Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry.

Supporting Information

for

Structure-functionality relationship and pharmacological profiles of *Pseudomonas aeruginosa* alkylquinolone quorum sensing modulators

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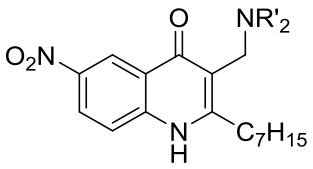
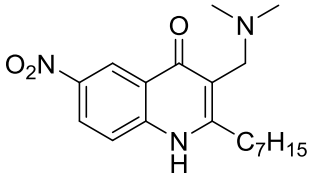
1. General experimental information – Chemistry

General procedure (A) for synthesis of 3-((dialkylamino)methyl)-2-heptyl-6-nitroquinolin-4(1H)-one *via* Mannich reaction:



In a round-bottom flask 2-heptyl-6-nitroquinolin-4(1H)-one (3) in EtOH was dissolved, then formaldehyde solution (37% in water) and the secondary amine were added and stirred at reflux for 48 hours. The volatile components of the reaction solution were then removed *in vacuo* and the mixture was extracted with ethyl acetate/water three times. The combined organic fractions were dried over Na_2SO_4 and dried *in vacuo*. The product was purified *via* preparative RP-HPLC or flash chromatography.

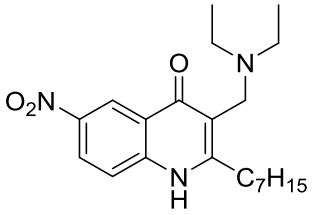
Synthesis of 3-((dimethylamino)methyl)-2-heptyl-6-nitroquinolin-4(1H)-one (9):



Compound **9** was synthesized according to the general procedure (A) from 2-heptyl-6-nitroquinolin-4(1H)-one (0.52 mmol, 150 mg), formaldehyde sol. (5.20 mmol, 192 µL), dimethylamine 2 M in THF (10.4 mmol, 5.2 mL), and 10 mL of EtOH. The crude product was purified *via* preparative HPLC to give 3-((dimethylamino)methyl)-2-heptyl-6-nitroquinolin-4(1H)-one (62 mg, 0.18 mmol, 34% yield) as an orange resin. ^{1}H NMR (500 MHz, DMSO-d_6) δ 12.57 (s, 1H), 9.06 (s, 1H), 8.85 (d, *J* = 2.7 Hz, 1H), 8.50 (dd, *J* = 9.1, 2.7 Hz, 1H), 7.84 (d, *J* = 9.2 Hz, 1H), 4.26 (d, *J* = 5.5 Hz, 2H), 2.88 – 2.82 (m, 2H), 2.79 (d, *J* = 4.9 Hz, 6H), 1.68 – 1.58 (m, 2H),

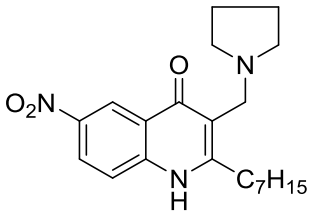
1.45 – 1.21 (m, 9H), 0.92 – 0.80 (m, 3H); ^{13}C NMR (126 MHz, DMSO-d_6) δ 176.4, 156.5, 143.3, 143.1, 126.6, 122.2, 121.2, 120.2, 109.7, 52.5, 42.2, 31.1, 31.1, 29.2, 28.7, 28.5, 22.0, 13.9. MS (ESI+): *m/z* 346.18 $(M+H)^+$. HRMS calcd. (%) for $C_{19}H_{28}N_3O_3$+: 346.21252; found: 346.21228.

Synthesis of 3-((diethylamino)methyl)-2-heptyl-6-nitroquinolin-4(1H)-one (10):



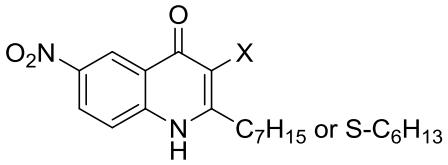
Compound **10** was synthesized according to the general procedure (A) from 2-heptyl-6-nitroquinolin-4(1H)-one (0.50 mmol, 144 mg), formaldehyde sol. (8 mmol, 294 µL), diethylamine (16 mmol, 1.16 g), and 10 mL of EtOH. The crude product was purified *via* flash chromatography using a gradient system of $CHCl_3$/MeOH (0→9% with 1 vol% of trimethylamine) and finally recrystallized from a mix of ethanol and water. The obtained solid was isolated by filteration and dried under vacuum to give 3-((diethylamino)methyl)-2-heptyl-6-nitroquinolin-4(1H)-one (79 mg, 0.21 mmol, 42% yield) as an orange resin. ^{1}H NMR (500 MHz, DMSO-d_6) δ 8.84 (d, *J* = 2.7 Hz, 1H), 8.39 (dd, *J* = 9.1, 2.7 Hz, 1H), 8.19 (s, 1H), 7.74 (d, *J* = 9.2 Hz, 1H), 3.71 (s, 2H), 2.83 – 2.77 (m, 2H), 2.61 (q, *J* = 7.1 Hz, 4H), 1.74 – 1.65 (m, 2H), 1.43 – 1.36 (m, 2H), 1.34 – 1.25 (m, 6H), 1.05 (t, *J* = 7.1 Hz, 6H), 0.89 – 0.82 (m, 3H); ^{13}C NMR (126 MHz, DMSO-d_6) δ 175.9, 163.4, 142.3, 125.4, 122.0, 46.2, 44.0, 31.3, 31.1, 29.1, 29.0, 28.4, 22.0, 13.9, 11.2 .MS (ESI+): *m/z* 374.16 $(M+H)^+$ HRMS calcd. (%) for $C_{21}H_{32}N_3O_3$+: 374.24382; found: 374.24408.

Synthesis of 2-heptyl-6-nitro-3-(pyrrolidin-1-ylmethyl)quinolin-4(1H)-one (11):



Compound **11** was synthesized according to the general procedure (A) from 2-heptyl-6-nitroquinolin-4(1H)-one (0.37 mmol, 107 mg), formaldehyde sol. (5.20 mmol, 192 µL pyrrolidine (14.8 mmol, 1.31 mL) dissolved in 20 mL of EtOH. The crude product was purified *via* preparative HPLC to give 2-heptyl-6-nitro-3-(pyrrolidin-1-ylmethyl)quinolin-4(1H)-one (25 mg, 0.067 mmol, 18% yield) as an orange resin. ^{1}H NMR (500 MHz, MeOD-d_4) δ 9.10 (d, *J*= 2.5 Hz, 1H), 8.50 (dd, *J*= 9.2, 2.6 Hz, 1H), 7.76 (d, *J*= 9.2 Hz, 1H), 4.29 (s, 2H), 2.98 – 2.87 (m, 2H), 2.07 (s, 4H), 1.75 (dt, *J*= 15.7, 7.8 Hz, 2H), 1.54 – 1.38 (m, 4H), 1.37 – 1.29 (m, 2H), 0.92 (t, *J*= 6.9 Hz, 3H); ^{13}C NMR (126 MHz, MeOD-d_4) δ 179.2, 169.7, 157.9, 145.4, 144.7, 127.9, 124.1, 122.9, 120.9, 55.1, 52.2, 33.0, 32.9, 31.0, 30.6, 30.2, 24.1, 23.7, 14.4. MS (ESI+): *m/z* 372.06 $(M+H)^+$. HRMS calcd. (%) for $C_{21}H_{30}N_3O_3$+: 372.22817; found: 372.22836.

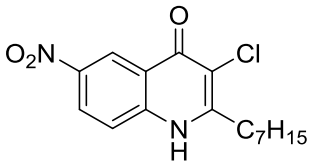
General procedure (B) for synthesis of 3-halo-2-heptyl or 2-(hexylthio)-6-nitroquinolin-4(1H)-ones



In a round-bottom flask intermediate **3** or **20** (2 mmol) was added and 1.1 eq. of the corresponding *N*-halosuccinamide (2.2 mmol) in 7.5 mLs of dry DMF under a N_2 atmosphere and left stirring overnight at room temperature. The reaction mixture was poured into water and then extracted three times with EtOAc (3× 15 mL). The combined organic fractions were dried over Na_2SO_4 and dried *in vacuo*. The crude product was purified *via* flash chromatography using

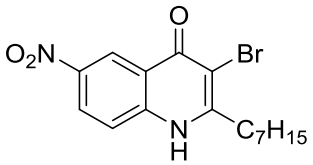
the binary system of $CHCl_3$/MeOH (0→5%). In some cases preparative HPLC was used instead.

Synthesis of 3-chloro-2-heptyl-6-nitroquinolin-4(1H)-one (13):



Compound **13** was synthesized according to the general procedure (B) from 2-heptyl-6-nitroquinolin-4(1H)-one (50 mg, 0.17 mmol), *N*-chlorosuccinimide (35 mg, 0.19 mmol). The crude product was purified *via* preparative HPLC to give 3-chloro-2-heptyl-6-nitroquinolin-4(1H)-one (33 mg, 0.1 mmol, 55% yield) as yellow solid. ^{1}H NMR (500 MHz, DMSO-d_6) δ 12.54 (s, 1H), 8.84 (d, *J*= 2.7 Hz, 1H), 8.44 (dd, *J*= 9.2, 2.7 Hz, 1H), 7.76 (d, *J*= 9.2 Hz, 1H), 2.90 – 2.82 (m, 2H), 1.75 – 1.66 (m, 2H), 1.42 – 1.21 (m, 8H), 0.89 – 0.82 (m, 3H). ^{13}C NMR (126 MHz, Acetone-d_6) δ 171.8, 152.7, 143.4, 126.7, 124.0, 123.2, 120.6, 116.8, 33.6, 32.4, 28.5, 23.2, 14.3. MS (ESI+): *m/z* 323.04 $(M+H)^+$. HRMS calcd. (%) for $C_{16}H_{20}ClN_2O_3$+: 323.11570; found: 323.11600.

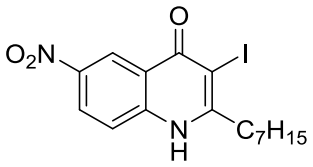
Synthesis of 3-bromo-2-heptyl-6-nitroquinolin-4(1H)-one (14):



Compound **14** was synthesized according to the general procedure (B) from 2-heptyl-6-nitroquinolin-4(1H)-one (100 mg, 0.35 mmol), *N*-bromosuccinimide (68 mg, 0.38 mmol). The crude product was purified *via* preparative HPLC to give 3-bromo-2-heptyl-6-nitroquinolin-4(1H)-one (79 mg, 0.2 mmol, 57% yield) as brown solid. ^{1}H NMR (300 MHz, DMSO-d_6) δ 12.55 (s, 1H), 8.84 (d, *J*= 2.6 Hz, 1H), 8.44 (dd, *J*= 9.2, 2.7 Hz, 1H), 7.76 (d, *J*= 9.2 Hz, 1H), 2.89 (dd, *J*=

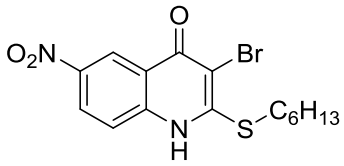
9.2, 6.6 Hz, 2H), 1.71 (p, *J*= 7.2 Hz, 2H), 1.48 – 1.19 (m, 8H), 0.93 – 0.80 (m, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 171.5, 154.1, 143.5, 142.8, 126.6, 122.5, 122.2, 120.4, 107.7, 35.2, 31.6, 29.1, 28.8, 28.0, 22.5, 14.4. MS (ESI+): *m/z* 367.00 $(M+H)^+$. HRMS calcd. (%) for $C_{16}H_{20}BrN_2O_3$+: 367.06518; found: 367.06537.

Synthesis of 3-Iodo-2-heptyl-6-nitroquinolin-4(1H)-one (15):



Compound **15** was synthesized according to the general procedure (B) from 2-heptyl-6-nitroquinolin-4(1H)-one (680 mg, 2.4 mmol), *N*-iodosuccinimide (594 mg, 2.64 mmol). The crude product was purified *via* preparative HPLC to give 3-iodo-2-heptyl-6-nitroquinolin-4(1H)-one (680 mg, 1.64 mmol, 68% yield) as brown solid. ^{1}H NMR (500 MHz, DMSO-d_6) δ 12.54 (s, 1H), 8.82 (d, *J*= 2.7 Hz, 1H), 8.44 (dd, *J*= 9.1, 2.7 Hz, 1H), 7.75 (d, *J*= 9.2 Hz, 1H), 2.99 – 2.90 (m, 2H), 1.69 (p, *J*= 7.4 Hz, 2H), 1.41 (p, *J*= 7.0 Hz, 2H), 1.36 – 1.26 (m, 6H), 0.90 – 0.83 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 173.0, 156.2, 143.1, 142.7, 126.2, 122.3, 119.8, 119.5, 87.5, 31.1, 28.7, 28.3, 27.8, 22.1, 14.0. MS (ESI+): *m/z* 415.08 $(M+H)^+$. HRMS calcd. (%) for $C_{16}H_{20}IN_2O_3$+: 415.05131; found: 415.05161.

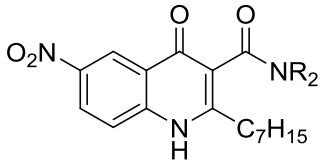
Synthesis of 3-bromo-2-(hexylthio)-6-nitroquinolin-4(1H)-one (21):



Compound **21** was synthesized according to the general procedure (B) from 2-(hexylthio)-6-nitroquinolin-4(1H)-one (102 mg, 0.3 mmol), N-bromosuccinimide (59 mg, 0.33 mmol). The crude product was purified *via* preparative HPLC to give 3-bromo-2-heptyl-6-nitroquinolin-4(1H)-

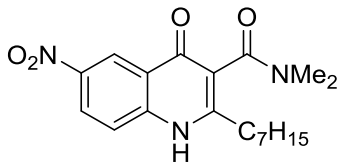
one (101 mg, 0.26 mmol, 87% yield) as brown solid. IR (cm $^{-1}$) 3315, 2950, 2834, 1020. ^{1}H NMR (500 MHz, DMSO-d_6) δ 8.90 (s, 1H), 8.38 (ddd, *J* = 9.2, 4.5, 2.6 Hz, 1H), 7.90 (dd, *J* = 9.2, 3.2 Hz, 1H), 1.67 (p, *J* = 7.3 Hz, 2H), 1.43 (t, *J* = 7.4 Hz, 2H), 1.27 (dt, *J* = 12.6, 6.1 Hz, 4H), 0.87 – 0.81 (m, 3H). ^{13}C NMR experiments were performed using Bruker Avance AV 300 or a Bruker DRX 500 at ambient as well as higher temperatures (100 °C). ^{13}C NMR (126 MHz, $CDCl_3$) δ 143.0, 143.0, 124.9, 120.6, 30.2, 28.3, 28.2, 27.2, 21.4, 13.2. MS (ESI+): m/z 384.97 (M+H) $^{+}$. HRMS calcd. (%) for $C_{15}H_{18}BrN_2O_3S$+: 385,02160; found: 385.02153.

General procedure (C) for synthesis of 2-heptyl-N,N-dialkyl-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxamides:



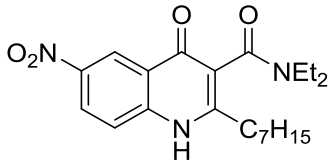
In a round-bottom flask 2-heptyl-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylic acid **6** (0.50 mmol, 165 mg) was suspended with HOBt (2.50 mmol, 338 mg) and EDC (2.50 mmol, 388 mg) in anhydrous THF (9 mL) and anhydrous DMF (2 mL) under nitrogen atmosphere. The reaction mixture was left to stir for 1 hr at room temperature. Afterward, the secondary amine (1.25 mmol, 2.5 eq.) was added and the reaction left to stir overnight at room temperature. The reaction solution was evaporated to dryness *in vacou*, uptaken in ethyl acetate/water and extracted three times. The combined organic fractions were dried over Na_2SO_4, filtered by gravity and the solvent removed *via* rotary evaporation *in vacuo*. The crude product was purified *via* preparative HPLC.

Synthesis of 2-heptyl-*N,N*-dimethyl-6-nitro-4-oxo-1,4-dihydroquinoline-3 carboxamide (17):



Compound **17** was synthesized according to the general procedure (C) from 2-heptyl-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylic acid **6** (0.50 mmol, 165 mg). The crude product was purified *via* preparative HPLC to give *N,N*-dimethyl-2-heptyl-6-nitro-4-oxo-1,4-dihydroquinoline-3 carboxamide (85 mg, 0.24 mmol, 47% yield) as yellow solid. ^{1}H NMR (500 MHz, DMSO-d_6) δ 0.81 - 0.89 (m, 3 H) 1.22 - 1.34 (m, 8 H) 1.57 - 1.74 (m, 2 H) 2.36 - 2.48 (m, 1 H) 2.70 (ddd, *J*= 13.4, 10.0, 6.2 Hz, 1 H), 2.84 (s, 3 H) 2.98 (s, 3 H) 7.76 (d, *J*= 9.1 Hz, 1 H) 8.43 (dd, *J*= 9.1, 2.5 Hz, 1 H) 8.81 (d, *J*= 2.8 Hz, 1 H); ^{13}C NMR (126 MHz, DMSO-d_6) δ 172.9, 166.1, 143.2, 152.5, 142.7, 126.1, 123.2, 121.6, 119.9, 119.1, 109.5, 37.2, 34.1, 31.7, 31.0, 28.7, 28.2, 22.0, 13.9. MS (ESI+): *m/z* 360.15 $(M+H)^+$. HRMS calcd. (%) for $C_{19}H_{16}N_3O_4$+: 360.19178; found: 360.19186.

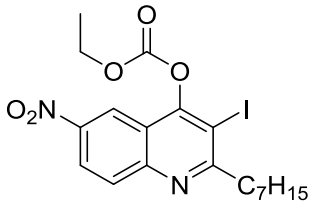
Synthesis of *N,N*-diethyl-2-heptyl-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxamide (18):



Compound **18** was synthesized according to the general procedure (C) from 2-heptyl-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylic acid (6) (0.50 mmol, 165 mg). The crude product was purified *via* preparative HPLC to give *N,N*-diethyl-2-heptyl-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxamide (51 mg, 0.14 mmol, 27% yield) as yellow solid. ^{1}H NMR (500 MHz, DMSO-d_6) δ 12.22 (s, 1H), 8.81 (d, *J* = 2.7 Hz, 1H), 8.43 (dd, *J* = 9.2, 2.7 Hz, 1H), 7.75 (d, *J* = 9.2 Hz, 1H), 3.62 (dq, *J* = 14.0, 7.1 Hz, 1H), 3.25 – 3.09 (m, 3H), 2.64 (ddd, *J* = 13.4, 10.7, 5.4 Hz, 1H), 2.48

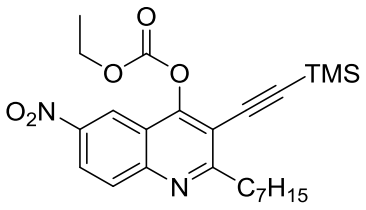
– 2.41 (m, 1H), 1.66 (ddt, *J* = 38.1, 11.9, 6.0 Hz, 2H), 1.35 – 1.30 (m, 2H), 1.28 – 1.22 (m, 6H), 1.13 (t, *J* = 7.0 Hz, 3H), 1.03 (t, *J* = 7.1 Hz, 3H), 0.87 – 0.84 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 173.1, 165.2, 151.9, 143.2, .142.6, 126.1, 123.2, 121.6, 119.9, 119.3, 42.5, 38.2, 31.8, 31.0, 28.9, 28.3, 28.2, 22.0, 14.1, 13.9, 12.6. MS (ESI+): *m/z* 388.17 $(M+H)^+$. HRMS calcd. (%) for $C_{21}H_{30}N_3O_4$+: 388.22308; found: 388.22336.

Synthesis of ethyl (2-heptyl-3-iodo-6-nitroquinolin-4-yl) carbonate (28):



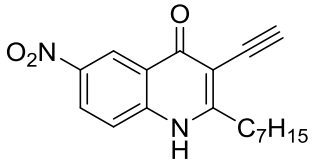
In a round-bottom flask compound (**15**) 3-iodo-2-heptyl-6-nitroquinolin-4(1H)-one (650 mg, 1.57 mmol), potassium tert-butoxide (224 mg, 1.25 mmol) were stirred for 1 h at room temperature in anhydrous THF. Afterwards, ethylchloroformate (165 µL, 1.1 mmol) was added. After 4 h, reaction was quenched with 5 mL of H_2O then evaporated *in vacuo*. Afterwards, 10 mL of H_2O was added and extracted with EtOAc (3× 25 mL), the combined organic fracions were dried over Na_2SO_4 and dried *in vacuo.* The crude compound was purified *via* flash chromatography with a gradient of hexane/EtOAc (0→12.5%) to yield the desired compound as yellow solid (680 mg, 89% yield). ^{1}H NMR (500 MHz, DMSO-d_6) δ 8.72 (d, *J*= 2.5 Hz, 1H), 8.48 (dd, *J*= 9.2, 2.6 Hz, 1H), 8.21 (d, *J*= 9.2 Hz, 1H), 4.41 (q, *J*= 7.1 Hz, 2H), 3.22 – 3.12 (m, 2H), 1.76 (p, *J*= 7.4 Hz, 2H), 1.42 – 1.26 (m, 11H), 0.89 – 0.82 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 168.2, 156.2, 150.5, 149.4, 145.6, 130.7, 124.3, 120.1, 118.1, 94.3, 66.4, 41.8, 31.2, 28.7, 28.5, 28.1, 22.1, 14.1. MS (ESI+): *m/z* 486.46 $(M+H)^+$. HRMS calcd. (%) for $C_{19}H_{24}IN_2O_5$+: 487.07244; found: 487.07306.

Synthesis of intermediate compound ethyl (2-heptyl-6-nitro-3-((trimethylsilyl)ethynyl)quinolin-4-yl) carbonate (12a):



Compound **(28)** ethyl-(2-heptyl-3-iodo-6-nitroquinolin-4-yl)-carbonate (680 mg, 1.4 mmol), copper(I) iodide (27 mg, 0.1 mol-%), and bis(triphenylphosphine)palladium(II) dichloride (50 mg, 0.05 mol-%) were added together into a 3 necked round-bottom flask. Afterward, the reaction vessel was evacuated then backfilled with Argon for three times. Under Argon atmosphere, dry DMF (4 mL) and dry triethylamine (380 µL, 2.73 mmol), Ethynyltrimethylsilane (579 µL, 4.1 mmol) were added. The brown reaction mixture was left to stir at room temperature overnight. TLC showed the disappearance of compound **16**. Thus, the reaction was stopped and the volatiles of the solution removed *in vacuo*. The crude product was used in the next step without further purification.

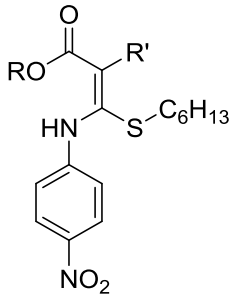
Synthesis of 3-ethynyl-2-heptyl-6-nitroquinolin-4(1H)-one (12):



Crude intermediate (**12a**) was dissolved in aq. 5 N KOH (5 mL) and EtOH (10 mL) at room tempreture and left stirring overnight. The reaction solution was neutralized with acetic acid then extracted with EtOAc (3× 25 mL). The combined organic fractions were dried over Na_2SO_4 filtered and all volatile materials were removed *in vacuo*. The crude compound was purified *via* preparative HPLC to yield the desired compound as yellow solid (148 mg, 38% yield (for 2 steps)). ^{1}H NMR (500 MHz, Acetone-d_6) δ 8.99 (d, *J*= 2.7 Hz, 1H), 8.41 (dd, *J*= 9.0, 2.7 Hz, 1H),

7.79 (d, *J*= 9.1 Hz, 1H), 3.86 (s, 1H), 3.00 – 2.95 (m, 3H), 1.84 (p, *J*= 7.6 Hz, 2H), 1.47 – 1.27 (m, 10H), 0.88 – 0.84 (m, 3H). ^{13}C NMR (126 MHz, Acetone-d_6) δ 176.2, 159.8, 144.4, 143.7, 126.8, 124.4, 122.9, 120.8, 105.9, 86.0, 78.4, 34.4, 32.4, 30.2, 29.2, 23.3, 14.3. MS (ESI+): *m/z* 313.12 $(M+H)^+$. HRMS calcd. (%) for $C_{18}H_{21}N_2O_3$+: 313.15467; found: 313.15488.

Synthesis of analogs 19 and 23-25 and their ketene-S/N-acetal intermediates

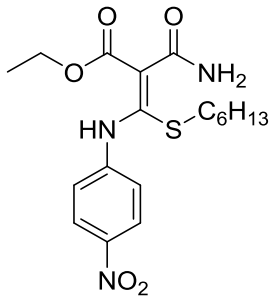


General Procedure (D) for methyl or ethyl (E/Z)-2-((hexylthio)((4-nitrophenyl)amino)methylene)-3-butanoates:

In a three-neck round-bottom flask, NaH (460 mg, 12 mmol, 60% dispersion in mineral oil) was dispersed into 50 mL of dry DMF. Afterward, the corresponding pos. 2-substituted acetates (10 mmol) were added portionwise with vigorous stirring with some effervescence being observed. After 30 min., 1-isothiocyanato-4-nitrobenzene (10 mmol) dissolved in 10 mL of DMF was added dropwise over 30 min. The color of the reaction mixture usually changed from transparent to yellow or dark red and left to stir at room temperature overnight. Last, 1-iodohexane (10 mmol) was added dropwise and left stirring for an additional 4 h at room temperature. It was observed that the reaction solution would become more transparent with the progression of time. The reaction solution was concentrated *in vacuo*, then extracted with EtOAc (3× 50 mL), the combined organic fractions were dried over Na_2SO_4, filtered by gravity and all volatile materials removed *in vacuo*. The crude compound was purified *via* flash chromatography with a binary

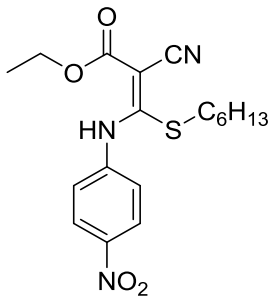
gradient system consisting of Hexane/EtOAc (0→33%) to yield the desired compounds as yellow to orange oils in yields between (39% and 79%). Depending on functional groups, the compounds were obtained as a isomere mixture (E/Z and tautomers) but directly used for cyclization. It's worth mentioning that no mass spectra could be obtained for these class of compounds due their ease of fragmentation using both single quad ESI and the high-resolution Orbitrap.

Synthesis of intermediate ethyl (E/Z)-2-carbamoyl-3-(hexylthio)-3-((4-nitrophenyl)amino)acrylate (19a):



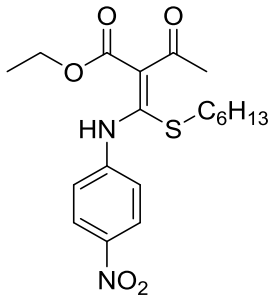
Compound **19a** was synthesized according to the general procedure (D) from ethyl 3-amino-3-oxopropanoate (983 mg, 7.50 mmol), NaH (290 mg, 7.50 mmol, 60% dispersion in oil), 1-isothiocyanato-4-nitrobenzene (1.35g, 7.50 mmol) and 1-iodohexane (1.43 mL, 7.50 mmol). The crude product was purified *via* flash chromatography using a gradient of hexane/EtOAc (0→10%) to give ethyl-(E/Z)-2-carbamoyl-3-(hexylthio)-3-((4-nitrophenyl)amino)acrylate (1.43 g, 3.6 mmol, 48% yield) as yellow oil. ^{1}H NMR (500 MHz, Chloroform-d) δ 8.22 – 8.15 (m, 2H), 7.41 – 7.35 (m, 1H), 6.93 – 6.85 (m, 1H), 4.22 – 4.09 (m, 2H), 3.37 (s, 1H), 3.04 (t, *J*= 7.4 Hz, 1H), 2.81 (t, *J*= 7.4 Hz, 1H), 1.67 (p, *J*= 7.5 Hz, 2H), 1.44 – 1.21 (m, 9H), 0.93 – 0.83 (m, 3H). ^{13}C NMR (126 MHz, Chloroform-d) δ 169.0, 167.3, 159.2, 156.2, 145.6, 144.1, 144.3, 125.2, 121.6, 120.5, 88.4, 61.9, 59.8, 32.5, 31.4, 31.3, 28.7, 28.1, 22.6, 22.6, 14.6, 14.1.

Synthesis of intermediate ethyl (E/Z)-2-cyano-3-(hexylthio)-3-((4-nitrophenyl)amino)acrylate (23a):



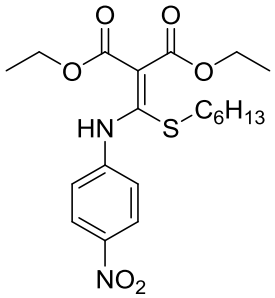
Compound **23a** was synthesized according to the general procedure (D) from ethyl 2-cyanoacetate (1.5 mL, 15 mmol), NaH (720 mg, 18 mmol, 60% dispersion in oil), 1-isothiocyanato-4-nitrobenzene (2.7g, 15 mmol) and 1-iodohexane (2.2 mL, 15 mmol). The crude product was purified *via* flash chromatography using a gradient hexane/EtOAc (0→10%) to yield ethyl-(E/Z)-2-cyano-3-(hexylthio)-3-((4-nitrophenyl)amino)acrylate (1.43 g, 3.6 mmol, 48% yield) as yellow oil. ^{1}H NMR (300 MHz, Chloroform-d) δ 11.66 (s, 1H), 8.33 – 8.21 (m, 2H), 7.56 – 7.44 (m, 2H), 4.29 (q, *J*= 7.1 Hz, 2H), 2.80 – 2.68 (m, 2H), 1.65 – 1.45 (m, 2H), 1.36 (t, *J*= 7.1 Hz, 3H), 1.35 – 1.10 (m, 6H), 0.96 – 0.78 (m, 3H). ^{13}C NMR (126 MHz, Chloroform-d) δ 167.5, 167.4, 145.5, 143.7, 125.2, 124.1, 116.7, 82.7, 77.4, 62.0, 60.5, 35.1, 31.2, 29.3, 28.2, 22.5, 14.4, 14.0.

Synthesis of intermediate ethyl (E/Z)-2-((hexylthio)((4-nitrophenyl)amino)methylene)-3-oxobutanoate (24a):



Compound **24a** was synthesized according to the general procedure (D) from ethyl 3-oxobutanoate (1.3g, 10 mmol), NaH (460 mg, 10 mmol, 60% dispersion in oil), 1-isothiocyanato-4-nitrobenzene (1.8g, 10 mmol) and 1-iodohexane (1.47 mL, 10 mmol). The crude product was purified *via* flash chromatography using a gradient Hexane/EtOAc (0→25%) to give ethyl-(E/Z)-2-((hexylthio)((4-nitrophenyl)amino)methylene)-3-oxobutanoate (3.1 g, 7.85 mmol, 79% yield) as yellow oil. ^{1}H NMR (300 MHz, Chloroform-d) δ 12.73 (s, 1H), 8.26 – 8.07 (m, 2H), 6.85 (dd, *J*= 28.3, 8.7 Hz, 2H), 4.37 – 4.08 (m, 2H), 3.05 (d, *J*= 8.4 Hz, 2H), 2.28 (s, 1H), 2.04 (s, 2H), 1.69 (q, *J*= 7.5 Hz, 2H), 1.51 – 1.24 (m, 9H), 0.88 (td, *J*= 4.8, 2.0 Hz, 3H). ^{13}C NMR (126 MHz, Chloroform-d) δ 175.4, 169.5, 165.5, 156.7, 143.8, 125.0, 125.0, 120.3, 120.1, 61.5, 61.3, 33.9, 31.3, 31.2, 29.0, 28.5, 22.5, 20.1, 14.2, 14.1, 14.0.

