Enantioselective PCCP Brønsted Acid Catalyzed Aminalization of Aldehydes

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Supporting information

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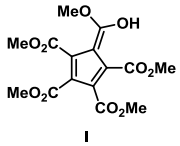
General

Chemicals and solvents were either purchased puriss *p.a*. from commercial suppliers or purified by standard techniques. For thin-layer chromatography (TLC), silica gel plates Merck 60 F254 were used and compounds were visualized by irradiation with UV light and/or by treatment with a solution of phosphomolybdic acid (AMC) or vaniline followed by heating. The solution of AMC was prepared from phosphomolybdic acid (25 g), $Ce(SO_4)_2 \cdot H_2O$ (10 g), conc. H_2SO_4 (60 ml) and H_2O (940 ml). The solution of vanilline was prepared from vanilline (15 g) in ethanol (250 ml) and conc. sulfuric acid (2.5 ml). Column chromatography was performed using silica gel Fluka (40-63 μm). ^{1}H, ^{19}F and ^{13}C NMR spectra were recorded with Bruker AVANCE III 400. Chemical shifts for protons are given in δ and are referenced to residual protium in the NMR solvent (Chloroform-*d*: δ = 7.26 ppm, DMSO-d_6: δ = 2.50 ppm, Acetonitrile-d_3 = 1.94 ppm). Chemical shifts for carbon are referenced to the carbon in NMR solvent (Chloroform-*d*: δ = 77.0 ppm, DMSO-d_6: δ = 39.5 ppm, Acetonitrile-d_3 = 118.2 ppm). The coupling constants *J* are given in Hz. Chiral HPLC was carried out using a LC20AD Shimadzu liquid chromatograph with SPD-M20A diode array detector with columns Daicel Chiralpak® IA, Daicel Chiralpak® IB, Daicel Chiralpak® AD, Daicel Chiralpak® ODH, Daicel Chiralpak® IG. Optical rotations were measured on AU-Tomatica polarimeter, Autopol III. Specific optical rotations are given in concentrations *c* [g/100 ml]. IR DRIFT spectras were recorded with Nicolet AVATAR 370 FT-IR in cm^{-1}. High-resolution mass spectras were recorded with a LCQ Fleet spectrometer.

Starting materials

Preparation of PCCP catalysts

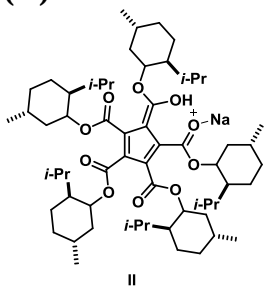
Tetramethyl 5-(hydroxy(methoxy)methylene)cyclopenta-1,3-diene-1,2,3,4-tetracarboxylate (I):



I

Compound **I** was prepared according to literature[1]; **^{1}H-NMR** (400 MHz, $CDCl_3$): δ_H = 20.09 (s, 1H), 4.04 (s, 6H), 3.90 (s, 6H), 3.76 (s, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ = 172.4 (2C), 167.8 (2C), 163.3, 133.7 (2C), 117.0, 106.4 (2C), 55.7 (2C), 52.7 (2C), 52.0 ppm; **MS** (ESI+) *m*/*z*: calc. for $C_{15}H_{15}O_{10}$ [M-H]$^-$: 355.1, found: 355.0.

Tetrakis((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl) 5-(hydroxy(((1*R*,2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl)oxy)methylene)cyclopenta-1,3-diene-1,2,3,4-tetracarboxylate (II):

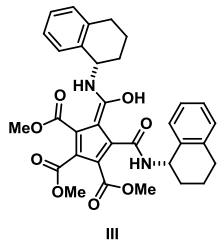


II

Compound **II** was prepared according to the published procedure[1]; **^{1}H-NMR** (400 MHz, $CDCl_3$) δ_H = 20.30 (s, 1H), 5.11 – 4.63 (m, 5H), 2.72 – 0.40 (m, 90H) ppm; **13C NMR** δ_C = 172.1 (2C) 167.1 (2C), 162.7, 134.3 (2C), 118.8, 106.5 (2C), 81.2 (2C), 76.6 (2C), 75.7, 47.5 (2C), 46.2 (3C), 41.6 (2C), 40.8, 40.3 (2C), 34.4-34.0 (5C), 32.0-31.7 (5C), 25.6-25.4 (5C), 23.3-21.0 (15C), 16.6-15.7 (5C) ppm; **HRMS** (ESI+) *m*/*z*: calc. for $C_{60}H_{96}O_{10}Na$ [M+Na]$^+$: 999.7, found: 999.9.

Trimethyl (*E*)-5-(hydroxy(((*S*)-1,2,3,4-tetrahydronaphthalen-1-yl)amino)methylene)-4-(((*S*)-1,2,3,4-tetrahydronaphthalen-1-yl)carbamoyl)cyclopenta-1,3-diene-1,2,3-tricarboxylate (III):

In dry flask PCCP **I** (300 mg, 0.84 mmol, 1.0 equiv.) and (*S*)-(+)-1,2,3,4-tetrahydro-1-naphthylamine (0.22 mL, 1.54 mmol, 2.0 equiv.) were dissolved in dry toluene (8.4 mL). Then the reaction mixture was refluxed for 45 min. After cooling to room temperature solvents were evaporated on rotavap. The crude product was purified by column chromatography (CH_2Cl_2/MeOH 20:1). Then combined organic phases were washed by 1M HCl (3×25 mL), dried over anhydrous $MgSO_4$, and solvents were evaporated *in vacuo* to give desired product **III** as red-brown syrup in 42 % yield (206 mg).

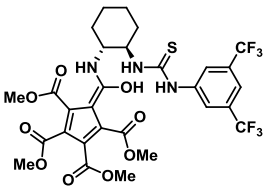


III

Red-brown syrup, 42 % yield (206 mg); $\mathbf{R_f}$ = 0.89 (CH_2Cl_2/MeOH = 7:1, detected in vanilline). **^{1}H-NMR** (600 MHz, $CDCl_3$): δ_H = 19.94 (s, 1H), 11.43 (s, 2H), 7.25 – 7.08 (m, 8H), 5.36 (d, *J* = 6.7 Hz, 2H), 3.79 (s, 3H), 3.69 (s, 6H), 2.91 (dt, *J* = 17.0, 6.2 Hz, 2H), 2.80 (dt, *J* = 16.9, 6.3 Hz, 2H), 2.15 (td, *J* = 7.5, 6.4, 3.5 Hz, 2H), 1.99 (dt, *J* = 12.8, 7.0 Hz, 4H), 1.94 – 1.85 (m, 2H) ppm; **^{13}C-NMR** (151 MHz, $CDCl_3$): δ_C = 168.9, 168.6 (2C), 167.5 (2C), 137.5 (2C), 135.4 (2C), 131.7, 129.4 (2C), 128.8 (2C), 127.7 (2C), 126.3 (2C), 117.8, 115.3 (2C), 52.8 (2C), 52.1 (2C), 49.7 (2C), 29.8 (2C), 29.2 (2C), 20.2 (2C) ppm; **IR** (KBr): ν = 3431, 2950, 2863, 1739, 1631, 1607, 1440, 1350, 1299, 1222, 1162, 1099, 1072, 1024, 1003 cm^{-1}; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –14.2 (*c* = 0.53; MeOH); **HRMS** (ESI-) *m*/*z*: calc. for $C_{33}H_{34}N_2O_8$ [M-H]$^-$: 585.2242, for: 585.2251.

Tetramethyl 5-((((1R,2R)-2-(3-(3,5-bis(trifluoromethyl)phenyl)thioureido)cyclohexyl)amino)(hydroxy)methylene)cyclopenta-1,3-diene-1,2,3,4-tetracarboxylate (IV):

In dry flask PCCP **I** (200 mg, 0.561 mmol, 1.0 equiv.) and 1-((1R,2R)-2-aminocyclohexyl)-3-(3,5-bis(trifluoromethyl)phenyl)thiourea (216 mg, 0.561 mmol, 1.0 equiv.) were dissolved in dry toluene (7 mL). Then the reaction mixture was refluxed for 60 min. After cooling to room temperature, solvents were evaporated on rotavap. The crude product was purified by column chromatography (CH_2Cl_2/MeOH 20:1). Then combined organic phases were washed by 1M HCl (3×25 mL), dried over anhydrous $MgSO_4$, and solvents were evaporated *in vacuo* to give desired product **IV** as brown solid in 82 % yield (330 mg).



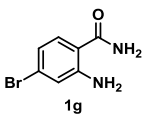
IV

Brown solid**,** yield 82% (330 mg), m.p. 67-68 °C; $\mathbf{R_f}$ = 0.89 (CH_2Cl_2/MeOH = 7:1, detected in vanilline).**^{1}H-NMR** (400 MHz, MeOD) δ_H 8.25 (s, 2H), 7.67 (s, 1H), 4.60 (bs, 1H), 3.73 (s, 12H), 2.91 (ddd, *J* = 11.8, 10.6, 4.2 Hz, 1H), 2.20 – 2.00 (m, 2H), 1.83 (d, *J* = 10.2 Hz, 2H), 1.53 (q, *J* = 12.3, 11.8 Hz, 1H), 1.48 – 1.27 (m, 3H) ppm; **^{13}C-NMR** (101 MHz, MeOD): δ_C = δ 183.6, 169.9, 169.86 (3C), 142.96 (2C), 132.63 (q, *J* = 33.4 Hz, 2C), 124.7 (q, *J* = 273 Hz, 2C); 124.4 (3C), 118.4 (2C), 118.3 (q, *J* = 4 Hz, 2C), 64.1, 56.5, 56.3, 52.0 (4C), 32.1, 31.1, 25.5, 24.7 ppm; **^{19}F NMR** (376 MHz, MeOD): δ_F -64.5; **IR** (KBr): ν = 3550, 3311, 3049, 3005, 2951, 2868, 2787, 1699, 1601, 1545, 1469, 1385, 1360, 1329, 1279, 1219, 1178, 1134, 1109, 1074 cm^{-1}; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = – 40.8 (*c* = 2.04; DMSO); **HRMS** (ESI-) *m*/*z*: calc. for $C_{29}H_{28}F_6N_3O_9S$ $[M\text{-}H]^-$: 708.1529, for: 708.1531.

Preparation of anthranilamide derivatives

2-Amino-4-bromobenzamide (**1g**) and 2-amino-5-methylbenzamide (**1m**) and were prepared according to the literature[2], 2-amino-6-bromobenzamide (**1i**) was prepared according to the published procedure[3], 2-(2-aminophenyl)acetamide (**1p**) was prepared according to the published procedure[4] and 2-(benzylamino)benzamide (**1q**) was prepared according to the published procedure[7].

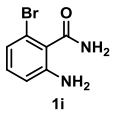
2-Amino-4-bromobenzamide (**1g**)



1g

[5]. **^{1}H-NMR** (400 MHz, DMSO-d_6) δ_H = 7.78 (s, 1H), 7.46 (d, *J* = 8.5 Hz, 1H), 7.15 (s, 1H), 6.99 – 6.86 (m, 1H), 6.80 (s, 2H), 6.71 – 6.57 (m, 1H) ppm; **^{13}C-NMR** (101 MHz, DMSO-d_6) δ_C = 170.5, 151.6, 130.7, 125.3, 118.1, 116.8, 112.7 ppm; **MS** (ESI+) *m*/*z*: calc. for $C_7H_6BrN_2ONa$ $[M-H+Na]^-$: 236.0, found: 236.2.

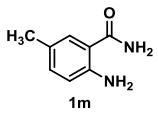
2-Amino-6-bromobenzamide (**1i**)



1i

Characterization according to the literature[6]. **^{1}H-NMR** (400 MHz, $CDCl_3$)) δ_H = 6.98 (t, *J* = 8.0 Hz, 1H), 6.91 (dd, *J* = 7.9 Hz, *J´* = 1.0 Hz, 1H), 6.63 (dd, *J* = 8.0 Hz, *J´* = 1.0 Hz, 1H), 6.03 (s, 2H), 4.59 (s, 2H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 169.5, 147.5, 131.7, 122.4, 121.2, 119.9, 115.5 ppm; **MS** (ESI+) *m*/*z*: calc. for $C_7H_8BrN_2O$ $[M+H]^+$: 215.0, found: 215.0.

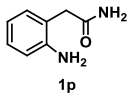
2-Amino-5-methylbenzamide (**1m**)



1m

Characterization according to the literature[2]. **^{1}H-NMR** (400 MHz, DMSO-d_6) δ_H = 7.67 (d, *J* = 15.3 Hz, 1H), 7.41 – 7.30 (m, 2H), 6.98 (s, 1H), 6.95 (dd, *J* = 8.3 Hz, *J´* = 1.8 Hz, 1H), 6.59 (d, *J* = 8.3 Hz, 1H), 6.31 (s, 2H), 2.14 (s, 3H) ppm; **^{13}C-NMR** (101 MHz, DMSO-d_6) δ_C = 171.3, 147.9, 132.7, 128.7, 122.7, 116.5, 113.8, 20.0 ppm; **MS** (ESI+) *m*/*z*: calc. for $C_8H_{10}N_2ONa$ $[M+Na]^+$: 173.1, found: 173.1.

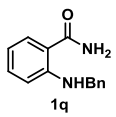
2-(2-aminophenyl)acetamide (1p)



1p

Brown solid, yield 50 % (110 mg), m.p. 140-141 °C; **^{1}H-NMR** (400 MHz, $CDCl_3$)) δ_H = 7.11 (td, *J* = 7.7 Hz, *J´* = 1.5 Hz, 1H), 7.07 – 7.01 (m, 1H), 6.78 – 6.67 (m, 2H), 5.75 (bs, 2H), 4.05 (bs, 1H), 3.47 (s, 2H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 173.9, 145.5, 131.0, 128.9, 120.2, 119.2, 116.6, 40.5 ppm; IR (KBr): ν = 3348, 3400, 3195, 1658, 1622, 1281 cm^{-1}; **HRMS** (ESI+) *m*/*z*: calc. for $C_8H_{11}N_2O$ $[M+H]^+$: 151.0866, found: 151.0865.

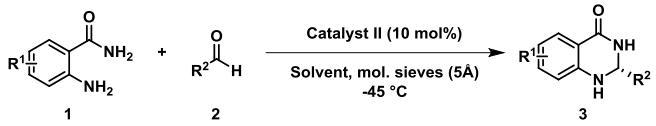
2-(benzylamino)benzamide (1q)



1q

Characterization according to the literature[7]. **^{1}H-NMR** (400 MHz, DMSO) δ_H = 8.59 (s, 1H), 7.86 (s, 1H), 7.62 (d, *J* = 7.2 Hz, 1H), 7.33 (d, *J* = 3.7 Hz, 3H), 7.28 – 7.16 (m, 4H), 6.61 (d, *J* = 8.2 Hz, 1H), 6.53 (t, *J* = 7.1 Hz, 1H), 4.38 (d, *J* = 5.3 Hz, 2H) ppm; **^{13}C-NMR** (101 MHz, DMSO) δ_C = 171.6, 149.6, 139.7, 132.5, 129.1, 128.5 (2C), 128.2, 127.1(2C), 126.8, 114.2, 111.5, 46.0 ppm**;** **MS** (ESI+) *m*/*z*: calc. for $C_{14}H_{15}N_2O$ $[M+H]^+$: 227.1, found: 227.1.

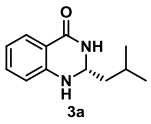
General procedure for aminalization of aldehydes



1 2 3

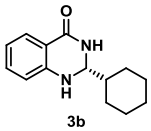
General procedure:
To the amide **1** (0.1 mmol, 1.0 equiv.) in dry flask, catalyst **II** (10 mg, 0.01 mmol, 0.1 equiv.) and molecular sieves (5 Å, 30 mg) were added. The reaction mixture was degassed and filled with argon. Solids were dissolved in dry toluene or THF (1 mL), and a resulted solution was cooled to –45 °C followed by dropwise addition of corresponding aldehyde **2** (0.1 mmol, 1.0 equiv.) dissolved in dry toluene or THF (1 mL). Then the reaction mixture was allowed to stir at the indicated temperature until complete consumption of starting material was observed. The reaction mixture was then directly loaded on silica and purified by column chromatography (*n*-Hexane/EtOAc) to give desired aminals **3a-p**.

(*R*)-2-Isobutyl-2,3-dihydroquinazolin-4(1*H*)-one (3a):


3a

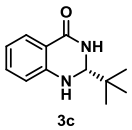
The title compound **3a** was prepared according to the general procedure (reaction time: 20 hours, solvent: toluene, mobile phase (*n*-hexane/EtOAc 3:1 to 2:1), affording the title compound as white solid in yield 96 % (19.5 mg), m.p. 144-145 °C, 81 % (93% after recrystallization) *ee*; $\mathbf{R_f}$ = 0.39 (*n*-hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.87 (dd, *J* = 7.8 Hz, *J´* = 1.5 Hz, 1H), 7.28 (ddd, *J* = 8.4 Hz, *J´* = 7.5, 1.7 Hz, 1H), 6.89 (s, 1H), 6.88 – 6.79 (m, 1H), 6.71 – 6.64 (m, 1H), 4.91 (tt, *J* = 6.5 Hz, *J´* = 1.6 Hz, 1H), 4.35 (s, 1H), 1.80 (dp, *J* = 13.2 Hz, *J´* = 6.6 Hz, 1H), 1.73 – 1.60 (m, 2H), 0.97 (d, *J* = 1.3 Hz, 3H), 0.95 (d, *J* = 1.3 Hz, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_c = 165.7, 147.6, 133.8, 128.6, 119.4, 116.4, 115.0, 63.7, 44.5, 23.9, 22.8, 22.7 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –107.7 (*c* = 0.39, THF); **Enantiomeric excess** (84 % *e.e.*) was determined by HPLC using chiral OD-H column (mobile phase: *n*-heptane/propan-2-ol = 80:20, λ = 210 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 8.1 min (*minor. enantiomer)*, t_R = 10.1 min (*major. enantiomer)*; **MS** (ESI+) *m/z*: calc. for $C_{12}H_{16}N_2O$ $[M+Na]^+$: 227, found: 227.

***(R)*-2-Cyclohexyl-2,3-dihydroquinazolin-4(1*H*)-one (3b)**


3b

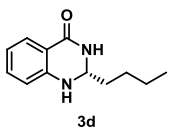
The title compound **3b** was prepared according to the general procedure (reaction time: 40 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 1:1), affording the title compound as white solid in yield 96 % (22 mg), 74 % *ee.*; $\mathbf{R_f}$ = 0.25 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.86 (d, *J* = 7.8 Hz, 1H), 7.31 – 7.25 (m, 1H), 6.85 – 6.76 (m, 1H), 6.65 (d, *J* = 8.1 Hz, 1H), 6.33 (bs, 1H), 4.63 (d, *J* = 5.0 Hz, 1H), 4.31 (bs, 1H), 1.94 – 1.56 (m, 6H), 1.44 – 0.99 (m, 5H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_c = 165.4, 147.5, 133.9, 128.6, 119.1, 115.8, 114.6, 69.7, 42.8, 27.6, 26.3, 25.9 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –68.2 (*c* = 0.33, THF); **Enantiomeric excess** (74 % *e.e.*) was determined by HPLC using chiral IA column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 7.9 min (*minor enantiomer)*, t_R = 9.7 min (*major enantiomer*; **MS** (ESI+) *m/z*: calc. for $C_{14}H_{18}N_2ONa$ $[M+Na]^+$: 253.1, found: 253.2.

***(R)*-2-*tert*-Butyl-2,3-dihydroquinazolin-4(1*H*)-one (3c)**


3c

The title compound **3c** was prepared according to the general procedure (reaction time: 72 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc = 1:1), affording the title compound as white solid in yield 95 % (19.0 mg), b.p. 156-159 °C, 10% *ee.*; $\mathbf{R_f}$ = 0.30 (*n*-Hexane/EtOAc 1:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.85 (dd, *J* = 7.8 Hz, *J´* = 1.3 Hz, 1H), 7.27 (ddd, *J* = 8.7 Hz, *J´* = 7.6 Hz, *J´´* = 1.5 Hz, 1H), 6.83 – 6.75 (m, 1H), 6.65 (d, *J* = 8.0 Hz, 1H), 6.24 (s, 1H), 4.57 (s, 1H), 4.32 (s, 1H), 1.01 (s, 6H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_c = 165.5, 147.7, 134.0, 128.6, 119.0, 115.1, 114.4, 73.6, 35.5, 24.7 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –4.0 (*c* = 0.25, THF); **Enantiomeric excess** (10 % *e.e.*) was determined by HPLC using chiral IH column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 12.1 min (*minor enantiomer)*, t_R = 13.9 min (*major enantiomer)*; **HRMS** (ESI+) *m/z*: calc. for $C_{12}H_{17}N_2O$ $[M+H]^+$: 205.1335, found: 205.1336.

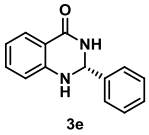
(*R*)-2-Butyl-2,3-dihydroquinazolin-4(1*H*)-one (3d):


3d

The title compound **3d** was prepared according to the general procedure (reaction time: 21 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 3:1 to 2:1), affording the title compound as white solid in yield 97 % (19.7 mg) and 76 % *ee.* $\mathbf{R_f}$ = 0.39 (*n*-Hexane/EtOAc = 1:1, detected in vanilline). **^{1}H-NMR** (400 MHz, $CDCl_3$): δ_H = 7.87 (d, *J* = 7.7 Hz, 1H), 7.32 – 7.27 (m, 1H), 6.89 – 6.80 (m, 1H), 6.13 (s, 1H), 4.87 (t, *J* = 5.8 Hz, 1H), 4.20 (s, 1H), 1.90 – 1.71 (m, 2H), 1.40 (dq, *J* =

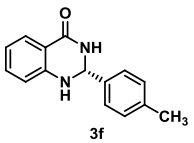
7.0 Hz, *J´* = 3.6 Hz, 4H), 0.94 (t, *J* = 7.0 Hz, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 165.3, 147.5, 133.9, 128.8, 119.6, 116.1, 114.9, 65.5, 35.5, 26.3, 22.6, 14.1 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –97,8 (*c* = 0.23, THF); **Enantiomeric excess** (76 % *e.e.*) was determined by HPLC using chiral IG column (mobile phase: *n*-heptane/propan-2-ol = 80:20, λ = 200 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 9.3 min (*minor enantiomer)*, t_R = 10.1 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{12}H_{16}N_2O$ $[M + Na]^+$: 227, found: 227.

(*R*)-2-Phenyl-2,3-dihydroquinazolin-4(1*H*)-one (3e):


3e

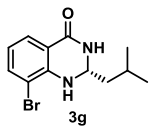
The title compound **3e** was prepared according to the general procedure (reaction time: 96 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 3:1), affording the title compound as white solid in the yield 77 % (17.3 mg), 68 % *ee*. $\mathbf{R_f}$ = 0.48 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, $(CD_3)_2SO$): δ_H = 8.28 (t, *J* = 2.0 Hz, 1H), 7.61 (dd, *J* = 7.8, 1.6 Hz, 1H), 7,55 – 7.47 (m, 2H), 7.45 – 7.31 (m, 3H), 7.24 (ddd, *J* = 8.6, 7.2, 1.6 Hz, 1H), 7.11 (s, 1H), 6.75 (dd, *J* = 8.1, 1.0 Hz, 1H), 6.67 (td, *J* = 7.4, 1.1 Hz, 1H) ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –135.3 (*c* = 0.26; THF); **Enantiomeric excess** (68 % *e.e.*) was determined by HPLC using chiral AD-H column (mobile phase: *n*-heptane/propan-2-ol = 80:20, λ = 228 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 11.7 min (*minor enantiomer)*, t_R = 13.7 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{14}H_{12}N_2O$ $[M + Na]^+$: 247, found: 246.

(*R*)-2-Tolyl-2,3-dihydroquinazolin-4(1*H*)-one (3f):


3f

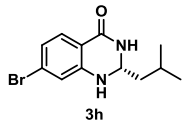
The title compound **3f** was prepared according to the general procedure (reaction time: 112 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 2:1)), affording the title compound as white solid in the yield 83 % (20 mg), b.p. 222 °C, 70% (97% after recrystalization) *e.e.* $\mathbf{R_f}$ = 0.25 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.95 (d, *J* = 6.6 Hz, 1H), 7.48 (d, *J* = 8.0 Hz, 2H), 7.37 – 7.30 (m, 1H), 7.25 (d, *J* = 8.2 Hz, 2H), 6.90 (t, *J* = 7.5 Hz, 1H), 6.66 (d, *J* = 8.0 Hz, 1H), 5.87 (s, 1H), 5.77 (s, 1H), 4.35 (s, 1H), 2.40 (s, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_c = 165.0, 147.5, 140.4, 135.8, 134.1, 129.9, 128. 9, 127.5, 119.8, 114.7, 69.1, 21.4 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –52.5 (*c* = 0.20; THF); **Enantiomeric excess** (70 % *e.e.*) was determined by HPLC using chiral IA column (mobile phase: *n*-Heptane/propan-2-ol = 90:10, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 25. 9 min (*minor enantiomer)*, t_R = 29.8 min (*major enantiomer)*; **HRMS** (ESI+) *m*/*z*: calc. for $C_{15}H_{15}N_2O$ $[M+H]^+$: 239.1179, found: 239.1181.

(*R*)-8-Bromo-2-isobutyl-2,3-dihydroquinazolin-4(1*H*)-one (3g):


3g

The title compound **3g** was prepared according to the general procedure (reaction time: 96 hours, mobile phase (*n*-Hexane/EtOAc 2:1 to 1:1), affording the title compound as white solid in yield 71 % (20 mg), b.p. 142-143 °C, 30 % *ee*. $\mathbf{R_f}$ = 0.5 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.89 – 7.82 (m, 1H), 7.53 (dd, *J* = 7.9 Hz, *J´* = 1.4 Hz, 1H), 6.73 (t, *J* = 7.8 Hz, 1H), 6.53 (s, 1H), 4.98 (tt, *J* = 6.4 Hz, *J´* = 1.5 Hz, 1H), 4.77 (s, 1H), 1.82 (dq, *J* = 12.9 Hz, *J´* = 6.5 Hz, 1H), 1.75 – 1.68 (m, 1H), 1.02 (s, 3H), 1.00 (s, 3H) ppm; **^{13}C-NMR** NMR (101 MHz, $CDCl_3$) δ = 164.5, 144.9, 136.7, 128.1, 119.7, 117.3, 108.9, 63.6, 44.6, 24.1, 22.7 ppm; IR (KBr): ν = 3402, 3305, 2964, 1684, 1383, 748 cm^{-1}; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –8.6 (*c* = 0.29; THF); **enantiomeric excess** (30 % *e.e.*) was determined by HPLC using chiral IA column (mobil phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 5.0 min (*minor. enantiomer)*, t_R = 5.9 min (*major enantiomer)*; HRMS (ESI+) m/z: calc. for $C_{12}H_{15}BrN_2NaO$ $[M+Na]^+$: 305.0260, found: 305.0266.

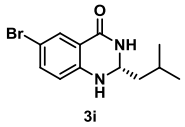
(*R*)-7-Bromo-2-isobutyl-2,3-dihydroquinazolin-4(1*H*)-one (3h):



3h

The title compound **3h** was prepared according to the general procedure (reaction time: 96 hours, mobile phase (*n*-Hexane/EtOAc 2:1)), affording the title compound as white solid in yield 89 % (25 mg), b.p. 166 °C, 70% *ee*. $\mathbf{R_f}$ = 0.33 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.72 (d, *J* = 8.3 Hz, 1H), 6.96 (d, *J* = 8.3 Hz, 1H), 6.85 (d, *J* = 1.6 Hz, 1H), 6.61 (bs, 1H), 4.92 (t, *J* = 6.2 Hz, 1H), 4.34 (s, 1H), 1.78 (tq, *J* = 15.2 Hz, *J´* = 8.6 Hz, *J´´* = 7.7 Hz, 1H), 1.71 – 1.61 (m, 2H), 0.98 (s, 3H), 0.96 (s, 3H) ppm; **^{13}C-NMR** NMR (101 MHz, $CDCl_3$) δ = 164.8, 148.3, 130.2, 128.4, 122.7, 117.6, 115.1, 63.8, 44.6, 24.0, 22.7, 22.7 ppm; IR (KBr): ν = 3305, 3197, 2870, 1651, 1375, 1265 cm^{-1}; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –63.6 (*c* = 0.30; THF); **enantiomeric excess** (70 % *e.e.*) was determined by HPLC using chiral IA column (mobil phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 7.3 min (*minor. enantiomer)*, t_R = 8.2 min (*major enantiomer)*; HRMS (ESI+) m/z: calc. for $C_{12}H_{16}BrN_2O$ $[M+H]^+$: 283.0441, found: 283.0441.

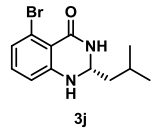
(*R*)-6-Bromo-2-isobutyl-2,3-dihydroquinazolin-4(1*H*)-one (3i):



3i

The title compound **3i** was prepared according to the general procedure (reaction time: 96 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 3:1 to 2:1), affording the title compound as light-yellow solid in yield 78 % (22 mg) and 80 % *ee*. $\mathbf{R_f}$ = 0,51 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, $CDCl_3$): δ_H = 7.99 (d, *J* = 2.3 Hz, 1H), 7.37 (dd, *J* = 8.6 Hz, *J´* = 2.4 Hz, 1H), 6.57 (d, *J* = 8.6 Hz, 1H), 6.32 (s, 1H), 4.91 (t, *J* = 6.3 Hz, 1H), 4.23 (s, 1H), 1.78 (dp, *J* = 13.0 Hz, *J´* = 6.6 Hz, 1H), 1.66 (td, *J* = 7.7 Hz, *J´* = 7.1 Hz, *J´´* = 1.9 Hz, 2H), 0.99 (d, *J* = 1.3 Hz, 3H), 0.98 (d, *J* = 1.3 Hz, 3H) ppm; **^{13}C-NMR** (101 MHz, CDCl3) δ_C = 164.2, 146.3, 136.6, 131.3, 117.9, 116.8, 111.6, 63.7, 44.5, 24.0, 22.7 (2C) ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –90,3 (*c* = 0,31; THF); **Enantiomeric excess** (80 % *e.e.*) was determined by HPLC using chiral OD-H (mobile phase: *n*-heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 9,7 min (*minor enantiomer)*, t_R = 14,2 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{12}H_{15}BrN_2O$ $[M+H]^+$: 283.04, found: 282.93.

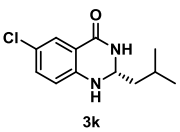
(*R*)-5-Bromo-2-isobutyl-2,3-dihydroquinazolin-4(1*H*)-one (3j):



3j

The title compound **3j** was prepared according to the general procedure (reaction time: 112 hours in a toluene, mobile phase (*n*-Hexane/EtOAc 2:1), affording the title compound as white solid in yield 83 % (23 mg), m.p. 173 °C, 66 % *ee*. $\mathbf{R_f}$ = 0.15 (*n*-Hexane/EtOAc = 2:1). **^{1}H-NMR** (400 MHz, ($CDCl_3$): δ_H = 7.11 – 7.00 (m, 2H), 6.92 (s, 1H), 6.65 (dd, *J* = 7.9 Hz, *J´* = 1.1 Hz, 1H), 4.79 (t, *J* = 6.2 Hz, 1H), 4.40 (s, 1H), 1.84 (dp, *J* = 13.2 Hz, *J´* = 6.6 Hz, 1H), 1.71 (dt, *J* = 13.6 Hz, *J´* = 6.8 Hz, 1H), 1.59 (ddd, *J* = 13.7 Hz, *J´* = 7.7 Hz, *J´´* = 5.9 Hz, 1H), 0.97 (d, *J* = 4.0 Hz, 3H), 0.96 (d, *J* = 4.0 Hz, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 163.3, 150.3, 133.3, 126.4, 123.7, 115.3, 114.9, 62.8, 43.8, 24.0, 22.9, 22.6 ppm; IR (KBr): ν = 3317, 2954, 1639, 1599, 1381, 1334 cm^{-1}; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –93.9 (*c* = 0.33; THF); **Enantiomeric excess** (66 % *e.e.*) was determined by HPLC using chiral IA (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 6,0 min (*minor enantiomer)*, t_R = 6,7 min (*major enantiomer)*; **HRMS** (ESI+) *m*/*z*: calc. for $C_{12}H_{16}BrN_2O$ $[M+H]^+$: 283.0441, found: 283.0438.

(*R*)-6-Chloro-2-isobutyl-2,3-dihydroquinazolin-4(1*H*)-one (3k):

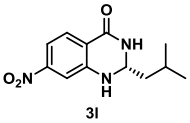


3k

The title compound **3k** was prepared according to the general procedure (reaction time: 72 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 2:1), affording the title compound as white solid in yield 83 % (20 mg), m.p.

