SUPPORTING INFORMATION

Directed Nickel-Catalyzed 1,2-Dialkylation of Alkenyl Carbonyl Compounds

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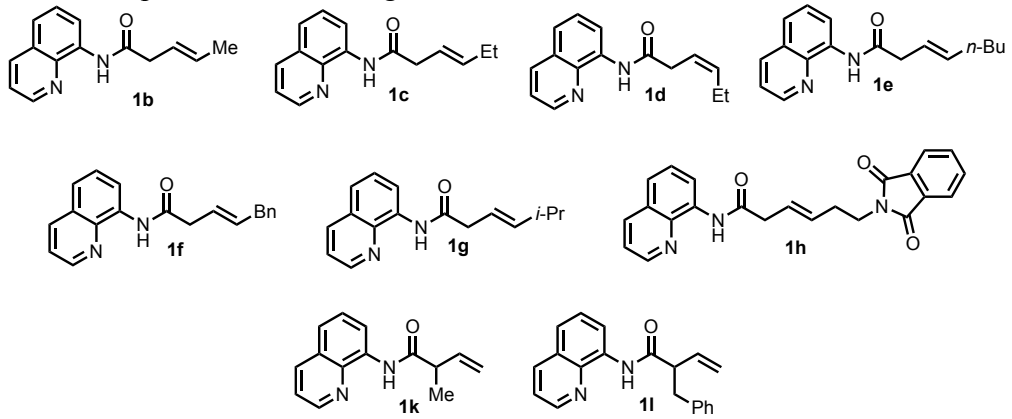
GENERAL INFORMATION

Unless otherwise noted, all materials were used as received from commercial sources without further purification. All aryl iodides, organozinc reagents, and solvents were purchased from MilliporeSigma, Alfa Aesar, Oakwood, and Combi-Blocks. Teflon-coated magnetic stir bars were soaked in concentrated nitric acid for at least 1 h, washed repeatedly with deionized water then acetone, and dried in an oven prior to use. In air- or moisture-sensitive reactions, anhydrous solvents from MilliporeSigma or from a Grubbs-type solvent purification system were used, and an inert atmosphere was maintained throughout the course of the reaction. ^{1}H and ^{13}C spectra were recorded with Bruker AV-400, DPX-500 and AV-600 instruments. Spectra were internally referenced to $SiMe_4$ or solvent signals. The following abbreviations (or combinations thereof) were used to explain multiplicities: b = broad, s = singlet, d = doublet, t = triplet, q = quartet, p = pentet, sept = septet, and m = multiplet. High-resolution mass spectra (HRMS) for new compounds were recorded on an Agilent LC/MSD TOF mass spectrometer.

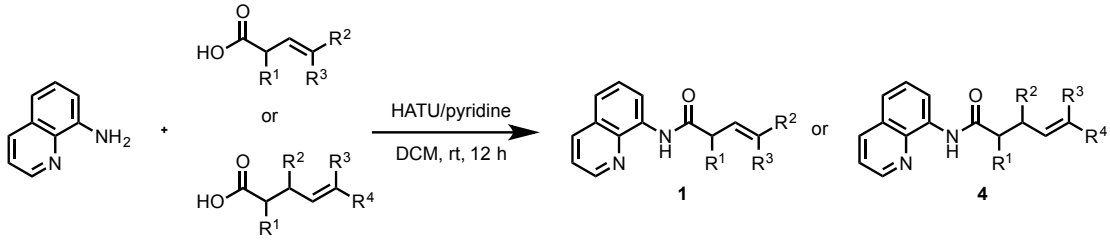
EXPERIMENTAL PROCEDURES

8-Aminoquinoline-Containing Alkene Substrate Synthesis

Table S1. 8-Aminoquinoline-containing alkene substrates **1b–h** and **1k–1l.**



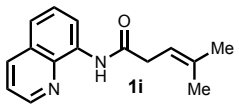
Alkene substrates **1b**–**h** and **1k–1l** were prepared according to literature methods.[1,2]



Scheme S1. Synthesis of alkene substrates using a general amide/ester coupling.

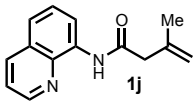
General Procedure for Amide Coupling: To a 50-mL flask equipped with a Teflon-coated stir bar was added alkenyl carboxylic acid (10 mmol, 1 equiv), 8-aminoquinoline (10 mmol, 1.0

equiv), HATU (11 mmol, 1.1 equiv), and dichloromethane (30 mL). After stirring at room temperature for 3 min, pyridine (20 mmol, 2 equiv) was added dropwise, and the reaction mixture was left to stir for 12 h. The reaction mixture was then washed with aq. $NaHCO_3$ (60 mL) and extracted with DCM (4 × 50 mL). The organic layers were combined, and the solvent was removed *in vacuo* to yield a yellow residue. Purification using column chromatography gave the pure product.



1i

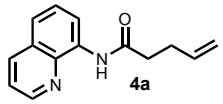
4-methyl-*N*-(quinolin-8-yl)pent-3-enamide (1i): A slurry of 2.94 g (60.0 mmol) NaCN in DMF (3.87 mL) was stirred at 0 ºC as 1-bromo-3-methylbut-2-ene (50.0 mmol) was added slowly. The mixture was allowed to warm to room temperature and was then heated at 50 ºC overnight. The reaction vessel was cooled to room temperature before extracting with pentane (3 × 50 mL). The organic layer was washed with brine, filtered over Na_2SO_4, and concentrated *in vacuo*. The corresponding 4-methylpent-3-enenitrile was carried on without purification and converted to 4-methylpent-enoic acid according to a literature procedure.[3] The title compound was prepared from 4-methylpent-3-enoic acid (1.14 g, 10 mmol) and 8-aminoquinoline (1.44 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a brown oil (1.968 g, 82% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 10.14 (s, 1H), 8.89–8.75 (m, 2H), 8.17 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.62–7.44 (m, 3H), 5.58 (tdt, *J* = 7.5, 2.9, 1.4 Hz, 1H), 3.37–3.26 (m, 2H), 1.93 (d, *J* = 1.4 Hz, 3H), 1.81 (d, *J* = 1.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 169.65, 147.75, 138.15, 137.71, 135.79, 134.07, 127.46, 126.95, 121.05, 120.93, 116.13, 115.82, 37.25, 25.37, 17.67; **HRMS** (ESI-TOF) Calc'd for $C_{15}H_{17}N_2O^+$ $[M+H]^+$ 241.1335, found 241.1339.



1j

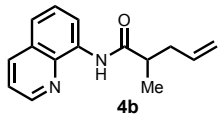
3-methyl-*N*-(quinolin-8-yl)but-3-enamide (1j): To a 50-mL Erlenmeyer flask equipped with a Teflon-coated magnetic stir bar were added chromium(VI) oxide (2.73 g, 2.7 M) and distilled water (4 mL). The reagent mixture was cooled to 0 °C, and concentrated sulfuric acid (2.3 mL) was added dropwise, thereby forming Jones reagent. The solution of Jones reagent was then diluted to a total volume of 10 mL with distilled water. To a 100-mL round-bottom flask equipped with a Teflon-coated magnetic stir bar were added 3-methyl-3-buten-1-ol (1 equiv) and acetone (30 mL). The reaction mixture was then cooled to 0 °C. Jones reagent was added slowly into the reaction mixture over a 30-min period. The reaction was maintained at 0 °C for an additional 2 h. After this time, the reaction mixture was quenched with EtOH (20 mL) while cooling. The reaction mixture was poured carefully into a separatory funnel containing water (30 mL) and extracted with DCM (2 × 30 mL). The combined organic extracts were dried with Na_2SO_4, filtered, and concentrated *in vacuo*. The crude carboxylic acid product was then carried on to the next step without further purification. The title compound was prepared from 3-methylbut-3-enoic acid (1.00 g, 10 mmol) and 8-aminoquinoline (1.44 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a yellow oil (1.781 g, 73% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 10.09 (s, 1H), 8.87–8.76 (m, 2H), 8.18 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.62–7.43 (m, 3H), 5.18–5.12 (m, 2H), 3.32 (d, *J* = 1.1 Hz, 2H), 1.95 (t, *J* = 1.1 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 168.69, 147.83, 139.40, 138.13,

135.81, 134.00, 127.47, 126.91, 121.10, 121.07, 115.93, 115.47, 47.46, 22.09; **HRMS** (ESI-TOF) Calc'd for $C_{14}H_{15}N_2O^+$ $[M+H]^+$ 227.1179, found 227.1170.



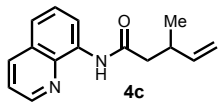
4a

***N*-(quinolin-8-yl)pent-4-enamide (4a)**: The title compound was prepared from pent-4-enoic acid (1.00 g, 10 mmol) and 8-aminoquinoline (1.44 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a brown solid (2.011 g, 89% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.86–8.71 (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), 5.94 (ddt, *J* = 16.7, 10.2, 6.4 Hz, 1H), 5.16 (dq, *J* = 17.1, 1.7 Hz, 1H), 5.05 (dq, *J* = 10.2, 1.4 Hz, 1H), 2.70–2.65 (m, 2H), 2.58 (tdd, *J* = 7.8, 5.7, 1.3 Hz, 2H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 170.94, 148.11, 138.34, 136.86, 136.37, 134.48, 127.94, 127.43, 121.58, 121.41, 116.46, 115.72, 37.33, 29.49; **HRMS** (ESI-TOF) Calcd for $C_{14}H_{15}N_2O^+$ $[M+H]^+$ 227.1179, found 227.1179.



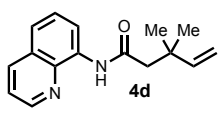
4b

2-Methyl-N-(quinolin-8-yl)pent-4-enamide (4b): The title compound was prepared from 2-methyl-pent-4-enoic acid (1.14 g, 10 mmol) and 8-aminoquinoline (1.44 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a yellow oil (1.872 g, 78% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.88 (s, 1H), 9.13–8.59 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.49 (m, 2H), 7.46 (dd, *J* = 8.2, 4.2 Hz, 1H), 6.03–5.76 (m, 1H), 5.15 (dq, *J* = 17.0, 1.6 Hz, 1H), 5.05 (ddt, *J* = 10.2, 2.0, 1.1 Hz, 1H), 2.70 (hept, *J* = 6.9 Hz, 1H), 2.64–2.51 (m, 1H), 2.46–2.23 (m, 1H), 1.35 (d, *J* = 6.9 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 174.55, 148.13, 138.47, 136.35, 135.65, 134.52, 127.94, 127.45, 121.56, 121.37, 117.07, 116.48, 42.65, 38.45, 17.50; **HRMS** (ESI-TOF) Calcd for $C_{15}H_{17}N_2O^+$ $[M+H]^+$ 241.1335, found 241.1334.



4c

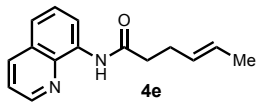
3-Methyl-N-(quinolin-8-yl)pent-4-enamide (4c): The title compound was prepared from 3-methyl-pent-4-enoic acid (1.14 g, 10 mmol) and 8-aminoquinoline (1.44 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a yellow oil (1.728 g, 72% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 9.05–8.59 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.48 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 5.90 (ddd, *J* = 17.2, 10.3, 6.9 Hz, 1H), 5.13 (dt, *J* = 17.2, 1.4 Hz, 1H), 5.01 (dt, *J* = 10.4, 1.3 Hz, 1H), 2.99–2.85 (m, 1H), 2.62 (dd, *J* = 14.3, 7.1 Hz, 1H), 2.51 (dd, *J* = 14.3, 7.4 Hz, 1H), 1.17 (d, *J* = 6.8 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 170.49, 148.11, 142.60, 138.35, 136.35, 134.48, 127.93, 127.43, 121.57, 121.40, 116.47, 113.61, 45.26, 34.83, 19.74; **HRMS** (ESI-TOF) Calcd for $C_{15}H_{17}N_2O^+$ $[M+H]^+$ 241.1335, found 241.1331.



4d

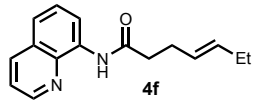
3,3-Dimethyl-*N*-(quinolin-8-yl)pent-4-enamide (4d): 3,3-Dimethylpent-4-enoic acid was prepared from methyl 3,3-dimethyl-pentenoate using a standard hydrolysis procedure. First, methyl 3,3-dimethyl-pentenoate (15 mmol, 1 equiv) was dissolved in a mixture of MeOH/THF/H_2O (1:1:1, 1 M) and NaOH (30

mmol, 2 equiv) and stirred at reflux for 4 h. The crude reaction mixture was first extracted with EtOAc (3 × 20 mL), acidified with 2 M HCl, and extracted again with EtOAc (3 × 20 mL). The combined organic layers were concentrated *in vacuo*. The crude material was carried on to next step without further purification. The title compound was prepared from 3,3-dimethyl-pent-4-enoic acid (1.28 g, 10 mmol) and 8-aminoquinoline (1.00 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a yellow oil (2.032 g, 80% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.77 (s, 1H), 9.09–8.68 (m, 2H), 8.15 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.55–7.47 (m, 2H), 7.44 (dd, *J* = 8.2, 4.2 Hz, 1H), 6.06 (dd, *J* = 17.4, 10.7 Hz, 1H), 5.08 (d, *J* = 22.2 Hz, 1H), 5.05 (d, *J* = 16.2 Hz, 1H), 2.55 (s, 2H), 1.26 (s, 6H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 169.91, 148.08, 146.90, 138.43, 136.28, 134.57, 127.92, 127.42, 121.52, 121.31, 116.41, 111.61, 51.17, 36.68, 27.07; **HRMS** (ESI-TOF) Calcd for $C_{16}H_{19}N_2O^+$ $[M+H]^+$ 255.1492, found 255.1490.



4e

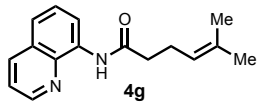
(*E*)-*N*-(quinolin-8-yl)hex-4-enamide (4e): (*E*)-Hex-4-enoic acid was prepared from (*E*)-hex-en-1-ol *via* Jones oxidation following an adapted literature procedure.[4] To a 50-mL Erlenmeyer flask equipped with a Teflon-coated magnetic stir bar were added chromium(VI) oxide (2.73 g, 2.7 M) and distilled water (4 mL). The reagent mixture was cooled to 0 °C, and concentrated sulfuric acid (2.3 mL) was added dropwise, thereby forming Jones reagent. The solution of Jones reagent was then diluted to a total volume of 10 mL with distilled water. To a 100-mL round-bottom flask equipped with a Teflon-coated magnetic stir bar were added (*E*)-4-hexen-1-ol (1 equiv) and acetone (30 mL). The reaction mixture was then cooled to 0 °C. Jones reagent was added slowly into the reaction mixture over a 30-min period. The reaction was maintained at 0 °C for an additional 2 h. After this time, the reaction mixture was quenched with EtOH (20 mL) while cooling. The reaction mixture was poured carefully into a separatory funnel containing water (30 mL) and extracted with DCM (2 × 30 mL). The combined organic extracts were dried with Na_2SO_4, filtered, and concentrated *in vacuo*. The crude carboxylic acid product was then carried on to the next step without further purification. The title compound was prepared from (*E*)-hex-4-enoic acid (1.14 g, 10 mmol) and 8-aminoquinoline (1.00 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a brown solid (1.824 g, 76% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.80 (ddd, *J* = 8.9, 5.9, 1.6 Hz, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.54 (t, *J* = 7.9 Hz, 1H), 7.50 (dd, *J* = 8.2, 1.5 Hz, 1H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 5.92–5.34 (m, 2H), 2.67–2.58 (m, 2H), 2.50 (tdd, *J* = 7.4, 5.8, 1.2 Hz, 2H), 1.69–1.63 (m, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.27, 148.09, 138.37, 136.35, 134.55, 129.34, 127.94, 127.45, 126.50, 121.56, 121.35, 116.46, 38.12, 28.50, 17.94; **HRMS** (ESI-TOF) Calcd for $C_{15}H_{17}N_2O^+$ $[M+H]^+$ 241.1335, found 241.1339.



4f

(*E*)-N-(quinolin-8-yl)hept-4-enamide (4f): Ethyl (*E*)-hept-4-enoate was prepared from 1-penten-3-ol using a Claisen orthoester rearrangement procedure as previously described in the literature.[5] Next, methyl (*E*)-hept-4-enoate (15 mmol, 1 equiv) was dissolved in a mixture of MeOH/THF/H_2O (1:1:1, 1M) and LiOH (30 mmol, 2 equiv) and stirred at room temperature for 4 h. The crude reaction mixture was first extracted with EtOAc (3 x 20 mL), acidified with 2M HCl, extracted again with EtOAc

(3 x 20 mL), and concentration *in vacuo*. The crude material was carried on to next step without further purification. The title compound was prepared from (*E*)-hept-4-enoic acid (1.28 g, 10 mmol) and 8-aminoquinoline (1.00 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a yellow oil (1.778 g, 70% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.84 (s, 1H), 8.87–8.76 (m, 2H), 8.18 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.61–7.45 (m, 3H), 5.64 (dtt, *J* = 15.2, 6.1, 1.3 Hz, 1H), 5.54 (dtt, *J* = 14.9, 6.6, 1.5 Hz, 1H), 2.68–2.62 (m, 2H), 2.59–2.48 (m, 2H), 2.03 (ttt, *J* = 7.4, 6.2, 1.3 Hz, 2H), 0.97 (t, *J* = 7.5 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 170.82, 147.62, 137.91, 135.88, 134.09, 133.20, 127.48, 126.99, 126.62, 121.09, 120.87, 115.98, 37.79, 28.06, 25.09, 13.29; **HRMS** (ESI-TOF) Calcd for $C_{16}H_{19}N_2O^+$ $[M+H]^+$ 255.1492, found 255.1496.



4g

5-Methyl-*N*-(quinolin-8-yl)hex-4-enamide (4g): 5-Methylhex-4-enoic acid was prepared using a modified literature procedure.[6] A mixture of 4-bromobutyric acid (8.38 g, 50 mmol, 1.0 equiv) and triphenylphosphine (13.11 g, 50 mmol, 1.0 equiv) was stirred at refluxed in MeCN (60 mL) for 48 h. After this time period, the solvent was removed *in vacuo*. The residue was washed with CH_2Cl_2 (50 mL), filtered and washed again with CH_2Cl_2 (3 × 50 ml) to afford (3-carboxypropyl)triphenylphosphonium bromide. (3-Carboxypropyl)triphenylphosphonium bromide (924 mg, 2.16 mmol, 1.08 equiv) was suspended in THF (12 ml) at –20 °C. NaHMDS (2.16 ml, 4.32 mmol, 2.16 equiv) was added dropwise into the suspension, and the reaction mixture was stirred for 20 min. The reaction vessel was then cooled to –78 °C, and acetone (2.0 mmol, 1.0 equiv) was added. After 18 h, the solvent was removed *in vacuo*. H_2O (60 ml) was added to the residue, and the resulting mixture was extracted with diethyl ether (3 × 20 ml). The diethyl ether layers were discarded, and the aqueous layer was acidified using HCl (1 M). The acidified aqueous layer was further extracted with ethyl acetate (3 × 20 ml). The combined organic layers were dried over Na_2SO_4 and concentrated *in vacuo*. The crude material was carried on to the amide coupling without further purification. The title compound was prepared from (*E*)-hept-4-enoic acid (1.28 g, 10 mmol) and 8-aminoquinoline (1.00 g, 10 mmol) according to the general amide coupling procedure. Purification using silica gel column chromatography (2:1 hexane:EtOAc) gave the pure product as a yellow oil (1.778 g, % yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.82–8.78 (m, 2H), 8.16 (dd, *J* = 8.2, 1.6 Hz, 1H), 7.54 (t, *J* = 7.9 Hz, 1H), 7.50 (dd, *J* = 8.2, 1.5 Hz, 1H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 5.23 (tq, *J* = 5.6, 1.5 Hz, 1H), 2.59 (dd, *J* = 7.9, 6.4 Hz, 2H), 2.51 (q, *J* = 7.4 Hz, 2H), 1.71 (d, *J* = 1.5 Hz, 3H), 1.67 (d, *J* = 1.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.52, 148.07, 138.37, 136.34, 134.61, 133.46, 127.94, 127.46, 122.55, 121.54, 121.31, 116.44, 38.30, 25.74, 24.24, 17.80; **HRMS** (ESI-TOF) Calcd for $C_{16}H_{19}N_2O^+$ $[M+H]^+$ 255.1492, found 255.1498.

General Procedure for Dicarbofunctionalization of Alkenes

General Procedure A (with organozinc halides): To an 8-mL scintillation vial equipped with a Teflon-coated magnetic stir bar were added the alkene substrate (0.1 mmol), $NiBr_2$ (15 mol%), anhydrous DMA (0.5 mL), and alkyl electrophile (0.8 mmol). Next, the vial was equipped with a septum cap and organozinc halide (0.8 mmol) was added dropwise at room temperature. After addition was complete, the reaction vial was left to stir at 60 ºC for 2–12 h. After the indicated reaction time, the vessel was allowed to cool to room temperature, and the reaction mixture was

diluted with 15 mL of aqueous HCl (1 M) and extracted with EtOAc (5 × 10 mL). The organic layers were combined, and the solvent was removed *in vacuo* to leave a yellow residue that afforded pure product after preparative thin layer chromatography (PTLC).

General Procedure B (with dialkylzinc): To an oven-dried 8-mL scintillation vial equipped with a Teflon-coated magnetic stir bar were added the alkene substrate (0.1 mmol or 0.5 mmol) and $NiBr_2$ (15 mol%). The vial was then equipped with a septum cap, which was pierced by a 20-gauge needle and introduced into an argon-filled glovebox antechamber. Once transferred inside the glovebox, anhydrous DMA (0.2 M), and the dialkylzinc reagent (6 or 8 equiv) were added. The vial was sealed with a screw-top septum cap, removed from the glovebox and alkyl halide (8 equiv) was added. (*Note:* If it is solid/high boiling, it can be added before the glovebox operation). The reaction vessel was placed in a heated stir plate at 60 ºC for 2–12 h. After the indicated reaction time, the vessel was allowed to cool to room temperature, and the reaction mixture was diluted with 15 mL of aqueous HCl (1 M) and extracted with EtOAc (5 × 10 mL). The organic layers were combined, and the solvent was removed *in vacuo* to leave a yellow residue that afforded pure product after preparative thin layer chromatography (PTLC).

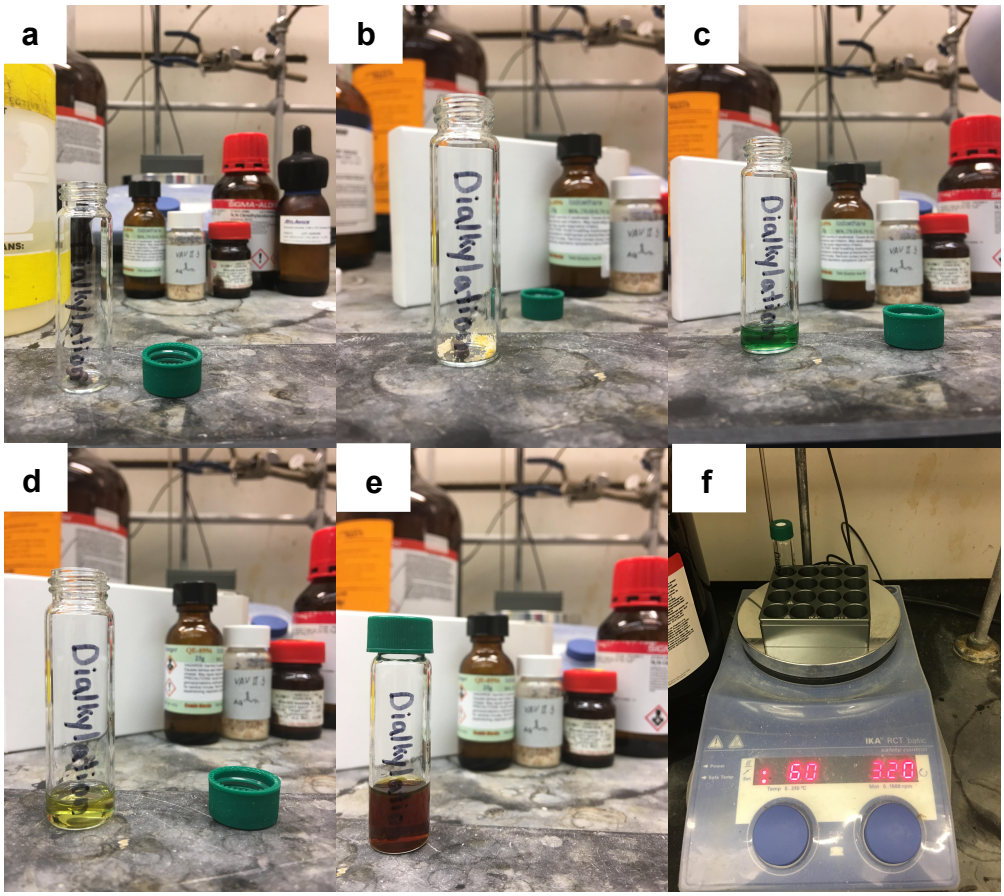
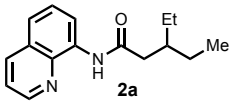
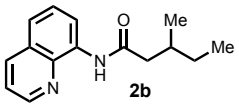


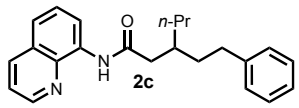
Figure S1. Photographic depiction of reaction setup following general procedure A. a) Standard reagents used outside glovebox. b) Reaction vial with alkene substrate and $NiBr_2$. c) Reaction vial with DMA (0.5 mL) added to solid components. d) Solution color change after addition of alkyl halide. e) Solution color change after addition of organozinc halide in THF. f) Reaction vial stirring at 60 ºC.



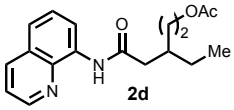
3-ethyl-*N*-(quinolin-8-yl)pentanamide (2a): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a yellow oil (21.2 mg, 83% yield). Additionally, the title compound was also prepared on larger scale from **1a** (106 mg, 0.5 mmol), iodoethane (624 mg, 4.0 mmol), and dimethylzinc (1.2 M in toluene, 3.0 mmol) according to General Procedure A with a reaction time of 2 h. Purification using silica gel column chromatography (1% EtOAc/Hexanes to 5% EtOAc/Hexanes, gradient) gave the pure product as a yellow oil (104 mg, 81% yield). **^{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), 7.56–7.42 (m, 3H), 2.49 (d, *J* = 7.1 Hz, 2H), 1.97 (hept, *J* = 6.5 Hz, 1H), 1.46 (qdd, *J* = 7.3, 6.2, 5.0 Hz, 4H), 0.95 (t, *J* = 7.5 Hz, 6H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.76, 148.11, 138.35, 136.34, 134.60, 127.94, 127.46, 121.54, 121.28, 116.36, 42.60, 38.32, 25.80, 10.91; **HRMS** (ESI-TOF) Calc'd for $C_{16}H_{21}N_2O^+$ $[M+H]^+$ 257.1648, found 257.1650.



3-methyl-*N*-(quinolin-8-yl)pentanamide (2b): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodomethane (113 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (19.4 mg, 80% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.81 (dt, *J* = 6.1, 1.5 Hz, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.41 (m, 3H), 2.57 (dd, *J* = 14.2, 6.3 Hz, 1H), 2.35 (dd, *J* = 14.2, 8.2 Hz, 1H), 2.10 (h, *J* = 6.8 Hz, 1H), 1.55–1.47 (m, 1H), 1.39–1.28 (m, 1H), 1.05 (d, *J* = 6.7 Hz, 3H), 0.97 (t, *J* = 7.5 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.50, 148.11, 138.35, 136.36, 134.57, 127.95, 127.46, 121.55, 121.31, 116.39, 45.67, 32.50, 29.49, 19.33, 11.41; **HRMS** (ESI-TOF) Calc'd for $C_{15}H_{19}N_2O^+$ $[M+H]^+$ 243.1492, found 243.1495.

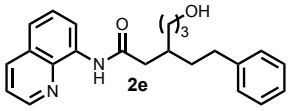


3-phenethyl-*N*-(quinolin-8-yl)hexanamide (2c): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), 1-bromopropane (98 mg, 0.8 mmol), benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (25.6 mg, 74% yield). **^{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), 7.58–7.43 (m, 3H), 7.24 (d, *J* = 15.0 Hz, 2H), 7.21–7.17 (m, 2H), 7.17–7.11 (m, 1H), 2.74–2.65 (m, 2H), 2.56 (dd, *J* = 6.9, 1.6 Hz, 2H), 2.17 (h, *J* = 6.4 Hz, 1H), 1.78–1.70 (m, 2H), 1.51–1.37 (m, 4H), 0.92 (t, *J* = 7.0 Hz, 3H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 171.35, 148.10, 142.58, 138.33, 136.34, 134.53, 128.34, 128.29, 127.44, 125.65, 121.56, 121.34, 116.41, 43.16, 36.14, 35.90, 35.19, 33.13, 19.75, 14.36; **HRMS** (ESI-TOF) Calc'd for $C_{23}H_{27}N_2O^+$ $[M+H]^+$ 347.2118, found 347.2118.

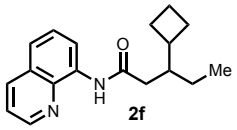


3-ethyl-5-oxo-5-(quinolin-8-ylamino)pentyl acetate (2d): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), 2-bromoethyl acetate

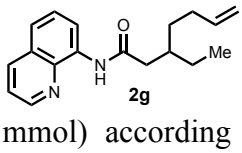
(134 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (4:1 hexane:EtOAc) gave the pure product as a colorless oil (16.9 mg, 51% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.82–8.75 (m, 2H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.43 (m, 3H), 4.18 (qt, *J* = 11.1, 6.9 Hz, 2H), 2.61–2.50 (m, 2H), 2.17 (dq, *J* = 14.4, 7.7, 7.1 Hz, 1H), 2.03 (s, 3H), 1.78 (qd, *J* = 6.9, 5.3 Hz, 2H), 1.55–1.48 (m, 2H), 0.97 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.19, 170.93, 148.14, 138.31, 136.38, 134.45, 127.94, 127.44, 121.60, 121.44, 116.44, 62.63, 42.46, 34.04, 31.94, 26.29, 21.02, 10.80; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{23}N_2O_3^+$ $[M+H]^+$ 315.1703, found 315.1708.



6-hydroxy-3-phenethyl-*N*-(quinolin-8-yl)hexanamide (2e): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), 1-3-bromo-1-propanol (111 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (3:1 hexane:EtOAc) gave the pure product as a colorless oil (23.2 mg, 64% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.82–8.73 (m, 2H), 8.17 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.42 (m, 3H), 7.24 (dd, *J* = 6.7, 1.3 Hz, 2H), 7.21–7.18 (m, 2H), 7.17–7.13 (m, 1H), 3.67 (t, *J* = 6.3 Hz, 2H), 2.76–2.67 (m, 2H), 2.64 (dd, *J* = 14.7, 6.2 Hz, 1H), 2.55 (dd, *J* = 14.6, 7.6 Hz, 1H), 2.21 (dt, *J* = 13.2, 6.4 Hz, 1H), 1.80–1.72 (m, 2H), 1.70–1.63 (m, 2H), 1.56 (qd, *J* = 6.7, 3.1 Hz, 2H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 171.26, 148.16, 142.34, 138.31, 136.42, 134.39, 128.35, 128.34, 127.96, 127.44, 125.75, 121.60, 121.50, 116.57, 62.85, 42.84, 35.93, 34.69, 33.20, 29.85, 29.54; **HRMS** (ESI-TOF) Calc'd for $C_{23}H_{27}N_2O_2^+$ $[M+H]^+$ 363.2067, found 363.2070.

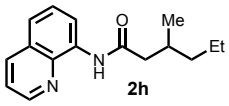


3-cyclobutyl-*N*-(quinolin-8-yl)pentanamide (2f): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), bromocyclobutane (108 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (16.1 mg, 57% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.87–8.77 (m, 2H), 8.18 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.60–7.44 (m, 3H), 2.46 (dd, *J* = 14.3, 5.9 Hz, 1H), 2.40 (dd, *J* = 14.2, 7.5 Hz, 1H), 2.37–2.26 (m, 1H), 2.10–2.03 (m, 2H), 2.00 (ddt, *J* = 12.7, 10.4, 3.7 Hz, 1H), 1.87–1.71 (m, 4H), 1.50 (dddd, *J* = 15.0, 12.4, 6.9, 4.9 Hz, 1H), 1.41–1.32 (m, 1H), 0.95 (t, *J* = 7.5 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.32, 147.66, 137.88, 135.88, 134.16, 127.48, 127.01, 121.08, 120.79, 115.88, 43.26, 39.99, 39.77, 27.27, 26.95, 23.83, 17.41, 10.46; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{23}N_2O^+$ $[M+H]^+$ 283.1805, found 283.1808.

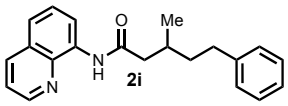


3-ethyl-*N*-(quinolin-8-yl)hept-6-enamide (2g): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), 4-bromobutene (108 mg, 0.8 mmol), and dimethylzinc (1.0 M in heptane, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (13.5 mg, 48% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.80 (ddd, *J* =

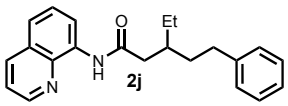
9.0, 5.9, 1.6 Hz, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.67–7.35 (m, 3H), 5.83 (ddt, *J* = 16.9, 10.2, 6.7 Hz, 1H), 5.32–4.71 (m, 2H), 2.51 (d, *J* = 7.0 Hz, 2H), 2.22–2.10 (m, 2H), 2.07 (dt, *J* = 14.6, 7.3 Hz, 1H), 1.54–1.43 (m, 5H), 0.96 (t, *J* = 7.5 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.01, 147.65, 138.37, 137.88, 135.89, 134.10, 127.48, 127.00, 121.10, 120.85, 115.92, 114.01, 42.29, 35.93, 32.14, 30.55, 25.70, 10.33; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{23}N_2O^+$ $[M+H]^+$ 283.1805, found 283.1808.



3-methyl-*N*-(quinolin-8-yl)hexanamide (2h): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodomethane (113 mg, 0.8 mmol), and diethylzinc (1.0 M in hexane, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (18.2 mg, 71% yield). **^{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), 7.57–7.42 (m, 3H), 2.56 (dd, *J* = 14.2, 6.2 Hz, 1H), 2.35 (dd, *J* = 14.2, 8.2 Hz, 1H), 2.23–2.13 (m, 1H), 1.50–1.40 (m, 2H), 1.40–1.31 (m, 1H), 1.31–1.24 (m, 1H), 1.05 (d, *J* = 6.6 Hz, 3H), 0.92 (t, *J* = 7.1 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.47, 148.10, 138.35, 136.35, 134.57, 127.94, 127.46, 121.30, 116.39, 46.02, 39.13, 30.68, 20.13, 19.76, 14.23; **HRMS** (ESI-TOF) Calc'd for $C_{16}H_{21}N_2O^+$ $[M+H]^+$ 257.1648, found 257.1649.

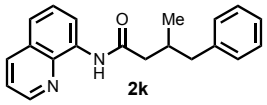


3-methyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (2i): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodomethane (113 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (23.2 mg, 73% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.81–8.66 (m, 2H), 8.15 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.61–7.39 (m, 3H), 7.27–7.23 (m, 2H), 7.21–7.18 (m, 2H), 7.18–7.13 (m, 1H), 2.74 (ddd, *J* = 13.7, 10.8, 5.6 Hz, 1H), 2.67 (ddd, *J* = 13.7, 10.6, 5.9 Hz, 1H), 2.62 (dd, *J* = 14.2, 6.1 Hz, 1H), 2.40 (dd, *J* = 14.2, 8.2 Hz, 1H), 2.31–2.19 (m, 1H), 1.81 (ddt, *J* = 13.5, 11.2, 5.7 Hz, 1H), 1.64–1.57 (m, 1H), 1.12 (d, *J* = 6.7 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.11, 148.10, 142.43, 138.32, 136.35, 134.49, 128.34, 128.32, 127.93, 127.43, 125.69, 121.56, 121.37, 116.42, 45.82, 38.74, 33.47, 30.76, 19.76; **HRMS** (ESI-TOF) Calc'd for $C_{21}H_{23}N_2O^+$ $[M+H]^+$ 319.1805, found 319.1811.

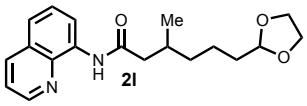


3-ethyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (2j): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (25.6 mg, 77% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.83–8.74 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.41 (m, 3H), 7.25–7.22 (m, 2H), 7.21–7.18 (m, 2H), 7.17–7.13 (m, 1H), 2.70 (dd, *J* = 9.6, 7.0 Hz, 2H), 2.56 (d, *J* = 7.0 Hz, 2H), 2.12 (hept, *J* = 6.5 Hz, 1H), 1.75 (tdd, *J* = 7.9, 6.5, 4.1 Hz, 2H), 1.58–1.50 (m, 2H), 0.98 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 171.38, 148.11, 142.59, 138.34, 136.35, 134.53, 128.34, 128.31, 127.94, 127.45,

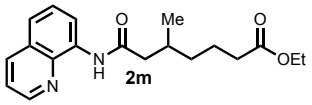
125.66, 121.56, 121.35, 116.41, 42.77, 36.74, 35.40, 33.17, 26.26, 10.80; **HRMS** (ESI-TOF) Calc'd for $C_{22}H_{25}N_2O^+$ $[M+H]^+$ 333.1961, found 333.1964.