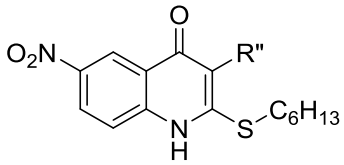
Synthesis of intermediate diethyl 2-((hexylthio)((4-nitrophenyl)amino)methylene)malonate (25a):



Compound **25a** was synthesized according to the general procedure (D) from diethyl malonate (1.15 mL, 7.5 mmol), NaH (290 mg, 7.5 mmol, 60% dispersion in oil), 1-isothiocyanato-4-nitrobenzene (1.35g, 7.5 mmol) and 1-iodohexane (1.43 mL, 7.5 mmol). The crude product was purified *via* flash chromatography using a gradient hexane/EtOAc (0→10%) to give diethyl-2-((hexylthio)((4-nitrophenyl)amino)methylene)malonate (1.24 g, 2.92 mmol, 39% yield) as an orange oil. ^{1}H NMR (300 MHz, Chloroform-d) δ 10.59 (s, 1H), 8.26 – 8.16 (m, 2H), 7.58 – 7.46 (m, 1H), 6.92 – 6.84 (m, 1H), 4.39 – 4.10 (m, 4H), 3.18 (s, 1H), 3.08 – 2.93 (m, 0H), 2.50 – 2.34 (m, 1H), 1.52 – 1.07 (m, 12H), 0.97 – 0.60 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 166.5,

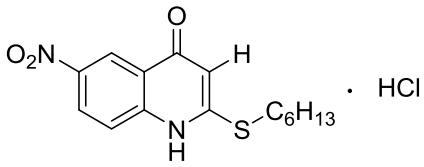
156.8, 152.8, 148.4, 141.0, 125.2, 124.8, 121.4, 120.0, 117.6, 73.7, 70.4, 61.9, 60.8, 60.5, 41.2, 32.0, 31.7, 30.5, 29.1, 27.2, 21.8, 21.8, 18.8, 13.9, 13.8, 13.7.

General procedure (E) for synthesis of 3-substituted-2-(hexylthio)-6-nitroquinolin-4(1H)-ones



In a three-neck round-bottom flask equipped with a thermometer and a dean stark apparatus, the corresponding intermediates were added dropwise on 25 mL of refluxing Dowtherm™ over 30 min. After completion of addition, the reaction mixture was allowed to reflux for another 30 min. The reaction was let to cool down to room temperature and then poured on ice cold diethyl ether saturated with HCl to give the corresponding HCl salt. The precipitate was then filtered and washed with hexane (50 mL) and diethyl ether (50 mL) unless stated otherwise.

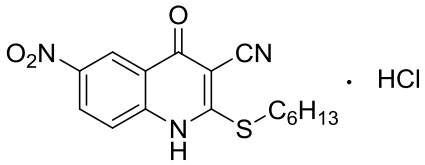
Synthesis of compound 2-(hexylthio)-6-nitroquinolin-4(1H)-one hydrochloride (19):



Compound **19** was synthesized according to the general procedure (E) from ethyl-(E)-2-carbamoyl-3-(hexylthio)-3-((4-nitrophenyl)amino)acrylate (**19a**). The desired compound was yielded as brown solid (990 mg, 2.88 mmol, 80% yield). ^{1}H NMR (300 MHz, DMSO-d_6) δ 12.04 (s, 1H), 8.76 (d, *J*= 2.7 Hz, 1H), 8.41 (dd, *J*= 9.2, 2.7 Hz, 1H), 7.87 (d, *J*= 9.2 Hz, 1H), 6.57 (s, 1H), 3.20 (t, *J*= 7.3 Hz, 2H), 1.67 (ddd, *J*= 12.4, 8.3, 6.4 Hz, 2H), 1.49 – 1.34 (m, 2H), 1.26 (tdd, *J*= 7.9, 6.6, 5.4, 2.8 Hz, 4H), 0.91 – 0.80 (m, 3H). ^{13}C NMR (75 MHz, DMSO) δ 170.7, 158.8, 145.9, 143.4, 143.4, 126.3, 122.0, 121.6, 121.1, 105.8, 100.0, 40.8, 40.5, 40.3, 40.0, 39.8, 39.7,

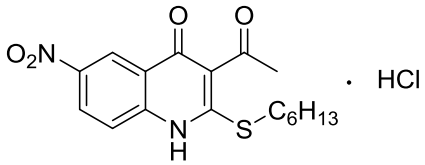
39.4, 39.1, 31.1, 31.1, 28.6, 28.3, 22.5, 14.3. MS (ESI+): *m/z* 307.10 $(M+H)^+$. HRMS calcd. (%) for $C_{15}H_{19}N_2O_3S+$: 307.11109; found: 307.11115.

Synthesis of compound 2-(hexylthio)-6-nitro-4-oxo-1,4-dihydroquinoline-3-carbonitrile hydrochloride (23):



Compound **23** was synthesized according to the general procedure (E) ethyl-(E)-2-cyano-3-(hexylthio)-3-((4-nitrophenyl)amino)acrylate (**23a**). The desired compound was yielded as brown solid (1.28g, 3.47 mmol, 97% yield). IR (cm -1) 2926, 2855, 2223, 1502, 1337. ^{1}H NMR (500 MHz, DMSO-d_6) δ 12.65 (s, 1H), 8.71 (d, *J*= 2.7 Hz, 1H), 8.50 (dd, *J*= 9.1, 2.8 Hz, 1H), 7.90 (d, *J*= 9.1 Hz, 1H), 3.41 (t, *J*= 7.3 Hz, 2H), 1.71 – 1.61 (m, 2H), 1.41 (dtdd, *J*= 9.1, 6.9, 4.6, 2.1 Hz, 2H), 1.27 (tt, *J*= 6.7, 5.9, 2.0 Hz, 4H), 0.90 – 0.79 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 172.8, 159.5, 143.8, 127.3, 123.1, 121.0, 115.1, 32.8, 30.6, 28.6, 27.5, 21.9, 13.8. MS (ESI+): *m/z* 332.11 $(M+H)^+$. HRMS calcd. (%) for $C_{16}H_{18}N_3O_3S+$: 3032.10634; found: 332.10648.

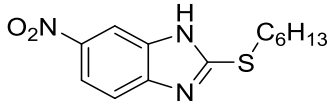
Synthesis of compound 3-acetyl-2-(hexylthio)-6-nitroquinolin-4(1H)-one hydrochloride (24):



Compound **24** was synthesized according to the general procedure (E) ethyl-(E)-2-((hexylthio)((4-nitrophenyl)amino)methylene)-3-oxobutanoate (**24a**). The desired compound was yielded as brown solid (1.1g, 2.9 mmol, 37% yield). ^{1}H NMR (500 MHz, DMSO-d_6) δ 11.74 (s, 1H), 8.78 (d, *J*= 2.7 Hz, 1H), 8.46 (dd, *J*= 9.1, 2.7 Hz, 1H), 7.92 (d, *J*= 9.2 Hz, 1H), 3.23 (t, *J*= 7.3 Hz, 2H), 2.49 (s, 3H), 1.57 (p, *J*= 7.4 Hz, 2H), 1.37 (dqd, *J*= 14.3, 6.9, 6.0, 2.9 Hz, 2H), 1.25

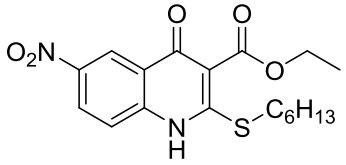
(ddd, *J*= 7.3, 4.4, 2.7 Hz, 4H), 0.87 – 0.80 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 199.0, 173.2, 153.4, 143.3, 126.6, 124.2, 123.3, 121.4, 120.0, 56.0, 31.9, 31.3, 30.6, 28.2, 27.7, 21.9, 13.8. MS (ESI+): *m/z* 349.04 $(M+H)^+$. HRMS calcd. (%) for $C_{17}H_{21}N_2O_4S$+: 349.12165; found: 349.12198.

Synthesis of compound 2-(hexylthio)-6-nitro-1H-benzo[d]imidazole (20):



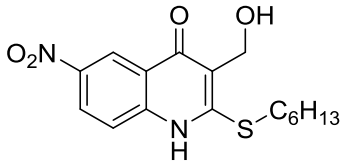
In a round-bottom flask, 6-nitro-1H-benzo[d]imidazole-2-thiol (195 mg, 1 mmol), potassium carbonate (152 mg, 1.1 mmol) and 1-iodohexane (156 µL, 1.1 mmol) was dissolved in acetone (7 mLs). The reaction mixture was left stirring at room temperature for 4 h and evaoprated to dryness afterwards. The crude product was purified *via* flash chromatography using a gradient $CHCl_3$/MeOH (0→2.5%) to give 2-(hexylthio)-6-nitro-1H-benzo[d]imidazole (225 mg, 0.80 mmol, 80% yield) as an yellow oil. ^{1}H NMR (300 MHz, Acetone-d_6) δ 8.33 (d, *J*= 2.3 Hz, 1H), 8.09 (dd, *J*= 8.8, 2.2 Hz, 1H), 7.59 (d, *J*= 8.8 Hz, 1H), 3.39 (dd, *J*= 7.7, 6.9 Hz, 2H), 3.05 (s, 1H), 1.88 – 1.73 (m, 2H), 1.54 – 1.40 (m, 2H), 1.38 – 1.23 (m, 4H), 0.93 – 0.82 (m, 3H). ^{13}C NMR were performed using Bruker Avance AV 300 or a Bruker DRX 500. ^{13}C NMR (75 MHz, Acetone-d_6) δ 156.8, 142.9, 117.4, 112.0, 40.3, 31.4, 31.1, 29.0, 28.2 22.3, 13.4. MS (ESI+): *m/z* 280.04 $(M+H)^+$. HRMS calcd. (%) for $C_{13}H_{18}N_3O_2S$+: 280.11142; found: 280.11157.

Synthesis of compound ethyl 2-(hexylthio)-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylate (25):



Compound **25** was synthesized according to the general procedure (E) diethyl-2-((hexylthio)((4-nitrophenyl)amino)methylene)malonate (**25a**). Upon standard work-up procedure, only a little amount of precipitate was obtained and later found to be compound **22** instead. Whereas, the desired compound was obtained *via* evaporation of the filtrate *in vacuo* followed by flash chromatography hexane/EtOAc gradient (0→50%). The desired compound was obtained as slightly yellow solid (500 mg, 1.32 mmol, 17% yield). ^{1}H NMR (500 MHz, DMSO-d_6) δ 8.83 (d, *J*= 2.8 Hz, 1H), 8.20 (dd, *J*= 9.1, 2.8 Hz, 1H), 7.56 (d, *J*= 9.2 Hz, 1H), 7.18 (s, 1H), 4.19 (q, *J*= 7.1 Hz, 2H), 3.15 (t, *J*= 7.3 Hz, 2H), 1.64 – 1.54 (m, 2H), 1.36 (tt, *J*= 8.8, 7.0 Hz, 2H), 1.28 – 1.23 (m, 7H), 0.88 – 0.78 (m, 3H). ^{13}C NMR (126 MHz, DMSO-d_6) δ 171.3, 167.5, 150.6, 141.0, 125.8, 124.8, 123.8, 121.9, 59.9, 30.8, 30.1, 29.4, 28.0, 22.1, 14.2, 13.9. MS (ESI+): *m/z* 379.12 $(M+H)^+$. HRMS calcd. (%) for $C_{18}H_{23}N_2O_5S$+: 379.13222; found: 379.13257.

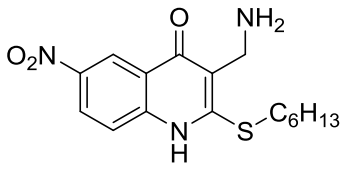
Synthesis of compound 2-(hexylthio)-3-(hydroxymethyl)-6-nitroquinolin-4(1H)-one (26):



In a two-neck round-bottom flask compound (**25**) ethyl 2-(hexylthio)-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylate (242 mg, 0.64 mmol) was dissolved in 15 mL anhydrous THF. The reaction vessel was then cooled down to -78 °C, where DIBAL (1 M in hexane, 2.6 mmol) was added dropwise. The reaction mixture was then allowed to warm to room temperature and left to stir overnight. The reaction was monitored *via* TLC till the disappearance of starting material was complete. Any excess DIBAL was quenched with few milliliters of Rochelle salt solution. The reaction solution was then extracted with EtOAc (3× 25 mL). The combined org. phase was washed with Saturated $NaHCO_3$ (10 mLs), dried over Na_2SO_4, filtered and the volatiles was removed *in vacuo*. The m/z value of the desired compound was confirmed *via* MS

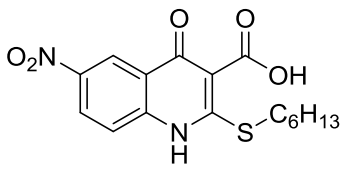
(ESI+) but couldn't be obtained as a pure compound after flash chromatography due to stability issues. MS (ESI+): *m/z* 337.11 $(M+H)^+$.

Synthesis of compound 3-(aminomethyl)-2-(hexylthio)-6-nitroquinolin-4(1H)-one (27):



In a two neck round-bottom flask compound (**25**) 2-(hexylthio)-6-nitro-4-oxo-1,4-dihydroquinoline-3-carbonitrile hydrochloride (218 mg, 0.66 mmol) was dissolved in anhydrous THF (7 mLs). Borane.THF complex solution (1 mL, 1 mmol) was then added dropwise with effervescence being observed upon addition. After completion of the addition, the reaction mixture was allowed to reflux for 6 h. The reaction was then stopped, cooled to room temperature and 1 M HCl (10 mLs) was added. Afterwards, the reaction solution was evaporated to dryness *in vacuo*. The crude compound was purified *via* preparative HPLC to yield the desired compound as orange solid (42 mg, 0.13 mmol, 20% yield). IR (cm^{-1}) 2953, 2923, 2854, 1324, 1015. ^{1}H NMR (300 MHz, DMSO-d_6) δ 8.87 (d, J = 2.8 Hz, 1H), 8.20 – 7.97 (m, 3H), 7.49 (d, J = 9.2 Hz, 1H), 3.98 (s, 2H), 3.26 (t, J = 7.3 Hz, 2H), 1.67 (ddd, J = 14.8, 8.2, 6.5 Hz, 2H), 1.41 (q, J = 7.0, 6.5 Hz, 2H), 1.33 – 1.19 (m, 4H), 0.93 – 0.79 (m, 3H).^{13}C NMR (75 MHz, DMSO-d_6) δ 172.8, 163.1, 160.7, 152.4, 140.1, 127.5, 123.9, 122.3, 121.6, 108.4, 37.1, 30.8, 29.5, 29.0, 28.1, 22.0, 13.9. MS (ESI+): *m/z* 336.12 $(M+H)^+$. HRMS calcd. (%) for $C_{16}H_{22}N_3O_3S$+: 336.13764; found: 336.13779.

Synthesis of compound 2-(hexylthio)-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylic acid (22):



In a round-bottom flask compound (**25**) ethyl 2-(hexylthio)-6-nitro-4-oxo-1,4-dihydroquinoline-3-carboxylate (500 mg, 1.32 mmol) was dissolved in 25 mLs of 10% (w/v) NaOH and a few drops of EtOH. The reaction was allowed to reflux overnight. Afterward, the reaction was cooled to room temperature and extracted with EtOAc (3× 10 mL). The aqueous layer was acidified with conc. HCl in an ice bath. The color change from red to yellow and precipitate formation was observed. The aqueous solution was then extracted with EtOAc (3× 50 mL), the combined organic fractions were dried over Na_2SO_4, filtered and all volatile material removed *in vacuo*. The desired compound was obtained as yellow solid without further purification (420 mg, 1.2 mmol, 91% yield). IR (cm $^{-1}$) 3315 (broad), 2952, 2926, 2854, 1555, 1512, 1330. ^{1}H NMR (300 MHz, MeOD-d_4) δ 8.98 (d, *J*= 2.6 Hz, 1H), 8.37 – 8.27 (m, 1H), 7.73 (d, *J*= 9.1 Hz, 1H), 3.18 (t, *J*= 7.3 Hz, 2H), 1.71 (q, *J*= 7.2 Hz, 2H), 1.50 (p, *J*= 6.8 Hz, 2H), 1.35 (dq, *J*= 6.6, 3.5 Hz, 4H), 0.99 – 0.86 (m, 3H). ^{13}C NMR (75 MHz, DMSO-d_6) δ 175.1, 172.0, 168.5, 141.8, 124.6, 121.8, 121.8, 121.5, 105.9, 39.5, 30.9, 29.6, 28.6, 28.4, 22.1, 13.9. MS (ESI-): *m/z* 348.96 $(M-H)^-$. HRMS calcd. (%) for $C_{16}H_{19}N_2O_5S^+$: 351.10092; found: 351.10141.

2. General experimental information – Biology

2.1 Chemicals, bacterial strains, and media

Yeast extract was obtained from Fluka, peptone and casein from Merck, Bacto™ Tryptone from BD Biosciences, and Gibco® PBS from Life Technologies. Salts and organic solvents of analytical grade were obtained from VWR.

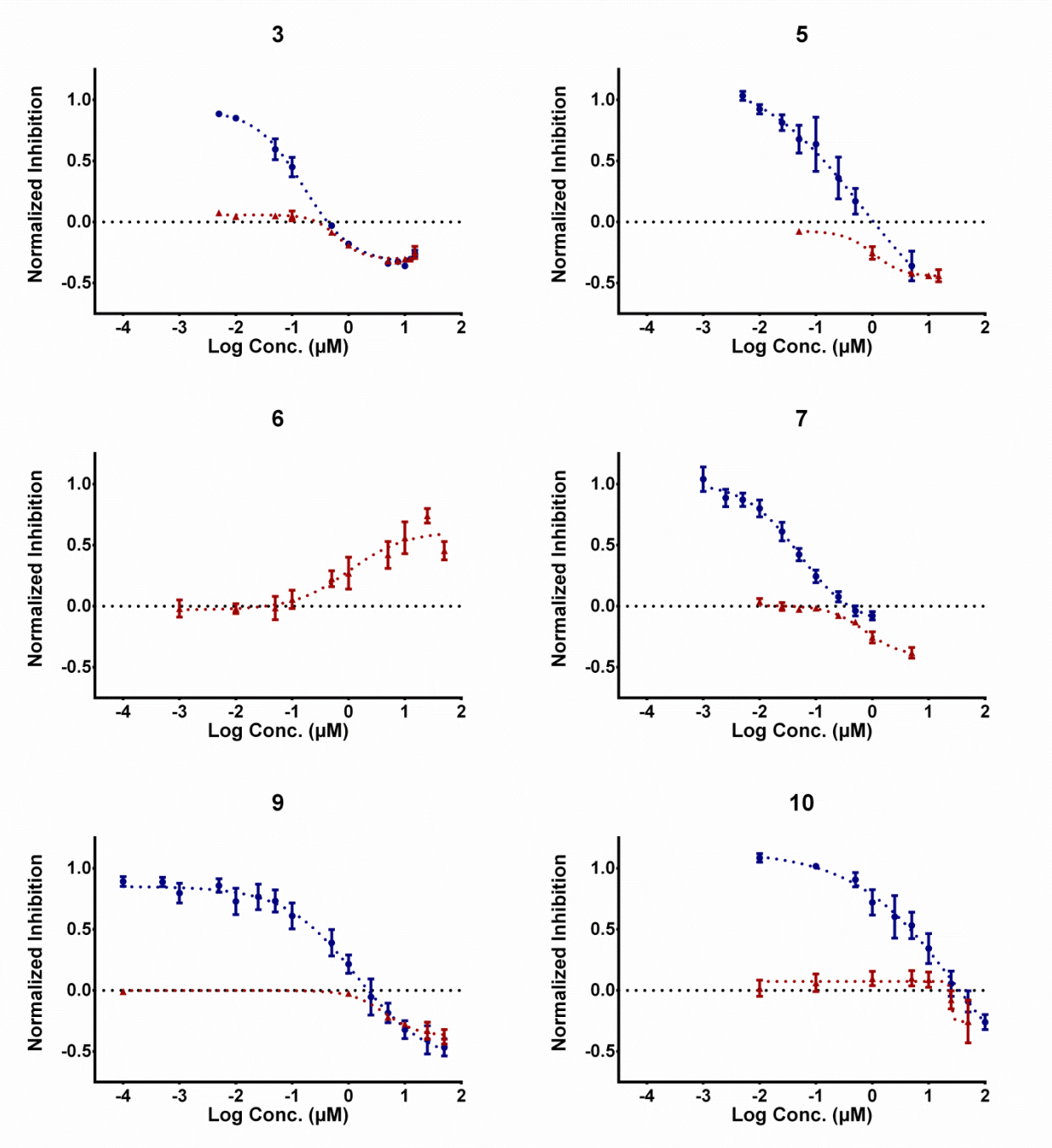
P. aeruginosa PA14 strain and isogenic *pqsR* knockout mutant were stored in glycerol stocks at -80 °C.

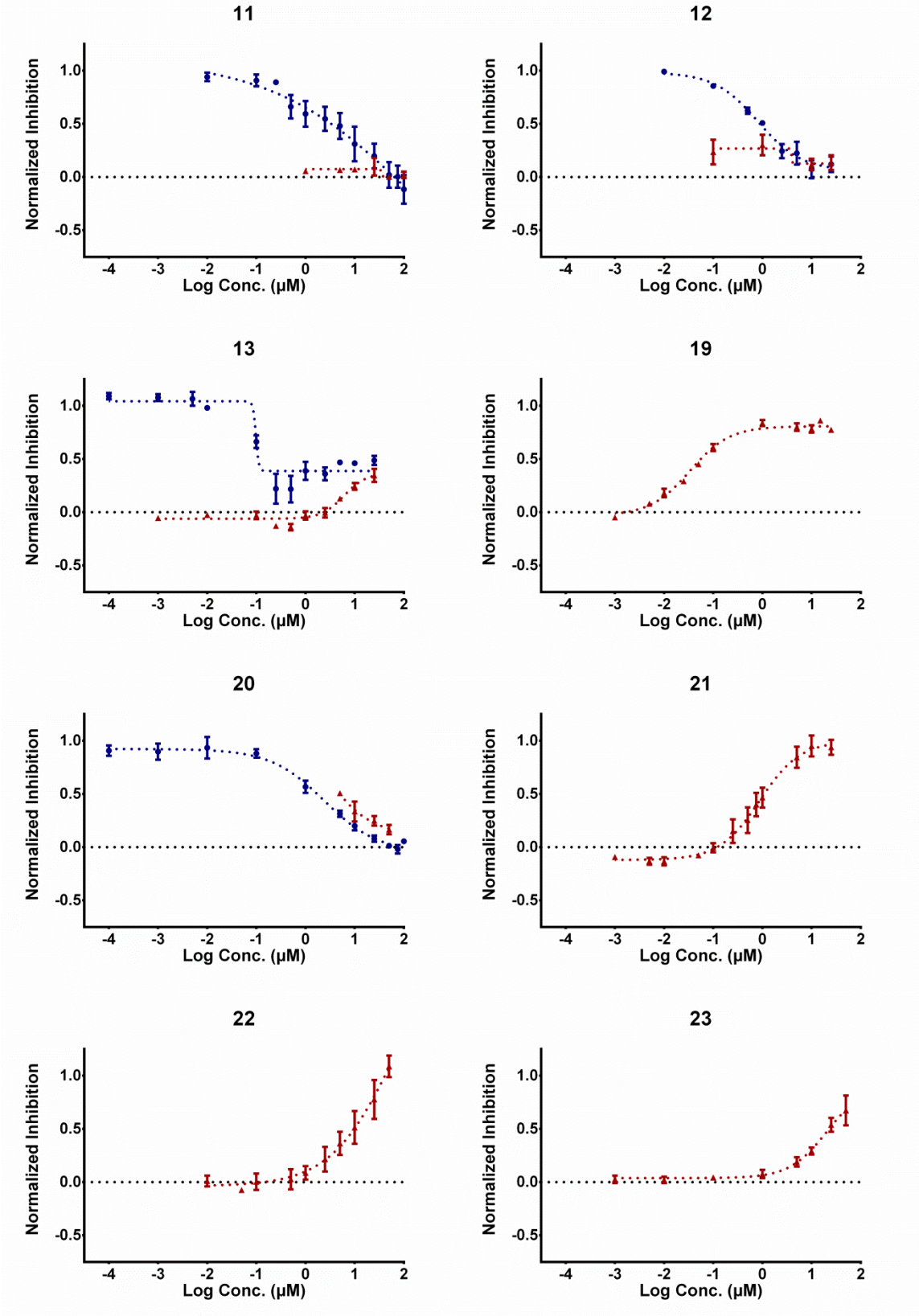
Minimal medium PPGAS3 and Luria-Bertani (LB) were used as bacterial growth media.

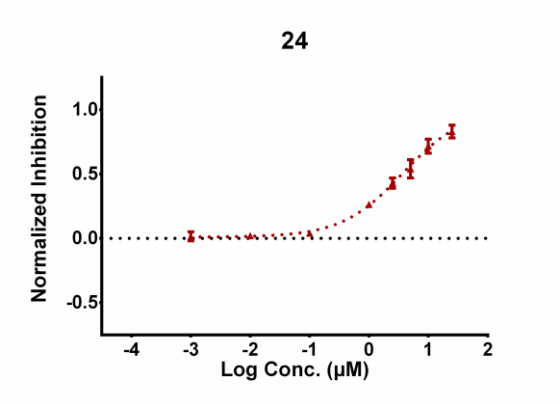
2.2 *E. coli* reporter gene assay: dose-response curves

Shown below are dose-response curves from *E. Coli* reporter gene assay in both experimental settings, namely agonistic (no PQS in red) and antagonistic settings (+50 nM PQS in blue).

Curves were plotted *via* GraphPad Prism. Error bars represent standard error of the mean of at least n = 2 trials.

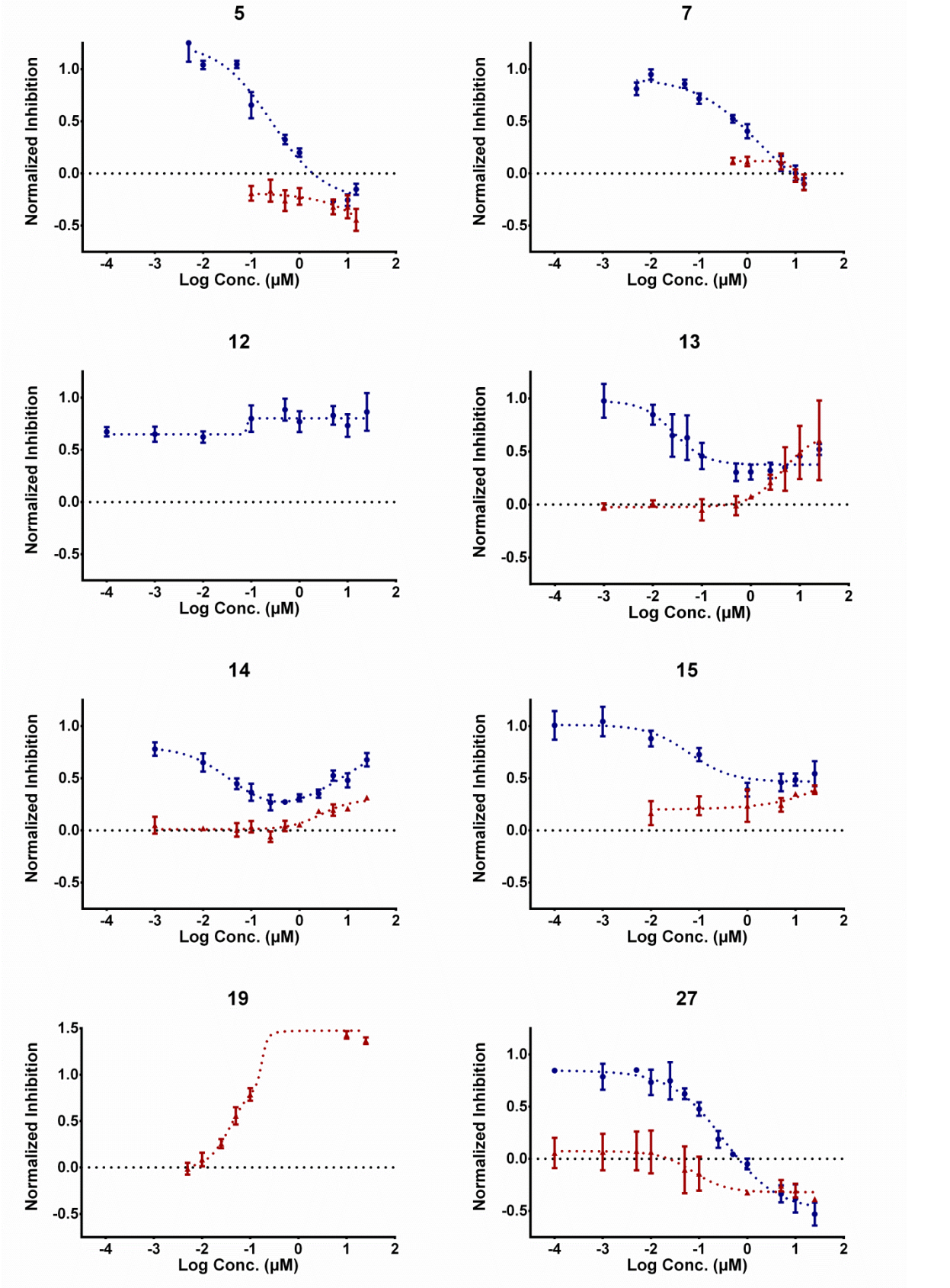



11
12
13
19
20
21
22
23
Normalized Inhibition
1.0
0.5
0.0
-0.5
-4
-3
-2
-1
0
1
2
Log Conc. (μM)



2.3 *P. aeruginosa* reporter-gene assay: dose-response curves

Shown below are dose-response curves from *P. aeruginosa* reporter gene assay in both experimental settings. Color scheme as for the *E. coli* experiment (*vide supra*), *viz.* agonistic (no PQS in red) and antagonistic settings (+50 nM PQS in blue). Software and statistics correspond to the settings of above.


