Highly Efficient Stereo Conservative Amidation and Deamidation of α-Amino Acids

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Supporting Information

We would like to summarize the analytical and spectral data of important peptide building blocks, since the data were reported only partly and in different journals for each compound.

A. Spectral data of compounds

General Remarks.

All starting materials were obtained from Acros, Merck or Fluka. 1,4-Dioxane was distilled from sodium/benzophenone and stored over molecular sieves (4Å). The yields reported are after purification. Melting points are uncorrected. Optical Rotation was measured for solutions in given solvents at 20 °C. NMR spectra: ^{1}H (300.14 and 400.14 MHz), ^{13}C (75.48 and 100.63 MHz), and ^{19}F NMR (282.37 MHz). Internal standards used: TMS (0 ppm) for ^{1}H, $CDCl_3$ (77.00 ppm) for ^{13}C and $CFCl_3$ (0 ppm) for ^{19}F NMR spectroscopy. The multiplicity of the ^{13}C NMR signals concerning the $^{13}C^{1}H$ coupling was determined by the DEPT (90° & 135°) method. Mass spectra: GC-MS-CI using NH_3, GC-MS-EI coupling (70 eV) and MS-EI direct inlet. Exact Mass: Quattro LC method using nanospray and MicroTof Bruker Daltonics using Loop injection. Elemental Analysis: Mikroanalytisches Laboratorium, Organische Chemie, Universität Münster. X-Ray: Data sets were collected with a Nonius KappaCCD diffractometer. Programs used: data collection COLLECT[1a], data reduction Denzo-SMN[1b], absorption correction SORTAV1[1c-d], structure solution SHELXS-97[1e], structure refinement SHELXL-97[1f], graphics DIAMOND.[1g]

General Procedure I (GP-I). Boc Protection of free Amino Acids

To a solution of free amino acids **1** (50 mmol) in 1:1 mixture of THF/H_2O (300 mL), $NaHCO_3$ (150 mmol) and Boc_2O (60 mmol) were added consecutively at 0 °C. After 30 min, the solution was stirred overnight at room temperature. The turbid solution was extracted with Et_2O (2×200 mL). The aqueous layer was acidified to pH = 4-5 by careful addition of half sat. citric acid at 0 °C and then extracted with CH_2Cl_2 (3×200 mL). The combined organic phase was dried (Na_2SO_4) and evaporated under reduced pressure to give the Boc-amino acids with high purity as solids or hard colorless oils, which crystallize on standing. These Boc-amino acids were used for next step without purification.

2-[*N*-[(*tert*-Butyloxy)carbonyl]amino]-4-fluoro-4-pentenoic acid (2f) [Boc-Fap-OH]. Following GP-I, from H-Fap-OH **1f** (400 mg, 3.0 mmol), title compound **2f** was isolated as an oil which was crystallized from CH_2Cl_2/pentane (1:2) in a freezer (696 mg, > 99 %): mp 85 °C (CH_2Cl_2/pentane); NMR shows carbamate dynamics with 68:32 ratio form ^{19}F NMR; δ_H (300.14 MHz, $CDCl_3$): 1.45 (3×s, 9 H), 2.50-2.90 (2×m, 2 H), 4.39 (dd, 1 H, $^{3}J_{HF}$ = 49.1 Hz, $^{2}J_{HH}$ = 3.0 Hz), 4.34-4.59 (2×m, 1 H), 4.67 (dd, 1 H, $^{3}J_{HF}$ = 16.9 Hz, $^{2}J_{HH}$ = 3.0 Hz), 5.25/5.48 (2×bs, 1 H), 11.0 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 28.18 (2×3×q), 34.61/35.45 (2×ddd, $^{2}J_{CF}$ = 27.3 Hz), 51.0/51.83 (2×d), 80.55 (2×s), 93.81 (2×ddd, $^{2}J_{CF}$ = 17.6 Hz), 155.40/155.44 (2×s), 161.69 (2×d, $^{1}J_{CF}$ = 259.0 Hz), 175.69 (s); δ_F (282.37 MHz, $CDCl_3$): For major rotamer: –95.59 (ddt, 1 F, $^{3}J_{HF}$ = 17.8 Hz, $^{3}J_{HF}$ = 50.2 Hz, $^{3}J_{HF}$ = 13.8 Hz); For minor rotamer: –97.10 (ddt, 1 F, $^{3}J_{HF}$ = 17.8 Hz, $^{3}J_{HF}$ = 50.2 Hz, $^{3}J_{HF}$ = 13.8 Hz); MS-ES, *m/z*: 234.1 [M+H], 256.1 [M+Na]. Analytical and spectral data agree with literature.[2]

2-[*N*-[(*tert*-Butyloxy)carbonyl]amino]-4-pentenoic acid (2g) [Boc-Alg-OH]. Following GP-I, from H-Alg-OH **1g** (2.76 g, 24 mmol), title compound **2g** was isolated as an oil which was crystallized from CH_2Cl_2/pentane (1:2) in a freezer (5.1 g, > 99 %): mp 109 °C (CH_2Cl_2/pentane); The NMR shows carbamate dynamics with 73:27 ratio form ^{1}H NMR; δ_H (300.14 MHz, $CDCl_3$): 1.45 (3×s, 9 H), 2.42-2.67 (2×m, 2 H), 4.40/4.19 (2×bs, 1 H), 5.05-5.18 (2×m, 2 H), 5.19/6.30 (2×bs, 1 H), 5.66-5.84 (m, 1 H), 11.62 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 28.20/27.02 (2×3×q), 36.37 (2×dd), 52.74/54.20 (2×d), 80.20/81.71 (2×s), 119.23 (2×dd), 132.10 (2×d), 155.47/156.58 (2×s), 176.50 (s); MS-ES, *m/z*: 216.1 [M+H], 238.1 [M+Na]. Analytical and spectral data agree with literature.[3]

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General procedure II (GP-II). Phthalimide Protection of free Amino Acids

To a solution of amino acids **1** (10 mmol) in H_2O (20 mL) in an open flask, phthalic anhydride (15 mmol, freshly recrystallized from $CHCl_3$) was added. The solution was irradiated in a microwave oven until the water was evaporated. Then again H_2O (20 mL) was added and this procedure was repeated three times. The residue was cooled, dissolved in Et_2O or CH_2Cl_2 (100 mL), washed with water, and dried ($MgSO_4$). Evaporation of solvent gave crude solids, which were purified by recrystallization (Et_2O/pentane or CH_2Cl_2/pentane).

(*S*)-2-(1,3-Dioxoisoindolin-2-yl)propanoic acid (2h) [PhtN-L-Ala-OH]. Following GP-II, from L-alanine (**1a**) (4.46 g, 50 mmol), title compound **2h** was isolated as white crystals (10.85 g, > 99 %): mp 160-161 °C (CH_2Cl_2/pentane); $[\alpha]_D$ –24.4 (*c* 1.0, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 1.72 (d, 3 H, $^3J_{HH}$ = 7.3 Hz), 5.04 (q, 1 H, $^3J_{HH}$ = 7.3 Hz), 7.73 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.5 Hz), 7.86 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.5 Hz), 11.07 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 14.92 (q), 47.23 (d), 123.54 (2×d), 131.83 (2×s), 134.19 (2×d), 167.32 (2×s), 175.44 (s); MS-ES, *m/z*: 220 [M+H], 242 [M+Na]; MS-EI, *m/z* (%): 219 (7) [M], 174 (100) [M–CO_2], 147 (12) [174–C_2H_6], 130 (22) [M–(76+CH_4], 104 (7) [174–C_3H_4NO], 76 (10), 57 (2). Analytical and spectral data agree with literature.[4]

(*S*)-3-Methyl-2-(1,3-dioxoisoindolin-2-yl)butanoic acid (2i) [PhtN-L-Val-OH]. Following GP-II, from L-valine (**1i**) (586 mg, 5 mmol), title compound **2i** was isolated as a white solid (1.18 g, 95 %): mp 112-113 °C (CH_2Cl_2/pentane); $[\alpha]_D$ –51.4 (*c* 1.03, CH_2Cl_2); δ_H (400.14 MHz, $CDCl_3$): 0.92 (d, 3 H, $^3J_{HH}$ = 6.7 Hz), 1.17 (d, 3 H, $^3J_{HH}$ = 6.7 Hz), 2.76 (m, 1 H), 4.63 (d, 1 H, $^3J_{HH}$ = 8.5 Hz), 7.74 (2×dd, 2 H, $^4J_{HH}$ = 3.2 Hz, $^3J_{HH}$ = 5.5 Hz), 7.87 (2×dd, 2 H, $^4J_{HH}$ = 3.2 Hz, $^3J_{HH}$ = 5.5 Hz), 10.88 (bs, 1 H); δ_C (100.63 MHz, $CDCl_3$): 19.48 (q20.86 (q), 28.38 (d), 57.54 (d), 123.61 (2×d), 131.59 (2×s), 134.24 (2×d), 167.69 (2×s), 174.46 (s); MS-ES, *m/z*: 248 [M+H], 270 [M+Na]; MS-EI, *m/z* (%): 247 (25) [M], 205 (18) [M–C_3H_6], 202 (100) [M–CO_2], 187 (39) [202–CH_4], 160 (30) [202–C_3H_8], 148 (66) [202–C_4H_8], 130 (48), 104 (40) [148–CNO], 76 (23), 55 (20). Analytical and spectral data agree with literature.[4]

(*S*)-2-(1,3-Dioxoisoindolin-2-yl)-3-phenylpropanoic acid (2j) [PhtN-L-Phe-OH]. Following GP-II, from L-phenylalanine (**1j**) (826 mg, 5 mmol), title compound **2j** was isolated as a white solid (1.46 g, > 98 %): mp 177 °C (Et_2O/pentane); $[\alpha]_D$ –162.8 (*c* 1.01, CH_2Cl_2); δ_H (400.14 MHz, $CDCl_3$): 3.56-3.65 (m, 2 H), 5.23 (dd, 1 H, $^3J_{HH}$ = 7.7 Hz, $^3J_{HH}$ = 8.8 Hz), 7.17 (m, 5 H), 7.66 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.4 Hz), 7.76 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.4 Hz), 10.35 (bs, 1 H); δ_C (100.63 MHz, $CDCl_3$): 34.35 (dd), 53.04 (d), 123.51 (2×d), 126.90 (d), 128.56 (2×d), 128.78 (2×d), 131.46 (2×s), 134.12 (2×d), 136.40 (s), 167.36 (2×s), 174.48 (s); MS-ES, *m/z*: 296 [M+H], 318 [M+Na]; MS-EI, *m/z* (%): 295 (14) [M], 249 (10) [M–CO_2], 232 (10), 204 (8) [M–C_7H_7], 160 (5) [204–CO_2], 148 (100) [M–147], 147 (40) [M–148], 130 (25), 104 (17), 91 (36), 77 (16), 65 (8), 50 (2). Analytical and spectral data agree with literature.[4]

General procedure III (GP-III). *N*-Alkyl Amidation of PG-Xaa-OH

N-Methyl morpholine (10 mmol) and isobutyl chloroformate (10 mmol) were successively added to a solution of Boc-Xaa-OH **2a-g** (10 mmol) or PhtN-Xaa-OH **2h-n** (10 mmol) in THF (20 mL) at –20 °C. After an activation period of 3 min, 40 % aqueous methylamine (12-50 mmol) or *N*-alkyl amine (13 mmol) in THF (5 mL) was added to above solution, and the resulting solution was stirred for 1 h at –20 °C prior to the addition of 5 % $NaHCO_3$ (20 mL). After 30 min at room temperature, the aqueous phase was extracted with CH_2Cl_2 (3×50 mL). The combined organic layer was washed with 5 % $NaHCO_3$ (2×20 mL) and dried (Na_2SO_4). Evaporation of solvents under reduced pressure gave Boc-Xaa-NHMe **3a-g** or PhtN-

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Xaa-NHR.**3h-n** The crude products were purified by flash chromatography (EtOAc/cyclohexane, 1:2) or by crystallization (EtOAc/pentane or CH_2Cl_2/pentane).

***tert*-Butyl (*S*)-1-(methylcarbamoyl)ethylcarbamate (3a) [Boc-L-Ala-NHMe].** Following GP-III, from Boc-L-Ala-OH **2a** (9.46 g, 50 mmol), title compound **3a** was isolated as a white crystalline solid (9.92 g, > 98 %): mp 148 °C (CH_2Cl_2/pentane); $[\alpha]_D$ −12.9 (*c* 1.03, MeOH); δ_H (300.14 MHz, $CDCl_3$): 1.35 (d, 3 H, $^3J_{HH}$ = 6.9 Hz), 1.44 (3×s, 9 H), 2.81 (d, 3 H, $^3J_{HH}$ = 4.5 Hz), 4.19 (dq, 1 H, $^3J_{HH}$ = 7.3 Hz, $^3J_{HH}$ = 7.0 Hz), 5.26 (d, 1 H, $^3J_{HH}$ = 7.3 Hz), 6.58 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 18.68 (q), 26.08 (q), 28.28 (3×q), 50.10 (d), 79.93 (s), 155.52 (s), 173.36 (s); MS-ES, *m/z*: 203.2 [M+H], 225.2 [M+Na]. Analytical and spectral data agree with literature.[5]

(*S*)-*tert*-Butyl 2-(methylcarbamoyl)pyrrolidine-1-carboxylate (3b) [Boc-L-Pro-NHMe]. Following GP-III, from Boc-L-Pro-OH **2b** (10.76 g, 50 mmol), title compound **3b** was isolated as a white solid (11.4 g, > 99 %): mp 84 °C (CH_2Cl_2/pentane); $[\alpha]_D$ −81.0 (*c* 1.0, CH_2Cl_2); NMR shows carbamate dynamics resulted in ^{13}C NMR signal broadening; δ_H (300.14 MHz, $CDCl_3$): 1.46 (3×s, 9 H, $^3J_{HH}$ = 7.3 Hz), 1.76-2.45 (2×m, 4 H), 2.81 (d, 3 H, $^3J_{HH}$ = 4.8 Hz), 2.75-2.83 (bs, 1 H, overlapped under dd at 2.81), 3.42 (m, 2 H), 4.24 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 18.96 (dd), 23.87/24.19 (2×dd), 26.04 (q), 28.24/28.34 (2×3×s), 47.06 (dd), 60.16/60.71 (2×d), 77.20/80.33 (2×s), 156.24/158.56 (2×s), 172.72/172.89 (2×s); MS-ES, *m/z*: 229.2 [M+H], 251.2 [M+Na]. Analytical and spectral data agree with literature.[6]

***tert*-Butyl (*R*)-(methylcarbamoyl)(phenyl)methylcarbamate (3d) [Boc-D-Phg-NHMe].** Following GP-III, from Boc-D-Phg-OH **2d** (1.2 g, 4.78 mmol), title compound **3d** was isolated as a white solid (1.25 g, > 99 %): mp 136 °C (EtOAc/pentane); $[\alpha]_D$ −108.4 (*c* 1.0, MeOH); δ_H (300.14 MHz, $CDCl_3$): 1.41 (3×s, 9 H), 2.74 (d, 3 H, $^3J_{HH}$ = 4.9 Hz), 5.21 (q, 1 H, $^3J_{HH}$ = 4.9 Hz), 5.92 (bs, 1 H), 6.34 (bs, 1 H), 7.25-7.38 (m, 5 H); δ_C (75.48 MHz, $CDCl_3$): 26.35 (q), 28.25/28.07 (2×3×q), 58.34/58.49 (2×d), 79.96 (s), 127.08 (2×d), 128.09 (s), 128.80 (2×d), 138.55 (s), 155.22 (s), 170.80 (s); MS-ES, *m/z*: 265.2 [M+H], 287.2 [M+Na]; MS-EI, *m/z* (%): 206 (3) [M–C_2H_4NO], 190 (4) [M–$C_4H_{10}O$], 162 (1) [M–(56+CO_2)], 150 (13) [206–56], 148 (2) [M–116], 133 (7) [206–74], 120 (3) [148–CH_5N], 116 (3) [M–148], 106 (57) [150–CO_2], 91 (3) [120–CO], 77 (44) [C_6H_5], 74 (3), 58 (19), 56 (36) [74–H_2O], 51 (31), 44 (98), 41 (100); ES-EM for [$C_{14}H_{20}N_2O_3$+Na]: Calcd, 287.1366; Found, 287.1345. Anal. Calcd for $C_{14}H_{20}N_2O_3$: C, 63.62; H, 7.63; N, 10.60. Found: C, 63.59; H, 7.43; N, 10.58.

***tert*-Butyl (*S*)-1-(methylcarbamoyl)-2-phenylethylcarbamate (3e) [Boc-L-Phe-NHMe].** Following GP-III, from Boc-L-Phe-OH **2e** (1.28 g, 4.8 mmol), title compound **3e** was isolated as a white solid (1.32 mg, > 99 %): mp 142-143 °C (EtOAc/pentane); $[\alpha]_D$ +12.4 (*c* 1.0, MeOH); δ_H (300.14 MHz, $CDCl_3$): 1.38 (3×s, 9 H), 2.71 (d, 3 H, $^3J_{HH}$ = 4.9 Hz), 3.03 (2×dd, overlapped, 2 H), 4.34 (dd, 1 H, $^3J_{HH}$ = 7.6 Hz, $^3J_{HH}$ = 7.2 Hz), 5.22 (d, 1 H, $^3J_{HH}$ = 7.7 Hz), 6.13 (bs, 1 H), 7.14-7.30 (m, 5 H); δ_C (75.48 MHz, $CDCl_3$): 26.00 (q), 28.21 (3×q), 38.86 (dd), 55.97 (d), 80.01 (s), 126.75 (s), 128.47 (2×d), 128.24 (2×d), 136.89 (s), 155.42 (s), 171.90 (s); MS-ES, *m/z*: 279.2 [M+H], 301.2 [M+Na], MS-EI, *m/z* (%): 222 (1) [M–56], 220 (1) [M–C_2H_4NO], 205 (1) [M–(H_2O+56)], 202 (1) [M–77], 187 (1) [M–91], 176 (1) [205–CH_5N], 161 (5) [M–117], 131 (5) [161– CH_5N], 120 (50) [220–(CO_2+56)], 117 (3) [M–161], 103 (12) 91 (58) [C_7H_7], 87 (28) [162–77], 77 (12) [C_6H_5], 65 (15), 56 (39) (C_4H_8), 44 (90), 41 (100); ES-EM for [$C_{15}H_{22}N_2O_3$+Na]: Calcd, 301.1523; Found, 301.1500. Anal. Calcd for $C_{14}H_{20}N_2O_3$: C, 64.73; H, 7.97; N, 10.06. Found: C, 64.63; H, 7.81; N, 10.03. Analytical and spectral data agree with literature.[7]

***tert*-Butyl 1-(methylcarbamoyl)-3-fluorobut-3-enylcarbamate (3f) [Boc-Fap-NHMe].** Following GP-III, from Boc-Fap-OH **2f** (474 mg, 2.03 mmol), title compound **3f** was isolated as an oil which was crystallized from CH_2Cl_2/pentane (1:1) in a freezer (493 mg, > 99 %): mp 112-113 °C (CH_2Cl_2/pentane); NMR shows carbamate dynamics resulted in ^{13}C and ^{19}F NMR signal broadening; δ_H (300.14 MHz, $CDCl_3$): 1.44 (3×s, 9 H), 2.50-2.76 (2×m, 2 H), 2.81 (d, 3 H, $^3J_{HH}$ = 4.8 Hz), 4.37 (dd, 1 H, $^3J_{HF}$ = 49.6 Hz, $^2J_{HH}$ = 2.9 Hz), 4.35 (dd, 1 H, $^3J_{HH}$ = 7.2 Hz, $^3J_{HH}$ = 7.6 Hz), 4.63 (dd, 1 H, $^3J_{HF}$ = 17.1 Hz, $^2J_{HH}$ = 2.9 Hz), 5.33 (d, 1 H, $^3J_{HH}$ = 8.4 Hz), 6.60 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$, major/minor): 26.13 (q), 28.18/28.24 (2×3×q), 35.23 (ddd, $^2J_{CF}$

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= 27.3 Hz), 51.99 (d), 80.30 (s), 93.08 (ddd, $^{2}J_{CF}$ = 18.8 Hz), 155.50 (s), 162.41 (d, $^{1}J_{CF}$ = 255.8 Hz), 171.31 (s); δ_F (282.37 MHz, $CDCl_3$): For major rotamer: −96.06 (m, 1 F); For minor rotamer: −96.62 (m, 1 F); MS-ES, *m/z*: 247 [M+H], 269 [M+Na]; MS-EI, *m/z* (%): 246 (4) [M], 231 (1) [M−CH_3], 213 (1) [M−(CH_2+HF)], 190 (13) [M−57], 188 (23) [M−58], 187 (5) [M−59], 173 (12) [M−74], 145 (1) [190−CO_2] or [173−CO], 132 (21) [188−57], 110 (2), 88 (54) [188−(77+CO_2)], 74 (4) [$C_4H_{10}O$], 58 (15) [C_2H_4NO], 57 (100) [C_4H_9]; ES-EM for [$C_{11}H_{19}FN_2O_3$+Na]: Calcd, 269.1272; Found, 269.1263. Anal. Calcd for $C_{11}H_{19}FN_2O_3$: C, 53.65; H, 7.78; N, 11.37. Found: C, 53.67; H, 7.64; N, 11.37.

***tert*-Butyl 1-(methylcarbamoyl)but-3-enylcarbamate (3g) [Boc-Alg-NHMe].** Following GP-III, from Boc-Alg-OH **2g** (2.4 g, 11.2 mmol), title compound **3g** was isolated as a solid which was recrystallized from CH_2Cl_2/pentane in a freezer (2.51 g, > 99 %): mp 113 °C (CH_2Cl_2/pentane); δ_H (300.14 MHz, $CDCl_3$): 1.44 (3×s, 9 H), 2.38-2.60 (2×m, 2 H), 2.81 (d, 3 H, $^{3}J_{HH}$ = 4.8 Hz), 4.16 (dd, 1 H, $^{3}J_{HH}$ = 6.8 Hz, $^{3}J_{HH}$ = 7.1 Hz), 5.07-5.15 (2×m, 2 H), 5.18 (bs, 1 H), 5.67-5.82 (m, 1 H), 6.45 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 26.06 (q), 28.26 (3×q), 36.97 (dd), 53.90/53.95 (2×d), 80.12 (s), 118.65 (dd), 133.23 (d), 155.61 (s), 172.02 (s); MS-ES, *m/z*: 229.1 [M+H], 251.1 [M+Na]. Anal. Calcd for $C_{11}H_{20}N_2O_3$: C, 57.87; H, 8.83; N, 12.27. Found: C, 57.93; H, 8.78; N, 12.13. Analytical and spectral data was not given in the literature.[8]

(*S*)-*N*-Methyl-2-(1,3-dioxoisoindolin-2-yl)propanamide (3h) [PhtN-L-Ala-NHMe]. Following GP-III, from PhtN-L-Ala-OH **3h** (2.19 g, 10 mmol), title compound **3h** was isolated as a white solid (2.3 g, > 99 %); mp 175-176 °C (Et_2O/pentane); $[\alpha]_D$ −1.3 (*c* 1.01, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 1.69 (d, 3 H, $^{3}J_{HH}$ = 7.4 Hz), 2.80 (d, 3 H, $^{3}J_{HH}$ = 4.8 Hz), 4.89 (q, 1 H, $^{3}J_{HH}$ = 7.4 Hz), 6.30 (bs, 1 H), 7.73 (2×dd, 2 H, $^{4}J_{HH}$ = 3.0 Hz, $^{3}J_{HH}$ = 5.5 Hz), 7.84 (2×dd, 2 H, $^{4}J_{HH}$ = 3.0 Hz, $^{3}J_{HH}$ = 5.5 Hz); δ_C (75.48 MHz, $CDCl_3$): 15.19 (q), 26.47 (q), 49.39 (d), 123.39 (2×d), 131.83 (2×s), 134.16 (2×d), 167.79 (2×s), 169.73 (s); MS-ES, *m/z*: 233 [M+H], 255 [M+Na]; EI, *m/z* (%): 232 (1) [M], 213 (1), 275 (67) [M−C_2H_4NO], 274 (100) [M−C_2H_5NO], 160 (10) [174−CH_4], 148 (12) [174−C_2H_6], 130 (28) [M−C_4H_8NO], 104 (10) [147−CHNO], 76 (13), 55 (5). Analytical and spectral data agree with literature.[9]

(*S*)-*N*,3-Dimethyl-2-(1,3-dioxoisoindolin-2-yl)butanamide (3i) [PhtN-L-Val-NHMe]. Following GP-III, from PhtN-L-Val-OH **2i** (1.24 g, 5 mmol) gives title compound **3i** as a white solid (1.28 g, > 98 %); mp 137 °C (EtOAc/cyclohexane); $[\alpha]_D$ −28.9 (*c* 1.0, CH_2Cl_2); δ_H (400.14 MHz, $CDCl_3$): 0.85 (d, 3 H, $^{3}J_{HH}$ = 6.5 Hz), 1.10 (d, 3 H, $^{3}J_{HH}$ = 6.5 Hz), 2.82 (d, 3 H, $^{3}J_{HH}$ = 6.5 Hz), 4.42 (d, 1 H, $^{3}J_{HH}$ = 11.5 Hz), 6.97 (bs, 1 H), 7.77 (2×dd, 2 H, $^{4}J_{HH}$ = 3.0 Hz, $^{3}J_{HH}$ = 5.7 Hz), 7.86 (2×dd, 2 H, $^{4}J_{HH}$ = 3.3 Hz, $^{3}J_{HH}$ = 5.2 Hz); δ_C (100.63 MHz, $CDCl_3$): 19.44 (q), 19.75 (q), 26.22 (q), 27.57 (d), 63.10 (d), 123.56 (2×d), 131.34 (2×s), 134.35 (2×d), 168.39 (2×s), 169.39 (s); GC-MS-CI, *m/z*: 260 [M+H], 277 [M+NH_3]; EI, *m/z* (%): 260 (3) [M], 218 (65) [M−C_3H_6], 202 (100) [M−C_2H_5NO], 188 (11) [218−CH_5N], 160 (31) [202−C_3H_6], 148 (57) [M−$C_6H_{11}NO$], 130 (44) [M−$C_8H_4O_2$], 104 (17) [148−CHNO], 76 (13), 55 (25). Analytical and spectral data agree with literature.[9]

(*S*)-*N*-Methyl-2-(1,3-dioxoisoindolin-2-yl)-3-phenylpropanamide (3j) [PhtN-L-Phe-NHMe]. Following GP-III, from PhtN-L-Phe-OH **2j** (1.39 g, 5 mmol), title compound **3j** was isolated as a white solid (1.53 g, > 99 %); mp 192 °C (CH_2Cl_2/pentane); $[\alpha]_D$ −115.9 (*c* 1.01, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$-CD_3OD (4:1)): 2.79 (d, 3 H, $^{3}J_{HH}$ = 4.7 Hz), 3.48-3.65 (m, 2 H), 5.06 (dd, 1 H, $^{3}J_{HH}$ = 7.2 Hz, $^{3}J_{HH}$ = 9.2 Hz), 7.06-7.19 (bs+m, 6 H), 7.66-7.72 (m, 2 H), 7.72-7.78 (m, 2 H); δ_C (75.48 MHz, $CDCl_3$-CD_3OD (4:1)): 26.18 (q), 34.30 (dd), 55.29 (d), 123.09 (2 d), 126.57 (d), 128.29 (2×d), 128.54 (2×d), 131.23 (2×s), 134.02 (2×d), 136.63 (s), 167.93 (2×s), 169.41 (s); GC-MS-CI, *m/z*: 309 [M+H]; GC-MS-EI, *m/z* (%): 308 (10) [M], 277 (7) [M−CH_5N], 250 (65) [M−C_2H_4NO], 232 (90) [C_6H_4], 204 (15), 189 (20), 161 (98), 160 (100) [M−$C_8H_6NO_2$], 148 (25), 131 (93), 104 (80), 91 (48), 76 (68), 65 (18), 58 (30), 50 (10); GC-MS-EM for [$C_{18}H_{16}N_2O_3$]: Calcd, 308.1161; Found, 308.1174. Anal. Calcd for $C_{18}H_{16}N_2O_3$: C, 70.12; H, 5.23; N, 9.09. Found: C, 69.16; H, 4.90; N, 8.79.

(*S*)-*N*-Butyl-2-(1,3-dioxoisoindolin-2-yl)propanamide (3k) [PhtN-L-Ala-NH^{n}Bu]. Following GP-III, from PhtN-L-Ala-OH **2k** (658 mg, 3 mmol) and *n*-butyl amine (0.33 mL, 3.3 mmol), title compound **3k** was isolated as a white solid (818 mg, > 99 %); mp 137 °C (CH_2Cl_2/pentane); $[\alpha]_D$ −0.3 (*c* 1.02, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 0.90 (t, 3 H, $^{3}J_{HH}$ = 7.0 Hz), 1.33 (m, 2 H), 1.48 (m, 2 H), 1.70 (d, 3 H, $^{3}J_{HH}$ = 7.5 Hz), 3.25 (m, 2 H), 4.90 (q, 1 H, $^{3}J_{HH}$ = 7.5 Hz), 6.20 (bs, 1 H), 7.74 (2×dd, 2 H, $^{4}J_{HH}$ = 3.1 Hz, $^{3}J_{HH}$ = 5.3 Hz), 7.85 (2×dd, 2 H, $^{4}J_{HH}$ = 3.1 Hz, $^{3}J_{HH}$ = 5.3 Hz); δ_C (75.48 MHz, $CDCl_3$): 13.58 (q), 15.26 (q),

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19.90 (t), 31.40 (t), 39.56 (t), 49.57 (d), 123.40 (2×d131.83 (2×s), 134.15 (2×d), 167.79 (2×s), 168.98 (s); MS-ES, *m/z*: 275 [M+H], 297 [M+Na]; GC-MS-EI, *m/z* (%): 274 (1) [M], 259 (1) [M–CH_4], 245 (7) [M–C_2H_6], 232 (1) [M–C_3H_8], 219 (1) [M–C_4H_{10}], 202 (5) [M–$C_4H_{10}N$], 200 (2), 185 (3) [M–(76+CH_4)], 175 (88) [M–C_5H_9NO], 174 (100) [M–$C_5H_{10}NO$], 160 (34) [174–CH_4], 147 (20) [174–C_2H_6], 130 (35) [M–(76+73)], 104 (15) [174–C_3H_5NO], 76 (17) [C_6H_4], 56 (4) [C_4H_8], 50 (3); ES-EM for [$C_{15}H_{18}N_2O_3$+H]: Calcd, 275.1390; Found, 275.1406; For [$C_{15}H_{18}N_2O_3$+Na]: Calcd, 297.1210; Found, 297.1216. Anal. Calcd for $C_{15}H_{18}N_2O_3$: C, 65.68; H, 6.61; N, 10.21; Found: C, 65.55; H, 6.38; N, 10.12.

