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# SUPPORTING INFORMATION

# Palladium(II)-Catalyzed γ-Selective Hydroarylation of Alkenyl Carbonyl Compounds with Arylboronic Acids

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## Contents

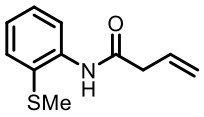
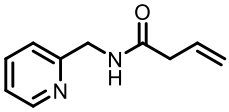
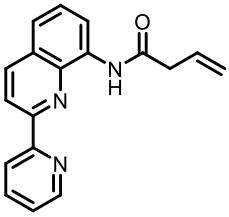
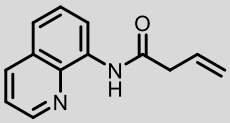
## General Information

Unless stated otherwise, all materials were used as received from commercial sources without further purification. THF and diisopropylamine were purified by a Grubbs-type solvent purification system prior to use. DCM, MeCN, and DMF were purchased from Aldrich and used as received. 1-Dram reaction vials and caps were purchased from ChemGlass (Cat#: CG-4904-05) with TFE septa. Ambient temperature refers to 21–24 °C. Low temperatures were maintained using ice/water (0 °C) and acetone/dry ice (–78 °C) baths. Elevated temperatures were maintained by an Ika heating block for 1-dram vials or a silicon oil bath for larger vessels. Thin-layer chromatography (TLC) was performed using EMD Millipore 250 mm silica gel F-254 plates (250 μm) with F-254 fluorescent indicator and visualized by UV fluorescence quenching, iodine, Seebach's stain, or potassium permanganate stain. SiliCycle SiliaFlash P60 silica gel (particle size 40–63 μm) was used for flash chromatography. $^{1}H$ and $^{13}C$ NMR spectra were recorded on a Bruker DRX-600 MHz equipped with a 5mm DCH cryoprobe (600 MHz and 150 MHz, respectively). $^{19}F$ spectra were recorded on a Bruker DPX-400 MHz and peaks referenced to hexaflurorobenzene. Spectra were internally referenced to $Me_4Si$ or residual solvent signals. High-resolution mass spectra (HRMS) were recorded on an Agilent LC/MSD TOF mass spectrometer. Gas chromatography measurements were acquired with an Agilent Technologies 7890A gas chromatography (USA) equipped with a flame ionization detector and with a DB-5 column (polyimide coating, 30 m 0.25 mm x 0.25 μm) manufactured by J&W.

**Chemicals and Suppliers:**
Alfa Aesar: Vinyl acetic acid, crotonic acid, diethylamine
Oakwood: 8-Aminoquinoline, EDC, HATU, hydroxybenzotriazole, phenylboronic acid
Fisher: Diisopropylamine, potassium *tert*-butoxide
Aldrich: *t*-butanol, *n*-butyl lithium (2.5 M in hexanes), solvents used for purification
TCI: Benzotrifluoride, *tert*-amyl alcohol

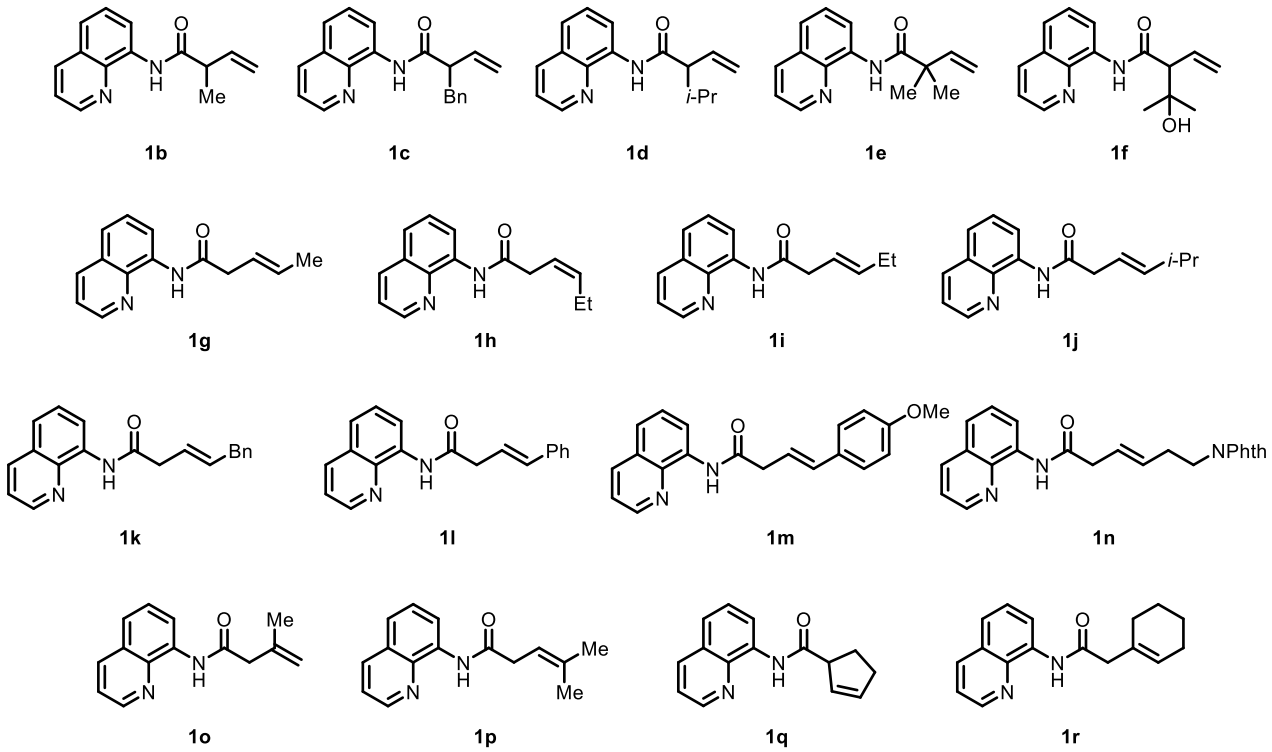
## Screen of Directing Groups

**Table S1.** Directing Group Optimization[a]

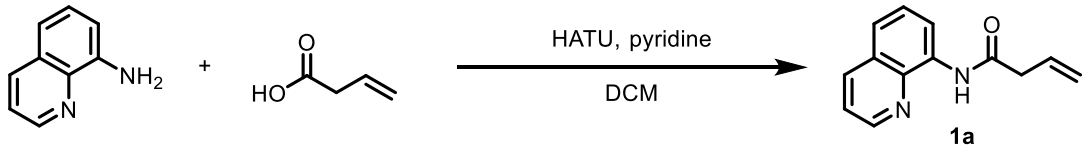

| Entry | Directing Group | % SM | % yield |
|---|---|---|---|
| 1 |  | 46% | trace |
| 2 |  | 20% | trace |
| 3[b] |  | 46% | trace |
| 4 |  | 6% | 48% |

[a] Reaction conditions: alkene (0.1 mmol), $Pd(OAc)_2$ (10 mol%), NaF (2 equiv), phenylboronic acid (2 equiv), MeCN:*m*-xylene (1:1, 0.1 mL), water (2.5 equiv), 120 °C, 5 h. Yields based on $^1H$ NMR analysis of the crude reaction mixture with dibromomethane as an internal standard. [b] $PhCF_3$ (1 mL), 80 °C, 12 h.

## Substrate Synthesis




Alkenes **1b–1r** were synthesized as reported.[1–6]

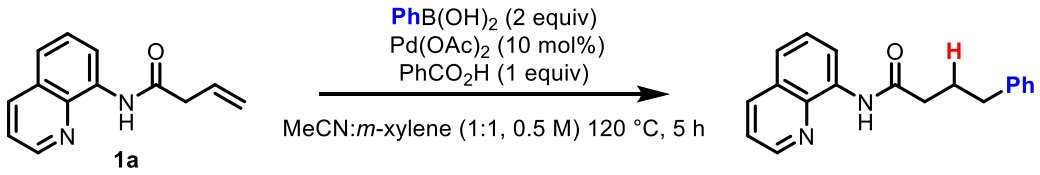



***N*-(quinolin-8-yl)but-3-enamide (1a)**: Alkene **1a** was synthesized following a previously published procedure from our laboratory, which is included here for convenience.[2] Vinyl acetic acid (3.3 mL, 39 mmol) was charged into a 250-mL round bottom flask containing DCM (90 mL). 8-Aminoquinoline (4.235 g, 30 mmol), pyridine (4.83 mL, 60 mmol), and HATU (19.01 g, 50mmol) were added sequentially, and the reaction was stirred at ambient temperature for 16 h. The deep brown solution was diluted with EtOAc (300 mL), washed with sat. $NaHCO_3$ (100 mL, ×2) and brine (100 mL, ×1). The organic layer was then dried, concentrated under vacuum, and purified by column chromatography (10–15% EtOAc in hexanes) to afford 5.5 g (70%) yield of the desired product as a yellow oil. Large yellow crystals were obtained after the addition of a seed crystal under vacuum. This material was then ground into a fine powder before use.

## Screen of Different Sources of Phenylboronic Acid / Addition of Water

In the early stages of screening, upon switching to a freshly purchased bottle of phenylboronic acid, the yield unexpectedly dropped, prompting a systematic investigation of the role of phenylboronic acid supplier.

**Table S2.** Investigation of Different Phenylboronic Acid Suppliers[a]

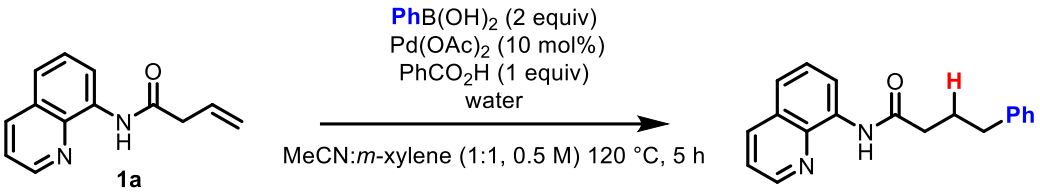



| Entry | Vendor | physical appearance | % SM | % yield |
|---|---|---|---|---|
| 1 | Aldrich | medium-sized clumps | 6% | 49% |
| 2 | Oakwood | fluffy white powder | 6% | 10% |
| 3 | Frontier | large clumps | 3% | 53% |
| 4 | Acros (Lot A) | white powder | 4% | 11% |
| 5 | Acros (Lot B) | white powder | 8% | 10% |
| 6 | Acros (Lot C) | white powder | 25% | 23% |

[a] Reaction conditions: alkene **1a** (0.1 mmol), $Pd(OAc)_2$ (10 mol%), $PhCO_2H$ (1 equiv), phenylboronic acid (2 equiv), MeCN:*m*-xylene (1:1, 0.2 mL), 120 °C, 5 h. Yields based on $^1H$ NMR analysis of the crude reaction mixture with dibromomethane as an internal standard.

Upon investigation of multiple sources of phenylboronic acid, the data suggested to us that the phenylboronic acid samples with a clumpy physical appearance generally provided better yields. Inspection of each batch by $^1H$ NMR showed no significant difference in impurity profile. We then reasoned that precise stoichiometry of water might necessary for the reaction to function optimally. The boronic acids from Table S2, Entries 1 and 2, were then tested with varying amounts of water.

**Table S3.** Examination of Different Phenylboronic Acid Sources with Varying Amounts of Exogenous Water[a]



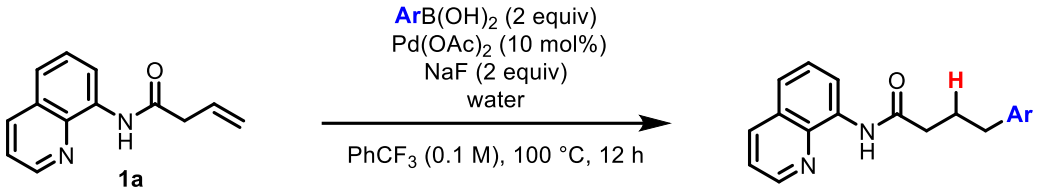

| Entry | Vendor (appearance) | water | % SM | % yield |
|---|---|---|---|---|
| 1 | Oakwood (powder) | 2.5 equiv | <2% | 48% |
| 2 | Oakwood (powder) | 5 equiv | <2% | 44% |
| 3 | Oakwood (powder) | 10 equiv | <2% | 40% |
| 4 | Aldrich (clumps) | 2.5 equiv | 2% | 54% |
| 5 | Aldrich (clumps) | 5 equiv | <1% | 48% |
| 6 | Aldrich (clumps) | 10 equiv | 5% | 30% |

[a] Reaction conditions: alkene **1a** (0.1 mmol), $Pd(OAc)_2$ (10 mol%), $PhCO_2H$ (1 equiv), phenylboronic acid (2 equiv), MeCN:*m*-xylene (1:1, 0.2 mL), 120 °C, 5 h. Yields based on $^1H$ NMR analysis of the crude reaction mixture with dibromomethane as an internal standard.

Upon addition of water, the discrepancy in yield between the two sources of phenylboronic acid was resolved (Entry 1, 4). However, as more water was added, the yield decreased, and formation of reduced alkene was observed (Entry 3, 6).

In light of these observations, we hypothesized that since each individual batch of boronic acid would likely contain varying amounts of water, different quantities of exogenous water would need to be added to achieve optimal water content in the reaction mixture. We then screened 0 equiv, 1.5 equiv, and 2.5 equiv of water respectively with different boronic acids. Here we present representative results for several arylboronic acids to illustrate how different amounts of added water affect the yield.

**Table S4.** Screen of Different Boronic Acids with Different Amounts of Water[a]



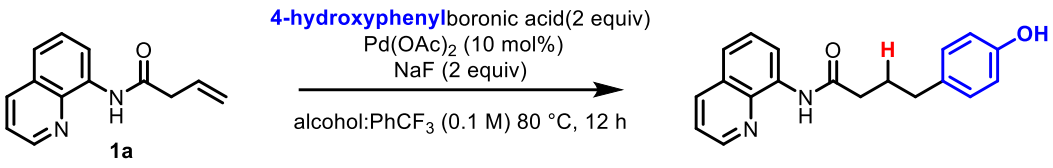

| Entry | Ar = | water | % SM | % yield |
|---|---|---|---|---|
| 1 | 4-iodophenyl | 0 equiv | 77% | 20% |
| 2 | 4-iodophenyl | 1.5 equiv | 67% | 24% |
| 3 | 4-iodophenyl | 2.5 equiv | 37% | 39% |
| 4 | 3-formylphenyl | 0 equiv | 29% | 50% |
| 5 | 3-formylphenyl | 1.5 equiv | 54% | 39% |
| 6 | 3-formylphenyl | 2.5 equiv | 54% | 26% |
| 7 | 4-chlorophenyl (Source A) | 0 equiv | 95% | 5% |
| 8 | 4-chlorophenyl (Source A) | 1.5 equiv | 85% | 12% |
| 9 | 4-chlorophenyl (Source A) | 2.5 equiv | 53% | 30% |
| 10 | 4-chlorophenyl (Source B) | 0 equiv | 42% | 46% |
| 11 | 4-chlorophenyl (Source B) | 1.5 equiv | 7% | 85% |
| 12 | 4-chlorophenyl (Source B) | 2.5 equiv | 4% | 85% |

[a] Reaction conditions: alkene **1a** (0.1 mmol), $Pd(OAc)_2$ (10 mol%), NaF (2 equiv), arylboronic acid (2 equiv), $PhCF_3$ (1 mL), 100 °C, 12 h. Yields based on $^1H$ NMR analysis of the crude reaction mixture with dibromomethane as an internal standard.

As can be seen from Entries 1–6, for 4-iodophenylboronic acid 2.5 equiv additional water is required, while for 3-formylphenylboronic acid any additional water decreases yield. We also attempted the reaction using two different batches of 4-chlorophenylboronic acid. As can be seen from Entries 7–12, both batches gave higher yield as more water is added, but Source A seems to require even more water than 2.5 equiv for optimal performance, while Source B gives high yield at 1.5–2.5 equiv water.

## Screen of Hydroarylation for Polar Boronic Acids

**Table S5.** Investigation of Solvents for Polar Boronic Acids[a]

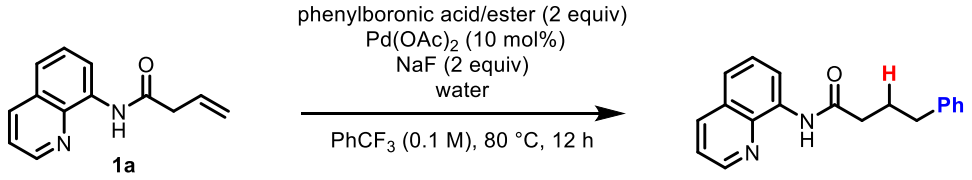



| Entry | Alcohol | % SM | % yield |
|---|---|---|---|
| 1 | 20% ethanol | 85% | trace |
| 2 | 10% *t*-butyl alcohol | 55% | 27% |
| 3 | 20% *t*-butyl alcohol | 24% | 72% |
| 4 | 33% *t*-butyl alcohol | 29% | 55% |
| 5 | 50% *t*-butyl alcohol | 43% | 26% |
| 6 | 10% *t*-amyl alcohol | 51% | 18% |
| 7 | 20% *t*-amyl alcohol | 24% | 55% |
| 8 | 33% *t*-amyl alcohol | 22% | 37% |
| 9 | 50% *t*-amyl alcohol | 29% | 32% |

[a] Reaction conditions: alkene **1a** (0.1 mmol), $Pd(OAc)_2$ (10 mol%), NaF (2 equiv), 4-hydroxyphenylboronic acid (2 equiv), alcohol:$PhCF_3$ (1 mL), 80 °C, 12 h. Yields based on $^1H$ NMR analysis of the crude reaction mixture with dibromomethane as an internal standard.

## Examination of Alternative of Organoboron Coupling Partners

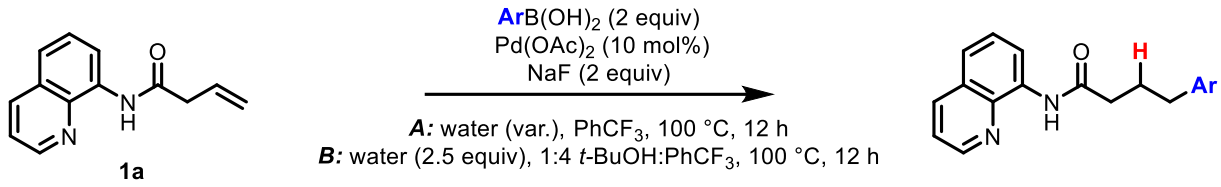
**Table S6.** Assessment of Different Organoboron Coupling Partners[a]




| Entry | Boron Source | GC analysis |
|---|---|---|
| 1 | PhB(pin) | only SM and unreacted PhB(pin) observed |
| 2 | PhB(MIDA) | only SM observed |
| 3 | $PhBF_3^-K^+$ | only SM observed |
| 4 | PhB(npg) | only SM and unreacted PhB(npg) observed |
| 5 | $PhB(OH)_2$ | product observed |
| 6 | triphenylboroxine | product observed, 82% isolated |

[a] Reaction conditions: alkene **1a** (0.1 mmol), $Pd(OAc)_2$ (10 mol%), NaF (2 equiv), phenylboronic acid/ester (2 equiv), $PhCF_3$ (1 mL), 80 °C, 12 h. Yields based on GC analysis of the crude reaction mixture. npg = neopentyl glycol

## General Procedures for Evaluating Boronic Acid Scope




Unless otherwise stated, procedures for evaluating the boronic acid scope were as follows. General Procedure B was mostly used for boronic acids containing polar functional groups that did not dissolve well in benzotrifluoride.

**General Procedure A:** To a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (2.2 mg, 0.01 mmol), alkene (21.2 mg, 0.1 mmol), boronic acid (0.2 mmol), NaF (8.4 mg, 0.2 mmol), water, and benzotrifluoride (1 mL). As the reaction was found to give variable yields depending on the water content of the individual batch of boronic acid (see page S7), three test reactions were examined with 0 equiv (0 µL), 1.5 equiv (2.7 µL), and 2.5 equiv (4.5 µL) of water. If the reaction seemed to benefit from having more water, additional experiments were performed with even higher amounts of water (5 equiv, 10 equiv, etc.). The highest yielding examples are reported below. The vial was sealed with an unpunctured TFE septum-covered screw cap and placed in a heating block that was pre-heated to 100 °C. After 12 h, the reaction was brought to room temperature, filtered through a plug of silica gel, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum, re-dissolved in acetone, and separated by preparative TLC.

**General Procedure B:** To a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (2.2 mg, 0.01 mmol), alkene (21.2 mg, 0.1 mmol), boronic acid (0.2 mmol), NaF (8.4 mg, 0.2 mmol), water (4.5 µL), *t*-BuOH (0.2 mL), and benzotrifluoride (0.8 mL). The vial was sealed with an unpunctured TFE septum-covered screw cap and placed in a heating block that was pre-heated to 100 °C. After 12 h, the reaction was brought to room temperature, filtered through silica, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum, re-dissolved in acetone, and separated by preparative TLC.

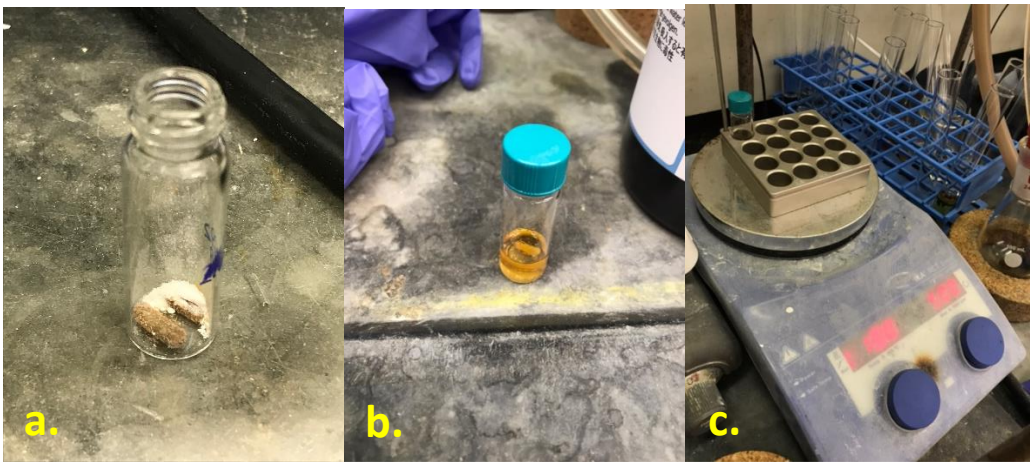



**Figure S1.** From left to right: a) addition of solids and stir bar to vial. b) addition of solvent and water. c) vial placed in heating block and stirred.

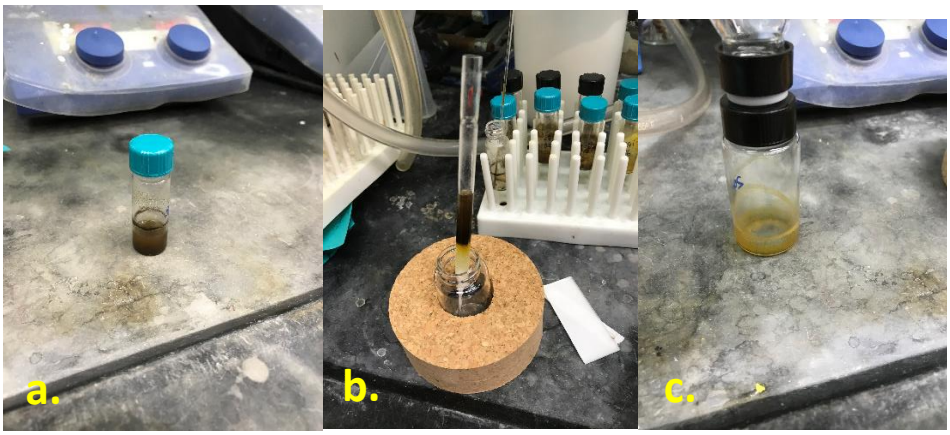
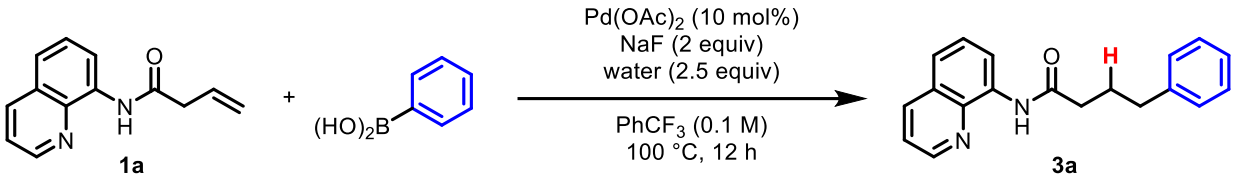
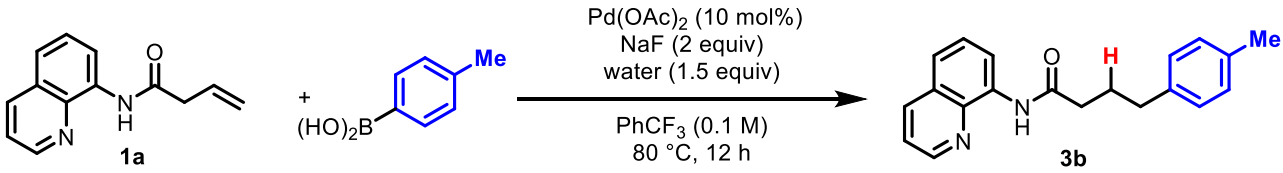



**Figure S2.** From left to right: a) reaction mixture after heating for 12 h. b) workup by filtering through silica plug. c) post-workup crude reaction mixture.

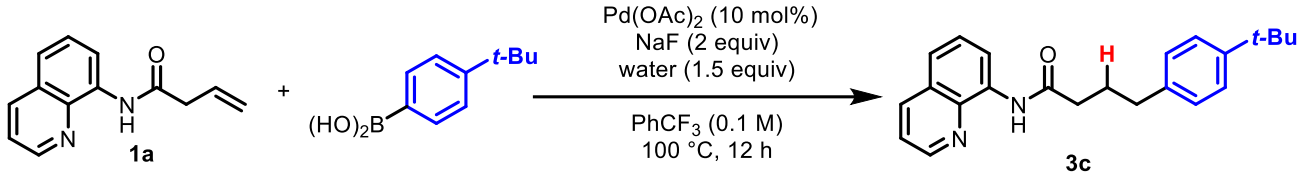



**4-phenyl-*N*-(quinolin-8-yl)butanamide (3a):** The reaction was carried out according to General Procedure A using phenylboronic acid (24.4 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 55–75% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 291.1 [M+H], cone voltage 15V). Purification afforded 24 mg (86%) of **3a** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.85–8.76 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.48 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.32–7.27 (m, 2H), 7.26–7.23 (m, 2H), 7.22–7.18 (m, 1H), 2.77 (t, *J* = 7.6 Hz, 2H), 2.58 (t, 2H), 2.17 (p, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 170.97, 147.64, 141.05, 137.88, 135.91, 134.05, 127.96, 127.49, 126.98, 125.51, 121.13, 120.93, 115.99, 36.86, 34.75, 26.59. **HRMS** calcd. for $C_{19}H_{19}N_2O^+$ $[M+H]^+$: 291.1492 Found: 291.1494.

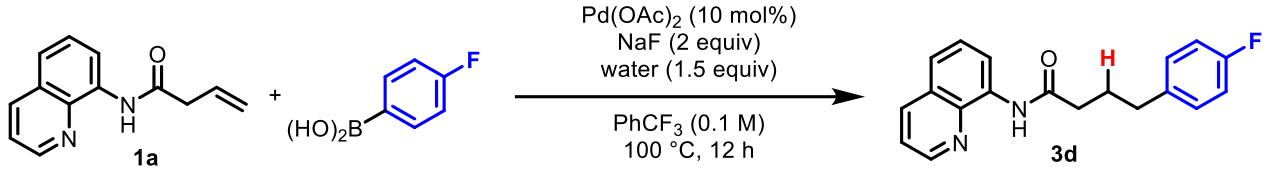



***N*-(quinolin-8-yl)-4-(*p*-tolyl)butanamide (3b):** The reaction was carried out according to General Procedure A at 80 ˚C using 4-methylphenylboronic acid (27.2 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 305.2 [M+H], cone voltage 15V). Purification afforded 30.4 mg (90%) of **3b** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.82–8.77 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.56–7.48 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.15–7.09 (m, 4H), 2.73 (t, *J* = 7.5 Hz, 2H), 2.57 (t, *J* = 7.5 Hz, 2H), 2.32 (s, 3H), 2.14 (p, *J* = 7.5

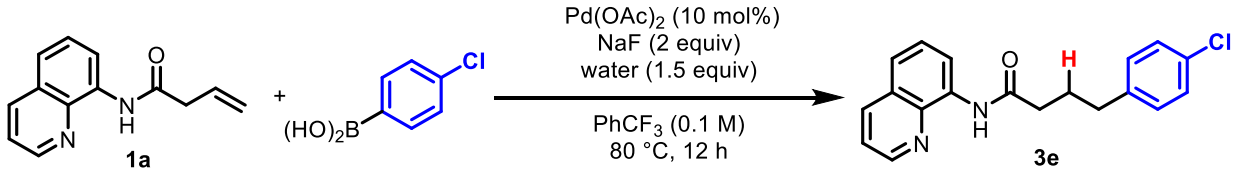
Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.64, 148.23, 138.54, 138.48, 136.50, 135.56, 134.67, 129.23, 128.60, 128.08, 127.59, 121.71, 121.50, 116.58, 37.49, 34.91, 27.28, 21.15. **HRMS** calcd. for $C_{20}H_{21}N_2O^+$ $[M+H]^+$: 305.1648, Found: 305.1649.




**4-(4-(*tert*-butyl)phenyl)-*N*-(quinolin-8-yl)butanamide (3c):** The reaction was carried out according to General Procedure A at 80 ˚C using 4-*tert*-butylphenylboronic acid (35.6 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 24.6 mg (71%) of **3c** as a yellow solid. **$^{1}$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.82–8.76 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.40 (m, 3H), 7.31 (d, *J* = 8.4 Hz, 2H), 7.18 (d, *J* = 8.2 Hz, 2H), 2.74 (t, *J* = 7.6 Hz, 2H), 2.58 (t, *J* = 7.5 Hz, 2H), 2.16 (p, *J* = 7.5 Hz, 2H), 1.31 (s, 9H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.67, 148.88, 148.19, 138.52, 136.56, 134.65, 128.36, 128.09, 127.61, 126.56, 125.42, 121.70, 121.50, 116.64, 37.59, 34.81, 34.50, 31.55, 27.13. **HRMS** calcd. for $C_{23}H_{27}N_2O^+$ $[M+H]^+$: 347.2218, Found: 347.2220.

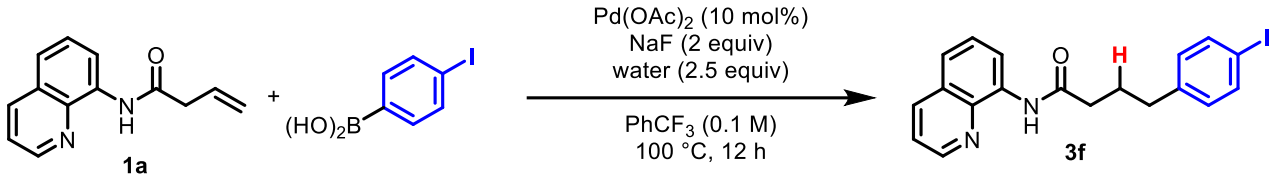



**4-(4-fluorophenyl)-*N*-(quinolin-8-yl)butanamide (3d):** The reaction was carried out according to General Procedure A using 4-fluorophenylboronic acid (28.0 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (2% EtOAc/toluene) to afford 19 mg (62%) of **3d** as an orange solid. **$^{1}$H NMR** (600 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.79 (ddd, *J* = 9.0, 5.9, 1.6 Hz, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.49 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.22–7.15 (m, 2H), 7.01–6.92 (m, 2H), 2.74 (t, *J* = 7.6 Hz, 2H), 2.57 (t, *J* = 7.4 Hz, 2H), 2.13 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.42, 161.51 (d, *J* = 243.1 Hz), 148.27, 138.47, 137.24 (d, *J* = 3.2 Hz), 136.55, 134.61, 130.03 (d, *J* = 8.0 Hz), 128.11, 127.60, 121.68 (d, *J* = 24.8 Hz), 116.61, 115.36, 115.22, 37.31, 34.50, 27.30. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –117.83. **HRMS** calcd. for $C_{19}H_{18}FN_2O^+$ $[M+H]^+$: 309.1398, Found: 309.1396.

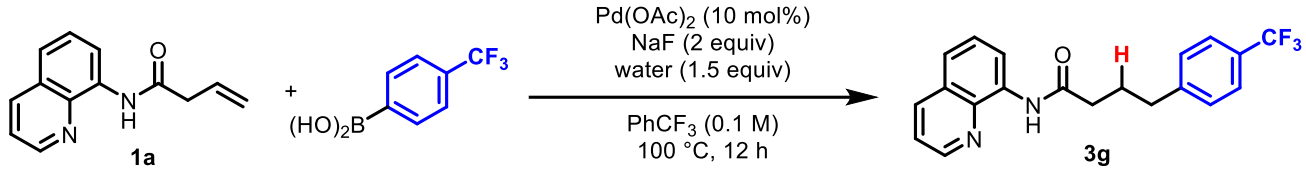



**4-(4-chlorophenyl)-*N*-(quinolin-8-yl)butanamide (3e):** The reaction was carried out according to General Procedure A at 80 ˚C using 4-chlorophenylboronic acid (31.3 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 30 mg (92%) of **3e** as a white solid. **$^{1}$H NMR** (600 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.83–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.57–7.48 (m, 2H), 7.46 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.26 (dd, *J* = 6.3, 2.1 Hz, 2H), 7.20–7.15 (m, 2H), 2.74 (t, *J* = 7.6 Hz, 2H), 2.57 (t, *J* = 7.4 Hz, 2H), 2.13 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.32, 148.27, 140.07, 138.45, 136.54,

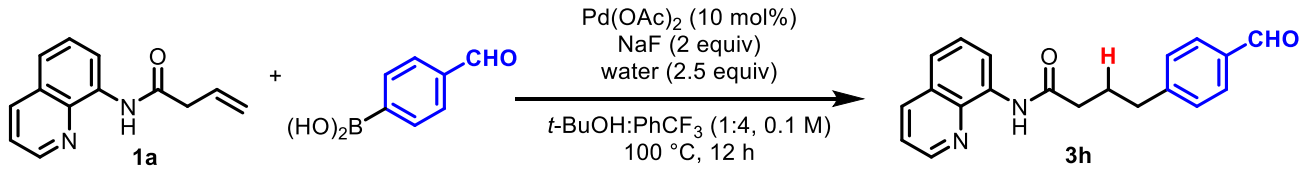
134.57, 131.85, 130.05, 128.65, 128.09, 127.58, 121.75, 121.61, 116.60, 37.24, 34.64, 27.05. **HRMS** calcd. for $C_{19}H_{18}ClN_2O^+$ [M+H]$^+$: 325.1102, Found: 325.1103.



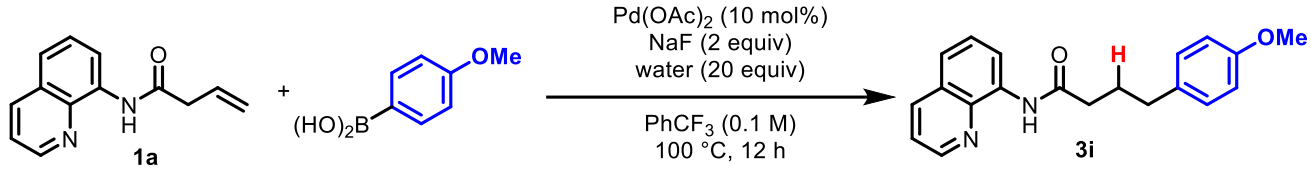

**4-(4-iodophenyl)-*N*-(quinolin-8-yl)butanamide (3f):** The reaction was carried out according to General Procedure A using 4-iodophenylboronic acid (49.6 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 14 mg (34%) of **3f** as a white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.77 (s, 1H), 8.92–8.71 (m, 2H), 8.16 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.64–7.58 (m, 2H), 7.56–7.49 (m, 2H), 7.46 (dd, *J* = 8.3, 4.3 Hz, 1H), 7.00 (d, *J* = 8.0 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.16, 148.13, 141.13, 138.31, 137.45, 136.40, 134.42, 130.70, 127.95, 127.44, 121.62, 121.47, 116.45, 91.05, 37.08, 34.64, 26.78. **HRMS** calcd. for $C_{19}H_{18}IN_2O^+$ [M+H]$^+$: 417.0464, Found: 417.0463.



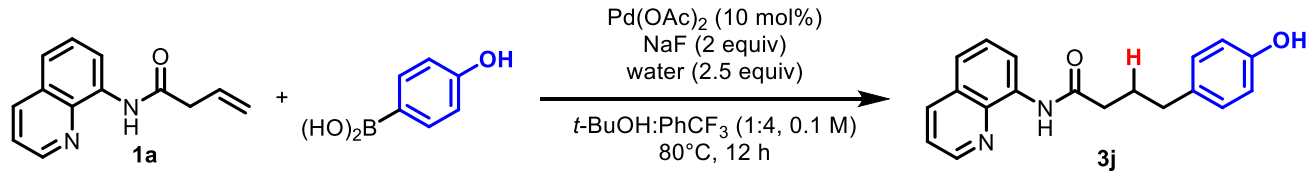

**4-(4-(trifluoromethyl)phenyl)-*N*-(quinolin-8-yl)butanamide (3g):** The reaction was carried out according to General Procedure A using 4-(trifluoromethyl)phenylboronic acid (38.0 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (20% EtOAc/hexane) to afford 28 mg (78%) of **3g** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.84–8.67 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.49 (m, 4H), 7.46 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.35 (d, *J* = 7.9 Hz, 2H), 2.83 (t, *J* = 7.6 Hz, 2H), 2.58 (t, *J* = 7.3 Hz, 2H), 2.17 (dq, *J* = 8.9, 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 170.56, 147.68, 145.17, 137.84, 135.96, 133.93, 128.41, 127.92 (q, *J* = 32.4 Hz), 127.50, 126.97, 124.89 (q, *J* = 3.9 Hz), 123.88 (q, *J* = 271.8 Hz). 121.17, 121.06, 116.02, 36.60, 34.51, 26.23.**$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –62.53. **HRMS** calcd. for $C_{20}H_{18}F_3N_2O^+$ [M+H]$^+$: 359.1366, Found: 359.1365.



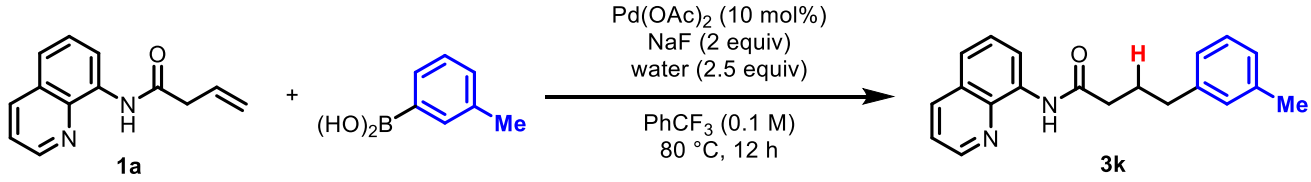

**4-(4-formylphenyl)-*N*-(quinolin-8-yl)butanamide (3h):** The reaction was carried out according to General Procedure B using 4-formylphenylboronic acid (30.0 mg, 0.2 mmol). The product was purified by preparative TLC (3% EtOAc/toluene) to afford 11 mg (35%) of **3h** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.97 (s, 1H), 9.79 (s, 1H), 8.83–8.74 (m, 2H), 8.21–8.12 (m, 1H), 7.84–7.79 (m, 2H), 7.58–7.48 (m, 2H), 7.49–7.43 (m, 1H), 7.43–7.38 (m, 2H), 2.91–2.80 (m, 2H), 2.60 (t, *J* = 7.3 Hz, 2H), 2.19 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 192.09, 149.14, 148.28, 138.43, 136.56, 134.82, 134.51, 130.16, 129.39, 128.09, 127.56, 121.78, 121.67, 116.61, 37.22, 35.51, 26.73. **HRMS** calcd. for $C_{20}H_{19}N_2O_2^+$ [M+H]$^+$: 319.1441 Found: 319.1441.




**4-(4-methoxyphenyl)-*N*-(quinolin-8-yl)butanamide (3i):** The reaction was carried out according to General Procedure A using 4-methoxyphenylboronic acid (30.4 mg, 0.2 mmol) and water (36 µL, 20 equiv). The product was purified by preparative TLC (20% EtOAc/hexane) to afford 19 mg (59%) of **3i** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.87–8.76 (m, 2H), 8.18 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.50 (m, 2H), 7.48 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.20–7.16 (m, 2H), 6.90–6.84 (m, 2H), 3.81 (s, 3H), 2.74 (t, *J* = 7.5 Hz, 2H), 2.59 (t, *J* = 7.4 Hz, 2H), 2.21–2.11 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.05, 157.42, 147.63, 137.88, 135.91, 134.06, 133.10, 129.01, 127.48, 126.98, 121.12, 120.91, 115.98, 113.37, 54.80, 36.84, 33.83, 26.82. **HRMS** calcd. for $C_{20}H_{21}N_2O_2^+$ $[M+H]^+$: 321.1598, Found: 321.1597.

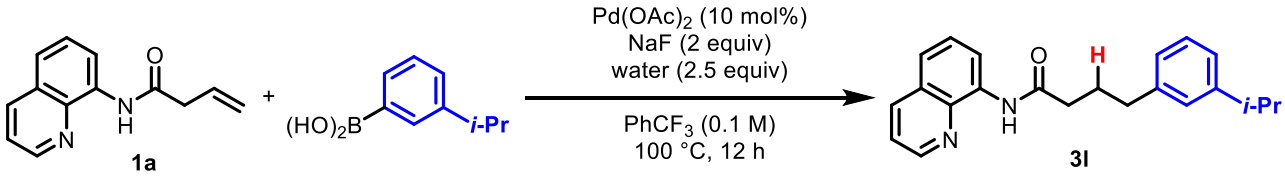



**4-(4-hydroxyphenyl)-*N*-(quinolin-8-yl)butanamide (3j):** The reaction was carried out according to General Procedure B using 4-hydroxyphenylboronic acid (27.6 mg, 0.2 mmol). The product was purified by preparative TLC (20% EtOAc/hexane) to afford 25 mg (82%) of **3j** as a yellow solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.79 (ddd, *J* = 9.0, 5.9, 1.6 Hz, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.62–7.41 (m, 3H), 7.13–6.96 (m, 2H), 6.86–6.62 (m, 2H), 2.68 (t, *J* = 7.5 Hz, 2H), 2.57 (t, *J* = 7.5 Hz, 2H), 2.11 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.90, 154.08, 148.16, 138.33, 136.48, 134.35, 133.32, 129.60, 127.98, 127.47, 121.62, 121.59, 116.68, 115.30, 37.32, 34.28, 27.31. **HRMS** calcd. for $C_{19}H_{19}N_2O_2^+$ $[M+H]^+$: 307.1441, Found: 307.1439. **X-ray** (single-crystal) Brown single crystals suitable for X-ray diffraction were obtained by slow evaporation of a saturated solution of **3j** in acetonitrile (CCDC 1835959).

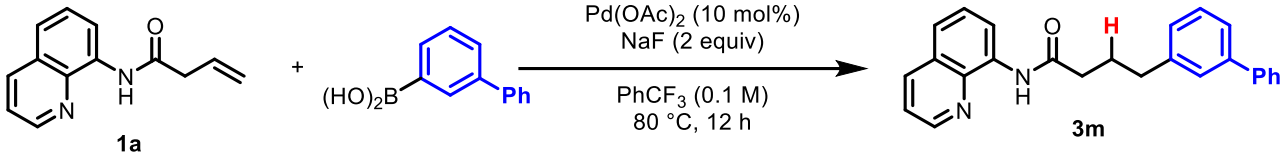



***N*-(quinolin-8-yl)-4-(*m*-tolyl)butanamide (3k):** The reaction was carried out according to General Procedure A at 80 ˚C using 3-methylphenylboronic acid (27.2 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 305.2 [M+H], cone voltage 15V). Purification afforded 29 mg (95%) of **3k** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.84–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.56–7.48 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.19 (t, *J* = 7.5 Hz, 1H), 7.08–7.00 (m, 3H), 2.73 (t, *J* = 7.6 Hz, 2H), 2.57 (t, *J* = 7.5 Hz, 2H), 2.33 (d, *J* = 0.8 Hz, 3H), 2.15 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.04, 147.64, 140.98, 137.89, 137.51,

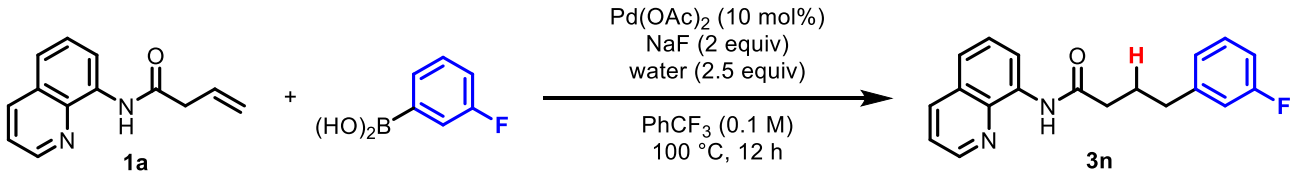
135.91, 134.07, 128.95, 127.85, 127.49, 126.99, 126.25, 125.13, 121.12, 120.92, 115.99, 36.89, 34.66, 26.60, 20.95. **HRMS** calcd. for $C_{20}H_{21}N_2O^+$ $[M+H]^+$: 305.1648, Found: 305.1649.




**4-(3-isopropylphenyl)-*N*-(quinolin-8-yl)butanamide (3l):** The reaction was carried out according to General Procedure A using 3-isopropylphenylboronic acid (32.8 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 25 mg (76%) of **3l** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.83–8.76 (m, 2H), 8.15 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.54 (t, *J* = 7.9 Hz, 1H), 7.49 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.44 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.23 (dd, *J* = 15.1, 7.5 Hz, 1H), 7.11–7.04 (m, 3H), 2.88 (hept, *J* = 6.8 Hz, 1H), 2.79–2.72 (m, 2H), 2.59 (t, *J* = 7.5 Hz, 2H), 2.16 (p, *J* = 7.6 Hz, 2H), 1.24 (d, *J* = 6.9 Hz, 6H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.64, 149.15, 148.22, 141.59, 138.47, 136.50, 134.66, 128.48, 128.08, 127.58, 126.91, 126.12, 124.13, 121.71, 121.51, 116.58, 37.58, 35.45, 34.22, 27.27, 24.18. **HRMS** calcd. for $C_{22}H_{25}N_2O^+$ $[M+H]^+$: 333.1961 Found: 333.1960.

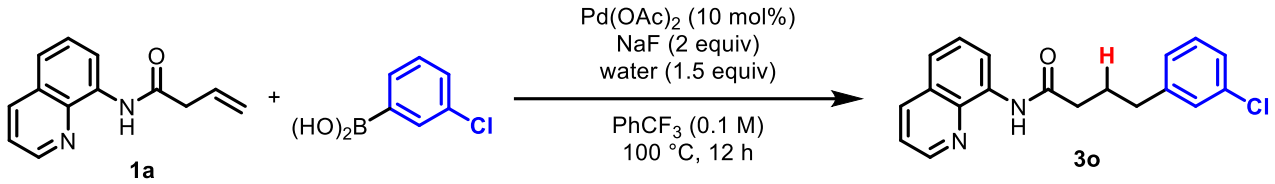



**4-([1,1'-biphenyl]-3-yl)-*N*-(quinolin-8-yl)butanamide (3m):** The reaction was carried out according to General Procedure A at 80 ˚C using 3-bisphenylboronic acid (39.6 mg, 0.2 mmol) and no water. The product was purified by preparative TLC (1% EtOAc/toluene) to afford 29 mg (79%) of **3m** as a white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.79 (d, *J* = 7.5 Hz, 1H), 8.76–8.71 (m, 1H), 8.15 (dt, *J* = 8.3, 1.3 Hz, 1H), 7.61–7.29 (m, 11H), 7.27–7.21 (m, 1H), 2.84 (t, *J* = 7.5 Hz, 2H), 2.61 (t, *J* = 7.4 Hz, 2H), 2.22 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.53, 148.25, 142.12, 141.52, 141.39, 138.45, 136.48, 134.62, 128.98, 128.81, 128.07, 127.65, 127.62, 127.56, 127.33, 127.31, 125.03, 121.70, 121.54, 116.58, 37.43, 35.39, 27.20. **HRMS** calcd. for $C_{25}H_{23}N_2O^+$ $[M+H]^+$: 367.1805 Found: 367.1807.

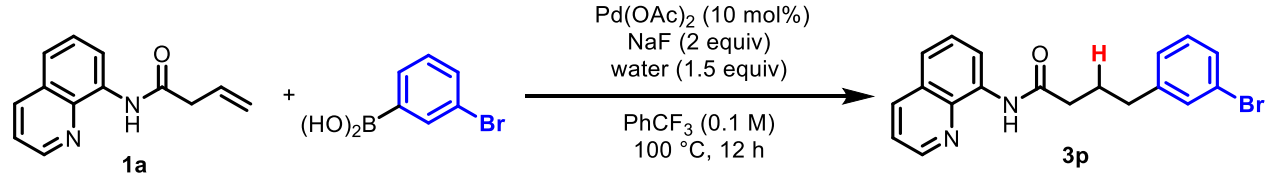



**4-(3-fluorophenyl)-*N*-(quinolin-8-yl)butanamide (3n):** The reaction was carried out according to General Procedure A using 3-fluorophenylboronic acid (28.0 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 28 mg (91%) of **3n** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.84–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.48 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.28–7.22 (m, 1H), 7.04–7.00 (m, 1H), 6.96 (dt, *J* = 10.0, 2.1 Hz, 1H), 6.92–6.86 (m, 1H), 2.76 (t, *J* = 7.6 Hz, 2H), 2.57 (t, *J* = 7.4 Hz, 2H), 2.15 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ171.28, 163.08 (d, *J* = 245.4 Hz), 148.26, 144.21 (d, *J* = 7.2 Hz), 138.44, 136.50, 134.56, 129.93 (d, *J* = 8.3 Hz), 128.07, 127.54, 124.33 (d, *J* = 2.7 Hz), 121.73, 121.58, 116.58, 115.52 (d, *J* = 20.9 Hz) 112.99 (d, *J* = 21.0 Hz), 37.24, 35.00,

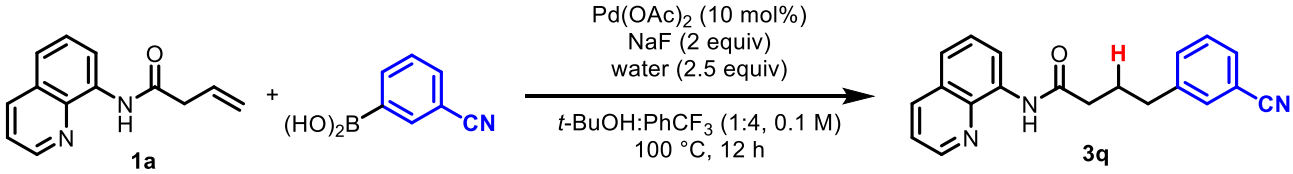
26.89. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –113.92. **HRMS** calcd. for $C_{19}H_{18}FN_2O^+$ $[M+H]^+$: 309.1398 Found: 309.1399.



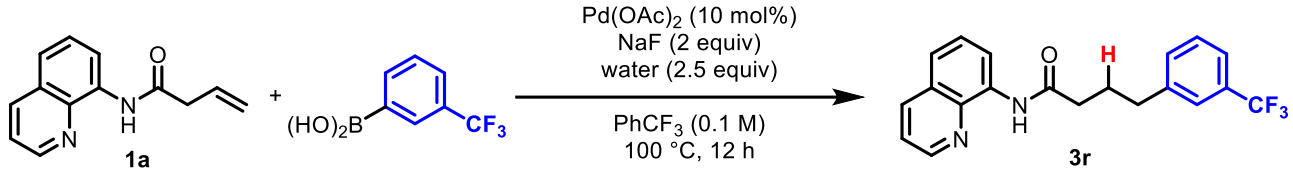

**4-(3-chlorophenyl)-*N*-(quinolin-8-yl)butanamide (3o):** The reaction was carried out according to General Procedure A using 3-chlorophenylboronic acid (31.2 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 27mg (83%) of **3o** as a colorless oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.86–8.74 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.48 (m, 2H), 7.46 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.28–7.15 (m, 3H), 7.12 (dt, *J* = 7.6, 1.5 Hz, 1H), 2.80–2.69 (m, 2H), 2.57 (t, *J* = 7.4 Hz, 2H), 2.15 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.27, 148.29, 143.68, 138.45, 136.52, 134.54, 134.30, 129.80, 128.82, 128.07, 127.55, 126.89, 126.33, 121.74, 121.61, 116.60, 37.23, 34.95, 26.92. **HRMS** calcd. for $C_{19}H_{18}N_2O^+$ $[M+H]^+$: 325.1102 Found: 325.1102.



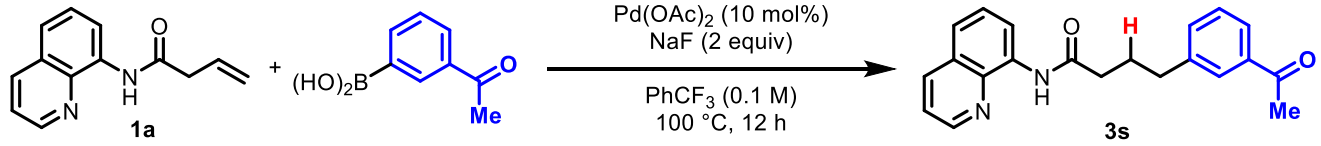

**4-(3-bromophenyl)-*N*-(quinolin-8-yl)butanamide (3p):** The reaction was carried out according to General Procedure A using 3-bromophenylboronic acid (40.1 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 27.3 mg (76%) of **3p** as a pale orange oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.86–8.79 (m, 2H), 8.19 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.52 (m, 2H), 7.48 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.43 (d, *J* = 1.8 Hz, 1H), 7.36 (dt, *J* = 6.4, 2.2 Hz, 1H), 7.21–7.16 (m, 2H), 2.77 (t, *J* = 7.6 Hz, 2H), 2.60 (t, *J* = 7.4 Hz, 2H), 2.17 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (151 MHz, $CDCl_3$) δ 171.24, 148.28, 144.01, 138.42, 136.54, 134.53, 131.73, 130.11, 129.26, 128.07, 127.56, 127.36, 122.62, 121.74, 121.61, 116.62, 37.23, 34.93, 26.94. **HRMS** calcd. for $C_{19}H_{18}BrN_2O^+$ $[M+H]^+$: 369.0597, Found: 369.0598.



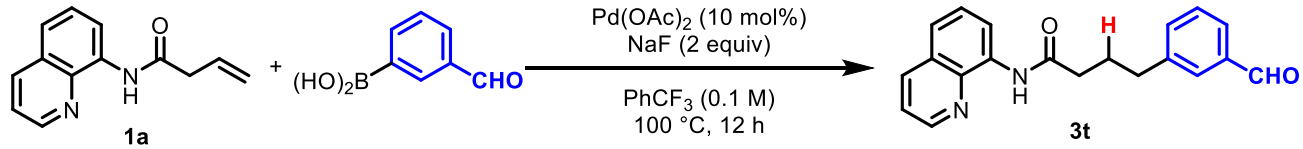

**4-(3-cyanophenyl)-*N*-(quinolin-8-yl)butanamide (3q):** The reaction was carried out according to General Procedure B using 3-cyanophenylboronic acid (29.4 mg, 0.2 mmol). The product was purified by preparative TLC (3% MeCN/hexanes) to afford 21 mg (66%) of **3q** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.83 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.77 (dd, *J* = 7.3, 1.6 Hz, 1H), 8.18 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.45 (m, 6H), 7.39 (t, *J* = 7.7 Hz, 1H), 2.84–2.77 (m, 2H), 2.59 (t, *J* = 7.3 Hz, 2H), 2.16 (p, *J* = 7.3 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.03, 148.39, 143.07, 138.43, 136.58, 134.42, 133.28, 132.24, 130.03, 129.37, 128.10, 127.54, 121.76, 119.10, 116.65, 112.59, 37.08, 34.82, 26.83. **HRMS** calcd. for $C_{20}H_{18}N_3O^+$ $[M+H]^+$: 316.1444, Found: 316.1443.



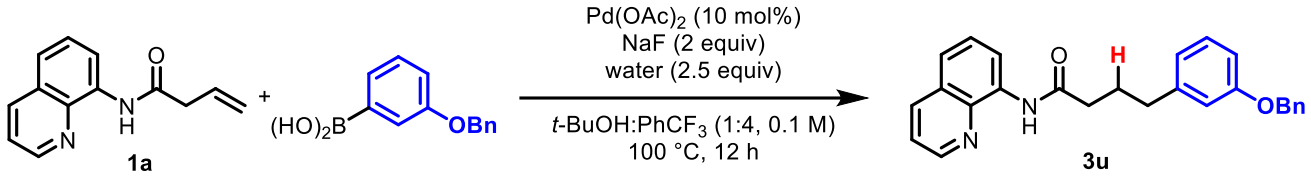

***N*-(quinolin-8-yl)-4-(3-(trifluoromethyl)phenyl)butanamide (3r):** The reaction was carried out according to General Procedure A using 3-(trifluoromethyl)phenylboronic acid (38.0 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 34 mg (95%) of **3r** as an off-white solid. **NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.79 (ddd, *J* = 8.9, 5.8, 1.6 Hz, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.37 (m, 7H), 2.85–2.81 (m, 2H), 2.60 (t, *J* = 7.3 Hz, 2H), 2.18 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.15, 148.29, 142.57, 138.45, 136.53, 134.53, 132.09, 130.85 (q, *J* = 31.9 Hz), 128.97, 128.08, 127.55, 121.76, 125.34 (q, *J* = 3.8 Hz), 124.36 (q, *J* = 272.1 Hz), 123.05 (q, *J* = 3.9 Hz).121.64, 116.60, 37.26, 35.12, 26.99. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –62.73. **HRMS** calcd. for $C_{20}H_{18}F_3N_2O^+$ $[M+H]^+$: 359.1366, Found: 359.1365.



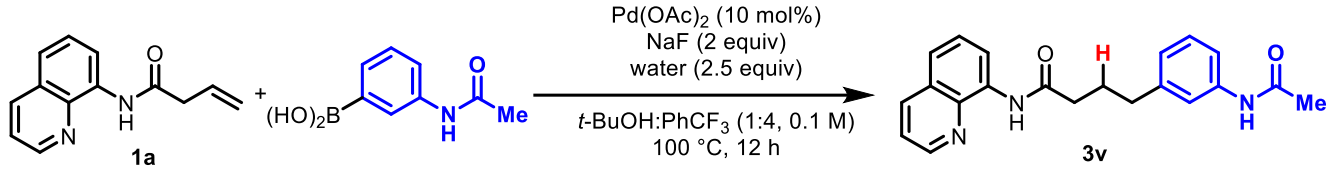

**4-(3-acetylphenyl)-*N*-(quinolin-8-yl)butanamide (3s):** The reaction was carried out according to General Procedure A using 3-acetylphenylboronic acid (32.8 mg, 0.2 mmol) and no water. The product was purified by preparative TLC (3% EtOAc/toluene) to afford 21 mg (63%) of **3s** as an orange oil. **$^{1}$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.91–8.65 (m, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.87–7.82 (m, 1H), 7.79 (dt, *J* = 7.7, 1.4 Hz, 1H), 7.58–7.49 (m, 2H), 7.48–7.42 (m, 2H), 7.39 (t, *J* = 7.6 Hz, 1H), 2.87–2.81 (m, 2H), 2.64–2.56 (m, 5H), 2.23–2.15 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 198.48, 171.32, 148.30, 142.19, 138.44, 137.46, 136.53, 134.53, 133.54, 128.82, 128.47, 128.08, 127.56, 126.35, 121.77, 121.64, 116.61, 37.33, 35.18, 27.07, 26.82. **HRMS** calcd. for $C_{21}H_{21}N_2O_2^+$ $[M+H]^+$: 333.1598, Found: 333.1597.



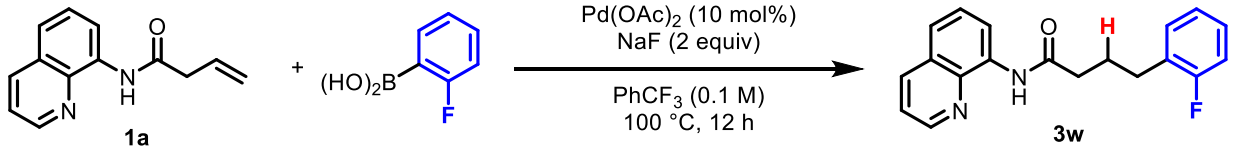

**4-(3-formylphenyl)-*N*-(quinolin-8-yl)butanamide (3t):** The reaction was carried out according to General Procedure A using 3-formylphenylboronic acid (30.0 mg, 0.2 mmol) and no water. The product was purified by preparative TLC (40% EtOAc/hexane) to afford 24 mg (75%) of **3t** as an off-white solid. **$^{1}$H NMR** (600 MHz, $CDCl_3$) δ 10.01 (s, 1H), 9.82 (s, 1H), 8.84–8.77 (m, 2H), 8.19 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.79 (q, *J* = 2.1 Hz, 1H), 7.74 (dt, *J* = 7.5, 1.5 Hz, 1H), 7.59–7.52 (m, 3H), 7.51–7.47 (m, 2H), 2.89 (t, 2H), 2.62 (t, *J* = 7.3 Hz, 2H), 2.26–2.18 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 192.63, 171.18, 148.31, 142.76, 138.44, 136.77, 136.55, 134.95, 134.52, 129.81, 129.27, 128.09, 127.83, 127.56, 121.77, 121.65, 116.61, 37.24, 34.99, 26.96. **HRMS** calcd. for $C_{20}H_{19}N_2O_2^+$ $[M+H]^+$: 319.1441, Found: 319.1443.



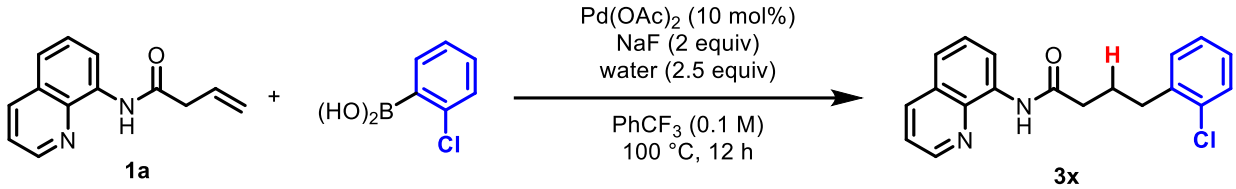

**4-(3-(benzyloxy)phenyl)-*N*-(quinolin-8-yl)butanamide (3u):** The reaction was carried out according to General Procedure A using 3-benzyloxyphenylboronic acid (45.6 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (3% EtOAc/toluene) to afford 38 mg (96% yield) of **3u** as a pale-yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.79 (ddt, *J* = 6.0, 4.3, 2.7 Hz, 2H), 8.15 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.62–7.47 (m, 2H), 7.47–7.35 (m, 5H), 7.35–7.18 (m, 2H), 6.95–6.79 (m, 3H), 5.04 (d, *J* = 2.3 Hz, 2H), 2.75 (td, *J* = 7.4, 2.3 Hz, 2H), 2.56 (td, *J* = 7.5, 2.3 Hz, 2H), 2.16 (dq, *J* = 9.3, 7.3 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.55, 159.07, 148.26, 143.30, 138.46, 137.25, 136.49, 134.64, 129.55, 128.68, 128.08, 128.03, 127.65, 127.57, 121.72, 121.53, 121.42, 116.58, 115.38, 112.43, 70.04, 37.35, 35.33, 27.00. **HRMS** calcd. for $C_{26}H_{25}N_2O_2^+$ $[M+H]^+$: 397.1911, Found: 397.1911.



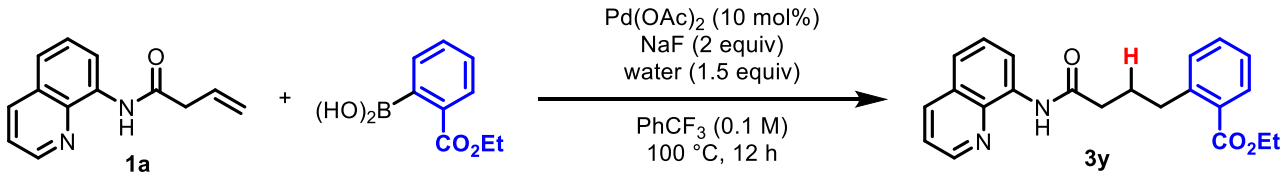

**4-(3-acetamidophenyl)-*N*-(quinolin-8-yl)butanamide (3v):** The reaction was carried out according to General Procedure B using 3-acetamidophenylboronic acid (35.8 mg, 0.2 mmol). The product was purified by preparative TLC (20% EtOAc/hexanes) to afford 26 mg (75% yield) of **3v** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.96–8.55 (m, 2H), 8.15 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.37 (m, 5H), 7.31 (s, 1H), 7.23 (t, *J* = 7.8 Hz, 1H), 6.97 (d, *J* = 7.6 Hz, 1H), 2.72 (t, *J* = 7.5 Hz, 2H), 2.55 (t, *J* = 7.5 Hz, 2H), 2.18–2.10 (m, 5H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ171.50, 168.44, 148.16, 142.40, 138.32, 138.05, 136.40, 134.43, 129.05, 127.95, 127.41, 124.55, 121.63, 121.51, 119.91, 117.68, 116.48, 37.22, 35.06, 26.87, 24.61. **HRMS** calcd. for $C_{21}H_{22}N_3O_2^+$ $[M+H]^+$: 348.1707, Found: 348.1707.



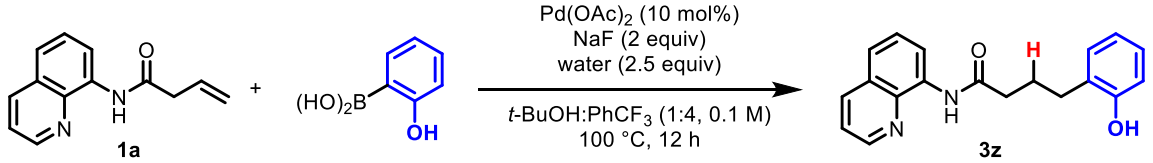

**4-(2-fluorophenyl)-*N*-(quinolin-8-yl)butanamide (3w):** The reaction was carried out according to General Procedure A using 2-fluorophenylboronic acid (28.0 mg, 0.2 mmol) and no water. The product was purified by preparative TLC (2% EtOAc/toluene) to afford 13 mg (42%) of **3w** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.85–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.43 (m, 3H), 7.32–7.22 (m, 1H), 7.18 (tdd, *J* = 7.4, 5.2, 1.8 Hz, 1H), 7.12–6.95 (m, 2H), 2.81 (t, *J* = 7.6 Hz, 2H), 2.60 (t, *J* = 7.5 Hz, 2H), 2.16 (p, *J* = 7.6 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 170.80, 160.74 (d, *J* = 244.8 Hz), 147.65, 137.88, 135.91, 134.04, 130.37 (d, *J* = 5.0 Hz),127.48, 127.84 (d, *J* = 15.9 Hz), 127.27 (d, *J* = 8.2 Hz), 126.97, 123.55 (d, *J* = 3.5 Hz), 121.12, 120.94, 116.01, 114.80 (d, *J* = 22.3 Hz), 36.85, 27.94, 25.33. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –118.85. **HRMS** calcd. for $C_{19}H_{18}FN_2O^+$ $[M+H]^+$: 309.1398, Found: 309.1397.



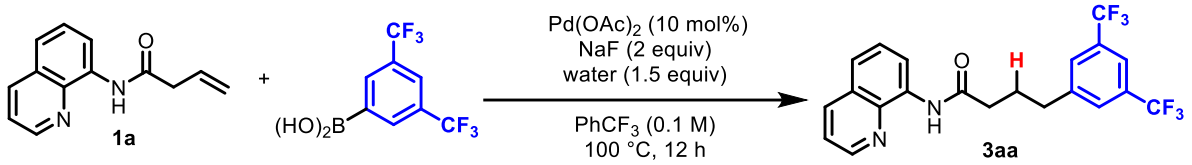

**4-(2-chlorophenyl)-*N*-(quinolin-8-yl)butanamide (3x):** The reaction was carried out according to General Procedure A using 2-chlorophenylboronic acid (31.3 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 325.1 [M+H], cone voltage 15V). Purification afforded 4 mg (12%) of **3x** as a colorless oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.92–8.60 (m, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.49 (m, 2H), 7.46 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.35 (dd, *J* = 7.9, 1.4 Hz, 1H), 7.29 (dd, *J* = 7.5, 1.7 Hz, 1H), 7.20 (td, *J* = 7.4, 1.4 Hz, 1H), 7.15 (td, *J* = 7.6, 1.8 Hz, 1H), 2.90 (t, *J* = 7.7 Hz, 2H), 2.63 (t, *J* = 7.5 Hz, 2H), 2.17 (p, *J* = 7.6 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.28, 148.13, 139.13, 138.35, 136.40, 134.50, 134.04, 130.61, 129.54, 127.96, 127.49, 127.46, 126.82, 121.60, 121.42, 116.49, 37.35, 32.88, 25.40. **HRMS** calcd. for $C_{19}H_{18}ClN_2O^+$ $[M+H]^+$: 325.1108, Found: 325.1110.



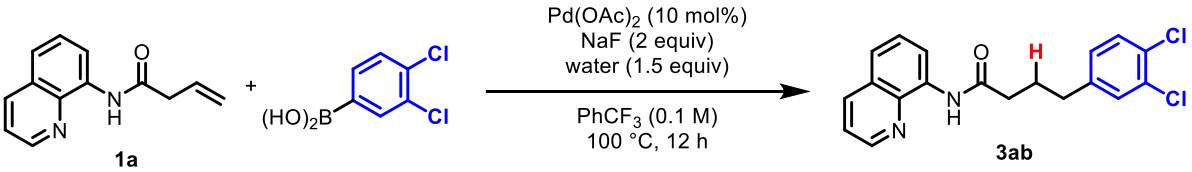

**ethyl 2-(4-oxo-4-(quinolin-8-ylamino)butyl)benzoate (3y):** The reaction was carried out according to General Procedure A using 2-ethoxylcarbonylphenylboronic acid (38.8 mg, 0.2 mmol) and water (2.7 µL, 1.5 equiv). The product was purified by preparative TLC (40% EtOAc/hexane) to afford 14 mg (39%) of **3y** as a pale yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.82–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.89 (dd, *J* = 7.8, 1.5 Hz, 1H), 7.56–7.51 (m, 1H), 7.50 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.47–7.41 (m, 2H), 7.33 (dd, *J* = 7.7, 1.3 Hz, 1H), 4.36 (q, *J* = 7.1 Hz, 2H), 3.15–3.07 (m, 2H), 2.63 (dd, *J* = 8.0, 7.1 Hz, 2H), 2.22–2.10 (m, 2H), 1.39 (t, *J* = 7.1 Hz, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.62, 167.82, 148.23, 143.46, 138.50, 136.49, 134.71, 132.05, 131.31, 130.87, 130.03, 128.08, 127.58, 126.20, 121.71, 121.48, 116.58, 61.01, 37.93, 33.89, 27.50, 14.47. **HRMS** calcd. for $C_{22}H_{23}N_2O_3^+$ $[M+H]^+$: 363.1703, Found: 363.1705.



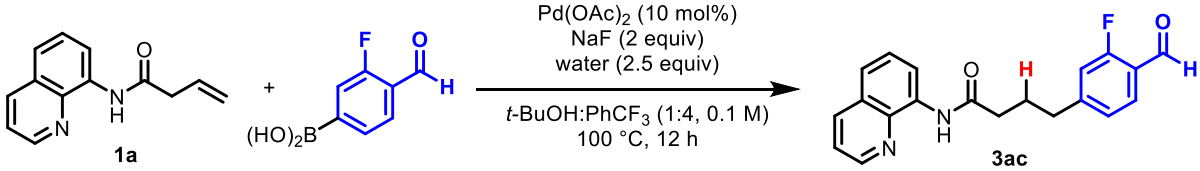

**4-(2-hydroxyphenyl)-*N*-(quinolin-8-yl)butanamide (3z):** The reaction was carried out according to General Procedure B using 2-hydroxyphenylboronic acid (27.6 mg, 0.2 mmol). The product was purified by preparative TLC (3% EtOAc/toluene) to afford 9 mg (29%) of **3z** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.92 (s, 1H), 8.88–8.76 (m, 2H), 8.18 (dd, *J* = 8.2, 1.7 Hz, 1H), 8.12 (s, 1H), 7.65–7.51 (m, 2H), 7.47 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.21–7.09 (m, 2H), 6.93 (dd, *J* = 8.0, 1.2 Hz, 1H), 6.84 (td, *J* = 7.4, 1.2 Hz, 1H), 2.79 (t, *J* = 7.5 Hz, 2H), 2.69–2.60 (m, 2H), 2.11–1.99 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 173.03, 155.42, 148.40, 138.45, 136.63, 134.10, 130.28, 128.09, 127.90, 127.58, 127.20, 122.13, 121.83, 120.12, 117.27, 116.79, 35.54, 29.47, 26.03. **HRMS** calcd. for $C_{19}H_{19}N_2O_2^+$ $[M+H]^+$: 307.1441, Found: 307.1439.



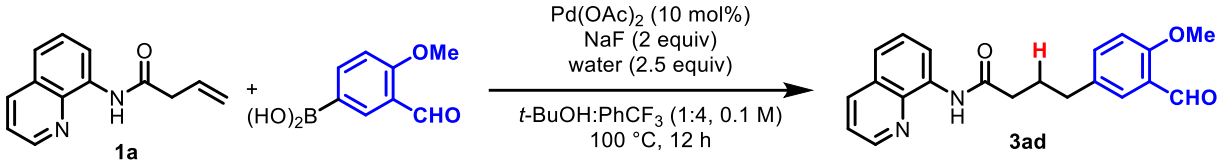

**4-(3,5-bis(trifluoromethyl)phenyl)-*N*-(quinolin-8-yl)butanamide (3aa):** The reaction was carried out according to General Procedure A using 3,5-bis(trifluoromethyl)phenylboronic acid (51.6 mg, 0.2 mmol) and water (2.7 μL, 1.5 equiv). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 36.5 mg (94%) of **3aa** as a white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.83–8.75 (m, 2H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.71 (d, *J* = 11.5 Hz, 3H), 7.59–7.52 (m, 2H), 7.47 (dd, *J* = 8.2, 4.2 Hz, 1H), 2.94–2.88 (m, 2H), 2.64 (t, *J* = 7.2 Hz, 2H), 2.24–2.15 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 170.74, 148.34, 144.16, 138.43, 136.58, 134.43, 131.79 (d, *J* = 33.0 Hz), 128.80, 128.11, 127.56, 123.54 (q, *J* = 272.6 Hz), 121.81, 121.77, 120.45–120.18 (m), 116.65, 37.09, 35.03, 26.81. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –63.04. **HRMS** calcd. for $C_{21}H_{17}F_6N_2O^+$ $[M+H]^+$: 427.1242, Found: 427.1242.



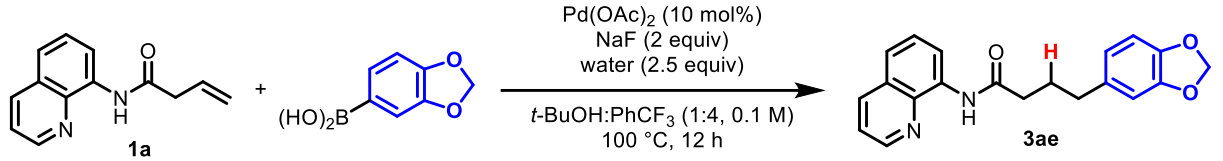

**4-(3,4-dichlorophenyl)-*N*-(quinolin-8-yl)butanamide (3ab):** The reaction was carried out according to General Procedure A using 3,4-dichlorophenylboronic acid (38.2 mg, 0.2 mmol) and water (2.7 μL, 1.5 equiv). The product was purified by preparative TLC (2% EtOAc/toluene) to afford 25 mg (70% yield) of **3ab** as a white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.88–8.75 (m, 2H), 8.19 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.52 (m, 2H), 7.48 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.40–7.35 (m, 2H), 7.09 (dd, *J* = 8.2, 2.1 Hz, 1H), 2.77–2.72 (m, 2H), 2.60 (t, *J* = 7.3 Hz, 2H), 2.15 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 170.97, 148.19, 141.76, 138.30, 136.41, 134.34, 132.28, 130.49, 130.32, 129.94, 128.03, 127.95, 127.41, 121.64, 121.56, 116.48, 36.95, 34.24, 26.66. **HRMS** calcd. for $C_{19}H_{17}Cl_2N_2O^+$ $[M+H]^+$: 359.0718, Found: 359.0718.



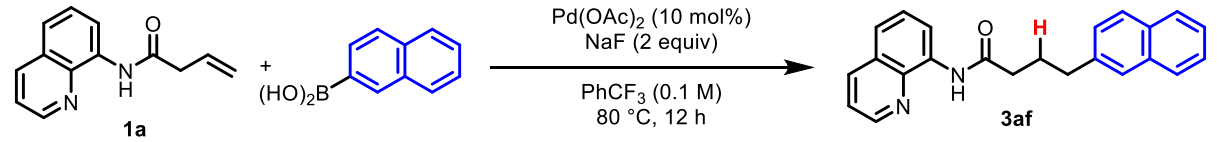

**4-(3-fluoro-4-formylphenyl)-*N*-(quinolin-8-yl)butanamide (3ac):** The reaction was carried out according to General Procedure B using 3-fluoro-4-formylphenylboronic acid (33.6 mg, 0.2 mmol). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 15 mg (45%) of **3ac** as a yellow solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 10.31 (s, 1H), 9.79 (s, 1H), 8.91–8.68 (m, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.79 (t, *J* = 7.6 Hz, 1H), 7.58–7.49 (m, 2H), 7.47 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.18–7.13 (m, 1H), 7.07 (dd, *J* = 11.4, 1.4 Hz, 1H), 2.87–2.81 (m, 2H), 2.60 (t, *J* = 7.2 Hz, 2H), 2.18 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 186.46, 170.26, 164.36 (d, *J* = 258.7 Hz), 151.39 (d, *J* = 8.7 Hz), 147.72, 137.82, 135.97, 133.85, 128.30 (d, *J* = 2.6 Hz), 127.50, 126.95, 124.57 (d, *J* = 2.9 Hz), 121.85 (d, *J* = 8.2 Hz), 121.21, 121.14, 116.02, 115.88 (d, *J* = 20.3 Hz), 36.45, 34.77, 25.80. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –122.41. **HRMS** calcd. for $C_{20}H_{18}FN_2O_2^+$ $[M+H]^+$: 337.1347, Found: 337.1348.



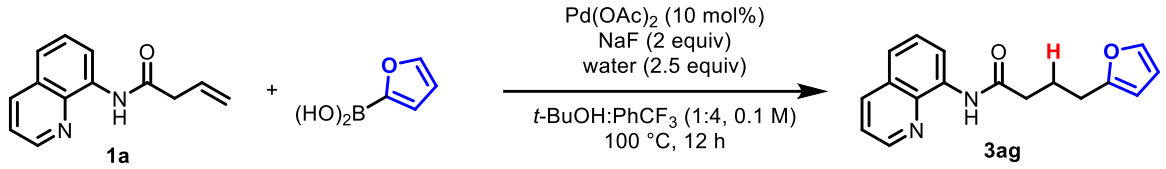

**4-(3-formyl-4-methoxyphenyl)-*N*-(quinolin-8-yl)butanamide (3ad):** The reaction was carried out according to General Procedure B using 3-formyl-4-methoxyphenylboronic acid (36.2 mg, 0.2 mmol). The product was purified by preparative TLC (2% EtOAc/toluene) to afford 11 mg (32%) of **3ad** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 10.43 (s, 1H), 9.78 (s, 1H), 8.89–8.74 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.70 (d, *J* = 2.4 Hz, 1H), 7.59–7.49 (m, 2H), 7.45 (ddd, *J* = 9.8, 8.3, 3.3 Hz, 2H), 6.92 (d, *J* = 8.5 Hz, 1H), 3.89 (s, 3H), 2.75 (t, *J* = 7.6 Hz, 2H), 2.57 (t, *J* = 7.4 Hz, 2H), 2.14 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 190.05, 171.34, 160.49, 148.31, 138.44, 136.50, 136.29, 134.58, 133.92, 128.34, 128.07, 127.53, 124.75, 121.75, 121.57, 116.56, 111.97, 55.86, 37.32, 34.21, 27.11. **HRMS** calcd. for $C_{21}H_{21}N_2O_3^+$ $[M+H]^+$: 349.1547, Found: 349.1547.



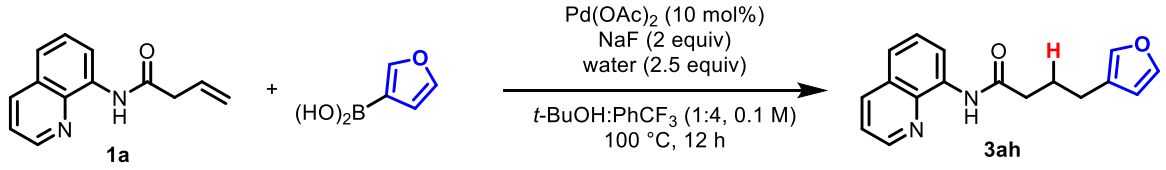

**4-(benzo[*d*][1,3]dioxol-5-yl)-*N*-(quinolin-8-yl)butanamide (3ae):** The reaction was carried out according to General Procedure B using 3,4-methylenedioxyphenylboronic acid (33.2 mg, 0.2 mmol). The product was purified by preparative TLC (20% EtOAc/hexanes) to afford 14 mg (42%) of **3ae** as an orange oil. **$^1$H NMR** (500 MHz, $(CD_3)_2CO$) δ 9.88 (s, 1H), 8.97–8.72 (m, 2H), 8.36 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.79–7.40 (m, 3H), 6.87–6.67 (m, 3H), 6.02–5.86 (m, 2H), 2.90–2.79 (m, 2H), 2.66 (dt, *J* = 35.0, 7.4 Hz, 2H), 2.09–2.02 (m, 2H). **$^{13}$C NMR** (150 MHz, $(CD_3)_2CO$) δ 171.85, 149.41, 148.62, 146.69, 139.13, 137.32, 136.64, 135.94, 129.01, 127.96, 122.81, 122.14, 116.76, 109.69, 108.82, 101.68, 37.41, 37.36, 35.53, 28.32. **HRMS** calcd. for $C_{20}H_{19}N_2O_3^+$ $[M+H]^+$: 335.1390, Found: 335.1392.



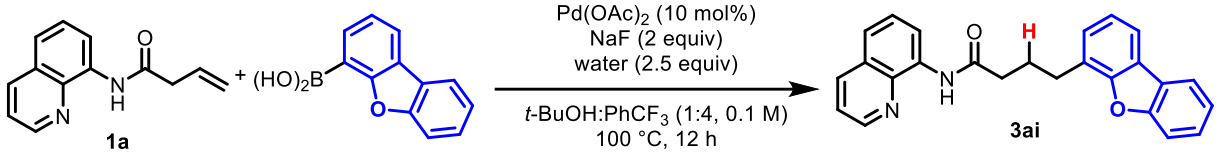

**4-(naphthalen-2-yl)-*N*-(quinolin-8-yl)butanamide (3af):** The reaction was carried out according to General Procedure A at 80 ˚C using 2-napthylboronic acid (24.4 mg, 0.2 mmol) and no water. The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 341.2 [M+H], cone voltage 15V). Purification afforded 17 mg (50%) of **3af** as an off-white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.83–8.76 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.82–7.74 (m, 3H), 7.68 (dd, *J* = 1.7, 0.9 Hz, 1H), 7.57–7.48 (m, 2H), 7.47–7.37 (m, 4H), 2.94 (t, *J* = 7.5 Hz, 2H), 2.61 (t, *J* = 7.4 Hz, 2H), 2.26 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.57, 148.25, 139.12, 138.47, 136.50, 134.64, 133.74, 132.23, 128.17, 128.08, 127.74, 127.61, 127.58, 127.44, 126.86, 126.04, 125.34, 121.72, 121.55, 116.59, 37.39, 35.44, 27.01. **HRMS** calcd. for $C_{23}H_{21}N_2O^+$ $[M+H]^+$: 341.1648, Found: 341.1646.



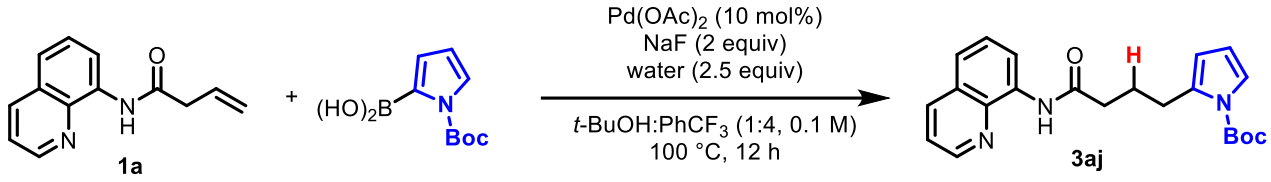

**4-(furan-2-yl)-*N*-(quinolin-8-yl)butanamide (3ag):** The reaction was carried out according to General Procedure B using 2-furanylboronic acid (22.3 mg, 0.2 mmol). The product was purified by preparative TLC (5% ether/toluene) to afford 7 mg (25%) of **3ag** as a bright orange solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.83–8.76 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.56–7.52 (m, 1H), 7.50 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.33 (dd, *J* = 1.9, 0.8 Hz, 1H), 6.29 (dd, *J* = 3.1, 1.9 Hz, 1H), 6.09–6.05 (m, 1H), 2.80 (td, *J* = 7.3, 0.8 Hz, 2H), 2.61 (t, *J* = 7.4 Hz, 2H), 2.18 (p, *J* = 7.3 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.36, 155.35, 148.26, 141.21, 138.48, 136.52, 134.65, 128.09, 127.58, 121.73, 121.55, 116.59, 110.27, 105.60, 37.25, 27.46, 24.11. **HRMS** calcd. for $C_{17}H_{17}N_2O_2^+$ $[M+H]^+$: 281.1285, Found: 281.1286.



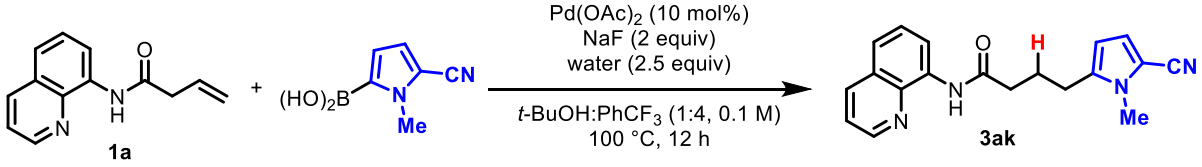

**4-(furan-3-yl)-N-(quinolin-8-yl)butanamide (3ah):** The reaction was carried out according to General Procedure B using 3-furanylboronic acid (22.4 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 10 mg (38%) of **3ah** as a white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.84–8.73 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.48 (m, 2H), 7.46 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.39–7.36 (m, 1H), 7.29 (t, *J* = 1.2 Hz, 1H), 6.38–6.28 (m, 1H), 2.65–2.52 (m, 4H), 2.09 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.39, 148.11, 142.89, 139.17, 138.31, 136.37, 134.46, 127.93, 127.42, 124.13, 121.58, 121.41, 116.42, 110.90, 37.26, 25.74, 24.14. **HRMS** calcd. for $C_{17}H_{17}N_2O_2^+$ $[M+H]^+$: 281.1285, Found: 281.1284.