5
7
12
13
14
15
19
27
Normalized Inhibition
Log Conc. (μM)

2.4 Effects on pyocyanin in *P. aeruginosa*

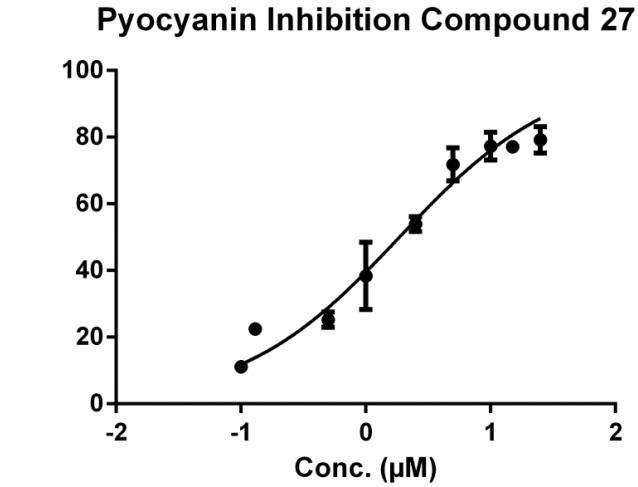


Figure S1. Inhibition of virulence factor pyocyanin was evaluated in the clinical isolate PA14. Representative dose-response curve of compound **27**. Black dotes represent the reduction of pyocyanin in presence of a given compound concentration relative to DMSO control (which equals 0%). The continuous black line is the none-linear regression analysis to determine IC_{50} values using a log (inhibitor) versus response model with constrains (bottom = 0%; top =100%). Non-linear regression was performed with the aid of Graph Pad Prism 6.

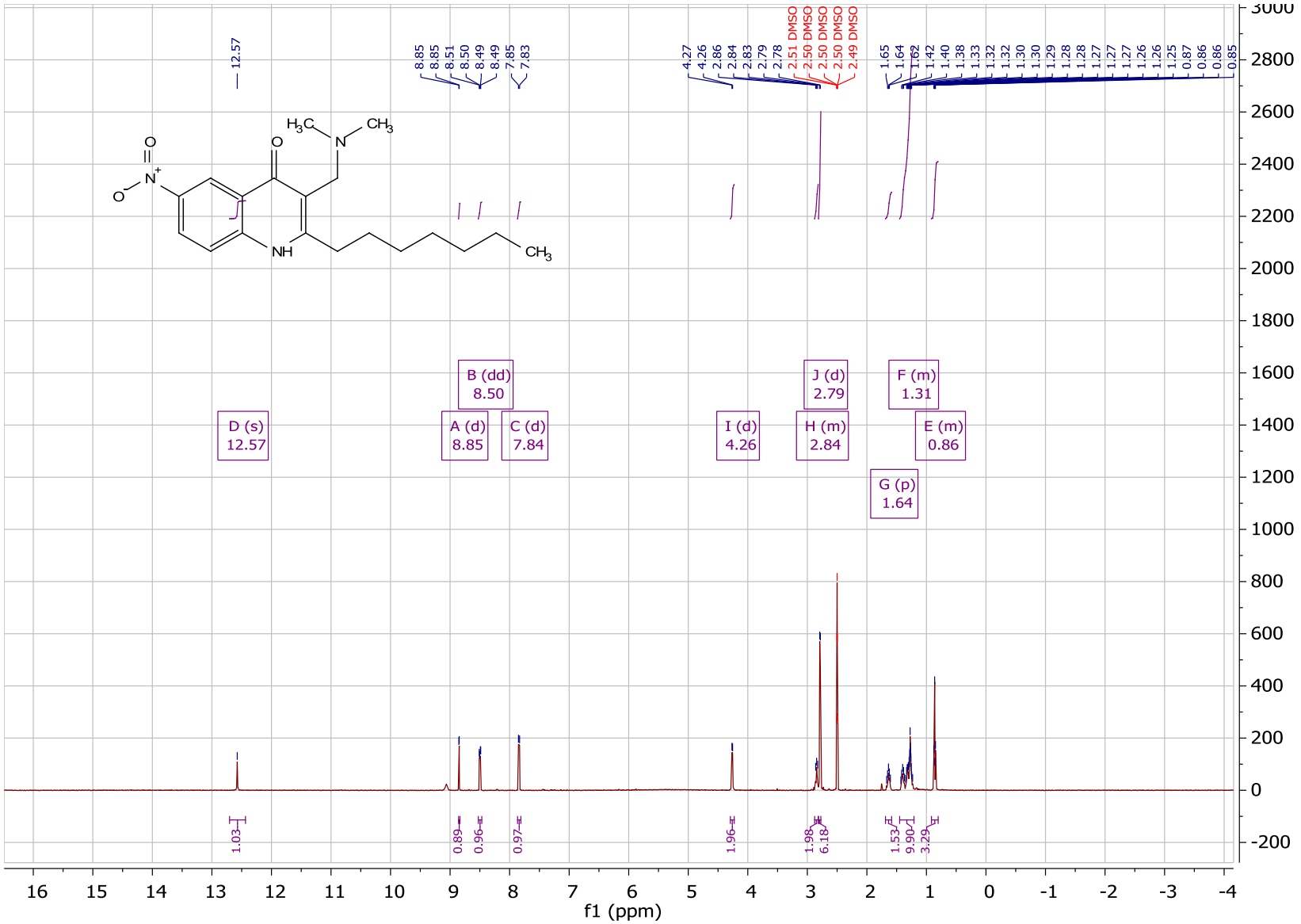
3. Additional tables and graphs

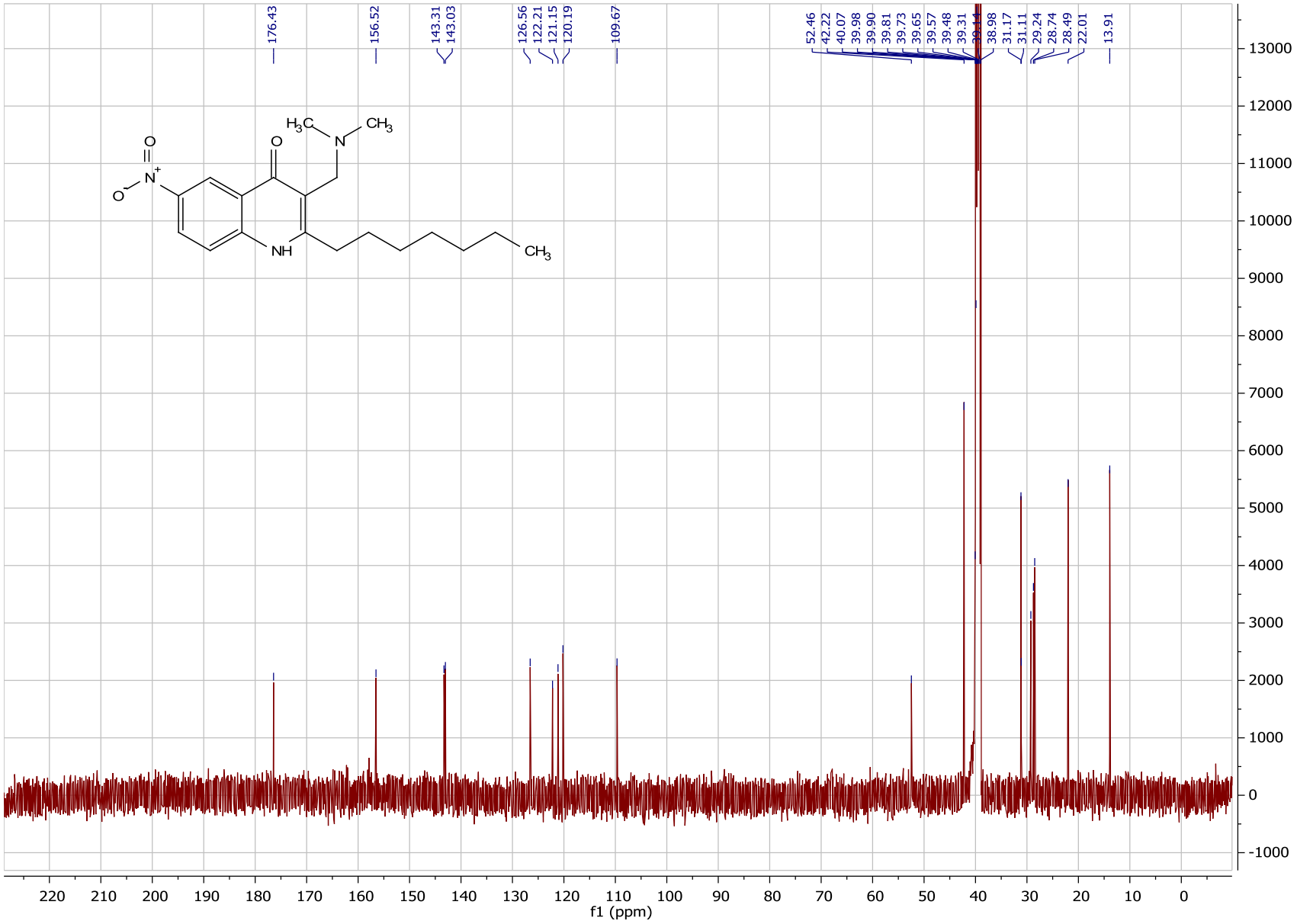
Table S1. CpK_a and percentage of ionization for ionizable substituents at position 3

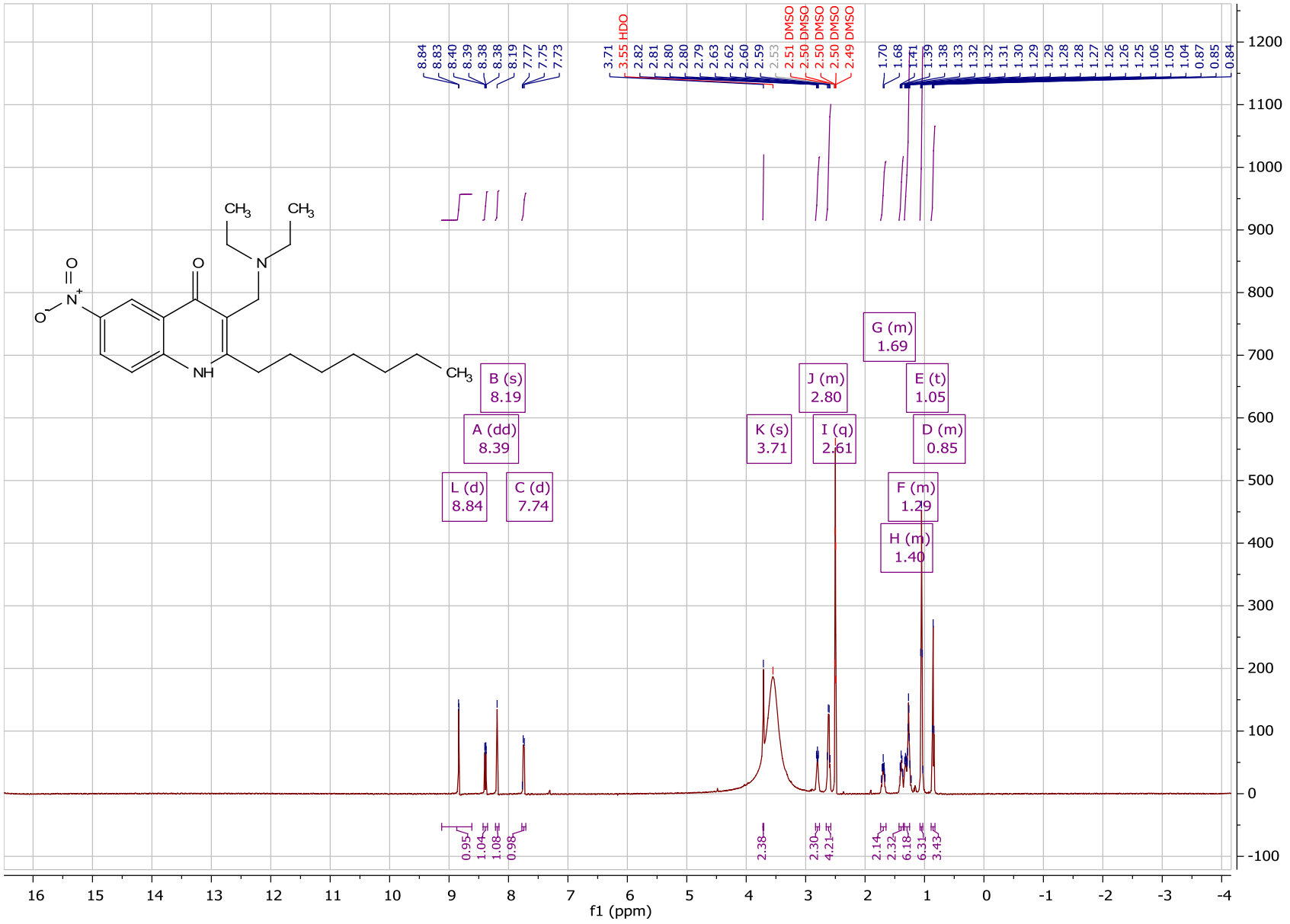
Compound No.	Calculated % ionization of position 3 substituent @ pH 6.5	CpK_a	Position 3 chemical group
4	1%	8.3 ± 0.8	OH
6	100%	3.6 ± 0.8	COOH
22	100%	3.6 ±0.8	COOH
9	83%	12.0 ± 0.9	CH_2NMe_2
10	83%	11.9 ± 0.5	CH_2NEt_2
11	83%	11.8 ± 0.5	$CH_2NC_4H_9$
27	83%	12.0 ± 0.9	CH_2NH_2

Values were calculated by the use of GALAS algorithm as implemented in ACDLabs (Build 2911. 12 Jul 2016) for CpK_a determination.

4. Graphical representation of ^{1}H and ^{13}C NMR spectra of the compounds




176.43
156.52
143.31
143.03
126.56
122.21
121.15
120.19
109.67
52.46
42.22
40.07
39.98
39.90
39.81
39.73
39.65
39.57
39.48
39.31
39.14
38.98
31.17
31.11
29.24
28.74
28.49
22.01
13.91
H3C
CH3
N
O
O
N+
O-
NH
CH3
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


8.84
8.83
8.40
8.39
8.38
8.38
8.19
7.77
7.75
7.73
3.71
3.55 HDO
2.82
2.81
2.80
2.80
2.79
2.63
2.62
2.60
2.59
2.53
2.51 DMSO
2.50 DMSO
2.50 DMSO
2.50 DMSO
2.49 DMSO
1.70
1.68
1.41
1.39
1.38
1.33
1.32
1.32
1.31
1.30
1.29
1.29
1.28
1.28
1.27
1.26
1.26
1.25
1.06
1.05
1.04
0.87
0.85
0.84
B (s)
8.19
A (dd)
8.39
L (d)
8.84
C (d)
7.74
K (s)
3.71
J (m)
2.80
I (q)
2.61
G (m)
1.69
E (t)
1.05
D (m)
0.85
F (m)
1.29
H (m)
1.40
0.95
1.04
1.08
0.98
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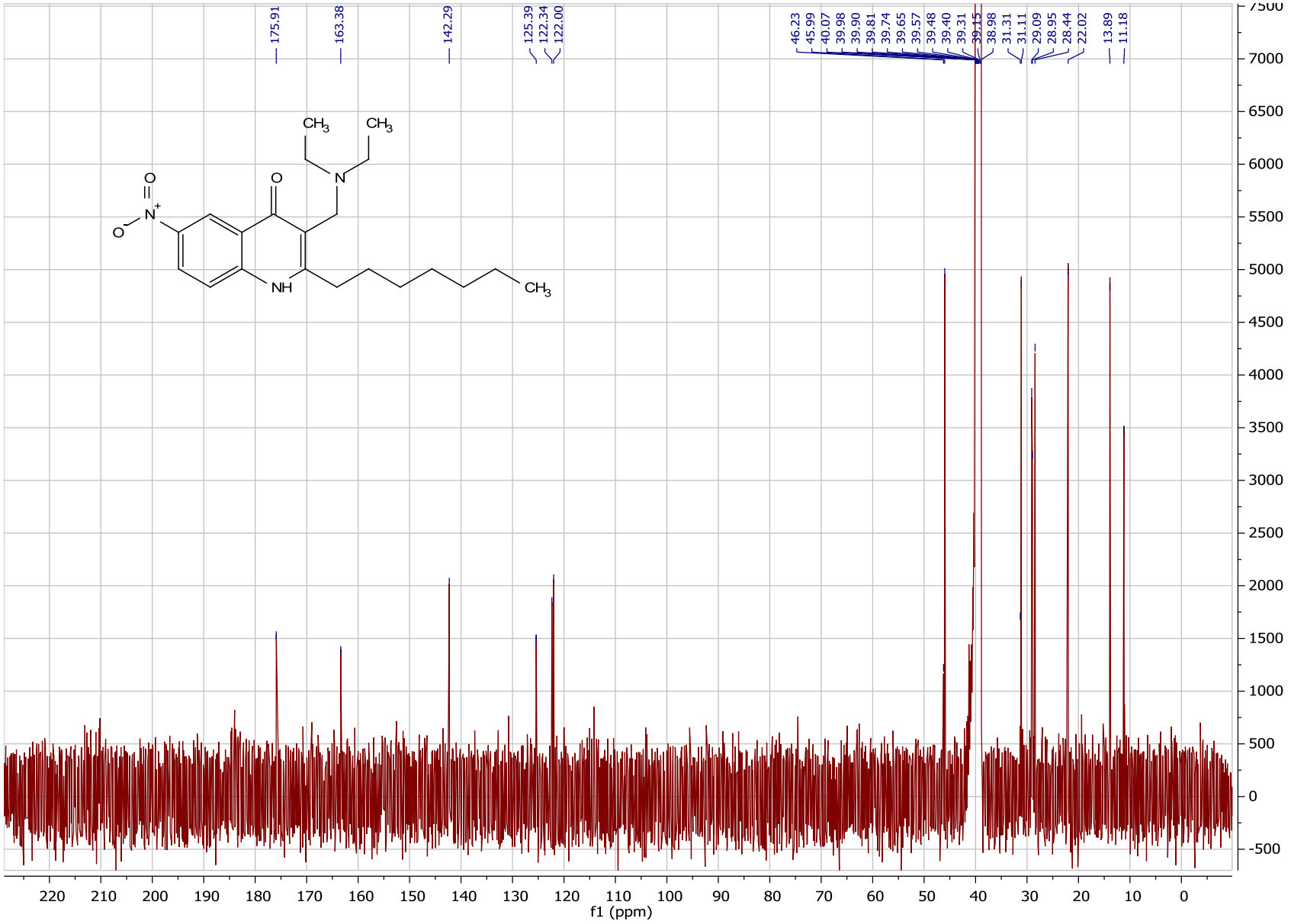
2.30
4.21
2.14
2.32
6.18
6.31
3.43
f1 (ppm)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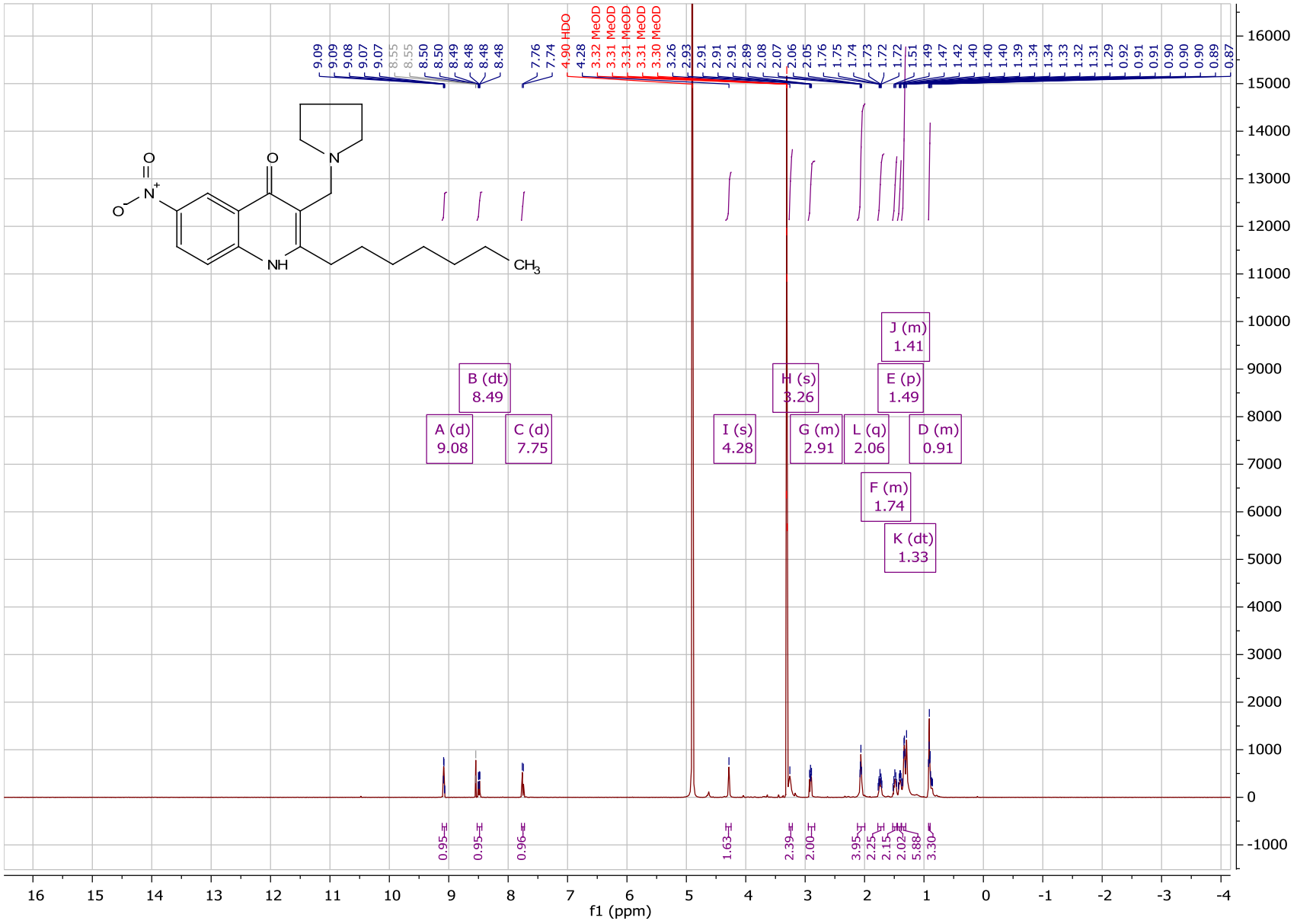
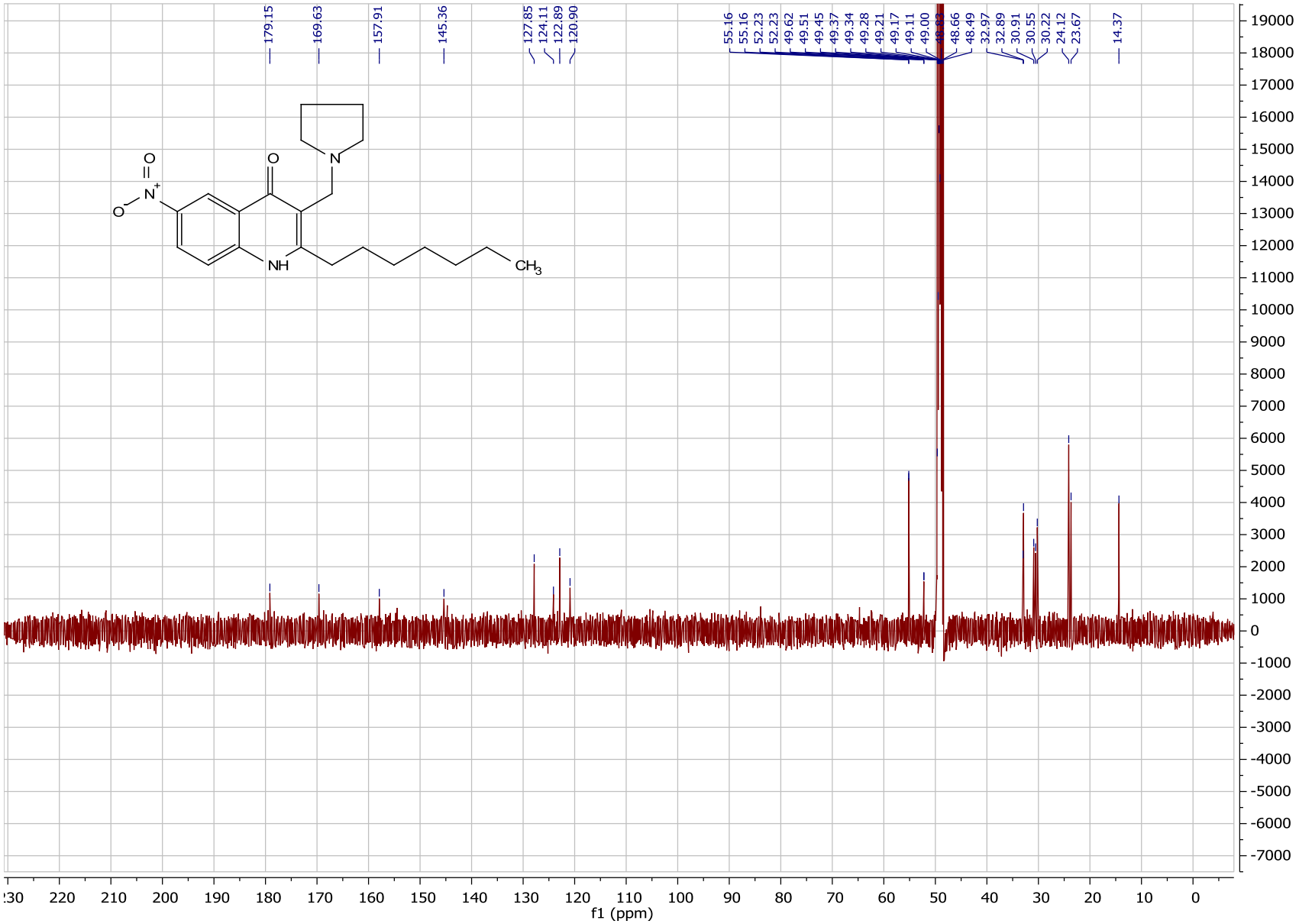
125.39
122.34
122.00
46.23
45.99
40.07
39.98
39.90
39.81
39.74
39.65
39.57
39.48
39.40
39.31
39.15
38.98
31.31
31.11
29.09
28.95
28.44
22.02
13.89
11.18
CH3
CH3
N
O
O
N+
O-
NH
CH3
f1 (ppm)


