ANNEXE 1 : PARTIE EXPÉRIMENTALE

Remarques générales

Toutes les réactions ont été effectuées sous atmosphère d'azote dans de la verrerie séchée à la flamme sous pression réduite. Les solvants anhydres et certains réactifs liquides ont été distillés avant leur utilisation, et ils sont rapportés dans le tableau G.1 suivant.

Tableau G.1 : Agents desséchants utilisés pour la distillation de différents solvants et réactifs.

Solvant / Réactif distillé	Agent desséchant
Acétonitrile	Hydrure de calcium
Anhydride trifluorométhanesulfonique	P_2O_5
Dichloroéthane	Hydrure de calcium
Dichlorométhane	Hydrure de calcium
N,*N*-Diisopropylamine	Hydrure de calcium
Éther diéthylique	Hydrure de calcium
Méthanol	Mg^0 et I_2
Tétrahydrofurane	Sodium, Benzophénone
N,*N*,*N*-triéthylamine	Hydrure de calcium
Toluène	Hydrure de calcium

En cas d'indication contraire, les réactifs et les produits de départ ont été reçus d'un fournisseur et utilisés tels quels. Le *N*-formylbenzotriazole a été synthétisé selon la méthode décrite par Katritzky.[73] La 2,6-di-*tert*-butyl-4-méthylpyridine a été synthétisée selon la méthode rapportée par Stang.[74]

Les chromatographies sur couche mince ont été effectuées sur des plaques de verre recouvertes de gel de silice (0.25 mm, Silicyle) ou bien sur des plaques de verre recouvertes d'oxyde d'alumine activé (0.25 mm, EMD Chemicals). Les produits en chromatographie sur couche mince ont été révélés à la lampe UV, puis par trempage dans différents révélateurs, suivi d'un chauffage. Les chromatographies éclair ont été effectuées avec du gel de silice (40-63 μm, Silicyle).

Les spectres infrarouge ont été obtenus par dépôt d'un film de produit sur une pastille de bromure de potassium, et enregistrés avec un spectromètre Perkin-Elmer 1600 FT-IR. Les spectres de résonance

magnétique nucléaire (^{1}H, ^{13}C) ont été enregistrés avec un appareil Bruker AC-300. L'étalon interne est le chloroforme (7,26 ppm) ou l'acétonitrile (1.96 ppm) pour la résonance des protons et le chloroforme (77,0 ppm) ou l'acétonitrile (118.3 ppm) pour la résonance des carbones. Les déplacements chimiques (δ) sont rapportés en ppm et les constantes de couplage en Hertz (Hz). Les abréviations utilisées pour les différents signaux en RMN ^{1}H sont: singulet (s), doublet (d), triplet (t), quadruplet (q), quintuplet (qn), sextuplet (sext), multiplet (m), doublets de doublet (dd), doublets de triplet (dt), etc. Les spectres de masse ont été enregistrés avec un spectromètre VG Micromass ZAB-2F ou ESI-Q-Tof (Maxis).

Modes opératoires

Usual Reaction Work-up and Purification: After addition of the indicated aqueous solution, layers were separated. The aqueous phase was extracted with the indicated solvent and washed with the indicated aqueous solution. The combined organic phases were dried over anhydrous Na_2SO_4, filtered and concentrated under reduced pressure using a rotary evaporator. The crude material was purified by flash chromatography using silica gel with the indicated eluent.

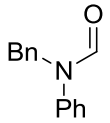
General procedure method A: The amide substrate was dissolved in 1,2-dichloroethane and 2,6-di-*tert*-butyl-4-methylpyridine (DTBMP) was added. The solution was cooled to 0 °C then Tf_2O was added rapidly and the reaction mixture was stirred at 0 °C for 2 minutes. The nucleophile substrate was added and the solution was heated at 60 °C overnight. The reaction mixture was allowed to warm up to rt, then was cooled to 0 °C. $NaBH_3CN$ was added and the reaction mixture was stirred overnight. NaOH (15%) was added, phases were separated, and the aqueous phase was extracted with CH_2Cl_2 (3×). The organic layers were combined, dried over anhydrous Na_2SO_4, filtered and concentrated under reduced pressure. The crude material was purified by flash chromatography using silica gel with the indicated eluent.

General procedure method B: The amide substrate was dissolved in 1,2-dichloroethane and 2,6-di-*tert*-butyl-4-methylpyridine (DTBMP) was added. The solution was cooled to 0 °C then Tf_2O was added rapidly and the reaction mixture was stirred at 0 °C for 2 minutes. The nucleophile substrate was added and the solution was heated at 60 °C overnight. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replaced by THF. The solution was cooled at 0 °C then $LiAlH_4$ was added and the mixture was stirred overnight. The reaction mixture was diluted with Et_2O, then H_2O, NaOH (15%) and H_2O were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4

was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified by flash chromatography using silica gel with the indicated eluent.

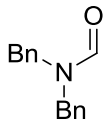
General procedure method C: The amide substrate was dissolved in 1,2-dichloroethane and 2,6-di-*tert*-butyl-4-methylpyridine (DTBMP) was added. The solution was cooled to 0 °C then Tf_2O was added rapidly and the reaction mixture was stirred at 0 °C for 2 minutes. The nucleophile substrate was added and the solution was heated at 60 °C overnight. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH was added followed by $NaBH_4$ and the reaction mixture was stirred for overnight. NaOH (15%) was added, the phases were separated, and the aqueous phase was extracted with CH_2Cl_2 (3×). The organic layers were combined, dried over anhydrous Na_2SO_4, filtered and concentrated under reduced pressure. The crude material was purified by flash chromatography using silica gel with the indicated eluent.

***N*-Benzyl-*N*-phenylformamide (1-10a)**



To a solution of *N*-benzylaniline (2.00 g, 10.9 mmol) in THF (135 mL) at rt was added added *N*-formylbenzotriazole[75] (2.25 g, 15.3 mmol) at rt. The reaction mixture was stirred for 15 h at rt and then concentrated under reduced pressure. DCM was added and the organic layer was washed twice with aq NaOH (2 N). The usual work-up (DCM, brine) gave **1-10a** (quantitative yield) as a yellowish solid: mp 46-48 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.56 (s, 1H), 7.34-7.09 (m, 10H), 5.00 (s, 2H). The characterization fits the one already reported for the same compound.[76]

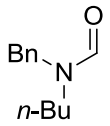
***N*,*N*-Dibenzylformamide (1-10b)**



To a solution of *N*,*N*-dibenzylamine (0.49 mL, 2.53 mmol) in THF (32 mL) at rt was added added *N*-formylbenzotriazole[114] (484 mg, 3.29 mmol) at rt. The reaction mixture was stirred for 15 h at rt and then concentrated under reduced pressure. DCM was added and the organic layer was washed twice with aq NaOH (2 N). The usual work-up (DCM, brine) and purification (100 mL 10% to 40% EtOAc in

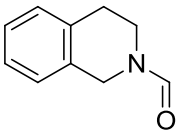
hexanes) gave **1-10b** (402 mg, 71%) as a colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.43 (s, 1H), 7.40-7.16 (m, 10H), 4.41 (s, 2H), 4.27 (s, 2H). The characterization fits the one already reported for the same compound.[77]

***N*-Benzyl-*N*-butylformamide (1-10c)**



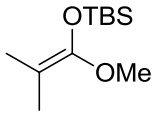
To a solution of *N*-benzylbutan-1-amine (560 mg, 3.43 mmol) in THF (112 mL) at rt was added added *N*-formylbenzotriazole[114] (513 mg, 3.49 mmol) at rt. The reaction mixture was stirred for 15 h at rt and then concentrated under reduced pressure. DCM was added and the organic layer was washed twice with aq NaOH (2 N). The usual work-up (DCM, brine) and purification (100 mL 20% to 40% EtOAc in hexanes) gave **1-10c** (466 mg, 71%) as a colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.22 (s, 1H, rotamers), 814 (s, 1H, rotamers), 7.37-7.12 (m, 5H), 4.46 (s, 1H), 4.31 (s, 1H), 3.21-3.13 (m, 1H), 3.07 (t, 1H, *J* = 7.1), 1.48-1.36 (m, 2H), 1.28-1.15 (m, 2H), 0.87-0.79 (m, 3H). The characterization fits the one already reported for the same compound.[78]

3,4-Dihydroisoquinoline-2(1*H*)-carbaldehyde (1-10d)



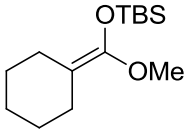
To a solution of 1,2,3,4-tetrahydroisoquinoline (0.47 mL, 3.75 mmol) in THF (125 mL) at rt was added added *N*-formylbenzotriazole[114] (717 mg, 4.88 mmol) at rt. The reaction mixture was stirred for 15 h at rt and then concentrated under reduced pressure. DCM was added and the organic layer was washed twice with aq NaOH (2 N). The usual work-up (DCM, brine) gave **1-10d** (quantitative yield) as a yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.27 (s, 1H), 8.21 (s, 1H), 7.27-7.12 (m, 4H), 4.70 (s, 1H), 4.55 (s, 1H), 3.80 (t, 1H, *J*= 6.2 Hz), 3.66 (t, 1H, *J*= 5.9 Hz), 3.00-2.82 (m, 2H). The characterization fits the one already reported for the same compound.[79]

***tert*-Butyl((1-methoxy-2-methylprop-1-en-1-yl)oxy)dimethylsilane (1-12a)**



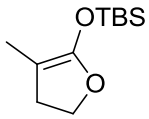
To a solution of *n*-BuLi (2.5 M in hexanes, 8.40 mL, 21.0 mmol) was added dropwise *N*,*N*-diisopropylamine (2.97 mL, 21.0 mmol) at -78°C. Following complete addition, the solution was diluted in THF (25 mL). The resulting mixture was cooled to -78 °C and methyl isobutyrate (2.29 mL, 20.0 mmol) was added. A clear solution was obtained and after stirring for 10 min. DMPU (2.17 mL, 18.0 mmol) was added at -78 °C followed by a solution of TBSCl (3.17 g, 21.0 mmol) in THF (7 mL). The mixture was allowed to warm to rt, stirred for additional 15 min. and quenched with 0 °C precooled aqueous acetic acid (1 M, 22 mL). The layers were separated and the organic phase was dried (Na_2SO_4), filtered and concentrated in vacuo. The residue was purified by rectification under reduced pressure (48-51 °C, 2 Torr) to afford TBS ketene acetal **1-12a** (3.64 g, 84%) as a clear and colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.51 (s, 3H), 1.57 (s, 3H), 1.53 (s, 3H), 0.95 (s, 9H), 0.14 (s, 6H). The characterization fits the one already reported for the same compound.[80]

***tert*-Butyl(cyclohexylidene(methoxy)methoxy)dimethylsilane (1-12b)**



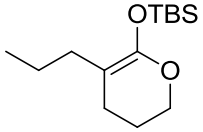
To a solution of *n*-BuLi (2.5 M in hexanes, 4.92 mL, 12.3 mmol) was added dropwise *N*,*N*-diisopropylamine (1.72 mL, 12.3 mmol) at 0 °C. Following complete addition, the solution was diluted in THF (15 mL). The resulting mixture was cooled to -78 °C and methyl cyclohexanecarboxylate (1.67 mL, 11.7 mmol) was added. A clear solution was obtained and after stirring for 10 min. DMPU (1.30 mL, 10.5 mmol) was added at -78 °C followed by a solution of TBSCl (1.85 g, 12.3 mmol) in THF (4 mL). The mixture was allowed to warm to rt, stirred for additional 15 min. and quenched with 0 °C precooled aqueous acetic acid (1 M, 19 mL). The layers were separated and the organic phase was dried (Na_2SO_4), filtered and concentrated in vacuo. The residue was purified by rectification under reduced pressure (55-59 °C, 2 Torr) to afford TBS ketene acetal **1-12b** (2.49 g, 83%) as a clear and colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.51 (s, 3H), 2.11-2.04 (m, 4H), 1.49-1.45 (m, 6H), 0.95 (s, 9H), 0.14 (s, 6H). The characterization fits the one already reported for the same compound.[81]

***tert*-Butyldimethyl((3-methyl-4,5-dihydrofuran-2-yl)oxy)silane (1-12c)**



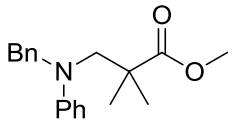
To a solution of *n*-BuLi (2.5 M in hexanes, 4.66 mL, 11.6 mmol) was added dropwise *N*,*N*-diisopropylamine (1.63 mL, 11.6 mmol) at -78 °C. Following complete addition, the solution was diluted in THF (21 mL) and allowed to warm up to 0 °C, then was stirred for 10 minutes. The resulting mixture was cooled to -78 °C and α-methyl-γ-butyrolactone (1.0 mL, 10.6 mmol), DMPU (1.28 mL, 10.6 mmol) and TBSCl (2.89 g, 18.6 mmol) in solution in THF (3.5 mL) were added. The reaction mixture was allowed to warm up to rt and was stirred for 15h. The solution was cooled at 0 °C then water and hexanes were added. The usual work-up (Et_2O, brine) and the purification of the residue by rectification under reduced pressure (46-49 °C, 3 mbar) gave TBS ketene acetal **1-12c** (1.38 g, 61%) as a clear colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.17 (t, 2H, *J*= 8.8), 2.51 (t, 2H, *J*= 8.9), 1.52 (s, 3H), 0.94 (s, 9H), 0.17 (s, 6H). The characterization fits the one already reported for the same compound.[82]

***tert*-Butyldimethyl((5-propyl-3,4-dihydro-2*H*-pyran-6-yl)oxy)silane (1-12d)**



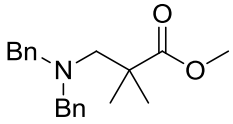
To a solution of *n*-BuLi (2.5 M in hexanes, 0.62 mL, 1.55 mmol) was added dropwise *N*,*N*-diisopropylamine (0.22 mL, 1.55 mmol) at -78 °C. Following complete addition, the solution was diluted in THF (2 mL) and allowed to warm up to 0 °C, then was stirred for 10 minutes. The resulting mixture was cooled to -78 °C and **1-19** (200 mg, 1.41 mmol), DMPU (0.17 mL, 1.41 mmol) and TBSCl (234 mg, 1.55 mmol) in solution in THF (0.5 mL) were added. The reaction mixture was allowed to warm up to rt and was stirred for 15h. The solution was cooled at 0 °C then water and hexanes were added. The usual work-up (Et_2O, brine) and purification (silica gel saturated with Et_3N, 100 % hexanes) gave **1-12d** (200 mg, 55%) as a yellow oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.99-3.89 (m, 2H), 1.97-1.92 (m, 4H), 1.77 (dt, 2H, *J*= 12.6, 6.1), 1.42-1.29 (m, 2H), 0.93 (s, 9H), 0.87 (t, 3H *J*= 7.3), 0.13 (s, 6H); ^{13}C NMR (100 MHz) δ 149.9, 84.8, 67.4, 32.1, 26.0, 24.2, 23.8, 21.0, 14.2; MS (ESI): *m/z* (rel %): 279 [MNa^+] (100); HRMS (ESI) calcd for $C_{19}H_{31}NO$ [MH^+] 279.1751, found 279.1747.

Methyl 3-(*N*-benzyl-*N*-phenylamino)-2,2-dimethylpropanoate (1-14a)



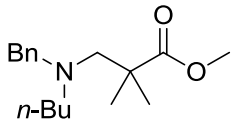
Following the General Experimental Method A, *N*-benzyl-*N*-phenylformamide **1-10a** (50 mg, 0.24 mmol) was treated DTBMP (53 mg, 0.26 mmol) and Tf_2O (45 μL, 0.24 mmol) in DCE (1.6 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (52 mg, 0.24) was added and the reaction mixture was heated at 60 °C. Reduction with $NaBH_3CN$ (90 mg, 1.44 mmol) and quenching with NaOH 15% afforded **1-14a** (67 mg, 94%) after usual purification (5% EtOAc in hexanes) as a yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.38-7.13 (m, 7H), 6.77-6.64 (m, 3H), 4.61 (s, 2H), 3.72 (s, 2H), 3.51 (s, 3H), 1.31 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 177.7 (s), 149.2 (s), 138.6 (s), 129.0 (d), 128.5 (d), 126.6 (d), 117.0 (d), 113.5 (d), 60.4 (t), 56.0 (t), 51.9 (q), 45.1 (s), 24.1 (q); IR (film) ν 3067, 2997, 2871, 1725, 1598, 1496, 1443 cm^{-1}; MS (ESI): *m/z* (rel %): 297 [M^+] (16), 196 (70), 91 (100); HRMS (ESI) calcd for $C_{19}H_{23}NO_2$ [M^+] 297.1729, found 297.1738.

Methyl 3-(dibenzylamino)-2,2-dimethylpropanoate (1-14b)



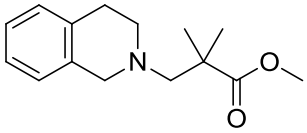
Following the General Experimental Method A, *N*,*N*-dibenzylformamide **1-10b** (180 mg, 0.80 mmol) was treated DTBMP (181 mg, 0.88 mmol) and Tf_2O (0.15 mL, 0.88 mmol) in DCE (5.3 mL) for 2 min. at -30 °C. Nucleophile **1-12a** (173 mg, 0.80) was added and the reaction mixture was heated at 60 °C. The reduction with $NaBH_3CN$ (100 mg, 1.60 mmol) and quench with NaOH 15% afforded **1-14b** (249 mg, 99%) after usual purification (5% and 20% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.21 (m, 10H), 3.57 (s, 3H), 3.53 (s, 4H), 2.73 (s, 2H), 1.11 (s, 6H); ^{13}C NMR (75MHz, $CDCl_3$) δ 178.2 (s), 139.5 (s), 129.1 (d), 128.1 (d), 126.9 (d), 63.0 (t), 59.4 (t), 51.6 (q), 43.7 (s), 24.1 (q); IR (film) ν 3061, 30,32, 2971, 2835, 2802, 1730, 1594, 1495, 1450, 1368 cm^{-1}; MS (ESI): *m/z* (rel %): 312 [M^+] (30), 210 (100), 91 (62); HRMS (ESI) calcd for $C_{20}H_{25}NO_2$ [M^+] 312.1963, found 312.1971.

Methyl 3-(benzyl(butyl)amino)-2,2-dimethylpropanoate (1-14c)



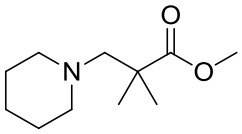
Following the General Experimental Method A, *N*-benzyl-*N*-butylformamide **1-10c** (50 mg, 0.26 mmol) was treated DTBMP (60 mg, 0.29 mmol) and Tf_2O (0.49 μL, 0.29 mmol) in DCE (1.1 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (56 mg, 0.26) was added and the reaction mixture was heated at 60 °C. The reduction with $NaBH_3CN$ (99 mg, 1.57 mmol) and quench with NaOH 15% afforded **1-14c** (84 mg, 85%) after usual purification (50% EtOAc in hexanes) as yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.34-7.21 (m, 5H), 3.61 (s, 3H), 3.58 (s, 2H), 2.66 (s, 2H), 2.36-2.31 (m, 2H), 1.39-1.32 (m, 2H), 1.21-1.14(m, 2H), 1.17 (s, 3H), 0.82 (t, 3H, *J*= 7.3); ^{13}C NMR (75MHz, $CDCl_3$) δ 178.5 (s), 140.6 (s), 128.8 (d), 128.3 (d), 126.8 (d), 64.2 (t), 60.4 (t), 55.1 (t), 51.8 (q), 44.4 (s), 29.0 (t), 24.2 (q), 20.7 (t), 14.3 (t); IR (film) ν 3150, 3028, 1958, 2872, 2799, 1724, 1664, 1586, 1446 cm^{-1}; MS (ESI): *m/z* (rel %): 278 [M^+] (50), 176 (100), 91 (62); HRMS (ESI) calcd for $C_{17}H_{27}NO_2$ [M^+] 278.2120, found 278.2128.

Methyl 3-(3,4-dihydroisoquinolin-2(1*H*)-yl)-2,2-dimethylpropanoate (1-14d)



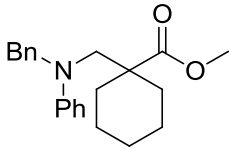
Following the General Experimental Method C, 3,4-dihydroisoquinoline-2(1*H*)-carbaldehyde **1-10d** (50 mg, 0.31 mmol) was treated DTBMP (70 mg, 0.34 mmol) and Tf_2O (58 μL, 0.34 mmol) in DCE (2.0 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (67 mg, 0.31 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.18 mL, 3.10 mmol) and $NaBH_4$ (35 mg, 0.93 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-14d** (64 mg, 84%) after usual purification (25% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.10-7.07 (m, 2H), 6.98-6.97 (m, 2H), 3.70 (s, 2H), 3.67 (s, 3H), 2.83-2.78 (m, 4H), 2.67 (s, 2H), 1.21 (s, 6H); ^{13}C NMR (75MHz, $CDCl_3$) δ 178.2 (s), 135.5 (s), 134.5 (s), 128.6 (d), 126.4 (d), 125.9 (d), 125.4 (d), 66.3 (t), 57.6 (t), 52.6 (t), 51.6 (q), 44.2 (s), 29.2 (t), 23.4 (q); IR (film) ν 3065, 3024, 1983, 2926, 2794, 2741, 1725, 1664, 1602, 1479, 1442, 1282 cm^{-1}; MS (ESI): *m/z* (rel %): 270 [MNa^+] (44), 248 [M^+] (72); HRMS (ESI) calcd for $C_{15}H_{21}NO_2$ [MNa^+] 270.1465, found 270.1469.

Methyl 2,2-dimethyl-3-(piperidin-1-yl)propanoate (1-14e)



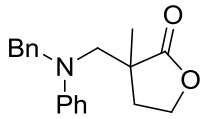
Following the General Experimental Method A, 1-formylpiperidine **1-10e** (98 μL, 0.88 mmol) was treated DTBMP (202 mg, 0.98 mmol) and Tf_2O (166 μL, 0.98 mmol) in DCE (2.2 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (190 mg, 0.88 mmol) was added and the reaction mixture was heated at 60 °C. The reduction with $NaBH_3CN$ (342 mg, 5.30 mmol) and quench with NaOH 15% afforded **1-14e** (114 mg, 65%) after usual purification (50% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.65 (s, 3H), 2.42 (s, 2H), 2.39-2.32 (m, 4H), 1.51-1.45 (m, 4H), 1.37-1.32 (m, 2H); ^{13}C NMR (75MHz, $CDCl_3$) δ 178.6 (s), 67.8 (t), 56.6 (t), 51.7 (q), 44.2 (s), 26.6 (t), 24.3 (t), 23.9 (q); IR (film) ν 2937, 2851, 2786, 1725, 1664, 1468, 1447, 1276 cm^{-1}; MS (ESI): *m/z* (rel %): 200 [M^+] (100), 98 (33); HRMS (ESI) calcd for $C_{11}H_{21}NO_2$ [M^+] 200.1651, found 200.1644.

Methyl 1-((benzyl(phenyl)amino)methyl)cyclohexanecarboxylate (1-14f)



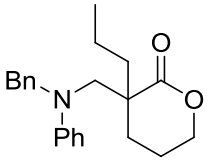
Following the General Experimental Method A. *N*-Benzyl-*N*-phenylformamide **1-10a** (50 mg, 0.24 mmol) was treated DTBMP (53 mg, 0.26 mmol) and Tf_2O (44 μL, 0.26 mmol) in DCE (1.6 mL) for 2 min. at 0 °C. Nucleophile **1-12b** (62 mg, 0.24 mmol) was added and the reaction mixture was heated at 60 °C. The reduction with $NaBH_3CN$ (90 mg, 1.44 mmol) and quench with NaOH 15% afforded **1-14f** (72 mg, 89%) after usual purification (50% EtOAc in hexanes) as yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.24-7.10 (m, 8H), 6.72-6.65 (m, 2H), 4.49 (s, 2H), 3.60 (s, 2H), 3.52 (s, 3H), 2.30-2.27 (m, 2H), 1.64-1.55 (m, 4H), 1.33-1.21 (m, 4H); ^{13}C NMR (75MHz, $CDCl_3$) δ 176.2 (s), 148.8 (s), 138.3 (s), 128.8 (d), 128.4 (d), 126.5 (d), 116.8 (d), 113.4 (d), 61.5 (t), 55.9 (t), 51.6 (q), 50.3 (s), 33.2 (d), 25.6 (d), 23.3 (d); IR (film) ν 3065, 3028, 2942, 2852, 1725, 1590, 1500, 1446, 1356 cm^{-1}; MS (ESI): *m/z* (rel %): 338 [M^+] (100); HRMS (ESI) calcd for $C_{22}H_{27}NO_2$ [MH^+] 338.2120, found 338.2121.

3-((Benzyl(phenyl)amino)methyl)-3-methyldihydrofuran-2(3*H*)-one (1-14g)



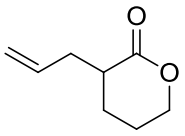
Following the General Experimental Method A. N-Benzyl-N-phenylformamide **1-10a** (50 mg, 0.24 mmol) was treated DTBMP (53 mg, 0.26 mmol) and Tf_2O (44 μL, 0.26 mmol) in DCE (1.6 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (51 mg, 0.24 mmol) was added and the reaction mixture was heated at 60 °C. The reduction with AcOH (0.13 mL, 2.40 mmol), $NaBH_3CN$ (45 mg, 0.72 mmol) and quench with NaOH 15% afforded **1-14g** (65 mg, 91%) after usual purification (7% to 30% EtOAc in hexanes) as yellowish solid: mp 105-112 °C; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.10 (m, 7H), 6.76-6.64 (m, 3H), 4.63 (dd, 2H, J = 17.1, 7.8), 4.32-4.18 (m, 2H), 3.76 (m, 2H), 2.57-2.39 (m, 1H), 2.09-1.91 (m, 1H), 1.30 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 181.8 (s), 148.9 (s), 137.9 (s), 129.2 (d), 128.5 (d), 126.7 (d), 126.5 (d), 117.1 (d), 112.7 (d), 65.3 (t), 56.5 (t), 54.3 (t), 44.7 (s), 32.3 (t), 21.5 (q); IR (film) ν 3069, 3032, 2975, 2926, 2872, 1762, 1598, 1668, 1495, 1450, 1397 cm^{-1}; MS (ESI): *m/z* (rel %): 318 [MNa^+] (100), 296 [M^+] (5); HRMS (ESI) calcd for $C_{19}H_{21}NO_2$ [MNa^+] 318.1465, found 318.1469.

3-((Benzyl(phenyl)amino)methyl)-3-propyltetrahydro-2*H*-pyran-2-one (1-14h)



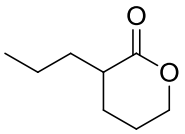
Following the General Experimental Method A, *N*-benzyl-*N*-phenylformamide **1-10a** (50 mg, 0.24 mmol) was treated DTBMP (53 mg, 0.26 mmol) and Tf_2O (44 μL, 0.26 mmol) in DCE (1.6 mL) for 2 min. at 0 °C. Nucleophile **1-12d** (62 mg, 0.24 mmol) was added and the reaction mixture was heated at 60 °C. The reduction with AcOH (0.13 mL, 2.40 mmol), $NaBH_3CN$ (45 mg, 0.72 mmol) and quench with NaOH 15% afforded **1-14h** (63 mg, 78%) after usual purification (2 to 10% EtOAc in hexanes) as yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.24-7.10 (m, 8H), 6.72-6.65 (m, 2H), 4.62 (dd, 2H, *J* = 19.7, 8.7), 4.22-4.17 (m, 1H), 4.14-4.09 (m, 1H), 3.94 (d, 1H, *J* = 15.3), 3.70 (d, 1H, *J* = 15.3), 2.16-2.09 (m, 1H), 1.82-173 (m, 4H), 1.47-1.34 (m, 3H), 0.94 (t, H, *J* = 7.1); ^{13}C NMR (75MHz, $CDCl_3$) δ 175.9 (s), 149.4 (s), 138.0 (s), 129.1 (d), 128.3 (d), 126.7 (d), 70.3 (t), 58.7 (t), 54.7 (t), 48.7 (t), 41.5 (s), 27.7 (t), 21.2 (t), 17.8 (t), 14.5 (q); IR (film) ν 3068, 3032, 2950, 2876, 1725, 1598, 1495, 1446, 1237 cm^{-1}; MS (ESI): *m/z* (rel %): 360 [Na^+] (100), 338 [H^+] (5); HRMS (ESI) calcd for $C_{22}H_{27}NO_2$ [MNa^+] 360.1934, found 360.1937.

3-Allyltetrahydro-2*H*-pyran-2-one (1-18)



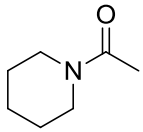
To a solution of γ-valerolactone **1-17** (200 mg, 2.00 mmol) in THF (22 mL) at -78 °C was added LiHMDS (1.0 M in THF, 2.20 mL, 2.20 mmol). DMPU (0.75mL, 6.20 mmol) was added and the resulting mixture was stirred for 30 min. at -78°C. Allylbromide (0.18 mL, 2.10 mmol) was added and the reaction mixture was stirred for 3h, then was allowed to warm up to rt and was stirred for 15 h. The solution was cooled at 0 °C then saturated aq. NH_4Cl was added. THF was removed by concentration under reduce pressure and usual wok-up (AcOEt, brine) following by purification (22% AcOEt in hexanes) gave **1-18** (280 mg, 79%) as a yellowish oil: ^{1}H NMR (300 MHz, CD_3Cl) δ 5.87-5.73 (m, 1H), 5.13-5.07 (m, 2H), 4.33-4.28 (m, 2H), 2.61-2.50 (m, 2H), 2.35-2.25 (m, 1H), 2.10-2.01 (m, 1H), 1.94-1.85 (m, 2H), 1.63-1.51 (m, 1H). The characterization fit the one already reported for the same compound.[83]

3-Propyltetrahydro-2*H*-pyran-2-one (1-19)



To a solution of **1-18** (200 mg, 1.41 mmol) in AcOEt (14 mL) at -78°C was added Pd/C, and the mixture was hydrogenated at 55-60 psi for 2 h. Then, the reaction mixture was filtered, evaporated and **1-19** (1.98 g, 99%) was obtained as a colorless oil: ^{1}H NMR ($CDCl_3$, 300 M0Hz) δ 4.32-4.26 (m, 2H), 2.49-2.41 (m, 1H), 2.15-2.04 (m, 1H), 1.92-1.84 (m, 3H), 1.47-1.33 (m, 4H), 0.93 (t, 3H, *J* = 7.1). The characterization fits the one already reported for the same compound.[84]

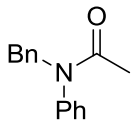
1-(Piperidin-1-yl)ethanone (1-22a)



To a solution of piperidine (1.55 mL, 15.7 mmol) in DCM (8 mL) at 0°C was added anhydride acetic (0.74 mL, 7.86 mmol). The reaction mixture was allowed to warm up to rt and was stirred for 15 h. 2 N HCl (4mL) was added and the usual work-up (DCM, brine) gave **1-22a** (quantitative yield) as a

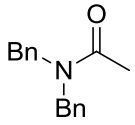
yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.56-3.52 (m, 2H), 3.40-3.37 (m, 2H), 2.08 (s, 3H), 1.64-1.52 (m, 6H). The characterization fits the one already reported for the same compound.[85]

***N*-Benzyl-*N*-phenylacetamide (1-22d)**



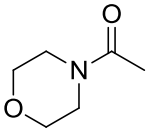
To a solution of *N*-benzylaniline (1.63 g, 8.88 mmol) in DCM (60 mL) at 0°C was added anhydride acetic (0.42 mL, 4.44 mmol). The reaction mixture was allowed to warm up to rt and was stirred for 15 h. 2 N HCl (10mL) was added and the usual work-up (DCM, brine) gave **1-22d** (quantitative yield) as a red oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.40-7.16 (m, 8H), 7.11-6.93 (m, 2H), 4.89 (s, 2H), 1.89 (s, 3H). The characterization fit the one already reported for the same compound.[86]

***N*,*N*-Dibenzylacetamide (1-22e)**



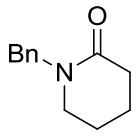
To a solution of *N*,*N*-dibenzylamine (0.80 mL, 4.18 mmol) in DCM (3 mL) at 0°C was added anhydride acetic (0.20 mL, 2.09 mmol). The reaction mixture was allowed to warm up to rt and was stirred for 15h. 2 N HCl (1.1 mL) was added and the usual work-up (DCM, brine) gave **1-22e** (355 mg, 71%) as a yellow oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.38-7.17 (m, 10H), 4.60 (s, 2H), 4.44 (s, 2H), 2.22 (s, 3H). The characterization fits the one already reported for the same compound.[87]

1-Morpholinoethanone (1-22f)



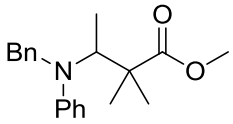
To a solution of morpholine (3.10 mL, 31.4 mmol) in DCM (105 mL) at 0°C was added anhydride acetic (1.48 mL, 15.7 mmol). The reaction mixture was allowed to warm up to rt and was stirred for 15 h. 2 N HCl (10mL) was added and the usual work-up (DCM, brine) gave **1-22f** (1.30 g, 65%) as a yellow oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.57-3.49 (m, 2H), 3.42-3.33 (m, 2H), 2.07 (s, 3H), 1.70-1.43 (m, 4H). The characterization fits the one already reported for the same compound.[88]

1-Benzylpiperidin-2-one (1-22g)



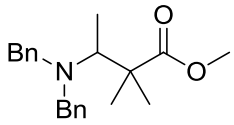
To a solution of *n*-BuLi (2.7 M in hexanes, 1.26 mL, 3.42 mmol) in THF (9mL) was added a solution of δ-valerolactam (300 mg, 3.03 mmol) in THF (3mL) at -78 °C. The reaction mixture was stirred for 20 min. and BnBr (0.36 mL, 3.03 mmol) was added. The resulting mixture was allowed to warm up to rt and was stirred for 15 h. Saturated aq NH_4Cl was added and the usual work-up (Et_2O) and purification (0% to 40% Et_2O/hexanes) gave **1-22g** (464 mg, 81%) asa yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.24 (m, 5H), 4.60 (s, 3H), 3.19 (t, 3H, *J* = 6.2), 2.47 (t, 3H, *J* = 5.8), 1.84-1.74 (m, 4H). The characterization fits the one already reported for the same compound.[89]

Methyl 3-(benzyl(phenyl)amino)-2,2-dimethylbutanoate (1-24a)



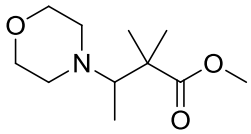
Following the General Experimental Method C, acetamide **1-22d** (38 mg, 0.17 mmol) was treated DTBMP (38 mg, 0.19 mmol) and Tf_2O (32 μL, 0.19 mmol) in DCE (1.1 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (37 mg, 0.17 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.1 mL, 1.70 mmol) and $NaBH_4$ (19 mg, 0.51 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-24a** (36 mg, 68%) after usual purification (7% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.37-7.09 (m, 6H), 6.83-6.64 (m, 4H), 4.55-4.48 (m, 3H), 3.54 (s, 3H), 1.33 (s, 3H), 1.30-1.27 (s, 6H); ^{13}C NMR (75MHz, $CDCl_3$) δ 177.7 (s), 149.3 (s), 139.2 (s), 128.7 (d), 128.3 (d), 126.6 (d), 126.3 (d), 117.4 (d), 115.4 (d), 60.9 (d), 51.7 (q), 48.9 (t), 48.6 (s), 23.2 (q), 23.0 (q), 13.6 (q); IR (film) ν 30332, 2958, 2852, 2806, 1730, 1590, 1450, 1269, 1122 cm^{-1}; MS (ESI): *m/z* (rel %): 334 [MNa^+] (100), 312 [MH^+] (62); HRMS (ESI) calcd for $C_{20}H_{25}NO_2$ [MH^+] 312.1964, found 312.1961.

