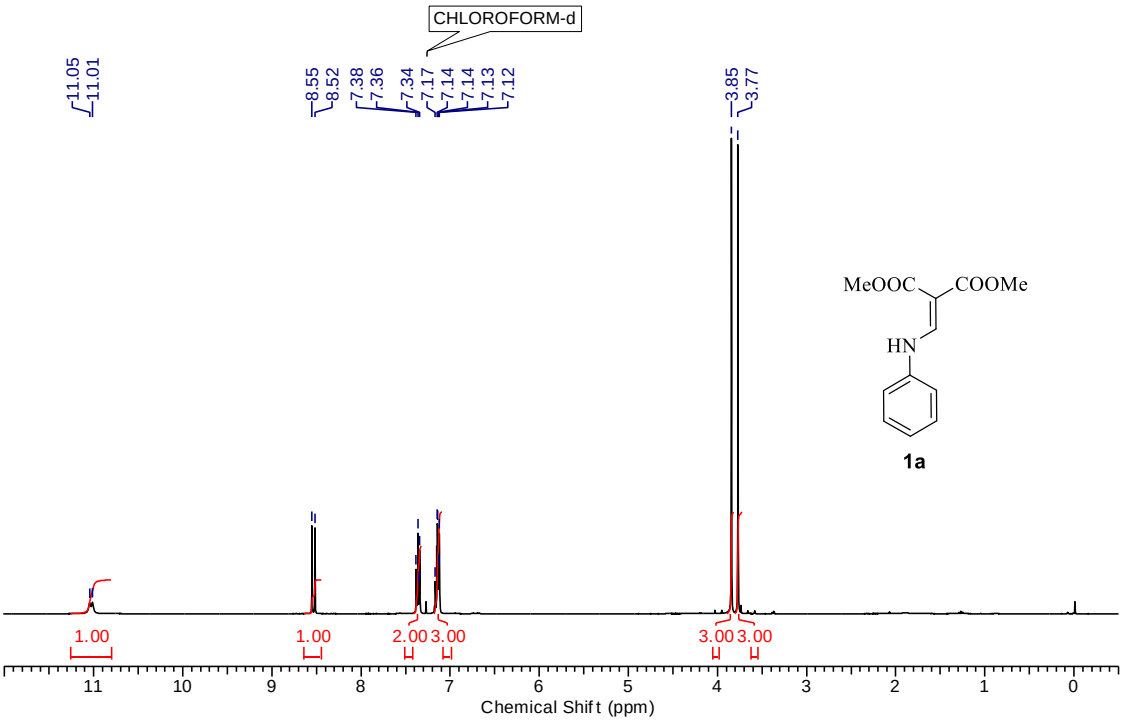
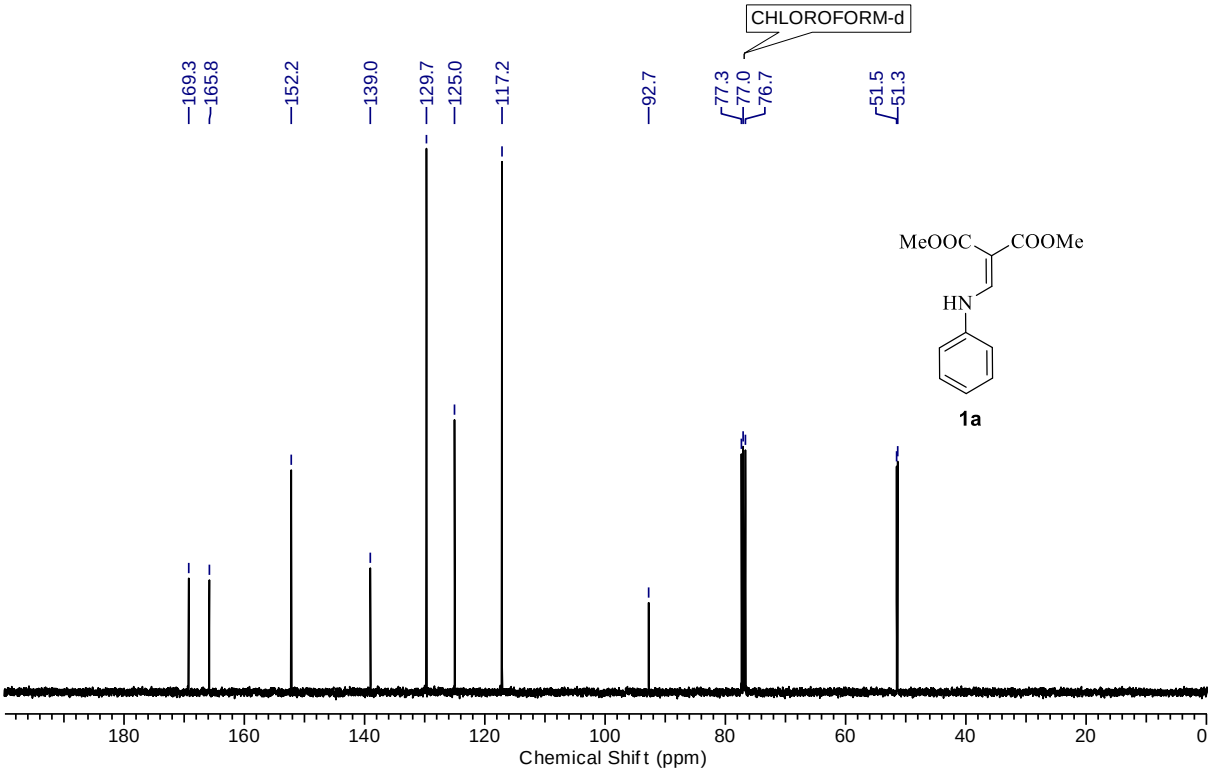
5. NMR Spectra's

I] NMR Spectrums of Enamines:

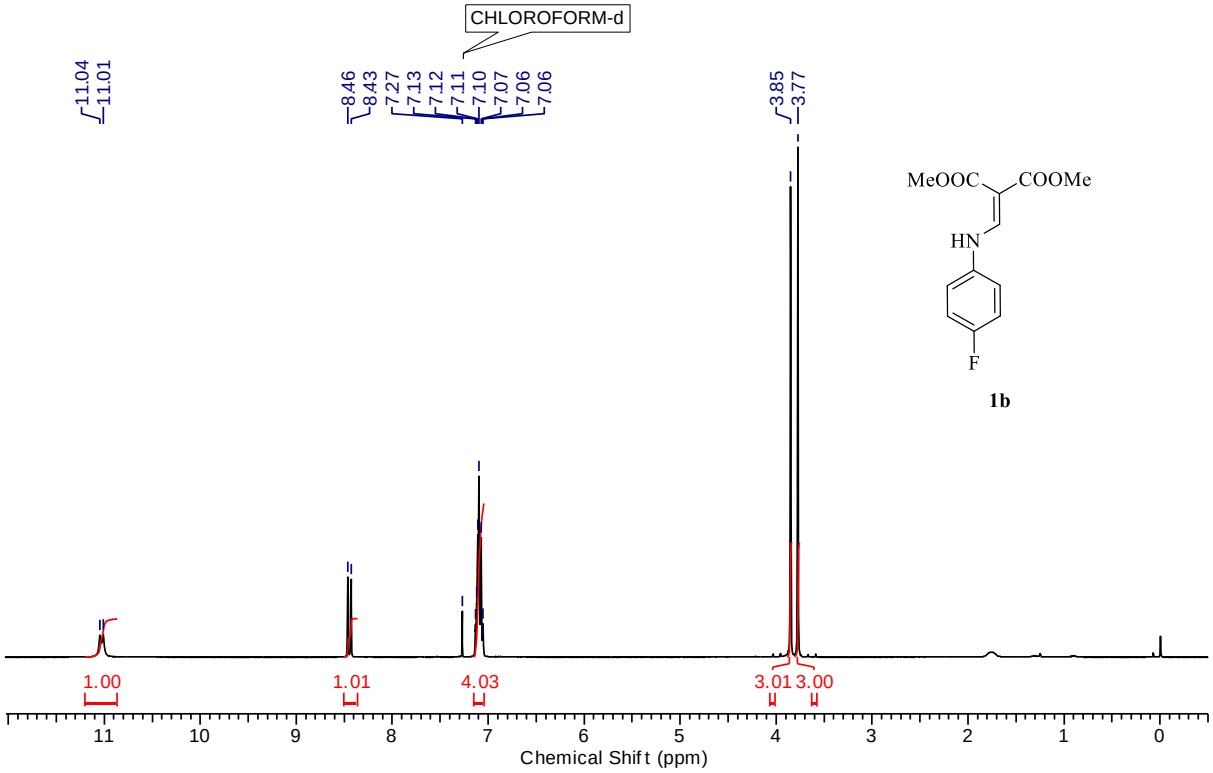
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1a



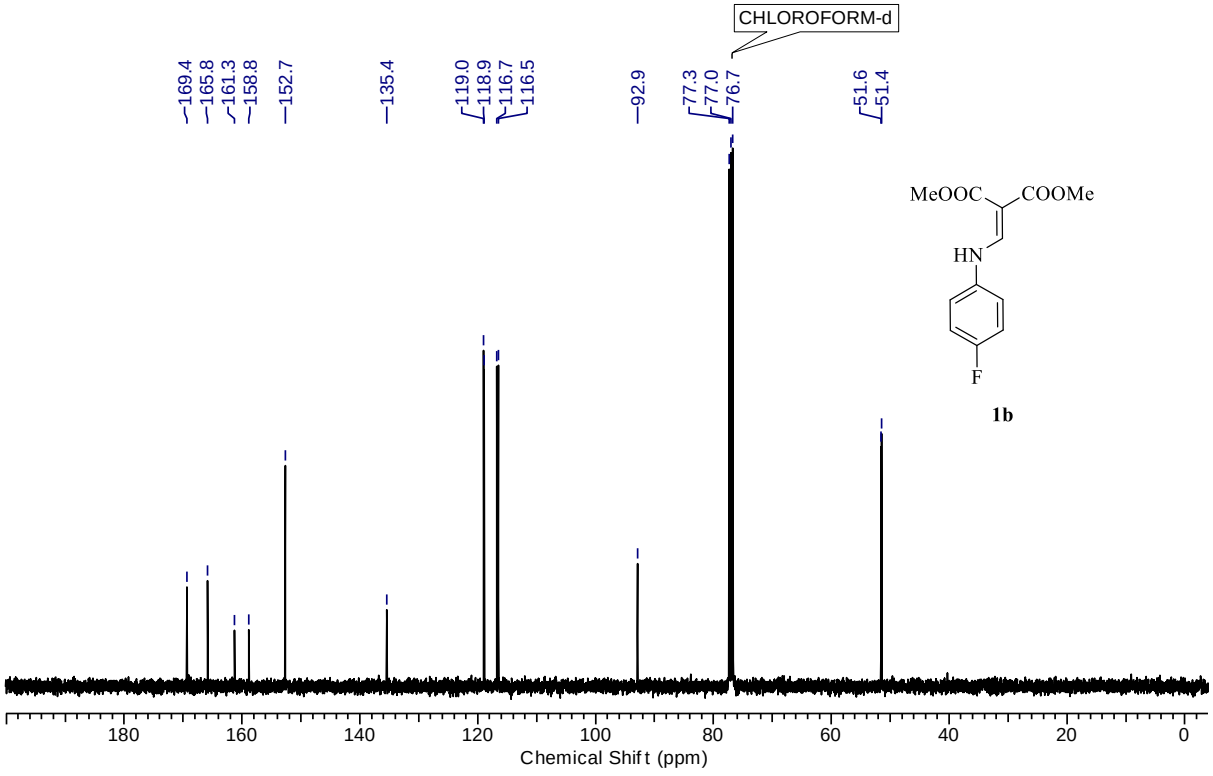
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1a



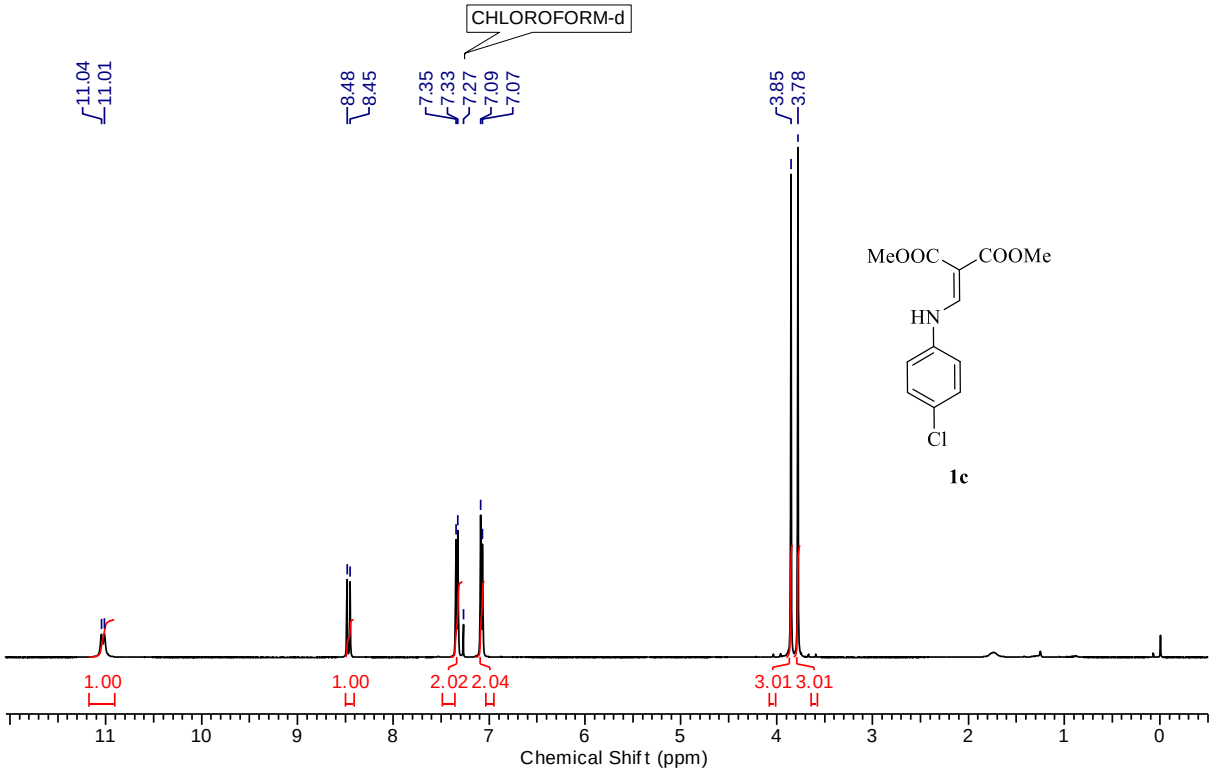
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1b



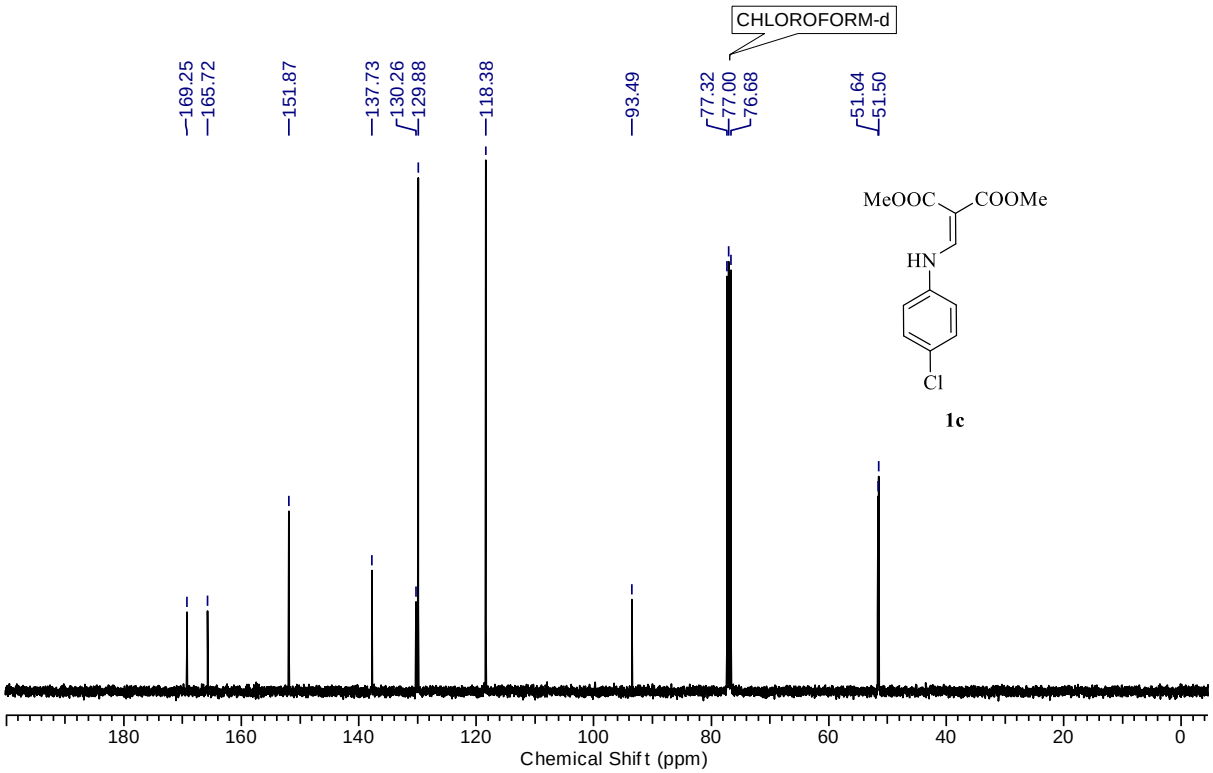
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1b



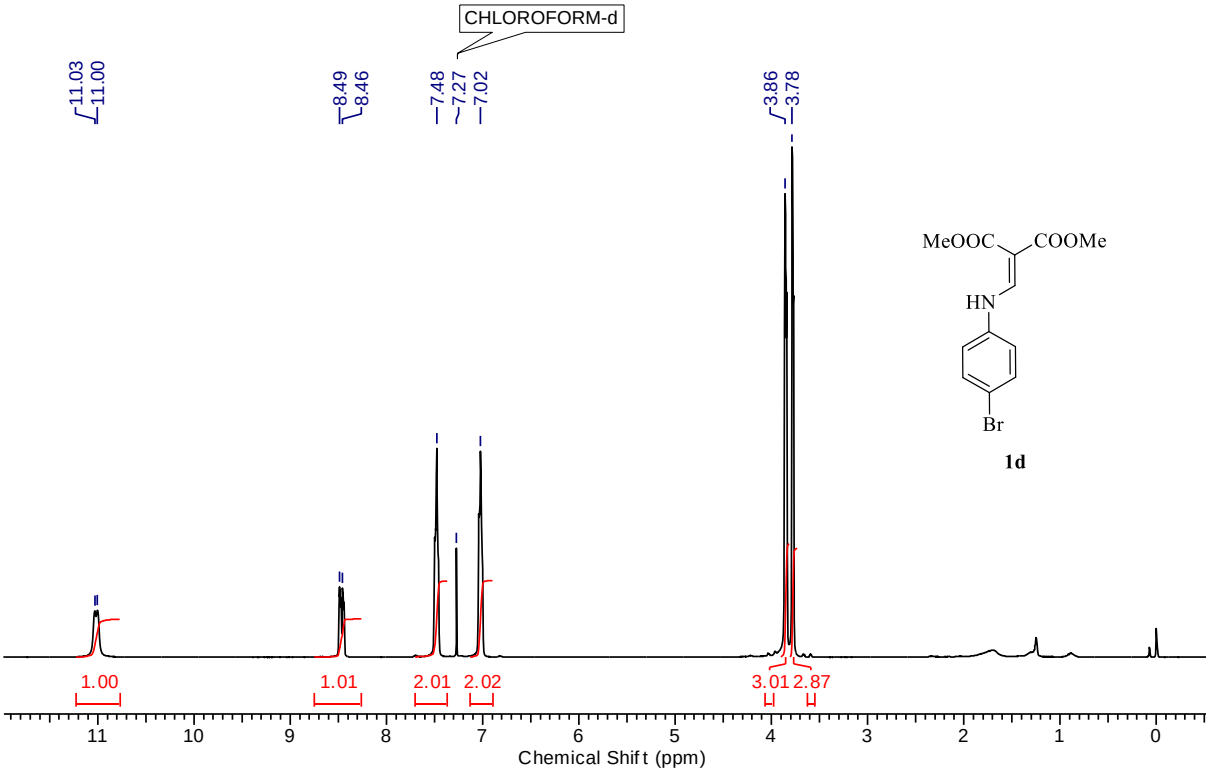
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1c



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1c



^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1d



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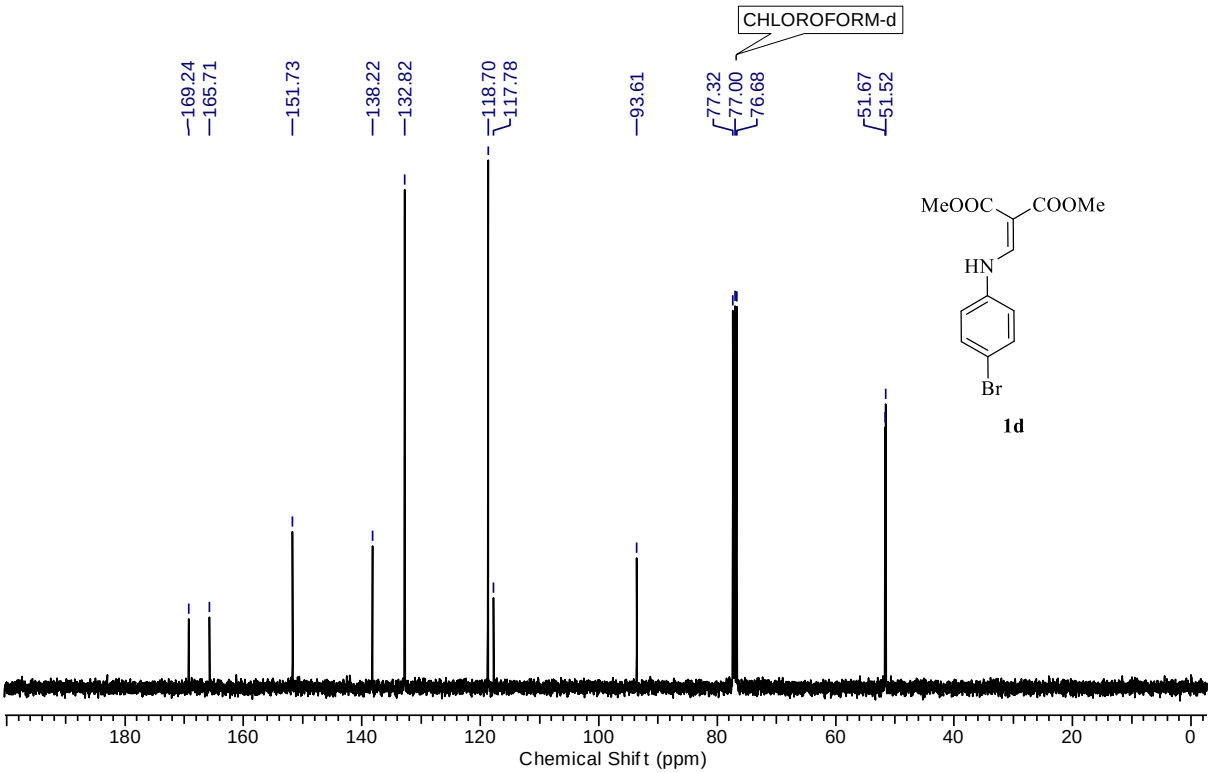
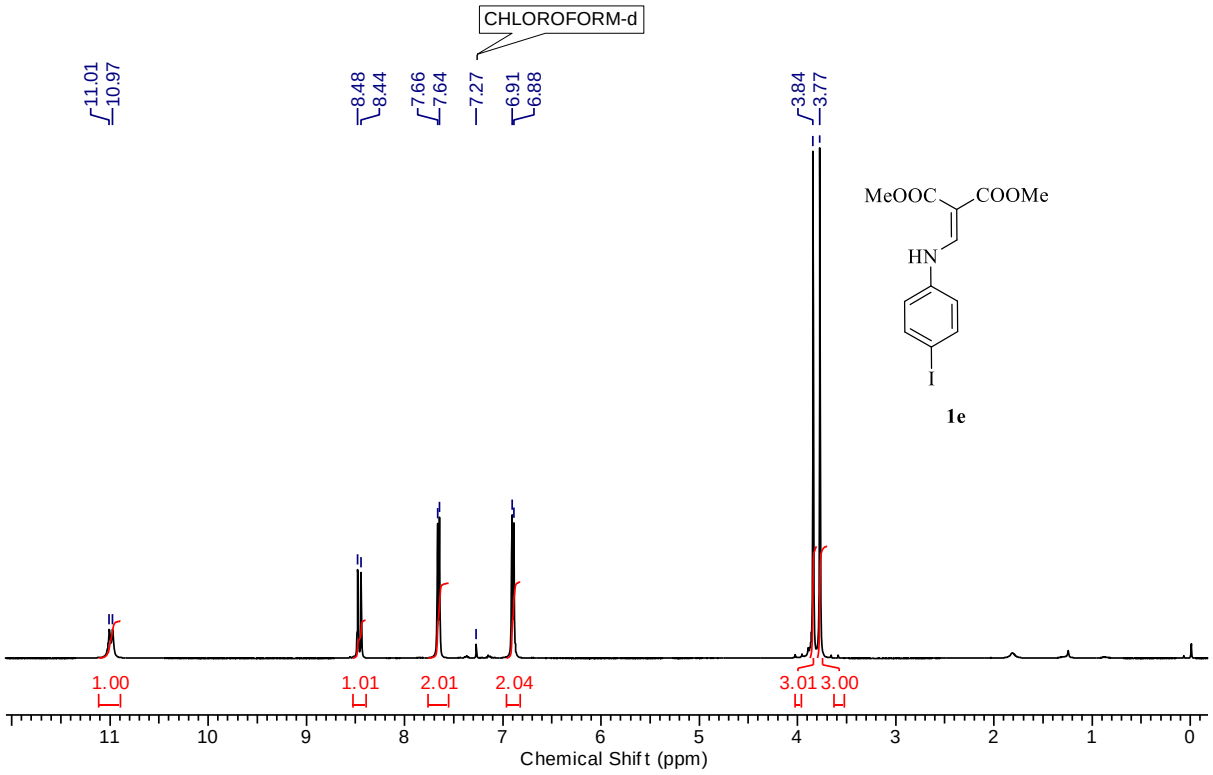
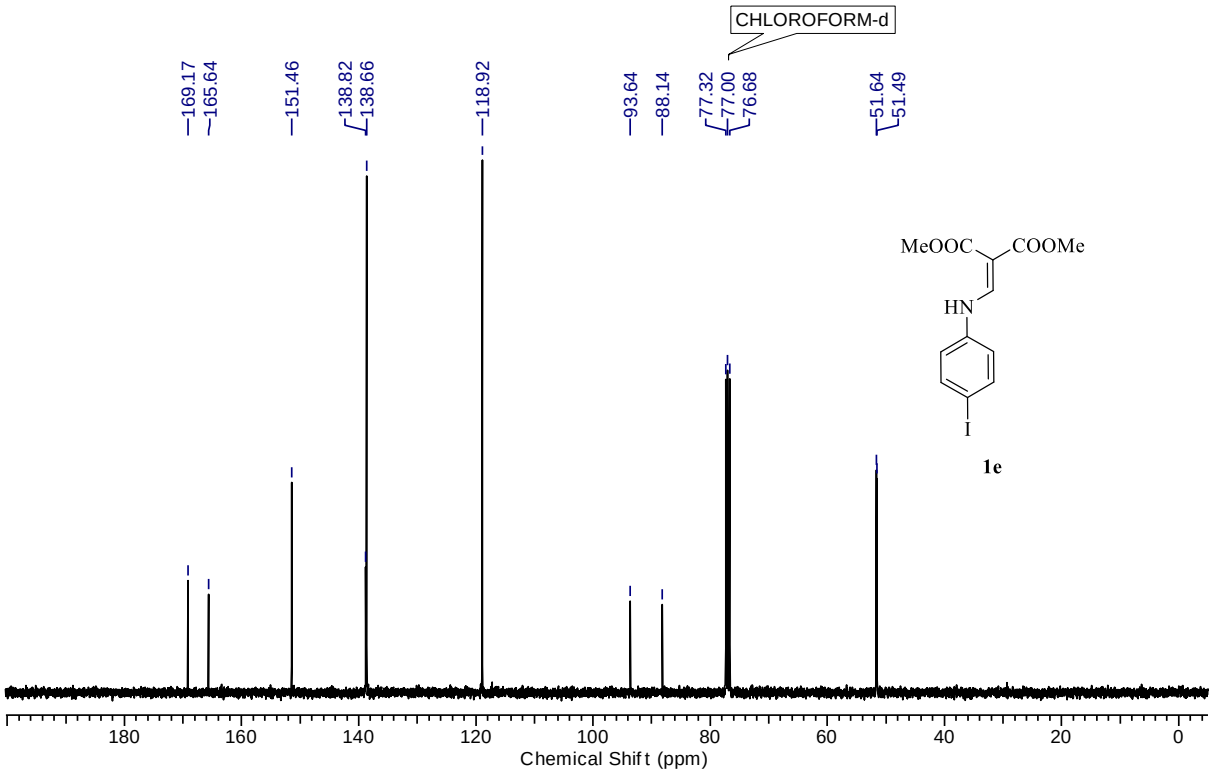


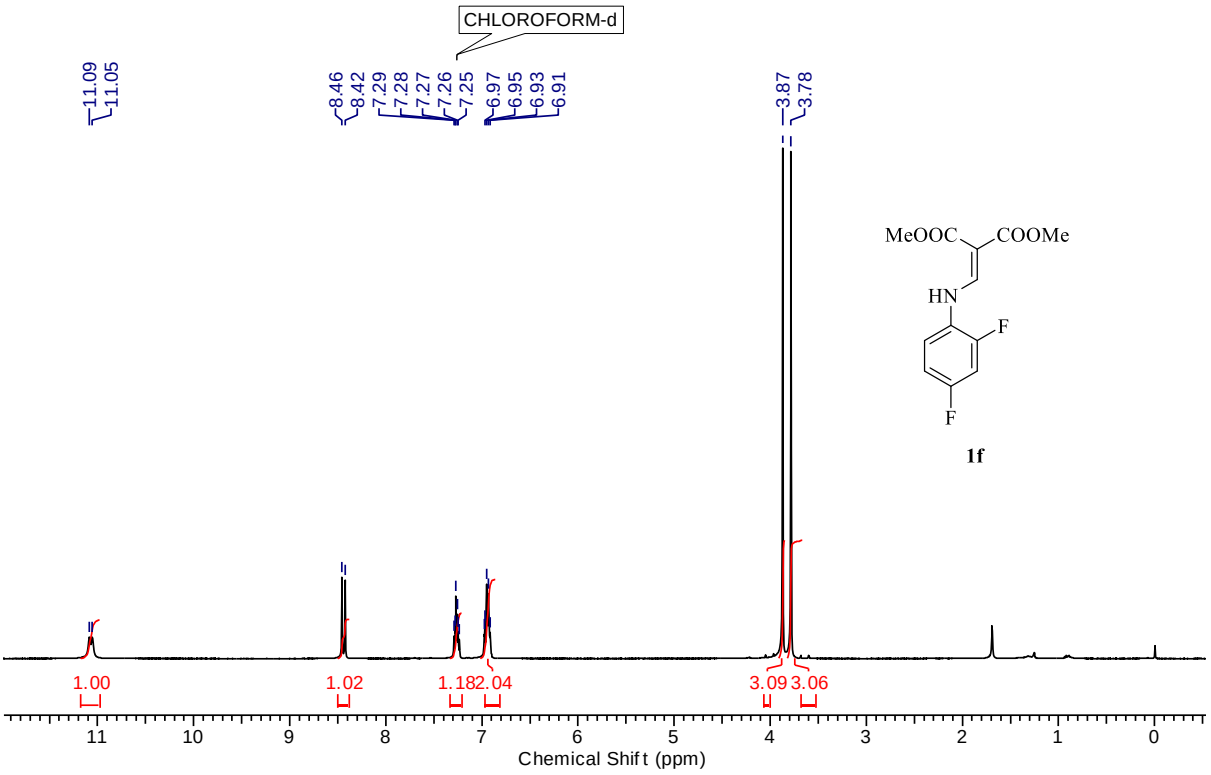
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1e



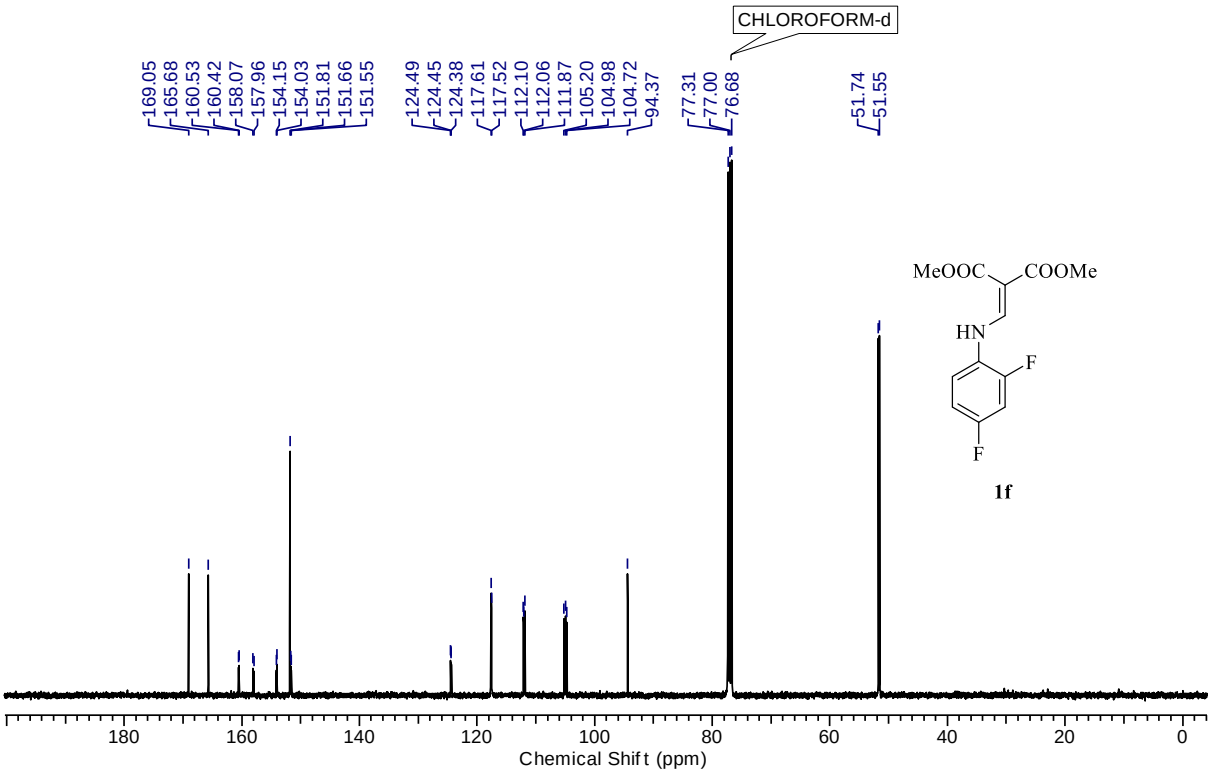
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1e



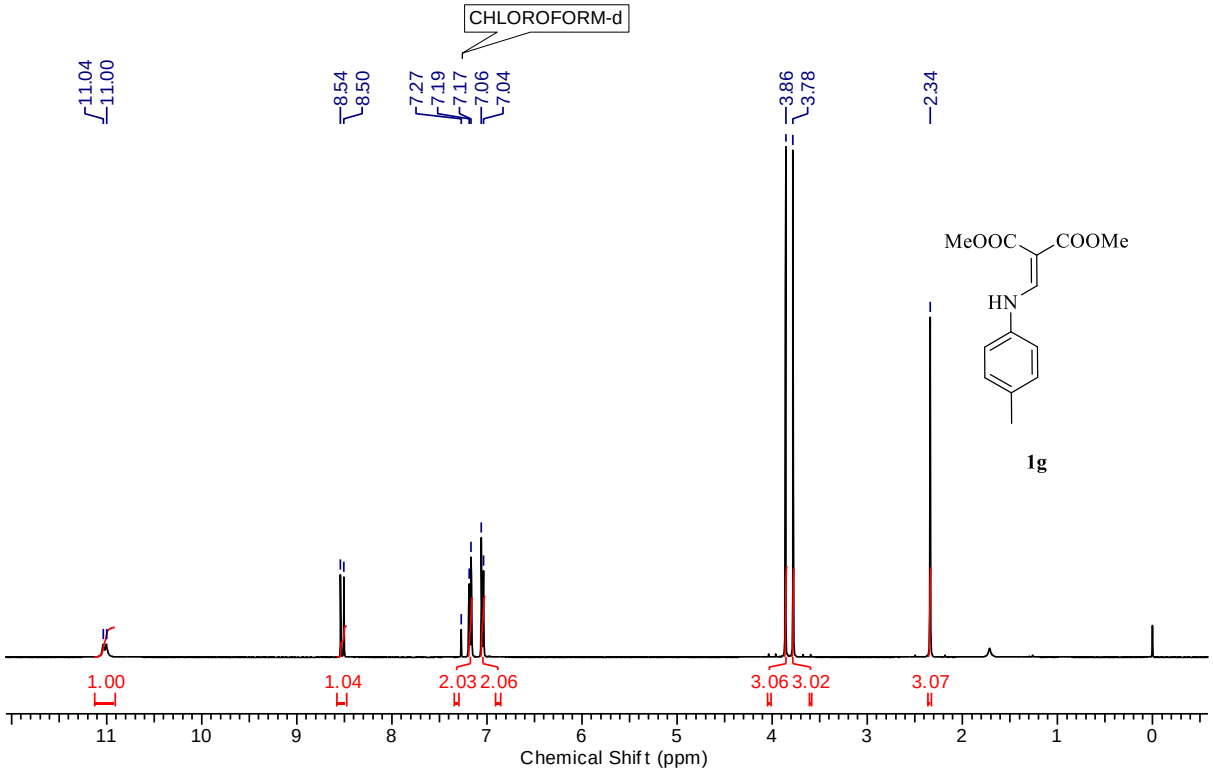
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1f



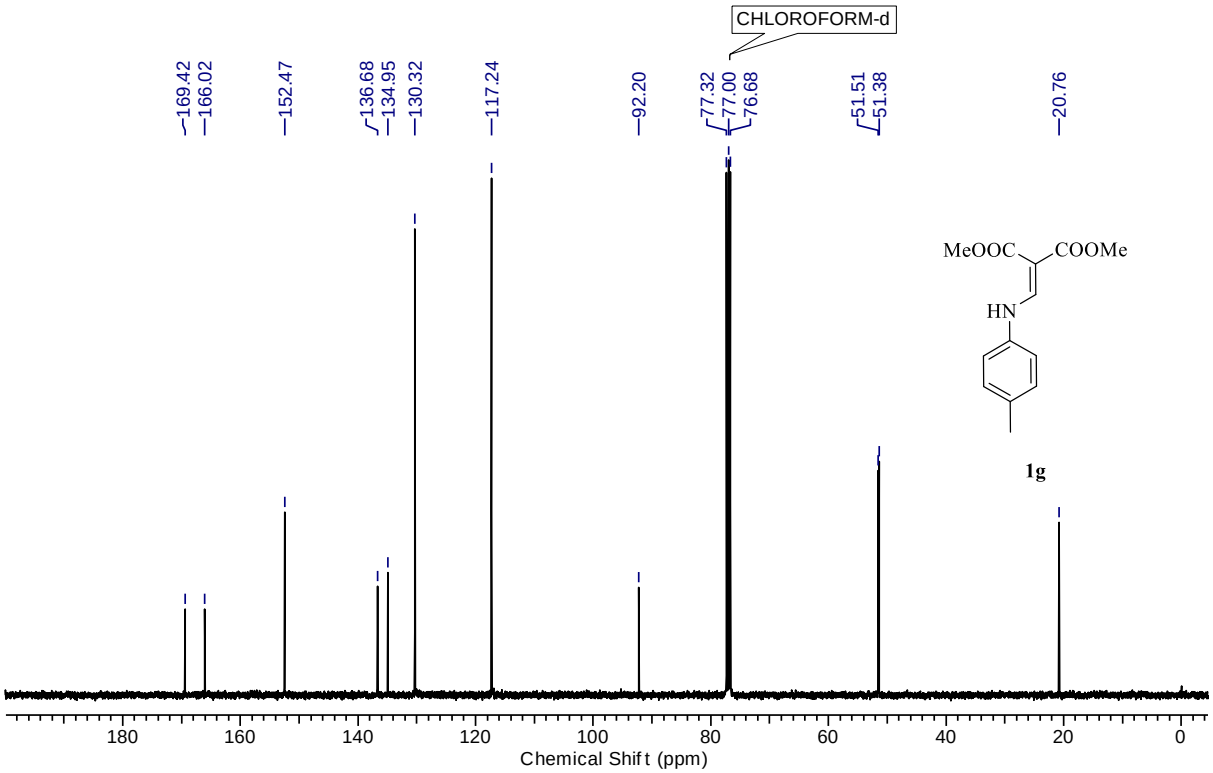
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1f



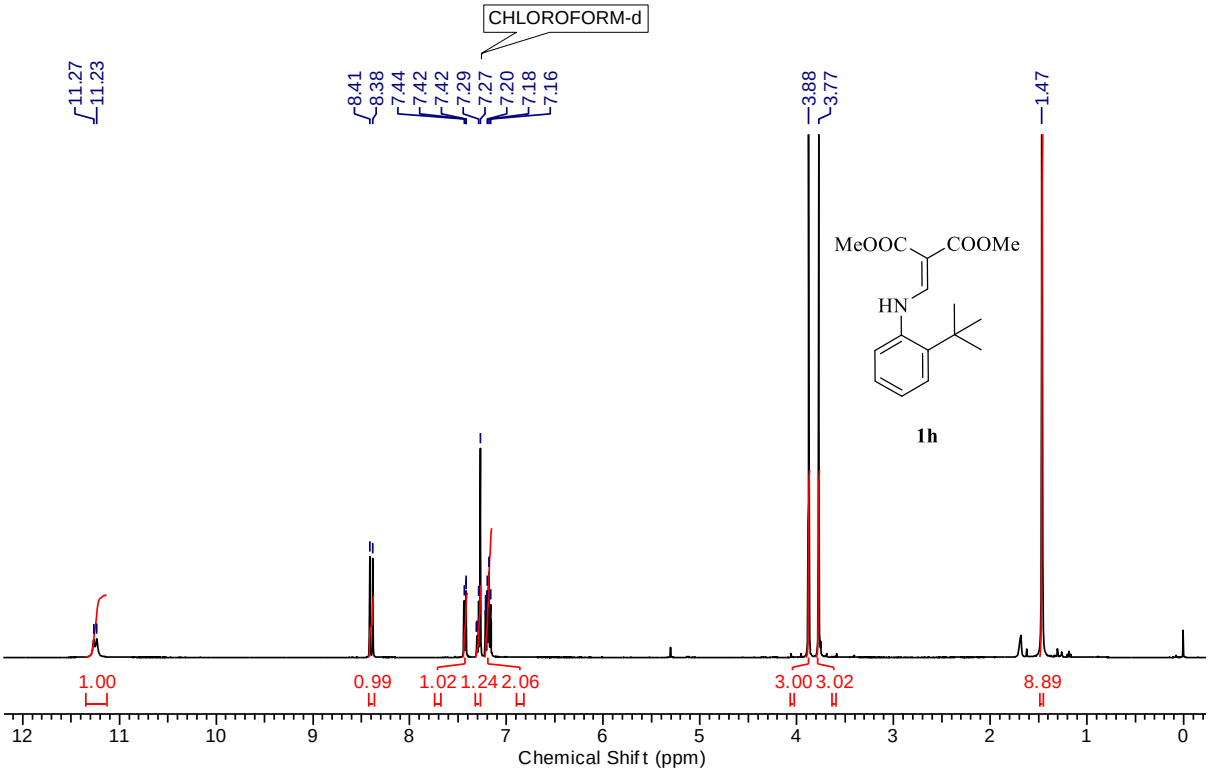
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1g



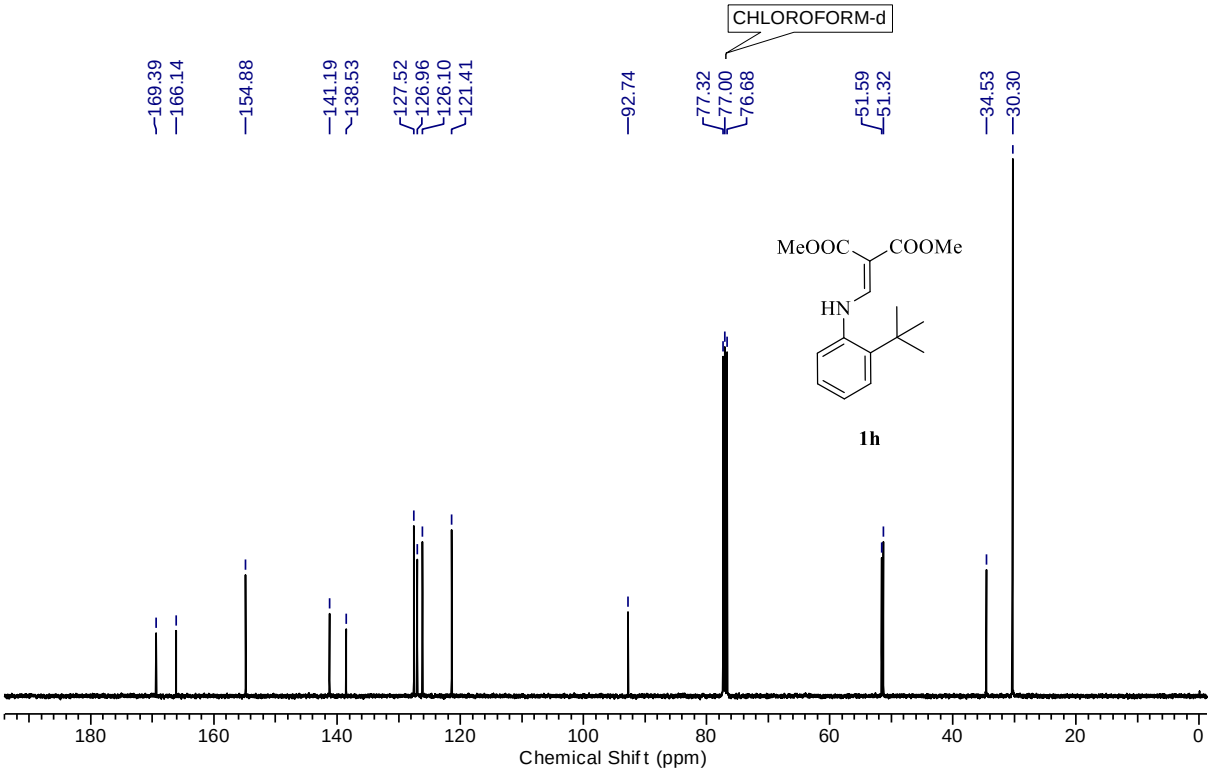
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1g



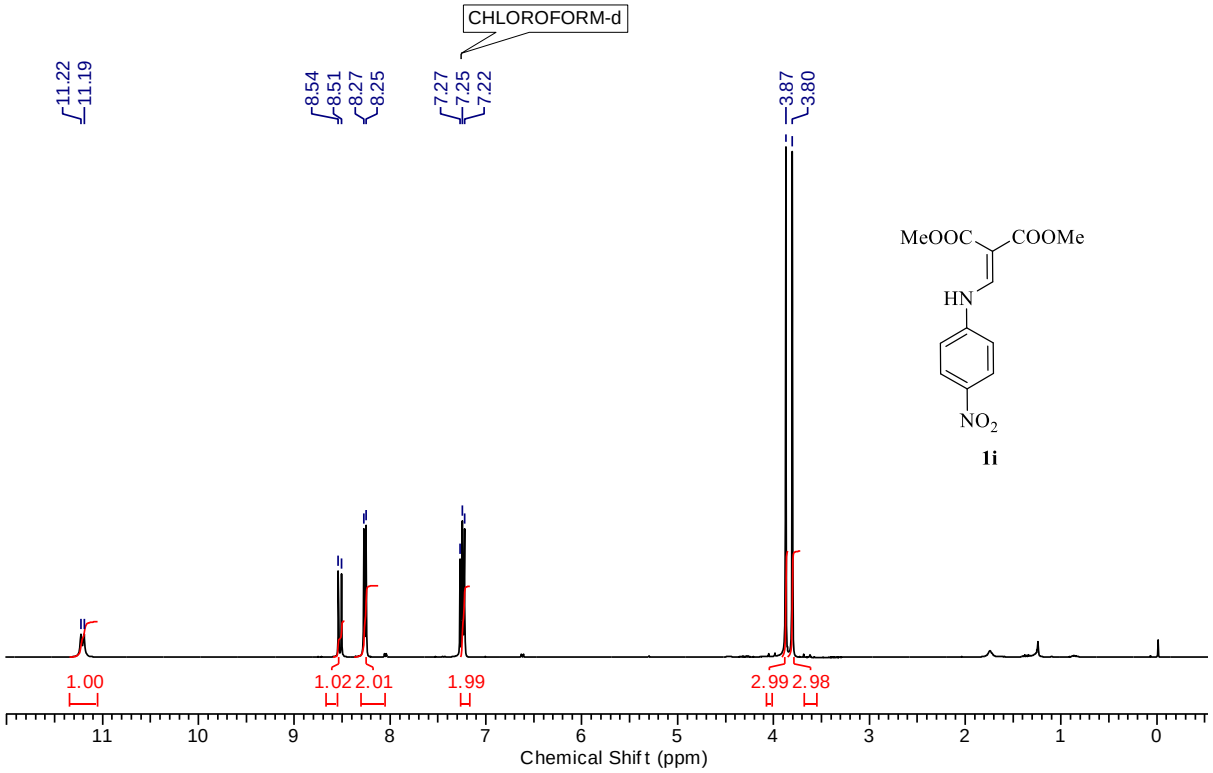
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1h



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1h



^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1i



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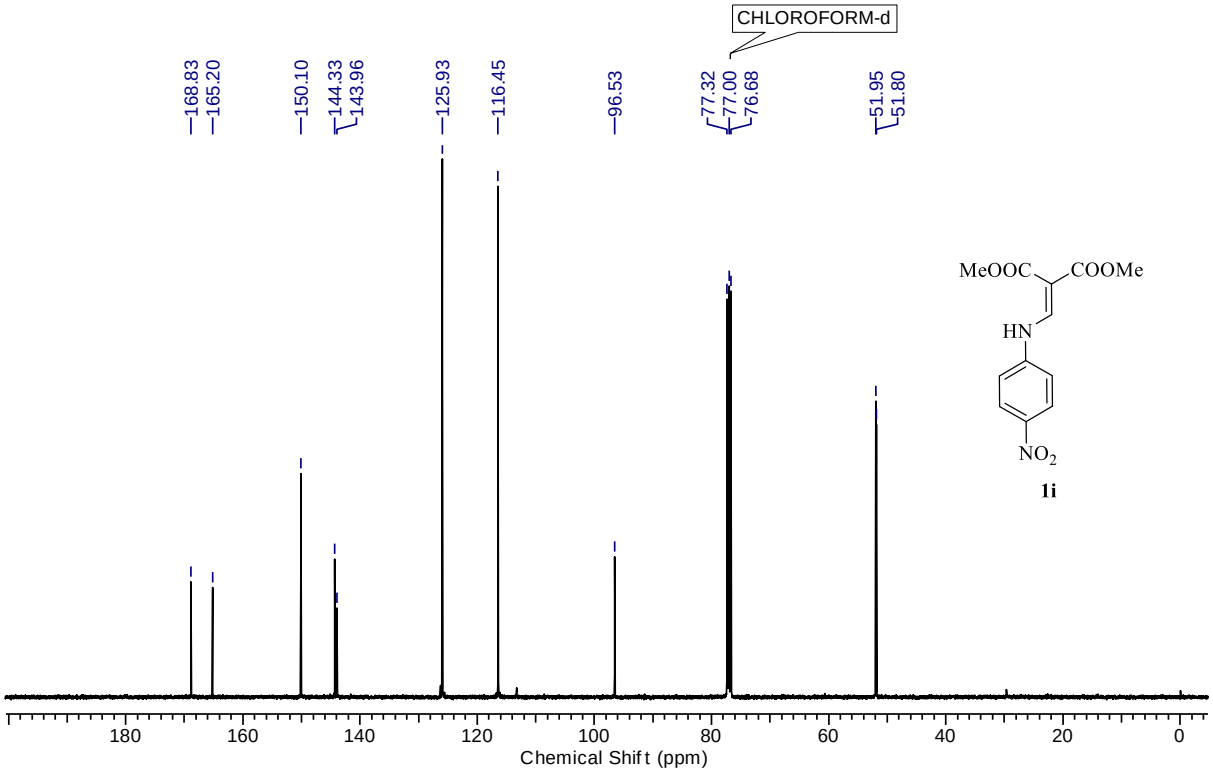
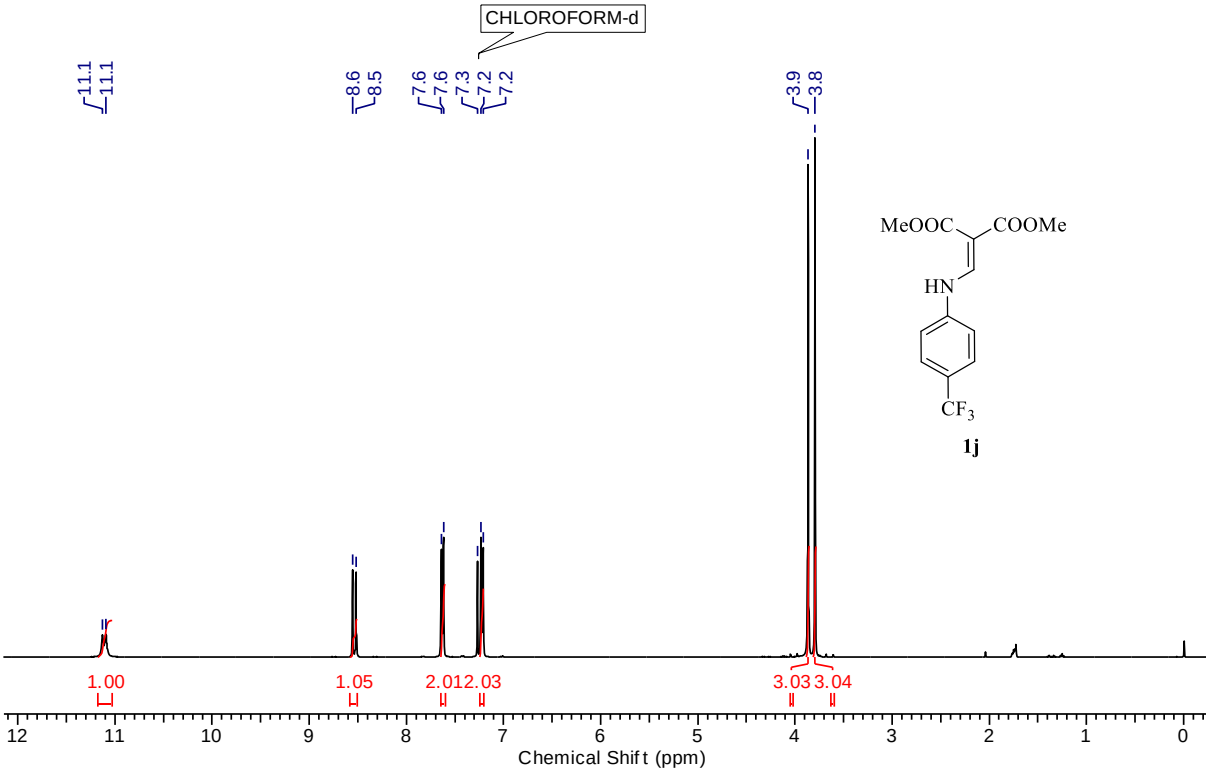
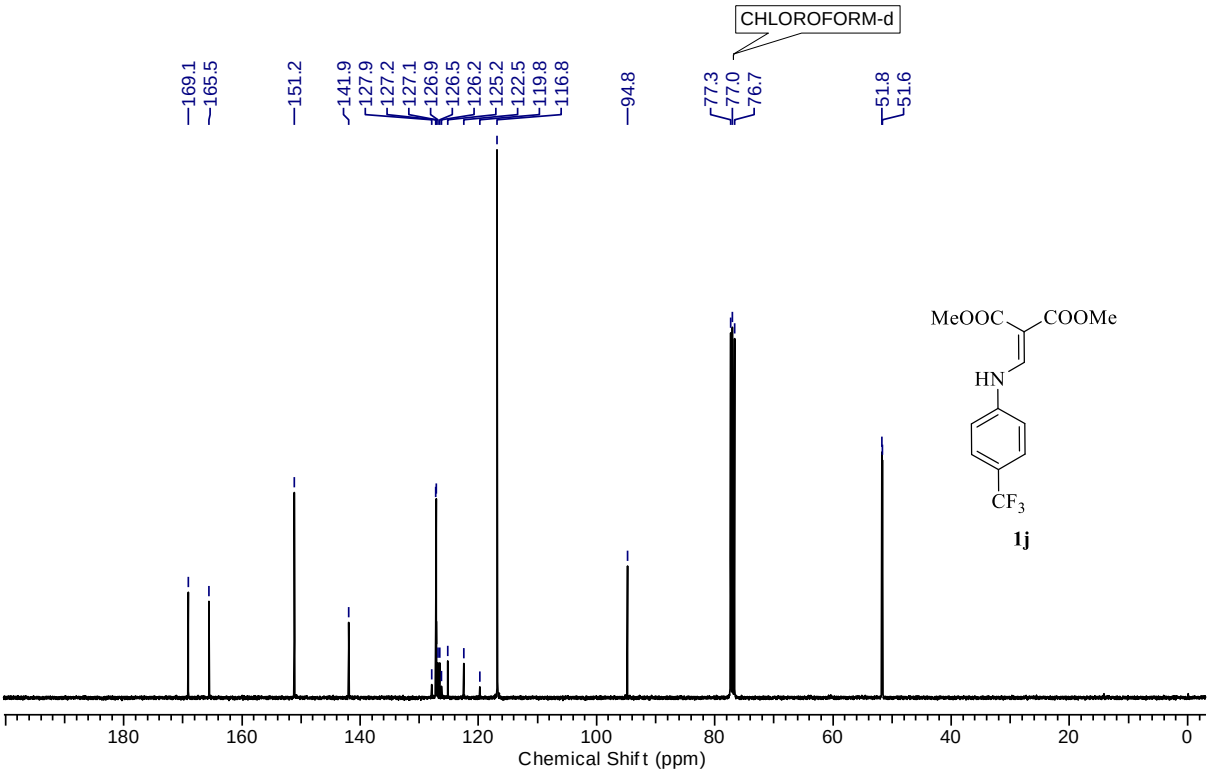


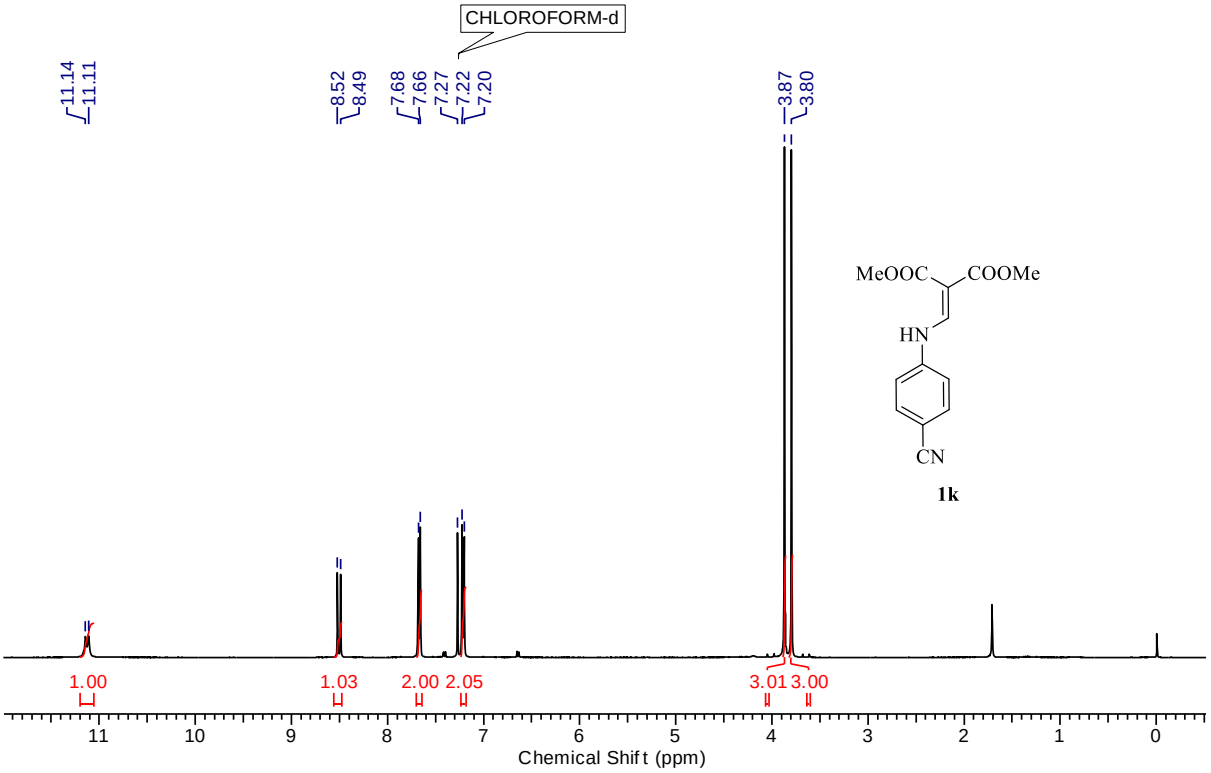
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1j