(*S*)-*N*-Isobutyl-2-(1,3-dioxoisoindolin-2-yl)propanamide (3l) [PhtN-L-Ala-NH^{i}Bu]. Following GP-III, from PhtN-L-Ala-OH **2l** (658 mg, 3 mmol) and *iso*-butyl amine (242 mg, 3.3 mmol), title compound **3l** was isolated as a white solid (816 mg, > 98 %); mp 150 °C (CH_2Cl_2/pentane); $[\alpha]_D$ −0.6 (*c* 1.03, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 0.89 (m, 3 H), 1.12 (d, 3 H, $^3J_{HH}$ = 6.6 Hz), 1.46 (m, 2 H), 1.70 (d, 3 H, $^3J_{HH}$ = 7.3 Hz), 3.91 (m, 1 H), 4.90 (q, 1 H, $^3J_{HH}$ = 7.3 Hz), 5.87 (bs, 1 H), 7.74 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.5 Hz), 7.86 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.5 Hz). δ_H (75.48 MHz, $CDCl_3$): 10.15 (q), 15.30 (q), 20.17 (q), 29.45 (t), 47.10 (d), 49.67 (d), 123.41 (2×d), 131.84 (2×s), 134.14 (2×d), 167.80 (2×s), 168.32 (s); MS-ES, *m/z*: 275 [M+H], 297 [M+Na]; GC-MS-EI, *m/z* (%): 274 (1) [M], 245 (7) [M–(2 CH_4)], 219 (4) [M–C_4H_8], 202 (9) [M–$C_4H_{10}N$], 200 (7), 185 (13) [M–(76+CH_4)], 175 (75) [M–C_5H_9NO], 174 (100) [M–$C_5H_{10}NO$], 160 (30) [174–CH_4], 147 (27) [174–C_2H_6], 130 (34) [M–(76+73)], 104 (21) [174–C_3H_5NO], 76 (22) [C_6H_4], 56 (7) [C_4H_8], 50 (6); ES-EM for [$C_{15}H_{18}N_2O_3$+H]: Calcd, 275.1390; Found, 275.1402; For [$C_{15}H_{18}N_2O_3$+Na]: Calcd, 297.1210; Found, 297.1214. Anal. Calcd for $C_{15}H_{18}N_2O_3$: C, 65.68; H, 6.61; N, 10.21; Found: C, 65.54; H, 6.38; N, 10.09.

(*S*)-*N*-*tert*-Butyl-2-(1,3-dioxoisoindolin-2-yl)propanamide (3m) [PhtN-L-Ala-NH^{t}Bu]. Following GP-III, from PhtN-L-Ala-OH **2m** (658 mg, 3 mmol) and *tert*-butyl amine (0.35 mL, 3.3 mmol), title compound **3m** was isolated as a white solid (818 mg, > 99 %); mp 156-157 °C (EtOAc/cyclohexane); $[\alpha]_D$ −0.6 (*c* 1.0, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 1.35 (3×s, 9 H), 1.68 (d, 3 H, $^3J_{HH}$ = 7.4 Hz), 4.83 (q, 1 H, $^3J_{HH}$ = 7.4 Hz), 5.81 (bs, 1 H), 7.73 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.5 Hz), 7.86 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.5 Hz); δ_C (75.48 MHz, $CDCl_3$): 15.42 (q), 28.60 (3×q), 50.23 (d), 51.58 (s), 123.44 (2×d), 131.89 (2×s), 134.13 (2×d), 167.84 (2×s), 168.14 (s); MS-ES, *m/z*: 275 [M+H], 297 [M+Na]; GC-MS-EI, *m/z* (%): 219 (1) [M–C_4H_8], 202 (2) [M–$C_4H_{11}N$] or [M–(56+CH_4)], 200 (7) [M–$C_4H_{10}O$], 185 (12) [M–($C_4H_{11}N$+CH_4)], 175 (100) [M–C_5H_9NO], 174 (85) [M–$C_5H_{10}NO$], 160 (35) [175–CH_4], 148 (28) [175–C_2H_6], 130 (38) [M–(76+73)], 104 (24) [174–C_3H_4NO], 76 (13) [C_6H_4], 56 (5) [C_4H_8], 50 (7); ES-EM for [$C_{15}H_{18}N_2O_3$+H]: Calcd, 275.1390; Found, 275.1415; For [$C_{15}H_{18}N_2O_3$+Na]: Calcd, 297.1210; Found, 297.1226. Anal. Calcd for $C_{15}H_{18}N_2O_3$: C, 65.68; H, 6.61; N, 10.21; Found: C, 65.54; H, 6.38; N, 10.09.

(*S*)-2-(1,3-Dioxoisoindolin-2-yl)-*N*-phenylpropanamide (3n) [PhtN-L-Ala-NHPh]. Following GP-III, from PhtN-L-Ala-OH **2n** (658 mg, 3 mmol) and aniline (242 mg, 3.3 mmol), title compound **3n** was isolated as a white solid (877 mg, > 99 %); mp 157 °C (CH_2Cl_2/pentane); $[\alpha]_D$ −0.4 (*c* 1.01, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 1.79 (d, 3 H, $^3J_{HH}$ = 7.4 Hz), 5.06 (q, 1 H, $^3J_{HH}$ = 7.4 Hz), 7.07 (dd, 1 H, $^4J_{HH}$ = 1.0 Hz, $^3J_{HH}$ = 7.8 Hz), 7.26 (2×dd, 2 H, $^3J_{HH}$ = 7.6 Hz, $^3J_{HH}$ = 8.1 Hz), 7.49 (2×dd, 2 H, $^4J_{HH}$ = 1.0 Hz, $^3J_{HH}$ = 8.1 Hz), 7.71 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.5 Hz), 7.83 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.5 Hz), 8.17 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 15.37 (q), 50.75 (d), 120.19 (2×d), 123.56 (2×d), 124.56 (d), 128.88 (2×d), 131.71 (2×s), 134.33 (2×d), 137.45 (s), 167.42 (s), 167.97 (2×s); MS-ES, *m/z*: 295 [M+H], 317 [M+Na]; GC-MS-EI, *m/z* (%): 294 (10) [M], 202 (3) [M–93], 174 (100) [M–119], 160 (5) [174–CH_4], 148 (9) [174–C_2H_6], 130 (18) [M–(93+77)], 119 (2) [M–174], 104 (5) [174–C_3H_5NO], 93 (5) [C_6H_7N], 77 (7) [C_6H_5], 65 (4), 51 (2). ES-EM: For [$C_{17}H_{15}N_2O_3$]: Calcd, 295.1083; Found, 295.1075; For [$C_{17}H_{14}N_2NaO_3$]; Calcd, 317.0902; Found, 317.0886. Analytical and spectral data was not given in the literature.[10]

(*S*)-*N*-Benzyl-2-(1,3-dioxoisoindolin-2-yl)propanamide (3o) [PhtN-L-Ala-NHBn]. Following GP-III and from PhtN-L-Ala-OH **2o** (658 mg, 3 mmol) and benzyl amine (0.36 mL, 3.3 mmol), title compound **3o** was isolated as white solid (918 mg, > 99 %); mp 140-141 °C (EtOAc/cyclohexane); $[\alpha]_D$ +0.4 (*c* 1.04, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 1.70 (d, 3 H, $^3J_{HH}$ = 7.3 Hz), 4.43 (2×dd, 2 H, overlapped, $^2J_{HH}$ = 5.7 Hz), 4.94 (q, 1 H, $^3J_{HH}$ = 7.3 Hz), 6.45 (bs, 1 H), 7.26 (m, 5 H), 7.71 (2×dd, 2 H, $^4J_{HH}$ = 3.2 Hz, $^3J_{HH}$ = 5.5 Hz), 7.82 (2×dd, 2 H, $^4J_{HH}$ = 3.2 Hz, $^3J_{HH}$ = 5.5 Hz); δ_C (75.48 MHz, $CDCl_3$): 15.25 (q), 43.77 (dd), 49.40 (d), 123.44 (2×d), 127.42 (d), 127.59 (2×d), 128.63 (2×d), 131.83 (2×s), 134.17 (2×d), 137.87 (s), 167.76 (2×s), 169.04 (s); MS-ES, *m/z*: 309 [M+H], 331 [M+Na]; EI, *m/z* (%): 308 (51) [M], 201 (1) [M–106], 175 (55), 174 (77) [201–CH_2O], 160

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(16) [174–CH_4], 147 (14) [$C_8H_5NO_2$], 130 (27) [M–(106+77)], 106 (100) [C_7H_9N], 91 (22) [C_7H_8], 77 (7) [C_6H_5], 65 (5). ES-EM: For [$C_{18}H_{17}N_2O_3$]: Calcd, 309.1239; Found, 309.1223; For [$C_{18}H_{16}N_2NaO_3$]; Calcd, 331.1059; Found, 331.1054. Analytical data agree with literature.[11]

(*S*)-4-Fluoro-*N*-methyl-2-(1,3-dioxoisoindolin-2-yl)pent-4-enoic amide (3p) [PhtN-L-Fap-NHMe]. To a solution of *N*-methyl amide **4p** (438 mg, 3 mmol in $CHCl_3$/MeOH (2:1, 30 mL), phthalic anhydride (3.6 mmol, freshly recrystallized from $CHCl_3$) was added at 0 °C. After 10 min, oxalyl chloride (4.5 mmol) was added drop wise at 0 °C. Then the solution was refluxed for 5 h and cooled to rt. The solvent was evaporated under vacuum and the residue was recrystallized from CH_2Cl_2/pentane (2:1) in a freezer to give title compound **3p** as white prisms (738 mg, 89 %). In X-ray structure determination, 0.5 eq. CH_2Cl_2 was observed as solvent of crystallization: mp 169 °C (CH_2Cl_2/pentane); $[\alpha]_D$ –64.6 (*c* 1.02, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 2.78 (d, 3 H, $^3J_{HH}$ = 4.9 Hz), 3.03-3.14 (m, 1 H), 3.14-3.32 (m, 1 H), 4.28 (ddd, 1 H, $^4J_{HH}$ = 0.5 Hz, $^3J_{HF}$ = 49.1 Hz, $^2J_{HH}$ = 3.0 Hz), 4.50 (dd, 1 H, $^3J_{HF}$ = 16.8 Hz, $^2J_{HH}$ = 3.0 Hz), 5.02 (dd, $^3J_{HH}$ = 4.9 Hz, $^3J_{HH}$ = 10.9 Hz), 6.32 (bs, 1 H), 7.76 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.5 Hz), 7.86 (2×dd, 2 H, $^4J_{HH}$ = 3.0 Hz, $^3J_{HH}$ = 5.5 Hz); δ_C (75.48 MHz, $CDCl_3$): 26.51 (q), 31.42 (ddd, $^2J_{CF}$ = 27.2 Hz), 51.17 (d), 93.34 (ddd, $^2J_{CF}$ = 19.4 Hz), 123.58 (2×d), 131.51 (2×s), 134.40 (2×d), 162.28 (d, $^1J_{CF}$ = 258.0 Hz), 167.67 (2×s), 168.15 (s); δ_F (282.41 MHz, $CDCl_3$): –98.13 (dddd, 1 F, $^3J_{HF}$ = 12.1 Hz, $^3J_{HF}$ = 16.8 Hz, $^3J_{HF}$ = 17.0 Hz, $^3J_{HF}$ = 49.1 Hz); MS-ES, *m/z*: 277 [M+H], 299 [M+Na]; GC-MS-EI, *m/z* (%): 276 (17) [M], 256 (15) [M–HF], 245 (7), 218 (65) [M–C_2H_4NO or M–C_3H_4F], 198 (100) [218–HF], 189 (10), 171 (13), 160 (41) [218–C_2H_4NO], 148 (12), 130 (41) [M–$C_8H_4NO_2$], 104 (70) [160–C_2H_2NO], 76 (96), 58 (55), 50 (68), 42 (49); GC-HRMS for [$C_{14}H_{12}FN_2O_3$]: Calcd, 276.0910; Found, 276.0915; For [$C_{14}H_{12}FN_2O_3$–HF]: Calcd, 256.0848; Found, 256.0856. Anal. Calcd for $C_{14}H_{13}FN_2O_3$: C, 60.87; H, 4.74; N, 10.14. Found: C, 59.99; H, 4.58; N, 9.81.

General Procedure IV (GP-IV). Preparation of *N*-Methyl Amides

(A) To a solution of Boc-Xaa-NHMe (10 mmol) in anhyd MeOH, HCl-MeOH reagent (20 mL) was added and stirred for 1 h at rt. Then excess reagent and solvent were removed under vacuum. The resulting white solid or oil was stirred in anhyd Et_2O (50 mL) for 2 h and the solid was collected by filtration. The HCl-salts were dried under vacuum over P_2O_5 in desiccator.

(B) To a solution of Boc-Xaa-NHMe (10 mmol) in anhyd CH_2Cl_2 (15 mL), TFA (15 mL) was added and stirred for 1 h at rt. Then excess reagent and solvent were removed under vacuum. The resulting white solid or oil was neutralized by 2N KOH or sat. $NaHCO_3$, extracted with CH_2Cl_2 (5×50 mL), dried over $MgSO_4$ and evaporated. The crude *N*-methyl amides were purified by column chromatography (CH_2Cl_2/MeOH, 9:1).

(*S*)-2-Amino-*N*-methylpropanoic amide hydrochloride (4a) [HCl×H-L-Ala-NHMe]. Following GP-IV-A, from Boc-L-Ala-NHMe **3a** (7.15 g, 35.4 mmol), title compound **4a** was isolated as a white powder (4.81 g, 98 %): mp 218-220 °C (MeOH/Et_2O); $[\alpha]_D$ +11.2 (*c* 1.04, MeOH); δ_H (300.14 MHz, CD_3OD): 1.51 (d, 3 H, $^3J_{HH}$ = 7.0 Hz), 2.79 (s, 3 H), 3.97 (q, 1 H, $^3J_{HH}$ = 7.0 Hz), 4.78 (bs, 4 H); δ_C (75.48 MHz, CD_3OD): 17.60 (d), 26.39 (q), 50.30 (d), 171.45 (s); MS-ES, *m/z*: 103 [M+H], 125 [M+Na]. Analytical and spectral data agree with literature.[2,12]

(*S*)-*N*-Methylpyrrolidine-2-carboxamide hydrochloride (4b) [HCl×H-L-Pro-NHMe]. Following GP-IV-A, from Boc-L-Pro-NHMe **3b** (11.73 g, 51.4 mmol), title compound **4b** was isolated as a white powder (8.0 g, > 98 %): mp 160-162 °C (MeOH/Et_2O); $[\alpha]_D$ –46.5 (*c* 1.02, MeOH); δ_H (300.14 MHz, CD_3OD): 1.95-2.12 (m, overlapped, 3 H), 2.38-2.49 (m, 1 H), 2.80/2.92 (2×s, 3 H), 2.33-2.48 (m, 2 H), 4.28 (dd, 1 H, $^3J_{HH}$ = 7.0 Hz, $^3J_{HH}$ = 8.4 Hz), 4.75 (bs, 4 H); δ_C (75.48 MHz, CD_3OD):

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25.07 (dd), 26.55 (dd), 30.93 (q), 47.35 (dd), 61.18 (d), 170.04 (s); MS-ES, *m/z*: 129.2 [M+H], 151.2 [M+Na]. Analytical and spectral data agree with literature.[2,13]

2-Amino-4-fluoro-*N*-methylpent-4-enoic amide (4f) [H-Fap-NHMe]. Following GP-IV-B, from Boc-Fap-NHMe **3f** (340 mg, 1.38 mmol), title compound **4f** was isolated as an oil (200 mg, 98 %); δ_H (300.14 MHz, $CDCl_3$): 1.63 (bs, 2 H), 2.31 (ddd, 1 H, $^3J_{HH}$ = 5.4 Hz, $^3J_{HF}$ = 9.9 Hz, $^2J_{HH}$ = 15.3 Hz), 2.82 (d, 3 H, $^3J_{HH}$ = 5.0 Hz), 2.88 (dddd, 1 H, $^4J_{HH}$ = 0.9 Hz, $^3J_{HH}$ = 3.9 Hz, $^3J_{HF}$ = 10.4 Hz, $^2J_{HH}$ = 15.3 Hz), 3.57 (dd, 1 H, $^3J_{HH}$ = 3.9 Hz, $^3J_{HH}$ = 5.6 Hz), 4.37 (ddd, 1 H, $^4J_{HH}$ = 0.7 Hz, $^2J_{HH}$ = 2.8 Hz, $^3J_{HF}$ = 49.6 Hz), 4.67 (dd, 1 H, $^2J_{HH}$ = 2.8 Hz, $^3J_{HF}$ = 17.1 Hz), 7.46 (bs, 1 H); δ_C (75.48 MHz, $CDCl_3$): 25.68 (q), 37.55 (ddd, $^2J_{CF}$ = 27.6 Hz), 52.22 (d), 92.91 (ddd, $^2J_{CF}$ = 20.2 Hz), 163.33 (d, $^1J_{CF}$ = 257.8 Hz), 174.00 (s); δ_F (282.37 MHz, $CDCl_3$): –96.43 (ddt, 1 F, $^3J_{HF}$ = 6.4 Hz, $^3J_{HF}$ = 22.5 Hz, $^3J_{HF}$ = 50.5 Hz); MS-ES, *m/z*: 147.2 [M+H], 169.2 [M+Na]. Analytical and spectral data agree with literature.[14]

2-Amino-*N*-methylpent-4-enoic amide (4g) [H-Alg-NHMe]. Following GP-IV-B, from Boc-Alg-NHMe **3g** (2.24 g, 9.8 mmol), title compound **4g** was isolated as an oil (1.03 g, 82 %); δ_H (300.14 MHz, $CDCl_3$): 1.43 (bs, 2 H), 2.13-2.26 (m, 1 H), 2.48-2.60 (m, 1 H), 2.74 (d, 3 H, $^3J_{HH}$ = 5.0 Hz), 3.34 (dd, 1 H, $^3J_{HH}$ = 3.9 Hz, $^3J_{HH}$ = 4.6 Hz), 5.02-5.12 (m, 2 H), 5.60-5.76 (m, 1 H), 7.32 (bs, 1 H). δ_C (75.48 MHz, $CDCl_3$): 25.58 (q), 39.59 (dd), 53.92 (d), 118.40 (dd), 134.42 (d), 174.85 (s); MS-ES, *m/z*: 129.1 [M+H], 151.1 [M+Na]; GC-MS-EI, *m/z* (%): 126 (1) [M–H_2], 111 (1) [M–NH_3], 95 (1) [M–(H_2+CH_5N], 87 (17) [C_3H_5], 70 (100) [M–58], 68 (12) [M–(H_2+58)], 58 (14) [M–C_2H_4NO], 53 (9), 43 (28), 42 (25) (C_3H_6), 41 (44); ES-EM for [$C_6H_{12}FN_2O$+H]: Calcd, 129.1022; Found, 129.1015.

General Procedure V (GP-V). Deamidation of PhtN-Xaa-NHR

To a solution of the desired *N*-phthaloyl *N'*-alkyl amides **3** (5 mmol) in a 2:1 mixture of Ac_2O and AcOH (25 mL), granular $NaNO_2$ (100 mmol) was added in portions over 2 h at 0→4 °C. Evolution of a brown gas occurs, the solution may change color, and sometimes a solid comes out of solution. After 14-16 h, the mixture was warmed up to rt within 20 min, given into ice-water (25 mL), and extracted with Et_2O or CH_2Cl_2 (3×50 mL). The combined organic layer was washed (carefully!) with 5 % Na_2CO_3 (3×50 mL), H_2O, and dried (Na_2SO_4). Evaporation of solvents gave a yellowish liquid. GC shows complete conversion of phthalimido-amides. To that residue anhyd 1,4-dioxane (25 mL) was added and the solution was refluxed. The yellowish color of the solution disappeared in first 1 h but reflux was continued for 5 h. Then cooled to rt and the solvent was removed under vacuum to give colorless oil. GC of the crude product as such shows high purity.

(*S*)-*tert*-Butyl methyl pyrrolidine-1,2-dicarboxylate (5b) [Boc-L-Pro-OMe]. Following GP-V, from Boc-L-Pro-NHMe **3b** (457 mg, 2 mmol), title compound **5b** was isolated as a colorless oil (395 mg, 86 %): $[\alpha]_D$ –44.8 (*c* 1.05, CH_2Cl_2); Two sets of spectral data for rotamers were observed in 62:38 ratio and differentiated as major/minor rotamers by NMR (^{1}H and ^{13}C) signal to signal integration; δ_H (300.14 MHz, $CDCl_3$, major/minor): 1.41/1.46 (2×3×s, 9 H), 1.80-2.03/2.12-2.30 (2×m, 4 H), 3.34-3.60 (m, 2 H), 3.72 (2×s, 3 H), 4.22/4.32 (2×dd, 2 H, $^3J_{HH}$ = 4.0 Hz, $^3J_{HH}$ = 8.4 Hz); δ_C (75.48 MHz, $CDCl_3$, major/minor): 23.60/24.26 (2×dd), 28.27 (3×q), 30.80/29.84 (2×dd), 46.25/46.48 (2×q), 51.86/51.74 (2×dd), 59.05/51.68 (2×d), 79.73/88.45 (2×s), 153.73/154.39 (2×s), 173.67/173.42 (2×s); MS-ES, *m/z*: 230 [M+H], 252 [M+Na]; GC-MS-EI, *m/z* (%): 229 (1) [M], 170 (40) [M–$C_2H_3O_2$], 156 (7) [M–C_4H_9O], 142 (3), 128 (32), [M–$C_5H_9O_2$], 114 (88) [170–C_4H_9], 70 (100) [170–$C_5H_9O_2$ or 128–$C_2H_3O_2$], 57 (58), 41 (20). Analytical and spectral data agree with literature.[15]

(*S*)-Methyl 2-(1,3-dioxoisoindolin-2-yl)propanoate (5h) [PhtN-L-Ala-OMe]. Following GP-V, from PhtN-L-Ala-NHMe **3h** (464 mg, 2 mmol), title compound **5h** was isolated as a white solid (448 mg, 96 %): mp 71 °C (CH_2Cl_2/pentane); $[\alpha]_D$ –0.3

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(*c* 1.03, CH_2Cl_2); δ_H (400.14 MHz, $CDCl_3$): 1.71 (d, 3 H, $^3J_{H,H}$ = 7.3 Hz), 3.75 (s, 3 H), 4.99 (q, 1 H, $^3J_{H,H}$ = 7.3 Hz), 7.74 (2×dd, 2 H, $^4J_{H,H}$ = 3.0 Hz, $^3J_{H,H}$ = 5.3 Hz), 7.87 (2×dd, 2 H, $^4J_{H,H}$ = 3.0 Hz, $^3J_{H,H}$ = 5.3 Hz); δ_C (100.63 MHz, $CDCl_3$): 15.20 (q), 47.37 (d), 52.65 (q), 123.42 (2×d), 131.91 (2×s), 134.08 (2×d), 167.29 (2×s), 170.10 (s); MS-ES, *m/z*: 234 [M+H], 256 [M+Na]; GC-MS-EI, *m/z* (%): 333 (4) [M], 175 (12), 174 (100) [M–59], 148 (20) [174–C_2H_6], 130 (25) [M–(59+CH_4O)] or [M–104], 104 (9) [M–130], 91 (2), 76 (12) [C_6H_4], 66 (2), 59 (1), 50 (5). Analytical and spectral data agree with literature.[16]

(*S*)-Methyl 3-methyl-2-(1,3-dioxoisoindolin-2-yl)butanoate (5i) [PhtN-L-Val-OMe]. Following GP-V, from PhtN-L-Val-NHMe **3i** (260 mg, 1 mmol) and $NaNO_2$ (1.38 g, 20 mmol), title compound **5i** was isolated as a colorless oil (256 mg, > 98 %): $[\alpha]_D$ –47.5 (*c* 1.01, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 0.92 (d, 3 H, $^3J_{H,H}$ = 6.8 Hz, 6/7-H_3), 1.15 (d, 3 H, $^3J_{H,H}$ = 6.7 Hz, 7/6-H_3), 2.77 (dqq, 1 H, $^3J_{H,H}$ = 8.3 Hz, $^3J_{H,H}$ = 6.7 Hz, $^3J_{H,H}$ = 6.8 Hz, 5-H), 3.71 (s, 3 H, 1-H_3), 4.58 (d, 1 H, $^3J_{H,H}$ = 8.3 Hz, 4-H), 7.75 (2×dd, 2 H, $^4J_{H,H}$ = 3.1 Hz, $^3J_{H,H}$ = 5.6 Hz, 12-H_2), 7.88 (2×dd, 2 H, $^4J_{H,H}$ = 3.1 Hz, $^3J_{H,H}$ = 5.6 Hz, 11-H_2); δ_C (75.48 MHz, $CDCl_3$): 19.29 (q, C-6/7), 20.80 (q, C-7/6), 28.48 (d, C-5), 52.28 (q, C-1), 57.53 (d, C-4), 123.49 (2 d, C-11), 131.67 (2 s, C-10), 134.14 (2 d, C-12), 167.70 (2 s, C-9), 169.25 (s, C-3); GC-MS-CI, *m/z*: 262 [M+H], 279 [M+NH_3]; EI, *m/z* (%): 261 (4) [M], 219 (12) [M–C_3H_6], 293 (52) [M–$C_2H_2O_2$], 202 (100) [M–59], 187 (30) [203–CH_4], 160 (62) [203–C_3H_6], 148 (72) [202–C_4H_{10}], 132 (35) [M–129], 130 (85) [M–131], 114 (32) [M–146], 104 (50) [C_7H_5O], 76 (42), 59 (5), 55 (18), 50 (11). Analytical and spectral data agree with literature.[17]

(*S*)-Methyl 2-(1,3-dioxoisoindolin-2-yl)-3-phenylpropanoate (5j) [PhtN-L-Phe-OMe]. Following GP-V, from PhtN-L-Phe-NHMe **3j** (308 mg, 1 mmol) and $NaNO_2$ (1.38 g, 20 mmol), title compound **5j** was isolated as a colorless oil (303 mg, > 98 %): $[\alpha]_D$ –139.2 (*c* 1.1, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 3.48-3.62 (2×dd, 2 H, overlapped, 5-H_2), 3.77 (s, 3 H, 1-H_3), 5.16 (dd, 1 H, $^3J_{H,H}$ = 5.6 Hz, $^3J_{H,H}$ = 10.8 Hz, 4-H), 7.16 (m, 5 H, 7-H_2, 8-H_2 and 9-H), 7.67 (2×dd, 2 H, $^4J_{H,H}$ = 3.1 Hz, $^3J_{H,H}$ = 5.5 Hz,14-H_2), 7.77 (2×dd, 2 H, $^4J_{H,H}$ = 3.1 Hz, $^3J_{H,H}$ = 5.5 Hz, 13-H_2); δ_H (75.48 MHz, $CDCl_3$): 34.60 (dd, C-5), 52.77 (q, C-1), 53.21 (d, C-4), 123.40 (2×d, C-13), 126.78 (d, C-9), 128.48 (2×d, C-7), 128.77 (2×d, C-8), 131.56 (2×, C-12), 134.02 (2×d, C-14), 136.68 (s, C-6), 167.38 (2×s, C-11), 169.31 (s, C-3); GC-MS-CI, *m/z*: 310 [M+H], 327 [M+NH_3]; GC-MS-EI, *m/z* (%): 309 (5) [M], 277 (2) [M–CH_4O], 250 (35) [M–$C_2H_3O_2$], 249 (34) [M–(CO_2+CH_4)], 232 (68) [M–77], 218 (18) [M–91], 204 (10) [M–(91+CH_4)], 190 (65) [218–CH_4O], 162 (100) [M–147], 161 (72) [250–91], 147 (3) [M–162], 131 (70) [162–CH_3O], 130 (64) [162–CH_4O], 117 (17), 103 (38), 91 (39), 76 (45), 65 (13), 59 (5), 50 (11). Analytical and spectral data agree with literature.[18]

(*S*)-Butyl 2-(1,3-dioxoisoindolin-2-yl)propanoate (5k) [PhtN-L-Ala-O^{n}Bu]. Following GP-V, from PhtN-L-Ala-NH^{n}Bu **3k** (274 mg, 1 mmol), title compound **5k** was isolated as an oil (270 mg, > 98 %): $[\alpha]_D$ –0.4 (*c* 1.01, CH_2Cl_2); δ_H (400.14 MHz, $CDCl_3$): 0.88 (t, 3 H, $^3J_{HH}$ = 7.5 Hz, 1-H_3), 1.31 (m, 2 H, 2-H_2), 1.58 (m, 2 H, 3-H_2), 1.71 (d, 3 H, $^3J_{HH}$ = 7.5 Hz, 8-H_3), 4.16 (t, 2 H, $^3J_{HH}$ = 6.7 Hz, 4-H_2), 4.97 (q, 1 H, $^3J_{HH}$ = 7.4 Hz, 7-H), 7.75 (2 dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.3 Hz, 13-H_2), 7.87 (2 dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.3 Hz, 12-H_2). δ_C (100.63 MHz, $CDCl_3$): 13.48 (q, C-1), 15.16 (q, C-8), 18.90 (t, C-2), 30.38 (t, C-3), 47.57 (d, C-7), 65.57 (t, C-4), 123.36 (2×d, C-12), 131.93 (2×s, C-11), 134.05 (2×d, C-13), 167.36 (2×s, C-10), 169.65 (s, C-6); ES-MS, *m/z*: 276 [M+H], 298 [M+Na]; GC-MS-EI, *m/z* (%): 275 (1) [M], 220 (4) [M–C_4H_8], 202 (8) [M–C_4H_8O], 175 (22), 174 (100) [M–(57+CO_2)] or [M–102], 160 (2) [174–CH_4)], 147 (19) [174–C_2H_6], 130 (27) [M–(C_4H_8O+76)], 104 (10) [C_7H_4O], 76 (13) [C_6H_4], 57 (11) [C_4H_8], 50 (4), 41 (7); ES-EM for [$C_{15}H_{17}NO_4$+H]: Calcd: 276.1230; Found, 276.1252; For [$C_{15}H_{17}NO_4$+Na]: Calcd, 298.1050; Found, 298.1077.