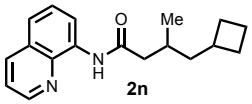
3-methyl-4-phenyl-*N*-(quinolin-8-yl)butanamide (2k): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodomethane (113 mg, 0.8 mmol), and diphenylzinc (122 mg, 0.6 mmol) according to General Procedure A with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (19.1 mg, 63% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.78 (s, 1H), 8.80 (t, *J* = 6.9 Hz, 2H), 8.15 (d, *J* = 9.9 Hz, 1H), 7.56–7.48 (m, 2H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.28 (t, *J* = 7.5 Hz, 2H), 7.25–7.17 (m, 3H), 2.79 (dd, *J* = 13.4, 6.2 Hz, 1H), 2.63–2.56 (m, 2H), 2.51 (ddp, *J* = 14.3, 7.9, 6.4 Hz, 1H), 2.38 (dd, *J* = 14.2, 7.9 Hz, 1H), 1.05 (d, *J* = 6.6 Hz, 3H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 171.18, 148.24, 140.45, 138.45, 136.49, 134.62, 129.44, 128.39, 128.06, 127.56, 126.13, 121.70, 121.51, 116.56, 45.17, 43.22, 32.83, 19.77. Analytical data are consistent with previously published data.[4]



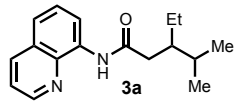
6-(1,3-dioxolan-2-yl)-3-methyl-*N*-(quinolin-8-yl)hexanamide (2l): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and 2-(1,3-dioxalan-2-yl)ethylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (14.1 mg, 43% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.82 (ddd, *J* = 9.0, 5.9, 1.6 Hz, 2H), 8.19 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.59–7.46 (m, 3H), 4.89 (t, *J* = 4.8 Hz, 1H), 4.01–3.94 (m, 2H), 3.89–3.84 (m, 2H), 2.60 (dd, *J* = 14.2, 6.1 Hz, 1H), 2.38 (dd, *J* = 14.2, 8.2 Hz, 1H), 2.25–2.17 (m, 1H), 1.69 (ddd, *J* = 13.6, 8.9, 4.9 Hz, 2H), 1.54 (dddd, *J* = 21.4, 19.5, 8.7, 6.6 Hz, 3H), 1.40–1.34 (m, 1H), 1.08 (d, *J* = 6.6 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 170.82, 147.66, 137.89, 135.89, 134.08, 127.48, 126.98, 121.10, 120.87, 115.94, 104.08, 64.39, 45.39, 36.24, 33.56, 30.46, 21.03, 19.20; **HRMS** (ESI-TOF) Calc'd for $C_{19}H_{25}N_2O_3^+$ $[M+H]^+$ 329.1860, found 329.1861.



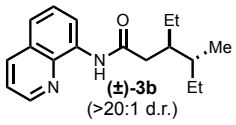
ethyl 5-methyl-7-oxo-7-(quinolin-8-ylamino)heptanoate (2m): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and 3-ethoxy-3-oxopropylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (17.0 mg, 52% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 10.18 (s, 1H), 9.22–9.15 (m, 2H), 8.55 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.97–7.81 (m, 3H), 4.51 (q, *J* = 7.1 Hz, 2H), 2.96 (dd, *J* = 14.3, 6.2 Hz, 1H), 2.80–2.66 (m, 3H), 2.63–2.55 (m, 1H), 2.19–2.05 (m, 2H), 1.89 (ddt, *J* = 13.2, 10.9, 5.4 Hz, 1H), 1.72 (dddd, *J* = 10.4, 8.0, 6.5, 3.8 Hz, 1H), 1.63 (t, *J* = 7.1 Hz, 3H), 1.46 (d, *J* = 6.6 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 173.67, 171.13, 148.14, 138.33, 136.36, 134.49, 127.93, 127.43, 121.58, 121.38, 116.42, 60.23, 45.72, 36.20, 34.44, 30.66, 22.46, 19.64, 14.24; **HRMS** (ESI-TOF) Calc'd for $C_{19}H_{25}N_2O_3^+$ $[M+H]^+$ 329.1860, found 329.1863.



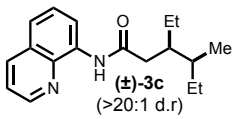
4-cyclobutyl-3-methyl-*N*-(quinolin-8-yl)butanamide (2n): The title compound was prepared from **1a** (21.2 mg, 0.1 mmol), iodomethane (113 mg, 0.8 mmol), and cyclobutylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 2 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (18.6 mg, 66% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.86–8.80 (m, 2H), 8.19 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.60–7.42 (m, 3H), 2.55 (dd, *J* = 14.2, 6.2 Hz, 1H), 2.46 (hept, *J* = 7.9 Hz, 1H), 2.35 (dd, *J* = 14.2, 8.2 Hz, 1H), 2.22–2.13 (m, 1H), 2.13–2.04 (m, 2H), 1.88 (dtt, *J* = 10.9, 9.5, 8.4 Hz, 1H), 1.83–1.77 (m, 1H), 1.72–1.64 (m, 2H), 1.57 (dd, *J* = 7.9, 5.5 Hz, 1H), 1.42 (ddd, *J* = 13.4, 8.1, 7.0 Hz, 1H), 1.03 (d, *J* = 6.7 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.39, 148.11, 138.36, 136.35, 134.57, 127.95, 127.46, 121.55, 121.30, 116.39, 46.10, 44.26, 34.16, 29.51, 29.22, 28.71, 19.92, 18.67; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{23}N_2O^+$ $[M+H]^+$ 283.1805, found 283.1809.



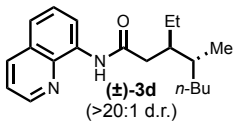
3-ethyl-4-methyl-*N*-(quinolin-8-yl)pentanamide (3a): The title compound was prepared from **1b** (22.6 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (18.1 mg, 67% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.85 (s, 1H), 8.87–8.79 (m, 2H), 8.19 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.60–7.44 (m, 3H), 2.57 (dd, *J* = 14.6, 5.9 Hz, 1H), 2.41 (dd, *J* = 14.6, 7.9 Hz, 1H), 2.00–1.93 (m, 1H), 1.91 (td, *J* = 6.8, 4.2 Hz, 1H), 1.55–1.46 (m, 1H), 1.41 (dt, *J* = 14.1, 7.2 Hz, 1H), 1.02–0.96 (m, 6H), 0.94 (d, *J* = 6.8 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.70, 147.65, 137.88, 135.88, 134.16, 127.48, 127.01, 121.08, 120.79, 115.89, 42.40, 39.19, 28.80, 23.29, 19.10, 18.18, 11.41; **HRMS** (ESI-TOF) Calc'd for $C_{17}H_{23}N_2O^+$ $[M+H]^+$ 271.1805, found 271.1806.



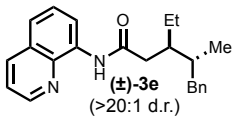
3-ethyl-4-methyl-*N*-(quinolin-8-yl)hexanamide (3b): The title compound was prepared from **1c** (24.0 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (19.3 mg, 68% yield). The title compound was also prepared on larger scale from **1c** (120.0 mg, 0.5 mmol), iodoethane (624 mg, 4.0 mmol), and dimethylzinc (1.2 M in toluene, 4.0 mmol) according to General Procedure A with a reaction time of 12 h. Purification using silica gel column chromatography (1% EtOAc/Hexanes to 5% EtOAc/Hexanes, gradient) gave the pure product as a colorless oil (89.5 mg, 63% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.80 (ddd, *J* = 9.0, 5.9, 1.6 Hz, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.42 (m, 3H), 2.54–2.42 (m, 2H), 2.02 (tdd, *J* = 12.2, 6.3, 3.6 Hz, 1H), 1.53–1.42 (m, 2H), 1.30 (dt, *J* = 13.6, 7.4 Hz, 1H), 1.20–1.10 (m, 1H), 0.96 (t, *J* = 7.4 Hz, 3H), 0.91 (dd, *J* = 8.4, 7.0 Hz, 6H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 172.09, 148.11, 138.35, 136.34, 134.63, 127.94, 127.47, 121.55, 121.25, 116.36, 41.75, 40.36, 36.65, 26.23, 22.83, 15.50, 12.30, 12.21; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{25}N_2O^+$ $[M+H]^+$ 285.1961, found 285.1964.



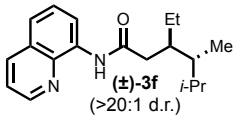
3-ethyl-4-methyl-*N*-(quinolin-8-yl)hexanamide (3c): The title compound was prepared from **1d** (24.0 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (16.5 mg, 58% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.85–8.73 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.57–7.41 (m, 3H), 2.55 (dd, *J* = 14.6, 4.9 Hz, 1H), 2.29 (dd, *J* = 14.6, 8.8 Hz, 1H), 2.09–2.00 (m, 1H), 1.50–1.38 (m, 3H), 1.27–1.20 (m, 1H), 0.94 (td, *J* = 7.4, 2.2 Hz, 6H), 0.87 (d, *J* = 6.8 Hz, 3H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 172.25, 148.10, 138.34, 136.34, 134.63, 127.94, 127.47, 121.55, 121.24, 116.33, 41.20, 39.17, 35.90, 27.07, 24.63, 14.73, 12.28, 12.00; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{25}N_2O^+$ $[M+H]^+$ 285.1961, found 285.1964.



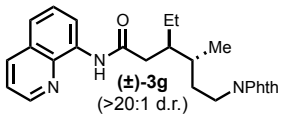
3-ethyl-4-methyl-*N*-(quinolin-8-yl)octanamide (3d): The title compound was prepared from **1e** (26.8 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (19.3 mg, 62% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.80 (ddd, *J* = 9.0, 5.9, 1.6 Hz, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.42 (m, 3H), 2.57–2.39 (m, 2H), 2.04–1.95 (m, 1H), 1.65 (s, 1H), 1.49 (dqd, *J* = 14.9, 7.5, 5.4 Hz, 1H), 1.44–1.18 (m, 7H), 1.17–1.07 (m, 1H), 0.96 (t, *J* = 7.5 Hz, 3H), 0.92 (d, *J* = 6.8 Hz, 3H), 0.88 (t, *J* = 7.1 Hz, 3H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 172.11, 148.10, 138.35, 136.34, 134.63, 127.94, 127.48, 121.54, 121.24, 116.35, 42.00, 40.31, 34.70, 33.21, 30.03, 23.04, 22.90, 16.08, 14.15, 12.25; **HRMS** (ESI-TOF) Calc'd for $C_{20}H_{29}N_2O^+$ $[M+H]^+$ 313.2274, found 313.2279.



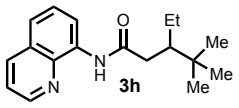
3-ethyl-4-methyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (3e): The title compound was prepared from **1f** (30.2 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (20.7 mg, 60% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.83–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.63–7.43 (m, 3H), 7.22 (dd, *J* = 8.1, 7.0 Hz, 2H), 7.16–7.10 (m, 3H), 2.82 (dd, *J* = 13.3, 4.6 Hz, 1H), 2.60 (dd, *J* = 14.6, 6.6 Hz, 1H), 2.52 (dd, *J* = 14.6, 7.4 Hz, 1H), 2.37–2.27 (m, 1H), 2.11–2.06 (m, 1H), 2.06–2.01 (m, 1H), 1.67–1.58 (m, 1H), 1.42 (dt, *J* = 13.9, 7.4 Hz, 1H), 1.01 (t, *J* = 7.4 Hz, 3H), 0.88 (d, *J* = 6.8 Hz, 3H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 171.75, 148.12, 141.49, 138.33, 136.34, 134.58, 129.06, 128.18, 128.16, 127.94, 127.46, 125.65, 121.55, 121.30, 116.37, 41.92, 40.33, 39.92, 37.08, 23.23, 15.62, 12.19; **HRMS** (ESI-TOF) Calc'd for $C_{23}H_{27}N_2O^+$ $[M+H]^+$ 347.2118, found 347.2120.



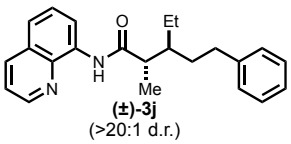
3-ethyl-4,5-dimethyl-*N*-(quinolin-8-yl)hexanamide (3f): The title compound was prepared from **1g** (25.4 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (15.2 mg, 51% yield). **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.82 (s, 1H), 8.80 (ddd, *J* = 9.0, 5.9, 1.5 Hz, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.41 (m, 3H), 2.61 (dd, *J* = 14.7, 6.2 Hz, 1H), 2.48 (dd, *J* = 14.7, 8.0 Hz, 1H), 2.24–2.13 (m, 1H), 1.63 (dq, *J* = 13.6, 6.8 Hz, 1H), 1.54 (dqd, *J* = 14.0, 7.6, 3.4 Hz, 1H), 1.33 (pd, *J* = 7.2, 4.6 Hz, 1H), 1.27–1.17 (m, 1H), 0.99–0.94 (m, 6H), 0.86 (dd, *J* = 6.8, 6.0 Hz, 6H); **^{13}C NMR** (125 MHz, $CDCl_3$) δ 171.93, 148.09, 138.32, 136.32, 134.60, 127.91, 127.45, 121.54, 121.22, 116.33, 41.68, 41.10, 38.90, 30.21, 21.86, 21.63, 19.92, 11.93, 11.76; **HRMS** (ESI-TOF) Calc'd for $C_{19}H_{27}N_2O^+$ $[M+H]^+$ 299.2118, found 299.2119.



6-(1,3-dioxoisoindolin-2-yl)-3-ethyl-4-methyl-*N*-(quinolin-8-yl)hexanamide (3g): The title compound was prepared from **1h** (38.5 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (9.0 mg, 21% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.80 (s, 1H), 8.80 (dd, *J* = 4.2, 1.7 Hz, 1H), 8.72 (dd, *J* = 7.2, 1.8 Hz, 1H), 8.15 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.80 (dd, *J* = 5.4, 3.0 Hz, 2H), 7.68 (dd, *J* = 5.5, 3.0 Hz, 2H), 7.54–7.40 (m, 3H), 3.78–3.68 (m, 2H), 2.53 (dd, *J* = 14.7, 6.4 Hz, 1H), 2.43 (dd, *J* = 14.7, 7.6 Hz, 1H), 2.05 (s, 1H), 1.85 (dtd, *J* = 12.7, 8.2, 4.1 Hz, 1H), 1.78 (ddt, *J* = 10.3, 7.2, 3.7 Hz, 1H), 1.47 (ddd, *J* = 15.1, 7.6, 6.1 Hz, 2H), 1.35 (dq, *J* = 14.3, 7.5 Hz, 1H), 1.06 (d, *J* = 6.8 Hz, 3H), 0.93 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.55, 168.37, 148.14, 138.32, 136.31, 134.52, 133.79, 132.16, 127.91, 127.42, 123.11, 121.56, 121.29, 116.37, 41.85, 39.99, 36.71, 32.46, 32.12, 23.09, 15.95, 12.18; **HRMS** (ESI-TOF) Calc'd for $C_{26}H_{28}N_3O_3^+$ $[M+H]^+$ 430.2125, found 430.2131.

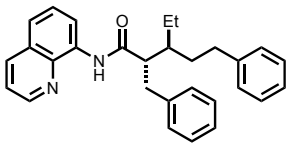


3-ethyl-4,4-dimethyl-*N*-(quinolin-8-yl)pentanamide (3h): The title compound was prepared from **1i** (24.0 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (17.6 mg, 62% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.87–8.75 (m, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.58–7.42 (m, 3H), 2.69 (dd, *J* = 15.3, 4.7 Hz, 1H), 2.32 (dd, *J* = 15.4, 7.1 Hz, 1H), 1.86 (dddd, *J* = 9.2, 7.0, 4.7, 3.2 Hz, 1H), 1.70 (dqd, *J* = 13.8, 7.6, 3.2 Hz, 1H), 1.18 (ddt, *J* = 14.4, 9.2, 7.3 Hz, 1H), 0.99 (t, *J* = 7.4 Hz, 3H), 0.96 (s, 9H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 172.53, 148.09, 138.35, 136.35, 134.74, 127.95, 127.49, 121.54, 121.17, 116.29, 46.85, 39.66, 33.72, 27.67, 23.99, 13.55; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{25}N_2O^+$ $[M+H]^+$ 285.1961, found 285.1965.



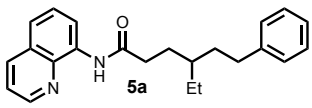
(±)-3j
(>20:1 d.r.)

3-ethyl-2-methyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (3j): The title compound was prepared from **1k** (22.6 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (18.0 mg, 52% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.89 (s, 1H), 8.85–8.70 (m, 2H), 8.16 (ddd, *J* = 8.2, 3.3, 1.7 Hz, 1H), 7.60–7.40 (m, 3H), 7.23–7.15 (m, 4H), 7.13–7.08 (m, 1H), 2.70 (t, *J* = 6.9 Hz, 1H), 2.68–2.58 (m, 2H), 1.89–1.83 (m, 2H), 1.70–1.63 (m, 1H), 1.55–1.51 (m, 2H), 1.31 (d, *J* = 6.9 Hz, 3H), 0.98 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 174.98, 148.14, 142.65, 138.50, 136.32, 134.57, 128.30, 128.27, 127.95, 127.46, 125.63, 121.54, 121.27, 116.39, 44.95, 42.36, 32.92, 31.51, 23.97, 14.08, 11.46; **HRMS** (ESI-TOF) Calc'd for $C_{23}H_{27}N_2O^+$ $[M+H]^+$ 347.2118, found 347.2120.

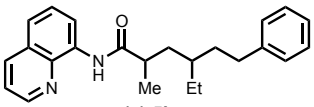


(±)-3k
(>20:1 d.r.)

2-benzyl-3-ethyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (3k): The title compound was prepared from **1l** (30.2 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (16.9 mg, 40% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.61 (s, 1H), 8.80–8.65 (m, 2H), 8.16–8.06 (m, 1H), 7.53–7.35 (m, 3H), 7.26–7.22 (m, 3H), 7.19 (ddd, *J* = 11.3, 8.0, 5.9 Hz, 5H), 7.16–7.04 (m, 2H), 3.16 (dd, *J* = 13.6, 10.1 Hz, 1H), 2.94 (dd, *J* = 13.6, 4.4 Hz, 1H), 2.86 (ddd, *J* = 10.2, 5.9, 4.4 Hz, 1H), 2.70 (dddd, *J* = 31.6, 13.2, 10.4, 5.5 Hz, 2H), 1.96 (ddt, *J* = 13.5, 11.1, 5.4 Hz, 1H), 1.91–1.66 (m, 3H), 1.49 (dt, *J* = 14.4, 7.3 Hz, 1H), 0.99 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 172.98, 148.01, 142.43, 140.30, 138.34, 136.19, 134.33, 128.92, 128.39, 128.37, 128.31, 127.84, 127.36, 126.07, 125.71, 121.47, 121.26, 116.38, 53.54, 42.13, 35.57, 33.12, 32.13, 23.70, 11.75; **HRMS** (ESI-TOF) Calc'd for $C_{29}H_{31}N_2O^+$ $[M+H]^+$ 423.2431, found 423.2431.

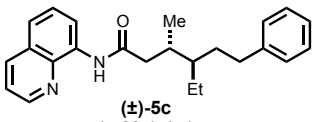


4-ethyl-6-phenyl-*N*-(quinolin-8-yl)hexanamide (5a): The title compound was prepared from **4a** (22.6 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (22.5 mg, 65% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.86–8.75 (m, 2H), 8.16 (dt, *J* = 8.3, 2.2 Hz, 1H), 7.58–7.40 (m, 3H), 7.25 (d, *J* = 1.7 Hz, 3H), 7.21–7.14 (m, 3H), 2.68–2.60 (m, 2H), 2.60–2.53 (m, 2H), 1.90–1.83 (m, 2H), 1.70–1.62 (m, 2H), 1.51–1.42 (m, 3H), 0.93 (t, *J* = 7.3 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 172.01, 148.10, 142.90, 138.34, 136.37, 134.57, 129.19, 128.34, 128.30, 127.47, 125.62, 121.57, 121.32, 116.40, 38.25, 35.55, 34.99, 33.08, 28.74, 25.52, 10.66; **HRMS** (ESI-TOF) Calc'd for $C_{23}H_{27}N_2O^+$ $[M+H]^+$ 347.2118, found 347.2119.



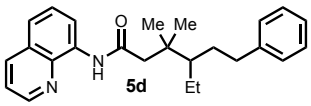
(±)-5b
(1:1 d.r.)

4-ethyl-2-methyl-6-phenyl-*N*-(quinolin-8-yl)hexanamide (5b): The title compound was prepared from **4b** (24.0 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the product as a as a colorless oil (19.1 mg, 53% yield). This product was isolated as an inseparable 1:1 mixture of diastereomers. The reported d.r. was determined by ^{1}H NMR analysis; d.r. values for the crude reaction mixture and purified product were identical. The ensuing analytical data represents both diastereomers. **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.87 (s, 1H), 8.80 (ddt, *J* = 5.6, 3.7, 1.7 Hz, 2H), 8.17 (dt, *J* = 8.3, 1.8 Hz, 1H), 7.59–7.41 (m, 3H), 7.25–7.08 (m, 5H), 2.70 (dp, *J* = 14.0, 6.8, 6.2 Hz, 1H), 2.60 (dt, *J* = 10.1, 6.8 Hz, 2H), 1.90 (dt, *J* = 16.6, 8.4 Hz, 1H), 1.73–1.58 (m, 2H), 1.53–1.39 (m, 4H), 1.32 (dd, *J* = 6.8, 2.2 Hz, 3H), 0.90 (q, *J* = 7.1 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 148.14, 142.99, 138.47, 136.35, 136.33, 134.59, 128.35, 128.31, 128.24, 128.20, 127.94, 127.46, 125.56, 125.51, 121.56, 121.30, 116.46, 40.75, 40.59, 38.35, 38.31, 36.47, 36.45, 35.25, 35.12, 33.01, 32.84, 25.79, 25.73, 18.60, 18.53, 10.42, 10.40; **HRMS** (ESI-TOF) Calc'd for $C_{24}H_{29}N_2O^+$ $[M+H]^+$ 361.2274, found 361.2274.



(±)-5c
(> 20:1 d.r.)

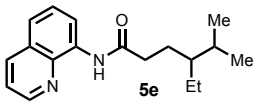
4-ethyl-3-methyl-6-phenyl-*N*-(quinolin-8-yl)hexanamide (5c): The title compound was prepared from **4c** (24.0 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (20.5 mg, 57% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.79 (s, 1H), 8.80 (dq, *J* = 5.6, 1.9, 1.5 Hz, 2H), 8.16 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.56–7.43 (m, 3H), 7.27–7.24 (m, 2H), 7.23–7.19 (m, 2H), 7.18–7.12 (m, 1H), 2.70 (ddd, *J* = 13.6, 10.9, 5.5 Hz, 1H), 2.65–2.58 (m, 1H), 2.57 (dd, *J* = 14.0, 5.3 Hz, 1H), 2.47–2.40 (m, 1H), 2.37–2.29 (m, 1H), 1.68 (dddd, *J* = 13.6, 10.8, 5.9, 4.7 Hz, 1H), 1.53 (dddd, *J* = 13.5, 10.7, 7.9, 5.5 Hz, 1H), 1.43 (pd, *J* = 7.1, 2.2 Hz, 2H), 1.38–1.30 (m, 1H), 1.03–0.91 (m, 6H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.59, 148.11, 142.98, 138.33, 136.35, 134.54, 128.37, 128.29, 127.94, 127.45, 125.64, 121.57, 121.33, 116.39, 43.76, 43.08, 34.31, 32.20, 31.88, 23.69, 15.65, 12.21; **HRMS** (ESI-TOF) Calc'd for $C_{24}H_{29}N_2O^+$ $[M+H]^+$ 361.2274, found 361.2271.



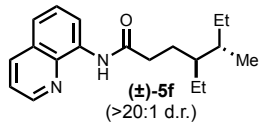
5d

4-ethyl-3,3-dimethyl-6-phenyl-*N*-(quinolin-8-yl)hexanamide (5d): The title compound was prepared from **4d** (25.4 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and benzylzinc bromide (0.5 M in THF, 0.8 mmol) according to General Procedure B with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (23.9 mg, 64% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.77 (s, 1H), 8.84–8.77 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.57–7.40 (m, 3H), 7.26 (d, *J* = 4.2 Hz, 2H), 7.22–7.15 (m, 3H), 2.74 (ddd, *J* = 13.5, 11.8, 5.2 Hz, 1H), 2.61 (ddd, *J* = 13.5, 11.4, 5.6 Hz, 1H), 2.47 (d, *J* = 2.4 Hz, 2H), 1.89 (dddd, *J* = 14.4, 11.7, 5.7, 2.9 Hz, 1H), 1.77–1.68 (m, 1H), 1.46 (dddd, *J* = 13.7, 11.8, 7.1, 5.3 Hz, 1H), 1.29 (qd, *J* = 6.7, 6.0, 2.7 Hz, 2H), 1.14 (d, *J* = 2.5 Hz, 6H), 1.03 (t, *J* = 7.3 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 170.83, 148.11, 143.08, 138.37, 136.31, 134.56, 128.35, 128.30, 127.93, 127.43, 125.68, 121.54,

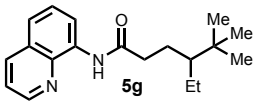
121.27, 116.32, 49.32, 48.58, 37.66, 36.50, 33.50, 25.33, 25.29, 23.91, 14.35; **HRMS** (ESI-TOF) Calc'd for $C_{25}H_{31}N_2O^+$ $[M+H]^+$ 375.2431, found 375.2432.



3-ethyl-2-methyl-5-phenyl-*N*-(quinolin-8-yl)pentanamide (5e): The title compound was prepared from **4e** (24.0 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (15.6 mg, 55% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.84–8.74 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.40 (m, 3H), 2.66–2.46 (m, 2H), 1.95–1.59 (m, 3H), 1.47–1.35 (m, 1H), 1.35–1.23 (m, 2H), 1.21–1.11 (m, 1H), 0.95–0.85 (m, 9H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 172.21, 148.09, 138.35, 136.36, 134.61, 127.94, 127.47, 121.55, 121.27, 116.38, 45.16, 36.51, 28.89, 25.90, 22.74, 19.35, 19.12, 12.01; **HRMS** (ESI-TOF) Calc'd for $C_{18}H_{25}N_2O^+$ $[M+H]^+$ 285.1961, found 285.1965.

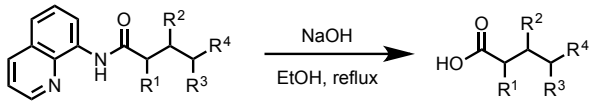


4-ethyl-5-methyl-*N*-(quinolin-8-yl)heptanamide (5f): The title compound was prepared from **4f** (25.4 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (15.5 mg, 52% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.83 (s, 1H), 8.86–8.78 (m, 2H), 8.19 (dd, *J* = 8.2, 1.7 Hz, 1H), 7.62–7.45 (m, 3H), 2.66–2.52 (m, 2H), 1.82 (qdt, *J* = 13.7, 9.4, 6.6 Hz, 2H), 1.57–1.48 (m, 1H), 1.48–1.35 (m, 2H), 1.33–1.26 (m, 1H), 1.25–1.16 (m, 2H), 0.96 (t, *J* = 7.4 Hz, 3H), 0.93–0.90 (m, 3H), 0.88 (d, *J* = 6.9 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.73, 147.62, 137.90, 135.90, 134.15, 127.48, 127.01, 121.09, 120.80, 115.93, 43.23, 36.15, 35.59, 26.09, 21.74, 14.69, 11.98, 11.87; **HRMS** (ESI-TOF) Calc'd for $C_{19}H_{27}N_2O^+$ $[M+H]^+$ 299.2118, found 299.2119.



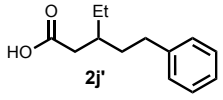
4-ethyl-5,5-dimethyl-*N*-(quinolin-8-yl)hexanamide (5g): The title compound was prepared from **4g** (26.8 mg, 0.1 mmol), iodoethane (137 mg, 0.8 mmol), and dimethylzinc (1.2 M in toluene, 0.8 mmol) according to General Procedure A with a reaction time of 12 h. Purification using preparative thin layer chromatography (PTLC) (9:1 hexane:EtOAc) gave the pure product as a colorless oil (12.2 mg, 41% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 9.81 (s, 1H), 8.85–8.76 (m, 2H), 8.16 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.59–7.40 (m, 3H), 2.69 (ddd, *J* = 15.2, 10.0, 5.3 Hz, 1H), 2.45 (ddd, *J* = 14.7, 9.6, 6.5 Hz, 1H), 2.13 (dddd, *J* = 12.8, 9.5, 6.5, 2.4 Hz, 1H), 1.40 (dddd, *J* = 13.2, 10.9, 9.7, 5.3 Hz, 1H), 1.34–1.22 (m, 3H), 0.92 (d, *J* = 14.6 Hz, 12H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 171.75, 147.63, 137.89, 135.91, 134.14, 127.49, 127.01, 121.10, 120.83, 115.95, 42.28, 36.91, 32.75, 29.24, 27.20, 26.86, 13.62; **HRMS** (ESI-TOF) Calc'd for $C_{19}H_{27}N_2O^+$ $[M+H]^+$ 299.2118, found 299.2121.

General Procedure for Removal of 8-Aminoquinoline Directing Group

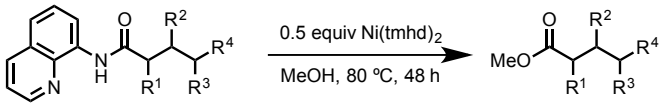


Scheme S2. Amide hydrolysis to remove 8-aminoquinoline directing group.

General Procedure for Hydrolysis of Directing Group: The 8-aminoquinoline directing group was removed by adapting a literature procedure.[7] To a flame-dried 20-mL sealed vessel equipped with a Teflon-coated magnetic stir bar was added dicarbofunctionalized product (0.1 mmol), NaOH (1.5 mmol, 15 equiv), and 0.4 mL of EtOH. The resulting mixture was stirred at 130 ºC for 16 h. At this time, the reaction mixture was allowed to cool to room temperature, diluted with 50 mL of EtOAc and washed with HCl (1 M, 3 × 4 mL). The organic layers were combined, dried over Na_2SO_4, and concentrated *in vacuo* to give pure hydrolysis free acid product.

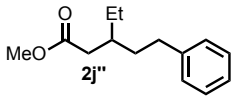


3-ethyl-5-phenylpentanoic acid (2j'): The title compound was prepared from **2j** (33.2 mg, 0.1 mmol) using the general directing group hydrolysis procedure. Following a straightforward work-up, the product was obtained as a brown oil (20.1 mg, 98% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 7.30–7.26 (m, 2H), 7.20–7.15 (m, 3H), 2.62 (t, *J* = 8.2 Hz, 2H), 2.36 (d, *J* = 7.0 Hz, 2H), 1.90 (hept, *J* = 6.5 Hz, 1H), 1.70–1.60 (m, 2H), 1.51–1.39 (m, 2H), 0.92 (t, *J* = 7.4 Hz, 3H); **^{13}C NMR** (150 MHz, $CDCl_3$) δ 141.91, 127.89, 127.84, 125.30, 37.65, 35.62, 34.80, 32.54, 25.67, 10.22.



Scheme S3. Amide methanolysis to remove 8-aminoquinoline directing group.

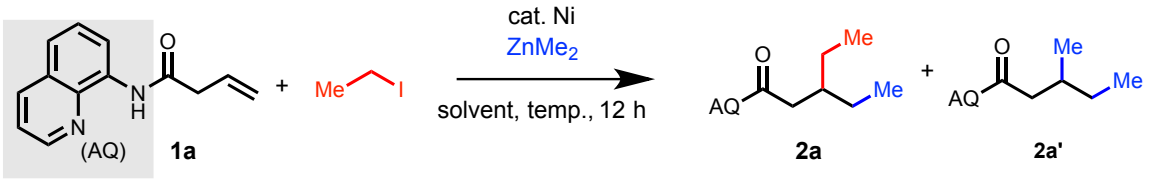
General Procedure for Methanolysis of Directing Group: The 8-aminoquinoline directing group was removed by adapting a literature procedure.[9] To a 2 dram vial equipped with a Teflon-coated magnetic stir bar was added dicarbofunctionalized product (0.1 mmol), $Ni(tmhd)_2$ (0.05 mmol, 0.5 equiv), and 1.0 mL of MeOH. The resulting mixture was stirred at 80 ºC for 48 h. At this time, the reaction mixture was allowed to cool to room temperature, then concentrated *in vacuo* over an ice bath. The crude residue was purified by silica gel column chromatography to give pure methyl ester product.



methyl 3-ethyl-5-phenylpentanoate (2j''): The title compound was prepared from **2j** (33.2 mg, 0.1 mmol) using the general directing group methanolysis procedure. The crude residue was purified using PTLC (20:1 pentane:Et_2O), giving pure product as a colorless oil (17.8 mg, 81% yield). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 7.32–7.29 (m, 2H), 7.25–7.16 (m, 3H), 3.69 (s, 3H), 2.63 (ddd, *J* = 9.0, 6.6, 1.8 Hz, 2H), 2.34 (dd, *J* = 6.9, 1.9 Hz, 2H), 1.91 (p, *J* = 6.5 Hz, 1H), 1.73–1.59 (m, 2H), 1.52–1.35 (m, 1H), 0.93 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (150 MHz, $CDCl_3$) δ 173.86, 142.51, 128.33, 128.30, 125.72, 51.43, 38.46, 36.26, 35.37, 33.01, 26.21, 10.70.

Optimization Table with Selected Additional Entries

Table S2. Extended optimization table (as shown in Table 1).[a,b]



entry	cat. Ni	EtI (equiv)	$ZnMe_2$ (equiv)	solvent (M)	temp. (ºC)	yield **2a** (%)[b]	yield **2a'** (%)[b]
1	20% $Ni(cod)_2$	2	2	dioxane (0.5)	100	19	14
2	20% $Ni(cod)_2$	2	2	THF (0.5)	100	23	18
3	20% $Ni(cod)_2$	2	2	MeCN (0.5)	100	8	5
4	20% $Ni(cod)_2$	2	2	toluene (0.5)	100	11	7
5	20% $Ni(cod)_2$	2	2	NMP (0.5)	100	16	8
6	20% $Ni(cod)_2$	2	2	DMF (0.5)	100	13	5
7	20% $Ni(cod)_2$	2	2	DMA (0.5)	100	17	8
8	20% $Ni(cod)_2$	2	2	DMA (0.5)	RT	11	4
9	20% $Ni(cod)_2$	2	2	DMA (0.5)	60	15	6
10	20% $Ni(cod)_2$	2	2	DMA (0.1)	60	21	10
11	20% $Ni(cod)_2$	2	2	DMA (1.0)	60	11	4
12	20% $NiCl_2$•glyme	2	2	DMF (0.5)	100	31	16
13	20% $NiCl_2$•glyme	2	2	DMF (0.5)	RT	6	2
14	20% $NiCl_2$•glyme	2	2	THF (0.5)	RT	21	16
15	20% $NiCl_2$•glyme	2	2	toluene (0.5)	RT	9	4
16	20% $NiCl_2$•glyme	2	2	dioxane (1.0)	100	40	15
17	20% $NiCl_2$•glyme	2	2	dioxane (0.1)	100	28	6
18	20% $NiCl_2$•glyme	2	2	dioxane (0.2)	100	26	8
19	20% $NiCl_2$•glyme	2	2	DMF (1.0)	100	28	< 5
20	20% $NiCl_2$•glyme	2	2	DMA (1.0)	100	36	< 5
21	20% $NiCl_2$•glyme	3	3	DMF (0.5)	100	46	16
22	20% $Ni(OAc)_2$•$4H_2O$	3	3	DMF (0.5)	100	41	12
23	20% $Ni(acac)_2$	3	3	DMF (0.5)	100	51	16
24	20% $NiBr_2$	3	3	DMF (0.5)	100	58	17
25	15% $NiBr_2$	2	2	DMA (1.0)	100	58	12
26	15% $NiBr_2$	2	2	DMA (0.5)	100	60	14
27	15% $NiBr_2$	2	2	DMA (0.2)	100	60	11
28	15% $NiBr_2$	1	1	DMA (0.2)	100	20	11
29	10% $NiBr_2$	2	2	DMA (0.2)	100	63	22
30	15% $NiBr_2$	4	4	DMA (0.2)	60	70	6
31	15% $NiBr_2$	4	2	DMA (0.2)	60	44	27
32	15% $NiBr_2$	8	2	DMA (0.2)	60	45	11
33	15% $NiBr_2$	8	4	DMA (0.2)	60	72	14
34	15% $NiBr_2$	6	6	DMA (0.2)	60	70	16
35	15% $NiBr_2$	6	4	DMA (0.2)	60	63	18
36	15% $NiBr_2$	8	8	DMA (0.2)	60	90	7
37	15% $NiBr_2$	8	6	DMA (0.5)	60	83	12
38	5% $NiBr_2$	8	4	DMA (0.2)	60	56	19
39	1% $NiBr_2$	8	6	DMA (0.2)	60	44	15
40	none	8	8	DMA (0.5)	60	0	0

[a]Reaction conditions: alkene (0.1 mmol), $ZnMe_2$ (1.2 M in toluene). [b]Yields determined by ^1H NMR analysis using CH_2Br_2 as internal standard; n.d. = not detected.

Representative ^{1}H NMR Spectrum of Crude Reaction Mixture

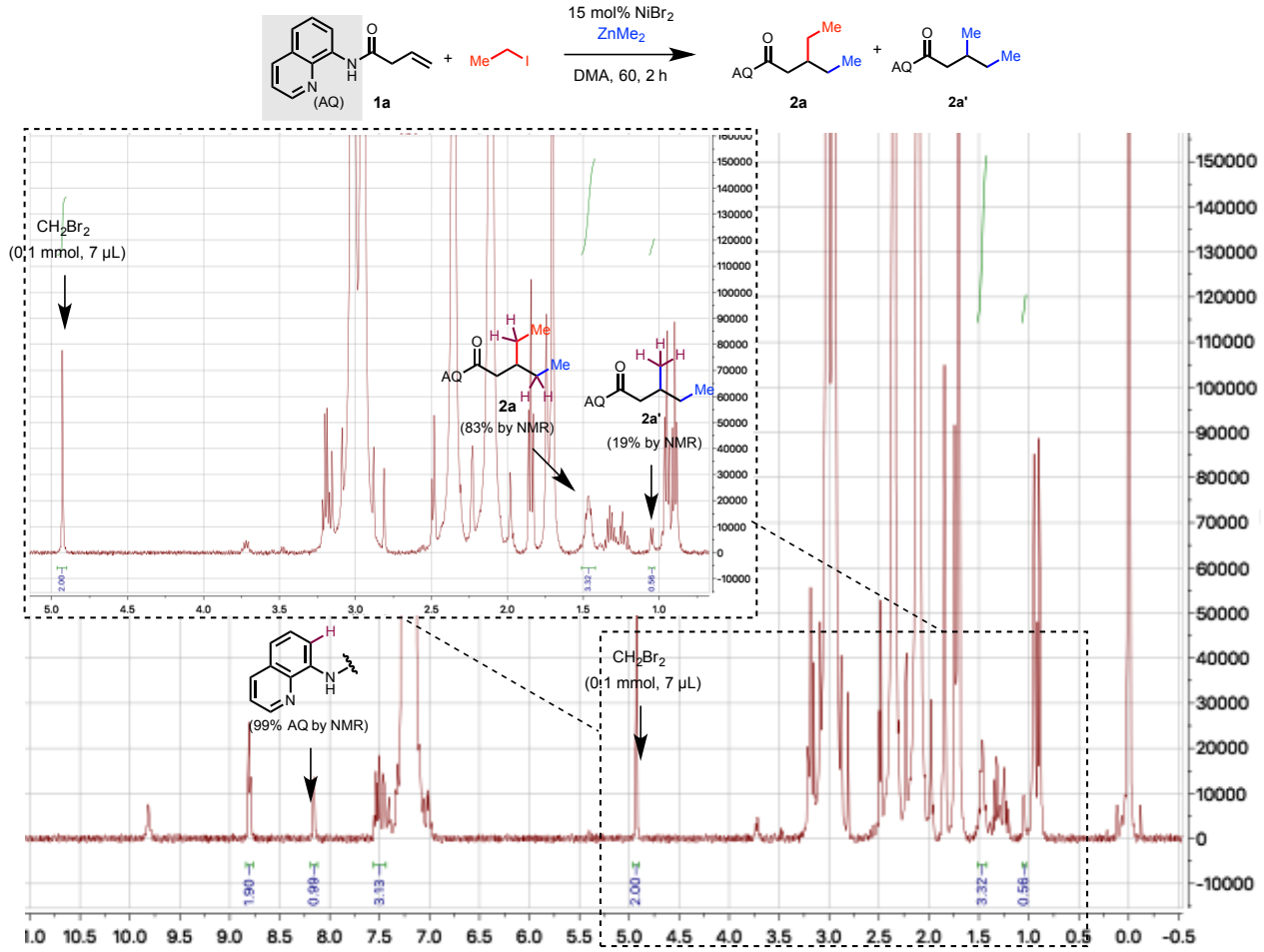


Figure S2. Representative ^{1}H NMR spectrum of crude reaction mixture using standard conditions with peak integration relative to dibromomethane.