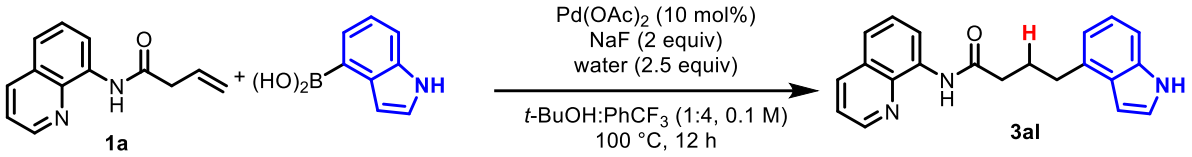

**4-(dibenzo[b,d]furan-4-yl)-N-(quinolin-8-yl)butanamide (3ai):** The reaction was carried out according to General Procedure B using 4-(dibenzofuranyl)boronic acid (42.4 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 2.7 mg (7%) of **3ai** as a light yellow solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.80 (d, *J* = 7.5 Hz, 1H), 8.72 (d, *J* = 4.3 Hz, 1H), 8.15 (d, *J* = 8.2 Hz, 1H), 7.92 (d, *J* = 7.6 Hz, 1H), 7.81 (d, *J* = 7.6 Hz, 1H), 7.59–7.46 (m, 3H), 7.46–7.37 (m, 2H), 7.37–7.27 (m, 3H), 3.15 (t, *J* = 7.5 Hz, 2H), 2.65 (t, *J* = 7.5 Hz, 2H), 2.44–2.25 (m, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.41, 155.99, 154.79, 148.04, 138.30, 136.29, 134.52, 127.90, 127.47, 127.42, 126.90, 125.44, 124.52, 123.93, 122.81, 122.51, 121.53, 121.35, 120.61, 118.46, 116.43, 111.67, 37.43, 29.22, 25.59. **HRMS** calcd. for $C_{25}H_{21}N_2O_2^+$ $[M+H]^+$: 381.1598, Found: 381.1595.



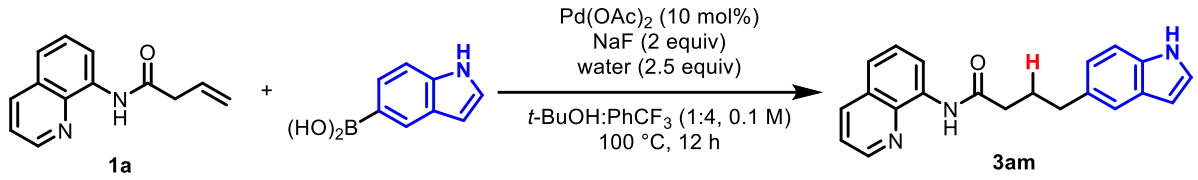

**tert-butyl 2-(4-oxo-4-(quinolin-8-ylamino)butyl)-1H-pyrrole-1-carboxylate (3aj):** The reaction was carried out according to General Procedure B using *N*-Boc-2-pyrroleboronic acid (42.2 mg, 0.2 mmol). The product was purified by preparative TLC (3% EtOAc/toluene) to afford 9 mg (24%) of **3aj** as a dark orange oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.98–8.63 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.54 (t, *J* = 7.9 Hz, 1H), 7.50 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.20 (dd, *J* = 3.4, 1.8 Hz, 1H), 6.09 (t, *J* = 3.3 Hz, 1H), 6.06 (s, 1H), 3.00 (t, *J* = 7.4 Hz, 2H), 2.63 (t, *J* = 7.6 Hz, 2H), 2.16 (p, *J* = 7.5 Hz, 2H), 1.58 (s, 9H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.66, 149.62, 148.23, 138.48, 136.50, 135.10, 134.69, 128.08, 127.58, 121.70, 121.49, 121.23, 116.59, 111.77, 110.09, 83.54, 37.68, 28.42, 24.88. **HRMS** calcd. for $C_{22}H_{26}N_3O_3^+$ $[M+H]^+$: 380.1969, Found: 380.1970.



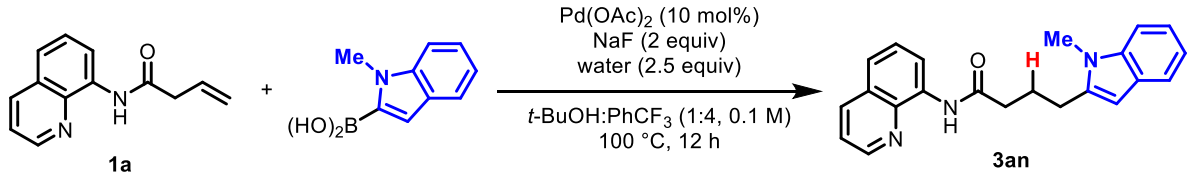

**4-(5-cyano-1-methyl-1H-pyrrol-2-yl)-N-(quinolin-8-yl)butanamide (3ak):** The reaction was carried out according to General Procedure B using 5-cyano-1-methyl-1H-pyrrol-2-ylboronic acid (30.0 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 6.6 mg (21%) of **3ak** as an off-white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.81 (bs, 1H), 8.82 (d, J=2.8 Hz, 1H), 8.77 (d, J=6.0 Hz, 1H), 8.19 (d, J=7.7 Hz, 1H), 7.51–7.59 (m, 2H), 7.48 (dd, J=8.2, 4.2 Hz, 1H), 6.73 (d, J=3.9 Hz, 1H), 6.02 (d, J=3.8 Hz, 1H), 3.68 (s, 3H), 2.75 (t, J=7.6 Hz, 2H), 2.67 (t, J=7.0 Hz, 2H), 2.16 (p, J=7.3 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 170.71, 148.18, 138.94, 138.24, 136.57, 134.30, 128.01, 127.47, 121.71, 121.66, 119.13, 116.58, 114.45, 107.88, 103.86, 36.75, 32.33, 25.97, 23.98. **HRMS** calcd. for $C_{19}H_{19}N_4O^+$ $[M+H]^+$: 319.1553, Found: 319.1546.



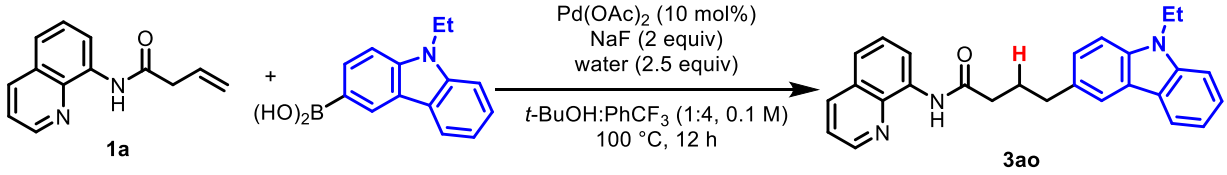

**4-(1*H*-indol-4-yl)-*N*-(quinolin-8-yl)butanamide (3al):** The reaction was carried out according to General Procedure B using 4-indolylboronic acid (32.2 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER Pyridine-Diol column with methanol to afford 9.7 mg (29%) of **3al** as an off-white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.98 (bs, 1H), 8.81–8.88 (m, 2H), 8.28 (d, J=7.6 Hz, 1H), 7.99 (bs, 1H), 7.67 (d, J=7.8 Hz, 1H), 7.58–7.64 (m, 1H), 7.51–7.57 (m, 2H), 7.36 (d, J=8.1 Hz, 1H), 7.16–7.22 (m, 1H), 7.10–7.14 (m, 1H), 7.06–7.09 (m, 1H), 2.95 (t, J=7.3 Hz, 2H), 2.65–2.74 (m, 2H), 2.27 (p, J=7.4 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.82, 148.10, 138.34, 136.78, 134.56, 127.99, 127.54, 127.50, 122.16, 121.63, 121.59, 121.40, 119.35, 119.02, 116.53, 115.72, 111.10, 77.26, 37.66, 25.94, 24.60. **HRMS** calcd. for $C_{21}H_{20}N_3O^+$ $[M+H]^+$: 330.1601, Found: 330.1601.



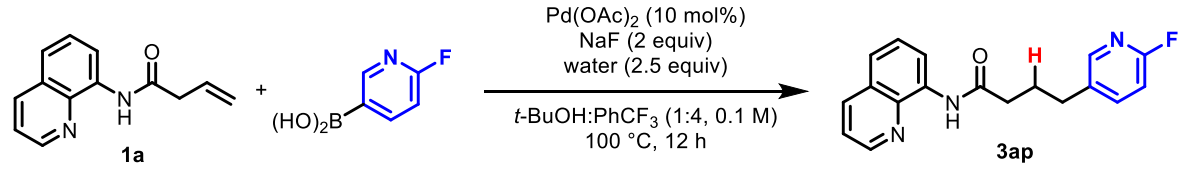

**4-(1H-indol-5-yl)-N-(quinolin-8-yl)butanamide (3am):** The reaction was carried out according to General Procedure B using 5-indolylboronic acid (32.2 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 13 mg (40%) of **3am** as a white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.87–8.74 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 8.06 (s, 1H), 7.66 (d, *J* = 7.9 Hz, 1H), 7.59–7.47 (m, 2H), 7.45 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.36 (d, *J* = 8.1 Hz, 1H), 7.19 (t, *J* = 7.5 Hz, 1H), 7.11 (t, *J* = 7.4 Hz, 1H), 7.05 (s, 1H), 2.93 (t, *J* = 7.4 Hz, 2H), 2.64 (t, *J* = 7.4 Hz, 2H), 2.27 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.75, 148.06, 138.31, 136.37, 136.33, 134.51, 127.91, 127.47, 127.42, 121.89, 121.58, 121.53, 121.33, 119.17, 118.95, 116.41, 115.64, 111.05, 77.32, 77.00, 76.68, 37.60, 25.88, 24.54. **HRMS** calcd. for $C_{21}H_{19}N_3O^+$ $[M+H]^+$: 352.1420, Found: 352.1418.



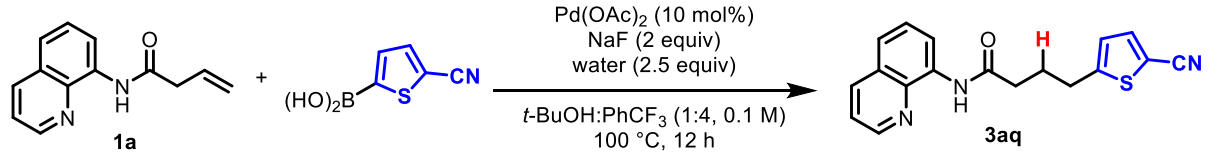

**4-(1-methyl-1H-indol-2-yl)-N-(quinolin-8-yl)butanamide (3an):** The reaction was carried out according to General Procedure B using *N*-methylindole-2-boronic acid (35.0 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP 150×4.6mm column with methanol to afford 16 mg (47%) of **3an**. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.79 (bs, 1H), 8.72–8.87 (m, 2H), 8.16 (d, J=8.0 Hz, 1H), 7.64 (d, J=7.8 Hz, 1H), 7.47–7.59 (m, 2H), 7.45 (dd, J=8.2, 4.2 Hz, 1H), 7.24–7.32 (m, 1H), 7.18–7.24 (m, 1H), 7.06–7.13 (m, 1H), 6.92 (s, 1H), 3.74 (s, 3H), 2.92 (t, J=7.2 Hz, 2H), 2.63 (t, J=7.3 Hz, 2H), 2.25 (p, J=7.3 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 172.25, 148.47, 138.73, 137.53, 136.88, 134.99, 128.40, 128.34, 127.92, 127.00, 121.99, 121.91, 121.78, 119.53, 119.06, 116.95, 114.53, 109.56, 38.04, 33.02, 26.56, 24.89. **HRMS** calcd. for $C_{22}H_{22}N_3O^+$ $[M+H]^+$: 344.1757, Found: 344.1759.



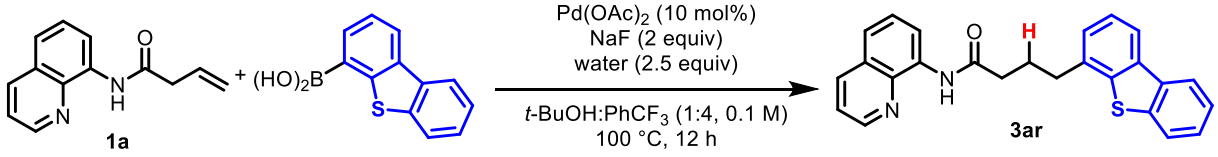

**4-(9-ethyl-9H-carbazol-3-yl)-N-(quinolin-8-yl)butanamide (3ao):** The reaction was carried out according to General Procedure B using 9-ethyl-3-carbazole boronic acid (47.8mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP 150×4.6mm column with methanol to afford 15 mg (36%) of **3ao** as an off-white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 10.07 (b s, 1H), 8.86 (d, J= 7.7 Hz, 1H), 8.77 (dd, J= 4.5, 1.7 Hz, 1H), 8.31 (s, 1H), 8.04 (d, J= 7.7 Hz, 1H), 7.98 (s, 1H), 7.56–7.50 (m, 3H), 7.45–7.29 (m, 4H), 7.17 (t, J= 7.4 Hz, 1H), 7.34–7.26 (m, 2H), 2.98 (t, J= 7.5 Hz, 2H), 2.73 (t, J= 7.1 Hz, 2H), 2.27 (p, J= 7.4 Hz, 2H), 1.40 (t, J= 7.2 Hz, 3H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.9, 148.0, 140.3, 138.7, 136.8, 134.6, 132.0, 128.1, 127.7, 126.6, 125.6, 123.2, 122.9, 121.6, 121.5, 120.5, 120.3, 118.7, 116.9, 108.5, 37.7, 37.5, 35.4, 27.9, 14.0 (Note: two $sp^2$ carbons not observed, possibly due to signal overlap). **HRMS** calcd. for $C_{27}H_{26}N_3O^+$ $[M+H]^+$: 408.2070, Found: 408.2086.



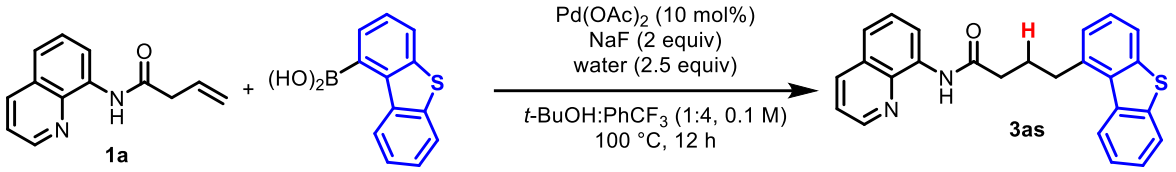

**4-(6-fluoropyridin-3-yl)-*N*-(quinolin-8-yl)butanamide (3ap):** The reaction was carried out according to General Procedure B using 6-fluoro-3-pyridylboronic acid (28.2 mg, 0.2 mmol). The product was purified by preparative TLC (20% EtOAc/hexanes) to afford 5 mg (16%) of **3ap** as an orange solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.86–8.72 (m, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 8.09 (d, *J* = 2.5 Hz, 1H), 7.68 (td, *J* = 8.0, 2.6 Hz, 1H), 7.61–7.48 (m, 2H), 7.47 (dd, *J* = 8.2, 4.2 Hz, 1H), 6.87 (dd, *J* = 8.3, 2.9 Hz, 1H), 2.82–2.71 (m, 2H), 2.61 (t, *J* = 7.3 Hz, 2H), 2.15 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 170.95, 162.56 (d, *J* = 237.2 Hz), 148.33, 147.25 (d, *J* = 14.1 Hz), 141.31 (d, *J* = 7.6 Hz), 138.43, 136.57, 134.53 (d, *J* = 4.2 Hz), 134.45, 128.10, 127.55, 121.78 (d, *J* = 9.4 Hz), 116.63, 109.35, 109.23. **$^{19}$F NMR** (376 MHz, $CDCl_3$) δ –72.11. **HRMS** calcd. for $C_{17}H_{18}FN_3O^+$ $[M+H]^+$: 310.1350, Found: 310.1351.



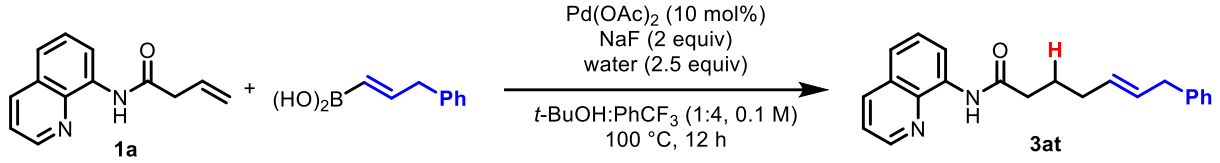

**4-(5-cyanothiophen-2-yl)-N-(quinolin-8-yl)butanamide (3aq):** The reaction was carried out according to General Procedure B using 5-cyanothiophene-2-boronic acid (30.5 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 6 mg (19%) of **3aq** as an off-white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.93 (bs, 1H), 8.84 (dd, J=4.3, 1.5 Hz, 1H), 8.80 (dd, J=7.1, 1.3 Hz, 1H), 8.26 (d, J=8.0 Hz, 1H), 7.56–7.63 (m, 2H), 7.51–7.56 (m, 1H), 7.48 (d, J=3.8 Hz, 1H), 6.89 (d, J=3.8 Hz, 1H), 3.04 (t, J=7.6 Hz, 2H), 2.59–2.73 (m, 2H), 2.23 (p, J=7.4 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.20, 152.86, 148.23, 138.29, 137.78, 136.48, 134.29, 127.99, 127.44, 125.50, 121.72, 121.69, 116.52, 114.54, 107.39, 36.58, 29.41, 26.92. **HRMS** calcd. for $C_{18}H_{16}N_3OS^+$ $[M+H]^+$: 322.1009, Found: 322.1012.



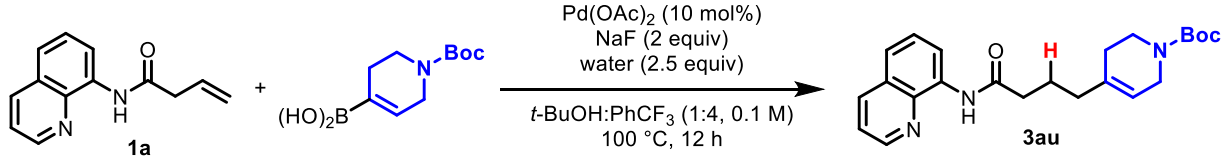

**4-(dibenzo[b,d]thiophen-4-yl)-N-(quinolin-8-yl)butanamide (3ar):** The reaction was carried out according to General Procedure B using 4-dibenzothienylboronic acid (45.6 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 14 mg (36%) of **3ar** as a white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.80 (dd, *J* = 7.3, 1.5 Hz, 1H), 8.74 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.18–8.09 (m, 2H), 8.09–7.99 (m, 1H), 7.89–7.78 (m, 1H), 7.58–7.47 (m, 2H), 7.47–7.39 (m, 4H), 7.37 (d, *J* = 7.3 Hz, 1H), 3.07 (t, *J* = 7.5 Hz, 2H), 2.66 (t, *J* = 7.4 Hz, 2H), 2.37 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.17, 148.04, 139.27, 139.08, 138.28, 136.28, 136.11, 135.75, 135.69, 134.47, 127.89, 127.40, 126.59, 126.41, 124.86, 124.31, 122.77, 121.67, 121.52, 121.37, 119.50, 116.44, 37.31, 34.36, 24.80. **HRMS** calcd. for $C_{25}H_{21}N_2OS^+$ $[M+H]^+$: 397.1369, Found: 397.1364.



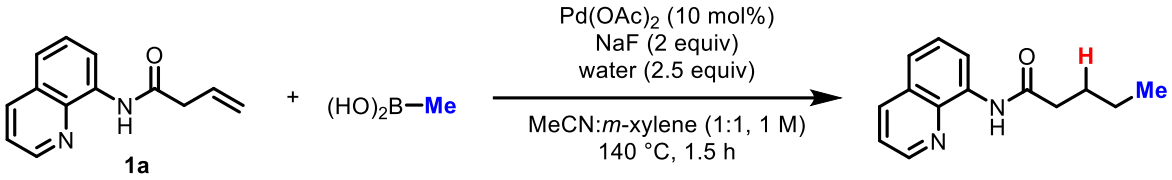

**4-(dibenzo[b,d]thiophen-1-yl)-N-(quinolin-8-yl)butanamide (3as):** The reaction was carried out according to General Procedure B using 1-dibenzothienylboronic acid (45.6 mg, 0.2 mmol). The product was purified by SFC on a Zymor SPHER HADP column with methanol to afford 12 mg (31%) of **3as** as a white solid. **$^1$H NMR** (400 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.86–8.77 (m, 1H), 8.74 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.22–8.09 (m, 2H), 8.02 (d, *J* = 7.7 Hz, 1H), 7.83 (dd, *J* = 6.1, 3.0 Hz, 1H), 7.58–7.47 (m, 2H), 7.43 (td, *J* = 8.0, 4.0 Hz, 4H), 7.37 (d, *J* = 7.3 Hz, 1H), 3.07 (t, *J* = 7.5 Hz, 2H), 2.66 (t, *J* = 7.4 Hz, 2H), 2.37 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (101 MHz, $CDCl_3$) δ 171.17, 148.04, 139.27, 139.08, 138.28, 136.28, 136.11, 135.75, 135.69, 134.47, 127.89, 127.40, 126.59, 126.41, 124.86, 124.31, 122.77, 121.67, 121.52, 121.37, 119.50, 116.44, 37.31, 34.36, 24.81. **HRMS** calcd. for $C_{25}H_{21}N_2OS^+$ $[M+H]^+$: 397.1369, Found: 397.1368.




**(E)-7-phenyl-*N*-(quinolin-8-yl)hept-5-enamide (3at):** The reaction was carried out according to General Procedure B using *E*-3-phenylpropen-1-yl-boronic acid (32.4 mg, 0.2 mmol). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 331.2 [M+H], cone voltage 15V). Purification afforded 11 mg (33%) of **3at** (20:80 *Z/E*) as a yellow solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.84–8.63 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.54 (t, *J* = 7.9 Hz, 1H), 7.50 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.27 (t, *J* = 6.9 Hz, 2H), 7.21–7.16 (m, 3H), 5.71–5.61 (m, 1H), 5.59–5.49 (m, 1H), 3.35 (d, *J* = 6.7 Hz, 2H), 2.57 (t, *J* = 7.6 Hz, 2H), 2.19 (q, *J* = 7.2 Hz, 2H), 1.92 (p, *J* = 7.4 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.84, 148.25, 140.99, 138.49, 136.52, 134.69, 130.90, 130.28, 128.63, 128.51, 128.09, 127.61, 126.04, 121.72, 121.50, 116.57, 39.17, 37.64, 32.10, 25.44. **HRMS** calcd. for $C_{22}H_{23}N_2O^+$ $[M+H]^+$: 331.1810, Found: 331.1812.

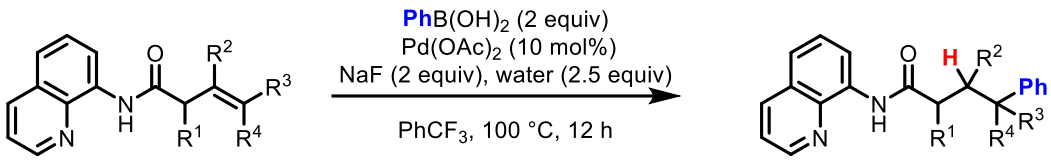



***tert*-butyl 4-(4-oxo-4-(quinolin-8-ylamino)butyl)-3,6-dihydropyridine-1(2H)-carboxylate(3au):** The reaction was carried out according to General Procedure B using *N*-Boc-1,2,3,6-tetrahydropyridine-4-boronic acid (45.4 mg, 0.2 mmol). The product was purified by preparative TLC (20% EtOAc/hexanes) to afford 12 mg (30%) of **3au** as a colorless oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.88–8.68 (m, 2H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.62–7.41 (m, 3H), 5.43 (s, 1H), 3.86 (s, 2H), 3.50 (d, *J* = 5.9 Hz, 2H), 2.55 (t, *J* = 7.4 Hz, 2H), 2.18–2.03 (m, 4H), 1.95 (p, *J* = 7.4 Hz, 2H), 1.47 (s, 9H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.62, 148.28, 138.47, 136.54, 134.63, 128.10, 127.60, 121.75, 121.56, 116.57, 79.58, 37.51, 36.68, 29.85, 28.65, 28.53, 28.29, 23.17. **HRMS** calcd. for $C_{23}H_{30}N_3O_3^+$ $[M+H]^+$: 396.2282, Found: 396.2279.

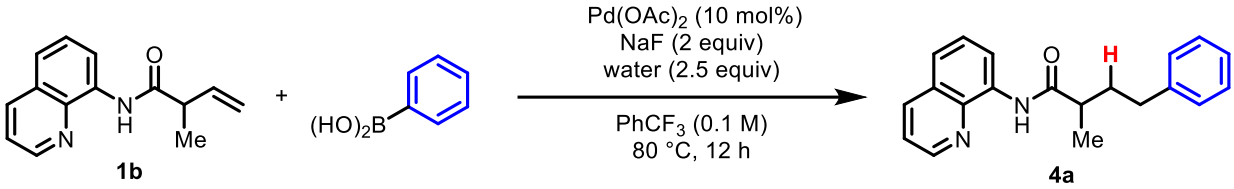



***N*-(quinolin-8-yl)pentanamide (6):** The reaction was carried out according to General Procedure A at 140 ˚C using MeCN:*m*-xylene (1:1, 0.1 mL), methylboronic acid (28.2 mg, 0.2 mmol) and water (4.5 µL, 2.5 equiv). The product was purified by preparative TLC (2% EtOAc/tol) to afford 4 mg (18%) of **6** as an orange oil. **$^{1}$H NMR** (600 MHz, $CDCl_3$) 9.81 (s, 1H), 8.80 (ddd, *J* = 8.9, 5.9, 1.5 Hz, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.54 (t, *J* = 7.9 Hz, 1H), 7.50 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.46 (dd, *J* = 8.3, 4.2 Hz, 1H), 2.57 (t, *J* = 7.6 Hz, 2H), 1.81 (p, *J* = 7.6 Hz, 2H), 1.47 (h, *J* = 7.4 Hz, 2H), 0.99 (t, *J* = 7.4 Hz, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 172.07, 148.25, 138.50, 136.52, 134.74, 128.09, 127.61, 121.70, 121.45, 116.55, 38.17, 27.92, 22.60, 14.02. **HRMS** calcd. for $C_{14}H_{17}N_2O^+$ $[M+H]^+$: 229.1335, Found: 229.1335.

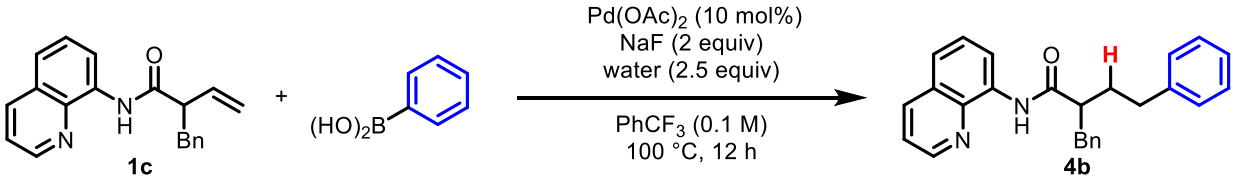
**General Procedure for Evaluating Alkene Scope**



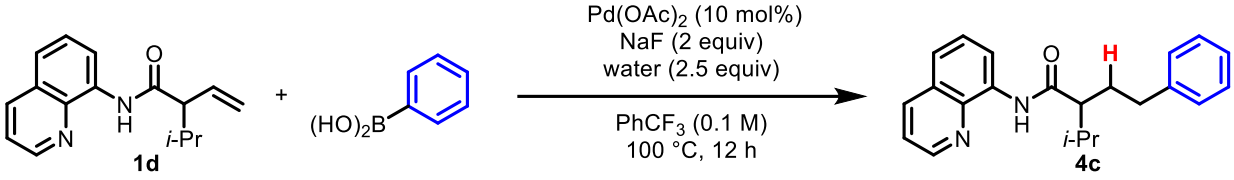

Unless otherwise stated, the procedure for evaluating the alkene scope was as follows.
**General Procedure C:** To a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (2.2 mg, 0.01 mmol), alkene (21.2 mg, 0.1 mmol), phenylboronic acid (24.4 mg, 0.2 mmol), NaF (8.4 mg, 0.2 mmol), water (4.5 μL, 0.25 mmol), and benzotrifluoride (1 mL). The vial was sealed with an unpunctured TFE septum-covered screw cap, and placed in a heating block that was pre-heated to 100 °C. After 12 h, the reaction was brought to room temperature, filtered through a plug of silica gel, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum, re-dissolved in acetone, and separated by preparative TLC.




**2-methyl-4-phenyl-*N*-(quinolin-8-yl)butanamide (4a):** The reaction was carried out according to General Procedure C at 80 ˚C using alkene **1b** (22.6 mg, 0.1mmol). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 305.2 [M+H], cone voltage 15V). Purification afforded 25 mg (82%) of **4a** as a yellow solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.87 (s, 1H), 8.85–8.79 (m, 2H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.49 (m, 2H), 7.46 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.30–7.17 (m, 5H), 2.81–2.68 (m, 2H), 2.63 (dqd, *J* = 8.5, 6.9, 5.6 Hz, 1H), 2.22 (dddd, *J* = 14.0, 9.4, 8.4, 5.8 Hz, 1H), 1.86 (dddd, *J* = 13.6, 9.5, 6.8, 5.6 Hz, 1H), 1.36 (d, *J* = 6.9 Hz, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 175.14, 148.28, 141.90, 138.63, 136.51, 134.70, 128.65, 128.54, 128.10, 127.60, 126.02, 121.73, 121.55, 116.66, 42.43, 36.19, 33.78, 18.40. **HRMS** calcd. for $C_{20}H_{21}N_2O^+$ [M+H]$^+$: 305.1648, Found: 305.1647.

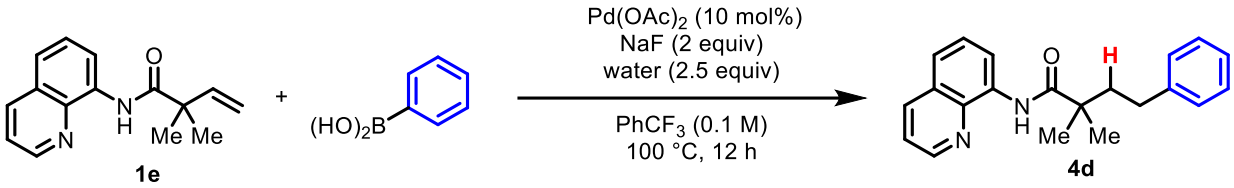



**2-benzyl-4-phenyl-*N*-(quinolin-8-yl)butanamide (4b):** The reaction was carried out according to General Procedure C using alkene **1c** (26.8 mg, 0.08 mmol). The product was purified by preparative TLC (10% ether/toluene) to afford 24 mg (72%) of **4b** as a yellow solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.69 (s, 1H), 8.81 (dd, *J* = 7.6, 1.4 Hz, 1H), 8.75 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.13 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.53 (t, *J* = 7.9 Hz, 1H), 7.49 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.42 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.28–7.08 (m, 9H), 3.17 (dd, *J* = 13.7, 8.1 Hz, 1H), 2.89 (dd, *J* = 13.7, 6.7 Hz, 1H), 2.85–2.73 (m, 2H), 2.65 (ddd, *J* = 14.0, 9.5, 6.9 Hz, 1H), 2.21 (dtd, *J* = 14.7, 9.5, 5.3 Hz, 1H), 1.93 (dddd, *J* = 14.0, 9.8, 6.9, 4.4 Hz, 1H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 173.54, 148.06, 141.52, 139.38, 138.38, 136.24, 134.29, 128.96, 128.49, 128.41, 128.38, 127.87, 127.37, 126.27, 125.90, 121.54, 121.50, 116.56, 50.36, 39.31, 34.15, 33.61. **HRMS** calcd. for $C_{26}H_{25}N_2O^+$ [M+H]$^+$: 381.1961, Found: 381.1959.

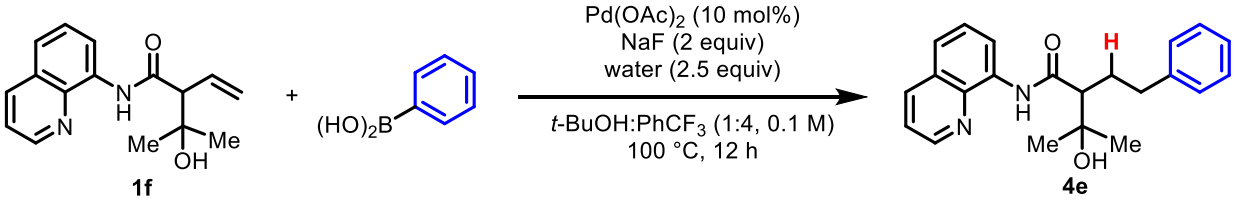



**2-isopropyl-4-phenyl-*N*-(quinolin-8-yl)butanamide (4c):** The reaction was carried out according to General Procedure C using alkene **1d** (25.4 mg, 0.1mmol). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 333.2 [M+H], cone voltage 15V). Purification afforded 19 mg (57%) of **4c** as a pale yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.87 (dd, *J* = 7.6, 1.5 Hz, 1H), 8.82 (dd, *J* = 4.2,

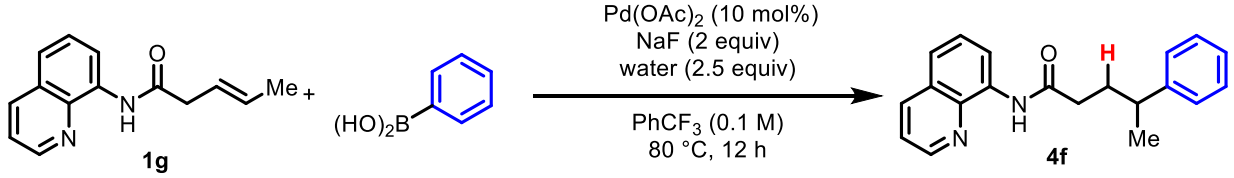
1.7 Hz, 1H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.56 (t, *J* = 7.9 Hz, 1H), 7.52 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.46 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.30–7.23 (m, 2H), 7.22–7.14 (m, 3H), 2.79 (ddd, *J* = 14.2, 9.9, 4.8 Hz, 1H), 2.59 (ddd, *J* = 13.7, 9.3, 7.1 Hz, 1H), 2.22 (ddd, *J* = 10.8, 7.6, 3.1 Hz, 1H), 2.19–2.11 (m, 1H), 2.03 (dq, *J* = 13.8, 6.9 Hz, 1H), 1.95 (dddd, *J* = 13.2, 10.2, 7.1, 3.1 Hz, 1H), 1.03 (dd, *J* = 6.7, 4.5 Hz, 6H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 174.03, 148.16, 141.99, 138.49, 136.33, 134.42, 128.53, 128.36, 127.98, 127.47, 125.82, 121.59, 121.41, 116.51, 55.68, 34.02, 32.03, 31.28, 20.90, 20.41. **HRMS** calcd. for $C_{22}H_{25}N_2O^+$ $[M+H]^+$: 333.1967, Found: 333.1968.




**2,2-dimethyl-4-phenyl-*N*-(quinolin-8-yl)butanamide (4d):** The reaction was carried out according to General Procedure C using alkene **1e** (24.0 mg, 0.1mmol). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 319.2 [M+H], cone voltage 15V). Purification afforded 5 mg (16%) of **4d** as a colorless oil. **$^{1}$H NMR** (600 MHz, $CDCl_3$) δ 10.32 (s, 1H), 9.04–8.57 (m, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.55 (t, *J* = 7.9 Hz, 1H), 7.53–7.49 (m, 1H), 7.49–7.46 (m, 1H), 7.28–7.18 (m, 4H), 7.15 (t, *J* = 7.2 Hz, 1H), 2.74–2.49 (m, 2H), 2.09–1.92 (m, 2H), 1.48 (s, 6H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 176.09, 148.18, 142.22, 138.77, 136.27, 134.55, 128.34, 128.26, 127.90, 127.41, 125.69, 121.51, 121.24, 116.24, 43.84, 43.68, 31.48, 25.71. **HRMS** calcd. for $C_{21}H_{23}N_2O^+$ $[M+H]^+$: 319.1810, Found: 319.1809.

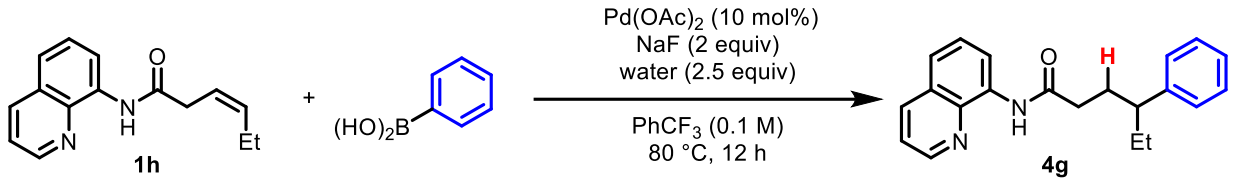



**3-hydroxy-3-methyl-2-phenethyl-*N*-(quinolin-8-yl)butanamide (4e):** The reaction was carried out according to General Procedure B using alkene **1f** (27.0 mg, 0.1 mmol) and phenylboronic acid (24.4 mg, 0.2 mmol). The product was purified by preparative TLC (20% EtOAc/hex) to afford 24 mg (69%) of **4e** as an orange oil. **$^{1}$H NMR** (600 MHz, DMSO-$d_6$) δ 10.39 (d, *J* = 4.0 Hz, 1H), 9.09–8.83 (m, 1H), 8.73 (dd, *J* = 8.0, 3.8 Hz, 1H), 8.54–8.28 (m, 1H), 7.60 (dddd, *J* = 27.9, 12.2, 8.0, 3.7 Hz, 3H), 7.41–7.01 (m, 5H), 5.08–4.81 (s, 1H), 2.60 (ddt, *J* = 14.4, 9.4, 4.5 Hz, 2H), 2.53–2.44 (m, 2H), 1.88 (qt, *J* = 12.6, 9.8, 4.5 Hz, 2H), 1.17 (dd, *J* = 22.3, 4.0 Hz, 6H). **$^{13}$C NMR** (150 MHz, DMSO) δ 172.62, 148.82, 141.74, 138.03, 136.55, 134.72, 128.28, 128.25, 127.84, 127.07, 125.76, 122.09, 121.47, 116.08, 70.19, 58.45, 33.68, 29.59, 28.64, 26.99. **HRMS** calcd. for $C_{22}H_{25}N_2O_2^+$ $[M+H]^+$: 349.1911, Found: 349.1910.

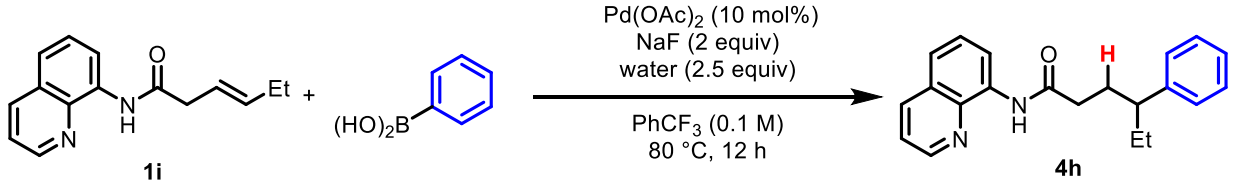



**4-phenyl-*N*-(quinolin-8-yl)pentanamide (4f):** The reaction was carried out according to General Procedure

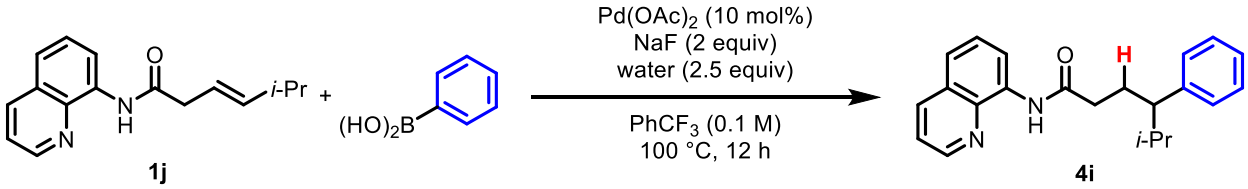
C at 80 °C using alkene **1g** (22.6 mg, 0.1 mmol). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 27 mg (89%) of **4f** as a pale orange oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.71 (s, 1H), 8.80–8.73 (m, 2H), 8.15 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.56–7.46 (m, 2H), 7.44 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.31 (t, *J* = 7.6 Hz, 2H), 7.27–7.17 (m, 3H), 2.87–2.79 (m, 1H), 2.43 (t, *J* = 7.7 Hz, 2H), 2.21–2.01 (m, 2H), 1.33 (d, *J* = 7.0 Hz, 3H).**$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.78, 148.06, 146.53, 138.27, 136.63, 134.58, 128.65, 128.07, 127.60, 127.26, 126.32, 121.65, 121.48, 116.70, 39.66, 36.32, 33.80, 22.68. **HRMS** calcd. for $C_{20}H_{21}ClN_2O^+$ $[M+H]^+$: 305.1648, Found: 305.1648.




**4-phenyl-*N*-(quinolin-8-yl)hexanamide (4g):** The reaction was carried out according to General Procedure C at 80 ˚C using alkene **1h** (24.0 mg, 0.1mmol). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 15 mg (47%) of **4g** as a pale yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.65 (s, 1H), 8.90–8.62 (m, 2H), 8.14 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.52 (t, *J* = 7.9 Hz, 1H), 7.48 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.43 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.31 (t, *J* = 7.5 Hz, 2H), 7.24–7.18 (m, 3H), 2.54 (tt, *J* = 10.0, 5.0 Hz, 1H), 2.46–2.31 (m, 2H), 2.26 (dddd, *J* = 13.7, 9.2, 6.8, 4.5 Hz, 1H), 2.01 (dddd, *J* = 14.0, 10.5, 8.6, 5.8 Hz, 1H), 1.86–1.69 (m, 1H), 1.70–1.60 (m, 1H), 0.80 (t, *J* = 7.4 Hz, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.75, 148.04, 144.64, 138.31, 136.33, 134.55, 128.46, 127.92, 127.88, 127.44, 126.22, 121.55, 121.31, 116.39, 47.35, 36.13, 31.90, 29.97, 12.15. **HRMS** calcd. for $C_{21}H_{23}N_2O^+$ $[M+H]^+$: 319.1805, Found: 319.1807.

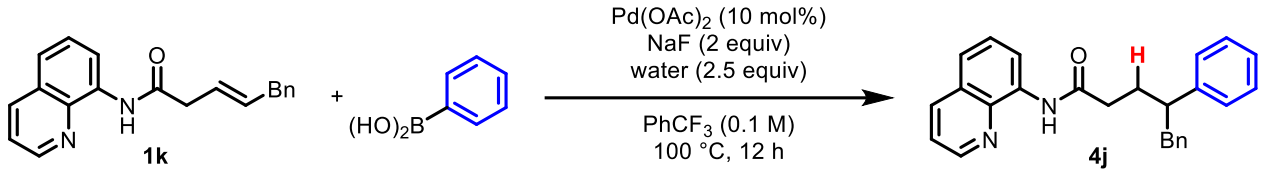



**4-phenyl-*N*-(quinolin-8-yl)hexanamide (4h):** The reaction was carried out according to General Procedure C at 80 ˚C using alkene **1i** (24.0 mg, 0.1mmol). The product was purified by preparative TLC (1% EtOAc/toluene) to afford 17 mg (53%) of **4h** as a yellow oil. Analytical data were in agreement with that of compound **4g**.

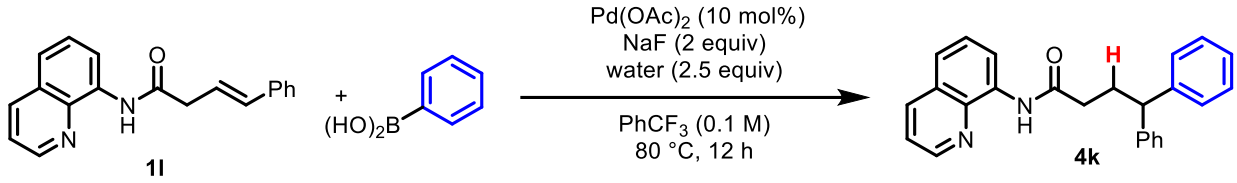



**5-methyl-4-phenyl-*N*-(quinolin-8-yl)hexanamide (4i):** The reaction was carried out according to General Procedure C using alkene **1j** (24.0 mg, 0.1 mmol). The product was purified by preparative TLC (10% EtOAc/toluene) to afford 14 mg (42%) of **4i** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.61 (s, 1H), 8.81–8.72 (m, 2H), 8.14 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.52 (t, *J* = 7.9 Hz, 1H), 7.48 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.43 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.33–7.28 (m, 2H), 7.24–7.19 (m, 1H), 7.19–7.16 (m, 2H), 2.45–2.31 (m, 3H), 2.30–2.22 (m, 1H), 2.08–1.98 (m, 1H), 1.92–1.81 (m, 1H), 1.01 (d, *J* = 6.6 Hz, 3H), 0.75 (d, *J* = 6.7 Hz, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.98, 148.14, 143.72, 138.43, 136.44, 134.69, 128.70, 128.40, 128.05, 127.57, 126.29, 121.67,

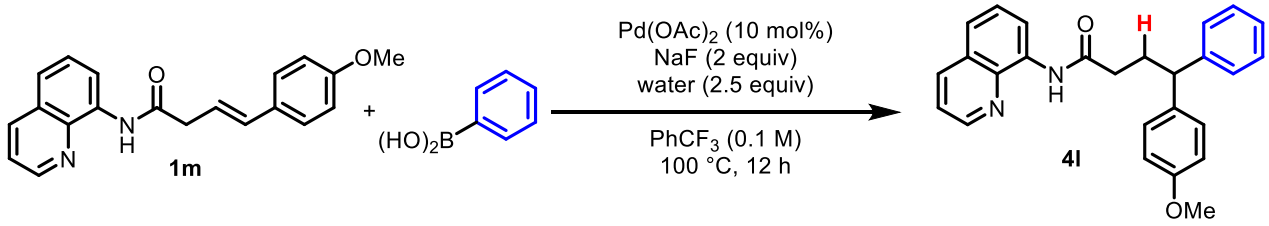
121.41, 116.50, 52.78, 36.54, 33.89, 28.78, 21.09, 20.99. **HRMS** calcd. for $C_{22}H_{25}N_2O^+$ [M+H]$^+$: 333.1961, Found: 333.1962.




**4,5-diphenyl-*N*-(quinolin-8-yl)pentanamide (4j):** The reaction was carried out according to General Procedure C using alkene **1k** (30.2 mg, 0.1 mmol). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 10 mg (26%) of **4j** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.64 (s, 1H), 8.80–8.73 (m, 2H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.49 (m, 2H), 7.46 (dd, *J* = 8.2, 4.3 Hz, 1H), 7.33–7.29 (m, 2H), 7.24–7.19 (m, 5H), 7.17–7.12 (m, 1H), 7.08–7.05 (m, 2H), 3.03–2.94 (m, 3H), 2.47–2.29 (m, 3H), 2.18–2.08 (m, 1H).**$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.61, 148.15, 144.02, 140.32, 138.41, 136.45, 134.62, 129.31, 128.62, 128.23, 128.04, 128.02, 127.55, 126.55, 126.01, 121.68, 121.45, 116.50, 47.70, 44.16, 36.23, 31.21. **HRMS** calcd. for $C_{26}H_{25}N_2O^+$ [M+H]$^+$: 381.1961, Found: 381.1961.

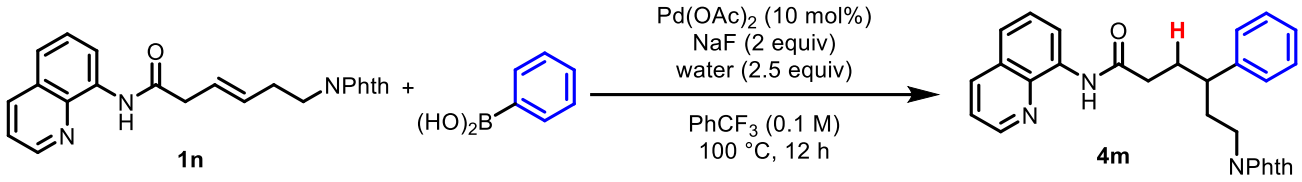



**4,4-diphenyl-*N*-(quinolin-8-yl)butanamide (4k):** The reaction was carried out according to General Procedure C at 80 ˚C using alkene **1l** (28.8 mg, 0.1 mmol). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 367.2 [M+H], cone voltage 15V). Purification afforded 29 mg (79 %) of **4k** as a white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.73 (s, 1H), 8.83–8.78 (m, 2H), 8.18 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.60–7.50 (m, 2H), 7.47 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.37–7.30 (m, 8H), 7.22 (tt, *J* = 5.7, 2.6 Hz, 2H), 4.09 (t, *J* = 7.8 Hz, 1H), 2.65–2.59 (m, 2H), 2.58–2.53 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.42, 148.19, 144.40, 138.43, 136.48, 134.63, 128.71, 128.07, 127.57, 126.48, 121.71, 121.52, 116.57, 50.69, 36.45, 31.17. **HRMS** calcd. for $C_{25}H_{23}N_2O^+$ [M+H]$^+$: 367.1805, Found: 367.1807.

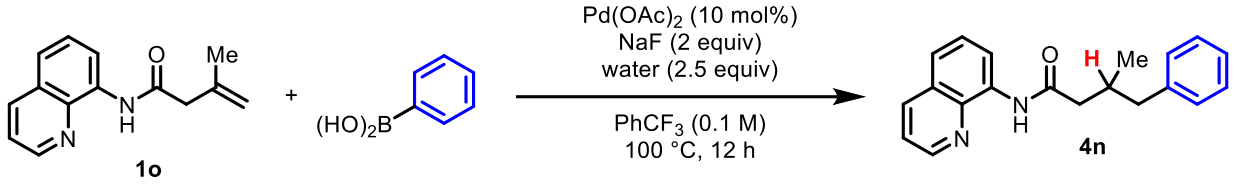



**4-(4-methoxyphenyl)-4-phenyl-*N*-(quinolin-8-yl)butanamide (4l):** The reaction was carried out according to General Procedure C using alkene **1m** (31.8 mg, 0.1 mmol). The product was purified by preparative TLC (3% EtOAc/toluene) to afford 30 mg (76%) of **4l** as a pale orange oil. **$^1$H NMR** (500 MHz, $CDCl_3$) δ 9.68 (s, 1H), 8.89–8.64 (m, 2H), 8.14 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.52 (t, *J* = 7.9 Hz, 1H), 7.48 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.43 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.28 (d, *J* = 4.4 Hz, 4H), 7.23–7.15 (m, 3H), 6.90–6.78 (m, 2H), 4.00 (t, *J* = 7.6 Hz, 1H), 3.75 (s, 3H), 2.53 (dtd, *J* = 11.9, 8.5, 7.6, 4.0 Hz, 4H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.47,

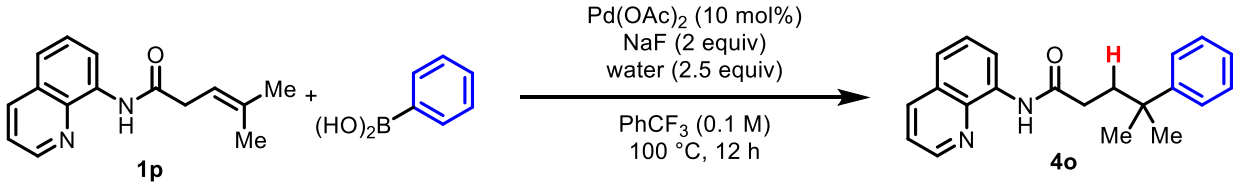
158.16, 148.16, 144.79, 138.39, 136.49, 136.44, 134.60, 128.96, 128.65, 128.03, 127.93, 127.52, 126.36, 121.68, 121.49, 116.53, 114.05, 55.31, 49.81, 36.45, 31.31. **HRMS** calcd. for $C_{26}H_{25}N_2O_2^+$ [M+H]$^+$: 397.1916, Found: 397.1914.




**6-(1,3-dioxoisoindolin-2-yl)-4-phenyl-*N*-(quinolin-8-yl)hexanamide (4m):** The reaction was carried out according to General Procedure C using alkene **1n** (38.5, 0.1mmol). The product was purified by flash column chromatography (silica, 3% MeCN/DCM) to afford 23 mg (50%) of **4m** as a white solid. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.63 (s, 1H), 8.76 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.72 (dd, *J* = 7.5, 1.6 Hz, 1H), 8.14 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.74 (dt, *J* = 7.0, 3.5 Hz, 2H), 7.69–7.59 (m, 2H), 7.54–7.45 (m, 2H), 7.43 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.29–7.20 (m, 4H), 7.12 (tt, *J* = 6.7, 2.0 Hz, 1H), 3.81–3.32 (m, 2H), 2.76 (tt, *J* = 10.0, 4.6 Hz, 1H), 2.36 (t, *J* = 7.6 Hz, 2H), 2.26 (dtd, *J* = 16.0, 8.1, 7.6, 4.6 Hz, 1H), 2.21–2.12 (m, 1H), 2.11–1.98 (m, 2H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.29, 168.25, 148.05, 143.09, 138.28, 136.32, 134.46, 133.70, 132.09, 128.67, 127.91, 127.73, 127.41, 126.55, 123.00, 121.55, 121.35, 116.42, 43.54, 36.73, 35.70, 34.91, 32.61. **HRMS** calcd. for $C_{29}H_{26}N_3O_3^+$ [M+H]$^+$: 464.1974, Found: 464.1972.

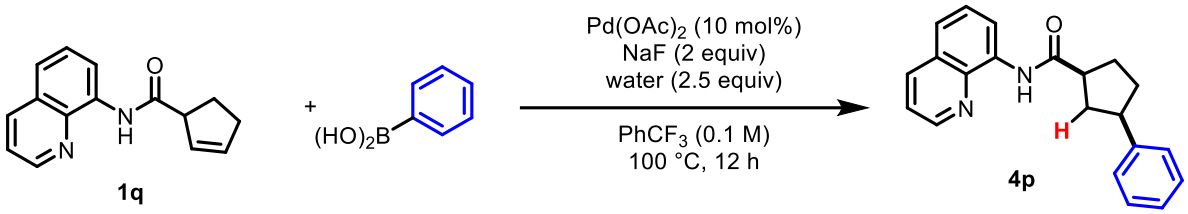



**3-methyl-4-phenyl-*N*-(quinolin-8-yl)butanamide (4n):** The reaction was carried out according to General Procedure C using alkene **1o** (22.6 mg, 0.1 mmol). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 12 mg (26%) of **4m** as a yellow oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.85–8.75 (m, 2H), 8.19–8.14 (m, 1H), 7.57–7.49 (m, 2H), 7.45 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.31–7.26 (m, 2H), 7.24–7.16 (m, 3H), 2.79 (dd, *J* = 13.4, 6.3 Hz, 1H), 2.62–2.56 (m, 2H), 2.38 (dd, *J* = 14.2, 8.0 Hz, 1H), 1.05 (d, *J* = 6.5 Hz, 3H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.21, 148.25, 140.46, 138.48, 136.51, 134.63, 129.46, 128.41, 128.08, 127.58, 126.14, 121.72, 121.53, 116.58, 45.19, 43.24, 32.84, 19.78. **HRMS** calcd. for $C_{20}H_{21}N_2O^+$ [M+H]$^+$: 305.1648, Found: 305.1649.

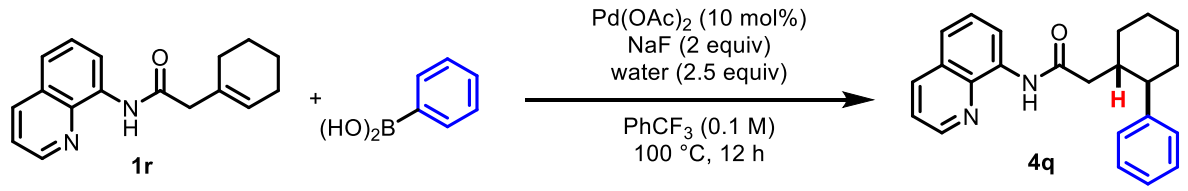



**4, 4-dimethyl-4-phenyl-*N*-(quinolin-8-yl)pentanamide (4o):** The reaction was carried out according to General Procedure C using alkene **1p** (24.0 mg, 0.1 mmol). The product was purified by preparative TLC (5% EtOAc/toluene) to afford 6 mg (19%) of **4o** as a colorless oil. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.63 (s, 1H), 8.89–8.65 (m, 2H), 8.14 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.54–7.50 (m, 1H), 7.48 (dd, *J* = 8.3, 1.5 Hz, 1H), 7.46–7.39 (m, 3H), 7.37–7.32 (m, 2H), 7.22–7.17 (m, 1H), 2.36–2.28 (m, 2H), 2.22–2.17 (m, 2H), 1.40 (s, 6H). **$^{13}$C NMR** (150 MHz,

$CDCl_3$) δ 171.83, 148.18, 147.97, 138.21, 136.28, 134.48, 128.26, 127.84, 127.37, 125.80, 125.69, 121.47, 121.20, 116.28, 39.23, 37.41, 33.78, 28.95. **HRMS** calcd. for $C_{21}H_{23}N_2O^+$ $[M+H]^+$: 319.1805, Found: 319.1807.




**3-phenyl-*N*-(quinolin-8-yl)cyclopentane-1-carboxamide (4p):** The reaction was carried out according to General Procedure C using alkene **1q** (23.8 mg, 0.1mmol). The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 317.2 [M+H], cone voltage 15V). Purification afforded 5 mg (15%) of **4p** as a colorless oil. Relative stereochemistry was established by 2D NMR analysis and by analogy to **4q**. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.90 (s, 1H), 8.93–8.72 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.55 (t, *J* = 7.9 Hz, 1H), 7.50 (dd, *J* = 8.3, 1.4 Hz, 1H), 7.46 (dd, *J* = 8.3, 4.2 Hz, 1H), 7.37–7.28 (m, 4H), 7.24–7.17 (m, 1H), 3.24–3.07 (m, 2H), 2.51 (dt, *J* = 13.4, 7.1 Hz, 1H), 2.31 (dtd, *J* = 13.0, 6.6, 3.9 Hz, 1H), 2.25–2.07 (m, 3H), 1.93 (dddd, *J* = 16.0, 13.9, 10.0, 5.9 Hz, 1H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 174.55, 148.13, 144.60, 138.42, 136.39, 134.68, 128.39, 127.97, 127.48, 127.19, 126.15, 121.58, 121.34, 116.43, 47.19, 46.51, 39.00, 34.17, 29.71. **HRMS** calcd. for $C_{21}H_{21}N_2O^+$ $[M+H]^+$: 317.1654, Found: 317.1657.

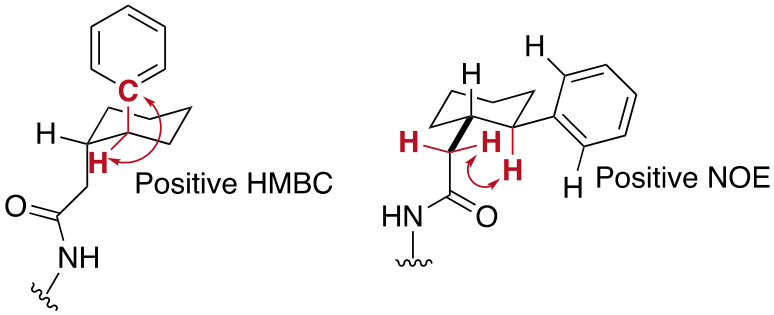



**2-(2-phenylcyclohexyl)-*N*-(quinolin-8-yl)acetamide (4q):** The reaction was carried out according to General Procedure C using alkene **1r** (26.6 mg, 0.1mmol). The product was purified by mass-directed prep LC. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 65–95% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 345.2 [M+H], cone voltage 15V). Purification afforded 11 mg (32%) of **4q** as a colorless oil. Relative stereochemistry was established by 2D NMR analysis. **$^1$H NMR** (600 MHz, $CDCl_3$) δ 9.59 (s, 1H), 8.78 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.72 (dd, *J* = 7.4, 1.5 Hz, 1H), 8.13 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.54–7.45 (m, 2H), 7.43 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.27 (dd, *J* = 9.5, 7.3 Hz, 4H), 7.15 (tt, *J* = 6.7, 2.0 Hz, 1H), 2.44 (dd, *J* = 14.5, 3.4 Hz, 1H), 2.35 (td, *J* = 11.4, 3.5 Hz, 1H), 2.32–2.23 (m, 1H), 2.13 (ddd, *J* = 13.2, 3.5, 1.7 Hz, 1H), 2.10 (s, 1H), 1.94–1.86 (m, 1H), 1.85–1.75 (m, 2H), 1.61–1.51 (m, 2H), 1.42 (dtt, *J* = 28.7, 12.8, 3.4 Hz, 2H), 1.31–1.16 (m, 1H). **$^{13}$C NMR** (150 MHz, $CDCl_3$) δ 171.37, 148.01, 145.66, 138.26, 136.31, 134.53, 128.61, 127.89, 127.65, 127.42, 126.23, 121.51, 121.22, 116.24, 50.57, 43.47, 40.17, 35.96, 32.83, 26.82, 26.24. **HRMS** calcd. for $C_{23}H_{25}N_2O^+$ $[M+H]^+$: 345.1967, Found: 345.1967.

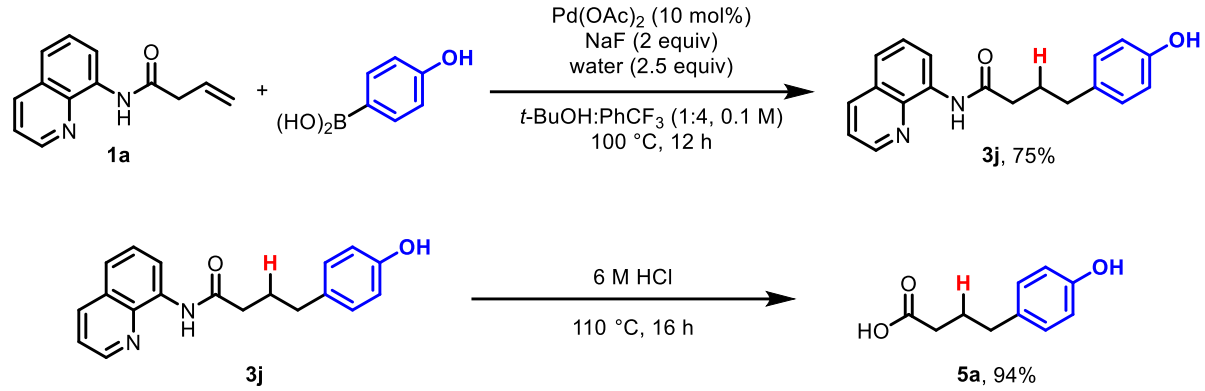
To assign the correct relative stereochemistry of the cyclic products, full 2D NMR analysis was used. First, the benzyl proton was properly assigned in the $^1$H spectrum using HMBC to identify the positive correlation between a phenyl carbon and a C($sp^3$)–H hydrogen. Once the benzyl hydrogen was assigned, we sought to find a positive NOE correlation between it and another proton. If palladium underwent *syn*-insertion, then the two tertiary hydrogens on the ring would be *trans* to each other. Assuming this was the pathway, we should

be able to observe at least one of the following NOEs: 1) NOE between the benzyl proton and the α-protons of the carbonyl, as they are on the same side of the ring. These are labeled in red for clarity below. 2) NOE between the hydrogens on the *ortho* positions of the phenyl ring and the hydrogen on the β-position of the carbonyl, depending on the orientation of the phenyl ring. Indeed, we are able to observe a strong NOE correlation corresponding to the first interaction.

The same logic was used to assign the relative stereochemistry for compound **4q**. A graphical depiction is shown below.



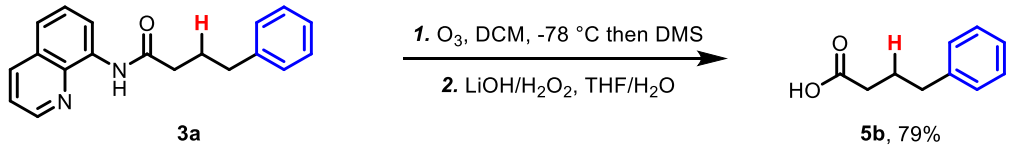
**Large-Scale Synthesis and Deprotection**




**Large-Scale Synthesis of 3j**

To a 200-mL bomb flask equipped with a magnetic stir bar were added $Pd(OAc)_2$ (159 mg, 0.71 mmol), **1a** (1.51 g, 7.1 mmol), 4-hydroxyphenylboronic acid (1.959 g, 14.2 mmol), NaF (596.3 mg, 14.2 mmol), water (0.32 mL, 17.75 mmol), *t*-butanol (14.2 mL), and benzotrifluoride (56.8 mL). The flask was sealed and placed in an oil bath that was pre-heated to 100 °C. After 12 h, the reaction was brought to room temperature, filtered through silica, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum, re-dissolved in acetone, and columned at 20% EtOAc/hex to yield 1.63 g (75%) of **3j** as an orange-brown solid.

**Large-Scale Deprotection of 3j to prepare 4-(4-hydroxyphenyl)butanoic acid (5a):** To a round bottom flask equipped with a magnetic stir bar were added **3j** (1.40 g, 4.57 mmol) and 6 M HCl (25 mL). The flask was sealed and heated at 110 ˚C for 16 h. The mixture was then diluted with water, then extracted with EtOAc (×3). The organic layers were combined, dried, and concentrated under vacuum. The solid was triturated with 0 ˚C EtOAc, decanted, and then recrystallized in acetone through slow evaporation to yield the free acid **5a** as an orange solid. (770 mg, 4.27 mmol). **$^1$H NMR** (600 MHz, $(CD_3)_2CO$) δ 8.06 (s, 1H), 7.10–6.97 (m, 2H), 6.80–6.64 (m, 2H), 2.59–2.52 (m, 2H), 2.29 (t, *J* = 7.4 Hz, 2H), 1.85 (tt, *J* = 8.9, 6.9 Hz, 2H). **$^{13}$C NMR** (150 MHz, $(CD_3)_2CO$) δ 174.57, 156.43, 133.32, 130.17, 115.98, 34.83, 33.48, 27.81.

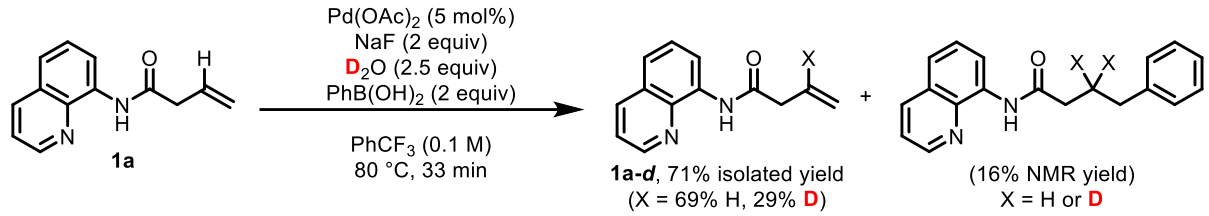



**Small-Scale Deprotection of 3a to prepare 4-phenylbutanoic acid (5b):**

The reaction was carried out according to the procedure by Maulide[7] using **3a** (96 mg, 0.33 mmol), which gave 42 mg (79%) of **5b** as an off-white solid. **$^1$H NMR** (600 MHz, $CD_3Cl$) δ 7.34–7.10 (m, 5H), 2.68 (t, *J* = 7.6 Hz, 2H), 2.38 (t, *J* = 7.4 Hz, 2H), 1.97 (p, *J* = 7.5 Hz, 2H). **$^{13}$C NMR** (150 MHz, $CD_3Cl$) δ 179.58, 141.32, 128.62, 128.56, 126.19, 35.13, 33.39, 26.35.

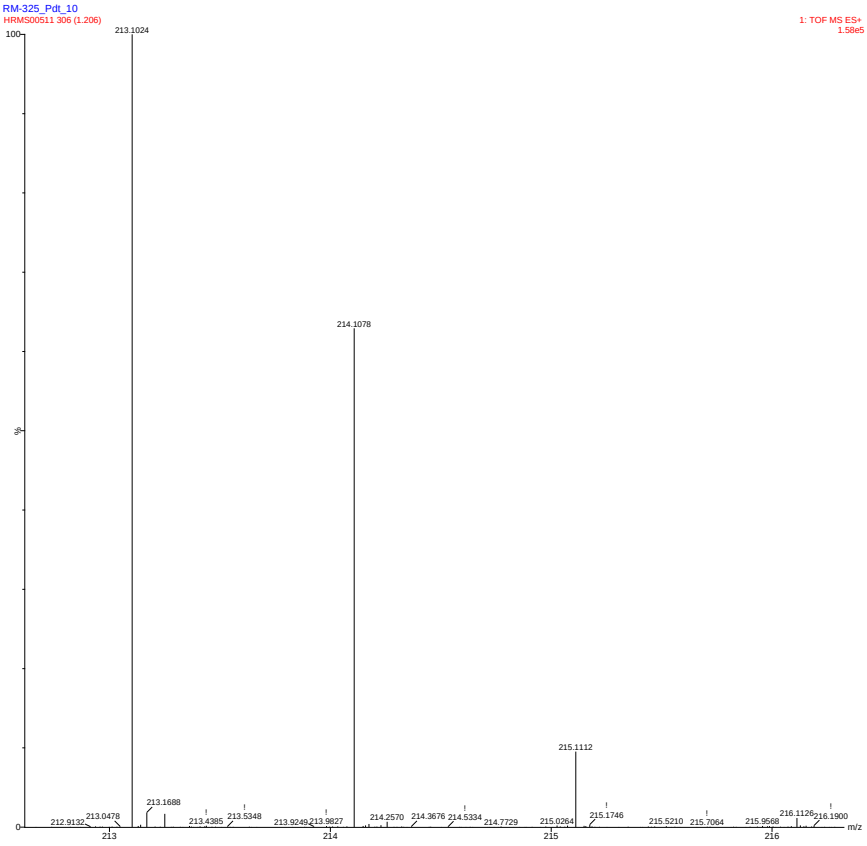
## Procedures for Deuterium Incorporation Studies

To identify the origin of the hydrogen atom in the hydroarylated product, various deuterium incorporation studies were conducted using deuterated reagents. Each reaction was run and purified using a Waters Autopurification LC. Deuterium incorporation was then determined based on high-resolution mass spectrum data and confirmed by $^{1}$H-NMR and $^{13}$C-NMR. High-resolution mass spectra of non-deuterated compounds are also listed for comparison.




**Deuterium incorporation studies with alkene 1a and $D_2O$:**
To a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (1.1 mg, 0.005 mmol), **1a** (21.2 mg, 0.1 mmol), phenylboronic acid (24.4 mg, 0.2 mmol), NaF (8.4 mg, 0.2 mmol), $D_2O$ (4.5 µL, 0.25 mmol), and benzotrifluoride (1 mL). The vial was sealed with an unpunctured TFE septum-covered screw cap, and placed in a heating block that was pre-heated to 80 °C. After 33 min, the reaction was brought to room temperature, filtered through a plug of silica gel, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum. $^{1}$H-NMR analysis of the crude mixture yielded 16% of hydro-or-deutero-arylated product. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 35–55% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 213.1 [M+H], cone voltage 15V). Purification afforded 15 mg (71%) of **1a-*d*** as an off-white solid. The isotopic distribution of labeled (**1a-*d***) and unlabeled (**1a**) compounds was determined by obtaining a high-resolution mass spectrum on an LC-TOF (Waters I-Class LC and Waters G2-XS TOF running in ESI+ mode) and processing the continuum data using Cerno Massworks 5.0.[8]

**Figure S3**. HRMS data for **1a-*d***




Mixture Results:

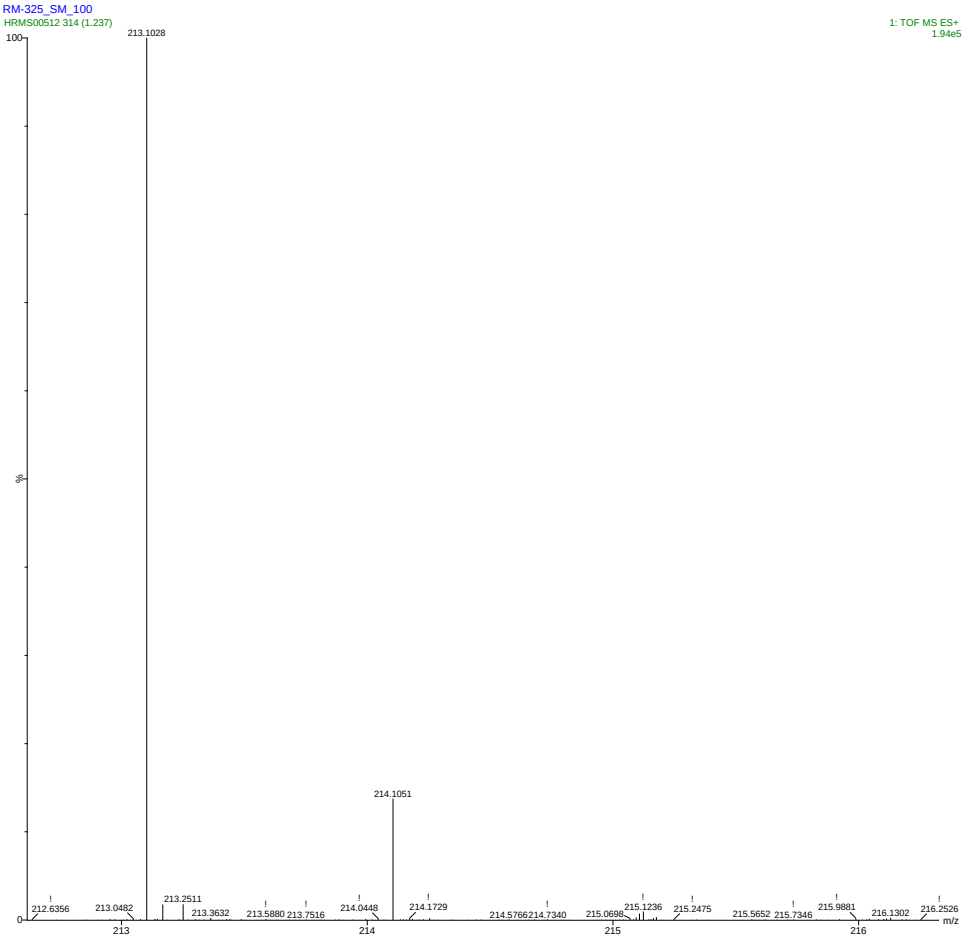
0.693 $C_{13}H_{13}N_2O$

0.290 $C_{13}H_{12}N_2O[^2H]$

0.017 $C_{13}H_{11}N_2O[^2H]_2$

Overall Mass Error (mDa): -4.0231

**Figure S4.** HRMS data for **1a**




Mixture Results:

1.000 $C_{13}H_{13}N_2O$

-0.008 $C_{13}H_{12}N_2O[^2H]$

0.008 $C_{13}H_{11}N_2O[^2H]_2$

Overall Mass Error (mDa): 2.8968

**Figure S5.** $^{1}$H-NMR spectra for **1a-*d***

RM-325-pure.1.fid

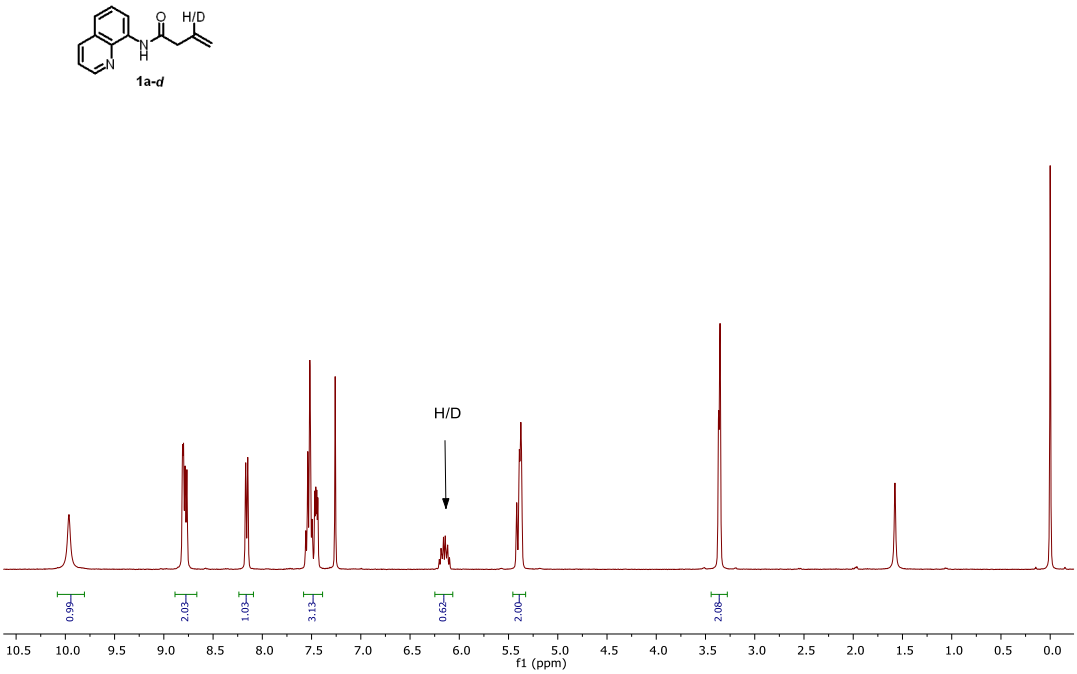
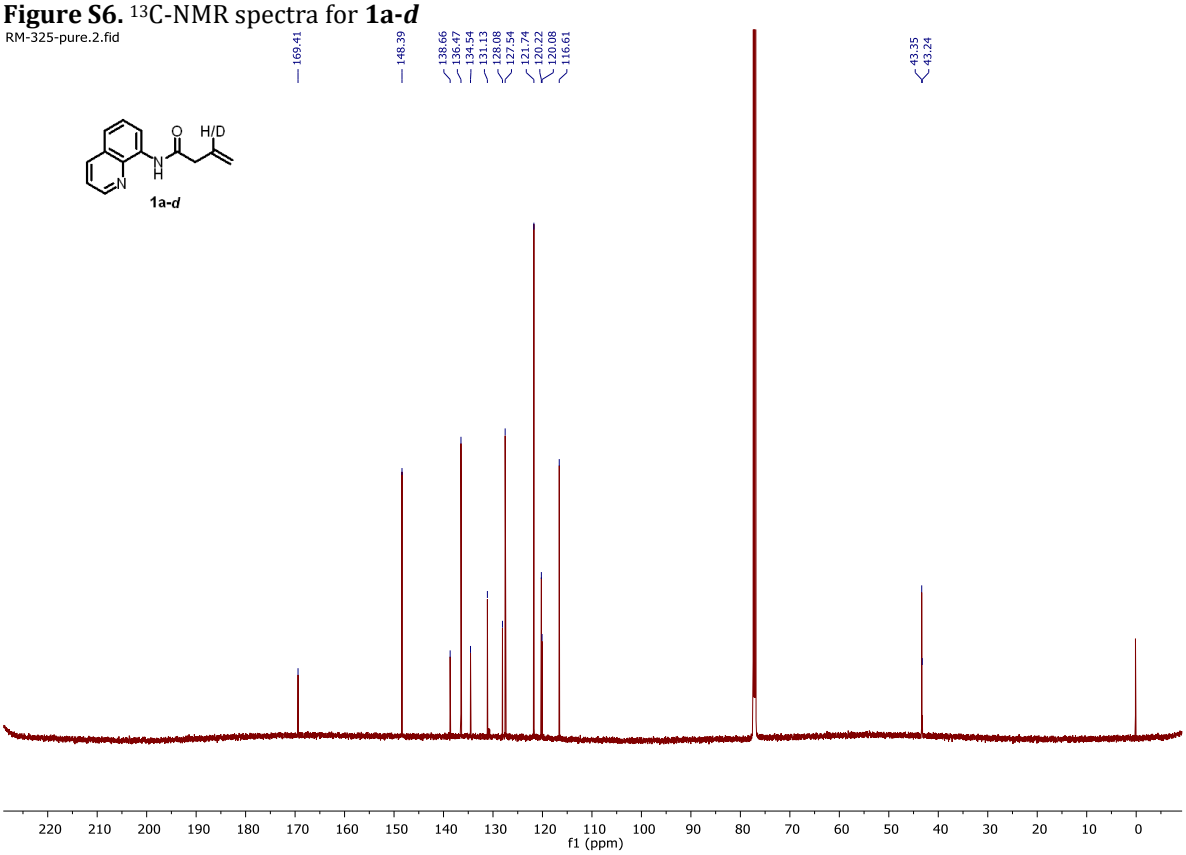
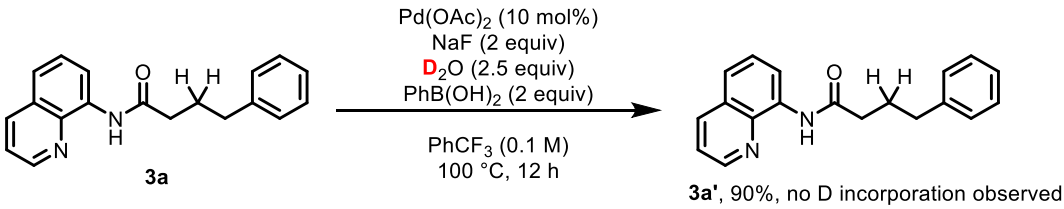



**Figure S6.** $^{13}$C-NMR spectra for **1a-*d***

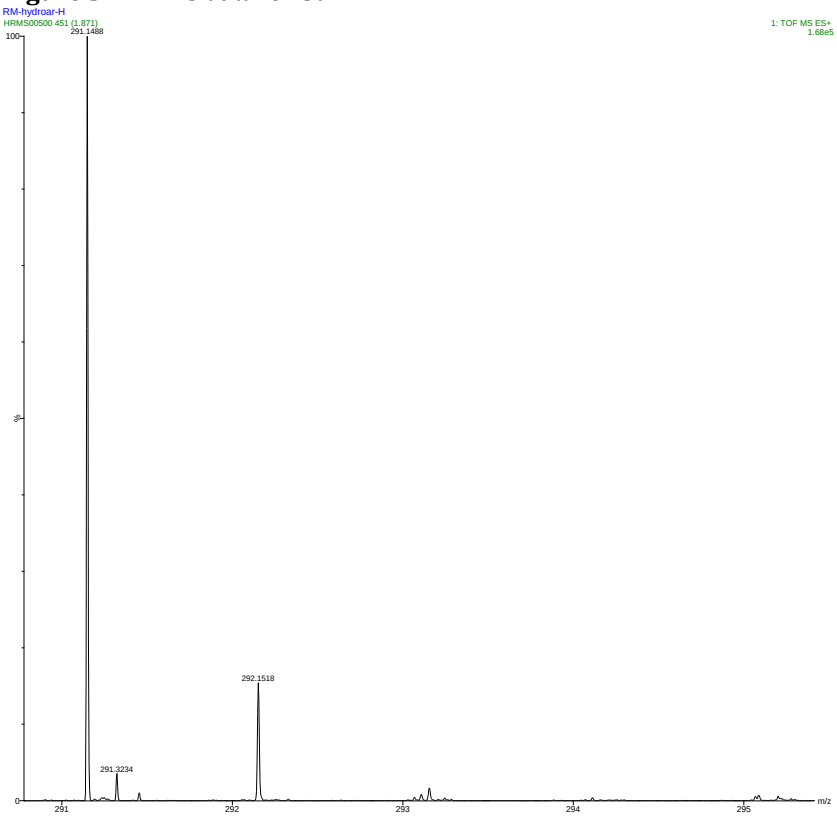
RM-325-pure.2.fid





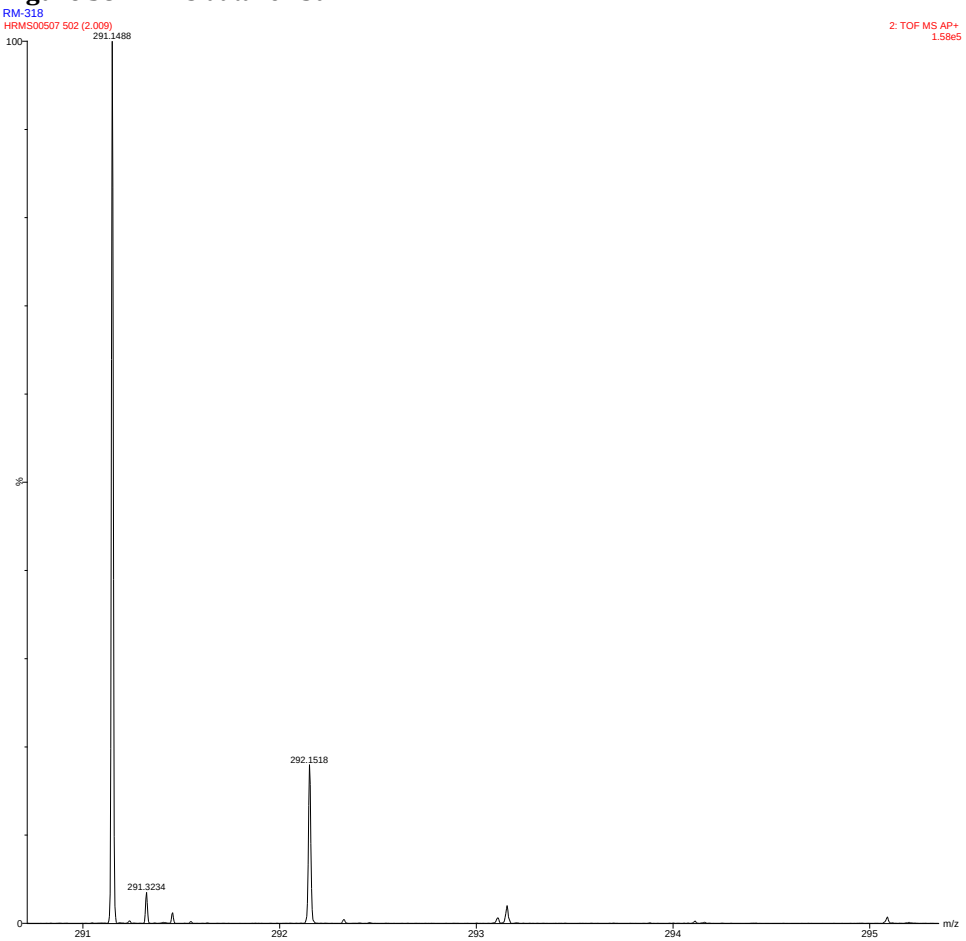

**Deuterium incorporation studies with hydroarylation product 3a and $D_2O$:**
To a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (2.2 mg, 0.01 mmol), **3a** (29.0 mg, 0.1 mmol), phenylboronic acid (24.4 mg, 0.2 mmol), NaF (8.4 mg, 0.2 mmol), $D_2O$ (4.5 µL, 0.25 mmol), and benzotrifluoride (1 mL). The vial was sealed with an unpunctured TFE septum-covered screw cap, and placed in a heating block that was pre-heated to 100 °C. After 12 hours, the reaction was brought to room temperature, filtered through a plug of silica gel, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 55–75% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 291.1 [M+H], cone voltage 15V). Purification afforded 26 mg (90%) of **3a'** as an off-white solid. The isotopic distribution of **3a** and **3a'** was determined by obtaining a high-resolution mass spectrum on an LC-TOF (Waters I-Class LC and Waters G2-XS TOF running in ESI+ mode) and processing the continuum data using Cerno Massworks 5.0.[8]

**Figure S7.** HRMS data for **3a**

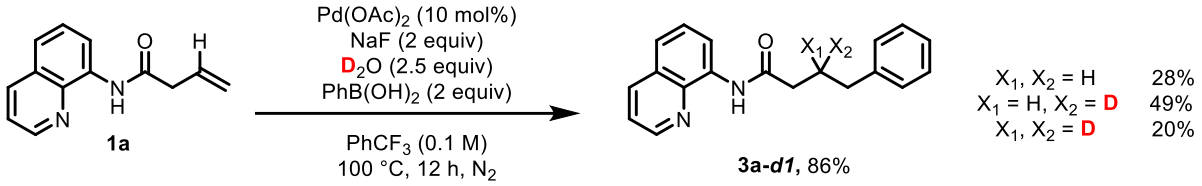



Mixture Results:
1.013 $C_{19}H_{19}N_2O$
-0.008 $C_{19}H_{18}N_2O[^2H]$
-0.004 $C_{19}H_{17}N_2O[^2H]_2$
-0.001 $C_{19}H_{16}N_2O[^2H]_3$
Overall Mass Error (mDa): 1.1390