(*S*)-*iso*-Butyl 2-(1,3-dioxoisoindolin-2-yl)propanoate (5l) [PhtN-L-Ala-O^{i}Bu]. Following GP-V, from PhtN-L-Ala-O^{i}Bu **3l** (274 mg, 1 mmol), title compound **5l** was isolated as an oil (268 mg, 97 %): $[\alpha]_D$ –0.5 (*c* 1.02, CH_2Cl_2); Two NMR signals were observed for diastereotropic protons or groups; δ_H (400.14 MHz, $CDCl_3$): 0.80-0.90 (m, 3 H, 1/3-H_3), 1.17-123 (m, 3 H, 3/1-H_3), 1.45-1.62 (m, 2 H, 4-H_2), 1.70/1.71 (2×d, 3 H, $^3J_{HH}$ = 7.5 Hz, 8-H_3), 4.85-5.02 (q+m, overlapped, 2 H, 2-H and 7-H), 7.74 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.4 Hz, 13-H_2), 7.87 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.4 Hz, 12-H_2); δ_C (100.63 MHz, $CDCl_3$): 9.35/9.39 (2×q, C-1/3), 15.15/15.16 (2×q, C-8), 19.14/19.17 (2×q, C-3/1), 28.52/28.64 (2×d, C-2), 47.75/47.76 (2×d, C-7), 74.00/74.10 (2×t, C-4), 123.34 (2×2×d, C-12), 131.95 (2×2×s, C-11), 134.03/134.04 (2×2×d, C-13), 167.39 (2×2×s, C-

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10), 169.22/169.25 (2×s, C-6); MS-ES, *m/z*: 276 [M+H], 298 [M+Na]; GC-MS, *m/z* (%): 275 (1) [M], 220 (8) [M–C_4H_8], 202 (3) [M–C_4H_8O], 175 (50), 174 (100) [M–(57+CO_2)] or [M–102], 160 (2) [174–CH_4)], 147 (38) [174–C_2H_6], 130 (51) [M–(C_4H_8O+76)], 104 (20) [C_7H_4O], 76 (22) [C_6H_4], 57 (3) [C_4H_8], 50 (7), 41 (10); ES-EM for [$C_{15}H_{18}NO_4$+H]: Calcd, 276.1230; Found, 276.1228; for [$C_{15}H_{18}NO_4$+Na]: Calcd, 298.1050; Found, 298.1047.

(*S*)-Benzyl 2-(1,3-dioxoisoindolin-2-yl)propanoate (5o) [PhtN-L-Ala-OBn]. Following GP-VI and from PhtN-L-Ala-NHBn **3o** (308 mg, 1 mmol), title compound **5o** was isolated as an oil (303 mg, 98 %): $[\alpha]_D$ –0.2 (*c* 1.01, CH_2Cl_2); δ_H (400.14 MHz, $CDCl_3$): 1.73 (d, 3 H, $^3J_{HH}$ = 7.4 Hz), 5.02 (q, 1 H, $^3J_{HH}$= 7.4 Hz), 5.19 (2×dd, 2 H, overlapped, $^4J_{HH}$ = 6.2 Hz, $^3J_{HH}$ = 12.4 Hz), 7.30 (m, 5 H), 7.72 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.4 Hz), 7.85 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.4 Hz); δ_C (100.63 MHz, $CDCl_3$): 15.22 (q), 47.63 (d), 67.40 (dd), 123.40 (2×d), 127.97 (2×d), 128.22 (d), 128.45 (2×d), 131.90 (2×s), 134.07 (2×d), 135.29 (s), 167.33 (2×s), 169.52 (s); MS-ES, *m/z*: 310 [M+H], 332 [M+Na]; GC-MS-EI, *m/z* (%): 203 (43) [M–C_7H_6O] or [M–(91+CH_4)], 175 (20), 174 (100) [M–(91+CO_2)], 160 (3) [174–CH_4)], 147 (15) [174–C_2H_6], 130 (24) [M–(104+77)], 104 (7) [M–(130+77)], 91 (25) [C_7H_7], 76 (8) [C_6H_4], 65 (7), 50 (3). Analytical and spectral data agree with literature.[19]

(*S*)-Methyl 4-fluoro-2-(1,3-dioxoisoindolin-2-yl)pent-4-enoate (5p) [PhtN-L-Fap-OMe]. Following GP-V, from PhtN-L-Fap-NHMe **3p** (276 mg, 1 mmol), title compound **5p** was isolated as a colorless oil (252 mg, 91 %): $[\alpha]_D$ –67.9 (*c* 1.1, CH_2Cl_2); δ_H (300.14 MHz, $CDCl_3$): 3.04-3.24 (m, 2 H), 3.68 (s, 3 H), 4.22 (dd, 1 H, $^3J_{HF}$ = 49.2 Hz, $^2J_{HH}$ = 3.0 Hz), 4.45 (dd, 1 H, $^3J_{HF}$ = 16.8 Hz, $^2J_{HH}$ = 3.1 Hz), 5.09 (dd, 1 H, $^3J_{HH}$ = 5.7 Hz, $^3J_{HH}$ = 10.3 Hz), 7.67 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.5 Hz), 7.79 (2×dd, 2 H, $^4J_{HH}$ = 3.1 Hz, $^3J_{HH}$ = 5.4 Hz); δ_C (75.48 MHz, $CDCl_3$): 31.70 (ddd, $^2J_{CF}$ = 27.7 Hz), 49.01 (q), 52.87 (d), 93.22 (ddd, $^2J_{CF}$ = 20.2 Hz), 123.58 (2×d), 131.66 (2×s), 134.31 (2×d), 161.87 (d, $^1J_{CF}$ = 258.6 Hz), 167.22 (2×s), 168.64 (s); δ_F (282.37 MHz, $CDCl_3$): –98.26 (dddd, 1 F, $^3J_{HF}$ = 12.9 Hz, $^3J_{HF}$ = 15.9 Hz, $^3J_{HF}$ = 16.6 Hz, $^3J_{HF}$ = 49.2 Hz); MS-ES, *m/z*: 278 [M+H], 300 [M+Na]; GC-MS-EI, *m/z* (%): 257 (1) [M–HF], 245 (3) [M–CH_4O], 218 (45) [M–$C_2H_4O_2$ or M–C_3H_5F], 198 (100) [218–HF], 190 (40) [218–CH_4O], 172 (7) [M–104], 163 (9), 143 (5), 130 (100) [M–$C_8H_5NO_2$], 115 (15), 104 (40) [M–C_7H_6O], 76 (47), 59 (20), 50 (51); ES-EM for [$C_{14}H_{12}FNO_4$+H]: Calcd, 278.0823; Found, 278.0801.

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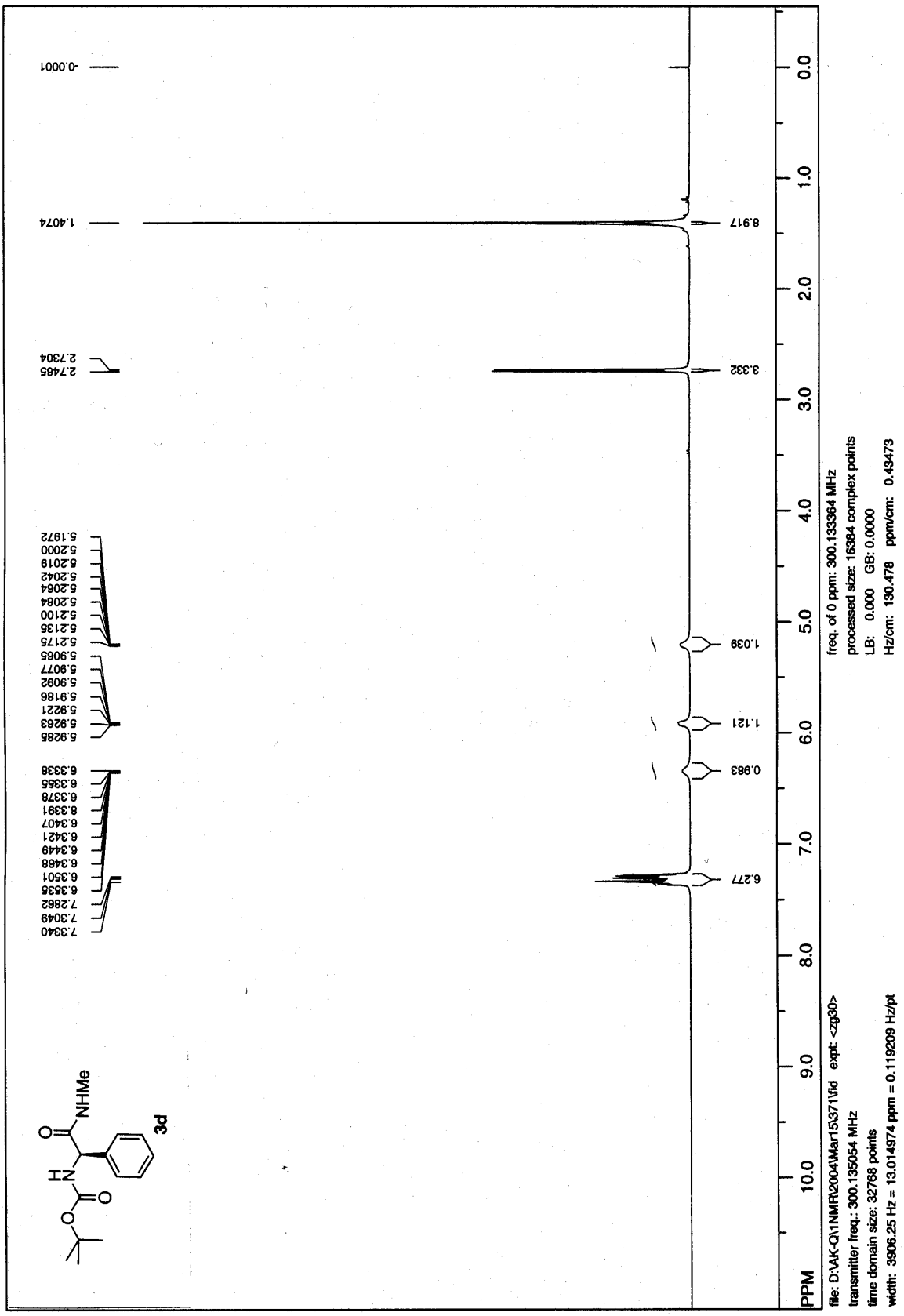
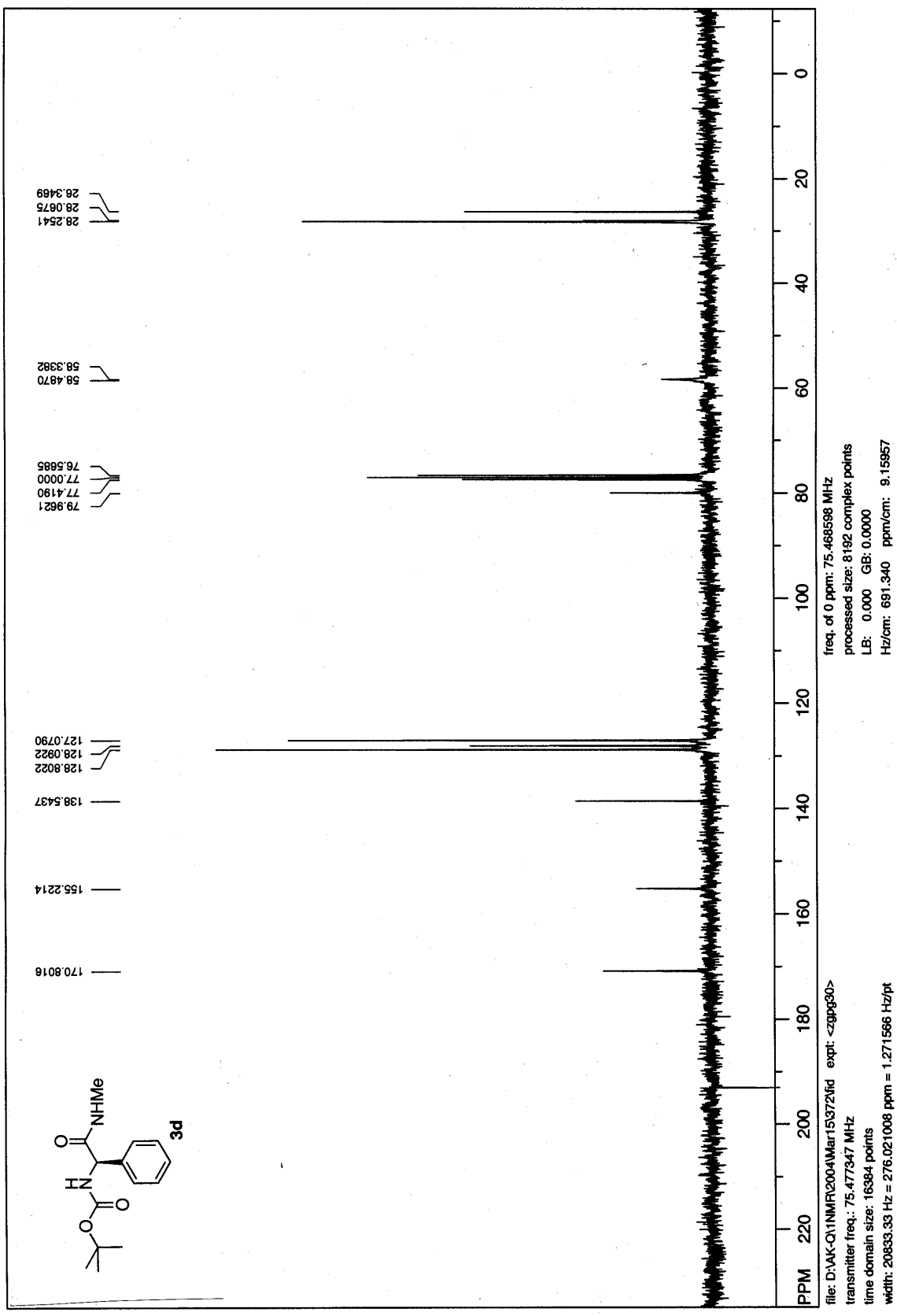
B. Spectra of compounds

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79.9621
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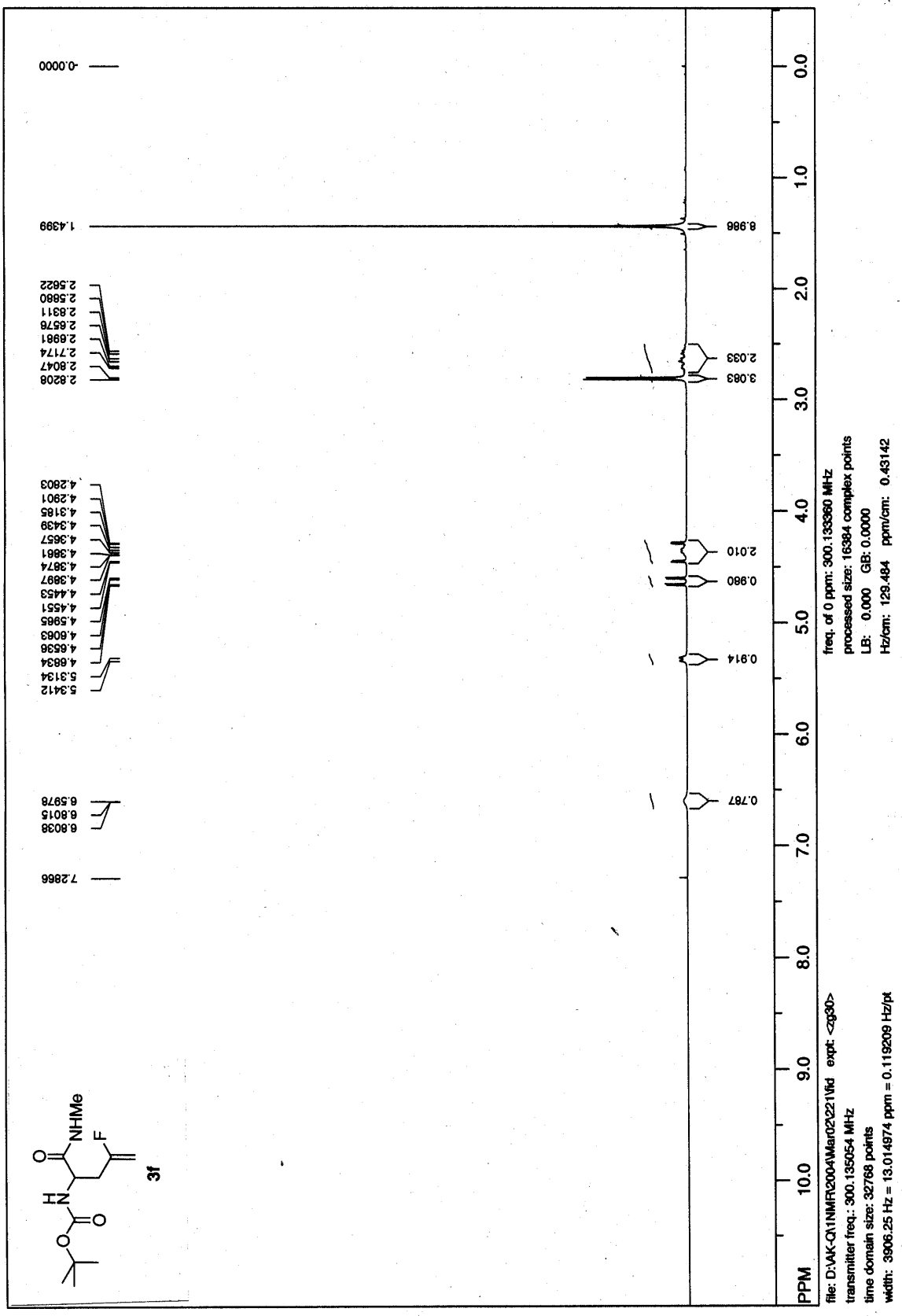
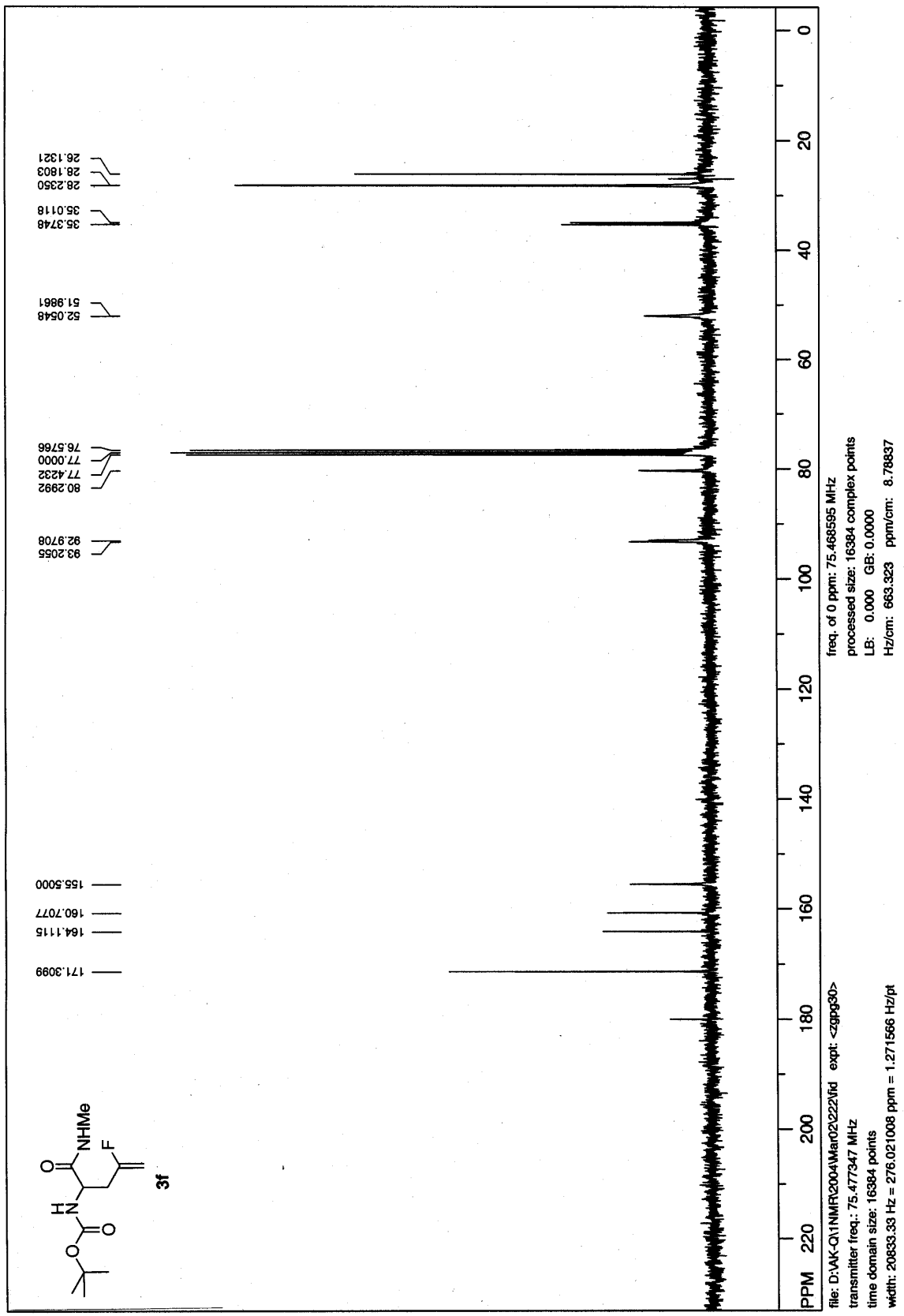
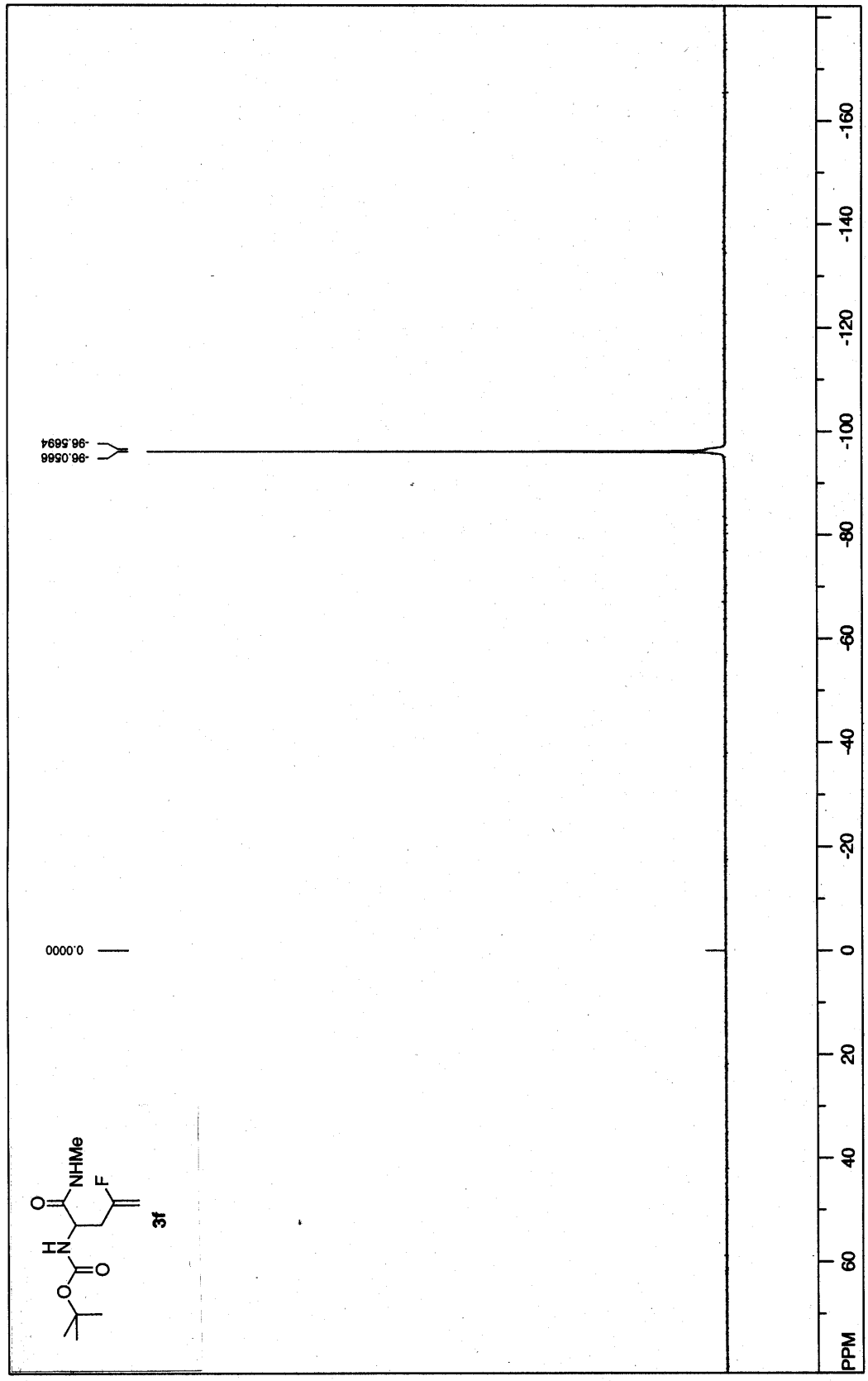
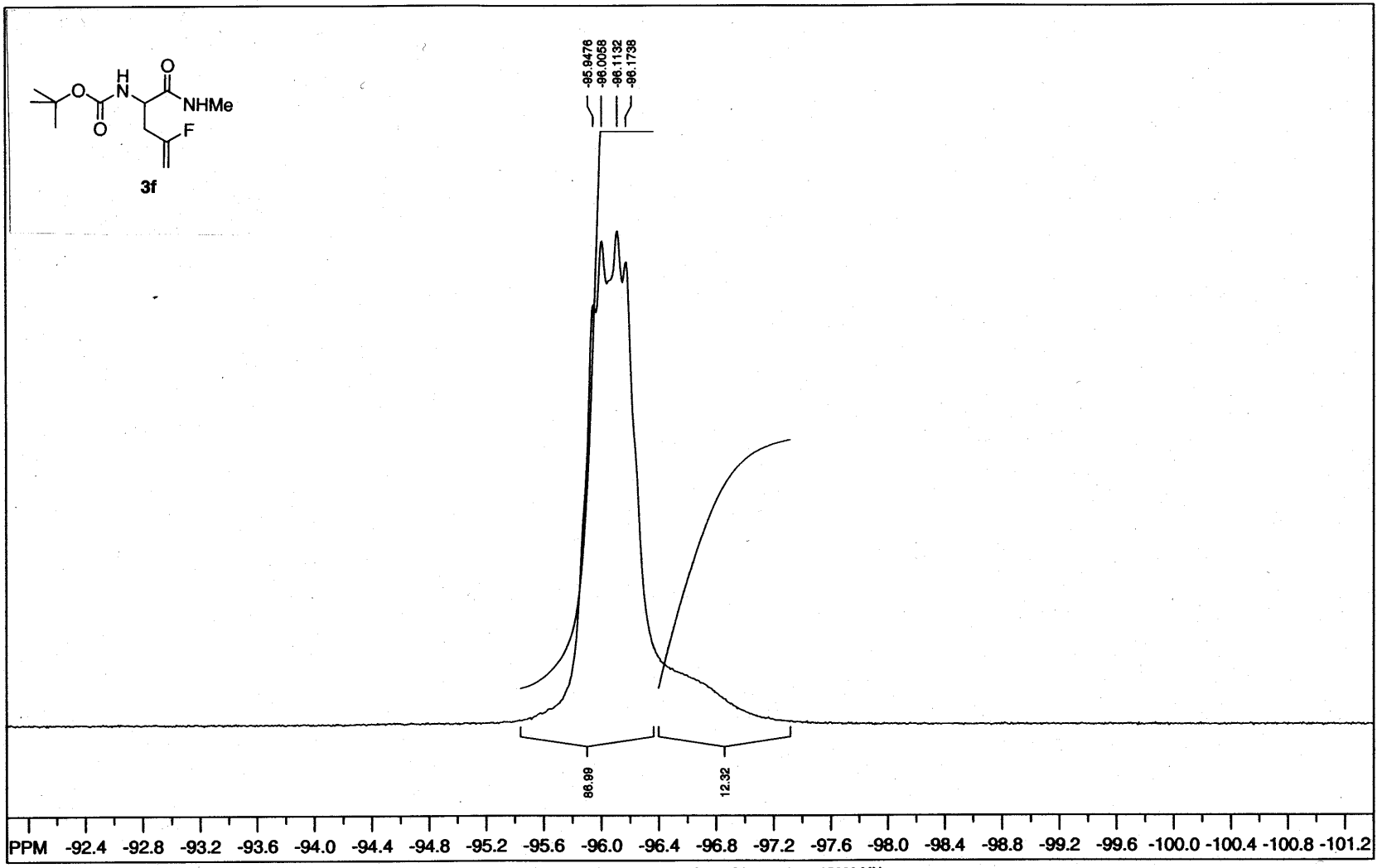
0
file: D:\AK-Q1\NMR\2004\Mar15\372\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 256
freq. of 0 ppm: 75.468598 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 691.340 ppm/cm: 9.15957