A (d) 9.08
B (dt) 8.49
C (d) 7.75
I (s) 4.28
H (s) 3.26
G (m) 2.91
L (q) 2.06
E (p) 1.49
J (m) 1.41
D (m) 0.91
F (m) 1.74
K (dt) 1.33
f1 (ppm)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169.63
157.91
145.36
127.85
124.11
122.89
120.90
55.16
55.16
52.23
52.23
49.62
49.51
49.45
49.37
49.34
49.28
49.21
49.17
49.11
49.00
48.83
48.66
48.49
32.97
32.89
30.91
30.55
30.22
24.12
23.67
14.37
O
N
O
N+
O
NH
CH3
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18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
-7000
230
220
210
200
190
180
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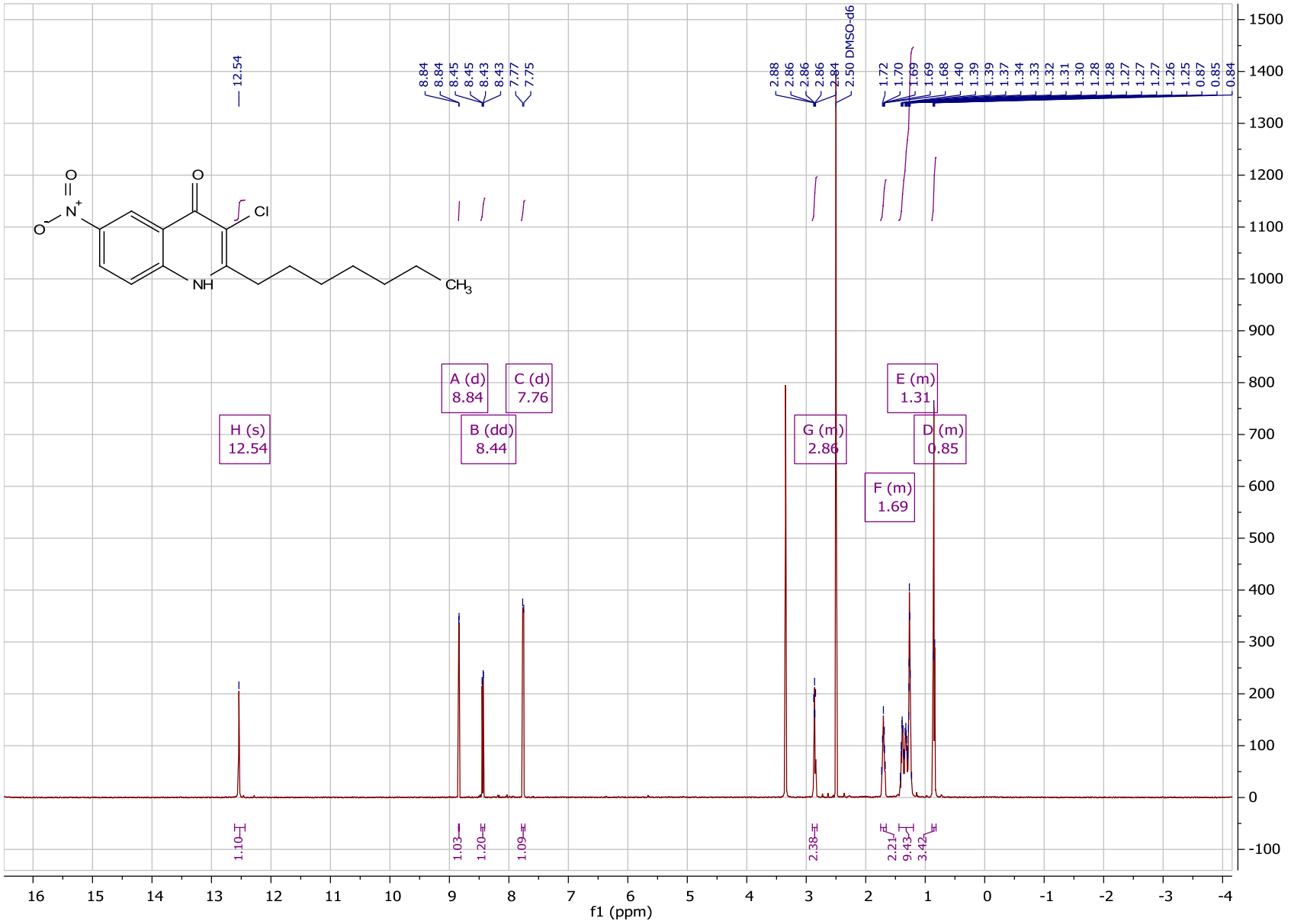
50
40
30
20
10
0
f1 (ppm)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2.86
2.86
2.84
2.50 DMSO-d6
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1.70
1.69
1.69
1.68
1.40
1.39
1.39
1.37
1.34
1.33
1.32
1.31
1.30
1.28
1.28
1.27
1.27
1.27
1.26
1.25
0.87
0.85
0.84
O
O
N+
O-
Cl
NH
CH3
A (d)
8.84
C (d)
7.76
B (dd)
8.44
H (s)
12.54
G (m)
2.86
E (m)
1.31
D (m)
0.85
F (m)
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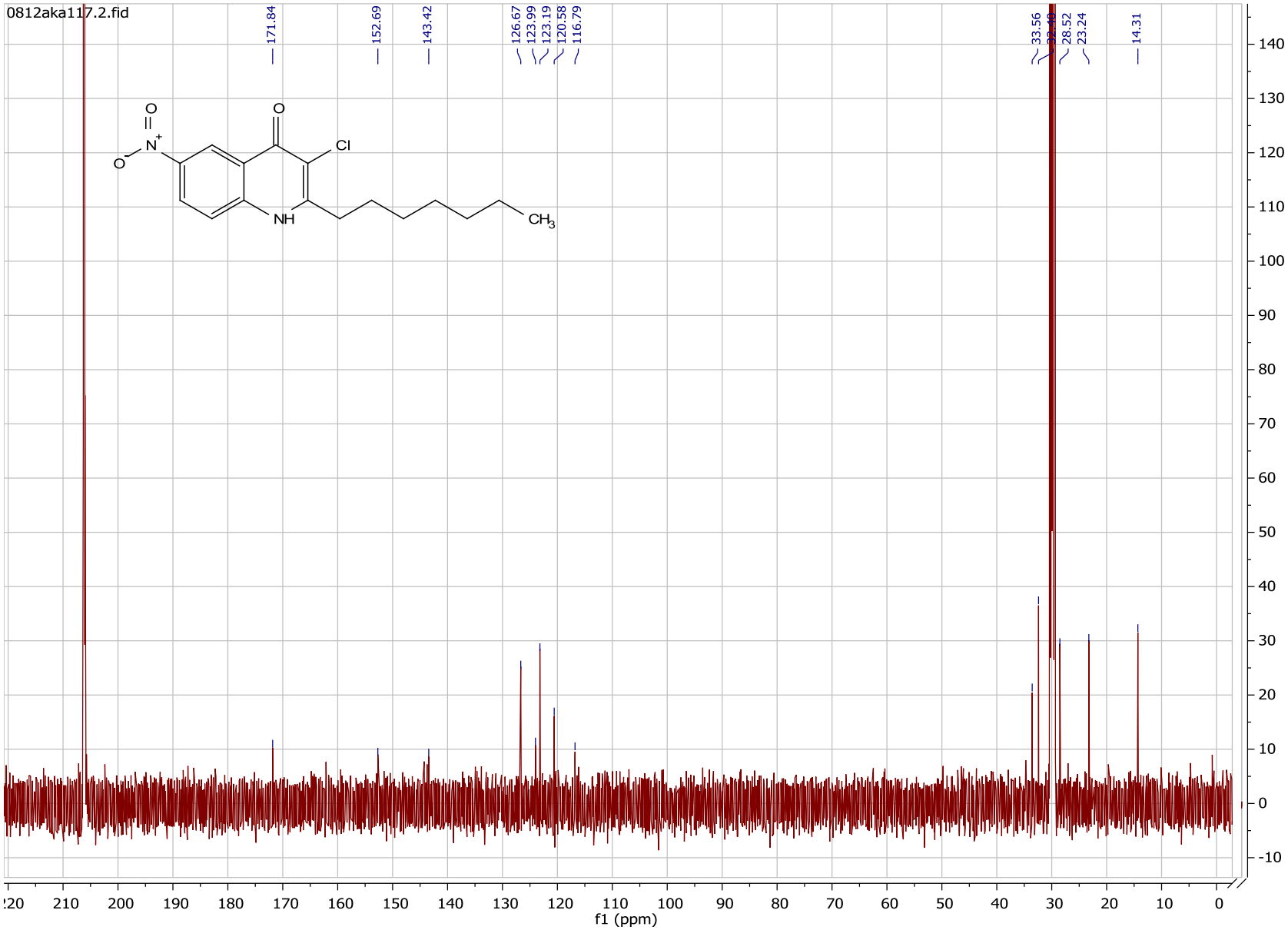
1.10
1.03
1.20
1.09
2.38
2.21
9.43
3.42
f1 (ppm)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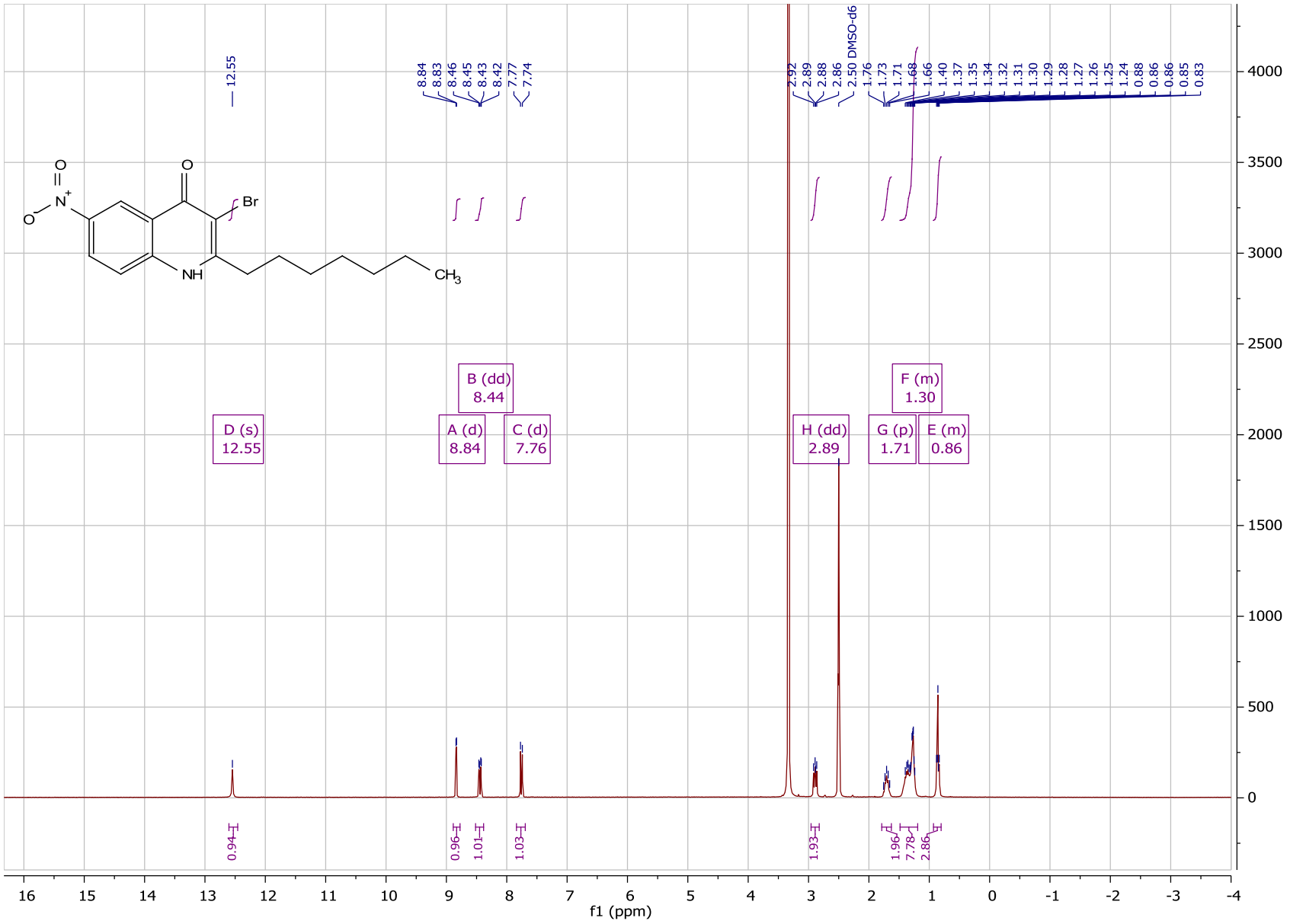
O
O
N+
O
Cl
NH
CH3
f1 (ppm)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2.86
2.50 DMSO-d6
1.76
1.73
1.71
1.68
1.66
1.40
1.37
1.35
1.34
1.32
1.31
1.30
1.29
1.28
1.27
1.26
1.25
1.24
0.88
0.86
0.86
0.85
0.83
O
O
N+
O-
Br
NH
CH3
D (s)
12.55
B (dd)
8.44
A (d)
8.84
C (d)
7.76
H (dd)
2.89
F (m)
1.30
G (p)
1.71
E (m)
0.86
0.94
0.96
1.01
1.03
1.93
1.96
7.78
2.86
4000
3500
3000
2500
2000
1500
1000
500
0
16
15
14
13
12
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10
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8
7
6
5
4
3
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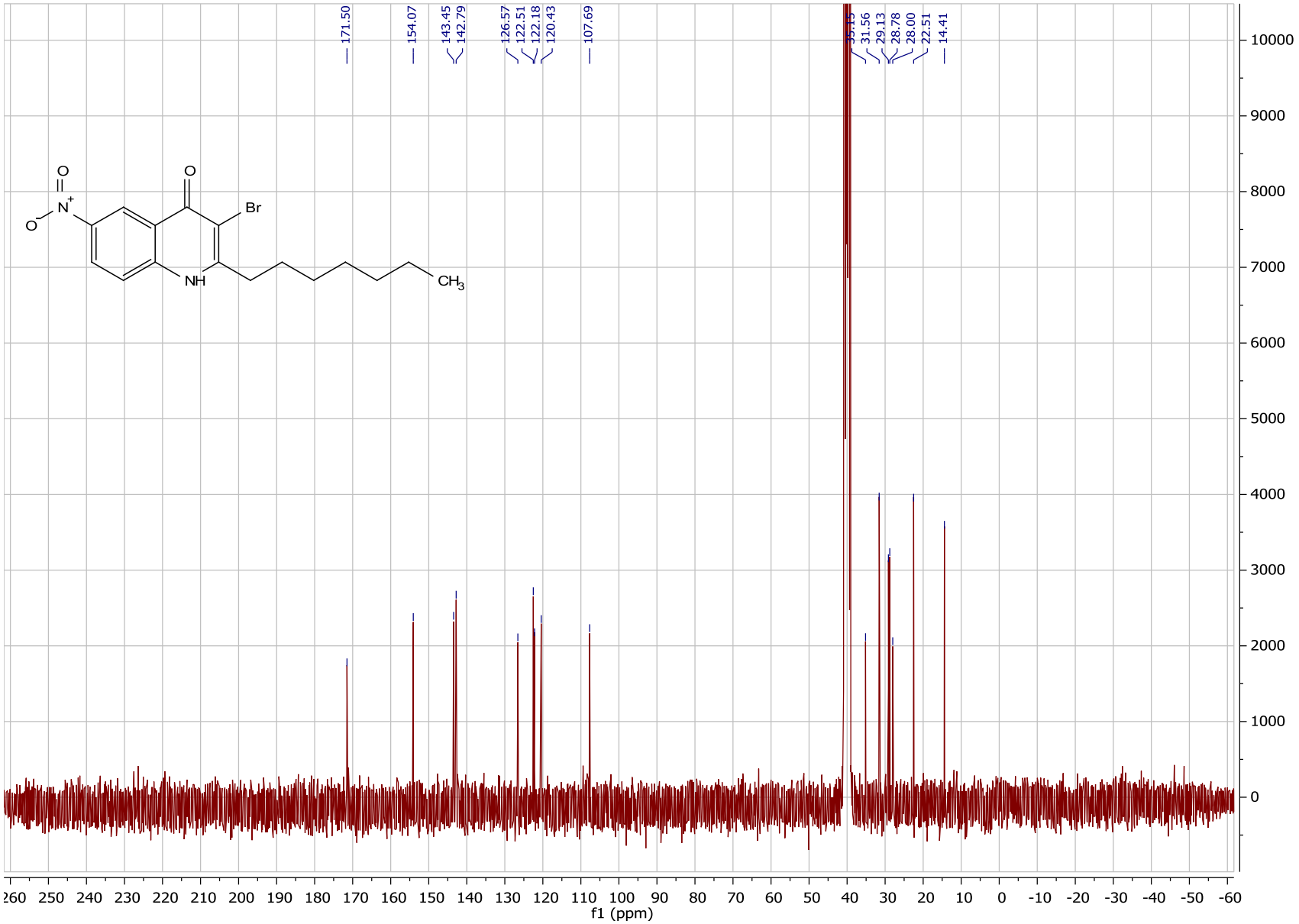
1
0
-1
-2
-3
-4
f1 (ppm)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22.51
14.41
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O
N+
O-
Br
NH
CH3
10000
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8000
7000
6000
5000
4000
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2000
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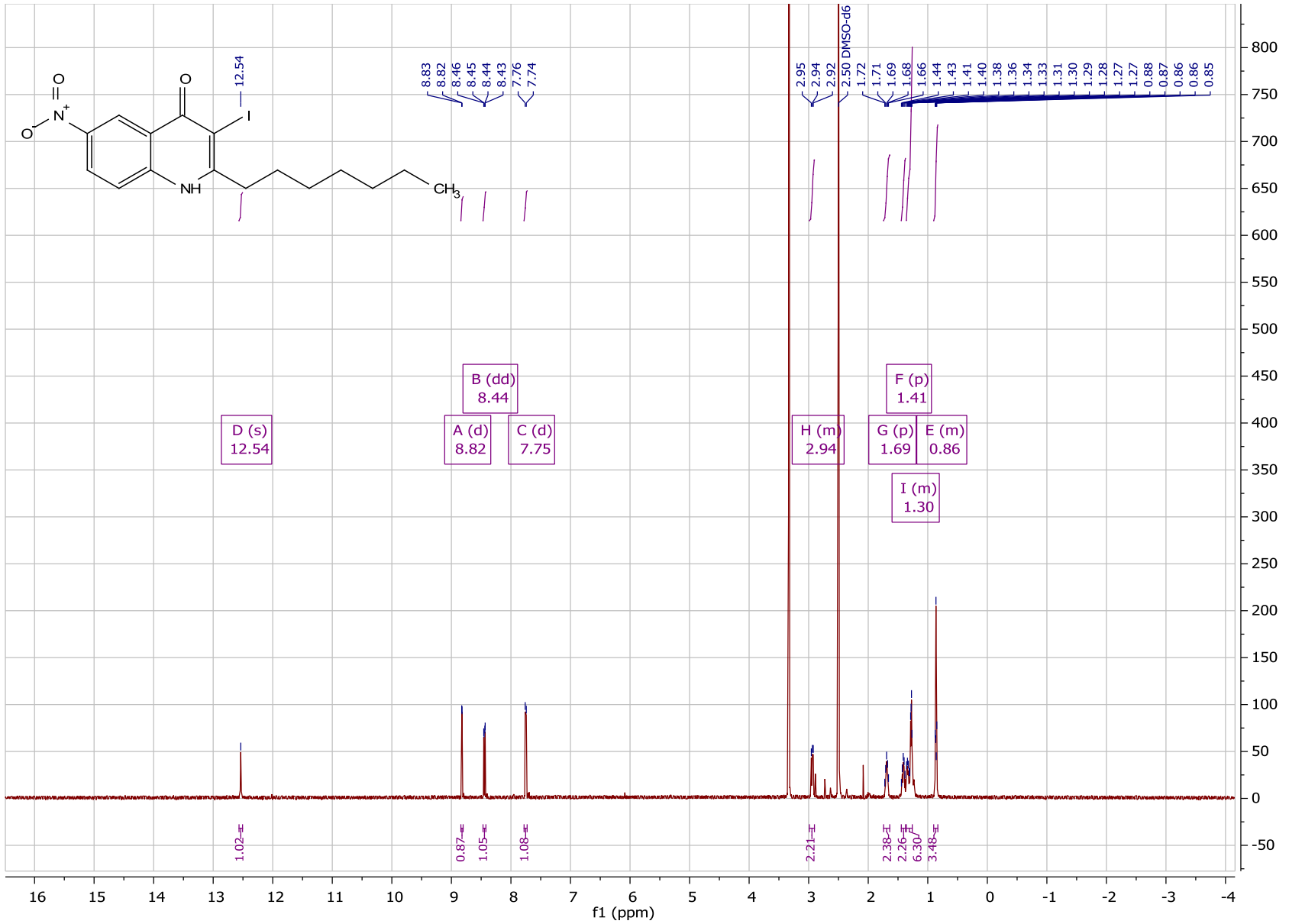
f1 (ppm)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1.69
1.68
1.66
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1.43
1.41
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1.38
1.36
1.34
1.33
1.31
1.30
1.29
1.28
1.27
1.27
0.88
0.87
0.86
0.86
0.85
B (dd)
8.44
D (s)
12.54
A (d)
8.82
C (d)
7.75
H (m)
2.94
F (p)
1.41
G (p)
1.69
E (m)
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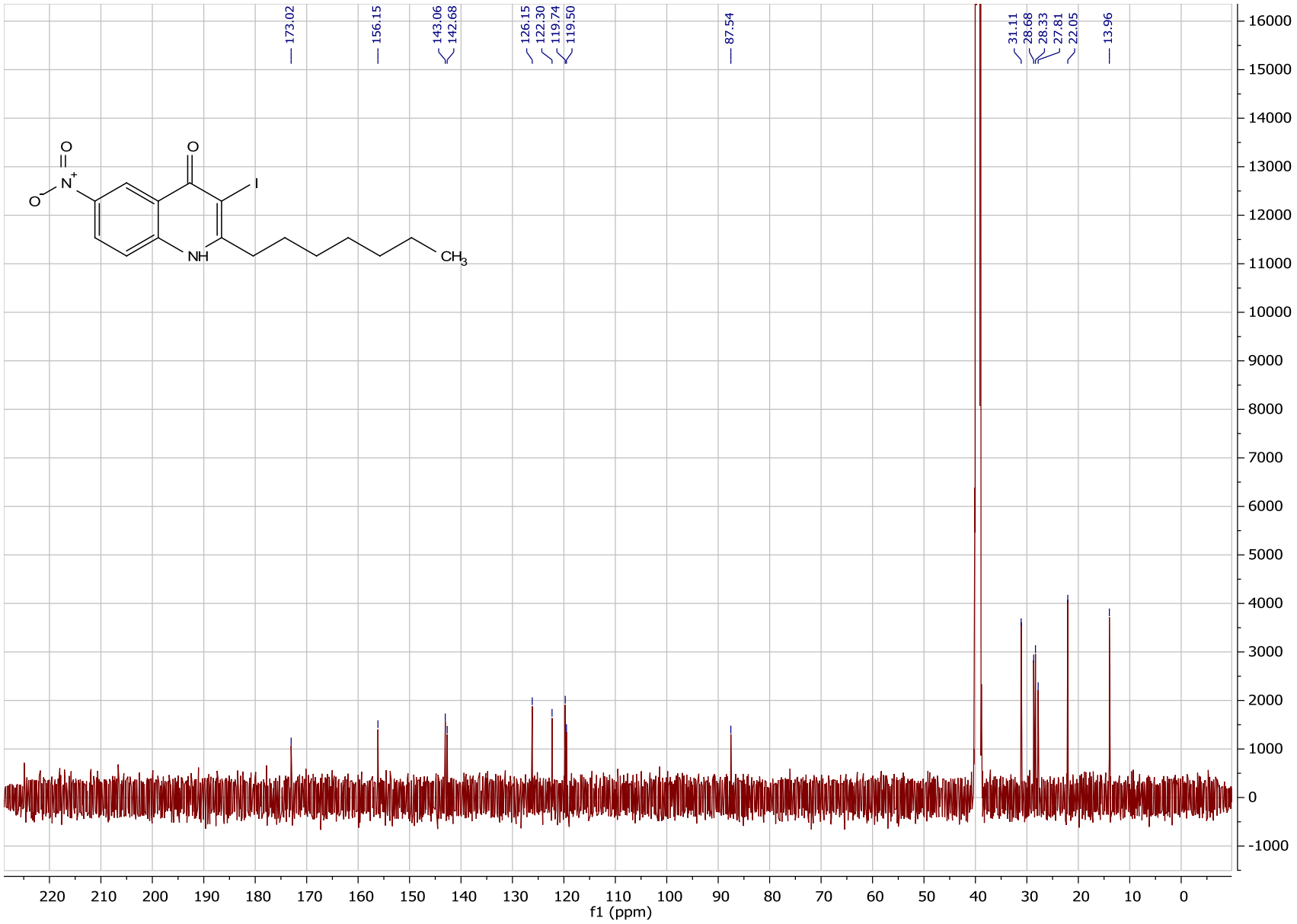
f1 (ppm)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22.05
13.96
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O
N+
O-
I
NH
CH3
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
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200
190
180
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110
100
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80
70
60
50
40
30
20
10
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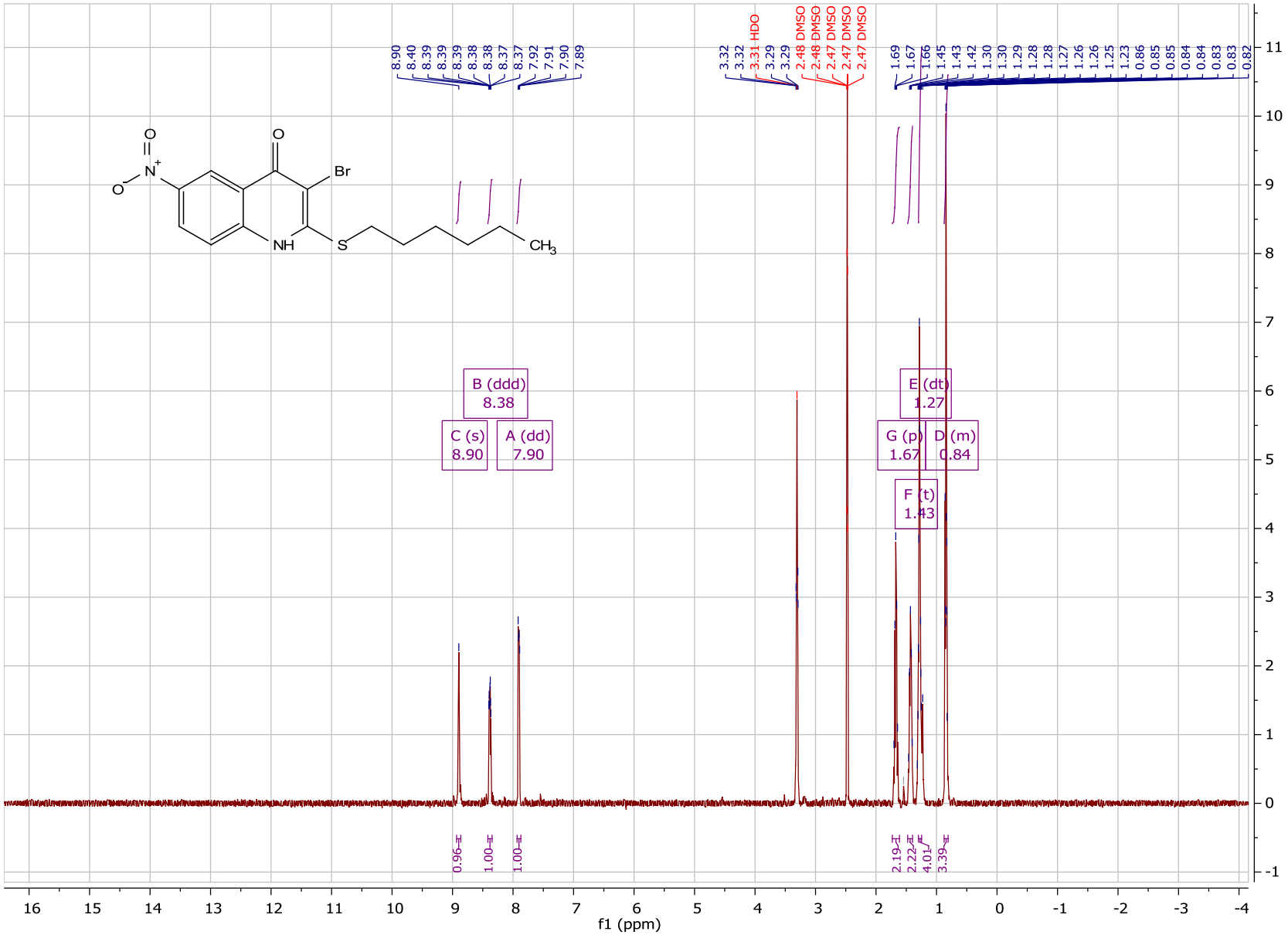
f1 (ppm)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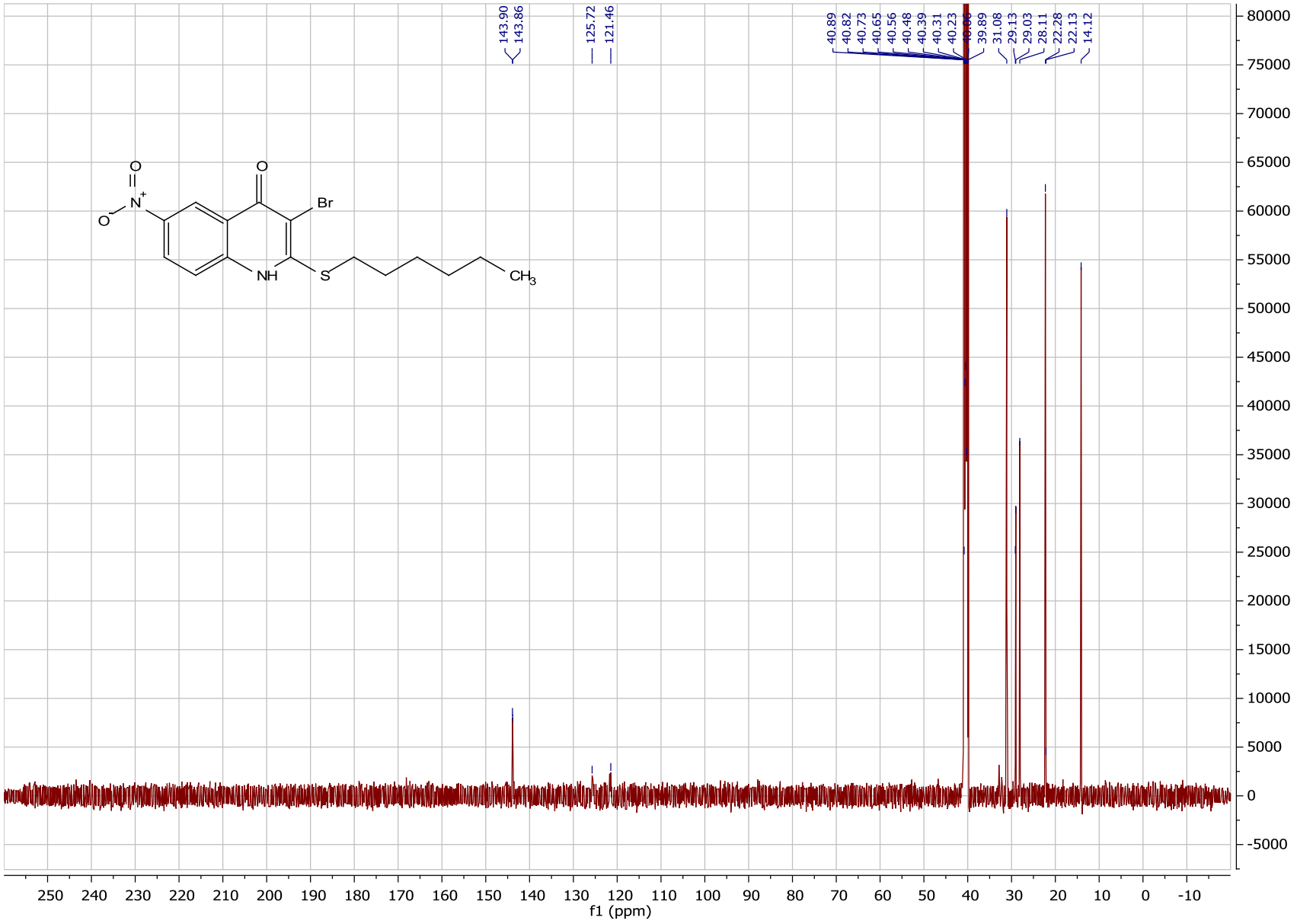
7.91
7.90
7.89
3.32
3.32
3.31 HDO
3.29
3.29
2.48 DMSO
2.48 DMSO
2.47 DMSO
2.47 DMSO
2.47 DMSO
1.69
1.67
1.66
1.45
1.43
1.42
1.30
1.30
1.29
1.28
1.28
1.27
1.26
1.26
1.25
1.23
0.86
0.85
0.85
0.84
0.84
0.83
0.83
0.82
O
O
N+
O
Br
NH
S
CH3
B (ddd)
8.38
C (s)
8.90
A (dd)
7.90
E (dt)
1.27
G (p)
1.67
D (m)
0.84
F (t)
1.43
0.96
1.00
1.00
2.19
2.22
4.01
3.39
f1 (ppm)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40.23
39.89
31.08
29.13
29.03
28.11
22.28
22.13
14.12
O
O
N+
O-
Br
NH
S
CH3
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
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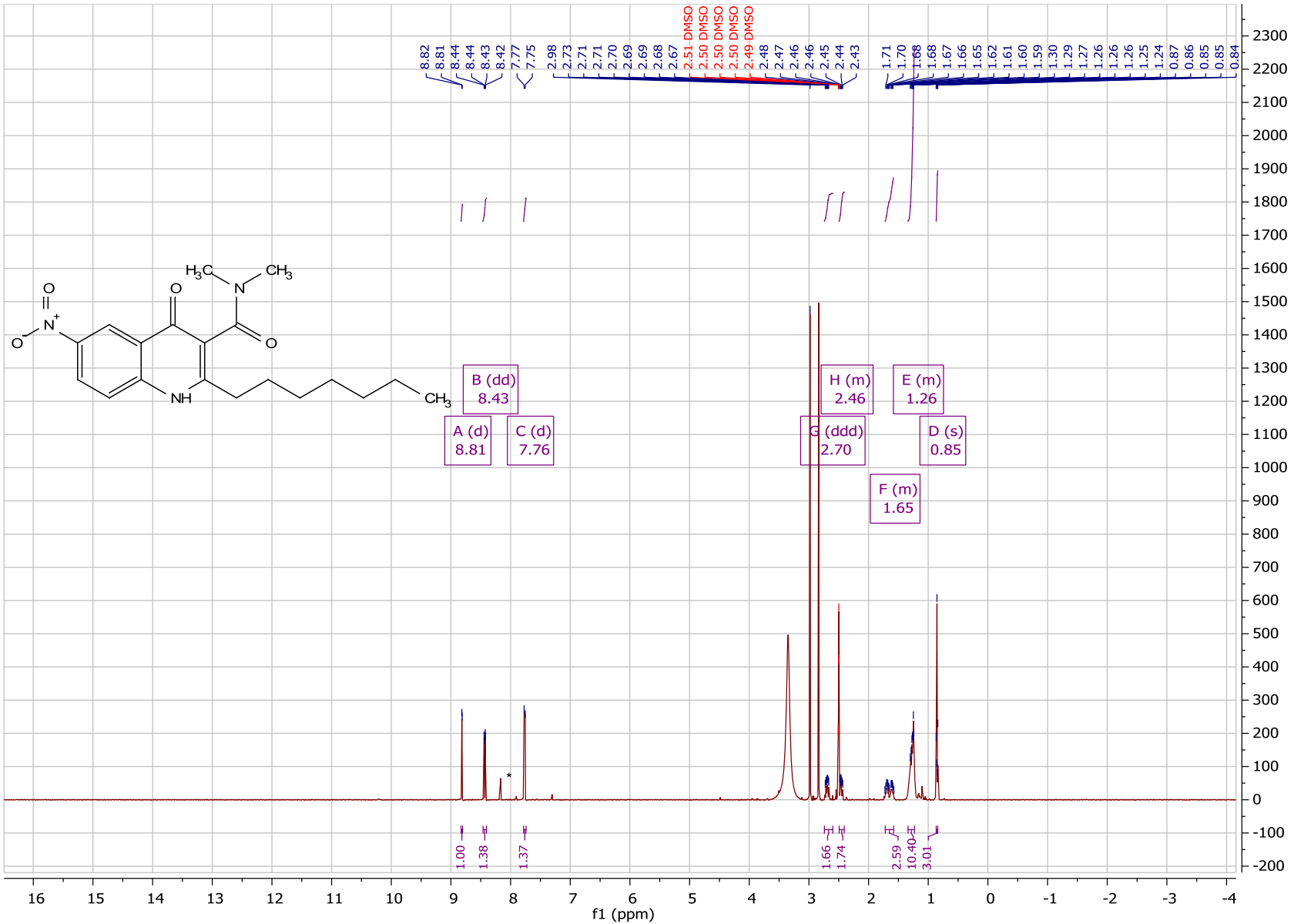
0
-5000
250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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8.42
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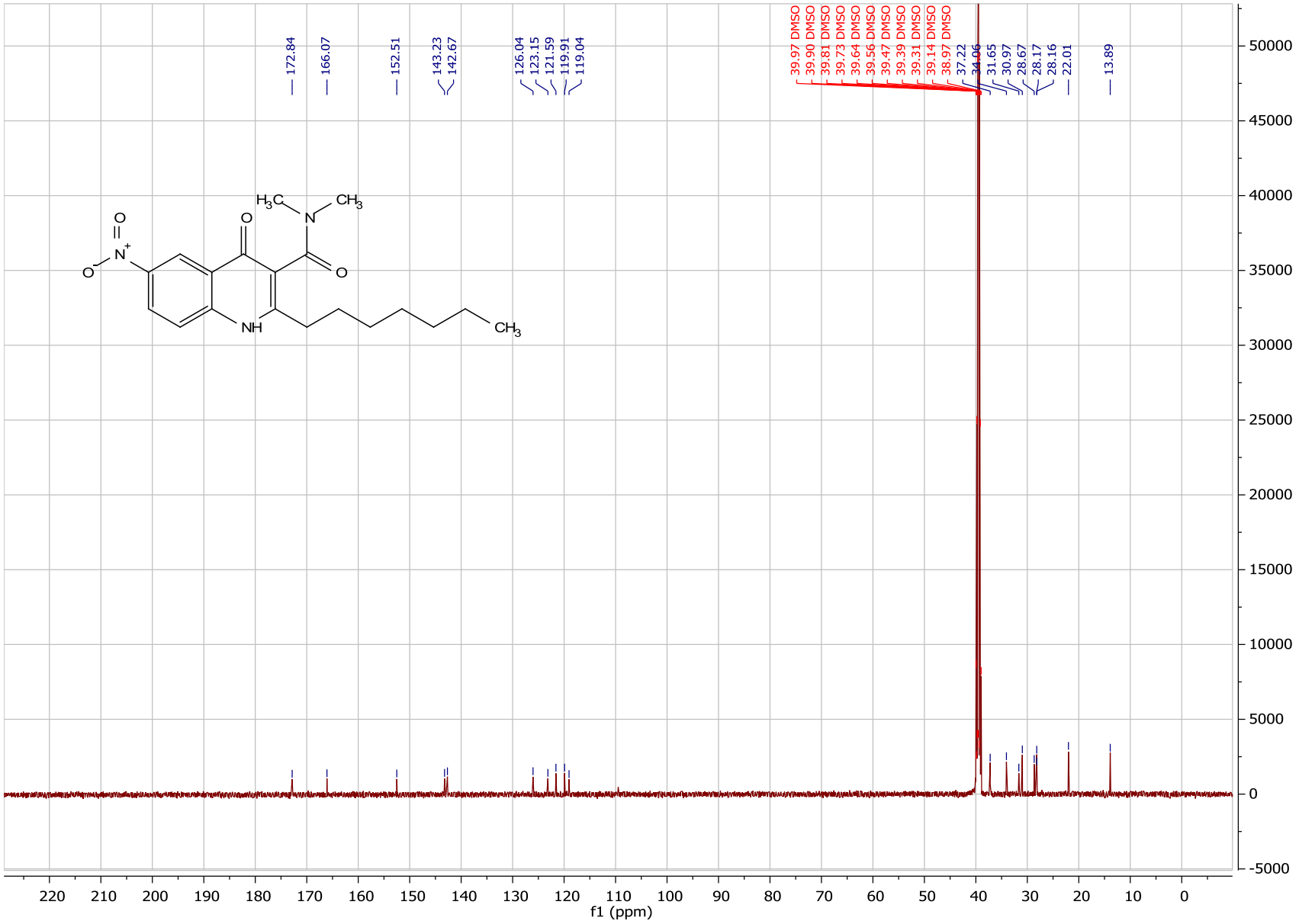
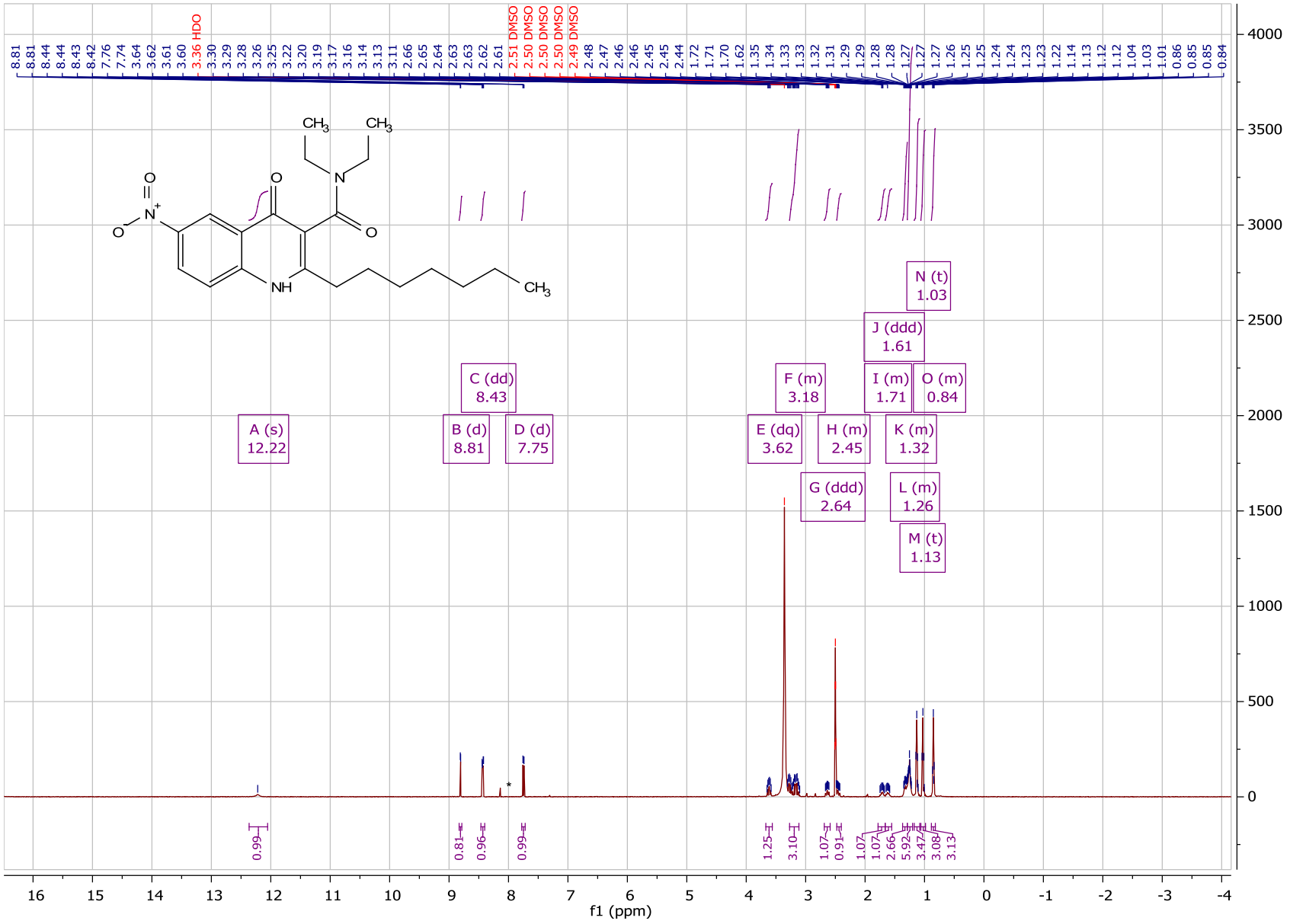
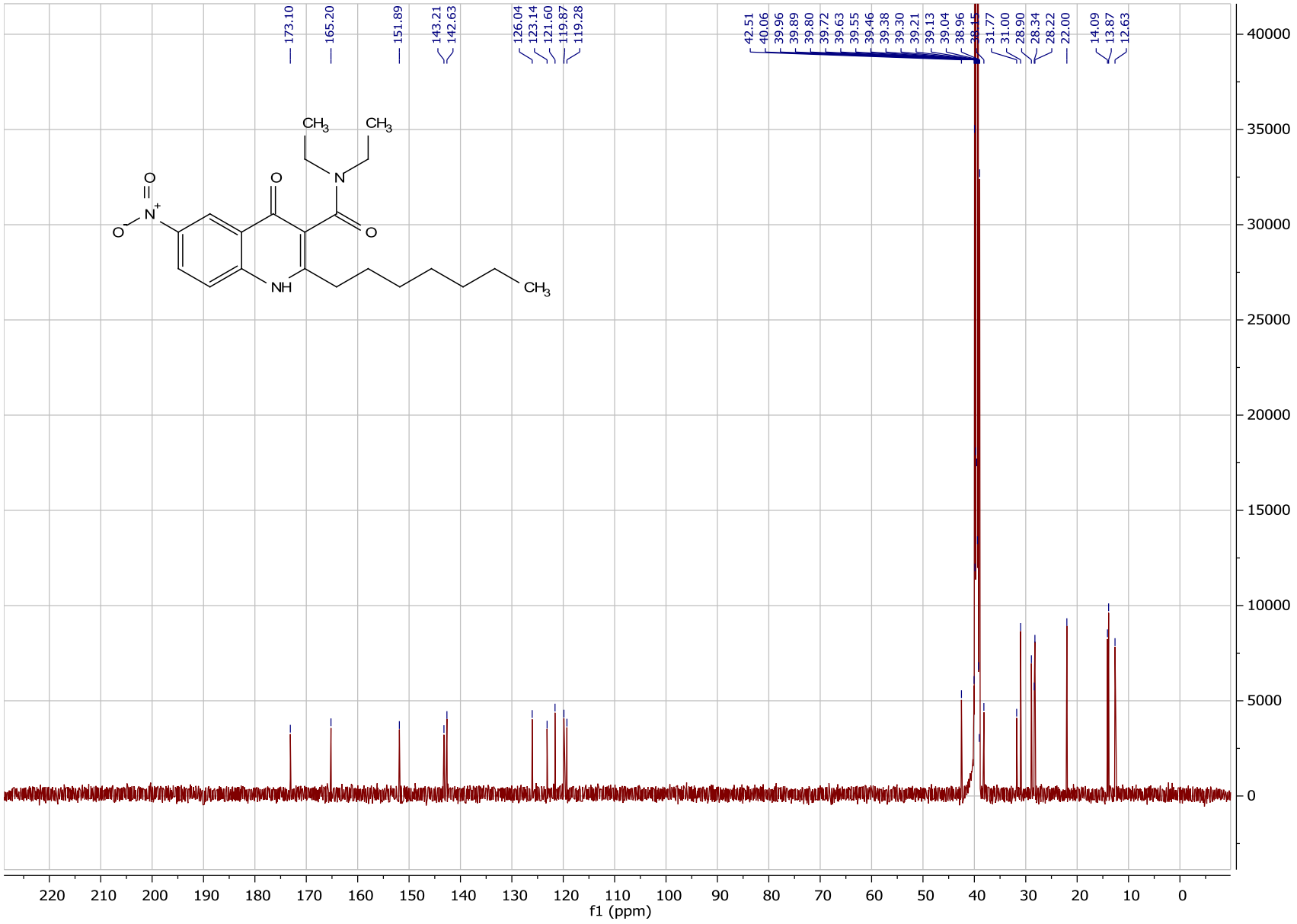
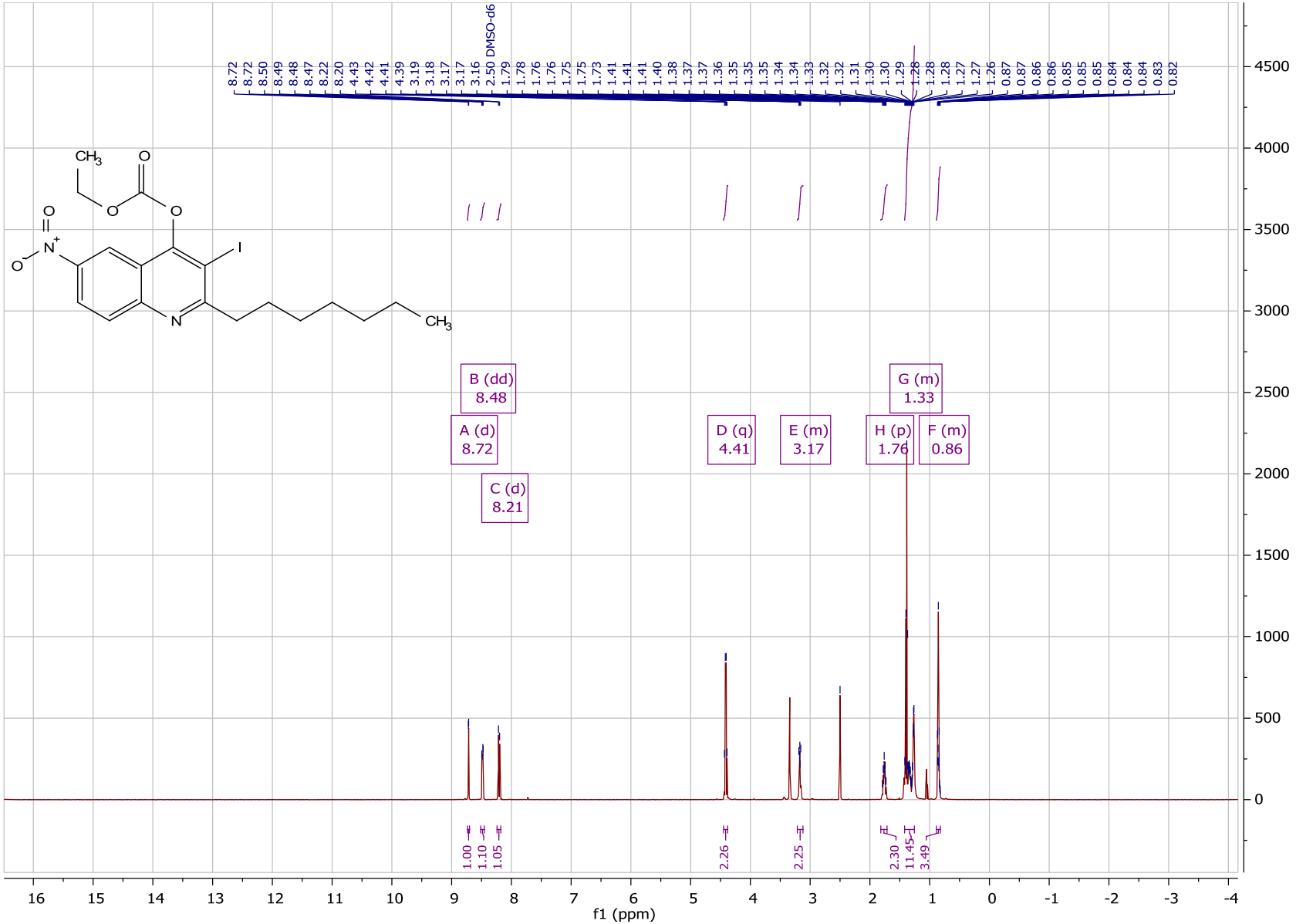
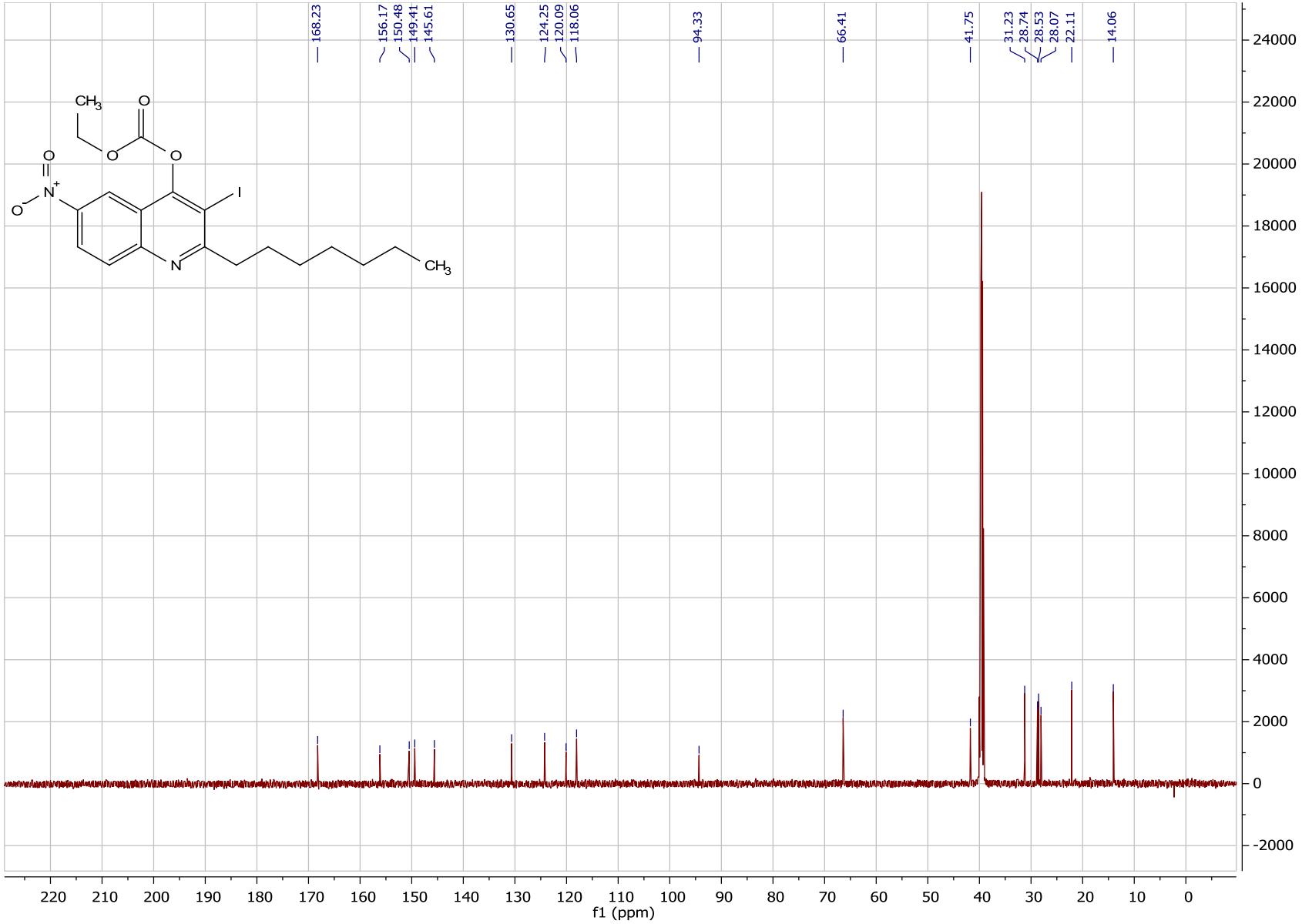
2.71
2.70
2.69
2.69
2.68
2.67
2.51 DMSO
2.50 DMSO
2.50 DMSO
2.50 DMSO
2.49 DMSO
2.48
2.47
2.46
2.46
2.45
2.44
2.43
1.71
1.70
1.68
1.68
1.67
1.66
1.65
1.62
1.61
1.60
1.59
1.30
1.29
1.27
1.26
1.26
1.26
1.25
1.24
0.87
0.86
0.85
0.85
0.84
B (dd)
8.43
A (d)
8.81
C (d)
7.76
H (m)
2.46
E (m)
1.26
G (ddd)
2.70
D (s)
0.85
F (m)
1.65
1.00
1.38
1.37
1.66
1.74
2.59
10.40
3.01
f1 (ppm)