**Figure S8**. HRMS data for **3a'**

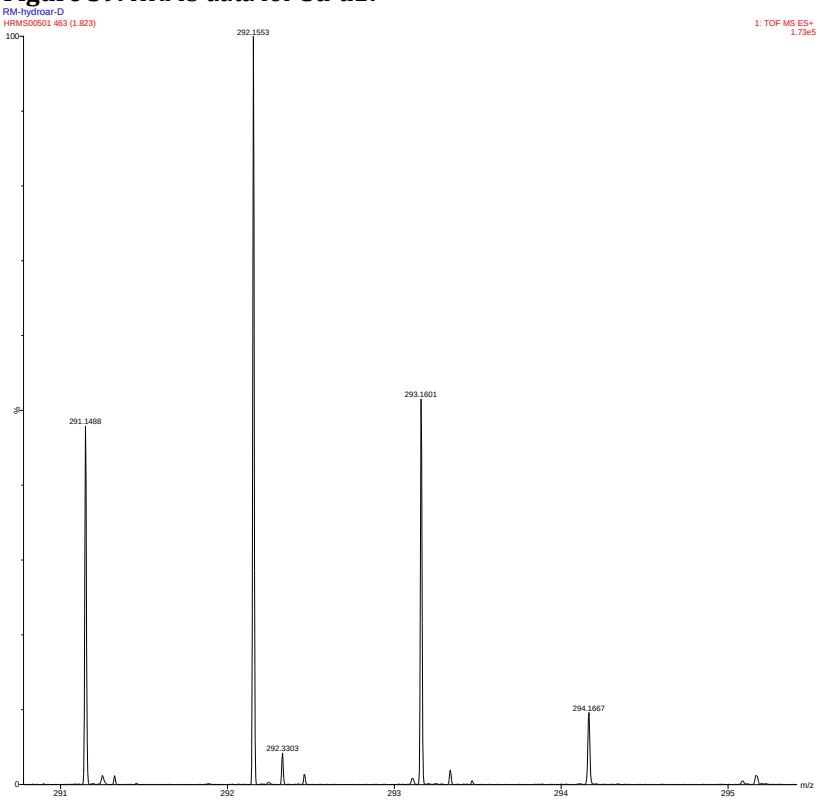



Mixture Results:
1.008 $C_{19}H_{19}N_2O$
-0.002 $C_{19}H_{18}N_2O[^2H]$
-0.002 $C_{19}H_{17}N_2O[^2H]_2$
-0.004 $C_{19}H_{16}N_2O[^2H]_3$
Overall Mass Error (mDa): 0.3230




**Deuterium incorporation studies with $D_2O$ in reaction conditions:** In a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (2.2 mg, 0.01 mmol), alkene **1a** (21.2 mg, 0.1 mmol), phenylboronic acid (24.4 mg, 0.2 mmol), and NaF (8.4 mg, 0.2 mmol). The vial was placed on a lyophilizer overnight to dry. The vial was then sealed with an unpunctured TFE septum-covered screw cap, then evacuated and backfilled with nitrogen (×3). $D_2O$ (4.5 µL, 0.25 mmol) and benzotrifluoride dried over 4 Å molecular sieves (1 mL) were then added to the vial, and the punctured septum was sealed with grease. The vial was then placed in a heating block that was pre-heated to 100 °C. After 12 h, the reaction was brought to room temperature, filtered through a plug of silica gel, and washed with acetone to elute all organic materials. The filtrate was concentrated by vacuum, re-dissolved in acetone, and separated by preparative TLC (1% EtOAc/toluene) to afford 25 mg (86%) of **3a-*d1*** as a pale orange oil. The isotopic distribution of **3a-*d1*** was determined by obtaining a high-resolution mass spectrum on an LC-TOF (Waters I-Class LC and Waters G2-XS TOF running in ESI+ mode) and processing the continuum data using Cerno Massworks 5.0.[8]

**Figure S9.** HRMS data for **3a-*d1*.**




Mixture Results:
0.279 $C_{19}H_{19}N_2O$
0.491 $C_{19}H_{18}N_2O[^2H]$
0.200 $C_{19}H_{17}N_2O[^2H]_2$
0.030 $C_{19}H_{16}N_2O[^2H]_3$
Overall Mass Error (mDa): 0.2615

**Figure S10.** $^{1}$H-NMR spectra for **3a-*d1***

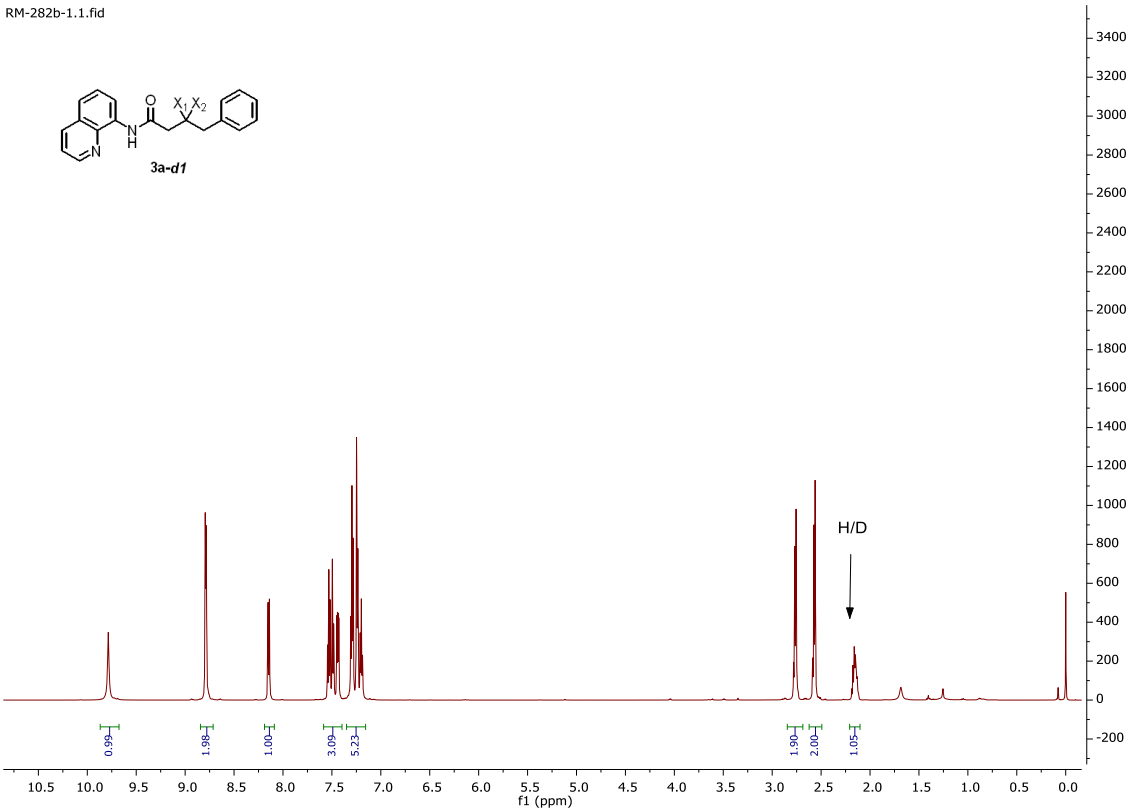
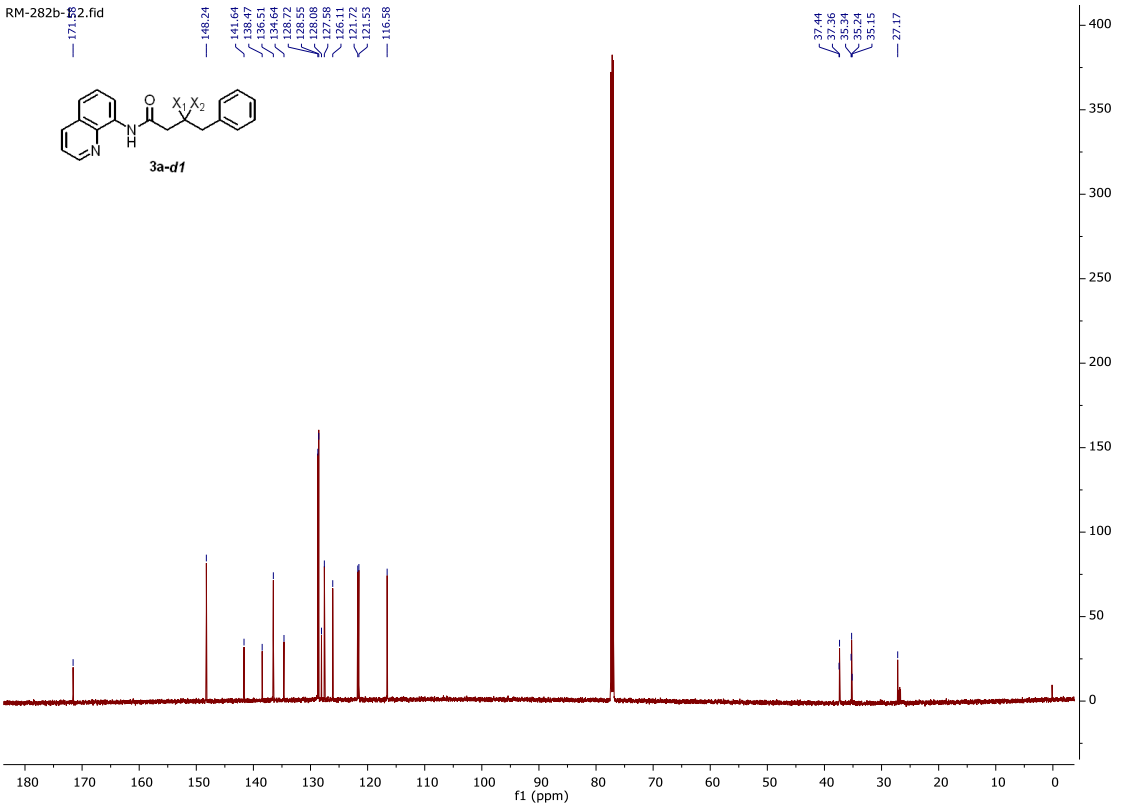
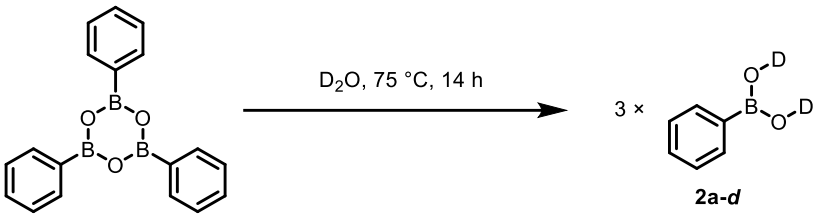
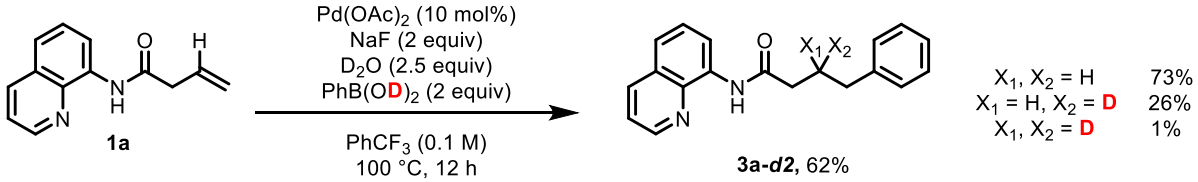



**Figure S11.** $^{13}$C-NMR spectra for **3a-*d1***



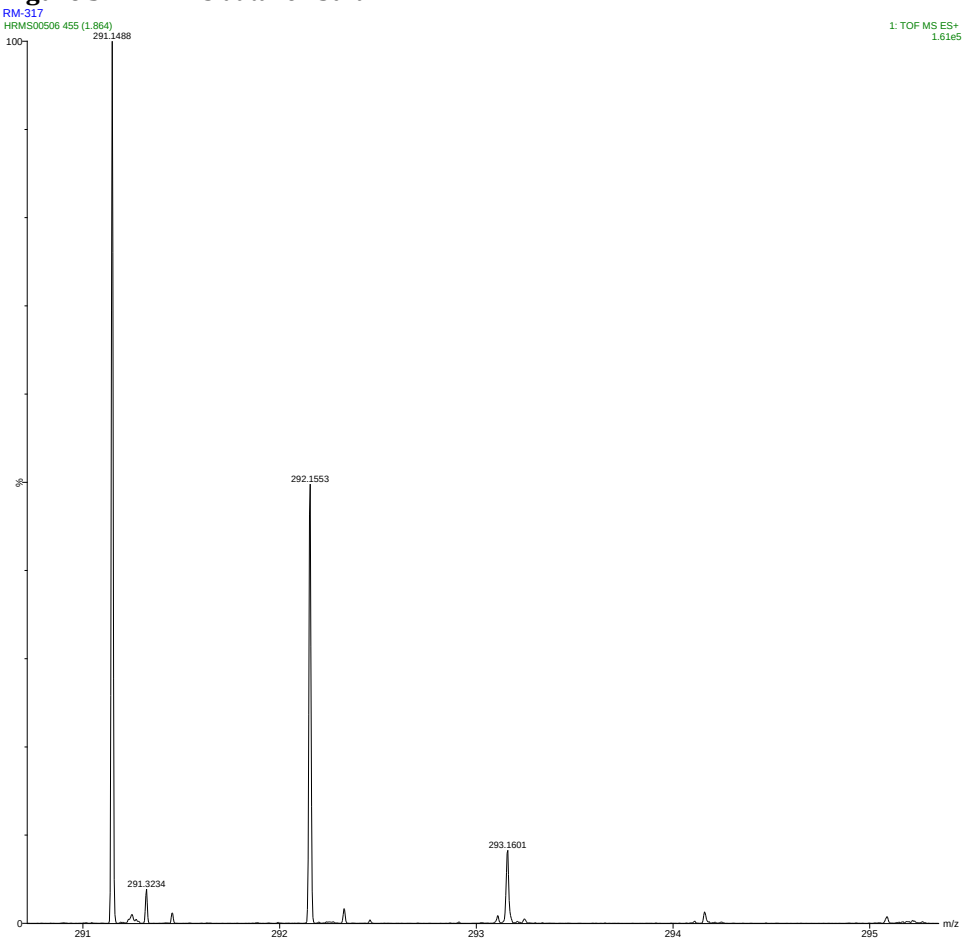



***d*²-phenylboronic acid (2a-*d*):** This reaction was carried out based on a procedure reported by Hou with slight modifications.[9] Triphenylboroxine was synthesized according to the procedure by Hayashi.[10] In a flame-dried 1-dram (4 mL) vial equipped with a magnetic stir bar were added triphenylboroxine (160 mg, 0.51 mmol) and $D_2O$ (1.8 mL, 0.28 M). The vial was then sealed with an unpunctured TFE septum-covered screw cap, then placed in a heating block that was pre-heated to 75 °C. After 14 h, the reaction was filtered while it was still hot to remove any excess triphenylboroxine. The filtrate was then cooled to room temperature, and a white solid crashed out of solution. After filtration, the solid was dried under vacuum for 4 hours to yield 88 mg (46%) of **2a-*d*** as a white solid (84% D), containing 9 mol% triphenylboroxine. **¹H NMR** (600 MHz, $(CD_3)_2SO$) δ 8.02 (s, 0.16H), 7.87 (s, 0.26 H), 7.78 (d, *J* = 7.1 Hz, 2H), 7.49–7.08 (m, 3H).




**Deuterium incorporation studies with $PhB(OD)_2$ in reaction conditions:** In a 1-dram (4 mL) vial equipped with a magnetic stir bar were added $Pd(OAc)_2$ (2.2 mg, 0.01 mmol), alkene **1a** (21.2 mg, 0.1 mmol), **2a-*d*** (24.8 mg, 0.2 mmol), and NaF (8.4 mg, 0.2 mmol). The vial was then sealed with an unpunctured TFE septum-covered screw cap. $H_2O$ (4.5 µL, 0.25 mmol) and benzotrifluoride dried over 4 Å molecular sieves (1 mL) were then added to the vial. The vial was then placed in a heating block that was pre-heated to 100 °C. After 12 h, the reaction was brought to room temperature, filtered through a plug of silica gel, and washed with acetone to elute all organic materials. The crude material was purified on a Waters Autopurification LC with a Waters BEH C18 column (19×160 mm, 5 mm) using a 0.1% aqueous formic acid:acetonitrile gradient (30 mL/min, main segment of gradient at 55–75% acetonitrile over 8 min) at ambient temperature. Fractionation was triggered by a Waters QDa single quadrupole mass spec in ESI+ (m/z = 291.1 [M+H], cone voltage 15V). Purification afforded 18 mg (62%) of **3a-*d2*** as an off-white solid. The isotopic distribution of **3a-*d2*** was determined by obtaining a high-resolution mass spectrum on an LC-TOF (Waters I-Class LC and Waters G2-XS TOF running in ESI+ mode) and processing the continuum data using Cerno Massworks 5.0.[8]

**Figure S12.** HRMS data for **3a-*d2***




Mixture Results:
0.731 $C_{19}H_{19}N_2O$
0.260 $C_{19}H_{18}N_2O[^2H]$
0.009 $C_{19}H_{17}N_2O[^2H]_2$
0.001 $C_{19}H_{16}N_2O[^2H]_3$
Overall Mass Error (mDa): 0.3147

**Figure S13.** $^{1}$H-NMR spectra for **3a-*d2***

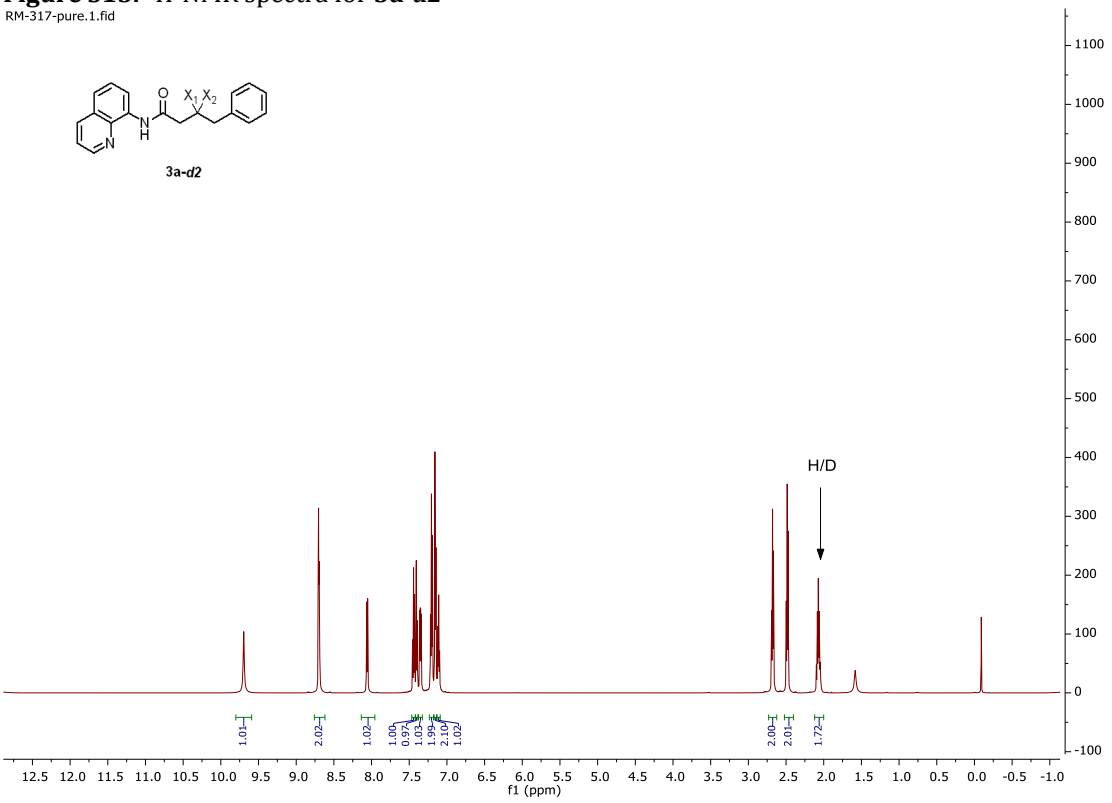
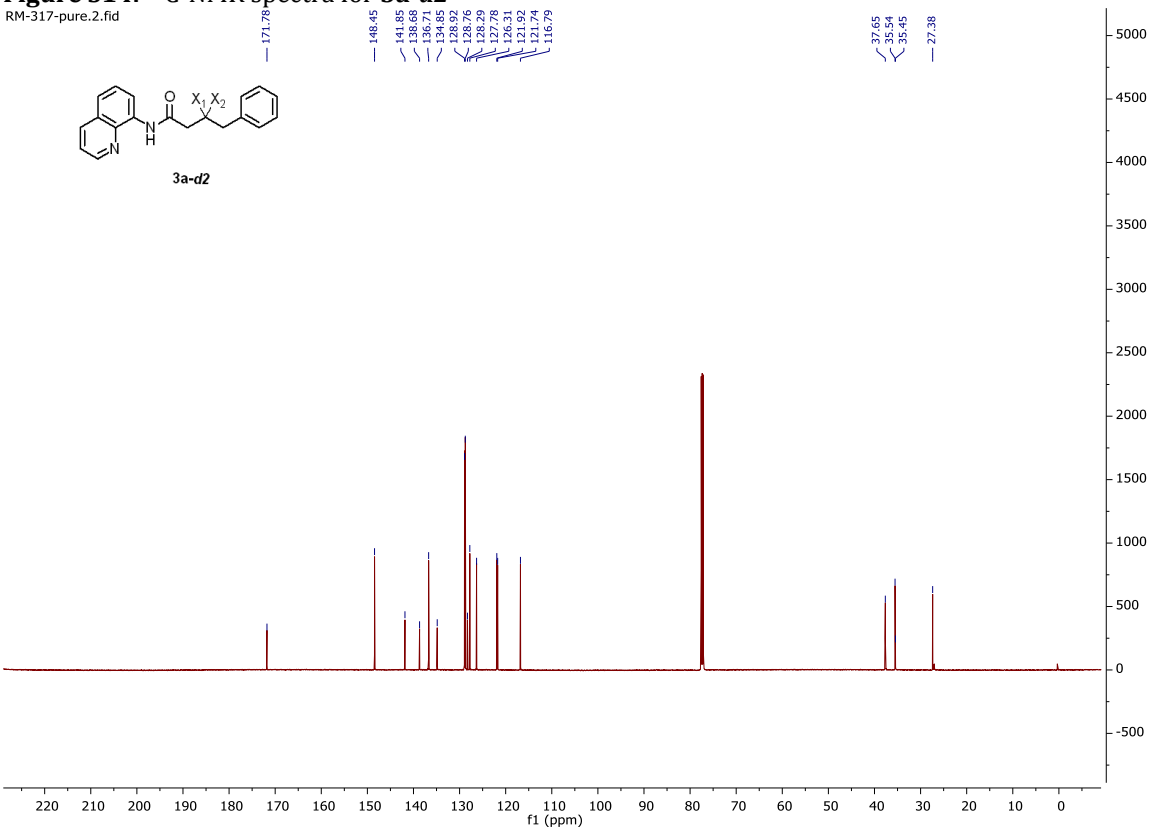
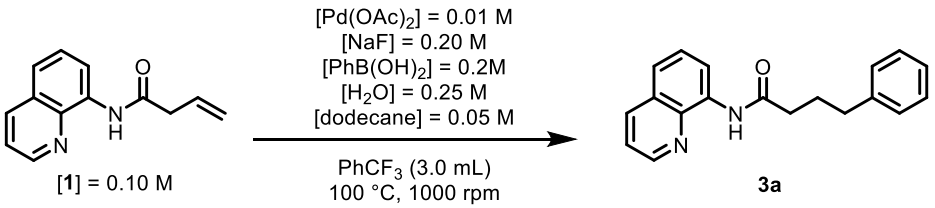



**Figure S14.** $^{13}$C-NMR spectra for **3a-*d2***



## General Procedure For Kinetic Experiments

Unless specified otherwise, kinetic experiments were conducted as follows.




**General Kinetic Procedure:** To a 2-Dram glass vial with screw cap septum was added phenylboronic acid (73.16 mg, 0.60 mmol) and sodium fluoride (25.19 mg, 0.60 mmol). **1** (212.25 mg, 1.00 mmol), palladium acetate (22.45 mg, 0.10 mmol), and dodecane (85.17 mg, 0.50 mmol) were added to a 10-mL volumetric flask and dissolved in benzotrifluoride using heat and sonication. Once solids had dissolved, the flask was cooled down to room temperature, and benzotrifluoride was further added as necessary to prepare a 10 mL stock solution of palladium acetate (0.01 M) and **1** (0.1 M). 3 mL of this stock solution was added to the vial using a 5 mL volumetric syringe. The cap was then taped shut with electrical tape. The reaction was then started by adding water (13.52 µL, 0.075 mmol) using a 50 µL microsyringe to the vial and immediately placing it into a heating block that was pre-heated to 100 °C with a stir rate of 1000 rpm. This was considered t=0 min for the kinetic time course.

Reaction progress was monitored by removing an aliquot (~15 µL) from the reaction mixture. Each aliquot was acquired using a new syringe (1 mL) and new hypodermic needle. Each aliquot was quenched by injection into a 1-Dram glass vial containing ethyl acetate (1 mL), dried over sodium sulfate, and analyzed by gas chromatography equipped with a flame ionization detector.

## Analysis by Gas Chromatography with Flame Ionization Detection

For gas chromatography-flame ionization detection analysis, helium was used as the carrier gas, with a constant flow rate of 6.0 mL/min. The oven temperature program started at 150 °C, was raised to 171 °C at a rate of 14 °C/min, then was raised to 280 °C at 30 °C/min, and subsequently was raised to 300 °C at 20°C/min and held at 300 °C for two minutes. The temperature of the detector and injector was held at 350 °C and 350 °C respectively. The retention time for each compound of interest is listed below.

**Figure S15.** GC-FID of **1** with $t_R$ = 3.44 min.

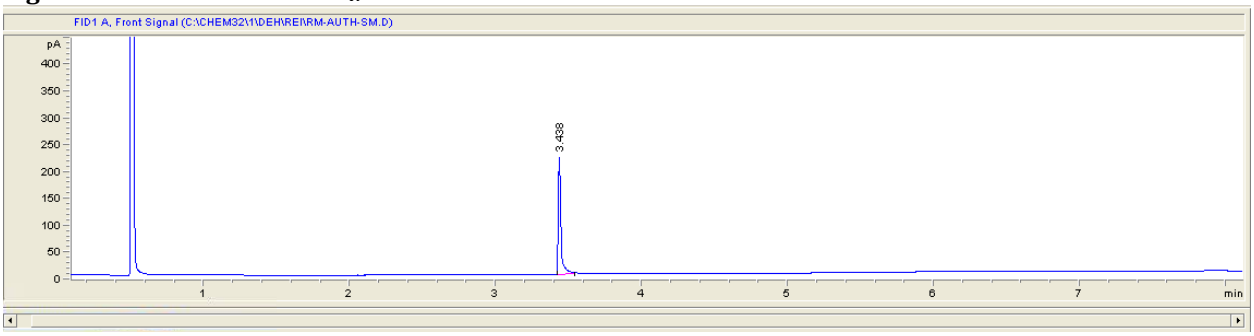



**Figure S16.** GC-FID of **3a** with $t_R$ = 5.72 min.

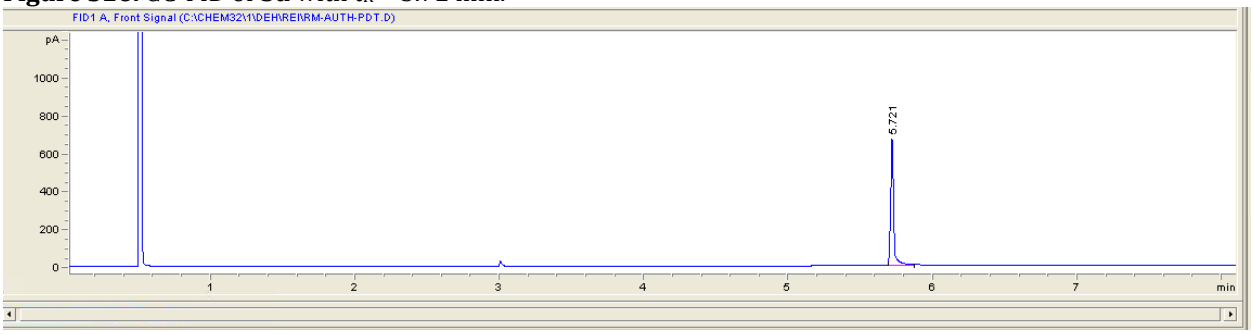



**Figure S17.** GC-FID of dodecane with $t_R$ = 0.814 min.

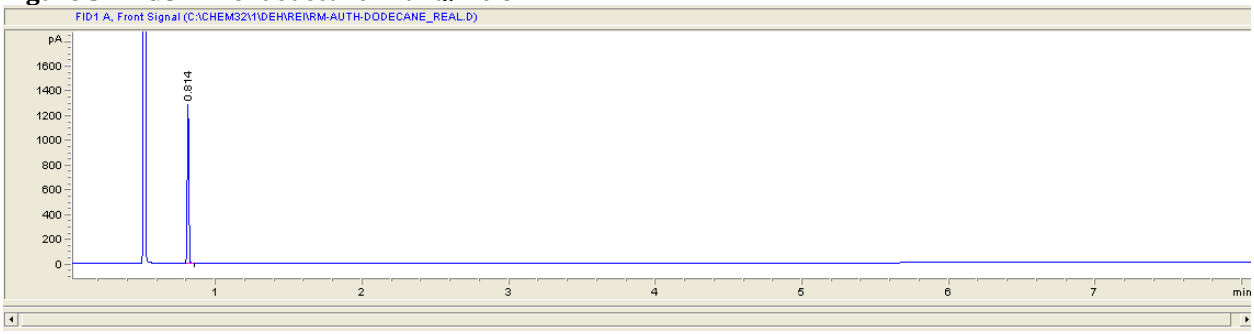


**Figure S18.** GC-FID of biphenyl with $t_R$ = 1.25 min.

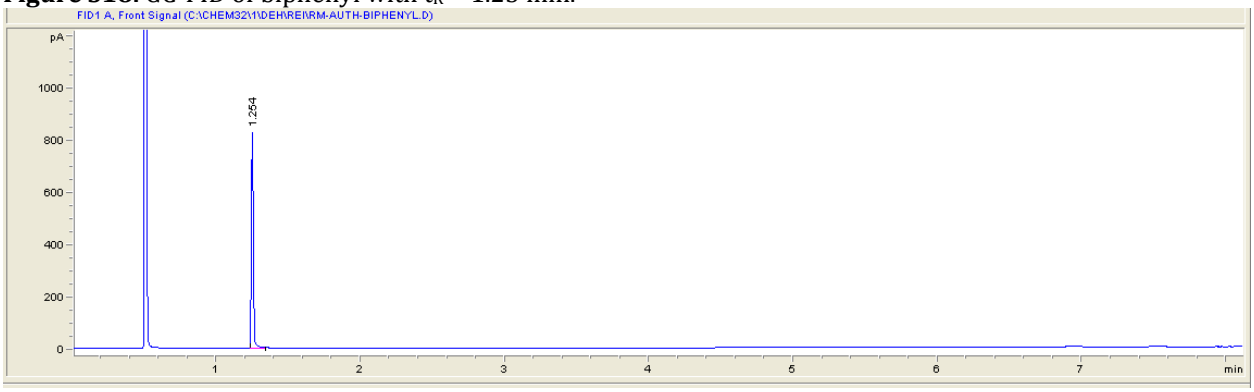
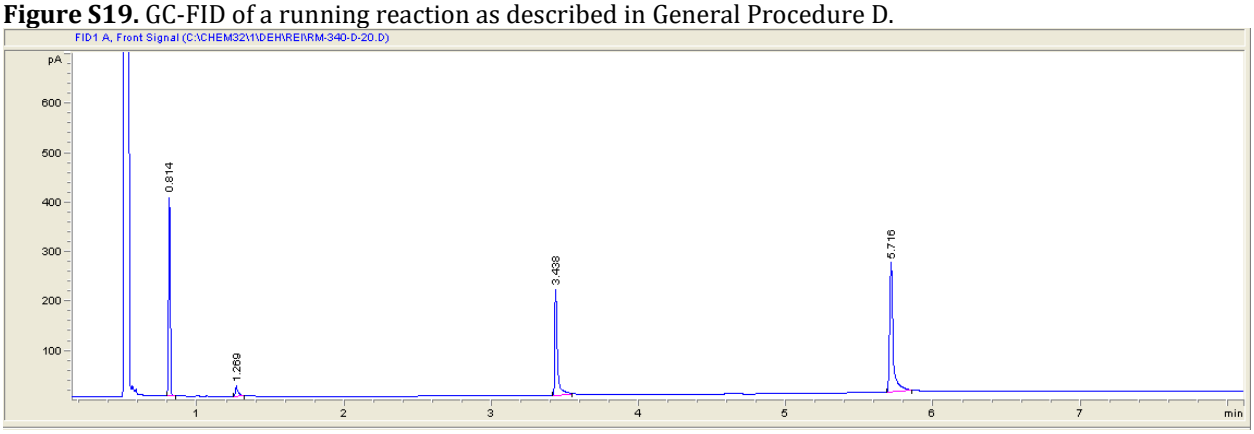



**Figure S19.** GC-FID of a running reaction as described in General Procedure D.



## Kinetic Data

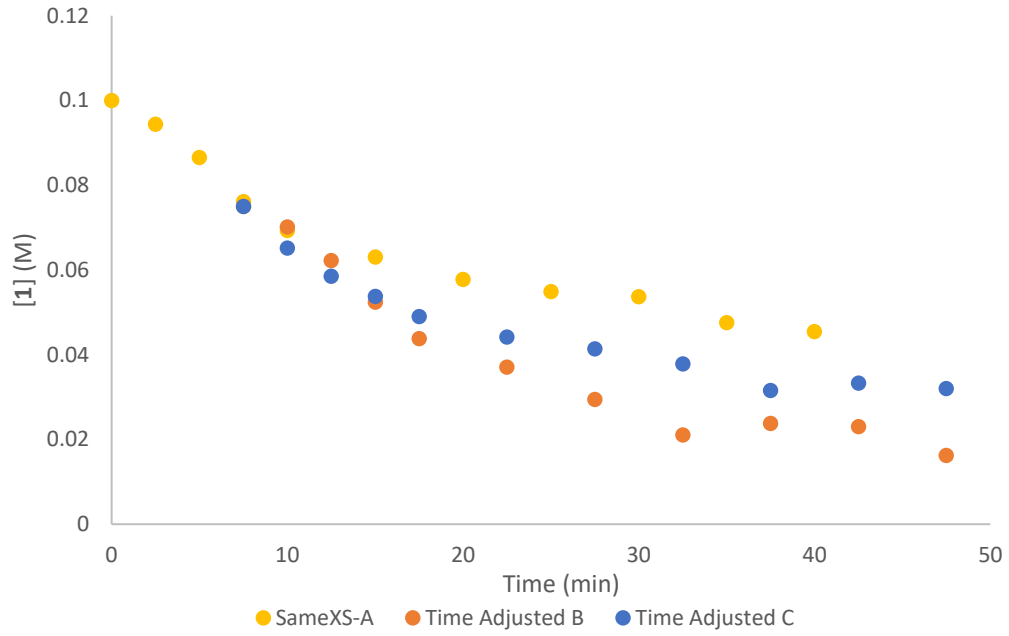
The procedures and results for the kinetic experiments are as follows.

**Same Excess Experiment**
Same excess studies were completed using General Kinetic Procedure, with the following variations:

| Experiment | [**1**] (M) | [**2a**] (M) | [**3a**] (M) |
|---|---|---|---|
| SameXS-A | 0.100 | 0.200 | 0 |
| SameXS-B | 0.075 | 0.175 | 0 |
| SameXS-C | 0.075 | 0.175 | 0.025 |

B and C were both time-adjusted by 7.5 minutes in Figure S20.

**Figure S20:** Kinetic profile for experiments performed at same excess




**Different Excess Experiments**
Different excess studies were completed using General Kinetic Procedure, with the following variations:

| Experiment | [**1**] (M) | [**2a**] (M) |
|---|---|---|
| Alkene-A | 0.100 | 0.200 |
| Alkene-B1 | 0.200 | 0.200 |
| Alkene-B2 | 0.200 | 0.200 |

| Experiment | [**1**] (M) | [**2a**] (M) |
|---|---|---|
| Boronic-A | 0.100 | 0.200 |
| Boronic-B1 | 0.100 | 0.100 |
| Boronic-B2 | 0.100 | 0.100 |
| Boronic-C | 0.400 | 0.400 |

**Figure S21:** Kinetic profile for experiments performed at different excess in **1**

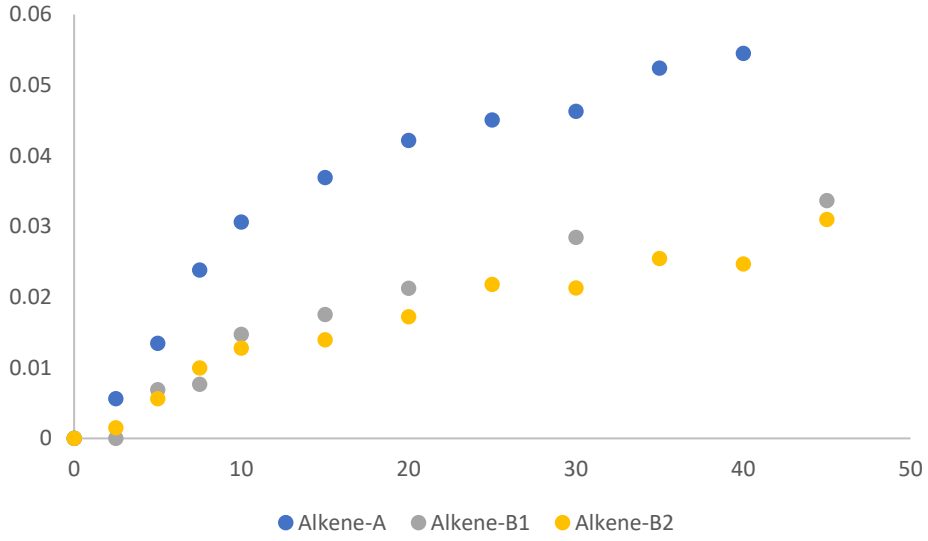
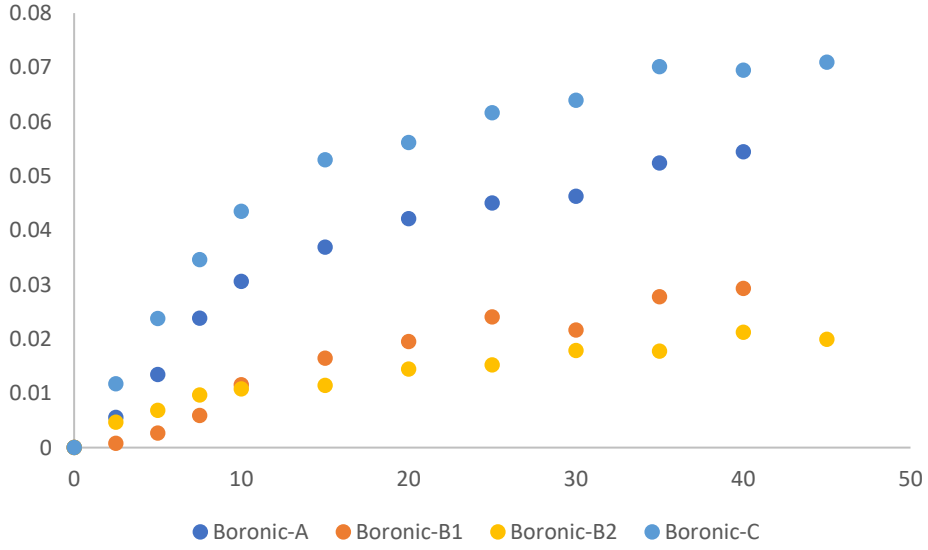



**Figure S22:** Kinetic profile for experiments performed at different excess in **2a**

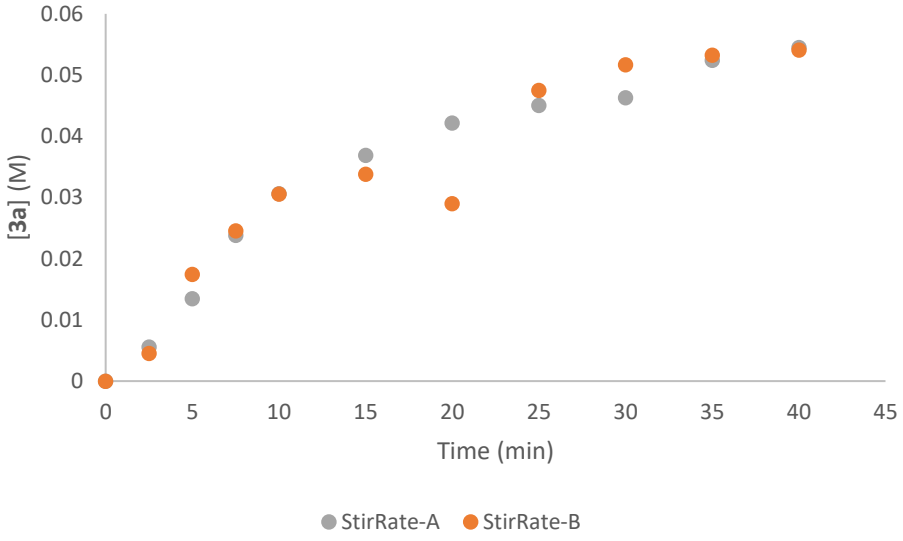


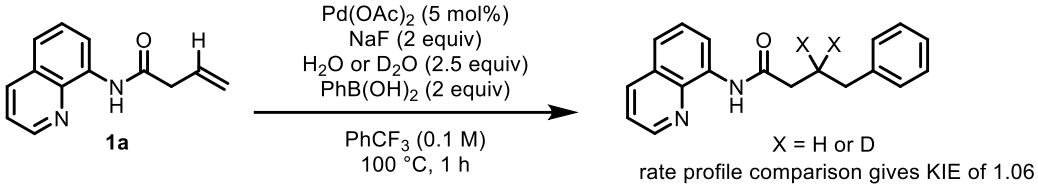
**Comparison of Different Stir Rates**

Comparison of different stir rates were conducted using General Kinetic Procedure, with the following variations:

| Experiment | RPM |
|---|---|
| StirRate-A | 1000 |
| StirRate-B | 500 |

**Figure S23:** Kinetic profile for experiments performed at different stir rates




**Comparison of global rate profile between using $H_2O$ and $D_2O$:**

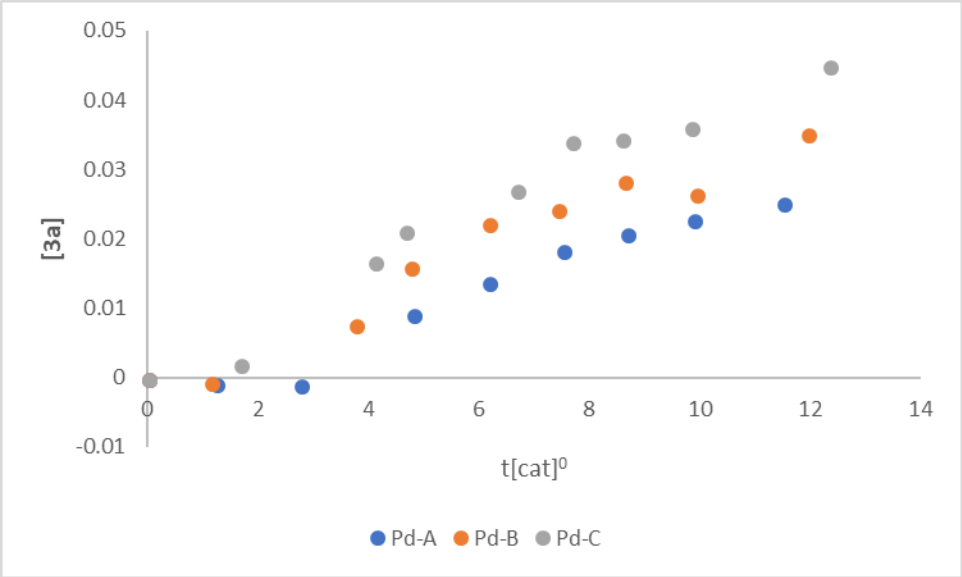
Comparison of global rate profile between using $H_2O$ and $D_2O$ was conducted using General Kinetic Procedure and benzotrifluoride dried over 4 Å molecular sieves. The rate profile is as shown in Scheme 4 of the main paper.

**Determination of catalyst order**

Determination of catalyst order was conducted using General Kinetic Procedure, with the following variations:

| Experiment | $[Pd(OAc)_2]$ |
|---|---|
| Pd-A | 0.00983 |
| Pd-B | 0.01509 |
| Pd-C | 0.01933 |

**Figure S24:** Kinetic profile for experiments performed at different concentrations in $Pd(OAc)_2$




Using the graphical analysis method developed by Burés[11], the data obtained above was plotted as [**3a**] against a normalized time scale, $t[cat]^m$.

**Figure S25:** Kinetic profile replotted normalized time scale where m = 1

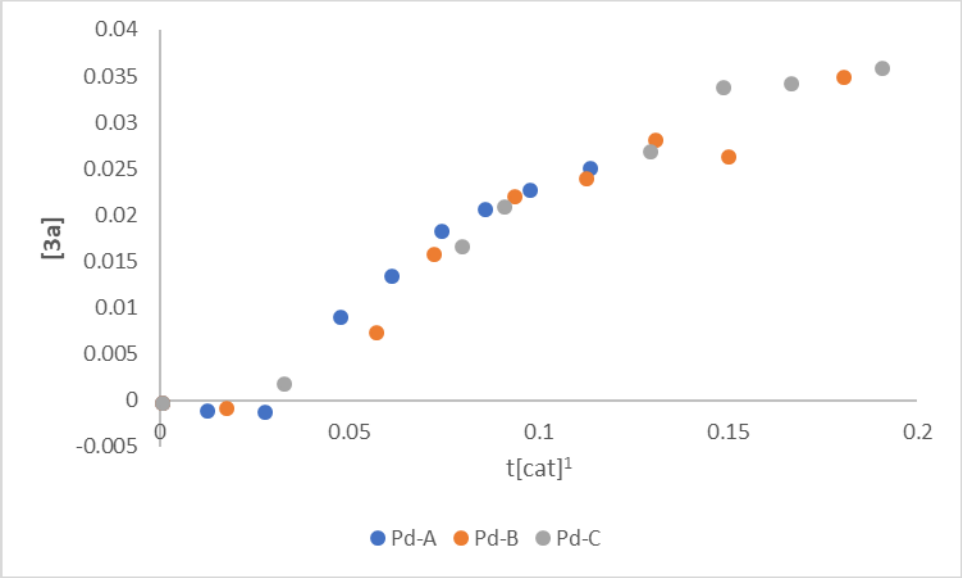
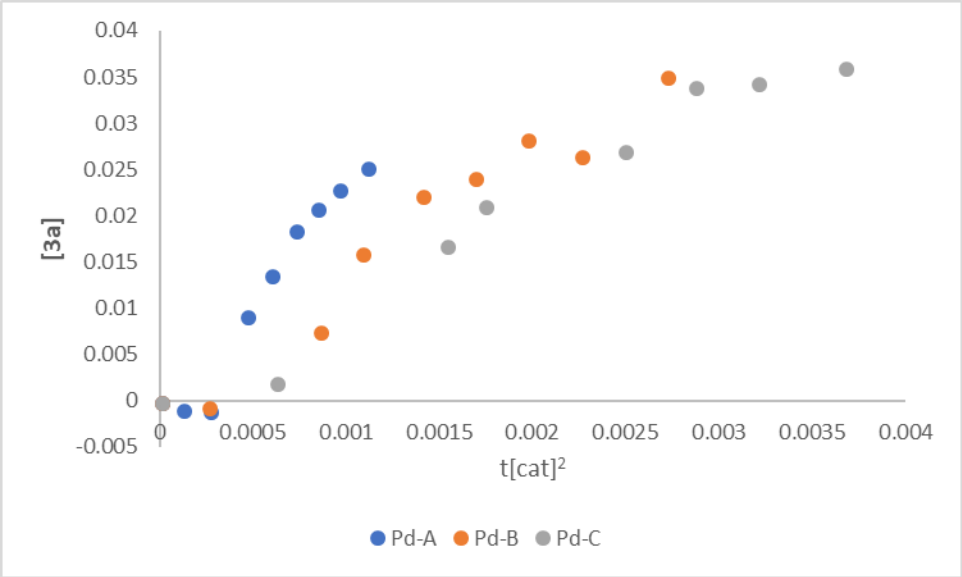


**Figure S26:** Kinetic profile replotted normalized time scale where m = 2



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1. K. S. Yang, J. A. Gurak, Z. Liu, and K. M. Engle, *J. Am. Chem. Soc.* 2016, **138,** 14705.
2. J. A. Gurak, K. S. Yang, Z. Liu, and K. M. Engle, *J. Am. Chem. Soc*. 2016, **138,** 5805.
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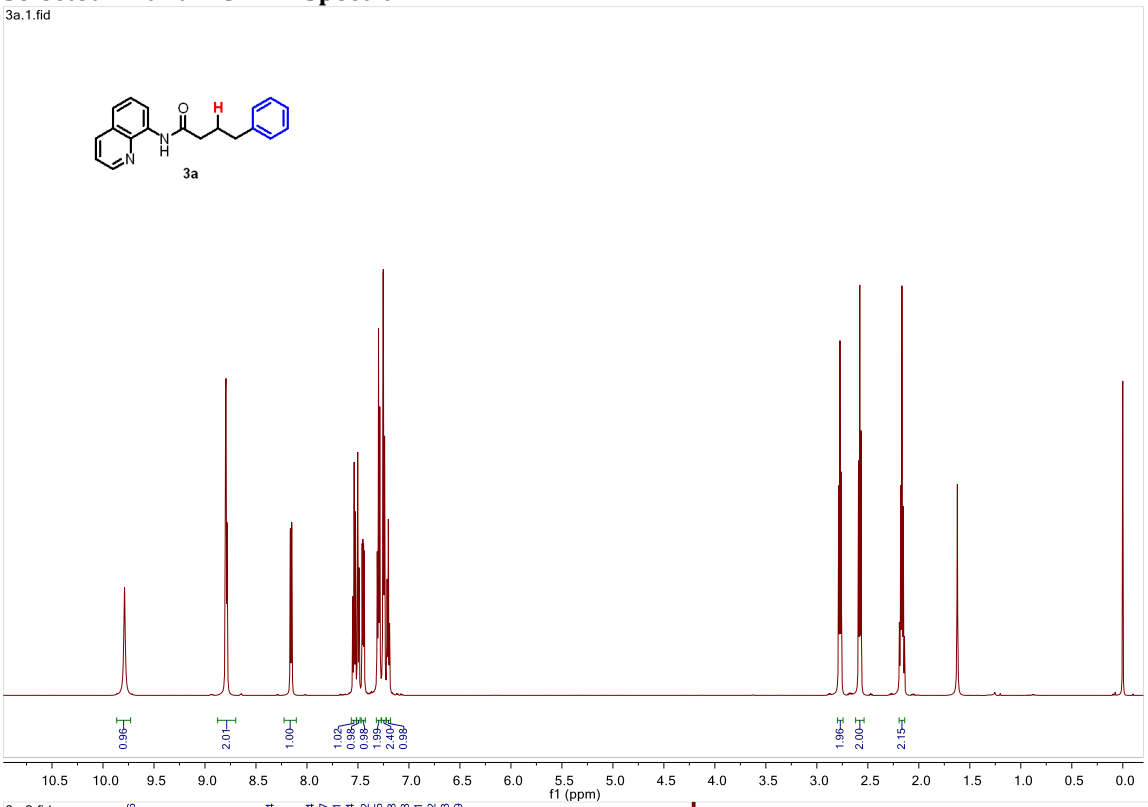
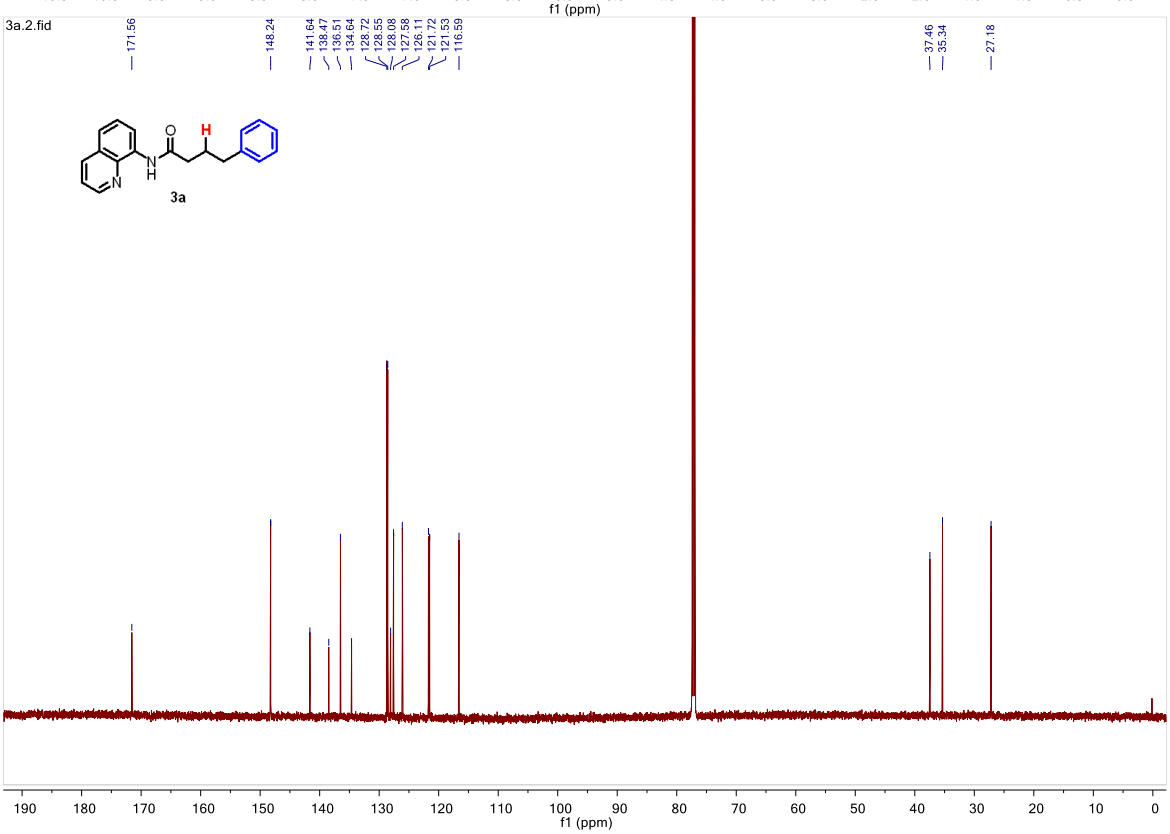
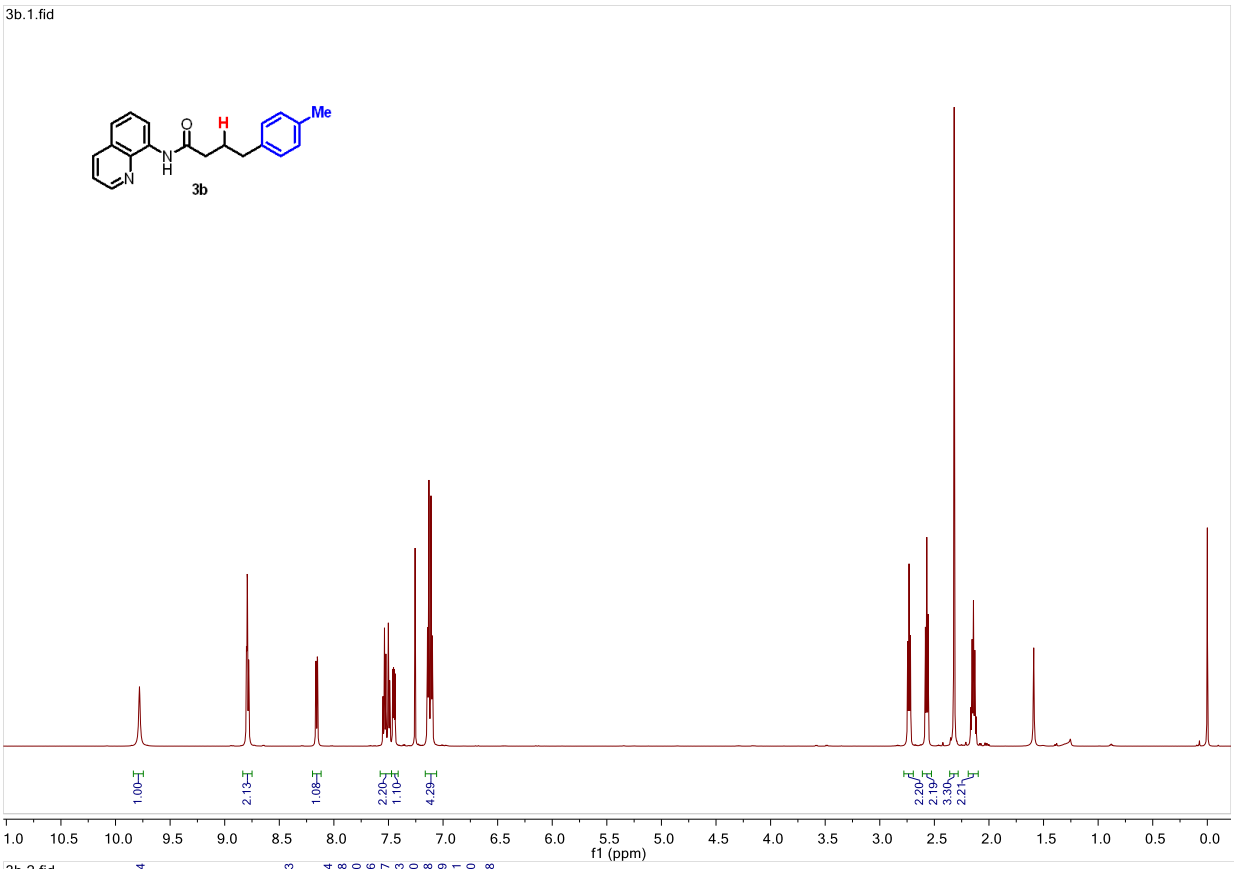
9. A. Gao, X.-Y. Liu, H. Li, C.-H. Ding, and X.-L. Hou, *J. Org. Chem.,* 2017, **82**, 9988.
10. C. M. So, S. Kume, and T. Hayashi, *J. Am. Chem. Soc.*, 2013, **135,** 10990.
11. J. Burés, *Angew. Chem. Int. Ed.,* 2016, **55**, 2028.

**Selected $^{1}H$ and $^{13}C$ NMR Spectra**

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Me
O
H
N
H
N
3b
1.00
2.13
1.08
2.20
1.10
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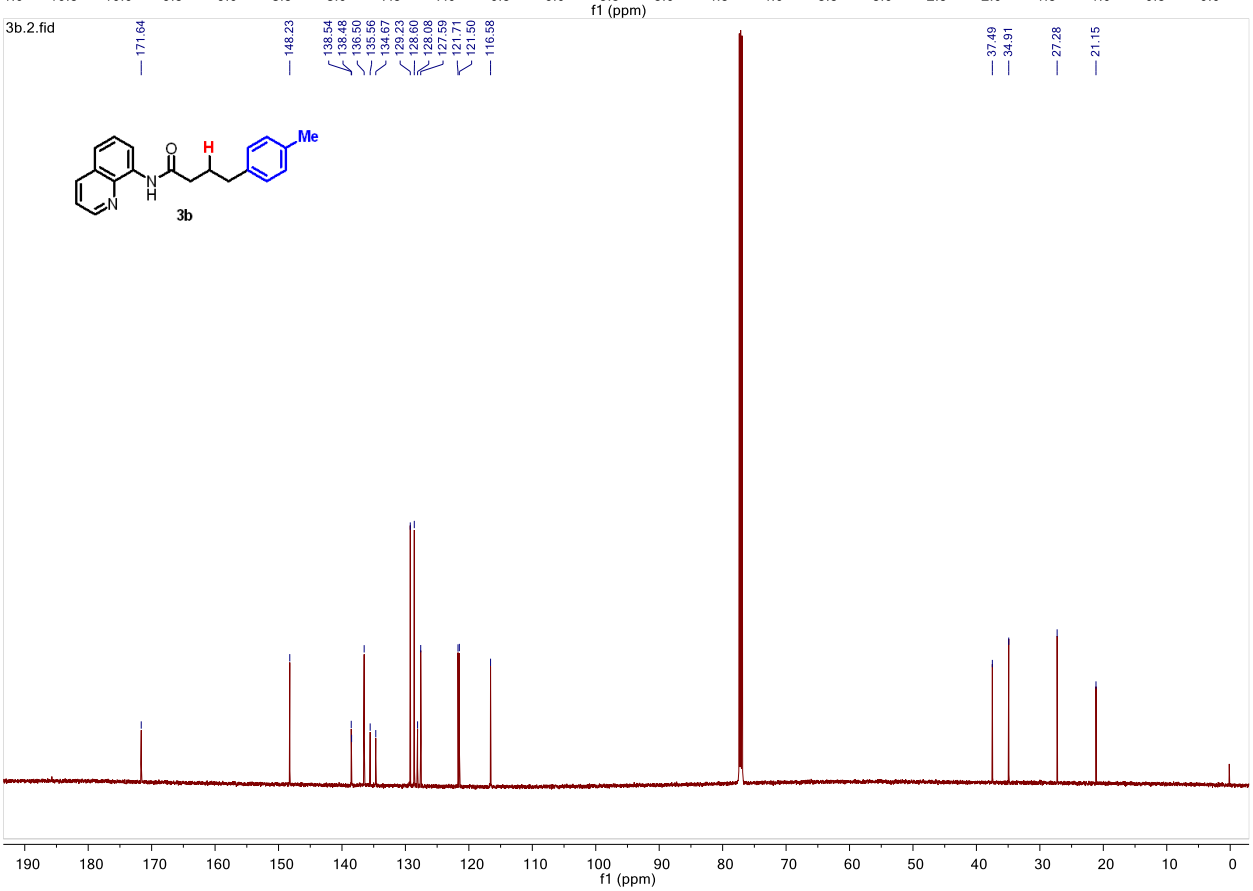
2.20
2.19
3.30
2.21
1.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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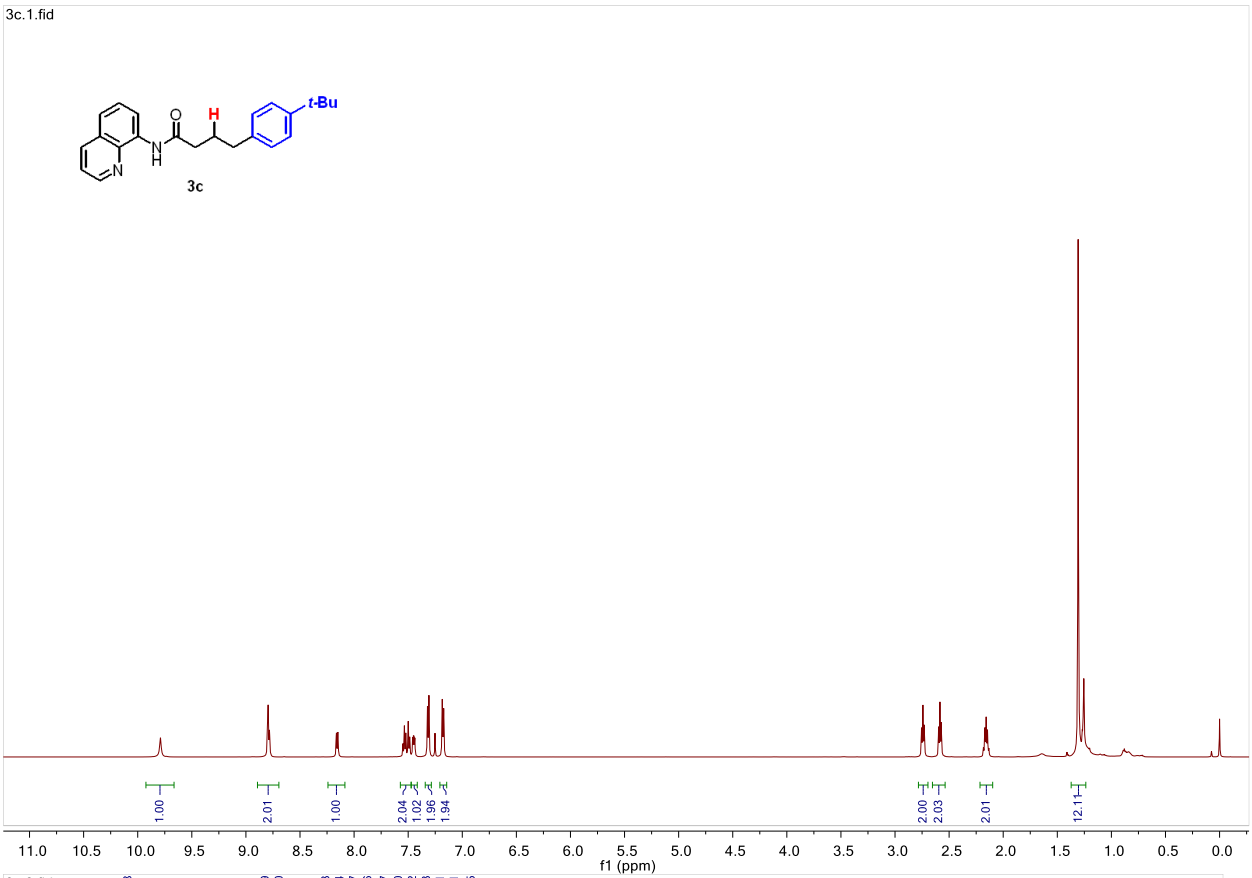
138.54
138.48
136.50
135.66
134.67
129.23
128.60
128.08
127.59
121.71
121.50
116.58
37.49
34.91
27.28
21.15
Me
O
H
N
H
N
3b
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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t-Bu
H
O
N
H
N
3c
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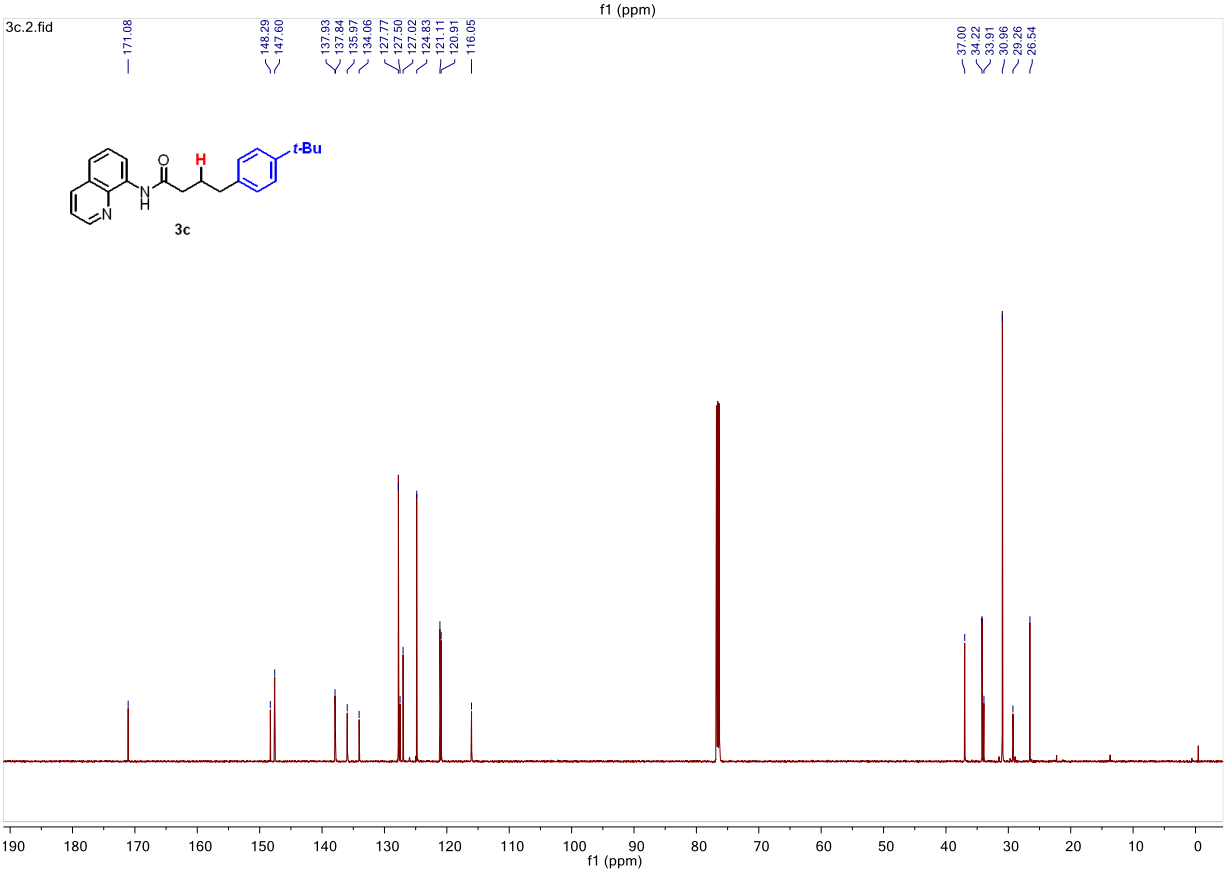
1.00
2.04
1.02
1.96
1.94
2.00
2.03
2.01
12.11
11.0
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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116.05
37.00
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30.96
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26.54
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H
O
N
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N
3c
190
180
170
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110
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90
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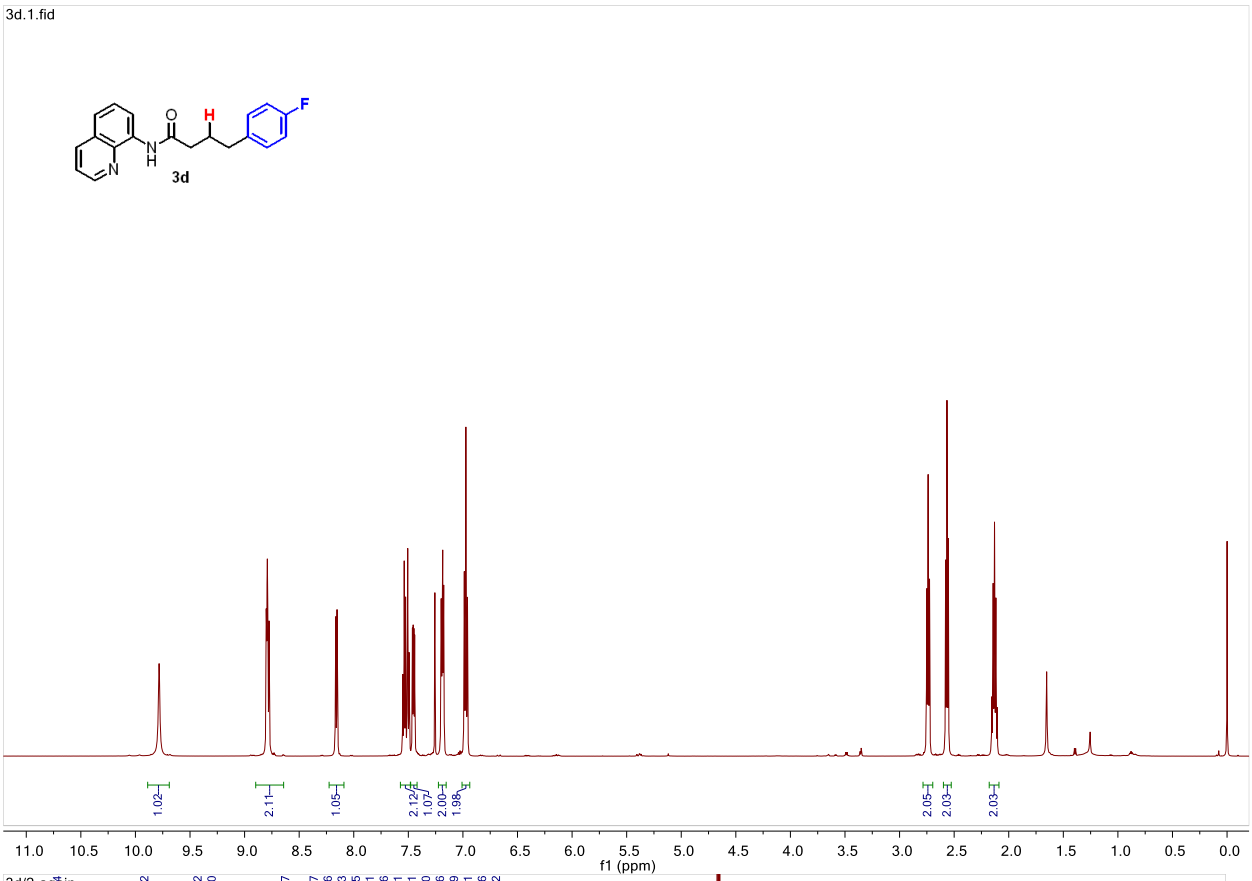
50
40
30
20
10
0
f1 (ppm)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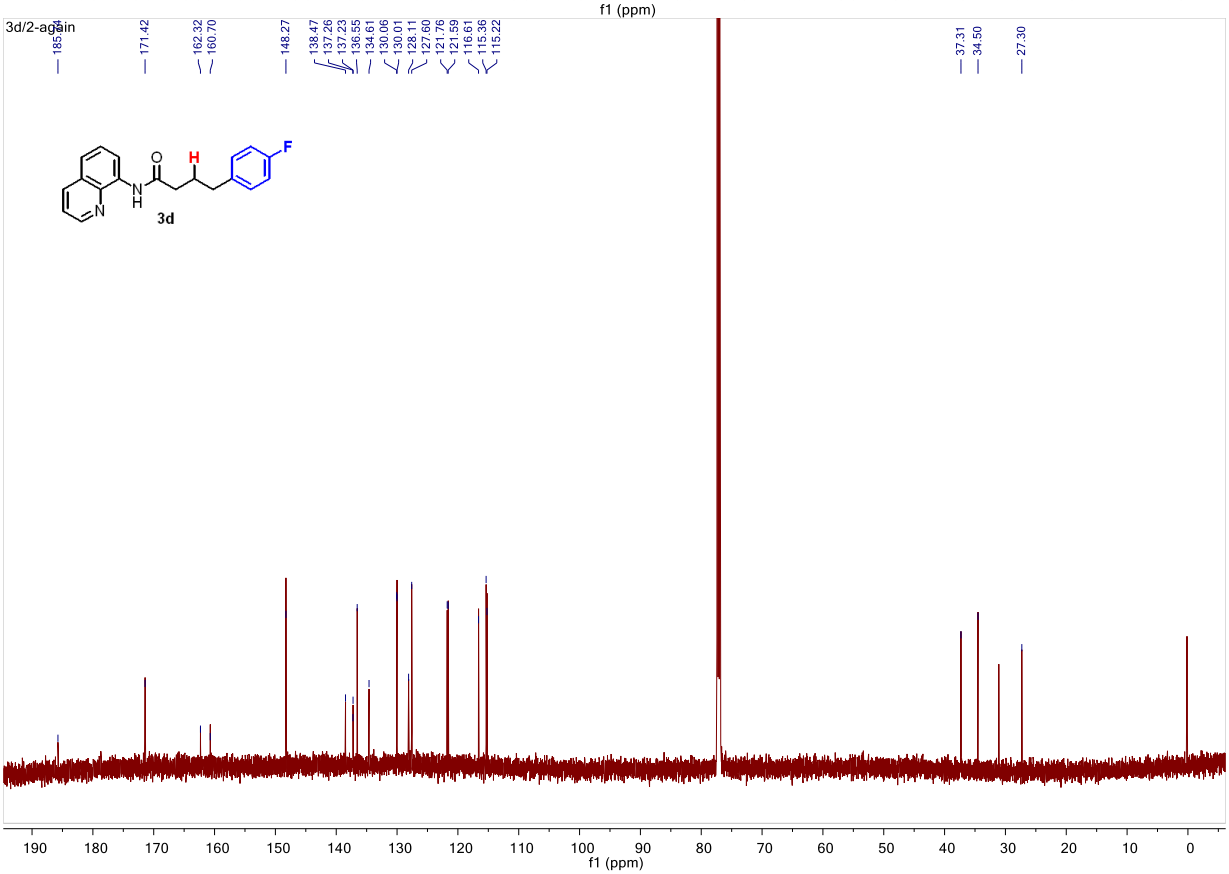
2.03
f1 (ppm)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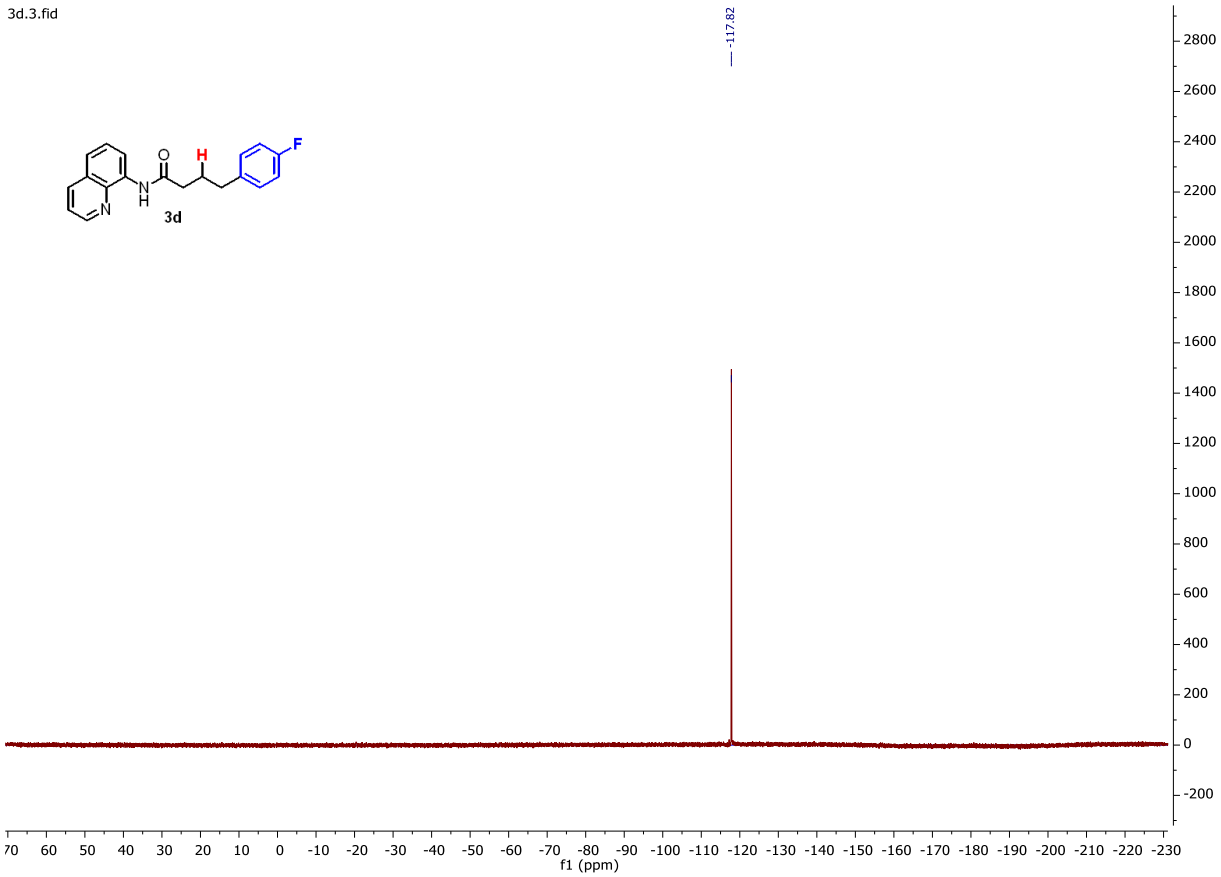
3d
f1 (ppm)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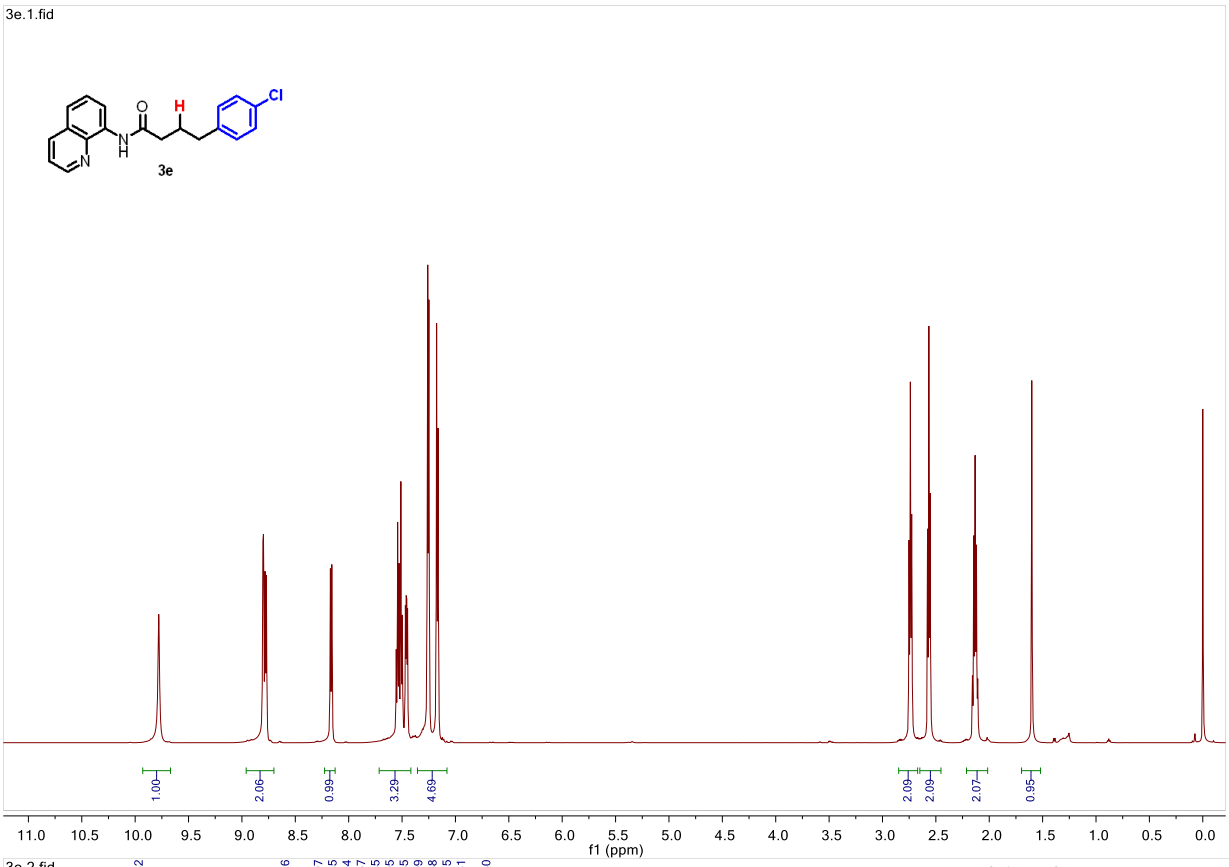
3d
f1 (ppm)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4.69
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2.09
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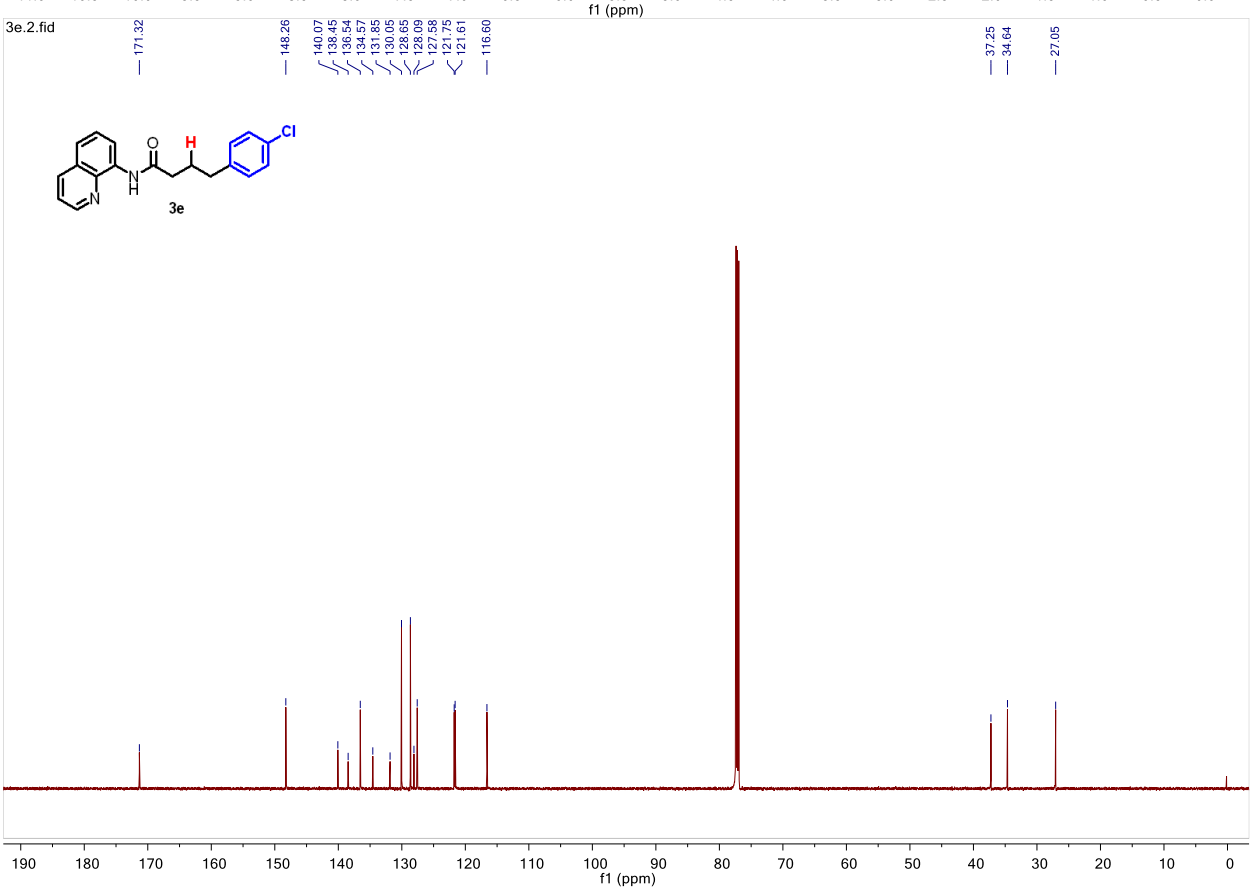
0.95
f1 (ppm)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148.26
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130.05
128.65
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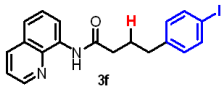
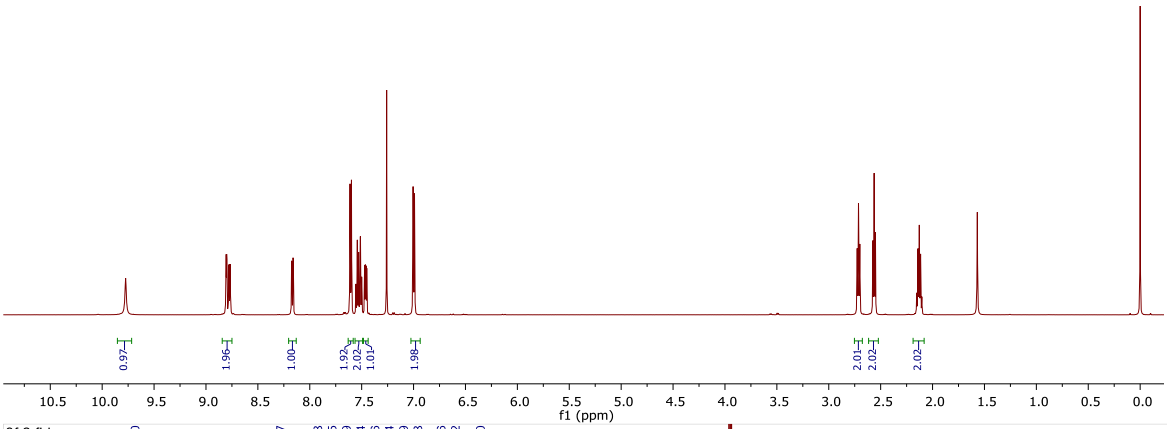
27.05
3e
f1 (ppm)