Methyl 3-(dibenzylamino)-2,2-dimethylbutanoate (1-24b)



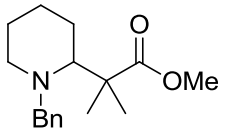
Following the General Experimental Method C, acetamide **1-22e** (50 mg, 0.21 mmol) was treated DTBMP (47 mg, 0.23 mmol) and Tf_2O (39 μL, 0.23 mmol) in DCE (1.4 mL) for 2 min. at -30 °C. Nucleophile **1-12a** (46 mg, 0.21 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.12 mL, 2.10 mmol) and $NaBH_4$ (24 mg, 0.63 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-24b** (67 mg, 99%) after usual purification (7% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.23 (m, 10H), 3.72 (d, 1H, *J*= 13.9), 3.50 (s, 3H), 3.32 (d, 1H, *J*= 13.9), 3.12 (q, 1H, *J*= 7.0), 1.12 (s, 3H), 1.08 (s, 3H), 1.03 (d, 3H, *J*= 7.0); ^{13}C NMR (75MHz, $CDCl_3$) δ 177.9 (s), 139.9 (s), 129.2 (d), 128.0 (d), 126.8 (d), 60.1 (d), 55.6 (t), 51.5 (q), 47.9 (s), 23.3 (q), 22.3 (q), 7.8 (q); IR (film) ν 3069, 3028, 2979, 2946, 2839, 2806, 1726, 1598, 1496, 1446, 1356, 1261, 1154 cm^{-1}; MS (ESI): *m/z* (rel %): 348 [MNa^+] (100), 326 [MH^+] (84); HRMS (ESI) calcd for $C_{21}H_{27}NO_2$ [MNa^+] 348.1934, found 348.1935.

Methyl 2,2-dimethyl-3-morpholinobutanoate (1-22c)



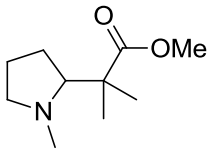
Following the General Experimental Method C, acetamide **1-22f** (50 mg, 0.39 mmol) was treated DTBMP (87 mg, 0.43 mmol) and Tf_2O (72 μL, 0.43 mmol) in DCE (2.5 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (84 mg, 0.39 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.22 mL, 3.90 mmol) and $NaBH_4$ (44 mg, 1.17 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-22c** (43 mg, 55%) after usual purification (7% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.66 (s, 3H), 3.61 (t, 4H, *J*= 4.5), 2.81 (q, 1H, *J*= 7.1), 2.70-2.55 (m, 2H), 2.50-2.35 (m, 2H), 1.16 (s, 3H), 1.09 (s, 3H), 0.97 (d, 3H, *J*= 7.2); ^{13}C NMR (75MHz, $CDCl_3$) δ 178.1 (s), 67.6 (t), 65.5 (d), 51.5 (q), 51.4 (t), 48.8 (s), 23.2 (q), 20.6 (q), 7.5 (q); IR (film) ν 2962, 2852, 2806, 1730, 1442, 1276, 1191, 1126 cm^{-1}; MS (ESI): *m/z* (rel %): 238 [MNa^+] (100), 216 [MH^+] (100); HRMS (ESI) calcd for $C_{11}H_{21}NO_2$ [MNa^+] 216.1954, found 216.1598.

Methyl 2-(1-benzylpiperidin-2-yl)-2-methylpropanoate (1-24d)



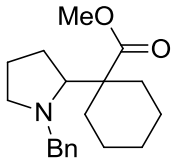
Following the General Experimental Method C, acetamide **1-22g** (50 mg, 0.26 mmol) was treated DTBMP (60 mg, 0.29 mmol) and Tf_2O (49 μL, 0.29 mmol) in DCE (1.7 mL) for 2 min. at -30 °C. Nucleophile **1-12a** (56 mg, 0.26 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.15 mL, 2.60 mmol) and $NaBH_4$ (30 mg, 0.78 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-24d** (49 mg, 67%) after usual purification (7% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.43-7.33 (m, 5H), 3.73 (d, 1H, *J*= 13.0), 3.66 (s, 3H), 3.23 (d, 1H, *J*= 13.0), 2.93-2.89 (m, 1H), 2.71 (dt, 1H, *J*= 7.8, 4.1), 2.13-2.04 (m, 1H), 1.83-1.80 (m, 1H), 1.68-1.64 (m, 1H), 1.50-1.07 (m, 4H), 1.28 (s, 3H), 1.16 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 179.4, 140.6, 128.3, 128.1, 126.6, 66.8, 57.6, 51.8, 49.6, 46.3, 29.7, 25.5, 23.9, 22.4, 19.3; IR (film) ν 3029, 2938, 2860, 2790, 1726, 1590, 1491, 1253, 1134 cm^{-1}; MS (ESI): *m/z* (rel %): 298 [MNa^+] (42), 276 [MH^+] (100); HRMS (ESI) calcd for $C_{17}H_{25}NO$ [MH^+] 276.1958, found 276.1967.

Methyl 2-methyl-2-(1-methylpyrrolidin-2-yl)propanoate (1-24e)



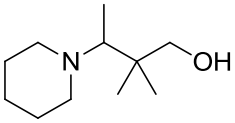
Following the General Experimental Method C, acetamide **1-22b** (0.10 mL, 1.08 mmol) was treated DTBMP (244 mg, 1.19 mmol) and Tf_2O (0.20 mL, 1.19 mmol) in DCE (7.2 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (233 mg, 1.08 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.62 mL, 10.8 mmol) and $NaBH_4$ (122 mg, 3.24 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-24e** (136 mg, 68%) after usual purification (35% to 100% EtOAc in hexanes, 1% MeOH in DCM) as brownish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.67 (s, 3H), 3.09-2.98 (m, 1H), 2.79-2.69 (m, 1H), 2.35-2.24 (m, 1H), 2.27 (s, 3H), 1.89-1.75 (m, 1H), 1.72-1.50 (m 3H), 1.15 (s, 3H), 1.11 (s, 3H); 178.4 (s), 71.5 (d), 58.4 (t), 51.6 (q), 45.8 (s), 43.4 (q), 27.6 (t), 23.4 (t), 23.0 (q), 20.0 (q); IR (film) ν 2963, 2782, 1730, 1594, 1446, 1409, 1257, 1130, 1044 cm^{-1}; MS (ESI): *m/z* (rel %): 186 [MH^+] (100); HRMS (ESI) calcd for $C_{20}H_{25}NO_2$ [MH^+] 186.1489, found 186.1491.

Methyl 1-(1-benzylpyrrolidin-2-yl)cyclohexanecarboxylate (1-24f)



Following the General Experimental Method C, *N*-benzylpyrrolidin-2-one **1-22c** (46 μL, 0.29 mmol) was treated DTBMP (64 mg, 0.31 mmol) and Tf_2O (52 μL, 0.31 mmol) in DCE (2.0 mL) for 2 min. at 0 °C. Nucleophile **1-12b** (74 mg, 0.29 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then was cooled to let to 0 °C. AcOH (0.17 mL, 2.90 mmol) and $NaBH_4$ (33 mg, 0.87 mmol) were added. The usual work-up (NaOH 15%, DCM) gave **1-24f** (59 mg, 68%) after usual purification (7% EtOAc in hexanes) as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.41-7.38 (m, 2H), 7.33-7.19 (m, 3H), 3.99 (d, 1H, *J*= 13.9), 3.66 (s, 3H), 3.48 (d, 1H, *J*= 13.9), 2.97-2.93 (m, 1H), 2.84-2.79 (m, 1H), 2.30-2.20 (m, 1H), 2.15-2.09 (m, 2H), 1.83-1.75 (m, 2H), 1.70-1.54 (m, 5H), 1.48-1.06 (m, 5H); ^{13}C NMR (75MHz, $CDCl_3$) δ 176.8, 141.0, 128.2 , 128.0, 126.5, 71.4, 62.7, 55.1, 53.5, 51.3, 31.1, 30.1, 27.5, 26.0, 24.9, 23.7, 23.4; IR (film) ν 3028, 2942, 2790, 1726, 1606, 1446, 1212, 1130 cm^{-1}; MS (ESI): *m/z* (rel %): 324 [MNa^+] (8), 302 [MH^+] (100); HRMS (ESI) calcd for $C_{19}H_{27}NO_2$ [MH^+] 302.2115, found 302.2117.

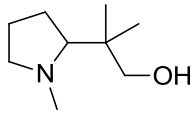
2,2-Dimethyl-3-(piperidin-1-yl)butan-1-ol (1-29a)



Following the General Experimental Method B, acetamide **1-22a** (50 mg, 0.39 mmol) was treated DTBMP (89 mg, 0.43 mmol) and Tf_2O (73 μL, 0.43 mmol) in DCE (1.6 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (85 mg, 0.59 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replaced by THF (1.7 mL). The solution was cooled at 0 °C then $LiAlH_4$ (30 mg, 0.78 mmol) was added and the mixture was stirred for overnight. The reaction mixture was cooled at 0°C. The solution was diluted with Et_2O then H_2O (30 μL), NaOH 15% (30 μL) and H_2O (0.1 mL) were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4 was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified (5% to 20 % (5% NH_4OH in MeOH) in DCM) and gave **1-29a** (29 mg, 40%) as a yellow oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.95 (d, 1H, *J* = 7.2), 3.69-3.60 (m, 1H), 3.57 (d, 1H, *J* = 7.2), 3.21 (q, 1H, *J* = 10.6), 2.17-1.80 (m, 8H), 1.70-1.68 (m, 1H), 1.26 (d, 3H, *J* = 10.6), 1.17 (s, 3H), 0.82 (s, 3H); ^{13}C NMR

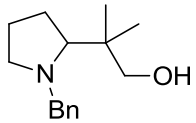
(75MHz, $CDCl_3$) δ 72.9 , 72.7, 62.8, 37.2, 29.8, 24.4, 22.0, 18.1, 8.9; IR (film) ν 3332 (br), 2961, 2924, 2851, 1582, 1480, 1443, 1403, 1276, 1158, 1031 cm^{-1}; MS (ESI): *m/z* (rel %): 186 [MH^+] (100); HRMS (ESI) calcd for $C_{11}H_{23}NO$ [MH^+] 186.1852, found 186.1857.

2-Methyl-2-(1-methylpyrrolidin-2-yl)propan-1-ol (1-29b)



Following the General Experimental Method B, *N*-methylpyrrolidin-2-one **1-22b** (98 µL, 1.00 mmol) was treated DTBMP (226 mg, 1.10 mmol) and Tf_2O (186 µL, 1.10 mmol) in DCE (7 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (216 mg, 1.00 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replaced by THF (7 mL). The solution was cooled at 0 °C then $LiAlH_4$ (76 mg, 2.00 mmol) was added and the mixture was stirred for overnight. The reaction mixture was cooled at 0°C. The solution was diluted with Et_2O then H_2O (76 µL), NaOH 15% (76 µL) and H_2O (228 µL) were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4 was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified (5% to 35%(5% NH_4OH in MeOH) in DCM) and gave **1-22b** (133 mg, 84%) as a yellow oil: ^1H NMR (300 MHz, $CDCl_3$) δ 3.71 (d, 1H, *J*= 11.1), 3.67-3.54 (m, 1H), 3.49 (d, 1H, *J*= 11.1), 3.32 (t, 1H, *J*= 8.3), 3.22-3.09 (m, 1H), 2.97 (s, 3H), 2.29-1.86 (m, 4H), 1.18 (s, 3H), 0.93 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 84.3 (d), 73.4 (t), 62.9 (t), 50.0 (q), 41.7 (s), 32.2 (t), 28.2 (t), 27.9 (q), 25.2 (q); IR (film) ν 3061, 2979, 2872, 1668, 1606, 1487, 1442, 1298, 1232, 1175, 1031 cm^{-1}; MS (ESI): *m/z* (rel %): 158 [MH^+] (100); HRMS (ESI) calcd for $C_9H_{19}NO$ [MH^+] 158.1545, found 158.1555.

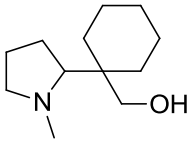
2-(1-Benzylpyrrolidin-2-yl)-2-methylpropan-1-ol (1-29c)



Following the General Experimental Method B, *N*-benzylpyrrolidin-2-one **1-22c** (46 µL, 0.29 mmol) was treated DTBMP (64 mg, 0.31 mmol) and Tf_2O (53 µL, 0.31 mmol) in DCE (1.1 mL) for 2 min. at 0 °C. Nucleophile **1-12a** (61 mg, 0.29 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replaced by THF (1.1 mL). The solution was cooled at 0 °C then $LiAlH_4$ (21 mg, 0.58 mmol) was added and the mixture was stirred for overnight. The reaction mixture was cooled at 0°C. The solution was diluted

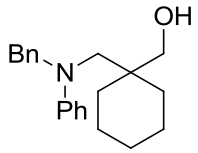
with Et_2O then H_2O (21 μL), NaOH 15% (21 μL) and H_2O (63 μL) were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4 was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified (5% (5% NH_4OH in MeOH) in DCM) and gave **1-29c** (31 mg, 42%) as an orange oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.45-7.19 (m, 5H), 4.16 (d, 1H, *J*= 13.1), 3.80 (d, 1H, *J*= 10.7), 3.40-3.30 (m, 2H), 2.84-2.77 (m, 2H), 2.42-2.34 (m, 1H), 1.83-1.71 (m, 4H), 1.28 (s, 3H), 0.80 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 139.2 (s), 128.5 (d), 127.1 (d), 74.3 (d), 70.4 (t), 62.9 (t), 54.2 (t), 37.3 (s), 27.7 (t), 25.6 (q), 24.3 (t), 23.5 (q); IR (film) ν 3014 (br), 2957, 2867, 1594, 1486, 1447, 1405, 1354 cm^{-1}; MS (ESI): *m/z* (rel %): 234 [MH^+] (100); HRMS (ESI) calcd for $C_{15}H_{23}NO$ [MH^+] 234.1858, found 234.1862.

(1-(1-Methylpyrrolidin-2-yl)cyclohexyl)methanol (1-29d)



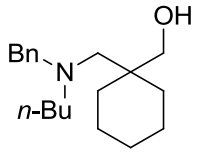
Following the General Experimental Method B, *N*-methylpyrrolidin-2-one **1-22b** (56 μL, 0.58 mmol) was treated DTBMP (131 mg, 0.64 mmol) and Tf_2O (108 μL, 0.64 mmol) in DCE (4 mL) for 2 min. at 0 °C. Nucleophile **1-12b** (149 mg, 0.58 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replaced by THF (4 mL). The solution was cooled at 0 °C then $LiAlH_4$ (55 mg, 1.46 mmol) was added and the mixture was stirred for overnight. The reaction mixture was cooled at 0°C. The solution was diluted with Et_2O then H_2O (55 μL), NaOH 15% (55 μL) and H_2O (165 μL) were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4 was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified (5% (5% NH_4OH in MeOH) in DCM) and gave **1-29d** (72 mg, 63%) as a yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.84-3.75 (m , 2H), 3.69-3.64 (m, 1H), 3.40-3.32 (m, 1H), 3.15-3.09 (m, 1H), 2.96 (s, 3H), 2.14-2.01 (m, 4H), 1.95-1.90 (m, 1H), 1.60-1.24 (m, 8H), 1.18-1.14 (m, 1H); ^{13}C NMR (75 MHz) δ 79.3 (d), 70.6 (t), 57.7 (t), 45. 7 (q), 38.9 (s), 31.4 (t), 26.7 (t), 26.4 (t), 25.4 (t), 23.3 (t), 20.9 (t), 20.8(t); IR (film) ν 3139 (br), 2938, 2856, 1664, 1586, 1446, 1278, 1249, 1163, 1031 cm^{-1}; MS (ESI): *m/z* (rel %): 198 [MH^+] (100); HRMS (ESI) calcd for $C_{12}H_{23}NO$ [MH^+] 198.1858, found 198.1854.

(1-((Benzyl(phenyl)amino)methyl)cyclohexyl)methanol (1-29e/1-29g)



Following the General Experimental Method B, *N*-benzyl-*N*-phenylformamide **1-10a** (50 mg, 0.24 mmol) was treated DTBMP (53 mg, 0.26 mmol) and Tf_2O (44 μL, 0.26 mmol) in DCE (2 mL) for 2 min. at 0 °C. Nucleophile **1-12b** (62 mg, 0.24 mmol) or **1-33a** (54 mg, 0.24 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replace by THF (2 mL). The solution was cooled at 0 °C then $LiAlH_4$ (20 mg, 0.52 mmol) was added and the mixture was stirred for overnight. The reaction mixture was cooled at 0°C. The solution was diluted with Et_2O then H_2O (20 μL), NaOH 15% (20 μL) and H_2O (60 μL) were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4 was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified (DCM) and gave **1-29e** (41 mg, 55%) or **1-29g** (47 mg, 63%) as a yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.36-7.15 (m, 8H), 6.90 (d, 1H, *J*= 8.3), 6.72 (t, 1H, *J*= 7.2), 4.63 (s, 2H), 3.66 (s, 2H), 2.01 (bs, 1H), 1.58-1.27 (m, 10H); ^{13}C NMR (75 MHz) δ 150.2 (s), 138.4 (s), 228.9 (d), 128.4 (d), 126.9 (d), 126.5 (d), 117.5 (d), 114.8 (d), 65.7 (t), 59.8 (t), 57.0 (t), 40.7 (s), 31.6 (t), 26.1 (t), 21.6 (t); IR (film) ν 3346 (br), 3149, 3071, 2932, 2856, 1598, 1495, 1450, 1352, 1031 cm^{-1}; MS (ESI): *m/z* (rel %): 310 [MH^+] (100); HRMS (ESI) calcd for $C_{21}H_{27}NO$ [MH^+] 310.2171, found 310.2163.

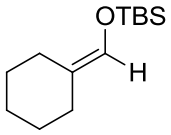
(1-(*N*-Benzyl-*N*-butylaminomethyl)cyclohexyl)methanol (1-29f/1-29h)



Following the General Experimental Method B, *N*-benzyl-*N*-butylformamide **1-10c** (100 mg, 0.52 mmol) was treated DTBMP (119 mg, 0.58 mmol) and Tf_2O (98 μL, 0.58 mmol) in DCE (3.5 mL) for 2 min. at 0 °C. Nucleophile **1-12b** (133 mg, 0.52 mmol) or **1-33a** (117 mg, 0.52 mmol) was added and the reaction mixture was heated at 60 °C. The reaction mixture was allowed to warm up to rt, then 1,2-dicloroethane was evaporated and replaced by THF (3.5 mL). The solution was cooled at 0 °C then $LiAlH_4$ (49 mg, 1.30 mmol) was added and the mixture was stirred for overnight. The reaction mixture was cooled at 0°C. The solution was diluted with Et_2O then H_2O (49 μL), NaOH 15% (49 μL) and H_2O

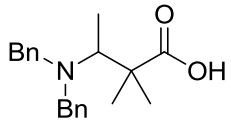
(147 μL) were added. The reaction mixture was stirred for 20 minutes, then Na_2SO_4 was added and the solution was stirred for 20 minutes again. The organic layer was filtered and concentrated under reduced pressure. The crude material was purified (5% (5% NH_4OH in MeOH) in DCM) and gave **1-29f** (72 mg, 63%) or **1-29h** (66 mg, 58%) as a yellow oil; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.41-7.26 (m, 5H), 3.60 (s, 2H), 3.53 (s, 2H), 2.53 (s, 2H), 2.45-2.36 (m, 2H), 1.53-1.23 (m, 10H), 0.88-0.83 (m, 3H); ^{13}C NMR (75 MHz) δ 138.4, 129.1, 128.4, 127.2, 70.2, 65.9, 61.2, 55.7, 37.4, 32.6, 28.6, 26.4, 21.6, 13.9; IR (film) ν 3028, 2926 (br), 2856, 1594, 1446, 1405, 1051 cm^{-1}; MS (ESI): *m/z* (rel %): 288 [MH^+] (8), 176 (100); HRMS (ESI) calcd for $C_{19}H_{31}NO$ [MH^+] 288.2327, found 288.2329.

tert-Butyl(cyclohexylidenemethoxy)dimethylsilane (1-33a)



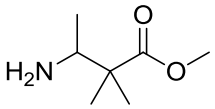
To a solution of cyclohexanecarboxaldehyde (1.30 mL, 10.7 mmol) and DIPEA (2.98 mL, 17.1 mmol) in DCM (100 mL) at 0 C was added *tert*-butyldimethylsilyl trifluoromethanesulfonate (3.93 mL, 17.1 mmol). The reaction mixture was allowed to warm up to rt and was stirred for 15 h. Saturated aq Na_2CO_3 was added and the usual work-up (DCM) and purification (silica gel saturated with Et_3N, 100% hexanes) gave **1-33a** (20 mg, 82%) as a colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.02 (s, 1H), 2.20-2.16 (m, 2H), 1.92-1.90 (m, 2H), 1.49-1.43 (m, 6H), 0.92 (s, 9H), 0.11 (s, 6H). The characterization fits the one already reported for the same compound.[90]

3-(Dibenzylamino)-2,2-dimethylbutanoic acid (1-34a)



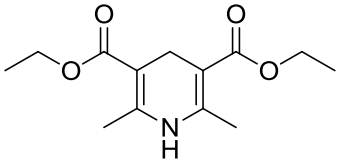
To a solution of **1-24b** (17 mg, 0.05 mmol) in THF (1.0 mL) at rt was added TMSOK (40 mg, 0.31 mmol). The reaction mixture was stirred for 15h at reflux then NH_4Cl (2 mL) was added. The usual work-up (EtOAc, brine) gave **1-34a** (15.2 mg, 95%) as a colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.47-7.28 (m, 10H), 4.08 (d, 2H, *J* = 13.5), 3.46 (d, 2H, *J* = 13.5), 3.19 (q, 1H, *J* = 7.0), 1.38 (s, 3H), 1.16 (d, 3H, *J* = 7.0), 1.14 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 210.3, 135.0, 129.9, 129.2, 128.6, 59.0, 55.1, 44.4, 25.4, 21.8, 6.9; IR (film) ν 3125 (br), 2950, 2860, 2810, 1795, 1666, 1575, 1410, 1298 cm^{-1}; MS (ESI) *m/z* (rel %): 334 [MNa^+] (90), 312 [MH^+] (100); HRMS (ESI) calcd for $C_{20}H_{25}NO_2$ [MNa^+] 334.1778, found 346.1774.

Methyl 3-amino-2,2-dimethylbutanoate (1-35c)



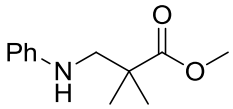
To a solution of β-amino ester **1-24b** (20 mg, 0.06 mmol) in AcOEt (1mL) was added Pd/C, and the mixture was hydrogenated at 55-60 psi for 18 h. Then, the reaction mixture was filtered, evaporated **1-35c** (16.8mg, 84%) was obtained as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.76 (s, 3H), 3.62-3.49 (m, 1H), 1.48-1.27 (m, 9H). The characterization fits the one already reported for the same compound.[91]

Diethyl 2,6-dimethyl-1,4-dihydropyridine-3,5-dicarboxylate (1-44)



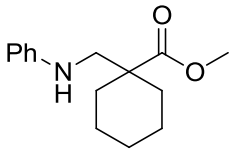
Ethyl acetoacetate (10 g, 76.8 mmol), paraformaldehyde (1.15 g, 38.4 mmol) and ammonium acetate (29 g, 375 mmol) were added to a 250 mL beaker equipped with a magnetic stirrer. The beaker was loosely covered with a plastic recipient and under slow agitation, the mixture was warmed to 70 °C in a water bath. After around 10 min., the mixture becomes a thick pale yellow paste resulting in the lost of agitation. Within the next minute, a highly exothermic reaction occurs resulting in the formation of a yellow solid. One minute after the appearance of the solid, the mixture was allowed to cool to rt, diluted with water (60 mL) and the yellow suspension was stirred for 10 min. at rt. The solid was filtered, washed thoroughly with water and suspended in EtOH (40 mL). The suspension was refluxed for 5 min. and allowed to slowly cool back to rt with stirring. The solid was filtered and washed thoroughly with EtOH yielding **1-44** (12.6 g 65%) as a bright yellow solid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 5.13 (s, 1H), 4.17 (q, 4H, *J*= 10.5 Hz), 3.26 (s, 2H), 2.19 (s, 6H), 1.28 (t, 6H, *J*=7.0 Hz). The characterization fits the one already reported for the same compound.[92]

Methyl 2,2-dimethyl-3-(phenylamino)propanoate (1-48a)



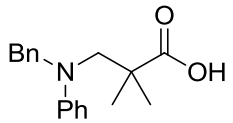
To a solution of β-amino ester **1-14a** (30 mg, 0.10 mmol) in AcOEt (1mL) was added Pd/C, and the mixture was hydrogenated at 55-60 psi for 18 h. Then, the reaction mixture was filtered, evaporated **1-48a** (quantitative yield) was obtained as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.19-7.16 (m, 2H), 6.68-6.61 (m, 3H), 3.68 (s, 3H), 3.23 (s, 2H), 1.27 (s, 6H). The characterization fits the one already reported for the same compound.[93]

Methyl 1-((phenylamino)methyl)cyclohexanecarboxylate (1-48b)



To a solution of β-amino ester **1-14f** (30 mg, 0.08 mmol) in AcOEt (1mL) was added Pd/C, and the mixture was hydrogenated at 55-60 psi for 18 h. Then, the reaction mixture was filtered, evaporated **1-48b** (quantitative yield) was obtained as colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.31-7.20 (m, 2H), 6.88-6.75 (m, 3H), 3.71 (s, 3H), 3.24 (s, 2H), 2.19-2.14 (m, 2H), 1.77-1.46 (m, 4H), 1.39-1.26 (m, 6H), ^{13}C NMR (75 MHz, CD_3Cl) δ 176.2, 148.2, 129.2, 117.3, 112.8, 53.5, 51.9, 47.9, 32.3, 25.8, 22.9; IR (film) ν 3208 (br), 3009, 2975, 2845, 2722, 1792, 1672, 1510, 1450, 1211, 1026 cm^{-1}; MS (ESI): *m/z* (rel %): 270 [MNa^+] (100), 248 [MH^+] (55); HRMS (ESI) calcd for $C_{15}H_{21}NO_2$ [MNa^+] 270.1465, found 270.1495.

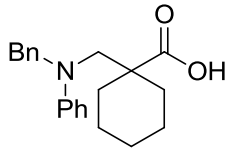
3-(Benzyl(phenyl)amino)-2,2-dimethylpropanoic acid (1-49a)



To a solution of **1-14a** (30 mg, 0.10 mmol) in THF (1.0 mL) at rt was added TMSOK (72 mg, 0.60 mmol). The reaction mixture was stirred for 15 h then NH_4Cl (4 mL) was added. The usual work-up (EtOAc, brine) gave **1-49a** (quantitative yield) as a colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.12 (m, 7H), 6.80 (d, 2H, *J*= 8.2), 6.72 (t, 1H, *J*= 7.2), 4.60 (s, 2H), 3.70 (s, 2H), 1.28 (s, 3H); ^{13}C NMR (75MHz, $CDCl_3$) δ 184.1 (s), 149.1 (s), 138.0 (s), 128.9 (d) 128.4 (d), 126.7 (d), 117.8 (d), 59.9 (t), 56.6 (t), 44.8 (s), 23.9 (q); IR (film) ν 3068 (br), 2971, 2880, 1602, 1489, 1298, 1150, 1035 cm^{-1};

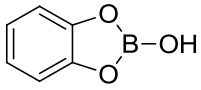
MS (ESI): *m/z* (rel %): 306 [MNa^+] (100), 284 [MH^+] (25); HRMS (ESI) calcd for $C_{18}H_{21}NO_2$ [MNa^+] 306.1465, found 306.1464.

1-((Benzyl(phenyl)amino)methyl)cyclohexanecarboxylic acid (1-49b)



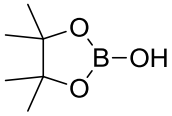
To a solution of **1-14f** (34 mg, 0.10 mmol) in THF (1.0 mL) at rt was added TMSOK (89 mg, 0.60 mmol). The reaction mixture was stirred for 15 h at reflux then NH_4Cl (4 mL) was added. The usual work-up (EtOAc, brine) gave **1-49b** (quantitative yield) as a colorless oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.28-7.09 (m, 3H), 7.18-7.09 (m, 4H), 6.80 (d, 2H, *J*= 8.3), 6.72 (t, 1H, *J*= 7.2), 4.61 (s, 2H), 3.65 (s, 2H), 2.25-2.21 (m, 2H), 1.66-1.62 (m, 2H), 1.39-1.18 (m, 6H); ^{13}C NMR (75MHz, $CDCl_3$) δ 181.8 (s), 148.9 (s), 138.0 (s), 128.8 (d), 128.4 (d), 126.6 (d), 117.2 (d), 113.9 (d), 61.2 (t), 56.2 (t), 50.4 (s), 32.9 (t), 25.5 (t), 23.3 (t); IR (film) ν 3130 (br), 2926, 2852, 1725, 1639, 1594 cm^{-1}; MS (ESI): *m/z* (rel %): 346 [MNa^+] (100), 324 [MH^+] (32); HRMS (ESI) calcd for $C_{21}H_{25}NO_2$ [MNa^+] 346.1778, found 346.1774.