-0.0000
1.4399
2.5622
2.5880
2.8311
2.8578
2.8981
2.7174
2.8047
2.8208
4.2803
4.2901
4.3185
4.3439
4.3657
4.3861
4.3874
4.3897
4.4453
4.4551
4.5985
4.6063
4.6536
4.6834
5.3134
5.3412
6.5978
6.8015
6.8038
7.2866
8.986
2.033
3.083
2.010
0.980
0.914
0.787
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
NHMe
F
3f
file: D:\AK-Q\1NMR\2004\Mar02\2221\fid expt: <qg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133360 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 129.484 ppm/cm: 0.43142

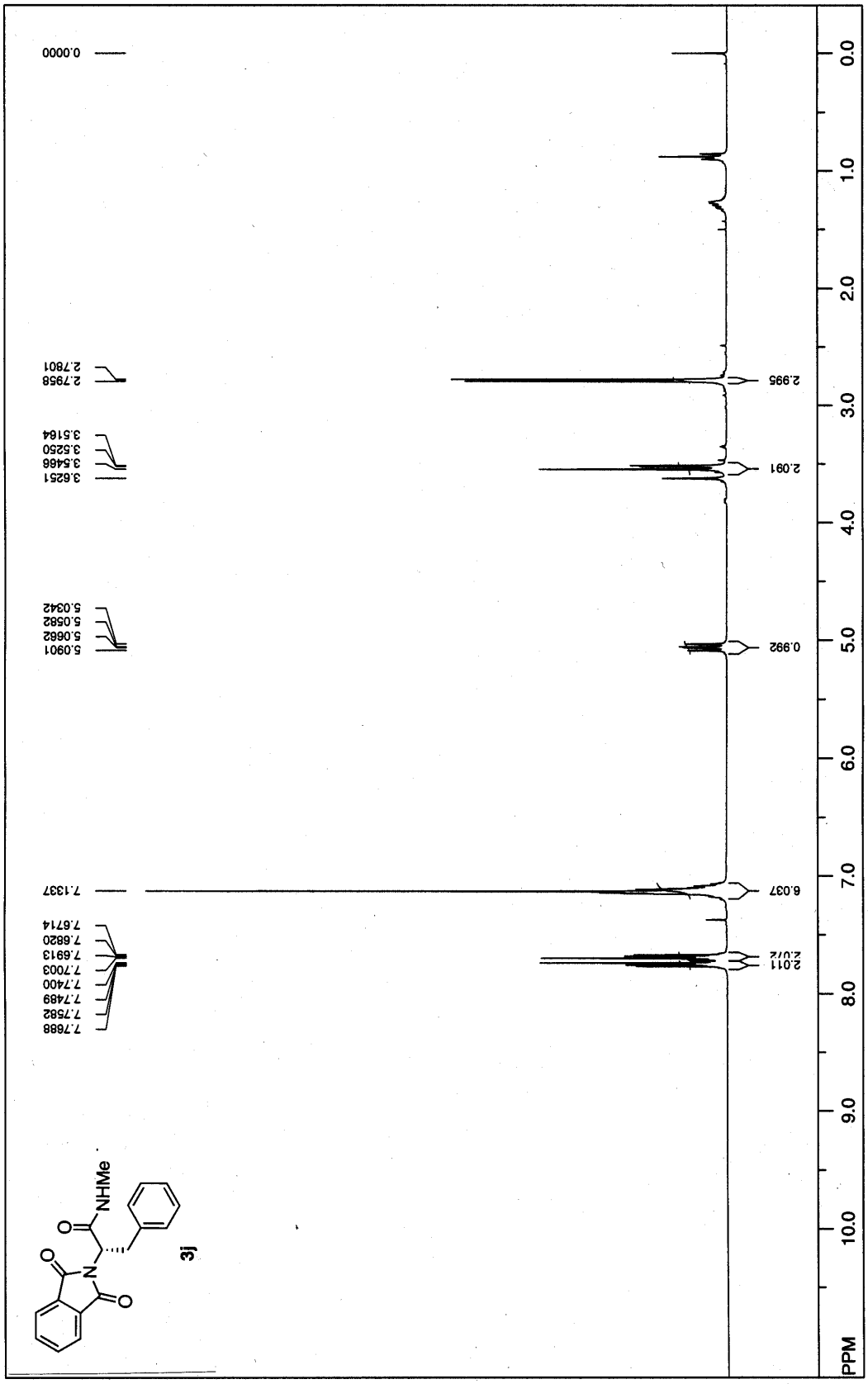

3f
NHMe
F
O
O
O
O
H
N
171.3099
164.1115
160.7077
155.5000
93.2055
92.9708
80.2992
77.4232
77.0000
76.5766
52.0548
51.9861
35.3748
35.0118
28.2350
28.1803
26.1321
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q\1NMR\2004\Mar02\222\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 1024
freq. of 0 ppm: 75.468595 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 663.323 ppm/cm: 8.78837

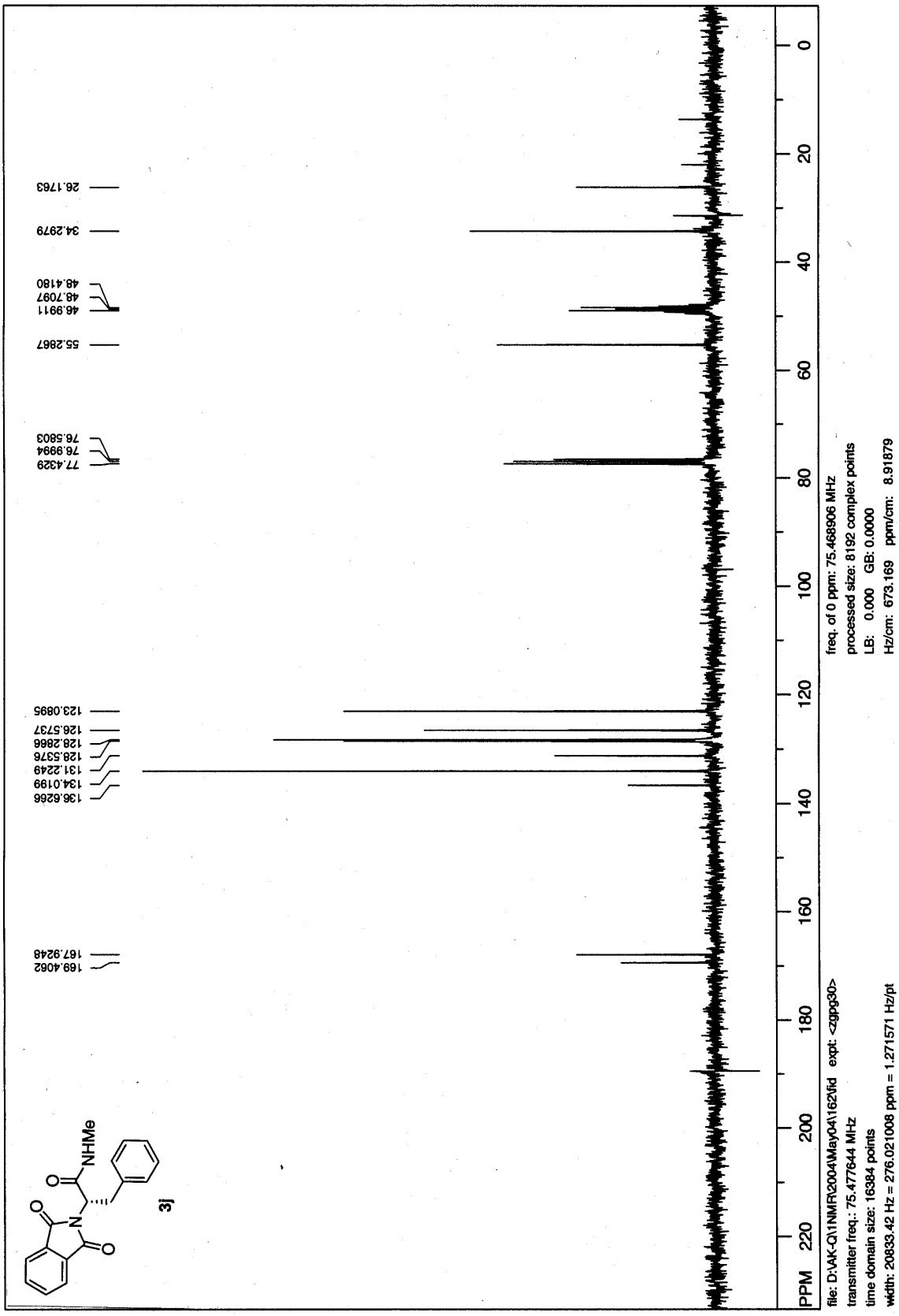

-96.0586
-96.5694
0.0000
NHMe
F
3f
PPM
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
file: D:\AK-Cr\1NMR\2004\Mar02\226\fid expt: <zgflhig_kb>
transmitter freq.: 282.370863 MHz
time domain size: 65536 points
width: 125000.00 Hz = 442.680235 ppm = 1.907349 Hz/pt
number of scans: 256
freq. of 0 ppm: 282.407666 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 2757.787 ppm/cm: 9.76654

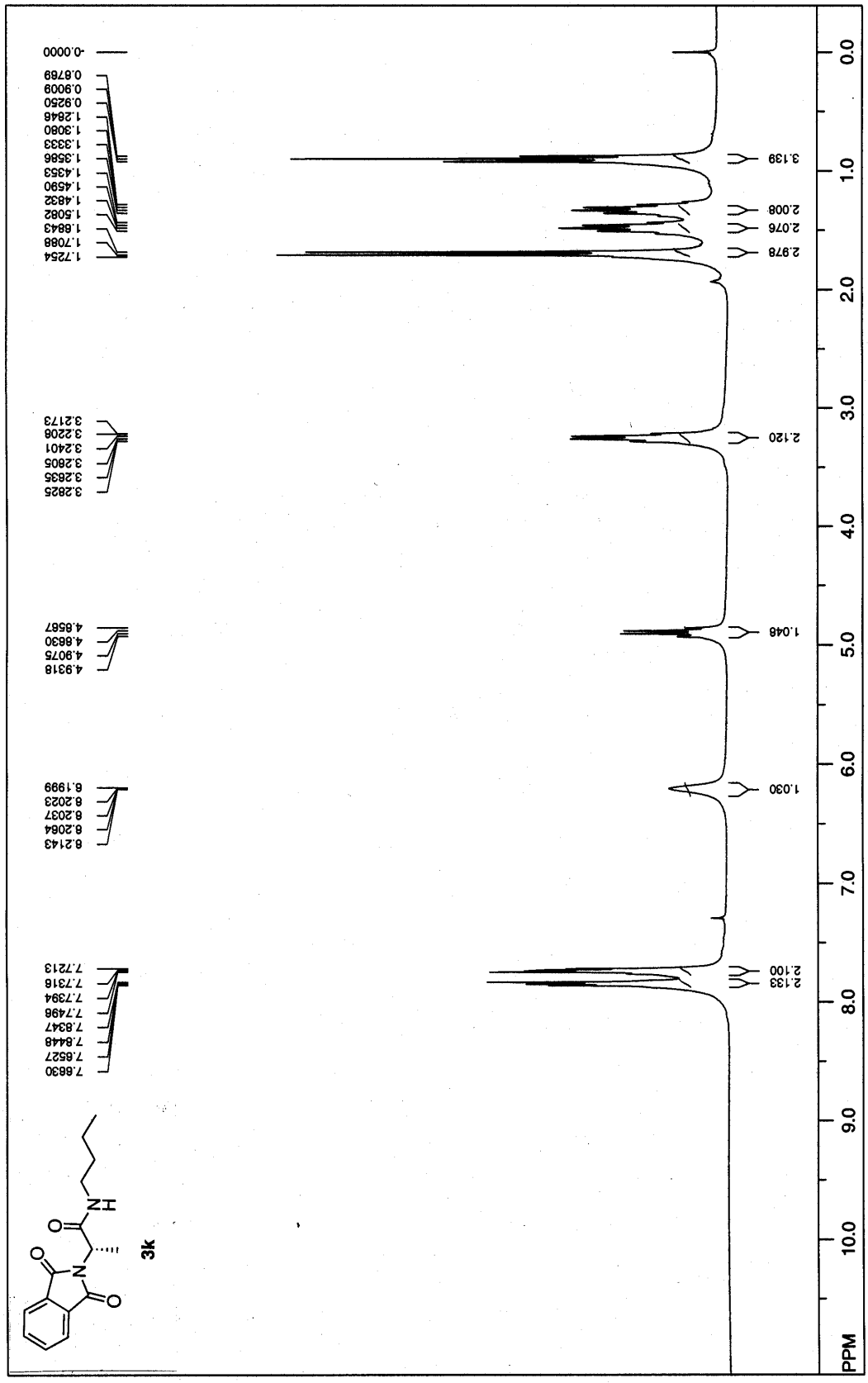


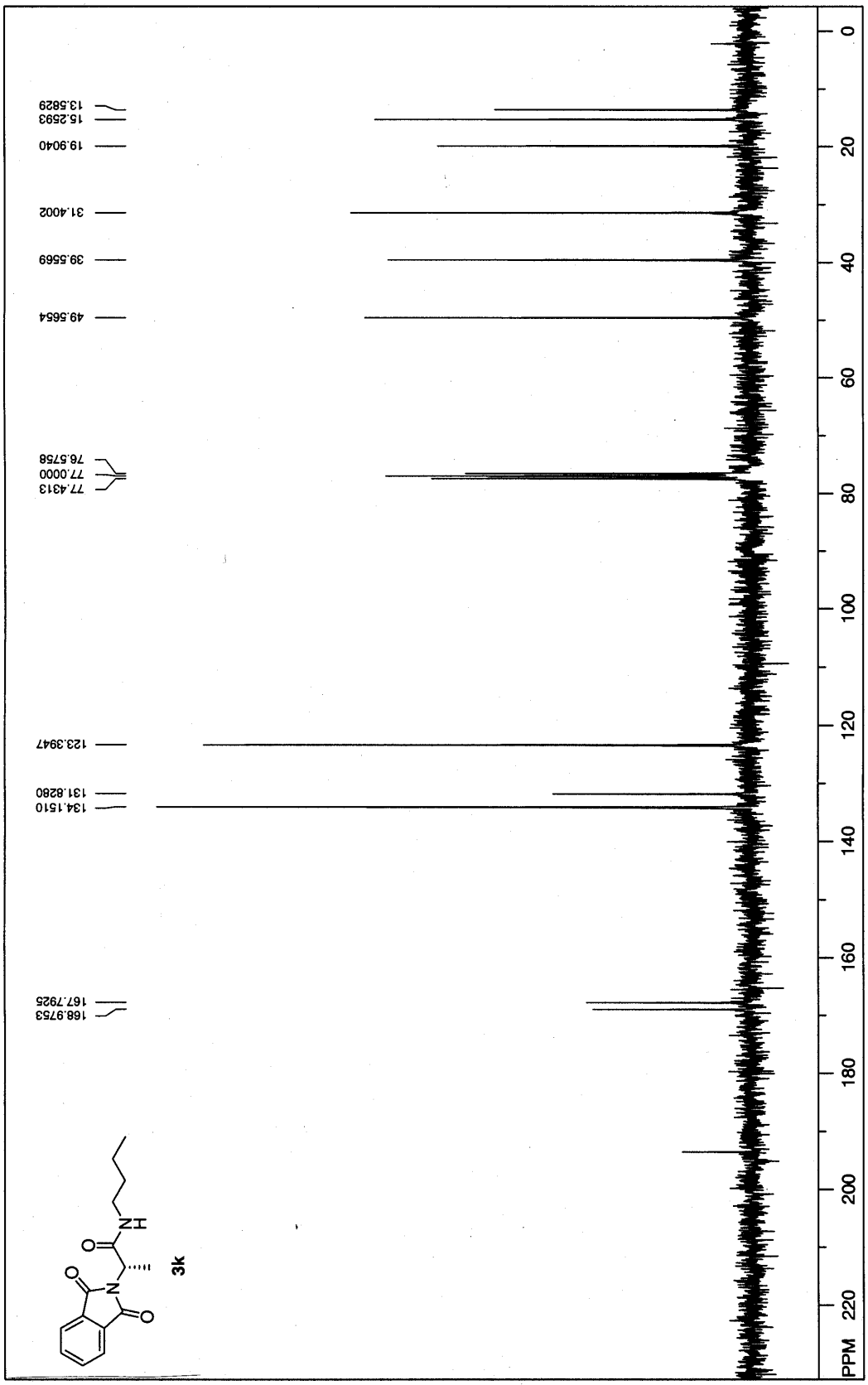
file: D:\AK-C\1NMR\2004\Mar02\225\fid expt: <zgf_kb>
transmitter freq.: 282.370863 MHz
time domain size: 65536 points
width: 125000.00 Hz = 442.680235 ppm = 1.907349 Hz/pt
number of scans: 512

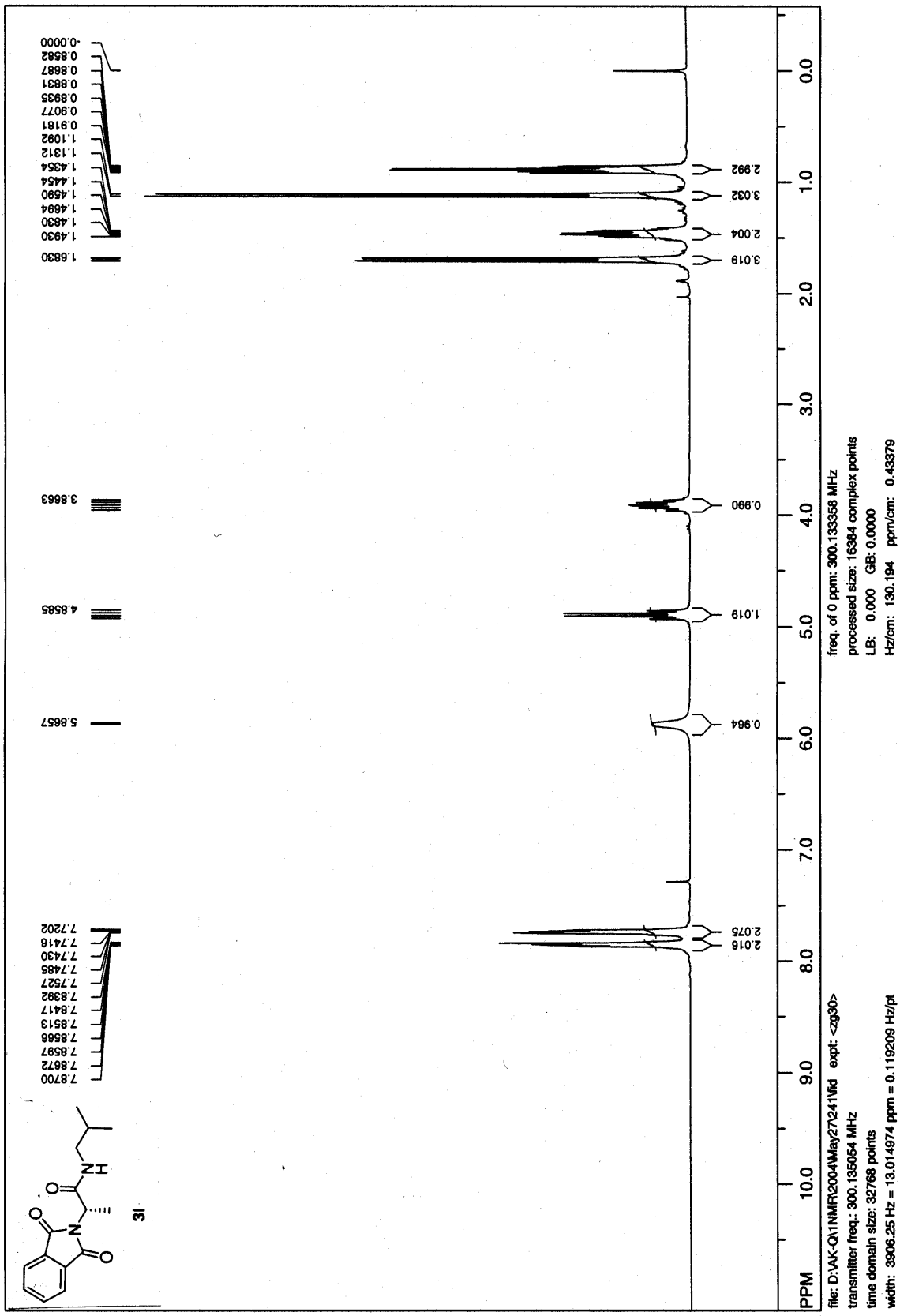
freq. of 0 ppm: 282.407666 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 99.953 ppm/cm: 0.35398

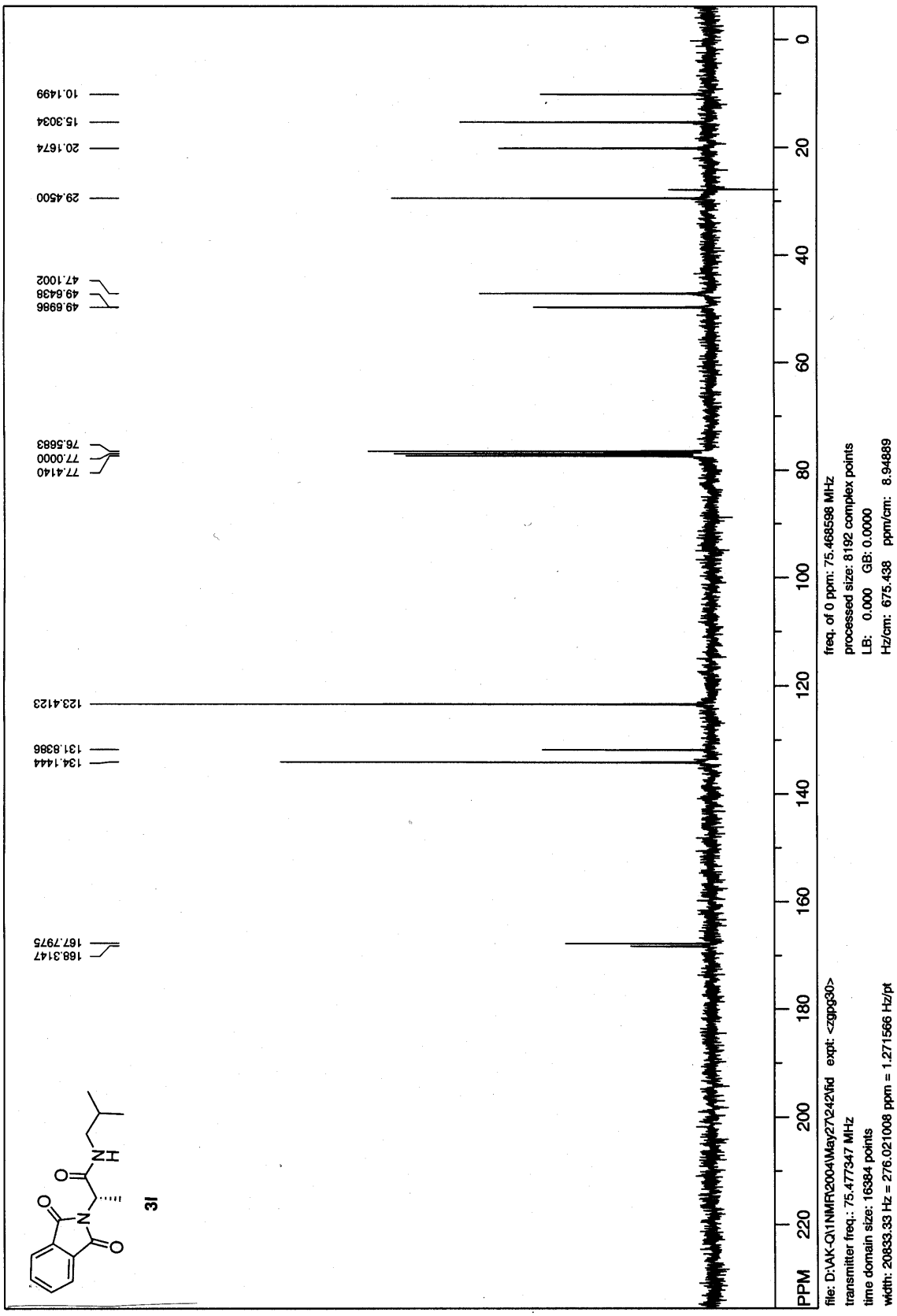

0.0000
2.7958
2.7801
3.5164
3.5250
3.5466
3.6251
5.0901
5.0662
5.0582
5.0342
7.1337
7.6714
7.6820
7.6913
7.7003
7.7400
7.7489
7.7582
7.7688
2.995
2.091
0.992
6.037
2.011
2.012
NHMe
3j
PPM
file: D:\AK-Q1\NMR\2004\May04\161\fid expt: <zg30>
transmitter freq.: 300.136236 MHz
time domain size: 32768 points
width: 3906.27 Hz = 13.014974 ppm = 0.119210 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.134535 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 129.769 ppm/cm: 0.43237

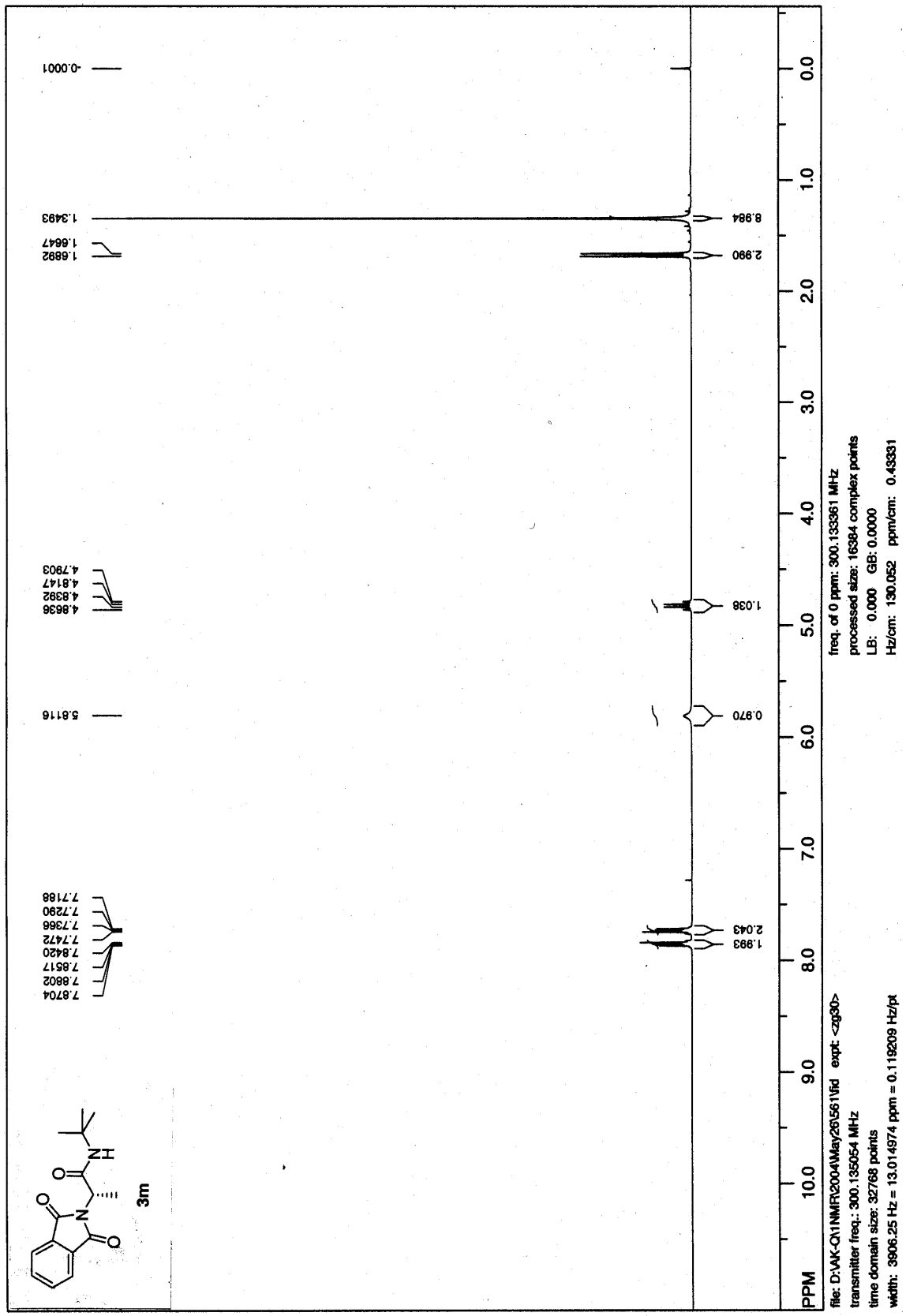

NHMe
3j
26.1763
34.2979
48.4180
48.7097
46.9911
55.2867
76.5803
76.9994
77.4329
123.0895
126.5737
128.2866
128.5376
131.2249
134.0199
136.6266
167.9248
169.4062
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q\1NMR\2004\May04\1162\fid expt: <zgpg30>
transmitter freq.: 75.477644 MHz
time domain size: 16384 points
width: 20833.42 Hz = 276.021008 ppm = 1.271571 Hz/pt
number of scans: 256
freq. of 0 ppm: 75.468906 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 673.169 ppm/cm: 8.91879