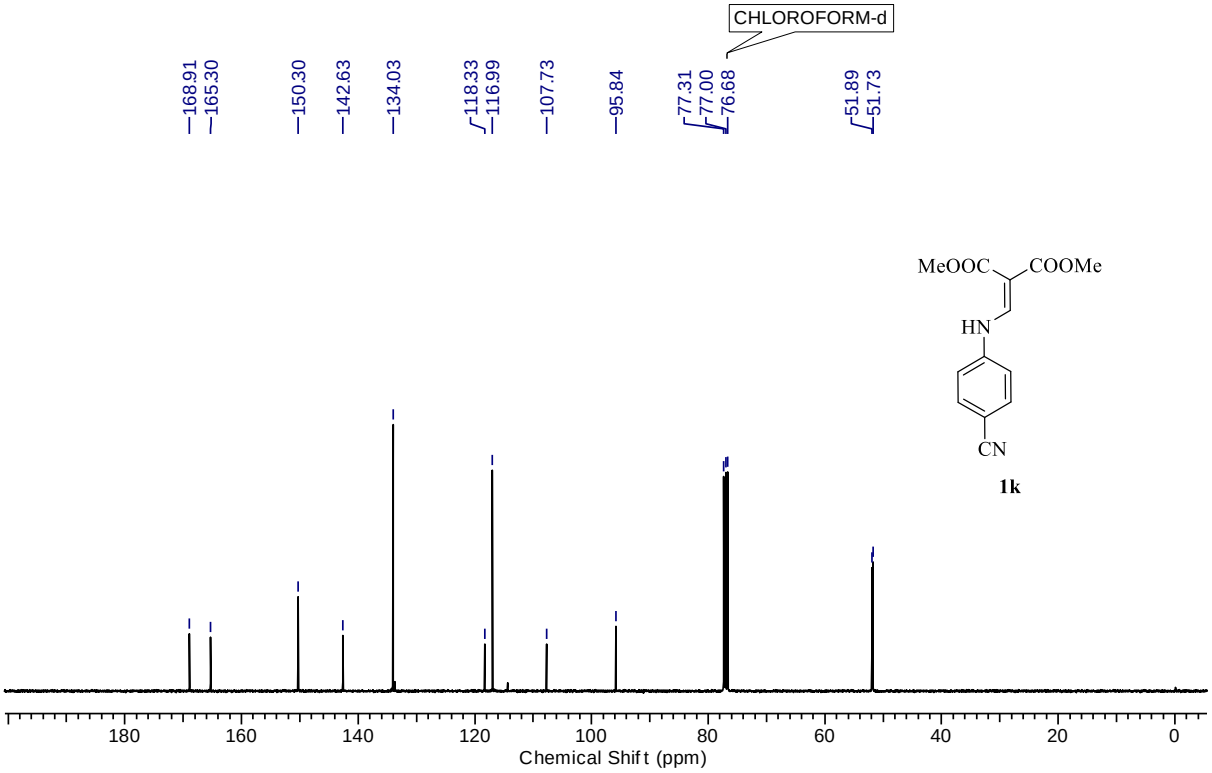
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1j



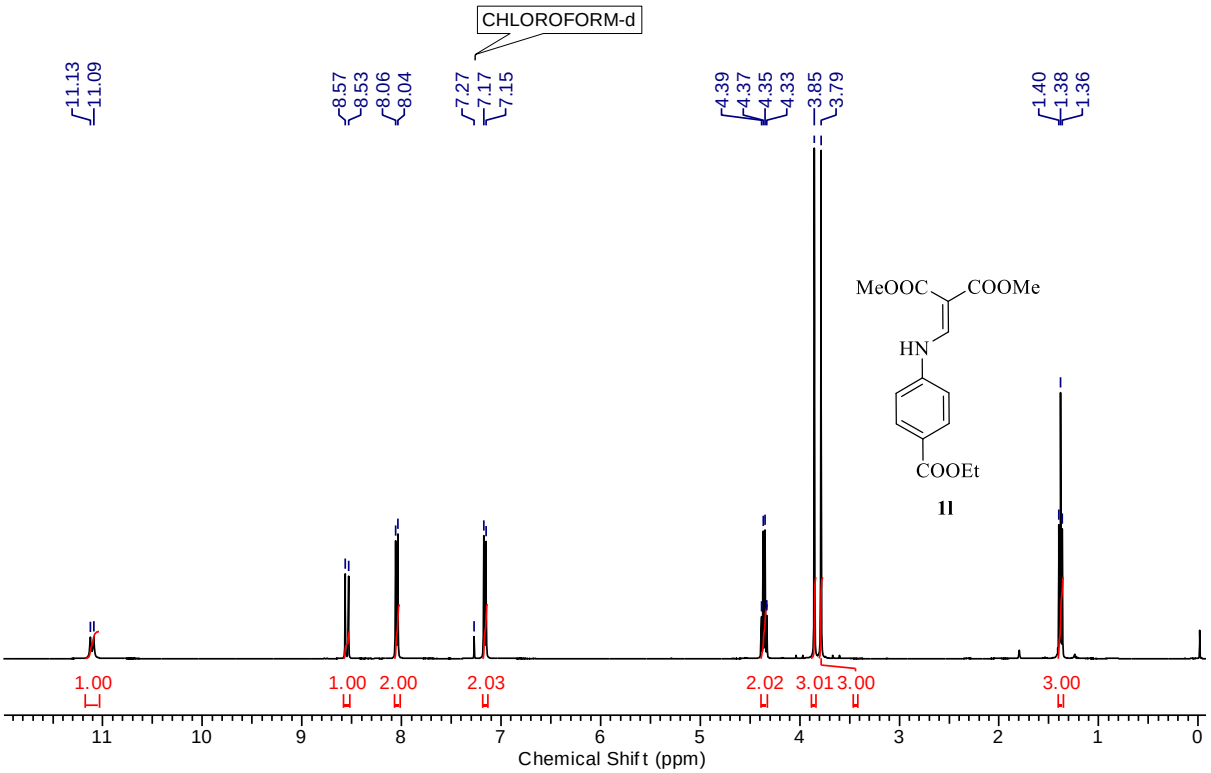
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1k



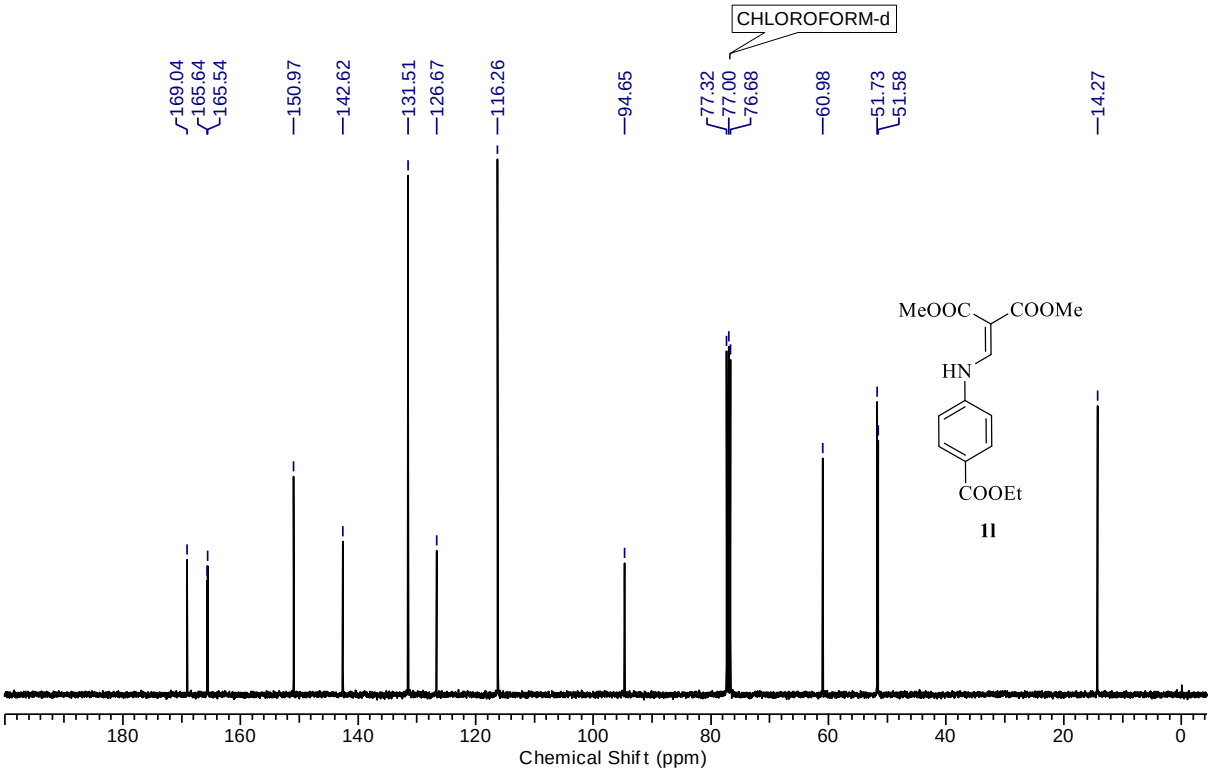
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1k



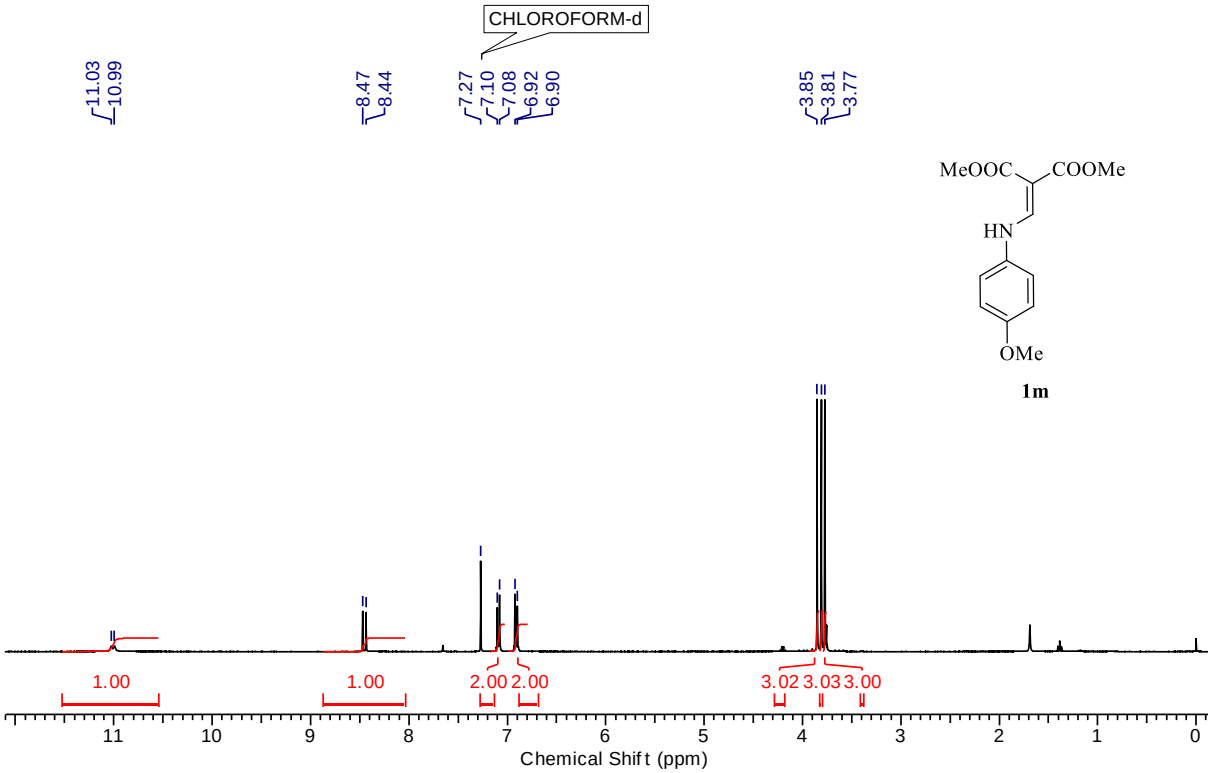
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1l



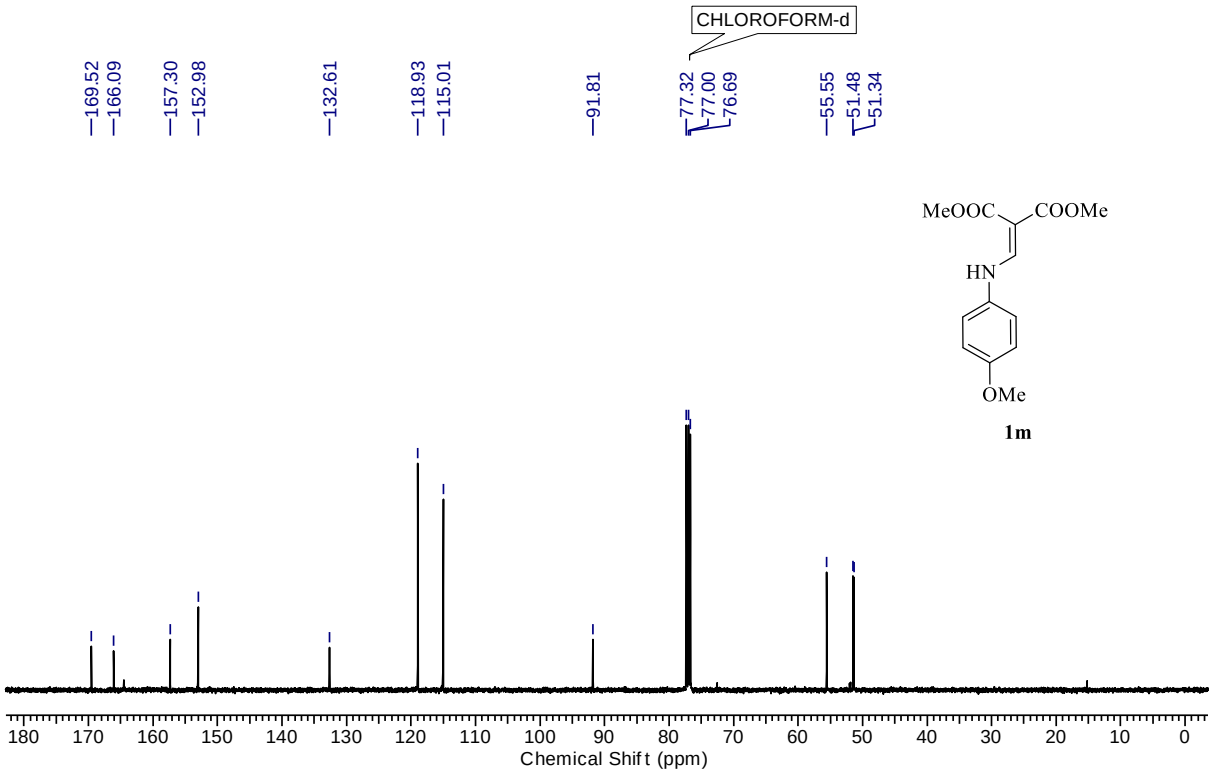
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1l



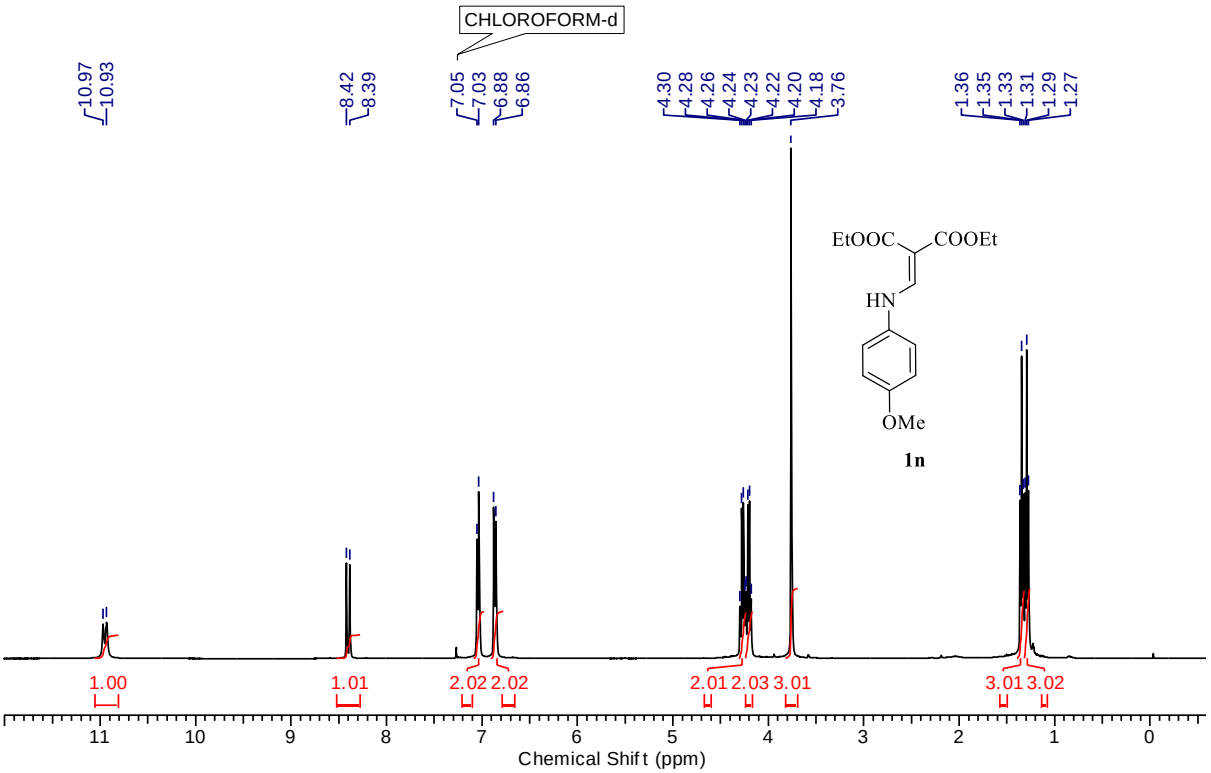
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1m



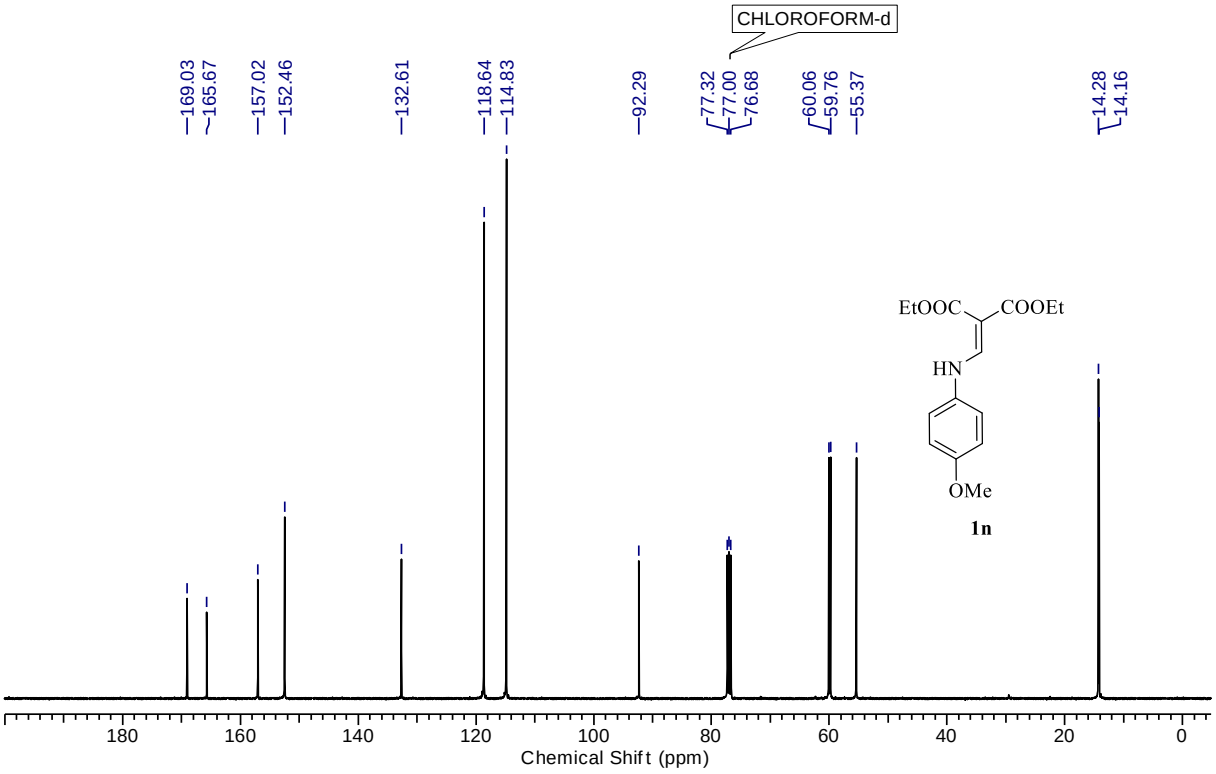
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1m



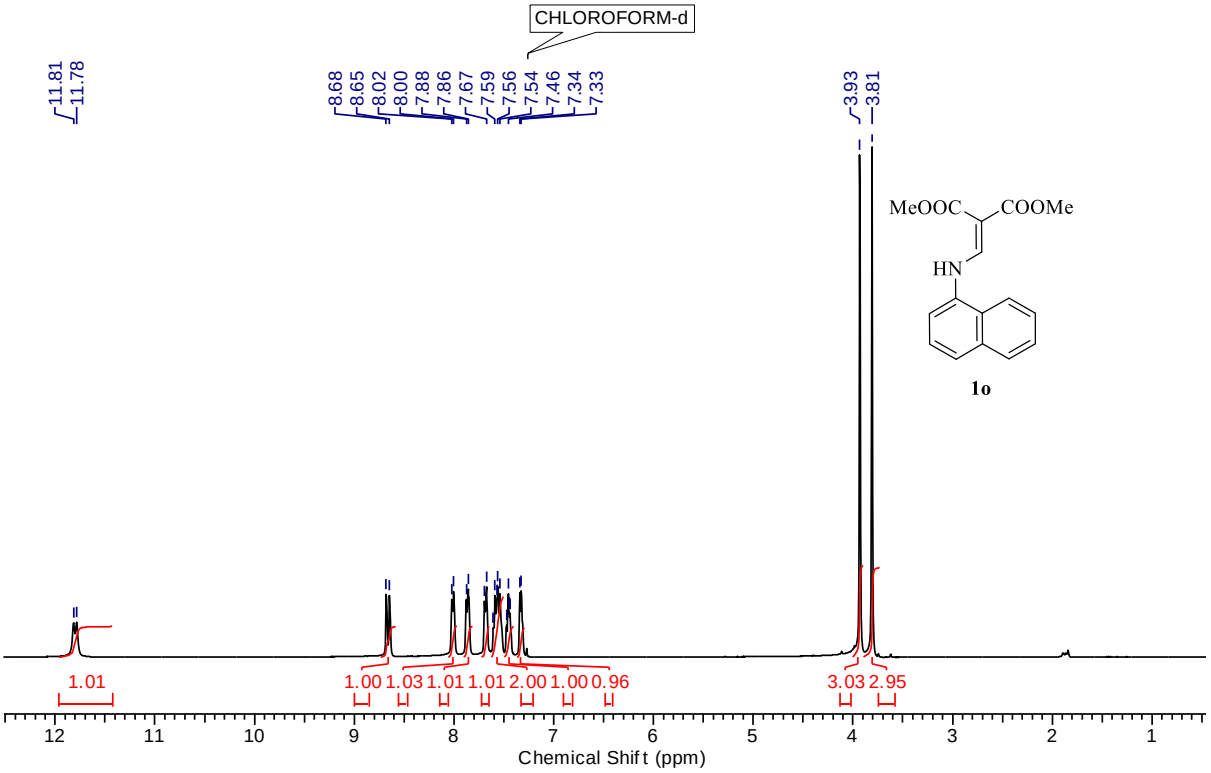
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1n



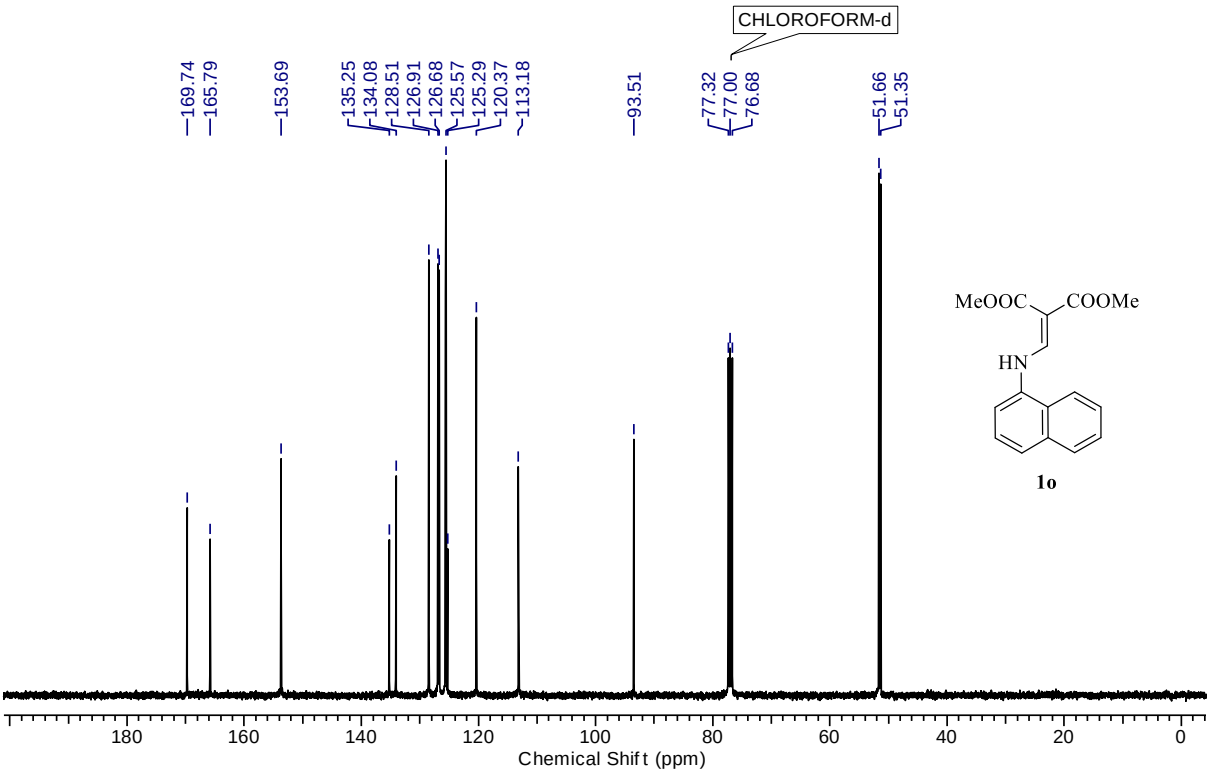
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1n



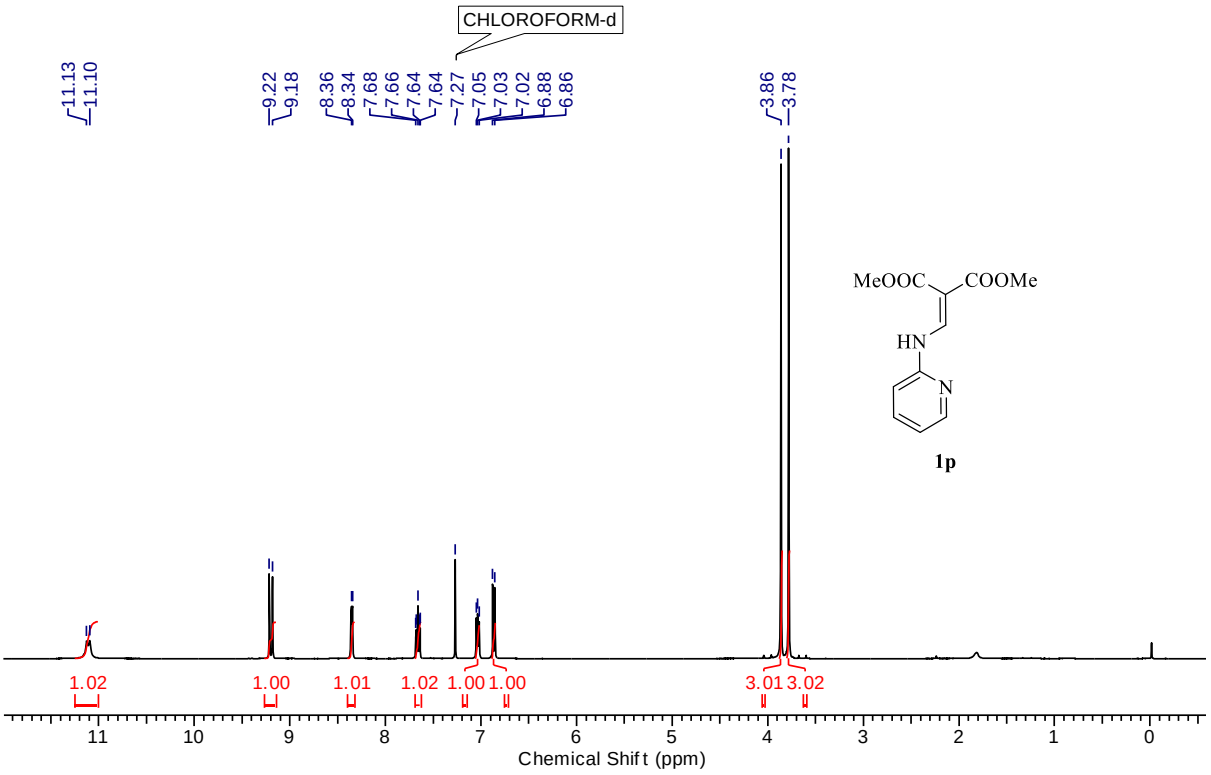
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1o



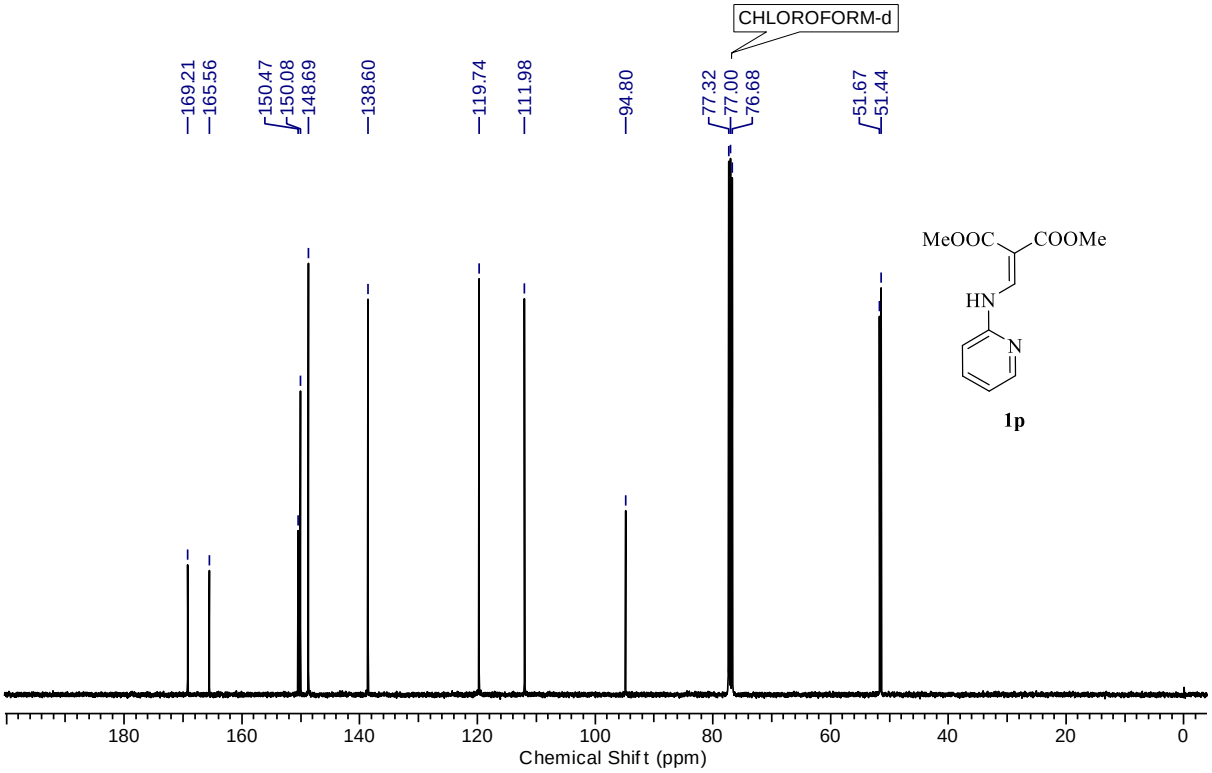
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1o



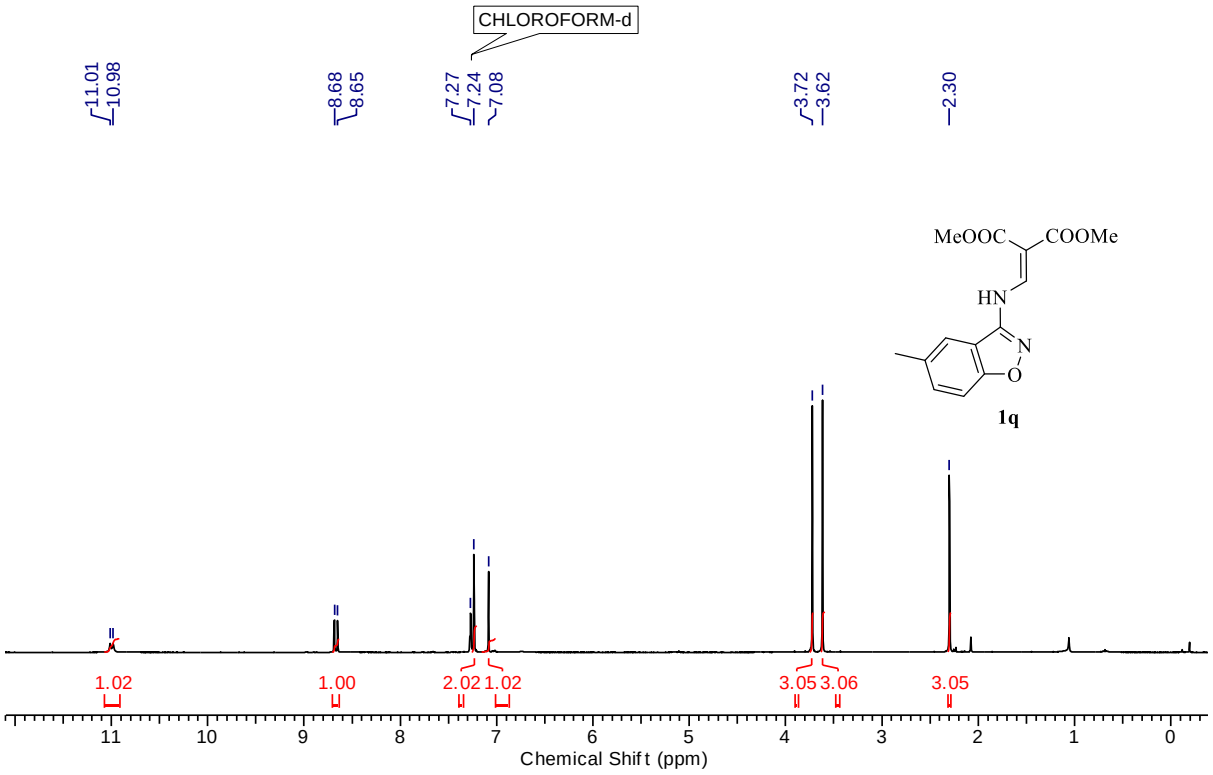
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1p



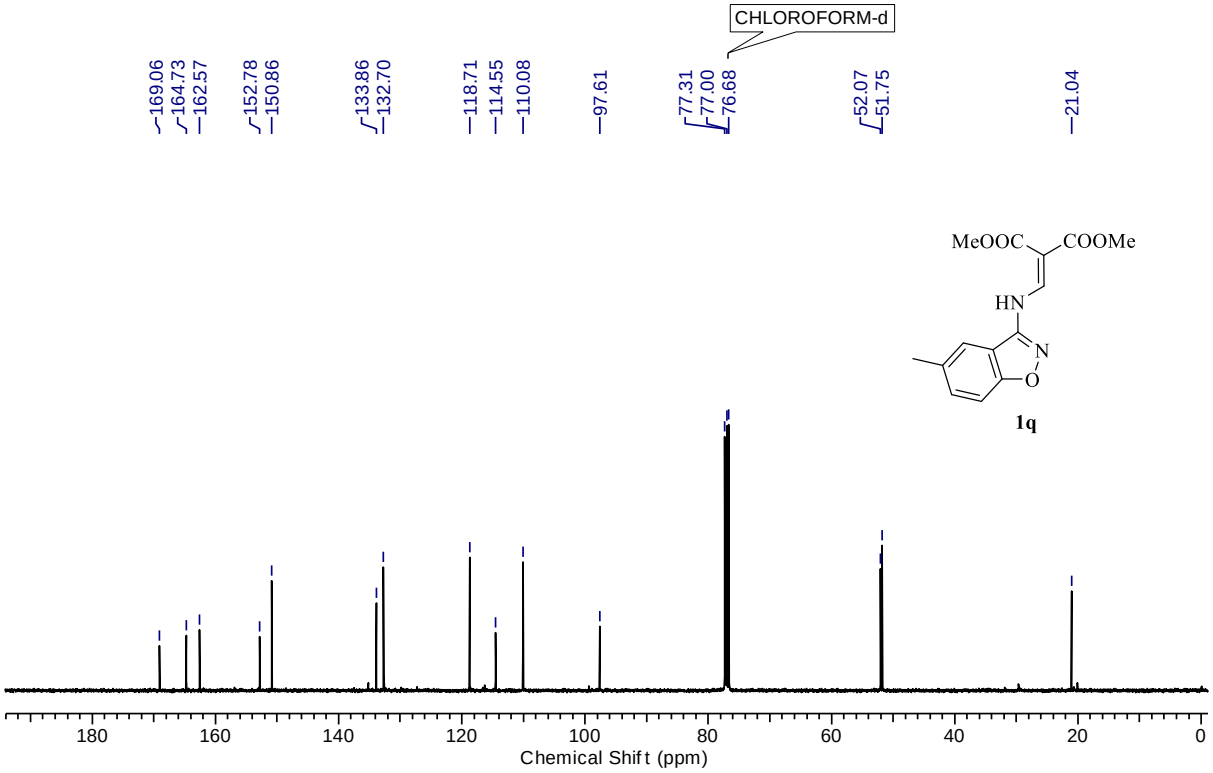
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1p



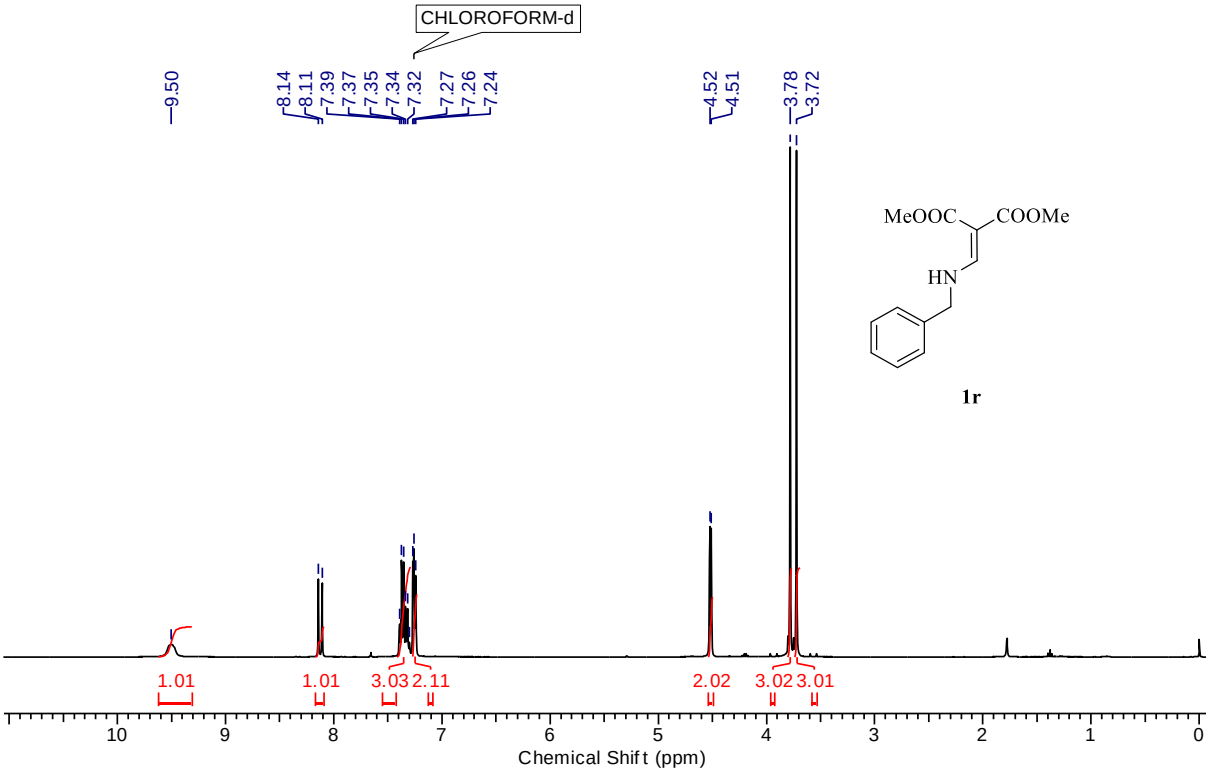
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1q



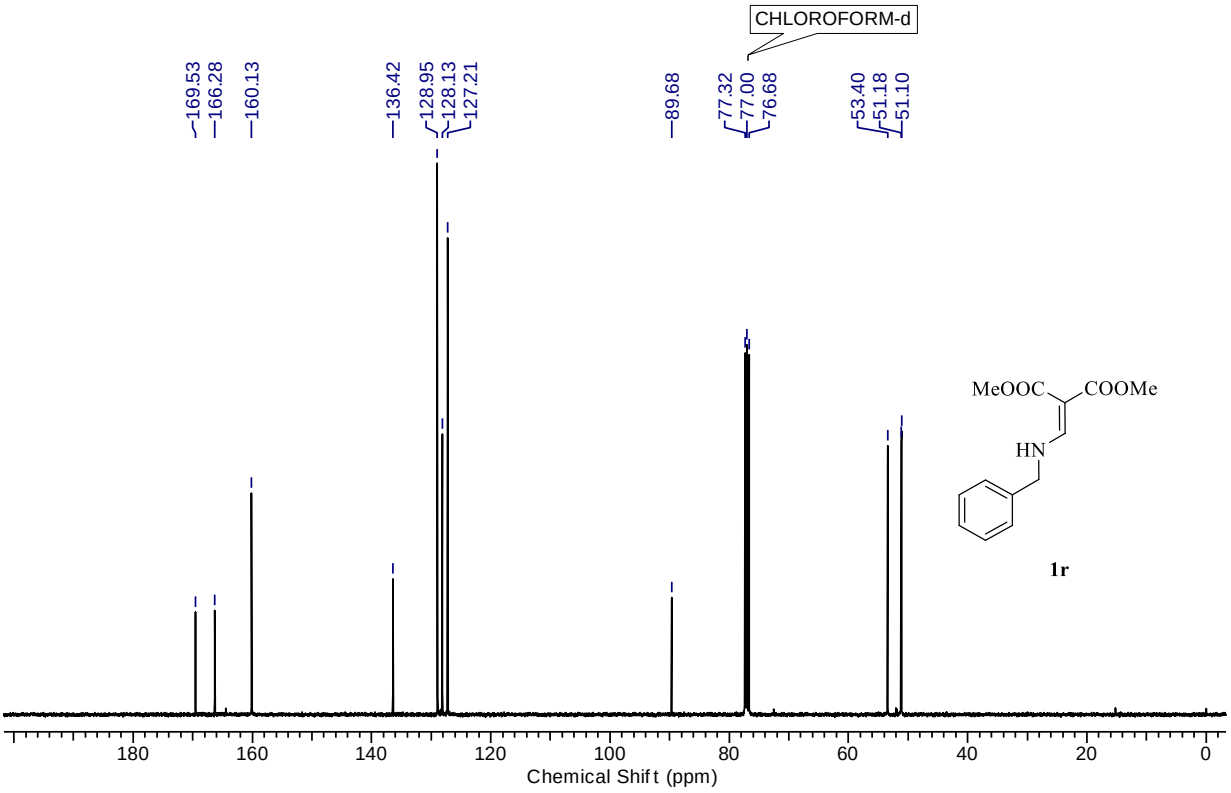
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1q



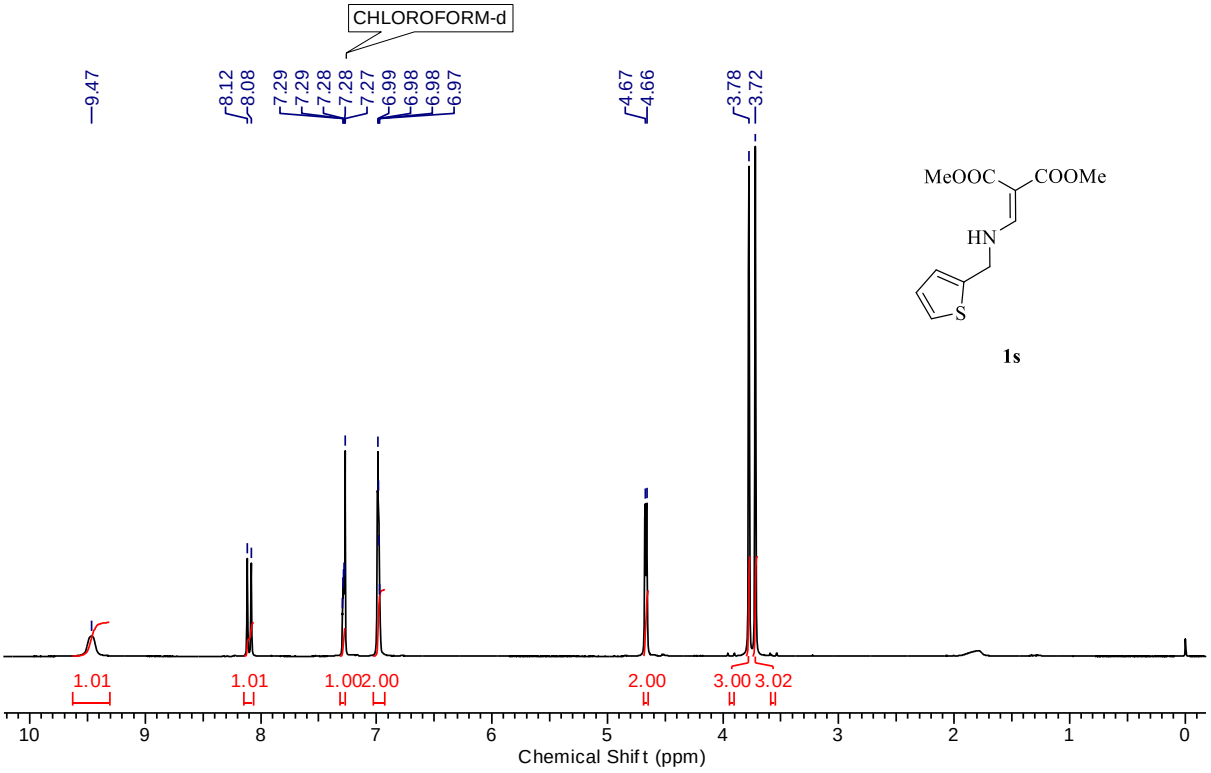
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1r



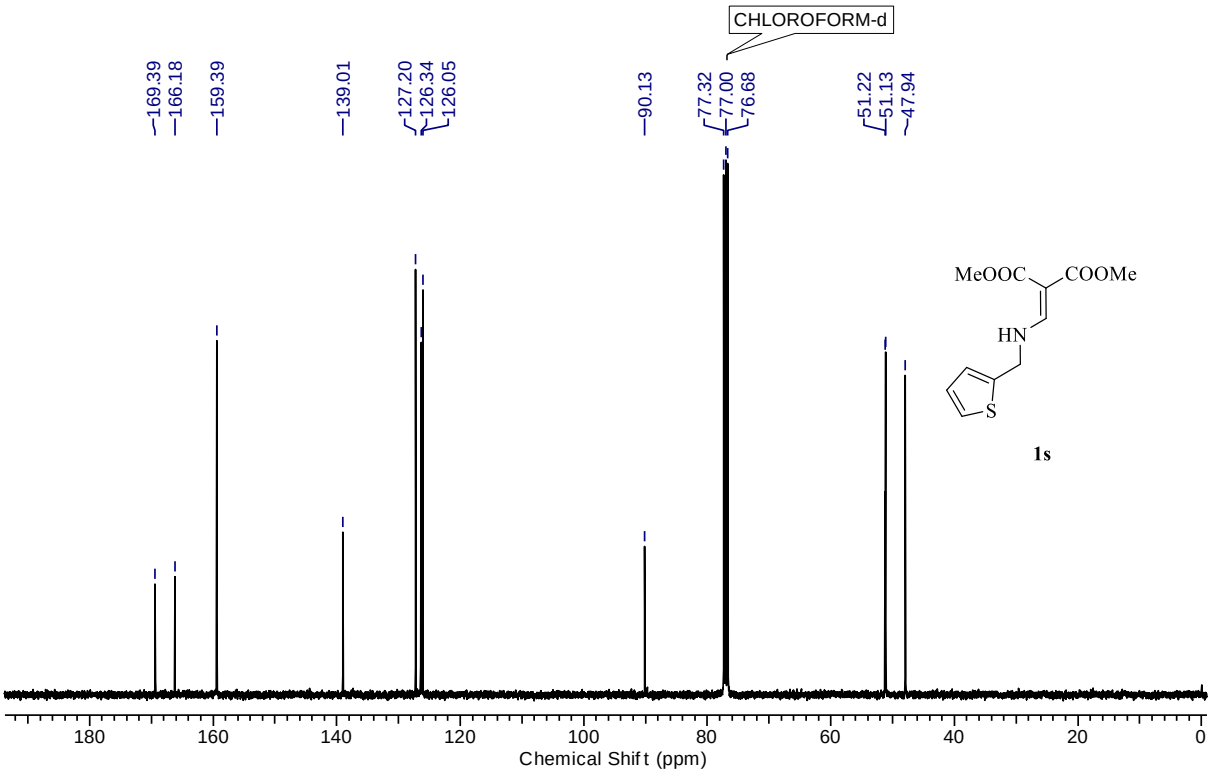
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1r



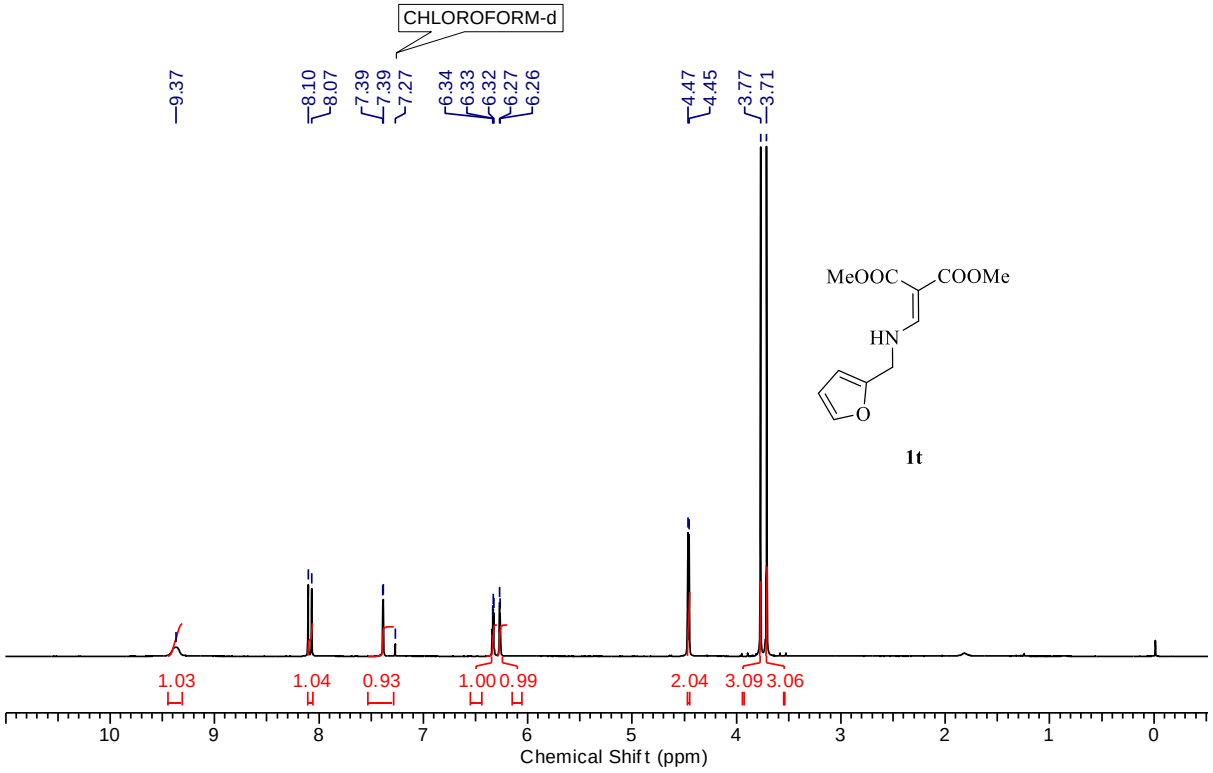
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1s



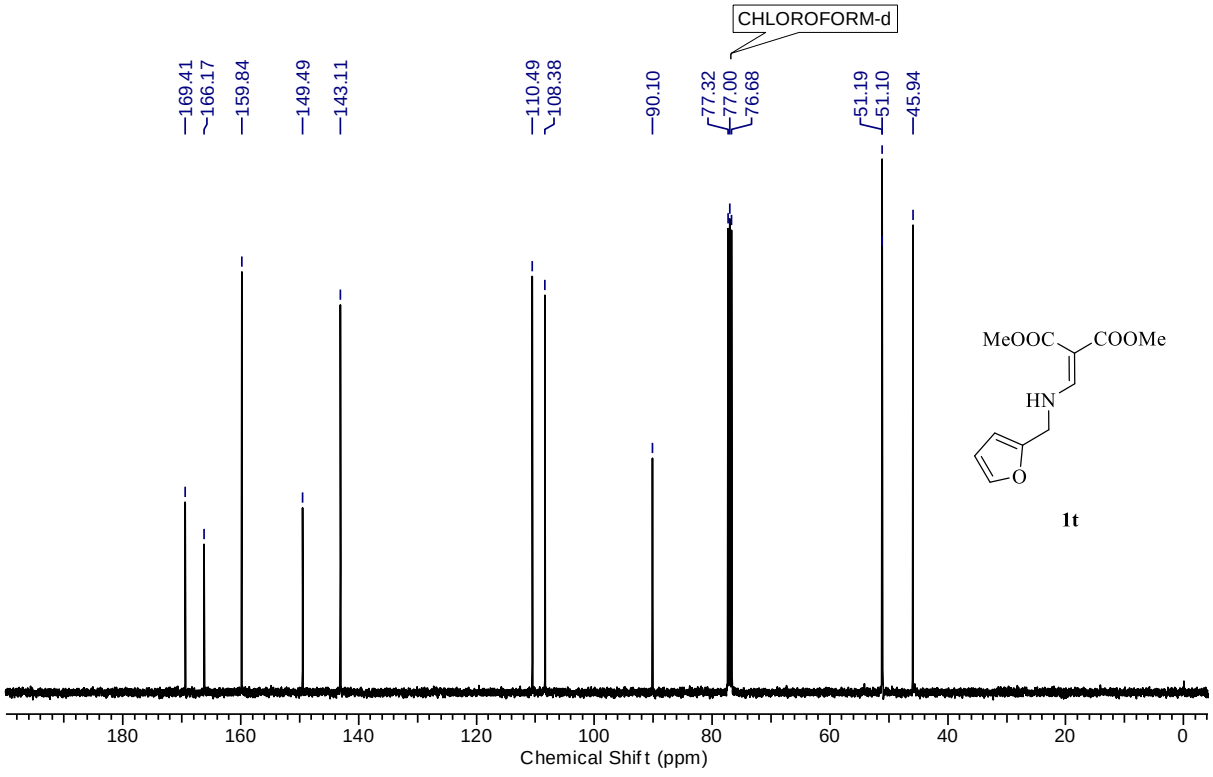
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1s



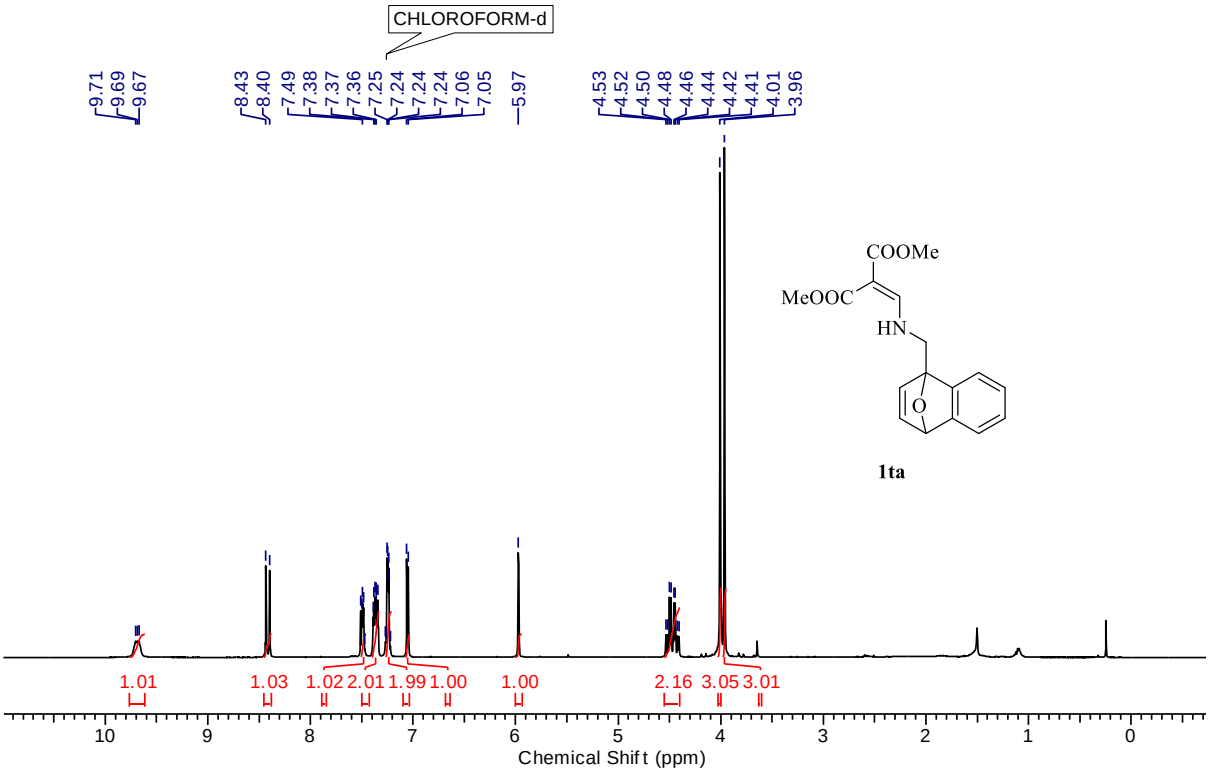
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1t



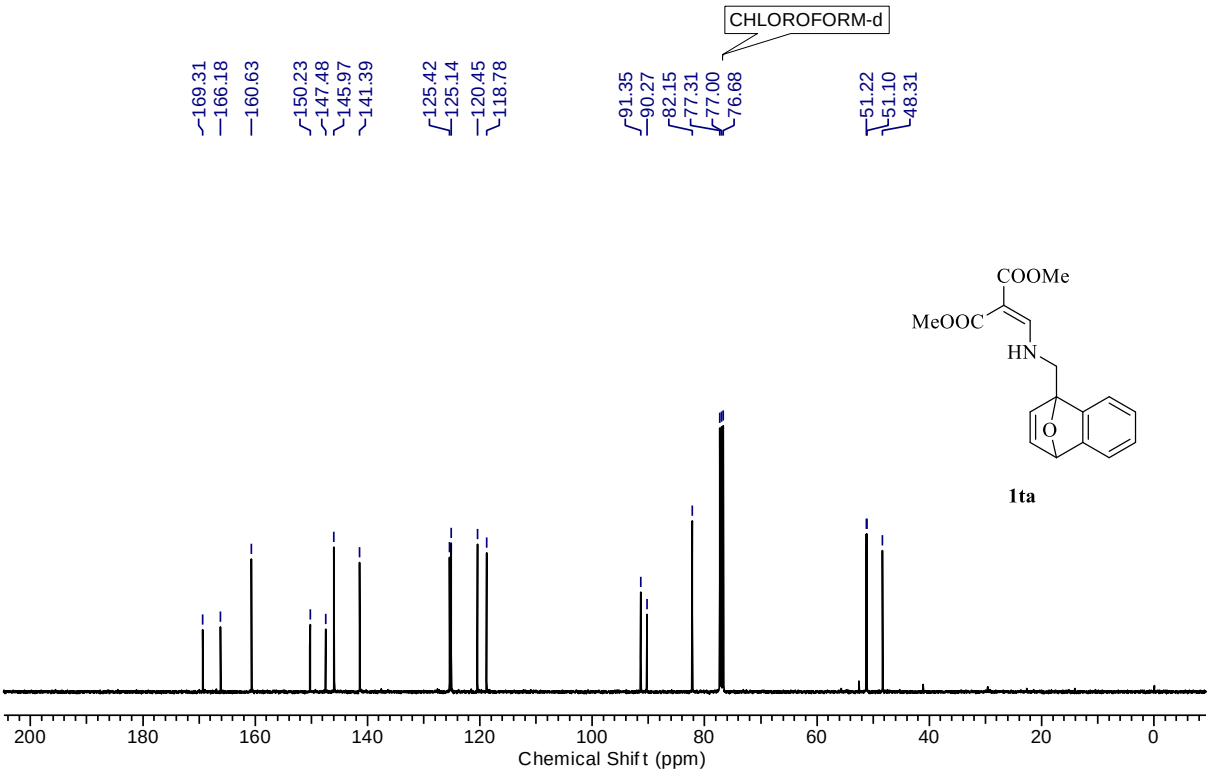
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1t