Determination of Relative Stereochemistry for Internal Substrates

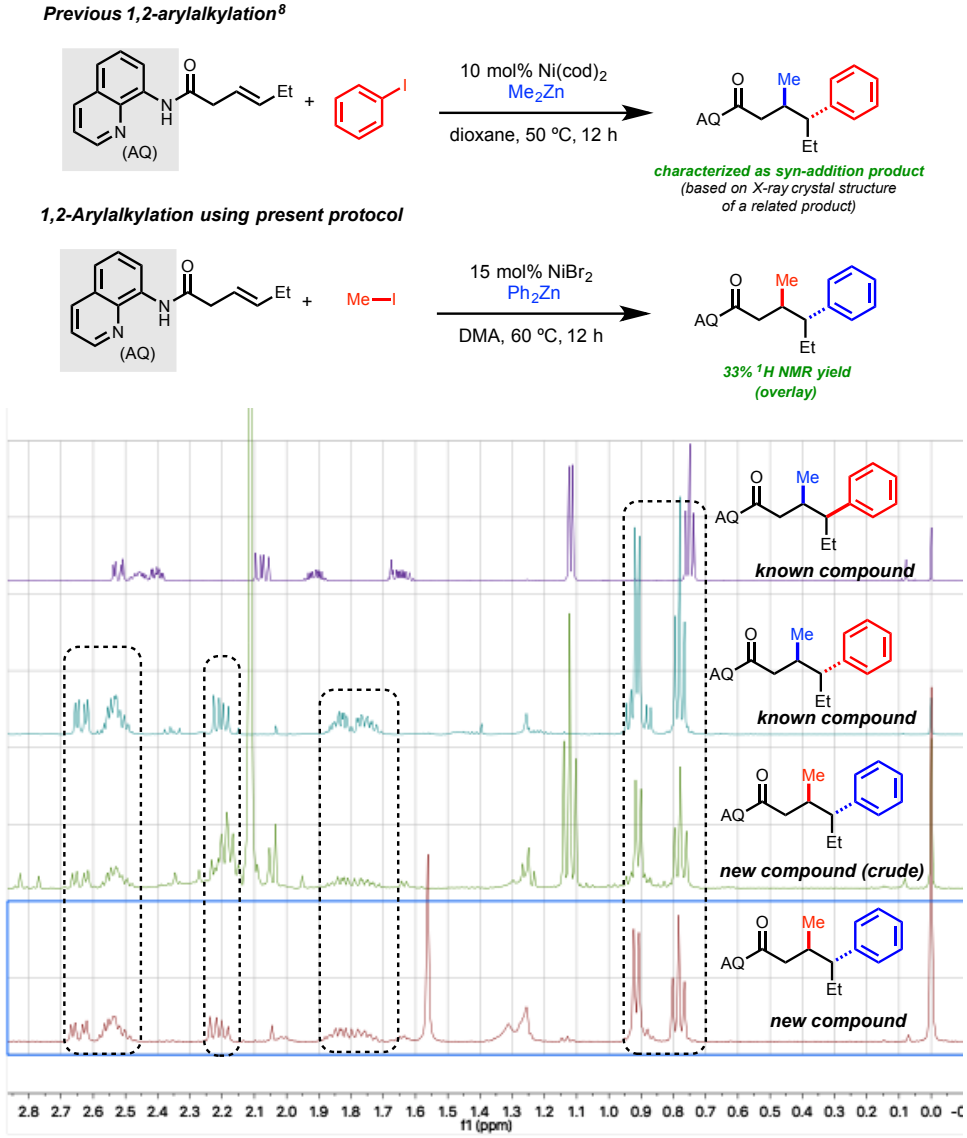


Figure S3. Comparison of a previously characterized diastereomer under previous literature conditions and an adapted synthesis of the same diastereomer using current conditions.

Representative Unsuccessful Coupling Partners

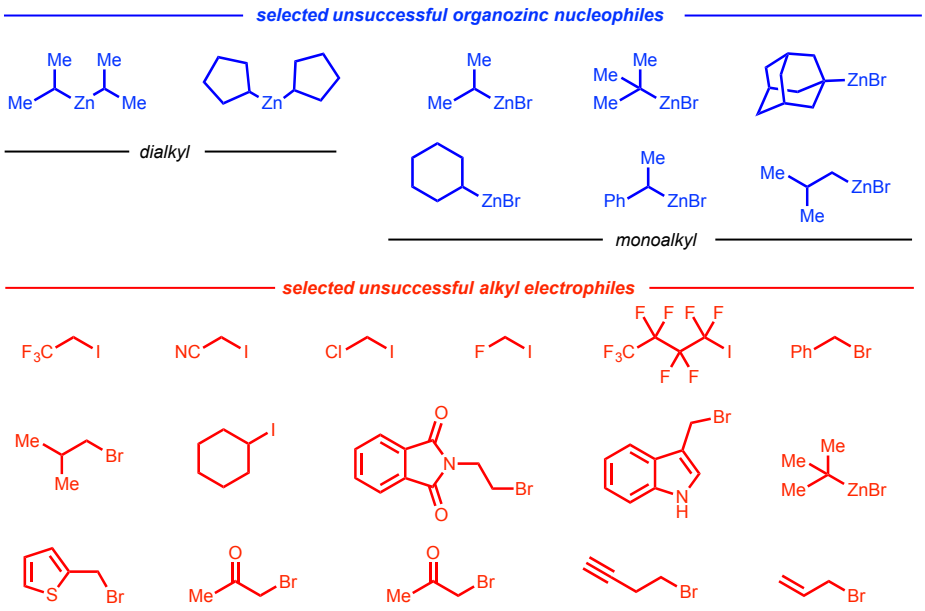
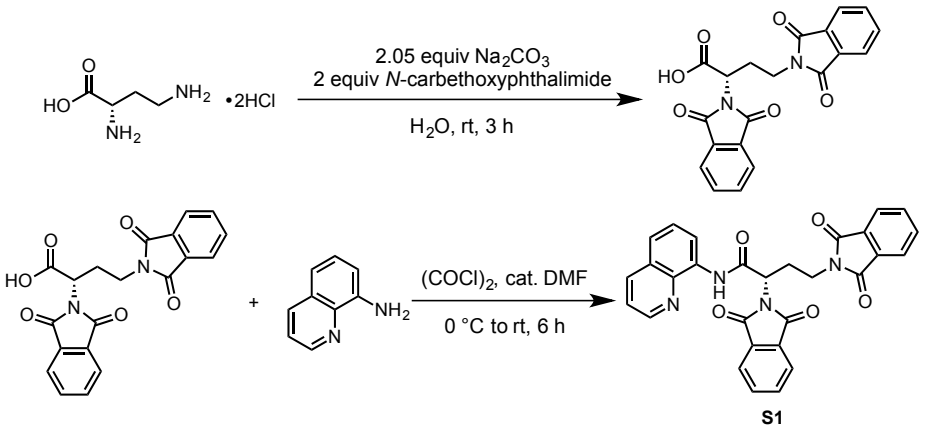


Figure S4. Selected examples of low-yielding coupling partners in the reported optimized 1,2-dialkylation reaction.

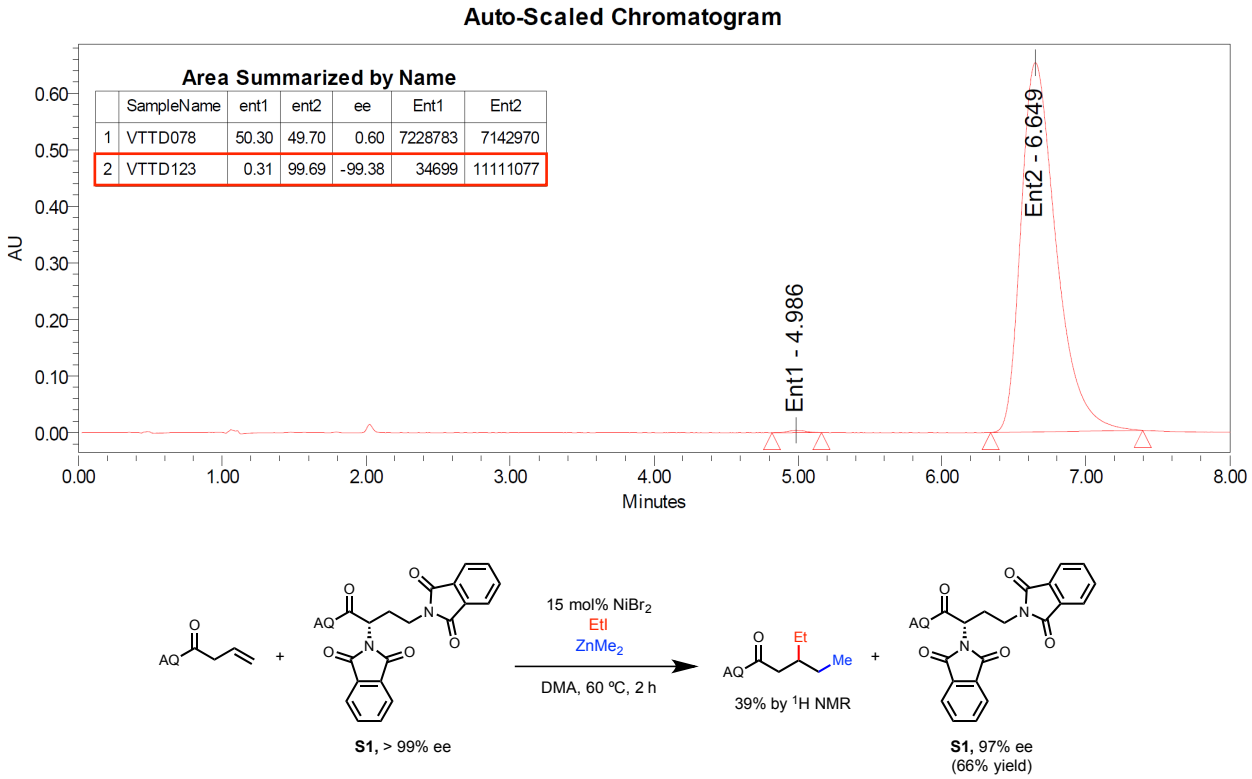
Procedure for Racemizable Additive Experiment



Scheme S4. Synthesis of racemizable additive **S1**.

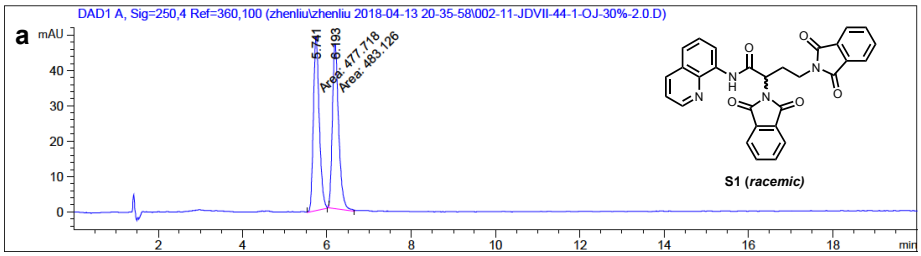
(*S*)-2,4-bis(1,3-dioxoisoindolin-2-yl)-*N*-(quinolin-8-yl)butanamide (S1): Na_2CO_3 (1.30 g, 12.3 mmol) and water (16 mL) were charged into a 50-mL RB flask. To this solution was added L-2,4-diaminobutyric acid dihydrochloride (1.15 g, 6.00 mmol). Once all solids were dissolved, *N*-carbethoxyphthalimide (2.63 g, 12.0 mmol) was added, and the reaction was allowed to stir at ambient temperature for 3 h. The reaction was then diluted with sat. $NaHCO_3$ (50 mL). The aqueous layer was washed with EtOAc (150 mL, ×3) then acidified with conc. HCl to pH = 1 and extracted with EtOAc (100 mL, ×3). The organic layers were combined, dried over Na_2SO_4,

and concentrated to give crude (*S*)-2,4-bis(1,3-dioxoisoindolin-2-yl)butanoic acid as a white viscous oil (quantitative yield of crude material), which was used in the next step without further purification. Crude (*S*)-2,4-bis(1,3-dioxoisoindolin-2-yl)butanoic acid (757 mg, 2.00 mmol) was charged into a 50-mL RB flask containing DCM (12.5 mL) and cooled to 0 °C. Oxalyl chloride (0.16 mL, 1.90 mmol) was added dropwise to the solution followed by 2–3 drops of *N,N*-dimethylformamide. The reaction was allowed to warm to ambient temperature stir for 3 h. The reaction was then cooled to 0 °C, and 8-aminoquinoline (260 mg, 1.80 mmol) was added. The reaction was allowed to warm to room temperature and stir for 3 h. The resulting solution was diluted with DCM (50 mL), washed with sat. $NaHCO_3$ (50 mL, ×2), brine (50 mL, ×1), dried over Na_2SO_4, and concentrated. The crude mixture was purified by column chromatography (40% EtOAc in Hexanes) to afford **3c** (391 mg, 39% yield, 99% ee) as a white solid. Compound **3c** was analyzed by chiral SFC on a Daicel IA column (3 mm, 4.6 × 250 mm) under isocratic conditions [60% MeOH / CO_2 (3 mL/min), 1600 psi backpressure] at 30 °C. The enantiomers were detected by UV light (220 nm). **^{1}H NMR** (600 MHz, $CDCl_3$) δ 10.27 (s, 1H), 8.67 (dd, *J* = 5.0, 4.0 Hz, 1H), 8.64 (dd, *J* = 4.3, 1.7 Hz, 1H), 8.11 (dd, *J* = 8.3, 1.7 Hz, 1H), 7.90 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.80 (dd, *J* = 5.4, 3.1 Hz, 2H), 7.76 (dd, *J* = 5.4, 3.0 Hz, 2H), 7.69 (dd, *J* = 5.5, 3.0 Hz, 2H), 7.52–7.46 (m, 2H), 7.39 (dd, *J* = 8.3, 4.3 Hz, 1H), 5.14 (t, *J* = 8.1 Hz, 1H), 3.94 (dt, *J* = 14.6, 7.4 Hz, 1H), 3.86 (dt, *J* = 14.1, 6.0 Hz, 1H), 3.00 (td, *J* = 7.6, 5.9 Hz, 2H). **^{13}C NMR** (150 MHz, $CDCl_3$) δ 168.33, 168.15, 166.24, 148.50, 138.58, 136.35, 134.41, 134.14, 133.91, 132.11, 132.02, 127.93, 127.37, 123.80, 123.46, 122.13, 121.75, 116.91, 52.72, 35.37, 27.34. **HRMS** calcd. for $C_{29}H_{21}N_4O_5^+$ $[M+H]^+$: 505.15065, Found: 505.15073.



Scheme S5. Racemization test with additive **S1**.

General Procedure for racemizable additive experiment: To an oven-dried 8-mL scintillation vial equipped with a Teflon-coated magnetic stir bar were added the alkene substrate (0.1 mmol), chiral additive (**S1**) (0.1 mmol) and $NiBr_2$ (15 mol%). The vial was then equipped with a septum cap, which was pierced by a 20-gauge needle and introduced into an argon-filled glovebox antechamber. Once transferred inside the glovebox, anhydrous DMA (0.2 M), and the dialkylzinc reagent (2 equiv) were added. The vial was sealed with a screw-top septum cap, removed from the glovebox and alkyl halide (2 equiv) was added. The reaction vessel was placed in a heated stir plate at 60 ºC for 2h. After the indicated reaction time, the vessel was allowed to cool to room temperature, and the reaction mixture was diluted with 15 mL of aqueous sat. $NaHCO_3$ and extracted with EtOAc (5 × 10 mL). The organic layers were combined, and the solvent was removed *in vacuo* to leave a yellow residue that afforded pure product and recovered chiral additive after preparative thin layer chromatography (PTLC) (1:1 hexanes:EtOAc). The recovered chiral additive ee was determined by SFC analysis on a Chiralpak OJ-H column (30% isopropanol in CO_2, 1.0 mL/min) with retention time 5.75 min (minor) and 6.20 min (major).



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
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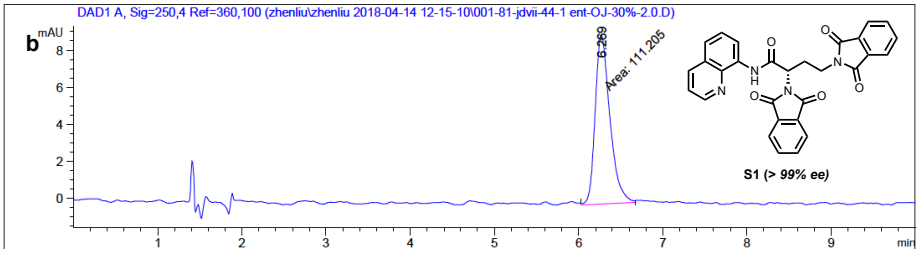
2	6.193	MM	0.1724	483.12634	46.70114	50.2814
Totals :				960.84412	95.97465	



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
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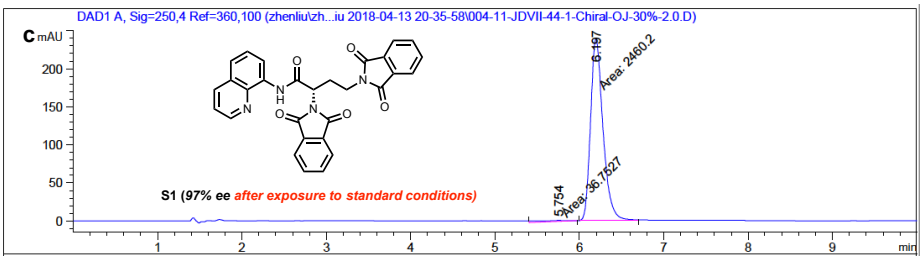

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2	6.197	MM	0.1720	2460.20361	238.44966	98.5281
Totals :				2496.95633	239.78098	

Figure S5. SFC traces for racemic **S1** (**a**), enantiopure **S1** (**b**), and enantioenriched recovered **S1** after reaction conditions (**c**).

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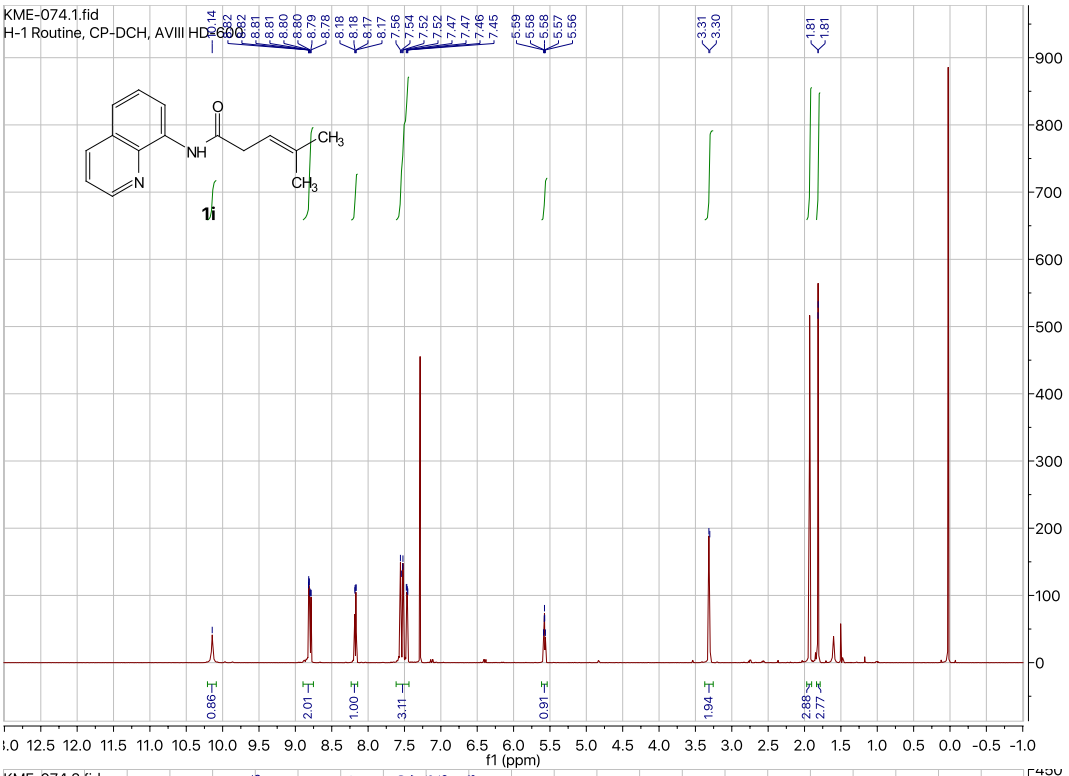
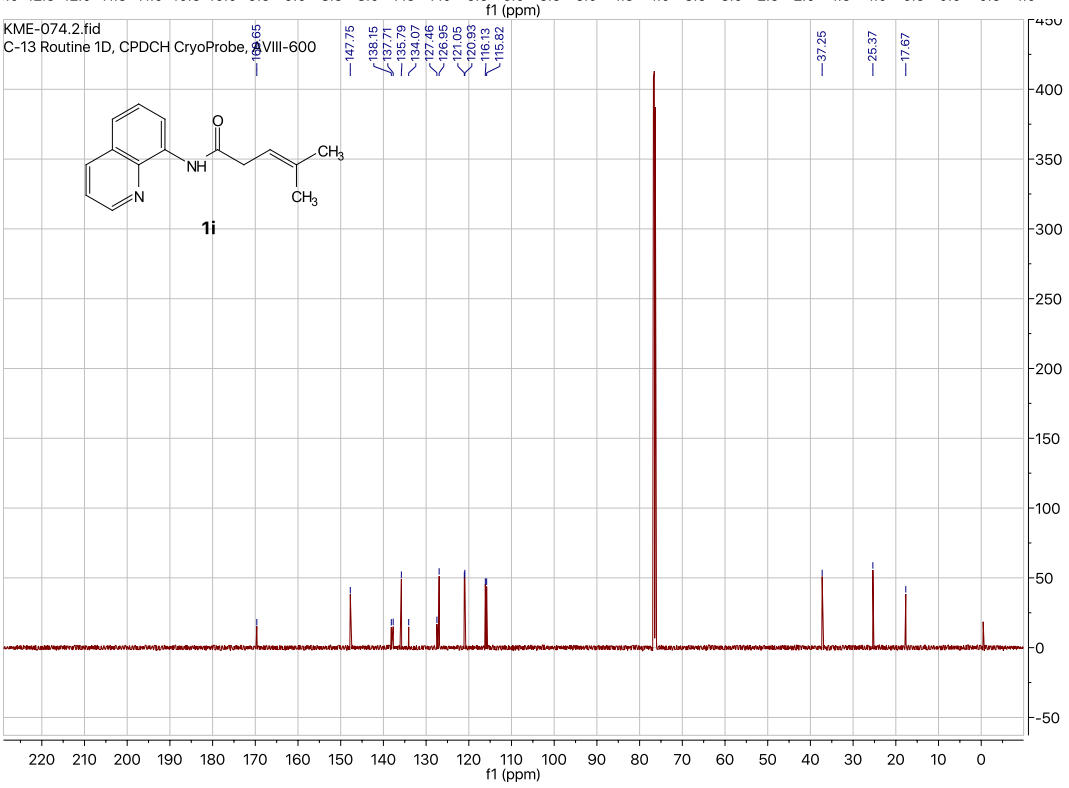
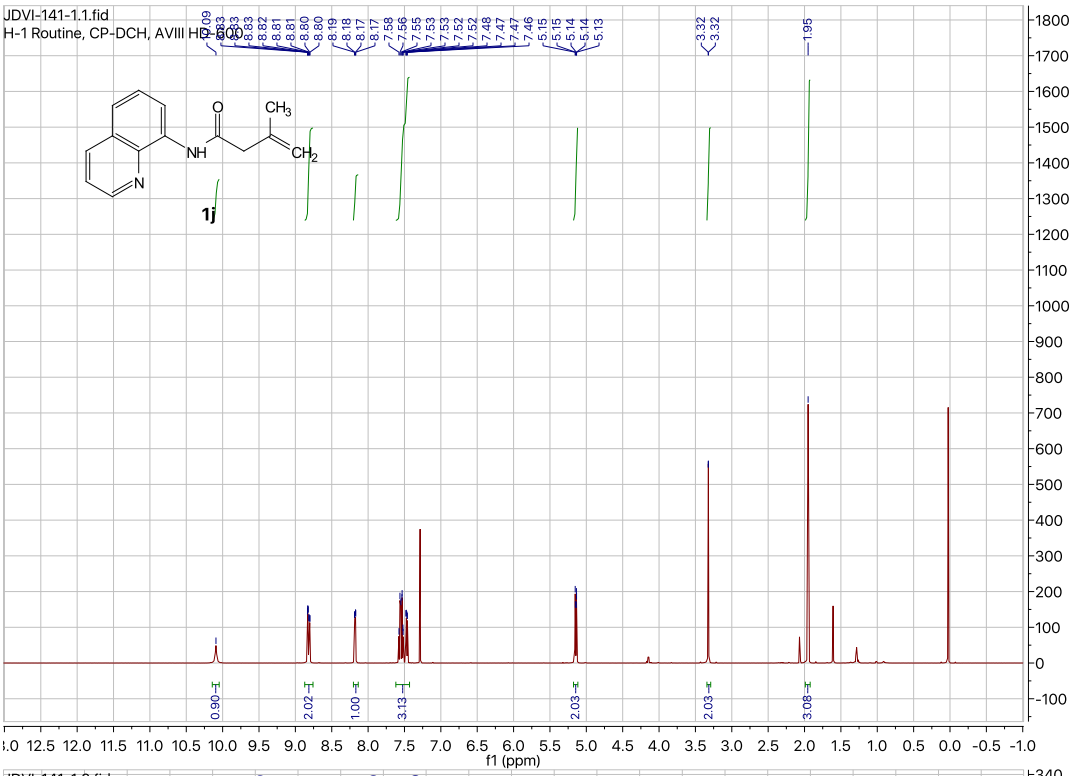
(9) T. Deguchi, H.-L. Xin, H. Morimoto and T. Ohshima, *ACS Catal.*, 2017, **7**, 3157–3161.