Benzo[*d*][1,3,2]dioxaborol-2-ol (2-42)



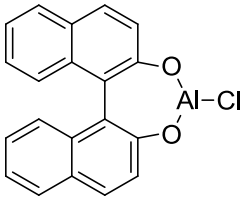
Boric acid (3.10 g, 50.1 mmol) and catechol (5.54 g, 50.3 mmol) in toluene (100 mL) were refluxed in a Dean-Stark apparatus for 18 h. The mixture was then cooling to rt and the product precitpitates from solution. A grey-white solid (4.90 g, 72%) was obtained after filtration: ^{1} δ 7.26-7.09 (m, 4H). The characterization fits the one already reported for the same compound.[94134]

4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-ol (2-44)



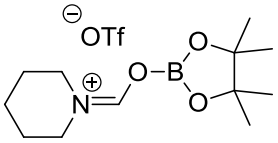
Boric acid (3.10 g, 50.1 mmol) and pinacol (5.92 g, 50.3 mmol) in toluene (100 mL) were refluxed in a Dean-Stark apparatus for 18 h. The mixture was then cooling to rt and the product precitpitates from solution. A white solid (5.98 g, 83%) was obtained after filtration: ^{1} δ 1.27 (s, 9H). The characterization fits the one already reported for the same compound.[95]

(S)-1,1'-Binaphthol-AlCl (2-49)



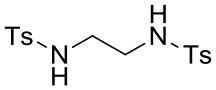
To a solution of (*S*)-(−)-1,1′-bi(2-naphthol) (8.6 mg, 0.03 mmol) in toluene (1.0 mL)at 0 ºC was added a solution of Me_2AlCl (1 M in hexanes, 30 μL, 0.03 mmol). The reaction mixture was stirred for 1 h, and then salts were removed by filtration to give after evaporation **2-61** as a grey solid: ^{1}H NMR (300MHz, $CDCl_3$) δ 8.03-7.81 (dd, 2H, *J*= 26.0, 9.0 Hz).

1-(((4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methylene)piperidin-1-ium trifluoromethanesulfonate (2-59)



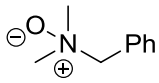
To a solution of *N*-formylpiperidine (49 μL, 0.44 mmol) in ACN (2.5 mL) at 0 ºC was added dropwise Tf_2O (82 μL, 0.49 mmol). Then, a premixed solution of **2-43** (71 mg, 0.49 mmol) and NaH 60% in oil (19 mg, 0.49 mmol) in ACN (2.5 mL) was added and the resulting mixture was stirred for 12 h. The solution was evaporated and to give the crude material as a orange solid: ^{1}H NMR (300 MHz, CD_3CN) δ 8.22 (s, 1H), 5.94 (br s, 1H), 3.66-3.59 (m, 4H), 1.77-1.69 (m, 6H), 1.21 (s, 9H).

***N,N'*-(Ethane-1,2-diyl)bis(4-methylbenzenesulfonamide) (2-60)**



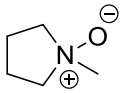
To a stirred solution of ethylenediamine (0.67 mL, 10 mmol) in pyridine (50 mL) was added *p*-toluenesulfonyl chloride (3.91 g, 20.5 mmol) at 0 ºC. The resulting solution was stirred for 18 h and then, the reaction mixture was poured into water (250 mL). The resulting solids were collected by filtration, washed with diethyl ether, and dried under reduced pressure to give **2-46** (2.22 g, 60%) as a white powder: ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.71 (d, 4H, *J*= 8.0 Hz), 7.31 (d, 4H, *J*= 8.0 Hz), 4.92 (br s, 2H), 3.04 (s, 4H), 2.42 (s, 6H). The characterization fits the one already reported for the same compound.[96]

***N,N*-Dimethyl-1-phenylmethanamine oxide (2-63)**



To a solution of *N,N*-dimethylbenzylamine (4.39 mL, 29.6 mmol) in MeOH (150 mL) was added H_2O_2 50% wt. (4.3 mL, 148 mmol) at 0 ºC. The reaction mixture was stirred for 18 h, and then the mixture was cooled to 0ºC. A suspension of MnO_2 (1.20 g, 13.8 mmol) in water (20 mL) was added dropwise. The resulting mixture was stirred for 1h, and then filtered over Celite®, washed with MeOH, and dried under reduced pressure. The resulting solids were dissolve with $CHCl_3$ and filtered to give **2-49** (3.05 g, 68%) as a pink solid: ^{1}H NMR (300 MHz, $CDCl_3$) δ 4.40 (s, 2H), 3.11 (s, 6H). The characterization fits the one already reported for the same compound.[97]

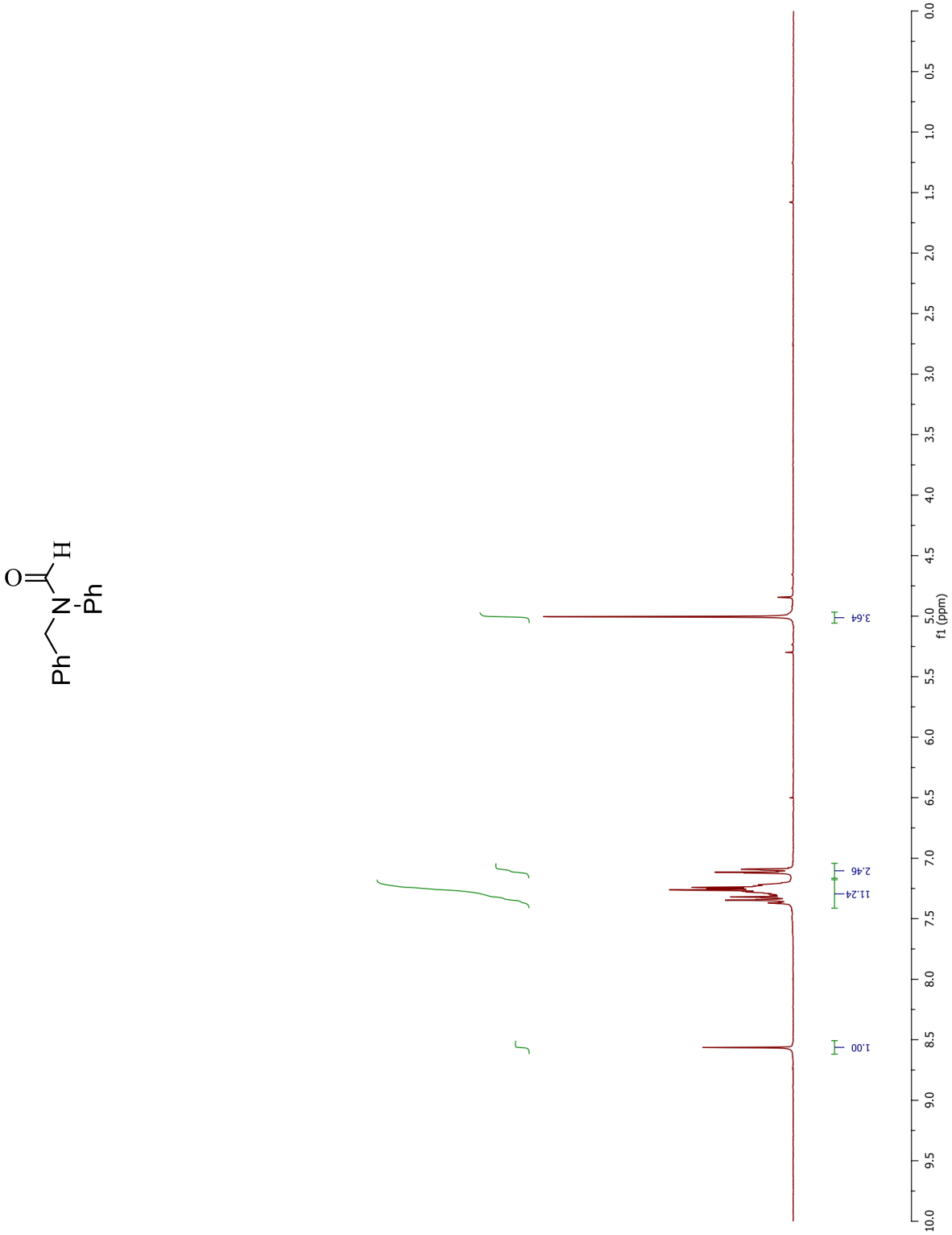
1-Methylpyrrolidine 1-oxide (2-65)



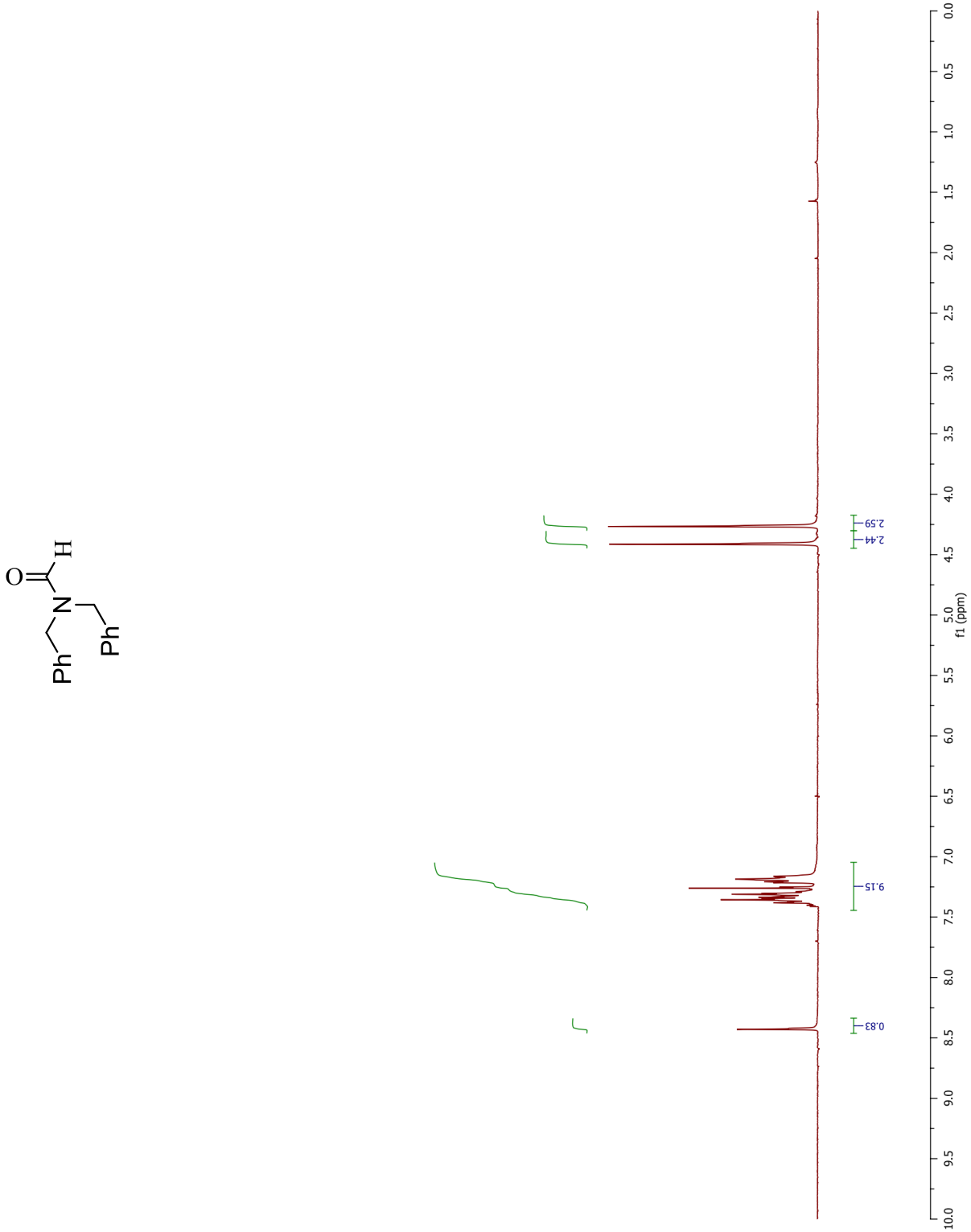
To a solution of *N*-methylpyrrolidine (5.13 mL, 49.4 mmol) in MeOH (165 mL) was added H_2O_2 50% wt. (7.1 mL, 247 mmol) at 0 ºC. The reaction mixture was stirred for 18 h, and then the mixture was cooled to 0ºC. A suspension of MnO_2 (2.10 g, 24.2 mmol) in water (30 mL) was added dropwise. The resulting mixture was stirred for 1 h, and then filtered over Celite®, washed with MeOH, and dried under reduced pressure. The resulting solids were dissolving with $CHCl_3$ and filtered to give **2-51** (3.73 g, 75%) as a yellowish oil: ^{1}H NMR (300 MHz, $CDCl_3$) δ 3.54-3.48 (m, 2H), 3.33-3.27 (m, 2H), 3.30 (s, 3H), 2.52-2.43 (m, 2H), 2.01-1.93 (m, 2H). The characterization fits the one already reported for the same compound.[98]

ANNEXE 2 : SPECTRES DE RÉSONANCE MAGNÉTIQUE NUCLÉAIRE DES PROTONS

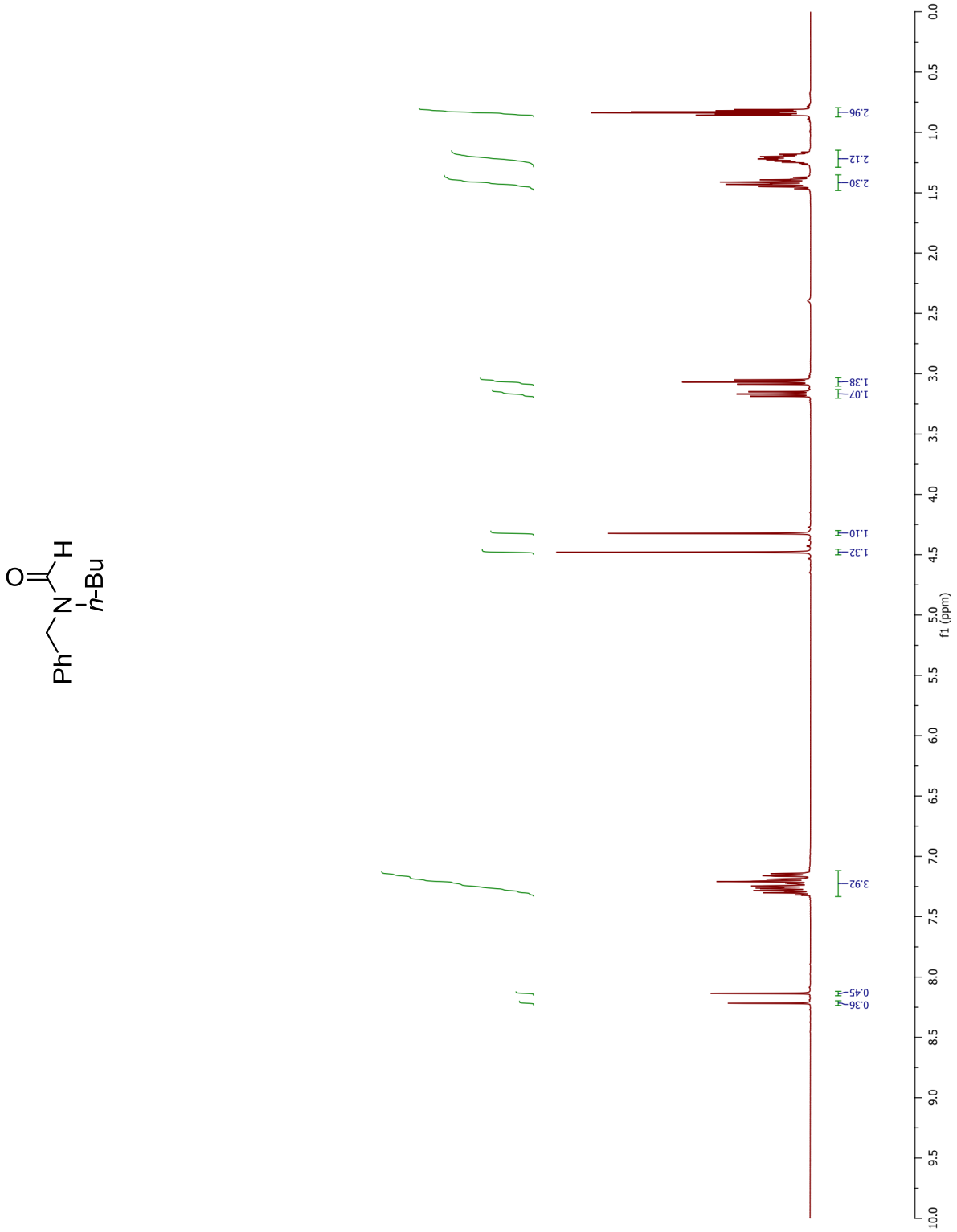
_N_-Benzyl-_N_-phenylformamide (1-10a)



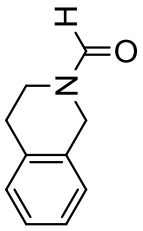
***N*,*N*-Dibenzylformamide (1-10b)**

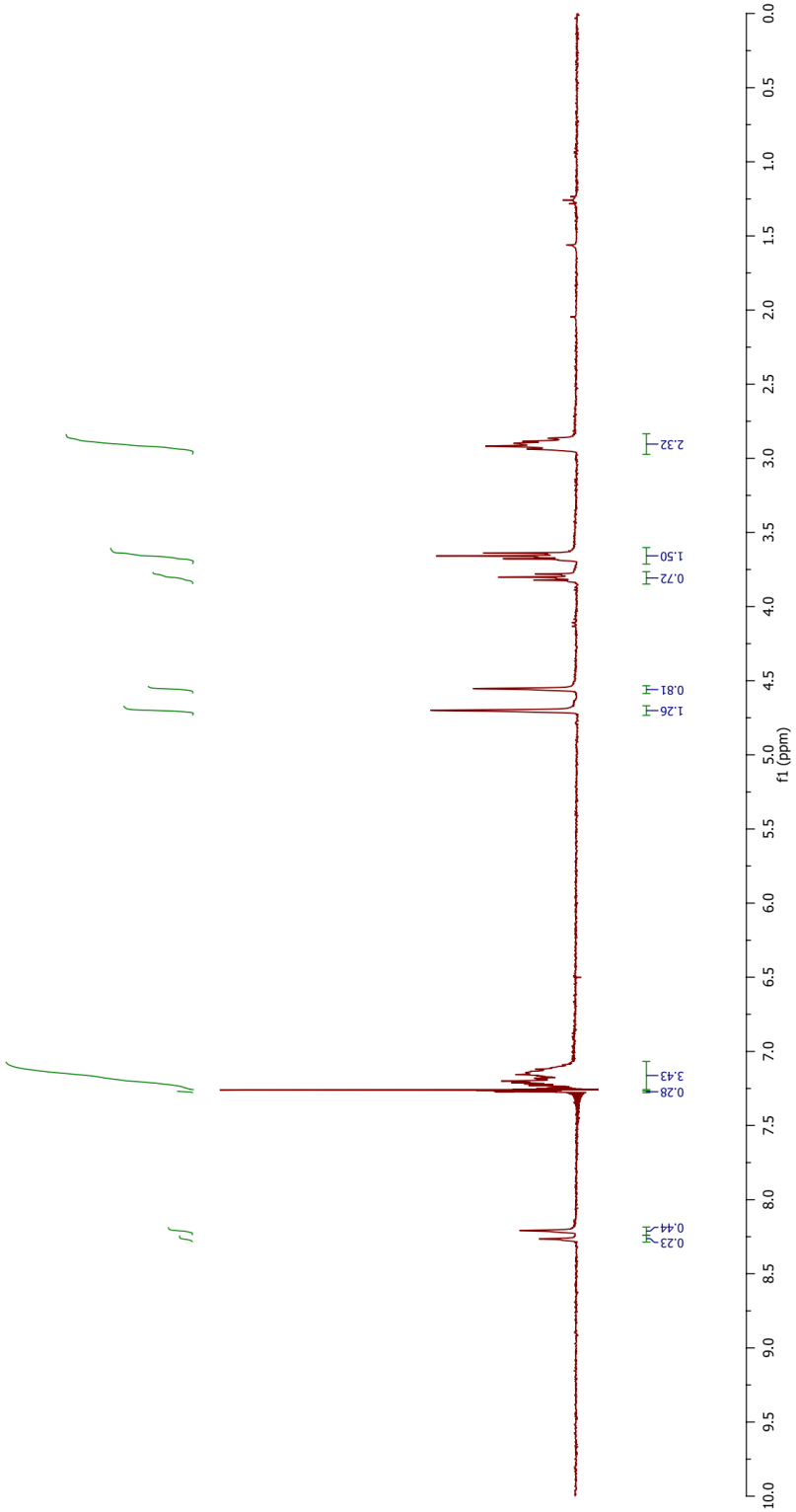


_N_-Benzyl-_N_-butylformamide (1-10c)

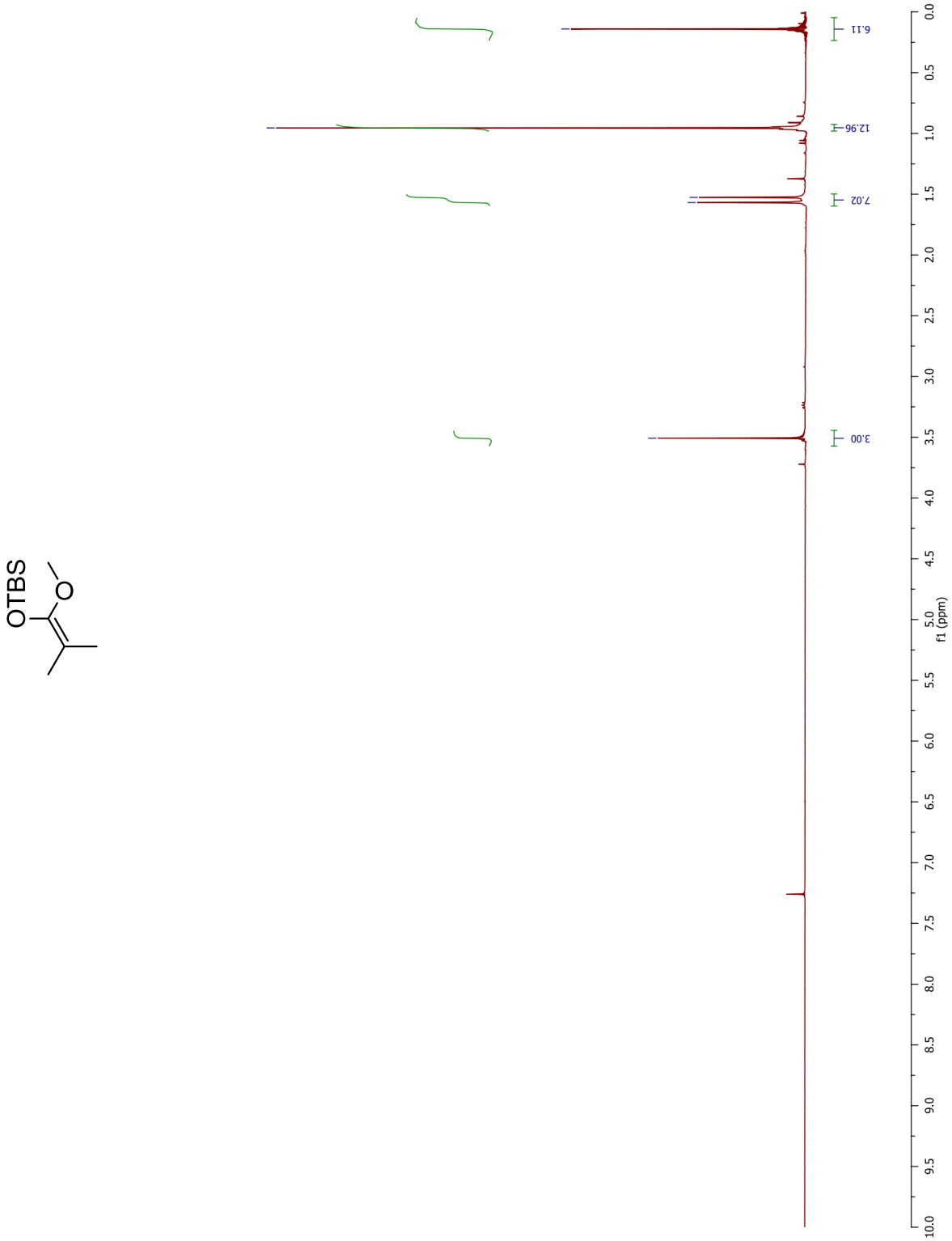


3,4-Dihydroisoquinoline-2(1H)-carbaldehyde (1-10d)

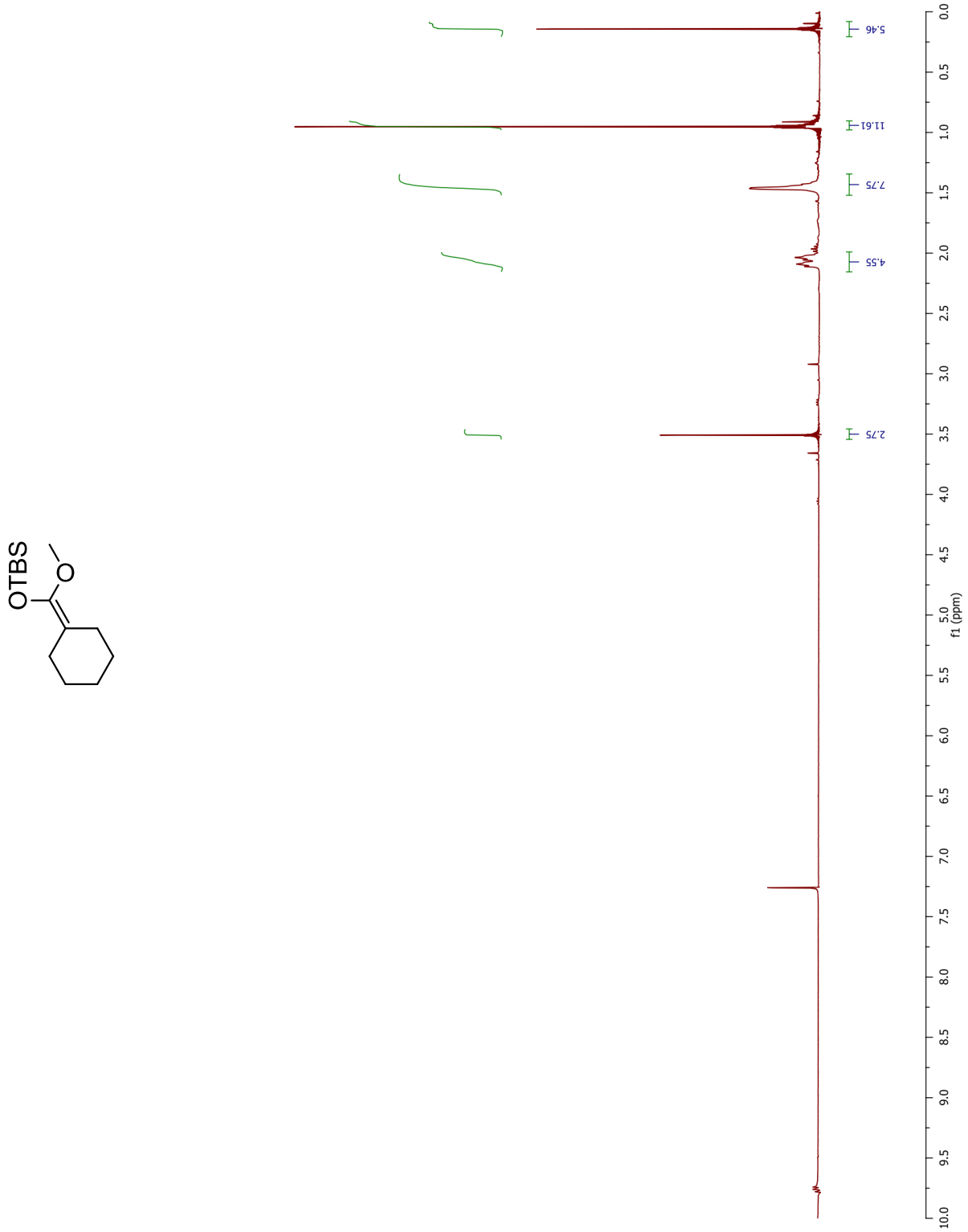




tert-Butyl((1-methoxy-2-methylprop-1-en-1-yl)oxy)dimethylsilane (1-12a)