154-155 °C, 76 % *ee.* $\mathbf{R_f}$ = 0.39 (*n*-Hexane/EtOAc = 1:1, detected in vanilline). **^{1}H-NMR** (400 MHz, $CDCl_3$) δ_H = 7.88 – 7.78 (m, 1H), 7.23 (dd, *J* = 8.6 Hz, *J´* = 2.5 Hz, 1H), 6.88 (s, 1H), 6.62 (d, *J* = 8.6 Hz, 1H), 4.90 (t, *J* = 6.3 Hz, 1H), 4.31 (s, 1H), 1.79 (dq, *J* = 13.2 Hz, *J´* = 6.6 Hz, 1H), 1.66 (td, *J* = 6.8 Hz, *J´* = 4.8 Hz, 2H), 0.98 (s, 3H), 0.97 (s, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C 164.5, 146.0, 133.7, 128.2, 124.5, 117.5, 116.5, 63.8, 44.4, 24.0, 22.8, 22.7 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –116.1 (*c* = 0.28; THF); **Enantiomeric excess** (76 % *e.e.*) was determined by HPLC using chiral OD-H column (mobile phase: *n*-Heptane/propan-2-ol = 90:10, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 9.2 min (*minor enantiomer)*, t_R = 13.0 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{12}H_{15}ClN_2O$ $[M + Na]^+$: 261, found: 261.

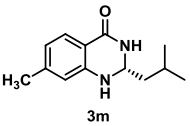
(*R*)-2-Isobutyl-7-nitro-2,3-dihydroquinazolin-4(1*H*)-one (3l):



3l

The title compound **3l** was prepared according to the general procedure (reaction time: 40 hours, solvent: THF at -65 °C, mobile phase (*n*-Hexane/EtOAc 2:1), affording the title compound as orange solid in yield 96 % (24 mg), b.p. 184 °C, 42 % *ee.* $\mathbf{R_f}$ = 0.37 (*n*-Hexane/EtOAc = 1:1, detected in vanilline). **^{1}H-NMR** (400 MHz, $CDCl_3$) δ_H 8.03 (d, *J* = 8.5 Hz, 1H), 7.63 (dd, *J* = 8.5 Hz, *J´* = 2.1 Hz, 1H), 7.53 (d, *J* = 2.1 Hz, 1H), 6.63 (s, 1H), 5.01 (t, *J* = 6.3 Hz, 1H), 4.61 (s, 1H), 1.83 (dt, *J* = 13.3 Hz, *J´* = 6.6 Hz, 1H), 1.71 (td, *J* = 7.6 Hz, *J´* = 7.0 Hz, *J´´* = 2.3 Hz, 2H), 1.02 (s, 3H), 1.00 (s, 2H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 163.5, 151.5, 147.8, 130.3, 120.5, 113.6, 109.8, 63.9, 44.7, 24.0, 22.7 (2C) ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –55.9 (*c* = 0.34; THF); **IR** (KBr): ν = 3512, 3067, 2944, 1745, 1329, 1269, 1159 cm^{-1}; **Enantiomeric excess** (36 % *e.e.*) was determined by HPLC using chiral IG column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 254 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 7.06 min (*major enantiomer)*, t_R = 8.08 min (*minor enantiomer)*; **HRMS** (ESI+) *m*/*z*: calc. for $C_{12}H_{15}N_3O_3$ $[M+Na]^+$: 272.1006 found: 272.1007.

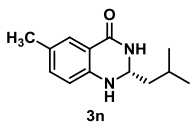
(*R*)-2-Isobutyl-7-methyl-2,3-dihydroquinazolin-4(1*H*)-one (3m):



3m

The title compound **3m** was prepared according to *the general procedure* (reaction time: 84 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 3:1 to 2:1), affording the title compound as yellow solid in yield 80 % (18 mg), 69 % *ee.* $\mathbf{R_f}$ = 0.2 (*n*-Hexane/EtOAc = 1:1). **^{1}H-NMR** (400 MHz, $CDCl_3$) δ_H = 7.76 (d, *J* = 7.8 Hz, 1H), 6.67 (d, *J* = 7.9 Hz, 1H), 6.48 (s, 1H), 6.05 (s, 1H), 4.89 (t, J = 6.2 Hz, 1H), 4.13 (s, 1H), 2.29 (s, 3H), 1.76 (dq, *J* = 13.2 Hz, *J´* = 6.6 Hz, 1H), 1.64 (t, *J* = 6.7 Hz, 3H), 0.98 (s, 3H), 0.96 (s, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_H = 165.5, 147.6, 144.8, 128.8, 121.0, 115.3, 113.9, 63.8, 44.5, 24.1, 22.8, 22.7, 21.9 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –89.2 (*c* = 0.19; THF); **Enantiomeric excess** (69 % *e.e.*) was determined by HPLC using chiral IG column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 223 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 17.0 min (*minor enantiomer)*, t_R = 18.5 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{13}H_{18}N_2O$ $[M + Na]^+$: 241, found: 241.

(*R*)-2-Isobutyl-6-methyl-2,3-dihydroquinazolin-4(1*H*)-one (3n):

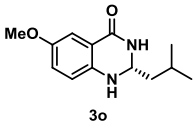


3n

The title compound **3n** was prepared according to the general procedure (reaction time: 16 hours, solvent: toluene, mobile phase (*n*-hexane/EtOAc 3:1 to 2:1), affording the title compound as white solid in yield 96 % (20 mg) and 73 % *ee.* $\mathbf{R_f}$ = 0.18 (*n*-Hexane/EtOAc = 1:1, detected in vanilline). **^{1}H-NMR** (400 MHz, $CDCl_3$) δ_H = 7.69 (s, 1H), 7.12 (dd, *J* = 8.1 Hz, *J´* = 1.9 Hz, 1H), 6.60 (d, *J* = 8.1 Hz, 1H), 6.12 (s, 1H), 4.87 (t, *J* = 6.2 Hz, 1H), 4.07 (s, 1H), 2.27 (s, 3H), 1.77 (dq, *J* = 13.3 Hz, *J´* = 6.7 Hz, 1H), 1.65 (t, *J* = 6.7 Hz, 2H), 0.98 (d, *J* = 1.1 Hz, 3H), 0.97 (d, *J* = 1.1 Hz, 3H) ppm.; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 165.6, 145.3, 134.8, 129.2, 128.6, 116.5,

115.3, 63.9, 44.4, 24.1, 22.8, 22.7, 20.6 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –111.1 (*c* = 0.27; THF); **Enantiomeric excess** (73 % *e.e.*) was determined by HPLC using chiral OD-H column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 220 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 7.2 min (*minor enantiomer)*, t_R = 9.3 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{13}H_{18}N_2O$ $[M + Na]^+$: 241, found: 241.

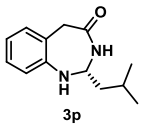
(*R*)-2-Isobutyl-6-methoxy-2,3-dihydroquinazolin-4(1*H*)-one (3o):



3o

The title compound **3o** was prepared according to the general procedure (reaction time: 24 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 2:1 to 1:1), affording the title compound as white solid in yield 74 % (17 mg), b.p. 127 °C, 64 % *ee.* $\mathbf{R_f}$ = 0.52 (*n*-Hexane/EtOAc = 1:3, detected in vanilline); **^{1}H-NMR** (400 MHz, $CDCl_3$): δ_H = 7.40 (d, *J* = 3.0 Hz, 1H), 6.93 (dd, *J* = 8.7 Hz, *J´* = 3.0 Hz, 1H), 6.67 (d, *J* = 8.7 Hz, 1H), 6.62 (s, 1H), 4.84 (t, *J* = 6.2 Hz, 1H), 4.00 (s, 1H), 3.78 (s, 3H), 1.80 (dp, *J* = 13.2 Hz, *J´* = 6.6 Hz, 1H), 1.65 (t, *J* = 6.7 Hz, 2H), 0.97 (d, *J* = 1.3 Hz, 3H), 0.95 (d, *J* = 1.3 Hz, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 165.6, 153.6, 141.6, 122.4, 117.7, 117.4, 110.6, 64.0, 55.9, 44.2, 24.0, 22.8, 22.7 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –72.7 (*c* = 0.55; THF); **Enantiomeric excess** (64 % *e.e.*) was determined by HPLC using chiral IG column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 11.6 min (*minor enantiomer)*, t_R = 13.0 min (*major enantiomer)*; **MS** (ESI+) *m*/*z*: calc. for $C_{13}H_{18}N_2O_2$ $[M + Na]^+$: 257, found: 257.

(R)-2-isobutyl-1,2,3,5-tetrahydro-4*H*-benzo[d][1,3]diazepin-4-one (3p)



3p

The title compound **3p** was prepared according to the general procedure (reaction time: 24 hours, solvent: toluene, mobile phase (*n*-Hexane/EtOAc 1:1), affording the title compound as white solid in yield 55 % (12 mg), b.p. 170-172 °C, 35 % *ee.* **^{1}H-NMR** (400 MHz, $CDCl_3$): δ_H = 7.05 (t, J = 7.6 Hz, 1H), 6.97 (d, *J* = 7.6 Hz, 1H), 6.72 (td, *J* = 7.5 Hz, *J´* = 1.1 Hz, 1H), 6.53 (dd, *J* = 8.0 Hz, *J´* = 1.0 Hz, 1H), 6.13 (d, *J* = 7.2 Hz, 1H), 5.21 (p, *J* = 6.9 Hz, 1H), 4.56 (d, *J* = 15.1 Hz, 1H), 3.99 (d, *J* = 6.9 Hz, 1H), 3.29 (dd, *J* = 15.1 Hz, *J´* = 1.7 Hz, 1H), 1.80 (dp, *J* = 13.4 Hz, *J´* = 6.7 Hz, 1H), 1.56 (t, *J* = 7.0 Hz, 2H), 0.99 (s, 3H), 0.97 (s, 3H) ppm; **^{13}C-NMR** (101 MHz, $CDCl_3$) δ_C = 172.8, 144.0, 132.3, 128.4, 119.7, 117.7, 116.1, 61.1, 43.8, 42.4, 24.7, 22.6, 22.5 ppm; $[\boldsymbol{\alpha}]_{\mathbf{D}}^{\mathbf{20}}$ = –26.0 (*c* = 0.25; THF); **IR** (KBr): ν = 3305, 3192, 2960,1654, 1495 cm^{-1}; **Enantiomeric excess** (35 % *e.e.*) was determined by HPLC using chiral IA column (mobile phase: *n*-Heptane/propan-2-ol = 80:20, λ = 190 nm, *V* = 1 mL/min, *T* = 25 °C), t_R = 7.0 min (*major enantiomer)*, t_R = 10.7 min (*minor enantiomer)*; **HRMS** (ESI+) *m*/*z*: calc. for $C_{13}H_{19}N_2O$ $[M+Na]^+$: 219.1491 found: 219.1488.

Literature

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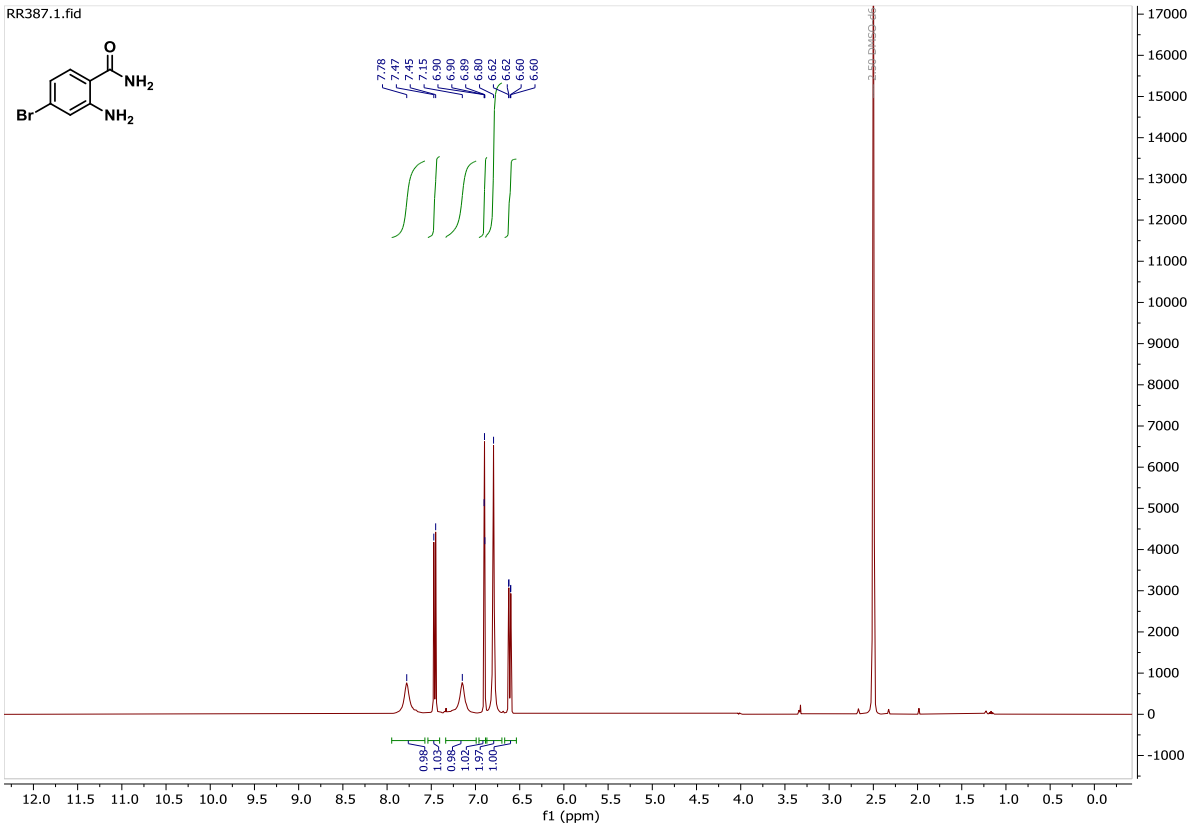
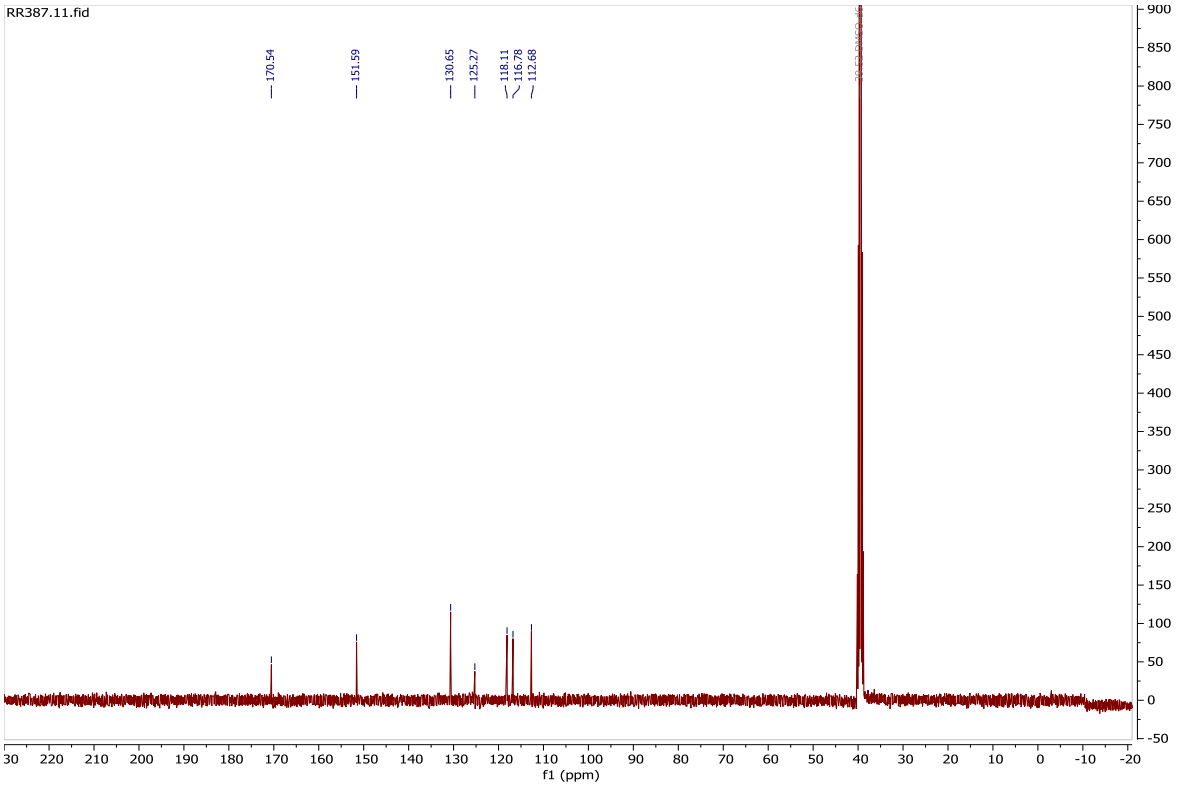
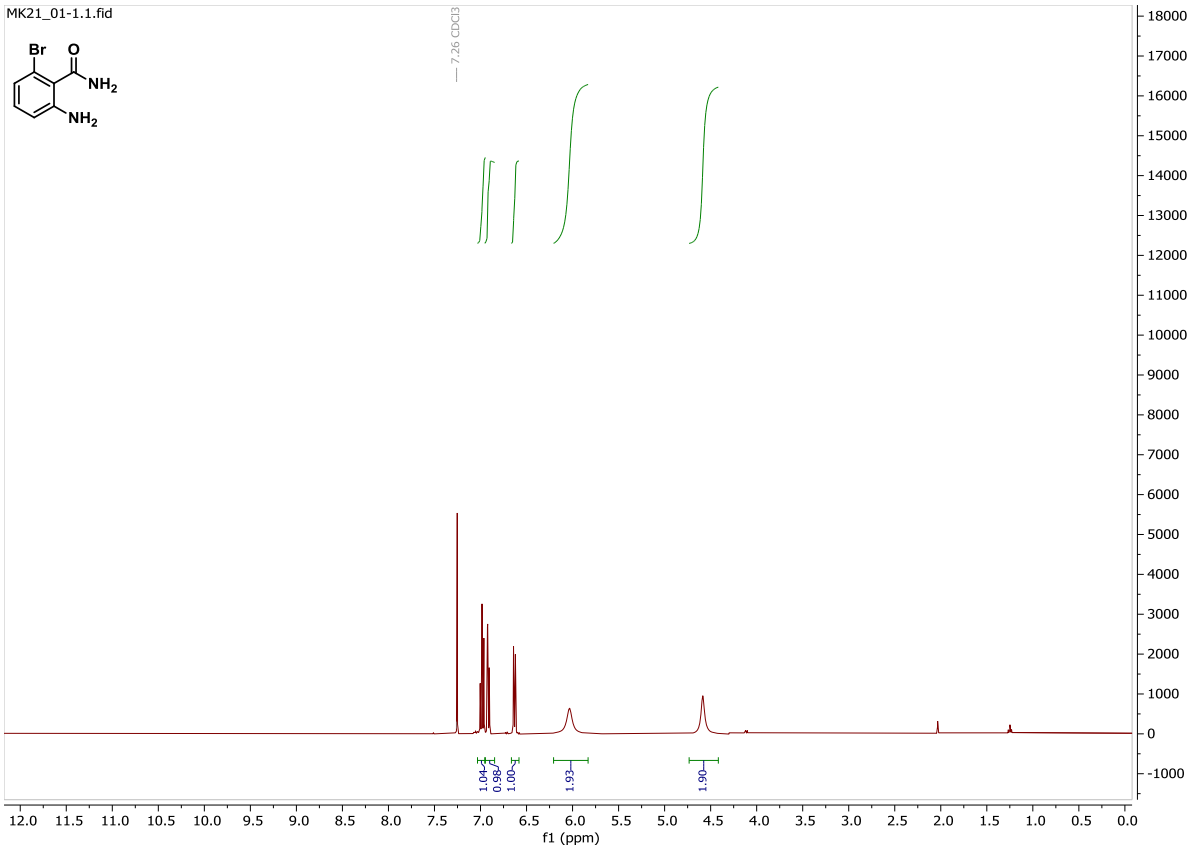
NMR spectra



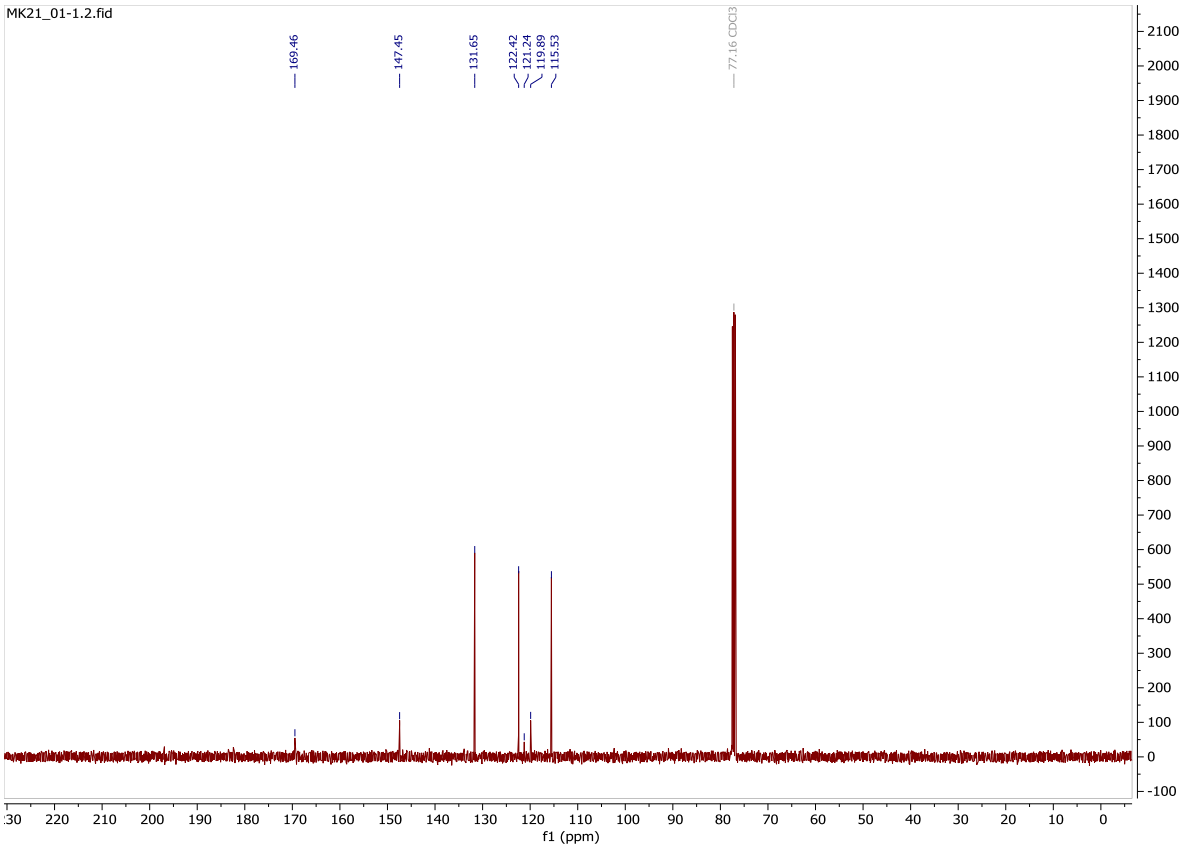
^{1}H NMR (400 MHz, DMSO) of **1g**.



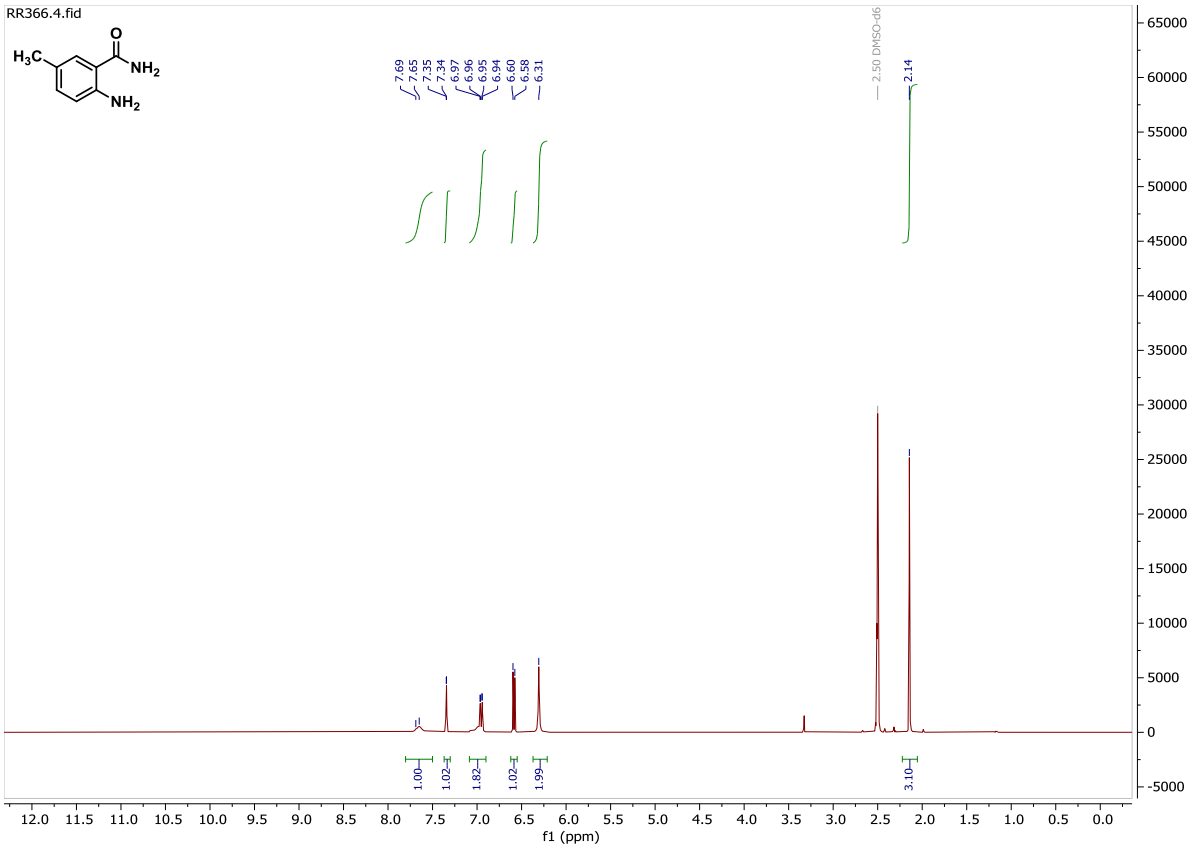
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **1g**.



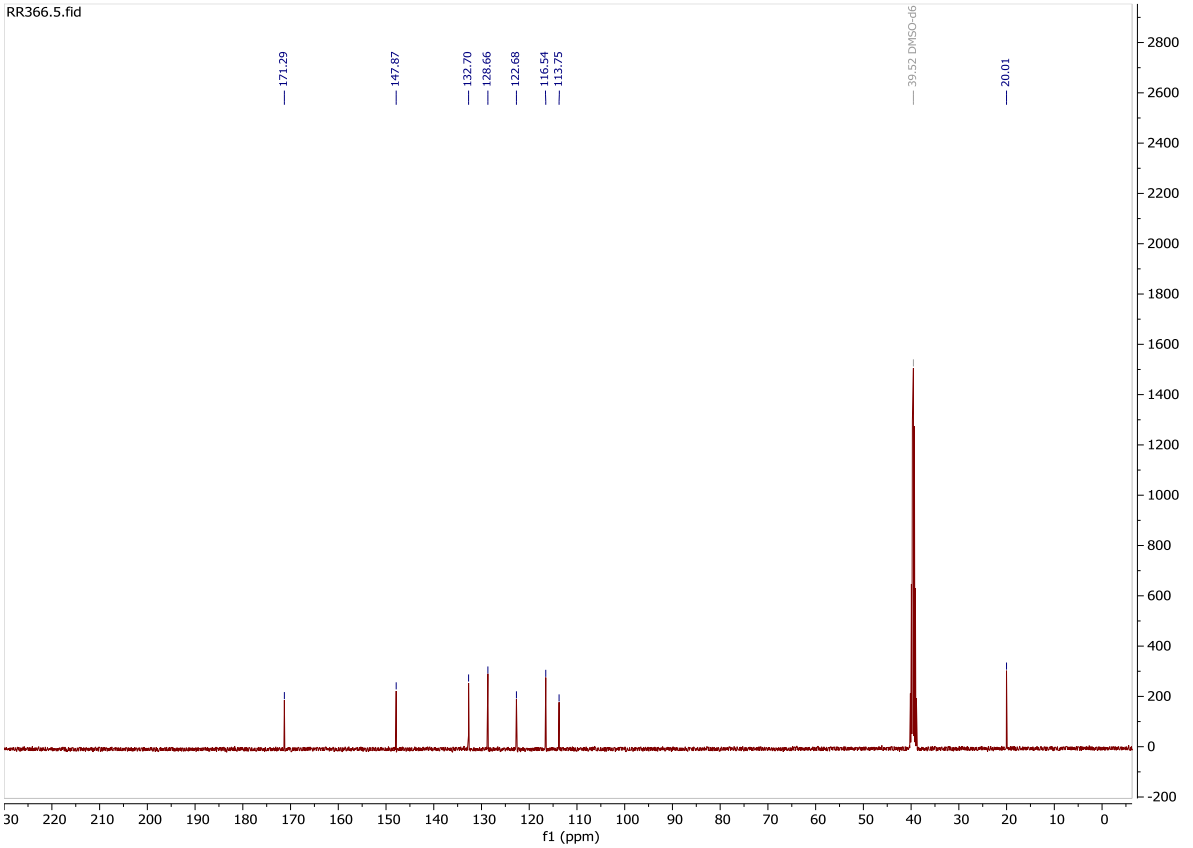
^{1}H NMR (400 MHz, DMSO) of **1i**.



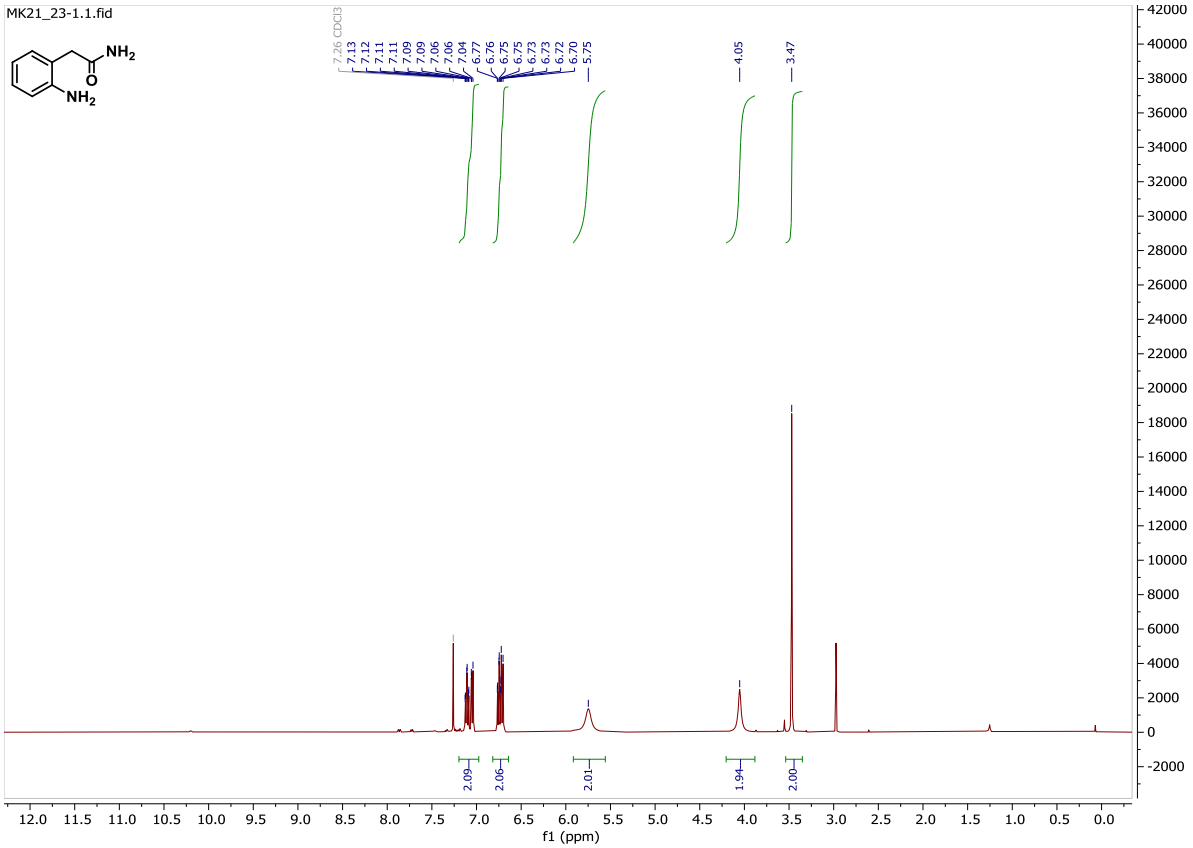
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **1i**.