3f.1.fid

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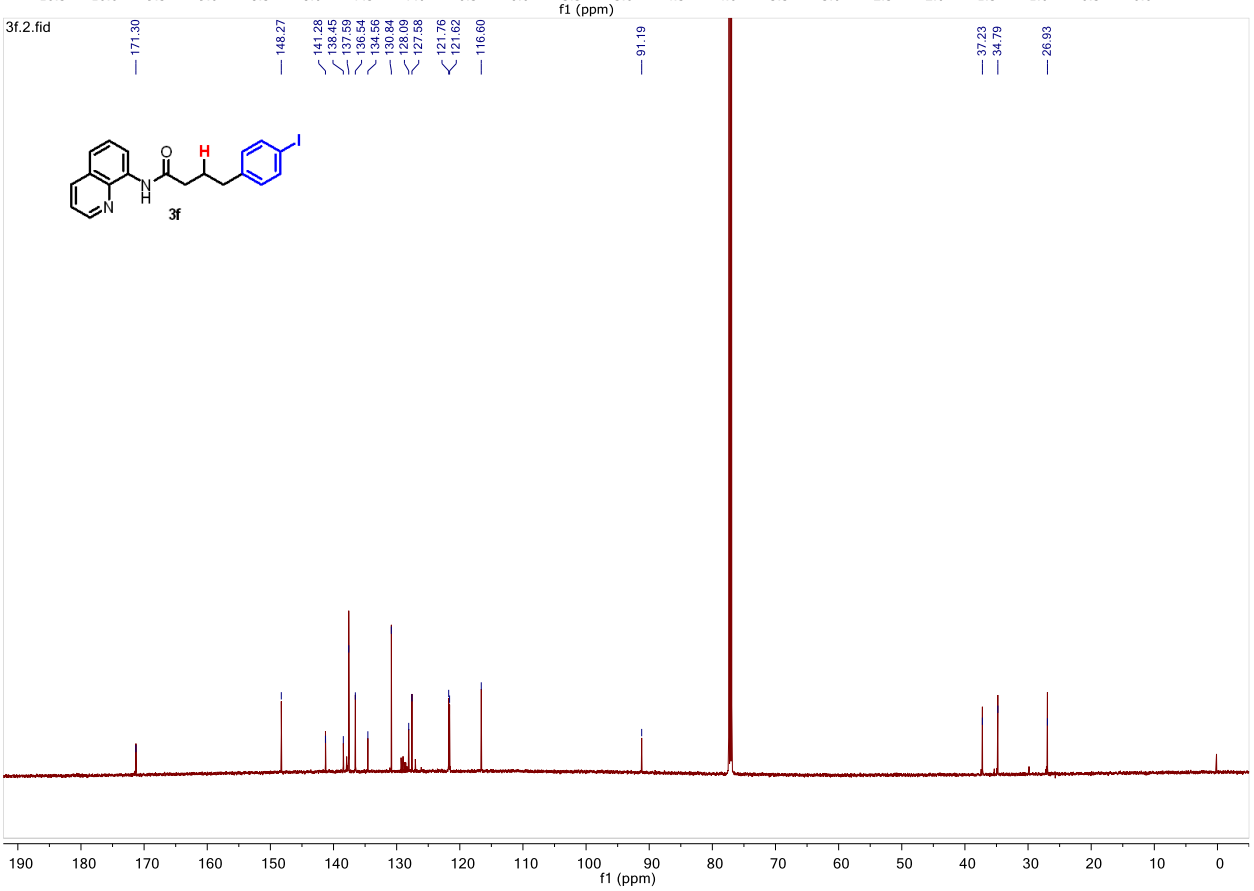

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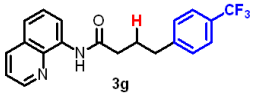


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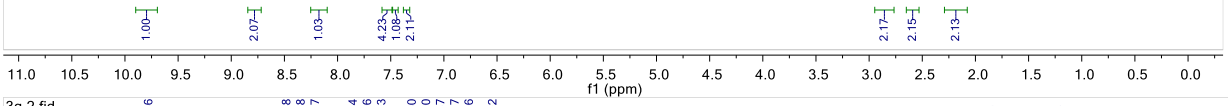





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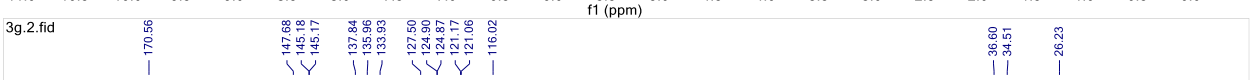


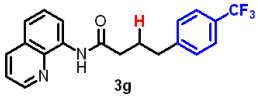


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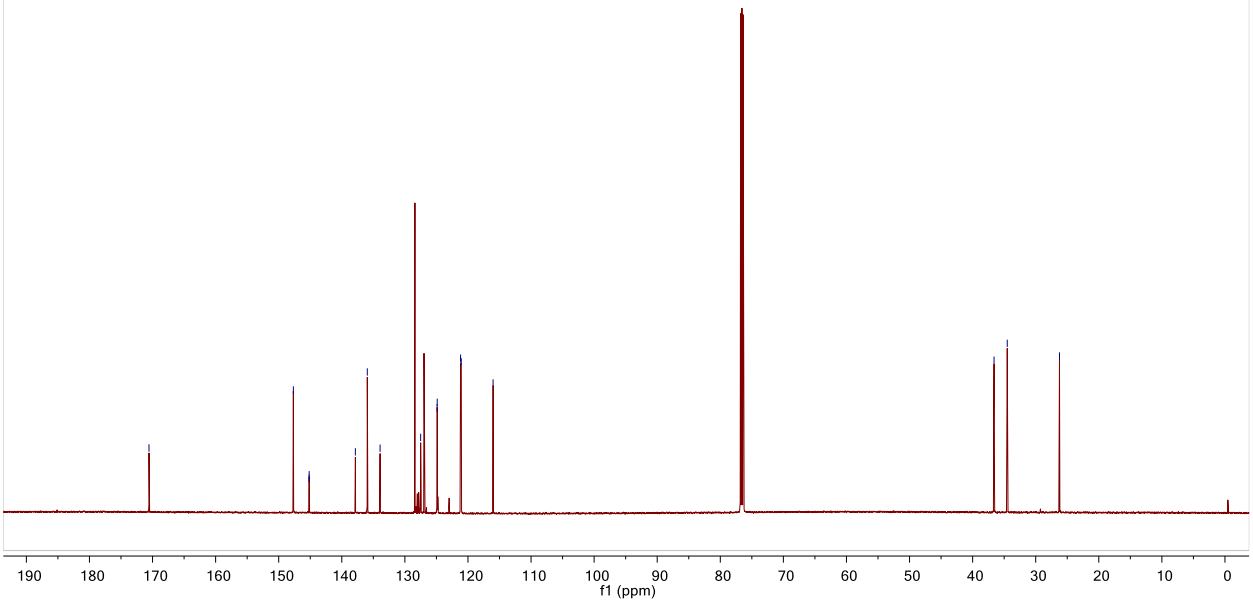

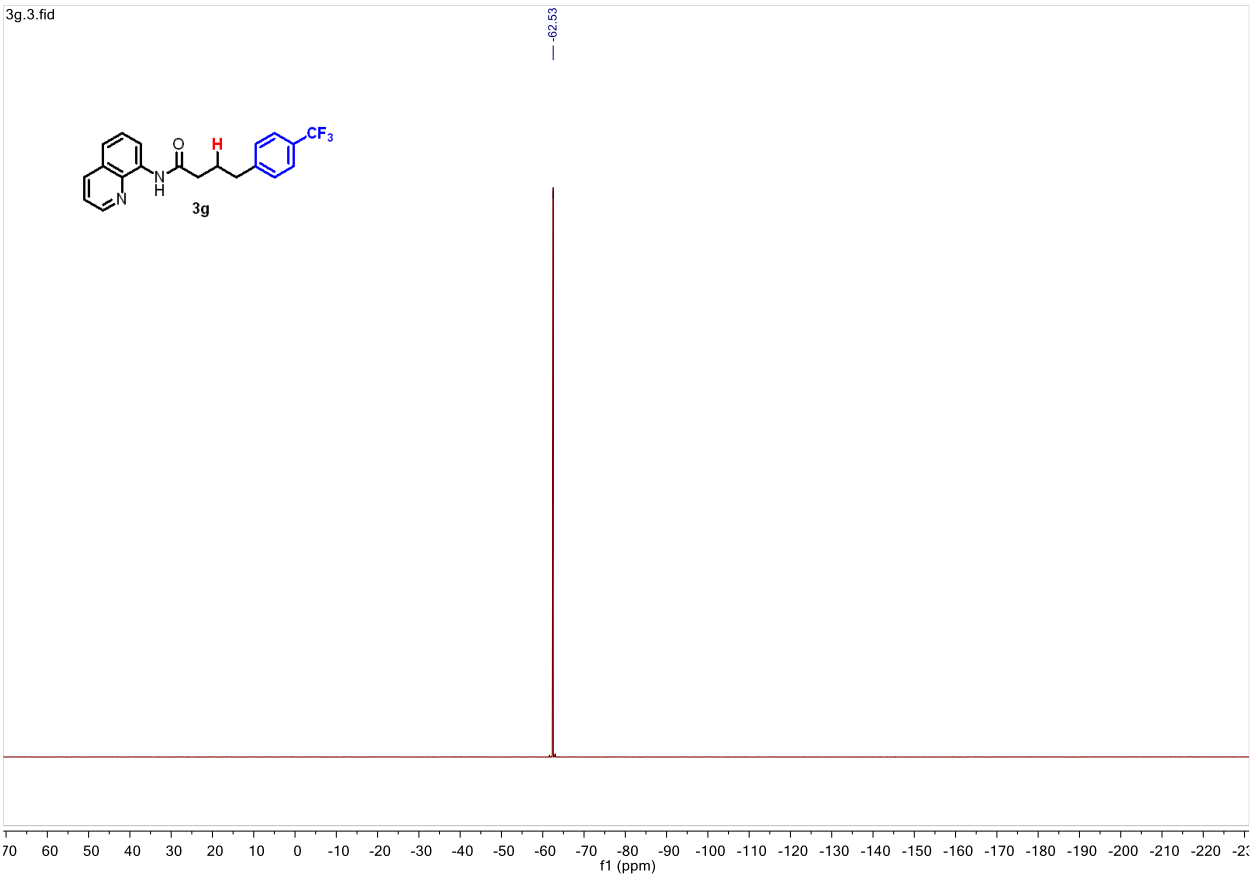
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-62.53
O
H
CF3
N
H
N
3g
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

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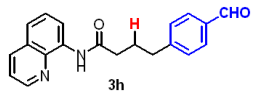


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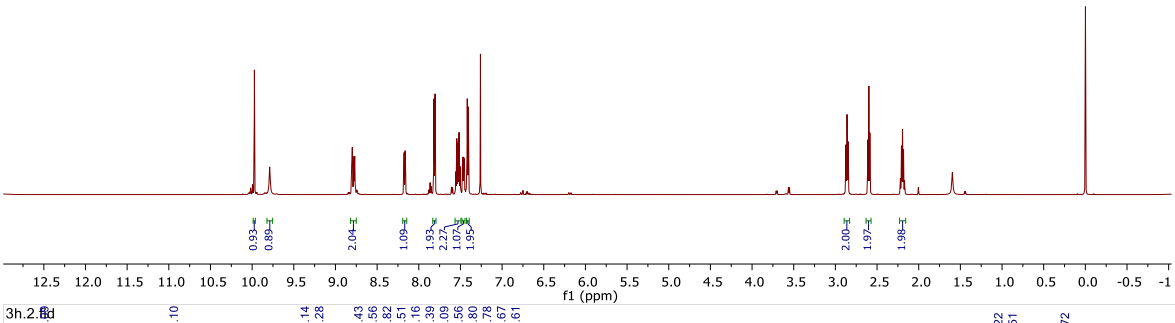


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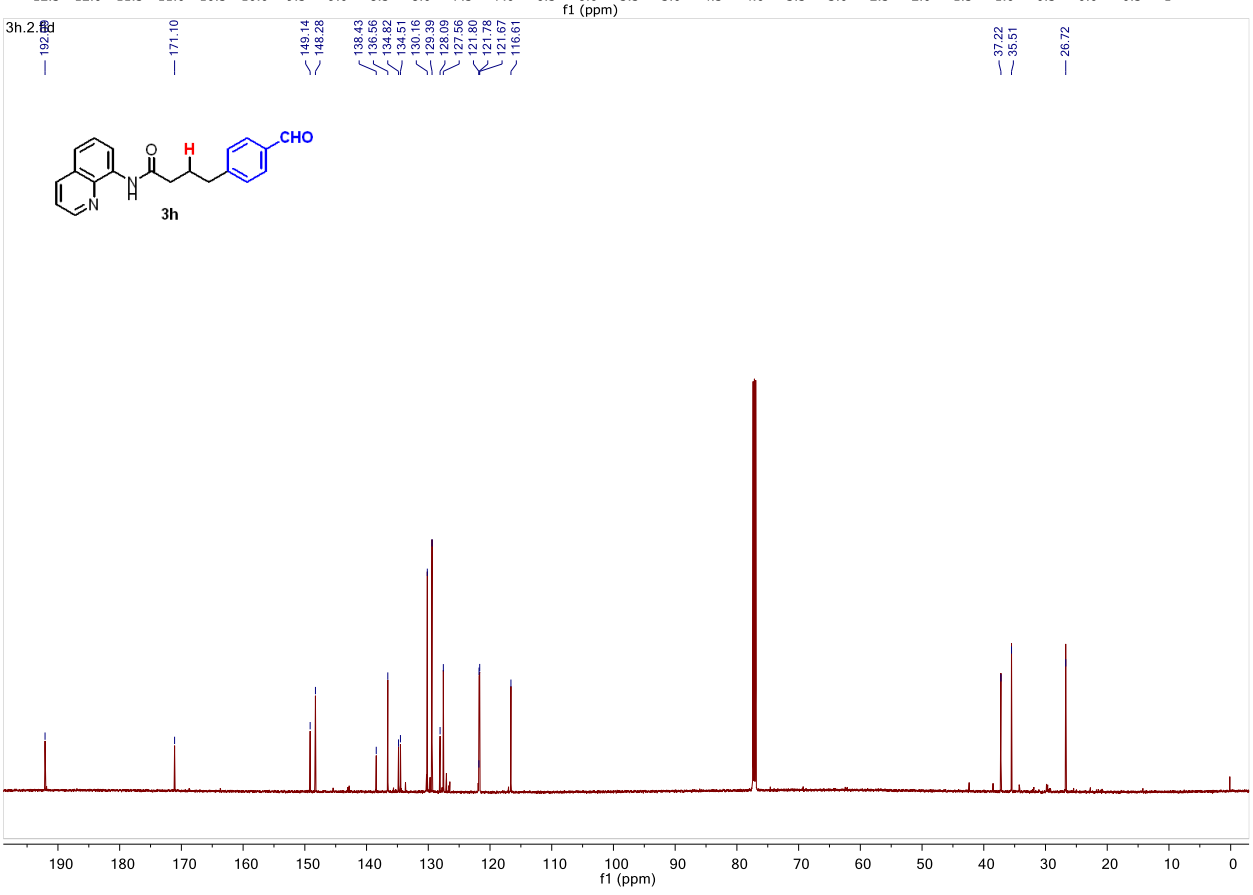
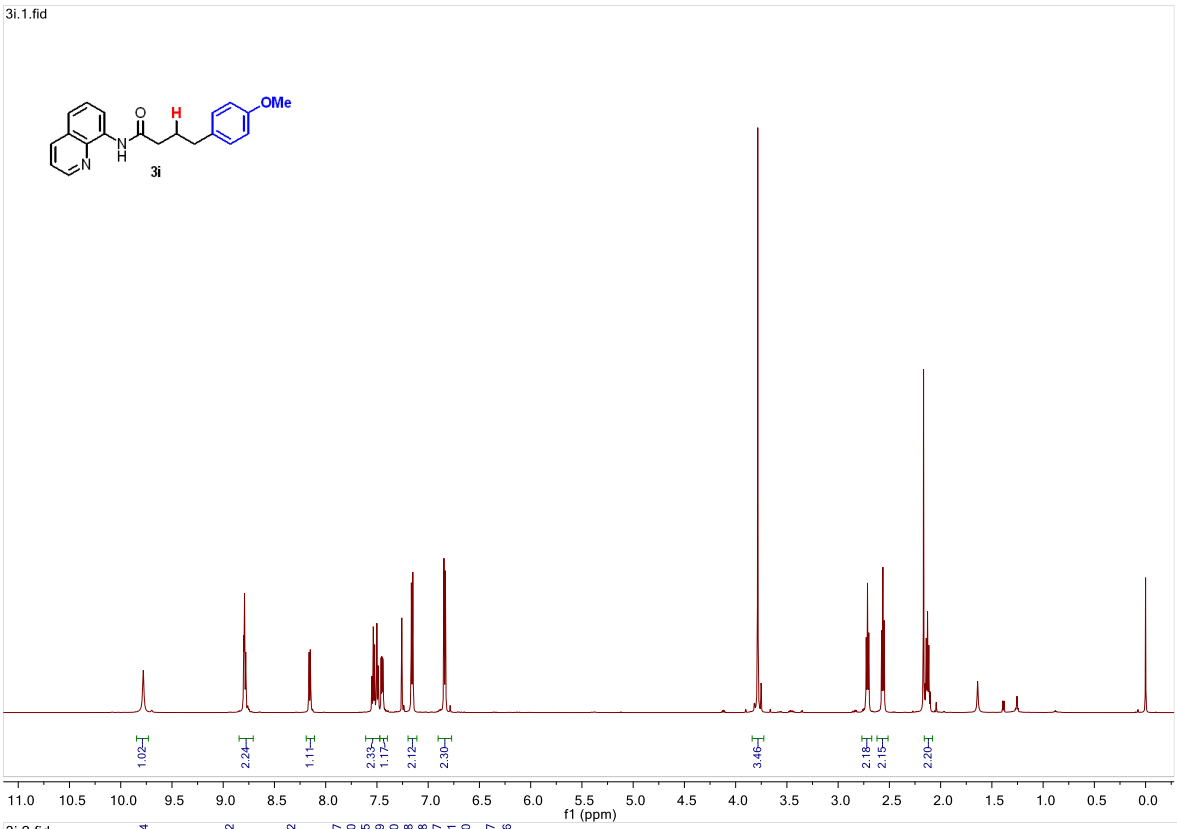
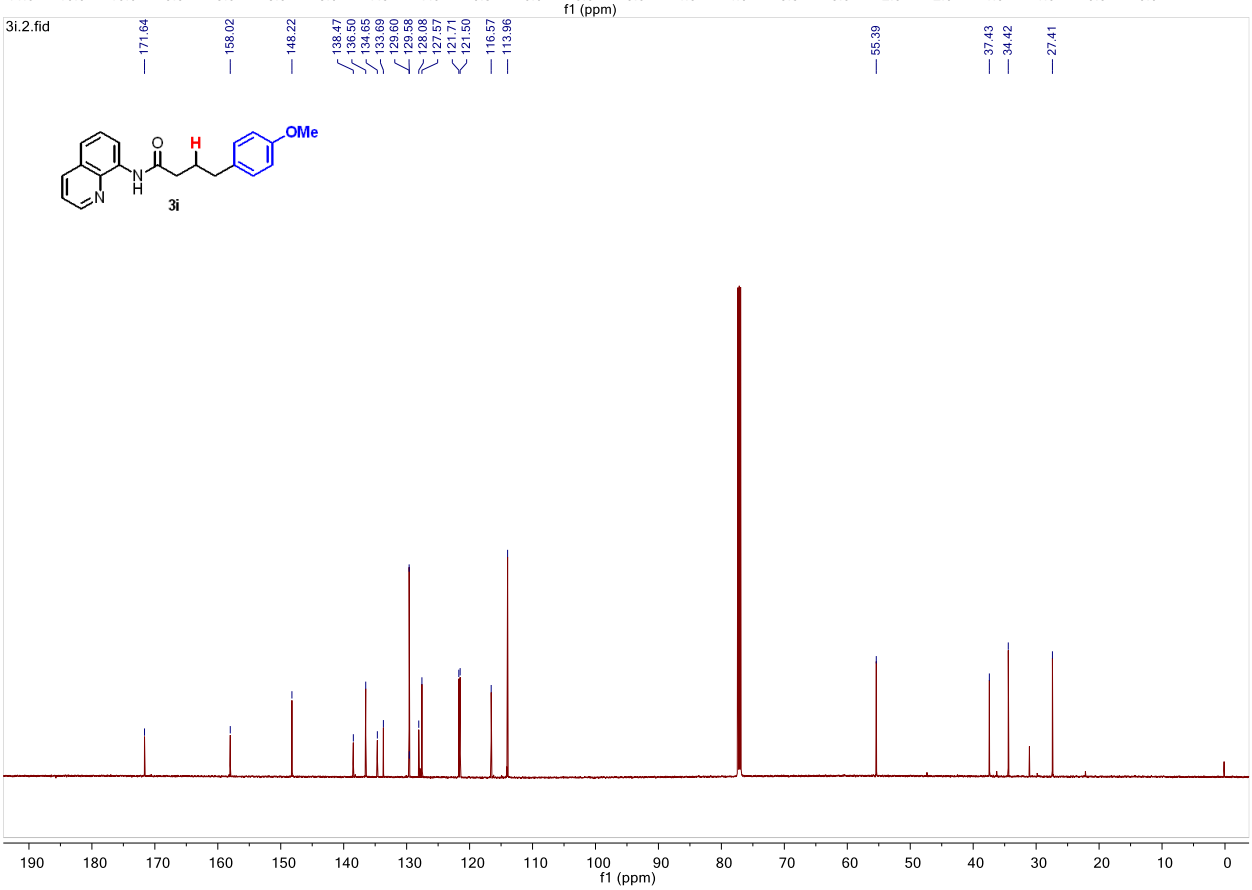


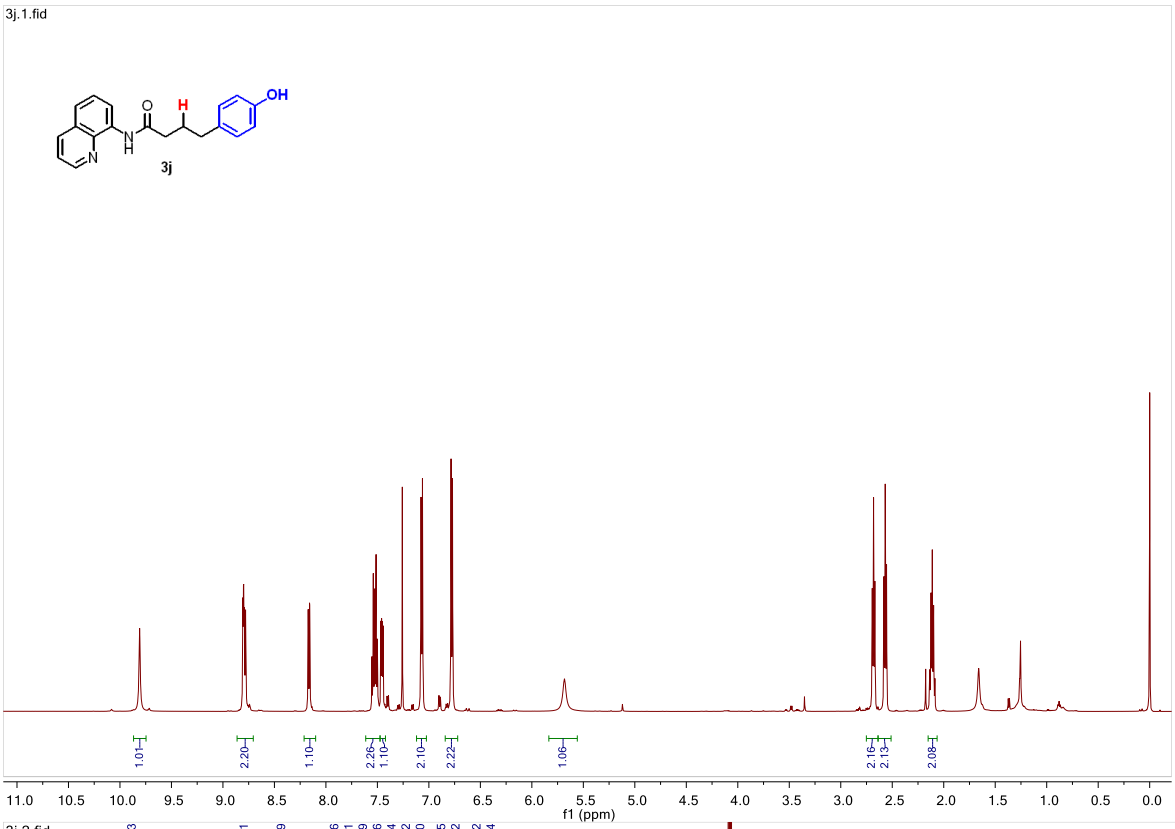


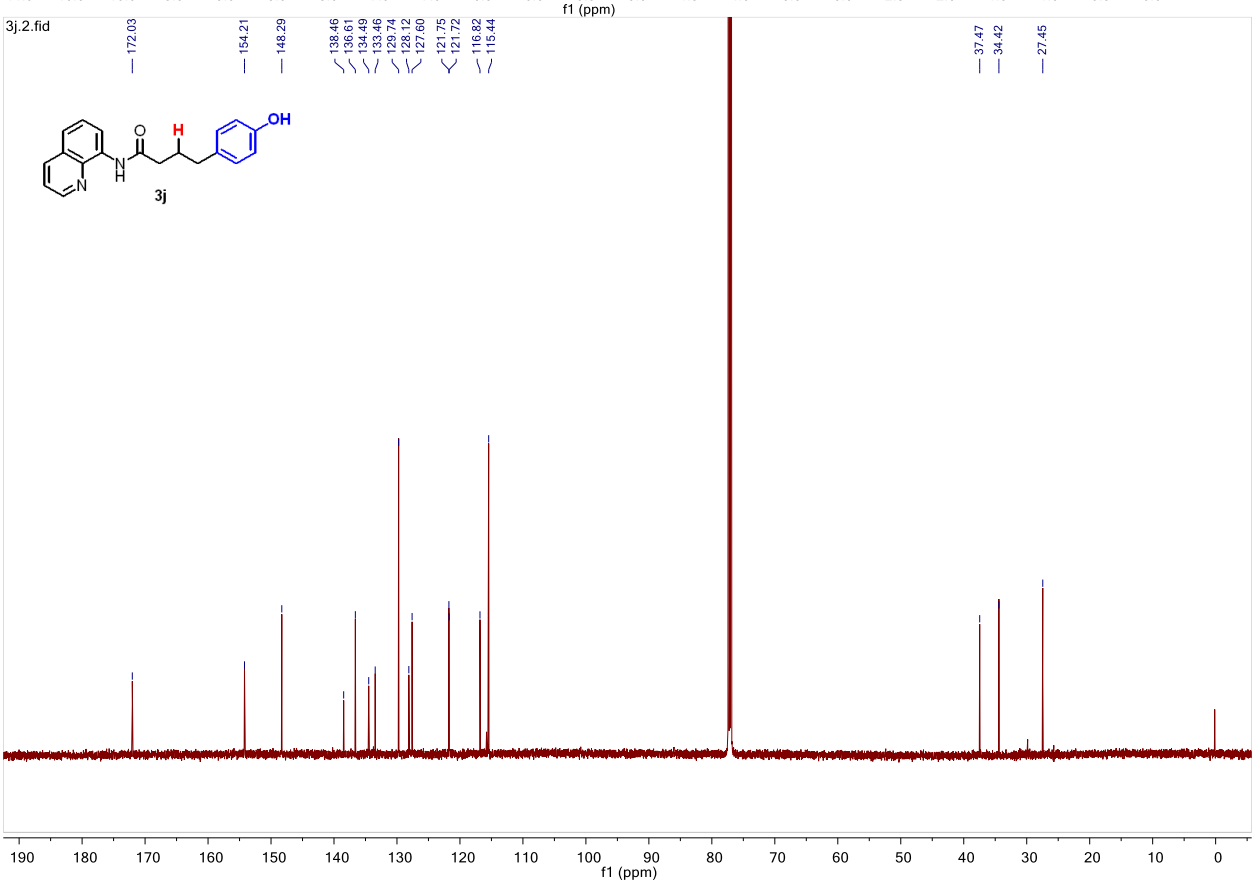


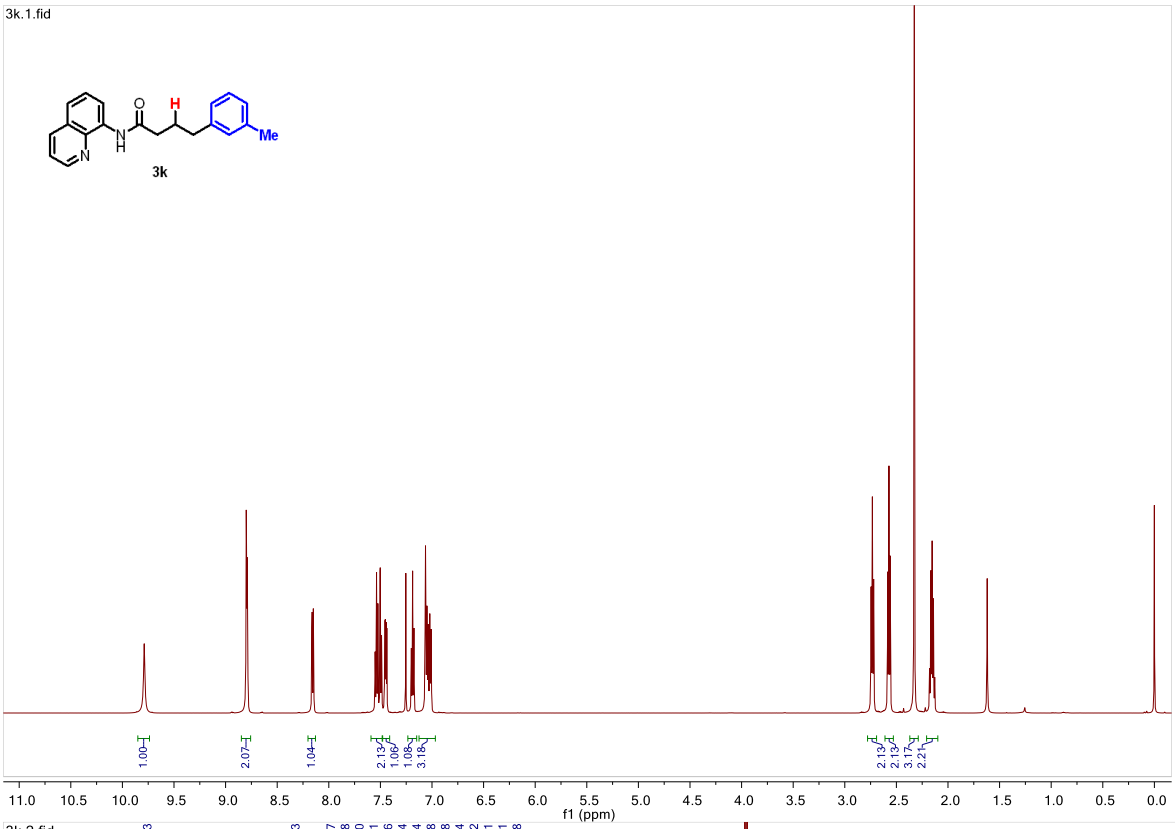
3h

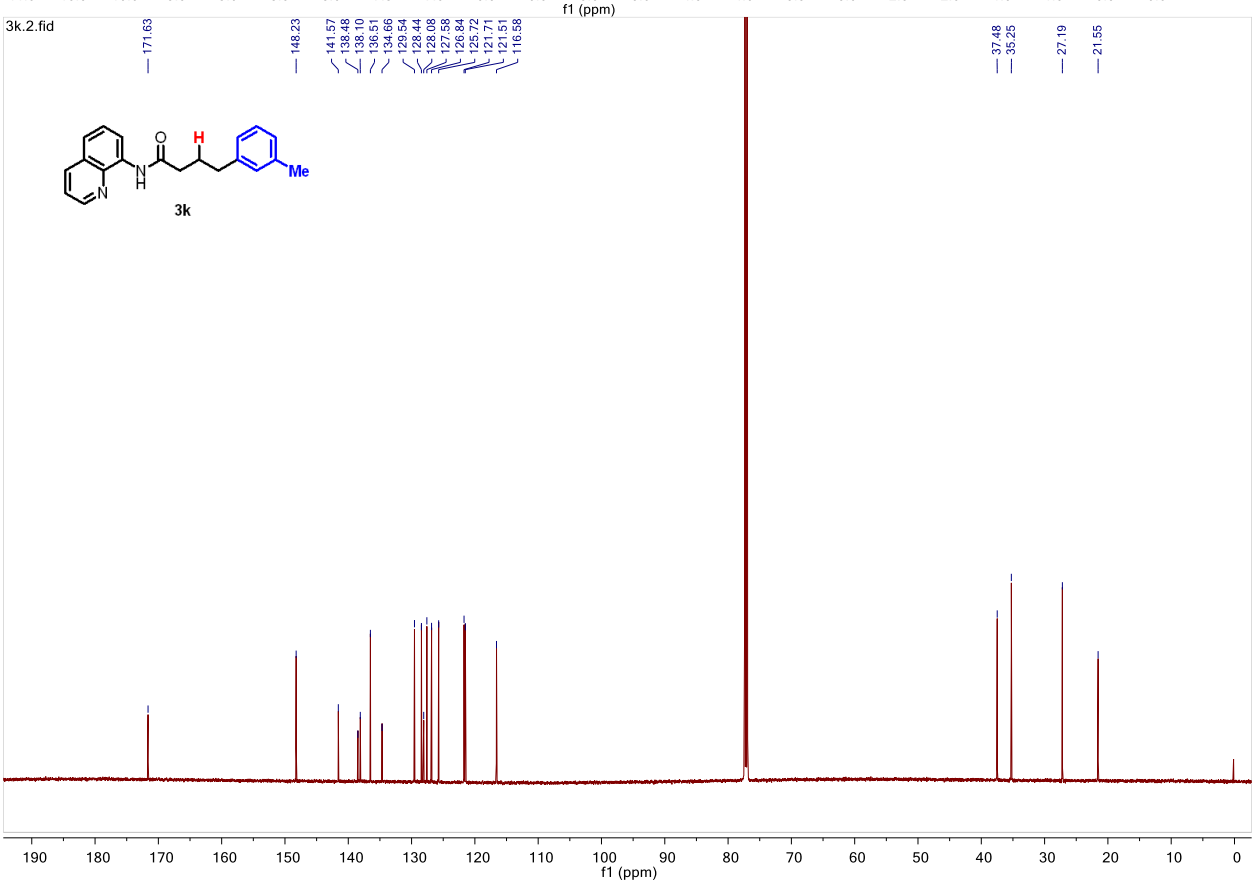

3i.1.fid
OMe
H
O
N
H
N
3i
1.02
2.24
1.11
2.33
1.17
2.12
2.30
3.46
2.18
2.15
2.20
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

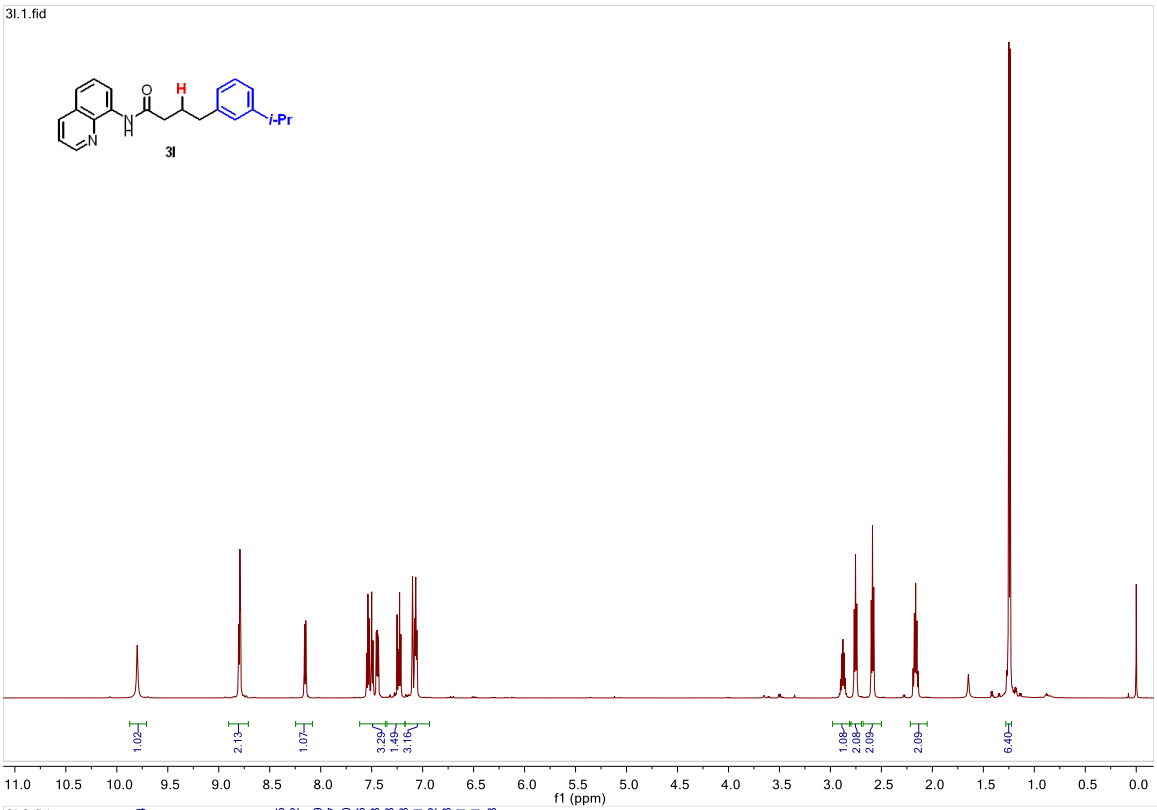

3i.2.fid
171.64
158.02
148.22
138.47
136.50
134.65
133.69
129.60
129.58
128.08
127.57
121.71
121.50
116.57
113.96
55.39
37.43
34.42
27.41
OMe
H
O
N
H
N
3i
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

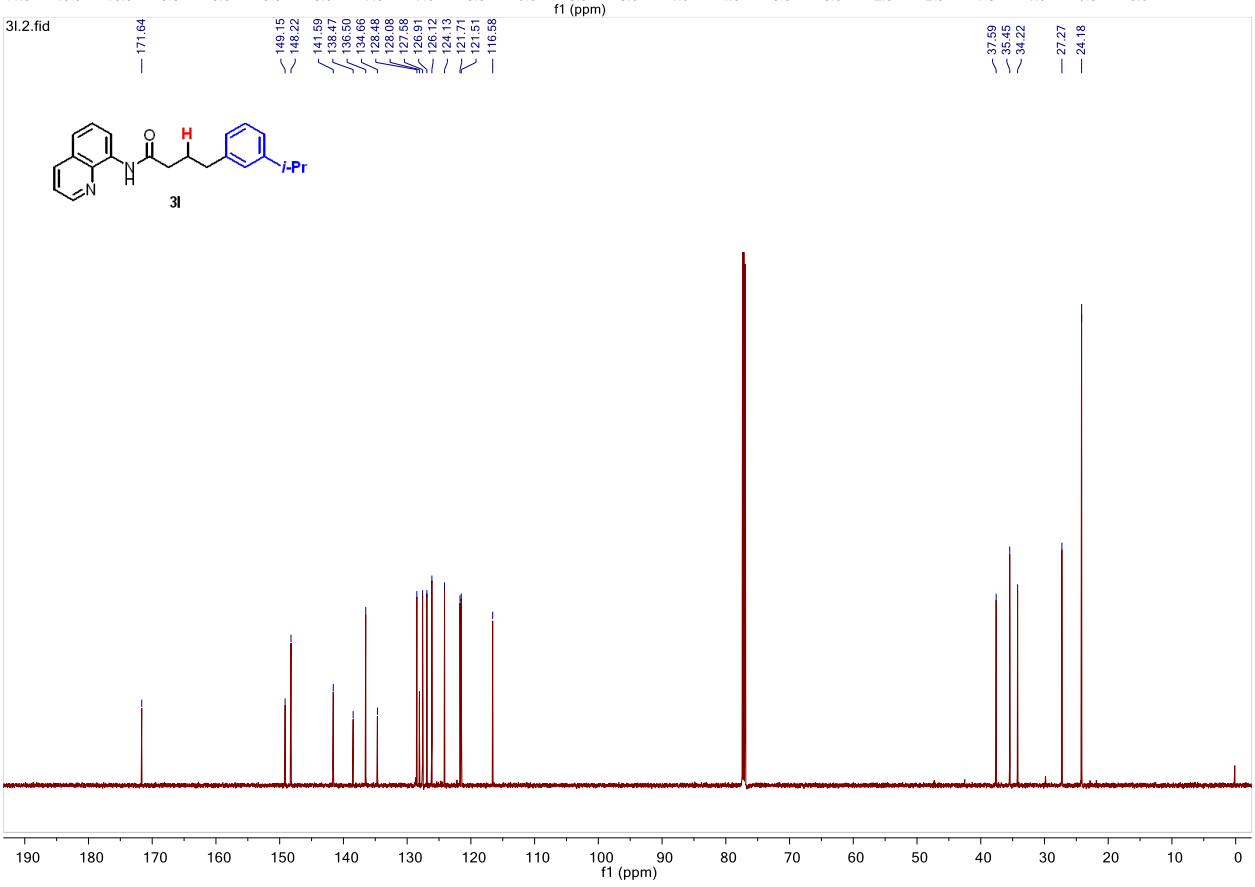

3j.1.fid
OH
H
O
N
H
N
3j
1.01
2.20
1.10
2.26
1.10
2.10
2.22
1.06
2.16
2.13
2.08
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

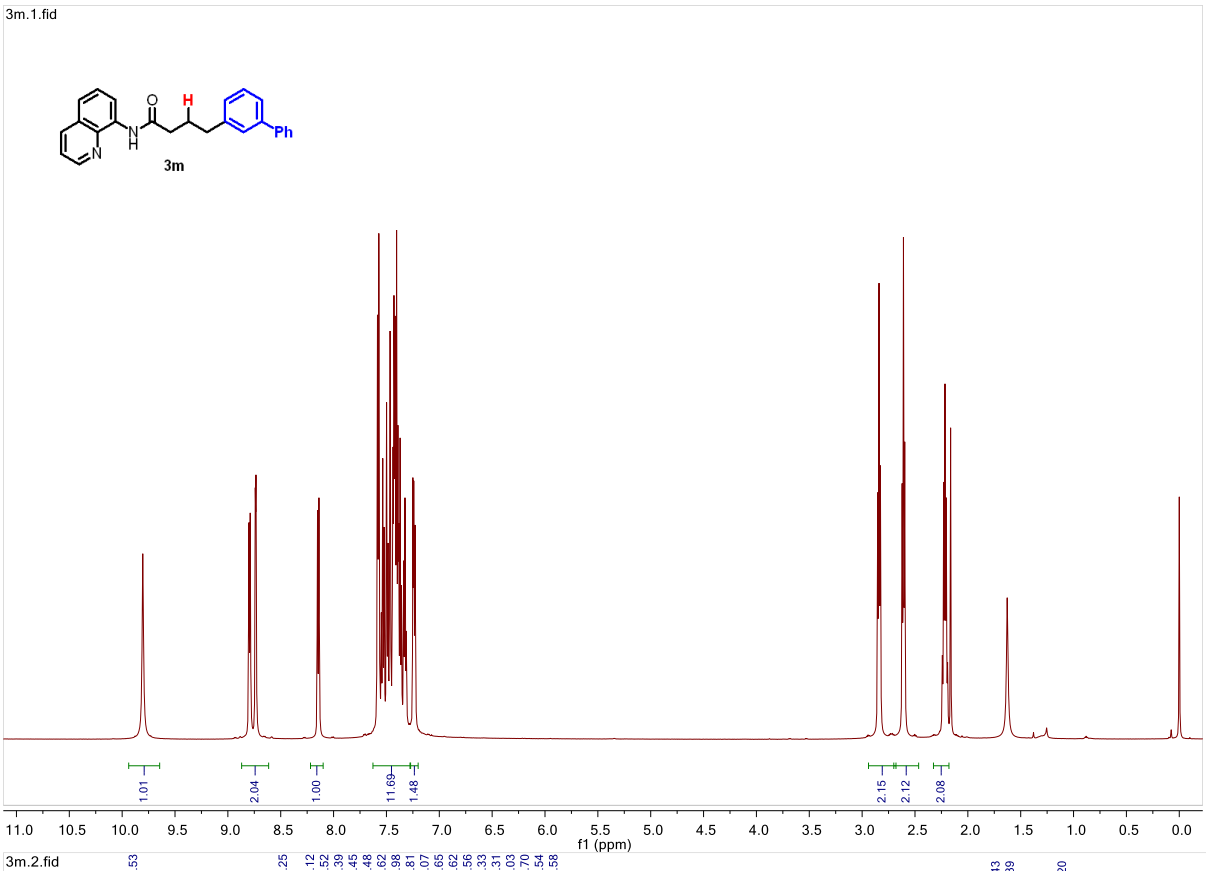

3j.2.fid
172.03
154.21
148.29
138.46
136.61
134.49
133.46
129.74
128.12
127.60
121.75
121.72
116.82
115.44
37.47
34.42
27.45
OH
H
O
N
H
N
3j
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

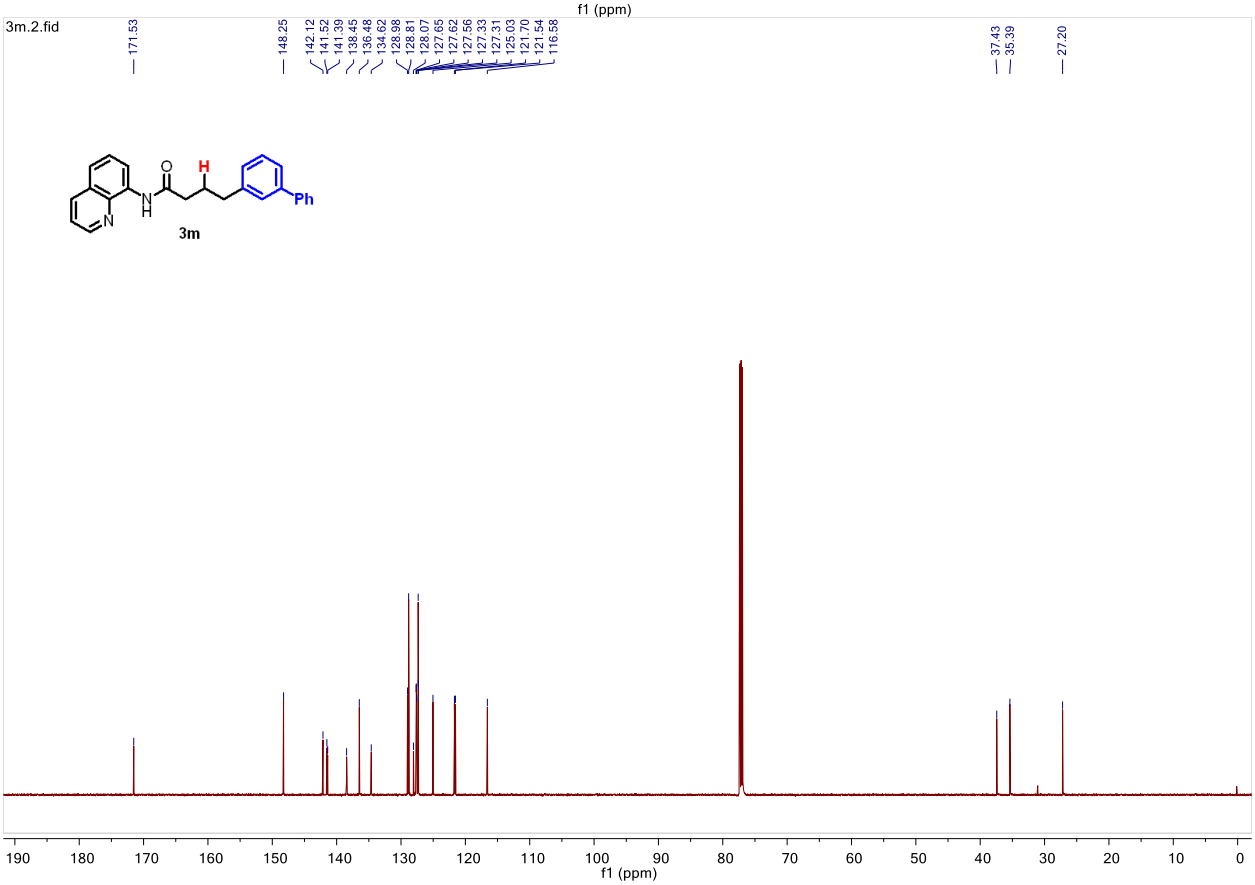

3k.1.fid
3k
1.00
2.07
1.04
2.13
1.06
1.08
3.18
2.19
2.13
3.17
2.21
f1 (ppm)

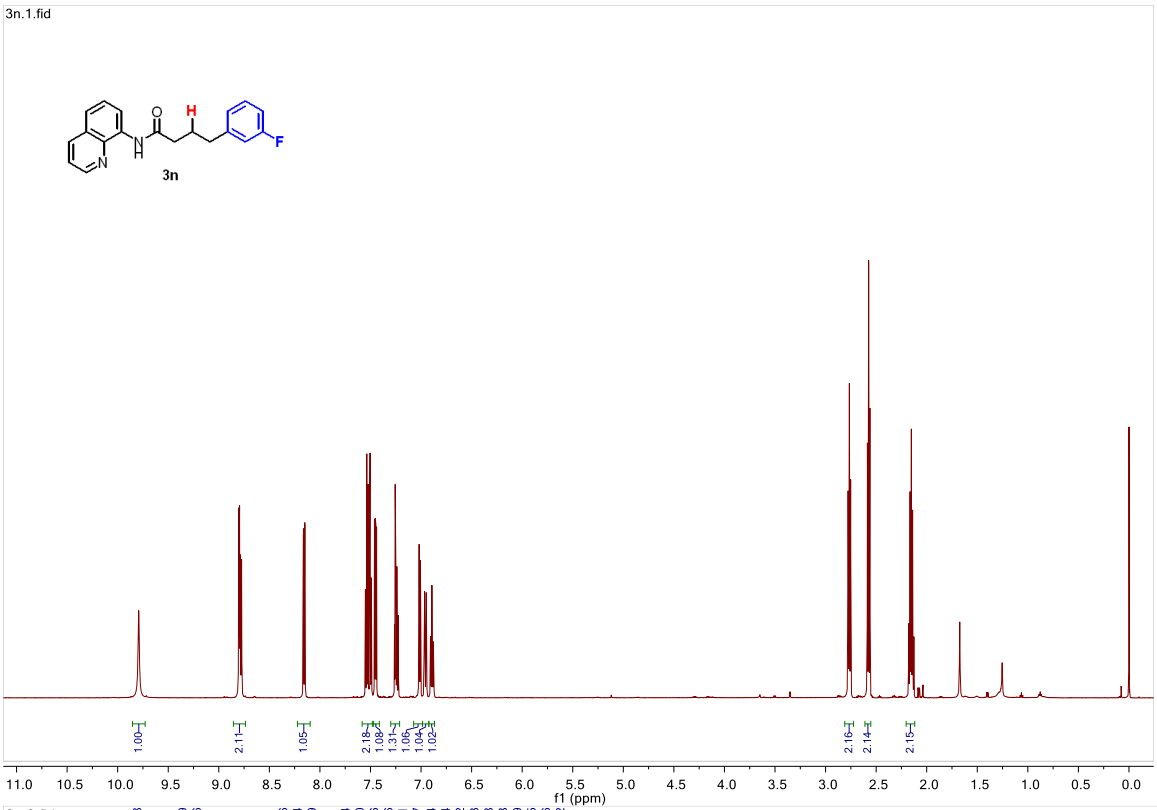

3k.2.fid
171.63
148.23
141.57
138.48
138.10
136.51
134.66
129.54
128.44
128.08
127.58
126.84
125.72
121.71
121.51
116.58
37.48
35.25
27.19
21.55
3k
f1 (ppm)

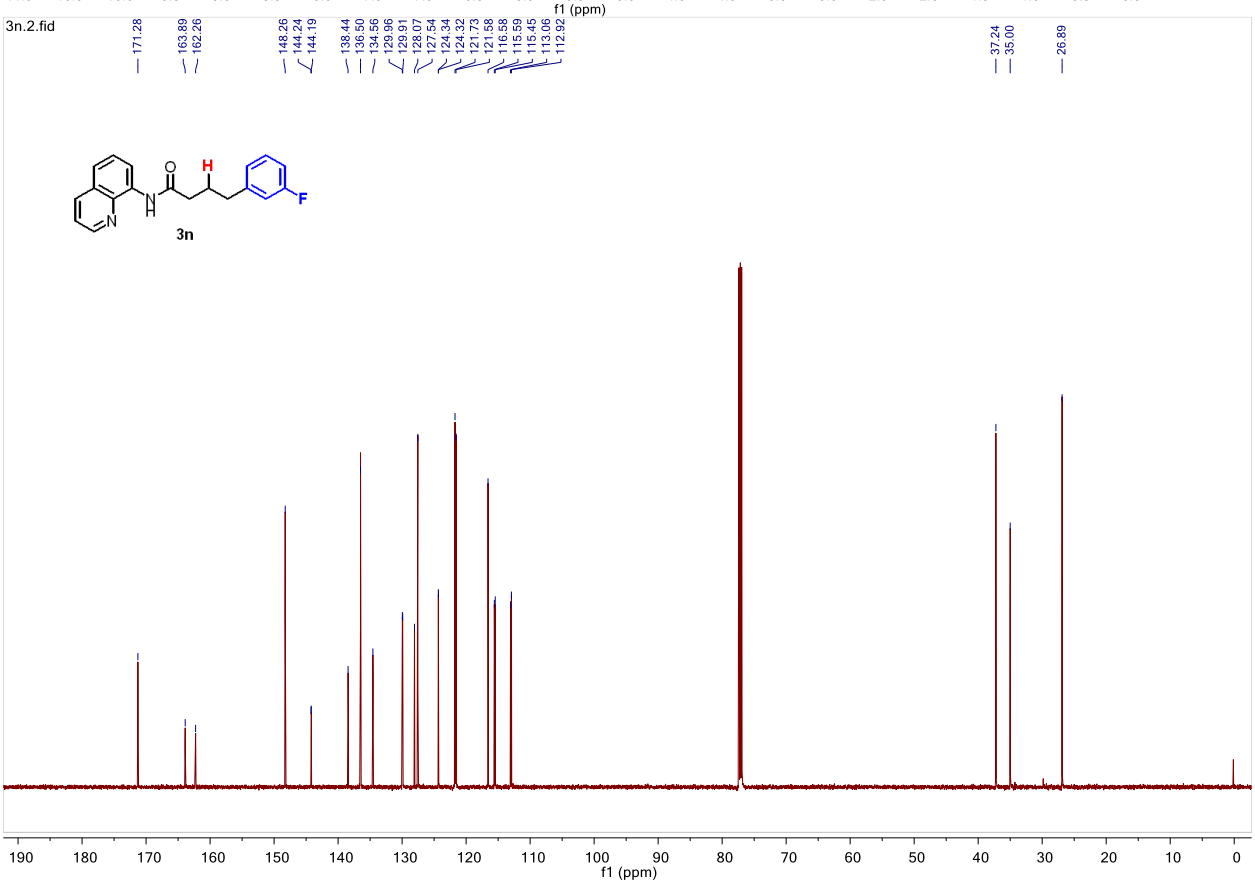

3l.1.fid
i-Pr
3l
1.02
2.13
1.07
3.29
1.49
3.16
1.08
2.08
2.09
2.09
6.40
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

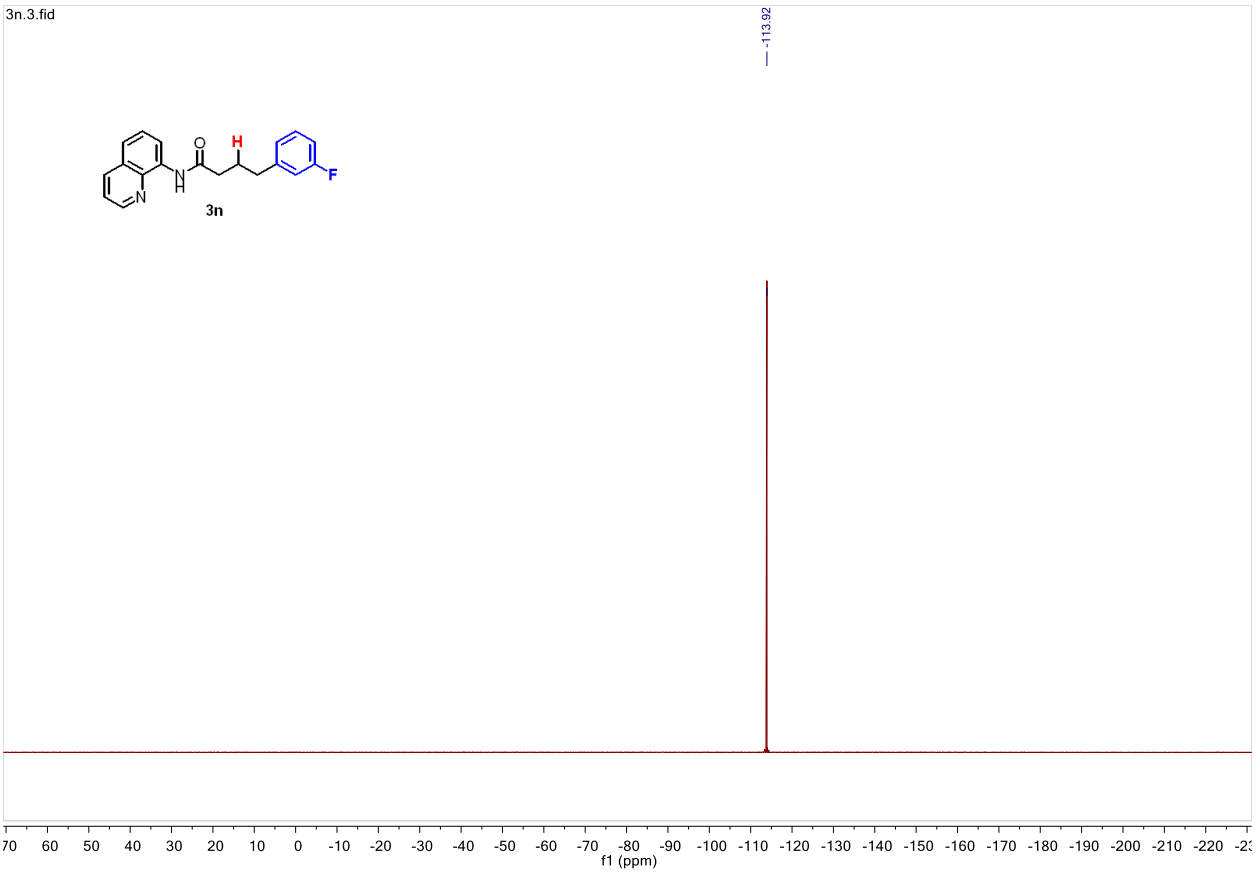

3l.2.fid
171.64
149.15
148.22
141.59
138.47
136.50
134.66
128.48
128.08
127.58
126.91
126.12
124.13
121.71
121.51
116.58
37.59
35.45
34.22
27.27
24.18
i-Pr
3l
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

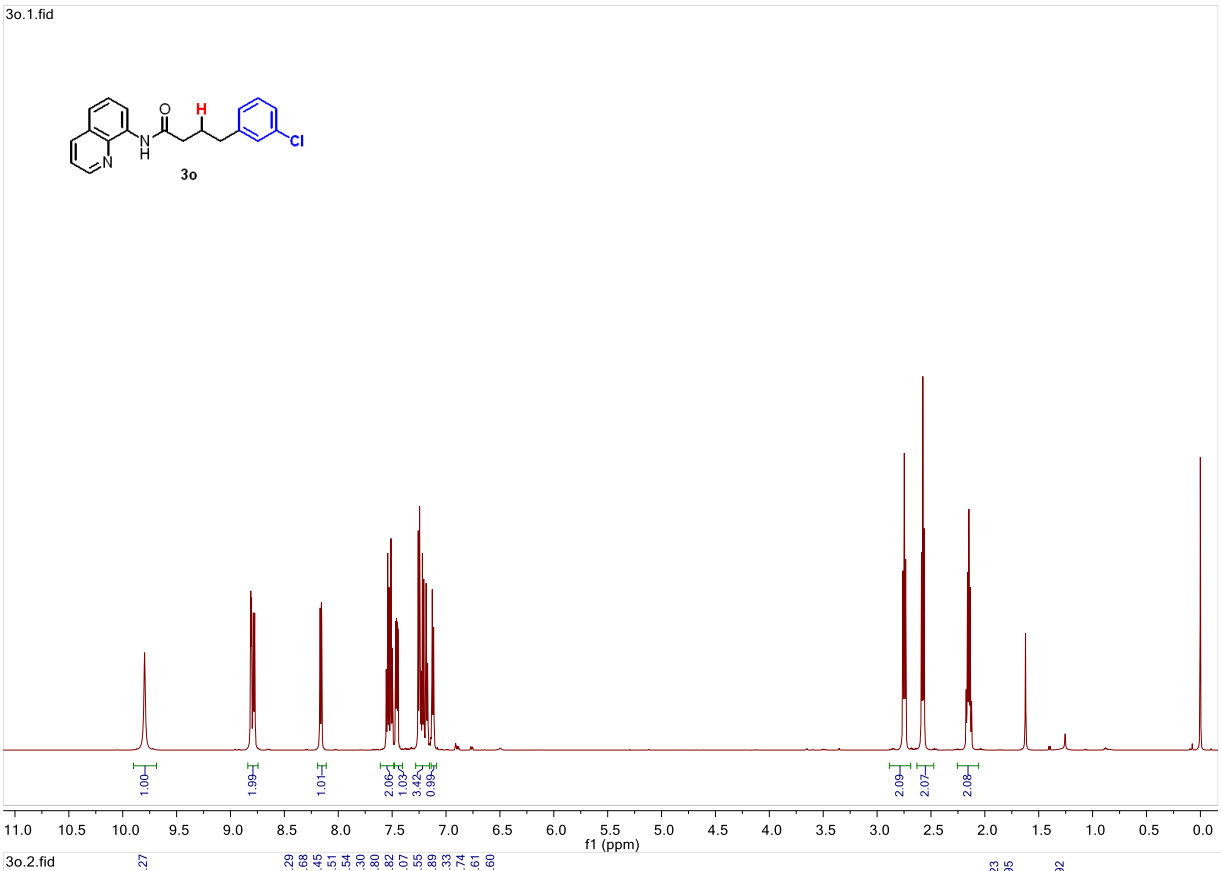

3m.1.fid
3m
1.01
2.04
1.00
11.69
1.48
2.15
2.12
2.08
f1 (ppm)

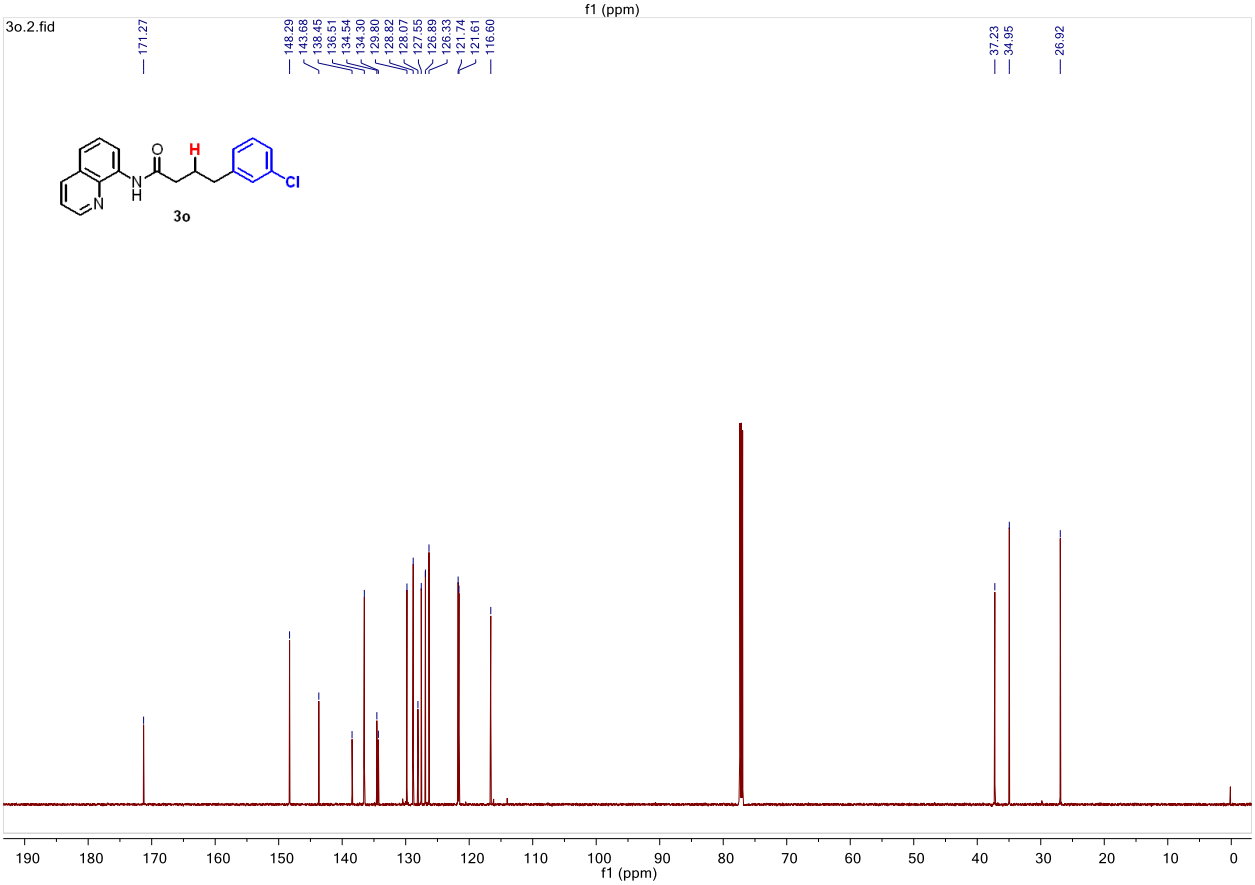

3m.2.fid
171.53
148.25
142.12
141.52
141.39
138.45
136.48
134.62
128.98
128.81
128.07
127.65
127.62
127.56
127.33
127.31
125.03
121.70
121.54
116.58
37.43
35.39
27.20
3m
f1 (ppm)

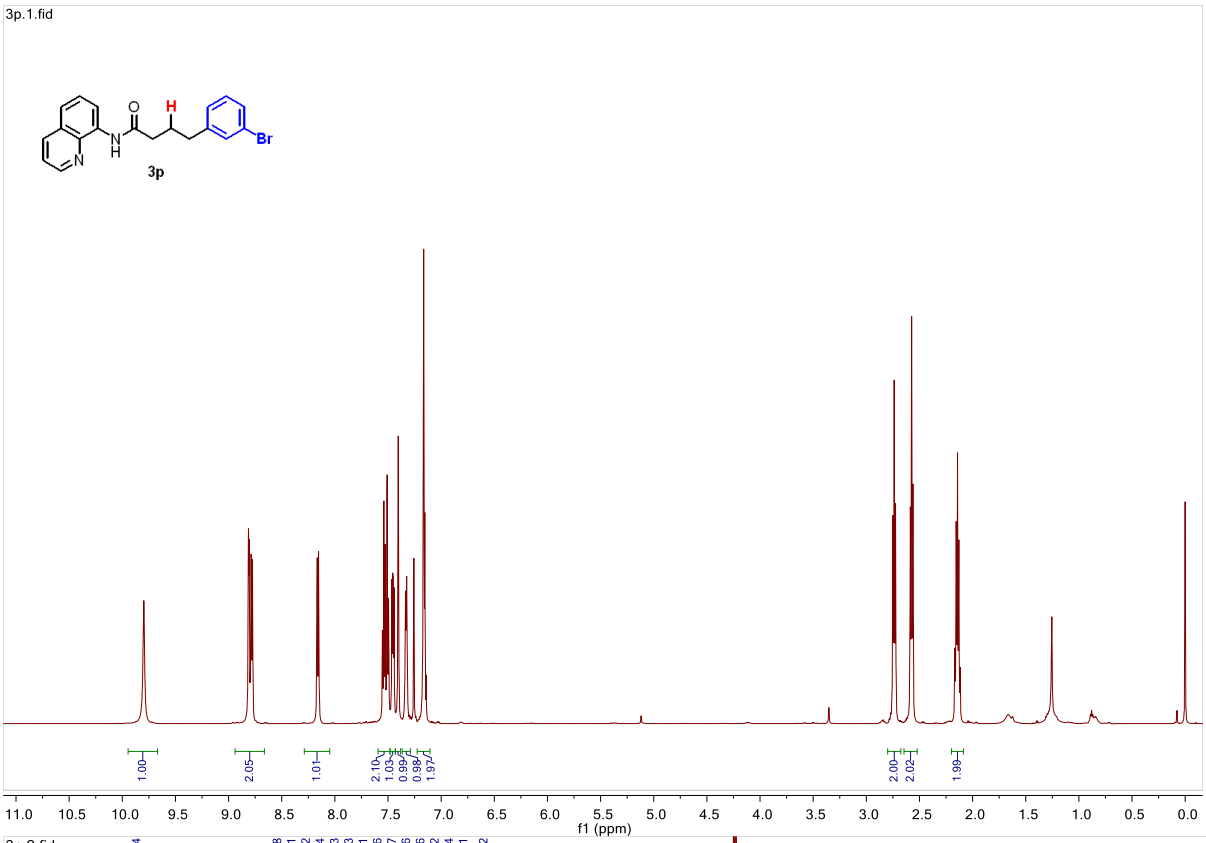

3n.1.fid
3n
1.00
2.11
1.05
2.18
1.08
1.31
1.06
1.04
1.02
2.16
2.14
2.15
f1 (ppm)

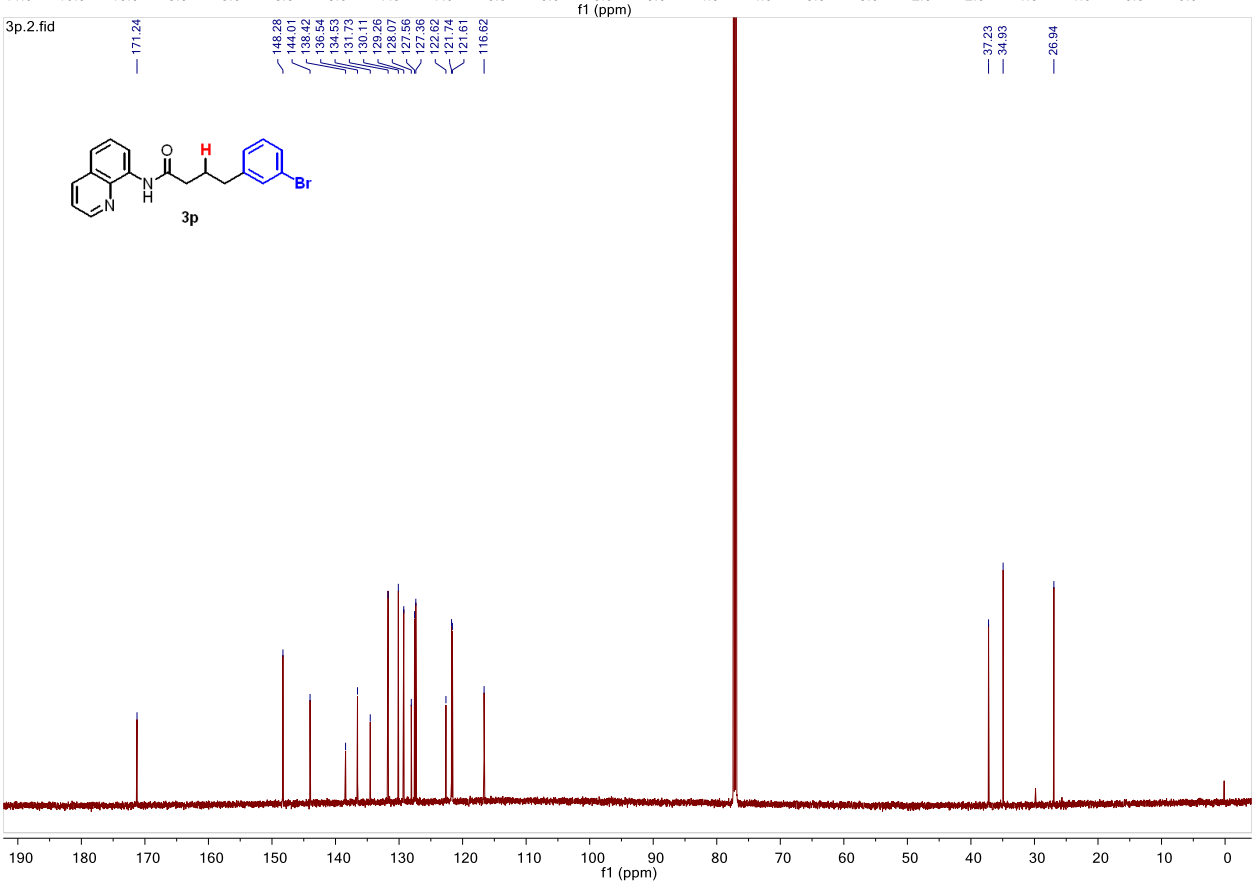

3n.2.fid
171.28
163.89
162.26
148.26
144.24
144.19
138.44
136.50
134.56
129.96
129.91
128.07
127.54
124.34
124.32
121.73
121.58
116.58
115.59
115.45
113.06
112.92
37.24
35.00
26.89
3n
f1 (ppm)


3n.3.fid
-113.92
O
H
N
H
N
F
3n
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

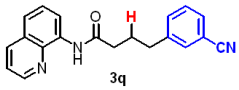

3o.1.fid
3o
1.00
1.99
1.01
2.06
1.03
3.42
0.99
2.09
2.07
2.08
f1 (ppm)


3o.2.fid
171.27
148.29
143.68
138.45
136.51
134.54
134.30
129.80
128.82
128.07
127.55
126.89
126.33
121.74
121.61
116.60
37.23
34.95
26.92
3o
f1 (ppm)

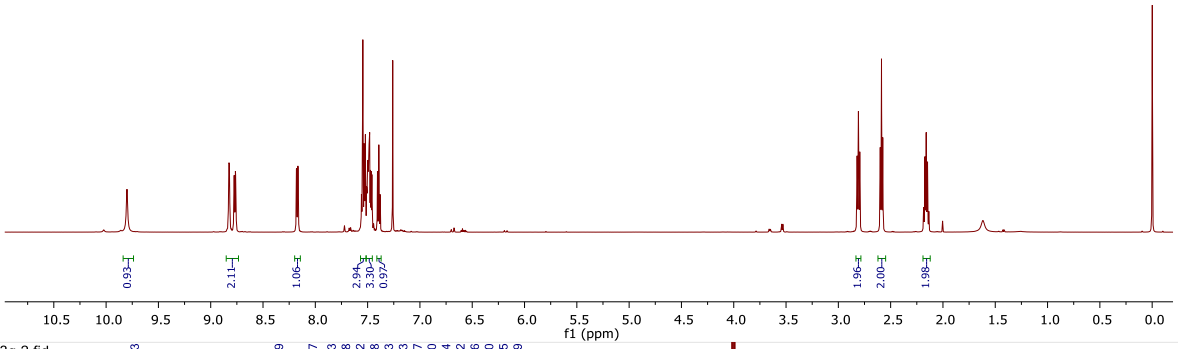

3p.1.fid
3p
1.00
2.05
1.01
2.10
1.03
0.99
0.98
1.97
2.00
2.02
1.99
f1 (ppm)


3p.2.fid
171.24
148.28
144.01
138.42
136.54
134.53
131.73
130.11
129.26
128.07
127.56
127.36
122.62
121.74
121.61
116.62
37.23
34.93
26.94
3p
f1 (ppm)

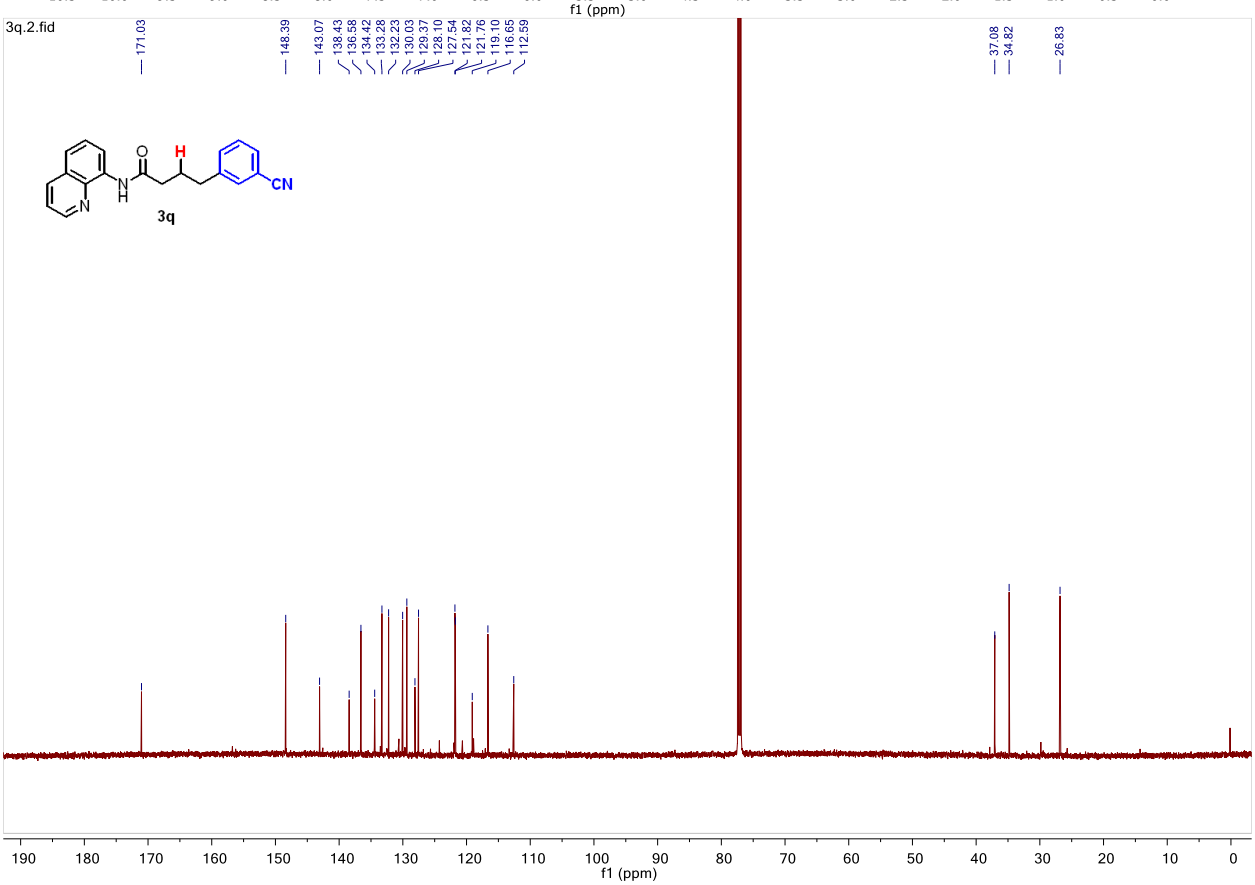
3q.1.fid



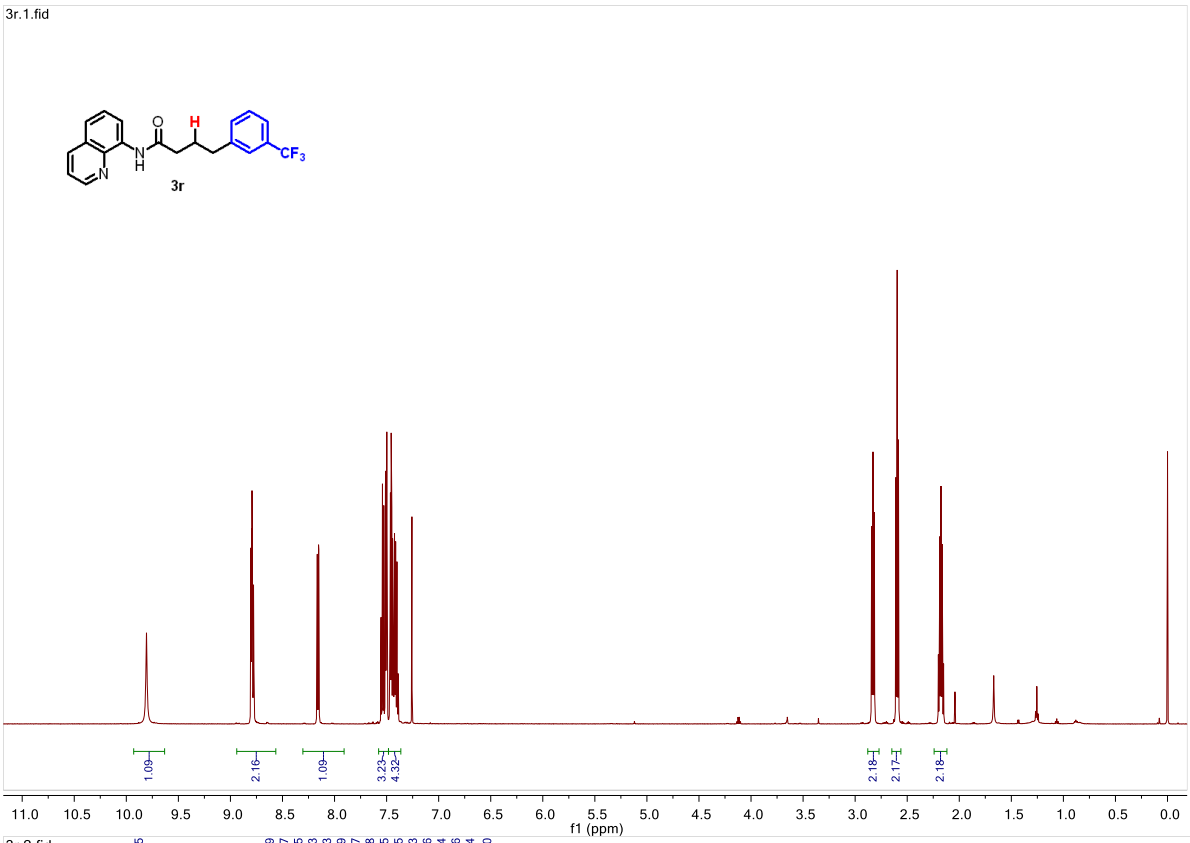

3q

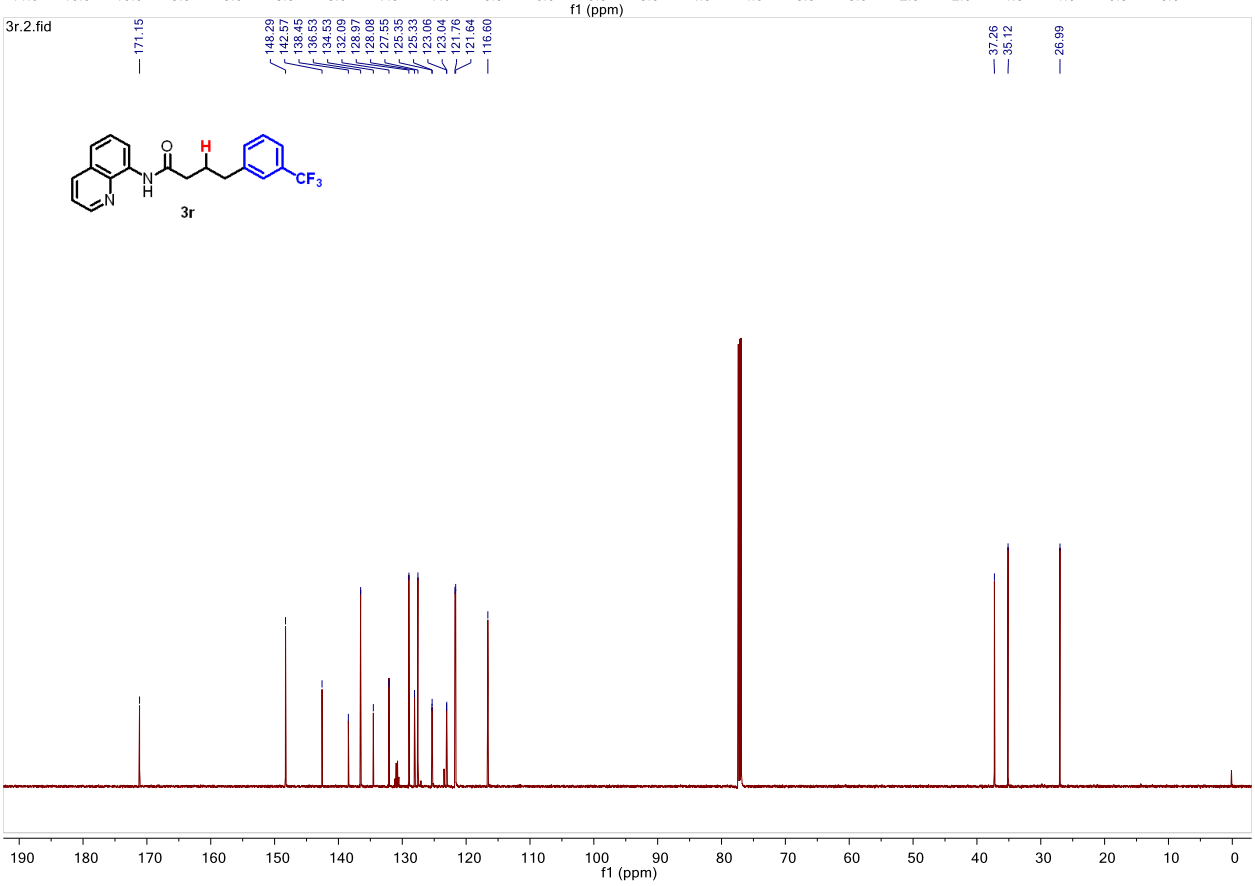


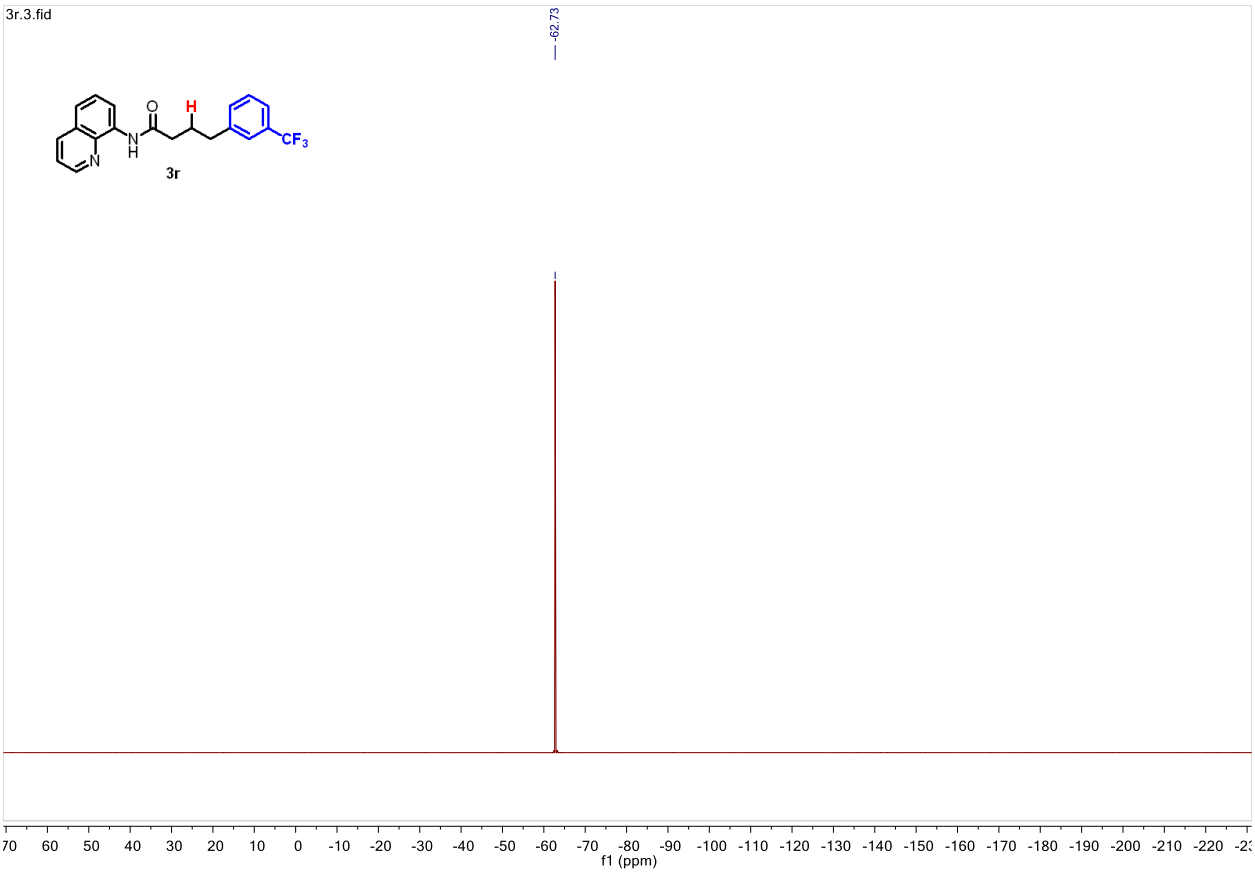

3q.2.fid

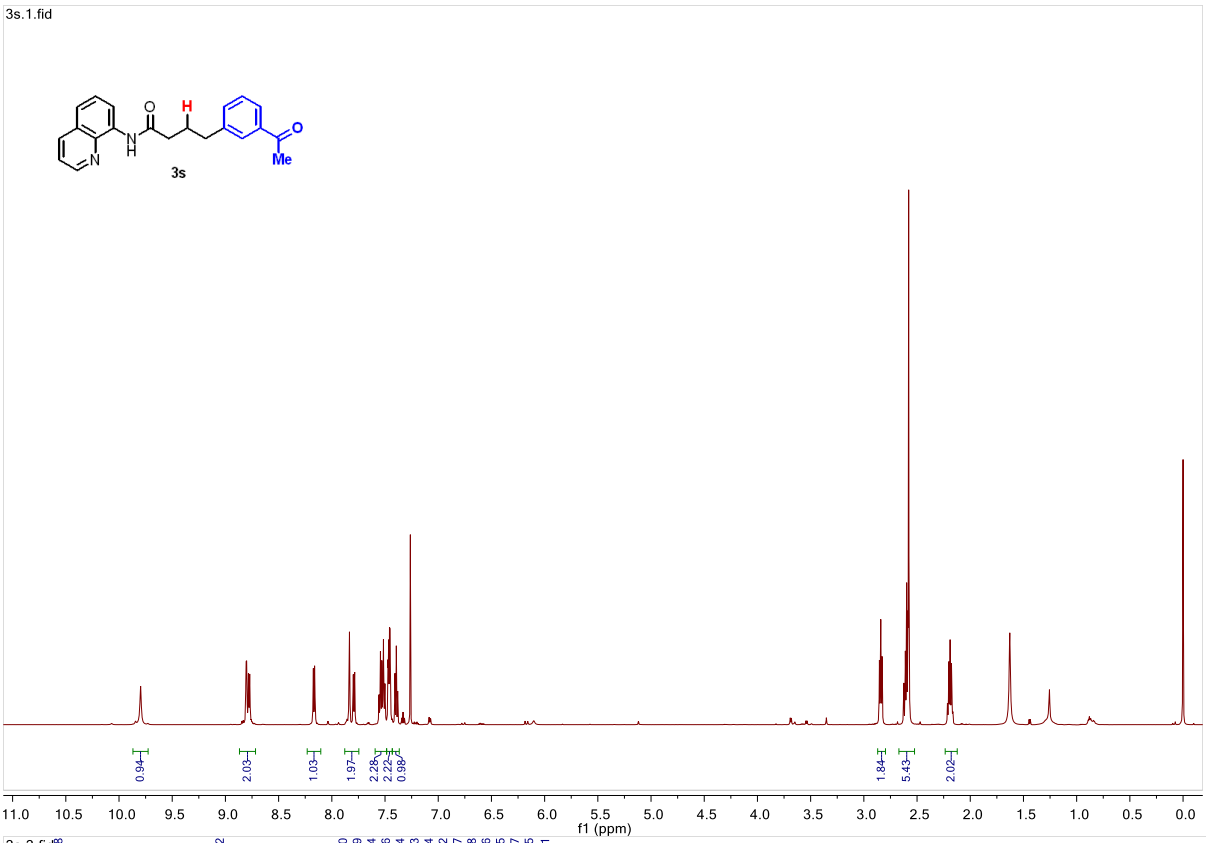


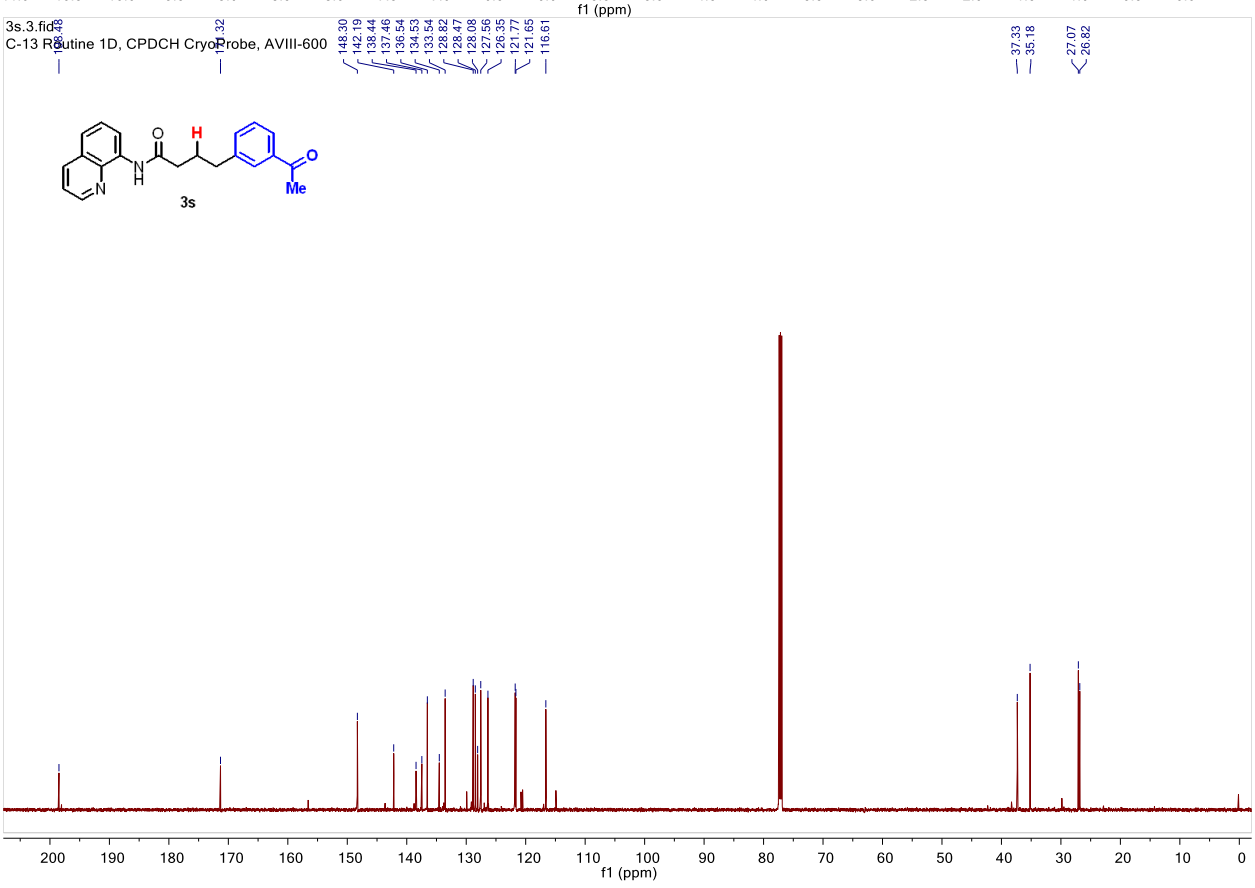

3q


3r.1.fid
3r
1.09
2.16
1.09
3.23
4.32
2.18
2.17
2.18
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