Selected ^{1}H- and ^{13}C-NMR Spectra



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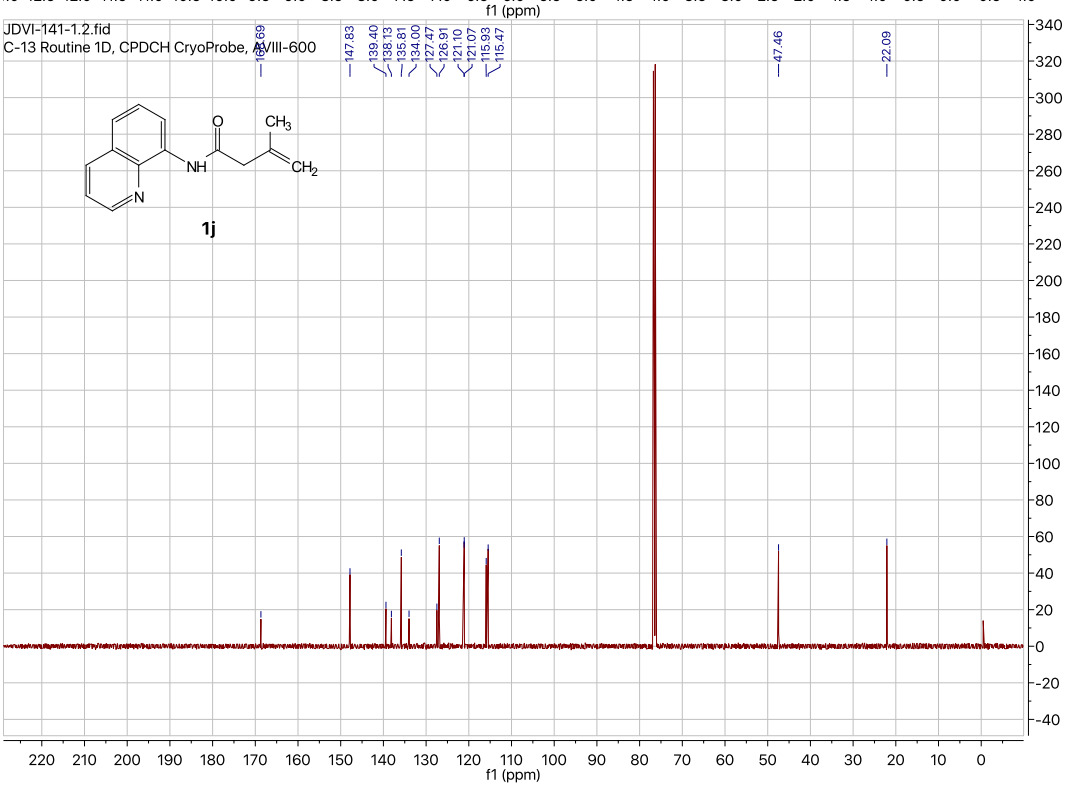
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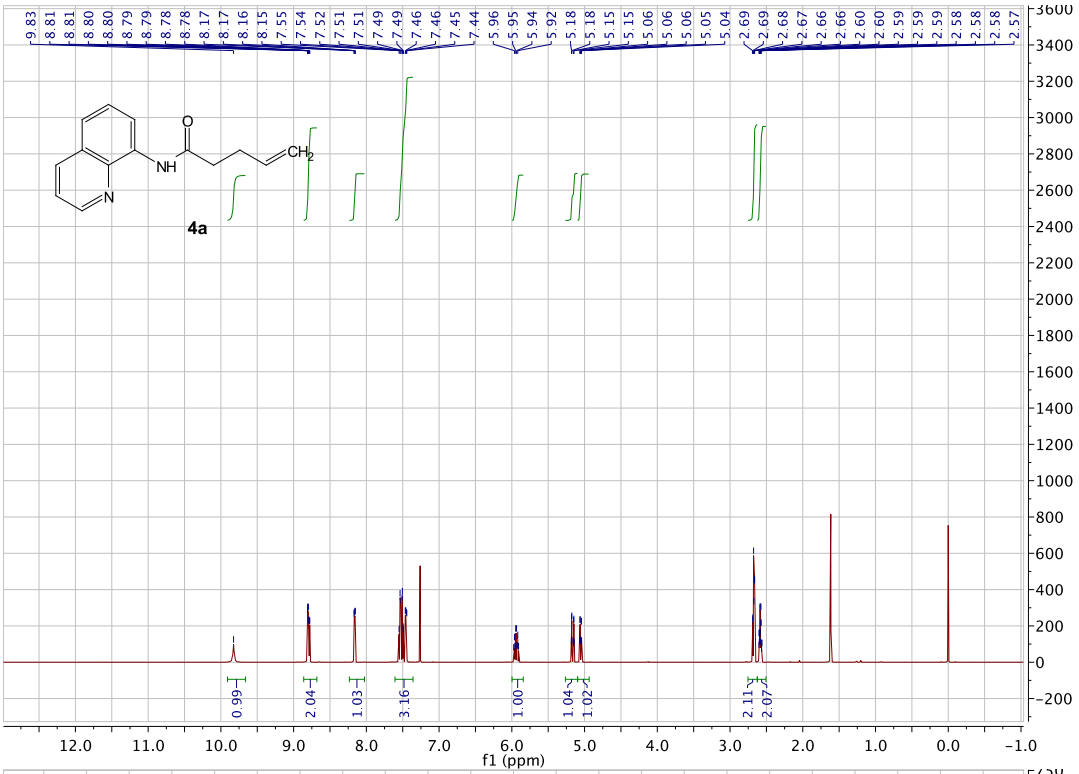
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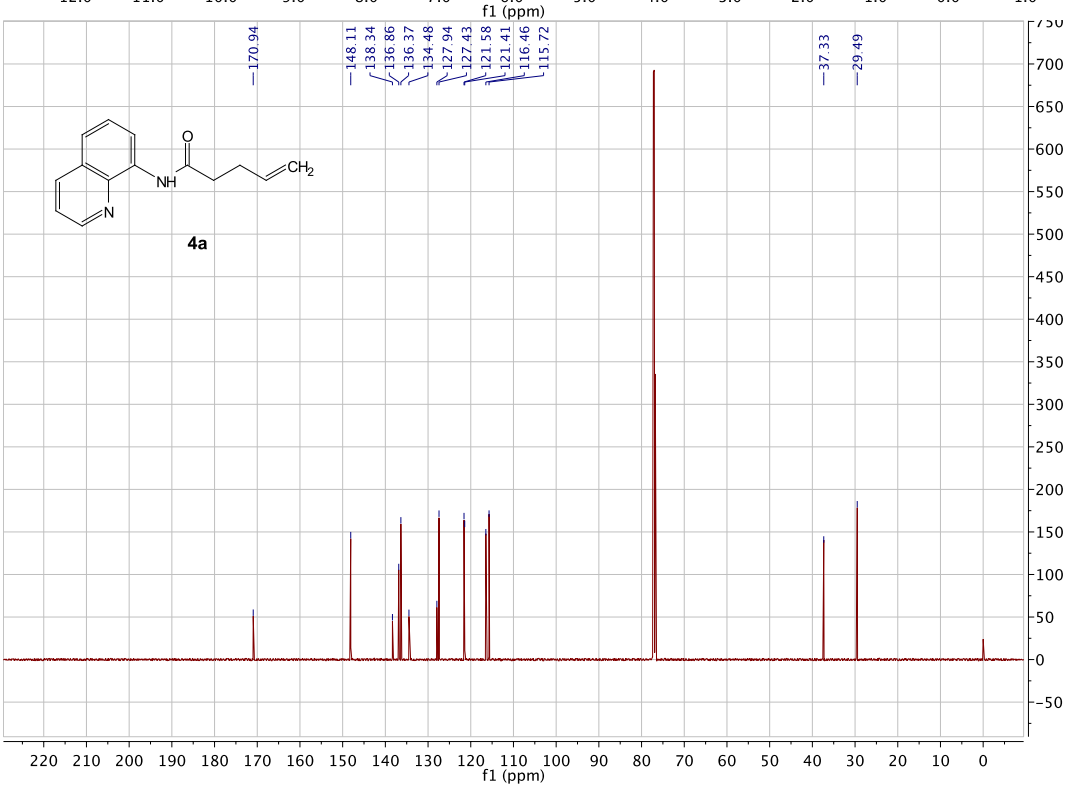
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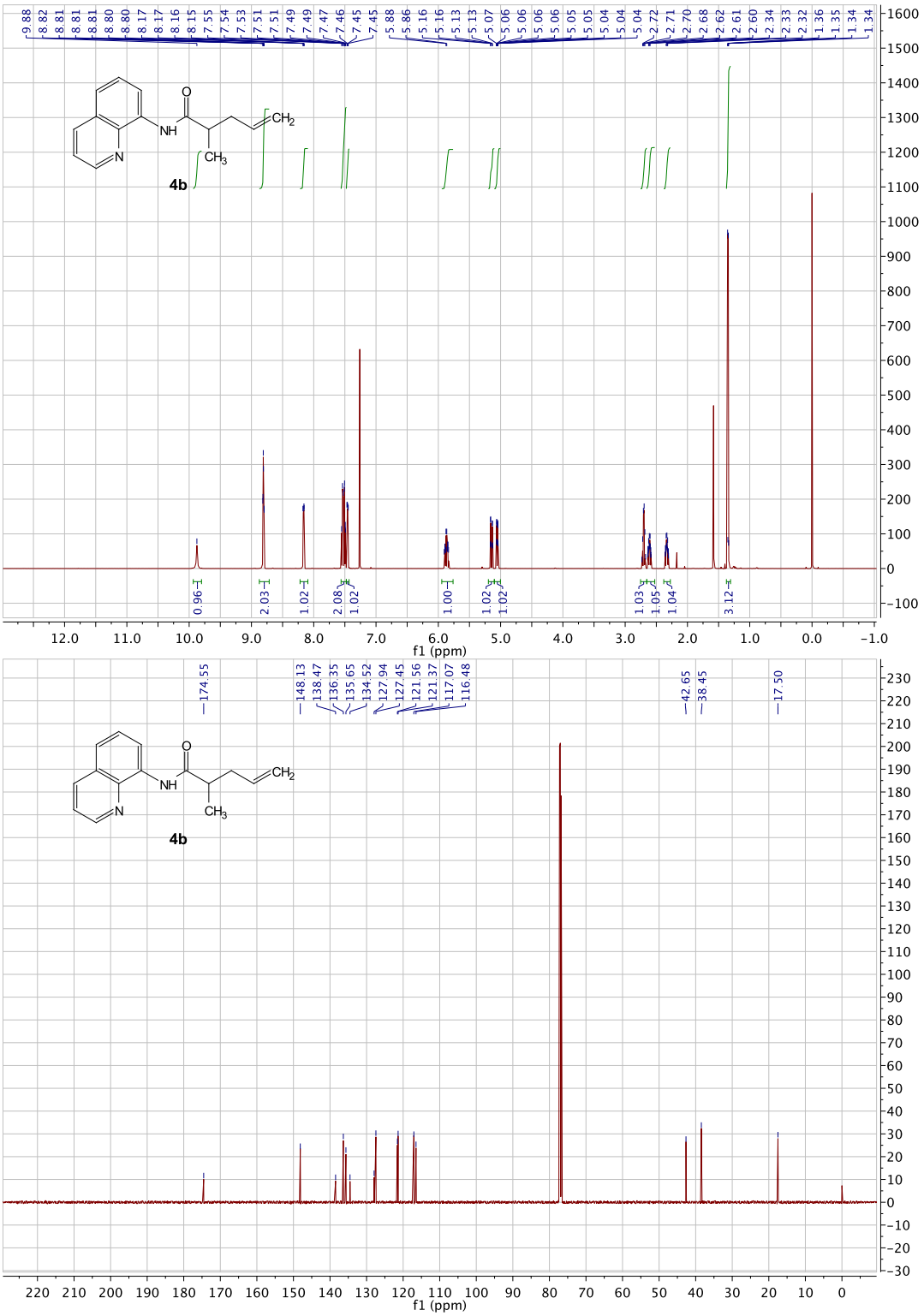
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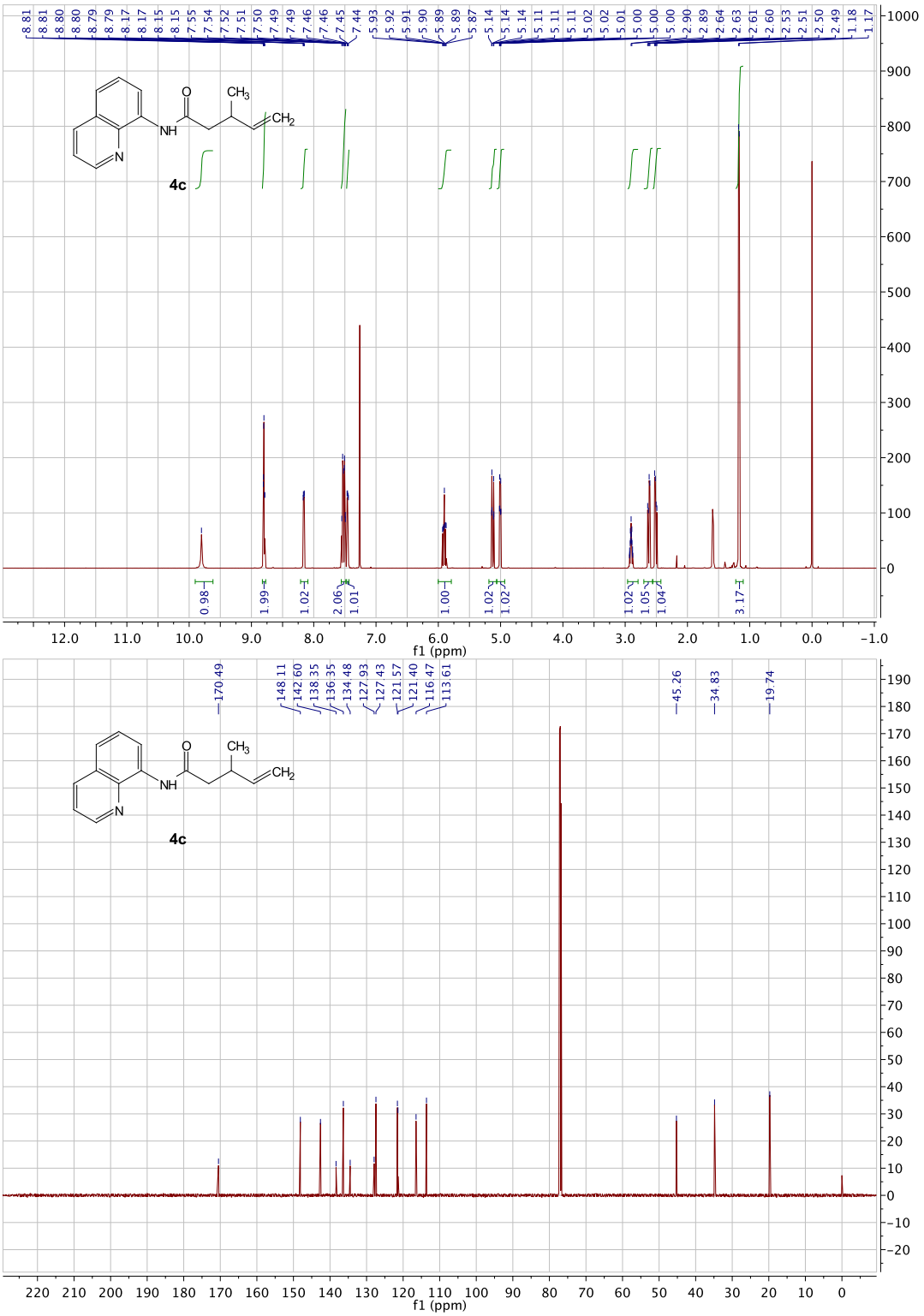
f1 (ppm)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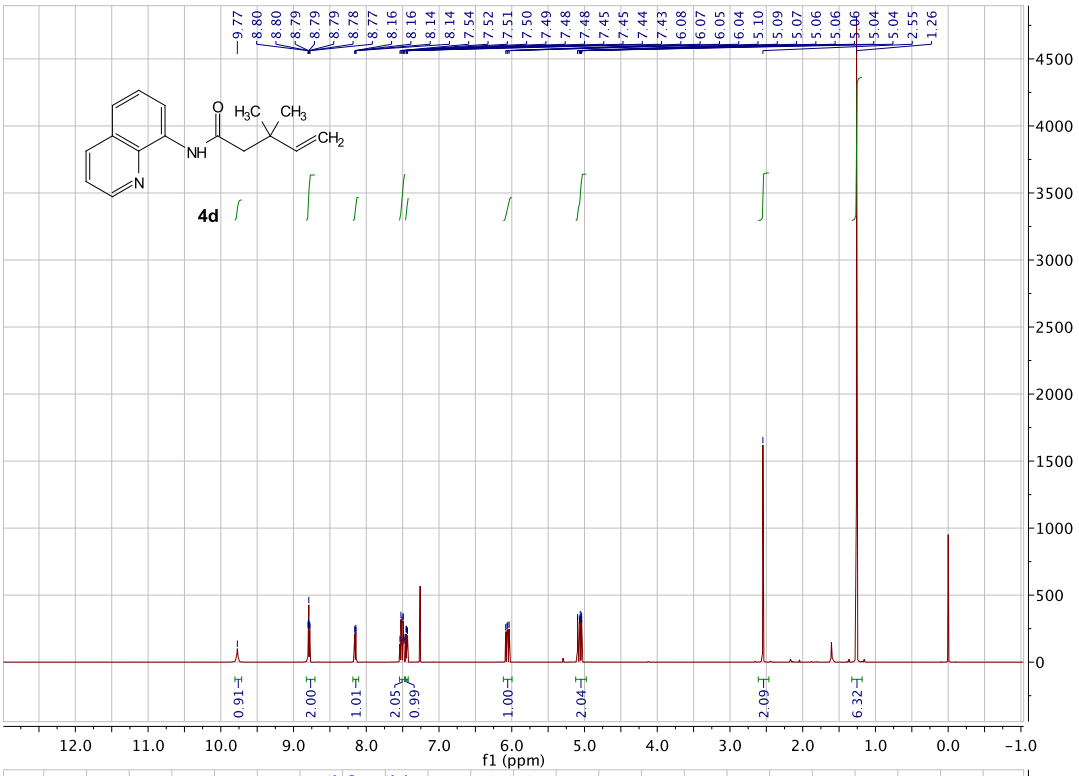
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NH
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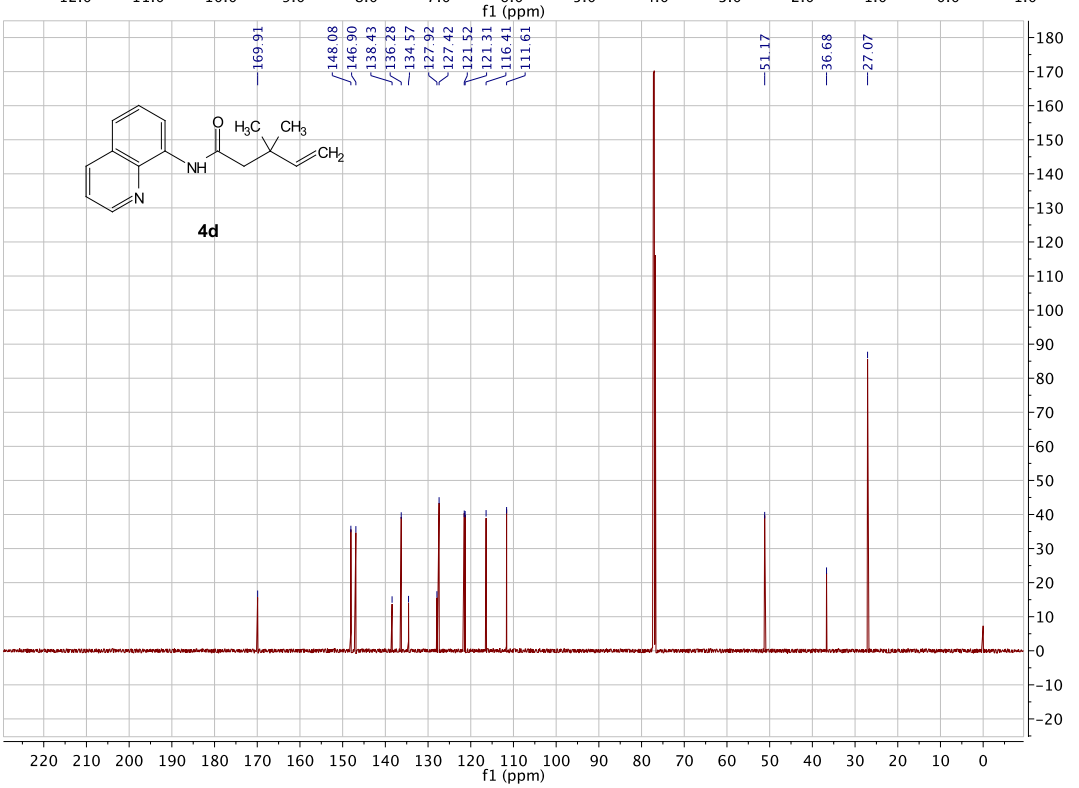
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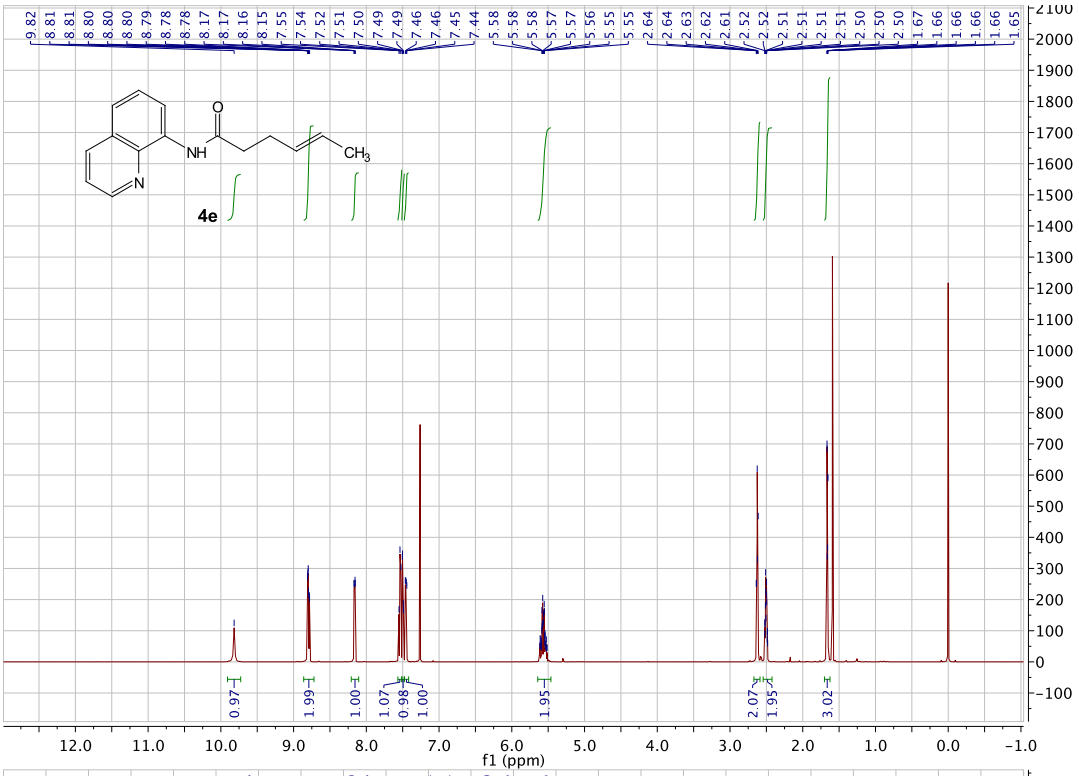
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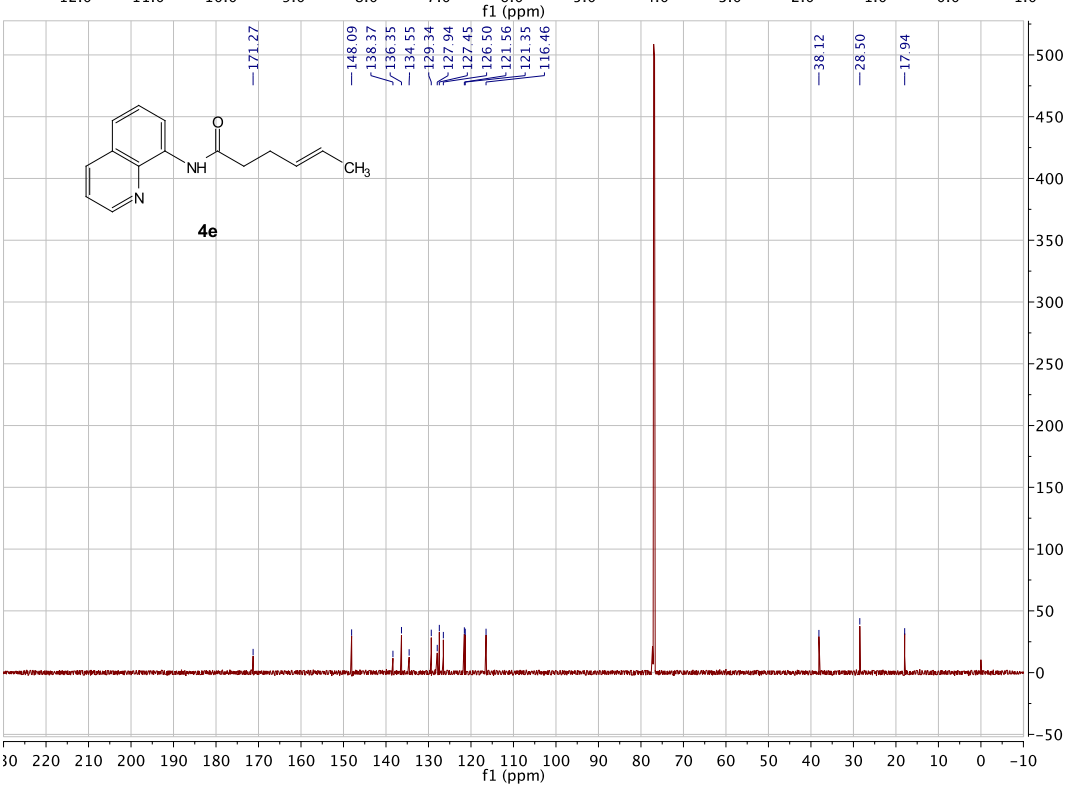
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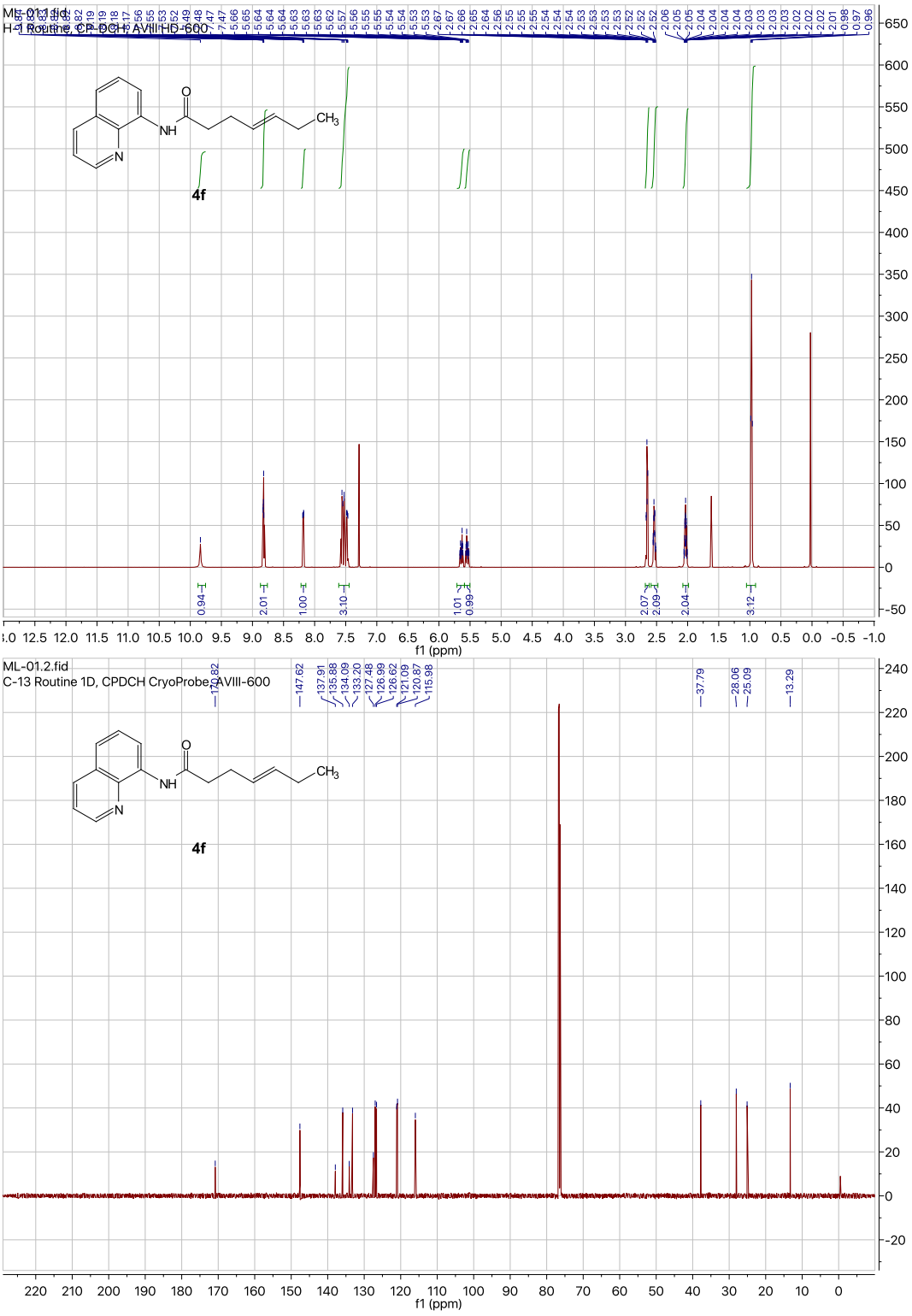
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4f
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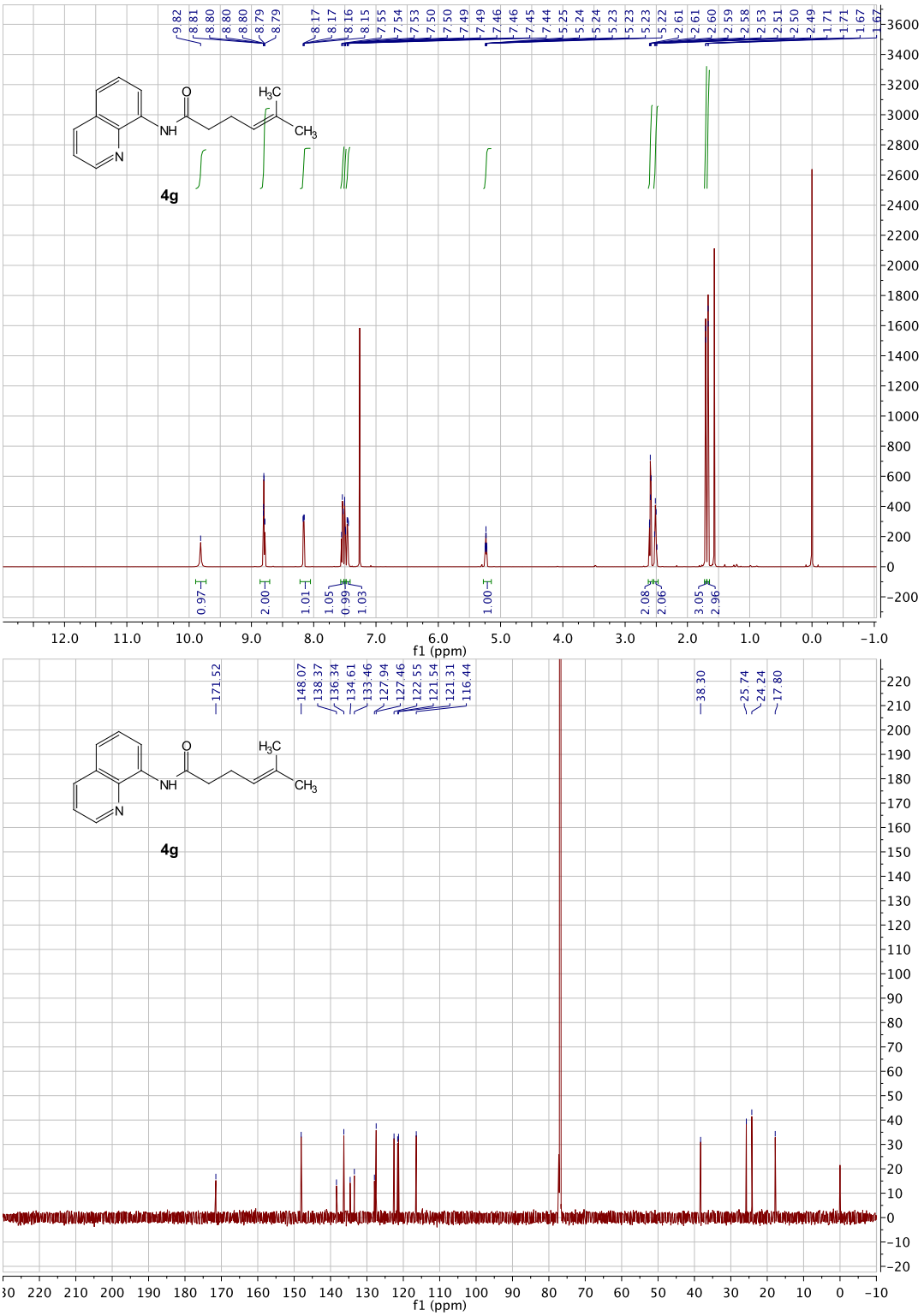
f1 (ppm)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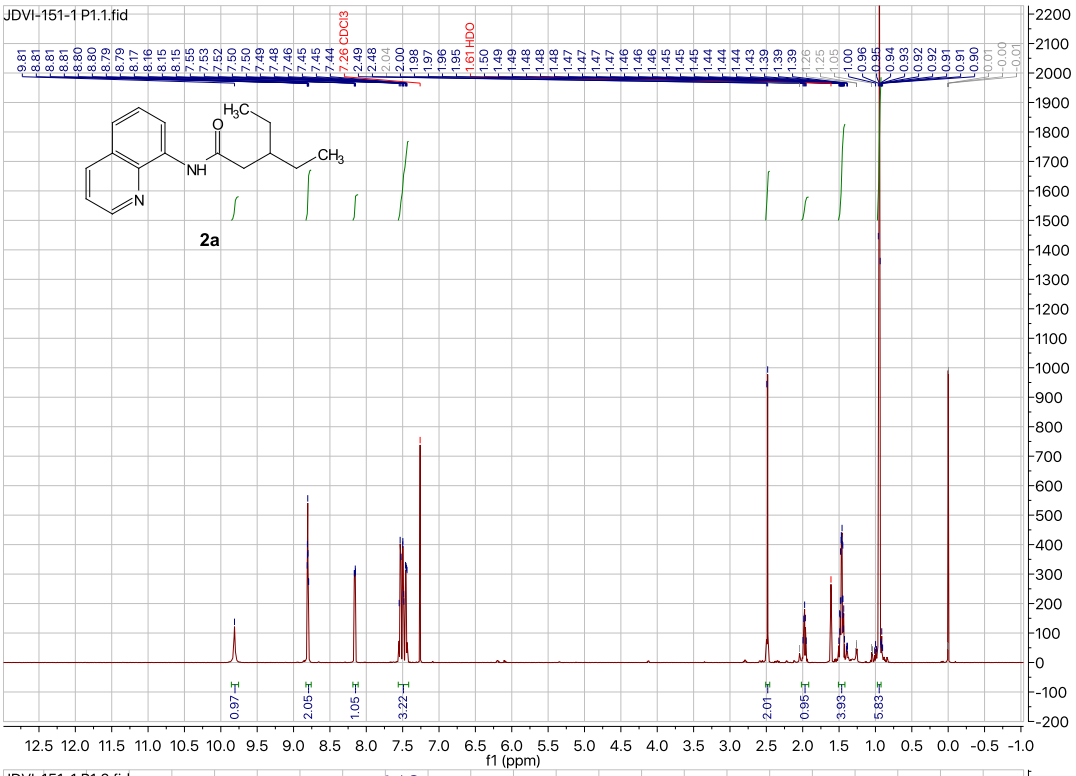
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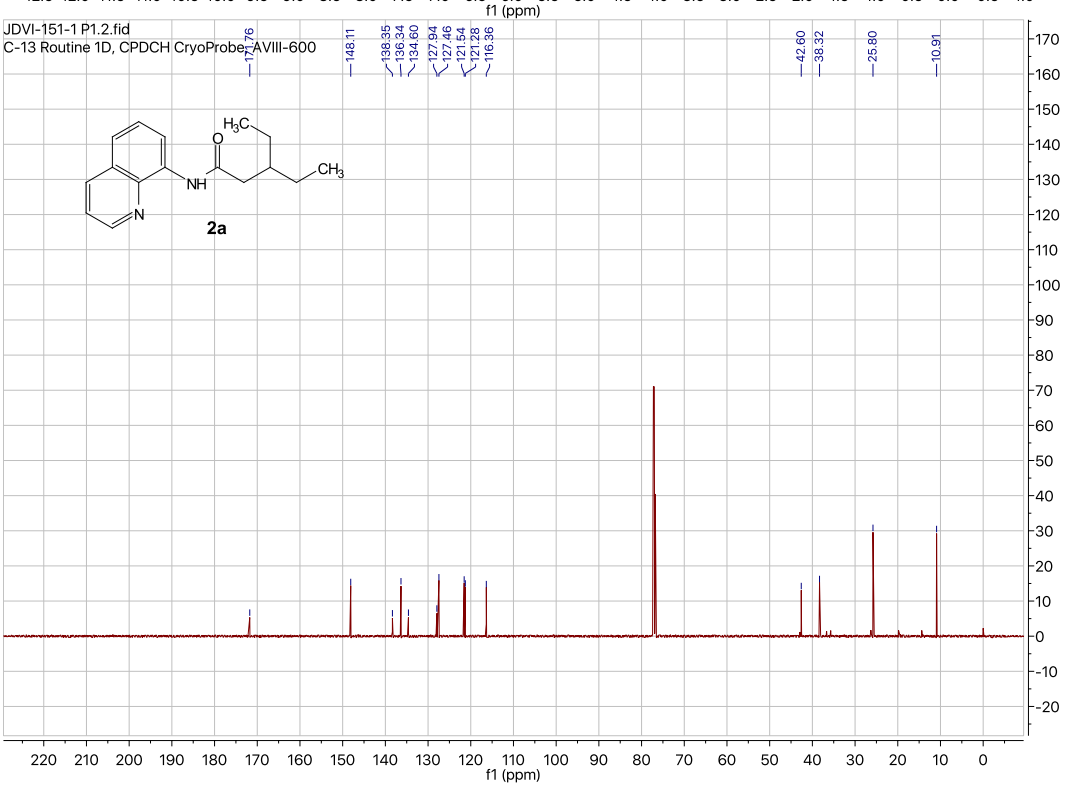
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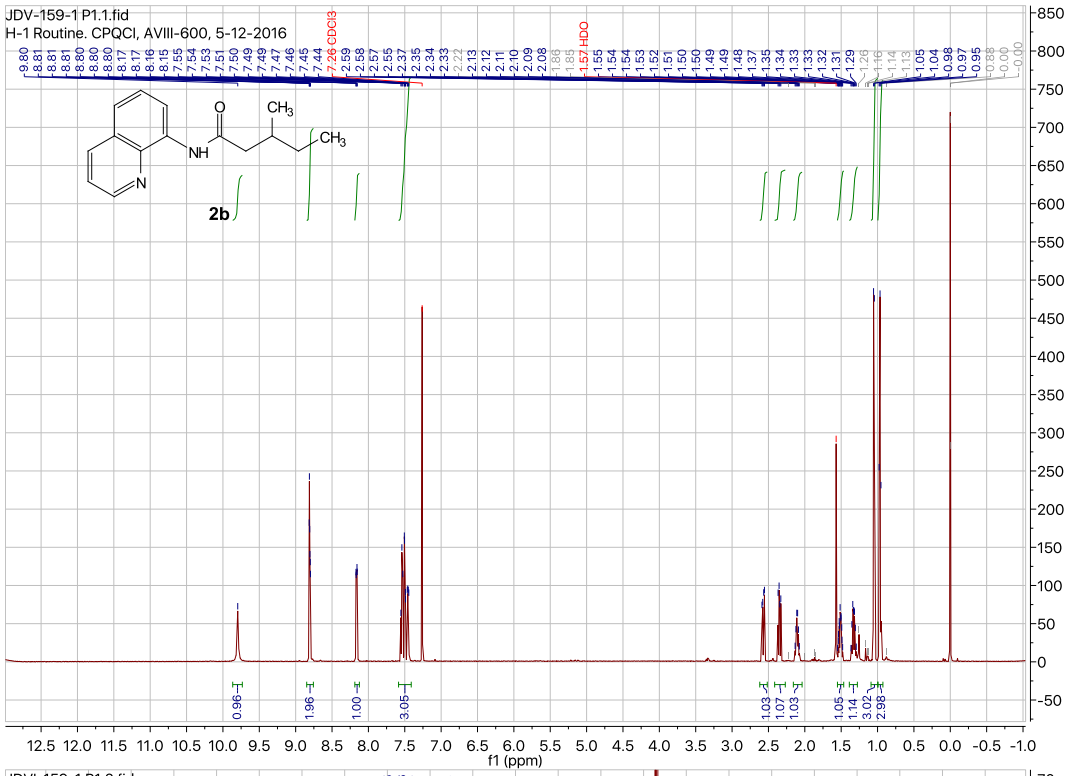
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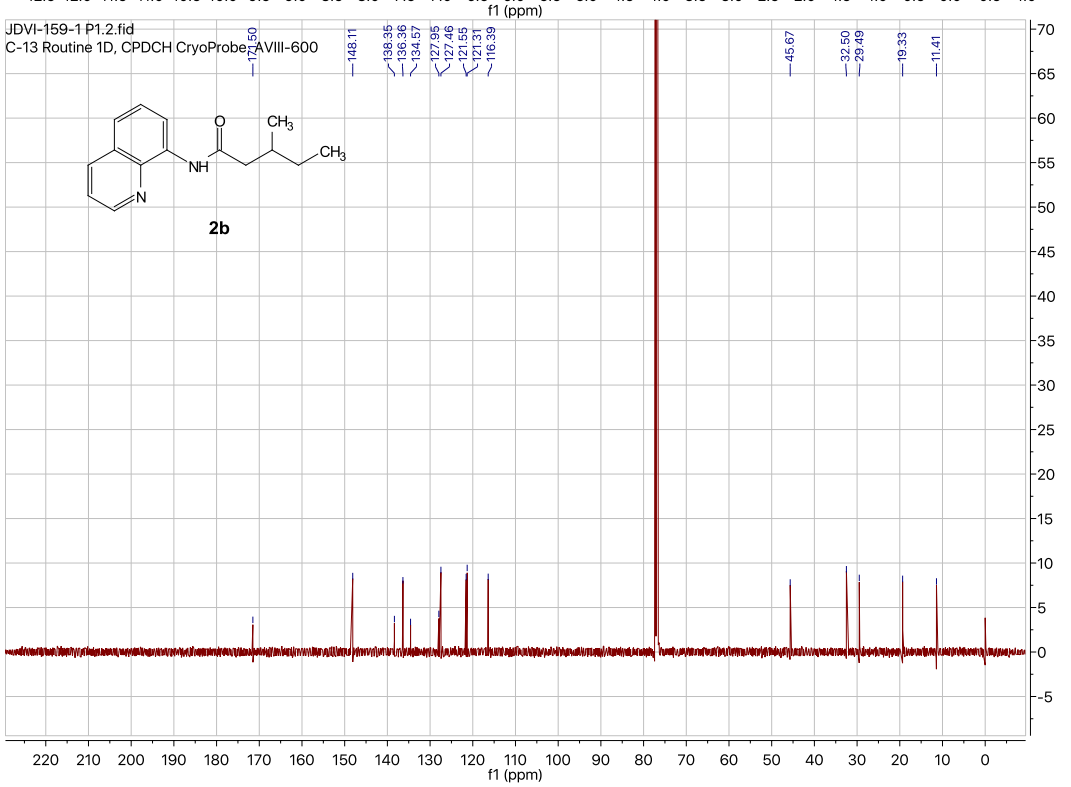
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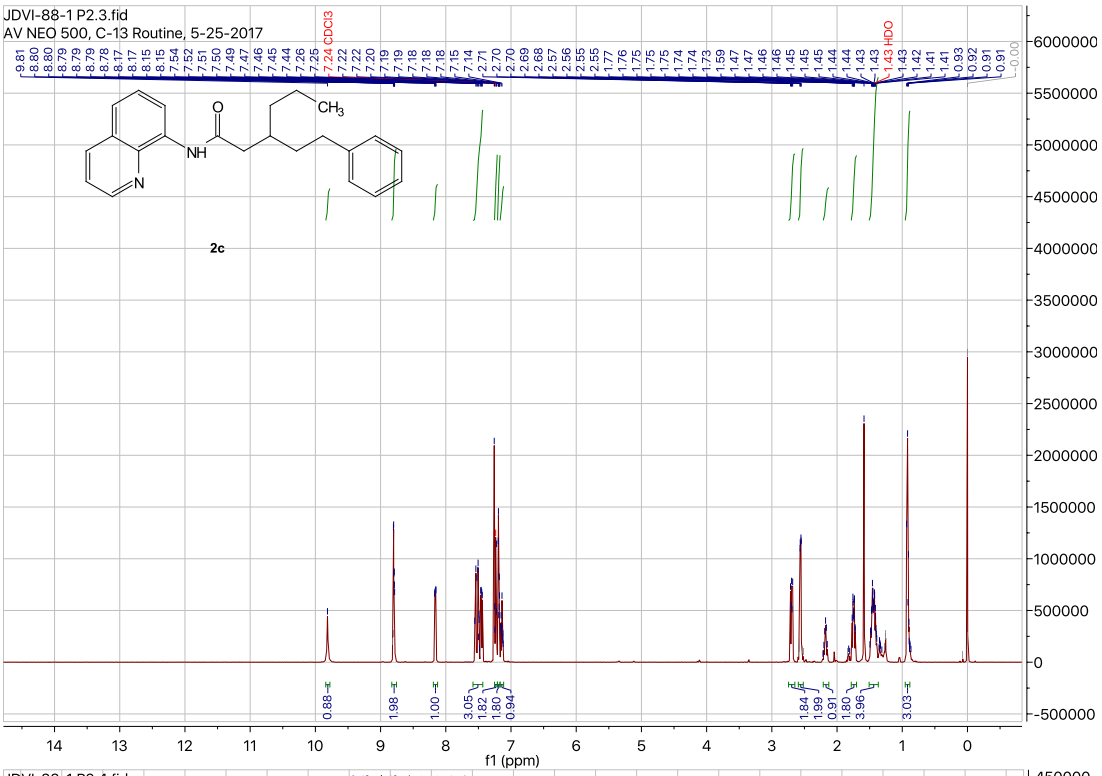
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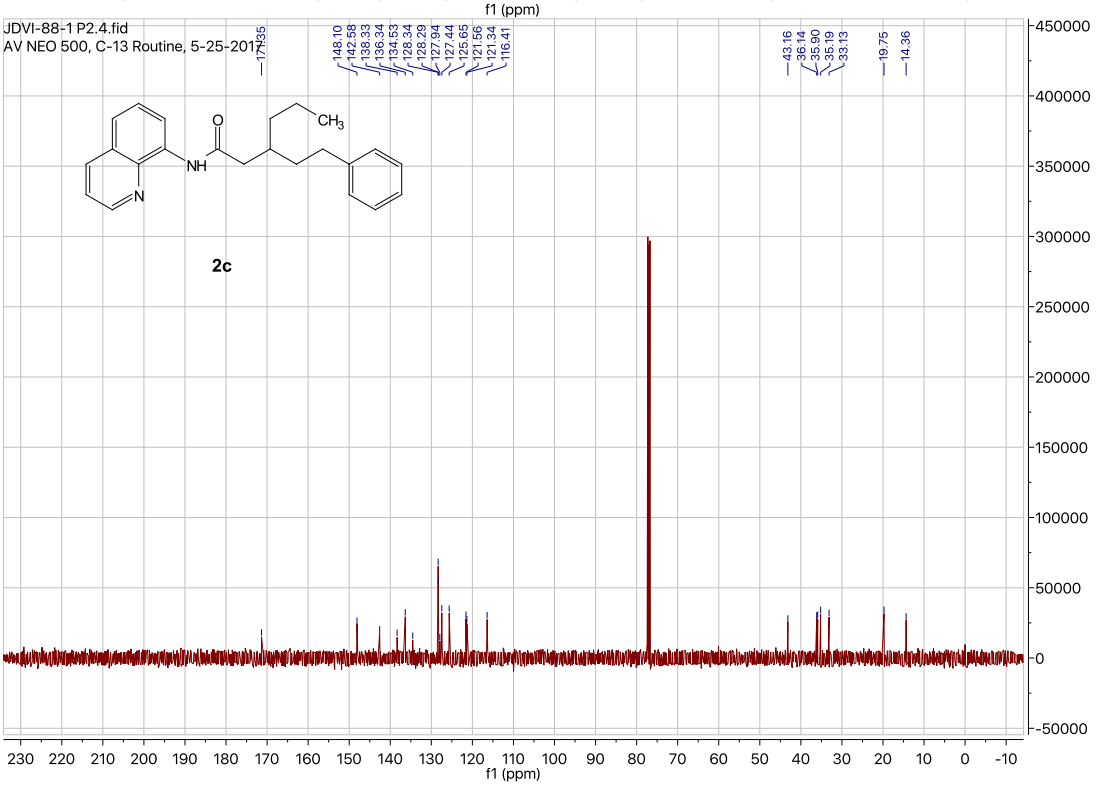
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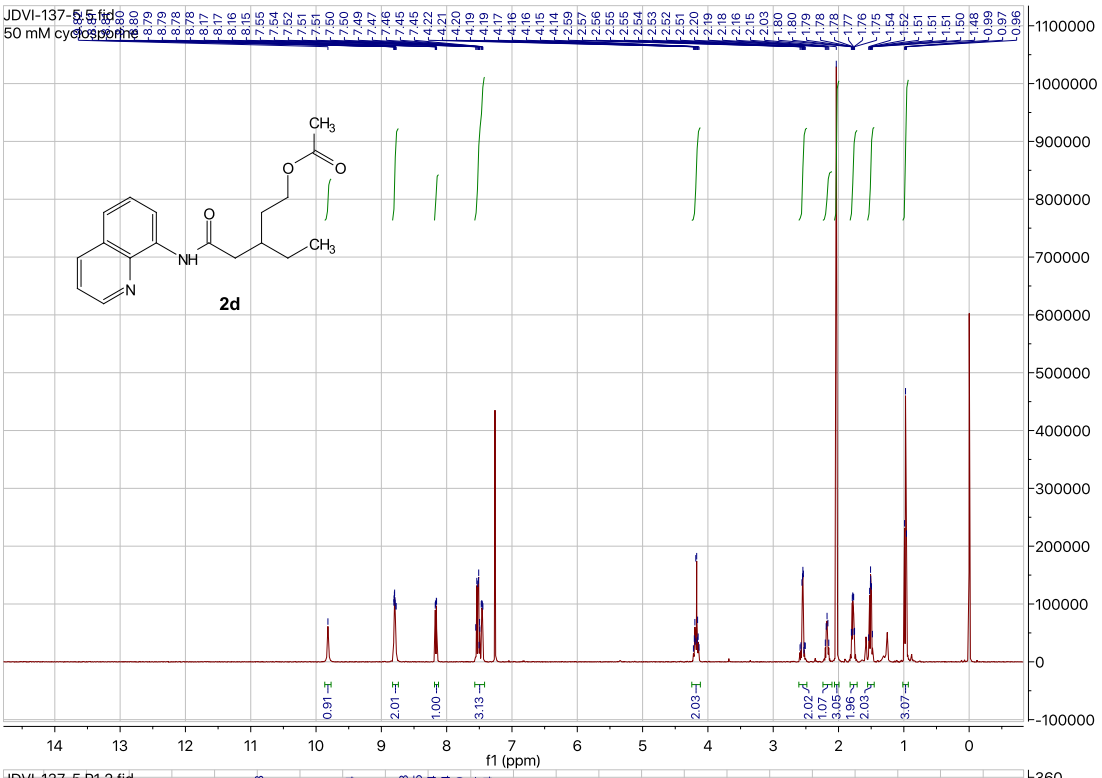
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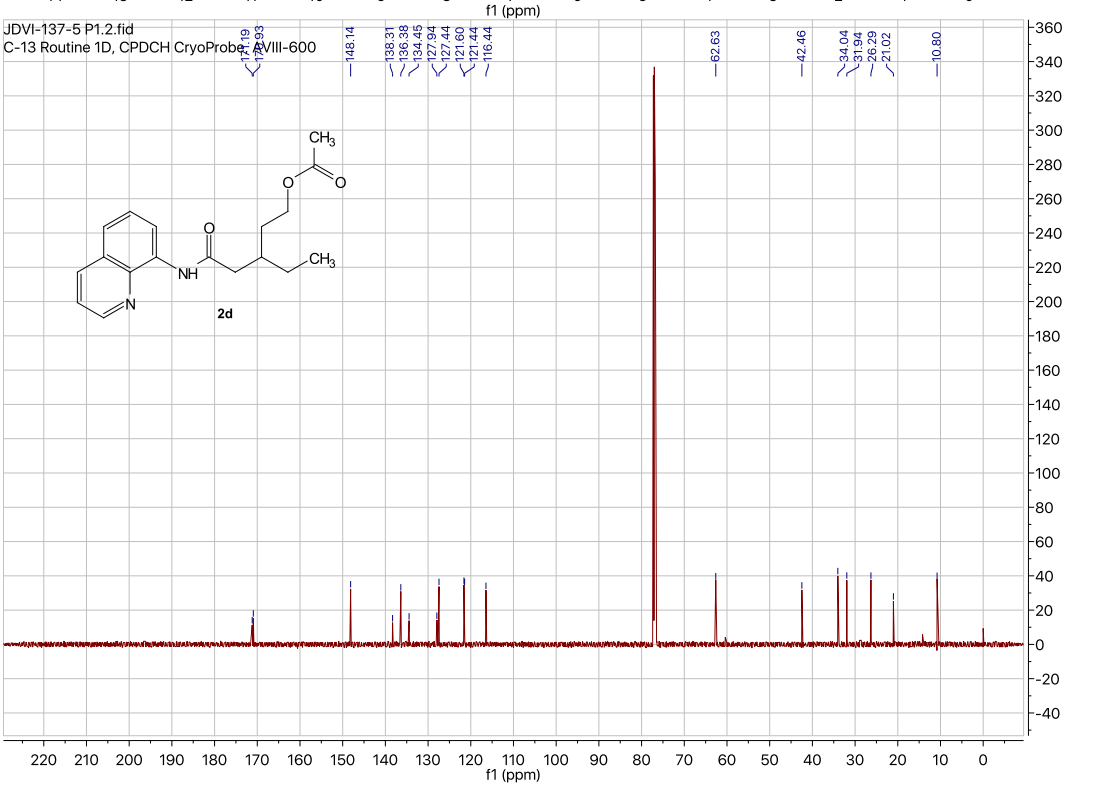
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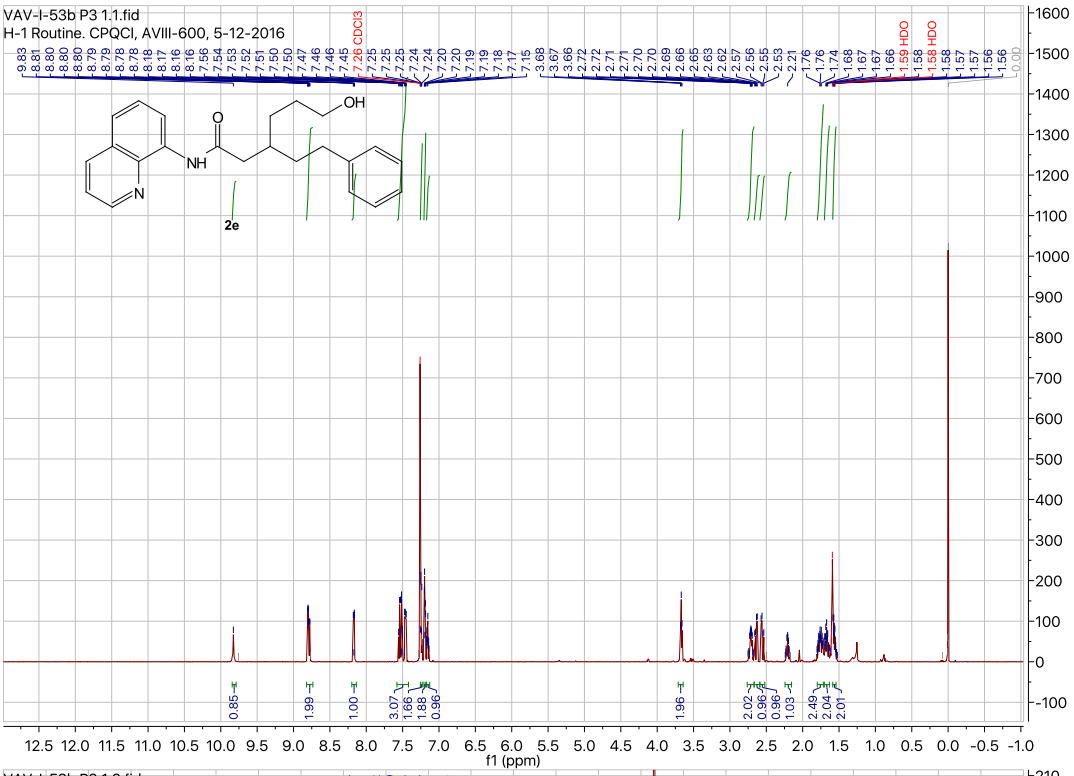
f1 (ppm)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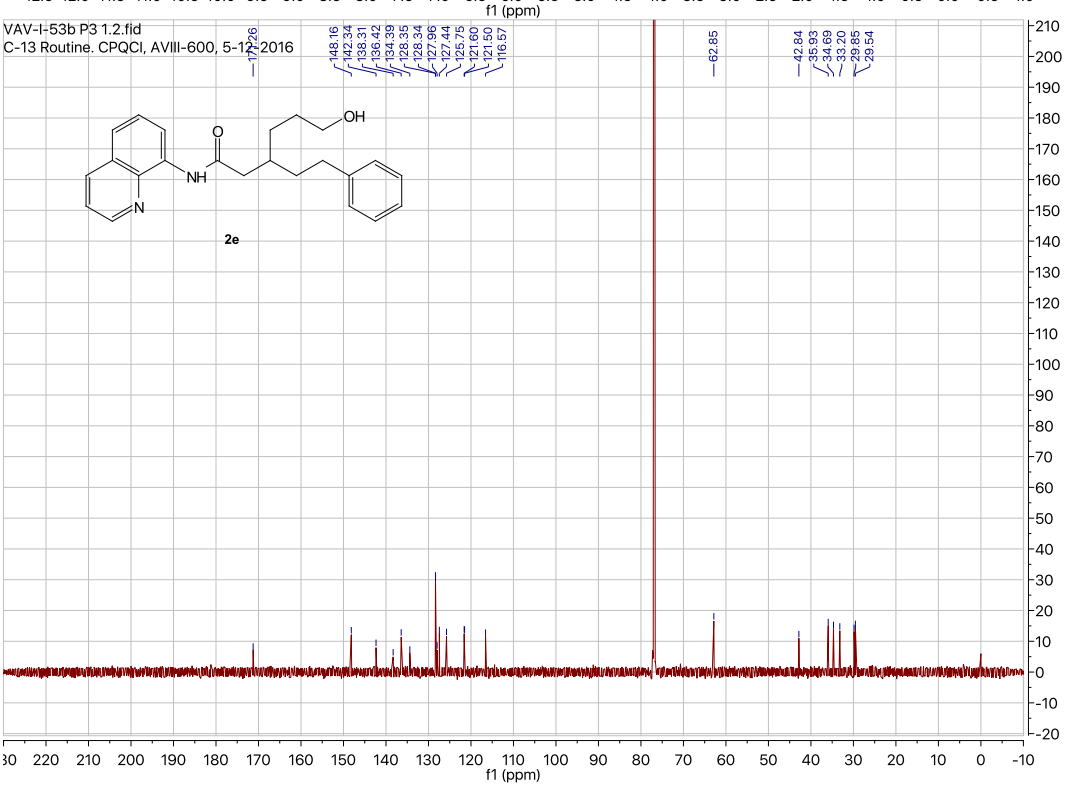
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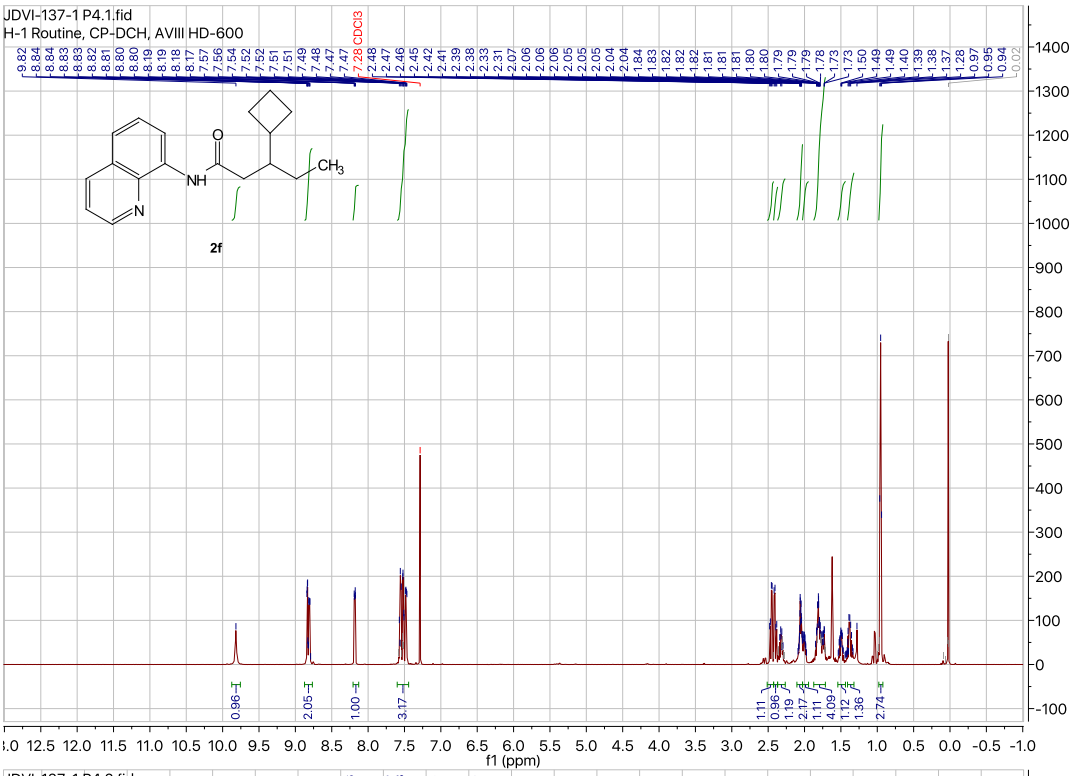
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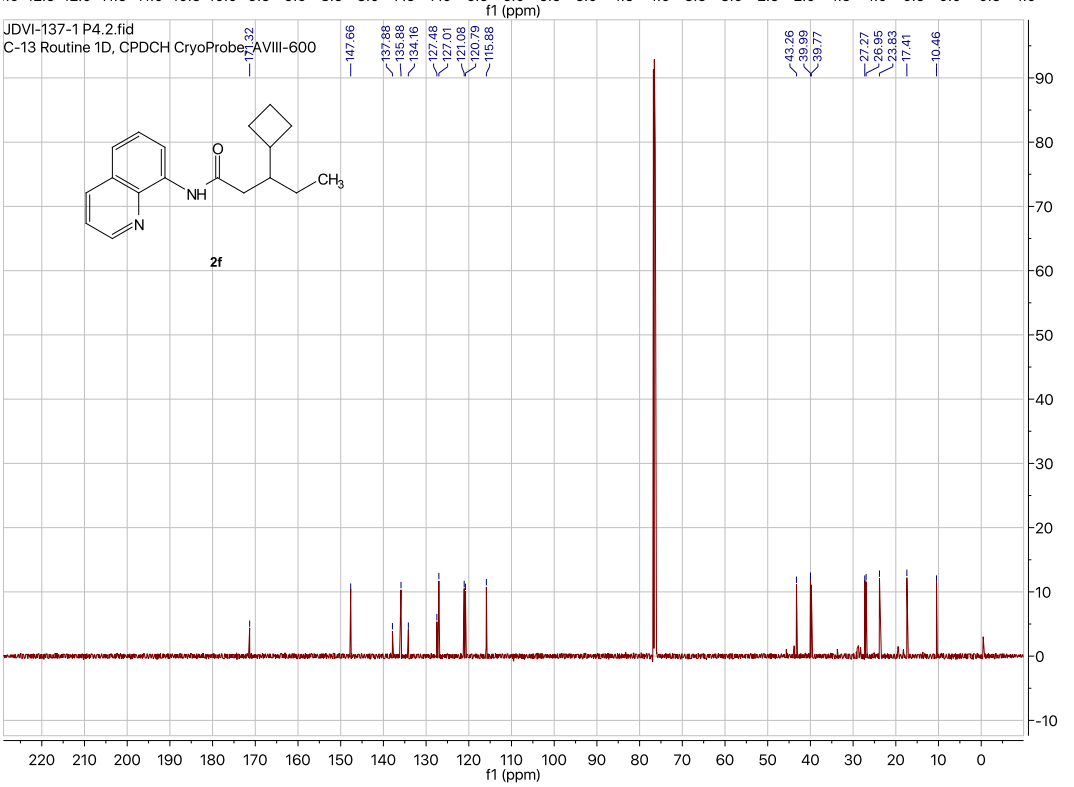
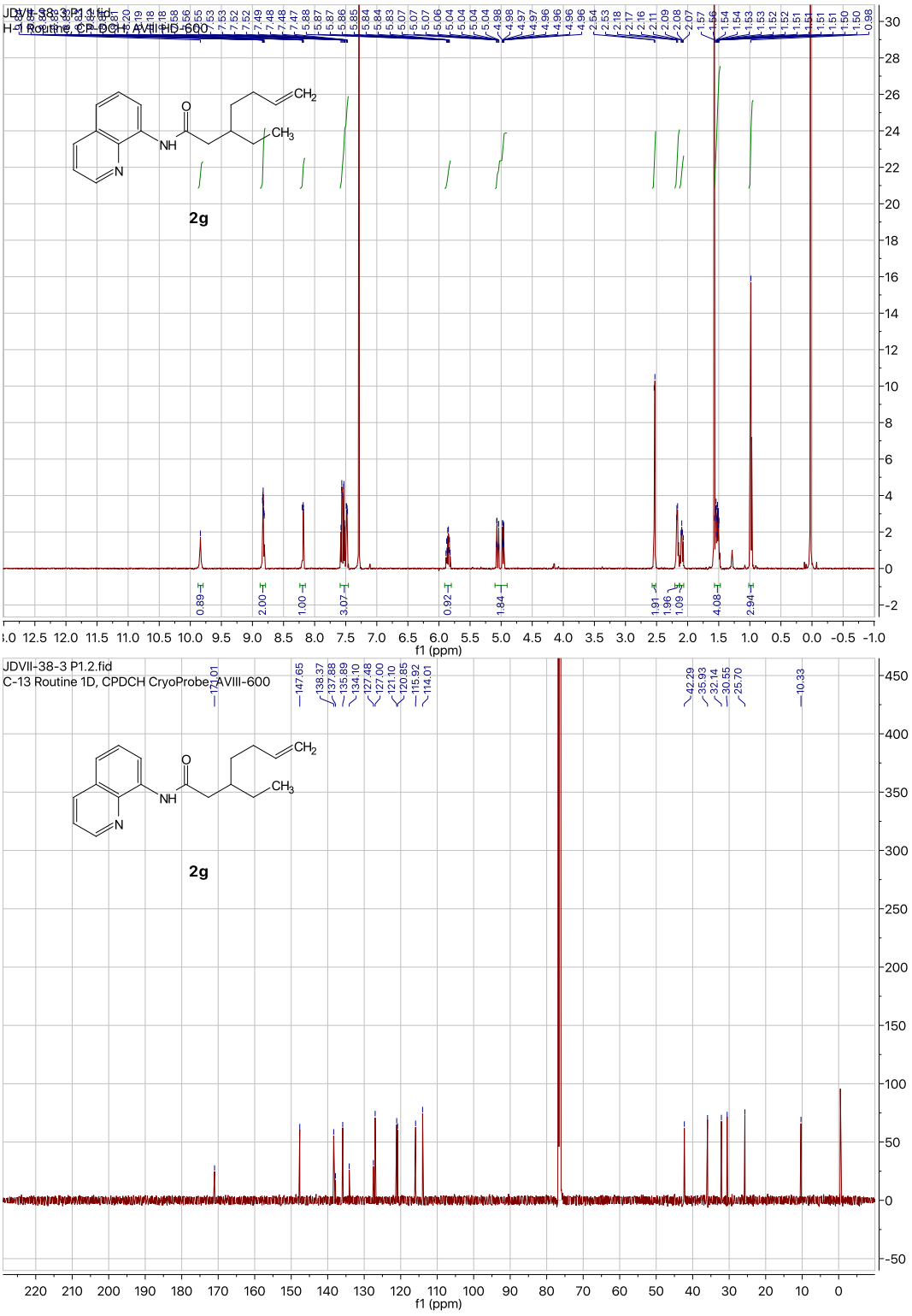
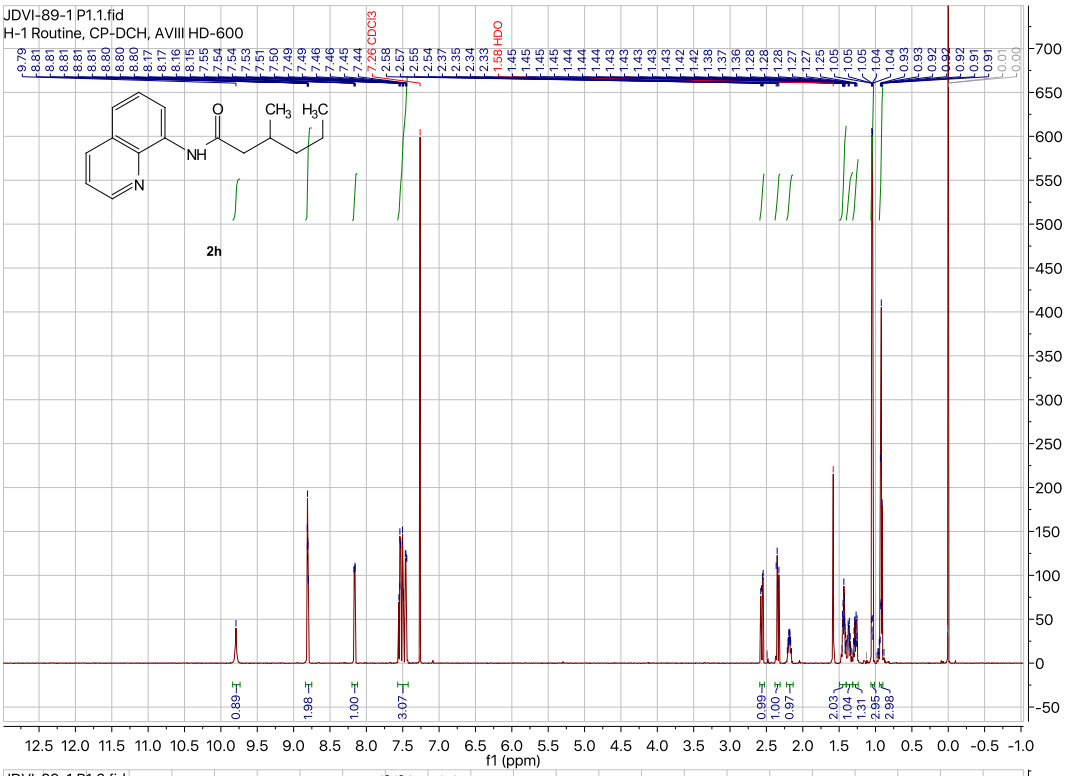
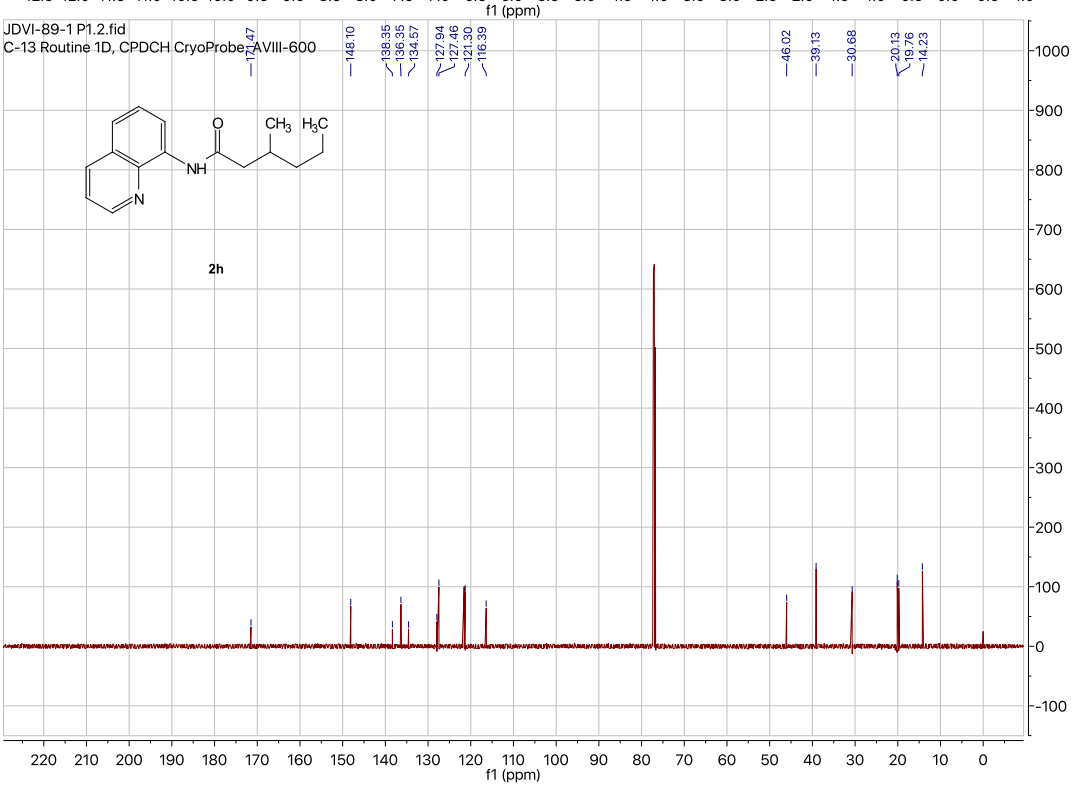
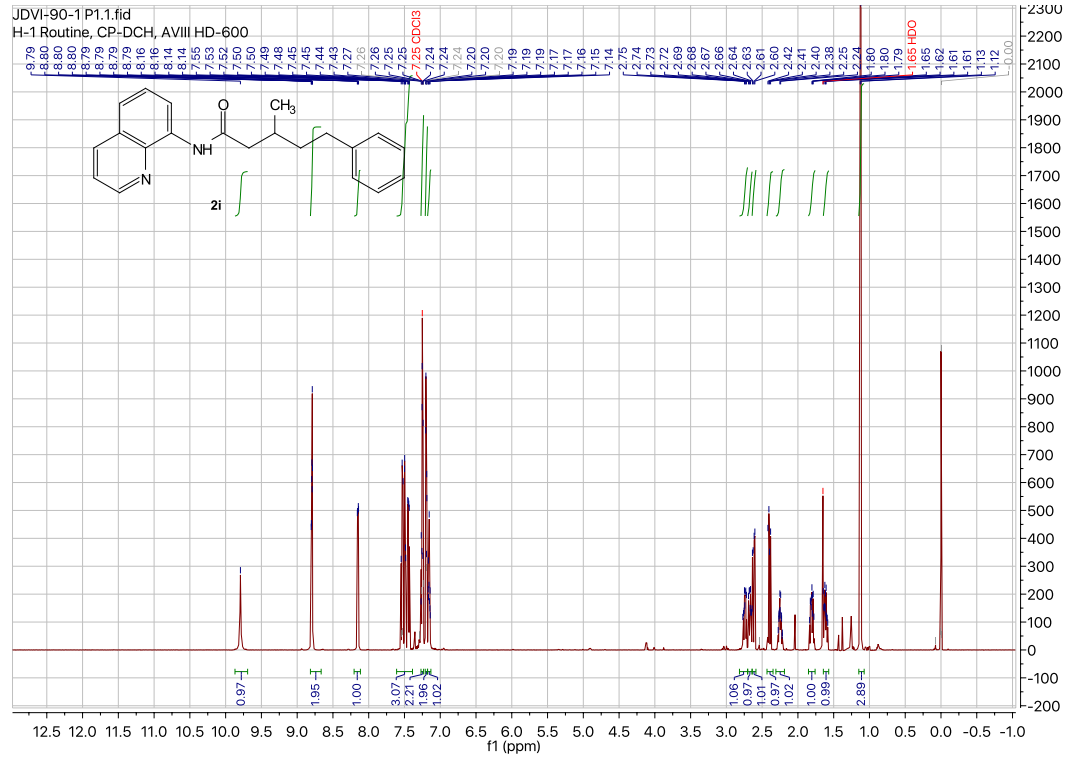
2f
f1 (ppm)