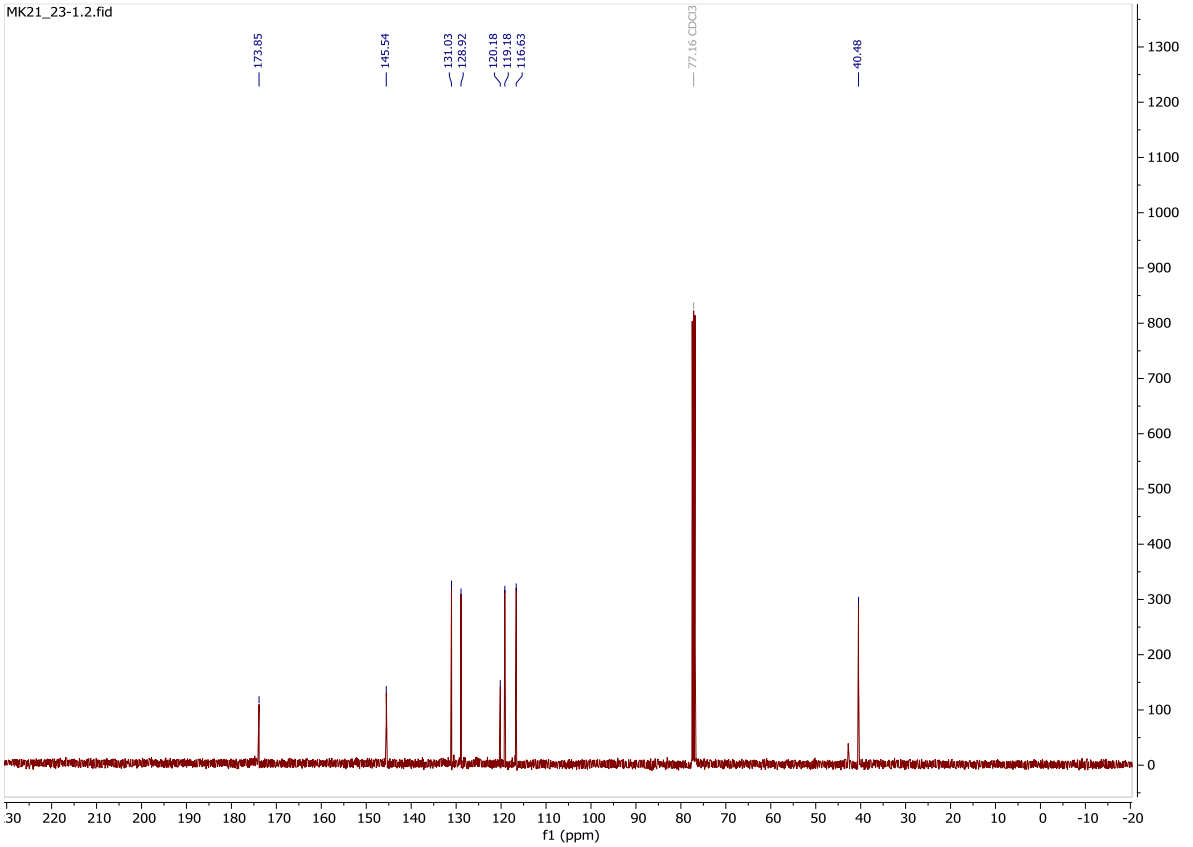
^{1}H NMR (400 MHz, DMSO) of **1m**.



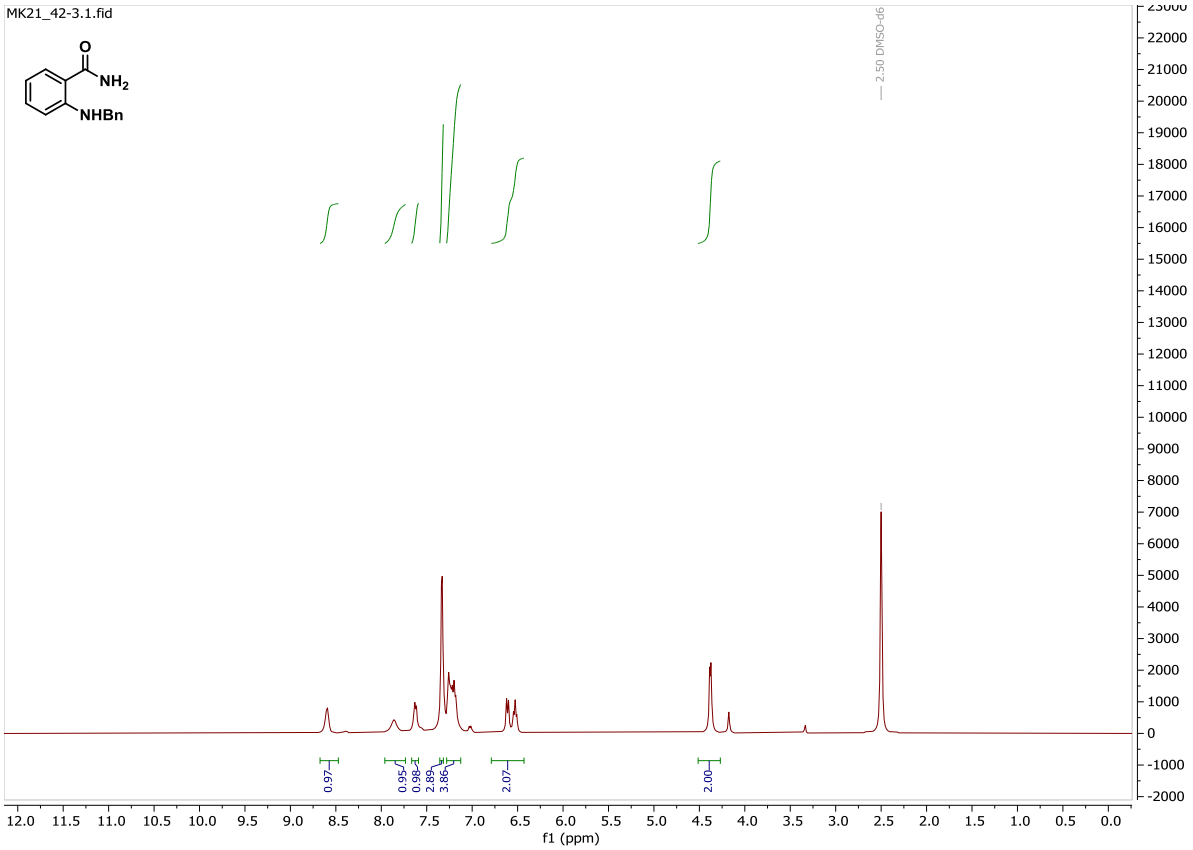
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **1m**.



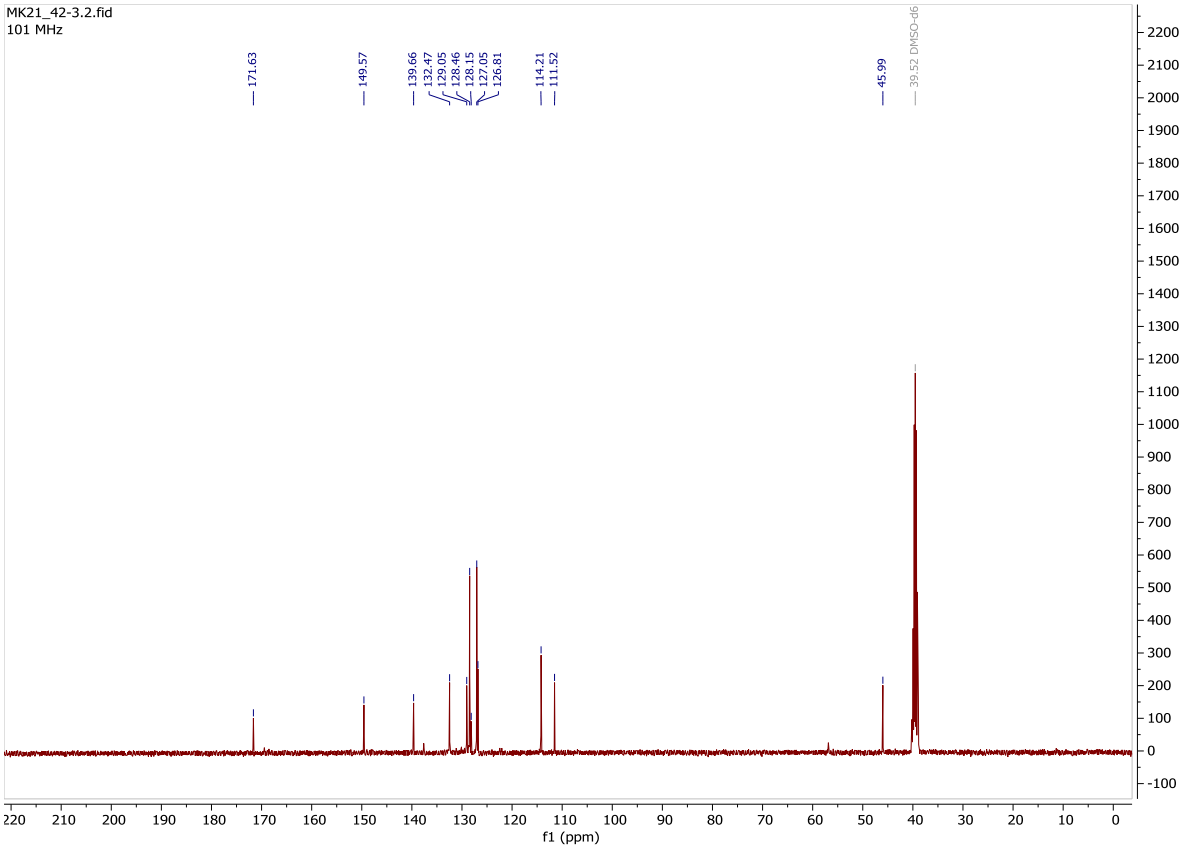
^{1}H NMR (400 MHz, DMSO) of **1p**.



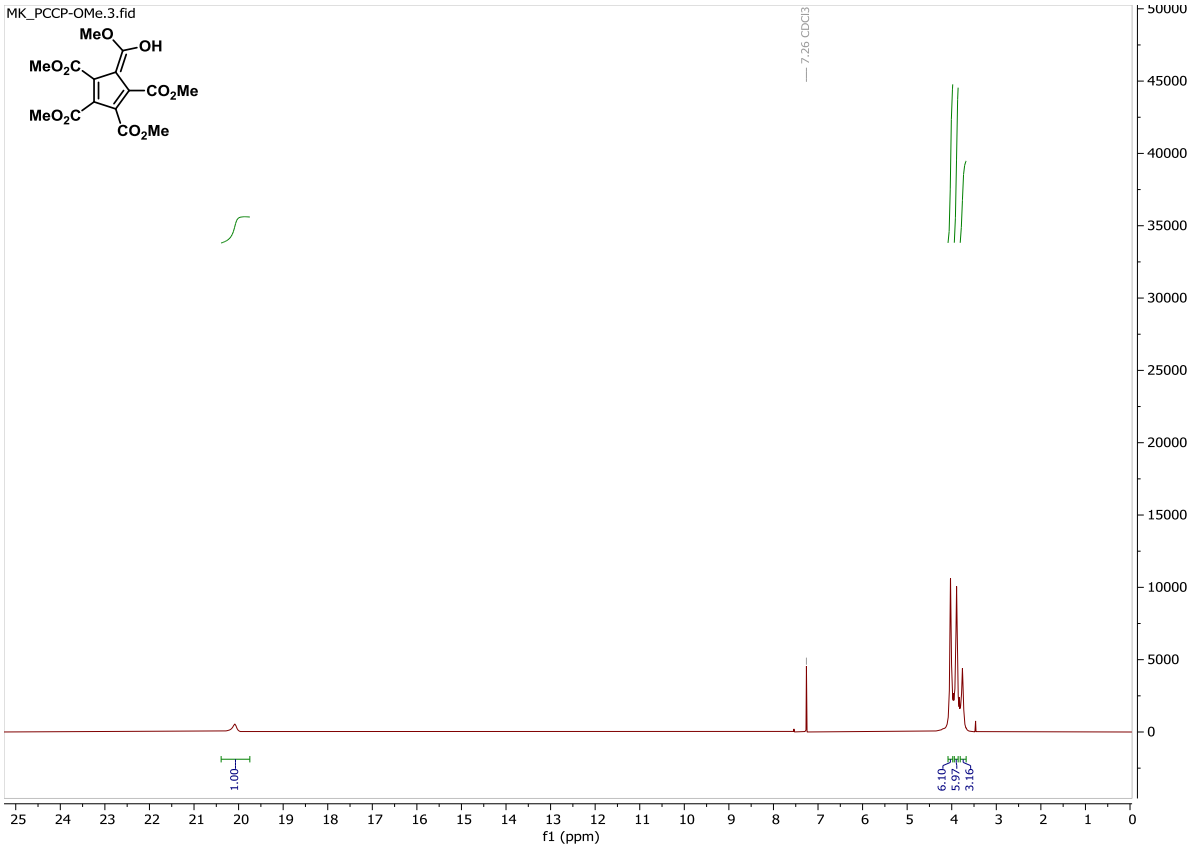
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **1p**.



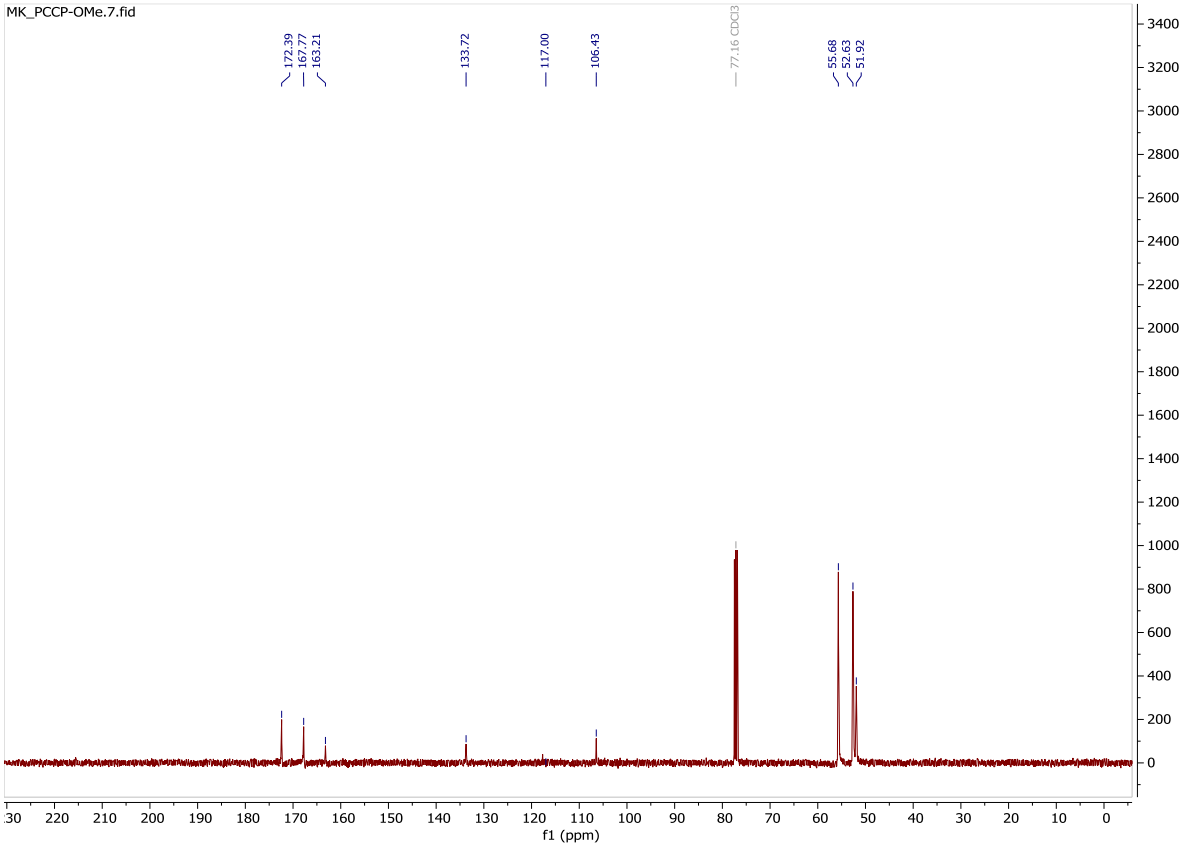
^{1}H NMR (400 MHz, DMSO) of **1q**.



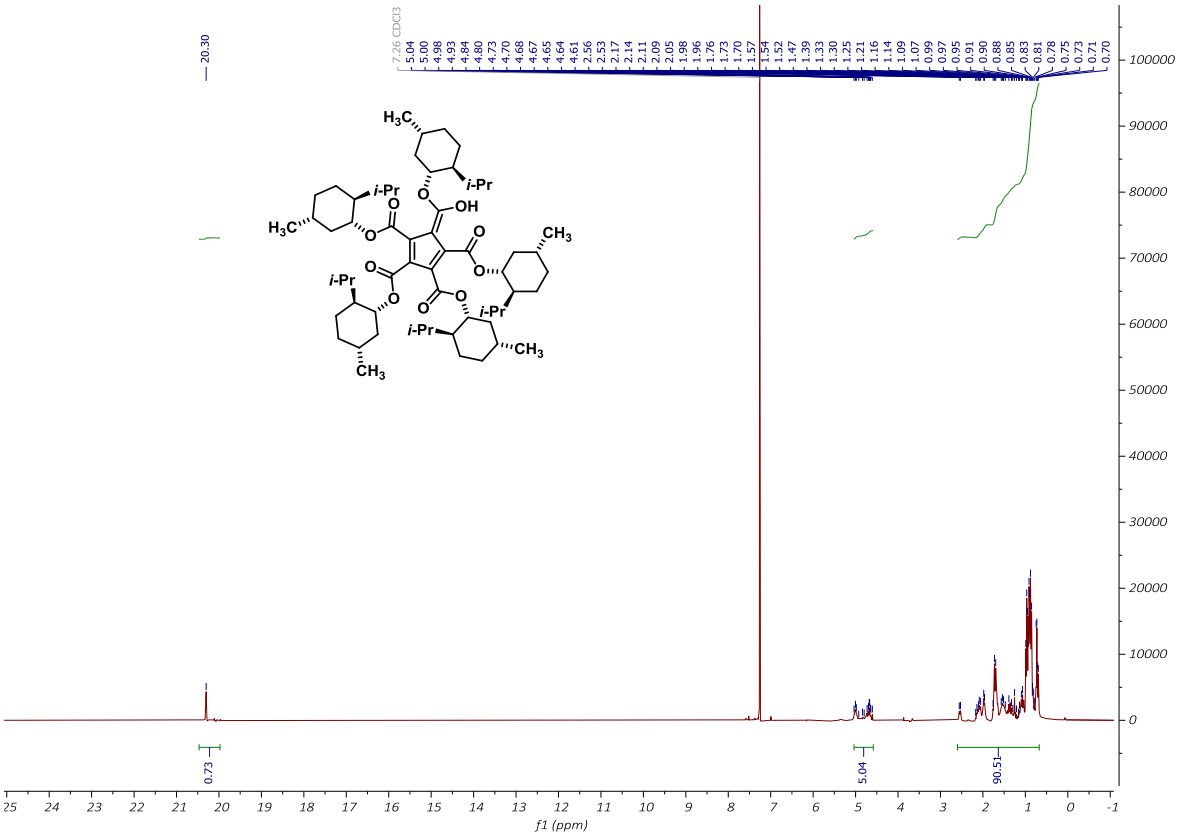
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **1q**.



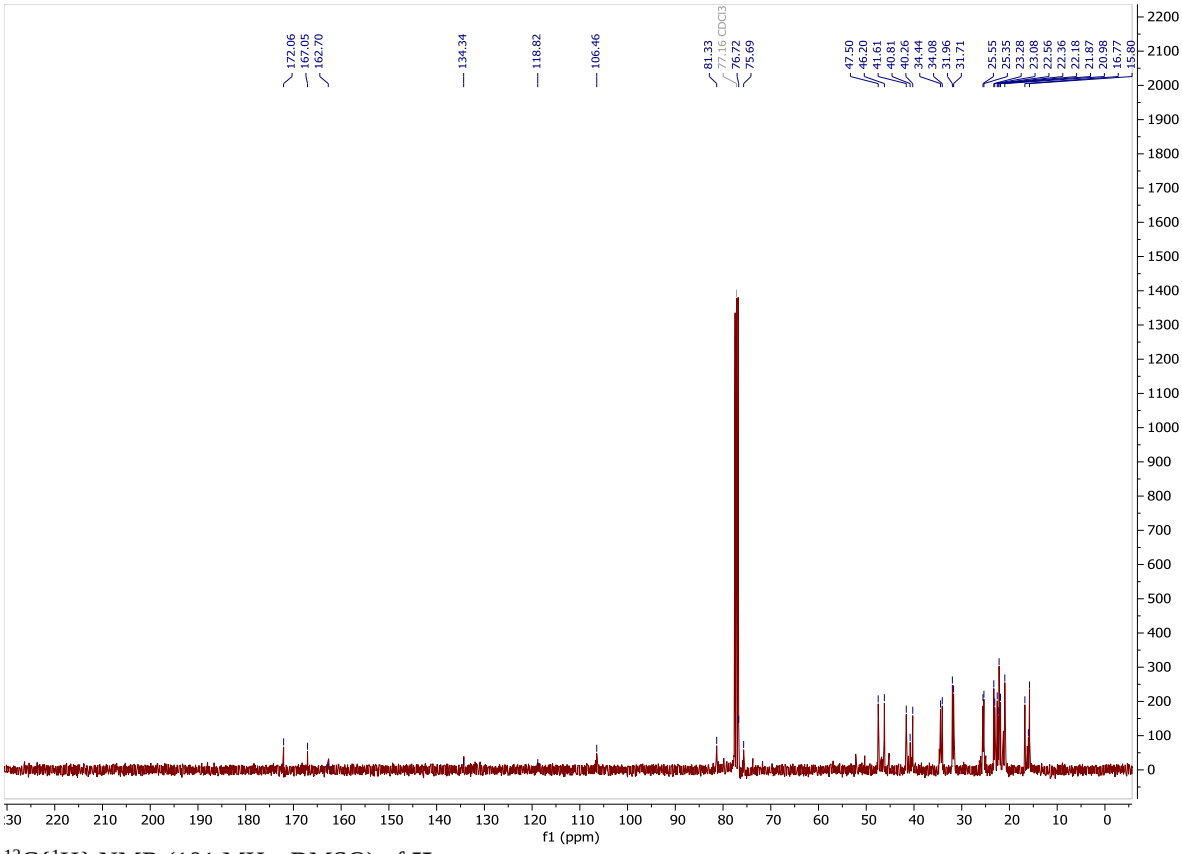
^{1}H NMR (400 MHz, DMSO) of **I**.



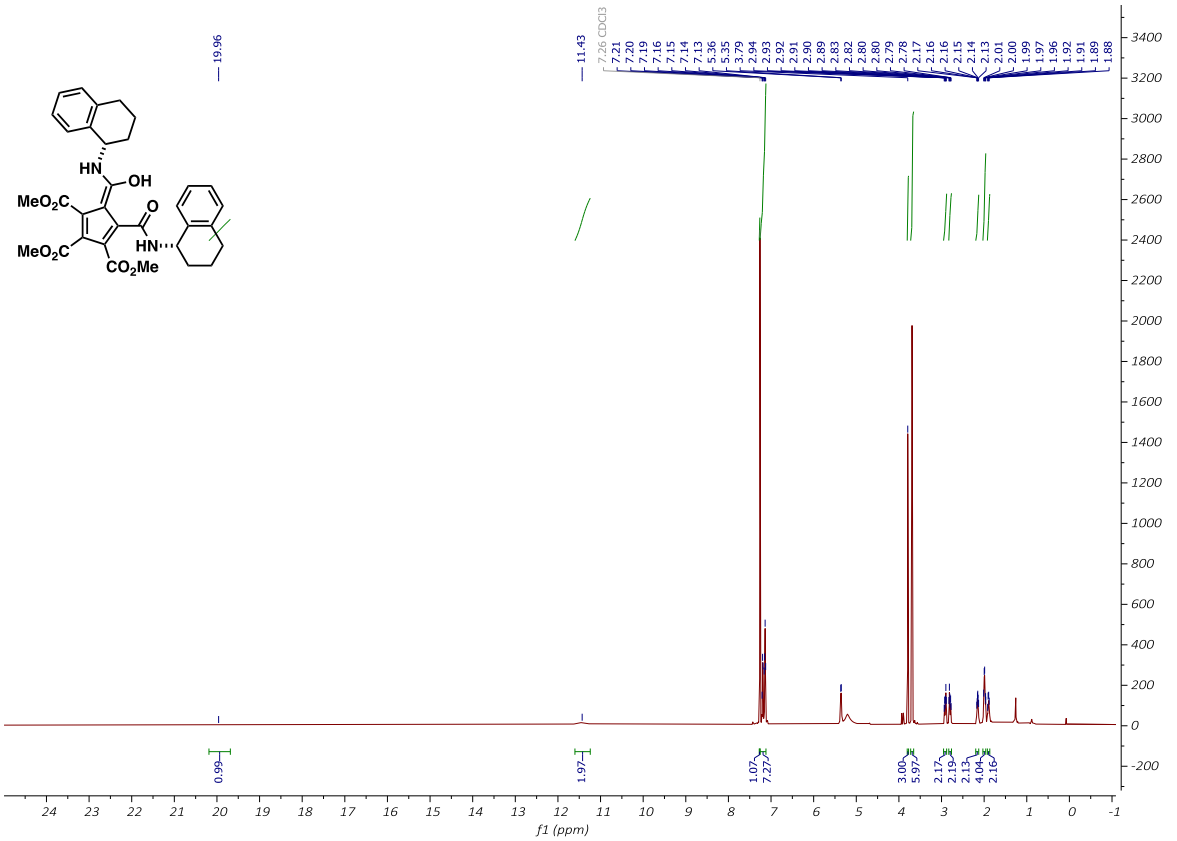
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **I**.



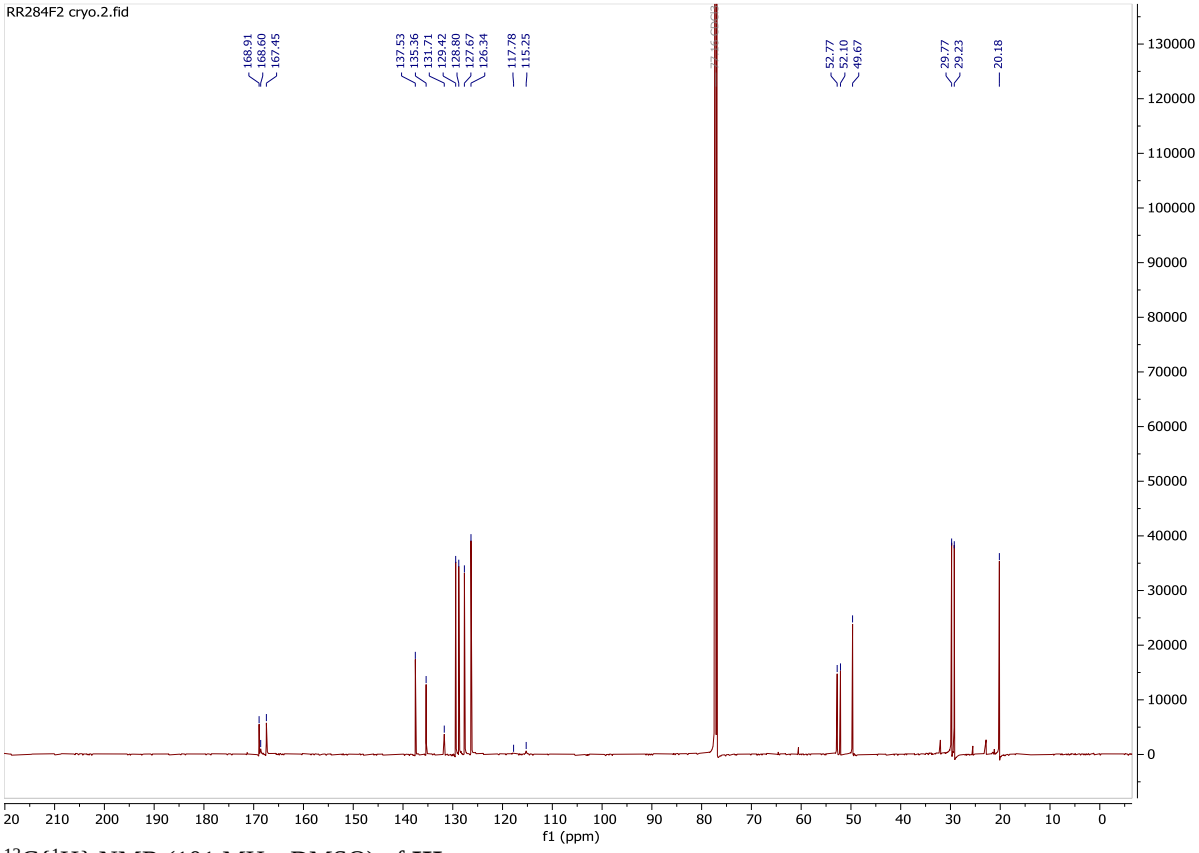
^{1}H NMR (400 MHz, DMSO) of **II**.



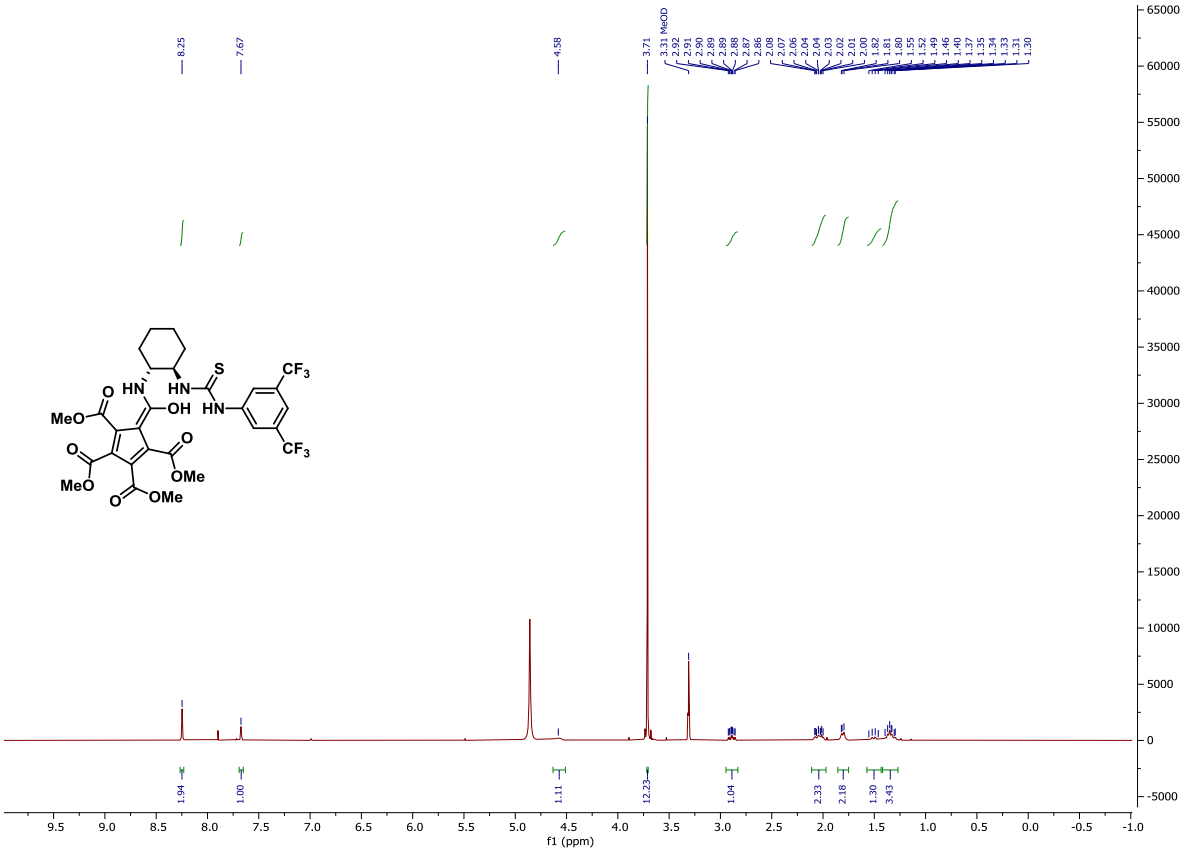
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **II**.



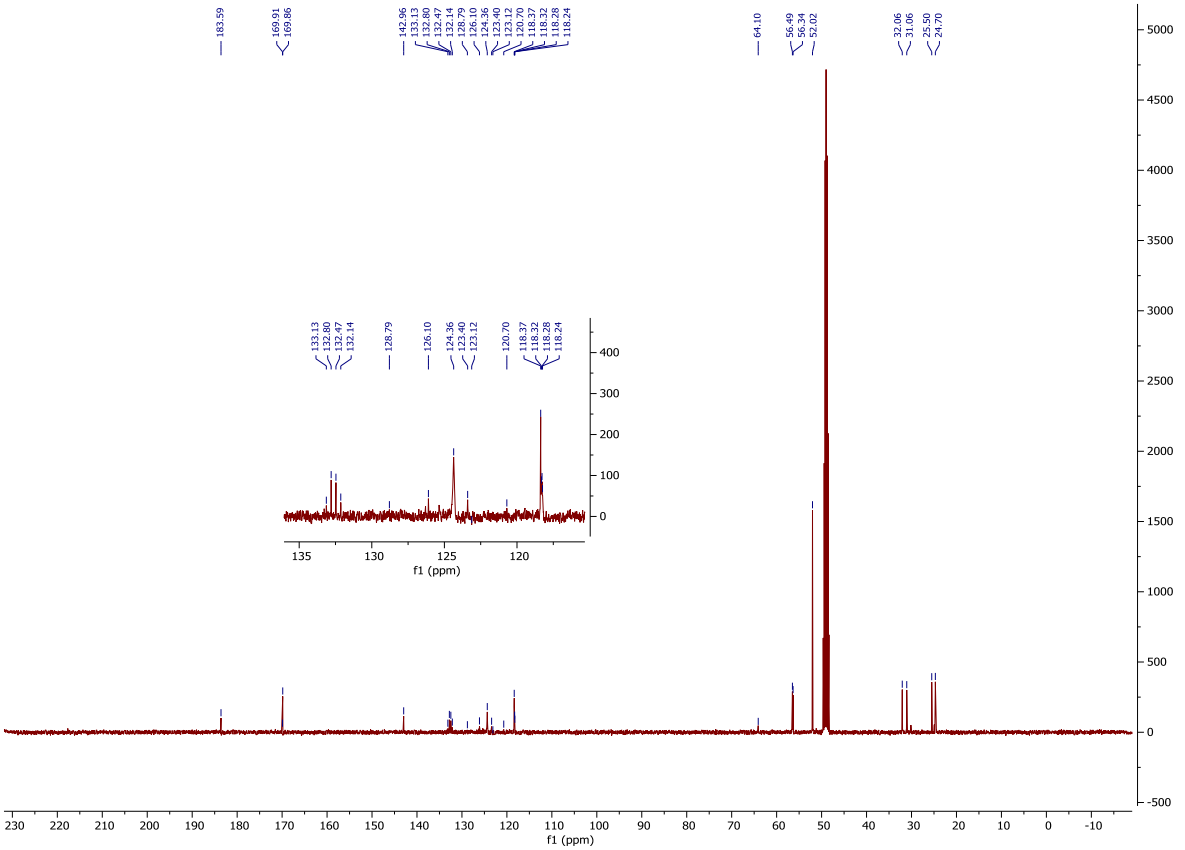
^{1}H NMR (400 MHz, DMSO) of **III**.