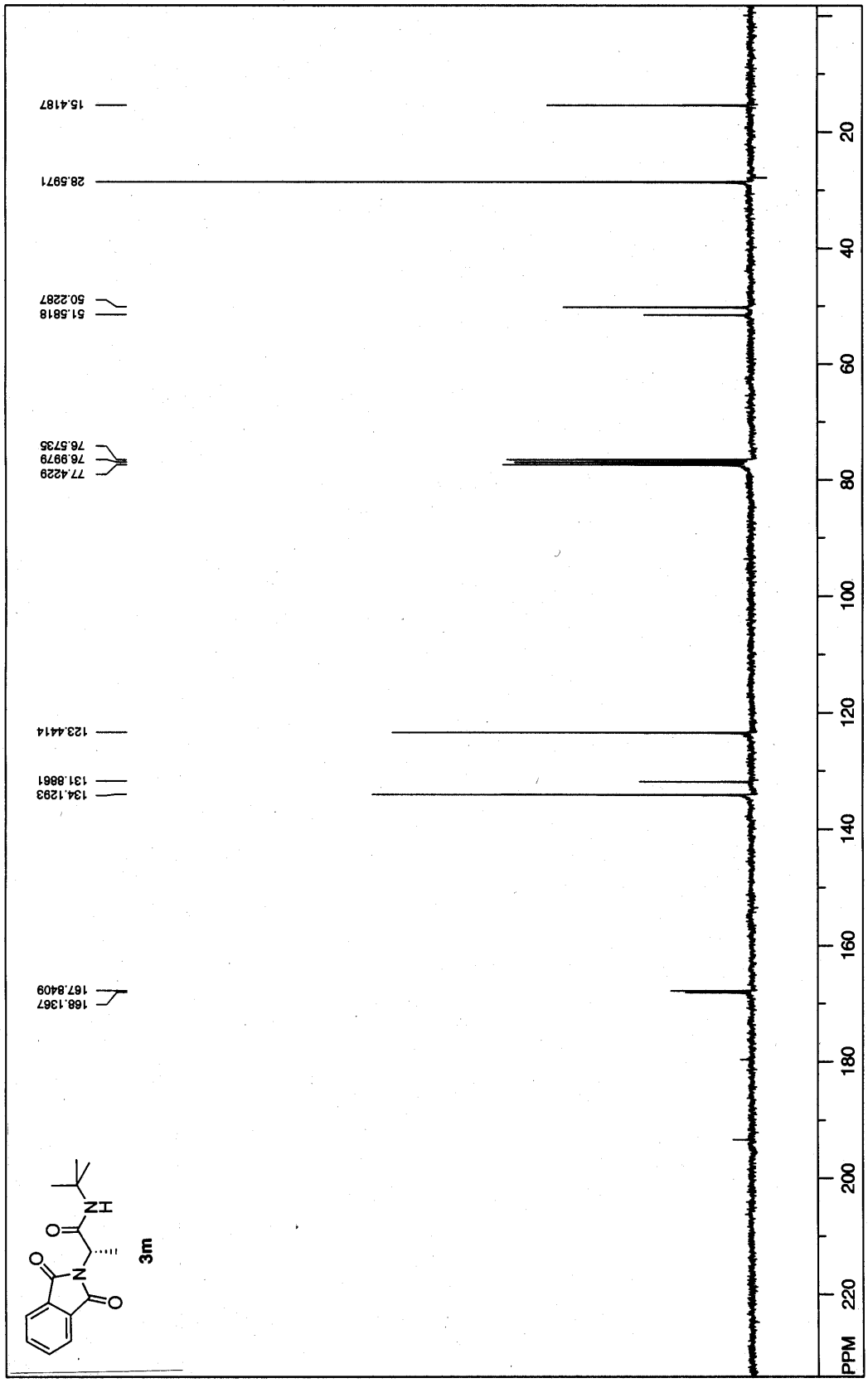

3k
7.8630
7.8527
7.8448
7.8347
7.7496
7.7394
7.7316
7.7213
8.2143
8.2064
8.2037
8.2023
8.1999
4.9318
4.9075
4.8630
4.8567
3.2825
3.2635
3.2805
3.2401
3.2208
3.2173
1.7254
1.7088
1.6843
1.5082
1.4832
1.4590
1.4353
1.3586
1.3333
1.3080
1.2848
0.9250
0.9009
0.8769
-0.0000
3.139
2.008
2.076
2.978
2.120
1.046
1.030
2.133
2.100
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
file: D:\AK-Q\1NMR\2004\May27\2511fid expt: <zg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133356 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 128.206 ppm/cm: 0.42716

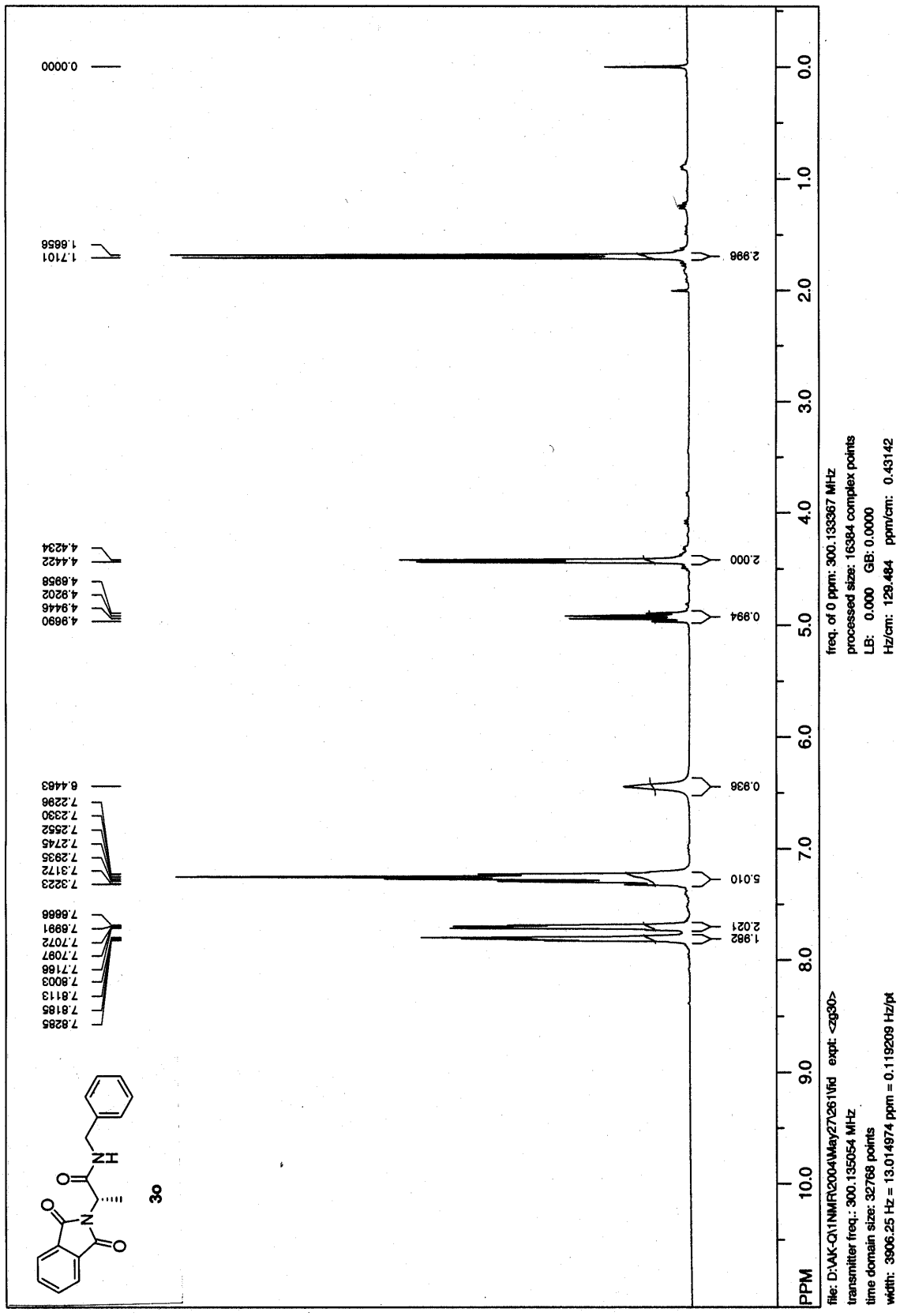

13.5829
15.2593
19.9040
31.4002
39.5569
49.5654
76.5758
77.0000
77.4313
123.3947
131.8280
134.1510
167.7925
168.9753
3k
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q1\NMR\2004\May27\252\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 256
freq. of 0 ppm: 75.468598 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 662.566 ppm/cm: 8.77834

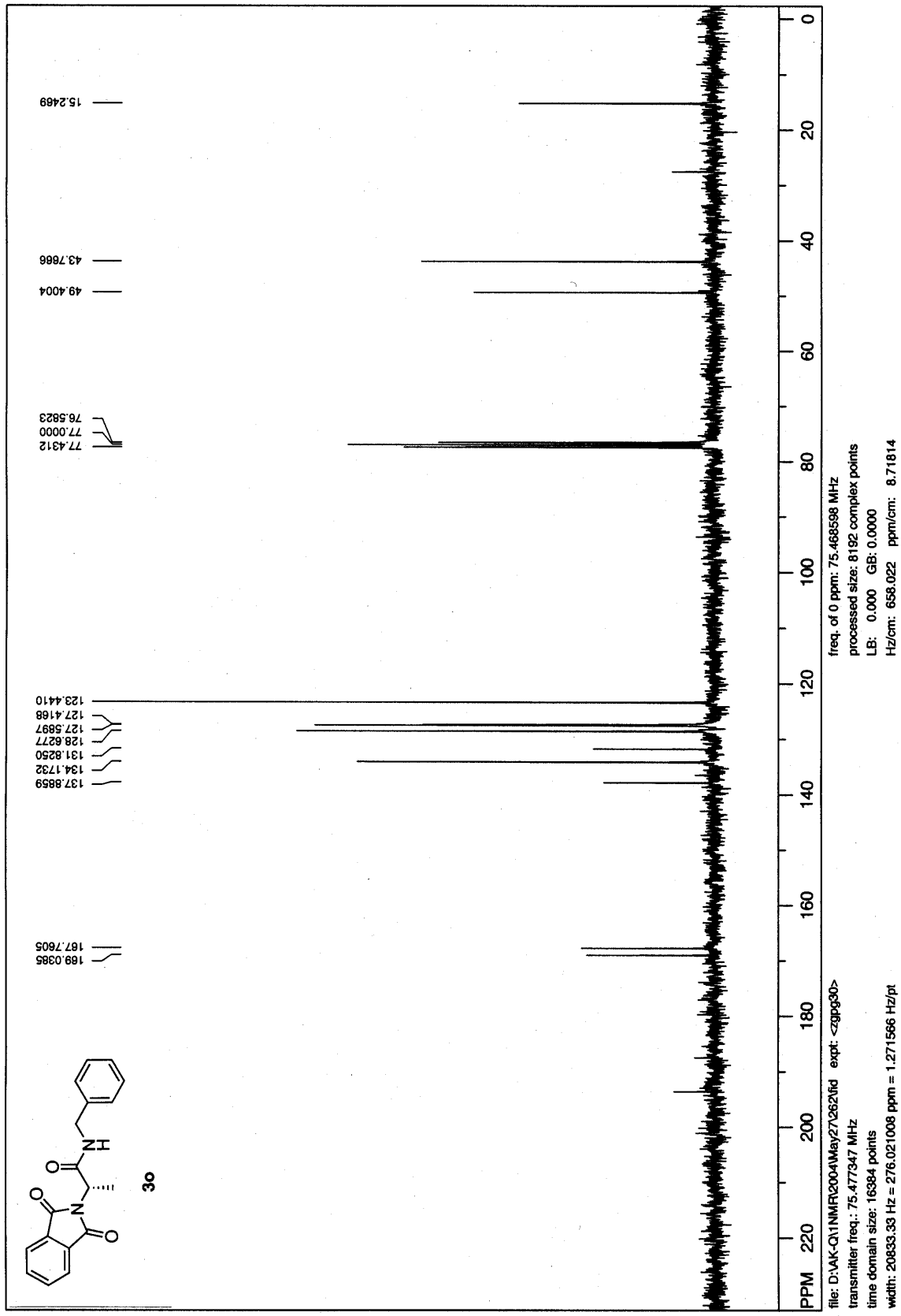

3l
7.8700
7.8672
7.8597
7.8566
7.8513
7.8417
7.8392
7.7527
7.7485
7.7430
7.7416
7.7202
1.6830
1.4930
1.4830
1.4694
1.4590
1.4454
1.4354
1.1312
1.1092
0.9181
0.9077
0.8935
0.8831
0.8687
0.8582
-0.0000
3.8663
4.8585
5.8657
2.075
2.016
0.984
1.019
0.990
2.992
3.032
2.004
3.019
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
file: D:\AK-Q\1NMR\2004\May27\2411fid expt: <zg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133358 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 130.194 ppm/cm: 0.43379

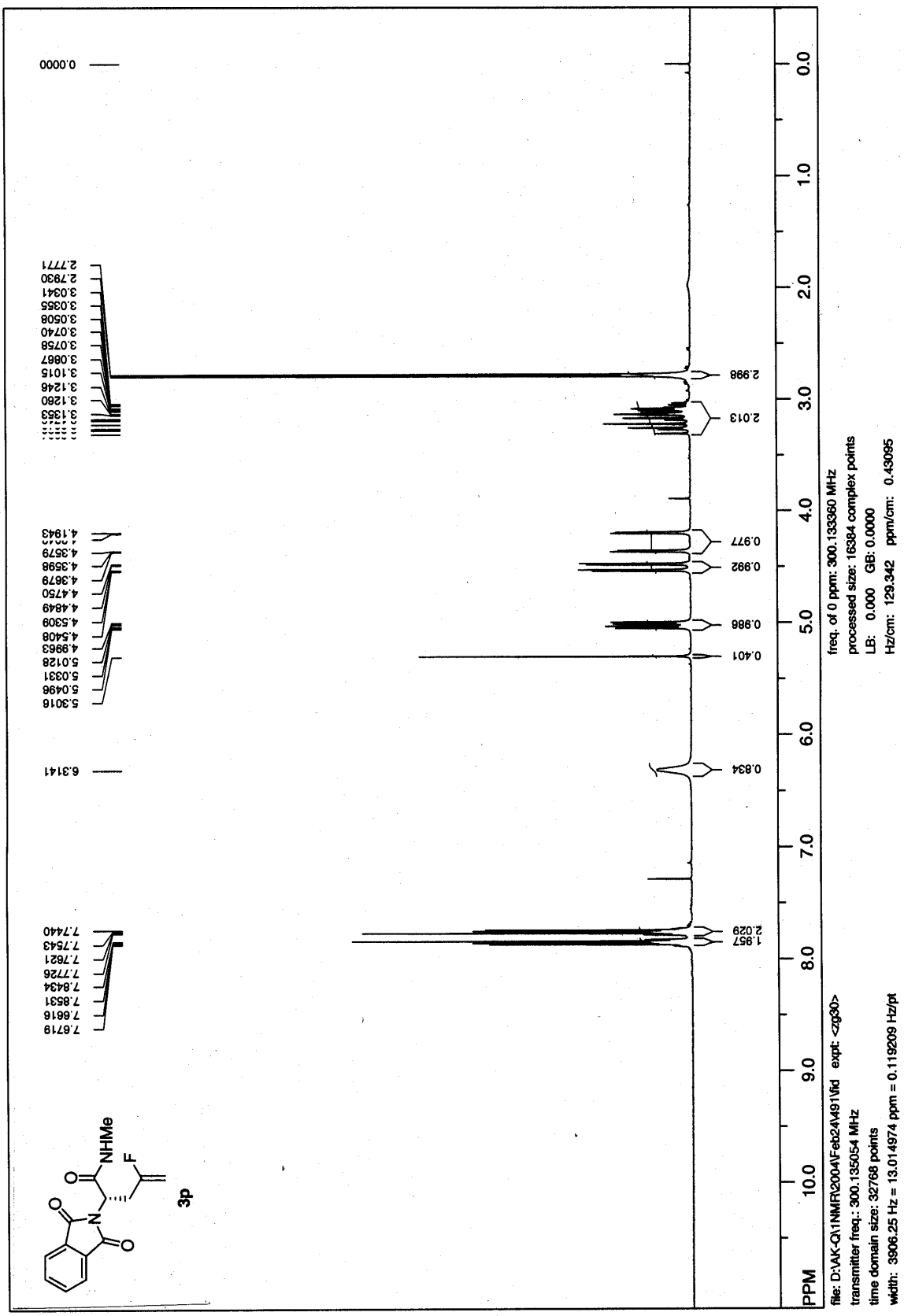

3l
168.3147
167.7975
134.1444
131.8386
123.4123
77.4140
77.0000
76.5683
49.6986
49.8438
47.1002
29.4500
20.1674
15.3034
10.1499
PPM
220
200
180
160
140
120
100
80
60
40
20
0
file: D:\AK-Q\1NMR\2004\May27\2427fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 256
freq. of 0 ppm: 75.468598 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 675.438 ppm/cm: 8.94889

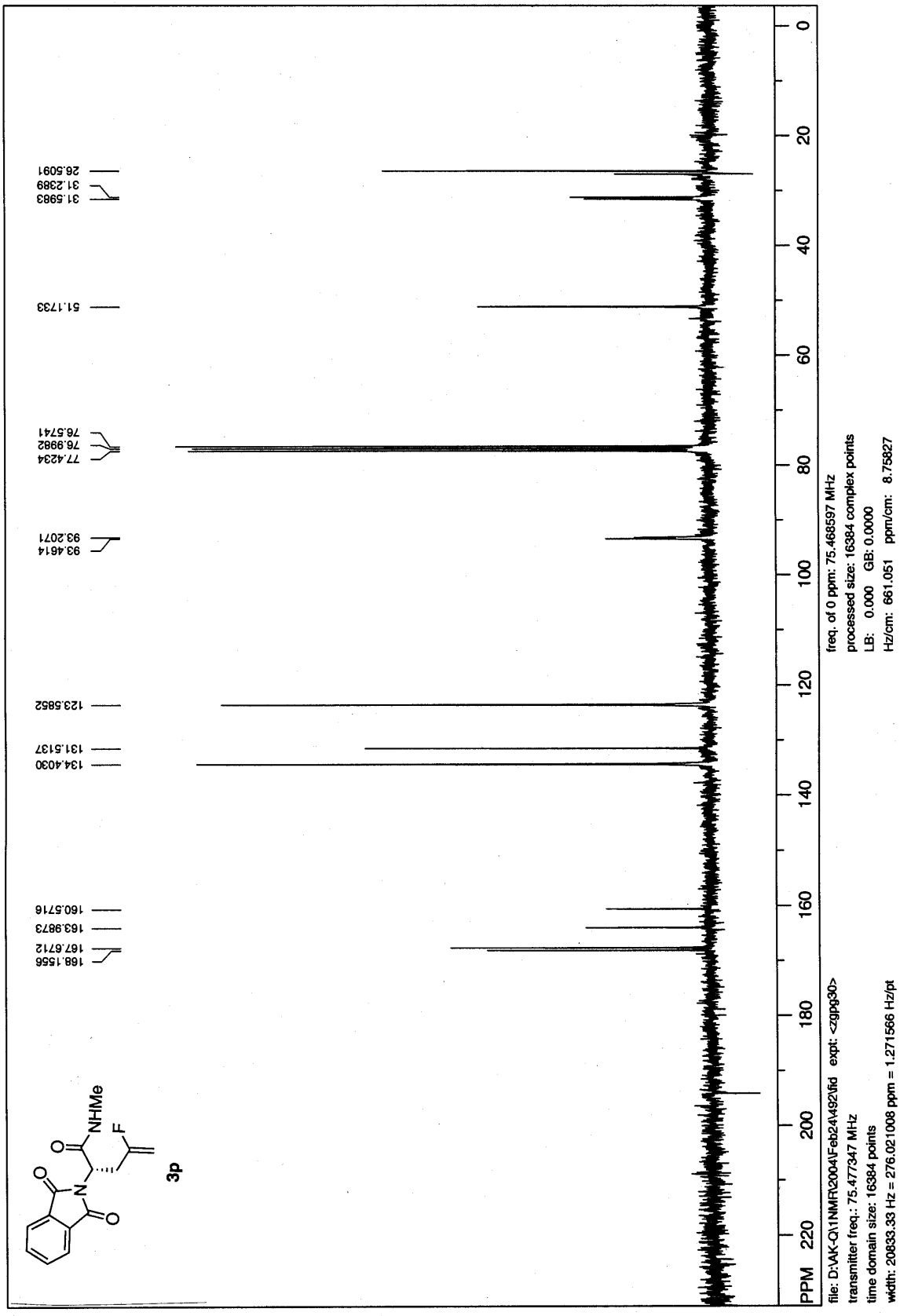

-0.0001
1.3493
1.6647
1.6892
4.7903
4.8147
4.8392
4.8636
5.8116
7.7188
7.7290
7.7366
7.7472
7.8420
7.8517
7.8602
7.8704
8.984
2.990
1.038
0.970
2.043
1.983
3m
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
file: D:\AK-Q\1NMR\2004\May26\561\fid expt: <zg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133361 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 130.052 ppm/cm: 0.43331

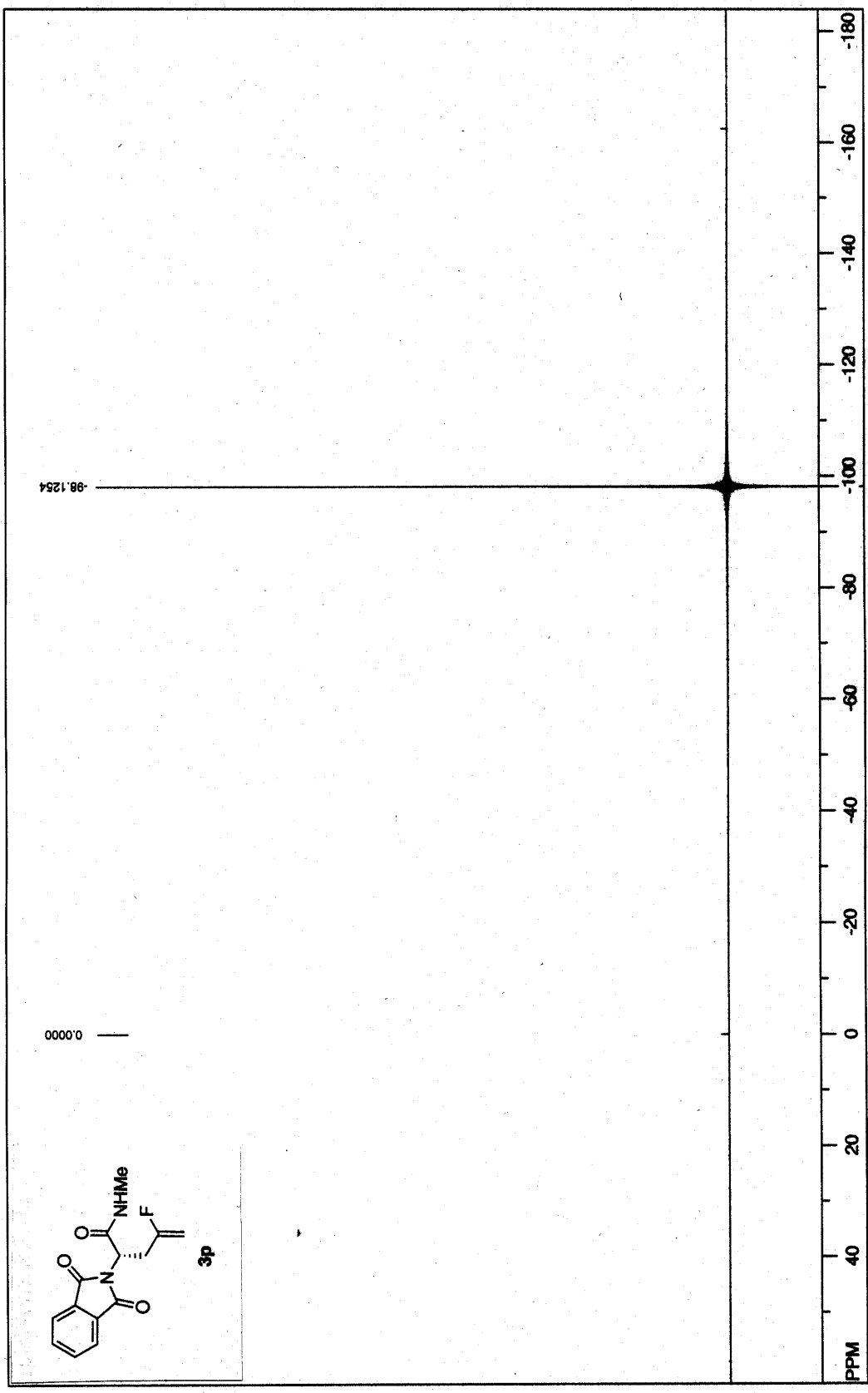

15.4187
28.5971
50.2287
51.5818
76.5735
76.9979
77.4229
123.4414
131.8861
134.1293
167.8409
168.1367
3m
PPM 220 200 180 160 140 120 100 80 60 40 20
file: D:\AK-Q\1NMR\2004\May26\5624fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 1024
freq. of 0 ppm: 75.468596 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 659.537 ppm/cm: 8.73821

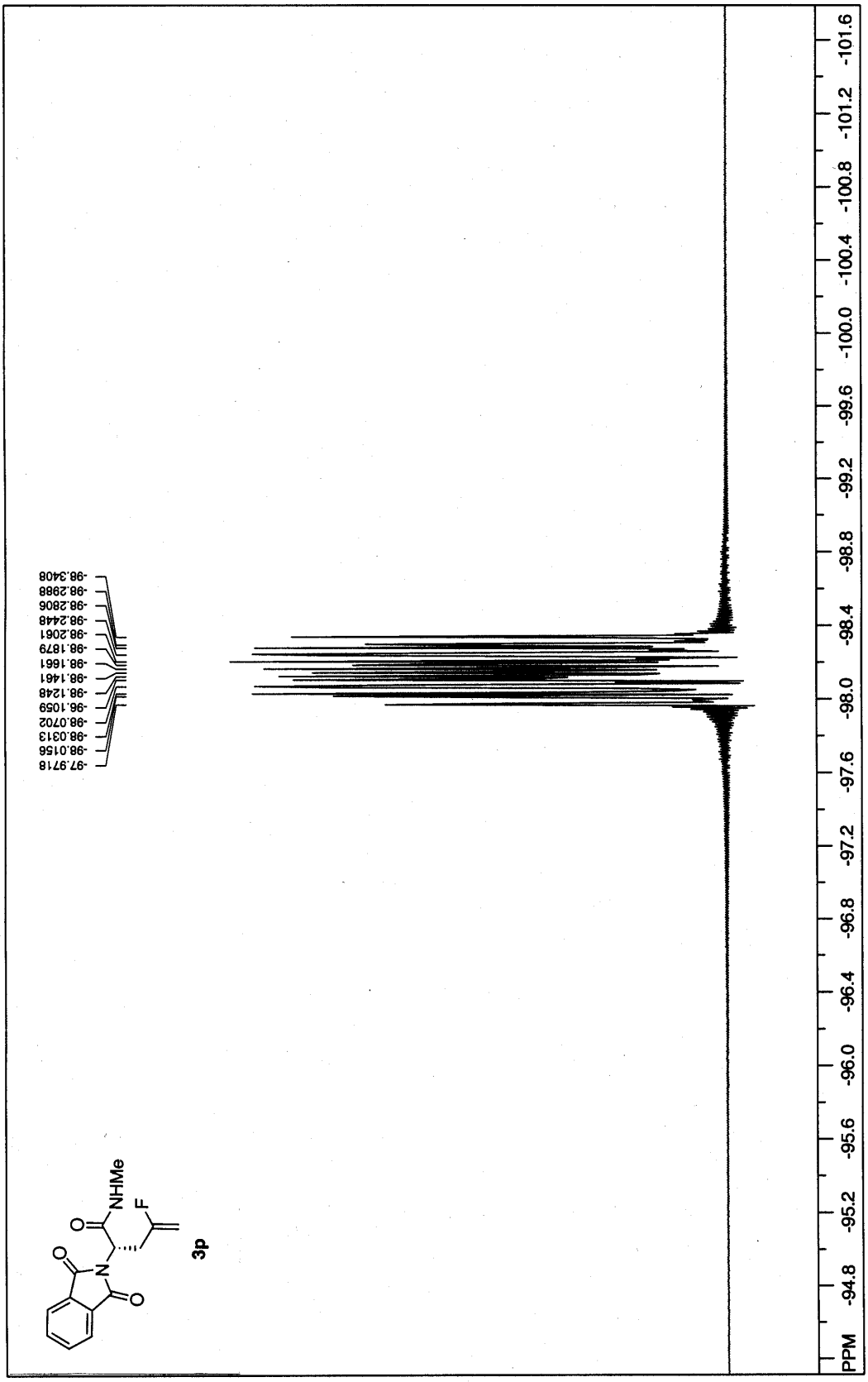

0.0000
1.7101
1.6858
4.4234
4.4422
4.6858
4.8202
4.8446
4.9690
6.4463
7.2286
7.2330
7.2552
7.2745
7.2935
7.3172
7.3223
7.6868
7.6891
7.7072
7.7097
7.7166
7.8003
7.8113
7.8185
7.8285
2.998
2.000
0.994
0.936
5.010
2.021
1.982
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
3o
file: D:\AK-Q\1\NMR\2004\May27\2611\fid expt: <zg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133867 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 129.484 ppm/cm: 0.43142