172.84
166.07
152.51
143.23
142.67
126.04
123.15
121.59
119.91
119.04
39.97 DMSO
39.90 DMSO
39.81 DMSO
39.73 DMSO
39.64 DMSO
39.56 DMSO
39.47 DMSO
39.39 DMSO
39.31 DMSO
39.14 DMSO
38.97 DMSO
37.22
34.06
31.65
30.97
28.67
28.17
28.16
22.01
13.89
H3C
CH3
N
O
O
N+
O-
O
NH
CH3
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

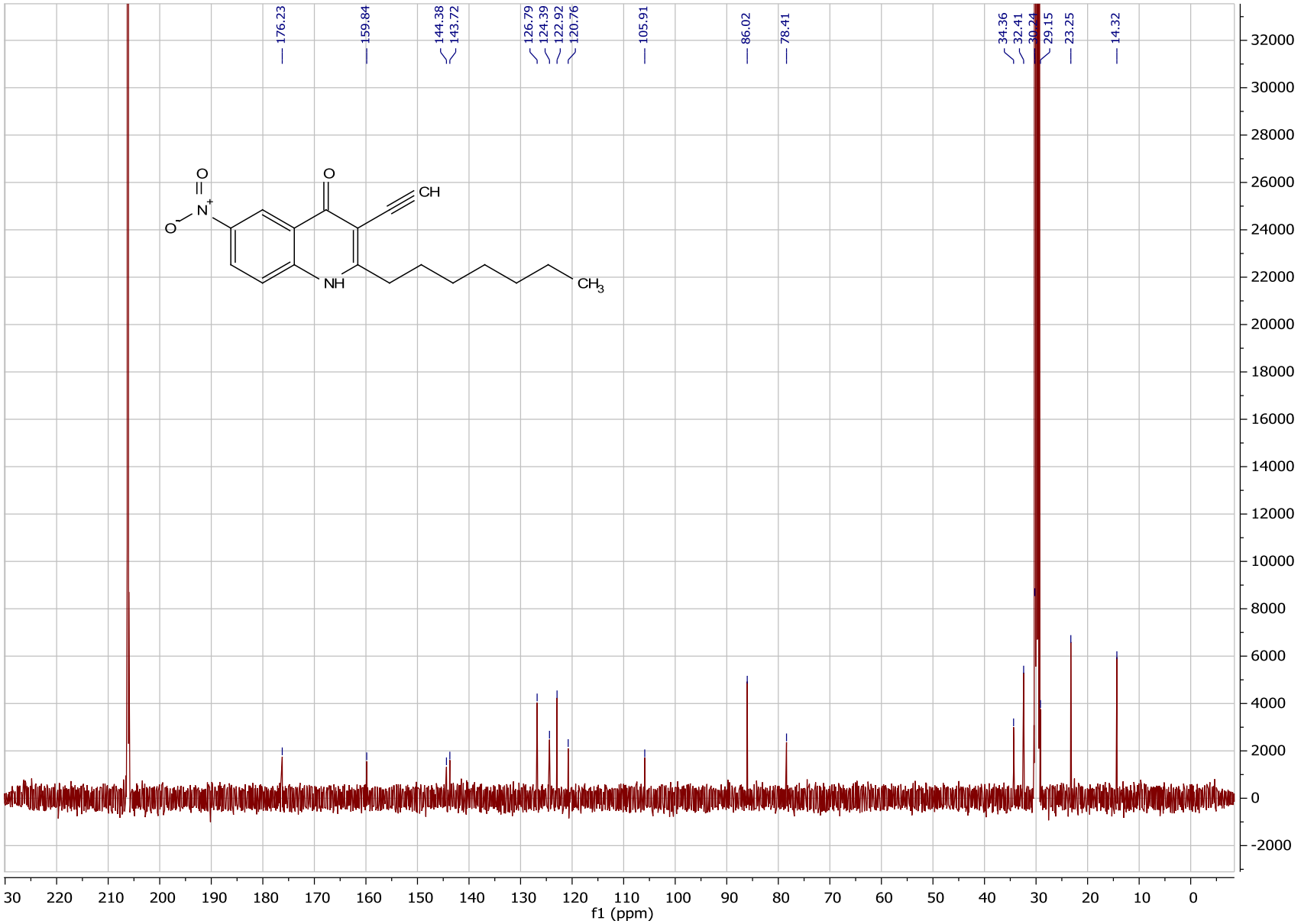

8.81 8.81 8.44 8.44 8.43 8.42 7.76 7.74 3.64 3.62 3.61 3.60 3.36 HDO 3.30 3.29 3.28 3.26 3.25 3.22 3.20 3.19 3.17 3.16 3.14 3.13 3.11 2.66 2.65 2.64 2.63 2.63 2.62 2.61 2.51 DMSO 2.50 DMSO 2.50 DMSO 2.50 DMSO 2.49 DMSO 2.48 2.47 2.46 2.46 2.45 2.45 2.44 1.72 1.71 1.70 1.62 1.35 1.34 1.33 1.33 1.32 1.31 1.29 1.29 1.28 1.28 1.27 1.27 1.27 1.26 1.25 1.25 1.24 1.24 1.23 1.23 1.22 1.14 1.13 1.12 1.12 1.04 1.03 1.01 0.86 0.85 0.85 0.84
CH3
CH3
N
O
O
N+
O-
O
O
NH
CH3
A (s) 12.22
C (dd) 8.43
B (d) 8.81
D (d) 7.75
F (m) 3.18
E (dq) 3.62
H (m) 2.45
G (ddd) 2.64
J (ddd) 1.61
I (m) 1.71
K (m) 1.32
O (m) 0.84
N (t) 1.03
L (m) 1.26
M (t) 1.13
0.99
0.81
0.96
0.99
1.25
3.10
1.07
0.91
1.07
1.07
2.66
5.92
3.47
3.08
3.13
4000
3500
3000
2500
2000
1500
1000
500
0
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -4
f1 (ppm)

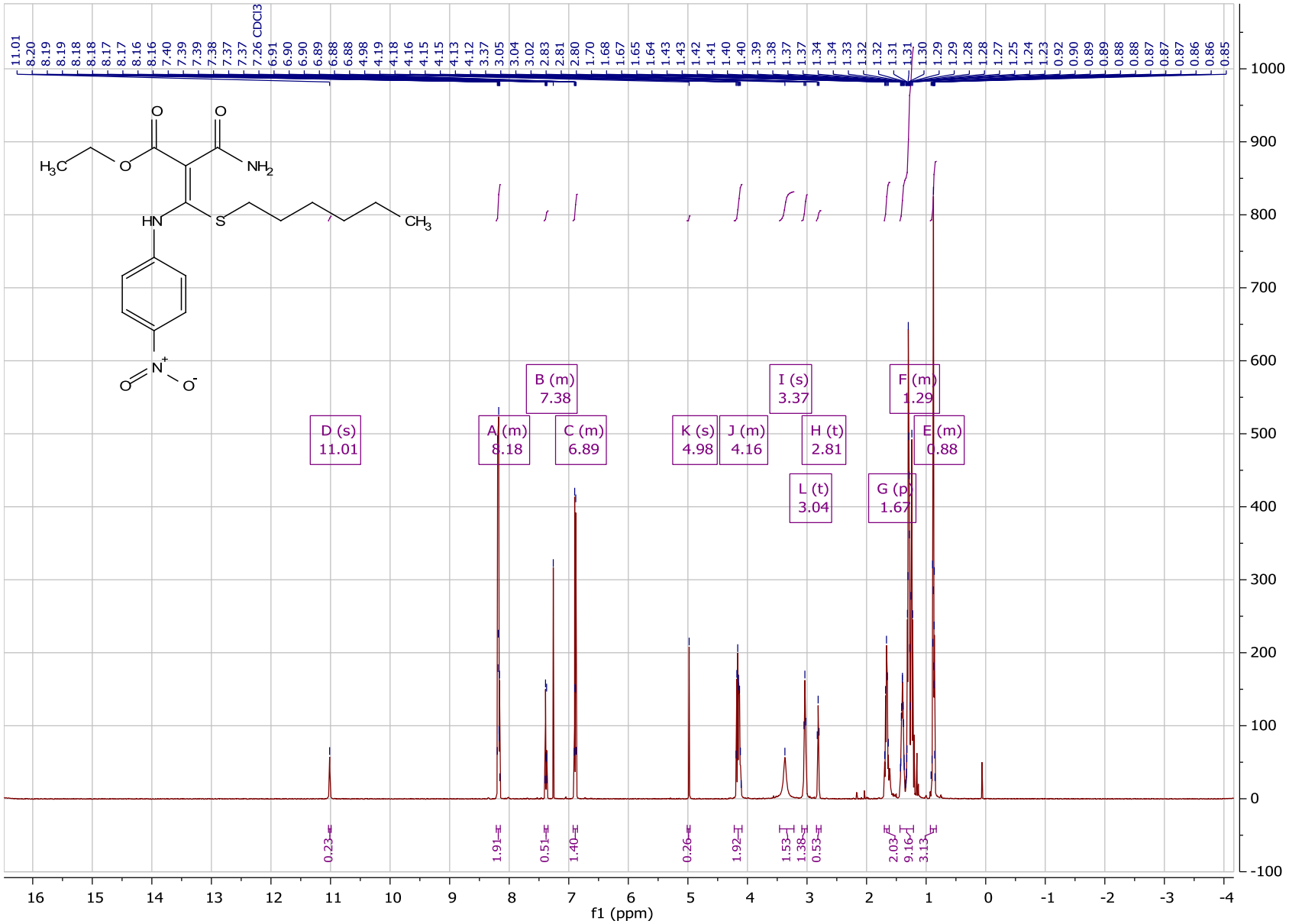

173.10
165.20
151.89
143.21
142.63
126.04
123.14
121.60
119.87
119.28
42.51
40.06
39.96
39.89
39.80
39.72
39.63
39.55
39.46
39.38
39.30
39.21
39.13
39.04
38.96
39.15
31.77
31.00
28.90
28.34
28.22
22.00
14.09
13.87
12.63
CH3
CH3
N
O
O
O
O
N+
O-
NH
CH3
40000
35000
30000
25000
20000
15000
10000
5000
0
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