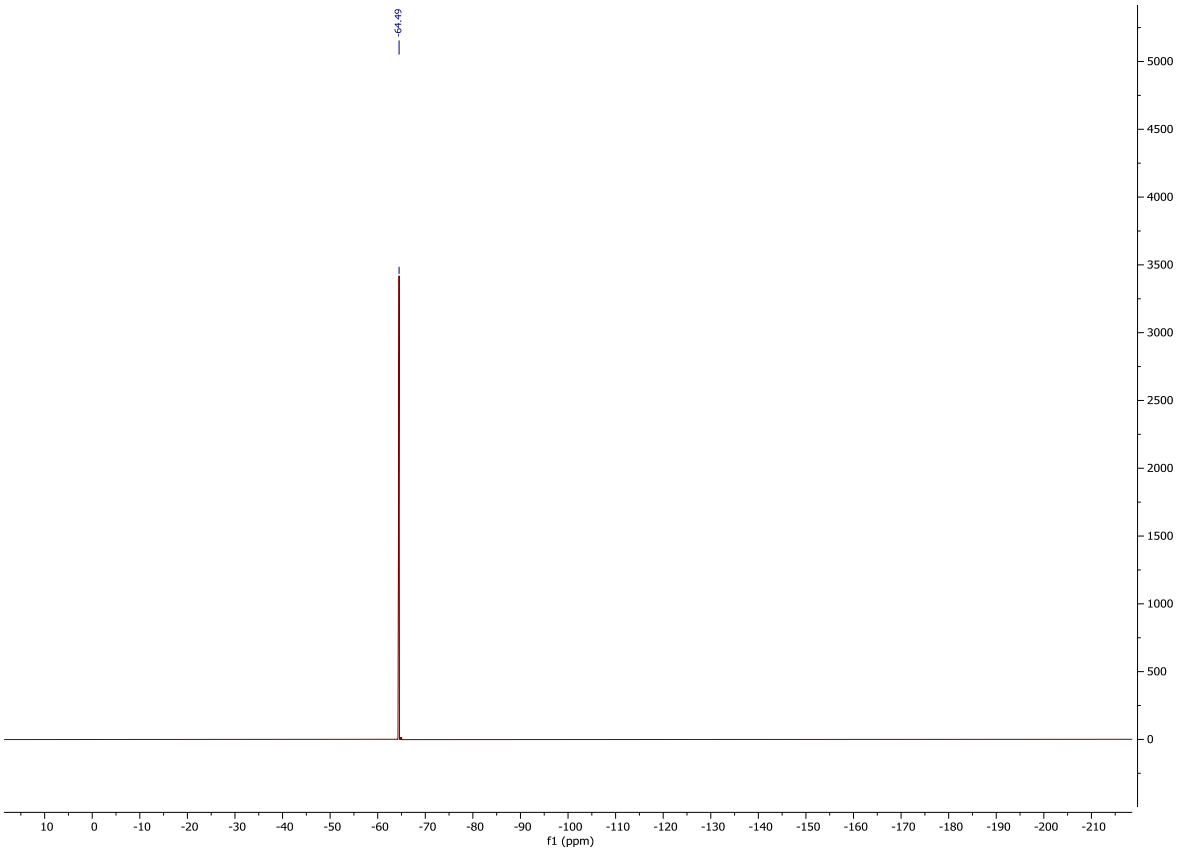
^{13}C{^{1}H} NMR (101 MHz, DMSO) of **III**.



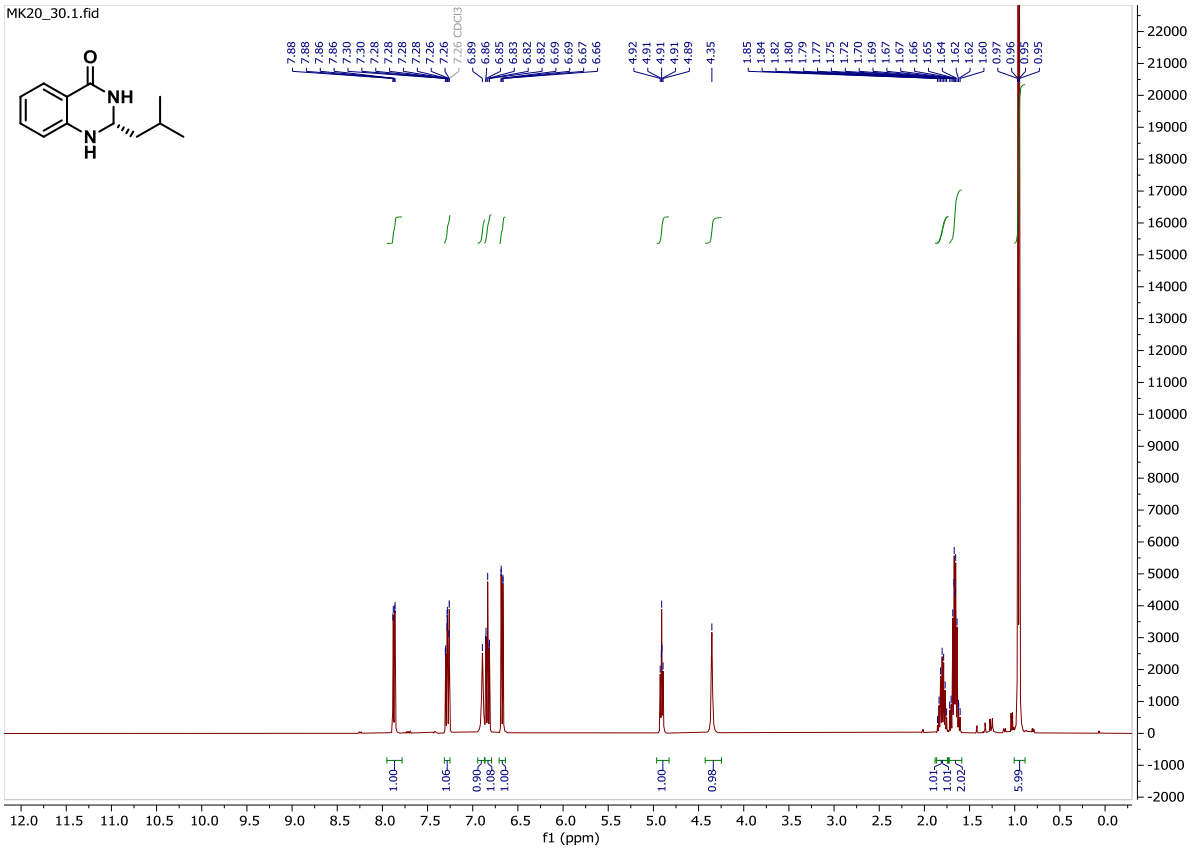
^{1}H NMR (400 MHz, MeOD) of **IV**.



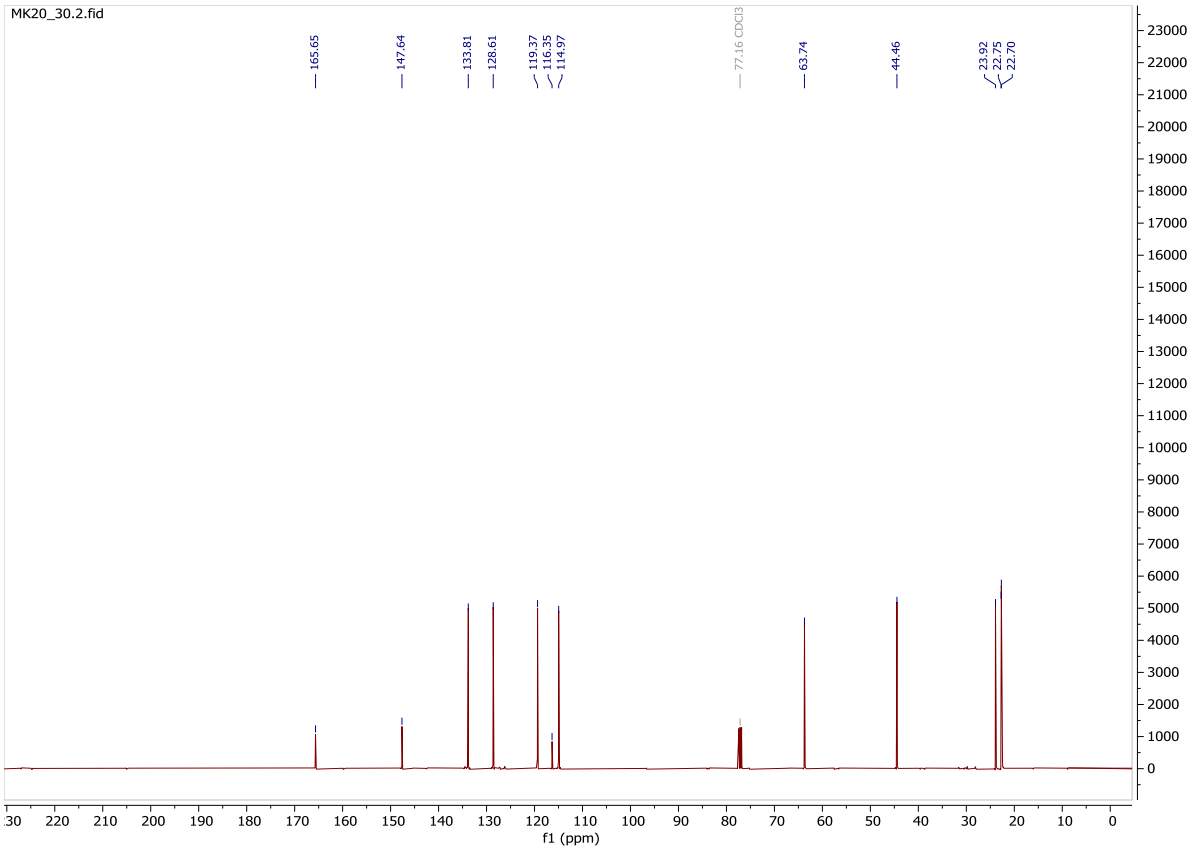
^{13}C{^{1}H} NMR (101 MHz, MeOD) of **IV**.



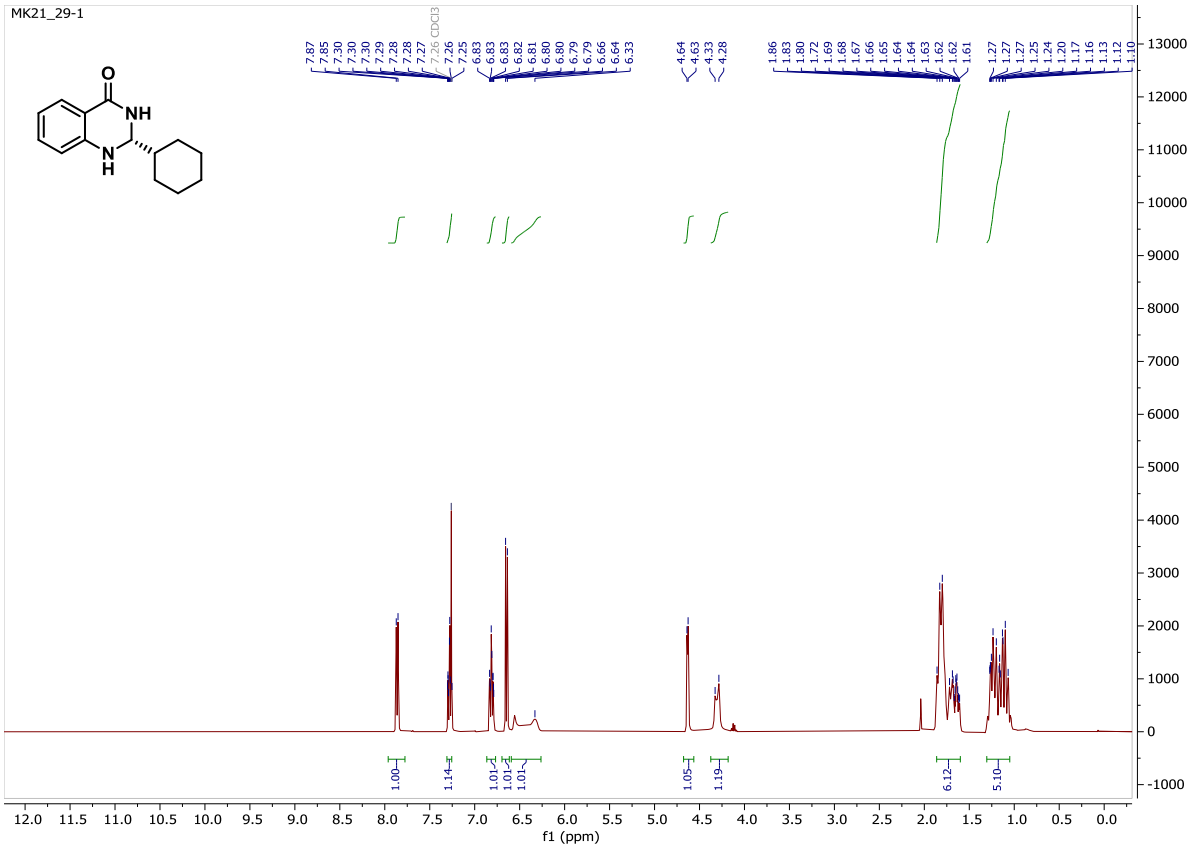
^{19}F NMR (376 MHz, MeOD) of **IV**.



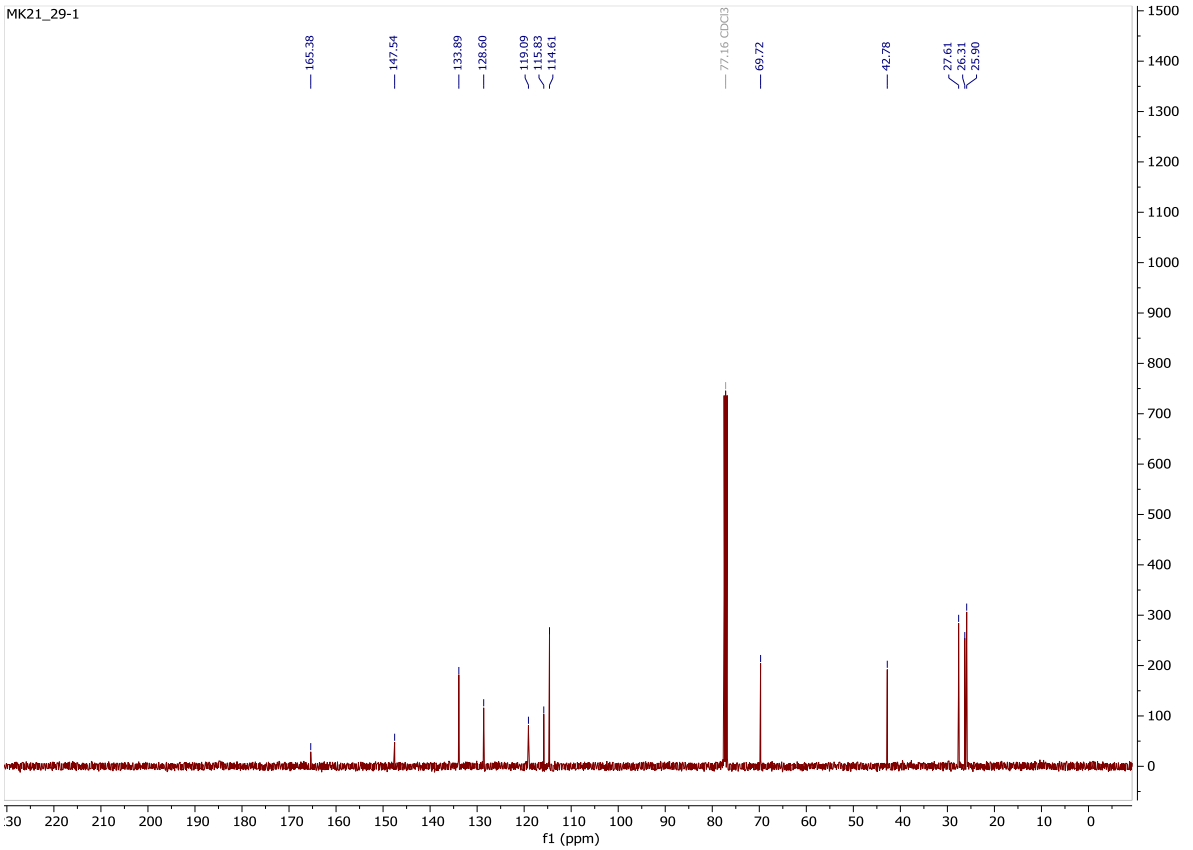
^{1}H NMR (400 MHz, $CDCl_3$) of **3a**.



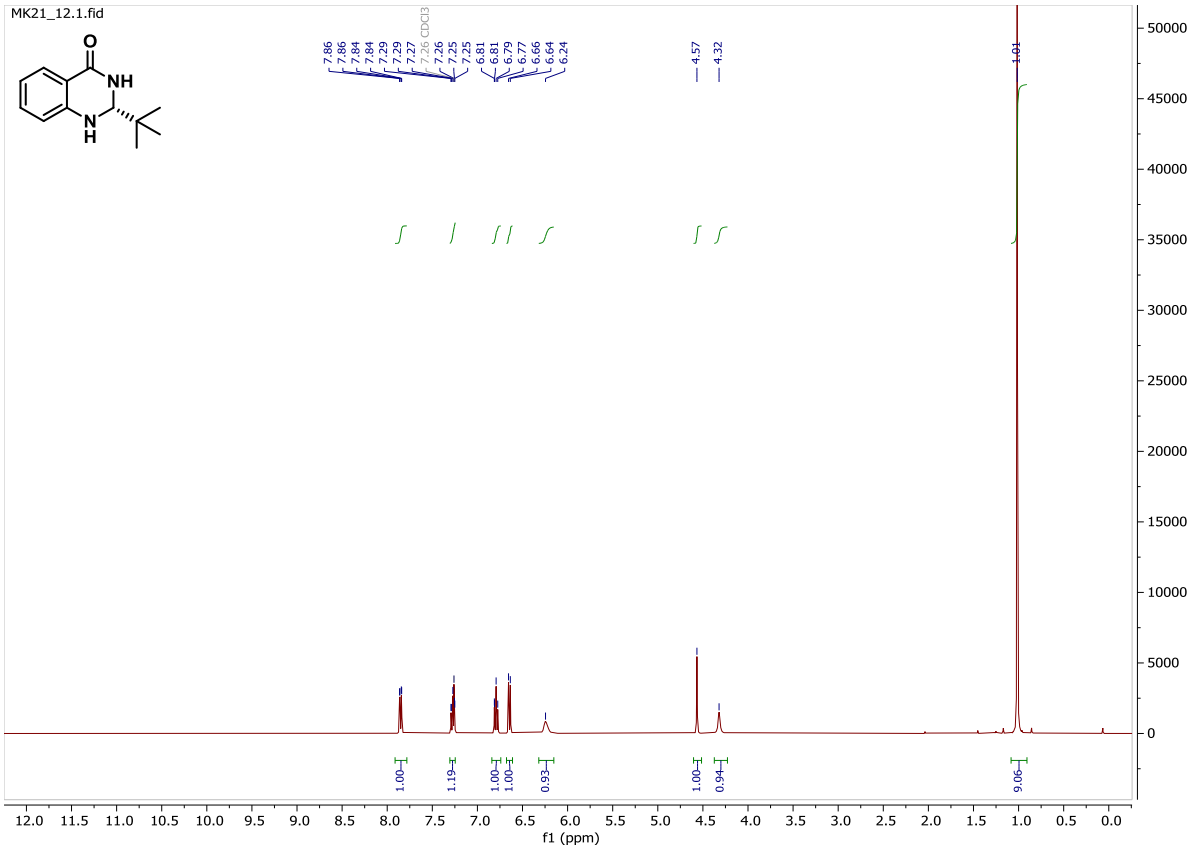
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3a**.



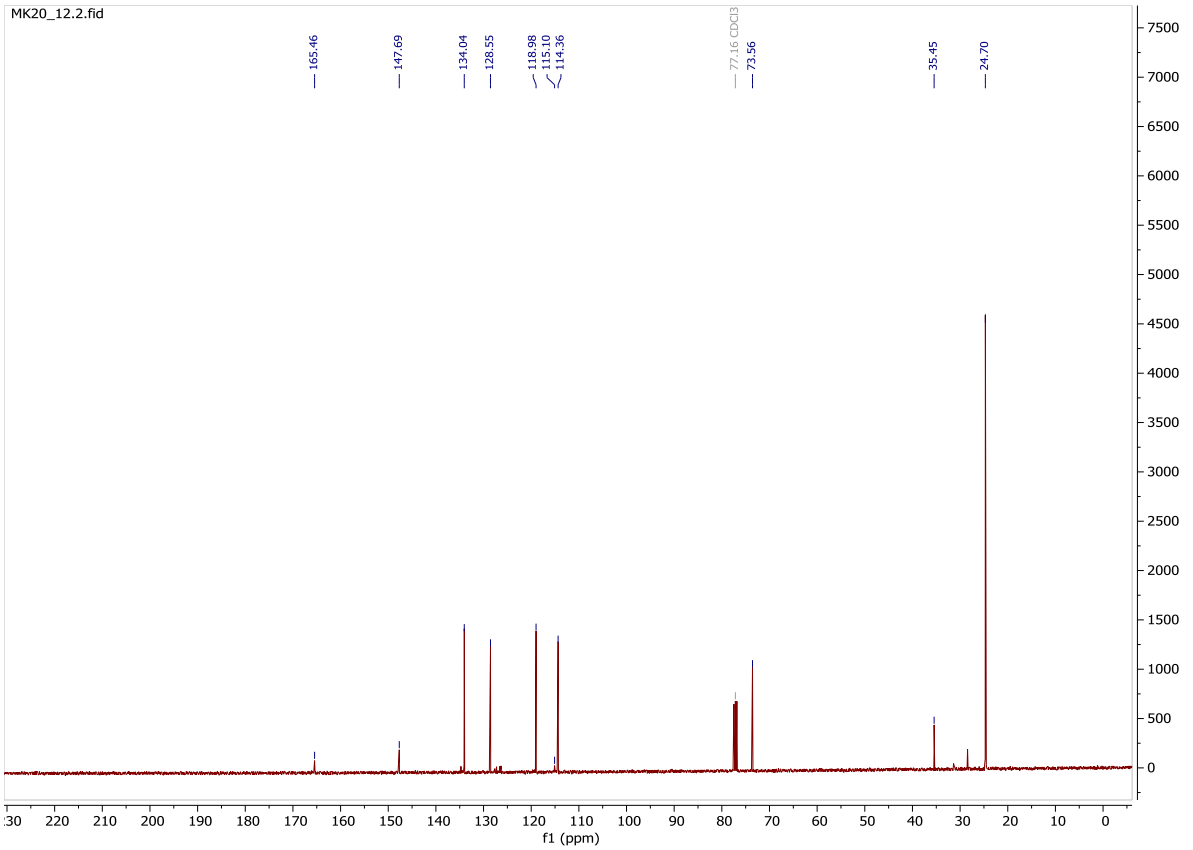
^{1}H NMR (400 MHz, $CDCl_3$) of **3b**.



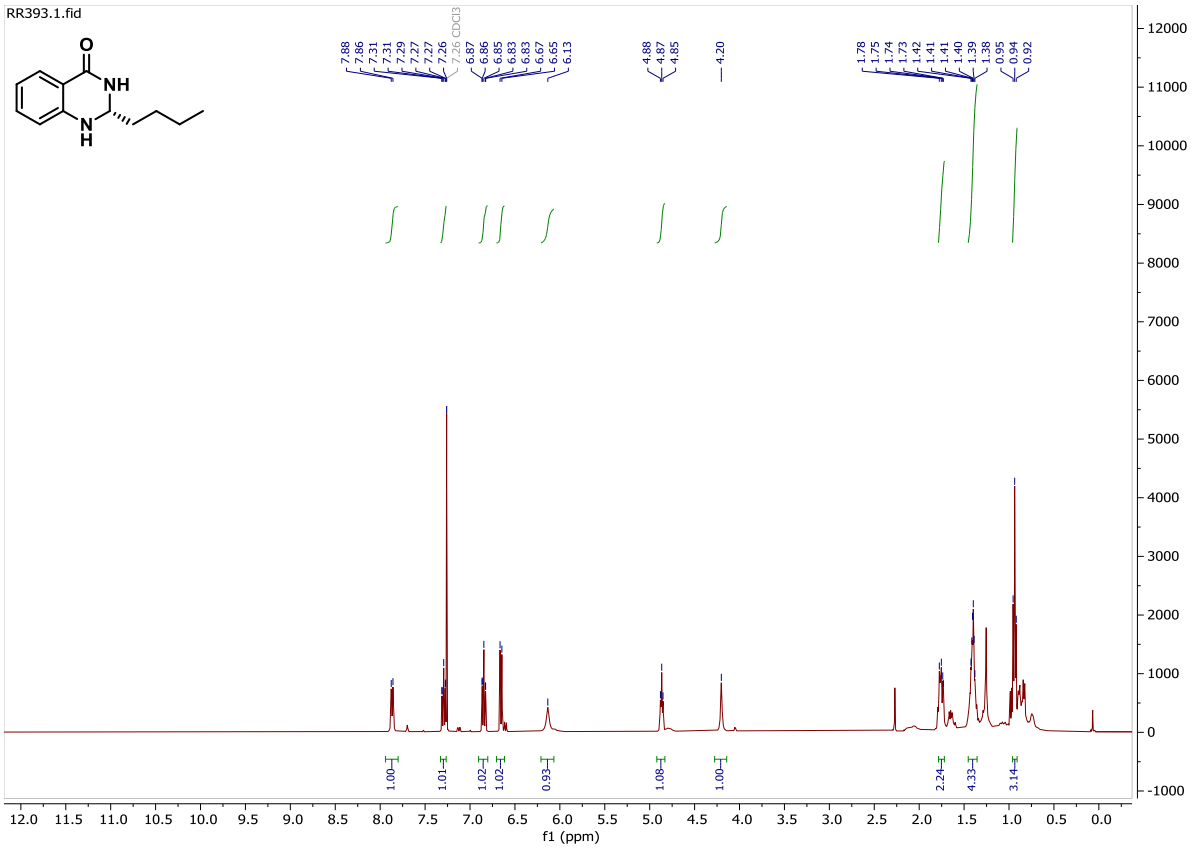
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3b**.



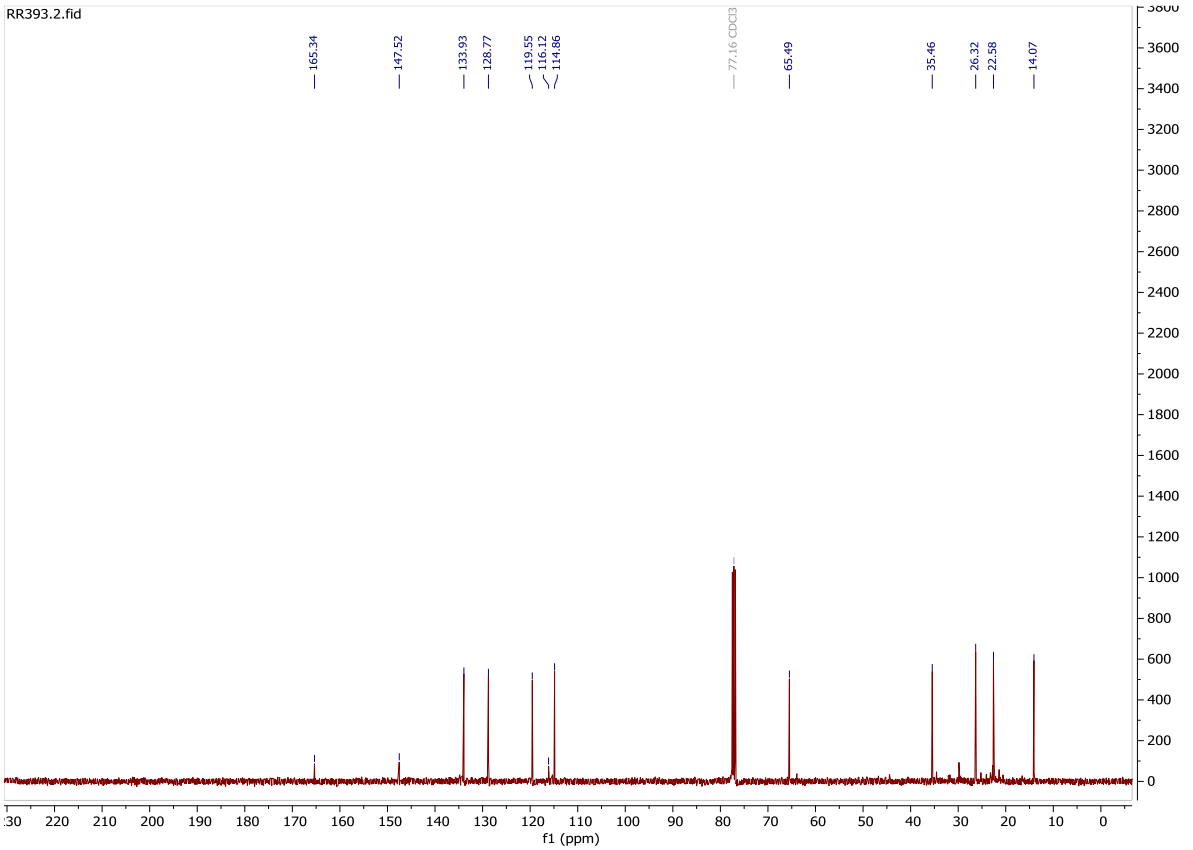
^{1}H NMR (400 MHz, $CDCl_3$) of **3c**.



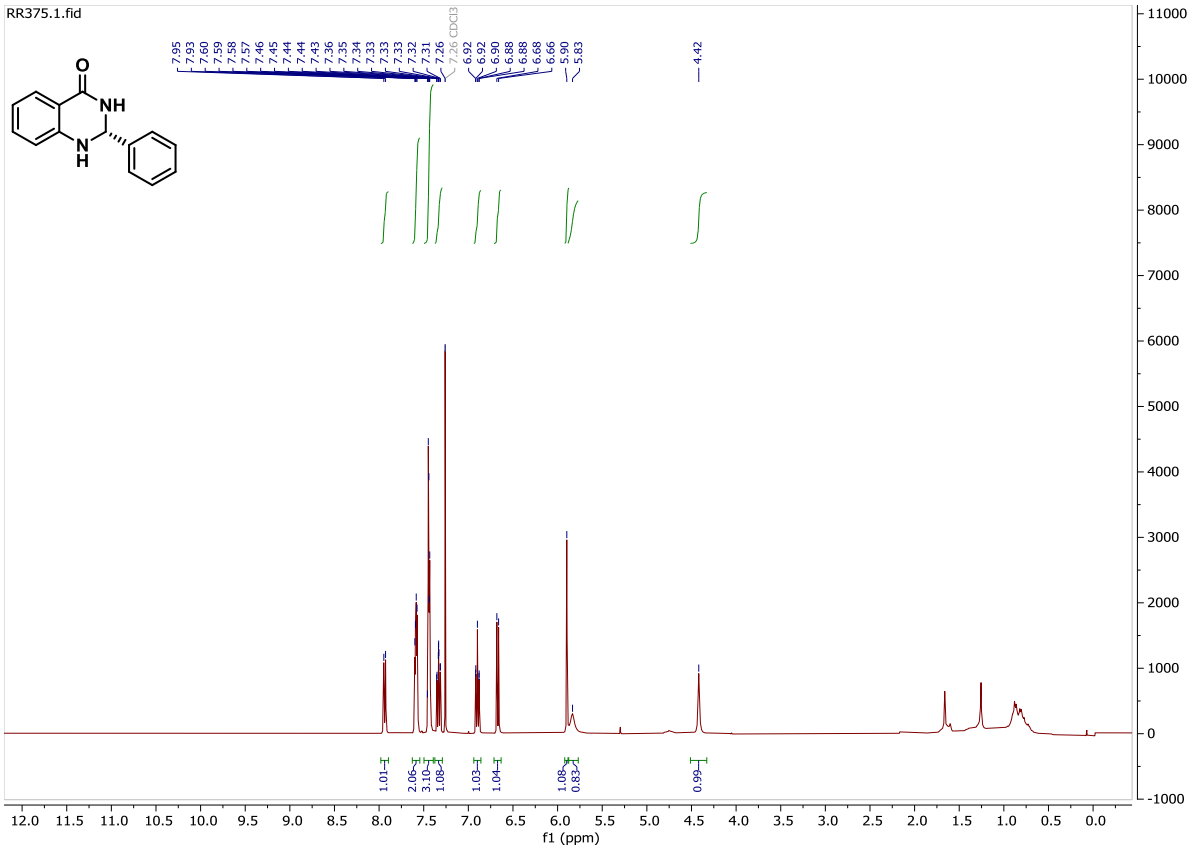
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3c**.