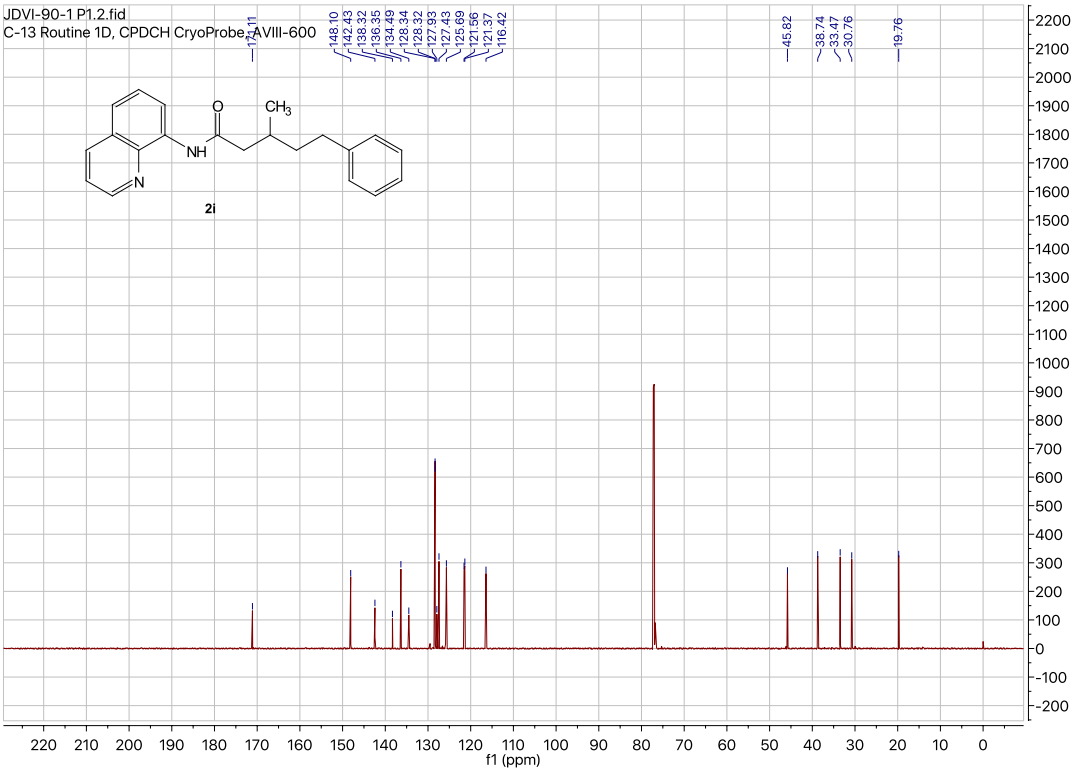

JDVI-137-1 P4.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
2f
f1 (ppm)

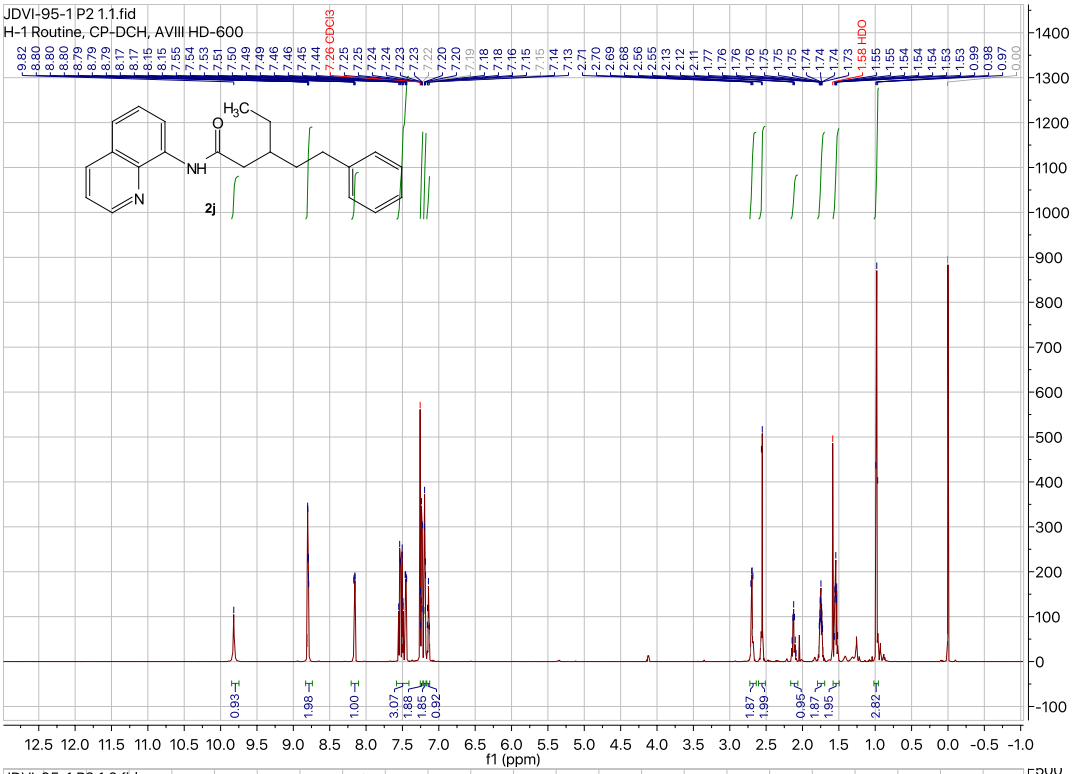

JDVII-38-3 P1.1.fid
H-1 Routine, CPDCH CryoProbe, AVIII-HD-600
2g
f1 (ppm)
JDVII-38-3 P1.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
2g
f1 (ppm)

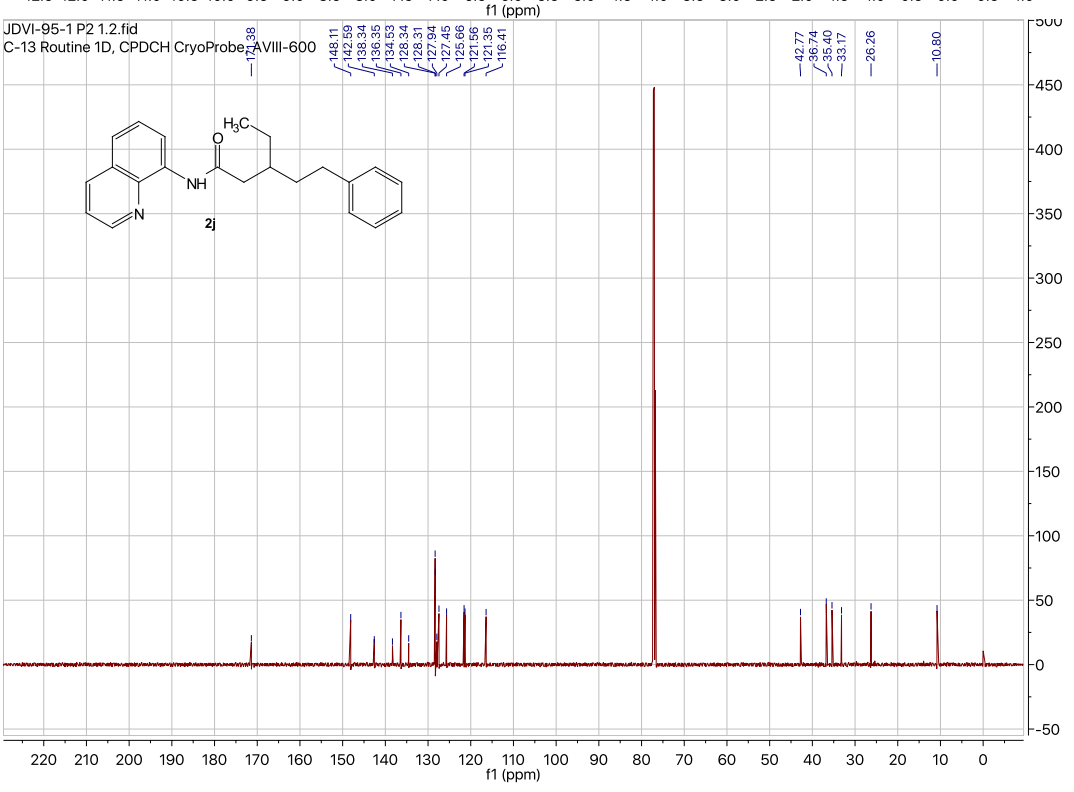

JDVI-89-1 P1.1.fid
H-1 Routine, CP-DCH, AVIII HD-600
7.26 CDCl3
1.58 HDO
0.89
1.98
1.00
3.07
0.99
1.00
0.97
2.03
1.04
1.31
2.95
2.98
2h
f1 (ppm)