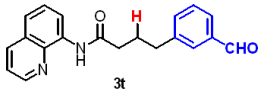

3r.2.fid
171.15
148.29
142.57
138.45
136.53
134.53
132.09
128.97
128.08
127.55
125.35
125.33
123.06
123.04
121.76
121.64
116.60
37.26
35.12
26.99
3r
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


3r.3.fid
-62.73
O
H
N
H
N
CF3
3r
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

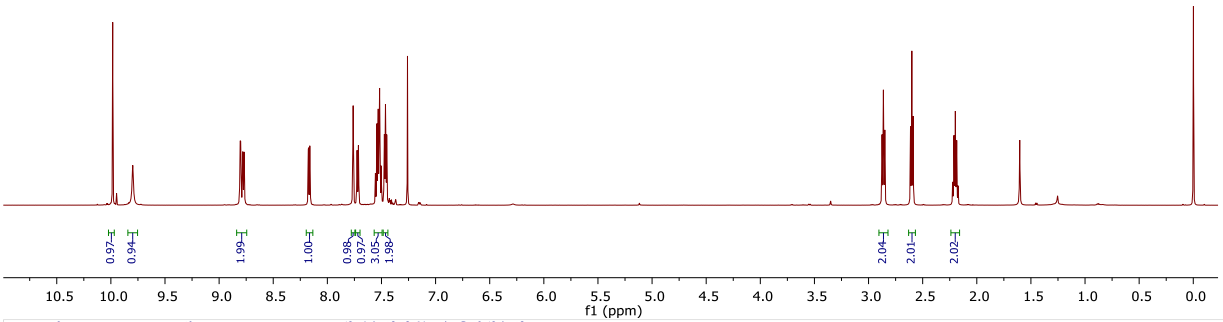

3s.1.fid
3s
0.94
2.03
1.03
1.97
2.28
2.22
0.98
1.84
5.43
2.02
f1 (ppm)


3s.3.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
168.43
169.32
148.30
142.19
138.44
137.46
136.54
134.53
133.54
128.82
128.47
128.08
127.56
126.35
121.77
121.65
116.61
37.33
35.18
27.07
26.82
3s
f1 (ppm)

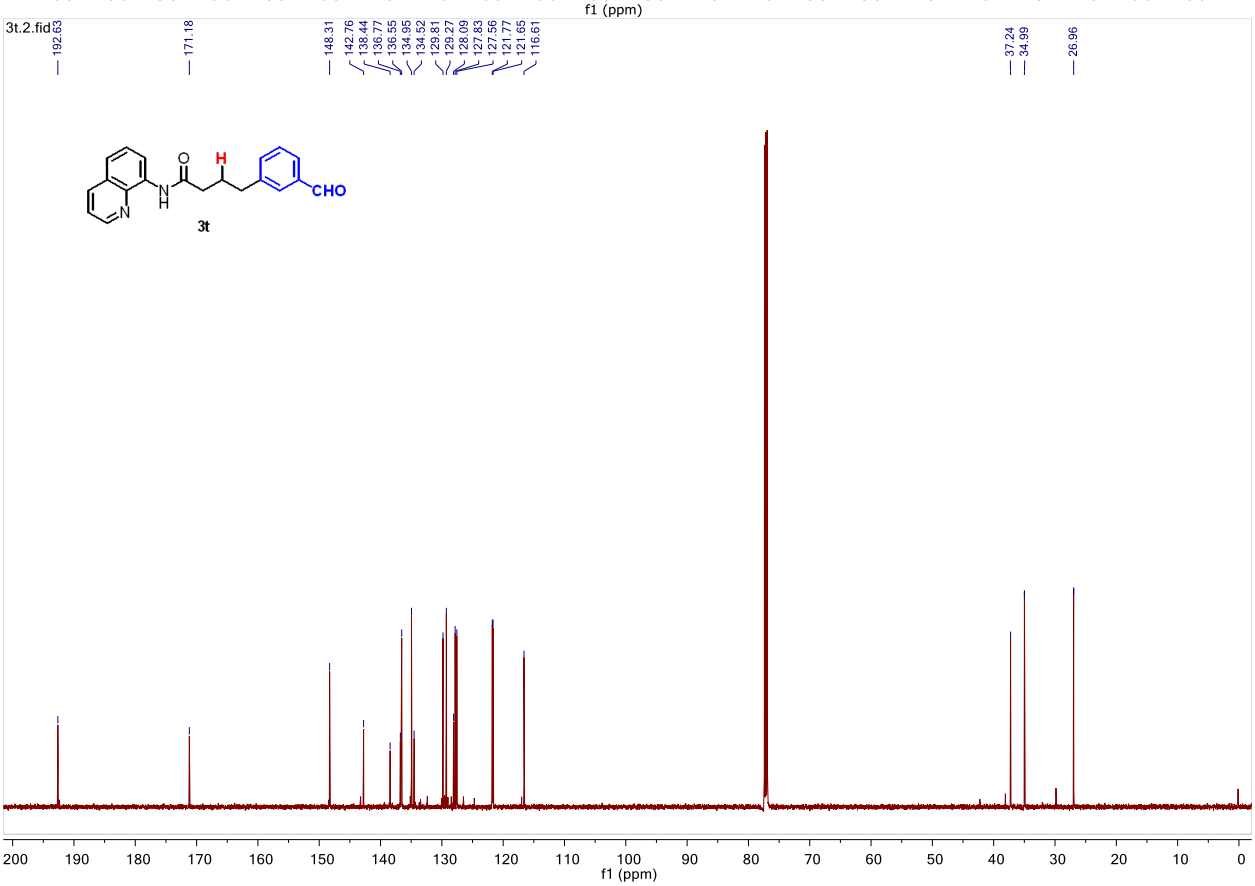
RM-248a-2-pure.1.fid



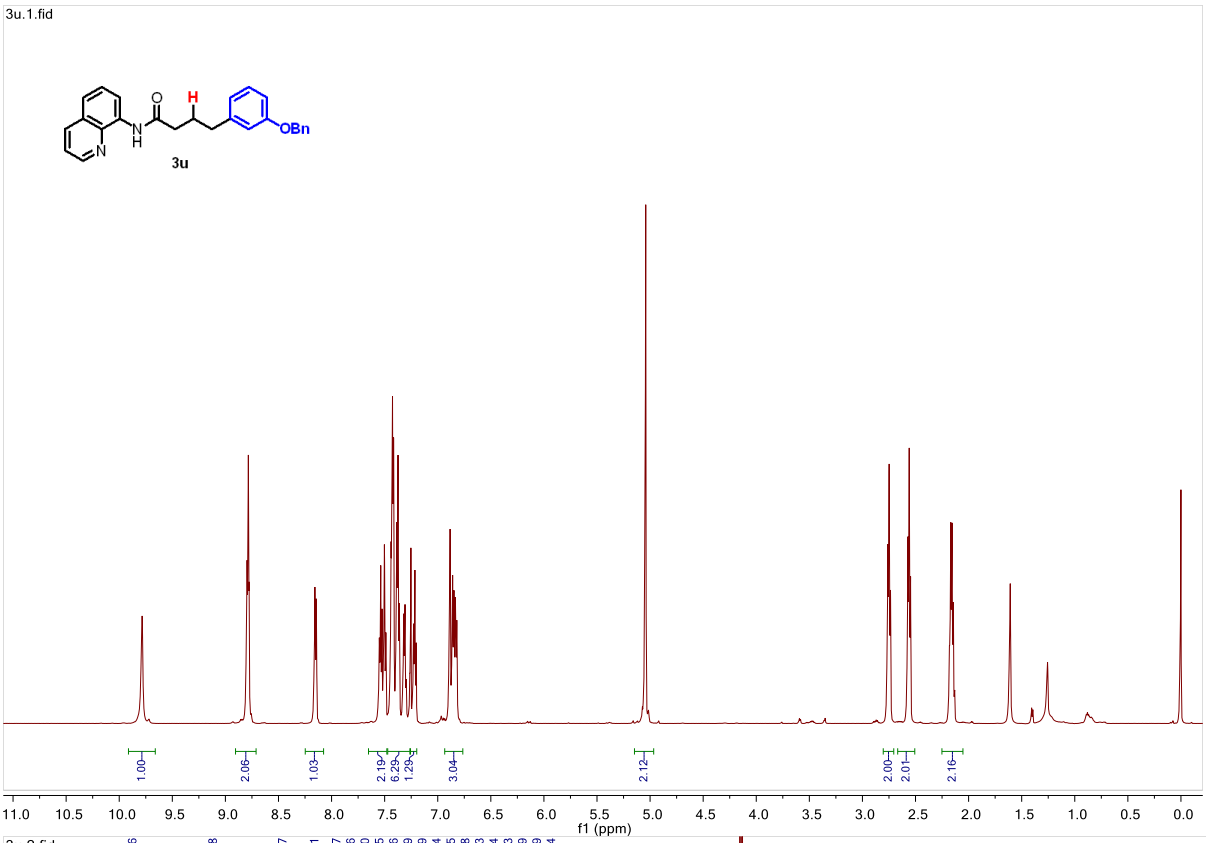

3t

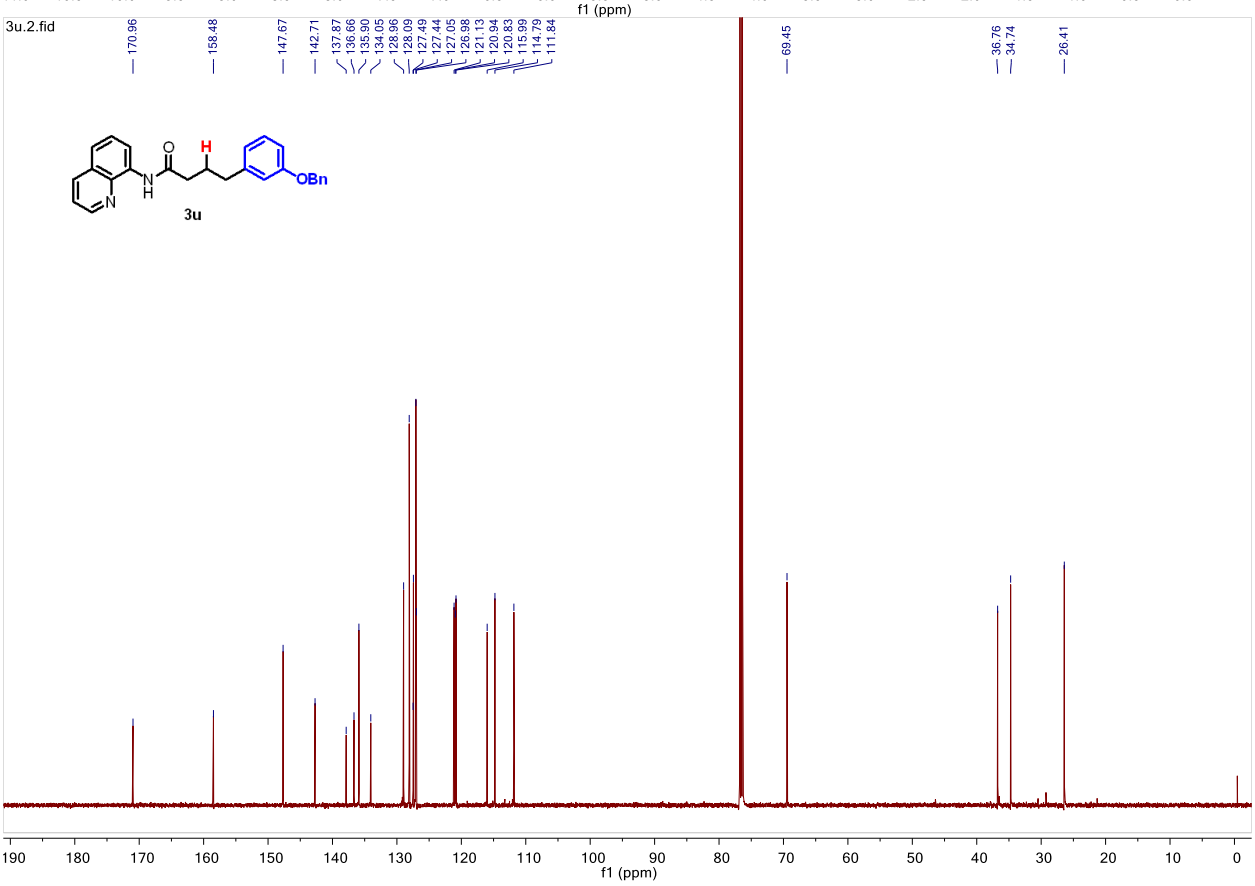


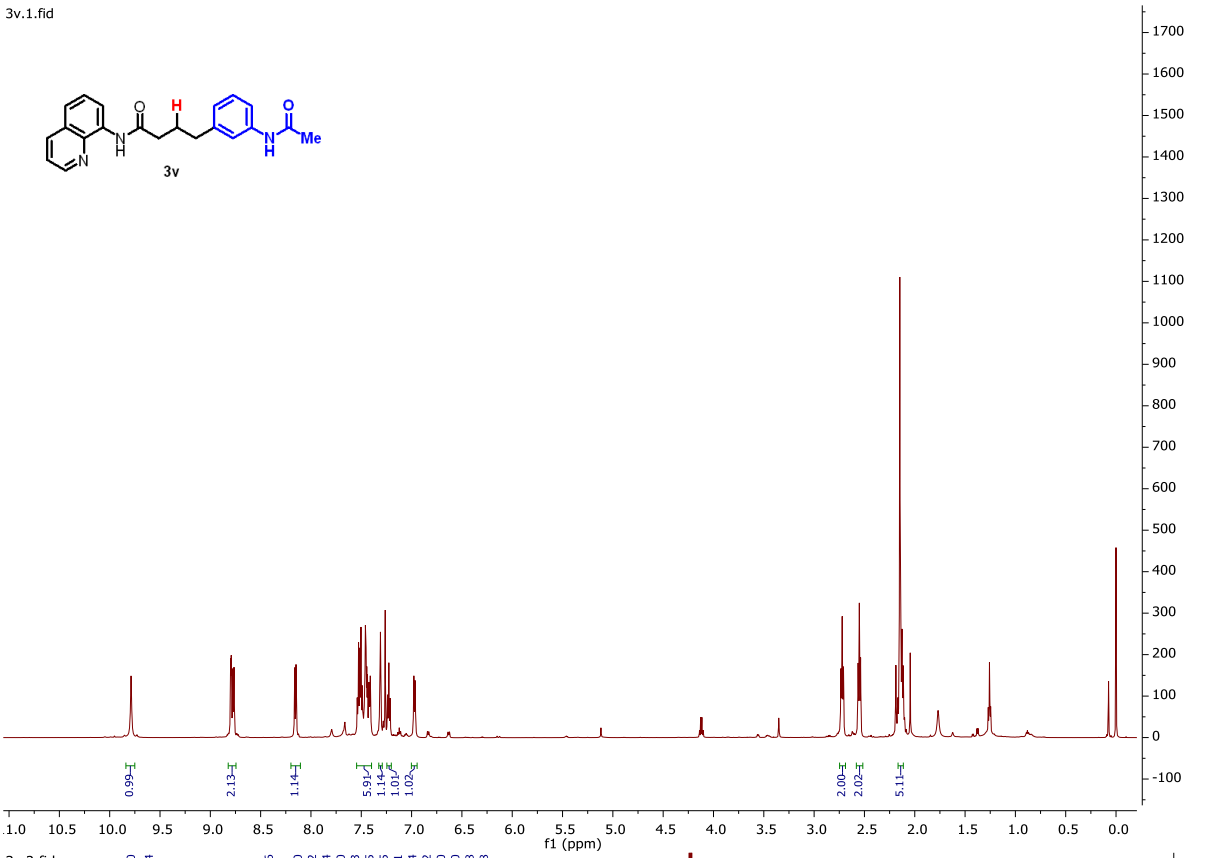

3t.2.fid

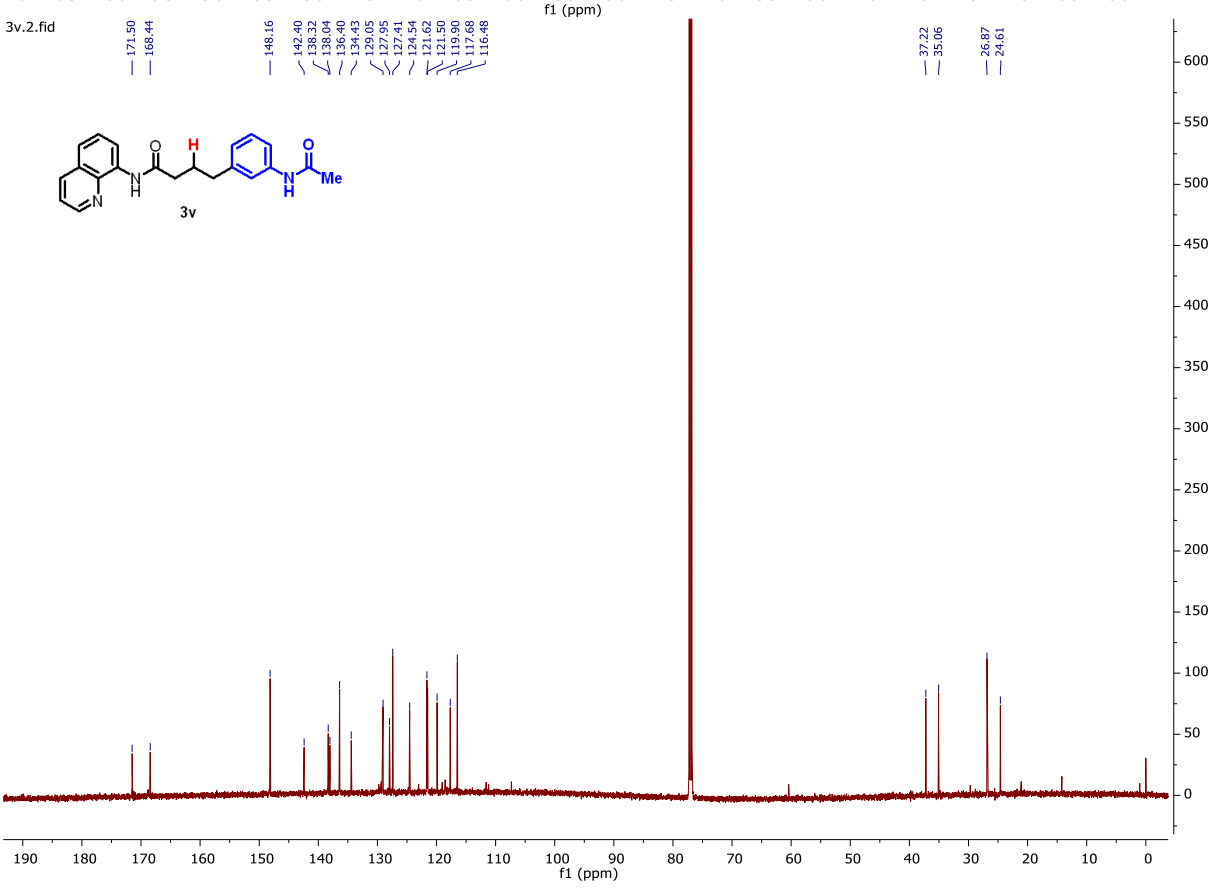


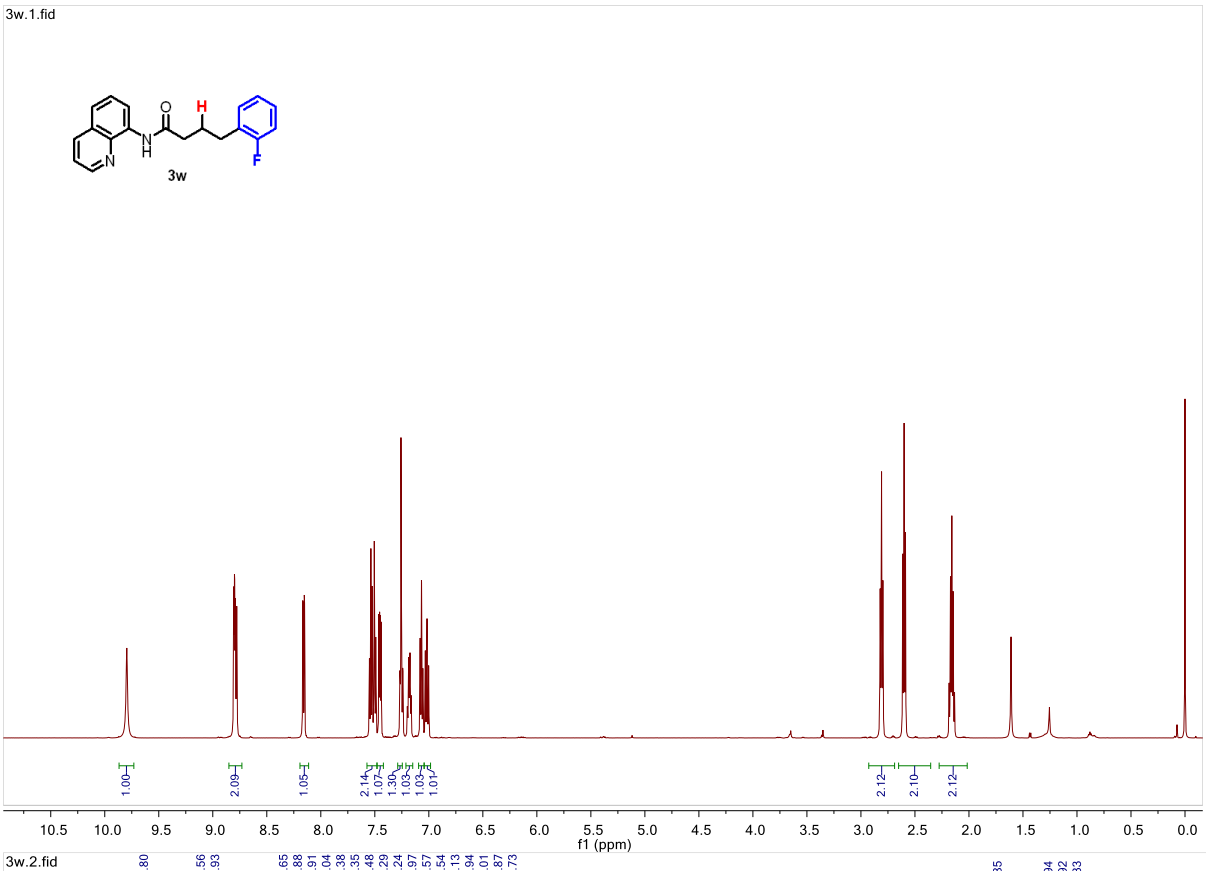

3t

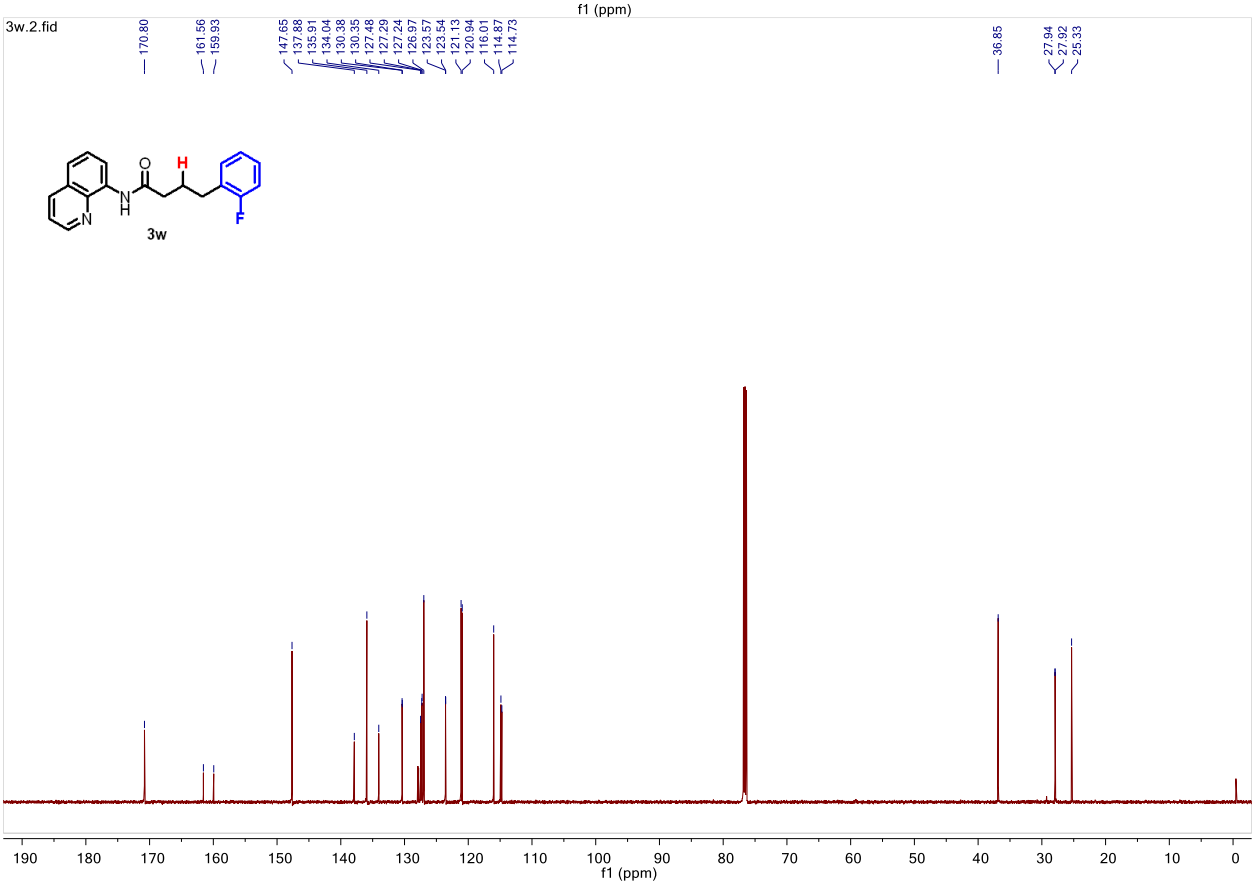

3u.1.fid
3u
1.00
2.06
1.03
2.19
6.29
1.29
3.04
2.12
2.00
2.01
2.16
f1 (ppm)

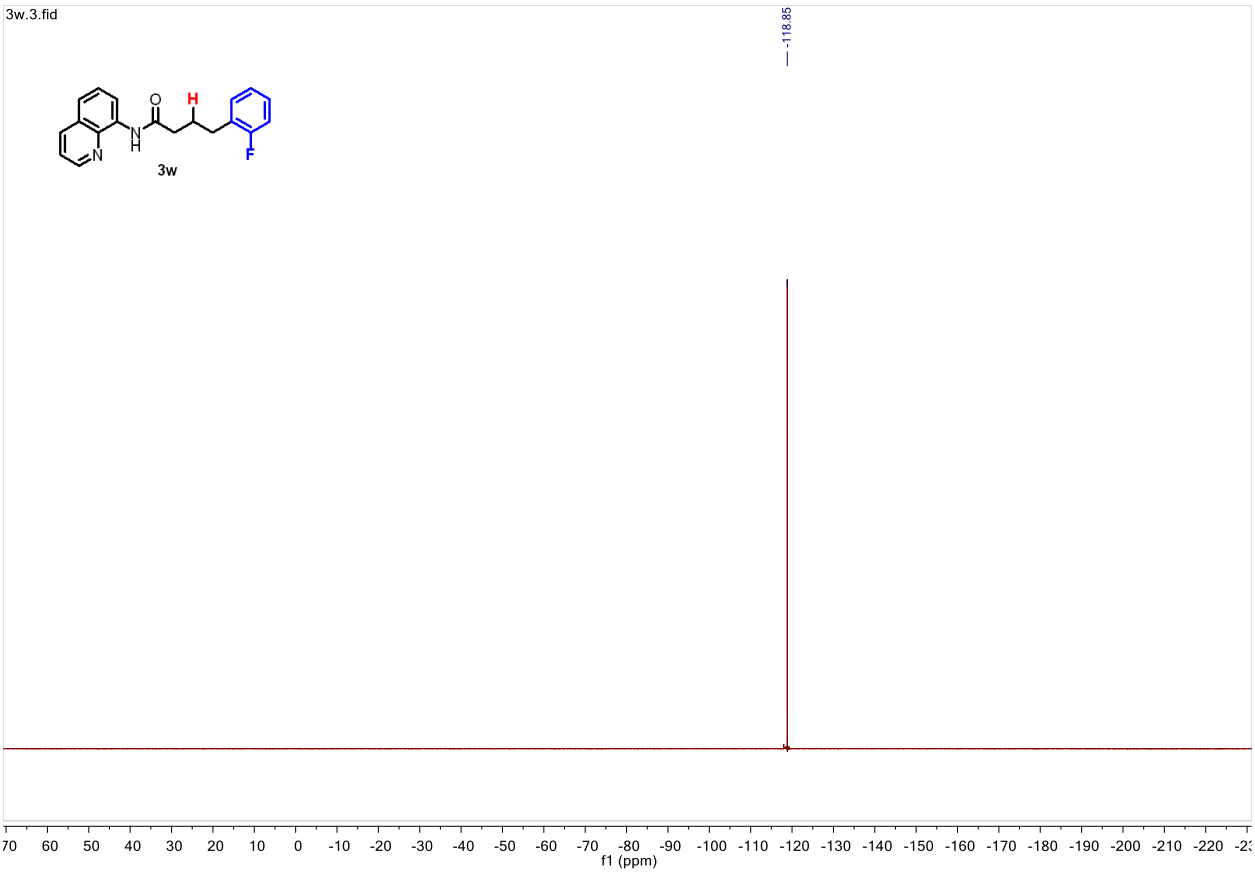

3u.2.fid
170.96
158.48
147.67
142.71
137.87
136.66
135.90
134.05
128.96
128.09
127.49
127.44
127.05
126.98
121.13
120.94
120.83
115.99
114.79
111.84
69.45
36.76
34.74
26.41
3u
f1 (ppm)

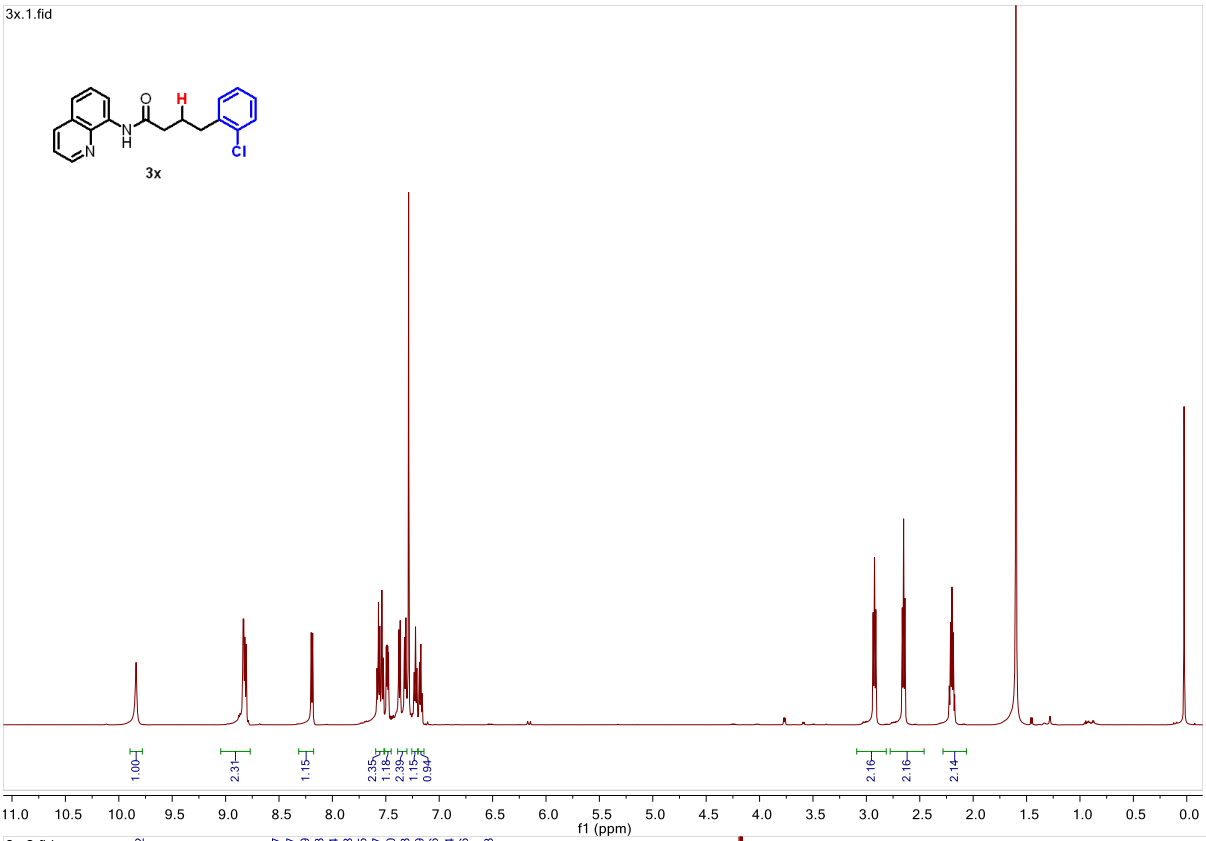

3v.1.fid
3v
f1 (ppm)

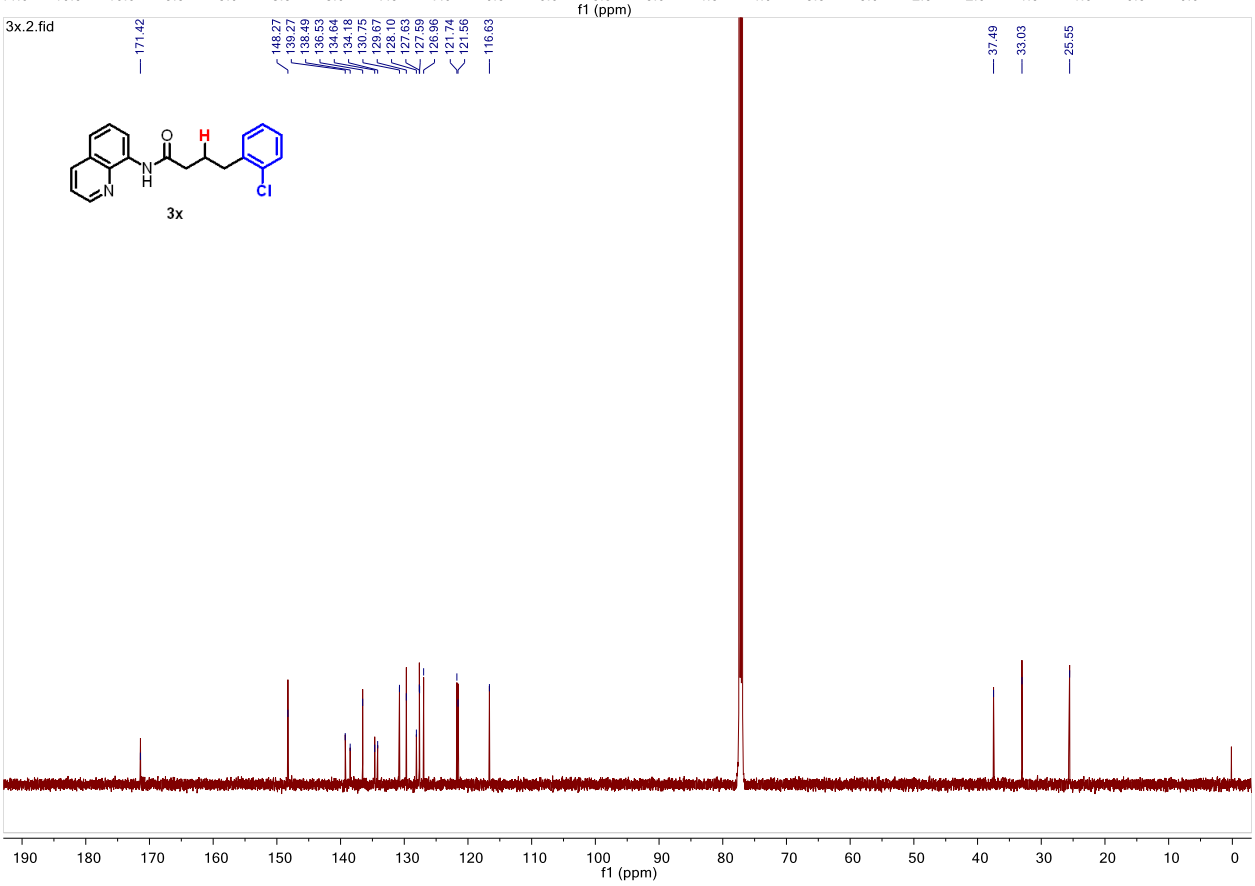

3v.2.fid
171.50
168.44
148.16
142.40
138.32
138.04
136.40
134.43
129.05
127.95
127.41
124.54
121.62
121.50
119.90
117.68
116.48
37.22
35.06
26.87
24.61
3v
f1 (ppm)

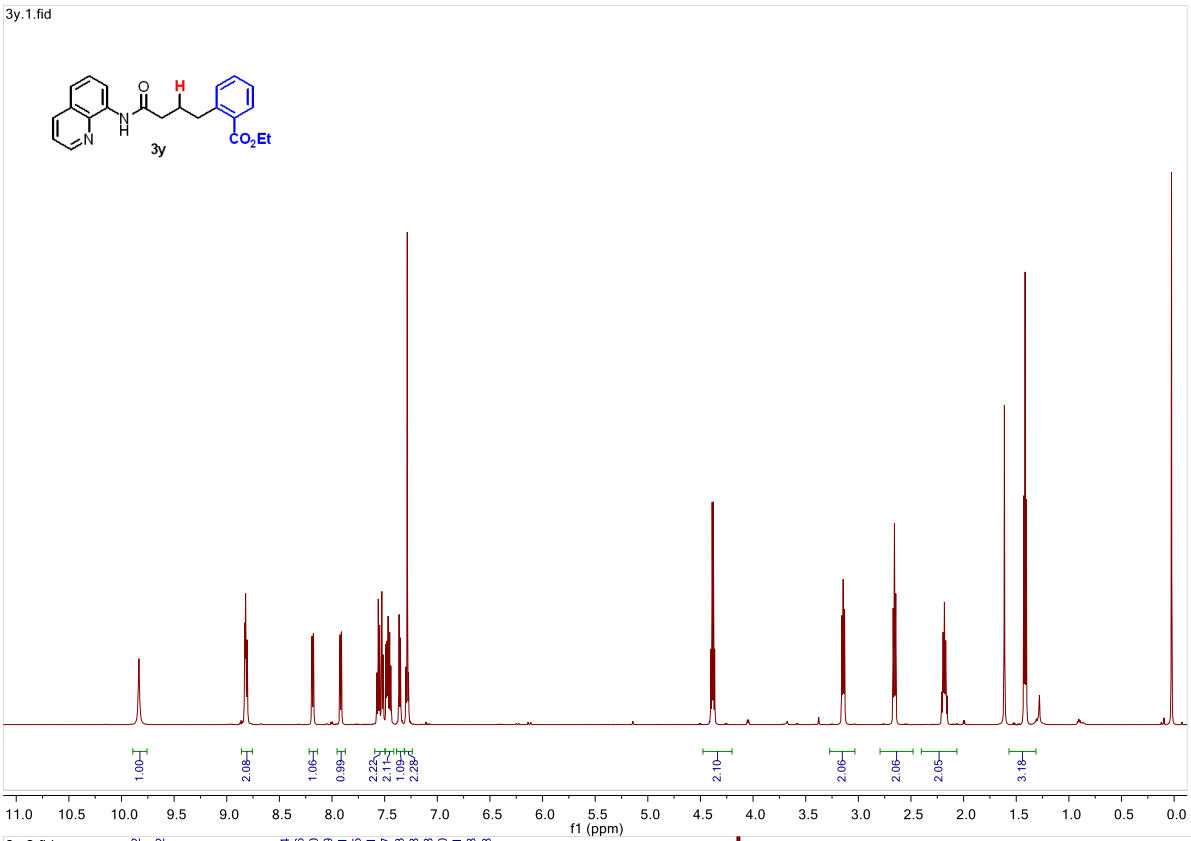

3w.1.fid
3w
1.00
2.09
1.05
2.14
1.07
1.30
1.03
1.03
1.01
2.12
2.10
2.12
f1 (ppm)

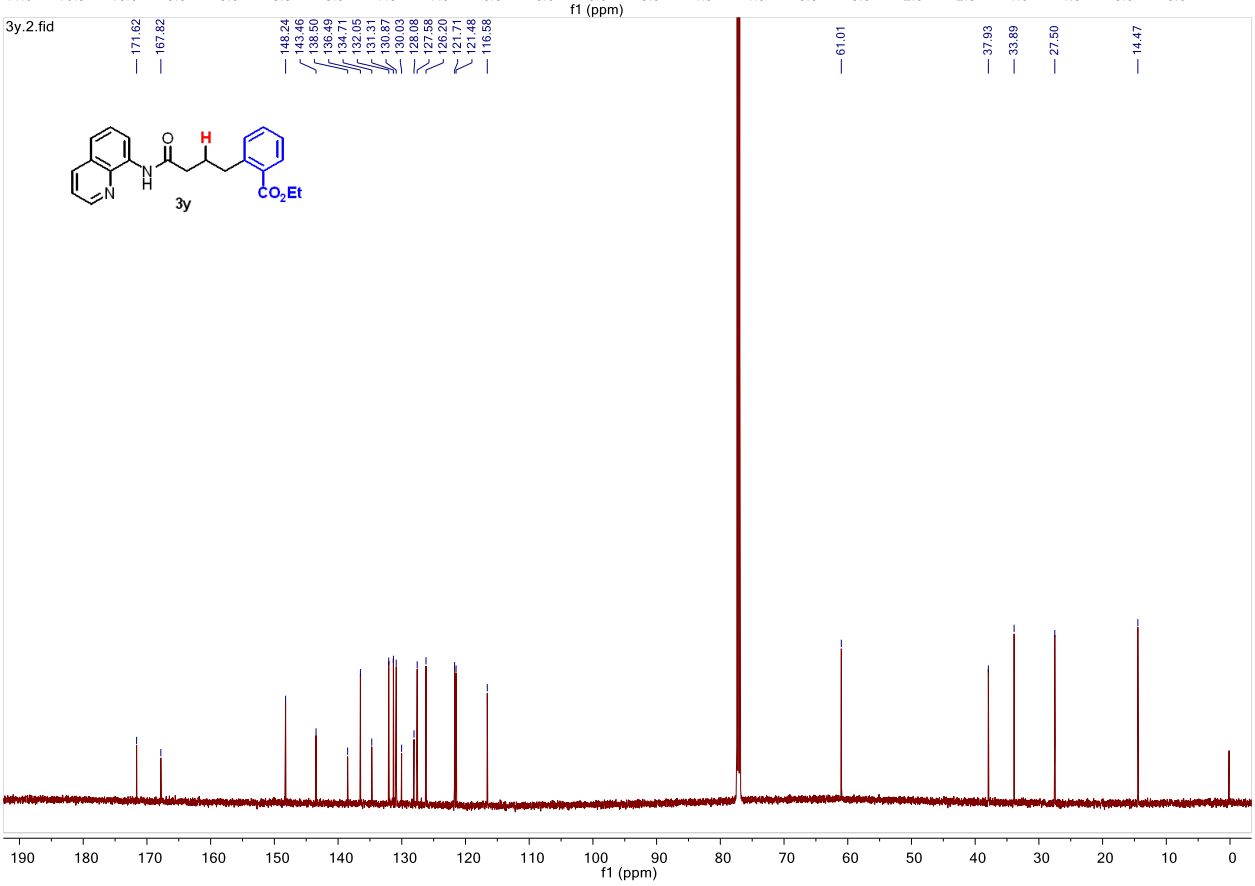

3w.2.fid
170.80
161.56
159.93
147.65
137.88
135.91
134.04
130.38
130.35
127.48
127.29
127.24
126.97
123.57
123.54
121.13
120.94
116.01
114.87
114.73
36.85
27.94
27.92
25.33
3w
f1 (ppm)

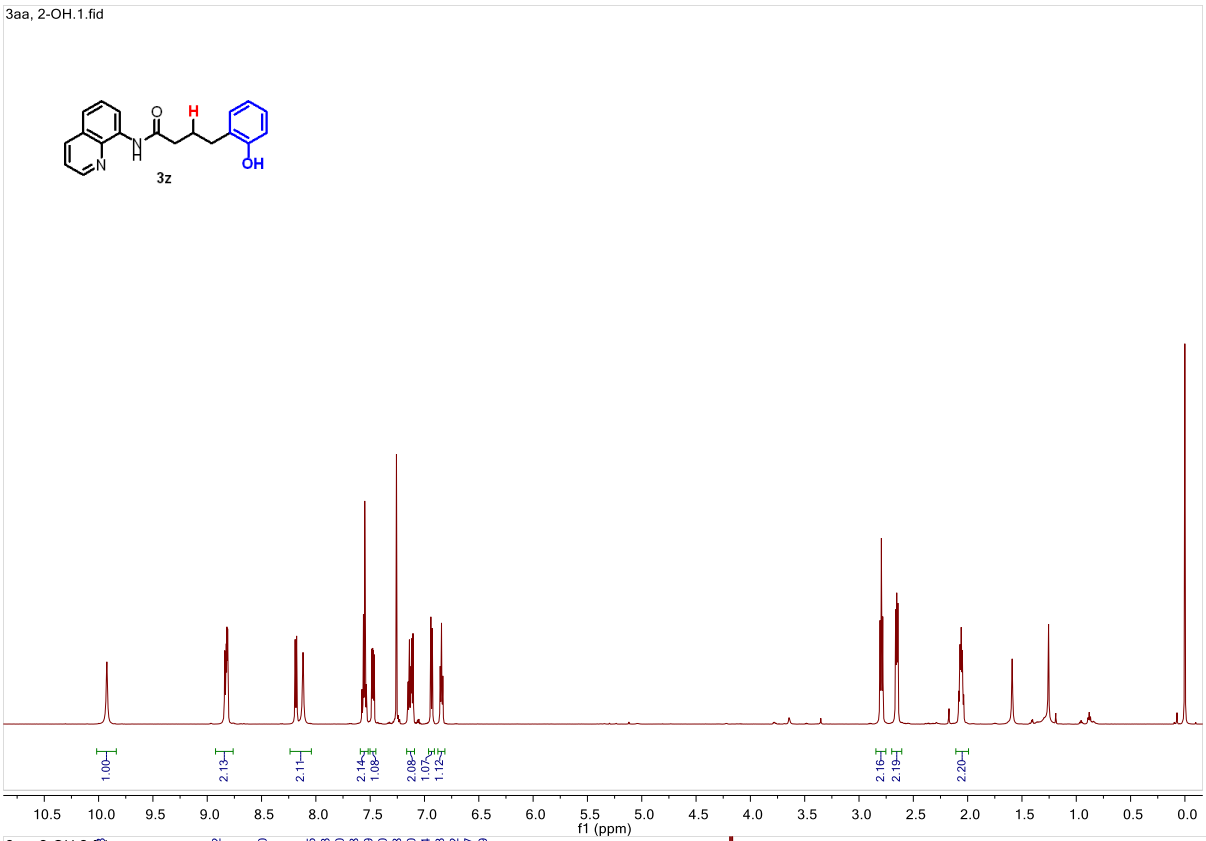

3w.3.fid
-118.85
O
H
N
H
N
F
3w
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

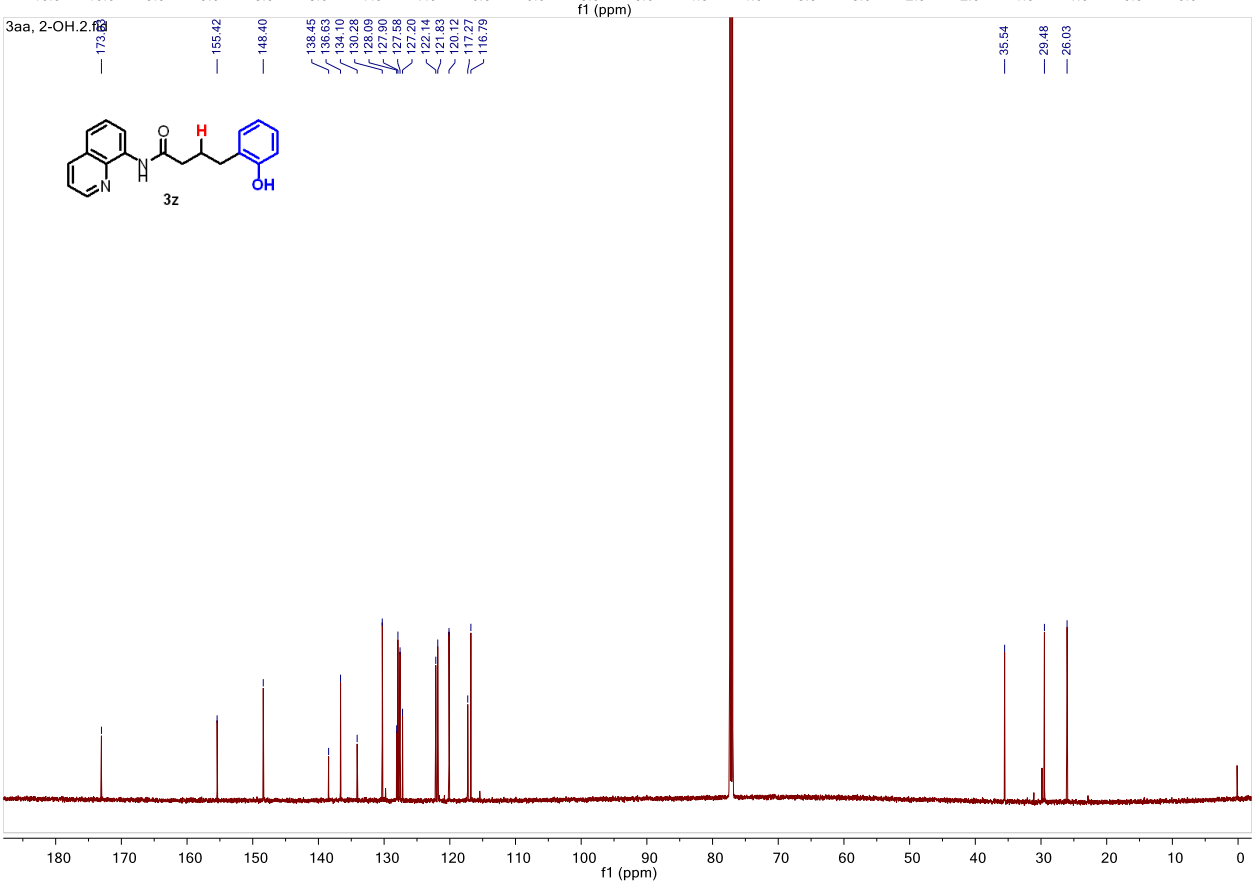

3x.1.fid
3x
1.00
2.31
1.15
2.35
1.16
2.39
1.15
0.94
2.16
2.16
2.14
f1 (ppm)

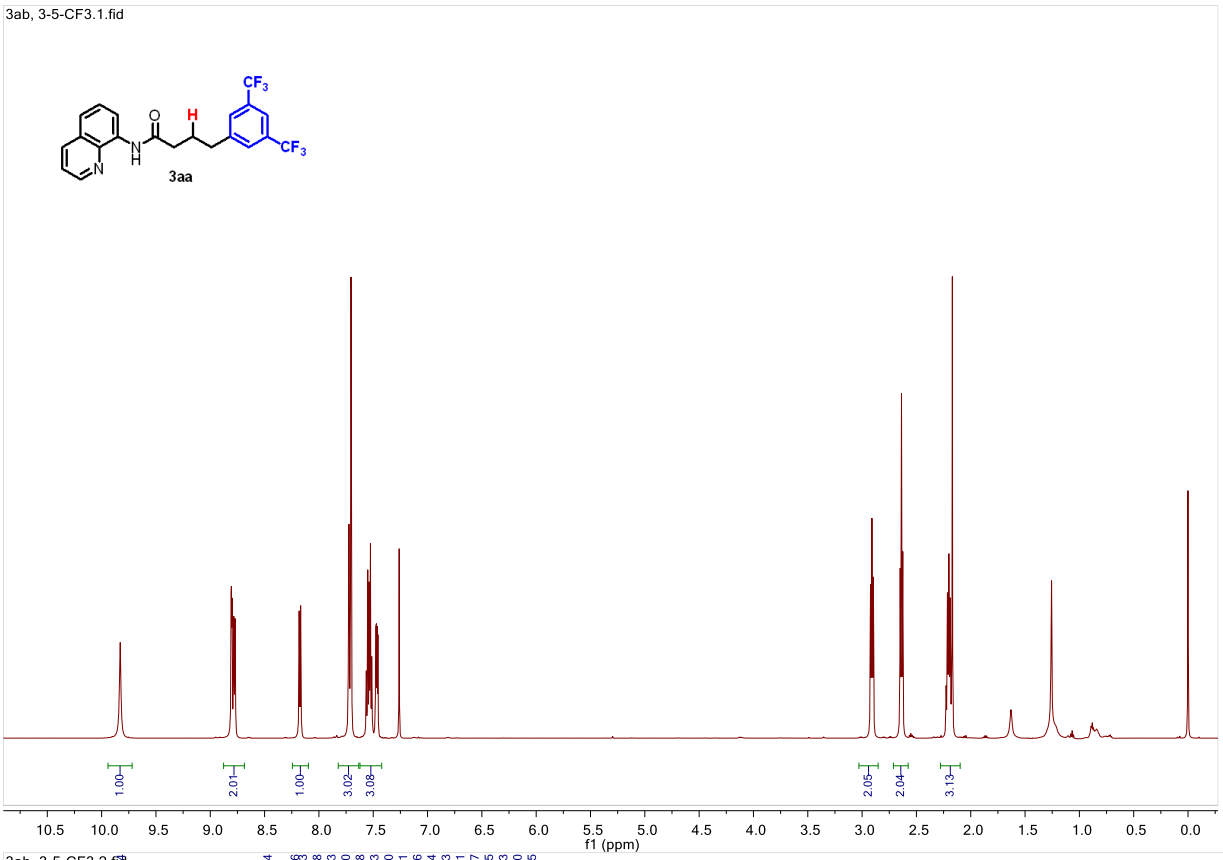

3x.2.fid
171.42
148.27
139.27
138.49
136.53
134.64
134.18
130.75
129.67
128.10
127.63
127.59
126.96
121.74
121.56
116.63
37.49
33.03
25.55
3x
f1 (ppm)

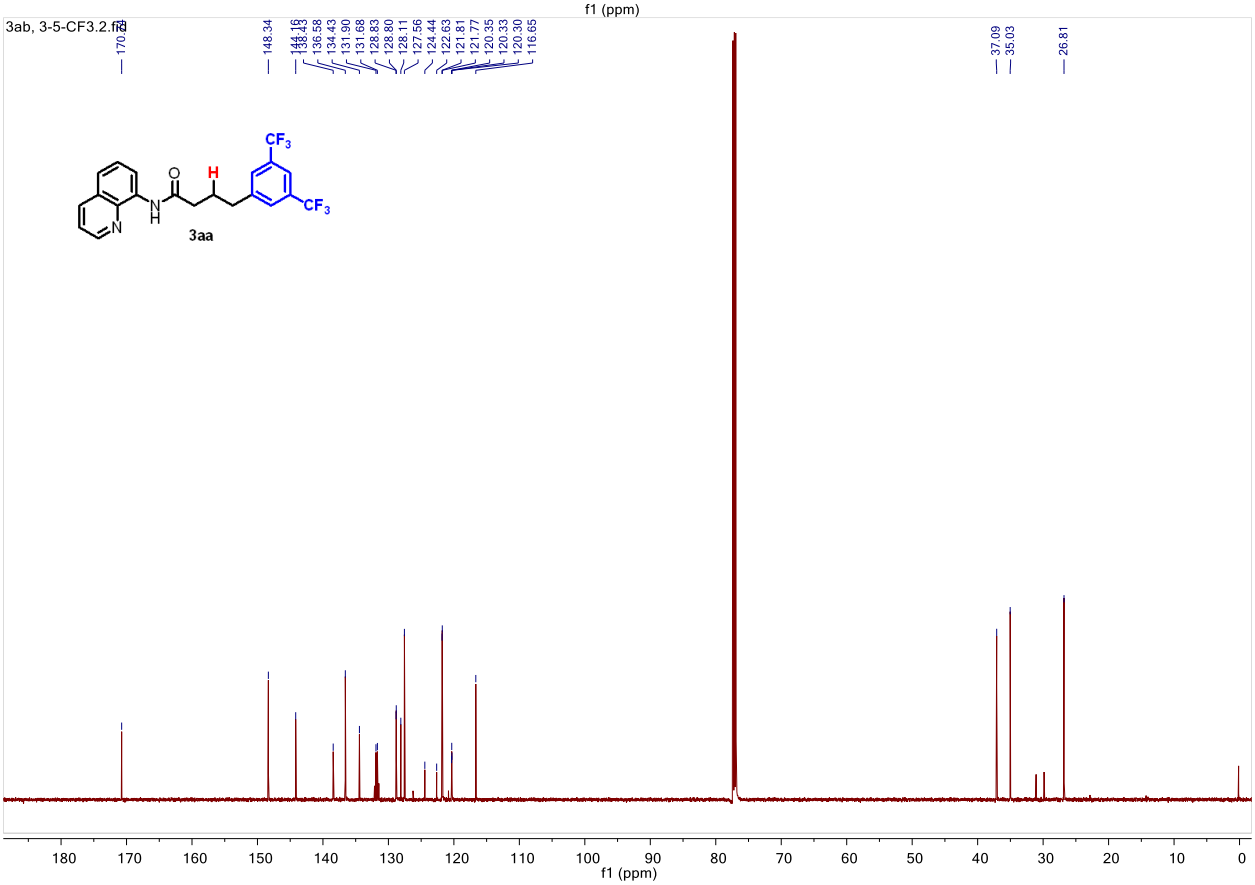

3y.1.fid
3y
1.00
2.08
1.06
0.99
2.22
2.11
1.09
2.28
2.10
2.06
2.06
2.05
3.18
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

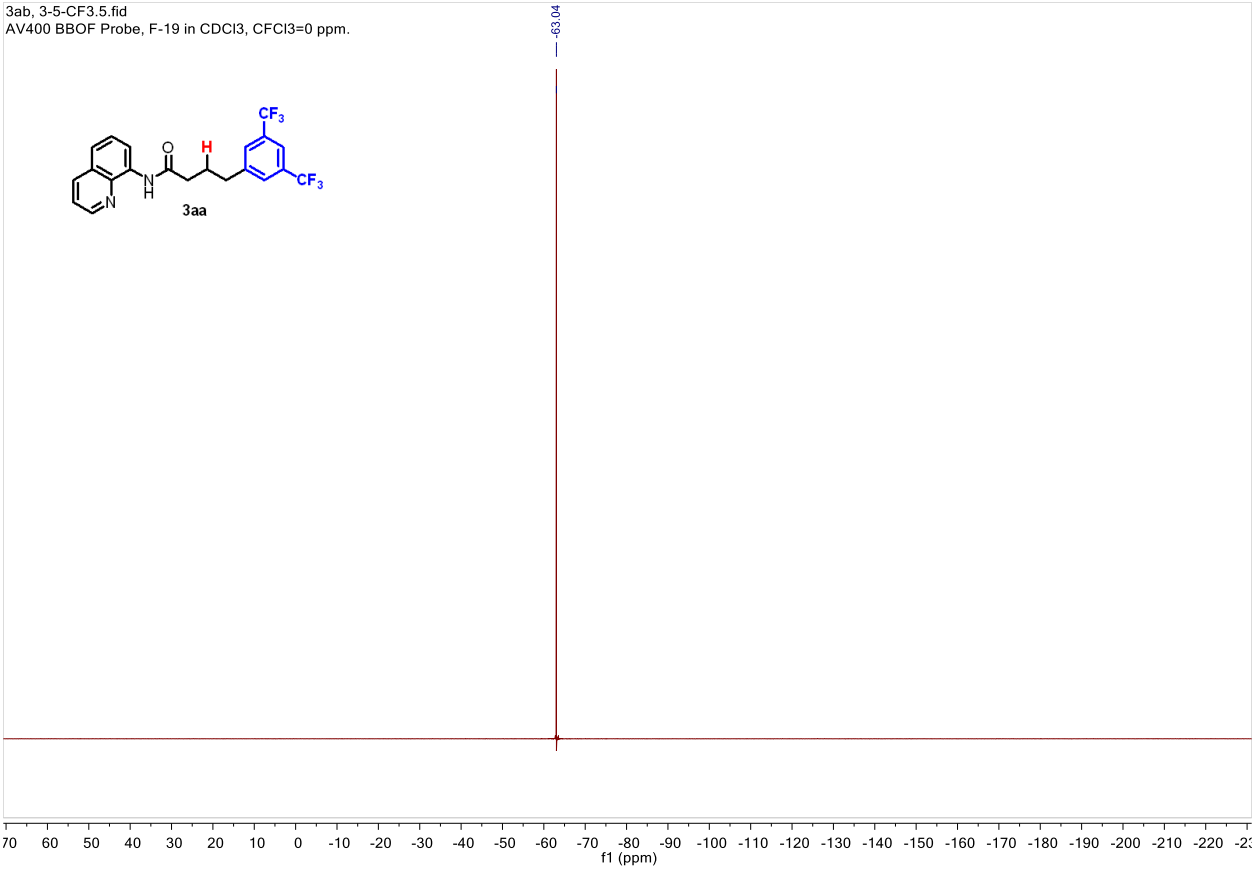

3y.2.fid
171.62
167.82
148.24
143.46
138.50
136.49
134.71
132.05
131.31
130.87
130.03
128.08
127.58
126.20
121.71
121.48
116.58
61.01
37.93
33.89
27.50
14.47
3y
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

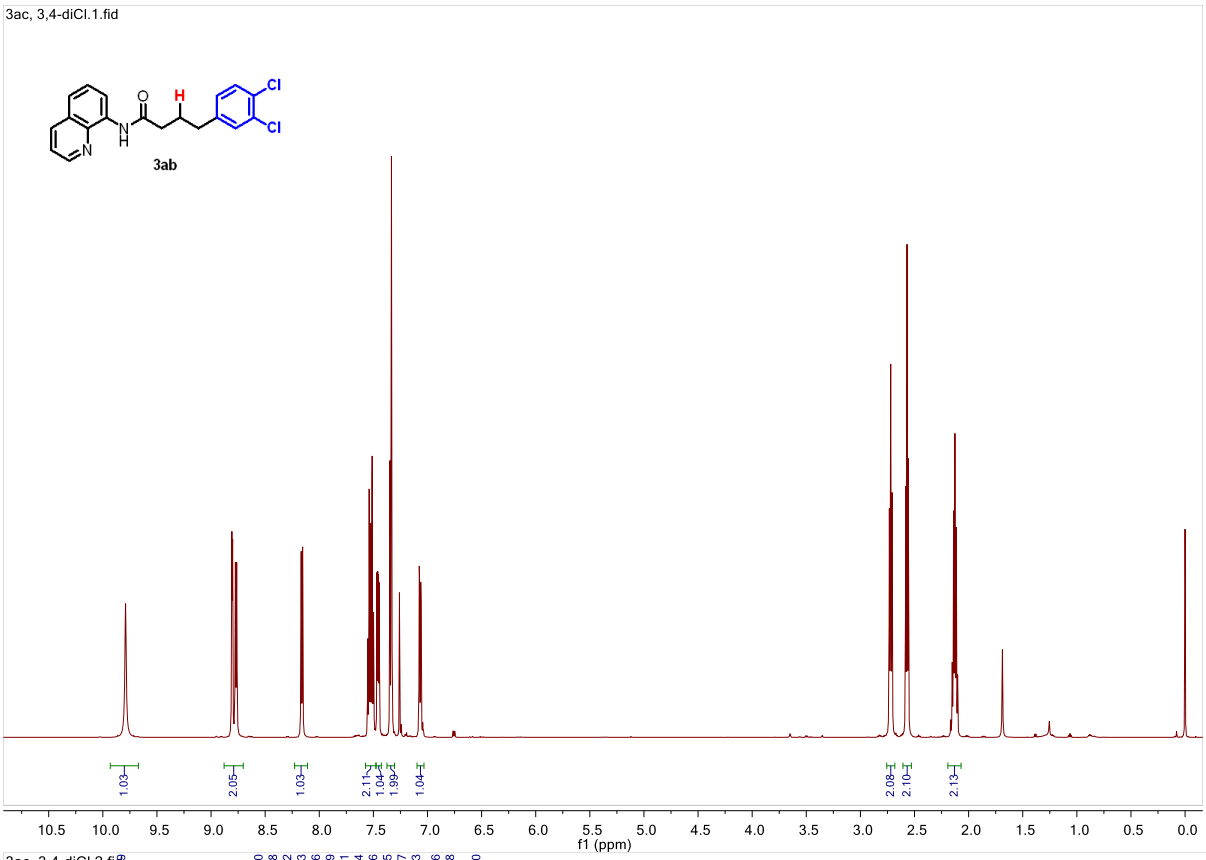

3aa, 2-OH.1.fid
3z
1.00
2.13
2.11
2.14
1.08
2.08
1.07
1.12
2.16
2.19
2.20
f1 (ppm)

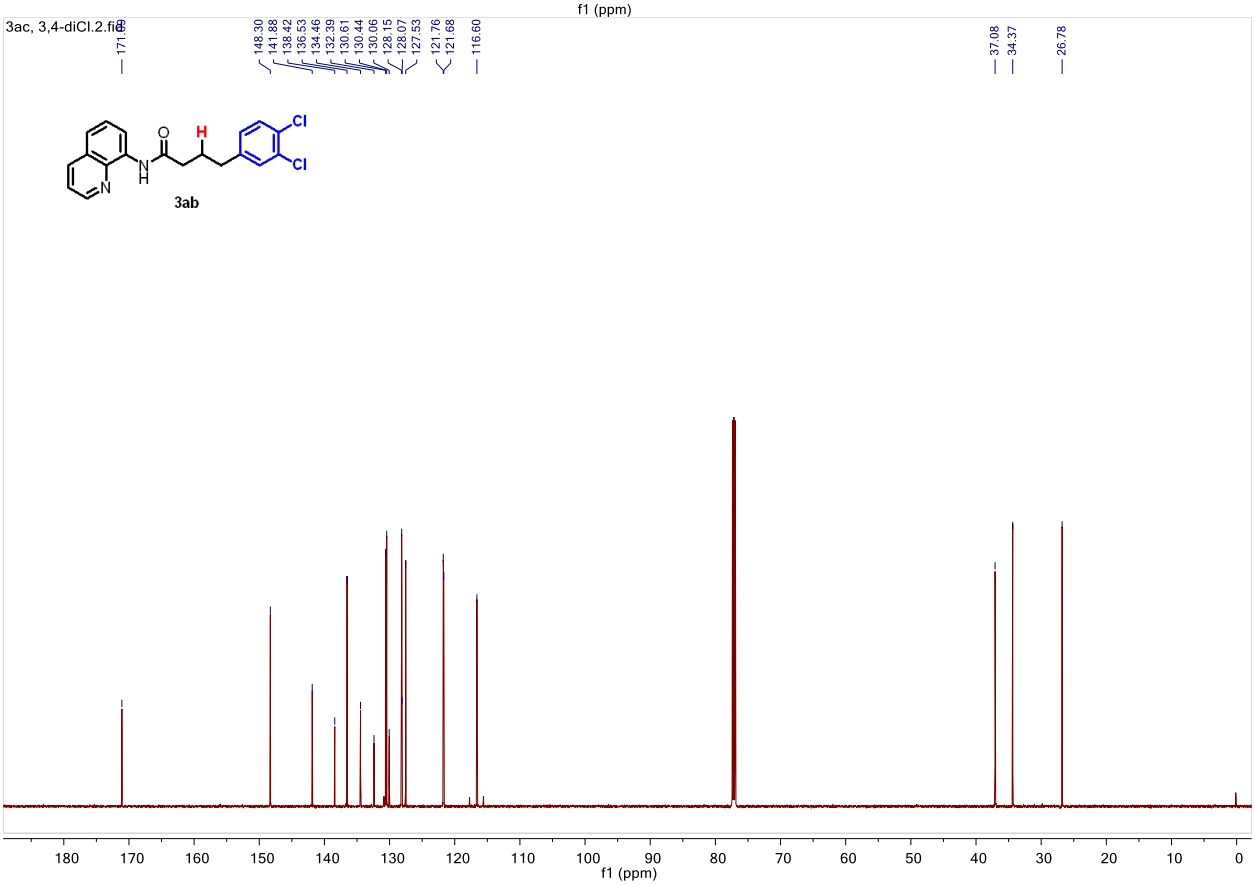

3aa, 2-OH.2.fid
173.61
155.42
148.40
138.45
136.63
134.10
130.28
128.09
127.90
127.58
127.20
122.14
121.83
120.12
117.27
116.79
35.54
29.48
26.03
3z
f1 (ppm)


3ab, 3-5-CF3.1.fid
CF3
H
O
N
H
N
CF3
3aa
1.00
2.01
1.00
3.02
3.08
2.05
2.04
3.13
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

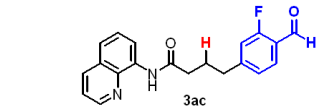

3ab, 3-5-CF3.2.fid
170.22
148.34
144.16
138.43
136.58
134.43
131.90
131.68
128.83
128.80
128.11
127.56
124.44
122.63
121.81
121.77
120.35
120.33
120.30
116.65
37.09
35.03
26.81
CF3
H
O
N
H
N
CF3
3aa
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


3ab, 3-5-CF3.5.fid
AV400 BBOF Probe, F-19 in CDCl3, CFCl3=0 ppm.
-63.04
CF3
CF3
O
H
N
H
N
3aa
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)


3ac, 3,4-diCl.1.fid
3ab
1.03
2.05
1.03
2.11
1.04
1.99
1.04
2.08
2.10
2.13
f1 (ppm)


3ac, 3,4-diCl.2.fid
171.89
148.30
141.88
138.42
136.53
134.46
132.39
130.61
130.44
130.06
128.15
128.07
127.53
121.76
121.68
116.60
37.08
34.37
26.78
3ab
f1 (ppm)