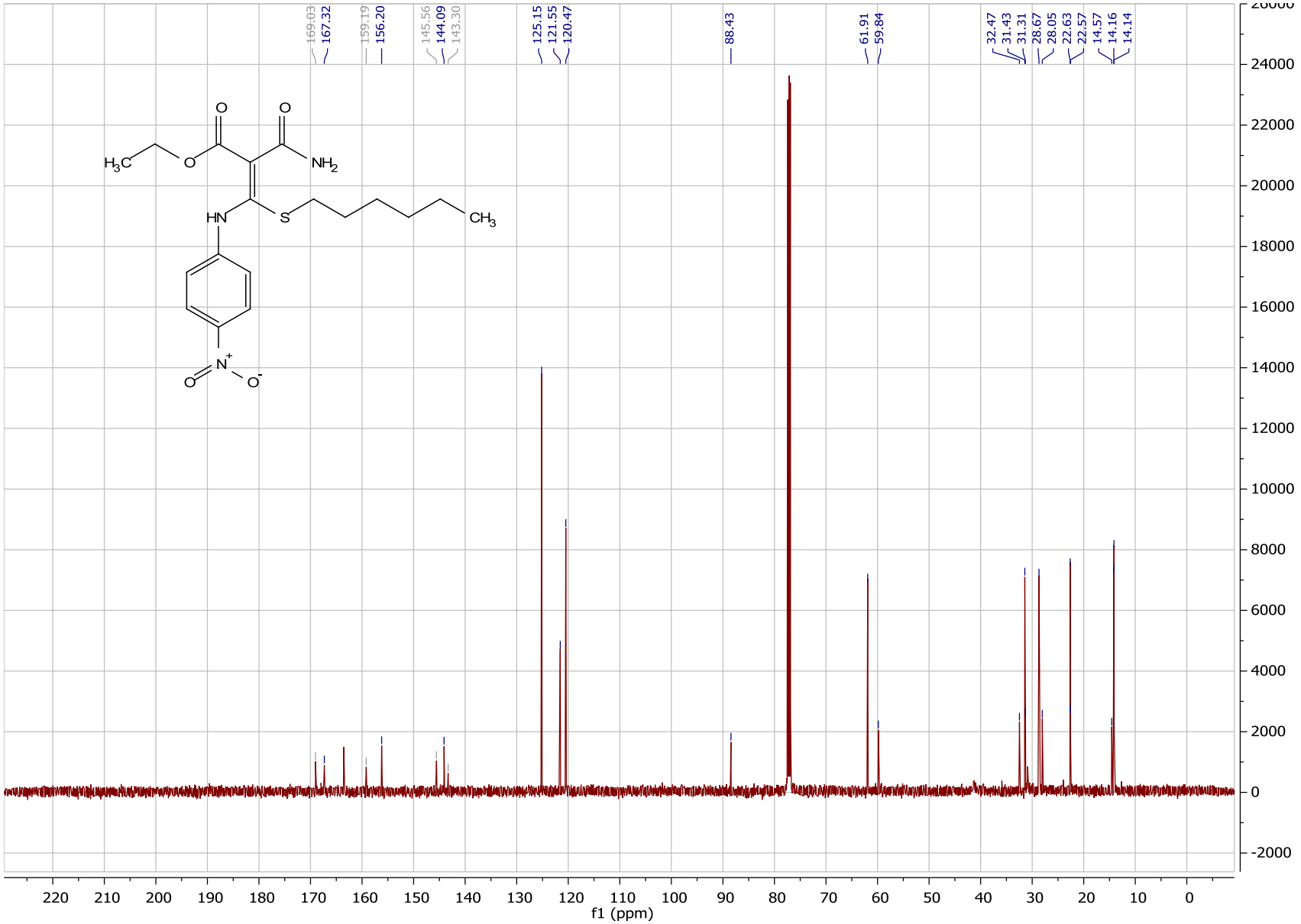

8.72 8.72 8.50 8.49 8.48 8.47 8.22 8.20 4.43 4.42 4.41 4.39 3.19 3.18 3.17 3.17 3.16 2.50 DMSO-d6 1.79 1.78 1.76 1.76 1.75 1.75 1.73 1.41 1.41 1.41 1.40 1.38 1.37 1.37 1.36 1.35 1.35 1.35 1.34 1.34 1.33 1.32 1.32 1.31 1.30 1.30 1.29 1.28 1.28 1.28 1.27 1.27 1.26 0.87 0.87 0.86 0.86 0.85 0.85 0.85 0.84 0.84 0.84 0.83 0.82
B (dd) 8.48
A (d) 8.72
C (d) 8.21
D (q) 4.41
E (m) 3.17
G (m) 1.33
H (p) 1.76
F (m) 0.86
1.00 1.10 1.05 2.26 2.25 2.30 11.45 3.49
f1 (ppm)

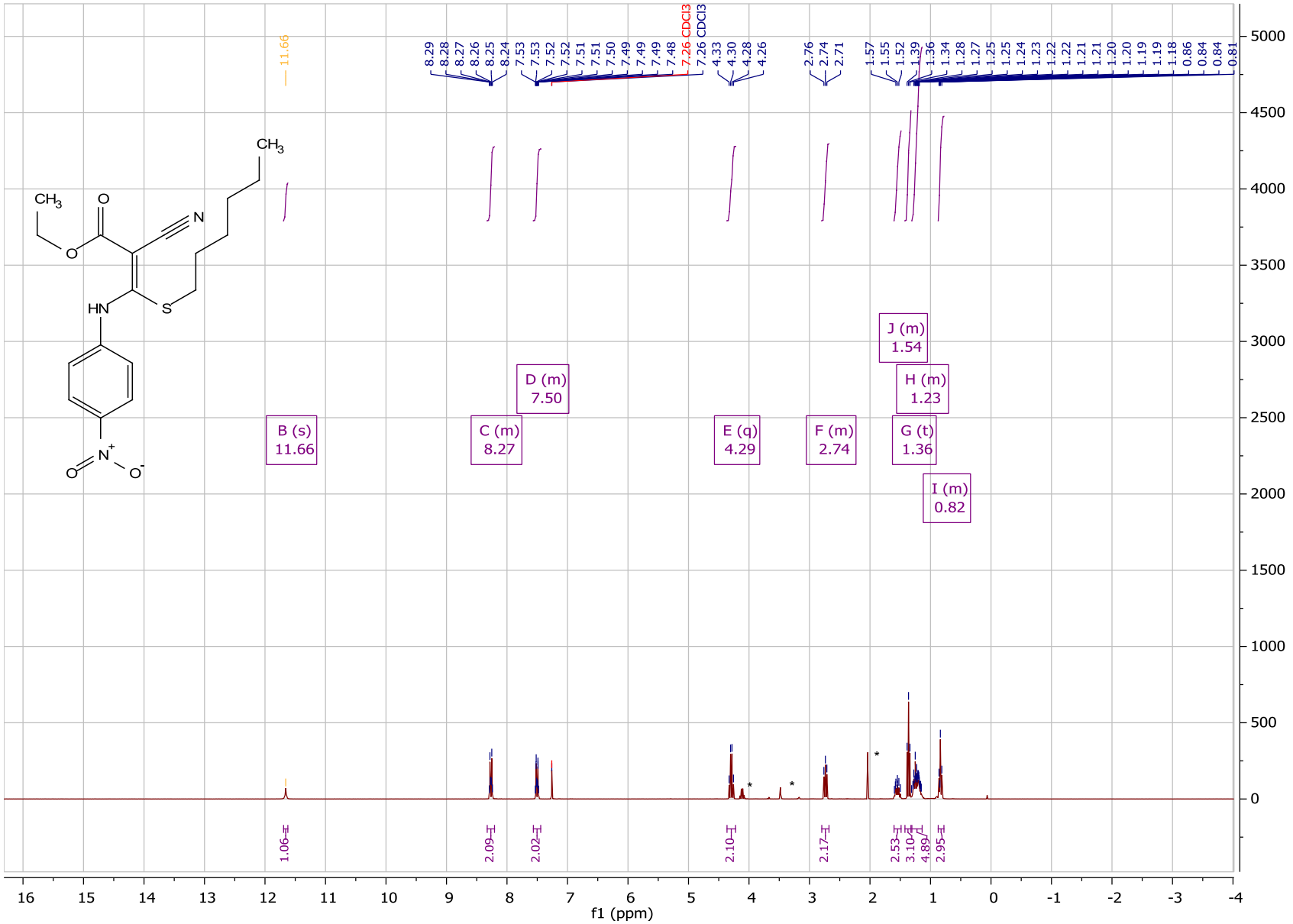

168.23
156.17
150.48
149.41
145.61
130.65
124.25
120.09
118.06
94.33
66.41
41.75
31.23
28.74
28.53
28.07
22.11
14.06
CH3
O
O
O
O
N+
O-
I
N
CH3
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

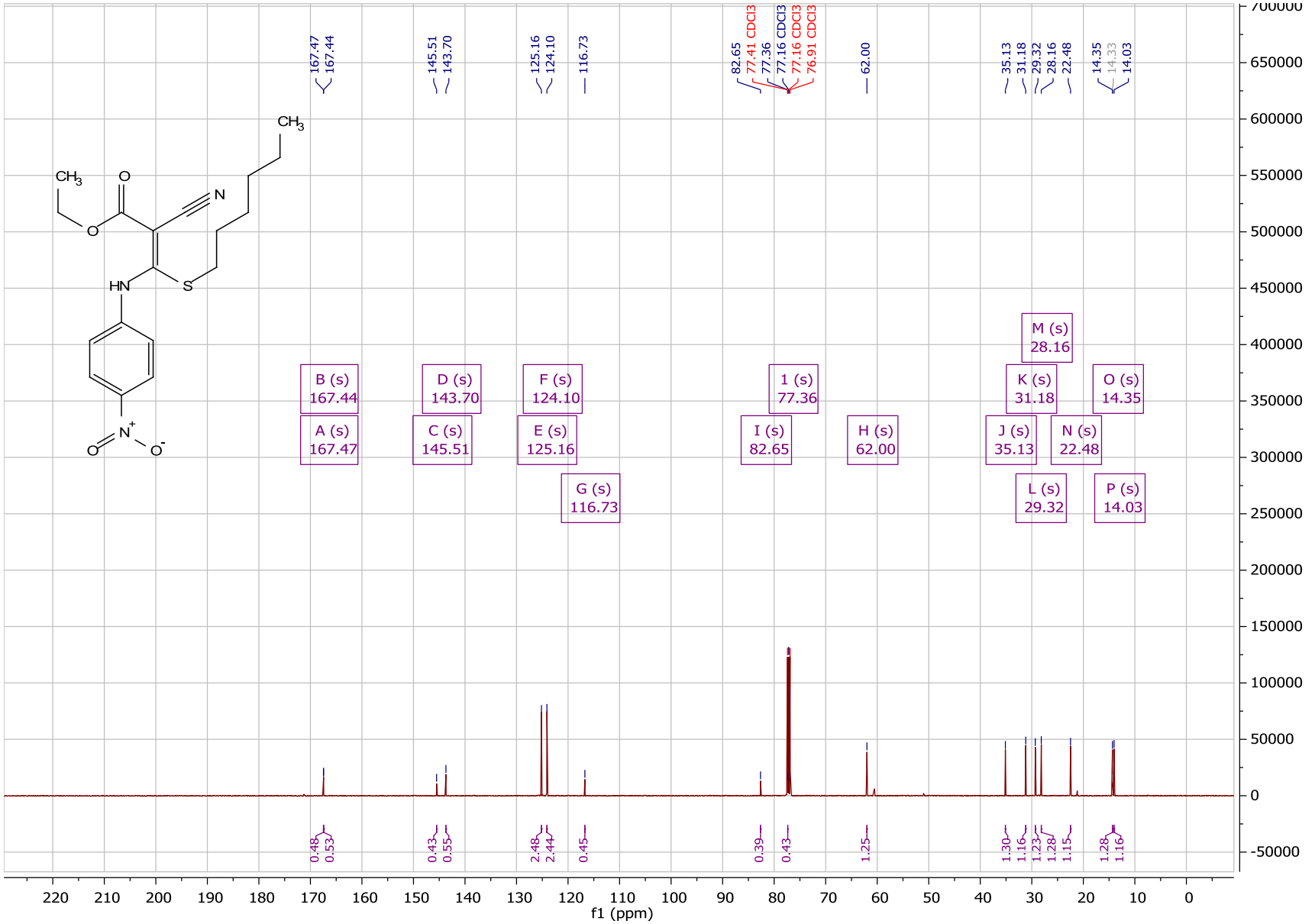

8.99 8.99 8.42 8.41 8.40 8.40 7.80 7.78 3.86 2.99 2.98 2.96 2.86 HDO 2.06 Acetone 2.05 Acetone 2.05 Acetone 2.05 Acetone 2.04 Acetone 1.85 1.84 1.84 1.82 1.45 1.45 1.44 1.42 1.41 1.37 1.35 1.35 1.35 1.34 1.34 1.32 1.32 1.31 1.31 1.30 1.29 1.29 1.29 1.28 1.28 1.28 1.27 1.27 1.26 1.26 0.87 0.87 0.86 0.86 0.85 0.85
O
O
N+
O-
O
CH
NH
CH3
A (d) 8.99
B (dd) 8.41
C (d) 7.79
D (s) 3.86
J (m) 2.97
E (m) 1.83
F (d) 0.85
G (m) 1.43
H (m) 1.36
I (tq) 1.28
1.02
1.05
0.99
0.95
2.44
2.32
2.46
2.49
6.01
3.35
90000
85000
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -4
f1 (ppm)

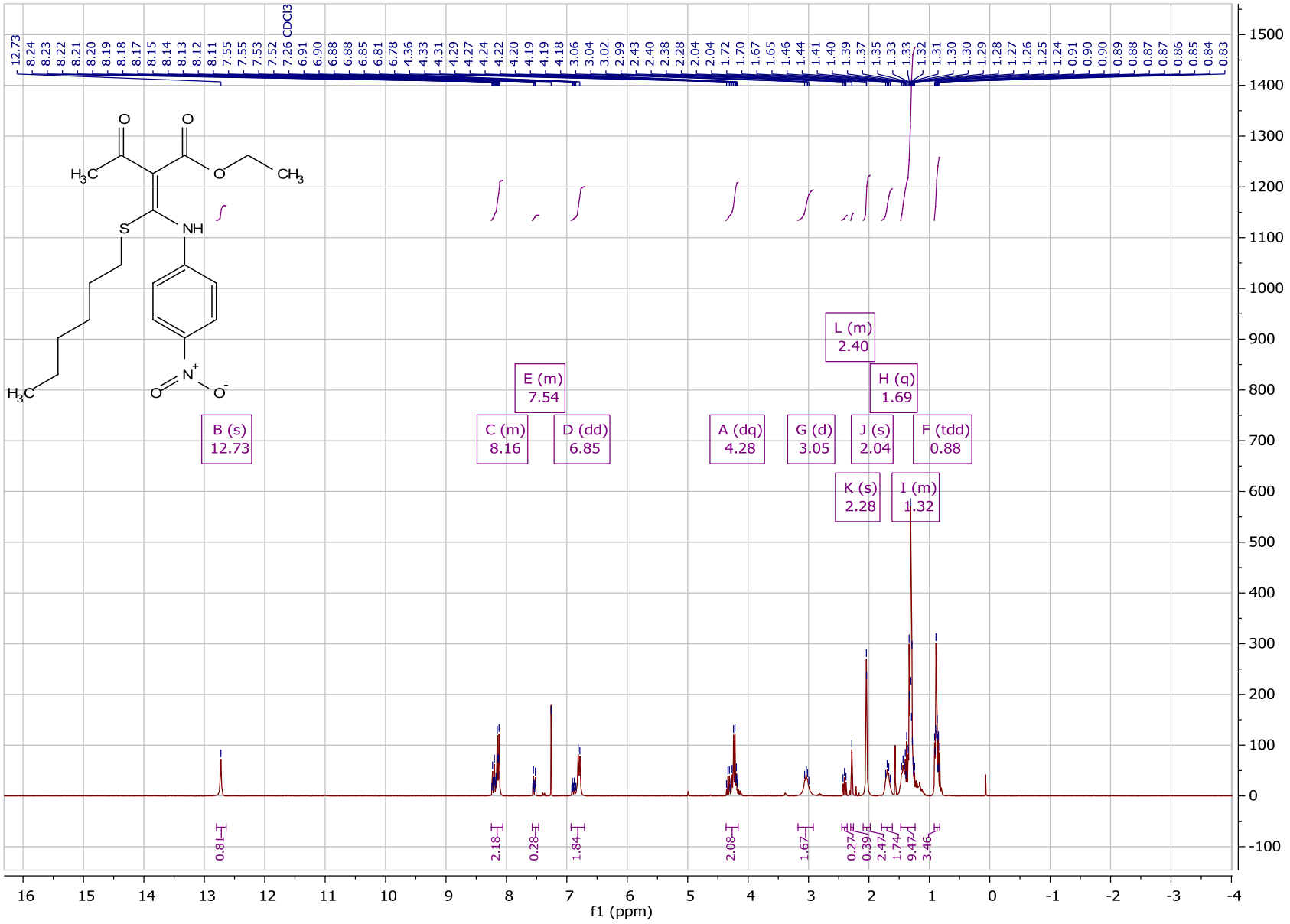

176.23
159.84
144.38
143.72
126.79
124.39
122.92
120.76
105.91
86.02
78.41
34.36
32.41
30.24
29.15
23.25
14.32
O
O
N+
O-
CH
NH
CH3
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
30
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

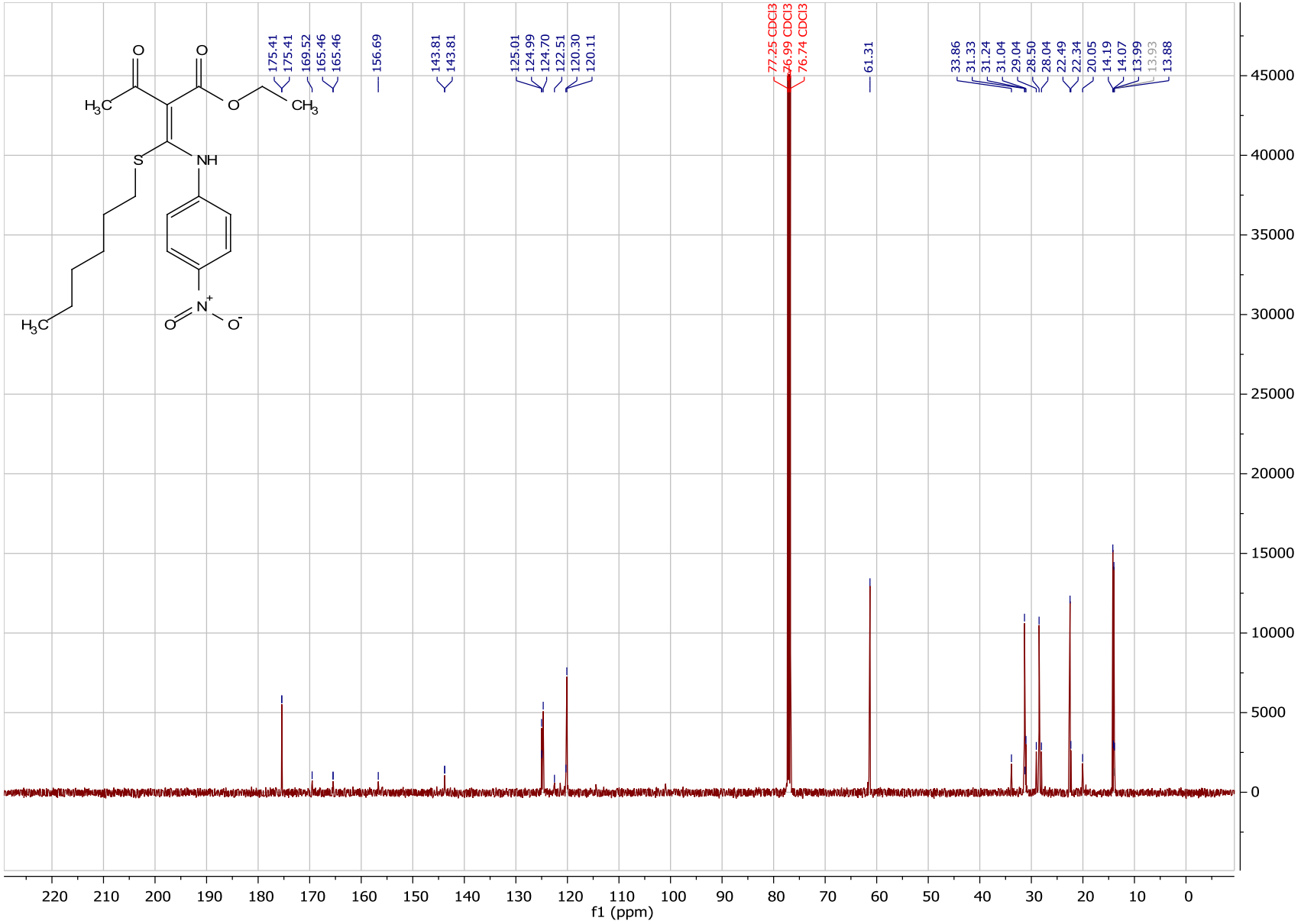

D (s) 11.01
A (m) 8.18
B (m) 7.38
C (m) 6.89
K (s) 4.98
J (m) 4.16
I (s) 3.37
H (t) 2.81
L (t) 3.04
F (m) 1.29
G (p) 1.67
E (m) 0.88
f1 (ppm)

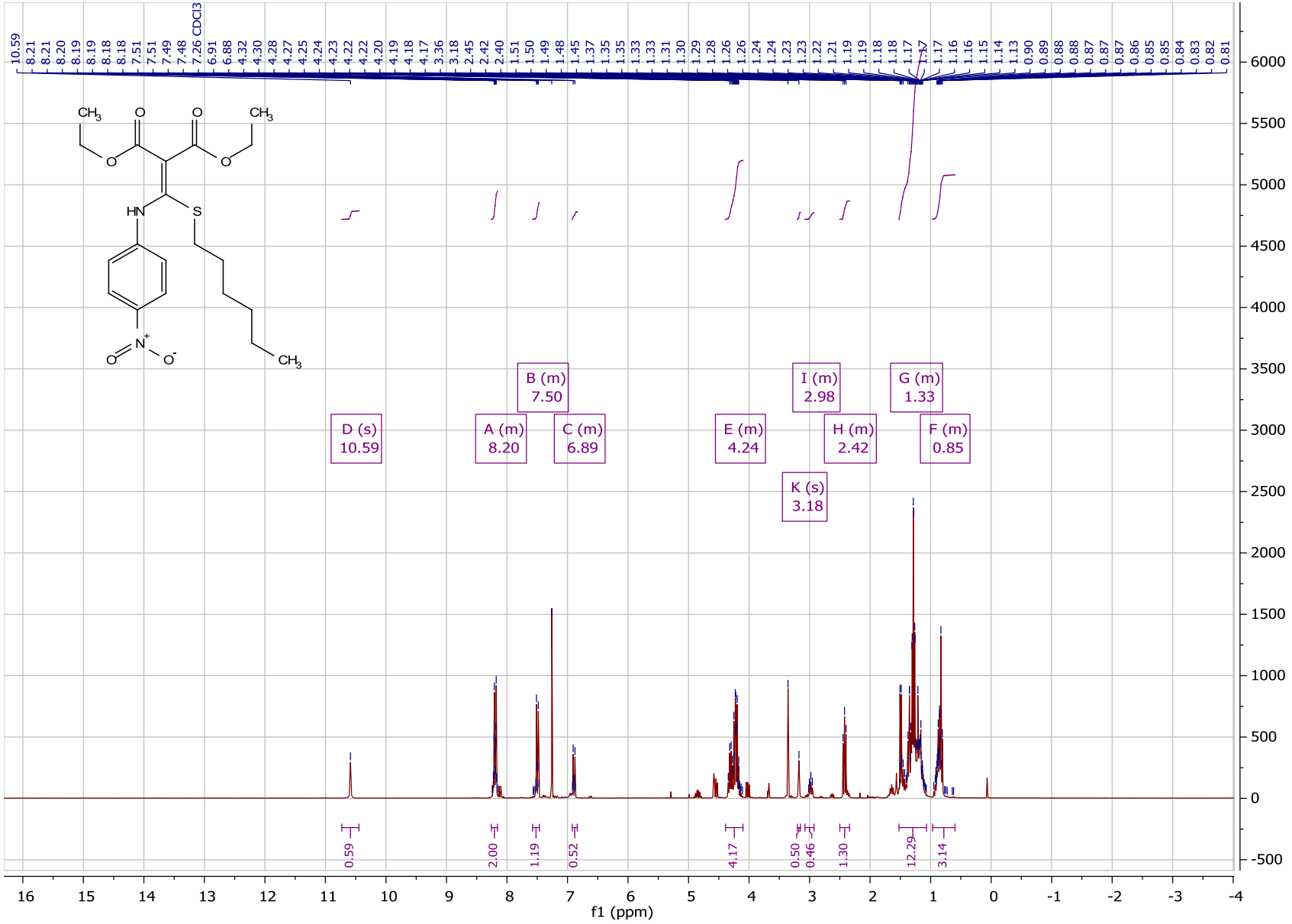

169.03
167.32
159.19
156.20
145.56
144.09
143.30
125.15
121.55
120.47
88.43
61.91
59.84
32.47
31.43
31.31
28.67
28.05
22.63
22.57
14.57
14.16
14.14
O
O
H3C
O
NH2
HN
S
CH3
N+
O
O-
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-2000
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

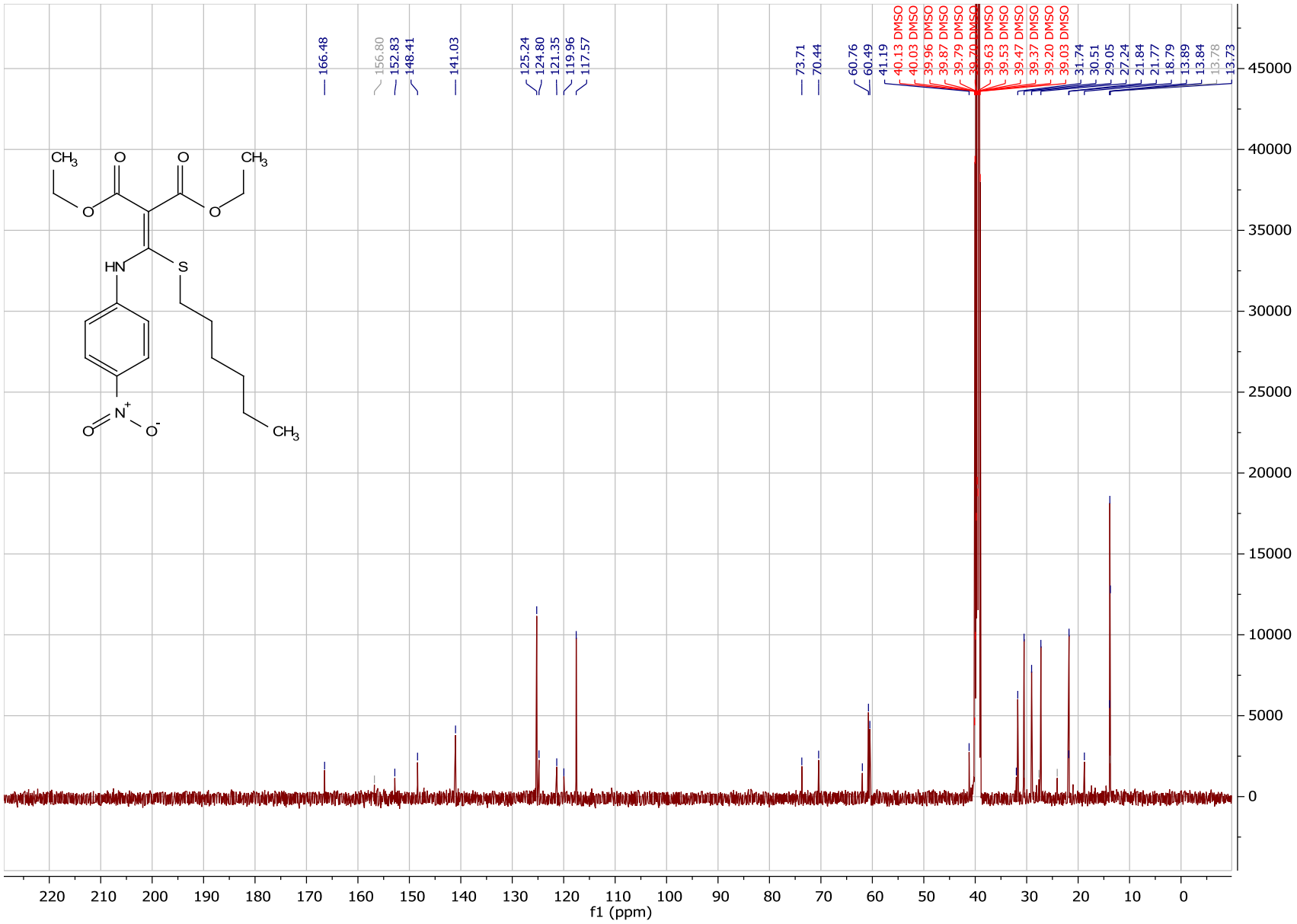

11.66
8.29
8.28
8.27
8.26
8.25
8.24
7.53
7.53
7.52
7.52
7.51
7.51
7.50
7.49
7.49
7.49
7.48
7.26 CDCl3
7.26 CDCl3
4.33
4.30
4.28
4.26
2.76
2.74
2.71
1.57
1.55
1.52
1.39
1.36
1.34
1.28
1.27
1.25
1.25
1.24
1.23
1.22
1.22
1.21
1.21
1.20
1.20
1.19
1.19
1.18
0.86
0.84
0.84
0.81
B (s)
11.66
C (m)
8.27
D (m)
7.50
E (q)
4.29
F (m)
2.74
G (t)
1.36
H (m)
1.23
I (m)
0.82
J (m)
1.54
1.06
2.09
2.02
2.10
2.17
2.53
3.10
4.89
2.95
f1 (ppm)


167.47
167.44
145.51
143.70
125.16
124.10
116.73
82.65
77.41 CDCl3
77.36
77.16 CDCl3
77.16 CDCl3
76.91 CDCl3
62.00
35.13
31.18
29.32
28.16
22.48
14.35
14.33
14.03
B (s) 167.44
A (s) 167.47
D (s) 143.70
C (s) 145.51
F (s) 124.10
E (s) 125.16
G (s) 116.73
1 (s) 77.36
I (s) 82.65
H (s) 62.00
M (s) 28.16
K (s) 31.18
J (s) 35.13
N (s) 22.48
L (s) 29.32
O (s) 14.35
P (s) 14.03
0.48
0.53
0.43
0.55
2.48
2.44
0.45
0.39
0.43
1.25
1.30
1.16
1.23
1.28
1.15
1.28
1.16
f1 (ppm)


B (s)
12.73
C (m)
8.16
E (m)
7.54
D (dd)
6.85
A (dq)
4.28
G (d)
3.05
J (s)
2.04
L (m)
2.40
H (q)
1.69
F (tdd)
0.88
K (s)
2.28
I (m)
1.32
f1 (ppm)


175.41
175.41
169.52
165.46
165.46
156.69
143.81
143.81
125.01
124.99
124.70
122.51
120.30
120.11
77.25 CDCl3
76.99 CDCl3
76.74 CDCl3
61.31
33.86
31.33
31.24
31.04
29.04
28.50
28.04
22.49
22.34
20.05
14.19
14.07
13.99
13.93
13.88
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