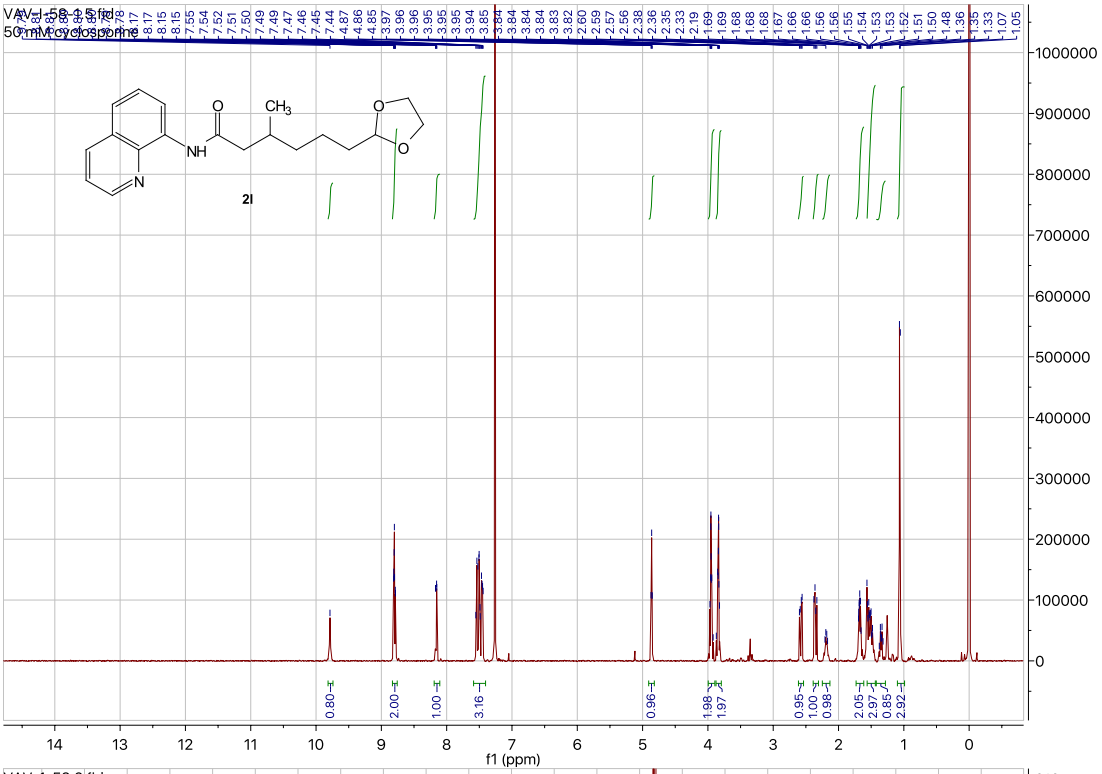

JDVI-89-1 P1.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
171.47
148.10
138.35
136.35
134.57
127.94
127.46
121.30
116.39
46.02
39.13
30.68
20.13
19.76
14.23
2h
f1 (ppm)

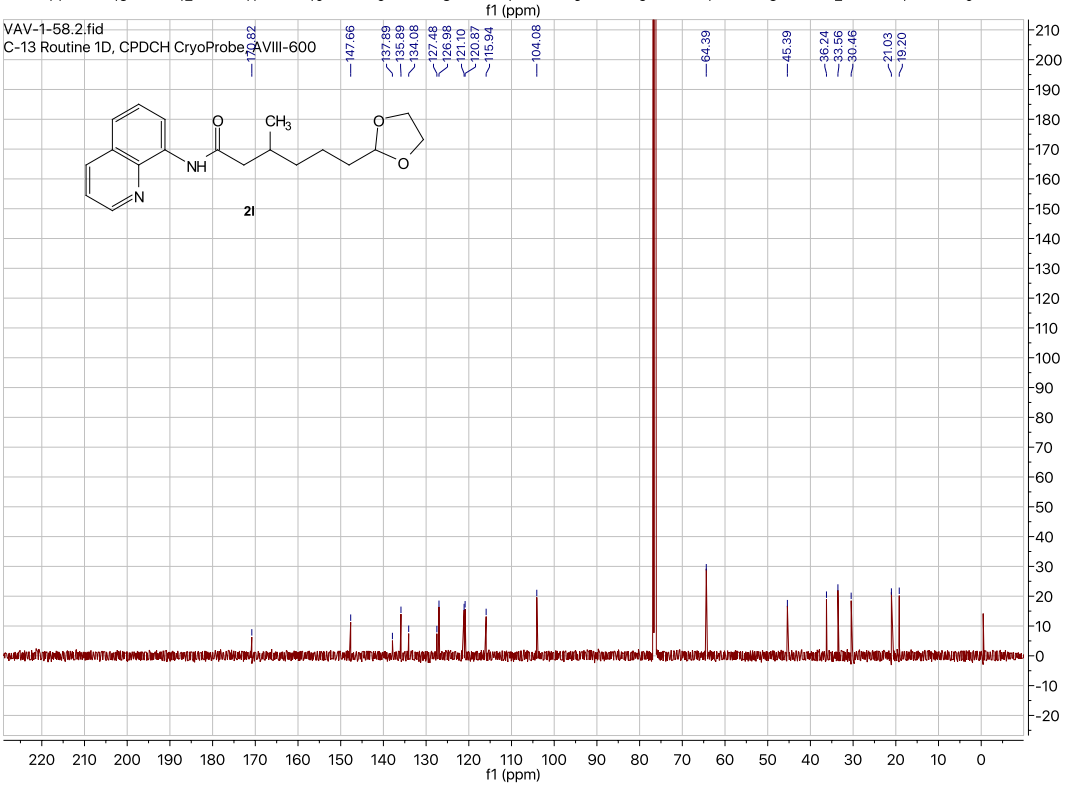

JDVI-90-1 P1.1.fid
H-1 Routine, CP-DCH, AVIII HD-600
2i
f1 (ppm)

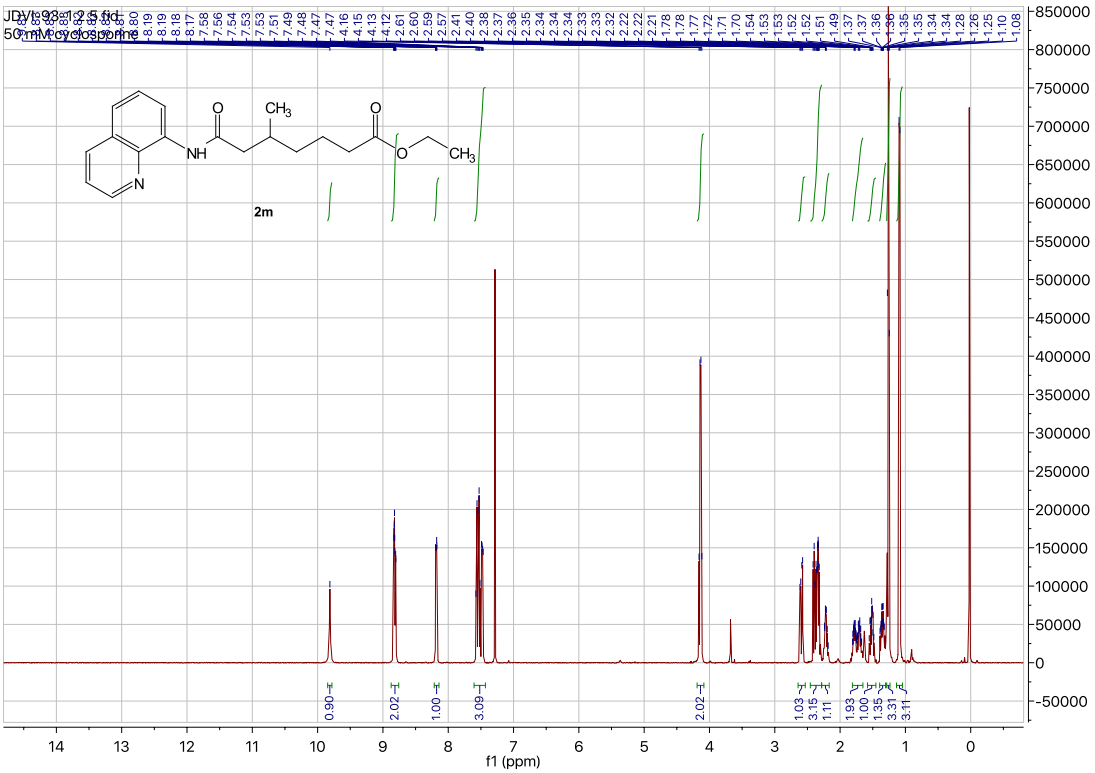

JDVI-90-1 P1.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
2i
f1 (ppm)

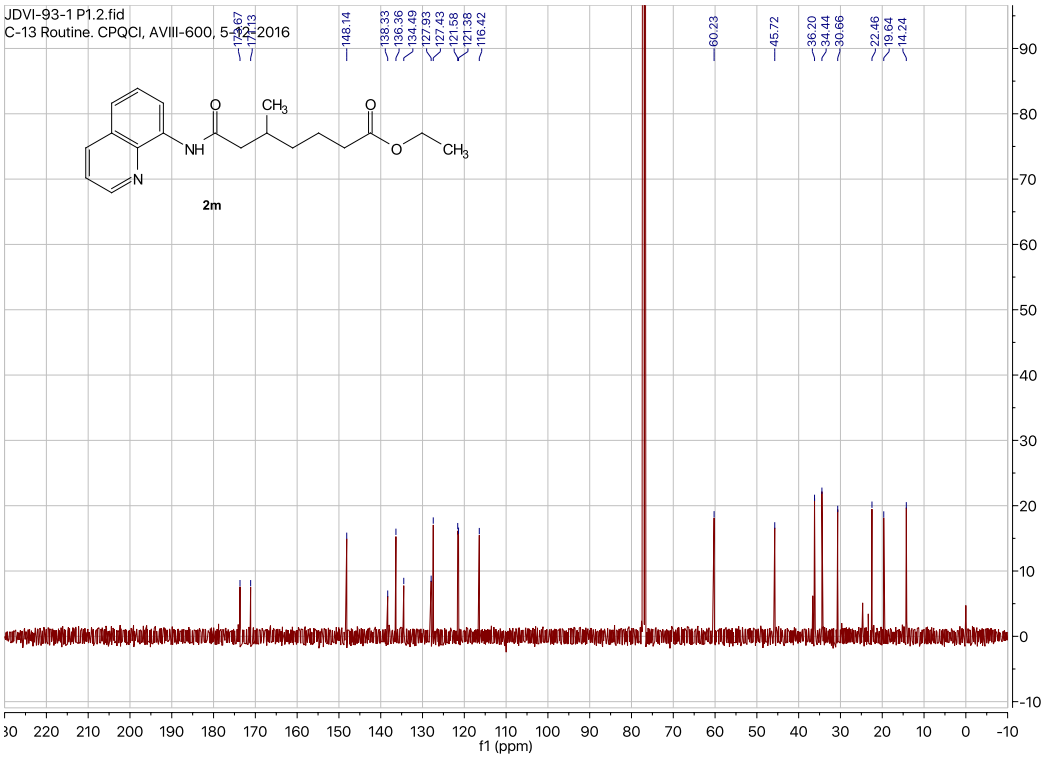

JDVI-95-1 P2 1.1.fid
H-1 Routine, CP-DCH, AVIII HD-600
7.26 CDCl3
1.58 HDO
2j
f1 (ppm)

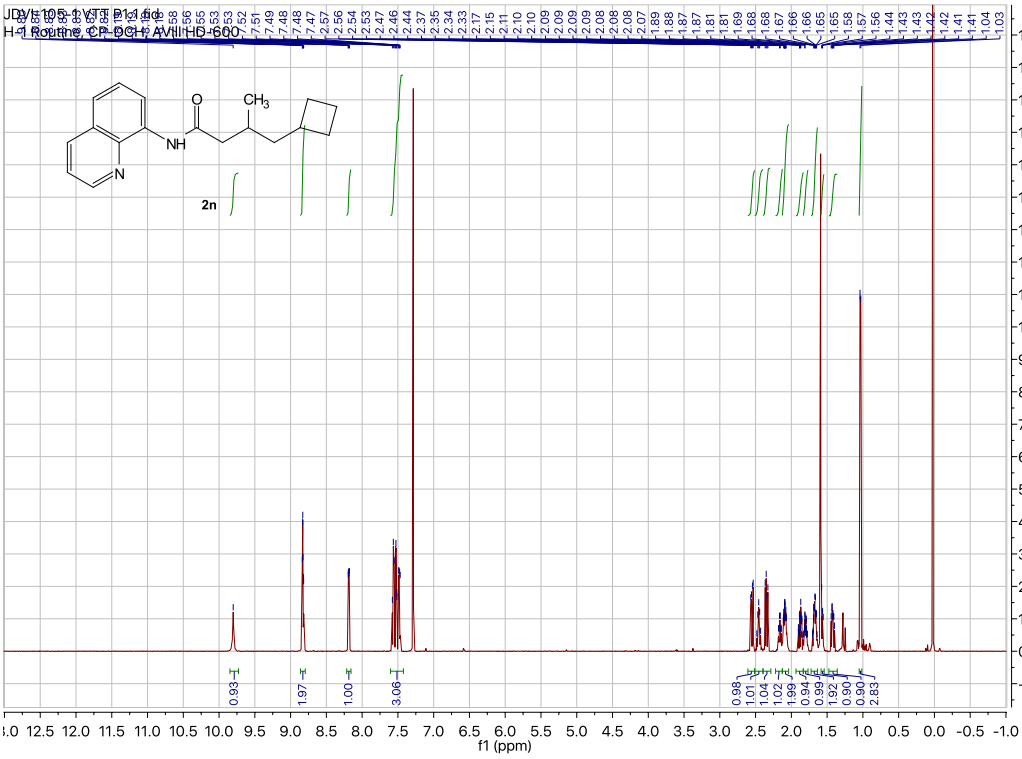

JDVI-95-1 P2 1.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
172.38
148.11
142.59
138.34
136.35
134.53
128.34
128.31
127.94
127.45
125.66
121.56
121.35
116.41
42.77
36.74
35.40
33.17
26.26
10.80
2j
f1 (ppm)

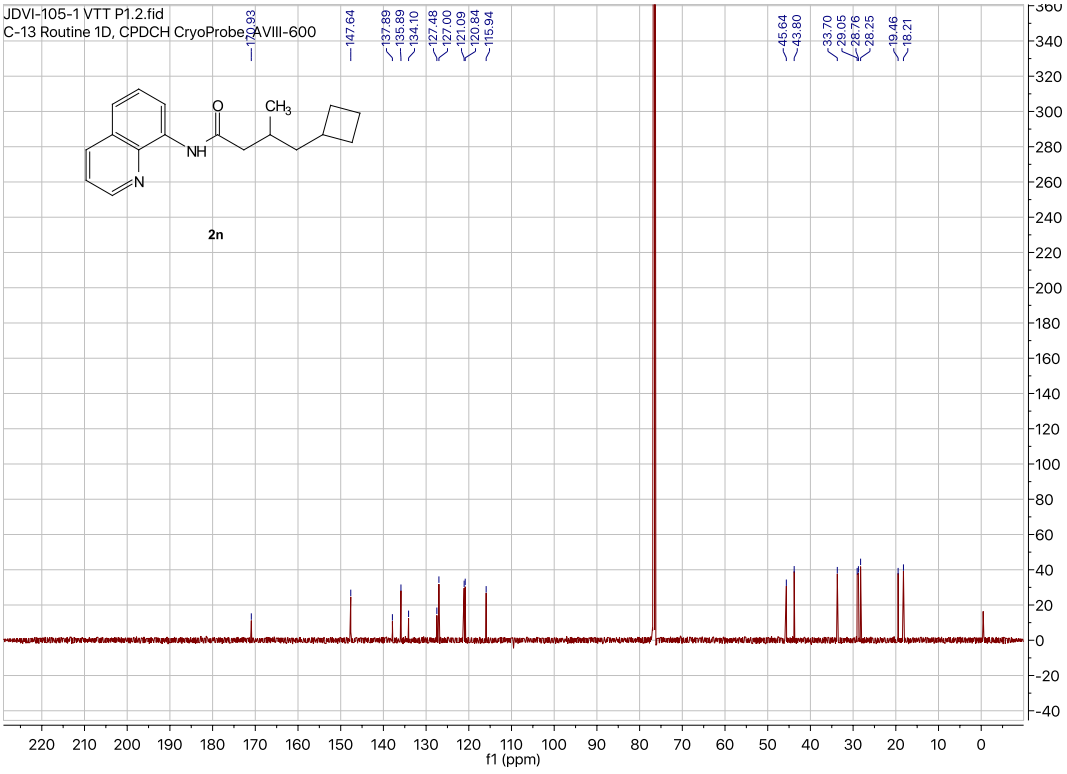

VAV-I-58-1.5.fid
50 mM cyclosporine
2l
f1 (ppm)

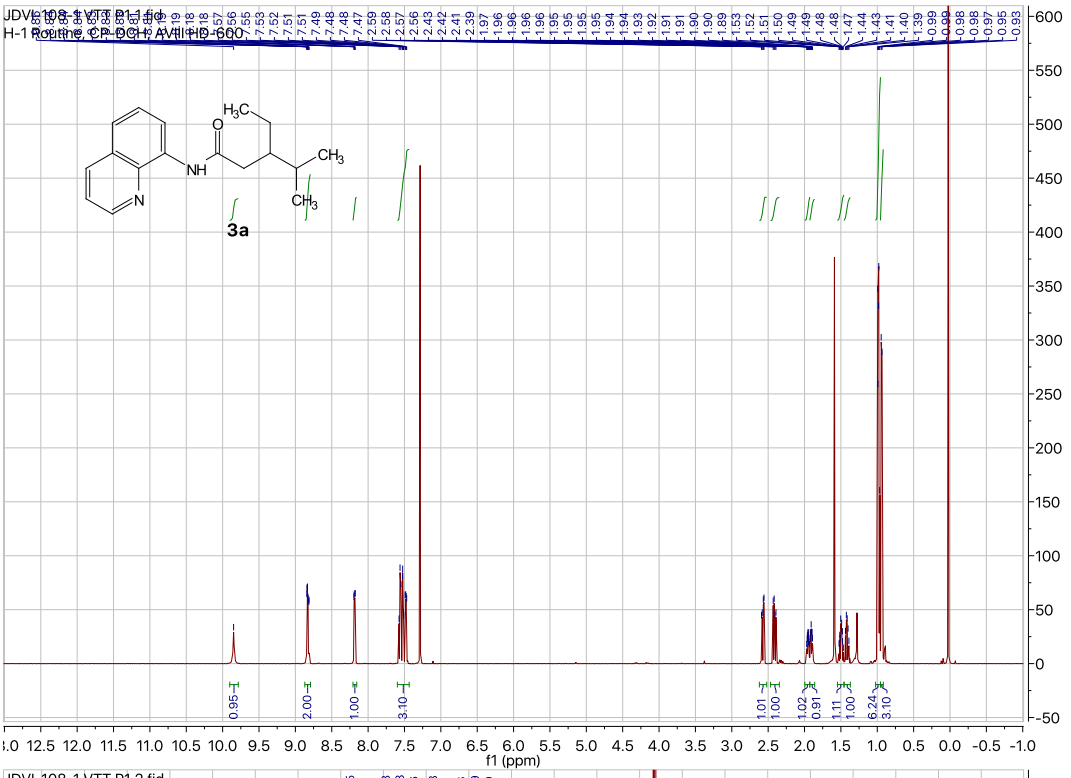

VAV-1-58.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
2l
f1 (ppm)

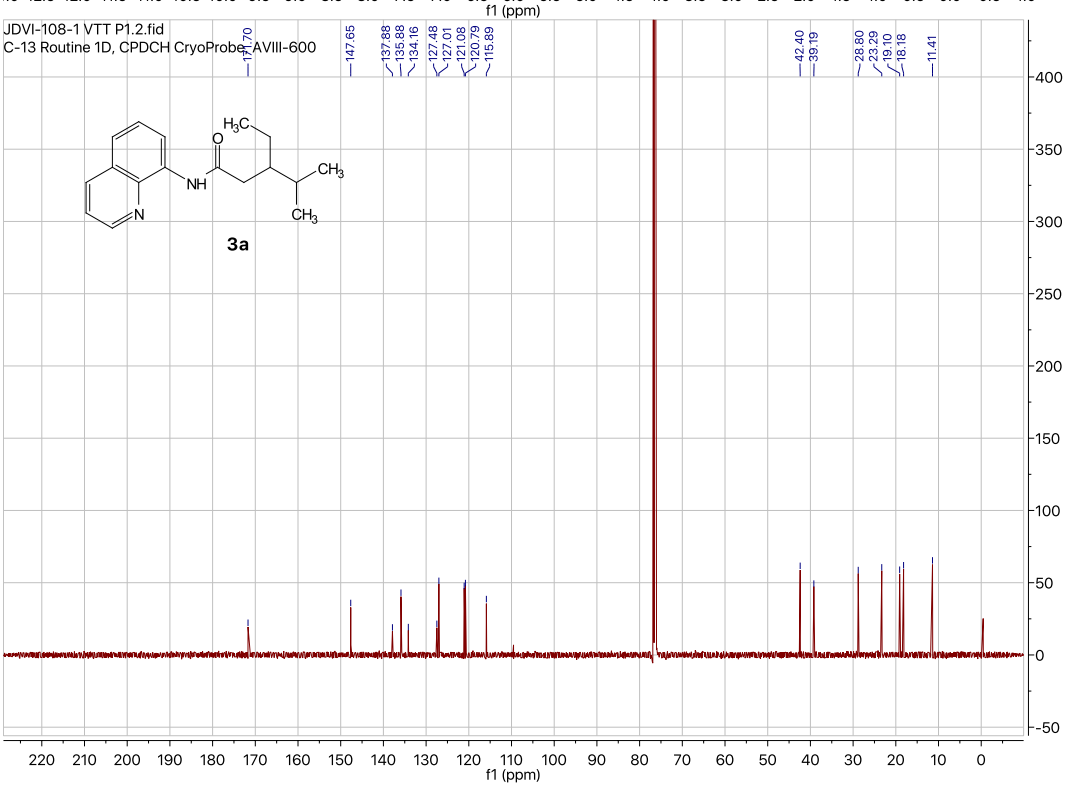

JDVI-93-1 P2.5.fid
50 mM cyclosporine
2m
f1 (ppm)

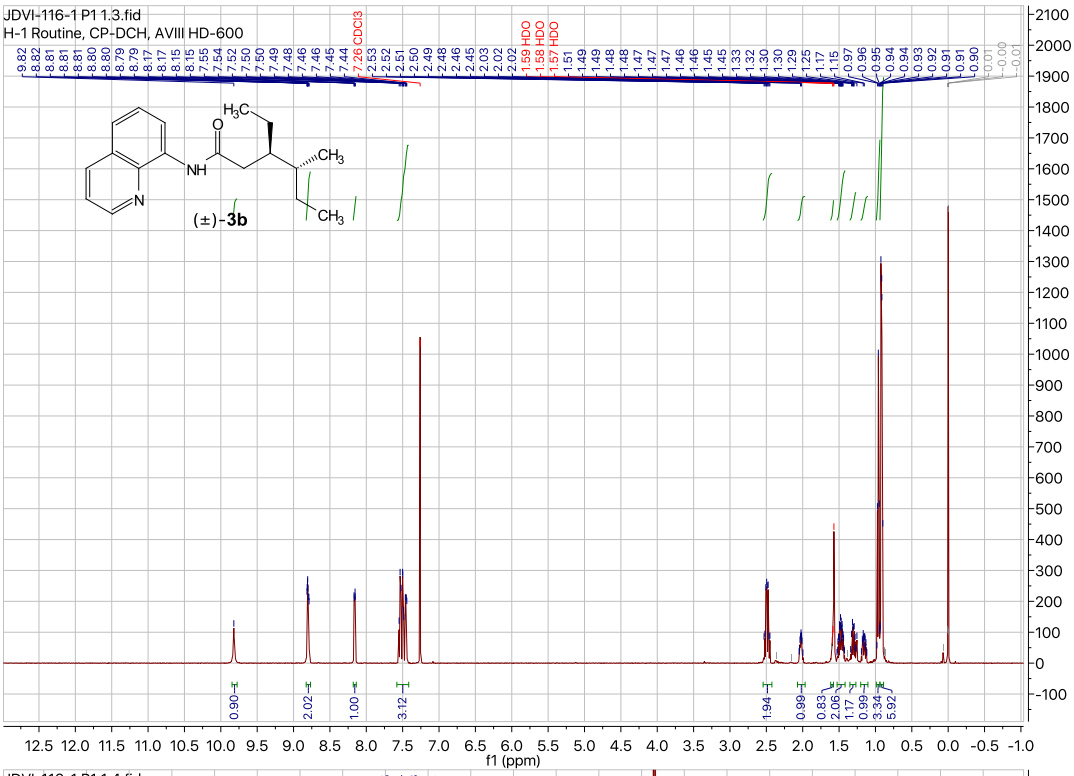

JDVI-93-1 P1.2.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
2m
f1 (ppm)

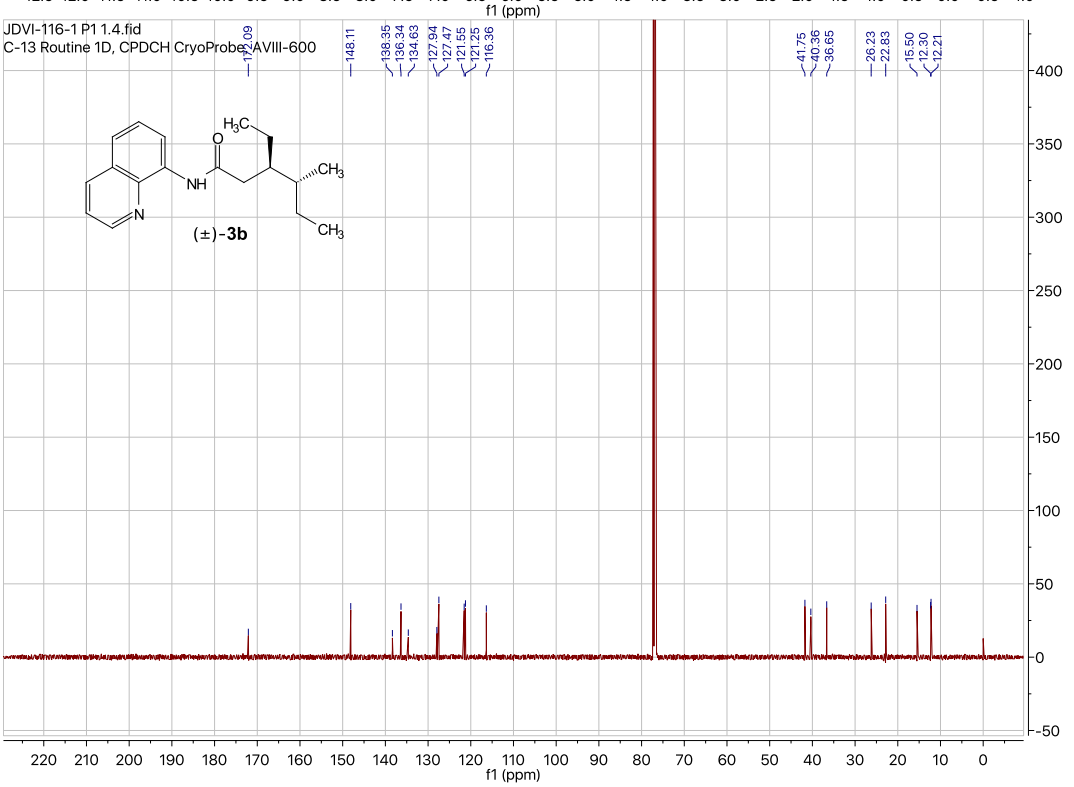

JDVI-105-1 VTT P1.1.fid
H-1 Routine, CPDCH AVIII-HD-600
O
CH3
NH
N
2n
0.93
1.97
1.00
3.06
0.98
1.01
1.04
1.02
1.99
0.94
0.99
1.92
0.90
0.90
2.83
f1 (ppm)

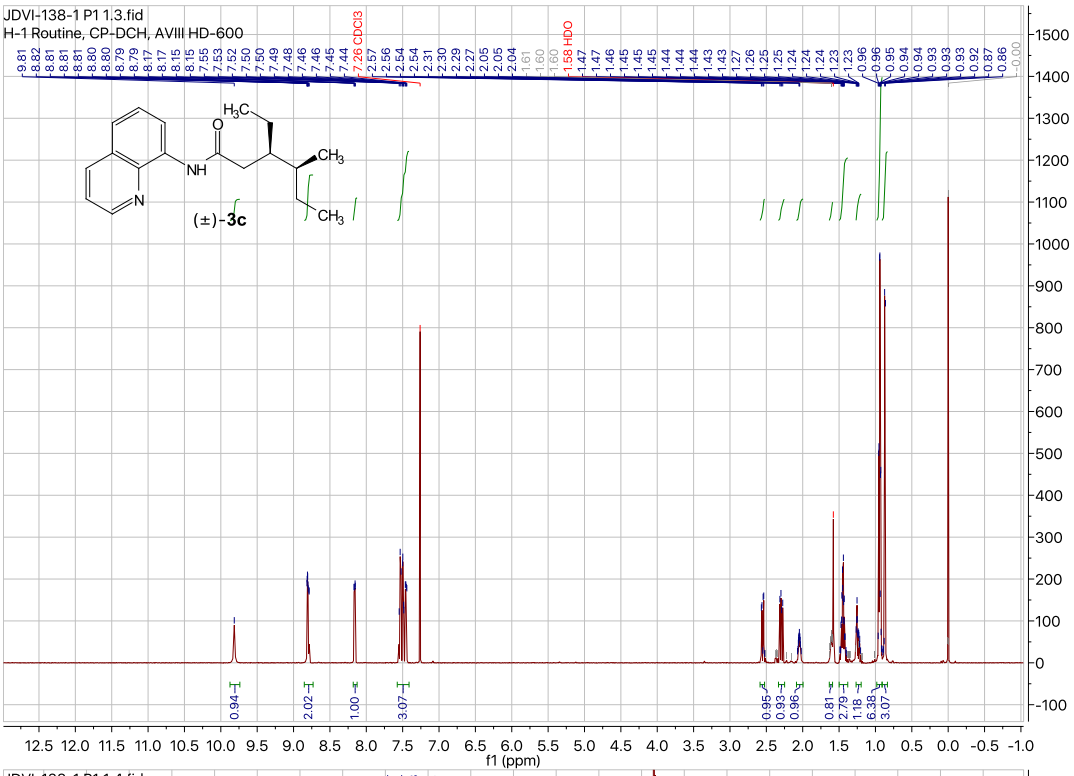

JDVI-105-1 VTT P1.2.fid
C-13 Routine 1D, CPDCH CryoProbe AVIII-600
147.64
137.89
135.89
134.10
127.48
127.00
121.09
120.84
115.94
45.64
43.80
33.70
29.05
28.76
28.25
19.46
18.21
O
CH3
NH
N
2n
f1 (ppm)

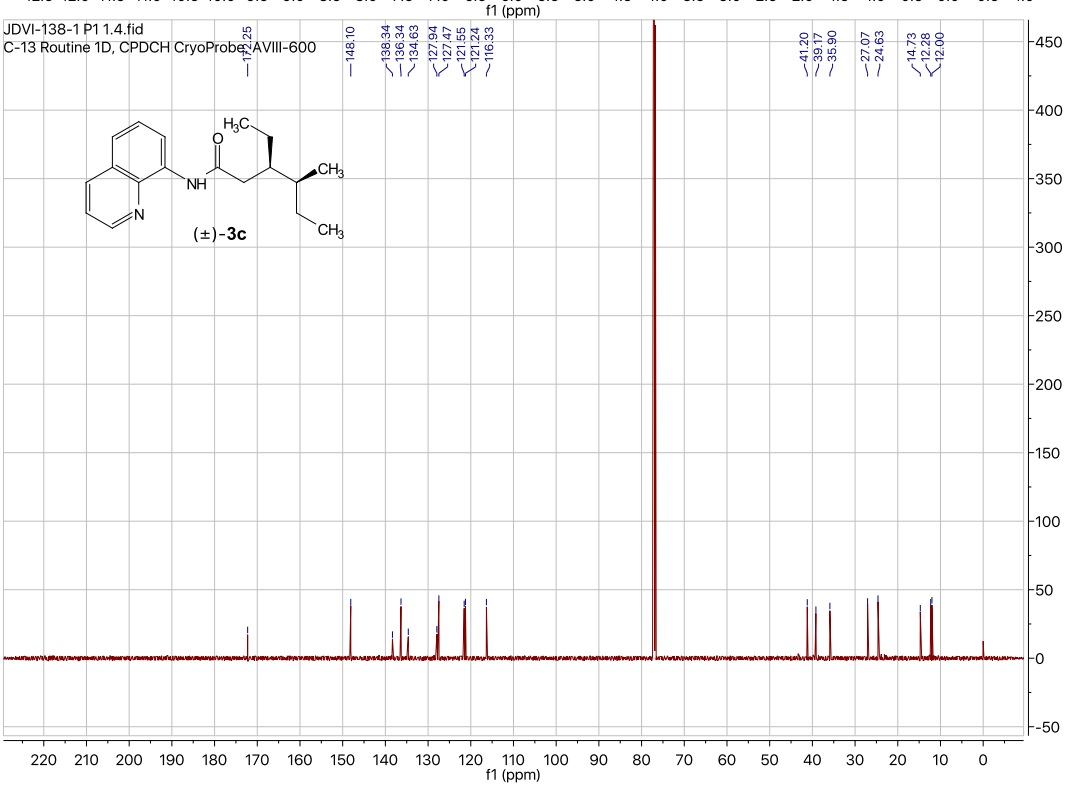

JDVI-108-1 VTT P1.1.fid
H-1 Routine, CP-DCH AVIII-HD-600
3a
f1 (ppm)

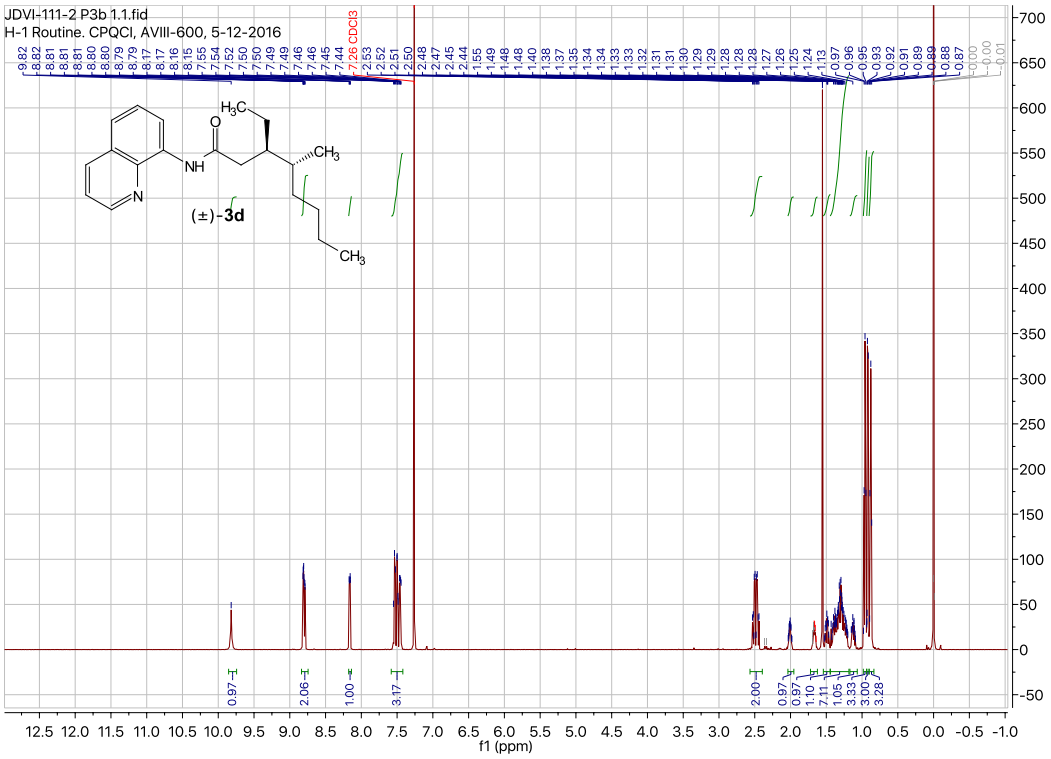

JDVI-108-1 VTT P1.2.fid
C-13 Routine 1D, CPDCH CryoProbe-AVIII-600
3a
f1 (ppm)

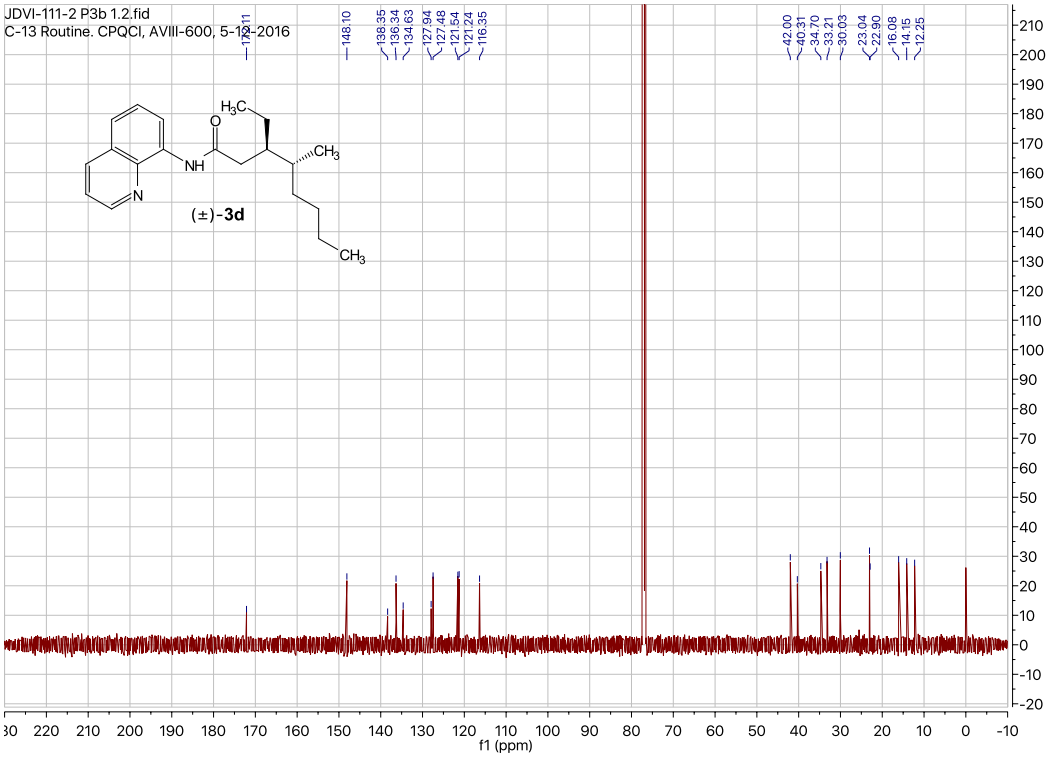

JDVI-116-1 P1 1.3.fid
H-1 Routine, CP-DCH, AVIII HD-600
(±)-3b
f1 (ppm)