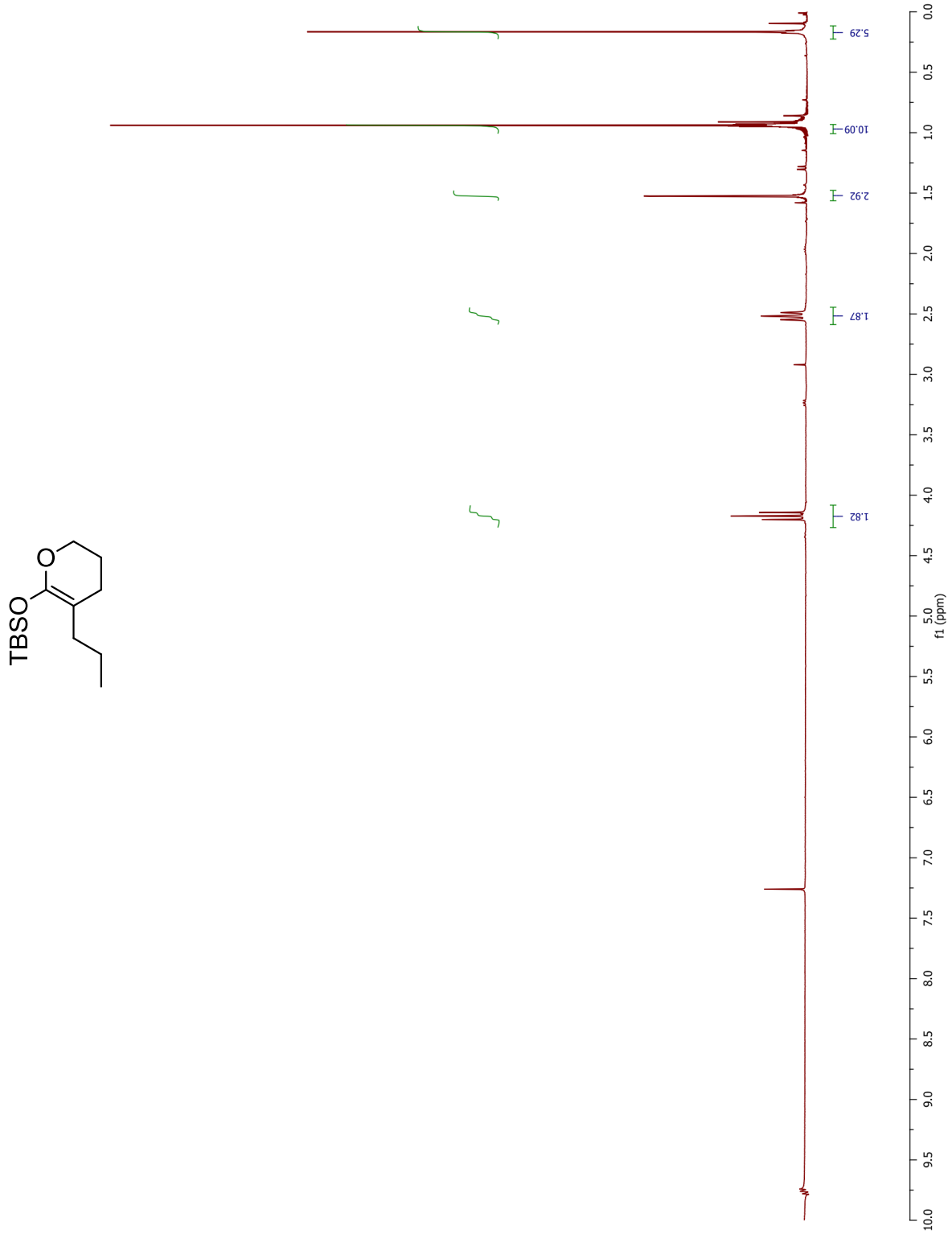


***tert*-Butyl(cyclohexylidene(methoxy)methoxy)dimethylsilane (1-12b)**

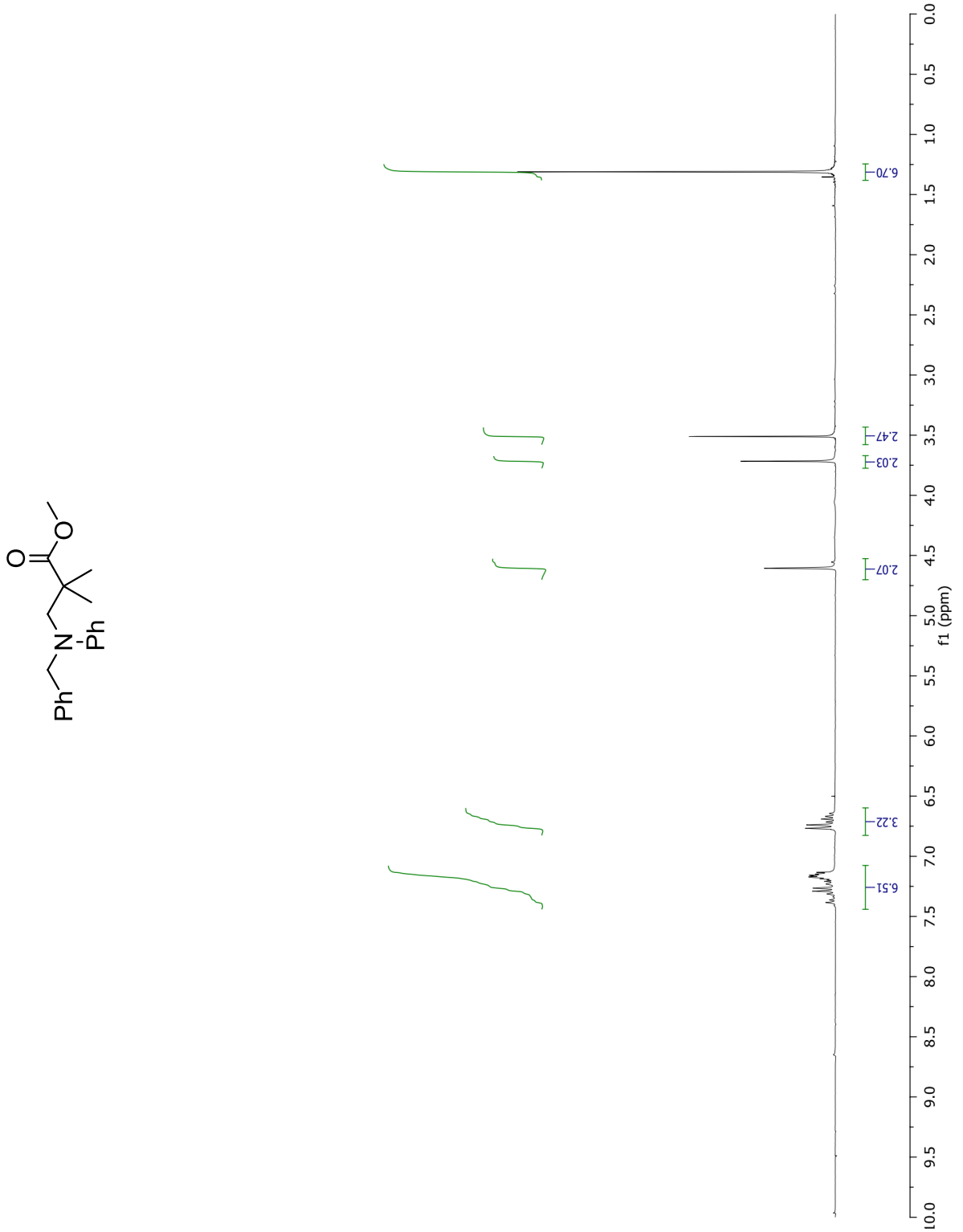


***tert*-Butyldimethyl((3-methyl-4,5-dihydrofuran-2-yl)oxy)silane (1-12c)**

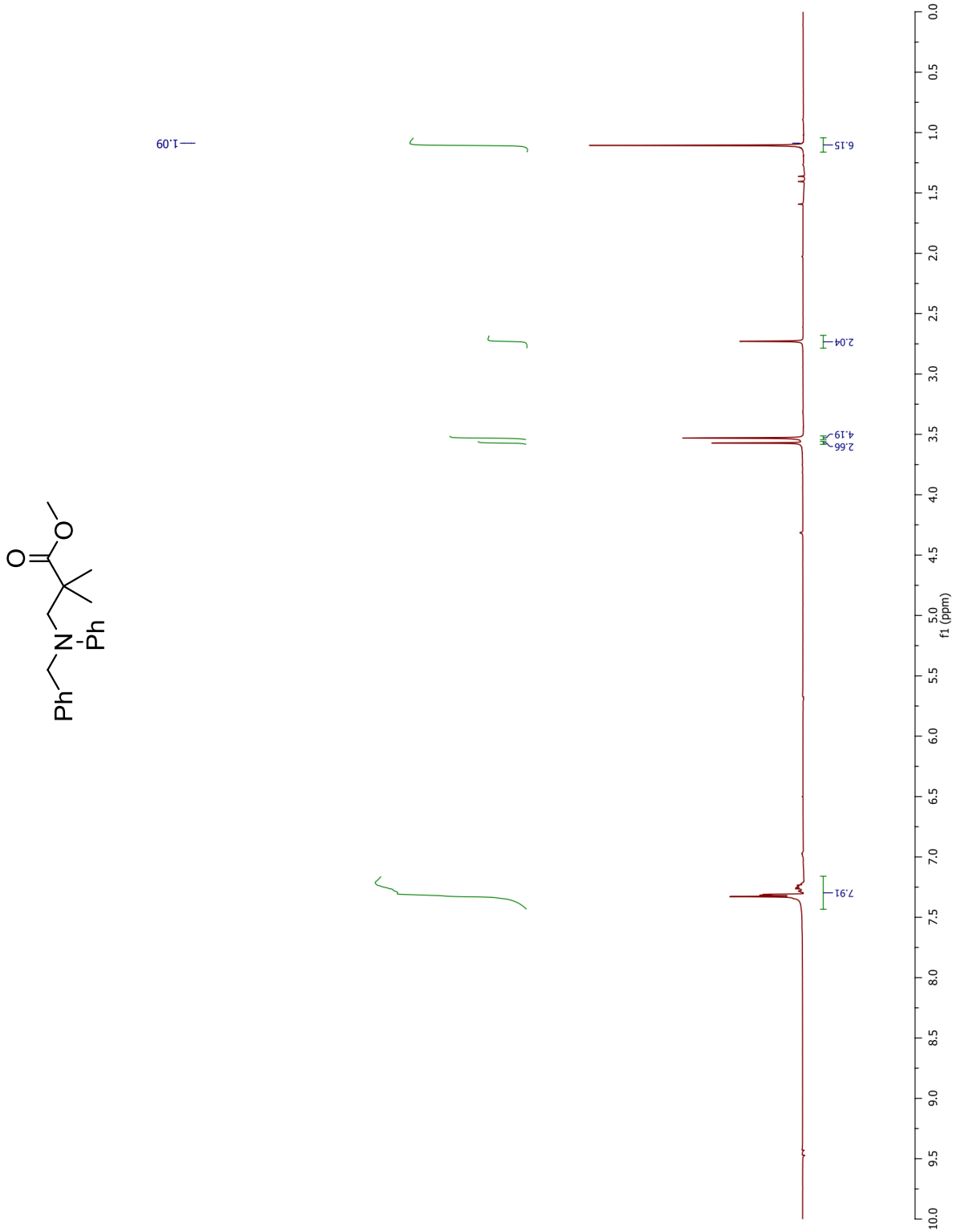
***tert*-Butyldimethyl((5-propyl-3,4-dihydro-2H-pyran-6-yl)oxy)silane (1-12d)**



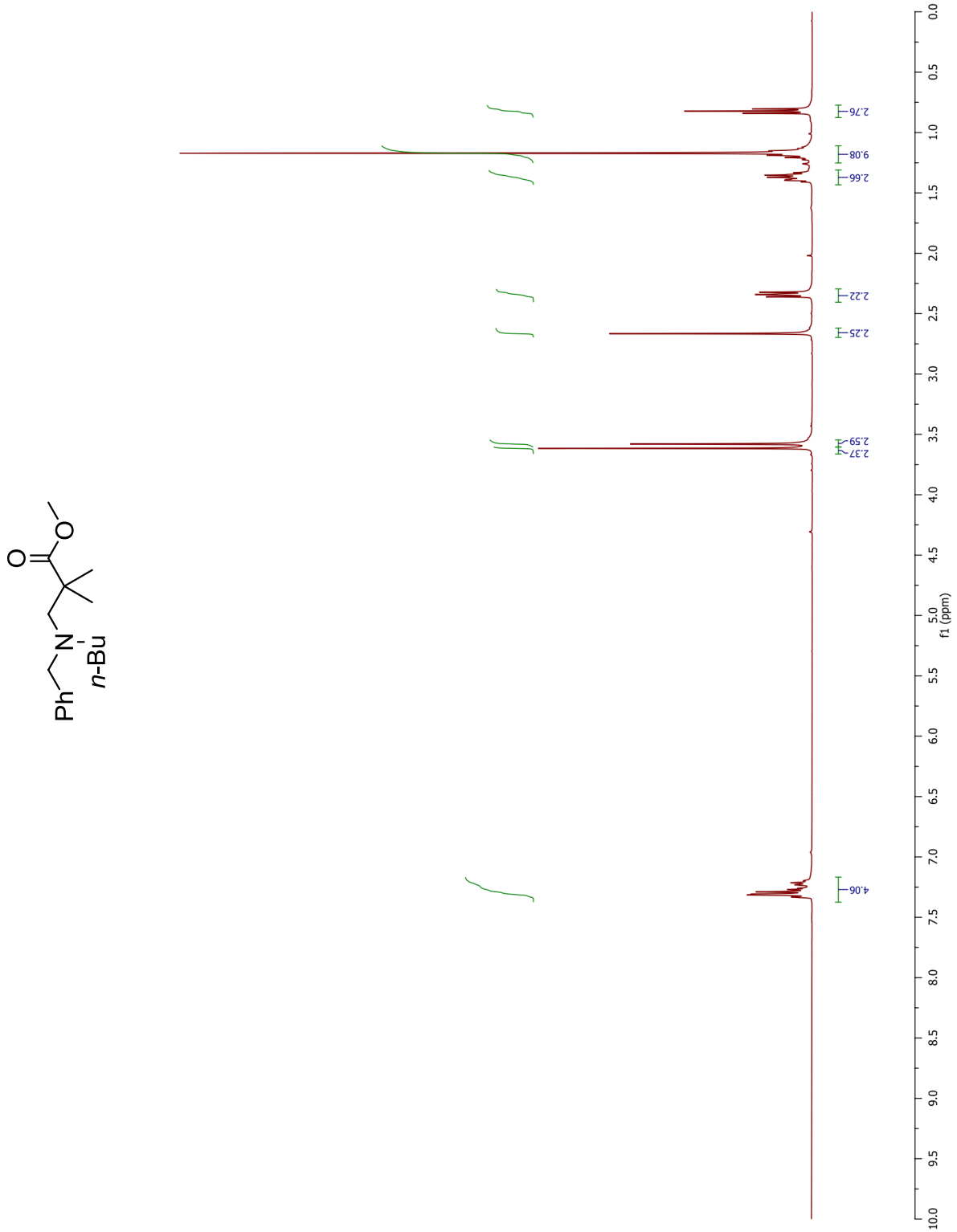
Methyl 3-(benzyl(phenyl)amino)-2,2-dimethylpropanoate (1-14a)



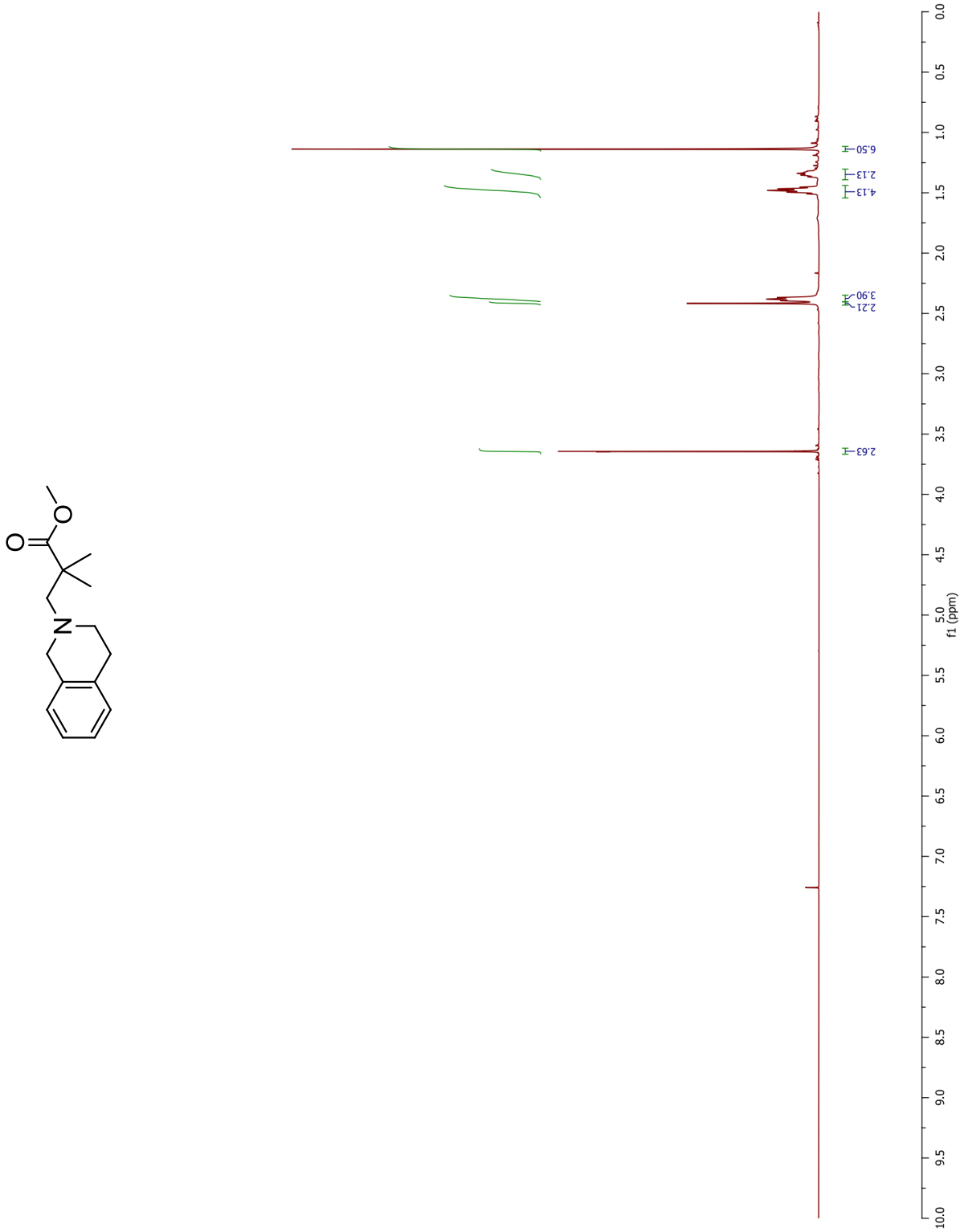
Methyl 3-(dibenzylamino)-2,2-dimethylpropanoate (1-14b)



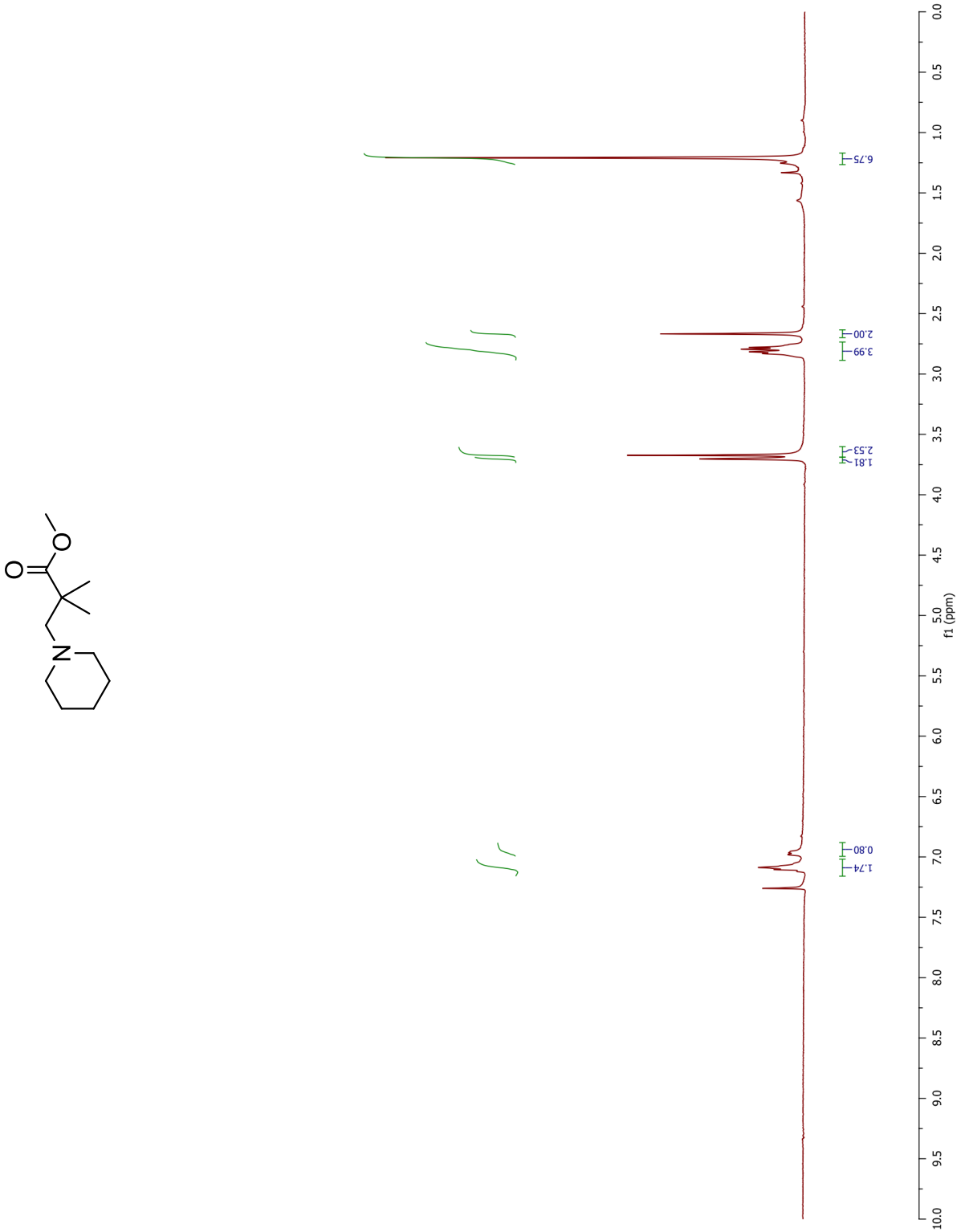
Methyl 3-(benzyl(butyl)amino)-2,2-dimethylpropanoate (1-14c)



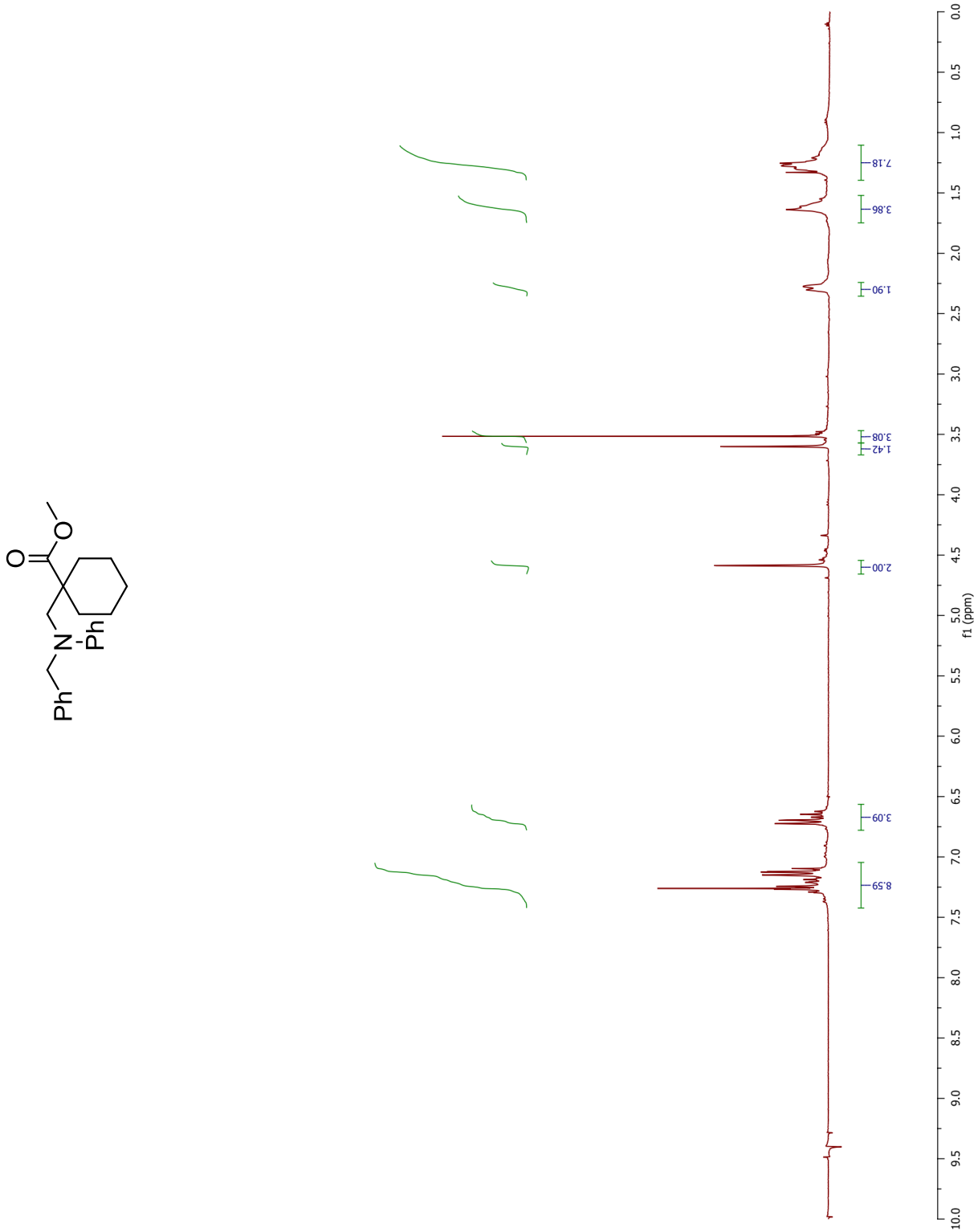
Methyl 3-(3,4-dihydroisoquinolin-2(1H)-yl)-2,2-dimethylpropanoate (1-14d)



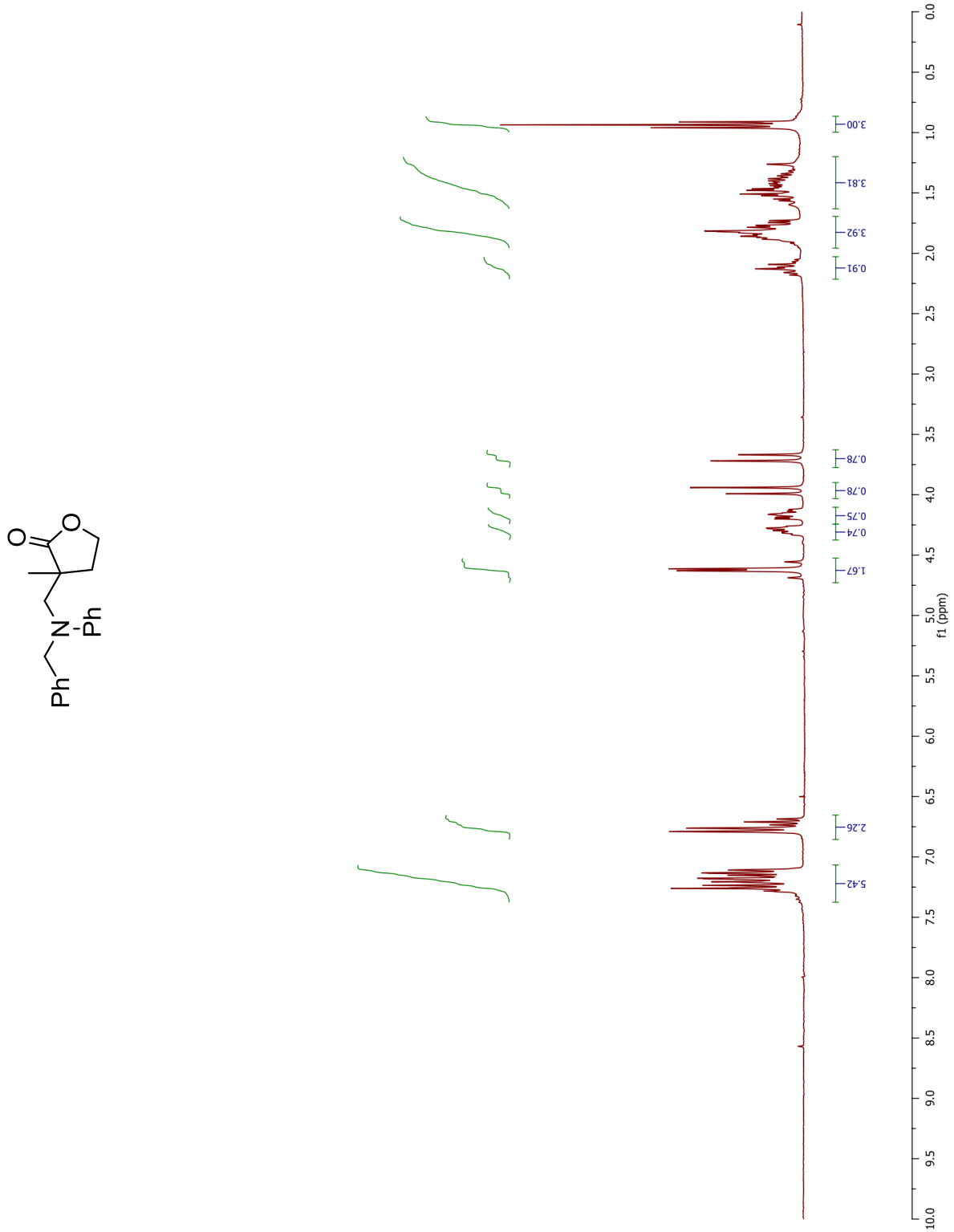
Methyl 2,2-dimethyl-3-(piperidin-1-yl)propanoate (1-14e)



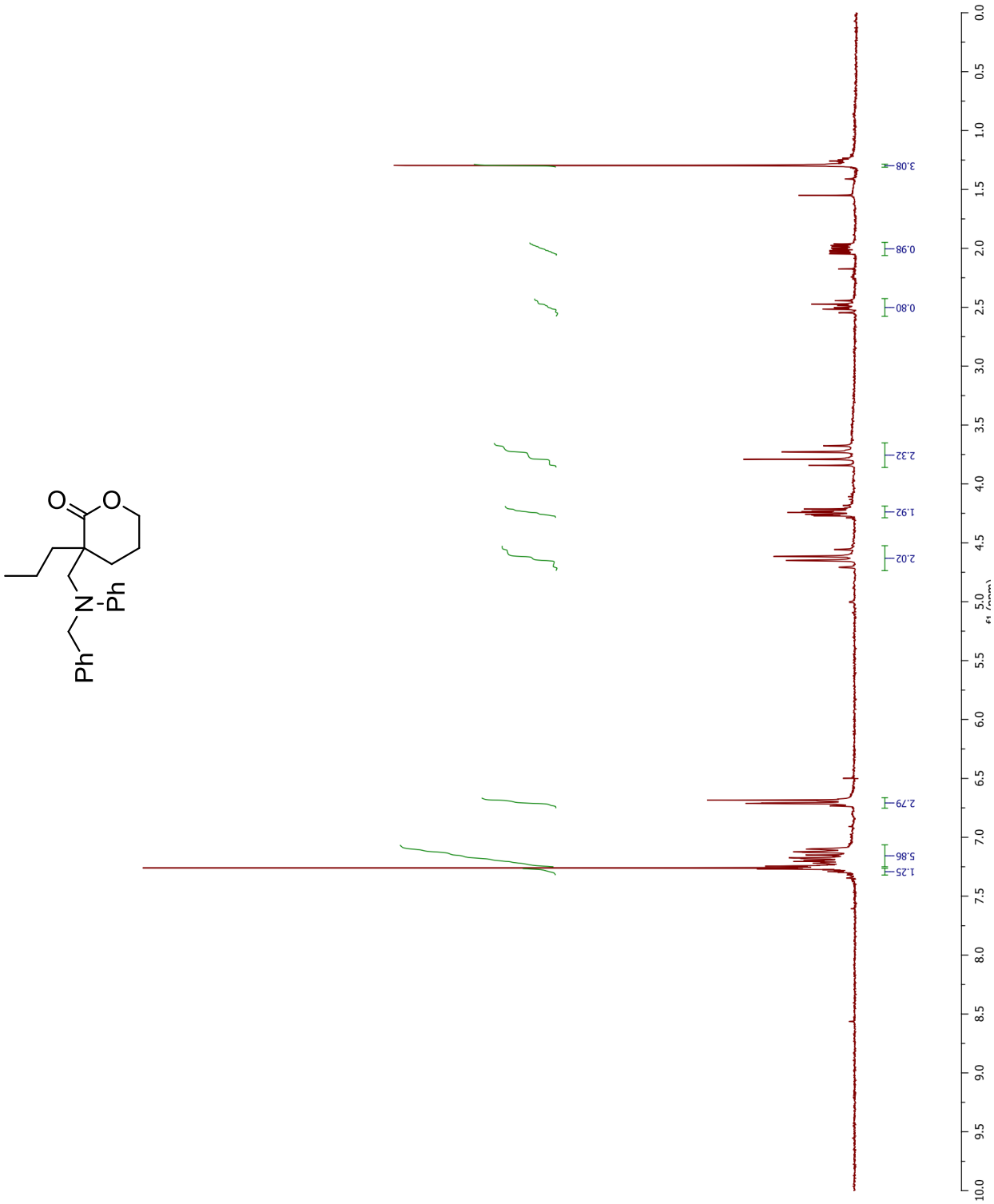
Methyl 1-((benzyl(phenyl)amino)methyl)cyclohexanecarboxylate (1-14f)