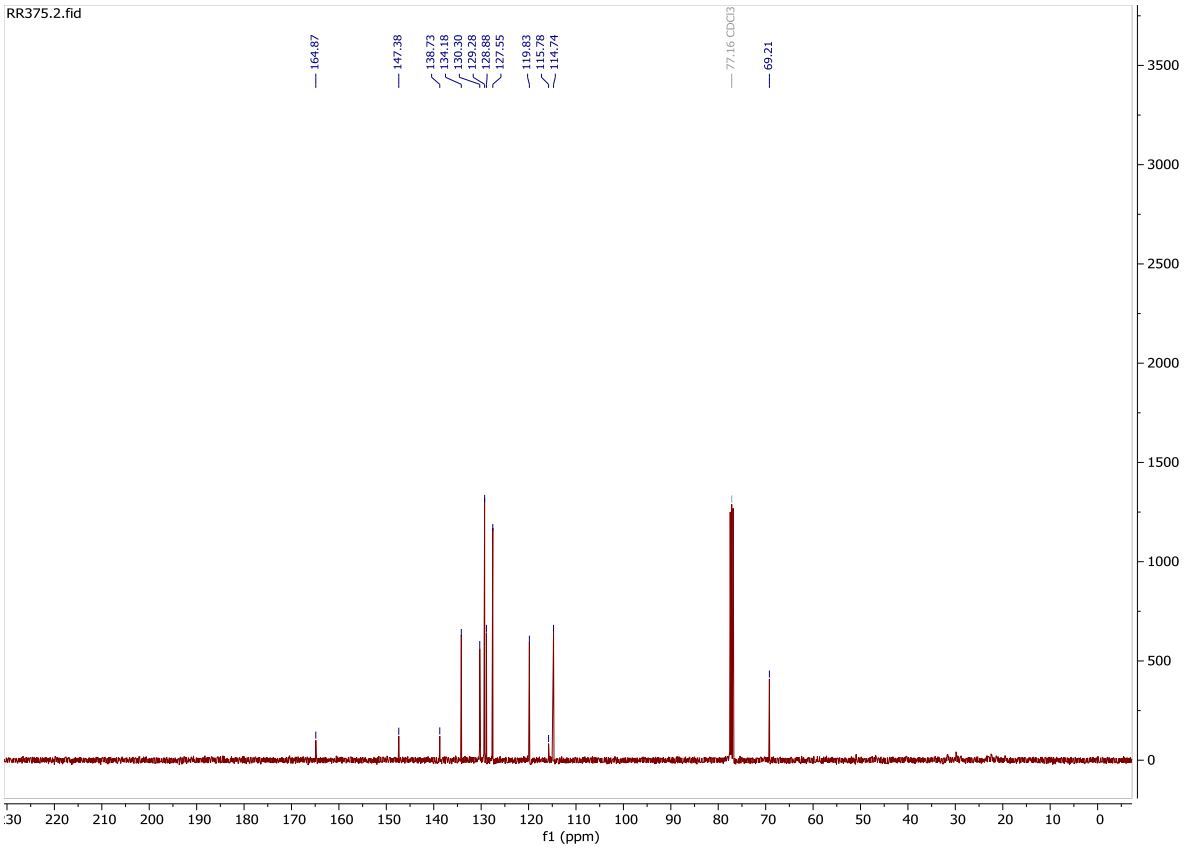
^{1}H NMR (400 MHz, $CDCl_3$) of **3d**.



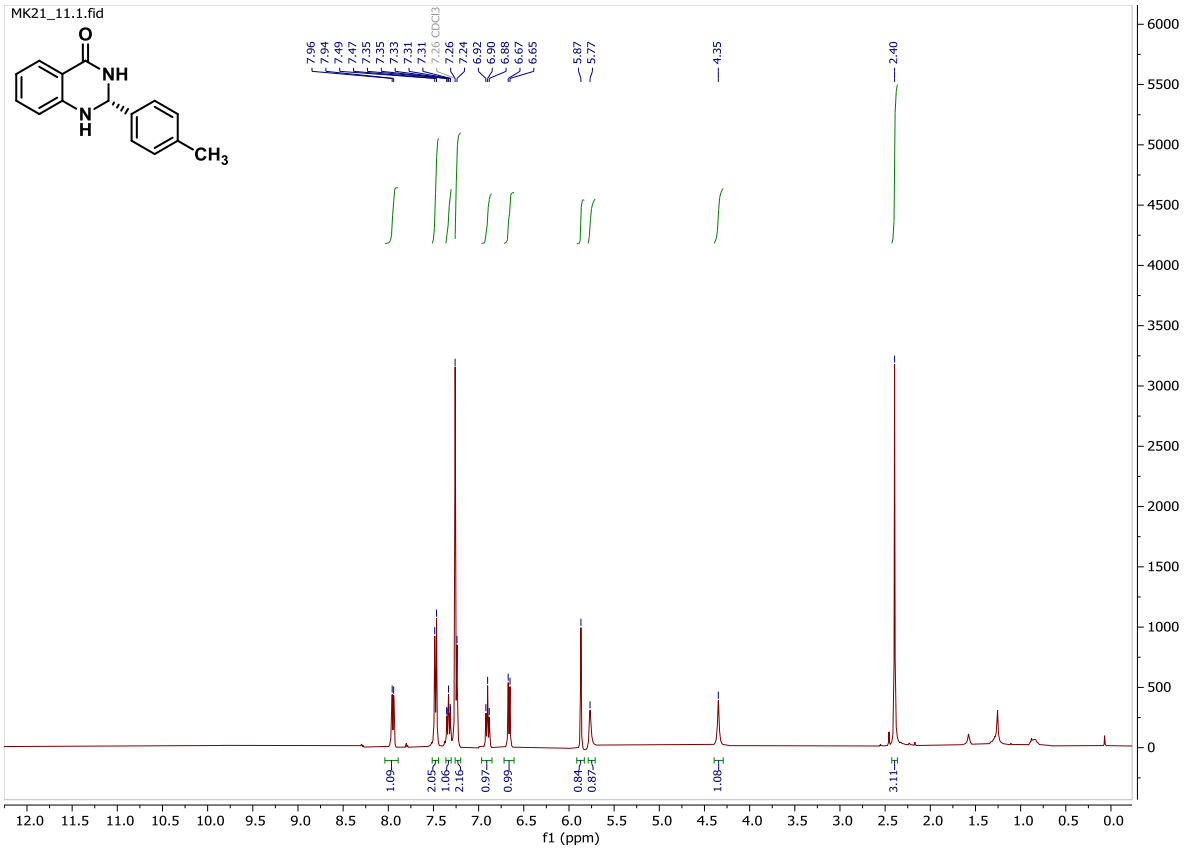
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3d**.



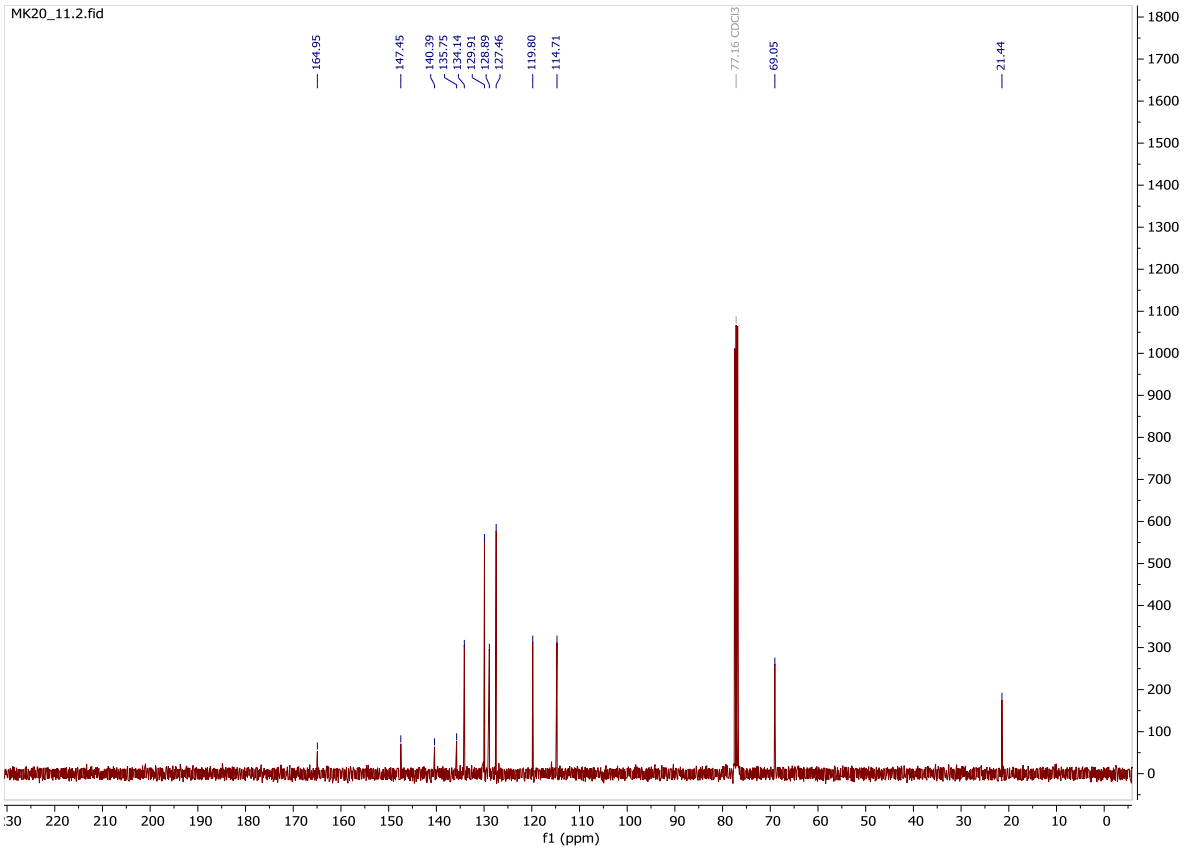
^{1}H NMR (400 MHz, $CDCl_3$) of **3e**.



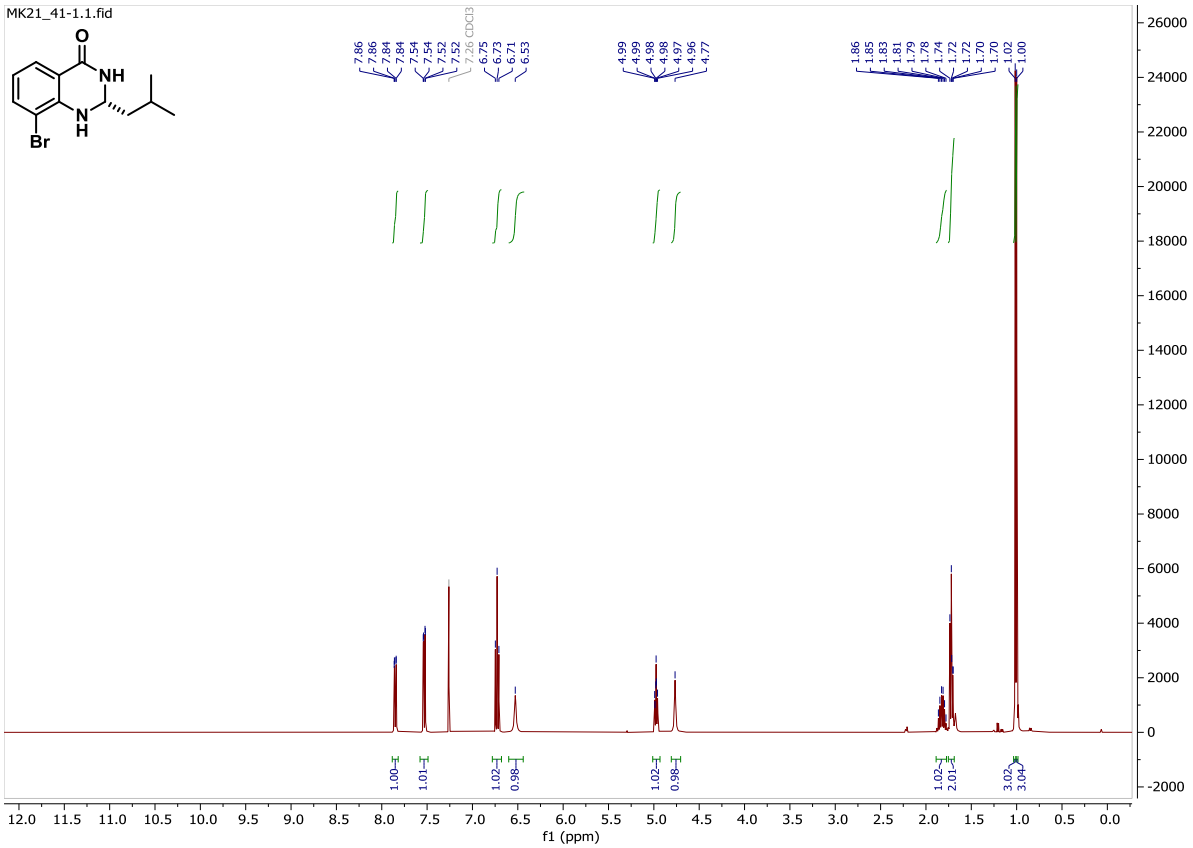
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3e**.



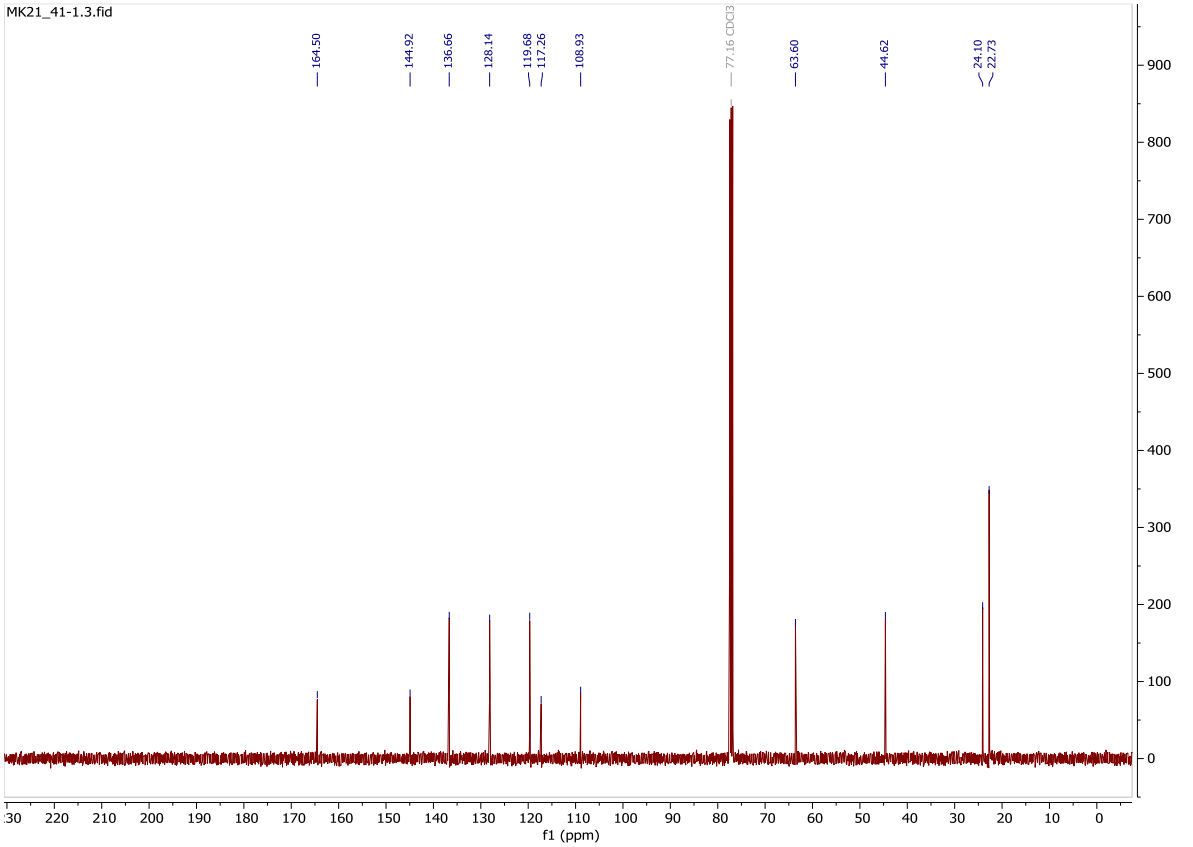
^{1}H NMR (400 MHz, $CDCl_3$) of **3f**.



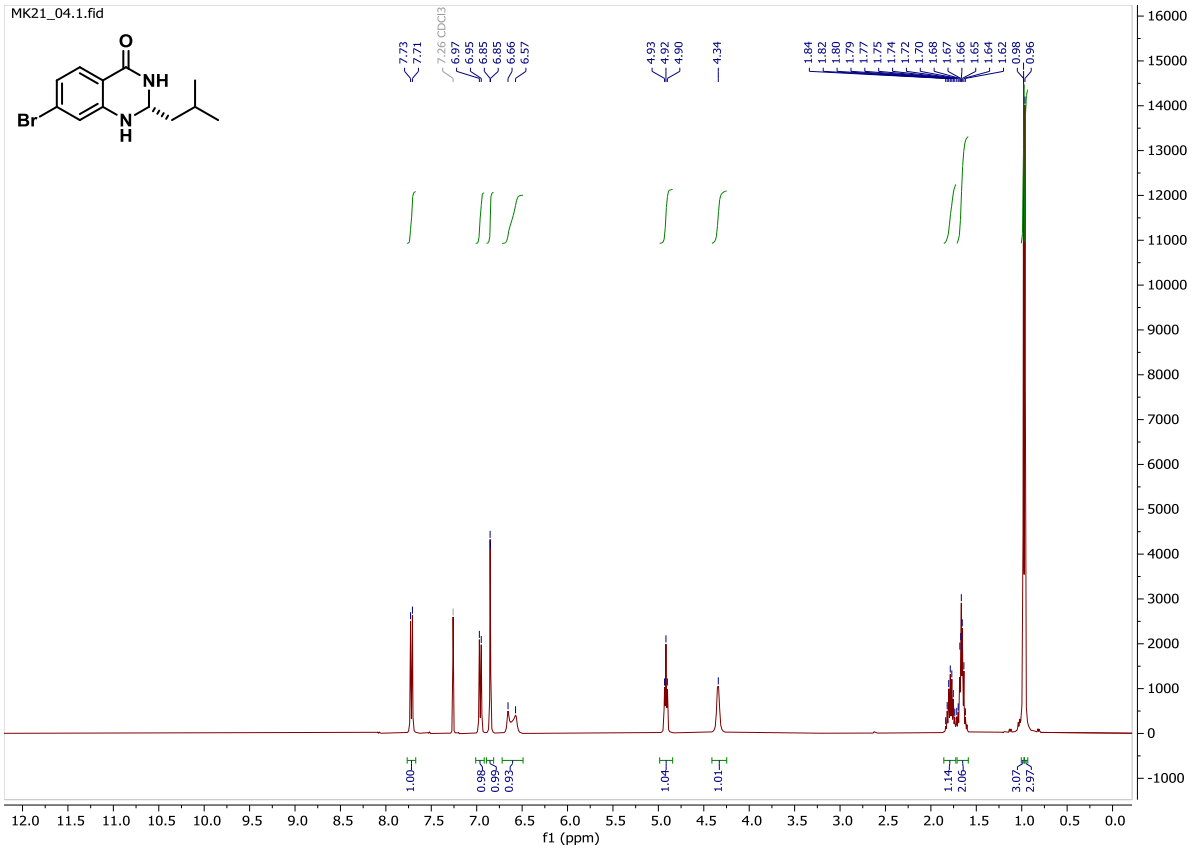
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3f**.



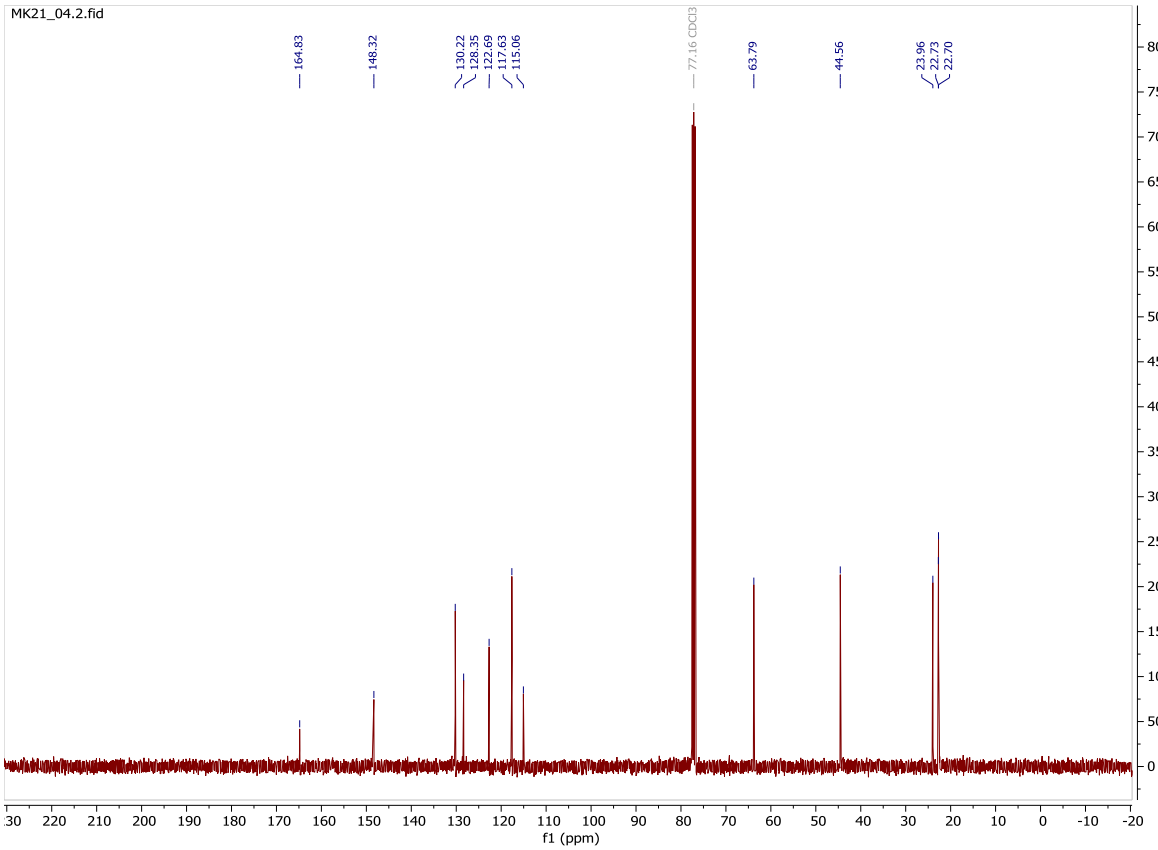
^{1}H NMR (400 MHz, $CDCl_3$) of **3g**.



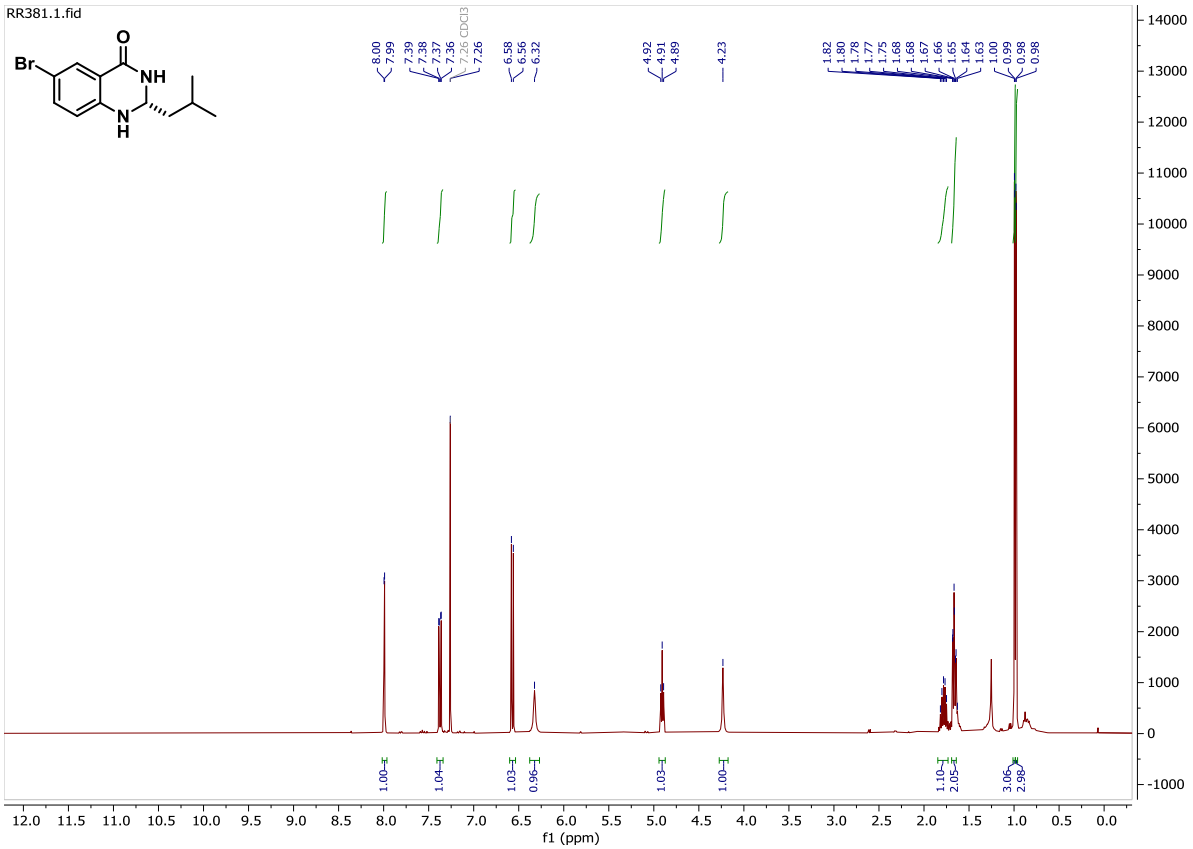
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3g**.



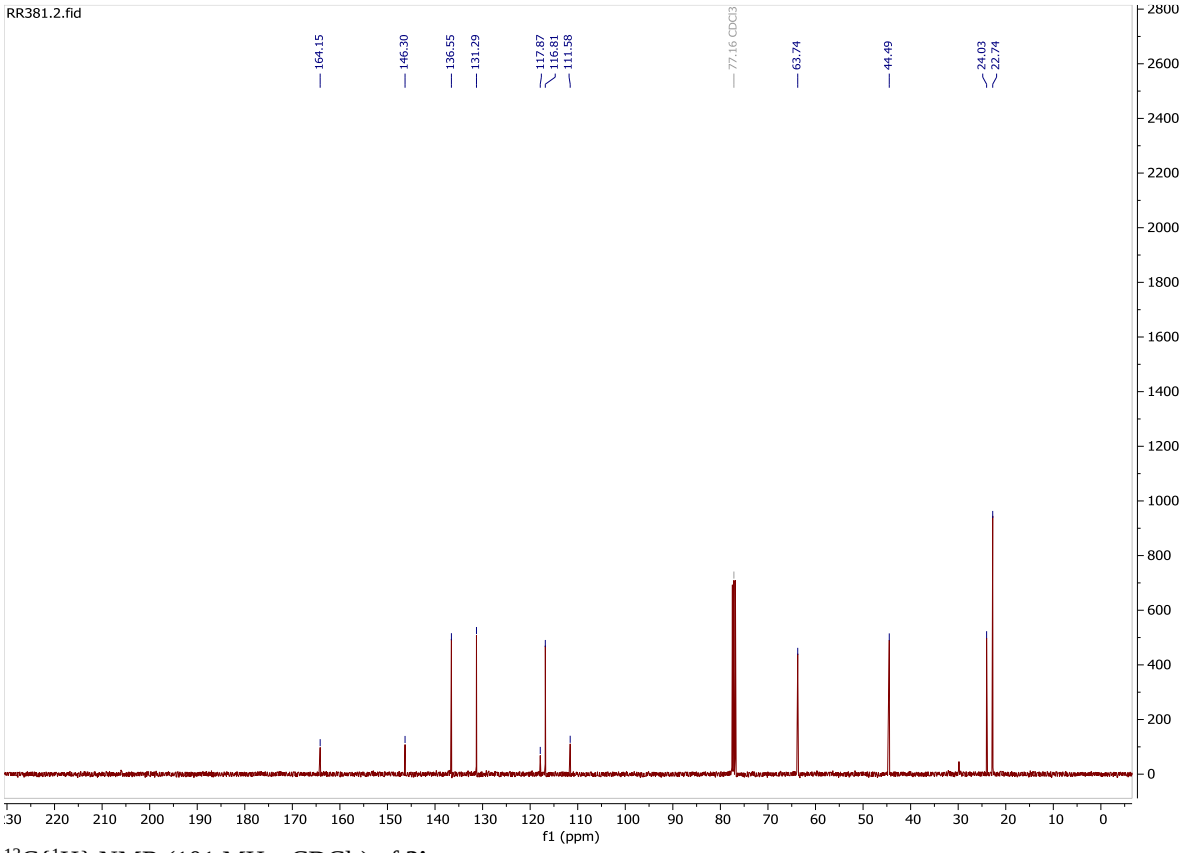
^{1}H NMR (400 MHz, $CDCl_3$) of **3h**.



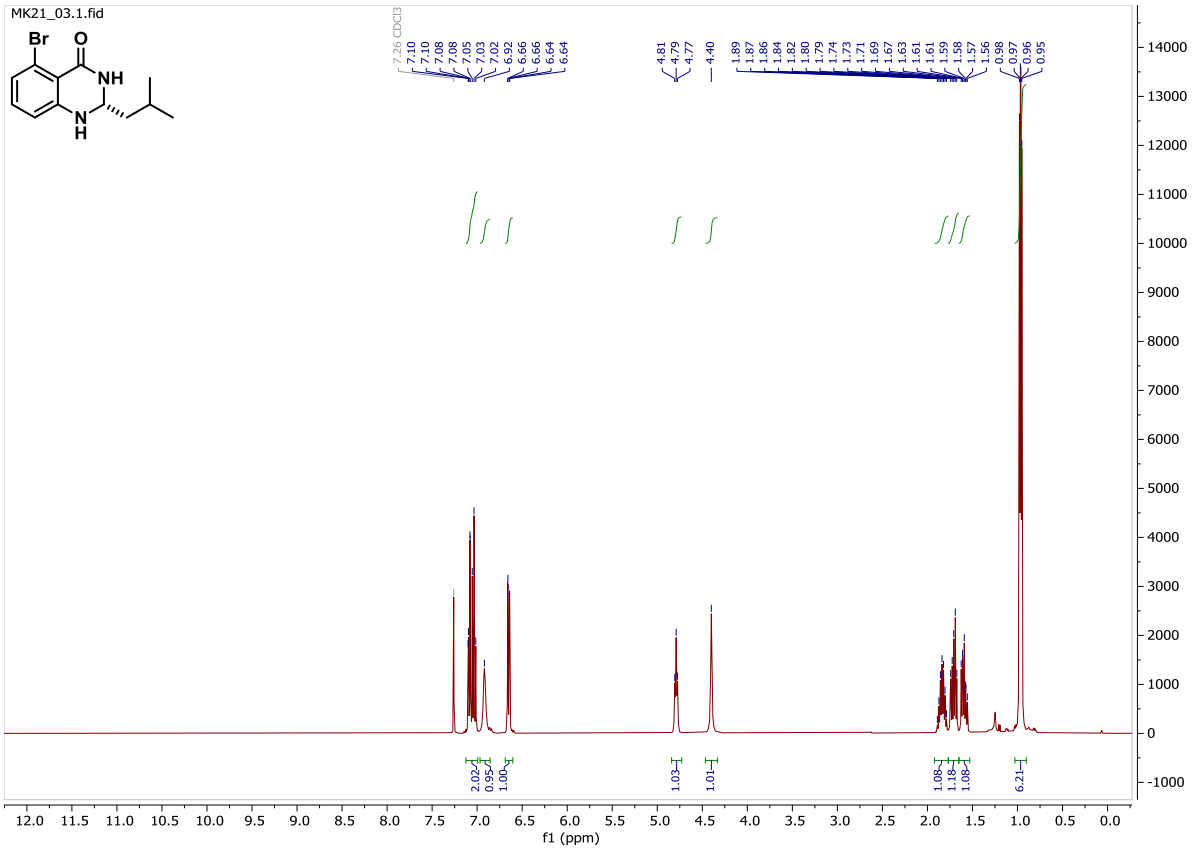
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3h**.