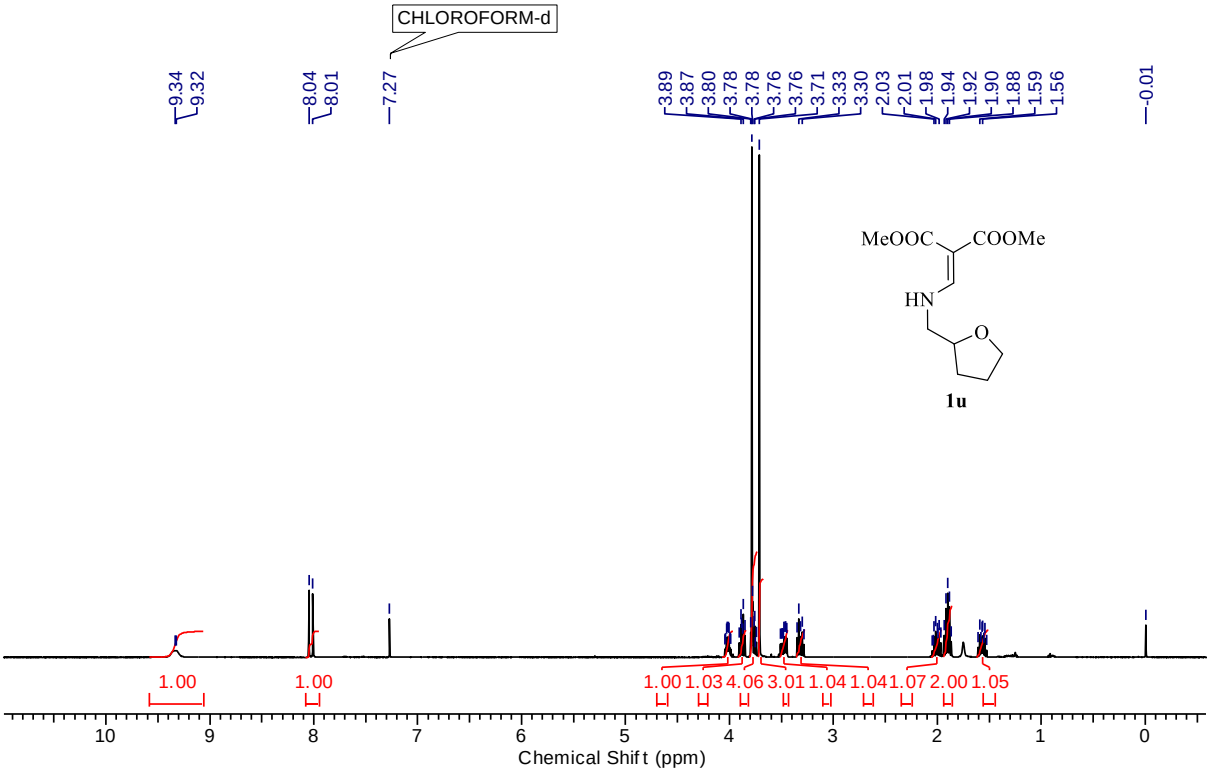
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1ta



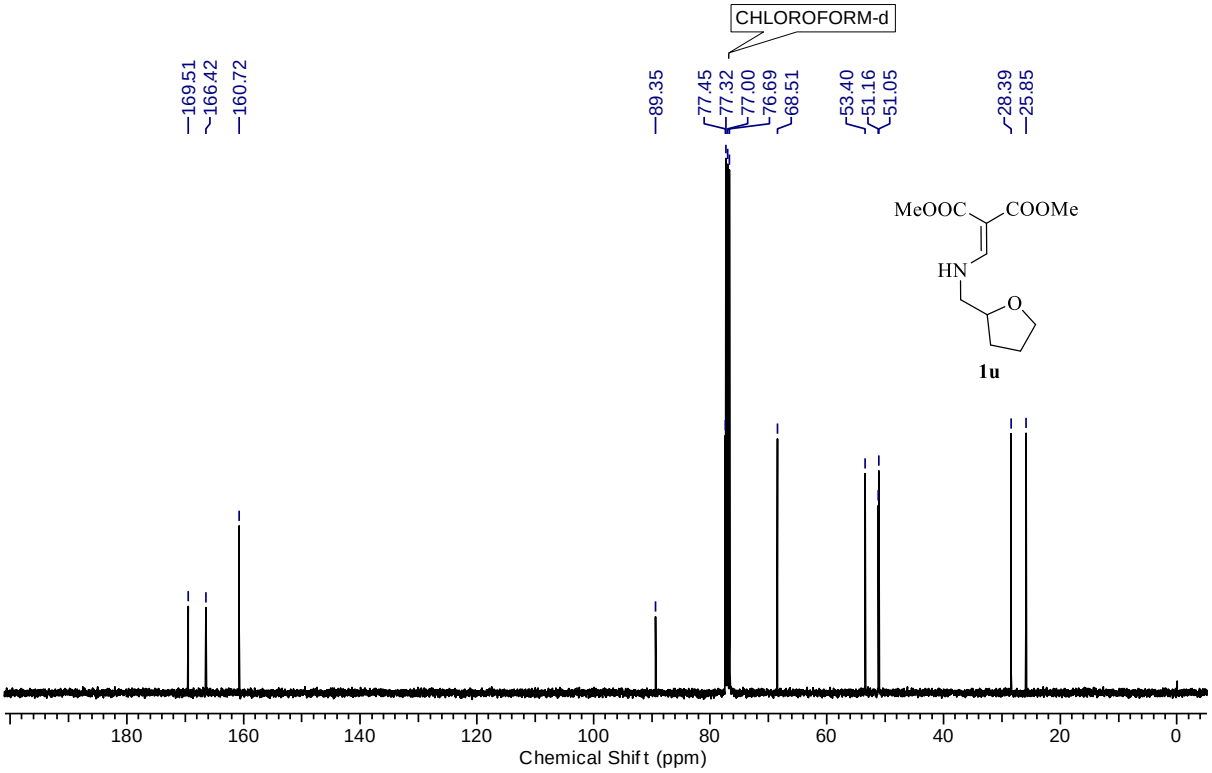
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1ta



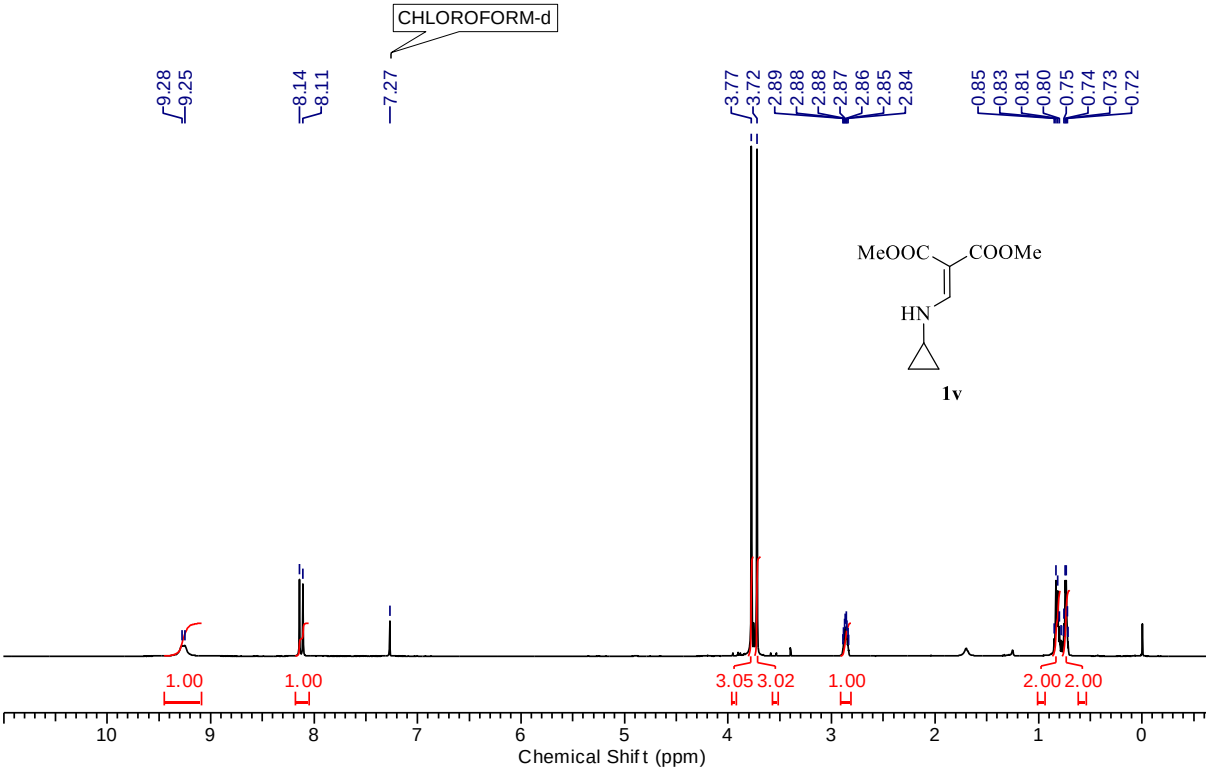
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1u



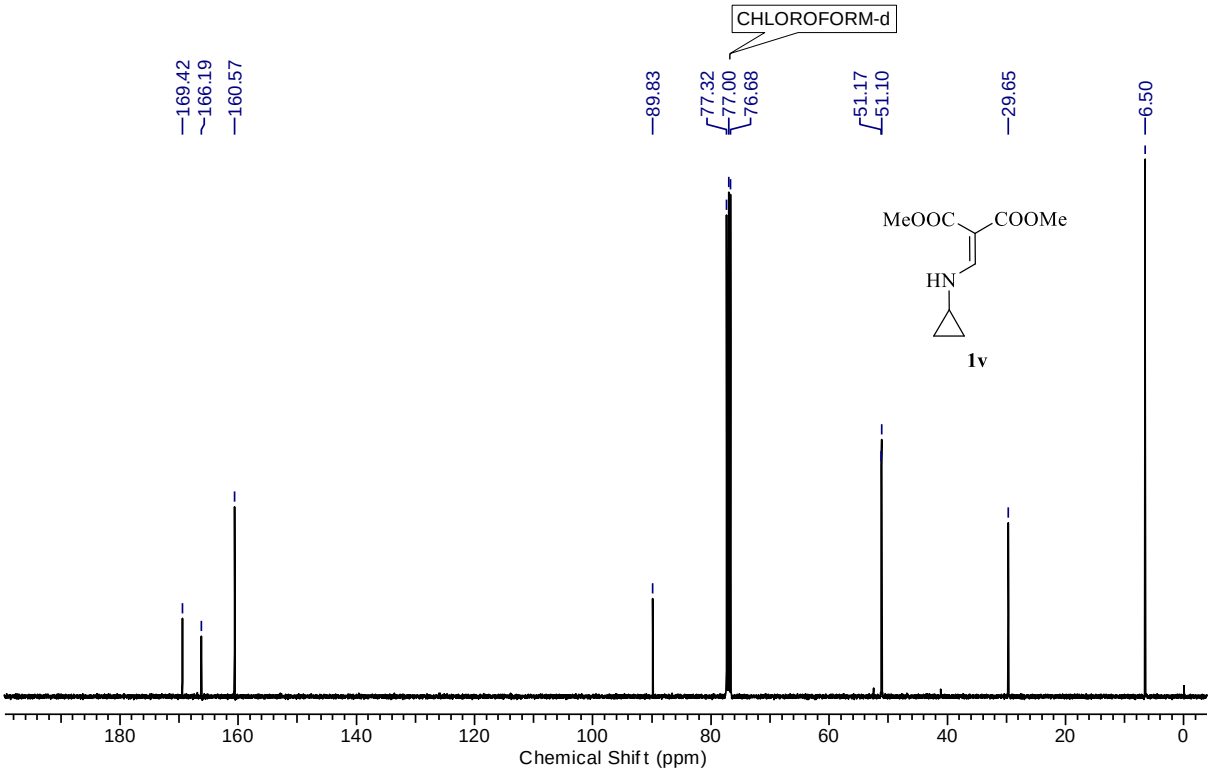
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1u



^{1}H NMR (400 MHz, $CDCl_3$) spectra of 1v

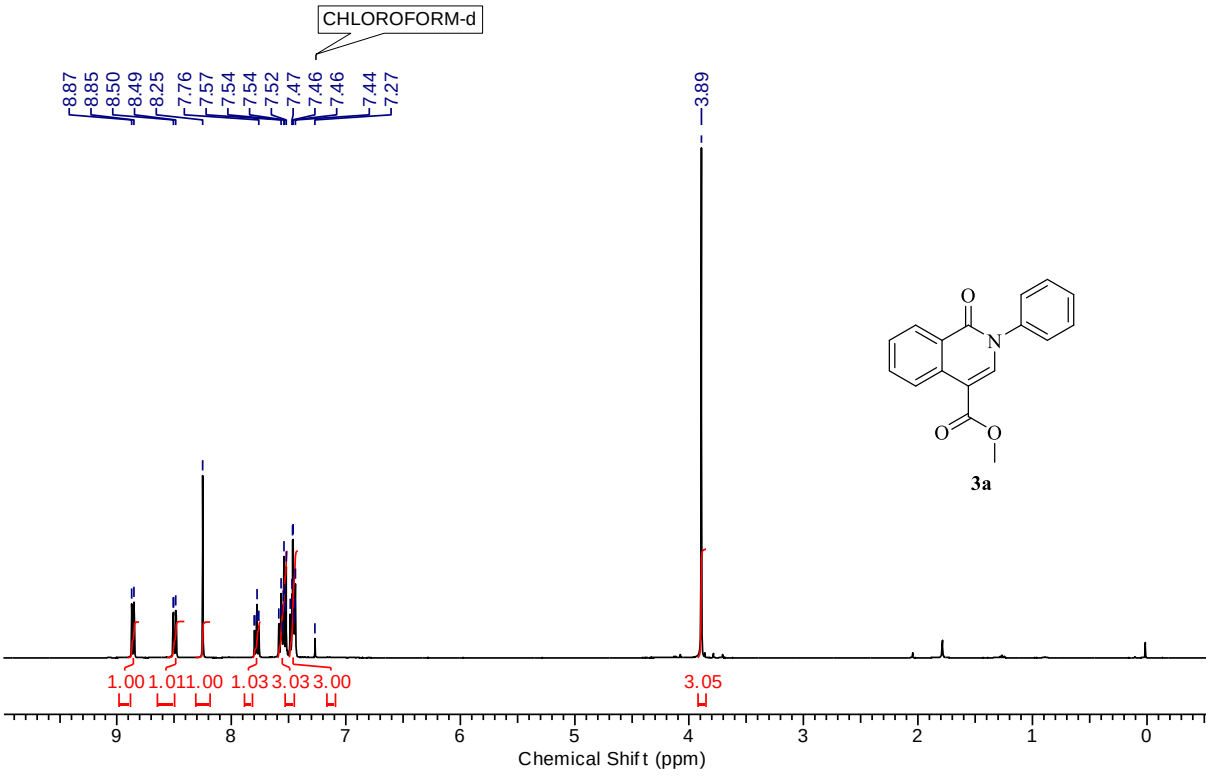


^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 1v

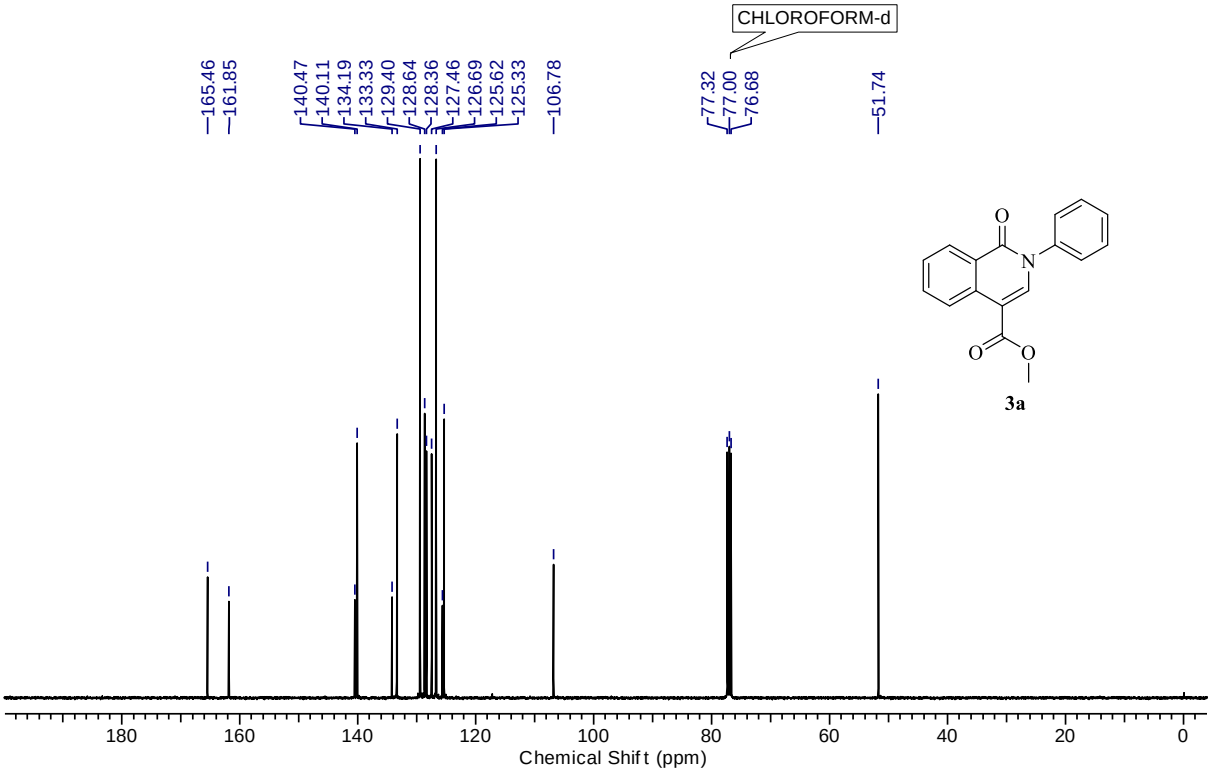


II] NMR Spectrums of Isoquinolones:

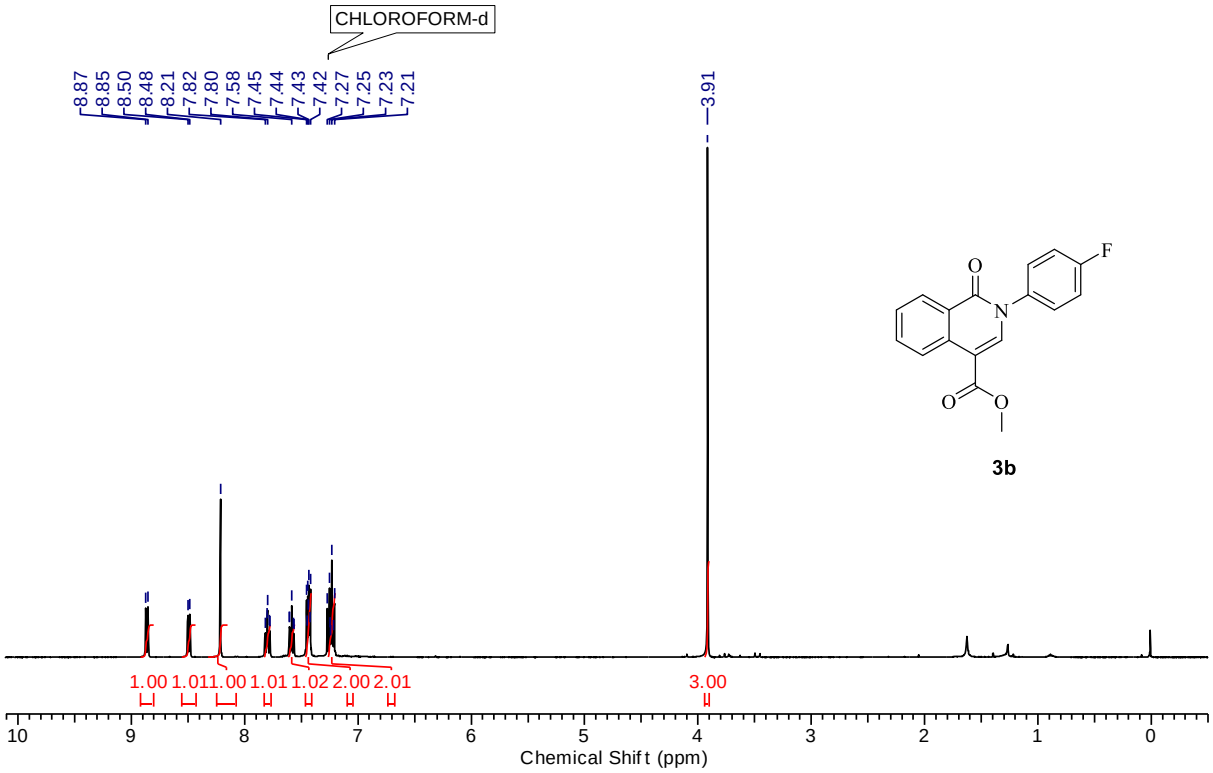
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3a



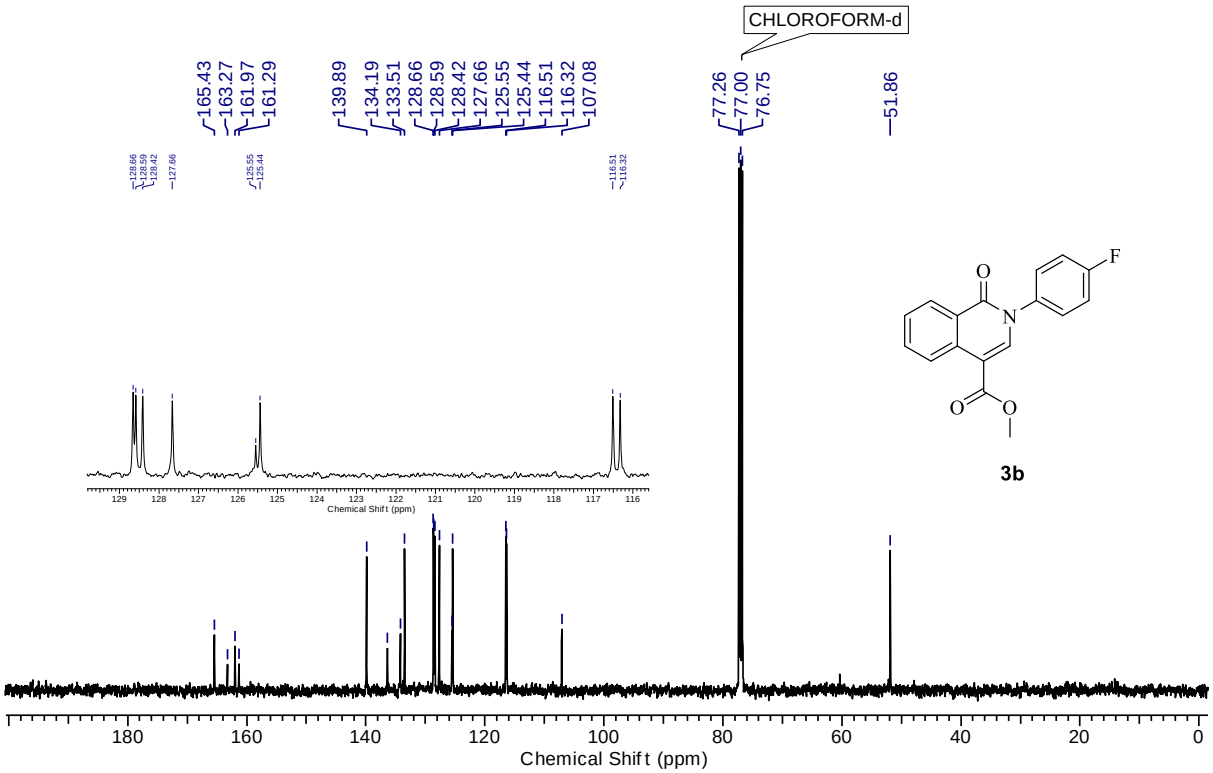
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3a



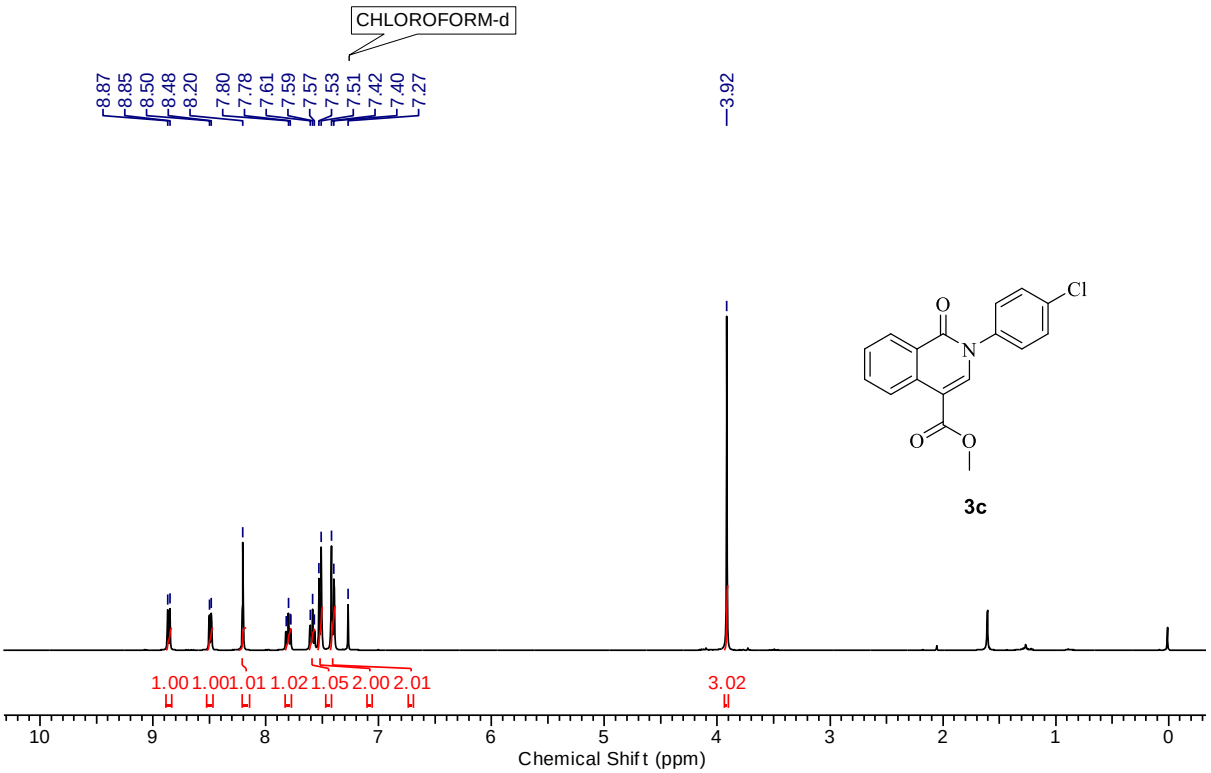
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3b



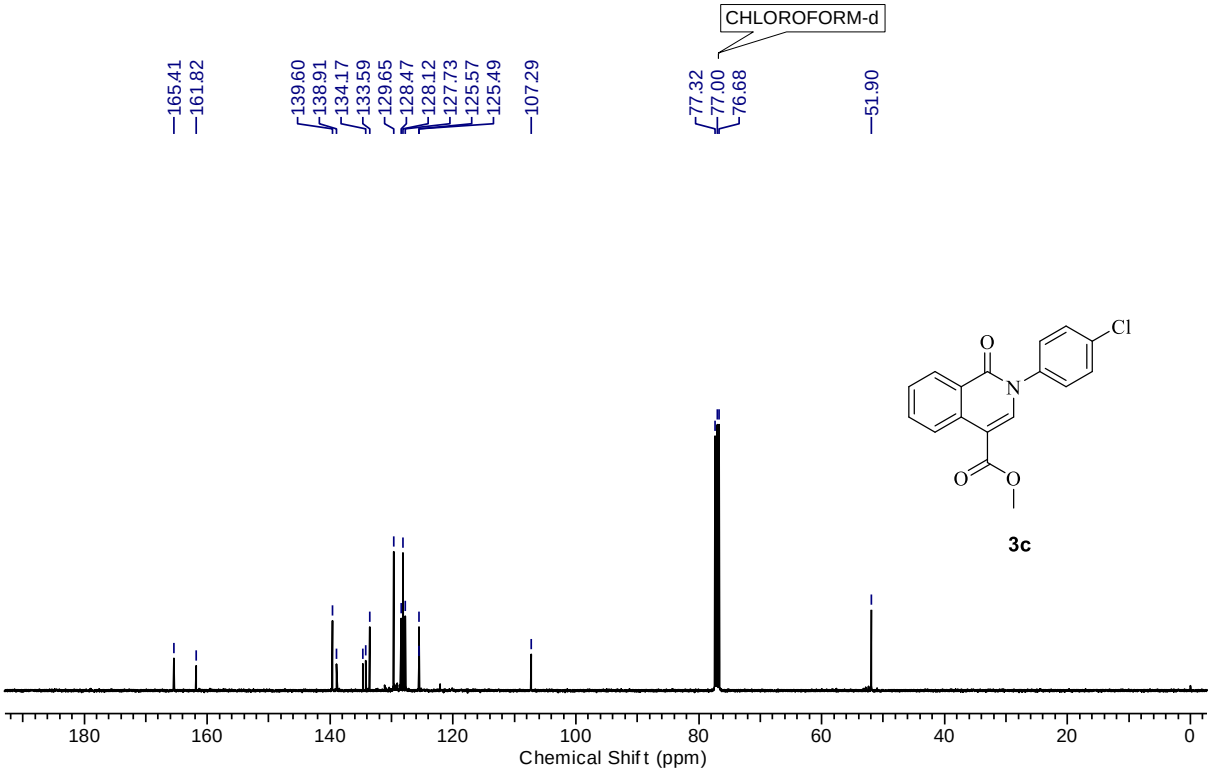
^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) spectra of 3b



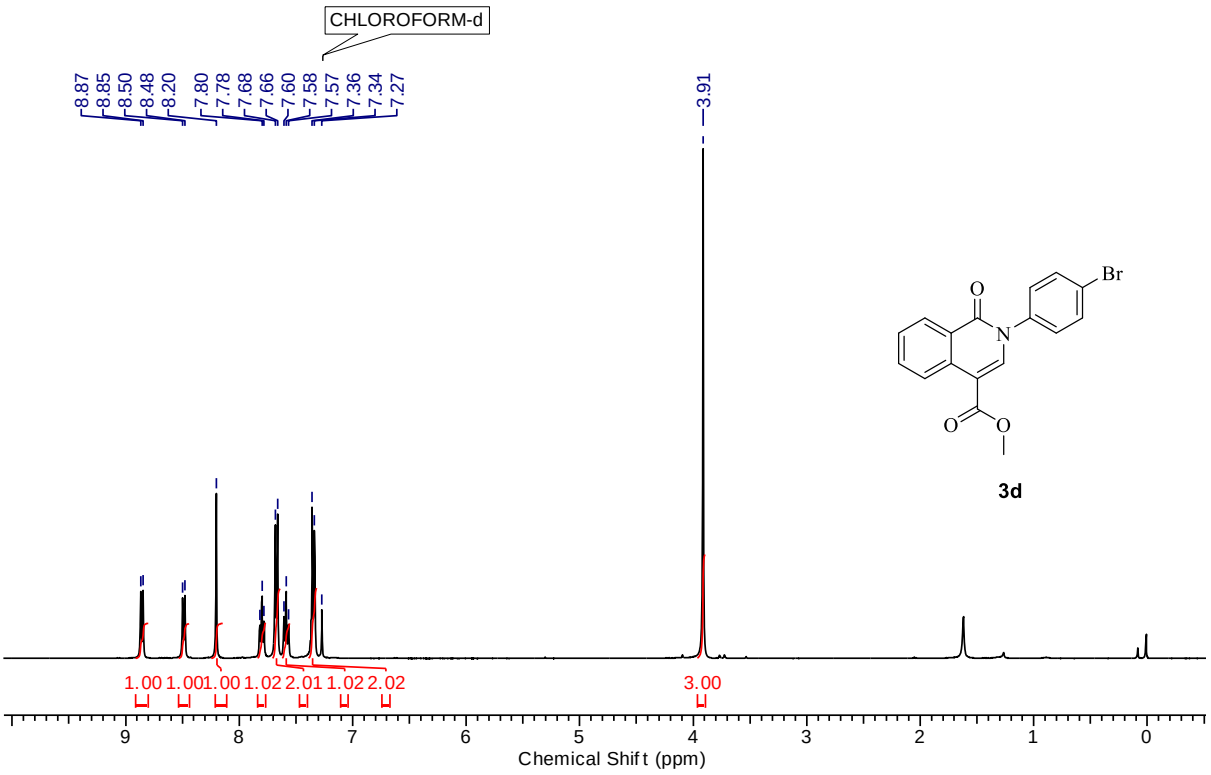
^{1}H NMR (500 MHz, $CDCl_3$) spectra of 3c



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3c

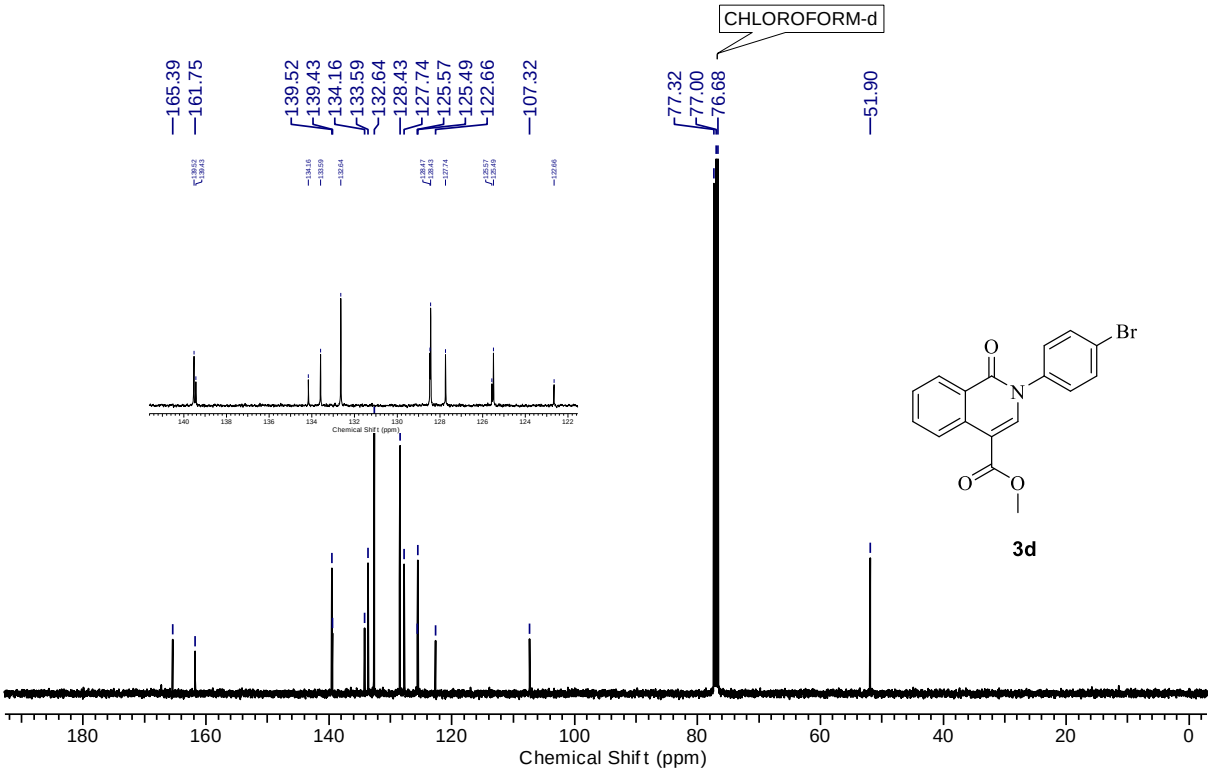


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3d



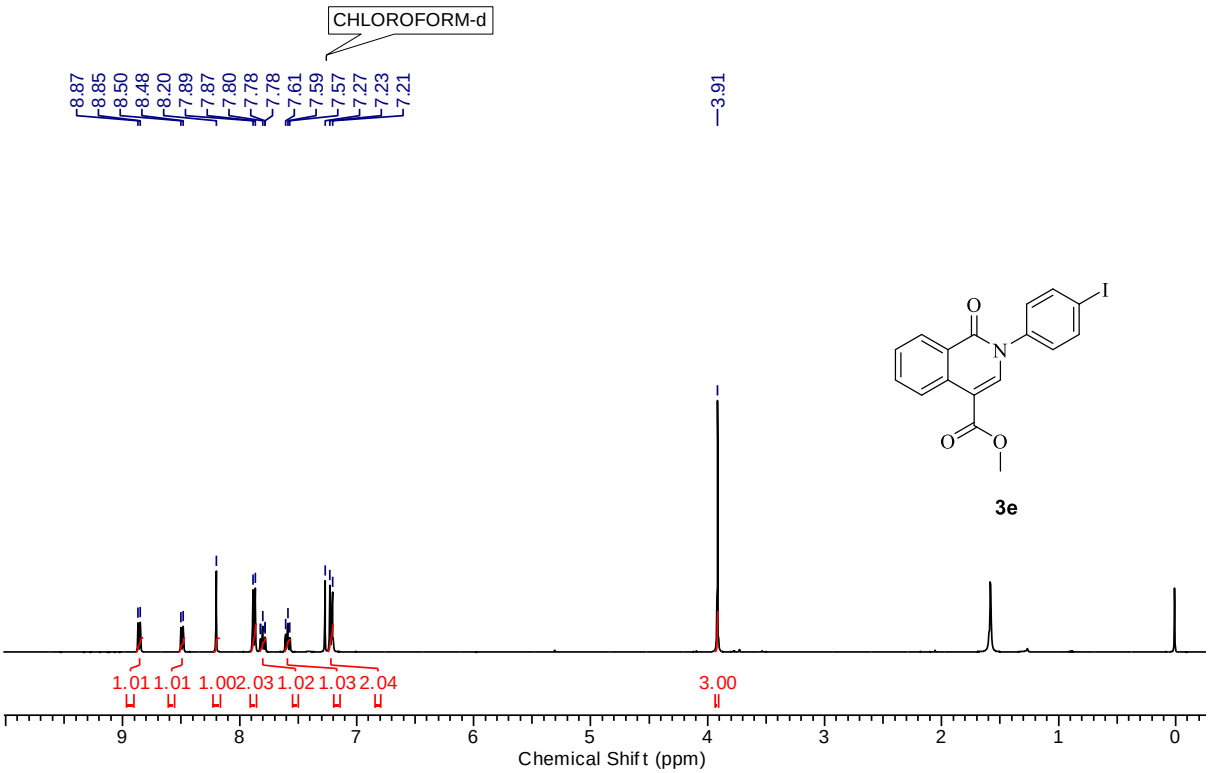
3d

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3d

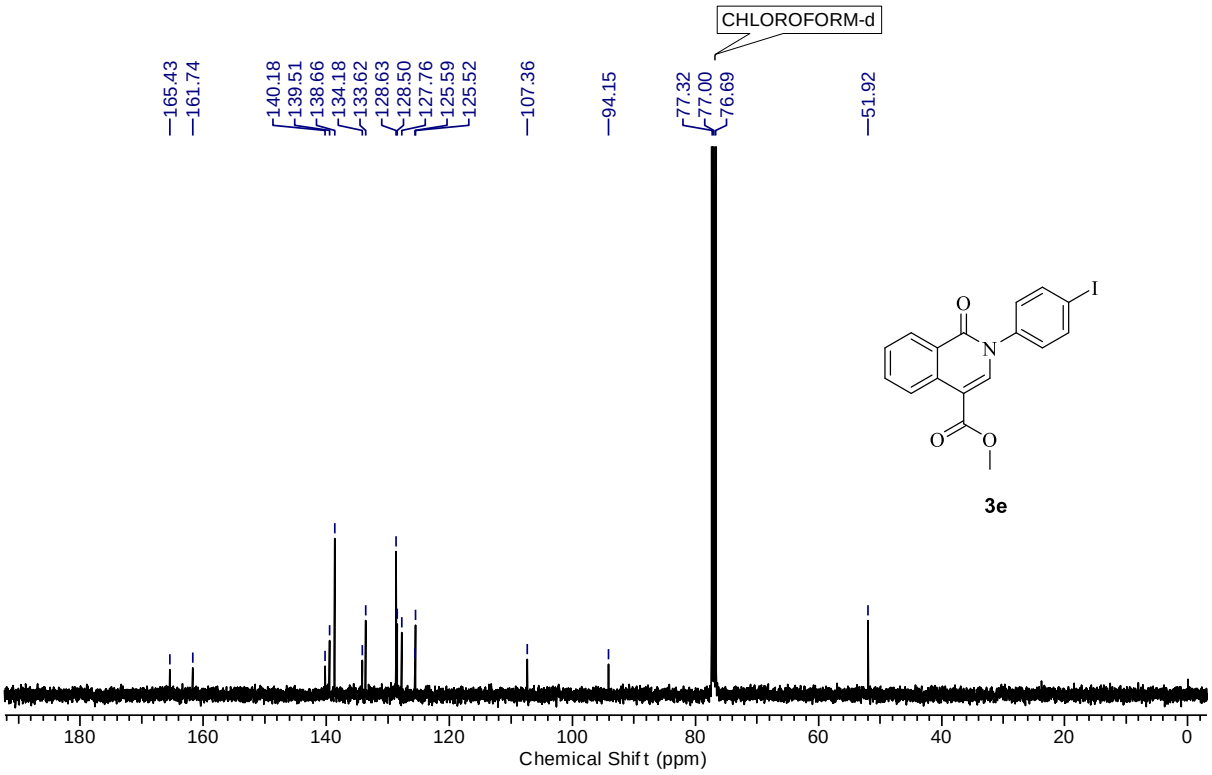


3d

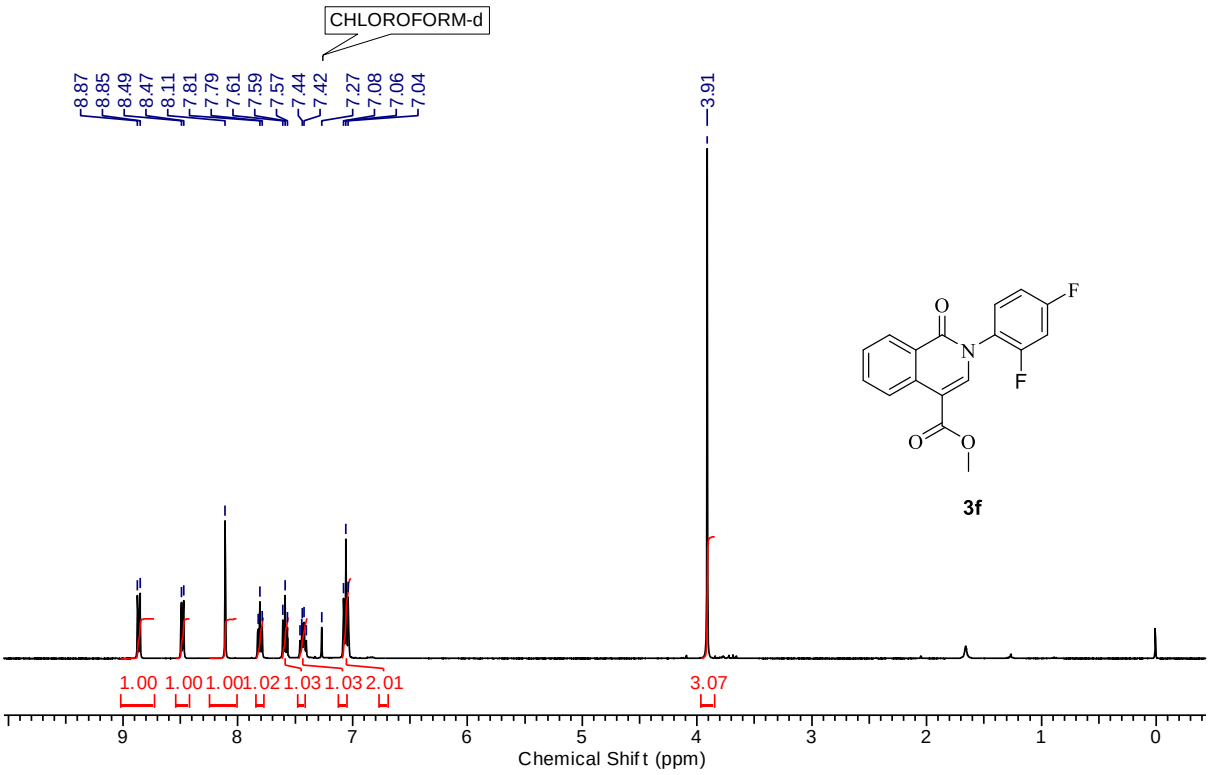
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3e



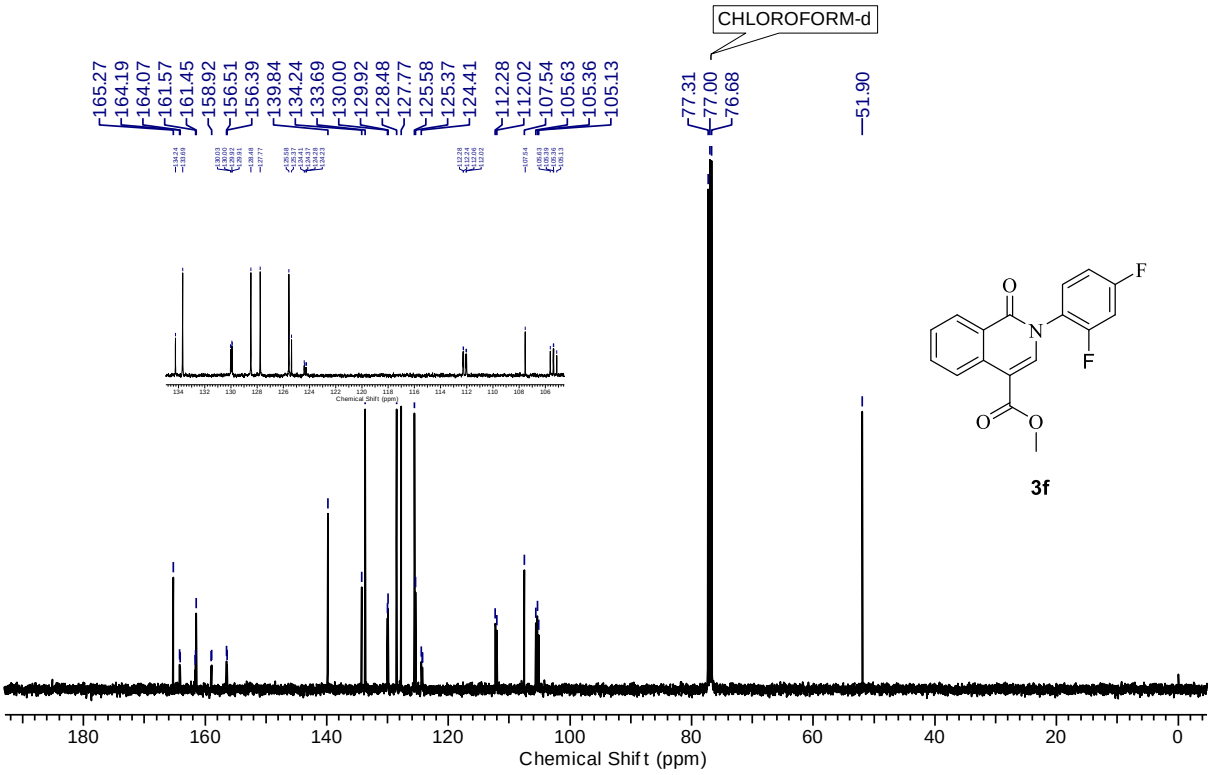
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3e



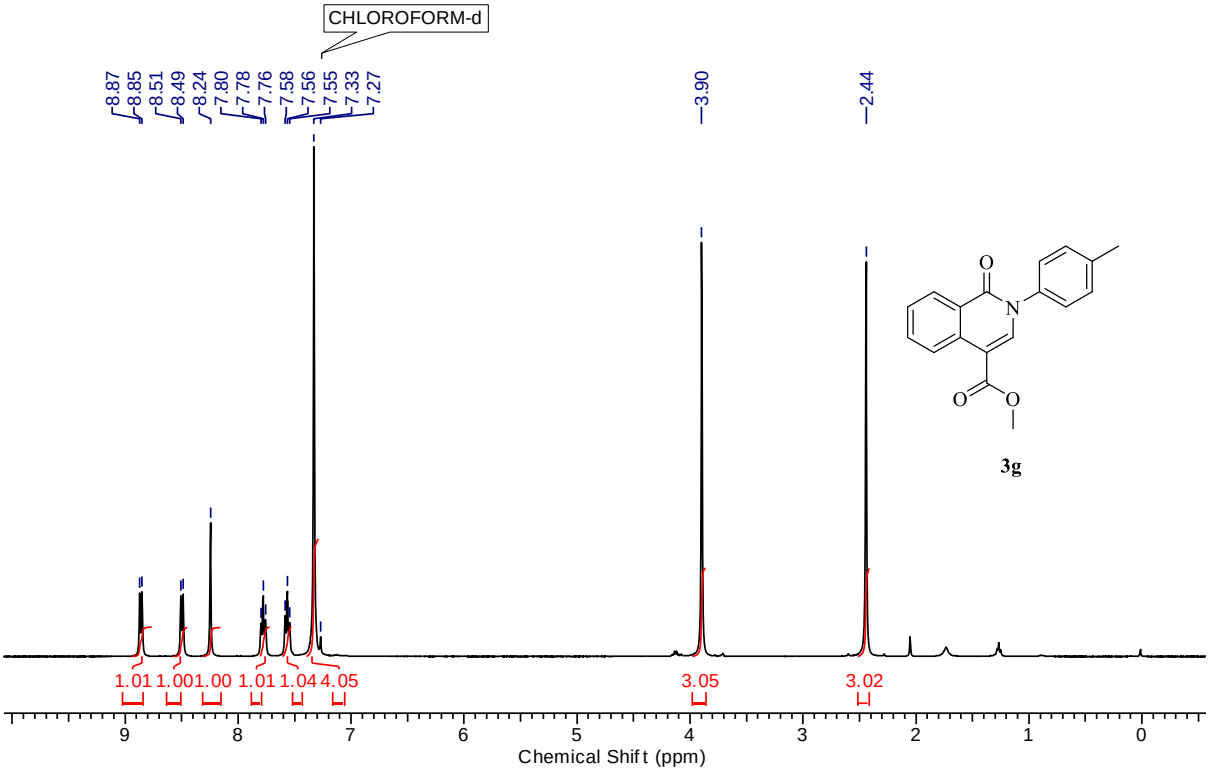
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3f



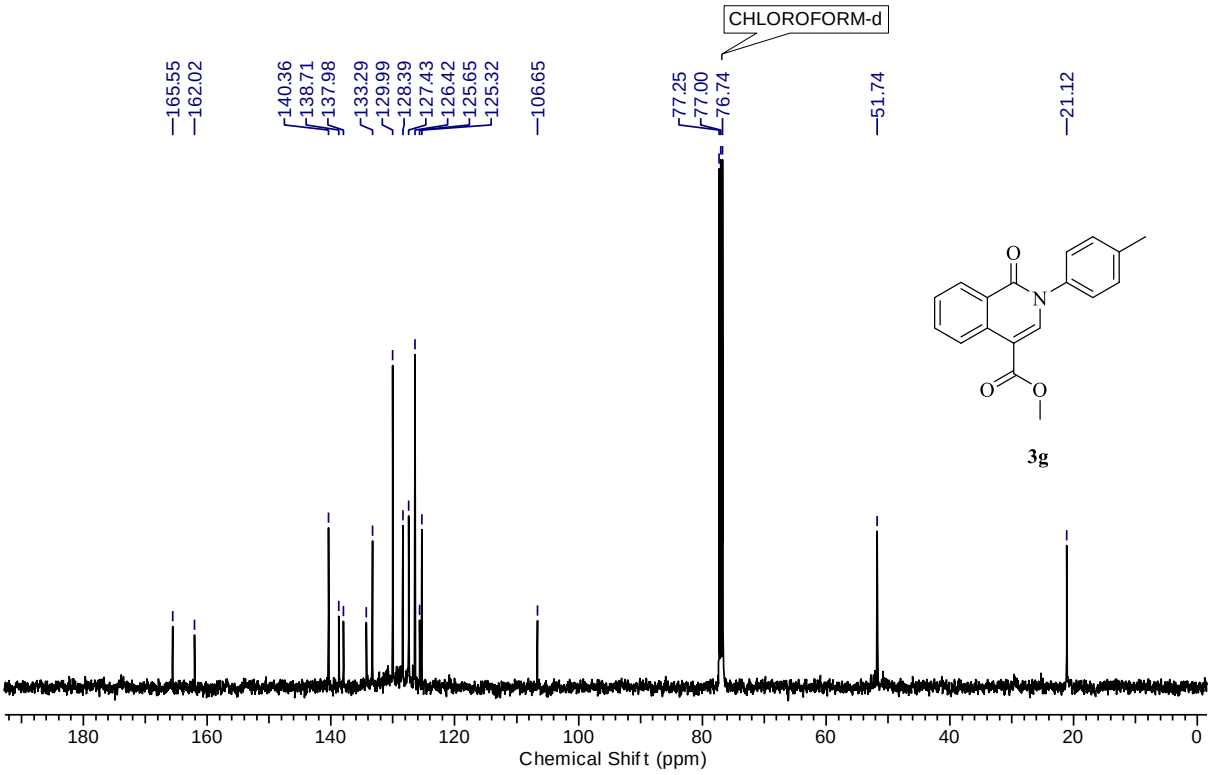
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3f



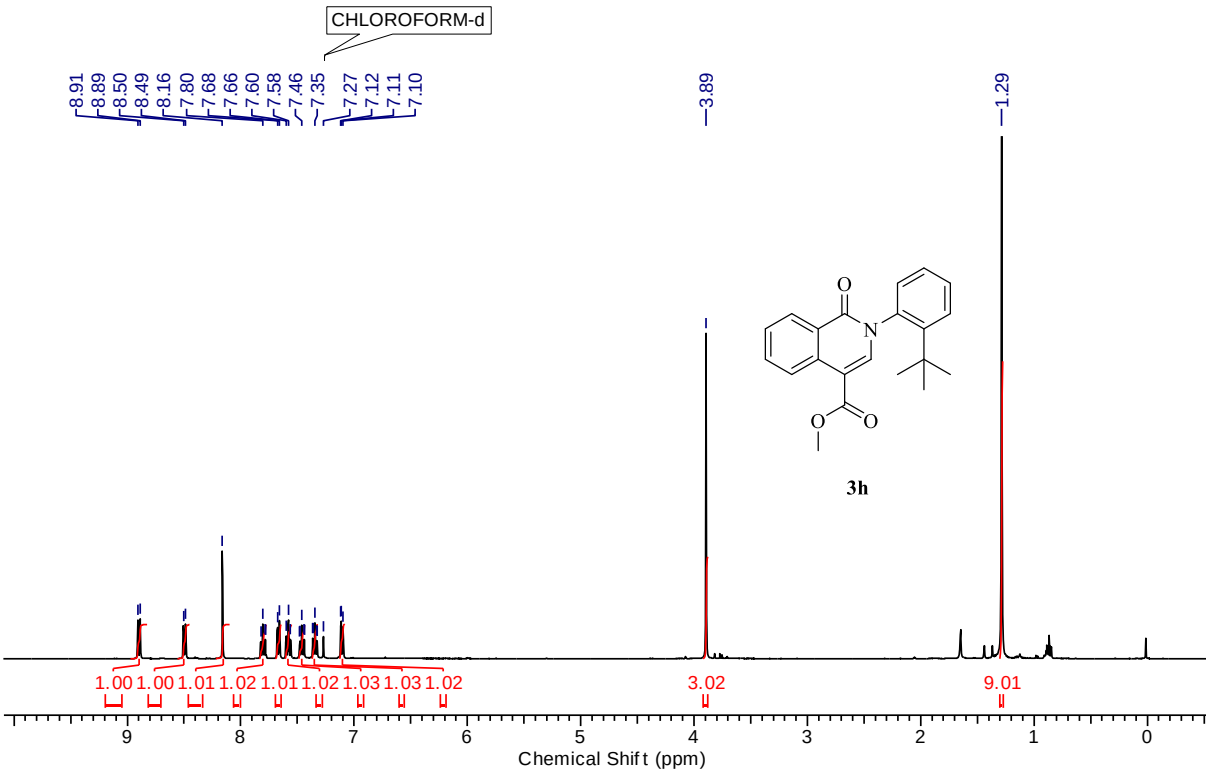
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3g



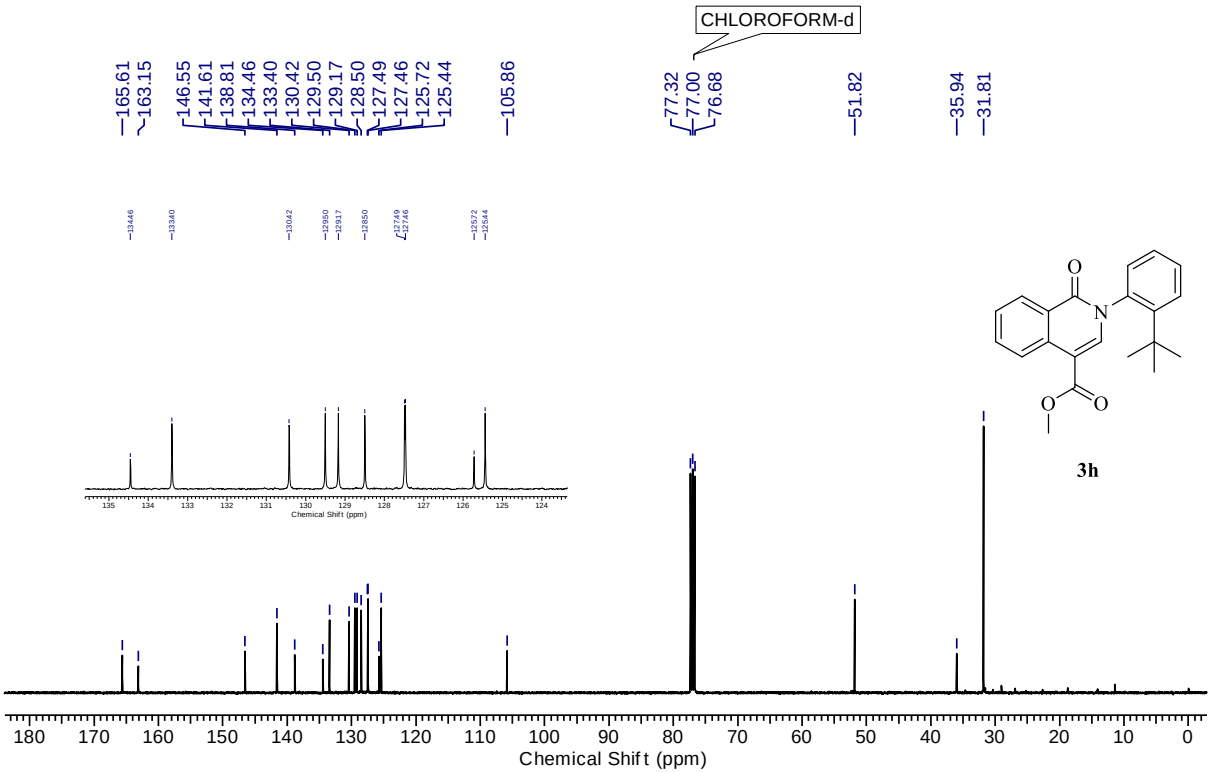
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3g



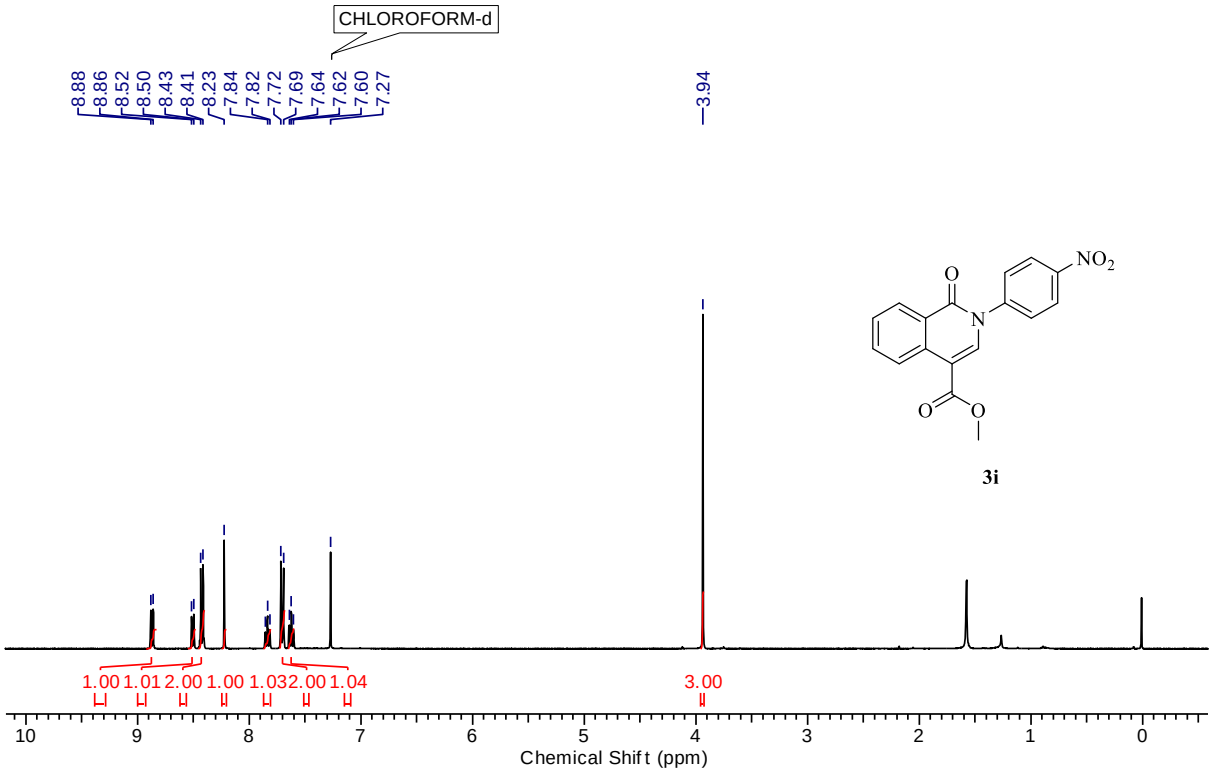
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3h