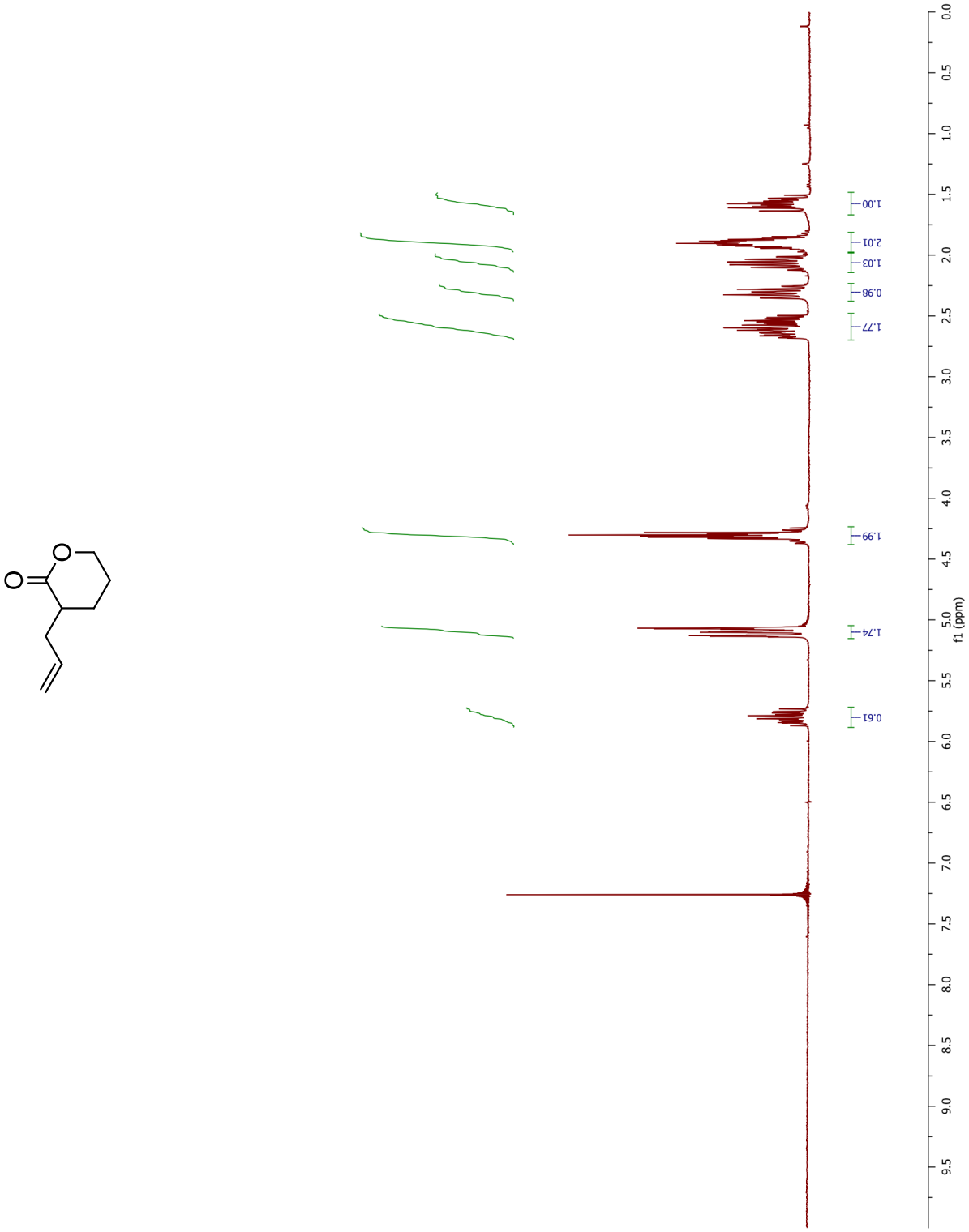
3-((benzyl(phenyl)amino)methyl)-3-methyldihydrofuran-2(3H)-one (1-14g)



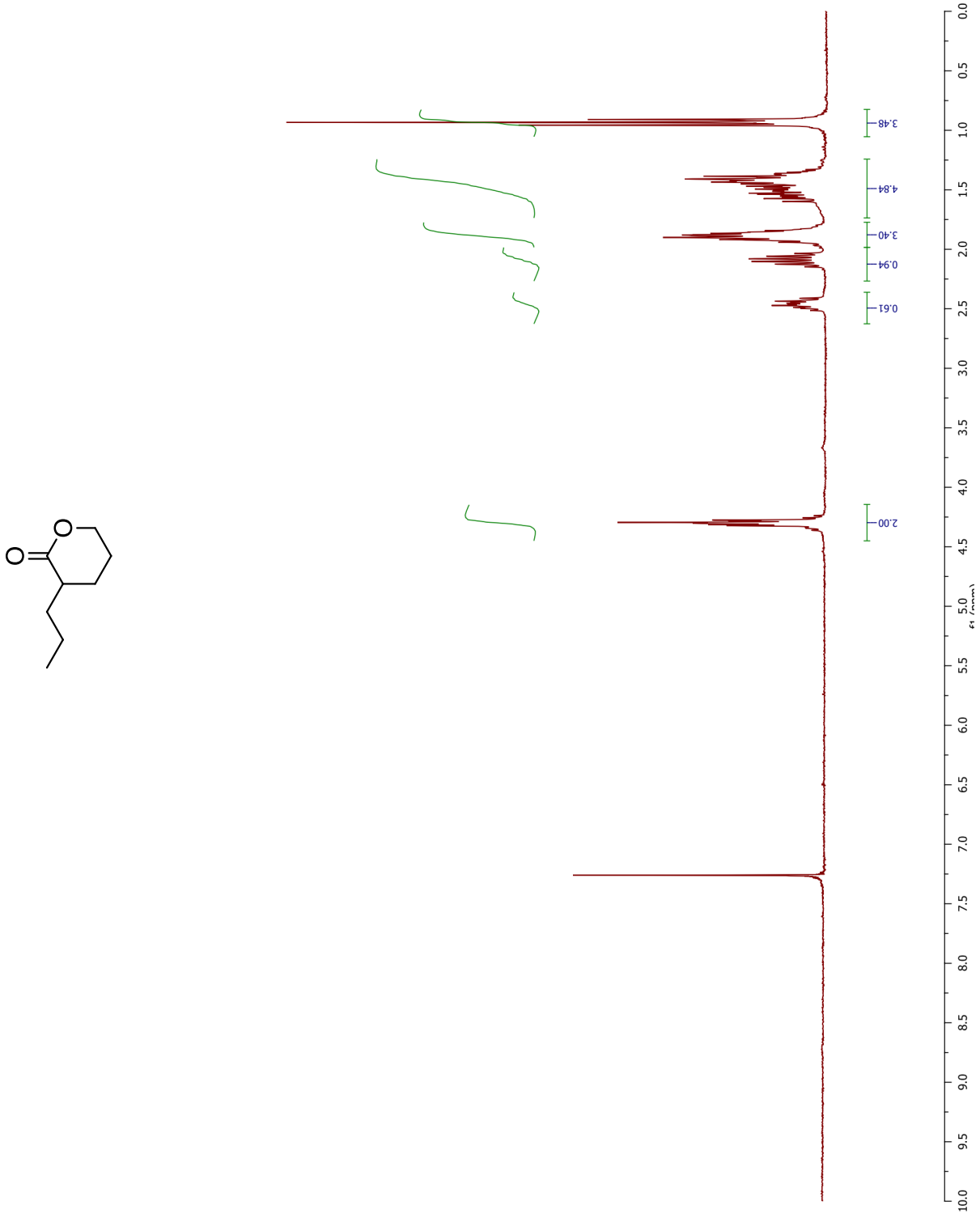
3-((Benzyl(phenyl)amino)methyl)-3-propyltetrahydro-2H-pyran-2-one (1-14h)



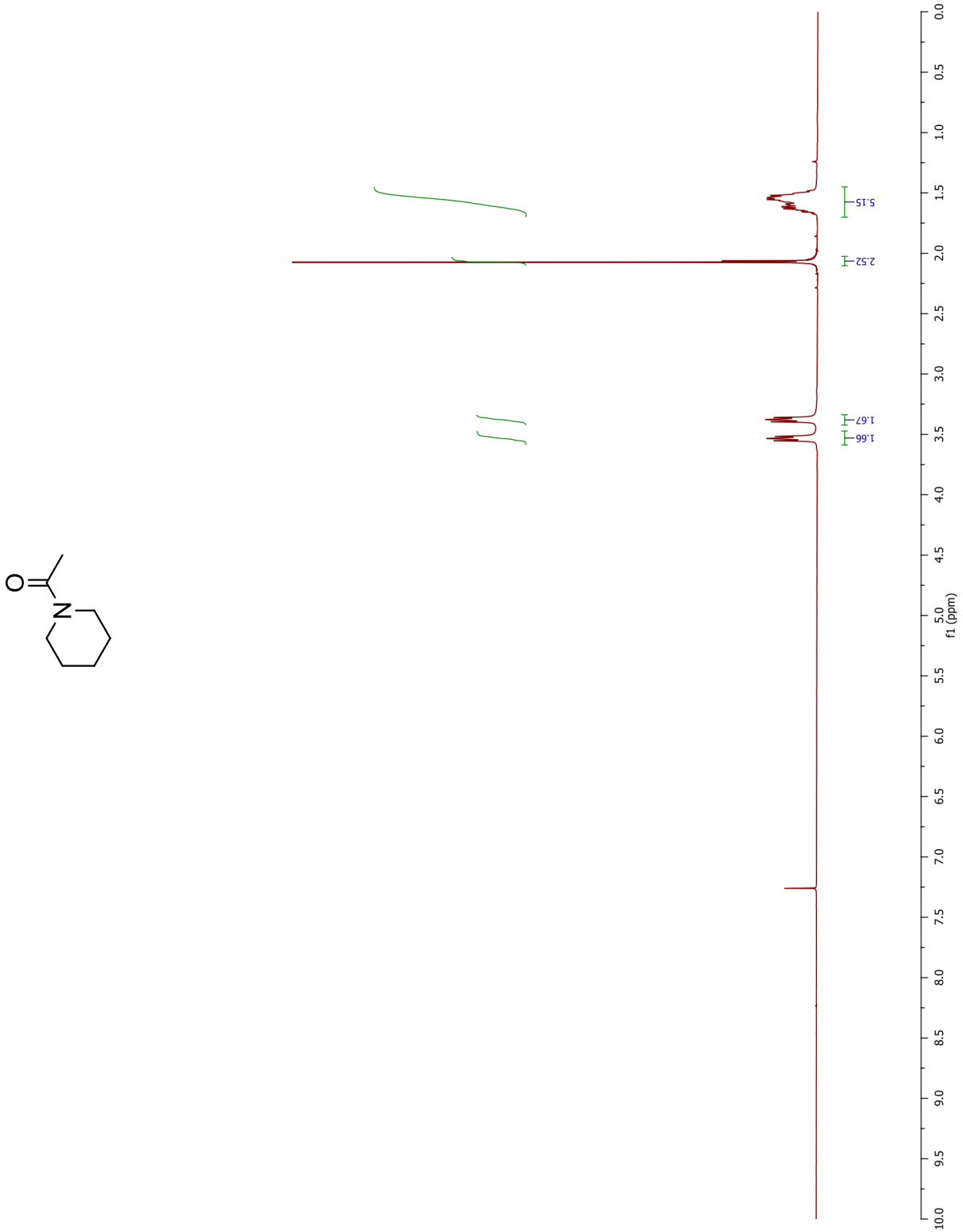
3-Allyltetrahydro-2H-pyran-2-one (1-18)



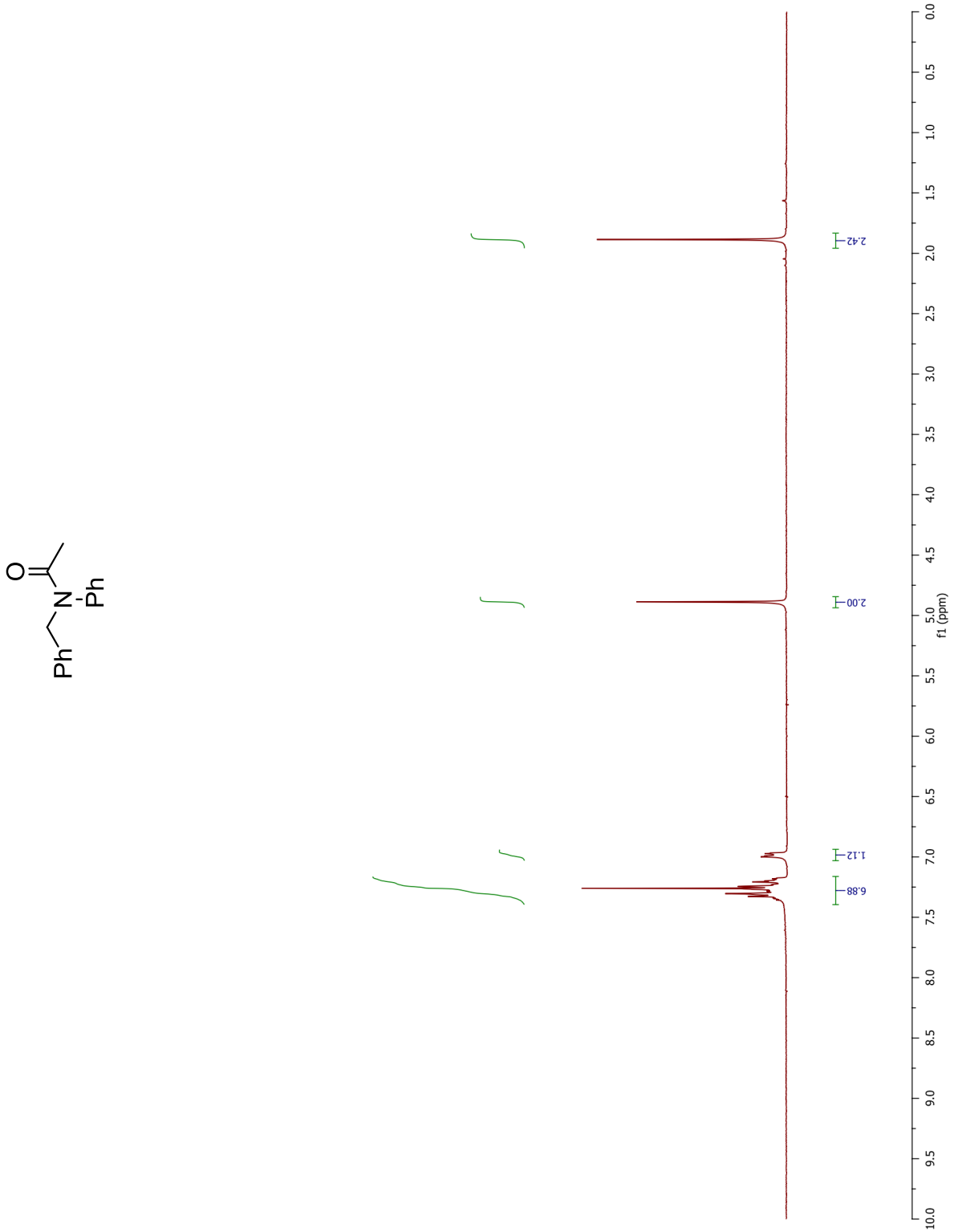
3-Propyltetrahydro-2H-pyran-2-one (1-19)



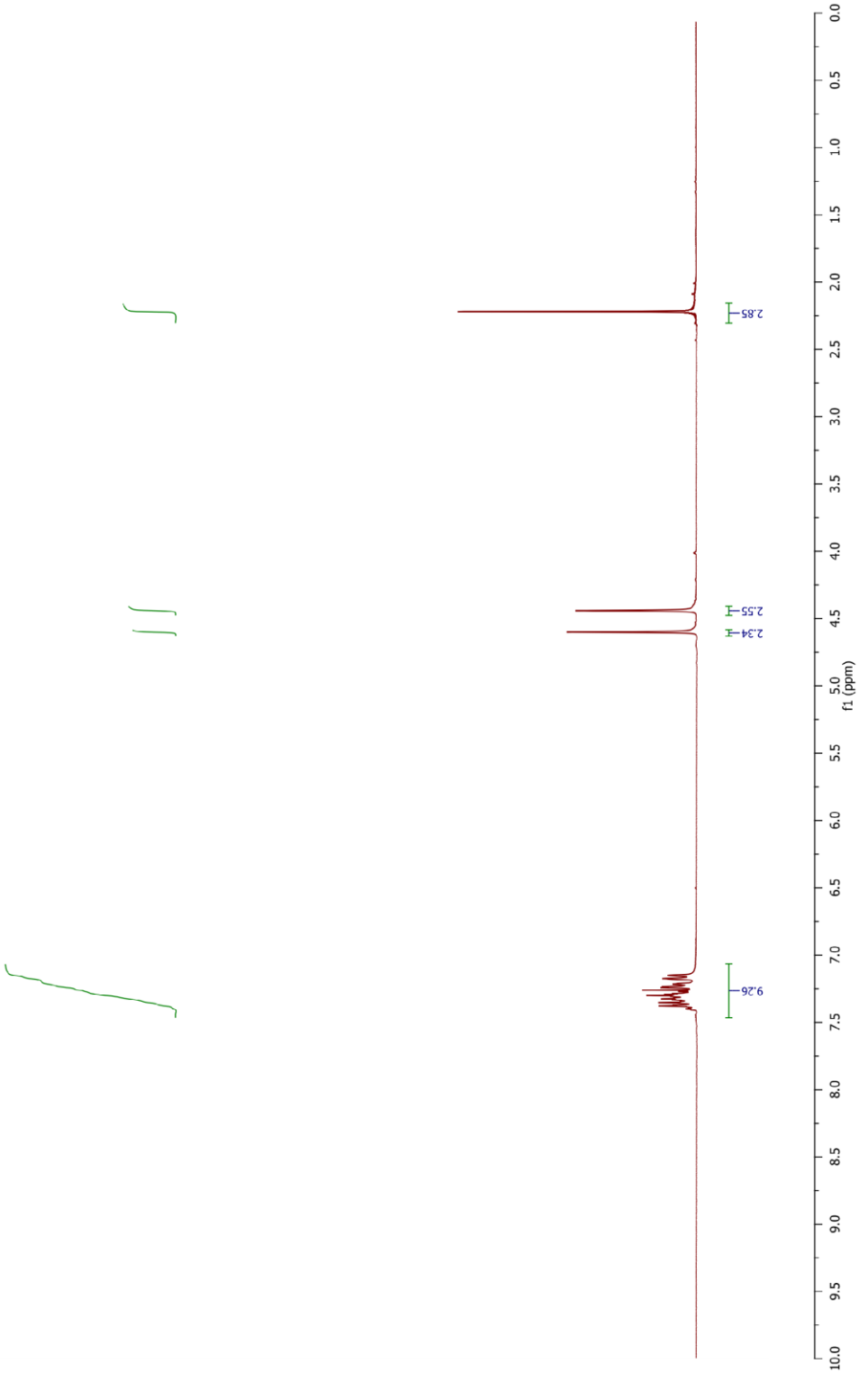
1-(Piperidin-1-yl)ethanone (1-22a)



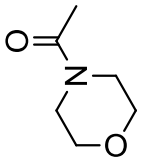
_N_-Benzyl-_N_-phenylacetamide (1-22d)

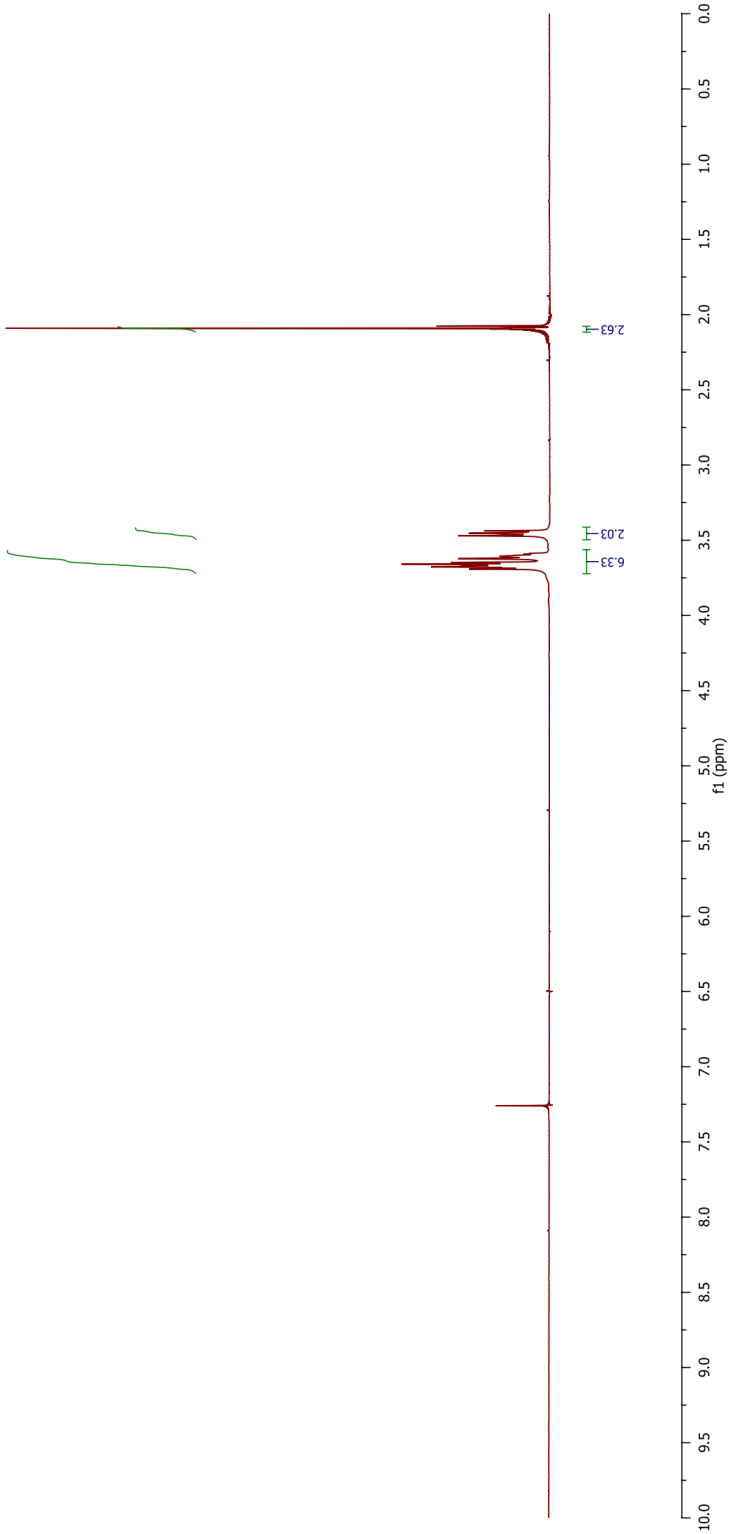


***N*,*N*-Dibenzylacetamide (1-22e)**

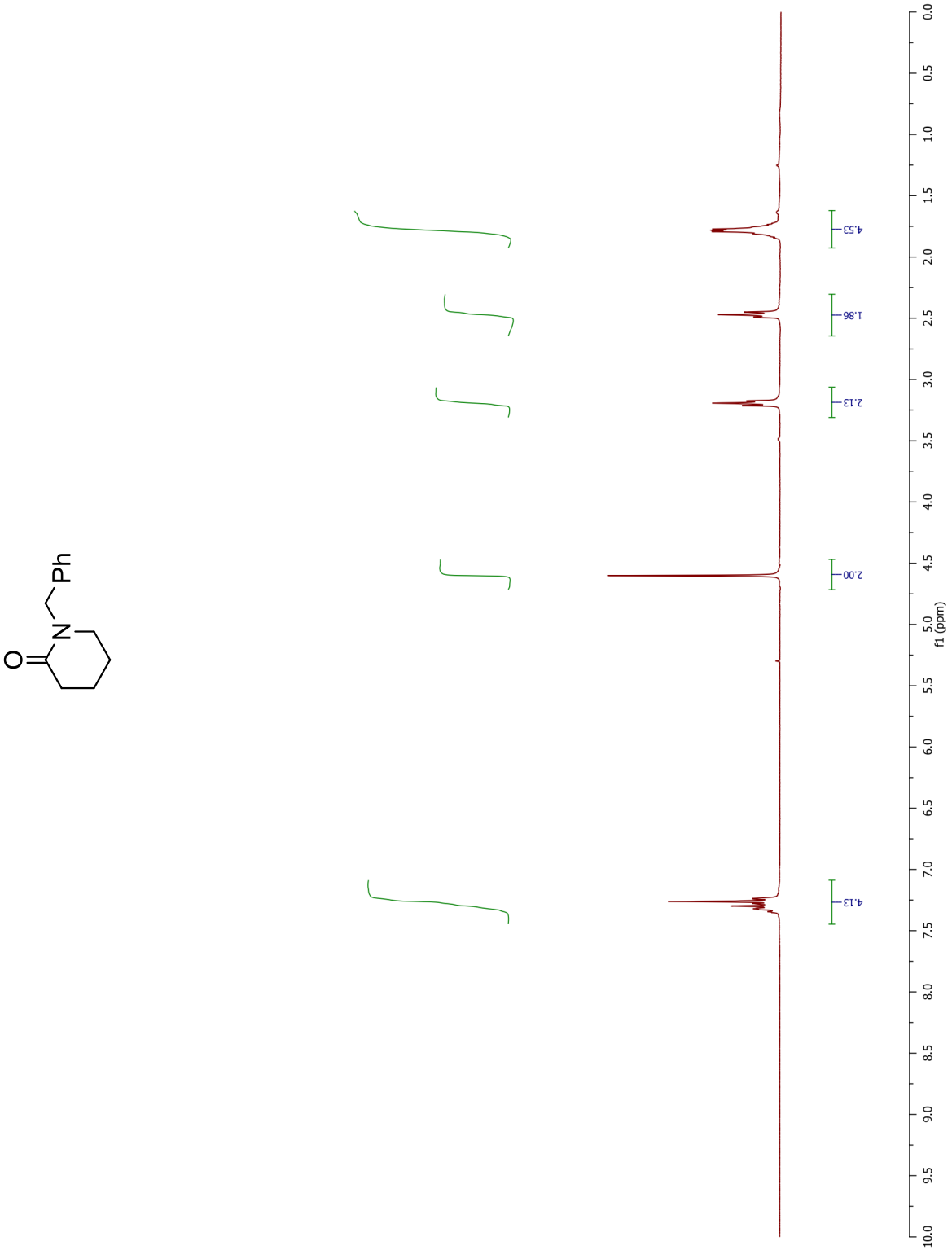


1-Morpholinoethanone (1-22f)

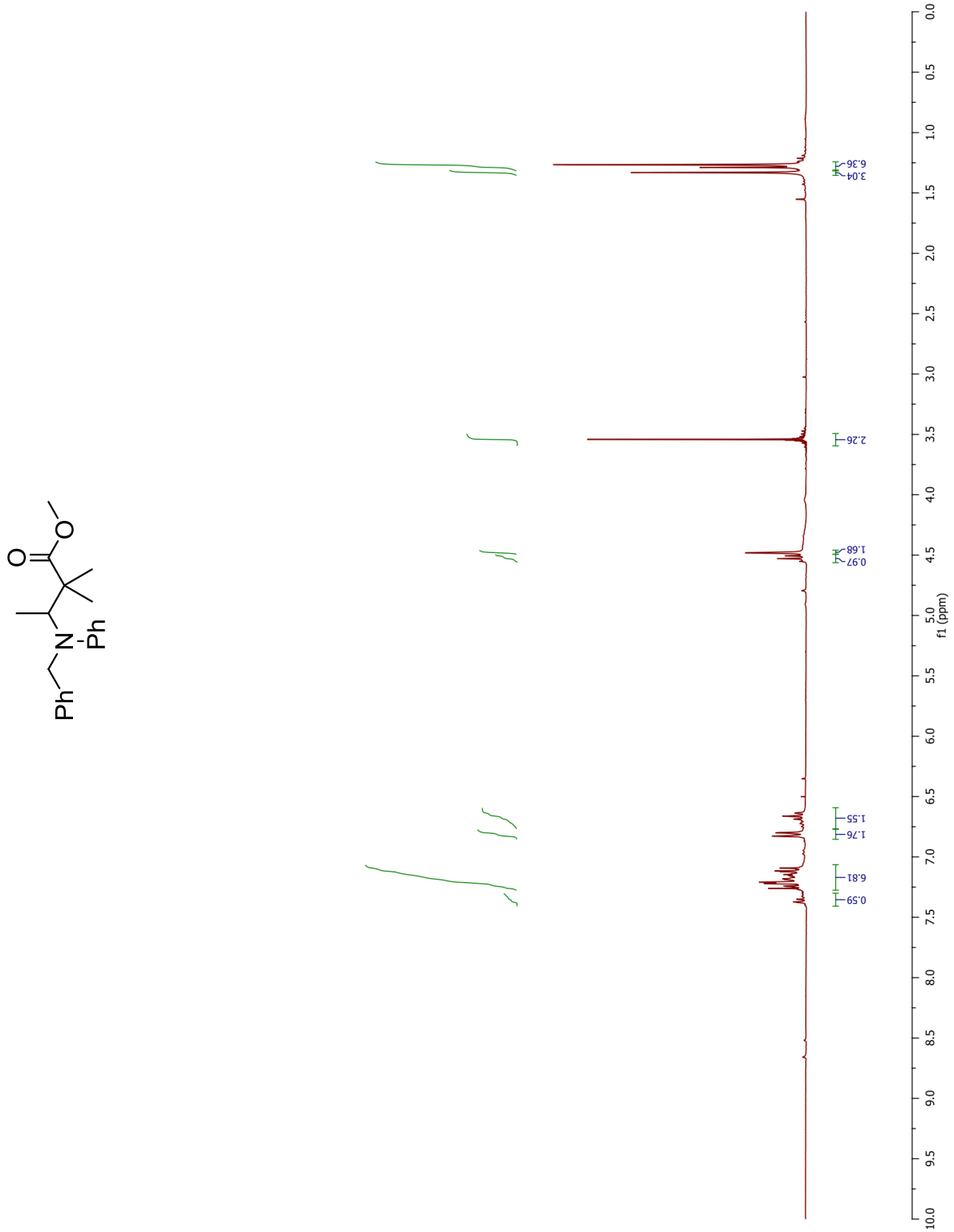




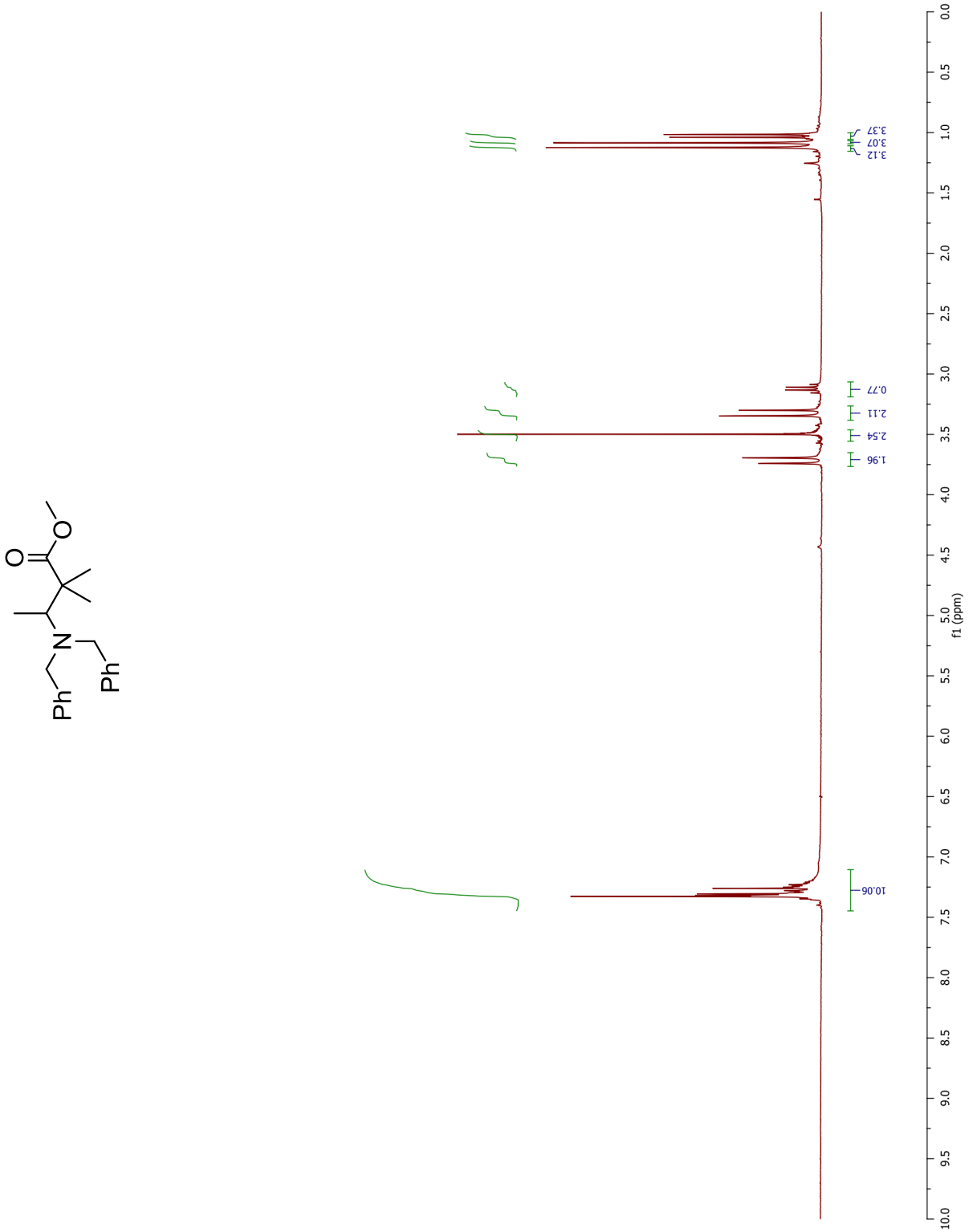
1-Benzylpiperidin-2-one (1-22g)