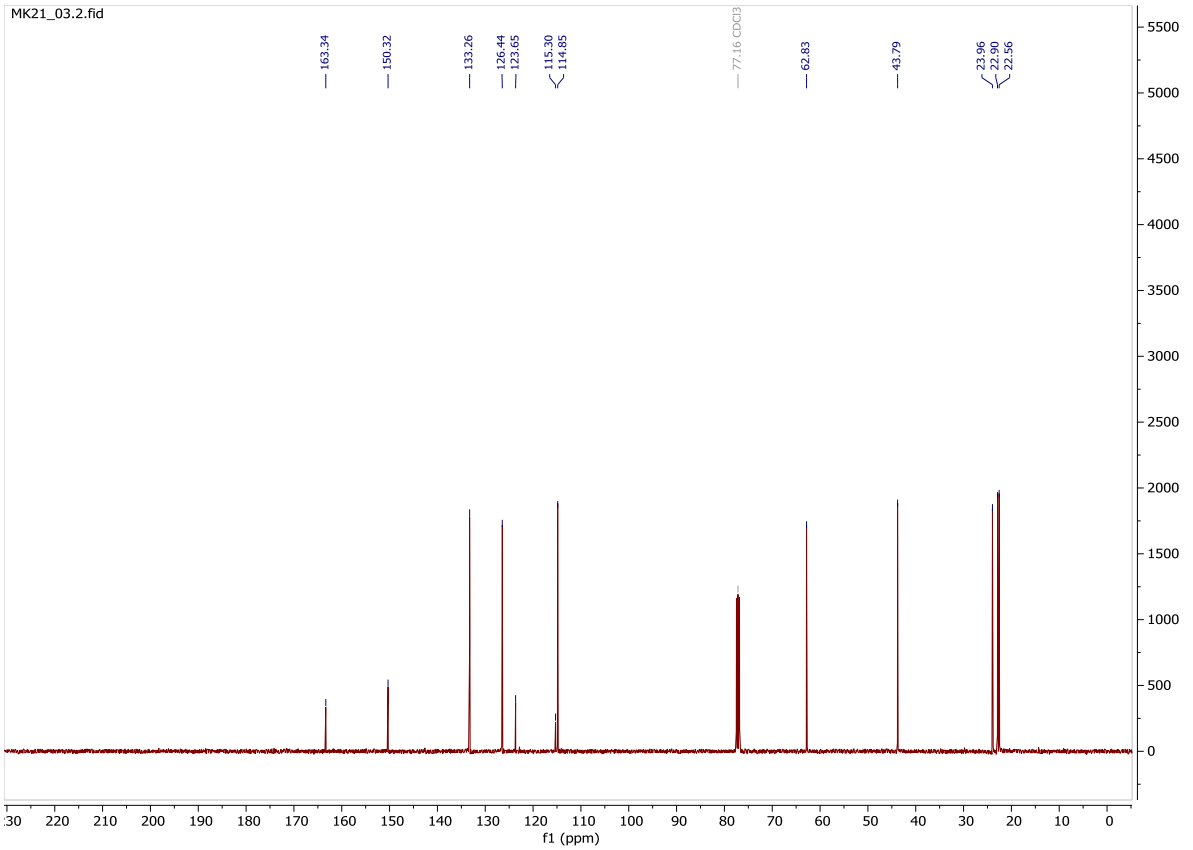
^{1}H NMR (400 MHz, $CDCl_3$) of **3i**.



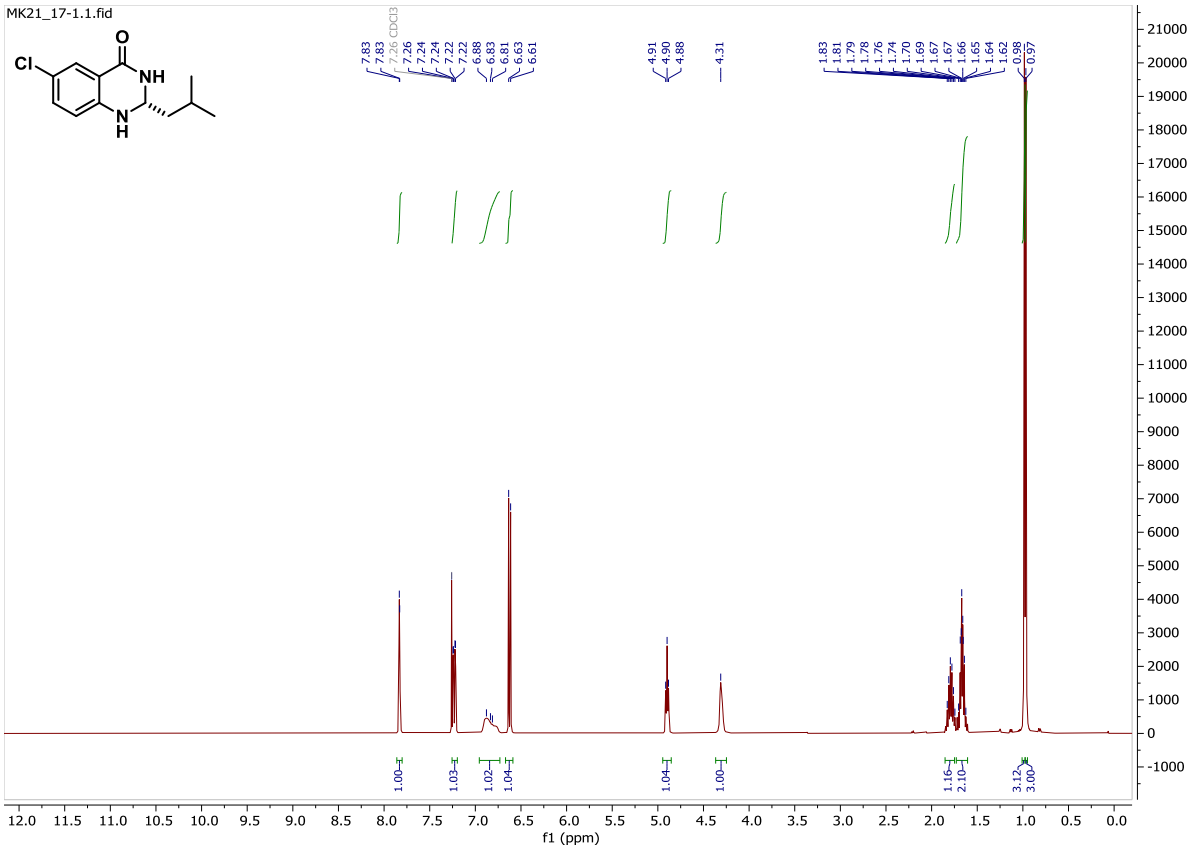
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3i**.



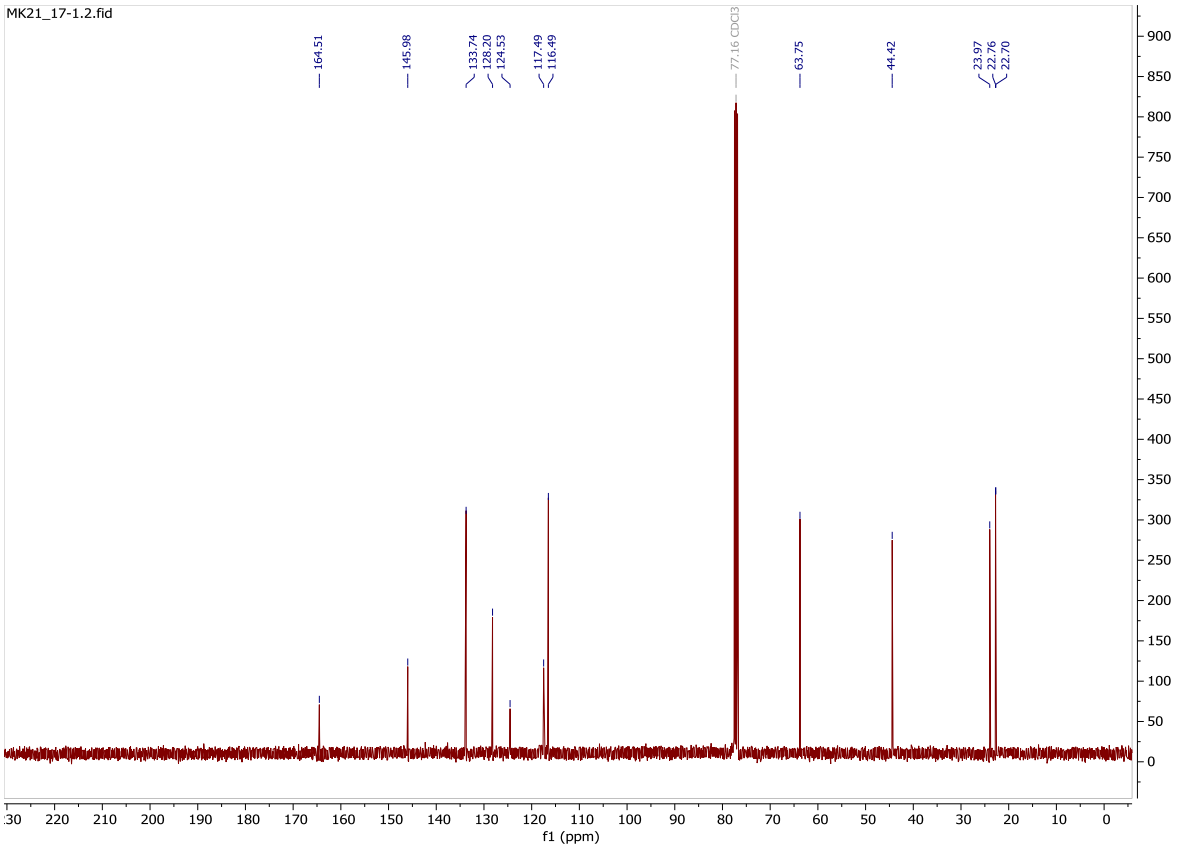
^{1}H NMR (400 MHz, $CDCl_3$) of **3j**.



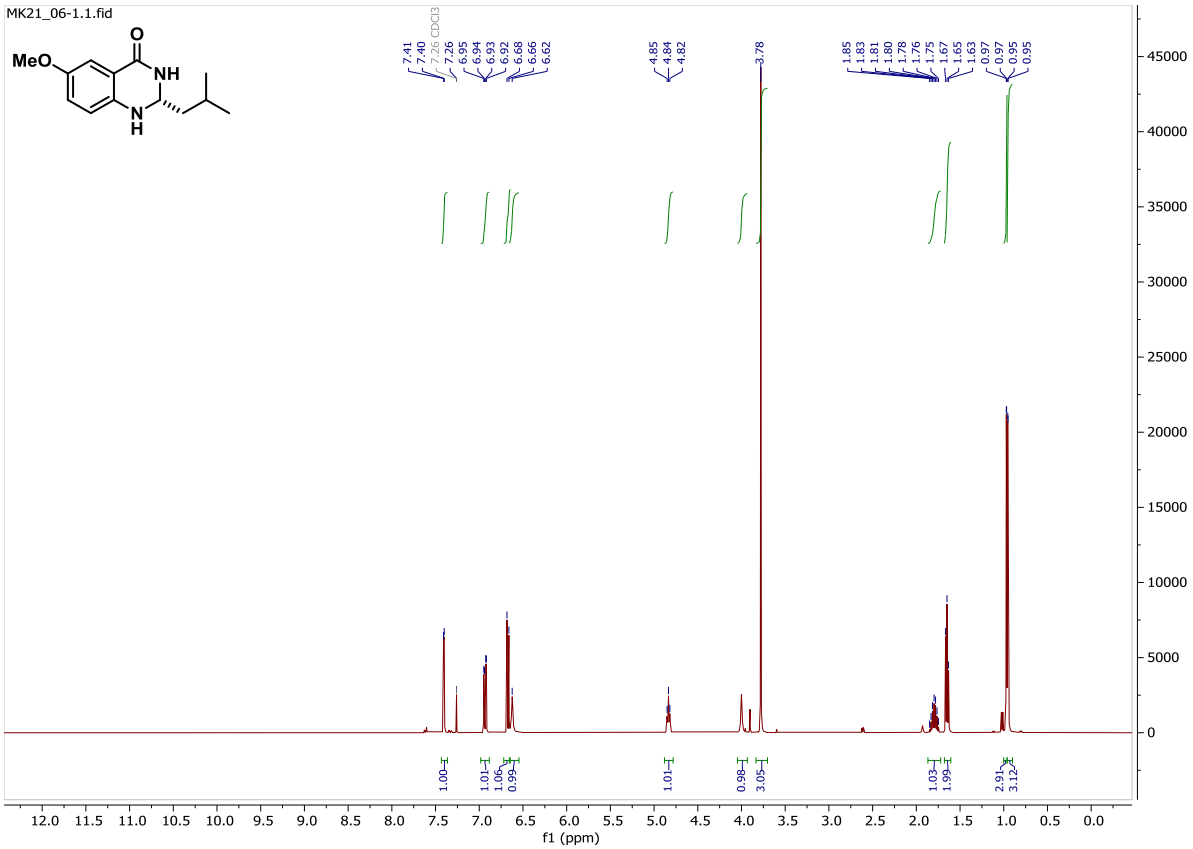
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3j**.



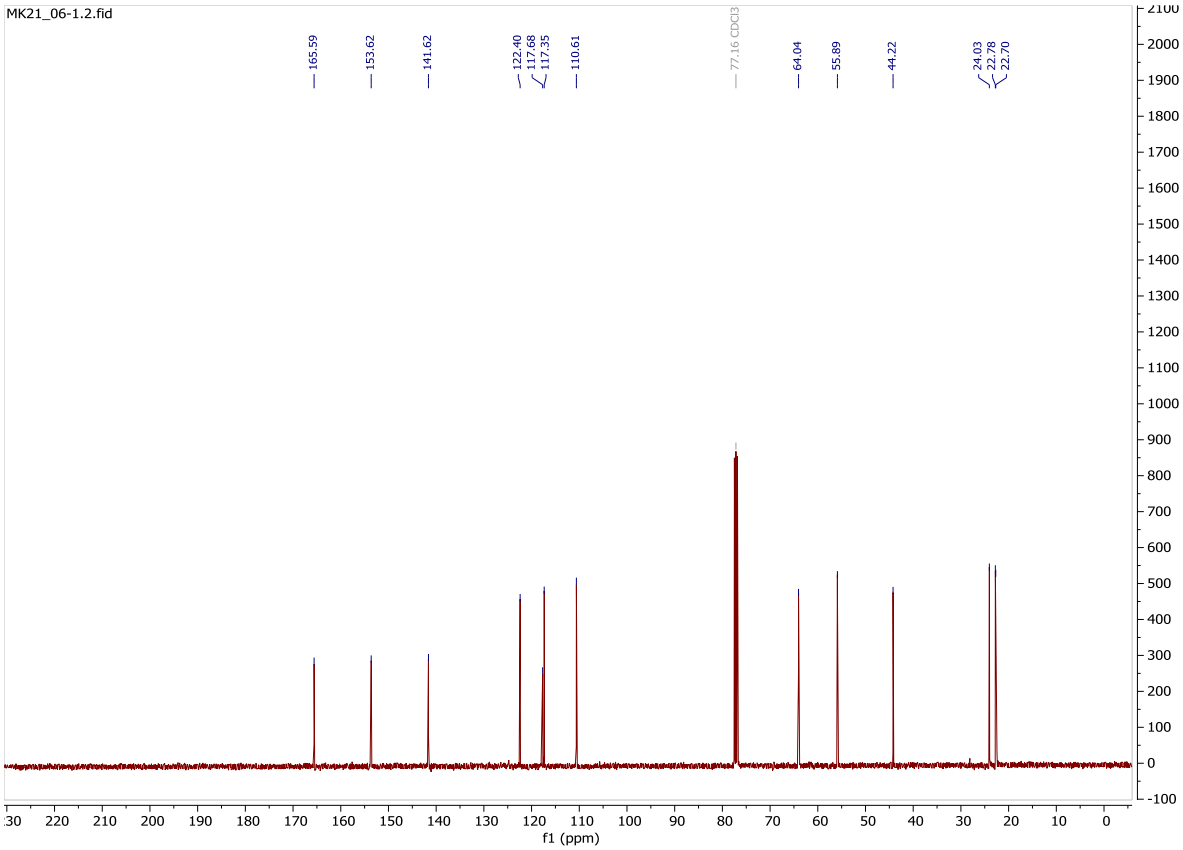
^{1}H NMR (400 MHz, $CDCl_3$) of **3k**.



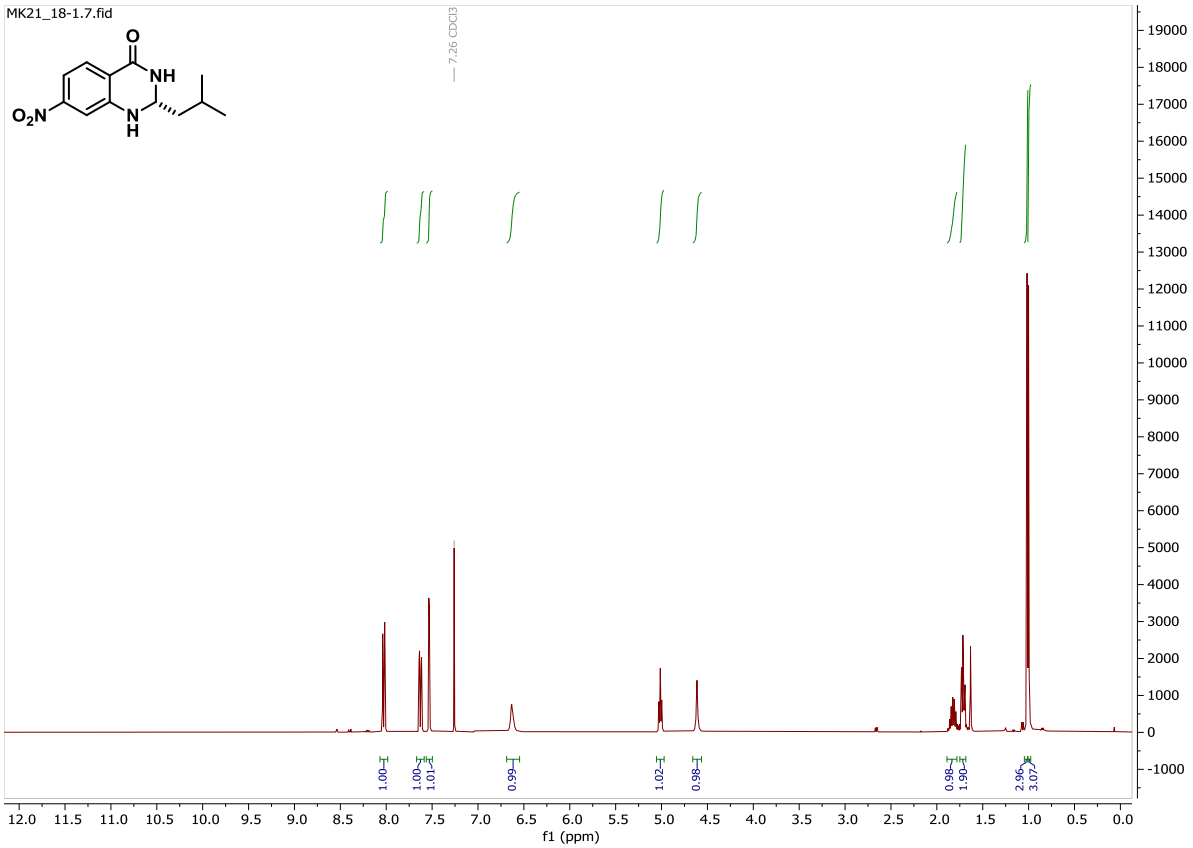
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3k**.



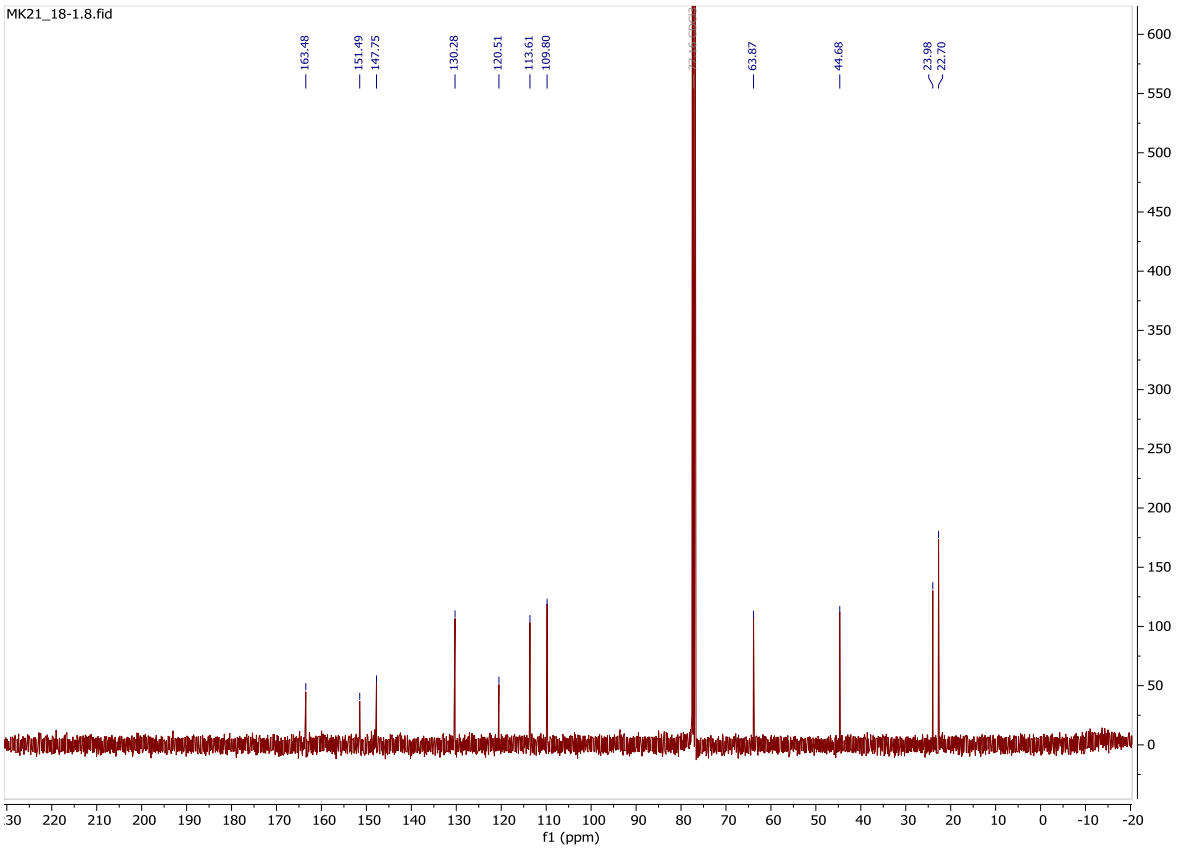
^{1}H NMR (400 MHz, $CDCl_3$) of **3l**.



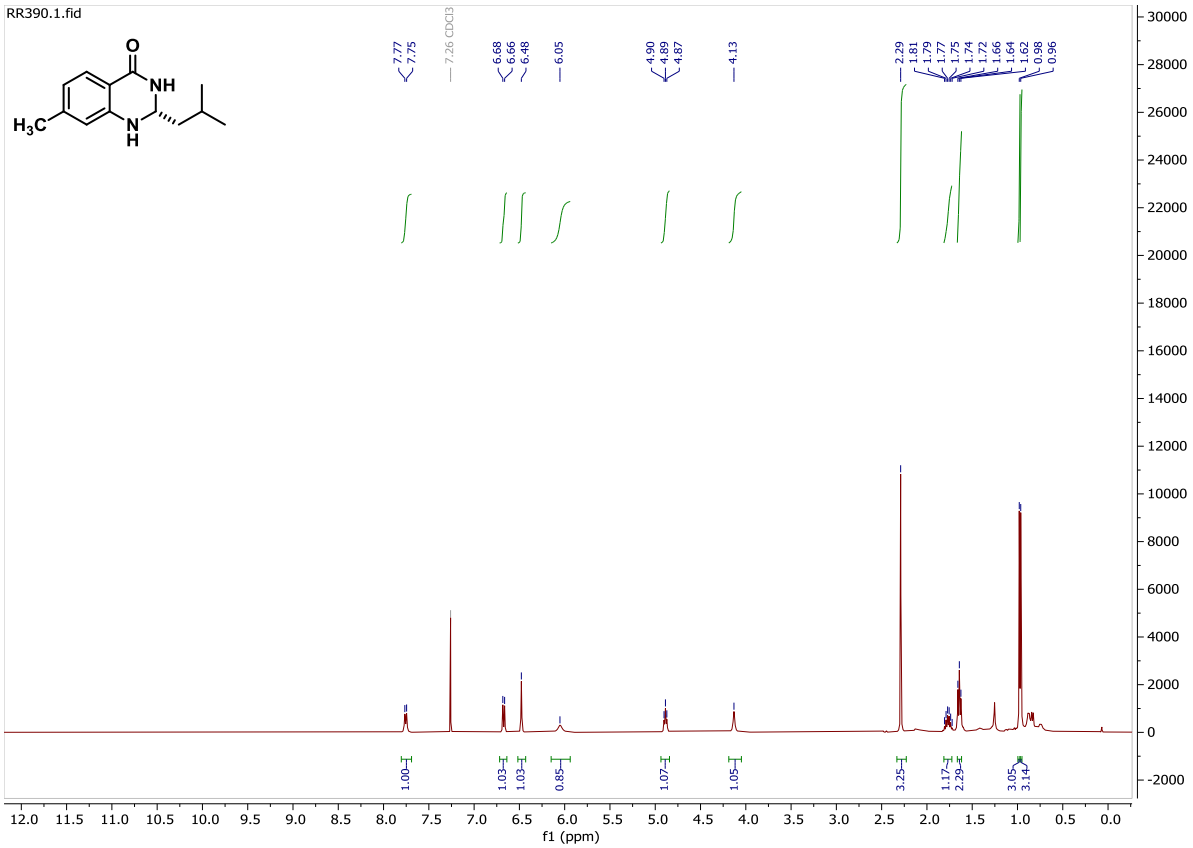
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3l**.



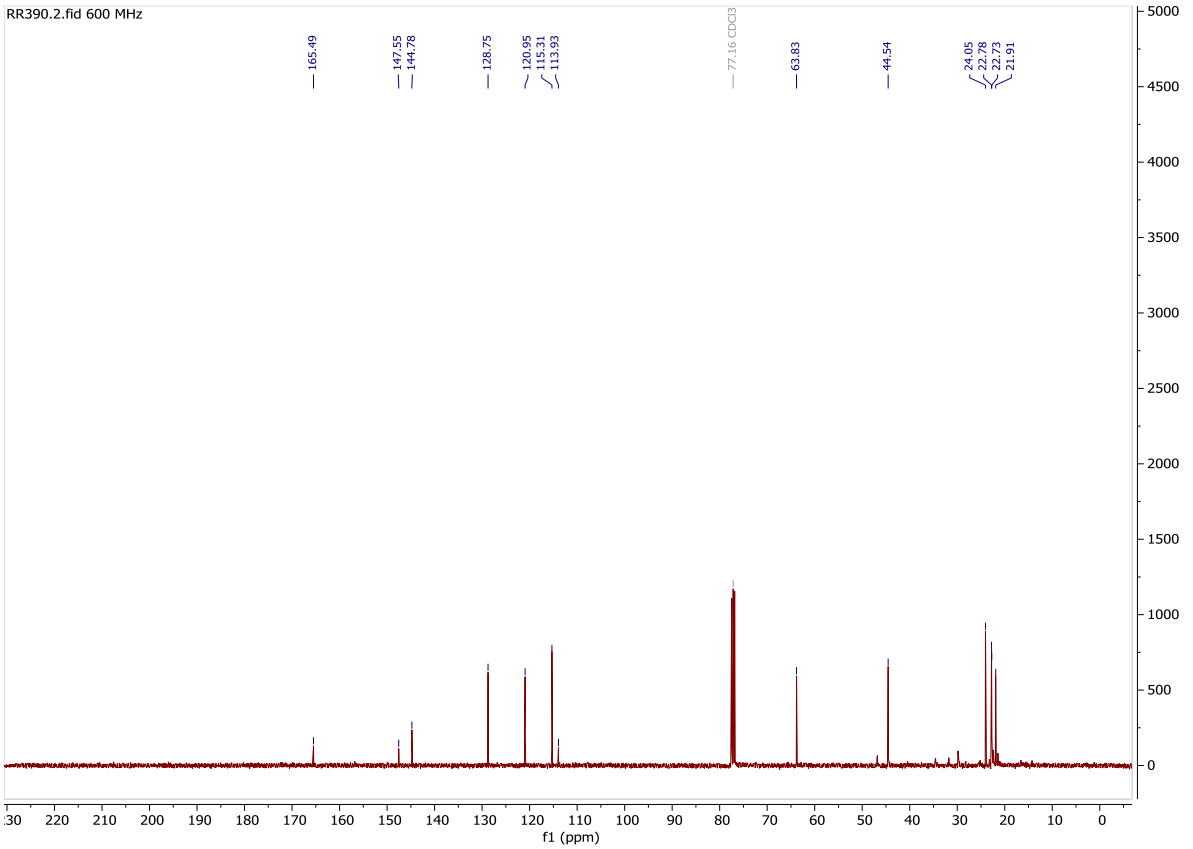
^{1}H NMR (400 MHz, $CDCl_3$) of **3m**.



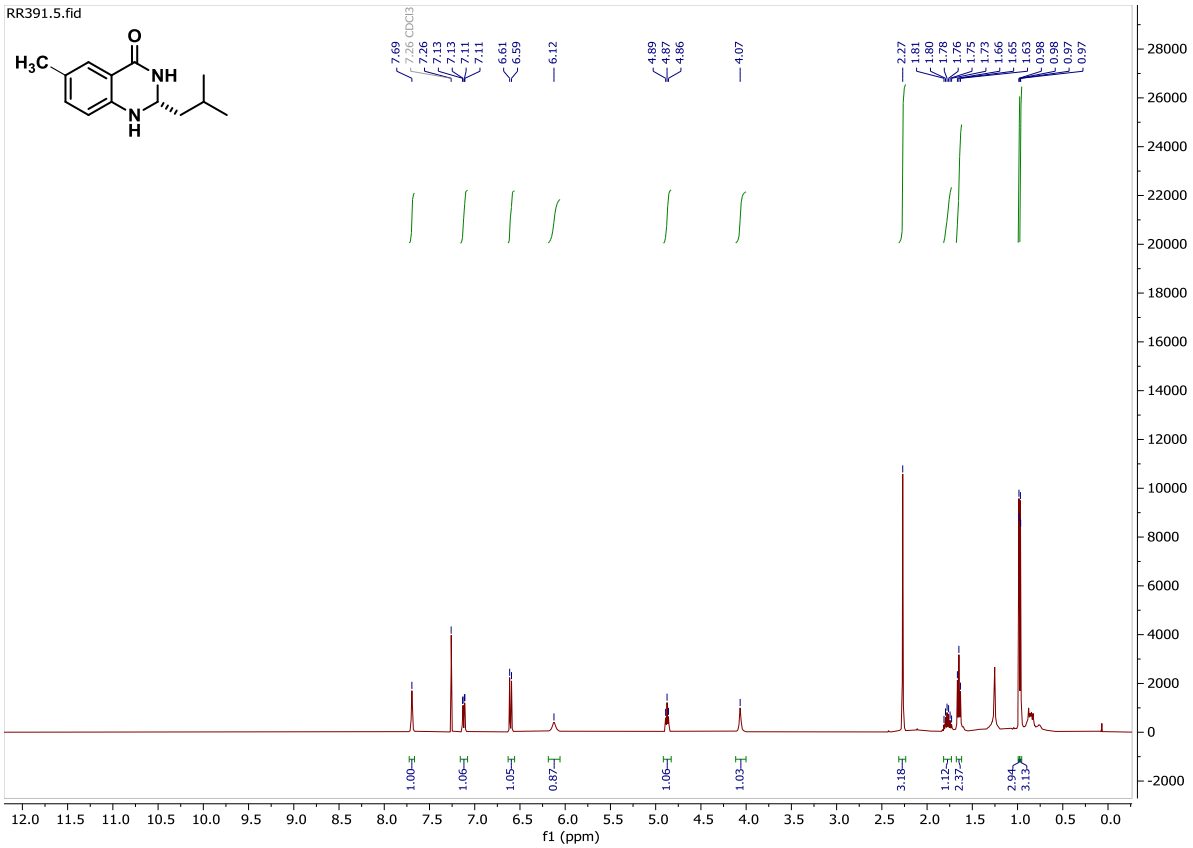
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3m**.