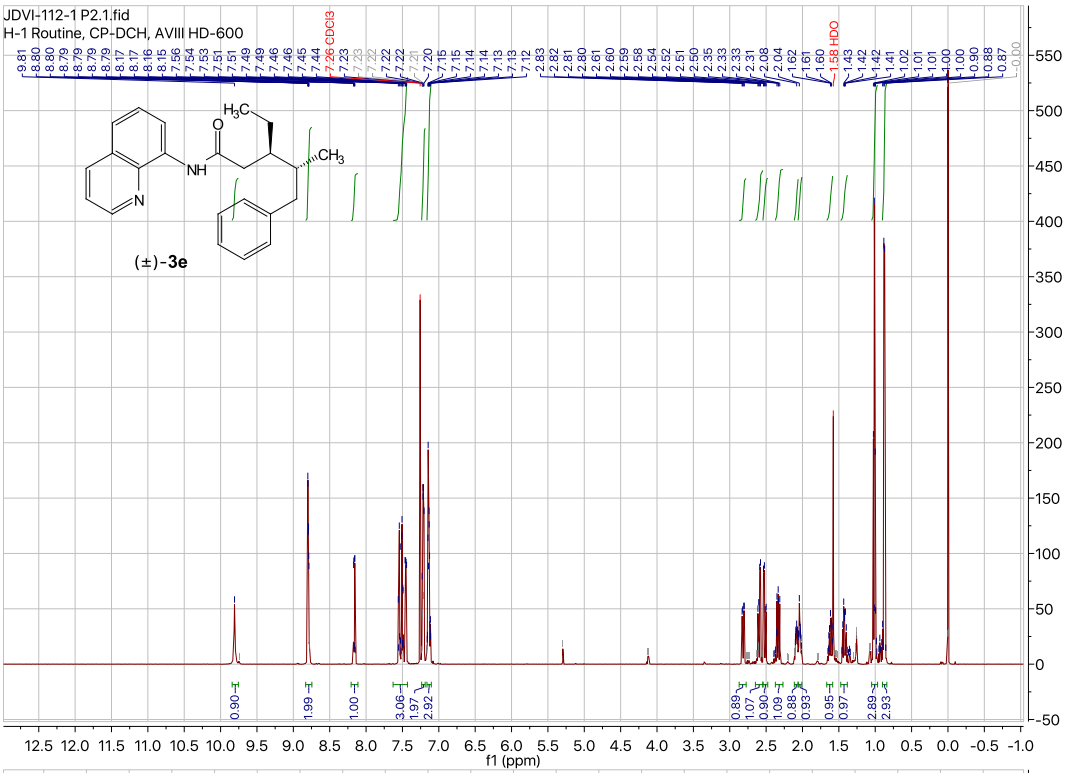

JDVI-116-1 P1 1.4.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-3b
f1 (ppm)

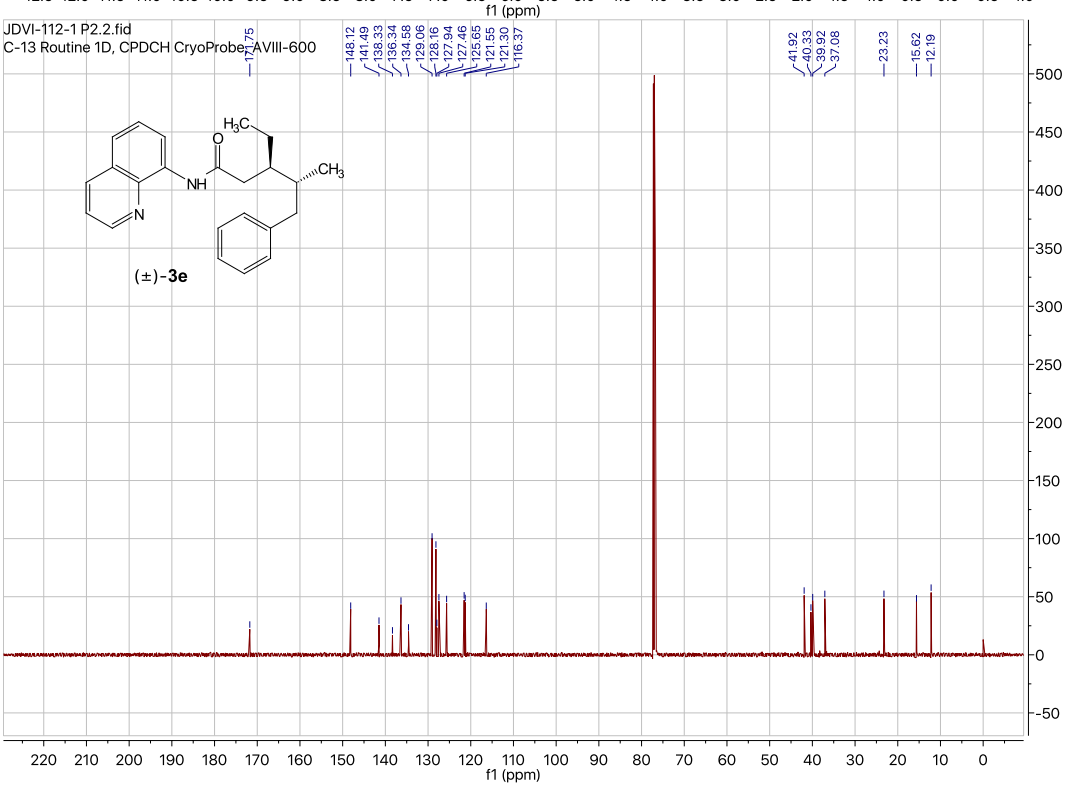

JDVI-138-1 P1 1.3.fid
H-1 Routine, CP-DCH, AVIII HD-600
(±)-3c
f1 (ppm)

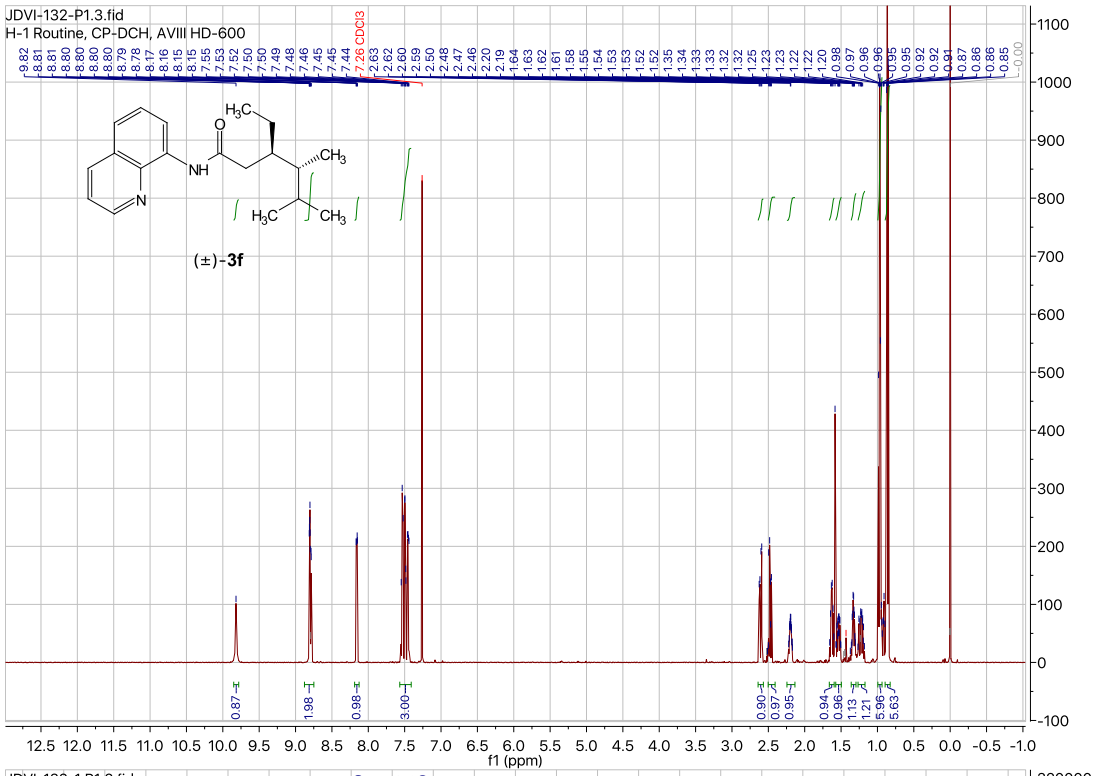

JDVI-138-1 P1 1.4.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-3c
f1 (ppm)

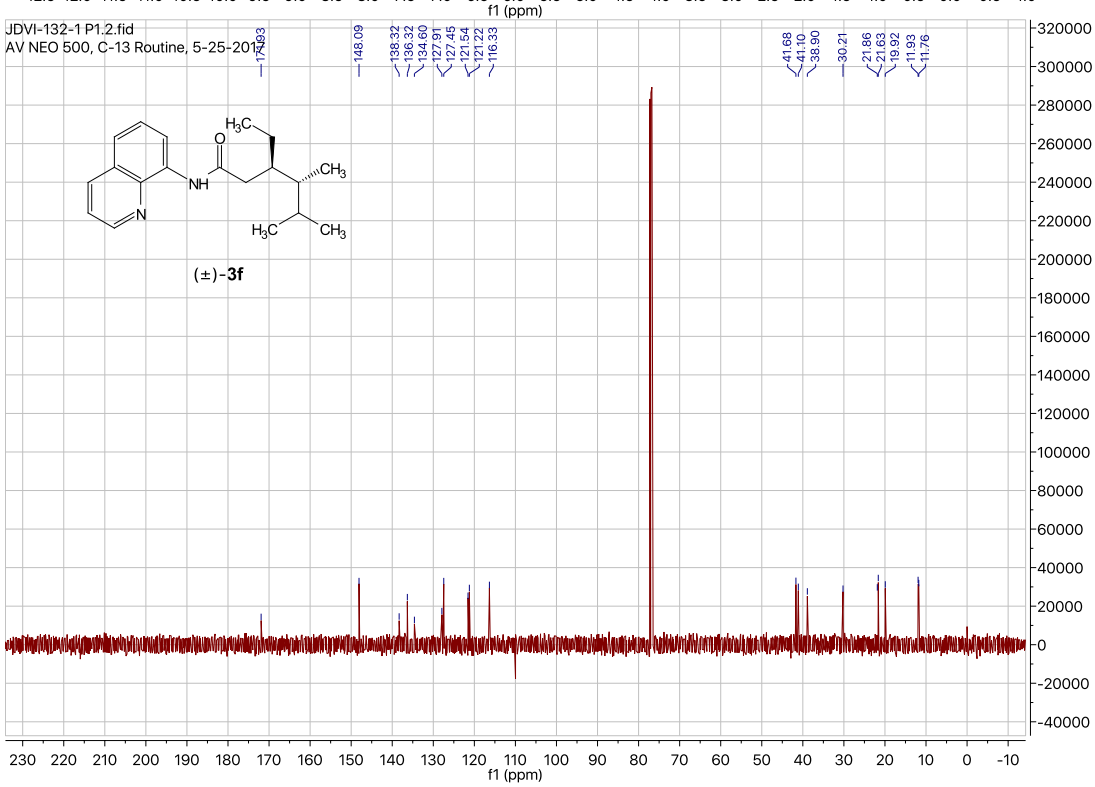

JDVI-111-2 P3b 1.1.fid
H-1 Routine. CPQCI, AVIII-600, 5-12-2016
(±)-3d
f1 (ppm)

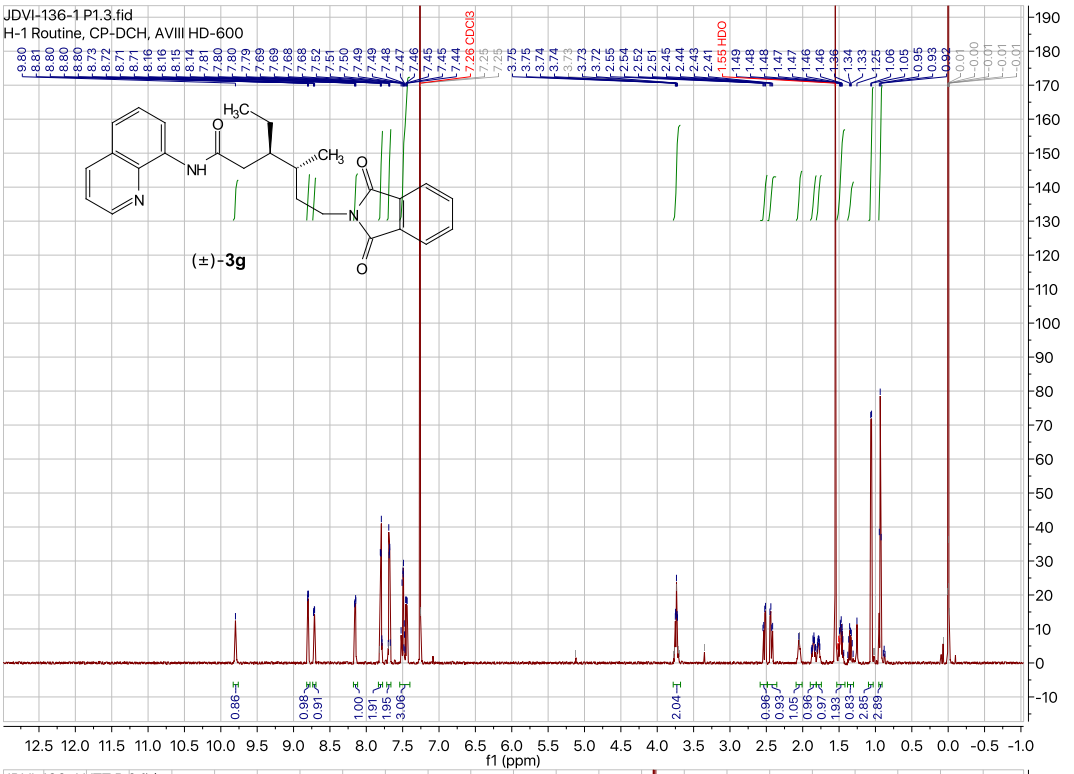

JDVI-111-2 P3b 1.2.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
(±)-3d
f1 (ppm)

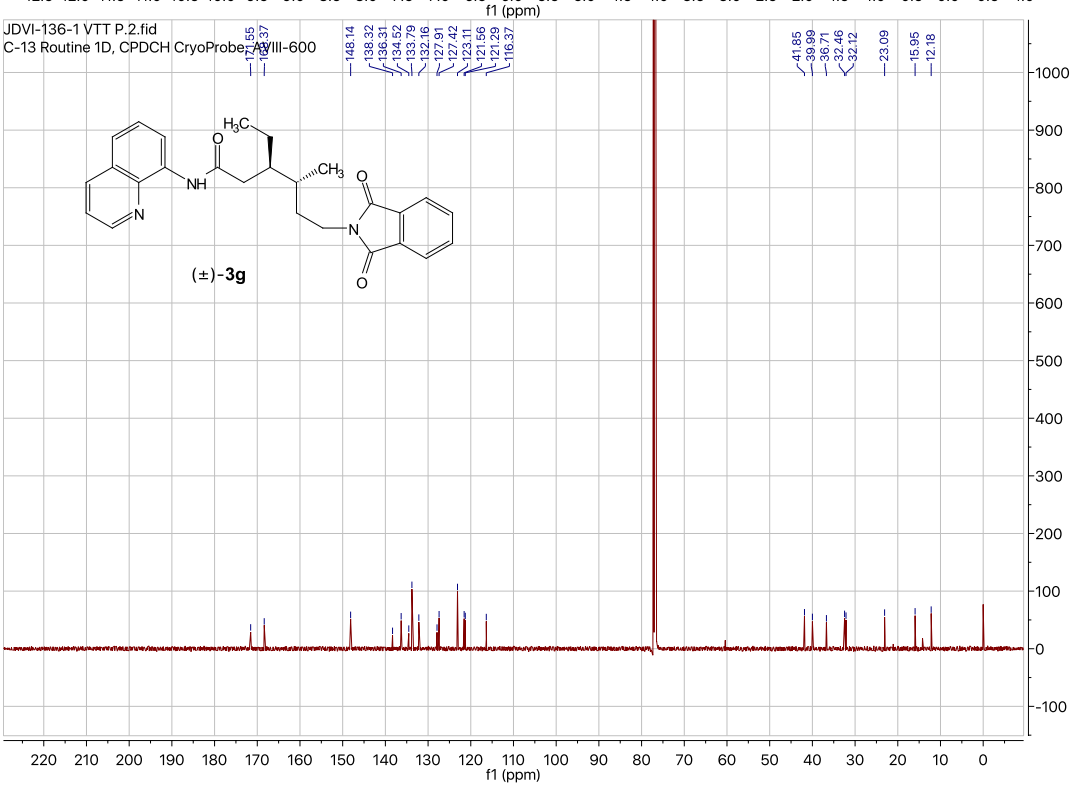

JDVI-112-1 P2.1.fid
H-1 Routine, CP-DCH, AVIII HD-600
(±)-3e
f1 (ppm)

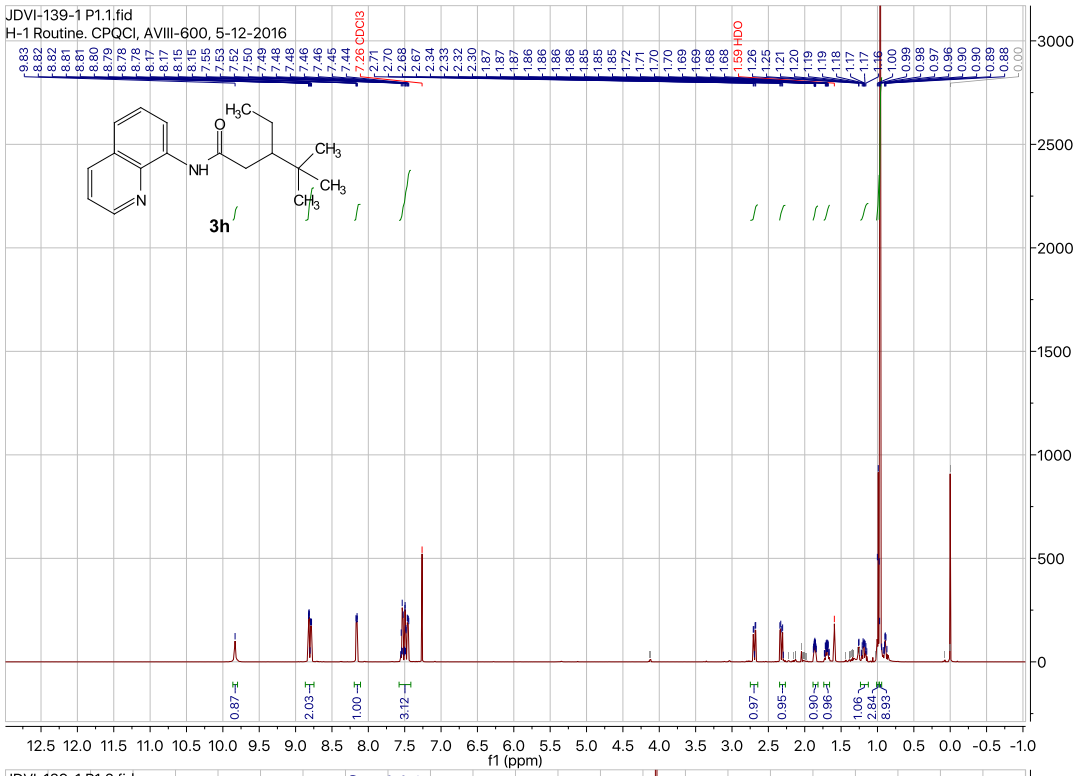

JDVI-112-1 P2.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-3e
f1 (ppm)

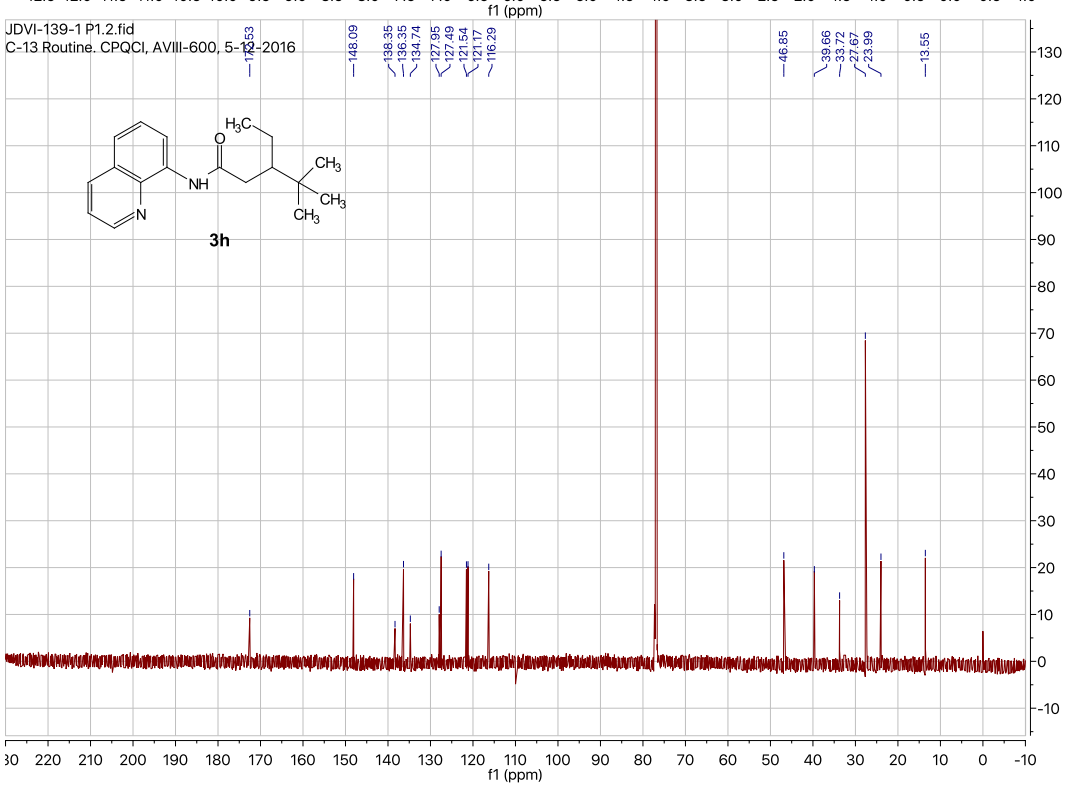

JDVI-132-P1.3.fid
H-1 Routine, CP-DCH, AVIII HD-600
(±)-3f

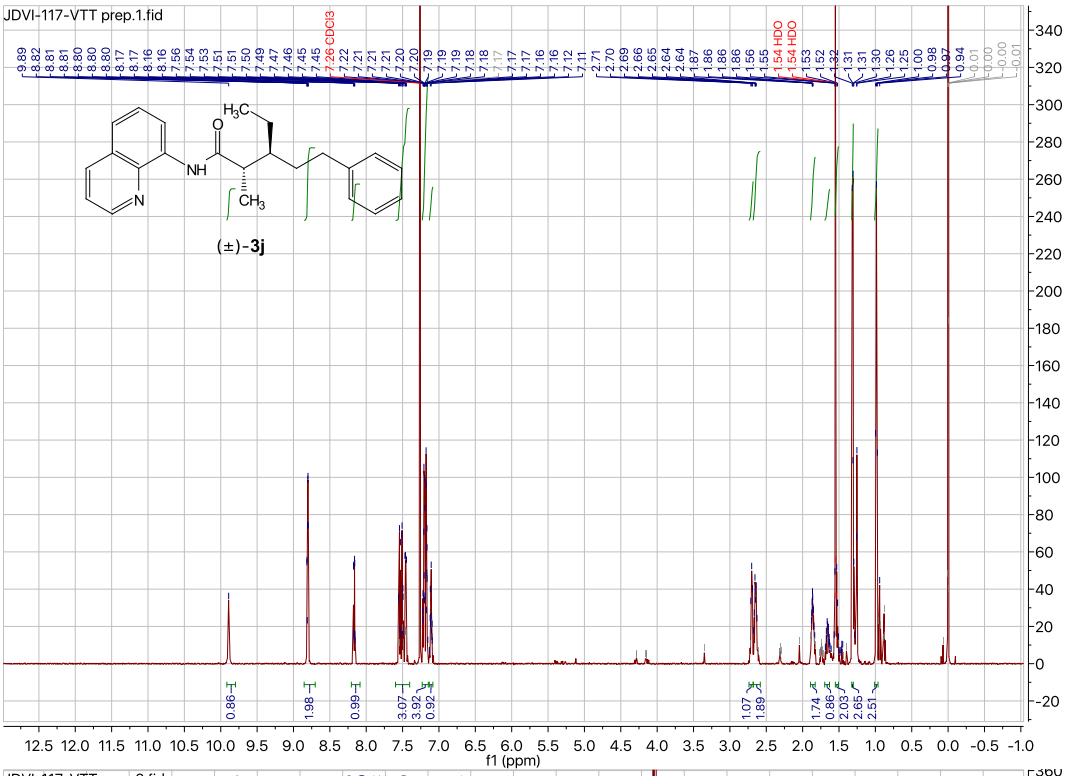

JDVI-132-1 P1.2.fid
AV NEO 500, C-13 Routine, 5-25-2017
(±)-3f

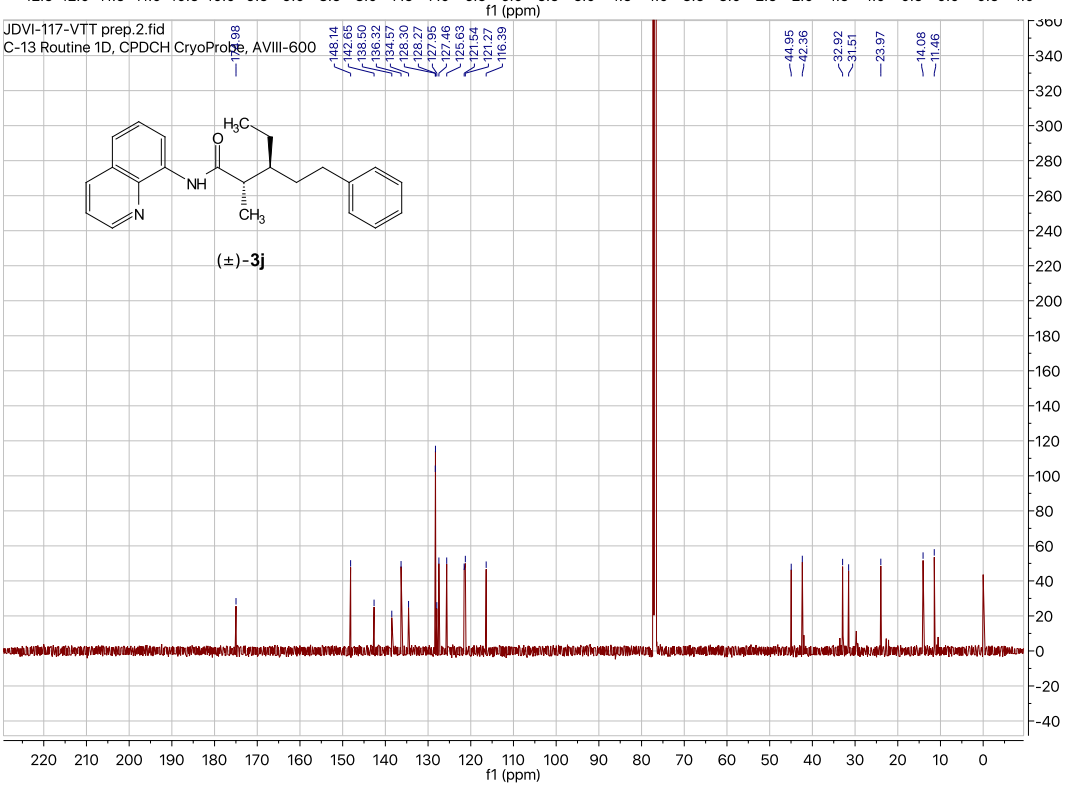

JDVI-136-1 P1.3.fid
H-1 Routine, CP-DCH, AVIII HD-600
(±)-3g
f1 (ppm)

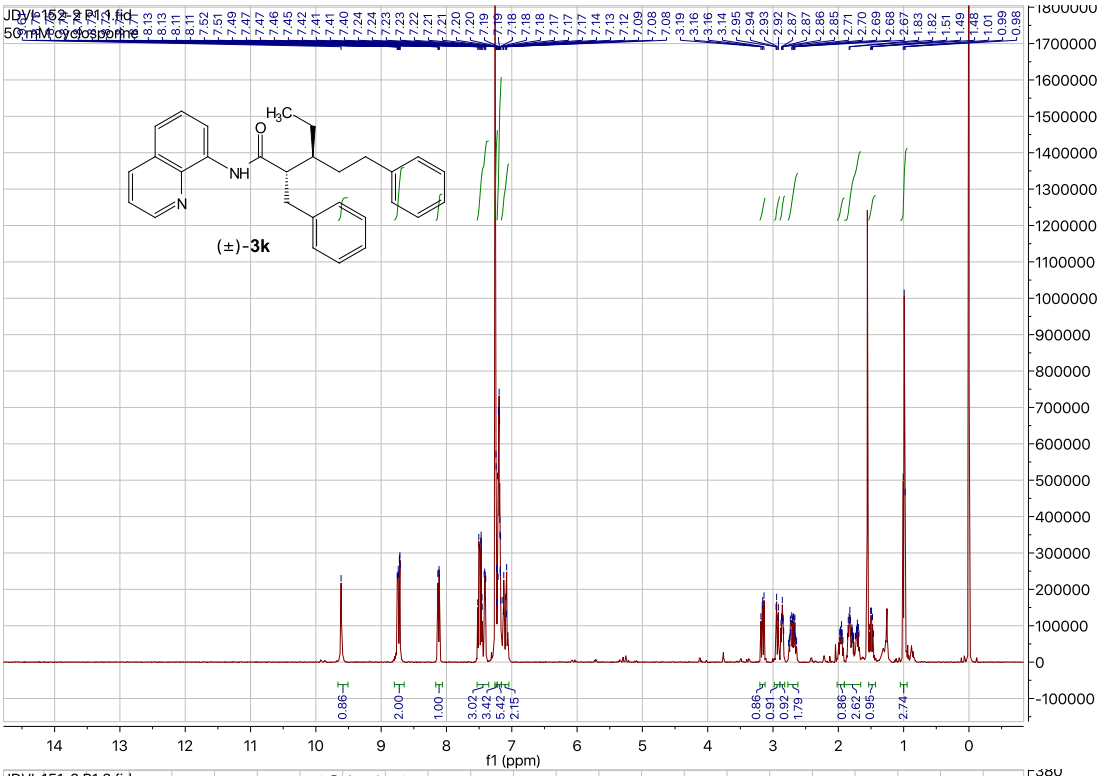

JDVI-136-1 VTT P.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-3g
f1 (ppm)

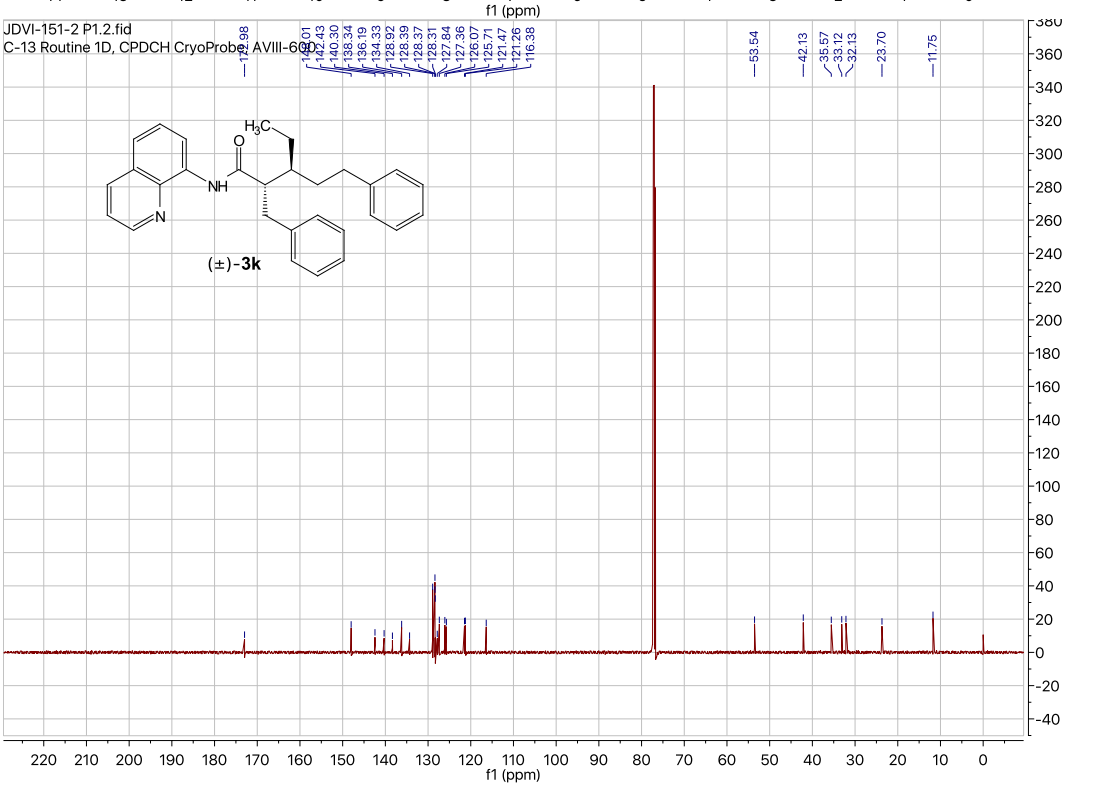

JDVI-139-1 P1.1.fid
H-1 Routine. CPQCI, AVIII-600, 5-12-2016
3h
f1 (ppm)

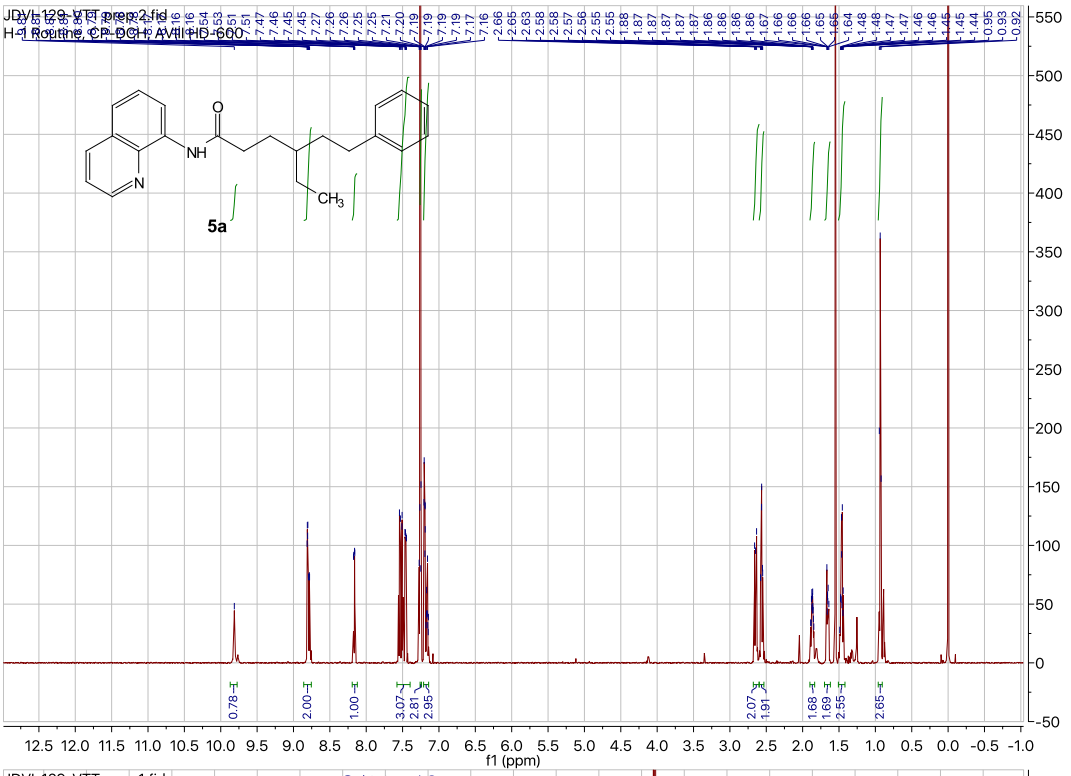

JDVI-139-1 P1.2.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
3h
f1 (ppm)

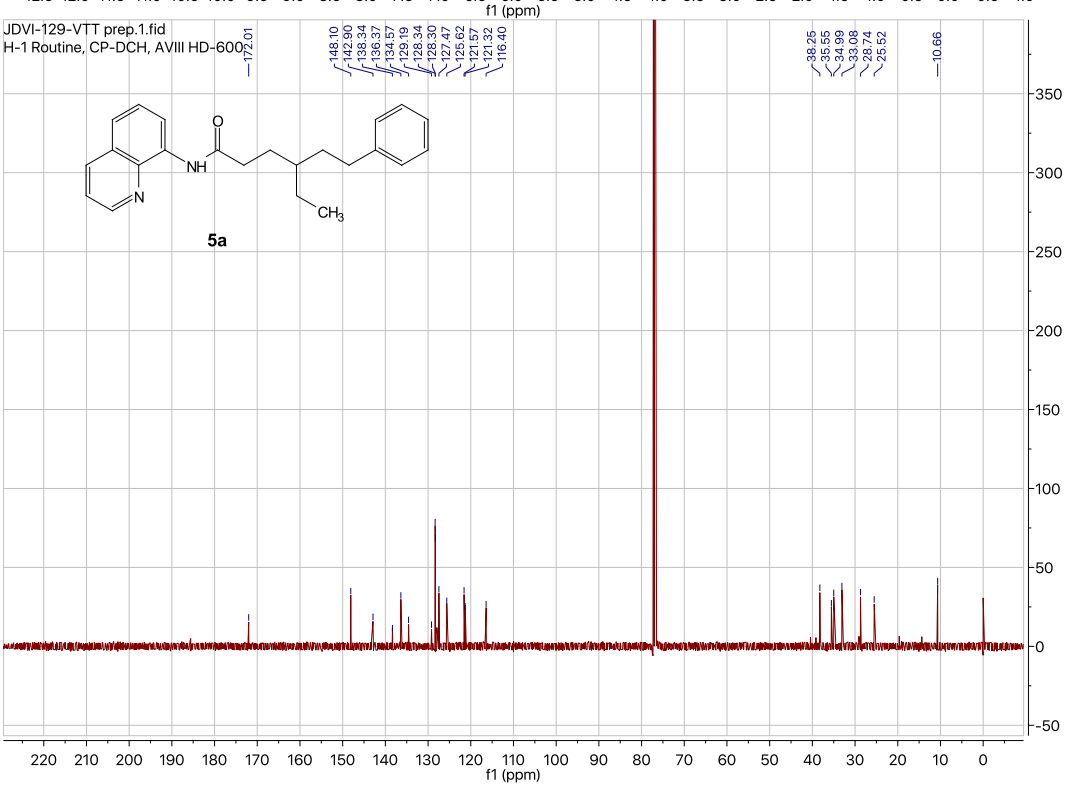

JDVI-117-VTT prep.1.fid
(±)-3j
f1 (ppm)