$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 3h

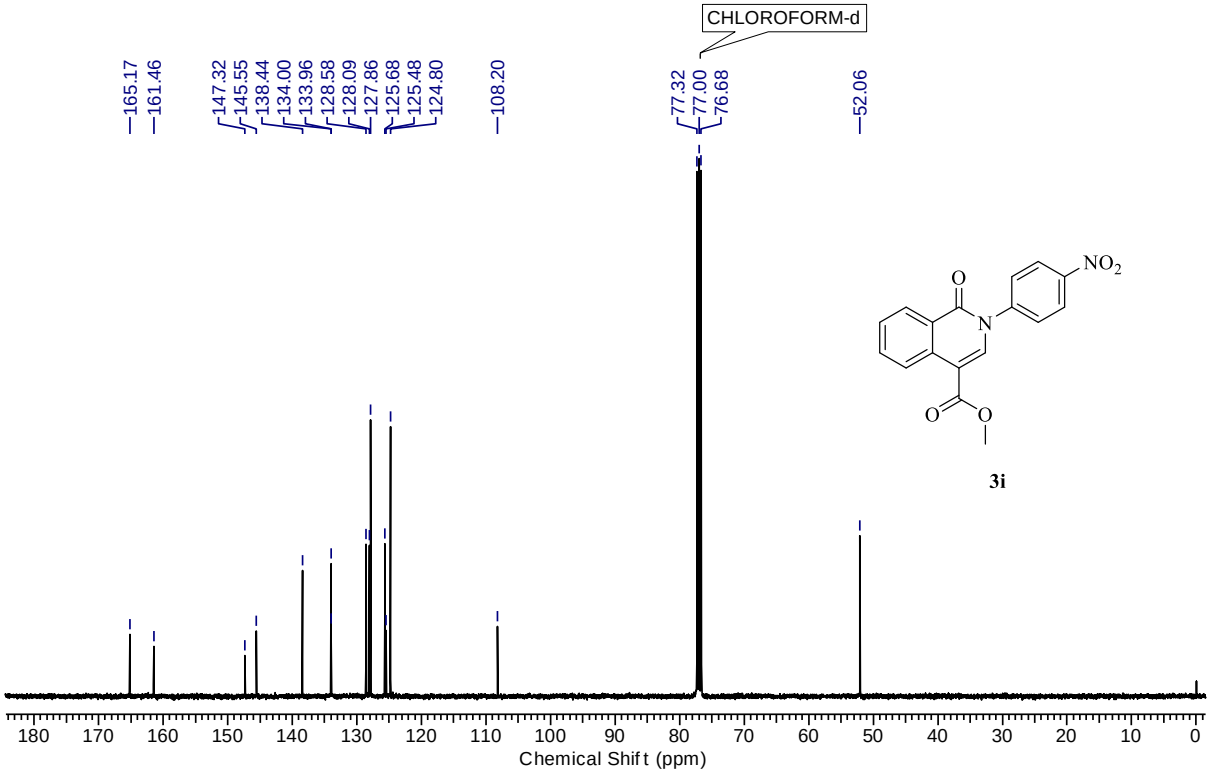


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3i



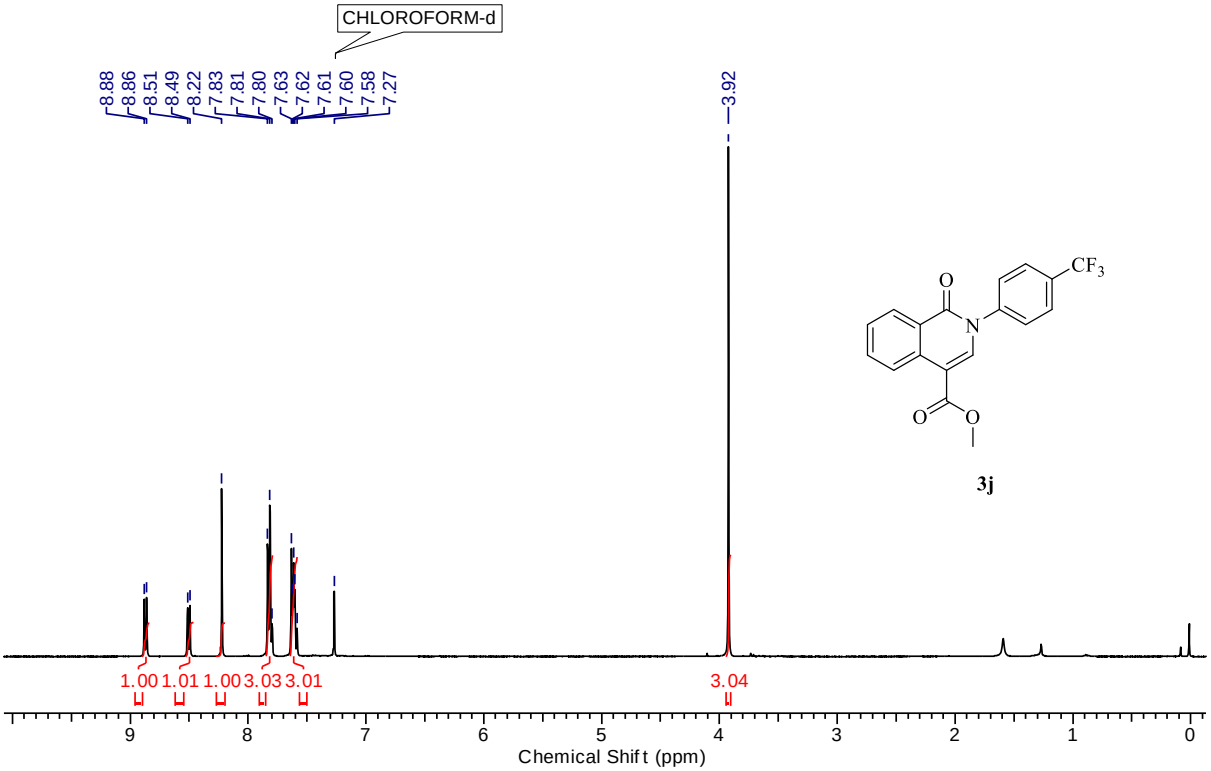
3i

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3i



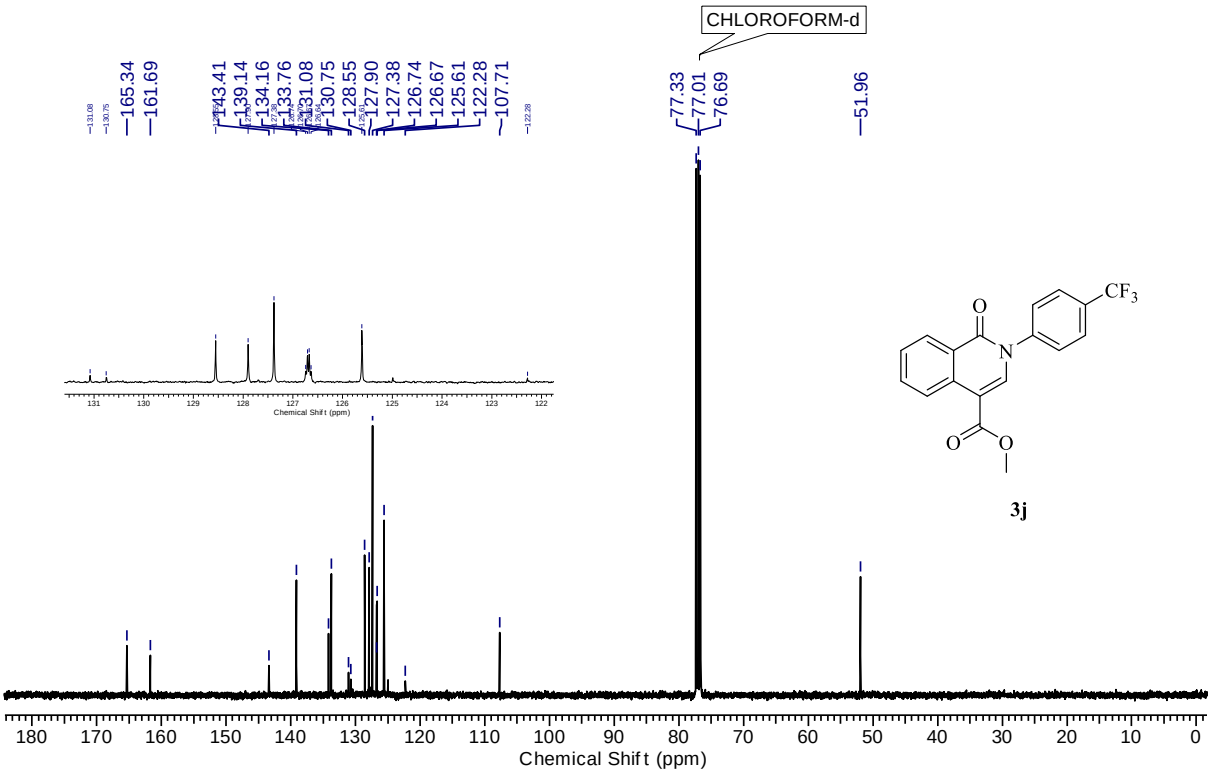
3i

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



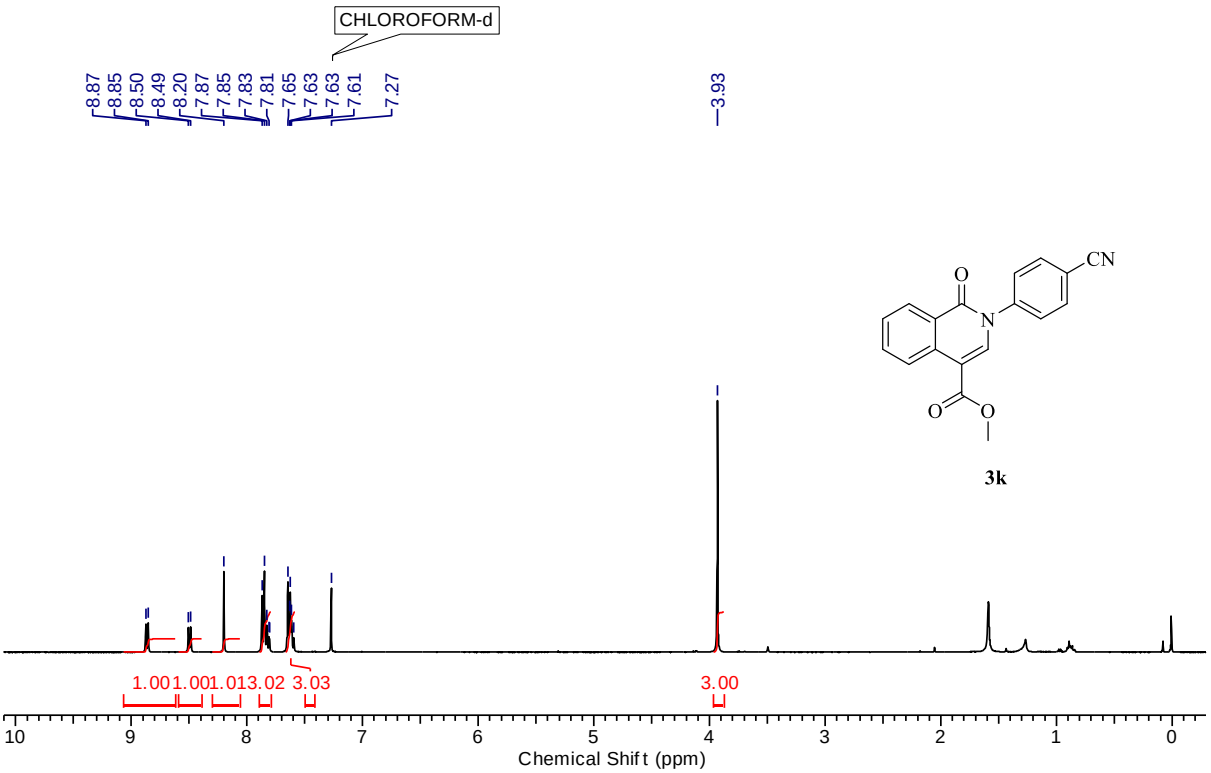
3j

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3j



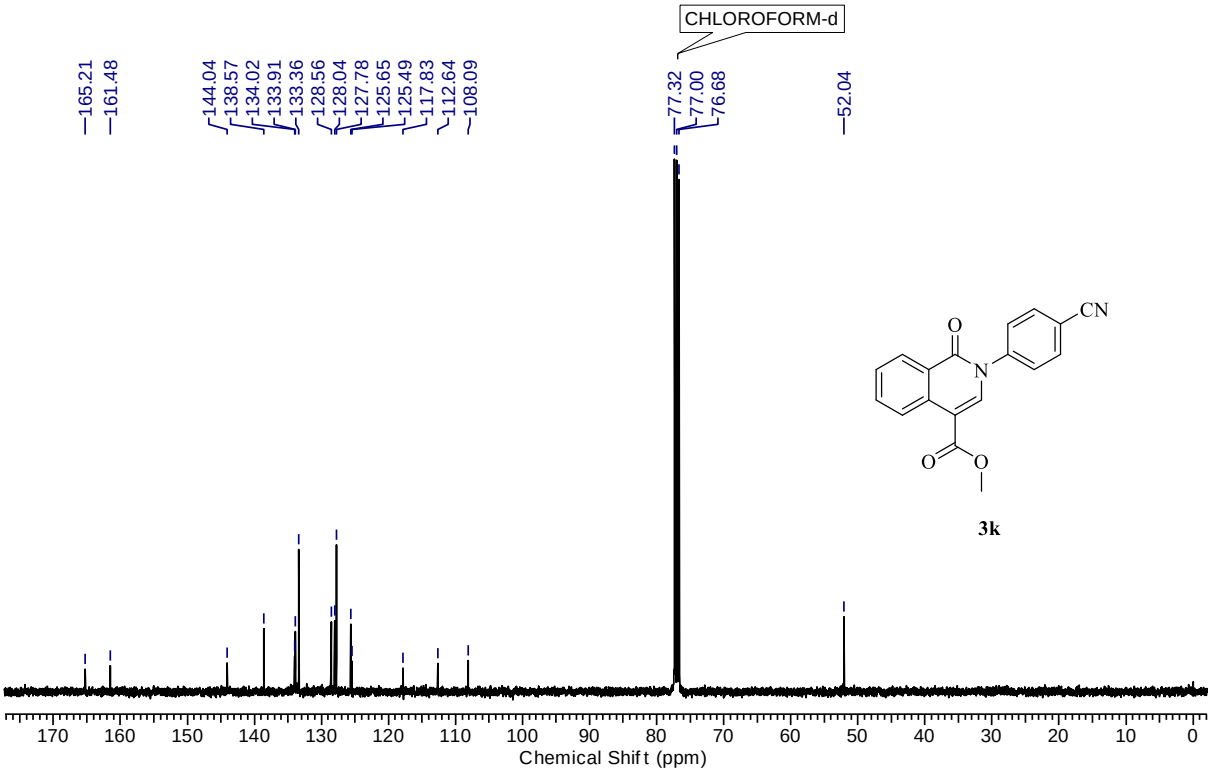
3j

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



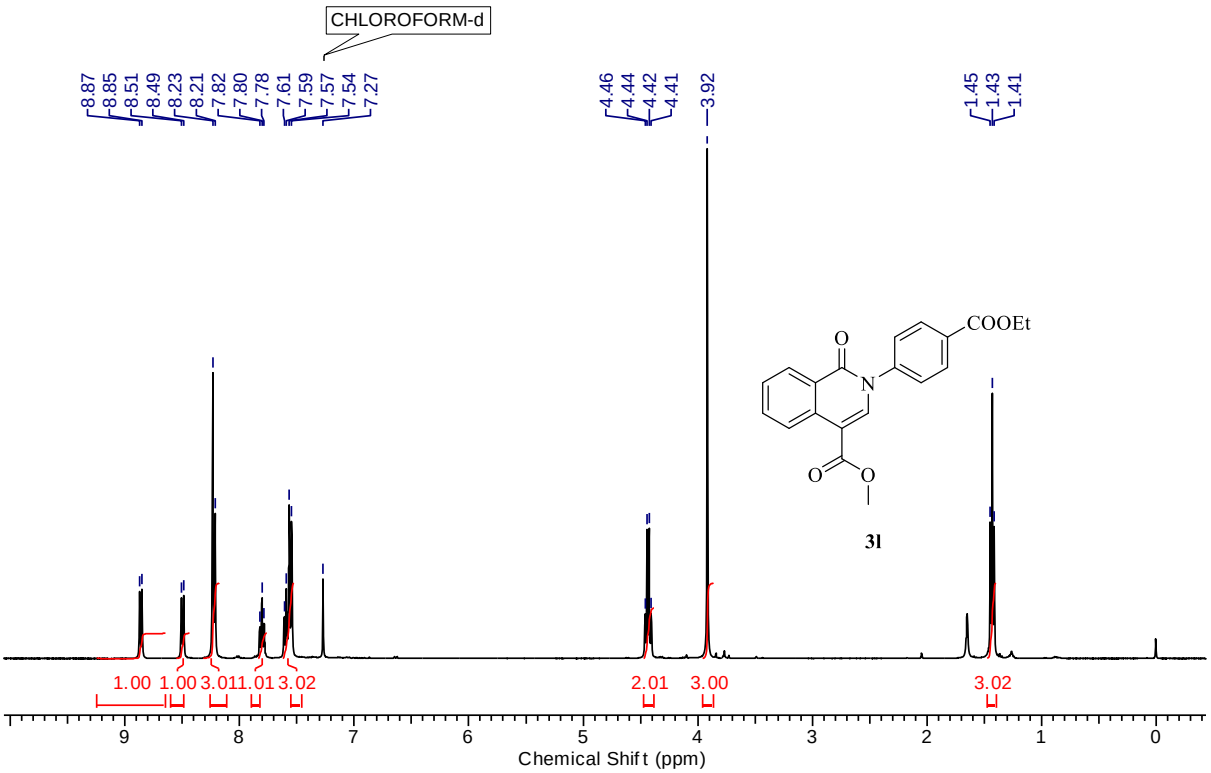
3k

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3k

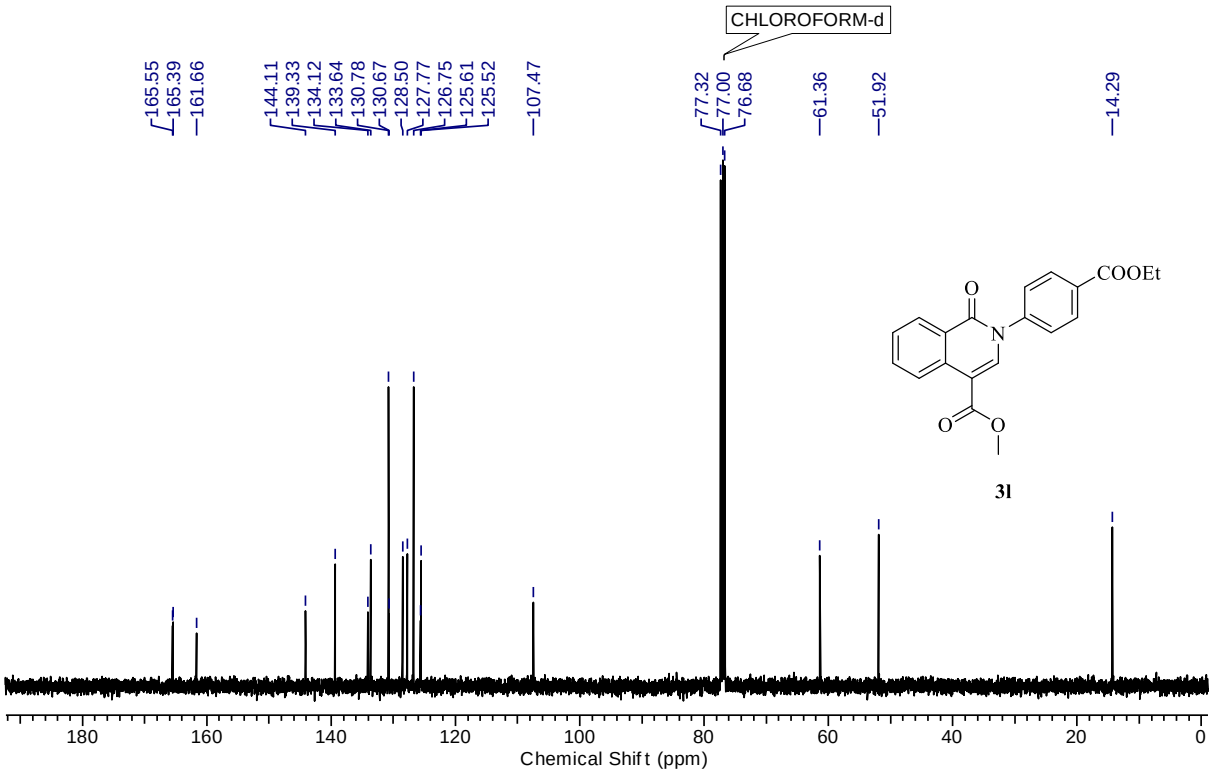


3k

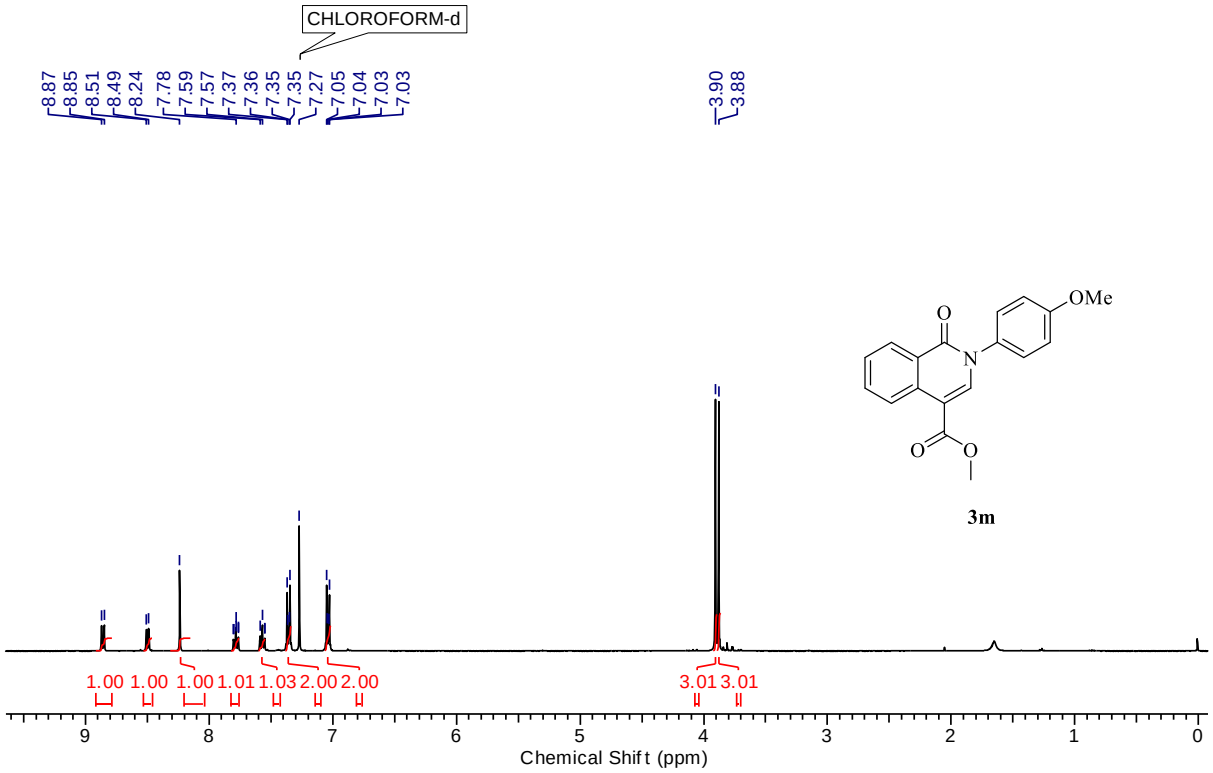
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3l



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3l

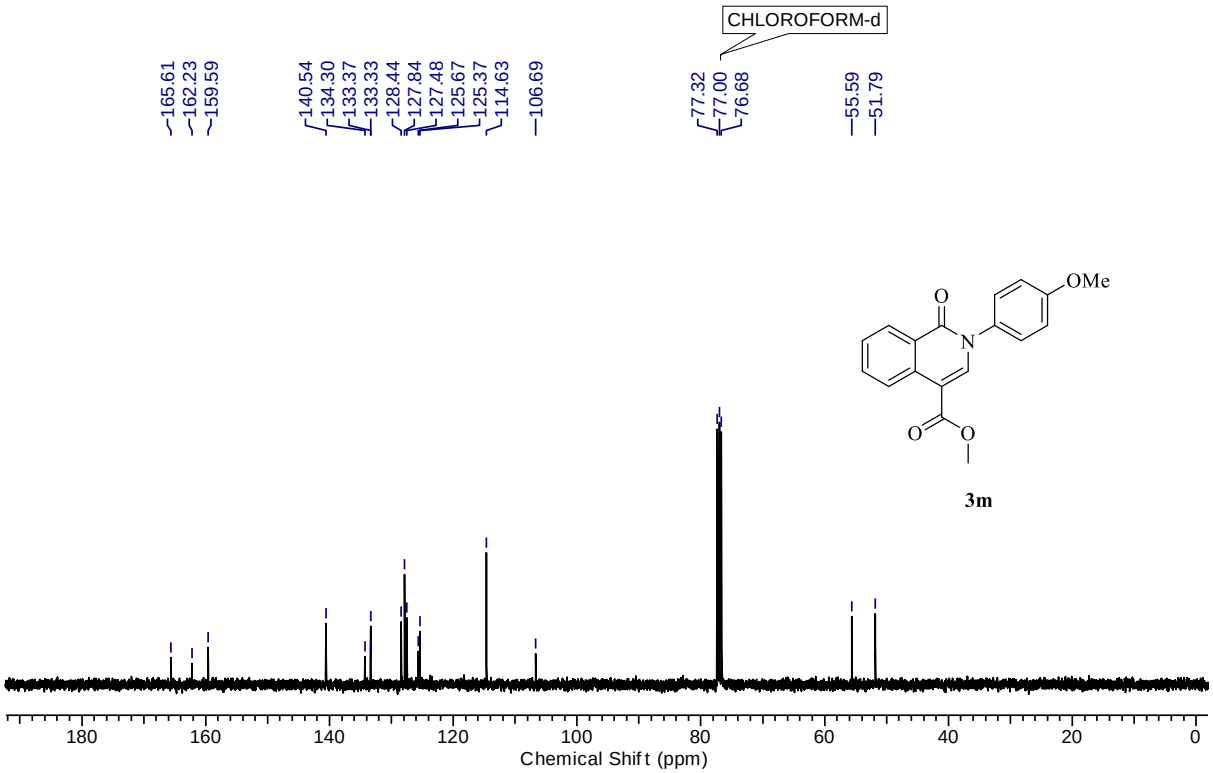


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3m



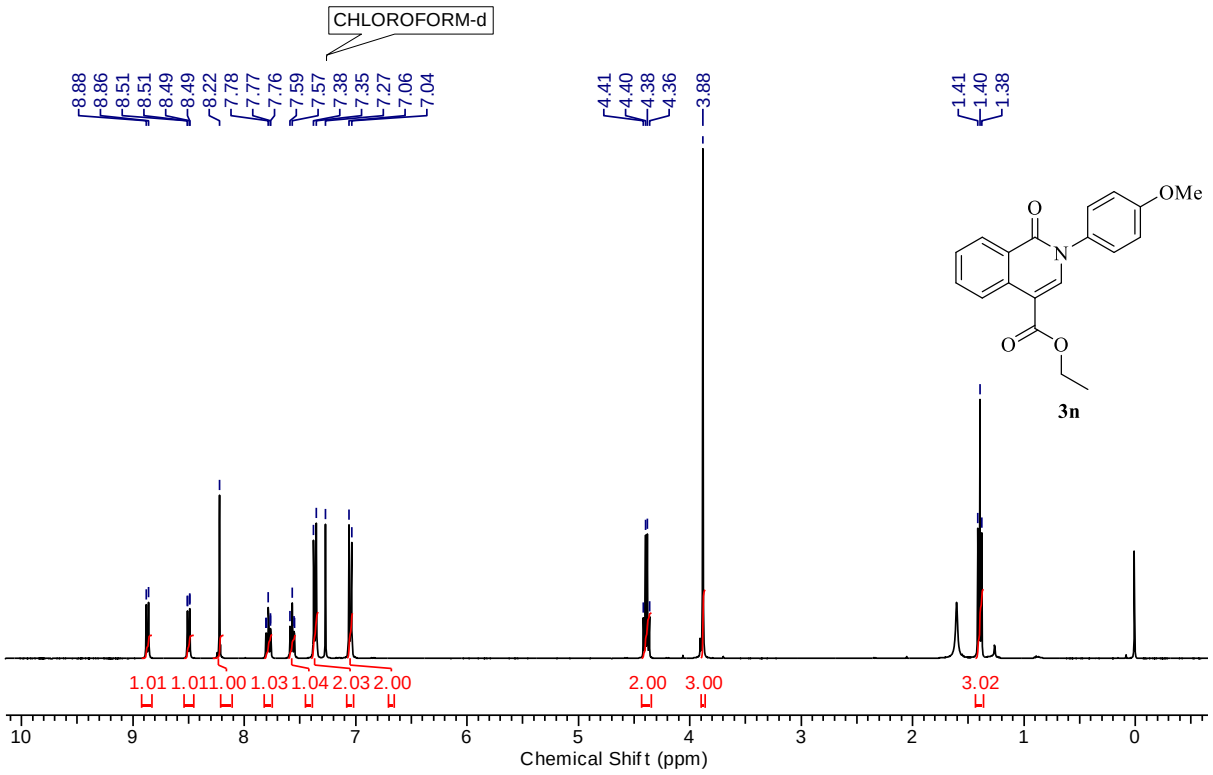
3m

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3m

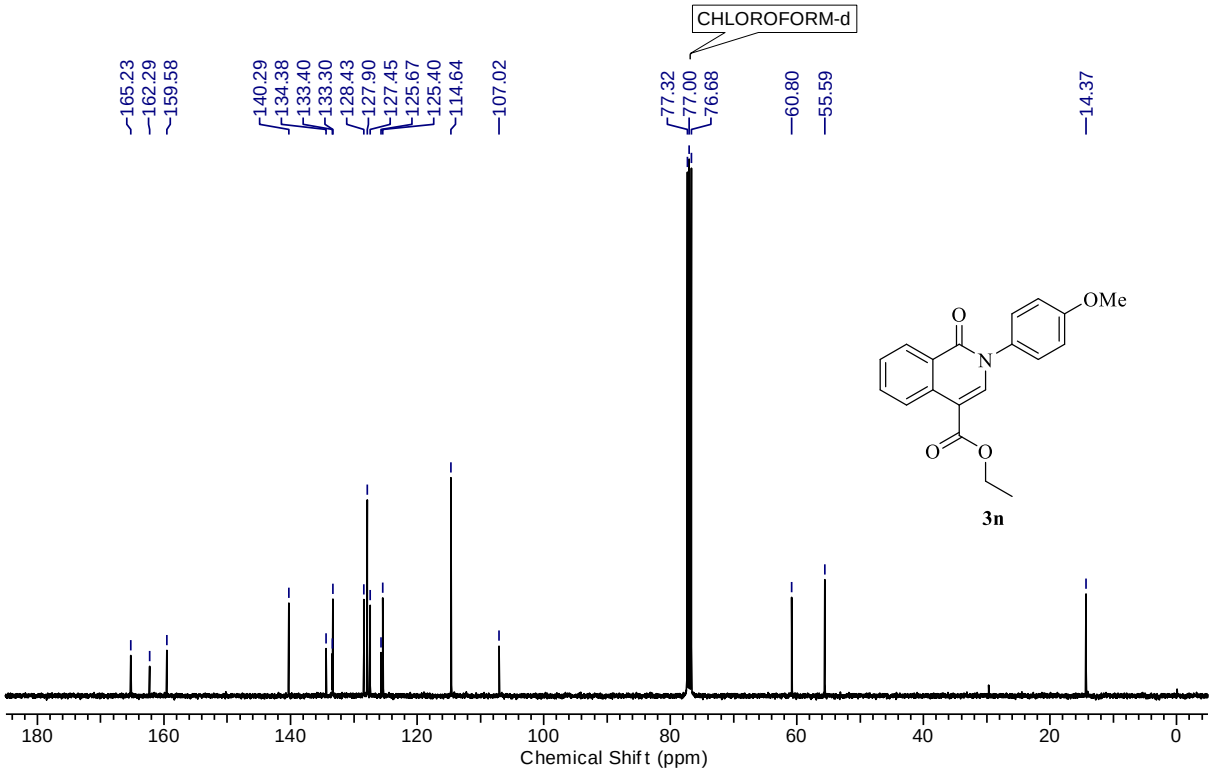


3m

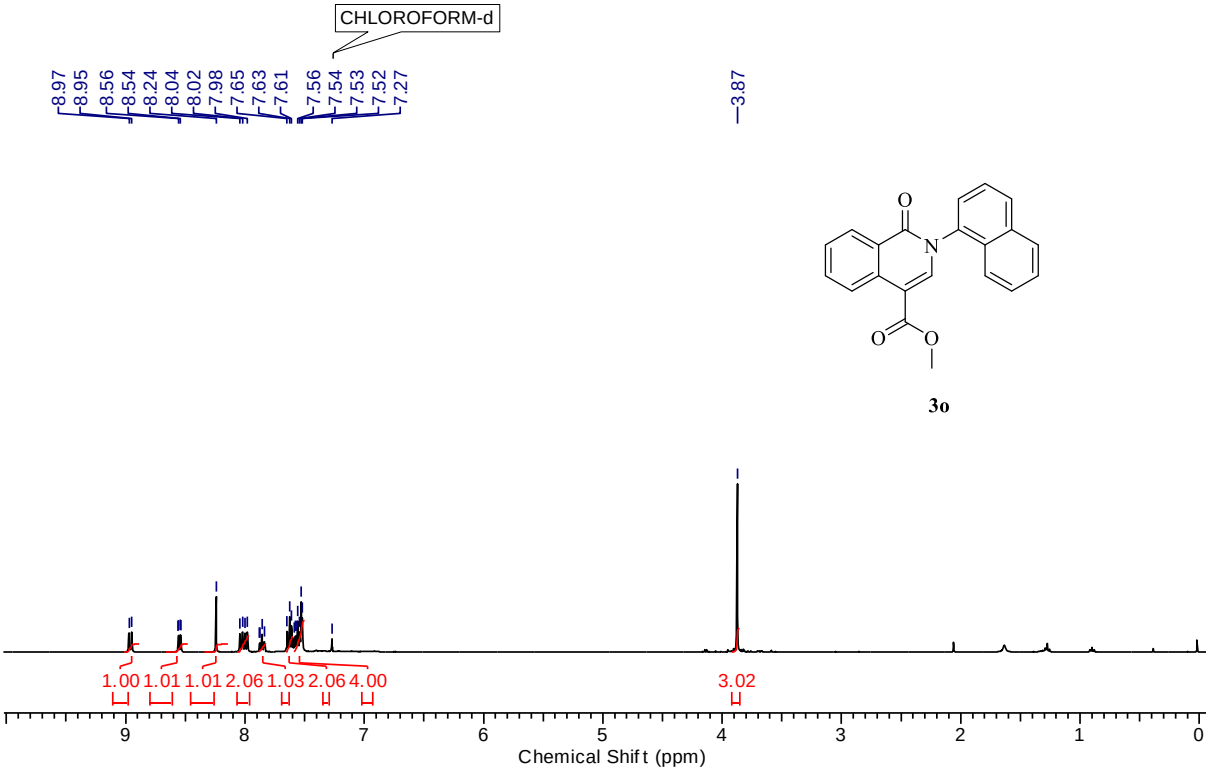
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3n



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3n

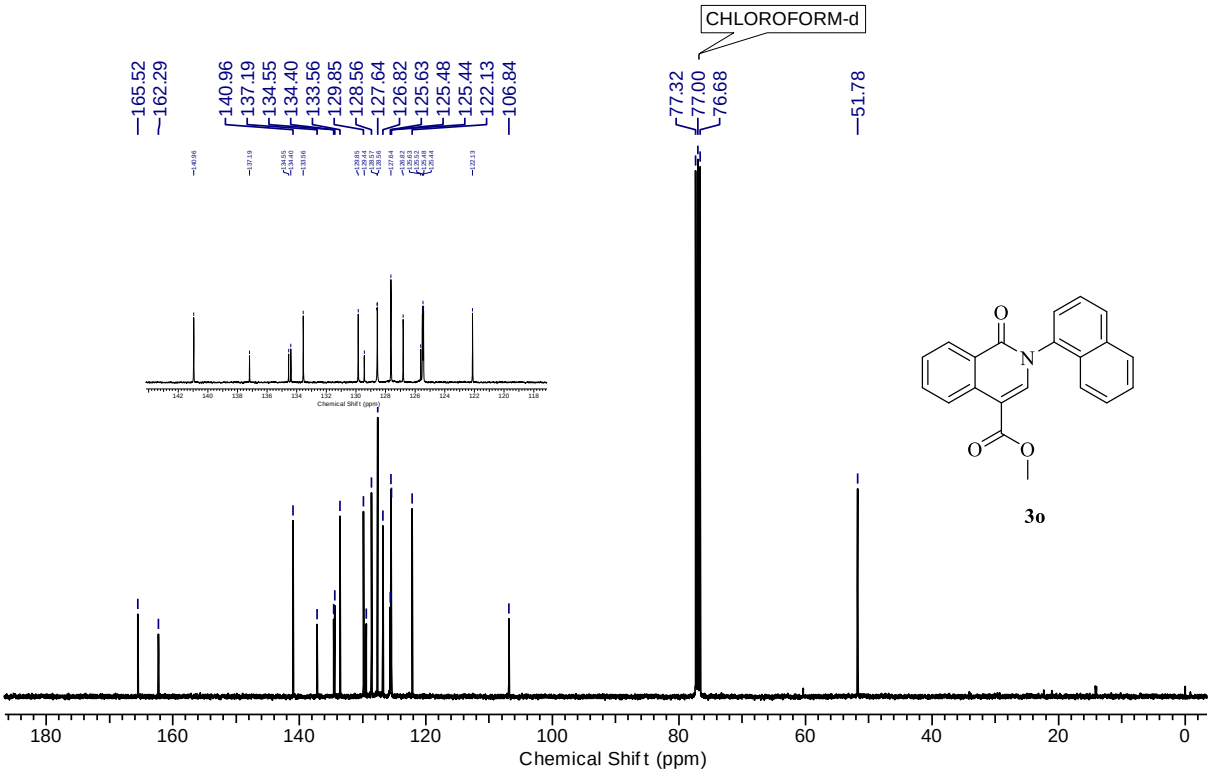


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3o



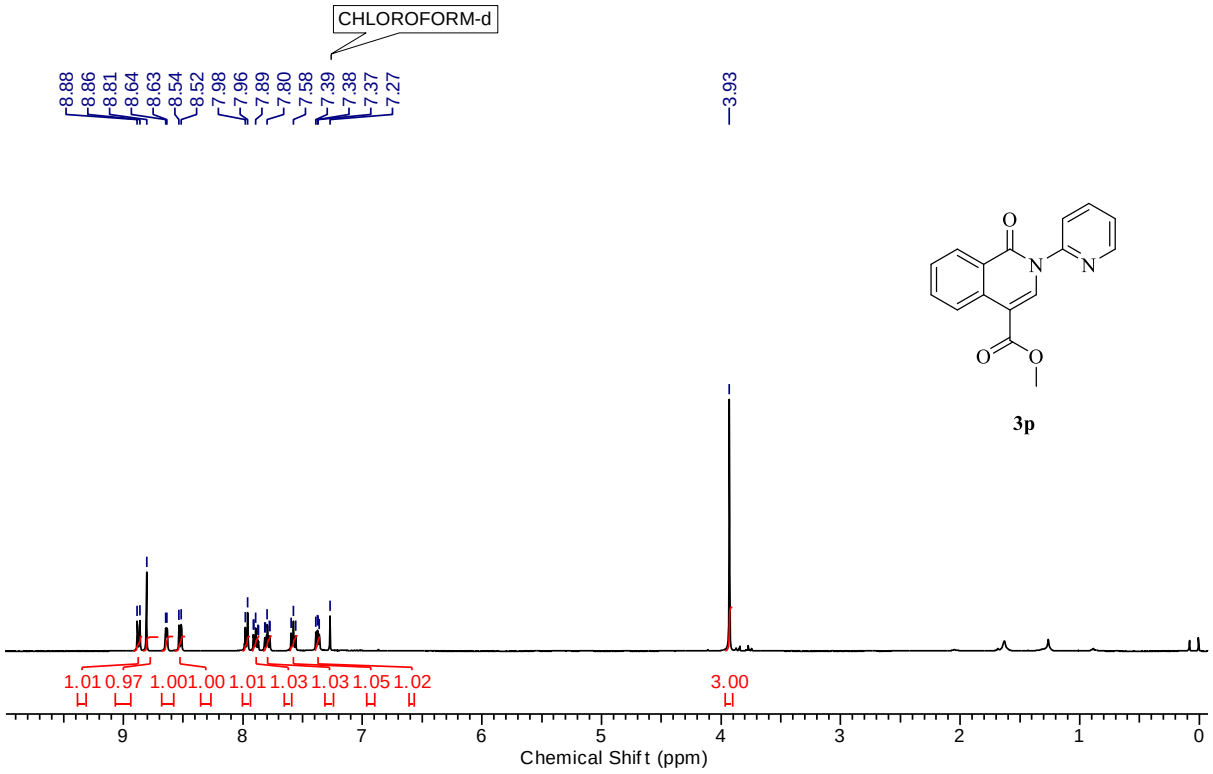
3o

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3o

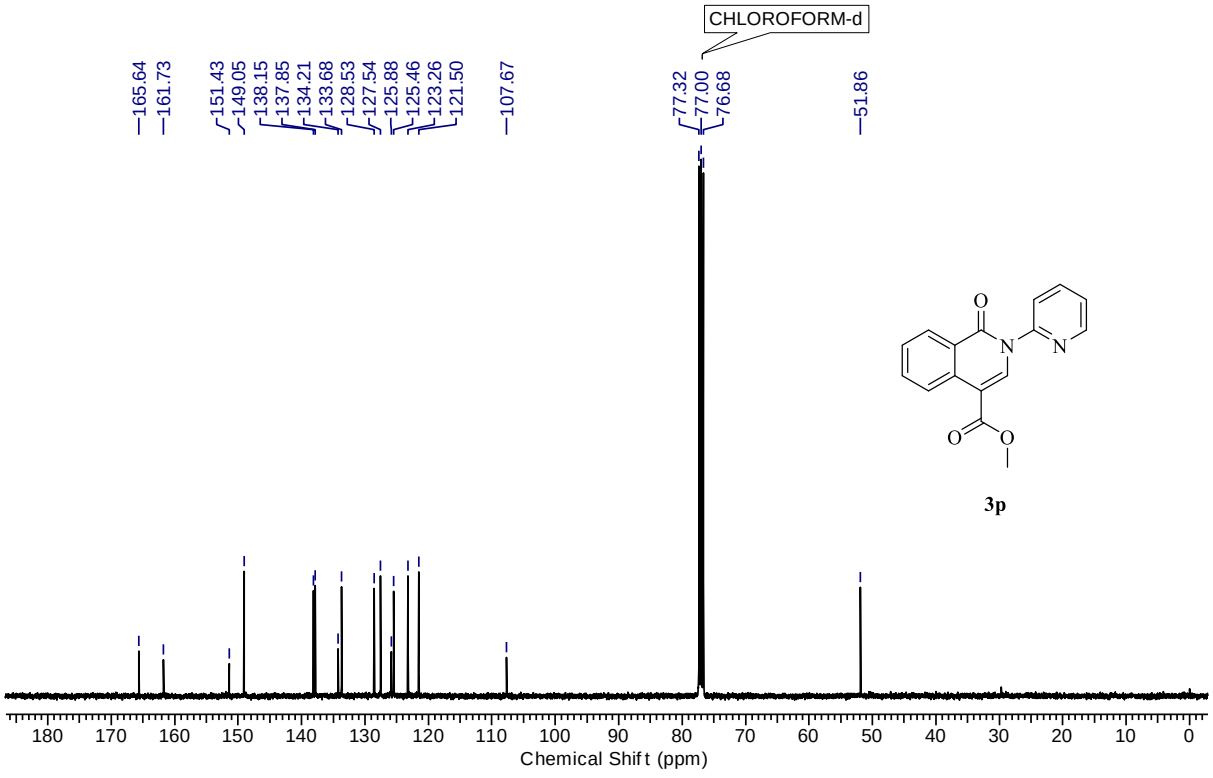


3o

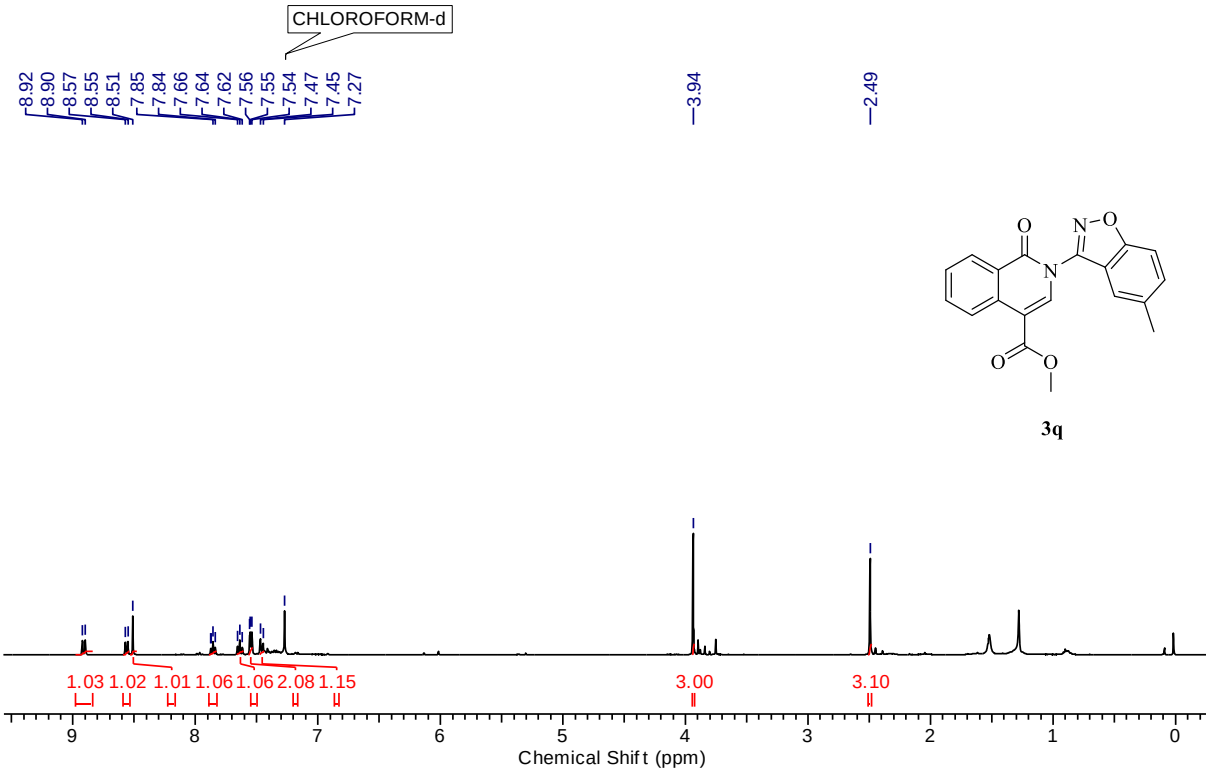
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3p



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3p

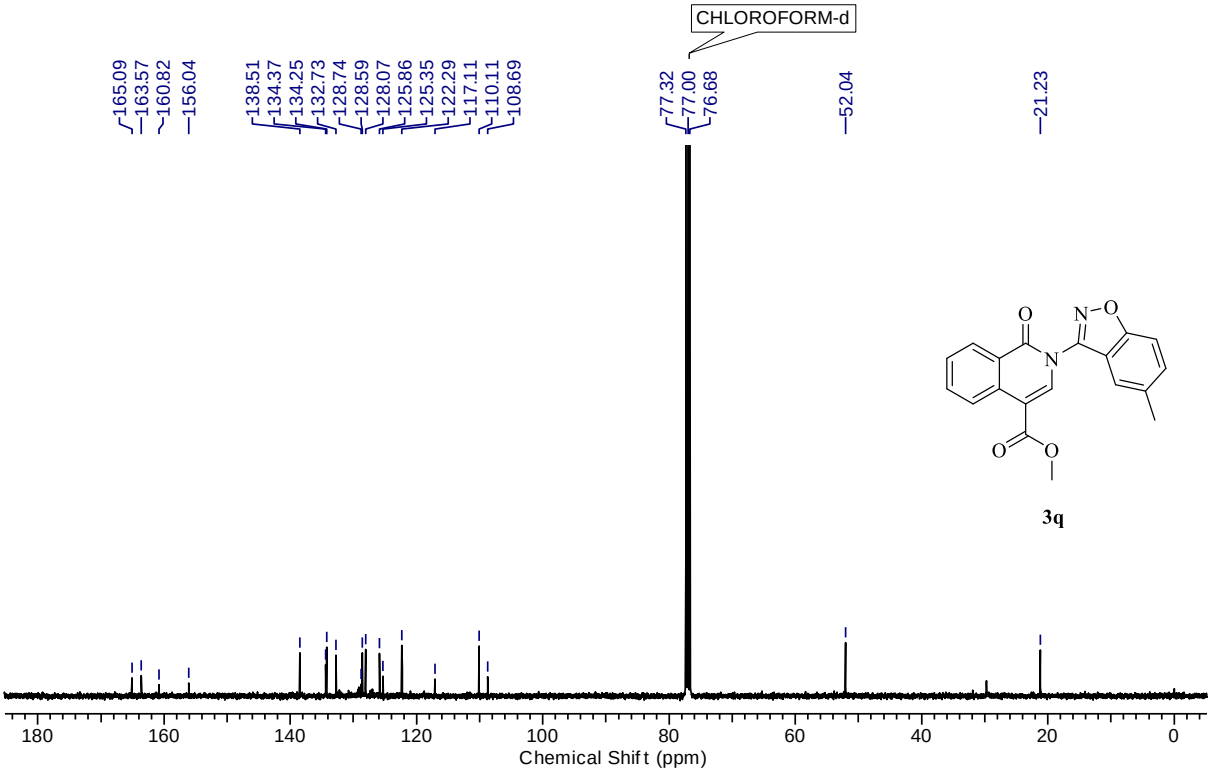


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3q



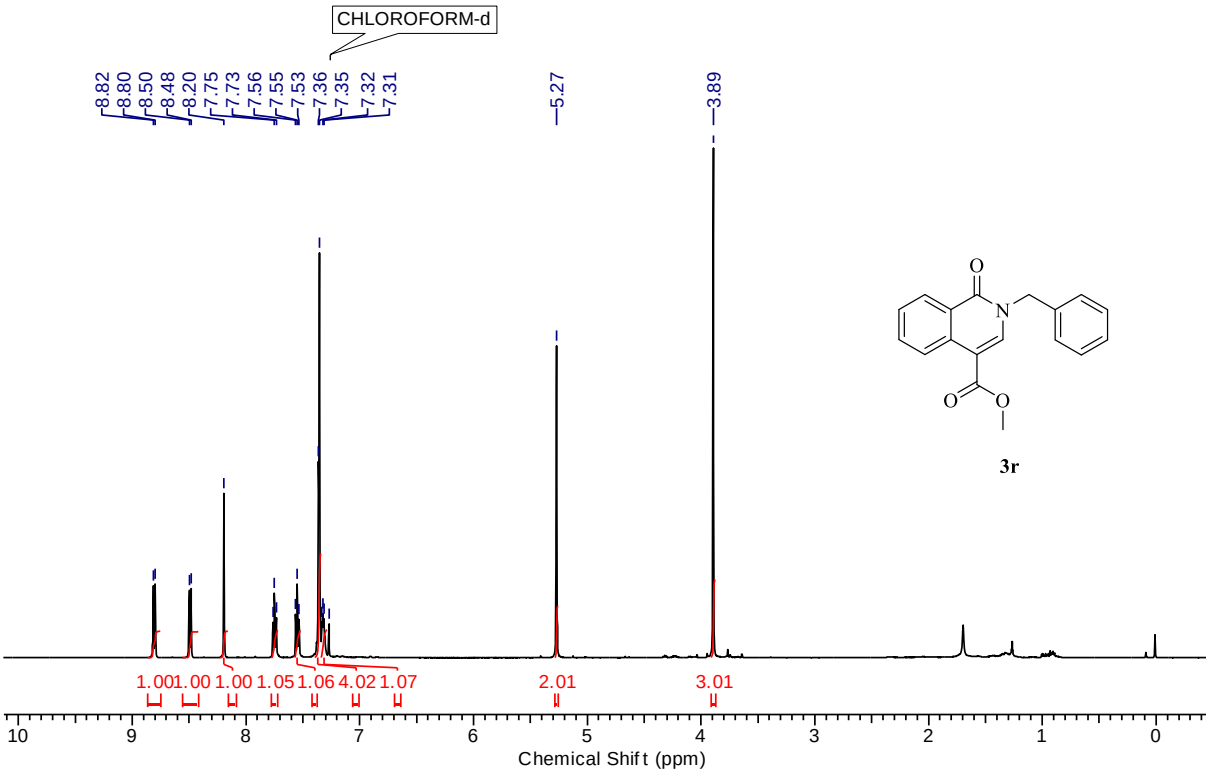
3q

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3q

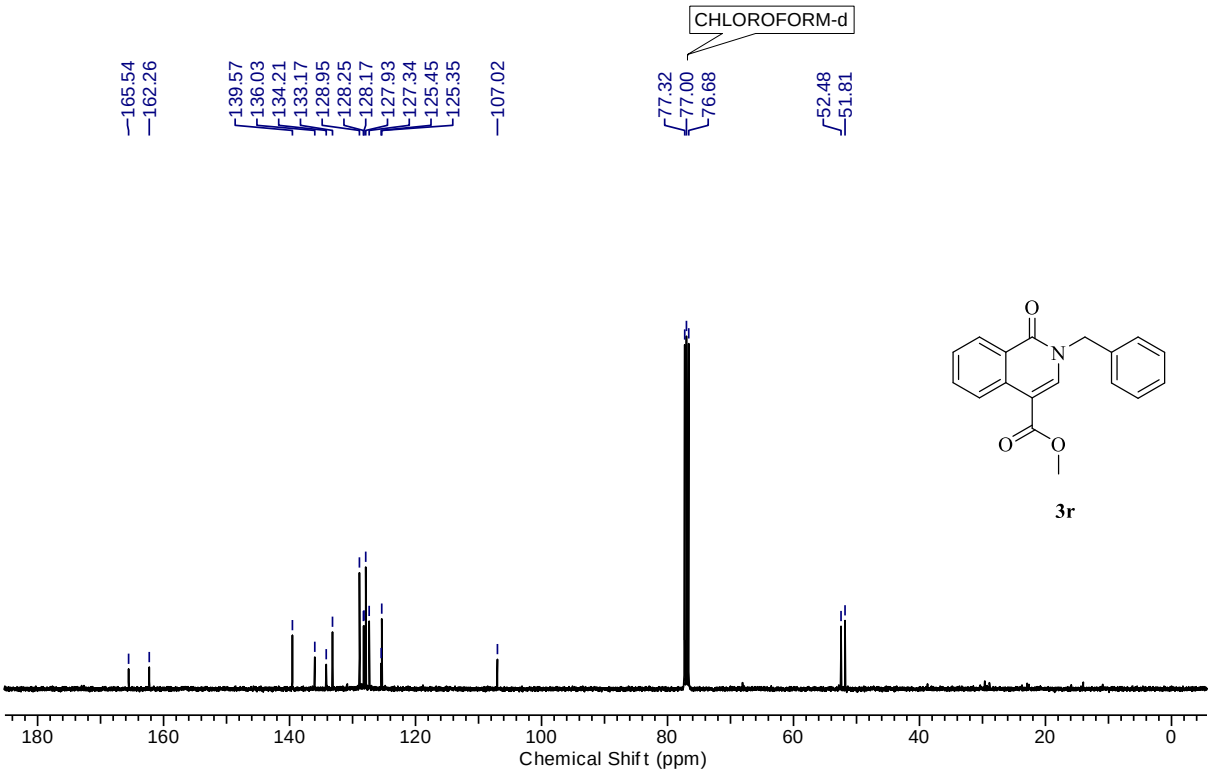


3q

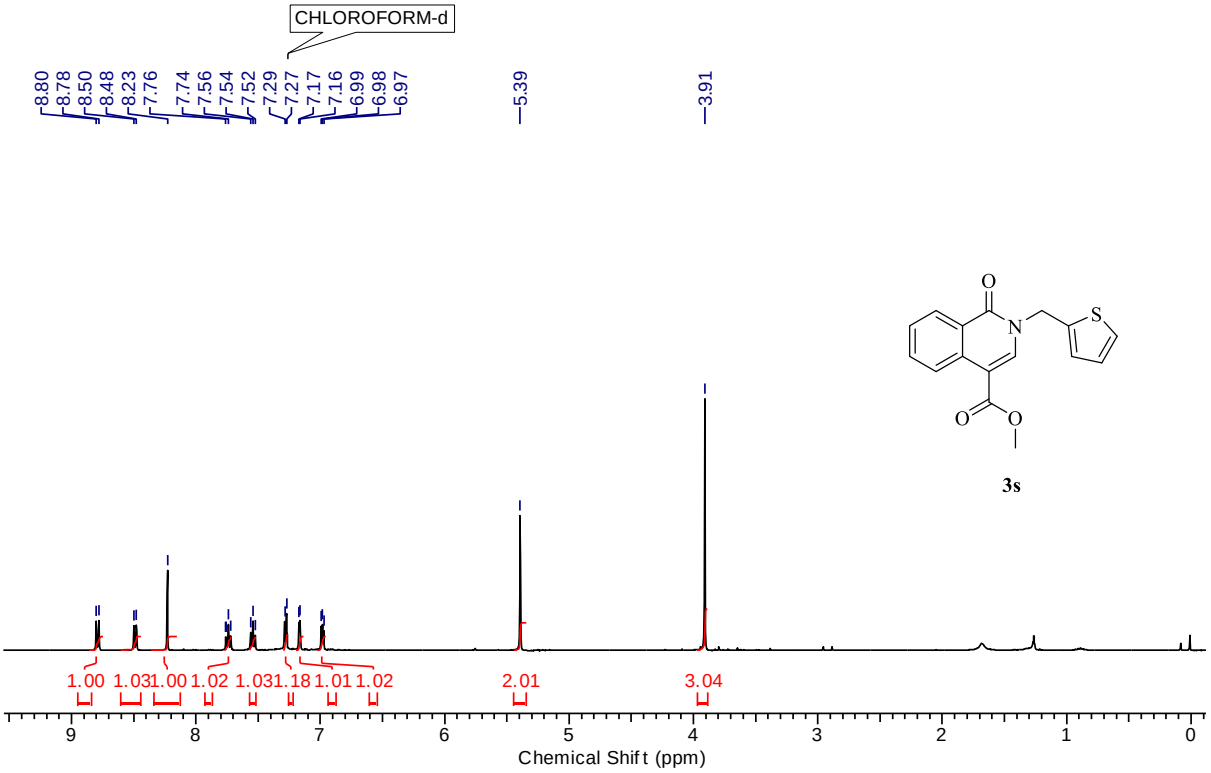
^{1}H NMR (500 MHz, $CDCl_3$) spectra of 3r