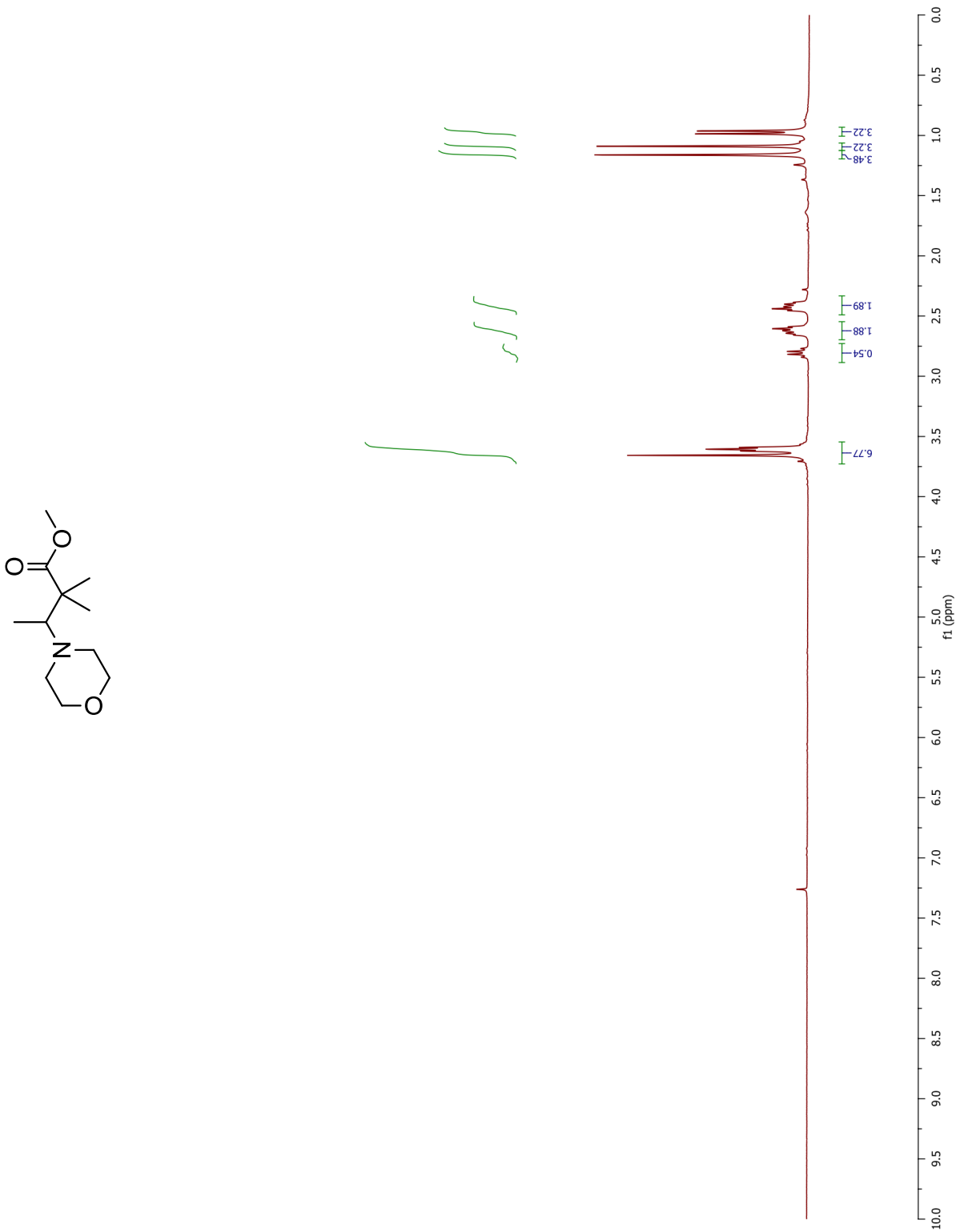
Methyl 3-(benzyl(phenyl)amino)-2,2-dimethylbutanoate (1-24a)



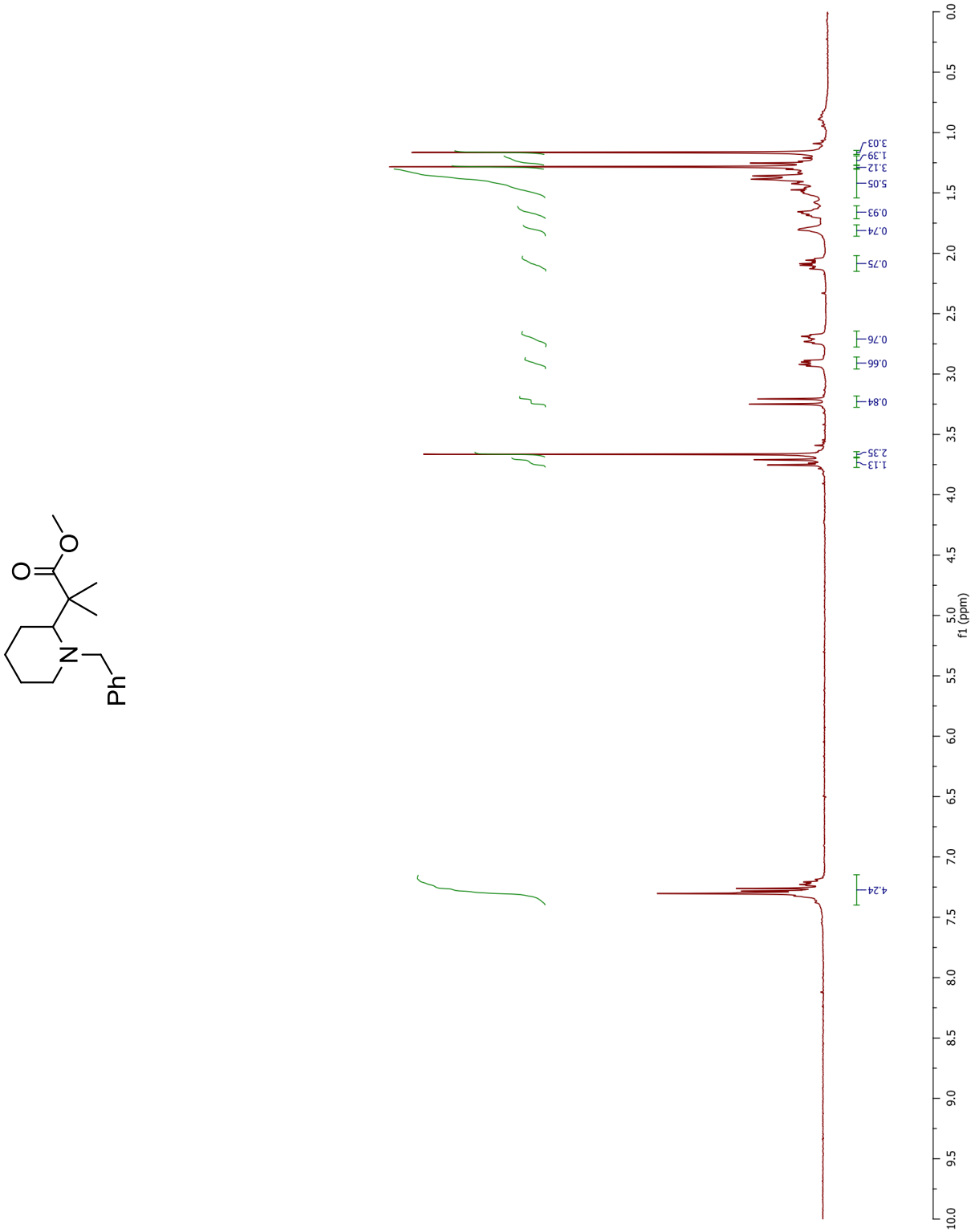
Methyl 3-(dibenzylamino)-2,2-dimethylbutanoate (1-24b)



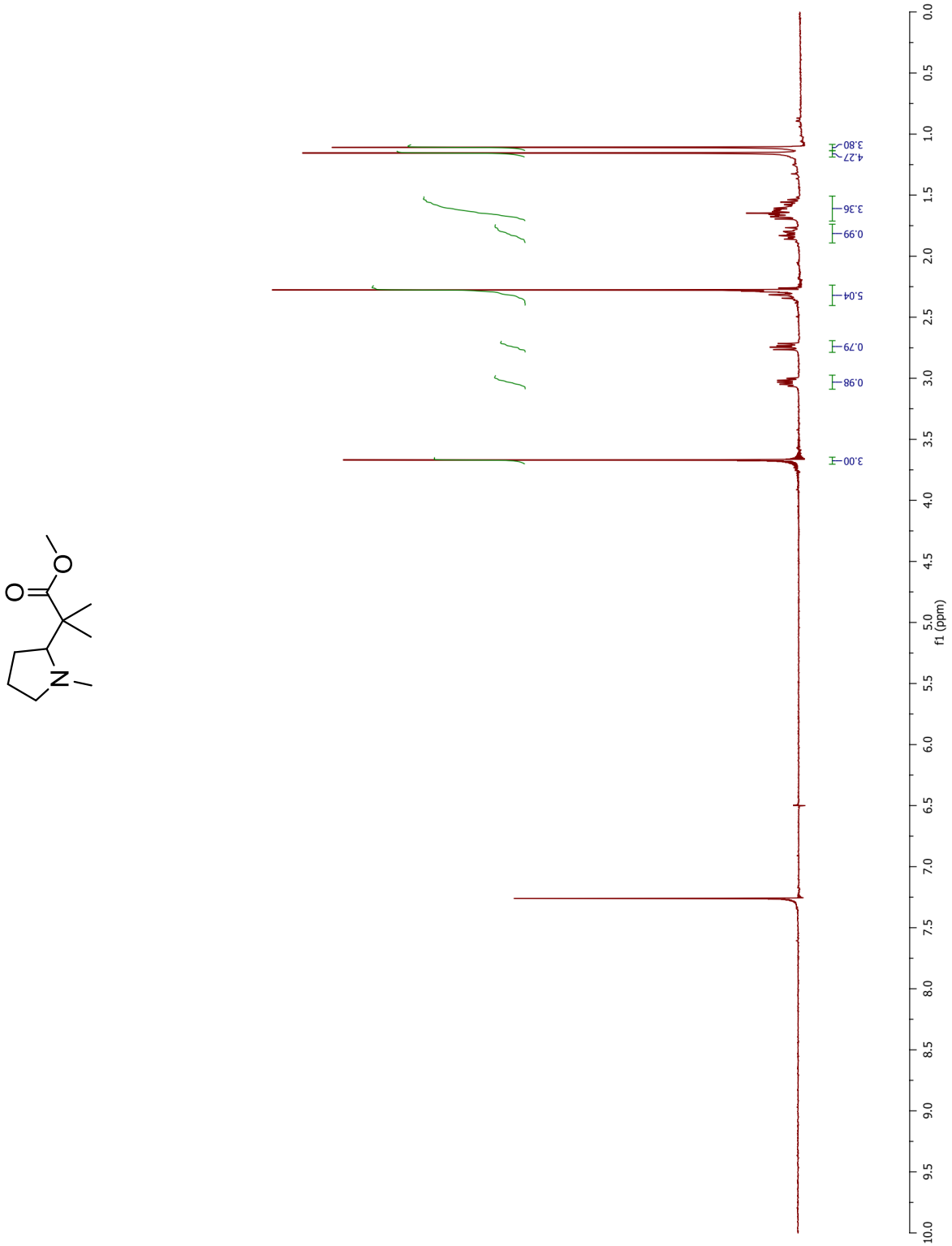
Methyl 2,2-dimethyl-3-morpholinobutanoate (1-22c)



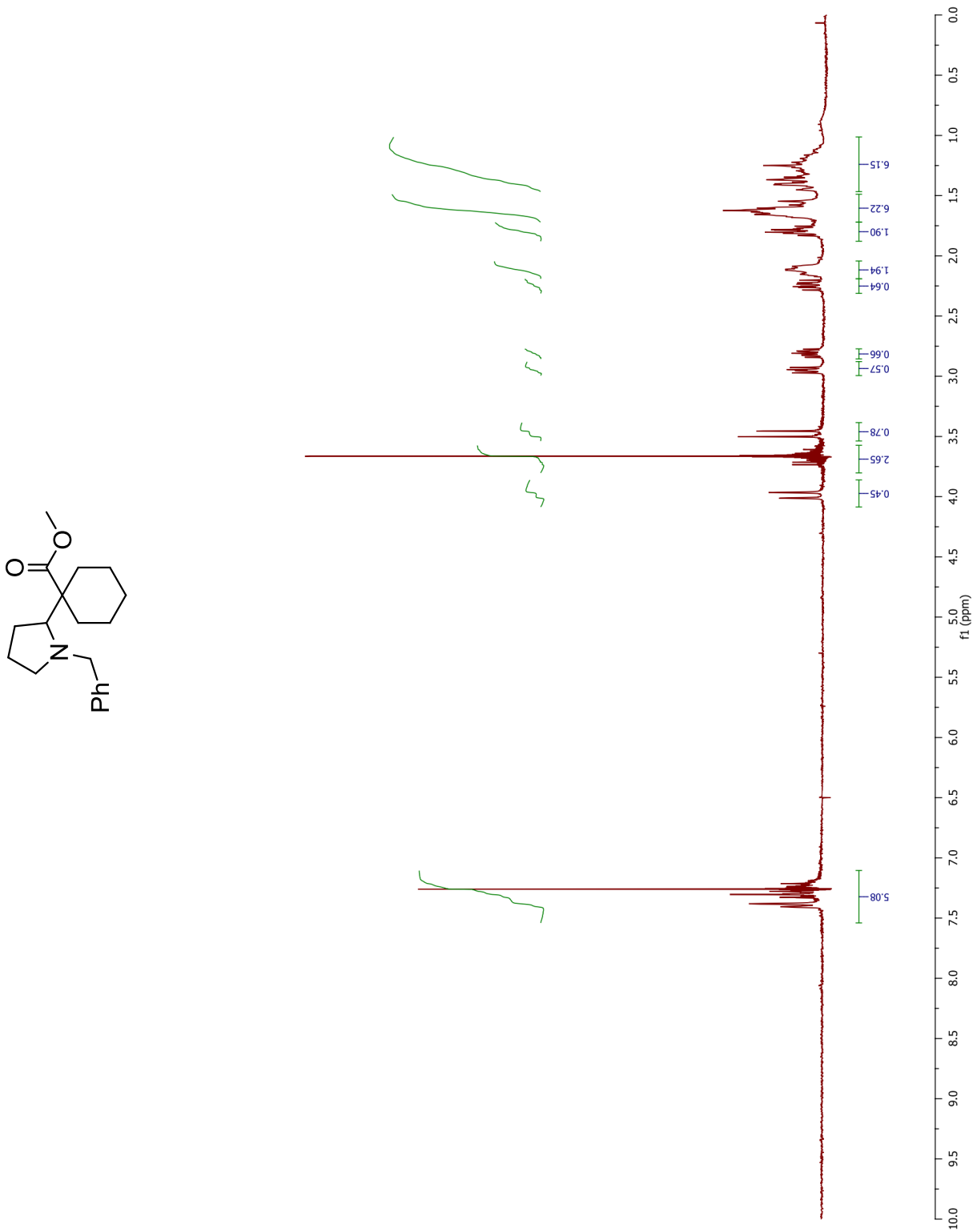
Methyl 2-(1-benzylpiperidin-2-yl)-2-methylpropanoate (1-24d)



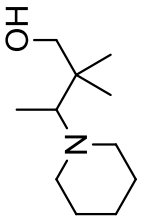
Methyl 2-methyl-2-(1-methylpyrrolidin-2-yl)propanoate (1-24e)

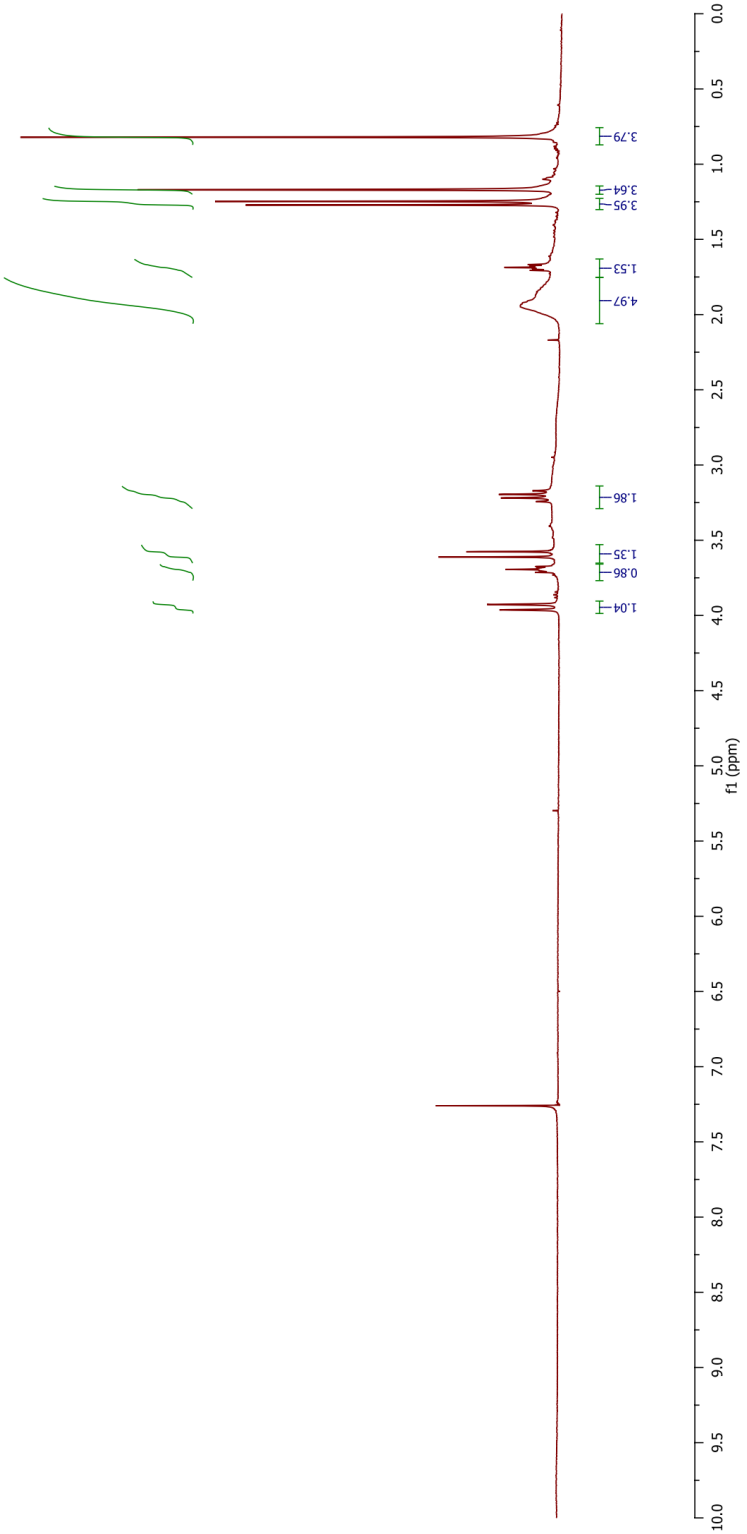


Methyl 1-(1-benzylpyrrolidin-2-yl)cyclohexanecarboxylate (1-22f)

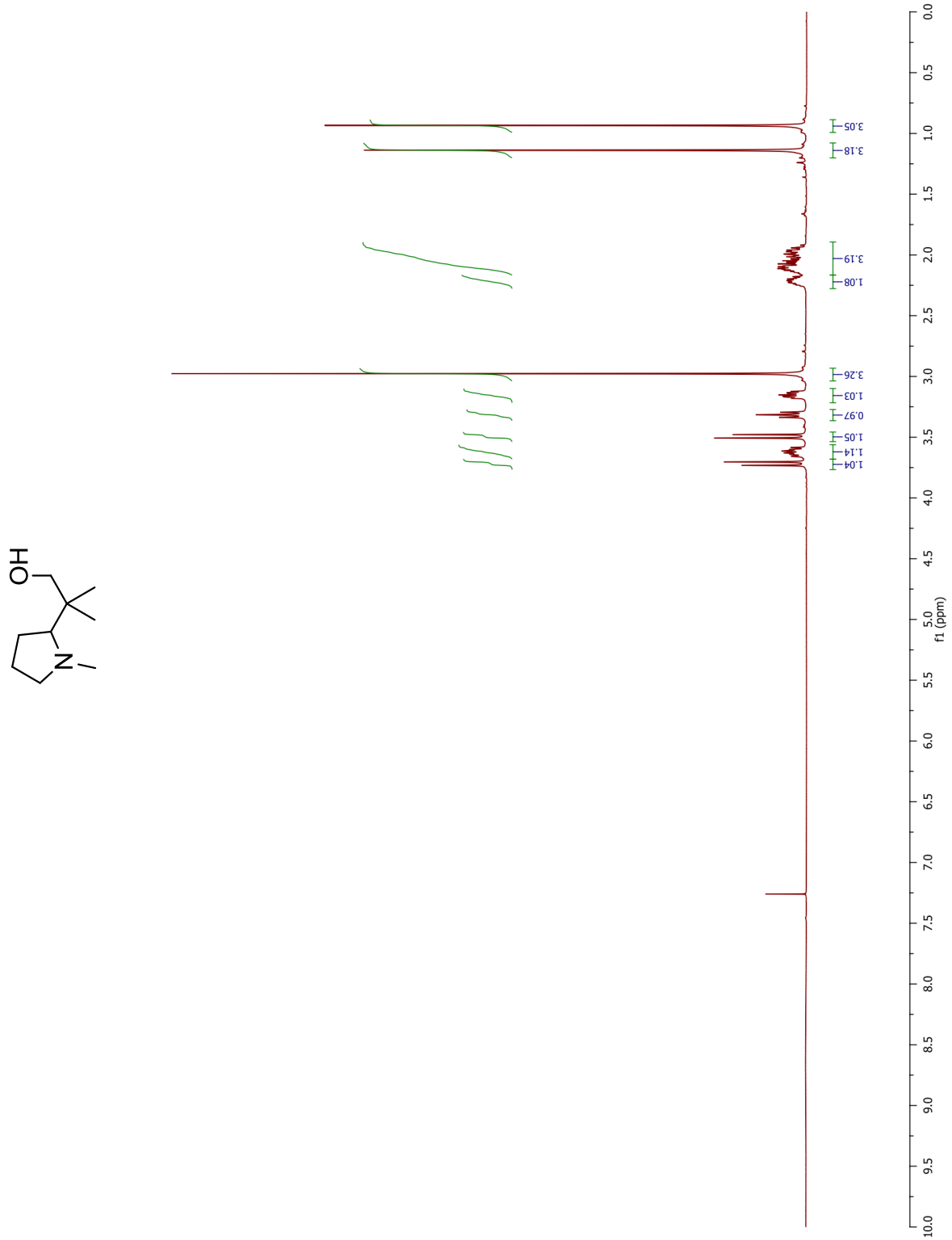


2,2-Dimethyl-3-(piperidin-1-yl)butan-1-ol (1-29a)

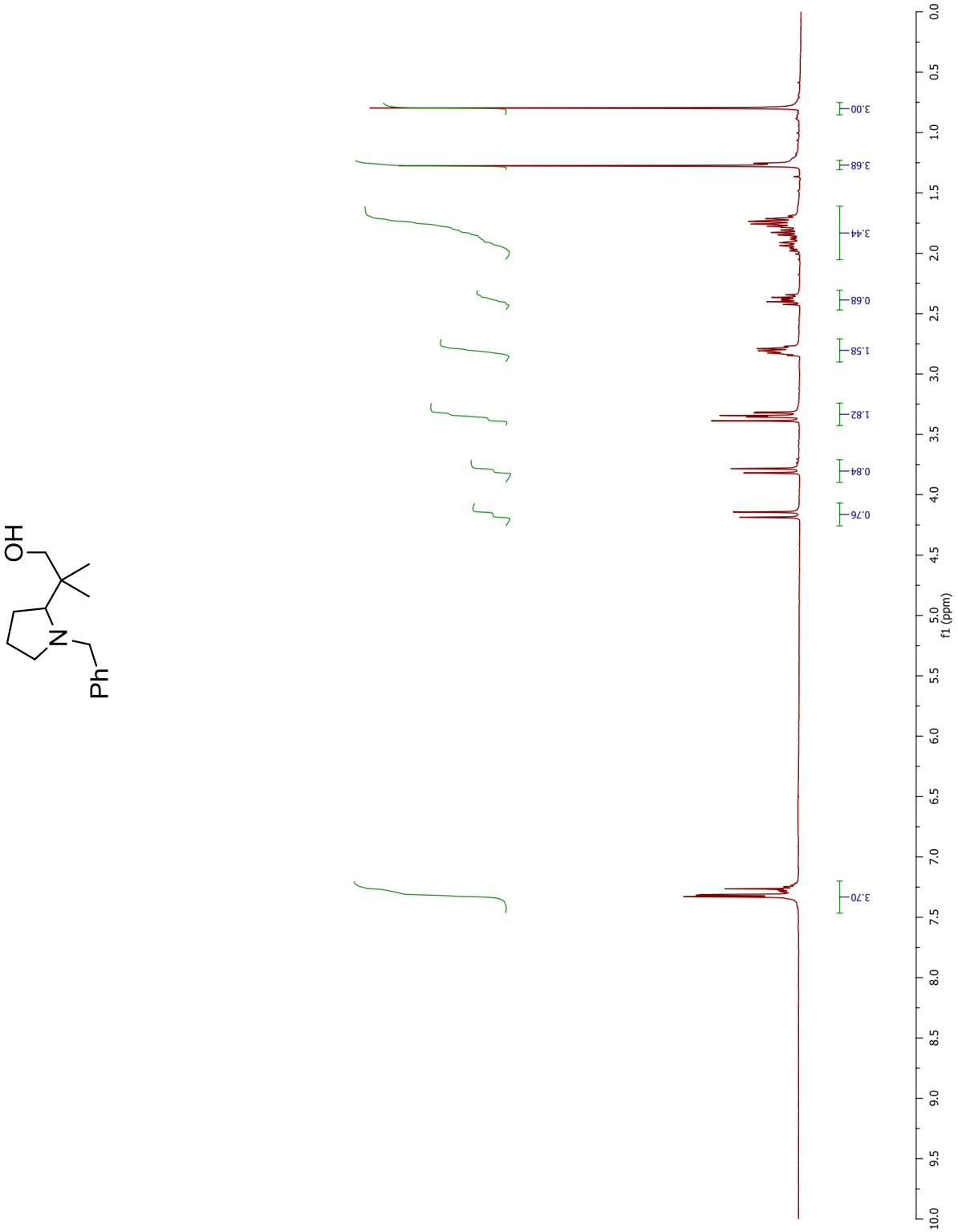




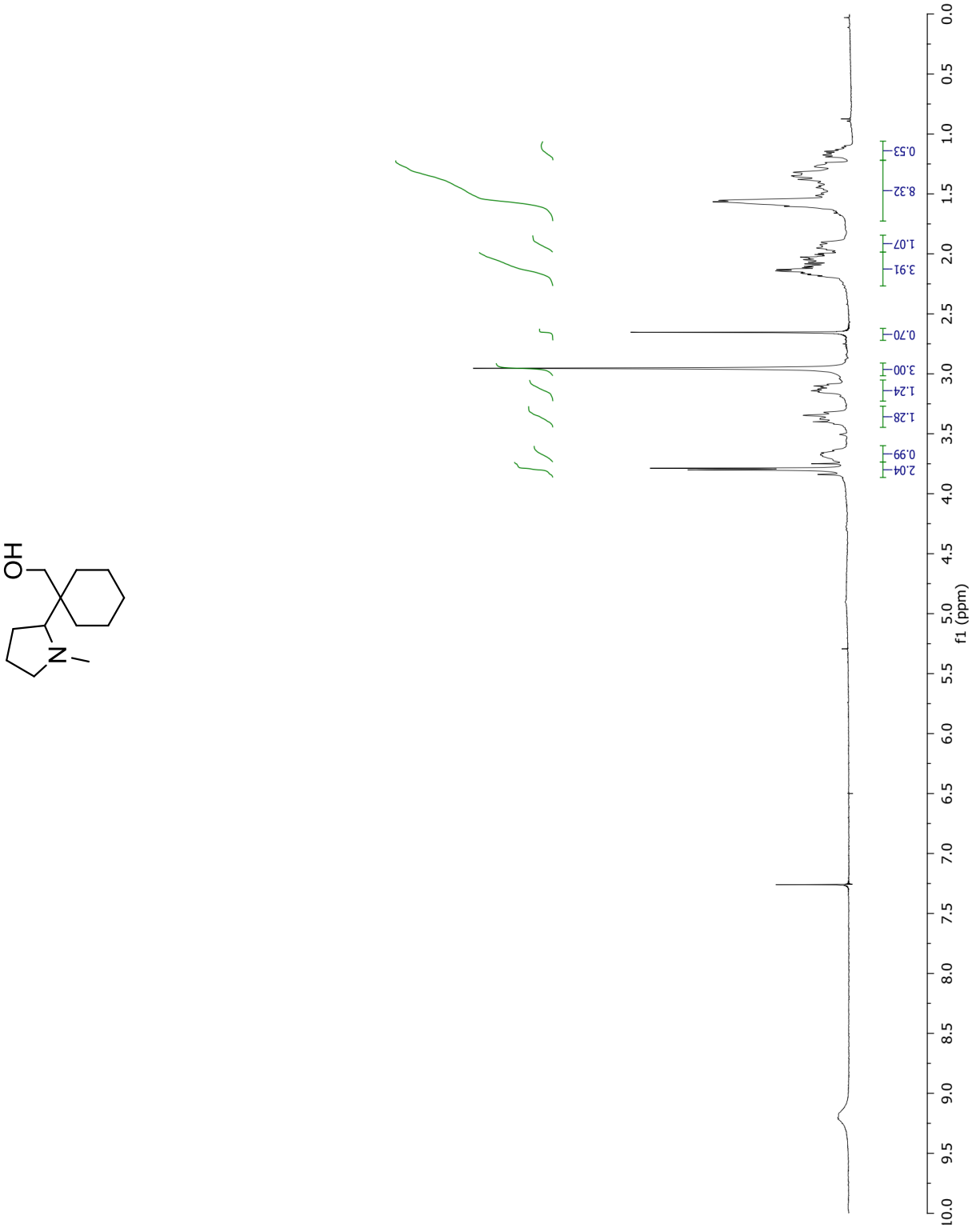
2-Methyl-2-(1-methylpyrrolidin-2-yl)propan-1-ol (1-22b)