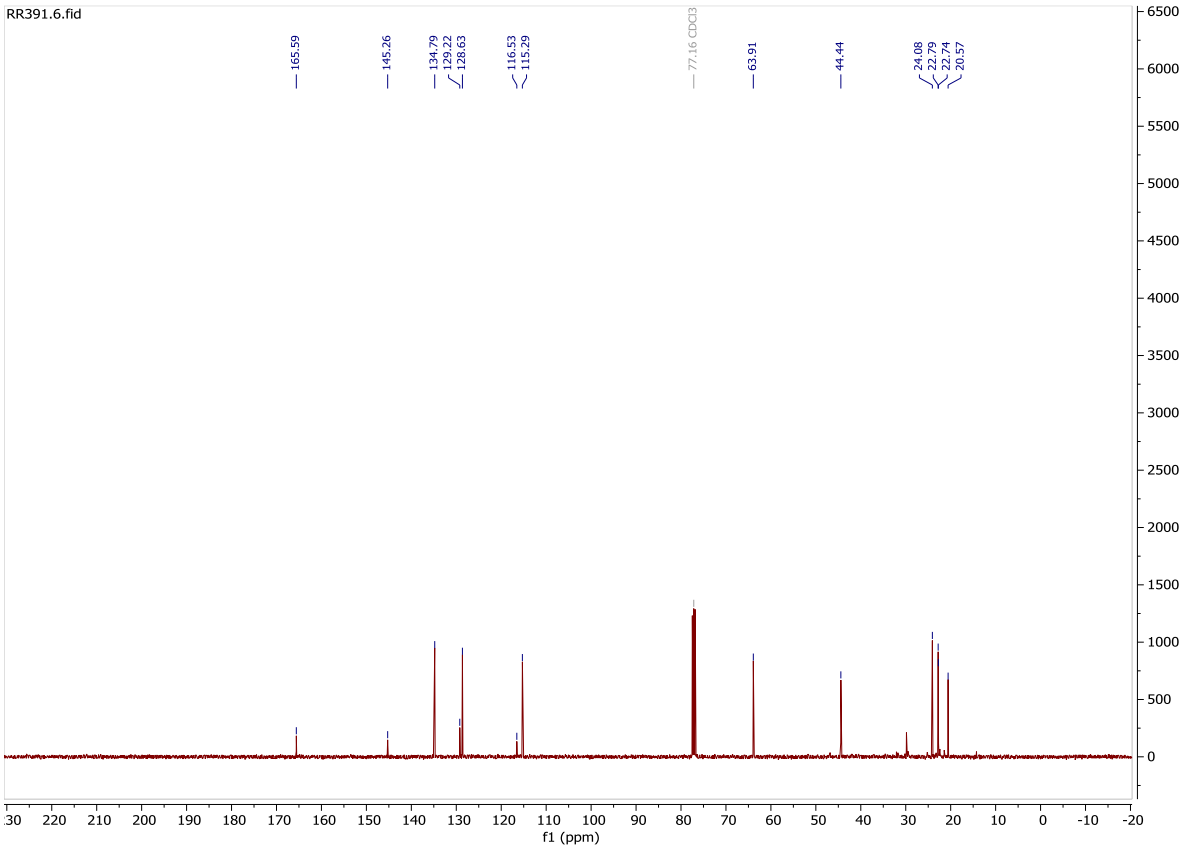
^{1}H NMR (400 MHz, $CDCl_3$) of **3n**.



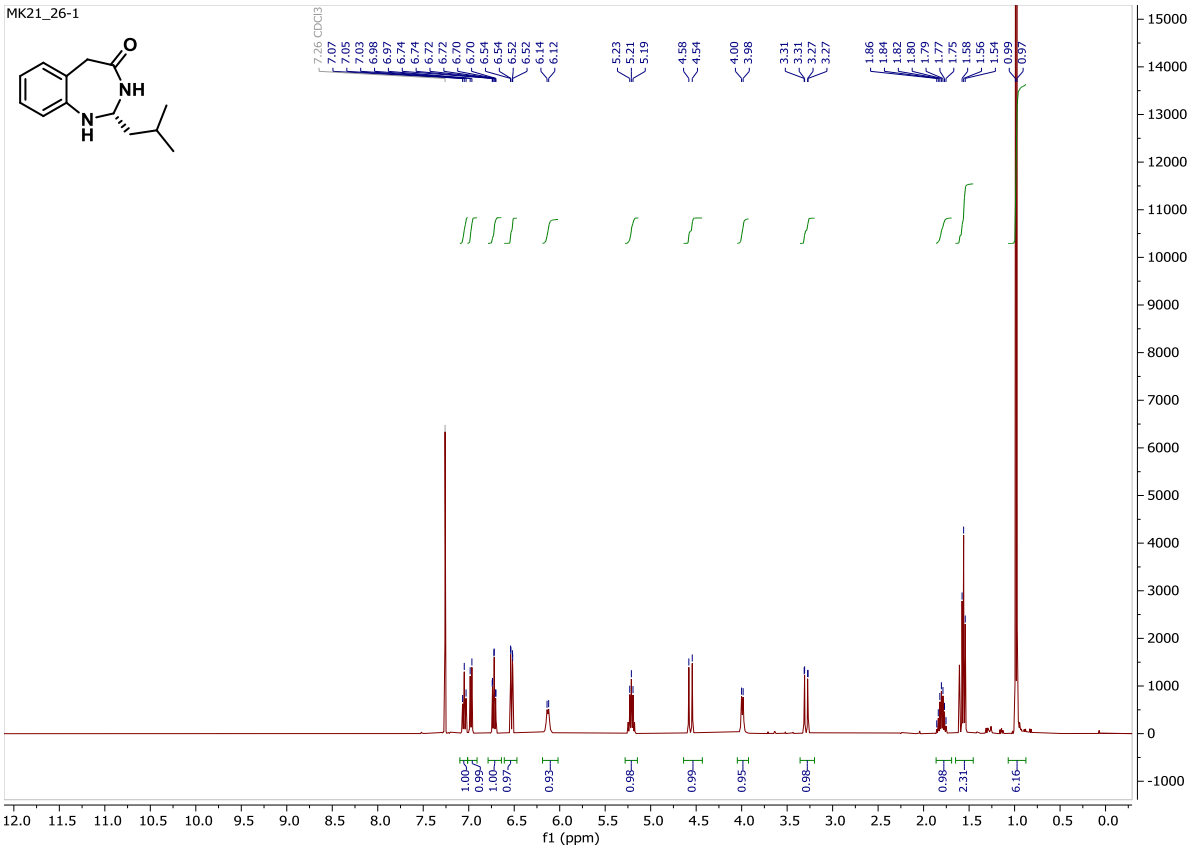
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3n**.



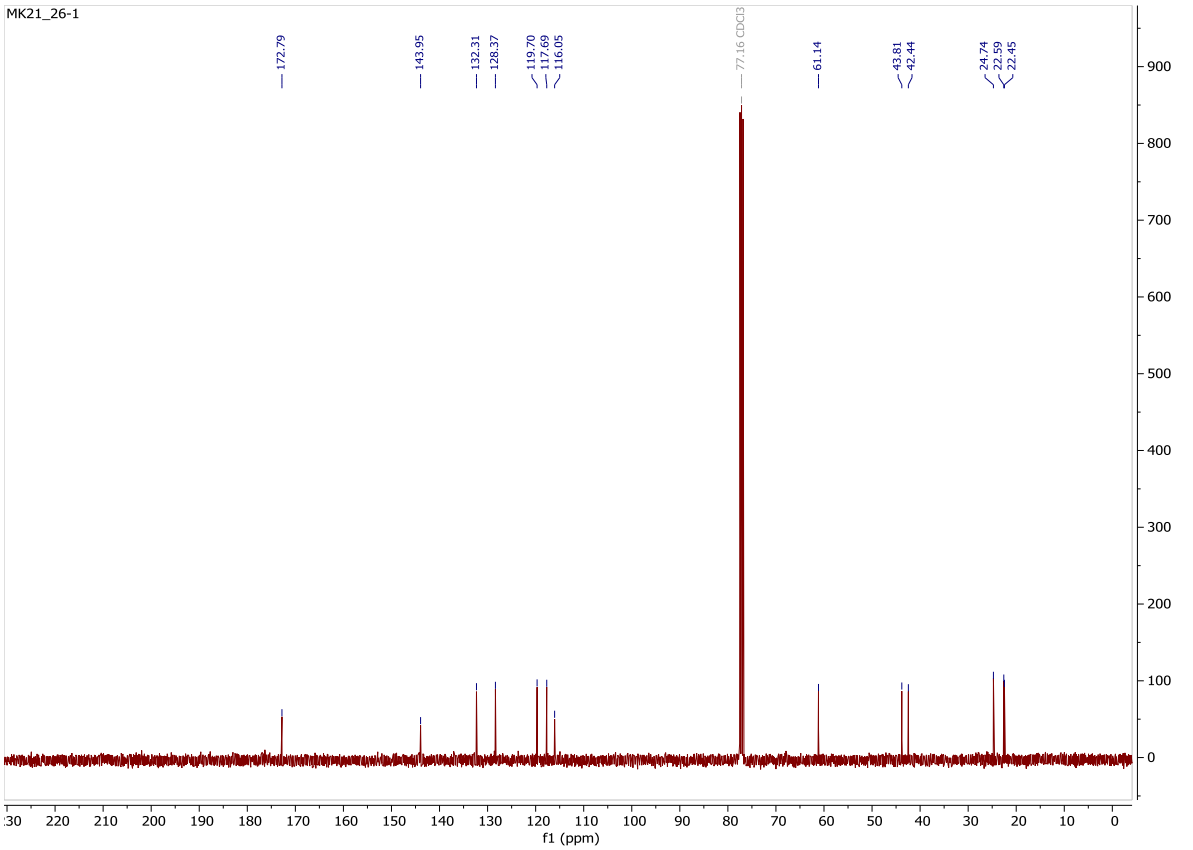
^{1}H NMR (400 MHz, $CDCl_3$) of **3o**.



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



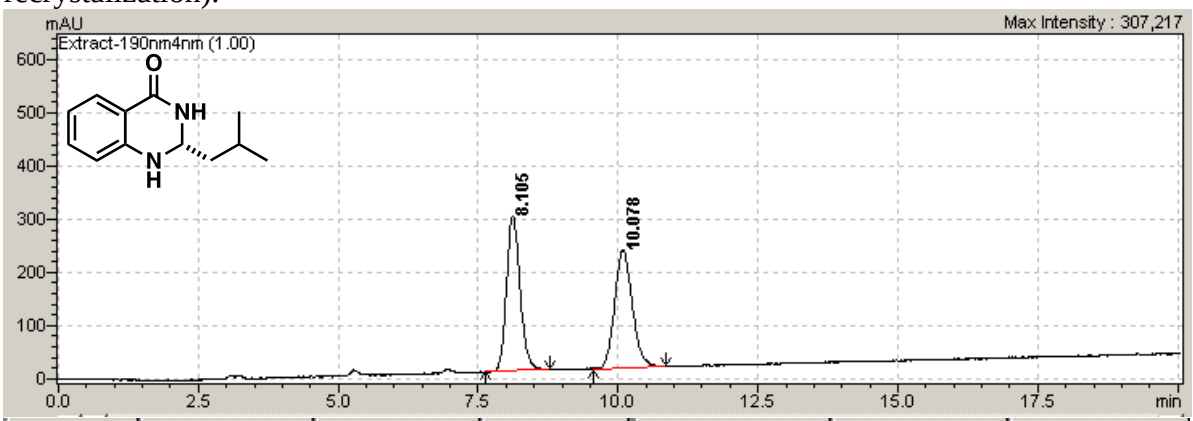
^{1}H NMR (400 MHz, $CDCl_3$) of **3p**.



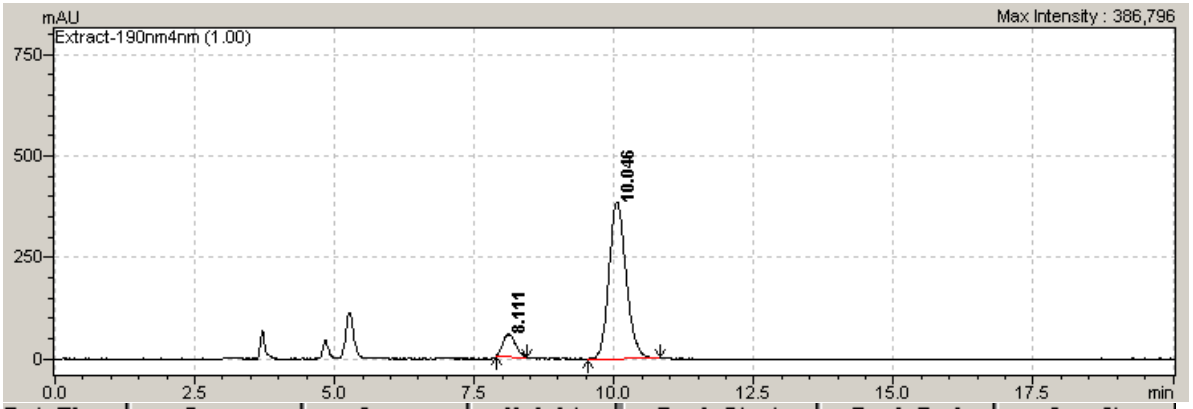
^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) of **3p**.

HPLC chromatograms

Conditions: OD-H column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 191 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 8.1 min (minor), t_R= 10.1 min (major), *ee* 81% (93% after recrystalization).

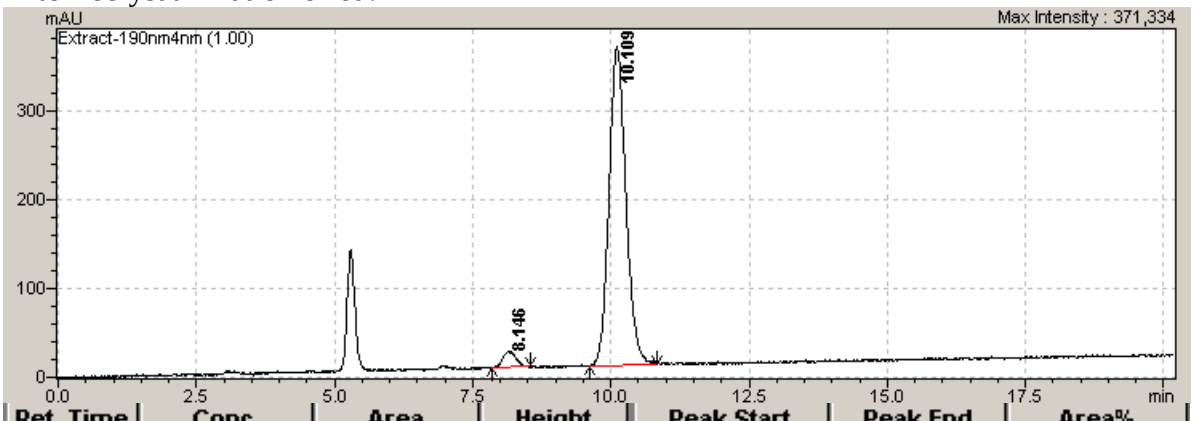


Ret. Time	Conc.	Area	Height	Peak Start	Peak End	Area%
8.105	50.24399	4883478	292154	7.637	8.768	50.2440
10.078	49.75601	4836048	220875	9.568	10.859	49.7560



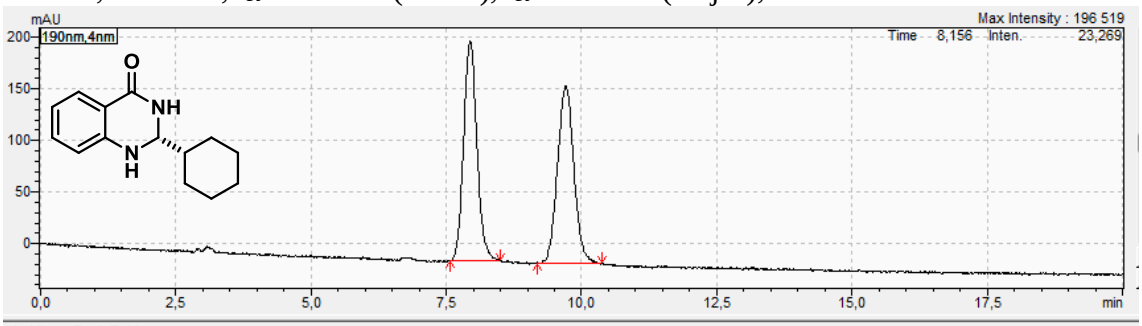
Ret. Time	Conc.	Area	Height	Peak Start	Peak End	Area%
8.111	9.85331	899375	56975	7.883	8.448	9.8533
10.046	90.14669	8228274	386294	9.547	10.837	90.1467

After recrysatillization of **6a**.



Ret. Time	Conc.	Area	Height	Peak Start	Peak End	Area%
8.146	3.65770	288438	17982	7.861	8.544	3.6577
10.109	96.34230	7597335	357805	9.611	10.827	96.3423

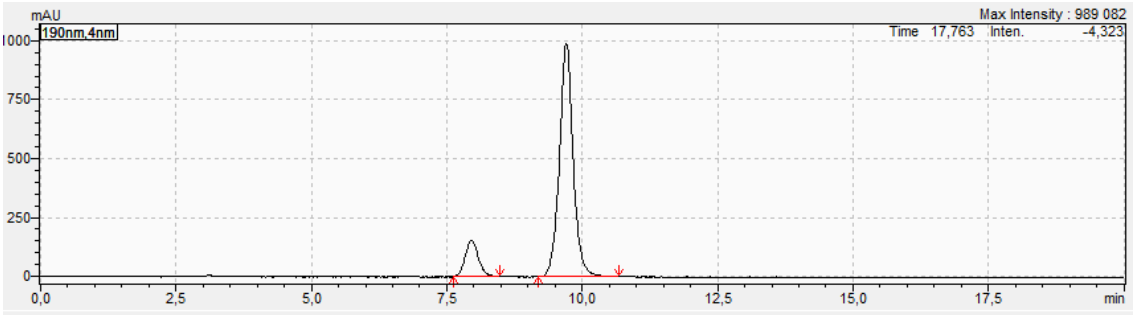
Conditions: IA column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 8.0 min (minor), t_R= 9.7 min (major), *ee* 74%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,945	50,235	3641882	213306	0,000000	M	7,563	8,501	50,235
9,713	49,765	3607798	171901	0,000000	M	9,184	10,368	49,765
	100,000	7249679	385206					100,000

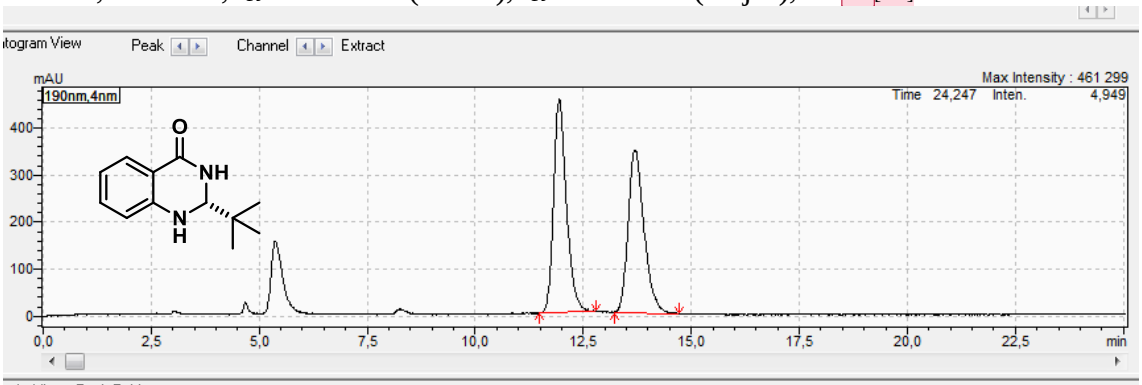


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,960	12,925	2597782	152465	0,000000	M	7,616	8,469	12,925
9,705	87,075	17500445	990758	0,000000	M	9,184	10,688	87,075
	100,000	20098227	1143223					100,000

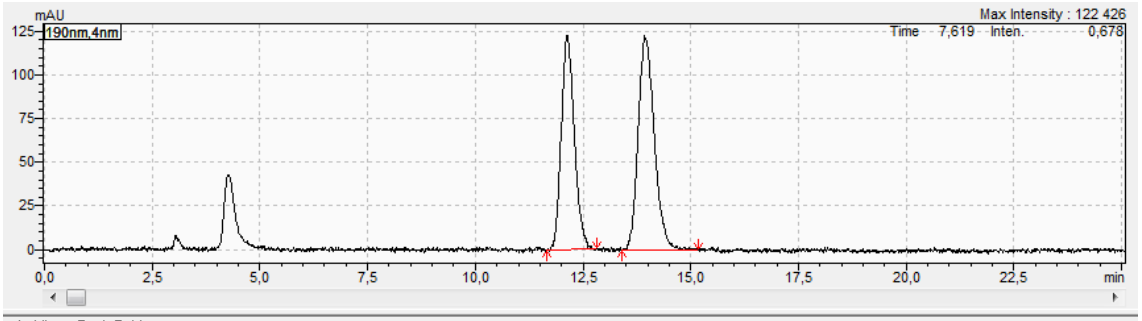
Conditions: IH column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 12.1 min (minor), t_R= 13.9 min (major), *ee* 10[C1]%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
11,938	51,307	9349099	452909	0,000000	M	11,477	12,789	51,307
13,698	48,693	8872862	346618	0,000000	M	13,216	14,731	48,693
	100,000	18221961	799527					100,000

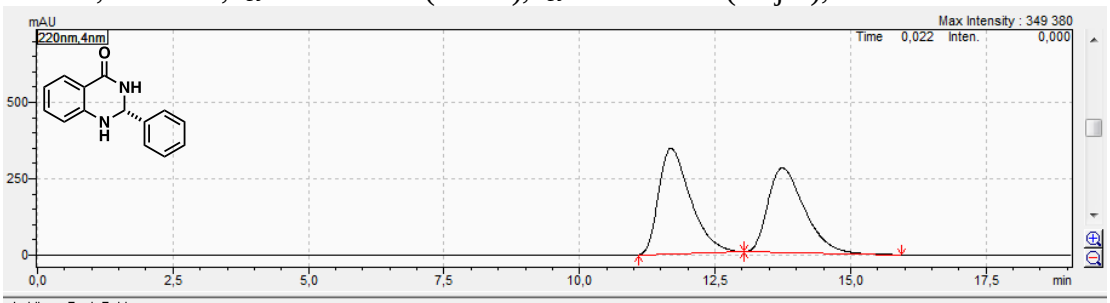


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
12,146	44,770	2589769	122574	0,000000	M	11,648	12,821	44,770
13,931	55,230	3194814	122787	0,000000	M	13,408	15,168	55,230
	100,000	5784582	245361					100,000

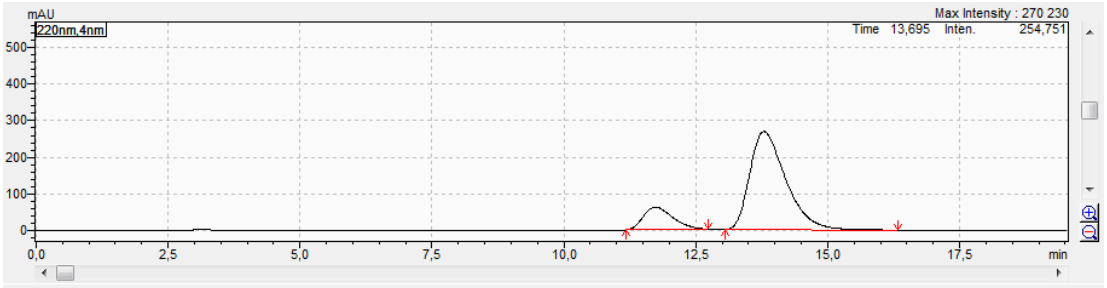
Conditions: AD-H column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 220 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 11.73 min (minor), t_R= 13.79 min (major), *ee* 68%.



ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
11,687	52,280	14160187	345184	0,000000	M	11,093	13,035	52,280
13,743	47,720	12925118	277372	0,000000	M	13,035	15,947	47,720
	100,000	27085305	622556					100,000

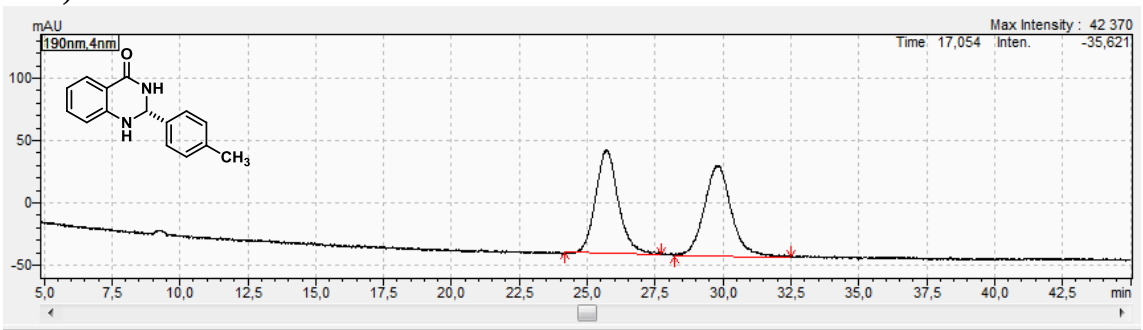


ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
11,733	15,814	2399670	61631	0,000000	M	11,179	12,725	15,814
13,793	84,186	12774769	268849	0,000000	M	13,056	16,320	84,186
	100,000	15174439	330479					100,000

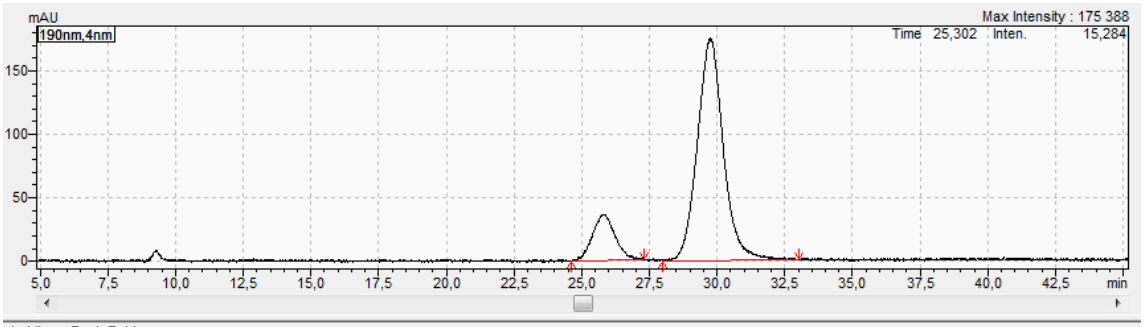
Conditions: IA column, mobile phase: *n*-Heptane / *i*-PrOH – 90:10, λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 25.9 min (minor), t_R= 29.8 min (major), *ee* 70% (after recrystalization 97%).



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
25,687	49,020	4802710	82677	0,000000	M	24,181	27,701	49,020
29,834	50,980	4994772	72549	0,000000	M	28,192	32,512	50,980
	100,000	9797483	155226					100,000

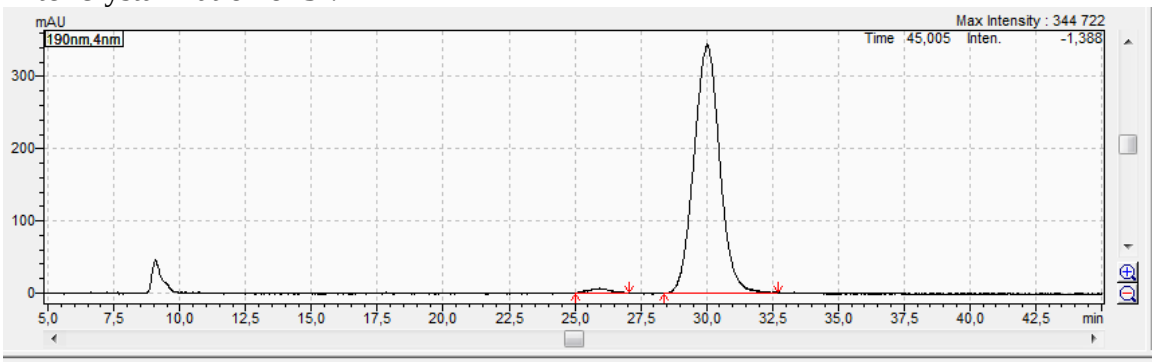


ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
25,871	15,379	2100959	36230	0,000000	M	24,597	27,307	15,379
29,753	84,621	11560190	174359	0,000000	M	28,000	33,013	84,621
	100,000	13661149	210588					100,000

After crystallization of **3f**.