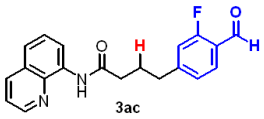
3ac.1.fid



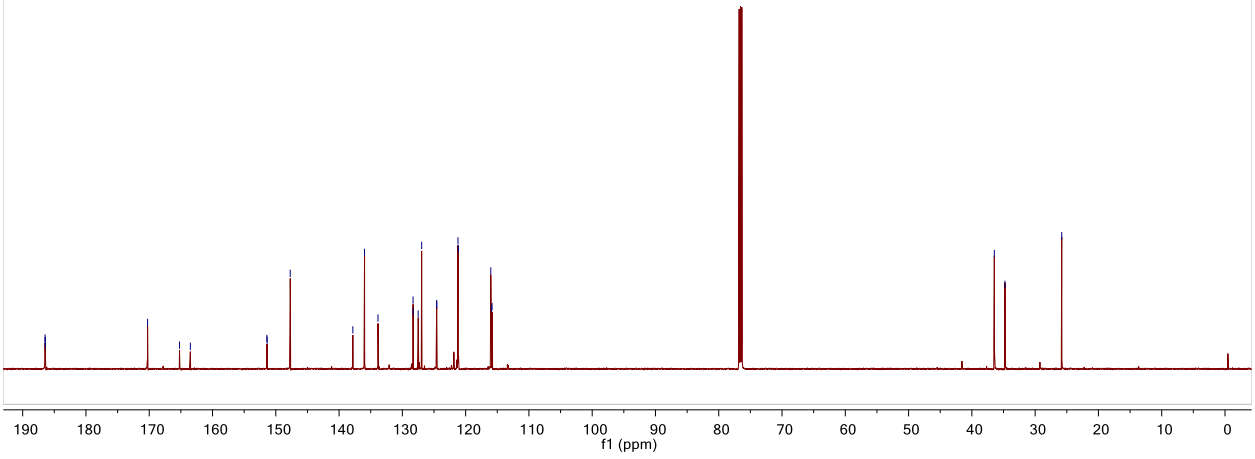

3ac

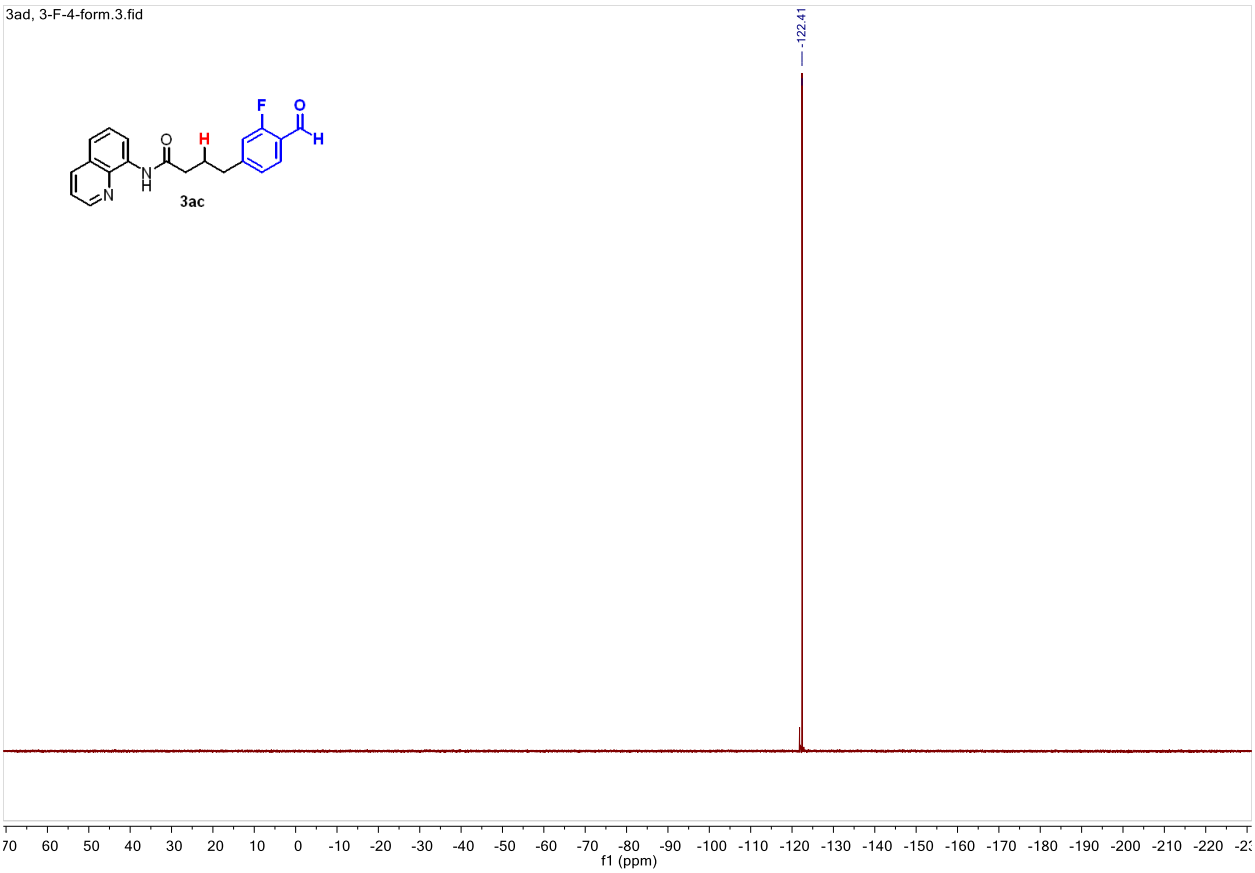


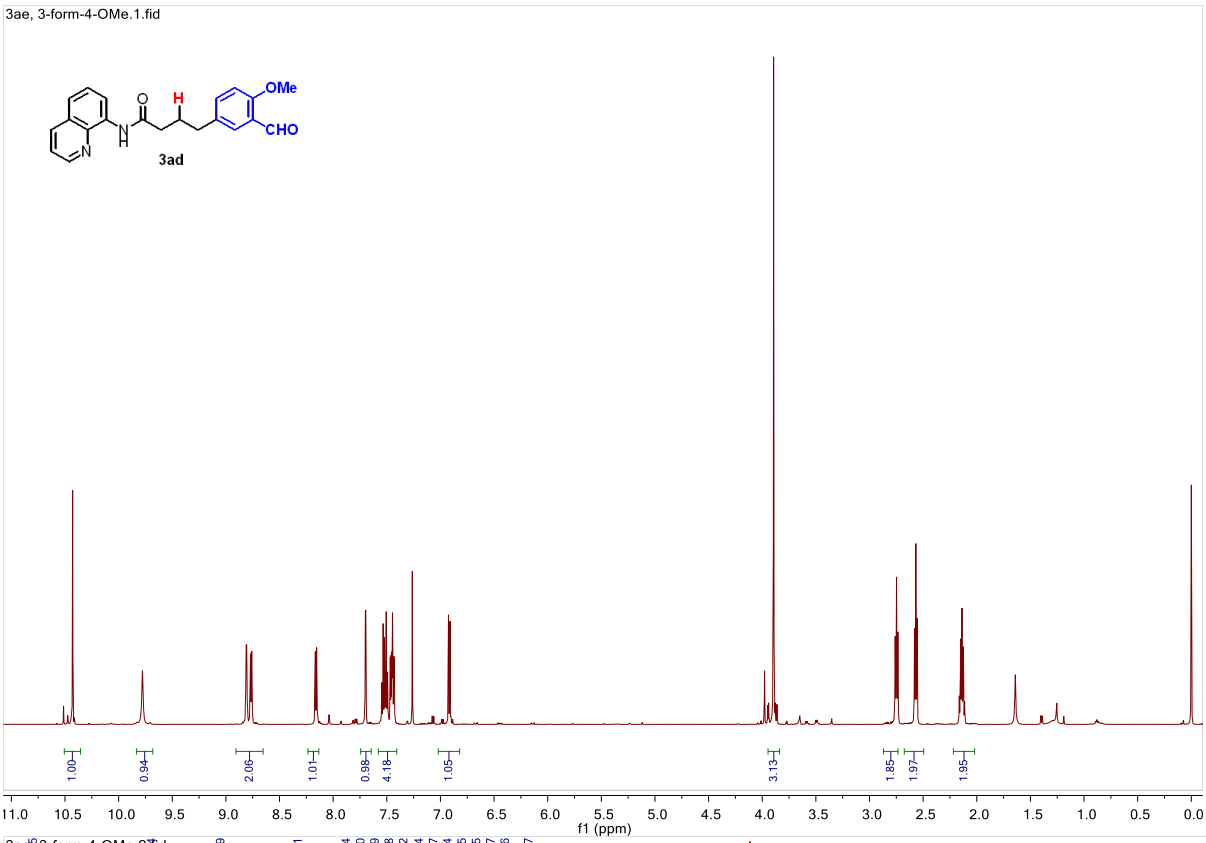

3ac.33-F-4-form.2.fid

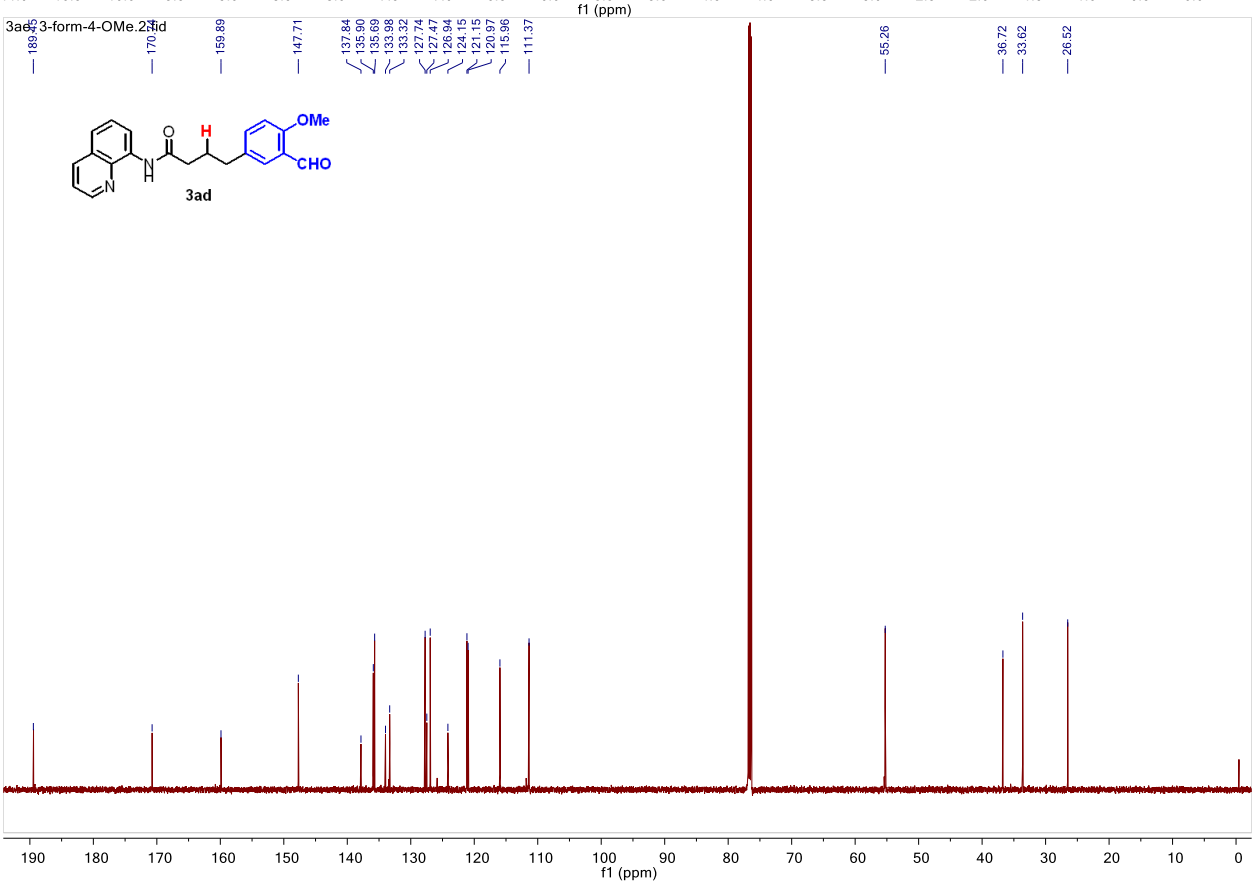



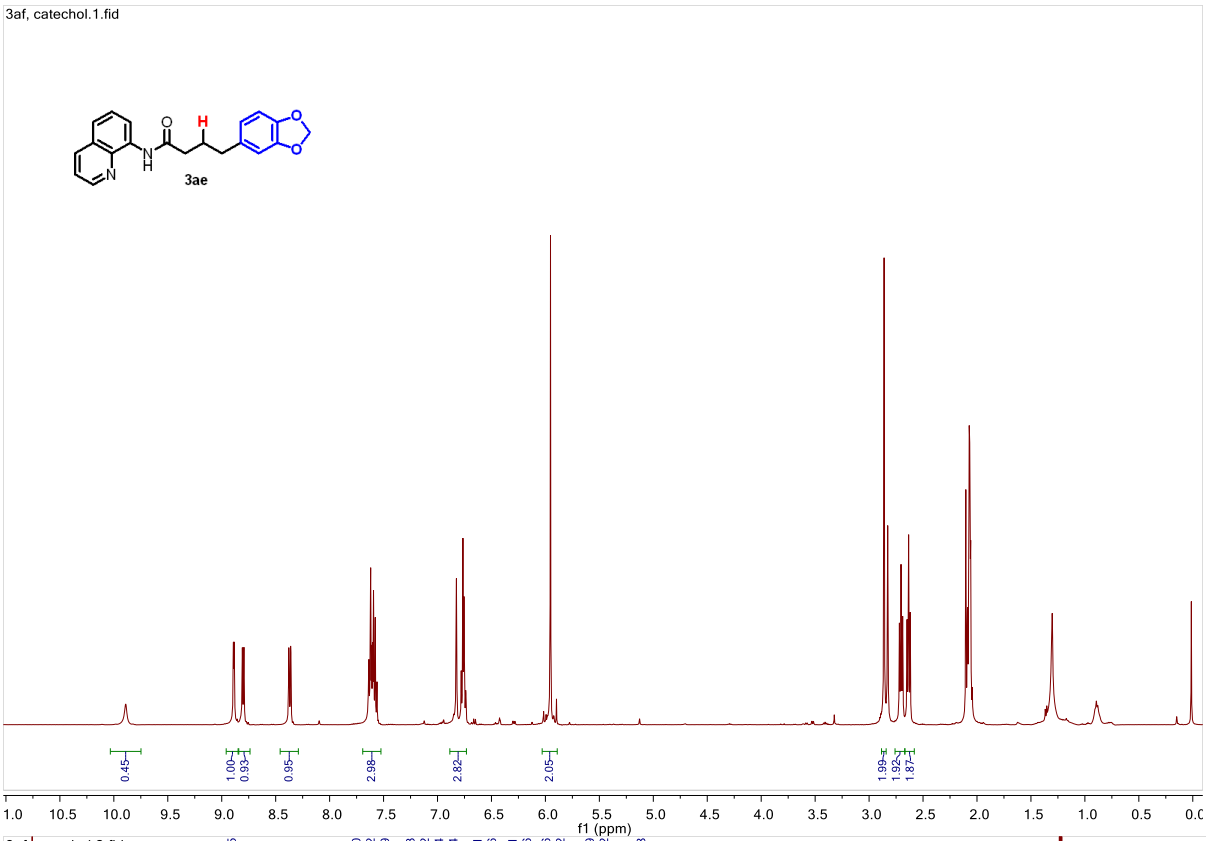

3ac

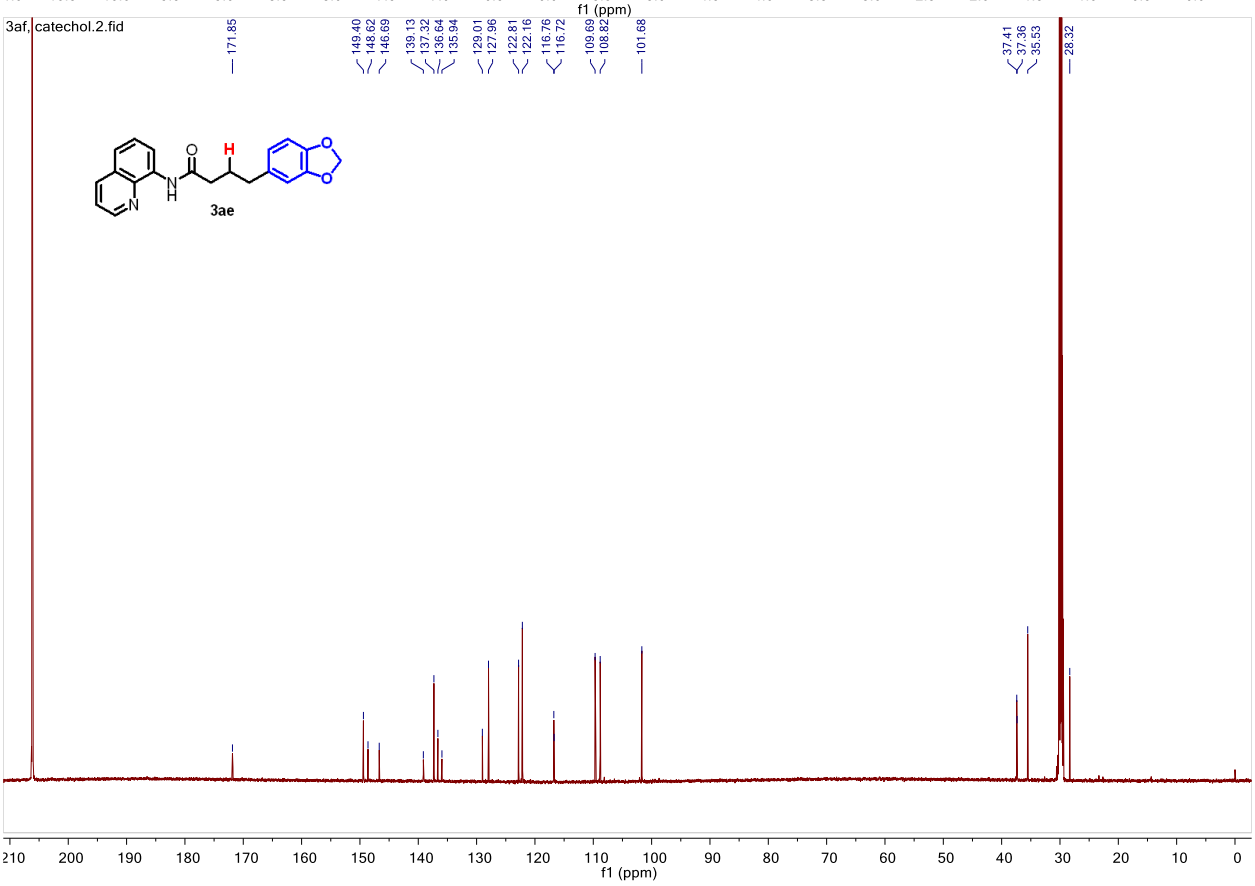


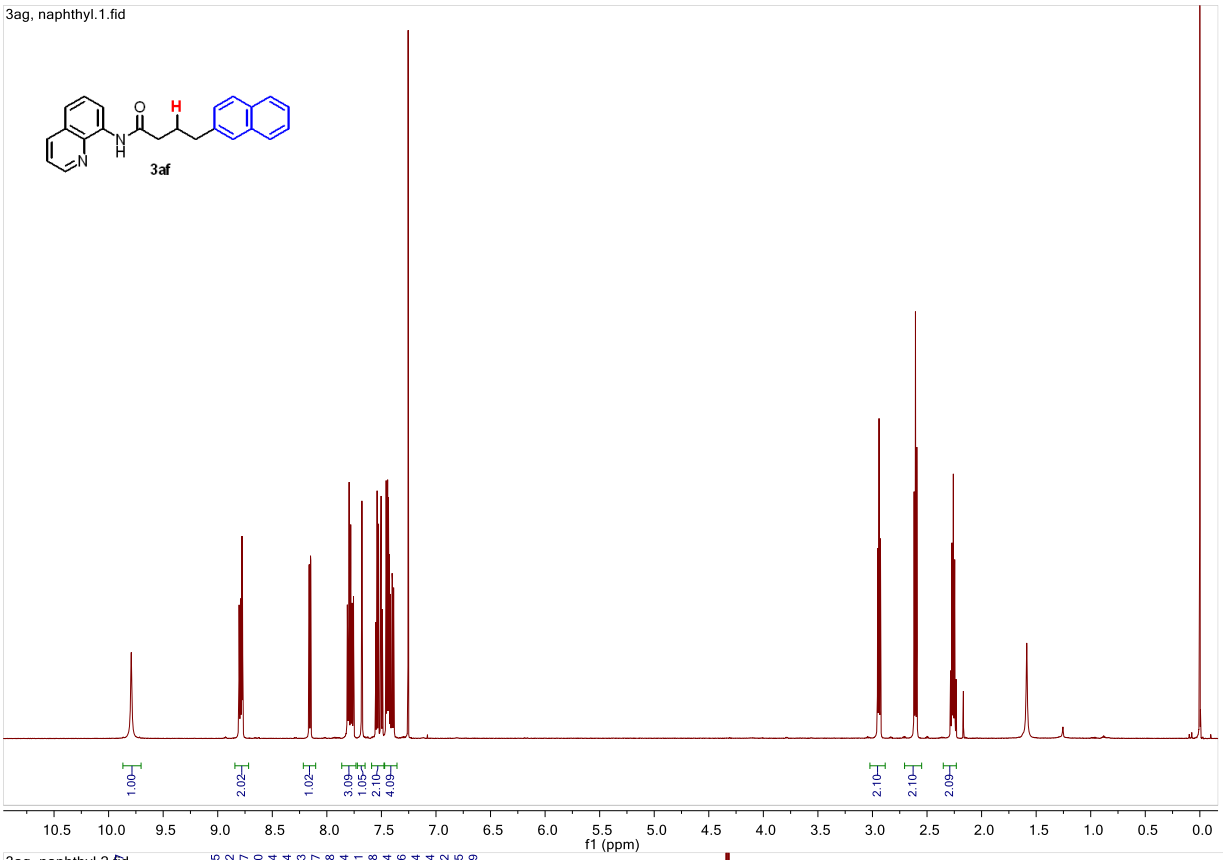

3ad, 3-F-4-form.3.fid
-122.41
F
O
H
O
H
N
N
3ac
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

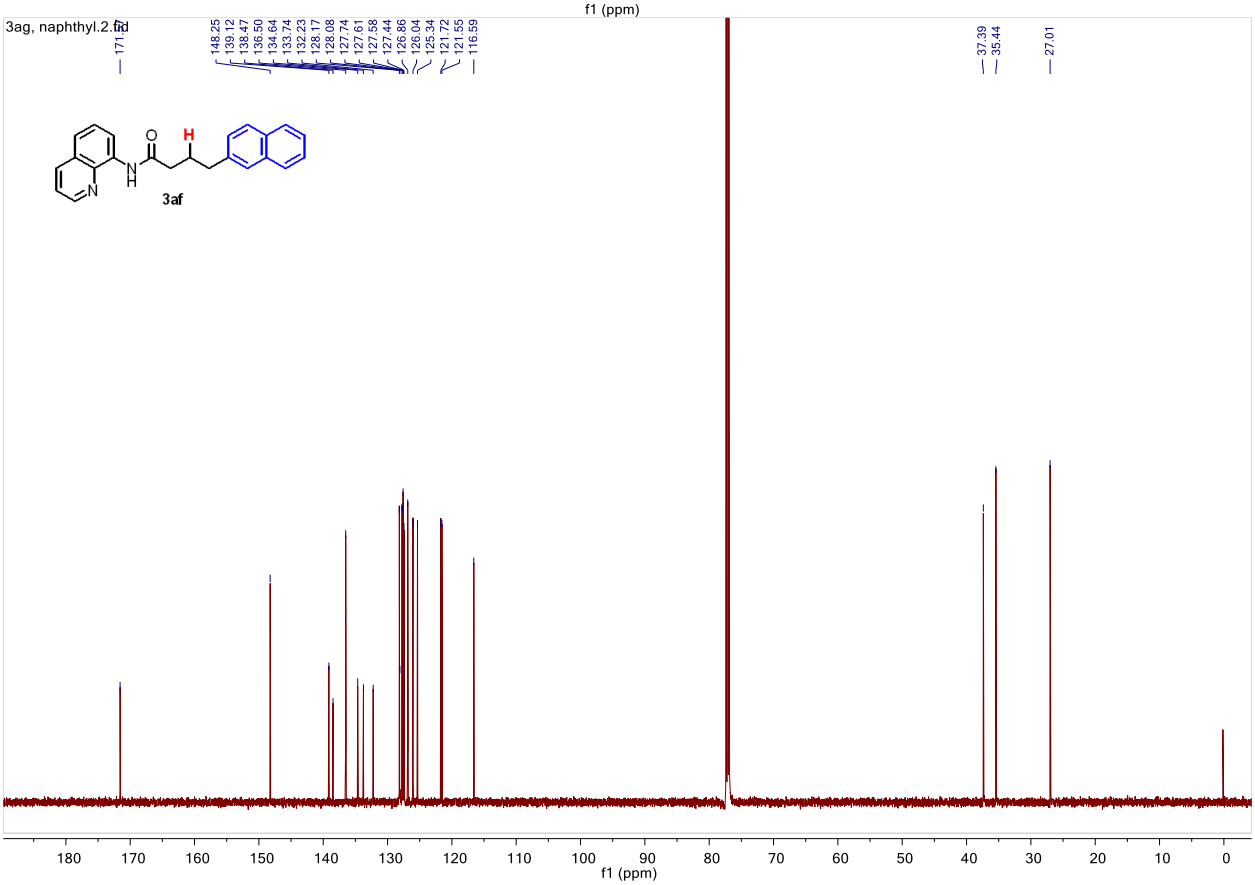

3ae, 3-form-4-OMe.1.fid
OMe
CHO
H
O
N
N
3ad
1.00
0.94
2.06
1.01
0.98
4.18
1.05
3.13
1.85
1.97
1.95
f1 (ppm)

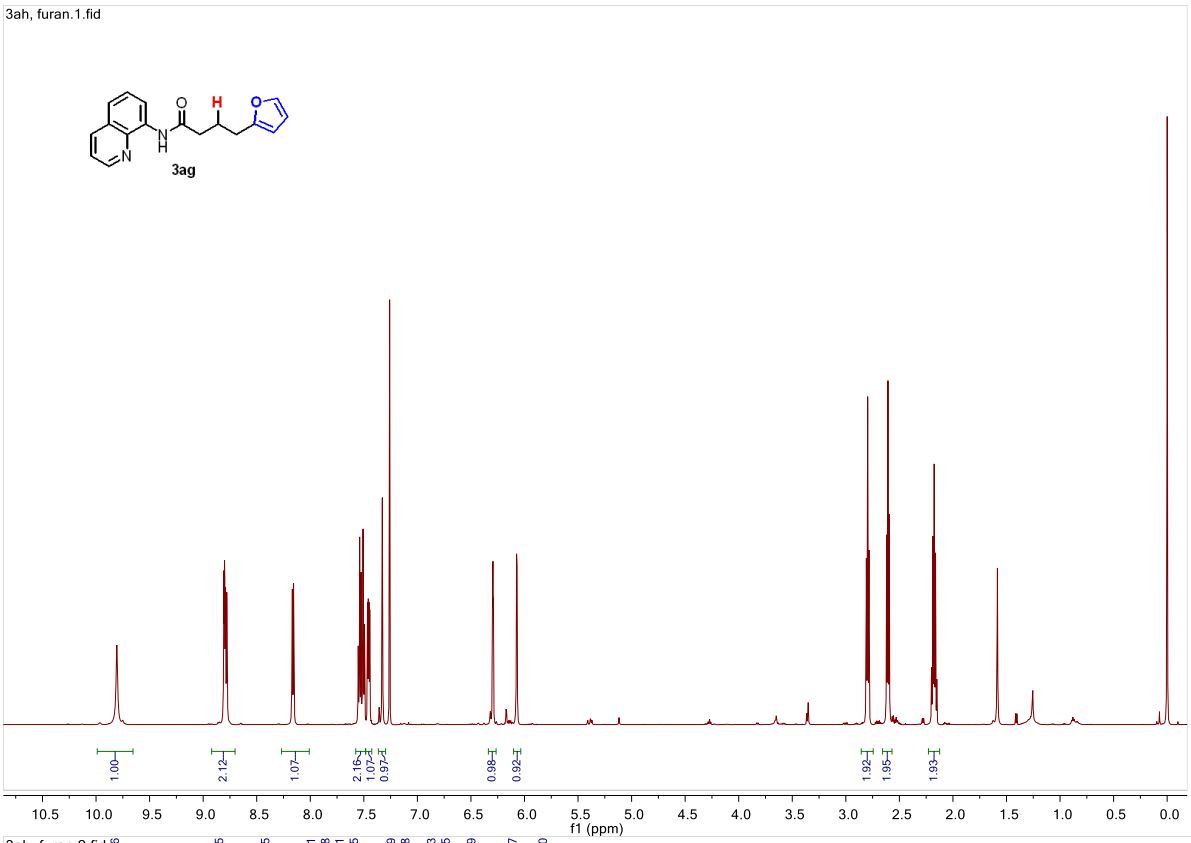

3ae, 3-form-4-OMe.2.fid
189.42
170.74
159.89
147.71
137.84
135.90
135.69
133.98
133.32
127.74
127.47
126.94
124.15
121.15
120.97
115.96
111.37
55.26
36.72
33.62
26.52
OMe
CHO
H
O
N
N
3ad
f1 (ppm)

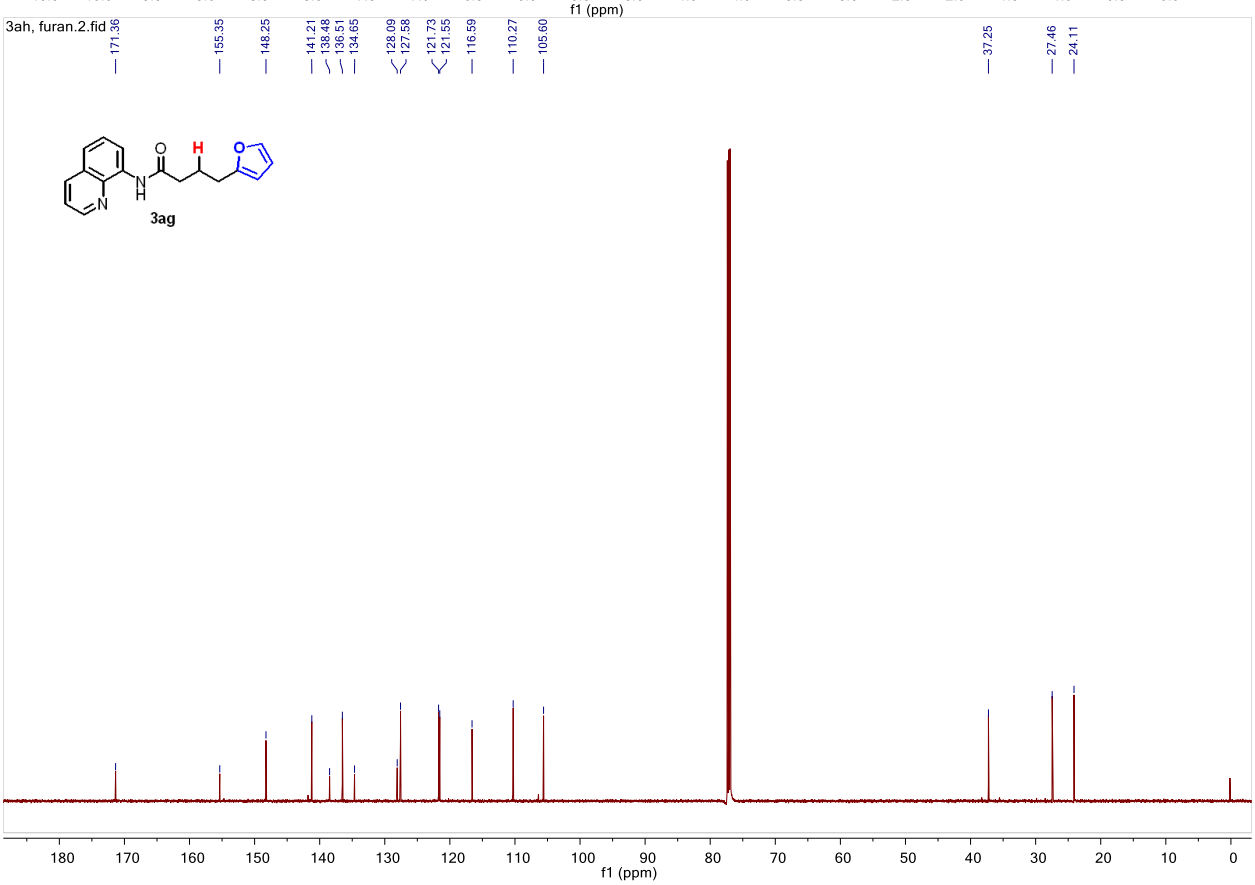

3af, catechol.1.fid
3ae
0.45
1.00
0.93
0.95
2.98
2.82
2.05
1.99
1.92
1.87
f1 (ppm)

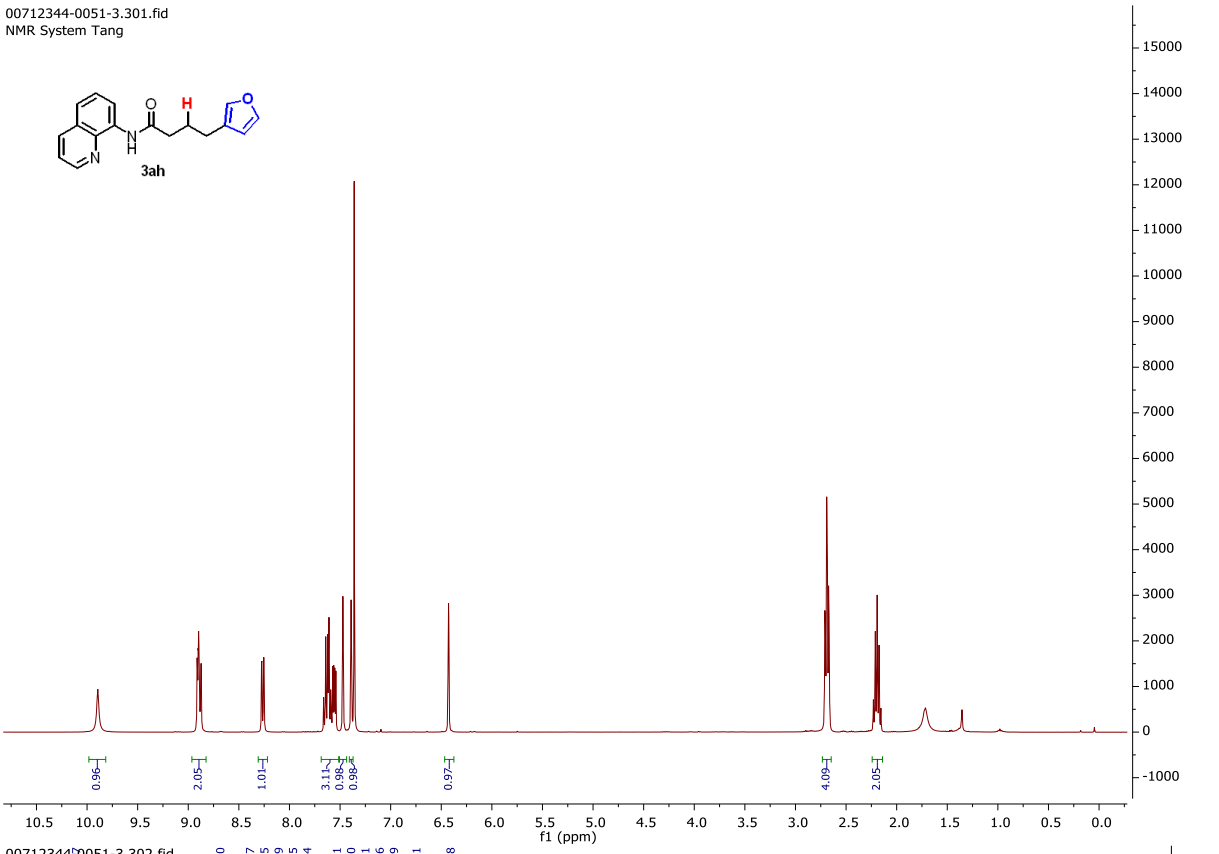

3af, catechol.2.fid
171.85
149.40
148.62
146.69
139.13
137.32
136.64
135.94
129.01
127.96
122.81
122.16
116.76
116.72
109.69
108.82
101.68
37.41
37.36
35.53
28.32
3ae
f1 (ppm)

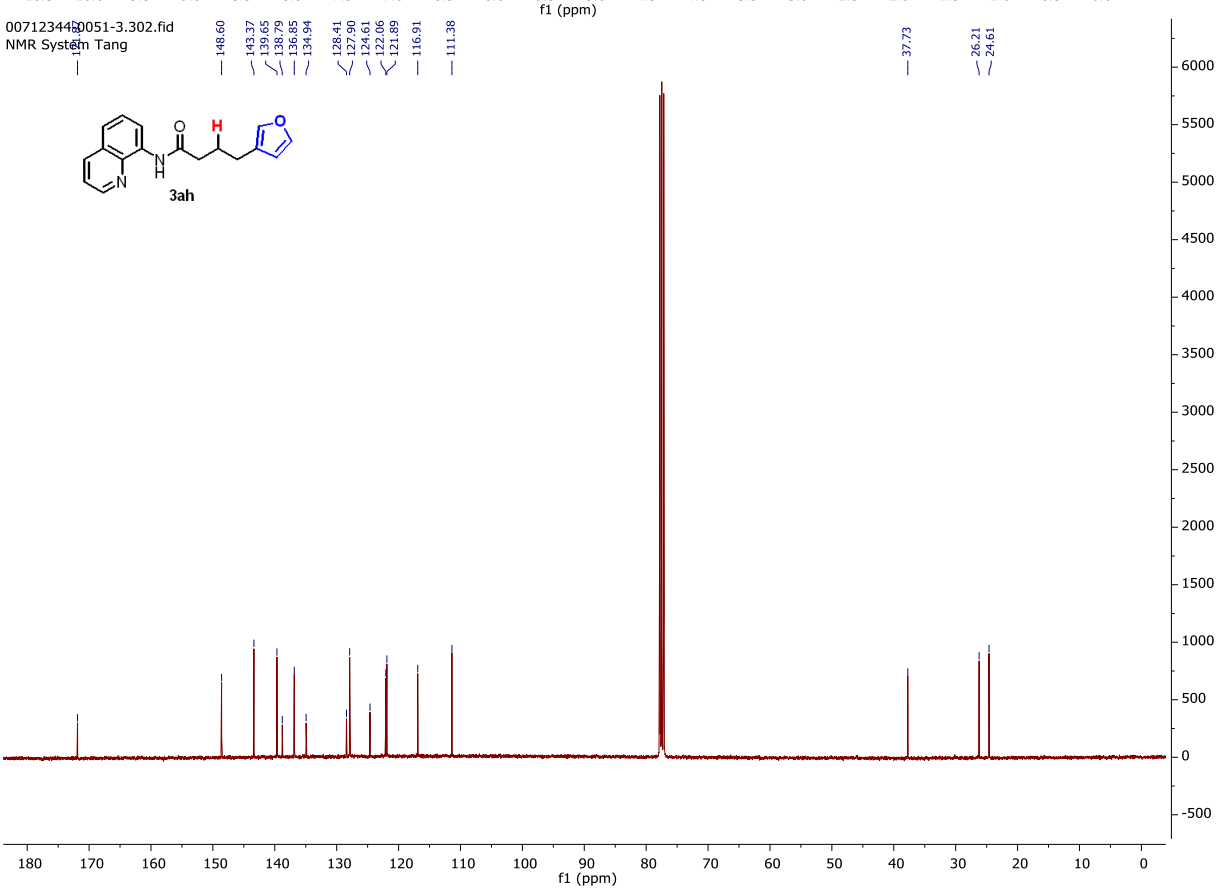

3ag, naphthyl.1.fid
3af
1.00
2.02
1.02
3.09
1.05
2.10
4.09
2.10
2.10
2.09
f1 (ppm)

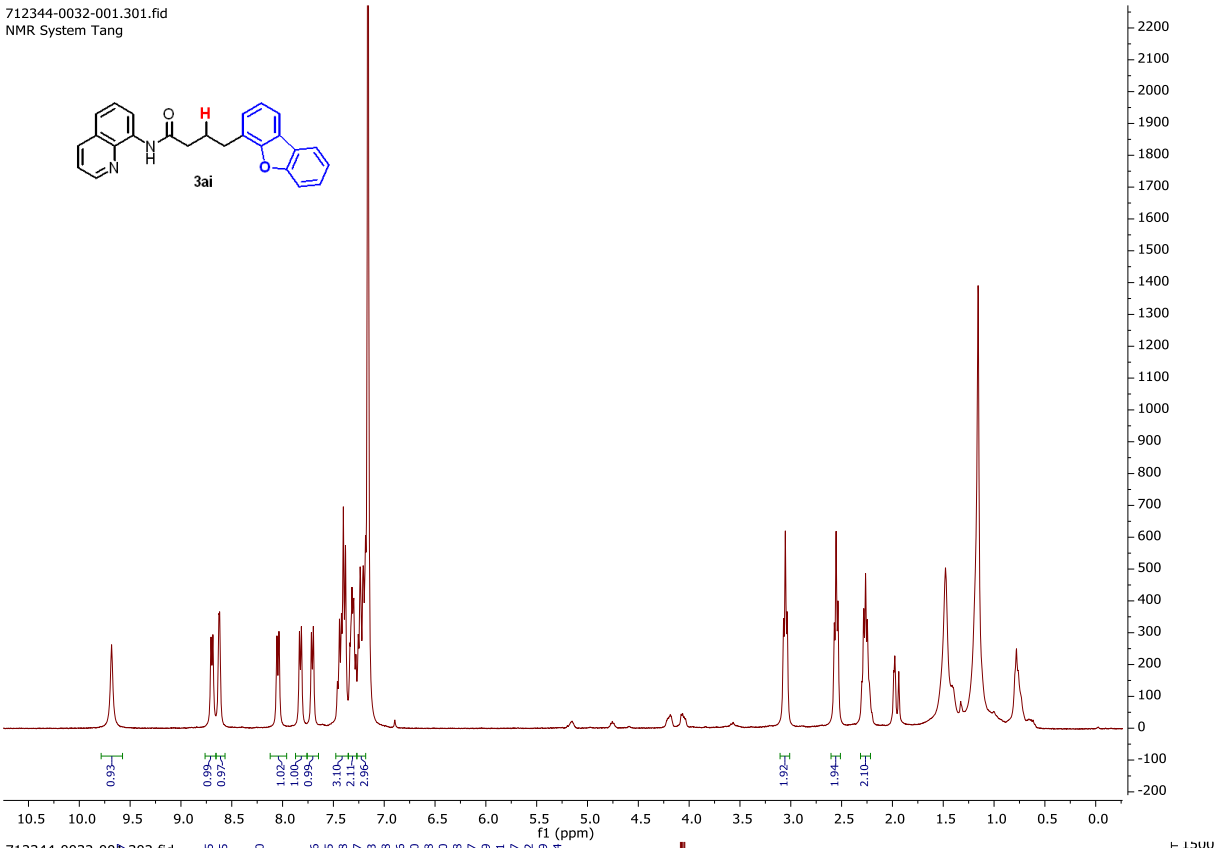

3ag, naphthyl.2.fid
171.1
148.25
139.12
138.47
136.50
134.64
133.74
132.23
128.17
128.08
127.74
127.61
127.58
127.44
126.86
126.04
125.34
121.72
121.55
116.59
37.39
35.44
27.01
3af
f1 (ppm)

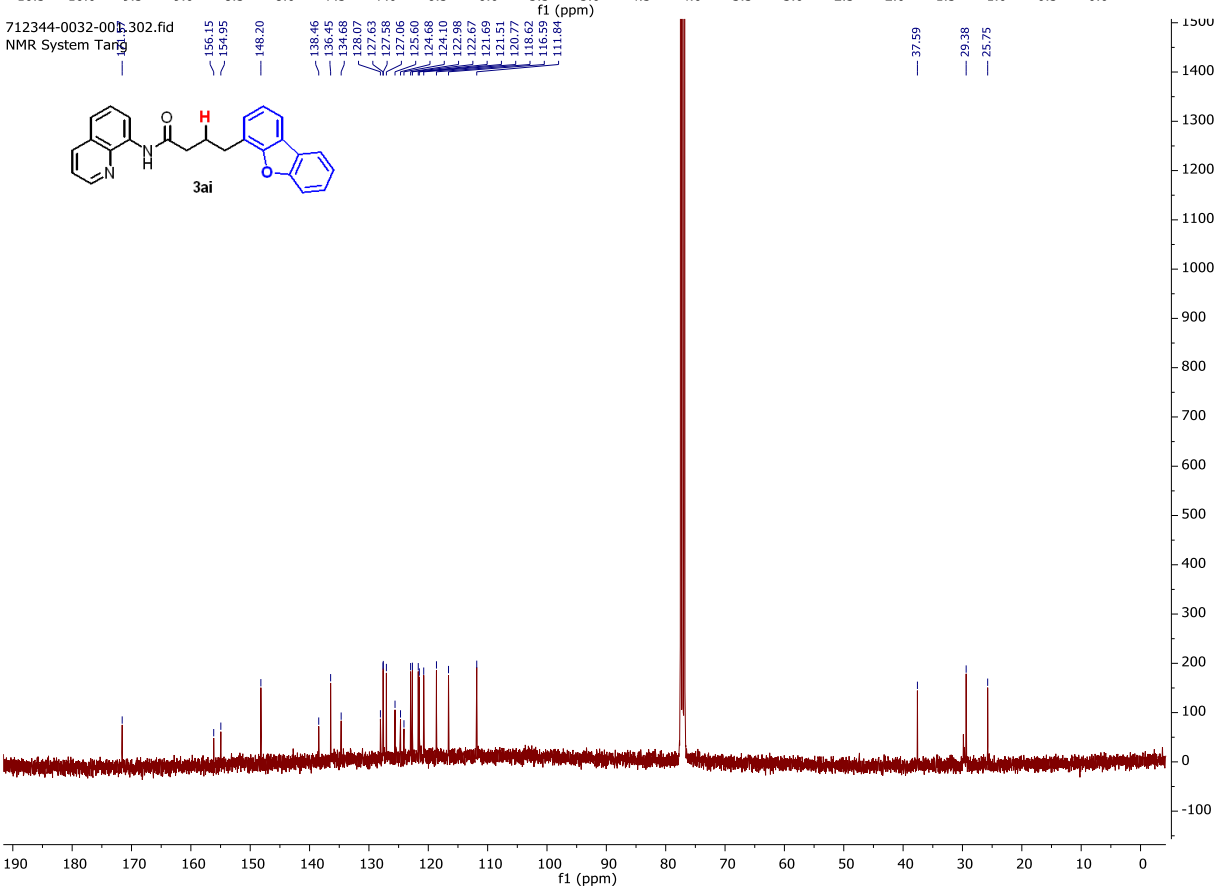

3ah, furan.1.fid
3ag
1.00
2.12
1.07
2.16
1.07
0.97
0.98
0.92
1.92
1.95
1.93
f1 (ppm)

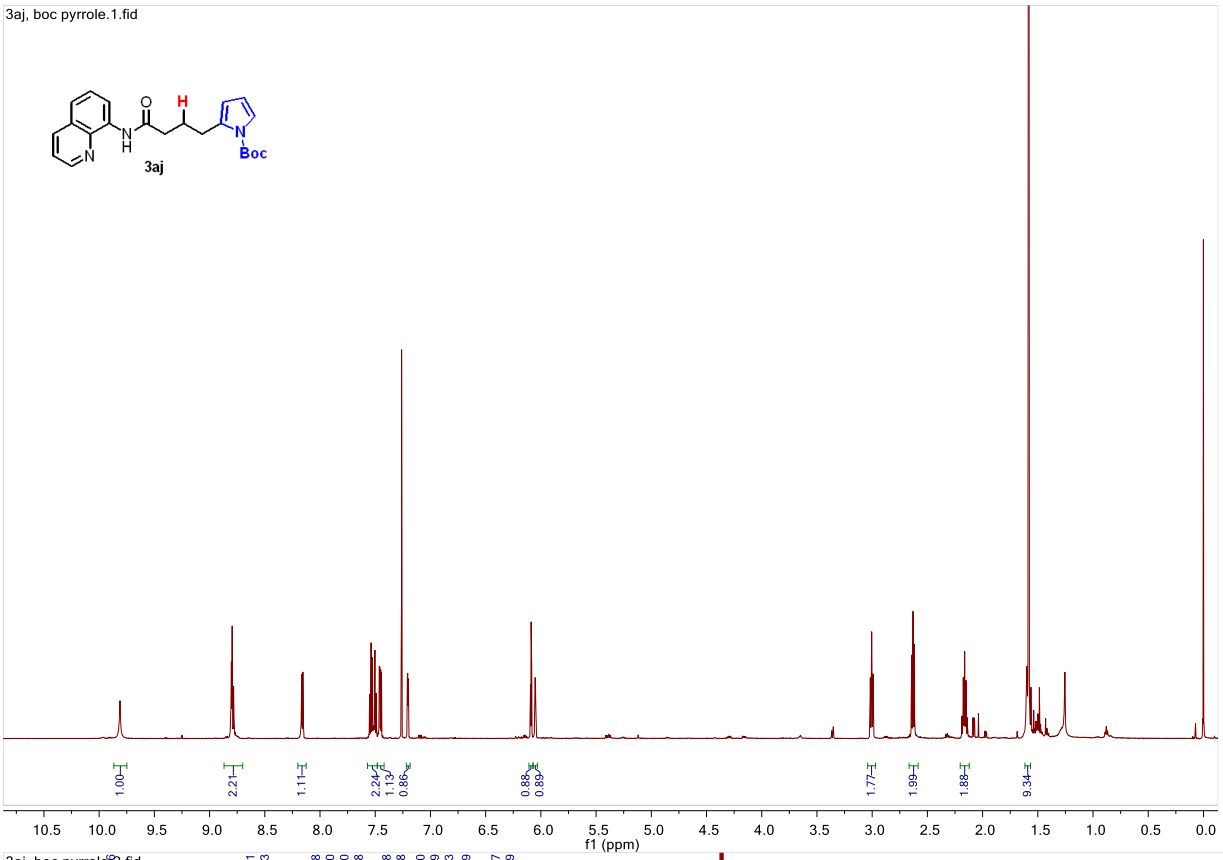

3ah, furan.2.fid
171.36
155.35
148.25
141.21
138.48
136.51
134.65
128.09
127.58
121.73
121.55
116.59
110.27
105.60
37.25
27.46
24.11
3ag
f1 (ppm)

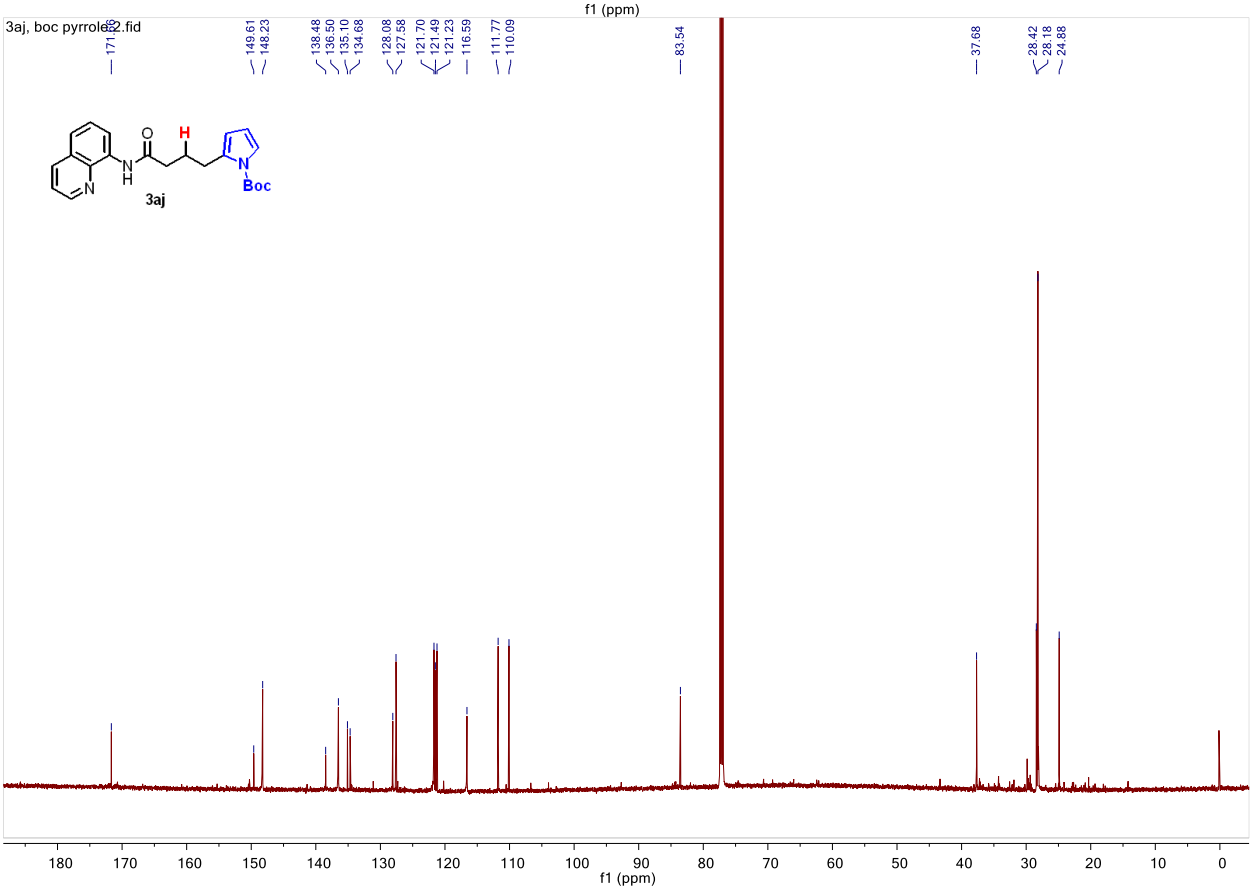

00712344-0051-3.301.fid
NMR System Tang
3ah
0.96
2.05
1.01
3.11
0.98
0.98
0.97
4.09
2.05
f1 (ppm)

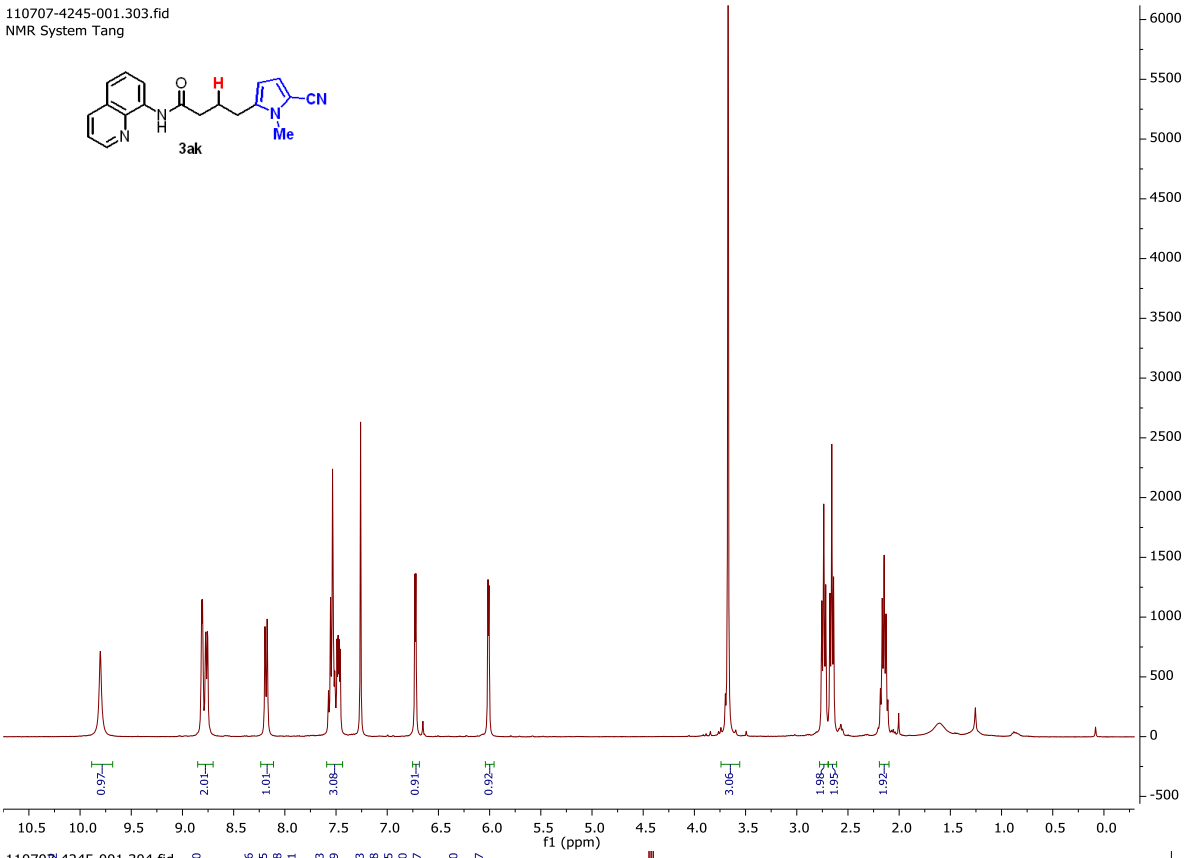

00712344-0051-3.302.fid
NMR System Tang
148.60
143.37
139.65
138.79
136.85
134.94
128.41
127.90
124.61
122.06
121.89
116.91
111.38
37.73
26.21
24.61
3ah
f1 (ppm)

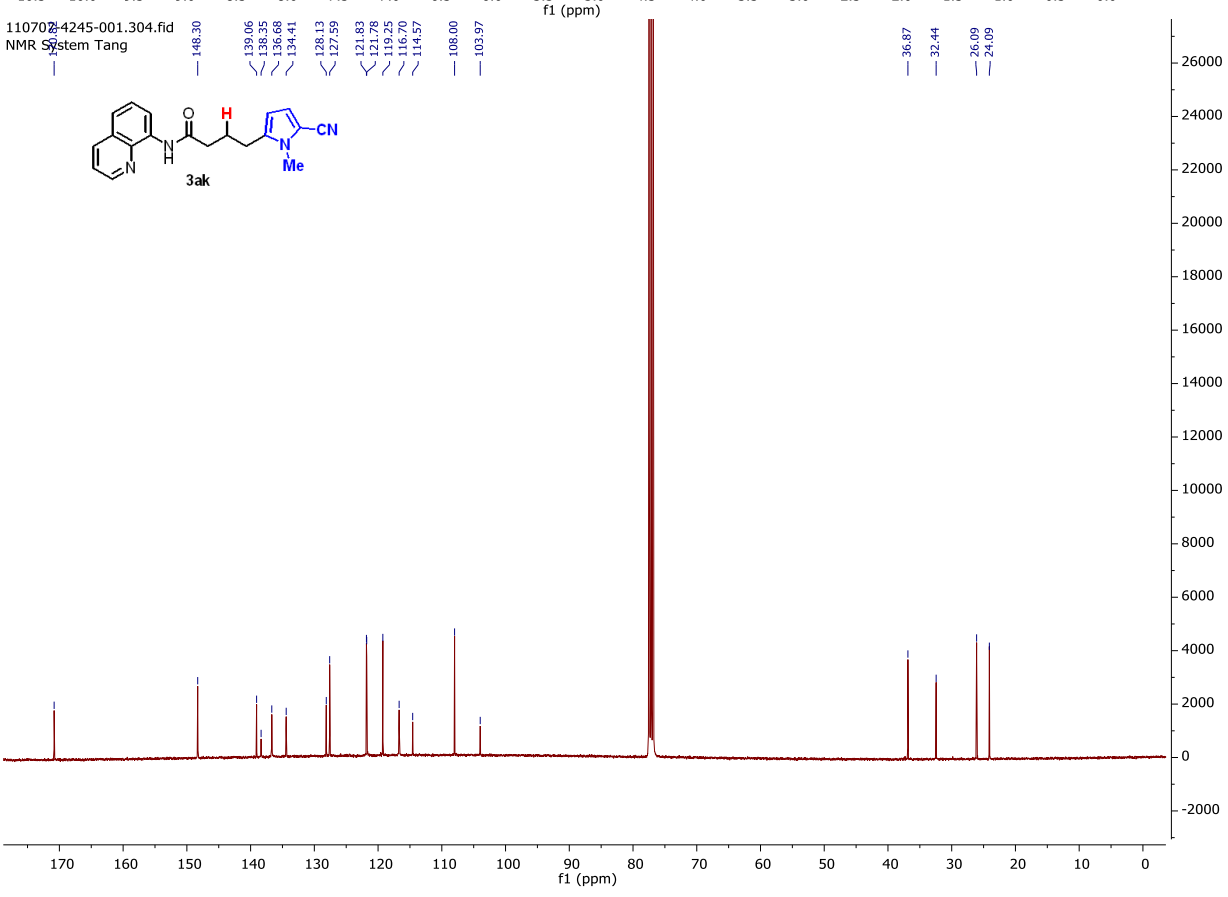

712344-0032-001.301.fid
NMR System Tang
3ai
f1 (ppm)

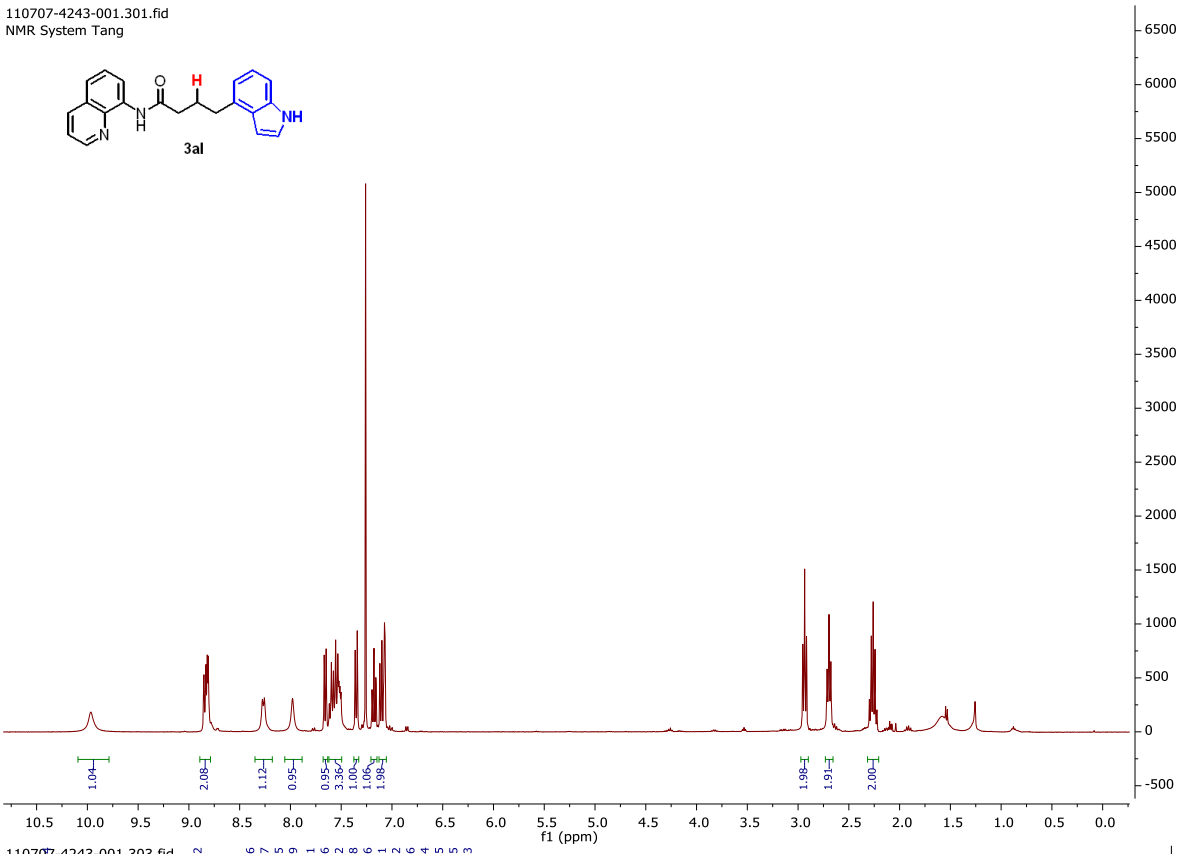

712344-0032-001.302.fid
NMR System Tang
156.15
154.95
148.20
138.46
136.45
134.68
128.07
127.63
127.58
127.06
125.60
124.68
124.10
122.98
122.67
121.69
121.51
120.77
118.62
116.59
111.84
37.59
29.38
25.75
3ai
f1 (ppm)

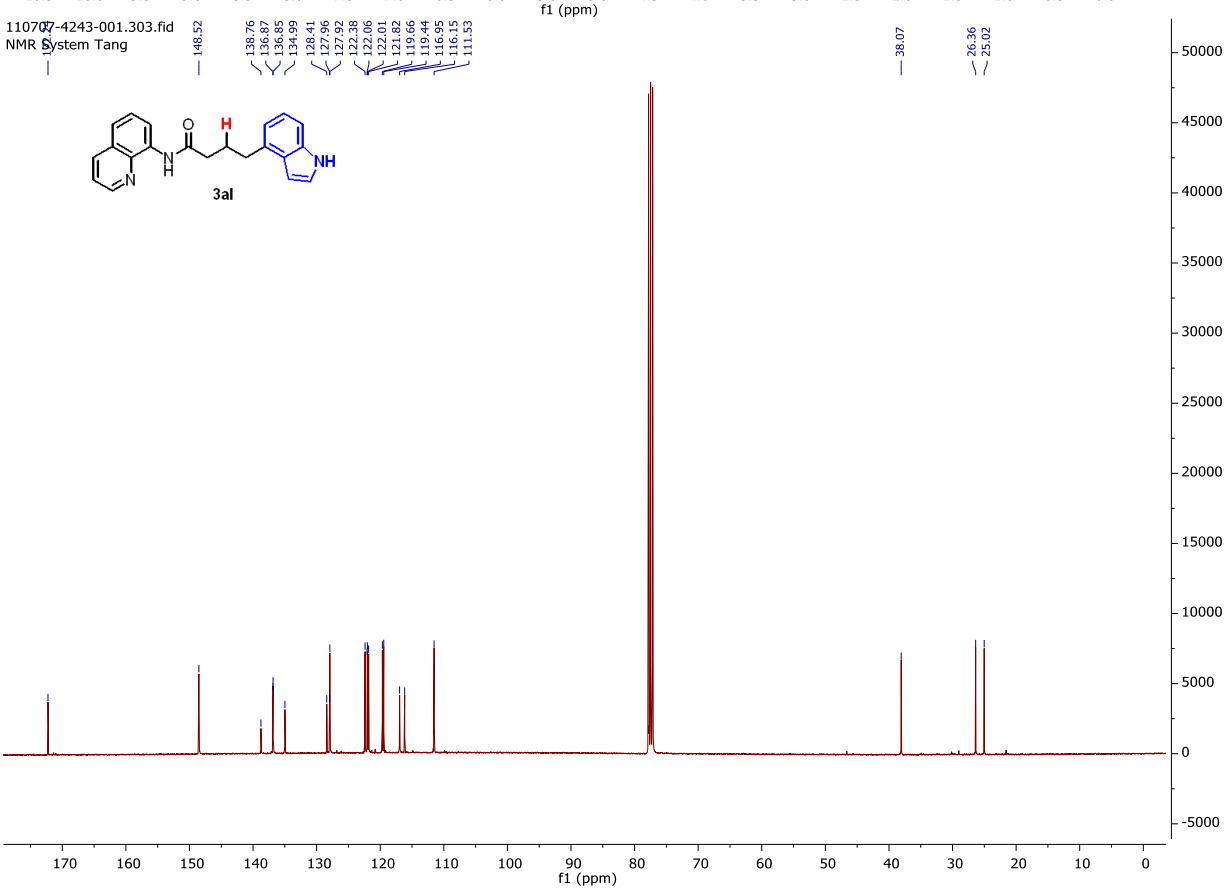

3aj, boc pyrrole.1.fid
3aj
1.00
2.21
1.11
2.24
1.13
0.86
0.88
0.89
1.77
1.99
1.88
9.34
f1 (ppm)


3aj, boc pyrrole2.fid
171.26
149.61
148.23
138.48
136.50
135.10
134.68
128.08
127.58
121.70
121.49
121.23
116.59
111.77
110.09
83.54
37.68
28.42
28.18
24.88
3aj
f1 (ppm)

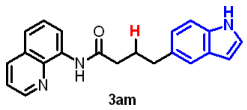

110707-4245-001.303.fid
NMR System Tang
3ak
0.97
2.01
1.01
3.08
0.91
0.92
3.06
1.98
1.95
1.92
f1 (ppm)


110707-4245-001.304.fid
NMR System Tang
3ak
148.30
139.06
138.35
136.68
134.41
128.13
127.59
121.83
121.78
119.25
116.70
114.57
108.00
103.97
36.87
32.44
26.09
24.09
f1 (ppm)

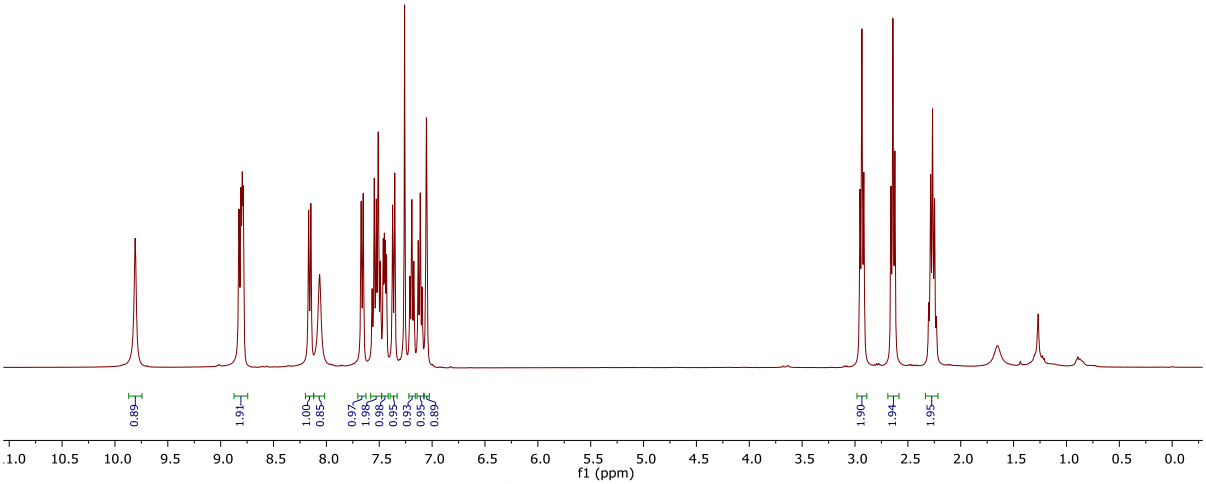

110707-4243-001.301.fid
NMR System Tang
3al
f1 (ppm)


110707-4243-001.303.fid
NMR System Tang
148.52
138.76
136.87
136.85
134.99
128.41
127.96
127.92
122.38
122.06
122.01
121.82
119.66
119.44
116.95
116.15
111.53
38.07
26.36
25.02
3al
f1 (ppm)

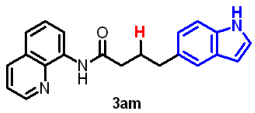
00712344-0032-1.301.fid
NMR System Tang



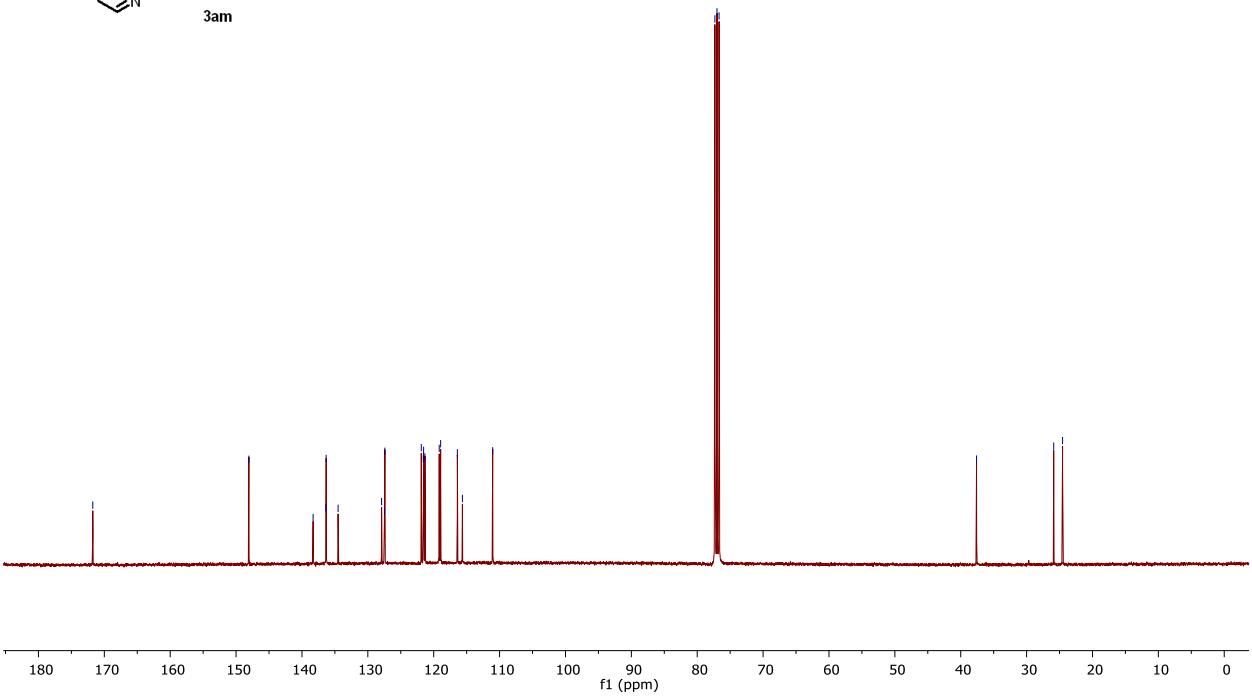

3am



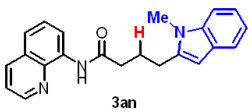

00712344-0032-1.302.fid
NMR System Tang


3am



110717-3333-002.401.fid
NMR System Puhi
110717-3333-002

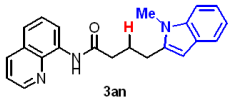



3an

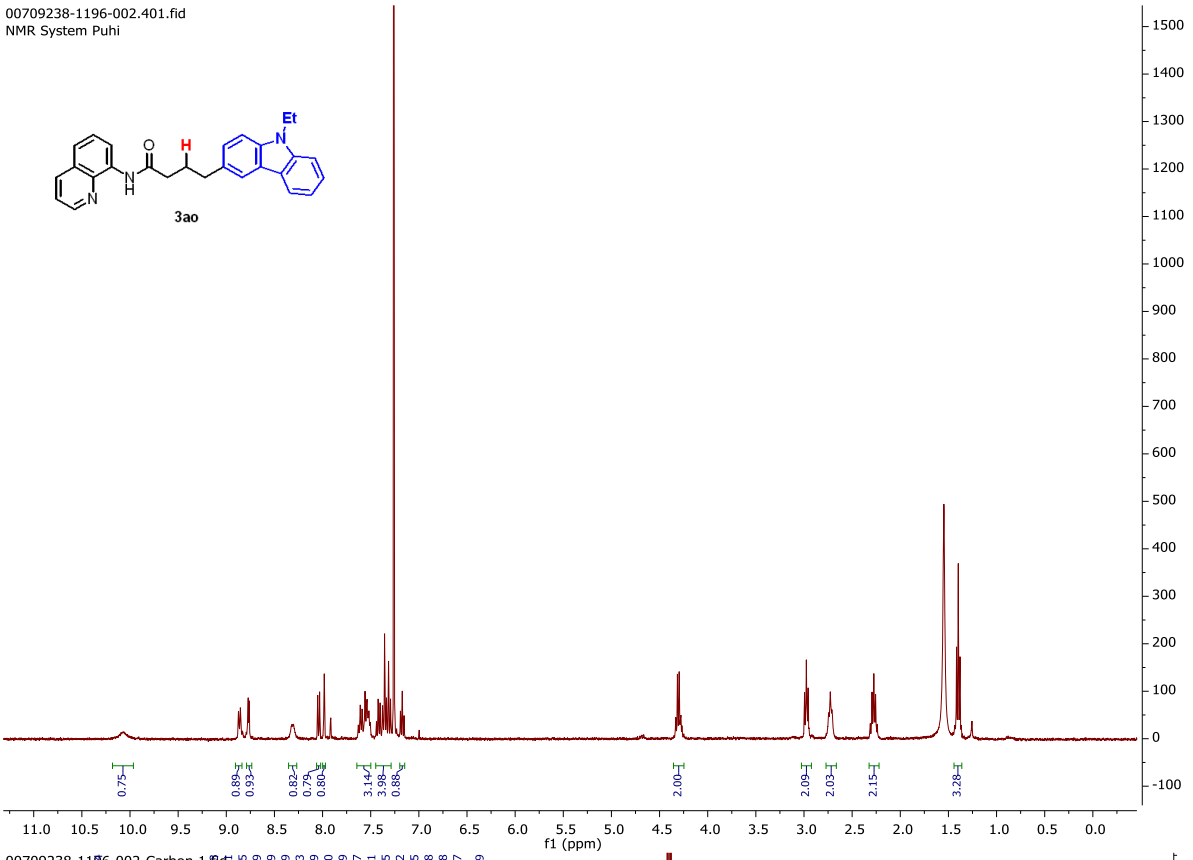


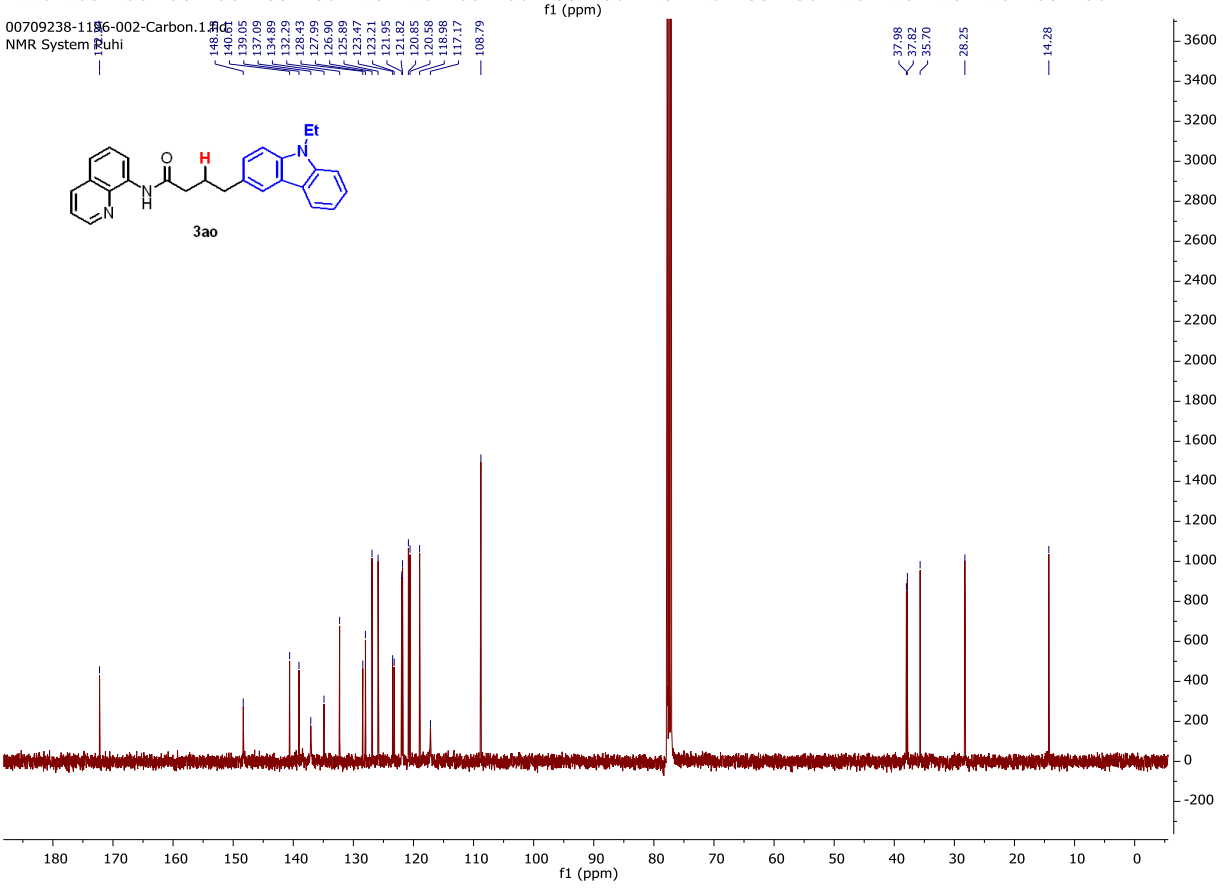

110717-3333-002.402.fid
NMR System Puhi
110717-3333-002

172.25
148.47
138.73
137.53
136.88
134.99
128.40
128.34
127.32
127.00
121.99
121.91
121.78
119.53
119.06
116.95
114.53
109.56
38.04
33.02
26.56
24.89

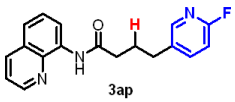



3an

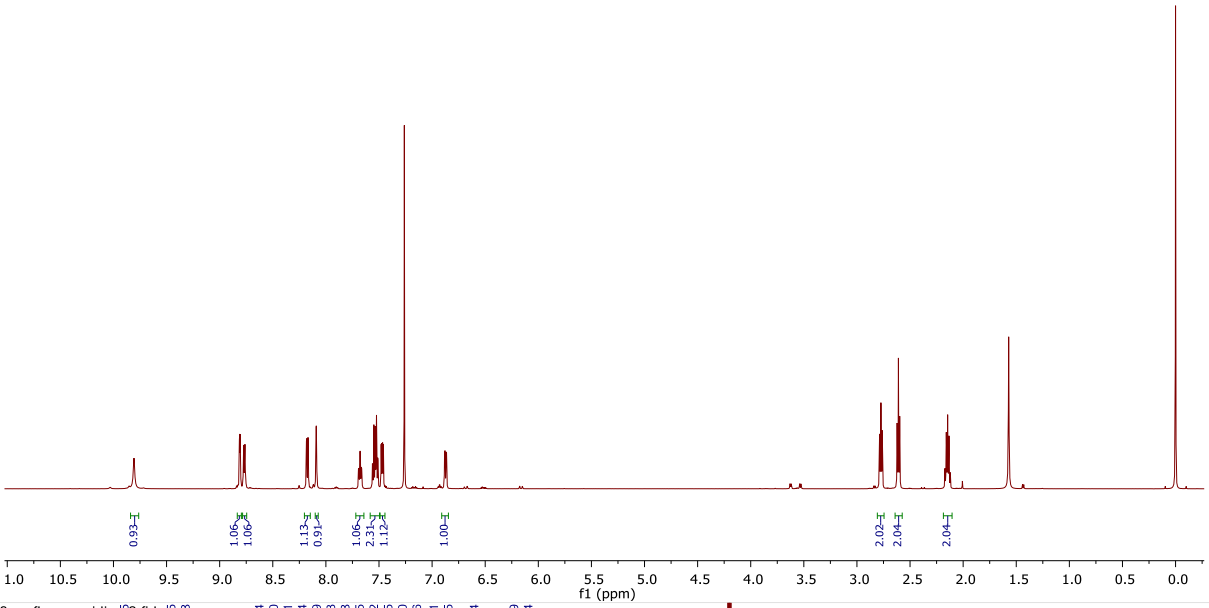

00709238-1196-002.401.fid
NMR System Puhi
Et
N
O
H
N
H
N
3ao
0.75
0.89
0.93
0.82
0.79
0.80
3.14
3.98
0.88
2.00
2.09
2.03
2.15
3.28
f1 (ppm)


00709238-1196-002-Carbon.1.fid
NMR System Puhi
148.36
140.61
139.05
137.09
134.89
132.29
128.43
127.99
126.90
125.89
123.47
123.21
121.95
121.82
120.85
120.58
118.98
117.17
108.79
37.98
37.82
35.70
28.25
14.28
Et
N
O
H
N
H
N
3ao
f1 (ppm)

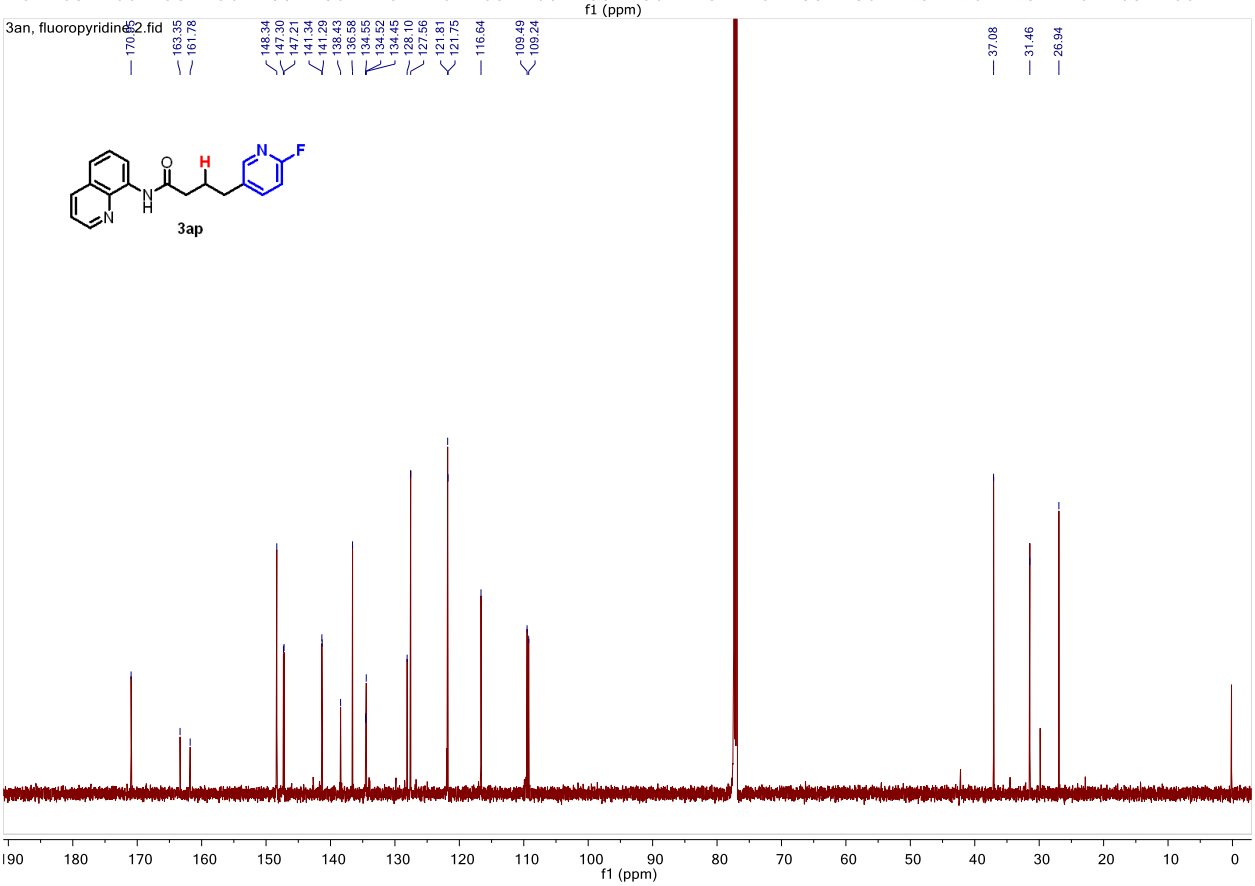
3ap.1.fid



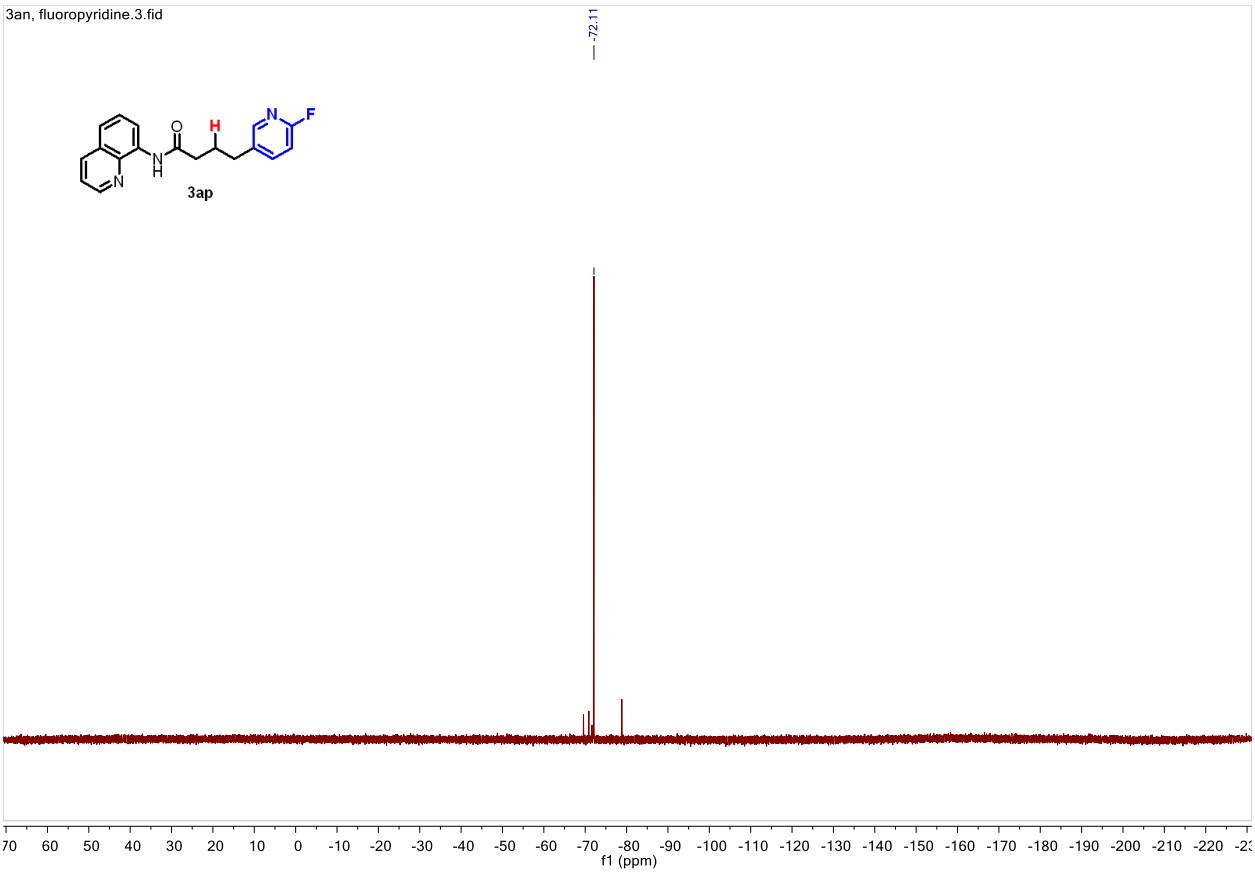

3ap

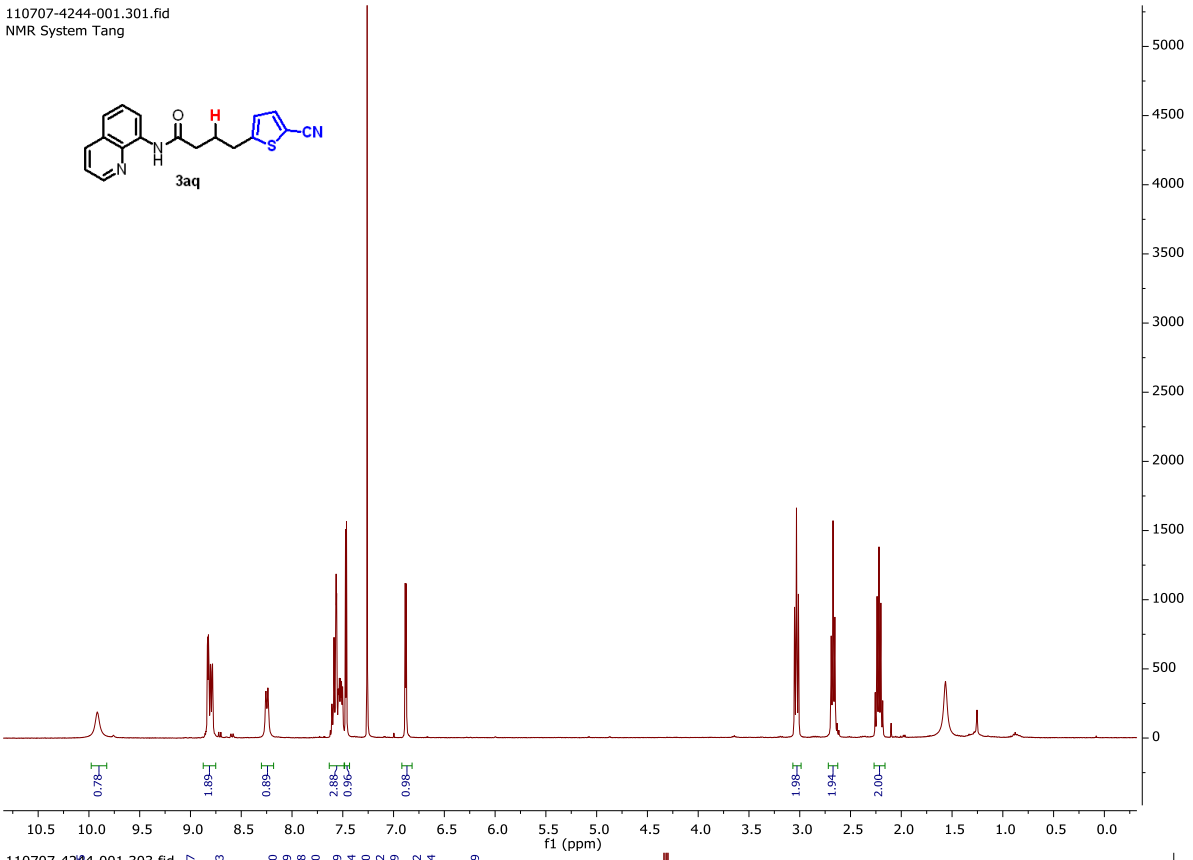


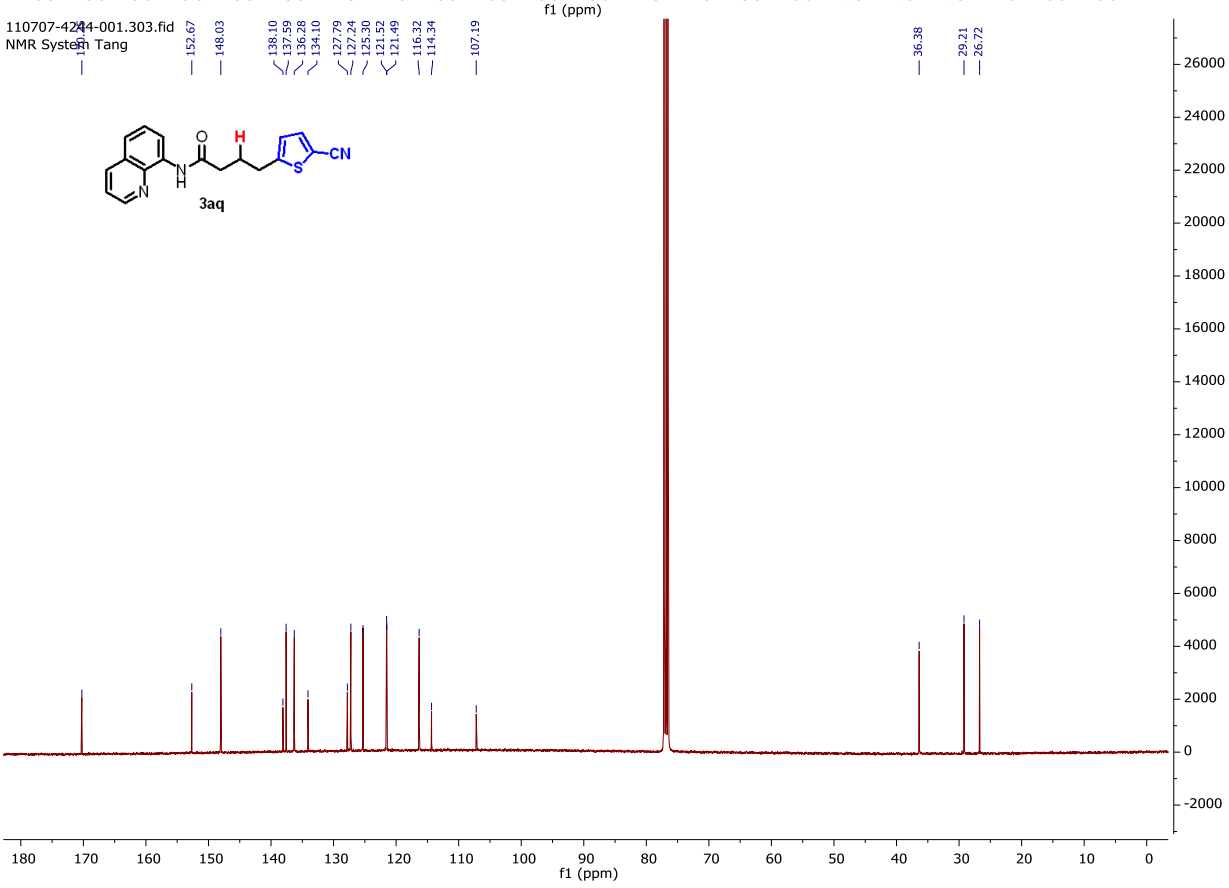

3an, fluoropyridine2.fid

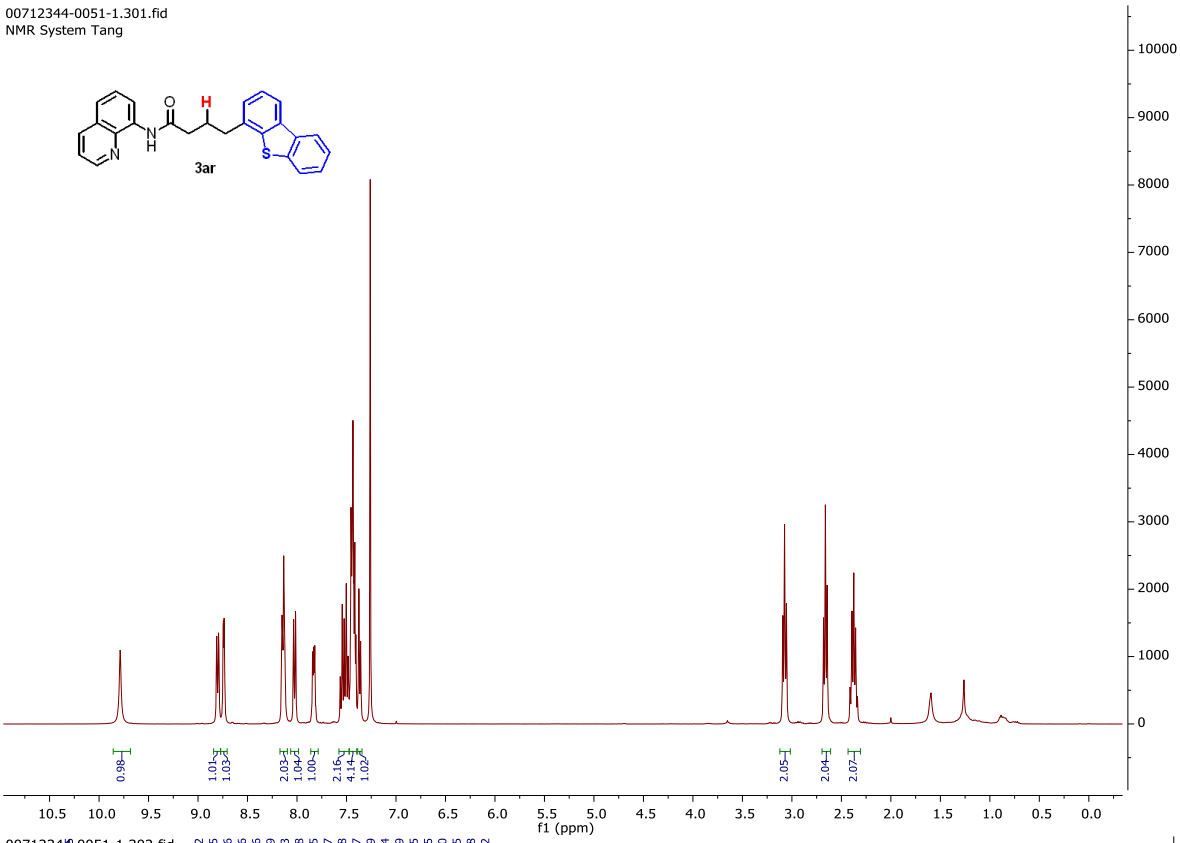


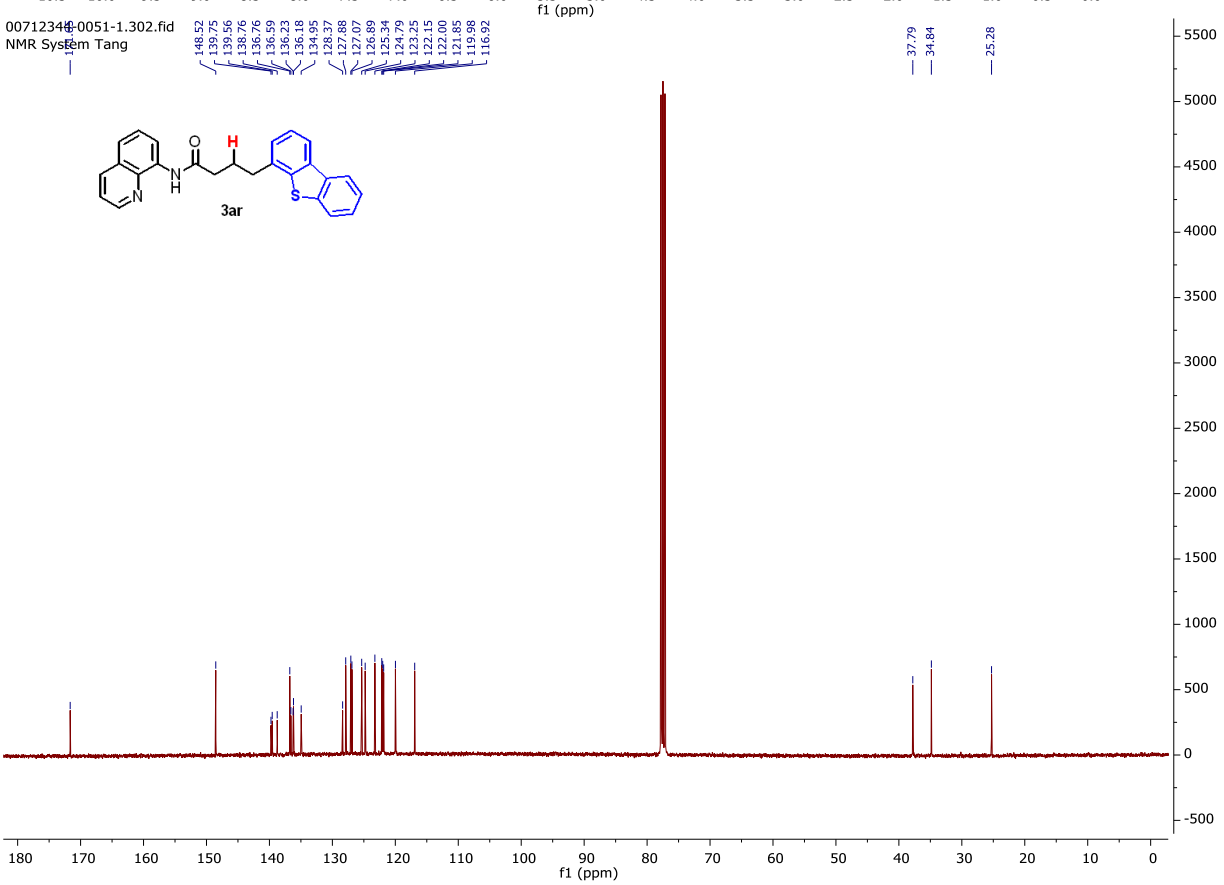

3ap


3an, fluoropyridine.3.fid
-72.11
3ap
70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220
f1 (ppm)