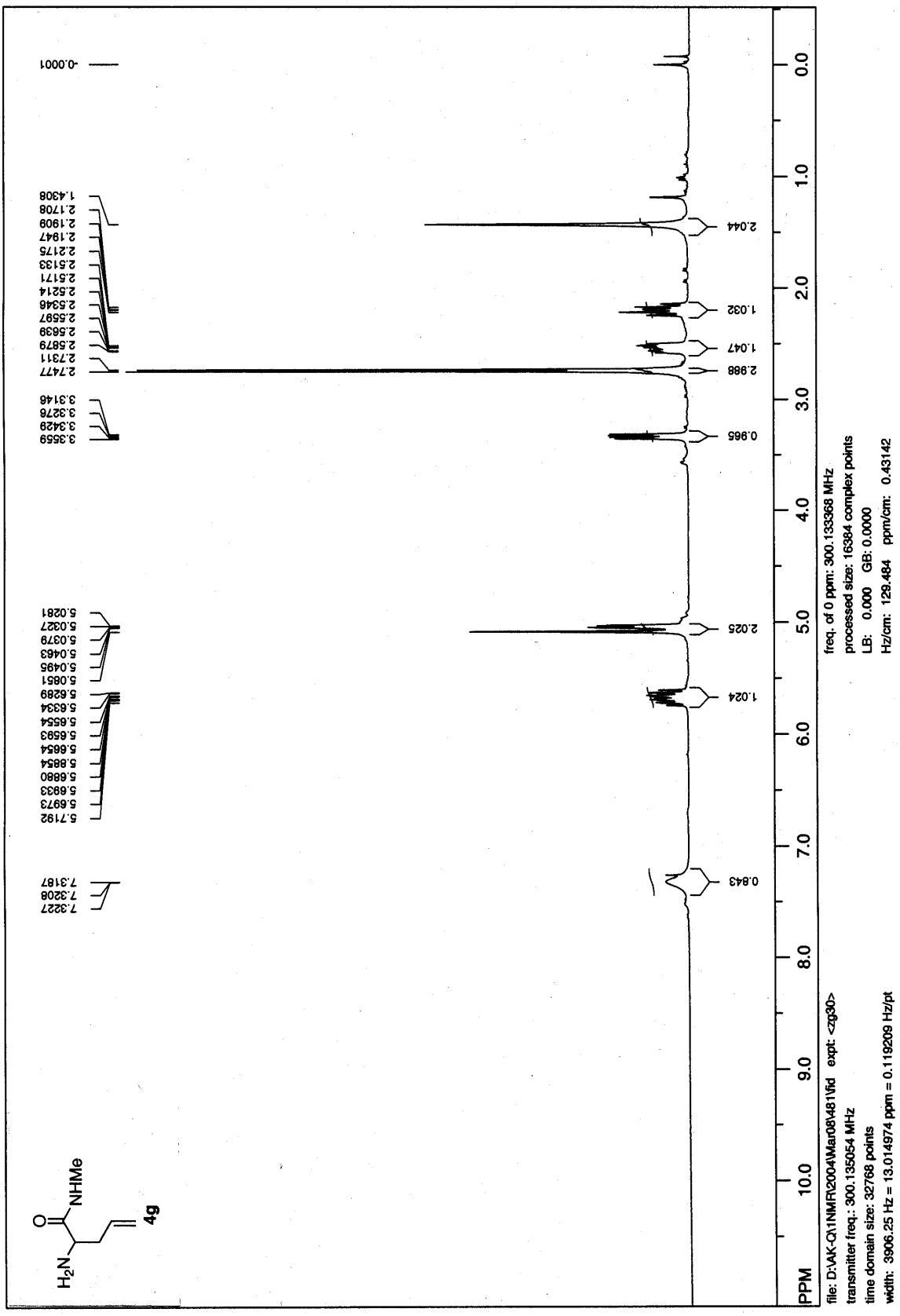

15.2469
43.7666
49.4004
76.5823
77.0000
77.4312
123.4410
127.4168
127.5897
128.6277
131.8250
134.1732
137.8859
167.7605
189.0385
3o
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q\1NMR\2004\May27\2\2\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 256
freq. of 0 ppm: 75.468598 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 658.022 ppm/cm: 8.71814


0.0000
2.7771
2.7930
3.0341
3.0355
3.0508
3.0740
3.0758
3.0887
3.1015
3.1246
3.1280
3.1353
4.1943
4.3579
4.3598
4.3679
4.4750
4.4849
4.5309
4.5408
4.9963
5.0128
5.0331
5.0496
5.3016
6.3141
7.6719
7.6816
7.8531
7.8434
7.7726
7.7621
7.7543
7.7440
2.998
2.013
0.977
0.982
0.986
0.401
0.834
1.857
2.029
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
NHMe
F
3p
file: D:\AK-Q\1\NMR\2004\Feb24\4491\fid expt: <zg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133360 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 129.342 ppm/cm: 0.43095


26.5091
31.2389
31.5983
51.1733
76.5741
76.9982
77.4234
93.2071
93.4614
123.5852
131.5137
134.4030
160.5716
163.9873
167.6712
168.1556
NHMe
F
O
O
N
O
3p
PPM
220
200
180
160
140
120
100
80
60
40
20
0
file: D:\AK-Q\1NMR\2004\Feb24\4921\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 1024
freq. of 0 ppm: 75.468597 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 661.051 ppm/cm: 8.75827


0.0000
-98.1254
NHMe
F
3p
PPM
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
file: D:\AK-Q1\NMR\2004\Feb24\4495\fid expt: <gfhig_kb>
transmitter freq.: 282.370663 MHz
time domain size: 65536 points
width: 125000.00 Hz = 442.660235 ppm = 1.907949 Hz/pt
number of scans: 256
freq. of 0 ppm: 282.407868 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 2580.588 ppm/cm: 9.13904


NHMe
F
O
O
N
O
3p
-97.9718
-98.0156
-98.0313
-98.0702
-98.1059
-98.1248
-98.1461
-98.1661
-98.1879
-98.2061
-98.2448
-98.2806
-98.2988
-98.3408
PPM -94.8 -95.2 -95.6 -96.0 -96.4 -96.8 -97.2 -97.6 -98.0 -98.4 -98.8 -99.2 -99.6 -100.0 -100.4 -100.8 -101.2 -101.6
file: D:\AK-Q\1NMR\2004\Feb24\496\fid expt: <zgf_ktb>
transmitter freq.: 282.370863 MHz
time domain size: 65536 points
width: 125000.00 Hz = 442.680235 ppm = 1.907349 Hz/pt
number of scans: 512
freq. of 0 ppm: 282.407668 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 78.230 ppm/cm: 0.27705


-0.0001
1.4308
2.1708
2.1909
2.1947
2.2175
2.5133
2.5171
2.5214
2.5346
2.5597
2.5639
2.5879
2.7311
2.7477
3.3146
3.3276
3.3429
3.3559
5.0281
5.0327
5.0379
5.0463
5.0495
5.0851
5.6289
5.6334
5.6554
5.6593
5.6654
5.8854
5.8880
5.8933
5.9273
5.7192
7.3187
7.3208
7.3227
2.044
1.032
1.047
2.988
0.865
2.025
1.024
0.843
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
NHMe
O
H2N
4g
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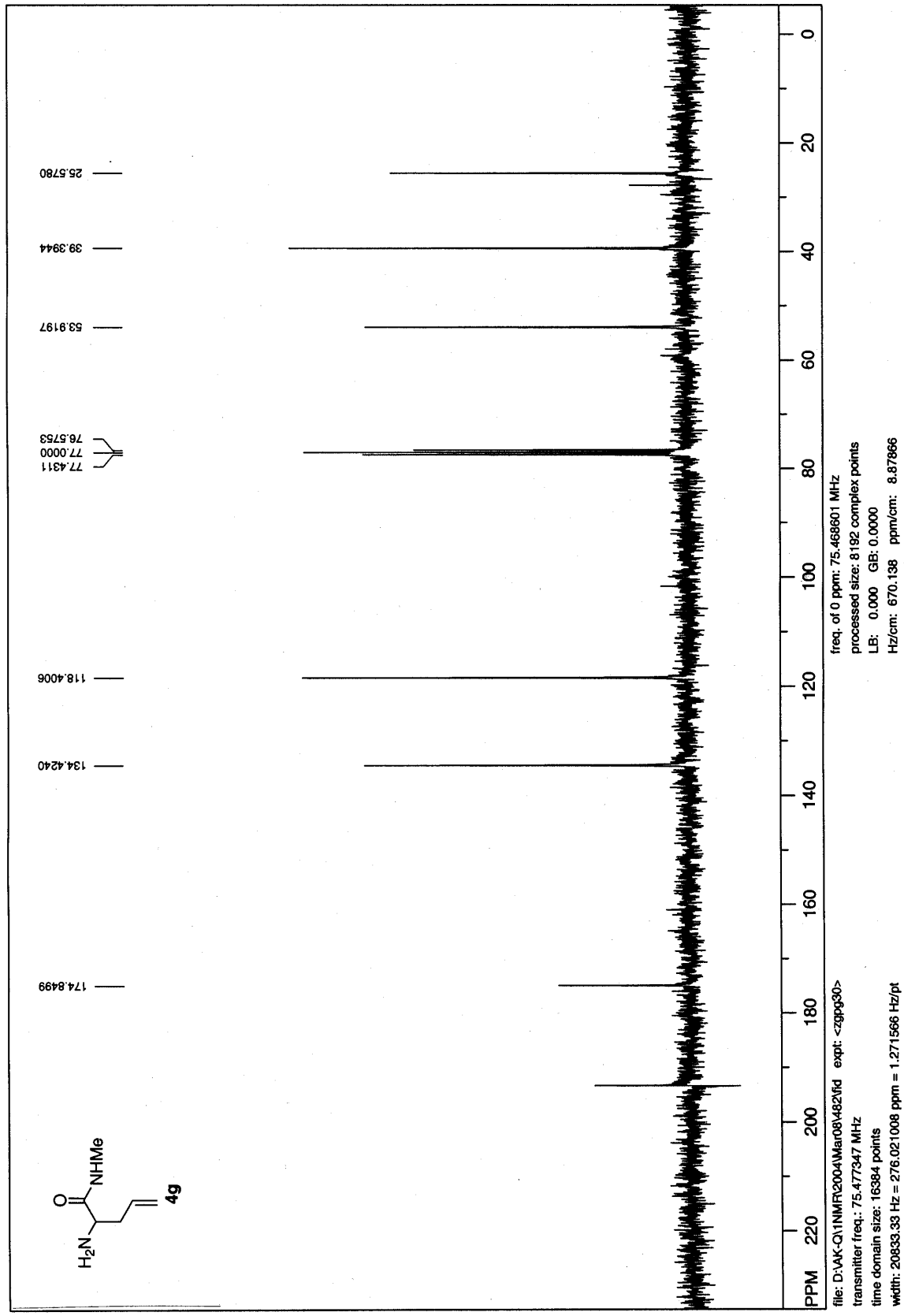
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NHMe
O
H_2N
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118.4006
77.4311
77.0000
76.5753
53.9197
39.3944
25.5780
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q\1NMR\2004\Mar08\482\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
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number of scans: 256
freq. of 0 ppm: 75.468601 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
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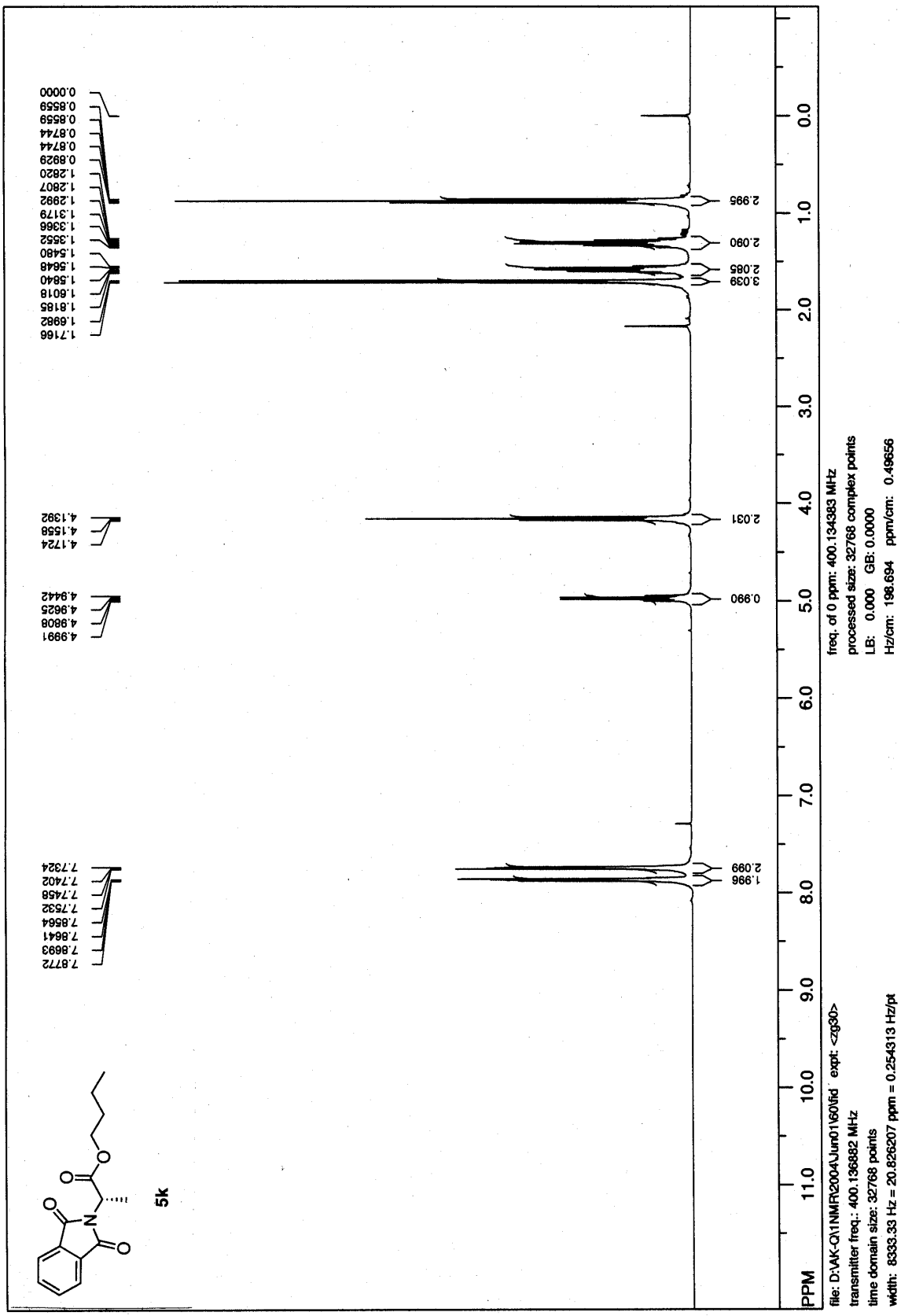
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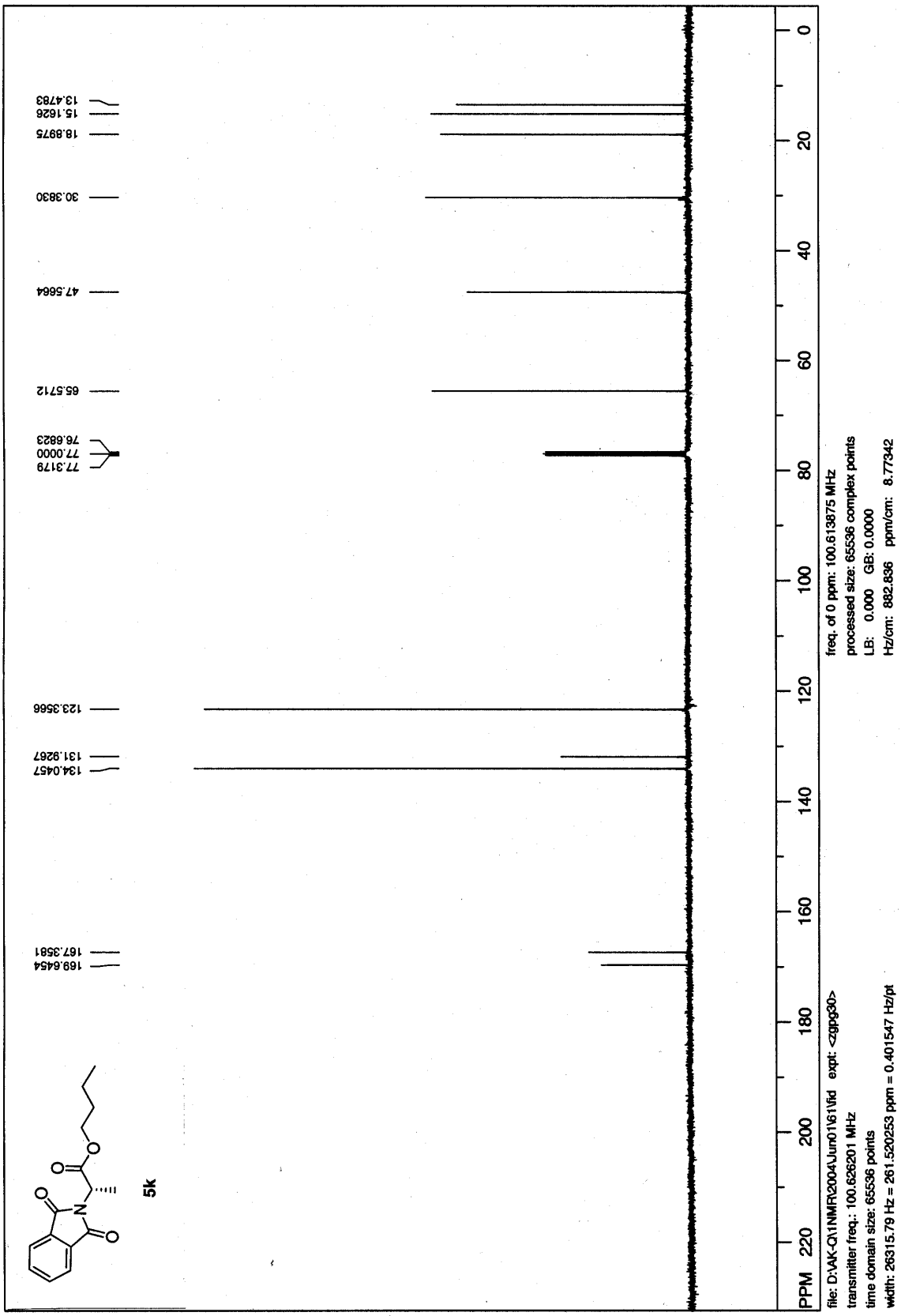
7.8641
7.8564
7.7532
7.7458
7.7402
7.7324
4.9991
4.9808
4.9625
4.9442
4.1724
4.1558
4.1392
1.7166
1.6982
1.8185
1.6018
1.5840
1.5648
1.5480
1.3552
1.3366
1.3179
1.2992
1.2807
1.2820
0.8929
0.8744
0.8559
0.8559
0.0000
1.996
2.099
0.990
2.031
3.039
2.085
2.090
2.985
PPM
file: D:\AK-Q\1NMR\2004\Jun01\601di expt: <zg30>
transmitter freq.: 400.136882 MHz
time domain size: 32768 points
width: 8333.33 Hz = 20.826207 ppm = 0.254313 Hz/pt
number of scans: 16
freq. of 0 ppm: 400.134383 MHz
processed size: 32768 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 198.694 ppm/cm: 0.49656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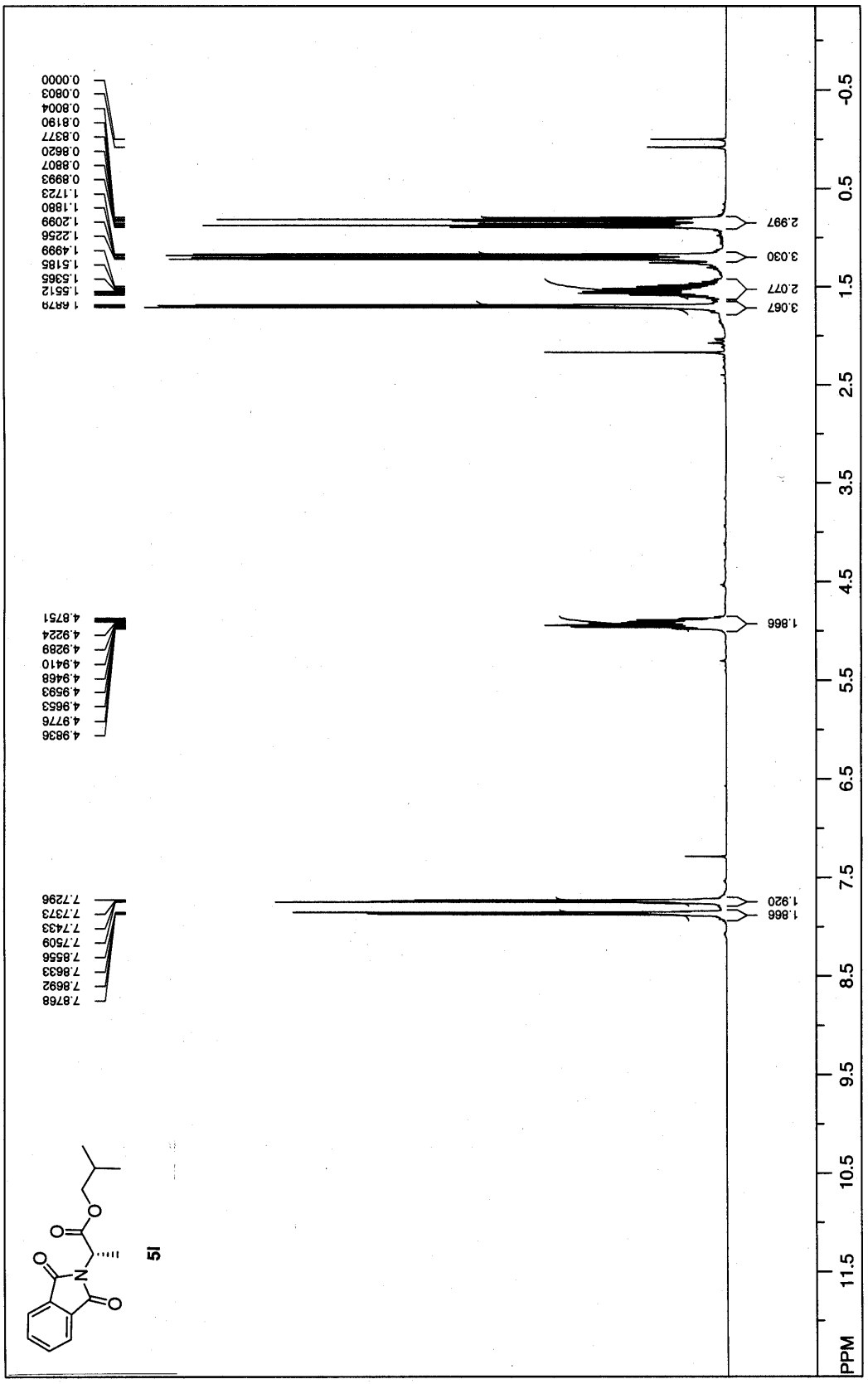
15.1626
18.8975
30.3830
47.5664
65.5712
76.6823
77.0000
77.3179
123.3566
131.9267
134.0457
167.3581
169.6454
5k
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q\1NMR\2004\Jun01\1\fid expt: <zgpg30>
transmitter freq.: 100.626201 MHz
time domain size: 65536 points
width: 26315.79 Hz = 261.520253 ppm = 0.401547 Hz/pt
number of scans: 1024
freq. of 0 ppm: 100.613875 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 882.836 ppm/cm: 8.77342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7.8633
7.8556
7.7509
7.7433
7.7373
7.7296
4.9836
4.9776
4.9653
4.9593
4.9468
4.9410
4.9289
4.9224
4.8751
1.8878
1.5512
1.5365
1.5185
1.4999
1.2256
1.2099
1.1880
1.1723
0.8993
0.8807
0.8620
0.8377
0.8190
0.8004
0.0803
0.0000
3.067
2.077
3.030
2.997
1.866
1.920
1.866
PPM
11.5
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
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time domain size: 32768 points
width: 8333.33 Hz = 20.826207 ppm = 0.254313 Hz/pt
number of scans: 16
freq. of 0 ppm: 400.134383 MHz
processed size: 32768 complex points
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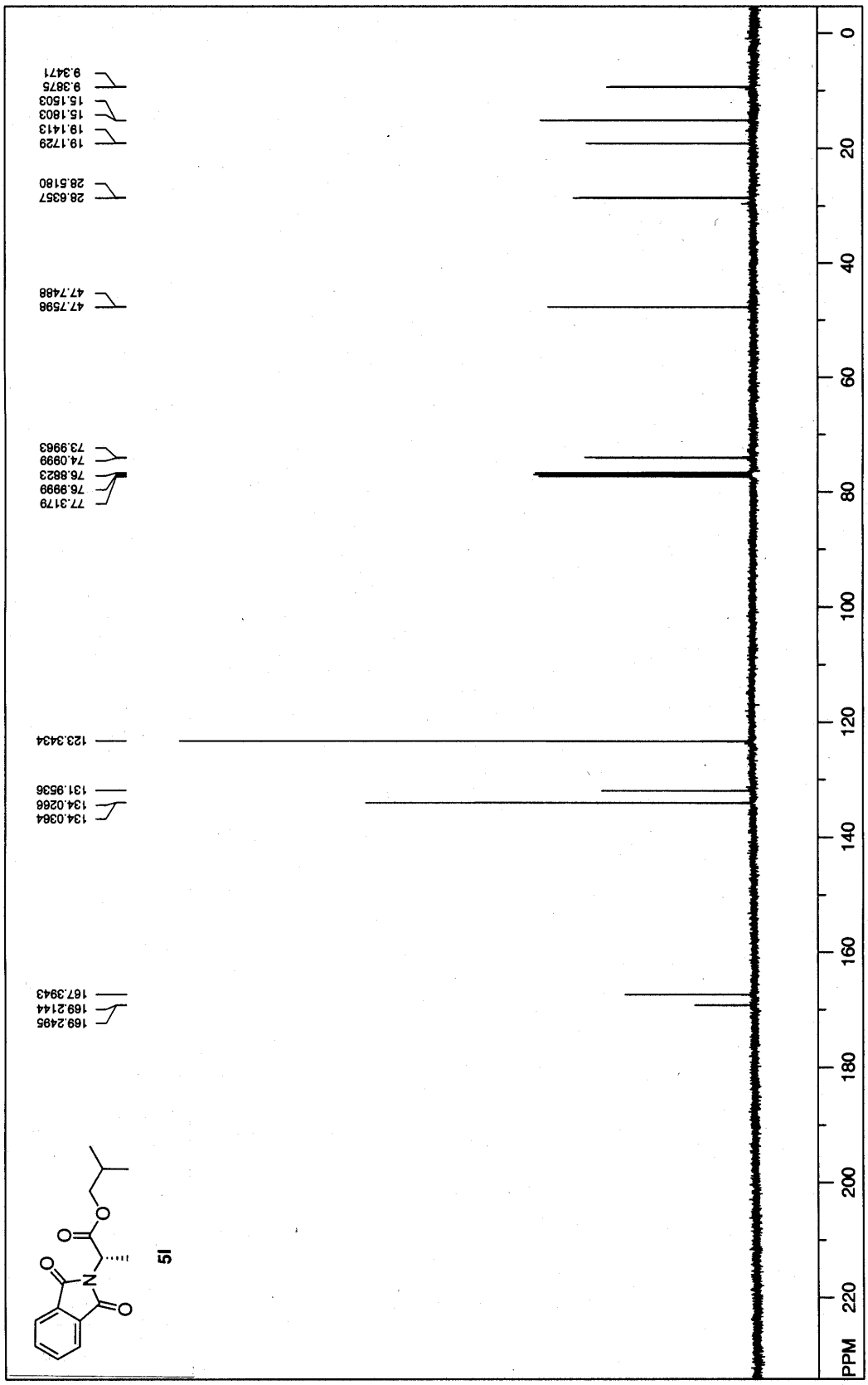
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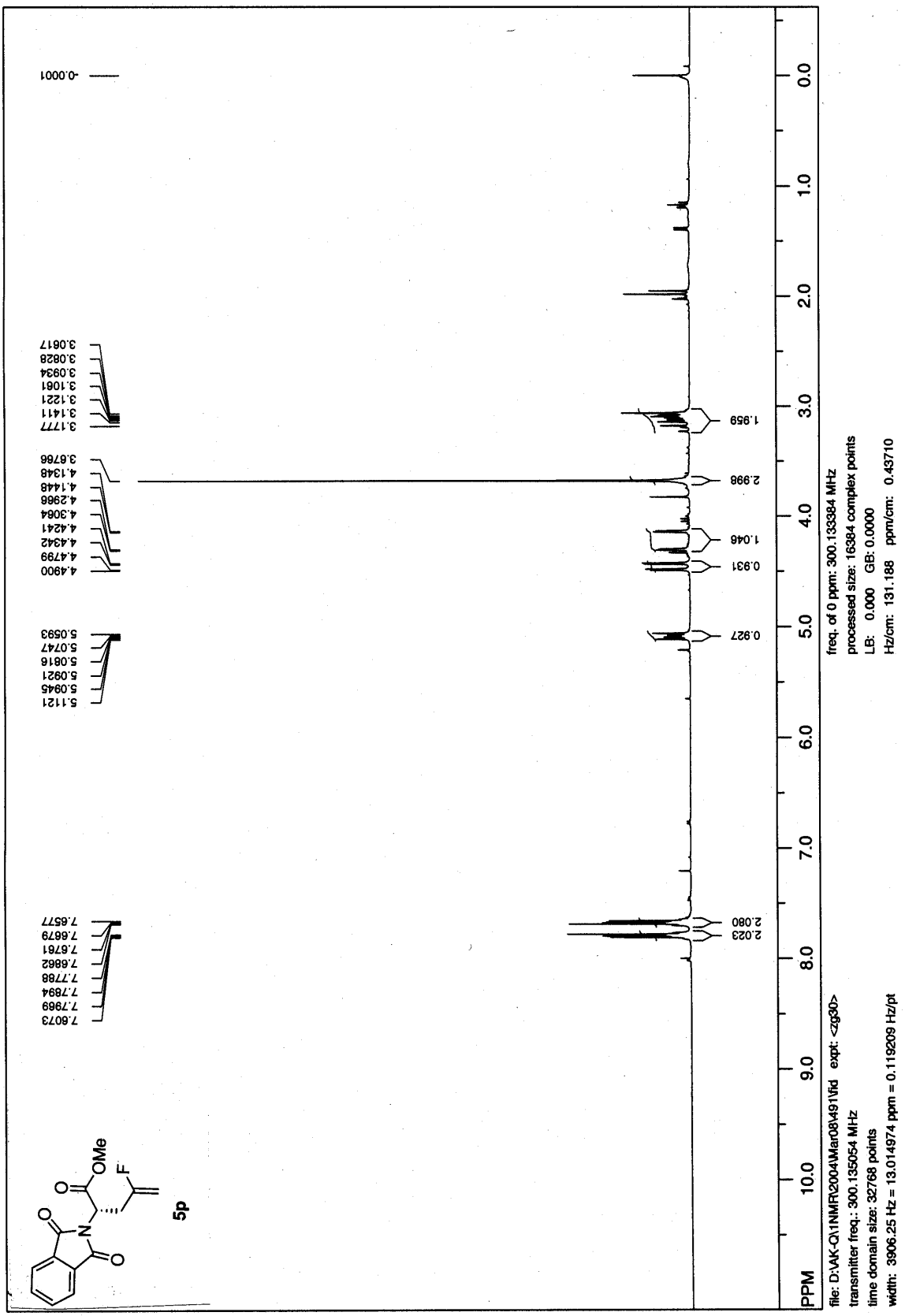
15.1803
19.1413
19.1729
28.5180
28.6357
47.7488
47.7598
73.9963
74.0999
76.8823
76.9999
77.3179
123.3434
131.9536
134.0266
134.0364
167.3943
169.2144
169.2485
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q1\NMR\2004\Jun01\1\fid expt: <zgpg30>
transmitter freq.: 100.626201 MHz
time domain size: 65536 points
width: 26315.79 Hz = 261.520253 ppm = 0.401547 Hz/pt
number of scans: 1024
freq. of 0 ppm: 100.613874 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 890.488 ppm/cm: 8.84947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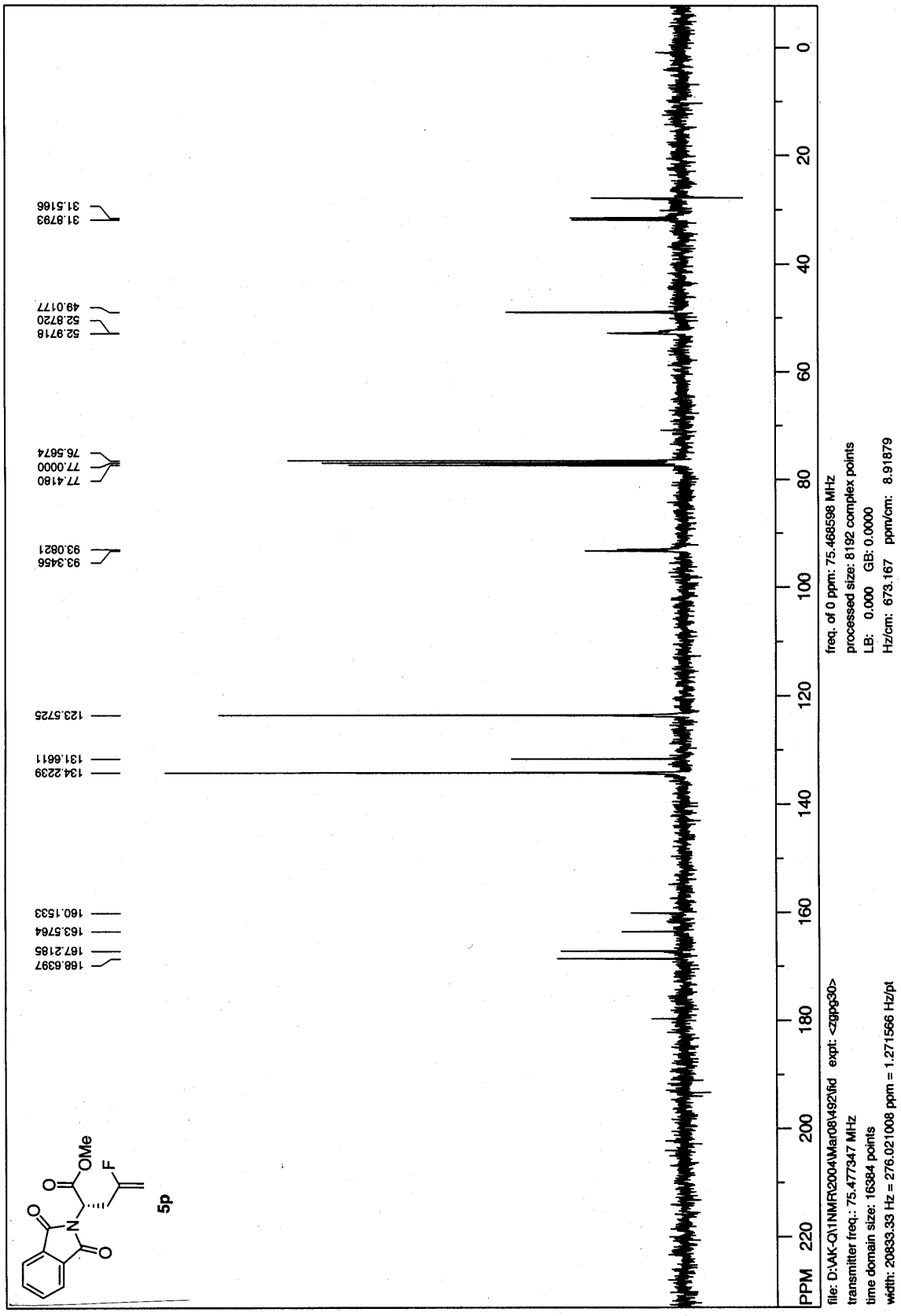
7.7969
7.7894
7.7788
7.6862
7.6761
7.6679
7.6577
5.1121
5.0945
5.0921
5.0816
5.0747
5.0593
4.4900
4.4799
4.4342
4.4241
4.3064
4.2966
4.1448
4.1348
3.8766
3.1777
3.1411
3.1221
3.1061
3.0934
3.0828
3.0617
2.080
2.023
0.927
1.046
0.931
2.998
1.859
PPM
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
file: D:\AK-Q\1NMR\2004Mar08\4911\fid expt: <zg30>
transmitter freq.: 300.135054 MHz
time domain size: 32768 points
width: 3906.25 Hz = 13.014974 ppm = 0.119209 Hz/pt
number of scans: 40
freq. of 0 ppm: 300.133384 MHz
processed size: 16384 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 131.188 ppm/cm: 0.43710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77.0000
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93.0821
93.3456
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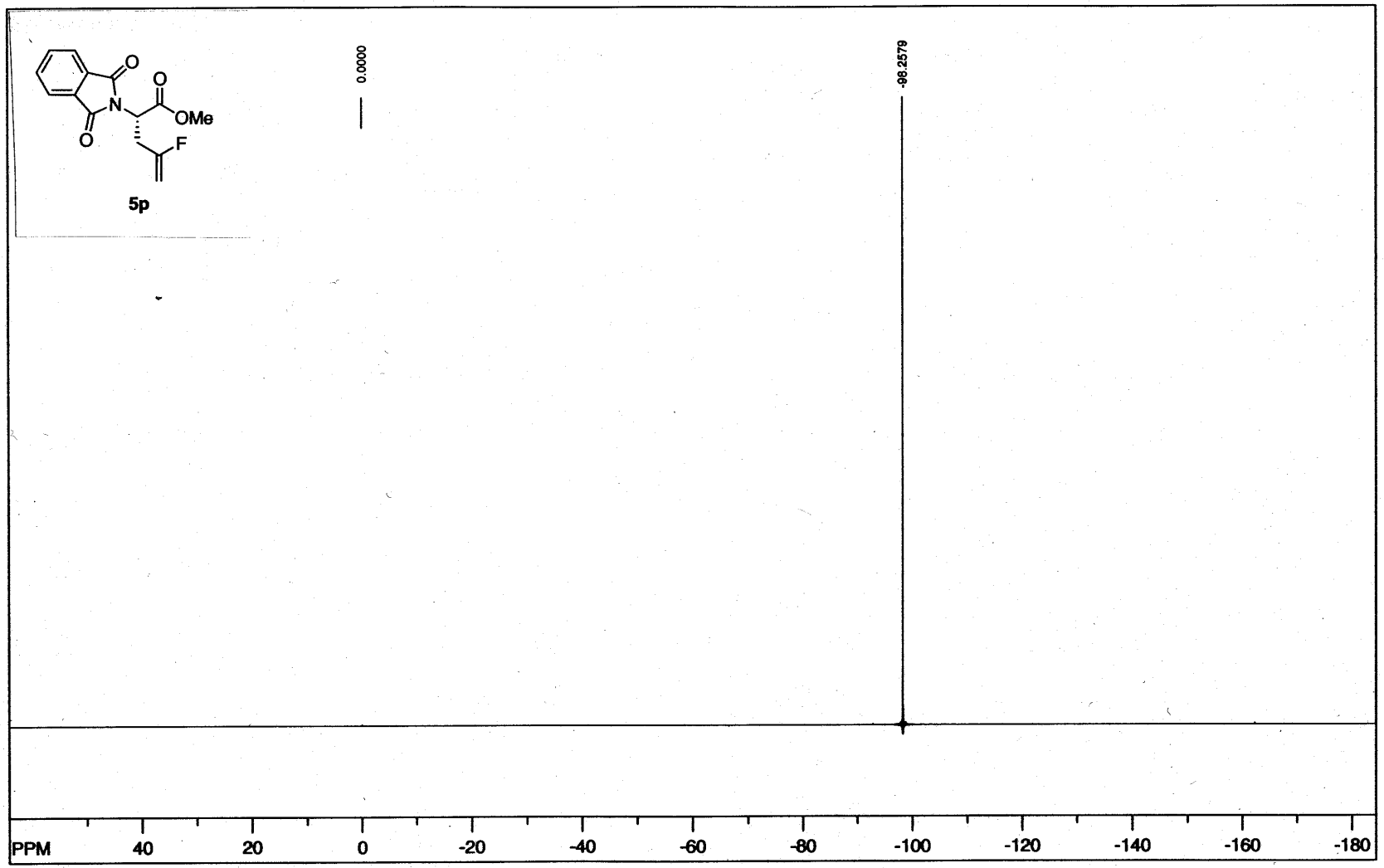
131.6611
134.2239
160.1533
163.5764
167.2185
168.6397
5p
OMe
F
O
N
PPM 220 200 180 160 140 120 100 80 60 40 20 0
file: D:\AK-Q1\NMR\2004\Mar08\492\fid expt: <zgpg30>
transmitter freq.: 75.477347 MHz
time domain size: 16384 points
width: 20833.33 Hz = 276.021008 ppm = 1.271566 Hz/pt
number of scans: 256
freq. of 0 ppm: 75.468598 MHz
processed size: 8192 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 673.167 ppm/cm: 8.91879