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3r

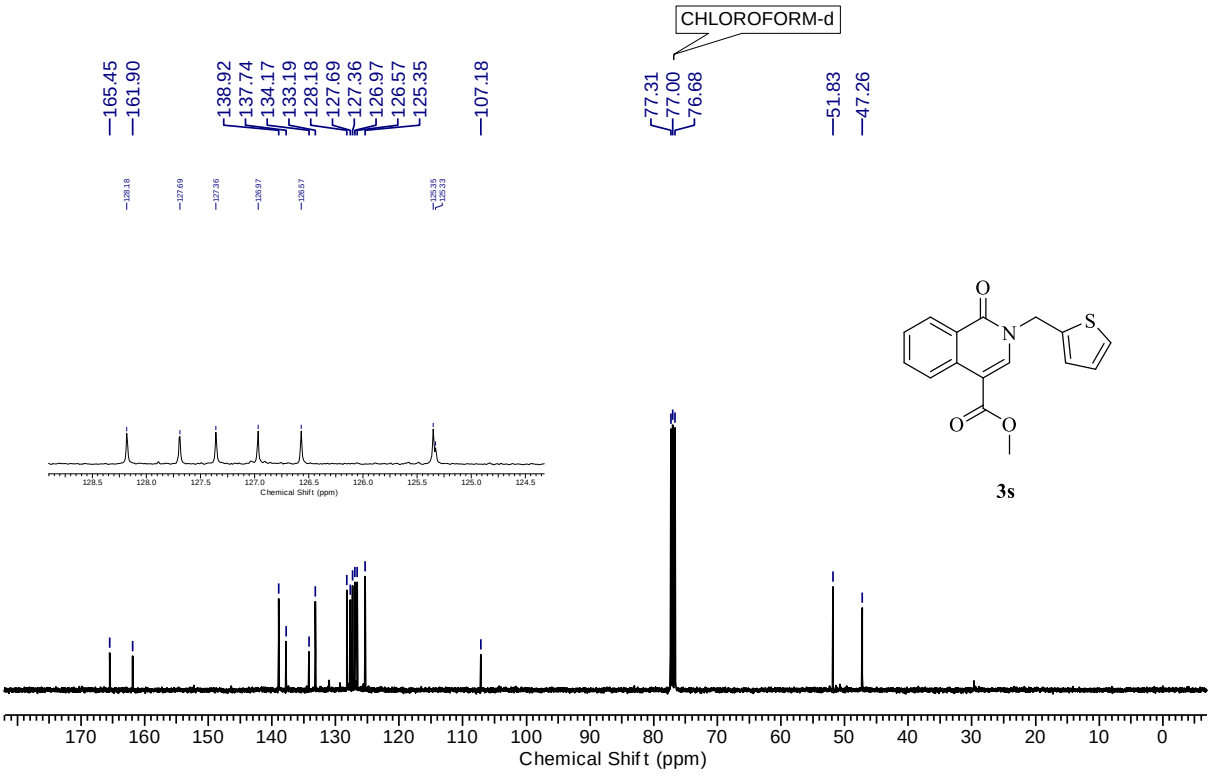


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3s



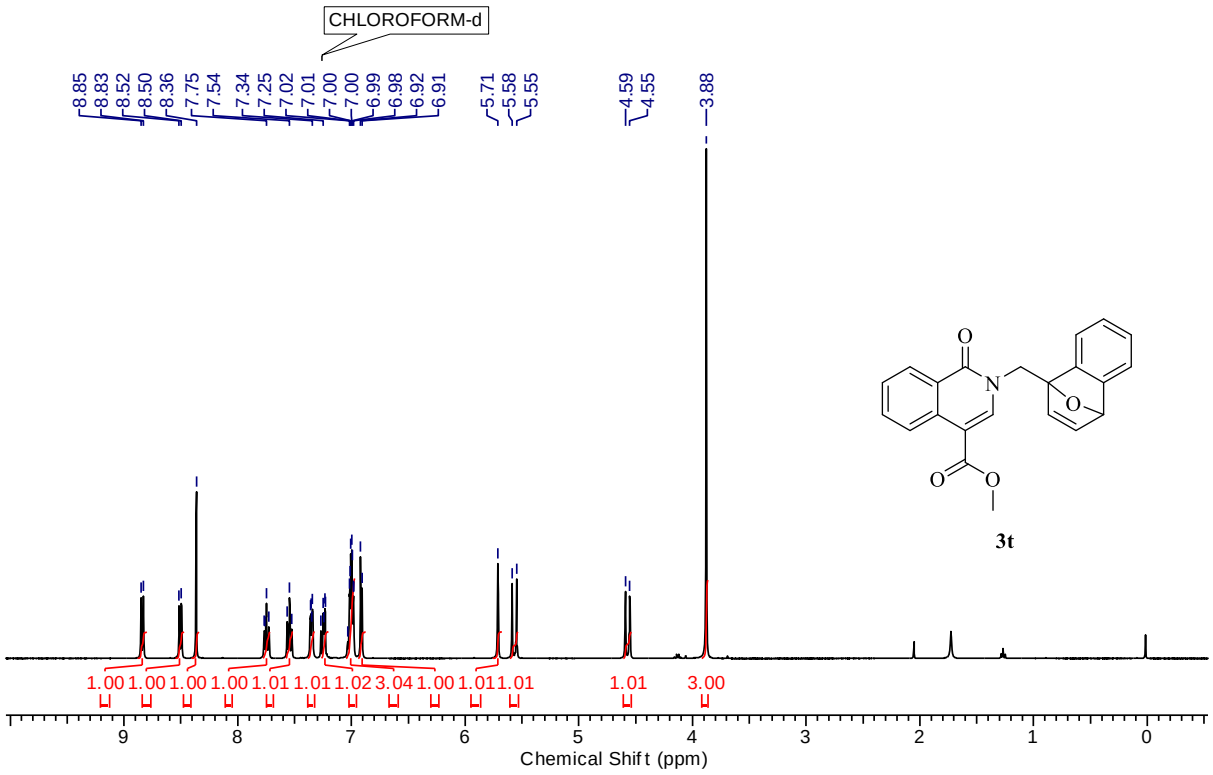
3s

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3s



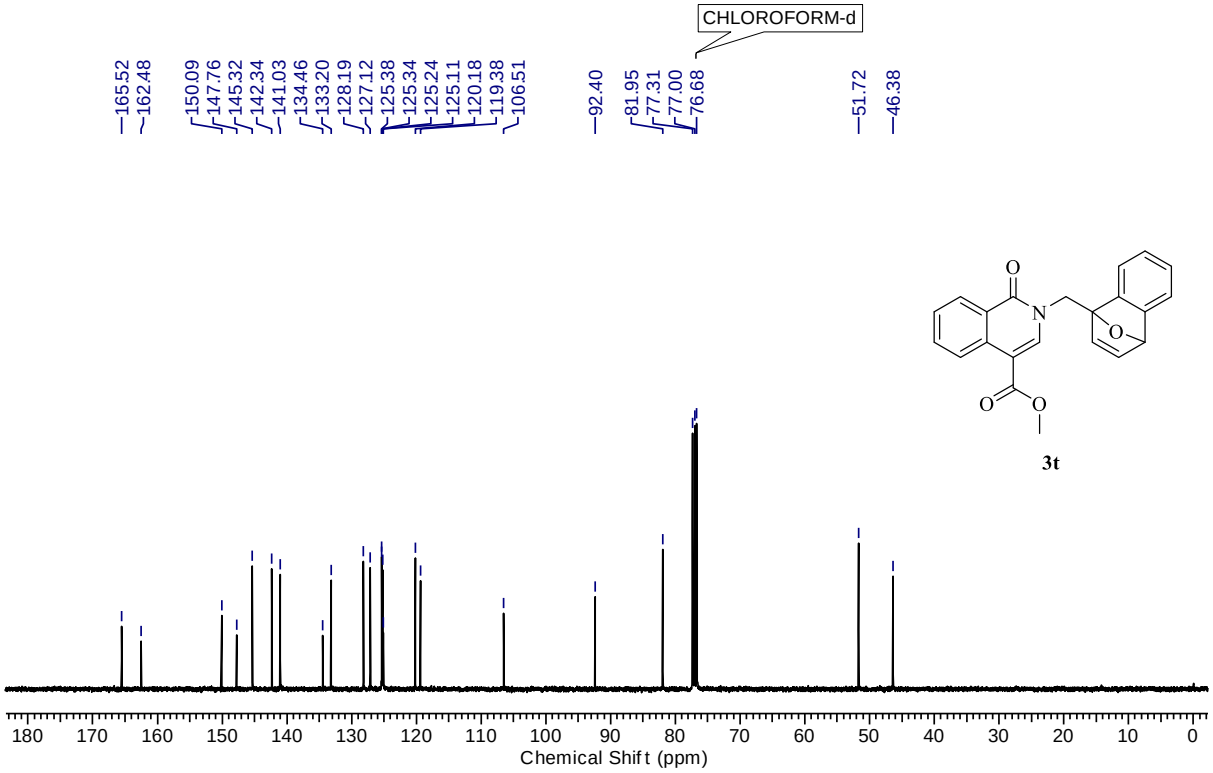
3s

^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3t



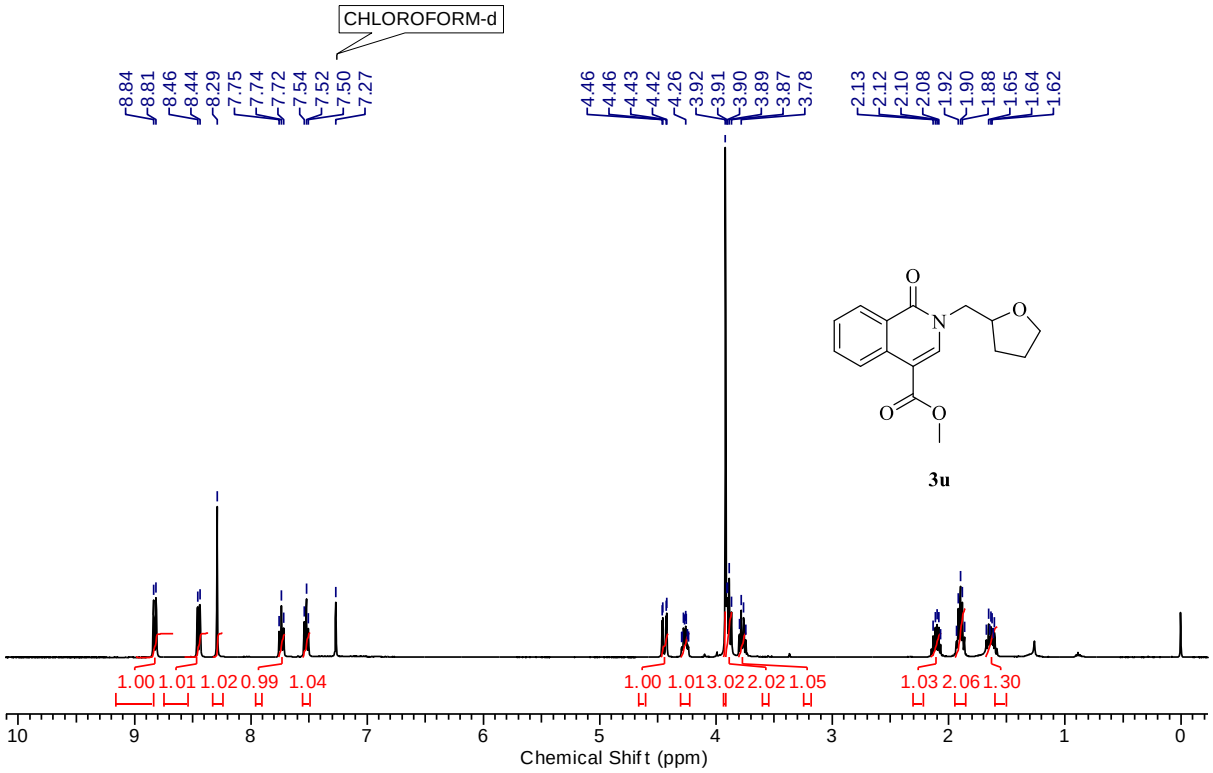
3t

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3t

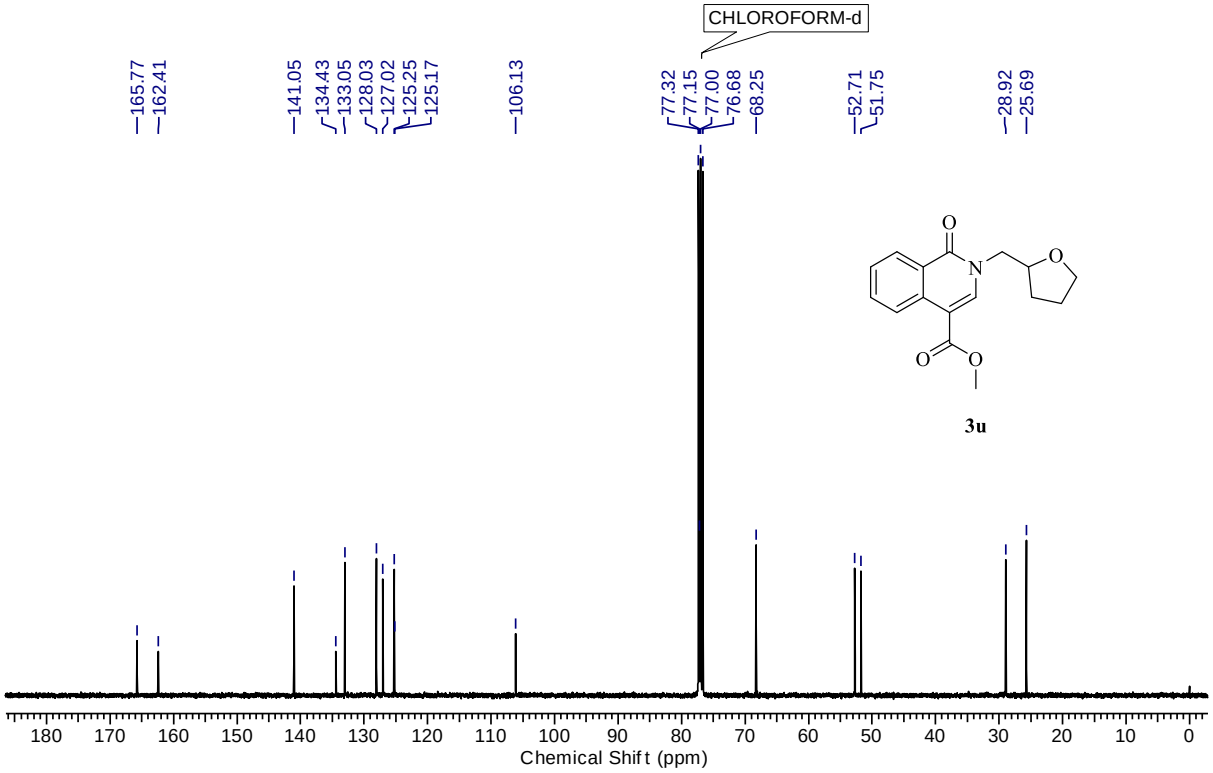


3t

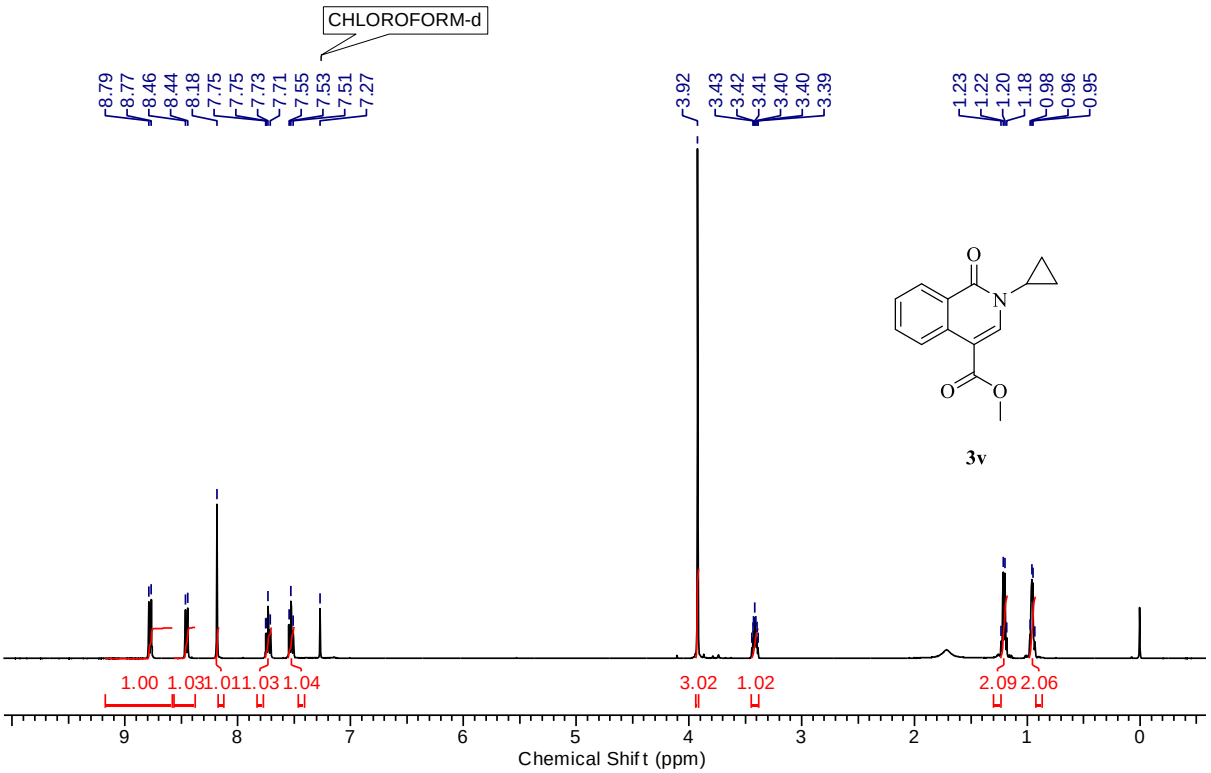
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3u



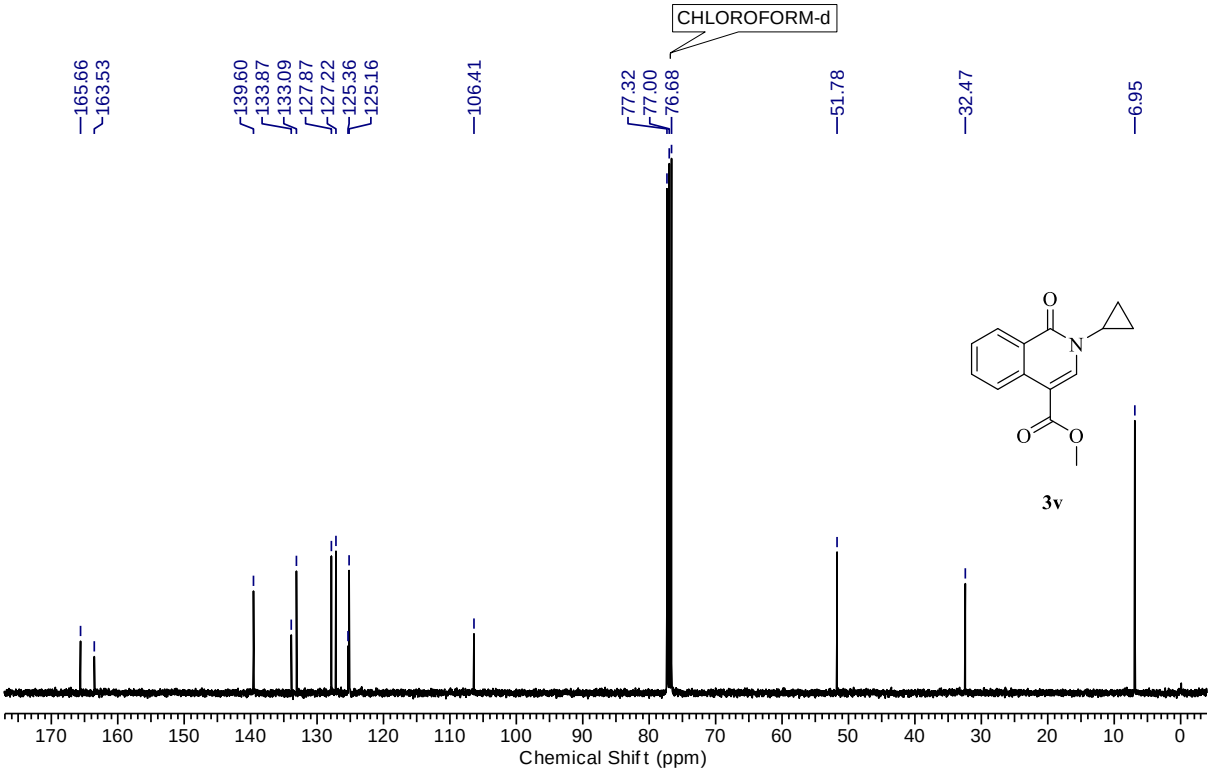
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3u



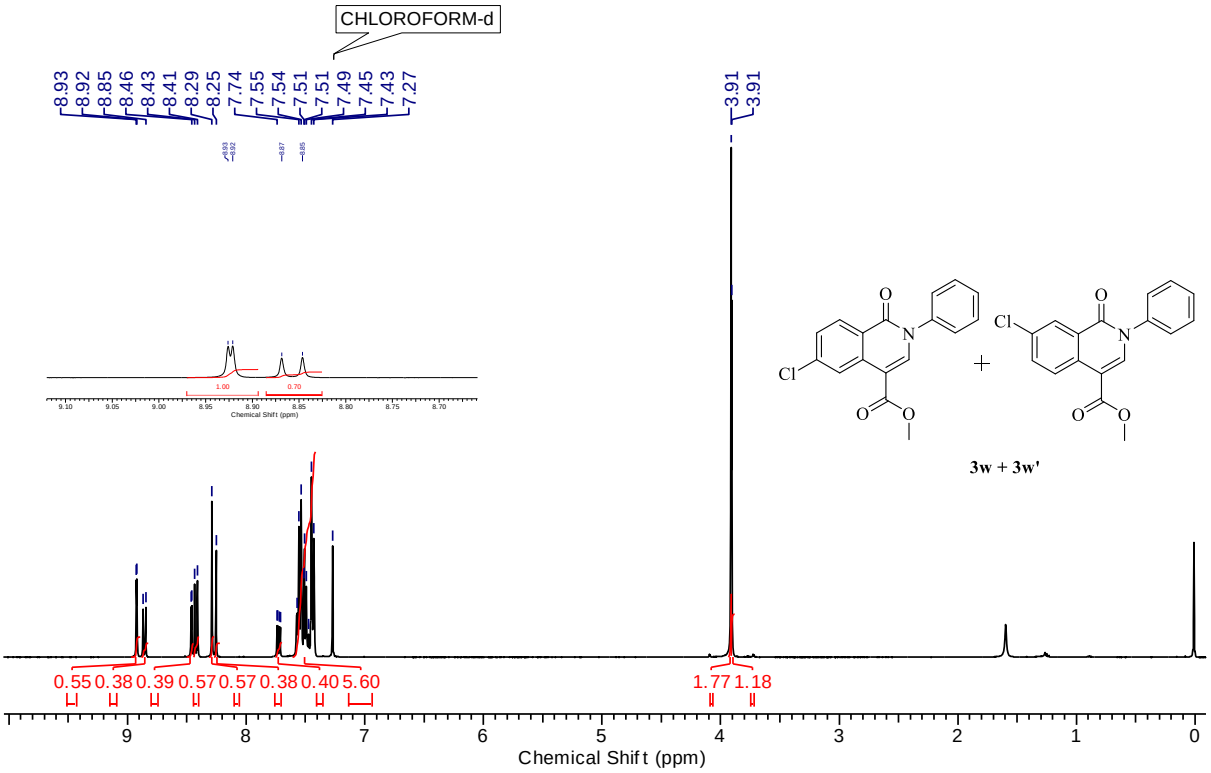
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3v



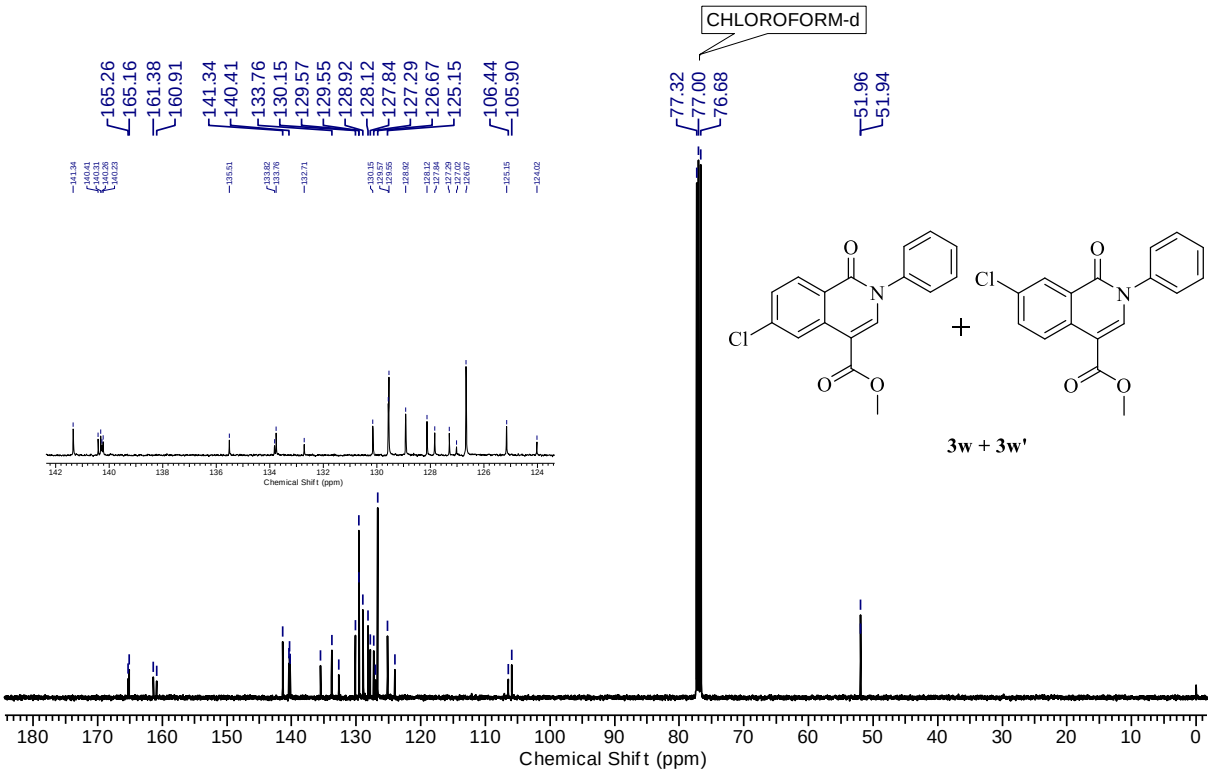
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3v



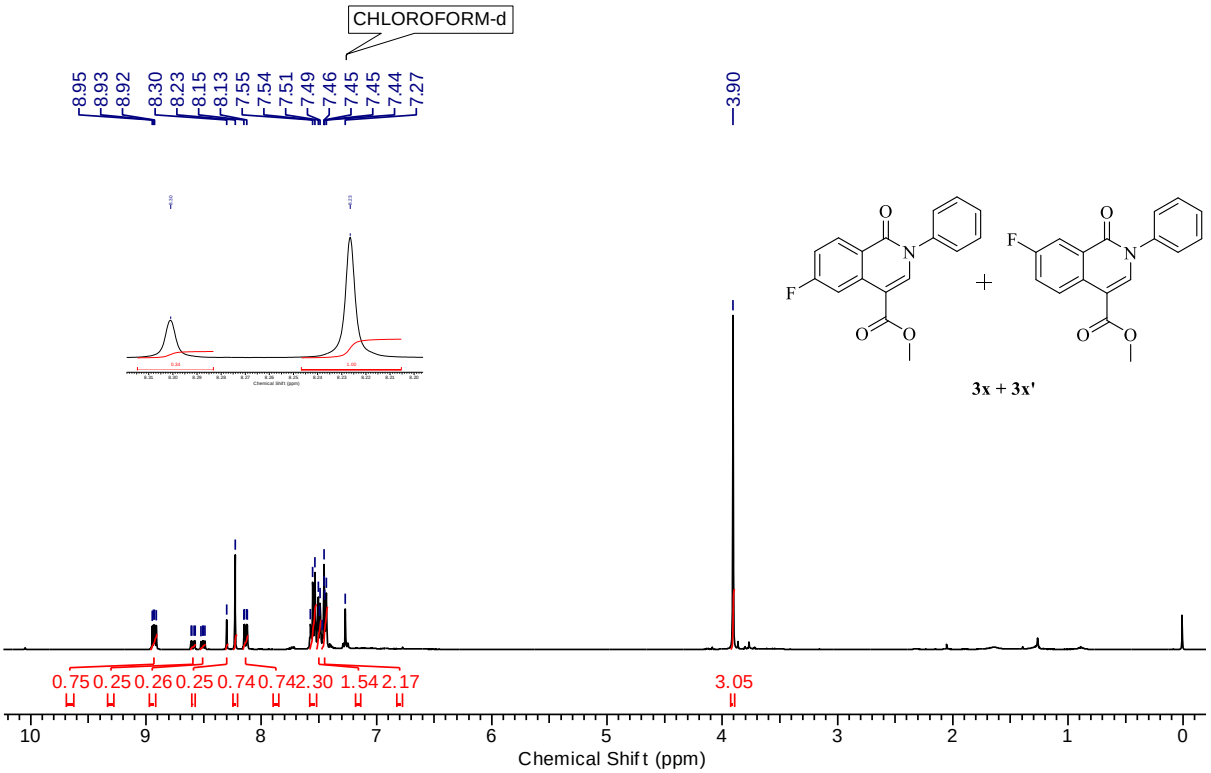
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3w + 3w'



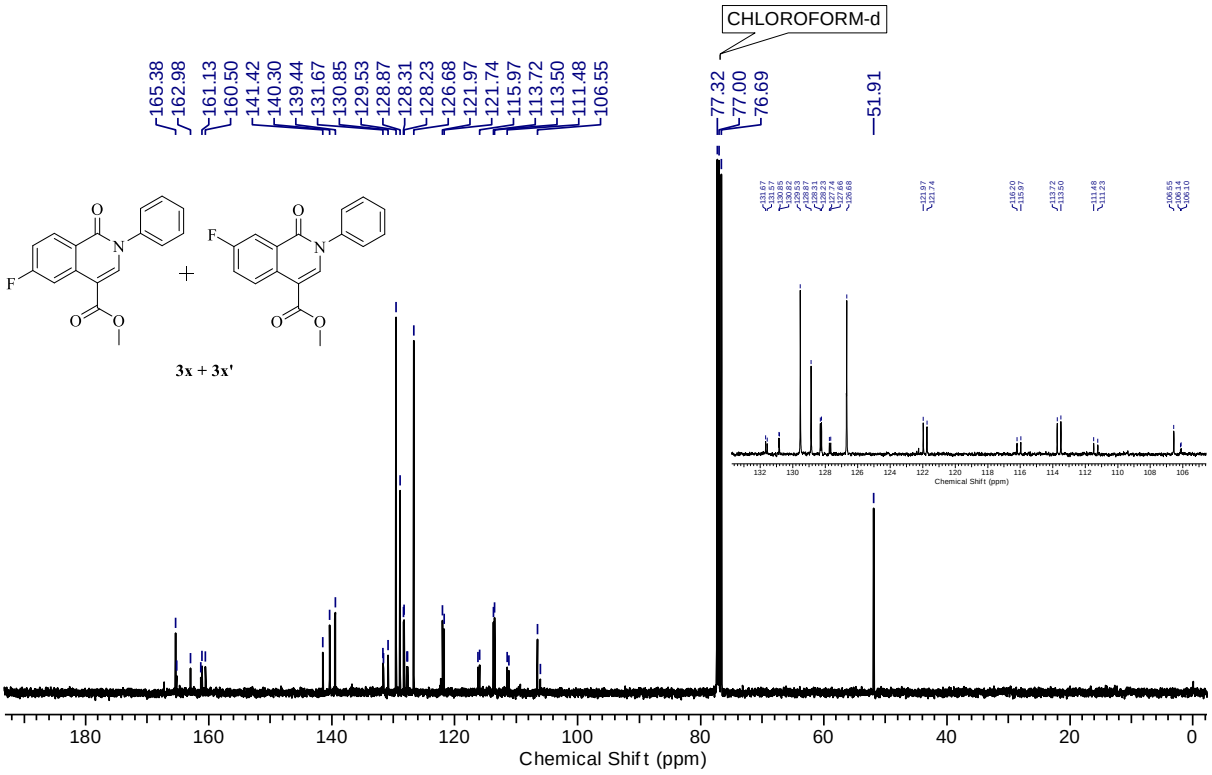
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3w + 3w'



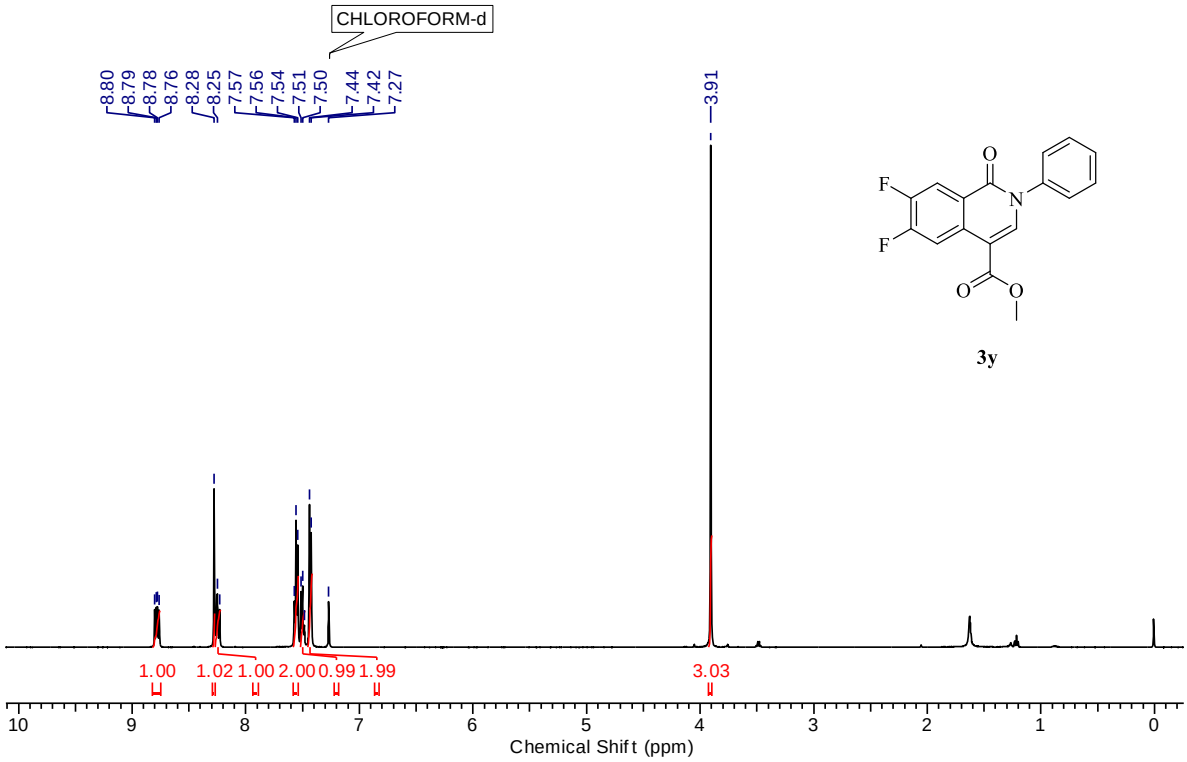
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3x + 3x'



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3x + 3x'

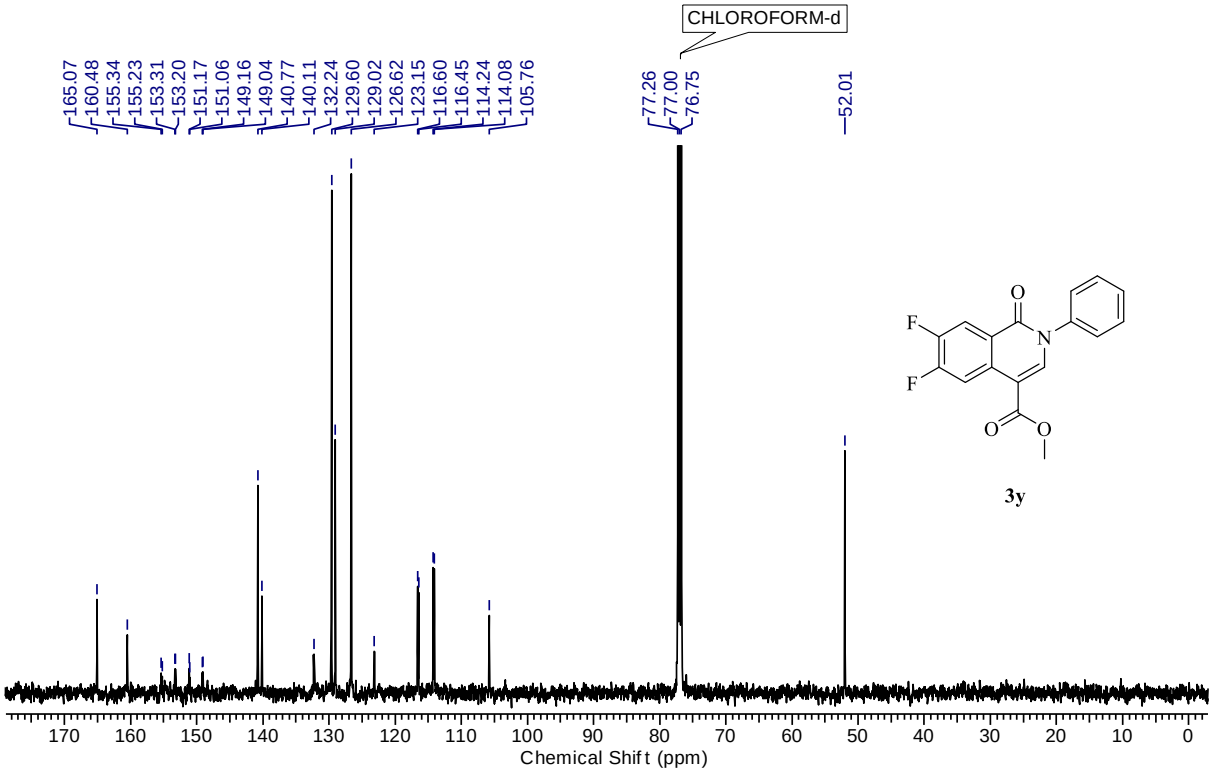


^{1}H NMR (500 MHz, $CDCl_3$) spectra of 3y



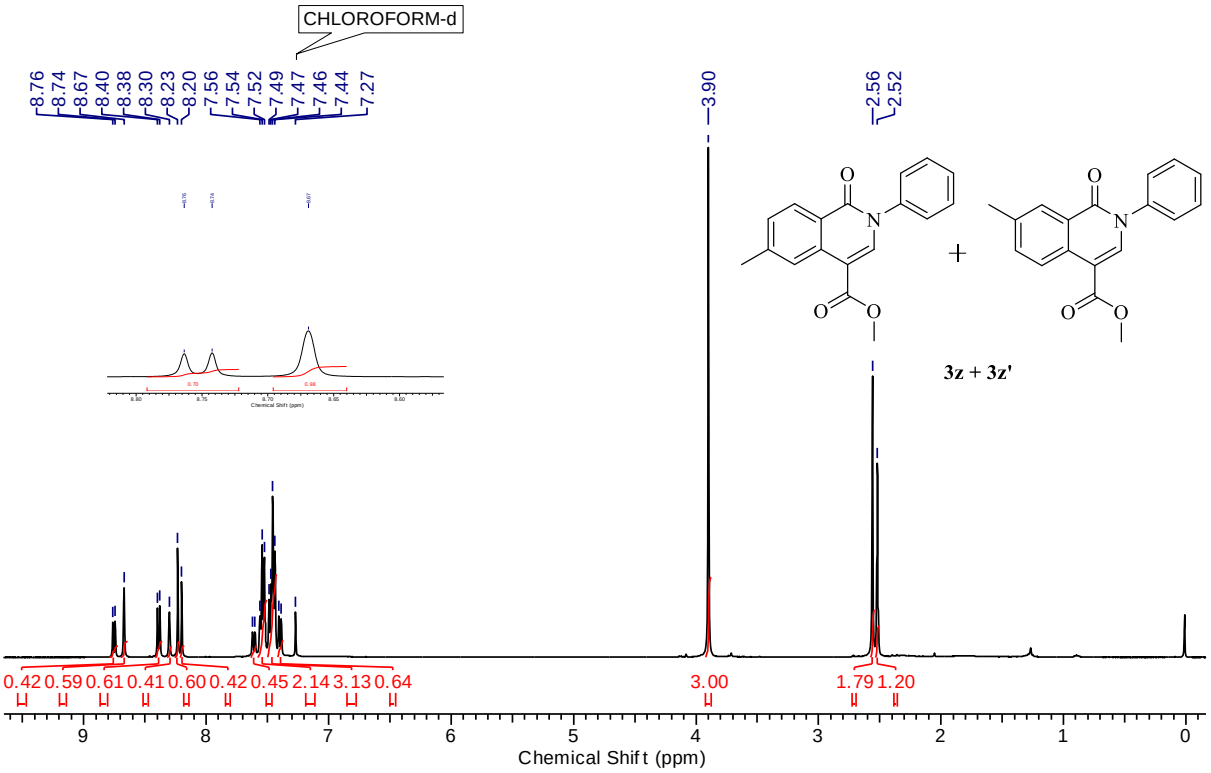
3y

^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) spectra of 3y

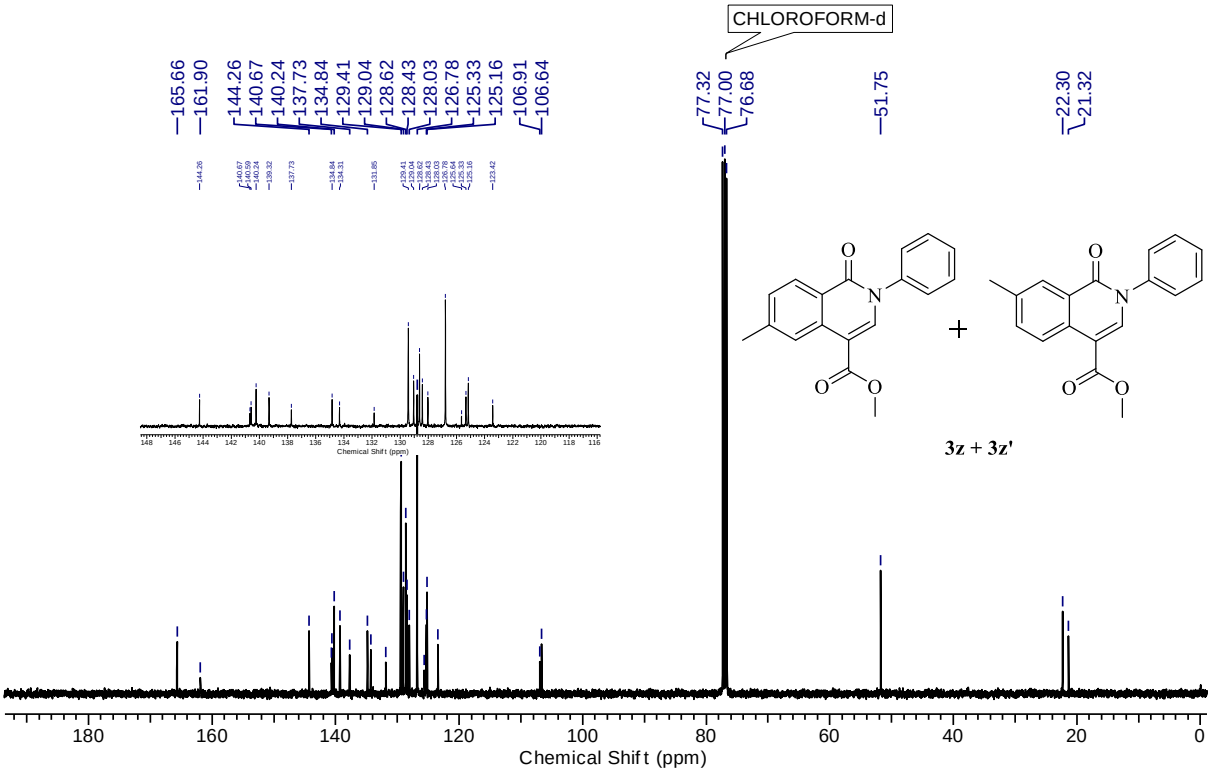


3y

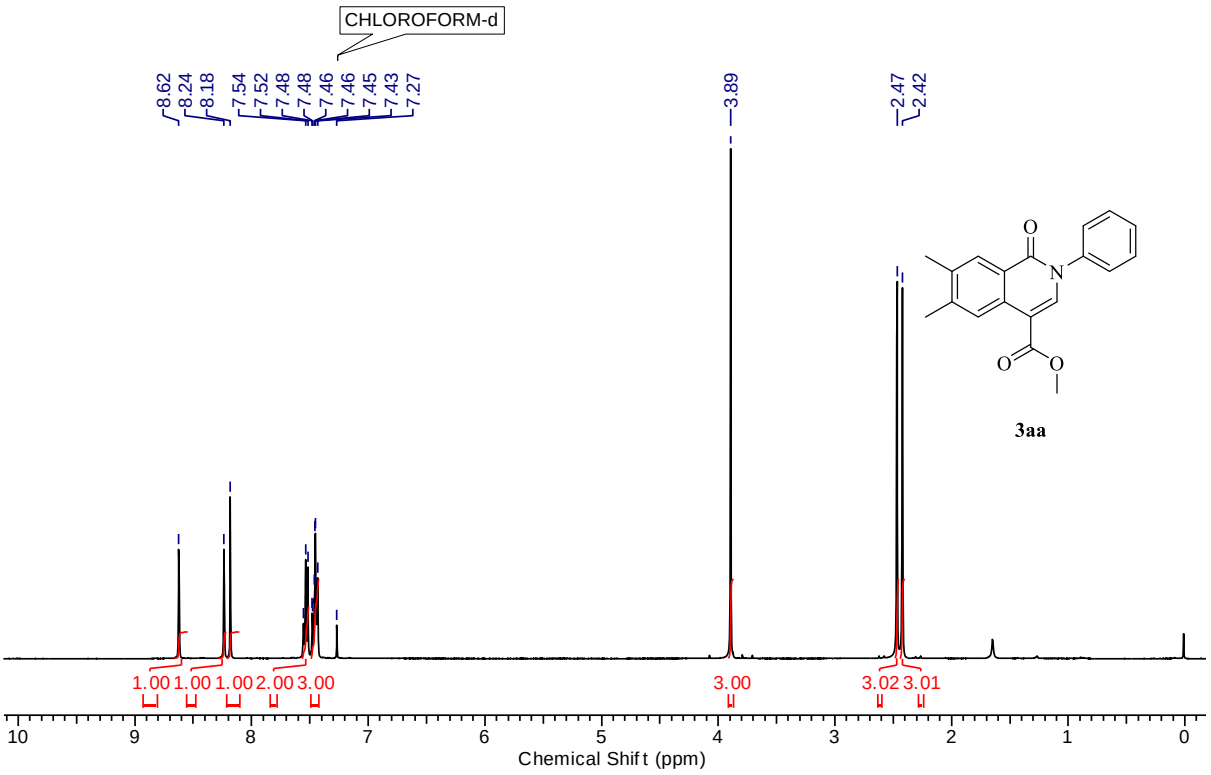
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3z + 3z'



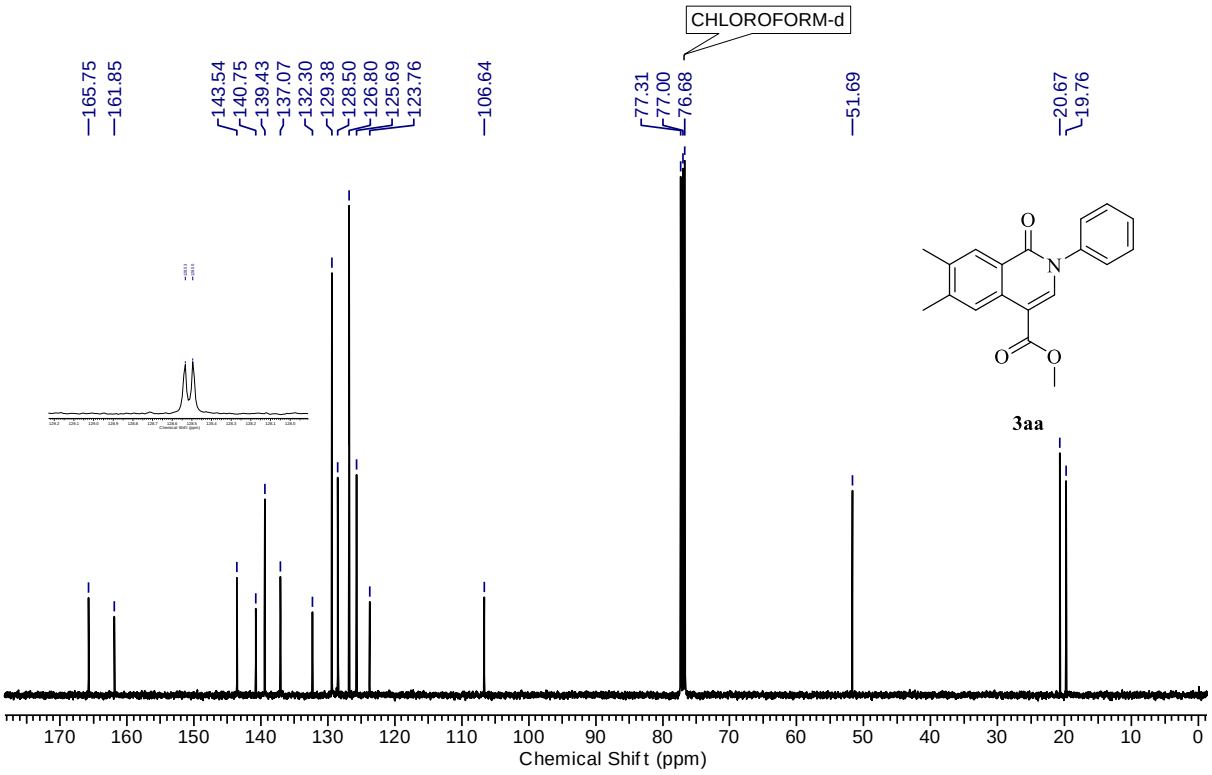
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3z + 3z'



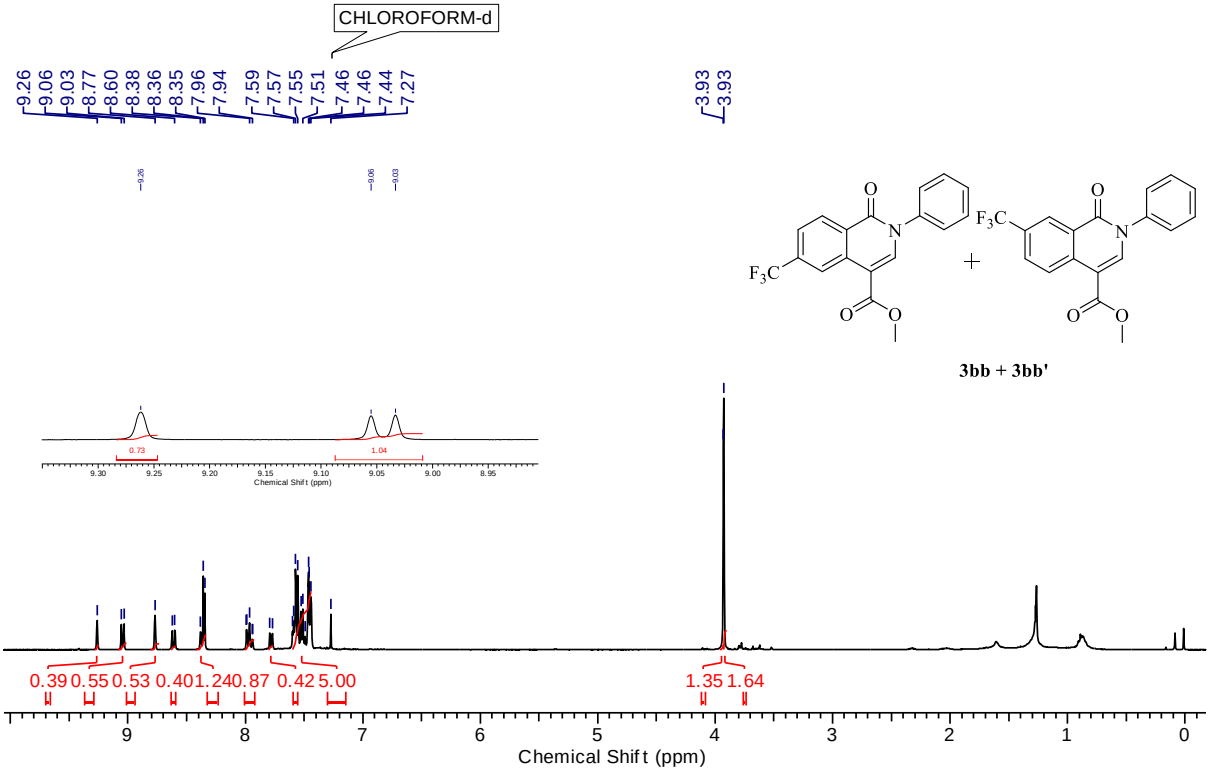
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3aa



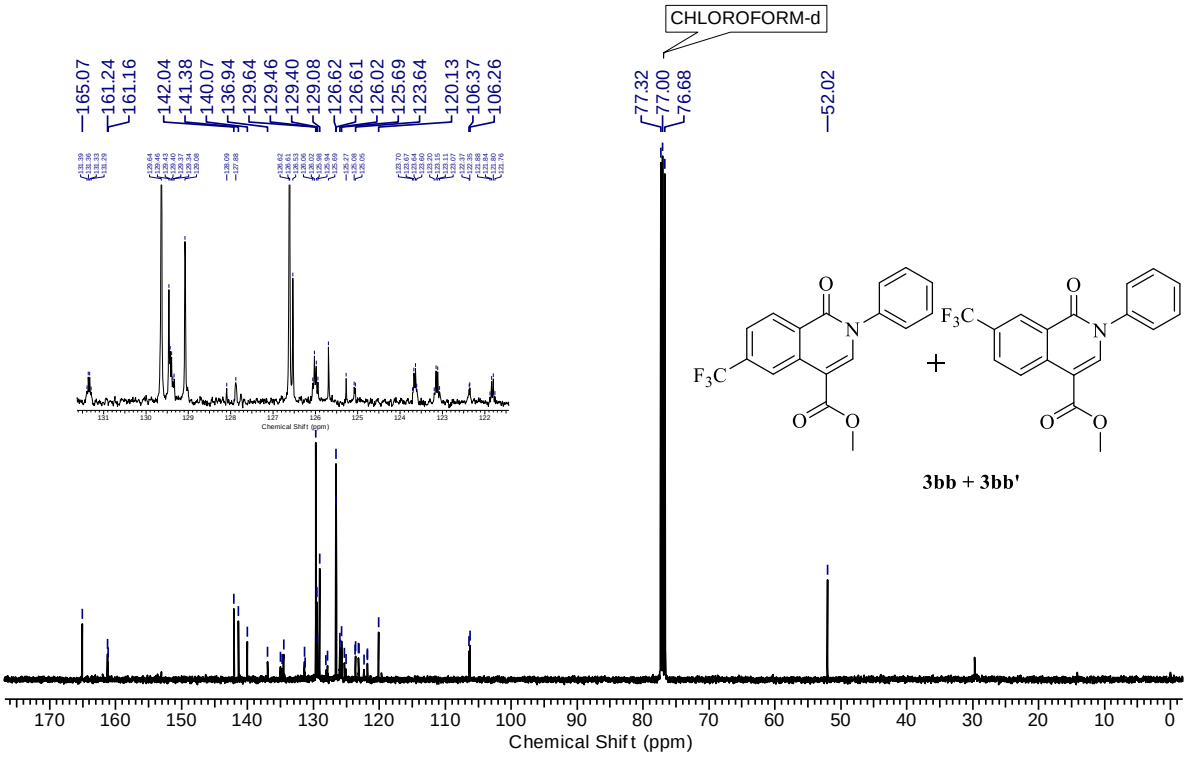
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 3aa



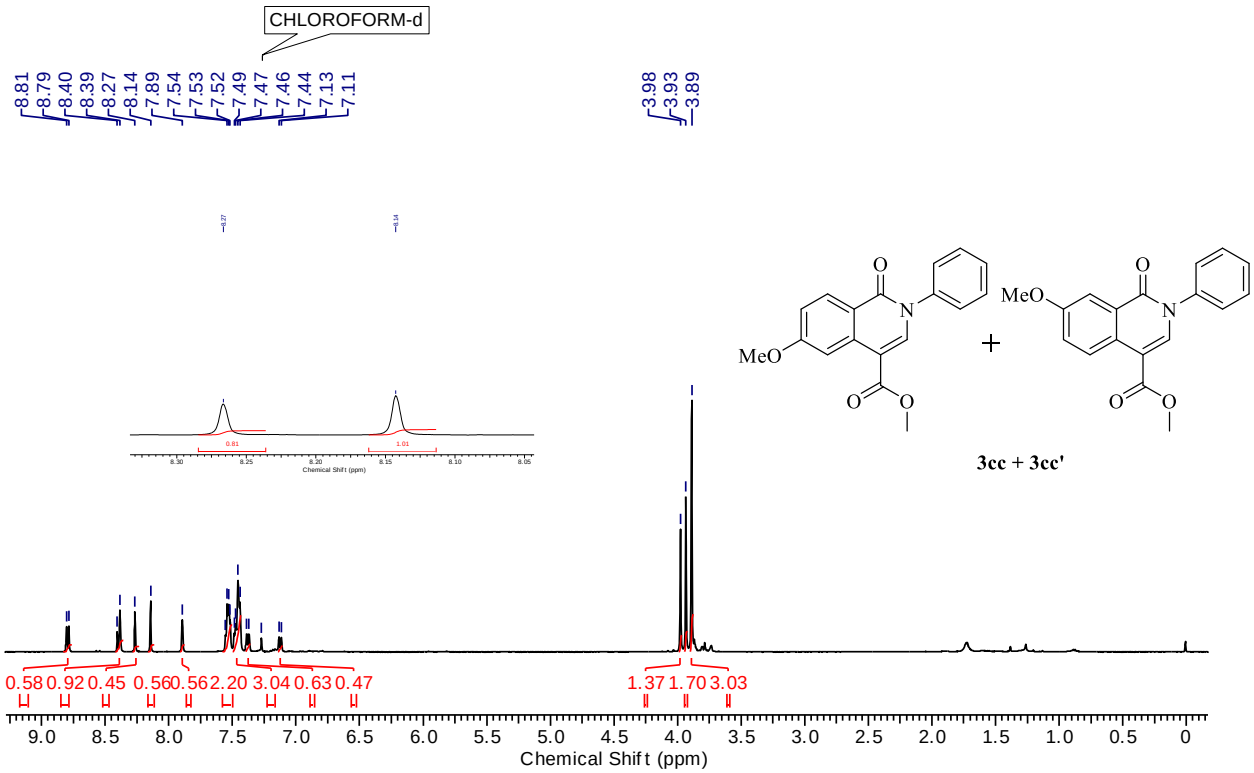
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3bb + 3bb'



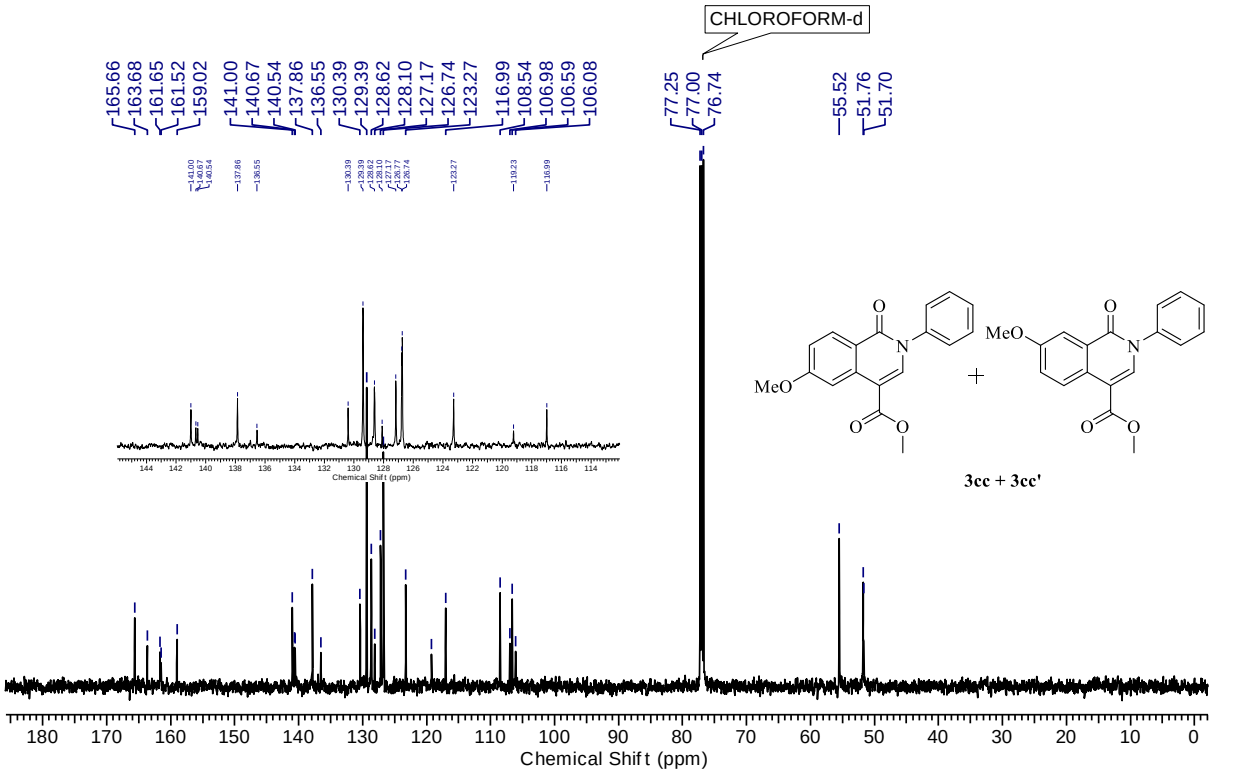
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3bb + 3bb'



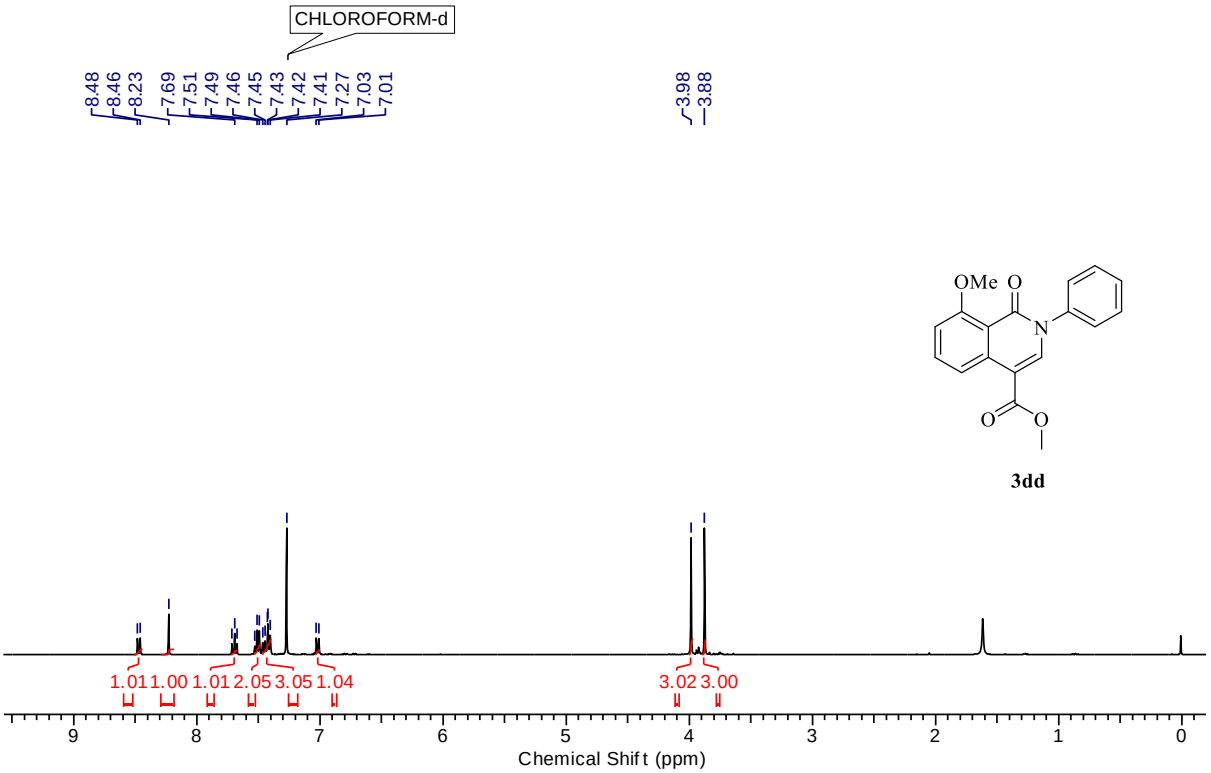
^{1}H NMR (500 MHz, $CDCl_3$) spectra of 3cc + 3cc'



^{13}C{^{1}H} NMR (125 MHz, $CDCl_3$) spectra of 3cc + 3cc'