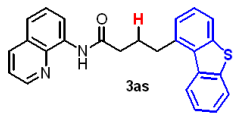

110707-4244-001.301.fid
NMR System Tang
3aq
0.78
1.89
0.89
2.88
0.96
0.98
1.98
1.94
2.00
f1 (ppm)


110707-4244-001.303.fid
NMR System Tang
170.14
152.67
148.03
138.10
137.59
136.28
134.10
127.79
127.24
125.30
121.52
121.49
116.32
114.34
107.19
36.38
29.21
26.72
3aq
f1 (ppm)


00712344-0051-1.301.fid
NMR System Tang
3ar
f1 (ppm)


00712344-0051-1.302.fid
NMR System Tang
3ar
f1 (ppm)

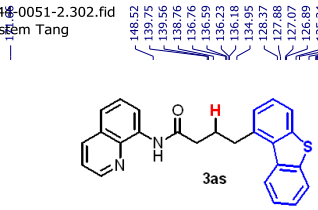
00712344-0051-2.301.fid
NMR System Tang




3as

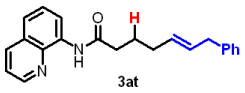



00712344-0051-2.302.fid
NMR System Tang

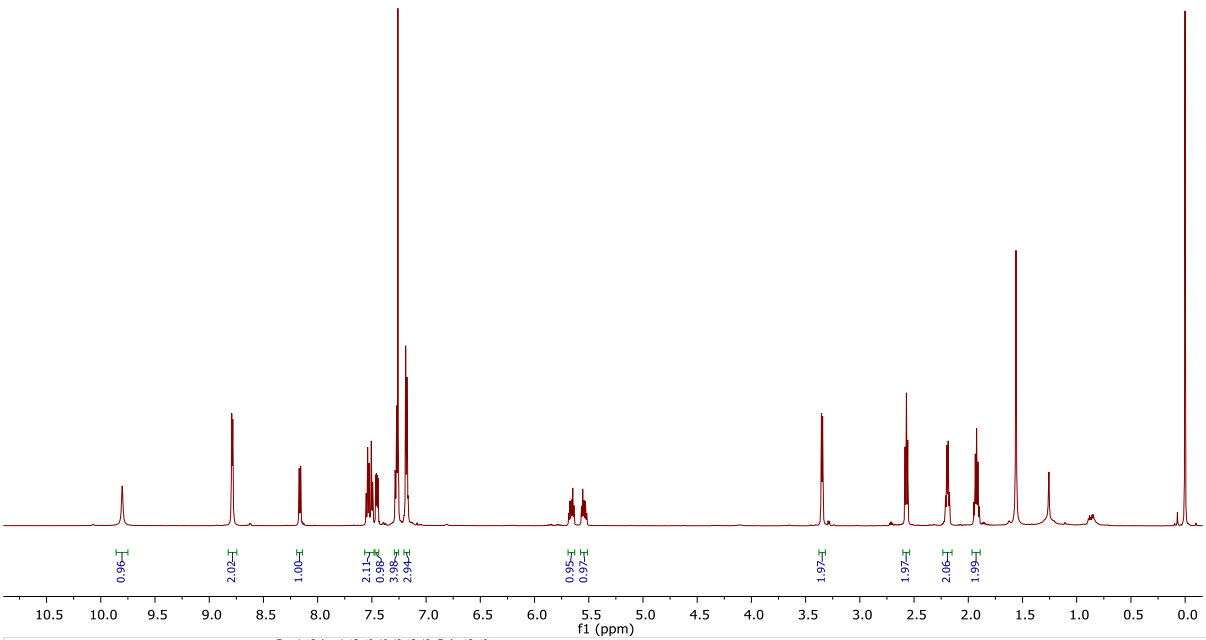



3as

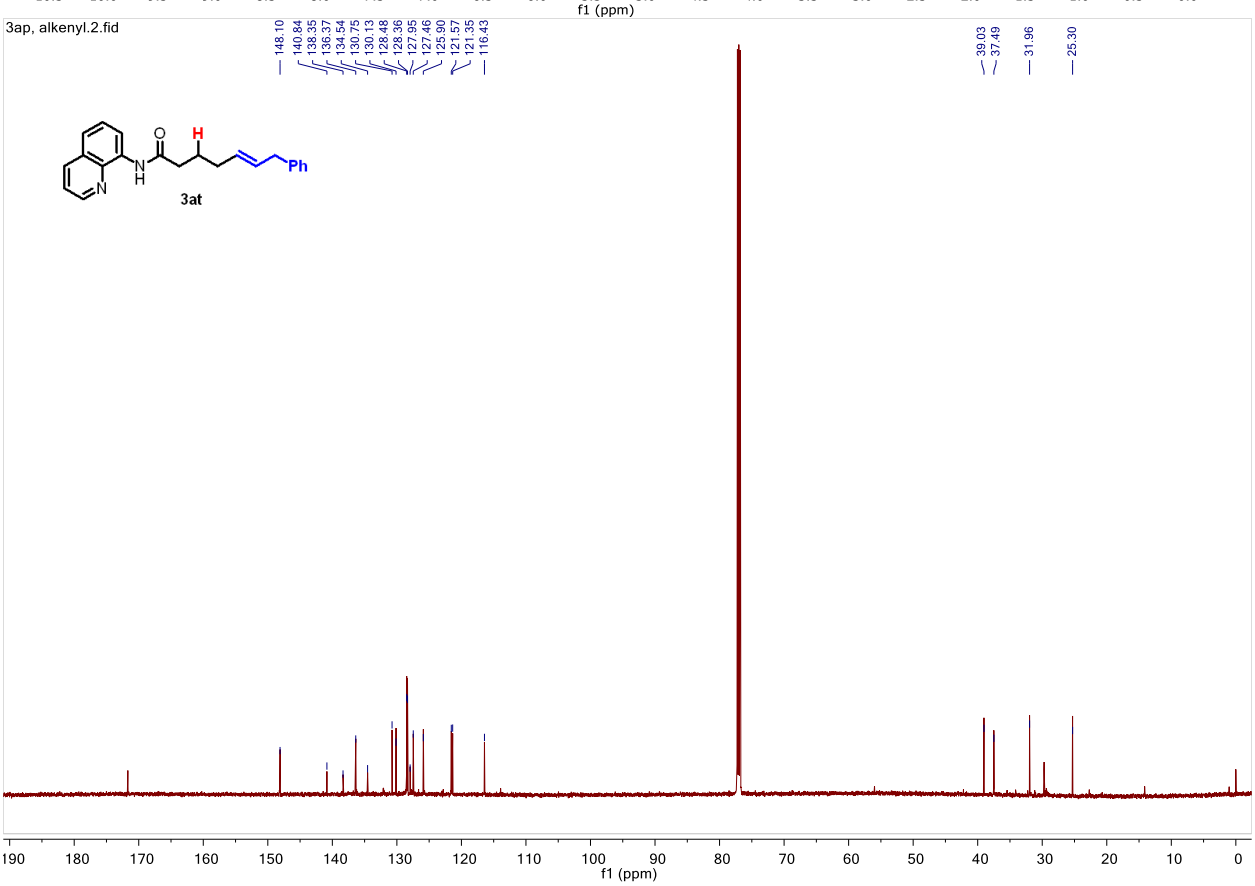
RM-243a-20.1.fid



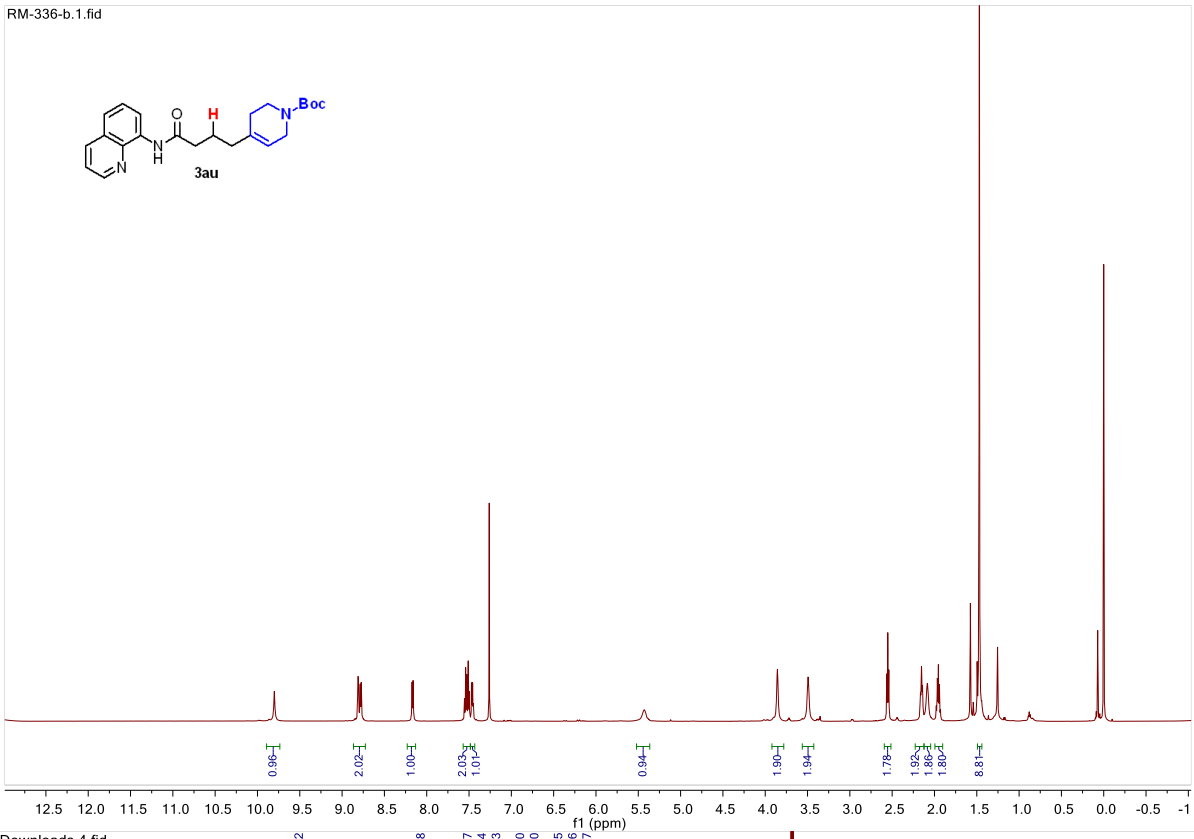

3at

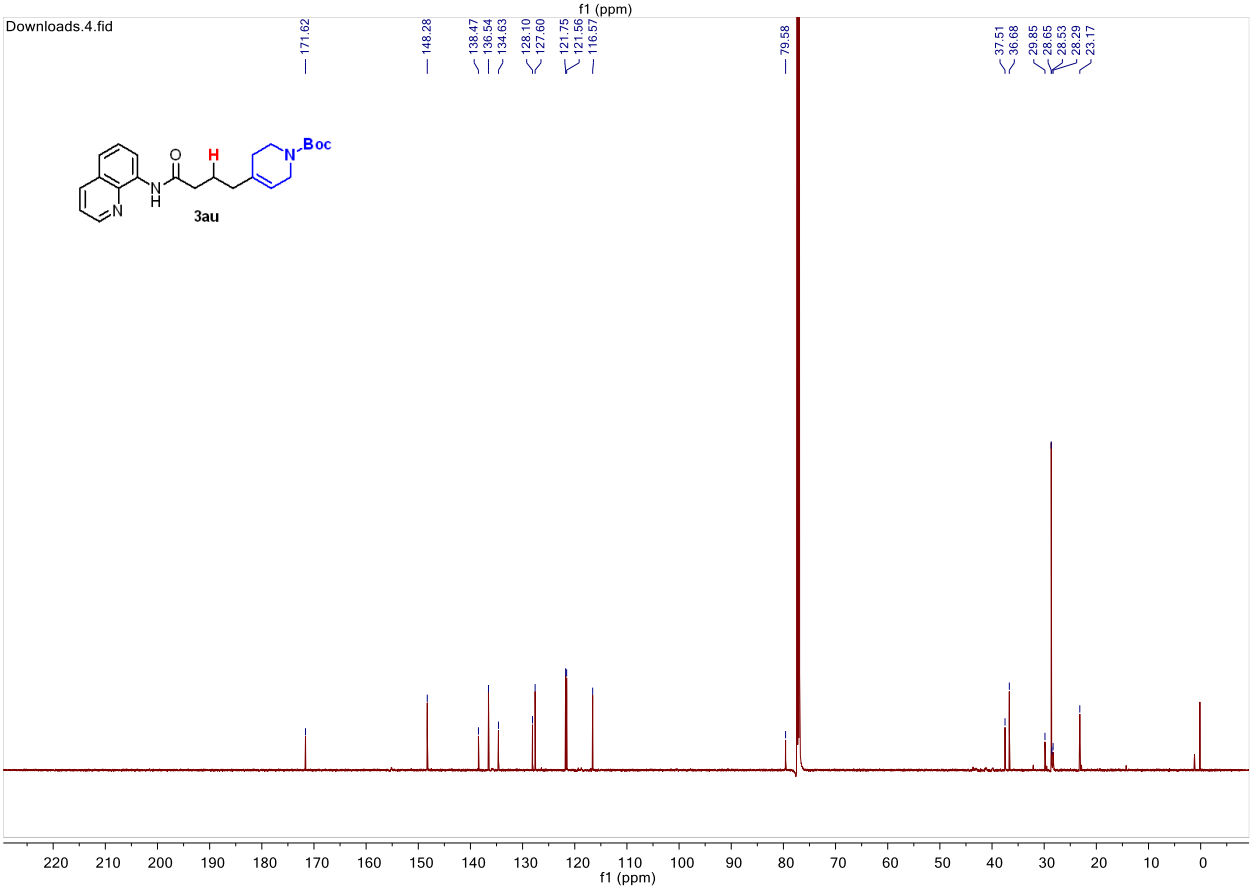


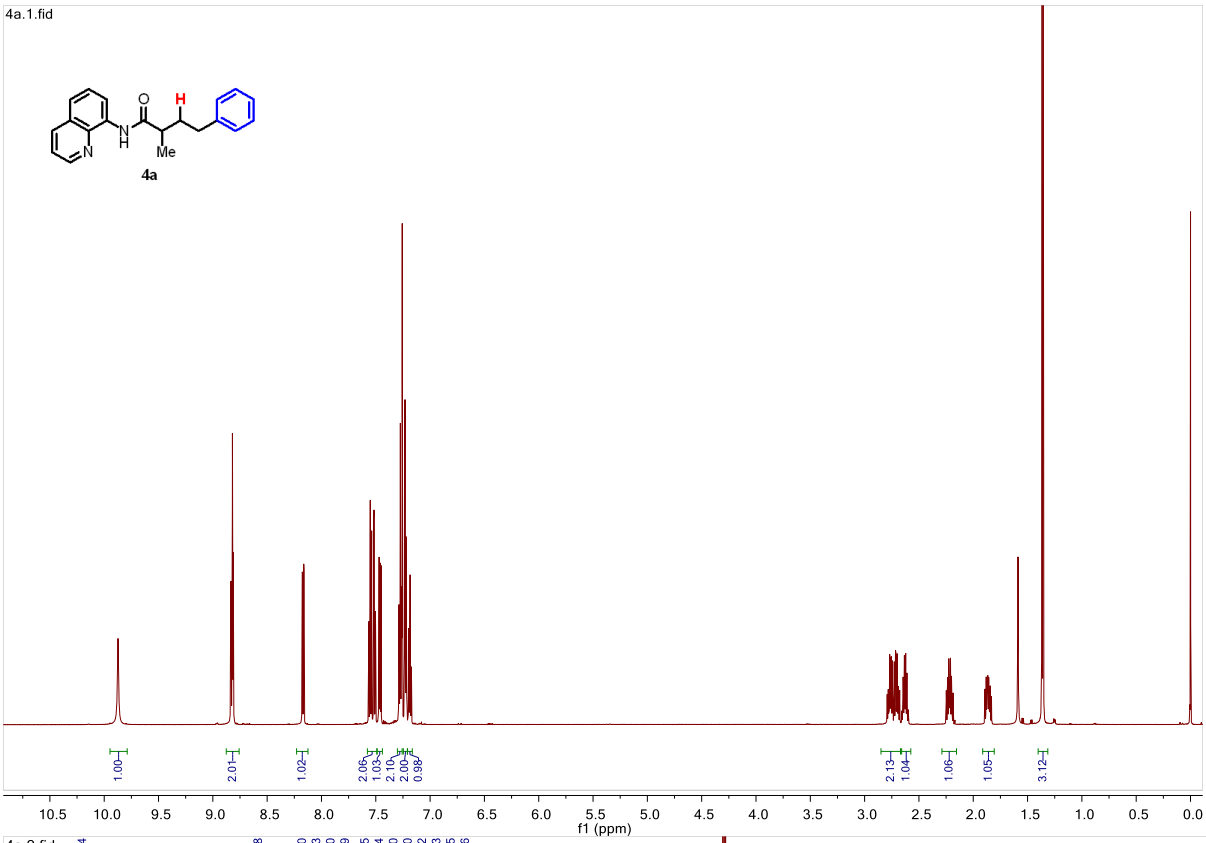

3ap, alkenyl.2.fid

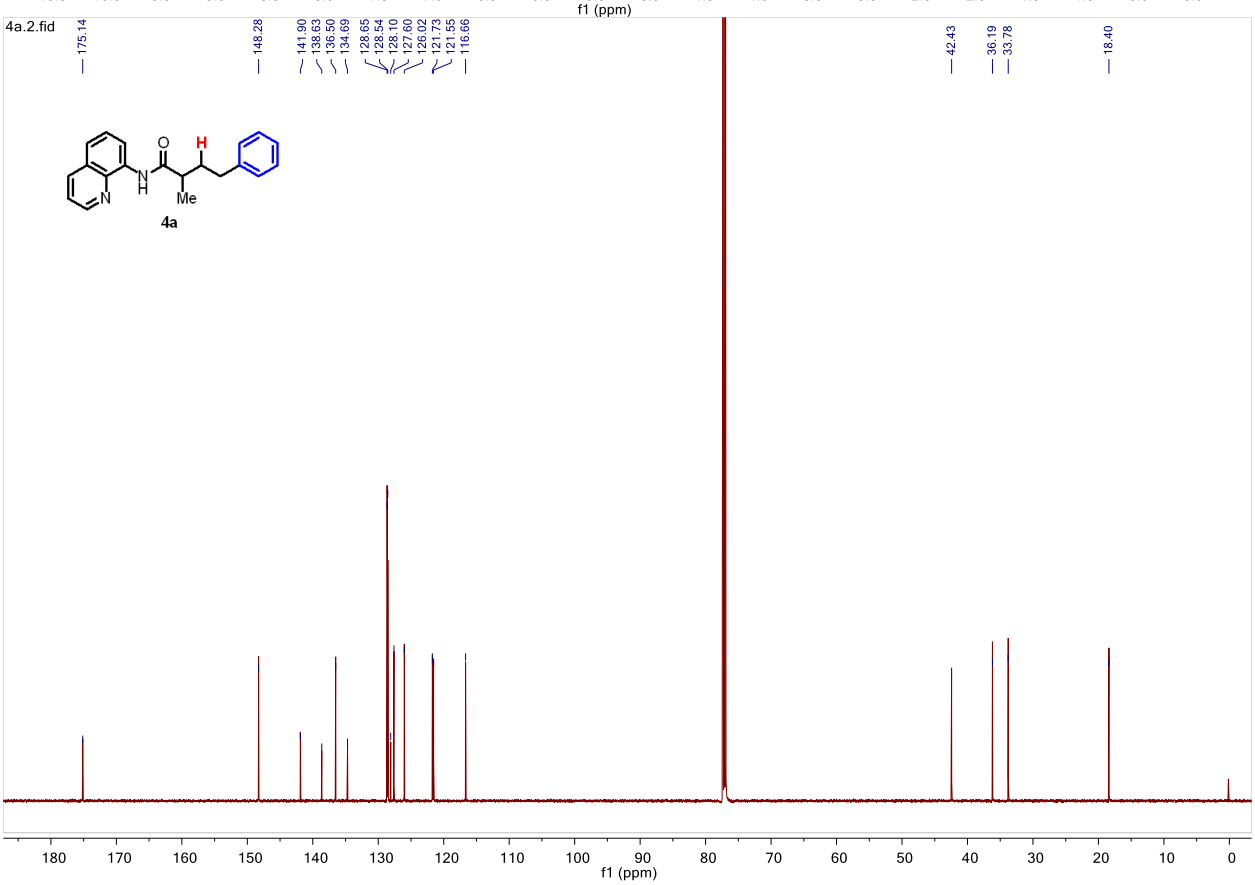


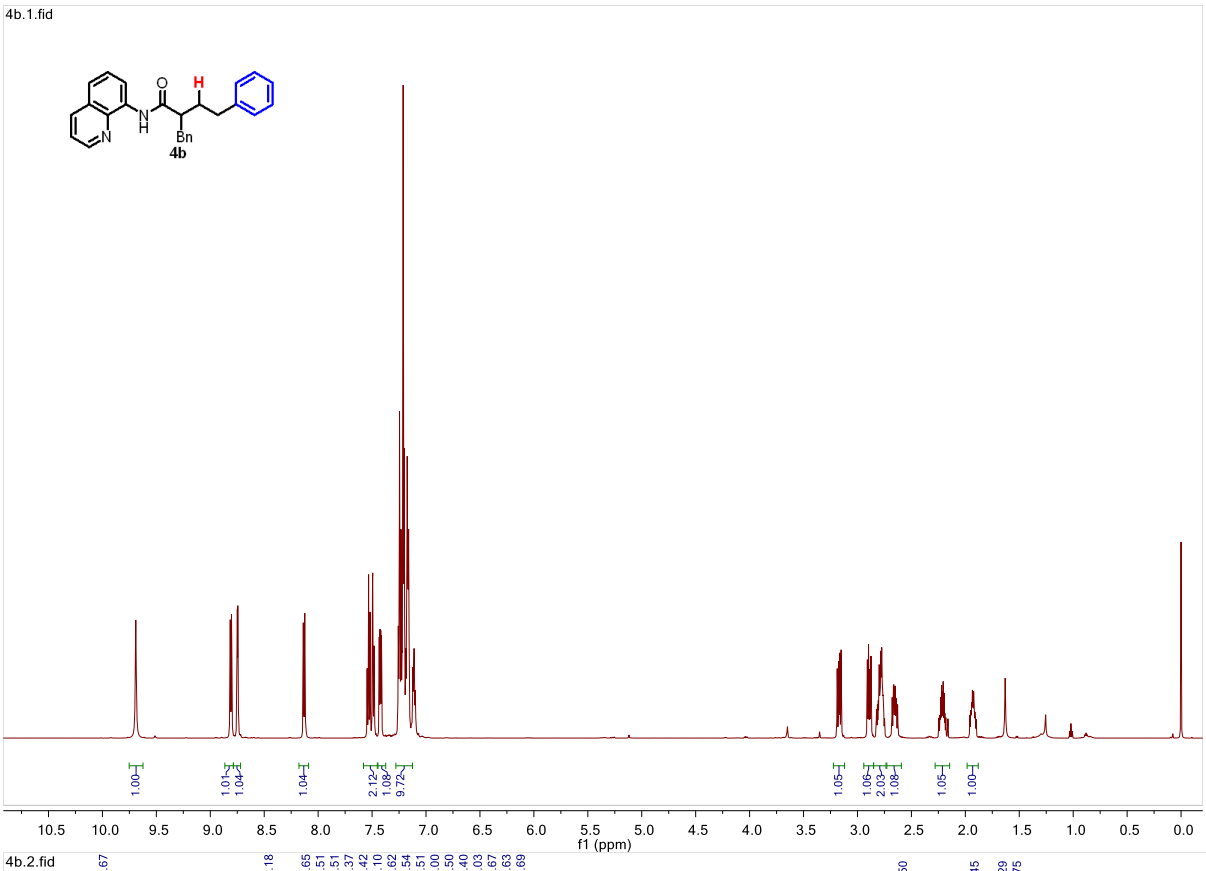

3at

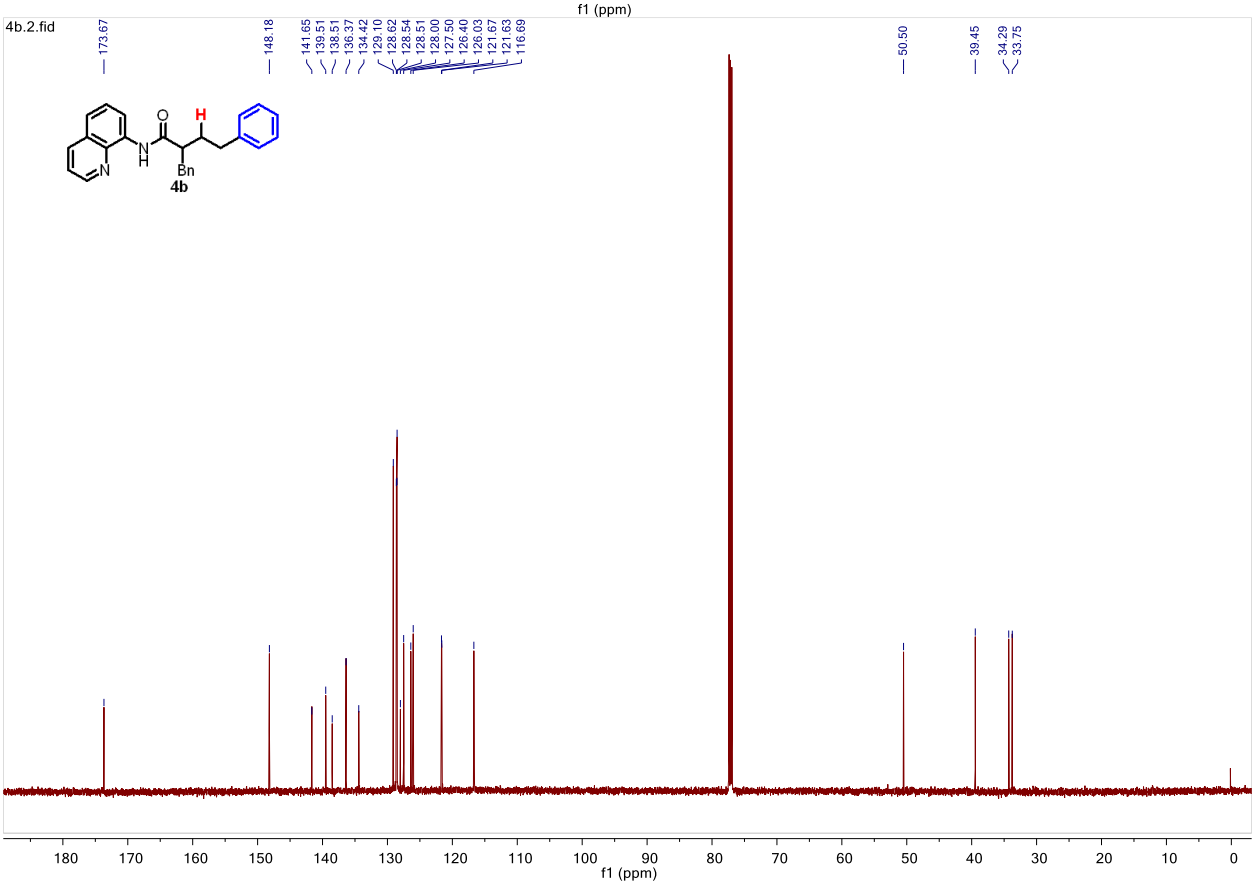

RM-336-b.1.fid
Boc
H
O
N
H
N
3au
0.96
2.02
1.00
2.03
1.01
0.94
1.90
1.94
1.78
1.92
1.88
1.80
8.81
12.5 12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1
f1 (ppm)

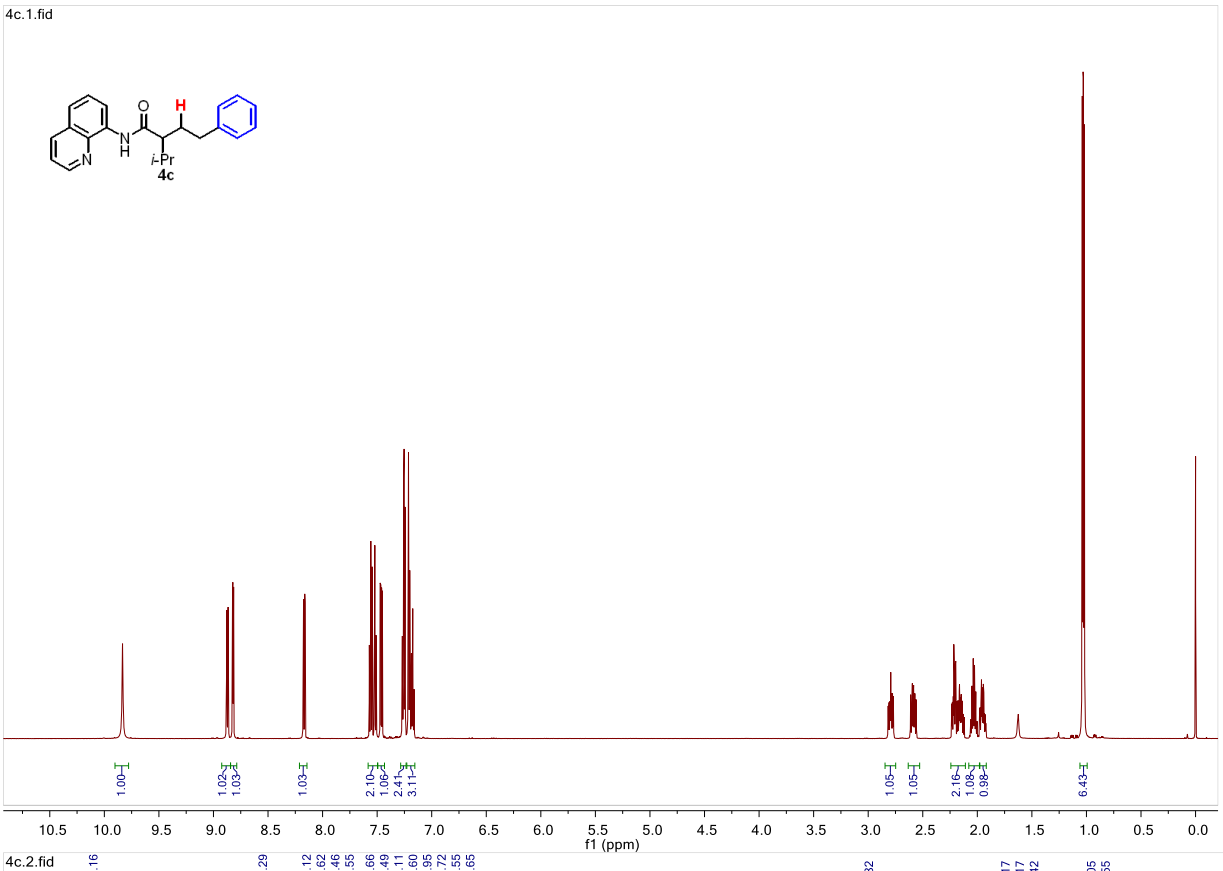

Downloads.4.fid
171.62
148.28
138.47
136.54
134.63
128.10
127.60
121.75
121.56
116.57
79.58
37.51
36.68
29.85
28.65
28.53
28.29
23.17
Boc
H
O
N
H
N
3au
220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

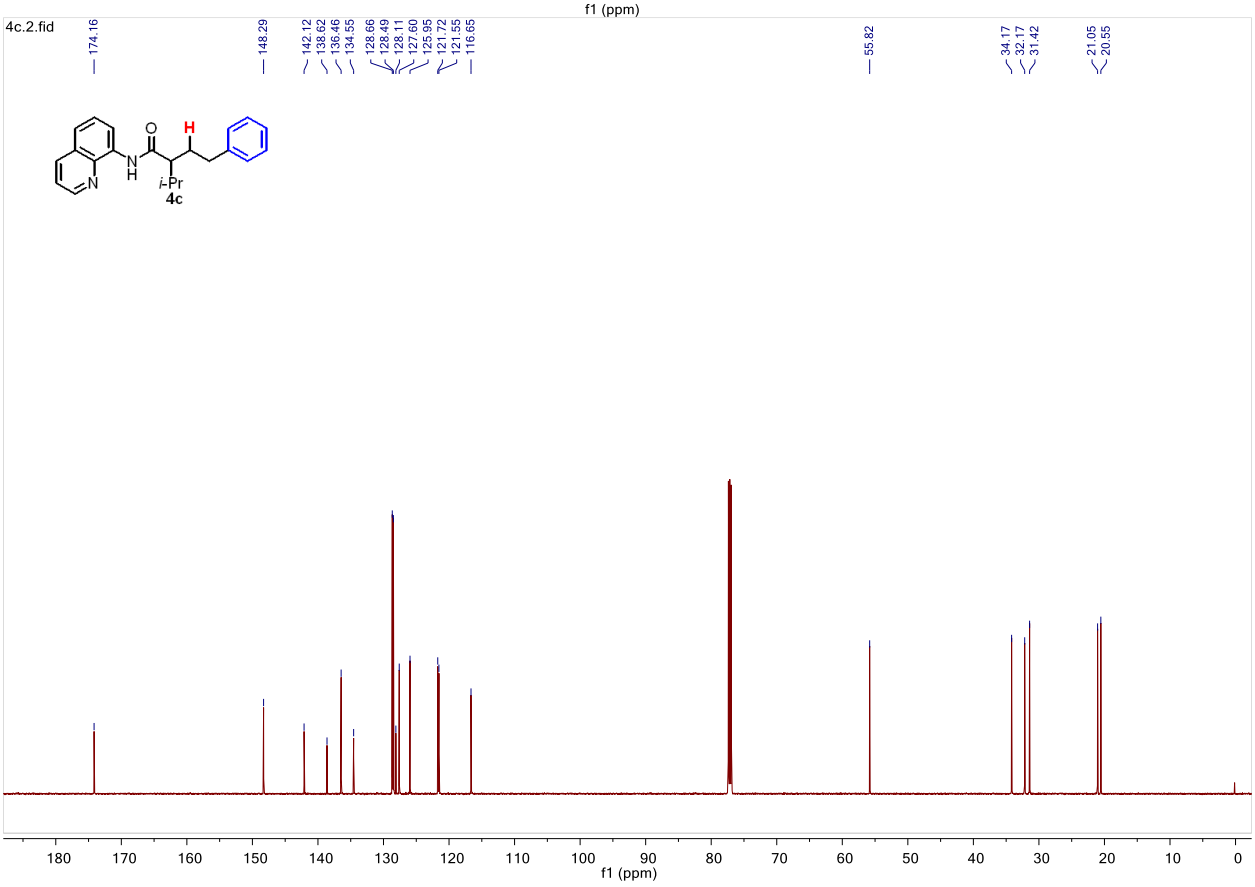

4a.1.fid
O
H
N
N
H
Me
4a
1.00
2.01
1.02
2.06
1.03
2.10
2.06
0.98
2.13
1.04
1.06
1.05
3.12
10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

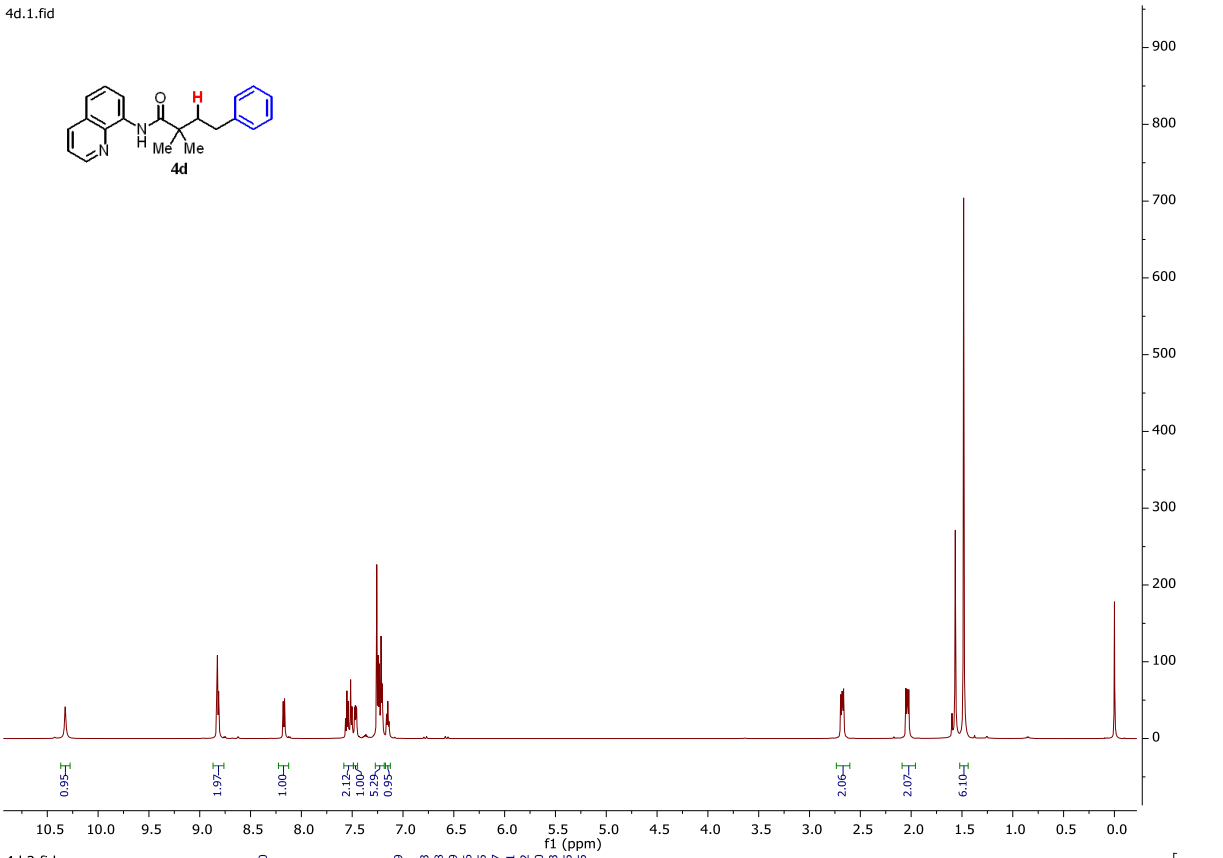

4a.2.fid
175.14
148.28
141.90
138.63
136.50
134.69
128.65
128.54
128.10
127.60
126.02
121.73
121.55
116.66
42.43
36.19
33.78
18.40
O
H
N
N
H
Me
4a
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

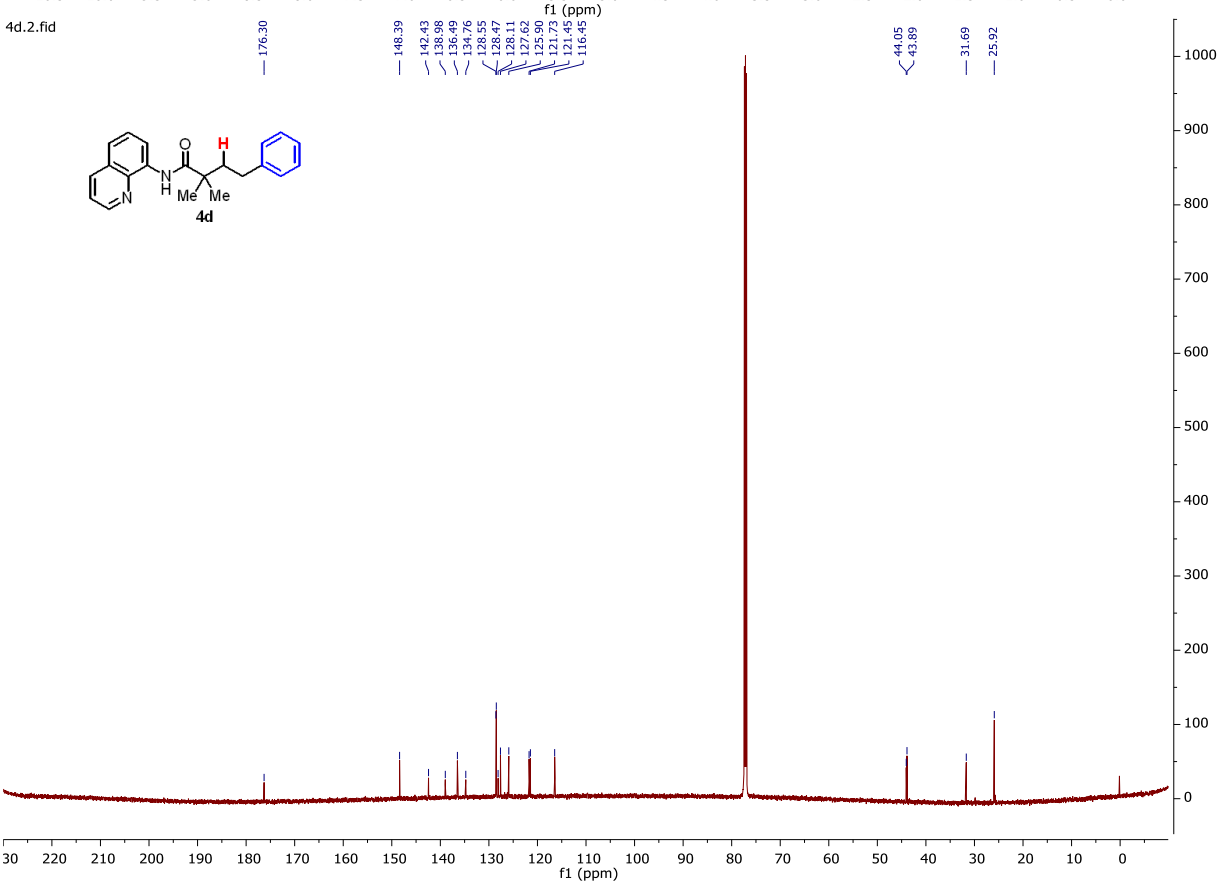

4b.1.fid
4b
1.00
1.01
1.04
1.04
2.12
1.08
9.72
1.05
1.06
2.03
1.08
1.05
1.00
f1 (ppm)

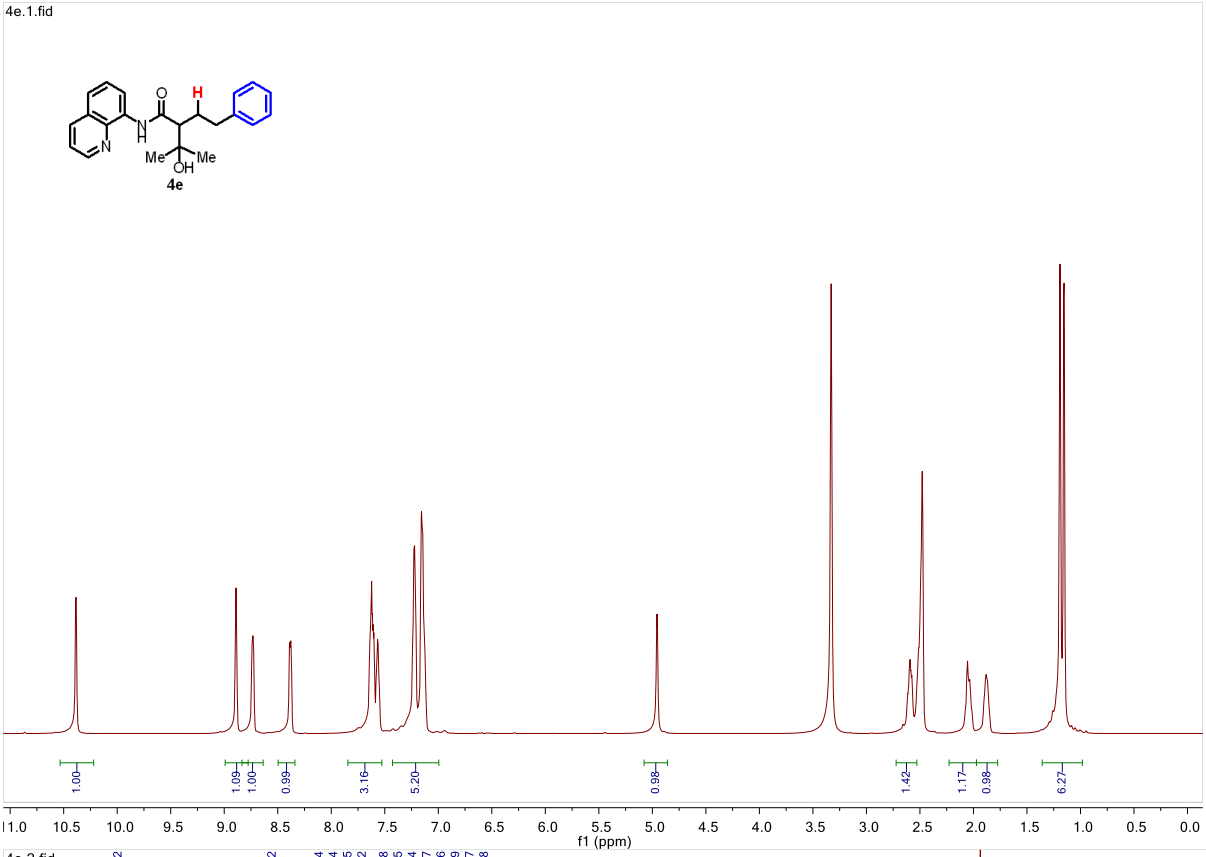

4b.2.fid
173.67
148.18
141.65
139.51
138.51
136.37
134.42
129.10
128.62
128.54
128.51
128.00
127.50
126.40
126.03
121.67
121.63
116.69
50.50
39.45
34.29
33.75
4b
f1 (ppm)

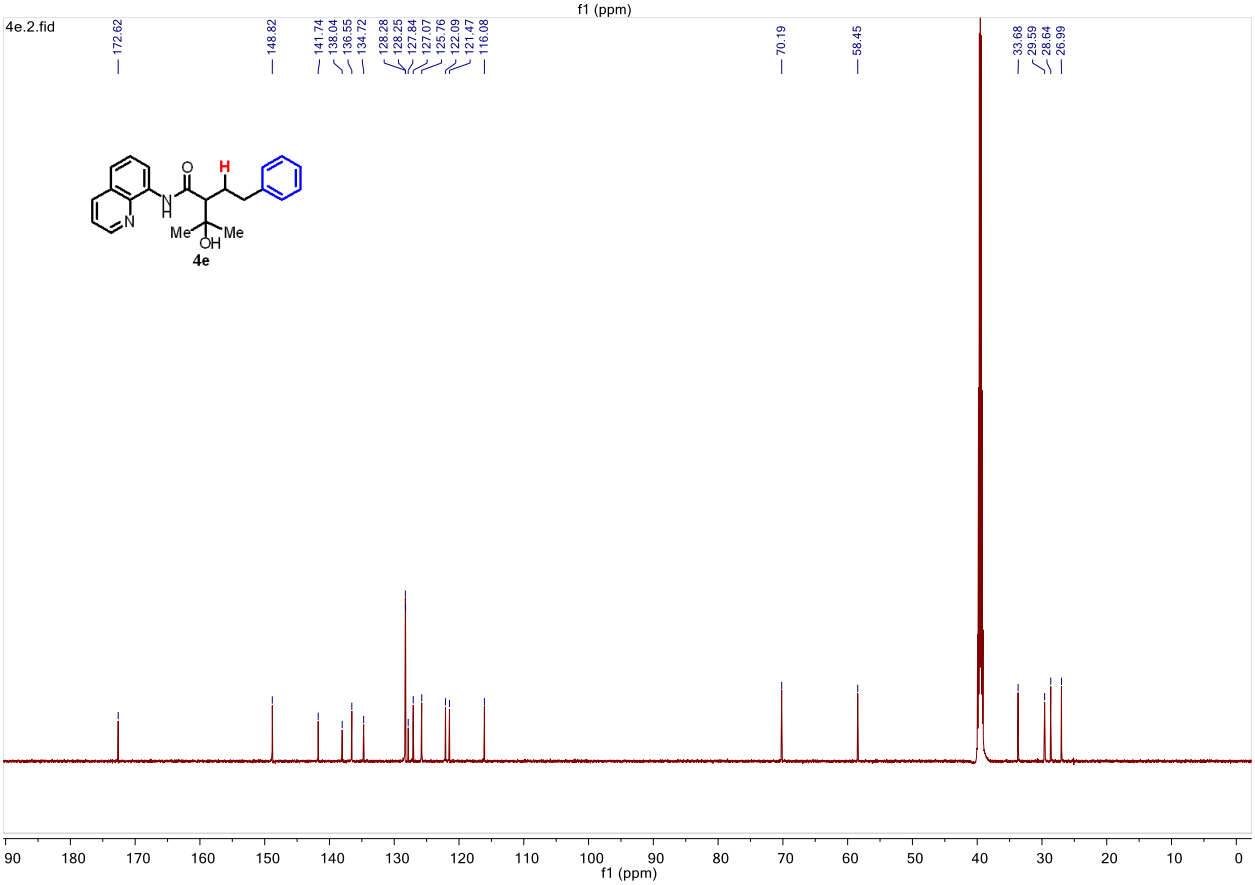

4c.1.fid
i-Pr
4c
1.00
1.02
1.03
1.03
2.10
1.06
2.41
3.11
1.05
1.05
2.16
1.08
0.98
6.43
f1 (ppm)

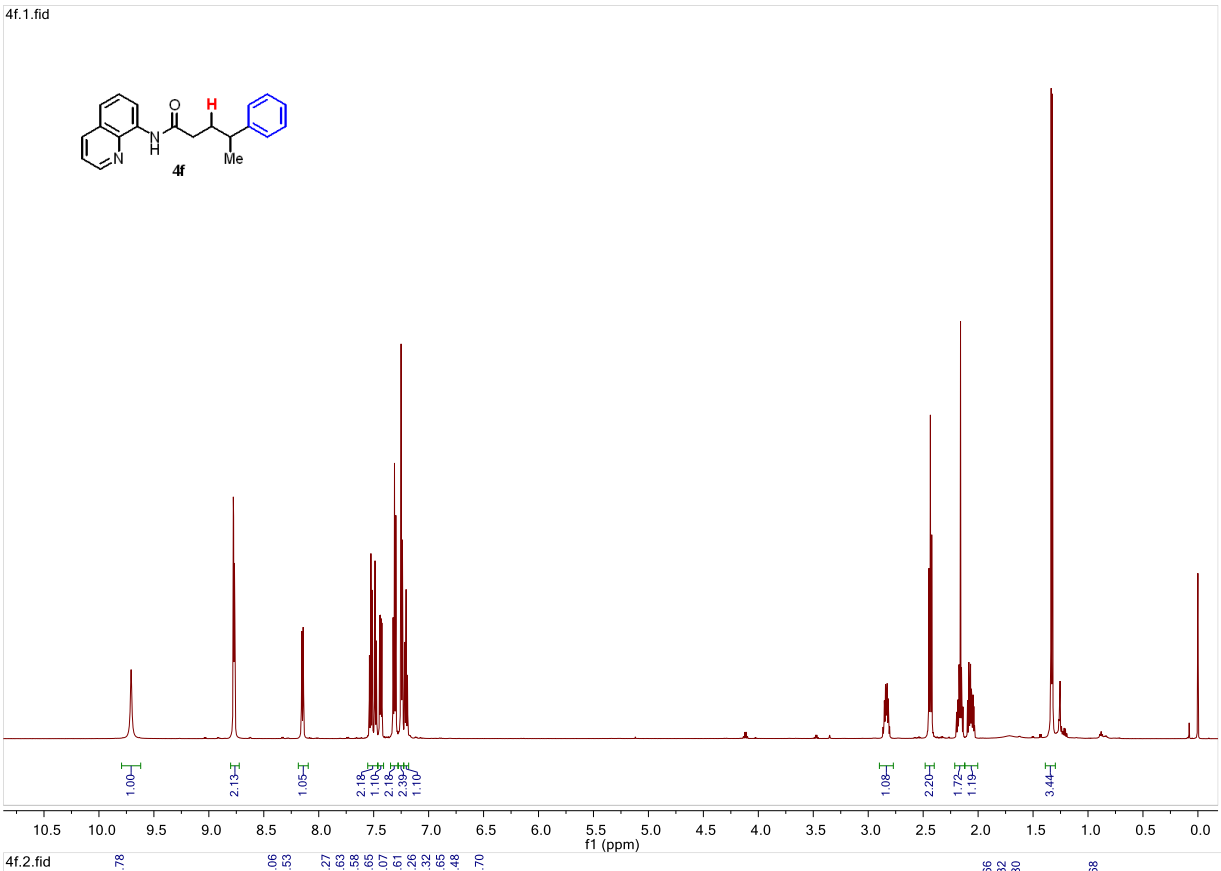

4c.2.fid
174.16
148.29
142.12
138.62
136.46
134.55
128.66
128.49
128.11
123.60
125.55
121.72
121.55
116.65
55.82
34.17
32.17
31.42
21.05
20.55
i-Pr
4c
f1 (ppm)

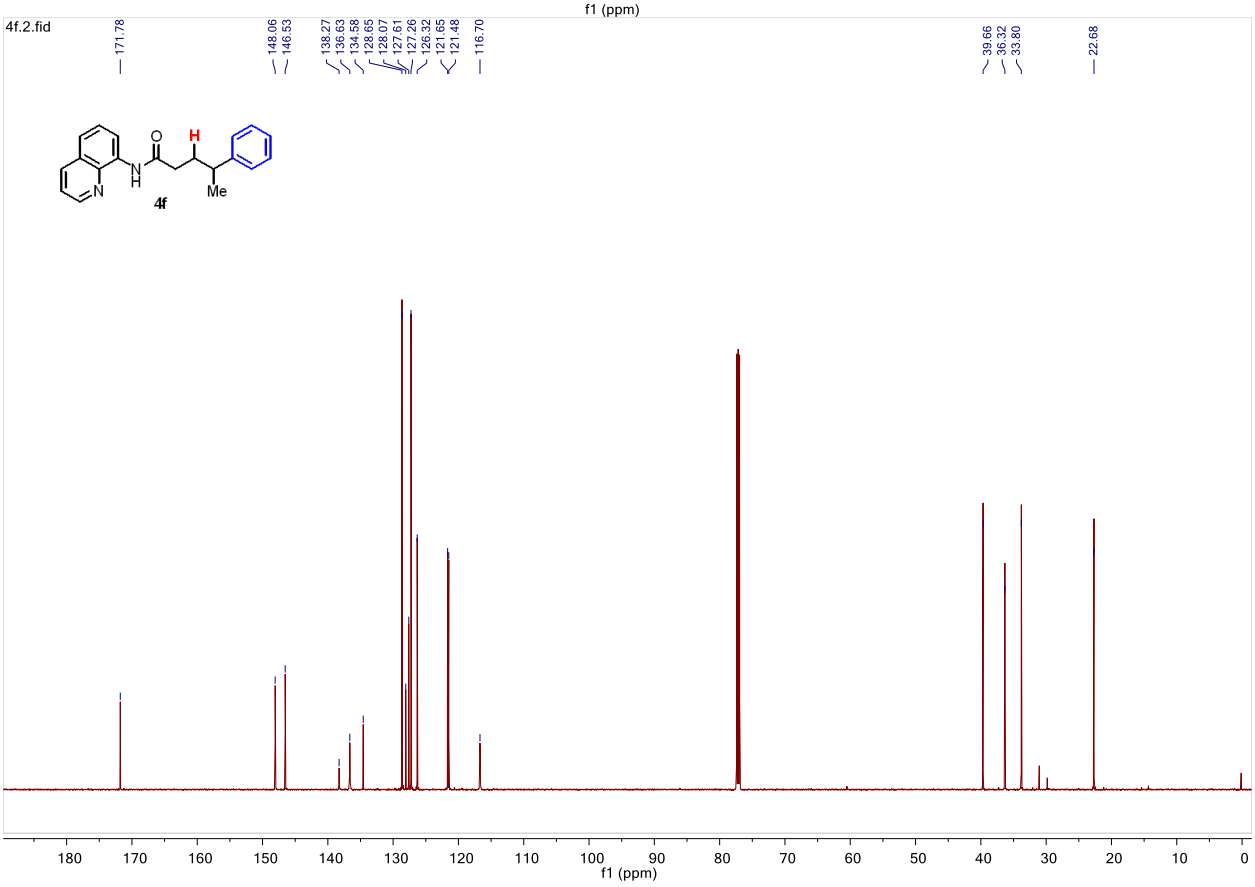

4d.1.fid
4d
0.95
1.97
1.00
2.12
1.00
5.29
0.95
2.06
2.07
6.10
f1 (ppm)


4d.2.fid
176.30
148.39
142.43
138.98
136.49
134.76
128.55
128.47
128.11
127.62
125.90
121.73
121.45
116.45
44.05
43.89
31.69
25.92
4d
f1 (ppm)


4e.1.fid
4e
1.00
1.09
1.00
0.99
3.16
5.20
0.98
1.42
1.17
0.98
6.27
f1 (ppm)


4e.2.fid
172.62
148.82
141.74
138.04
136.55
134.72
128.28
128.25
127.84
127.07
125.76
122.09
121.47
116.08
70.19
58.45
33.68
29.59
28.64
26.99
4e
f1 (ppm)


4f.1.fid
4f
1.00
2.13
1.05
2.18
1.10
2.18
2.39
1.10
1.08
2.20
1.72
1.19
3.44
f1 (ppm)


4f.2.fid
171.78
148.06
146.53
138.27
136.63
134.58
128.65
128.07
127.61
127.26
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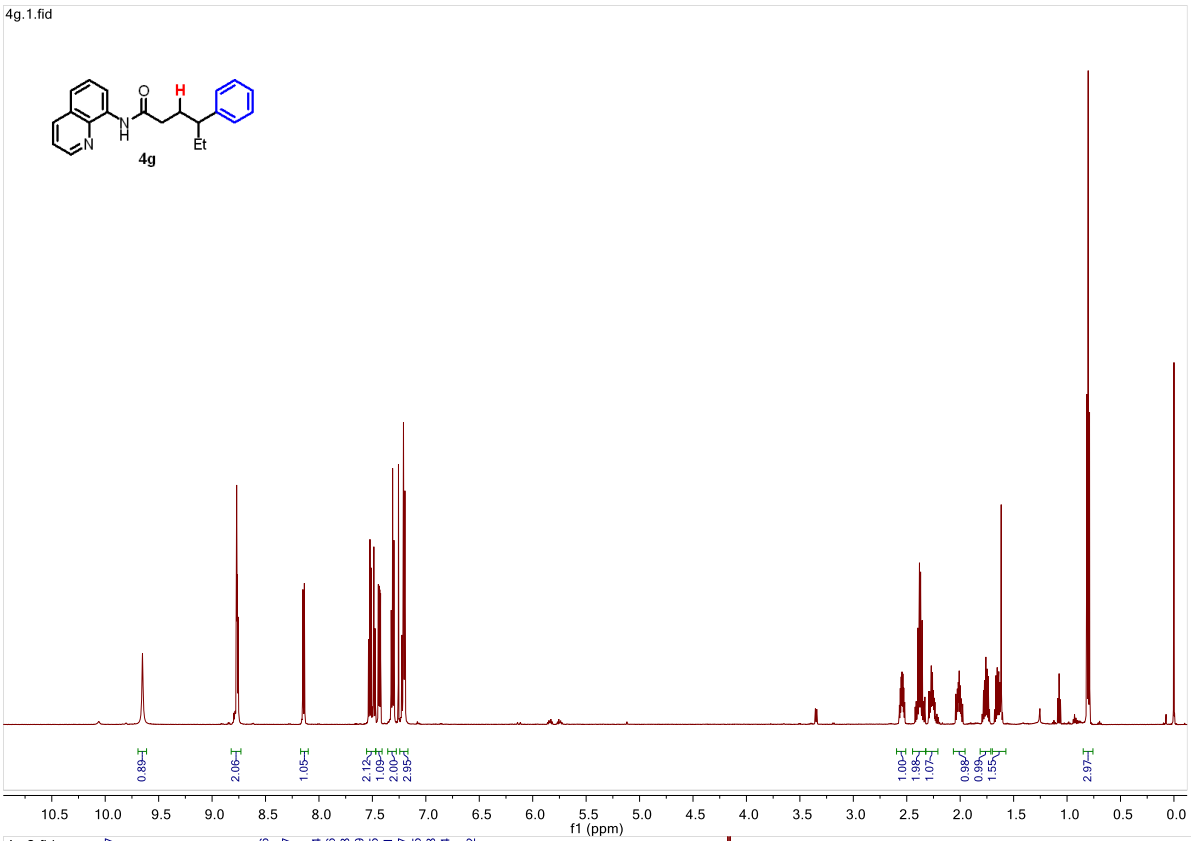
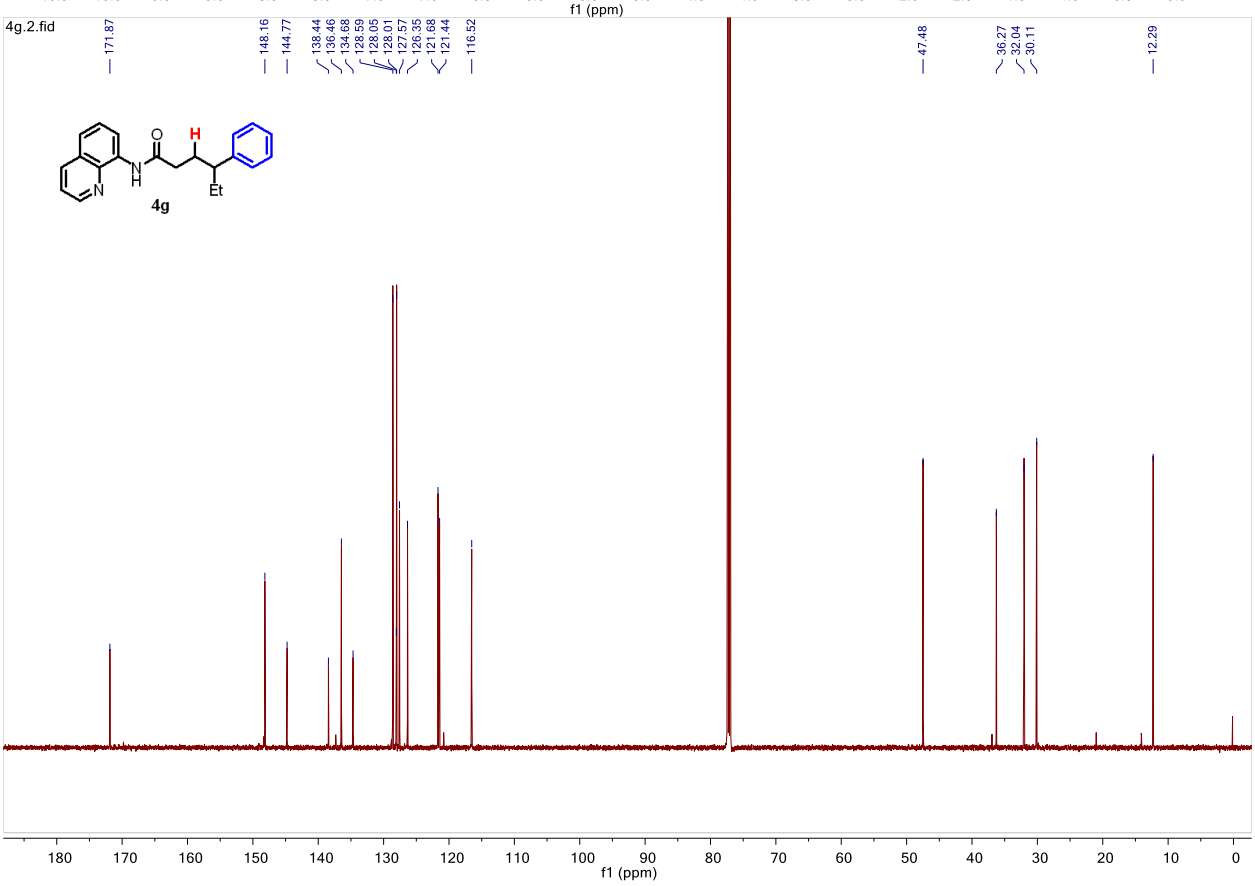
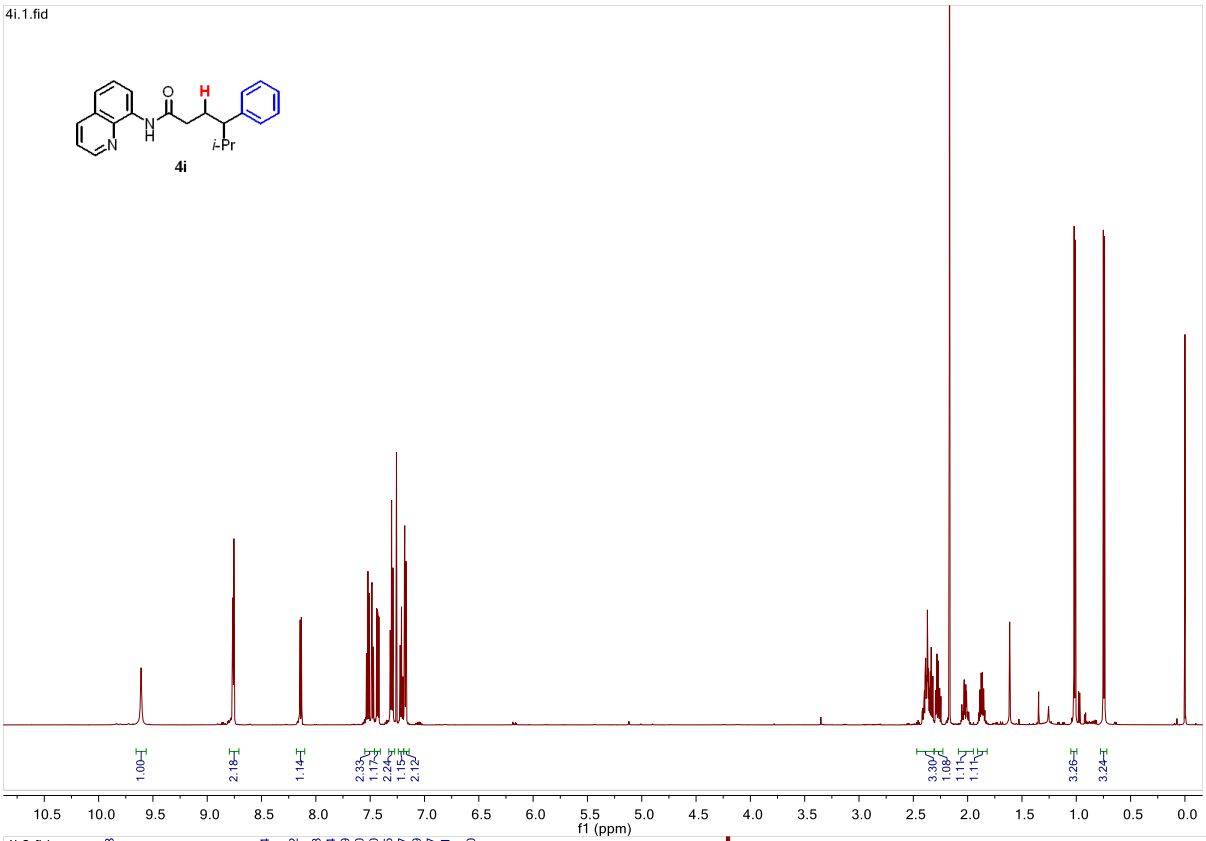
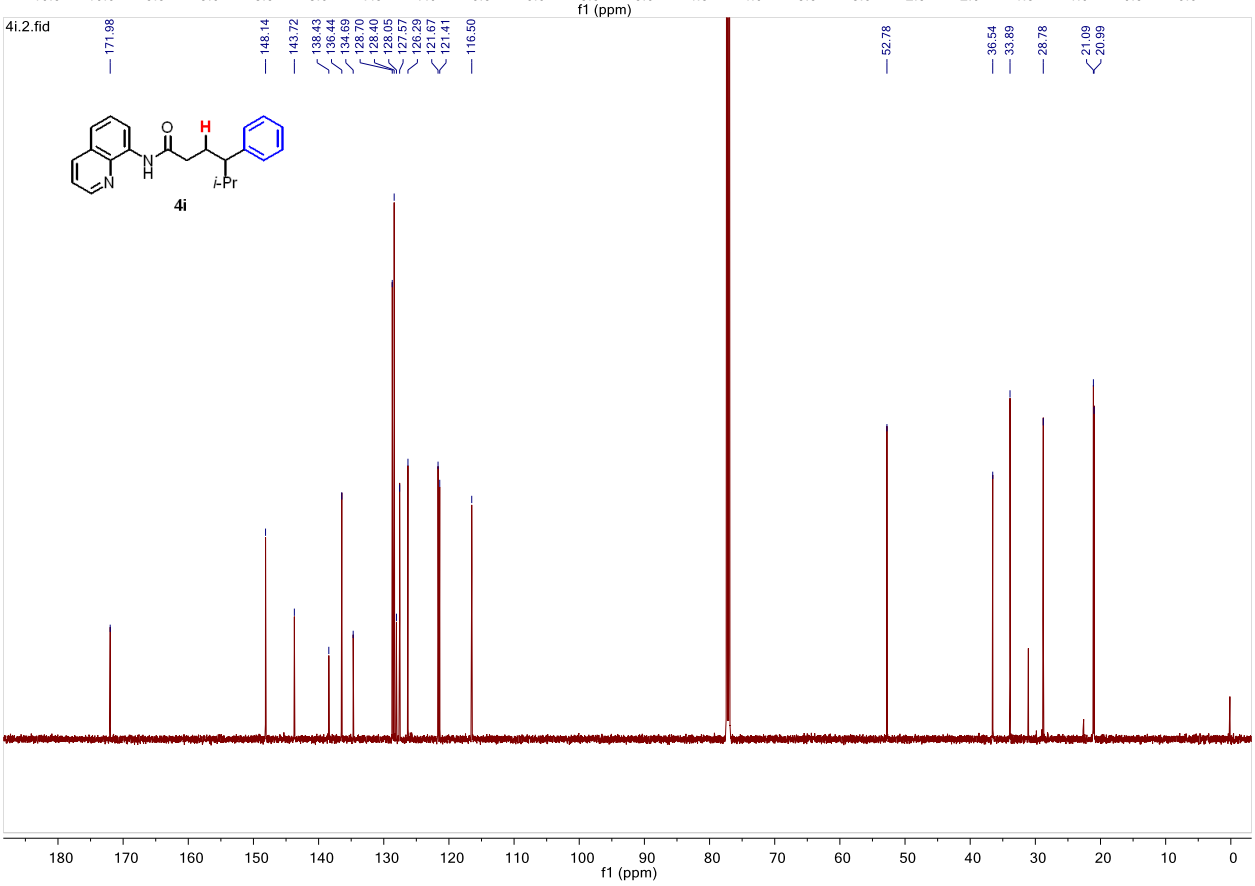
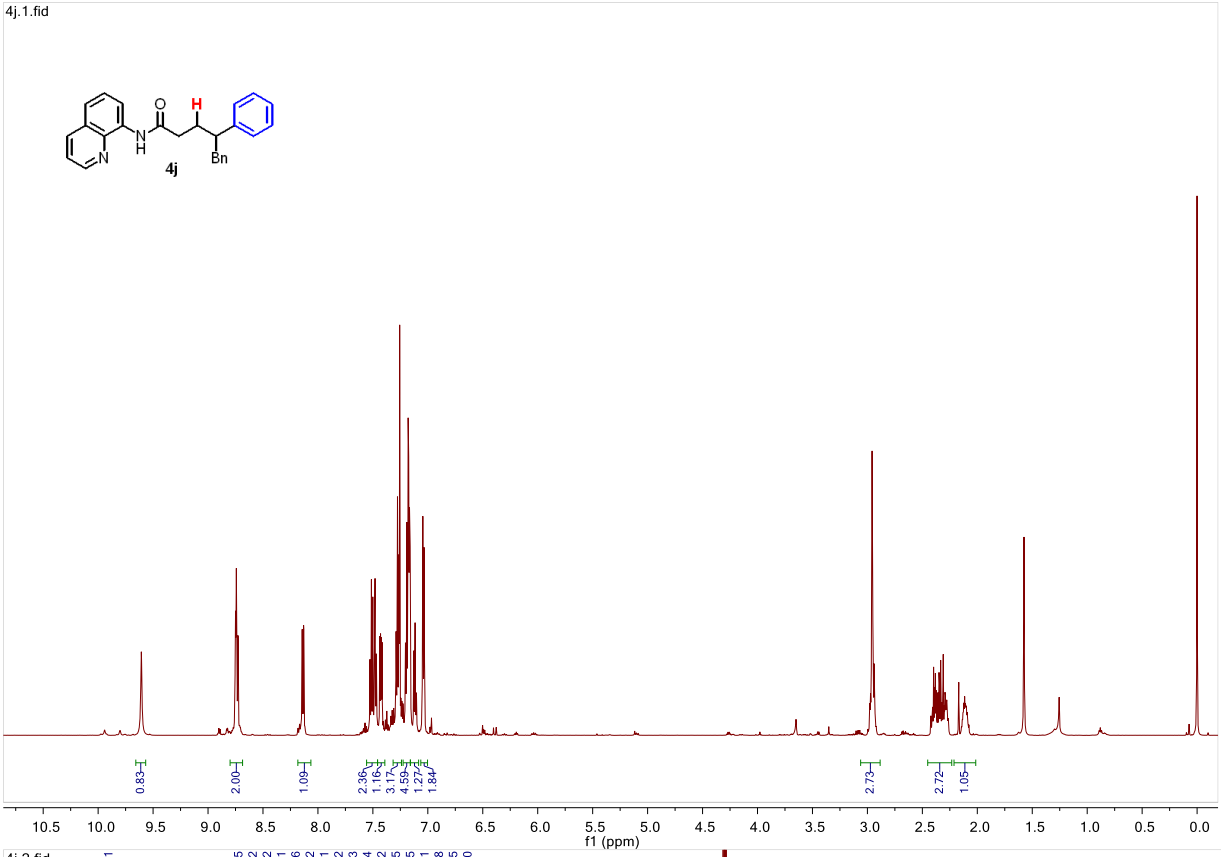
121.65
121.48
116.70
39.66
36.32
33.80
22.68
4f
f1 (ppm)

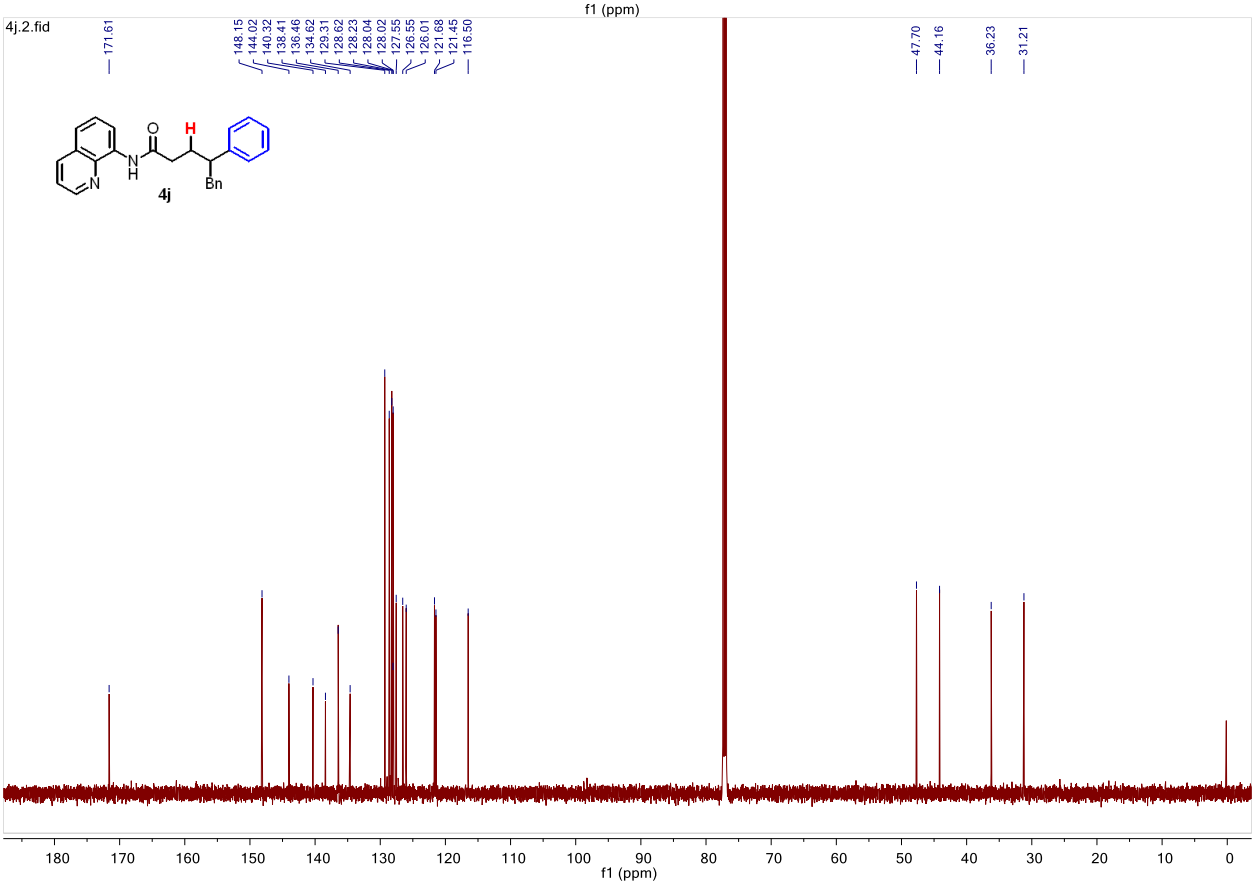

4g.1.fid
4g
0.89
2.06
1.05
2.12
1.09
2.00
2.95
1.00
1.98
1.07
0.98
0.99
1.55
2.97
f1 (ppm)

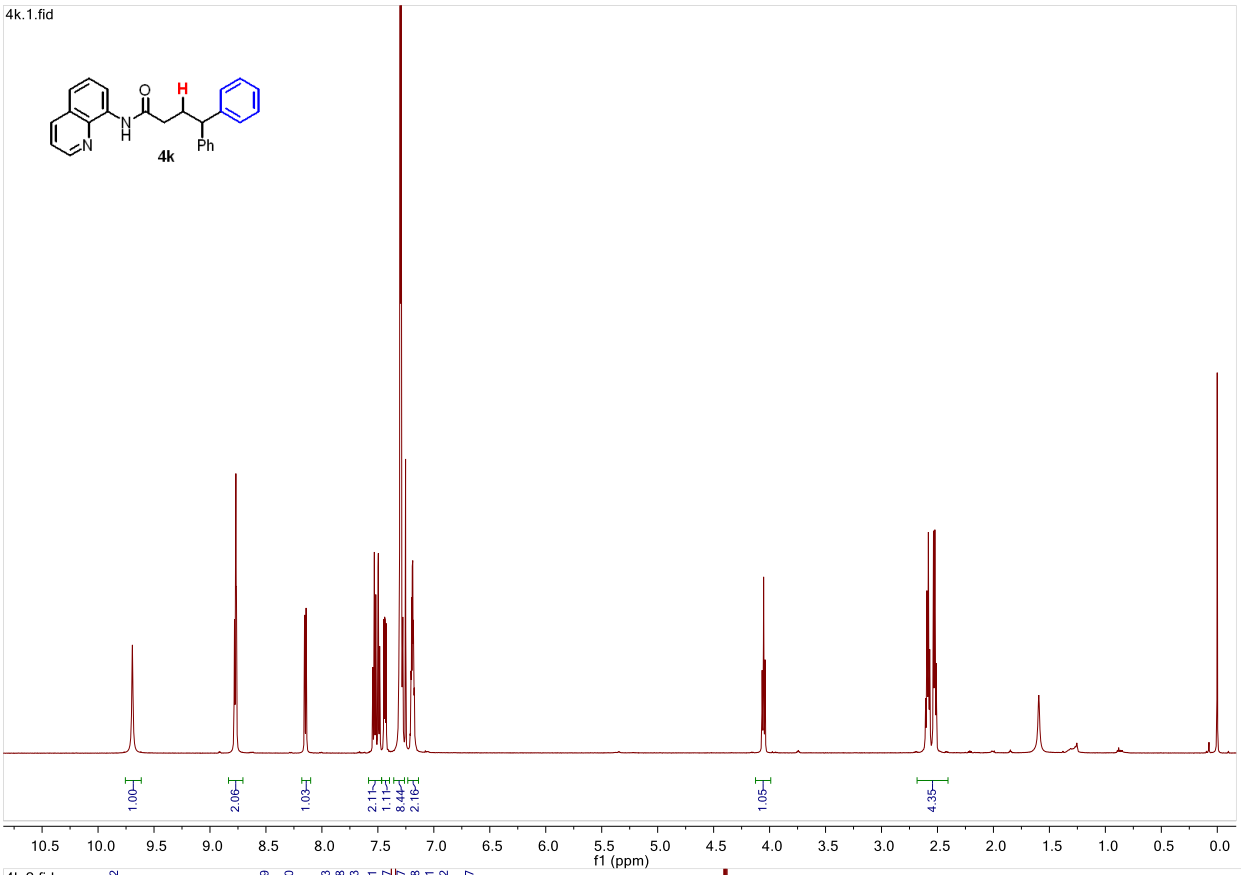

4g.2.fid
171.87
148.16
144.77
138.44
136.46
134.68
128.59
128.05
128.01
127.57
126.35
121.68
121.44
116.52
47.48
36.27
32.04
30.11
12.29
4g
f1 (ppm)