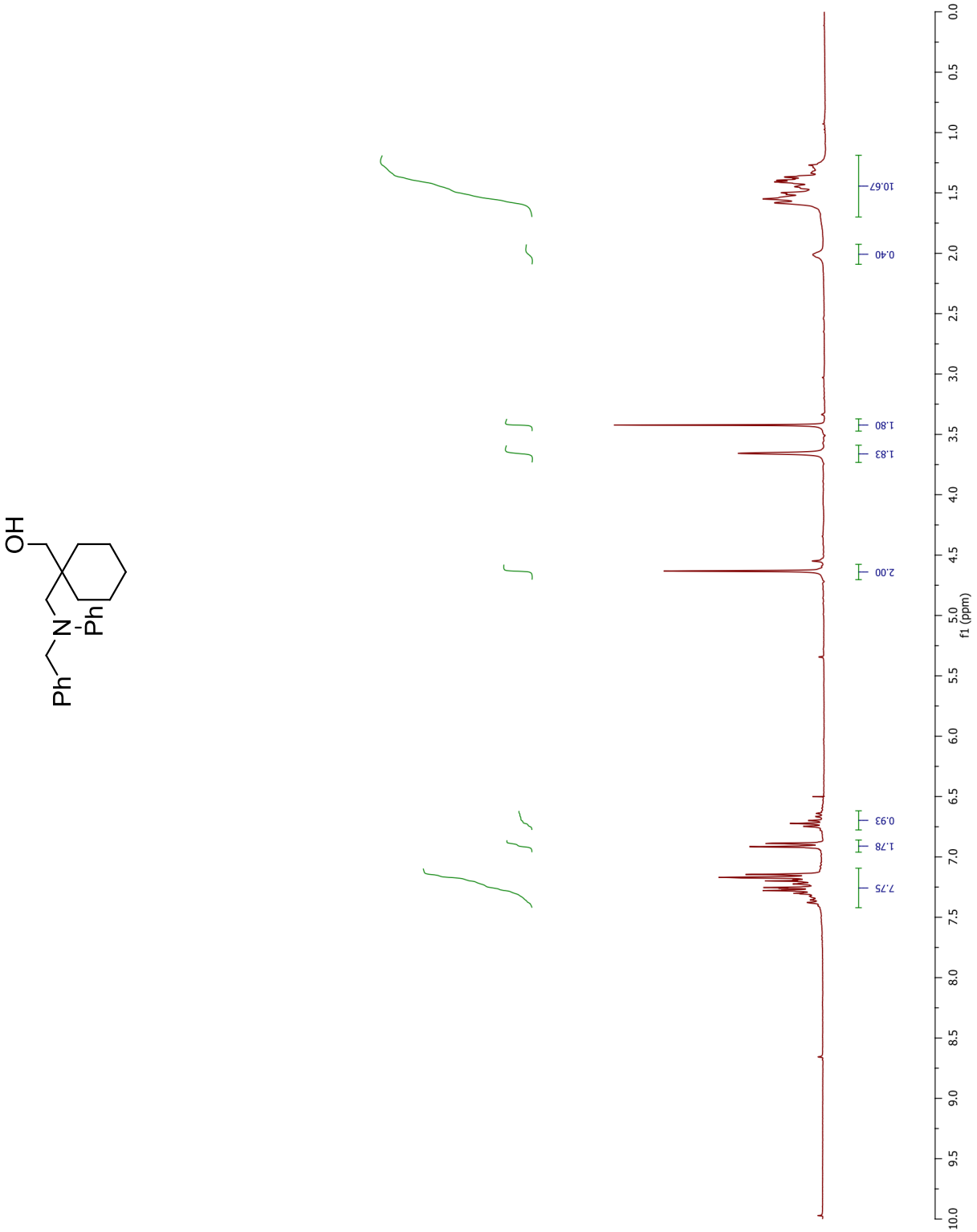
2-(1-Benzylpyrrolidin-2-yl)-2-methylpropan-1-ol (1-29c)



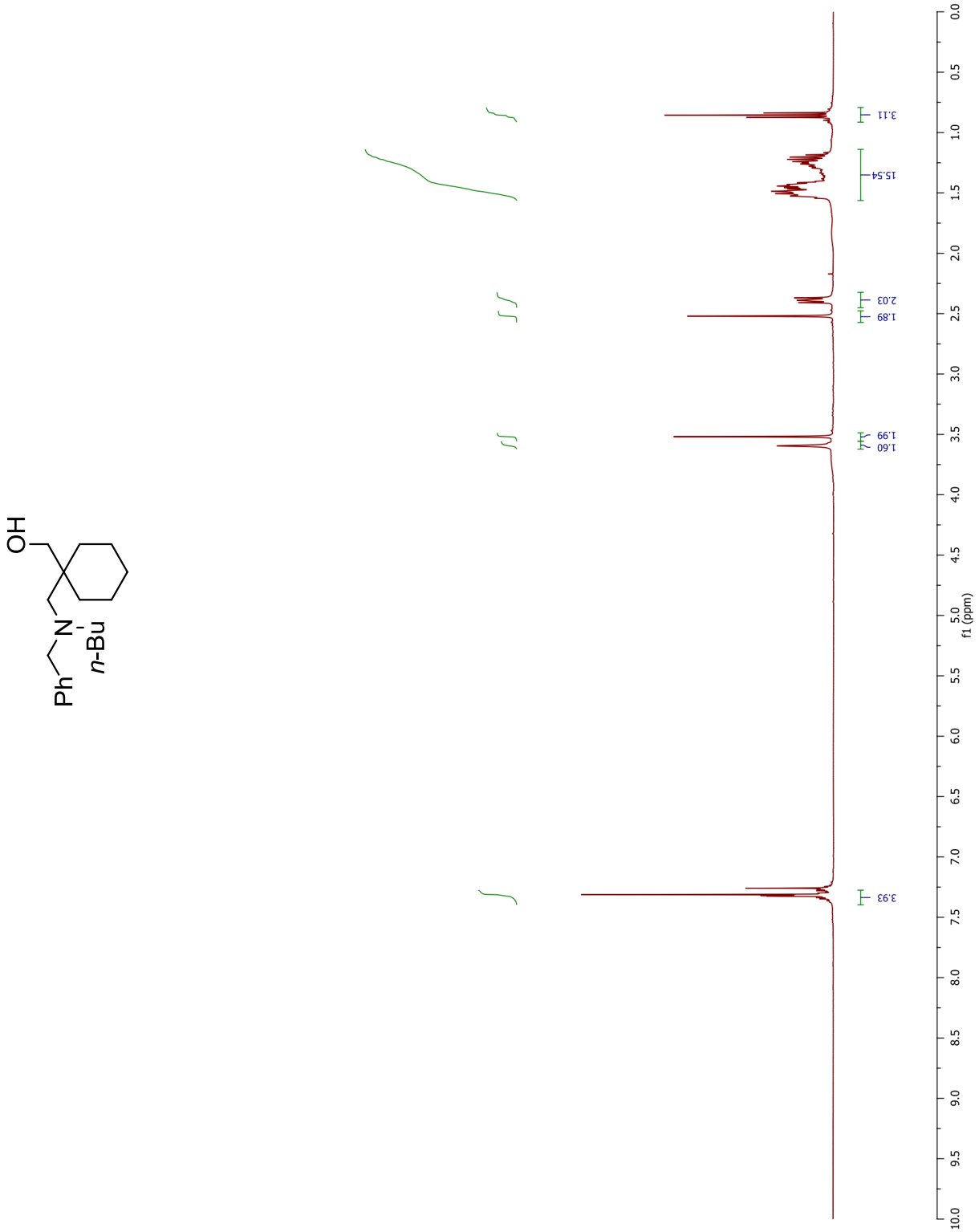
(1-(1-Methylpyrrolidin-2-yl)cyclohexyl)methanol (1-22d)



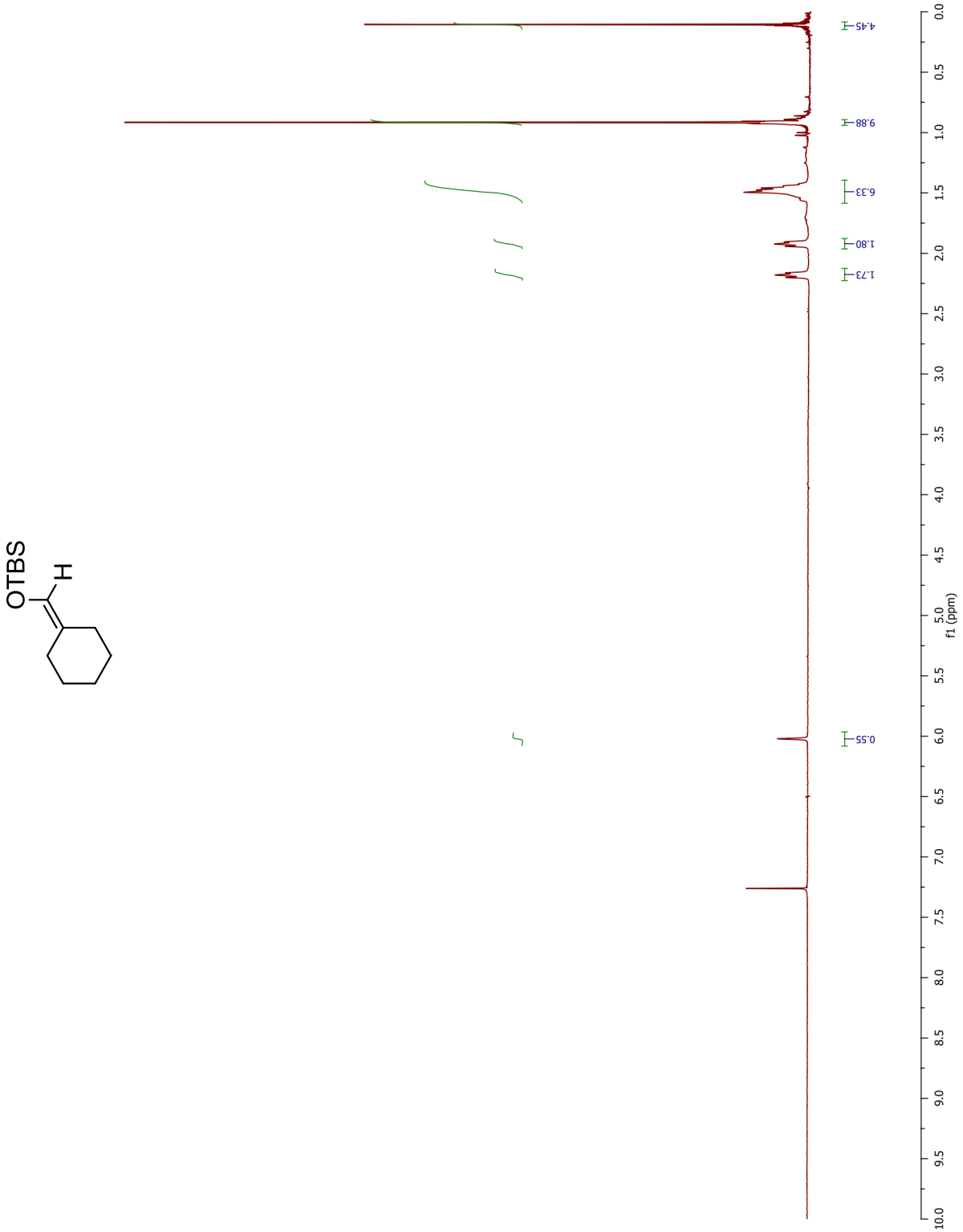
(1-((Benzyl(phenyl)amino)methyl)cyclohexyl)methanol (1-29e/1-29g)



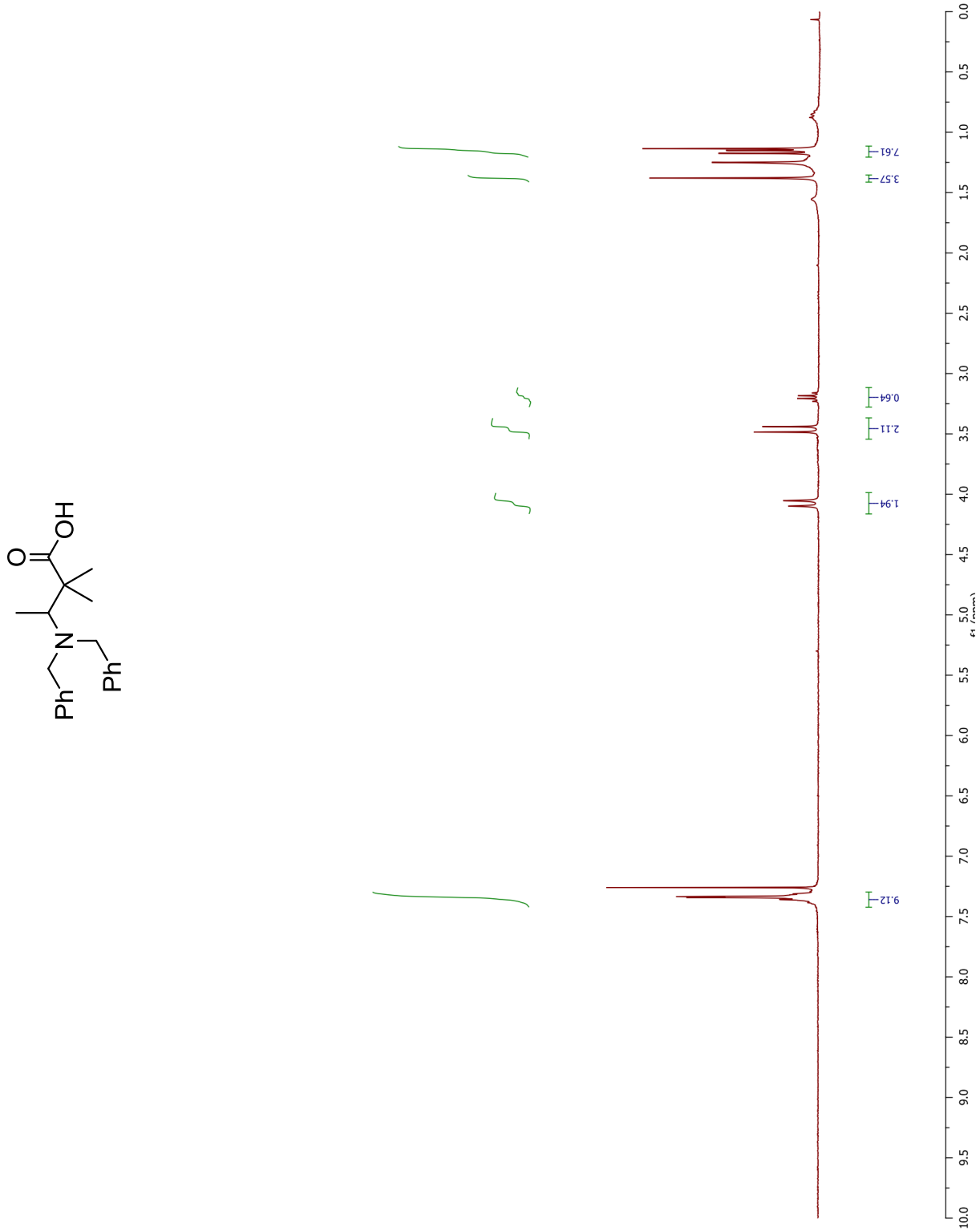
(1-((Benzyl(butyl)amino)methyl)cyclohexyl)methanol (1-29f/1-29h)



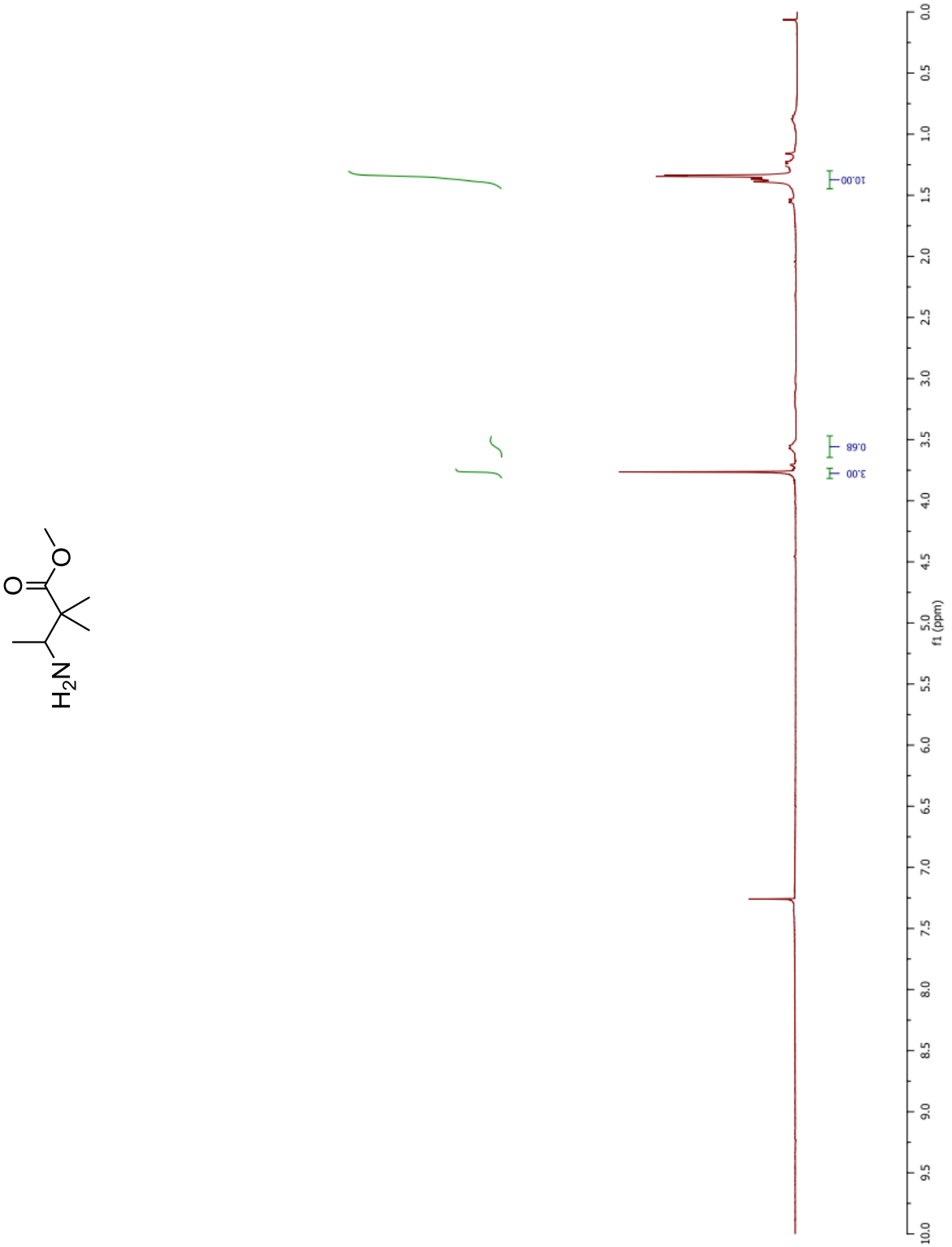
tert-Butyl(cyclohexylidenemethoxy)dimethylsilane (1-33a)



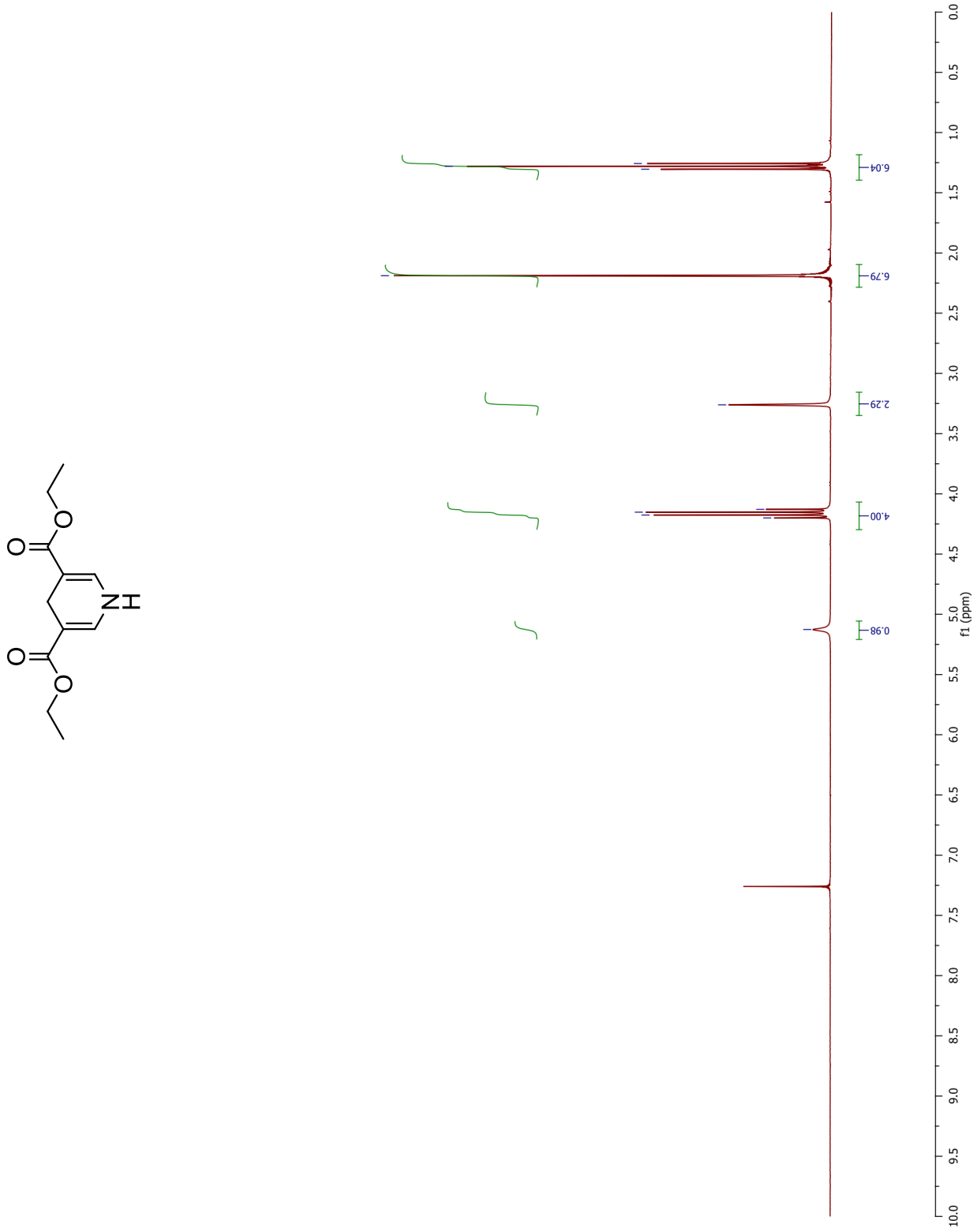
3-(Dibenzylamino)-2,2-dimethylbutanoic acid (1-34a)



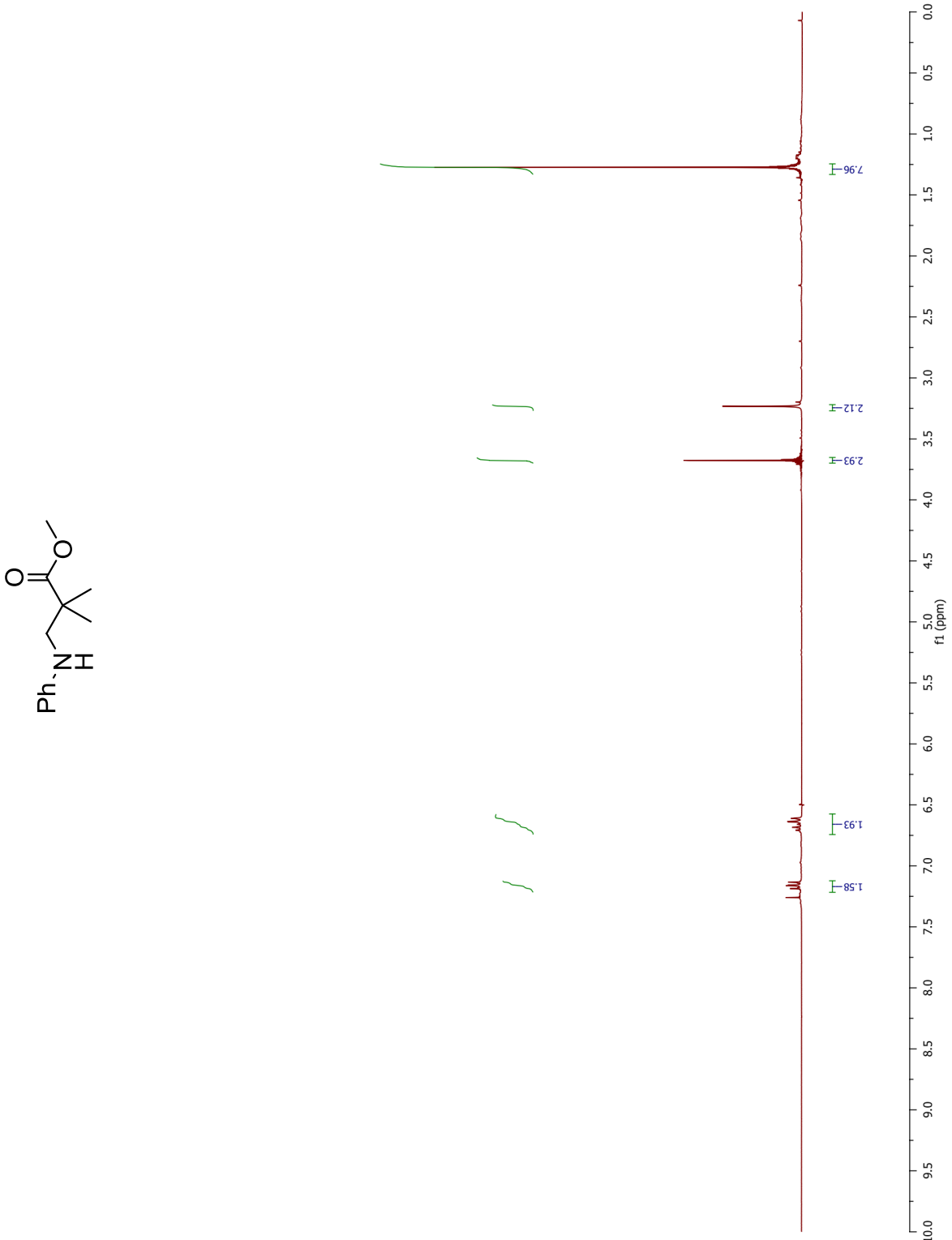
Methyl 3-amino-2,2-dimethylbutanoate (1-35c)



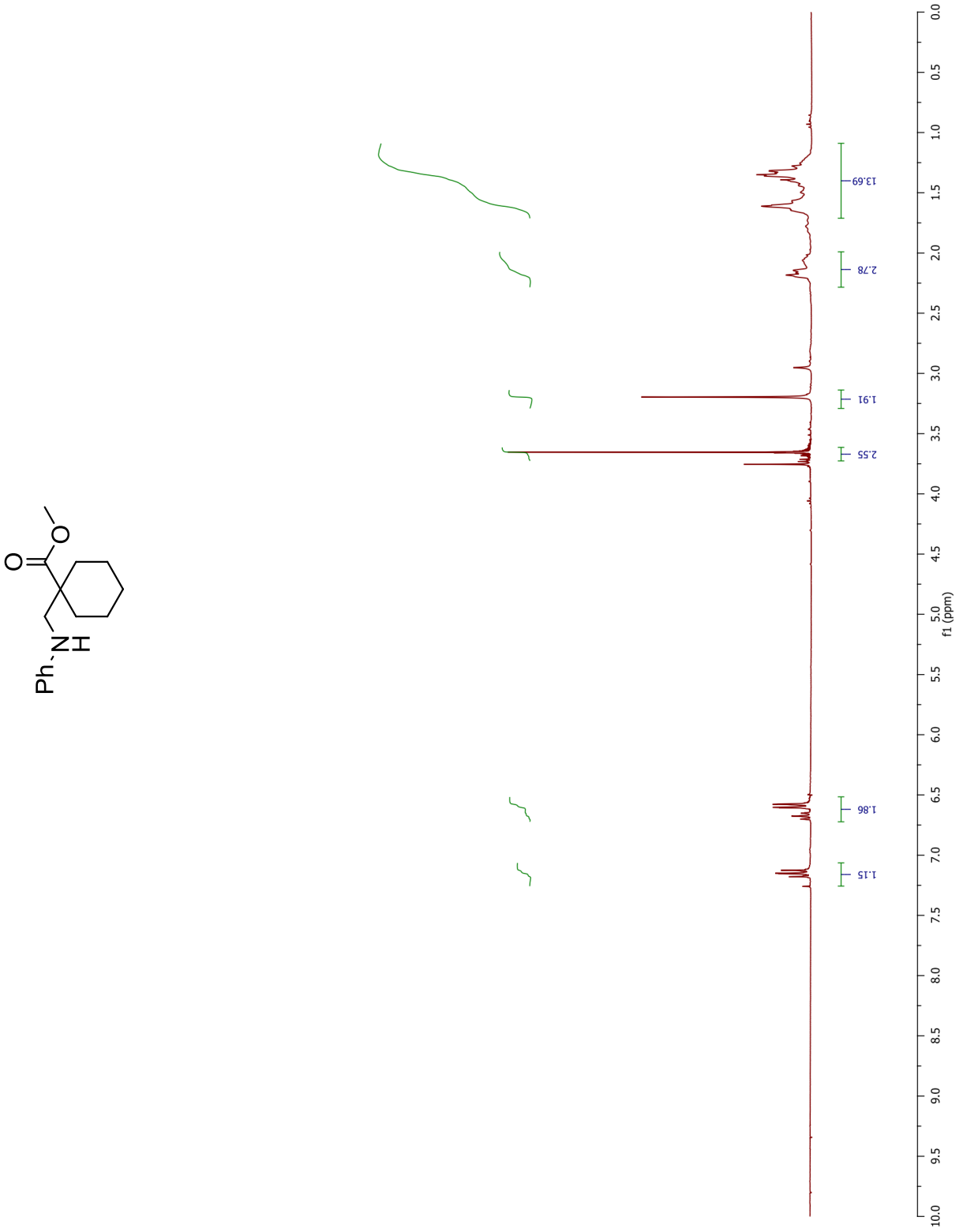
Diethyl 2,6-dimethyl-1,4-dihydropyridine-3,5-dicarboxylate (1-44)



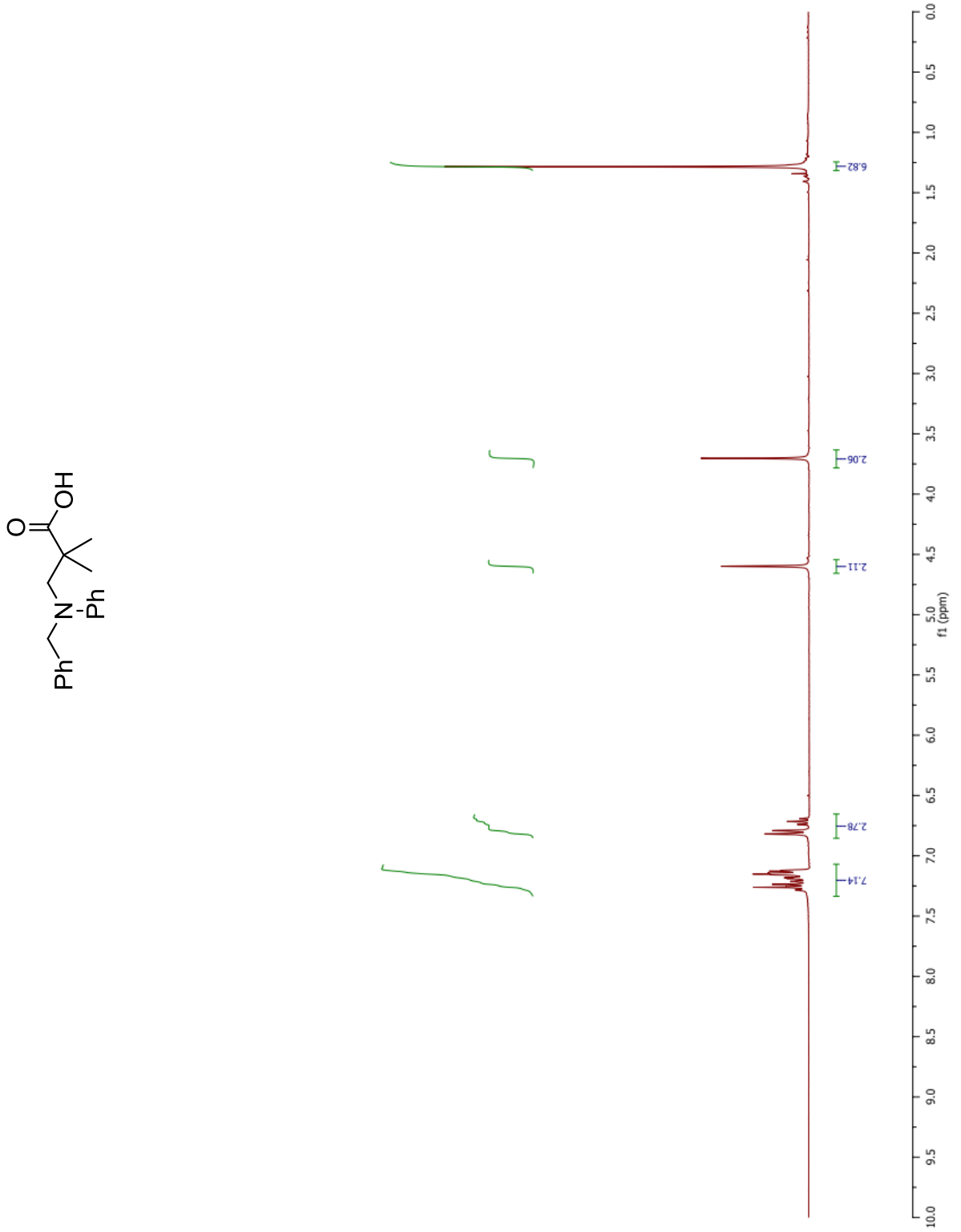
Methyl 2,2-dimethyl-3-(phenylamino)propanoate (1-48a)