10.59 8.21 8.21 8.20 8.19 8.19 8.18 8.18 7.51 7.51 7.49 7.48 7.26 CDCl3 6.91 6.88 4.32 4.30 4.28 4.27 4.25 4.24 4.23 4.22 4.22 4.20 4.19 4.18 4.17 3.36 3.18 2.45 2.42 2.40 1.51 1.50 1.49 1.48 1.45 1.37 1.35 1.35 1.33 1.33 1.31 1.30 1.29 1.28 1.26 1.26 1.24 1.24 1.23 1.23 1.22 1.21 1.19 1.19 1.18 1.18 1.17 1.17 1.17 1.16 1.16 1.15 1.14 1.13 0.90 0.89 0.88 0.88 0.87 0.87 0.87 0.86 0.85 0.85 0.84 0.83 0.82 0.81
CH3 O O CH3
O O
HN S
O N+ O-
CH3
D (s) 10.59
A (m) 8.20
B (m) 7.50
C (m) 6.89
E (m) 4.24
K (s) 3.18
I (m) 2.98
H (m) 2.42
G (m) 1.33
F (m) 0.85
0.59 2.00 1.19 0.52 4.17 0.50 0.46 1.30 12.29 3.14
6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0 -500
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -4
f1 (ppm)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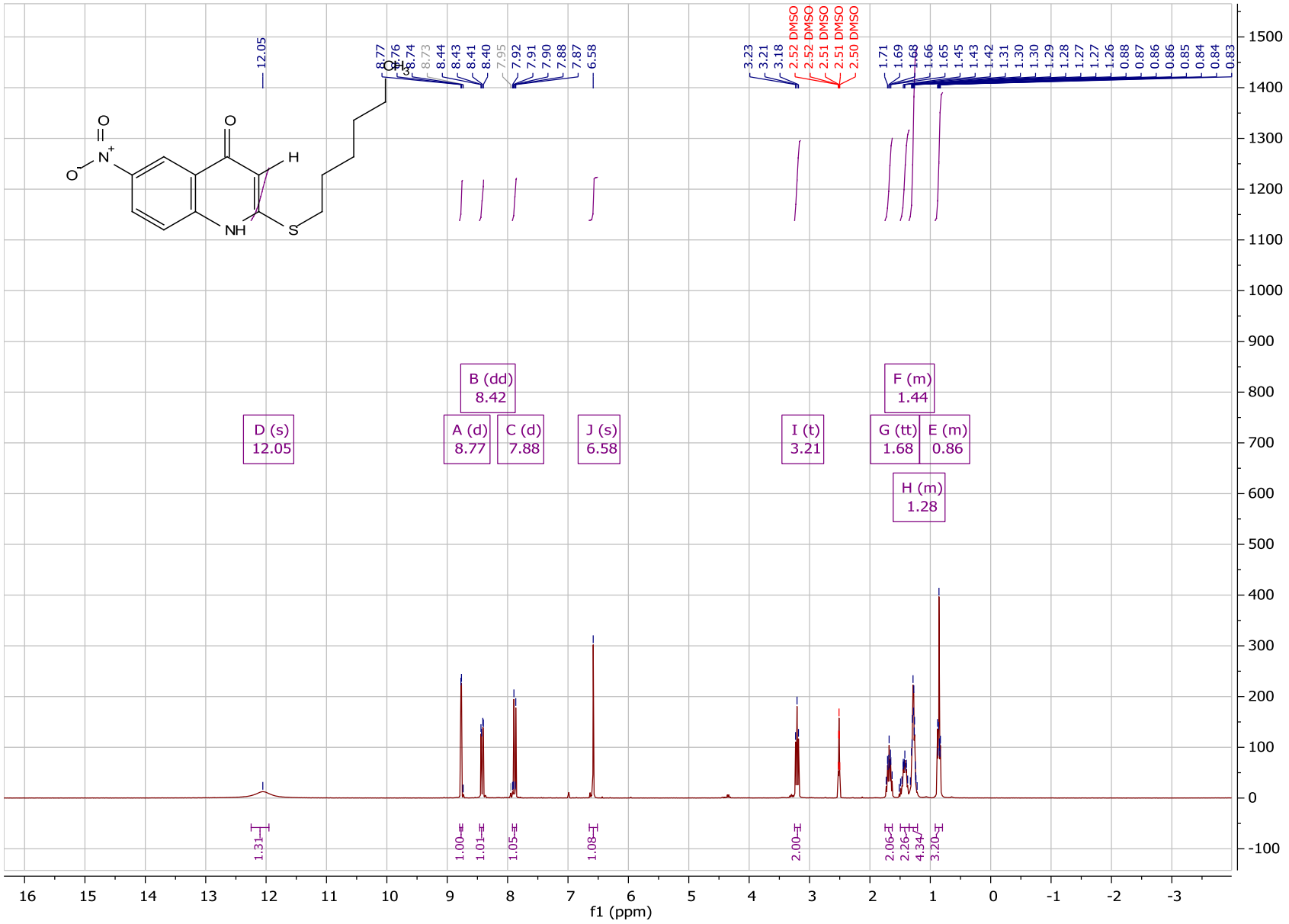
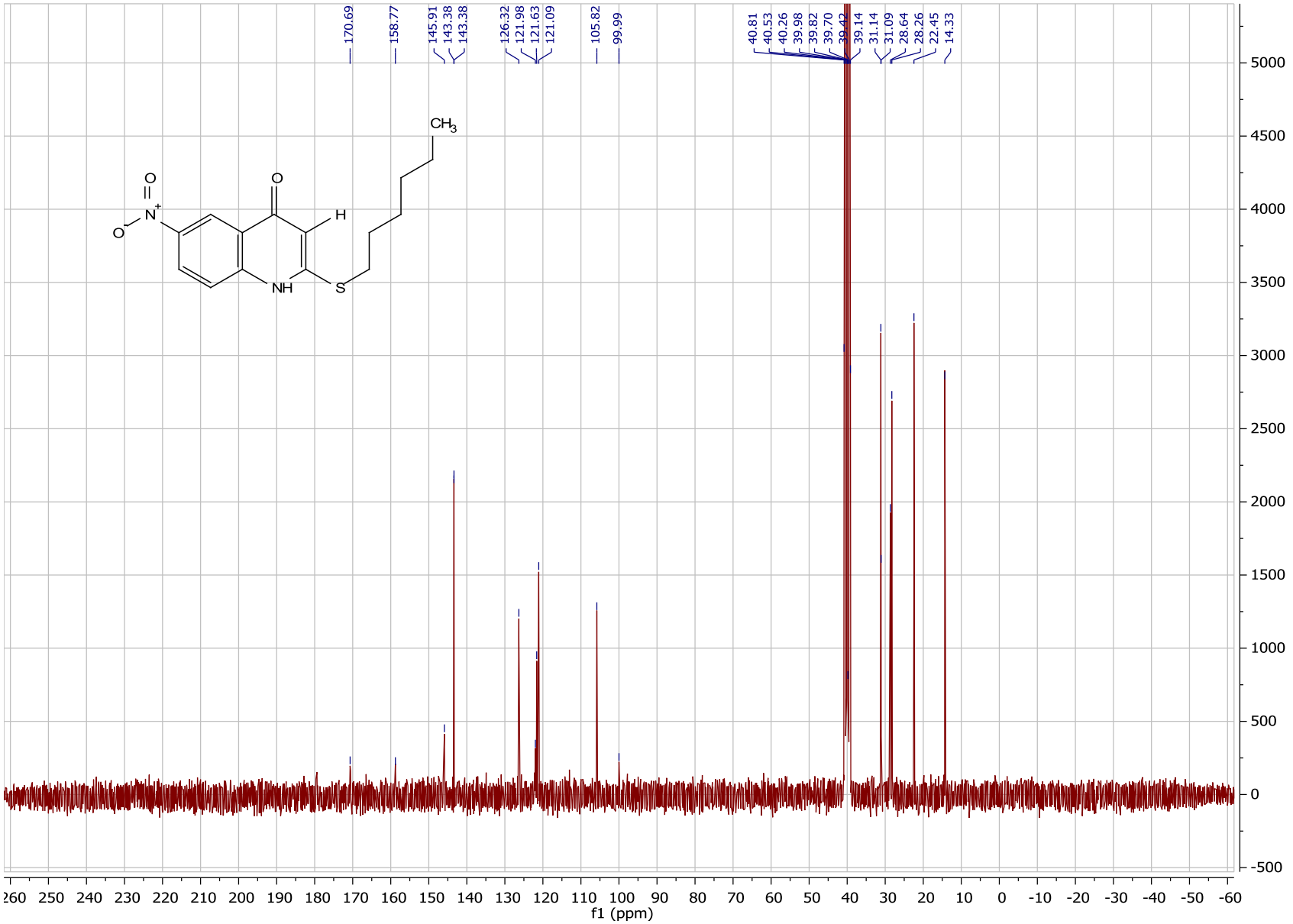
156.80
152.83
148.41
141.03
125.24
124.80
121.35
119.96
117.57
73.71
70.44
60.76
60.49
41.19
40.13 DMSO
40.03 DMSO
39.96 DMSO
39.87 DMSO
39.79 DMSO
39.70 DMSO
39.63 DMSO
39.53 DMSO
39.47 DMSO
39.37 DMSO
39.20 DMSO
39.03 DMSO
31.74
30.51
29.05
27.24
21.84
21.77
18.79
13.89
13.84
13.78
13.73
CH3
O
O
O
CH3
HN
S
N+
O
O-
CH3
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


12.05
8.77
8.76
8.74
8.73
8.44
8.43
8.41
8.40
7.95
7.92
7.91
7.90
7.88
7.87
6.58
3.23
3.21
3.18
2.52 DMSO
2.52 DMSO
2.51 DMSO
2.51 DMSO
2.50 DMSO
1.71
1.69
1.68
1.66
1.65
1.45
1.43
1.42
1.31
1.30
1.30
1.29
1.28
1.27
1.27
1.26
0.88
0.87
0.86
0.86
0.85
0.84
0.84
0.83
B (dd)
8.42
F (m)
1.44
D (s)
12.05
A (d)
8.77
C (d)
7.88
J (s)
6.58
I (t)
3.21
G (tt)
1.68
E (m)
0.86
H (m)
1.28
1.31
1.00
1.01
1.05
1.08
2.00
2.06
2.26
4.34
3.20
f1 (ppm)


170.69
158.77
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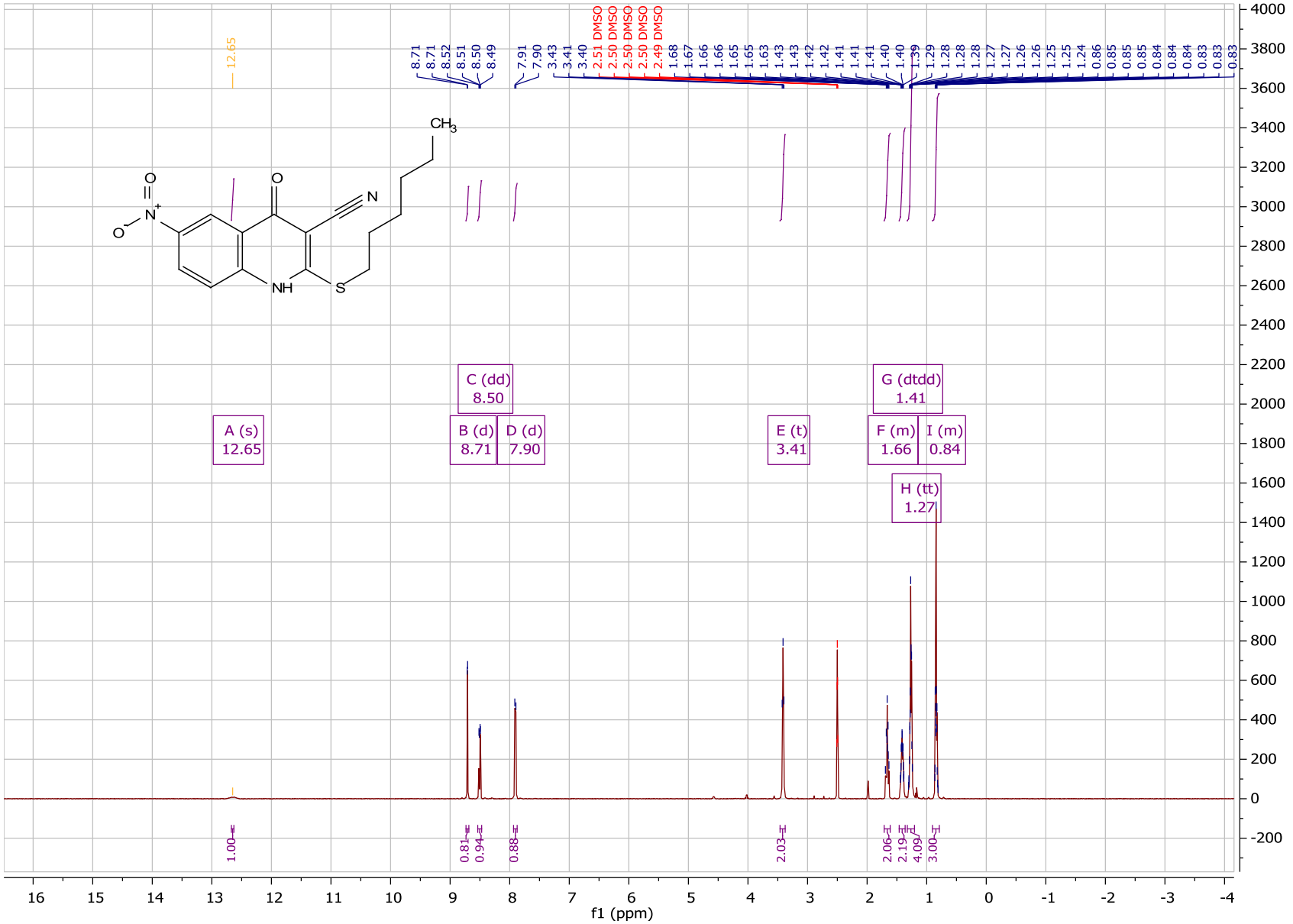
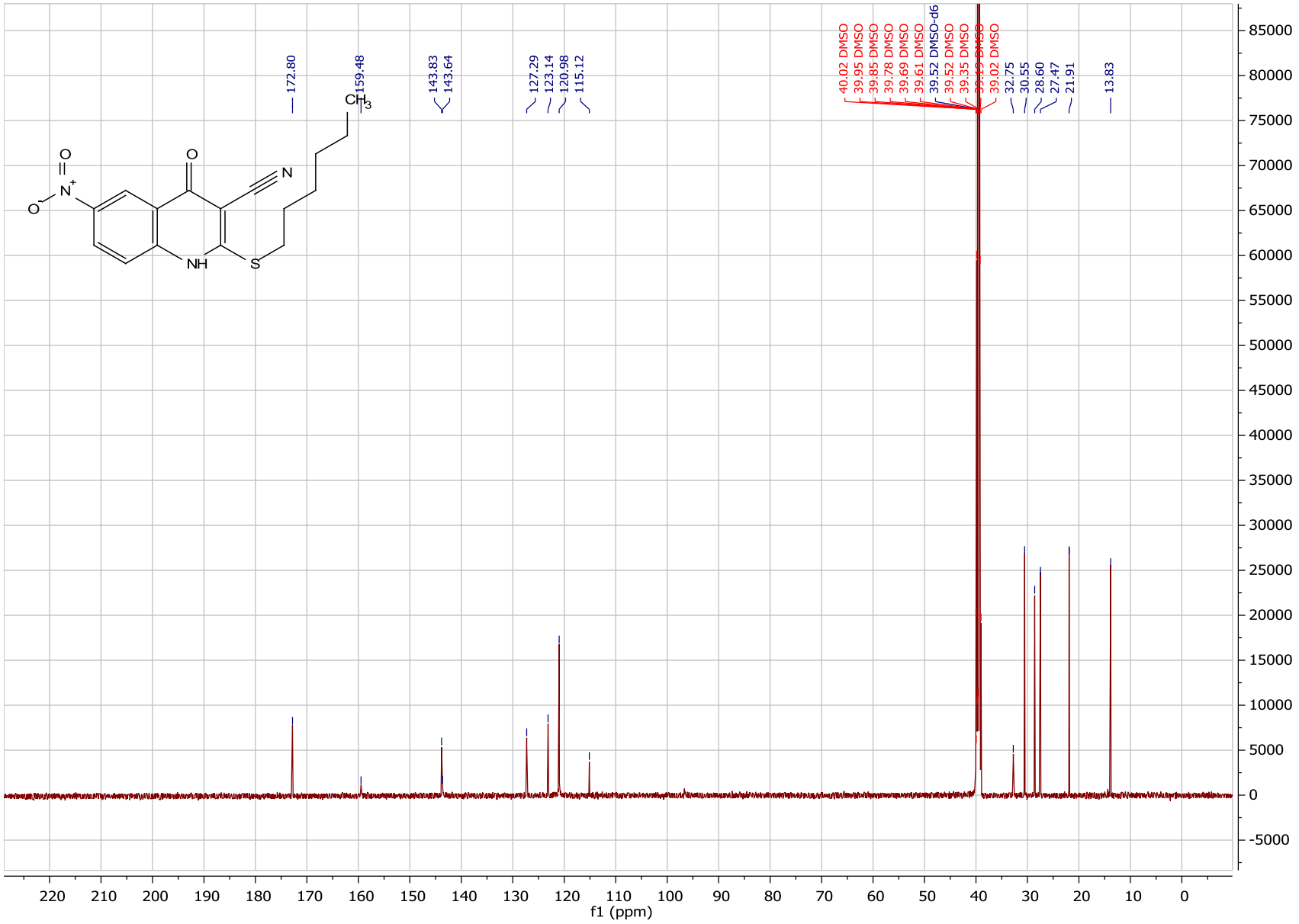
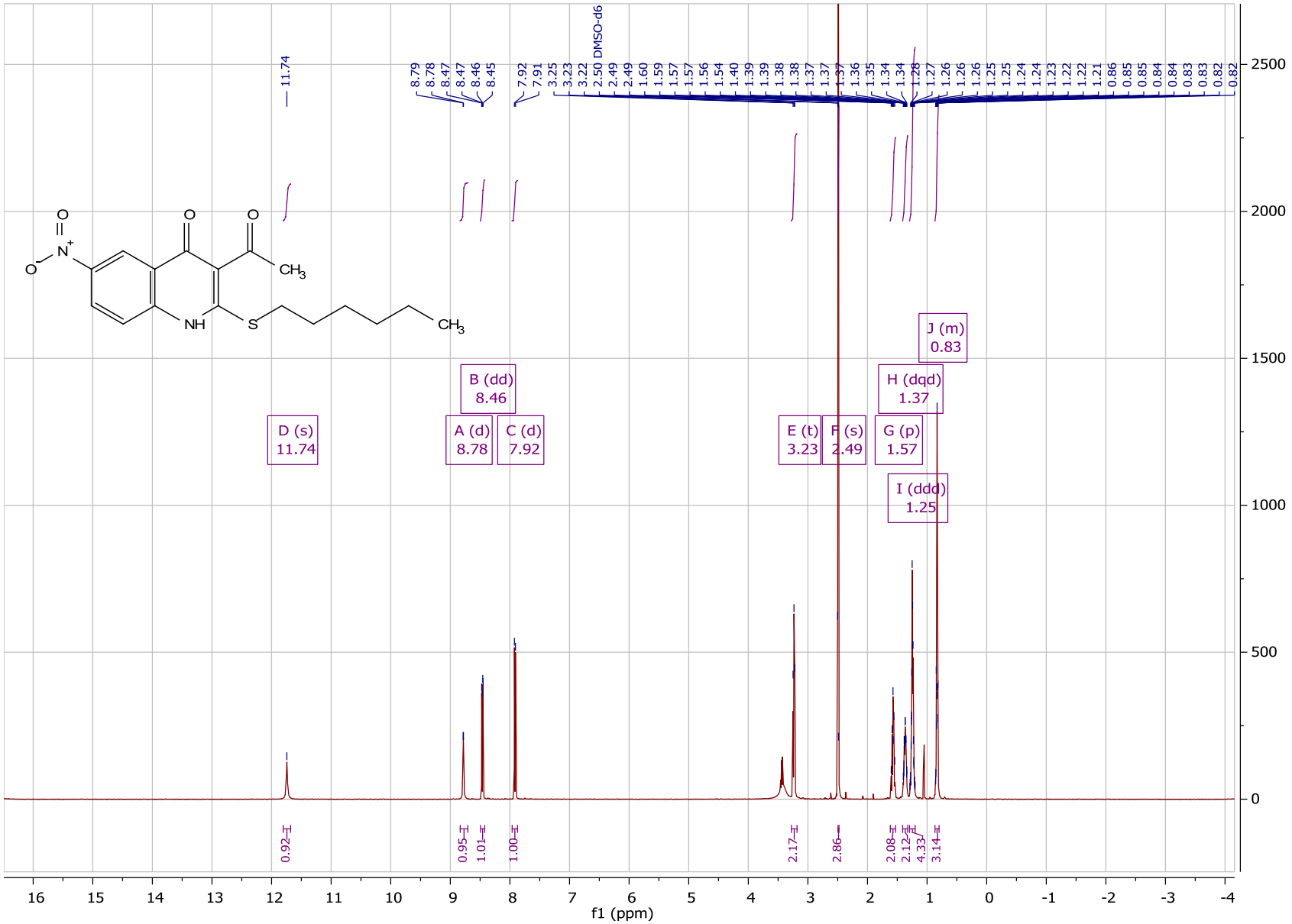
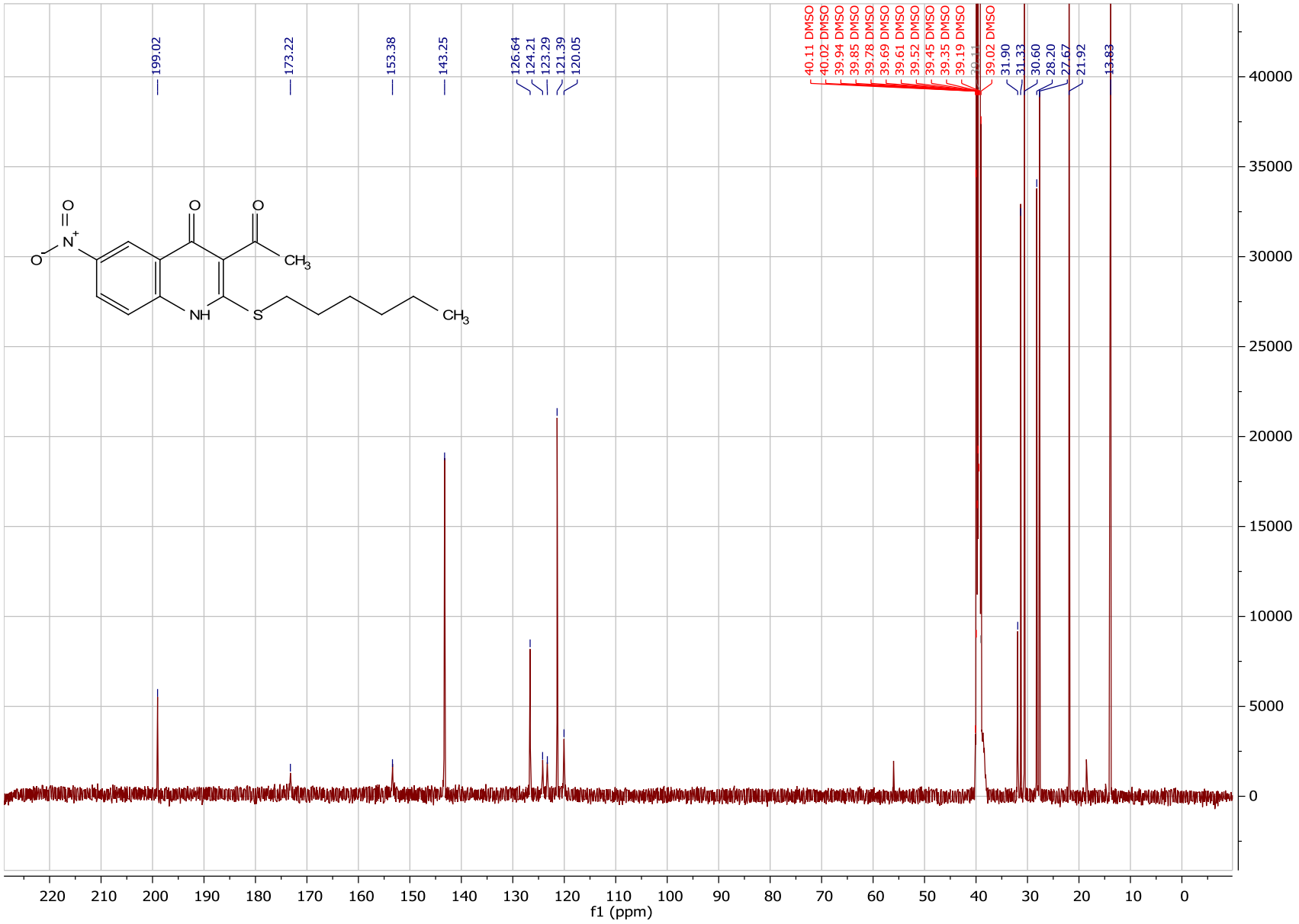
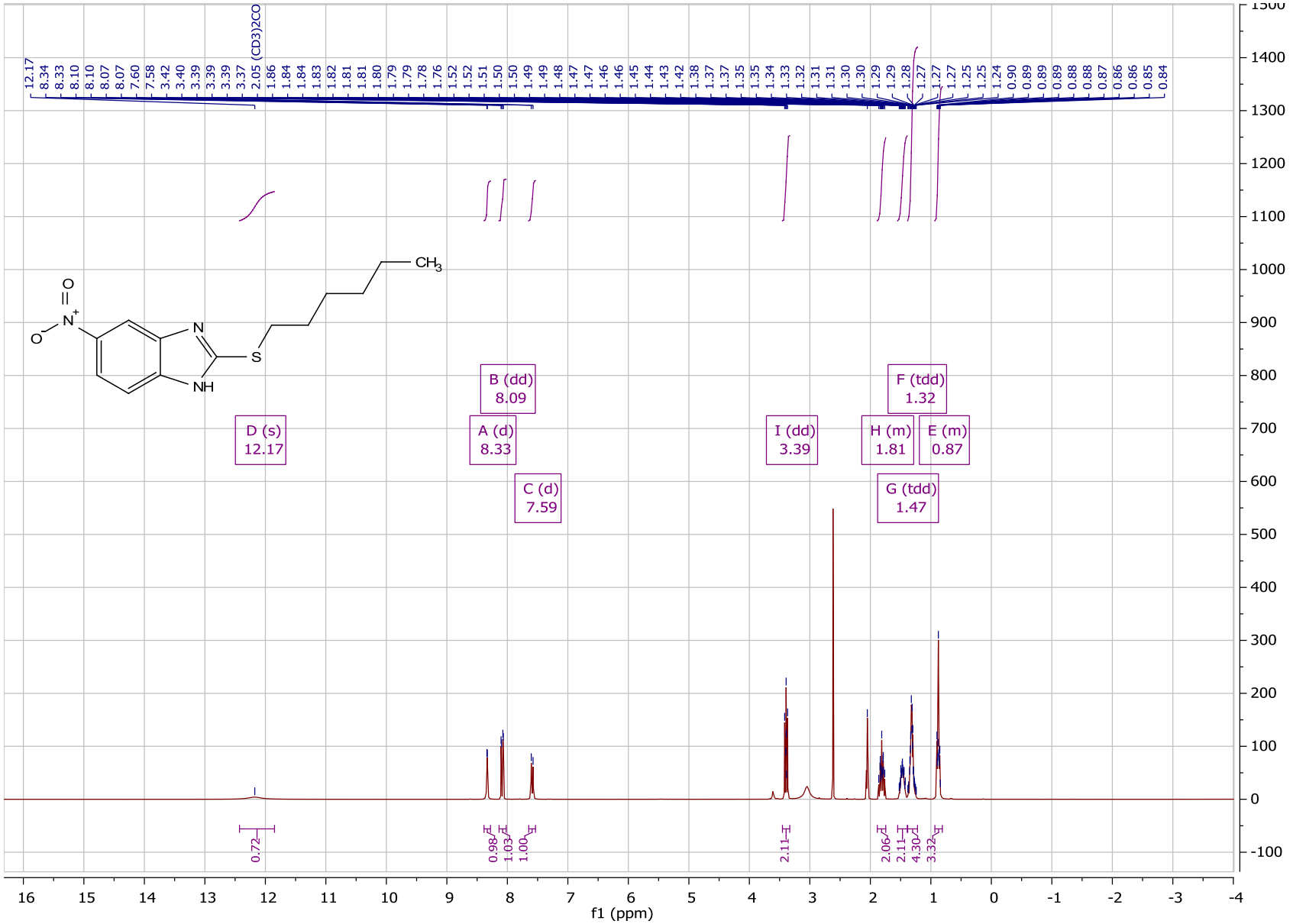
143.38
143.38
126.32
121.98
121.63
121.09
105.82
99.99
40.81
40.53
40.26
39.98
39.82
39.70
39.42
39.14
31.14
31.09
28.64
28.26
22.45
14.33
CH3
O
O
N+
O-
H
NH
S
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
-500
260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60
f1 (ppm)

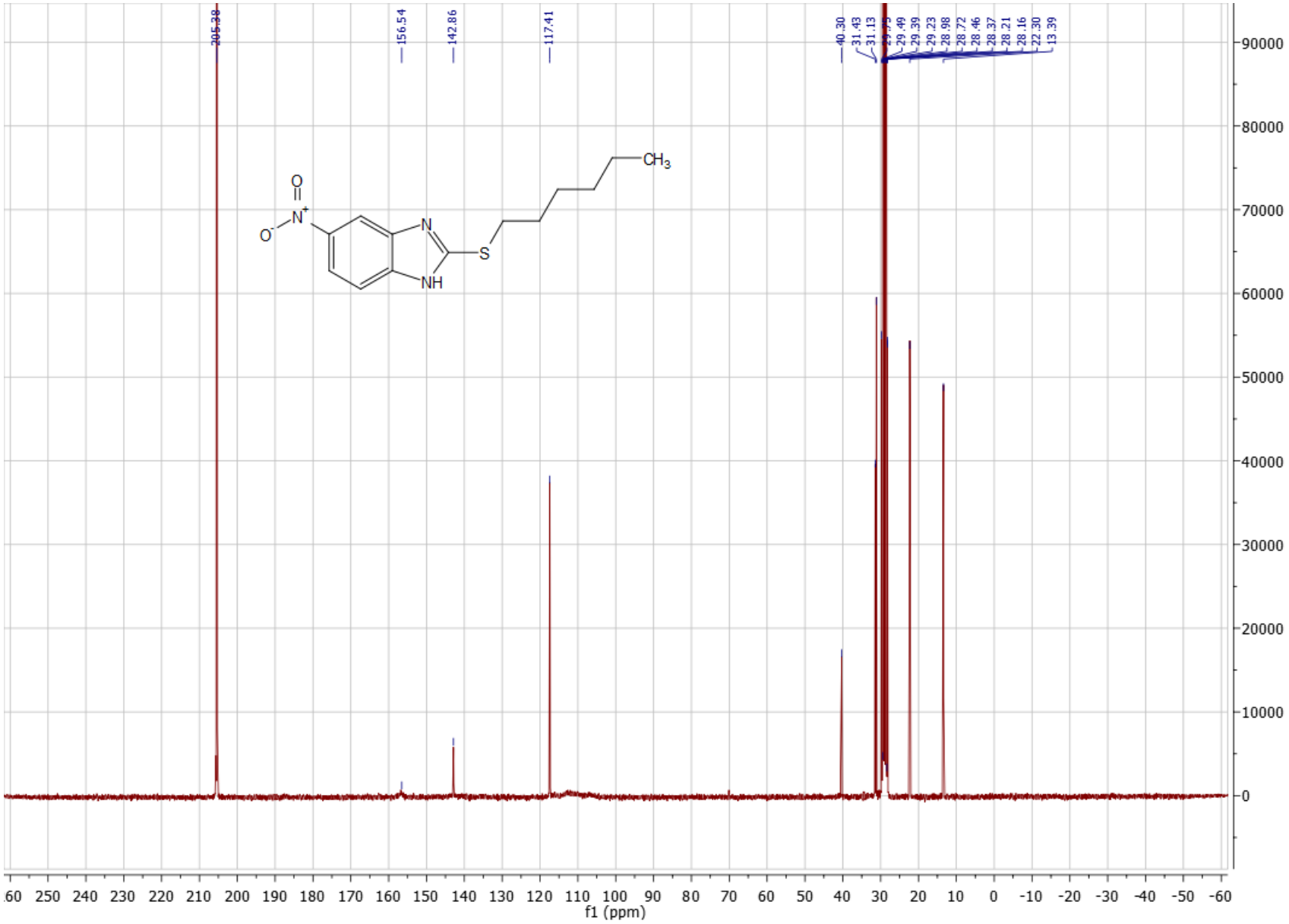

12.65
8.71
8.71
8.52
8.51
8.50
8.49
7.91
7.90
3.43
3.41
3.40
2.51 DMSO
2.50 DMSO
2.50 DMSO
2.50 DMSO
2.49 DMSO
1.68
1.67
1.66
1.66
1.65
1.65
1.63
1.43
1.43
1.42
1.42
1.41
1.41
1.41
1.41
1.40
1.40
1.39
1.29
1.28
1.28
1.28
1.27
1.27
1.26
1.26
1.25
1.25
1.24
0.86
0.85
0.85
0.85
0.84
0.84
0.84
0.83
0.83
0.83
CH3
O
N
O
N+
O-
O
N
NH
S
A (s)
12.65
C (dd)
8.50
B (d)
8.71
D (d)
7.90
E (t)
3.41
G (dtdd)
1.41
F (m)
1.66
I (m)
0.84
H (tt)
1.27
1.00
0.81
0.94
0.88
2.03
2.06
2.19
4.09
3.00
f1 (ppm)