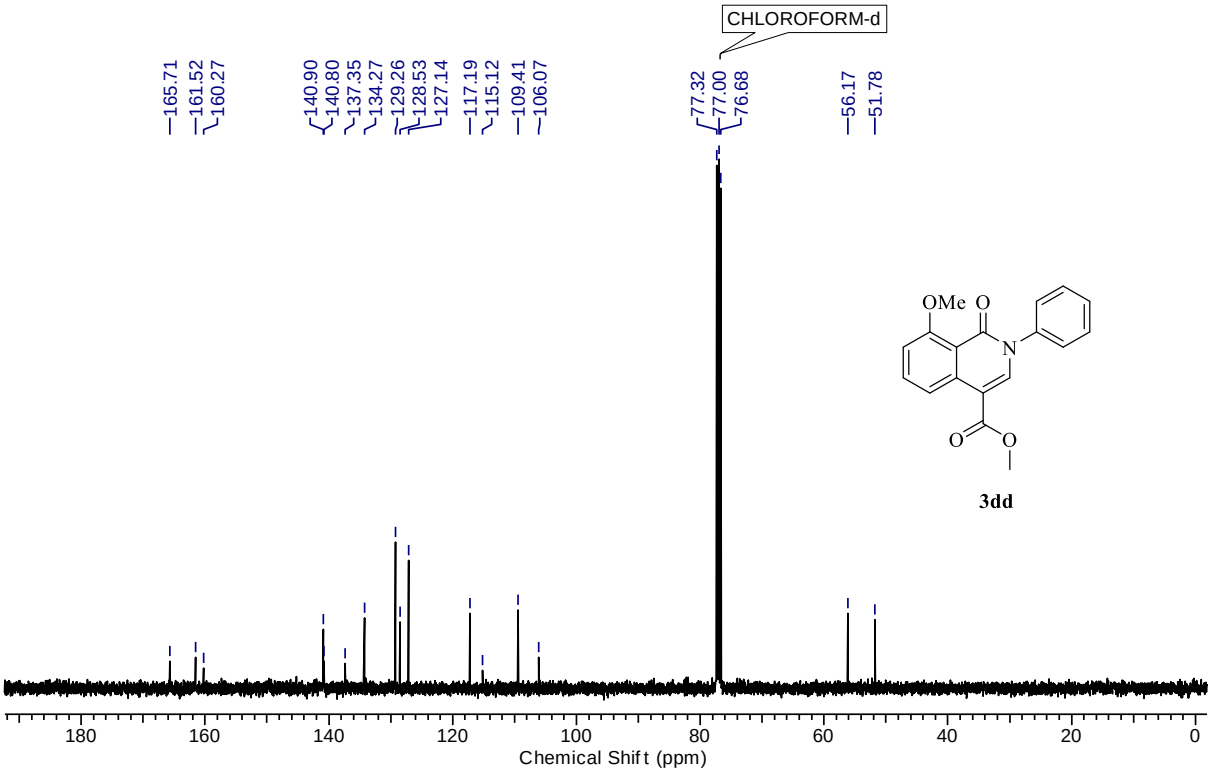


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3dd



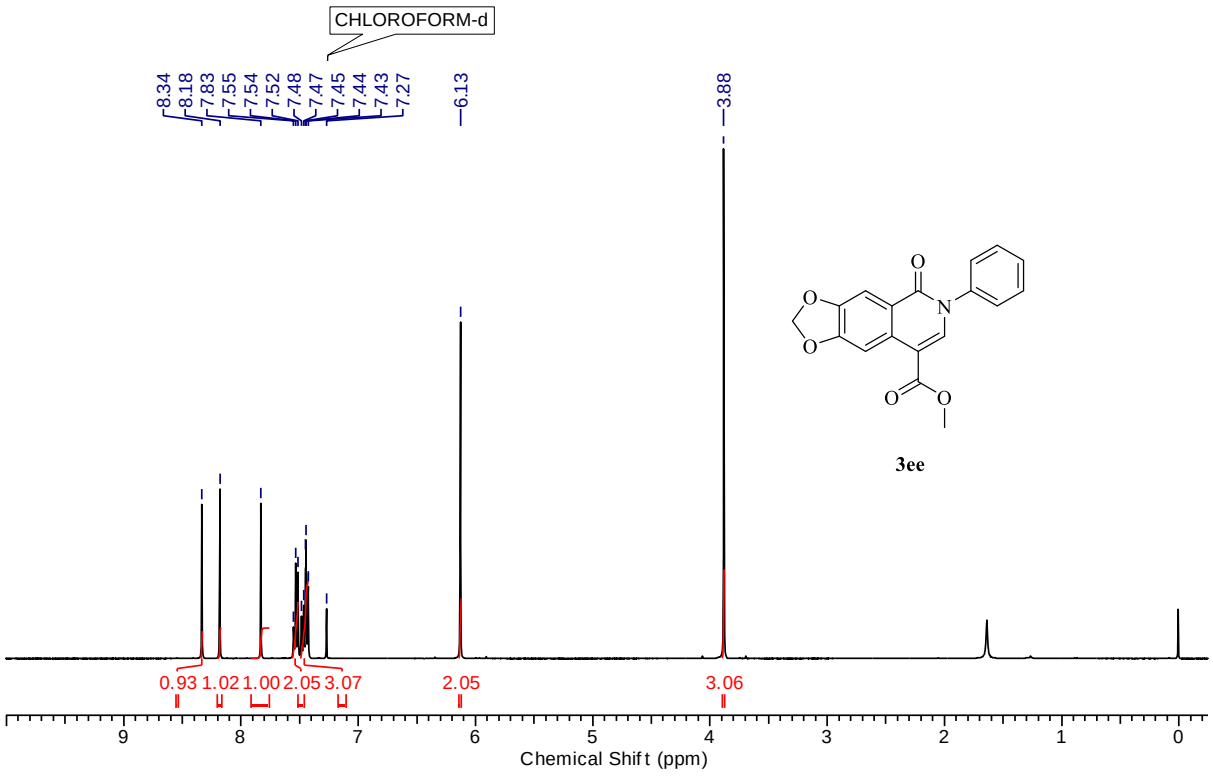
3dd

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3dd

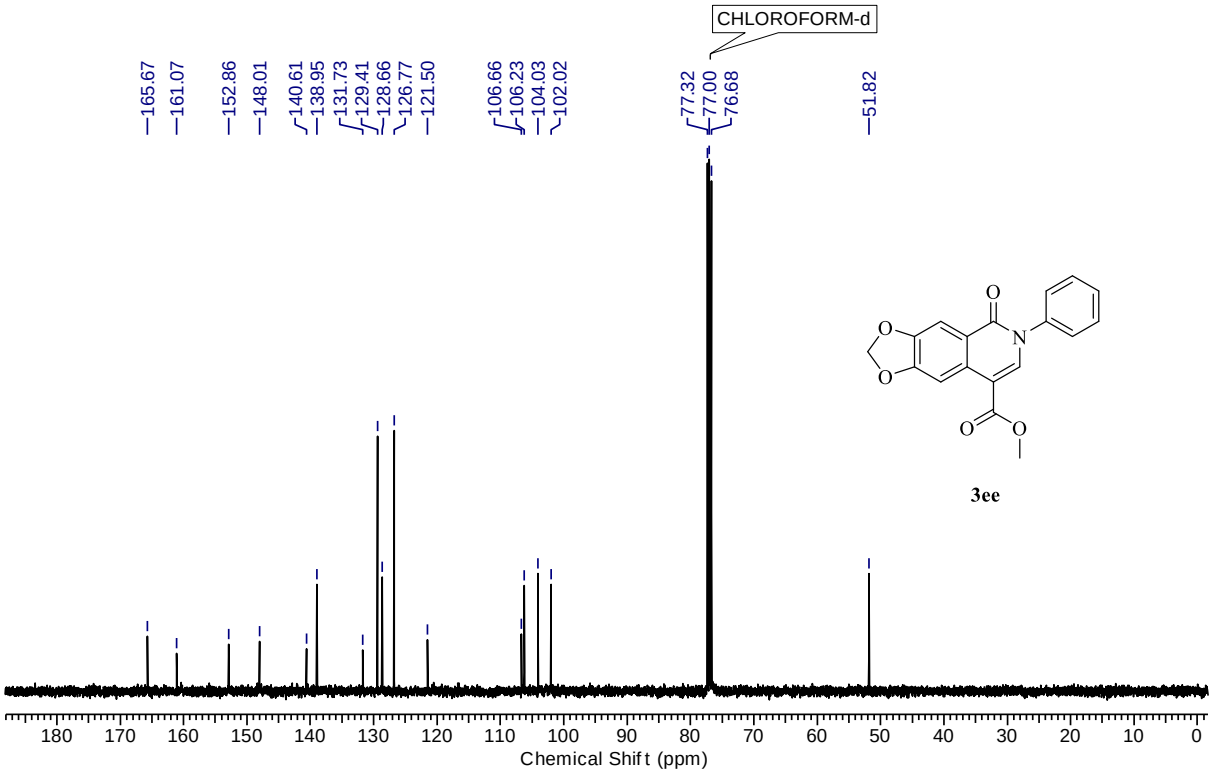


3dd

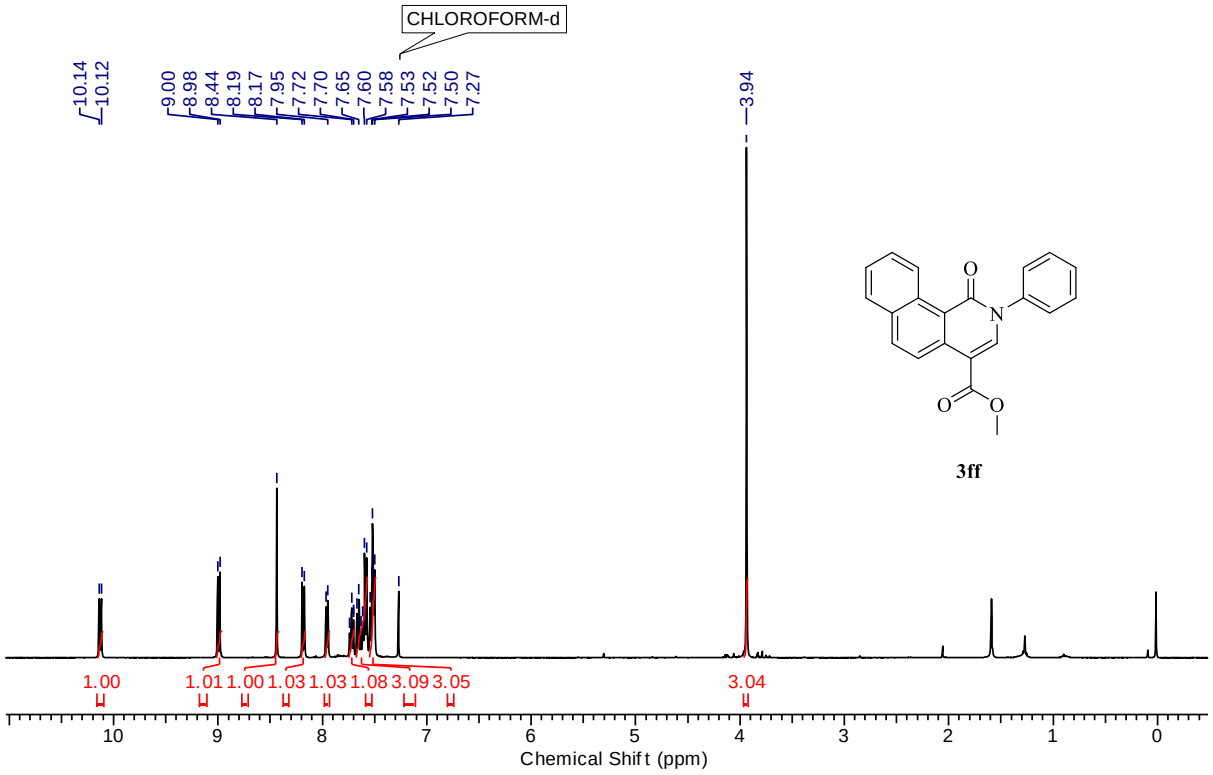
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3ee



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3ee

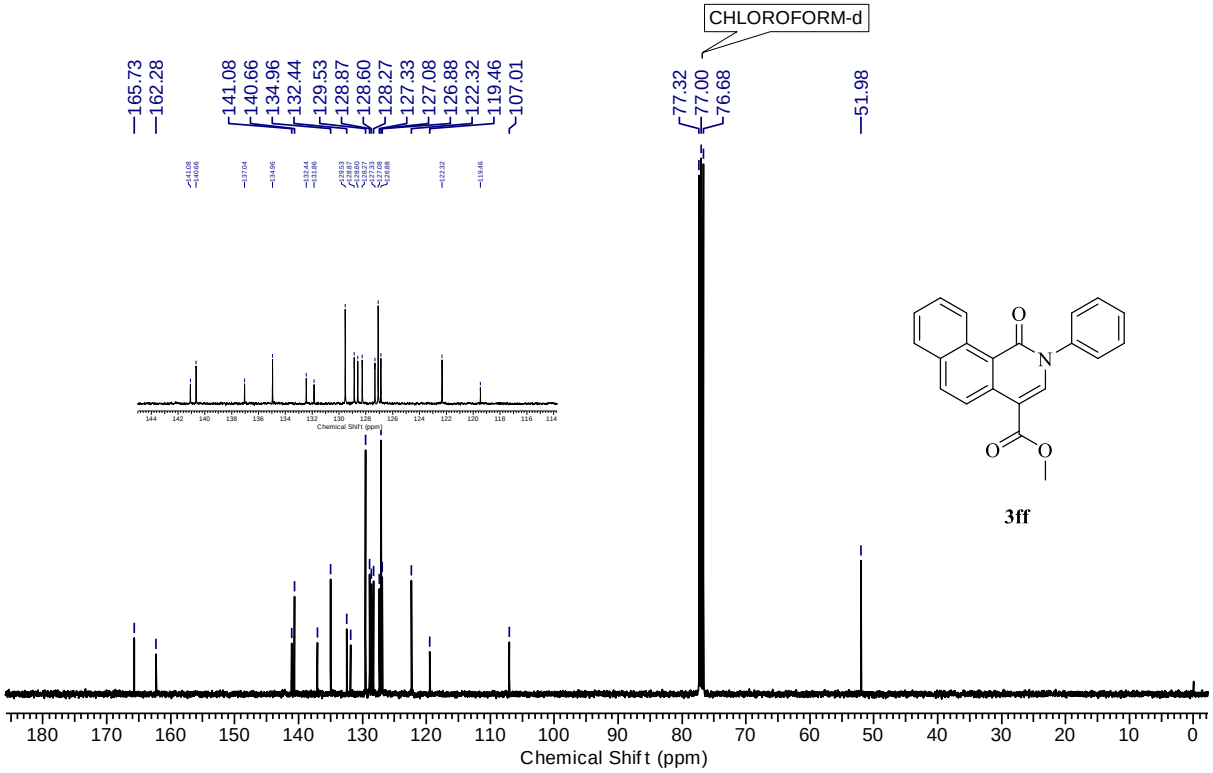


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3ff



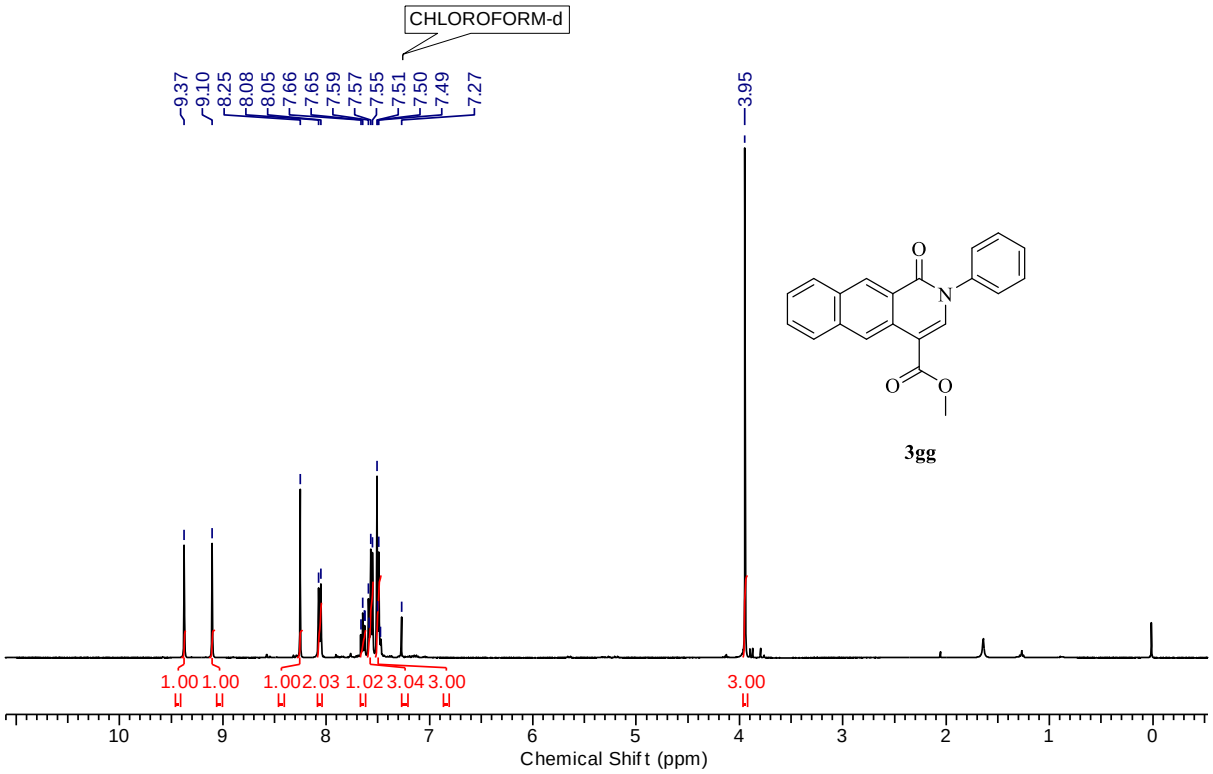
3ff

$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 3ff



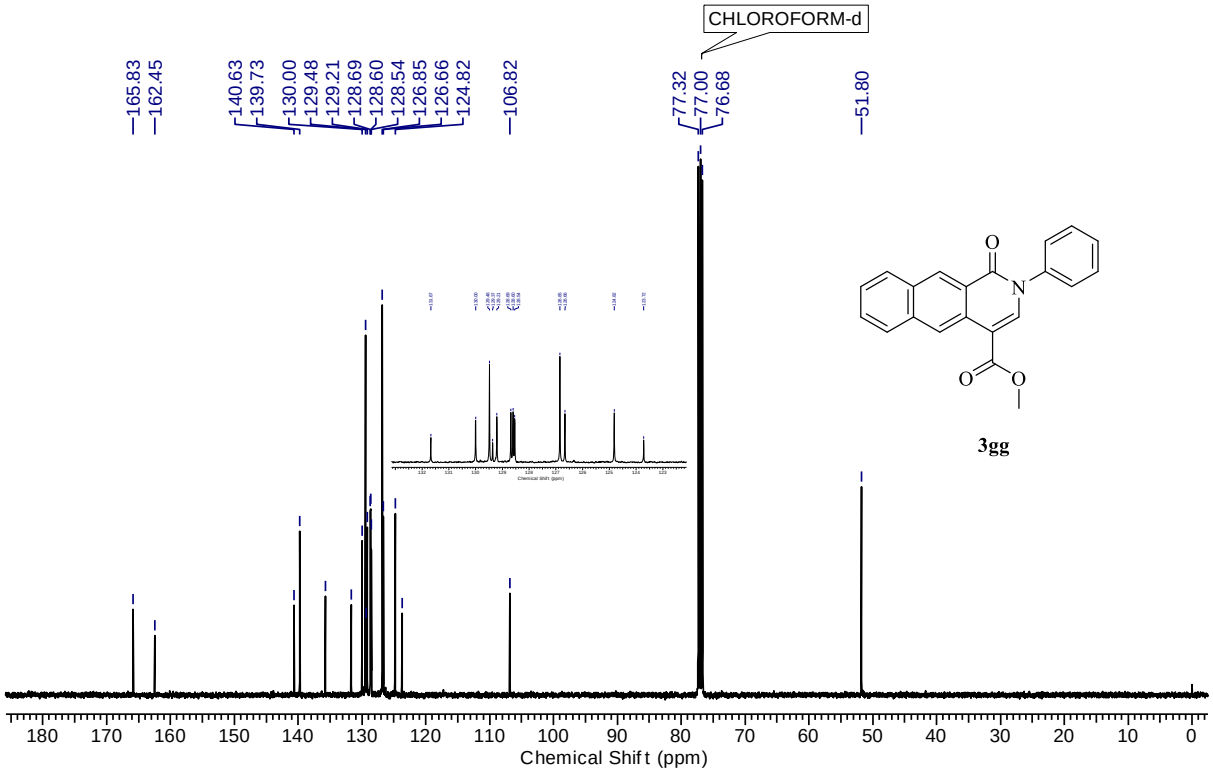
3ff

^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3gg



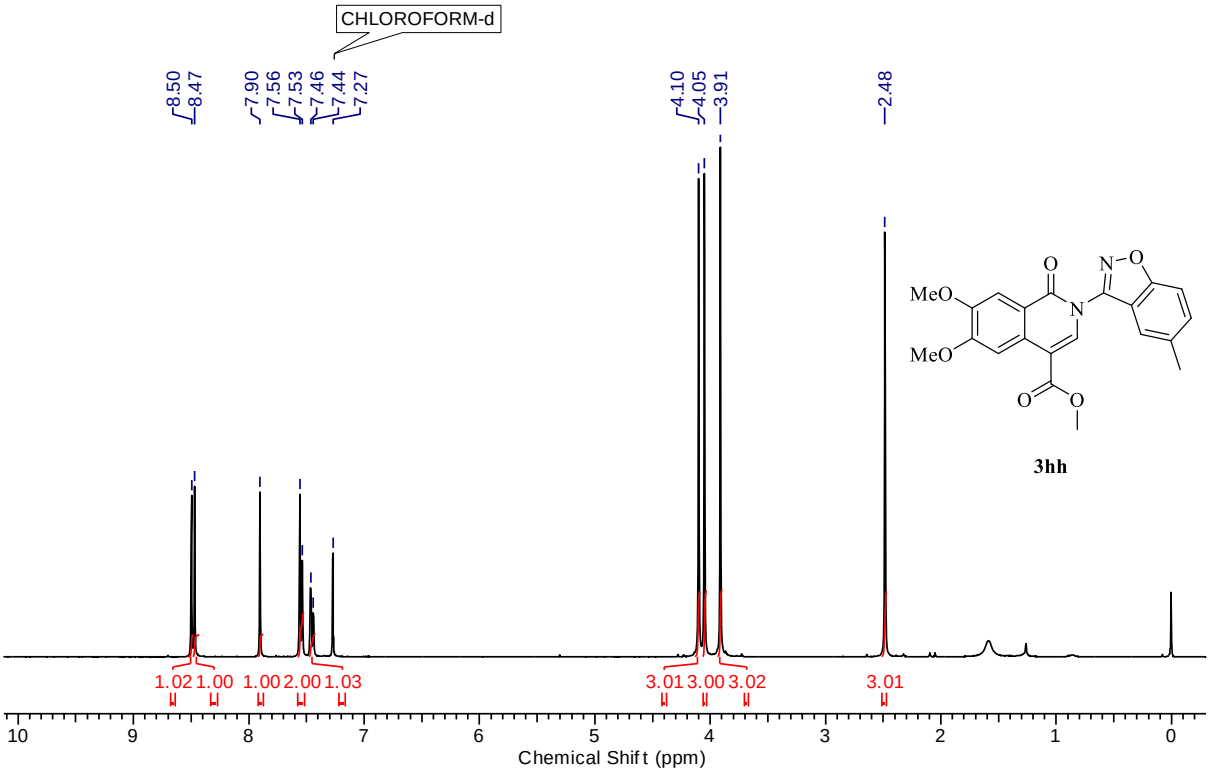
3gg

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3gg

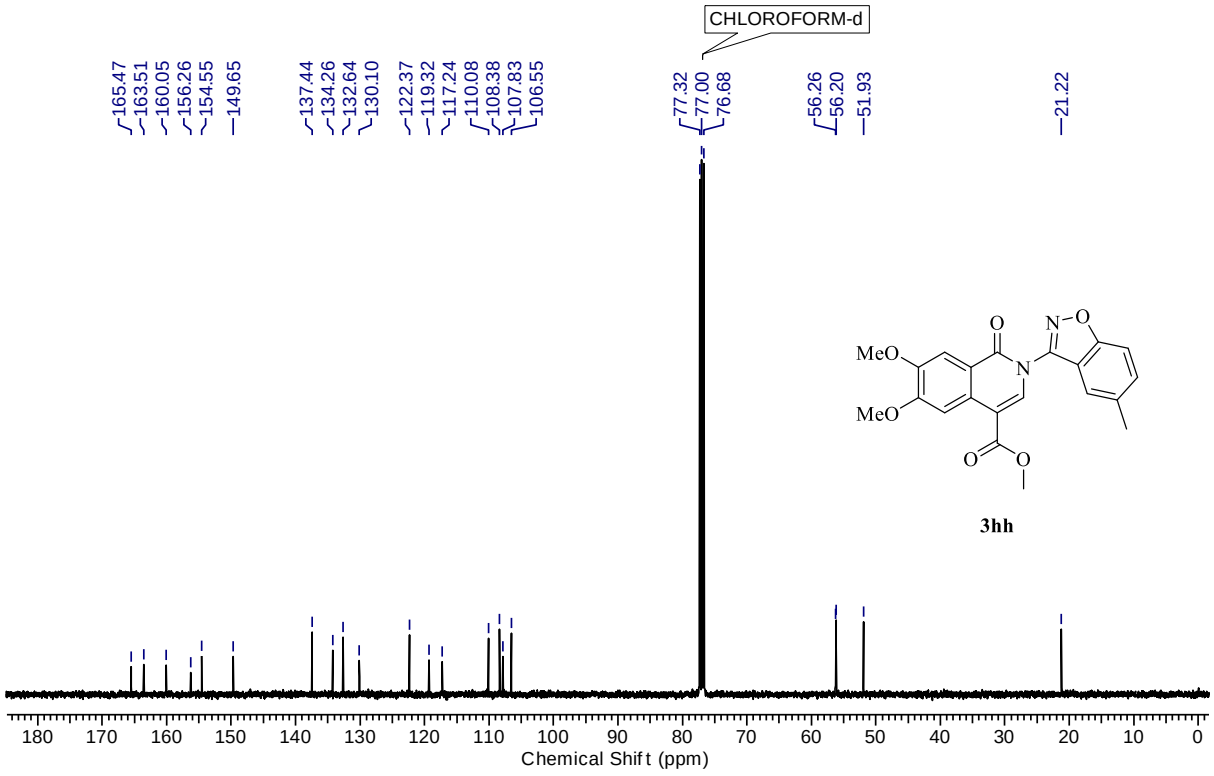


3gg

^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3hh

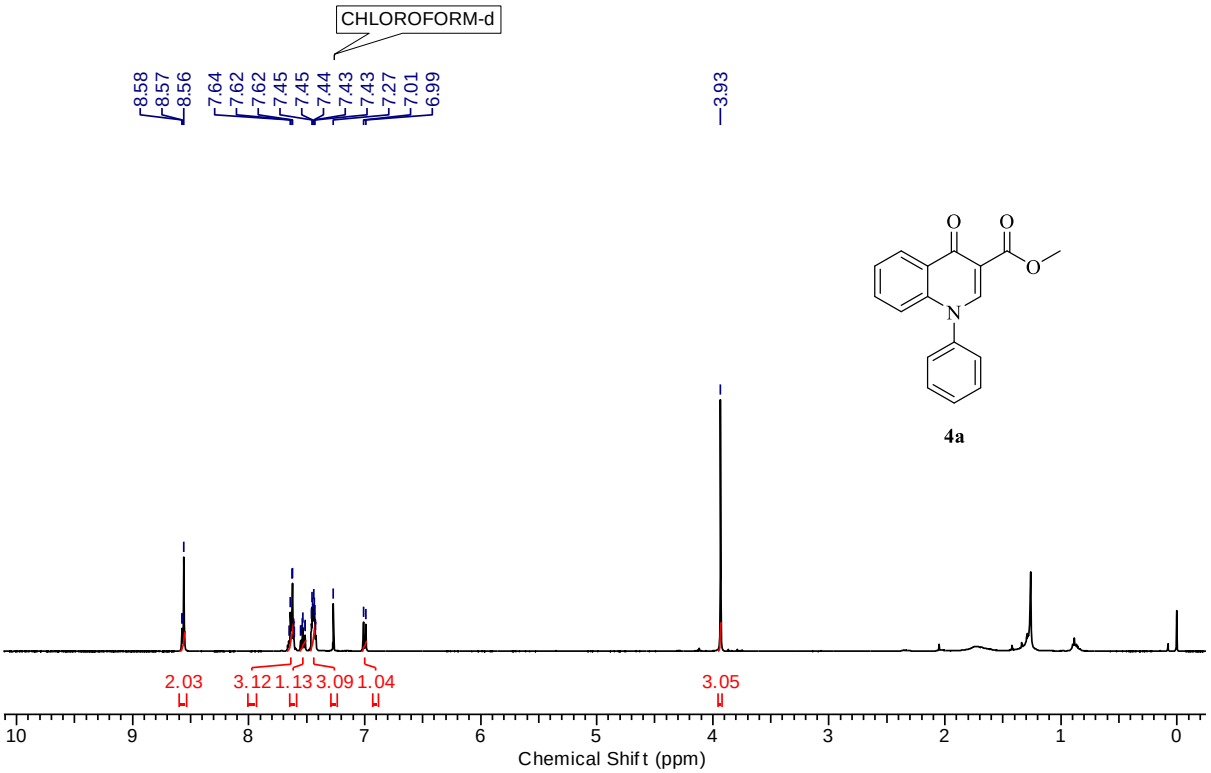


^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3hh

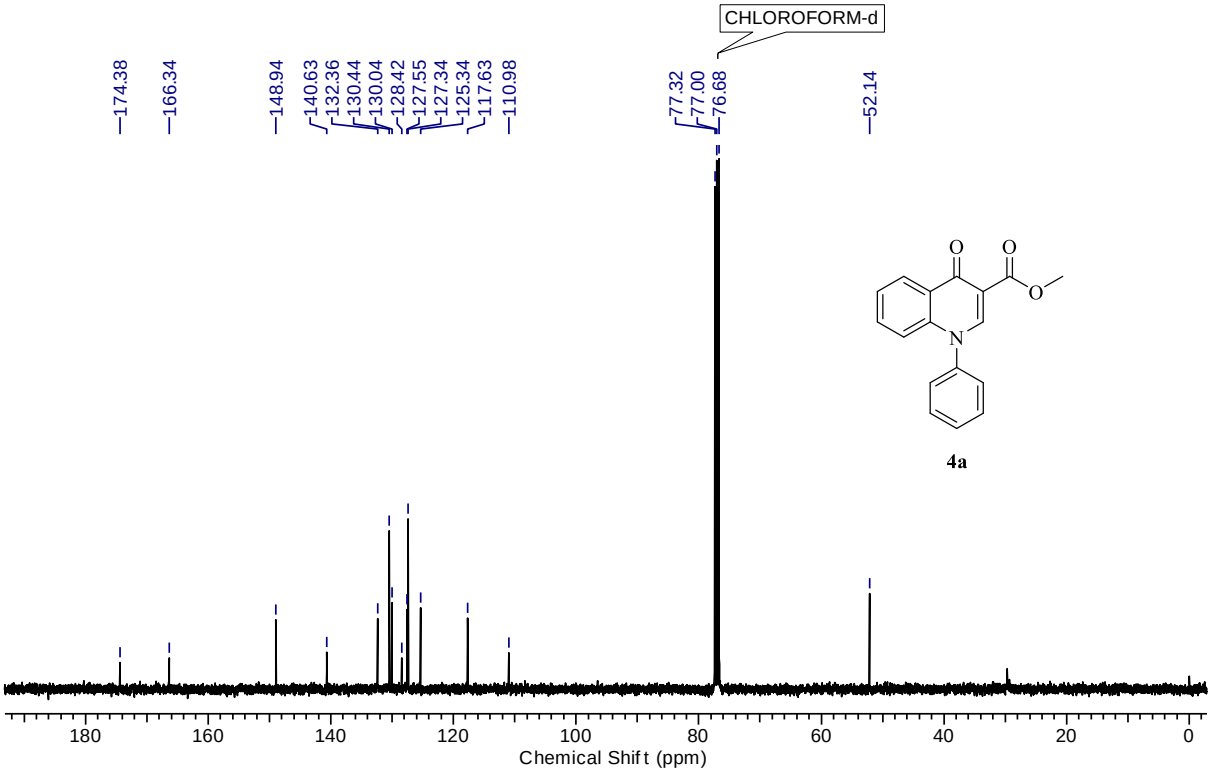


III] NMR Spectrums of Quinolones:

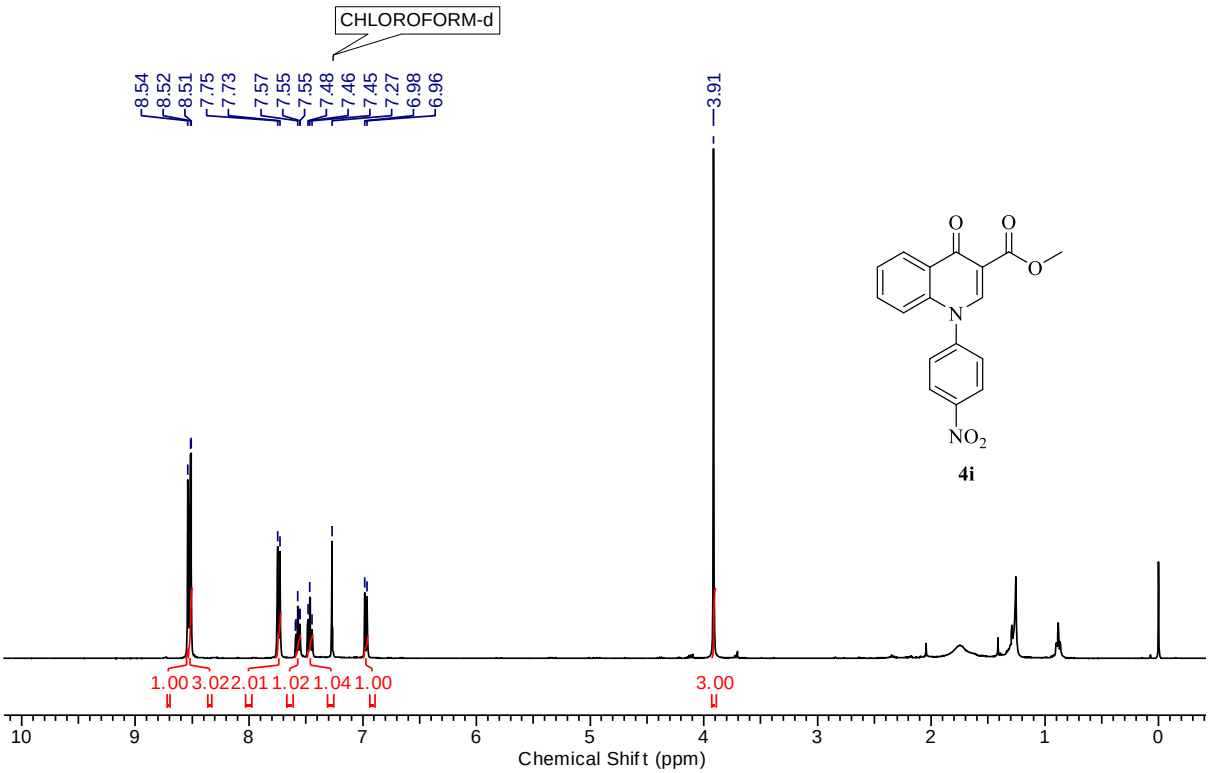
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4a



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4a

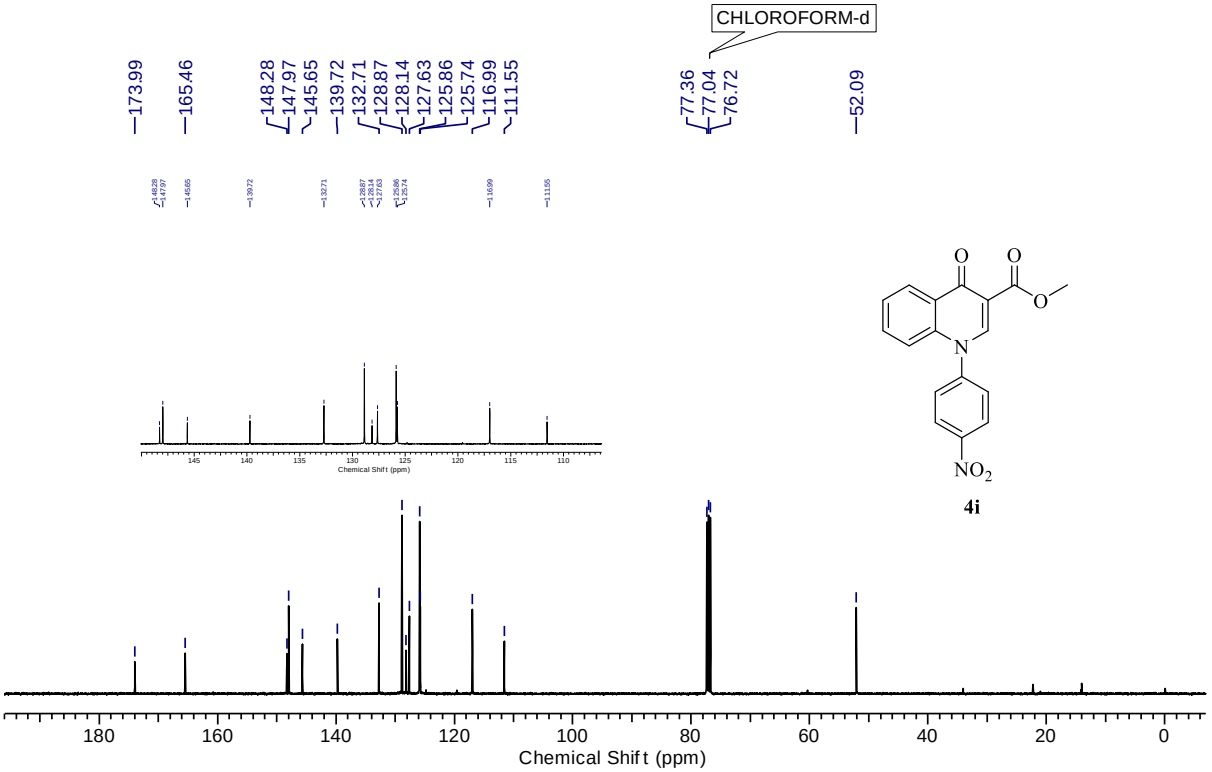


^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4i



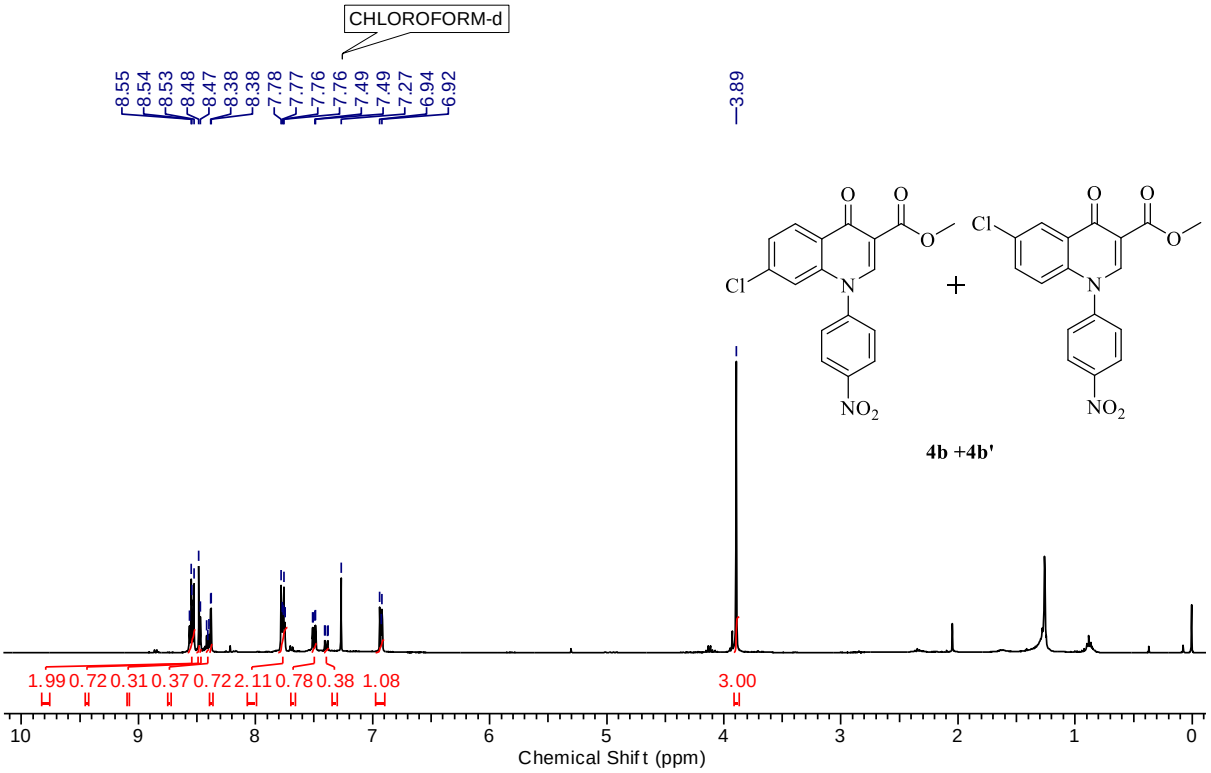
4i

^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4i

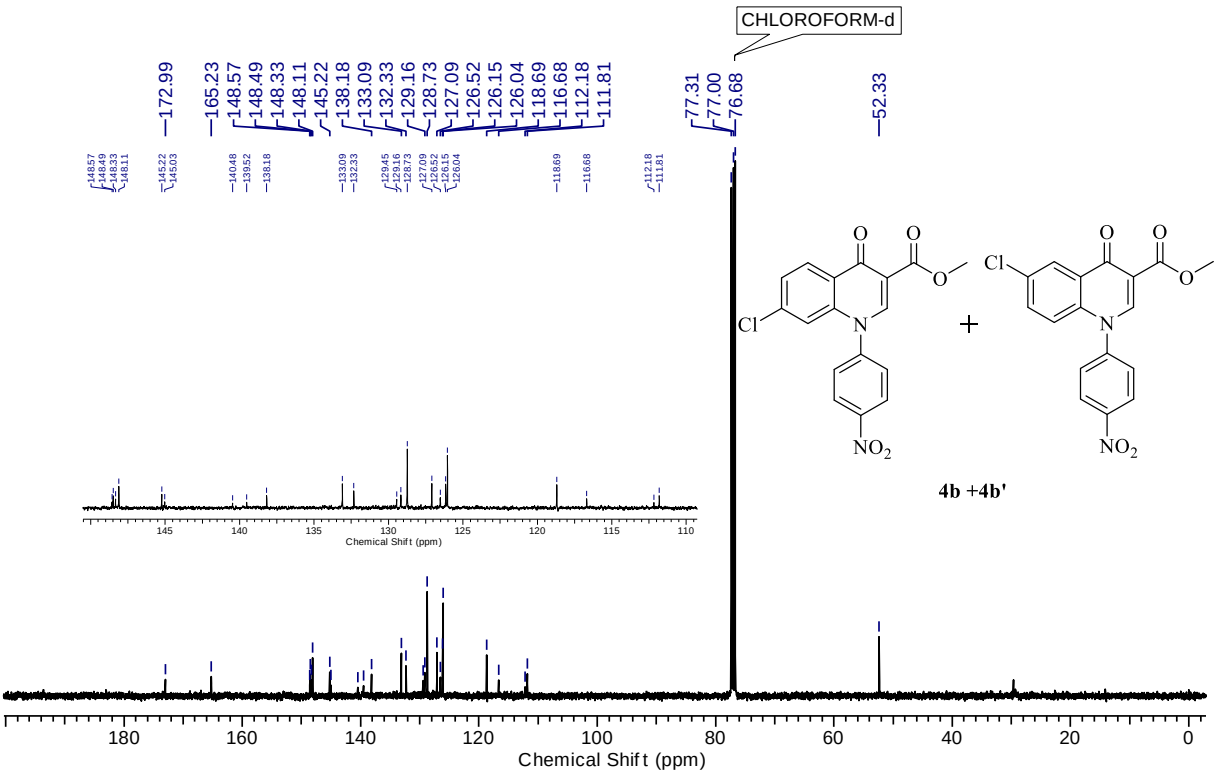


4i

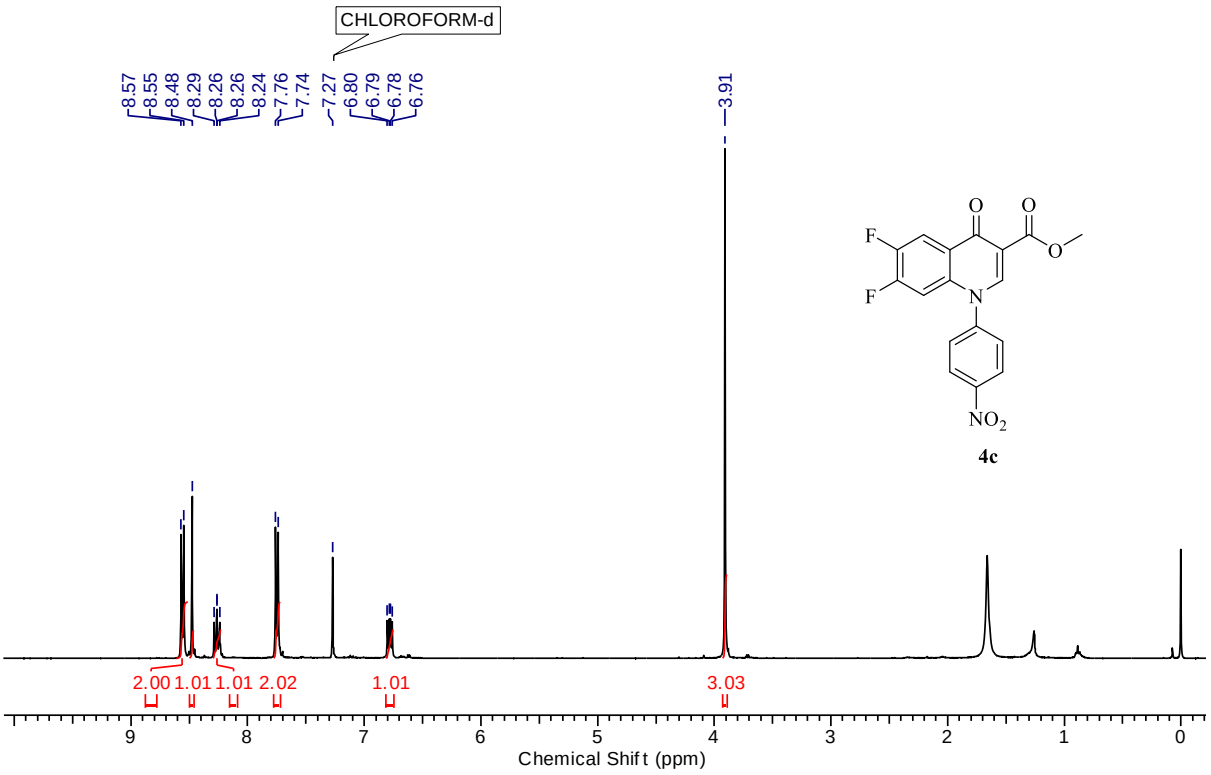
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4b + 4b'



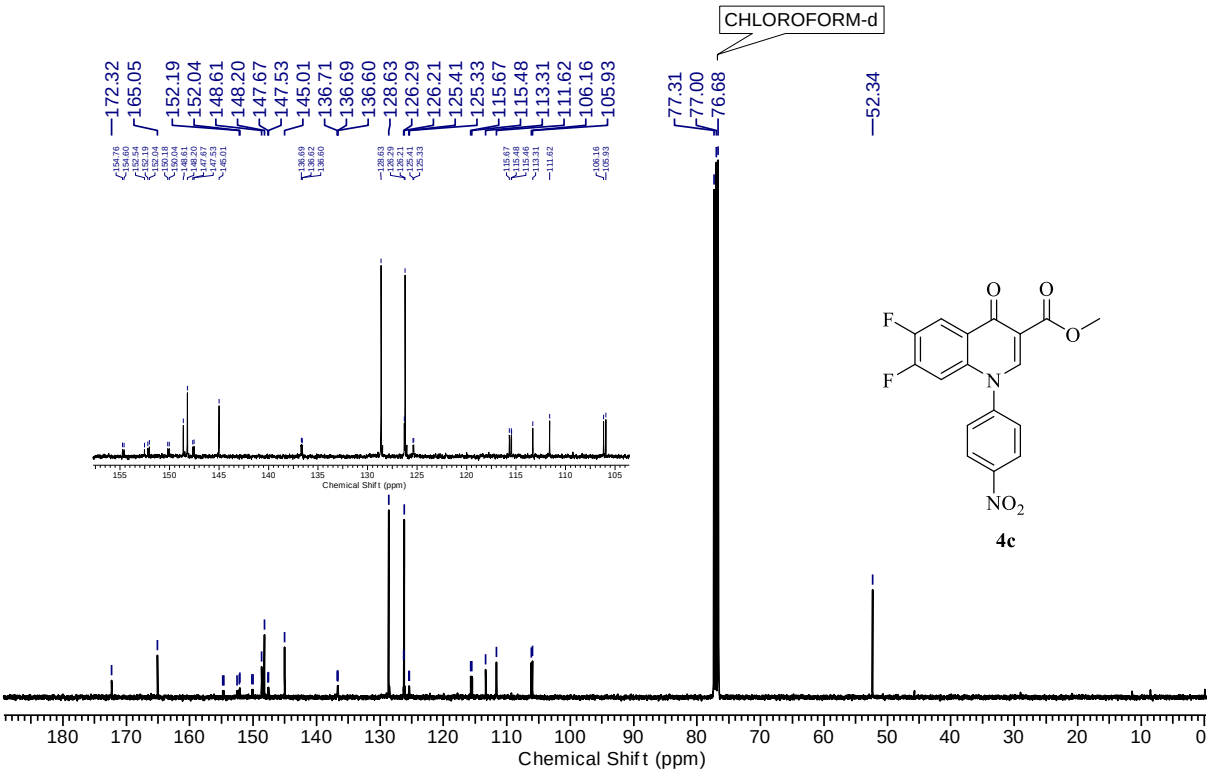
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4b + 4b'



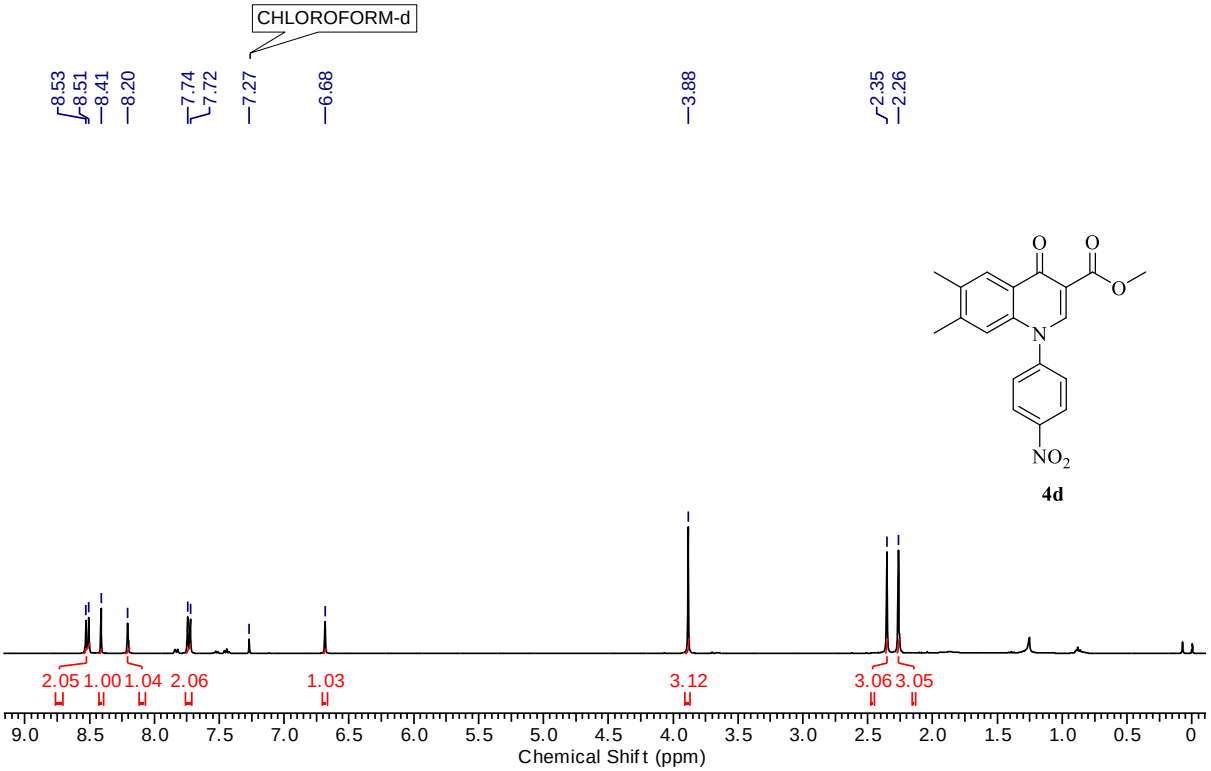
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4c



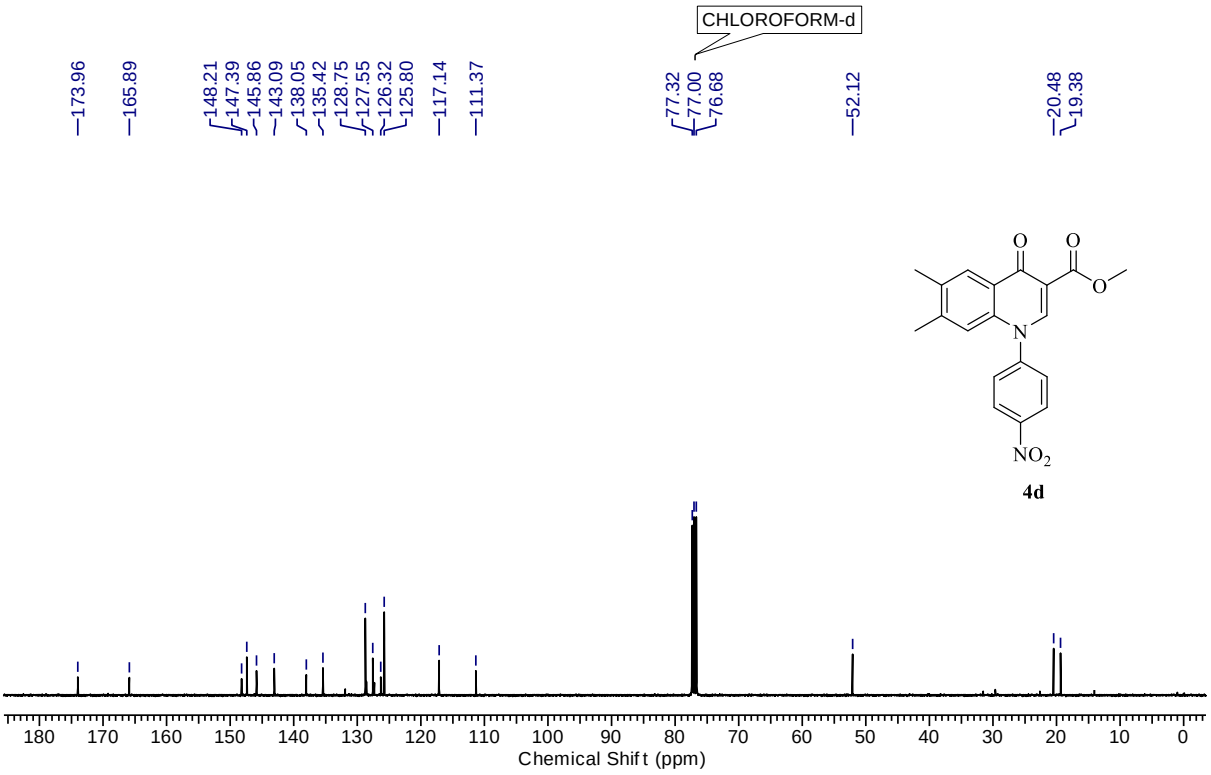
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4c



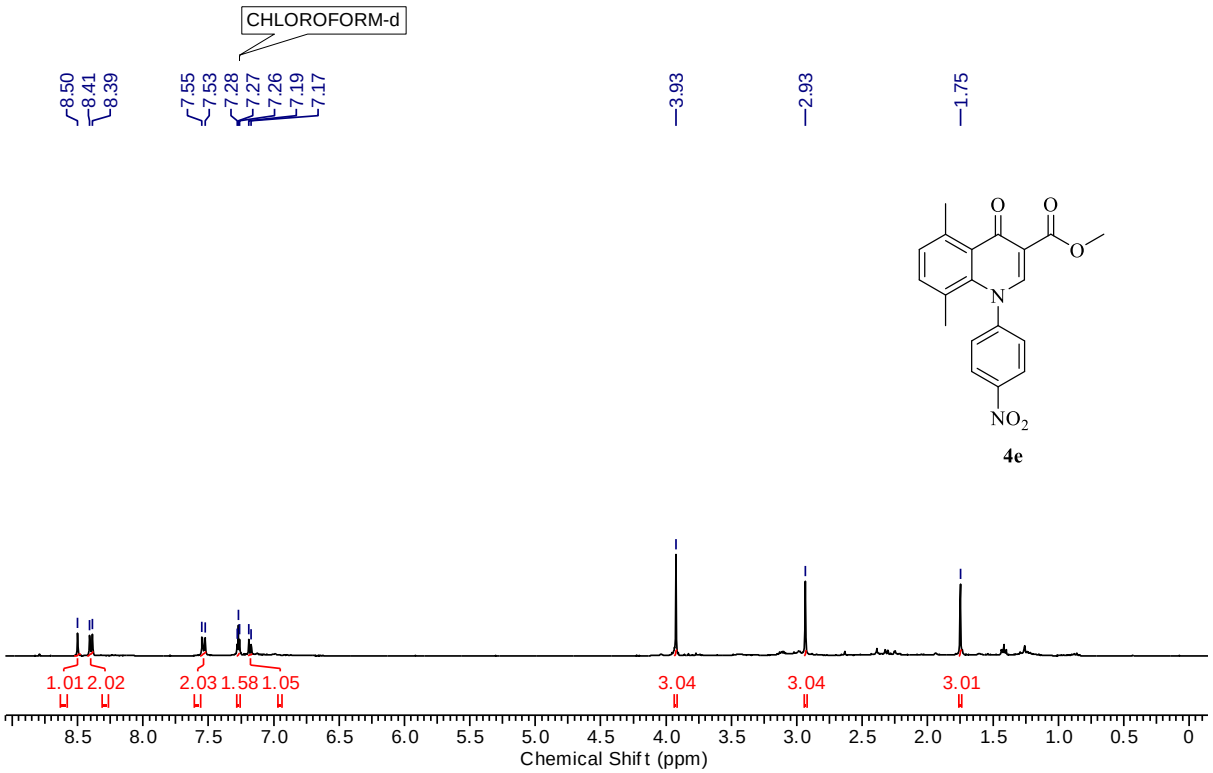
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4d



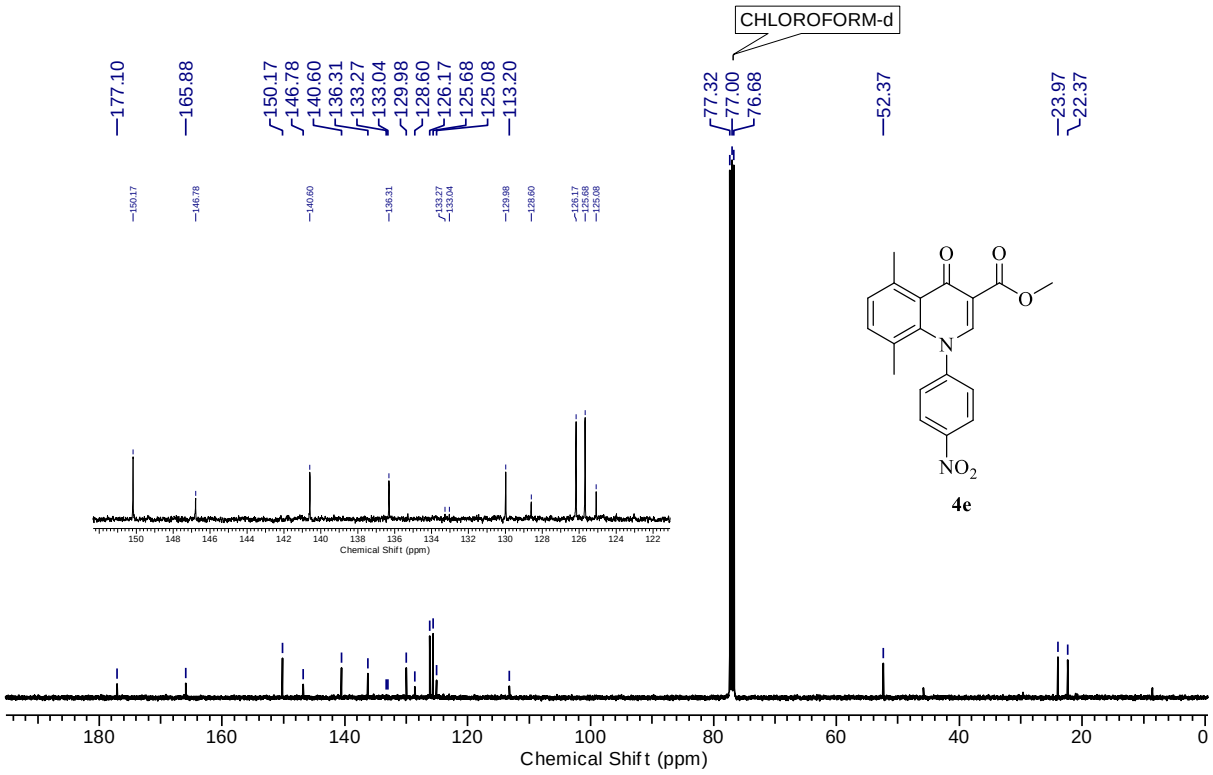
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4d