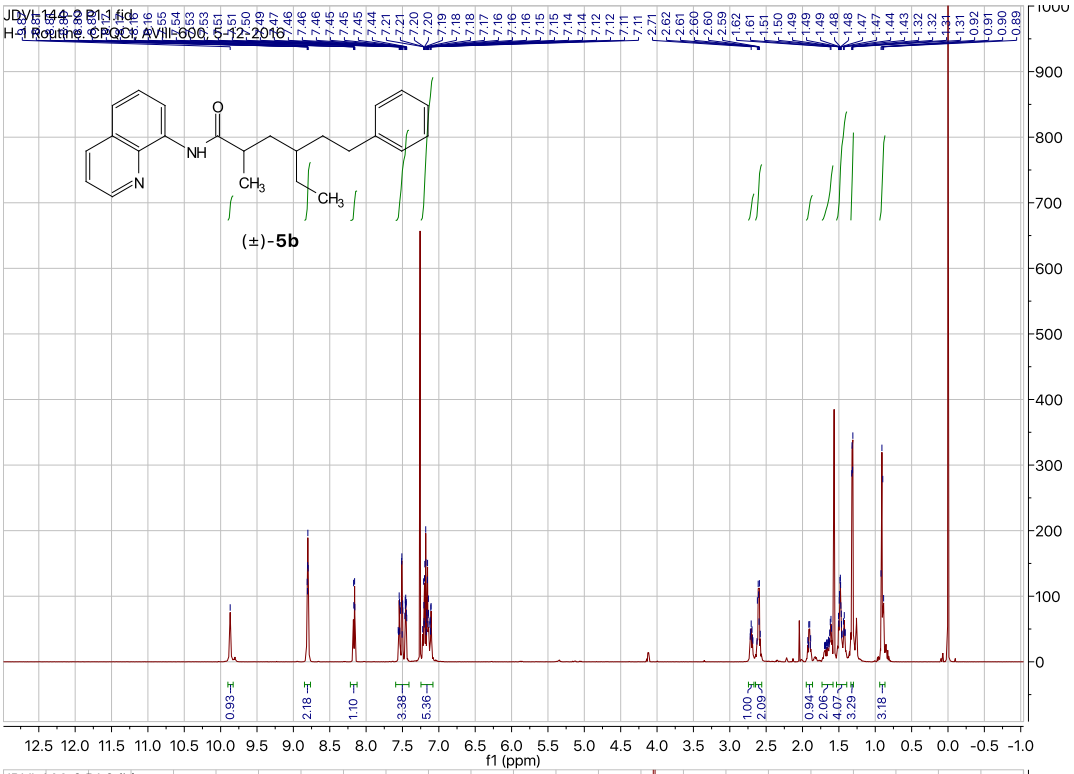

JDVI-117-VTT prep.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-3j
f1 (ppm)

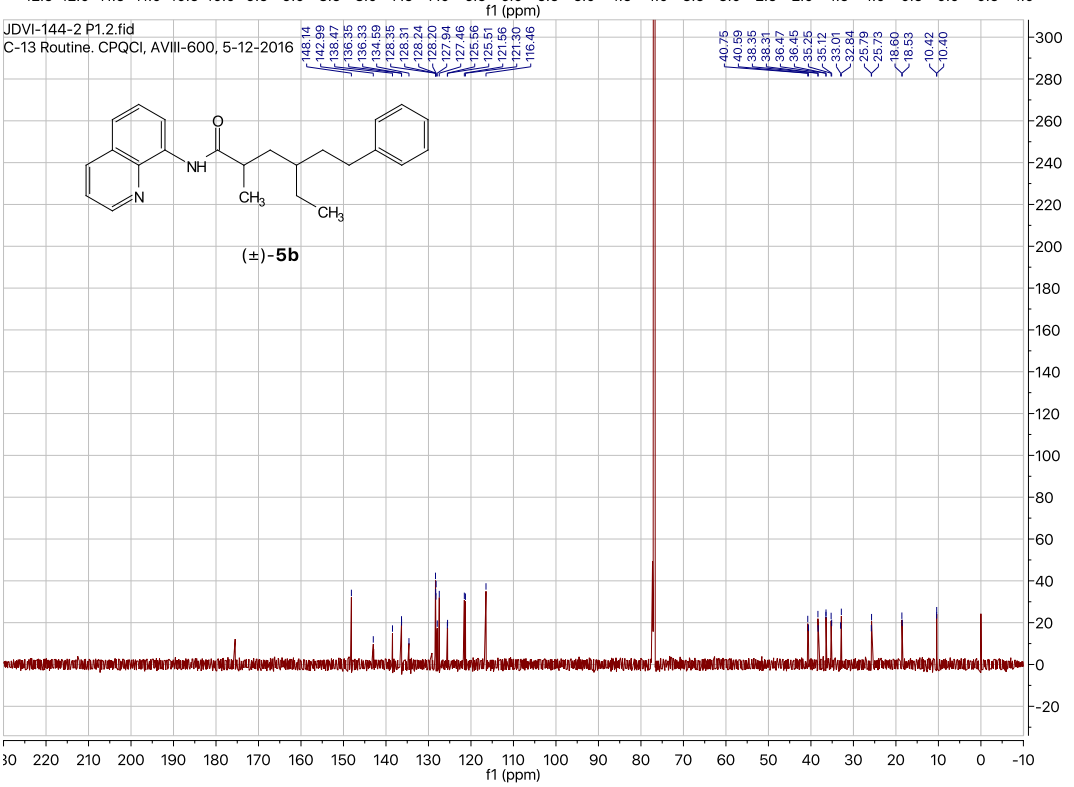

JDVI-152-2 P1.1.fid
50 mM cyclosporine
(±)-3k
f1 (ppm)

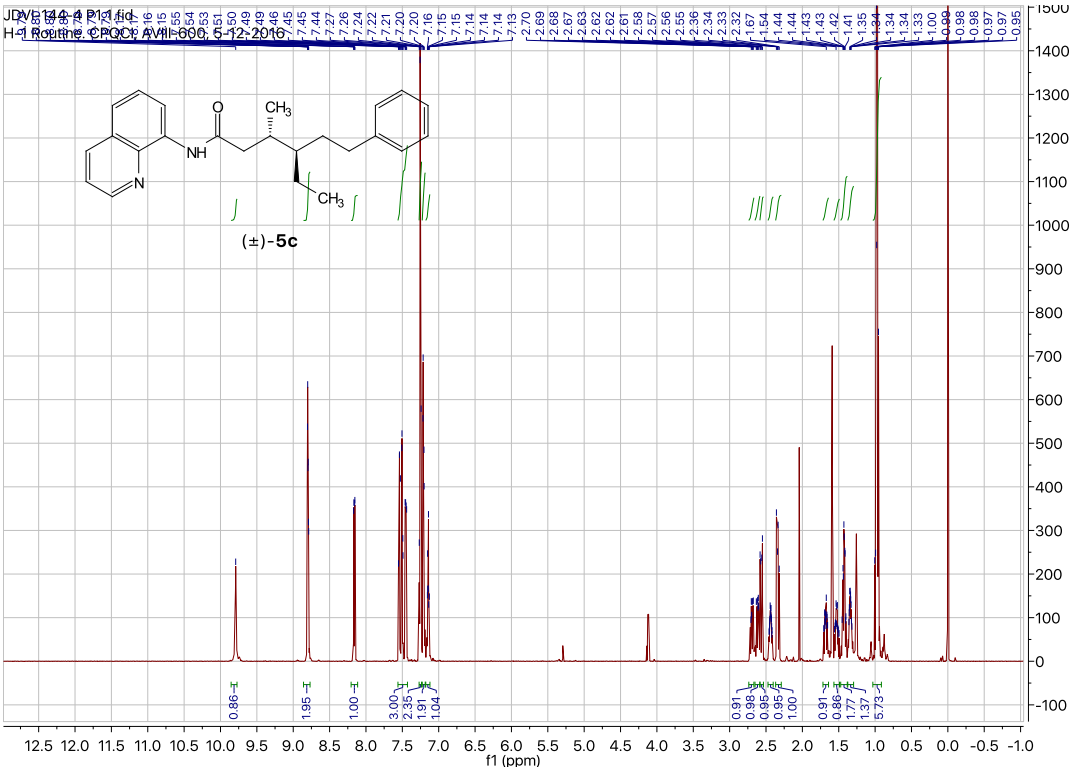

JDVI-151-2 P1.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-3k
f1 (ppm)

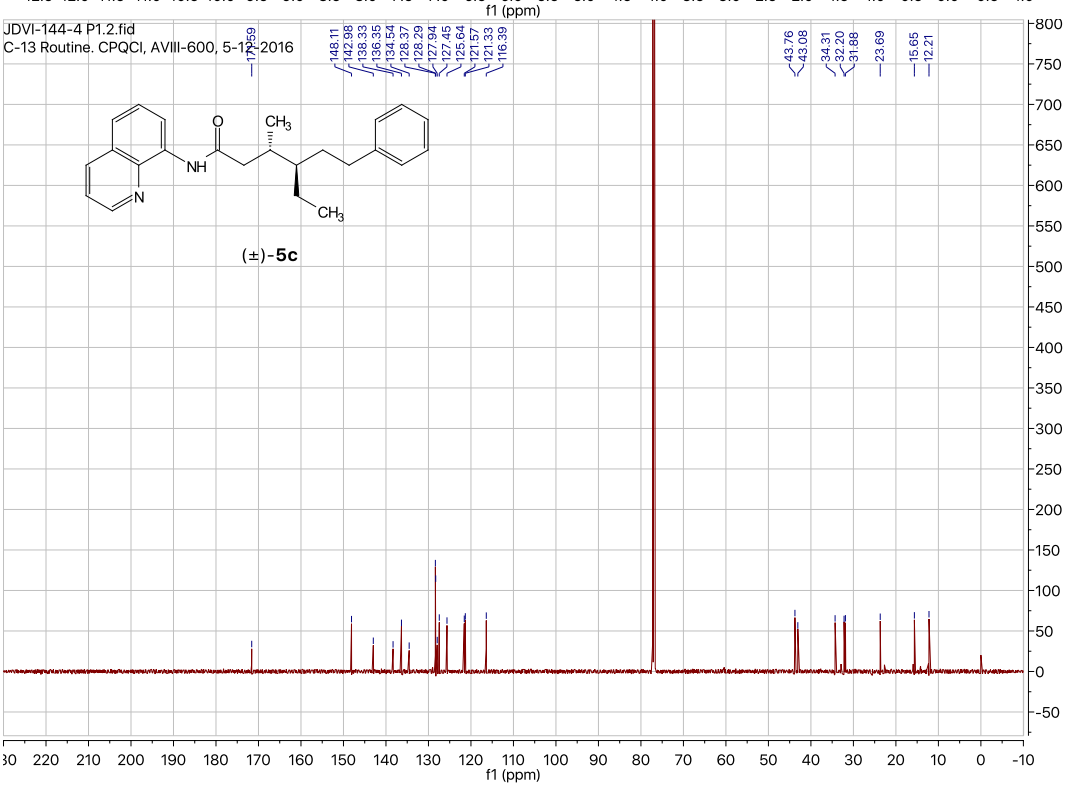

JDVI-129-VTT prep2.fid
H-1 Routine, CP-DCH, AVIII HD-600
O
NH
N
CH3
5a
f1 (ppm)

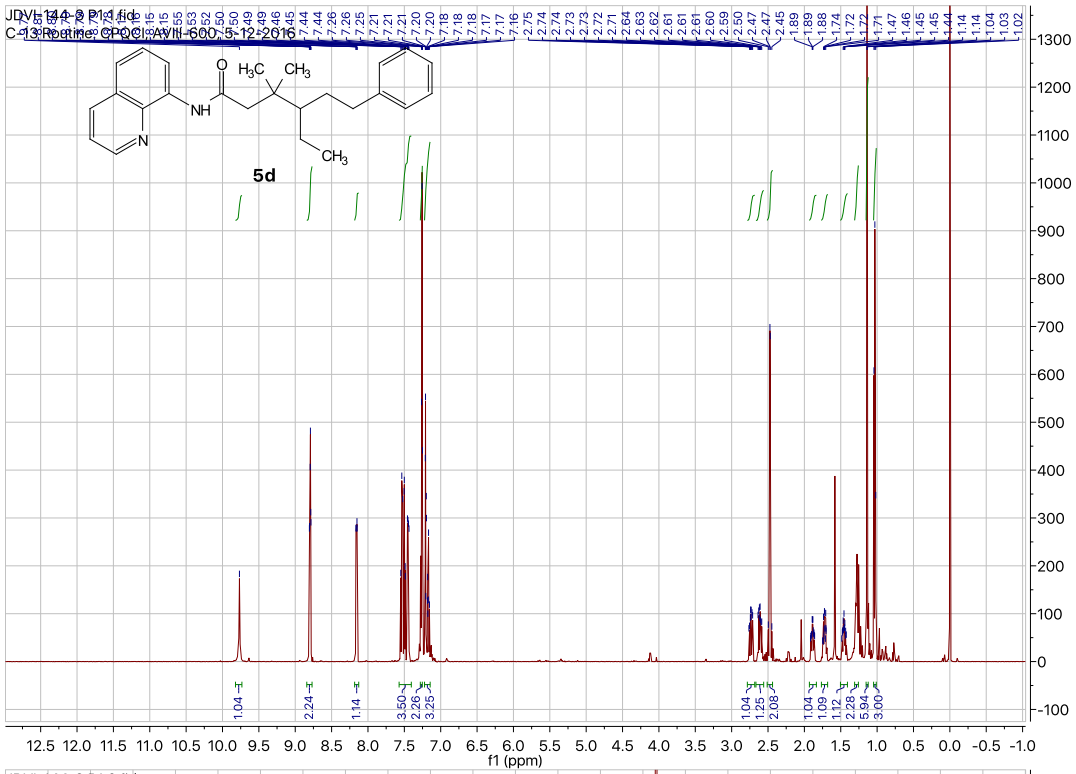

JDVI-129-VTT prep.1.fid
H-1 Routine, CP-DCH, AVIII HD-600
O
NH
N
CH3
5a
f1 (ppm)

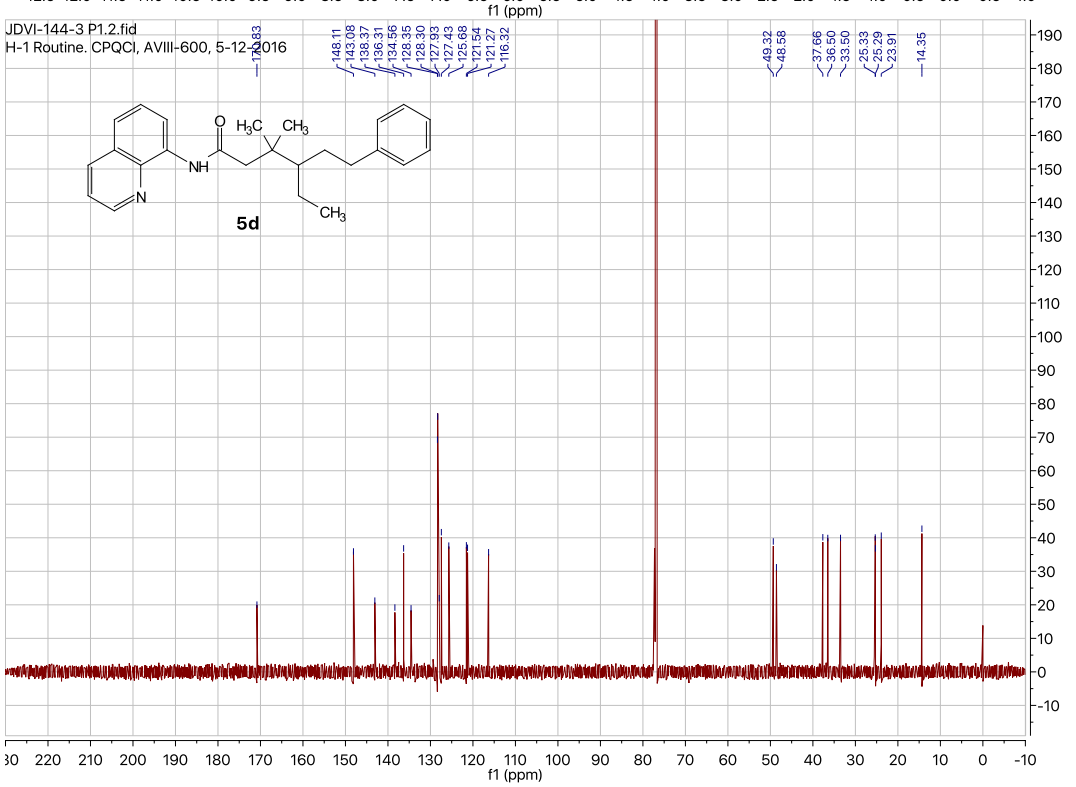

JDVI-144-2 P1.1.fid
H-1 Routine. CPQCI, AVIII-600, 5-12-2016
(±)-5b
f1 (ppm)

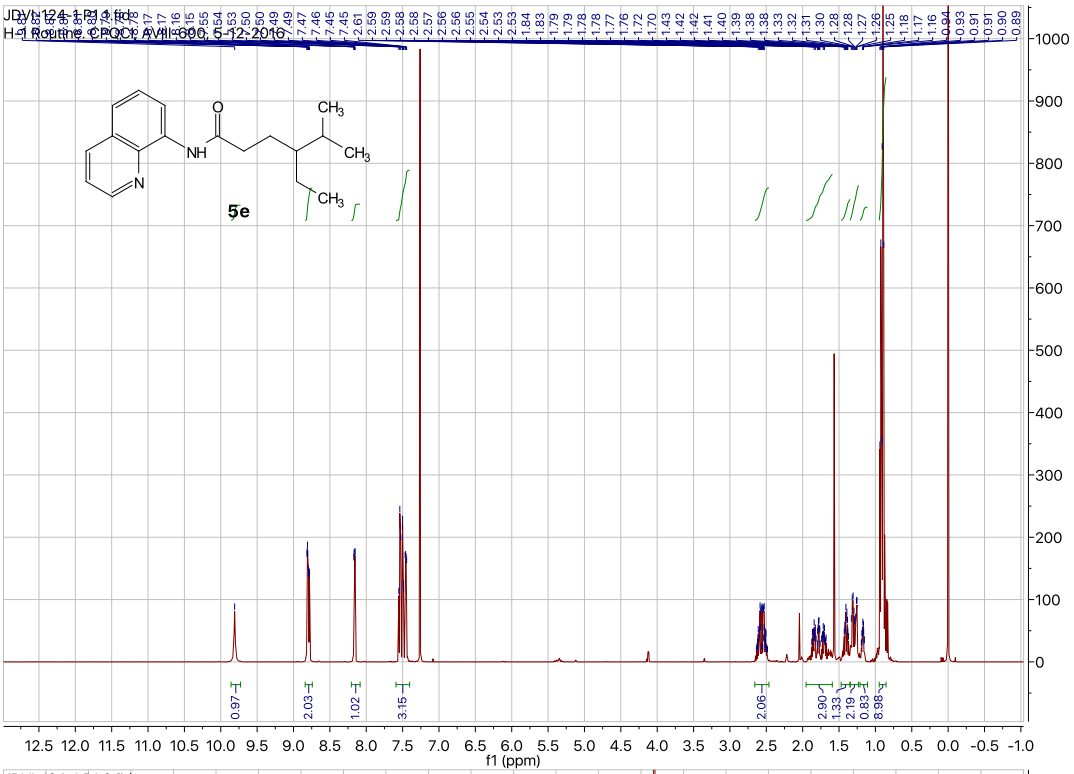

JDVI-144-2 P1.2.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
(±)-5b
f1 (ppm)

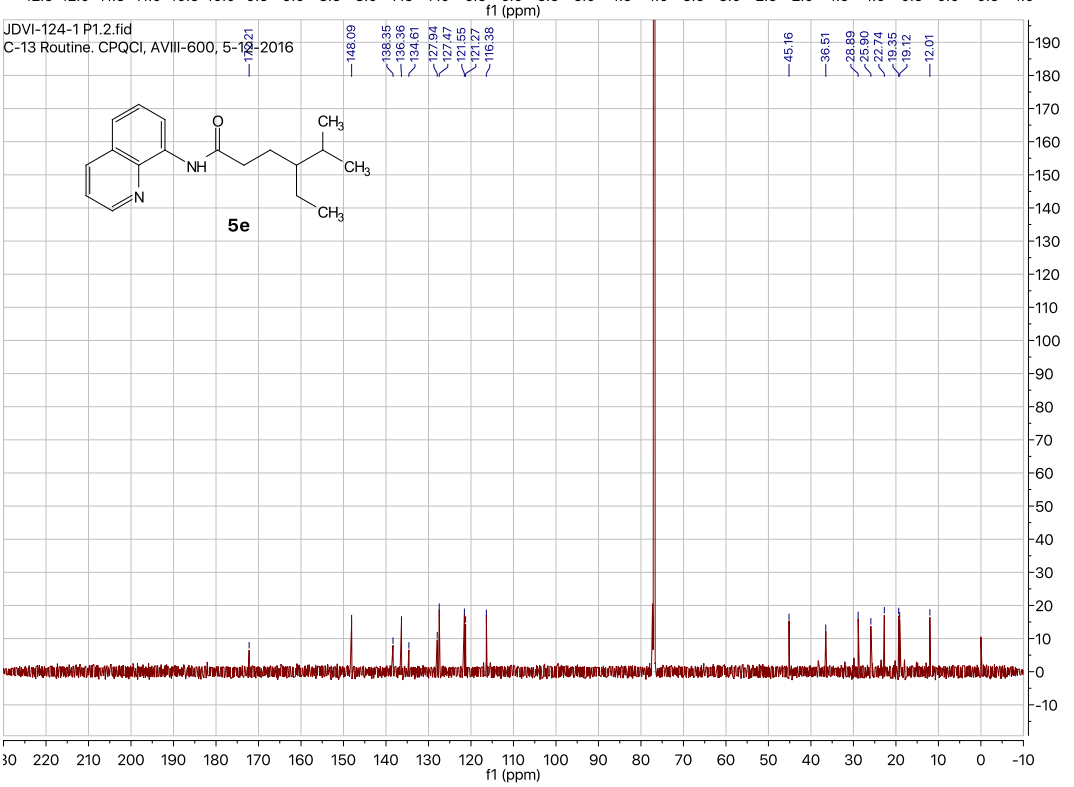

JDVI-144-4 P1.fid
H-1 Routine. CPQCI, AVIII-600, 5-12-2016
(±)-5c
f1 (ppm)

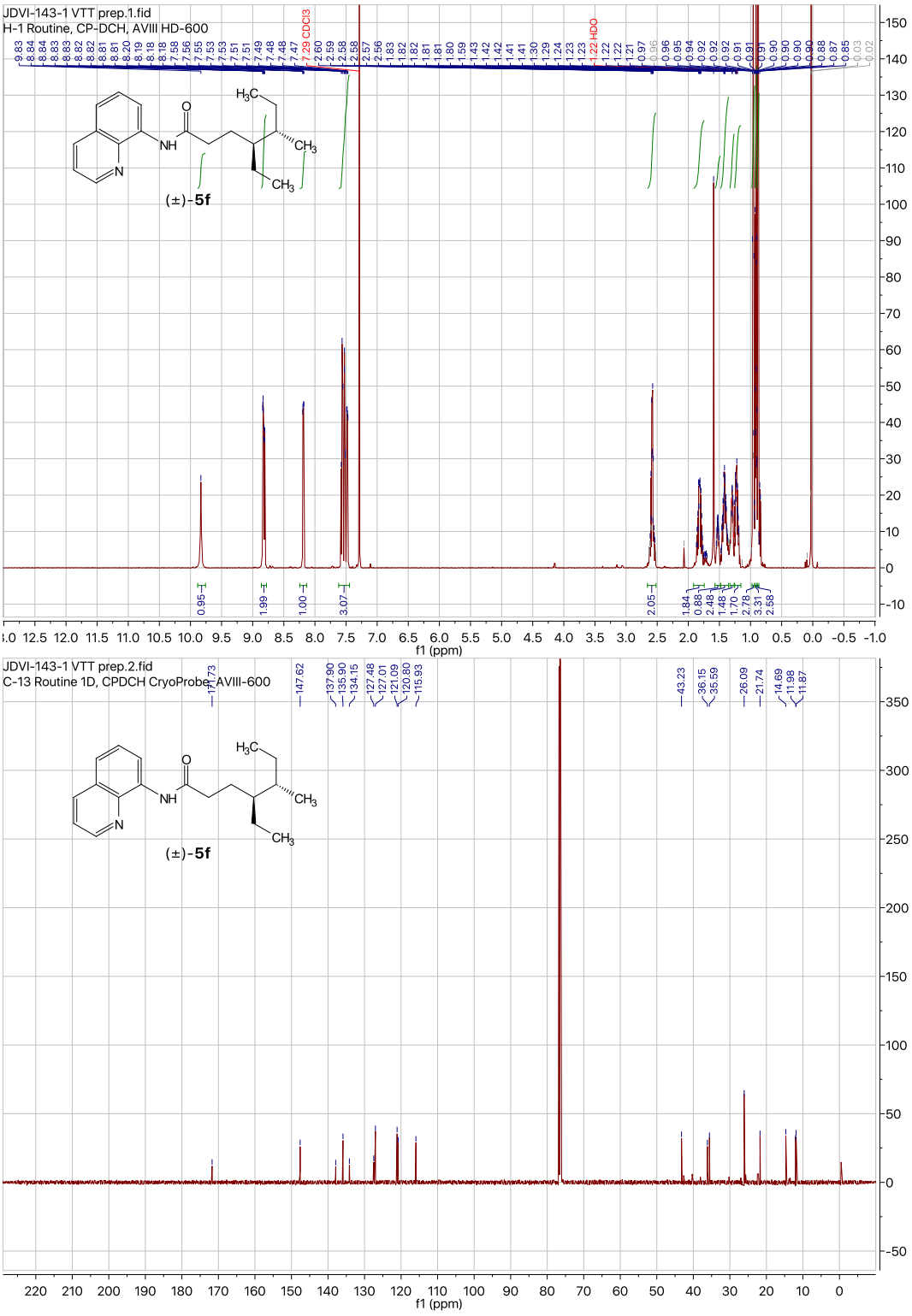

JDVI-144-4 P1.2.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
(±)-5c
f1 (ppm)

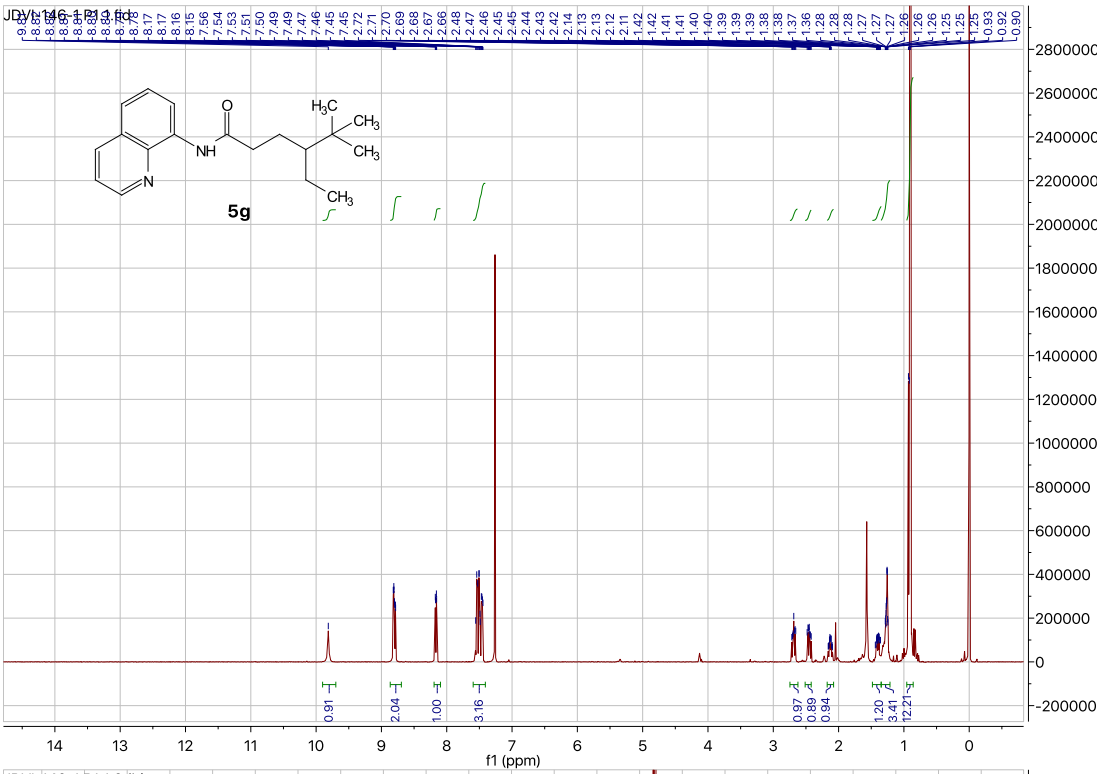

JDVI-144-3 P1.1.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
O
H3C
CH3
NH
N
CH3
5d
1.04
2.24
1.14
3.50
2.26
3.25
1.04
1.25
2.08
1.04
1.09
1.12
2.28
5.94
3.00
f1 (ppm)

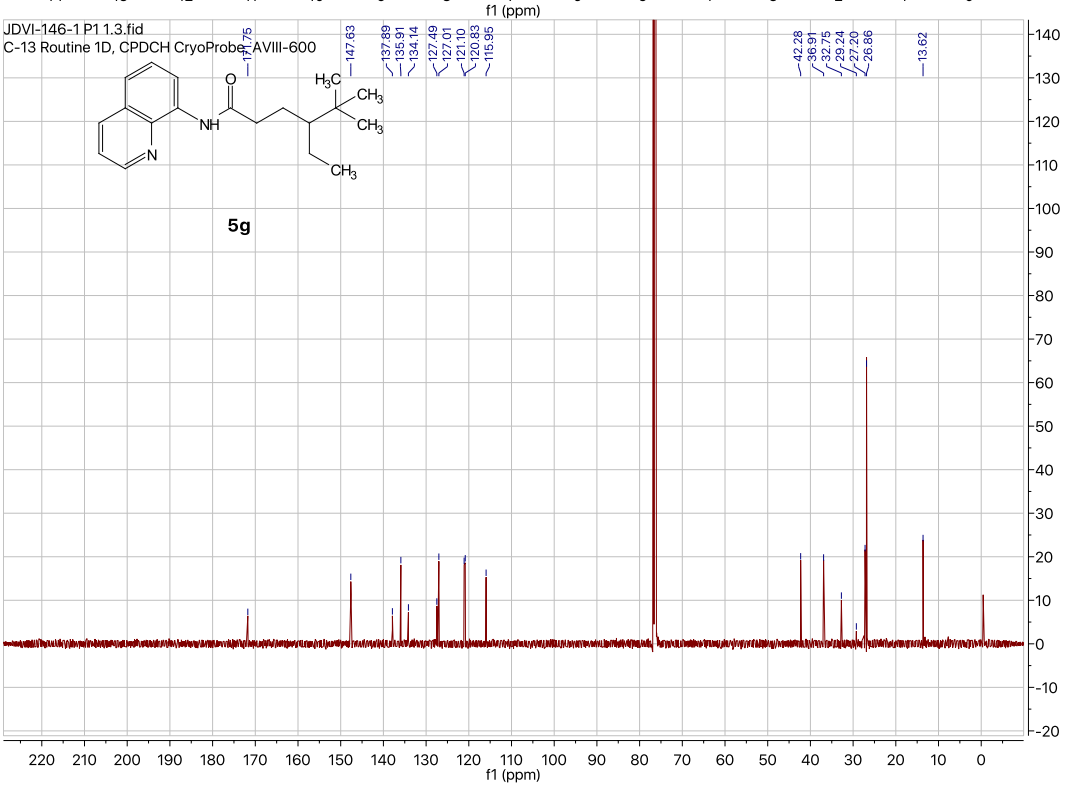

JDVI-144-3 P1.2.fid
H-1 Routine. CPQCI, AVIII-600, 5-12-2016
148.11
143.08
138.37
136.31
134.56
128.35
128.30
127.93
127.43
125.68
121.54
121.27
116.32
49.32
48.58
37.66
36.50
33.50
25.33
25.29
23.91
14.35
O
H3C
CH3
NH
N
CH3
5d
f1 (ppm)

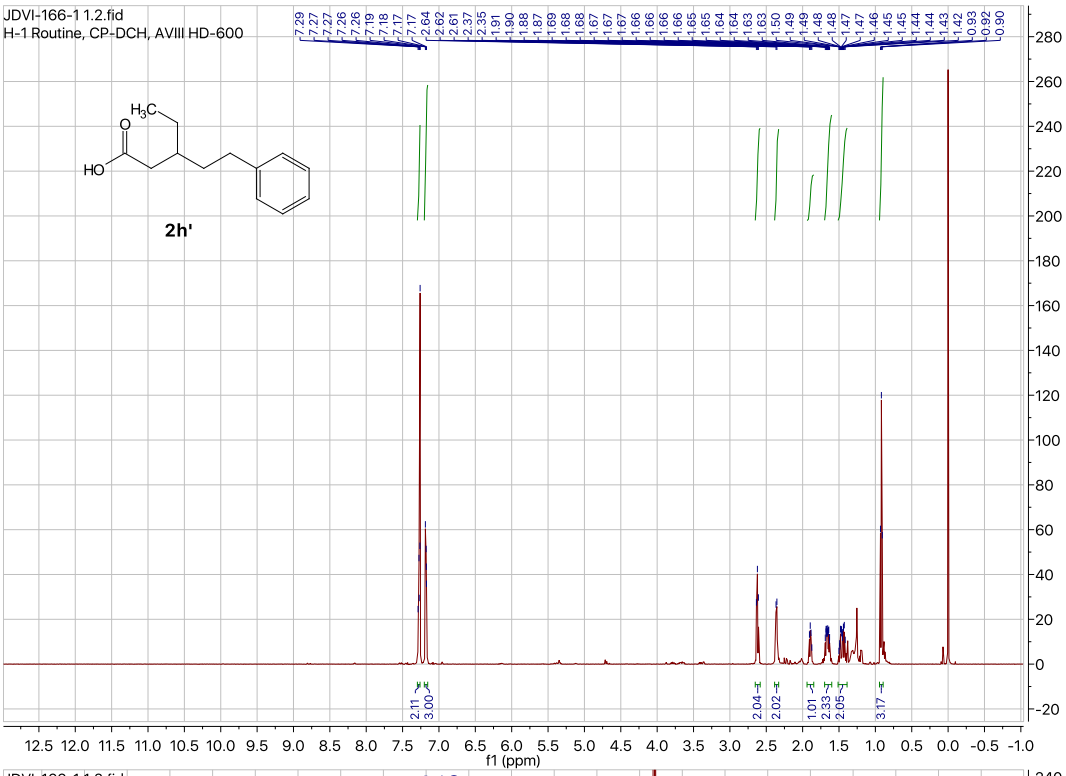

JDVI-124-1 P1.4.fid
H-1 Routine. CPQCI, AVIII-600, 5-12-2016
5e
f1 (ppm)

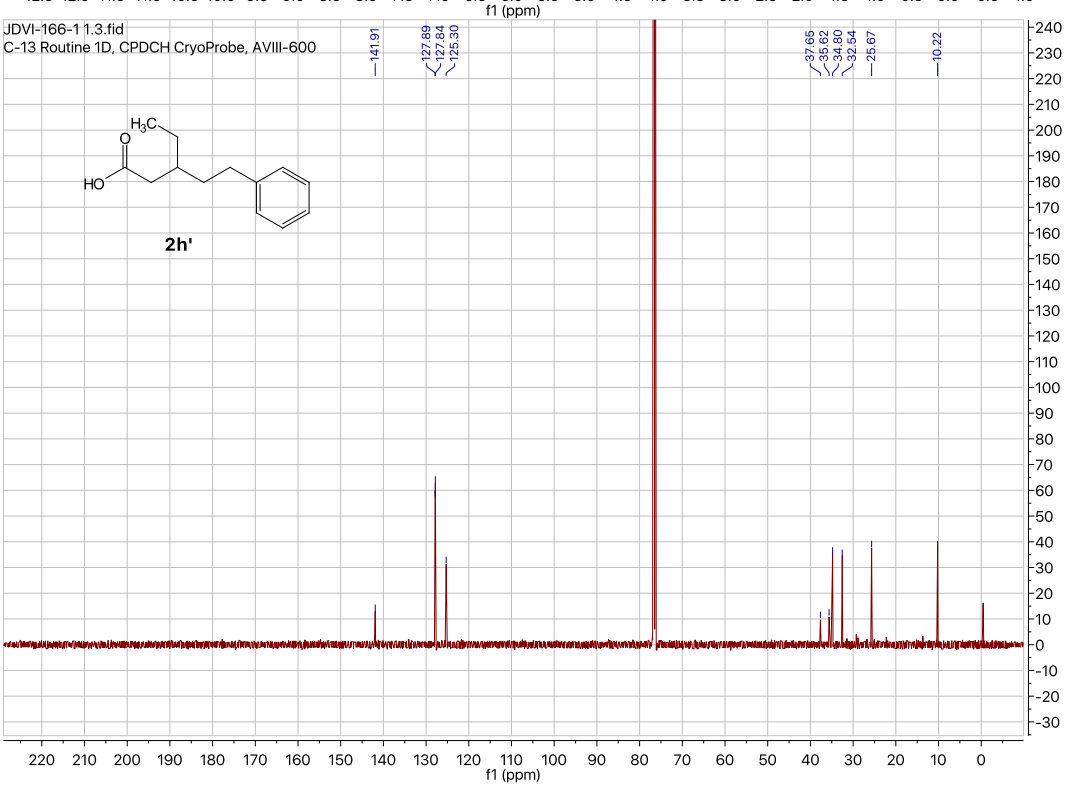

JDVI-124-1 P1.2.fid
C-13 Routine. CPQCI, AVIII-600, 5-12-2016
5e
f1 (ppm)


JDVI-143-1 VTT prep.1.fid
H-1 Routine, CP-DCH, AVIII HD-600
(±)-5f
JDVI-143-1 VTT prep.2.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
(±)-5f
f1 (ppm)


JDVI-146-1 P1 1.fid
5g
f1 (ppm)


JDVI-146-1 P1 1.3.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
5g
f1 (ppm)


JDVI-166-1 1.2.fid
H-1 Routine, CP-DCH, AVIII HD-600
2h'
f1 (ppm)


JDVI-166-1 1.3.fid
C-13 Routine 1D, CPDCH CryoProbe, AVIII-600
2h'
f1 (ppm)