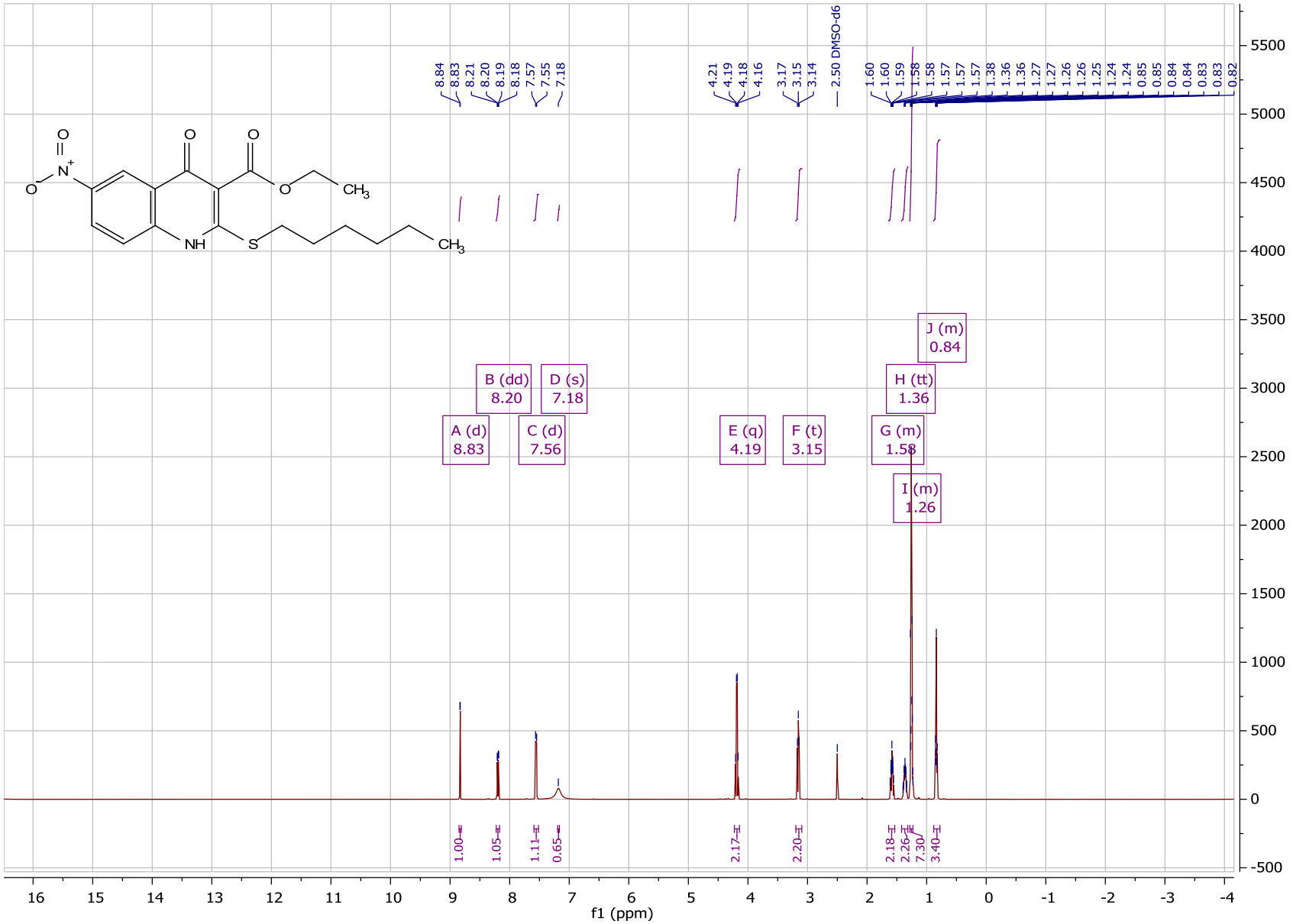

172.80
159.48
143.83
143.64
127.29
123.14
120.98
115.12
40.02 DMSO
39.95 DMSO
39.85 DMSO
39.78 DMSO
39.69 DMSO
39.61 DMSO
39.52 DMSO-d6
39.52 DMSO
39.35 DMSO
39.19 DMSO
39.02 DMSO
32.75
30.55
28.60
27.47
21.91
13.83
O
O
N+
O-
N
NH
S
CH3
85000
80000
75000
70000
65000
60000
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

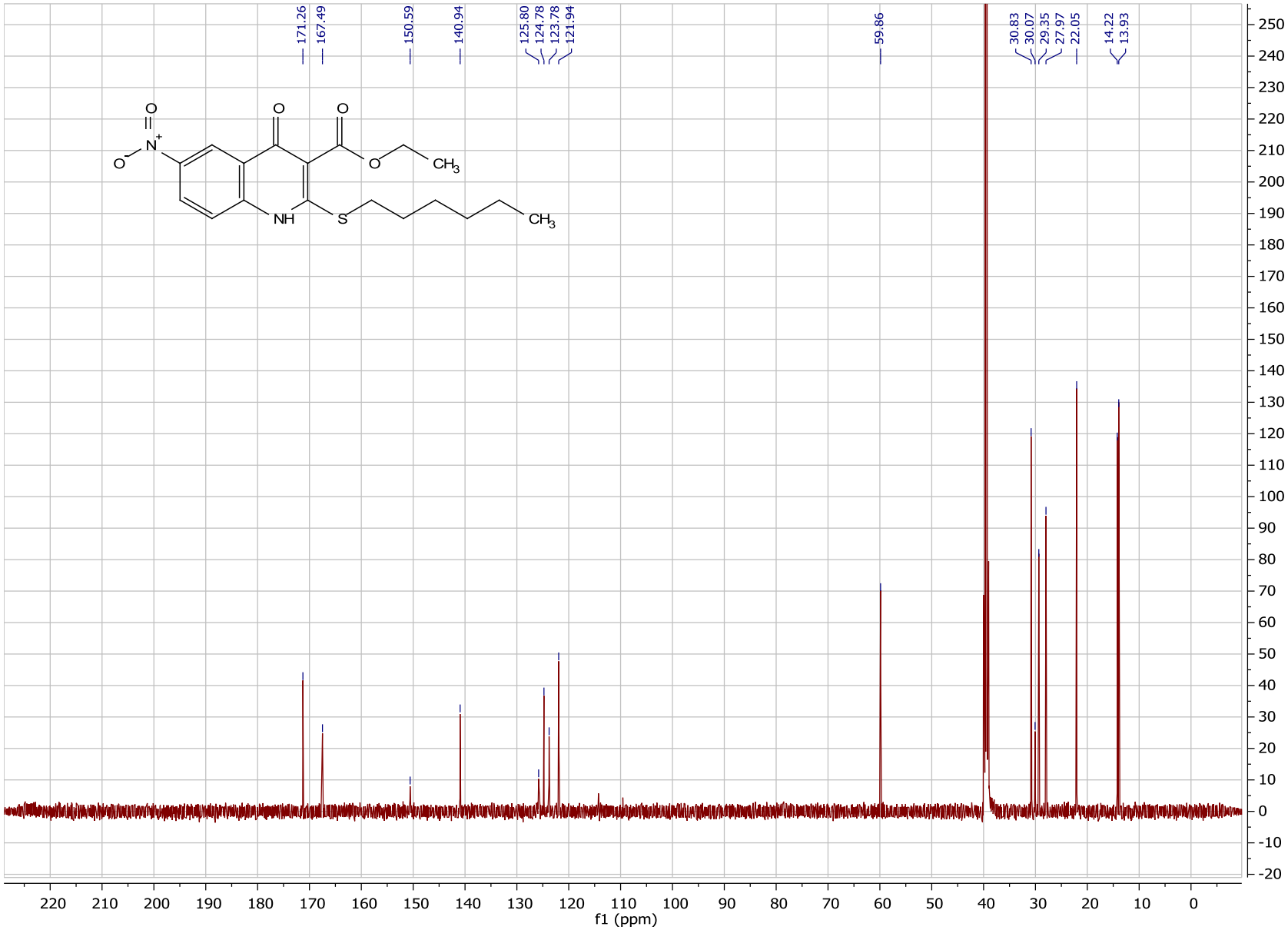

11.74
8.79
8.78
8.47
8.47
8.46
8.45
7.92
7.91
3.25
3.23
3.22
2.50 DMSO-d6
2.49
2.49
1.60
1.59
1.57
1.57
1.56
1.54
1.40
1.39
1.39
1.38
1.38
1.37
1.37
1.37
1.36
1.35
1.34
1.34
1.28
1.27
1.26
1.26
1.26
1.25
1.25
1.24
1.24
1.23
1.22
1.22
1.21
0.86
0.85
0.85
0.84
0.84
0.83
0.83
0.82
0.82
O
O
O
N+
O-
CH3
NH
S
CH3
D (s)
11.74
B (dd)
8.46
A (d)
8.78
C (d)
7.92
E (t)
3.23
F (s)
2.49
G (p)
1.57
H (dqd)
1.37
I (ddd)
1.25
J (m)
0.83
0.92
0.95
1.01
1.00
2.17
2.86
2.08
2.12
4.33
3.14
2500
2000
1500
1000
500
0
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
f1 (ppm)

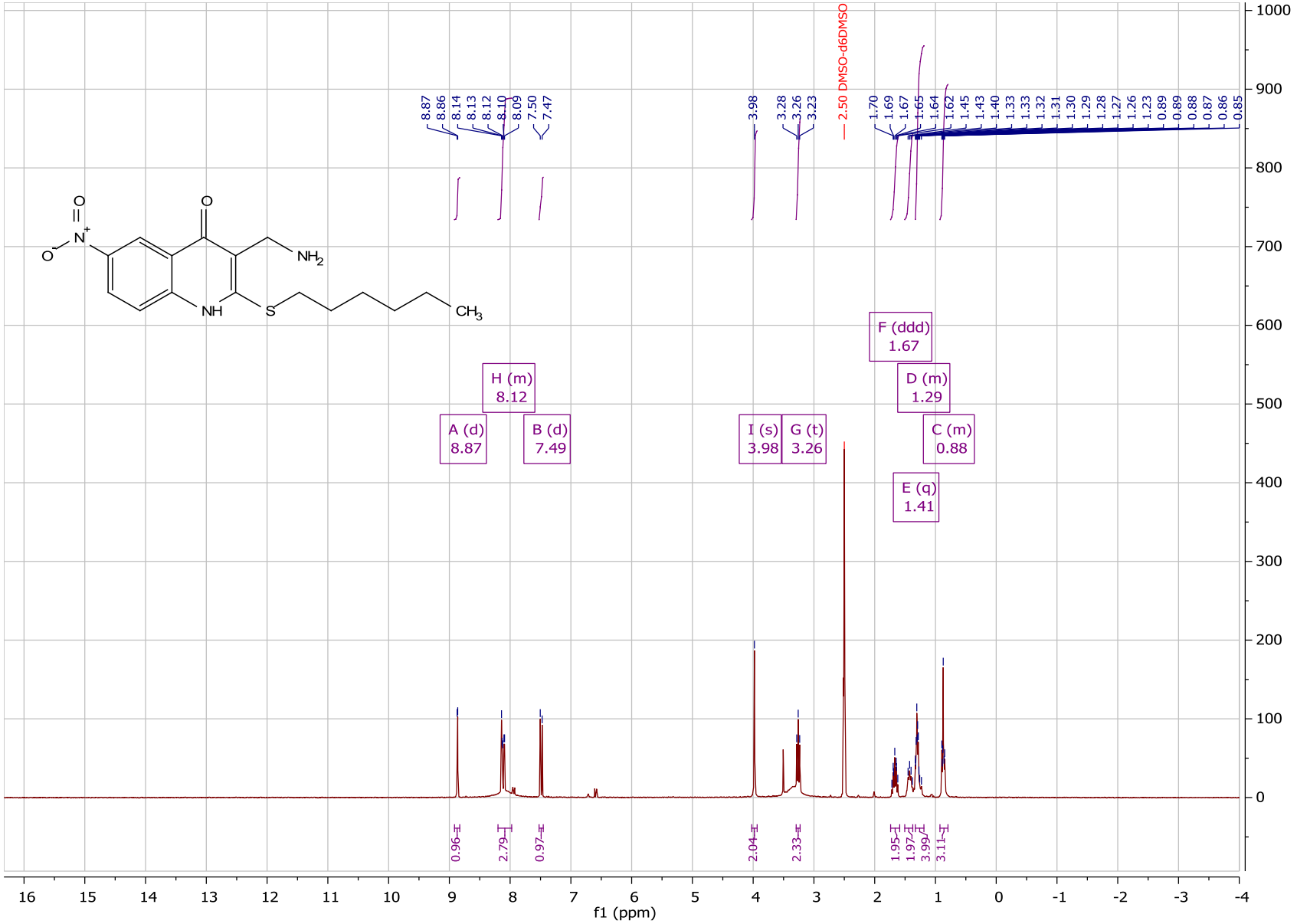

199.02
173.22
153.38
143.25
126.64
124.21
123.29
121.39
120.05
40.11 DMSO
40.02 DMSO
39.94 DMSO
39.85 DMSO
39.78 DMSO
39.69 DMSO
39.61 DMSO
39.52 DMSO
39.45 DMSO
39.35 DMSO
39.19 DMSO
39.02 DMSO
31.90
31.33
30.60
28.20
27.67
21.92
13.83
O
O
O
N+
O
CH3
NH
S
CH3
40000
35000
30000
25000
20000
15000
10000
5000
0
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

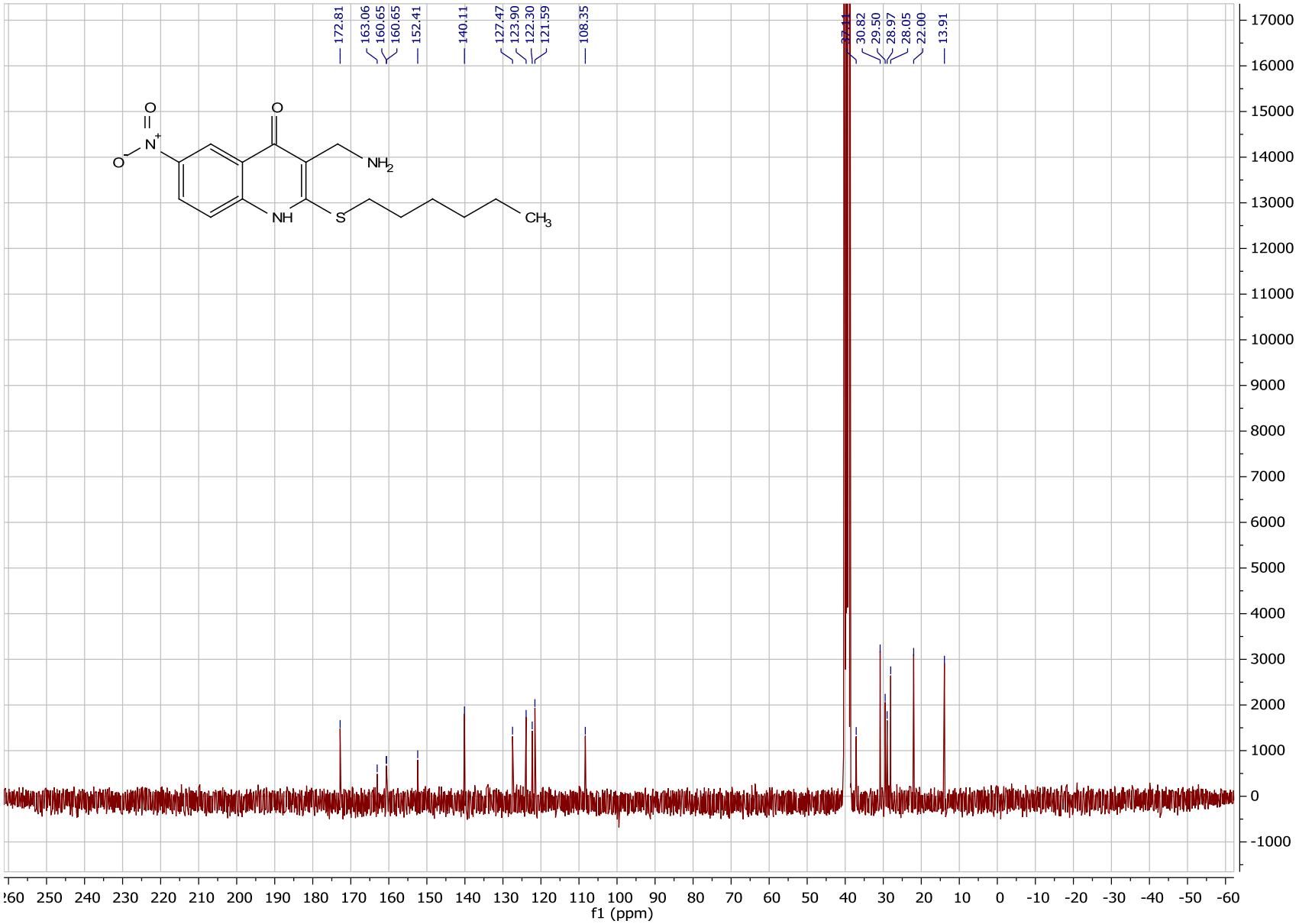

12.17
8.34
8.33
8.10
8.10
8.07
8.07
7.60
7.58
3.42
3.40
3.39
3.39
3.39
3.37
(CD3)2CO
2.05
1.86
1.84
1.84
1.83
1.82
1.81
1.81
1.80
1.79
1.79
1.78
1.76
1.52
1.52
1.51
1.50
1.50
1.49
1.49
1.48
1.47
1.47
1.46
1.46
1.45
1.44
1.43
1.42
1.38
1.37
1.37
1.35
1.35
1.34
1.33
1.32
1.31
1.31
1.30
1.30
1.29
1.29
1.28
1.27
1.27
1.27
1.25
1.25
1.24
0.90
0.89
0.89
0.89
0.88
0.88
0.87
0.86
0.86
0.85
0.84
CH3
O
N+
O-
N
S
NH
D (s)
12.17
B (dd)
8.09
A (d)
8.33
C (d)
7.59
I (dd)
3.39
F (tdd)
1.32
H (m)
1.81
E (m)
0.87
G (tdd)
1.47
0.72
0.98
1.03
1.00
2.11
2.06
2.11
4.30
3.32
f1 (ppm)

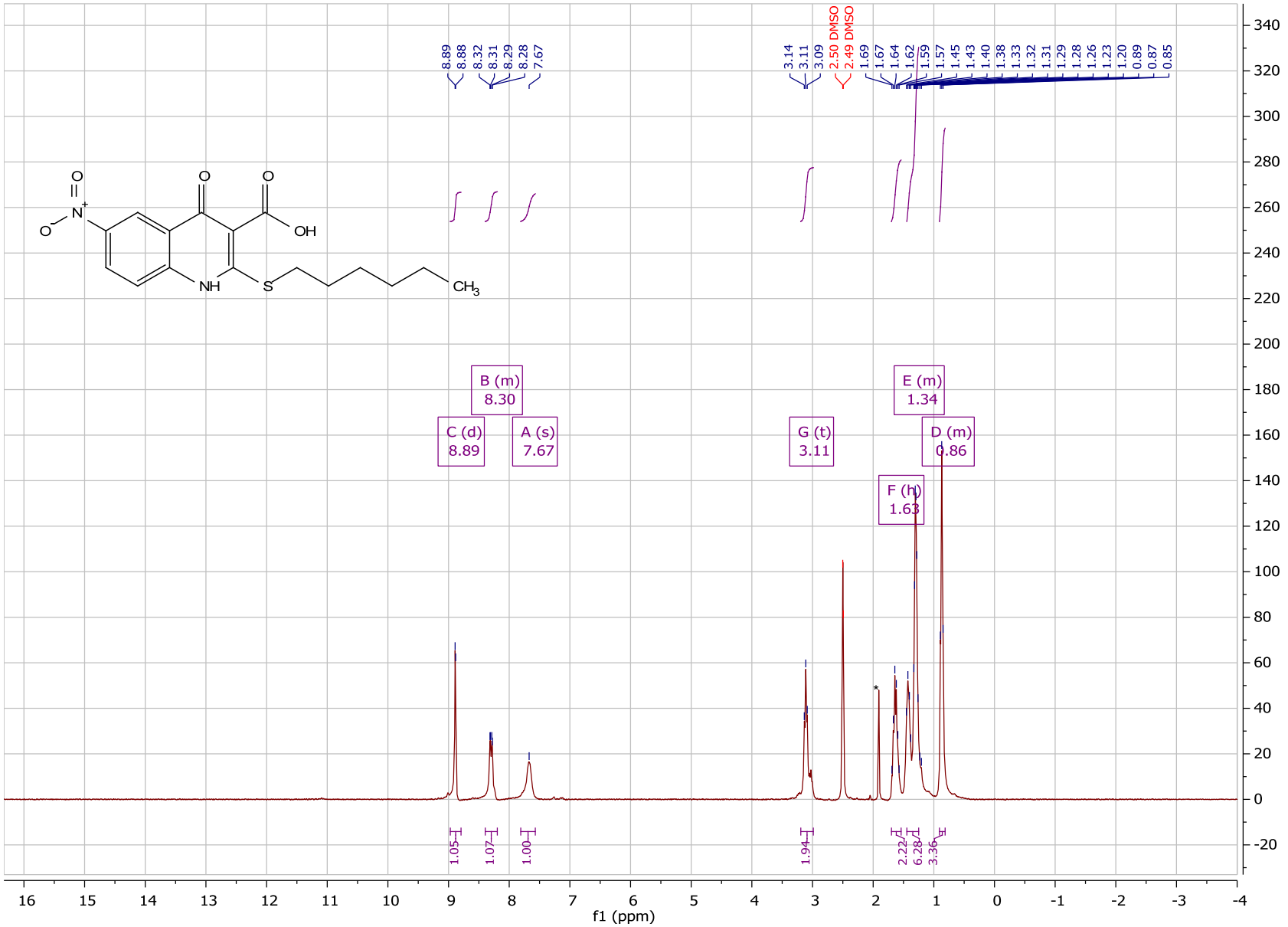

205.38
156.54
142.86
117.41
40.30
31.43
31.13
29.49
29.39
29.23
28.98
28.72
28.46
28.37
28.21
28.16
22.30
13.39
CH3
S
NH
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
f1 (ppm)

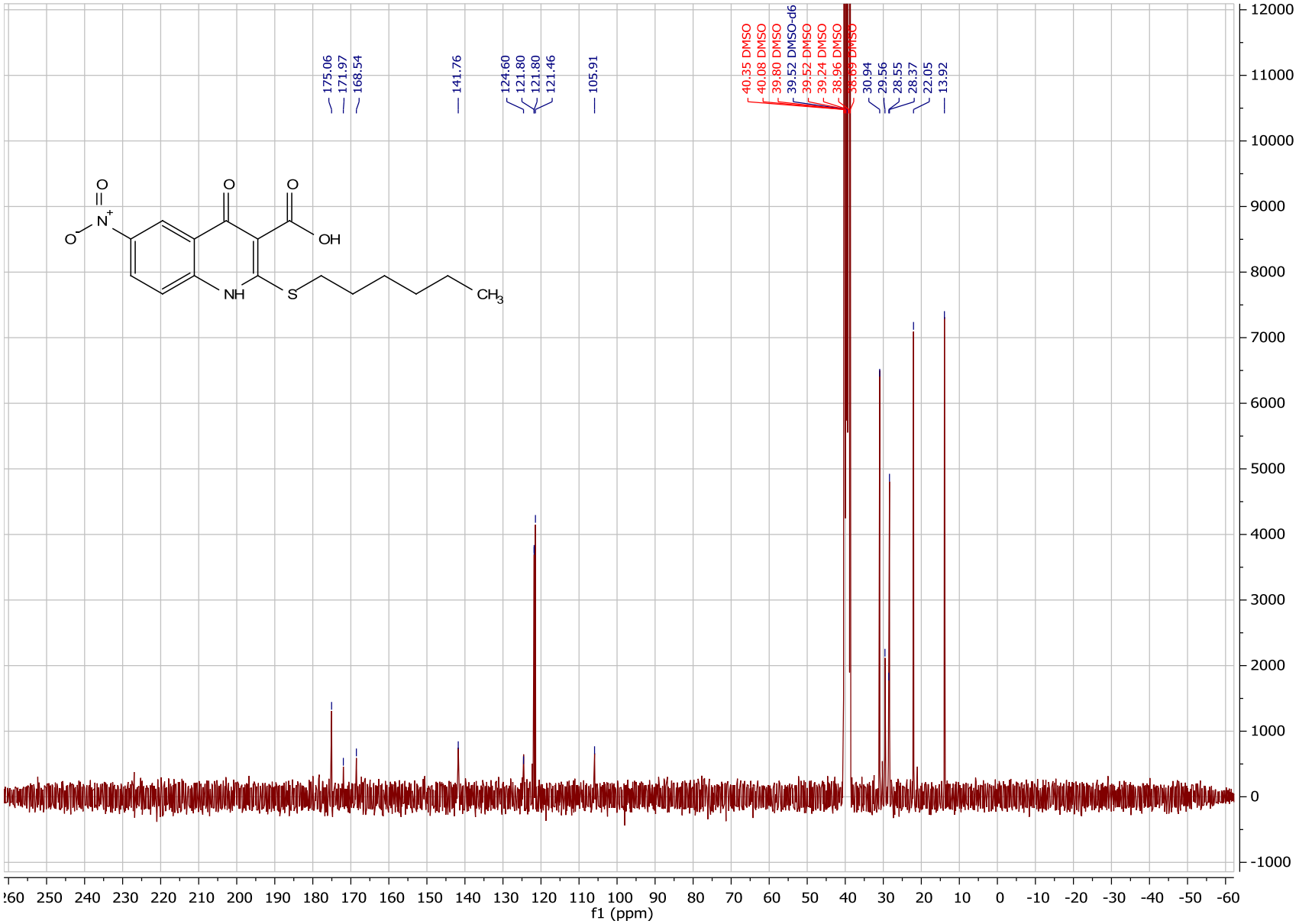

8.84
8.83
8.21
8.20
8.19
8.18
7.57
7.55
7.18
4.21
4.19
4.18
4.16
3.17
3.15
3.14
2.50 DMSO-d6
1.60
1.60
1.59
1.58
1.58
1.57
1.57
1.57
1.38
1.36
1.36
1.27
1.27
1.26
1.26
1.25
1.24
1.24
0.85
0.85
0.84
0.84
0.83
0.83
0.82
A (d) 8.83
B (dd) 8.20
C (d) 7.56
D (s) 7.18
E (q) 4.19
F (t) 3.15
G (m) 1.58
H (tt) 1.36
I (m) 1.26
J (m) 0.84
1.00
1.05
1.11
0.65
2.17
2.20
2.18
2.26
7.30
3.40
f1 (ppm)


171.26
167.49
150.59
140.94
125.80
124.78
123.78
121.94
59.86
30.83
30.07
29.35
27.97
22.05
14.22
13.93
O
O
O
N+
O-
O
CH3
NH
S
CH3
f1 (ppm)


8.87
8.86
8.14
8.13
8.12
8.10
8.09
7.50
7.47
3.98
3.28
3.26
3.23
2.50 DMSO-d6DMSO
1.70
1.69
1.67
1.65
1.64
1.62
1.45
1.43
1.40
1.33
1.33
1.32
1.31
1.30
1.29
1.28
1.27
1.26
1.23
0.89
0.89
0.88
0.87
0.86
0.85
NH2
NH
S
CH3
F (ddd)
1.67
D (m)
1.29
H (m)
8.12
A (d)
8.87
B (d)
7.49
I (s)
3.98
G (t)
3.26
C (m)
0.88
E (q)
1.41
0.96
2.79
0.97
2.04
2.33
1.95
1.97
3.99
3.11
f1 (ppm)


172.81
163.06
160.65
160.65
152.41
140.11
127.47
123.90
122.30
121.59
108.35
37.11
30.82
29.50
28.97
28.05
22.00
13.91
O
O
N+
O
NH2
NH
S
CH3
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60
f1 (ppm)


8.89
8.88
8.32
8.31
8.29
8.28
7.67
3.14
3.11
3.09
2.50 DMSO
2.49 DMSO
1.69
1.67
1.64
1.62
1.59
1.57
1.45
1.43
1.40
1.38
1.33
1.32
1.31
1.29
1.28
1.26
1.23
1.20
0.89
0.87
0.85
B (m)
8.30
C (d)
8.89
A (s)
7.67
E (m)
1.34
G (t)
3.11
D (m)
0.86
F (h)
1.63
1.05
1.07
1.00
1.94
2.22
6.28
3.36
f1 (ppm)


175.06
171.97
168.54
141.76
124.60
121.80
121.80
121.46
105.91
40.35 DMSO
40.08 DMSO
39.80 DMSO
39.52 DMSO-d6
39.52 DMSO
39.24 DMSO
38.96 DMSO
38.69 DMSO
30.94
29.56
28.55
28.37
22.05
13.92
O
O
O
N+
O
OH
NH
S
CH3
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60
f1 (ppm)