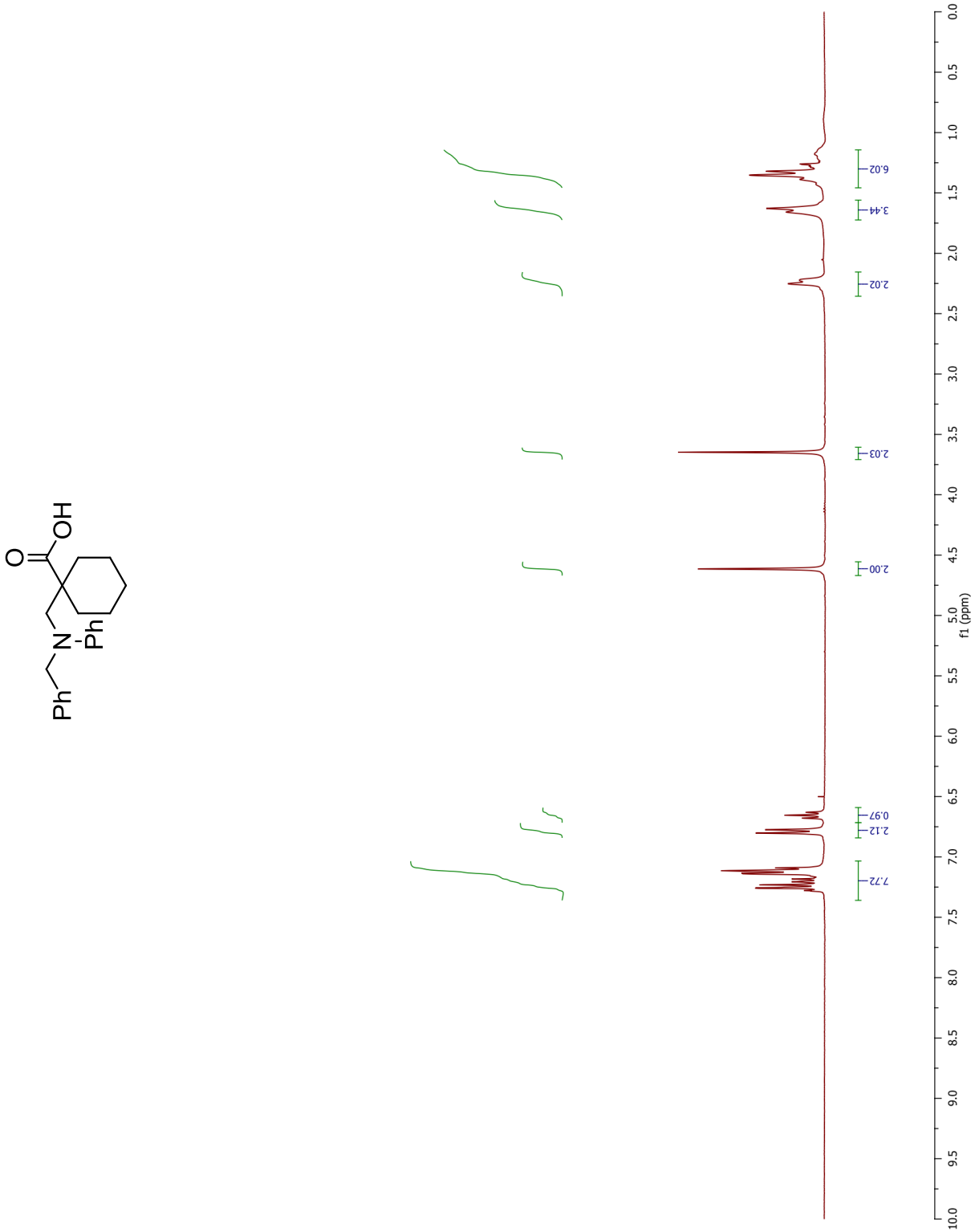
Methyl 1-((phenylamino)methyl)cyclohexanecarboxylate (1-48b)



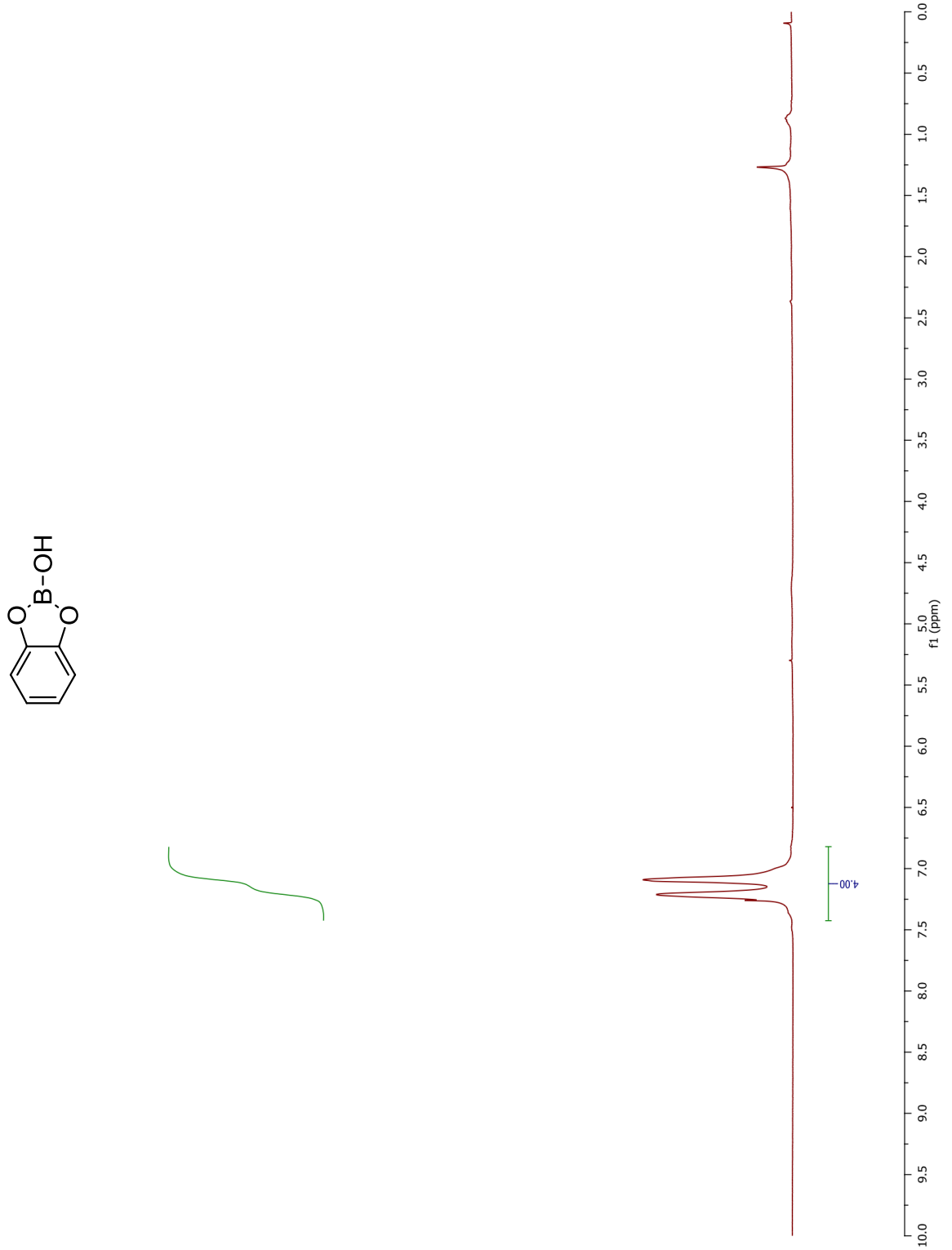
3-(Benzyl(phenyl)amino)-2,2-dimethylpropanoic acid (1-49a)



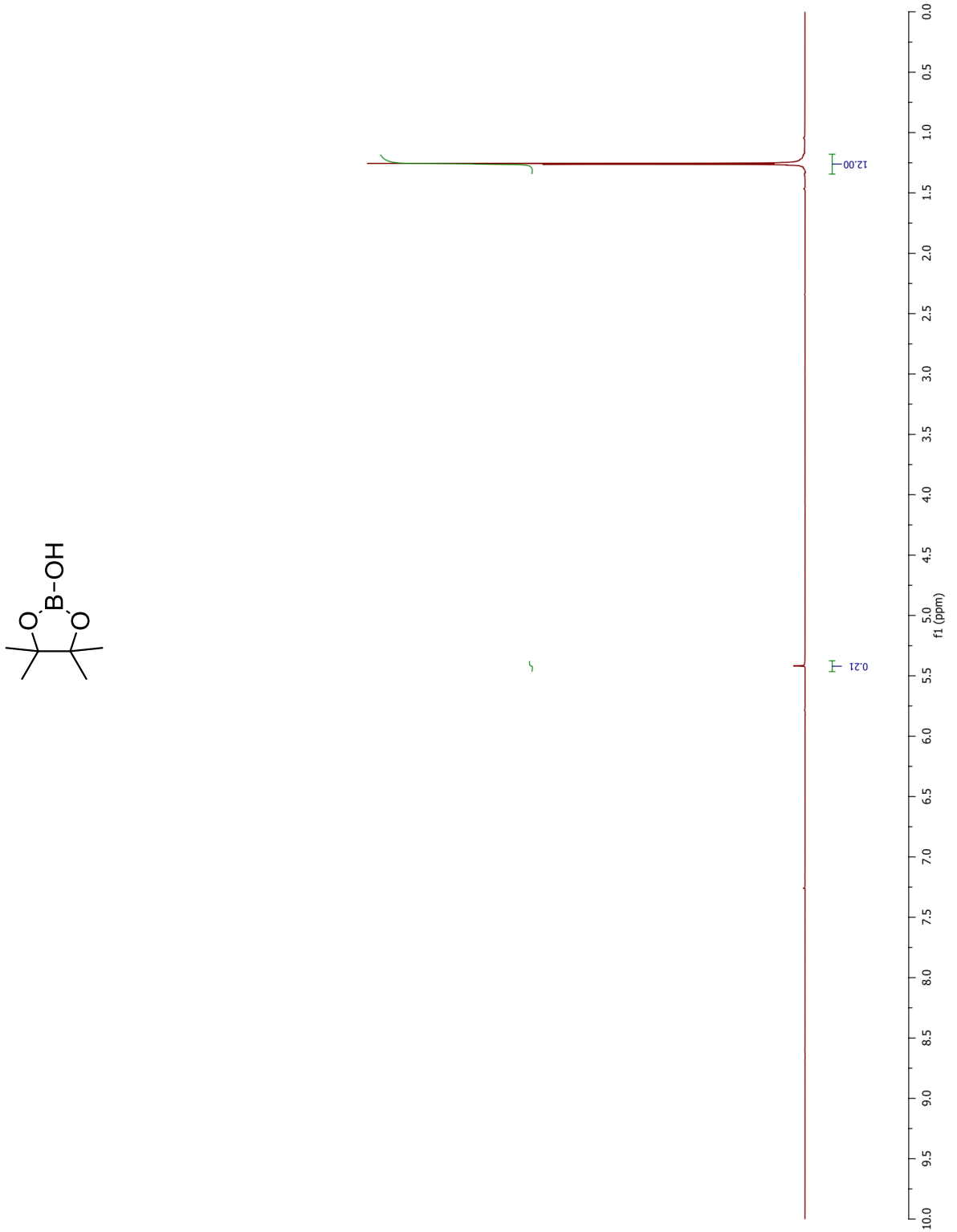
1-((Benzyl(phenyl)amino)methyl)cyclohexanecarboxylic acid (1-49b)



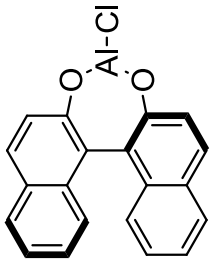
Benzo[d][1,3,2]dioxaborol-2-ol (2-42)

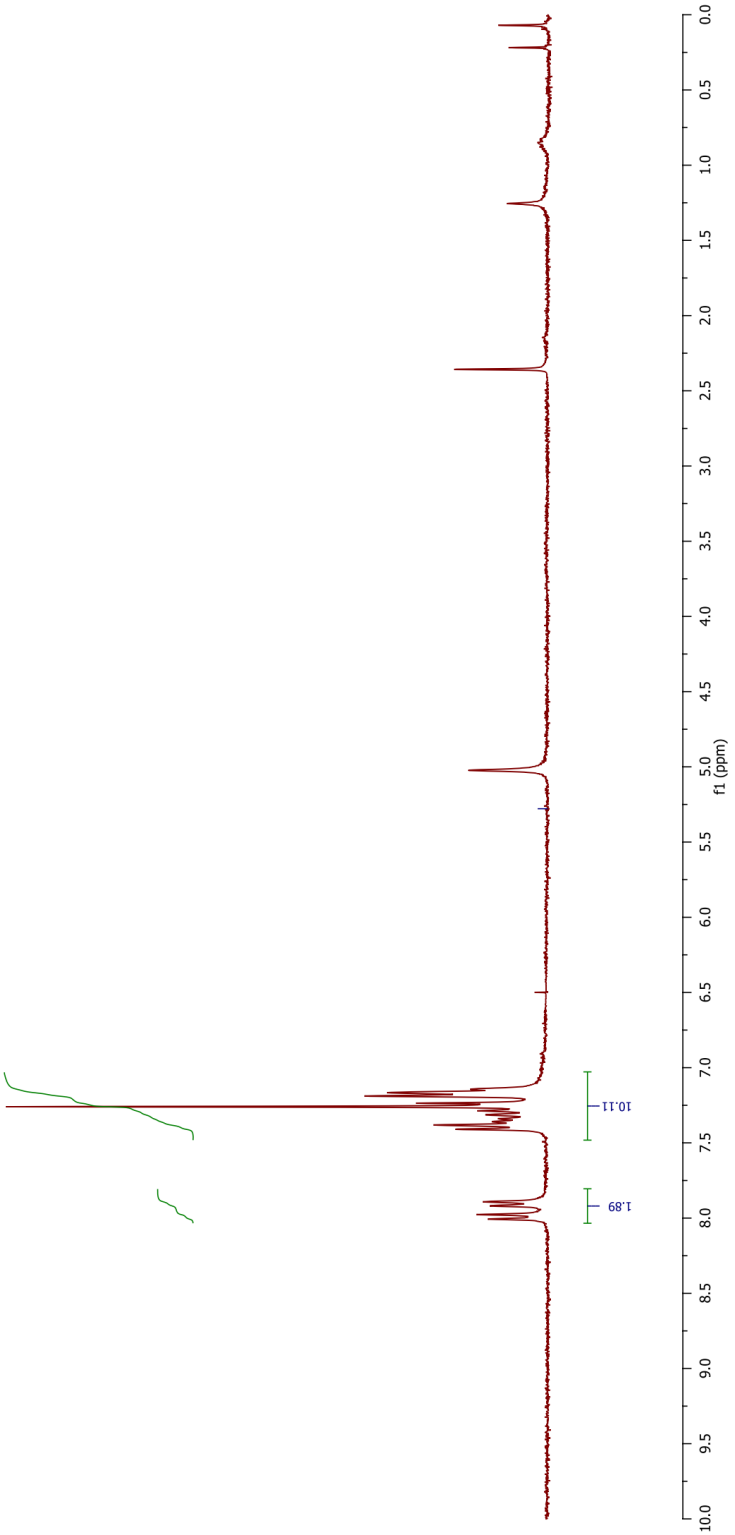


4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-ol (2-44)

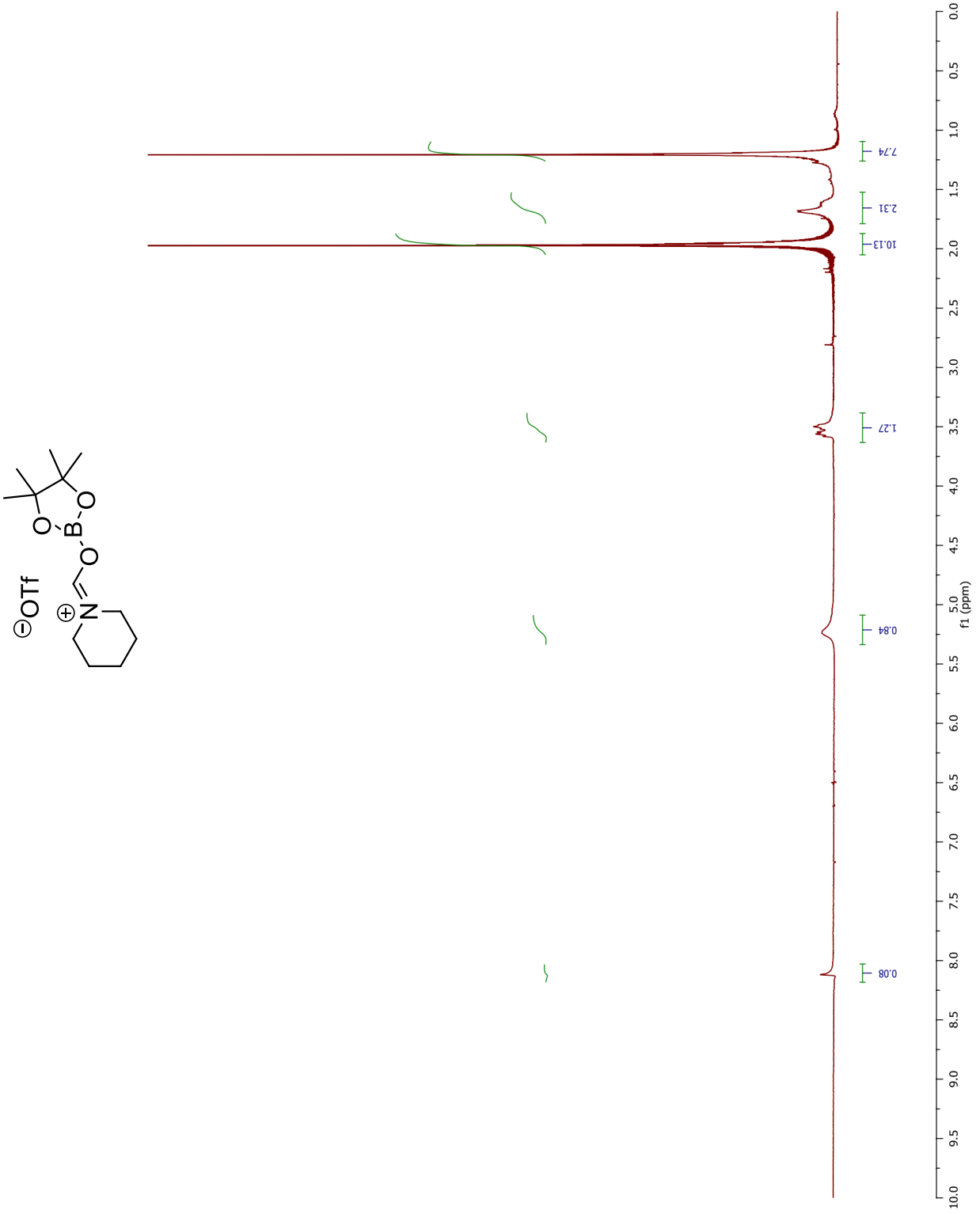


(S)-1,1'-Binaphthol-AlCl (2-49)

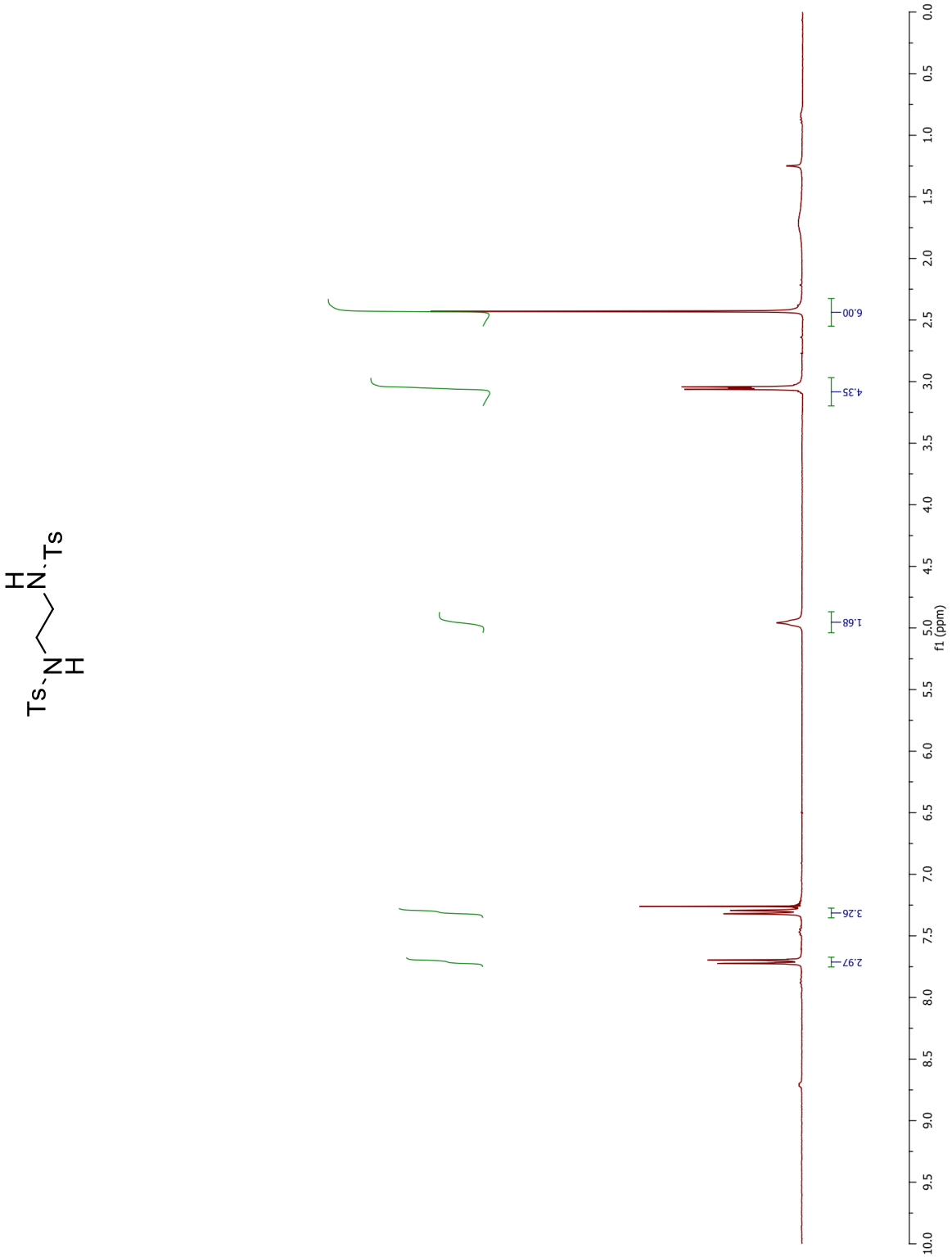




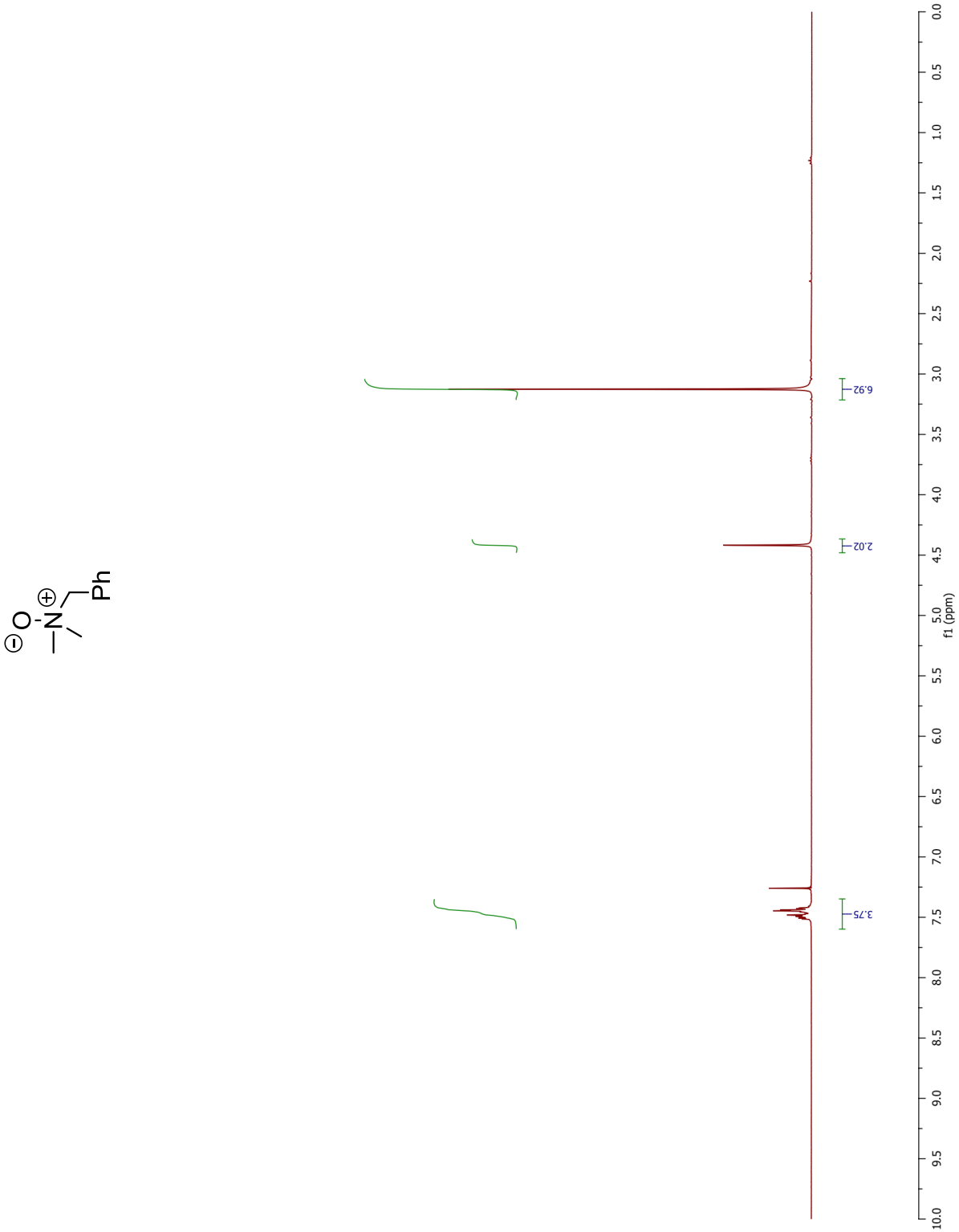
1-(((4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)oxy)methylene)piperidin-1-ium trifluoromethanesulfonate (2-59)



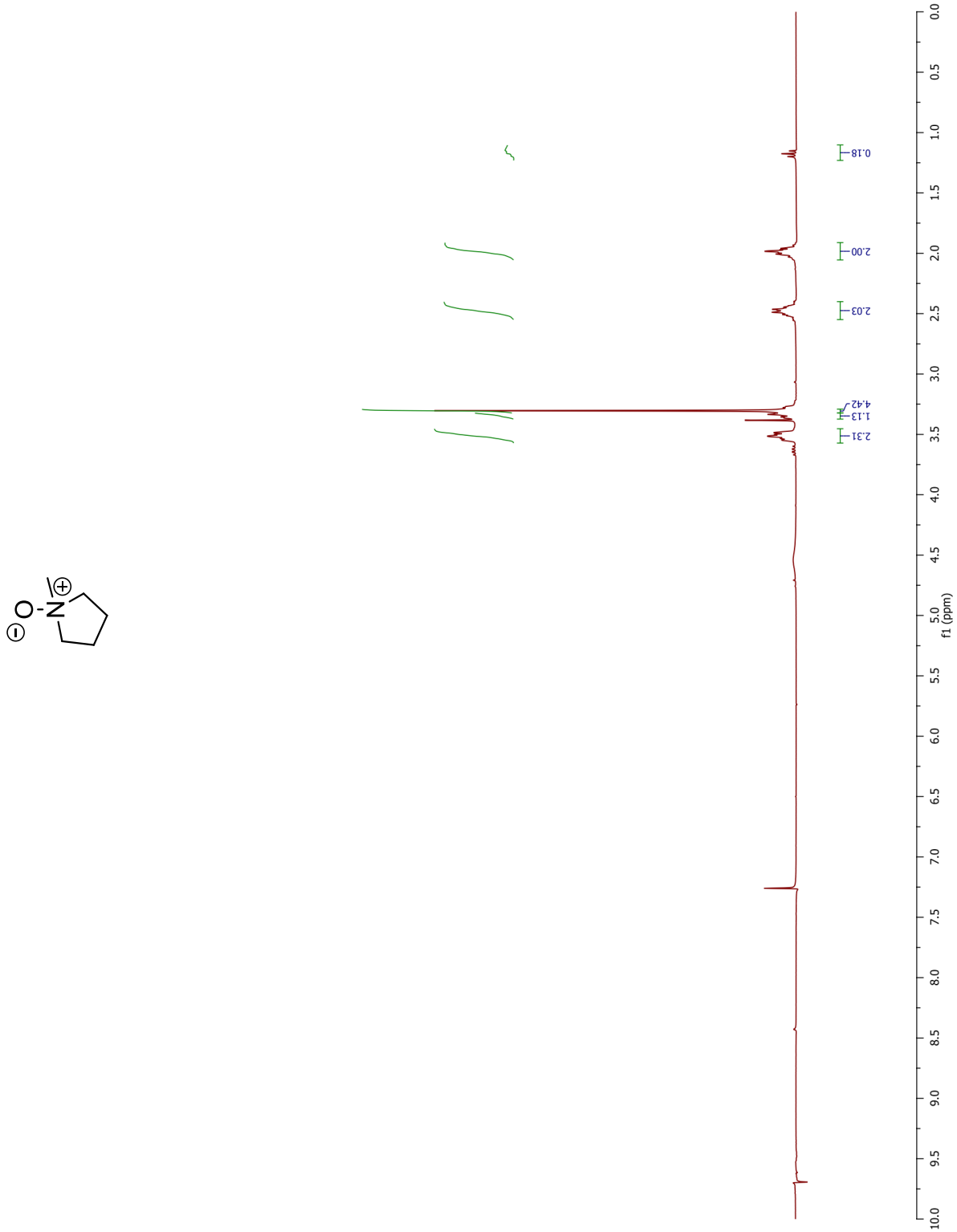
***N*,*N*'-(Ethane-1,2-diyl)bis(4-methylbenzenesulfonamide) (2-60)**



***N*,*N*-Dimethyl-1-phenylmethanamine oxide (2-63)**



1-Methylpyrrolidine 1-oxide (2-65)



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