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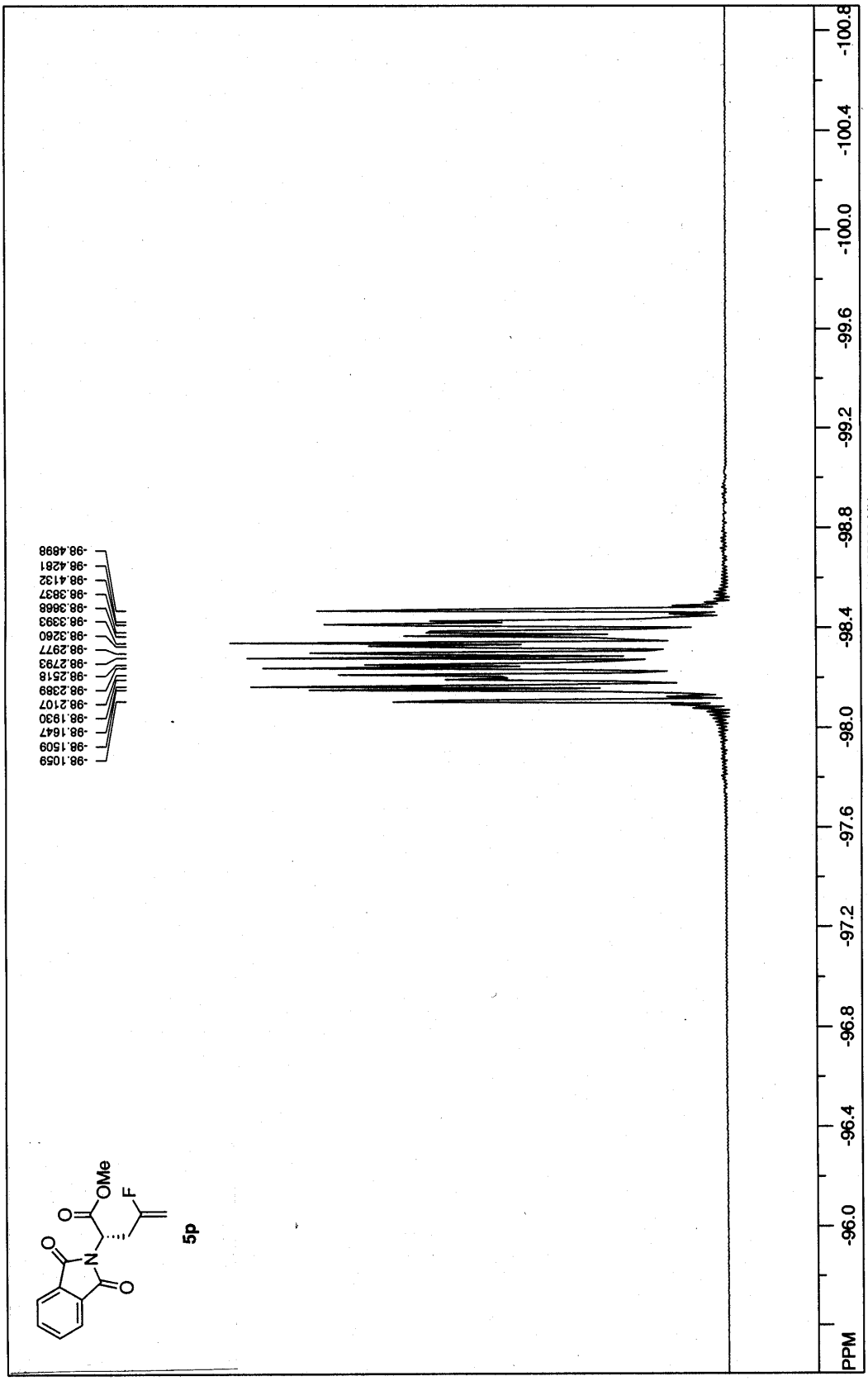
time domain size: 65536 points
width: 125000.00 Hz = 442.680235 ppm = 1.907349 Hz/pt
number of scans: 256

freq. of 0 ppm: 282.407660 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 2598.771 ppm/cm: 9.20340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-98.1647
-98.1930
-98.2107
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-98.2518
-98.2793
-98.2977
-98.3260
-98.3393
-98.3668
-98.3837
-98.4132
-98.4261
-98.4898
OMe
F
O
O
N
O
5p
PPM
-96.0
-96.4
-96.8
-97.2
-97.6
-98.0
-98.4
-98.8
-99.2
-99.6
-100.0
-100.4
-100.8
file: D:\AK-Q\1NMR\2004\Mar08\4961fid expt: <zgf_kb>
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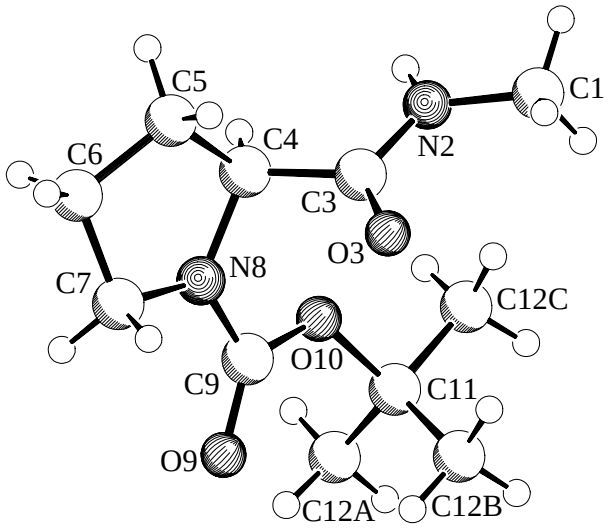
time domain size: 65536 points
width: 125000.00 Hz = 442.680235 ppm = 1.907349 Hz/pt
number of scans: 512
freq. of 0 ppm: 282.407660 MHz
processed size: 65536 complex points
LB: 0.000 GB: 0.0000
Hz/cm: 57.456 ppm/cm: 0.20348

C. X-Ray data of compounds

I. (*S*)-*tert*-Butyl 2-(methylcarbamoyl)pyrrolidine-1-carboxylate (3b)



SCHAKAL

Figure.1 X-Ray structure of **3b**

Table 1. Crystal data and structure refinement for **3b**.

Identification code	HAF2824
Empirical formula	$C_{11}\ H_{20}\ N_2\ O_3$
Formula weight	228.29
Temperature	223(2) K
Wavelength	1.54178 Å
Crystal system, space group	monoclinic, C2 (No.5)
Unit cell dimensions	a = 25.002(1) Å
	b = 6.254(1) Å β = 107.73(1)°.
Volume	1277.3(3) $Å^3$
Z, Calculated density	4, 1.187 Mg/m^3
Absorption coefficient	0.708 mm^{-1}
F(000)	496
Crystal size	0.60×0.06×0.03 mm
Theta range for data collection	3.71 to 64.65°.
Limiting indices	-24<=h<=24, -5<=k<=7, -10<=l<=9
Reflections collected / unique	2317 / 1167 [R(int) = 0.039]
Completeness to theta = 64.65	75.0 %
Max. and min. transmission	0.9791 and 0.6761
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	1167 / 1 / 153
Goodness-of-fit on F^2	1.008
Final R indices [I>2σ(I)]	R1 = 0.0421, wR^2 = 0.1087
R indices (all data)	R1 = 0.0570, wR^2 = 0.1164
Absolute structure parameter	0.2(5)
Largest diff. peak and hole	0.146 and -0.151 $eÅ^{-3}$

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

	x	y	z	U(eq)
C(1)	9127(2)	1952(8)	-2402(7)	85(2)
N(2)	8646(2)	2687(6)	-1950(5)	58(1)
C(3)	8444(2)	4665(7)	-2284(5)	54(1)
O(3)	8646(1)	5987(6)	-2987(4)	81(1)
C(4)	7914(2)	5128(7)	-1807(5)	54(1)
C(5)	7399(2)	5313(11)	-3400(6)	91(2)
C(6)	7100(2)	7323(9)	-3191(6)	79(2)
C(7)	7539(2)	8773(9)	-2196(5)	67(1)
N(8)	7935(1)	7293(6)	-1137(4)	56(1)
C(9)	8356(2)	7974(8)	147(5)	50(1)
O(9)	8434(1)	9877(5)	521(3)	64(1)
O(10)	8656(1)	6337(4)	960(3)	55(1)
C(11)	9201(2)	6679(7)	2239(5)	55(1)
C(12A)	9106(2)	7760(10)	3690(5)	76(2)
C(12B)	9594(2)	7926(10)	1538(6)	82(2)
C(12C)	9404(2)	4397(9)	2608(6)	85(2)

Table 3. Bond lengths [Å] and angles [°] for **3b**.

C(1)-N(2)	1.446(5)
N(2)-C(3)	1.334(6)
C(3)-O(3)	1.220(5)
C(3)-C(4)	1.528(5)
C(4)-N(8)	1.465(5)
C(4)-C(5)	1.569(5)
C(5)-C(6)	1.502(8)
C(6)-C(7)	1.478(6)
C(7)-N(8)	1.454(5)
N(8)-C(9)	1.340(5)
C(9)-O(9)	1.233(5)
C(9)-O(10)	1.334(5)
O(10)-C(11)	1.481(5)
C(11)-C(12A)	1.497(6)
C(11)-C(12C)	1.516(7)
C(11)-C(12B)	1.517(6)
C(3)-N(2)-C(1)	121.9(4)
O(3)-C(3)-N(2)	123.2(4)
O(3)-C(3)-C(4)	121.9(4)
N(2)-C(3)-C(4)	114.9(4)
N(8)-C(4)-C(3)	110.4(3)
N(8)-C(4)-C(5)	101.3(4)
C(3)-C(4)-C(5)	109.2(3)
C(6)-C(5)-C(4)	105.3(4)
C(7)-C(6)-C(5)	105.8(4)
N(8)-C(7)-C(6)	102.4(4)
C(9)-N(8)-C(7)	121.7(4)
C(9)-N(8)-C(4)	122.8(4)
C(7)-N(8)-C(4)	114.0(3)
O(9)-C(9)-O(10)	125.9(4)
O(9)-C(9)-N(8)	122.9(4)
O(10)-C(9)-N(8)	111.2(4)
C(9)-O(10)-C(11)	121.4(3)
O(10)-C(11)-C(12A)	109.8(3)
O(10)-C(11)-C(12C)	101.1(3)
C(12A)-C(11)-C(12C)	112.3(4)
O(10)-C(11)-C(12B)	110.0(3)
C(12A)-C(11)-C(12B)	112.6(4)
C(12C)-C(11)-C(12B)	110.5(4)

Table 4. Anisotropic displacement parameters ($Å^2 \times 10^3$) for **3b**.
The anisotropic displacement factor exponent takes the form:
$-2\,\pi^2\,[\,h^2\,a^{*2}\,U_{11} + \ldots + 2\,h\,k\,a^*\,b^*\,U_{12}\,]$

	U11	U22	U33	U23	U13	U12
C(1)	76(3)	93(4)	94(4)	3(3)	36(3)	23(3)
N(2)	62(3)	60(3)	58(2)	1(2)	24(2)	2(2)
C(3)	59(3)	60(3)	46(2)	0(2)	19(2)	-6(3)
O(3)	88(2)	74(2)	98(3)	21(2)	52(2)	7(2)
C(4)	52(3)	58(3)	49(2)	-12(2)	11(2)	-10(2)
C(5)	49(3)	149(6)	68(3)	-44(3)	10(2)	-4(3)
C(6)	74(3)	88(4)	65(3)	22(3)	8(3)	-7(3)
C(7)	60(3)	81(3)	53(2)	13(3)	7(2)	15(3)
N(8)	55(2)	66(2)	42(2)	-6(2)	6(2)	8(2)
C(9)	59(3)	51(3)	45(2)	-3(2)	21(2)	-2(2)
O(9)	85(2)	53(2)	52(2)	-5(2)	18(2)	6(2)
O(10)	51(2)	50(2)	53(2)	6(1)	2(1)	1(2)
C(11)	44(2)	65(3)	49(2)	3(2)	5(2)	-3(2)
C(12A)	69(3)	99(4)	50(3)	-4(3)	3(2)	9(3)
C(12B)	63(3)	107(4)	77(3)	9(3)	24(3)	-11(3)
C(12C)	68(3)	84(4)	83(4)	4(3)	-5(3)	12(3)

Table 5. Hydrogen coordinates ($\times 10^4$) and isotropic displacement parameters ($Å^2 \times 10^3$) for **3b**.

	x	y	z	U(eq)
H(1A)	9466	2202	-1503	128
H(1B)	9148	2728	-3361	128
H(1C)	9089	435	-2646	128
H(2)	8505(18)	1820(70)	-1330(60)	68(16)
H(4)	7850	4037	-1045	65
H(5A)	7526	5408	-4372	109
H(5B)	7152	4069	-3513	109
H(6A)	6909	7967	-4257	95
H(6B)	6820	7017	-2630	95
H(7A)	7714	9591	-2883	80
H(7B)	7385	9766	-1558	80
H(12A)	8845	6923	4076	114
H(12B)	8951	9174	3378	114
H(12C)	9460	7883	4556	114
H(12D)	9460	9384	1317	123
H(12E)	9606	7258	528	123
H(12F)	9968	7933	2319	123
H(12G)	9393	3678	1596	127
H(12H)	9163	3650	3125	127
H(12I)	9786	4402	3339	127

II. (*S*)-*N*-Methyl-2-(1,3-dioxoisoindolin-2-yl)propanamide (3h)

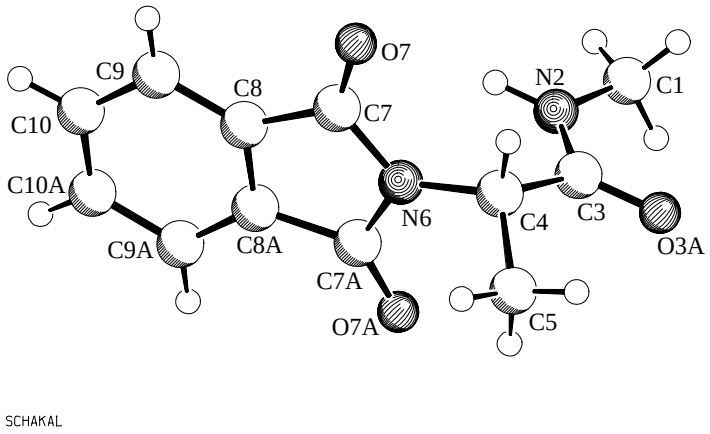


Figure 1. X-Ray structure of **3h**

Table 1. Crystal data and structure refinement for **3h**.

Identification code	HAF2882
Empirical formula	$C_{12}\ H_{12}\ N_2\ O_3$
Formula weight	232.24
Temperature	223(2) K
Wavelength	1.54178 Å
Crystal system, space group	monoclinic, Cc (No.9)
Unit cell dimensions	a = 10.929(1) Å b = 11.064(1) Å β = 96.12(1)°. c = 9.906(1) Å
Volume	1190.99(19) $Å^3$
Z, Calculated density	4, 1.295 Mg/m^3
Absorption coefficient	0.787 mm^{-1}
F(000)	488
Crystal size	0.40×0.15×0.10 mm
Theta range for data collection	8.01 to 63.59°.
Limiting indices	-12<=h<=12, -12<=k<=12, -11<=l<=11
Reflections collected / unique	1595 / 1594 [R(int) = 0.0400]
Completeness to theta = 63.59	97.9 %
Max. and min. transmission	0.9254 and 0.7436
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	1594 / 2 / 159
Goodness-of-fit on F^2	1.003
Final R indices [I>2σ(I)]	R1 = 0.0408, wR^2 = 0.1141
R indices (all data)	R1 = 0.0426, wR^2 = 0.1167
Absolute structure parameter	0.4(3)
Largest diff. peak and hole	0.216 and -0.122 $eÅ^{-3}$

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

	x	y	z	U(eq)
C(1)	5625(3)	-1116(3)	5565(3)	69(1)
N(2)	6601(2)	-234(2)	5563(2)	52(1)
C(3)	7149(2)	222(2)	6701(2)	47(1)
O(3A)	6868(2)	-67(2)	7825(2)	60(1)
C(4)	8257(2)	1054(2)	6568(2)	52(1)
C(5)	8527(4)	1889(3)	7776(3)	73(1)
N(6)	8125(2)	1715(2)	5283(2)	46(1)
C(7)	8882(2)	1535(2)	4261(2)	48(1)
O(7)	9721(2)	805(2)	4300(2)	67(1)
C(8)	8480(2)	2406(2)	3171(2)	45(1)
C(9)	8921(3)	2629(3)	1941(3)	62(1)
C(10)	8340(4)	3545(3)	1139(3)	74(1)
C(10A)	7371(3)	4195(3)	1538(3)	71(1)
C(9A)	6946(3)	3982(3)	2785(3)	60(1)
C(8A)	7499(2)	3072(2)	3573(2)	43(1)
C(7A)	7249(2)	2598(2)	4920(2)	47(1)
O(7A)	6447(2)	2906(2)	5607(2)	66(1)

Table 3. Bond lengths [Å] and angles [°] for **3h**.