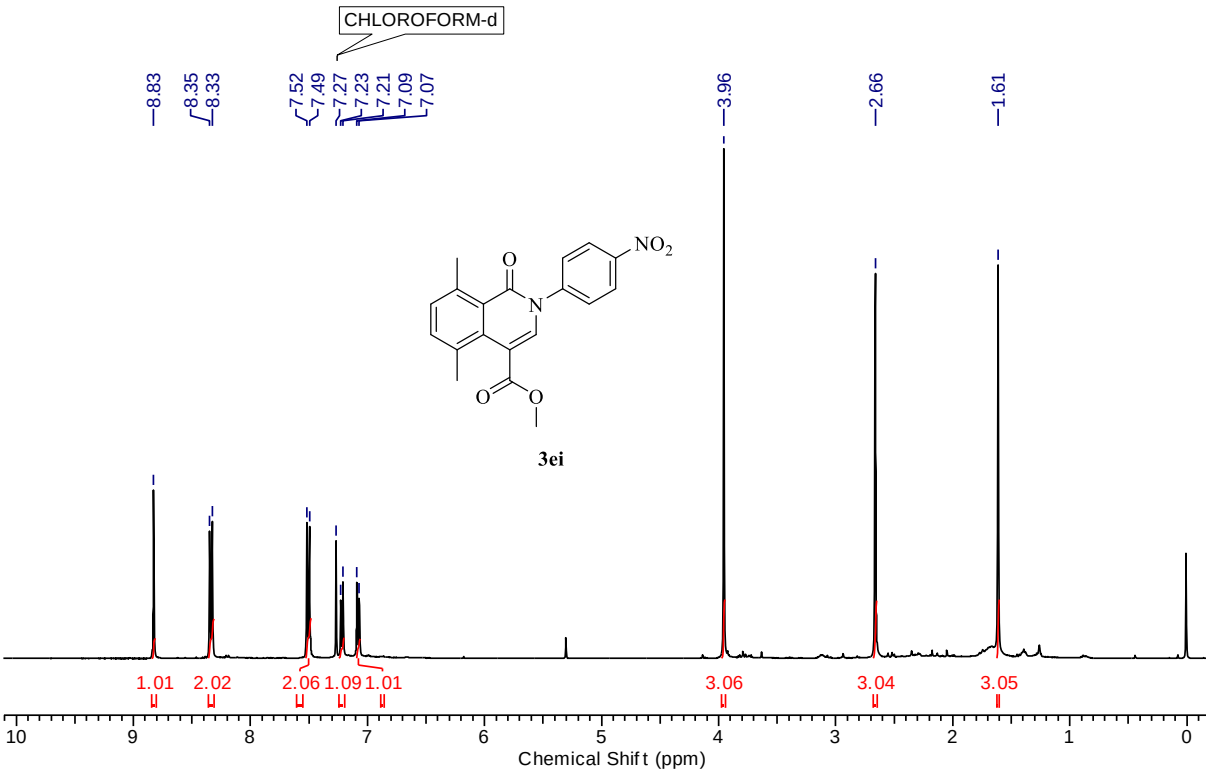
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4e



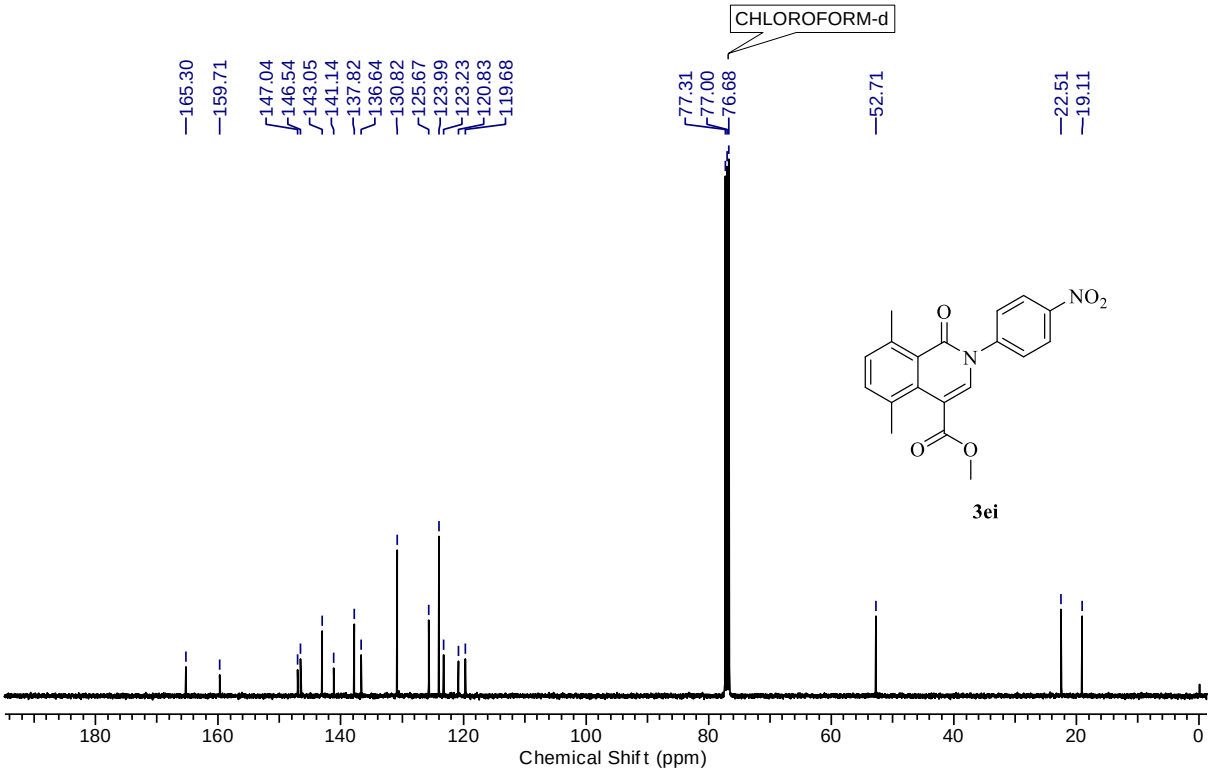
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4e



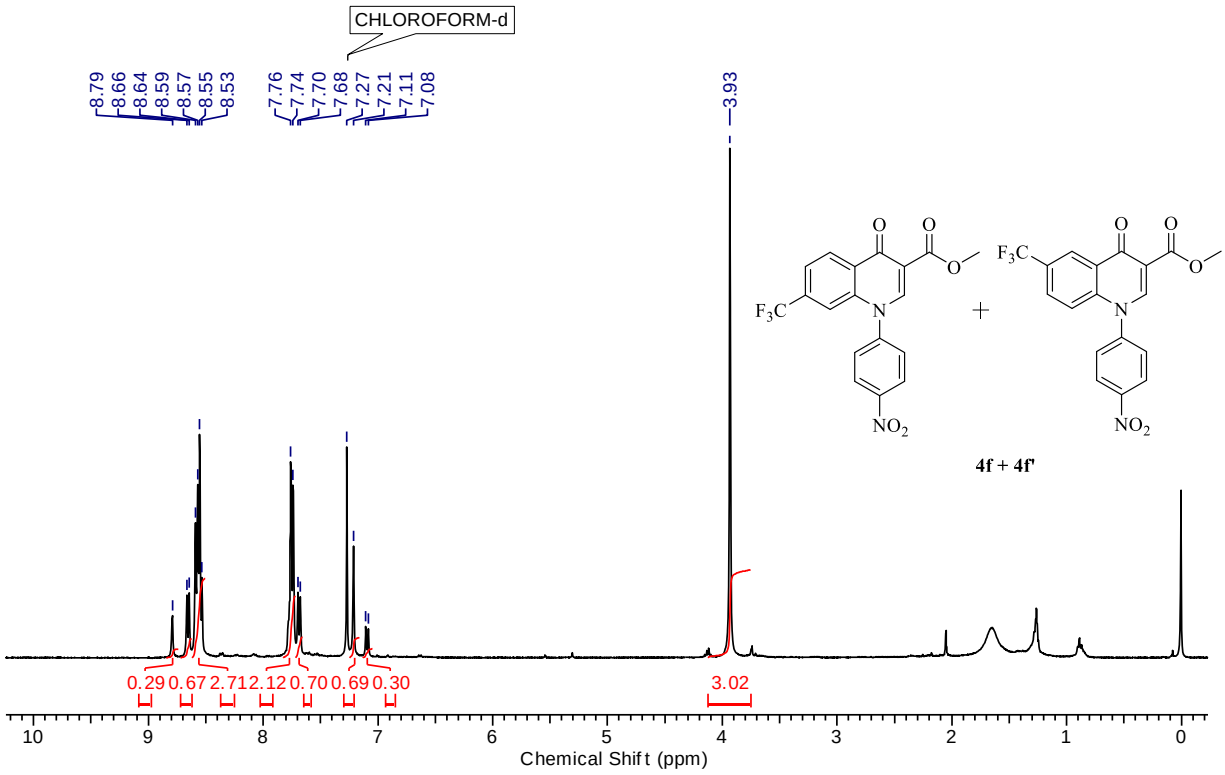
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3ei



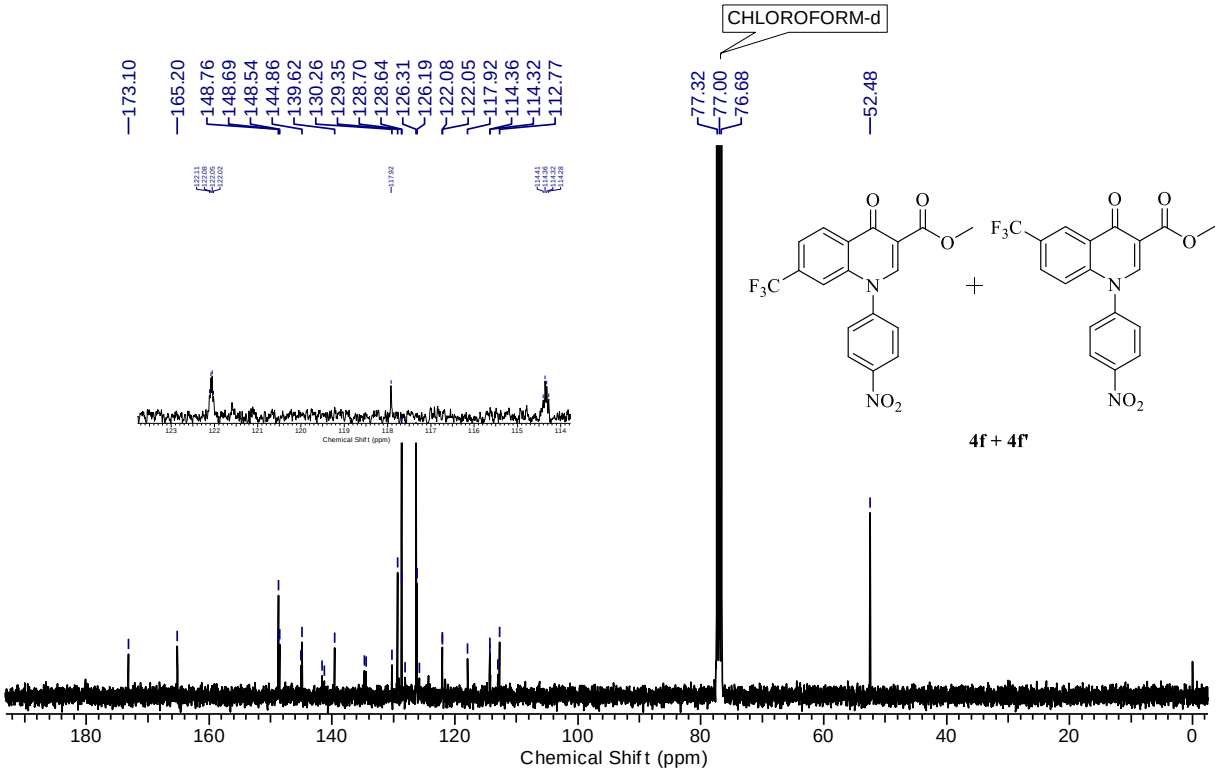
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3ei



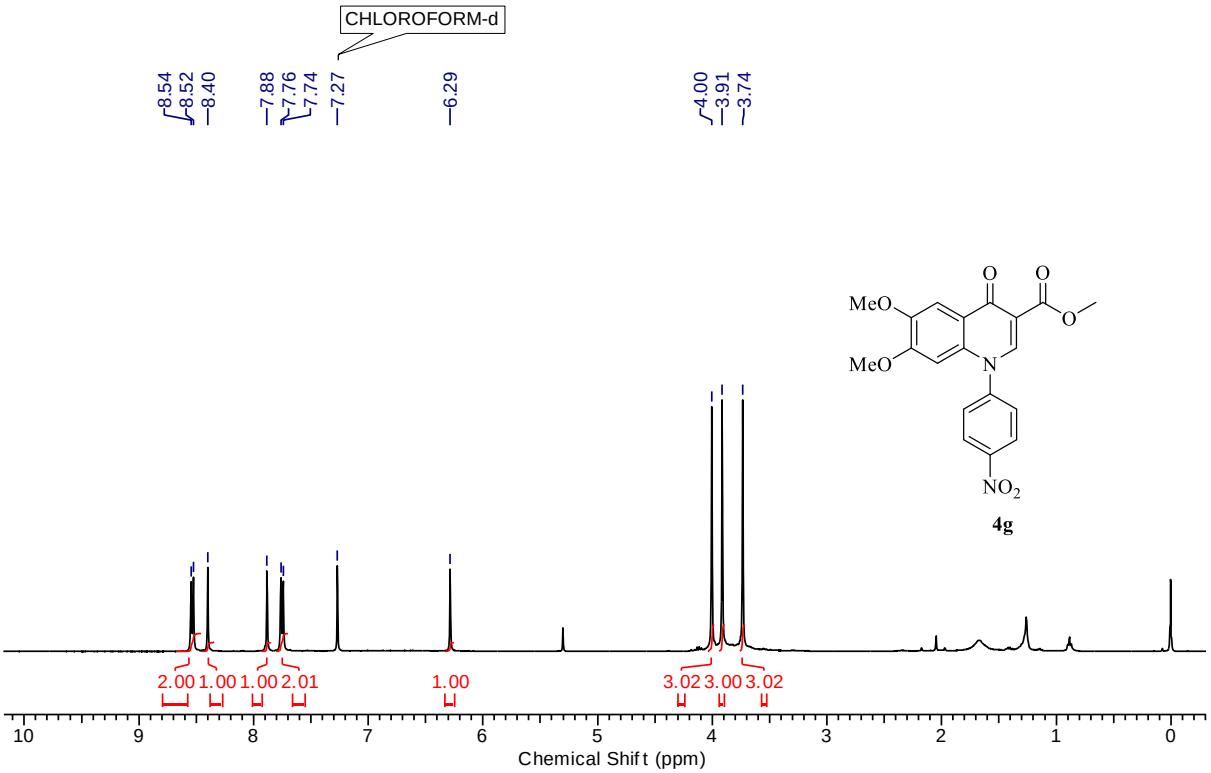
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4f + 4f'



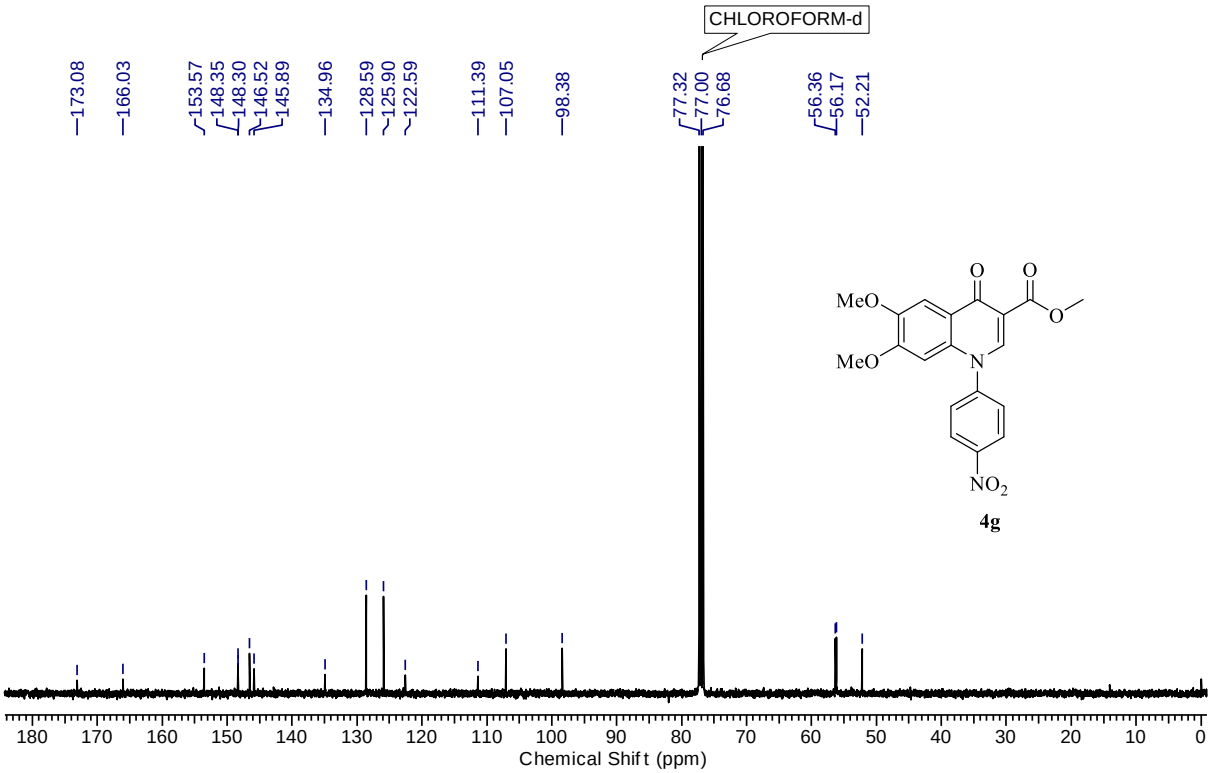
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4f + 4f'



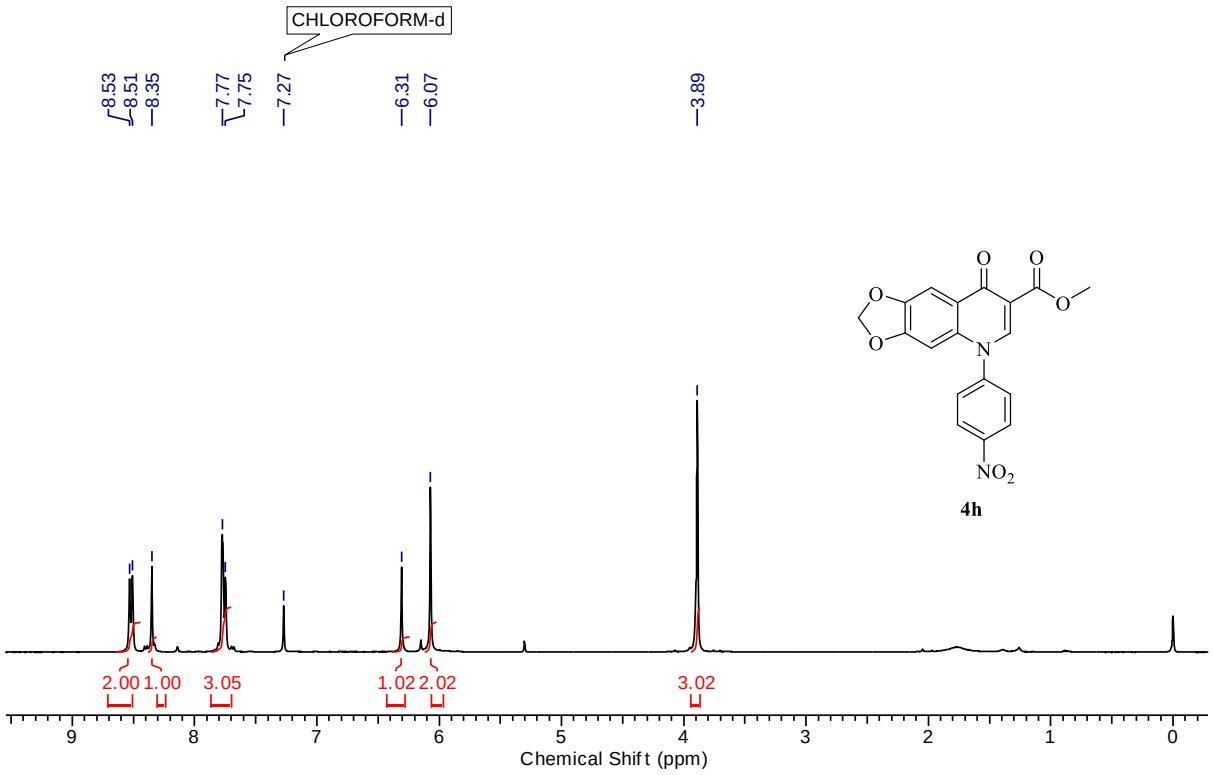
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4g



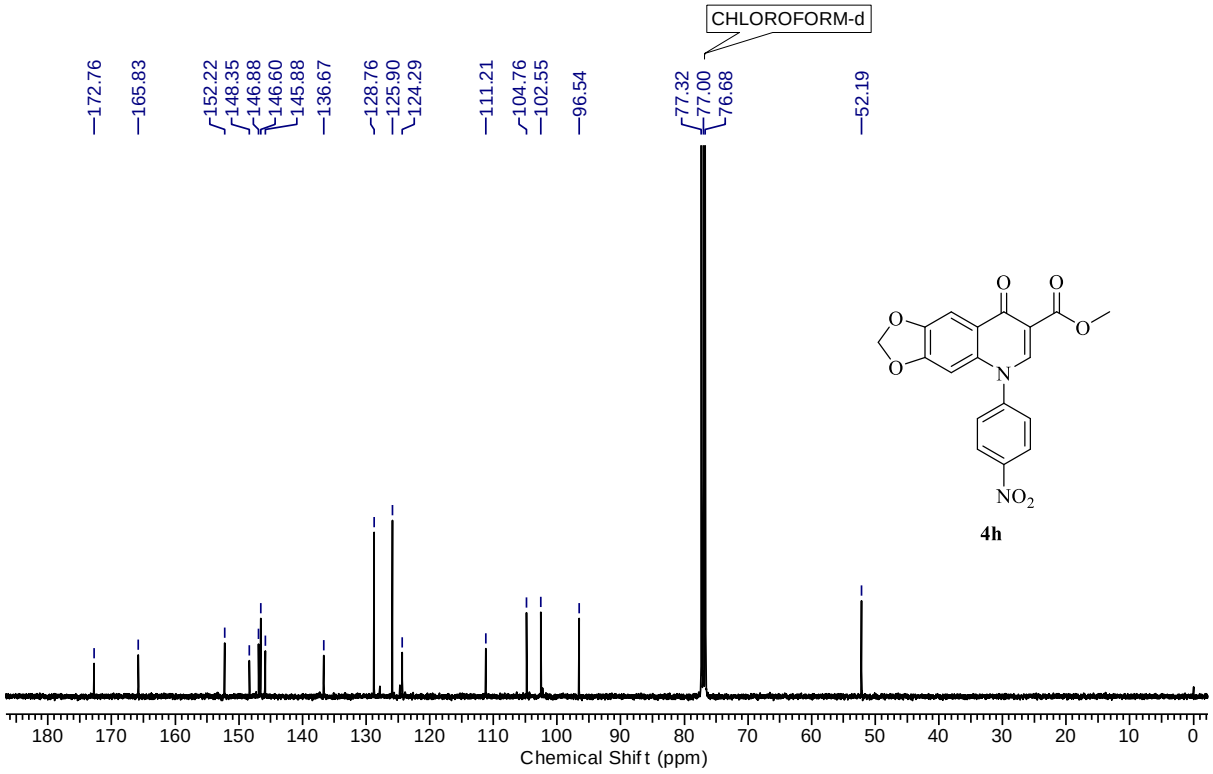
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4g



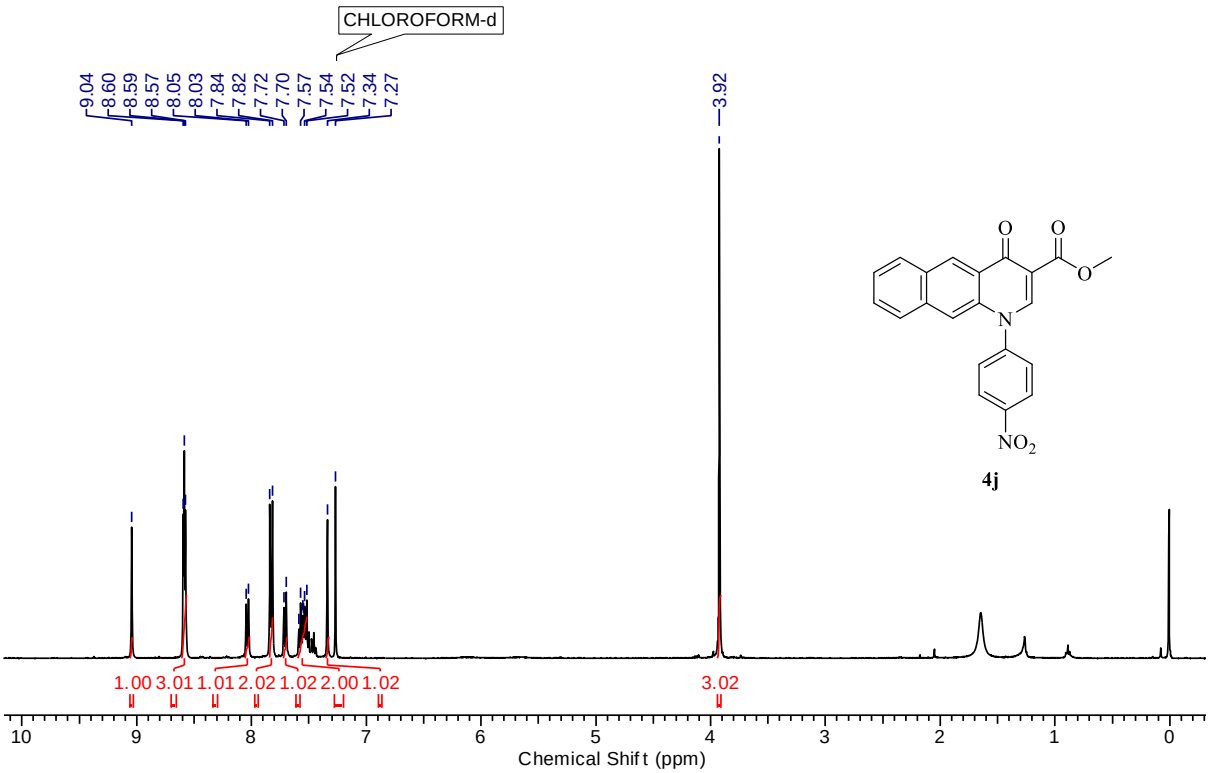
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4h



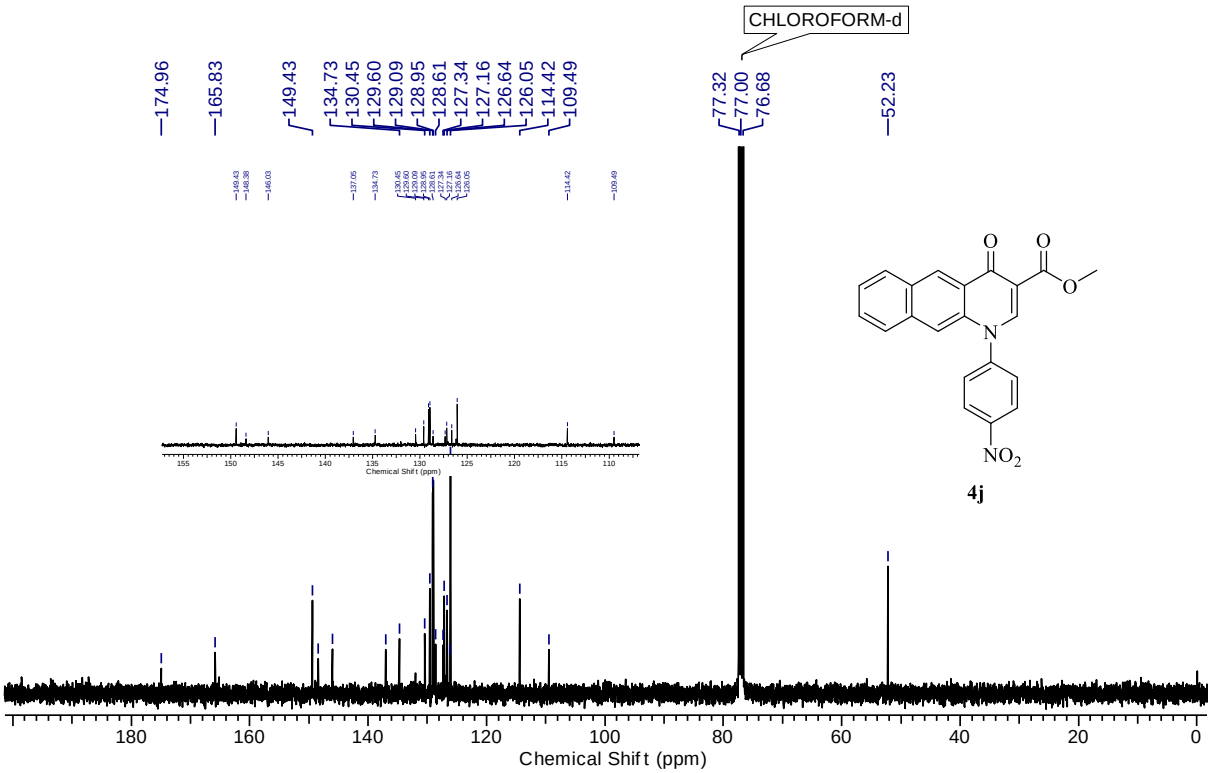
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4h



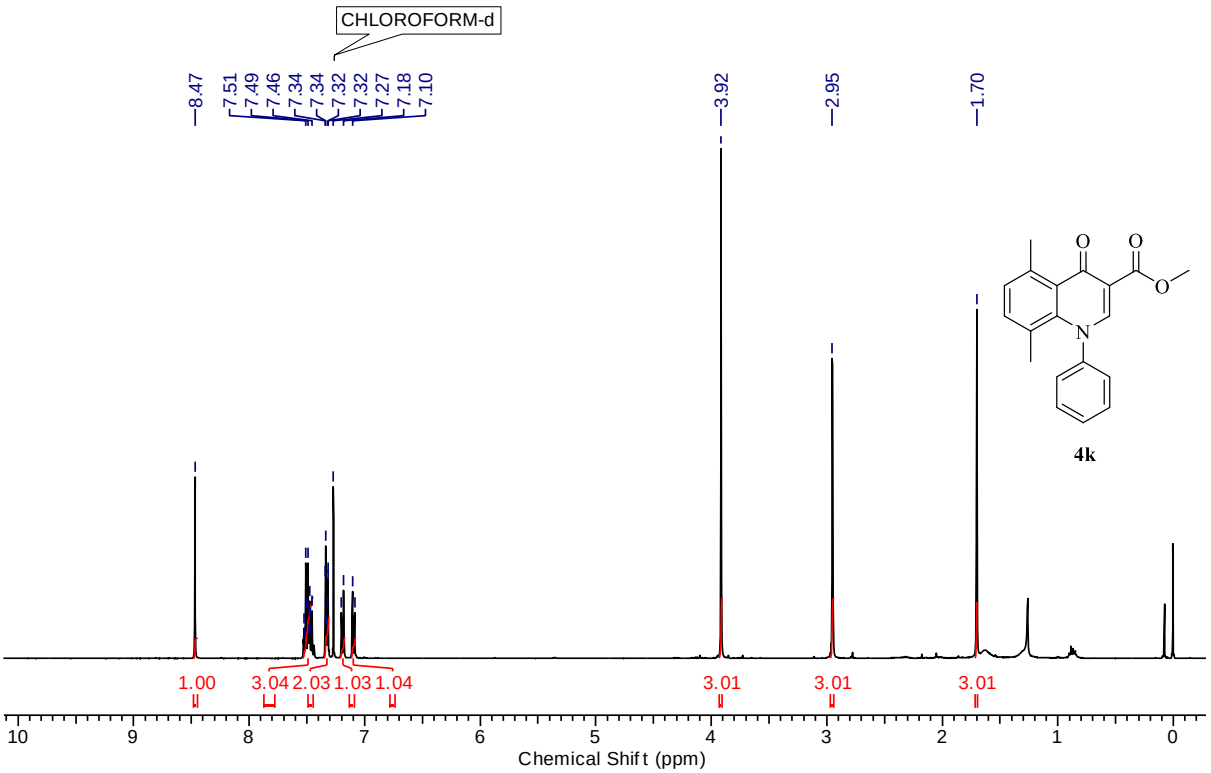
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4j



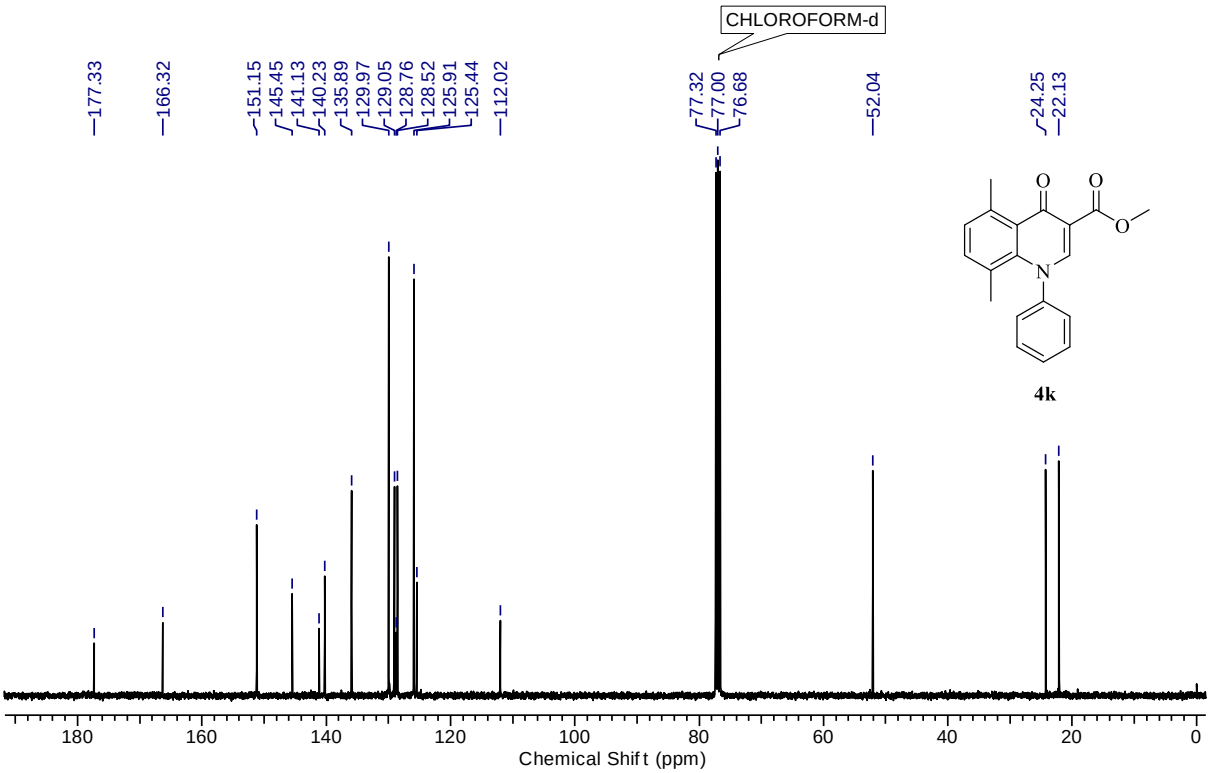
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4j



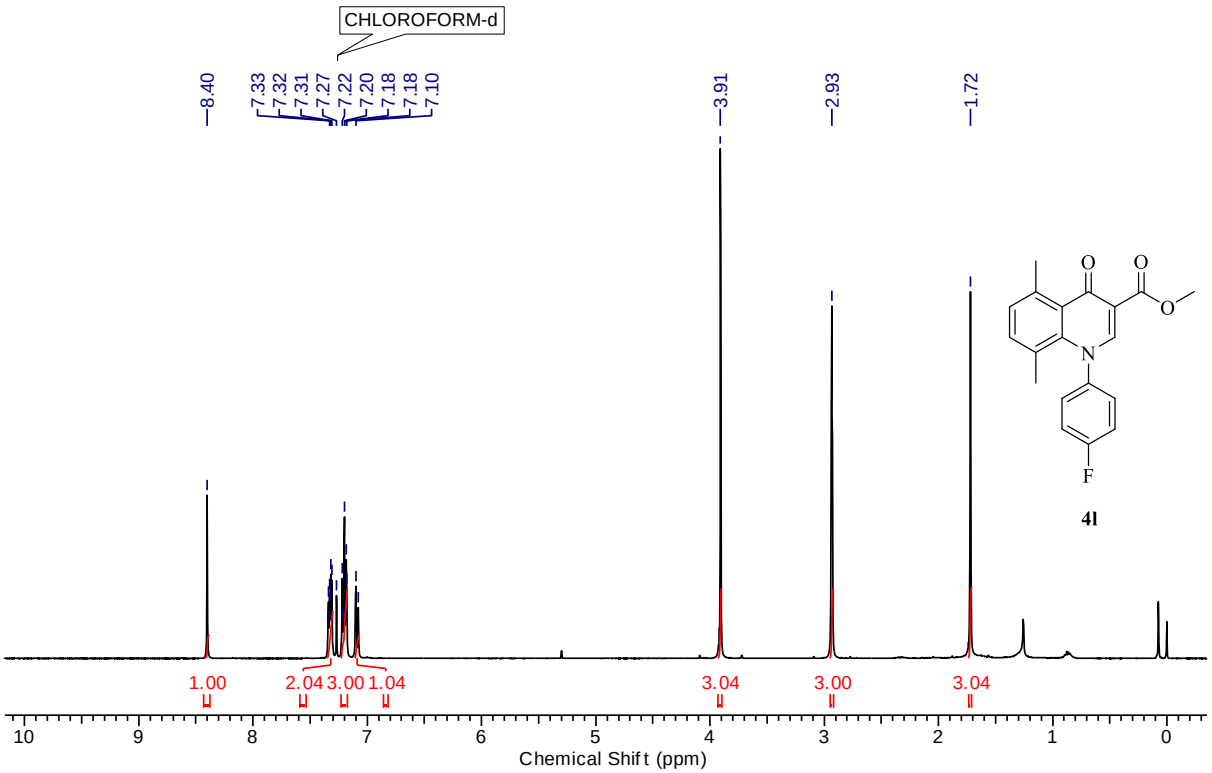
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4k



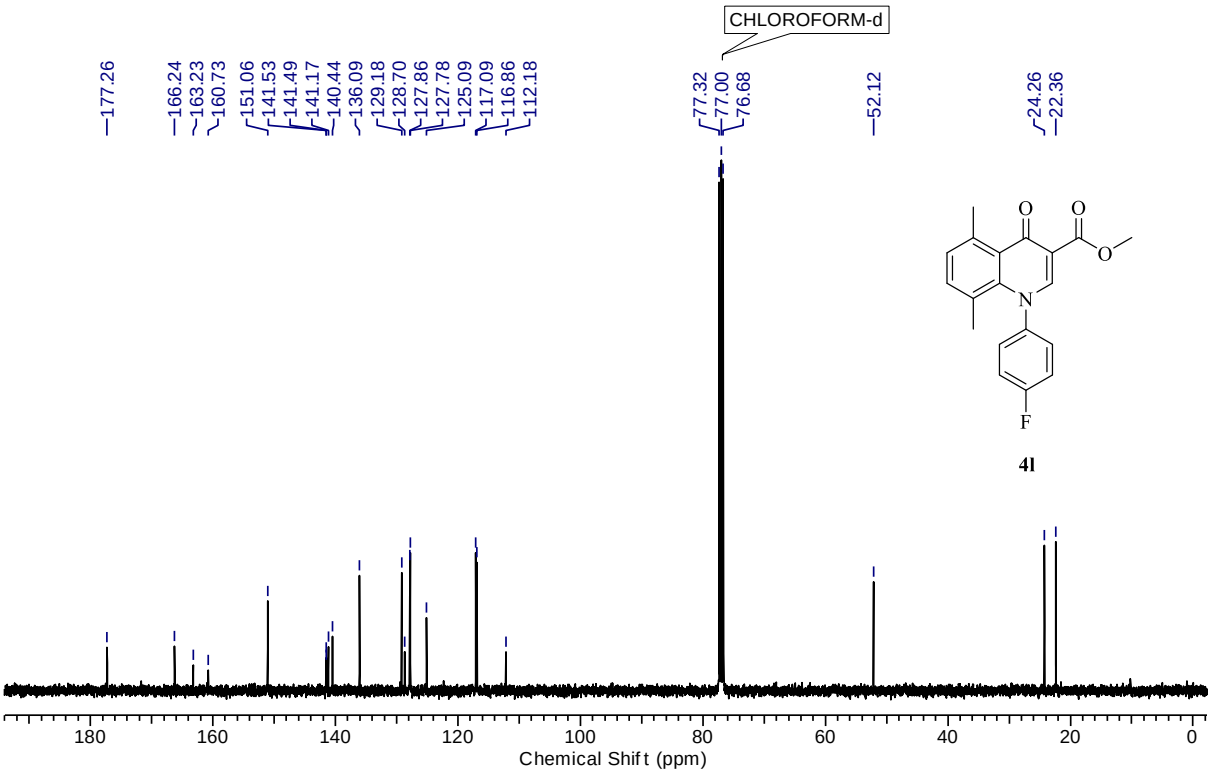
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4k



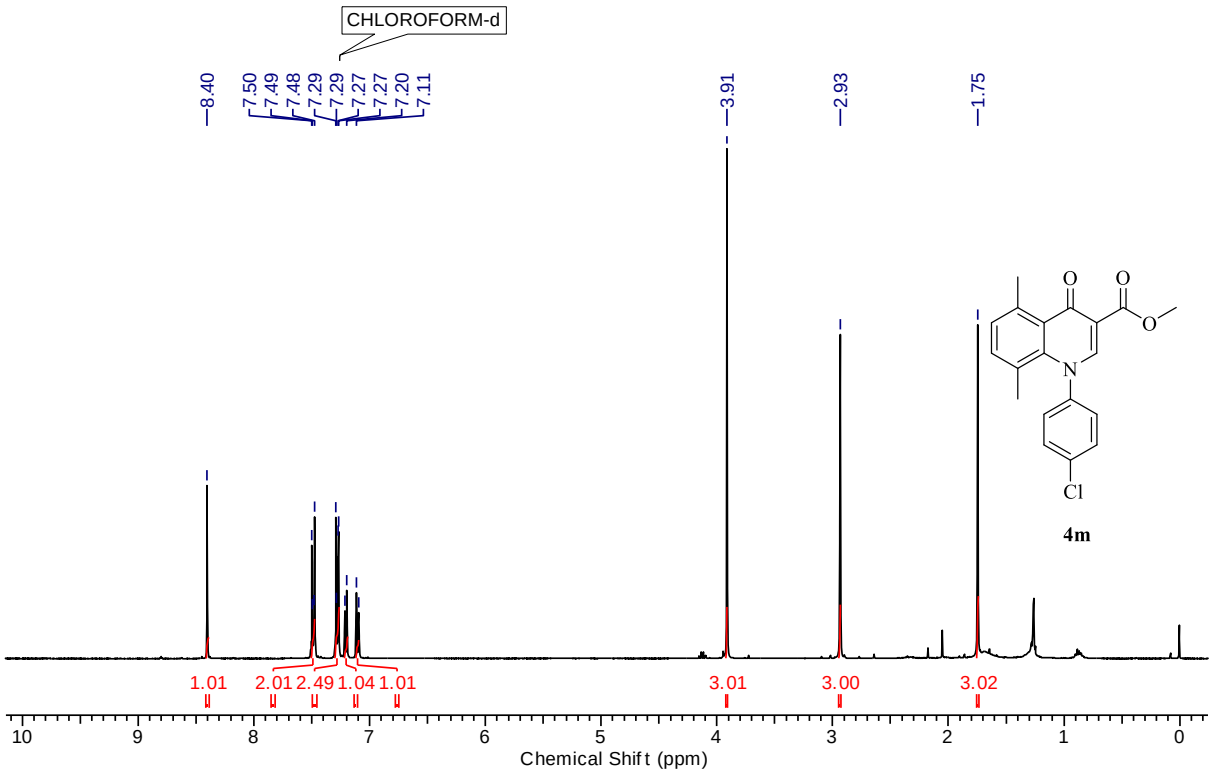
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4l



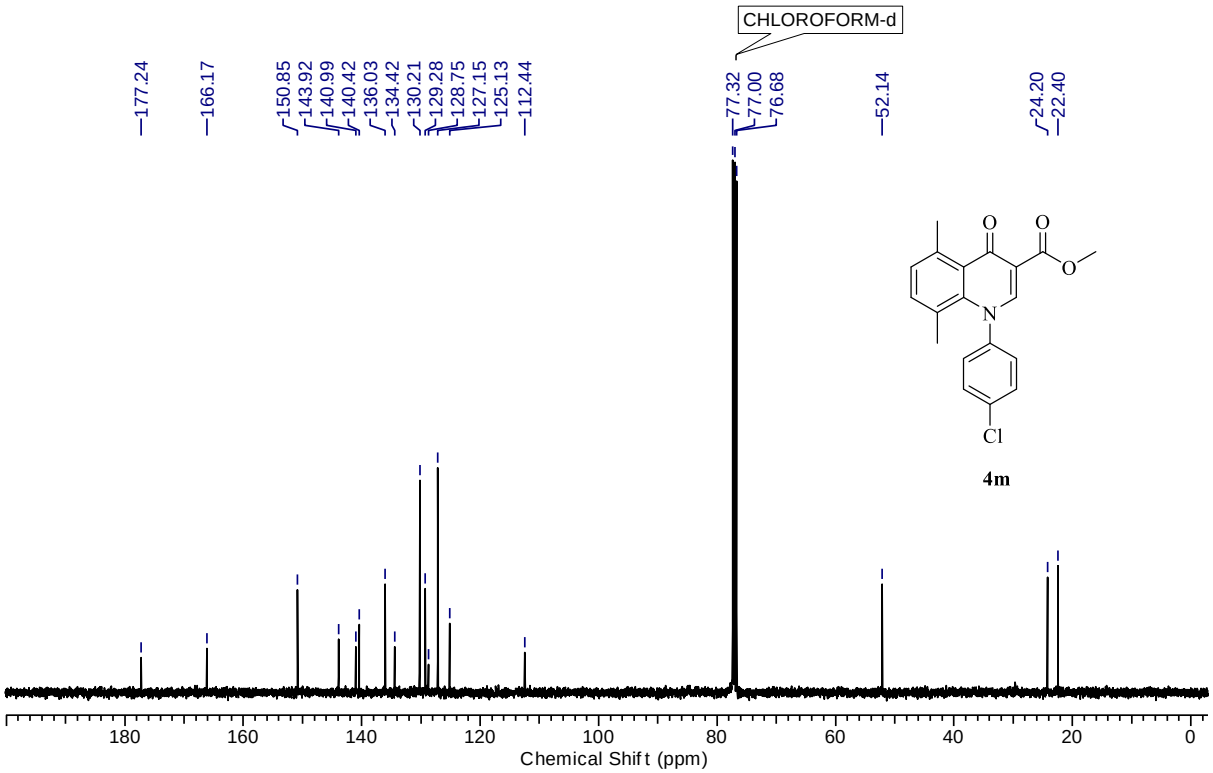
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4l



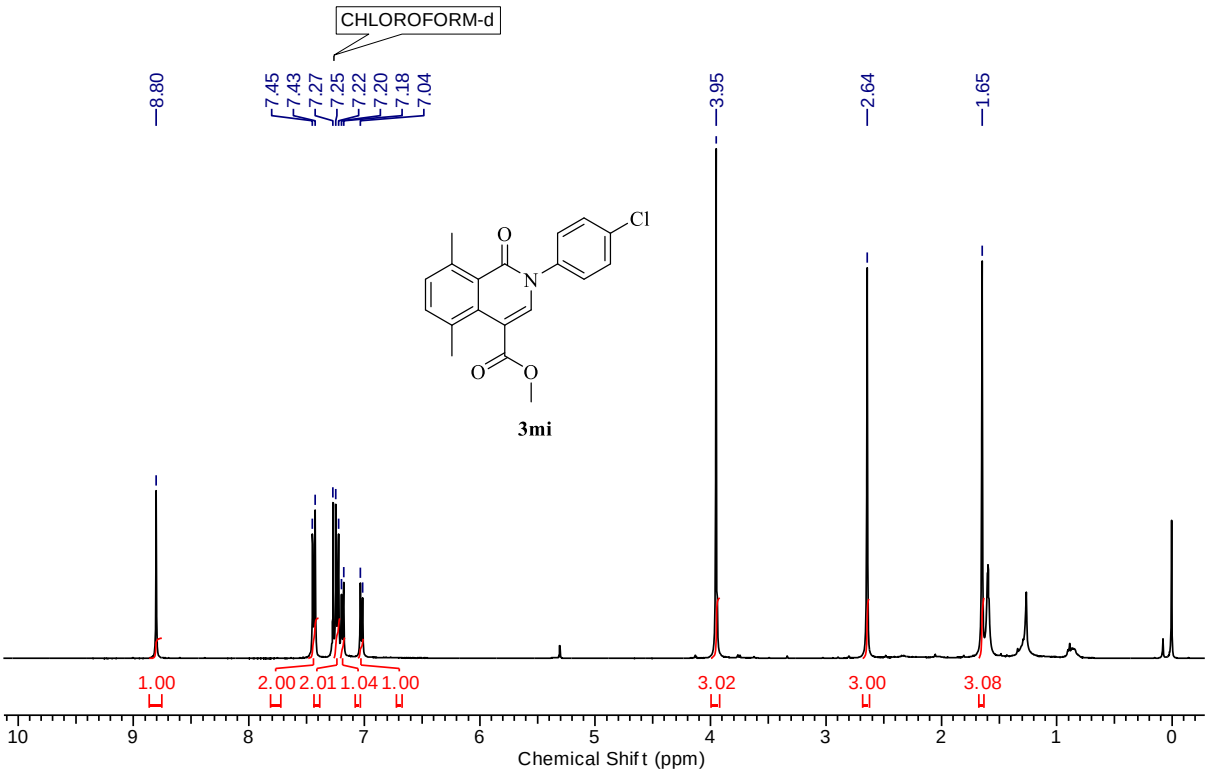
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4m



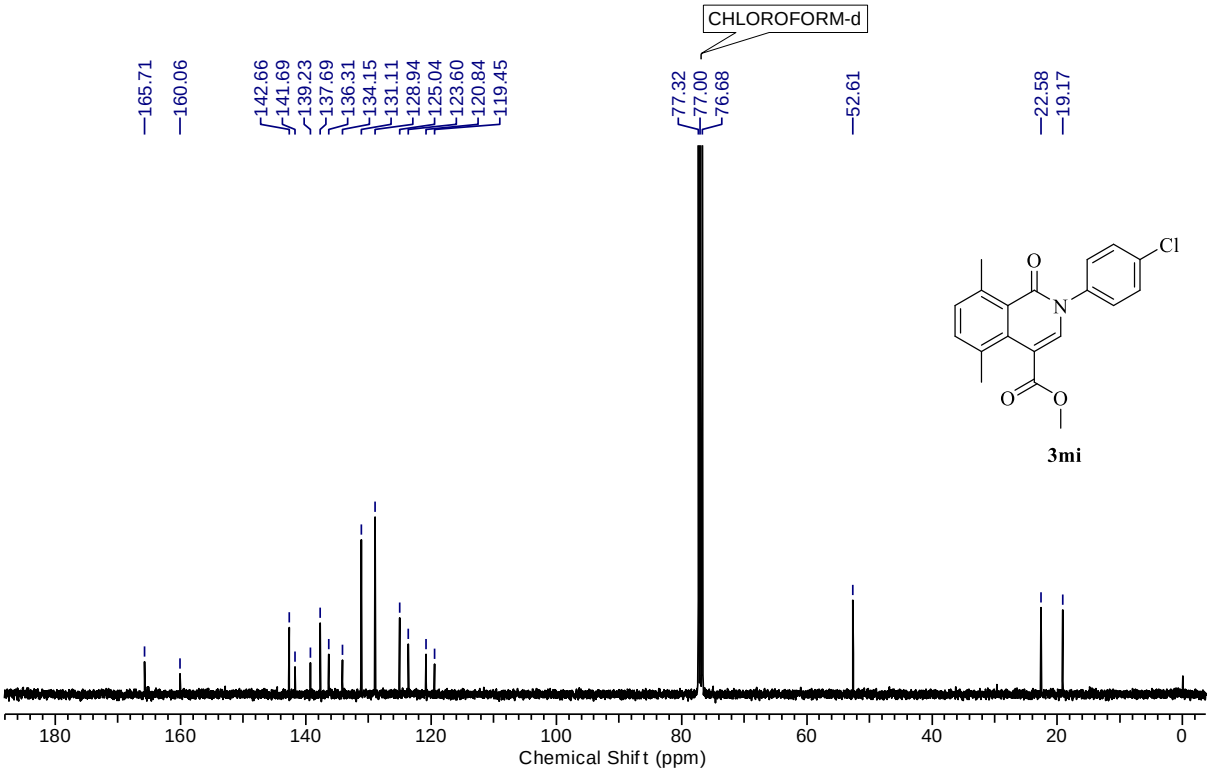
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4m



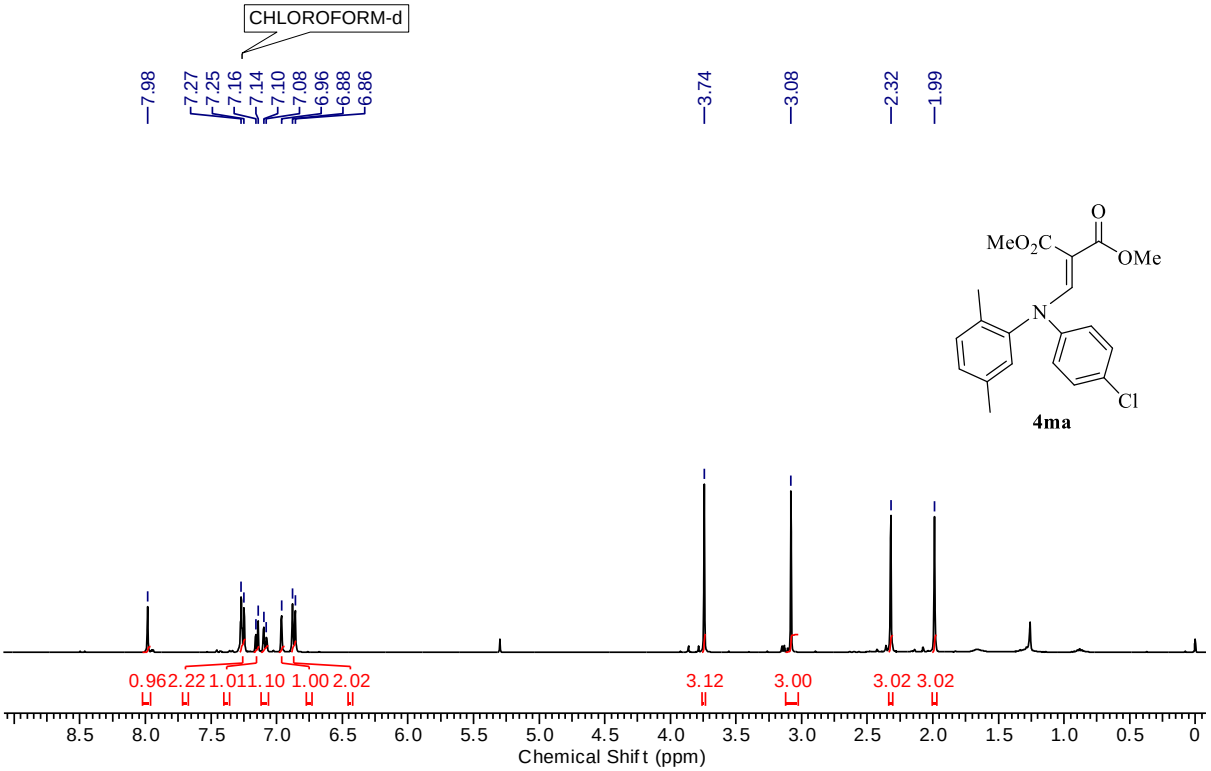
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 3mi



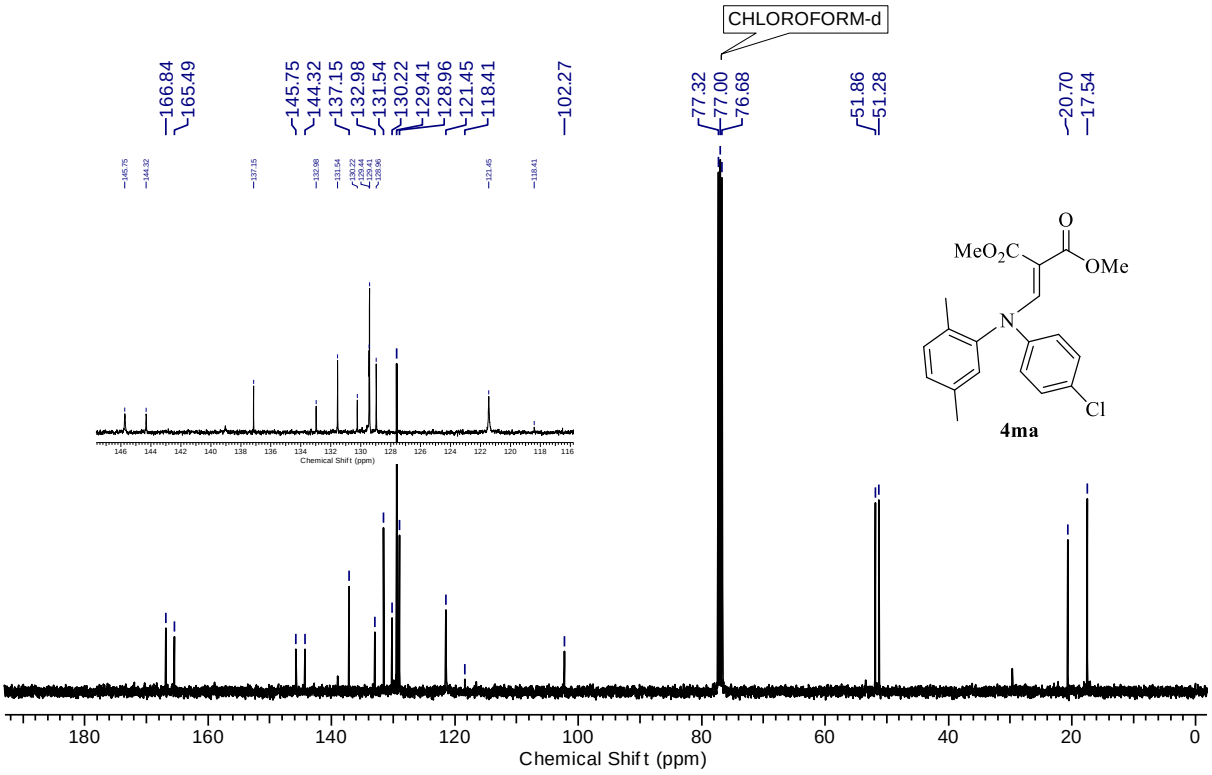
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 3mi



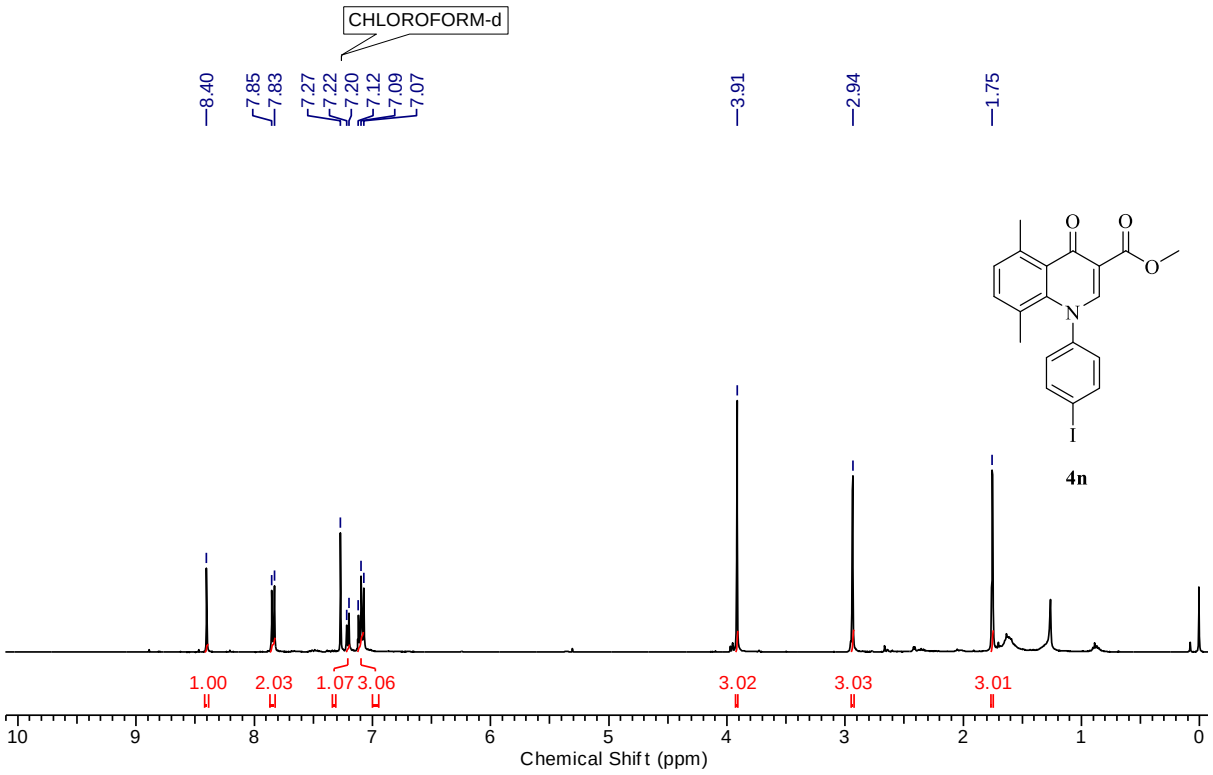
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4ma