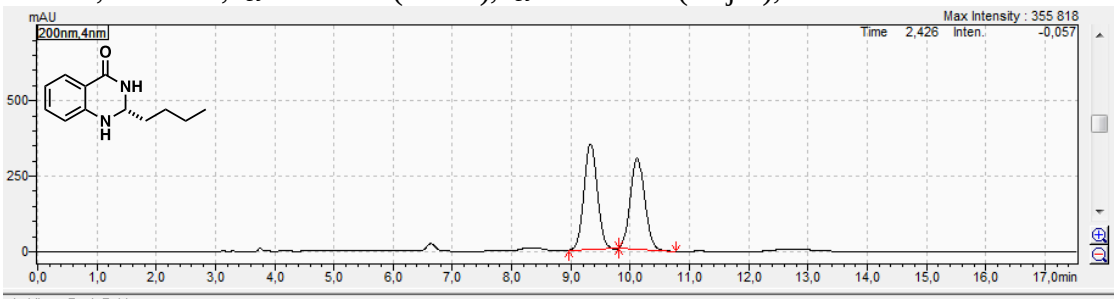


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
25,922	1,373	322401	6401	0,000000	M	25,024	27,040	1,373
30,029	98,627	23164015	344118	0,000000	M	28,405	32,704	98,627
	100,000	23486416	350519					100,000

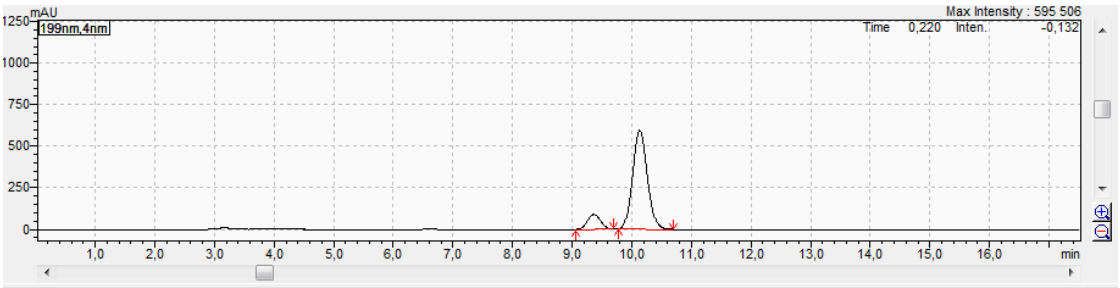
Conditions: IG column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 199 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 9.4 min (minor), t_R= 10.1 min (major), *ee* 76%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
9,330	51,496	5478119	348411	0,000000	M	8,960	9,803	51,496
10,118	48,504	5159820	301926	0,000000	M	9,803	10,773	48,504
	100,000	10637939	650337					100,000

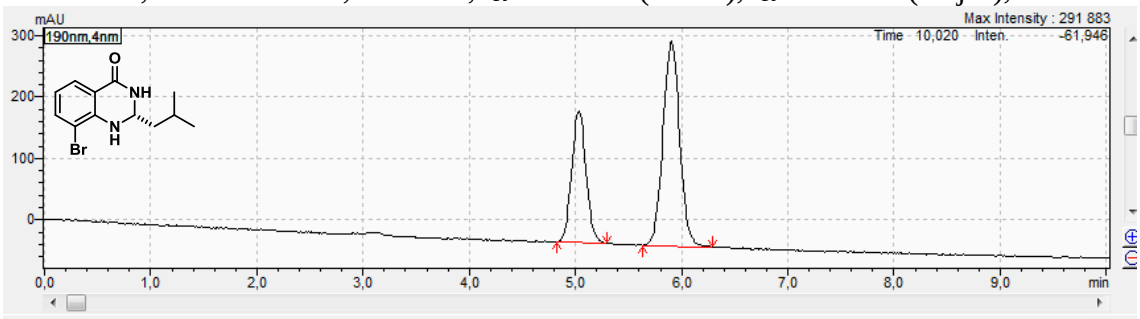


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
9,363	11,916	1364777	88700	0,000000	M	9,067	9,696	11,916
10,134	88,084	10088601	593007	0,000000	M	9,781	10,688	88,084
	100,000	11453377	681707					100,000

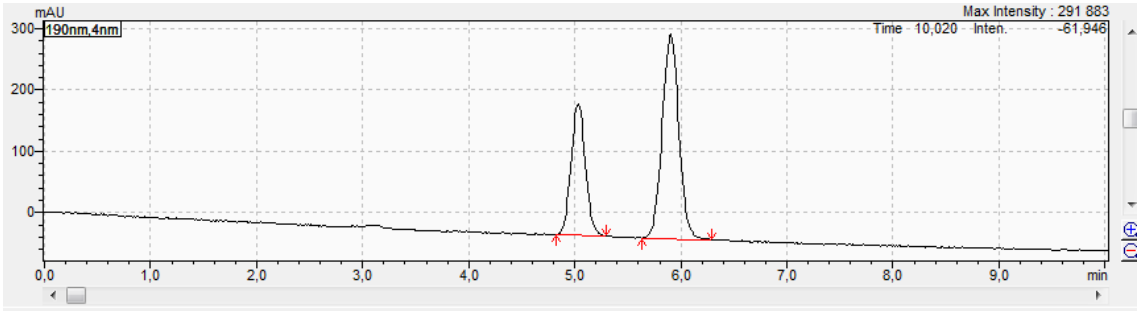
Conditions: OD-H column, mobile phase: *n*-Heptane / *i*-PrOH – 90:10
λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 5.0 min (minor), t_R= 5.9 min (major), *ee* 30%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
5,033	35,428	2005040	213347	0,000000	M	4,821	5,291	35,428
5,906	64,572	3654427	334356	0,000000	M	5,632	6,293	64,572
	100,000	5659468	547703					100,000

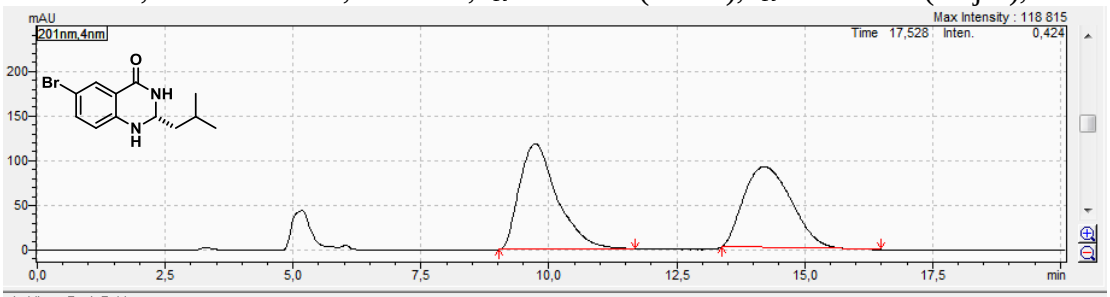


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
5,033	35,428	2005040	213347	0,000000	M	4,821	5,291	35,428
5,906	64,572	3654427	334356	0,000000	M	5,632	6,293	64,572
	100,000	5659468	547703					100,000

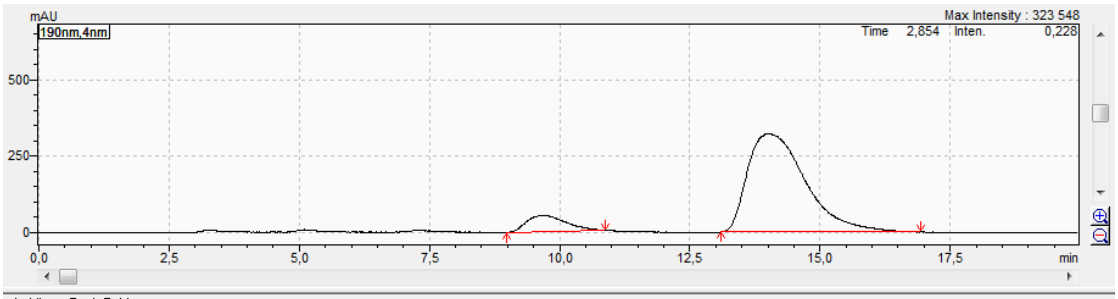
Conditions: OD-H column, mobile phase: *n*-Heptane / *i*-PrOH – 90:10
λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 9.7 min (minor), t_R= 14.0 min (major), *ee* 80%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
9,734	50,824	6049318	117772	0,000000	M	9,024	11,680	50,824
14,207	49,176	5853204	90291	0,000000	M	13,387	16,491	49,176
	100,000	11902522	208063					100,000

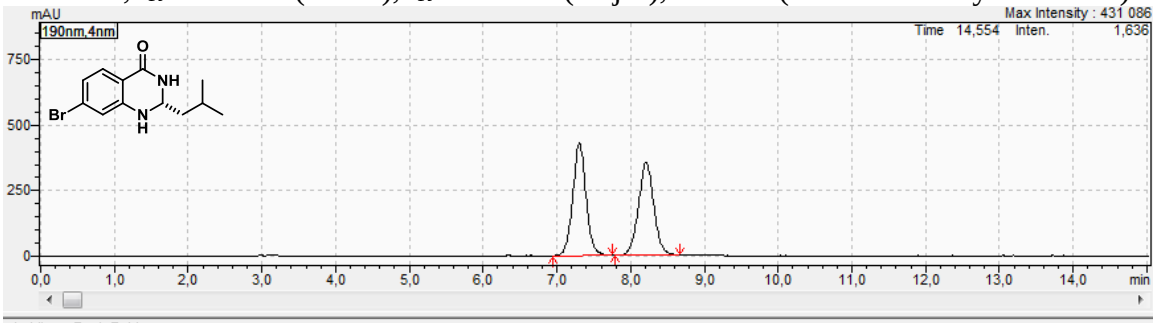


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
9,673	9,934	2747274	52402	0,000000	M	8,971	10,869	9,934
14,015	90,066	24907109	322399	0,000000	M	13,088	16,928	90,066
	100,000	27654382	374801					100,000

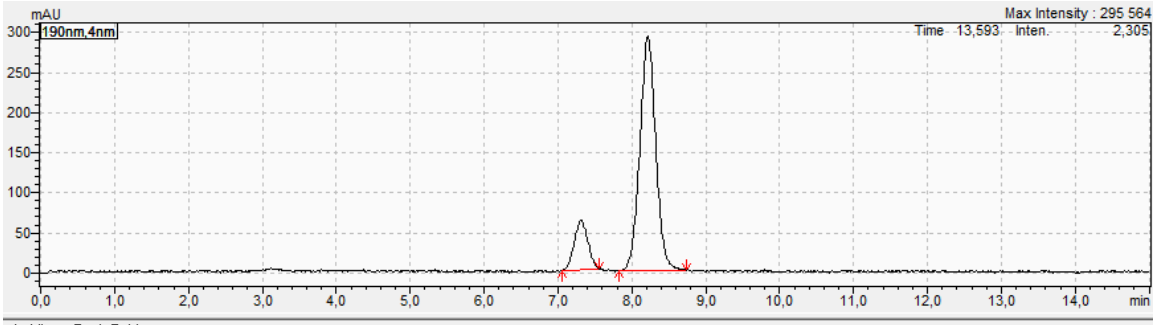
Conditions: IA column, mobile phase: n-Heptane/i-PrOH – 80:20, 1.0 mL/min, λ= 190 nm, T= 25 °C, t_R= 7.3 min (minor), t_R= 8.2 min (major), *ee* 70% (80% after recrystalization) .



ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,305	50,834	5323574	427639	0,000000	M	6,944	7,744	50,834
8,213	49,166	5148989	355116	0,000000	M	7,797	8,672	49,166
	100,000	10472563	782755					100,000

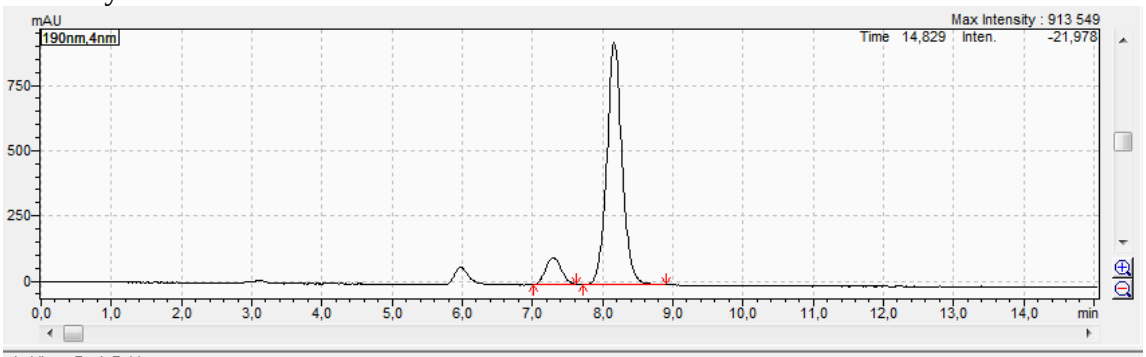


ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,310	15,296	782109	61238	0,000000	M	7,061	7,552	15,296
8,216	84,704	4330886	292021	0,000000	M	7,829	8,747	84,704
	100,000	5112995	353260					100,000

After crystalization of **3h**.

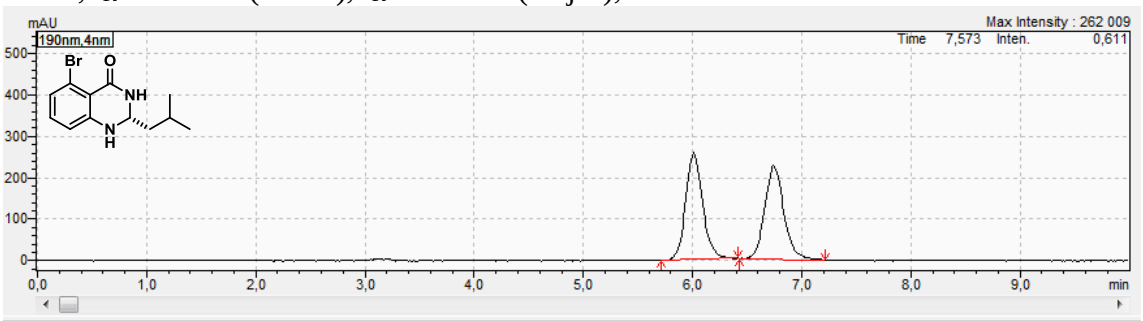


ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,289	9,904	1554510	101980	0,000000	M	7,019	7,616	9,904
8,162	90,096	14140617	927410	0,000000	M	7,712	8,896	90,096
	100,000	15695127	1029390					100,000

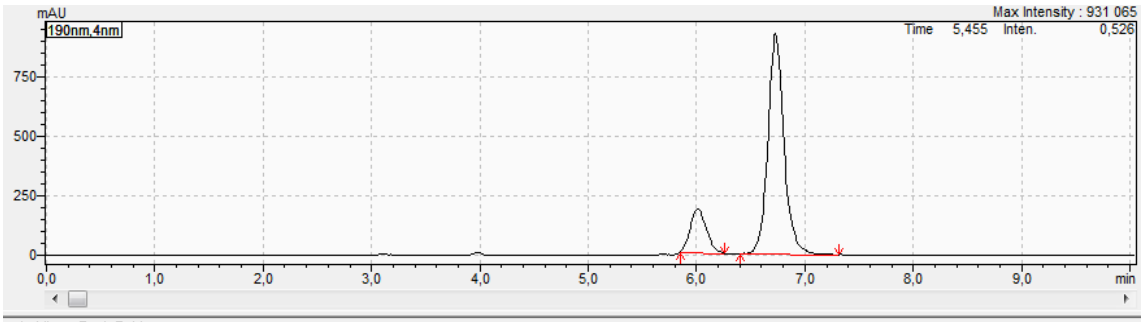
Conditions: IA column, mobile phase: *n*-Heptane/*i*-PrOH – 80:10, 1.0 ml/min, λ= 190 nm, *t*= 25 °C, t_R= 6.0 min (minor), t_R= 6.7 min (major), *ee* 66%.



ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
6,010	50,728	2804441	259462	0,000000	M	5,717	6,411	50,728
6,743	49,272	2723998	226359	0,000000	M	6,432	7,211	49,272
	100,000	5528439	485821					100,000

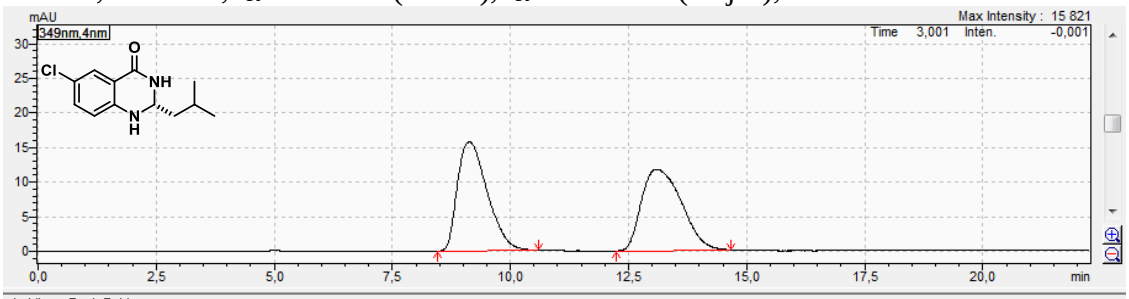


esults View - Peak Table

e Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
6,008	16,674	1899964	183084	0,000000	M	5,845	6,261	16,674
6,730	83,326	9494655	925771	0,000000	M	6,400	7,317	83,326
	100,000	11394619	1108855					100,000

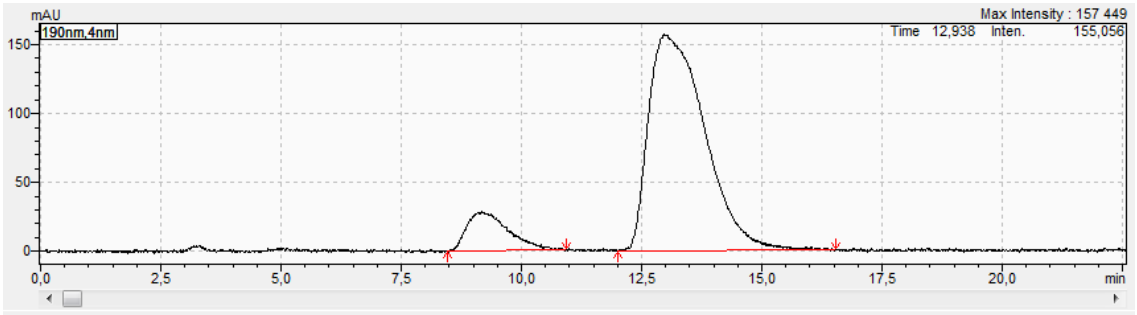
Conditions: OD-H column, mobile phase: *n*-heptane / *i*-PrOH – 90:10, λ= 223 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 9.2 min (minor), t_R= 13.0 min (major), *ee* 76%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
9,130	50,135	693530	15756	0,000000		8,459	10,603	50,135
13,096	49,865	689787	11752	0,000000		12,245	14,677	49,865
	100,000	1383317	27508					100,000

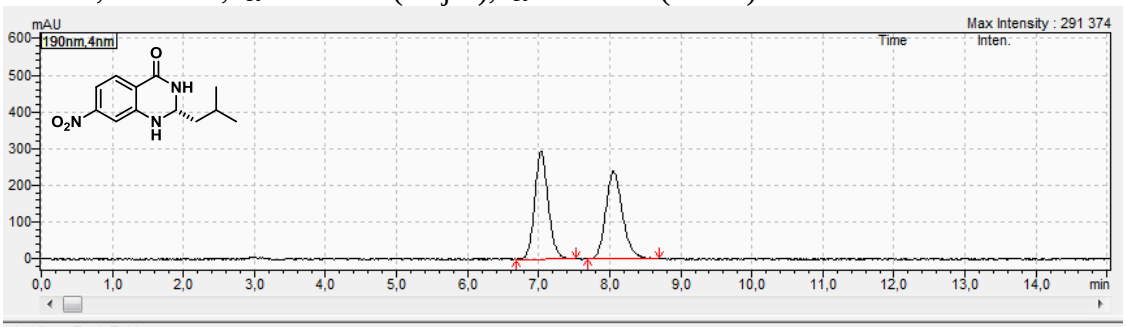


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
9,164	11,752	1694422	28598	0,000000	M	8,459	10,933	11,752
12,971	88,248	12723793	156786	0,000000	M	12,000	16,533	88,248
	100,000	14418215	185385					100,000

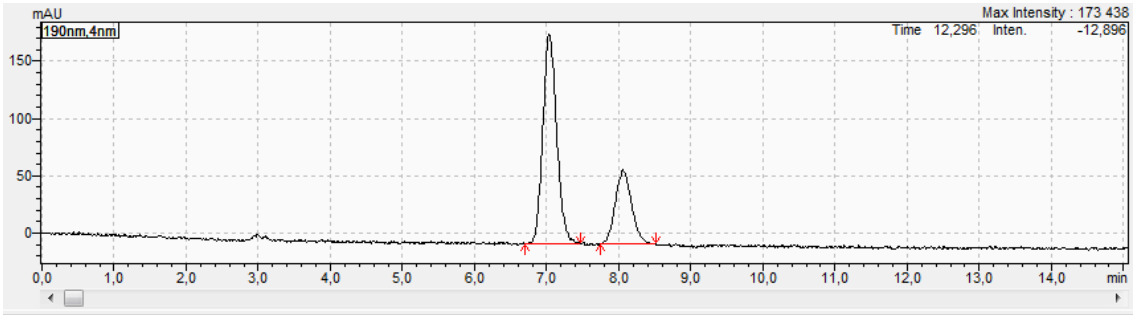
Conditions: IG column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 7.0 min (major), t_R= 8.0 min (minor) *ee* 36%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,035	49,915	3854976	292065	0,000000	M	6,688	7,531	49,915
8,053	50,085	3868169	238646	0,000000	M	7,691	8,693	50,085
	100,000	7723145	530711					100,000

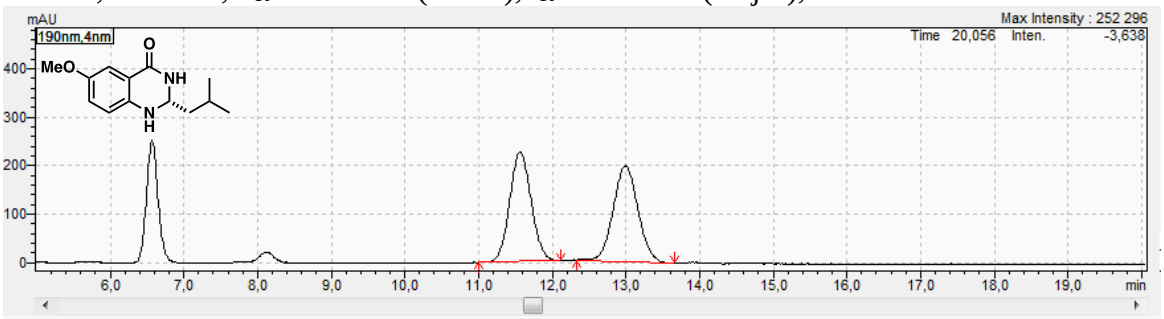


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,033	71,023	2468521	183190	0,000000	M	6,699	7,467	71,023
8,060	28,977	1007147	64832	0,000000	M	7,744	8,512	28,977
	100,000	3475669	248022					100,000

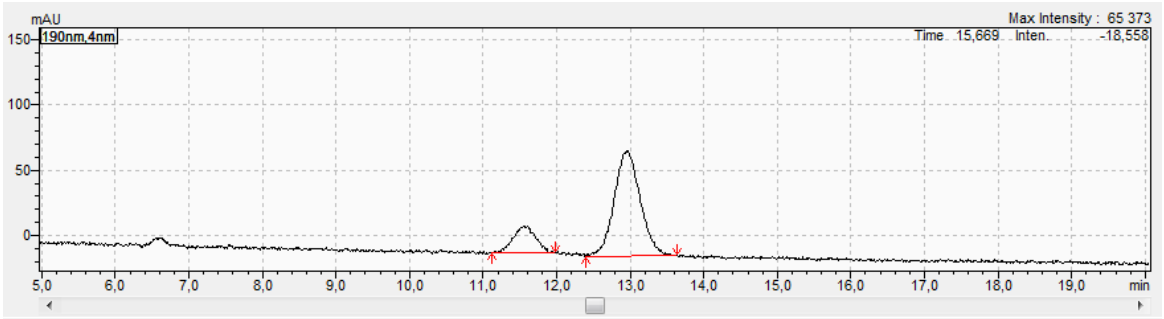
Conditions: IG column, mobile phase: *n*-heptane / *i*-PrOH – 80:20, λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C,: t_R= 11.6 min (minor), t_R= 13.0 min (major), *ee* 64%.



ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
11,567	49,961	4584257	226636	0,000000	M	10,997	12,117	49,961
12,993	50,039	4591378	197315	0,000000	M	12,331	13,664	50,039
	100,000	9175635	423951					100,000

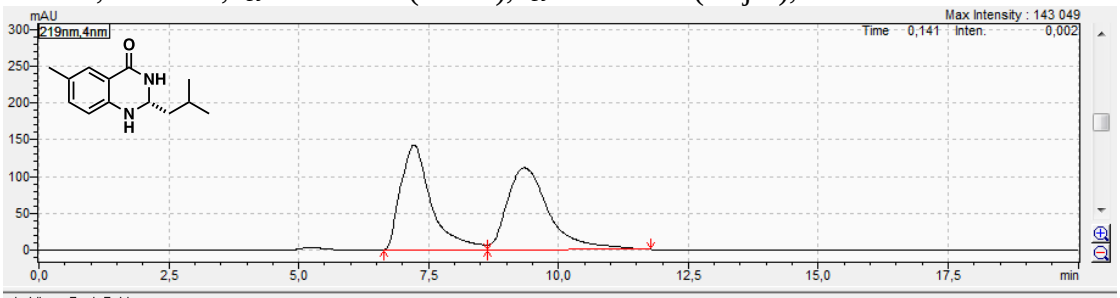


ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
11,546	18,071	433629	19967	0,000000	M	11,125	11,979	18,071
12,961	81,929	1966018	80800	0,000000	M	12,395	13,632	81,929
	100,000	2399647	100767					100,000

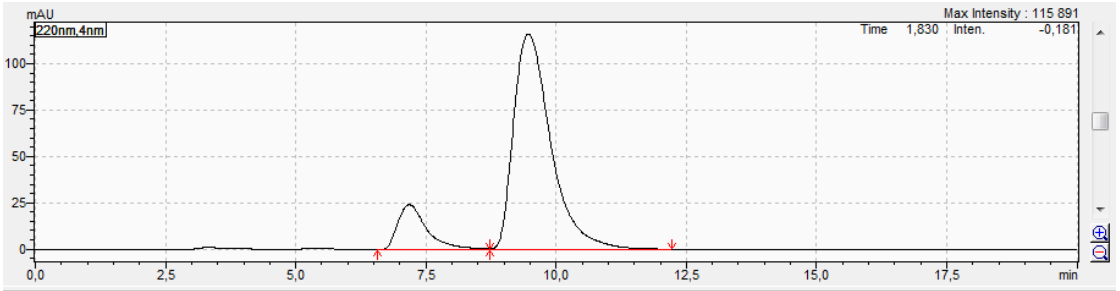
Conditions: OD-H column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 220 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 7.18 min (minor), t_R= 9.47 min (major), *ee* 72%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,217	48,577	5853335	142191	0,000000	M	6,635	8,629	48,577
9,341	51,423	6196185	110879	0,000000	V M	8,629	11,787	51,423
	100,000	12049519	253070					100,000

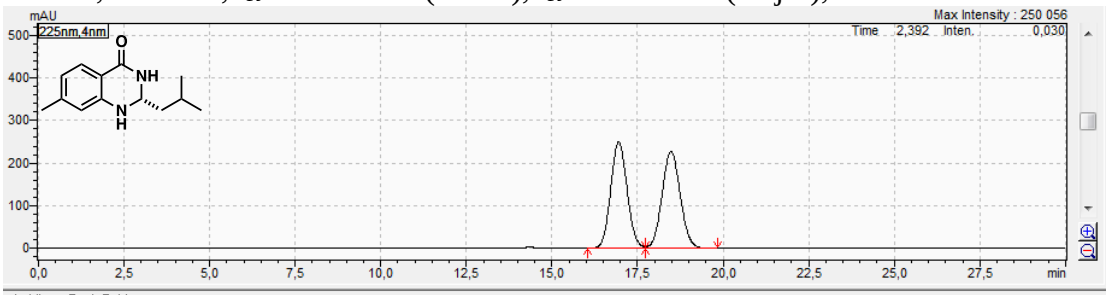


ults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,183	13,994	938101	24193	0,000000		6,571	8,725	13,994
9,466	86,006	5765648	116031	0,000000	V	8,725	12,224	86,006
	100,000	6703750	140224					100,000

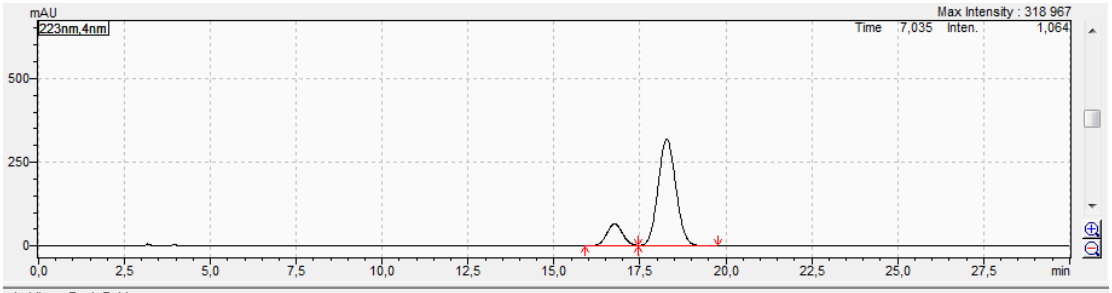
Conditions: IG column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 223 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 16.76 min (minor), t_R= 18.28 min (major), *ee* 69%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
16,949	49,791	8315227	249925	0,000000		16,032	17,728	49,791
18,477	50,209	8384995	227446	0,000000	V	17,728	19,840	50,209
	100,000	16700223	477371					100,000

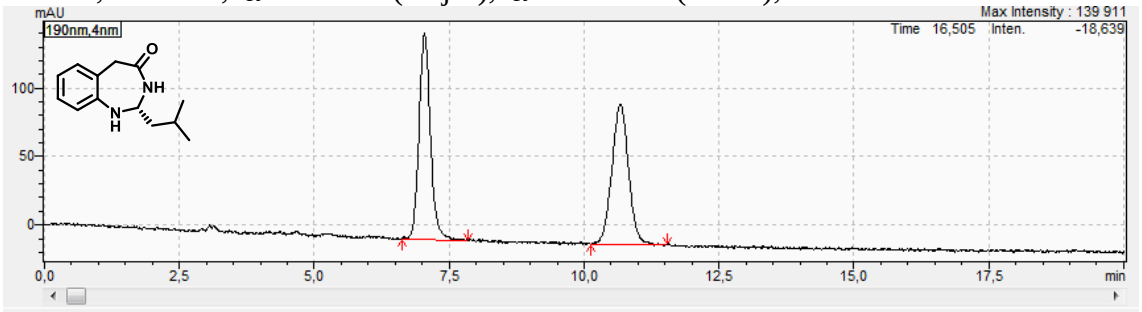


sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
16,761	15,710	2150824	65984	0,000000		15,904	17,461	15,710
18,280	84,290	11539565	318829	0,000000	V	17,461	19,765	84,290
	100,000	13690388	384813					100,000

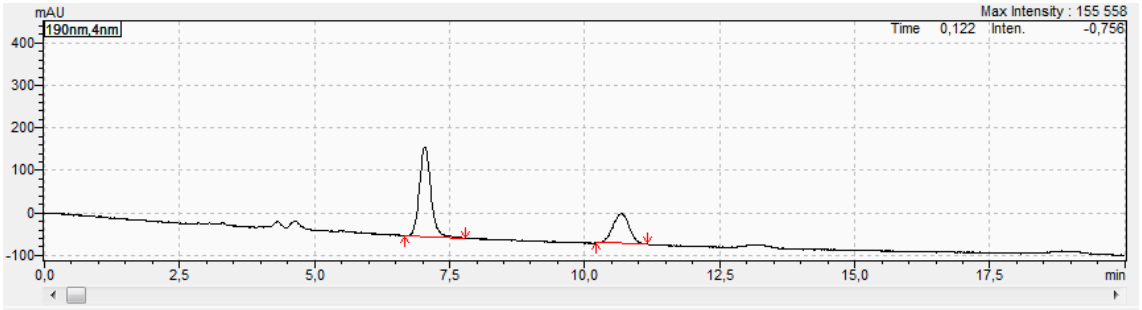
Conditions: IA column, mobile phase: *n*-Heptane / *i*-PrOH – 80:20, λ= 190 nm, *V*= 1.0 ml/min, *t*= 25 °C, t_R= 7.0 min (major), t_R= 10.7 min (minor), *ee* 35%.



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,043	50,158	2207270	150446	0,000000	M	6,624	7,851	50,158
10,670	49,842	2193357	102241	0,000000	M	10,133	11,541	49,842
	100,000	4400627	252687					100,000



sults View - Peak Table

Compound | Group | Calibration Curve

Ret. Time	Conc.	Area	Height	Similarity Index	Mark	Peak Start	Peak End	Area%
7,044	67,453	3073730	210558	0,000000	M	6,667	7,787	67,453
10,671	32,547	1483129	70355	0,000000	M	10,208	11,157	32,547
	100,000	4556858	280913					100,000

X-Ray section

The diffraction experiment for crystal structure determination was performed on Bruker D8 VENTURE Kappa Duo with PHOTONIII detector by IμS micro-focus sealed tube with MoKα (0.71073) radiation at a temperature 120(2) K. The structure was solved by direct methods (XT[1a]) and refined by full matrix least squares based on F^2 (SHELXL2018[1b]). The hydrogen atoms on carbon were fixed into idealized positions (riding model) and assigned temperature factors either Hiso(H) = 1.2 U_{eq}(pivot atom) or Hiso(H) = 1.5 U_{eq}(pivot atom) for methyl moiety, the hydrogen atoms in –N-H amoieties were found on difference Fourier maps and refined under rigid body assumption with assigned temperature factors H_{iso}(H) = 1.2 U_{eq}(pivot atom).

Crystal data for **3h**: $C_{12}H_{15}BrN_2O$; *Mr* = 283.17; Monoclinic, $P2_1$ (No 4), *a* = 11.0816 (3) Å, *b* = 9.0888 (3) Å, *c* = 12.4473 (4) Å, β = 95.745 (1)°, *V* = 1247.38 (7) Å^3, Z = 4, D_x = 1.508 Mg m^{-3}. Prism, colourless of dimensions 0.19 × 0.12 × 0.12 mm, multi-scan absorption correction (μ = 3.28 mm^{-1}) T_{min} = 0.63, T_{max} = 0.70; a total of 38831 measured reflections (θ_{max}= 30˚), from which 7225 were unique (R_{int} = 0.028) and 6671 observed according to the $I > 2\sigma(I)$ criterion. The refinement converged (Δ/σmax= 0.002) to *R* = 0.022 for observed reflections and w$R(F^2)$ = 0.059, *GOF* = 1.14 for 293 parameters and all 7225 reflections. The final difference map displayed no peaks of chemical significance (Δρmax = 0.53, Δρmin -0.31 e.Å^{-3}).

The two symmetrically independent molecules fit each other well, with maximal deviation 0.7 Å between isopropyl moieties. The determination of absolute structure was based on anomalous scattering of bromine atom. Absolute structure parameter: -0.011 (2).[2]

X-ray crystallographic data have been deposited with the Cambridge Crystallographic Data Centre (CCDC) under deposition number **2081064** for **3h** and can be obtained free of charge from the Centre via its website (www.ccdc.cam.ac.uk/getstructures).

1a SHELXT: Sheldrick, G.M. (2015). *Acta Cryst*. A71, 3-8.

1b SHELXL: Sheldrick, G.M. (2015). *Acta Cryst*. C71, 3-8.

2 Parsons,S., Flack, H.D. and Wagner, T. (2013) *Acta Cryst*. B69, 249-259.

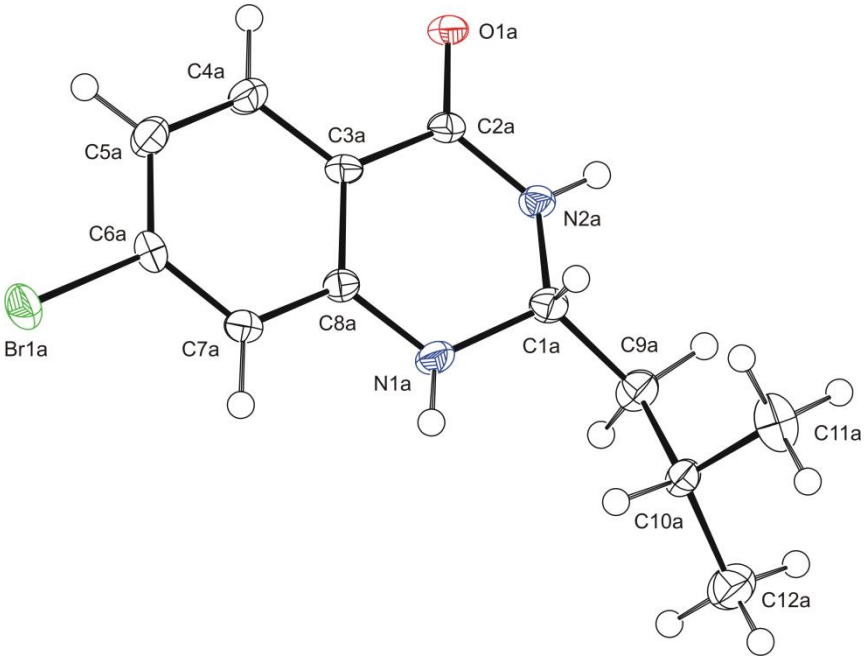


Fig. 1. View on the one of two symmetrically independent molecules of **3h**. Displacement ellipsoid are drawn on 30% probability level. Two independent molecules fit one on other almost perfectly with maximal difference of corresponding atoms 0.275 Å.