C(1)-N(2)	1.445(3)
N(2)-C(3)	1.319(3)
C(3)-O(3A)	1.229(3)
C(3)-C(4)	1.538(4)
C(4)-N(6)	1.462(3)
C(4)-C(5)	1.515(4)
N(6)-C(7)	1.388(3)
N(6)-C(7A)	1.388(3)
C(7)-O(7)	1.220(3)
C(7)-C(8)	1.478(4)
C(8)-C(9)	1.379(4)
C(8)-C(8A)	1.394(4)
C(9)-C(10)	1.398(6)
C(10)-C(10A)	1.373(6)
C(10A)-C(9A)	1.385(4)
C(9A)-C(8A)	1.374(4)
C(8A)-C(7A)	1.486(4)
C(7A)-O(7A)	1.215(3)
C(3)-N(2)-C(1)	121.7(2)
O(3A)-C(3)-N(2)	122.6(2)
O(3A)-C(3)-C(4)	120.6(2)
N(2)-C(3)-C(4)	116.5(2)
N(6)-C(4)-C(5)	112.1(2)
N(6)-C(4)-C(3)	111.6(2)
C(5)-C(4)-C(3)	112.7(2)
C(7)-N(6)-C(7A)	111.12(19)
C(7)-N(6)-C(4)	123.5(2)
C(7A)-N(6)-C(4)	125.4(2)
O(7)-C(7)-N(6)	125.2(2)
O(7)-C(7)-C(8)	128.2(2)
N(6)-C(7)-C(8)	106.6(2)
C(9)-C(8)-C(8A)	120.6(2)
C(9)-C(8)-C(7)	131.1(2)
C(8A)-C(8)-C(7)	108.3(2)
C(8)-C(9)-C(10)	116.9(3)
C(10A)-C(10)-C(9)	122.2(3)
C(10)-C(10A)-C(9A)	120.7(3)
C(8A)-C(9A)-C(10A)	117.5(3)
C(9A)-C(8A)-C(8)	122.1(2)
C(9A)-C(8A)-C(7A)	131.0(2)
C(8)-C(8A)-C(7A)	106.9(2)
O(7A)-C(7A)-N(6)	124.8(2)
O(7A)-C(7A)-C(8A)	128.2(3)
N(6)-C(7A)-C(8A)	107.03(19)

Table 4. Anisotropic displacement parameters ($Å^2 \times 10^3$) for **3h**.
The anisotropic displacement factor exponent takes the form:
$-2\,\pi^2\,[\,h^2\,a^{*2}\,U_{11} + \ldots + 2\,h\,k\,a^*\,b^*\,U_{12}\,]$

	U11	U22	U33	U23	U13	U12
C(1)	82(2)	67(2)	57(2)	2(1)	1(1)	-27(2)
N(2)	68(1)	57(1)	32(1)	0(1)	6(1)	-18(1)
C(3)	66(2)	45(1)	28(1)	4(1)	6(1)	1(1)
O(3A)	85(1)	66(1)	30(1)	6(1)	11(1)	-1(1)
C(4)	62(1)	57(2)	37(1)	2(1)	-2(1)	-5(1)
C(5)	101(2)	72(2)	42(2)	-1(1)	-8(1)	-23(2)
N(6)	57(1)	45(1)	37(1)	1(1)	7(1)	-2(1)
C(7)	47(1)	48(1)	48(1)	-6(1)	7(1)	-3(1)
O(7)	57(1)	68(1)	75(1)	-6(1)	4(1)	15(1)
C(8)	46(1)	47(1)	43(1)	-3(1)	9(1)	-6(1)
C(9)	67(2)	71(2)	51(2)	-8(1)	25(1)	-13(1)
C(10)	105(2)	77(2)	40(1)	8(1)	14(2)	-32(2)
C(10A)	94(2)	59(2)	57(2)	15(1)	-3(2)	-12(2)
C(9A)	62(2)	55(2)	60(2)	4(1)	-1(1)	-4(1)
C(8A)	47(1)	42(1)	41(1)	-1(1)	6(1)	-2(1)
C(7A)	51(1)	48(1)	44(1)	-8(1)	16(1)	-7(1)
O(7A)	66(1)	74(1)	64(1)	-5(1)	31(1)	4(1)

Table 5. Hydrogen coordinates ($\times 10^4$) and isotropic displacement parameters ($Å^2 \times 10^3$) for **3h**.

	x	y	z	U(eq)
H(1A)	5960	-1870	5943	104
H(1B)	5258	-1250	4642	104
H(1C)	5003	-820	6111	104
H(2)	6810(30)	-30(30)	4720(40)	63
H(4)	8984	523	6551	63
H(5A)	9227	2397	7640	109
H(5B)	8712	1412	8594	109
H(5C)	7814	2393	7866	109
H(9)	9581	2187	1656	74
H(10)	8623	3722	298	88
H(10A)	6991	4790	959	85
H(9A)	6303	4443	3081	71

III. (*S*)-4-Fluoro-*N*-methyl-2-(1,3-dioxoisoindolin-2-yl)pent-4-enamide (3p)

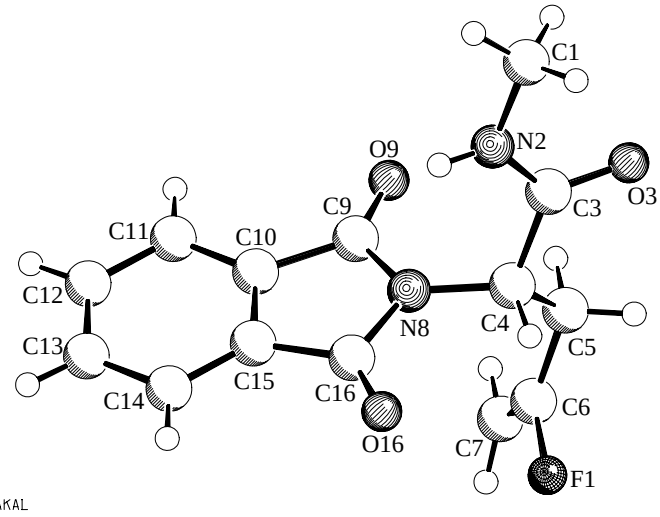


Figure 1. X-ray structure of 3p

Table 1. Crystal data and structure refinement for **3p**.

Identification code	HAF2757
Empirical formula	$C_{14}\ H_{13}\ F\ N_2\ O_3$ * 0.5 C $H_2\ CL_2$
Formula weight	318.73
Temperature	223(2) K
Wavelength	1.54178 Å
Crystal system, space group	orthorhombic, $P2_12_12_1$ (No.19)
Unit cell dimensions	a = 7.778(1) Å b = 17.538(1) Å c = 22.402(1) Å
Volume	3055.9(5) $Å^3$
Z, Calculated density	8, 1.386 Mg/m^3
Absorption coefficient	2.437 mm^{-1}
F(000)	1320
Crystal size	0.90×0.60×0.20 mm
Theta range for data collection	4.68 to 65.04°.
Limiting indices	-9<=h<=9, -20<=k<=20, -25<=l<=26
Reflections collected / unique	13926 / 5039 [R(int) = 0.042]
Completeness to theta = 65.04	98.4 %
Max. and min. transmission	0.6414 and 0.2177
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	5039 / 0 / 396
Goodness-of-fit on F^2	1.031
Final R indices [I>2σ(I)]	R1 = 0.0470, wR^2 = 0.1365
R indices (all data)	R1 = 0.0507, wR^2 = 0.1406
Absolute structure parameter	-0.03(2)
Largest diff. peak and hole	0.509 and -0.431 $eÅ^{-3}$

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

x	y	z	U(eq)	
C(1A)	8778(4)	5509(2)	2942(1)	58(1)
N(2A)	9383(3)	5611(1)	2336(1)	45(1)
C(3A)	10160(3)	6252(1)	2172(1)	39(1)
O(3A)	10343(3)	6794(1)	2513(1)	55(1)
C(4A)	10934(3)	6286(1)	1545(1)	40(1)
C(5A)	11208(4)	7115(2)	1347(1)	48(1)
C(6A)	11974(4)	7177(2)	745(1)	53(1)
C(7A)	11424(5)	7526(2)	276(1)	65(1)
F(1A)	13534(3)	6823(2)	725(1)	89(1)
N(8A)	10018(3)	5833(1)	1105(1)	39(1)
C(9A)	8394(3)	6005(2)	880(1)	40(1)
O(9A)	7529(2)	6536(1)	1045(1)	49(1)
C(10A)	8036(4)	5422(2)	418(1)	48(1)
C(11A)	6549(5)	5311(2)	82(1)	63(1)
C(12A)	6591(7)	4701(2)	-319(2)	81(1)
C(13A)	8010(7)	4247(2)	-378(2)	85(1)
C(14A)	9494(7)	4356(2)	-39(2)	77(1)
C(15A)	9448(5)	4954(2)	365(1)	54(1)
C(16A)	10767(4)	5207(2)	803(1)	54(1)
O(16A)	12167(3)	4956(2)	913(1)	75(1)
C(1B)	-791(5)	8658(2)	2659(2)	74(1)
N(2B)	512(3)	8271(2)	2996(1)	54(1)
C(3B)	1654(3)	8630(2)	3336(1)	42(1)
O(3B)	1693(3)	9325(1)	3392(1)	54(1)
C(4B)	2877(4)	8119(2)	3696(1)	43(1)
C(5B)	4481(4)	8564(2)	3906(1)	52(1)
C(6B)	5668(5)	8086(2)	4262(2)	60(1)
C(7B)	7244(6)	7935(3)	4179(3)	102(2)
F(1B)	4884(4)	7778(2)	4753(1)	123(1)
N(8B)	3337(3)	7434(1)	3369(1)	39(1)
C(9B)	2960(4)	6689(2)	3561(1)	45(1)
O(9B)	2178(3)	6533(1)	4008(1)	64(1)
C(10B)	3711(3)	6177(1)	3101(1)	42(1)
C(11B)	3685(4)	5391(2)	3055(2)	55(1)
C(12B)	4422(4)	5073(2)	2546(2)	58(1)
C(13B)	5143(4)	5518(2)	2106(2)	54(1)
C(14B)	5182(4)	6309(2)	2158(1)	49(1)
C(15B)	4457(3)	6621(2)	2661(1)	41(1)
C(16B)	4241(3)	7437(2)	2834(1)	41(1)
O(16B)	4705(3)	8006(1)	2573(1)	56(1)
C(1)	5999(7)	8362(2)	1220(2)	93(1)
Cl(1)	7887(2)	8808(1)	965(1)	116(1)
Cl(2)	4162(2)	8906(1)	1105(1)	115(1)

Table 3. Bond lengths [Å] and angles [°] for **3p**.

C(1A)-N(2A)	1.448(4)
N(2A)-C(3A)	1.327(3)
C(3A)-O(3A)	1.230(3)
C(3A)-C(4A)	1.530(3)
C(4A)-N(8A)	1.451(3)
C(4A)-C(5A)	1.535(4)
C(5A)-C(6A)	1.478(4)
C(6A)-C(7A)	1.289(5)
C(6A)-F(1A)	1.364(4)
N(8A)-C(9A)	1.393(3)
N(8A)-C(16A)	1.416(4)
C(9A)-O(9A)	1.208(3)
C(9A)-C(10A)	1.480(4)
C(10A)-C(15A)	1.376(5)
C(10A)-C(11A)	1.394(4)
C(11A)-C(12A)	1.397(5)
C(12A)-C(13A)	1.368(7)
C(13A)-C(14A)	1.395(6)
C(14A)-C(15A)	1.386(4)
C(15A)-C(16A)	1.487(5)
C(16A)-O(16A)	1.200(4)
C(1B)-N(2B)	1.436(4)
N(2B)-C(3B)	1.328(4)
C(3B)-O(3B)	1.227(3)
C(3B)-C(4B)	1.537(4)
C(4B)-N(8B)	1.451(3)
C(4B)-C(5B)	1.545(4)
C(5B)-C(6B)	1.480(4)
C(6B)-C(7B)	1.268(6)
C(6B)-F(1B)	1.368(4)
N(8B)-C(16B)	1.389(3)
N(8B)-C(9B)	1.407(3)
C(9B)-O(9B)	1.204(3)
C(9B)-C(10B)	1.486(4)
C(10B)-C(11B)	1.382(4)
C(10B)-C(15B)	1.384(4)
C(11B)-C(12B)	1.393(5)
C(12B)-C(13B)	1.375(5)
C(13B)-C(14B)	1.393(4)
C(14B)-C(15B)	1.373(4)
C(15B)-C(16B)	1.492(4)
C(16B)-O(16B)	1.213(3)
C(1)-Cl(2)	1.737(5)
C(1)-Cl(1)	1.758(5)

C(3A)-N(2A)-C(1A)	120.8(3)
O(3A)-C(3A)-N(2A)	122.4(2)
O(3A)-C(3A)-C(4A)	119.7(2)
N(2A)-C(3A)-C(4A)	117.8(2)
N(8A)-C(4A)-C(3A)	114.1(2)
N(8A)-C(4A)-C(5A)	113.0(2)
C(3A)-C(4A)-C(5A)	110.9(2)
C(6A)-C(5A)-C(4A)	112.9(2)
C(7A)-C(6A)-F(1A)	119.0(3)
C(7A)-C(6A)-C(5A)	130.2(3)
F(1A)-C(6A)-C(5A)	110.8(3)
C(9A)-N(8A)-C(16A)	111.5(2)
C(9A)-N(8A)-C(4A)	124.9(2)
C(16A)-N(8A)-C(4A)	123.2(2)
O(9A)-C(9A)-N(8A)	124.1(2)
O(9A)-C(9A)-C(10A)	130.0(3)
N(8A)-C(9A)-C(10A)	105.9(2)
C(15A)-C(10A)-C(11A)	122.1(3)
C(15A)-C(10A)-C(9A)	108.8(3)
C(11A)-C(10A)-C(9A)	129.0(3)
C(10A)-C(11A)-C(12A)	115.8(4)
C(13A)-C(12A)-C(11A)	121.8(4)
C(12A)-C(13A)-C(14A)	122.3(3)
C(15A)-C(14A)-C(13A)	116.0(4)
C(10A)-C(15A)-C(14A)	121.9(3)

C(10A)-C(15A)-C(16A)	108.4(2)
C(14A)-C(15A)-C(16A)	129.7(3)
O(16A)-C(16A)-N(8A)	124.0(3)
O(16A)-C(16A)-C(15A)	130.7(3)
N(8A)-C(16A)-C(15A)	105.3(3)
C(3B)-N(2B)-C(1B)	123.3(3)
O(3B)-C(3B)-N(2B)	123.1(3)
O(3B)-C(3B)-C(4B)	120.7(2)
N(2B)-C(3B)-C(4B)	116.0(2)
N(8B)-C(4B)-C(3B)	111.7(2)
N(8B)-C(4B)-C(5B)	111.9(2)
C(3B)-C(4B)-C(5B)	111.4(2)
C(6B)-C(5B)-C(4B)	112.4(2)
C(7B)-C(6B)-F(1B)	117.8(4)
C(7B)-C(6B)-C(5B)	130.0(4)
F(1B)-C(6B)-C(5B)	112.2(3)
C(16B)-N(8B)-C(9B)	111.8(2)
C(16B)-N(8B)-C(4B)	123.8(2)
C(9B)-N(8B)-C(4B)	124.3(2)
O(9B)-C(9B)-N(8B)	124.7(3)
O(9B)-C(9B)-C(10B)	129.7(3)
N(8B)-C(9B)-C(10B)	105.5(2)
C(11B)-C(10B)-C(15B)	121.0(3)
C(11B)-C(10B)-C(9B)	130.4(3)
C(15B)-C(10B)-C(9B)	108.6(2)
C(10B)-C(11B)-C(12B)	117.0(3)
C(13B)-C(12B)-C(11B)	121.8(3)
C(12B)-C(13B)-C(14B)	120.9(3)
C(15B)-C(14B)-C(13B)	117.2(3)
C(14B)-C(15B)-C(10B)	122.1(3)
C(14B)-C(15B)-C(16B)	130.0(3)
C(10B)-C(15B)-C(16B)	107.9(2)
O(16B)-C(16B)-N(8B)	124.8(2)
O(16B)-C(16B)-C(15B)	129.0(2)
N(8B)-C(16B)-C(15B)	106.2(2)
Cl(2)-C(1)-Cl(1)	113.3(2)

Table 4. Anisotropic displacement parameters ($Å^2 \times 10^3$) for **3p**.
The anisotropic displacement factor exponent takes the form:
$-2\,\pi^2\,[\,h^2\,a^{*2}\,U_{11} + \ldots + 2\,h\,k\,a^*\,b^*\,U_{12}\,]$

U11	U22	U33	U23	U13	U12	
C(1A)	61(2)	71(2)	42(1)	11(1)	-2(1)	-7(2)
N(2A)	55(1)	39(1)	40(1)	-1(1)	-4(1)	-5(1)
C(3A)	43(1)	38(1)	37(1)	-1(1)	-6(1)	-1(1)
O(3A)	75(1)	43(1)	47(1)	-12(1)	-3(1)	-6(1)
C(4A)	45(1)	36(1)	39(1)	1(1)	-4(1)	-4(1)
C(5A)	59(2)	39(1)	45(1)	3(1)	-1(1)	-6(1)
C(6A)	51(2)	52(2)	56(2)	6(1)	2(1)	-9(1)
C(7A)	69(2)	78(2)	49(2)	12(2)	-5(2)	-7(2)
F(1A)	58(1)	119(2)	90(1)	36(1)	18(1)	14(1)
N(8A)	46(1)	32(1)	39(1)	-2(1)	0(1)	0(1)
C(9A)	48(1)	37(1)	34(1)	5(1)	1(1)	0(1)
O(9A)	50(1)	52(1)	47(1)	1(1)	0(1)	9(1)
C(10A)	66(2)	43(2)	35(1)	4(1)	-6(1)	-10(1)
C(11A)	83(2)	64(2)	42(2)	7(1)	-18(2)	-21(2)
C(12A)	120(3)	71(3)	51(2)	2(2)	-28(2)	-32(3)
C(13A)	146(4)	61(2)	49(2)	-11(2)	-18(2)	-21(3)
C(14A)	119(3)	56(2)	57(2)	-15(2)	-2(2)	2(2)
C(15A)	81(2)	40(2)	41(1)	-4(1)	-2(1)	1(2)
C(16A)	67(2)	41(2)	53(2)	-7(1)	5(1)	7(1)
O(16A)	67(2)	66(2)	91(2)	-23(1)	-10(1)	27(1)
C(1B)	72(2)	56(2)	94(3)	-4(2)	-32(2)	5(2)
N(2B)	56(1)	35(1)	69(2)	-7(1)	-14(1)	4(1)
C(3B)	50(1)	33(1)	44(1)	-3(1)	0(1)	2(1)
O(3B)	71(1)	31(1)	59(1)	-6(1)	-12(1)	7(1)
C(4B)	54(1)	35(1)	40(1)	-5(1)	-1(1)	4(1)
C(5B)	64(2)	38(1)	52(2)	-5(1)	-13(1)	0(1)
C(6B)	71(2)	50(2)	59(2)	6(1)	-15(2)	-6(2)
C(7B)	72(3)	93(3)	140(4)	45(3)	-18(3)	-3(2)
F(1B)	126(2)	173(3)	71(1)	52(2)	-10(2)	0(2)
N(8B)	49(1)	27(1)	41(1)	1(1)	3(1)	1(1)
C(9B)	52(1)	33(1)	49(1)	7(1)	1(1)	1(1)
O(9B)	92(2)	48(1)	52(1)	12(1)	24(1)	0(1)
C(10B)	48(1)	32(1)	47(1)	1(1)	2(1)	4(1)
C(11B)	57(2)	37(2)	72(2)	1(1)	4(2)	2(1)
C(12B)	55(2)	36(2)	84(2)	-18(1)	-8(2)	8(1)
C(13B)	50(2)	51(2)	60(2)	-15(1)	-4(1)	10(1)
C(14B)	50(2)	49(2)	49(2)	-6(1)	5(1)	6(1)
C(15B)	43(1)	34(1)	46(1)	-3(1)	-2(1)	4(1)
C(16B)	46(1)	38(1)	40(1)	2(1)	-2(1)	2(1)
O(16B)	76(1)	39(1)	53(1)	9(1)	14(1)	-3(1)
C(1)	146(4)	55(2)	78(2)	6(2)	22(3)	8(2)
Cl(1)	141(1)	89(1)	118(1)	-29(1)	40(1)	0(1)
Cl(2)	121(1)	85(1)	140(1)	11(1)	-58(1)	-17(1)

Table 5. Hydrogen coordinates ($\times 10^4$) and isotropic displacement parameters ($Å^2 \times 10^3$) for **3p**.

x	y	z	U(eq)	
H(1AA)	9755	5468	3209	87
H(1AB)	8094	5048	2966	87
H(1AC)	8081	5944	3056	87
H(2A)	9290(40)	5220(20)	2130(15)	54
H(4A)	12095	6058	1577	48
H(5AA)	10099	7381	1350	57
H(5AB)	11962	7370	1635	57
H(7AA)	12096	7533	-73	78
H(7AB)	10352	7772	282	78
H(11A)	5580	5628	122	76
H(12A)	5616	4600	-554	97
H(13A)	7985	3846	-657	102
H(14A)	10468	4043	-83	93
H(1BA)	-1225	9086	2888	111
H(1BB)	-1724	8308	2573	111
H(1BC)	-303	8842	2287	111
H(2B)	640(50)	7820(20)	2941(17)	64
H(4B)	2249	7955	4059	51
H(5BA)	5093	8760	3556	62
H(5BB)	4114	9001	4147	62
H(7BA)	7834	7621	4451	122
H(7BB)	7823	8138	3847	122
H(11B)	3192	5085	3354	66
H(12B)	4427	4540	2501	70
H(13B)	5616	5284	1766	64
H(14B)	5683	6616	1862	59
H(1A)	5866	7873	1013	112
H(1B)	6116	8257	1647	112

IV. (*S*)-Methyl 2-(1,3-dioxoisoindolin-2-yl)propanoate (5h)

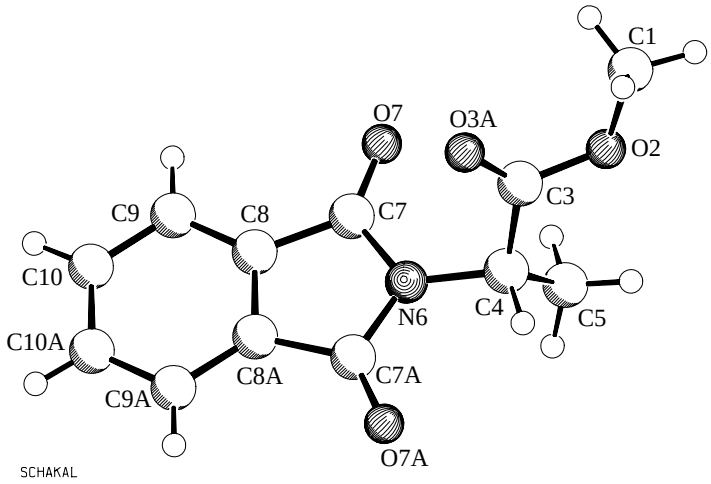


Figure.1 X-Ray structure of **5h**

Table 1. Crystal data and structure refinement for **5h**.

Identification code	HAF2888
Empirical formula	C_{12} H_{11} N O_4
Formula weight	233.22
Temperature	223(2) K
Wavelength	1.54178 Å
Crystal system, space group	monoclinic, $P2_1/c$ (No.14)
Unit cell dimensions	a = 10.300(1) Å b = 15.373(1) Å β = 98.49(1)°. c = 7.235(1) Å
Volume	1133.0(2) $Å^3$
Z, Calculated density	4, 1.367 Mg/m^3
Absorption coefficient	0.874 mm^{-1}
F(000)	488
Crystal size	0.50×0.05×0.03 mm
Theta range for data collection	5.21 to 64.98°.
Limiting indices	-11<=h<=11, -17<=k<=14, -8<=l<=8
Reflections collected / unique	10254 / 1609 [R(int) = 0.071]
Completeness to theta = 64.98	83.4 %
Absorption correction	Empirical
Max. and min. transmission	0.9743 and 0.6691
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	1609 / 0 / 156
Goodness-of-fit on F^2	1.043
Final R indices [I>2σ(I)]	R1 = 0.0764, wR^2 = 0.2084
R indices (all data)	R1 = 0.1247, wR^2 = 0.2465
Largest diff. peak and hole	0.388 and -0.262 $eÅ^{-3}$

Table 2. Atomic coordinates ($\times 10^4$) and equivalent isotropic displacement parameters ($Å^2 \times 10^3$) for **5h**.
U(eq) is defined as one third of the trace of the orthogonalized U_{ij} tensor.

	x	y	z	U(eq)
C(1)	6399(6)	1722(3)	-141(8)	89(2)
O(2)	6567(3)	1266(2)	1633(4)	66(1)
C(3)	6655(4)	401(3)	1530(7)	52(1)
O(3A)	6627(4)	10(2)	105(5)	76(1)
C(4)	6681(6)	-5(3)	3417(7)	65(2)
C(5)	7137(6)	530(3)	5101(7)	83(2)
N(6)	7353(4)	-843(2)	3432(5)	56(1)
C(7)	8652(5)	-947(3)	3102(6)	53(1)
O(7)	9359(4)	-352(2)	2797(5)	72(1)
C(8)	8928(5)	-1891(3)	3159(6)	48(1)
C(9)	10020(5)	-2356(3)	2883(6)	54(1)
C(10)	9955(5)	-3260(3)	2991(6)	63(2)
C(10A)	8826(6)	-3673(3)	3344(7)	63(2)
C(9A)	7722(5)	-3211(3)	3606(6)	54(1)
C(8A)	7799(5)	-2308(3)	3511(6)	48(1)
C(7A)	6791(5)	-1634(3)	3729(6)	53(1)
O(7A)	5678(3)	-1719(2)	4058(5)	74(1)

Table 3. Bond lengths [Å] and angles [°] for **5h**.

C(1)-O(2)	1.449(5)
O(2)-C(3)	1.337(5)
C(3)-O(3A)	1.190(5)
C(3)-C(4)	1.497(6)
C(4)-N(6)	1.462(6)
C(4)-C(5)	1.488(6)
N(6)-C(7A)	1.378(6)
N(6)-C(7)	1.402(6)
C(7)-O(7)	1.210(5)
C(7)-C(8)	1.477(6)
C(8)-C(9)	1.372(6)
C(8)-C(8A)	1.385(6)
C(9)-C(10)	1.395(7)
C(10)-C(10A)	1.382(6)
C(10A)-C(9A)	1.377(7)
C(9A)-C(8A)	1.392(6)
C(8A)-C(7A)	1.491(6)
C(7A)-O(7A)	1.212(5)
C(3)-O(2)-C(1)	115.6(4)
O(3A)-C(3)-O(2)	123.9(4)
O(3A)-C(3)-C(4)	125.1(5)
O(2)-C(3)-C(4)	110.8(4)
N(6)-C(4)-C(5)	112.9(4)
N(6)-C(4)-C(3)	108.5(4)
C(5)-C(4)-C(3)	118.6(5)
C(7A)-N(6)-C(7)	111.0(4)
C(7A)-N(6)-C(4)	124.7(4)
C(7)-N(6)-C(4)	124.3(4)
O(7)-C(7)-N(6)	124.0(5)
O(7)-C(7)-C(8)	128.9(5)
N(6)-C(7)-C(8)	107.0(4)
C(9)-C(8)-C(8A)	121.0(4)
C(9)-C(8)-C(7)	131.8(5)
C(8A)-C(8)-C(7)	107.2(4)
C(8)-C(9)-C(10)	117.6(5)
C(10A)-C(10)-C(9)	121.1(5)
C(9A)-C(10A)-C(10)	121.6(5)
C(10A)-C(9A)-C(8A)	116.9(5)
C(8)-C(8A)-C(9A)	121.8(4)
C(8)-C(8A)-C(7A)	108.3(4)
C(9A)-C(8A)-C(7A)	129.9(5)
O(7A)-C(7A)-N(6)	123.8(5)
O(7A)-C(7A)-C(8A)	129.8(5)
N(6)-C(7A)-C(8A)	106.4(4)

Table 4. Anisotropic displacement parameters ($Å^2 \times 10^3$) for **5h**.
The anisotropic displacement factor exponent takes the form:
$-2\ \pi^2\ [\ h^2\ a^{*2}\ U_{11} + ... + 2\ h\ k\ a^*\ b^*\ U_{12}\ ]$

	U11	U22	U33	U23	U13	U12
C(1)	125(5)	63(4)	73(4)	16(3)	0(4)	23(4)
O(2)	93(3)	43(2)	61(2)	3(2)	8(2)	12(2)
C(3)	56(3)	41(3)	59(3)	2(2)	7(3)	13(2)
O(3A)	103(3)	57(2)	65(3)	-9(2)	0(2)	21(2)
C(4)	78(4)	48(3)	71(4)	1(3)	18(3)	19(3)
C(5)	122(5)	64(4)	63(4)	-8(3)	9(3)	38(4)
N(6)	62(3)	40(2)	67(3)	6(2)	13(2)	8(2)
C(7)	66(4)	41(3)	51(3)	4(2)	3(3)	-11(3)
O(7)	86(3)	46(2)	84(3)	1(2)	18(2)	-13(2)
C(8)	60(3)	42(3)	40(3)	-4(2)	2(2)	-2(3)
C(9)	55(3)	58(3)	49(3)	-2(2)	6(2)	2(3)
C(10)	74(4)	57(4)	56(3)	-7(3)	4(3)	19(3)
C(10A)	92(4)	39(3)	56(3)	1(2)	2(3)	11(3)
C(9A)	69(3)	47(3)	46(3)	6(2)	3(2)	-7(3)
C(8A)	61(3)	39(3)	40(3)	3(2)	0(2)	0(3)
C(7A)	61(3)	45(3)	50(3)	6(2)	1(2)	-1(3)
O(7A)	58(2)	79(3)	84(3)	10(2)	13(2)	4(2)

Table 5. Hydrogen coordinates ($\times 10^4$) and isotropic displacement parameters ($Å^2 \times 10^3$) for **5h**.

	x	y	z	U(eq)
H(1A)	7165	1630	-751	133
H(1B)	6292	2339	72	133
H(1C)	5626	1501	-930	133
H(4)	5754	-148	3502	78
H(5A)	7036	201	6216	125
H(5B)	6617	1058	5064	125
H(5C)	8053	680	5123	125
H(9)	10785	-2075	2630	65
H(10)	10692	-3595	2820	75
H(10A)	8810	-4283	3406	76
H(9A)	6952	-3492	3840	65