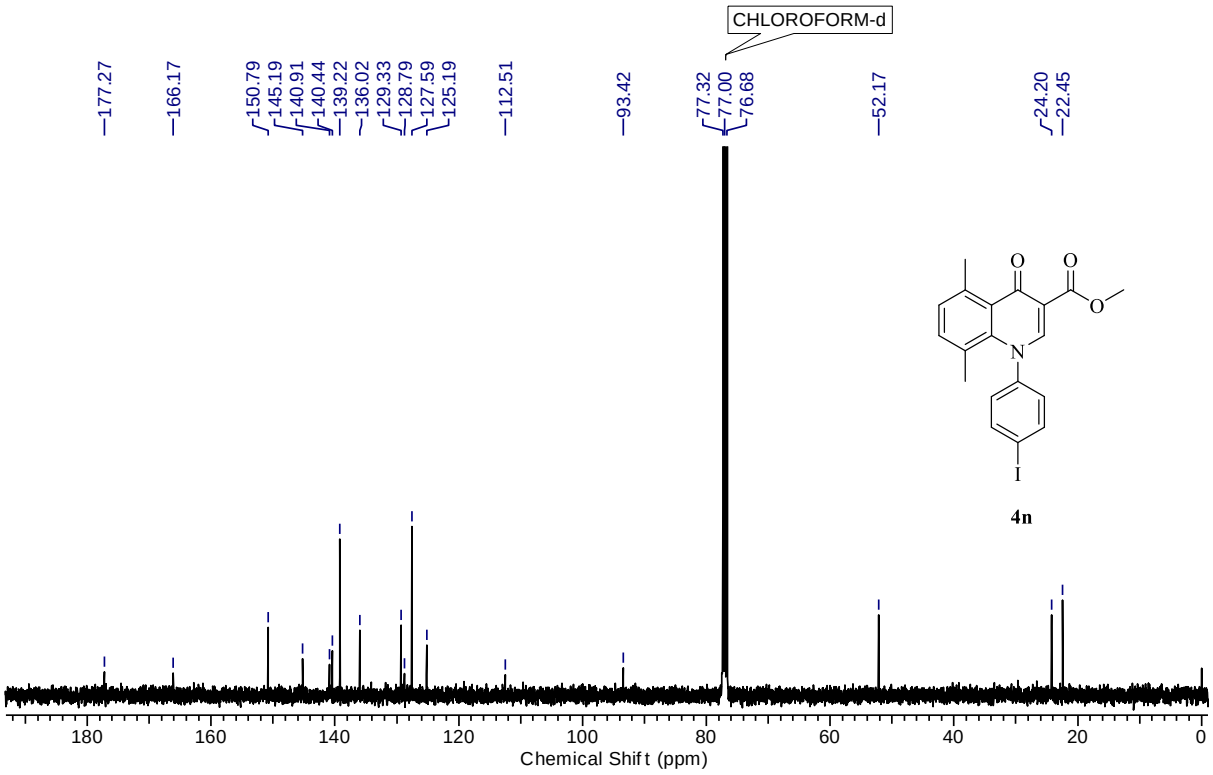
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4ma



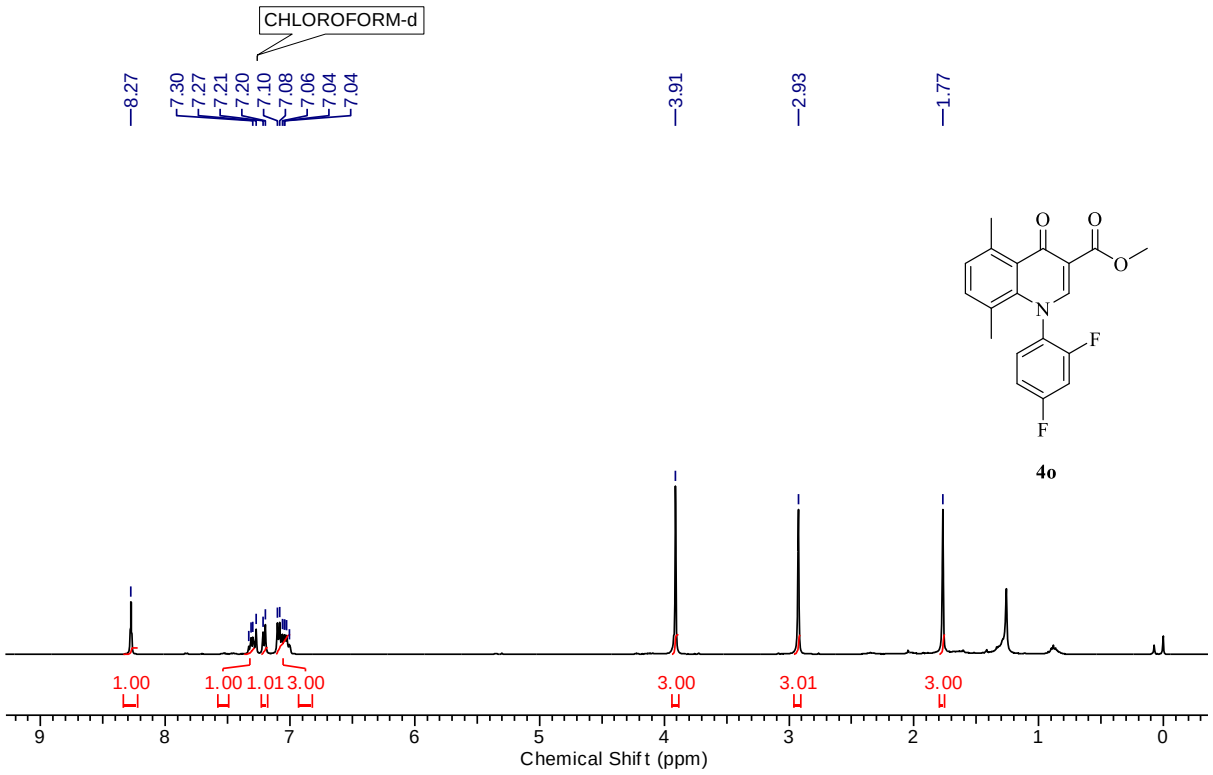
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4n



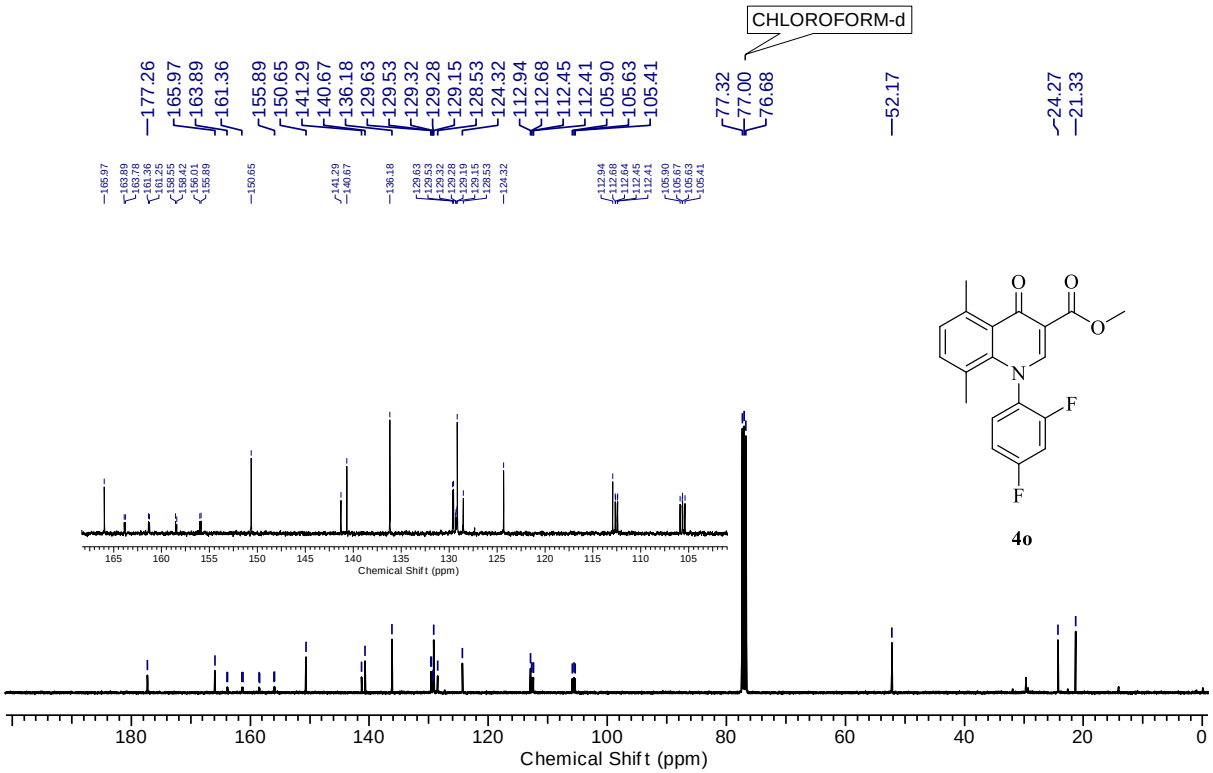
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4n



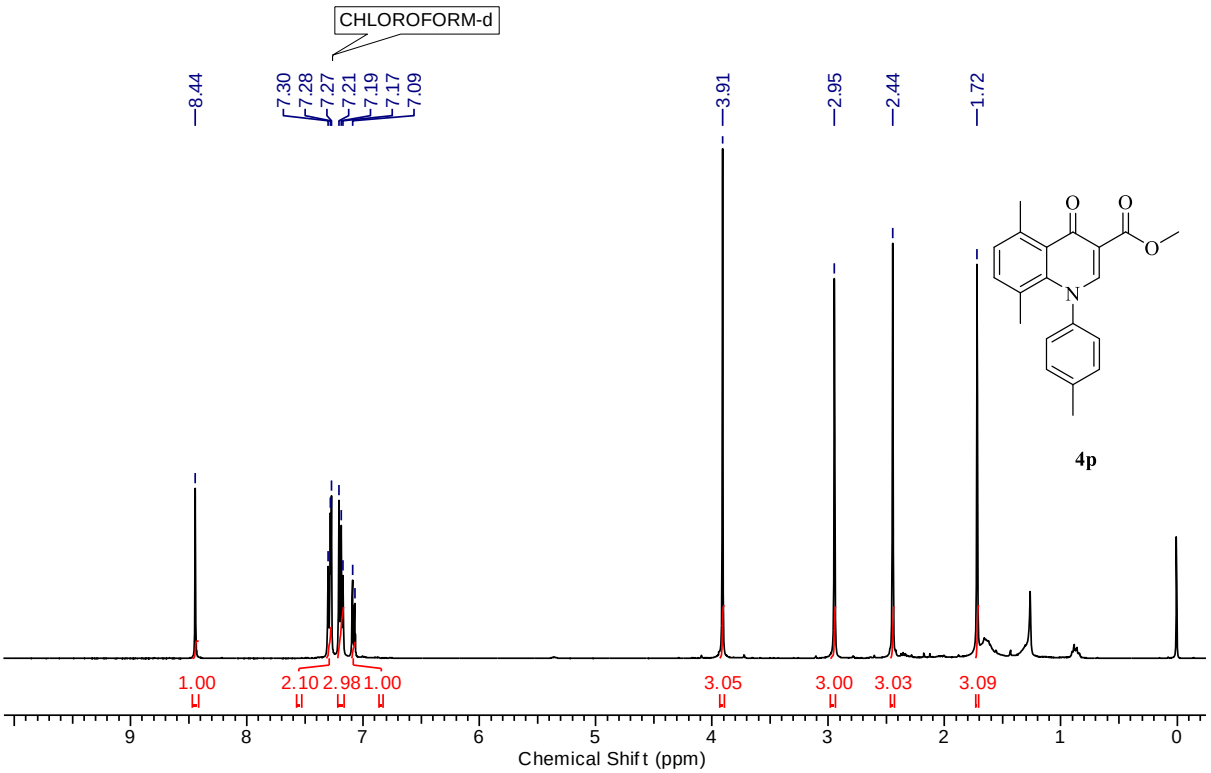
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4o



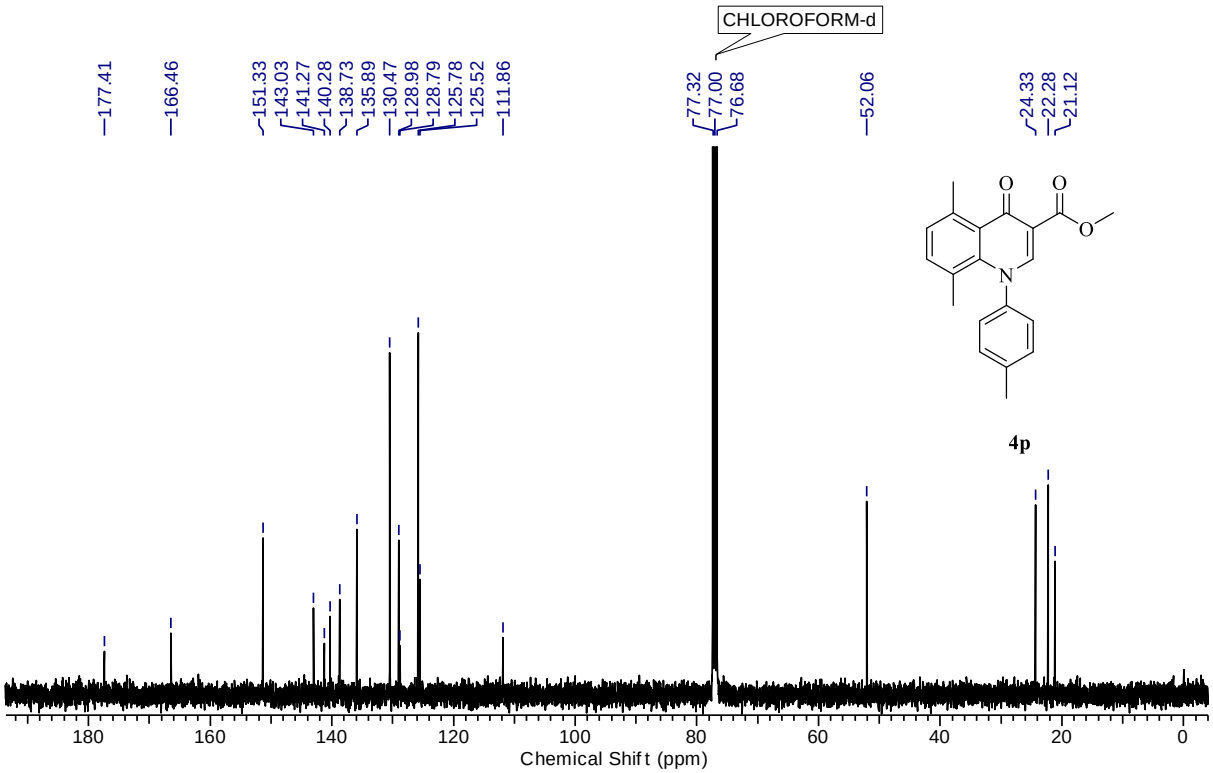
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4o



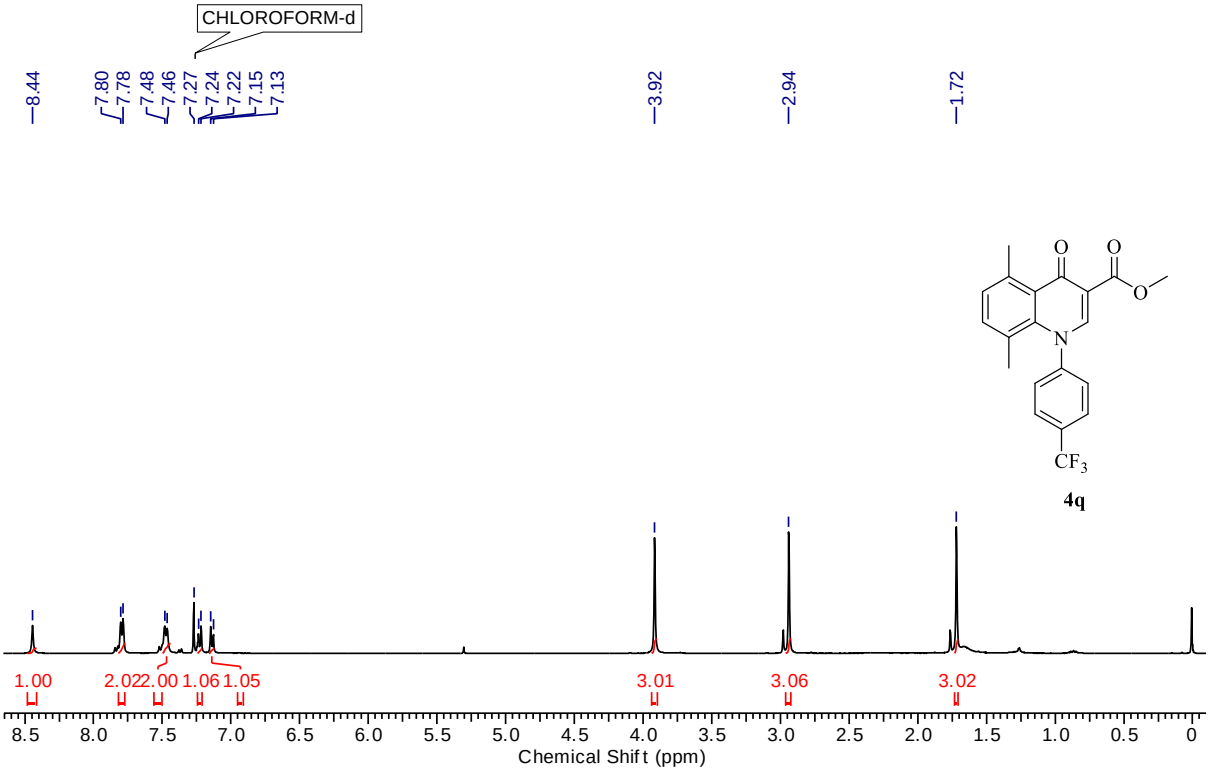
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4p



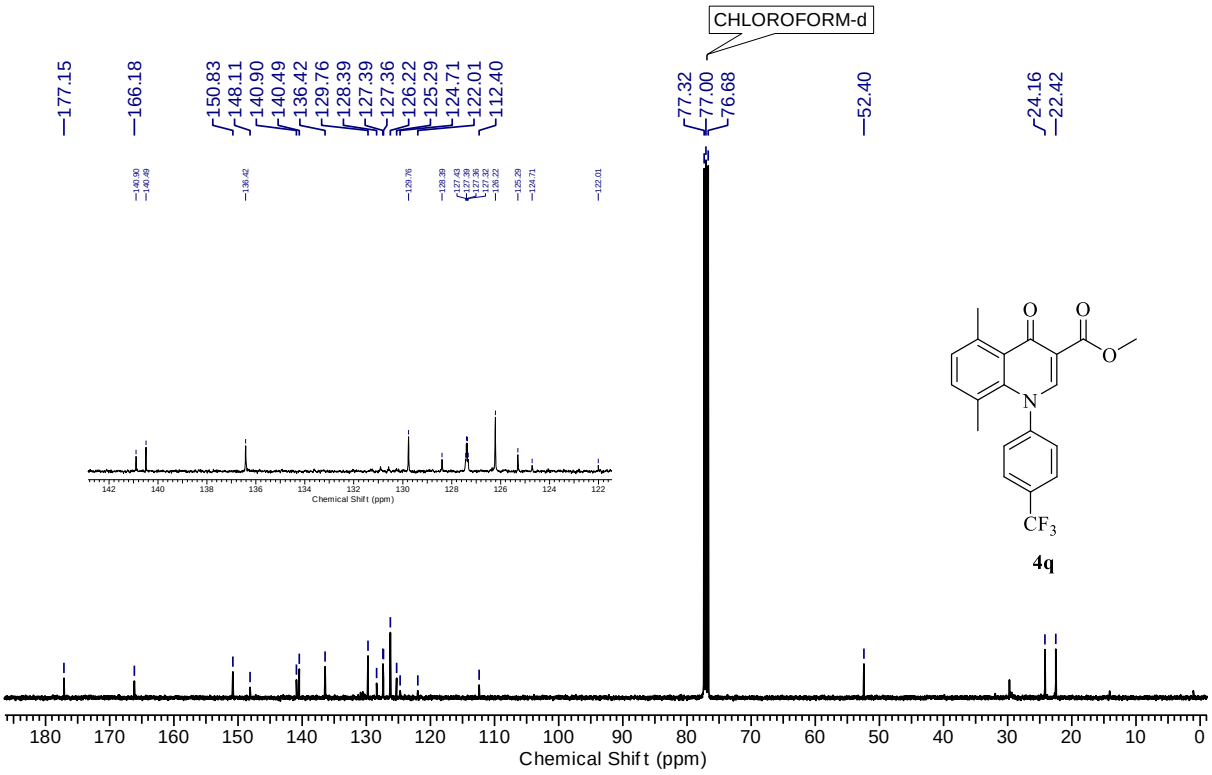
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4p



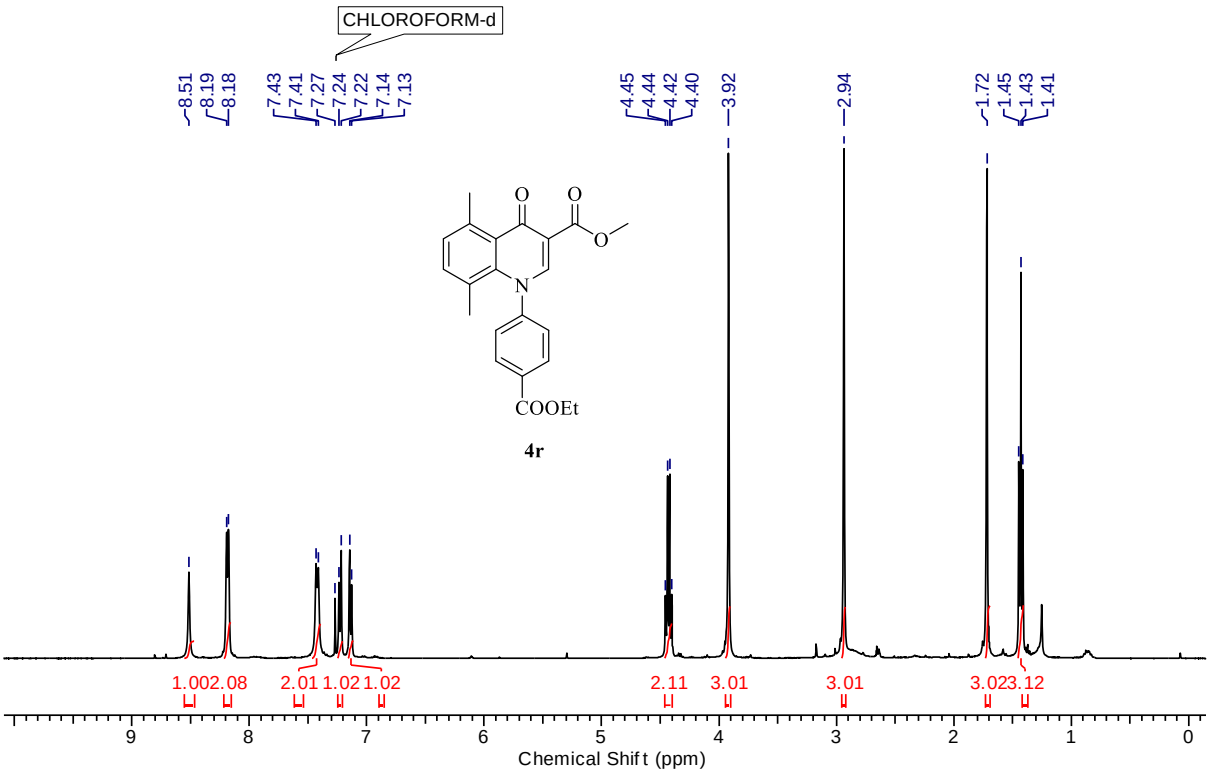
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4q



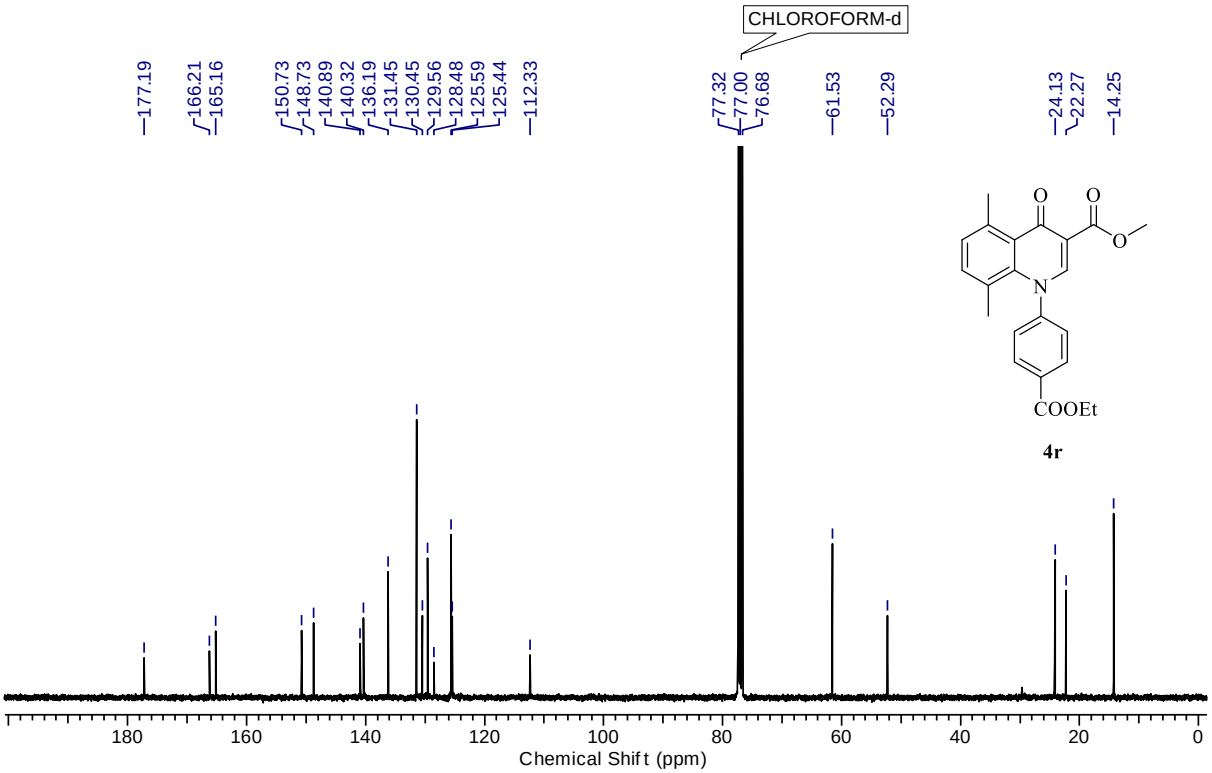
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4q



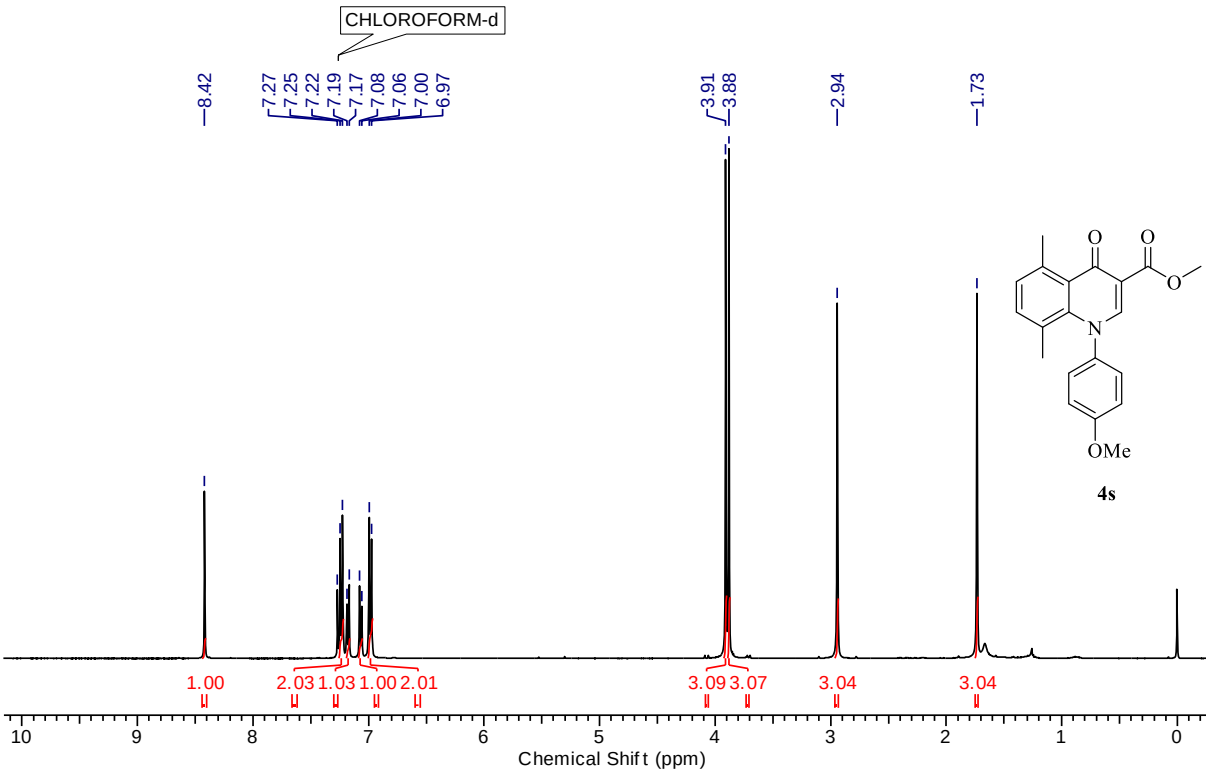
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4r



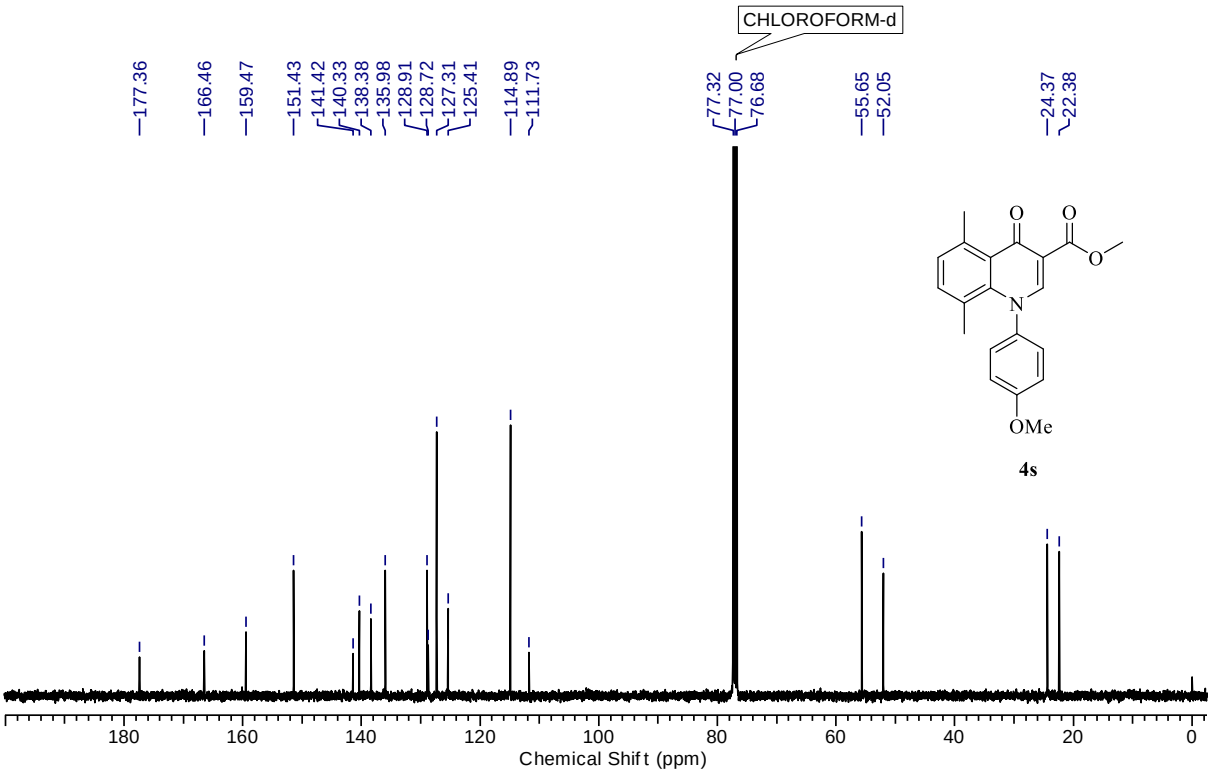
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4r



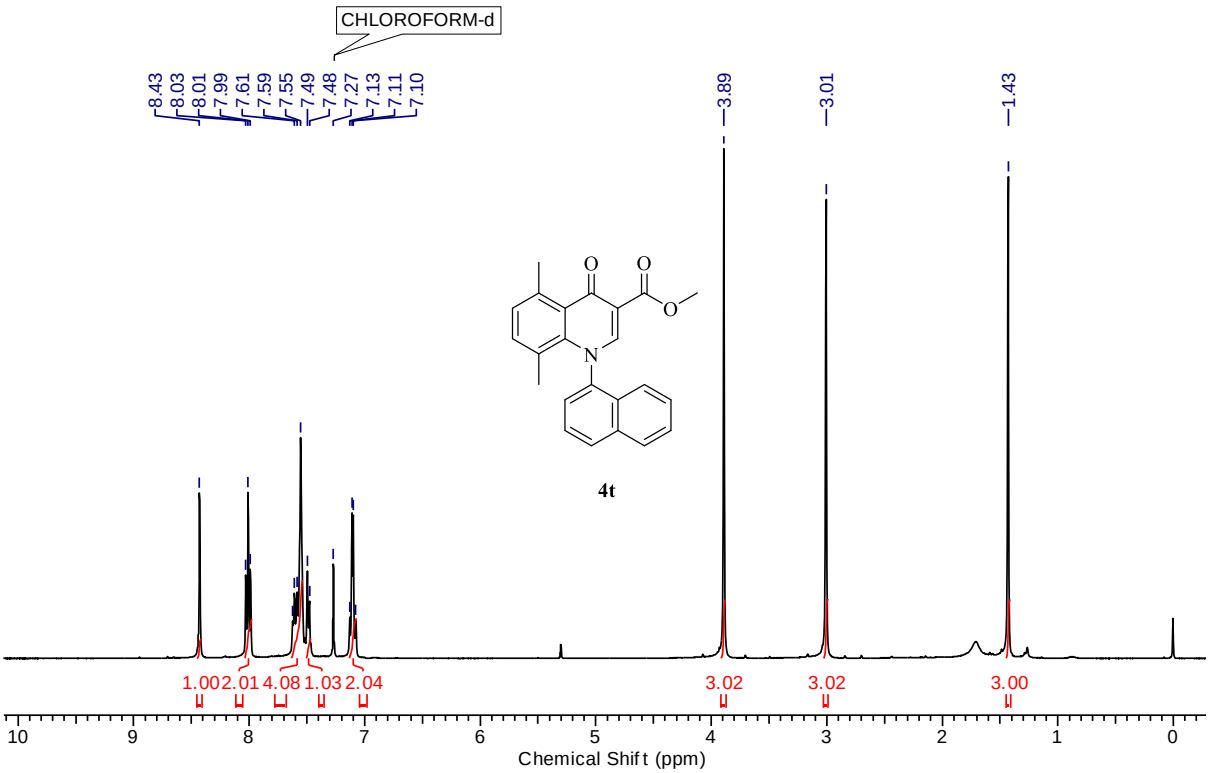
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4s



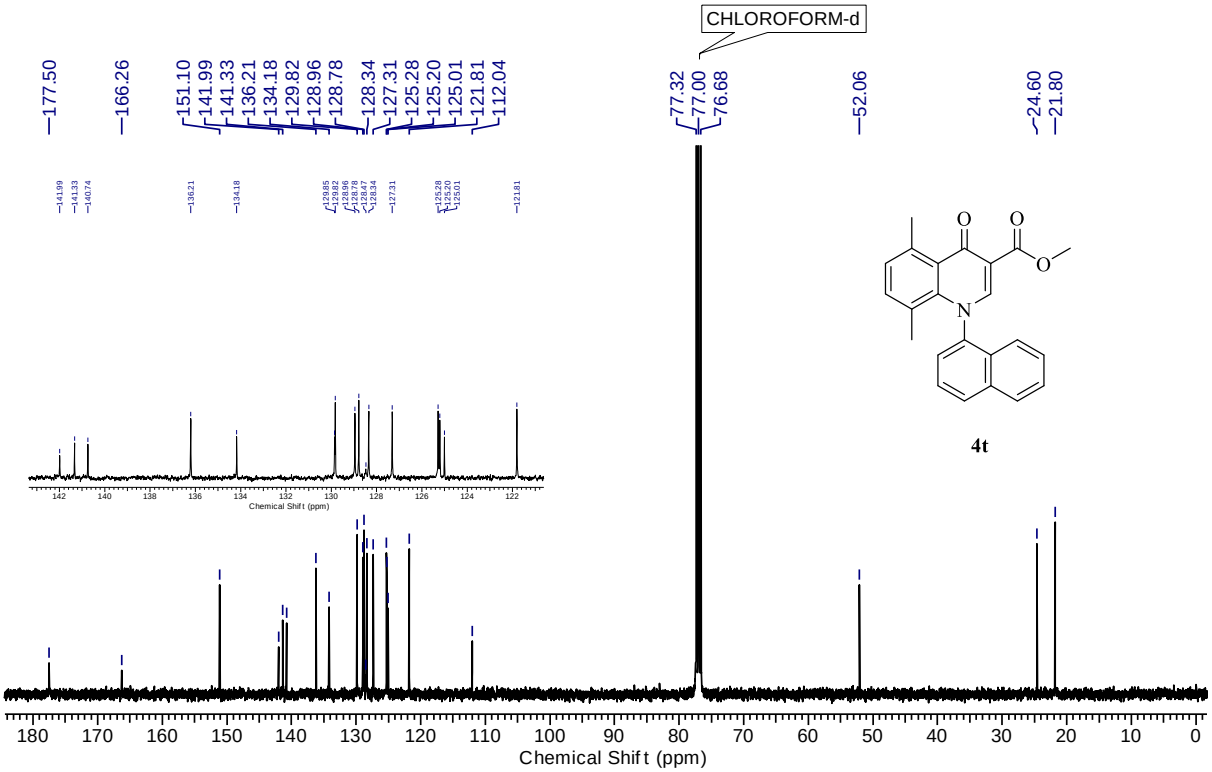
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4s



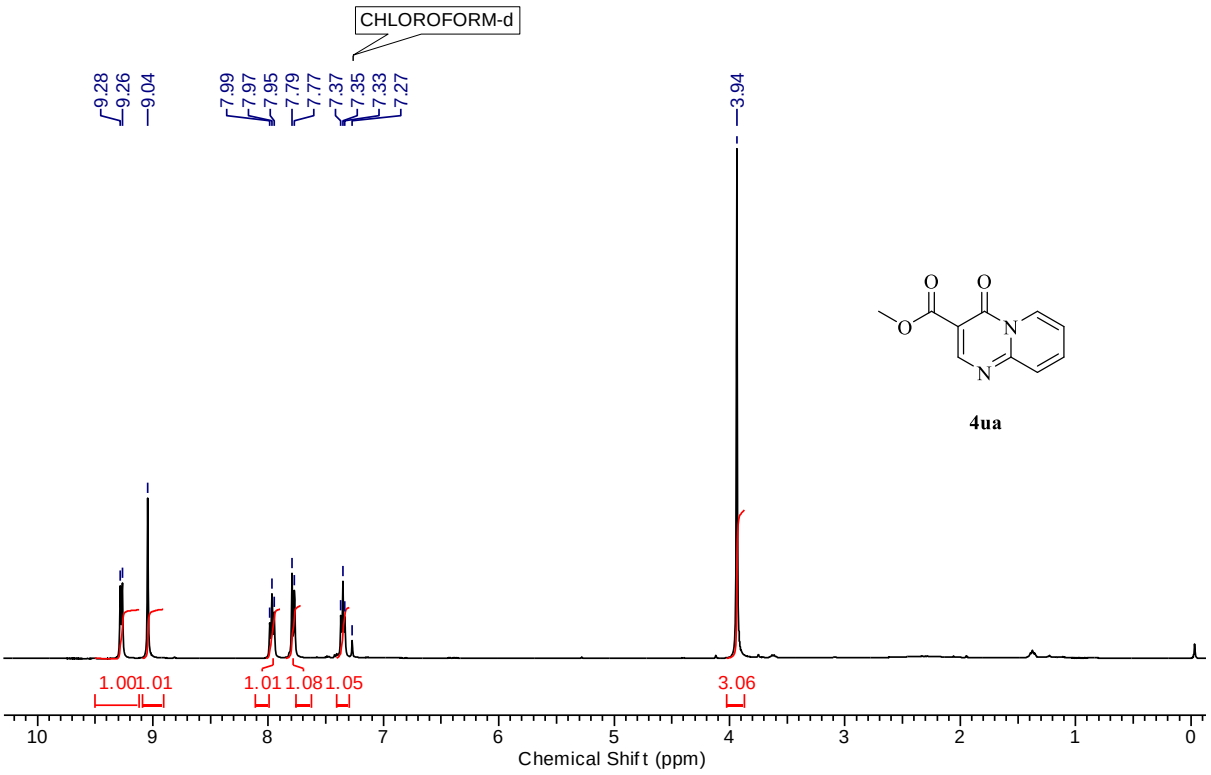
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4t



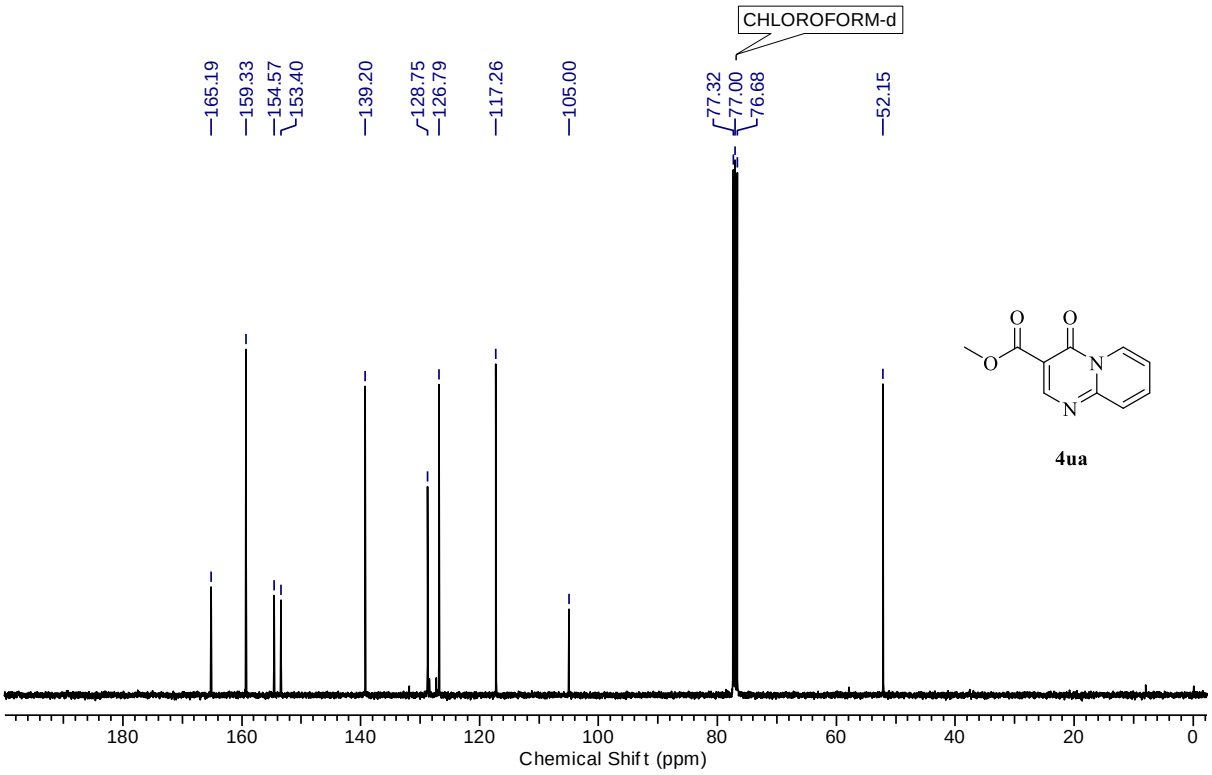
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4t



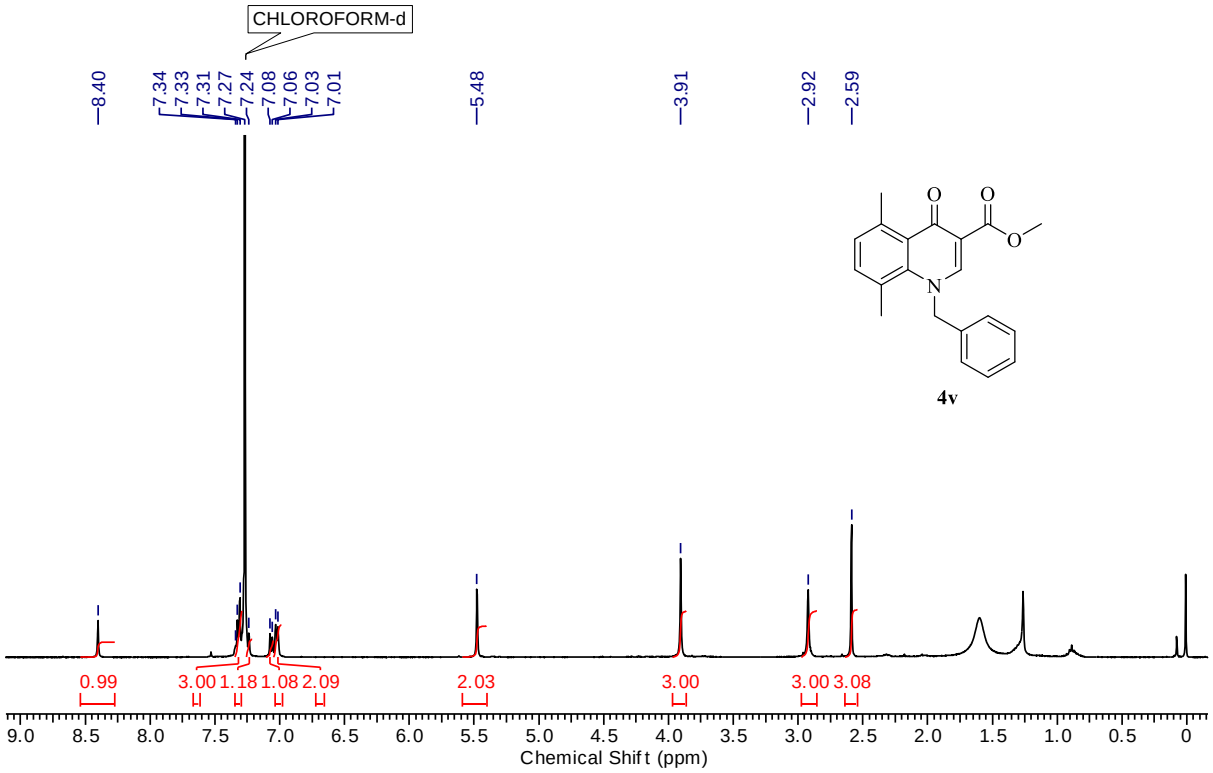
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4ua



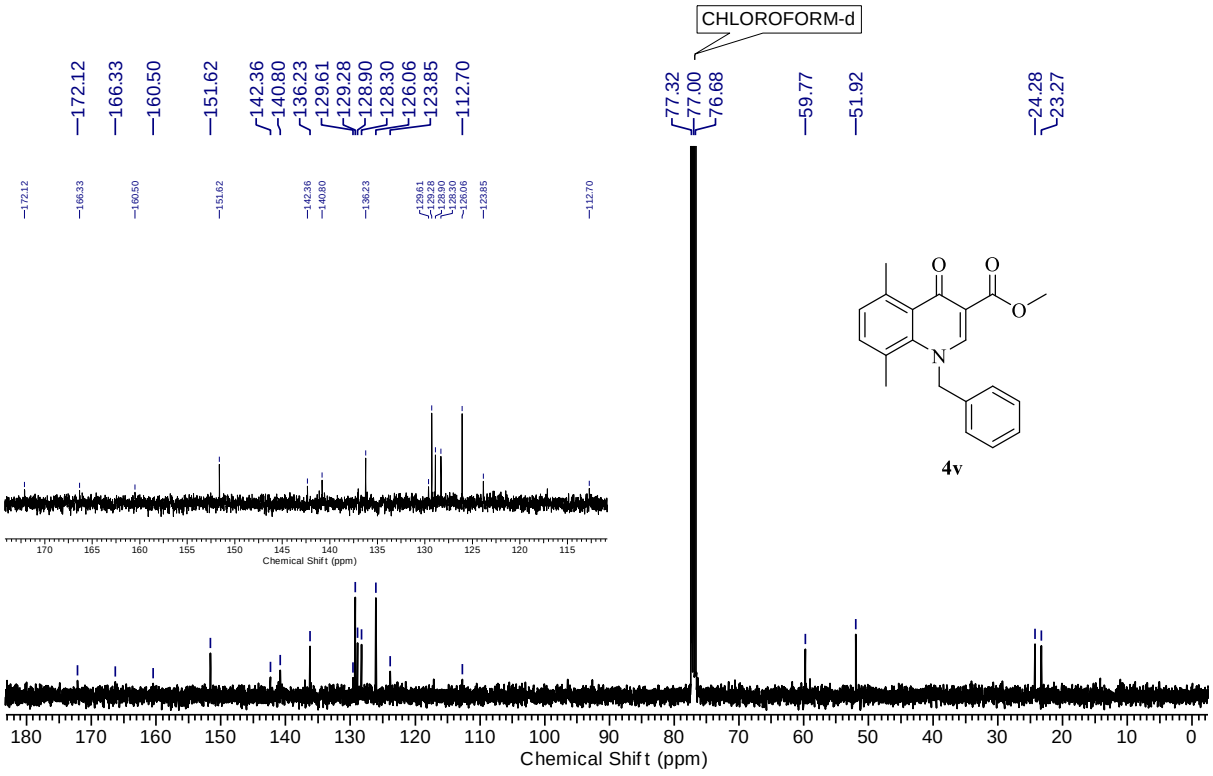
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4ua



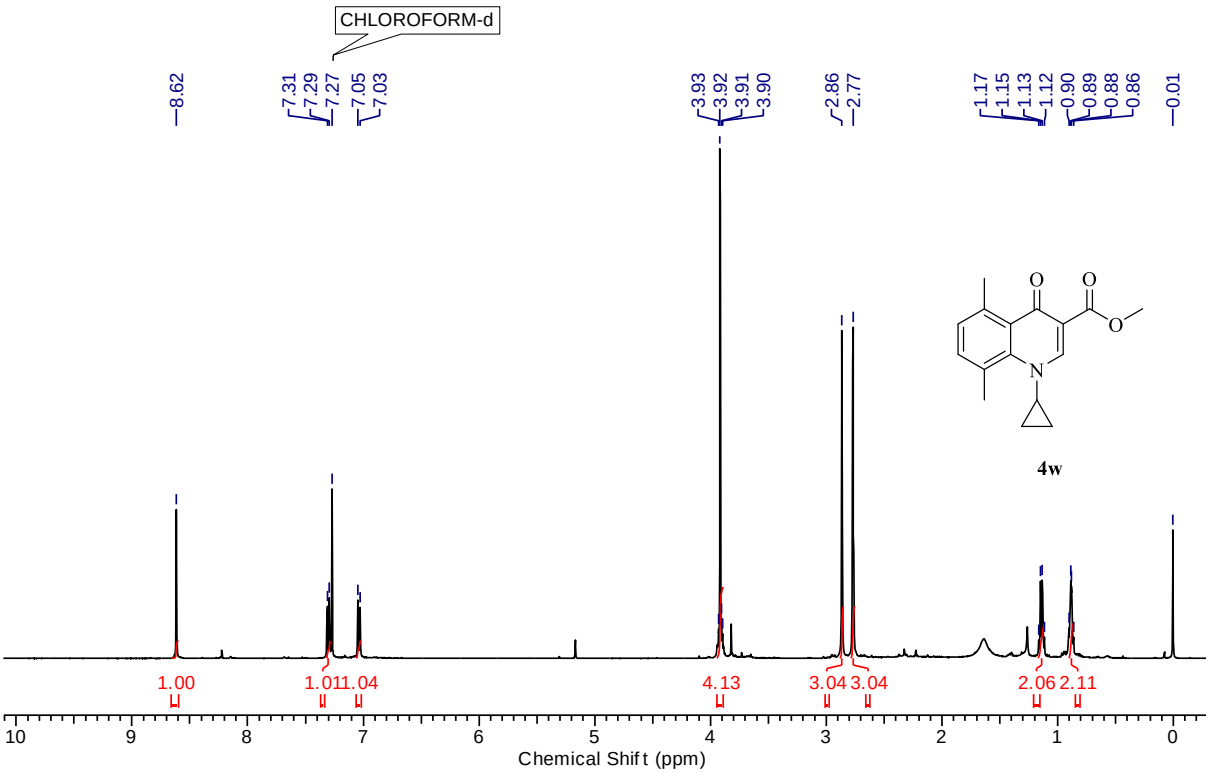
^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4v



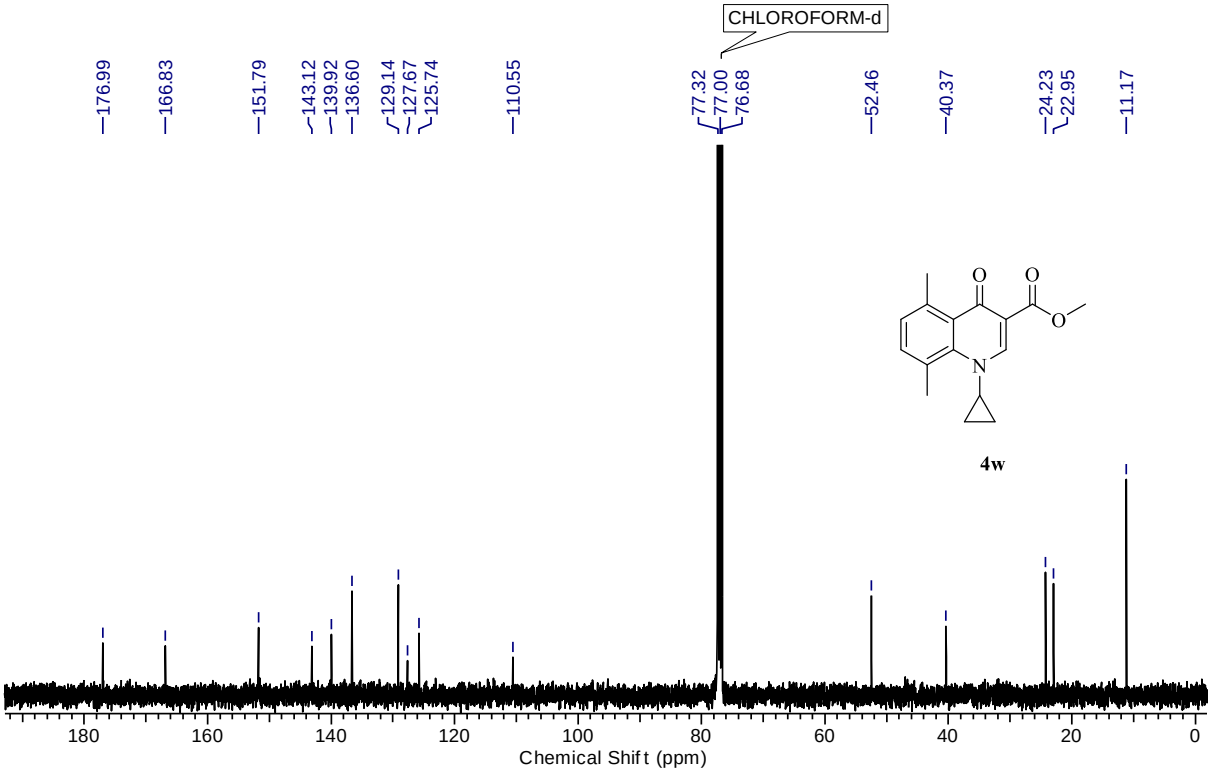
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of 4v



^{1}H NMR (400 MHz, $CDCl_3$) spectra of 4w

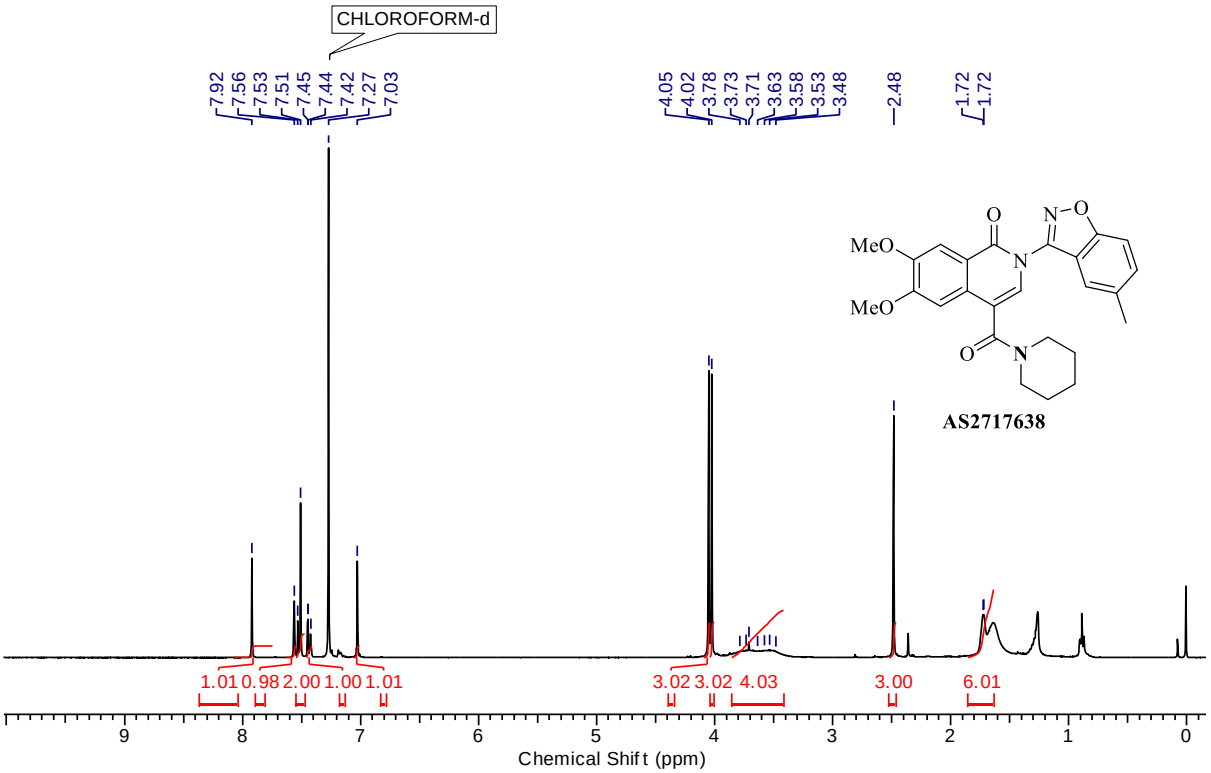


$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectra of 4w

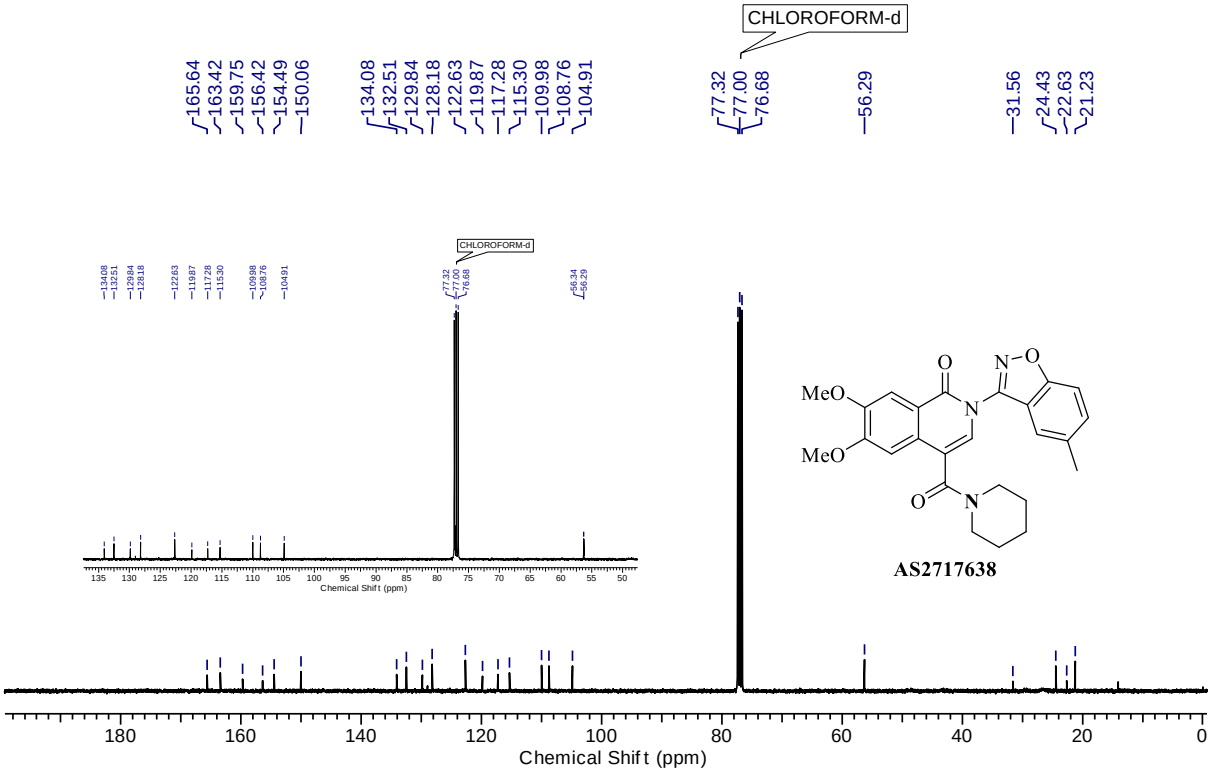


IV] NMR Spectra of AS2717638:

^{1}H NMR (400 MHz, $CDCl_3$) spectra of AS2717638



^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectra of AS2717638



HRMS chromatogram of AS2717638