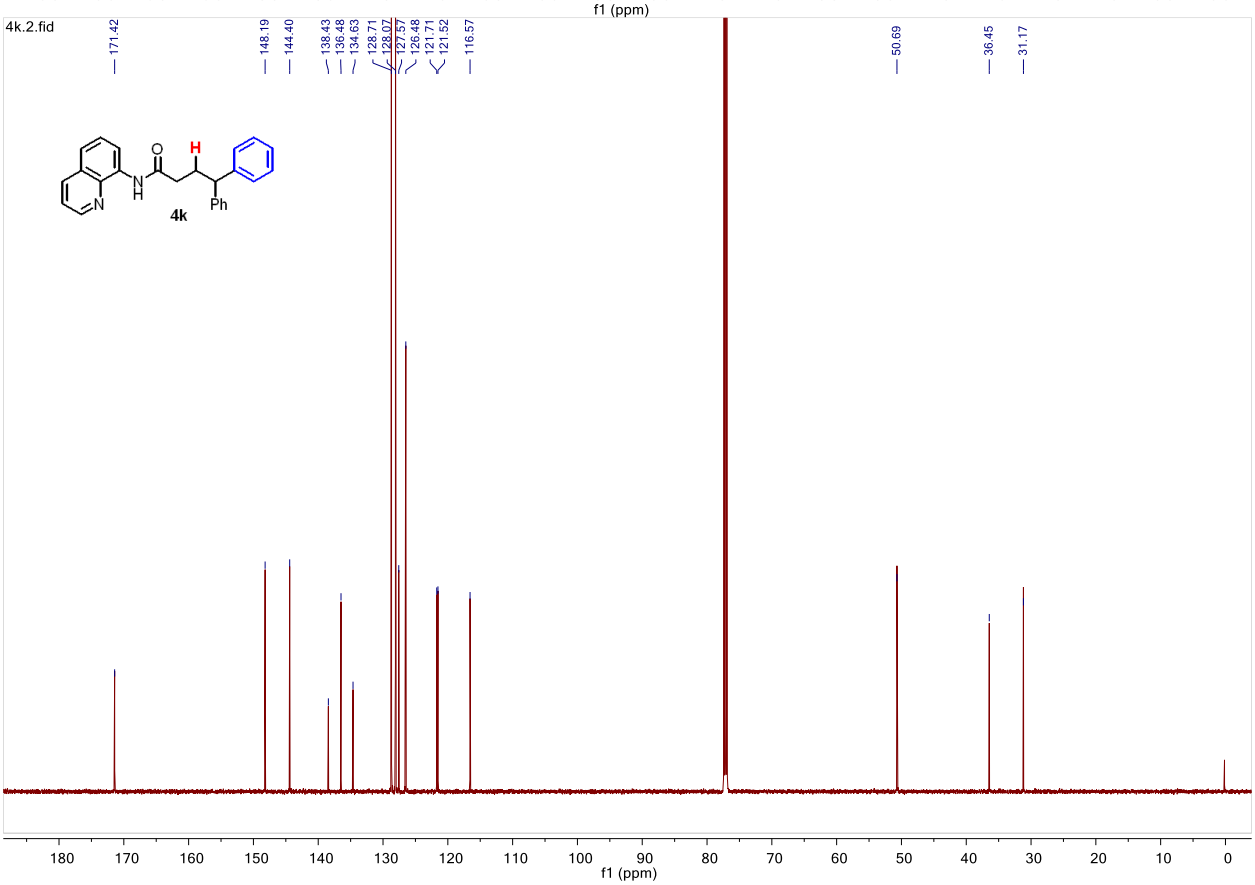

4i.1.fid
4i
1.00
2.18
1.14
2.33
1.17
2.24
1.15
2.12
3.30
1.08
1.11
1.11
3.26
3.24
f1 (ppm)


4i.2.fid
171.98
148.14
143.72
138.43
136.44
134.69
128.70
128.40
128.05
127.57
126.29
121.67
121.41
116.50
52.78
36.54
33.89
28.78
21.09
20.99
4i
f1 (ppm)

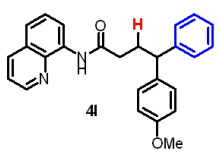

4j.1.fid
4j
0.83
2.00
1.09
2.36
1.16
3.17
4.59
1.27
1.84
2.73
2.72
1.05
f1 (ppm)


4j.2.fid
171.61
148.15
144.02
140.32
138.41
136.46
134.62
129.31
128.62
128.23
128.04
128.02
127.55
126.55
126.01
121.68
121.45
116.50
47.70
44.16
36.23
31.21
4j
f1 (ppm)


4k.1.fid
4k
1.00
2.06
1.03
2.11
1.11
8.44
2.16
1.05
4.35
f1 (ppm)


4k.2.fid
171.42
148.19
144.40
138.43
136.48
134.63
128.71
128.07
127.57
126.48
121.71
121.52
116.57
50.69
36.45
31.17
4k
f1 (ppm)

RM-261a-pure.1.fid

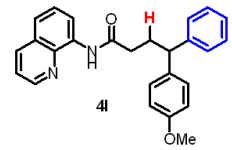


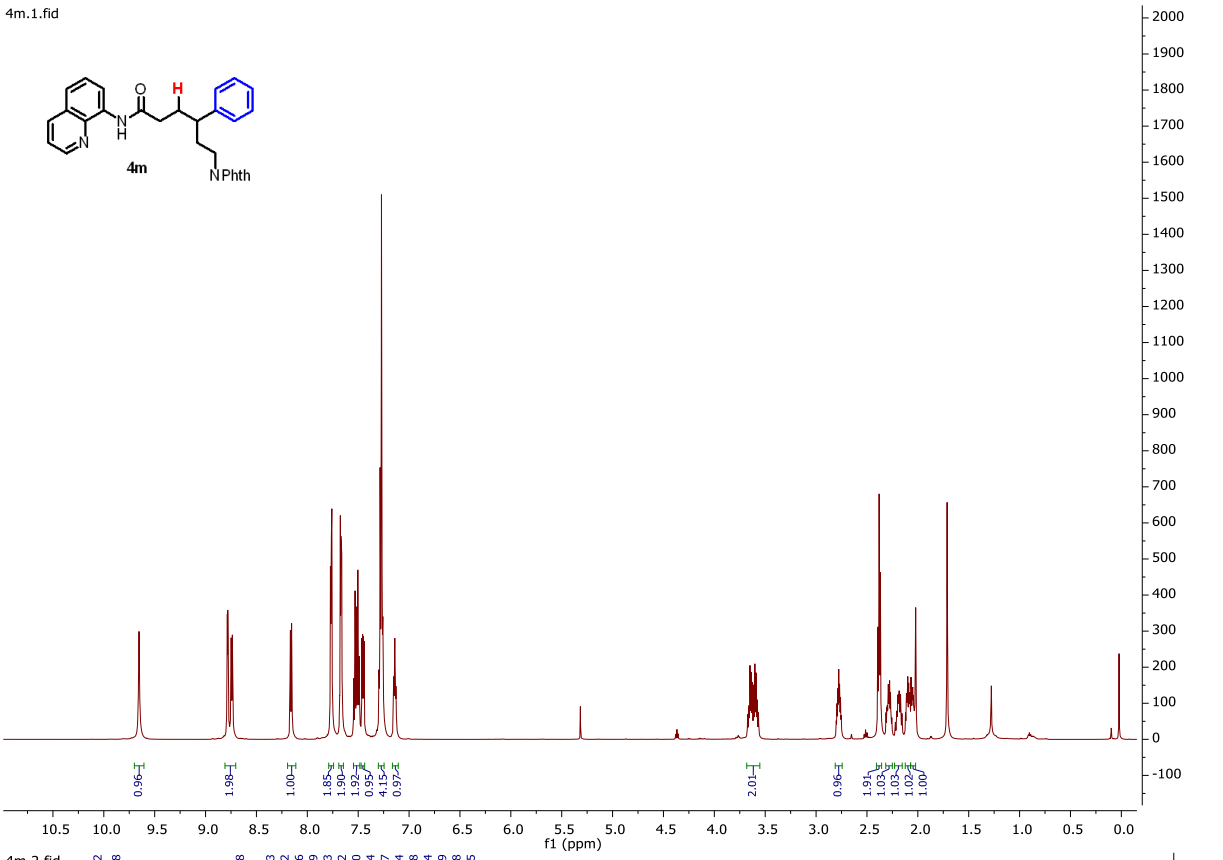


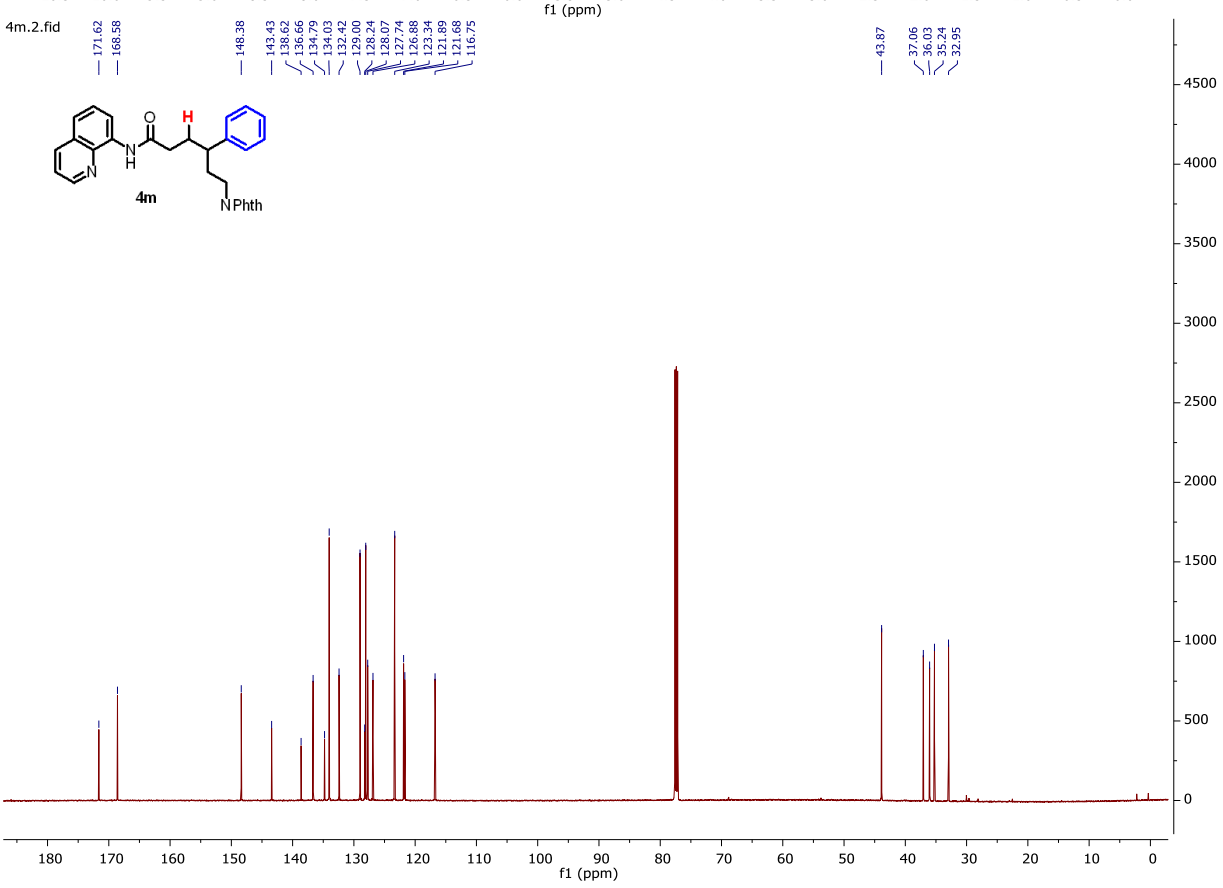


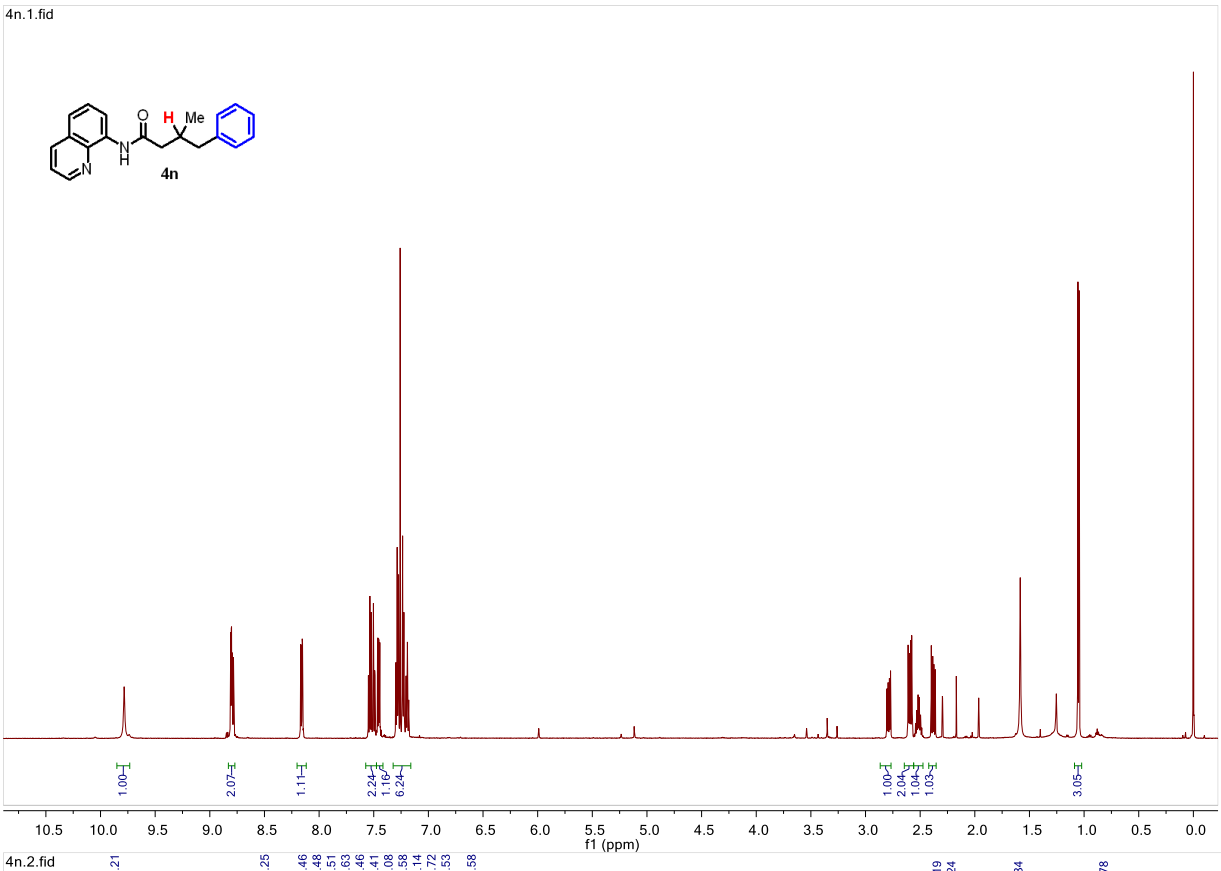
4l--HNMR needs retake.2.fid

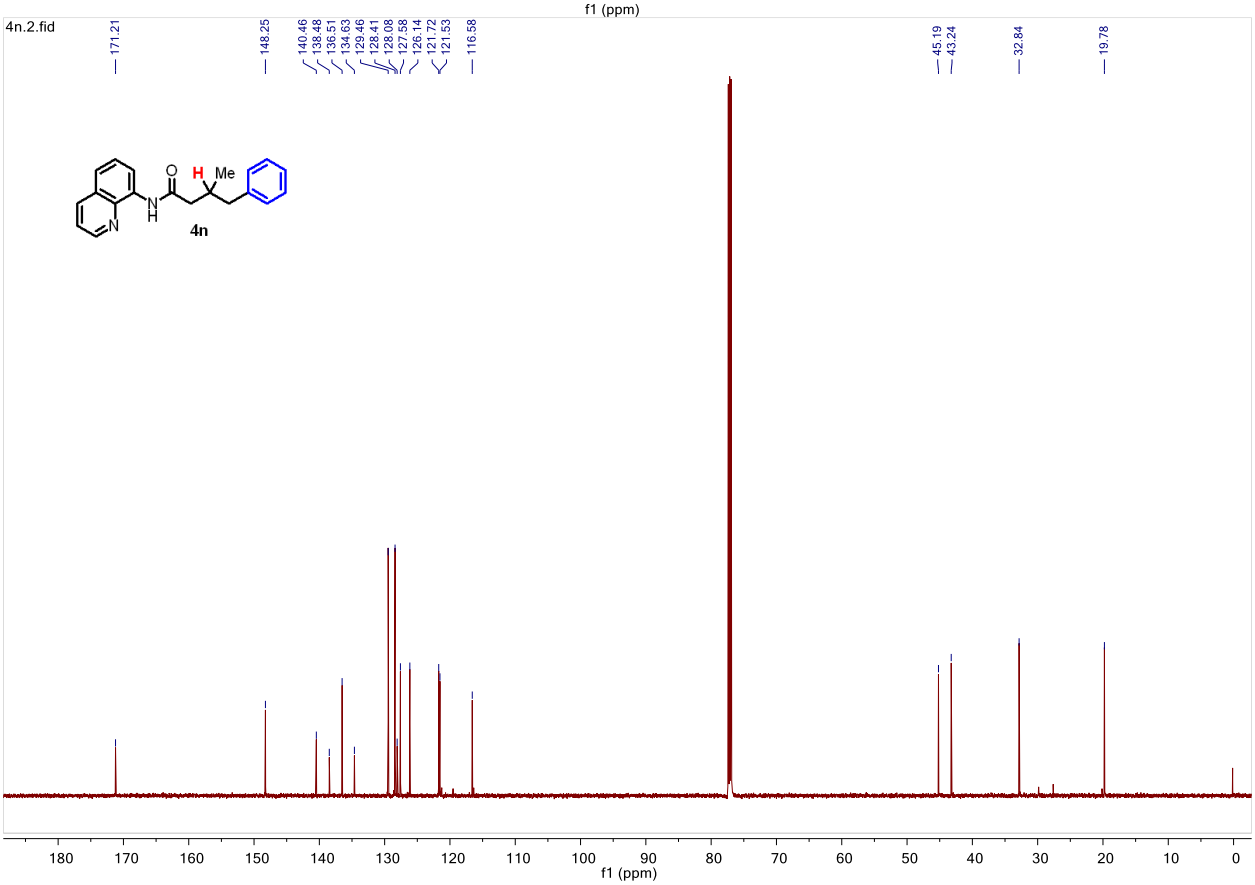
171.83
158.37
148.37
145.00
138.60
136.70
136.66
134.82
129.17
128.87
128.24
128.15
127.74
126.57
121.89
121.71
116.74
114.27
55.54
50.03
36.67
31.54

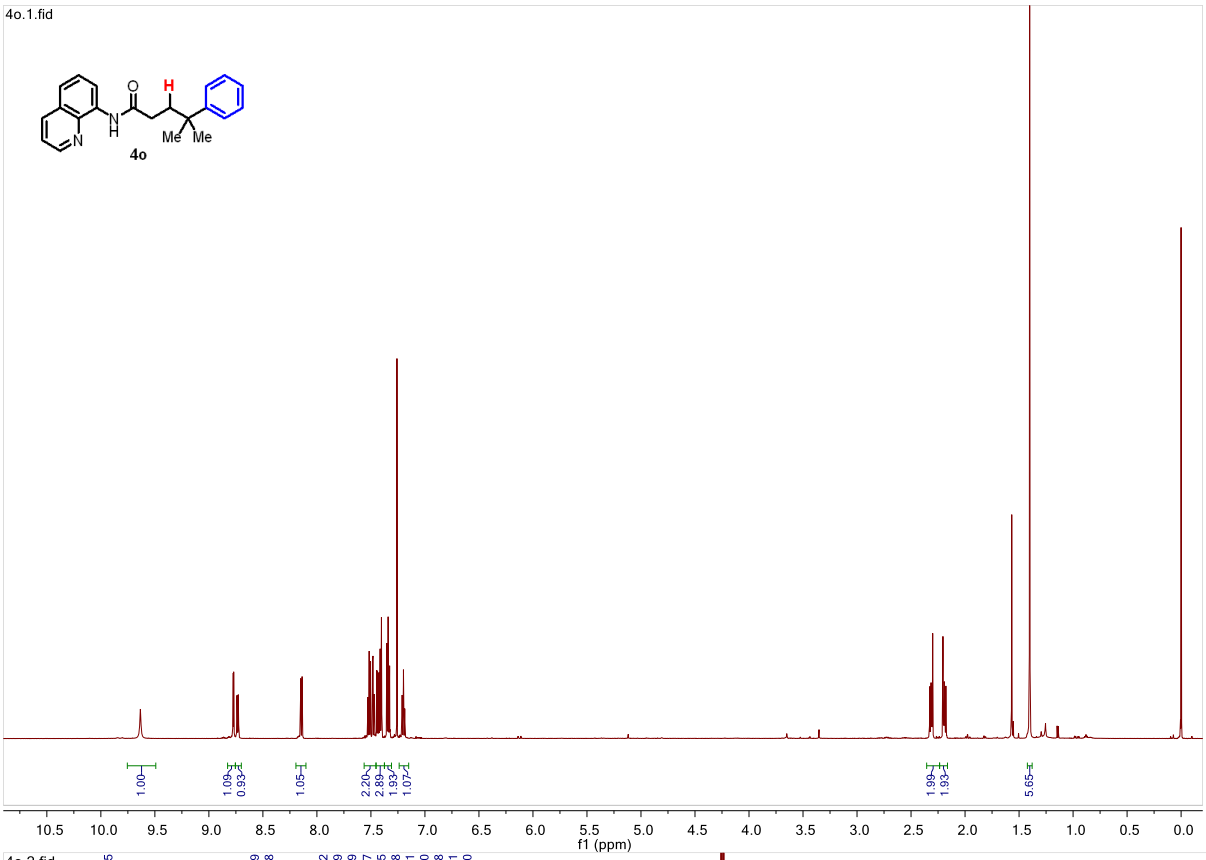


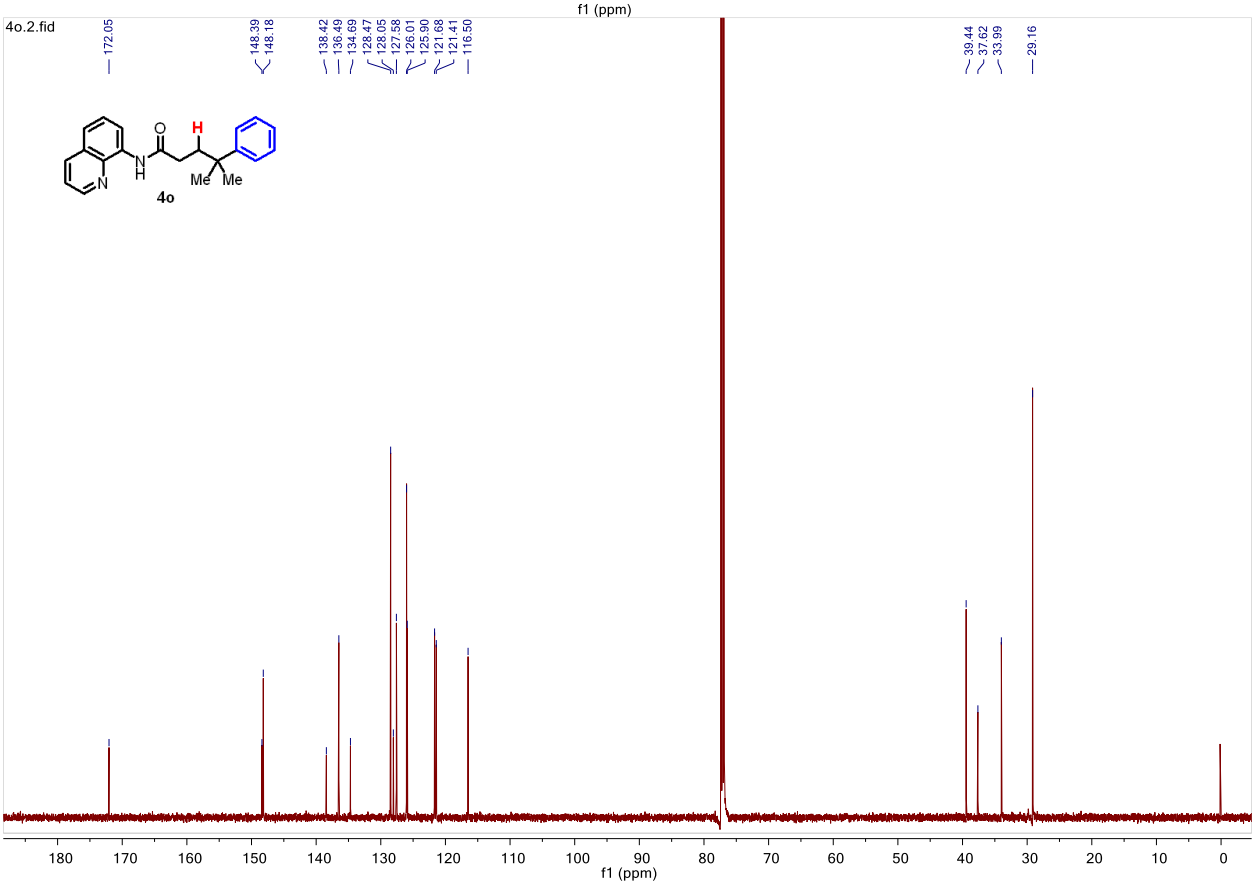

4m.1.fid
4m
NPhth
f1 (ppm)

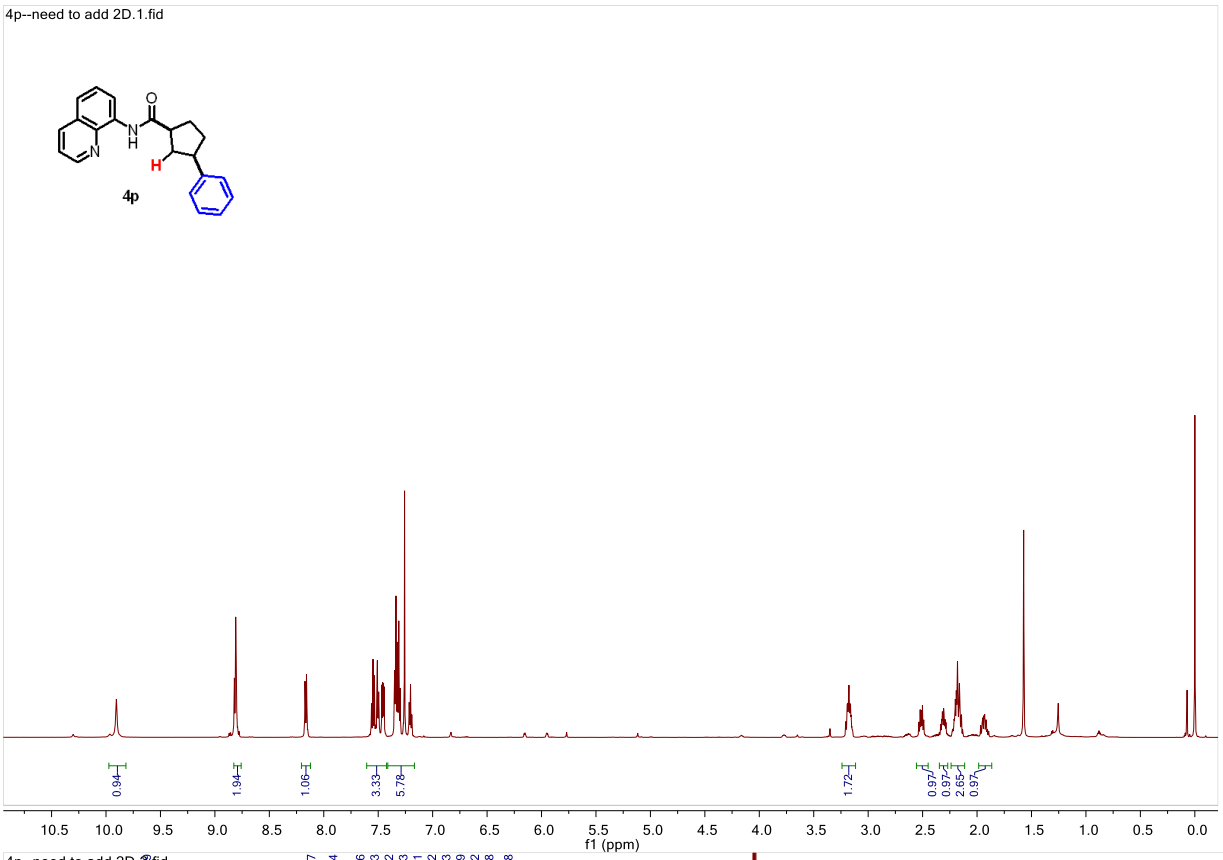

4m.2.fid
171.62
168.58
148.38
143.43
138.62
136.66
134.79
134.03
132.42
129.00
128.24
128.07
127.74
126.88
123.34
121.89
121.68
116.75
43.87
37.06
36.03
35.24
32.95
4m
NPhth
f1 (ppm)

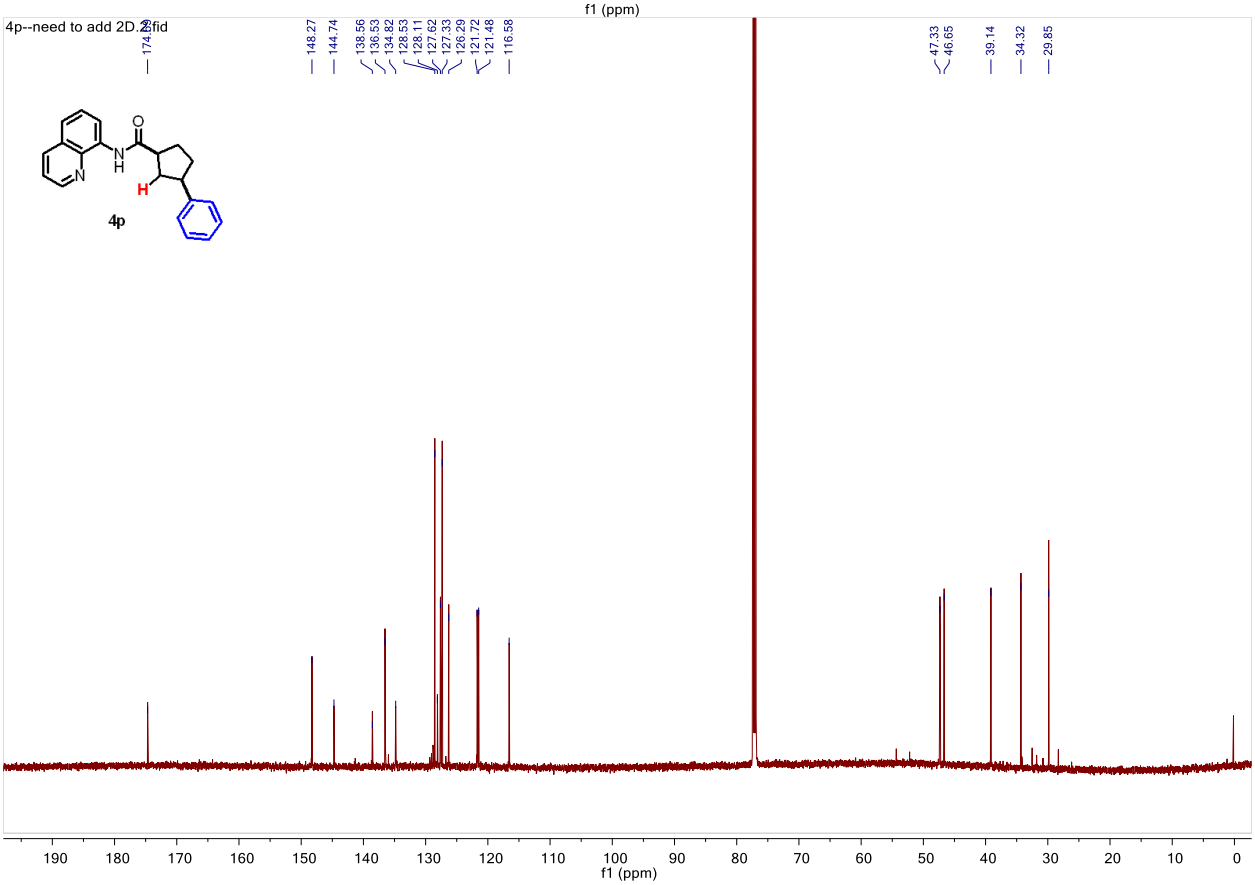

4n.1.fid
4n
1.00
2.07
1.11
2.24
1.16
6.24
1.00
2.04
1.04
1.03
3.05
f1 (ppm)


4n.2.fid
171.21
148.25
140.46
138.48
136.51
134.63
129.46
128.41
128.08
127.58
126.14
121.72
121.53
116.58
45.19
43.24
32.84
19.78
4n
f1 (ppm)


4o.1.fid
4o
1.00
1.09
0.93
1.05
2.20
2.89
1.93
1.07
1.99
1.93
5.65
f1 (ppm)


4o.2.fid
172.05
148.39
148.18
138.42
136.49
134.69
128.47
128.05
127.58
126.01
125.90
121.68
121.41
116.50
39.44
37.62
33.99
29.16
4o
f1 (ppm)


4p--need to add 2D.1.fid
4p
0.94
1.94
1.06
3.33
5.78
1.72
0.97
0.97
2.65
0.97
f1 (ppm)


4p--need to add 2D.2.fid
174.28
148.27
144.74
138.56
136.53
134.82
128.53
128.11
127.62
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126.29
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121.48
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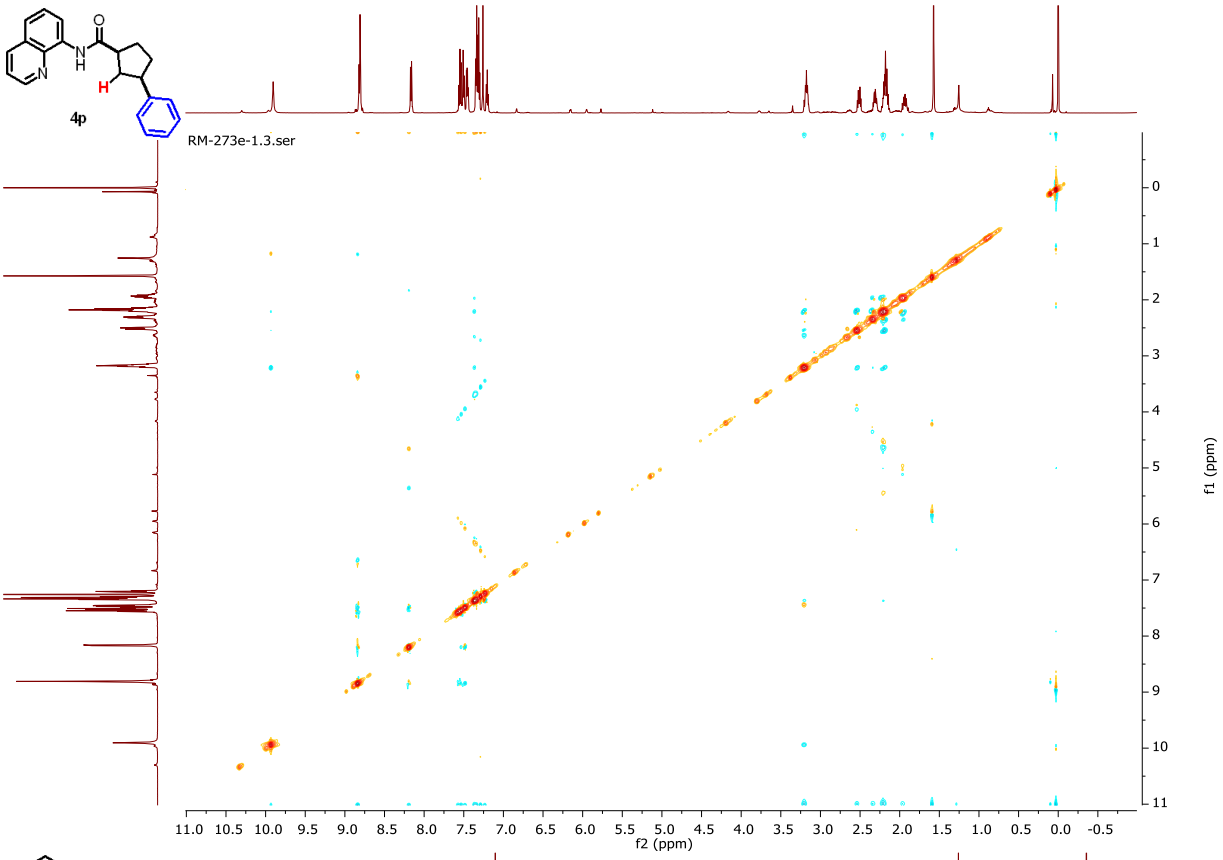
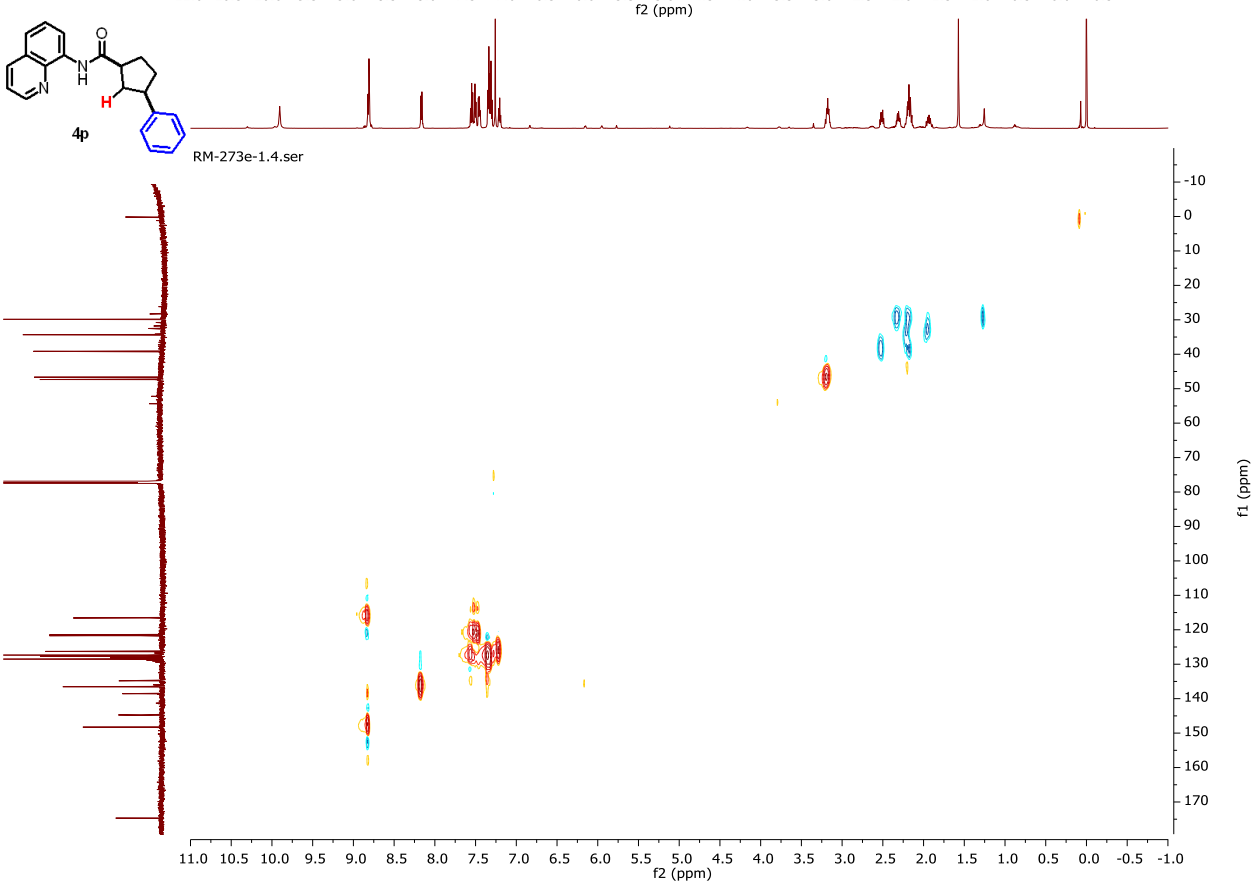
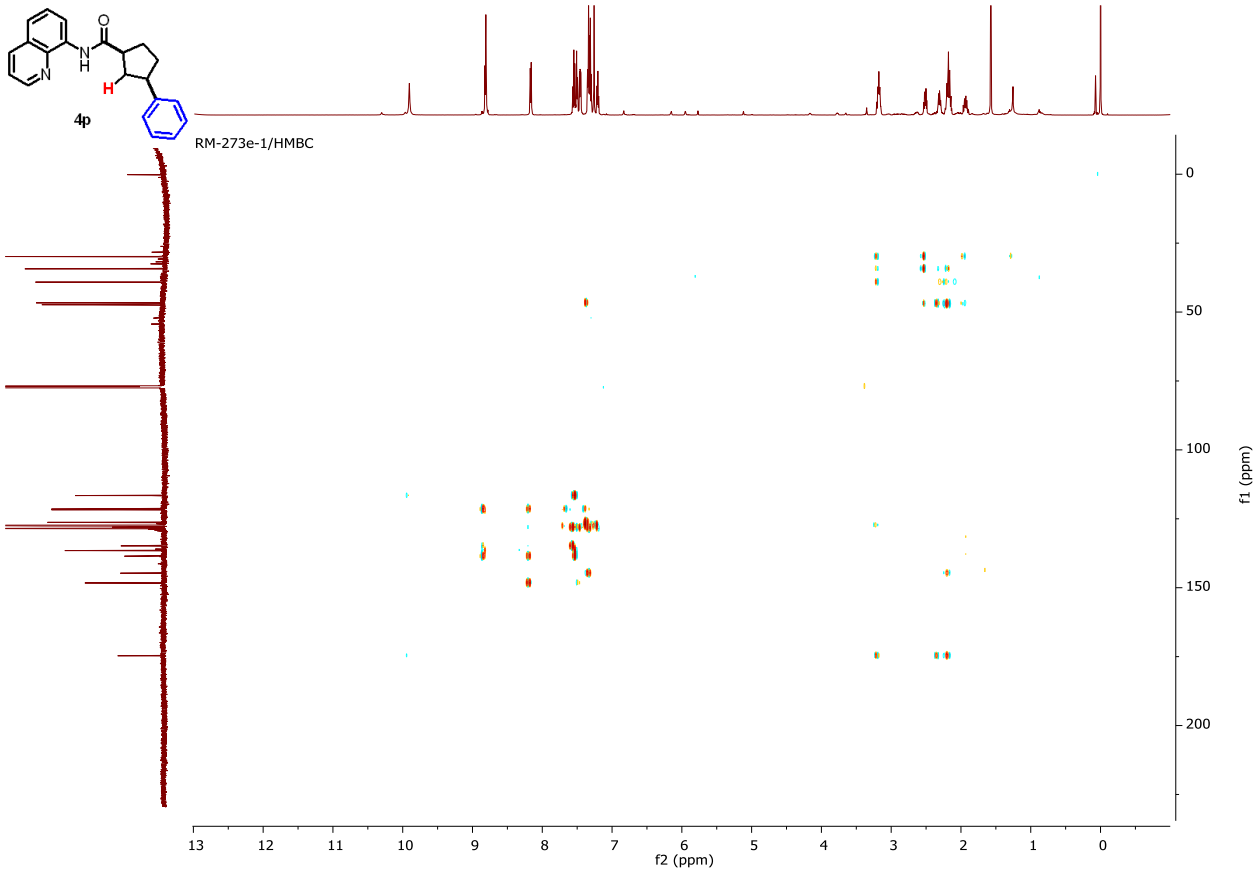
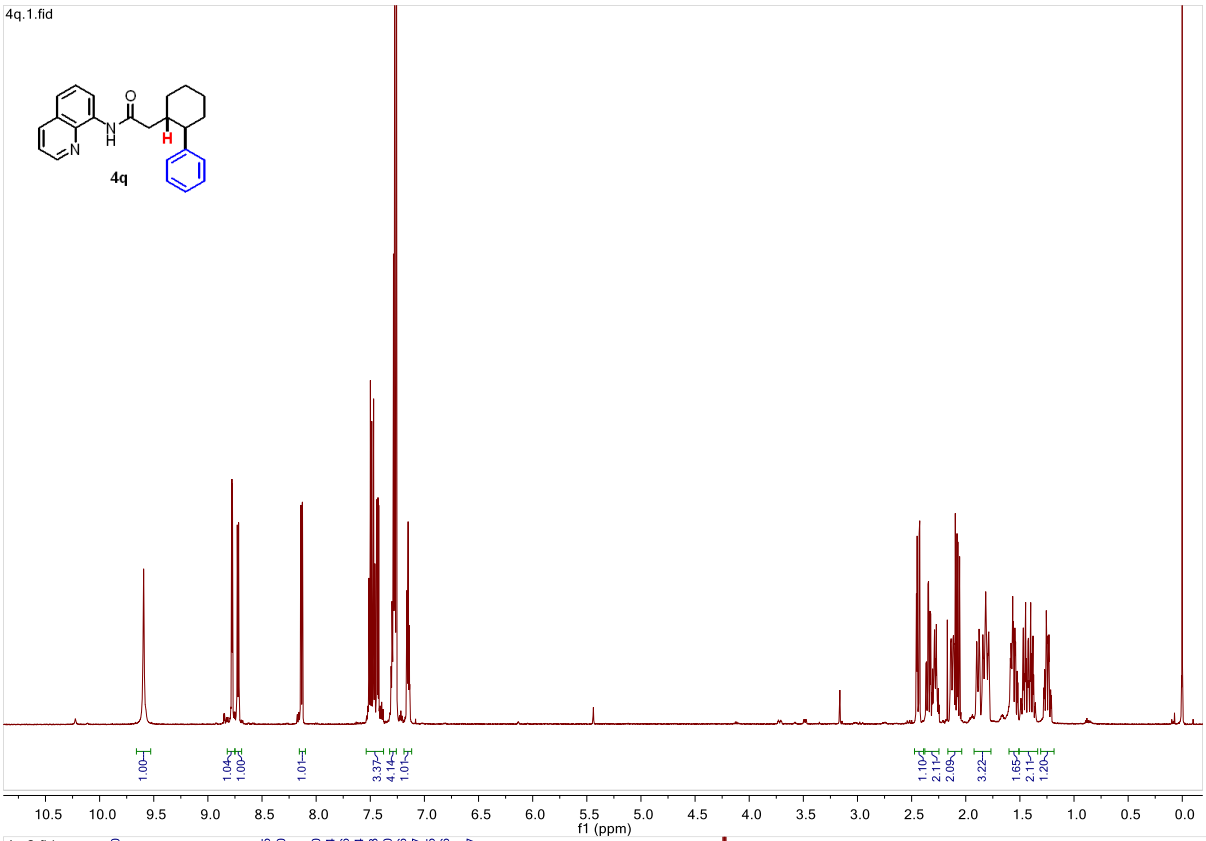
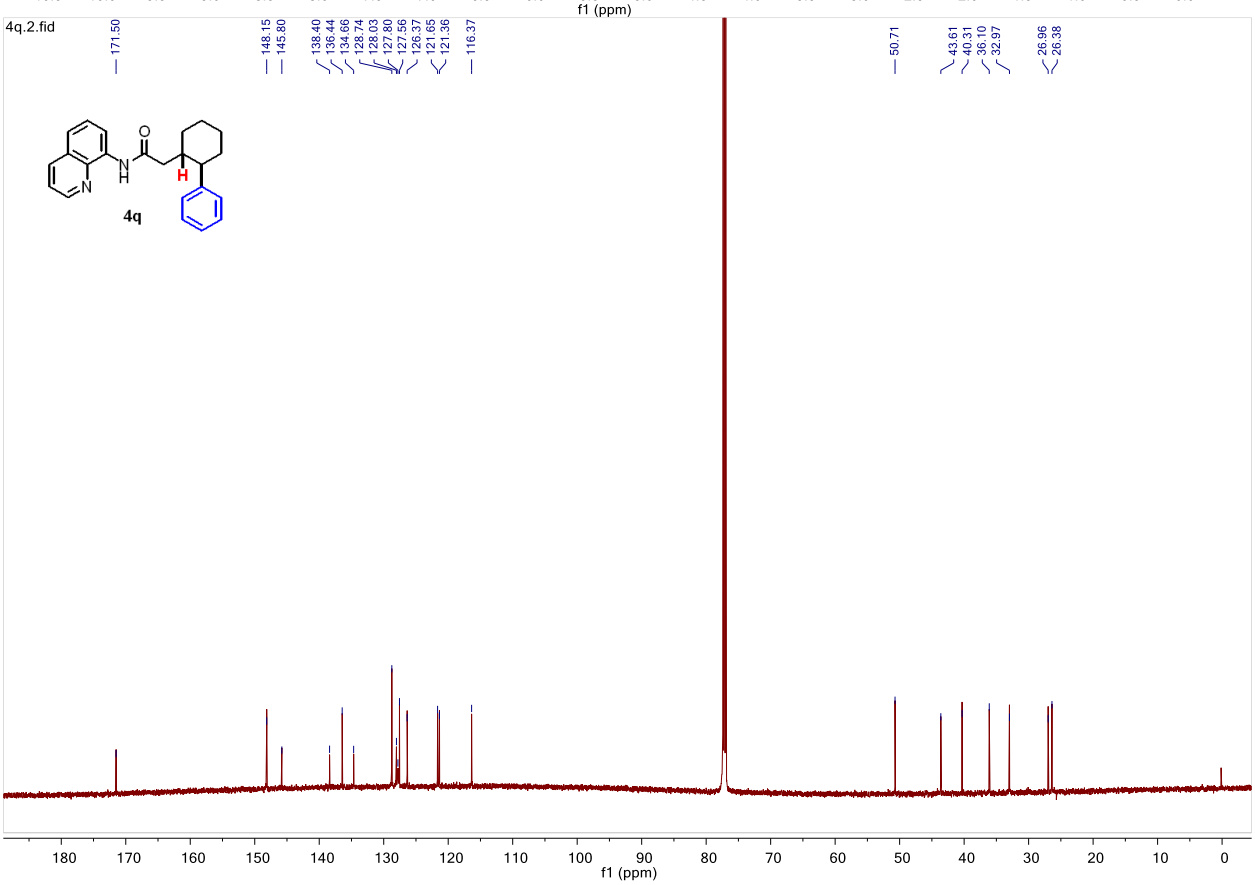
47.33
46.65
39.14
34.32
29.85
4p
f1 (ppm)

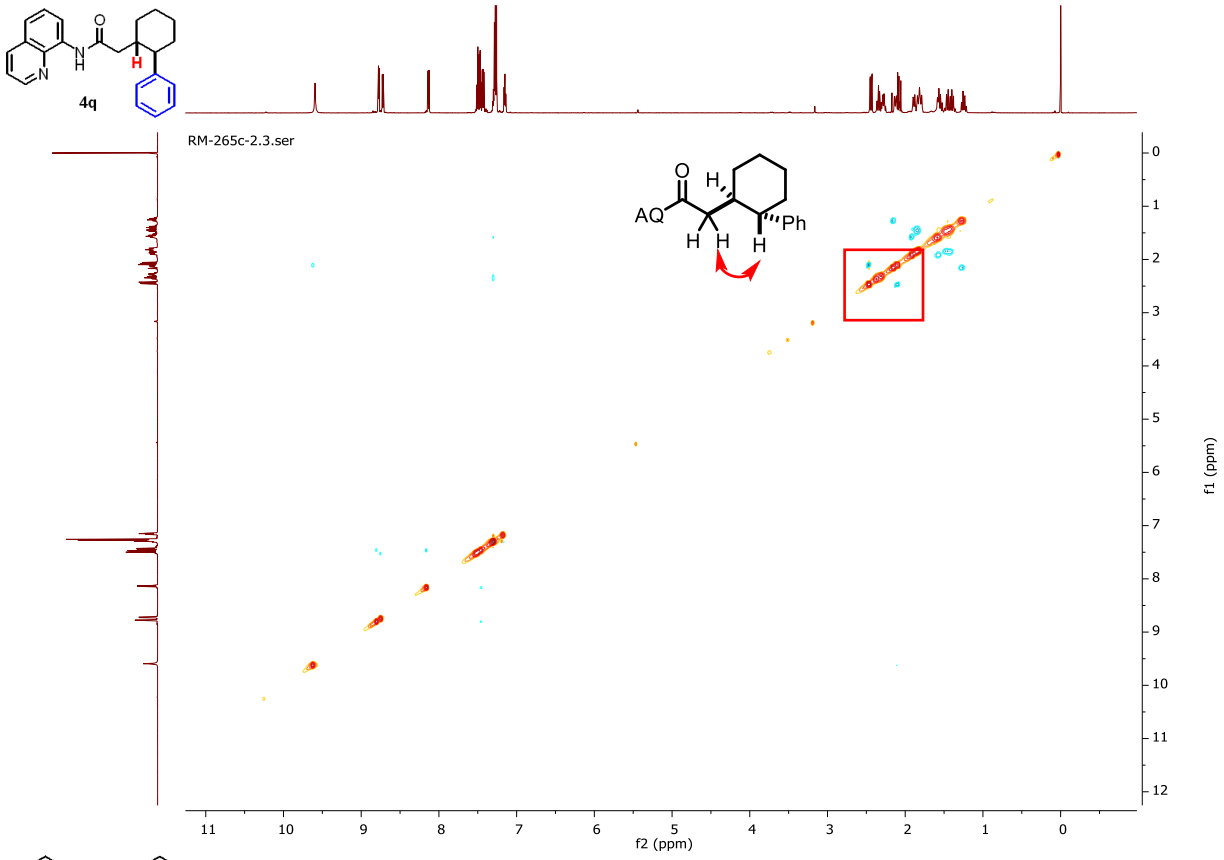

4p
RM-273e-1.3.ser
f2 (ppm)
f1 (ppm)

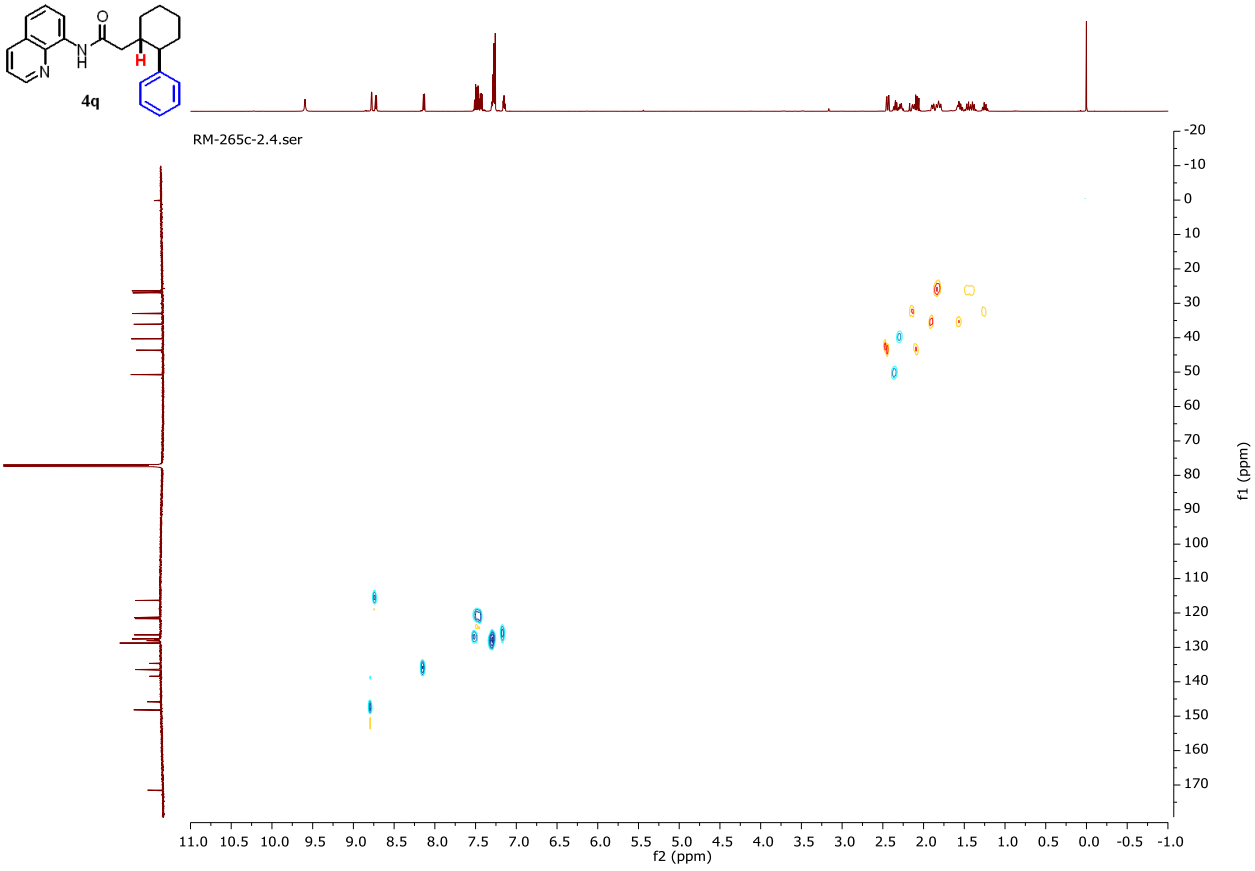

4p
RM-273e-1.4.ser
f2 (ppm)
f1 (ppm)

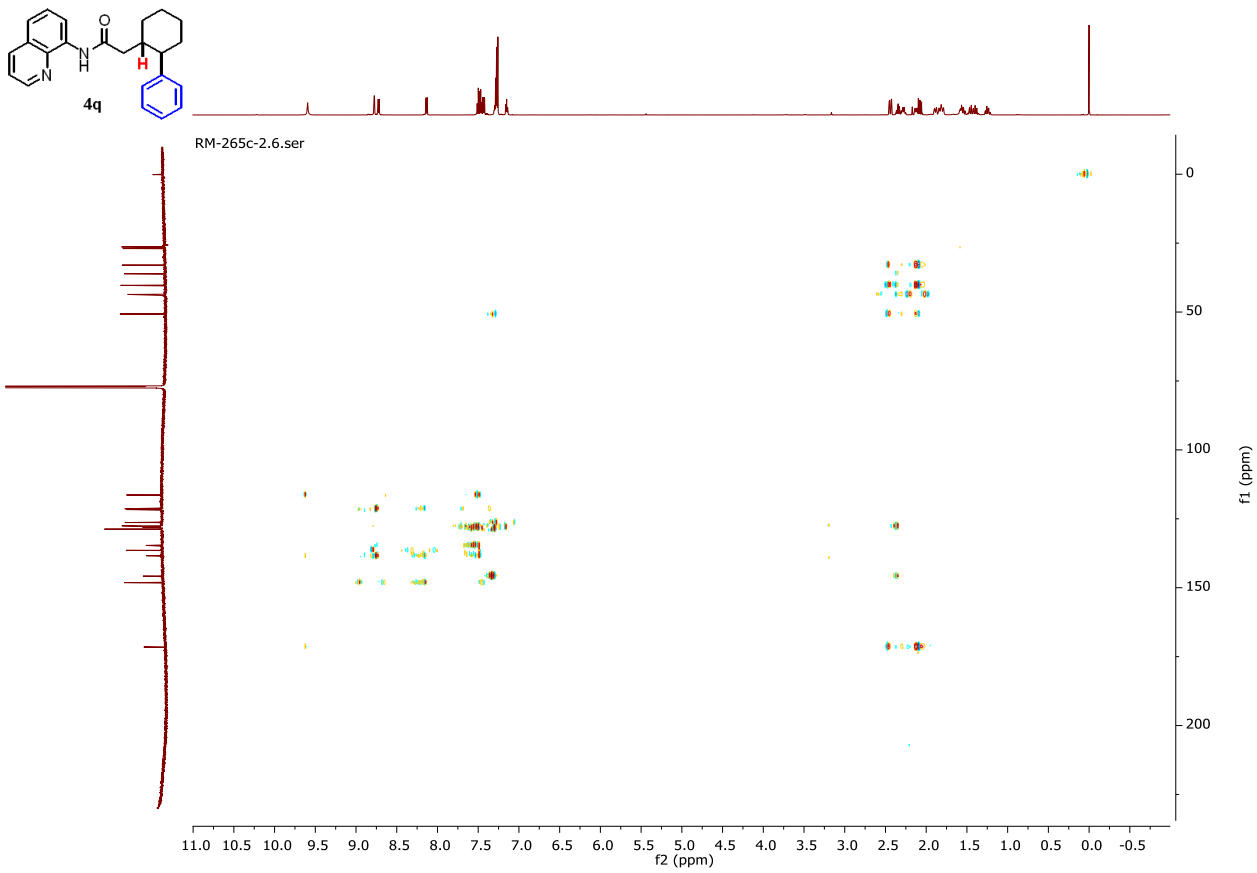

4p
RM-273e-1/HMBC
f2 (ppm)
f1 (ppm)


4q.1.fid
4q
1.00
1.04
1.00
1.01
3.37
4.14
1.01
1.10
2.11
2.09
3.22
1.65
2.11
1.20
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

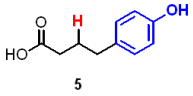

4q.2.fid
171.50
148.15
145.80
138.40
136.44
134.66
128.74
128.03
127.80
127.56
126.37
121.65
121.36
116.37
50.71
43.61
40.31
36.10
32.97
26.96
26.38
4q
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


4q
RM-265c-2.3.ser
AQ
Ph
f2 (ppm)
f1 (ppm)


4q
RM-265c-2.4.ser
f2 (ppm)
f1 (ppm)


4q
RM-265c-2.6.ser
f2 (ppm)
f1 (ppm)

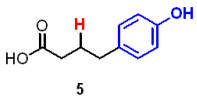
5.1.fid



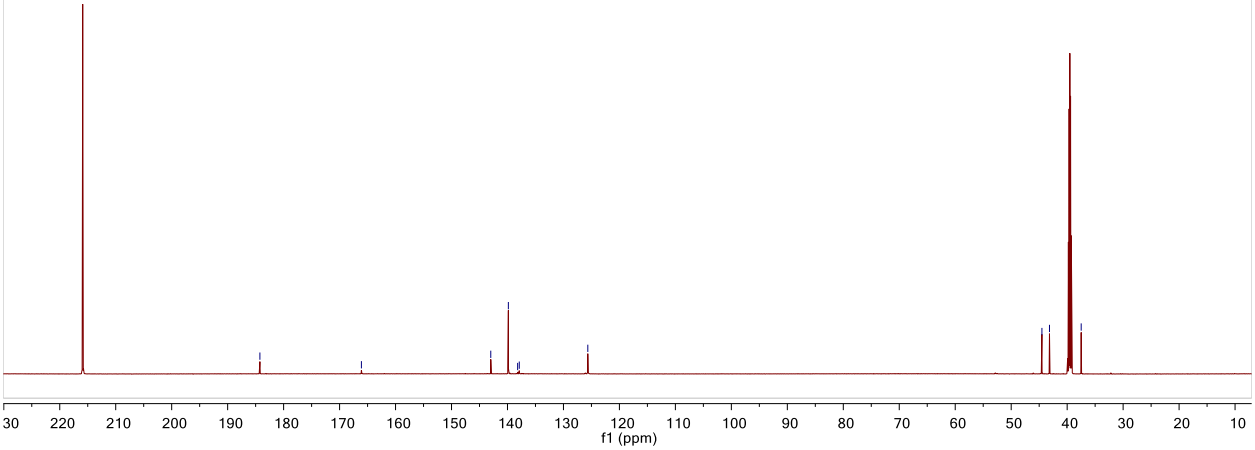

5

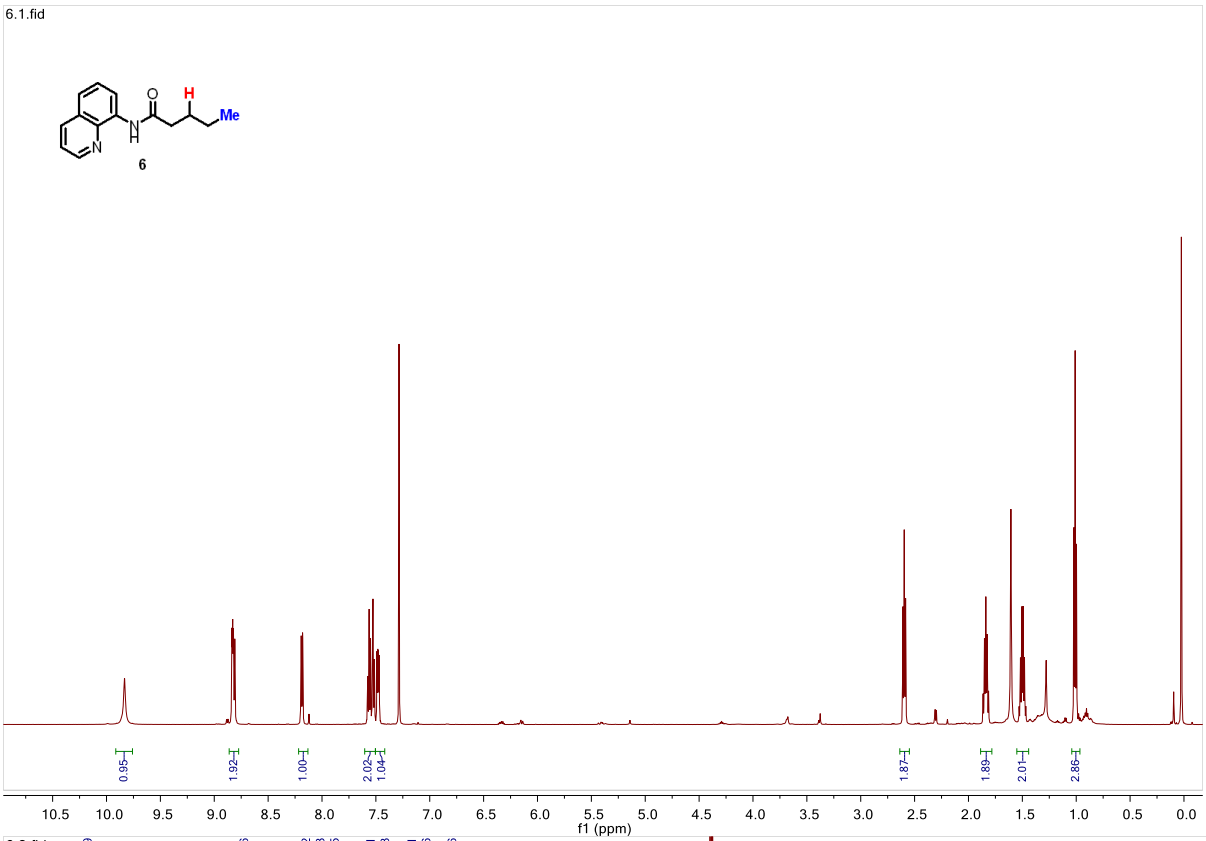


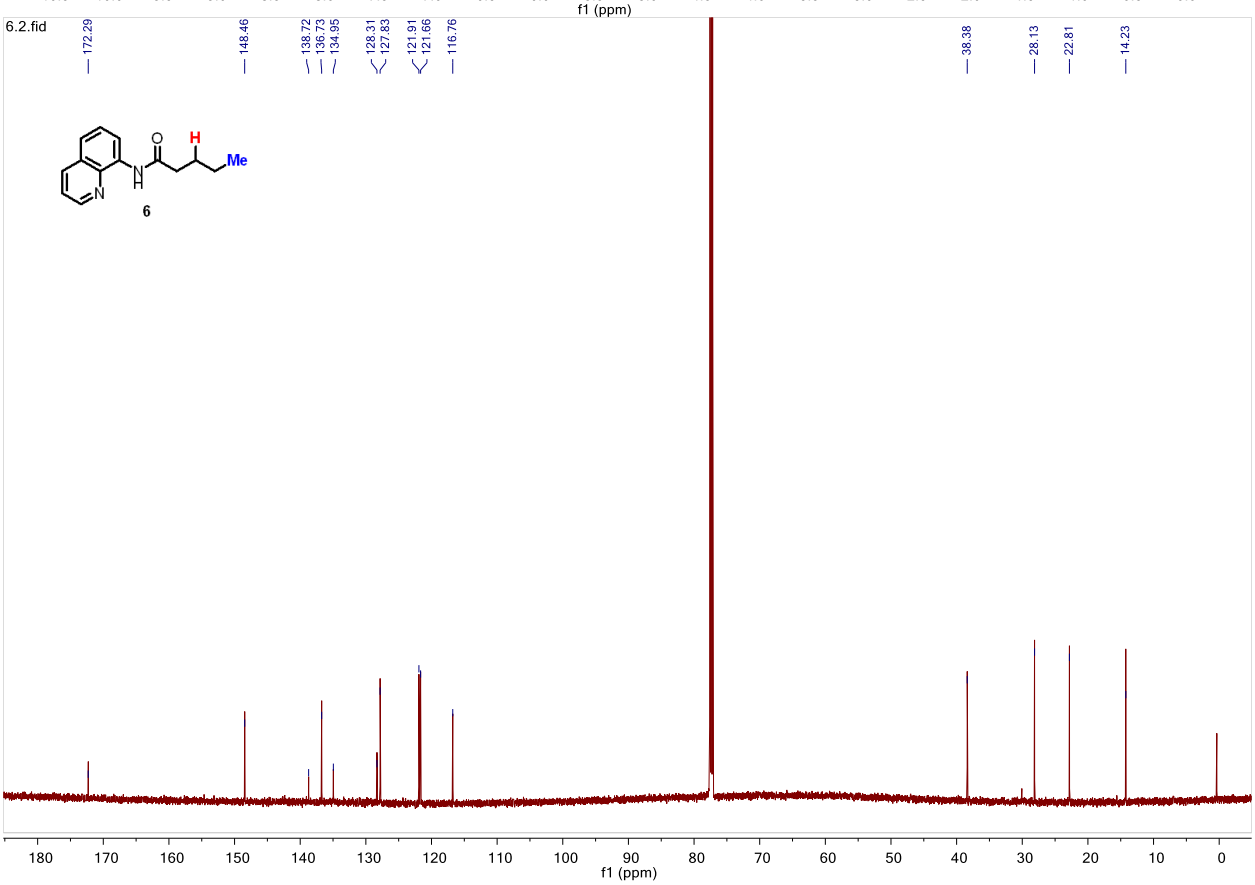

5.2.fid


5




6.1.fid
O
H
N
H
Me
N
6
0.95
1.92
1.00
2.02
1.04
1.87
1.89
2.01
2.86
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


6.2.fid
172.29
148.46
138.72
136.73
134.95
128.31
127.83
121.91
121.66
116.76
38.38
28.13
22.81
14.23
O
H
N
H
Me
N
6
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

**X-ray Crystallographic Methods and Results for 3j**

**Experimental Summary**

The single crystal X-ray diffraction studies were carried out on a Bruker Pt 135 CCD diffractometer equipped with Cu $K_a$ radiation (l = 1.54179). Crystals of the subject compound were used as received (grown from MeCN). A 0.290 x 0.170 x 0.125 mm light violet irregular crystal was mounted on a Cryoloop with Paratone oil.

Data were collected in a nitrogen gas stream at 100(2) K using f and v scans. Crystal-to-detector distance was 45 mm using exposure time 2 and 4s depending on the detector 2$q$ position with a scan width of 1.50°. Data collection was 99.5% complete to 67.50° in A total of 19137 reflections were collected covering the indices, -13<=h<=13, -18<=k<=18, -11<=l<=11. 2971 reflections were found to be symmetry independent, with a $R_{int}$ of 0.0359. Indexing and unit cell refinement indicated a **P**rimitive, **Monoclinic** lattice. The space group was found to be ***P2$_1$/c***. The data were integrated using the Bruker SAINT Software program and scaled using the SADABS software program. Solution by direct methods (SHELXT) produced a complete phasing model consistent with the proposed structure.

All nonhydrogen atoms were refined anisotropically by full-matrix least-squares (SHELXL-2014). All carbon bonded hydrogen atoms were placed using a riding model. Their positions were constrained relative to their parent atom using the appropriate HFIX command in SHELXL-2014.

Hydrogen atom bonded to Oxygen atom was refined using HXIF 148 command.

Crystallographic data are summarized in Table S7.

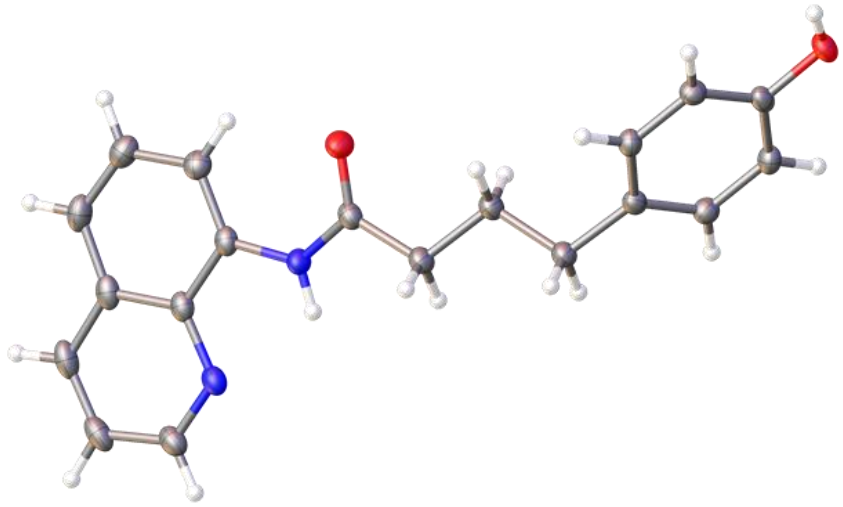


**Table S7**. Crystal data and structure refinement for **3j** (Engle94).

| | | |
|---|---|---|
| Report date | 2018-03-15 | |
| Identification code | engle94 | |
| Empirical formula | C19 H18 N2 O2 | |
| Molecular formula | C19 H18 N2 O2 | |
| Formula weight | 306.35 | |
| Temperature | 100.0 K | |
| Wavelength | 1.54178 Å | |
| Crystal system | Monoclinic | |
| Space group | P 1 21/c 1 | |
| Unit cell dimensions | a = 11.2477(4) Å | a= 90°. |
| | b = 15.3784(5) Å | b= 114.2040(10)°. |
| | c = 9.6298(3) Å | g = 90°. |
| Volume | 1519.25(9) $Å^3$ | |
| Z | 4 | |
| Density (calculated) | 1.339 $Mg/m^3$ | |
| Absorption coefficient | 0.704 $mm^{-1}$ | |
| F(000) | 648 | |
| Crystal size | 0.29 x 0.17 x 0.125 $mm^3$ | |
| Crystal color, habit | light violet irregular | |
| Theta range for data collection | 4.309 to 72.273°. | |
| Index ranges | -13<=h<=13, -18<=k<=18, -11<=l<=11 | |
| Reflections collected | 19137 | |
| Independent reflections | 2971 [R(int) = 0.0359] | |
| Completeness to theta = 67.500° | 99.5 % | |
| Absorption correction | Semi-empirical from equivalents | |
| Max. and min. transmission | 0.5230 and 0.4401 | |
| Refinement method | Full-matrix least-squares on $F^2$ | |
| Data / restraints / parameters | 2971 / 0 / 210 | |
| Goodness-of-fit on $F^2$ | 1.036 | |
| Final R indices [I>2sigma(I)] | R1 = 0.0350, wR2 = 0.0906 | |
| R indices (all data) | R1 = 0.0368, wR2 = 0.0925 | |
| Largest diff. peak and hole | 0.337 and -0.149 e.$Å^{-3}$ | |

**Table S8**. Atomic coordinates ( x $10^4$) and equivalent isotropic displacement parameters ($Å^2$x $10^3$) for Engle94. U(eq) is defined as one third of the trace of the orthogonalized $U^{ij}$ tensor.

| | x | y | z | U(eq) |
|---|---|---|---|---|
| O(1) | 2999(1) | 5050(1) | 4562(1) | 31(1) |
| O(2) | 7322(1) | 3528(1) | 13897(1) | 27(1) |
| N(1) | 613(1) | 3329(1) | -2(1) | 24(1) |
| N(2) | 1991(1) | 4083(1) | 2655(1) | 22(1) |
| C(1) | -92(1) | 2943(1) | -1308(1) | 27(1) |
| C(2) | -362(1) | 3310(1) | -2748(1) | 30(1) |
| C(3) | 126(1) | 4115(1) | -2813(1) | 29(1) |
| C(4) | 889(1) | 4564(1) | -1451(1) | 25(1) |
| C(5) | 1449(1) | 5394(1) | -1404(1) | 29(1) |
| C(6) | 2174(1) | 5778(1) | -34(1) | 29(1) |
| C(7) | 2377(1) | 5366(1) | 1359(1) | 25(1) |
| C(8) | 1847(1) | 4561(1) | 1353(1) | 21(1) |
| C(9) | 1096(1) | 4135(1) | -61(1) | 22(1) |
| C(10) | 2521(1) | 4327(1) | 4139(1) | 22(1) |
| C(11) | 2456(1) | 3636(1) | 5228(1) | 23(1) |
| C(12) | 3445(1) | 3770(1) | 6862(1) | 23(1) |
| C(13) | 3419(1) | 3022(1) | 7900(1) | 22(1) |
| C(14) | 4409(1) | 3137(1) | 9527(1) | 20(1) |
| C(15) | 5379(1) | 2519(1) | 10235(1) | 22(1) |
| C(16) | 6333(1) | 2648(1) | 11700(1) | 23(1) |
| C(17) | 6324(1) | 3403(1) | 12487(1) | 21(1) |
| C(18) | 5327(1) | 4006(1) | 11831(1) | 22(1) |
| C(19) | 4394(1) | 3874(1) | 10363(1) | 22(1) |

**Table S9**. Bond lengths [Å] and angles [°] for Engle94.

| | | | |
|---|---|---|---|
| O(1)-C(10) | 1.2290(13) | C(14)-C(19) | 1.3941(15) |
| O(2)-H(2) | 0.899(17) | C(15)-H(15) | 0.9500 |
| O(2)-C(17) | 1.3752(13) | C(15)-C(16) | 1.3927(15) |
| N(1)-C(1) | 1.3208(14) | C(16)-H(16) | 0.9500 |
| N(1)-C(9) | 1.3631(15) | C(16)-C(17) | 1.3878(15) |
| N(2)-H(2A) | 0.8800 | C(17)-C(18) | 1.3919(15) |
| N(2)-C(8) | 1.4044(13) | C(18)-H(18) | 0.9500 |
| N(2)-C(10) | 1.3563(13) | C(18)-C(19) | 1.3876(15) |
| C(1)-H(1) | 0.9500 | C(19)-H(19) | 0.9500 |
| C(1)-C(2) | 1.4105(16) | | |
| C(2)-H(2B) | 0.9500 | C(17)-O(2)-H(2) | 109.5 |
| C(2)-C(3) | 1.3652(18) | C(1)-N(1)-C(9) | 117.57(10) |
| C(3)-H(3) | 0.9500 | C(8)-N(2)-H(2A) | 115.3 |
| C(3)-C(4) | 1.4179(16) | C(10)-N(2)-H(2A) | 115.3 |
| C(4)-C(5) | 1.4162(17) | C(10)-N(2)-C(8) | 129.46(9) |
| C(4)-C(9) | 1.4231(15) | N(1)-C(1)-H(1) | 118.0 |
| C(5)-H(5) | 0.9500 | N(1)-C(1)-C(2) | 124.01(11) |
| C(5)-C(6) | 1.3684(17) | C(2)-C(1)-H(1) | 118.0 |
| C(6)-H(6) | 0.9500 | C(1)-C(2)-H(2B) | 120.7 |
| C(6)-C(7) | 1.4149(16) | C(3)-C(2)-C(1) | 118.61(10) |
| C(7)-H(7) | 0.9500 | C(3)-C(2)-H(2B) | 120.7 |
| C(7)-C(8) | 1.3736(16) | C(2)-C(3)-H(3) | 119.9 |
| C(8)-C(9) | 1.4331(15) | C(2)-C(3)-C(4) | 120.11(10) |
| C(10)-C(11) | 1.5162(15) | C(4)-C(3)-H(3) | 119.9 |
| C(11)-H(11A) | 0.9900 | C(3)-C(4)-C(9) | 116.57(11) |
| C(11)-H(11B) | 0.9900 | C(5)-C(4)-C(3) | 124.14(10) |
| C(11)-C(12) | 1.5229(14) | C(5)-C(4)-C(9) | 119.28(10) |
| C(12)-H(12A) | 0.9900 | C(4)-C(5)-H(5) | 120.0 |
| C(12)-H(12B) | 0.9900 | C(6)-C(5)-C(4) | 120.07(10) |
| C(12)-C(13) | 1.5314(15) | C(6)-C(5)-H(5) | 120.0 |
| C(13)-H(13A) | 0.9900 | C(5)-C(6)-H(6) | 119.3 |
| C(13)-H(13B) | 0.9900 | C(5)-C(6)-C(7) | 121.43(11) |
| C(13)-C(14) | 1.5153(14) | C(7)-C(6)-H(6) | 119.3 |
| C(14)-C(15) | 1.3963(15) | C(6)-C(7)-H(7) | 120.0 |

| | | | |
|---|---|---|---|
| C(8)-C(7)-C(6) | 119.94(10) | C(17)-C(16)-H(16) | 120.1 |
| C(8)-C(7)-H(7) | 120.0 | O(2)-C(17)-C(16) | 118.09(10) |
| N(2)-C(8)-C(9) | 114.63(9) | O(2)-C(17)-C(18) | 122.29(10) |
| C(7)-C(8)-N(2) | 125.25(10) | C(16)-C(17)-C(18) | 119.62(10) |
| C(7)-C(8)-C(9) | 120.10(10) | C(17)-C(18)-H(18) | 120.1 |
| N(1)-C(9)-C(4) | 123.11(10) | C(19)-C(18)-C(17) | 119.77(10) |
| N(1)-C(9)-C(8) | 117.73(9) | C(19)-C(18)-H(18) | 120.1 |
| C(4)-C(9)-C(8) | 119.16(10) | C(14)-C(19)-H(19) | 119.2 |
| O(1)-C(10)-N(2) | 122.91(10) | C(18)-C(19)-C(14) | 121.64(10) |
| O(1)-C(10)-C(11) | 122.91(9) | C(18)-C(19)-H(19) | 119.2 |
| N(2)-C(10)-C(11) | 114.17(9) | | |
| C(10)-C(11)-H(11A) | 108.9 | | |
| C(10)-C(11)-H(11B) | 108.9 | | |
| C(10)-C(11)-C(12) | 113.49(9) | | |
| H(11A)-C(11)-H(11B) | 107.7 | | |
| C(12)-C(11)-H(11A) | 108.9 | | |
| C(12)-C(11)-H(11B) | 108.9 | | |
| C(11)-C(12)-H(12A) | 109.3 | | |
| C(11)-C(12)-H(12B) | 109.3 | | |
| C(11)-C(12)-C(13) | 111.82(9) | | |
| H(12A)-C(12)-H(12B) | 107.9 | | |
| C(13)-C(12)-H(12A) | 109.3 | | |
| C(13)-C(12)-H(12B) | 109.3 | | |
| C(12)-C(13)-H(13A) | 109.1 | | |
| C(12)-C(13)-H(13B) | 109.1 | | |
| H(13A)-C(13)-H(13B) | 107.8 | | |
| C(14)-C(13)-C(12) | 112.62(8) | | |
| C(14)-C(13)-H(13A) | 109.1 | | |
| C(14)-C(13)-H(13B) | 109.1 | | |
| C(15)-C(14)-C(13) | 121.41(9) | | |
| C(19)-C(14)-C(13) | 120.95(9) | | |
| C(19)-C(14)-C(15) | 117.63(10) | | |
| C(14)-C(15)-H(15) | 119.3 | | |
| C(16)-C(15)-C(14) | 121.33(10) | | |
| C(16)-C(15)-H(15) | 119.3 | | |
| C(15)-C(16)-H(16) | 120.1 | | |
| C(17)-C(16)-C(15) | 119.88(10) | | |

**Table S10**. Anisotropic displacement parameters ($Å^2 x\ 10^3$) for Engle94. The anisotropic displacement factor exponent takes the form: $-2p^2[\ h^2\ a^{*2}U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}\ ]$

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{23}$ | $U^{13}$ | $U^{12}$ |
|---|---|---|---|---|---|---|
| O(1) | 41(1) | 25(1) | 21(1) | -2(1) | 7(1) | -4(1) |
| O(2) | 26(1) | 32(1) | 17(1) | -1(1) | 2(1) | -1(1) |
| N(1) | 22(1) | 26(1) | 19(1) | -1(1) | 5(1) | 4(1) |
| N(2) | 27(1) | 20(1) | 17(1) | 0(1) | 6(1) | -1(1) |
| C(1) | 23(1) | 30(1) | 23(1) | -4(1) | 4(1) | 3(1) |
| C(2) | 23(1) | 42(1) | 19(1) | -5(1) | 3(1) | 6(1) |
| C(3) | 25(1) | 45(1) | 17(1) | 4(1) | 7(1) | 11(1) |
| C(4) | 22(1) | 33(1) | 20(1) | 4(1) | 9(1) | 10(1) |
| C(5) | 30(1) | 34(1) | 26(1) | 10(1) | 15(1) | 9(1) |
| C(6) | 31(1) | 26(1) | 33(1) | 6(1) | 17(1) | 4(1) |
| C(7) | 26(1) | 24(1) | 25(1) | 0(1) | 11(1) | 2(1) |
| C(8) | 21(1) | 24(1) | 18(1) | 2(1) | 8(1) | 6(1) |
| C(9) | 20(1) | 25(1) | 19(1) | 2(1) | 7(1) | 6(1) |
| C(10) | 21(1) | 24(1) | 18(1) | -1(1) | 5(1) | 3(1) |
| C(11) | 24(1) | 25(1) | 17(1) | -1(1) | 6(1) | -1(1) |
| C(12) | 24(1) | 24(1) | 17(1) | -1(1) | 6(1) | -1(1) |
| C(13) | 23(1) | 22(1) | 18(1) | -1(1) | 6(1) | -1(1) |
| C(14) | 21(1) | 22(1) | 17(1) | 1(1) | 7(1) | -2(1) |
| C(15) | 26(1) | 21(1) | 20(1) | -1(1) | 10(1) | 0(1) |
| C(16) | 22(1) | 24(1) | 22(1) | 4(1) | 7(1) | 3(1) |
| C(17) | 21(1) | 26(1) | 15(1) | 1(1) | 6(1) | -4(1) |
| C(18) | 26(1) | 21(1) | 20(1) | -2(1) | 10(1) | -2(1) |
| C(19) | 21(1) | 22(1) | 20(1) | 2(1) | 7(1) | 2(1) |

**Table S11**. Hydrogen coordinates ( x $10^4$) and isotropic displacement parameters ($Å^2$x $10^3$) for Engle94.

| | x | y | z | U(eq) |
|---|---|---|---|---|
| H(2) | 7176(8) | 4018(11) | 14313(11) | 41 |
| H(2A) | 1694 | 3546 | 2484 | 27 |
| H(1) | -437 | 2384 | -1275 | 33 |
| H(2B) | -872 | 3004 | -3655 | 36 |
| H(3) | -47 | 4374 | -3771 | 35 |
| H(5) | 1320 | 5685 | -2325 | 35 |
| H(6) | 2550 | 6333 | -18 | 34 |
| H(7) | 2879 | 5646 | 2297 | 30 |
| H(11A) | 2606 | 3060 | 4871 | 27 |
| H(11B) | 1569 | 3634 | 5209 | 27 |
| H(12A) | 3253 | 4322 | 7256 | 27 |
| H(12B) | 4329 | 3815 | 6879 | 27 |
| H(13A) | 2537 | 2982 | 7889 | 27 |
| H(13B) | 3597 | 2469 | 7494 | 27 |
| H(15) | 5389 | 1999 | 9706 | 26 |
| H(16) | 6988 | 2222 | 12160 | 28 |
| H(18) | 5284 | 4507 | 12388 | 27 |
| H(19) | 3729 | 4296 | 9915 | 26 |

**Table S12**. Hydrogen bonds for Engle94 [Å and °].

| D-H...A | d(D-H) | d(H...A) | d(D...A) | <(DHA) |
|---|---|---|---|---|
| O(2)-H(2)...O(1)#1 | 0.90 | 1.86 | 2.7487(12) | 171.8 |

Symmetry transformations used to generate equivalent atoms:

#1 -x+1,-y+1,-z+2